

Ref:	NR/SMTH/Part/04
Issue:	18
Date:	02 December 2023
Compliance date:	02 March 2024

NR/L3/SIG/11231

NR/SMTH/Part/04

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Published and Issued by Network Rail, 2nd Floor, One Eversholt Street, London, NW1 2DN.



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WL18	Replace a Siemens Zone Controller TPWS Circuit Breaker
WL19	Replace a Siemens Zone Controller I/O Cable
WL20	Replace a Siemens Ethernet Switch Power Supply
WL21	Replace a Siemens Ethernet Switch Power Buffer Unit
WL22	Replace a Siemens AMI-SRA Modular Technicians Facility PC
WL23	Replace a Siemens BlueChip C110 Technicians Facility PC
WP01	Replace a WESTPLEX Module
WP02	Divert a Faulty WESTPLEX Cable Core
WP03	Replace a WESTPLEX LAN End of Line (EOL) Unit

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AC01		
Replace or Repair an ATP Loop (Chilterns)		
Issue No. 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check the identity of loop by physically tracing or electrically proving.
3. Check the existing loop cable is correctly labelled.
4. Check the existing loop cable has safe insulation.
5. Check any replacement cable is the correct type and is not damaged.
6. Check any replacement cable has safe insulation.

AFTER INSTALLATION WORK

7. Check the loop has been correctly installed.
8. Check that any joints are secure and sealed.
9. Test the loop transmission level is in excess of 100 μ A and record the test measurements on the record card.
10. Check the Mod/End LED is steady.
- * 11. Arrange with the Signaller to illuminate one aspect and verify that the telegrams, the Site Test Certificate and the aspect displayed correspond.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AC02		
Replace an ATP LEU (Chilterns)		
Issue No. 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Power Supply Unit, Adaptor Board, Signal Adaptor Board, Telegram Generator Board, Telegram Generator TSR Board, Modulator/Output Board, Lightning Protection Board, LEU Sub-rack
Excludes:	All other ATP Equipment

GENERAL

Immediately prior to withdrawing a plug-in LEU, touch a part of the metalwork of the associated rack with the bare hand to discharge any personal static electricity.

Do not touch any board-mounted components or tracking.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement LEU is correct type and is not damaged.

Telegram Generator & Telegram Generator TSR Boards Only

3. Check replacement LEU is fitted with correct EPROMS and labelling corresponds to signal identity.

AFTER INSTALLATION WORK

4. Check replacement LEU is correctly installed.

Modulator/Output Board Replacement Only

5. Test Loop Transmission Level [NR/SMS/PartB/Test/029](#) (ATP Equipment (Chilterns) Loop Test)) and record the test measurements on the record card, together with the reason for the test.
- * 6. Arrange with the Signaller to illuminate each aspect and verify that each of the telegrams, the Site Test Certificate and the aspect displayed correspond.
7. Check or arrange for correct labelling of LEU.
8. Replace the LEU cover.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AC03		
Replace an ATP Interface (Chilterns)		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Simple Signal Interface or Complex Signal Encoder
Excludes:	All other types of Interface.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement interface unit is correct type and is not damaged.
3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.
6. (Simple Signal Interface only). Check signal controlling the LEU is Isolated from the power supply.

AFTER INSTALLATION WORK

7. Check replacement interface unit is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement unit to the wiring diagram.
- * 10. Carry out functional checks [NR/SMS/PartC/AP12](#) (ATP Equipment (Chilterns)).
11. Check or arrange for, correct labelling of interface unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG01		
Replace an ATP Beacon (GWML)		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	GWML Beacon and Beacon Disconnection Box
Excludes:	All other ATP equipment

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement unit is not damaged.
3. Isolate existing ATP beacon in ATP enclosures.
4. [WIRE COUNT](#) beacon disconnection box to wiring diagrams.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check replacement unit has been correctly installed.
8. Check that the height of replacement beacon is 10mm ± 1mm below the top surface of the running rails.
9. Check that the replacement beacon is mounted with the centre line of the beacon offset 150mm to the left of the track centre line looking towards the signal.
10. [WIRE COUNT](#) beacon disconnection box to wiring diagrams.
11. Reconnect beacon in ATP enclosure.
- * 12. Check the beacon operates correctly (LEDs on encoder flashing 50% duty cycle as follows: Signal Beacon A-H1, Infill or Additional Beacon B-H1).
- * 13. Test beacon signal level and check messages using ATP ground tester.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG02		
Replace an ATP Loop (GWML)		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	GWML Loop Cable, TDA box and RDA box
Excludes:	All other ATP equipment

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement item is correct type and is not damaged.
3. Isolate existing ATP loop in ATP enclosures.
4. [WIRE COUNT](#) the TDA box to wiring diagrams.
5. Check existing wiring is correctly labelled.
6. Check existing wiring has safe insulation.
7. Check any replacement cable has safe insulation.
8. Test resistance of loop from TDA box end (340 to 400 ohm).

AFTER INSTALLATION WORK

9. Check item has been correctly installed.
10. Check any replacement cable is replaced as labelled.
11. Test resistance of loop from TDA box end (340 to 400 ohm).
12. [WIRE COUNT](#) the TDA box to wiring diagrams.
13. Reconnect loop in ATP enclosure.
- * 14. Test loop signal level using ATP ground tester at intervals throughout the length of the cable.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG03		
Joint/Add a Length of Cable to a ATP Loop (GWML)		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	GWML ATP loops
Excludes:	All Other ATP Loops

General

- Where an additional length of loop requires termination in TDA or RDA boxes - use [NR/SMTH/Part04/CA03](#) (Renew a Cable or Wire).
- For renewal of terminations in TDA & RDA boxes - use [NR/SMTH/Part04/CA01](#) (Remove and Refit a Cable Core or Wire).

BEFORE INSTALLATION WORK

1. Check identity of loop by physically tracing or electrically proving.
2. Isolate loop in ATP enclosure.
3. Check any length of cable to be added is correct type and is not damaged.
4. Check any length of cable to be added has safe insulation.

AFTER INSTALLATION WORK

5. Check joint(s) secure and sealed.
6. Test resistance of loop from TDA box end (340 to 400 ohm).
7. Reconnect loop in ATP enclosure.
- * 8. Test loop signal level using ATP ground tester at intervals throughout the length of the cable.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG04		
Replace an ATP Encoder (GWML)		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	GWML ATP Encoders
Excludes:	All Other ATP Encoders

BEFORE INSTALLATION WORK

1. Check replacement encoder is correct type and is not damaged.
2. Check existing encoder is isolated from supply.
3. Remove and retain the parameter plugs from the existing encoder.

AFTER INSTALLATION WORK

4. Check replacement encoder is correctly installed.
5. Check parameter plugs installed in correct position on encoder.
6. Reconnect the supply to the encoder.
7. Reset replacement encoder BITE memory using ATP ground tester.
- * 8. Check replacement encoder operates correctly.
- * 9. Test the messages transmitted by the signal beacon against the encoder parameterisation sheets for all aspects and routes.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG05		
Replace an ATP Parameter Plug (GWML)		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	GWML Main Parameter Plug, No SR Plug, TSR Plug & ESR Plug
Excludes:	All other ATP equipment

BEFORE INSTALLATION WORK

1. Check replacement plug is correct type and is not damaged.
2. Check replacement plug is correctly labelled.
3. Check encoder is isolated from power supply.
4. Remove parameter plug to be replaced, from encoder.

AFTER INSTALLATION WORK

5. Check replacement plug is installed in correct position on encoder.
6. Reconnect the power supply to the encoder.
7. Check encoder operates correctly.
8. Test the messages transmitted by the signal beacons as follows:
 - a) No SR plug – confirm a message is present.
 - b) ESR plug – confirm message contains ESR component.
 - c) TSR plug - test message for relevant route(s) against included parameterisation sheets.
 - d) Main parameter plug - test message against parameterisation sheets for all aspects and routes.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AG06		
Replace an ATP LIT (GWML)		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	GWML ATP LIT
Excludes:	All other ATP Equipment

BEFORE INSTALLATION WORK

1. Check replacement ATP LIT is correct type and is not damaged.
2. [WIRE COUNT](#) existing ATP LIT to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing ATP LIT is Isolated from the supply.

AFTER INSTALLATION WORK

5. Check replacement ATP LIT is correctly installed.
6. [WIRE COUNT](#) replacement ATP LIT to the wiring diagram.
- * 7. Test ATP LIT output voltage (Grey body 16-32V, Black body 32-40V).
8. Check signal aspect relevant to replaced ATP LIT illuminates.
9. Check, or arrange for, correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AP01		
Replace a TPWS Plug-in Module		
Issue No: 06	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Overspeed Sensor Modules, Train Stop Modules, Signalling Interface Modules.
Excludes:	Transmitter loops, Self-Powered OSS Modules (SPOSM)

***** INDEPENDENCE EXEMPT *****

BEFORE INSTALLATION WORK

1. Check replacement TPWS module is Correct Type and is Not Damaged (colour and pin code) and has no bent or miss-aligned spring contacts.
2. Check replacement TPWS module mod state is correct.
3. Check plugboard is free of contamination.
4. Check replacement TPWS module is correctly sealed.
5. Check existing TPWS module is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check spades are locked in the plugboard.
7. Check replacement TPWS module is Correctly Installed and the retaining clip is in place.
- * 8. Apply [NR/SMS/PartB/Test/231](#) - TPWS Transmitter Loop Test (following Failure) to the equipment.
9. Check, or arrange for, Correct Labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AP02		
Replace or Repair a TPWS Transmitter Loop		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	TPWS trigger and arming loops associated with Train Stop and Overspeed Sensor Modules (including SPOSM)
Excludes:	All other transmitter loops

GENERAL

• The arming loop is the first loop which the train runs over in the direction of travel for which the loops are provided, and the trigger loop is the second loop.

• In some cases, there may be another loop between the arming and trigger loops, which forms part of a pair of loops provided for trains running in the opposite direction.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).

2. Check replacement loop is correct type and is not damaged.

It is very important that buffer stop mini-loops are not replaced with standard TPWS transmitter loops and vice versa.

3. Record existing loop position on the record card, together with the reason for the test.

It is very important that all the replacement loops are installed in the correct positions (see location diagrams).

If necessary, mark the bearers/sleepers or carefully measure the distances between loops, signals and loops etc, before the removal of the existing loops.

4. Check replacement loop connection and plug coupler has safe insulation.

5. Check replacement loop is correctly labelled.

6. Test that replacement loop resistance is less than 10 ohm and that each core is isolated from the screen.

This shall only be done using a digital multi-meter (DMM) and not a high voltage insulation tester (e.g. Megger).

7. Check existing loop is isolated from the supply.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AP02		
Replace or Repair a TPWS Transmitter Loop		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

8. Check replacement loop is correctly installed (no metallic debris, correct position and correct track).

Transmitter loops shall be installed at the correct height below rail level, see [NR/SMS/PartZ/Z08](#) (Train Protection - Reference Values).

9. Check that each loop is connected to its correct module, as shown on the location wiring diagrams.

It is vital that each loop is connected back to its correct terminations in the TPWS enclosure or apparatus case and in particular that arming loop and trigger loop tail / feeder cables are not crossed over, particularly if the disconnection box has been disturbed.

10. Check security of the replacement loop (mountings).

11. Check the plug coupler to verify that no metallic dust, moisture or other contaminants exists between the two halves before reconnecting.

- * 12. If this work has been triggered by a "Failure" carry out [NR/SMS/PartB/Test/231](#) (TPWS Module or Transmitter Loop Test (following failure)).

- * 13. If this work has been triggered by "Track Renewal Work" carry out [NR/SMS/PartB/Test/232](#) (TPWS Module or Transmitter Loop Test (following Pway Work)).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AP04		
Replace a TPWS Baseplate or Trackside Enclosure Plugboard Panel		
Issue No: 07	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	TPWS Trackside Enclosure Plugboard Panels, TPWS Baseplates.
Excludes:	All other TPWS Equipment

BEFORE INSTALLATION WORK

1. Check replacement baseplate or plugboard is Correct Type and is Not Damaged.

Baseplates and Plugboard Panels that have the facility for both the OSS and TSS to be suppressed by energisation of the Suppression input are labelled “OSS Suppression Enabled”.

It is very important that an installation with OSS Suppression is not replaced with “non-OSS Suppression Enabled” equipment.

2. WIRE COUNT the existing baseplate or plugboard to wiring diagram.
3. Check that existing wiring has Safe Insulation.
4. Check that existing wiring is Correctly Labelled.
5. Check existing baseplate or plugboard is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement baseplate or plugboard is Correctly Installed.
7. Check wiring is replaced as labelled.
8. WIRE COUNT the replacement baseplate or plugboard to the wiring diagram.
9. Check all links and the fuse or MCB that are part of the circuit and baseplate are correctly replaced and secure.
10. Check the TPWS modules fitted to the baseplate or plugboards are correctly installed and the retaining clip is in place.
11. Carry out [NR/SMS/PartB/Test/231](#) - TPWS Transmitter Loop Test (following Failure)
12. Check, or arrange for, Correct Labelling of the baseplate or plugboard.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AP05		
Replace a TPWS Failure Indication Unit (FIU)		
Issue No: 06	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	TPWS Failure Indication Unit (F.I.U.) Master Unit and Slave Unit, for use in Mechanical Signal Boxes.
Excludes:	All other TPWS equipment.

BEFORE INSTALLATION WORK

1. Check replacement FIU is Correct Type and is Not Damaged.
2. WIRE COUNT the existing FIU to wiring diagram.
3. Check that existing wiring has Safe Insulation.
4. Check that existing wiring is Correctly Labelled.
5. Check existing FIU is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement FIU is Correctly Installed and positioned.
7. WIRE COUNT the replacement FIU to the wiring diagram.
8. Check that the End Termination Plug is correctly attached to the top most FIU.
9. Carry out [NR/SMS/PartB/Test/234](#) - TPWS Failure Indication Unit Test.
10. Check or arrange for Correct Labelling of the FIU.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW01		
Replace an AWS Permanent Magnet		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Depot test magnets, Speed Restriction Magnets
Excludes:	Vortok depot test magnets

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement magnet is correct type and is not damaged.

AFTER INSTALLATION WORK

3. Check replacement magnet is correctly installed.
4. Check the lateral position and height of replacement magnet above or below rail level. For further information see [NR/SMS/PartZ/Z08](#) (Train Protection - Reference Values).
5. Test replacement magnet. Carry out [NR/SMS/PartB/Test/024](#) (AWS Tests) and record the test measurements on the record card together with the reason for the test.

NOTE: For details of measuring depot test magnet strengths, see [NR/GN/SIG/19040](#).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW02		
Replace an AWS Electro-Inductor		
Issue No: 10	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	All electro and suppressor inductors
Excludes:	None

GENERAL

Both Electro and Suppressed magnets can be supplied with Mil 5015 plug coupled connection.

When testing a plug coupled unit, use a "Breakout box". Meter leads or prods shall not be brought into contact with the plug coupled pins or sockets.

Vortok AWS magnets are designed with internal spark quench diodes, there is no requirement for external spark quench diodes in the design.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement inductor is correct type and is not damaged.
3. Carry out a [WIRE COUNT](#) of the existing inductor to the wiring diagram.
4. If provided, remove plug coupler dust cap and check socket is clear of obstruction.
5. Check existing wiring has safe insulation.
6. Carry out [INSULATION TEST](#) replacement inductor (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing inductor is Isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement inductor is correctly installed.
10. Check wiring is replaced as labelled.
11. If provided, check that the plug coupler is free from damage and securely latched.
12. Carry out a [WIRE COUNT](#) of the replacement inductor to the wiring diagram.
13. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW02		
Replace an AWS Electro-Inductor		
Issue No: 10	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- 14. Carry out [EARTH TEST \(DC\)](#) supplies when replacement inductor energised.
- 15. Check the lateral position and height of replacement inductor above or below rail level. For further information refer to [NR/SMS/PartZ/Z08](#) (Train Protection - Reference Values).
- * 16. Carry out [NR/SMS/PartB/Test/024](#) (AWS Tests) and record the test measurements on the record card together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW03		
Replace a TrainStop/Trip Cock Tester		
Issue No: 07	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Hydraulic and Pneumatic TrainStop/Trip Cock Tester
Excludes:	Indusi Trainstop

BEFORE INSTALLATION WORK

1. Check replacement unit is correct type and is not damaged.
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) replacement unit (minimum 2M ohm terminals to case).
5. Check existing wiring and hoses are correctly labelled.
6. Check existing unit is Isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement unit is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement unit to the wiring diagram.
10. Check terminations are secure and suitably protected.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
- * 12. Test voltage with supply restored.
13. Check wires, cables and hoses are clear of moving parts and are secured.
14. Check hoses are installed as labelled.
15. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where the supply designed to be earth free.
16. TRIP COCK TESTERS ONLY. Carry out [NR/SMS/PartB/Test/177](#) (Treadle - Gauge Test).
- * 17. Carry out [NR/SMS/PartB/Test/044](#) (Mechanical Treadle Timing and Adjustment Test).
18. TRAINSTOPS ONLY. Test down detection with arm proving linkage disconnected.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW03		
Replace a TrainStop/Trip Cock Tester		
Issue No: 07	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

19. TRAINSTOPS ONLY. Carry out [NR/SMS/PartB/Test/026](#) (Trainstop Calibration Test).
- * 20. Test (gauge) unit (height above rail level, positioning).
- * 21. TRAINSTOPS ONLY. Test detection corresponds with the arm position for both up and down positions of the Trainstop arm.
22. TRIP COCK TESTERS ONLY. Test detection corresponds with the indication for both the raised and operated positions of the ramp/treadle arm.
23. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW04		
Replace a Trainstop Power Pack		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Hydraulic
Excludes:	All other types

BEFORE INSTALLATION WORK

1. Check replacement Trainstop power pack is correct type and is not damaged.
2. [WIRE COUNT](#) existing Trainstop power pack to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) the replacement Trainstop power pack (minimum 2M ohm terminals to case).
5. Check existing wiring and hoses are correctly labelled.
6. Check existing Trainstop power pack is Isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement Trainstop power pack is correctly installed.
8. Check wiring and hoses are replaced as labelled.
9. [WIRE COUNT](#) replacement Trainstop power pack to the wiring diagram.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
11. Check wires and cables are clear of moving parts.
12. Check cable is secured.
13. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where supplies are designed to be earth free.
- * 14. Check detection corresponds with arm position for both up and down positions of the Trainstop arm.
15. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW05		
Replace an Indusi Trainstop		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Train-stop associated with a stop signal; Train-stop associated with speed control
Excludes:	Mechanical Train-stop equipment, Train-stop associated with speed control where re-railing is taking place

General

- This test plan only applies on Network Rail Lines where NEXUS 'METRO' Trains operate.

BEFORE REPLACEMENT WORK

1. Using a scribe, mark position of existing Indusi train-stop on the rail.
2. Check replacement trainstop is correct type and is not damaged.
3. [WIRE COUNT](#) existing trainstop to the wiring diagram.
4. Check that any existing wiring has safe insulation.
5. [INSULATION TEST](#) replacement Indusi train-stop (minimum of 2M ohm terminals to case).
6. Check any existing wiring is correctly labelled.
7. [INSULATION TEST](#) existing cable if reused.

AFTER INSTALLATION WORK

8. Check that replacement trainstop is lined up to the scribe mark.
9. Check replacement Indusi train-stop is correctly installed and level.
10. Gauge the trainstop.
 - The running edge to longitudinal centre line of magnet: 220±5mm.
 - The top of the trainstop shall be level with crest of the rail, or 0-10mm below crest of rail level.
11. Check wiring is replaced as labelled.
12. Check that all cables are correctly located, secured and free from damage, particularly where the cable passes under rails.
13. [WIRE COUNT](#) replacement trainstop to the wiring diagram.
14. Check terminations are secure and suitably protected.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AW05		
Replace an Indusi Trainstop		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

15. Check entry cable is secured and the Indusi train-stop wiring is not susceptible to mechanical damage.
16. Check that the Indusi Trainstop is mounted centrally in the ballast bay, or near the fastening first approached by normal traffic. Rectify as necessary.
17. Check that the Indusi train-stop and its fixings are clear of ballast.
- * 18. Using Trainstop tester test the trainstop and record the results along with the reason for the test on the record card.
19. Check or arrange correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX01		
Replace an AzL 70, 70/30 and 70/30s Evaluator Card		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Thales AzL 70, 70/30 and 70/30s Axle Counter Evaluator Card
Excludes:	AzLM, AzLE and any other types of Axle Counter Evaluator Card

GENERAL

Before any work is undertaken the following shall be undertaken:

- a) Take possession of the relevant axle counter section.
- b) Disconnection of the output of the evaluator to the signalling system.**
- c) Appropriate electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check replacement evaluator card is correct type and is not damaged.

AFTER INSTALLATION WORK

3. Check replacement evaluator card is correctly installed.
4. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply.
- * 5. Carry out [NR/SMS/PartC/AX11](#) (Axle Counter AzL70) – Part 3 (Evaluator) or [NR/SMS/PartC/AX12](#) (Axle Counter AzL70/30) – Part 3 (Evaluator) and record the test measurements on the record card, together with the reason for the test.
- * 6. Check evaluator is reset, see [NR/SMS/PartC/AX00](#) (Axle Counters General).
- * 7. Check with Signaller that the axle counter section is clear, before reconnection of evaluator to TPR (this shall be undertaken after steps 05 and 06).
8. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX02		
Replace an AzL 70, 70/30 and 70/30s Count Head or Lineside Amplifier		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	AzL 70, 70/30 and 70/30s Count Head or Lineside Amplifier
Excludes:	SK30H or SK30K Rail Contacts connected to a EAK30H or EAK30K. Any Other Type of Axle Counter count Head or Lineside amplifier

GENERAL

Before any work is undertaken the following shall be undertaken:

- a) Take possession of the relevant axle counter section.
- b) Disconnection of the output of the evaluator to the signalling system.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

For Further Information see [SMS Appendix 15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check that the affected section is correctly isolated the equipment from the interlocking.
3. Check replacement head or lineside amplifier is correct type and is not damaged.
4. [WIRE COUNT](#) existing head or lineside amplifier to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check replacement head or lineside amplifier is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) the replacement head or lineside amplifier to the wiring diagram.
10. Check cable is secured.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX02		
Replace an AzL 70, 70/30 and 70/30s Count Head or Lineside Amplifier		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

11. Carry out [NR/SMS/PartB/Test/042](#) (Axle Counters Dummy Wheel Test - AzL 70, 70/30, 70/30s) and record the test measurements on record card together with the reason for the test.
12. Test evaluator (BUPL, SIPL and battery voltage), carry out [NR/SMS/PartC/AX11](#) (Axle Counter AzL70) or [NR/SMS/PartC/AX12](#) (Axle Counter AzL70/30).
13. Check evaluator is reset, See [NR/SMS/PartC/AX00](#) (Axle Counters General).
14. Check with Signaller that the axle counter section is clear, before reconnection of evaluator to TPR (this shall be done only after steps 11, 12 and 13 are all complete).
15. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX03		
Replace a SK30H Rail Contact (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	SK30H Rail Contacts
Excludes:	All other types of Rail Contact

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

- | New rail fixing nuts and bolts shall be used when replacing a rail contact.
- ⋮ Cables are supplied connected and sealed to the rail contact unit.
- | Where a Rail Contact Adapter (RCA) is used the maximum distance between the Rail Contact and EAK is 30m.
- | The 8m rail contact cable shall not be used with the RCA.
- ⋮ The Signaller is responsible for restoring the axle counter section.
- ⋮ For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

- | 1. For Missing Equipment Only: Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- | 2. Check that the replacement rail contact is of the correct type and is not damaged.
- | 3. Power down and isolate the EAK.
- | 4. [WIRE COUNT](#) (including the screen) the existing rail contact cable to the wiring diagram.
- | 5. Check the existing wiring has safe insulation.
- | 6. Check the existing wiring is correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX03		
Replace a SK30H Rail Contact (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

7. Check that the orientation of the replacement rail contact is correct to the reference (normal) direction of travel (SK1-SK2) see [NR/SMS/PartC/AX15](#) (Axle Counter Thales AzLM).
8. Check the position of the replacement rail contact in respect of clearance points, joints, welds etc. See [NR/SMS/PartC/AX00](#) (Axle Counters General).
9. Check the replacement rail contact is correctly installed and secure, see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
10. Confirm that new rail fixing nuts and bolts have been used.
11. Check (if provided) the protection plates and flux plates are correctly installed and secure.
12. [WIRE COUNT](#) (including the screen) the replacement rail contact to the wiring diagram.
13. Check the cable screen is clamped correctly.
14. Check that the cable cores from the cable clamp to the terminals are twisted together.
15. Check that the cable is correctly labelled, secured and correctly routed.
16. Remove any litter and metallic objects near the replacement rail contact.
17. Check the power is restored to the EAK.
18. Test the replacement rail contact [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM)) and record the test measurements on the record card, together with the reason for the test.
19. Test the replacement rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).
20. Check the security of the unit and any padlocks, where fitted.
 - **NOTE:** For Torque settings see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
21. With the Signaller's permission, reconnect the section disconnection link(s).
22. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
23. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX04		
Replace a EAK30H Unit (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	EAK30H Lineside Junction Box, EAK30H Sub Rack
Excludes:	All other EAK Junction Boxes, EAK30H Digital Board and Analogue Board

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Reference [NR/SMTH/Part04/AX05](#) (Replace an EAK30H Board (AzLM) - Appendix A - Card Compatibility Tables).

The EAK30H shall be powered down for this task by disconnection of the power supply at the REB or the local supply.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

- Each detection point has a unique address set by DIP switches inside the unit.

- Replacement junction boxes or sub racks need to have their DIP switch settings copied from the original box or rack, or the evaluator will not recognise the new unit.

- The DIP switch settings can also be found on the location diagrams.

- The Signaller is responsible for restoring the axle counter section.

- For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the EAK unit is isolated from the power supply.
2. Check that the replacement EAK or sub rack is of correct type and is not damaged.
3. [WIRE COUNT](#) (including the screen) the existing unit to the wiring diagram.
4. Check the Earth Bonding corresponds to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring and connectors are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX04		
Replace a EAK30H Unit (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

7. Check the replacement unit is correctly installed and secure.
8. Check that the DIP switch settings correspond with the address code indicated on the diagrams. The analogue card shall need to be physically removed to access the switches.
9. Check that the earth bond is correctly installed and test the continuity from the unit to earth.
10. Check that the wiring and connectors are replaced as labelled and are secure.
11. Check the cable screen is clamped correctly.
12. [WIRE COUNT](#) (including the screen) the replacement unit to the wiring diagram.
13. Restore the power to the EAK.
14. Test the replacement unit [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM) and record the test measurements on the record card, together with the reason for the test.
15. Test the replacement rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).
16. Check the torque setting of the EAK lid bolts and base plate, see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
17. Check the security of the unit and any padlocks, where fitted.
18. With the Signallers' permission, reconnect the section disconnection link(s).
19. Observe that the section is successfully restored to normal operation.
20. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX05		
Replace an EAK30H Board (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	EAK30H Digital (evaluator) and Analogue (rail contact) Boards
Excludes:	EAK30H Unit and Sub rack, any other board or card in other EAK units

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The EAK30H shall be powered down for this task by disconnection of the power supply at the REB or the local supply.

The unit shall not be powered up with any of the boards missing.

The digital board is 'plug and go', but replacement of the analogue board will require adjustment of the rail contacts.

The Signaller is responsible for restoring the axle counter section.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the EAK unit is correctly Isolated from the power supply.
2. Check that the replacement board is correct type or equivalent (see "Appendix A" below) and is not damaged.

NOTE: *Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAK(s). Where it is planned to upgrade from ISDN to DSL refer to "Appendix A" to check compatability with each detection point controlled by each serial card.*

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX05		
Replace an EAK30H Board (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

3. Check the replacement unit is correctly installed and secure.
4. Restore the power to the EAK unit.
5. With the Signallers' permission, reconnect the section disconnection link(s).
6. Observe that the section is successfully restored to normal operation.

For Analogue Boards Only

7. Test the operation of the replacement board [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM) and record the test measurements on record card together with the reason for the test.

⋮ Replacement of the analogue board might require adjustment of the rail contacts.

8. Test the replacement rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).

APPENDIX A - Card Compatibility Tables

Analogue Board

Version	Board Name	Compatible With	Board Name
3CR 01836 AEAB	Analogue board	3FW 18601 AEAB (#1)	High Power Analogue Board
3CR 01836 AFAA	Analogue board	3FW 18601 AEAB (#1)	High Power Analogue Board (H or K type)
3CR 31011 AFAA	24v Analogue board	3CR 31011 AFAA	24v Analogue board
3FW 18602 AEAB	Analogue board (RCA)	3FW 18602 AEAB	Analogue board (RCA)

Table 1 - Analogue Board

⋮ #1 When upgrading Analogue Boards to the high power variant, consideration should be taken into the increased power requirements of the high-power board.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX05		
Replace an EAK30H Board (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Evaluator (Digital) Board (3CR 01859XXXX)

Version	Board Name	Compatible With
DAAB	Evaluator Board with ISDN	DBAA DBAB DBAA
DBAA	Evaluator Board with ISDN (*) and 4ms Software (Former DAAC Board)	DBAA DBAB DBAA
DBAB	Evaluator Board with ISDN (*) and 4ms Software (Former DAAB Board)	DBAB DBAA
EAAA(#2)	Evaluator board EAK30H, DSL, 2.4ms (380KM/H) Software	EAAA EBAA
EBAA(#2)	Evaluator board EAK30H, DSL, 4ms (250KM/H) Software	EBAA EAAA

Table 2 - Evaluator Board (Digital Board)

#2 Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAK(s). Where it is planned to upgrade from ISDN to DSL, the evaluator hard ware (Serial Cards) and EAK hardware (Digital Cards or K-Type EAK) will need to be replaced at the same time to check compatability.

The DSL transmission requires the SCC CPU's to be installed (version 7HA 10057 ABAA). Where fitted, the V.24 converters are utilised also need to be upgraded from ISDN to DSL.

NOTE: Where two EAK's are controlled from one serial card, the Digital Card in both EAK's will need to be replaced (or the EAK in the case of a K style EAK).

NOTE: Mixed configuration of ISDN / DSL transmission within the same ACE is supported.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX06		
Replace a EP/EPCM CPU Card (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	AzLM EC/EPCM CPU Card
Excludes:	AzLM Evaluator Serial and Parallel Cards any other axle counter evaluator or their cards

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The evaluator shall be powered down for this task by disconnection of its power supply.

Some installations have a '2 out of 3' system where the removal of one CPU card will not affect the working of the other two. If you are in doubt about the installation, ask your SM(S).

CPU boards are uniquely identified to include the data version number, replacement boards shall be operating the same site specific version of geographic data as the one they are replacing otherwise the evaluator might shut down.

The Installed Software Status Record (ISSR) will tell you the status of the installed site specific software.

The connection of a laptop with the diagnostic software will also identify the installed site specific software.

The Signaller is responsible for resetting the axle counter.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the evaluator is correctly isolated from the power supply.
3. Check that the replacement CPU(s) board is of the correct type and is not damaged.
4. Check for correct compatibility of CPUs and Flash Cards.
5. Check that the original / replacement compact flash card status corresponds with the Installed Software Status Record (ISSR).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX06		
Replace a EP/EPCM CPU Card (AzLM)		
Issue No: 08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

6. Check the replacement CPU card is correctly installed and secure.
7. Restore the power to the evaluator.
8. Check that the software version of the replacement CPU card corresponds with that of the original by use of a laptop with the diagnostic software.
9. Check that the affected axle counter sections are disturbed by use of a laptop with the diagnostic software.
10. Check that the correct serial and parallel I/O card LEDs are illuminated.
11. Check that the alphanumeric display on the CPU shows a rotating bar.
12. With the Signaller's permission, reconnect the section disconnection link(s).
13. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX07		
Replace an ACE Serial/Parallel Card (AzLM)		
Issue No:08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	AzLM Evaluator I/O Serial and Parallel Cards
Excludes:	CPU Cards and any other axle counter evaluator or their cards

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The Signaller is responsible for restoring the axle counter section.

The evaluator does not require to be powered down for this task.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the replacement card is correct type or equivalent (see “Appendix A” below) and is not damaged.

NOTE: Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAK(s). Where it is planned to upgrade from ISDN to DSL refer to “Appendix A” to check compatibility with each detection point controlled by each serial card.

AFTER INSTALLATION WORK

2. Check the replacement card is correctly installed and secure.

Check that the correct serial and parallel I/O card LEDs are illuminated [LED indications [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems)].

3. Where NT/LT communication is implemented, check the correct operation of any affected serial I/O cards at adjacent ACE’s by use of diagnostics.

4. With the Signallers’ permission, reconnect the output of the affected section(s) to the signalling system.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX07		
Replace an ACE Serial/Parallel Card (AzLM)		
Issue No:08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

APPENDIX A - Card Compatibility Table

ISDN Serial I/O cards (3CR01881xxxx)		
Version	Compatible with preferred choice	Alternative Choice
RAAA (NT/NT)	RAAA (NT/NT)	QBAA (Configurable), PCAA
RBAA (NT/LT)	RBAA (NT/LT)	QBAA (Configurable)
PCAA (NT/NT)	PCAA (NT/NT) or RAAA (NT/NT)	QBAA (Configurable)
QBAA (configurable)	QBAA (configurable) (#1)	RAAA, RBAA, PCAA (#1)
PFAC (NT/LT)	PFAC (NT/LT)	

#1 If in doubt on NT/LT configurable compatibility consult your SM(S).

DSL Serial I/O cards (3CR01881xxxx)	
Version	Compatible with
TAAA	TAAA (#2)
QAAA	QAAA (#2)

#2 Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAKs. Where it is planned to upgrade from ISDN to DSL, the evaluator hardware (Serial Cards) and EAK hardware (Digital Cards or K-Type EAK) will need to be replaced at the same time to check compatibility. This will be treated as extensive and simultaneous.

The DSL transmission requires the SCC CPU's to be installed (version 7HA 10057 ABAA). Where fitted, the V.24 converters are utilised will also need to be upgraded from ISDN to DSL.

NOTE1: Where two EAK's are controlled from a single serial card, the Digital Cards in both EAK's will need to be replaced or the EAK in the case of a K style EAK.

NOTE2: Mixed configuration of ISDN / DSL transmission within the same ACE is supported.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX07		
Replace an ACE Serial/Parallel Card (AzLM)		
Issue No:08	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Parallel card (3CR01893xxxx)		
Version	Compatible with preferred choice	Alternative Choice
QEBB (1 vital input (GF/GF))	QEBB	QAAA, QEAC
PEBB (2 vital input GF/GF)	PEBB	PEAC, PDBB, PDAC, PAAA
REBB (2 vital inputs GF/GB)	REBB	NA
QAAA (1 vital input GF/GF)	QAAA	QEAC
PDAC (2 vital input GF/GF)	PEBB	PEAC, PDBB, PDAC, PAAA
PAAA (2 vital inputs GF/GF)	PEBB	PEAC, PDBB, PDAC, PAAA
PDBB (2 vital inputs GF/GF)	PEBB	PEAC, PDBB, PDAC, PAAA
QEAC (1 vital inputs GF/GF)	QEBB	QEAC
PEAC (2 vital inputs GF/GF)	PEBB	PEAC PDBB, PDAC, PAAA

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX08		
Remove and Refit Rail Contact (All Azi & AzLM)		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	All Thales (AzL) Rail Contacts that are removed and refitted without disconnection of the cable to the EAK for Track Engineering Work.
Excludes:	Replacement of a Thales (AzL) Rail Contact.

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

- ⋮ The Signaller is responsible for restoring the axle counter section.
- ⋮ For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the rail contact is not damaged, is the correct type and is correctly labelled.
2. Check that the affected section is correctly isolated from the Interlocking.
3. Power down and isolate the EAK.
4. Check the position of the rail contact using the wheel detection point position record, if this is not available measure the rail contact from a datum point that is not going to change during the work. This shall include details relating to which rail the contact is fitted on and its orientation.

AFTER INSTALLATION WORK

5. Check that the orientation of the refitted rail contact is correct to the reference direction of travel (SK1-SK2) [Direction of travel ([NR/SMS/PartC/AX11](#), [NR/SMS/PartC/AX12](#) & [NR/SMS/PartC/AX15](#))].
6. Check the position of the refitted rail contact in relation the Axle counter head site form or Datum point recorded in step 4.
7. The rail contact shall not be located within 1m of block joints, ½ m of a weld & 2m of another rail contact.

⋮ **NOTE:** *This step is not applicable for Birmingham New Street*

8. In areas fitted with redundant rail contacts, check that the second head is located as per the requirements of the Wheel Detection Point Position Record.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX08		
Remove and Refit Rail Contact (All Azi & AzLM)		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

9. Check the refitted rail contact is correctly installed and secure, see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
10. Check (if provided) the protection plates and flux plates are correctly installed and secure.
11. Check the power is restored to the EAK.
12. Test the refitted rail contact, [NR/SMS/PartB/Test/042](#) (Axle Counters Dummy Wheel Test – Azi 70, 70/30, 70/30S) or [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM)) and record the test measurements on the record card, together with the reason for the test.
13. Test the refitted rail contact [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM)) and record the test measurements on the record card, together with the reason for the test.
14. Test the refitted rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).
15. Check the security of the unit and any padlocks, where fitted. For Torque setting see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
16. With the Signaller's permission, reconnect the section disconnection link(s).
17. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX09		
Replace an EAK30K Unit (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	EAK30K Lineside Junction Box
Excludes:	All other EAK Junction Boxes

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

The EAK30K is to be powered down for this task by disconnection of the power supply at the REB or the local supply.

Electrostatic precautions are to be taken when working inside the unit.

The EAK shall be changed in its entirety, changing of the electronic board contained within the EAK is strictly prohibited.

Each detection point has a unique address set by DIP switches inside the unit. Replacement junction boxes require having their DIP switches set to that of the original or the evaluator does not recognize the new unit. The DIP switch settings can also be found on the location diagram.

• The Signaller is responsible for restoring the axle counter section

• For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

• NOTE: Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAK(s). Where it is planned to upgrade from ISDN to DSL refer to "Appendix A" to check compatibility with each detection point controlled by each serial card.

1. Check that the EAK unit is correctly isolated from the power supply.
2. Check that the replacement EAK unit is of the correct type, undamaged, and is correctly labelled.
3. [WIRE COUNT](#) (including the screen) the existing unit to the wiring diagram.
4. Check the ARD plug direction corresponds to the diagram.
5. Check the Earth Bonding is correctly as shown on the wiring diagram
6. Check the existing wiring has safe insulation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX09		
Replace an EAK30K Unit (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

7. Check the existing wiring and connectors are correctly labelled.

AFTER INSTALLATION WORK

8. Check the replacement unit is correctly installed, secure and correctly labelled.
9. Check that the DIP switch settings correspond with the address code indicated on the diagrams.
10. Check S1 S2 and S3.
 - S1 and S2 shall be set to 1, S3 shall be set to H3.
11. Check that the earth bond is correctly installed and test the continuity from the unit. See torque settings in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
12. Check that the wiring and connectors are replaced as labelled and are secured.
13. Check the cable screen is clamped correctly.
14. [WIRE COUNT](#) (including the screen) the replacement unit to the wiring diagram.
15. Check the ARD plug direction corresponds to the diagram.
16. Check the security of the unit to the pedestal. For torque settings in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
17. Restore the power to the EAK.
18. Test the replacement unit [NR/SMS/PartB/Test/045](#) (Axle Counter Dummy Wheel Test AzLM) and record the measurements on the record card, together with the reason for the test.
19. Test the replacement rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).
20. Check the security of the unit and any padlocks, where fitted. For torque settings in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
21. With the Signallers' permission, reconnect the output of the affected section(s) to the signalling system.
22. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
23. Check that the unit is correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX09		
Replace an EAK30K Unit (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

APPENDIX A - Card Compatibility Tables

Version	Board Name	Compatible With
DABA	EAK 30K ISDN	DABA
FEAA	EAK 30K DSL, 120v 4ms (250KM/H)	FEAA
FFAA	EAK 30K DSL, 24v 4ms (250KM/H)	FFAA
FAAA	EAK 30K DSL, 120v 2.4ms (380KM/H)	FAAA
FCAA	EAK 30K DSL, 24v 2.4ms (380KM/H)	FCAA

#2 Communication technology (ISDN or DSL) needs to be consistent between Serial Card in the ACE and Digital Card in the EAK(s). Where it is planned to upgrade from ISDN to DSL, the evaluator hardware (Serial Cards) and EAK hardware (Digital Cards or K-Type EAK) will need to be replaced at the same time to check compatibility.

The DSL transmission requires the SCC CPU's to be installed (version 7HA 10057 ABAA). Where fitted, the V.24 converters are utilised also need to be upgraded from ISDN to DSL.

NOTE 1: Where two EAK's are controlled from one serial card, the Digital Card in both EAK's will need to be replaced (or the EAK in the case of a K style EAK).

NOTE 2: Mixed configuration of ISDN / DSL transmission within the same ACE is supported.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX10		
Replace an Rail Contact Adaptor (RCA) (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Rail Contact Adaptor connected to SK30H, EAK30H, SK30K or EAK30K
Excludes:	Removal of Rail Contact Adaptor

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

- The EAK shall be powered down for this task.
- Electrostatic precautions shall be taken when working inside the unit.

• The Signaller is responsible for restoring the axle counter section.

• For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the rail contact adaptor is of the correct type and is undamaged.
3. Isolate the EAK.
4. [WIRE COUNT](#) (including the screen) the existing rail contact adaptor cables to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check the rail contact adaptor is mounted securely.
 - The RCA shall sit in a position level or above the EAK and Rail contact to prevent water draining into the RCA.
8. Check the rail contact adaptor is correctly installed.
9. [WIRE COUNT](#) (including the screen / drain wire) the replacement rail contact adaptor to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX10		
Replace an Rail Contact Adaptor (RCA) (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

10. Check the cable screens are clamped, zip tied or terminated correctly.
11. Check that the cable cores from the cable clamp to the terminals in the RCA and the EAK are twisted together.
12. Check that the cable is correctly labelled, secured and correctly routed.
13. Check the security and seating of the card within the RCA.
14. Check the cable glands are tight and the cable secured.
15. Check the seal on the lid is intact and is not cut or damaged (flattened).
16. Secure the metal plate inside the RCA and then secure the outer lid.
17. Power up the EAK.
18. With the Signalers permission, reconnect the section disconnection link(s).
19. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX11		
Replace a SK30K Rail Contact (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	SK30K Rail Contact
Excludes:	All other types of Rail Contact

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection method as required.

The disconnection link shall not be reconnected, and possession given up unless the equipment has passed all tests and is fit for use.

Cables are supplied connected and sealed to the rail contact unit. A cable of any length (4m, 5.5m or 8m) can be used as long as there is sufficient to reach from the EAK.

Where a Rail Contact Adapter (RCA) is used the maximum distance between the Rail Contact and EAK is 30m.

The 8m rail contact cable shall not be used with the RCA.

The Signaller is responsible for restoring the axle counter section.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

- For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- Check that the affected section is correctly isolated from the interlocking.
- Check that the replacement rail contact is of the correct type and is not damaged.
- Power down and isolate the EAK.
- [WIRE COUNT](#) (including the screen) the existing rail contact cable to the wiring diagram.
- Check the existing wiring has safe insulation.
- Check the existing wiring is correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX11		
Replace a SK30K Rail Contact (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

8. If a rail clamp is fitted, check the position of the rail contact using the Wheel Detection Point Position Record. If this is not available, then the location of the rail contact shall be measured from a datum point that is not going to change during the work. This shall include verification of details relating to which rail the contact is fitted on.

AFTER INSTALLATION WORK

9. If a Rail Clamp is fitted, verify the position of the refitted rail contact in relation to the Wheel Detection Point Position Record or the Datum point recorded in Step 8.
 - The rail contact shall not be located within 1m of block joints, ½ m of a weld and 2m of another rail contact. Note, this is not applicable to Birmingham New Street.
 - In areas fitted with redundant rail contacts check that the second head is located between 2 and 3 meters away from the refitted head. Note, this is not applicable to Birmingham New Street.
10. Check the replacement rail contact is correctly installed and secured, see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
11. Confirm that new rail fixing nuts and bolts have been used.
12. Check (if provided) the protection plates and flux plates are correctly installed and secure.
13. [WIRE COUNT](#) (including the screen) the replacement rail contact to the wiring diagram.
14. Check the cable screen is clamped correctly.
15. Check that the cable cores from the cable clamp to the terminals are twisted together.
16. Check that the cable is correctly labelled, secured and correctly routed.
17. Check the power is restored to the EAK.
18. Test the replacement rail contact [NR/SMS/PartB/Test/045](#) (Thales Axle Counters Dummy Wheel Test (AzLM) and record the test measurements on record card, together with the reason for the test.
19. Test the replacement rail contact to [NR/SMS/PartB/Test/031](#) (Thales Axle Counter Reference Direction Function Test).
20. Check the security of the unit and any padlocks, where fitted. For Torque setting see [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
21. With the Signaller's permission, reconnect the output of the affected section(s) to the signalling system.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX11		
Replace a SK30K Rail Contact (AzLM)		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

22. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
23. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX20		
Replace a Siemens AzS 350 U Axle Counter Card (VESBA)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	VESBA
Excludes:	BLEA12, SIRUIS2, STEU and VAU

***** INDEPENDENCE EXEMPT *****

GENERAL

Before any work is undertaken:

- a) Possession of the affected axle counter evaluator (ACE) shall be taken.
- b) Possession shall also be taken of any adjacent connected evaluators. This affects multiple track sections and any signalling functions carried over the evaluator transmission links.
- c) The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- d) Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided in the evaluator cabinet and nearby working surface to assist in this procedure.
- e) Only one axle counter evaluator shall be worked on at any one time.

BEFORE INSTALLATION WORK

1. Check that possession of the affected ACE has been taken.
2. Check that the affected ACE is powered down by switching off the relevant power supply board.
3. Check that the replacement card is not damaged and is correct type. Check that the replacement card status corresponds with the Baseline document.
4. Remove the fuse from the affected VESBA card.

The fuses of the replacement VESBA card shall be removed before the card is inserted into the evaluator rack.

AFTER INSTALLATION WORK

5. Check that the replacement card is correctly installed and secure.
6. Set both the potentiometers as far counter clockwise as they can go.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX20		
Replace a Siemens AzS 350 U Axle Counter Card (VESBA)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

7. Replace the fuses into the replacement VESBA card.
8. Power up the affected ACE by switching on the relevant power supply board
9. Reset the system by simultaneously pressing the red buttons on both of the VAU boards for approximately 1 second.

Observe that only the LED 'VGL' remains illuminated after approximately 5 seconds.
10. Test the evaluator VESBA card levels [NR/SMS/PartC/AX31](#) (Siemens AzS 350U Axle Counter Evaluator).
11. Arrange with the Signaller to reset the affected section(s).
12. Observe that the section is successfully restored to normal operation.
13. Check, or arrange for the correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX21		
Replace a Siemens AzS 350 U Axle Counter Card (SIRIUS2, STEU, VAU)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	SIRUIS2, STEU and VAU
Excludes:	BLEA12 and VESBA

***** INDEPENDENCE EXEMPT *****

GENERAL

Before any work is undertaken:

- a) Possession of the affected axle counter evaluator (ACE) shall be taken.
- b) Possession shall also be taken of any adjacent connected evaluators. This affects multiple track sections and any signalling functions carried over the evaluator transmission links.
- c) The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- d) Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided in the evaluator cabinet and nearby working surface to assist in this procedure.
- e) Only one axle counter evaluator shall be worked on at any one time.

BEFORE INSTALLATION WORK

1. Check that possession of the affected ACE has been taken.
2. Check that the replacement card is not damaged and is correct type. Check that the replacement card status corresponds with the Baseline document.
3. Shut down the affected evaluator by switching off the RELEVANT power supply board for the affected evaluator.

AFTER INSTALLATION WORK

4. Check that the replacement card is correctly installed and secure.
5. Power up the evaluator by switching on the RELEVANT power supply board for the affected Evaluator.
6. Simultaneously press the red buttons (system reset) on each VAU boards for both computer channels for approximately 1 second. After pressing the red buttons (system reset), the LED "ANL" lights up on both VAU boards for approximately 3 seconds. After the LED "ANL" on the VAU boards has gone off, the LED "VGL" lights up.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX21		
Replace a Siemens AzS 350 U Axle Counter Card (SIRIUS2, STEU, VAU)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

7. Arrange with the Signaller to reset the affected sections.
8. Observe that the section(s) is/are successfully restored to normal operation.
9. Check, or arrange for the correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX22		
Replace a Siemens AzS 350 U Axle Counter Card (BLEA12)		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	BLEA12
Excludes:	VESBA, DIGDO, SIRUIS2, STEU and VAU

GENERAL

Before any work is undertaken:

- a) Possession of the affected axle counter evaluator (ACE) shall be taken.
- b) Possession shall also be taken of any adjacent connected evaluators. This affects multiple track sections and any signalling functions carried over the evaluator transmission links.
- c) The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- d) Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided in the evaluator cabinet and nearby working surface to assist in this procedure.
- e) Only one axle counter evaluator shall be worked on at any one time only one BLEA12 shall be changed at any one time.

BEFORE INSTALLATION WORK

1. Check that the replacement BLEA12 card is not damaged and is correct type.
Check that the replacement card status corresponds with the baseline document.
2. Shut down the affected evaluator by switching off the RELEVANT power supply board for the affected evaluator.
3. Check the configuration of the dip switches and jumper setting of the existing BLEA12 board to the diagrams.

AFTER CONFIGURATION OF THE BLEA12 BOARD

4. Check the configuration of the dip switches and jumper setting on the replacement BLEA12 board, to the diagrams.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX22		
Replace a Siemens AzS 350 U Axle Counter Card (BLEA12)		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

5. Check that the replacement card is correctly installed and secure.
6. Power up the evaluator by switching on the RELEVANT power supply board for the affected evaluator.
7. Simultaneously press the red buttons (system reset) on each VAU boards for both computer channels for approximately 1 second .After pressing the red buttons (system reset), the LED 'ANL' lights up on both VAU boards for approximately 3 seconds. After the LED 'ANL' on the VAU boards has gone off, the LED 'VGL' lights up.
8. Arrange with the Signaller to reset the affected section(s).
9. Observe that the section(s) is/are successfully restored to normal operation.
10. Check or arrange for the correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX23		
Replace a Siemens AzSM(E) Axle Counter VENUS2 CPU Card		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	VENUS 2 CPU Card
Excludes:	IIC-OMC VENUS3, ZAN, VESUV3, VESIN, RASI V24KOP & BUREP16

General

Possession of the affected axle counter evaluator (ACE) shall be taken.

Disconnection of the output of the evaluator to the signalling system. This might affect up to 16 sections.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

For 1.5 seconds at the end of the update procedure the axle counter synchronizes the affected channel. At this point the axle counter is effectively blind. Therefore, no train movements shall be allowed in the affected area while the axle counter is updating the affected channel.

Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided.

Only one axle counter evaluator shall be worked on at any one time.

CPU boards are uniquely identified to include the data version number.

Replacement boards shall be operating the same site-specific version of geographic data as the one they are replacing otherwise the evaluator shuts down.

The Equipment List advises you the status of the board hardware and software.

BEFORE INSTALLATION WORK

1. Check that the replacement CPU card is not damaged and is correct type. Check that the replacement card status corresponds with the "Baseline" document.

Only use a VENUS2 that is installed with the correct program and configuration software for the evaluator being repaired

2. Shut down the affected computer channel by setting the reset switch of the relevant VENUS2 card and switching off the relevant power supply board for the affected computer channel.

AFTER INSTALLATION WORK

3. Check that the replacement CPU card is correctly installed and secure.

4. Perform the "update computer channel" procedure (S&D on line manual).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX23		
Replace a Siemens AzSM(E) Axle Counter VENUS2 CPU Card		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

5. Check that the affected channel has updated and that the card operates correctly by observing the correct indications on the evaluator (S&D on line manual).
6. Check or arrange for the correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX24		
Replace a Siemens AzSM (E) Axle Counter non CPU Card		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	VENUV 3, VESIN, RASI, BUREP16, & V24KOP
Excludes:	VENUS 2, ZAN

***** INDEPENDENCE EXEMPT *****

General

Possession of the affected axle counter evaluator (ACE) shall be taken.

Disconnection of the output of the evaluator to the signalling system. This might affect up to 16 sections.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

For 1.5 seconds at the end of the update procedure the axle counter synchronizes the affected channel. At this point the axle counter becomes effectively blind. Therefore, no train movements shall be allowed in the affected area while the axle counter is updating the affected channel.

Electrostatic precautions shall be taken when handling boards. Discharge points (ESD) are provided in the evaluator cabinet.

Only one axle counter evaluator shall be worked on at any one time.

BEFORE INSTALLATION WORK

1. Check that the replacement card is not damaged and is correct type. Check that the replacement card status corresponds with the "Baseline document".
2. Shut down the affected evaluator by switching off the relevant power supply board for the affected computer channel.

AFTER INSTALLATION WORK

3. Check that the replacement card is correctly installed and secure.
4. Perform the 'update computer channel' procedure (S&D on line manual).
5. Check that the affected channel has updated and that the card operates correctly by observing the correct indications on the evaluator (S&D on line manual).
6. Observe that the section(s) is/are successfully restored to normal operation.
7. Check or arrange for the correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX25		
Replace a Siemens AzSM (E) Axle Counter ZAN Card		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	ZAN.
Excludes:	VENUS 2, VESUV3, VESIN, RASI, V24KOP & BUREP16.

***** INDEPENDENCE EXEMPT *****

Before any work is undertaken.

- Possession of the relevant axle counter section (this may affect up to 4 sections).
- Disconnection of the output of the evaluator to the signalling system. This may affect up to 16 sections.
- The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- The ZAN card has two input channels for the two independent ZP43 wheel detectors. Check that the removal of the affected ZAN card will not increase the current disruption to the railway operation.
- Appropriate electrostatic precautions shall be taken when handling boards.
- Only one axle counter evaluator shall be worked on at any one time.

BEFORE INSTALLATION WORK

1. Check that the replacement card is not damaged and is correct type. Check that the replacement card status corresponds with the Baseline document.
 2. Remove the fuses from the affected ZAN card.
- The fuses of the replacement ZAN card shall be removed before the card is inserted in to the evaluator rack.

AFTER INSTALLATION WORK

3. Check that the replacement card is correctly installed and secure.
4. Replace the fuses into the replacement ZAN card.
5. Test the evaluator ZAN card levels [NR/SMS/PartC/AX30](#) (Siemens AzSM (E) Axle Counter Evaluator).
6. Observe that the section(s) is/are successfully restored to normal operation.
7. Check or arrange for the correct labelling of the unit.

END

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX26		
Replace a Siemens Axle Counter DEK 43 Wheel Detector or Trackside Connection Box		
Issue No. 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Trackside Connection Box, DEK 43 Wheel Detector
Excludes:	All other Junction Boxes, Individual Connection Box Cards

GENERAL

Before any work is undertaken;

- Take possession of the relevant axle counter section.
- The Trackside Connection Box shall be powered down by removal of the ZAN or VESBA card fuse or at the local point of supply.
- The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided in the evaluator cabinet and nearby working surface to assist in this procedure.

⋮ The Signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check that the replacement wheel detector or trackside connection box is not damaged and is correct type.
3. Remove the fuse on the ZAN or VESBA card which supplies the Trackside Connection Box.
4. [WIRE COUNT](#) the existing wheel detector or trackside connection box to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring and connectors are correctly labelled.

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX26		
Replace a Siemens Axle Counter DEK 43 Wheel Detector or Trackside Connection Box		
Issue No. 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

7. Check that the replacement wheel detector or trackside connection box is correctly installed and secure.
8. Observe any restrictions that apply to the position of the axle counter equipment to other line side equipment or cabling.
9. Check that the adaptor plates are correct for the rail profile installed.
10. Check that the wiring and connectors are replaced as labelled and are secure.
11. Check the cable is clamped correctly.
12. [WIRE COUNT](#) the replacement unit to the wiring diagram.
13. Restore the power to the Wheel Detector Trackside Connection Box.

Where the wheel detector or trackside connection box is used with an AzSME evaluator

14. Test the replacement unit, see [NR/SMS/PartC/AX30](#) (Siemens AzSM (E) Axle Counter Evaluator).
15. Test evaluator ZAN card levels, see [NR/SMS/PartC/AX30](#) (Siemens AzSM (E) Axle Counter Evaluator).
16. Check that the ZAN card LED's illuminate correctly, when the head is influenced, see [NR/SMS/PartC/AX30](#) (Siemens AzSM (E) Axle Counter Evaluator).

Where the wheel detector or trackside connection box is used with an AzS350U evaluator

17. Test the replacement unit:
 - a) For ZP 43 V use [NR/SMS/PartC/AX29](#) (Siemens AzS ZP 43 V Wheel Detector Equipment).
 - b) For ZP 43 D use [NR/SMS/PartC/AX28](#) (Siemens AzS ZP 43 D Wheel Detector Equipment).
18. Test evaluator VESBA card levels see [NR/SMS/PartC/AX31](#) (Siemens AzS 350U Axle Counter Evaluator).
19. Check that the VESBA card LED's illuminate correctly, when the head is influenced [NR/SMS/PartC/AX31](#) (Siemens AzS 350U Axle Counter Evaluator).
20. Check the security of the unit and any padlocks where fitted.

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX26		
Replace a Siemens Axle Counter DEK 43 Wheel Detector or Trackside Connection Box		
Issue No. 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

21. Observe that the section is successfully restored to normal operation.
22. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX27		
Replace a Siemens Axle Counter ZP 43 PCB Card		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	All ZP 43 PCB cards
Excludes:	All other Siemens cards

GENERAL

Before any work is undertaken:

- a) Possession of the affected axle counter section shall be taken (this affects more than one section).
- b) The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.
- c) Electrostatic precautions shall be taken when handling boards. Electrostatic discharge points (ESD) are provided in the evaluator cabinet and nearby working surface to assist in this procedure.
- d) Only one axle counter evaluator shall be worked on at any one time.
- e) The Signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check that the replacement card is not damaged and is correct type.
2. Check that the replacement card status corresponds with the baseline document.
3. Remove the fuse on the ZAN or VESBA card which supplies the Trackside Connection Box.

AFTER INSTALLATION WORK

4. Check that the replacement card is correctly installed and secure.
5. For ZP 43 D check that switch S1 is set to FR.
6. Replace the fuse on the ZAN or VESBA card which supplies the Trackside Connection Box.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX27		
Replace a Siemens Axle Counter ZP 43 PCB Card		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

7. Test the replacement unit:
 - a) For ZP 43 V use [NR/SMS/PartC/AX29](#) (Siemens AzS ZP 43 V Wheel Detector Equipment).
 - b) For ZP 43 D use [NR/SMS/PartC/AX28](#) (Siemens AzS ZP 43 D Wheel Detector Equipment).

Where the wheel detector or trackside connection box is used with an AzSME evaluator:

8. Test the evaluator ZAN card levels [NR/SMS/PartC/AX30](#) (Siemens AzSM (E) Axle Counter Evaluator).
9. Check that the ZAN card LED's illuminate correctly, when the wheel detector is influenced.

Where the wheel detector or trackside connection box is used with an AzS350U evaluator

10. Test evaluator VESBA card levels [NR/SMS/PartC/AX31](#) (Siemens AzS 350U Axle Counter Evaluator).
11. Check that the VESBA card LED's illuminate correctly, when the head is influenced.
12. Observe that the section(s) is/are successfully restored to normal operation.
13. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX28		
Replace a Siemens WSD Wheel Detector (ACM 100 Axle Counter)		
Issue No. 03	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Siemens WSD Wheel Detector only
Excludes:	ZP D 43 and ZP 43 V Wheel Detection Equipment - Trackside Connection Box, DEK 43 Wheel Detector and all other Junction Boxes or Individual Connection Box Cards

Before any work is undertaken the following shall be undertaken:

- a) Possession taken of the relevant axle counter section.
- b) Disconnection of the output of the ACM module (evaluator) to the signalling system where applicable.
- c) The WSD wheel detector shall be powered down by removal of the appropriate links.

The output of the ACM shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

Keep metallic objects at least 20cm away from the counting heads. The movement of metallic objects including tools, steel toe-cap boots and jewellery across the upper surface of the counting heads can cause occupation of the track sections. The wheel detector is very sensitive.

⋮ The signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Observe any restrictions that apply to the position of the axle counter equipment to other line side equipment or cabling.
2. Check that the adapter plate (C25326-A39-C2 for BS 113A and Bull-Head Rail and C25326-A39-C17 for UIC 54 and UIC 60) is correct for the rail profile installed.
3. Check that the wheel detector is correctly isolated from the ACM by disconnection at the appropriate links.
4. Check that the replacement wheel detector is not damaged and is the correct type.
5. Wire count the existing wheel detector to the wiring diagram.
6. Check the existing wiring has safe insulation.
7. Check the existing wiring and connectors are correctly labelled.

EXCHANGE OF WSD

8. Disconnect the wheel detector cabling in the corresponding disconnection box.
9. Remove the cable securing clips from the WSD cable
10. Remove the wheel detector from the rail web bracket
11. Installation is reversal of the removal using a torque of (45 Nm) to fix the wheel detector to the bracket.
12. Refer to cabling wiring diagrams when reconnecting the wheel detector wires.

AFTER INSTALLATION WORK

13. Check that the replacement wheel detector is correctly installed and secured [Mechanical checks in ([NR/SMS/Part/C/AX51](#))].
14. Check that the wiring and connectors are replaced as labelled and are secure.
15. Check the cable is clamped correctly.
16. Wire count the replacement unit to the wiring diagram.
17. Reconnect the appropriate links to the wheel detector.
18. Calibrate and test the replacement unit [[NR/SMS/Part/B/Test038](#)].
19. Observe that the section is successfully restored to normal operation.
20. Check that the unit is correctly labelled.

End

Includes: Siemens ACM 100 Axle Counter ACM Module

Before any work is undertaken the following shall be undertaken:

- a) Possession of the relevant ACM module. Possession shall also be taken of any adjacent connected ACMs. This will affect multiple track sections and any signalling functions carried over the ACM transmission links.
- b) Disconnection of the output of the evaluator to the signalling system where ISOL links are not locally available.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

Only one ACM can be replaced at any one time, in order to prevent inadvertent exchange of ID plugs.

Precaution shall be taken when the handling ID Plug. Do not touch the connecting pins.

Spares shall be kept in the original packaging

The signaller is responsible for resetting the axle counter.

BEFORE INSTALLTION WORK

1. Check that the replacement ACM Module is Not Damaged and is the Correct Type.
2. Check that the ID Plug corresponds with the signalling records.
3. Check that the ACM Module is Correctly Isolated from the power supply.

AFTER INSTALLTION WORK

4. Check that the replacement ACM Module is Correctly Installed and secure.
5. Remove the ID Plug from the faulty ACM Module and insert into replacement ACM.
6. Check that the ID Plug is Correctly Installed and secure.
7. Re-connect power to the ACM Module.
8. After 15 seconds the ACM will enter its configuration acceptance mode, indicated by a flashing green "OK" LED with all other LEDs not lit. If you are sure that the original ID Plug is correctly inserted in the replacement ACM, press and hold the front panel buttons labelled RST_RR1 and RST_RR2 simultaneously (mimumum 3 seconds). This will enable the new ACM and it will then enter its normal operation mode, indicated by a solid green "OK" LED.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX29		
Replace a Siemens Axle Counter ACM 100 Module		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

9. Arrange with the signaller to reset the affected sections.
10. Observe that the section(s) is/are successfully restored to normal operation.
11. Check that the unit is correctly labelled.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX30		
Replace a Siemens Axle Counter System Sub-Components		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Sub -Component parts associated with the Siemens ACM100 Axle Counter system.
Excludes:	All other Axle Counter types and Sub-Components.

Before any work is the following shall be undertaken:

- a) Possession of the relevant ACM modules. Possession shall also be taken of any adjacent connected ACMs. This will affect multiple track sections and any signalling functions carried over the ACM transmission links.
- b) Disconnection of the output of the evaluator to the signalling system where ISOL links are not locally available.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all required tests and is fit for use.

Precaution shall be taken when the handling ID Plug. Do not touch the connecting pins.

Spares shall be kept in the original packaging

⋮ The signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and is of the correct type.
2. Isolate the specific power supply for the component being replace.
3. Check the existing connection wiring and connectors are correctly labelled.

Battery Module

4. Battery Modules are supplied fully charged but will self-discharge over time.
5. Remove the replacement Battery Module fuse.
6. Disconnect the power supply wiring to the battery module.
7. Remove and replace the battery module from the DIN rail.
8. Reconnect the power supply.
9. Check that the replacement Battery Module is correctly Installed, secured and labelled.
10. Refit the Battery Module fuse.
11. Switch on the Power Supply Unit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX30		
Replace a Siemens Axle Counter System Sub-Components		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

12. Check that the Uninterruptible Power Supply Module front “BAT >85%” lamp is steady on.

Ethernet Switch

13. Allow the replacement battery to charge and check that the Uninterruptible Power Supply Module front “BAT >85%” lamp is steady on. (**Note:** Recharge may take >12 hrs, hence confirm within 7days)
14. Disconnect power and communications cables from the unit.
15. Remove and replace the module from the DIN rail.
16. Reconnect the power and communications cables to the unit.
17. Check that the replacement Ethernet Switch Module is Correctly Installed, secured and labelled.
18. Check that the Ethernet Switch Module is correctly labelled.
19. Reconnect the Power Supply Unit.

ID Plug

Only one ID plug should be replaced at any one time in order to prevent inadvertent exchange of ID plugs.

20. Check that the New ID Plug corresponds with the signalling records.
21. Check that the Module requiring the replacement ID plug is correctly isolated from the power supply.
22. Remove the ID Plug from the unit.
23. Fit the new ID Plug.
24. Check that the replacement ID Plug is correctly installed, secured and labelled.
25. Reconnect the Power Supply Unit.
26. After 15 seconds the ACM will enter its configuration acceptance mode, indicated by a flashing green “OK” LED with no other LEDs lit. If you are sure that the replacement ID Plug is correctly inserted in the ACM, press and hold the front panel buttons labelled RST_RR1 and RST_RR2 simultaneously (minimum 3 seconds). This will enable the ACM and it will then enter its normal operation mode, indicated by a solid green “OK” LED.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX30		
Replace a Siemens Axle Counter System Sub-Components		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

Power Supply Unit

- | 27. Isolate the Power Supply Unit from the incoming AC supply.
- | 28. Remove battery module fuse.
- | 29. Remove wiring to the Power Supply Unit.
- | 30. Remove and replace the Power Supply Unit from the DIN rail.
- | 31. Check that the replacement Power Supply Unit is correctly installed and secure.
- | 32. Check that the Power Supply Unit is correctly labelled.
- | 33. Reconnect the AC supply to the Power Supply Unit.
- | 34. Replace the Battery Module Fuse.
- | 35. Switch on the Power Supply Unit front switch.
- | 36. Check that the "DC 24V" lamp is steady on.

Surge Filter

- | 37. Disconnect the wiring from the Surge Filter.
- | 38. Remove and replace the Surge Filter from the DIN rail.
- | 39. Reconnect the wiring to the Surge Filter.
- | 40. Check that the replacement Surge Filter is correctly installed, secured and labelled.
- | 41. Reconnect the Power Supply Unit.

Uninterruptable Power Supply

- | 42. Check that the replacement Uninterruptable Power Supply Module front DIP switches positions, corresponds with the table below. (L = Left, R = Right).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/AX30		
Replace a Siemens Axle Counter System Sub-Components		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

43. Remove Battery Module fuse.

1	R
2	R
3	L
4	R
5	L
6	R
7	R
8	R
9	L
10	R
1	R
2	R
3	R
4	R
5	R
6	R
7	R
8	R
9	L

44. Disconnect the wiring from the UPS module.

45. Remove and replace the UPS module from the DIN rail.

46. Check that the replacement Uninterruptible Power Supply Module is correctly installed, secured and labelled.

47. Refit the Battery Module fuse.

48. Reconnect the Power Supply Unit.

49. Check that the Uninterruptible Power Supply Module front “OK” lamp is steady on.

AFTER INSTALLATION WORK

50. Arrange with the signaller to reset the affected sections.

51. Observe that the section(s) is/are successfully restored to normal operation.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX31		
Replace a Siemens WSD Wheel Detector secured with Rail Clamp (ACM 100 Axle Counter)		
Issue No: 04	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Siemens WSD Wheel Detector secured with Rail Clamp only
Excludes:	Siemens WSD Wheel Detector when bolted to rail web

GENERAL

Before any work is undertaken the following shall be undertaken:

- a) Possession taken of the relevant axle counter section.
- b) Disconnection of the output of the ACM module (evaluator) to the signalling system where applicable.
- c) The WSD wheel detector shall be powered down by removal of the associated links.

The output of the ACM shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

Keep metallic objects at least 20cm away from the counting heads. The movement of metallic objects including tools, steel toe-cap boots and jewellery across the upper surface of the counting heads might cause occupation of the track sections.

The wheel detector is very sensitive.

The Signaller is responsible for resetting the axle counter section.

Mechanical checks can be found in [NR/SMS/PartC/AX51](#) (Siemens Axle Counter ACM 100 (ACM Module and WSD Wheel Detector)).

Further information on the Siemens Axle Counter can be found in [NR/SMS/Appendix/01](#) (General Information on the Siemens Axle Counter System).

BEFORE INSTALLATION WORK

1. Observe any restrictions that apply to the positioning of the axle counter equipment in relation to other line side equipment or cabling.
2. Check the wheel detector is correctly isolated from the ACM by disconnection at the associated links.
3. Check the replacement wheel detector is not damaged and is the correct type.
4. Carry out a [WIRE COUNT](#) on the existing wheel detector to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring and connectors are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX31		
Replace a Siemens WSD Wheel Detector secured with Rail Clamp (ACM 100 Axle Counter)		
Issue No: 04	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

7. Check that the replacement wheel detector is correctly installed and secured.
8. Check that the wiring and connectors are replaced as labelled and are secure.
9. Check the cable is clamped correctly.
10. Carry out a [WIRE COUNT](#) on the replacement unit to the wiring diagram.
11. Reconnect the links to the wheel detector.
12. Calibrate and test the replacement unit [NR/SMS/PartB/Test/038](#) (Siemens ACM 100 - Calibration of Wheel Detector).
13. Observe that the section is successfully restored to normal operation.
14. Check that the unit is correctly labelled.

END

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX40		
Replace a Frauscher Wheel Sensor RSR123		
Issue No: 09	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Frauscher wheel sensor RSR123 (or F500 Wheel Sensor for SATWS and ATWS)
Excludes:	All other wheel sensor systems

GENERAL

If the wheel sensor is associated with an EBI Gate 200 Level Crossing System, disconnect the power supply before undertaking installation work.

The possession of the axle counter section shall not be given up unless the equipment has passed all the tests and is fit for use.

Protection/Possession arrangement shall be taken before commencing work on any track sections.

Liaise with Signaller before carrying out this test.

For EBI Gate 200 Level Crossing System the Technician is responsible for resetting the axle counter, on all other systems it is the Signaller's responsibility.

BEFORE INSTALLATION WORK

- For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- Mark the web of the rail to indicate the location of the sensor to assist with locating the replacement unit.
- Check that the replacement wheel sensor is of the correct type and is not damaged.

AFTER INSTALLATION WORK

- Check that the new sensor is mounted at the same location using the marked rail web as a reference point.
- Check the rail head sensor securing nuts are tightened to torque values shown in [NR/SMS/PartC/AX41](#) (Frauscher RSR123 Wheel Sensors) - Periodic Task 2.
- Measure the distance between the next rail joint or the next rail weld. The distance shall be at least 60 cm.
- Carry out [NR/SMS/PartC/AX40](#) (Frauscher Advanced Axle Counter) – Periodic Task 3.

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX40		
Replace a Frauscher Wheel Sensor RSR123		
Issue No: 09	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Final Checks (excluding EBI Gate 200 & Vamos Level Crossing Systems)

8. Carry out [NR/SMS/PartB/Test/040](#) (Frauscher: RSR123 Wheel sensor adjustment – associated with AEB Boards) - Section 1.
9. Check the rail sensor current/voltages as described in [NR/SMS/PartC/AX41](#) (Frauscher RSR123 Wheel Sensors) - Service B.
10. Carry out [NR/SMS/PartB/Test/037](#) (Frauscher: RSR123 Wheel Sensor Occupancy Detection Capability Test). *

Final Checks - EBI Gate 200 Level Crossing System

11. Adjust both wheel sensor systems and detection capability as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) - Sections 1 to 5.

Final Checks - Vamos Level Crossing System

12. Adjust both wheel sensor systems and detection capability as described in [NR/SMS/PartB/Test/157](#) (Frauscher : RSR123 Wheel sensor adjustment – associated with IMC Boards) - Sections 1 to 3.

Final Checks – SATWS and ATWS Trackworker Safety System

13. Following the installation of the train detector, use a connected SATWS or ATWS control unit and warning device to carry out a functional test to confirm that the system operates correctly.

⋮ The functional test involves waiting for a train to pass over the sensor or (where possible), using the dummy wheel to simulate a train.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX41		
Replace an Advanced Evaluation Board AEB		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Advanced Evaluation Board AEB
Excludes:	All other types of boards

GENERAL

Protection/Possession arrangement shall be taken before commencing work on any track sections.

Liase with Signaller before carrying out this test.

Boards can be plugged and unplugged with voltage applied

When replacing boards, it is recommended that you remove only one board at a time from the system, as this will prevent one board being mistaken for another.

IMPORTANT: If an AEB is replaced because of an unknown failure, also replace the respective BSI.

The Signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check that the replacement AEB is of the correct type and not damaged.
2. Check the following details for each new AEB-board in accordance with design and configuration documents (copies of which are contained in the site prints) or by means of the ASD or FDS:
 - a) Board ID.
 - b) DIP-switch settings.

AFTER INSTALLATION WORK

3. Carry out a Sensor Head adjustment as described in [NR/SMS/PartB/Test/040](#) (Frauscher: RSR123 Wheel sensor adjustment – associated with AEB Boards).
4. Check the sensor system currents by means of the ASD/FDS or at the test sockets of the AEB, as described in [NR/SMS/PartC/AX41](#) (Frauscher : RSR123 Wheel Sensors).
5. Check the occupancy detection capability as described in [NR/SMS/PartB/Test/040](#) (Frauscher: RSR123 Wheel sensor adjustment – associated with AEB Boards).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX42		
Replace a COM-AdC and/or COM-WNC Board		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Frauscher COM-AdC and/or COM-WNC Boards
Excludes:	All other types of board

GENERAL

Appropriate Protection / Possession arrangement shall be taken before commencing work on any track sections

Liaise with Signaller before carrying out this test.

Boards can be plugged and unplugged with voltage applied.

When replacing boards, it is recommended that you remove only one board at any time from the system, as prevents one board being mistaken for another.

The Signaller is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check that the replaced COM-AdC and/or COM-WNC is of the correct type and not damaged.

DURING WORK

2. Remove the CF (Compact Flash) card of the defective COM-AdC or COM-WNC and transfer it to the new COM-AdC or COM-WNC. Refer to [NR/SMTH/Part04/AX43](#) (Replace a (Compact Flash) CF Card).

NOTE: The 'on board' CF card on the replacement COM AdC or COM WNC card is blank, therefore it is essential that the existing CF Card is transferred to the new COM AdC or COM WNC as this holds the site-specific safety critical data configuration.

3. Check the following details for each new COM-board in accordance with design and configuration documents (copies of which are contained in the site prints) or by means of the ASD or FDS.
 - Board ID.
 - DIP-switch settings.

AFTER INSTALLATION WORK

4. Check the occupancy detection capability as described in [NR/SMS/PartC/AX40](#) (Frauscher Advanced Axle Counter: Occupancy Detection Capability).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX43		
Replace a (Compact Flash) CF Card		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Frauscher CF(Compact Flash) mounted on a COM-AdC and/or COM-WNC card
Excludes:	All other types of CF (Compact Flash)

**Appropriate Protection / Possession arrangement shall be taken before commencing work on any track sections.
Liaise the Signaller before carrying out this test.**

When changing CF cards, it is recommended, that no additional CF cards are in the vicinity, so as to avoid one card being mistaken for another.

Boards can be plugged and unplugged with voltage applied.

When replacing boards, it is recommended to check that you remove only one board at a time from the system, as prevents one board being mistaken for another.

BEFORE INSTALLATION WORK

1. Check that the CF card contains the correct configuration according to the design and configuration documents.

Configuration files stored on a PC can only be used if a full verification has to be done in the same way as commissioning. If there are no configuration files available then they should be regenerated according to the specifications of the design and configuration documents, then saved on to the CF card which shall be verified again.

2. Switch off the power supply to all boards on the CAN segment.

It is possible that more than one board rack is connected to the CAN segment.

DURING WORK

3. Remove the CF card and transfer it to the new COM Card or replace the CF card with a new card. Only one CF card should be changed at a time to make sure cards the correct card in reinstalled.

AFTER INSTALLATION WORK

4. Switch on the power supply to all boards on the CAN segment and Check all boards have powered up.
5. Check the system is functioning as described in section 4 of [NR/SMTH/Part04/AX42](#) (Replace a COM-AdC and/or COM-WNC Board).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part-04/AX44		
Replace an Overvoltage Protection Unit BSI005		
Issue No. 04	Issue Date: 04/03/17	Compliance Date: 31/05/17

Includes:	Overvoltage Protection Unit BSI005 Standard and Plug Coupled version
Excludes:	All other types of Overvoltage Protection Unit



Protection / Possession arrangement shall be taken before commencing work on any track sections
 Liaise with signaller before carrying out this test.

If the overvoltage protection unit is associated with an EBI Gate 200 Level Crossing System, disconnect the power supply before undertaking installation work.

Care should be taken when removing the clamps of the BSI005 as they can be subject to transient over voltages.

If an AEB/IMC is replaced in cause of an unknown failure the respective BSI005 shall be replaced also (see [NR/SMTH/AX41](#), [NR/SMTH/AX50](#)).

IDENTIFICATION



Standard Unit



Plug Coupled Version

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part-04/AX44		
Replace an Overvoltage Protection Unit BSI005		
Issue No. 04	Issue Date: 04/03/17	Compliance Date: 31/05/17

BEFORE INSTALLATION WORK

Both types

1. Check that the replacement overvoltage protection unit is of the Correct Type and Not Damaged.

Standard Unit

2. Check existing wires are securely tightened in their terminal blocks
3. Check existing wiring has Safe Insulation.
4. Check existing wiring is Correctly Labelled.
5. Check existing unit is Isolated from the supply.



The green and yellow terminal blocks are disconnected by pulling them gently towards you

Plug Coupled Version

6. Check the plug coupler for damage

AFTER INSTALLATION WORK

Standard Unit

7. Check replacement unit is Correctly Installed (Unit is level).
8. Check the termination blocks have been fully pressed home. They should be flush with the front plate.
9. Check there no metallic debris in the vicinity of the terminals.
10. Check wiring is replaced as labelled.

Plug Coupled Version

11. Check Plug coupler is secure and fully pressed home

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part-04/AX44		
Replace an Overvoltage Protection Unit BSI005		
Issue No. 04	Issue Date: 04/03/17	Compliance Date: 31/05/17

Final Checks Standard Unit and Plug Coupled (excluding EBI Gate 200 and Vamos System)

12. Check the sensor system currents on the test sockets of the AEB as described in [NR/SMS/AX41](#).
13. Check the axle detection capability of the respective wheel sensor as described in [NR/SMS/AX40](#)

Final Checks Standard Unit - EBI Gate 200 Level Crossing System (Only)

14. Power up the EBI Gate system [NR/SMS/Test082](#) Section 4 & 5.

Final Checks Standard Unit – Vamos Level Crossing System (Only)

15. Power up the VAMOS system [NR/SMS/Test157](#) Section 2.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX45		
Replace a Power Supply Board (Crowbar)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Power Supply Board (Crowbar)
Excludes:	All other types of boards

GENERAL

- | Liaise with Signaller before carrying out this test.
- | Electrostatic precautions shall be taken when handling the evaluation board and/or the board rack.
- ⋮ The removal of this card will power down the entire CAN Bus.
- ⋮ The Signaller is responsible for resetting the axle counter.
- ⋮ Boards can be plugged and unplugged with voltage applied.

BEFORE INSTALLATION WORK

- | 1. Check that the replaced power supply board is of the correct type and not damaged.

AFTER INSTALLATION WORK

- | 2. Check the green PWR LED on the front panel of the Power Supply Board is illuminated when the board is securely in position.
- | 3. Check that the other boards mounted in the rack power up.
- | 4. Carry out a reset on the AEB as described in [NR/SMS/PartB/Test/040](#) (Frauscher: RSR123 Wheel sensor adjustment – associated with AEB Boards).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX46		
Replace an Input/Output Extension Board IO-EXB		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Input/Output Extension Board IO-EXB
Excludes:	All other types of boards

GENERAL

Protection/Possession arrangement shall be taken before commencing work on any track sections.

Liase with Signaller before carrying out this test.

Electrostatic precautions shall be taken when handling the evaluation board and/or the board rack.

• The Signaller is responsible for resetting the axle counter.

• Boards can be plugged and unplugged with voltage applied.

BEFORE INSTALLATION WORK

1. Check that the replaced IO EXB board is of the correct type and not damaged.
2. Check the following details for each new IO EXB -board in accordance with design and configuration documents (copies of which are contained in the site prints) or by means of the ASD or FDS:
 - Board ID

AFTER INSTALLATION WORK

3. When the IO-EXB board is replaced it displays the following message in the alpha-numeric display: ER1 then 111 followed by ER2 111. This indicates the IO-EXB and AEB are out of synchronisation.

To synchronise the system

4. Synchronise the system by using the buttons located on the front panel of the IO EXB board (See Figure 1).

Track section A

- a) Contact the Signaller and confirm that no trains are in the section.
- b) Push both buttons to the left (in direction of "Section A") within 500 ms.
- c) Retain both buttons in this position for at least 500 ms.
- d) Release both buttons within 500 ms.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX46		
Replace an Input/Output Extension Board IO-EXB		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Track section B (If Configured)

- a) Contact the Signaller and confirm that no trains are in the section.
 - b) Push both buttons to the right (in direction of "Section B") within 500 ms.
 - c) Remain both buttons in this position for at least 500 ms.
 - d) Release both buttons within 500 ms.
5. Remove and refit the AEB associated with the IO-EXE board that has been replaced.
 6. Check that the clear/occupied status for the respective track section(s) is/are indicated correctly.

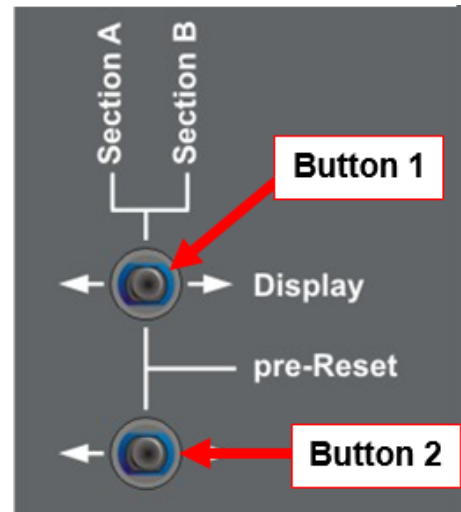


Figure 1 – Buttons on the IO-EXB Board

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX50		
Replace a Frauscher IMC Board		
Issue No: 04	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Frauscher : IMC Boards
Excludes:	All other types of boards

Protection / Possession arrangement shall be taken before commencing work on any track sections Liaise with Signaller before carrying out this test.

The Technician is responsible for resetting the axle counter if this board is associated with one.

If an IMC board is replaced because of an unknown failure the respective over voltage protection unit (BSI) shall also be replaced.

When replacing boards, it is recommended that only one board is removed from the system at any one time. This prevents one board being mistaken for another.

BEFORE INSTALLATION WORK

1. Check that the replacement IMC is of the correct type and not damaged.
2. Power down the system

AFTER INSTALLATION WORK

3. Carry out a Sensor Head adjustment as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) or [NR/SMS/PartB/Test/157](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC Boards) - Section 1.
4. After the IMC board is replaced and the EBI Gate 200 is powered up, the ACB displays the following message in the alpha-numeric display -109, -209 alternating.
5. When used as part of an EBIGate200 system reset the relevant block section [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) – Section 3.
6. Check the wheel sensor detection capability as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) Section 4 & 5 or [NR/SMS/PartB/Test/157](#) (Frauscher : RSR 123 Wheel Sensor Adjustment - associated with IMC Boards) Section 3.

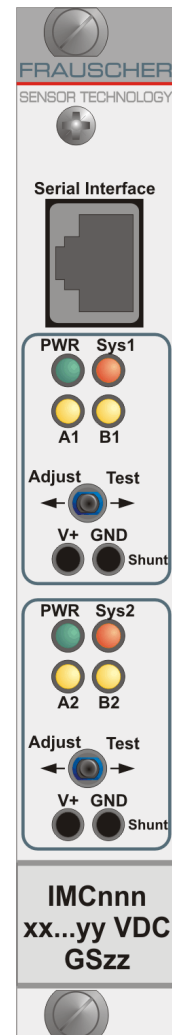


Figure 1 – IMC Board

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX51		
Replace a Frauscher ASC2000 Axle Counter Board ACB		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Frauscher ACS2000 : ACB Boards associated with the EBI Gate 200 Level Crossing System
Excludes:	All other types of boards

Appropriate Protection / Possession arrangement shall be taken before commencing work on any track sections

Liase with Signaller before carrying out this test.

Appropriate electrostatic precautions shall be taken when handling the board and/or the board rack.

The Technician is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check that the replaced ACB board is of the correct type and not damaged.
2. Power down the EBI Gate 200 System.

AFTER INSTALLATION WORK

3. After the ACB board is replaced and the EBI Gate 200 is powered up, the ACB displays the following message in the alpha-numeric display -109, -209 alternating.
4. Confirm the Block Section is clear and operate the "Reset" switch.
5. Check that the clear/occupied status for the respective block section is indicated correctly.
6. Simulate a train passing through the block section as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) - Section 3.

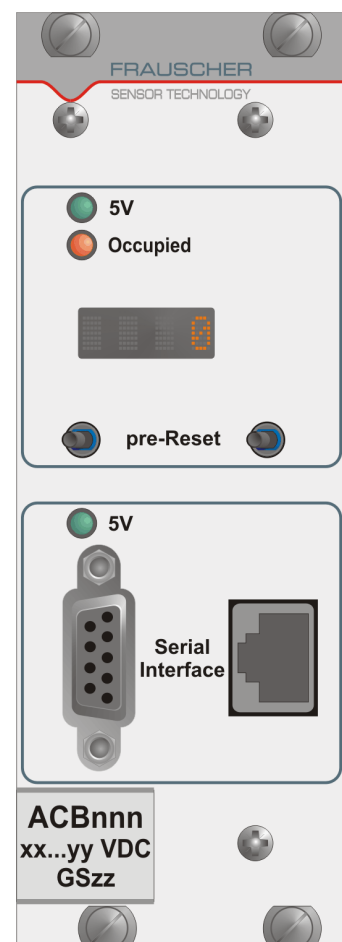


Figure 1 – ACB Board

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX52		
Replace a Frauscher ACS2000 : SIC Fuse Board		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Frauscher ACS2000 : SIC Fuse Board associated with the EBI Gate 200 Level Crossing System
Excludes:	All other types of boards

Appropriate Protection / Possession arrangement shall be taken before commencing work on any track sections.

Liaise with Signaller before carrying out this test.

When replacing boards, it is recommended to check that at any time; only one board is removed from the system, as this prevents one board being mistaken for another.

The Technician is responsible for resetting the axle counter.

BEFORE INSTALLATION WORK

1. Check that the replacement SIC fuse board is of the correct type and not damaged.
2. Power down the EBI Gate 200 System.

AFTER INSTALLATION WORK

3. Power up the EBI Gate 200 System.
4. After the SIC fuse board is replaced and the EBI Gate 200 is powered up, the ACB displays the following message in the alphanumeric display -109, -209 alternating.
5. Reset the relevant block section [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) - Section 3.
6. Check the wheel sensor detection capability as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel sensor adjustment for systems fitted with IMC & ACB Boards) - Section 4.



Figure 1 – SIC Board

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX53		
Remove and Refit Frauscher Wheel Sensor RSR123		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Remove and refit the same Frauscher RSR-123 Wheel Sensor (or F500 Wheel Sensor for SATWS or ATWS) and associated Rail Claw for Track Engineering work
Excludes:	Replacement of Frauscher RSR-123 Rail Sensor (see SMTH/Part04/AX40). Any other type of Axle Counter Wheel Sensor

GENERAL

If the wheel sensor is associated with an EBI Gate 200 Level Crossing System, disconnect the power supply before undertaking work.

The possession of the axle counter section shall not be given up unless the equipment has passed all the tests and is fit for use.

Protection/Possession arrangement shall be taken before commencing work on any track sections.

Liaise with Signaller before carrying out this test.

For EBI Gate 200 Level Crossing System the Technician is responsible for resetting the axle counter, on all other systems it is the Signaller's responsibility.

BEFORE INSTALLATION WORK

1. Check the physical siting of the of the Rail Sensor by referring to the Detection Point siting form. If a siting form is not available, the rail sensor position shall be accurately measured from a datum point, which is not going to change during the work, and recorded. The record shall also include which rail the sensor is fitted to.
2. On removal of the Rail Claw, the condition of the washer shall be assessed. If there is any evidence of damage or deterioration, then the washer shall be renewed as part of the work

AFTER INSTALLATION WORK

3. Check that the Rail Sensor is correctly mounted at the same location in relation to the Detection Point siting form or datum point recorded in Step 1.
4. Carry out [NR/SMS/PartC/AX41](#) (Frauscher : RSR123 Wheel Sensors) - Periodic Task 2 – Head Sensor Security.
5. Check there is a minimum 600mm between the Rail Sensor and any rail joint or rail weld.
6. Carry out [NR/SMS/PartC/AX40](#) (Frauscher Advanced Axle Counter) – Periodic Task 3 – Rail Sensor Height Check.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX53		
Remove and Refit Frauscher Wheel Sensor RSR123		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Final Checks (excluding EBI Gate 200 & Vamos Level Crossing Systems)

7. Carry out [NR/SMS/PartB/Test/040](#) (RSR123 Wheel Sensor Adjustment – associated with AEB Boards) – Steps 1.1 to 1.8 only.
8. Carry out [NR/SMS/PartC/AX41](#) (Frauscher : RSR123 Wheel Sensors) - Service B – Wheel Sensor Calibration Checks.
9. Carry out [NR/SMS/PartB/Test037](#) (Frauscher: RSR123 Wheel Sensor Occupancy Detection Capability Test).

Final Checks - EBI Gate 200 Level Crossing System

10. Adjust both wheel sensor systems and detection capability as described in [NR/SMS/PartB/Test/082](#) (Frauscher : RSR123 Wheel Sensor Adjustment – associated with IMC & ACB Boards) - Sections 1 to 5.

Final Checks - Vamos Level Crossing System

11. Adjust both wheel sensor systems and detection capability as described in [NR/SMS/PartB/Test/157](#) (Frauscher : RSR123 Wheel Sensor Adjustment – associated with IMC Boards) - Sections 1 to 3.

Final Checks – SATWS and ATWS Trackworker Safety System

12. Following the installation of the train detector, use a connected SATWS or ATWS control unit and warning device to carry out a functional test to confirm that the system operates correctly.

• The functional test involves waiting for a train to pass over the sensor or (where possible), using the dummy wheel to simulate a train.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX60		
Replace a Converter ISDN Ethernet (CIE) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Converter ISDN Ethernet (CIE) (AzLM)
Excludes:	All other types of Converter

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when working inside the unit.

The Signaller is responsible for restoring the axle counter section.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the replacement is of the correct type or equivalent and is undamaged. (see Appendix A – Equivalent Types).
3. Check that the wiring of is correct to diagram and correctly labelled.
4. Check that the program plug is correctly labelled and is for the correct CIE.
5. Power down the CIE.

AFTER INSTALLATION WORK

6. Check the replacement unit is correctly installed, correct type and secure.
7. Check that all Wago plugs and wires are secured and terminated correctly (Line 1 & Line 2 are keyed).
8. Check that the programming plug is secure and corresponds with the CIE functions and is the correct one for the CIE.
9. Power up the CIE.
10. Check that the LED indications on the CIE are working correct.
11. Check both network A and B channels are working.
12. With the Signaller's permission, reconnect the equipment to the interlocking.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX60		
Replace a Converter ISDN Ethernet (CIE) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

13. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

APPENDIX A - Equivalent Types

Type	Equipment Name	Equivalent Type
3JA 13539 AAAA	Converter ISDN Ethernet (CIE)	3JA 13539 ABAA

Do not replace a 3JA 13539 ABAA with a 3JA 13539 AAAA.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX61		
Replace a Converter ISDN Ethernet (CIE) DC - DC Power Supply (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Converter ISDN Ethernet (CIE) DC - DC Power Supply
Excludes:	All other types of types of Converter Power Supply

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when working inside the unit.

The Signaller is responsible for restoring the axle counter section

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the replacement is of the correct type and is undamaged.
3. Check that the wiring of is correct to diagram and correctly labelled.
4. Power down the CIE DC - DC Power Supply.

AFTER INSTALLATION WORK

5. Check the replacement unit is correctly installed, correct type and secure.
6. Check that all Wago plugs and wires are secured and terminated correctly.
7. Power up the CIE DC - DC Power Supply.
8. Check that the LED indications on the CIE DC - DC Power Supply are working correct.
9. With the Signaller's permission, reconnect the equipment to the Interlocking
10. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX62		
Replace a Single Channel Controller (SCC) CPU Card (AzLM) in a 2oo2 System		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Single Channel Controller (SCC) CPU Card (AzLM) 2oo2 ACE
Excludes:	All other types of CPU Card, Single Channel Controller (SCC) CPU Card (AzLM) 2oo3 ACE

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The evaluator shall be powered down for this task by disconnection of its power supply.

- The Program plug is uniquely identified to include the data version number.

- The Program plug will have the unique ACE name and version number of the software.

- The Installed Software Status Record (ISSR) will tell you the status of the installed site specific software.

- The connection of a laptop with the diagnostic software will also identify the installed site specific software.

- The Signaller is responsible for restoring the axle counter section.

- For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected CPU(s) is correctly isolated from the power supply.
2. Check that the replacement CPU(s) board is of the correct type and is not damaged.
3. Check for correct compatibility of CPUs and program plugs.
4. Check that the original / replacement Program plug status corresponds with the Installed Software Status Record (ISSR).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX62		
Replace a Single Channel Controller (SCC) CPU Card (AzLM) in a 2oo2 System		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

5. Check the replacement CPU card(s) is correctly Installed and secure.
6. Restore the power to the affected CPU(s).
7. After approximately 3 minutes check via diagnostics that the CPU's are functional.
8. Check that the software version of the replacement CPU card(s) corresponds with that of the original by use of a laptop with the diagnostic software.
9. Check that the sections under the ACE's control are available for reset (if applicable). The diagnostic software can be used to perform this check.
10. With the Signaller's permission, reconnect the section disconnection link(s).
11. Request that each section under the ACE control is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX63		
Replace a Power Data Coupling Unit (PDCU) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Power Data Coupling Unit (PDC) (AzLM)
Excludes:	All other types of Power Data Coupling Unit

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

• The Signaller is responsible for restoring the axle counter section.

• For Further Information see [NR/SMS/Appendix/15](#) – General Information on the Thales Axle Counter Systems.

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the replacement unit is of the correct type or equivalent and is undamaged. (See Appendix A – Equivalent types)
3. If applicable, isolate the Power Data Coupling Unit (PDCU).
4. [WIRE COUNT](#) the existing Power Data Coupling Unit (PDCU) to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check that the replacement unit is securely installed.
8. [WIRE COUNT](#) the Power Data Coupling Unit (PDCU) to the wiring diagram.
9. Check the existing wiring is correctly labelled.
10. Check the wires are correctly twisted to the point of termination.
11. Reconnect the Power Data Coupling Unit (PDCU) to each Serial card.
12. If applicable, power up the Power Data Coupling Unit (PDCU).
13. Check the red LED is not illuminated.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX63		
Replace a Power Data Coupling Unit (PDCU) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

14. With the Signaller's permission, reconnect the equipment to the Interlocking.
15. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
16. Check that the unit is correctly labelled.

APPENDIX A - Equivalent types

Type	Equipment Name	Equivalent Type
3CR 01892 AAAA	Power Data Coupling Unit (PDCU)	3CR 01892 BAAB

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX64		
Replace a DC - DC Converter (Power Supply to EAK) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	DC - DC Converter (Power Supply to EAK) (AzLM)
Excludes:	All other types of DC – DC Power Converter

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when working inside the unit.

The Signaller is responsible for restoring the axle counter section.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section(s) are correctly isolated from the Interlocking.
2. Check that the replacement DC – DC Power Converter is of the correct type, is undamaged and is correctly labelled.
3. Isolate the DC – DC Power Converter.
4. [WIRE COUNT](#) the existing DC – DC Power Converter to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check the DC – DC Power Converter is mounted securely and labelled correctly.
 8. [WIRE COUNT](#) the replacement DC – DC Power Converter to the wiring diagram.
 9. Power up the DC – DC Power Converter.
 10. Check the U_A green LED is illuminated.
 11. Check the output voltage of the replaced unit on the PDCU busbar.
- Any paralleled units shall be powered down during this test.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX64		
Replace a DC - DC Converter (Power Supply to EAK) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

12. With the Signaller's permission, reconnect the output of the affected section(s) to the signalling system.
13. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX65		
Replace an ACE DC - DC Power Card (AzLM) 2oo2 ACE		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Replace an ACE DC - DC Power Card (AzLM) 2oo2 ACE
Excludes:	All other DC –DC Power cards, DC – DC Power Card AzLM 2oo3 ACE

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection method as required.

Electrostatic precautions shall be taken when working inside the unit.

The Signaller is responsible for restoring the axle counter section

The ACE shall be powered down for the replacement of this card.

For Further Information see [NR/SMSAppendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the ACE is correctly isolated from the power supply.
2. Check that the replacement DC - DC Converter card is of the correct type and is not damaged.

If replacement unit is PowerOne variant check the supplier version number is V106 or greater, see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems) for further details.

AFTER INSTALLATION WORK

3. Check the replacement DC - DC Converter card is correctly installed and secure.
4. Restore the power to the ACE.
5. Check that the correct serial and parallel I/O card LEDs are illuminated see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems) – LED Indications.
6. Check the LED on the front of the DC/DC Power cards. If extinguished the voltages are out of tolerance and shall be investigated.
7. With the Signaller's permission, reconnect the equipment to the interlocking.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX65		
Replace an ACE DC - DC Power Card (AzLM) 2oo2 ACE		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

8. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
9. If possible, observe the passage of a train over the affected section(s).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX66		
Replace an ISDN V.24 Converter		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	ISDN V.24 converter
Excludes:	All other Axle Counter Cards and converters

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

- The Signaller is responsible for restoring the axle counter section.
- The ACE does not have to be powered down for this task.
- For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the replacement unit is of the correct type or equivalent and is undamaged.
3. Isolate the ISDN V.24 Converter.
4. [WIRE COUNT](#) the existing ISDN V.24 converter to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check that the replacement unit is securely installed.
8. [WIRE COUNT](#) the ISDN V.24 Converter to the wiring diagram.
9. Check the existing wiring is correctly labelled.
10. Check the wires are correctly twisted to the point of termination.
11. Power up the ISDN V.24 Converter.
12. Check the status of the LED's, see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems) for more details.
13. With the Signaller's permission, reconnect the equipment to the Interlocking.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX66		
Replace an ISDN V.24 Converter		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

14. Request the section is reset, observe that the section(s) are successfully restored to normal operation.
15. Check that the unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX69		
Replace a Thales Axle Counter Sub-rack		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Replace a Thales Axle Counter Sub-rack
Excludes:	All other types of Axle Counter and Non-Axle Counter Sub-rack

GENERAL

This Test Plan shall not be attempted without the express consent of the S&TME and needs to be done in conjunction with Thales. A “Release of Controls” is required and this is not easily achieved safely.

Before any work is undertaken the following shall be undertaken:

- a) Possession of the axle counter section(s) shall be taken.
- b) Disconnection of the output of the evaluator to the signalling system.**
- c) During the replacement process “No Additional work”, disturbance to EAK’s or any other equipment connected to the ACE shall be allowed.**
- d) Electrostatic precautions shall be taken when working inside the unit.

Alternative protection shall be in place before the reconnection of the disconnection links to allow the testing of the reset circuits.

The ACE shall be powered down for the replacement of this unit.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section(s) are correctly isolated from the Interlocking.
2. Check that the ACE is correctly isolated from the power supply.
3. Check that the replacement ACE Sub-rack is of the correct type and is not damaged.
4. [WIRE COUNT](#) the ACE Sub rack to the wiring diagrams.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring and connectors are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX69		
Replace a Thales Axle Counter Sub-rack		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

7. Check the replacement Sub rack is correctly installed and secure.
8. Check that all cards in the Sub-rack are fitted and secure.
9. Check that the wiring and connectors are replaced as labelled and secure.
10. [WIRE COUNT](#) the replacement unit to the wiring diagram.
11. If fitted, check the replacement power supply card is correctly installed and secure.
12. Restore the power to the ACE.
13. Check that the correct I/O card LEDs are illuminated correctly and use diagnostic system (where available) [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems) – LED indications.
14. Check the LED indications on the cards and the diagnostic system (where available) to shows the affected section(s) are disturbed.
15. If fitted, check the LED's on the front of power supply cards. If extinguished the voltages are out of tolerance and are to be investigated.
16. If fitted, check the LED's on the CPUs are showing the correct indication.
17. With the Signaller's permission, reconnect the equipment to the Interlocking.
18. Where the ACE has multiple sections and outputs to the interlocking this shall be tested and corresponded to the correct section, reset type and the correct indication to the Signaller.
19. This shall be completed for each section and each output and shall be observed using the AzLM Diagnostic software as well as the LED indications (not applicable for 70/30).
20. Check with the Signaller all the affected section(s) are showing occupied.
21. Request the section(s) is reset, observe that the section(s) are successfully restored to normal operation.
22. If possible, observe the passage of a train over the affected section(s).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX70		
Replace a Sedlbauer unit (PMC Transformer) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Sedlbauer unit (PMC Transformer) (AzLM)
Excludes:	All other types of PMC Transformer

GENERAL

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

The Signaller is responsible for restoring the axle counter section.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section is correctly isolated from the interlocking.
2. Check that the replacement unit is of the correct type and is undamaged.
3. Isolate the data line.
4. [WIRE COUNT](#) the existing Sedlbauer unit (PMC Transformer) to the wiring diagram.
5. Check the existing wiring has safe insulation.
6. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check that the replacement unit is securely installed.
8. [WIRE COUNT](#) the Sedlbauer unit (PMC Transformer) to the wiring diagram.
9. Check the quality of the soldered terminations.
10. Check the existing wiring and unit is correctly labelled.
11. Check the wires are correctly twisted to the point of termination.
12. Reinstate the data line and check for any relevant error messages using the diagnostic software.
13. With the Signaller's permission, reconnect the equipment to the Interlocking.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX70		
Replace a Sedlbauer unit (PMC Transformer) (AzLM)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

14. Request the section is reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX73		
Replace a Single Channel Controller (SCC) CPU Card (AzLM) in a 2oo3 System		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Single Channel Controller (SCC) CPU Card (AzLM) 2oo3 ACE
Excludes:	All other types of CPU Card, Single Channel Controller (SCC) CPU Card (AzLM) 2oo2 ACE

GENERAL

The preferred method for this task is not to power down the evaluator, as each CPU can be changed on an individual basis, the associated re-synchronisation time has been proven to be no more than 10 minutes.

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection as required.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The Program plug is uniquely identified to include the data version number.

The Program plug will have the unique ACE name and version number of the software.

The Installed Software Status Record (ISSR) will tell you the status of the installed site specific software.

The connection of a laptop with the diagnostic software will also identify the installed site specific software.

The Signaller is responsible for restoring the axle counter section

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected CPU(s) is correctly isolated from the power supply.
2. Check that the affected CPU(s) board is of the correct type and is not damaged.
3. Check for correct compatibility of CPU(s) and program plugs.
4. Check that the original / replacement Program plug status corresponds with the Installed Software Status Record (ISSR).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX73		
Replace a Single Channel Controller (SCC) CPU Card (AzLM) in a 2oo3 System		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

5. Check the replacement CPU card(s) is correctly Installed and secure.
6. Restore the power to the affected CPU(s).
7. After approximately 10 minutes check via diagnostics that the CPU's are functional.
8. Check that the software version of the replacement CPU card(s) corresponds with that of the original by use of a laptop with the diagnostic software.
9. Check that the sections under the ACE's control are available for reset (if applicable). The diagnostic software can be used to perform this check.
10. If required, request any disturbed sections under the ACE control are reset, observe that the section(s) are successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX74		
Replace an ACE DC - DC Power Card (AzLM) 2oo3 ACE		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Replace an ACE DC - DC Power Card (AzLM) 2oo3 ACE
Excludes:	All other DC – DC Power cards, DC – DC Power Card AzLM 2oo2 ACE

GENERAL

- The preferred method for this task is not to power down the evaluator, as each DC – DC converter can be changed on an individual basis.

Before any work is undertaken on the axle counter system you shall reach a clear understanding with the Signaller on the work being undertaken and any impact on the signalling system. Implement protection method as required.

Electrostatic precautions shall be taken when working inside the unit.

- The Signaller is responsible for restoring the axle counter section

For Further Information see [NR/SMS/Appendix 15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Check that the affected section(s) are correctly isolated from the Interlocking.
2. Check that the replacement DC - DC Power Converter card is of the correct type, is undamaged and is correctly labelled.

AFTER INSTALLATION WORK

3. Check the DC – DC Power Converter card is correctly installed, secure and correctly labelled.
4. If required, restore the power to the DC – DC power converter.
 - Check that the correct serial I/O card and/or CPU LEDs are illuminated, see [NR/SMS/Appendix 15](#) (General Information on the Thales Axle Counter Systems) – LED Indications.
5. Check the LEDs on the front of the DC/DC Power cards. If extinguished, the voltages are out of tolerance and shall be investigated.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX95		
Replace a RSE Wheel Sensor Assembly		
Issue No. 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021
Includes:	RSE wheel sensor	
Excludes:	All other wheel sensor systems.	

GENERAL

Liase with Signaller before carrying out this test.

Wiring Assessment

Before undertaking any work an assessment of the condition of the wiring shall be undertaken (with particular regard to insulation degradation) to ascertain whether its condition allows the changes to be made safely.

BEFORE INSTALLATION WORK

- For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- Check that the replacement wheel sensor is of the correct type and is not damaged.
- Check existing wiring at the cable junction box is correctly labelled.
- [WIRE COUNT](#) the cable junction box to the wiring diagram.

DURING WORK (If the rail is to be replaced)

- Check the adapter plate being fitted is the correct type for the rail section.
- Check that if the sensor is to be fitted to 113lb flat bottom rail that an assessment has been made as to the effects of drilling two 13mm holes outside the normal drilling zone of the rail.

AFTER INSTALLATION WORK

- Check tail cable is correctly wired to the cable junction box (polarity conscious, secure at junction box end, correctly routed and secured) and labelling is correct.
- [WIRE COUNT](#) the cable junction box to the wiring diagram.
- Check terminations are secure.
- Examine the sensing head fixings to the rail. Check that they are secure and that there is no evidence of movement.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX95		
Replace a RSE Wheel Sensor Assembly		
Issue No. 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

11. Check the height setting of the wheel sensor as described in [NR/SMS/PartC/AX99](#) (Trains Entering Terminal Stations System (TETS) - Clause 1.8.
12. Check the operation of the wheel sensor as described in [NR/SMS/PartC/AX99](#) (Trains Entering Terminal Stations System (TETS) - Clause 1.11.
13. Repeat clauses 11 and 12 after a settling period of at least twenty train movements.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX96		
Replace a RSE Wheel Sensor Assembly Cable Junction Box		
Issue No. 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	RSE Wheel Sensor Cable Junction Box
Excludes:	All other Junction Boxes

GENERAL

Liaise with Signaller before carrying out this test.

Wiring Assessment

Before undertaking any work an assessment of the condition of the wiring shall be undertaken (with particular regard to insulation degradation) to ascertain whether its condition allow the changes to be made safely.

BEFORE INSTALLATION WORK

- For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- Check that the replacement wheel sensor is of the correct type and is not damaged.
- [WIRECOUNT](#) the cable junction box to the wiring diagram.
- Check the cable core colours/number to the wiring diagram.
- Check existing wiring at the cable junction box is correctly labelled.
- Isolate the existing cable junction box from the supply.

AFTER INSTALLATION WORK

- Check the junction box is correctly installed.
- Check tail cables are correctly wired to the cable junction box (polarity conscious, secure at junction box end, correctly routed and secured) and labelling is correct.
- [WIRECOUNT](#) the cable junction box to the wiring diagram.
- Check terminations are secure.
- Reconnect the supply to the cable junction box.
- Check the operation of the wheel sensor as described in [NR/SMS/PartC/AX99](#) (Trains Entering Terminal Stations System (TETS)) - Clause 1.11.
- Carry out the ASR 4 functional test as described in [NR/SMS/PartC/AX99](#) (Trains Entering Terminal Stations System (TETS)) - Clause 3.2 for each wheel sensor that was linked via the replaced cable junction box.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX97		
Replace a ARS 4 Evaluation Board or Enclosure		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	ARS 4 Evaluator Interface Board, Voltage Converter Board or Enclosure
Excludes:	All other Evaluator Unit Boards or Enclosures.



Liase with signaller before carrying out this test.

Wiring Assessment

Before undertaking any work an assessment of the condition of the wiring shall be undertaken (with particular regard to insulation degradation) to ascertain whether it is in a suitable condition to allow the changes to be made safely.

BEFORE INSTALLATION WORK

1. Check that the unit is of the Correct Type and is Not Damaged.
2. Check the anti-static protection is still in place if the unit is a board.
3. Isolate the existing unit from the supply.
4. Check the existing wiring is correctly labelled.
5. [WIRECOUNT](#) the existing terminals to the wiring diagram.

AFTER INSTALLATION WORK

6. Check replacement evaluator interface PCB, voltage converter PCB or holder is correctly installed.
7. Check the wiring is replaced to diagram and labelling is correct.
8. WIRECOUNT the replacement unit terminals to the wiring diagram.
9. Check terminations are secure.
10. Check the operation of the wheel sensor as described in [NR/SMS/AX99](#) Clause 1.11.
11. Carry out the ASR 4 functional test as described in [NR/SMS/AX99](#) Clause 3.2 for each wheel sensor that was linked via the replaced cable junction box.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/AX98		
Replace a ARS 4 Power Supply		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	ARS 4 Power Supply
Excludes:	All other Power Supplies.

| Liaise with signaller before carrying out this test.

Wiring Assessment

| Before undertaking any work an assessment of the condition of the wiring shall be undertaken (with particular regard to insulation degradation) to ascertain whether it is in a suitable condition to allow the changes to be made safely.

BEFORE INSTALLATION WORK

- |** 1. Check that the replacement power supply is of the Correct Type and is Not Damaged.
- |** 2. [WIRECOUNT](#) the existing power supply to the wiring diagram.
- |** 3. Check existing wiring is correctly labelled.
- |** 4. Isolate the existing unit from the power supply.

AFTER INSTALLATION WORK

- |** 5. Check the power supply is correctly installed.
- |** 6. [WIRECOUNT](#) the power supply to the wiring diagram.
- |** 7. Check terminations are secure and labelling is correct.
- |** 8. Reconnect the power supply and check the 50V d.c. (nominal) supply voltage to the evaluation unit.

| This should measure between 45 - 72Vd.c.

- |** 9. Check the operation of the wheel sensor as described in [NR/SMS/AX99](#) Clause 1.11.
- |** 10. Carry out the ASR 4 functional test as described in [NR/SMS/AX99](#) Clause 3.2 for each wheel sensor that was linked via the replaced cable junction box.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA02		
Replace a Platform Identification Beacon System (Including Sub-components)		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Platform Identification Beacon System (PIBS) equipment only
Excludes:	All other track mounted Balises or Beacons

GENERAL

Voltages over 110V might be present in this equipment.

The unique location and identification details for each individual beacon are defined by means of the coding plug in the control panel and are documented on the site record diagram.

BEFORE INSTALLATION WORKS

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check that the replacement component, mountings and fixings are not damaged and are the correct type (beacon mountings shall be correct for the type of sleepers; cable type shall be C3 or E3 as shown on site record diagram).
3. Record the existing beacon position (BEACON ONLY).

The correct placement of the reinstalled beacon is critical (see location diagram), this might necessitate marking appropriate bearers/sleepers or carefully measuring the distances between beacon and signal, etc., before removal of the existing beacon.
4. Record the identification number on back of existing coding plug.
5. Check that the replacement component connection (and plug coupler where applicable) has safe insulation.
6. Check that the replacement component is correctly labelled.
7. Check that the existing component is isolated from the supply.

AFTER INSTALLATION WORKS

8. Check that the replacement beacon or component is correctly installed (no metallic debris, correct position, correct track, correct coding plug).

The beacon should be installed at the correct height and not above rail level.
9. Check the security of the replacement component (mountings and fixings).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA02		
Replace a Platform Identification Beacon System (Including Sub-components)		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

10. Examine the plug coupler (where applicable) and check that no metallic dust, moisture or other contaminants exists between the two halves before reconnecting.
 - It is vital that each beacon component is connected back to its correct terminations on the control panel and in particular that adjacent beacons are not crossed over, particularly if the disconnection box has been disturbed.
11. Check that the replacement component is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA03		
Replace a Balise or Beacon		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	TASS, Tracklink III Beacon, Siemens Fixed, Alstom Fixed and Ansaldo Fixed Type
Excludes:	KVB, Tracklink II Beacon, Siemens switchable, Alstom switchable and Ansaldo switchable

GENERAL

• The unique location and identification details for each individual Beacon is stated on the Location Area Plan.

• The following forms are available:

- [NR/SMTH/Part02/Form/04](#) (Balise - Certificate of Conformity).

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Verify that the details contained in the Certificate of Conformity match the new Balise which is to be installed.

• **NOTE:** *If the Balise is to be “removed and replaced” without fitting a new Balise then step 2 need not be completed.*

3. Check the Beacon and Mountings are not damaged.
4. Check the Balise Positioning Form corresponds to the intended location of the Beacon.

AFTER INSTALLATION WORK

5. Check the replaced Beacon is securely mounted.
6. Verify the Beacon is located in accordance with the Balise Positioning Form.
7. Check the labelling of both beacon and mounting are visible and readable.
8. If possible, check the correct operation of the Balise by observing the passage of a train over it.

• **NOTE:** *This task can be completed remotely using data downloads.*

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA07		
Program a Balise or Beacon		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Tracklink III, Fixed Ansaldo, Siemens and Alstom Eurobalises.
Excludes:	Tracklink II, PIBS and all switchable balise types.

BEFORE PROGRAMMING

1. Check the replacement Balise is the for the correct application / system.
2. Check the Balise is the correct type and is not damaged.
3. Verify you have the correct version of Balise Positioning / Siting Form for the Balise to be replaced.
4. Verify you have the correct telegram information for the Balise to be replaced.

AFTER PROGRAMMING

5. Check the ID label on the Balise and the Certificate of Conformity match.
6. Confirm the correct telegram information has been loaded onto the Balise.
7. Check the details on the Certificate of Conformity are correct, all the relevant sections have been completed and the Programmer has signed where required.
8. Sign and date the Certificate of Conformity seal it in a clear plastic pouch and attached it to the Balise.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA08		
Replace an Alstom Switchable Balise		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Alstom Switchable Balise and Balise Disconnection Box
Excludes:	All other types of Balise

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check existing Balise and mounting bracket assembly is correctly labelled (compare with the Balise Positioning Form).
3. All replacement Balises shall be installed in the correct position (see Balise Positioning Forms). This can necessitate marking the bearers / sleepers or carefully measuring from the setting out feature specified on the Balise Positioning Form.
4. Check replacement unit is not damaged and is the correct type.
5. Check the condition / type of the existing sleeper. Check that the replacement mounting bracket assembly can be accommodated as a new installation.
6. Check the replacement unit is correctly labelled.
7. If the Balise is to be renewed, check the replacement Balise for the installation of correct data via a Certificate of Conformity.

If a Disconnection box is fitted

8. [WIRE COUNT](#) the Balise disconnection box to wiring diagrams.
9. Isolate existing Balise in LEU enclosure.
10. Check existing wiring has safe insulation.
11. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

12. Check that the replacement unit has been correctly installed (in accordance with the Balise Positioning form).
13. If screws and bolts are used for fastening the Vortok mounting bar to concrete or wooden sleepers, check that they are tightened to the correct torque. Check the Balise fixings are secure. i.e. The tab washers are applied correctly. Refer to [NR/SMS/PartZ/Z08](#) (Train Protection – Reference Values).
14. Reconnect Balise in LEU enclosure (Switchable Balise or disconnection box only).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA08		
Replace an Alstom Switchable Balise		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. [WIRE COUNT](#) Balise disconnection box to wiring diagrams (disconnection box only).
- * 16. For the replacement of a Switchable Balise or disconnection box, check the micro coder operates correctly by inspecting the LEU Micro-coder indications, which should be as follows:
 - OUT1 and OUT2: off or flashing green (for unused output).
 - ERR: off.
 - OK: Flickering green.
 - ETH1 TX and ETH2 TX: off.
 - ETH1 LNK and ETH2 LNK: off.
17. For a Switchable Balise, disconnection box or associated cabling, check the messages transmitted by the Switchable Balise against the LEU parameterisation sheets for any route set from the associated signal.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA12		
Replace a KVB Balise		
Issue No. 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	KVB Fixed, switchable and Marker Balise and/or brackets
Excludes:	Any other type of Balise

GENERAL

⋮ An “BCC encoding plug” is attached to the UCS card in the encoder. It determines the codes that are sent to switchable Balise.

⋮ An “BCB encoding plug” is attached to a fixed Balise. It determines the codes generated by the Balise.

Inserting the wrong coding plug causes the wrong message to be sent to the Train potentially causing a Wrong side Failure.

BEFORE RE-INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Where the bracket is to be removed measure and record the position of the Balise to the fixed asset identified on the Balise siting form.
3. Check the replacement item is the correct type and is not damaged.
4. Check the BCB (fixed Balise) coding plug labelling currently fitted is correct to the configuration documents (**FIXED BALISE ONLY**).

AFTER RE-INSTALLATION WORK

5. Check that the correct Balise type has been fitted.
6. Check the security and tightness of the Balise to the mounting brackets.
7. Check that the plug coupler has been correctly attached to the Balise and is secure (**SWITCHABLE BALISE ONLY**).
8. Check that the correct BCB (fixed Balise) coding plug has been fitted to the Balise and is secure (**FIXED BALISE ONLY**).
9. Check the Balise has been fitted in the correct position to the fixed asset.
10. Measure and record the Balise height from the centre point of the Balise.
 - ⋮ This should be between 70-163mm below rail height.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA12		
Replace a KVB Balise		
Issue No. 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

11. Measure the height of each of the four corners of the Balise and compare these against the centre point measurement, the difference is to be no more than <40mm.
12. Verify that the Balise is centrally mounted between and parallel to the running rails, by measuring from each corner to the foot of the rail.
- * 13. Carry out [NR/SMS/PartB/Test/209](#) (KVB Balise Test) – Section 1, Balise Test.
- * 14. Carry out [NR/SMS/PartB/Test/209](#) (KVB Balise Test) – Section 2, “Presence train” Test.
15. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA13		
Replace a KVB encoding plug (BCB and BCC)		
Issue No. 1	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB BCC (Encoder coding plug) and KVB BCB (Balise coding plug)
Excludes:	Any other type of encoding plug

Details of configuration information can be found in the DCO (Dossier de Configuration).

The BCC plug is attached to the UCS card in the encoder. It determines the codes that are sent to switchable Balise.

The BCB plug is attached to a fixed Balise. It determines the codes generated by the Balise.

Inserting the wrong coding plug will cause the wrong message to be sent to the Train potentially causing a Wrong side Failure.

Appropriate electrostatic precautions shall be undertaken when handling any cards in the encoder rack.

BEFORE RE-INSTALLATION WORK

1. Check the replacement item is the correct type and is not damaged.
2. Check the encoding plug currently fitted is correct to the configuration documents.
3. Isolate the Encoder rack (BCC ONLY).

AFTER INSTALLATION WORK

4. Check that the correct coding plug has been fitted and is secure.
5. Arrange for the encoder rack to be powered and check the UCS (processor) card green and yellow LEDs illuminate together.

Check within 30 seconds the yellow LED has extinguished and the green LED stays lit. (BCC ONLY)
6. Carry out [SMS/PartB/Test 209](#) – Balise Test, Section 4.

Test ALL possible output codes generated for ALL outputs are correct to the configuration documents using the Maintenance test tool attached to the maintenance port of the SBI (output) card. (BCC ONLY).
7. Carry out [SMS/PartB/Test 209](#) – Balise Test, Section 1. Test the code generated by the Balise is correct using the Maintenance Testing Tool on the Balise. (BCB ONLY)
8. Check or arrange for correct labelling of unit

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA14		
Replace a KVB UCS processor card		
Issue No. 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB UCS card
Excludes:	Any other type of card

Removal and replacement of the BCC shall be undertaken using the appropriate SMTH test plan.

• The BCC plug is attached to the UCS card in the encoder. It determines the codes that are sent to switchable Balise.

• Details of configuration information can be found in the DCO (Documentation de Dossier).

• Inserting the wrong coding plug will cause the wrong message to be sent to the Train potentially causing a Wrong side Failure.

Appropriate electrostatic precautions shall be undertaken when handling any cards in the encoder rack.

BEFORE RE-INSTALLATION WORK

1. Check the replacement item is the correct type and is not damaged.
2. Check the BCC currently fitted to the UCS card is correct to the configuration documents.
3. Isolate the Encoder rack.

AFTER RE-INSTALLATION WORK

4. Check the UCS card has been correctly installed.
5. Arrange for the encoder rack to be powered and check the UCS (processor) card green and yellow LEDs illuminate together.
 - Check within 30 seconds the yellow LED has extinguished and the green LED stays lit.
6. Check that the correct BCC coding plug has been fitted to the UCS card.
7. Carry out [SMS/PartB/Test 209](#) – Balise Test, Section 4.
 - Test ALL possible output codes generated for ALL outputs are correct to the configuration documents using the Maintenance test tool attached to the maintenance port of the SBI (output) card.
8. Check or arrange for correct labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA15		
Replace a KVB ECI or KVB SBI card		
Issue No. 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB ECI (input) or SBI (output) card
Excludes:	Any other type of card

Details of configuration information can be found in the DCO (Dossier de Configuration).

Appropriate electrostatic precautions shall be undertaken when handling any cards in the encoder rack.

BEFORE RE-INSTALLATION WORK

1. Check the replacement item is the correct type and is not damaged.
2. Isolate the Encoder rack.
3. Wire count the output card outputs to the wiring diagram (SBI CARD ONLY).

AFTER RE-INSTALLATION WORK

4. Check the replacement card has been correctly installed.
5. Wire count the outputs to the wiring diagram (SBI CARD ONLY).
6. Arrange for the encoder rack to be powered up and check the inputs on the maintenance test tool agree with the configuration documents.
 - Arrange for one input to change state and check the change of state is read on the Maintenance test tool. (ECI CARD ONLY)
 - For additional information see [SMS Appendix 23](#) – General information on the KVB Test Set Sections 6 & 9.
7. Test one output from the SBI card using the maintenance test tool connected to the output or placed on the Balise and check it is correct to the configuration documents.
 - Arrange for a change of state code to be generated by the output card and check the code changes using the maintenance test tool attached to the SBI output or placed on the Balise and check the code is correct to the configuration documents. (SBI CARD ONLY).
 - Refer to [SMS/PartB/Test 209](#) – Balise test Sections 1 & 2.
8. Check or arrange for correct labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA16		
Replace a KVB Cable Attenuator		
Issue No. 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB cable attenuator
Excludes:	Any other type of attenuator

***** INDEPENDENCE EXEMPT *****

⋮ Details of configuration information can be found in the DCO (Dossier de Configuration).

⋮ The attenuator is fitted where the output card to beacon cable is less than 150m.

BEFORE RE-INSTALLATION WORK

1. Check the replacement attenuator is the correct type and is not damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement attenuator has been correctly installed.
3. Test one correct message is being generating by the beacon using the KVB Maintenance Test tool laid on the Balise.

⋮ Refer to [SMS/PartB/Test 209](#) – Balise Test, Section 1.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA17		
Replace a KVB Encoder Power Card		
Issue No. 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB encoder power card
Excludes:	Any other type of card

⋮ Details of configuration information can be found in the DCO (Dossier de Configuration).

Appropriate electrostatic precautions shall be undertaken when handling any cards in the encoder rack.

BEFORE RE-INSTALLATION WORK

1. Check the replacement card is the correct type and is not damaged.
2. Isolate the encoder rack.

AFTER RE-INSTALLATION WORK

3. Check the replacement card has been correctly installed.
4. Arrange for the encoder rack to be powered and check the green LED illuminates on the power card.
5. Check the UCS (processor) card green and yellow LEDs illuminate together.
 - Check within 30 seconds the yellow LED has extinguished and the green LED stays lit.
6. Test at least one correct message is being generated from the output card in the encoder rack using the KVB Maintenance Test tool.
 - ⋮ Refer to [SMS/PartB/Test 209](#) – Balise Test, Section 4.
7. Check or arrange for correct labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA18		
Replace a KVB Encoder Rack/Housing		
Issue No. 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	KVB Encoder Rack/Housing
Excludes:	Any other type of Rack/Housing & replacement of any other KVB component

Details of configuration information can be found in the DCO (Dossier de Configuration).

Appropriate electrostatic precautions shall be undertaken when handling any cards in the encoder rack.

BEFORE RE-INSTALLATION WORK

1. Check the replacement component is the correct type and is not damaged.
2. Check the BCC currently fitted to the UCS card is correct to the configuration documents.
3. Isolate the encoder rack.
4. Wire count the output card outputs to the wiring diagram.

AFTER RE-INSTALLATION WORK

5. Check the replacement component has been correctly installed.
6. Wire count the outputs to the wiring diagram.
7. Check that the correct BCC coding plug has been fitted to the UCS card.
8. Arrange for the encoder rack to be powered and check the UCS (processor) card green and yellow LEDs illuminate together.
 - Check within 30 seconds the yellow LED has extinguished and the green LED stays lit.
9. Carry out [SMS/PartB/Test 209](#) – Balise Test, Section 4.
 - Test ALL possible output codes generated for ALL outputs are correct to the configuration documents using the Maintenance test tool attached to the maintenance port of the SBI (output) card.
10. Check or arrange for correct labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA19		
Program a Siemens S21 Switchable (Transparent) Eurobalise		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	S21 Switchable (Transparent) Balise
Excludes:	All other types of Balise or Beacon

GENERAL

The process for programming a switchable (transparent) Balise is the same as that for a fixed Siemens S21 Balise. BA07, the SMTH for programming Balises and beacons deliberately excludes switchable Balises as they require a separate competency.

BEFORE PROGRAMMING

1. Check the replacement Balise is for the correct application / system.
2. Check the Balise is the correct type and is not damaged.
3. Verify you have the correct version of Balise Positioning / Siting Form for the Balise to be replaced.
4. Verify you have the correct telegram information for the Balise to be replaced.

AFTER PROGRAMMING

5. Check the ID label on the Balise and the Certificate of Conformity match.
6. Confirm the correct telegram information has been loaded onto the Balise.
7. Check the details on the Certificate of Conformity are correct, all the relevant sections have been completed and the Programmer has signed where required.
8. Sign and date the Certificate of Conformity, seal it in a clear plastic pouch and attached it to the Balise.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA20		
Replace a Siemens S21 Switchable (Transparent) Eurobalise		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	S21 Switchable (Transparent) Balise
Excludes:	All other types of Balise or Beacon

GENERAL

The unique location and identification details for each individual S21 Balise are stated on the corresponding Balise Positioning Form. The Signalling Plan and ETCS Data Generation Plan (EDGP) also indicate general positioning information for each Balise group. The Location Area Plan indicates general positioning information for switchable Balise groups only.

The following forms are available:

- a) [NR/SMTH/Part02/Form/04](#) (Balise - Certificate of Conformity).
- b) Balise Positioning Form.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Confirm the switchable (transparent) Balises identity using the Location Area Plan.
2. **For Missing Equipment Only:** Using the Balise Positioning Form relating to the missing Balise, identify and mark the location where the replacement Balise is to be fitted.

NOTE: If either the Location Area Plan or Balise Positioning Form is not available contact your (SM)S before proceeding.

3. Verify that the details contained in the Certificate of Conformity match both the details on the Balise Positioning Form and the labelling on the replacement Balise.

NOTE: If the details do not match contact your (SM)S before proceeding.

4. Check the Balise and mountings are not damaged.
5. Check the Balise Positioning Form corresponds to the intended location of the Balise.
6. [WIRE COUNT](#) Balise disconnection box to wiring diagrams.
7. Check existing wiring has safe insulation.
8. Check existing wiring is correctly labelled.
9. Isolate Balise.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA20		
Replace a Siemens S21 Switchable (Transparent) Eurobalise		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

10. Check the replaced Balise is securely mounted.
11. If screws and bolts are used for fastening the Vortok mounting bar to concrete or wooden sleepers, check that they are tightened to the correct torque. Check the Balise fixings are secure. Refer to [NR/SMS/PartZ/Z08](#) (Train Protection – Reference Values).
12. Verify the Balise is located in accordance with the Balise Positioning Form.
13. Check the labelling of both Balise and mounting are visible and readable.
14. Check that the tail cable from the Balise is secure.
15. [WIRE COUNT](#) Balise disconnection box to wiring diagrams (disconnection box only).
16. Check wiring is correctly labelled.
17. Correspond the LEU with the switchable (transparent) data Balise for both the straight and divergent route using the MD4 checksum sheets and the TPG unit (to read back MD4 checksums).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA22		
Replace a Siemens S21 MS Lineside Electronic Unit (LEU)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Replacement of Siemens LEU S21 MS (Modular Standard)
Excludes:	All other types of Lineside Electronic Unit

GENERAL

Unauthorised tampering with wiring or with the stored data might cause the system to no longer function safely.

The configuration key fixed to the baseplate of the LEU shall not be removed at any time. The configuration key for each of the replacement LEUs is pre-configured by the supplier and is supplied fixed to the baseplate of its LEU. There is no requirement to replace configuration keys or to check that a configuration key matches the LEU or Balise group.

Individual modules of the LEU S21 MS unit cannot be replaced. The LEU S21 MS shall always be replaced as a unit

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

Before replacing the LEU S21 MS, confirm the arrangements with the Signaller for the work to be carried out.

Asset Identification Image



Figure 1 - LEU S21 MS (Modular Standard)

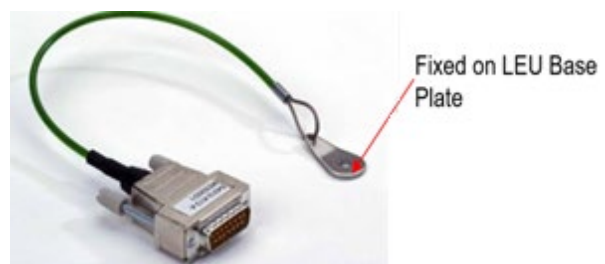


Figure 2 – LEU Configuration Key

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BA22		
Replace a Siemens S21 MS Lineside Electronic Unit (LEU)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

BEFORE INSTALLATION

1. Check the replacement LEU is of the correct configuration by checking the LEU id label on the front of the unit.
2. Check that the 3 x plug couplers (X1, X2 and X4) and 1 x earth wire have safe insulation and are correctly labelled.
3. Isolate the LEU from the power supply using the MCB circuit breaker which is present either on the side or below the LEU unit.

AFTER INSTALLATION

4. Check the replacement LEU is correctly installed on to the REB rack.
5. Check that the 3 x plug couplers (X1, X2 and X4) and 1 x earth wire are correctly and securely installed.
6. Reinststate the power supply to the LEU from the MCB circuit breaker.
7. Check the top LED display on the LEU is showing a small 'o' that alternates between top and bottom at intervals of one second to confirm the LEU is working as expected. See Figure 3.

NOTE: that the bottom LED does not display any indication as it is not utilised on Thameslink.

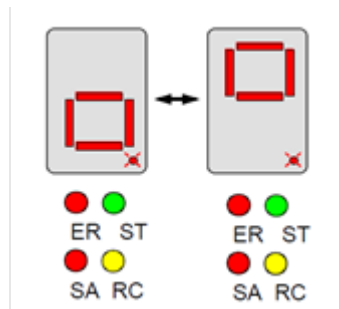


Figure 3 - Front display of each channel in front of the LEU

8. Check that the green ST light under the top LED display is lit to confirm the LEU is transmitting a valid telegram.
9. Correspond the LEU with the switchable (transparent) Balise for both the straight and divergent routes, using the MD4 checksum sheets and the TPG unit (to read back MD4 checksums).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL01		
Replace a Block Instrument		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Tokenless block, Block bell
Excludes:	Token, Tablet, Staff, No-signaller key token, Intermediate token, auxiliary and control instruments

GENERAL

- For the purpose of any wire labelling the block instrument shall be viewed from the rear.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement block instrument is not damaged and is correct type.
3. Check that the internal wiring of the replacement block instrument corresponds to the internal wiring of the redundant block instrument.
4. Check that the contact arrangement of the replacement instrument corresponds functionally to the contact arrangement of the redundant instrument.
5. [WIRE COUNT](#) existing block instrument to the wiring diagram.
6. Check existing wiring has safe insulation.
7. [INSULATION TEST](#) replacement instrument (minimum 2M ohms terminals to case).
8. Check existing wiring is correctly labelled.
9. Check existing instrument is Isolated from the supply.

AFTER INSTALLATION WORK

10. Check replacement block instrument is correctly installed.
11. Check wiring is replaced as labelled.
12. [WIRE COUNT](#) replacement block instrument to the wiring diagram.
13. Check terminations are secure and suitably protected.
14. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where circuits are designed to be earth free.
- * 15. Check correct correspondence of block instrument with adjacent signal box and any intermediate block instruments/indicators, for all indications.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL01		
Replace a Block Instrument		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 16. [BLOCK CONTROLS TEST](#) (NOT PERMISSIVE (FREE BLOCK) OR NON INTEGRAL BLOCK BELL).
- * 17. [BLOCK RECOVERY TEST](#) (NOT PERMISSIVE (FREE BLOCK) OR NON INTEGRAL BLOCK BELL).
- 18. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL02		
Replace a Block Switch		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Standard Block Switch
Excludes:	Intermediate block section signal switch

BEFORE INSTALLATION WORK

1. Check replacement block switch is not damaged (broken pin) and is correct type.
2. [WIRE COUNT](#) existing block switch to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

5. Check replacement block switch is correctly installed.
6. Check wiring is replaced as labelled.
7. [WIRE COUNT](#) replacement block switch to the wiring diagram.
8. Check terminations are secure and suitably protected.
9. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on block circuits which where designed to be earth free.
- * 10. Check correct correspondence of block instruments and bells between the controlling signal box and each adjacent signal box when controlling signal box is both switched in and out (All lines, TOL, LC, bells).
- * 11. Check correct correspondence of all other circuits, including telephones, which pass through block switch between controlling signal box. This includes each adjacent signal box when controlling signal box is both switched in and out.
- * 12. [BLOCK CONTROLS TEST](#).
- * 13. [BLOCK RECOVERY TEST \(WELWYN AND ONE ACCEPTANCE BLOCK CONTROLS ONLY\)](#).
14. Check, or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL03		
Replace a Block Winder		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

BEFORE INSTALLATION WORK

1. Check replacement block winder is not damaged and is correct type.
2. Carry out a [WIRE COUNT](#) existing block winder to the wiring diagram.
3. Check the existing wiring has safe insulation.
4. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

5. Check the replacement block winder is correctly installed.
6. Check the wiring is replaced as labelled.
7. Carry out a [WIRE COUNT](#) on the replacement block winder to the wiring diagram.
8. Check the terminations are secure and suitably protected.
9. Carry out [EARTH TEST \(DC\)](#) where the circuits are designed to be earth free.
- * 10. Carry out a [BLOCK RECOVERY TEST](#) on the equipment.
- * 11. Check the block winder is correctly sealed.
12. Check, or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL04		
Replace a Single Line Block Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Token, no-signaller key token intermediate token and auxiliary instruments
Excludes:	Tokenless block and one train staff instruments

General

- ⋮ The term token also includes tablet and staff.

BEFORE INSTALLATION WORK

1. Check and record in the logbook the number of tokens in each instrument in the system, and any tokens that might have been removed (Pilotman, damage).
2. Check replacement instrument is not damaged and is correct type (Configuration).
3. Check that the internal wiring of the replacement instrument corresponds to the internal wiring of the redundant instrument.
4. Check that the contact arrangement of the replacement instrument corresponds functionally to the contact arrangement of the redundant instrument.
5. [WIRE COUNT](#) the existing instrument to the wiring diagram.
6. Check existing wiring has safe insulation.
7. [INSULATION TEST](#) replacement instrument (minimum 2M ohms terminals to case).
8. Check existing wiring is correctly labelled.
9. Check existing instrument is Isolated from the supply.

AFTER INSTALLATION WORK

10. Check all tokens are removed from the instrument to be replaced.
11. Check replacement instrument is set to the same phase as the instrument being replaced (**EXCLUDES TABLET INSTRUMENTS**).
12. Check that all tokens removed from the redundant instrument are installed into the replacement instrument.
13. Check replacement instrument is correctly installed.
14. Check wiring is replaced as labelled.
15. [WIRE COUNT](#) replacement instrument to the wiring diagram.
16. Check wires and cables are clear of moving parts.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL04		
Replace a Single Line Block Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

17. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where circuits have been designed to be earth free.
- * 18. Check correct correspondence of block instrument with adjacent signal box and any intermediate block instruments/indicators, for all indications.
- * 19. Check that with any contact in the normal proving circuit broken, the by-pass resistor allows enough current to pass to operate the block bells but this inhibits the operation of the token lock relay at each instrument in the system
(HOME/DISTANT/SECTION SIGNAL NORMAL PROVING CIRCUITS ONLY).
- * 20. Check that a token cannot be withdrawn with a contact in the normal proving circuit broken **(HOME/DISTANT/SECTION SIGNAL NORMAL PROVING CIRCUITS ONLY).**

: Repeat step 20 for each contact in all the Normal proving circuits in the system
: **(HOME/DISTANT/SECTION SIGNAL NORMAL PROVING CIRCUITS ONLY).**
- * 21. Carry out [BLOCK CONTROLS TEST](#).
- * 22. Check that a token once withdrawn, can be replaced in the same instrument and that any release previously effective is now cancelled.
23. Check or arrange for correct labelling of instrument.
24. Check all instruments in the system are secure and locked.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL05		
Replace a Control Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Ground frame release control instrument, intermediate block section signal switch
Excludes:	Tokenless block instruments, key release instruments

BEFORE INSTALLATION WORK

1. Check replacement instrument is not damaged and is correct type (Commutator lock positions).
2. Check that the internal wiring of the replacement instrument corresponds to the internal wiring of the redundant instrument.
3. Check that the contact arrangement of the replacement instrument corresponds functionally to the contact arrangement of the redundant instrument.
4. [WIRE COUNT](#) the existing instrument to the wiring diagram.
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement instrument (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing instrument is isolated from the supply.
9. Check replacement instrument is set to the same commutator position as the instrument to be replaced.

AFTER INSTALLATION WORK

10. Check replacement instrument is correctly installed.
11. Check wiring is replaced as labelled.
12. [WIRE COUNT](#) replacement instrument to the wiring diagram.
13. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits where designed to be earth free.
- * 14. Check commutator is locked in the correct positions.
- * 15. Check commutator lock is released only by the correct function.
- * 16. Test that each contact only makes in the positions as specified in the wiring diagrams.
- * 17. Check that with each contact broken the correct circuit function de-energises.
18. Check, or arrange for, correct labelling of instrument.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/BL05		
Replace a Control Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

- * 19. Check the instrument is secure and locked.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA01		
Remove and Refit an Existing Cable Core or Wire		
Issue No: 08	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	A single cable core or wire. This includes a previously disconnected core or wire (proceed from step 6).
Excludes:	A broken wire or cable core (CA13), Line Wires (Telegraph) (CA31) and Telecoms cables (CAB001)

GENERAL

Where a cable core or wire is not correctly labelled, see [NR/SMTH/Part03/A06](#) (Defined Check: Check for Correct Labelling).

BEFORE DISCONNECTION

1. [WIRE COUNT](#) the cable core/wire to the wiring diagram.
2. Track cables only: Check bonding, jumpering and polarities to bonding plan.
3. Check cable core/wire is correctly labelled.
4. Check cable core/wire has safe insulation.
5. Note the position of any links, red dome nuts or equivalent.

AFTER RE-CONNECTION

6. Check cable core/wire is correctly installed and has not been damaged whilst disconnected.
7. Check cable core/wire is replaced as labelled.
8. Check cable core/wire is not susceptible to mechanical damage.
9. Track cables only: Check bonding, jumpering and polarities to bonding plan.
10. [WIRE COUNT](#) the cable core/wire to the wiring diagram.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Check with the Maintenance Test Plan for the item of equipment fed by the affected cable or wire and carry out steps marked with an asterisk *.
13. Check or arrange for correct labelling of cable core/wire.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA02		
Renew a Multi-Core Cable		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Multicore signalling cables
Excludes:	<ul style="list-style-type: none"> a) Renewing a cable with intermediate terminations, links or contacts. b) Refitting any removed or broken cable core(s)/wires that are not correctly labelled. c) Telecom cables (see Part 06). d) Plug coupled cables.

GENERAL

Where it is not possible to fully complete this test plan for all cable cores, this test plan shall only be used when authorised by the SM(S).

A cable changeover being carried out under this Test Plan shall only be left unattended after the completion of step 10, provided that ALL of the following criteria are met:

- a) Testing cannot be completed due to shift change; possession constraints or staff being called to a higher priority safety related failure.
- b) Steps 11 to 23 of the test plan have been completed for ALL circuits that have been changed over to the new cable.
- c) A label shall be attached to both ends of the cable giving the following details:
 - An explanation of the work being undertaken. The start date/time and estimated date/time when the work is to be completed.
 - The signature and name of the SMTH Tester.
 - Contact details for the person responsible for the work.
 - The work shall be completed, and any access restrictions removed within 1 week.

Operationally equivalent cables (with a greater or equal number of cores) are defined in [NR/SMS/PartZ/Z05](#) (Cable – Reference Values).

BEFORE INSTALLATION WORK

Existing Cable

1. Check identity of existing cable by physically tracing or positively electrically proving.
2. Check no intermediate terminations, links or contacts exist between the ends to be disconnected.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA02		
Renew a Multi-Core Cable		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

3. [WIRE COUNT](#) the existing cable to the wiring diagrams.
4. Check cable terminals associated with the existing cable are correctly labelled.

Replacement Cable

5. Check replacement cable is not damaged and is correct type.
6. Check replacement cable is prepared for change over (all joints are properly made, and cable ends are crimped or precisely stripped for clamp type terminations).
7. [CONTINUITY TEST](#) all cores in the replacement cable.
8. Check replacement cable has safe insulation.
9. [INSULATION TEST](#) all cores in the replacement cable.
10. Check replacement cable is correctly labelled.

For Each Circuit (pair) to be Changed Over

11. Check the existing cable cores are isolated at both ends.
12. [CONTINUITY TEST](#) the existing cores to prove there is not a cross in the circuit.
13. Check existing cable cores have correct insulation (i.e., cut back and bomb-tailed) (see [NR/L3/SIG/10064/E052](#)).

AFTER INSTALLATION WORK

For Each Circuit (pair) When it has Been Changed Over

14. Check that any existing red straps have been recovered and diagrams altered to show red straps recovered. Return the circuit diversion labels to your SM(S).
(RECTIFICATION OF TEMPORARY DIVERSIONS ONLY)
15. Check each replacement cable core is correctly installed.
16. Check each replacement cable core is replaced as labelled.
17. Check replacement cable cores are not susceptible to mechanical damage.
18. [WIRE COUNT](#) the replacement cable cores to the wiring diagram.
19. Check any links, red dome nuts or equivalent, are correctly replaced to diagram and secure.
20. [CABLE FUNCTION TEST](#) each circuit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA02		
Renew a Multi-Core Cable		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

21. Refer to the Maintenance Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk “*”.

Spare Cores

22. Check each replacement cable core is correctly Installed.
23. Check each replacement cable core is replaced as labelled.
24. Check any additional spare cores in the replacement cable are terminated (e.g., a 37 core in lieu of 32 core: - cores 33 to 37 shall be terminated where practicable).
25. Check spare cores in the replacement cable, that cannot be terminated, are correctly insulated (bomb tailed with ends cut back) (see [NR/L3/SIG/10064/E052](#)).
26. Check replacement cable cores are not susceptible to mechanical damage.
27. Check links are removed at both ends of any terminated spare cores.
28. [WIRE COUNT](#) the spare cores in the replacement cable to the wiring diagram.

Final Checks

29. Check or arrange for correct labelling of cable.
30. Check or arrange for correct installation of cable in the cable route.
31. Check or arrange for replacement diagrams for operationally equivalent cables only.

The following information shall be included and submitted with the SMTH log sheet):

- Cable identification.
- Cable from/to.
- Replacement cable type/size/cores.
- Spare cores.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA03		
Renew a Cable or Wire		
Issue No: 09	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Internal wiring between terminals and/or equipment. b) External single core cables between terminals and/or equipment. c) Track circuit jumper cables.
Excludes:	<ul style="list-style-type: none"> a) Renewing a cable/wire with intermediate terminations, links or contacts. b) Refitting any removed or broken cable core(s)/wires. c) Telecoms tail cables (see Part 06). d) Plug coupled cables.

GENERAL

Operationally equivalent cables (with a greater or equal number of cores) are defined in [NR/SMS/PartZ/Z05](#) (Cable – Reference Values).

BEFORE INSTALLATION WORK

1. [EARTH TEST \(AC\)](#) or [EARTH TEST \(DC\)](#) all busbars affected by the work or check ELD / remote monitoring systems.

2. [WIRE COUNT](#) the cable core/wire to the wiring diagram (where more than one cable core/wire is to be removed at once).

3. Check the insulation condition of adjacent wires.

4. Check the identity of each cable/wire by physically tracing.

Physically tracing is the preferred method, but if this might cause additional damage to a degraded wire or adjacent wire(s) then identification by positively electrically proving is to be used.

5. Check no intermediate terminations, links or contacts exist between the ends to be disconnected.

6. Check the replacement cable/wire is not damaged and is correct type.

Where degraded wires are present, the replacement wire should, if practicable, be run in a different route from the wire to be replaced. If this is not practicable, then extreme caution should be taken during the replacement to prevent damage to new/existing wires, i.e., rather than pulling wires through, they should be carefully laid in.

7. Label all new cables/wires at each end.

8. Check equipment terminals associated with the existing cable/wire are correctly labelled.

9. Check existing cable/wire is isolated from the supply.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA03		
Renew a Cable or Wire		
Issue No: 09	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

10. [CONTINUITY TEST](#) each wire/core of the replacement cable/wire (excluding track circuit cables).

11. Check replacement cable/wire has safe insulation.

• If the insulation is of a different type from the existing wiring, check that they are permitted to be run together or are segregated, see NR/L3/SIG/11303 (Signalling Installation).

AFTER INSTALLATION WORK

12. Check replacement cable/wire is correctly installed.

13. Check replacement cable/wire is replaced as labelled.

14. [CONTINUITY TEST](#) each core in the replacement cable/wire.

15. [INSULATION TEST](#) the replacement cable/wire.

16. Check replacement cable/wire is not susceptible to mechanical damage.

17. [WIRE COUNT](#) the replacement cable/wire to the wiring diagram.

18. Check any links, red dome nuts or equivalent, are correctly replaced to diagram and secure.

19. [CABLE FUNCTION TEST](#) the affected circuits.

20. Refer to the Maintenance Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.

Final Checks

21. [EARTH TEST \(AC\)](#) or [EARTH TEST \(DC\)](#) each busbar affected by the work or check the remote monitoring system, if fitted.

22. Check or arrange for correct labelling of cable/wire.

23. Check that any existing red straps have been recovered and diagrams altered to show red straps recovered. Return the circuit diversion labels to your SM(S), (rectification of temporary diversions only).

24. Check that, where existing degraded wire could not be completely removed, it has been insulated at each end using 'end caps/bomb tails' and secured so that it cannot come into contact with working circuitry (degraded wires only). see [GI/E052](#) (Insulation of Unterminated Wires).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA03		
Renew a Cable or Wire		
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25. Check or arrange for replacement diagrams (operationally equivalent cables only).

The following information shall be included with the SMTH logbook sheet:

- a) Cable identification.
- b) Cable from/to.
- c) Replacement cable type/size/cores.
- d) Spare cores terminated/insulated.
- e) Additional links used.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA04		
Joint or Add a Length of Cable		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ol style="list-style-type: none"> 1. All multicore, tail, and track cables, requiring jointing after damage or where additional length is now required 2. Plug Coupled Cables mid-section only
Excludes:	<ol style="list-style-type: none"> 1. Plug Coupled Cables where a connector is involved. 2. Telecoms tail cables (see CAB001). 3. Jointing or adding length to single core internal wire (wire shall be renewed).

GENERAL

Operationally equivalent cables (with a greater or equal number of cores) are defined in [NR/SMS/PartZ/Z05](#) (Cable – Reference Values).

BEFORE INSTALLATION WORK

1. Check identity of existing cable by physically tracing or positively electrically proving.
2. Check that there are no intermediate terminations in the section of cable to be replaced.
3. Check any length of cable to be added is not damaged and is correct type.
4. Check any length of cable to be added has safe insulation.

If the insulation is of a different type from the existing wiring, check that they are permitted to be run together or should be segregated (see NR/L3/SIG/11303).

5. [CORRELATION CHECK](#) the cable core to the wiring diagram where a cable is to be removed from a termination point.
6. Check all cable cores are correctly labelled at the jointing point.
7. Check affected cable is isolated at terminated ends.

AFTER INSTALLATION WORK

8. Check cable cores are jointed as labelled.
9. [CONTINUITY TEST](#) affected cable wire.
10. Check joints are secure and sealed.
11. Carry out an [INSULATION TEST](#) affected cable (this shall be undertaken after joint is sealed).
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure at terminated ends.

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NR/SMTH/Part04/CA04		
Joint or Add a Length of Cable		
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13. [CABLE FUNCTION TEST](#) the affected circuits.
14. Refer to the Maintenance Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.
15. [CORRELATION CHECK](#) cable core/wire to the wiring diagram where a cable has been removed from a termination point.

Spare Cores

16. Check any additional spare cores in the replacement cable are terminated (e.g. 37core in lieu of 32core, cores 33 to 37 shall be terminated where practicable).
17. Check spare cores in the replacement cable, that cannot be terminated, are correctly insulated (bomb tailed with ends cut back), see [NR/L3/SIG/10064/E052](#) (Insulation of Unterminated Wires).
18. Where a cable has been removed from a termination point, check any links, red dome nuts or equivalent, are correctly replaced to diagram and secured.

Final Checks

19. Check or arrange for correct labelling of cable.
20. Check or arrange for replacement diagrams (operationally equivalent cables only).

The following information shall be included with the SMTH log sheet:

- a) Cable identification.
- b) Cable from/to.
- c) Replacement cable type/size/cores.
- d) Spare cores terminated/insulated.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA05		
Divert a Faulty Cable Core		
Issue No: 08	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Faulty cable diversion, one core at a time
Excludes:	Telecoms tail cables

BEFORE INSTALLATION WORK

1. Check that there are no intermediate terminations in the section of cable to be diverted.
2. Check faulty core is isolated at both ends.

NOTE: Steps 3 and 4 can be deferred, after completion of a minimum test of all spares or 10% of the cable capacity, whichever is greater. Deferral requires the authority of the SM(S).

3. [CONTINUITY TEST](#) all cores in the existing cable.
4. [INSULATION TEST](#) all cores of the existing cable.
5. Check cable core to be used is spare (no other connections or voltage present).
6. Check cable core to be used has safe insulation.
7. [WIRE COUNT](#) faulty cable core to the wiring diagram.

AFTER INSTALLATION WORK

8. Check red jumper wires have been used and are the correct type.
9. Check red dome nuts, or equivalent, have been fitted to prevent link reinsertion.
10. Check wiring diagrams have been correctly amended to show the alteration.
11. Check red jumper wires are correctly installed and secure. [WIRE COUNT](#) red jumper wires to the amended diagram.
12. Check isolated cable core is suitably secured and insulated.
13. [CABLE FUNCTION TEST](#) diverted circuit.
14. Check that all contacts in the affected circuit at locations at each end of the core diversion are independently proved in the circuit operation.

NOTE: In polarised circuit configuration, where it is not practicable to test contacts individually, confirmation of correct polarities will suffice for this element of the circuit under test.

15. Refer to the Maintenance Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA05		
Divert a Faulty Cable Core		
Issue No: 08	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

16. Check, or arrange for, correct temporary labelling of diverted cable cores (see [NR/SMTH/Part01/Module/12](#) (The Diversion of a Circuit/Relay Contact or Emergency Equipment Relocation)).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA06		
Renew a Plug Coupled Cable (“interconnect”) with a Non-Certified Replacement		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ol style="list-style-type: none"> 1. MIL5015 Plug Coupled Cables without a valid Certificate of Conformance (including missing environmental caps) or which cannot be certified/tested prior to use. 2. Where a cable has been laid out in preparation for installation and left unattended for a period of 28 days or more. 3. Where a cable is to be pulled through a UTX/URX.
Excludes:	<ol style="list-style-type: none"> 1. MIL5015 Supplier Certified Plug Coupled Cables (“interconnects”) 2. Unsealed Plug Coupled Cables or without a certificate which have been tested in accordance with instructions from your line manager 3. Cables with plug couplers on only one end (“leads”)(use CA08)

GENERAL

Use this test plan if:

- a) There is doubt about the validity of the Certificate of Conformance, the cable packaging is damaged, or the environmental seals (weather caps) are missing.
- b) The cable has been installed but left unconnected for 28 days or more.
- c) Damage is suspected during installation.
- d) Where a cable is to be pulled through a UTX/URX.

BEFORE INSTALLATION WORK

4. Check identity of existing cable and receptacle/plug by checking it is labelled correctly to the diagram by physically tracing or positively electrically proving.
5. Check that the replacement cable is of the correct type, length and for physical damage.
6. Check receptacles and couplers of existing cable are correctly labelled at both ends of the cable.
7. Isolate the existing cable from the supply.
8. [CONTINUITY TEST](#) all cores in the replacement cable using breakout box/es, for cables above 12 core testing shall be carried out on the location disconnection links (Excluding Track Circuit Cables).
9. [INSULATION TEST](#) the replacement cable using a breakout box/es, for cables above 12 core testing shall be carried out on the location disconnection links.
10. Check replacement cable is correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA06		
Renew a Plug Coupled Cable (“interconnect”) with a Non-Certified Replacement		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

DURING INSTALLATION WORK

11. Examine cable plug coupler receptacle or plug and existing panel mounted receptacle or plug for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.

AFTER INSTALLATION WORK

12. Check plug in connectors are correctly aligned, are securely mated and are mechanically locked.
13. Check that the cable has been correctly installed.
14. Check the cables are replaced correctly to the wiring diagram (where more than one cable has been removed at once).
15. Refer to the Test Plan for the item of equipment fed by the affected cable and carry out the steps marked with an asterisk *.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA07		
Renew a Plug Coupled Cable (“interconnect”) with a Certified Replacement		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ol style="list-style-type: none"> 1. Supplier Certified Plug Coupled Cables (“interconnects”). 2. Unsealed Plug Coupled Cables or without a certificate which have been tested in accordance with instructions from the SM(S).
Excludes:	<ol style="list-style-type: none"> 1. Plug Coupled Cables without a valid Certificate of Conformance (including missing environmental caps) or which cannot be certified/tested prior to use (use CA06 for uncertified cables). 2. Where a cable has been laid out in preparation for installation and left unattended for a period of 28 days or more. 3. Where a cable is to be pulled through a UTX/URX (use Plan CA06) Cables with plug couplers on only one end (“leads”) (use CA08). 4. Cables with plug couplers on only one end (“leads”).

GENERAL

Do not use this test plan if:

- a) There is doubt about the validity of the Certificate of Conformance, the cable packaging is damaged, or the environmental seals (weather caps) are missing.
- b) The cable has been installed but left unconnected for 28 days or more.
- c) Damage is suspected during installation.

BEFORE INSTALLATION WORK

1. Check identity of existing cable and receptacle/plug by checking it is labelled correctly to the diagram by physically tracing or positively electrically proving.
2. Check that the replacement cable is of the correct type, length and for physical damage.
3. Check that the Certificate of Conformance, packaging, seals and environmental caps are present and intact.
4. Check receptacles and couplers of existing cable are correctly labelled at both ends of the cable.
5. Isolate the existing cable from the supply.
6. Check replacement cable is correctly labelled.

DURING INSTALLATION WORK

7. Examine replacement cable plug coupler pins/sockets and existing receptacles for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA07		
Renew a Plug Coupled Cable (“interconnect”) with a Certified Replacement		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

8. Check that the cable has been correctly installed.
9. Check cables are replaced correctly to the wiring diagram (where more than one cable has been removed at once).
10. Check plug in connectors are correctly aligned, securely mated and mechanically locked.
11. Refer to the Test Plan for the item of equipment fed by the affected cable and carry out the steps marked with an asterisk *.
12. On completion of the test plan a copy of the Certificate of Conformance shall be returned with the log sheet to the SM(S).

If any damage is observed or suspected during installation, testing shall be required as detailed in [NR/SMTH/Part04/CA06](#) (Renew a Plug Coupled Cable (“interconnect”) with a Non-Certified Replacement).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA08		
Replacing one end of a damaged “interconnect” cable		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	a) Replacing one end of a plug coupled damaged cable (“interconnect”)
Excludes:	b) Adding a section of cable between two plug coupled ends. (See NR/SMTH/Part04/CA04) c) Telecoms Tail cables (see NR/SMTH/Part/06)

GENERAL

Failure to isolate cables before disconnection can result in voltages being present on exposed pins or cable cores.

This test plan is applicable where a length of cable with a single plug coupler is to be spliced onto an existing plug coupled cable, e.g., when an existing plug coupler (or cable within the vicinity of a plug coupler) has been damaged and requires replacement.

Where possible, the whole cable should be replaced with a certified replacement before jointing is considered.

BEFORE INSTALLATION WORK

Existing Cable

1. Check identity of existing cable and receptacle/plug by checking it is labelled correctly to the diagram or by physically tracing.
2. Isolate the existing cable at both ends.
3. Unplug both ends.

Replacement Cable

4. Check that the replacement cable is the correct length and the plug coupler connector/configuration match the existing cable and are not damaged.
5. Check all cable cores are correctly labelled at jointing point.

DURING INSTALLATION WORK

6. Examine replacement cable plug coupler pins/sockets and existing receptacle for signs of contamination, moisture or degradation/damage.

AFTER INSTALLATION WORK

7. Check replacement cable cores are jointed as labelled.
8. [CONTINUITY TEST](#) all cores in the replacement cable using breakout boxes or disconnection links (excluding track circuit cables).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA08		
Replacing one end of a damaged “interconnect” cable		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

9. Check joints are secure and sealed.
10. [INSULATION TEST](#) the replacement cable using a breakout box or disconnection links (this shall be undertaken after joint is sealed).
11. Check plug in connector is correctly aligned, is securely mated and is mechanically locked.
12. [CABLE FUNCTION TEST](#) the affected circuits.
13. Check the Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.
14. Check or arrange for correct labelling of cables.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA09		
Replace a panel mounted wired receptacle or plug (Non-Certified Replacement)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	a) MIL5015 panel mounted receptacles or plugs with prewired harness without a valid Certificate of Conformance or with missing environmental caps.
Excludes:	a) MIL5015 Sealed Supplier Certified panel mounted receptacles or plugs with prewired harness. b) MIL5015 Non-Supplier Certified panel mounted receptacles or plugs, with prewired harness which have been pre-tested in accordance with instructions from your Line Manager. c) All other types of Receptacles and plugs.

GENERAL

Failure to isolate cables and wires before disconnection can result in voltages being present on exposed pins.

This test plan is applicable where a panel mounted wired receptacle or plug, or its internal wiring harness has been damaged and requires replacement.

This test is not applicable if:

- a) The replacement panel mounted wired receptacle or plug is still sealed and has a valid Certificate of Conformance attached to it.
- b) The replacement panel mounted wired receptacle or plug is undamaged and the environmental seals (end caps) are fitted correctly.

On some of the early projects, panel mounted receptacles or panel mounted plugs were sometimes not completely populated, i.e., not all the pins or sockets had wires connected to them. This practise is now discontinued. This can mean that a replacement could have a number of wires which are not shown on the location diagrams.

Unterminated wires shall be bomb tail crimped and secured. The additional wire shall be added to and identified on the diagram.

Disconnected receptacles and plugs should be replaced one at a time.

BEFORE INSTALLATION WORK

1. Check identity of existing panel mounted receptacle or plug, by checking it is labelled correctly to the diagram or by physically tracing the wires from the harness.
2. Check that the replacement panel mounted receptacle or plug and its pre-wired harness, are not damaged and match the connector/configuration of the existing assembly.
3. [WIRE COUNT](#) the existing panel mounted receptacle or plug to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA09		
Replace a panel mounted wired receptacle or plug (Non-Certified Replacement)		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

4. [CONTINUITY TEST](#) all cores in the replacement panel mounted receptacle or plug using breakout boxes.
5. [INSULATION TEST](#) the replacement panel mounted receptacle/plug using breakout boxes.
6. Note any links, and red dome nuts or equivalent, are correct to diagram.
7. Isolate both ends of the cable which is to be unplugged.
8. Check affected wires are isolated at terminated ends of the harness.
9. Remove the outgoing plug coupled cable, fit an environmental cap and secure it.
10. Examine cable plug coupler receptacle or plug and existing panel mounted receptacle or plug for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.
11. Check all wires are correctly labelled at their termination point.

AFTER INSTALLATION WORK

12. Check replacement wires are correctly terminated and correctly labelled.
13. Check the outgoing cable connector coupling ring is correctly aligned, is securely mated and is mechanically locked.
14. [WIRE COUNT](#) the replacement panel mounted receptacle or plug to the wiring diagram.
15. Check any links, and red dome nuts or equivalent, are correctly replaced to diagram and secure.
16. [CABLE FUNCTION TEST](#) the affected circuits.
17. Check the Maintenance Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.
18. Check or arrange for correct labelling of the panel mounted receptacle or plug.

The following information shall be included with the SMTH log sheet:

- a) Replacement receptacle or plug serial number.
- b) The results of both the [CONTINUITY TEST](#) and the [INSULATION TEST](#)

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA10		
Replace a panel mounted wired receptacle or plug (Certified Replacement)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<p>a) Sealed Supplier Certified panel mounted receptacles or plugs with prewired harness.</p> <p>b) Non-Supplier Certified panel mounted receptacles or plugs, with prewired harness which have been pre-tested in accordance with instructions from your SM(S).</p> <p>AND</p> <p>c) The replacement panel mounted wired receptacle or plug is undamaged and the environmental seals (end caps) are fitted correctly.</p>
Excludes:	<p>a) Panel mounted receptacles with missing environmental caps, or damage is suspected.</p> <p>b) All other types of receptacles and plugs.</p>

GENERAL

Failure to isolate cables and wires before disconnection can result in voltages being present on exposed pins.

This test plan is applicable where a panel mounted wired receptacle or plug, or its internal wiring harness has been damaged and requires replacement.

If the environmental caps are missing or damaged the unit cannot be used and a replacement unit should be sourced.

On some of the early projects panel mounted receptacles or panel mounted plugs were sometimes not completely populated, i.e., not all the pins or sockets had wires connected to them. This practise is now discontinued. This can mean that a replacement could have a number of wires which are not shown on the location diagrams.

Unterminated wires shall be bomb tail crimped and secured. The additional wire shall be added to and identified on the diagram.

Disconnected receptacles and plugs should be replaced one at a time.

BEFORE INSTALLATION WORK

1. Check identity of existing panel mounted receptacle or plug, by checking it is labelled correctly to the diagram or by physically tracing the wires from the harness.
2. Check that the replacement panel mounted receptacle or plug and its pre-wired harness are not damaged and match the connector/configuration of the existing assembly.
3. [WIRE COUNT](#) the existing cable cores to the wiring diagram.
4. Note any links, and red dome nuts or equivalent, are correct to diagram.
5. Isolate both ends of the cable which is to be unplugged.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA10		
Replace a panel mounted wired receptacle or plug (Certified Replacement)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

6. Check affected wires are isolated at terminated ends of the harness.
7. Remove the outgoing plug coupled cable, fit an environmental cap and secure it.
8. Examine cable plug coupler receptacle or plug and existing panel mounted receptacle or plug for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.
9. Check all wires are correctly labelled at their termination point.

AFTER INSTALLATION WORK

10. Check replacement wires are correctly terminated and correctly labelled.
11. Check the outgoing cable connector coupling ring is correctly aligned, is securely mated and is mechanically locked.
12. [WIRE COUNT](#) the replacement cable cores to the wiring diagram.
13. Note any links, and red dome nuts or equivalent, are correct to diagram.
14. [CABLE FUNCTION TEST](#) the affected circuits.
15. Check the Test Plan for the item of equipment fed by the affected cable and carry out steps marked with an asterisk *.
16. Check or arrange for correct labelling of panel mounted receptacle or plug.
 - The following information shall be included with the SMTH log sheet:
 - a) Replacement receptacle or plug serial number.
 - b) The Certificate of Conformance shall be returned to the SM(S).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA11		
Replace a Non-Standard Westrace Plug Coupler Wiring Loom		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Non-Standard Westrace Plug Coupler and Wiring Loom
Excludes:	All other plug coupler or wiring loom

This test plan is applicable only for a Non-Standard Westrace Plug Coupler Wiring Loom where its internal wiring harness or plug couplers has been damaged and requires replacement.

As each Non-Standard Westrace wiring loom is unique to the installation, this test is only applicable if:

- The replacement Non-Standard Westrace plug coupler has been specifically manufactured for the specific SOM24/Gland plate.
- The new Non-Standard Westrace plug coupler wiring is of suitable length to be installed.
- Specific authority from the S&TME is granted before the work takes place.

Failure to isolate the SOM24 modules and plug couplers to the Westrace Level Crossing Controller can result in unwanted aspect clearances, crossing operation or damage to the Westrace system.

Come to a clear understanding with the Signaller the extent of the work to be carried out, the equipment that will be affected by the work and the timescales involved in installation and testing.

Check routes are normalised, and level crossing is in Local Control and the barriers pumped into the raised position.

BEFORE INSTALLATION WORK

1. Obtain the agreement of the S&TME to use the replacement Non-Standard Westrace plug coupler harness.
2. Check replacement Non-Standard Westrace plug coupler is not damaged.
3. Check replacement Non-Standard Westrace plug coupler has safe insulation.
4. Check replacement Non-Standard Westrace plug coupler wiring is correct to the Non- standard Westrace plug coupler pin number. Refer to the site copies of the diagrams *

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA11		
Replace a Non-Standard Westrace Plug Coupler Wiring Loom		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

NOTE: The diagrams refer the Non-Standard Westrace plug coupler analysis from the non-wire side.

5. Check replacement Non-Standard Westrace plug coupler pins are the correct male or female pins to the site copy diagrams.
6. Check replacement Non-Standard Westrace plug coupler pins are of the correct length for mating male and female pins and that they are secure in the plug coupler base unit.
7. Check guide pins and jack screws are correct to the Non-Standard Westrace plug coupler site copy diagrams.
8. Check any wiring which has a requirement to be a twisted pair is correct to the site copy diagrams.
9. Continuity test all cores in the replacement Non-Standard Westrace plug coupler.
10. Check existing Non-Standard Westrace plug coupler is isolated from the supplies at all terminals and the SOM24 Module power supply is Isolated.
11. Wire count existing Non-Standard Westrace plug coupler terminals to the wiring diagram.
12. Check existing Non-Standard Westrace plug coupler terminals are correctly labelled.
13. Check using the site copy, the existing Non-Standard Westrace plug coupler wiring by physically tracing.

DURING THE INSTALLATION

- Remove the existing Non-Standard Westrace plug coupler from the SOM24 Module Connector Plate and or Gland Plate.
- Insert and secure the new Non-Standard Westrace plug coupler to the SOM24 Module Connector Plate and or Gland Plate ensuring the plug coupler is the correct orientation.
- Working in a logical order, carry out a "wire by wire" replacement of the existing Non-Standard Westrace plug coupler wiring harness with the new, removing each wire as soon as it is removed.
- Insulate each removed wire as soon as it is removed.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA11		
Replace a Non-Standard Westrace Plug Coupler Wiring Loom		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

14. Check replacement Non-Standard Westrace plug coupler is correctly installed on the correct SOM24 Module Connector Plate and / or Gland Plate and check the plug coupler retaining screws or clips for security.
15. Check replacement wires are correctly terminated.
16. Check terminated twisted pair wires are twisted up to 25mm (1 inch) from the terminals.
17. Wire count affected wires to the site diagrams.
18. Arrange for the Westrace Level Crossing Controller to be powered up and observe the module status indications.

NOTE: Come to a clear understanding with the Signaller that the Westrace Level Crossing Controller is to be powered up and that all Signal Routes are normalized to minimize unwanted aspects clearing to proceed SOM24 Modules are powered up *

19. Check the Maintenance Test Plan for the item of equipment fed by the affected Non-Standard Westrace Plug Coupler and carry out steps marked with an asterisk *

NOTE: If the affected Non-Standard Westrace plug coupler goes to a Level Crossing Controller, carry out a Level Crossing Sequence Test [NR/SMS/PartB/Test/070](#) (AHBC Operational Sequence Test) or [NR/SMS/PartB/Test/075](#) (MCB Operational Sequence Test).

20. [Earth Test](#) circuits where designed to be earth free.
21. Check at the TF-L for any error messages on the Technician's terminal and arrange for them to be removed.
22. Check or arrange for correct labelling of the Non-Standard Westrace plug coupler.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA12		
Remove and Refit a Multi-core Cable		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Tail cable and Multi-core cables. b) This includes a previously disconnected core or wire (proceed from step 6).
Excludes:	<ul style="list-style-type: none"> a) Single cable cores or wires (CA01). b) Cable cores or wires that are Broken (CA13). c) Telecoms cables (CAB001).

BEFORE DISCONNECTION

1. [WIRE COUNT](#) cable cores to the wiring diagram.
2. Check cable is correctly labelled.
3. Check cable cores are correctly labelled.
4. Check cable cores have safe insulation.
5. Record the position of any links, red dome nuts or equivalent.

AFTER RE-CONNECTION

6. Check cable cores are correctly installed and have not been damaged whilst disconnected.
7. Check cable cores are replaced as labelled.
8. Check the cable is not susceptible to mechanical damage.
9. [WIRE COUNT](#) the cable cores to the wiring diagram.
10. Confirm any links, and red dome nuts or equivalent, are correctly replaced and are secure.
11. Check with the Maintenance Test Plan for all items of equipment fed by the affected cable and carry out steps marked with an asterisk *.
12. [CABLE FUNCTION TEST](#) the affected cable.
13. Check or arrange for correct labelling of the cable or cable cores.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA13		
Re-termination of a Broken Existing Cable Core or Wire		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	A single cable core or wire which has broken or pulled loose from a crimp
Excludes:	<ul style="list-style-type: none"> a) Any re-termination where the reconnection point cannot be proved by use of the diagrams and/or tracing or electrical proving the circuit. b) Any disconnection that has been made in a controlled way and is labelled.

BEFORE RE-CONNECTION

1. Check for evidence on site, in signalling diagrams, plans, layouts and records that the wire was previously connected. If no evidence is found, stop and inform your SM(S).
2. Note any links, and red dome nuts or equivalent that are in place.

AFTER RE-CONNECTION

3. Check cable core/wire is correctly installed and has not been damaged whilst disconnected.
4. Check cable core/wire is replaced as labelled.
5. Check cable core/wire is not susceptible to mechanical damage.
6. [WIRE COUNT](#) the cable core/wire to the wiring diagram.
7. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
8. [INSULATION TEST](#) the cable core/wire. This is not required for a track circuit bonding cable.
9. Check with the Test Plan for the item of equipment fed by the affected cable or wire and carry out steps marked with an asterisk *.
10. [CABLE FUNCTION TEST](#) the affected circuits (multicore signalling cables only and where more than one cable core has been removed at once).
11. Check or arrange for correct labelling of cable core/wire.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA14		
Replace AZLM Axle Counter Lineside Cable		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	AzLM Lineside 2, 10, and 20 pair cable replacement
Excludes:	All other cables

GENERAL

Before any work takes place, the following shall be undertaken:

a) Take possession of the relevant axle counter sections.

b) Disconnection of the output of the evaluator to the signalling system.

c) The EAK30K is to be powered down for this task by disconnection of the power supply at the REB or the local supply.

The output of the evaluator shall not be reconnected, and possession of the axle counters given up unless the equipment has passed all tests and is fit for use.

The Signaller is responsible for resetting the axle counter.

For Further Information see [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems).

BEFORE INSTALLATION WORK

1. Where applicable, check EPR is applied to all sections fed by the cable under test.
2. Check that all EAK's fed by the cable are isolated.
3. Check and note position of any jumpers or links.
4. [WIRE COUNT](#) existing cable to the wiring diagram.
5. Check cable terminations associated with the existing cable are correctly labelled.
6. Check replacement cable is not damaged and of correct type.
7. Check replacement cable has safe insulation.
8. Check replacement cable is correctly labelled.

AFTER INSTALLATION WORK

9. Check replacement cable is not damaged and is correct type.
10. Check replacement cable is correctly installed.

NOTE: See guidance on axle counter cable installation in [NR/SMS/Appendix/15](#) (General Information on the Thales Axle Counter Systems) and in Appendix A.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA14		
Replace AZLM Axle Counter Lineside Cable		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

11. [WIRE COUNT](#) replacement cable to the wiring diagram.
12. [CONTINUITY TEST](#) replacement cable.
13. [INSULATION TEST](#) replacement cable.
 - NOTE: Insulation testers should be set to 250V.
14. Carry out a BALANCED PAIR TEST on all pairs.
 - NOTE: For BALANCED PAIR TEST see Appendix A.
15. Reconnect power to all EAK's.
16. Check that both lights on all relevant serial cards are lit.
17. Request that all affected sections are reset, observe that the sections are restored to normal operation.
18. Observe ACE diagnostics and check that all affected EAK's are communicating with the ACE.

NOTE: ACE diagnostics should be checked after a period of 24 hours to confirm uninterrupted transmission between the ACE and EAK(s).

APPENDIX A

Balanced Pair Test

For each pair of wires forming a circuit they should have resistance values to within 1 ohm of each other or 0.5% of the loop resistance for longer cables.

- a) Take two cores for the circuit under test.
- b) Choose a third core for reference.
- c) Measure the loop resistance between the 1st core and reference core.
Reading (1).
- d) Measure the loop resistance between the 2nd core and reference core.
Reading (2).
- e) The difference in the two readings (1 & 2) is the 'unbalance' in the pair.
- f) Check that the difference in the readings is less than 1Ω.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA14		
Replace AZLM Axle Counter Lineside Cable		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Correct Installation

- Cable insulation should be stripped back to a minimum of 8mm at all terminations (see Figure 1).
- Confirm that the twist is maintained on each pair within the cable to within 25mm of termination (see Figure 2).



Figure 1 – Cables Stripped to a minimum of 8mm

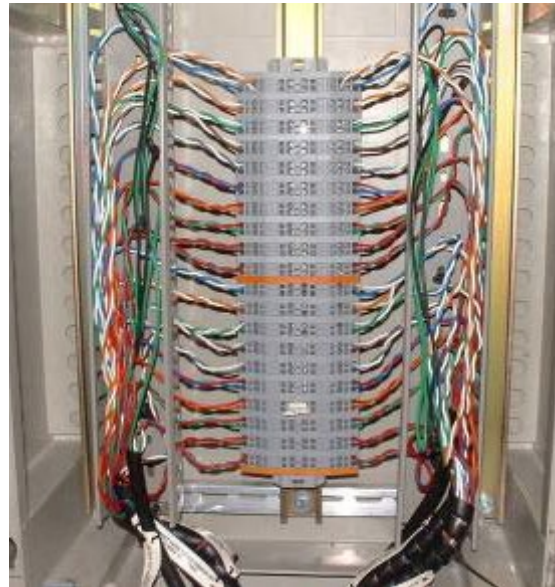


Figure 2 – Twist maintained up to the cable termination

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA21		
Renew a Single Ended Plug Coupled Cable (“lead”) with a Certified Replacement		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Supplier Certified Single Ended Plug Coupled Cable (“lead”). b) Unsealed Plug Coupled Cables or without a certificate which have been tested in accordance with instructions from your SM(S).
Excludes:	<ul style="list-style-type: none"> a) Single Ended Plug Coupled Cable (“lead”) without a valid Certificate of Conformance (including missing environmental caps) or which cannot be certified/tested prior to use (use CA22 for uncertified cables). b) Where a cable has been laid out in preparation for installation and left unattended for a period of 28 days or more. c) Single Ended Plug Coupled Cable which are not fitted with a MIL5015 Specification plug or receptacle. (eg TPWS, Point machine, SSI cables etc.)

GENERAL

Do not use this test plan if:

- a) There is doubt about the validity of the Certificate of Conformance, the cable packaging is damaged, or the environmental seals (weather caps) are missing.
- b) The cable has been installed but left unconnected for 28 days or more.
- c) If any damage is observed or suspected during installation, testing shall be required as detailed in [NR/SMTH/Part04/CA22](#) (Renew a Single Ended Plug Coupled Cable (“lead”) with a Non Certified Replacement).

BEFORE INSTALLATION WORK

Existing Cable

1. Check identity of existing cable and receptacle/plug by checking it is labelled correctly to the diagram or by physically tracing or positively electrically proving.
2. [WIRE COUNT](#) the existing cable to the wiring diagrams at the free end.
3. Check cable terminals associated with the existing cable are correctly labelled at the free end.
4. Note any links, and red dome nuts or equivalent, are correct to diagram.
5. Isolate the existing cable from the supply.

Replacement Cable

6. Check that the replacement cable is of the correct type, length and for physical damage.

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Renew a Single Ended Plug Coupled Cable (“lead”) with a Certified Replacement		
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7. Check that the Certificate of Conformance, packaging, seals and environmental caps are present and intact.
8. Check replacement cable is correctly labelled.

DURING INSTALLATION WORK

9. Examine replacement cable plug coupler pins/sockets and existing receptacles for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.

AFTER INSTALLATION WORK

10. Check that the cable has been correctly installed.
11. Check cables are replaced correctly to the wiring diagram (where more than one cable has been removed at once).
12. Check plug in connectors are correctly aligned, are securely mated and are mechanically locked.
13. [WIRE COUNT](#) the replacement cable cores to the wiring diagram.
14. Check any links, and red dome nuts or equivalent, are correctly replaced to diagram and secure.
15. [CABLE FUNCTION TEST](#) each circuit.
16. Refer to the Test Plan for the item of equipment fed by the affected cable and carry out the steps marked with an asterisk *.
17. On completion of the test plan a copy of the Certificate of Conformance shall be returned with the log sheet to the SM(S)

END

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NR/SMTH/Part04/CA22		
Renew a Single Ended Plug Coupled Cable (“lead”) with a Non-Certified Replacement		
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Includes:	<ul style="list-style-type: none"> a) Single Ended Plug Coupled Cable (“lead”) without a valid Certificate of Conformance (including missing environmental caps) or which cannot be certified/tested prior to use. b) Where a cable has been laid out in preparation for installation and left unattended for a period of 28 days or more. c) Single Ended Plug Coupled Cable which are not fitted with a MIL5015 Specification plug or receptacle. (eg TPWS, Point machine, SSI cables etc.)
Excludes:	<ul style="list-style-type: none"> a) Supplier Certified Single Ended Plug Coupled Cable (“lead”). b) Unsealed Plug Coupled Cables or without a certificate which have been tested in accordance with instructions from your line manager

GENERAL

Use this test plan if:

- a) There is doubt about the validity of the Certificate of Conformance, the cable packaging is damaged, or the environmental seals (weather caps) are missing.
- b) The cable has been installed but left unconnected for 28 days or more.
- c) Damage is suspected during installation.

BEFORE INSTALLATION WORK

Existing Cable

1. Check identity of existing cable and receptacle/plug by checking it is labelled correctly to the diagram or by physically tracing or positively electrically proving.
2. [WIRE COUNT](#) the existing cable to the wiring diagrams at the free end.
3. Check cable terminals associated with the existing cable are correctly labelled at the free end.
4. Note any links, and red dome nuts or equivalent, are correct to diagram.
5. Isolate the existing cable from the supply.

Replacement Cable

6. Check that the replacement cable is of the correct type, length and for physical damage.
7. Check replacement cable is correctly labelled.

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Renew a Single Ended Plug Coupled Cable (“lead”) with a Non-Certified Replacement		
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8. [CONTINUITY TEST](#) all cores in the replacement cable using breakout box/es, for cables above 12 core testing shall be carried out on the location disconnection links (excluding Track Circuit Cables).
9. [INSULATION TEST](#) the replacement cable using a breakout box/es, for cables above 12 core testing shall be carried out on the location disconnection links.

DURING INSTALLATION WORK

10. Examine replacement cable plug coupler pins/sockets and existing receptacles for signs of contamination, moisture, or degradation/damage. Confirm the O-ring seal is intact.

AFTER INSTALLATION WORK

11. Check that the cable has been correctly installed.
12. Check cables are replaced correctly to the wiring diagram (where more than one cable has been removed at once).
13. Check plug in connectors are correctly aligned, are securely mated and are mechanically locked.
14. [WIRE COUNT](#) the replacement cable cores to the wiring diagram.
15. Check any links, and red dome nuts or equivalent, are correctly replaced to diagram and secure.
16. [CABLE FUNCTION TEST](#) each circuit.
17. Refer to the Test Plan for the item of equipment fed by the affected cable and carry out the steps marked with an asterisk * .
18. Check or arrange for correct labelling of the panel mounted receptacle or plug.

The following information shall be included with the SMTH logbook sheet:

- a) Cable and receptacle/plug identification.
- b) Replacement receptacle or plug serial number.
- c) Replacement receptacle serial number.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA31		
Renew a Telegraph Line Wire		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Telegraph Line wires (on Pole Routes)
Excludes:	All other type of Wire or Cable

BEFORE DISCONNECTION

1. **For Missing Wire/s Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. [WIRE COUNT](#) the Line wire to the wiring diagram.
3. Check Line wire is correctly labelled.
4. Check Line wire has safe insulation (if applicable).

AFTER RE-CONNECTION

5. Check Line wire is correctly installed and has not been damaged whilst disconnected.
6. Check the Line wire is correctly regulated.
7. Check the Line wire is not susceptible to mechanical damage.
8. [WIRE COUNT](#) the Line wire to the wiring diagram.
9. Check with the Maintenance Test Plan for the item of equipment fed by the affected Line wire/ and carry out steps marked with an asterisk *.
10. Check equipment fed by the Line wire operates correctly.
11. Check or arrange for correct labelling of Line wire.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA32		
Remove and Refit a Telegraph Line Wire		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Telegraph Line wires (on Pole Routes)
Excludes:	All other type of Wire or Cable

BEFORE DISCONNECTION

1. [WIRE COUNT](#) the Line wire to the wiring diagram.
2. Check Line wire is correctly labelled.
3. Check Line wire has safe insulation (If applicable).

AFTER RE-CONNECTION

4. Check Line wire is correctly installed and has not been damaged whilst disconnected.
5. Check Line wire is replaced as labelled.
6. Check the Line wire is correctly regulated.
7. Check the Line wire is not susceptible to mechanical damage.
8. [WIRE COUNT](#) on the Line wire to the wiring diagram.
9. Check with the Maintenance Test Plan for the item of equipment fed by the affected Line wire/ and carry out steps marked with an asterisk *.
10. Check equipment fed by the Line wire operates correctly.
11. Check or arrange for correct labelling of Line wire.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CA40		
Replace a Frauscher Concentrator 'Hotlink' Crossover Cable		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Frauscher Concentrator 'Hotlink' Crossover Cable
Excludes:	All other Patch Cables

GENERAL

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image

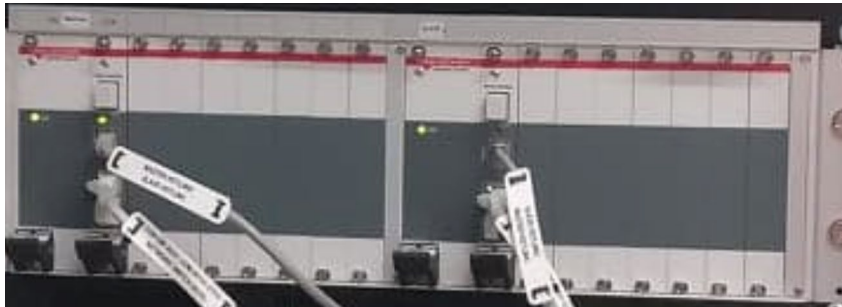


Figure 1 – Frauscher Concentrator 'Hotlink' Crossover Cable

BEFORE INSTALLATION WORK

1. Check that the replacement Hotlink Crossover Cable is of the correct type, version and is <2m long.
2. Check the replacement is not damaged.
3. Confirm the new cable is correctly labelled or transfer the labels from the existing cable during the replaced process.
4. Check identity of existing cable by physically tracing.
5. Check cable terminations are not damaged and are correctly labelled.

AFTER INSTALLATION WORK

6. Check each cable is correctly installed and secure.
7. Remove the currently (Master) operating System COM card and observe that the changeover to the (Slave) system occurs then repeat and observe that the system reverts back to starting arrangement of Master and Slave.
8. Confirm the Power and Status LEDs are indicating correct status on the PSC & COM cards.
9. If any Error indications are observed, further investigation shall be carried out. Refer to product O&MM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CE01		
Replace a Secondary Cell or Battery		
Issue No: 09	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	All alkaline or acid secondary cells, used singly or as part of a battery
Excludes:	Telecoms cells or batteries

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement cell/battery is not damaged and is correct type and that the total number of cells remains unaltered.
 - The output voltage and power of the battery charger shall be as specified for the replacement cell or battery.
3. Isolate the charging supply.
4. [WIRE COUNT](#) any external wires connected to the existing cell or battery to the wiring diagram.
5. Check any external wires connected to the existing cell or battery are correctly labelled.
6. Check existing wiring has safe insulation.
7. Check circuits to/from the existing cell/battery are isolated from the supply.

AFTER INSTALLATION WORK

8. Check replacement cell/battery is correctly installed.
9. Check correct conductors are on the correct cell or battery terminals.
10. Check any external wires connected to the replacement cell or battery are replaced as labelled.
11. Reconnect the charging supply.
12. [WIRE COUNT](#) any external wires connected to the replacement cell or battery to the wiring diagram.
13. Check any links and red dome nuts, or equivalent, are correctly replaced and secure.
- * 14. Check setting of battery charger by checking the charge current.
- * 15. Test output voltage and polarity with the output disconnected.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CE01		
Replace a Secondary Cell or Battery		
Issue No: 09	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

- * 16. Test voltage with the circuits restored.
- 17. Where earthed circuits are not used, carry out [NR/SMS/PartB/Test/053](#) (Earth Leakage Detector (ELD): Testing and Calibration) or [NR/SMS/PartB/Test/051](#) (Busbar Earth Test).
- 18. Check or arrange for correct labelling of unit.

Track Feed Sets Only

- * 19. Test the track circuit concerned (Voltage, current, drop shunt, pick-up shunt). See [NR/SMS/PartB/Test/251](#) (DC Track Circuit Test), Full Test.

Signal Lamps Only

- * 20. Test the signal lamp (Lamp voltage, auxiliary filament). See [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/CE02		
Replace a Primary Cell or Battery		
Issue No: 08	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

***** NO RECORD OF TEST REQUIRED *****

Includes:	Primary cells used singly or as part of battery
Excludes:	Telecoms cells or batteries

BEFORE INSTALLATION WORK

1. Check replacement cell/battery is not damaged and is correct type and that the total number of cells remains unaltered.
2. Carry out a [WIRE COUNT](#) on any external conductors connected to the existing cell/battery to the wiring diagram.
3. Check existing wiring has safe insulation.

AFTER INSTALLATION WORK

4. Check replacement cell or battery is correctly installed.
 5. Check correct conductors are on the correct cell or battery terminals.
 6. Carry out a [WIRE COUNT](#) on any external conductors connected to the replacement cell/battery to the wiring diagrams.
 - * 7. Test output voltage and polarity with the output disconnected.
 - * 8. Test voltage with the circuits restored.
 9. Carry out a [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on supplies where earthed circuits are not used.
 - * 10. **For Track Feeds Only:** Carry out [NR/SMS/PartB/Test/251](#) (DC Track Circuit Test), Full Test.
 - * 11. **For Signal Feeds Only:** Carry out [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests),
 - * 12. **For TCAID Units Only:** Carry out [NR/SMS/PartB/Test/043](#) (TCAID Test)
- NOTE:** *TCAID Batteries fitted before 2019 are rated at 8v and all batteries fitted since 2020 are rated at 7.2v.*
13. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/DE01		
Replace a Detonator Placer		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Mechanical parts of detonator placer
Excludes:	All other types of detonator placer

It is the responsibility of the Signaller to provide detonators and to check that they are installed in the detonator placer correctly.

Replacement of the drive unit for power operated detonator placers is covered by the appropriate Electric Motor/Hydraulic Power Pack Maintenance Test Plan.

BEFORE INSTALLATION WORK

1. Check replacement detonator placer is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement detonator placer is correctly installed.
3. Check new split pins are correctly installed.
4. Check lever is free to operate and correctly places detonators on railhead.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL01		
Replace a Fuse Holder		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	All types of fuse, link or arrestor holders
Excludes:	No exclusions

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement holder is not damaged and is correct type.
3. Check existing holder is isolated from supply.
4. [WIRE COUNT](#) existing holder to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

7. Check replacement holder is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement holder to the wiring diagram.
10. Check correctly rated fuse, link or arrestor is inserted.
11. Carry out an [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where the circuit is designed to be earth free.
12. Check with the Maintenance Test Plan for the item of equipment fed via the holder and carry out steps marked with an asterisk “*“.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL02		
Replace a Barrelled or Clip in Component		
Issue No: 07	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Fuses, links, and clip in arrestors
Excludes:	SSI security fuses

General

- This Maintenance Test Plan is not required when disconnecting and reconnecting a fuse or link for isolation purposes.

BEFORE INSTALLATION WORK

1. Check for any evidence of wiring or component damage, short circuits, scorching, strong smells or unusual amounts of moisture which might require attention.
2. Check replacement component is not damaged and is correct type.

AFTER INSTALLATION WORK

3. Check replacement component is correctly installed.
4. Check the fuse remains intact whilst operating each item of equipment fed by the fuse (**FUSES ONLY**).
5. Test circuit current with the maximum number of functions fed by the fuse energised (**FUSES ONLY**).
6. Check at least one item of equipment fed via the component operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL03		
Replace a Wire Ended Component		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Two wired component, resistor, capacitor, choke, track resistor, track capacitor, track rectifier, track diode, track tuning cards
Excludes:	All other types of component.

BEFORE INSTALLATION WORK

1. Check replacement component is not damaged and is correct type.
2. [WIRE COUNT](#) existing component terminals to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing component is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement component is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement component terminals to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are secure and correctly replaced.
10. Test voltage with input and output circuits restored.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies where designed to be earth free.
12. Check or arrange for correct labelling of unit.
13. Check with the Maintenance Test Plan for the item of equipment fed via the component and carry out steps marked with an asterisk “*“.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL04		
Replace a Filament Lamp		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	All filament lamps fitted signals
Excludes:	Filament Panel Lamps. Signal Light Modules (SLM)

***** INDEPENDENCE EXEMPT *****

***** NO RECORD OF TEST REQUIRED *****

GENERAL

Do not touch Quartz Halogen lamps with your bare hands. If this occurs, the glass shall be cleaned with methylated spirits.

When replacing Halogen Lamp on Bombardier fibre optic signals and indicators, check that the replacement lamp is correctly installed. A correctly installed lamp shall have the wires protruding from the bottom of the lamp assembly.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement lamp is not damaged and is correct type.
3. Check lamp holder is not damaged.
4. Carry out [INSULATION TEST](#) replacement lamp (minimum 2M ohms terminals to base), (**LEVEL CROSSING FILAMENT LAMPS ONLY**).

AFTER INSTALLATION WORK

5. Check replacement lamp is correctly installed.
- * 6. Check lamp illuminates.
7. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) barrier supply (**LEVEL CROSSING FILAMENT LAMPS ONLY**).

Signal Lamps Only

- * 8. Test signal lamp [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL04		
Replace a Filament Lamp		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

9. Test that lamp proving is effective [NR/SMS/PartB/Test/022](#) (Signal Lamp & Light Module Proving Tests) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.
10. Carry out [NR/SMS/PartB/Test/302](#) (Signal Visibility Check) (**MECHANICAL SEARCHLIGHT SIGNAL LAMPS ONLY**).
11. Check signal head door fits correctly (door seal intact, no case damage, no extraneous light enters).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL05		
Replace a Filament Lamp Holder and/or Springs		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Pre-focused filament lamp holder assembly, Filament lamp holder alone (for signals that do not require critical focusing, such as position light signals and alphanumeric indicators), Individual springs within a filament lamp holder
Excludes:	Lamp holder alone, for signals that require critical focusing, such as long range signals and most position light junction indicators, Signal Light Modules (SLM)

Removal and replacement of the lamp is covered by Maintenance Test Plan [NR/SMTH/Part04/EL04](#) (Replace a Filament Lamp) which shall be used to replace it into the holder.

For signals with pre-focused lamp holder assemblies, the complete optical assembly including lens holder and lamp holder shall be replaced, with seals intact.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.
2. [WIRE COUNT](#) existing holder to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

5. Check replacement item is correctly installed and lamp springs correctly tensioned (The insertion of the lamp shall produce a visible movement on the springs).
6. Check correct filter colour (**INTEGRAL OPTICAL ASSEMBLY ONLY**).
7. Check that the red notches on the lamp holder and optical unit are aligned (**ANSALDO SD 321 SIGNALS ONLY**).
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) holder to the wiring diagram.
10. Check inserted lamp is correct type.
- * 11. Check lamp illuminates.
12. Check for correct alignment of holder.
13. Check that no extraneous light enters signal head (**SIGNAL LAMP HOLDERS/SPRINGS ONLY**).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL05		
Replace a Filament Lamp Holder and/or Springs		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

14. Carry out an [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) where supplies are designed to be earth free.
- * 15. Test signal lamp [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests) and record the test measurements on the record card, together with the reason for the test (**SIGNAL LAMP HOLDERS/SPRINGS ONLY**).
16. Test that lamp proving is effective [NR/SMS/PartB/Test/022](#) (Signal Lamp and Light Module Proving Tests) and record the test measurements on record card, together with the reason for the test (**SIGNAL LAMP HOLDERS/SPRINGS ONLY**).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL06		
Replace a Terminal Block		
Issue No: 07	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	All BA style terminal blocks, clamp type terminations, chocolate strip, binding post, terminal blocks in disconnection boxes.
Excludes:	Replacement of BA style terminal blocks with clamp type terminations.

BEFORE INSTALLATION WORK

1. Check replacement terminal block is not damaged and is correct type.
2. Check position of any affected links, and red dome nuts or equivalent, is recorded in the record of test (see guidelines on links in [NR/L3/SIG/10064/B002](#) (Disconnections).
3. WIRE COUNT existing terminal block to the wiring diagram.
4. Check cable core numbers to the wiring diagram.
5. Check existing wiring has safe insulation (intact around crimps or precisely stripped for clamp type terminations).
6. Check existing wiring is correctly labelled.
7. Check existing terminal block is Isolated from the supply.

AFTER INSTALLATION WORK

8. With the wiring disconnected INSULATION TEST replacement terminal block (minimum 2M ohms terminals to earth).
9. Check replacement terminal block is correctly installed.
10. Check wiring is replaced as labelled.
11. WIRE COUNT replacement terminal block to the wiring diagram.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. CABLE FUNCTION TEST the affected circuits (terminal blocks for multicore signalling cables only).
15. Check with the Maintenance Test Plan for the item of equipment fed via the terminal block and carry out steps marked with an asterisk “*“.
16. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL07		
Replace a Non Plug in Unit		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Earth fault detector, shelf type relay (with non-detachable top), metal clad relay, shelf type/metal clad lamp proving relays, block relay unit, timing relay, polar bias relay, polar stick relay, neutral polar relay, contactor, AC vane relay, FDM equipment, signal flashing aspect unit, wicket gate solenoid
Excludes:	Inverter, converter, track circuit relay, relay with detachable top, code follower relay, code transmitter, panel switches, ATP equipment, TPWS FIU

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type and free of internal contamination.
 - Extra care should be taken when checking Polar relays, as there are occasions when the same catalogue number applies to a number of "Types" (ie 2/3 position, N/C/R bias, coil resistance, etc).
 - The bias might be determined by examining the de-energised position of the contact arm. Centre biased relays are 3 position (See the relay equipment standard for details).
2. Check that any transportation locking mechanism has been removed.
3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.
6. Check existing unit is isolated from the supply.
7. Check replacement unit is correctly sealed.
8. Check replacement relay is magnetically latched in same position as the one to be replaced (**LATCHED RELAYS AND POLAR STICK RELAYS ONLY**).
 - **Such relays shall only be changed one at a time.**
9. Note and record the jumper settings W1, W2, W3 and W4 – any replacement ICDR unit requires a jumper adding, using a wire wrapping tool, to the same setting (refer to the Ansaldo O&M manual for more information). (**TRACK CIRCUIT MONITORING UNIT (ICDR) ON ANSALDO SIGNALLED AREAS ONLY**).

AFTER INSTALLATION WORK

10. Check replacement unit is correctly installed (Unit is level).

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NR/SMTH/Part04/EL07		
Replace a Non Plug in Unit		
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11. Check replacement unit has shrouds fitted to all vertical terminals and no metallic debris in the vicinity.
12. Check wiring is replaced as labelled.
13. WIRE COUNT replacement unit to the wiring diagram.
14. Check wire wrap jumpers on either W1, W2, W3 or W4 have been correctly installed (**TRACK CIRCUIT MONITORING UNIT (ICDR) ON ANSALDO SIGNALLED AREAS ONLY**).
15. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply where designed to be earth free.
- * 16. Test signal lamp whilst both flashing and steady. [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests) and record the test measurements on the record card, together with the reason for the test (**SIGNAL LAMP PROVING RELAYS AND SIGNAL FLASHING ASPECT UNITS ONLY**).
- * 17. Check replacement unit operates correctly.

Polar relays shall have both the normal and reverse operation checked (and the centre position, where applicable).

 - Check correct operation means observing the correct operation of the unit itself and confirming correct operation of one function operated by the unit. For example, a route can be set, points operated normal and reverse, etc.
 - It also includes checking that any timing mechanism which is contained within the circuits of the replacement unit or associated with it continues to operate within its design specification as shown on the circuits and control tables.
- * 18. Check unit de-energises when the correct number of illuminated lamps are removed and the unit becomes energised when the correct number of lamps are fitted. (**LAMP PROVING RELAYS ONLY**).
- * 19. **FDM EQUIPMENT ONLY:** Measure and record, voltages, TX level and RX levels, on the record card, together with the reason for the test.
- * 20. [BLOCK CONTROLS TEST](#) replacement unit (**BLOCK RELAY UNITS AND BLOCK REPEAT RELAYS ONLY**).
- * 21. [BLOCK RECOVERY TEST](#) replacement unit (**BLOCK RELAY UNITS AND BLOCK REPEAT RELAYS ONLY**).
- * 22. Test for correct time delay according to the wiring diagram (**TIMING RELAYS ONLY**).
- * 23. Check replacement unit is correctly sealed (**TIMING RELAYS ONLY**).

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NR/SMTH/Part04/EL07		
Replace a Non Plug in Unit		
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- * 24. Test for each polarity (**POLARISED CIRCUITS ONLY**).
- * 25. Check sensitivity of unit (**EARTH FAULT DETECTOR ONLY**).
- * 26. Check wicket gate cannot be opened when locked (**WICKET GATE SOLENOID ONLY**).
- 27. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL08		
Replace a Plug in Unit		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	*** INDEPENDENT EXEMPT ***
	Earth fault detector, converter, transformer rectifier, neutral relay, AC vane relay, timing relay, FDM units, individual geographical unit relays, lamp proving relays, Londex pulse generator, 5P point contactor units.
Excludes:	*** NOT INDEPENDENT EXEMPT ***
	Latched relay, polarised magnetic stick relay, DC polarised moving iron relay. Shelf type relays with detachable tops (Remax).
Excludes:	Lamp, track circuit relay, panel switches, ATP equipment, SSI modules, TPWS Modules, Westlock modules, Westplex modules

GENERAL

During relay replacement, record the information required in accordance with NR/L2/SIG/11129, to enable the SM(S) to update the relay database.

For “Londex pulse generators” (when no spare is available) check pins 11 & 12 (P & R on later units) on the disconnected plug have been linked using red jumper wire labelled at both ends.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement plug-in unit is not damaged (contact spring alignment, internal contamination including zinc flakes, relay comb alignment, loose object) and is correct type.
3. Check any wiring between the bottom half of the detachable top and the relay terminals has safe insulation (**DETACHABLE TOP RELAYS ONLY**).
4. Test any wiring between the bottom half of the detachable top and the relay terminals is correct (**DETACHABLE TOP RELAYS ONLY**).
5. Check plugboard is free of contamination.
6. Check signal box controlling device, relays, and either equipment on the ground or the state of any detection, are in correspondence.
7. Check replacement plug-in unit is correctly sealed.
8. Check replacement relay is latched in the correct position (see wiring diagram) (**LATCHED RELAYS & POLARISED MAGNETIC STICK RELAYS ONLY**).

Latched and polarised magnetic stick relays shall only be changed one at a time.

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NR/SMTH/Part04/EL08		
Replace a Plug in Unit		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

9. Check spades are locked in the plugboard (this might not be practicable on some geographical relay units).
10. Check any replacement plug-in unit is correctly installed and the retaining clip is in place.
- * 11. Check replacement plug-in unit operates correctly.

***NOTE:** Check correct operation means observing the correct operation of the unit itself and confirming correct operation of one function operated by the unit. For example, a route can be set, points operated normal and reverse, etc. It also includes checking that any timing mechanism which is contained within the circuits of the replacement unit, or associated with it, continues to operate within its design specification as shown on the circuits and control tables.*
- * 12. Check or test sensitivity of unit (**EARTH FAULT DETECTOR ONLY**).
- * 13. Test input voltage, output voltage and polarity (**TRANSFORMER/RECTIFIER & CONVERTER ONLY**).
- * 14. Test for correct time delay according to the wiring diagram. (**TIMING RELAYS ONLY**).
- * 15. Check replacement plug-in unit is correctly sealed (**TIMING RELAYS ONLY**).
- * 16. Check replacement plug-in unit de-energises when the correct number of illuminated lamps are removed and becomes energised when the correct number of lamps are refitted (**LAMP PROVING RELAYS ONLY**).
- * 17. Test FDM equipment for Voltage, TX level, RX level, background and record the test measurements on the record card, together with the reason for the test (**FDM EQUIPMENT ONLY**).
- * 18. Test for each polarity (**POLARISED CIRCUITS ONLY**).
- * 19. Test pulse ring circuits for correct timing according to the wiring diagrams (**LONDEX PULSE GENERATORS ONLY**).
- * 20. [BLOCK CONTROLS TEST](#) (**DC POLARISED MOVING IRON RELAY ONLY**).
21. [POINT DETECTION AND CORRESPONDENCE TEST](#) equipment (**5P POINT CONTACTOR UNITS ONLY**).
22. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL09		
Remove and Replace a Plug in Unit - Relay		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Earth fault detector, converter, transformer rectifier, neutral relay, AC vane relay, track circuit relay, timing relay, FDM units, individual geographical unit relays, lamp proving relays, latched relay, polarised magnetic stick relay, DC polarised moving iron relay, TPWS Modules and FS2600 receiver units.
Excludes:	Lamp, panel switches, ATP equipment, SSI modules, Westlock modules, Westplex modules, Londex pulse generator, 5P point contactor units and geographical relay units/sets

This test plan is only to be used when the same plug in unit/relay is being removed & re-fitted within a short space of time for the following purposes:

- a) Testing of contacts.
- b) Checking the front of a relay base for silver migration/contamination.
- c) Checking the front of spades for security/integrity.

Relays/plug in units shall only be removed & refitted one at a time when using this test plan.

***** INDEPENDENCE EXEMPT *****

***** NO RECORD OF TEST REQUIRED *****

BEFORE REMOVAL WORK

1. Check rear of the plug board is free of contamination.
2. Check signal box controlling device, relays, and either equipment on the ground or the state of any detection, are in correspondence.
3. Check latched position of end relay to verify it is replaced in the same position. **(LATCHED RELAYS & POLARISED MAGNETIC STICK RELAYS ONLY).**

AFTER REPLACEMENT WORK

4. Check spades are locked in the plug board (this may not be practicable on some geographical relay units).
5. Check plug-in unit/relay is correctly installed and the retaining clip/pin is in place.
6. Check latched position of relay to ensure it has been installed in the same position. **(LATCHED RELAYS & POLARISED MAGNETIC STICK RELAYS ONLY).**
7. Check plug-in unit/relay operates correctly.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL09		
Remove and Replace a Plug in Unit - Relay		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

8. Check correct operation means observing the correct operation of the unit itself and confirming correct operation of one function operated by the unit.

• For example, a route can be set, points operated normal and reverse, etc.

• It also includes checking that any timing mechanism which is contained within the circuits of the replacement unit, or associated with it, continues to operate within its design specification as shown on the circuits and control tables.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL10		
Replace an Audible Unit		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Yodalarm, Annunciator, Box alarm, Barrier bell
Excludes:	Block bells

BEFORE INSTALLATION WORK

1. Check replacement audible unit is not damaged and is correct type.
2. [WIRE COUNT](#) existing audible unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

5. Check replacement audible unit is correctly installed (Unit is facing in correct direction).
6. Check wiring is replaced as labelled.
7. [WIRE COUNT](#) replacement audible unit to the wiring diagram.
8. For devices fitted to emit voice messages, confirm the jumper on the circuit board is fitted in the correct position (see Appendix A).
9. Check terminations are secure and suitably protected.
10. Check any cable is secured.
11. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on circuits and supplies, where designed to be earth free.
- * 12. Check audible unit operates correctly (Another Train Coming feature) and is meets the requirements of the site-specific assessment that determine the levels at each location.
13. For devices fitted to emit voice messages, confirm the correct message is being given for both the normal passage of a train and the "Another Train Coming" warning.
- * 14. Check night-time sound output meets the requirements of the site-specific assessment (**INDEPENDENT DAY/NIGHT SETTINGS ONLY**).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL10		
Replace an Audible Unit		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

APPENDIX A - Voice Message Audible Warning Units

1. There are considerable differences between the circuit feeding an existing Yodalarm and the new unit. Instead of adjusting sound levels by resistor on the audible warning control unit, the new units have individual volume controls for day and night settings internal to the units.
2. The change between day and night is achieved by reducing the supply voltage to 12V. The new unit recognises the lower voltage and switches to the night volume level.
3. As supplied, the new units are set for an output of 80dB by day and 70dB at night, (measured at 3m on axis). If required to adjust the sound levels to better suit local conditions, then the internal volume controls can be adjusted. Set the day level first as it also sets the maximum night level. Then adjust the night level to finish.
4. When used at automatic crossings with ATC circuits, a jumper shall be removed from the circuit board (see Figure 1). In this form the voice message only occurs on the ATC tone. 4 seconds of standard ATC tone are followed by a 4 second voice message "WARNING – ANOTHER TRAIN IS APPROACHING", then repeats the sequence continually.
5. This unit can also be used at MSL type crossings that have no ATC circuits. In this case the jumper shall be retained (see Figure 1), and the voice message occurs on the "first train" tone. 4 seconds of tone are followed by a 4 second voice message "WARNING – MORE THAN ONE TRAIN MAY BE APPROACHING", then repeats the sequence continually.
6. For the positions of terminals and the volume controls see the local diagrams.

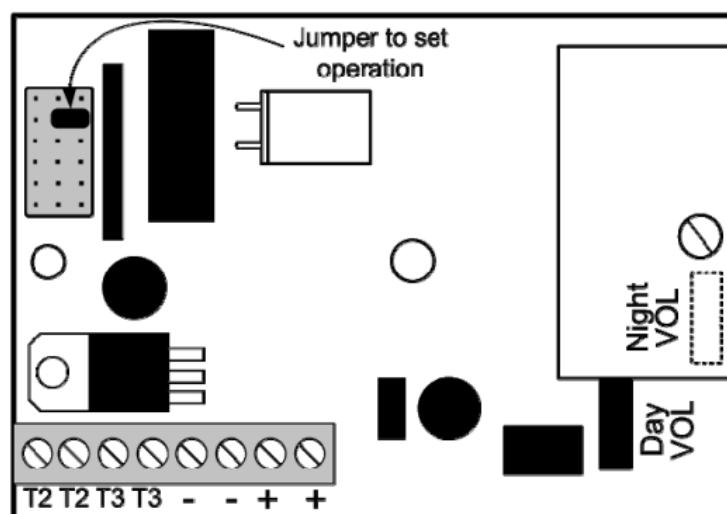


Figure 1 – Jumper and Day and Night Volume Control Positions

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/EL11		
Replace a Push Button or Switch Unit		
Issue No. 06	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	Emergency replacement switch, Absent switch, Train ready to start switch (TRTS), Axle counter switch, Barrier limit switch, Barrier door microswitch, Barrier boom microswitch, Level crossing operators control switches.
Excludes:	Domino panel switch, Point microswitch, Block switch, Time switch, Sealed releases.

BEFORE INSTALLATION WORK

1. Check replacement unit is Not Damaged and is Correct Type.
2. WIRE COUNT existing unit to the wiring diagram.
3. Check existing wiring has Safe Insulation.
4. Check existing wiring is Correctly Labelled.
5. Check existing unit is Isolated from supply.

AFTER INSTALLATION WORK

6. Check replacement unit is Correctly Installed.
7. Check replacement unit is secure and locating pin is engaged. **(SQUARE D EMERGENCY REPLACEMENT SWITCH ONLY)**
8. Check wiring is replaced as labelled.
9. WIRE COUNT replacement unit to the wiring diagram.
10. Check any links, and red dome nuts or equivalent, affected by the work (or testing) are correctly replaced and secure.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuit where designed to be earth free.
- * 12. Test that the affected micro-switch only makes and breaks in the appropriate positions as specified in the wiring diagrams. **(BARRIER LIMIT SWITCH ONLY)**
- * 13. Check circuit operates correctly for all positions of the replacement unit.
14. Check or arrange for Correct Labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL12		
Replace a Plugboard		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Plugboard for all plug-in components
Excludes:	

BEFORE INSTALLATION WORK

1. Check replacement plugboard is not damaged and is correct type (pin code) and is of a non-phenolic type where applicable.
2. Check replacement plugboard and capacitor assembly is not damaged and is correct type (Pin code) and capacitor is correct value (**PLUGBOARD AND TRACK CIRCUIT VITAL DETECTION CIRCUIT CAPACITOR (TH) ASSEMBLY ON ANSALDO SIGNALLED AREAS ONLY**).
3. Check detection circuit capacitor is secure (**PLUGBOARD AND TRACK CIRCUIT VITAL DETECTION CIRCUIT CAPACITOR (TH) ASSEMBLY ON ANSALDO SIGNALLED AREAS ONLY**).
4. [WIRE COUNT](#) existing plugboard to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.
7. Check and Record the position of the relay (**REDUNDANT CIRCUITRY ONLY, EITHER PERMANENTLY ENERGISED OR PERMANENTLY DE-ENERGISED RELAYS**).

AFTER INSTALLATION WORK

8. Check replacement plugboard is correctly installed.
9. Check wiring is replaced as labelled.
10. Check connections are securely locked in the plugboard.
11. [WIRE COUNT](#) the replacement plugboard to the wiring diagram.
12. Check item of equipment fitted to the plugboard is correctly installed and the retaining clips in place.
13. Check with the Maintenance Test Plan for the item of equipment fitted to this plugboard and carry out steps marked with an asterisk “*“ (**EXCLUDING PERMANENTLY DE-ENERGISED RELAYS**).
14. Check for correct operation of each back contact carrying a working circuit by partially withdrawing each back contact relay spade in turn. At the end of this test, repeat the [WIRE COUNT](#) to the wiring diagram (**PERMANENTLY DE-ENERGISED RELAYS ONLY**).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL12		
Replace a Plugboard		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

15. Check for correct voltage and polarity across the coil. Check for correct operation of each relay contact carrying a working circuit by isolating the relay coil **(PERMANENTLY ENERGISED RELAYS ONLY)**.
16. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL13		
Re-allocate a Contact		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Relay contacts
Excludes:	Replacing a contact

General

- If a relay is removed, a Maintenance Test Plan shall be used to replace it into the plugboard.

BEFORE INSTALLATION WORK

1. Check replacement contact is on the correct item of equipment.
2. Check replacement contact is correct type (Arm, front, back, bottom).
3. Check replacement contact is spare and not damaged.
4. Check all other contacts of the affected item of equipment are not damaged.
5. [WIRE COUNT](#) existing contact to the wiring diagram.
6. Check existing wiring has safe insulation.
7. Check that replacement contacts make and break in the correct positions as specified in the wiring diagrams.
8. Check existing wiring is correctly labelled for both the original contact position and temporary re-allocation.
9. Check existing contact is Isolated from the supply.

AFTER INSTALLATION WORK

10. Check terminations are secure and suitably protected.
11. Check wiring is replaced as temporarily labelled.
12. Check wiring diagrams show the alteration.
13. [WIRE COUNT](#) re-allocated contact to the amended wiring diagram.
14. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
15. Test that the function performed by the contact replaced operates correctly.
16. The Maintenance Test Plan/s for the equipment fed by the reallocated contact should be checked and any requirement marked with an asterisk “*“ carried out.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL14		
Replace a Geographical Relay Unit		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	All types of geographical units
Excludes:	Individual relays within geographical units

BEFORE INSTALLATION WORK

1. Check replacement geographical unit is not damaged (contact spring alignment, internal contamination, loose object) and is correct type.
2. Check ball bearing is not loose (**WESTPAC MK.1 EQUIPMENT ONLY**).
3. Check relays in replacement geographical unit are latched in the correct position (**LATCHED RELAYS ONLY**).

AFTER INSTALLATION WORK

4. Check replacement geographical unit is correctly installed (Relays, external connections).
5. Check replacement geographical unit operates correctly.
 - Check correct operation means observing the correct operation of the unit itself and confirming correct operation of each relay within the unit. For example, a route can be set, points operated normal and reverse, etc.
6. Test relays in replacement geographical unit for correct time delay according to the wiring diagram (**TIMING RELAYS ONLY**).
7. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL15		
Replace a Contact		
Issue No: 07	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Individual contacts in: point machines, Electrical point detectors, Hand crank cut-out assemblies, Signal heads, Signal machines, Signal arm contact box, Detonator placers, Electro-mechanical banner signals and Barrier equipment
Excludes:	Mechanical treadles

BEFORE INSTALLATION WORK

1. Check replacement contact is not damaged and is correct type.
2. Wire count existing contact to wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing contact is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement contact is correctly installed.
7. Check wiring is replaced as labelled.
8. Wire count replacement contact to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check terminations are secure and suitably protected.
11. Check wires and cables are secure and clear of moving parts.
12. Carry out an EARTH TEST (DC) or EARTH TEST (AC) on the supplies and circuits, if designed to be earth free. (For point detection circuits this shall be done for both Normal and Reverse power operations).
13. Test that the replacement contact only makes and breaks in the correct positions as specified in the wiring diagram.
14. Carry out a Point Detection Test [NR/SMS/Test/010 to 013](#) and record the results on the record card, together with the reason for the test (**HAND CRANK CUT-OUT CONTACTS IN DETECTION CIRCUITS ONLY**).
15. Check function operated by the replacement contact operates correctly.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL15		
Replace a Contact		
Issue No: 07	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

16. The Maintenance Test Plan/s for the equipment fed by the renewed contact should be checked and any requirement marked with an asterisk * carried out.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL16		
Replace a Panel Tile		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Domino panel switch/push button
Excludes:	All other panel tiles

***** INDEPENDENCE EXEMPT *****

BEFORE INSTALLATION WORK

1. Check replacement tile is not damaged and is correct type.
2. Check replacement tile detail to faceplate drawing.

AFTER INSTALLATION WORK

3. Check replacement tile is correctly installed.
4. Check tiles are correctly positioned to the fascia plate diagram **(WHEN MORE THAN ONE TILE REMOVED)**.
5. Check switches and buttons operate correctly for all positions.
6. Check that the replacement tile displays the correct indications.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/EL17		
Replace an Electromagnetic Lock		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes: Armature, Lock body, Cables, Fixings, Brackets.
--

BEFORE INSTALLATION WORK

1. Check replacement part is Not Damaged and is Correct Type.
2. WIRE COUNT terminals to existing wiring diagram.

AFTER INSTALLATION WORK

3. Check the replacement part is Correctly Installed.
4. Check the armature and lock body are aligned correctly.
5. The armature requires to have some movement to allow it to mate cleanly with the lock. Check this movement is adequate for correct mating.
6. Check cable is not liable to be damaged mechanically in normal operation.
7. WIRE COUNT the replacement part to the wiring diagram.
8. Carry out [SMS Test 210](#) Electromagnetic Lock Test.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL18		
Remove and Refit a Contact Bank		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

***** INDEPENDENCE EXEMPT *****

Includes:	Complete contact banks associated with signal arm contact boxes, Barrier equipment and Lever contact boxes, where no wires are disconnected and no re-tensioning of contacts is carried out.
Excludes:	All other types of Contact Bank.

BEFORE INSTALLATION WORK

1. Check position of contact bank seating, marking position if required.
2. Check existing contact bank has safe insulation.
3. Check existing contact bank is correctly labelled.

AFTER INSTALLATION WORK

4. Check contact bank is correctly installed.
5. Check wires and cables are secure and clear of moving parts.
6. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL19		
Replace a Printed Circuit Board (PCB) in an Ansaldo T72 Point Machine Junction Box		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Ansaldo T72 point machine junction box with integral PCB only
Excludes:	Any other type of PCB

BEFORE INSTALLATION WORK

1. Arrange protection of the particular points with the Signaller.
2. Check replacement PCB assembly is not damaged and is correct type.
3. [WIRE COUNT](#) existing PCB terminations to the wiring diagram.
4. Note position of plug couplers and 'dummy' plug coupler(s) (i.e. no cable attached), if fitted.
5. Check existing wiring has safe insulation.
6. Check PCB point heater supply cable (2 core) and point control/detection cable (3 core) are isolated.

AFTER INSTALLATION WORK

7. Check replacement PCB assembly is correctly installed.
8. Check plug couplers and 'dummy' plug coupler(s), if applicable, have been correctly installed.
9. [WIRE COUNT](#) replacement PCB terminations to the wiring diagram.
10. Check in conjunction with the Signaller, the lie of points is detected and indicated correctly for both positions of point.
- * 11. Carry out a [POINT DETECTION AND CORRESPONDENCE TEST](#) on the affected ends.
12. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL20		
Removing Dim resistor associated with LED signal head/signal module		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Replacement of a filament head with an LED head and a like for like replacement of a SL35 filament lamp with a LED SL35 module when the Signal can display a flashing aspect
Excludes:	Planned alterations to signals undertaken with design

General

• The 'dim' resistor is provided to increase the life of a filament lamp but can prevent an LED unit from displaying a flashing aspect.

• The exact details of the circuit can be different to those shown in Appendix A. If this is the case the new circuit shall be drawn out and passed to your SM(S).

BEFORE WORK BEGINS

1. Identify whether the signal is controlled from SSI or from relays.
2. Identify whether the signal is capable of displaying a flashing aspect and whether this is a flashing single, flashing double yellow or flashing green.
3. Check that the wiring associated with the feed to the signal matches the available wiring diagrams.
4. Apply temporary label to the wire(s) to be removed and insulated or through crimped.
5. Isolate the feed to the signal head either by powering down the TFM or removing the fuse to the signal head circuits.

AFTER REPLACING SIGNAL HEAD

6. Check that the wires identified in step 4 have either been insulated (bombed) or through crimped.
7. Check the site records have been amended to show the changed wiring.
8. Undertake a wire count.
9. Remove temporary labels.
10. Reconnect power to the signal head.
11. [ASPECT TEST](#) the signal for all aspects including flashing aspects.
12. Record details of wiring change and pass this information to your SM(S) to allow master drawings to be amended.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL20		
Removing Dim resistor associated with LED signal head/signal module		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

APPENDIX A - Wiring Diagrams

Examples show circuits for flashing yellow, similar changes required for double yellow and where flashing green is provided.

Diagram A - extract from T28333

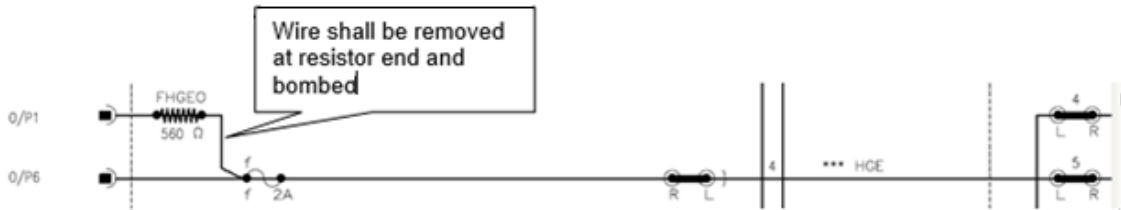


Diagram B - extract from T28330

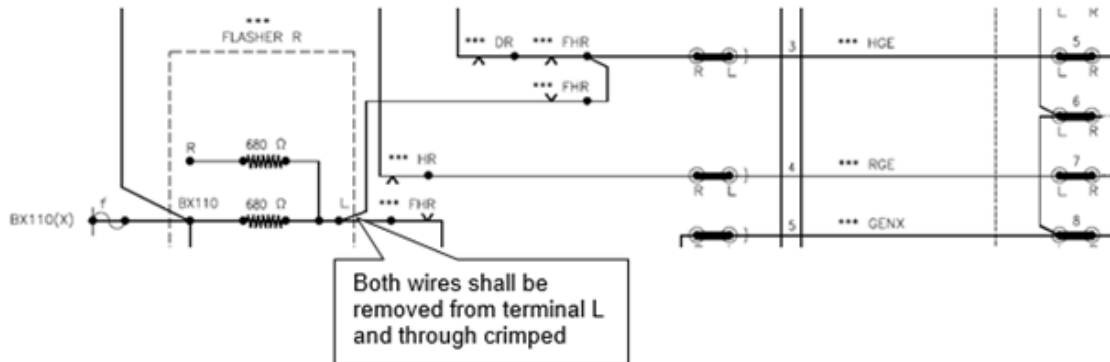


Figure 1 – Circuit Examples

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL21		
Replace a Light Emitting Diode (LED) Signal Light Module (SLM)		
Issue No: 07	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Individual LED SLMs
Excludes:	Complete signals fitted with LED SLMs

BEFORE INSTALLATION WORK

1. Note whether the existing 'on' aspect has two red lights or one red and one white. (POSITION LIGHT SIGNALS ONLY).
2. Check replacement SLM is not damaged and is correct type.
 - Different types of SLMs are provided for mounting below and above the driver's eye level.
3. [WIRE COUNT](#) existing SLM to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

6. Check replacement SLM is correctly orientated for its application.
7. Check that hood is correctly installed and is correct type.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) SLM to the wiring diagram.
10. Check that the SLM correctly illuminates.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supplies where designed to be earth free.
- * 12. Test LED SLM. Carry out [NR/SMS/PartB/Test/022](#) (Signal Lamp & Light Module Proving Test) and record the test measurements on the record card, together with the reason for the test.
13. Check for correct beam alignment, carry out [NR/SMS/PartC/SG00](#) (Signals: General) - Beam Alignment.
- * 14. [ASPECT TEST](#) signal.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL22		
Replace a Howells LED SL35 Light Engine		
Issue No. 04	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Howells LED SL35 Light Engine
Excludes:	Conventional SL35, other types of LED Signal Module

***** NOT INDEPENDENCE EXEMPT *****

GENERAL

When changing LED units, check the correct colour LED unit is placed in the correct aspect aperture. Each LED unit is designed to fit in place of an SL35 or SL18 filament lamp.

The LED colours are indicated by a coloured sleeve fitted to the Main and Common wires extending from the unit. Green shall only be fitted to a Green Aspect.

A white LED unit shall only be fitted to a white aspect.

MK2 LED SL35 Light Engines are not compatible with smooth DC power supply.

These units become hot during service. A cool down period is required before removing the unit.

BEFORE INSTALLATION WORK

1. Check LED SL35 light engine is not damaged, is correct type, free of contamination.
2. Check the colour of the module light engine corresponds to the colour of the aspect it is being fitted to.

NOTE: (Colour coding of the light engine is denoted by the colour of the sleeve on the Main (M) and Common (C) unit wiring).

3. [WIRE COUNT](#) existing wiring.
4. Check existing wiring is correctly labelled.
5. Check lamp holder is not damaged.
6. Check that the aspect to be replaced is isolated from the supply.

AFTER INSTALLATION WORK

7. Check LED SL35 light engine is correctly installed and orientated, and the lamp springs are holding the unit in the correct position.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL22		
Replace a Howells LED SL35 Light Engine		
Issue No. 04	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

8. [WIRE COUNT](#) LED SL35 light engine.

9. Check LED SL35 light engine colour corresponds to the colour of the aspect.

NOTE: (Colour coding of the light engine is denoted by the colour of the sleeve on the Main (M) and Common (C) unit wiring and on colour plate on rear of PCB).

10. Check terminations are secure and suitably protected.

11. Check aspect illuminates and displays correct colour.

* 12. Test each LED SL35 light engine voltage [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests – Voltage Test. Values are recorded in [NR/SMS/PartZ/Z01](#) (Signal – Reference Values).

13. Record the test measurements on the record card together with the reason for the test.

* 14. Test that lamp proving is effective for each LED SL35 light engine that has been replaced [NR/SMS/PartB/Test/022](#) (Signal Lamp and Light Module Proving Tests). Record on the record card together with the reason for the test.

15. Check the correspondence of each aspect (or test correspondence of each SSI telegram) to its associated signal box indication or aspect repeat relay.

16. Check signal head door fits correctly (door seal intact, no case damage, no extraneous light enters, and cable entry sealed).

17. Check for correct beam alignment [NR/SMS/PartC/SG00](#) (Signals General).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL23		
Replace a Dispatch Interface Unit		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Dispatch Interface Unit (DIU) as shown in the identification images below
Excludes:	All other types or styles of Dispatch Interface Unit

GENERAL

Asset Identification Image



Figure 1 – Dispatch Interface Units

BEFORE INSTALLATION WORK

1. Check replacement Interface Unit is not damaged, is correct type.
2. If the fascia plate is to be replaced, check the replacement has the correct markings and is the correct fascia colour. If the fascia plate is not being replaced, remove it and set it to one side for reuse.
3. The unit sighting/alignment shall be confirmed, and witness marks installed if required.
4. Isolated all wiring to the unit.
5. [WIRE COUNT](#) existing unit to the wiring diagram.
6. Check existing wiring has safe insulation.
7. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

8. Check the fascia plate has the correct markings and is the correct colour.
9. Check replacement unit is securely mounted and correctly sighted/aligned.
10. Check all terminations are secure and tight.
11. [WIRE COUNT](#) replacement unit to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL23		
Replace a Dispatch Interface Unit		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

12. Reconnect all wiring to the unit.
13. Carry out a correspondence test between the dispatcher's activation unit and the replaced indicator.
14. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL24		
Replace an Encapsulated LED Indicator		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

***** INDEPENDENCE EXEMPT *****

Includes:	Encapsulated LED Indicator
Excludes:	All other types of LED Indicator or light unit

GENERAL

Asset Identification Images



Figure 1 – Encapsulated LED Indicators

BEFORE INSTALLATION WORK

1. Check replacement Indicator is not damaged, correct colour and is correct type.
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Disconnect the power supply.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.
6. Check existing unit is isolated from supply.

AFTER INSTALLATION WORK

7. Check replacement unit is correctly installed.
8. Check replacement unit is securely mounted
9. [WIRE COUNT](#) replacement unit to the wiring diagram.
10. Check wiring is replaced as labelled.
11. Reconnect the power supply.
12. Carry out a correspondence test between the system controlling the illumination of the LED and the replaced LED indicator.
13. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/EL25		
Replace an Automatic Gate Closer		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Gate closer tube, Clamp plate, Chassis and Brackets.
Excludes:	All other Gate closer and Gate fittings

Equipment Identification



Figure 1 - Automatic Gate Closer

BEFORE INSTALLATION WORK

1. Check replacement part is Not Damaged and is Correct Type.
2. Check Clamp plate and Chassis is Not Damaged and is aligned correctly.
3. Insert locking pin in the articulated joint to stop the closer tube retracting into the chassis housing during the removal process (Figure 2).



Figure 2 – Locking Pin Insertion

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/EL25		
Replace an Automatic Gate Closer		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER INSTALLATION WORK

4. Check the replacement part is Correctly Installed.
5. Check the Clamp plate and Chassis are aligned correctly.
6. Check the gate completes it travel and locks from the following points:
 - a) From a fully open.
 - b) From a mid-swing.
 - c) From quarter-swing.
 - d) From 50mm from the closed position.
7. Carry out closing speed test of the gate closer, from fully open to the closed and locked position of 10 seconds (+/- 2 seconds).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL26		
Replace an ABB Power Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	ABB Power Switch OT16F3
Excludes:	All other Power Switches

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - ABB Power Switch OT16F3

BEFORE INSTALLATION WORK

1. Check that the replacement Power Switch is of the Correct Type and is Not Damaged.
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Power Switch.
4. Switch the Power Switch to the off position
5. Isolate the supply to the Power Switch and verify this by using a volt meter on the input terminals.
6. WIRE COUNT the Power Switch and check the wires have safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL26		
Replace an ABB Power Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

7. Remove the wires from the Power Switch and insulate them.
8. Remove the Power Switch from the DIN rail and label it as faulty.

AFTER INSTALLATION WORK

9. Check that the replaced Power Switch is securely mounted on the DIN rail.
10. WIRE COUNT the Power Switch and check all cables are correctly installed and secure.
11. Reconnect the power supply and check the input voltage.
12. Switch the Power Switch to the ON position and check the output voltage.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL27		
Replace an Intelligent Infrastructure Busbar Monitor		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 06/06/2021

Includes:	All types of Intelligent Infrastructure Signalling Busbar Monitor (II-BMD)
Excludes:	All other types of Busbar or Earth Leakage Monitoring

***** INDEPENDENCE EXEMPT *****

BEFORE INSTALLATION WORK

1. Check the replacement unit is the correct type, not damaged and correctly sealed and where GPRS comms is required the SIM card has been activated.
2. Inform the remote monitoring system operator of the site details and the device serial number.
3. Confirm the Identity of the unit to be replaced.
4. WIRE COUNT the II-BMD plug couplers to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.
7. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

8. Check the device is correctly installed and securely mounted.
9. WIRE COUNT the II-BMD plug couplers to the wiring diagram and verify all wiring is secure.
10. Check the antenna or Ethernet cable is securely connected.
11. Reconnect the power supply.
12. Visually check the unit has powered up and is displaying the correct indications, including the run light flashing
 - ⋮ The following steps require use of the manufacturers' II-BMD diagnostic application:
13. Check the diagnostic display site specific information correlates with the wiring diagram.
14. Check the value of earth loop resistance is less than 40 ohms. Where the value is greater than 40 ohms refer to II-BMD installation and maintenance instructions.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL27		
Replace an Intelligent Infrastructure Busbar Monitor		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 06/06/2021

15. Test the voltage of each monitored busbar in turn with a digital multi-meter (150k shunt fitted) and simultaneously check the associated channel voltage is within a tolerance of + / - 5%.
16. Check the display value for each busbar leg is > 50K Ω . Connect a 47K Ω test resistor between an earth terminal and each busbar leg in turn for 10 seconds; observe the displayed value for the associated input falls to <50K Ω . (Where the value for either leg of a busbar is <=50K Ω do not proceed with the test for the affected busbar).
17. Report any values of resistance to earth below the reportable level in accordance with earth fault management procedures.
18. Check the data from the unit is being received correctly in the II system.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL28		
Replace a CHINFA DRP20 Redundancy Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CHINFA DRP20 Redundancy Unit (20A)
Excludes:	All other types of CHINFA Redundancy Unit

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - CHINFA DRP20 Redundancy Unit

BEFORE INSTALLATION WORK

1. Check that the replacement Redundancy unit is of the Correct Type and is Not Damaged.
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Redundancy unit.
4. Isolate the supply to the Redundancy Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Redundancy Unit and check all the wires have safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL28		
Replace a CHINFA DRP20 Redundancy Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

6. Remove the wires from the Redundancy Unit and insulate them.
7. Remove the Redundancy Unit from the DIN rail and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced Redundancy Unit is securely mounted on the DIN rail.
9. WIRE COUNT the Redundancy Unit and check all cables are correctly installed and secure.
10. Reconnect the power supply and check the input and output voltages.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL29		
Replace a Fuse Surge or Lightning Protector		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Furse ESP 120-5A Surge Protectors and Furse ESP CCTV/B Video Lightning Protector
Excludes:	All other Surge / Lightning Protectors

Appropriate electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Images

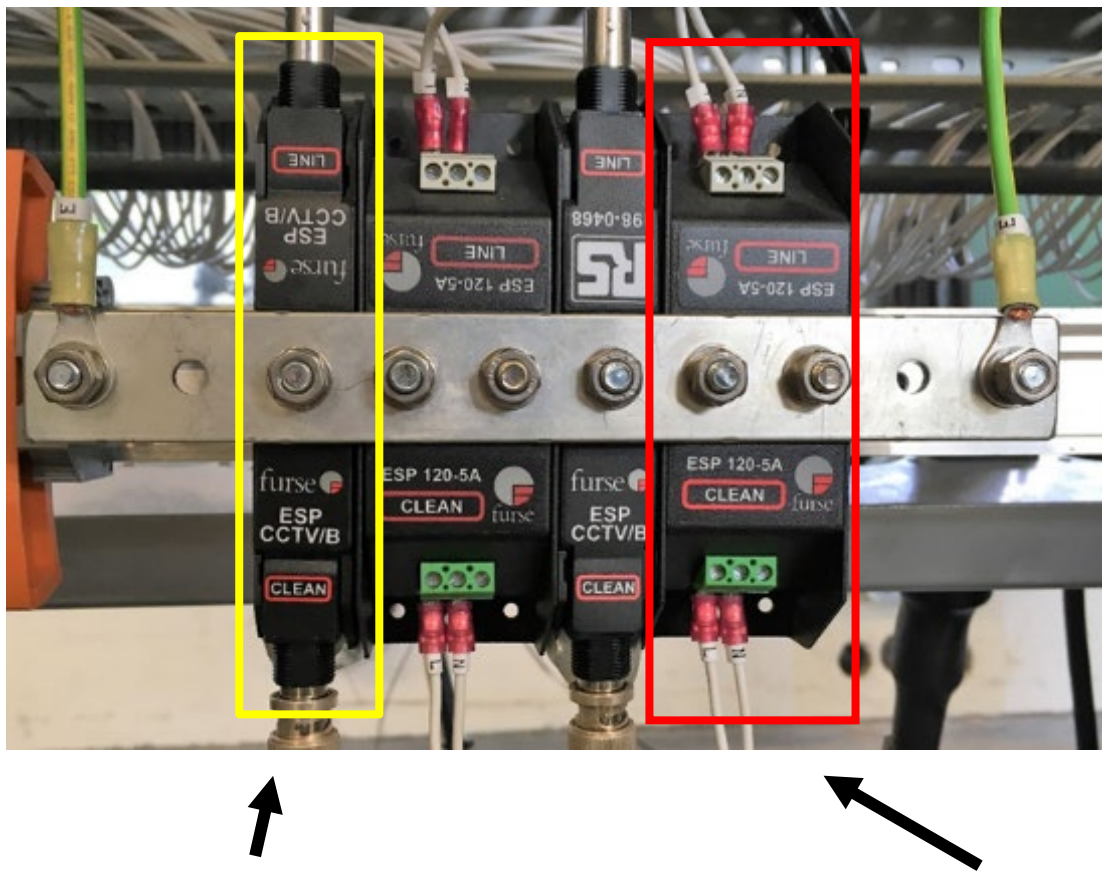


Figure 1 - A Furse ESP CCTV/B Video Lightning Protector and a Furse ESP 120-5A Surge Protector

BEFORE INSTALLATION WORK

1. Check that the replacement Protector is of the Correct Type and is Not Damaged.
2. Verify the location of the faulty Protector.
3. WIRE COUNT the Protector and check the wires have safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL29		
Replace a Furse Surge or Lightning Protector		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

4. Remove the wires / coaxial cables from the Protector and insulate them.
5. Remove the Protector from the Earth Bar and label it as faulty.

AFTER INSTALLATION WORK

6. Check that the replaced Protector is securely mounted.
7. WIRE COUNT the Surge Protector and check all cables / coaxial cables are correctly installed and secure.
8. Check the input and outputs are within the acceptable range.
 - 90 – 150 VAC
9. Observe or ask the Signaller to observe the CCTV Monitor is displaying the correct picture.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL30		
Replace a GE UPS Inverter Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GE UPS Inverter Module
Excludes:	All other types of Inverter Module

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - GE UPS Inverter Module

BEFORE INSTALLATION WORK

1. Check that the replacement Inverter Module is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Inverter Unit.
4. Remove the Inverter Module and label it as faulty.

This Module does not require powering down or disconnection as it is a plug-in unit

AFTER INSTALLATION WORK

5. Check that the replaced Inverter Module is securely mounted.
6. Verify the Green LED in the top left of the unit is lit.
7. Reset module count via GE UPS Inverter Monitor webpage.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL31		
Replace a GE UPS Inverter Monitor Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GE UPS Inverter Monitor Module
Excludes:	All other types of Inverter Monitor Module

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Inverter Monitor Module

BEFORE INSTALLATION WORK

1. Check that the replacement Inverter Monitor Module is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Module.
4. Remove the ethernet cable.
5. Remove the Inverter Monitor Module and label it as faulty.

⋮ This Monitor Module does not require powering down

AFTER INSTALLATION WORK

6. Check that the replaced Inverter Monitor Module is securely mounted.
7. Check the Ethernet cable are secure.
8. Configure GE UPS Inverter Monitor Module as shown in the ASM Configuration Documentation.
9. Verify the Green LED is lit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL32		
Replace a GE UPS Rectifier Controller Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GE UPS Rectifier Controller Module
Excludes:	All other types of Rectifier Controller Module

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Rectifier Controller Module



Figure 2 - Alarm Configuration Jumpers

BEFORE INSTALLATION WORK

1. Check that the replacement Rectifier Controller Module is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Module.
4. Remove the Rectifier Controller Module and label it as faulty.
 - ⋮ This Controller Module does not require powering down.
5. Confirm that the Configuration Jumpers (Figure 2) on the new module are in the same positions as the old module.

AFTER INSTALLATION WORK

6. Check that the replaced Rectifier Controller Module is securely mounted and the control screen is illuminated.
 - ⋮ Scroll through the menu to verify it is responding.
7. Configuration as shown in ASM Configuration Documentation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL33		
Replace a GE UPS Rectifier Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GE UPS Rectifier Module
Excludes:	All other types of Rectifier Module

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Rectifier Module

BEFORE INSTALLATION WORK

1. Check that the replacement Rectifier Module is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Module.
4. Remove the Rectifier Module and label it as faulty.

⋮ This Rectifier Module does not require powering down

AFTER INSTALLATION WORK

5. Check that the replaced Rectifier Module is securely mounted.
6. Verify the Green LED is illuminated.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL34		
Replace a Miniature Circuit Breaker		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Hager Miniature Circuit Breakers (MCB), Schneider Miniature Circuit Breakers (MCB)
Excludes:	All other types Miniature Circuit Breakers (MCB)

Equipment Identification Image



Figure 1 - Hager type MCB



Figure 2 - Schneider type MCB

BEFORE INSTALLATION WORK

1. Check that the replacement MCB is of the correct type and is not damaged.
2. Verify the location of the faulty MCB.
3. Switch the MCB to the off position
4. Isolate the supply to the MCB and verify this by using a volt meter on the input terminals.
5. [WIRE COUNT](#) the MCB and check the wires have safe insulation and are correctly labelled.
6. Remove the wires from the MCB and insulate them.
7. Remove the MCB and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced MCB is securely mounted.
9. [WIRE COUNT](#) the MCB and check all cables are correctly installed and secure.
10. Reconnect the power supply.
11. Switch the MCB ON position and check the final function operates.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL35		
Replace a SIPLUS LOGO Power Supply		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	SIPLUS LOGO Power supply unit 24v 1.3A
Excludes:	All other types of Power supply

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - SIPLUS LOGO Power Supply Unit

BEFORE INSTALLATION WORK

1. Check that the replacement Power Supply Unit is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Power Supply Unit.
4. Isolate the supply to the Power Supply Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Power Supply Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the Power Supply Unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced Power Supply Unit is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL35		
Replace a SIPLUS LOGO Power Supply		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

8. WIRE COUNT the Power Supply Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL36		
Replace a PULS Power Supply		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	A PULS CPS20.241 or CP10.241 Power Supply
Excludes:	All other types of Power Supply

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - CP10.241 Power Supply



Figure 2 - CPS20.241 Power Supply

BEFORE INSTALLATION WORK

1. Check that the replacement Power Supply Unit is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Power Supply Unit.
4. Isolate the supply to the Power Supply Unit and verify this by using a volt meter on the input terminals.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL36		
Replace a PULS Power Supply		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

5. WIRE COUNT the Power Supply Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the Power Supply Unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced Power Supply Unit is securely mounted.
8. WIRE COUNT the Power Supply Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL37		
Replace a PULS Redundancy Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	PULS 12-28Vdc Redundancy Unit
Excludes:	All other types of Redundancy Unit

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Redundancy Unit

BEFORE INSTALLATION WORK

1. Check that the replacement Redundancy Unit is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Power Supply.
4. Isolate the supply to the Redundancy Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Redundancy Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the Redundancy Unit and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL37		
Replace a PULS Redundancy Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

7. Check that the replaced Redundancy Unit is securely mounted.
8. WIRE COUNT the Redundancy Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL38		
Replace a Powerone AC-DC Converter		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Powerone AC-DC Converter (PSU)110/24v 14A
Excludes:	All other types of Power Converter

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Powerone AC-DC Converter

BEFORE INSTALLATION WORK

1. Check that the replacement AC-DC Converter is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty AC-DC Converter.
4. Isolate the supply to the AC-DC Converter and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the AC-DC Converter and check the wires have safe insulation and are correctly labelled.
6. Remove the AC-DC Converter and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced AC-DC Converter is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL38		
Replace a Powerone AC-DC Converter		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

8. WIRE COUNT the AC-DC Converter and check all cables are correctly installed and secure.
9. Reconnect the supply and check the incoming and outgoing supply are within tolerances.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL39		
Replace a Schneider Relay		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Schneider 90 – 240VAC Relay
Excludes:	All other types of relay

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Schneider Relay

BEFORE INSTALLATION WORK

1. Check that the replacement Schneider Relay is of the Correct Type and is Not Damaged.
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Schneider Relay.
4. Isolate the supply to the Schneider Relay and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Schneider Relay and check the wires have safe insulation and are correctly labelled.
6. Remove the wires from the Schneider Relay and insulate them.
7. Remove the Schneider Relay and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL39		
Replace a Schneider Relay		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

8. Check that the replaced Schneider Relay is securely mounted.
9. WIRE COUNT the Schneider Relay and check all cables are correctly installed and secure.
10. Reconnect the power supply and check the input voltage.
11. Verify the Green LED is lit
12. Check the final function operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL40		
Replace a Standard Shunt		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Unipart Rail Standard Shunt
Excludes:	All other types of relay

Equipment Identification Image



Figure 1 – Standard Shunt

BEFORE INSTALLATION WORK

1. Check that the replacement Standard Shunt is of the Correct Type and is Not Damaged.
 - ⋮ These units are now colour coded to aid identification
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Standard Shunt.
4. Remove the plug couplers from the Standard Shunt.
5. Remove the Standard Shunt and label it as faulty.

AFTER INSTALLATION WORK

6. Check that the replaced Standard Shunt is securely mounted.
7. Reconnect the plug couplers, checking correctly installed and secure.
8. Confirm the module output for the replaced shunt is working correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL42		
Replace a Siemens SITOP PSU200M Power Supply Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Siemens SITOP PSU200M
Excludes:	All other SITOP Power Supply Units

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 – SITOP PSU200M

BEFORE INSTALLATION WORK

1. Check that the replacement Power Supply Unit is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Power Supply Unit.
4. Isolate the supply to the Power Supply Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Power Supply Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the Power Supply Unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced Power Supply Unit is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL42		
Replace a Siemens SITOP PSU200M Power Supply Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

8. WIRE COUNT the Power Supply Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL43		
Replace a Siemens SITOP UPS1600 UPS Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Siemens SITOP UPS1600 UPS Unit
Excludes:	All other SITOP UPS's

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - SITOP UPS 1600

BEFORE INSTALLATION WORK

1. Check that the replacement UPS Unit is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty UPS Unit.
4. Isolate the supply to the UPS Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the UPS Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the UPS Unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced UPS Unit is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL43		
Replace a Siemens SITOP UPS1600 UPS Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

8. WIRE COUNT the UPS Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and configure as shown in the ASM Configuration Documentation
10. Test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL44		
Replace a Phoenix Contact Battery Management Module Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Phoenix Contact Battery Management Module Unit
Excludes:	All other types of Battery Management Module Unit

GENERAL

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 – QUINT Battery Management Module

BEFORE INSTALLATION WORK

1. Check that the replacement Battery Management Module Unit is of the correct type and version.
2. Check the replacement is not damaged.
3. Verify the location of the faulty Battery Management Module Unit.
4. Switch the UPS from mains operation to service mode (press and hold service button >6 seconds).
5. Check UPS has entered Service Mode by checking indications.
6. Remove all the fuses from the Battery Management Module.
7. [WIRE COUNT](#) the Battery Management Module Unit and check the wires have safe insulation and are correctly labelled.
8. Disconnect the UPS and battery connections to the Battery Management Module Unit.
9. Remove the Battery Management Module Unit and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL44		
Replace a Phoenix Contact - Battery Management Module Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

10. Check that the replaced Battery Management Module Unit is securely mounted.
11. Reconnect the UPS and battery connections to the Battery Management Module Unit.
12. [WIRE COUNT](#) the Battery Management Module Unit and check all cables are correctly installed and secure.
13. Replace all the fuses from the Battery Management Module Unit.
14. Switch the UPS from service mode back to mains operation (press and hold service button >1 seconds).
15. Check UPS has entered Normal Mode by checking indications.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL45		
Replace a Phoenix Contact Power Supply Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Phoenix Contact Power Supply QUINT4-PS/1AC/24DC/10 PSU
Excludes:	All other Phoenix Contact Power Supply Unit

GENERAL

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 – QUINT PSU (Unpowered / Powered)

BEFORE INSTALLATION WORK

1. Check that the replacement Power Supply Unit is of the correct type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty Power Supply Unit.
4. Isolate the supply to the Power Supply Unit and verify this by using a voltmeter on the input terminals.
5. [WIRE COUNT](#) the Power Supply Unit and check the wires have safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL45		
Replace a Phoenix Contact - Power Supply Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

6. Remove the Power Supply Unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced Power Supply Unit is securely mounted.
8. [WIRE COUNT](#) the Power Supply Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL46		
Replace a Phoenix Contact Quint DC-UPS Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Phoenix Contact Quint DC-UPS/24DC/24DC/10/USB Unit
Excludes:	All other Quint DC-UPS's

GENERAL

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image

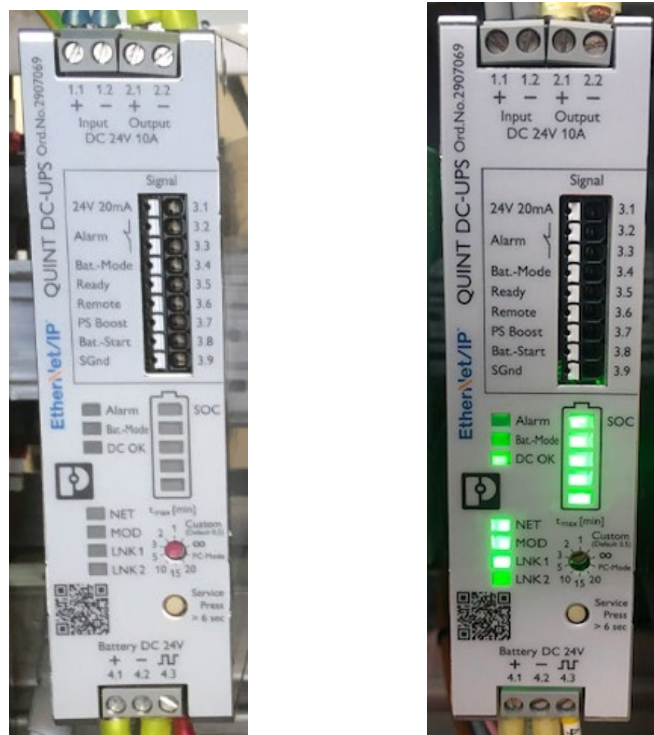


Figure 1 – QUINT DC-UPS (Unpowered / Powered)

BEFORE INSTALLATION WORK

1. Check that the replacement UPS Unit is of the correct type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty UPS Unit.
4. Isolate the supply to the UPS Unit and verify this by using a voltmeter on the input terminals.
5. Remove all the fuses from the Battery Management Module.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL46		
Replace a Phoenix Contact - Quint DC-UPS Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

6. [WIRE COUNT](#) the UPS Unit and check the wires have safe insulation and are correctly labelled.
7. Remove the UPS Unit and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced UPS Unit is securely mounted.
9. [WIRE COUNT](#) the UPS Unit and check all cables are correctly installed and secure.
10. Replace all the fuses from the Battery Management Module Unit.
11. Reconnect the supply and configure as shown in the ASM Configuration Documentation
12. Test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL48		
Replace a Meanwell - Power Supply Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Meanwell 230-110Vac/12Vdc 1.25A Power Supply Unit
Excludes:	All other Meanwell Power Supply Units

GENERAL

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 – Meanwell PSU (Unpowered / Powered)

BEFORE INSTALLATION WORK

1. Check that the replacement Power Supply Unit is of the correct type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty Power Supply Unit.
4. Isolate the supply to the Power Supply Unit and verify this by using a volt meter on the input terminals.
5. [WIRE COUNT](#) the Power Supply Unit and check the wires have safe insulation and are correctly labelled.
6. Remove the Power Supply Unit and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL48		
Replace a Meanwell - Power Supply Unit		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

7. Check that the replaced Power Supply Unit is securely mounted.
8. [WIRE COUNT](#) the Power Supply Unit and check all cables are correctly installed and secure.
9. Reconnect the supply and test the incoming and outgoing supply.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL49		
Replace a Lineside Disconnection Box		
Issue No. 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Disconnection boxes, and terminal blocks within disconnection boxes, that contain tail cables only
Excludes:	All other Disconnection boxes

GENERAL

Where an incorrectly labelled cable core/wire is encountered and is causing a fault, see [DEFINED CHECK A6](#), correct labelling of cables and wires, for how to proceed.

BEFORE REPLACEMENT

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).

2. Check replacement disconnection box is not damaged and is correct type.

NOTE: This might be contained in the wiring diagrams.

3. [WIRE COUNT](#) existing disconnection box to the wiring diagram.

4. Check supply is isolated.

5. Check any existing wiring has safe insulation.

6. Check any existing wiring is correctly labelled.

7. [INSULATION TEST](#) the existing cable/s if reused.

AFTER REPLACEMENT

8. [INSULATION TEST](#) the terminal block(s) in replacement disconnection box(es) (minimum 2M ohms terminals to earth with wiring disconnected).

9. Check replacement disconnection box and wiring is correctly installed.

10. Check wiring is replaced as labelled.

11. [WIRE COUNT](#) replacement disconnection box to the wiring diagram.

12. Check terminations are secure and suitably protected.

13. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL49		
Replace a Lineside Disconnection Box		
Issue No. 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

14. Check with the Maintenance Test Plan for the item of equipment fed via the component and carry out steps marked with an asterisk “*“.
15. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL50		
Upgrade a TRTS Push Button		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Train ready to start switch (TRTS)
Excludes:	All other types of Push Buttons (Domino panel switch, Point micro switch, Block switch, Time switch, Sealed releases etc)

GENERAL

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.

Each replacement kit contains:

- a) Complete Push Button
- b) Front Gasket
- c) Light Shield
- d) Bag of Fixings

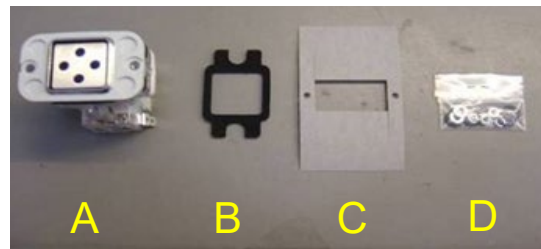


Figure 1 – Replacement Kit

2. Remove the two 3mm A/F Allen key “faceplate” retaining screws.



Figure 2 – Face Plate

3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled as applicable
6. Check existing unit is isolated from supply as required.

METHOD OF REPLACEMENT

7. Identify the button to be replaced.

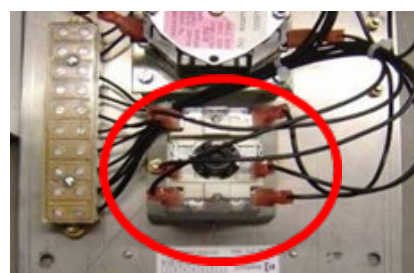


Figure 3 – Rear of Button

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL50		
Upgrade a TRTS Push Button		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- 8. Remove 2 off M4 nuts and washers using a 7mm A/F nut spinner to remove M4 nuts.

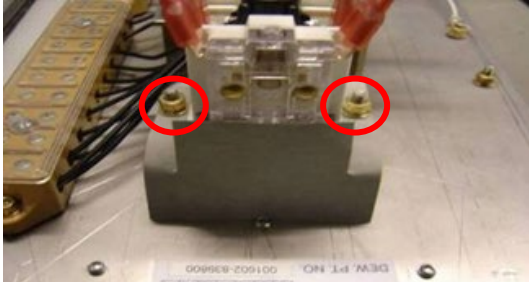


Figure 4 – Retaining Bolts

- 9. Once the nuts and spring washers are removed, lift of the contact block leaving the wires connected.

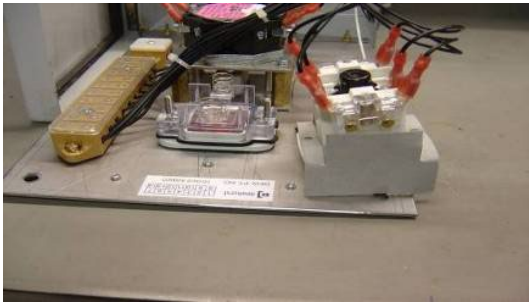


Figure 5 – Contact block removed

- 10. Remove the button carrier, surround and gasket from the faceplate.

Check that the spacers are not sitting on the head of the weld studs.



Figure 6 – Button carrier removed

- 11. Place the gasket over the weld studs ensuring that the gasket fits evenly around the pressel hole.



Figure 7 – New gasket fitted

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL50		
Upgrade a TRTS Push Button		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- Remove the elastic bands from each side of the assembly. Important (the button needs to be held together from this point).

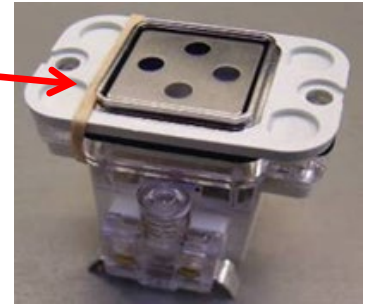


Figure 8 – New button unit

- Holding the button assembly together, slide the assembly on to the weld studs.

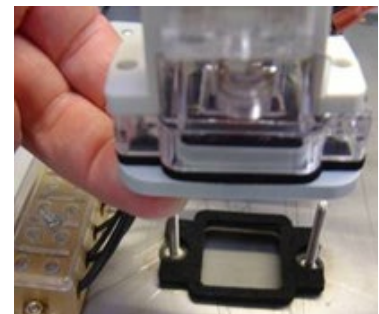


Figure 9 – Aligning Button unit

- Place the light shield on to the weld studs as shown and replace the flat washer, spring washer and nut on to the weld studs.

⋮ Tighten nuts using 7mm A/F nut spinner.

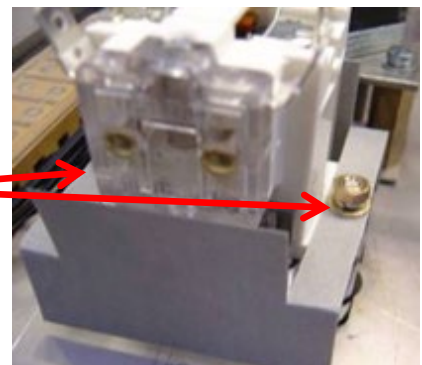


Figure 10 – Securing button in place

- Remove wires from old contact block and place them in the same position on the new contact block.
- Check wiring is replaced as labelled
- [WIRE COUNT](#) replacement unit to the wiring diagram
- Once all wires have been transferred to the new contact block, replace the faceplate ensuring no wires are trapped.



Figure 11 – Swapping Wiring to new contact block

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL50		
Upgrade a TRTS Push Button		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

19. Replace the two 3mm A/F Allen key “faceplate” retaining screws.

AFTER INSTALLATION WORK

20. Check replacement unit is correctly installed.
21. Check circuit operates correctly for all positions of the replacement unit (despatching trains).



Figure 12 – Illuminated button

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL51		
Replacing a Missing Link		
Issue No. 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

GENERAL

- ⋮ This Test Plan is for “Missing Links” but not links which have been slipped.
- ⋮ Where an incorrectly labelled cable core/wire is encountered and is causing a fault, see [DEFINED CHECK A6](#), correct labelling of cables and wires, for how to proceed.
- ▮ A note of all disconnections shall be recorded as a reference.

BEFORE INSTALLATION

- ▮ 1. Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- ▮ 2. Check replacement link is not damaged and is correct type.
 - ⋮ **NOTE:** *This information might be contained in the wiring diagrams.*
- ▮ 3. Check supply circuit from the link is isolated.

AFTER INSTALLATION

- ▮ 4. Check replacement link is correctly installed.
- ▮ 5. Check with the Maintenance Test Plan for the item of equipment fed via the component and carry out steps marked with an asterisk “*“.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL52		
Replace a STEGO Heater		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	STEGO CS 060 series of touch safe heaters without built in thermostat
Excludes:	All other types of Heater

Equipment Identification Image



Figure 1 - STEGO CS 060 Heater

BEFORE INSTALLATION WORK

1. Check the replacement heater is not damaged and is the correct type.
2. Isolate the power supply to the heater and check the heater is cool before handling.
3. [WIRE COUNT](#) the heater and check that the wires have safe insulation and are correctly labelled.
4. Remove the heater and label as faulty.

AFTER INSTALLATION WORK

5. Check the replacement heater is correctly installed and secure.
6. [WIRE COUNT](#) the heater.
7. Restore the power supply to heater.
8. Note the temperature setting on the external thermostat, then adjust the thermostat to 0°C and check the heater starts to warm.
9. Re-adjust the thermostat to the setting noted in the previous step.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL53		
Replace a Hygrotherm		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	STEGO ETF 012 series Electronic Hygrotherm
Excludes:	All other Hygrotherm

Equipment Identification Image



Figure 1 - STEGO ETF 012 Hygrotherm

BEFORE INSTALLATION WORK

1. Check the replacement hygrotherm is not damaged and the correct type.
2. Note the temperature and humidity setting.
3. Isolate the power supply to the hygrotherm.
4. [WIRE COUNT](#) the hygrotherm and check that the wires have safe insulation and are correctly labelled.
5. Remove the hygrotherm and label as faulty.

AFTER INSTALLATION WORK

6. Check the replacement hygrotherm is correctly installed.
7. Adjust the temperature and humidity setting to those shown on the replaced hygrotherm.
8. [WIRE COUNT](#) the hygrotherm.
9. Restore the power supply to hygrotherm.
10. Note the hygrotherm temperature setting, then adjust to 0°C and check the external heater starts to warm.
11. Re-adjust the temperature to the setting noted in the previous step.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/EL54		
Replace a Remote Disconnection Device (RDD)		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	All types of Voestalpine Remote Disconnection Devices (RDD)
Excludes:	Any other type of Remote Disconnection Switch (RSS)

GENERAL

NOTE: The magnetically latched disconnection relay is released when RDD protection is active and energised when RDD protection is removed.

BEFORE INSTALLATION WORK

1. Check the replacement unit is the correct type, not damaged, correctly sealed and where GPRS comms is required the SIM card has been activated.
2. Inform the RDD Administrator of the site details and the new device Globally Unique Identifier (GUID).
3. Confirm the identity of the unit to be replaced.
4. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence found stop and consult your SM(S).
5. [WIRE COUNT](#) the RDD plug couplers to the wiring diagram.
6. Check existing wiring has safe insulation.
7. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

8. Check the device is correctly installed and securely mounted.
9. [WIRE COUNT](#) the RDD plug couplers to the wiring diagram.
10. Check the plug couplers are securely connected.
11. Check the antenna or ethernet cable is securely connected.
12. Visually check the unit has powered up and is displaying the correct indications, including the "REC" LED flashing.
13. Check the RDD configuration is loaded and correct.
14. Check the device is communicating with the RDD web-based management system.
15. Check for correct operation of the RDD and correspond the display to its associated disconnection relay.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part4/HD01		
Remove and Refit the Phoenix MB HABD Equipment (for Tamping Work)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Phoenix HABD
Excludes:	All other HABD Systems

GENERAL

These tests shall be followed in the correct order so that no damage occurs to the HABD equipment when tamping works are scheduled within the limits of the HABD site.

To reduce the down time of the HABD system the disconnection and reconnection shall be planned as close to the tamping works as reasonably practicable.

All washers, spacers etc are to be accounted for during removal so that during reinstallation sensors are correctly affixed to their mountings in the correct position.

REMOVAL - SENSOR MODULE

1. Inform the Signaller which HABD site is to be disconnected and for what duration.
2. Save data to disk, before shutting down the SCT program.
3. Isolate the power to the cabinet.
4. Switch off the UPS.
5. Record the serial numbers or label the sleeper-mounted sensor modules with regards to their respective positions within the sleepers.
6. Lift out the sensor module and disconnect the plug coupler.
7. Check the plug coupler is protected with an end cap and has been replaced in the sleeper.
8. Confirm the sensor and sensor covers are safely stored in the HABD equipment room.
9. Confirm the protecting cover plate has been fitted to the sensor mounting frame to cover the hole.
10. Repeat the above steps for all sensors.
11. Label each cable, and confirm it has been withdrawn from the sleeper and protection has been fitted over the plug coupler.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part4/HD01		
Remove and Refit the Phoenix MB HABD Equipment (for Tamping Work)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

REMOVAL - RAIL SENSOR

12. Note the serial numbers or label the rail sensor with regards to their respective positions mark the exact position of the rail contacts on the rail.
13. Disconnect the rail sensor from its cable and fit the cable end with a protecting end cap.
14. Disconnect and remove the rail sensor, including the clamp and cable from the vicinity of the rails. Store within the equipment rooms.
15. Repeat the above for all rail sensors.

REFIT - RAIL SENSOR

16. Check the position of the rail sensors with respect to the installation diagrams or rail markings.
17. Check the rail clamp and its sensor are fitted correctly and secure.
18. Check that all spacers, washers and spring washers are installed in the correct order (APPENDIX A).
19. Carry out [NR/SMS/PartC/AX40](#) - Frauscher Advanced Axle Counter - Periodic Task 3 - Rail Sensor Height Check.
20. Carry out [NR/SMS/PartB/Test/082](#) - Frauscher: RSR 123 Wheel Sensor Adjustment - associated with IMC & ACB Boards - Section 1 only.

REFIT – SENSOR MODULE

21. Check that the interior of the sleeper is free from gravel.
22. Confirm each sensor is in the correct sleeper.
23. Check the sensor cable is reconnected and secure.
24. Check the sensor is correctly refitted and the sensor fastening components are not damaged, paying particular attention to the rubber dampers.
25. Check that the all the sensors face into the centre of the 4 foot.
26. Check the clearances of the sensors. There shall be a small gap of between 1mm to 3mm between the front edge of the scanner cover and the front edge of the chair steel piece.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part4/HD01		
Remove and Refit the Phoenix MB HADB Equipment (for Tamping Work)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

FINAL CHECKS

27. Reconnect the power to the cabinet.
28. Switch the UPS on.
29. Check that the system auto-configures and starts working.
30. Carry out [NR/SMS/PartB/Test/212](#) (Phoenix MB Accuracy Test).

If any of the recorded values recorded in step 28 was found outside the tolerance of its "Nominal Value" shown in the table below then a full calibration shall be carried out as defined in [NR/SMS/PartB/Test/211](#) (Phoenix MB Full Calibration Test).

Sensor	Nominal Value (Low)	Nominal Value (High)
HDB 1	70°C ± 3°C	120°C ± 5°C
HDB 2	70°C ± 3°C	120°C ± 5°C
HWB 1	300°C ± 10°C	400°C ± 20°C
HWB 2	300°C ± 10°C	400°C ± 20°C

Table 1 – Nominal Values

31. Check cables have been replaced into ducts and guides, using fasteners and clips. Replace lids.
32. **If practicable:** Observe system operation the passage of a train.

APPENDIX A - Order of Sensor Components

The following is a checklist on the order of re-application of the sensor mounting components. The correct order of their re-application is critical so that the optical geometry of the sensor is maintained.

- a) 2 X Bodywork washers (First Applied).
- b) 1X Spacer.
- c) 1 X Lower rubber buffer.
- d) Sensor.
- e) 1X Upper rubber buffer.
- f) 1 X Bodywork washer.
- g) 1 X Spring washer.
- h) 1 X M10 nut (Last Applied) Then tighten to 50NM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD02		
Remove and Refit EPOS HABD Equipment (for Tamping Work)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	EPOS - Hot Axle Box Detector (HABD)
Excludes:	All other Hot Axle Box Detector (HABD) Systems

GENERAL

These tests shall be followed in the correct order so that no damage occurs to the HABD equipment when tamping works are scheduled within the limits of the HABD site.

To reduce the down time of the HABD system the disconnection and reconnection shall be planned as close to the tamping works as reasonably practicable.

All washers, spacers etc are to be accounted for during removal so that during reinstallation sensors are correctly affixed to their mountings in the correct position.

To replace the EPOS-Units it is not necessary to shut down the "Control and Evaluation Unit"

REMOVAL - SENSOR MODULE

1. Inform the Signaller which HABD site is to be disconnected and for what duration.
2. Record the serial numbers or label the sleeper-mounted sensor modules with regards to their respective positions within the sleepers.
3. Lift out the sensor module and disconnect the plug coupler.
4. Check the plug coupler is protected with an end cap and has been replaced in the sleeper.
5. Confirm the sensor and sensor covers are safely stored in the HABD equipment room.
6. Confirm the protecting cover plate has been fitted to the sensor mounting frame to cover the hole.
7. Repeat the above steps for all sensors
8. Label each cable, and confirm it has been withdrawn from the sleeper and protection has been fitted over the plug coupler.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD02		
Remove and Refit EPOS HADB Equipment (for Tamping Work)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

REMOVAL - WHEEL SENSOR

9. Note the serial numbers or label the wheel sensor with regards to their respective positions. Mark the exact position of the wheel sensors on the rail.
10. Disconnect the wheel sensor from its cable and fit the cable end with a protecting end cap.
11. Disconnect and remove the wheel sensor, including the clamp and cable from the vicinity of the rails. Store within the equipment rooms.
12. Repeat the above for all rail sensors.

REFIT - WHEEL SENSOR

13. Check the position of the wheel sensors with respect to the installation diagrams or rail markings.
14. Check the rail clamp and its sensor are fitted correctly and secure.
15. Check that all spacers, washers and spring washers are installed in the correct order.
16. Carry out [NR/SMS/PartE/HO14](#) (Hot Axle Box Detector - Wheel Sensor) – The Wheel Sensor Height Check).
17. Carry out [NR/SMS/PartB/Test/184](#) (EPOS - RSR123 Wheel Sensor Voltage Adjustment).

REFIT – SENSOR MODULE

18. Check that the interior of the sleeper is free from gravel/ballast/debris.
19. Confirm each sensor is in the correct sleeper.
20. Check the sensor cable is reconnected and secure.
21. Check the sensor is correctly refitted and the sensor fastening components are not damaged paying particular attention to the rubber dampers.
22. Check that the all the sensors face into the centre of the 4 foot.
23. Check the clearances of the sensors. There shall be a small gap of between 1mm to 3mm between the front edge of the scanner cover and the front edge of the chair steel piece.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD02		
Remove and Refit EPOS HADB Equipment (for Tamping Work)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

FINAL CHECKS

24. Carry out [NR/SMS/PartB/Test/180](#) (EPOS - Manual Post Calibration Test).
25. Carry out [NR/SMS/PartB/Test/182](#) (EPOS - Verification of Measurement Accuracy).
26. Check cables have been replaced into ducts and guides, using fasteners and clips.
Replace lids.
27. Observe system operation the passage of a train.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD03		
Remove and Replace an EPOS HABD - Wheel Sensor		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	EPOS - Hot Axle Box Detector (HABD)
Excludes:	EPOS - Hot Axle Box Detector (HABD) when removing and refitting for Tamping Work. All other Hot Axle Box Detector (HABD) Systems

GENERAL

These tests shall be followed in the correct order so that no damage occurs to the HABD equipment when tamping works are scheduled within the limits of the HABD site.

To reduce the down time of the HABD system the disconnection and reconnection shall be planned as close to the tamping works as reasonably practicable.

All washers, spacers etc are to be accounted for during removal so that during reinstallation sensors are correctly affixed to their mountings in the correct position.

To replace the EPOS-Units it is not necessary to shut down the "Control and Evaluation Unit.

BEFORE INSTALLATION WORK

- Note the serial numbers, or label the wheel sensor, with their respective positions. Mark the exact position of the wheel sensors on the rail.
- Disconnect the wheel sensor from its cable and fit the cable end with a protecting end cap.
- Disconnect and remove the wheel sensor, including the clamp and cable from the vicinity of the rails. Store within the equipment rooms.
- Repeat the above for all rail sensors.

AFTER INSTALLATION WORK

- Check the position of the wheel sensors with respect to the installation diagrams or rail markings.
- Check the rail clamp and its sensor are fitted correctly and secure.
- Check that all spacers, washers and spring washers are installed in the correct order.
- Carry out [NR/SMS/PartE/HO14](#) (Hot Axle Box Detector - Wheel Sensor) - Wheel Sensor Height Check.
- Carry out [NR/SMS/PartB/Test/184](#) (EPOS - RSR123 Wheel Sensor Voltage Adjustment).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD03		
Remove and Replace an EPOS HADB - Wheel Sensor		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

FINAL CHECKS

10. Carry out [NR/SMS/PartB/Test/180](#) (EPOS - Manual Post Calibration Test).
11. Carry out [NR/SMS/PartB/Test/182](#) (EPOS - Verification of Measurement Accuracy).
12. Check cables have been replaced into ducts and guides, using fasteners and clips.
Replace lids.
13. Observe system operation the passage of a train.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD04		
Remove and Replace an EPOS HABD - Sensor Module		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	EPOS - Hot Axle Box Detector (HABD)
Excludes:	EPOS - Hot Axle Box Detector (HABD) when removing and refitting for Tamping Work. All other Hot Axle Box Detector (HABD) Systems

GENERAL

These tests shall be followed in the correct order so that no damage occurs to the HABD equipment when tamping works are scheduled within the limits of the HABD site.

To reduce the down time of the HABD system the disconnection and reconnection shall be planned as close to the tamping works as reasonably practicable.

All washers, spacers etc are to be accounted for during removal so that during reinstallation sensors are correctly affixed to their mountings in the correct position.

To replace the EPOS-Units it is not necessary to shut down the "Control and Evaluation Unit.

BEFORE INSTALLATION WORK

1. Inform the Signaller which HABD site is to be disconnected and for what duration.
2. Lift out the sensor module and disconnect the plug coupler.
3. Check the plug coupler is protected with an end cap and has been replaced in the sleeper.
4. Confirm the sensor and sensor covers are safely stored in the HABD equipment room.
5. Confirm the protecting cover plate has been fitted to the sensor mounting frame to cover the hole.
6. Repeat the above steps for all sensors.

AFTER INSTALLATION WORK

7. Check that the interior of the sleeper is free from gravel/ballast/debris.
8. Check the sensor cable is reconnected and secure.
9. Check the sensor is correctly refitted and the sensor fastening components are not damaged.

FINAL CHECKS

10. Carry out [NR/SMS/PartB/Test/180](#) (EPOS - Manual Post Calibration Test).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/HD04		
Remove and Replace an EPOS HADB - Sensor Module		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

11. Carry out [NR/SMS/PartB/Test/182](#) (EPOS - Verification of Measurement Accuracy).
12. Check cables have been replaced into ducts and guides, using fasteners and clips.
Replace lids.
13. Observe system operation the passage of a train.

END

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IE02		
Cambrian ERTMS: Replace a Vital Single Programmable Printed Circuit Board and/or associated Dongle		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	RBC CLAP board, CGL, CIC and CIRS boards plus any associated dongle. Note: "x" indicates there is more than one programme for this device.
Excludes:	All other components

***** INDEPENDENCE EXEMPT *****

- ⋮ Before handling any electronic equipment observe ESD precautions.
- ⋮ Observe board specific programming schedule, these are described in local instructions.
- ⋮ Programming can take place prior to or post Installation

BEFORE INSTALLATION WORK

1. Check the replacement board or dongle is of the Correct Type, Not Damaged and that any links or PCB mounted switches are in the correct position.
2. Isolate the power supply to the board being replaced.

AFTER INSTALLATION WORK

3. Check the board is secure and Correctly Labelled.
 - ⋮ When to restore the power supply is specified by the programming schedule for the item of equipment.

BEFORE PROGRAMMING

4. Refer to the programming schedule for the specific item of equipment.
5. Check the software to be installed is the current version.
6. Install the software.

NR/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IE02		
Cambrian ERTMS: Replace a Vital Single Programmable Printed Circuit Board and/or associated Dongle		
Issue No. 02	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER PROGRAMMING

7. Check the software has been correctly installed by comparing the displayed check sum and version with the details contained in the relevant etq file.
8. Print and attach the software version label to the front of the PCB.
9. Check any LEDs on the replaced board are indicating correctly. Refer to [NR/SMS/IE00](#) for LED information.
10. **MTOR ONLY:**
Function Test the replacement MTOR by observing the correct functioning of one control and one indication circuit managed by the replaced MTOR.
11. Check the TT or SILAM indicate the replacement is working correctly.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE03		
Cambrian ERTMS: Replace a Non Programmable Printed Circuit Board		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Non programmable boards
Excludes:	Programmable PCB, Dongle or CRCD

***** INDEPENDENCE EXEMPT *****

Before handling any electronic equipment observe ESD precautions.

Use the caps provided to protect fibre optic connectors, sockets and the ends of patch cords.

BEFORE INSTALLATION WORK

1. Check the replacement board is of the correct type and not damaged.
2. Check that any board mounted links or switches are correctly configured.
3. Isolate the power supply to the board being replaced.

AFTER INSTALLATION WORK

4. Check the board is secure and correctly labelled.
5. Clean the end of the fibre optic patch cord using an approved fibre optic wipe before insertion into the board connector.
6. Restore the power supply.
7. Check the board status LEDs indicate the replaced board is functioning correctly. Refer to [NR/SMS/PartC/IE00](#) (Cambrian ERTMS: General) for LED information.
8. Check using the TT or SILAM indicate the replacement is working correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE06		
Cambrian ERTMS: Replace an Item of Plug and Play Equipment		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Visual Display Unit (VDU), Keyboard, Mouse, USB extender, Printers, Speakers, Non-programmable Printed Circuit Boards and fans in Personal Computers, Modem, CATS Cabinet. "x" indicates there is more than one programme for this device
Excludes:	Programmable equipment

***** INDEPENDENCE EXEMPT *****

GENERAL

Before handling any electronic equipment observe ESD precautions.

BEFORE INSTALLATION WORK

1. Check the replacement item is of the correct type and not damaged.
2. Check that any board mounted links or switches are correctly configured.
3. Isolate the power supply where required.

AFTER INSTALLATION WORK

4. Check the equipment is correctly installed and labelled.
5. Restore the power supply.
6. Check the replaced item functions correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE07		
Cambrian ERTMS: Replace a Non-Vital Programmable Device		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	RCCS; Database Server, Signalling Server, Automatic Server, GEST Server, Signallers Workstation and Maintainer Workstation. SAM; SICAM Server and SILAM PC. SEI; TT Server, TTD and TTC. Other; KMC PC, CATS Cabinet, Terminal Server, Ethernet Switch, Modem and Multiplexer
Excludes:	RBC; PAPR Equipment, SEI; PAP and PES2 Equipment

***** INDEPENDENCE EXEMPT *****

GENERAL

Before handling any electronic equipment observe ESD precautions.

BEFORE INSTALLATION WORK

1. Check the replacement is of the correct type and not damaged.
2. Check that any board mounted links or switches are correctly configured.
3. Isolate the power supply to the equipment being replaced.

AFTER INSTALLATION WORK

4. Restore the power supply.

BEFORE PROGRAMMING

5. Check the software to be installed is the current version.
6. Configure the IP Address where applicable.
7. Install the software as described in the relevant system maintenance manual.

AFTER PROGRAMMING

8. Check the software has been correctly installed.
9. Check network connections are active.
10. Check the replacement operates correctly. This shall be carried out in liaison with the Signaller.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE08		
Replace a PVF rack (Ansaldo Interlocking)		
Issue No: 3	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	PVF rack
Excludes:	All other racks

***** INDEPENDENCE EXEMPT *****

⋮ This task will require the PVF rack to be powered off.

BEFORE RE-INSTALLATION WORK

1. Check the replacement rack is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement rack is correctly fitted.

⋮ The corresponding PFV rack can now be powered back up.

3. Check the fans have correctly started and the front panel shows a steady green LED.

For PVF2 only (Cambrian), Observe the green LED on the rack is illuminated and that the correct indications are displayed on the TT.

4. Check the TT that all systems are showing healthy (excluding the racks at the ROC).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE09		
Cambrian ERTMS: Replace a Plug in Power Supply		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Rack mounted plug in power supply units in the RBC, SEI, SILAM and Remote Object Controller
Excludes:	Other PSUs

***** INDEPENDENCE EXEMPT *****

GENERAL

Before handling any electronic equipment observe ESD precautions.

BEFORE INSTALLATION WORK

1. Check the replacement unit is of the correct type and not damaged.
2. Isolate the power supply.

AFTER INSTALLATION WORK

3. Check the unit is secure and correctly labelled.
4. Restore the power supply.
5. Check the outputs from the power supply are within tolerance and of the correct polarity.
6. Check the status of the system LEDs and that the correct indications are displayed on the Technicians Terminal or SILAM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE12		
Replace an Ansaldo Eurobalise Mounting Bracket		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Ansaldo Eurobalise Mounting Bracket
Excludes:	Any other Balise Mounting Bracket

BEFORE INSTALLATION WORK

1. Check the replacement bracket is of the correct type and not damaged.
2. Check the longitudinal position of the bracket is in accordance with the Signalling Plan. N_PIG 0 is the reference Balise therefore it shall be placed first and N-PIG1 etc. are positioned relative to N_PIG 0. N_PIG 0 has a tolerance of +/- 30cm approximately half sleeper interval.
3. Check the ID BOA of the existing bracket and the Balise are identical.

When a Balise is programmed the ID BOA is written on the end of the Balise, if this has become illegible the ID BOA shall be rewritten before removal.

4. When installing a sleeper mounted bracket, it shall be installed centrally between the rails.

All mounting brackets are designed to position the Balise centrally between the rails and at the correct height in relation to the rail head. (except for the sleeper mounted style).

5. Where the Balise is a "Calibration Balise" a marker is positioned independently from the track to indicate the required centre line position of the Balise.

AFTER INSTALLATION WORK

6. Check the replacement bracket is securely attached to the rail, sleeper or sleeper housing. When the bracket is attached to the foot of the rail the securing bolts shall be tightened to 20nm.
7. Check when a sleeper mounted bracket is used it is located centrally between the rails +/- 10mm.
8. Check that a Calibration Balise bracket is longitudinally aligned with the Balise centre line marker +/- 100mm.
9. Check the ID BOA bracket label is securely installed and correct type.

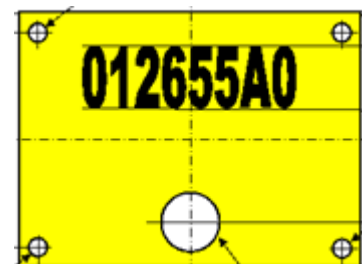


Figure 1 - Example of the ID BOA Label

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE14		
Replace a CRCD Board (Ansaldo Interlocking)		
Issue No: 3	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CRCD board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The MTOR ES 48 module shall be powered down during this task.

⋮ Powering off a MTOR ES 48 affects the section controlled by the module.

BEFORE RE-INSTALLATION WORK

- 1. Check the replacement board is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

- 2. Check the replacement board is correctly fitted.

⋮ The EMC protection panel can now be fitted. |

⋮ The MTOR ES 48 module can now be powered back up. |

- 3. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

(lit)	CG	⊗	⊗ ER	(unlit)
(lit)	V1	⊗	⊗ V2	(lit)
(flashing)	1	⊗	⊗ 2	(unlit)

- 4. Check the TT that all systems are showing healthy.

⋮ During initialisation of the MTOR ES48 module, all the other LEDs of the module are lit up. Even though the indicators seem to be indicating that the outputs are in the permissive state and the inputs high, the inputs are in fact in the restrictive state.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE15		
Cambrian ERTMS: Replace an ISDN/V24 Converter		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	V24 Converter (Used as an interface between the AzLM axle counter equipment and the FTN Network to Machynlleth SCC)
Excludes:	V24 Converters used for any other purpose and locations

GENERAL

Possession of the relevant axle counter section

- The removal of a serial card might affect one or more sections depending on the detection points served by it, the removal of a parallel card only affects one section.

Disconnection of the output of the evaluator to the signalling system.

The output of the evaluator shall not be reconnected to the signalling system and possession given up unless the equipment has passed all tests and is fit for use.

Electrostatic precautions shall be taken when handling boards. Where provided electrostatic discharge points (ESD) shall be used.

The V24 converter is produced in five versions, the original which is configurable as a TX or RX and later TX or RX units. These later TX or RX units are interchangeable with the original TX and RX versions and may be used as a like for like replacement.

- 3CR 31036 AAAA Converter ISDN/V24 Configurable
- 3CR 31036 BAAA Converter ISDN/V24 LT/LT
- 3CR 31036 BBAA Converter ISDN/V24 NT/NT (Not used on Cambrian)
- 3CR 31036 BCAA Converter ISDN/V24 LT/NT (Not used on Cambrian)
- 3CR 31036 BDAA Converter ISDN/V24 NT/NT

BEFORE INSTALLATION WORK

1. Check replacement V24 Converter is correct type and is not damaged.
2. [WIRE COUNT](#) the existing V24 Converter to wiring diagram.
3. Check that existing wiring has safe insulation.
4. Check that existing wiring is correctly labelled.
5. Check existing V24 Converter is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement V24 Converter is correctly installed and positioned.
7. [WIRE COUNT](#) the replacement V24 Converter to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE15		
Cambrian ERTMS: Replace an ISDN/V24 Converter		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

8. Check the correct LED indications on the converter are illuminated.
9. Check the affected axle counters sections operate correctly.
10. Check the affected axle counters sections operate correctly.

ISDN/V24 CONVERTER INDICATIONS

LED Name	Colour	Meaning		
POWER	Green	Power supply present	On - Okay	Off - Fault
B1 TX	Yellow	Logical state of the interface	On - High	Off - Low
B1 RX	Green	Logical state of the interface	On - High	Off - Low
B2 TX	Yellow	Not used		
B2 RX	Green	Not used		
+	Red	Remote power supply condition	Off - Okay	On -Fuse ruptured
-	Red	Remote power supply condition	Off - Okay	On -Fuse ruptured

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE16		
Cambrian ERTMS: Replace a Fibre Optic or LAN Patch Cord		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Single and Dual Core Fibre-Optic Patch Cords with Plug – in or Screw type connectors, Copper 8 way LAN patch Cords, pre – manufactured with fitted moulded plugs
Excludes:	All other types of Fibre Optic Cables, Multi core cables that are NOT Manufacturer fitted with Moulded on Plugs

GENERAL

Beware of Laser Light when replacing a Fibre Optic patch cord. Do not look into the open socket or end of the fibre optic patch cord. Use the caps provided to protect fibre optic sockets and the ends of patch cords.

BEFORE INSTALLATION WORK

1. Check identity of existing patch cord by physically tracing or alternative methods.
2. Check labelling is correct at both ends of the cord.
3. Check that the replacement cord is not damaged and is of the correct length and type.
4. For fibre optic cords only, clean the connector mating faces (where possible) using a proprietary fibre optic cleaning kit.

AFTER INSTALLATION WORK

5. Check the replacement cord is not damaged, is correctly installed and protected to the standards, and that both ends are correctly labelled.
6. Check all physical connections, ensuring that patch cord ends are correctly seated and locked in their receptacles.
7. Check for correct operation of equipment.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE18		
Replace a CALMS2 Board (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CALMS2 board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The MTOR ES48 Module shall be powered down during this task.

⋮ Powering off a MTOR ES 48 affects the section controlled by the module.

BEFORE RE-INSTALLATION WORK

1. Check the replacement board is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement board is correctly fitted.
 - ⋮ The EMC protection panel can now be fitted.
 - ⋮ The MTOR ES 48 module can now be powered back up.
3. Observe that the LEDs of the CALM2 board are all lit.
4. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

(lit)	CG	⊗	⊗ ER	(unlit)
(lit)	V1	⊗	⊗ V2	(lit)
(flashing)	1	⊗	⊗ 2	(unlit)

⋮ During initialisation of the MTOR ES48 module, all the other LEDs of the module are lit up. Even though the indicators seem to be indicating that the outputs are in the permissive state and the inputs high, the inputs are in fact in the restrictive state.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE19		
Replace a CALS Board (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CALS board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

⋮ PAP3 is not affected by this condition.

BEFORE RE-INSTALLATION WORK

- 1. Check the replacement board is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

- 2. Check the replacement board is correctly fitted.
 - ⋮ The corresponding PAP can now be powered back up.
- 3. Check the replacement board has correctly initialised (approximately 40 sec):
 - On the TT: CIER2 board is green.
 - All LEDs on the CALS board are steady green.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE19		
Replace a CALS Board (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- LEDs of CVO board are:

(lit)	W ⊗	⊗ H (unlit)
(pulsating)	M ⊗	⊗ E (unlit)
(flashing)	1 ⊗	⊗ 2 (unlit)

- Using a multimeter, check the voltage on the inspection points of the replacement board (See SMS Appendix 21).

⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.

⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE20		
Replace a CAP Board (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CAP board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

This will cause a loss of communication from the interlocking to trackside equipment.

PAP3 is not affected by this condition.

BEFORE RE-INSTALLATION WORK

1. Check the replacement board is the Correct Type and is Not Damaged.
2. Check the battery on the replacement board is in date and record.
3. Check the replacement board has the correct software version.

AFTER RE-INSTALLATION WORK

4. Check the replacement board is correctly fitted and secured.
- The corresponding PAP can now be powered back up.

DO NOT press the ABT/RST button



NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE20		
Replace a CAP Board (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

5. Check the replacement board has correctly initialised (approximately 40 sec):

- On the TT: CAP board is green.

- The LEDs of CAP board are:

- (flashing) BFL ⊗

- (flashing) CPU ⊗

- LEDs of CVO board are:

- lit) W ⊗ ⊗ H (unlit)

- (pulsating) M ⊗ ⊗ E (unlit)

- (flashing) 1 ⊗ ⊗ 2 (unlit)

⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack. |

⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks. |

6. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE21		
Replace a CAP Dongle (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CAP Dongle
Excludes:	All other Dongles

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

⋮ PAP3 is not affected by this condition.

⋮ The dongle is not read in normal use mode, it is only read when the board reinitialises

BEFORE RE-INSTALLATION WORK

1. Check the replacement dongle has the correct software version. |
⋮ There are different dongles fitted to the interlocking. |
2. Check the replacement CAP dongle is the Correct Type and is Not Damaged. |

AFTER RE-INSTALLATION WORK

3. Check the replacement dongle is correctly fitted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE21		
Replace a CAP Dongle (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

⋮ The corresponding PAP can now be powered back up.

4. Check the replacement board has correctly initialised (approximately 40 sec):

- On the TT: CAP board is green

- The LEDs of CAP board are:

- (flashing) BFL ⊗

- (flashing) CPU ⊗

- LEDs of CVO board are:

- lit) W ⊗ ⊗ H (unlit)

- (pulsating) M ⊗ ⊗ E (unlit)

- (flashing) 1 ⊗ ⊗ 2 (unlit)

⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.

⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks.

5. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE22		
Replace a CIER2 Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CIER2 board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

This will cause a loss of communication from the interlocking to trackside equipment.

PAP3 is not affected by this condition.

BEFORE RE-INSTALLATION WORK

1. Check the replacement board is the Correct Type and is Not Damaged.
2. Check the battery on the replacement board is in date and record.
3. Check the replacement board has the correct software version.

AFTER RE-INSTALLATION WORK

4. Check the replacement board is correctly fitted.
 - Re-insert the Ethernet cable into its previous slot.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE22		
Replace a CIER2 Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

⋮ The corresponding PAP can now be powered back up.

5. Check the replacement board has correctly initialised (approximately 40 sec):

- On the TT: CIER2 board is green.
- On the CIER2 board: Check that the LEDs are flashing green.
- LEDs of CVO board are:

(lit)	W ⊗	⊗ H (unlit)
(pulsating)	M ⊗	⊗ E (unlit)
(flashing)	1 ⊗	⊗ 2 (unlit)

⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.

⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks.

⋮ The “CONSOLE” port of the CIER board is inactive if it is connected after the board initialisation.

6. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE23		
Replace a CME+ Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CME+ board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

⋮ PAP3 is not affected by this condition.

BEFORE RE-INSTALLATION WORK

- 1. Check the replacement board is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

- 2. Check the replacement board is correctly fitted.
 - ⋮ The corresponding PAP can now be powered back up.
- 3. Check the replacement board has correctly initialised (approximately 40 sec):
 - On the TT: CME+ board is green.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE23		
Replace a CME+ Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- LEDs on the front face of the CME+ board are in their nominal state:

	V A	V A
(Unlit) E ⊗	(Flashing) ⊗ ⊗ (steady)	(Flashing) ⊗ ⊗ (steady)
	Rx	Tx
(Unlit) E ⊗	(Flashing) ⊗ ⊗ (steady)	(Flashing) ⊗ ⊗ (steady)
	V A	V A

LEDs on the front face of the CVO board are as follows:

lit)	W ⊗ ⊗ H (unlit)
(pulsating)	M ⊗ ⊗ E (unlit)
(flashing)	1 ⊗ ⊗ 2 (unlit).

A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.

A lit LED “2” means a fault on both of the other PAP-CSD racks.

- Check the TT that all systems are showing healthy.

END

NR/L3/SIG/10663 Signal Maintenance Specifications		
NR/SMTH/Part 04/IE24		
Replace a CP module (Ansaldo Interlocking)		
Issue No. 01	Issue Date: 03/03/2018	Compliance Date: 31/05/2018

Includes:	CP module
Excludes:	All other modules

***** INDEPENDENCE EXEMPT *****

BEFORE RE-INSTALLATION WORK

1. Check the replacement module is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement module is correctly fitted.
3. Check the TT that all systems are showing healthy.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE26		
Replace a CVO Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CME+ board
Excludes:	All other boards

***** INDEPENDENCE EXEMPT *****

The corresponding PAP shall be powered down during this task. In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

■ If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

■ This will cause a loss of communication from the interlocking to trackside equipment.

■ If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

■ This will cause a loss of communication from the interlocking to trackside equipment.

■ PAP3 is not affected by this condition.

BEFORE RE-INSTALLATION WORK

1. Check the replacement board is the Correct Type and is Not Damaged.
2. Check the replacement board has the correct software version. |

AFTER RE-INSTALLATION WORK

3. Check the replacement board is correctly fitted.
 - The corresponding PAP can now be powered back up.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE26		
Replace a CVO Board (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

4. Check the replacement board has correctly initialised (approximately 40 sec):

- On the TT: CVO board is green.
- LEDs on the front face of the CVO board are as follows:

lit)	W ⊗	⊗ H (unlit)
(pulsating)	M ⊗	⊗ E (unlit)
(flashing)	1 ⊗	⊗ 2 (unlit).

⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.

⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks.

5. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/10663 Signal Maintenance Specifications		
NR/SMTH/Part 04/IE27		
Replace a CVO Dongle (Ansaldo Interlocking)		
Issue No. 01	Issue Date: 03/03/2018	Compliance Date: 31/05/2018

Includes:	CVO dongle
Excludes:	All other dongles

The corresponding PAP shall be powered down during this task.

In order to keep the SEI operational while a component is being replaced, the following conditions shall be observed:

- At least two of the three PAP1, PAP2 and PAP3 shall be operational and running.
- At least one of the two Ethernet switches A and B shall be operational and running.

If PAP1 or one of the CVO or CIER2 boards in PAP1 are not running, do not disconnect or switch off Ethernet switch B.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

If PAP2 or one of the CVO or CIER2 boards in PAP2 are not running, do not disconnect or switch off Ethernet switch A.

⋮ This will cause a loss of communication from the interlocking to trackside equipment.

⋮ PAP3 is not affected by this condition.

⋮ The dongle is not read in normal use mode, it is only read when the board reinitialises.

BEFORE RE-INSTALLATION WORK

1. Check the replacement CVO dongle is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement dongle is correctly fitted.

⋮ The corresponding PAP can now be powered back up.

3. Check the CVO board has correctly initialised (approximately 40 sec):

⋮ • On the TT: CAP board is green.

⋮ • LEDs on the front face of the CVO board are :

⋮ (lit) W ⊗ ⊗ H (unlit)

⋮ (pulsating) M ⊗ ⊗ E (unlit)

⋮ (flashing) 1 ⊗ ⊗ 2 (unlit)

NR/L3/SIG/10663 Signal Maintenance Specifications		
NR/SMTH/Part 04/IE27		
Replace a CVO Dongle (Ansaldo Interlocking)		
Issue No. 01	Issue Date: 03/03/2018	Compliance Date: 31/05/2018

- ⋮ A flashing LED “2” on the CVO board means a fault on another PAP-CSD rack.
- ⋮ A lit LED “2” means a fault on both of the other PAP-CSD racks.
- 4. Check the TT that all systems are showing healthy.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE29		
Replace a IOM-AG module (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	IOM-AG modules
Excludes:	All other modules

***** INDEPENDENCE EXEMPT *****

The MTOR ES48 Module shall be powered down during this task by isolating the Power and CTRL trips.

BEFORE RE-INSTALLATION WORK

1. Check the replacement module is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement module is correctly fitted.
3. Re-insert the associated trips (figure 1) and power back up the MTOR.



Figure 1 - Power and Ctrl Trips

4. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

⋮ (lit)	CG	⊗	⊗ ER	(unlit)
⋮ (lit)	V1	⊗	⊗ V2	(lit)
⋮ (flashing)	1	⊗	⊗ 2	(unlit)

5. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE30		
Replace a IOM-SX module (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	IOM-SX modules
Excludes:	All other modules

***** INDEPENDENCE EXEMPT *****

The MTOR ES48 Module shall be powered down during this task by isolating the Power and CTRL trips.

BEFORE RE-INSTALLATION WORK

1. Check the replacement module is the Correct Type and is Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement module is correctly fitted.
3. Re-insert the associated trips (Figure 1) and power back up the MTOR.



Figure 1 – Power and Ctrl Trips

4. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

⋮ (lit)	CG	⊗	⊗ ER	(unlit)
⋮ (lit)	V1	⊗	⊗ V2	(lit)
⋮ (flashing)	1	⊗	⊗ 2	(unlit)

5. Check the TT that all systems are showing healthy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE31		
Replace a MTOR Dongle (Ansaldo Interlocking)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	MTOR dongle
Excludes:	All other dongles

The MTOR ES48 Module shall be powered down during this task.

The dongle is not read in normal use mode, it is only read when the board reinitialises.

The dongles are identified by a label (one master and one slave). The “master” dongle is inserted in the “master” position and the “slave” dongle in the “slave” position.

BEFORE RE-INSTALLATION WORK

1. Check the replacement dongle is labelled, the correct type and is not damaged.
2. Check the replacement dongle has the correct software version.

AFTER RE-INSTALLATION WORK

3. Check the dongle is correctly fitted.
 - The MTOR ES48 module can now be powered back up.
4. Observe the LED’s on the rear of the dongles light up.
 - During re-initialisation (40 sec) loss of the zone of the section controlled by the MTOR ES48 module (approximately 40 sec). The SEI considers all inputs to be in the restrictive state.

5. Observe the LED’s of the mtor2 boards are in ok state after initialisation (approximately 40 sec):

(lit)	CG	⊗	⊗ ER (unlit)
(lit)	V1	⊗	⊗ V2 (lit)
(flashing)	1	⊗	⊗ 2 (unlit)

6. Check the TT that the correct MTOR is showing healthy.
 - During initialisation of the MTOR ES48 module, all the other LED’s of the module are lit up.
 - Even though the indicators seem to be indicating that the outputs are in the permissive state and the inputs high, the inputs are in fact in the restrictive state.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE32		
Replace a MTOR2 Board (SEI-CLSS)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	MTOR2 board
Excludes:	All other boards

The MTOR ES48 Module shall be powered down during this task.

⋮ Powering off a MTOR ES 48 affects the section controlled by the module.

BEFORE RE-INSTALLATION WORK

1. Check the replacement board is the Correct Type and is Not Damaged. |
2. Check the replacement board has the correct software version. |

AFTER RE-INSTALLATION WORK

3. Check the replacement board is correctly fitted.
 - ⋮ The EMC protection panel can now be fitted. |
 - ⋮ The MTOR ES48 module can now be powered back up.
4. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

(lit)	CG	⊗	⊗ ER (unlit)
(lit)	V1	⊗	⊗ V2 (lit)
(flashing)	1	⊗	⊗ 2 (unlit)

5. Check the TT that all systems are showing healthy.
 - ⋮ During initialisation of the MTOR ES48 module, all the other LEDs of the module are lit up.
 - ⋮ Even though the indicators seem to be indicating that the outputs are in the permissive state and the inputs high, the inputs are in fact in the restrictive state.

END

NR/L3/SIG/10663 Signal Maintenance Specifications		
NR/SMTH/Part 04/IE33		
Replace a RIF computer (Ansaldo Interlocking)		
Issue No. 01	Issue Date: 03/03/2018	Compliance Date: 31/05/2018

Includes:	RIF computer
Excludes:	All other computers

***** INDEPENDENCE EXEMPT *****

The RIF computer shall be powered down during this task. If one RIF computer is switched off, the other shall be running otherwise all control will be lost.

BEFORE RE-INSTALLATION WORK

1. Check the replacement RIF is the Correct Type and is Not Damaged.
2. Check certificate of conformity is provided and correct, with the replacement RIF.

AFTER RE-INSTALLATION WORK

3. Check the replacement RIF is correctly fitted.
 - ⋮ The replacement RIF can now be powered back up.
4. Check the TT that all systems are showing healthy.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IE34		
Replace a VSS or 24VP fuse (Ansaldo Interlocking)		
Issue No: 2	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	VSS and 24VP fuse
Excludes:	All other fuses

MTOR ES48 modules associated with the faulty fuse shall be powered down before carrying out this task.

⋮ Powering off a MTOR ES 48 affects the section controlled by the module.

BEFORE RE-INSTALLATION WORK

1. Check the replacement fuse is the Correct Type and are Not Damaged.

AFTER RE-INSTALLATION WORK

2. Check the replacement fuse is correctly fitted.

⋮ The MTOR ES 48 module can now be powered back up.

3. Observe the LEDs of the MTOR2 boards are in OK state after initialisation (approximately 40 sec):

(lit)	CG	⊗	⊗	ER (unlit)
(lit)	V1	⊗	⊗	V2 (lit)
(flashing)	1	⊗	⊗	2 (unlit)

4. Check the TT that all systems are showing healthy.

⋮ During initialisation of the MTOR ES48 module, all the other LEDs of the module are lit up.

⋮ Even though the indicators seem to be indicating that the outputs are in the permissive state and the inputs high, the inputs are in fact in the restrictive state.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF01		
Replace an Atlas 200 ETCS Network Transmission Gateway LRU		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Atlas 200 Network Transmission Gateway (NTG) Cooling Fans, CPU Boards, Diagnostic Board, Switch Boards, PSU Boards
Excludes:	All other Atlas 200 Network Transmission Gateway Components

GENERAL

When removing or handling any NTG modules, check that an ESD wrist strap is connected to the ESD bonding point on the left-hand side of the cubicle; this wrist strap shall be worn on the wrist of personnel prior to the removal and handling of any NTG modules.

⋮ All NTG LRUs are hot swappable.

BEFORE INSTALLATION WORK

1. Check the replacement LRU is not damaged and is correct type.
2. Disconnect any cables and note their positions.

If replacing a cooling fan, do not remove more than one fan tray at the same time, as this could cause the NTG to overheat.

DURING THE WORK

For CPU Board

3. Synchronise the configuration from another board using the NMT.
4. Take a copy of the configuration parameters and then reboot the NTG via NMT.

AFTER INSTALLATION WORK

5. Check that replacement LRU is correctly installed.
6. Reconnect any cables that have been disconnected checking they are correctly seated and match the positions noted in Step 2.
7. Observe that the Diagnostic Board LEDs and chassis LEDs are showing normal indications.

For Cooling Fans

8. Observe that the 'FAN' LED on the Diagnostic Board is UNLIT.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF01		
Replace an Atlas 200 ETCS Network Transmission Gateway LRU		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

For Switch Board

9. Observe that the chassis LED relating to the replaced board is GREEN.

For Main CPU Board

10. Connect to the board and use the NMT to set the “RBC Daemon Port” and “RBC Disc. Timeout [sec]” parameters referring to the copy taken in Step 4. Save the changes and reboot the board.
11. Observe that the chassis LED relating to the replaced board is GREEN.

For a Diagnostic Board

12. Observe that the ‘Diag’ LED on the Diagnostic Board is flashing GREEN.

For PSU Board

13. Observe that the Diagnostic Board ‘PSU’ LED is UNLIT.
14. Observe that the PSU board ‘POWER’ LED is lit GREEN and the ‘FAULT’ LED is UNLIT.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF02		
Replace an Atlas 200 RBC Computing Subsystem Module		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	MPU, HSCU and REDMAN Modules, Computing Channel PSU, RBC Computing Channel Identity Device and USB Key
Excludes:	All other types

GENERAL

Repair or replacement of the sealed safety fuse located on the circuit board of a Redman module in the RBC shall not be carried out by first line maintenance under any circumstances as this might mask an unsafe condition.

When removing or handling any RBC modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the left-hand side of the Cubicle; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any RBC modules.

⋮ Spare modules should be stored in the same ambient conditions as the operational RBC to prevent any adverse effect to the performance of the modules, when unpacked and powered up.

When running the RBC in 2-out-of-2 mode, switching off either of the two Operational Channels will rupture the security fuse of the remaining Channel and cause the RBC to shut down. The rear circuit breakers shall always be used to power down an RBC.

When there is a faulty board in a computing channel (MPU, HSCU or REDMAN board), all three boards shall be replaced together.

Unless only the USB Key has failed, once it is inserted into its MPU it shall be considered as captive to the MPU and shall remain inserted, even when the MPU is removed and returned for repair.

⋮ If the system is fully functional, but running in degraded mode, it is recommended that failure reports are completed before attempting repairs to allow correct recording of indicators.

If more than one computing channel has failed the RBC is non-operational. It shall be powered down and all failed channels replaced before restarting using the RBC Start Up procedure. In this situation Education (Step 8) is not required.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. For USB Keys and Identity Devices, check that the correct channel specific replacement is selected from the available spares.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF02		
Replace an Atlas 200 RBC Computing Subsystem Module		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

3. Check for the correct working of the other two computing channels. Use the switch to power off the computing channel in which a faulty module has been identified.
4. Check the labelling of any cable connected to the equipment, noting the connector positions, before disconnecting any cable.

AFTER INSTALLATION WORK

5. Check replaced modules and boards are correctly installed.
6. Plug the Ethernet cables (RJ45) into the MPU board.
7. Use the front panel switch to turn on the power of the computing channel into which the new boards have been inserted.
8. Educate the module by logging on to the MSS HMI and applying RBC education.
9. After 2 minutes, check the LED indications (Table 1):

Board Name	LED	State in Normal Operation	Note
PSU	In OK	Steady ON	
	Out OK	Steady ON	
MPU	BFL	Steady OFF	
HSCU	CHANNEL A OK	Flashing every 0.5s	
	CHANNEL B OK	Flashing every 0.5s	
REDMAN	FIE	Steady ON	
	FI	Steady ON	

Table 1 – LED Indications

⋮ \$ For diagnostic use only by Alstom

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF02		
Replace an Atlas 200 RBC Computing Subsystem Module		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

10. Check the REDMAN display for correct details.

During normal operation, a text including the RBC software version, application SHA, maximum cycle time and mode is shown in a loop on the REDMAN display. For example:

“RBC Rt.r.k.vv,,SHAD=bbbbbbbbbbbbbbbbbbbb, Cycle duration is xxx ms / yyy ms, Mode is zzzz”.

Where:

- a) “Rt.r.k.vv” is a software version number, e.g. “R8.1.0.03”
- b) “bbbbbbbbbbbbbbbbbbbb” is the SHA database of the channel.
- c) “xxx ms” is the maximum channel cycle time since the display was last updated.
- d) “yyy ms” is the maximum channel cycle time since the channel was powered on.
- e) “zzzz” indicates whether the cubicle is running in 3oo3 or 2oo2 mode.

Any other behaviour indicates a faulty RBC channel.

11. On the MSS HMI, check that the previously reported alarms have become inactive (grey) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to the Alstom Maintenance Service.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF03		
Replace an Atlas 200 RBC Fan Unit		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18
Includes:	Atlas 200 Radio Block Centre (RBC) Fan Unit	
Excludes:	All other types of Fan Unit	

The RBC can run satisfactorily without any fans for a limited period, 15 minutes maximum, at room temperature between 0 – 40 °C. This is not normally an issue, as one of the two fan trays will normally be working during maintenance of the other tray.

BEFORE INSTALLATION WORK

1. Check the replacement Fan Unit is not damaged and is correct type.
2. Turn the fan switch, for the unit to be removed, at the rear of the RBC to the 'off' position, this should power off the fan tray.
3. Disconnect the plug on the rear of the Fan Unit.

AFTER INSTALLATION WORK

4. Re-connect the plug on the rear of the Fan Unit.
5. Check that replaced Fan Unit is correctly installed.
6. Turn the fan switch at the rear of the RBC to the 'on' position. This will power up the fan tray.
7. Confirm that the three fans are running by checking the airflow with your hand, and check that the three fan indicators on the new unit are lit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF04		
Replace an Atlas 200 RBC Front Panel Fuse		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18
Includes:	Atlas 200 Radio Block Centre (RBC) Front Panel Fuses	
Excludes:	All other front panel fuses	

When running the RBC in 2oo2 mode, switching off either of the two operational Computing Channels will cause the RBC to shut down.

Switching off both I/O groups will also remove power from the Computing Subsystem and cause the RBC to shut down.

BEFORE INSTALLATION WORK

1. Check the replacement fuse is not damaged and is correct type.
2. When a fuse is identified as faulty or has to be checked, use the related Computing Channel switch or I/O Group to power down the Computing Channel or I/O Group, thus removing power from the fuse.

AFTER INSTALLATION WORK

3. Use the related front panel switch to turn on the power of the related Computing Channel or I/O Group.
4. If the replaced fuse is related to a Computing Channel, check that all four PSU green LEDs called "In OK" and "Out OK" of the Computing Channel are lit and steady.
5. If the replaced fuse is related to an I/O Group, check that the green LEDs called "In OK" and "Out OK" of the I/O Group are lit and steady.
6. On the MSS HMI, check that the previously reported alarms have become inactive (grey) and clear them from the display.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF05		
Replace an Atlas 200 RBC I/O Subsystem Module		
Draft No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	EAU and I/O Power Supply Module (PSU)
Excludes:	All other types Power Supply Module

When removing or handling any RBC modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the left hand side of the Cubicle; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any RBC modules.

Switching off both I/O groups will also remove power from the Computing Subsystem and cause the RBC to shut down.

Spare modules should be stored in the same ambient conditions as the operational RBC to prevent any adverse effect to the performance of the modules, when unpacked and powered up.

If the system is fully functional, but running in degraded mode, it is recommended that failure reports are completed before attempting repairs to allow correct recoding of indicators.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. Check for the correct working of the other I/O group. Use the appropriate I/O Group switch to power off the I/O group in which a faulty module has been identified.
3. Remove the faulty module from the I/O Group and place it within an anti- static container.

AFTER INSTALLATION WORK

4. Check replaced Module is correctly installed.
5. Use the appropriate front panel I/O Group switch to turn on the power of the I/O group into which the new board has been inserted.
6. On the related I/O Group PSU, check that the green LEDs called "In OK" and "Out OK" are lit and steady.
7. On each EAU, after approximately 5 to 10 seconds, check that both orange LEDs called "R" flash at a rate of approximately once per second.
8. On the MSS HMI, check that the previously reported alarms have become inactive (grey) and clear them from the display.

Communications between the RBC and MSS can take several minutes to start following replacement of an EAU due to address caching in the network equipment.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF06		
Replace an Atlas 200 RBC Main PSU		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021
Includes:	Atlas 200 Radio Block Centre Main Power Supply Unit (PSU)	
Excludes:	All other Power Supply Unit's	

GENERAL

Switching off the incorrect circuit breaker when operating on a single Main Power Supply causes the RBC to shut down.

Check that CB1 is OFF before removing or attaching any Main PSU #1 plug, and that CB2 is OFF before removing or attaching any Main PSU #2 plug.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. Use the correct circuit breaker at the rear of the RBC cubicle to power off the failed Main PSU.

AFTER INSTALLATION WORK

3. Check that replaced PSU is correctly installed.
4. Use the correct circuit breaker at the rear of the RBC cubicle to turn on the power to the Main PSU which has been replaced.
5. Observe that the green "System" and "Uo" indicators on the new PSU are lit, and the red Error indication is not lit.
6. On the MSS HMI, check that the previously reported alarms have become inactive (grey) and clear them from the display.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF07		
Replace an RBC Maintenance Supervision System (MSS) Gateway PC / Wyse Terminal		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	MSS Client Gateway PCs and Wyse Terminals
Excludes:	All other MSS sub-components

GENERAL

- You should try to clear MSS Client faults by re-booting the device before resorting to replacement.

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and is the correct type.

MSS Client Gateway Only

2. Shut down through the Windows menu. If this is not possible, shut down using the power switch on the equipment.

Wyse Terminal Only

3. Shut down the Wyse Terminal using the power switch on the equipment.
4. Note the position of the cables connected to the MSS Client Gateway / Wyse terminal before carrying out any disconnections.
5. Disconnect all cables to the MSS Client Gateway / Wyse Terminal.

DURING THE WORK

For MSS Client Gateway

6. The replacement MSS Client Gateway shall be pre-configured for the same role as the removed one. The labelling of the two machines shall match:
 - a) The machine shall be for the same MSS, have the same unit name and scheme name, e.g. MSS1 CG 1 GWML
 - b) The MSS software baseline is the same, e.g. 3.1.0.15266
 - c) The S2K version is the same, e.g. 8.3
 - d) The HMI version is the same, e.g. v1.0
 - e) The two IP addresses (LAN1 and LAN2) are the same.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF07		
Replace an RBC Maintenance Supervision System (MSS) Gateway PC / Wyse Terminal		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

7. Re-connect all cables to the MSS Client Gateway/Wyse Terminal in the positions noted at step 3.
8. Check that replaced MSS Client Gateway/Wyse Terminal is correctly installed.
9. Where necessary, power on the replacement components.
10. Spare Wyse Terminals shall be configured to match the identity of the unit that was removed. Spare MSS Client Gateways are pre-configured.
11. After booting has completed, check that the new MSS Client Gateway/Wyse Terminal is working correctly by exercising the MSS HMI.
12. Check that the previously reported alarms have become inactive (grey) and clear them from the display.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF08		
Replace an RBC Maintenance Supervision System (MSS) Sub-Component		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	MSS Server, LAN switches, NTP server KVM and Console
Excludes:	MSS Client Gateways Wyse Terminals and Firewalls

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and is correct type.
2. For replacement of the MSS Server, first power down the unit using the switch found on the front.

All Sub-Component's

3. Disconnect power supply, as required.
4. Note the position of the cables connected to the unit being replaced.
5. Disconnect the cables.
6. Remove the failed equipment and label it as failed.

DURING THE WORK

For MSS Server

7. The replacement unit shall be pre-configured for the same role as the removed MSS Server. The hardware shall be of a compatible type, and the installed software and configuration shall be the same as for the removed unit. The labelling of the two machines shall match:
 - a) The machine shall be for the same MSS, have the same unit name and scheme name, e.g. MSS1 Server 1 GWML.
 - b) The MSS software baseline is the same, e.g. 3.1.0.15266.
 - c) The S2K version is the same, e.g. 8.3.
 - d) The Server version is the same, e.g. v0_2_5.
 - e) The three IP addresses are the same.

For LAN Switch

8. Insert a spare LAN Switch (from the approved Atlas 200 spares list) in the MSS cubicle. This shall be pre-configured and labelled with the cabinet name (e.g. MSS1) and either 'Switch A' or 'Switch B'.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF08		
Replace an RBC Maintenance Supervision System (MSS) Sub-Component		
Issue No: 04	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

AFTER INSTALLATION WORK

9. Check that replaced sub-component is correctly installed.
10. Reconnect all disconnected cables from the front and rear of the equipment and check the connector positions.
11. Where necessary, power up the replacement component.

For MSS Server replacement

12. Observe the start-up screen for error messages.
13. After booting has completed, check that the new MSS Server is working by observing the status of the server on a MSS HMI.

NOTE: A re-boot can take up to 10 minutes.

For NTP Server replacement

14. Check after a few minutes that the new NTP Time Server has reported that the antenna is functioning correctly.
15. Check after a few minutes that the new NTP Time Server is synchronised. If not, check the radio signal is available (Radio Antenna LED blinks), connections etc.

For KVM Switch replacement

16. Check that the switch is operating correctly by selecting each of the MSS Servers and MSS Client Gateways in turn.

For Console Replacement

17. Check the new console display is operating by selecting each channel on the KVM switch.

The keyboard and trackpad can be checked by logging in to the MSS client which is accessible when the Client Gateway is selected via the KVM switch."

All Sub-Component's

18. Check the status of every connection by looking at the associated LED indications.
19. On an MSS HMI, check that any previously reported alarms have become inactive (grey) and clear them from the display.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF10		
Replace an Atlas 200 LEU COBALT Micro-Coder		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18
Includes:	Atlas 200 Lineside Electronic Unit (LEU) COBALT Micro-Coder	
Excludes:	All other types of Micro-Coder	

BEFORE INSTALLATION WORK

1. Check replacement Micro-Coder is Correct Type and is Not Damaged.
2. Check the replacement Micro-Coder software version label is correct to the system baseline.
3. Isolate MIPS from main power supply at circuit breaker.

AFTER INSTALLATION WORK

4. Check replacement Micro-Coder is Correctly Installed.
5. Check the Configuration Key is Correctly Installed.
6. Check the local earth cable is Correctly Installed.
7. Check the balise cables, supply and current sensing inputs are Correctly Installed.
8. Reinstate power to MIPS via the circuit breaker .
- * 9. Check replacement Micro-Coder power supply status lamp is on.
- * 10. After allowing time to start up check replacement Micro-Coder indications are as follows:
 - OUT1 and OUT2: off or flashing green (for unused output).
 - ERR: off.
 - OK: Flickering green.
 - ETH1 TX and ETH2 TX: off.
 - ETH1 LNK and ETH2 LNK: off.
- * 11. Using the BEPT, Correspond the messages transmitted by the balise and signal aspects / route indicators with the LEU parameterisation sheet for all aspects & routes.
12. Transfer label from faulty Micro-Coder (or use replacement as necessary).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF11		
Replace an Atlas 200 LEU Configuration Key		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18
Includes:	Atlas 200 LEU Configuration Key	
Excludes:	All other Configuration Keys	

BEFORE INSTALLATION WORK

- 1 Check replacement Configuration Key is Correct Type and is Not Damaged.
- 2 Isolate MIPS from main power supply at circuit breaker.

AFTER INSTALLATION WORK

- 3 Check replacement Configuration Key is Correctly Installed.
- 4 Reinstate power to MIPS via the circuit breaker.
- 5 Check replacement Micro-Coder indications after allowing time to start up – if are as follows, then the Micro-Coder has started up correctly:
 - OUT1 and OUT2: off or flashing green (for unused output).
 - ERR: off.
 - OK: Flickering green.
 - ETH1 TX and ETH2 TX: off.
 - ETH1 LNK and ETH2 LNK: off.
- 6 Using the Balise & Encoder Programming and Testing Tool (BEPT), correspond the messages transmitted by the balise with the LEU parameterisation sheet for all aspects & routes.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IF12		
Replace an Atlas 200 LEU MIPS200 Power Supply		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18
Includes:	Atlas 200 LEU MIPS200 Power Supply	
Excludes:	All other Power Supplies	

BEFORE INSTALLATION WORK

- 1 Check replacement MIPS200 Power Supply is Correct Type and is Not Damaged.
- 2 Check existing MIPS200 is Isolated from supply at circuit breaker.

AFTER INSTALLATION WORK

- 3 Check replacement MIPS200 is Correctly Installed.
- 4 Reconnect the supply to the MIPS200 Power Supply.
- * 5 Check replacement MIPS200 24V output voltage status indication is lit.
- * 6 After allowing time for start up check replacement Micro-Coder indications are as follows:
 - OUT1 and OUT2: off or flashing green (for unused output).
 - ERR: off.
 - OK: Flickering green.
 - ETH1 TX and ETH2 TX: off.
 - ETH1 LNK and ETH2 LNK: off.
- 7 Check or arrange for correct labelling of MIPS200 Power Supply

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG10		
Replace a Futur 2500 Radio Block Centre (RBC) System – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Futur 2500 Radio Block Centre (RBC) System and Stratus TCC FTS
Excludes:	All other Futur 2500 & Stratus TCC FTS equipment



When removing or handling any boards the ESD wrist strap shall always. Prior to use check that an ESD wrist strap is connected to the ESD bonding point

RBC & STRATUS TCC

In normal operation, the Maintenance Elements are not used and all connections shall be disconnected from the Trainguard Futur 2500 RBC

During Maintenance task, the Maintenance Elements are used and shall be connected from the Trainguard Futur 2500 RBC

BEFORE INSTALLATION WORK

This can be prior to or post programming

- 1 Check the replacement board is of the correct type and not damaged and that any links or PCB mounted switches are in the correct position
- 2 Every cable shall be marked with a label with the name of the module and the connector to which it is connected
- 3 Isolate the power supply to the RBC processor before replacing a board

AFTER INSTALLATION WORK

This can be prior to or post programming

- 4 Before Switch ON the circuit breakers of the Trainguard Futur 2500, the power voltage shall be measured at the corresponding connector points.
- 5 Check that the voltage is in the permitted margins:
 - (90 – 264V AC).
- 6 Verify that the Trainguard Futur 2500 RBC has been properly mounted and earthed.
- 7 Verify that all the cables are correctly connected.
- 8 Check that the LED of the “PSU A” and of the “PSU B” is green.
- 9 Check that the three LEDs in the back of the RBC Processor MKII are green.
- 10 Check the TCC Software version.
- 11 Check the data and code version of every card (MPM, SIOM, DPM and TBS LAN).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG10		
Replace a Futur 2500 Radio Block Centre (RBC) System – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

- 12 Check that LEDs in the “PSU A” and in the “PSU B” are green.
- 13 Check that the three LEDs in the back of the RBC Processor MKII are green.
- 14 Check the ISDN Communication link of the TCC through the CTF.
- 15 Check the communication with every interlocking through the CTF.
- 16 Check the communications through the CTF (only If the Trainguard Futur 2500 RBC is connected with a ERTMS Manager equipment).
- 17 Check the communications through the CTF (only if the Trainguard Futur 2500 RBC is connected with others RBC equipment).
- 18 Check in CTF that there are no RBC Alarms
- 19 Record all values.

BEFORE PROGRAMMING

Radio Block Centre (RBC)



Incorrect RBC Processor MKII programming can cause a critical failure has occurred on that lane and that lane will be shut down

- 20 Refer to the programming schedule of specific item of equipment.
- 21 Check the software is installed in the correct version.
- 22 Install the software.
- 23 MPM Data corresponding to each specific RBC Processor MKII shall be recorded
- 24 DPM Data corresponding to each specific RBC Processor MKII shall be recorded

STRATUS TCC

- 25 Each piece of network configuration equipment for the different TCC should have network configuration data (IP address, network mask, and gateway)

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG10		
Replace a Futur 2500 Radio Block Centre (RBC) System – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER PROGRAMMING

- 26 Check the software has been correctly installed by comparing the displayed check sum and version with the details contained in the relevant DNA file
- 27 Print and attach the software version label to the front of the CCB
- 28 Check any LEDs on the replaced board are indicating correctly
- 29 Final MPM Data corresponding to each specific RBC Processor MKII shall be recorded
- 30 Final DPM Data corresponding to each specific RBC Processor MKII shall be recorded

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG11		
Replace a Moviola – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Moviola - Vital Printed Circuit Board and Associated Dongle
Excludes:	All other Moviola equipment

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

MOVIOLA

The Installation Tool shall be executed by an administrator user. In this way, the Installation Tool will create MoviolaW Administrator user and the MoviolaW user groups.

BEFORE INSTALLATION WORK

The installation shall be performed in the correct order from Step 1 to Step 7

- 1 Check that the PC has Window XP SP3 Operating System.
- 2 Check there is no other specific tool that is required to be installed to run the SAM Configuration tool.
- 3 Check the replacement board is of the correct type and not damaged and that any links or PCB mounted switches are in the correct position.
- 4 Isolate the power supply to the equipment being replaced.

AFTER INSTALLATION WORK

- 5 Restore the power supply.

BEFORE PROGRAMMING

- 6 Check the IP address.
- 7 Follow the procedures as described in the MoviolaW Installation manual to set up the MoviolaW Installer Setup Wizard and the Maintenance Tool.

AFTER PROGRAMMING

- 8 Check the software has been correctly installed.
- 9 Check network connections are active.
- 10 Check that the replacements operate correctly. This shall be done in liaison with the signaller.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG12		
Replace a Reliable Data Storage – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Reliable Data Storage - Vital Printed Circuit Board and Associated Dongle
Excludes:	All other Reliable Data Storage equipment

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

RDS – Blue Chip C110 PC

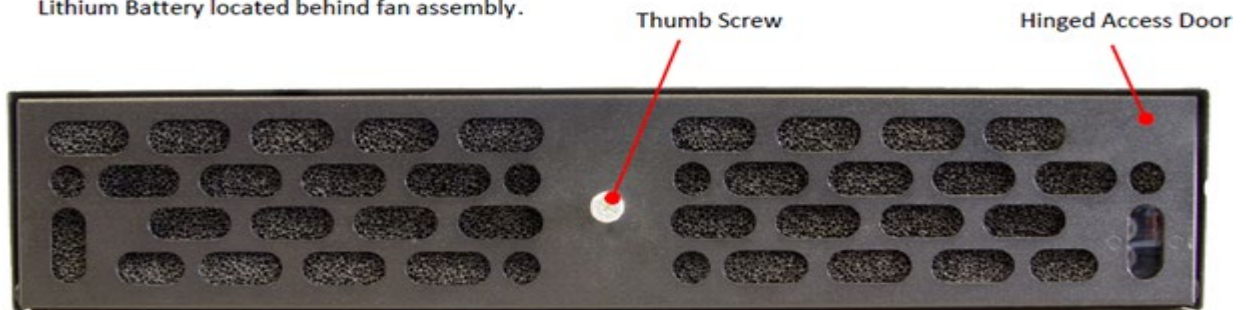
Observe only the board programming/installation schedule; these are described in Blue Chip C110 Installation & Configuration Guide and Maintenance Guide

To install the RDS -Blue Chip C110 PC, the user shall have the administration rights with a protected, non-expiry password.

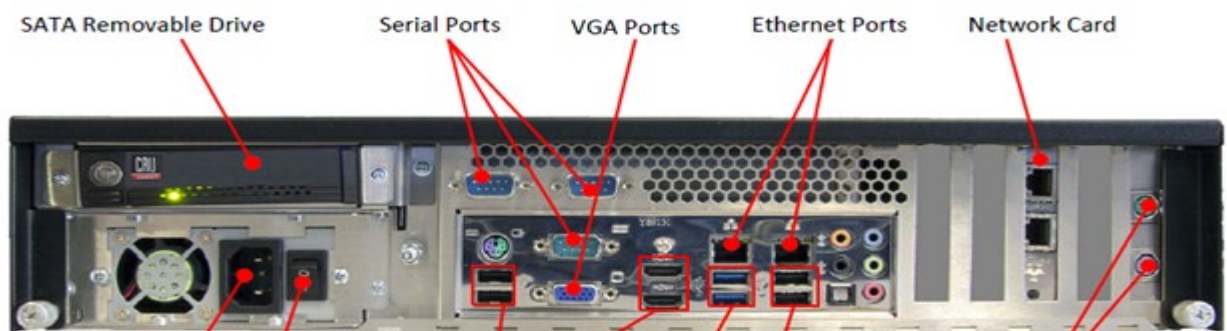
The password shall be added to the PC BIOS. The BIOS is to be configured to restart the machine after power-up, following shutdown.

Identification of Components

Note:
 Filter located on back of hinged access door.
 Fan assembly accessible when access door open.
 Lithium Battery located behind fan assembly.



FRONT VIEW



REAR VIEW

Main Input connector

On/Off Switch

HDMI Ports

USB 3.0 Ports

USB 2.0 ports

PS/2 Mouse and Keyboard ports

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG12		
Replace a Reliable Data Storage – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

BEFORE INSTALLATION WORK

1. The installation shall be performed in the correct order.
2. Check that PC has Window XP SP3 Operating System.
3. Check that the replaced PC is of the correct type and not damaged. This should include a check of the Mod state to check it is the same or later.
4. Record the serial number of the replacement unit.
5. Isolate the power supply using the Main Circuit Breaker (MCB).
6. Note the positions of all cables and which ports they are connected to.
7. Check the cables and wires are correctly labelled.
8. Unplug the cables from the PC.
9. Remove and retain the SATA Removable Drives.
10. Remove and retain the fixing securing the PC to the bracket and withdraw the PC.

AFTER INSTALLATION WORK

11. Insert the retained SATA Removable Drives into the replacement PC.
12. Secure the PC in position using the retained fixings.
13. Check the cables are in the correct position and then re-connect.
14. Re-apply the power supply using the associated MCB.
15. Check the replacement PC is correctly installed.
16. Perform the required test to ensure the system is operational.
17. Check or arrange for correct labelling of unit.
18. Restore the power supply.
19. Copy the configuration files to C:\RDS. After re-booting the operating system, the RDS will start.
20. Inform the SM(S) that the unit has been changed and of the replacement unit's serial number.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG12		
Replace a Reliable Data Storage – Vital Printed Circuit Board and Associated Dongle		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

BEFORE PROGRAMMING

21. Check the IP address.
22. Follow the procedures as described in the Reliable Data Storage Installation and Configuration Guide for to install and configure the RDS.

AFTER PROGRAMMING

23. Check the software has been correctly installed.
24. Check network connections are active.
25. Check that the replacements operate correctly. This shall be done in liaison with the signaller.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG13		
Replace a Thameslink RBC System – RBC Processor Mk2		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Thameslink Radio Block Centre (RBC) System - RBC Processor Mk2 only
Excludes:	All other Thameslink Radio Block Centre (RBC) System equipment

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

BEFORE INSTALLATION WORK

1. Check the replacement RBC Processor Mk2 is not damaged and is correct type.
2. Check that all the cables both front and back have Safe Insulation and are Correctly Labelled.
3. Disconnect and secure all connections to the RBC Processor.
4. Isolate the RBC Processor from the supply.

AFTER INSTALLATION WORK

5. Check the replaced Processor is securely mounted.
6. Reconnect and check that all cables and the plugs are securely locked in place.
7. Reconnect the power supply.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG14		
Replace a Thameslink RBC System - RBC Processor Mk2 Card		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Thameslink Radio Block Centre (RBC) System - RBC Processor Mk2 Card.
Excludes:	All other types of Thameslink Radio Block Centre (RBC) System equipment

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

Where an RBC Processor card has to be extracted from the Processor, the Processor shall be powered down first or otherwise the card will be damaged.

BEFORE INSTALLATION WORK

1. Check the replacement RBC Card is not damaged and is correct type.
2. Check that all the cables both front and back have Safe Insulation and are Correctly Labelled.
3. Isolate the RBC Processor Mk2 Unit from the supply.

AFTER INSTALLATION WORK

4. Check that all cables connected correctly and the plugs are securely locked in place.
5. Reconnect the power supply.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG15		
Replace a Thameslink RBC System - STRATUS TCC FTS		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Thameslink Radio Block Centre (RBC) System - STRATUS TCC FTS.
Excludes:	All other Thameslink Radio Block Centre (RBC) System equipment

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

BEFORE INSTALLATION WORK

1. Check the replacement STRATUS TCC FTS is not damaged and is correct type.
2. Check that all the cables both front and back have Safe Insulation and are Correctly Labelled.
3. Disconnect the VGA and USB Cables from the KVM switch (These connections are only used for Maintenance tasks).
4. Disconnect and secure all connections to the CPUA.
5. Isolate the CPUA from the supply.
6. Disconnect and secure all connections to the CPUB.
7. Isolate the CPUB from the supply.

AFTER INSTALLATION WORK

8. Check the replaced STRATUS TCC FTS is securely mounted.
9. Reconnect and check that all cables and the plugs are securely locked in place.
10. Reconnect the power supply to both CPUA and CPUB.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IG16		
Replace a Thameslink RBC System – ISDN Unit		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Thameslink Radio Block Centre (RBC) System - ISDN Unit.
Excludes:	All other ISDN Units

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

BEFORE INSTALLATION WORK

1. Check the replacement ISDN Unit is not damaged and is correct type.
2. Check that CPUA & CPUB and CPU-RJ48 cables have Safe Insulation and are Correctly Labelled.
3. Isolate the ISDN Unit from the supply.

AFTER INSTALLATION WORK

4. Check both CPUA & CPUB and CPU-RJ48 cables are connected correctly and the plugs are securely locked in place.
5. Reconnect the power supply.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG17		
Replacement of Printed Circuit Cards (PCCs) – SIOM, LAN and DPM Cards (Thameslink Only)		
Issue No: 02	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Thameslink Radio Block Centre (RBC) System - Printed Circuit Cards (PCCs) – SIOM, LAN and DPM Cards.
Excludes:	All other types of Radio Block Centre (RBC) - PCCs

GENERAL

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

Where an RBC Processor card has to be extracted from the Processor, the Processor shall be powered down first or otherwise the card will be damaged.

BEFORE INSTALLATION WORK

1. Check the replacement RBC Printed Circuit Card is not damaged and is correct type.
2. Isolate the RBC Processor Unit from the power supply.

AFTER INSTALLATION WORK

3. Check that Printed Circuit card is securely pushed home and locked in place.
4. Reconnect the power supply.
5. Check that the front LEDs of the MPM and SIOM cards are displaying a green or yellow light in the three channels.
6. To verify that the RBC processor works correctly, confirm that the LEDs on the rear of the processor unit are lit and displaying a steady green light.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG18		
Replace an NCL RBC System – RBC Processor Mk2		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	NCL Radio Block Centre (RBC) System - RBC Processor Mk2 only
Excludes:	All other NCL Radio Block Centre (RBC) System equipment

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.

BEFORE INSTALLATION WORK

1. Check the replacement RBC Processor Mk2 is not damaged and is correct type.
2. Check that all the cables both front and back have safe insulation and are correctly labelled.
3. Disconnect and secure all connections to the RBC Processor. All working shall be carried out in accordance with general instructions for staff working on S&T equipment.
4. Isolate the RBC Processor from the supply.

AFTER INSTALLATION WORK

5. Check the replaced Processor is securely mounted.
6. Reconnect and check that all cables and the plugs are locked in place.
7. Reconnect the power supply.

NOTE: When the RBC is powered down, the ETCS Enable button should be pressed as part of the arming process. This will be done as per instruction from the Signaller Shift Manager as part of the NCL RBC Startup Process - 156905-SIR-NOT-ESG-000001.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG19		
Replace an NCL RBC System - RBC Processor Mk2 Card		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	NCL Radio Block Centre (RBC) System - RBC Processor Mk2 Card
Excludes:	All other types of NCL Radio Block Centre (RBC) System equipment

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.

Where an RBC Processor card has to be extracted from the Processor, the Processor shall be powered down first or otherwise the card will be damaged.

BEFORE INSTALLATION WORK

1. Check the replacement RBC Card is not damaged and is correct type.
2. Check that all the cables both front and back have safe insulation and are correctly labelled.
3. Isolate the RBC Processor Mk2 Unit from the supply.

All working shall be carried out in accordance with general instruction for staff working on S&T Equipment.

AFTER INSTALLATION WORK

4. Check that all cables connected correctly, and the plugs are securely locked in place.
5. Reconnect the power supply.

NOTE: When the RBC is powered down, the ETCS Enable button should be pressed as part of the arming process. This will be done as per instruction from the Signaller Shift Manager as part of the NCL RBC Startup Process - 156905-SIR-NOT-ESG-000001.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG20		
Replace an NCL RBC System – TCC		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	NCL Radio Block Centre (RBC) System - TCC
Excludes:	All other NCL Radio Block Centre (RBC) System equipment

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.

NOTE: TCC is designed to be replaced as a complete unit (both CPU's). As a combined unit to include both PC's and chassis it is a 19kg two-person lift. It can either be removed in this way, or split down and removed as individual CPU's.

BEFORE INSTALLATION WORK

1. Inform the Signaller before undertaking any work on this unit.
2. Check the replacement TCC unit is not damaged and is correct type.
3. Check that all the cables both front and back have safe insulation and are correctly labelled
4. Disconnect the VGA and USB Cables from the KVM switch (These connections are only used for Maintenance tasks).
5. Isolate the CPUA from the supply All working shall be carried out in accordance with general instruction for staff working on S&T Equipment.
6. Disconnect and secure all connections to the CPUA.
7. Isolate the CPUB from the supply. All working shall be carried out in accordance with general instruction for staff working on S&T equipment.
8. Disconnect and secure all connections to the CPUB.

AFTER INSTALLATION WORK

9. Check the replaced TCC is securely mounted.
10. Reconnect and check that all cables and the plugs are securely locked in place.
11. Reconnect the power supply to both CPUA and CPUB.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG20		
Replace an NCL RBC System – TCC		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

12. Check that the LEDs on the front of the TCC unit are lit and showing a steady green light. When the RBC is powered down, the ETCS Enable button shall be pressed as part of the arming process. This will be done as per instruction from the Signaller Shift Manager as part of the NCL RBC Start up Process - 156905-SIR-NOT-ESG-000001

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG21		
Replace an NCL RBC System – ISDN Board		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	NCL Radio Block Centre (RBC) System ISDN Module, Processing Module, Quad Fast Ethernet Interface, Memory Module Carrier
Excludes:	All other ISDN Board, TCC Power Supply Unit

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.

BEFORE INSTALLATION WORK

1. Inform the Signaller before any work takes place on this equipment.
2. Check the replacement module is not damaged and is correct type.
3. Check that CPUA & CPUB and CPU-RJ48 cables have safe insulation and are correctly labelled.
4. Isolate the module from the supply by operating the rocker switch on the front of CPU A or B to the OFF position.

All work shall be carried out in accordance with general instruction for staff working on S&T Equipment.

AFTER INSTALLATION WORK

5. Check both CPUA & CPUB and CPU-RJ48 cables are connected correctly, and the plugs are securely locked in place.
6. Reconnect the module to the supply by operating the rocker switch on the front of CPU A or B to the ON position.

NOTE: *If the RBC is fully powered down, the ETCS Enable button shall be pressed as part of the arming process. This will be done as per instruction from the Signaller Shift Manager as part of the NCL RBC Start up Process -156905-SIR-NOT- ESG-000001*

7. Confirm that the LEDs are lit on the front of the TCC unit and show a steady green indication.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG22		
Replacement of Printed Circuit Cards (PCCs) – SIOM, LAN and DPM Cards (NCL Only)		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	NCL Radio Block Centre (RBC) System - Printed Circuit Cards (PCCs) - MPM,SIOM,LAN and DPM Cards
Excludes:	All other types of NCL Radio Block Centre (RBC) - PCCs

GENERAL

When removing or handling any boards, the ESD wrist strap shall always be worn and connected to the ESD bonding point.

Where an RBC Processor card has to be extracted from the Processor, the Processor shall be powered down first or otherwise the card will be damaged.

In the event of replacing multiple cards, each card should be replaced one at a time to avoid confusion.

Inform the Signaller before replacing any RBC cards.

BEFORE INSTALLATION WORK

1. Check the Mod State and Firmware version of the replacement printed card, and that it matches the existing.
2. Check the replacement RBC Printed Circuit Card is not damaged and is correct type.
3. Isolate the RBC Processor Unit from the power supply.

AFTER INSTALLATION WORK

4. Check that Printed Circuit card is securely pushed home and locked in place.
5. Reconnect the power supply.
6. Check that the front LEDs of the MPM and SIOM cards are displaying a green or yellow light in the three channels.

NOTE: It may take several minutes for the LEDs to display yellow or green following reboot of the RBC.

7. To verify that the RBC processor works correctly, confirm that the LEDs on the rear of the processor unit are lit and displaying a steady green light.

When the RBC is powered down, the ETCS Enable button shall be pressed as part of the arming process. This will be done as per instruction from the Signaller Shift Manager as part of the NCL RBC Start up Process - 156905-SIR-NOT-ESG-000001.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG22		
Replacement of Printed Circuit Cards (PCCs) – SIOM, LAN and DPM Cards (NCL Only)		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

8. Check the RBC Technician's Facility for any errors or fault codes.

⋮ **NOTE:** *The spare cards will be stored in a secure location.*

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG23		
Replace an NCL RBC System- 48V DC Power Supply		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Future 2500 RBC 48VDC Power Supply
Excludes:	Any other power supplies

GENERAL

- Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.
- The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.
- Caution:** The PSUs supply both the network switches and the RBC processor.
- The PSU Input is 230v AC. If any of the 48 V DC power supplies fail due to physical damage, unsuitable output voltage levels, failure alarms not tripping or other reasons, it shall be replaced by a serviceable one with a pre-wired IEC C14 plug.

BEFORE INSTALLATION WORK

Removal

1. Check the replacement unit is of the correct type and not damaged.
2. Voltage shall be checked on the 48 V DC output of all four PSUs. When the faulty PSU has been identified it shall be disconnected via the associated IEC C14 plug from the PD A or PD B. After the disconnection has been made, check for voltage on all other PSU's.
3. Disconnect the V+ and V- wire connections to the PSU from the DC Output terminals.
4. The unit shall be removed from the mounting rail with the IEC C14 plug disconnected at the PD A or PD B but with wires remaining terminated on the input side of the PSU

Replacement

5. Check that replacement unit is the same type as the one removed.
6. Check that the mains power supply A or B is isolated.
7. Place the PSU on the mounting rail.
8. Connect the V+ and V- wire connections to the DC Output terminals of the replacement PSU.
9. Check input side wires are terminated correctly prior to plugging the IEC C14 plug back into the PD A or PD B as per application design.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG23		
Replace an NCL RBC System- 48V DC Power Supply		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Perform the following checks for the proper installation after replacing power supplies:

10. Check that the 'PSU ON' LED is lit on all four power supplies.
11. Check that the Trainguard Futur 2500/Network Switches operates correctly.
12. Check the voltage at the output.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG24		
Replace an NCL RBC System- 230V AC 2U 10 Way PDU Strip		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Future 2500 RBC 230V AC 2U 10 Way PDU Strip
Excludes:	All Other Power Supplies

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

Work shall be carried out by competent staff in accordance with NR/L3/SIGELP/50002.

Caution: The PSUs supply both the network switches and the RBC processor.

All work shall be carried out in accordance with general instruction for staff work on S&T equipment.

BEFORE INSTALLATION WORK

Removal

1. To isolate the 230V AC equipment, the IEC C14 plugs shall be disconnected from the power distribution units (PDU) as per application design.
2. Isolate the 230V AC supply at the relevant MCB on the distribution Board within the power cubicle and apply a lock off device.
3. Operating the corresponding rotary isolation switches A or B to the OFF position and remove the securing screws and remove front of the rotary switch.
4. Test using digital multi-meter on the incoming / outgoing side from the rotary switch terminal block for 0V AC.
5. Remove the corresponding output wires from the rotary switch terminal block as per Power distribution diagrams.
6. Remove defective PDU strip.

Replacement

7. Check the replacement unit is of the correct type and not damaged.
8. Mount the replacement PDU strip in it's original position.
9. Reconnect the corresponding IEC C14 plugs to the PDU as per application design.
10. Reconnect the corresponding wires to the rotary switch output side terminal block as per Power distribution diagrams.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG24		
Replace an NCL RBC System- 230V AC 2U 10 Way PDU Strip		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

11. Replace front cover of rotary switch and secure with screws.
12. Turn rotary switch to ON position.
13. Remove Lock off device from the relevant MCB on the distribution Board within the power cubicle and restore power.

Perform the following checks to ensure the proper installation after replacing power supplies:

14. Check that the 'PSU ON' LED is lit on all four power supplies.
15. Check that the Trainguard Futur 2500/Network Switches operate correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IG25		
Replace an NCL RBC System- Future 2500 Series E Fan Module		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Future 2500 RBC Fan Module
Excludes:	Any Other Fan Module

***** INDEPENDENCE EXEMPT *****

GENERAL

Before undertaking any work within an existing/operational RBC cubicle, the Signaller shall be informed before doing so.

The ESD wrist strap shall be worn while carrying out tasks within the RBC Cubicle.

NOTE: *The fan module is designed to be hot swapped - there is no requirement to isolate the power supply.*

BEFORE INSTALLATION WORK

1. Check the replacement unit is of the correct type and not damaged.
2. Unscrew the two thumb screws at the front of the associated fan module that anchor the fan module to the cabinet.
3. Carefully slide the fan module out and away from the cabinet.

AFTER INSTALLATION WORK

4. Check the unit is correctly labelled.
5. Insert the new fan module, check that it is seated correctly in the cubicle.
6. Tighten up the two thumb screws at the front of the fan module.
7. Check the health indicator at the front of the fan module, the green 'on' indicator shall illuminate.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH01		
Replace an ElectroLogIXS Central Power Supply (CPS) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	CPS-3
Excludes:	All other UCI variants

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

CPS-3 modules shall be powered down before replacement.

Equipment Identification

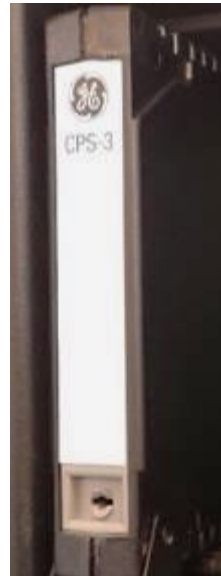


Figure 1 – CPS-3 Module

BEFORE INSTALLATION WORK

1. Check that the CDU-1 unit is fitted.
2. Check the replacement CPS module is the correct type and not damaged.
3. Verify the location of the failed unit.
4. Use the Maintenance Workstation or the ASM Configuration Documentation to verify the replacement module is the correct version (modification level).
5. Place the chassis power switch to the "OFF" position (O).



Location of the Version Information

AFTER INSTALLATION WORK

6. Check that replaced CPS-3 module is correctly installed.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH01		
Replace an ElectroLogIXS Central Power Supply (CPS) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

7. Place the chassis power switch to the “ON” position (I).
8. Check that after approximately 4 minutes that the system has restarted without error and that the “5V PWR” and Health LED’s on the CDU-1 are illuminated.



9. Check no alarm messages are displayed on CDU-1. If any alarm is displayed investigate further.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH02		
Replace an ElectroLogIXS Chassis Information (CI) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	UCI-3
Excludes:	All other UCI variants

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

When installing or removing the UCI-3 module the ElectroLogIXS Chassis power switch shall be switched to the “OFF” position.

Failure to remove power from the ElectroLogIXS can damage the module.

Equipment Identification Image



Figure 1 - UCI 3 Module

BEFORE INSTALLATION WORK

1. Check the CDU is fitted.
2. Check the replacement UCI-3 module is the correct type and version (modification level).
3. Check the replacement is not damaged.
4. Verify the location of the failed unit.
5. Check that UCI-3 module does not have an EPROM fitted, if fitted, this shall be removed.
6. Check that the UCI-3 module does not have DIP switch pack fitted this should be removed.
7. Place the chassis power switch to the “OFF” position (O).
8. Verify the DIP switches on the backplane are set as per ASM Configuration Documentation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH02		
Replace an ElectroLogIXS Chassis Information (CI) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

9. Place the faulty module within an anti-static container and label as faulty.

AFTER INSTALLATION

10. Check that the replaced UCI-3 module is correctly installed.
11. Place the Chassis power switch to the ON position (I).
12. Use the Maintenance Workstation or ASM Configuration Documentation to reload the application data.

13. Check that after approximately 4 minutes that the system has restarted without error and that the "5V PWR" and Health LED's on the CDU are illuminated.



14. Check no alarm messages are displayed on CDU-1. If any alarm is displayed investigate further.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH03		
Replace an ElectroLogIXS Communication Input/Output Protocol Converter (PCA) Module		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	CIO-PCA
Excludes:	CIO-1A, CIO-CLA, CIO-2A, CIO-MDA variants

Electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

The system shall not be powered down prior to changing CIO-PCA modules. These modules are designed to be “hot swappable”.

Equipment Identification Image



Figure 1 – CIO-PCA

BEFORE INSTALLATION WORK

1. Check that the CDU (Figure 2) is fitted, as this confirms that there are no faults, and the system is operating correctly.
2. Check the replacement CIO-PCA module is the correct type and version (modification level).
 - The replacement CIO-PCA module needs to be configured using the configuration application.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH03		
Replace an ElectroLogIXS Communication Input/Output Protocol Converter (PCA) Module		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

3. Check the replacement module is not damaged.
4. Do not switch off the power.
5. Check the existing cables for safe insulation.
6. Check existing cabling is correctly labelled.

AFTER INSTALLATION WORK

7. Check that replaced CIO-PCA module is secure and correctly installed.
8. All associated RSTi Modules shall be Power Cycled.
9. Check that after approximately 4 minutes that the system has restarted without error and that the "5V PWR" and Health LEDs on the CDU are illuminated.
10. Check no alarm messages are displayed on CDU-1. If any alarm is displayed, then investigate further.
11. Check the final function is working correctly



Figure 2 - CDU

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH04		
Replace an ElectroLogIXS Input / Output (IO) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	VIO24-86S, VIO50-86S, VLD-R8AC
Excludes:	All other VIO or VLD variants

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

The system shall not be powered down prior to changing IO modules. These modules are designed to be “hot swappable”.

Equipment Identification Image



Figure 1 - VIO24-86S, VIO50-86S & VLD-R8AC Modules

BEFORE INSTALLATION WORK

1. Check the CDU is fitted.
2. Check the replacement is the Correct Type and version (modification level) replacement I/O module.
3. Check the replacement I/O module is Not Damaged.
4. Verify the location of the failed module.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH04		
Replace an ElectroLogIXS Input / Output (IO) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

5. Check that replaced I/O module is correctly installed.

6. Check that after approximately 4 minutes that the system has restarted without error and that the "5V PWR" and Health LED's on the CDU are illuminated.



7. Clear SSR count on I/O module. The SSR count shall always be cleared when a new module is installed.

8. Check no alarm messages are displayed on CDU-1. If any alarm is displayed, then investigate further.

9. Check that link comes up correctly on the CDU-1.

10. Check that the VSSR is energised by visually checking the LED on the VLD-R8AC module, The LED can take up to 30s to first illuminate after the module is powered up and then should remain lit continuously.

• If there is a fault the VSSR will pick and drop every 30s until the SSR limit is reached.

11. Check at least one function controlled by the output module operates correctly.



END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH05		
Replace an ElectroLogIXS Vital Peripheral Master (VPM) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	VPM-3
Excludes:	All other VPM variants

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

When installing or removing a VPM-3 module verify that the power switch is in the OFF position. Failure to remove power from the ElectroLogIXS can damage the module.

Equipment Identification Image



Figure 1 - VPM-3 Module

BEFORE INSTALLATION WORK

1. Check the CDU is fitted
2. Check the replacement VPM-3 module is the correct type and version (modification level).
3. Check the replacement VPM-3 module is Not Damaged.
4. Verify the location of the failed module.
5. Place the chassis Power Switch to the "OFF" position (O).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH05		
Replace an ElectroLogIXS Vital Peripheral Master (VPM) Module		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

6. WIRE COUNT the VPM-3 module.
7. Check existing cabling has safe insulation.
8. Check existing cabling is correctly labelled.
9. Remove the module and place it in an anti-static bag, labelled it as faulty.

AFTER INSTALLATION WORK

10. Check that replaced VPM-3 module is correctly installed.
11. WIRE COUNT and check cabling is secure.
12. Place the power switch to the ON (I) position.
13. Check the module health on the VPM-3 the CPU Status Indications should be flashing yellow.



14. Check that after approximately 4 minutes that the system has restarted without error and that the "5V PWR" and Health LED's on the CDU-1 are illuminated.



15. Check no alarm messages are displayed on CDU-1. If any alarm is displayed, then investigate further.
16. If a new VPM-3 module has been installed, verify that the correct version of the Executive (firmware) is loaded by checking the Maintenance Terminal or ASM Configuration Documentation.
17. Clear SSR count on I/O module. The SSR count shall always be cleared when a new module is installed.
18. Verify that the correct LED indications are illuminated on the VPM-3.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH06		
Replace an ElectroLogIXS Personality Module (VIO24-86S and VIO50-86S)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	VIO24-86S and VIO50-86S Personality Modules
Excludes:	VLD-R8AC and all other Personality Module variants

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

If more than one Personality Module has to be replaced this shall be carried out one module at a time. This safety measure will remove the possibility that connectors will be accidentally crossed between adjacent modules.

Equipment Identification Image



Figure 1 - VIO24-86S



Figure 2 - VIO50-86S

BEFORE INSTALLATION WORK

1. Check that the CDU is fitted.
2. Check the replacement VIO24-86S or VIO50-86S module is the correct type and not damaged.

3. Check the keying pins are correctly configured on the personality module.

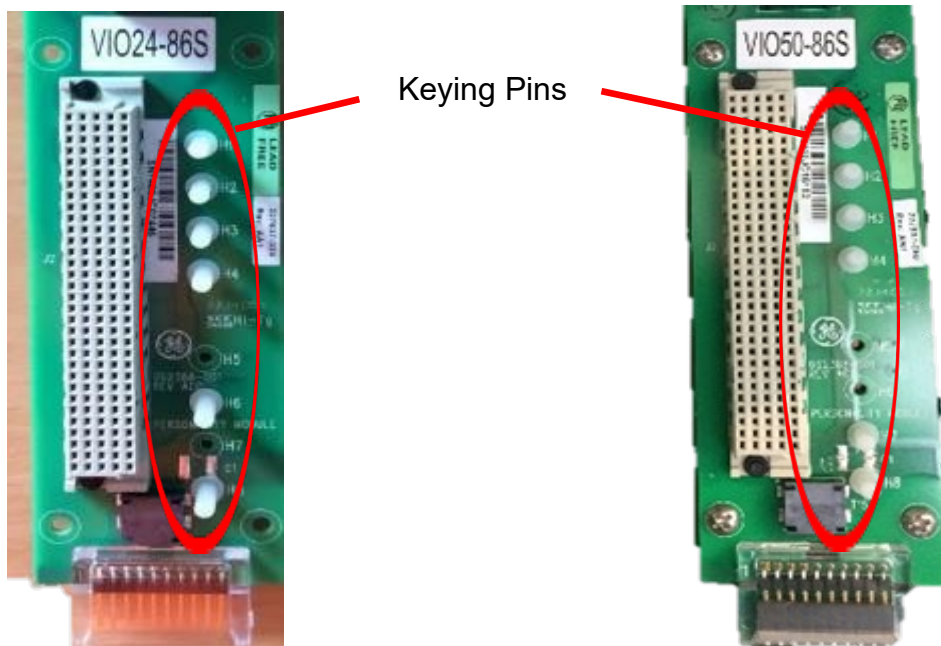
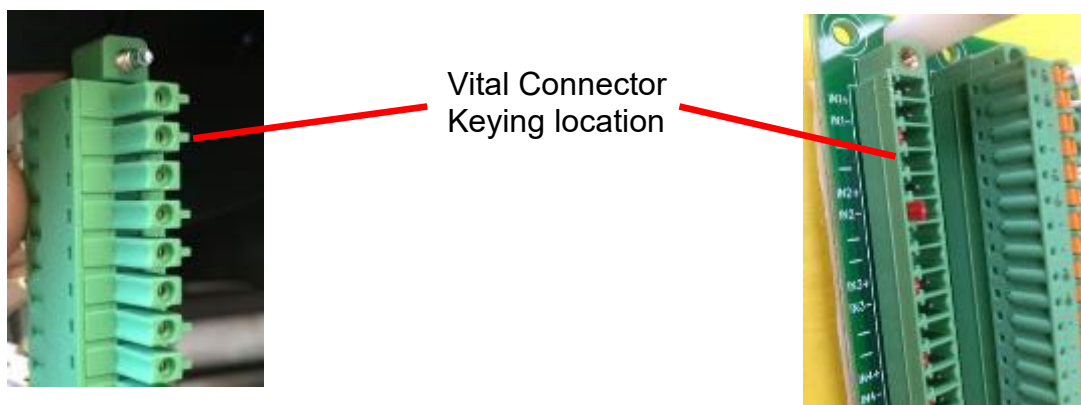


Figure 3 – Keying Pin Locations

4. Check the vital connector keying is correctly configured.



5. Check existing cabling has safe insulation.
6. Check existing cabling is correctly labelled.

AFTER INSTALLATION WORK

7. Check replacement personality module is correctly installed.
8. Verify the module keying pins correctly configured.
9. Verify the vital connector keying is correct before plugging in the terminal block.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH06		
Replace an ElectroLogIXS Personality Module (VIO24-86S and VIO50-86S)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

10. Check vital connectors are replaced as labelled.
11. Replace the Input / Output Module and check it is secure and has powered up.
12. Check no alarm messages are displayed on CDU-1. If any alarm is displayed, then investigate further.
13. Check at least one function controlled by the Input / Output module seated on the replaced personality module operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH07		
Replace an ElectroLogIXS Personality Module (VLD – R8AC)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	VLD-R8AC Personality Module
Excludes:	VIO50-86S Personality Module, VIO24-86S Personality Module and all other Personality Module variants

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

If more than one Personality Module has to be replaced this shall be carried out one module at a time. This safety measure will remove the possibility that connectors will be accidentally crossed between adjacent modules.

Equipment Identification Image



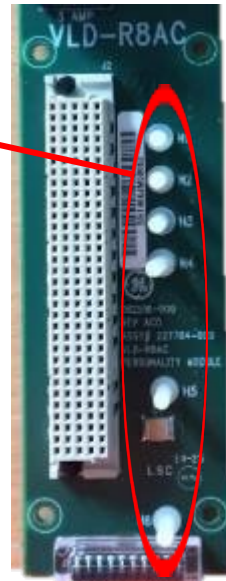
Figure 1 - VLD-R8AC

BEFORE INSTALLATION WORK

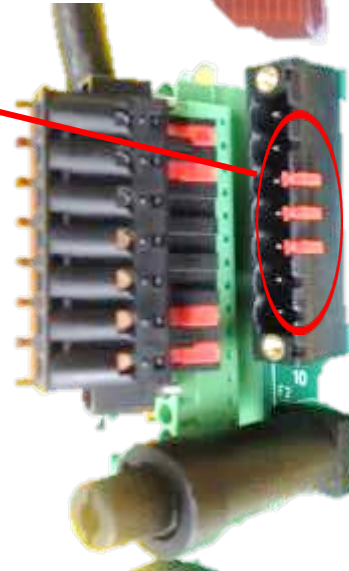
1. Check that the CDU is fitted.
2. Check the replacement VLD-R8AC module is the correct type and not damaged.
3. Verify the location of the failed module.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH07		
Replace an ElectroLogIXS Personality Module (VLD – R8AC)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- 4. Check the keying pins are correctly configured on the personality module.



- 5. Check vital connector keying is correctly configured on the 110vAC connector socket.



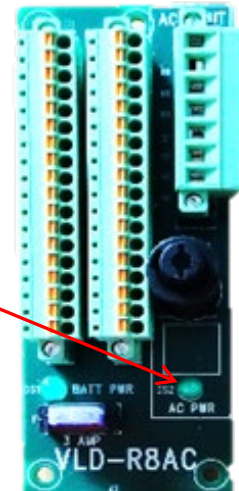
- 6. Check existing cabling has safe insulation.
- 7. Check existing cabling is correctly labelled.
- 8. Check existing personality module is Isolated from the 110vAC supply.

AFTER INSTALLATION WORK

- 9. Check replacement personality module is correctly installed.
- 10. Verify the module keying pins correctly configured.
- 11. Verify the vital connector keying is correct before plugging in the terminal block.
- 12. Check vital connectors are replaced as labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH07		
Replace an ElectroLogIXS Personality Module (VLD – R8AC)		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

13. Before replacing module, reconnect the 110V supply and check green AC PWR LED on the Personality Module is illuminated.



14. Replace the Output Module and check it is secure and has powered up.

15. Check no alarm messages are displayed on CDU-1. If any alarm is displayed, then investigate further.
16. Check at least one function controlled by the Output module seated on the replaced personality module operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH08		
Replace an ElectroLogIXS Chassis		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	ElectroLogIXS Chassis
Excludes:	All other types of Chassis

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

An ElectroLogIXS chassis change is straight forward, from a hardware point of view, as the connections to the system are plug coupled.

All system configuration settings shall need to be updated as these are stored on the backplane.

For further information see [NR/SMS/Appendix/22](#) – General Information on the ElectroLogIXS System.

Equipment Identification Images



1 Slot Chassis



4 Slot Chassis



9 Slot Chassis

Figure 1 – Chassis Layouts

BEFORE INSTALLATION WORK

1. Check CDU is fitted.
2. Check that the replacement Chassis unit is of the Correct Type and is Not Damaged.
3. Check the replacement is the correct version (modification level).
4. Verify the location of the faulty Chassis unit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IH08		
Replace an ElectroLogIXS Chassis		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

5. Power down using the chassis switch (O).
6. Isolate the supply to the Chassis Unit and verify this by using a volt meter on the input terminals.
7. WIRE COUNT the Chassis Unit and check all the wires have safe insulation and are correctly labelled.
8. Remove the wires from the Chassis Unit and insulate them.
9. Swap all modules from the old to new chassis including the personality modules. This shall be done one module at a time.
 - Installing each module following the individual test plans and reference to the site setup sheet.
10. Set chassis identity DIP switch shunts located under the UCI-3 module as per the location diagrams on the new chassis.
11. Remove and label as faulty the old Chassis Unit.

AFTER INSTALLATION WORK

12. Check that the replaced Chassis Unit is securely mounted.
13. Check modules are secure and correctly installed.
14. Reconnect the power supply.
15. WIRE COUNT the Chassis Unit and check all cables are correctly installed and secure.
16. Switch on using the Chassis switch (I).
17. Configuration as shown in ASM Configuration Documentation.
18. Check the system restarts without error after 4 minutes, that no alarm messages are displayed on CDU-1.
 - And the health and power LEDs are illuminated.
 - If any alarm is present investigate further.
19. Check one function on each IO module operates correctly.



END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK01		
Replace an ARAMIS System - Fan Units		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Client PC and Core Switch Fans
Excludes:	All other types of fan.

A tested electrostatic wrist strap and cord connected to the cubicle frame should be worn when undertaking these works.

To maintain proper cooling while the system is on, only one fan shall be replaced at a time.

Let the fan blades completely stop before you remove the fan tray.

The cooling fans are hot-swappable.

Equipment Identification Image



Client PC



Core Switch

Figure 1 – Type of Fan

BEFORE INSTALLATION WORK

1. Check replacement Fan is Correct Type and is Not Damaged.
2. Verify the identity of the failed Fan.
3. Remove the Fan.

AFTER INSTALLATION WORK

4. Check the Fan is mounted securely and locked into position.
5. Confirm power status LED for the Fan is now showing steady green LED (if fitted).
 - Let the fans may change speed a few times as they synchronize with each other and adjust to the proper operating speed.
6. Verify that replaced fan and the others in the bank are working.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK01		
Replace an ARAMIS System - Fan Units		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

7. Confirm the Fan is indicating healthy and failure has cleared from the Client PC Workstation.
8. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK02		
Replace an ARAMIS System - Power Supply Units		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Client PC, Firewall, Core Switch, Server, Access Switch, Maintenance Switch. SAN and Maintenance Server Power Supply Units (PSU)
Excludes:	All other ARAMIS PSU's and Equipment

A tested electrostatic wrist strap and cord connected to the cubicle frame should be worn when undertaking these works.

Only one PSU shall be powered down at a time. If you are required to replace both units then before powering down the second unit you will need to verify that the first unit is on line and fully enabled before commencing the replacement of the second PSU.

Equipment Identification Images



Client PC



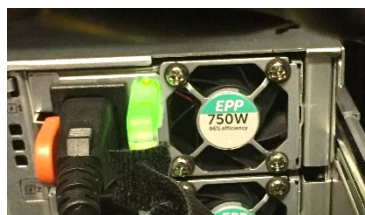
Firewall



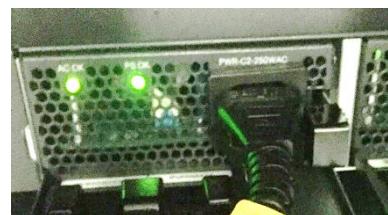
Core switch



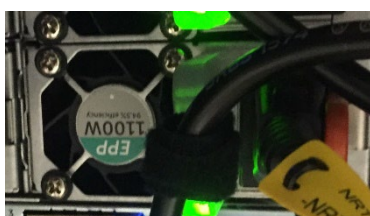
Server



Access Switch



Maintenance Switch



Maintenance Server



SAN

Figure 1 - PSU Types

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK02		
Replace an ARAMIS System - Power Supply Units		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

BEFORE INSTALLATION WORK

1. Check replacement PSU is Correct Type, Rating and is Not Damaged.
2. Verify the identity of the failed PSU.
3. Check the existing wiring has safe insulation.
4. Check the existing wiring is correctly labelled.
5. Disconnect Power supply by removing power lead, if not hot swappable.
6. Remove the PSU and label as faulty.

AFTER INSTALLATION WORK

7. Reconnect the power supply, if not hot swappable.
 - After the installation of a new power supply unit, wait for 15 seconds for the system to recognize the power supply unit and determine its status.
8. Check the PSU is mounted securely and locked into position.
9. Confirm Power Status LED's for both the replaced PSU and its partner are showing steady green indications (where fitted).
10. Using the Client Workstation confirm the replaced PSU is indicating healthy and failure has cleared.
11. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IK03		
Replace a Client PC – Hard Drive		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	ARAMIS Client PC – Hard Drive
Excludes:	All other Hard Drives

A tested electrostatic wrist strap and cord connected to the cubicle frame should be worn when undertaking these works.

To maintain proper system cooling, all empty hard-drive slots should have hard-drive blanks installed. If you are not replacing the hard drive immediately, insert a hard-drive blank in the empty hard-drive slot.

All hard drives are connected to the system board through the hard-drive backplane.

Hard drives are mounted on hard-drive carriers these are not supplied with the replacement hard drive and it is necessary to swap the carrier when a hard drive is replaced.

Use only hard drives that have been tested and approved for use with the hard-drive backplane.

When formatting a hard drive, allow enough time for the formatting to be completed. Be aware that high-capacity hard drives can take a number of hours to format and to up to an hour to re-build.

BEFORE INSTALLATION WORK

1. Check replacement Hard Drive is correct type and is not damaged.
2. Verify the identity of the failed Hard Drive
3. Remove the bezel, press the release button and withdraw the Hard Drive, seated on its carrier, using the carrier handle.

DURING THE INSTALATION

4. Check the replacement Hard Drive is correctly fitted to the carrier before inserting the Hard Drive and carrier into the server.

AFTER INSTALLATION WORK

5. Visually check the Hard Drive is mounted securely and has engaged with the backplane.
6. Verify the carrying handle has locked into place before replacing the bezel.
7. Confirm the failure has cleared from the Client PC Monitor.
8. Check that the replacement unit is correctly labelled

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK05		
Replace an ARAMIS System – SAN Controller		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	ARAMIS SAN Controller.
Excludes:	All other types of Controller.

A tested electrostatic wrist strap and cord connected to the cubicle frame shall be worn when undertaking these works.

When two controllers are installed in an enclosure, they must be the same model. Mixing controller types in the same enclosure is not supported.

Equipment Identification Image



Figure 1 – SAN Controller

BEFORE INSTALLATION WORK

1. Check replacement controller is correct type and is not damaged.
2. Verify the identity of the failed Controller.
3. Carry out a controlled shut down of the failed Controller using the SMU.
4. WIRE COUNT the Controller and check for safe insulation / correct labelling.
5. Disconnect the cables.
6. Remove the Controller and label as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK05		
Replace an ARAMIS System – SAN Controller		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

AFTER INSTALLATION WORK

7. Check the Controller is mounted securely and locked into position.
8. Reconnect the cables and WIRE COUNT the Controller.
 - The new Controller should automatically begin initializing.
 - If the firmware versions differ between the two controllers, the Partner Firmware Update feature brings the older firmware to the later firmware level.
9. Verify the Controller is displaying a green LED and is on line using the NAGIOS system.
10. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK06		
Replace an ARAMIS System – Amulet		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	ARAMIS Amulet.
Excludes:	All other types of Amulet.

This Test Plan contains a configuration process which can only be carried out by a competent person, if you do not hold Sig.20.30 then you will be unable to complete every step and therefore cannot restore this item to service.

Equipment Identification Image



Figure 1 – Amulet

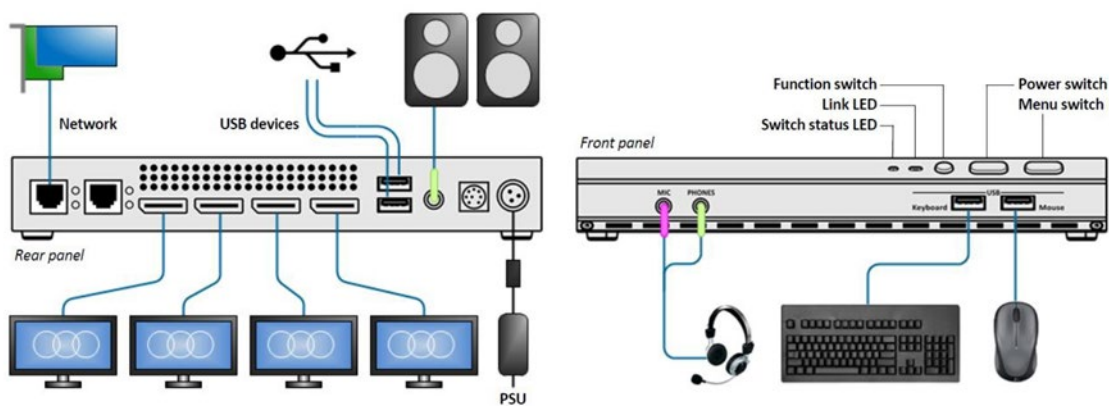


Figure 2 – Amulet Overview

BEFORE INSTALLATION WORK

1. Check replacement Amulet is correct type and is not damaged.
2. Verify the identity of the failed Amulet.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK06		
Replace an ARAMIS System – Amulet		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

3. Confirm and note the IP address of the PColP host.
4. WIRE COUNT the Amulet and check for safe insulation correct labelling.
5. Disconnect the power supply.
6. Disconnect the cables.
 - ⋮ The Network Fibre should have a cable cap fitted to stop contamination of the fibre.
7. Remove the Amulet and label as faulty.

AFTER INSTALLATION WORK

8. Check the is mounted securely.
9. Reconnect the cables and WIRE COUNT the Amulet.
10. Reconnect the power supply.
11. Carry out the Configuration Process shown in [NR/SMS/Appendix/19](#) Section 15 (Configuration of the Amulet).
12. Verify the operator's work station is working correctly.
13. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK07		
Replace an ARAMIS System – Maintenance Terminal		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	ARAMIS Maintenance Terminal.
Excludes:	All other types of Maintenance Terminal.

BEFORE INSTALLATION WORK

1. Check replacement Terminal is correct type and is not damaged.
2. WIRE COUNT the Terminal and check for safe insulation correct labelling.
3. Disconnect the power supply.
4. Disconnect the cables.
5. Remove the Terminal and label as faulty.

AFTER INSTALLATION WORK

6. Check the is mounted securely.
7. Reconnect the cables and WIRE COUNT the Terminal.
8. Reconnect the power supply.
9. Power up the terminal and log in.
10. Launch the Nagios System and confirm the status of the ARAMIS components.
11. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IK08		
Replace an ARAMIS System – KVM Rack		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	ARAMIS KVM Rack.
Excludes:	All other types of KVM Rack.

Equipment Identification Image

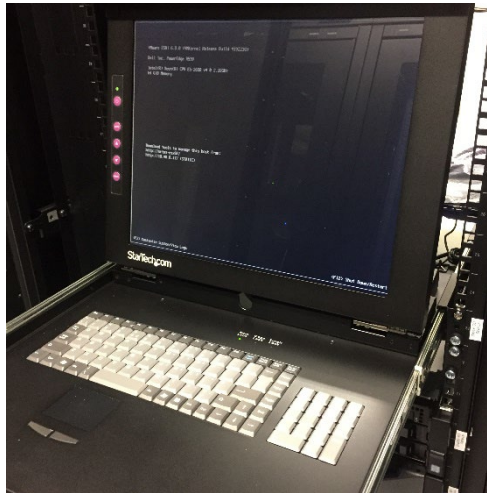


Figure 1 – KVM Rack

BEFORE INSTALLATION WORK

1. Check replacement KVM Rack is correct type and is not damaged.
2. WIRE COUNT the KVM Rack and check for safe insulation correct labelling.
3. Disconnect the power supply.
4. Disconnect the cables.
5. Remove the KVM Rack and label as faulty.

AFTER INSTALLATION WORK

6. Check the KVM Rack is mounted securely.
7. Reconnect the cables and WIRE COUNT the Terminal.
8. Reconnect the power supply.
9. Open the Maintenance Terminal.
10. Launch the Nagios System and confirm the status of the ARAMIS components.
11. Check that the replacement unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM01		
Replace a Smartlock SmartIO COM module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

GENERAL

Spare modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment prevent any adverse effect to the performance of the modules, when unpacked and powered-up.

When removing or handling any SmartIO modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the walkway side of the Rack; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any SmartIO modules.

Removal off both SmartIO COM modules, or removal of the second COM module while the other is not in its operational mode, terminates all communications with the CIXL, this causes all outputs on all SmartIO racks to go to their most restrictive state and the Signaller loses all controls and indications for the area controlled by the SmartIO.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is of the correct type.
2. Check the part number and model number of the replacement is the same as the module to be replaced.
3. Check the mechanical coding pins of the replacement module match those shown on the site-specific drawings.

AFTER INSTALLATION WORK

4. Check replacement item is correctly installed.
5. Observe front panel indicators and confirm that after the initialisation phases (Up to 10 minutes); both OK Indicators are blinking, both ERR indicators are off, and that INT and EXT indicators blink on both channels. See Figure 1.
6. Wait at least 10 minutes after powering up the replacement before performing any maintenance activity on the second COM module.
7. On the Support System (SSys) HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.

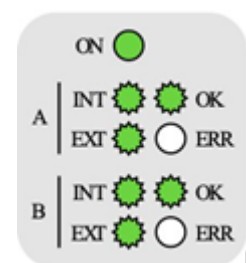


Figure 1 - Front Panel indicators

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM02		
Replace a Smartlock SmartIO Configuration key		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	SmartIO COM configuration key
Excludes:	All other parts and configuration keys

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment prevent any adverse effect to the performance of the part, when unpacked and powered-up.

Powering off both COM modules, or powering of a COM module while the other is not in its operational mode, terminates all communications with the CIXL, this this causes all outputs on all SmartIO racks to go to their most restrictive state and the signaller loses all controls and indications for the area controlled by the SmartIO.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs to aid the correct recording of observations.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is of the correct type.
2. Check that the replacement configuration key is labelled with the same identification information as the key being replaced.

AFTER INSTALLATION WORK

3. Check replacement item is Correctly Installed.
4. Observe front panel indicators and confirm that after the initialisation phases (Up to 10 minutes); both OK Indicators are blinking, both ERR indicators are off, and that INT and EXT indicators blink on both channels. See Figure 1.
5. Wait at least 10 minutes after powering up the COM module before performing any maintenance activity on the second COM module.
6. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the alarm display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.

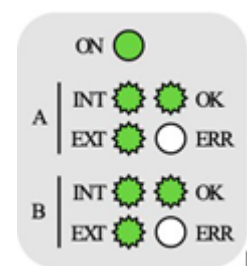


Figure 1 - Front Panel indicators

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM03		
Replace a Smartlock SmartIO PS Module		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	SmartIO PS module
Excludes:	All other types of Module

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment to prevent any adverse effect to the performance of the part, when unpacked and powered-up.

When removing or handling any SmartIO modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the walkway side of the Rack; this wristband SHALL be worn on the wrist of personnel prior to the removal and handling of any SmartIO modules.

Removal of both SmartIO PS modules, or removal of the second PS module, while the other is not in its operational mode, shuts down the SmartIO. This causes all outputs to be switched off (as opposed to going to their most restrictive states) and the Signaller loses all controls and indications for that area.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is of the correct type.
2. Check the part number and model number of the replacement is the same as the module to be replaced.
3. Check the mechanical coding pins of the replacement module match those shown on the site-specific drawings.

AFTER INSTALLATION WORK

4. Check replacement item is correctly installed.
5. Observe front panel indicators and confirm that both Power In and Power Out indications are lit green as shown in Figure 1.



Figure 1 - PS module operational mode indications

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM04		
Replace a Smartlock SmartIO Generic Module		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	SmartIO IM, PM2DC, SM2, SM7 modules
Excludes:	SmartIO PS and COM and all other modules

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment, this prevents any adverse effect to the performance of the part, when unpacked and powered-up.

When removing or handling any SmartIO modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the walkway side of the Rack; this wristband SHALL be worn on the wrist of personnel prior to the removal and handling of any SmartIO modules.

Removal of both SmartIO PSU modules, or removal of the second PSU module, while the other is not in its operational mode, shuts down the SmartIO. This causes all outputs to be switched off (as opposed to going to their most restrictive states) and the Signaller loses all controls and indications for that area.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is of the correct type.
2. Check the part number and model number of the replacement is the same as the module to be replaced.
3. Check the mechanical coding pins of the replacement module match those shown on the site-specific drawings.

AFTER INSTALLATION WORK

4. Check replacement item is correctly installed.
5. Observe front panel indicators and confirm that after the initialisation phases (Up to 3 minutes) all indicators are correct for the operational mode of the module type as shown in Table 1.

MODULE	COM IM	SM2 SM7	PM2DCv2
LED STATE			

Table 1 - Generic SmartIO modules operational mode, front panel LED state

6. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.
7. Check replacement module operates correctly.
 - “Operates correctly means”, observing the correct indications on the module itself and confirming the correct operation of one function operated by the TFM.
 - For example, a signal’s aspect can be changed, points operated normal and reverse, etc.
- For Signal modules check correct operation of the signal function.
 - “Operates correctly means”, confirming the signal aspect can be changed
- For Points Modules check correct operation of the points.
 - “Operates correctly means”, confirming the correct operation of the point ends both normal and reverse.
- For Input modules check, by changing the status of an input, that the module responds correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM05		
Replace a Smartlock Point Drive Isolation Module (PDIM)		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	SmartIO Point Drive Isolation Module
Excludes:	All other SmartIO modules

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment, this prevents any adverse effect to the performance of the part, when unpacked and powered-up.

Removal of a Point Drive Isolation Module (PDIM) causes the Signaller to not be able to move the affected point ends. However, the detection state of the point end continues to be reported.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs to aid the correct recording of observations.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is of the correct type.
2. Check the part number and model number of the replacement is the same as the module to be replaced.

AFTER INSTALLATION WORK

3. Check replacement item is correctly installed.
4. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.
5. Check replacement PDIM operates correctly.

“Operates correctly means”, confirming the correct operation of the point end both normal and reverse.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM06		
Replace a SmartIO Supply monitoring devices		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Surge Arrestors, 110V AC Supply and 120V DC supply detection relays, Earth leakage detectors
Excludes:	All other SmartIO modules and parts

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment, this prevents any adverse effect to the performance of the part, when unpacked and powered-up.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs to aid the correct recording of observations.

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is of the correct type.
2. Carry out a [WIRE COUNT](#) of the existing unit to the wiring diagrams.
3. Isolate the supply feed by opening the MCB to the device.

AFTER INSTALLATION WORK

4. Check replacement item is correctly installed.
5. Carry out a [WIRE COUNT](#) of the new unit to the wiring diagrams.
6. Close the MCB to the device.
7. Check the visual indication of correct operation on the replaced part.
8. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM07		
Replace a SmartIO Redundant or non-service critical device		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Voltage converters, UPS
Excludes:	Service affecting device replacement

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment, to prevent any adverse effect on the performance of the part, when unpacked and powered-up.

When removing or handling any SmartIO device, check that an ESD wrist strap is connected to the ESD Bonding Point on the walkway side of the rack; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any SmartIO component device.

Removal of some units whilst others are already in a failed state shuts down the SmartIO. This causes all outputs to be switched off (as opposed to going to their most restrictive states) and the signaller loses all controls and indications for that area.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs to aid the correct recording of observations.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is of the correct type
2. Check the part number and model number of the replacement is the same as the device to be replaced.
3. Isolate the supply feed to the device by opening the MCB.

AFTER INSTALLATION WORK

4. Check replacement item is correctly installed.
5. Close the MCB to the device.
6. Check the visual indication of correct operation on the replaced device (where applicable).
7. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to 2nd line maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IM08		
Replace a SmartIO service critical device or cable		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	MCBs, Isolation switches, Y-Diodes, Inter Rack Cables, Busbar fuse holders
Excludes:	Resilient or monitoring devices

GENERAL

Spare parts and modules shall be stored in ambient conditions no worse than for the operational SmartIO to prevent any adverse effect during storage. Prior to the installation of a spare, it shall be allowed to reach the same temperature as the operating equipment, this prevents any adverse effect to the performance of the part, when unpacked and powered-up.

When removing or handling any SmartIO device, check that an ESD wrist strap is connected to the ESD Bonding Point on the walkway side of the rack; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any SmartIO component device.

Removal of the above units for repair will shut down some or all SmartIO signalling and control functions. This will cause outputs to be switched off (as opposed to going to their most restrictive states) and the signaller will lose all controls and indications for the affected assets.

If the system is operational, but running in degraded mode, it is recommended that failure reports regarding the state of front panel indicators are completed before attempting repairs to aid the correct recording of observations.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is of the correct type.
2. Check the part number and model number of the replacement is the same as the device to be replaced.

AFTER INSTALLATION WORK

1. Check replacement item is correctly Installed.
2. Check the visual indication of correct operation on the replaced device (where applicable)
3. Observe front panel indicators on all affected SmartIO modules, confirm that after the initialisation phases (Up to 3 minutes) all indicators are correct for the operational mode of the module type as shown in Table 1.

MODULE	COM IM OM	SM2 SM7	PM2DCv2
LED STATE	<p>ON ●</p> <p>A INT ●● CK EXT ● ○ ERR</p> <p>B INT ●● CK EXT ● ○ ERR</p>	<p>ON ●</p> <p>INT ●● CK LAMP ● ○ ERR</p> <p>CELL ●● CK PW_TRK ● ○ ERR</p>	<p>ON ●</p> <p>INT ●● CK PMC ● ○ ERR</p> <p>PPM ●● CK PW_TRK ● ○ ERR</p>

Table 1 - Generic SmartIO modules operational mode, front panel LED state

- On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the checks failed, refer to 2nd line maintenance.
- Perform a check of the affected assets.

Maintenance affecting Signalling PW TRK supplies to SM modules:

Confirm that the PW_TRK LED is lit Green on all SM module front panels.

Maintenance affecting Point PPM supplies to PM modules.

Confirm that the PW_TRK, PPM and PMC LEDs are lit Green on all PM module front panels.

Maintenance affecting Point PW TRK, or PMC supplies to PM modules.

Check correct operation of the points.

“Operates correctly means”, confirming the correct operation of the point ends both normal and reverse.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IS01		
Replace a WESTeX Level Crossing Predictor Card		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	80012 Transceiver, 80013 Relay Drive, 80016 DAX, 80020 Control Interface, 80115 Data Recorder, 80211 Intelligent Processor Island, 80214 Processor, 80265 SEAR Interface, 80255 Data Recorder Interface, 80019 Keyboard/Display, 80020 Keyboard/Display Interface
Excludes:	Surge Protection Panel, Front Termination Panel, Rear Termination Panel, Mother Board

*****independence Exempt*****

Possession of the level crossing and level crossing predictor (LCP) shall be taken before any work can start.

- ⋮ Allow adequate time to complete all the testing.
- ⋮ Some setups require no trains within the strike in areas of the level crossing.

The LCP shall not be reconnected until all work is complete and system setup up in conjunction with the Manufactures Handbook.



Appropriate electrostatic precautions shall be taken when handling boards.

- ⋮ Electrostatic discharge points (ESD) are provided in the LCP cabinet.

BEFORE RE-INSTALLATION WORK

- 1 Check that Possession of the Level Crossing has been taken from the Signaller.
- 2 Check Level Crossing is placed on Local Control.
- 3 Check Replacement Card is correct type.
- 4 Refer to the replacement table for Programming and Recalibration requirements.
- 5 Shut down the LCP at the power switch located on the left of the Front Termination panel.

AFTER RE-INSTALLATION WORK

- 6 Check Software version (Processor Card only) and prepare to apply correct actions from the replacement, See Table 1.
- 7 Check Replacement card is correctly installed and aligned.
- 8 Plug in the Data Recorder Interface Cable (80214 to 80255 only).
- 9 Check that Jumpers have been applied correctly (80211 Intelligent Processor Island Card only).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/IS01		
Replace a WESTeX Level Crossing Predictor Card		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

- 10 Power up the LCP at the power switch located on the left of the Front Termination panel.
- 11 Allow the system to self test.
- 12 Apply appropriate actions from Table 1, referring to the manufacturers handbook.
- 13 Test LCP Test [NR/SMS/Test/155](#).
- 14 Once completed enter details on the Site Record Card.
- 15 Place Level crossing back onto Auto and hand back to Signaller.
- 16 Observe trains on all affected Strike Ins and Island cards and review readings.

Card Replacement	Calibration Setup Required	Approach Length and Linearisation Setup Required	Island Adjustment Required	Default Setting and Reprogramming Required
80211 Intelligent Processor Island	No	No	Yes (for track associated with 80211 only)	No
80012 Transceiver	Yes (for track associated with 80012 only)	No	No	No
80013 Relay Drive	No	No	No	No
80214 Processor	No	No	No	No
80214 Processor (New Software Update Level) #1	Yes (Both Tracks)	Yes #2	No	Yes (Both Tracks)
80115 Data Recorder	No	No	No	No
80016 DAX Card	No	No	No	No
80255 Data Recorder Interface Module	No	No	No	No
80019 Keyboard/Display	No	No	No	No
80020 Keyboard/Display Interface Module #1	Yes (Both Tracks)	Yes #2 (Both Tracks)	No	Yes (Both Tracks)

Table 1 – Card replacement set-up

#1 Where later versions of software level have been applied to the PROM or if the control interface Module is replaced, first set the system to default parameters and then perform complete reprogramming and recalibration referring to the manufacturers manual.

#2 Can be accomplished by re-entering the EZ and Linerisation data from the history record card.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS10		
Replace a Module in HXP-3 Level Crossing Processor		
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Includes:	RMM, SIM, TLM, TRM, RSI, RYD and CPU modules, present on the HXP-3R and HXP-3R2 systems and the AXD modules, present only on the HXP-3R2 systems.
Excludes:	All other Level Crossing Processor's Modules

Electrostatic protections (ESP) measures, as detailed within this procedure shall always followed.

BEFORE INSTALLATION WORK

NOTE: *If the RMM Module is to be replace in the, check that the local parameters are the same as those stated in the site diagrams. If they do not match, record the values and contact your SM(S) for guidance.*

1. Turn the system power off by placing the master ON/OFF switch in the OFF position.
2. Remove the front panel of the HXP-3.
3. Check that the replacement module is not damaged and is the correct type of Module.
4. Where applicable, compare the jumper settings on the replacement module to those on the site diagrams. If they do not match, record the settings and contact your supervisor for guidance.

Removal Procedure For Sim And RMM Modules

5. Remove the IDK
6. Using the ESD strap, remove the required module by placing a finger in the hole provided and pull gently to disengage the module for the DIN connectors.

Removal Procedure For All Other Modules

7. Using the ESD strap, remove the module by using a finger to gently pull out and up on the PC card ejector until the module disengages from the DIN connectors.
8. Pull the module straight out until clear of the top and bottom Module slots.

Installation Procedure For All Modules

9. Locate correct module slot and slide module into position until the DIN connectors are engaged.
10. Check the module is completely seated in the DIN connections.
11. Install the IDK where necessary.

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NOTE: Check that the same operating program software version is uploaded to both CPU modules before returning the unit to service by checking the information on the EPROMs.

AFTER INSTALLATION WORK

NOTE: If the RMM module is replaced in the HXP-3R, check that all local parameters are set correctly before returning the unit to service.

12. Check that replacement module is correctly installed.
13. Restore the systems power by placing the master on/off switch in the on position.
14. Check that the power LED on the TLM and each module belonging to the Normal System is on.
15. Place the Standby/Auto/Normal switch on the TLM in the standby position and check that the power LED on the TLM and each module belonging to the standby system is on.

NOTE: Any checks on the power LED on the SIM module must be carried out before the installation of the IDK, as the IDK will hide the display.

16. Install the IDK and verify the operation of the system as stated in the HXP-3 field reference manual.
17. Check that all diagnostic codes are deleted from memory by pressing the Monitor SEL key on the IDK until the SD mode is selected, then press shift and clear to delete.
18. Momentarily move the Standby/Auto/Normal switch on the TLM to the normal position to reset the system before placing it in the auto position.
19. Check the front panel is properly installed to the front of the HXP-3.

END

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NR/SMTH/Part04/IS15		
Replace a Module in VHLC (Vital Harmon Logic Controller)		
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Includes:	VLP, ACP, SSM, VGPIO, VGPI, NVIO, PSM, SIM and VSDAC Modules
Excludes:	All other VHLC Modules

General

Electrostatic Protection (ESP) measures shall be followed at all times.

NOTE: Before powering down the system, a list of all controls should be obtained as a reference.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is correct type.

NOTE: Before installing VLP, ACP and SIM modules, check that the correct memory chips are present on the replacement module.

2. Place the power switch on the PSM in the OFF position.

3. When replacing the PSM it is also necessary to isolate the supply to the module before removing it Remove the front panel.

4. When replacing the VLP module disconnect the cable for the Logger PC.

5. Check that the replacement Module is not damaged and is the correct type of Module.

NOTE: There might still be power at the I/O Modules even when the power is off.

6. Using the ESD strap, remove the Module by pulling gently to disengage the Module from its keyed connector on the front of the backboard.

NOTE: Each Module is connected using a cable with a keyed connector, thus preventing other Modules being installed in a slot wired for a different type of Module.

7. Mark the removed module as faulty.

AFTER INSTALLATION WORK

8. Check that replacement Module is seated and connected correctly.

9. When installing the PSM reconnect the supply to the module before removing it.

10. When installing the VLP module it is necessary to confirm that the cable for the Logger PC is re-inserted into the port on the front of the module.

11. Place the power switch on the PSM in the ON position.

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Replace a Module in VHLC (Vital Harmon Logic Controller)		
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12. During a normal set-up sequence check the following on the VLP Module:
 - a) The first pair of yellow LEDs light and stays lit.
 - b) The second, third, fourth and sixth LED pairs light in sequence.
 - c) The sixth LED lights, there is a pause, then the seventh LED lights.
 - d) The remaining LEDs light, one pair at a time until all are lit.
 - e) The LEDs turn on and off randomly for 2 seconds.
 - f) When the VLP start-up is complete, each LED turns on and off from bottom to top in a continually repeating sequential pattern.
13. Check that the message on the ACP CDU reads 'Harmon ATCS VHLC'.
14. When replacing an ACP, it is also be necessary to transfer the defined scheme data to the new module by using a laptop and you should contact your supervisor for guidance in this matter.
15. When replacing the VLP it is also be necessary to check the output of the Logger PC to confirm that data is being logged correctly.
 - A list of new controls shall be obtained as a check.
16. Check replacement module is correctly labelled.

END

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NR/SMTH/Part04/IS16		
Replace a HIMatrix Programmable Logic Controller (PLC) F30 and F3		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

GENERAL

- Before handling any electronic equipment observe electrostatic discharge precautions.
- Protection / Possession arrangements shall be made before commencing work on a HIMatrix Level Crossing System.
- Before powering down a HIMatrix unit inform the Signaller as to the effect on the operational railway.
- Protect against rain or inclement weather if working in an open location case or equipment housing.

EQUIPMENT IDENTIFICATION



Figure 1 – F30 Unit



Figure 2 – F3 Unit

BEFORE INSTALLATION WORK

If a local control facility is provided, this might need to be operated. Refer to the relevant application Faulting Guide. E.g, for an MCB level crossing, open the LCU door and turn the LCU switch from the Normal / Stop position to the Lower / Hand position.

Downloading data to a HIMatrix unit can take place prior to or post installation. If downloaded prior to installation, either an “F30 Download Record” or an “F3 Download Record” sticky label will be affixed to the HIMatrix unit. Refer to [NR/SMTH/Part04/IS17](#) (Download Data to a HIMatrix Programmable Logic Controller (PLC) F30 and F3).

1. Check the replacement HIMatrix unit is not damaged and is the correct type.
2. Isolate the power supply to the HIMatrix unit to be replaced using the corresponding fuse/MCB.

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3. Check the plugs and connectors and Ethernet cable(s) are correctly labelled.
4. Detach the wiring plugs and connectors and Ethernet cables and remove the RJ45 blanking plugs attached to the HIMatrix unit to be replaced.
5. Check the condition of the plugs and the associated wiring for safe insulation.
6. Remove the HIMatrix unit and label it as faulty.

AFTER INSTALLATION WORK

7. Check the replacement HIMatrix unit is correctly installed.
8. Reconnect all plugs and connectors and reinsert the RJ45 blanking plugs to the correct corresponding sockets in the HIMatrix unit. **DO NOT RECONNECT ANY ETHERNET CABLE(S).**
9. Check all plugs and connectors and RJ45 blanking plugs are correctly installed and secure.
10. Restore the power supply to the HIMatrix unit.
11. If the HIMatrix unit is an F3, check that the RUN LED is blinking (Figure 3).

If the F3 RUN LED is illuminated and not blinking, check there are no Ethernet cables connected and then power the unit off and on using the corresponding fuse/MCB.

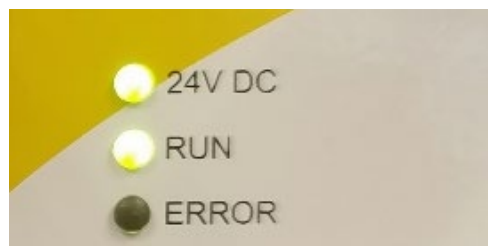


Figure 3 – HIMatrix unit RUN LED

12. If the HIMatrix unit is an F30, check that the RUN LED is illuminated and either steady or blinking.
 13. If the HIMatrix unit has not had data downloaded prior to installation or the downloaded data is incorrect, use the SILworX laptop to download the correct User Programme (F30) or Rack ID and IP Address (F3).
- Refer to [NR/SMTH/Part04/IS17](#) (Download Data to a HIMatrix Programmable Logic Controller (PLC) F30 and F3).

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14. After downloading the correct User Programme or Rack ID and IP Address, reconnect the Ethernet cable(s) to the correct corresponding sockets in the HIMatrix unit.
15. Check the Ethernet cable(s) are correctly installed and secure.
16. Check the HIMatrix unit Ethernet port LEDs (Figure 4) are either steady or blinking green.

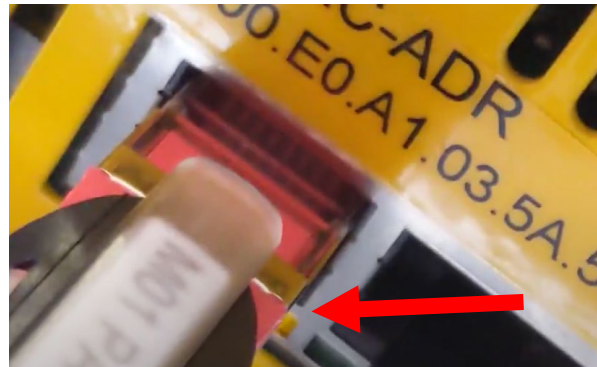


Figure 4 – HIMatrix unit Ethernet port LEDs

17. Check equipment connected to the HIMatrix unit operates correctly.

NOTE: “Operates correctly” means observing the correct LED indications and confirming the correct operation of at least one function operated by the HIMatrix unit. For example, a level crossing raising and lowering cycle, points operated normal and reverse, signal aspect changed.

If a Technician Reset button or similar is provided, it may need pressing after replacement of a HIMatrix unit. Refer to the relevant application Faulting Guide. E.g., for an MCB level crossing, replacement of the F30 or any F3 controlling red RTLs requires the Technician Reset button pressing.

18. Check the data logger to confirm the HIMatrix unit fault(s) has been cleared. If any alarm is present investigate further.

NOTE: Guidance on fault finding can be found in:

- [NR/SMTH/Part10/FF28](#) (Faulting Guide: HIMatrix Programmable Logic Controller (PLC) F30 & F3).
- [NR/SMTH/Part10/FF29](#) (Faulting Guide: HIMatrix Manually Controlled Barrier Level Crossing).

END

EQUIPMENT IDENTIFICATION



Figure 1 – F30 Unit



Figure 2 – F3 Unit

BEFORE DOWNLOADING

- ⋮ Downloading data to a HIMatrix unit can take place prior to or post installation.
- ⋮ If downloading after installation, confirm all the pre-download installation steps of [NR/SMTH/Part04/IS16](#) (Replace a HIMatrix Programmable Logic Controller (PLC) F30 and F3) have been completed.
- ⋮ If downloaded prior to installation, either an “F30 Download Record” sticky label (Figure 3) or an “F3 Download Record” sticky label (Figure 4) will be affixed to the HIMatrix unit.
- ⋮ The acronym MAC, used throughout this document, refers to Media Access Control.

HIMatrix F30 Download Record			
Hardware MAC Address:			
User Programme Filename:			
Technician Initials:		Date:	

Figure 3 - HIMatrix F30 Download Record Label

HIMatrix F3 Download Record			
Hardware MAC Address:			
IP Address:			
Rack Number:			
Technician Initials:		Date:	

Figure 4 - HIMatrix F3 Download Record Label

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1. Check any affixed label User Programme filename (for F30s) or Rack ID and IP Address (for F3s) against the location case diagrams. If the details match, new data does not need to be downloaded.
2. If downloading data prior to installation, obtain either an “F30 Download Record” or an “F3 Download Record” label and write on the label the following:
 - a) F30 – the MAC Address printed on the unit and the User Programme filename stated in the location case diagrams.
 - b) F3 – the MAC Address printed on the unit and the Rack ID and IP Address stated in the location case diagrams.

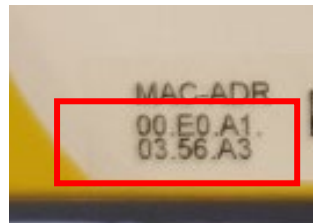


Figure 5 – MAC Address

3. Follow the procedures described in Appendix A to open SILworX and then follow:
 - a) Appendix B to download a User Programme to an F30; or
 - b) Appendix C to download a Rack ID and IP address to an F3.

AFTER DOWNLOADING

4. Remove the SILworX laptop Ethernet connection.

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APPENDIX A - Open SILworX

1. Start the laptop.
2. Log in to the laptop:
 - Username = maintainer
 - Password = maintainer
3. Check a SILworX licence dongle is inserted into a USB port on the laptop.
4. Insert into the laptop CD drive the maintenance copy CD containing the User Programme for the installation's F30.

NOTE: The CD will be labelled with the installation name and a User Programme filename matching the location case diagrams.

5. Start SILworX on the laptop – double click on the desktop icon or select the application from the Windows Start menu.

NOTE: If a dongle with a SILworX licence is not inserted, SILworX will report a licence error.

6. On the SILworX menu bar, select Project > Restore (Figure 6).

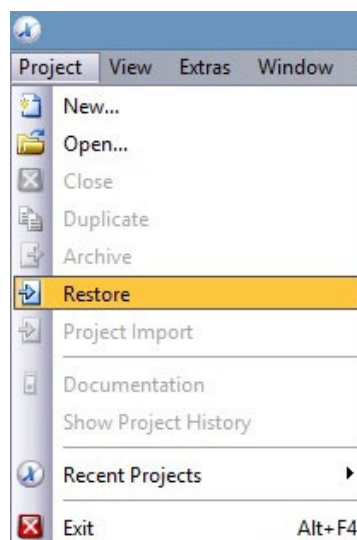


Figure 6 – Restore Option

7. At the Restore window, click the button (Figure 7) with three dots to begin browsing for the User Programme.



Figure 7 – Button

- Using Windows explorer (Figure 8), navigate to the CD drive, click on the filename matching that shown on the location case diagrams for the F30.

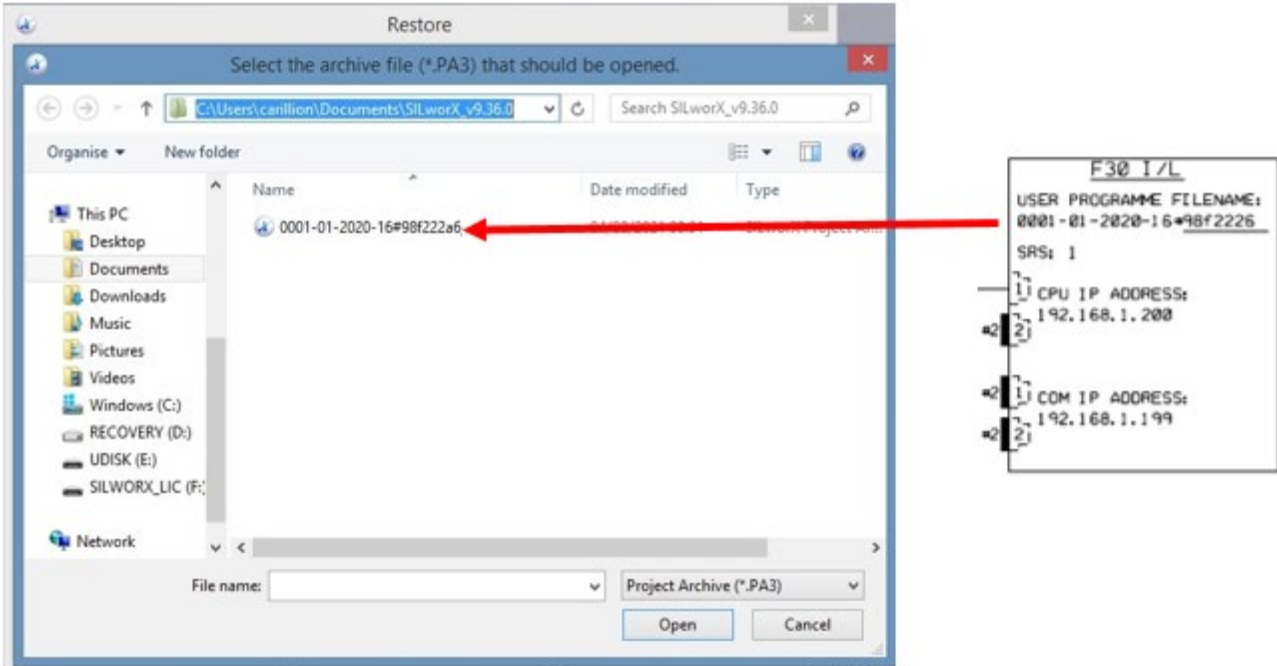


Figure 8 – Windows Explorer

- Click the Open button.
- At the Restore window (Figure 9), click the OK button.

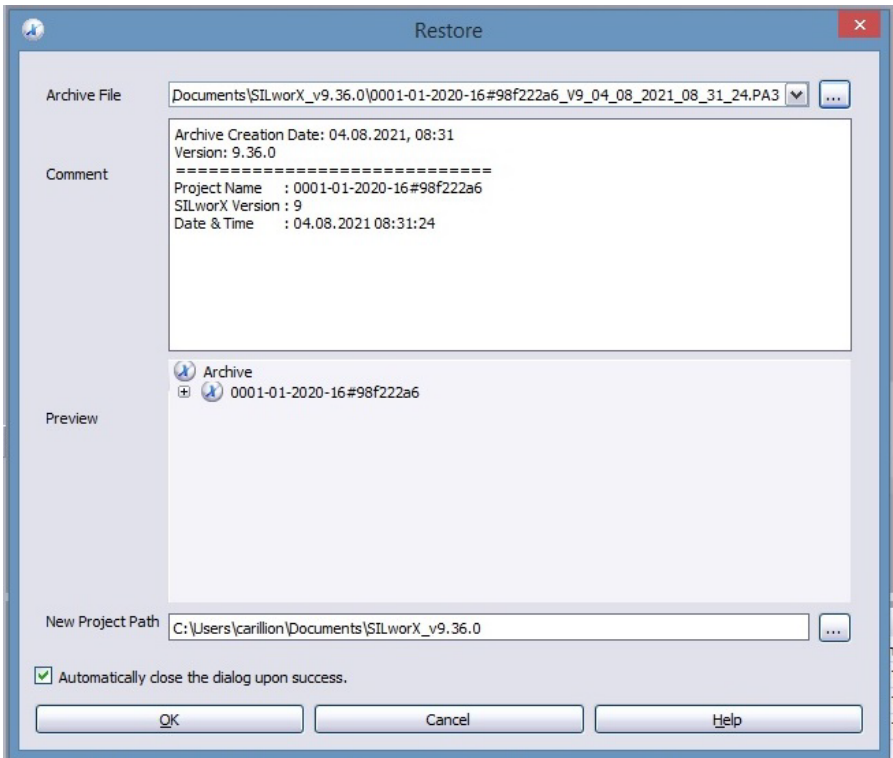


Figure 9 – Restore Window

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11. If you are then prompted to Overwrite, click the Yes button.
12. At the User Log-in window (Figure 10), type in the following credentials:
 - User Group = Administrator
 - Password = (Leave blank – see Figure 10)



Figure 10 – User Log-in Screen

13. Click the Log-in button. The User Programme is now open in SILworX.
14. Click on the + symbol adjacent to “Configuration” to expand the User Programme details beneath the “Configuration” entry.
15. Check the SRS number in square brackets (next to name of the installation) matches the location case diagrams for the F30 being downloaded. See Figure 11.

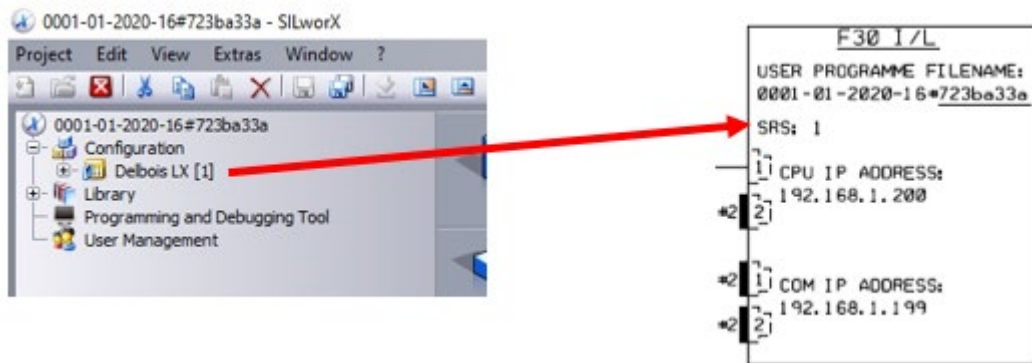


Figure 11 – SRS Number Comparison

16. Click on the installation name / SRS number to highlight it (Figure 12).

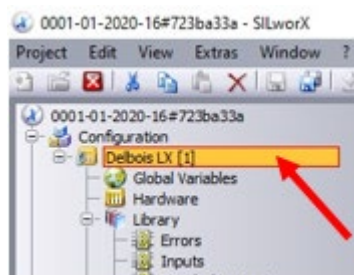


Figure 12 – Installation Name / SRS Number

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17. You are now ready to connect to the installation's F30 or F3s. Go to:

- a) Appendix B to download a User Programme to an F30; or
- b) Appendix C to download a Rack ID and IP address to an F3.

APPENDIX B - Download a User Programme to an F30

1. Connect an Ethernet cable between the laptop and the F30.
2. Click the Online button (Figure 13)

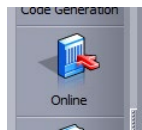


Figure 13 – Online Button

3. You are now connected to the F30.
4. At the System Login window (Figure 14), click the Search button.



Figure 14 – System Login Window

5. At the Search via MAC Window (Figure 15), enter the MAC address printed on the F30 module.

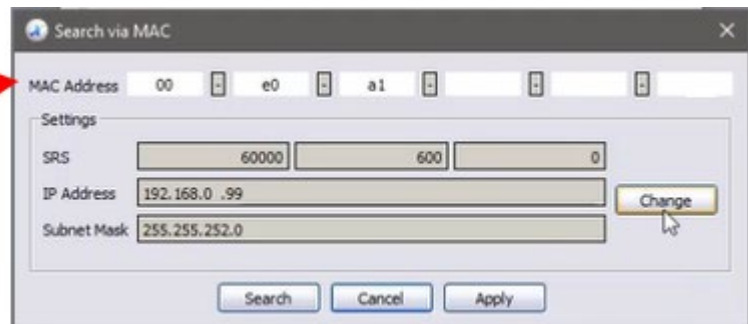


Figure 15 – Search via MAC Window and MAC Address

6. Click Search. The SRS etc. fields will self-populate.
7. Click the Apply button.
8. At the System Login window (Figure 16), enter one of the following Access Data credentials:
 - User Group = Administrator
 - Password = (Leave blank)
 - Access Mode = Administrator

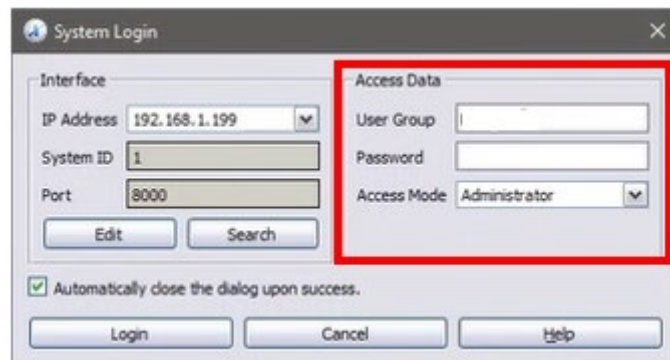


Figure 16 – System Login Window

9. Click the Login button. You are now logged into the F30.
10. Check the F30 System State is not RUN in one of two ways:
 - a) Check the RUN LED on the front of the F30 is blinking; or
 - b) Using SILworX, check the System State value is STOP (Figure 17).

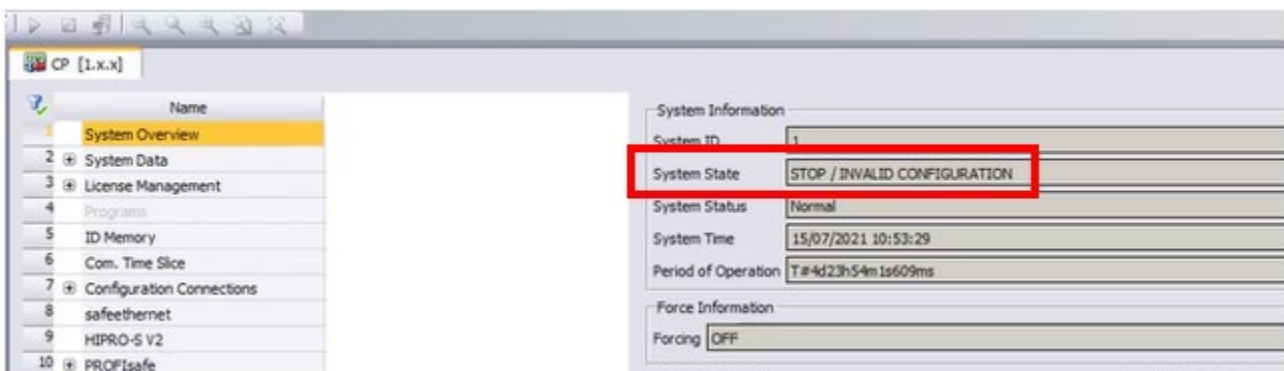


Figure 17 – System State Value

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- If the F30 System State is RUN, click on the square Stop button at the top of the screen (Figure 18).

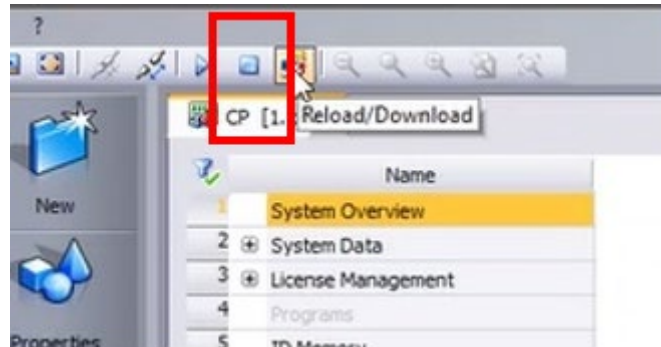


Figure 18 – Stop Button

- At the Resource Stop window (Figure 19) click the OK button.



Figure 19 – Resource Stop Window

- Download the new User Programme by clicking on the Reload/Download button (Figure 20).

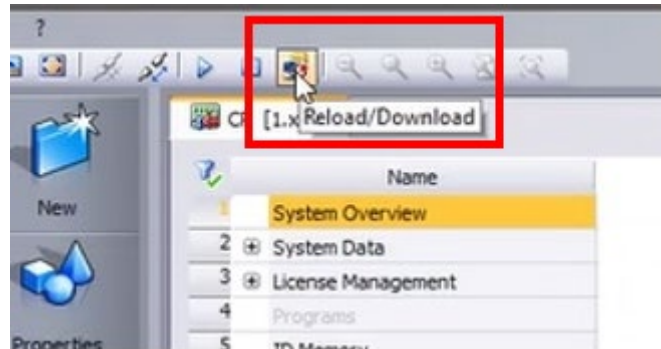


Figure 20 – Reload/Download Button

- At the Reload/Download window, untick the “Create Project Archive after Loading” checkbox.

- In the reload/download window, check the CRC matches the location case diagrams for the F30 being downloaded (Figure 21).

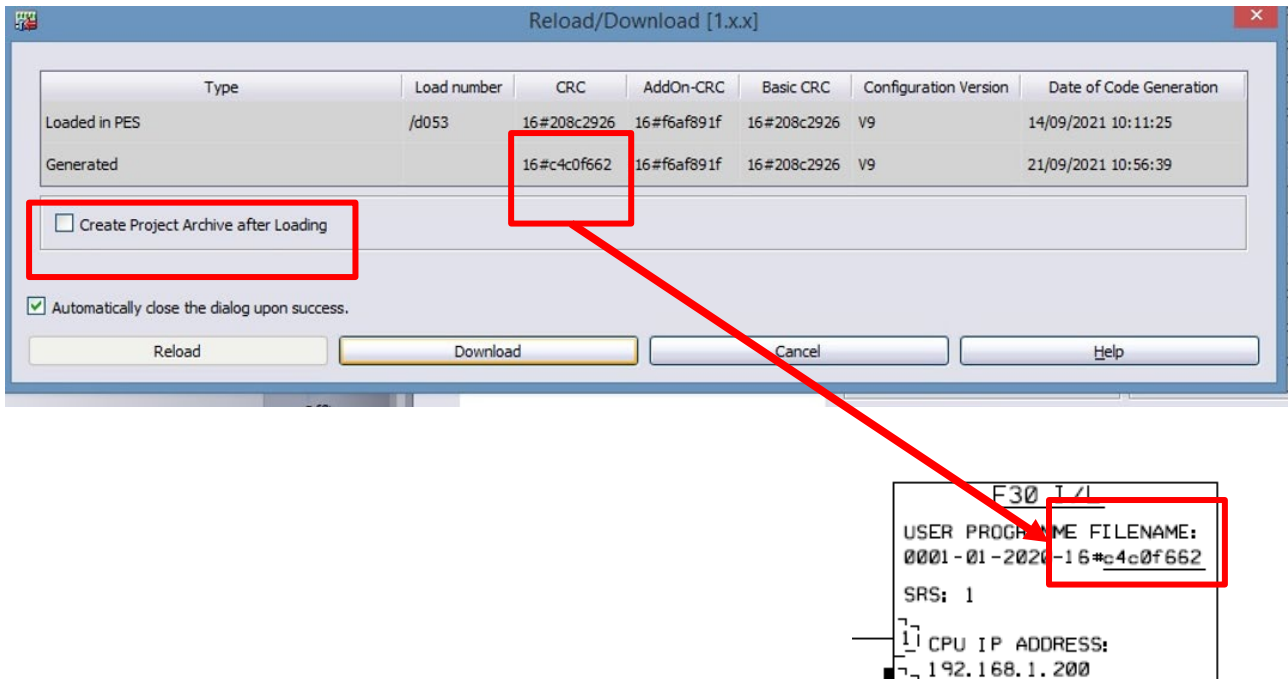


Figure 21 – Reload/Download Window

NOTE: “Loaded in the PES” refers to what is already downloaded to the F30. “Generated” is the new user programme to be downloaded. In some instances, only one CRC will be shown.

- Click the Download button.
- If the triangular Play button is greyed out (Figure 22), go to Step 19.

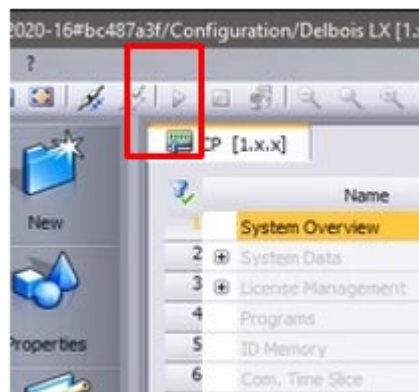


Figure 22 – Play Button Greyed out

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18. If the triangular Play button is not greyed out (Figure 23), click it to set the F30 System State to RUN. Then go to Step 20.

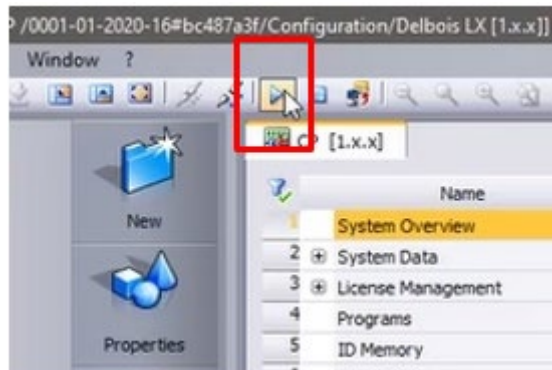


Figure 23 – Play Button NOT Grayed out

19. If the triangular Play button is greyed out, log-in to the F30 again following steps 1 to 9, then click the triangular Play button to set the F30 System State to RUN.
20. At the Resource Cold Start window (Figure 24) click the OK button. This completes the F30 download

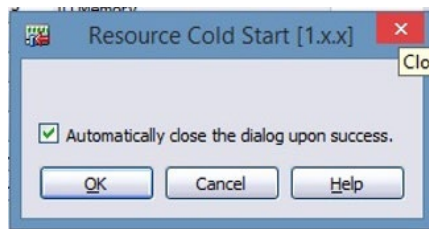


Figure 24 – Resource Cold Start Window

21. Close the Search via MAC and System Login windows (if open) and then close SILworX.

22. Disconnect the laptop Ethernet cable from the F30.

• If downloading as part of the installation of a new HIMatrix unit, continue to complete the remaining installation steps of [NR/SMTH/Part04/IS16](#) (Replace a HIMatrix Programmable Logic Controller (PLC) F30 and F3).

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APPENDIX C - Download a Rack ID and IP Address to an F3

If the F3 RUN LED is illuminated and steady (not blinking), check there are no Ethernet cables connected and power the unit off and on using the corresponding fuse/MCB.

1. Connect an Ethernet cable between the laptop and the F3.
2. Click the Online button (Figure 25).

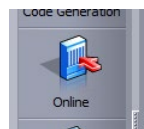


Figure 25 – Online Button

3. You are now connected to the F3.
4. At the System Login window (Figure 26), click the Search button.



Figure 26 – System Login Window

5. At the Search via MAC Window (Figure 27), enter the MAC address printed on the F3 module.

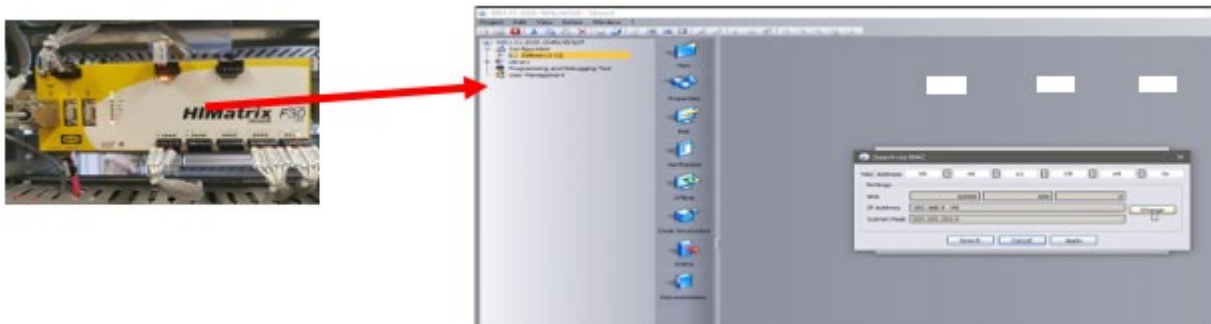


Figure 27 – Search via MAC Window

6. Click Search. The SRS etc. Fields will self-populate.
7. Click the Change button.

- At the Write via MAC window (Figure 28), enter the F30 Interlocking SRS number and F3 Rack ID, exactly as per the location case diagrams for the F3 being downloaded.

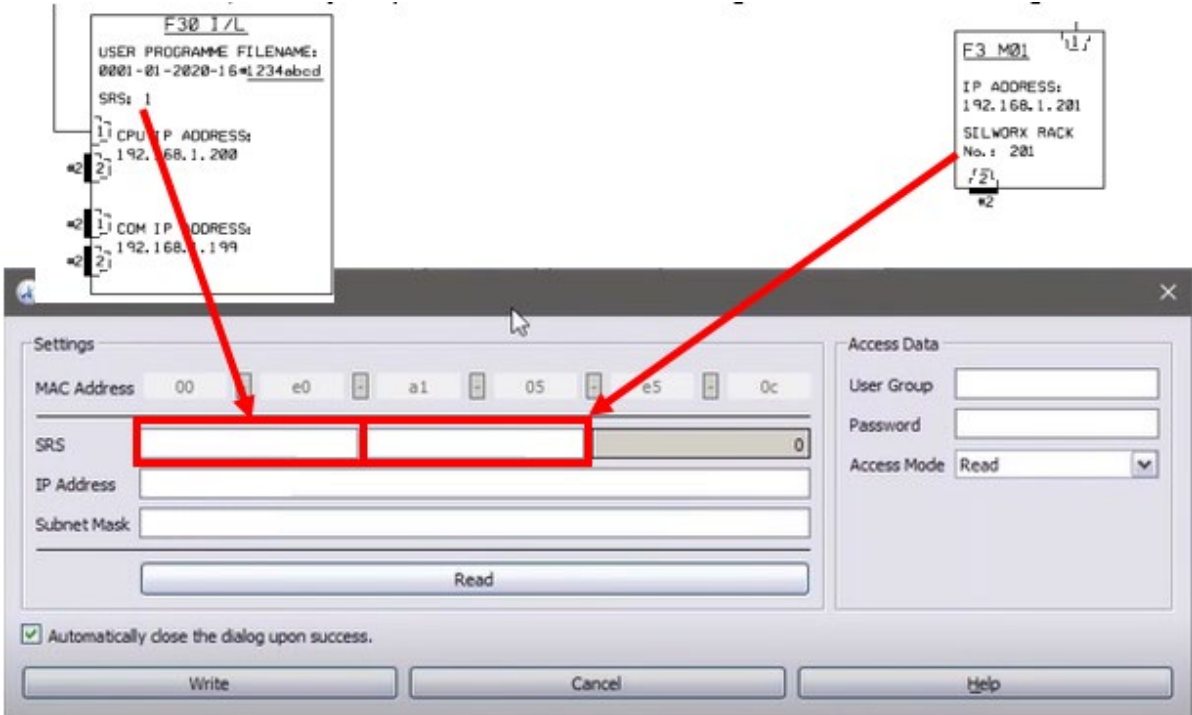
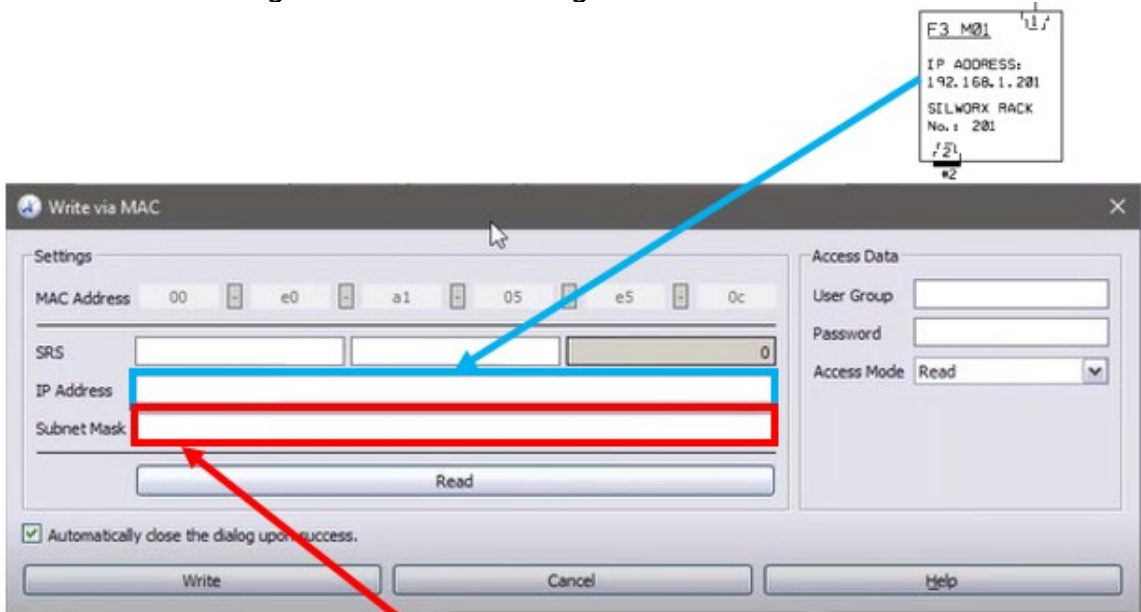


Figure 28 – Write via MAC Window

- Enter the F3 IP Address and Subnet Mask values (Figure 29) exactly as per the location case diagrams for the F3 being downloaded.




 SUBNET MASK DEFAULT: 255.255.252.0
 GATEWAY DEFAULT: 0.0.0.0

Figure 29 – IP Address and Subnet Mask values

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10. Enter the following Access Data credentials (Figure 30):

- User Group = Administrator
- Password = (Leave blank)
- Access Mode = Administrator

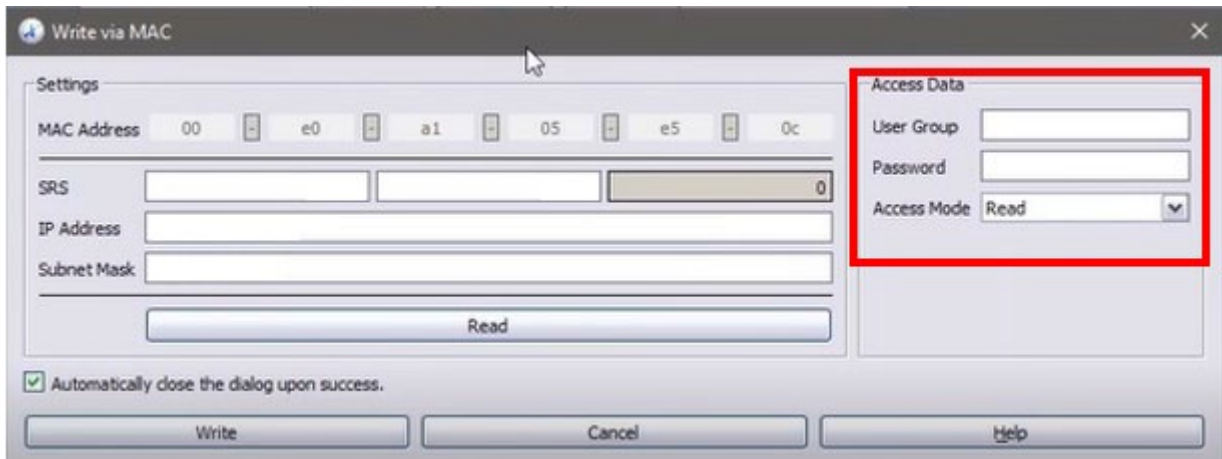


Figure 30 – Access Data Credentials

11. Click the Write button. This completes the F3 download.

12. Close the Search via MAC and System Login windows (if open) and then close SILworX.

13. Disconnect the laptop Ethernet cable from the F3.

- If downloading as part of the installation of a new HIMatrix unit, continue to complete the remaining installation steps of [NR/SMTH/Part04/IS16](#) (Replace a HIMatrix Programmable Logic Controller (PLC) F30 and F3).

END

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***** INDEPENDENCE EXEMPT *****

Includes:	SOM, SOMS, POM, IMON, UNOM
Excludes:	ECC-CU, ECC BUREP and all other types SIMIS Card

Before powering down an ACC obtain the Signaller's permission.

BEFORE INSTALLATION WORK

1. Check the replacement card is the correct type and not damaged.
2. Check the replacement card version and the mod. state is correct.
3. Power down the ACC by switching off the power supply boards of all three-computer channels.
4. Remove and label the failed card as defective.

AFTER INSTALATION WORK

5. Check the card is correctly installed and secure.
6. Power up the ACC by switching on the power supply boards of all three-computer channels.
7. Check the correct operation of replacement card.

NOTE: "Check the correct operation" means observing the correct indications on the EOM and confirming the correct operation of one function operated by the EOM, for example a signal aspect can be changed, or points operated normal & reverse.

8. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS21		
Replace a SIMIS-W ECC BUREP Card		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

***** INDEPENDENCE EXEMPT *****

Includes:	ECC BUREP Card
Excludes:	SOM, POM, IMON, UNOM, ECC-CU, and all other types SIMIS Card

Before powering down an ACC obtain the Signaller's permission.

⋮ Note: Consult Equipment List for modification state.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check the replacement card is the correct type and not damaged.
2. Check the replacement card version and the mod. state is correct.
3. Power down the ACC by switching off the power supply boards of all three-computer channels.
4. Remove and label the failed card as defective.

AFTER INSTALATION WORK

5. Check the card is correctly installed and secure.
6. Power up the ACC by switching on the power supply boards of all three-computer channels.
7. Check the correct operation of replacement card.

⋮ **NOTE:** "Check the correct operation" means observing the correct indications on the ECC-BUREP card (See ACC section in the S&D manual).

8. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS22		
Replace a SIMIS-W ECC-CU Card		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	ECC-CU Card
Excludes:	SOM, POM, IMON, UNOM, ECC BUREP and all other types SIMIS Card

Before powering down an ACC obtain the Signaller's permission.

⋮ Note: Consult Equipment List for modification state.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check the replacement card is the correct type and not damaged.
2. Check the replacement card version and the mod. state is correct.
3. Check that the replace card has the correct software version installed.
4. Power down the ACC by switching off the power supply boards of all three-computer channels.
5. Remove and label the failed card as defective.

AFTER INSTALATION WORK

6. Check the card is correctly installed and secure.
 7. Power up the ACC by switching on the power supply boards of all three-computer channels.
 8. Check the correct operation of replacement card.
- ⋮ **NOTE:** "Check the correct operation" means observing the correct indications on the ECC-CU card (See ACC section in the S&D manual).
9. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS23		
Replace a SIMIS-W IIC/OMC Non-CPU Card		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

***** INDEPENDENCE EXEMPT *****

Includes:	VESUV3, VESIN, KOMDA2, BUREP16 and BUMA Cards
Excludes:	SOM, POM, IMON, UNOM, ECC BUREP, ECC-CU, VENUS3, Axle Counter Evaluators and all other types SIMIS Card.

Before powering down an ACC obtain the Signaller's permission.

⋮ Note: Consult Equipment List for modification state.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check the replacement card is the correct type and not damaged.
2. Check the replacement card version and the mod. state is correct.
3. Power down affected computer channel by setting the reset switch to "OFF" ("AUS") on the relevant VENUS3 card and switching off the relevant power supply board for the affected computer channel.
4. Remove and label the failed card as defective.

AFTER INSTALATION WORK

5. Check the card is correctly installed and secure.
6. Power up the affected computer channels.
7. Perform the "update computer channel" procedure (See S&D Manual).
8. Check that the affected IIC/OMC channel has updated and that the card operates correctly by observing the correct Indications on the IIC/OMC (see the IIC/OMC section of the S&D manual).
9. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS24		
Replace a SIMIS-W IIC/OMC VENUS3 CPU Card		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	VENUS3 CPU Card
Excludes:	VESUV3, VESIN, KOMDA2, BUREP16 and BUMA Cards

Before powering down an ACC obtain the Signaller's permission.

⋮ Note: Consult Equipment List for modification state.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check the replacement card is the correct type and not damaged.
2. Check the replacement card version and the mod. state is correct.
3. Check the replacement card has the correct software version installed.
4. Power down affected computer channel by setting the reset switch to "OFF" ("AUS") on the relevant VENUS3 card and switching off the relevant power supply board for the affected computer channel.
5. Remove and label the failed card as defective.

AFTER INSTALATION WORK

6. Check the card is correctly installed and secure.
7. Power up the affected computer channels.
8. Perform the "update computer channel" procedure (See S&D Manual).
9. Check that the affected IIC/OMC channel has updated and that the card operates correctly by observing the correct Indications on the IIC/OMC (see the IIC/OMC section of the S&D manual).
10. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS25		
Replace an SIMIS-W SOM 6 Connector Plug		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Before powering down an ACC inform the Signaller as to the effect to the operational railway.

⋮ Note: Consult Equipment List for modification state.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check the replacement connector is the correct type and not damaged.

⋮ **NOTE:** This should include pin alignment, internal contamination (Inc. metallic flakes), code comb alignment.

2. Check the connector version and the mod. state is correct.

3. Check that the replacement card has the correct software version installed.

⋮ **NOTE:** There are 4 types of connector, depending on the type of lamps connected to the SOM6. Installation of the wrong type will cause incorrect operation of the SOM6.

4. Power down ACC by switching off the power supply boards for all three computer channels.

5. Remove and label the failed connector as defective.

AFTER INSTALATION WORK

6. Check the connector is correctly installed and secure.

7. Check that the red retain jumper is set in the correct position (see wiring diagrams).

8. Power up ACC by switching on the power supply boards for all three computer channels.

9. Check replacement SOM 6 card and connector operate correctly. By observing the correct indications on the SOM 6 and confirming correct operation all aspects controlled by the SOM 6.

10. Test for correct operating current for all aspects controlled by the SOM 6.

11. Check that the red retain function of the SOM 6 operates correctly by setting a proceed aspect (or the least restrictive aspect) for one or both the signals.

Then disconnect the feed to a lit aspect at the CDC and check that the SOM 6 correctly illuminates the most restrictive aspects.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS25		
Replace an SIMIS-W SOM 6 Connector Plug		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

12. Re-start the ACC, power down the ACC by switching off the power supply boards of all three computer channels After 10 seconds, power up the ACC by switching on the power supply boards of all three computer channels.
13. Check that the ACC card operates correctly by observing the correct indications on the ACC and VICOS. (See ACC section in the S&D manual).
14. Check, or arrange for the correct labelling of the new card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/IS26		
Replace a Siemens PAM Point Detection Module		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	PAM Point Detection Module
Excludes:	PSU Module, Transformer, Phase Detect Modules, ELDs and Motor Power Module.

⋮ Observe any local restrictions that apply.

BEFORE INSTALLATION WORK

1. Check that the replacement module is not damaged and is of the correct type.
2. Check that the plug connectors are not damage.
3. Check existing wiring has safe insulation.
4. Check the existing wiring is correctly labelled.
5. Isolate PAM at the incoming links. (PAM O&M Manual).

AFTER INSTALATION WORK

6. Check that the replacement module is correctly installed.
7. Check that the plug connections are replaced as labelled.
8. Check that the plug connections are secure.
9. Reconnect the PAM.
- * 10. Carry out [NR/SMS/PartB/Test/202](#) (Siemens Point Detection Module Test).
- * 11. Carry out [NR/SMS/PartB/Test/201](#) (Siemens Point Module Correspondence Test).
12. Check, or arrange for the correct labelling of the module, including normal & reverse labels.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/KL01		
Replace a Keylock within an Electric Release Instrument or Mechanical Lever		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Keylock's mounted within an Electric Release Instrument or Mechanical Lever
Excludes:	All other keylocks

⋮ This work does not require any electrical disconnections

BEFORE INSTALLATION WORK

1. Check replacement keylock is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement keylock is correctly installed, and that the solenoid assembly and terminal block are correctly fitted to the rear of the keylock (**ELECTRICAL RELEASE ONLY**).
3. Check that keys can only be withdrawn when the release is given.
4. Check that the release can only be given back when both keys are operated to the locked position.
5. Check that the key which operates the slide has to be removed first after the release is given, and that the key which releases the slide has to be operated first to return the release.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD01		
Replace a Barrier Boom		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Level Crossing Barrier Booms, Skirt, Pivot, AHBC shell bearings, ram pins, post, brackets, pogo stick and gear train
Excludes:	All other Barrier or Boom

BEFORE INSTALLATION WORK

1. For Missing Equipment Only: Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
 2. Check replacement item is not damaged and is correct type (length, cross-section, boom light position, reflecting strip, fracture segment, skirt, strainer wire).
 3. Check any existing wiring has safe insulation.
 4. Check any existing wiring is correctly labelled.
 5. Check existing barrier is isolated from the supply.
- During installation work check that the boom is supported and/or weights removed and check top ram pin moves freely in ram.

AFTER INSTALLATION WORK

6. Check replacement item is correctly installed.
7. Check barrier ram pins move freely in the ram (**BR-WR TYPE BARRIERS ONLY**).
8. Check top ram pin is prevented from turning in its frame (**AHB Mk.1 (PENGUIN) BARRIERS ONLY**).
9. Check wiring is replaced as labelled.
10. [WIRE COUNT](#) replacement boom to the wiring diagram.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Check new split pins, fracture bolts, and/or lock tabs are correctly installed.
13. Check all wires and cables are secure and clear of moving parts.
14. Carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Tests - Level crossing barriers). On the barrier supply throughout operation cycle.
15. Check barrier and any skirt moves freely.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD01		
Replace a Barrier Boom		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * | 16. Check any boom lights for correct alignment and operation.
- | 17. Check any strainer wire is correctly adjusted.
- | 18. Check the tip force and damping are correct according to the type of barrier (see the barrier equipment standard).
- | 19. Check the boom adapter locating pins retaining nuts are tightened to the correct torque (16 Nm) (**BR843 BARRIERS ONLY**).
- * | 20. Check barriers operate correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/LD02		
Replace a Barrier Power Pack		
Issue No. 06	Issue Date: 04/03/17	Compliance Date: 31/05/17

Includes:	Hydraulic and electro-mechanical power pack
Excludes:	Hydraulic actuator, hose, electric motor.

BEFORE INSTALLATION WORK

1. Check replacement power pack is Not Damaged and is Correct Type.
2. Check the auto/manual valve is switched to correct position [Hydraulic Power Unit ([NR/SMS/LC21](#))]. (BR SPEC 843 HYDRAULIC PACKS ONLY)
3. WIRE COUNT existing power pack to the wiring diagram.
4. Note the position of the top trunnion bracket in relation to the holes on the operating arm (long or short setting).
5. Check existing wiring has Safe Insulation.
6. [INSULATION TEST](#) replacement power pack (minimum 2M ohms terminals to case).
7. Check existing wiring is Correctly Labelled.
8. Check existing power pack is Isolated from the supply.

AFTER INSTALLATION WORK

9. Check any air has been excluded from the hydraulic system before continuing [General Information on Level Crossing Equipment ([NR/SMS/Appendix/03](#))]. (RURAL BARRIER HYDRAULIC PACKS ONLY)
10. Check the replacement pack has been Correctly Installed using new M12 X 50mm Grade 10.9 bolts torqued to 70Nm to secure the top trunnion and new M12 X 35mm Grade 8.8 bolts torqued to 70Nm to secure the bottom trunnion.
11. Check new spirol pins and tab washers have been fitted and are Correctly Installed.
12. Check in both the lowered and raised position, that the top trunnion pivot pin on the barrier pack is centralised and both circlips are Correctly Installed and undamaged.
13. Check that a bolt secured with a nut has been fitted to the unused holes within the operating arm and that both the nut and bolt head are coloured RED.
14. Check wiring is replaced as labelled.
15. [WIRE COUNT](#) replacement power pack to the wiring diagram.
16. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
17. Check barrier and any skirt moves freely.
18. Dynamic Earth Test [Level crossing barriers ([NR/SMS/Test/052](#))] barrier supply throughout operation cycle.
19. Check the tip force and damping are correct according to the type of barrier (see [NR/SMS/Part/Z04](#) and the appropriate the barrier equipment standard).
- * 20. Check barriers operate correctly.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD03		
Replace a Level Crossing Gate		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Gates, Gate post or boom gates with S&T equipment fitted
Excludes:	Gate stops

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type (length).
2. Check drive mechanism is disconnected.
3. Check any existing wiring has safe insulation (**ELECTRIC ITEMS ONLY**).
4. Check any existing wiring is correctly labelled (**ELECTRIC ITEMS ONLY**).
5. Check existing equipment is isolated from the supply (**ELECTRIC ITEMS ONLY**).

AFTER INSTALLATION WORK

6. Check replacement item is correctly installed.
7. Check gate moves freely with correct alignment of gate stop, gate post rollers, ramps and gate locks.
- * 8. Check any gate lamps are illuminated and are in correct alignment with road traffic.
9. Carry out an [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) on all gate lamps.
10. Check any red target is correctly fitted.
11. Check gate cannot be opened when locked (**LOCKABLE WICKET GATES ONLY**).
12. Check signals cannot be cleared until gates are fully open to railway and locked.
13. Check no gates can be unlocked with signals clear.
14. Check all gates lock into any gate stops.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD04		
Replace a Level Crossing Local Control Unit (LCU)		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	LCU Door Keylocks
Excludes:	All other door keylocks

BEFORE INSTALLATION WORK

1. Check replacement LCU is not damaged and is correct type.
2. [WIRE COUNT](#) existing LCU to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing LCU is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement LCU is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) LCU to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check terminations are secure and suitably protected.
11. Check wires and cables are secured and are clear of moving parts.
12. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) the supply where designed to be earth free.
13. Check that with the LCU door open, the key cannot be removed from the keylock.
- * 14. Check correct operation of barriers from LCU.
15. Check that LCU door cannot be closed until Auto/Normal button/switch has been operated to the Auto/Normal position. **(ABCL, AFBCL, AHBC, AOCL, AOCL, & MCB-CCTV ONLY).**
16. Check that with the LCU door closed and the key removed, the LCU door is locked.
17. Check that the crossing sequence does not re-set until the LCU door is closed and locked.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD04		
Replace a Level Crossing Local Control Unit (LCU)		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 18. Carry out a [NR/SMS/PartB/Test/070 - 084,159 and 160](#) (Level crossing sequence test). Record the test measurements on the record card together with the reason for the test.
- 19. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD05		
Replace a Level Crossing Flasher Unit		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Road light flasher units, bell pulse units
Excludes:	All other flasher units

BEFORE INSTALLATION WORK

1. Check replacement flasher unit is not damaged and is correct type.
2. [WIRE COUNT](#) existing flasher unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing flasher unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement flasher unit is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) flasher unit to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
- * 10. Check flashing rate of red road lights, see [NR/SMS/PartZ/Z04](#) (Level Crossing – Reference Values).
11. Check Flasher Unit Road Traffic Light delay setting. If required, adjust to check that barriers start to rise before the Road Traffic Lights turn off (**AOCL+B Crossing Flasher Units only**).
- * 12. Check bells operate correctly (**BELL PULSE UNITS ONLY**).
13. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply throughout operation cycle.
14. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD06		
Replace a Level Crossing Gate Post Mechanical Equipment Lock		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Gate post mechanical equipment, Blacks Lock, Level crossing keylock
Excludes:	LCU Door lock keylock, and Gate drive equipment

BEFORE INSTALLATION WORK

1. Check replacement lock is not damaged and is correct type.
 - During installation work check springs are not damaged and are correctly seated

AFTER INSTALLATION WORK

2. Check replacement lock is correctly installed.
3. Check that replacement lock can only be released by correct key/keys, including the emergency key.
4. Check plunger, when withdrawn is clear of lock face (**BLACKS LOCK ONLY**).
5. Check plunger travel does not damage casting.
6. Check new split pins and studs are correctly installed.
7. Check correct alignment of gate post rollers and ramps.
8. Check that the lever is locked until all gates are closed and bolted.
9. Check that all gates are locked by the lever/switch.
10. Check that the key cannot be removed from the keylock with the gate open.
11. Check that the gate is closed and locked with the key removed.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/LD07		
Replace an S60 Machine (Down Position) Damper Spring		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	S60 Barrier Machine
Excludes:	All other barrier machines

BEFORE INSTALLATION WORK

1. Check replacement dampening spring is Not Damaged and is of Correct Type.
2. With signallers permission take the crossing on local control and maintain the barrier boom in the raised position for the duration of the replacement

AFTER INSTALLATION WORK

3. Check replacement dampening spring is correctly installed.
4. Check the lock nut function is effective.
5. Check that no components within the barrier are susceptible to mechanical damage following the replacement.
6. Check that the when the boom is lowered the dampening is effective and the boom comes to rest in the horizontal position.
7. Check the weather seal is intact and correctly seated before reinstalling the outer casing.
8. If possible, observe the operation of the barrier through a complete lower and raise cycle.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD08		
Replace a Level Crossing Light Unit		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Road signal light unit, Miniature Stop Light (MSL) unit, Miniature Warning Light (MWL) unit
Excludes:	All other miniature stop lights

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement unit is not damaged and is correct type.
3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.
6. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement unit is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement unit to the wiring diagrams.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
11. Check lenses are of correct type (colour) and are correctly installed in the replacement unit. (Any rubber seals are seated correctly).
12. Check that the hoods are correctly fitted and are secure in the replacement unit.
13. Check that the correctly rated lamps are installed.
14. Check that all the lamps (main and any auxiliary) illuminate correctly and test for correct voltages [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests). Record the test measurements on the record card, together with the reason for the test.
15. Check the alignment and height of replacement unit for public use, see [NR/SMS/PartC/LC11](#) (Road Lights and Audible Warnings). (Check that the coloured lights cannot be misread as signal aspects by train drivers).
16. Check flashing rate of lights (70 - 90 flashes per minute) (RED ROAD LIGHTS ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD08		
Replace a Level Crossing Light Unit		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

17. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply throughout operation cycle.
18. Test that the red road lamps are proved [\(NR/SMS/PartD\)](#) (RED ROAD LIGHTS ONLY).
19. If proved, check all indications back to the relevant signal box.
20. Check, or arrange for, correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD09		
Replace a barrier boom light		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Boom Light Unit (for Level Crossing Barrier Boom)
Excludes:	All other types of Light Unit

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type (LED boom light unit has a white housing which differs to the filament type which is black).
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check wiring is replaced as labelled (LED boom lights are polarity sensitive - note wiring colour).
8. [WIRE COUNT](#) replacement unit to the wiring diagram.
9. Check boom lights for correct alignment (considering the angle of the road to that of the rail).
10. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supplies where designed to be earth free.
11. Check the boom lights for correct operation (i.e. illuminates and extinguishes at the correct boom angle).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD10		
Replace a Level Crossing Audible Warning Control Unit (AWCU)		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Mechanical Sangamo/Schlumberger Audible Warning Control Unit. Electronic Audible Warning Control Unit
Excludes:	Audible warning device (bell or yodel)

BEFORE INSTALLATION WORK

1. Check replacement AWCU is not damaged and is correct type.
2. [WIRE COUNT](#) existing AWCU to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing audible warning unit is Isolated from supply.

AFTER INSTALLATION WORK

6. Check replacement AWCU is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement AWCU to the wiring diagram.
9. Check terminations are secure and suitably protected.
- * 10. Check (as provided) that the 'on time', 'off time' are correctly set.
- * 11. Check that the time is correctly set (mechanical devices) or displayed correctly (electronic devices).
- * 12. Check (as provided) by using override switch that audible warnings operate correctly for day and night settings.
- * 13. Check override switch is left in correct position (mechanical devices).
14. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD11		
Replace a Level Crossing Gate Machine		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Wheel, gears, racks and gate drive levers within signal box
Excludes:	Gate equipment outside signal box

When replacement of gate machine requires the disarrangement of interlocking, a combination of this test plan and [NR/SMTH/Part04/LV05](#) (Replace a Mechanical Interlocking Component) shall be used.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement item is correctly installed.
3. Check lock nuts, wedge keys, pins and/or new split pins are correctly installed.
4. Check that the apparatus operated by the replacement items functions correctly in the correct direction with enough stroke and without undue strain on fittings, cranks, and stools.
5. Check all gates lock into any gate stop.
6. Check that gates cannot be operated from either fully across railway, or fully across road positions while they are locked by the correct locking levers.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD12		
Replace a PCB Board in an Invensys S60 Barrier Machine		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	S60 Barrier Machine PCB Board
Excludes:	Any other PCB Board

BEFORE INSTALLATION WORK

1. Check replacement unit is of correct type and is not damaged.
2. Check that any links or switches are correctly configured.
3. Isolate power by the S60 Barrier Machine.
4. Apply the Lock Bar with the tethered 'R' Clip in place within the affected barrier machine with the correct designation towards the motor (either keep down or keep up). Failure to do so can result in unintended movement. (Appendix B).

AFTER INSTALLATION WORK

5. Check replacement S60 PCB Board is correctly installed, labelled and check the board retaining screws for security.
6. Check wiring plugs and cables are correctly retained in their respected housings.
7. [WIRE COUNT](#) affected wires to the site diagrams.
8. Check wiring and cables are not susceptible to mechanical damage.
9. Arrange to restore the power supply to the S60 Barrier Machine.
10. Check that the snubbing settings match the component being removed.
11. Check correct status LED's are illuminated (Appendix A).
12. Check operation of the affected S60 Barrier Machine for correct operation.
13. Carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Test) - Level Crossing Barriers.

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Replace a PCB Board in an Invensys S60 Barrier Machine		
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APPENDIX A - PCB LED Indications

- i) The PCB has a series of LED indications that monitor key Barrier Machine functions. This minimizes the need for a multi-meter when troubleshooting the status of the mechanism. The LED indications are listed below (in left to right order on the PCB);
- ii) Power ON (Green) - Indicates Battery Power is present on terminals 4 & 5 and the PCB is receiving power. If the power level is outside the normal limits, the Health LED flashes at a rate of 4 Hz.
- iii) Gate Request (Red) - Also known as Gate Control (GC). Indicates Gate control input is present. The barrier should raise or be raised when LED is lit.
- iv) Brake On (Red) - Indicates power is being sent from the PCB to energize the electric brake. LED should be lit when the barrier is fully raised.
- v) Breaker Tripped (Red) - Indicates that the Electronic Auto Restore Overload is activated.
- vi) Motor Up (Red) - Indicates power is being sent from the PCB to energize the motor to raise the boom.
- vii) Motor Down (Green) - Indicates power is being sent from the PCB to energize the motor to lower the boom.
- viii) Health (Yellow) - Indicates that the microprocessor is operating properly. The LED flashes at a one (1) cycle per second rate (1/2 second on, 1/2 second off) when board is healthy. If the CPU detects a failed condition, the LED flashes at a rate of 4 Hz. Any mode other than 1 Hz indicates a failed condition. Refer to the Troubleshooting Section for further information.



Figure 1 - LED DETAIL

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APPENDIX B - Lock Bar Operation

1. Apply Lock Bar to prevent Movement. Always check that tethered R clip is used to secure the lock bar in place.



Figure 2 – Lock Bar

2. It is essential to apply the lock bar with the correct designation towards the motor (either keep down or keep up) failure to do so can result in unintended movement.
3. When the lock bar is applied to keep the barrier down, the barrier if raised falls down.
4. When the lock bar is applied to keep the barrier up, it is possible to move the barrier to the raised position.
5. When required to remove the lock bar, the following procedure shall be used:
 - a) Read and comply with any safety precautions.
 - b) Turn the Isolation switch to position '0'.
 - c) Check fingers and loose clothing are clear of the mechanism, remove the R-Clip and slide the look bar off. As this might be under a small amount load, it can require gently twisting to reduce the friction.
6. When the lock bar is removed, if the barriers is raised, it can fall under gravity.
7. Failure to remove the lock bar before powered movement of the S60 Barrier Machine can result in operation of external over-current protection or cause damage to the machine.

END

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NR/SMTH/Part04/LD14		
Replace EBI Gate 630 Barrier Crank Handle Gear Mechanism		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	630 Barrier Crank Handle Gear Mechanism
Excludes:	All other types of Crank Handle Mechanism

GENERAL

Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Take necessary precautions when working on or near the vicinity of high voltages (230V AC), only use approved insulated tools.

This task shall be completed with the boom in the lowered position, this is to prevent the boom from moving during the process.

BEFORE INSTALLATION WORK

1. Check replacement hand crank gear mechanism is not damaged and is the correct type.
2. Isolate the barrier machine from the supply.
3. Unscrew and remove hand crank gear mechanism, noting its position and orientation.

AFTER INSTALLATION WORK

4. Check the installed replacement hand crank gear mechanism is in the correct position and orientation.
5. Check cap head screws are tight with the correct size Allen key.
6. Check the operation of the crank handle, by operating the barrier machine, raising and lowering boom without excess force, with the gear teeth fully engaging.
7. Reconnect the main power supply.
8. Check the correct operation of the barrier machine under power.

END

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Replace an EBI Gate 630 Barrier Machine		
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Includes:	EBI Gate 630 Barrier Machine, Skirt, pogo stick, support arms, strainer wire, counter-weights, boom lights.
Excludes:	All other Barrier Machines and components

Appropriate Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Opening the Crank Hole Flap will release the electromagnetic brake which will cause the barrier boom to fall.

It is essential that the barrier boom is in the horizontal position (lowered) before any work activity is carried out.

Care shall be taken when manually operating the barrier machine if the counter-weights have been removed or the boom has been damaged, the unbalanced boom may cause the crank handle to turn.

BEFORE INSTALLATION WORK

1. Check the existing concrete pedestal is undamaged.
2. Check the existing earth connections are in place and there is continuity to an effective earth and are free from any earth faults.
3. Check existing barrier machine is in the fully horizontal (lowered) position.
4. Check the crank handle is inserted correctly into the crank hole.
5. Check the crank handle is secured in place with the locking pin and that it is locked in place with a padlock.
6. Check existing barrier machine is Isolated from the supply.
7. Check all fixing bolts are secure, free from corrosion and capable of sustaining the load.
8. Check any existing wiring for damage and that it has safe insulation.
9. Remove any existing boom assembly, support arms, counter-weights (noting there position).

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AFTER INSTALLATION

⋮ These steps should be carried out prior to the installation of the boom

10. Check the pedestal is sitting squarely and level on the base foundation.
11. Check the mounting bolts do not protrude into the pedestal by more than 108mm.
12. Check the pedestal mounting bolts are securely fastened.
13. Check the earth connections are in place and there is continuity to an effective earth and they are free from any earth faults.
14. Check the cable glands are securely sealed.
15. Check the cables are secured to the barrier machine cable tray.
16. Check any plug couplers are not damaged and are securely connected.
17. Check the wiring terminations correspond to the diagrams and the cores are correctly labelled.
18. Check the tension of the motor cog belt is between 5 - 10mm.
19. Unlock and remove the locking pin from the crank handle.
20. Manually operate the barrier machine to the fully vertical (raised) position. Check that the movement is smooth and unobstructed.
21. Manually operate the barrier machine to the fully horizontal (lowered) position. Check that the movement is smooth and unobstructed.
22. Close and lock the crank hole flap. |
23. Reconnect the power supply to the barrier machine. |
24. Check the voltage on the power supply terminals is between 21 to 28V DC
 - ⋮ Terminal X14 is the positive and X7 the negative. |
25. Carry out a [DYNAMIC EARTH TEST \(052\)](#)
26. Re-fit and secure the barrier machine front cover.
27. Check the correct electrical operation of the barrier machine. Raise the barrier machine and check that the movement is smooth and unobstructed.
28. Check the correct electrical operation of the barrier machine. Lower the barrier machine and check that the movement is smooth and unobstructed.

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- 29. Replace the crank handle and locking pin and padlock the cover.
- 30. Re-fit and lock the barrier machine external cover.

BOOM INSTALLATION / REFIT

- 31. Re isolate the barrier machine before proceeding.
- 32. Check the boom and fittings are Correctly Installed.
- 33. Check the barrier machine boom flange connections (Six M16 flange screws) are torqued to 140Nm.
- 34. Check the boom support arm to boom connections are secure, (Four M6 screws) torqued to 7Nm.
- 35. Check the number of counter weights for type of boom fitted is correct.
- 36. Check the weights are installed and distributed correctly to counter weight arm/s.
- 37. Check the correct installation of any boom extensions tubes.
- 38. Check the correct installation of any support arms.
- 39. Check the correct installation of any skirt.
- 40. Check any strainer wire is correctly installed and adjusted.
- 41. Check the safety 'break away' device surfaces are greased and free from dirt, and corrosion.
- 42. Check the safety 'break away' device is installed correctly and torque the M16 nut to 140Nm.
- 43. Check the pogo stick touches the ground when the boom is in the horizontal (lowered) position, it should not cause an upward pressure on the boom.
- 44. Check the pogo stick adjustment leg does not exceed 242mm in length.
- 45. Check the pogo stick adjustment counter-nut is torqued to 55Nm.
- 46. Check the boom light wiring is replaced as labelled.
- 47. Check the boom integrity wiring is replaced as labelled.
- 48. Check the wiring access plate water seal is intact.
- 49. Check the wiring access plate is secured in place.

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CHECK THE OPERATION OF THE BARRIER MACHINE

50. Unlock and remove the locking pin from the crank handle.
51. Manually operate the barrier machine to the fully vertical (raised) position and check the following:
 - a) The movement is smooth and unobstructed
 - b) The skirt moves freely
 - c) The Pogo stick moves freely
 - d) The gravitational pawl engages
 - e) Counter weights are free from obstruction
52. Remove the crank handle and allow the barrier to 'self-fall' to the horizontal (lowered) position and check the following:
 - a) The movement is smooth and unobstructed
 - b) The skirt moves freely
 - c) The Pogo stick moves freely
 - d) The Pogo stick makes contact with the ground without it applying an upward pressure on the boom
 - e) The boom is horizontal to the road surface
 - f) The gravitational pawl dis-engages
53. Reconnect the Power to the barrier machine
54. Check the barrier operates correctly using the Local Control Unit.
55. Check the boom lights are securely fitted to the boom and operate correctly.
56. Check the boom reflective strips are visible and clean.
57. If possible observe the passage of a train.

End

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NR/SMTH/Part 04/LD16		
Replace an EBI Gate 630 Barrier Boom		
Issue No. 02	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	EBI Gate 630 Barrier Boom, Skirt, pogo stick, support arms, strainer wire, counter-weights, boom lights.
Excludes:	All other Barrier Booms and components

Appropriate Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Manual Handling of components may be heavy and unevenly balanced.

Care shall be taken when carrying out any work inside the Barrier Machine there are movable parts.

Opening the Crank Hole Flap will release the electromagnetic brake which will cause the barrier boom to fall.

When operating the barrier, take care not to trap limbs between the boom assembly / fencing / guards.

It is essential that the barrier boom is in the horizontal position (lowered) before any work activity is carried out.

Care shall be taken when manually operating the barrier machine if the counter-weights have been removed or the boom has been damaged, the unbalanced boom may cause the crank handle to turn.

BEFORE INSTALLATION WORK

1. Check replacement item is Not Damaged and is Correct Type.
2. Check any existing wiring for damage and that it has safe insulation.
3. Check any existing wiring is Correctly Labelled.
4. Check barrier machine is in the horizontal (lowered) position.
5. Check the crank handle is inserted correctly into the crank hole.
6. Check the crank handle is secured in place with the locking pin and that it is locked in place with a padlock.

AFTER INSTALLATION WORK

7. Check replacement items are Correctly Installed.
8. Check the barrier machine boom flange connections (Six M16 flange screws) are torqued to 140Nm.
9. Check the boom support arm to boom connections (Four M6 screws) are torqued to 7Nm.

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Replace an EBI Gate 630 Barrier Boom		
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10. Check the number of counter weights for type of boom fitted is correct.
11. Check the weights are installed and distributed correctly to counter weight arm/s (Two M24 screws) torqued to 200Nm.
12. Check the correct installation of any boom extensions tubes.
13. Check the correct installation of any support arms.
14. Check the correct installation of any skirt.
15. Check any strainer wire is correctly installed and adjusted.
16. Check the safety 'break away' device surfaces are greased and free from dirt, and corrosion.
17. Check the safety 'break away' device is installed correctly:
 - M16 nut torque = 140Nm.
18. Check the pogo stick touches the ground when the boom is in the horizontal (lowered) position, it should not cause an upward pressure on the boom.
19. Check the pogo stick adjustment leg does not exceed 242mm in length.
20. Check the pogo stick adjustment counter-nut torqued to 55Nm:
21. Check the boom light wiring is replaced as labelled.
22. Check the boom integrity wiring is replaced as labelled.
23. Check the wiring access plate water seal is intact.
24. Check the wiring access plate is secured in place.

CHECK THE OPERATION OF THE BARRIER MACHINE

25. Check the barrier machine is installed as described in [NR/SMTH/Part 04/LD15](#)
26. Unlock and remove the locking pin from the crank handle.

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Replace an EBI Gate 630 Barrier Boom		
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27. Manually operate the barrier machine to the fully vertical (raised) position and check the following:
 - The movement is smooth and unobstructed
 - The skirt moves freely
 - The Pogo stick moves freely
 - The gravitational pawl engages
 - Counter weights are free from obstruction
28. Remove the crank handle and allow the barrier to 'self-fall' to the horizontal (lowered) position and check the following:
 - The movement is smooth and unobstructed
 - The skirt moves freely
 - The Pogo stick moves freely
 - The Pogo stick makes contact with the ground without it applying an upward pressure on the boom
 - The boom is horizontal to the road surface
 - The gravitational pawl dis-engages
29. Close and lock the crank hole flap. |
30. Replace the crank handle and locking pin and padlock the cover. |
31. Check the barrier operates correctly using the Local Control Unit.
32. Check the boom lights for correct operation and alignment.
33. Check the boom reflective strips are visible and clean.
34. If possible observe the passage of a train.

End

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NR/SMTH/Part04/LD17		
Replace an EBI Gate 630 Motor		
Issue No. 02	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	EBI Gate 630 Barrier Machine Motor
Excludes:	All other Level Crossing Systems

Appropriate Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Take necessary precautions when working on or near the vicinity of high voltages (230V AC), only use approved insulated tools.

This task shall be completed with the boom in the lowered position, this is to prevent the boom from moving during the process

BEFORE INSTALLATION WORK

1. Check the replacement motor is Not Damaged and is the Correct Type.
2. Isolate the barrier machine from the supply.
3. WIRE COUNT the motor.
4. Disconnect and label the connections to the motor as required.
5. Check the condition of the connector/plugs and the associated wiring.
6. Release and remove the motor and cog belt, noting its position and orientation.

AFTER INSTALLATION WORK

7. Check the installed replacement motor and cog belt are in the correct position and orientation.
8. Check the tension of the motor cog belt is between 5 – 10mm.
9. Check the motor mounting bolts are torqued to 30Nm.
10. WIRE COUNT the motor.
11. Check all connections, plugs and sockets are securely fitted.
12. Close and lock the crank hole flap.
13. Reconnect the main power supply.
14. Carry out a [DYNAMIC EARTH TEST \(052\)](#)
15. Check the correct operation and functionality of the barrier by raising and lowering the booms a number of times under power.

End

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NR/SMTH/Part04/LD18		
Replace EBI Gate 630 Cog Belt		
Issue No. 02	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	EBI Gate 630 Barrier Cog Belt
Excludes:	All other Level Crossing Cog Belts or Drive Belts

Appropriate Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Take necessary precautions when working on or near the vicinity of high voltages (230V AC), only use approved insulated tools.

This task shall be completed with the boom in the lowered position, this is to prevent the boom from moving during the process

BEFORE INSTALLATION WORK

1. Check the replacement cog belt is Not Damaged and is the Correct Type.
2. Isolate the barrier machine from the supply.
3. Release and remove the cog belt, noting its position and orientation.

AFTER INSTALLATION WORK

4. Check the installed replacement cog belt is in the correct position and orientation.
5. Check the motor mounting bolts are torqued to 30Nm.
6. Check the cog belt tension is correct, between 5-10mm.
7. Reconnect the main power supply.
8. Check the correct operation and functionality of the barrier by raising and lowering the booms a number of times under power.

End

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NR/SMTH/Part04/LD19		
Replace EBI Gate 2000 - Modular Components		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	EBI Gate 2000 Control Hut (ERR-8) Power Supply Module EMF-8: Sound Generator EDG-5, Earth leakage detection modules (Bender Units), Current measurement modules (of barrier machines circuits), Compact Flash cards for PLC A and B, Computer (KMP) for DNC.
Excludes:	All other Level Crossing Systems

Appropriate Protection / Possession arrangement shall be taken before commencing work on the Level Crossing System.

Take necessary precautions when working on or near the vicinity of high voltages (230V AC), only use approved insulated tools.

The following modules require configuration and/or programming before installing them in the system:

- a) Power Supply Module EMF-8,
- b) Sound Generator EDG-5,
- c) Earth leakage detection modules (Bender Units),
- d) Current measurement modules (of barrier machines circuits),
- e) Compact Flash cards for PLC A and B,
- f) Computer (KMP) for DNC.

Typically these parts are delivered by the manufacturer as already prepared for installation in strictly defined LX system and module position – identified by serial number on the device.

PRE INSTALLATION WORK

1. Check unit/ module has been configured / programmed correctly before installation commences, if you are unsure or unable to verify this do not install the item.

BEFORE INSTALLATION WORK

2. Check the replacement unit/module is Not Damaged and is the Correct Type/version.
3. Isolate the module by removing the corresponding fuse.
4. Detach all plugs or connectors attached to the module to be replaced.
5. Check the condition of the connector/plugs and the associated wiring.
6. Remove the module, noting its position and orientation.

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Replace EBI Gate 2000 - Modular Components		
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AFTER INSTALLATION WORK

7. Check the installed replacement module in the correct position and orientation.
8. Re-connect all plugs or connectors to the correct corresponding sockets in the module.
9. Check all connections, plugs and sockets are securely fitted.
10. Reinstall the fuse previously removed.
11. Check the correct operation and functionality of the replaced module by observing system status on local diagnostic panel or ERP-9.

End

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NR/SMTH/Part 04/LD20		
Replace a EBI Gate 200 Level Crossing System Sub-Component		
Issue No: 02	Issue Date: 04/03/17	Compliance Date: 31/05/17

Includes:	Sub -Component parts associated with the EBI Gate 200 Level Crossing system.
Excludes:	All other Types of Level Crossing and type or make of parts.



Before any work is undertaken possession of the EBI Gate 200 Level Crossing system should be taken. The signaller should be informed that the level crossing system will be non-operational.

The system should be powered down for this task by disconnection of the power supply at the unit fuse links. The unit shall not be powered up with any sub-component missing

BEFORE INSTALLATION WORK

1. Check the EBI Gate 200 unit has been isolated from the power supply and UPS isolation fuse
2. Check the replacement sub-component is of the Correct Type and is not damaged

INSTALLATION WORK

Red/Green LED Unit

3. Check existing wiring is correctly labelled.
4. Disconnect the aspect cable from the plug coupler.
5. Unbolt the aspect unit from the mounting frame.
6. Remove the aspect unit and store safely for return.
7. Fit the new aspect unit and fasten all fixing bolts.
8. Reconnect the aspect cable to the plug coupler.
9. Check the LED unit lights when required
10. If this is the only replacement being made move to the "AFTER INSTALLATION WORK" section.

Speaker

11. Check existing wiring is correctly labelled.
12. Disconnect the speaker cable from the speaker.
13. Unbolt the speaker from the unit.
14. Remove the speaker and dispose as directed.

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Replace a EBI Gate 200 Level Crossing System Sub-Component		
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15. Fit new the new speaker and fasten all fixing bolts.
16. Reconnect the speaker cable to the speaker.
17. Check speaker is operating correctly (Note each post has a speaker both front and back).
18. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Speaker Cable

19. Check existing wiring is correctly labelled.
20. Disconnect the speaker cable from the speaker and audio module.
21. Cut cable ties that secure the cable to the unit.
22. Remove the speaker cable.
23. Fit new the new speaker cable.
24. Secure the cable to the unit with new cable ties.
25. Reconnect the speaker cable to the speaker and audio module.
26. Check speaker connected to the cable is operating correctly (Note each post has a speaker both front and back).
27. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Microphone Assembly

28. Check existing wiring is correctly labelled.
29. Disconnect the microphone cable from the audio module.
30. Cut cable ties that secure the cable to the unit.
31. Unbolt the microphone assembly from the unit.
32. Remove the microphone assembly.
33. Fit new the new microphone assembly and fasten all fixing bolts.
34. Secure the cable to the unit with new cable ties.
35. Reconnect the microphone cable to the audio module.

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36. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Audio Module Unit

37. Check existing wiring is correctly labelled.
38. Disconnect all cables from the audio module unit.
39. Note the position of the adjuster on the audio module.
40. Remove the audio module unit.
41. Fit the new audio module unit, fasten all fixing bolts.
42. Reconnect the cables to the audio module unit.
43. Set the audio adjustment position the same position as the faulty unit.
44. Test the audio output levels and adjust as required.
45. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Audio Module Power Cable

46. Check existing wiring is correctly labelled.
47. Disconnect the cable from the audio module and the backplane.
48. Remove the audio module power cable.
49. Fit the new audio power cable.
50. Reconnect the cable to the audio module and the backplane
51. Check the audio module works when required
52. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Push Button Assembly

53. Check existing wiring is correctly labelled.
54. Disconnect the push button assembly cable from the backplane.
55. Remove the outer blue bezel using the special button extractor tool and unscrew the push button from the front.

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56. Fit the new switch to the unit then fit the push button blue bezel.
57. Reconnect the push button assembly cable to the backplane.
58. Operate the push button to check it operates.
59. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Power Supply Unit

60. Check existing wiring is correctly labelled.
61. Disconnect the wires from the Power Supply Unit.
62. Remove the Power Supply Unit from the backplane.
63. Fit the new Power Supply Unit to the backplane.
64. Reconnect the wires to the Power Supply Unit.
65. Check the equipment fed from the PSU operates correctly
66. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

UPS Controller

67. Check existing wiring is correctly labelled.
68. Disconnect the wires from the UPS Controller.
69. Remove the UPS Controller from the backplane.
70. Fit the new UPS Controller to the backplane.
71. Reconnect the wires to the UPS Controller.
72. Check the UPS is working by pulling the main fuse and leaving it on test for 15 minutes before reinstating the fuse.
73. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

UPS Battery

74. Check existing wiring is correctly labelled.
75. Disconnect the wires from the UPS Battery.

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76. Remove the UPS Battery from the mounting plate.
77. Fit the new UPS Battery to the mounting plate.
78. Reconnect the wires to the UPS Battery.
79. Allow the UPS battery to charge for 30 mins before testing it is working by pulling the main fuse and checking the system holds up before reinstating the fuse.
 - ⋮ Full charging can take up to 24hrs, if the battery is discharged.
80. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

AutoDial Unit

81. Check existing wiring is correctly labelled
82. Disconnect the antennae GSM cable from the AutoDial unit
83. Remove SIM Card
84. Remove DIN rail end stop fitted on the left hand side
85. Slide AutoDial unit to the left to unplug
86. Remove AutoDial unit from DIN Rail
87. Fit new AutoDial unit on DIN rail
88. Slide against Siemens CPU to ensure connection
89. Refit Din rail end stop
90. Reconnect antennae wires to AutoDial unit
91. Reinsert SIM card
92. Check “Error Messages” are being received from the affected unit
93. If this is the only replacement being made move to the “AFTER INSTALLATION WORK” section.

Antennae

94. Check existing wiring is correctly labelled
95. Disconnect the antennae GSM cable from the AutoDial unit
96. Remove fixing bolt of antennae to post to remove antennae

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97. Remove antennae gasket
98. Fit new antennae and gasket
99. Check "Error Messages" are being received from the affected unit
100. Connect GSM antennae cable to AutoDial unit

AFTER INSTALLATION WORK

101. Check the replacement item is Correctly Installed and secure.
102. Restore power to the EBI Gate 200 unit and reset the axle counter sections to zero [NR/SMS/TEST/082 Section 2](#) and then reset the Axle Counter Board (ACB) displays by turning the selector switch to the Reset position.
103. Inform the signaller when the level crossing system is successfully restored to normal operation. If possible, observe a train through the section(s).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD21		
Replace GateCare NR2 Power Operated Gate Opener (POGO) Sub-Components		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	All sub-component parts associated with the GateCare - NR2 - Power Operated Gate Opener (POGO)
Excludes:	All other Types of Enhanced User Worked Crossing

GENERAL

Before any work is undertaken possession of the NR2 Power Operated Gate Opener (POGO) shall be taken. Inform the Signaller that the level crossing system is non-operational.

Gate Replacement

BEFORE INSTALLATION WORK

1. Check the replacement gate is of the correct type and is not damaged

DURING WORK

2. Check the length of the gate.
3. Check all gates, posts and attachments, particularly for signs of damage or defects.
4. Check post cannot be rotated and that the hinge mountings are undamaged.
5. Check actuator mounting bracket and actuator for damage.
6. Locate and remove the green twelve-way terminal plug from the NR2 Control Board (Figure 1). The removal of this plug disables the red/green buttons, solenoids and N/C contact from a green aspect.
7. Unplug and move clear the X1 and X2 plugs (Figure 1). This disables the actuators.
8. Unpin the actuator and swing it fully open, securing it so that it does not interfere with the gate replacement.
9. Remove all signage from the damage gate.

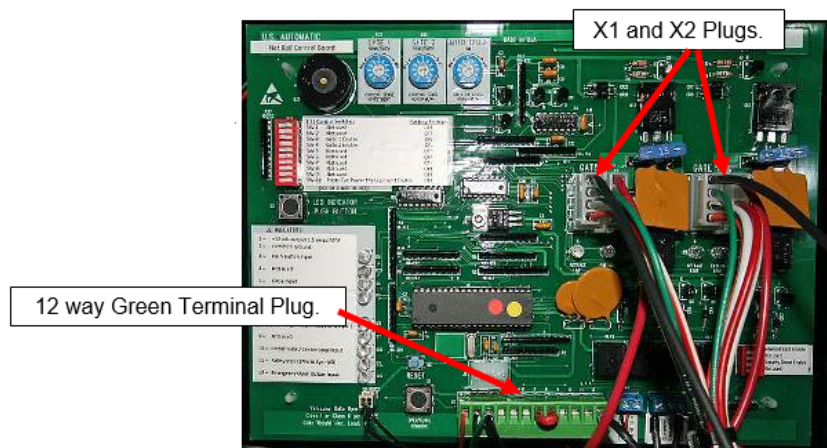


Figure 1 – NR2 Control Board

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD21		
Replace GateCare NR2 Power Operated Gate Opener (POGO) Sub-Components		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

10. Disconnect the solenoid. Access is gained by removing two small hex type grub screws and pulling off the end cap (Figure 2).
11. Remove the solenoid and its mounting bracket.
12. Pull solenoid cable back through the gate.
13. Remove and replace the gate.
14. Check the gates are horizontal using a spirit level and adjust as required.
15. Check that the rod eye hinge retaining pin and adjustment/securing nuts are in place and that the lock nuts are tight (Figure 3).

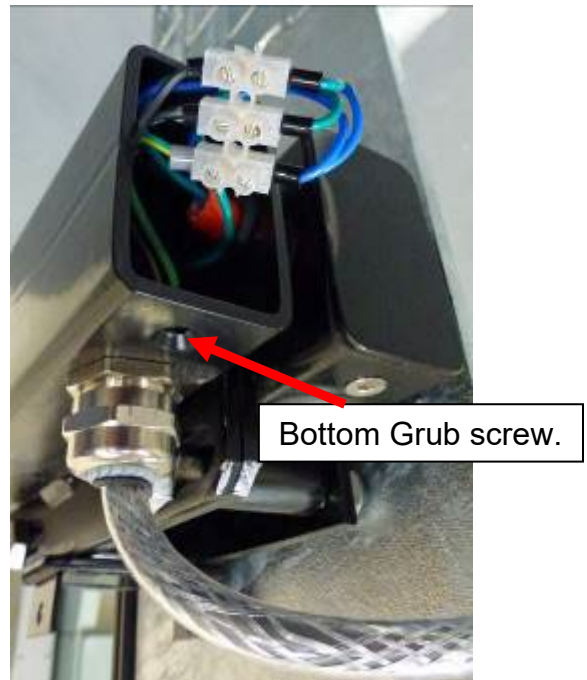


Figure 2 - Solenoid

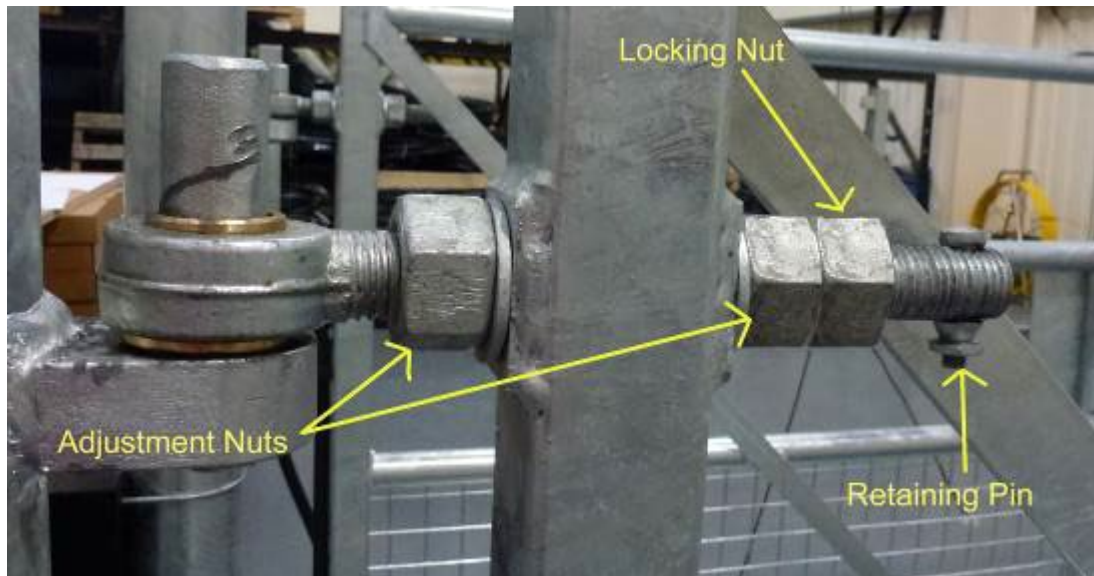


Figure 3 – Hinge Fittings

16. Clean and examine hinges and pivots, then lightly lubricate.
17. Re-thread cable and refit solenoid.
18. Reconnect the actuator.
19. Refit all signage to the new gate.

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NR/SMTH/Part04/LD21		
Replace GateCare NR2 Power Operated Gate Opener (POGO) Sub-Components		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

20. Reconnect the X1, X2 and green 12-way termination plug.
21. Press the reset button.
22. Operate the gates on power in both directions to check correct operation.
23. Check that both the retract and extend limit switches are operating correctly by observing the LED indications as explained in [NR/SMS/PartB/Test/084](#) (Power Operated Gate Opener Adjustment/Test).

Solenoid Replacement

BEFORE INSTALLATION WORK

24. Check the replacement Solenoid is of the correct type and is not damaged.

DURING WORK

25. Locate and remove the green twelve-way terminal plug from the NR2 Control Board (Figure 1). The removal of this plug disables the red/green buttons, solenoids and N/C contact from a green aspect.
26. Disconnect the solenoid; access is gained by removing two small hex type grub screws and pulling off the end cap (Figure 2).
27. Remove the solenoid from its mounting bracket.
28. Refit and reconnect the new solenoid.

AFTER INSTALLATION WORK

29. Reconnect the green 12-way termination plug.
30. Press the reset button.
31. Operate the gates on power in both directions to check correct operation.
32. Check the Solenoid is aligned correctly and that it does not bind with the latch pins and sits centrally between the latch pin jaws in both open and closed positions.

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Replace GateCare NR2 Power Operated Gate Opener (POGO) Sub-Components		
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Actuator Replacement

DURING WORK

33. Locate and remove the green twelve-way terminal plug from the NR2 Control Board (Figure 1). The removal of this plug disables the red/green buttons, solenoids and N/C contact from a green aspect.
34. Unplug and move clear the X1 and X2 plugs (Figure 1). This disables the actuators.
35. Disconnect the actuator at the disconnection box.
36. If the actuator that is to be replaced is in the fully extended or fully retracted position disengage the latch pin at the gate end first. This allows you to measure the distance from the actuator shoulder to the end of the ram (Figure 4). This measurement allows the replacement actuator to be coarsely adjusted, to length, saving time during the adjustment phase.

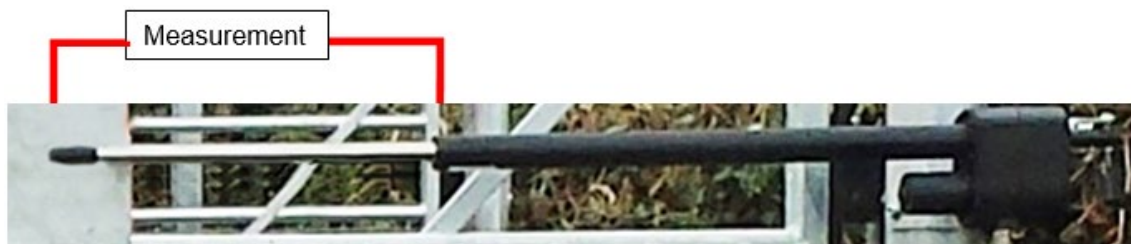


Figure 4 – Actuator Measurement

37. If you have a measurement taken in Step 36 you can now turn the ram section of the new actuator until the desired length is achieved.
38. Remove, replace and reconnect the actuator.

AFTER INSTALLATION WORK

39. Reconnect the X1, X2 and green 12-way termination plug.
40. Press the reset button.
41. Operate the gates on power in both directions to check correct operation.
42. Carry out a full adjustment and test as described in [NR/SMS/PartB/Test/084](#) (Power Operated Gate Opener Adjustment/Test).

NR2 Control Board Replacement

BEFORE INSTALLATION WORK

43. Check the replacement Control Board is of the correct type and is not damaged.

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NR/SMTH/Part04/LD21		
Replace GateCare NR2 Power Operated Gate Opener (POGO) Sub-Components		
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DURING WORK

44. Disconnect and mark all plugs and wires connected to the Control Board.
45. Note the settings on the three potentiometers at the top of the old Control Board and transfer these positions to the new Control Board.
46. Remove and replace the Control Board reconnecting all of the plugs and wires.

AFTER INSTALLATION WORK

47. Press the reset button.
48. Operate the gates on power in both directions to check correct operation.
49. Carry out a full adjustment and test as described in [NR/SMS/PartB/Test/084](#) (Power Operated Gate Opener Adjustment/Test).

Solar Panel Replacement

BEFORE INSTALLATION WORK

50. Check the replacement Solar Panel is of the correct type and is not damaged.

DURING WORK

51. Slip the Solar Panel cable links in the Control Box disconnection box.
52. Disconnect the Solar Panel cable one core at a time and insulation the exposed conductor.
53. Before installing the new Solar Panel check that the two core conductors are insulated.
54. Collapse the Solar Panel post in the approved manner
55. Remove and replace the Solar Panel.

AFTER INSTALLATION WORK

56. Reconnect the Solar panel at the disconnection box but do not replace the links.
57. Using a DC voltmeter, measure the DC voltage and confirm that it is between 17 and 22vDC volts on a sunny day (See Figure 5 and Table 1).



Figure 5 – Solar Panel Voltage Measurement

Weather conditions	Input voltage range
Bright and sunny	17 to 22 volts
Grey and cloudy	12.7 to 17 volts
Stormy and dark	Less than 12.7

Table 1 – Solar Panel Voltage Measurements

- 58. Replace the links.
- 59. Press the reset button.
- 60. Operate the gates on power in both directions to check correct operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD23		
Replace A Shunt (HXP-3)		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Replace a Shunt in the approach section of Level crossing using HXP-3 Predictor.
Excludes:	Replacement of components in the Island of the level crossing

Replacement of a single rail, removal of bonded out joints or minor sleeper replacement can be made without a track setup being undertaken provided the track voltage setup parameters as displayed on the level crossing predictor are unchanged from those on the record card.

If the values are not the same carry out the LIA adjustments [NR/SMS/Test/151](#)

To accurately predict a trains arrival time at the crossing, the HXP requires a linear change in the RX.

When connecting the hardwire shunt on an approach terminated with a NBS (Narrow Band Shunt) the RX will normally decrease to a value between "85" and "100", depending on the frequency and length of the approach.

When connecting the hardwire shunt on an approach terminated with a Wideband or Hardwire shunt, the RX should not change.

If a change is noted, check all connections and if the connections are good, replace the component.

BEFORE INSTALLATION WORK

1. Check that the replacement unit is of the Correct Type and is Not Damaged.
2. Wire Count existing unit to the wiring diagram.
3. Check existing wiring is Correctly Labelled.
4. Check and note Value of Loop Impedance (RX).
5. Check and note Value of Ballast Condition. (Phase Angle)
6. Check diagram to confirm replacement of Shunt is in the approach to the level crossing.
7. If rail is to be renewed mark positions of shunts to diagram.

AFTER INSTALLATION WORK

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD23		
Replace A Shunt (HXP-3)		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

8. If rails have been renewed check length of approach and position of replaced shunts to diagram.
9. Check wiring is replaced as labelled.
10. Check terminations are secure and suitably protected.
11. Place the STANDBY/AUTO/NORMAL switch on the Transfer Logic Module (TLM) in the NORMAL position.
12. Place the CW/MD switch on the Relay Driver Module (RYD) in the MD position.
13. Check RX is 100 or are within the tolerance values specified in the NR/SMS/PART C.
14. Place a hard wire shunt 10% in from the termination shunt (10% of the approach length inside the termination shunt i.e. at the marker positioned at 90% of the approach from the crossing).

A signal change (RX) of approximately 10% should be seen. If not, check all couplers and track connections.

15. Observe that a full crossing sequence occurs. (check the control tables for Stopping and non- stopping).
16. Remove the hard wire shunt.
17. Place the hardwire test shunt in the approach at the measured 50 percent point (measured from the nearest track wire connections).

⋮ The RX value at the 50 percent point should be half the value at step 4.

18. Remove the hard wire shunt.
19. Place the STANDBY/AUTO/NORMAL switch on the Transfer Logic Module (TLM) to the AUTO position.
20. Note the values of Loop Impedance, Phase Angle and Ballast Condition check to see that these are comparable to the values noted on mtce card, giving due consideration to any environmental changes which have occurred since the reading was first taken.
21. Test all affected track circuits [Voltage, current, drop shunt, pick-up shunt ([NR/SMS/Test/250 to 261](#))] and Record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD23		
Replace A Shunt (HXP-3)		
Issue No. 1	Issue Date: 03/03/18	Compliance Date: 31/05/18

- 22. Verify system operation by observing a minimum of one train normal move on the affected approach.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD30		
Replace a Coe 300 CCTV Module		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Any Coe module or 12V power supply feeding a Coe module. Also any repair to the fibre cable in the system.
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BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement item is correctly installed.
3. Carry out the tasks in [NR/SMS/TEST 047](#) following an alteration to the system.
4. Where there are two or more level crossings supervised by CCTV: Check that the picture of the correct level crossing appears on the correct monitor in the Signal box.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD32		
Replace a Newgate Barrier - Transformer		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine 110vac / 240vac Transformer
Excludes:	All other types of transformer

Before any work is undertaken possession of the Level Crossing shall be taken.

This equipment is rate at above 175 volts and reference shall be made to NR SIGELP 50002 – Safe Working Practises when Working on or near Signalling Power Distribution Equipment above 175 Volts

The unit shall not be powered up with any sub-component missing

Equipment Identification Image

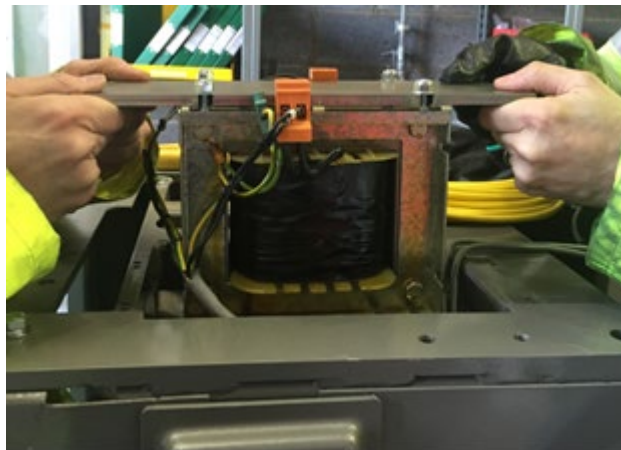


Figure 1 - 110vac / 240vac Transformer

BEFORE INSTALLATION WORK

1. Check replacement 110vac / 240vac Transformer is not damaged and is the correct Type.
2. Verify the barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
4. WIRE COUNT the Transformer and check the wires have safe insulation and are correctly labelled.
5. Remove the Transformer and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD32		
Replace a Newgate Barrier - Transformer		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

6. Check the Transformer is securely mounted.
7. WIRE COUNT the Transformer.
8. Remove barrier machine locking pin.
9. Reconnect the power supply to the machine.
10. Check barriers operate correctly by lowering and raising them.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD33		
Replace a Newgate Barrier - Door Access Safety Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine, Operators and Technicians doors
Excludes:	All other types of Door Safety Switch

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing

Equipment Identification Image



Table 1 - Door Safety Switch

BEFORE INSTALLATION WORK

1. Check replacement Safety Switch is not Damaged and is the Correct Type.
2. Verify the Barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
4. Isolate the Safety Switch by disconnecting the 24V Supply.
5. WIRE COUNT the Safety Switch and check the wires have safe insulation and are correctly labelled.
6. Remove the Safety Switch and label it as faulty.

AFTER INSTALLATION WORK

7. Check the Safety Switch is securely mounted.
8. WIRE COUNT the Safety Switch.
9. Verify door(s) closes and locks correctly.
10. Reconnect the Safety Switch Supply

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD33		
Replace a Newgate Barrier - Door Access Safety Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

11. Reconnect the power supply to the barrier machine.
12. Remove barrier machine locking pin.
13. Observe the lower & raise sequence.
14. Open the door and verify the barrier fails not operate.
15. Recheck the lower & raise sequence.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD34		
Replace a Newgate Barrier - BLSS Limit Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine BLSS Limit Switches
Excludes:	All other types of Limit Switch

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing

Equipment Identification Image



Figure 1 - BLSS Limit Switches

BEFORE INSTALLATION WORK

1. Check replacement Limit Switch is not damaged and is the correct Type.
2. Verify the barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
4. Isolate the Limit Switch by disconnecting the 24V supply.
5. WIRE COUNT the Limit Switch and check the wires have safe insulation and are correctly labelled.
6. Remove the Limit Switch and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD34		
Replace a Newgate Barrier - BLSS Limit Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

DURING THE WORK

7. Unlock and lower the barrier by hand to allow the Limit Switch mounting plate to be correctly positioned.

AFTER INSTALLATION WORK

8. Check the Limit Switches is securely mounted to the mounting plate.
 - Fixings shall be torqued to 6.8 Nm.
9. WIRE COUNT the Limit Switch.
10. Check the clearance between the limit switch and its cam by inserting a 1.5mm detection gauge, as shown in Figure 2.
11. Reconnect the Limit Switch supply.
12. Remove the 1.5mm gauge and offer up a 2mm detection gauge, this gauge should not be able to be inserted between the limit switch and its cam, as shown in Figure 3.



Figure 2 - 1.5 mm gauge (Inserted)



Figure 3 - 2 mm gauge (Unable to insert)

13. Release the Barrier locking pin and hand pump the barrier to the up position.
14. Reconnect the power supply to the barrier machine.
15. Observe the lower & raise sequence.
16. Check barrier down input is received by VIO module.
17. If possible, observe the passage of a train in both directions.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD35		
Replace a Newgate Barrier - Control Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine Control Module
Excludes:	All other types of Barrier Machine Control Module

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing

Equipment Identification Image



Figure 1 - Control Module

BEFORE INSTALLATION WORK

1. Check replacement control Module is not damaged and the software version, is the same or later, IP address as recorded on Label.
2. Verify the barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
4. WIRE COUNT the Control Module and check the wires have safe insulation and are correctly labelled.
5. Remove the Control Module and label it as faulty.

AFTER INSTALLATION WORK

6. Check the Control Module is securely mounted.
7. WIRE COUNT the Control Module and confirm all the plugs are pushed home.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD35		
Replace a Newgate Barrier - Control Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

8. Reconnect the power supply to the barrier machine
9. Remove barrier machine locking pin.
10. Observe the lower & raise sequence.
11. Verify Operation of the barrier machine by lowering and raising the barriers.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD36		
Replace a Newgate Barrier - Proximity Switch Assembly		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	NGR18000 Newgate Barrier Proximity Switch Assemble
Excludes:	Newgate Individual Proximity Switches and All other types of Proximity Switches

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing.

Individual Proximity Switches shall not be changed

Equipment Identification Image

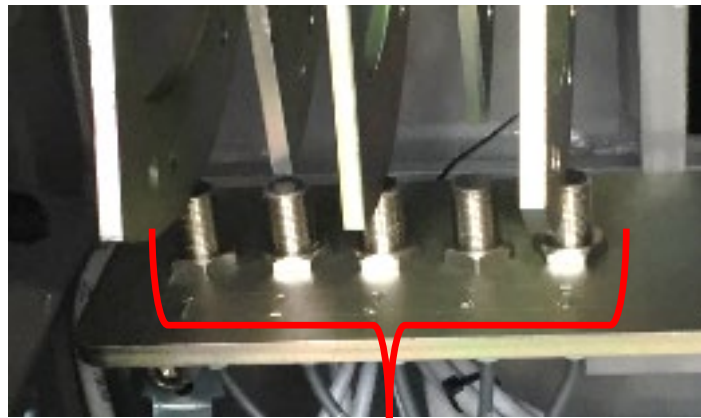


Figure 1 - Proximity Switches

BEFORE INSTALLATION WORK

1. Check replacement Proximity Switch Assembly is not damaged.
2. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
3. Verify the barrier is in a locked position using barrier machine locking pin.
4. WIRE COUNT the Proximity Switch Assembly and check the wires have safe insulation and are correctly labelled.
5. Remove the Proximity Switch Assembly, mark the failed switch and label the whole assembly as faulty.

AFTER INSTALLATION WORK

6. Check the Proximity Switch is secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD36		
Replace a Newgate Barrier - Proximity Switch Assembly		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

7. WIRE COUNT the Proximity Switch and check the wires have safe insulation and are correctly labelled.
8. Remove barrier machine locking pin and position the barrier as required for testing.
9. With the barrier in both the raised and lowered positions, check the clearance between each of the proximity switches and its cam by inserting a 1.5mm detection gauge. Remove the 1.5mm gauge and offer up a 2mm detection gauge and check that this gauge cannot be inserted.

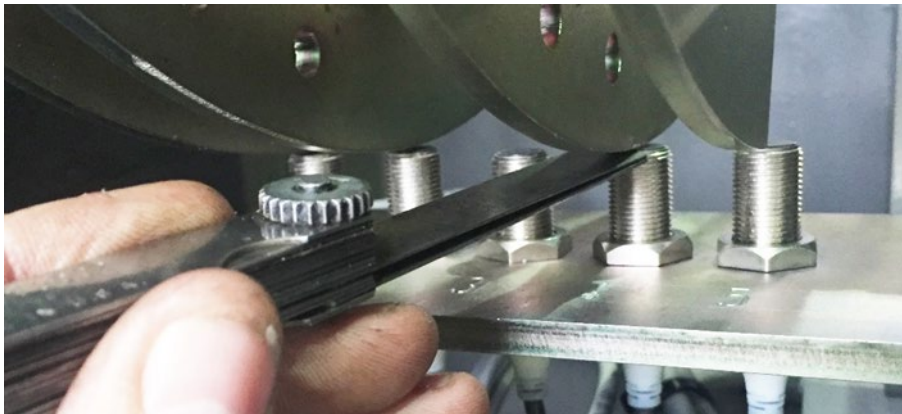


Figure 2 - Position of gauges with the 1.5 mm gauge (Inserted)

10. Hand pump the barrier to the raised position.
11. Check thread lock has been applied.
12. Reconnect machine to power supply
13. Check barriers operate correctly.
14. Apply anti-tamper paint.



END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD37		
Replace a Newgate Barrier - Hand Pump		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine Hand Pump Assembly
Excludes:	All other types of Hand Pump Assembly

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing.

Equipment Identification Image



Figure 1 - Hand Pump

BEFORE INSTALLATION WORK

1. Check replacement Hand Pump Assembly is not damaged.
2. Check an environmental spillage kit and waste oil container are both available.
3. Verify the barrier is in raised position and locked off using barrier machine locking pin.
4. Isolate the barrier machine at the LXP fuse links.
5. Remove the Hand Pump Assembly and label as faulty.

AFTER INSTALLATION WORK

6. Visually check for signs of oil seepage.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD37		
Replace a Newgate Barrier - Hand Pump		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

7. Remove barrier machine locking pin.
8. Release plunger on manual hand pump.
9. Release motor brake lever and secure in manual position.
10. Toggle pump direction lever to the right to lower the boom.
11. Manually pump to lower barrier. (During pumping observe oil level does not drop below minimum level, top up to minimum as required).
12. Check hand pump for ease of operation.
13. Toggle pump direction lever to the left to raise the boom.
14. Manually pump to raise barrier.
15. Manually raise and lower the barrier a minimum of three times. Leaving the barrier in the raised position.
16. Recheck oil level again.
17. Recheck for leaks from cylinder pipes and couplings.
18. Reconnect machine to power supply.
19. Raise and lower the barrier a minimum of three times on power. Leaving the barrier in the raised position.
20. Check for leaks from cylinder pipes and couplings.
21. Check oil level is correct.
22. If possible, observe a train over the crossing both directions.
23. Dispose of any contaminated items as per NR Environmental Policy

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD38		
Replace a Newgate Barrier - Hydraulic Hose or Damper Cylinder		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Hydraulic Hoses and Damper Cylinders
Excludes:	All other types of Hydraulic Hoses and Damper Cylinders

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing.

For details of the removal process see NRSMS Appendix 24 section 7.

Equipment Identification Image



Figure 1 - Hydraulic Hose

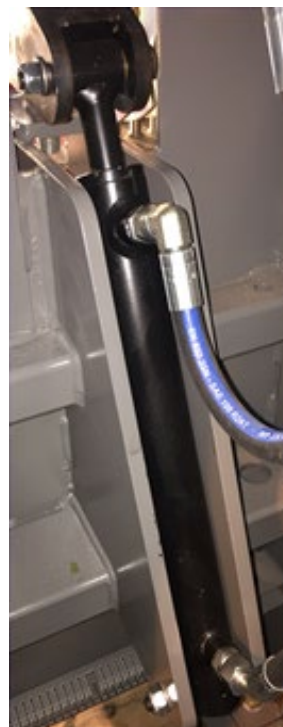


Figure 2 - Damper Cylinder

BEFORE INSTALLATION WORK

1. Check replacement Hydraulic Hose or Damper Cylinder is not damaged.
2. Check an environmental spillage kit and waste oil container are both available.
3. Verify the barrier is in raised position and locked off using barrier machine locking pin.
4. Isolate the barrier machine at the LXP fuse links.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD38		
Replace a Newgate Barrier - Hydraulic Hose or Damper Cylinder		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

5. Remove the Hydraulic Hose or Damper Cylinder and label as faulty.

AFTER INSTALLATION WORK

6. Visually check for signs of oil seepage.
7. Manually pump to raise barrier.
8. Manually raise and lower the barrier a minimum of three times. Leaving the barrier in the raised position.
9. Recheck oil level again.
10. Check for leaks from cylinder pipes and couplings.
11. Reconnect machine to power supply.
12. Raise and lower the barrier a minimum of three times on power. Leaving the barrier in the raised position.
13. Check for leaks from cylinder pipes and couplings.
14. Check oil level is correct.
15. If possible, observe a train over the crossing both directions.
16. Dispose of any contaminated items as per NR Environmental policy.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD39		
Replace a Newgate Barrier – Brake Release Safety Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier - Interlocking Brake Release Safety switch
Excludes:	All other types of Brake Release

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing.

Equipment Identification Image



Figure 1 - Interlocking Safety Switch Brake Release

BEFORE INSTALLATION WORK

1. Check replacement Safety Switch is not damaged and is the correct Type.
2. Release the manual brake.
3. Verify the barrier is in the raised position and locked off using the barrier machine locking pin.
4. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals.
5. WIRE COUNT the Safety Switch and check the wires have safe insulation and are correctly labelled.
6. Remove the Safety Switch and label it as faulty.

AFTER INSTALLATION WORK

7. Check the Safety Switch is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD39		
Replace a Newgate Barrier – Brake Release Safety Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- Fixings shall be torqued to 1.5 Nm.

8. WIRE COUNT the Safety Switch.
9. Reconnected the Barrier Machine supply
10. Remove the Barrier Locking Pin.
11. Check barriers don't operate with motor brake lever disengaged.
12. Engage motor brake lever.
13. Check barriers operate correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD40		
Replace a Newgate Barrier – Locking Pin Safety Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine – Locking Pin Safety Switch
Excludes:	All other types of Safety Switch

Before any work is undertaken possession of the Level Crossing shall be taken.

The unit shall not be powered up with any sub-component missing

Equipment Identification Image



Figure 1 - Locking Pin Safety Switch

BEFORE INSTALLATION WORK

1. Check replacement Safety Switch is not damaged and is the correct Type.
2. Remove the Safety Switch.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a volt meter on the input terminals.
4. Remove the Safety Switch and label it as faulty.

AFTER INSTALLATION WORK

5. Check the Safety Switch is securely mounted.
6. Check barriers don't operate with Safety Switch disengaged.
7. Engage the Safety Switch.
8. Check barriers operate correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD41		
Replace a Newgate Barrier – Barrier Cage		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18001 Newgate Barrier Cage
Excludes:	All other types of barrier machine cage

Before any work is undertaken possession of the Level Crossing shall be taken.

For information relation to the removal and refitting of both the front and side cages refer to [NR/SMS/Appendix/24](#) - General Information for the Newgate Barrier System

BEFORE INSTALLATION WORK

1. Check replacement Cage is complete, not Damaged and is the Correct Type.
2. Verify the barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links.
4. Check Guard Assembly has not damaged barrier machine.

AFTER INSTALLATION WORK

5. Check all fixings are secure.
6. Check guard position and clearances.

For detail of the clearances refer to [NR/SMS/PartC/LC32](#) - Barrier Machine: Newgate, section 4.2
7. Reconnect machine to power supply.
8. Remove barrier machine locking pin.
9. Check barriers operate correctly.
10. If possible, observe a train over the crossing both directions.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD42		
Replace a Newgate Barrier Machine - Heater and Thermostat		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	NGR18000 Newgate Barrier Machine, Heater and Thermostat units.
Excludes:	All other types of Heater and Thermostat

Before any work is undertaken possession of the Level Crossing shall be taken.

The barrier machine shall not be powered up with any sub-component missing.

If either a Heater or Thermostat unit fail, then both units shall be replaced at the same time.

Equipment Identification Image

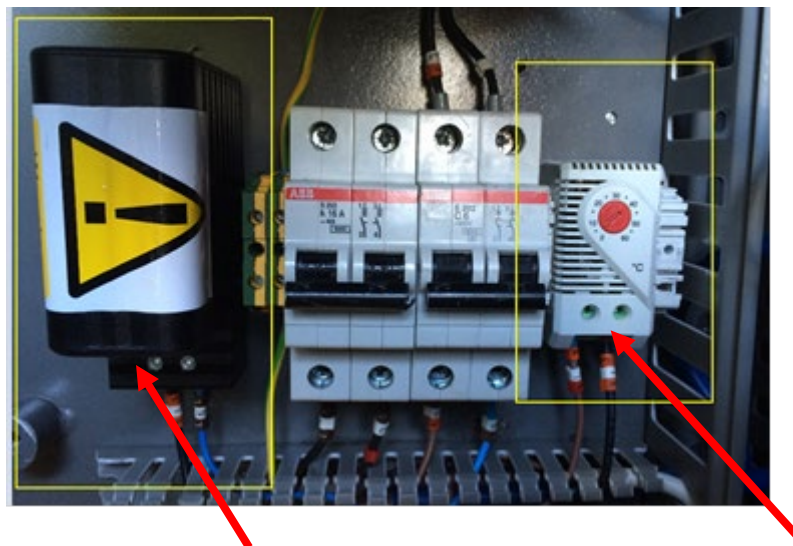


Figure 1 - Heater

Figure 2 - Thermostat unit

BEFORE INSTALLATION WORK

1. Check replacement Heater and Thermostat units are not damaged and are the correct type.
2. Verify the barrier is in raised position and locked off using barrier machine locking pin.
3. Isolate the barrier machine at the LXP fuse links, verify this by using a meter on the input terminals of both the Heater and Thermostat unit.
4. Allow time for the Heater to cool before handling.
5. WIRE COUNT the Heater and Thermostat units and check the wires have safe insulation and are correctly labelled.
6. Remove the Heater and Thermostat units and label both as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD42		
Replace a Newgate Barrier Machine - Heater and Thermostat		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER RE-INSTALLATION WORK

7. Check the Heater and Thermostat units are securely mounted.
8. WIRE COUNT the Heater and Thermostat units.
9. Reconnect the power supply to the barrier machine.
10. Remove barrier machine locking pin.
11. Adjust the Thermostat unit to zero and verify the heater unit starts to warm.
12. Re-adjust the Thermostat unit to its working temperature of 25 degrees.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD50		
Replace a Digital Barriers X-Net Unit		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Digital Barriers X-Net Encoder & Decoder Switch
Excludes:	All other types of Encoder - Decoder Switch / Unit

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Images

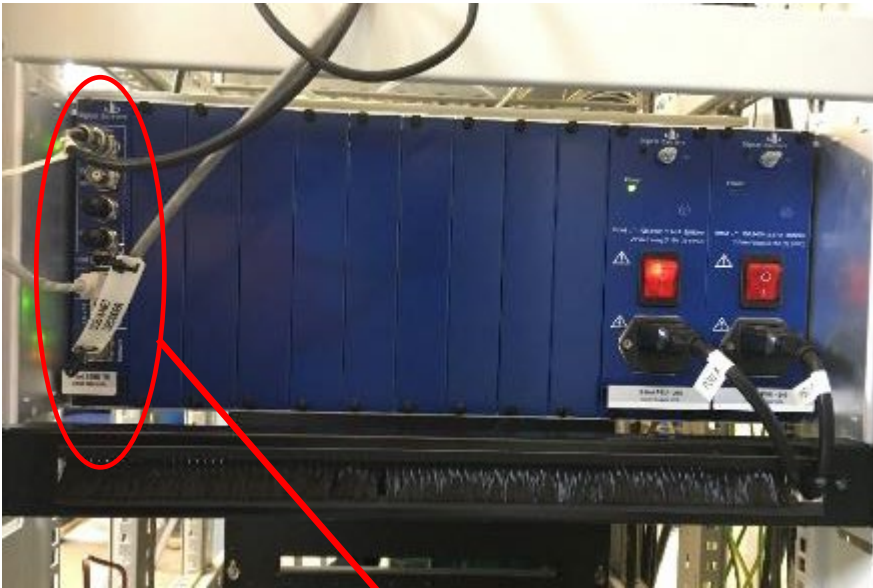


Figure 1 - X-Net Decoder Switch in situ



Figure 2 - X-Net Encoder Switch

BEFORE INSTALLATION WORK

1. Check that the replacement Unit is of the Correct Type and is Not Damaged.
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Unit.
4. WIRE COUNT the Unit and check all the wires have safe insulation and are correctly labelled.
5. Remove the wires from the Unit and insulate them.
6. Remove the unit and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD50		
Replace a Digital Barriers X-Net Unit		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

7. Check that the replaced Unit is securely mounted.
8. [WIRE COUNT](#) the Unit and check all cables are correctly installed and secure.
9. For Decoder and Encoder, carry out configuration as shown in ASM Configuration Documentation.
10. Observe or ask the Signaller to observe the CCTV Monitor is displaying the correct picture.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD51		
Replace an X-Net PSU 240V Power Supply Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Digital Barriers X-Net PSU 240V Power Supply Unit
Excludes:	All other types of Power Supply Unit

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - X-Net PSU 240V

BEFORE INSTALLATION WORK

1. Check that the replacement PSU is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty PSU.
4. Place the power switch to the OFF position.
5. Check all cables are correctly labelled.
6. Remove the input 240V cable.
7. Remove PSU and label as faulty.

AFTER INSTALLATION WORK

8. Check the replaced PSU is securely mounted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD51		
Replace an X-Net PSU 240V Power Supply Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

9. Reconnect the input 240V cable.
10. Place the power switch to the ON position.
11. Verify the Power LED is illuminated Green.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD52		
Replace an X-Net Encoder PSU		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	X-Net Encoder PSU 110-240Vac/12Vdc 1.25A
Excludes:	All other types of PSU

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - X-Net Encoder PSU

BEFORE INSTALLATION WORK

1. Check that the replacement PSU is of the Correct Type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty PSU.
4. Disconnect the PSU from the power source.
5. WIRE COUNT the unit and check for safe insulation.
6. Remove the PSU wires from the interface terminals (See Figure 2).
7. Remove the PSU and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced PSU is securely mounted.
9. Connect PSU wires from the interface terminals.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD52		
Replace an X-Net Encoder PSU		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

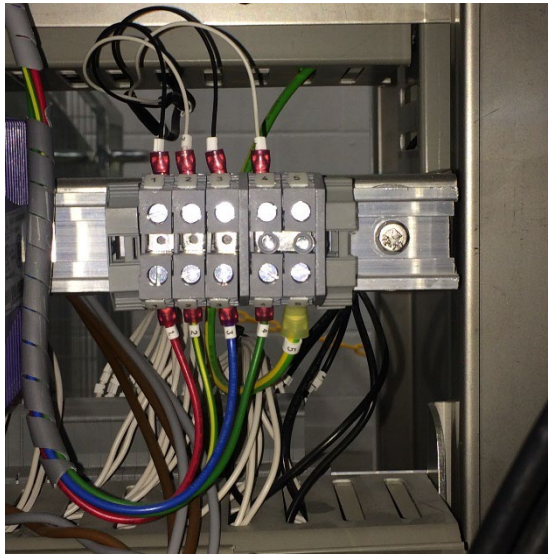


Figure 2 - X-Net Encoder PSU Interface

10. WIRE COUNT the PSU interface and check all cables are correctly installed and secure.
11. Re connect power supply and check the PSU output is within Nominally 12vdc and the correct polarity (refer to maintenance drawings).
12. Check the PSU unit is working using X-Net web interface to confirm power from the replaced unit operating.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD58		
Replace a Level Crossing Filament Light Unit		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Road signal filament light unit, Miniature Stop Light (MSL) unit
Excludes:	LCU Door lock keylock, and Gate drive equipment Road signal LED SLM light unit, Miniature Stop Light (MSL) unit

GENERAL

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement unit to the wiring diagrams.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check lenses are of correct type (colour) and are correctly installed in the replacement unit (any rubber seals are seated correctly).
11. Check that the hoods are correctly fitted and are secure in the replacement unit.
12. Check that the correctly rated lamps are installed.
13. Check that all the lamps (main and any auxiliary) illuminate correctly and test for correct voltages [NR/SMS/PartZ/Z01](#) (Signal – Reference Values) - Lamp voltage.

Record the test measurements on the NR/SMS record card, together with the reason for the test.
14. Check the alignment and height of replacement unit for public use (see HMRI guidance and crossing section order). Check that the coloured lights cannot be misread as signal aspects by train drivers.
15. Check flashing rate of lights [NR/SMS/PartZ/Z04](#) (Level Crossing – Reference Values), (RED ROAD LIGHTS ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD58		
Replace a Level Crossing Filament Light Unit		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

16. [EARTH TEST](#) supply throughout operation cycle.
17. Test that the red road lamps are proved as shown in the (NR/SMS/LX series), (RED ROAD LIGHTS ONLY).
18. If proved, check all indications back to the relevant signal box.
19. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD60		
Replace a BR843 Level Crossing Barrier Pedestal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	BR843 Level Crossing Barrier Pedestals
Excludes:	Any other type of Level Crossing Barrier Pedestal

Different hydraulic packs are fitted to ABCL, AOCL+B, AFBCL and some MCB (check the design details) level crossings. A blue hydraulic pack shall not be fitted to any other type of level crossing.

Any other hydraulic pack other than one coloured blue shall not be fitted to an ABCL, AOCL+B or AFBCL.

See [NR/SMS/PartC/LC00](#) (Level Crossings General) for more details on the two types.

The auto/manual valve on the hydraulic pack shall be in the Auto position for all automatic crossings except AFBCL.

For AFBCL and manually controlled crossings the valve shall be set to Manual.

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type (Mode of Operation).
2. Check existing concrete pedestal base is capable of undergoing the proposed renewals.
3. Check all fixing bolts are secure, free from corrosion and capable of sustaining load.
4. Check existing earth clamps/conductors are in place and there is continuity to an effective earth.
5. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#).
6. Check any circuits that can be isolated to the diagrams and isolate any incoming supplies at source.
7. [WIRE COUNT](#) all terminated wiring/cables to the diagrams.
8. Check any cabling corresponds to the diagrams and the cores are correctly labelled (individually) and are unambiguous with other cables.
9. Remove any detachable units i.e. hydraulic power packs, barrier boom arm, counter balance weights (noting positioning and quantity) and store in the transit box provided.
10. Check any Damp Proof Membrane (DPM) is in place.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD60		
Replace a BR843 Level Crossing Barrier Pedestal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

AFTER INSTALLATION WORK

11. Check pedestal is sitting squarely on base and is level.
12. Check pedestal is held firmly by all four fixing bolts/anchors.
13. Check Barrier Boom is correctly fitted and secure. See [NR/SMTH/Part04/LD01](#) (Replace a Barrier Boom) and [NR/SMTH/Part04/EL11](#) (Replace a Push Button or Switch Unit).
14. Check the earth continuity conductors are refitted, clearly labelled and effective.
15. [WIRE COUNT](#) all terminated wiring/cables to the diagrams.
16. Carry out correlation check, where more than cable core/wire has been removed at once.
17. Check the hydraulic pack is correctly installed, is the correct type for the crossing type, it is secure, and any damping devices are effective. See [NR/SMTH/Part04/LD02](#) (Replace a Barrier Power Pack).
18. Check trunnion bolts and spiral pins have been correctly installed for the hydraulic pack to pedestal fastenings.
19. Check that the Boom CR plug units are effective for each boom.
20. Check that any counter balance weights are correctly positioned and effective.
21. Check all fuses, links and red dome nuts are correctly re-installed and supplies to the pedestal are properly reinstated.
22. Check any contacts/bands in all circuits are effective to the final function using an angle meter.
23. Check that any contacts controlled by the relative position/angle of the boom arm are set correctly with angle meter.
24. Carry out [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#).
25. Check (if provided) any Earth Leakage Detectors (ELD) are reset 'clear' at the source location/REB.
26. Check wires and cables are secure and clear of any moving parts or gearing.
27. Check exterior doors of pedestal are secured and any 'Tamper' devices are effective. See [NR/SMTH/Part04/EL11](#) (Replace A Push Button or Switch Unit).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD60		
Replace a BR843 Level Crossing Barrier Pedestal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

28. Check Barrier skirt is fitted correctly and linkage to pedestal is secured. See [NR/SMTH/Part04/LD01](#) (Replace a Barrier Boom).
29. Fully test all Barrier functions and operation [NR/SMS/PartC/LC21](#) (Barrier Machine BR Spec 843) and [NR/SMS/PartC/LC10](#) (Level Crossings Operational Sequences).
30. Check (if provided) protection cage is in place and secure.
31. Check and local control functions are restored to remote or auto working.
32. If practical observe passage of trains in each direction.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LD61		
Replace an LCSS Cincoze DS-1200 – Maintenance PC		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Cincoze DS-1200 PC
Excludes:	All other types of Maintenance PC

Equipment Identification Image



Figure 1 - Cincoze DS-1200 PC

BEFORE INSTALLATION WORK

1. Check replacement PC is correct type and is not damaged.
2. [WIRE COUNT](#) the PC and check for safe insulation and correct labelling.
3. Power down the PC.
4. Disconnect the power supply.
5. Disconnect the cables.
6. Remove the PC and label as faulty.

AFTER INSTALLATION WORK

7. Check the PC is mounted securely.
8. Reconnect the cables and [WIRE COUNT](#) the PC.
9. Reconnect the power supply.
10. Power up the PC.
11. Connect to the Network using Maintenance Laptop - Remote Desktop.
12. Log on to LCSS and confirm the status of the components and alarms.
13. Check that the replacement PC unit is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE22		
Replace a Vamos Crossing System Sub-Component (Power Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Sub-Component parts associated with the Vamos Level Crossing system
Excludes:	All other types of Level Crossing

General

Before any work is undertaken possession of the Vamos Level Crossing system shall be taken. Inform the Signaller that the level crossing system shall be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the unit fuse links. The unit shall not be powered up with any sub-component missing.

BEFORE INSTALLATION WORK

1. Isolate the Vamos equipment from the power supply by switching off both of the circuit breakers.
2. Check the status window shows "0" when in the "Off" position.
3. For all of the items listed in the sub sections that follow check that the replacement sub-component is of the correct type and is not damaged.



Figure 1 - Circuit Breakers

After carrying out the "BEFORE INSTALLATION WORK" the Technician should identify the item to be replaced from the underlined sub sections in this document and carry out the steps associated with that item.

AFTER INSTALLATION WORK

Internal Equipment

Power Supply Circuit Breakers

Before carrying out this task the power supply shall be isolated at a point in the power supply circuit before it arrives at the Vamos location case. You shall prove the circuit breakers are dead before proceeding with their replacement.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE22		
Replace a Vamos Crossing System Sub-Component (Power Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

4. Disconnect the incoming supply and outgoing cables.
5. Release the module from mounting rail.
6. Mount new unit and check it is securely mounted on the rail.
7. Reconnect incoming and outgoing supply cables.



Figure 2 - Circuit Breakers

Mains Supply Surge Arrestor

Due to the proximity of the incoming power supply before carrying out this task the power supply shall be isolated at a point in the power supply circuit before it arrives at the Vamos location case. You shall prove the surge arrestors are dead before proceeding with their replacement.

8. Disconnect the incoming and outgoing supply cables.
9. Release the unit from mounting rail.
10. Mount new unit and check it is securely mounted on the rail.
11. Reconnect incoming and outgoing supply cables.
12. Check the indication window is green.



Figure 3 - Surge Arrestors

PULS Power Supply Unit

13. Disconnect the incoming supply and outgoing cables.
14. Release the module from mounting rail.
15. Mount new unit and check it is securely mounted on the rail.
16. Reconnect incoming and outgoing supply cables.
17. Power up unit and check the “DC ok” LED is lit.
18. Check the red “overload” LED is not lit (if it is a short circuit is present).



Figure 4 – PULS Power Supply Unit

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE22		
Replace a Vamos Crossing System Sub-Component (Power Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

PULS Buffer Module

19. Disconnect the incoming supply and outgoing cables.
20. Release the module from mounting rail.
21. Mount new unit and check it is securely mounted on the rail.
22. Reconnect incoming and outgoing supply cables.
23. Power up unit and check the “Status” LED is lit. If the “Diagnosis” or “Warning” LED’s are lit these shall be investigated.
24. Check the red “overload” LED is not lit (if it is a short circuit is present).



Figure 5 – PULS Buffer Unit

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE23		
Replace a Vamos Crossing System Sub-Component (Modular Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Sub-Component parts associated with the Vamos Level Crossing system
Excludes:	All other types of Level Crossing

General

Before any work is undertaken possession of the Vamos Level Crossing system shall be taken. Inform the Signaller that the level crossing system shall be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the unit fuse links. The unit shall not be powered up with any sub-component missing.

BEFORE INSTALLATION WORK

1. Isolate the Vamos equipment from the power supply by switching off both of the circuit breakers.
2. Check the status window shows "0" when in the "Off" position.
3. For all of the items listed in the sub sections that follow, check that the replacement sub-component is of the correct type and is not damaged.



Figure 1 - Circuit Breakers

After carrying out the "BEFORE INSTALLATION WORK" the Technician should identify the item to be replaced from the underlined sub sections in this document and carry out the steps associated with that item.

AFTER INSTALLATION WORK

Telemetry Module

4. Disconnect the incoming supply and outgoing cables.
5. Disconnect the antenna.
6. Release the module from mounting rail.
7. Mount new unit and check it is securely mounted on the rail.
8. Remove Sim Card and SD Card.

9. Reconnect incoming and outgoing supply cables.
10. Reconnect the antenna.
11. Replace SIM Card and SD Card. |
12. Power up unit (if possible) and check the following green LED's are lit: "Power" "GSM" or "GPRS".
13. Check the green "Accu" LED is not lit (this is not in use).
14. Check the interface screen is displaying data.
15. Attach an approved Laptop loaded with the MTC Program and add the crossing details and Dogfish reporting number (if the SIM card has been replaced update Dogfish).

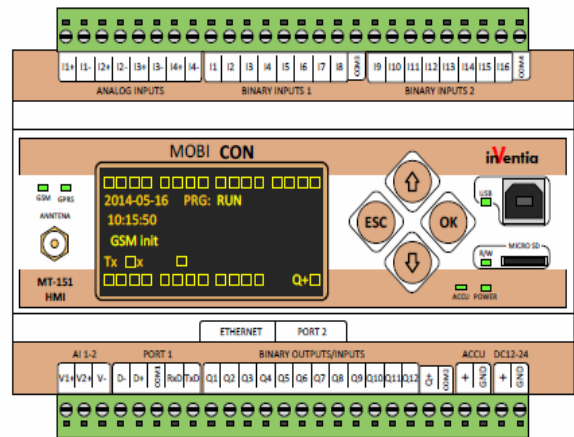


Figure 2 – Telemetry Module

Safety Module

16. Disconnect the incoming supply and outgoing cables.
17. Release the module from mounting rail.
18. Mount new unit and check it is securely mounted on the rail.
19. Reconnect incoming and outgoing supply cables.
20. Power up unit and check the following LED's are lit/flashing either yellow or green:
 - a) "SD"
 - b) "LF"
 - c) "G"
 - d) "R"

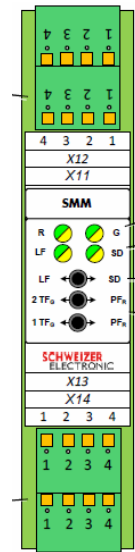


Figure 3 – Safety Module

Actuator Module

21. Disconnect the incoming supply and outgoing cables.
22. Release the module from mounting rail.
23. Mount new unit and check it is securely mounted on the rail.
24. Reconnect incoming and outgoing supply cables.

25. Power up unit and check the following LED's are lit/flashing either yellow or green:

- a) "HW"
- b) "Life"
- c) "Train Detection"
- d) "Out 1"
- e) "Out 2"

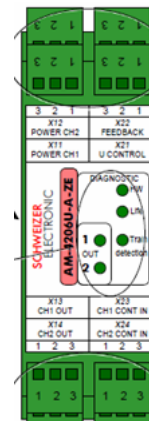


Figure 4 – Actuator Module

Acoustic Signal Generator

- 26. Disconnect the incoming supply and outgoing cables.
- 27. Release the module from mounting rail.
- 28. Mount new unit and check it is securely mounted on the rail.
- 29. Reconnect incoming and outgoing supply cables.
- 30. Check the volume levels for both day and night time modes are the same as set on the existing unit

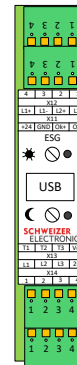


Figure 5 - Acoustic Signal Generator

Backplane (Train Detection)

- 31. Note the order and position of each IMC board, then remove and store them safely.
- 32. Disconnect the incoming supply and outgoing cables.
- 33. Note the position of the parameterization jumpers above each card slot. Check the parameterization jumpers on the replacement backplane match those on the backplane being replaced.
- 34. Remove the backplane and fit replacement.
- 35. Reconnect the incoming supply and outgoing cables.
- 36. Replace the IMC Boards.
- 37. Power up unit and check the green power LED's are lit on each card.

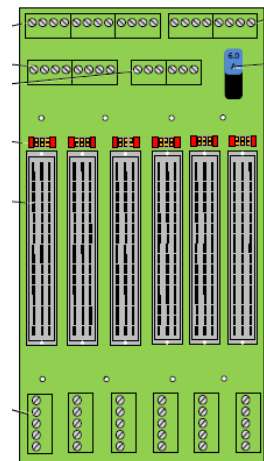


Figure 6 - Backplane

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE23		
Replace a Vamos Crossing System Sub-Component (Modular Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

38. Carry out [NR/SMS/PartB/Test/157](#) (Frauscher: RSR 123 Wheel Sensor Adjustment - associated with IMC Boards) - Section 3 Wheel Sensor Test (Detection Capability).

Coupling Relays

- | These relays are not currently in use and therefore shall not be tampered with.

ICM Boards

- | See [NR/SMTH/Part04/AX50](#) (Replace a Frauscher IMC Board).

BSI005 (Lightning Protection Unit)

- | See [NR/SMTH/Part04/AX44](#) (Replace an Overvoltage Protection Unit BSI005).

Contracting Terminals/Terminal Blocks

- | See [NR/SMTH/Part04/EL06](#) (Replace a Terminal Block).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE24		
Replace a Vamos / Flex Crossing System Sub-Component (External Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Sub-Component parts associated with the Vamos Level Crossing system
Excludes:	All other types of Level Crossing

General

Before any work is undertaken possession of the Vamos Level Crossing system shall be taken. Inform the Signaller that the level crossing system shall be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the unit fuse links. The unit shall not be powered up with any sub-component missing.

BEFORE INSTALLATION WORK

1. Isolate the Vamos equipment from the power supply by switching off both of the circuit breakers.
2. Check the status window shows "0" when in the "Off" position.
3. For all of the items listed in the sub sections that follow check that the replacement sub-component is of the correct type and is not damaged.



Figure 1 - Circuit Breakers

After carrying out the "BEFORE INSTALLATION WORK" the Technician should identify the item to be replaced from the underlined sub sections in this document and carry out the steps associated with that item.

AFTER INSTALLATION WORK

LED Red and Green User Visual Indications

4. Disconnect the incoming supply.
5. Remove and replace the LED unit.
6. Reconnect the incoming supply.
7. Check the new unit illuminates by simulating the passage of a train.



Figure 2 - Visual Indications

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LE24		
Replace a Vamos / Flex Crossing System Sub-Component (External Equipment)		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Warning Speaker

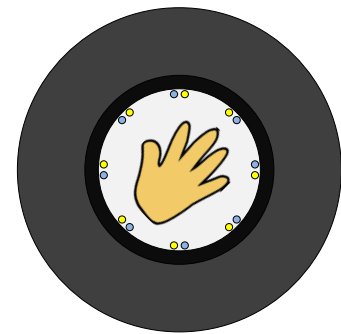
8. Disconnect the incoming supply.
9. Remove and replace the warning speaker unit.
10. Reconnect the incoming supply.
11. Check the new unit sounds the correct warning for both single and a second train approaching, by simulating the passage of train/trains.
12. Check and adjust the sound levels as required.



Figure 3 – Warning Speaker

On Demand Button

13. Disconnect the incoming supply.
14. Remove and replace the button unit.
15. Reconnect the incoming supply.
16. Check the new unit operates correctly and that the red LED is illuminated when the crossing is in “Standby Mode”.
17. Check that when the button is pressed the correct LED red and green user visual indications are displayed.



**Figure 4 -
On Demand
Button**

END

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NR/SMTH/Part04/LF01		
Replace a Flex Crossing - Sub-Components - Power		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Power Supply Circuit Breakers b) Mains Supply Surge Arrestor c) AKKUTEC Battery charger/AC adapter d) Main's filter e) Isolation Transformer
Excludes:	All other Flex Components and types of Level Crossing

GENERAL

Before any work is undertaken possession of the Flex Level Crossing system shall be taken. The Signaller shall be informed that the level crossing system will be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the incoming disconnection links. The unit shall not be powered up with any sub-component missing.

This SMTH Test Plan contains multiple items of equipment, to use it correctly the tester shall carry out the **BEFORE INSTALLATION WORK** and following the completion of the work carry out the **AFTER INSTALLATION WORK** steps for the item replaced.

BEFORE INSTALLATION WORK (All Sub-Components)

1. Check that the replacement sub-component is of the correct type and is not damaged.
2. Isolate Flex equipment from the power supply by disconnection of the incoming supply at the disconnection links.
3. Isolate the corresponding 24V MCB's and the battery back-ups, by removing the fuse in the battery interconnection.
4. Check the status window shows "0" when in the "Off" position, see Figure 1.
5. If applicable, [WIRE COUNT](#) the existing wiring to wiring diagram and disconnect outgoing cables.
6. If applicable, check any external wires connected to existing equipment are correctly labelled.
7. If applicable, check existing wiring has safe insulation.



Figure 1 - Incoming supply switch

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AFTER INSTALLATION WORK

Power Supply Circuit Breakers

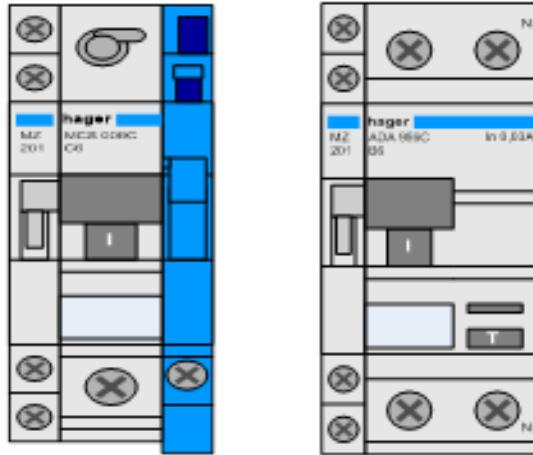


Figure 2 - Miniature Circuit Breakers MCB's and Residual Current Circuit Breakers RCCB's

8. Check Circuit breaker is correctly installed and securely mounted.
9. Check wiring is replaced as labelled and is securely terminated.
10. Carry out a [WIRE COUNT](#) to wiring diagram.
11. Power on the circuit breaker and monitor voltage. Confirm it is within specification.
12. Check the operation of circuit breaker by turning it to the off "0" position. Reinststate to the on "1" position.

Mains Supply Surge Arrestor

13. Check surge arrestors are correctly installed and securely mounted.
14. Check wiring is replaced as labelled and is securely terminated.
15. Carry out a [WIRE COUNT](#) to wiring diagram.
16. Reinststate power supply that was isolated
17. Check the indication window is green, see Figure 3.



Figure 3 - Mains Supply Surge Arrestor

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AKKUTEC Battery charger/AC adapter

- 18. Check unit is correctly installed and securely mounted.
- 19. Check wiring is replaced as labelled and is securely terminated.
- 20. Carry out a [WIRE COUNT](#) to wiring diagram.
- 21. Power up unit and check the “operation” LED is on and green.
- 22. Simulate a power failure, by disconnecting the battery, and check “fault” led is on and red, see Figure 4.
- 23. Check that both the condition LEDs are illuminated and displaying green.

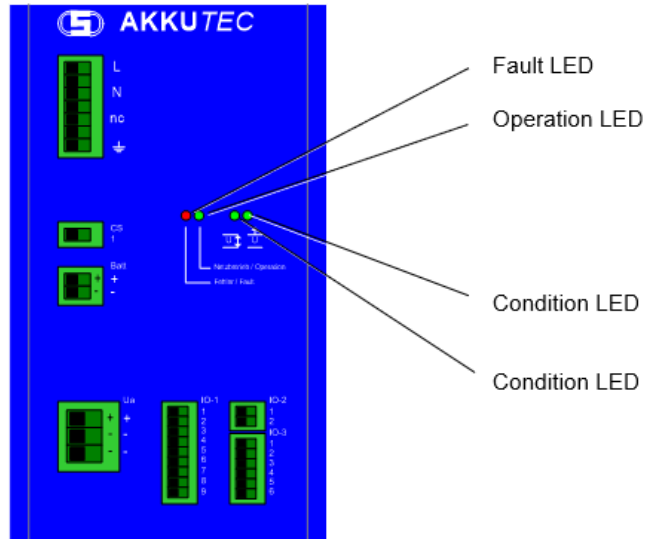


Figure 4 - AKKUTEC Battery charger/AC adapter

Main's filter

- 24. Check mains filter is of the type and correctly installed and securely mounted, see Figure 5.
- 25. Check wiring is replaced as labelled and is securely terminated.
- 26. Carry out a [WIRE COUNT](#) to wiring diagram.
- 27. Power up the unit and test the input and output voltages are within specification.

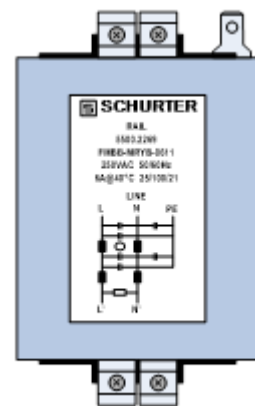


Figure 5 – Main's Filter

Isolation Transformer

- 28. Check replacement transformer-rectifier or battery charger is correctly installed.
- 29. Check wiring is replaced as labelled and is securely terminated.
- 30. [WIRE COUNT](#) replacement transformer-rectifier to the wiring diagram.
- 31. Check output circuits are disconnected before supply is restored.

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32. Test the input and output voltages are correct. The output voltages shall be tested at the busbar, as an additional check that the wiring has been correctly replaced.
33. Reinstate output circuit breakers.
34. Test output voltage is within specification, with the output circuits breakers restored.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LF02		
Replace a Flex Crossing - Sub-Components – Control		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Flex Life Diagnostic Unit b) F-CPU c) MPI Adapter d) Insulation Monitoring Device
Excludes:	All other Flex Components and types of Level Crossing.

GENERAL

Before any work is undertaken possession of the Flex Level Crossing system shall be taken. The Signaller shall be informed that the level crossing system will be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the incoming disconnection links. The unit shall not be powered up with any sub-component missing.

This SMTH Test Plan contains multiple items of equipment, to use it correctly the tester shall carry out the BEFORE INSTALLATION WORK and following the completion of the work carry out the AFTER INSTALLATION WORK steps for the item replaced.

BEFORE INSTALLATION WORK (All Sub-Components)

1. Check that the replacement sub-component is of the Correct Type and is Not Damaged.
2. Isolate Flex equipment from the power supply by disconnection of the incoming supply at the disconnection links.
3. Isolate the corresponding 24V MCB's and the battery back-ups, by removing the fuse in the battery interconnection.
4. Check the status window shows "0" when in the "Off" position, see Figure 1.
5. If applicable, [WIRE COUNT](#) the existing wiring/cabling to wiring diagram.
6. If applicable, check any external wires connected to existing equipment are correctly labelled.
7. If applicable, check existing wiring has safe insulation.



Figure 1 - Incoming supply switch

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
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Replace a Flex Crossing - Sub-Components – Control		
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AFTER INSTALLATION WORK

Flex Life Diagnostic Unit

ADDITIONAL BEFORE INSTALLATION REQUIREMENTS

8. Disconnect the antenna.
9. Release the GSM module from mounting rail, remove existing SIM card and retain it.

AFTER INSTALLATION

10. Check new unit is correctly installed and securely mounted.
11. Confirm the SIM card has been replaced in GPS unit.
12. Confirm the antenna is correctly installed and secure.
13. Check wiring / cabling is replaced as labelled and is securely terminated.
14. Power up unit and check that the “Power” LED is on and green.
15. Check the interface screen is displaying data, see Figure 2.
16. Send a test SMS message.
17. Reset the flex and simulate a failure and confirm the fault is logged on flex life.

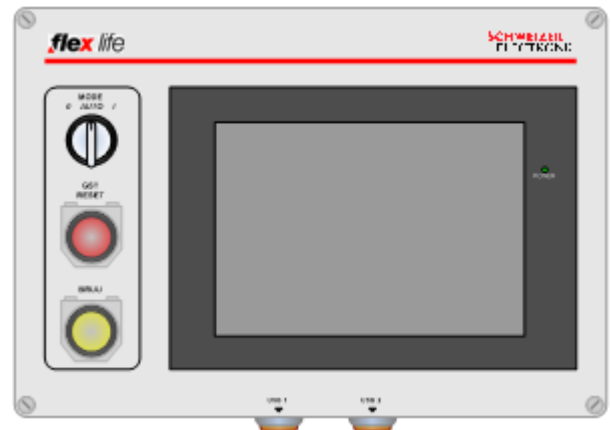


Figure 2 - Flex Life Diagnostic Unit

F-CPU

ADDITIONAL BEFORE INSTALLATION REQUIREMENTS

18. Remove MMC memory card.

AFTER INSTALLATION

19. Check new unit is correctly installed and securely mounted, see Figure 3.
20. Replace MMC memory card in PLC unit.
21. Check wiring / cabling is replaced as labelled and is securely terminated.

22. Power up unit and move the switch from STOP to RUN and check the following LEDs are illuminated green:
- a) “DC5V”
 - b) “RUN”

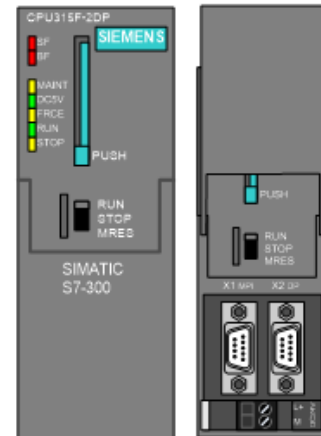


Figure 3 – F-CPU

MPI Adapter

23. Check adapter is correctly installed and securely mounted, see Figure 4.
24. Check wiring /cabling is replaced as labelled and is securely terminated.
25. Power up the MPI adapter and observe the following LEDs are illuminated green:
- a) “Power update”
 - b) “Active parameter”
 - c) “Connect data”

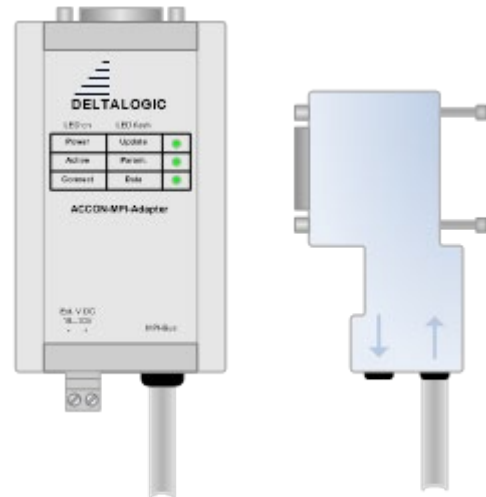


Figure 4 - MPI Adapter

Insulation Monitoring Device

26. Check unit is correctly installed and securely mounted, see Figure 5.
27. Check wiring / cabling is replaced as labelled and is securely terminated.
28. [WIRE COUNT](#) replacement unit to the wiring diagram.
29. Check replacement unit operates correctly.
30. Check or test sensitivity of unit and adjust as necessary.

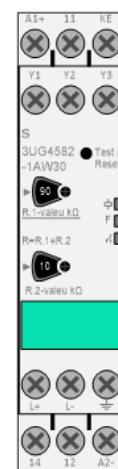


Figure 5 - Insulation Monitoring Device

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LF03		
Replace a Flex Crossing - Sub-Components – Modules		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) PLC Interface Module b) Power Module c) Actuator Module d) Optocoupler Module e) Fail-safe digital input/output module F-DI/O f) Standard digital input/ output modules g) Standard Analogue input
Excludes:	All other Flex Components and types of Level Crossing

GENERAL

Before any work is undertaken possession of the Flex Level Crossing system shall be taken. The Signaller shall be informed that the level crossing system will be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the incoming disconnection links. The unit shall not be powered up with any sub-component missing.

This SMTH Test Plan contains multiple items of equipment, to use it correctly the tester shall carry out the **BEFORE INSTALLATION WORK** and following the completion of the work carry out the **AFTER INSTALLATION WORK** steps for the item replaced.

BEFORE INSTALLATION WORK (All Sub-Components)

1. Check that the replacement sub-component is of the correct type and is not damaged.
2. Isolate Flex equipment from the power supply by disconnection of the incoming supply at the disconnection links.
3. Isolate the corresponding 24V MCB's and the battery back-ups, by removing the fuse in the battery interconnection.
4. Check the status window shows "0" when in the "Off" position, see Figure 1.
5. If applicable, [WIRE COUNT](#) the existing wiring / cabling to wiring diagram.
6. If applicable, check any external wires connected to existing equipment are correctly labelled.
7. If applicable, check existing wiring has safe insulation.



Figure 1 - Incoming supply switch

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AFTER INSTALLATION WORK

PLC Interface Module

ADDITIONAL BEFORE INSTALLATION REQUIREMENT

8. Remove and retain the identification label.

AFTER INSTALLATION

9. Check new unit is correctly installed and secure.
10. Set DP profibus address to the identification label and reinsert to the new Interface module, see Figure 2.
11. Reconnect the incoming power supply and the DSUB socket DP Profibus / F-CPU Interface cable.
12. Power up unit and check the green “ON” LED is illuminated.

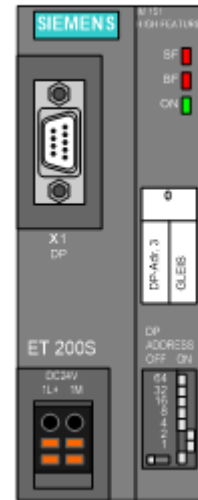


Figure 2 - PLC Interface Module

Power Module

ADDITIONAL BEFORE INSTALLATION REQUIREMENT

13. Check internal fuse and replace as necessary.

AFTER INSTALLATION

14. Check new module is correctly installed and secure, see Figure 3.
15. Reconnect the incoming power supply.
16. Power up and check the following green LEDs are illuminated:
 - a) “PWR”
 - b) “FSG”



Figure 3 - Power Module

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Actuator Module

- 17. Check new module is correctly installed and secure, see Figure 4.
- 18. Check the incoming power supply and other cables are connected as labelled, and terminations are tight.
- 19. Power up unit and check the following LEDs are illuminated / flashing either yellow or green:

- a) “Control 1”
- b) “Control 2”
- c) “Run/ Fail safe”
- d) “Out 1”
- e) “Out 2”

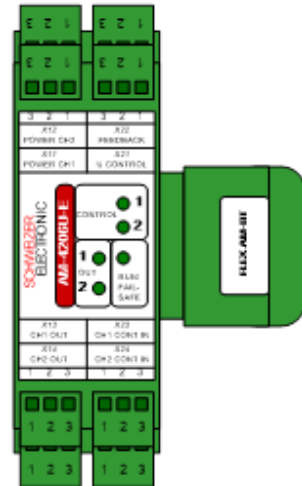


Figure 4 – Actuator Module

Optocoupler Module

- 20. Check new module is correctly installed and secure, see Figure 5.
- 21. [WIRE COUNT](#) the new optocoupler to wiring diagram.
- 22. Power up optocoupler and check the LED is lit yellow when energised.



Figure 5 - Optocoupler Module

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
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Replace a Flex Crossing - Sub-Components – Modules		
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Fail-safe digital input/output module F-DI/O

ADDITIONAL BEFORE INSTALLATION REQUIREMENT

- 23. Remove and retain the identification label.
- 24. Set the new module address dip switches to the identification label.

AFTER INSTALLATION

- 25. Check new module is correctly installed and secure, see Figure 6.
- 26. Power up the fail-safe digital input / output module F-DO and observe the following LED's:
 - a) "SF" is clear.
 - b) "1", "5", "9" and "13" are green.

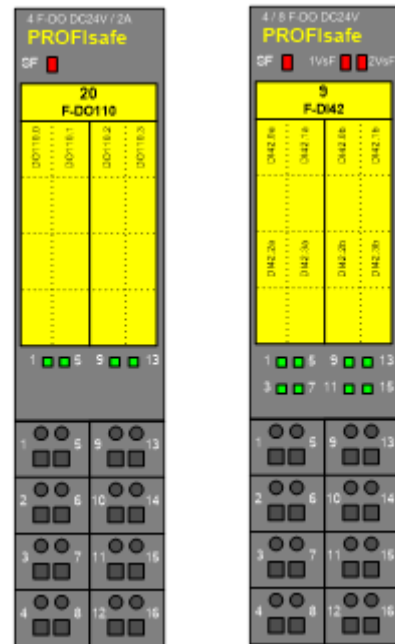


Figure 6 - Fail-safe digital output module (left) and Fail-safe digital input module (right)

Standard digital input/ output modules

ADDITIONAL BEFORE INSTALLATION REQUIREMENT

- 27. Remove and retain the identification label.
- 28. Fit the original identification label to the new digital input/output module.

AFTER INSTALLATION

- 29. Check new module is correctly installed and secure, see Figure 7.
- 30. Power up the digital input / output module and observe the 8-bit green LEDs correspond with the input / output controls.

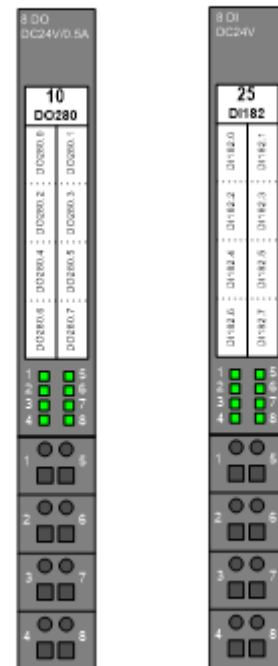


Figure 7 - Digital standard output module DO (left) and standard input module DI (right)

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LF03		
Replace a Flex Crossing - Sub-Components – Modules		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Standard Analogue input

- 31. Check new module is correctly installed and secure, see Figure 8.
- 32. [WIRE COUNT](#) the new optocoupler to wiring diagram.
- 33. Power up the module and check the “SF” LED is illuminated.



Figure 8 - Standard Analogue input

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LF04		
Replace a Flex Crossing - Sub-Components – Relay and Temperature		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<ul style="list-style-type: none"> a) Safety Relay b) Coupling Relay c) Temperature safety switch d) Heater Thermostat and Heater e) Connecting Terminal f) Acoustic Signal Generator
Excludes:	All other Flex Components and types of Level Crossing

GENERAL

Before any work is undertaken possession of the Flex Level Crossing system shall be taken. The Signaller shall be informed that the level crossing system will be non-operational.

The system shall be powered down for this task by disconnection of the power supply at the incoming disconnection links. The unit shall not be powered up with any sub-component missing.

This SMTH Test Plan contains multiple items of equipment, to use it correctly the tester shall carry out the **BEFORE INSTALLATION WORK** and following the completion of the work carry out the **AFTER INSTALLATION WORK** steps for the item replaced.

BEFORE INSTALLATION WORK (All Sub-Components)

1. Check that the replacement sub-component is of the correct type and is not damaged.
2. Isolate Flex equipment from the power supply by disconnection of the incoming supply at the disconnection links.
3. Isolate the corresponding 24V MCB's and the battery back-ups, by removing the fuse in the battery interconnection.
4. Check the status window shows "0" when in the "Off" position, see Figure 1.
5. If applicable, [WIRE COUNT](#) the existing wiring/cabling to wiring diagram.
6. If applicable, check any external wires connected to existing equipment are correctly labelled.
7. If applicable, check existing wiring has safe insulation.



Figure 1 - Incoming supply switch

AFTER INSTALLATION WORK

Safety Relay

- 8. Check new relay is correctly installed and secure, see Figure 2.
- 9. Check the incoming power supply and other cables are connected as labelled, and terminations are tight.
- 10. Power up unit and check that the “K1/ K2” LED are lit/flashing either yellow or green when relay energised.

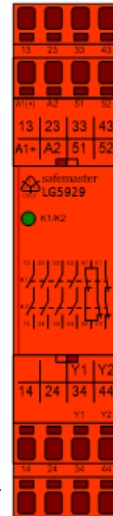


Figure 2 - Safety Relay

Coupling Relay

- 11. Check new relay is correctly installed and secure, see Figure 3.
- 12. Check the incoming power supply and other cables are connected as labelled, and terminations are tight.
- 13. Power up unit and check that the “24V” LED are lit/flashing either yellow or green when relay energised.



Figure 3 - Coupling Relay

Temperature safety switch

- 14. Check new relay is correctly installed and secure, see Figure 4.
- 15. Check the incoming power supply and other cables are connected as labelled, and terminations are tight.
- 16. Test using the test plug at the top of the module.



Figure 4 - Temperature Safety Switch

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LF04		
Replace a Flex Crossing - Sub-Components – Relay and Temperature		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Heater Thermostat and Heater

Additional Before Installation Requirement

- 17. Allow time for the Heater to cool before handling.

After Installation

- 18. Check new heater and thermostat units are correctly installed and secure, see Figure 5
- 19. [WIRE COUNT](#) the wiring/cabling to wiring diagram.
- 20. Reconnect the incoming power supply.
- 21. Whilst monitoring the voltage on the heater terminals, adjust the thermostat and listen for a click that corresponds with loss of voltage on the heater.
- 22. Adjust the Thermostat unit to zero and verify the heater unit starts to warm.

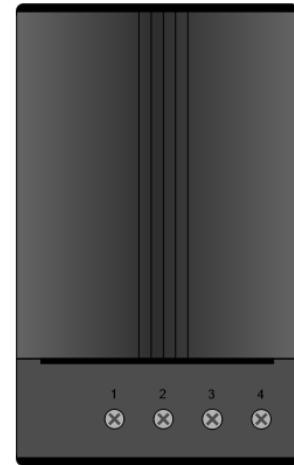
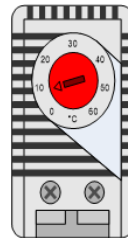


Figure 5 - Heater Thermostat & Heater

- 23. Re-adjust the Thermostat unit to its working temperature of 25 degrees.

Connecting Terminal

Additional Before Installation Requirement

- 24. Allow time for the Heater to cool before handling.

After Installation

- 25. With the wiring disconnected [INSULATION TEST](#) replacement terminal block (minimum 2M ohms terminals to earth).
- 26. Check new terminal block is correctly installed and secure.
- 27. Check all cables are connected as labelled, and terminations are tight.
- 28. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
- 29. [WIRE COUNT](#) replacement terminal block to the wiring diagram.
- 30. [CABLE FUNCTION TEST](#) the affected circuits (terminal blocks for multicore signalling cables only).

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Replace a Flex Crossing - Sub-Components – Relay and Temperature		
Issue No: 01	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

- 31. Check with the Maintenance Test Plan for the item of equipment fed via the terminal block and carry out steps marked with an asterisk *.

Acoustic Signal Generator

- 32. Check new generator is correctly installed and secure, see Figure 6.
- 33. Check all cables are connected as labelled, and terminations are tight.
- 34. Check / adjust the volume levels for both day and night modes.
- 35. Power up the generator and check the following LEDs are illuminated and green:
 - a) “Night”
 - b) “Day”

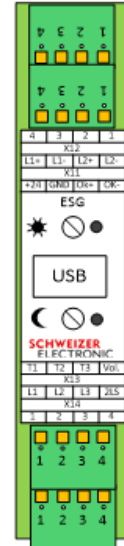


Figure 6 - Acoustic Signal Generator

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV01		
Replace an Electric Lever Lock		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Electric lock blades, dogs and contacts
Excludes:	All other types of Electric Lock

GENERAL

When a combined lever lock circuit controller is replaced, a combination of this Test Plan and [NR/SMTH/Part04/LV02](#) (Replace a Circuit Controller) shall be used.

BEFORE INSTALLATION WORK

1. Check replacement lever lock is not damaged and is correct type.
2. [WIRE COUNT](#) existing lever lock to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) replacement lever lock (minimum 2M ohms terminals to case).
5. Check existing wiring is correctly labelled.
6. Check existing lever lock is isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement lever lock and/or mechanical link are correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement lever lock to the wiring diagram.
10. Check terminations are secure and suitably protected.
- * 11. Test by breaking each Lock Checking Contact (LCC) in turn, and observing the circuit function de-energises (**LEVER LOCKS FITTED WITH LCC ONLY**).
12. Check lock operates correctly (economiser, integral contacts).
- * 13. Check any 'force down' feature operates correctly.
14. Check wires and cables are clear of moving parts and covers.
15. Check new split pins are correctly installed.
16. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) replacement lever lock circuits where designed to be earth free.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV01		
Replace an Electric Lever Lock		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * | 17. Check lever is correctly locked in the positions specified.
- | 18. Check or arrange for correct labelling of unit (colour, numbering).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV02		
Replace a Circuit Controller		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	All circuit controllers associated with signals, Slots, Level crossings, Lever frames, Contact box, Depression bars, Lever controller bands/contacts and Associated drives
Excludes:	Circuit controllers associated with point detector, AB Type 803 Style F Rotating Cam Switch

GENERAL

When a combined lever lock circuit controller is replaced, a combination of this Test Plan and [NR/SMTH/Part04/LV01](#) (Replace an Electric Lever Lock) shall be used.

BEFORE INSTALLATION WORK

1. Check replacement circuit controller is not damaged and is correct type (band configuration, normally in/out).
2. [WIRE COUNT](#) existing circuit controller to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) replacement circuit controller (minimum 2M ohms terminals to case).
5. Check existing wiring is correctly labelled.
6. Check existing circuit controller is isolated from the supply.

AFTER INSTALLATION WORK

7. Check that all bands, including spares, are in position (SGE and WESTINGHOUSE M4 ONLY).
8. Check replacement circuit controller and/or mechanical links are correctly installed.
9. Check new split pins are correctly installed.
10. Check wiring is replaced as labelled.
11. [WIRE COUNT](#) replacement circuit controller to the wiring diagram.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. If the circuit controller is the "Ultra Electronics" version then carry out [NR/SMS/PartB/Test/049](#) (Ultra Circuit Contact Box Set-up procedure).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV02		
Replace a Circuit Controller		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. Test that each affected contact/band only makes and breaks in the appropriate positions as specified in the wiring diagrams.
- * 16. Check each function operated by the replacement circuit controller operates correctly.
17. The Maintenance Test Plan/s for the equipment fed by the equipment should be checked and any requirement marked with an asterisk "*" carried out.
18. Check wires and cables are clear of moving parts and covers.
19. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) all circuits controlled by the circuit controller where designed to be earth free.
20. Check or arrange for correct labelling of unit (colour, numbering).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV03		
Replace a Plunger		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Sealed releases and Emergency releases Plungers
Excludes:	All other types of push button and electrical switches

BEFORE INSTALLATION WORK

1. Check replacement plunger is not damaged and is correct type.
2. [WIRE COUNT](#) existing plunger to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing plunger is Isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement plunger is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement plunger to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check terminations are secure and suitably protected.
11. Check wires are clear of moving parts.
12. Check plunger is clear of moving parts.
13. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply where designed to be earth free.
- * 14. Test for correct operation.
- * 15. Check plunger is correctly sealed (**SEALED RELEASE PLUNGERS ONLY**).
16. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV04		
Replace a Key Release Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	One train staff instruments, Ground frame key release instruments, Crank handle release instruments
Excludes:	Token instruments

BEFORE INSTALLATION WORK

1. Check replacement instrument is not damaged and is correct type (configuration).
2. Check that the internal wiring of the replacement instrument corresponds to the internal wiring of the redundant instrument.
3. Check that the contact arrangement of the replacement instrument corresponds functionally to the contact arrangement of the redundant instrument.
4. [WIRE COUNT](#) the existing instrument to the wiring diagram.
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement instrument (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing instrument is isolated from supply.
9. Check key is removed from redundant instrument.
10. Check replacement instrument is set to the same key position as the instrument to be replaced.

AFTER INSTALLATION WORK

11. Check key is replaced into the replacement instrument.
12. Check replacement instrument is correctly installed.
13. Check wiring is replaced as labelled.
14. [WIRE COUNT](#) replacement instrument to the wiring diagram.
15. Check wires and cables are clear of moving parts.
16. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits where designed to be earth free.
- * 17. Check key can only be withdrawn from the instrument when release is given.
- * 18. Check that the key, once withdrawn, can be replaced back into the instrument and that any function released by the withdrawal of the key is now cancelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV04		
Replace a Key Release Instrument		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

19. Check or arrange for correct labelling of instrument.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV05		
Replace a Mechanical Interlocking Component		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

GENERAL

When replacement of a lever or lever component requires the disarrangement of interlocking, a combination of this Maintenance Test Plan and [NR/SMTH/Part04/LV06](#) (Replace a Lever or Lever Component) shall be used.

Affected locking includes: all locking affected by the removal or potential release of any part which could alter the setting or integrity of the locking. This could vary from the need to test only levers interlocked with the lever being worked on, up to the need to test the whole frame.

Any locking which has had holding down straps or covers removed shall be considered as 'affected' and therefore shall be tested.

Where complete locking trays have not had their covers removed and no connection into the tray has been disturbed, then the locking within that tray may be considered as 'not affected' and need not be tested.

BEFORE INSTALLATION WORK

1. Carry out correlation check to locking chart for all affected locking.

Levers associated with the affected locking shall be in their usual position in the frame before work starts.

If anything less than a complete frame test is proposed, then the scope of the proposed testing shall be documented and independently checked.

2. Check electrical equipment driven by affected locking is isolated from the supply.
3. Check existing affected locking is correctly labelled.
4. Check replacement locking is not damaged and is correct type.
5. Check replacement key/tablet lock has correct configuration and all key/tablets in the system operate lock correctly.

AFTER INSTALLATION WORK

6. Check replacement locking is correctly labelled and installed.
7. Carry out correlation check to locking chart for all affected locking.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV05		
Replace a Mechanical Interlocking Component		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

8. Check new pins/split pins are correctly installed.
 - Remaining steps shall only be carried out after components designed to hold locking in place, have been secured.
9. Check with the Maintenance Test Plan for Lever Locks and Circuit Controllers and carry out steps marked with an asterisk “*” (locking components associated with electric locks or circuit controllers only).
10. Check that all affected levers operate correctly with adequate stroke and without undue strain.
11. Carry out [MECHANICAL LOCKING FUNCTION TEST](#) on the affected levers.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV06		
Replace a Lever or Lever Component		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Catch handle, Catch rod, Catch block, Spring, Quadrant, Cam/Crank/Rocker
Excludes:	Gate drive levers, Electric lock blades and Dogs

General

When replacement of lever or lever component requires the disarrangement of interlocking, a combination of this Maintenance Test Plan and [NR/SMTH/Part04/LV05](#) (Replace a Mechanical Interlocking Component) shall be used.

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.
2. Check electrical equipment connected to lever is isolated from the supply.

AFTER INSTALLATION WORK

3. Check replacement item is correctly labelled.
4. Check new pins and/or split pins are correctly installed.
5. Check lever is held in the frame until the catch handle is fully operated for all working positions.
6. Carry out [MECHANICAL LOCKING FUNCTION TEST](#) to affected levers.
7. Check with Maintenance Test Plan for Lever Locks and Circuit Controllers and carry out steps marked with an asterisk "*" (LEVERS ASSOCIATED WITH ELECTRIC LOCKS OR CIRCUIT CONTROLLERS ONLY).
8. Check lever/lever component operates correctly with adequate stroke and without undue strain.
9. Test that the apparatus controlled by the replacement lever/lever component operates correctly with adequate stroke and without undue strain.
10. Check or arrange for correct labelling of unit, (colour, numbering).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV07		
Replace a AB Type 803 Style F Rotating Cam Switch		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	AB type 803 style F rotating cam switches associated with mechanical signals and AHBCs
Excludes:	All other types of rotating cam switch

General

The front cover of these switches shall not be removed on site except for incident investigation as the unit is hermetically sealed.

BEFORE INSTALLATION WORK

1. Check replacement circuit controller is not damaged and is correct type and is fitted with a cable of correct length.
2. [WIRE COUNT](#) location end of existing circuit controller to the wiring diagram.
3. [INSULATION TEST](#) replacement circuit controller and cable from free end of cable (minimum 2M ohms cable to case and core to core). It may be necessary to rotate the cam contacts for the core being tested.
4. Check existing cable terminals are correctly labelled.
5. Check existing circuit controller is isolated from the supply.

AFTER INSTALLATION WORK

6. Remove existing circuit controller and cable complete.
7. Check replacement circuit controller and/or mechanical links are correctly installed.
8. Check new split pins are correctly installed.
9. Check cable is terminated in accordance with the cable terminal labels.
10. [WIRE COUNT](#) location end of replacement circuit controller to the wiring diagram.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Adjust each band to the settings specified in the wiring diagram using the adjuster screws on the front of the unit.
13. Test that each contact only makes and breaks in the correct positions as specified in the wiring diagrams.
- * 14. Check each function operated by the replacement circuit controller operates correctly.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV07		
Replace a AB Type 803 Style F Rotating Cam Switch		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. If the affected contact is associated with circuitry going to a point detector, microswitch or track feed circuit carry out steps marked with an asterisk “*“on the Maintenance Test Plan for the point detector/microswitch.
16. Check all cables are secure and clear of moving parts.
17. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) all circuits controlled by the circuit controller where designed to be earth free.
18. Check or arrange for correct labelling of unit including safety label covering can adjuster screws.
19. Check security cover is in place and padlocked.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV08		
Replace a Microswitch sub-component within Ultra circuit Controller		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Only Ultra circuit controllers
Excludes:	All other circuit controllers

BEFORE INSTALLATION WORK

1. Check replacement microswitch is not damaged and is the correct type.
2. Check existing wiring has safe insulation.
3. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

4. Check replacement microswitch is correctly installed.
5. Check wires are clear of moving parts and covers.
6. Test that the effected microswitch only makes and breaks in the positions as specified in the wiring diagrams.
7. Check each function operated by the circuit controller operates correctly.
8. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) all circuits and supplies controlled by the circuit controller.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/LV09		
Replace a Lever frame Key		
Issue No. 01	Issue Date: 04/03/17	Compliance Date: 31/05/17

Includes:	Token Key, Annettes key, single line staffs
Excludes:	Other key release instruments.

- ! This work does not require any electrical disconnections.

Colour Codes (for token keys ONLY)

- A configuration coloured Red
- B configuration coloured Blue
- C configuration coloured Green
- D configuration coloured Yellow

BEFORE INSTALLATION WORK

- 1 Check replacement Token Keys is not damaged.
- 2 Check that configuration is correct and that it is correctly painted. Token key only
- 3 Check that annex key is engraved correctly to diagram .

AFTER INSTALLATION WORK

- 4 Check replacement Keys can operate correctly in all release boxes and or instruments as appropriate.
- 5 Return old Keys to your SM(S) for disposal

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/LV10		
Replace a Lever frame key lock		
Issue No. 05	Issue Date: 04/03/17	Compliance Date: 31/05/17

Includes:	Annettes key lock, Token key lock
Excludes:	Other key locks

! This work does not require any electrical disconnections

Before Installation Work

- 1 Check replacement Lock is not damaged and is correct type.
- 2 Check that the key is correct to diagram.

After Installation Work

- 3 Check replacement Lock is correctly installed.
- 4 Check that the replacement Lock can only be released by the appropriate Key.
- 5 Check lock slide, when withdrawn is clear of lock face.
- 6 Check plunger travel cannot damage casting
- 7 Check that the Key cannot be removed from the Lock with the lever not fully normal (or reverse if appropriate).
- 8 Check that the Lever is locked in the appropriate position with the Key removed.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV11		
Re-allocate a Band		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	All Circuit Controllers Associated with Signal Box Lever Frames
Excludes:	All Other Types of Circuit Controller

GENERAL

Obtain permission from SFI Level 2 before undertaking this task.

BEFORE INSTALLATION WORK

1. Check the re-allocated band is the correct item of equipment.
2. Check re-allocated band is correct type.
3. Check re-allocated band is spare and not damaged.
4. Check all other bands of the affected item are not damaged.
5. [WIRE COUNT](#) existing band to the wiring diagram.
6. Check existing wiring has safe insulation.
7. Check that the re-allocated bands make and break in the correct positions, as specified in the wiring diagram.
8. Check existing wiring is correctly labelled for both the original band position and temporary re-allocation.
9. Check existing band is isolated from the supply.

AFTER INSTALLATION WORK

10. Check terminations are secure and suitably protected.
11. Check wiring is replaced as temporarily labelled.
12. Check wiring diagrams show the alteration.
13. [WIRE COUNT](#) re-allocated band to the amended wiring diagram.
14. Check any links and red dome nuts, or equivalent, are correctly replaced and secure.
15. Test that the function performed by the band replaced operates correctly.
16. The maintenance test plan/s for the equipment fed by the re-allocated band shall be checked and any requirements marked with an * carried out.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/LV11		
Re-allocate a Band		
Issue No: 01	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

- 17. Check wires are clear of any moving parts and not subject to mechanical damage.
- 18. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#), where designed to be earth free.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/MS01		
Replace a PM SOM24 MAU		
Issue No. 02	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	PM, SOM24, MAU
Excludes:	WestLock Trackside System (See WL07), WestLock, WestCad Equipment, PMB, Surge Protection Unit, Surge Suppression Unit

***** INDEPENDENCE EXEMPT *****

Liaison with the signaller is required and the appropriate possession is required before changing any PM.

Replacing a standalone PM shuts down the object controller and interlocking.

If a standalone PM is or both PMs in a pair are to be changed, it is necessary to check the correct technicians controls and lockout device status are reapplied to the PM(s) after changing.

Care should be taken not to touch the pins on the rear connector of any of these units.

BEFORE RE-INSTALLATION WORK

1. Check replacement module is Not Damaged and is Correct Type. Pay particular attention to check the 3 rows of pin connectors are undamaged.
2. Check replacement module mark and mod state is correct (local restrictions).
3. Check replacement module is sealed.
4. Use the TF(L) or TF(R) to record the state of technicians controls and the state of any patrolman's lockout that have been applied to the PM that is about to be changed. Liaise with the signaller to confirm the status of lockouts devices.
5. If replacing a MAU, note the position of the Optical Fibre cables and disconnect them from the unit taking care to protect the ends of the fibres.
6. If the PM to be replaced is the on-line unit of a Hot Standby Pair, use HOT STANDBY TEST [NR/SMS/Test156](#) to change to the off line PM.

AFTER INSTALLATION WORK

7. Before installing any module check it is correctly orientated before insertion into the racking as mechanical and / or electrical damage may be caused.
8. Check replacement module is Correctly Installed

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/MS01		
Replace a PM SOM24 MAU		
Issue No. 02	Issue Date: 01/09/18	Compliance Date: 01/12/18

PM ONLY

a) If both PMs of a Hot standby pair illuminate their green STANDBY OK LED then no further action is required.

⋮ The reboot process may take up to 15 minutes to reach this state.

b) If the off-line PM of a Hot standby pair does not illuminate it's green STANDBY OK LED or a single PM has been installed, then it is necessary to reconfigure the technicians controls by use of the TF(L) or TF(R) and the state of any patrolman's lockout by operating the affected patrolman's lockout.

⋮ Full details of how to carry out reconfiguration is contained in Westrace documentation. If you have any doubt about how to carry out these requirements STOP, and ask your SM(S) for guidance.

Use the TF(L) or TF(R) to check the state of technician's controls that have been re-applied against the listing taken at step 05.

Liaise with the signaller to confirm the status of lockouts devices that have been re-applied against the listing taken at step 05.

Use the TF(L) or TF(R) to enable the interlocking/ level crossing functionality (if appropriate) contained within the PM.

c) Check replacement PM can operate in hot standby mode with its twin if facility provided [Hot Standby Test ([NR/SMS/Test156](#))].

9. Check replacement module operates correctly [PM, SOM24, MAU only].

⋮ Operates correctly means observing the correct indications on the replaced unit itself and confirming correct operation of one function operated by the SOM24.

⋮ For example, a signal's aspect can be changed, points operated normal and reverse, etc.

10. Check or arrange for Correct Labelling of unit.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS02		
Replace an Invensys Rail Object Controller TPWS, or Points Equipment Panel		
Issue No: 03	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	TPWS Panel, Points Equipment Panel
Excludes:	Individual TPWS modules (use AP01) or relays on points equipment panels (use EL08).

GENERAL

It is possible to replace the TPWS Panel or Points Equipment Panel without removing the mounted equipment. However, it is recommended that the TPWS modules or relays are removed separately to reduce weight.

BEFORE INSTALLATION WORK

1. Check replacement panel is not damaged and is correct type.
2. Check replacement panel mark and mod state is correct (local restrictions).
3. Check replacement panel is sealed.

AFTER INSTALLATION WORK

4. Check replacement panel is correctly installed (plug coupled cables).
5. Check replacement module operates correctly.

NOTE: Check correct operation means observing the correct operation of the panel itself and confirming correct operation of each TPWS module or relay within the unit.

6. Check or arrange for correct labelling of unit.

NOTE: Particular attention should be given to the labelling of closed switch rails and point numbering.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS03		
Remove and Refit a Fibre Optic Patch Cord, Fibre Optic Patch Panel, Ethernet cables Fibre Optic lead.		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	All fibre optic patch cords, Fibre Optic Patch Leads Fibre Optic Enclosure, Ethernet cables
Excludes:	Ethernet switches MAU(MS01) DISAC(TMTH CAB004)

Visible light is used for transmitting data in the fibre optic system and is emitted within a tiny beam size, however the intensity can cause permanent eye damage.

Do not look into the end of a fibre or directly into the open connectors of a fibre optic termination or use magnifying equipment to observe the light.

Preplanning is essential before carrying out the requirements of this test plan.

Liaise with the Signaller to agree a possession(s) of all affected signalling equipment.

BEFORE INSTALLATION WORK

1. Check the replacement cable is the correct type, length and is undamaged.
2. WIRECOUNT the equipment and connections to the wiring diagram.
3. Check equipment and connections are correctly labelled.
4. Obtain a list of faults from the TF(L) or TF(R) and check that the task to change the equipment and connections can be undertaken without effect on the pre-planned arrangements.

AFTER INSTALLATION WORK

5. Check replaced equipment and / or connections have not been damaged whilst disconnected and are correctly installed.
6. Check equipment and connections are replaced as labelled.
7. WIRECOUNT the equipment and connections to the wiring diagram.
8. Check or arrange for correct labelling of equipment and connections.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS03		
Remove and Refit a Fibre Optic Patch Cord, Fibre Optic Patch Panel, Ethernet cables Fibre Optic lead.		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

9. Obtain a list of faults from the TF(L) or TF(R).
 - Check that the task to change the fibre optic equipment has not introduced additional faults onto the system, other than those that are listed as having occurred and cleared as a direct result of changing the fibre optic equipment subject to this test plan.
10. Check all modules fed by the equipment and the connections operate correctly, and that their normal indications are illuminated.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS05		
Replace a Surge Protection Unit, Surge Suppression Unit		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Surge Protection Unit, Surge Suppression Unit
Excludes:	Westlock, WestCAD Equipment, PMB, PM, SOM24, MAU

GENERAL

| Liaise with the Signaller before carrying out this work.

BEFORE INSTALLATION WORK

- |** 1. Check replacement module is not damaged and is correct type.
- |** 2. Check replacement module mark and mod state is correct (local restrictions).
- |** 3. Check replacement module is sealed if required.

AFTER INSTALLATION WORK

- |** 4. Check replacement module is correctly installed.
- |** 5. Wait 60 seconds and check the Surge Protection has not tripped or that the Surge Suppression units have not changed colour.
- |** 6. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS06		
Replace a Switch Rack		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Switch Rack
Excludes:	Surge Suppression Unit (MS05) Individual Isolators and MCBs

The complete Switch Rack is heavy and manual handling precautions should be in place whilst removing and replacing it.

Liaise with the Signaller as a possession is required before changing the Switch Rack.

BEFORE INSTALLATION WORK

1. Check replacement switch rack is not damaged and is correct type.
2. Isolate internal and external circuits by operating all isolators.
3. Isolate the switch rack to be changed by disconnecting the incoming DNO cable to the PB.
4. Check replacement switch rack plug coupler is free from any signs of corrosion, arcing and is in good mechanical condition and have safe insulation.

AFTER INSTALLATION WORK

5. Check replacement switch rack is correctly installed.
6. Check Surge suppression units are correctly installed.
7. Reconnect input DNO cable to PB.
8. Re-operate all isolators to internal circuits.
9. The battery shall remain isolated from external circuits at this stage.
10. Check status of battery and charger by checking LEDs on charger rack module(s).
11. Test battery output voltage with the output disconnected.
12. Reconnect battery to external circuits.
13. Carry out [NR/SMS/PartB/Test/053](#) (ELD Function Test) or [NR/SMS/PartB/Test/051](#) (Busbar Earth Test) on all power supplies.
14. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS07		
Replace a Battery Pack		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Modular Signalling System battery pack
Excludes:	All other battery packs

***** INDEPENDENCE EXEMPT *****

GENERAL

⋮ **This unit contains a 230V a.c. Supply.**

Battery packs used in the Invensys Modular Signalling System are very heavy. Correct manual handling procedures shall be considered at all times.

⋮ Care should be taken when placing the unit on the grillage of an OC installation.
 ⋮ The pins that support the pack on a flat surface might protrude through the grillage
 ⋮ thus causing Mechanical and / or Electrical damage.

BEFORE INSTALLATION WORK

1. Check replacement battery rack is not damaged and is correct type.
2. Isolate battery from the charger and external circuits by operating the isolator on the charger rack and battery.
3. Check existing PB connector and replacement battery pack connector are free from any signs of corrosion, arcing and is in good mechanical condition.

AFTER INSTALLATION WORK

4. Check replacement battery pack is correctly installed.
5. Reconnect battery to charger and input circuits by operating the isolator on the charger rack.
 ⋮ If the 230v a.c supply has been lost to the Power Box at any stage during the work
 ⋮ the red button on the charger card should be pressed. This is controlled soft start
 ⋮ facility for the charging circuit.
6. Check status of battery and charger by checking LEDs on charger module.
7. Test output voltage.
8. Reconnect battery to external circuits.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS07		
Replace a Battery Pack		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

9. Carry out [NR/SMS/PartB/Test/055](#) (Secondary Cell Test).

⋮ This test should be carried out after sufficient time has elapsed to allow the battery
⋮ to build up charge.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS08		
Replace an individual Power Rack Module		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Invensys Rail Power Box (PB) AC/DC PSU, Charger, Isolator Charger Battery MCB, Isolator PSU, PSU GK50-1, Alarm Card
Excludes:	Complete Power Rack

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is correct type.

The output voltage and power of the replacement module shall be as specified for the PB.

2. Isolate the module to be changed from its input power supply and its outputs.
3. Check existing PB module connector and replacement module connector are free from any signs of damage, corrosion, arcing and is in good mechanical condition and have Safe Insulation.

AFTER INSTALLATION WORK

4. Check replacement module is correctly installed.
5. Reconnect module to supply and external circuits.
6. Check status of module by checking status LEDs.
7. Carry out [NR/SMS/PartB/Test/053](#) - ELD Function Test or [NR/SMS/PartB/Test/051](#) - Busbar Earth Test on the affected power supplies.
8. Carry out [NR/SMS/PartB/Test/055](#) - Secondary Cell Test.
9. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS10		
Replace a Charger Rack		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Charger Rack
Excludes:	Individual Charger Rack modules

Liaise with the Signaller as a possession is required before changing the charger rack.

Replacing the complete charger rack requires the PB to be isolated from its external output circuits. The DNO supply cable may be left coupled.

BEFORE INSTALLATION WORK

1. Check replacement charger rack is not damaged and is correct type.
2. Isolate the charger rack to be changed from its internal and external circuits by operating all isolators and MCBs.
3. Check replacement charger rack plug coupler is free from any signs of corrosion, arcing and is in good mechanical condition and have safe insulation.

AFTER INSTALLATION WORK

4. Check replacement charger rack is correctly installed.
5. Re-operate all isolators to internal circuits.
The battery shall remain isolated from external circuits at this stage.
6. Check status of battery and charger rack modules by checking LEDs on charger rack module(s).
7. Test battery output voltage with its output disconnected.
8. Reconnect battery to external circuits.
9. Carry out [NR/SMS/PartB/Test/053](#) (ELD Function Test) or [NR/SMS/PartB/Test/051](#) (Busbar Earth Test) on all affected power supplies.
10. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS11		
Replace a Power Box Temperature Sensor		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Invensys Rail : Power Box (types 1, 2 and 3) Temperature Sensor
Excludes:	All other types of Temperature Sensor

GENERAL

The removal of a Battery Pack or part of the Temperature Sensor (Figure 1) might cause a loss of power from the power box. Before attempting any maintenance on the equipment, obtain the necessary permission from the Signaller.

Fully consider and understand the consequence of any interruption.

The temperature Sensor is located behind the behind the upper battery pack on PB1 and PB2 and behind the upper battery pack on the charger rack side of the PB3.

IDENTIFICATION

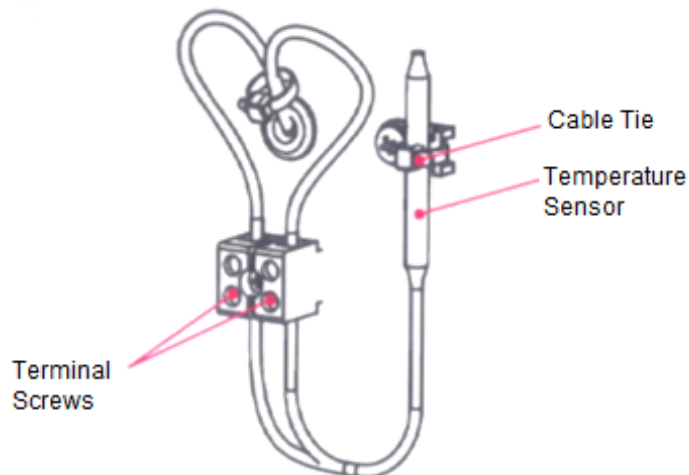


Figure 1 – Temperature Sensor

BEFORE INSTALLATION WORK

1. Check that the replacement Temperature Sensor is of the correct type (check part numbers match) and not damaged.
2. Isolate and remove the battery pack.

AFTER INSTALLATION WORK

The leads from the cable sensor are not polarity sensitive but care should be taken not to let the sensor or cable tie drop behind the other equipment.

3. Check the cable tie holding the sensor is tight and the sensor secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS11		
Replace a Power Box Temperature Sensor		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

4. Reconnect battery pack to charger and input circuits by operating the isolator on the charger rack.

If the 230v a.c supply has been lost to the Power Box at any stage during the work the red button on the charger card shall be pressed. This is controlled soft start facility for the charging circuit.
5. After replacing the battery pack check status of battery and charger by checking LEDs on charger module.
6. Test output voltage.
7. Reconnect battery to external circuits.
8. Check that the system is now fully operational.
9. Report to your SM(S) that the sensor has been replaced.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS12		
Replace an Invensys Rail Modular Technicians Facility PC		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Invensys Rail : Modular Technicians Facility PC (Local)
Excludes:	All other types of Technician Facility / Technicians Terminal

Liase with the Signaller before carrying out this work.

Electrostatic precautions shall be taken when handling the evaluation board and/or the board rack.

ASSET IDENTIFICATION IMAGE

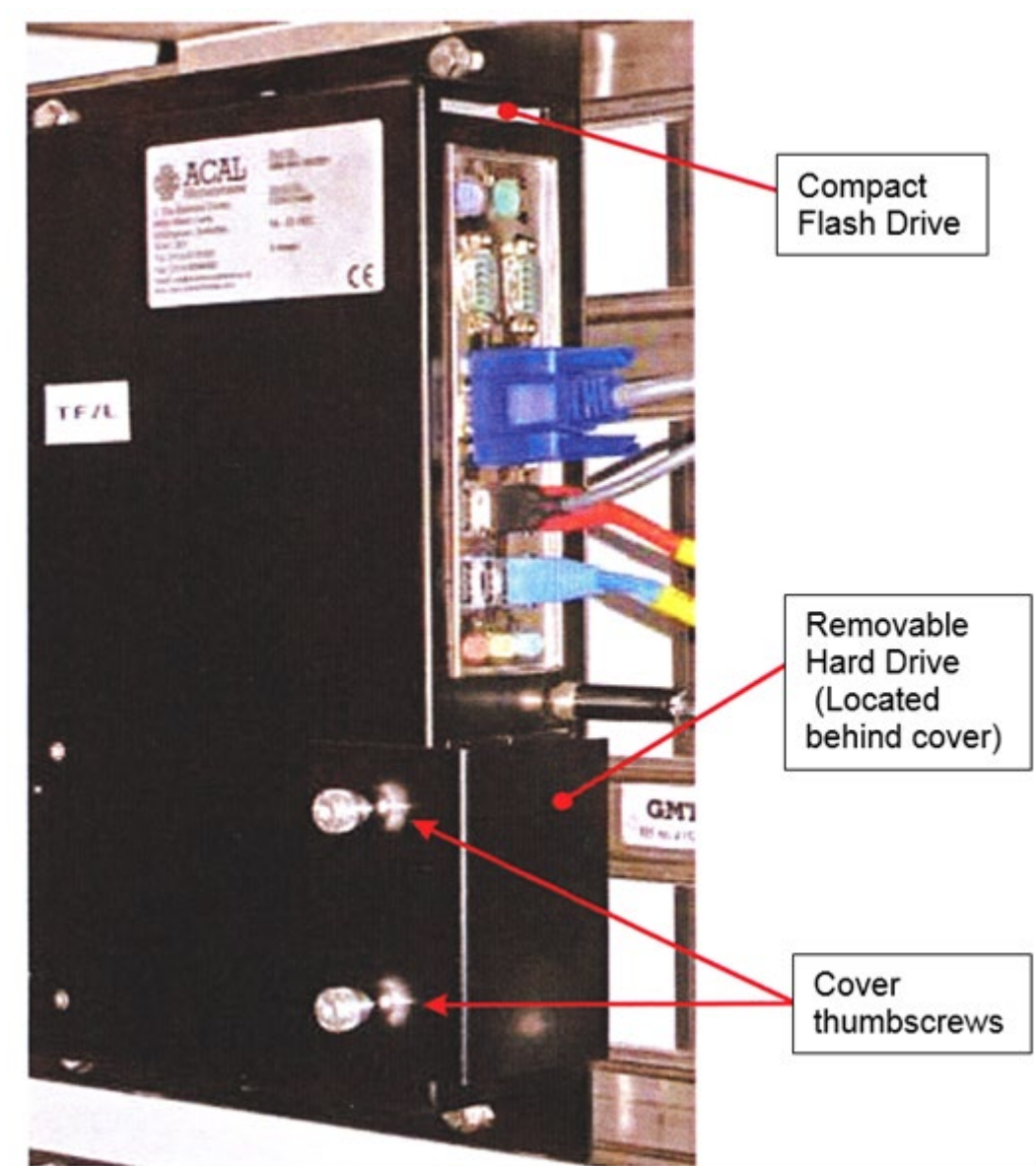


Figure 1 – Technicians Facility PC

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS12		
Replace an Invensys Rail Modular Technicians Facility PC		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

BEFORE INSTALLATION WORK

1. Check that the replaced PC is of the correct type and not damaged. This should include a check of the Mod state to confirm it is the same or later.
2. Record the serial number of the replacement unit.
3. Isolate the power supply using the MCB.
4. Note the positions of all cables and which ports they are connected to.
5. Check the cables and wires are correctly labelled.
6. Unplug the cables from the PC.
7. Remove and retain the compact flash card.
8. Remove and retain the fixing securing the PC to the bracket and withdraw the PC.

AFTER INSTALLATION WORK

9. Insert the retained compact flash card into the replacement PC.
10. Secure the PC in position using the retained fixings.
11. Check the cables are in the correct position and then re-connect.
12. Re-apply the power supply using the associated MCB.
13. Check the replacement switch is correctly installed.
14. Perform the required test to ensure the system is operational.
15. Check or arrange for correct labelling of unit.
16. Inform the SM(S) that the unit has been changed and of the replacement unit's serial number.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS13		
Replace a Rextron KAG12 Switch		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Rextron KVM KAG 12 Switch
Excludes:	All other types of Digital Video Switch

GENERAL

- | Liaise with Signaller before carrying out this work.
- | Electrostatic precautions shall be taken when handling the evaluation board and/or the board rack

IDENTIFICATION

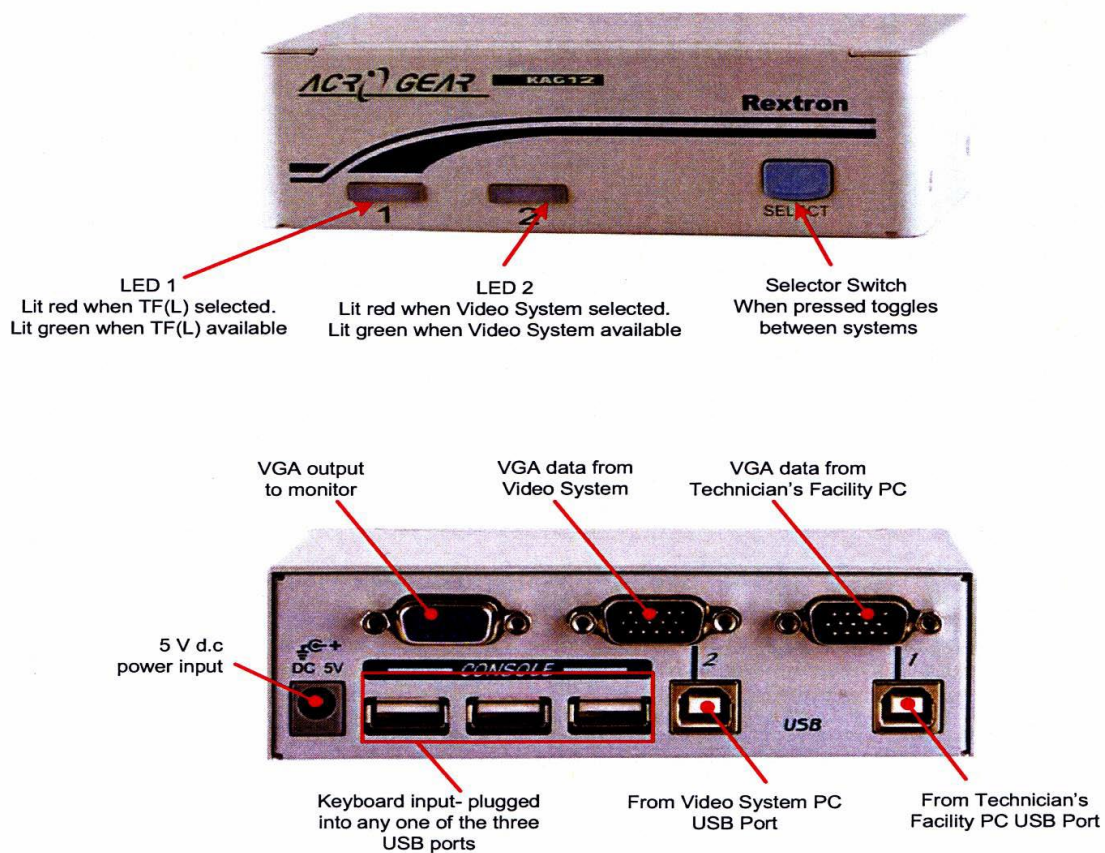


Figure 1 - Rextron KVM KAG 12 Switch

BEFORE INSTALLATION WORK

1. Check that the replaced switch is of the correct type and not damaged.
2. Isolate the power supply by removing the power input plug.
3. Note the positions of the cables connected to the switch ports. Check the cables and wires are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS13		
Replace a Rextron KAG12 Switch		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

4. Unplug the cables from the switch.

AFTER INSTALLATION WORK

5. Check the cables are in the correct position and then re-connect.
6. Check the replacement switch is correctly installed.
7. Reconnect the power supply.
8. Check both the Technician Facility and Digital Video Recorder are responding correctly.
9. Check or arrange for correct labelling of unit.
10. Inform the SM(S) that the unit has been changed and of the replacement unit's serial number.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS14		
Replace an Object Controller		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Invensys Rail : Modular Signalling Object Controllers (S) (P) (A) (G) (I)
Excludes:	All other Object Controllers and Invensys Modular Signalling Feeder Pillars and Power Boxes

GENERAL

Visible light is used for transmitting data in the fibre optic system and is emitted within a tiny beam size, however the intensity is to cause permanent eye damage.

Do not look into the end of a fibre or directly into the open connectors of a fibre optic termination or use magnifying equipment to observe the light.

The change of any Fibre Optic Equipment will affect the correct operation of the signalling equipment either:

- a) Directly controlled from the Object Controller/Modular Equipment Housing.
- b) Indirectly, equipment located remotely from the site that requires the fibre optic equipment to be changed.

Preplanning is essential before carrying out the requirements of this test plan.

The SM(S) will advise you as to the extent of the potential effects on signalling and telecommunications assets.

Liaise with the Signaller before carrying out any work that will effect signalling equipment.

BEFORE INSTALLATION WORK

1. Check the replacement Object Controller is not damaged, is the correct type and has the same or later mod state.
2. Isolate the supply to the Object Controller.

DURING WORK

3. Remove and retain the following WESTRACE Modules and place in antistatic bags (If fitted).

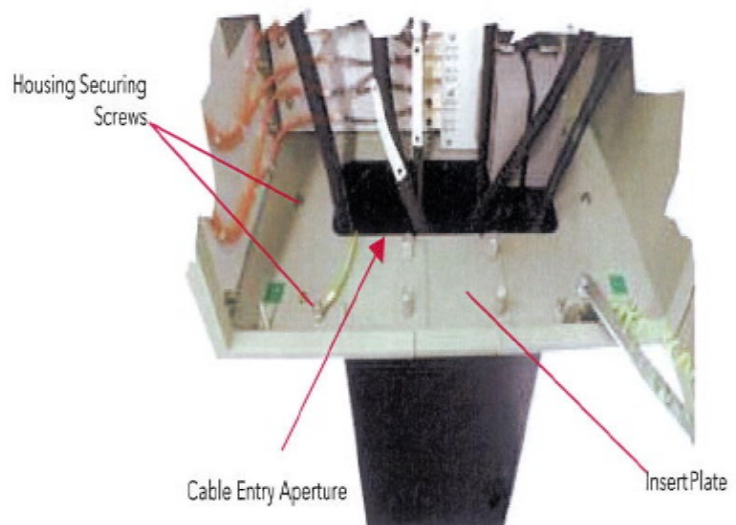


Figure 1 – Object Controller Housing

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS14		
Replace an Object Controller		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

4. Remove the address configuration plug from beneath the Compact Housing and insert it into the correct location in the replacement Object Controller.
5. Remove and retain any plug-in items such as Surge Arrestors, TPWS modules, Relays etc being careful to keep them clean and undamaged.
6. Remove the Insert Plate (See Figure 1).
7. Reach into the cable entry aperture and release the pedestal door catch.
8. Disconnect the earth lead, retaining fixings.
9. Check each cable is labelled, note its position.
10. Disconnect each cable in turn if available fit plug coupler protection caps.

Care shall be taken when moving Fibre Optic cables as they are easily broken and can suffer excessive transmission loss if bent.

Laser light: Do not look into the unprotected fibres or point them at other people.

11. Place each cable in an individual plastic bag to protect it from moisture and remove it from the housing.
 - All Object Controller housings are heavy and require more than one person to lift.
12. Remove and retain the fixings securing the housing to the pedestal and lift it clear.
13. Replace the insert plate.
14. Locate the new controller on to the pedestal and secure it in place.

AFTER INSTALLATION WORK

15. Remove the Insert plate and with the exception of the Power Cables reconnect the other cables in their correct locations.
16. Connect the earth lead.
17. Refit the WESTRACE Modules.
18. Refit all of the remaining plug in units which were removed from the original controller.
19. Reconnect the power cables.
20. Refit the insert plate.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS14		
Replace an Object Controller		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

21. Check for normal running.
 - c) If the housing includes PM(s), the WESTRACE starts automatically. Wait for the WESTRACE to complete start-up sequence and then check the PM(s) for normal running.
 - d) If the housing has no PMs fitted, check the SOM and MAUs LEDS for normal running.
22. Close and lock the Object Controller housing door.
23. Inform the SM(S) that the unit has been changed and the serial number of the replacement unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS15		
Replace a Feeder Pillar		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Invensys Rail: Modular Signalling Feeder Pillar
Excludes:	All other Feeder Pillars

GENERAL

⋮ **This unit contains a 230V a.c. Supply.**

| Liaise with the Signaller before carrying out this work.

BEFORE INSTALLATION WORK

- | 1. Check the replacement Object Controller is not damaged, is the correct type and has the same or later mod state.
- | 2. Isolate the supply to the Feeder Pillar from the DNO.

DURING WORK

- | 3. Remove the "Insert Plate" on both the current and replacement Pillars.
- | 4. Reach into the cable entry aperture and release the pedestal door catch.
- | 5. Disconnect the earth lead, retaining fixings.
- | 6. Check each cable is labelled, note its position.
- | 7. Disconnect each cable in turn. If available fit plug coupler protection caps.
- | 8. Place each cable in an individual plastic bag to protect it from moisture and remove it from the housing.

⋮ Feeder Pillar housings are heavy and require more than one person to lift

- | 9. Remove and retain the fixings securing the housing to the pedestal and lift it clear.
- | 10. Replace the insert plate.
- | 11. Locate the new Feeder Pillar on to the pedestal and secure it in place .

AFTER INSTALLATION WORK

- | 12. Connect the earth lead.
- | 13. Refit the insert plate.
- | 14. Reconnect the Feeder Pillar to the DNO.
- | 15. Check incoming and outgoing supply voltages.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS15		
Replace a Feeder Pillar		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

16. Check all connected equipment has powered up.
17. Close and lock the Feeder Pillar housing door.
18. Inform the SM(S) that the unit has been changed and the serial number of the replacement unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS16		
Replace a Power Box		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Invensys Modular Signalling Power Box PB1 and PB2
Excludes:	Invensys Modular Signalling Power Box PB3

GENERAL

⋮ **This unit contains a 230V a.c. Supply**

| Liaise with the Signaller before carrying out this work.

BEFORE INSTALLATION WORK

- | 1. Check the replacement Power Box is not damaged, is the correct type and has the same or later mod state.
- | 2. Isolate the supply to the Power Box.
- | 3. Isolate all outgoing supplies.

DURING WORK

- | 4. Remove the Insert Plate.
- | 5. Reach into the cable entry aperture and release the pedestal door catch.
- | 6. Disconnect the earth lead, retaining fixings.
- | 7. Check each cable is labelled, note its position.
- | 8. Noting their position, disconnect each cable that enters from the bottom of the housing, wrapping each one in a plastic bag to keep the connector clean and dry and remove the cables from the housing.

⋮ Both Battery and Power Boxes are heavy and require more than one person to lift.

- | 9. Remove the Battery Packs as detailed in [NR/SMTH/Part04/MS07](#) (Replace a Battery Pack).
- | 10. Remove the Switch Rack as detailed in [NR/SMTH/Part04/MS06](#) (Replace a Switch Rack).
- | 11. Remove the Charger Rack as detailed in [NR/SMTH/Part04/MS10](#) (Replace a Charger Rack).
- | 12. Remove and retain the fixings securing the housing to the pedestal and lift it clear.
- | 13. Locate the new controller on to the pedestal and secure it in place.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/MS16		
Replace a Power Box		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

AFTER INSTALLATION WORK

14. Replace the Switch Rack as detailed in [NR/SMTH/Part04/MS06](#) (Replace a Switch Rack).
15. Replace the Charger Rack as detailed in [NR/SMTH/Part04/MS10](#) (Replace a Charger Rack).
16. Replace the Battery Packs as detailed in [NR/SMTH/Part04/MS07](#) (Replace a Battery Pack).
17. Connect the earth lead.
18. Reconnect the cables.
19. Refit the insert plate.
20. Reconnect the incoming supply to the Power Box.
21. Reconnect the outgoing supplies.
22. Check for normal running.
23. Close and lock the Power Box housing door.
24. Inform the SM(S) that the unit has been changed and the serial number of the replacement unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW02		
Replace an Ethernet Extender Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Longspan Ethernet Extender Unit
Excludes:	All other types of Ethernet Extender Unit

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 – Base Side



Figure 2 - Camera Side

BEFORE INSTALLATION WORK

1. Check that the replacement Extender Unit is of the Correct Type and is Not Damaged.
2. Check the replacement is the correct version (modification level).
3. Verify the location of the faulty Extender Unit.
4. Location Case Only: Isolate the supply to the Extender Unit and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Extender Unit and check all the wires have safe insulation and are correctly labelled.
6. Remove the wires from the Extender Unit and insulate them.
7. Remove the Extender Unit and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced Extender Unit is securely mounted.
9. WIRE COUNT the Extender Unit and check all cables are correctly installed and secure.
10. Location Case Only: Reconnect the power supply and check the input voltages are within the specified tolerance.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW02		
Replace an Ethernet Extender Unit		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

11. Check the unit is working using the SRCM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW03		
Replace an GE RSTi Modbus TCP- IP Network Adapter		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GE RSTi Modbus TCP- IP Network Adapter STXMBE001
Excludes:	All other types of GE RSTi Modbus TCP- IP Network Adapter

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Images



Figure 1 - A single Network Adapter



Figure 2 - An adapter with ST Modules

BEFORE INSTALLATION WORK

1. Check that the replacement Network Adapter is of the Correct Type and version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty Extender Unit.
4. Isolate the supply to the Network Adapter and verify this by using a volt meter on the input terminals.
5. WIRE COUNT the Network Adapter Module and check all the wires have safe insulation and are correctly labelled.
6. If there is no damage to the wiring Module Connector, remove connector from Module.

Module Connector



NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW03		
Replace an GE RSTi Modbus TCP- IP Network Adapter		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

7. Remove the Network Adapter and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced Network Adapter is securely mounted.
9. WIRE COUNT the Network Adapter and check all cables are correctly installed and secure.
10. Reconnect the power supply and check the input voltages are within the specified tolerance.
11. Carry out configuration as shown in ASM Configuration Documentation.

12. Check the unit is working (MOD, Link, IO & Field Power LED's should be lit).

⋮ The Active Indication LED does flicker when in use.



13. Check at least one function controlled by each module operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW04		
Replace an GE RSTi ST Module Non-Configurable		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	RSTi ST-7241 Expansion Field Power Distribution module RSTi ST-1218 Digital Input 8 points Positive Logic module RSTi ST-3218 Analogue Input, 8 channels module RSTi ST 2328 24Vdc Digital Output Module RSTi ST 3214 Analogue Input Module RSTi ST 2748 Isolated Relay Output Module
Excludes:	All other types of RSTi ST Module

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Images



Figure 1 - Five RSTi ST Modules fitted to a TCP-IP Network Adapter

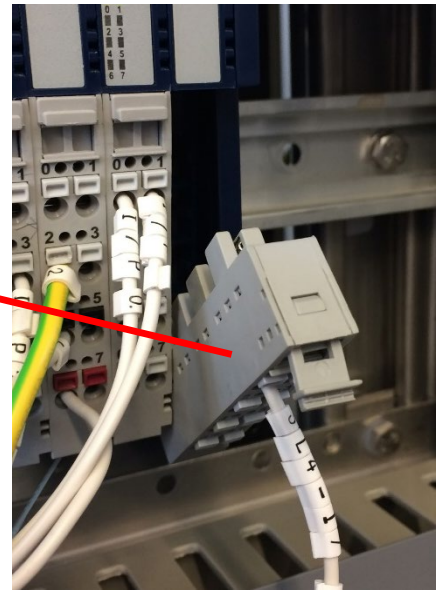
BEFORE INSTALLATION WORK

1. Check that the replacement ST Module is of the Correct Type and version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty ST Module.
4. Isolate the supply to the ST Module, verify this by using a volt meter on the input terminals.
5. Check all the wires have safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW04		
Replace an GE RSTi ST Module Non-Configurable		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- 6. If there is no damage to the wiring Module Connector, remove connector from Module.

Module Connector



- 7. Remove the ST Module and label it as faulty.

AFTER INSTALLATION WORK

- 8. Check that the replaced ST Module is securely mounted.
- 9. Reconnect the power supply to TCP-IP Network Adapter (including ST 7241 if used) and check the input voltages, refer to design for voltages.
- 10. Check the unit is working (Status LED lit, I/O may also be active).



ST Module Status Indication
Lit indicates Module ok

ST Module I / O Status Indication
Lit indicates IP/OP active if lit

- 11. Check at least one function controlled by each module operates correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW05		
Replace an GE RSTi ST Module Configurable		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	RSTi ST 5444 4 Channel PWM Output Source Module
Excludes:	All other types of RSTi ST Module

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Images



Figure 1 - RSTi ST Modules configurable fitted to a TCP-IP Network Adapter

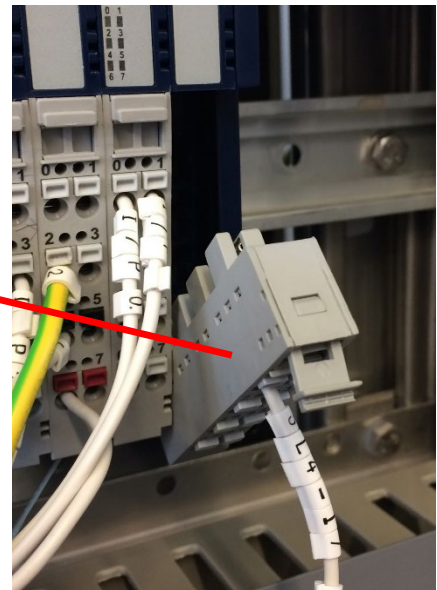
BEFORE INSTALLATION WORK

1. Check that the replacement ST Module is of the Correct Type and version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty ST Module.
4. Isolate the supply to the TCP-IP Network Adapter and the ST Module, verify this by using a volt meter on the input terminals.
5. WIRE COUNT the TCP-IP Network Adapter and the ST Module.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW05		
Replace an GE RSTi ST Module Configurable		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

6. Check all the wires have safe insulation and are correctly labelled.
7. If there is no damage to the wiring Module connector, remove connector from Module.

Module Connector



8. Remove the ST Module and label it as faulty.

AFTER INSTALLATION WORK

9. Check that the replaced ST Module is securely mounted.
10. WIRE COUNT the TCP-IP Network Adapter and the ST Module, check all cables are correctly installed and secure.
11. Reconnect the power supply and check the input voltages are within the specified tolerance.
12. Carry out Configuration as shown in ASM Calibration Documentation.
13. Check the unit is working.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW06		
Replace CISCO SFP Transceiver Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	GLC-FE-100LX-RGD SFP GLC-LX-SM-RGD SFP GLC-FE-100LX SFP GLC-FE-100FX SFP
Excludes:	All other Transceiver Modules

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - CISCO Transceiver Module

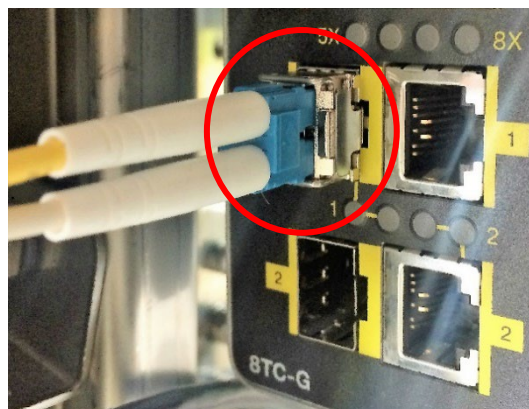


Figure 2 - CISCO Transceiver Module located in switch

BEFORE INSTALLATION WORK

1. Check that the replacement module is of the Correct Type and Version (modification level).
2. Check the replacement is Not Damaged.
3. Verify the location of the faulty module.
4. Check all cables are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW06		
Replace CISCO SFP Transceiver Module		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

5. Disconnect the cable and fit an “End Cap” in protect the fibre optic cable from contamination.
6. Remove module and label as faulty.

AFTER INSTALLATION WORK

7. Check the replaced module is securely mounted.
8. Remove the “End Cap” and visually check for contamination of the fibre.
9. Reconnect the cable.
10. Check one of the functions passing through the CISCO Network is working correctly.

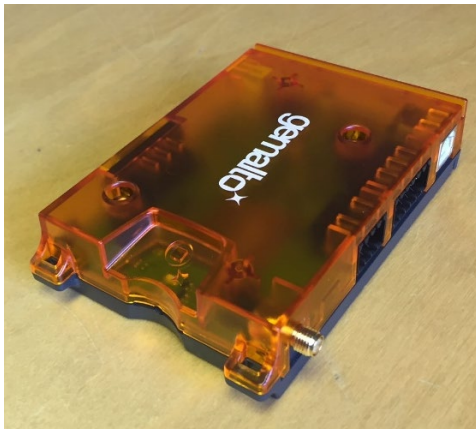
END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW07		
Replace a StackWatch Modem		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Stackwatch Modem
Excludes:	All other types and styles of Modem

For further information See [NR/SMS/Appendix/26](#) (General Information on the Fuel Cell System).

Equipment Identification Image



Modem View 1



Modem View 2

Figure 1 – StackWatch Modem

BEFORE INSTALLATION

1. Check that the replacement Modem is of the correct type, version (modification level).
2. Check the replacement unit is not damaged.
3. Disconnect the power supply.
4. WIRE COUNT existing modem to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.
7. Remove the SIM Card and transfer it to the replacement modem.
8. Remove the Modem and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW07		
Replace a StackWatch Modem		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

AFTER INSTALLATION

9. Check the Modem is securely fitted.
10. Check each cable connection is tight and secure.
11. Reconnect the power supply.
12. Check the red LED is illuminated.
 - ⋮ This indicated there is network connection.
13. Carry out the Configuration of the StackWatch Modem as shown in Appendix A.
14. The replaced unit should be returned to the depot for recycling.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW07		
Replace a StackWatch Modem		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

APPENDIX A - Configuration of the Stackwatch Modem

This process shall only be carried out by a person holding the “level 2” competency related to this equipment, if at any point during the process you are unsure of what you are seeing or the actions you should take, you should immediately stop work and seek advice.

- For further information See [NR/SMS/Appendix/26](#) (General Information on the Fuel Cell System).

Equipment Identification Image

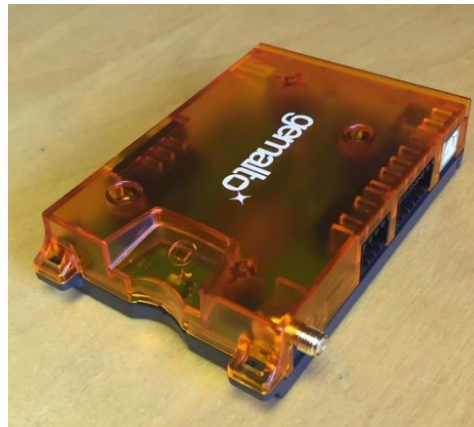


Figure 2 – StackWatch Modem

CONFIGURATION PROCESS

1. Open an internet browser (such as Edge, Chrome or Firefox) and navigate to:
<http://portal.fuelcellsystems.co.uk>

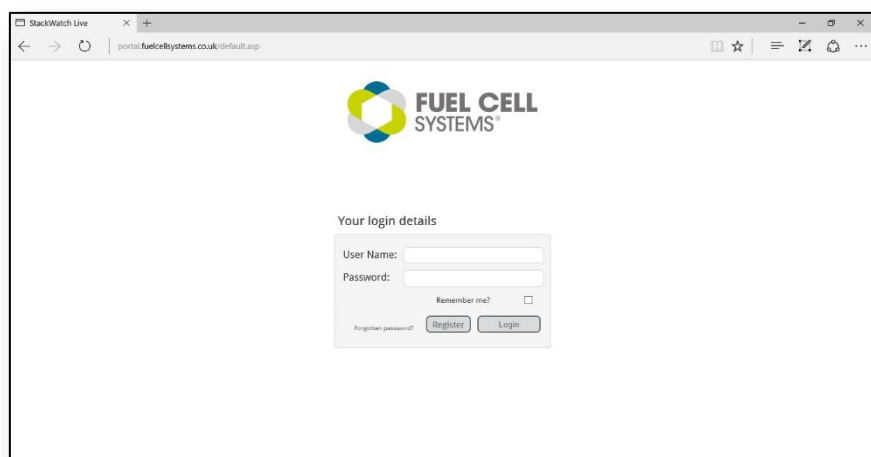


Figure 3 – Log In Screen

2. Log in with your user name and password (See Figure 3).

3. Once you are logged into StackWatch, you are presented with a screen similar to the one shown in Figure 4 for each piece of equipment you have monitored.

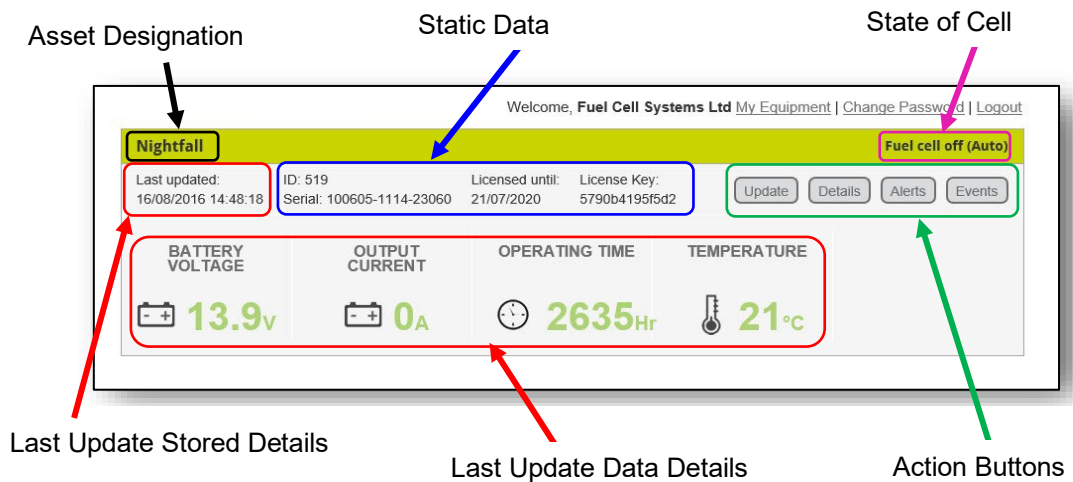


Figure 4 - Asset Detail Screen

4. This screen gives the following information:
- a) Asset Designation - Asset Name (Local Name).
 - b) State of Cell - What state the Fuel Cell is in. (On – Off – Auto – Manual).
 - c) Static Data – Serial numbers, licence dates, License Key and unit ID.

Heading	Description
ID	The unique ID assigned to this equipment.
Serial Number	The Serial Number of the fuel cell unit we expect to be monitoring.
Licensed Until	The date that the service license expires.
License Key	The service license for the monitoring of each piece of equipment.

Table 1 – Additional Information

4.1 Action Buttons

Button	Action
Update	Places the unit into the Stackwatch dial queue to retrieve the latest data (in advance of the next automatic update).
Details	Displays the Details page providing more information on the unit.
Alerts	Allows you to add and remove recipients of email and SMS alerts.
Events	Displays the event log for this unit.

Table 2 – Button Actions

- 4.2 Last Update Stored Details - This is the date and time the Fuel Cell updated its Date Details.
- 4.3 Last Update Data Details - These are the last data details received from the Fuel Cell.
- 5. Figure 5 shows the “Details” Page which gives the ability to interrogate the data.

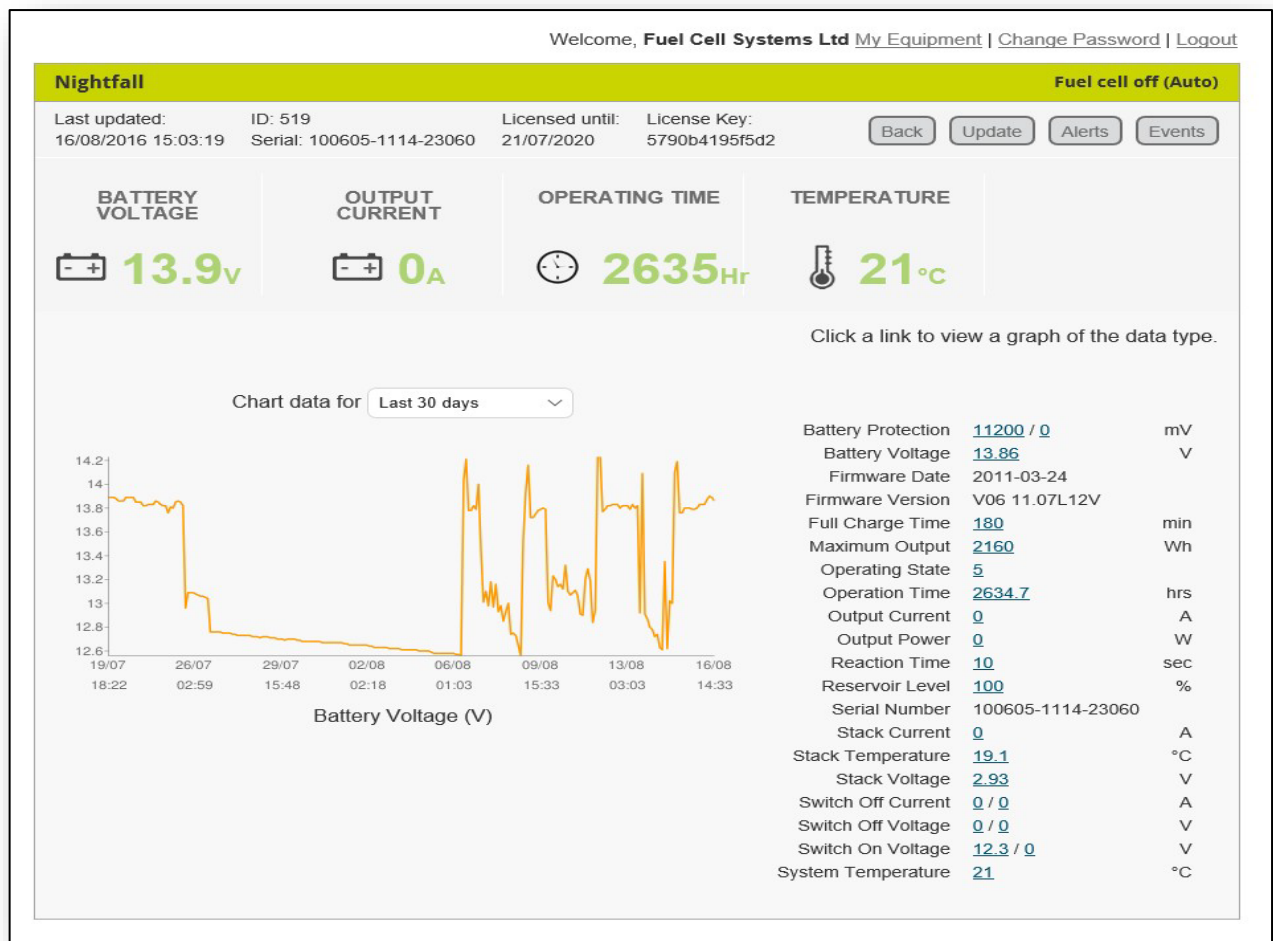


Figure 5 – The Details Page

- The right-hand side displays the last values stored by StackWatch.
- By clicking on any item, a graph appears on the left-hand side showing the historic data.
- You can change the time period this is displayed over by using the drop-down menu above the graph.

6. Figure 6 shows the “Notifications” Page which allows the automatic notification from the system to be configured and amended as required.

Figure 6 – Notifications Page

Heading	Description
Type	Email or SMS notifications.
Name	Name of the person receiving the notification.
Mobile/email	Either a mobile number or email address.
In hours / Out of hours	Tick to receive messages in and out of business hours. (0900 – 1700).
Normal / Information / Warning / Alarm / Serial Alarm	Tick to receive alerts for the different levels of alarm.
Delete	Tick to delete this contact.
Save	Saves the above information.

Table 3 – Notification Setup Options

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW08		
Replace a Dell KMM Rack Mounted Monitor		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Dell DKMM LED 185 KMM rack mounted monitor
Excludes:	All other types of rack mounted monitors

Appropriate electrostatic precautions shall be taken when equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - KVM Monitor: Front view, stored position



Figure 2 - KVM Monitor: Top view, extended position

BEFORE INSTALLATION WORK

1. Check that the replacement KMM monitor is of the Correct Type version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty KMM monitor.
4. Disconnect the KMM monitor power supply unit.
5. Disconnect the VGA connector(s) and PC jack plug. Check all the wires are correctly labelled.
6. Remove the KMM monitor and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW08		
Replace a Dell KMM Rack Mounted Monitor		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

7. Check that the replaced KMM monitor is securely mounted.
8. Reconnect the VGA connector(s) and PC jack plug to the KMM monitor and check all cables are correctly installed and secure.
9. Reconnect the power supply.
10. Check the KMM monitor LED power indicator, Red when the power is connected, Blue when the screen is opened.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW09		
Replace a Dell KVM Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Dell KVM SV831DUSBK Switch
Excludes:	All other types of switch

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Dell KVM Switch: Front view



Figure 2 - Dell KVM Switch: Rear view

BEFORE INSTALLATION WORK

1. Check that the replacement KVM switch is of the Correct Type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty KVM switch.
4. Disconnect the KVM switch power supply unit.
5. WIRE COUNT the unit and check cables for safe insulation.
6. Disconnect the VGA DIL connectors and PC jack plug connectors. Check all the wires are correctly labelled.
7. Remove the KVM switch and label it as faulty.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW09		
Replace a Dell KVM Switch		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

8. Check that the replaced KVM switch is securely mounted.
9. Reconnect the VGA DIL connectors and PC jack plug connectors to the KVM switch and check all connectors are correctly installed and secure.
10. WIRE COUNT the unit.
11. Reconnect the power supply.
12. Check on the front of the KVM switch that the power indicator is illuminated.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW10		
Replace a Patch Panel		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Brandrex FPCC1SXXX48LC2 Patch Panel
Excludes:	All other types of patch panel

⋮ The patch panel is used only for fibre optic cables and is unpowered.

Equipment Identification Image

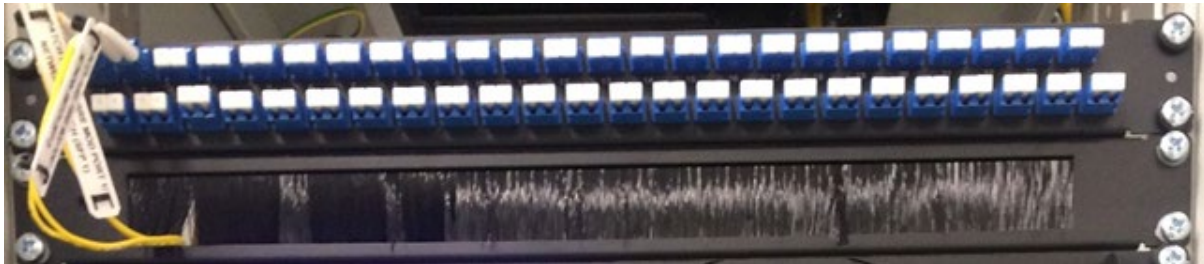


Figure 1 - Brandrex Patch Panel

BEFORE INSTALLATION WORK

1. Check that the replacement patch panel is of the Correct Type and version (modification level).
2. Check the replacement is not damaged.
3. Verify the location of the faulty patch panel.
4. WIRE COUNT the cables and check for safe insulation.
5. Check all the patch cables are correctly labelled.
6. Disconnect the patch cables from the patch panel (apply dust covers).
7. Remove the patch panel and label it as faulty.

AFTER INSTALLATION WORK

8. Check that the replaced patch panel is securely mounted.
9. Reconnect all the patch cables (remove dust covers)
10. WIRE COUNT the patch panel and check the cables are correctly installed and secure.
11. Check there are no “link faults” showing on the SRCM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW11		
Replace a Network / Ethernet Switch		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	CISCO IE2000, CISCO CGS2520, CISCO IE4000, CISCO WS-C3750X, CISCO 3850, CISCO IE-3010, RuggedCom 1500, RuggedCom 1510, RuggedCom i802 Westermo Lynx L106, Westermo TD-36, Westermo L110-F2G, Amplicon ex43008, CISCO WS 2960 CISCO C9300L and MOXA N Port 6650.
Excludes:	All other types of network switch

***** NOT INDEPENDENCE EXEMPT IF CONFIGURATION IS REQUIRED *****

Asset Identification Images



CISCO IE 2000



CISCO CGS2520



CISCO WS-C3750X



CISCO IE4000



CISCO 3850



RuggedCom 1500



RuggedCom 1510



RuggedCom i802



Westermo Lynx L106



Amplicon ex43008



Westermo TD-36



CISCO WS 2960



CISCO IE-3010



Westermo L110-F2G



MOXA N Port 6650



CISCO C9300L

Figure 1 - Types of Network / Ethernet switch

Appropriate electrostatic precautions shall be taken. Where provided electrostatic discharge points (ESD) shall be used.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW11		
Replace a Network / Ethernet Switch		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

BEFORE INSTALLATION WORK

1. Check that the replacement switch is of the correct type and is not damaged.
2. Check the replacement is the correct version (firmware modification level).
3. Verify the location of the faulty switch.
4. Isolate the supply to the switch and verify where possible by using a volt meter on the input terminals.

NOTE: *In some locations the power supply is duplicated, in which case both power supplies should be isolated.*

NOTE: *In some cases, switches can be replaced without powering down the switch. This should only be undertaken after confirming that this is acceptable for the system being worked on.*

5. [WIRE COUNT](#) the switch and check all the wires/cables have safe insulation and are correctly labelled.
6. Remove the cables from the switch and insulate them (for fibre cables install dust covers).

NOTE: *Some switches require these disconnections to be carried out following a set sequence.*

7. If provided: Remove SD card from the faulty unit and place it into the replacement unit.

NOTE: *If the SD card is found to be faulty refer to the "Configuration Procedure" in the site-specific equipment manuals.*

8. Remove the switch and label it as faulty.

AFTER INSTALLATION WORK

9. Check that the replaced unit is securely mounted.
10. Replace the wires/cables into the unit.

NOTE: *Some switches require these reconnections to be carried out in a different sequence from the disconnection sequence.*

11. [WIRE COUNT](#) the unit and check all cables are correctly installed and secure.
12. Reconnect the power supply if disconnected in step 4.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW11		
Replace a Network / Ethernet Switch		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

CONFIGURATION

13. If the unit requires configuration. Carry out the requirements as described in the site-specific equipment manuals.

NOTE: *At some locations the unit might have been pre-configured in which case this step is not required.*

TEST

14. When the configuration procedure has been completed, check one of the functions passing through the replaced unit is working correctly.
15. Check any monitoring equipment to verify the unit is functioning as expected.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW12		
Replace a Network Time Protocol (NTP) Server		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Time & Frequency Solutions M210 NTP Rackmount Server
Excludes:	All other NTP Servers and the M210 NTP Antenna

Appropriate electrostatic precautions shall be taken when working on this equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - M210 NTP Server (Front)



Figure 2 - M210 NTP Server (Back)

BEFORE INSTALLATION WORK

1. Check that the replacement unit is the correct type and version is not damaged.
 - Use the Maintenance Workstation or ASM Configuration Documentation to verify the replacement module is the correct version.
2. Check the replacement unit is the correct version (hardware and firmware).
3. Verify the location of the faulty unit.
4. Switch off the power using the switch on the back of unit.
5. Isolate the supply to the unit.
6. WIRE COUNT the unit and check all the wires have safe insulation and are correctly labelled.
7. Remove the wires from the unit and insulate them in the following sequence:
 - a) Power.
 - b) Cat5e Cables.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW12		
Replace a Network Time Protocol (NTP) Server		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

8. Remove the unit from the cubicle and label it as faulty.

AFTER INSTALLATION WORK

9. Check that the replaced M210 Server unit is securely mounted in the cubicle.
10. WIRE COUNT the M210 NTP Server unit and check all cables are correctly installed and secure.
11. Reconnect the wires to unit in the following sequence:
 - a) Cat5e Cables.
 - b) Power.
12. Reconnect the supply.
13. Switch on the power using the switch on the back of the M210 NTP Server unit.
14. Carry out Configuration as shown in the ASM Configuration Documentation - Configure a Time & Frequency Solutions M210 NTP Server.
15. When the configuration procedure has been completed check that the Server unit is tracking a minimum of 3 Satellites.

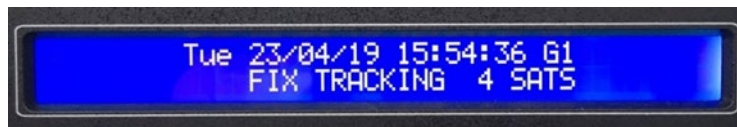


Figure 3 - Display indicating tracking 4 Satellites

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW13		
Replace a Network Time Protocol (NTP) Antenna		
Issue No: 2	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	M210 NTP Rackmount Server Antenna
Excludes:	All other NTP Equipment

***** INDEPENDENCE EXEMPT *****

Appropriate electrostatic precautions shall be taken when using this equipment. Where provided electrostatic discharge points (ESD) shall be used.

Equipment Identification Image



Figure 1 - Antenna (External)



Figure 2 - Antenna (Internal)

BEFORE INSTALLATION WORK

1. Check that the replacement antenna is of the correct type and is not damaged.
2. Verify the location of the faulty antenna.
3. Isolate the antenna connection from the rear of the M210 NTP server unit.
4. Check all the cables to the antenna have safe insulation and are correctly labelled.
5. Remove the wires from the antenna and insulate them.
6. Remove the M210 NTP server antenna from the mounting position and label it as faulty.

AFTER INSTALLATION WORK

7. Check that the replaced antenna is securely mounted in the correct position.
8. Check all the cables to the antenna are correctly installed and secure.
9. Re-connect the antenna connection to the rear of the M210 NTP server unit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/NW13		
Replace a Network Time Protocol (NTP) Antenna		
Issue No: 2	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

10. Check that the M210 NTP Server unit is tracking a minimum of 3 Satellites.

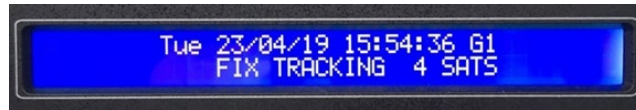


Figure 3 – Display indicating tracking 4 Satellites

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/OD01		
Replace an MCB-OD RADAR Scanner		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Complete Replacement of Honeywell YD136C series RADAR scanner
Excludes:	All other OD systems

GENERAL

Before any work is undertaken the following shall be undertaken:

- a) Crossing Placed in XCU or LCU Mode or auto lower inhibited by Signaller.
- b) Return to normal OD operation shall not occur unless the equipment has passed all tests and is fit for use.

The unit might be supplied with a plug coupler (YD136C1) connection or non-plug coupled (YD136C2).

Due to the Set-up process being too complex to describe in SMTH format, reference shall be made to the Installation and Setup Manual for RADAR to complete the stages referred to in this SMTH test plan.

BEFORE INSTALLATION WORK

1. Check that the affected scanner is correctly isolated. Slip the disconnection links for the affected scanner tail cable (non-plug coupled) and also disconnect the plug coupler (plug coupled version).
2. Check that the replacement scanner is of the correct type and is not damaged.
3. [WIRE COUNT](#) the existing scanner cable to the wiring diagram (non-plug coupled version).
4. Check after first removing all wires from the scanner terminals (non-plug coupled version) or with plug coupler disconnected (plug coupled version) the existing cables to equipment room have safe insulation.
5. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

6. [WIRE COUNT](#) the replacement scanner cable to the wiring diagram (non-plug coupled version).
7. Check the replacement scanner is correctly installed and secure.
8. Check that the cable is correctly labelled, secured and correctly routed.
9. Check that the beam height is correct (Installation and Set Up Manual).
10. Check the Surveillance Area created is correct (Installation and Set Up Manual).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/OD01		
Replace an MCB-OD RADAR Scanner		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

11. Remove any litter and vegetation near the scanner and within the Surveillance Area.
12. Test the replacement scanner (Walk Tests from Installation and Setup Manual) and record the test measurements on a new Record Card.
13. With the Signallers' permission, restore the crossing to automatic OD operation.
14. Observe that the crossing has successfully restored to normal operation by observing the next train if possible.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/OD02		
Replace a Level Crossing LIDAR Scanner		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	LIDAR scanners used at level crossings e.g. RLS3060 and RLS3060SH
Excludes:	All other OD systems.

Before any work is undertaken the following shall be undertaken:

- a) Crossing Placed in XCU/CCU or LCU Mode or auto lower inhibited by signaller as appropriate for the level crossing type.
- b) Return to normal operation using OD equipment shall not occur unless the equipment has passed all tests and is fit for use.

The unit may be supplied with a plug coupler connection or non-plug-coupled version.

Both plug coupled and non-plug coupled versions have an Ethernet connection in addition to the power/relay output cable. This connects via a standard RJ45 plug via a weatherproof connection box.

Reference shall be made to the Installation and Setup Manual for LIDAR in order to complete the stages referred to in this SMTH test plan.

BEFORE INSTALLATION WORK

1. Check that the affected scanner is correctly isolated. Slip the disconnection links for the affected scanner tail cable (non-plug coupled) and disconnect the plug coupler (plug coupled version).
2. Check that the replacement scanner is of the correct type and is not damaged.
3. WIRE COUNT the existing scanner cable to the wiring diagram (non-plug coupled version).
4. Check after first removing all wires from the scanner terminals (non-plug coupled version) or with plug coupler disconnected (plug coupled version) the existing signalling cable has safe insulation.
5. Check the existing wiring is correctly labelled.

AFTER INSTALLATION WORK

6. WIRE COUNT the replacement scanner cable to the wiring diagram (non plug coupled version).
7. Check the replacement scanner is correctly installed and secure.
8. Check that the cable is correctly labelled, secured and correctly routed.
9. Check that the beam height is correct (Installation and Set Up Manual).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/OD02		
Replace a Level Crossing LIDAR Scanner		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

10. Check the Detection Area created is correct (Installation and Set Up Manual).
11. Remove any litter and vegetation near the scanner and within the Detection Area.
12. Test the replacement scanner (Carry out the "Walk Tests" from Installation and Setup Manual) and Record the test measurements on a new Record Card.
13. With the Signallers' permission, restore the crossing to operation using the OD equipment.
14. Observe that the crossing has successfully restored to normal operation by observing the next train if possible.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/OD03		
Replace an MCB-OD RADAR Scanner Replaceable Component		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Replacement of Honeywell YD136C series RADAR scanner reference reflector and Line Replaceable Components as defined in the Repair Manual
Excludes:	All other OD systems. RADAR Range Finder, RADAR Radom

GENERAL

Before any work is undertaken the following shall be undertaken:

- a) Crossing Placed in XCU or LCU Mode or auto lower inhibited by Signaller.
- b) Return to normal OD operation shall not occur unless the equipment has passed all tests and is fit for use.

Due to the Set-up process being too complex to describe in SMTH format, reference shall be made to the RADAR Repair Manual and Installation and Setup Manual for RADAR to complete the stages referred to in this SMTH test plan.

BEFORE INSTALLATION WORK

1. Check that the replacement component is of the correct type and is not damaged.

AFTER INSTALLATION WORK

2. Check the replacement component is correctly installed and secure.
3. Remove any litter and vegetation near the scanner and within the Surveillance Area.
4. Test the replacement component (Repair Manual) and record the test measurements on a new record card.
5. With the Signallers' permission, restore the crossing to automatic OD operation.
6. Observe that the crossing has successfully restored to normal operation by observing the next train if possible.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA01		
Replace Rodding, Drives, Lock and Detector Equipment		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Switch extension pieces, Lock stretcher bars, lock and detector rods, Pins, Insulations, and Gate stops
Excludes:	Drive stretcher bars, Fixed stretcher bars, Adjustable stretcher bars, Electric detectors, Signal down rods and Gate locks

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement item is correctly installed.
3. Check that rodding rollers and stools are firmly installed.
4. Check any insulation, shims and self-alignment washers are correctly installed.
5. Check lock nuts, pins and/or new split pins are correctly installed (top roller, cranks).
6. Check that the apparatus operated by the replacement items functions correctly in the correct direction with satisfactory stroke and without undue strain on fittings, cranks, and stools.

POINTS ONLY:

7. Check the switch opening is correct, see [NR/SMS/Part/Z02](#) (Point: Reference Values).

MECHANICAL POINT DETECTOR ONLY:

8. Check dummy blades/spacers are present where required.

POINTS ONLY:

9. Carry out the correct Detection Test from ([NR/SMS/Test/010 to 013, 18](#)) and record the test measurements on the record card, together with the reason for the test.

MECHANICAL DETECTOR WHERE LOCK FITTED ONLY:

10. Check that with the point/bridge not locked, the signal blades are obstructed by the lock detector blade and that the relevant signal arm cannot move more than 5 degrees from horizontal (consider climatic conditions).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA01		
Replace Rodding, Drives, Lock and Detector Equipment		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

POINTS ONLY:

11. Carry out the correct Facing Point Lock Test from ([NR/SMS/Test/001 to 005](#)) and record the test measurements on the record card, together with the reason for the test.

SWING / LIFT BRIDGES ONLY:

12. Check the bridge lock.

GATES ONLY:

13. Check that all gates lock correctly and securely into the gate stop. Check that the gates cannot override the stops. Check that the gates cannot be manually pushed over the stops.

GATES ONLY:

14. Check that gates cannot be operated from either fully across railway or fully across road positions while they are locked by the correct locking lever.

DETONATOR PLACER ONLY:

15. Check that lever is free to operate and correctly places detonator on railhead.

HYDRO PNEUMATIC POINTS ONLY:

16. Check point operates in specified time (Mk1-3, 17-20 seconds, or Mk4, 15-30 seconds).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA02		
Replace or Adjust a Point Stretcher Bar		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Drive stretcher bars, Fixed stretcher bars, Adjustable stretcher bars
Excludes:	Tubular Stretcher Bars, Lock stretcher bars

GENERAL

The stretcher bar assembly (including all of the stretcher bar, the brackets, insulations, and nuts/bolts/washers) shall be considered as a line replacement unit which shall be replaced as a whole.

With the exception of defective nuts and bolts, which may be replaced in isolation (as a pair), any other replacement shall require the whole stretcher bar assembly to be replaced.

If any defects are found, other than a single loose nut and bolt, the whole assembly shall be replaced. Where an individual nut and bolt require replacement, they can be replaced individually but always as a pair.

BEFORE INSTALLATION WORK

- REPLACEMENT ONLY.** Check that the replacement stretcher assembly is not damaged and is correct type for the point system and position.
- Check that the bolt threads, bar threads, and contact faces of the nuts are not damaged, rusty, dirty, and do not have grease on them as this impairs the locking action. Clean and de-grease as necessary or replace with new ones.
- Measure the track gauge 100mm in front of the toes and at every stretcher bar position. For gauge details see [NR/SMS/PartZ/Z02](#) (Point – Reference Values). If the points are out of gauge by -2mm/+6mm then the SM(T) shall be informed to prompt any corrective maintenance required.
- FIXED STRETCHER BARS ONLY.** Where the track gauge is correct or the SM(T) has authorised continuance of the wide to gauge track, the fixed stretcher bar shall be measured and drilled according to the formula detailed in NR/L2/TRK/6100/Mod03 (Installing Stretcher Bars and setting them to the correct length) to maintain the required free wheel clearance and residual switch opening for the point system.
- FIXED STRETCHER BARS ONLY.** Check all stretcher bar lengths to confirm correct fit of the switch rail to the stock rail. Intermediate stretchers shall not be marked and drilled until both drive and rear stretchers have been checked for free wheel clearance and residual switch opening according to the formula detailed in NR/L2/TRK/6100/Mod03 (Installing Stretcher Bars and setting them to the correct length).
- ADJUSTABLE STRETCHER BARS ON NON HPSA POINT SYSTEMS, REPLACEMENT ONLY.** Check that the assembly has been correctly pre-built as detailed in NR/L2/TRK/6100/Mod06 (35mm Adjustable Stretcher Bars).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA02		
Replace or Adjust a Point Stretcher Bar		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

7. **ADJUSTABLE STRETCHER BARS ON HPSA POINT SYSTEMS, REPLACEMENT ONLY.** Check that the assembly has been correctly pre-built as detailed in NR/L2/SIG/11400.

DURING WORK

8. **FIXED STRETCHER BARS ONLY.** Installation and nut tightening shall be undertaken as detailed in NR/L2/TRK/6100/Mod05 (Fixed Stretcher Bars).
9. **ADJUSTABLE STRETCHER BARS ON NON HPSA POINT SYSTEMS ONLY.** Adjustment shall be carried out according to the formula detailed in NR/L2/TRK/6100/Mod03 (Installing Stretcher Bars and setting them to the correct Length) – 5.2 (Calculating the required free wheel clearance), to maintain the required Free Wheel Clearance and Residual Switch Opening for the point system.

Installation and nut tightening shall be undertaken as detailed in NR/L2/TRK/6100/Mod06 (35mm Adjustable Stretcher Bars).

10. **ADJUSTABLE STRETCHER BARS ON HPSA POINT SYSTEMS ONLY.** Adjustment shall be carried out according to the formula detailed in NR/L2/TRK/6100/Mod03 (Installing Stretcher Bars and setting them to the correct Length) – 5.2 (Calculating the required free wheel clearance), and residual switch opening for the point system.

Installation and nut tightening shall be undertaken as detailed in NR/L2/SIG/11400.

AFTER INSTALLATION WORK

11. Check that the replaced/adjusted stretcher is correctly installed.
12. **FIXED STRETCHER BARS ONLY.** Check that all fastenings are using M20 bolts with Hardlock nuts. Check the female (convex) nuts with a with a torque wrench/spanner set to 200Nm.
13. **ADJUSTABLE STRETCHER BARS ON NON HPSA POINT SYSTEMS ONLY.** Check that the assembly has been correctly installed and/or set up as detailed in NR/L2/TRK/6100/Mod06 (35mm Adjustable Stretcher Bars).
14. **ADJUSTABLE STRETCHER BARS ON HPSA POINT SYSTEMS ONLY.** Check that the assembly has been correctly installed and/or set up as detailed in NR/L2/SIG/11400.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA02		
Replace or Adjust a Point Stretcher Bar		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

15. Check the insulations, where required, are correctly installed on the correct side.

For all 6ft-mounted supplementary drives and 4ft-mounted supplementary drives with clamp locks, all stretcher bar insulations shall be in line with the soleplate insulation. For point machine operated 4ft mounted supplementary drives, the 2nd and subsequent stretcher bars shall be fitted with the insulations on the same side of the track. This avoids the risk of track circuit failure if the channel rod sag and come into contact with stretcher bars.

16. Check clearance between stretcher and bottom of stock rail for all extended stretcher bars, see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).

17. Check the switch opening is correct at the toe, see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).

18. Measure by use of the S&C gauge that the free wheel passage, free wheel clearance, and residual switch opening are correct throughout the length of the switch for the switch type and gauge of the track [NR/SMS/PartC/PF01](#) (Point Fittings) and [NR/SMS/PartZ/Z02](#) (Point – Reference Values). Record the results on the NR/SMS record card.

19. Check that the point drive is set correctly.

20. Check points by manual operation for freedom of movement throughout travel in both directions (N-R & R-N).

21. **SYSTEMS WITH SUPPLEMENTARY DRIVE ONLY.** Check that the supplementary drive remains effective with no signs of binding, excess wear, or distortion [NR/SMS/PartC/PF02](#) (Mechanical Supplementary Drives).

Any slack on adjustment in the supplementary drive shall not cause mechanical pressure forcing the switch tips away from the switch rail.

22. Test (gauge) the point detection (Detection tests ([NR/SMS/PartB/Test/010 to 013 and 18](#))) and record the test measurements on the NR/SMS record card, together with the reason for the test.

23. **SYSTEMS WITH SUPPLEMENTARY DETECTION ONLY.** Test (gauge) the supplementary detection, see [NR/SMS/PartB/Test/016](#) (Detection Test (Supplementary Detectors)) and record the test measurements on the NR/SMS record card, together with the reason for the test.

24. Test (gauge) the facing point lock [Facing Point Lock Test \(NR/SMS/PartB/Test/001 to 005\)](#) and record the test measurements on the NR/SMS record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA03		
Replace a Crank or Signal Wheel		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Compensator, gate crank, gate heel drive and signal wire adjuster
Excludes:	Lever frame components

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.
2. Check supporting stool is correct height.

AFTER INSTALLATION WORK

3. Check replacement item is correctly installed.
4. Check item is secure on the supporting stool and that the supporting stool is itself secure.
5. Check item moves freely throughout its travel.
6. Check new pins and/or split pins are correctly installed.
7. Check that chains and slings are correctly fitted (SIGNAL WHEEL OR WIRE ADJUSTER ONLY).
8. Check that the equipment operated by the crank or wheel functions in the correct direction with an acceptable amount of stroke and without undue strain on fittings or stools.
9. There should ideally be 7.5" of stroke at the lever tail (6.5" for point rodding), but this can vary by 2" over every 100 yards of wire, depending on temperature.
 - For long distance signals a draught wheel is used to double the stroke for details see [NR/SMS/PartC/SG00](#) (Signals: General) - Wire Adjustment.
10. If the crank is associated with Point Detection then a Detection Test shall be carried out [NR/SMS/Test/010 to 013, 18](#). Record test results on the record card, together with the reason for the test.
11. For Points Only – Carry out [NR/SMS/Test/001 to 005](#) (Facing Point Lock Test) and record the test measurements on the record card, together with the reason for the test (POINTS ONLY).
12. Check all gates lock into any gate stop (GATES ONLY).
13. Check that gates cannot be operated from either fully across the railway or fully across the road positions while they are locked by the correct locking lever (GATES ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA03		
Replace a Crank or Signal Wheel		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

14. Check lever is free to operate and correctly places detonator on railhead (DETONATOR PLACER ONLY).
15. Check bridge detection (SWING/LIFT BRIDGES ONLY).
16. Check point operates in specified time (Mk1to3 -17 to 20 seconds, or Mk4 - 15 to 30 sec), (HYDRO PNEUMATIC POINTS ONLY).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA04		
Replace or Adjust a Tubular Stretcher Bar		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Tubular Stretcher Bars
Excludes:	Fixed Stretcher Bars, Adjustable Stretcher Bars, Lock Stretcher Bars

GENERAL

- Details for the installation of Tubular Stretcher Bars can be found in
- NR/L2/TRK/6100/Mod04 Tubular Stretcher Bars.

BEFORE INSTALLATION WORK

1. Check that the replacement Tubular Stretcher Bar is not damaged and is correct Type for the point system and position.
2. Check that the replacement motion unit is not damaged and is correct type for the point system.
3. Check that the bolts are not damaged and are correct type for the point system and position.
4. Measure the track gauge 100mm in front of the toes and at every stretcher bar position. For gauge details see [NR/SMS/PartZ/Z02](#) (Point – Reference Values). If the nominal values are out of specification by -2mm/+6mm then the Section Manager (Track) shall be informed to prompt any corrective maintenance required.
5. Check that the tubular stretcher bar assembly has been correctly prebuilt as detailed in NR/L2/TRK/6100/Mod04 (Tubular Stretcher Bars).

DURING WORK

6. Where the track gauge is correct or the Section Manager (Track) has authorised continuance of the wide to gauge track, the tubular stretcher bar assembly shall be adjusted according to the formula detailed in NR/L2/TRK/6100/Mod03 (Installing Stretcher Bars and setting them to the correct length) to maintain the required free wheel clearance and residual switch opening for the point system.
7. Observe that the installation and nut tightening is undertaken as detailed in NR/L2/TRK/6100/Mod04 (Tubular Stretcher Bars).

AFTER INSTALLATION WORK

8. Check that the tubular stretcher bar assembly is correctly installed – (Primary and Secondary Locking Functions).
9. Apply a check torque to all fastenings (motion unit to switch rail and motion unit to tube), see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).
10. Check that the insulations are correctly installed (motion unit, drive and supplementary drive positions).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PA04		
Replace or Adjust a Tubular Stretcher Bar		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

11. Check the clearance between kicking strap and the bottom of the stock rail (front stretcher bar positions only), see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).
12. Check the switch opening is correct at the toe, see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).
13. Measure by use of the S&C gauge that the free wheel passage, free wheel clearance and residual switch opening are correct through the length of the switch for the switch type and gauge of the track, see [NR/SMS/PartZ/Z02](#) (Point – Reference Values).
 - Record the results on the NR/SMS record card.
14. Check that the point drive is set correctly.
15. Check the points by manual operation for freedom of movement throughout travel in both directions (N-R & R-N).
16. **SYSTEMS WITH SUPPLEMENTARY DRIVE ONLY.** Check that the supplementary drive remains effective with no signs of binding, excess wear or distortion, see [NR/SMS/PartC/PF02](#) (Mechanical Supplementary Drives).
 - Any slack on adjustment in the supplementary drive shall not cause mechanical pressure forcing the switch tips away from the switch rail.
17. Test (gauge) the point detection, see [NR/SMS/PartB/Test/011](#) (Detector Tests (Electrical Detectors) or [NR/SMS/PartB/014](#) (Lock and Detector Full Test (Clamp lock)) and record the test measurements on the NR/SMS record card together with the reason for the test.
18. **SYSTEMS WITH SUPPLEMENTARY DETECTION ONLY.** Test (gauge) the supplementary detection, see [NR/SMS/PartB/Test/016](#) (Detection Test (Supplementary Detectors)) and record the test measurements on the NR/SMS record card together with the reason for the test.
19. Test (gauge) the facing point lock, see [NR/SMS/PartB/Test/001](#) (Facing Point Lock Tests (Machine)) or [NR/SMS/PartB/Test/003](#) (Facing Point Lock Tests (Clamp lock)) and record the test measurements on the NR/SMS record card together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB01		
Replace a Complete Clamp Lock Body		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	RCPL Mk 1 and Mk 2, IBCL (Mk 2 and Mk 3)
Excludes:	Chair locks, clamp lock detector and lock arm assembly

GENERAL

Mk1 RCPL lock bodies shall only be used as replacements where the layout prevents fitment of later versions.

BEFORE INSTALLATION WORK

1. Check replacement clamp lock body is not damaged.
2. [WIRE COUNT](#) existing microswitch assembly to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check motor and detection are isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement clamp lock body is correctly installed.
7. Check tab washers and self-locking nuts are correctly installed.
8. Check that Spirol pins are flush with the clamp lock body (Mk 1 EQUIPMENT ONLY).
9. Check support brackets where fitted are secure and not damaged (Mk 1 EQUIPMENT ONLY).
10. Check wiring is replaced as labelled.
11. Check tail cable cores are on the correct terminals (EXCEPT FOR MOULDED CABLE).
12. [WIRE COUNT](#) replacement microswitch assembly to the wiring diagram.
13. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
14. Check terminations are secure and suitably protected.
15. Check wires and cables are secure and clear of moving parts and will not be chaffed by vibration of cover.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB01		
Replace a Complete Clamp Lock Body		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

16. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) detection circuits during normal and reverse power operation.
17. Test facing point lock [NR/SMS/Part B/Test/003](#) (Facing Point Lock Tests – Clamp Lock) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.
18. Test (gauge) clamp lock detection [NR/SMS/Part B/Test/013](#) (Detection Test – Clamp Lock) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.
- * 19. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/PB02		
Replace a Hydraulic Power Pack		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Clamp lock, and Derailer power packs
Excludes:	Barrier power packs

GENERAL

All replacement hydraulic power packs shall be fitted with level indicator and snorkel valve.

BEFORE INSTALLATION WORK

1. For Missing Equipment Only: Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement hydraulic power pack is not damaged and is correct type.
3. Check concrete pedestal is not damaged, is secure and reasonably level.
4. [WIRE COUNT](#) existing hydraulic power pack to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing hydraulic hoses are not damaged and are the correct length.
7. [INSULATION TEST](#) replacement hydraulic power pack (minimum 2M ohms terminals to case).
8. Check existing wiring and hydraulic hoses are correctly labelled.
9. Check existing hydraulic power pack is Isolated from the supply.

AFTER INSTALLATION WORK

10. Test to ascertain any air has been excluded from the hydraulic system before continuing. Check the system for air [NR/SMS/PartB/Test/015](#) (Clamp Lock: Test for air in the system).
11. Check replacement hydraulic power pack is correctly installed.
12. Check wiring is replaced as labelled.
13. [WIRE COUNT](#) replacement hydraulic power pack to the wiring diagram.
14. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
15. Check wires and cables are secure and clear of moving parts.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/PB02		
Replace a Hydraulic Power Pack		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

16. Check hydraulic hoses are replaced as labelled.
17. Check hydraulic hoses are free of fixed and moving parts such that they are not chafing whilst flexing in normal operation, and that all connections are secured by locking wires.
18. Check hydraulic hose locking wires are correctly fitted.
19. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supplies during normal and reverse power operation.
20. Check the direction lever is locked in the neutral position when the Power/Manual switch is set to power.
- * 21. Check points, or derailer, move in the correct direction under power operation.
22. Check points, or derailer, move in the correct direction when pumped manually and do not respond to power operation whilst set to manual.
23. Check hydraulic hoses and joints for leaks and that the fluid level is correct.
24. Check or arrange for, correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB03		
Replace a Hydraulic Actuator		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Clamp locks, Trainstops, Hydraulic Derailers, Hydraulic barrier rams, BR-WR barrier top & bottom ram brackets and pins
Excludes:	Train Operated Points, Other barrier ram brackets and pins

BEFORE INSTALLATION WORK

1. Check replacement hydraulic actuator is not damaged and is correct type.
 - ⋮ All replacement hydraulic actuators shall preferably be of the self-bleeding type.
2. Check existing hydraulic hoses are correctly labelled.
3. Check existing hydraulic hoses are not damaged.
4. During installation work check top ram pin moves freely in ram (BARRIERS ONLY).

AFTER INSTALLATION WORK

5. Test to ascertain any air has been excluded from the hydraulic system before continuing. See [NR/SMS/PartB/Test/015](#) (Clamp Lock: Test for air in the system).
6. Check replacement hydraulic actuators are correctly installed.
7. For barriers, check top and bottom ram brackets correct way up. See the barrier equipment standard for critical dimensions.
8. Check split pins and/or self-locking nuts are correctly installed.
9. Check security of hydraulic actuator.
10. Check barrier ram pins move freely in the ram (BR-WR-TYPE BARRIERS ONLY).
11. Check top ram pin is prevented from turning in its frame (Mk.1 PENGUIN BARRIERS ONLY).
12. Check hydraulic hoses are installed as labelled.
13. Check hydraulic hoses are clear of moving parts.
14. Check any locking wires are correctly fitted.
15. Check apparatus moves freely in the correct direction on manual operation.
16. Check the tip force and damping are correct according to the type of barrier (see the barrier equipment standard), (BARRIERS ONLY).
17. Check wires and cables are clear of moving parts.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB03		
Replace a Hydraulic Actuator		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- 18. Check apparatus moves in the correct direction on power.
- 19. Check hydraulic hoses and joints for leaks and that the fluid level is correct.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB04		
Replace a Hose		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Clamp locks, Hydraulic Derailer, Hydraulic barrier, BR-WR barrier, trainstop, Electro-pneumatic points, Chair lock and Hydraulic supplementary drive pipes
Excludes:	Missing or physically separated hoses

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement hose is not damaged and is correct type and length.
3. Check apparatus connectors associated with the existing hose are correctly labelled. (WHEN MORE THAN ONE HOSE IS DISCONNECTED).
4. Check air supply is disconnected (ELECTRO-PNEUMATIC APPARATUS ONLY).

AFTER INSTALLATION WORK

5. Test to ascertain any air has been excluded from the hydraulic system before continuing (ELECTRO-HYDRAULIC APPARATUS ONLY).
6. Check replacement hose is correctly installed.
7. Check hoses are installed as labelled.
8. Check hydraulic hoses are free of fixed and moving parts such that they do not chafe whilst flexing in normal operation.
9. Check any locking wires are correctly fitted.
10. Check apparatus moves freely in the correct direction on manual operation.
11. Check apparatus moves in the correct direction on power.
12. Check hoses and joints for leaks.
13. Check fluid level is at the correct level on the gauge. (ELECTRO-HYDRAULIC APPARATUS ONLY).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB05		
Replace an Electric Point Detector or Microswitch		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Clamp lock, Train operated points, Individual microswitches, Microswitch assembly, All separate electrical detectors, Chair locks
Excludes:	Clamp lock body, Clamp lock detector and arm assembly

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement detector/microswitch is not damaged and is correct type.
3. [WIRE COUNT](#) existing detector/microswitch to the wiring diagram.
4. Check existing wiring has safe insulation.
5. [INSULATION TEST](#) replacement detector/microswitch (minimum 2M ohms terminals to case).
6. Check existing wiring is correctly labelled.
7. Check existing detector or microswitch is isolated from the electrical supply.
8. Check air supply is disconnected (CHAIR LOCKS ONLY).

AFTER INSTALLATION WORK

9. Check replacement detector or microswitch is correctly installed.
10. Check any self-locking nuts are correctly installed.
11. Check wiring is replaced as labelled.
12. [WIRE COUNT](#) replacement detector/microswitch to the wiring diagram.
13. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
14. Check terminations are secure and suitably protected.
15. Check wires and cables are secure and clear of moving parts.
16. Identify and carry out the correct Facing Point Lock from the following: [NR/SMS/PartB/Test/001 to 005](#) and record the test measurements on the record card, together with the reason for the test (DETECTORS WITH INTEGRAL FACING POINT LOCKS ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB05		
Replace an Electric Point Detector or Microswitch		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

17. Identify and carry out the correct Detection Test from the following:
[NR/SMS/PartB/Test/010 to 013 or 018](#) and record the test measurements on the record card, together with the reason for the test.
18. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) detection circuits during normal and reverse power operation.
- * 19. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.
20. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB06		
Replace a Clamp Lock Detector and Lock Arm Assembly		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Clamp lock detector blade, Adjustable cam, Lock arm bracket, Lock arm, Lock arm pivot pin, Phosphor bronze bush, Drive lock slide, Coupling bar, First stretcher bar
Excludes:	Lock body, microswitches, Fixed stretcher bars, Adjustable stretcher bars

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement item is correctly installed.
3. Check all new split pins and self-locking nuts are correctly installed.
4. Check points manually for freedom of movement throughout travel.
5. Carry out [NR/SMS/PartB/Test/003](#) (Facing Point Lock Tests (Clamp Lock)) and record the test measurements on the record card, together with the reason for the test.
6. Carry out [NR/SMS/PartB/Test/013](#) (Detection Test (Clamp Lock)) and record the test measurements on the record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB07		
Replace A Break Out Device As Used Within Hy-Drive System		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Hy-drive system only
Excludes:	All other Break Out devices

BEFORE INSTALLATION WORK

1. Check replacement Break Out Device is not damaged.

AFTER INSTALLATION WORK

2. Check the Break Out Device is correctly installed.
3. Check the Break Out Device has not been operated.
4. Test (gauge) SO Unit detection, carry out [NR/SMS/PartB/Test/009](#) (Detection Test (SO Hydraulic Supplementary Point Drive System) and record the test measurements on the NR/SMS record card, together with the reason for the test.
5. If the Break out Device being replaced is at the rearmost SO unit then measure by use of the S&C gauge that the Free Wheel Passage & Free Wheel Clearance are correct at that position.

For the switch type and gauge of the track [NR/SMS/PartC/PF01](#) (Point Fittings) and Point Reference Values [NR/SMS/PartZ/Z02](#) (Point – Reference Values). Record the results on the NR/SMS record card.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB08		
Replace an SO Unit		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Hy-drive system
Excludes:	All other point operating equipment

BEFORE INSTALLATION WORK

1. Test the gauge of the points 100mm in front of the toe and at each SO Unit position. For NR60 Inclined S&C the gauge shall be 1435mm.
 If the points are out of gauge by more than -2mm/+6mm then inform the Section Manager (Track) to enable them to decide what action shall be taken.
2. Check existing break out devices are not damaged.
3. Check replacement SO Unit is not damaged and is the correct stroke length.
4. Check existing SO Unit is isolated from the supply.
5. Check existing hydraulic hoses are correctly labelled.
6. Check existing hydraulic hoses are not damaged.
7. Check the Excalibur fixings are not damaged.
8. Check the existing plug couplers are not damaged.
9. Check the existing cables are not damaged.

AFTER INSTALLATION WORK

10. Check replacement SO Unit is correctly installed and that the packing plates and plastic cones are in place, see Figure 1.

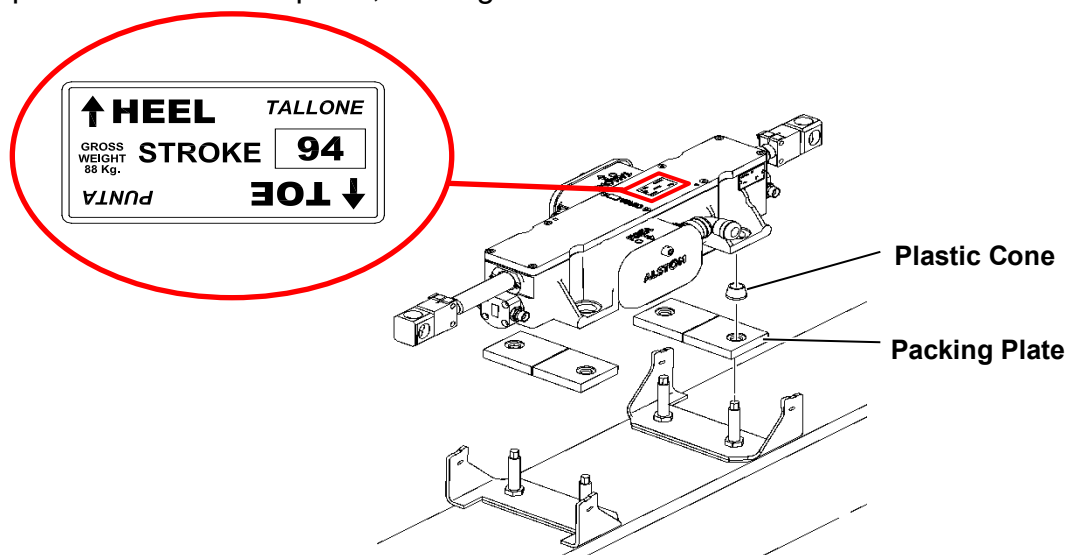


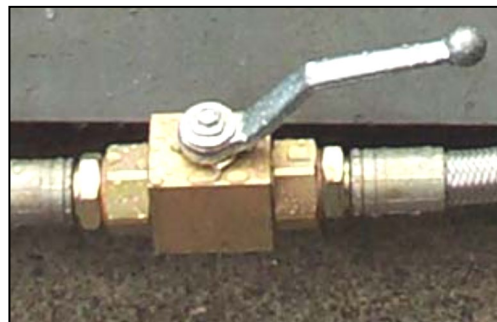
Figure 1 – Mounting an SO Unit

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB08		
Replace an SO Unit		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

11. Check the plug connector so that no metallic dust, moisture or other contaminants exists between the two halves before reconnecting.
12. Check the plug coupler has correctly fastened, an audible click is heard when the coupler snaps home. A strap wrench could be used if the connection is difficult to access.
13. Check cables are clear of moving parts.
14. Check hydraulic hoses are installed as labelled.
15. Check hydraulic hoses are clear of moving parts.
16. Check that the SO fixing nuts have been torque tightened to 250Nm.
17. Test that air has been removed from the hydraulic system:
 - a) Open the by-pass valve and then manually operate the points in one direction for at least 90 seconds.
 - b) Close the by-pass valve and operate the points to the opposite position.
 - c) Reopen the by-pass valve and manually operate the points in one direction for a further 90 seconds. Finally close the by-pass valve to return to normal operation.



**“Closed” Position
(Normal Operation)**



**“Opened” Position
(Bleeding the system)**

Figure 2 – By-pass valve positions

18. Check apparatus moves freely in the correct direction on manual operation.
19. Check apparatus moves in the correct direction on power.
20. Check hydraulic hoses and joints for leaks and that the fluid level is correct.
21. Check the cover has been replaced and that the fixing nuts have been torque tightened to 160Nm.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB08		
Replace an SO Unit		
Issue No: 03	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

22. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) detection circuits during normal and reverse power operation.
23. Measure by using an S&C gauge that the free wheel passage, free wheel clearance, and residual switch opening are correct throughout the length of the switch, for the switch type and gauge of the track.
24. Carry out [NR/SMS/PartC/PF01](#) (Point Fittings) and Point Reference Values [NR/SMS/PartZ/Z02](#) (Point – Reference Values) and record the results on the record card.
25. Test facing point lock [NR/SMS/PartB/Test/003](#) (Facing Point Lock Tests (Clamp lock)) and record the test measurements on the record card, together with the reason for the test.
26. Test (gauge) clamp lock detection [NR/SMS/PartB/Test/013](#) (Detection Test (Clamp Lock)) and record the test measurements on the record card, together with the reason for the test.
27. Test (gauge) SO Unit detection [NR/SMS/PartB/Test/009](#) (Detection Test (SO Hydraulic Supplementary Point Drive System) and record the test measurements on the record card, together with the reason for the test.
- * 28. Carry out [POINT DETECTION AND CORRESPONDENCE TEST](#) on the affected ends.
29. The final check before completion of the work is to ask the Signaller to operate the points to normal and reverse position (twice if possible) to observe correct operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB09		
Replace a Hy-drive Bypass Valve		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Alstom SO hydraulic supplementary drive system
Excludes:	All other types of hydraulic supplementary drive

The by-pass valve is located at the rear SO unit and is used to direct the flow of hydraulic oil to allow the system to be bled. The original by-pass valve is positioned underneath the cover of the rear SO unit. Hy-drive Mk 2 has a revised design and now the by-pass valve is housed in a lockable cover attached the rear SO cover. The operation of the valve has not changed. The cover should not be able to close if the valve is left in the bleed position – open.

Mk 1 by-pass valves cannot be upgraded to the Mk 2 valve design because the bearer may not have the extra holes required to secure the lockable cover. The cover shall be locked by a RKB221 padlock.

BEFORE INSTALLATION WORK

1. Check replacement valve with attached hose is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Test to ascertain any air has been excluded from the hydraulic system before continuing. Bleeding of air, which is important for the reliable operation of the SO Units, is achieved by:

a) Opening the By-Pass Valve;



Figure 1 – Open Position

b) Manually operating the points in only one direction (either Normal or Reverse) for at least 90 seconds;

c) Close By-Pass valve (see Figure 18), operate switches one way and re-open By- Pass valve;

d) Repeat the manual operation of the points in the same direction as before for 90 seconds;

e) Close the By-Pass Valve;



Figure 2 – Closed Position

NOTE: It is advisable to bleed longer switches SG, G and H for 120 seconds.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB09		
Replace a Hy-drive Bypass Valve		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

3. Check replacement valve is correctly installed.
4. Check hoses are installed as labelled.
5. Check hydraulic hoses are free of fixed and moving parts such that they will not chafe whilst flexing in normal operation.
6. Check apparatus moves freely in the correct direction on manual operation.
7. Check apparatus moves in the correct direction on power.
8. Check hoses and joints for leaks.
9. Check fluid level is sufficient.
10. Check that the valve is closed and locked.

NOTE: To lock the By-pass valve into position when work is complete. This is done by removing the handle completely, and turning the washer 90 degrees, and then re-assembling the handle. If this is done correctly, the handle cannot turn and is locked in the closed position.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PB18		
Remove and Refit Hydraulic Derailer Unit		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Hydraulic Derailers powered by SPX Hydraulic Pumps and Actuators. (Type BRB 817)
Excludes:	All other types of Derailer

GENERAL

The equipment shall not be operated on power until the unit has been proven to work correctly by hand pump operation.

Hydraulic Derailers use a standard Clamplock pump unit and a pair of Clamplock rams to drive a Derailer mechanism.



Figure 1 Hydraulic Derailer

BEFORE INSTALLATION WORK

1. Check replacement Derailer unit is not damaged and is the correct type.
2. Check the Derailer power pack has been isolated from the supply.

AFTER INSTALLATION WORK

3. Check replacement Derailer is correctly installed.
4. Check the torque settings of the nuts for the bolts holding the derailer mechanism to the rail at 80Nm.
5. Carry out the mechanical set up and test requirements as shown in [NR/SMS/PartB/Test/020](#) (Hydraulic Derailer (Type BRB 817) Tests) - Section 1.
6. Carry out the Detection, Motor Cut out and correspondence test as shown in [NR/SMS/PartB/Test/020](#) (Hydraulic Derailer (Type BRB 817) Tests) - Sections 2, 3 and 4.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC02		
Replace an Electric Motor		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Point machine, Boom gate, BR-WR style hydraulic barrier, Electro-mechanical barriers, Hydraulic power pack integral motor, Signal machines
Excludes:	Hydraulic pump

BEFORE INSTALLATION WORK

1. Check replacement electric motor is not damaged and is correct type.
2. [WIRE COUNT](#) existing electric motor to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) replacement electric motor (minimum 2M ohms terminals to case).
5. Check existing wiring is correctly labelled.
6. Check existing electric motor is isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement electric motor is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement electric motor to the wiring diagram.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
11. Check terminations are secure and suitably protected.
12. Check wires and cables are secure and clear of moving parts.
13. Test for correct polarity (**DC MOTORS ONLY**).
14. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) electric motor.
- * 15. Check that the apparatus moves in the correct direction under power.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC03		
Replace a HW2000 Point Machine Clutch		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	HW 2000 point machine
Excludes:	HW 1000 point machine clutch

BEFORE INSTALLATION WORK

1. Check replacement clutch is not damaged and is correct type.
2. [WIRE COUNT](#) existing clutch to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing clutch is isolated from the supply.

AFTER INSTALLATION WORK

5. Check replacement clutch is correctly installed.
6. Check wiring is replaced as labelled.
7. [WIRE COUNT](#) replacement clutch to the wiring diagram.
8. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
9. Check terminations are secure and suitably protected.
10. Check wires are secure and clear of moving parts.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies during normal and reverse operation.
- * 12. Test clutch for correct operation. Carry out a clutch slip current test as shown in [NR/SMS/PartC/PC05](#) (Point Machine HW Style).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC04		
Replace an Ansaldo T72 Point Machine VCC 'C' Arm Assembly		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	'C' arm assembly, shims, Hammer head bolts, Consumable wear components, Roller stabiliser
Excludes:	Lock frame assembly, Detector, brass plunger, Hollow bolt assembly

General

- Shims and a 4mm diameter drill are required.

BEFORE INSTALLATION WORK

1. Check replacement 'C' arm assembly is complete with wear pads and is not damaged and is correct type.
2. Check each replacement hammer head bolt assembly is complete with two plain and two spring washers, castellated nut and split pin and is not damaged (two assemblies required for each 'C' arm assembly).
3. Check replacement roller stabiliser components are not damaged.
4. Check replacement pads/plastic sleeve are not damaged.
5. [WIRE COUNT](#) existing detector to the wiring diagram.
6. Check existing wiring has safe insulation.
7. Check existing wiring is correctly labelled.
8. Check detection is Isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement 'C' arm assembly is correctly installed.
10. Check each replacement hammer head bolt/washers/nut/split pin assembly is correctly installed.
11. Check replacement roller stabiliser components are correctly installed.
12. Check replacement pads/plastic sleeve are correctly installed.
13. Check VCC detector assembly is correctly installed.
14. Check VCC coupling rod is correctly installed and adjusted.
15. Check tab washers, nuts and split pins are correctly installed.
16. Check wiring is replaced as labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC04		
Replace an Ansaldo T72 Point Machine VCC 'C' Arm Assembly		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

17. [WIRE COUNT](#) the new detector to the wiring diagram.
18. Check tail cable cores are on the correct terminals.
19. Check terminations are secure and suitably protected.
20. Check wires and cables are secured clear of moving parts.
21. Check points manually for freedom of movement throughout travel.
22. Carry out [NR/SMS/PartB/Test/005](#) (FPL Test (VCC Lock)).
23. Carry out [NR/SMS/PartB/Test/007](#) (Detection Test (VCC Detector)).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC05		
Replace an Ansaldo T72 Point Machine VCC Lock Frame Assembly		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Lock frame assembly, Detector, Brass plunger, Hollow bolt assembly
Excludes:	'C' arm assembly, Shims, Hammer head bolts, Consumable wear components, Roller stabiliser

General

• If 'C' arm assembly is disconnected see also [NR/SMTH/Part04/PC04](#) (Replace an Ansaldo T72 Point Machine VCC 'C' Arm Assembly).

• Split pins shall not be re-used, confirm replacement pins (4mm diameter x 32mm) are readily available.

BEFORE INSTALLATION WORK

1. Check replacement VCC lock frame assembly is not damaged and is correct type.
2. Check replacement hollow bolt assembly is complete with spring washer and nut and is not damaged.
3. Check replacement brass plunger is not damaged and is correct type.
4. [WIRE COUNT](#) existing detector to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled.
7. Check detection is isolated from the supply.

AFTER INSTALLATION WORK

8. Check replacement VCC lock frame assembly is correctly installed (VCC Clamp Lock Installation Manual Section 1).
9. Check replacement hollow bolt assembly is correctly installed (VCC Clamp Lock Installation Manual Section 1).
10. Check plastic sleeve. Renew if worn deeper than 1mm.
11. Check 'C' arm assembly is correctly installed (VCC Clamp Lock Installation Manual section 2).
12. Check each hammer head bolt/washers/nut/split pin assembly is correctly installed [NR/SMTH/Part04/PC04](#) (Replace an Ansaldo T72 Point Machine VCC 'C' Arm Assembly) and VCC Clamp Lock Installation Manual section 2.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC05		
Replace an Ansaldo T72 Point Machine VCC Lock Frame Assembly		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

13. Check replacement brass plunger is correctly installed [NR/SMS/Appendix/02](#) (General Information on Ansaldo Signalling Equipment) and VCC Detector Maintenance Manual section 2.
14. Check VCC detector assembly is correctly installed and adjusted. [NR/SMS/Appendix/02](#) and VCC Detector Maintenance Manual section 1.
15. Check VCC coupling rod is correctly installed and adjusted (VCC Clamp Lock Maintenance Manual section 2).
16. Check tab washers, nuts and split pins are correctly installed.
17. Check wiring is replaced as labelled.
18. Check tail cable cores are on the correct terminals
19. Check terminations are secure and suitably protected
20. Check wires and cables are secured clear of moving parts.
21. Check points manually for freedom of movement throughout travel.
22. Test (gauge), carry out [NR/SMS/PartB/Test/005](#) (FPL Test (VCC Lock)).
23. Test (gauge), carry out [NR/SMS/PartB/Test/007](#) (Detection Test (VCC Detector)).
- * 24. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC06		
Replace an Ansaldo T72 Point Machine VCC Detector Unit		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	AnsaldoT72 Point Machine
Excludes:	Clamp lock, train operated points, individual micro-switches, micro-switch assembly, all separate electric detectors, chair locks

BEFORE INSTALLATION WORK

1. Check replacement VCC detector assembly is not damaged and is correct type and hand.
2. [WIRE COUNT](#) existing detector to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check detection is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement VCC detector assembly is correctly installed.
7. Check tab washers, nuts and split pins are correctly installed.
8. Check wiring is replaced as labelled.
9. Check terminations are secure and suitably protected.
10. Check wires and cables are secured clear of moving parts.
11. Adjust detector cam stroke tappet screw [NR/SMS/PartB/Test/007](#) (Detection Test T72 with VCC Detector).
12. Check, whilst manually operating points, correct operation of detector.
13. Check points manually for freedom of movement throughout travel.
14. Test (gauge) [NR/SMS/PartB/Test/005](#) (Facing Point Locks Tests (T72 with VCC Lock)).
15. Test (gauge) [NR/SMS/PartB/Test/007](#) (Detection Test T72 with VCC Detector).
16. As applicable, carry out [NR/SMS/PartB/Test/016](#) (Detection Test (Supplementary Detectors)).
- * 17. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC07		
Replace a WRSL Style 63 Point Machine Circuit Controller		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Circuit controllers fitted to WRSL style 63 point machines
Excludes:	All other types of circuit controller

GENERAL

Because of the nature of the work this test plan calls on the Maintenance Testers to check the installer. This means that the Maintenance Tester needs to directly observe that the person doing the installation work (The Installer) carries out the task as described.

For information on the installation of Style 63 Point Machine Circuit Controller, refer to [SMS/Appendix/32](#).

BEFORE INSTALLATION WORK

1. Check replacement circuit controller is not damaged and has a test certificate from the manufacturer or servicing agent.
2. [WIRE COUNT](#) existing circuit controller to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check the point machine is isolated (drive fuse and detection fuses removed).

AFTER INSTALLATION WORK

5. Check wiring is replaced as labelled.
6. [WIRE COUNT](#) replacement circuit controller to the wiring diagram.
7. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
8. Check terminations are secure and suitably protected.
9. Check wires are secure and clear of moving parts.
10. Replace fuses. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies during normal and reverse operation.
11. Test (gauge) point detection, carry out [NR/SMS/PartB/Test/011](#) (Electrical Detection Test (Machine)) and record the test measurements on the NR/SMS record card, together with the reason for the test (circuit controller replacement).
12. Test facing point lock, carry out [NR/SMS/PartB/Test/001](#) (FPL Test (Machine)) and record the test measurements on the NR/SMS record card, together with the reason for the test (circuit controller replacement).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC07		
Replace a WRSL Style 63 Point Machine Circuit Controller		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * | 13. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.
- | 14. Check snubbing is effective by observing pulleys at the end of the stroke.
 - **NOTE:** *With the snubbing performing correctly, pulleys stop rapidly and easily. If the snubbing is faulty, the driveslide continues to its end stop, causing 'wind up' of the ballscrew and the pulleys reverse their rotation for a few degrees after stopping.*
- | 15. Forward the certificate of conformity for the new Circuit Controller to the SM(S).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC08		
Replace a HW2000 Point Machine Variable Resistor		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Variable Resistor fitted to HW 2000 style Point Machines
Excludes:	All other Variable Resistors

BEFORE INSTALATION

1. Check replacement resistor in not damaged and is the correct type.
2. [WIRE COUNT](#) existing resistor to wiring diagram.
3. Check the existing wiring for safe insulation.
4. Check existing variable resistor is isolated from the supply.

AFTER INSTALLATION WORK

5. Check replacement resistor is correctly installed.
6. Check the wiring is labelled.
7. [WIRE COUNT](#) replacement resistor to wiring diagram.
8. Check any links, red dome nuts or equivalent, are correctly replaced and secure.
9. Check terminations are secure and suitably protected.
10. Check wires are secure and clear of moving parts.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits and supplies during normal and reverse operation.
- * 12. Test Clutch for correct operation, carry out [NR/SMS/PartC/PC05](#) (Point Machine HW Style).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC09		
Replace a HW Style Point Machine Gearbox		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	HW 1000 and HW 2000 point machines
Excludes:	All other point operating equipment types

BEFORE INSTALLATION WORK

1. Check replacement gearbox is not damaged and is of correct type.
2. Check point motor is isolated from the supply.

AFTER INSTALLATION WORK

3. Check replacement gearbox is correctly installed.
4. Check wires and cables are secure and clear of moving parts.
5. Check the replacement gearbox operates smoothly and without undue strain during manual operation.
6. Check the point end moves in the correct direction whilst under power with adequate stroke and without undue strain on fittings.
7. Test clutch for correct operation, see clutch slip current test ([NR/SMS/PartC/PC05](#) (Point Machine HW Style) - Steps 11.4 and 11.5.
8. Test (gauge) point detection, carry out [NR/SMS/PartB/Test/011](#) (Detector Tests (Electrical Detectors)) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.
9. Test facing point lock, carry out [NR/SMS/PartB/Test/001](#) (FPL Test (Machine)) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC10		
Upgrade a HW1121 Point Machine Snubbing Resistor		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	HW 1121 snubbing resistor 4 Ohm to 3 Ohm conversion
Excludes:	All other snubbing resistors

BEFORE INSTALLATION WORK

1. Check replacement resistor is not damaged and is a 3 Ohm type.
2. [WIRE COUNT](#) existing component terminals to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. If not monitored by ELD, carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Tests).
6. Check existing component is isolated from the supply.
7. Measure and record the existing escapement, (using Appendix A) see Figure 1.



Figure 1 – Photo of Escapement Measurement

The HW1121 point machine has a throw of 152mm. The escapement measurement added to the switch rail opening at the drive stretcher bar equals the total machine throw. Wear in Roller Bearing, Throw Bar, Drive Rod Coupling Lug or Overdriving results in the sum of the measurements being less than 152mm

8. Measure and record left and right-hand switch rail openings at drive stretcher bar (using Appendix A).
9. Renew operation contacts and set contact (Figure 2) gap.

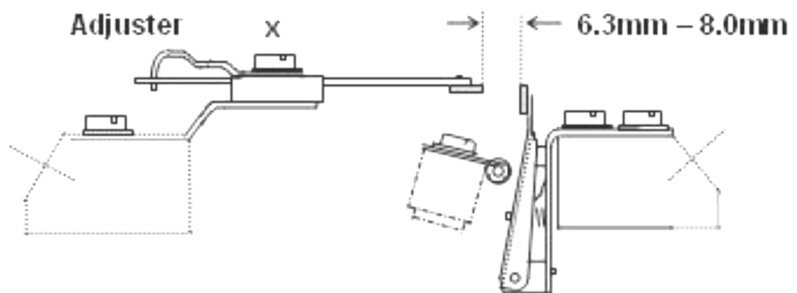


Figure 2 – Contact Gap

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC10		
Upgrade a HW1121 Point Machine Snubbing Resistor		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

10. Measure and record both snubbing circuits resistance (using Appendix A).

⋮ This is expected to be less than 5.7ohms.

⋮ To do this unplug snubbing diode block and connect meter (see Figure 3):

⋮ a) Bottom male pins (1&4) when D5-D6 contacts made.

⋮ b) Top male pins (3&6) when C3-C4 contacts made.



Figure 3 – Snubbing Circuit Resistance Testing Connections

11. Install the 3 Ohm replacement resistor and affix the label 'Modified Resistor Fitted' to the top of the point machine gearbox cover.

AFTER INSTALLATION WORK

12. Check replacement resistor is correctly installed.

13. Check wiring is replaced as labelled.

14. Check terminations are secure and suitably protected.

15. Re measure and record snubbing circuit resistance (using Appendix A).

16. [WIRE COUNT](#) replacement resistor terminals to the wiring diagram.

17. Check that the points operated by the replacement items functions correctly in the correct direction with necessary stroke and without undue strain on fittings and the front stretcher.

18. Check replacement contacts is correctly installed.

19. Check wiring is replaced as labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC10		
Upgrade a HW1121 Point Machine Snubbing Resistor		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

20. [WIRE COUNT](#) replacement contact to the wiring diagram.
21. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
22. Check terminations are secure and suitably protected.
23. Test that the replacement contact only makes and breaks in the correct positions as specified in the wiring diagram.
 - There shall no undue strain (flex) on the front stretcher. If required adjust the amount of point drive.
24. Check, measure and record escapement (using Appendix A).
25. Check wires and cables are secure and clear of moving parts.
26. Check function operated by the replacement contact operates correctly.
27. If not monitored by ELD, Carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Tests).
28. Carry out [NR/SMS/PartB/Test/001](#) (FPL Test (Machine) and record the test measurements on the NR/SMS record card, together with the reason for the test.
29. Check that the label 'Modified resistor fitted' has been fixed to the gearbox cover.
30. Complete HW1121 point machine 3 Ohm snubbing resistor record fitment form (Appendix A) and return to SM(S).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC10		
Upgrade a HW1121 Point Machine Snubbing Resistor		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

APPENDIX A - HW1121 Point Machine 3 Ohm snubbing resistor fitment record

Equipment Details

Signal Box or Control Centre	
Point Number	
Point End	
Serial Number of Point Machine	
Date of conversion	

Before Checks

Snubbing Circuit resistance checks		
C3-C4 made		Ohms
D5-D6 made		Ohms

Escapement		mm
Left Hand Switch Opening		mm
Right Han Switch Opening		mm

After Checks

Snubbing Circuit resistance checks		
C3-C4 made		Ohms
D5-D6 made		Ohms

Escapement		mm
Left Hand Switch Opening		mm
Right Han Switch Opening		mm

This form is to be returned to the SM(S) on completion of the work.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC11		
Replace an HW Style Throw Bar Assembly		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	HW Style Throw Bar
Excludes:	All other types of Throw Bar

Before installation

1. Check replacement throw bar is not damaged and is the correct type.
2. Check the machine is isolated from its supply.

After installation

3. Check keeper plates are present and are not damaged.
4. Check throw bar is correctly installed & greased.
5. Check locking bar moves freely within the replacement throw bar.
6. Check the throw bar coupling connection and drive rod are correctly installed.
7. Check cables and wiring are secure and free of moving parts.
8. Check replacement throw bar operates smoothly and without undue strain during manual operation.
9. Check the point end moves in the correct direction whilst under power with adequate stroke and without undue strain on fittings.
10. Carry out [NR/SMS/PartC/PC05](#) (Point Machine HW Style) - steps 10.5 and 10.6.
11. Carry out [NR/SMS/PartB/Test/011](#) (Electrical Detection Test (Machine)) and record measurements on the record card along with the reason for test.
12. Carry out ([NR/SMS/PartB/Test/001](#)) (Facing Point Locks Tests, Machines) and record the measurements on the record card, along with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC51		
Replace a Complete Point Machine		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Electric and electro–pneumatic point machines, Chair locks, Separate AC point controller units
Excludes:	Any other type of point operating equipment (POE)

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type (internal configurable wiring and straps).
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring (and hoses for EP machines and chair locks) are correctly labelled.
5. Check replacement controller contacts are in the correct position (matching existing), (SEPARATE AC POINT CONTROLLER UNITS ONLY).
6. Check existing unit is isolated from the electrical supply.
7. Check air supply is disconnected (ELECTRO-PNEUMATIC MACHINES AND CHAIR LOCKS ONLY).

AFTER INSTALLATION WORK

8. Where any plug coupler is used check that no metallic dust exists between the two halves before reconnecting the plug couplers.
9. Check replacement unit is correctly installed.
10. Check wiring (and hoses for EP machines and chair locks) are replaced as labelled.
11. [WIRE COUNT](#) replacement unit to the wiring diagram.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. Check wires and cables are secure and clear of moving parts.
15. Carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Tests) section 1 or 4 depending on whether the points are electronically monitored.
16. Carry out Test [NR/SMS/PartB/Test/011](#) (Electrical Detection Test - Machine) and record the results on the record card, together with the reason for the test (CHAIR LOCKS, ELECTRIC AND ELECTRO-PNEUMATIC POINT MACHINES ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC51		
Replace a Complete Point Machine		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

17. Carry out [NR/SMS/Test/001](#) (FPL Test - Machine) and record the results on the record card, together with the reason for the test (CHAIR LOCKS, ELECTRIC AND ELECTRO-PNEUMATIC POINT MACHINES ONLY).
- * 18. Carry out a [POINT DETECTION AND CORRESPONDENCE TEST](#) of the affected ends.
 - Separate AC point controller units shall be treated as a separate affected end for correspondence and detection tests.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC81		
Replace a Unistar HR Machine		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Unistar HR Point Machines
Excludes:	Any other type of point operating equipment (POE)

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type and set for correct stroke (External and internal data plate).
2. Check existing unit is isolated from the electrical supply.
3. Check existing plug coupled cables have safe insulation.
4. Check existing wiring and hydraulic are correctly labelled.

AFTER INSTALLATION WORK

5. Where any plug coupler is used check that no metallic dust exists between the two halves before reconnecting the plug couplers.
6. Check replacement unit is correctly installed.
7. Check installation is in accordance with [NR/SMS/PartZ/Z02](#) (Point - Reference Values).
8. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
9. Check plug coupled cables and hydraulic hoses are secure and clear of moving parts.
10. Carry out [NR/SMS/PartB/Test/052](#) (Dynamic Earth Tests) section 1 or 4 depending on whether the points are electronically monitored.
11. Where the machine being replaced is fitted at the toe of the points, carry out [NR/SMS/Test/270](#) (Facing Point Lock Tests (Unistar HR)) and record the results on the record card, together with the reason for the test.
12. For any machine being replaced, carry out [NR/SMS/Test/271](#) (Detection Test (Unistar HR)) and record the results on the record card, together with the reason for the test.
- * 13. [POINT DETECTION AND CORRESPONDENCE TEST](#) the affected ends.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC82		
Replace a Unistar HR Pump Unit		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Unistar HR Power Packs
Excludes:	Barrier, Clamp lock, and Derailer power packs

GENERAL

All replacement hydraulic power packs shall be fitted with level indicator and overpressure cut off relief valves.

BEFORE INSTALLATION WORK

1. For Missing Equipment Only: Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement hydraulic power pack is not damaged and is correct type.
3. Check concrete pedestal is not damaged, is secure and reasonably level.
4. Check existing plug coupled leads are undamaged.
5. Check existing hydraulic hoses are not damaged and are the correct length.
6. Check existing plug coupled leads and hydraulic hoses are correctly labelled.
7. Check existing hydraulic power pack is Isolated from the supply.

AFTER INSTALLATION WORK

8. Bleed the system to ascertain any air has been excluded from the hydraulic system before continuing.
9. Check replacement hydraulic power pack is correctly installed. Pedestal securing fastenings and power pack fastenings torqued to values given in [NR/SMS/PartZ/Z02](#) (Point - Reference Values).
10. Check plug coupled leads are replaced as labelled and gland plates / hood latches secured.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Check wires and cables are secure and clear of moving parts.
13. Check hydraulic hoses are replaced as labelled.
14. Check hydraulic hoses are free of fixed and moving parts such that they are not chafing whilst flexing in normal operation, and that all connections are secured by locking wires.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PC82		
Replace a Unistar HR Pump Unit		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

15. Check points move in the correct direction under power operation.
16. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supplies during normal and reverse power operation.
17. Check points move in the correct direction when pumped manually and do not respond to power operation whilst set to manual.
18. Check advisory LEDs illuminate and correspond to direction of movement selected (Normal/Reverse).
19. Check Direction Indication plates adjacent to manual selection switch and on Advisory LEDs are installed correctly to reflect the Normal lie of the points.
20. Check hydraulic hoses and joints for leaks and that the fluid level is correct.
21. Check or arrange for, correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PD01		
Replace an Electro-Pneumatic (EP) Valve		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	EP points, chair locks, trainstop
Excludes:	All other Electro-Pneumatic equipment

BEFORE INSTALLATION WORK

1. Check replacement EP valve is not damaged and is correct type.
2. [WIRE COUNT](#) existing EP valve to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing EP valve is isolated from the electrical supply.
6. Check air supply to existing EP valve is disconnected.

AFTER INSTALLATION WORK

7. Where any plug coupler is used, check that no metallic dust exists between the two halves before reconnecting the plug couplers.
8. Check replacement EP valve is correctly installed.
9. Check wiring and hoses are replaced as labelled.
10. Checkpoints move in the correct direction when operated manually (**EP POINTS ONLY**).
11. [WIRE COUNT](#) replacement EP valve to the wiring diagram.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. Check wires and cables are secure and clear of moving parts.
15. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) EP valve.
16. Carry out [NR/SMS/PartB/Test/011](#) (Electrical Detection Test – Machine) and record the test measurements on the NR/SMS record card, together with the reason for the test (**EP POINTS ONLY**).
17. Test (gauge) point detection (**CHAIR LOCKS ONLY**).
18. Check EP valve position corresponds to position of trainstop arm (**TRAINSTOPS ONLY**).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PD01		
Replace an Electro-Pneumatic (EP) Valve		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

19. Test detection corresponds with the arm position for both up and down positions of the trainstop arm (**TRAINSTOPS ONLY**).
- * 20. Check points move in the correct direction under power operation (**POINTS/CHAIR LOCKS ONLY**).
21. Check pneumatic hoses and joints for leaks.
22. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PD02		
Replace an Electro-Pneumatic (EP) Piston		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Pneumatic pump motor
Excludes:	All other pump motors

BEFORE INSTALLATION WORK

1. Check replacement EP piston is not damaged and is correct type.
2. Check existing air hoses are correctly labelled.
3. Check air supply to existing EP piston is disconnected.

AFTER INSTALLATION WORK

4. Where any plug coupler is used, check that no metallic dust exists between the two halves before reconnecting the plug couplers.
5. Check replacement EP piston is correctly installed.
6. Check air hoses are replaced as labelled.
7. Check air hoses are secure and clear of moving parts.
8. Check air hoses and joints for leaks.
9. Check that the points move in the correct direction under power operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PD03		
Replace an Electro-Pneumatic (EP) Slide Bar Assembly		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Electro-Pneumatic (EP) Slide Bar
Excludes:	All other Slide Bars

BEFORE INSTALLATION WORK

1. Check replacement assembly is not damaged and is correct type.
2. Check air supply is disconnected and exhausted.

AFTER INSTALLATION WORK

3. Where any plug coupler is used, check that no metallic dust exists between the two halves before reconnecting the plug couplers.
4. Check replacement assembly is correctly installed.
5. Check that points move in the correct direction under power operation.
6. Carry out, [NR/SMS/PartB/Test/001](#) (FPL Test (Machine) and record the test measurements on the NR/SMS record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH01		
Replace a HPSS Electrical Component		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	HPSS (HPSA point machine); Electronic Control Unit (ECU), motor, brake, toe and supplementary ail position sensors, power isolation switch, internal HPSA cables, supplementary cables, and tail cables
Excludes:	Gearbox, supplementary sensor mounting bracket (offset / standard), drive shaft, PowerLink supplementary drives, stretcher bar

GENERAL

Ask the Signaller to operate points, to check the correct points are being tested and thus eliminate confusion or doubt.

Liaise with the Signaller to apply a safe system of work and have a safe method of communicating with the Signaller to avoid injury whilst placing and removing gauges, it is recommended that the 3.5mm Hands-Free FPL Gauge is used.

Brake Assembly

Do not operate the brake lever(s) when the brake is removed; this misaligns the brake mechanism.

Motor Assembly

Do not strike the motor during removal or replacement as the motor contains sensitive electrical parts. It is advisable to prise the motor free and not to use a hammer.

ECU

Do not sit or place heavy objects on the ECU; this damage's the shock absorbing mounts.

Insulation Testing

Do not insulation test the motor, ECU or Rail Position Sensors as they contain sensitive electronic components. Disconnect these units before insulation testing the associated cables.

Rail Position Sensors (LVDTs)

There are two types of Rail Position Sensor(s), Insulated and Non-Insulated. Check that the correct type is fitted and is compatible with the Sensor Drive Bracket. Do not install a Non-Insulated Sensor (Toe or Supplementary) with an 'Insulated' Drive Bracket, See Figure 1, as this can lead to detection performance issues.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH01		
Replace a HPSS Electrical Component		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

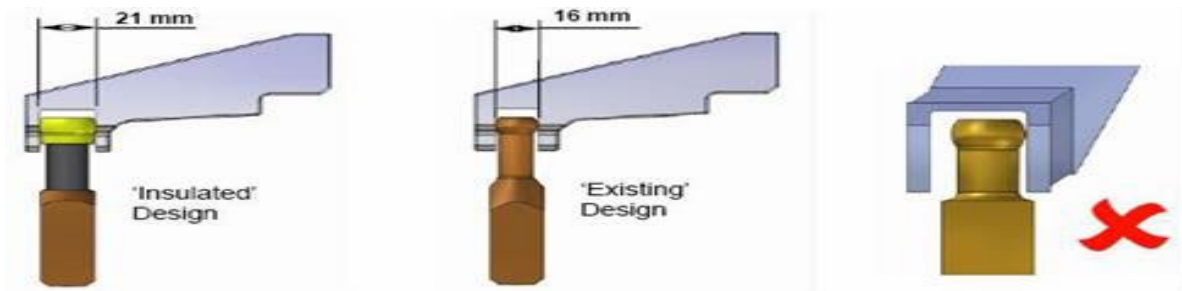


Figure 1 – LVDT's

Supplementary Sensor Bracket Mounting

If a Supplementary Sensor is being replaced and the existing mounting bracket is the 3mm thick / 2 hole mounting design, then this shall be replaced with the 5mm thick / 4 hole mounting bracket (Standard) design and Test PH03 carried out in addition to Test PH01. See Figure 2.

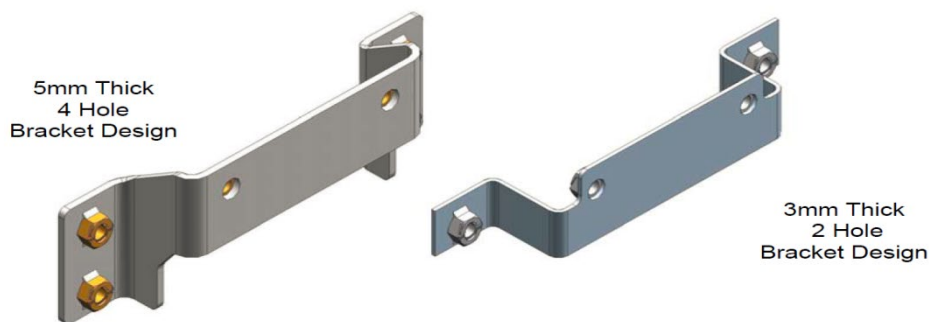


Figure 2 – Mounting Brackets

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check the replacement unit is not damaged and is correct type.
3. Check the replacement plug coupler cables are not damaged, the correct type and the plug couplers are free from damage and foreign bodies.
4. Check the existing wiring has safe insulation.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH01		
Replace a HPSS Electrical Component		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

5. Check the existing wiring is correctly labelled.
6. Check the existing unit is isolated from the electrical supply.

AFTER INSTALLATION WORK

7. Check the replacement unit is correctly installed.
- * 8. Check O-rings, clips, packing shims, washers, spring washers, rubber gaiters, insulators, cable protection seals, and cable ties are correctly installed (where applicable).
9. Check all bolts are correctly installed to the values stated in [NR/SMS/PartZ/Z02](#) (Point Reference Values).
10. Check the wiring is replaced correctly and secure.
11. Check all plug couplers are correctly seated and secure.
12. Check that all wires and cables are secure and clear of any moving parts.
13. Check the replacement item operates correctly and without undue strain during manual operation.
- * 14. Check that the switch openings are correct [NR/SMS/PartZ/Z02](#) (Point Reference Values).
- * 15. Test (gauge) Facing Point Lock [NR/SMS/PartB/Test/004](#) (Facing Point Lock Test).
- * 16. Test (gauge) Supplementary Sensor Integrity and Detection (HPSS Tests [\(NR/SMS/PartB/Test/008\)](#) if required. (Where multiple supplementary sensors or ECU or cables have been changed).
- * 17. Test following replacement of a single supplementary sensor, as follows:
 - a) Using the HPSA Handset, carry out the ECU Datum Reset procedure as detailed in [NR/SMS/PartC/PC51](#) (Appendix A). Check that the correct number of pairs of supplementary sensors is selected during this procedure.
 - b) Power operate the points (if required) to check that the open switch rail is on the side of the replaced sensor.
 - c) Place an 8mm (CEN54) or 10mm (RT60) gauge between the open switch and stock rails. It is strongly recommended that the Hands-Free Detection Gauge (PADS No.086/035401) is used, to avoid injury.
 - d) Ask the Signaller to power operate the points to close the switch rail against the gauge and stock rail. Ask what detection, if any, is given.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH01		
Replace a HPSS Electrical Component		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 18. [POINT DETECTION AND CORRESPONDENCE TEST](#) affected ends.
The point detection test shall be undertaken as detailed in [NR/SMS/PartB/Test/008](#) (HPSS Tests) - Supplementary Sensor Integrity and Detection Test (where Supplementary Detectors or ECU or cables have been changed).
- 19. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) detection circuits during normal and reverse power operation.
- 20. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH02		
Replace a HPSS Mechanical Component		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	HPSA point machine, gearbox, drive shaft, carriage, carriage shafts, drive arms, drive brackets, drive pins
Excludes:	Electronic Control Unit (ECU), motor, brake, toe and supplementary rail position sensor assembly, supplementary sensor mounting bracket (offset / standard), power isolation switch, internal HPSA cables, and tail cables

GENERAL

Ask the Signaller to operate points, to check the correct points are being tested and thus eliminate confusion or doubt.

You should come to an understanding with the Signaller to apply a safe system of work and have a safe method of communicating with the Signaller.

To avoid injury whilst placing and removing gauges, it is strongly recommended that the 3.5mm Hands-Free FPL Gauge (PADS No. 094/007001) is used.

Self-Locking Nuts & Bolts

The majority of mechanical connections in the HPSS use self-locking nuts or bolts. If a self-locking fastener is removed it shall be replaced, as regular re-use reduces the locking effectiveness.

New self-locking fasteners shall therefore be used (where applicable) when replacing any mechanical component.

Also, tell-tale marks shall be applied so that future inspections are able to identify loosening. In the case of a nut and bolt both components shall be changed.

Motors and brake

Any drive keys associated with replaced equipment shall be renewed.

Gearbox

Inspect Gearbox to check that the clevis is pinned to the leadscrew as shown in the following line drawing, see Figure 1:

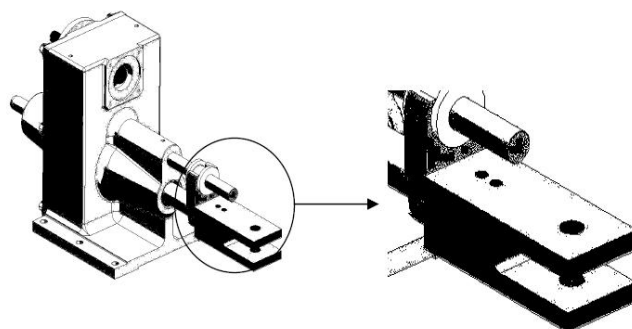


Figure 1 - Clevis is pinned to the leadscrew

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH02		
Replace a HPSS Mechanical Component		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check the replacement item is not damaged and is correct type.

AFTER INSTALLATION WORK

3. Check the replacement item is correctly installed.
4. Check any replaced fasteners are correctly installed to the values detailed in [NR/SMS/PartZ/Z02](#) (Points Reference Values).
5. Check that a visible gap exists between the white anti-rotation bush and the gearbox, with the HPSA in 'retract' (closed switch rails nearest to the ECU). If necessary, add packing shim(s) to the switch rail drive bracket to a minimum 2mm gap.
6. Check the switch rail packing shims and insulators are correctly installed.
7. Check any wires and cables are secure and clear of moving parts.
8. Check the replacement item operates correctly and without undue strain during manual operation.
9. Check O-rings, clips, packing shims, washers, spring washers, rubber gaiters, insulators, cable protection seals, and cable ties are correctly installed (where applicable).
10. Check that the switch openings are correct, see [NR/SMS/PartZ/Z02](#) (Points Reference Values).
11. Test the brake torque holding capability if the gearbox has been changed, or if the brake or brake cables have been disconnected. See [NR/SMS/PartB/Test/008](#) (HPSS Tests) - Brake Torque Test.
12. Check with the HPSS electrical component Test Plan [NR/SMTH/Part04/PH01](#) (Replace a HPSS Electrical Component) for equipment that has been disconnected or disarranged and test as required.
13. Test (gauge) Facing Point Lock [NR/SMS/PartB/Test/004](#) (Facing Point Lock Test HPSS).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH02		
Replace a HPSS Mechanical Component		
Issue No: 08	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

14. Where PowerLink Supplementary Drive, Stretcher bar assembly, Bearing block, Torque tube, Shear pin module, and Drive pins have been changed, or if Supplementary detectors or cables have been disconnected), carry out [NR/SMS/PartB/Test/008](#) (HPSS Tests) – Supplementary Sensor Integrity and Detection Test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH03		
Replace a supplementary sensor mounting bracket		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	HPSS; supplementary sensor mounting bracket (offset / standard)
Excludes:	Electronic Control Unit (ECU), motor, brake, toe and supplementary rail position sensor assembly, power isolation switch, internal HPSA cables, tail cables, gearbox, drive shaft, carriage, carriage shafts, drive arms, drive brackets, drive pins

Ask the Signaller to operate points, to check the correct points are being tested and thus eliminate confusion or doubt.

You should come to an understanding with the Signaller to apply a safe system of work and have a safe method of communicating with the Signaller

SUPPLEMENTARY SENSOR MOUNTING BRACKET

There are three types of bracket:

1. Non-handed, secured using 4 M12 screws to bearer wall, made from 5mm thick steel plate. All RT60 layouts and specific locations on UIC54B layouts. See **Figure 1**.

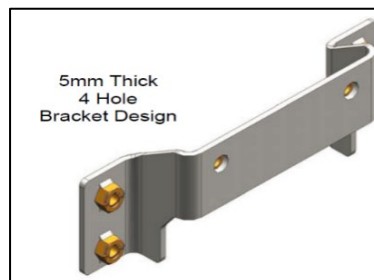


Figure 1 – Standard Mounting Bracket

2. Non-handed, secured using 2 M12 screws to bearer wall, made from 3mm thick steel plate. Installed on RT60 layouts and specific locations on UIC54B layouts. This style has been superseded and should not be installed. If this type of bracket is being replaced due to failure, inspect the other supplementary sensor mounting bracket and, if of the same 3mm type, replace with a 5mm thick bracket when possible. See **Figure 2**.

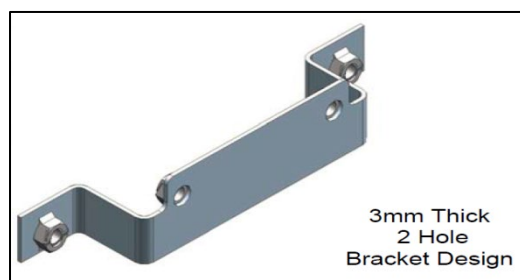


Figure 2 – Superseded Mounting Bracket

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH03		
Replace a supplementary sensor mounting bracket		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

- 3. Offset Mounting Bracket (L/H or R/H), secured using 4 M12 screws to bearer wall, made from 5mm thick steel plate. Situated at specific locations on UIC54B layouts only, see **Figure 3**.

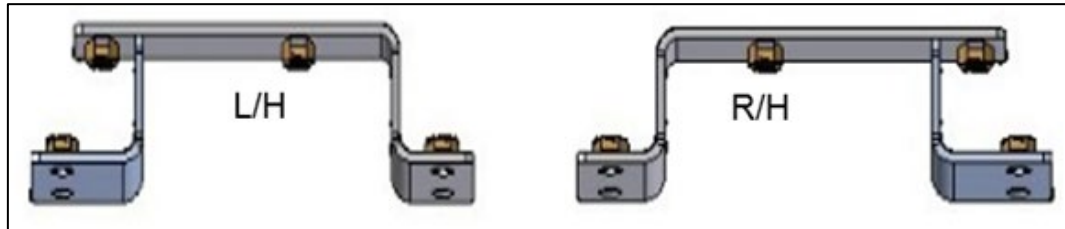


Figure 3 – Offset (Handed) Mounting Brackets

Table 1 shows the location of offset and standard supplementary sensor mounting bracket UIC54B only:

Switch Size	Supplementary 1 Bracket type (Bearer No.)	Supplementary 2 Bracket type (Bearer No.)
BVs	Not present	Not present
CVs	Offset Brackets (Bearer No 7)	Not present
DVs	Standard Brackets (Bearer No. 5)	Not present
EVs	Standard Brackets (Bearer No. 6)	Not present
FVs	Standard Brackets (Bearer No. 4)	Offset Brackets (Bearer No. 10)
SGVs	Standard Brackets (Bearer No. 5)	Offset Brackets (Bearer No. 11)

Table 1 - Bracket Type / Supplementary Bearer No. (UIC54B only)

BEFORE INSTALLATION WORK

1. Check the replacement unit is Not Damaged and is Correct Type.
2. Check the existing wiring has safe insulation.
3. Check the existing wiring is correctly labelled.
4. Check the existing unit is Isolated from the electrical supply.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PH03		
Replace a supplementary sensor mounting bracket		
Issue No: 01	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

AFTER INSTALLATION WORK

5. Check the replacement unit is correctly installed.
6. Check O-rings, clips, packing shims, washers, spring washers, rubber gaiters, insulators, cable protection seals, and cable ties are correctly installed (where applicable).
7. Check all bolts are correctly installed to the values stated in [NR/SMS/PartZ/Z02](#) (Points Reference Values).
8. Check all plug couplers are correctly seated and secure.
9. Check that all cables are secure and clear of any moving parts and heaters.
10. Check the replacement item operates correctly and without undue strain during manual operation.
11. Check that the switch openings are correct, see [NR/SMS/PartZ/Z02](#) (Points Reference Values).
12. Test (gauge) Facing Point Lock [NR/SMS/PartB/Test/004](#) (Facing Point Lock Tests HPSS).
13. For each affected supplementary sensor mounting bracket, carry out the following test:
 - a) With the point end in normal detection.
 - b) Disconnect the affected sensor and observe that detection is lost via the handset and outgoing KR line.

Supplementary sensors shall be disconnected at the sensor's plug coupler, not at the ECU.

 - c) Reconnect the affected sensor and observe that detection is regained via the handset and outgoing KR line.

NOTE: *It might be necessary to squeeze the Brake to restore detection in some cases.*

 - d) Repeat the steps 'b' and 'c' for the reverse detection.
 - e) Replace any supplementary cable clamps remove.
14. Point detection and correspondence test ([NR/SMTH/Part03/Test/B08](#)) affected ends.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PT01		
Replace a Hydro-Pneumatic Unit		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Hydro-Pneumatic Unit
Excludes:	All other point operating equipment

GENERAL

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type (pressure switch type, wiring configuration).
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check gauge is indicating the correct pressure level.
8. Check wiring is replaced as labelled.
9. Check terminations are secure and suitably protected.
10. [WIRE COUNT](#) replacement unit to the wiring diagram.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Check wires and cables are clear of moving parts.
13. Check points for freedom of movement throughout travel.
14. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits during normal and reverse operation where designed to be earth free.
15. Test any pressure switch correctly functions (pressure detection during and after point movement).
16. Check unit operates in the specified time:
 (Mk1 to 3:17–20 seconds or for Mark 4:15–30 seconds).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PT01		
Replace a Hydro-Pneumatic Unit		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

17. Carry out [NR/SMS/PartB/Test/018](#) (Train Operated Points Detection Test) for the affected end and record the test measurements on the NR/SMS record card, together with the reason for the test.
18. Check or arrange for correct labelling of unit.
19. Observe a train trail through the train operated points and check that the points operate correctly before handing back into service (this is required even if there is a sparse train service over the points).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PW01		
Replace a Transformer-Rectifier or Battery Charger		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Transformer-rectifiers and Battery Chargers
Excludes:	Any plug-in transformer-rectifier, transformer-rectifier or battery chargers used in track circuit feed sets

GENERAL

The correct battery charger shall be fitted for the battery size and type. Failure to do so will result in the failure of the battery and the standby supply.

BEFORE INSTALLATION WORK

1. Check replacement transformer-rectifier or battery charger is not damaged and is correct type.
2. [WIRE COUNT](#) existing transformer-rectifier/battery charger to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing transformer-rectifier or battery charger is isolated from the supply, any output circuits (transformer-rectifiers only) and battery (battery charger).

AFTER INSTALLATION WORK

6. Check replacement transformer-rectifier or battery charger is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement transformer-rectifier or battery charger to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check output circuits are disconnected before supply is restored.
- * 11. Test input and output voltages and ensure output polarity is correct. The output voltages and polarity shall be tested at the busbar as an additional check that the wiring has been correctly replaced.
- * 12. Test battery charging rate with output circuitry restored and ensure battery is being charged with the correct polarity (BATTERY CHARGERS ONLY).

It is advisable to return after a period of time, depending on the initial state of the cells, to retest the battery charger rate.

13. Test output voltage with output circuits restored.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PW01		
Replace a Transformer-Rectifier or Battery Charger		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- 14. Check any power off relay proving operates correctly (BATTERY CHARGERS ONLY).
- * 15. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply and outputs if designed to be earth free.
- * 16. Carry out [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Test) and record the test measurements on the appropriate record card, together with the reason for the test (SIGNAL FEED SETS ONLY).
- 17. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PW02		
Replace a Transformer		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Transformers
Excludes:	All track circuit feed equipment

BEFORE INSTALLATION WORK

1. Check replacement transformer is not damaged and is correct type.
2. [WIRE COUNT](#) existing transformer to the wiring diagram.
3. Check existing wiring has safe insulation.
4. [INSULATION TEST](#) replacement transformer (use 1000V insulation tester) (minimum 2M ohms terminals to case).
5. Check existing wiring is correctly labelled.
6. Check existing transformer is Isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement transformer is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement transformer to the wiring diagram.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply and outputs.
- * 12. Test correct operation of ALL AC phase sensitive equipment where local or control coils are fed from a supply via the cable under test (AC RELAY AREAS ONLY).
- * 13. Test voltage with input and output circuits restored.
- * 14. Test signal lamp, carry out, [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests), and record the test measurements on the NR/SMS record card, together with the reason for the test (SIGNAL FEED SETS ONLY).
15. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/PW03		
Replace a Non-Plug in Inverter or Converter		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Devices which change a DC supply to an AC or DC supply
Excludes:	All other types of Inverter or Converter

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement unit to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check terminations are secure and suitably protected.
11. Test input and output voltages and polarity.
- * 12. Test voltage with input and output circuits restored.
- * 13. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply and output if designed to be earth free.
14. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE11		
Replace a Solar Panel		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Solar Panel related to a Vamos Crossing
Excludes:	All other Solar Panel or Array.

Equipment Identification Image



Figure 1 – A Three Panel Solar Array

BEFORE INSTALLATION

1. Check that the replacement Solar Panel is of the correct type, version (modification level).
2. Check the replacement unit is not damaged.
3. [WIRE COUNT](#) the Solar Panel and check the wires have safe insulation and are correctly labelled.
4. Disconnect the Solar Panel output fuses.
5. Disconnect cables and insulate the cable connected to the panel being replaced.
6. Remove the failed Solar Panel from mounting rails and label it as faulty.

AFTER INSTALLATION

7. Check the replacement Solar Panel is correctly installed and is secure.
8. Check the panel is correctly angled and aligned
9. Reconnect all cables.
10. [WIRE COUNT](#) and check all connections are tight and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE11		
Replace a Solar Panel		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

11. Replace the Solar Panel output fuses.
12. Verify that the Solar panel is producing voltage by checking on the LED screen on the Solar Charge Controller and that there are no error messages shown.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE12		
Replace a Wind Turbine Nacelle		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	LE – 600 and the FM1803 Turbine
Excludes:	All other types of Turbine

Equipment Identification Image



Figure 2 - LE - 600



Figure 1 – FM1813

BEFORE INSTALLATION

1. Check that the replacement Turbine is of the correct type, version (modification level).
2. Check the replacement unit is not damaged.
3. Disconnect the turbine output fuses.
4. Switch the turbine brake to the on position and wait for the turbine to stop rotating.

If the turbine fails to stop turning within one minute the brake should be released. This shall be reported to your SM(S).

NOTE: There are two reasons the brake will fail to stop the turbine spinning, either the wind is too strong and is overcoming the brake or the brake has failed.

If the wind is blowing too hard, this is to be recorded on the record card.

5. When the turbine has stopped moving, lower the tower using the approved method.

Under no circumstances shall the turbine be lowered if the blades are still turning.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE12		
Replace a Wind Turbine Nacelle		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

6. [WIRE COUNT](#) the turbine and check the wires have safe insulation and are correctly labelled.
7. Disconnect cables.
8. Remove the failed Turbine Nacelle and label it as faulty.

AFTER INSTALLATION

9. Check the replacement Turbine Nacelle is correctly installed and is secure.
10. Reconnect all cables.
11. [WIRE COUNT](#) and check all connections are tight and secure.
12. Raise the turbine using the approved method and secure it in place.
13. Release the turbine brake and confirm that the blades turn.
14. Replace the Turbine output fuses.
15. Verify that the Turbine is producing voltage by checking on the LED screen on the Solar Charge Controller and that there are no error messages shown.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE13		
Replace a Metron4		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Metron4 Monitor
Excludes:	All other types of Monitor unit

Equipment Identification Image

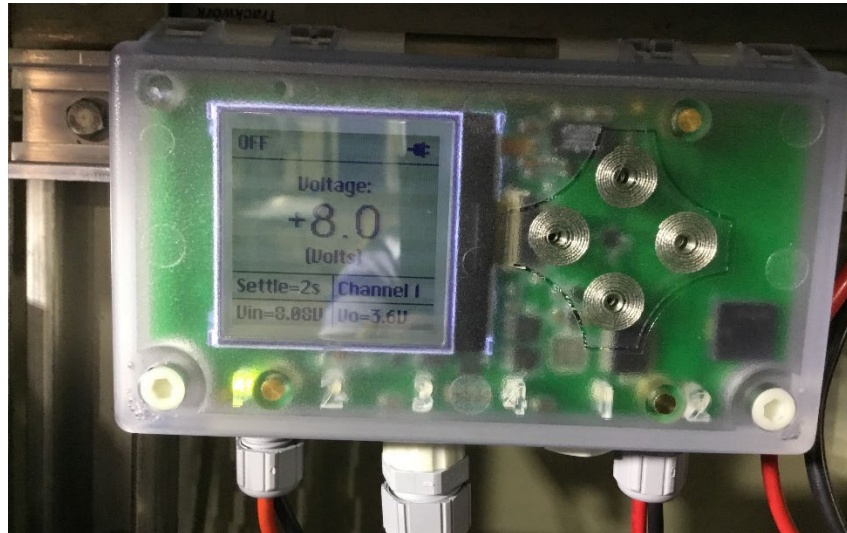


Figure 1 – Metron4 Monitor

BEFORE INSTALLATION

1. Check that the replacement Metron4 Monitor is of the correct type, version (modification level).
2. Check the replacement unit is not damaged.
3. [WIRE COUNT](#) the Metron4 Monitor and check the wires have safe insulation and are correctly labelled.
4. Disconnect power at the fuses.
5. Disconnect cables.
6. Remove the failed Metron4 Monitor from mounting rails and label it as faulty.

AFTER INSTALLATION

7. Check the replacement Metron4 Monitor is correctly installed and is secure.
8. Reconnect all cables.
9. [WIRE COUNT](#) and check all connections are tight and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE13		
Replace a Metron4		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

10. Replaces fuses and power up the unit.
11. Confirm that the PT10 is on (Green LED illuminated) and Metron4 is communicating over GSM.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE14		
Replace a TriStar Charge Controller		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	TriStar Charge Controller (Solar)
Excludes:	All other Charge Controller Units

Equipment Identification Image

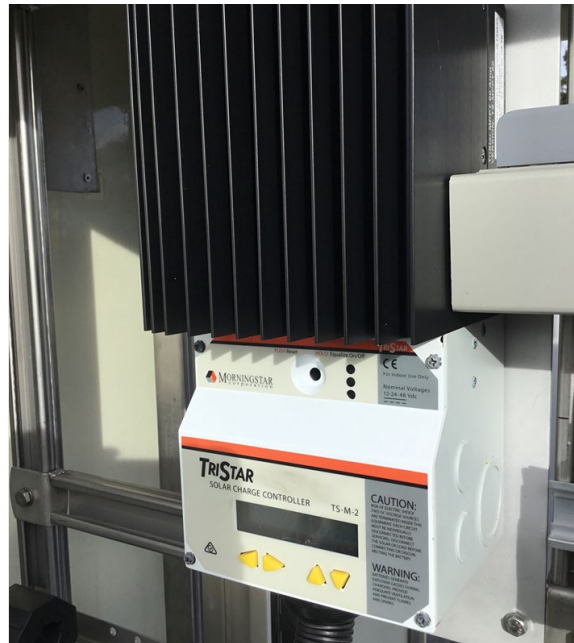


Figure 1 – Charge Controller

BEFORE INSTALLATION

1. Check that the replacement Charge Controller is of the correct type, version (modification level).
2. Check the replacement unit is not damaged.
3. [WIRE COUNT](#) the Charge Controller and check the wires have safe insulation and are correctly labelled.
4. Disconnect power at the fuses.
5. Disconnect cables.
6. Remove the failed Charge Controller from mounting rails and label it as faulty.
7. Note the configuration by recording the positions of the dip switches located under the removeable front panel. These shall be needed after installation of the new unit.

AFTER INSTALLATION

8. Check the replacement Charge Controller is correctly installed and is secure.
9. Reconnect all cables.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE14		
Replace a TriStar Charge Controller		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

10. [WIRE COUNT](#) and check all connections are tight and secure.
11. Check the configuration dip switches are in the positions recorded during step 7.
12. Replaces fuses and power up the unit.
13. Verify that the LED screen is working and no error messages shown.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE20		
Replace a Direct Methanol Fuel Cell Unit		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	EFOY Fuel Cell Unit Pro 2400 Duo
Excludes:	All other Fuel Cell Units

- | **Do not smoke in the vicinity of methanol fuel cell or fuel cartridge.**
- | **Protect from heat and ignition sources. Methanol is highly flammable!**
- | **Do not touch leaked methanol.**
- | **The EFOY Pro fuel cell shall not be opened.**
- | **Gloves and eye protection shall be worn during this task.**
- ⋮ Leakage of a small quantity of methanol evaporates, leaving no residue.
- ⋮ For further information See [NR/SMS/Appendix/26](#) (General Information on the Direct Methanol Fuel Cell System).

Equipment Identification Image



Figure 1 - EFOY Fuel Cell Unit

BEFORE INSTALLATION

- | 1. Check that the replacement Fuel Cell Unit is of the correct type, version (modification level).
- | 2. Check the replacement unit is not damaged.
- | 3. WIRE COUNT the Fuel Cell Unit and check the wires have safe insulation and are correctly labelled.
- | 4. Carry out the “Manual Off” process to power down the system.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE20		
Replace a Direct Methanol Fuel Cell Unit		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

5. Confirm the “Manual Off” process has finished, and the unit has stopped humming.
Do Not disconnect the Fuel Cartridges or Batteries during the shutdown process.
6. Disconnect power at the fuses.
7. Disconnect the Fuel Cartridges using [NR/SMTH/Part04/RE21](#) (Replace a Direct Methanol Fuel Cell Cartridge).
8. Disconnect the exhaust hose and protect it from the ingress of impurities, seal the exhaust outlet with the protective cap (swap the protection cap from new unit to old).
9. Remove the off-heat tube or the off-heat 90° elbow and remove the flange and fit it onto the new unit (if fitted).



Figure 2 – Off Heat Fittings

10. Disconnect cables.
11. Remove the failed Fuel Cell Unit from mounting plate and label it as faulty.

AFTER INSTALLATION

12. Check the replacement Fuel Cell Unit is correctly installed and is secure.
13. Reconnect all cables, pipes and fittings.
14. WIRE COUNT and check all connections are tight and secure.
15. Check the exhaust hose is secure and correctly fitted.
16. Check the off-heat tube or the off-heat bow is securely fitted.
17. Verify the Fuel Cartridges are correctly fitted.
18. Carry out a “Manual On” Power up of the system.
19. Verify that there are no error messages and the red LED is no longer illuminated.
20. The replaced unit should be returned to the depot for return to supplier.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE21		
Replace a Direct Methanol Fuel Cell Cartridge		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	EFOY Fuel Cartridge M5, M10 or M28
Excludes:	All other types of Fuel Cartridge

- | **Do not smoke in the vicinity of the methanol fuel cell or fuel cartridge.**
- | **Protect from heat and ignition sources. Methanol is highly flammable!**
- | **Do not touch leaked methanol.**
- | **The EFOY Pro fuel cell shall not be opened.**
- | **Gloves and eye protection shall be worn during this task**
- | **The fuel cartridge can be changed while the device is in operation.**

Equipment Identification Image



Figure 1 - EFOY Fuel Cartridges

BEFORE INSTALLATION

- | 1. Check that the replacement Fuel Cartridge is of the correct type and not damaged.
- | 2. For Annual Replacement
 - | Replace the empty Fuel Cartridge and the second cartridge.
- | 3. For a Fault Issue
 - | Check the yellow warning light on the unit is flashing, the red LED on the operating panel is illuminated and the message “Fuel Cartridge Empty” is shown.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE21		
Replace a Direct Methanol Fuel Cell Cartridge		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

4. Verify the identity of the Fuel Cartridge to be exchanged.
5. Disconnect the cartridge connector.
 - Only one Fuel Cartridge shall be replaced at a time.
6. Remove the cartridge.

AFTER INSTALLATION

7. Check the replacement cartridge is secure and the strap tightened (if fitted).
8. Check the cartridge connector is secure.
 - Do not over tighten.
9. Verify that the fuel sensor yellow LED is extinguished.
10. For a Fault Issue
 - Press the okay button on the control panel and verify that the error message and the red LED is no longer illuminated.
11. Re-set the fuel cartridge, using the Fuel Cartridge Sub-menu.
 - For Details of this process see [NR/SMS/Appendix/26](#) (General Information on the Direct Methanol Fuel Cell System).
12. Verify that a screw cap has been fitted to the empty cartridge before leaving site.
13. The empty cartridge should be returned to the depot for recycling.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE22		
Replace a Direct Methanol Fuel Cell Cartridge Sensor		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	EFOY Fuel Cartridge Sensor FS
Excludes:	All other Fuel Cartridge Sensors

- | **Do not smoke in the vicinity of the methanol fuel cell or fuel cartridge.**
- | **Protect from heat and ignition sources. Methanol is highly flammable!**
- | **Do not inhale exhaust gases directly for prolonged periods.**
- | **Do not touch leaked methanol.**
- | **The EFOY Pro fuel cell shall not be opened.**
- | **Gloves and eye protection shall be worn during this task**
- ⋮ Leakage of a small quantity of methanol evaporates, leaving no residue.
- ⋮ For further information See [NR/SMS/Appendix/26](#) (General Information on the Direct Methanol Fuel Cell System).

Equipment Identification Image

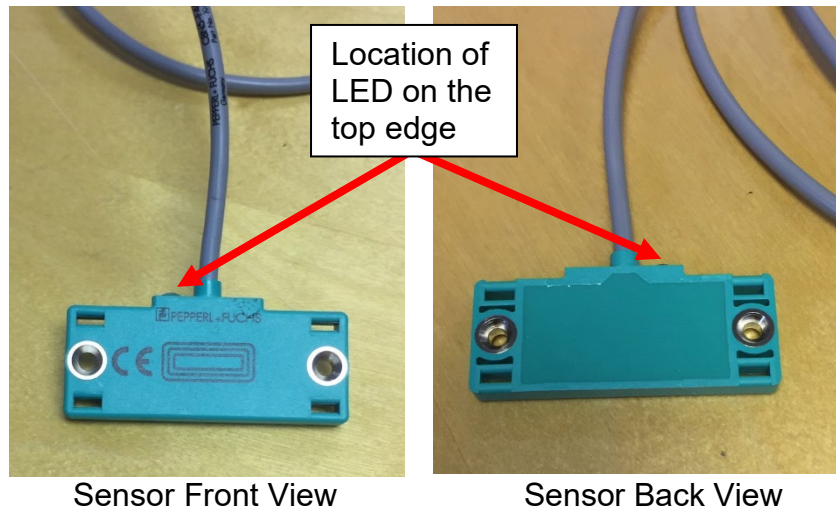


Figure 1 - EFOY Fuel Cartridge Sensor

BEFORE INSTALLATION

- | 1. Check that the replacement Fuel Cartridge Sensor is of the correct type, version (modification level).
- | 2. Check the replacement unit is not damaged.
- | 3. Check the Fuel Cartridge Sensor wire has safe insulation and are correctly labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE22		
Replace a Direct Methanol Fuel Cell Cartridge Sensor		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

4. Remove Fuel Cartridge.
5. Unplug and remove the Fuel Cartridge Sensor and label it as faulty.

AFTER INSTALLATION

6. Reconnect the Fuel Cartridge Sensor cable and check the connections is tight and secure.
7. Check the yellow LED is illuminated before mounting the sensor. Place the sensor face down on the top of the Fuel Cell and verify the LED is extinguished.
8. Now install to final position.
9. Verify that the sensor is fitted with the correct sensing face facing outward.
10. Check the replacement Fuel Cartridge Sensor is correctly installed and is secure.
11. Re-install the Fuel Cartridge and check it is correctly fitted and secure.
12. The replaced unit should be returned to the depot for recycling.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE23		
Replace a Direct Methanol Fuel DuoCartSwitch		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	EFOY DuoCartSwitch
Excludes:	All other types of DuoCartSwitch

- | **Do not smoke in the vicinity of the methanol fuel cell or fuel cartridge.**
- | **Protect from heat and ignition sources. Methanol is highly flammable!**
- | **Do not inhale exhaust gases directly for prolonged periods.**
- | **Do not touch leaked methanol.**
- | **The EFOY Pro fuel cell shall not be opened.**
- | **Gloves and eye protection shall be worn during this task.**
- ⋮ Leakage of a small quantity of methanol evaporates, leaving no residue.
- ⋮ For further information See [NR/SMS/Appendix/26](#) (General Information on the Direct Methanol Fuel Cell System).

Equipment Identification Image



Figure 1 - EFOY DuoCartSwitch

BEFORE INSTALLATION

- | 1. Check that the replacement DuoCartSwitch is of the correct type, version (modification level).
- | 2. Check the replacement DuoCartSwitch is not damaged.
- | 3. Check the cable for safe insulation and correct labelling.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/RE23		
Replace a Direct Methanol Fuel DuoCartSwitch		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

4. Disconnect the cable.
5. Remove the DuoCartSwitch and label it as faulty.

AFTER INSTALLATION

6. Check the replacement DuoCartSwitch is correctly installed and is secure.
7. Reconnect the cable and verify the cable is pushed home and secure.
8. The replaced unit should be returned to the depot for recycling.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SB01		
Replace a Back Projection Lamp Unit		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	The GraphXMaster CX50-100U
Excludes:	All other back project lamp units

GENERAL

High voltages are present in the projector. The precautions for working on high voltage equipment shall be implemented and observed.

Never look directly into the lens of the projector. The light emitted might cause permanent damage to your eyes.

Never remove the lamp from its housing directly after use. The lamp is under great pressure when hot and might explode causing personal injury and/or property damage. Allow the lamp to cool completely, before removal.

Wear eye protection (UV goggles with side protection) and clean cotton gloves when handling the lamp.

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. Check the sapphire (glass) surface of the replacement unit for fingerprints or similar 'oil or grease' contamination.
3. If necessary, clean the sapphire (glass) surface, see [NR/SMS/Appendix/02](#) (General Information on Ansaldo Signalling Equipment) - 6.2.

AFTER INSTALLATION WORK

4. Check replacement unit is correctly installed, see [NR/SMS/Appendix/02](#) (General Information on Ansaldo Signalling Equipment) - 6.2.
5. Reset lamp timer (Service menu).
6. Check CSC. (GraphXMaster CX50-100U Installation and Maintenance Manual 54-017148-02P – Adjust CSC (section 2)).
7. Check replacement unit is correctly aligned. (GraphXMaster CX50-100U Installation and Maintenance Manual 54-017148-02P – 6-Axis Adjustment (section 2)).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG01		
Replace an LED Buffer Stop Unit		
Issue No: 01	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	LED Buffer Stop Units
Excludes:	All Other Buffer Stop lights

BEFORE INSTALLATION WORK

1. Check replacement component is not damaged, correct colour LED and is correct type.
2. [WIRE COUNT](#) the existing component terminals to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Disconnect the power supply

AFTER INSTALLATION WORK

6. Check replacement component is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) the replacement component terminals to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are secure and correctly replaced.
10. Test voltage with input and output circuits restored.
11. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) the circuits and supplies where designed to be earth free.
12. Check that a red aspect is illuminated.
13. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG02		
Replace a Lens		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Chipped or cracked signal filter, chipped or cracked level crossing lights, chipped or cracked MARI (stencil) (with legend remaining). Outer dispersing lens for Ansaldo SD 321 Signal
Excludes:	Integral optical assembly, Signal optical unit

GENERAL

Ansaldo SD 321 Signals:

There are three different types of lenses on the Ansaldo SD 321 signal, these are type 'A' the 'standard' lens and types 'Bd' and 'Bs' which are used for signals located on curves.

Confirm that the correct type of lens is fitted.

Filament Lamp Signals:

Some signals may be fitted with a 'Spreadlite' lens.

When replacing a lens confirm that the correct type is used.

More details are in [NR/SMS/PartC/SG00](#) (Signals: General).

All Signals:

Details of the lens type can be found on the NR/SMS signal lamp voltage record card or signal sighting form.

If you are unsure about the correct type of lens, ask your SM(S).

BEFORE INSTALLATION WORK

1. Check replacement item is not damaged and is correct type and colour.
2. Note position of hot strip (SIGNAL FILTERS ONLY).

AFTER INSTALLATION WORK

3. Check replacement item is correctly installed and aligned.
4. Signal sighting forms include specific details on signal alignment and configuration.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG03		
Replace a Signal Wire (or part of)		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

***** NO RECORD OF TEST REQUIRED WHEN ONLY ONE SIGNAL WIRE IS DISCONNECTED *****

Includes:	Mechanical signal wire, sling, replacement of a chain by a sling
Excludes:	All other types of wire, sling or chain connections

BEFORE INSTALLATION WORK

1. Check replacement signal wire is not damaged (rust) and is correct type (length, diameter).
2. Check wires are correctly labelled (WHEN MORE THAN ONE SIGNAL WIRE IS DISCONNECTED).

AFTER INSTALLATION WORK

3. Check replacement wire is correctly installed.
4. Check signal wires are replaced as labelled (WHEN MORE THAN ONE SIGNAL WIRE IS DISCONNECTED).
5. Check replacement wire is free moving and clear of obstruction.
6. Check wire strands are suitably cut back.
7. Check that there is adequate stroke and that the equipment operates correctly from the correct lever without undue strain on fittings.

NOTE: *There should ideally be 7.5" of stroke at the lever tail, but this can vary by 2" over every 100 yards of wire, depending on temperature. For long distance signals a draught wheel is used to double the stroke. See [NR/SMS/PartC/SG00](#) (Signals: General) – 20. Wire Adjustment.*

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG05		
Replace a Reflective Board, Sign or Support Structure		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Reflective Distant Signal Boards, Reflective Boards associated with RETB, Reflective Boards associated with ERTMS, Externally Lit Notice Boards, Reflective Trackside Boards associated with Level Crossings, Public Information Boards Attached to Light Units or Telephones at Level Crossings, Support Structures
Excludes:	TSR and PSR boards, Other trackside information boards

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check the replacement is of the correct type and not damaged.
3. Check the position of the board or sign is as described on the SSIFT App or on the local layout diagrams.
4. If the SSIFT App is not available stop work and inform you supervisor.

AFTER INSTALLATION WORK

5. Check the support structure is upright, secure in the ground and cannot be rotated.
6. Check the board is secure on the support structure and cannot rotate.
7. Check the board, sign or post is clear of the structure gauge.
8. Check the position of the board is correct to the SSIFT App (if available) or the local Layout diagrams and that it is facing in the correct direction.
9. Check where fitted that any external illumination is correctly positioned to illuminate the whole sign.
10. Measure the correct voltage is applied to the lamp or lamps.
11. For Reflective Distant Signal Boards, Reflective Boards associated with RETB, Reflective Boards associated with ERTMS: Carry out [NR/SMS/PartB/Test/302](#) (Signal Visibility Check).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG06		
Replace a Lamp Case		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

BEFORE INSTALLATION WORK

1. Check replacement lamp case is not damaged and is correct type.
2. [WIRE COUNT](#) existing lamp case to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing lamp case is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement lamp case is correctly installed and aligned (backlight permanently obscured, or back blinder set to obscure backlight when signal arm is 5 degrees or more from the horizontal).
7. [INSULATION TEST](#) replacement lamp case (minimum 2M ohms terminals to lamp case).
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) lamp case to the wiring diagram.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
11. Check cable is secured.
12. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply if designed to be earth free.
- * 13. Check correct correspondence of the lamp proving indicator with lamp lit and lamp out.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG07		
Replace a Signal Arm or Fittings		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Signal arm, Spectacle casting, Disc, Back blinder, Spindle, Backstop, Lever plate, Down rod, Balance weight arm, Fixed signal
Excludes:	Down wire, Crank, Lamp case, Notice board, Circuit controller

BEFORE INSTALLATION WORK

1. Check replacement signal arm is not damaged and is correct type.

AFTER INSTALLATION WORK

2. Check replacement signal arm is correctly installed and within structure gauge.
3. Check the spectacle colours are correct.
4. Check new split pins are correctly installed.
5. Check for correct alignment of the spectacle casting.

For Moving Arms Only

6. Check signal operates correctly from the correct lever without undue strain on the fittings.
7. Test contact settings are correct according to the diagram, in any contact boxes connected to the arm or slot.
8. Check for correct correspondence between the signal arm or slot and any signal indicator or proving relay.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG08		
Replace a Mechanical Searchlight Mechanism		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Plug-coupled, free-wired, AC and AC electro-mechanical mechanisms
Excludes:	Fibre optic, Light emitting diode and Dichroic mirror types

BEFORE INSTALLATION WORK

1. Check replacement mechanism is not damaged and is correct type ('Home', 'distant').
2. Check mechanism is free of internal contamination.
3. Check replacement mechanism is correctly sealed.
4. [WIRE COUNT](#) existing mechanism to the wiring diagram (FREE-WIRED MECHANISMS ONLY).
5. Check existing wiring has safe insulation.
6. Check existing wiring is correctly labelled (FREE-WIRED MECHANISMS ONLY).
7. Check existing mechanism is isolated from the supply.

AFTER INSTALLATION WORK

Where any plug coupler is used check that no metallic dust or contamination exists between the two halves before reconnecting the plug couplers.

8. Check replacement mechanism is correctly installed (Level).
9. Check wiring is replaced as labelled (FREE-WIRED MECHANISMS ONLY).
10. [WIRE COUNT](#) replacement mechanism to the wiring diagram (FREE-WIRED MECHANISMS ONLY).
11. Check any retaining clips are in place.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. Check correctly rated lamp is installed.
15. Check entry cable is secured and the signal head wiring is not susceptible to mechanical damage.
16. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits if designed to be earth free.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG08		
Replace a Mechanical Searchlight Mechanism		
Issue No: 06	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 17. Test signal lamp, carry out [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests) and record the test measurements on the NR/SMS record card, together with the reason for the test.
- 18. Check for correct beam alignment [NR/SMS/PartC/SG00](#) (Signals: General) – Beam Alignment.

NOTE: Signal sighting forms include specific details on signal alignment and configuration.

- * 19. [ASPECT TEST](#) signal.
- 20. Check or arrange for correct labelling of mechanism.
- 21. Check signal head door fits correctly (door seal intact, no case damage, no extraneous light enters).

NOTE: Sighting forms, where provided, include specific details on signal alignment and configuration.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG11		
Replace an Ansaldo SD 321 Signal Head Filter Unit		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Ansaldo SD 321 signal head filter unit
Excludes:	Signal optical unit

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. [WIRE COUNT](#) existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

5. Check replacement unit is correctly installed.
6. Check plug coupler is correctly installed.

Check that no metallic dust or contamination exists between the two halves of the plug coupler before reconnection.

7. [WIRE COUNT](#) replacement unit to the wiring diagram.
8. Check terminations are secure and suitably protected.
- * 9. Test each signal lamp fed by the replacement unit [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG12		
Replace an Ansaldo SD 321 Signal Head Optical Unit		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Ansaldo SD 321 signal head optical unit
Excludes:	Signal head filter unit

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. Check replacement unit is free of internal contamination.
3. Check existing wiring has safe insulation.
4. Check existing unit is Isolated from the supply.

AFTER INSTALLATION WORK

5. Check replacement unit is correctly installed.
6. Check plug coupler is correctly installed.
 - **Check that no metallic dust or contamination exists between the two halves of the plug coupler before reconnection.**
7. Check terminations are secure and suitably protected.
8. Check correct lamps are installed.
9. Check lamp holders are correctly installed (align red marks before inserting lamp holder).
- * 10. Test each signal lamp [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests).
11. Arrange for a double yellow aspect to be displayed in a 4 aspect signal, (a red aspect in a 2 or 3 aspect head).
12. Check that when observed from the signal beam alignment point the signal is correctly aligned. In the case of a 4 aspect signal head the output of the unchanged optical unit and the replaced unit should appear the same colour and equally bright (See NR/SMS record card or signal sighting card for details of the signal beam alignment point).
- * 13. [ASPECT TEST](#) the signal.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG15		
Replace a Ground Position Light LED Signal		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Ground Position Light LED Signal
Excludes:	All other Position Light Signals

BEFORE INSTALLATION WORK

1. Note whether the existing 'on' aspect has two red lights or one red and one white.
2. Check replacement position light signal is not damaged and is correct type.
3. Check replacement position light internal wiring corresponds to the internal wiring of the existing position light or revised installation drawing.
4. [WIRE COUNT](#) existing position light signal to the wiring diagram.
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement signal head (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing signal head is Isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement position light signal is correctly installed and within structure gauge.
10. Check LED Signal Light Modules or equivalent, are correct type and colour, and are correctly orientated for their application.
11. Check that hoods are correctly installed and are correct type.
12. Check wiring is replaced as labelled.
13. [WIRE COUNT](#) replacement unit to the wiring diagram or revised installation drawing.
14. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
15. Check terminations are secure and suitably protected.
16. Check cable entry is secured and the signal head wiring is not susceptible to mechanical damage.
17. Carry out an [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) if the circuit is designed to be earth free.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG15		
Replace a Ground Position Light LED Signal		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

- * 18. Test the supply to each Signal Light Module and record the test measurements along with the other details required on the record card, together with the reason for the test.
- 19. Check for correct signal sighting.
- * 20. Carry out an [ASPECT TEST](#) signal.
- 21. Check or arrange for correct labelling of the unit.
- 22. Check signal head door fits correctly (Door seal intact, no case damage).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG51		
Replace a Filament Type Signal Head		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Filament lamp Colour light signals, Position light signals (PLS), Position light junction indicators (PLJI), Theatre type indicators (SARI), stencil type indicators (MARI)
Excludes:	Mechanical searchlight signal, Banner repeater signal, Electro-mechanical types, Fibre optic types, Dichroic mirror types, and Light emitting diode (LED) types

BEFORE INSTALLATION WORK

1. Check replacement signal head is not damaged and is correct type.
2. **If the Item is Missing** - Check for evidence on site and on the wiring diagrams that the missing equipment was previously fitted. If no evidence is present, consult your SM(S).
3. Check replacement signal head internal wiring corresponds to the internal wiring of the existing signal head.
4. [WIRE COUNT](#) existing signal head to the wiring diagram.
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement signal head (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing signal head is isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement signal head is correctly installed and within structure gauge.
10. Check filters are of correct type (colour) and are correctly installed.
11. Check wiring is replaced as labelled.
12. [WIRE COUNT](#) replacement signal head to the wiring diagram.
13. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
14. Check terminations are secure and suitably protected.
15. Check that correctly rated lamps of the correct type are fitted in all aspects.
16. Check entry cable is secured, and the signal head wiring is not susceptible to mechanical damage.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG51		
Replace a Filament Type Signal Head		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

17. Check correct hoods fitted.
18. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits if designed to be earth free.
- * 19. Test each signal lamp, carry out [NR/SMS/PartB/Test/021](#) Filament Signal Lamp Tests) and record the test measurements along with the other details required on the NR/SMS record card, together with the reason for the test.
20. Check for correct signal sighting [NR/SMS/PartB/Test/302](#) (Signal Visibility Check) and beam alignment [NR/SMS/PartC/SG00](#) (Signals: General).
 - Signal sighting forms include specific details on signal alignment and configuration.
 - Otherwise, see NR/GN/SIG/19032 for generic details.
- * 21. [ASPECT TEST](#) signal.
22. Check or arrange for correct labelling of unit.
23. Check signal head door fits correctly (Door seal intact, no case damage, no extraneous light enters).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG52		
Replace an Electro-Mechanical Signal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Banner repeater signal, Solenoid shunt signal, Motor driven signal
Excludes:	Electro-mechanical searchlight mechanisms

BEFORE INSTALLATION WORK

1. Check replacement signal is not damaged and is correct type.
2. **If the Item is Missing** - Check for evidence on site and on the wiring diagrams that the missing equipment was previously fitted. If no evidence is present, consult your SM(S).
3. [WIRE COUNT](#) existing signal to wiring diagram.
4. Check existing wiring has safe insulation.
5. [INSULATION TEST](#) replacement signal (minimum 2M ohms terminals to case).
6. Check existing wiring is correctly labelled.
7. Check existing signal is isolated from the supply.

AFTER INSTALLATION WORK

8. Check replacement signal is correctly installed and within structure gauge.
9. Check wiring is replaced as labelled.
10. [WIRE COUNT](#) replacement signal to wiring diagram.
11. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
12. Check terminations are secure and suitably protected.
13. Check replacement signal lamps are correct type.
14. Check replacement signal wiring is not susceptible to mechanical damage.
15. Check replacement signal door fits correctly (door seal intact, no case damage).
16. Check for correct alignment of signal [NR/SMS/PartC/SG00](#) (Signals: General).
17. Test signal mechanism operates freely.
18. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply if designed to be earth free.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG52		
Replace an Electro-Mechanical Signal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

* 19. [ASPECT TEST](#) replacement signal.

NOTE: *Sighting forms include specific details on signal alignment and configuration.*

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG53		
Replace an Electro-Mechanical Indicator		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Electro-mechanical indicators connected in series with relay coils
Excludes:	Any other type of indicator

GENERAL

BEFORE INSTALLATION WORK

1. Check replacement indicator is not damaged and is correct type.
2. **If the Item is Missing** - Check for evidence on site and on the wiring diagrams that the missing equipment was previously fitted. If no evidence is present, consult your SM(S).
3. [WIRE COUNT](#) existing indicator to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

6. Check replacement indicator is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) replacement indicator to the wiring diagram.
9. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) supply if designed to be earth free.
- * 10. Test for correct operation and correspondence between the equipment and the indicator.
11. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG54		
Replace a Fibre Optic Signal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Alphanumeric indicators, Banner repeater signal, Position light signal, Preliminary route indicator, Points indicator, Fibre optic harness, Fibre optic light box
Excludes:	Filament types, Dichroic mirror types and Light emitting diode types

GENERAL

- Replacement fibre optic harness and signal heads are supplied already connected together.

BEFORE INSTALLATION WORK

1. Note whether the existing 'on' aspect has two red lights or one red and one white (POSITION LIGHT SIGNAL ONLY).
2. **If the Item is Missing** - Check for evidence on site and on the wiring diagrams that the missing equipment was previously fitted. If no evidence is present, consult your SM(S).
3. Check replacement fibre optic unit is not damaged and is correct type.
4. Check replacement unit has the correct coloured filters (LIGHT BOX ONLY).
5. Check replacement signal head lens has the correct Hot Strip setting (SIGNAL HEAD ONLY).
 - Signal light boxes contain specific information on Hot Strip setting.
6. Check replacement fibre optic harness is colour coded at the light box end.
7. [WIRE COUNT](#) existing unit to the wiring diagram.
8. Check existing wiring has safe insulation.
9. [INSULATION TEST](#) replacement signal head heater terminals (minimum 2M ohms terminals to case), (SIGNAL HEAD ONLY).
10. Check existing wiring is correctly labelled.
11. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

12. Check replacement unit is correctly installed and within structure gauge.
13. Check wiring is replaced as labelled.
14. [WIRE COUNT](#) replacement unit to the wiring diagram.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG54		
Replace a Fibre Optic Signal		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. Check terminations are secure and suitably protected.
16. Check replacement fibre optic harness is not kinked or damaged and colour codes match the light box, (HARNESS TYPE ONLY).
17. Check correctly rated lamps are correctly installed, (LIGHT BOX ONLY).
18. Check fibre optic cable is secured and not susceptible to mechanical damage.
19. Check correct hoods are fitted, (SIGNAL HEAD ONLY).
20. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) electrical circuits.
- * 21. Test each signal lamp, carry out [NR/SMS/PartB/Test/021](#) (Filament Signal Lamp Tests) and record the test measurements along with the other details required on the NR/SMS record card together with the reason for the test.
- * 22. Check correct beam alignment [NR/SMS/PartC/SG00](#) (Signals: General), (SIGNAL HEAD ONLY).
23. Signal light boxes contain specific information on signal alignment.
24. [ASPECT TEST](#) signal.
25. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG55		
Replace a Light Emitting Diode (LED) Signal Head		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	LED type main signal head, LED type position light junction indicator (PLJI), LED type position light signal (PLS), PLS fitted with LED Signal Lamp Modules (SLMs). LED Style MARI and SARI units
Excludes:	Filament types, Fibre optic types, Dichroic mirror types, replace a filament type signal head with a LED type, work that includes a data change, Individual LED SLMs

BEFORE INSTALLATION WORK

1. Note whether the existing 'on' aspect has two red lights or one red and one white. (PLS ONLY).
2. Check replacement signal head is not damaged and is correct type.
 - Different alignments of the SLM front screen are provided for the signal configuration circumstances; see [NR/SMS/PartC/SG00](#) (Signals: General) for more details.
3. Check replacement signal head internal wiring corresponds to the internal wiring of the existing signal head or revised installation drawing.
4. [WIRE COUNT](#) existing signal head to the wiring diagram.
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement signal head (minimum 2M ohms terminals to case).
7. Check existing wiring is correctly labelled.
8. Check existing signal head is isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement signal head is correctly installed and within structure gauge.
10. Check LED SLMs, or equivalent, are correct type and colour, and are correctly orientated for their application.
11. Check that hoods are correctly installed and are correct type.
12. Check wiring is replaced as labelled.
13. [WIRE COUNT](#) replacement head to the wiring diagram or revised installation drawing.
14. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SG55		
Replace a Light Emitting Diode (LED) Signal Head		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. Check terminations are secure and suitably protected.
16. Check cable entry is secured, and the signal head wiring is not susceptible to mechanical damage.
17. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits if designed to be earth free.
- * 18. Test the supply to each SLM and record the test measurements along with the other details required on the NR/SMS record card, together with the reason for the test.
19. Check for correct signal sighting, carry out [NR/SMS/PartB/Test/302](#) (Signal Visibility Check) and beam alignment [NR/SMS/PartC/SG00](#) (Signals: General).
- * 20. [ASPECT TEST](#) signal.
21. Check or arrange for correct labelling of the unit.
22. Check signal head door fits correctly (door seal intact, no case damage).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL01		
Replace a SMARTLOCK CIXL I/O Subsystem Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	XAU, EAU and I/O PSU
Excludes:	All other types

GENERAL

Spare modules should be stored in the same ambient conditions as the operational interlocking to prevent any adverse effect to the performance of the modules, when unpacked and powered-up.

When removing or handling any CIXL modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the left-hand side of the Cubicle; this wristband shall be worn on the wrist of personnel prior to the removal and handling of any CIXL modules.

Do not switch off both I/O groups as this removes power from the Computing Subsystem and cause the CIXL to shut down.

If the system is fully functional, but running in degraded mode, it is recommended that failure reports are completed before attempting repairs to allow correct recording of indicators.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is the correct type.
2. Check for the correct working of the other I/O group. Use the I/O Group switch to power-off the I/O group in which a faulty module has been identified.

REMOVAL OF EXISTING SMARTLOCK I/O MODULE

3. Unplug the faulty Module from its backplane, by simultaneously applying thumb leverage in an upward and downward direction on the top and bottom card ejectors respectively, on the front panel of the Module.
4. Remove the faulty Module from the I/O Group and place it within an anti-static container.

INSTALLATION OF REPLACEMENT SMARTLOCK I/O MODULE

5. Withdraw a replacement LRU from its anti-static container, plug it into the empty slot and check that the LRU is seated correctly in its slot.

AFTER INSTALLATION WORK

6. Check that replaced modules and cards are correctly installed.
7. Use the front panel I/O Group switch to turn on the power of the I/O group into which the new board has been inserted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL01		
Replace a SMARTLOCK CIXL I/O Subsystem Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

8. On the related I/O Group PSU, check that the green LEDs called “In OK” and “Out OK” are steady on.
9. On each XAU, after approximately 20 to 30 seconds, check that the red LEDs called “OK1” and “OK2” flash as a rate of approximately once per second and check that the red LED called “RXHS” is steady on.
10. On each EAU, after approximately 5 to 10 seconds, check that both orange LEDs called “R” flash at a rate of approximately once per second.
11. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to Second Line Maintenance.

Following replacement of an EAU due to address caching in the network equipment, communications between the CIXL and the Support System can take several minutes to start.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL02		
Replace a SMARTLOCK CIXL Computing Subsystem Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	MPU, HSCU and Redman Modules, Computing Channel PSU, CIXL Computing Channel Identity Device and PCMCIA Card
Excludes:	All other types of Computing Subsystem Modules

GENERAL

Repair or replacement of the sealed safety fuse located on the circuit board of a Redman module in the CIXL shall not be carried out by first line maintenance under any circumstances, as this might mask an unsafe condition.

• Spare modules should be stored in the same ambient conditions as the operational interlocking to prevent any adverse effect to the performance of the modules, when unpacked and powered-up.

When removing or handling any CIXL modules, check that an ESD wrist strap is connected to the ESD Bonding Point on the left-hand side of the Cubicle. This wristband shall be worn on the wrist of personnel prior to the removal and handling of any CIXL modules.

When running the CIXL in 2-out-of-2 mode, do not switch off either of the two operational Computing Channels as this causes the CIXL to shut down.

When there is a faulty board in a computing channel (MPU, HSCU or Redman board), all three boards shall all be replaced together.

Unless only the PCMCIA card has failed, once it is inserted into its MPU it shall be considered as captive to the MPU and shall remain inserted, even when the MPU is removed and returned for repair.

• If the system is fully functional, but running in degraded mode, it is recommended that failure reports are completed before attempting repairs to allow correct recording of indicators.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. For PCMCIA cards and Identity Devices, check that the correct channel specific replacement is selected from the available spares.
3. Check for the correct working of the other two computing channels. Use the computing channel switch to power-off the computing channel in which a faulty module has been identified.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL02		
Replace a SMARTLOCK CIXL Computing Subsystem Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

REMOVAL OF EXISTING SMARTLOCK COMPUTING CHANNEL MODULE

4. Unplug the MPU, HSCU and REDMAN boards from their backplane, by simultaneously applying thumb leverage in an upward and downward direction on the top and bottom cars ejectors respectively, on the front panels of the Modules.
5. Remove the MPU, HSCU and REDMAN boards from the Computing Channel and place each within an anti-static container.

REMOVAL OF EXISTING SMARTLOCK COMPUTING CHANNEL PCMCIA CARD

6. For failures of PCMCIA card only, press the button to eject the failed PCMCIA card and remove it from the MPU.

REMOVAL OF EXISTING CIXL COMPUTING CHANNEL IDENTITY DEVICE

7. Withdraw the device from the Maintenance Panel.

INSTALLATION OF REPLACEMENT COMPUTING CHANNEL IDENTITY DEVICE

8. Insert the spare Identity Device that has been pre-programmed for the computing channel (a specific Device labelled "A", "B" and "C" is associated with each computing channel).

INSTALLATION OF REPLACEMENT SMARTLOCK COMPUTING CHANNEL MODULE OR PCMCIA CARD

9. Withdraw replacement MPU, HSCU and REDMAN boards from their anti-static containers, plug them into the empty slots and check that the cards are seated correctly in their slots.
10. Insert the spare PCMCIA card that has been pre-programmed for the computing channel.

NOTE: A specific PCMCIA card labelled "A", "B" and "C" is associated with each computing channel.

AFTER INSTALLATION WORK

11. Check that replaced modules and cards are correctly installed.
12. Use the front panel switch to turn on the power of the computing channel into which the new modules have been inserted.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL02		
Replace a SMARTLOCK CIXL Computing Subsystem Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

13. After 3 minutes, check the following LED indications (See Table 1):

Board name	LED	State in normal operation	Note
PSU	2 x In OK	Steady ON	
	2 x Out OK	Steady ON	
MPU	CPU	Steady ON	#
	PCI	Steady ON	#
	FUS	Steady ON	#
	SYS	Steady ON	#
	CHS	Steady OFF	
	BFL	Steady OFF	
HSCU	CHANNEL A OK	Flashing at about 1/sec	
	CHANNEL B OK	Flashing at about 1/sec	
REDMAN	FIE	Steady ON	
	FI	Steady ON	

Table 1 – LED Indications

14. Check the REDMAN display for correct details.

NOTE: During normal operation, a text including the CIXL identity, the scheme name, each VIXL's data version and mode and the maximum used Time-Slot time since last display is shown in a loop on the REDMAN display. Any other behaviour indicates a faulty CIXL Channel.

15. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to Second Line Maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL03		
Replace a SMARTLOCK CIXL Main PSU		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	CIXL Main PSU only
Excludes:	I/O PSU and Computing Channel PSU

GENERAL

Do not switch off the incorrect circuit breaker when operating on a single Main Power Supply as this causes the CIXL to shut down.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is the correct type.
2. Use the circuit breaker at the rear of the CIXL cubicle to power-off the failed Main PSU.

REMOVAL OF EXISTING SMARTLOCK CIXL MAIN PSU

3. Using the two handles on the front panel of the Main PSU withdraw it from the PSU Sub-rack.
4. Remove the faulty Module from the main PSU sub-rack and place it within an anti-static container.

INSTALLATION OF REPLACEMENT SMARTLOCK CIXL MAIN PSU

5. Insert a spare Main PSU into the sub-rack and check that it is seated correctly in its slot.

AFTER INSTALLATION WORK

6. Check that replaced PSU is correctly installed.
7. Use the circuit breaker at the rear of the CIXL cubicle to turn on the power to the Main PSU which has been replaced.
8. Observe that the green "System" and "Uo" indicators on the new PSU are lit, and the red Error indicator is not lit.
9. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to Second Line Maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL04		
Replace a SMARTLOCK TICC Front End Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	FE Cassette, FE PSU
Excludes:	All Gateway Components, DLM and LDT

GENERAL

Do not shut down an operational FE Power Supply when the redundant FE cassette is not operating correctly, as this causes trackside signals controlled through the Front End to revert to their most restrictive conditions.

BEFORE INSTALLATION WORK

1. For replacement of a FE Cassette, obtain the correct, pre-programmed spare unit for this FE.

NOTE: A pre-configured spare for each FE has been supplied with the SMARTLOCK installation and is labelled 1A, 1B, 2A etc.

2. Check the replacement module is not damaged and is the correct type.
3. Use the FE circuit breaker on the front of the TICC to power-off the failed FE. Wait at least 10 seconds to permit the discharge of the possible residual voltages.

REMOVAL OF EXISTING FE MODULE

4. Extract the FE module by pulling on its handles.

INSTALLATION OF REPLACEMENT FE MODULE

5. Insert the spare Front End Module, pushing it until its rear connectors are engaged correctly and completely with the related connectors of the backplane, and it is flush with the front of the rack.
6. Secure the FE Module into the rack, using the four front panel screws.

AFTER INSTALLATION WORK

7. Check that replaced Module is correctly installed.
8. Use the circuit breaker for the FE to turn on the power.
9. Check that the LED "Vout" of the FE PSU is ON.
10. For replacement of the FE PSU, measure the output voltage supplied by the PSU, connecting a multimeter to the test points. Check that the voltage is 24V DC +/- 10%, adjusting it, if needed.
11. Check that the related FE cassette is working properly by observing the LEDs.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL04		
Replace a SMARTLOCK TICC Front End Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

12. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to Second Line Maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL05		
Replace a SMARTLOCK TICC GW Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Gateway Module, Gateway Configuration Device and Gateway PSU
Excludes:	All Front-End Components, DLM and LDT

GENERAL

Do not switch off the wrong (working) gateway of a pair, as this results in loss of output to the trackside datalink and reversion of signals to red retained.

The Gateway PSUs are each protected by a fuse in the power tray, and an internal fuse. These should be checked before replacing the PSU.

BEFORE INSTALLATION WORK

1. For replacement of a GW Configuration Device, obtain the correct, pre-programmed spare unit for this GW.
2. Check the replacement module is not damaged and is the correct type.
3. Use the circuit breaker at the base of the TICC to power-off the failed module or PSU.

REMOVAL OF EXISTING GW MODULE

4. Disconnect the two cables from the "MODEM" and "TDL" connectors on the front panel of the GW Module.
5. Extract the GW Module from the sub-rack.

REMOVAL OF EXISTING GW CONFIGURATION DEVICE

6. Power-off and remove the corresponding DLM or LDT to gain access to the configuration device from the rear of the cubicle.
7. Remove the GW module following clauses 4 and 5.
8. Disconnect the power and earth wiring from the Configuration Device, noting the positions.
9. Unscrew the Configuration Device from the sub-rack and remove, noting the position.

REMOVAL OF EXISTING GW PSU

10. Extract the GW PSU from the sub-rack.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL05		
Replace a SMARTLOCK TICC GW Module		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

INSTALLATION OF REPLACEMENT GW MODULE OR GW PSU

11. Insert the replacement GW Module/PSU and check that it is seated correctly in its slot.
12. Secure the GW module/PSU into the sub-rack using the four screws.
13. For GW Module replacement, re-connect the two cables to the “MODEM” and “TDL” connectors on the front panel of the GW Module.

INSTALLATION OF REPLACEMENT GW CONFIGURATION DEVICE

14. Screw the replacement GW Configuration Device into the sub-rack into the position noted in clause 9.
15. Re-connect the power and earth wiring into the positions noted in Step 9.
16. Re-fit the GW Module following clause's 11 - 13.
17. Re-fit and switch on the power to the corresponding DLM or LDT removed at clause 8.

AFTER INSTALLATION WORK

18. Check that replaced GW components are correctly installed.
19. Use the Switch or circuit breaker at the base of the TICC cubicle to turn on the power to GW.
20. Observe that the LED “Vout” on the PSU is lit.
21. On the SSys HMI, check that the previously reported alarms have become inactive (white) and clear them from the display. If the failure is still present or if one of the previous checks failed, refer to Second Line Maintenance.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL06		
Replace a SMARTLOCK SSys Component		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Support Server and Network Devices (includes Remote Client Router)
Excludes:	SSys Local and Remote Client PCs

GENERAL

- Endeavour to clear Support Server faults by rebooting the device before resorting to replacement.

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and is the correct type.
2. For replacement of the SSer, Shut down the SSer through the windows menu. If this is not possible, then force a power-down using the power switch.
3. For Network Device replacement, power-off the Network Device by removing its power connector.

REMOVAL OF EXISTING SUPPORT SERVER

4. Disconnect all cables from the rear of the SSer to be replaced, noting connector positions.
5. Remove the SSer from the SSys rack.

REMOVAL OF EXISTING NETWORK DEVICE

6. Disconnect all cables from the front and rear of the Network Device, noting the positions.
7. Remove the Network Device from the SSys rack.

INSTALLATION OF REPLACEMENT NETWORK DEVICE

8. Insert a spare Ethernet network device (from the approved Smartlock 400 spare list) in the SSys rack (if the device is a router or IDNet Switch, it needs to be a pre-configured unit. IMNet switches are left on factory default settings).
9. Reconnect all cables at the front and rear of the Ethernet network device in the positions noted in Step 4.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL06		
Replace a SMARTLOCK SSystem Component		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

INSTALLATION OF REPLACEMENT SUPPORT SERVER

10. Install a configured spare SSystem into the SSystem rack.

The replacement unit shall be pre-configured for the same role as the removed SSystem. The hardware shall be of a compatible type, and the installed software and configuration shall be the same as for the removed unit. The labelling of the two machines shall match:

- a) The machine shall be for the same scheme, and have the same name within that scheme, e.g. Horsham SSystem1A.
- b) The S2K version is the same, e.g. 6.6.1.
- c) The Support System software baseline is the same, e.g. 1.4.9.
- d) The specific application data release shall be the same, e.g. Horsham 1.7.

11. Reconnect all cables at the rear of the new SSystem in the positions.

AFTER INSTALLATION WORK

12. Check that replaced SSystem components are correctly installed.
13. Where necessary, power-on the replacement component.
14. For SSystem replacement, observe the start-up screen for error messages.
15. After booting has completed, check that the new Support Server is working by observing the status of the server on the HMI.
16. For Network device replacement, On the Client HMI, check that the previously reported alarms have become inactive (white) and clear them from the display.
17. As required, arrange for the Addition/Removal of machines from the Windows Domain.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SL07		
Replace a SMARTLOCK SSys Client PC		
Issue No: 02	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	SSys rack mounted Local client / client gateway PCs, desk-top Client PCs and Remote Client PCs
Excludes:	All other SSys rack mounted equipment

GENERAL

Replacement of a Client PC hardware requires configuration in the Windows Server domain to allow the SSer to be recognised and function.

The removed hardware shall also be removed from the SSer domain configuration.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is the correct type.
2. Shut down the SSys Client through the windows menu. If this is not possible, then force a power-down using the power switch.

REMOVAL OF EXISTING CLIENT PC

3. Disconnect all cables from the rear of the SSys Client noting the positions.
4. Remove the SSys Client.

INSTALLATION OF REPLACEMENT CLIENT PC

5. Install a configured spare SSys Client PC.
6. Reconnect all cables to the SSys Client in the positions noted at Step 3.

AFTER INSTALLATION WORK

7. Check that replaced Client PC is correctly installed.
8. Where necessary, power-on the replacement components.
9. After booting has completed, check that the new Client PC is working correctly by exercising the Support System HMI.
10. As required, arrange for the addition/Removal of machines from the Windows Domain.
11. Check that the previously reported alarms have become inactive (white) and clear them from the display.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SS01		
Replace an SSI MPM or PPM		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Mk2A, Mk2B and Mk3 MPMs
Excludes:	Mk1A and Mk1B MPMs

***** INDEPENDENCE EXEMPT *****
 PROVIDED THAT THERE IS NO SYSTEM SHUTDOWN AND NO RE-ENTRY OR
 MODIFICATION OF TECHNICIANS CONTROLS IS REQUIRED

• The Installed SSI Software Record (ISSR) sheet details software version, hardware mod state, hardware compatibility and Memory Module (MM) serial number.

BEFORE INSTALLATION WORK

1. Print a current list of all controls from the Technician's Terminal (TT), in case a power down is necessary.
2. Check the printout against the Technician's Controls Logbook.
3. Check replacement MM is not damaged and is correct type, ensuring that the front panel of the replacement MM is identically labelled to that of the existing MM (Control Centre name/number, Interlocking name/number, Module name, program label, data label), **(IF MM IS TO BE REPLACED)**.

• The existing MM may be reused, unless it is suspected that it was causing a problem, in which case it shall be returned with the MPM/PPM.

4. Check replacement MPM or PPM is not damaged and is correct type. Check for the correct mod state (label on the rear of the unit). This shall be the same as the mod state of the existing MPM or PPM.
5. Check compatibility between the replacement MM and the existing MPM or PPM is correct (mod state compatibility as defined in SSI 8150), **(IF MM IS TO BE REPLACED)**.
6. Check replacement MPM or PPM and MM are sealed.
7. Enter details of the MM on the next available line of the ISSR and strike out the line relating to the existing MM **(IF MM IS TO BE REPLACED)**.

• Once the replacement MM has been checked in service, a copy of the amended ISSR shall be returned to the National Records Group.

8. Insert the replacement MM into the replacement MPM or PPM **(IF MM IS TO BE REPLACED)**.

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NR/SMTH/Part04/SS01		
Replace an SSI MPM or PPM		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

9. Check a SSI Equipment Status Report is completed for the existing MPM or PPM (serial number, mod state, manufacturer, lamps/indicators, MPM or PPM, Interlocking).
10. Check existing MPM is disabled from the interlocking via the Technician's Terminal **(MPM ONLY)**.

..... This allows the interlocking to continue to operate by reconfiguring the two remaining MPMs from a triplicate to a duplicate system. When only two MPMs are working and one is to be replaced the interlocking shall be stopped.

..... The successful disabling of an MPM is reported via MPM1. Hence, if MPM 1 is the MPM being disabled, "CONTROL NOT ACKNOWLEDGED" is displayed on the TT Screen instead of "CONTROL EXECUTED", although the MPM is in fact disabled.

11. Check existing MPM or PPM is switched off. This is achieved by pulling the ON/OFF switch toggle, to release the lock and set the switch to the OFF position.

REMOVAL OF EXISTING MPM OR PPM

12. Identify and remove the module fuse from the cubicle base.
13. Disconnect the power cable and data cables from the rear of the existing MPM/PPM.
14. Remove the existing MPM/PPM (4 securing screws) from the interlocking cubicle.

INSTALLATION OF REPLACEMENT MPM OR PPM

15. Install the MM out of the existing MPM or PPM into the replacement MPM/PPM **(IF MM IS TO BE REUSED)**.
16. Install the replacement MPM or PPM with MM into the Interlocking Cubicle (4 securing screws).
17. Reconnect the data cables and power cable and replace the module fuse.
18. Pull the ON/OFF switch toggle to release the lock and set the switch to the ON position.

..... It is not necessary to re-enable the MPM from the Technician's Terminal. The unit starts automatically when power is applied

AFTER INSTALLATION WORK

19. Check replacement MPM/PPM and memory module are correctly installed.

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Replace an SSI MPM or PPM		
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20. Check that the replacement MPM or PPM is operating correctly by observing the indicator LEDs (all alight, front and rear of unit). Observe the operation of the Interlocking for about five minutes.
21. Check that all controls are entered from the Technician's Terminal before starting interlocking (**MPMs AFTER TOTAL SYSTEM SHUTDOWN ONLY**).
 - ⋮ A new list of controls shall be obtained from the Technician's Terminal as a check.
22. Check or arrange for correct labelling of unit.
23. Return the SSI Equipment Status Report to your SM(S). A copy of the Equipment Status Report and ISSR shall accompany the faulty module on its return for repair.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/SS02		
Replace an SSI TFM, DLM, or LDT		
Issue No. 06	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	Point TFM, signal TFM.
Excludes:	MPM, PPM.

***** INDEPENDENCE EXEMPT *****

• The “Installed SSI Software Record” (ISSR) sheet at the interlocking details allowable mod states and any local restrictions.

BEFORE INSTALLATION WORK

1. Check replacement TFM or DLM or LDT is Not Damaged and is Correct Type.
2. Check replacement TFM or DLM or LDT mark and mod state is correct (local restrictions).
3. Check replacement TFM or DLM or LDT is sealed.
4. Isolate existing TFM or DLM or LDT power supplies in the correct order (110V then any 140V supply).

AFTER INSTALLATION WORK

5. Check replacement TFM or DLM or LDT is Correctly Installed.
6. Check TFM or DLM or LDT power supplies are restored in the correct order (any 140V then 110V supply).
7. Check replacement TFM operates correctly. **(TFM ONLY)**

• “Operates correctly means”, observing the correct indications on the TFM itself and confirming the correct operation of one function operated by the TFM.

• For example, a signal’s aspect can be changed, points operated normal and reverse, etc.

8. Check or arrange for Correct Labelling of unit.
9. Check that the TFM current proving function is in use, by carrying out a Lamp Proving Test [\[Remove lamp test \(NR/SMS/Test/022\)\]](#) for each current-proved output. **(ALSTOM Mk3, MOD STATE 4, SIGNAL MODULE ONLY)**

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/SS02		
Replace an SSI TFM, DLM, or LDT		
Issue No. 06	Issue Date: 01/09/18	Compliance Date: 01/12/18

It is not necessary to carry out the first filament failure test, but only to confirm with the signaller that the lamp-out condition has been detected.

If the module fails to detect lamp out, the signal shall be immediately treated as defective and steps shall be taken to investigate and correct the failure.

Current proving links in the 75-way plug coupler shall be verified by visually checking for correct position of the pins and measurement of electrical continuity. If the links and plug coupler are in place, the module itself should be sent for investigation.

The details of the failure discovered shall be reported promptly to your Section Manager (Signals).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SS03		
Replace an Ansaldo Interlocking Plug in Module		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	The Area Controller (AC), Field Device Controller (FDC), Field Isolation Unit (FIU), Field Adaption Unit (FAU), Interlocking Unit, CIU Interlocking Module
Excludes:	Any other type or make of plug in module

General

Module(s) shall only be changed with the co-operation the maintenance desk operator. The Signaller shall be informed of any likely affects.

Before changing any module(s) that form part of a replicated system check that the other components in that system are functioning correctly.

Before disconnecting or reconnecting the red or green fibre optic data transfer cables confirm that the Fibre Interface module is not fully inserted to allow the capacitors to discharge.

The Area Controller (AC), Field Device Controller (FDC), Field Isolation Unit (FIU) and Field Adaption Unit (FAU) modules can be removed and replaced without powering down but once removed allow 10 seconds (minimum) to elapse before replacement.

The CIU Interlocking module shall be powered down before removal.

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is correct type.
2. Check cover of replacement module is correctly fitted and secure.

AFTER INSTALLATION WORK

3. Check replacement module is correctly installed.
4. Check replacement module operates correctly.
 - Check correct operation means observing the correct indications on the module itself.
5. Check or arrange for correct labelling of module.
6. Advise box Technician of serial number of failed module and replacement module.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/SS04		
Replace a VHLC Card		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	VHLC Card
Excludes:	All other equipment card types

BEFORE RE-INSTALLATION WORK

1. Check replacement card is not damaged.
2. Check replacement card is correct type.

AFTER RE-INSTALLATION WORK

3. Check card is installed correctly.
4. Complete VHLC voltage [SMS/PartB/152](#).
5. Check green status LEDs.
6. Check on known input to corresponding input LED.
7. Check one known output to corresponding output LED.
8. Observe the interlocking for five minutes.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SS05		
Replace an SSI TFM Plug Coupler		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	SSI TFM Plug Coupler where its internal wiring harness or plug coupler has been damaged
Excludes:	All Other Plug Couplers

GENERAL

Failure to isolate the SSI TFM plug coupler wires and plug coupler to the TFM can result in unwanted point movements, aspect clearances or damage to the SSI Datalink.

You shall come to a clear understanding with the Signaller on:

- a) The extent of the work to be carried out.
- b) The equipment that shall be affected by the work.
- c) The timescales involved in installation and testing

As each TFM address is unique to the SSI, this test is only applicable if:

- d) The replacement SSI TFM plug coupler has been specifically manufactured for the specific site/module.
- e) The new SSI TFM plug coupler wiring is of correct length to be installed

Verify that all routes are normalized, points are keyed to the required position and clamped and scotched.

BEFORE INSTALLATION WORK

1. Obtain the agreement of the S&TME to use the replacement SSI TFM Plug coupler harness.
2. Check replacement SSI TFM plug coupler is not damaged.
3. Check replacement SSI TFM plug coupler has safe insulation.
4. Check replacement SSI TFM plug coupler wiring is correct to the SSI TFM plug coupler pin number. Refer to the site copies of the diagrams.

NOTE: The diagrams refer the SSI TFM plug coupler analysis from the wire side.

5. Check replacement SSI TFM plug coupler address pins to the site copies of the diagrams.
6. Check the anti-rotation collars are present on the specified address pins. Refer to the SSI TFM plug coupler analysis.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SS05		
Replace an SSI TFM Plug Coupler		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

7. Check guide Pins and Jack Screws are correct to the SSI TFM plug coupler analysis.
8. Check Datalink wiring has been completed as a twisted pair.
9. [CONTINUITY TEST](#) all cores in the replacement SSI TFM plug coupler.
10. Check existing SSI TFM plug coupler is isolated from the supplies at all terminals and the TFM Module power supply is isolated.
11. [WIRE COUNT](#) existing SSI TFM plug coupler terminals to the wiring diagram.
12. Check existing SSI TFM plug coupler terminals are correctly labelled.
13. Physically trace the existing SSI TFM plug coupler wiring.

DURING INSTALLATION WORK



14. Remove the existing SSI TFM plug coupler from the TFM Module.
15. Insert and secure the new SSI TFM plug coupler to the TFM Module checking the plug coupler is the correct orientation.
16. Working in a logical order, carry out a "wire by wire" replacement of the existing SSI TFM plug coupler wiring harness. Remove and insulate each wire as soon as it is detached.

AFTER INSTALLATION WORK

17. Check replacement SSI TFM plug coupler is correctly installed on the correct TFM module and check the plug coupler retaining screws for security.
18. Check replacement wires are correctly terminated.
19. Check terminated twisted pair wires are twisted up to 25mm (1 inch) from the terminals.
20. [WIRE COUNT](#) affected wires to the site diagrams.
21. Arrange for the SSI Module to be powered up and observe the module status indications.

NOTE: Come to a clear understanding with the Signaller that the 551 TFM Module is to be powered up and that all Signal Routes and points are normalized to minimize unwanted aspects clearing to proceed or point movements when Module is powered up

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NR/SMTH/Part04/SS05		
Replace an SSI TFM Plug Coupler		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

22. Check the Maintenance Test Plan for the item of equipment fed by the affected SSI TFM Plug Coupler and carry out steps marked with an asterisk '*'.

23. If the affected SSI TFM plug coupler goes to point detection circuits, carry out steps marked with an asterisk '*

 on the Maintenance Test Plan for the point detection circuits.24. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits where designed to be earth free.
25. Check at the SSI Interlocking for any error messages on the Technicians Terminal and arrange for them to be removed.
26. Check or arrange for correct labelling of the SSI plug coupler.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/SW10		
Replace a Siemens Train Staff Lockout Device		
Issue No: 01	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Siemens Train Staff Lockout Device (TSLD)
Excludes:	All other types of lockout device

BEFORE INSTALLATION WORK

1. Check the replacement instrument is the correct type and not damaged.
2. [WIRE COUNT](#) the existing instrument to the wiring diagram.
3. Check the wiring for safe insulation and that it is correctly labelled.
4. Remove the existing key from the instrument.
NOTE: The key has to be removed before the instrument is powered down.
5. Disconnect the power supply.
6. Remove and label the failed instrument as defective.

AFTER INSTALATION WORK

7. Check the instrument is securely installed.
8. [WIRE COUNT](#) the new instrument to the wiring diagram.
9. Check the wire and cables are clear of moving parts.
10. Reconnect the power supply.
11. Replace the key into the instrument.
12. Check the key can only be removed when a release is given.
13. Check that once removed, the key, can be replaced back into the system and that any function released by the withdrawal of the key is cancelled.
14. Check, or arrange for the correct labelling of the new instrument.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC00		
Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
Issue No: 07	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI Track, EBI Track 400 Circuits only
Excludes:	Any other type of Track Circuit

GENERAL

A full NR/SMS test shall be completed unless the following tests are completed satisfactorily within the stated limits.

EBI TRACK 200 (TI21) TRACK CIRCUITS

Defined Tasks:	<ul style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renew or remove and refit Track circuit bonding not located within the tuned zone (all types, including traction bonding) c) Track replacement of a short length of plain rail (for defect) but not re-railing, S&C, rail located within the tuned zone, IRJs (except when referred here by TC03 (Testing Track circuits After IRJ Renewal))
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If both track tuning units are removed from the same track circuit (TC'2'), it is possible for TC'3' to be energised by TC'1' feed with a train on TC'3'. If it is required to remove both track tuning units disconnect both adjacent track circuits (TC'1' and TC'3') and inform your SM(S).

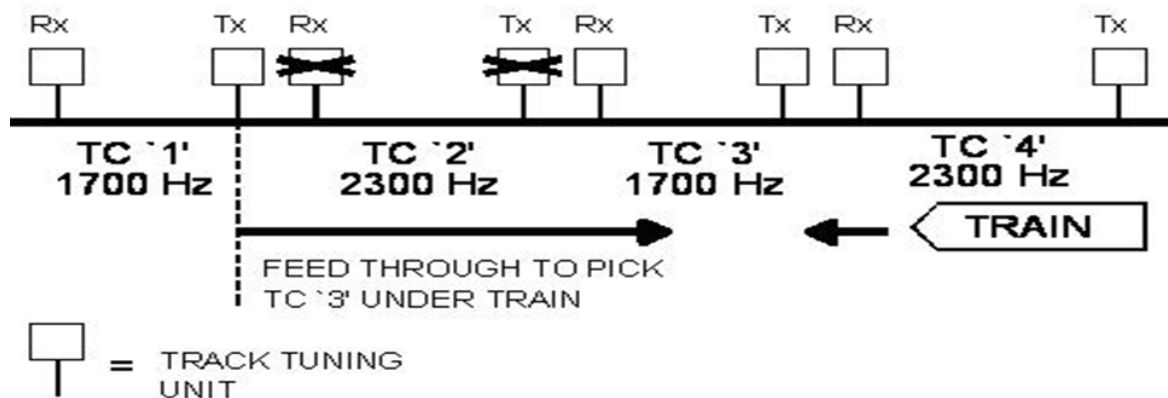


Figure 1

1. Carry out a drop shunt and pick-up shunt test, see [NR/SMS/PartB/Test/253](#) (EBI Track 200 (Audio Frequency) Track Circuit Test)).

The values obtained shall not deviate from the previously recorded reading by more than +0.1 ohm and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).

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NR/SMTH/Part04/TC00		
Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
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2. For Analogue receivers measure the voltage across the 1Ω resistor; compare this reading against the record card. The reading obtained shall not deviate by more than +10 % from the previously recorded reading.
3. For Digital receivers, record the *Inow* AV current using the display on the receiver and compare this reading against the record card. The reading obtained shall not deviate by more than +10 % from the previously recorded reading.
4. Check for correct stagger of track with respect to all adjacent track circuits affected. **(SINGLE RAIL ONLY)**.
5. Confirm track circuit drops with 0.5 ohm at all extremities and visually check all bonding. **(SINGLE RAIL ONLY)**
6. Check correspondence of the track circuit indication with the Signaller.
7. If available, check RCM traces have returned to their normal operating level as before the work.

AC TRACK CIRCUITS: SINGLE RAIL, DOUBLE RAIL, VT1 (SP)

Defined Tasks:	<ol style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renewal of like-for-like track tail cables (excluding doubling), c) Track circuit components listed in TC01, TC02, d) Track circuit bonding (all types, including traction bonding), e) Track replacement of a short length of plain rail (for defect) but not re-railing, S&C, or IRJ (except when referred here by TC03)
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1. Carry out a drop shunt and pick-up shunt test, see [NR/SMS/PartB/Test/260](#) (50Hz AC Track Circuit Test).

The values obtained shall not deviate from the previously recorded reading by more than +0.1 ohm and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
2. Check the relay control coil voltage, see [NR/SMS/PartB/Test/260](#). The values obtained shall not deviate by more than +10 % from the previously recorded reading.
3. Check for correct stagger of track with respect to all adjacent track circuits affected, see [NR/SMS/PartB/Test/260](#).
4. Confirm track circuit drops with 0.5 ohm at all extremities and visually check all bonding **(SINGLE RAIL TRACK CIRCUITS ONLY)**.

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Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
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5. Perform a stability test, see [NR/SMS/PartB/Test/260](#) (**DOUBLE RAIL TRACK CIRCUITS ONLY**).
6. Check correspondence of the track circuit indication with the Signaller.
7. If available, check RCM traces have returned to their normal operating level as before the work.

REED TRACK CIRCUITS

Defined Tasks:	<ol style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renewal of like-for-like track tail cables (excluding doubling), c) Track circuit components listed in TC01, TC02, d) Track circuit bonding (all types, including traction bonding), e) Track replacement of a short length of plain rail (for defect) but not re-railing, S&C, or IRJs (except when referred here by TC03)
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1. Carry out a drop shunt and pick-up shunt test, see [NR/SMS/PartB/Test/257](#) (Reed Type RT Track Circuit Test).

The values obtained must not deviate from the previously recorded reading by more than +0.1 ohm and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).

2. Check the track receiver filter output voltage t11/t12 is 150 to 300 mV [Receiver track filter voltage, see [NR/SMS/PartB/Test/257](#)].
3. The values obtained shall not deviate by more than +10 % from the previously recorded reading.
4. Confirm track circuit drops with 0.5 ohm at all extremities and visually check all bonding (**SINGLE RAIL ONLY**).
5. Check correspondence of the track circuit indication with the Signaller.
6. If available, check RCM traces have returned to their normal operating level as before the work.

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NR/SMTH/Part04/TC00		
Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
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FS2600 TRACK CIRCUITS

Defined Tasks:	<ul style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renewal of like-for-like track tail cables (excluding doubling) c) Track circuit components listed in TC01, TC02 d) Track circuit bonding (all types, including traction bonding) e) Track replacement of a short length of plain rail (for defect) but not re- railing, S&C, or IRJs (except when referred here by TC03)
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1. Carry out a drop shunt and pick-up shunt test, see [NR/SMS/PartB/Test/259](#) (FS 2600 Track Circuit Test).

The values obtained shall not deviate from the previously recorded reading by more than +0.1 ohm and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).

2. Check the Monitor Point Voltage (MPV), see [NR/SMS/PartB/Test/259](#).

The values obtained shall not deviate by more than +10 % from the previously recorded reading.

3. Check correspondence of the track circuit indication with the Signaller.

4. If available, check RCM traces have returned to their normal operating level as before the work.

HVI TRACK CIRCUITS

Defined Tasks:	<ul style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renewal of like-for-like track tail cables (excluding doubling), c) Track circuit components listed in TC01, TC02, d) Track circuit bonding (all types, including traction bonding), e) Track replacement of a short length of plain rail (for defect) but not re- railing, S&C, or IRJs (except when referred here by TC03)
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1. Carry out a drop shunt and pick-up shunt test, see [NR/SMS/PartB/Test/255](#) (HVI (High Voltage Impulse) Track Circuit Test).

The values obtained shall not deviate from the previously recorded reading by more than +0.1 ohm and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).

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NR/SMTH/Part04/TC00		
Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
Issue No: 07	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

2. Check the relay coil voltage, see [NR/SMS/PartB/Test/255](#).
 - The values obtained shall not deviate by more than +10 % from the previously recorded reading.
3. Check for correct stagger of track with respect to all adjacent track circuits affected.
4. Confirm track circuit drops with 0.5 ohm at all extremities and visually check all bonding.
5. Check correspondence of the track circuit indication with the Signaller.
6. If available, check RCM traces have returned to their normal operating level as before the work.

EBI TRACK 400 TRACK CIRCUITS

Defined Tasks:	<ol style="list-style-type: none"> a) Remove/Replace track circuit connections b) Renew or Remove and Refit Track Circuit bonding not located within the tuned zone (all types, including traction bonding) c) Track replacement of a short length of plain rail (for defect) but not re-railing, S&C, rail located within the tuned zone, or IRJ (except when referred here by TC03)
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1. Carry out a drop shunt and pick-up shunt test, [NR/SMS/PartB/Test/263](#) (EBI Track 400 Audio Frequency Track Circuit Test).
 - The values obtained shall not deviate from the previously recorded reading by more than +0.1Ω and be greater than or equal to the minimum value listed in [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values).
 - On the pick-up shunt, allow 2 seconds between each value to allow the slow-to-pick relay drive from the Rx to operate.
 - Station Area Frequency circuits should operate within 1 second.
 - The pick-up value should be 0.1Ω higher than the drop-shunt value.
2. Check the *ITH* (Threshold) using the display on the receiver and compare this with the record card. The obtained reading shall not deviate from the previously recorded reading.
3. Check the *INOW AV* using the display on the receiver and compare this with the record card. The obtained reading shall not deviate by more than +/-10% of the previously recorded reading.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
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Partial Testing of EBI Track 200 (TI21), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks		
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4. Check the *INOW QUAL* value using the display on the receiver. The obtained reading shall not be less than 100%.
5. Check the display of the Receiver for a steady “PICK” or “drop” indication.

If one of these indications cycles with “ERR” then refer to [NR/SMS/Appendix/10](#) (General information on EBI Track 400 Audio Frequency Track Circuit Equipment) to investigate and rectify the reason.
6. Confirm track circuit drops with minimum shunt value as per [NR/SMS/PartZ/Z03](#) (Train Detection – Reference Values) at all extremities and visually check all bonding (**SINGLE RAIL ONLY**).
7. Confirm track circuit drops with 0.2Ω shunt at the following positions within the track circuit (**STATION AREA FREQUENCY CIRCUITS ONLY**):
 - Transmitter Pole
 - Mid-Point
 - Receiver Pole
8. Check correspondence of the track circuit indication with the Signaller.
9. If available, check RCM traces have returned to their normal operating level as before the work.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC01		
Replace Plug in Track Circuit Equipment		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	All plug-in track circuit equipment, Track relays with detachable tops
Excludes:	All other types of Plug in equipment

GENERAL

During relay replacement, record the information required in accordance with NR/L2/SIG/11129, to enable the SM(S) to update the relay database.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement track circuit relay is not damaged (contact spring alignment, internal contamination, relay comb alignment, loose object) and is correct type.
3. Check track circuit receiver is isolated from the supply (ASTER, SF15 AND TI21 TRACK CIRCUITS ONLY).
4. Check any wiring between the bottom half of the detachable top and the relay terminals has safe insulation (DETACHABLE TOP RELAYS ONLY).
5. Test any wiring between the bottom half of the detachable top and the relay terminals are correct (DETACHABLE TOP RELAYS ONLY).
6. Check replacement unit is correctly sealed (RELAYS ONLY).
7. Check plugboard is free of contamination.

AFTER INSTALLATION WORK

8. Check spades are locked in plugboard.
9. Check replacement unit is correctly installed, and the retaining clip is in place.
10. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
- * 11. Carry out track circuit [NR/SMS/Test/251 to 263](#) (full test) and record the test measurements on the record card, together with the reason for the test.
12. Check, or arrange for, correct labelling of unit.

Where wiring between relay coil and rails is removed

- * 13. Test relay coil polarity is correct (DC TRACK CIRCUITS IN AC ELECTRIFIED AREAS ONLY).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC02		
Replace Track Circuit Equipment		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Track Circuit Equipment
Excludes:	All plug-in track circuit equipment, trackside track circuit units

GENERAL

During relay replacement, record the information required in accordance with NR/L2/SIG/11129, to enable the SM(S) to update the relay database.

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement unit is not damaged and is correct type and free of internal contamination.
3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Carry out [INSULATION TEST](#) replacement transformer (use 1000V insulation tester) (minimum 2M ohms terminals to case). (TRACK ISOLATING TRANSFORMER ONLY).
6. Check existing wiring is correctly labelled.
7. Check replacement unit is correctly sealed (RELAYS ONLY)
8. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

9. Check replacement unit is correctly installed (level).
10. Check wiring is replaced as labelled.
11. [WIRE COUNT](#) replacement unit to the wiring diagram.
12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
13. Check terminations are secure and suitably protected.
14. Check output circuits are disconnected before supply is restored. (TRANSFORMER-RECTIFIER / BATTERY CHARGER ONLY).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC02		
Replace Track Circuit Equipment		
Issue No: 09	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 15. Test input and output voltages and output polarity. (TRANSFORMER-RECTIFIER / BATTERY CHARGER ONLY).
- 16. Carry out EARTH TEST (DC) or EARTH TEST (AC) primary supply. (TRANSFORMER-RECTIFIER / BATTERY CHARGER ONLY).
- * 17. Test battery charging rate with output circuitry restored. (BATTERY CHARGERS ONLY).
 - It is advisable to return after a period of time, depending on the initial state of the cells, to retest the battery charger rate.
- * 18. Test output voltage with output circuits restored. (TRANSFORMER-RECTIFIER / BATTERY CHARGER ONLY).
- * 19. Check polarity/phase (stagger) on the rails and check this conforms to the bonding plan. (TRACK CIRCUITS EXCEPT REED AND JOINTLESS TYPES).
- * 20. Test the track circuit and record the test measurements on the record card, together with the reason for the test.
- 21. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC03		
Testing Track Circuits After IRJ Renewal		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Renewal of insulating rail joint installed in the same track bed. EBI Track 200 (T121), EBI Track 400, 50Hz AC, FS2600, Reed, HVI, DC Track Circuits only
Excludes:	Renewal of IRJ in other track circuit types

BEFORE INSTALLATION

1. When an IRJ is renewed, it shall be cleaned of any swarf and the effectiveness of the insulations tested at the time of installation.

AFTER INSTALLATION

2. Refer to [NR/SMTH/Part04/TC00](#) (Partial Testing of EBI Track 200 (T121), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks) and complete relevant test (**EXCLUDING DC TRACKS**).
3. Complete [NR/SMS/PartB/Test/251](#) (DC Track Circuit Test) – Full Test and Residual Voltage Test (**DC TRACKS ONLY**).
4. Check that IRJ clearances conform to any shown on the Bonding Plan and [NR/SMS/PartZ/Z03](#) (Train Detection - Reference Values) – Section 3 (IRJ CLEARANCES).

There shall not be a worsening of any existing clearances; existing non-conforming clearances shall be reported to your SM(S).

5. Check fittings and fixings for security (side leads, track circuit connections). Check that side leads and tail cables are clear of tamping zone.
6. Check cable side lead/tail cable is not susceptible to mechanical damage.
7. Check that rail clips are not shorting on the IRJ plate.
8. If available, check RCM current traces have returned to their normal level as before the renewal.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC04		
Replace a Trackside Track Tuning Unit		
Issue No: 08	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	All Aster, SF15, EBI Track 200 (TI21) and EBI Track 400 trackside units external to apparatus case
Excludes:	All other types of trackside unit

GENERAL

CAUTION: Disconnection of TX and RX tuning units of the same track circuit from the rails at the same time can result in Wrong Side Failure. Confirm adequate means of protecting safety of the line are in place while completing this work.

If both track tuning units are removed from the same track circuit (TC'2'), it is possible for TC'3' to be energised by TC'1' feed with a train on TC'3'.

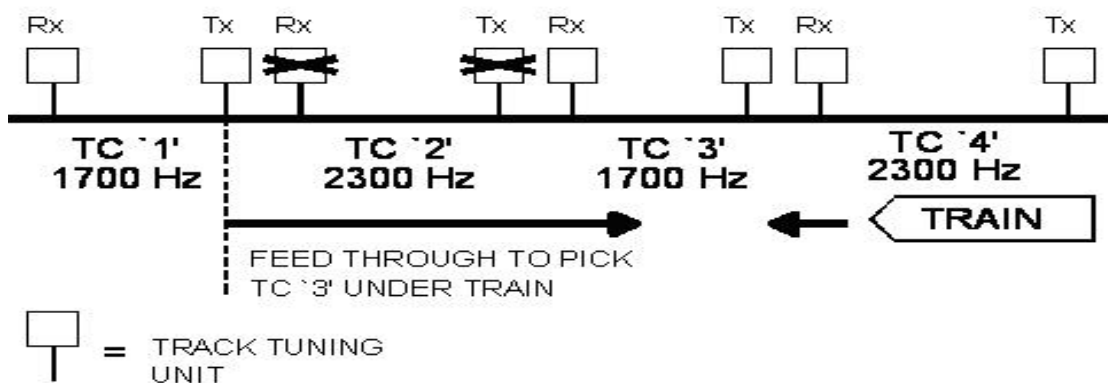


Figure 1 – Track Layout

BEFORE INSTALLATION WORK

- For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
- Check replacement unit is not damaged and is correct type.
- [WIRE COUNT](#) existing unit to the wiring diagram.
- Check existing wiring has safe insulation.
- Check existing wiring is correctly labelled.
- Check existing unit is isolated from the supply.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC04		
Replace a Trackside Track Tuning Unit		
Issue No: 08	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

AFTER INSTALLATION WORK

7. Check replacement unit is correctly installed.
8. Check wiring is replaced as labelled.
9. [WIRE COUNT](#) replacement unit to the wiring diagram.
10. Check T1 & T2 terminals are arranged as Figure 2 (**EBI TRACK 200 (TI21) TRACK CIRCUITS ONLY**).

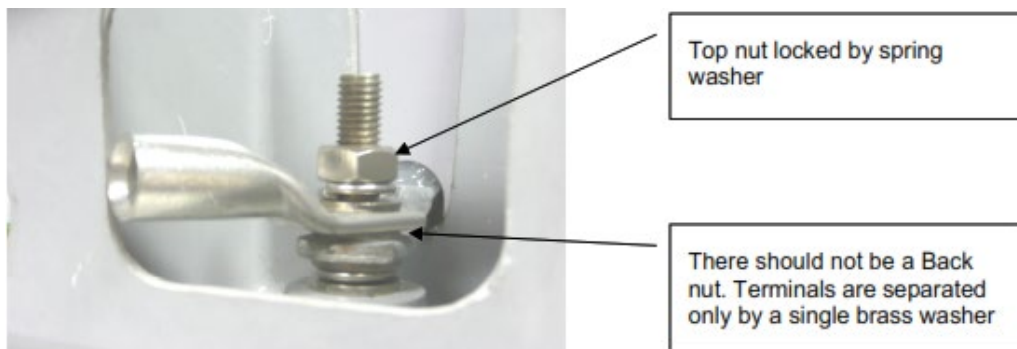


Figure 2 – T1 & T2 Correct Terminal Arrangement

11. Check that any sound reducing jacket previously fitted has been replaced (**EBI TRACK 200 (TI21) TRACK CIRCUITS ONLY**).
- * 12. Refer to [NR/SMS/PartB/Test/253](#) (EBI200) or [NR/SMS/PartB/Test/254](#) (SF15 / Aster U) or [NR/SMS/PartB/Test/263](#) (EBI400) and carry out Maintenance Test of the track and record the test measurements on the record card, together with the reason for the test.

Both associated track circuits (receivers) shall be tested if a centre feeding transmitter unit has been replaced.

13. If the replaced track circuit tuning unit is part of a Tuned Zone, refer to [NR/SMS/PartB/Test/253](#) (EBI200) or [NR/SMS/PartB/Test/254](#) (SF15 / Aster U) or [NR/SMS/PartB/Test/263](#) (EBI400) and carry out Maintenance Test for the companion tuning unit track circuit, record the test measurements on the record card, together with the reason for the test.
14. Where available, check RCM traces have returned to normal levels.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC05		
Replace a Track Circuit Interrupter		
Issue No: 07	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

BEFORE INSTALLATION WORK

1. Check replacement track circuit interrupter is not damaged and is correct type.
2. Wire count existing track circuit interrupter to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring is correctly labelled.
5. Check existing track circuit interrupter is isolated.

AFTER INSTALLATION WORK

6. Check replacement track circuit interrupter is correctly installed.
7. Check wiring is replaced as labelled.
8. Wire count replacement track circuit interrupter to the wiring diagram.
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Where duplicated leads are connected to the track interrupter, all connections should be checked against the bonding diagram before they are connected together.
- * 11. Check only the correct track circuit energises when the cable is reconnected to the track circuit interrupter.
- * 12. Test track circuit. Refer to track circuit full test [NRSMS/PartB/Index](#) (Index – Specific Tests -Tests 250 to 261) and record the test measurements on the record card, together with the reason for the test. (WHERE NO TRACK CIRCUIT INTERRUPTER RELAY PROVIDED).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC06		
Replace an Impedance Bond		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement unit is not damaged and is correct type.
3. [INSULATION TEST](#) replacement impedance bond (minimum 1M ohm at 1000V) auxiliary coil to case and auxiliary coil to traction coil. This shall be performed with no cables or tuning capacitors attached to the terminals. A short circuit shall also be applied across the running rails if the side leads have been installed.
4. [WIRE COUNT](#) existing unit to the wiring diagram.
5. Check existing wiring has safe insulation.
6. Check existing conductors are correctly labelled.
7. Check existing unit is isolated.

AFTER INSTALLATION WORK

8. Check replacement unit is correctly installed.
9. Check replacement unit, fittings and fixings for security (Side leads, busbars). Check that side leads are clear of tamping zone.
10. Check conductors are replaced as labelled.
11. [WIRE COUNT](#) replacement unit to the wiring diagram.
- * 12. Test all IRJs in the affected track circuit that are required to be electrically staggered with respect to adjacent track circuits.
- * 13. Test track circuit voltage and phase are correct.
14. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
15. Check terminations are secure and suitably protected.
16. Check cable is secured.
- * 17. Check for correct phase (stagger) of the track circuit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC06		
Replace an Impedance Bond		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- * 18. Test all affected track circuits, see [NR/SMS/PartB/Tests/251 to 263](#) and record the test measurements on the appropriate NR/SMS record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC07		
Replace a Track Loop		
Issue No: 06	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	Reed track loops
Excludes:	ATP track loops

BEFORE INSTALLATION WORK

1. Check replacement loop is not damaged and is correct type.
2. [WIRE COUNT](#) existing loop to the wiring diagrams.
3. Check replacement loop has safe insulation.
4. Check replacement loop is correctly labelled.
5. Check resistance of replacement loop is correct (14 to 19 ohms).
6. Check loop fuses are removed.

AFTER INSTALLATION WORK

7. Check loop is correctly installed.
8. Check security of replacement loop to the rails.
9. [INSULATION TEST](#) replacement loop (minimum 1M ohm).
- * 10. Test track circuit [Track circuit full test \(NR/SMS/Test/250 to 261\)](#) and record the test measurements on the record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC08		
Replace a Track Circuit Aid (TCAID) Unit		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	TCAID(N), TCAID(D)
Excludes:	All other types of Track Circuit Aid

GENERAL

Accuracy of connection is absolutely vital if a TCAID(D) is to function correctly and not suffer from false detections or failures to detect trains.

The TCAID (MC) is a non-direction selective TCAID mounted in a metal case. This type is no longer used. Any found shall be reported to your SM(S).

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type. MOD Level 0-2 (of the unit) are not for use in high voltage track circuit areas, MOD Level 3 can be used in all track circuit areas up to 160V.
2. Carry out a [WIRE COUNT](#) on the existing unit to wiring diagram (see track circuit equipment standards).
3. Check that existing wiring has safe insulation.
4. Check that existing wiring is correctly labelled.
5. Check existing unit is isolated from the supply by slipping links in the disconnection box.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check wiring is replaced as labelled.
8. WIRE COUNT the replacement unit to the wiring diagram (see track circuit equipment standards).
9. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.
10. Check terminations are secure and suitably protected.
- * 11. Test TCAID unit [NR/SMS/PartB/Test/043](#) (TCAID Test) and record the test measurements on the NR/SMS record card, together with the reason for the test.
- * 12. Test the track circuit [Track circuit full test \(NR/SMS/Test/251 to 263\)](#) and record the test measurements on the NR/SMS record card, together with the reason for the test.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC09		
Replace ZKL3000-RC		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

Includes:	Dual Inventive ZKL3000-RC T-COD
Excludes:	RS 3000 or any other remotely operated device or switch

GENERAL

- The installation siting form and access to the 'MTinfo 3000' Application is required for this test.

BEFORE INSTALLATION WORK

1. Check replacement ZKL3000-RC is not damaged, is the correct type and is calibrated.
2. Confirm the device is positioned correctly by corresponding it to the siting form.
3. **For Missing Equipment Only:** Check for evidence on site, the siting form, and records that the equipment was previously installed. If no evidence found stop and consult your SM(S).

AFTER INSTALLATION WORK

4. Check replacement ZKL3000-RC is correctly installed.
5. Check the power cable is routed correctly, clear of the tamping zone, and suitably protected where it passes under the running rail (installations with external/solar power supply only).
6. Switch the ZKL3000-RC to 'Operational' (Override Key horizontal in relation to the device).
7. Using the MTinfo 3000 App, find the correct ZKL3000-RC device by using its unique ID and check that 'Detection Quality' is at least 80%.

If detection quality is below 80% the test has failed, and the device shall be returned and quarantined.

8. Using the MTinfo 3000 App, correspond the displayed status of the device to each Override Key switch position in turn: 'Operational' → 'ON' → 'Operational' → 'OFF' → 'Operational'.

- **NOTE:** It is advised to pause for a few seconds at each key position to allow time for the status to be updated in the application.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TC09		
Replace ZKL3000-RC		
Issue No: 01	Issue Date: 02/12/2023	Compliance Date: 02/03/2024

9. With the ZKL3000-RC keyed to 'Operational' but not activated, test the affected Track Circuit.

For DC Tracks complete [NR/SMS/PartB/Test/251](#) (DC Track Circuit Tests) – Full Test and [NR/SMS/PartB/Test/251](#) (DC Track Circuit Tests) – Residual Voltage Test **(DC TRACKS ONLY)**.

For all other Track Circuit types, refer to [NR/SMTH/Part04/TC00](#) (Partial Testing of EBI Track 200 (T121), 50Hz AC, Reed, FS2600, HVI, EBI Track 400 Track Circuits for Defined Tasks) and complete relevant test **(EXCLUDING DC TRACKS)**.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TQ01		
Replace a Mechanical Treadle		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	Type 69 one and two arm mechanical treadles
Excludes:	Electronic treadles

GENERAL

Treadle arm guards shall not be fitted to mechanical treadles. If any are found on an existing installation inform your SM(S).

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement treadle is not damaged, the arm is free to move, and the correct gland is available.
3. Check the replacement treadle is the correct type either bi-directional or uni-directional (A-B or B-A) refer to [NR/SMS/PartC/TQ00](#) (Treadles – General) for more information.
4. Check the correct timing rod is fitted with the letter V or A stamped on the top. Note timing rods with the letter X stamped on them shall not be installed (refer to RIA 66 Section 6).
5. Check existing wiring has safe insulation.
6. [INSULATION TEST](#) replacement treadle (minimum 2M ohms terminals to case).
7. [WIRE COUNT](#) existing treadle to the wiring diagram (Non-Plug coupled version only).
8. Check existing wiring is correctly labelled.
9. Check existing treadle is isolated from the supply.
10. Check and examine the treadle bracket for damage and replace if required.
11. Remove and replace with new rubber washers.

AFTER INSTALLATION WORK

12. Check replacement treadle is correctly installed (no arm guard).
13. Check the Signalling diagrams for the correct configuration of the treadle.
14. Check wiring is replaced as labelled.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TQ01		
Replace a Mechanical Treadle		
Issue No: 07	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

15. [WIRE COUNT](#) replacement treadle to the wiring diagram. (Non-Plug coupled version only).
16. Check cable links, and red dome nuts or equivalent, are correctly replaced and secure.
17. Check terminations are secure and suitably protected.
18. Check wires and cables are clear of moving parts and are secured.
19. [EARTH TEST \(DC\)](#) or [EARTH TEST \(AC\)](#) circuits where designed to be earth free.
20. Check replacement treadle for the correct level of oil (refer to [NR/SMS/PartC/TQ00](#) (Treadles – General) for more information).
21. Carry out [NR/SMS/PartB/Test/177](#) (Treadle Gauging Test).
22. Carry out [NR/SMS/PartB/Test/044](#) (Treadle Timing and Adjustment Test).
23. Record the test measurements on the appropriate NR/SMS record card
24. Check with the Maintenance Test Plan for the item of equipment fed via this treadle and carry out steps marked with an asterisk “*“.
25. Arrange for follow up visit after 48 hours to retune the treadle arm function.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TQ03		
Replace a GETS or Siemens Electronic Wheel Sensor		
Issue No: 03	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	GETS WDD Wheel Sensor, Siemens WSR wheel sensor
Excludes:	Any other type or make of electronic wheel sensor

BEFORE INSTALLATION WORK

1. **For Missing Equipment Only:** Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S).
2. Check replacement unit is not damaged and is correct type.
3. [WIRE COUNT](#) existing unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring and connectors are correctly labelled.
6. Check existing unit is Isolated from the supply.

AFTER INSTALLATION WORK

7. Check replacement unit is correctly installed.
 - The pre moulded cable from the wheel sensor(s) shall NOT be shortened.
 - Check any restrictions that apply to the positioning of the wheel sensor equipment relative to other equipment (e.g. TPWS), rail joints and clearance points.
8. Check wiring and connectors are replaced as labelled.
9. [WIRE COUNT](#) replacement sensor to the wiring diagrams.
10. Remove any litter and metallic objects near to the replacement wheel sensor.
11. Carry out the full [NR/SMS/PartC/TQ13](#) (Siemens Wheel Sensor), starting with Service B to set the height correctly; Calibrate in accordance with Appendix A in the SMS (SIEMENS UNITS ONLY).
12. Carry out the full [NR/SMS/PartC/TQ14](#) (GET's Treadle Replacement Unit). Calibrate the WDD to BJ and ETU units in accordance with Appendix A in the SMS (units only).
13. If the sensor forms part of a track feed circuit, carry out steps marked with an "*" on the Maintenance Test Plan for the track feed equipment.
14. Observe that the wheel sensor is successfully restored to normal operation.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 4/TQ04		
Replace a GETs Electronic Treadle Unit (ETU)		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	GETs ETU
Excludes:	Any other Electronic Treadle Relay Unit

BEFORE INSTALLATION WORK

1. Check replacement unit is not damaged and is correct type.
2. WIRE COUNT existing unit to the wiring diagram.
3. Check existing wiring has safe insulation.
4. Check existing wiring and connectors are correctly labelled.
5. Check existing unit is isolated from the supply.

AFTER INSTALLATION WORK

6. Check replacement unit is correctly installed.
7. Check wiring and connectors are replaced as labelled.
8. WIRE COUNT replacement ETU to the wiring diagrams.
9. Calibrate and set up in accordance with [SMS TQ14](#) Appendix A
10. Check treadle time delay is correct for site specific application.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/TQ11		
Replace a Treadle Timing Screw		
Issue No: 02	Issue Date: 01/06/2019	Compliance Date: 07/09/2019

Includes:	Type 59 ,69 and Sagem Euro Treadle Timing Screws Arm
Excludes:	All other types of treadle

Liaison with the signaller is required and an appropriate possession may be required.

***** INDEPENDENCE EXEMPT *****

BEFORE INSTALLATION WORK

1. Check existing treadle is not damaged.
2. Check replacement timing screw is Not Damaged and is Correct Type.
3. Check existing timing screw, which is being replaced, is Not Damaged.

If the existing timing screw is broken and one part still remains in the treadle fluid reservoir, arrange for the treadle to be changed at the earliest opportunity.

AFTER INSTALLATION WORK

4. Check replacement timing screw is Correctly Installed.
5. Carry out [NR/SMS/PartB/Test/177](#) (Treadle Gauging Test).
6. Carry out [NR/SMS/PartB/Test/044](#) (Treadle Timing and Adjustment Test).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/TS10		
Style JE Trainstop (Complete) and or Trip Arm		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	JE Style Trainstop (Complete) and or Trip Arm
Excludes:	The Motor Assembly and any other type or make of Trainstop or sub-component.



Trainstops contain moving parts which can cause severe personal injury.

Further information can be found in [SMS Appendix 18](#) – General Information on the JE Style Trainstop.

BEFORE INSTALLATION WORK

- 1 Check the replacement Trainstop and or Trip Arm is Not Damaged and is the Correct Type.
- 2 Check cable core numbers to the wiring diagram.
- 3 Check existing wiring has Safe Insulation.
- 4 Check existing wiring is Correctly Labelled.
- 5 Isolate the Trainstop from the supply.

AFTER RE-INSTALLATION WORK

- 6 Reinstate power supply to the Trainstop.
- 7 Carry out [SMS/Test 028](#) –JE Style TrainStop Positioning Check.
- 8 Carry out [SMS/Test 027](#) –JE Style Trainstop Detection Test.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 04/TS11		
Style JE Trainstop - Motor Assembly		
Issue No: 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Style JE Trainstop Motor Assembly
Excludes:	Any other type or make of Trainstop or sub-component.



Trainstops contain moving parts which can cause severe personal injury.

Further information can be found in [SMS Appendix 18](#) – General Information on the Style JE Trainstop.

BEFORE INSTALLATION WORK

1. Check the replacement Trainstop motor assembly is Not Damaged and is the Correct Type.
2. Check cable core numbers to the wiring diagram.
3. Check existing wiring has Safe Insulation.
4. Check existing wiring is Correctly Labelled.
5. Isolate the Trainstop from the supply.

AFTER RE-INSTALLATION WORK

6. Reinstate power supply to the Trainstop.
7. Carry out [SMS/Test 027](#) – Style JE TrainStop Detection Test.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC01		
Replace WESTCAD-E MCR Modules (except CPU-4)		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Siemens WESTCAD-E MCR Housing Modules, CPU-2N, CPU-3, NET- 4 TM, EAM-TM1, SA-2, SA-2TM, SA-2TF, SCO-4MT, SCO-4ST, KCO-2F, MCO-2F, VID-4, SER-8, VID-2TF
Excludes:	CPU-4 modules, CPU Compact Flash Memory Module, MCR Housing & Signalling Network Components

***** NOT INDEPENDENCE EXEMPT IF CONFIGURATION IS REQUIRED *****

Modules can be replaced while the Modular Control Rack housing is powered up.

- Where the MCR is fitted with two PSUs, either PSU is capable of powering the housing and the other PSU or RFM can be replaced with the remaining PSU powered up and the housing operational.
- Where two CPUs are fitted, never remove one unless the other is fitted and fully operational, unless both have failed.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged, is the correct type, and has the correct Module Coding Pegs.
2. Record the serial number of the replacement unit.
3. On dual CPU systems check that the System Arbiter Module changeover switch is set to the system that does not contain the module being replaced.
4. Check that cables attached to the module to be replaced are correctly labelled.
5. If replacing a Power Supply module, turn off the power at the Rear Filter Module.
6. If replacing an RFM, switch off and disconnect the power cable.

AFTER INSTALLATION WORK

7. Check the replacement item is correctly installed and secure.
8. Check cables are securely terminated in the correct location.
9. If a PSU or RFM module has been replaced, restore the power to the RFM.
10. If a VID-4 has been replaced, re-boot the associated CPU-4 module.
11. If the replaced module requires configuration this shall be carried out in accordance with the instructions found in the latest version of the System Maintenance Manual.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC01		
Replace WESTCAD-E MCR Modules (except CPU-4)		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

12. On a dual CPU system, set the System Arbiter Module Changeover switch to 'Auto'.
13. Apply the system checks in [NR/SMS/PartC/IC16](#) (WESTCAD - MCR) to confirm the correct operation of the new module.
14. Place the old module into an anti-static bag.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC02		
Replace WESTCAD-E MCR CPU-4 Modules		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Siemens WESTCAD-E MCR Housing CPU-4 Modules, Compact Flash Memory Modules
Excludes:	All other WESTCAD-E Modules, MCR Housing and all Signalling Network Components

***** INDEPENDENCE EXEMPT *****

Modules can be replaced while the Modular Control Rack housing is powered up.

- Where two CPUs are fitted, never remove one unless the other is fitted and fully operational, unless both have failed.
- To replace only the Compact Flash Memory Module, it is first necessary to remove the CPU-4.

BEFORE INSTALLATION WORK

1. If replacing a CPU-4, check the replacement module is not damaged, is the correct type, and has the correct Module Coding Pegs.
2. If replacing the Compact Flash Memory Module, check it is labelled with the correct and Data Version and is for the correct SYS1 or SYS2.
3. Check the date on the label on the front of the CPU-4 module. If more than four years has elapsed since the date on the label, do not use that module.
4. Record the serial number of the replacement unit, except for Compact Flash Memory Modules.
5. On dual CPU systems check that the System Arbiter Module changeover switch is set to the system that does NOT contain the module being replaced.
6. Check that cables attached to the module to be replaced are correctly labelled.

DURING WORK

7. Eject the Compact Flash Memory Module from the module being replaced and insert it into the slot on the new CPU-4 module, checking it is correctly oriented before pressing fully into position.

AFTER INSTALLATION WORK

8. Check the replacement item is correctly installed and secure.
9. Check cables are securely terminated in the correct location.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC02		
Replace WESTCAD-E MCR CPU-4 Modules		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

10. Place the System Arbiter Module Changeover control switch to 'Auto'.
11. Apply the required system checks in [NR/SMS/PartC/IC16](#) (WESTCAD – MCR) to confirm correct working of the new module.
12. Place the old CPU-4 module into an anti-static bag, or protective case for Compact Flash Memory Module.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC03		
Replace WESTCAD-E MCR Housing		
Issue No: 02	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	Siemens WESTCAD-E MCR Housing
Excludes:	All other WESTCAD-E Modules and all Signalling Network Components

***** NOT INDEPENDENCE EXEMPT IF CONFIGURATION IS REQUIRED *****

This test plan requires the housing to be powered down.

BEFORE INSTALLATION WORK

1. Check the replacement housing is not damaged and is the correct type.
2. Check the replacement housing has the correct Housing Coding Pegs for each module slot at the front and rear.
3. Record the serial number of the replacement housing.
4. Check that cables attached to the housing modules are correctly labelled.
5. On dual CPU housings attach temporary labels identifying the SYS1 and SYS2 CPUs.
6. Turn off the power at the Rear Filter Modules.

AFTER INSTALLATION WORK

7. Check the replacement housing is correctly installed and secure.
8. Check all housing modules are correctly installed and secure.
9. On dual CPU housings verify the SYS1 and SYS2 CPUs are in the correct slots and remove temporary labelling.
10. Check cables are securely terminated in the correct location.
11. Restore the power to the housing PSUs.
12. If the replaced housing requires configuration this shall be carried out in accordance with the instructions found in the latest version of the System Maintenance Manual.
13. On a dual CPU system, check the System Arbiter Module Changeover switch is set to 'Auto'.
14. Apply the required system checks in [NR/SMS/PartC/IC16](#) (WESTCAD - MCR) to confirm the correct operation of the new housing.
15. Place the removed housing into protective packaging.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 4/ WC04		
Replace WESTCAD Level Crossing Touch Screen Device (Integral Processor)		
Issue No: 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	WESTCAD-LC-TSD (Level Crossing Touch Screen Device) with integral Processor.
Excludes:	WESTCAD-LC-TSD (Level Crossing Touch Screen Device) with external Processor, WESTRONIC 1024 TDM System and WESTRONIC Eight Bit TDM

***** INDEPENDENCE EXEMPT *****

The unit and associated power supply should be unplugged from its power source before replacement.

BEFORE INSTALLATION WORK

1. Check that the unit has not been accidentally switched off or the contrast and brightness controls altered.
 - The contrast and brightness controls are accessible after removal of a rear mounted protective cover (refer to the technical manual for additional information if required).
2. The field end Time Division Multiplexer (TDM) System status is displayed on the LC-TSD screen (Top middle section). Investigate further any TDM faults displayed before replacing the LC-TSD.
3. Record any reminders that have been applied to the LC-TSD.
4. Switch off power to the LC-TSD using its rear mounted ON/OFF rocker switch.
5. Record the part number, serial number and Mod state of the current and replacement unit. Investigate further any part number or Mod state differences.
6. Check all cables attached to the existing LC-TSD are correctly labelled related to their current connected position i.e. Mains Power, Network 1 and 2.

DURING INSTALLATION WORK

7. Eject the LC-TSD CompactFlash Memory Module from the existing unit (accessible after removal of a top mounted protective cover).
8. Check the CompactFlash Memory Module Data version matches that detailed in site drawings. Investigate further any version number differences.
9. Install this Compact Flash Memory Module into the replacement LC-TSD.
10. Replace the top access cover plate on both the existing and replacement units.
11. Disconnect all cables from the existing unit and remove it from the VESA Mounting bracket. Attach the replacement unit to the VESA Mounting bracket.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 4/ WC04		
Replace WESTCAD Level Crossing Touch Screen Device (Integral Processor)		
Issue No: 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

12. Reconnect all cables referring to cable labels and connector identification as necessary.

⋮ Refer to site drawings as required.

AFTER INSTALLATION WORK

13. Check the replacement item is correctly installed and secure.

14. Check cables are securely terminated in the correct location.

15. Switch on power to the LC-TSD using its rear mounted ON/OFF rocker switch.

16. Adjust screen brightness and contrast as necessary.

⋮ The contrast and brightness controls are accessible after removal of a rear mounted protective cover (refer to the technical manual for additional information if required).

17. Follow the user manual related to screen calibration and cleaning mode selection.

18. Liaise with the Signaller to safely test LC-TSD functionality, check the new unit is working correctly.

19. Verify that any applied reminders have been restored correctly or re-apply as necessary.

20. Identify the suspect unit with a suitable label and pack in a protective container.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 4/WC05		
Replace WESTCAD Level Crossing Touch Screen Device (External Processor)		
Issue No: 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

Includes:	Siemens WESTCAD-LC-TSD (Level Crossing Touch Screen Device) with an external processor
Excludes:	Siemens WESTCAD-LC-TSD (Level Crossing Touch Screen Device) with an integral processor, WESTRONIC 1024 TDM System and the WESTRONIC Eight Bit TDM

***** INDEPENDENCE EXEMPT *****

The unit and associated power supply should be unplugged from its power source before replacement.

BEFORE INSTALLATION WORK

1. Check that the unit has not been accidentally switched off or the contrast and brightness controls altered.
 - ⋮ The contrast and brightness controls are accessible after removal of a rear mounted protective cover (refer to the technical manual for additional information if required).
2. The supporting CPU-2N processor card is installed in a 3U housing located in the workstation desk section. Investigate further any CPU-2N processor card related faults before replacing the LC-TSD.
3. The field end Time Division Multiplexer (TDM) System status is displayed on the LC-TSD screen (Top middle section). Investigate further any TDM faults displayed before replacing the LC-TSD.
4. The supporting CPU-2N processor card is installed in a 3U housing located in the workstation desk section. Investigate further any CPU-2N processor card faults before replacing the LC-TSD (refer to the Westronic 1024 technical manual for additional information if required).
5. Record any reminders that have been applied to the LC-TSD.
6. Switch off power to the LC-TSD by unplugging the 12VDC power plug. Measure output voltage from the power adapter.
 - ⋮ Change the power adapter if its output voltage is not within the range 12VDC \pm 5%.
7. Record the part number, serial number and Mod state of the current and replacement unit. Investigate further any part number or Mod state differences.
8. Check all cables attached to the existing LC-TSD are correctly labelled related to their current connected position i.e. DC Power, VGA, USB, serial.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 4/WC05		
Replace WESTCAD Level Crossing Touch Screen Device (External Processor)		
Issue No: 01	Issue Date: 01/09/18	Compliance Date: 01/12/18

DURING INSTALLATION WORK

9. Disconnect all cables from the existing unit and remove it from the VESA Mounting bracket. Attach the replacement unit to the VESA Mounting bracket .
10. Reconnect all cables (excluding the power cable) referring to cable labels and connector identification as necessary.
 - ⋮ Refer to site drawings as required.

AFTER INSTALLATION WORK

11. Check the replacement item is correctly installed and secure.
12. Check cables are securely terminated in the correct location.
13. Switch on power to the LC-TSD by connecting the 12VDC power plug.
14. Adjust screen brightness and contrast as necessary.
 - ⋮ The contrast and brightness controls are accessible after removal of a rear mounted protective cover (refer to the technical manual for additional information if required).
15. Follow the user manual related to screen calibration and cleaning mode selection.
16. Liaise with the Signaller to safely test LC-TSD functionality, check the new unit is working correctly.
17. Verify that any applied reminders have been restored correctly or re-apply as necessary.
18. Identify the suspect unit with a suitable label and pack in a protective container.

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WC06		
Replace a WESTCAD – WESTLOCK Ancillary Components		
Issue No: 01	Issue Date: 07/03/2020	Compliance Date: 06/06/2020

Includes:	12v 300W PSU, 5V EMC PSU, 230V Power Filter Module, 2U 10 Way IEC Distribution Panel, Fan Tray and Mains Switch Box Panel.
Excludes:	Any ancillary equipment that requires configuration

***** INDEPENDENCE EXEMPT *****

Before handling any electronic equipment observe ESD precautions.

BEFORE INSTALLATION WORK

1. Check the replacement unit is of the correct type and not damaged.
2. Isolate the power supply.

AFTER INSTALLATION WORK

3. Check the unit is secure and correctly labelled.
4. Restore the power supply.
5. Verify using the Technicians Terminal or equivalent system that the replaced unit is working correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL01		
Replace a WESTLOCK Interlocking Module		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	MP, CM, SCM, DI and PM
Excludes:	Any other type or make of interlocking module

***** INDEPENDENCE EXEMPT *****

GENERAL

- WESTLOCK MPs receive configuration data from the associated MPs. This requires two MP modules to be operational.

NEVER UNLOCK MORE THAN ONE MP MODULE AT A TIME. Never unlock a healthy MP when another is indicating a fault. Do not remove both DIs, CMs or SCMs at the same time. Do not remove both PMs from a FEP at the same time.

Each SCM is connected to a single data link, therefore a faulty but still operational SCM shall not be replaced if the other data link has failed - repair the faulty data link first.

- If a DI module has a field (input) fault and a module fault, resolve the field fault first.

- If the standby PM in a FEP has an Ethernet fault, resolve the Ethernet fault before removing the active module or swapping between active and standby modules.

- WESTLOCK interlocking modules can be removed and replaced with the equipment powered up.

- Provided the other WESTLOCK interlocking modules are serviceable, replacing a single MP module or one of a pair of duplicated CM, SCM or PM modules, will not affect the operational capability of the equipment.

- If the equipment has two faults, one in an MP and one in another type of WESTLOCK interlocking module, replace the MP first. Wait until the Active indicator of the replaced module illuminates, then replace the remaining faulty module.

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. Check connectors for damaged pins. If damaged pins are present, do not insert the module.
3. Check that all CIP & TIF interlocking modules are locked (lock lever in three o'clock position and lock indicator off).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL01		
Replace a WESTLOCK Interlocking Module		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

4. Check that all FEP PMs are fully inserted (captive screws are tight) and powered (PMs are switched off if the module is not fully inserted and the lower handle locked in the up position by the red switch).

AFTER INSTALLATION WORK

5. Check that the replacement module is correctly installed.
 - If the replaced module is an MP or a CM, wait for the module to be programmed by the associated MP modules. This can take up to 10 minutes for an MP and two minutes for a CM.
 - If the replaced module is a PM, the new module will load its configuration from the PM backplane and start automatically. This will take approximately 35 seconds.
6. Check that for a replaced MP, the active indicator then starts flashing at the same rate as the associated MPs. This can take a further one to two minutes.
7. Check that for other replaced CIP & TIF module types, the active indicator is lit. This can take one to two minutes.
8. On the FEP, press the red Change Over button on the active PM to make the new module active. Check that the new module is error free.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL03		
Replace a WestLock Power Supply Unit (PSU)		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Traco TSL 120-124P
Excludes:	Any other type or make of PSU

GENERAL

- ⋮ WestLock PSUs may be removed and replaced with the cubicle powered up.
- ⋮ Two identical PSUs are fitted in each CIP, TIF and SIF cubicle.
- ⋮ A failed PSU may be replaced with the equipment still being powered by the second PSU.
- ⋮ Store unused WestLock PSUs in their original packing

BEFORE INSTALLATION WORK

1. Check the replacement power supply unit (PSU) is not damaged and is correct type.

REMOVAL OF EXISTING POWER SUPPLY UNIT

2. Positively identify the power supply unit to be removed. The front panel of the PSU has a DC on status indicator, lit when the output is present.

⋮ **NOTE:** *If one power supply unit is faulty, powering down the remaining PSU will remove the DC supply from the cubicle equipment.*

3. Positively identify the input and output power fuses for the PSU to be removed.

Remove the fuses and check on the PSU input terminals that the 110V AC is absent.

4. Note the positions of the input and output wires on the PSU terminals. Check the cables and wires are correctly labelled.

5. Remove the wires from the PSU terminals, insulating them using insulating tape.

6. Remove the PSU from the DIN rail and label it.

INSTALLATION OF REPLACEMENT POWER SUPPLY UNIT

7. Fit the serviceable replacement PSU onto the DIN rail, in the same position as the original PSU.

8. Connect the input and output wires in the positions noted at step 04. If in doubt, refer to the site records.

9. Re-fit the fuses removed at step 03.

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NR/SMTH/Part04/WL03		
Replace a WestLock Power Supply Unit (PSU)		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

10. On the front panel of the PSU, check the DC On status indicator is lit.
11. At the TW(L), check the fault list to confirm correct operation of the PSU.

AFTER INSTALLATION WORK

12. Check the replacement PSU is correctly installed.
13. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL04		
Replace a WestLock CSG or TW(L) Module		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	CSG/TW(L) housing cards, housing power supplies and KVM unit
Excludes:	Any other type or make of module

GENERAL

Only a WRSL supplied replacement module that has the correct part number shall be used.

Follow precautions and local instructions for the handling of electrostatic sensitive devices when replacing these modules.

• A failed PSU may be replaced with the remaining PSU powered up and the TW(L)/CSG operational.

• The housing is fitted with two PSUs. Either PSU is capable of powering the equipment.

• Store unused modules in their original packing

BEFORE INSTALLATION WORK

1. Check the replacement module is not damaged and is correct type.
2. Check the data cables connected to the card to be replaced, are correctly labelled.

REMOVAL OF EXISTING HOUSING CARDS

3. At the rear of the housing, set the input power switches for both PSUs to the off (O) position.
4. Disconnect any data cables from the card.
5. Undo the single securing screw at the left and right of the card.
6. Release the card from the backplane connector by pressing the left and right card handles apart.
7. Carefully slide the card from the housing and place it in an anti-static bag.

REMOVAL OF EXISTING HOUSING PSUS

8. At the rear of the housing, set the power input switch supplying the failed PSU to the off (O) position.
9. At the front of the housing, undo the screws securing the PSU to the housing and remove the PSU.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL04		
Replace a WestLock CSG or TW(L) Module		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

REMOVAL OF EXISTING KVM UNIT

10. Isolate power to the KVM by disconnecting the mains cable feeding the KVM power supply. Check cables are correctly labelled.
11. Disconnect the connectors from the rear of the KVM unit.
12. Unscrew the four screws securing the KVM to the rack and withdraw the complete KVM.

INSTALLATION OF REPLACEMENT HOUSING CARDS

13. Check the replacement card is correct type (the same type as the one removed and has been supplied by WRSL specifically for this type of installation).
14. Insert the card into its correct position and secure using the two front panel screws.
15. Reconnect the data cables as necessary. Check each cable is fitted into the correct connector. If in doubt, refer to the site records.
16. Set the input power switches to on (I). Wait for the processor to boot up.
17. If the replaced card was a Rear Transition Module (which contains the hard disk drive) load the operating program from the USB memory stick.

Insert a USB memory stick containing the correct version and application, then select the application (TW(L), CSG 'A' or CSG 'B') using the keyboard/VDU.

18. Check all indications are correct and the equipment works correctly.

INSTALLATION OF REPLACEMENT HOUSING PSU

19. Check the replacement PSU is correct type (the same type as that removed).
20. Check the PSU is the correct way up, then carefully align the PSU with the guides within the housing and slide the PSU fully into the housing.
21. Apply firm pressure on the PSU front panel to fully insert the PSU into the housing.
22. Secure the PSU with the front panel screws.
23. Restore the mains input supply and check the status indicator on the front panel illuminates.

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NR/SMTH/Part04/WL04		
Replace a WestLock CSG or TW(L) Module		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

INSTALLATION OF REPLACEMENT KVM UNIT

24. Check that the replacement KVM unit is correct type (the same type as the one removed).
25. Slide the KVM housing into the rack and secure with the four screws.
26. Reconnect the cables at the rear of the KVM housing.
27. Restore power to the KVM.
28. Test for correct operation.

AFTER INSTALLATION WORK

29. Check the replacement item is correctly installed.
30. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL05		
Replace a WESTLOCK CIP or TIF Baseplate		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	MP, CM, DI and SCM Baseplates
Excludes:	Any other type or make of Baseplate

GENERAL

Obtain permission from SFI Level 2 before undertaking this task.

The affected CIP or TIF sub-system shall be powered down during this procedure. In Dual Cubicles, power shall only be removed from the required sub-system.

Baseplates are inherently very reliable. Before deciding to replace a baseplate, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

BEFORE INSTALLATION WORK

1. Check the replacement baseplate is not damaged and is correct type.
2. [WIRE COUNT](#) any cables and wires connected to the baseplate.
3. Check any cables and wires are correctly labelled.
4. Make a hard copy of the applied Technician's controls and verify this against the locally recorded list.
5. For older WESTLOCK cubicles containing one WESTLOCK sub-system (CIP or TF), power down the WESTLOCK cubicle by setting the input power switch on the two power distribution panels in the lower part of the cubicle to the off (O) position.

For Dual WESTLOCK Cubicles, power down the affected sub-system by opening the relevant fuse carriers on the power distribution rail.

AFTER INSTALLATION WORK

6. Check the replacement Baseplate is correctly installed.
7. Check wiring is replaced as labelled.
8. [WIRE COUNT](#) each cable fitted.
9. Set the input power switches to on (I) or close the fuse carriers as required.
10. If the replaced baseplate was other than an MP baseplate, wait for the interlocking to boot up. Check that on the MP modules the Active indicator is flashing and that on the other module types the Active indicator is lit.
11. If the replaced baseplate was an MP baseplate, arrange for the interlocking to be reprogrammed by a competent person.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL05		
Replace a WESTLOCK CIP or TIF Baseplate		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

12. If the replaced baseplate was a CIP MP baseplate, at the TW/TF re-apply any previously applied Technician's Controls; issue a Technician's Request 'Enable CIP', using the method described in the WESTLOCK Technician's Workstation manual or WESTLOCK Technician's Facility Manual.
13. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL06		
Replace a WESTLOCK FEP Housing Backplane		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	FEP Housing Backplane and PM Backplane / 40HP Housing Backplane B47000/353AA / 40HP Housing Backplane Shield B53454/1
Excludes:	Any other type or make of Housing, Backplane or Shield

GENERAL

The affected FEP sub-system shall be powered down during this procedure.

Only one FEP Housing Backplane shall be replaced at a time within the locality to the need to remove the Addressing Plug from the Housing.

Backplanes are inherently very reliable. Before deciding to replace a backplane, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

The Housing Backplane fits to the top half of the FEP housing and does not contain any configuration data. It is therefore not necessary to re-programme the FEP after this procedure, provided the PM backplanes fitted to the lower half of the housing are not disturbed.

BEFORE INSTALLATION WORK

1. Check the replacement backplane is not damaged and is correct type.
2. Check the cables connected to the FEP Housing to be replaced are correctly labelled.
3. [WIRE COUNT](#) all connections to be removed.
4. Power down the FEP Housing by opening the relevant fuse carriers on the power distribution rail. Note that there are two power supplies to each Housing.

AFTER INSTALLATION WORK

5. Check replacement unit is correctly installed.
6. Check wiring / cables are installed as labelled.
7. [WIRE COUNT](#) each cable fitted to the correct connector.
8. Power up the FEP Housing by closing the fuse carriers on the power distribution rail. Note that there are two power supplies to each switch.
9. Wait for the PMs to boot up. If both PMs are available, the Primary PM in Slot 1 becomes active. Check that the active PM has a green flashing Active indication and that both PMs indicate no fault, Standby OK and Ethernet activity.
10. Check or arrange for correct labelling of unit.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL06		
Replace a WESTLOCK FEP Housing Backplane		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

11. Check new red seals covering the retaining screws on the Addressing Plug are installed.
12. Replace any front panel removed.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL07		
Replace a Siemens Zone Controller Module		
Issue No: 05	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Westrace IO Modules, PM, RSA, MAU and IO Module Surge Cassettes. (including PIM50, ROM50, SOM24, SOM110, CIM and LOM110)
Excludes:	All any other type or make of Trackside module

INDEPENDENCE EXEMPT

GENERAL

- | Do not remove both RSAs from a Zone Controller at the same time.
- ⋮ Each RSA is connected to a single Ethernet and SMB data link.
- | A faulty but still operational RSA shall not be replaced if the other Ethernet or SMB link has failed - repair the faulty link first.
- | Do not remove both MAUs from a Zone Controller at the same time.
- | Each MAU is connected to a single SMB data link. Therefore, a faulty but still operational MAU shall not be replaced if the other SMB link has failed - repair the faulty link first.
- ⋮ If an I/O Module has a field (input) fault and a module fault, resolve the field fault first.
- ⋮ WESTLOCK Trackside modules may be removed without impacting other modules in the system. They should be removed and inserted with the signalling supply isolated. The logic supply can remain powered up.
- ⋮ Provided the other RSA/PM is serviceable, replacing a single RSA/PM module does not affect the operational capability of the equipment
- ⋮ Provided the other MAU is serviceable, replacing a single MAU module does not affect the operational capability of the equipment.
- ⋮ Changing a Surge Cassette does not affect the operational capability of the equipment.
- ⋮ MAUs, RSAs and PMs are not necessarily all provided.

BEFORE INSTALLATION WORK

- | 1. Check the replacement module is not damaged and is correct type.
- | 2. Check connectors for damaged pins. If damaged pins are present, do not insert the module.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL07		
Replace a Siemens Zone Controller Module		
Issue No: 05	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

3. If the module to be replaced is a MAU, check the Optical Fibre cables are correctly labelled.
4. Check that all modules are fully inserted, and all RSA, PM, MAU and IO Modules are powered.

NOTE: Zone Controller modules are switched off if the module is not fully inserted with the lower handle locked and the red switch has popped up).

AFTER INSTALLATION WORK

5. Check that the replacement module is correctly installed.

If the replaced module is an RSA, the new module loads its configuration from the backplane and starts automatically.

This takes approximately 35 seconds.

If the replaced module is a SOM110 and LOM110 module, after the module starts, the FEP downloads the configuration data to the new module.

This takes approximately 5 seconds.

6. If the module being replaced is a SOM110 or LOM110, check the module operates correctly.

Operates correctly means:

- a) Observing the correct indications on the module itself.
- b) Confirming correct operation of one function operated by the module.

For example, a signal's aspect can be changed, points operated normal and reverse, etc.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL08		
Replace a Siemens Zone Controller Housing Backplane		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Housing Backplane WESTRACE Mk2 80HP Backplane B47000/351AA WESTRACE Mk2 80HP shield backplane B53433/1
Excludes:	Any other type or make of Housing, Backplane or Shield

GENERAL

- | **The affected Housing shall be powered down during this procedure.**
- | **Only one Housing Backplane shall be replaced at a time.**
- | The Housing Backplane fits to the top 3U section of the housing and connects 24V DC power and SMB to the modules.
- | The Housing Backplane does not contain any configuration data. It is therefore not necessary to re-programme the RSA after this procedure provided the PM backplane is not disturbed.
- | Backplanes are inherently very reliable. Before deciding to replace a backplane, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

BEFORE INSTALLATION WORK

- | 1. Check the replacement backplane is not damaged and is correct type.
- | 2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.
- | 3. [WIRE COUNT](#) all cables and connectors.
- | 4. Power down the housing using the circuit breakers on the front of the 24V DC Power Supply Module.

AFTER INSTALLATION WORK

- | 5. Check replacement unit is correctly installed.
- | 6. Check any wiring is replaced as labelled.
- | 7. [WIRE COUNT](#) all cables and connectors.
- | 8. Power up the housing using the circuit breakers on the front of the 24V DC Power Supply Module.
- | 9. Check that each module in the housing has a green flashing active indication and an RSA indicates Ethernet activity. Check that the power indication on the modules is green (both supplies are operating.)

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL08		
Replace a Siemens Zone Controller Housing Backplane		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

10. Check new red seals covering the retaining screws on the Addressing Plug are installed.
11. Replace the front panel in front of the Addressing Plug.
12. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL09		
Replace a Siemens Zone Controller PM Backplane		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller PM Backplane WESTRACE Mk2 PM Backplane B47000/299AA WESTRACE Mk2 PM Backplane Shield B52217/1
Excludes:	Any other type or make of Backplane or Shield

GENERAL

Before undertaking this task, permission shall be sought from SFI level 2.

The Housing Backplane fits to the middle section of the housing behind an RSA and connects the Ethernet to the RSA.

The PM backplane used by the RSA contains the site-specific data for the RSA. It is therefore necessary to re-programme the RSA module after changing a PM backplane.

The RSA plugged into the backplane shall be powered down during this procedure, it is not necessary to power down the housing.

Backplanes are inherently very reliable. Before deciding to replace a backplane, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

BEFORE INSTALLATION WORK

1. Check the replacement backplane is not damaged and is correct type.
2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.
3. [WIRE COUNT](#) all cables and connectors.

AFTER INSTALLATION WORK

4. Check replacement unit is correctly installed.
5. Check wiring is replaced as labelled.
6. [WIRE COUNT](#) all cables and connectors.
7. Arrange for the RSA to be reprogrammed. Refer to the WESTLOCK FLM for details of the procedure to programme an RSA.
8. Wait for the RSA to boot up. Check that each module in the housing has a green flashing active indication and that the RSA indicates Ethernet activity.
9. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL10		
Replace a Siemens Zone Controller Surge Interface Board		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Surge Interface Backplane, SOM110 Surge Interface board B47000/346AA and SOM110 Interface Board Cover B53401/1
Excludes:	Any other type or make of Interface Board or Cover

GENERAL

• The Surge Interface Board connects the bottom half of the IOM to the Surge Cassette and fits to the lower 6U section of the housing.

• Interface Boards are inherently very reliable. Before deciding to replace an Interface Board, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

BEFORE INSTALLATION WORK

1. Check the replacement interface board is not damaged and is correct type.
2. Check the cables connected to the Zone Controller Surge Interface Board to be replaced are correctly labelled.

AFTER INSTALLATION WORK

3. Check replacement unit is correctly installed.
4. Check cables removed are replaced as labelled.
5. Power up the SOM110 by raising the lower handle until the red button clicks into place. Wait for the module to boot up. Check that the module is operating normally.
6. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL11		
Replace a Siemens Zone Controller MAU Backplane		
Issue No: 02	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Housing Backplane, WESTRACE Mk2 Dual MAU Backplane B47000/354AA and WESTRACE Mk2 Dual MAU Backplane Shield B53461/1
Excludes:	Any other type or make of Housing, Backplane or Shield

GENERAL

• The MAU Backplane fits to the bottom 3U section of the housing and connects 24V DC power and SMB to two MAU modules. The MAU Backplane does not contain any configuration data.

• Backplanes are inherently very reliable. Before deciding to replace a backplane, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

BEFORE INSTALLATION WORK

1. Check the replacement backplane is not damaged and is correct type.
2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.

AFTER INSTALLATION WORK

3. Check that each module in the housing has two green flashing SMB indications. Check that the power indication on the MAU is green (both supplies are operating).
4. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL12		
Replace a WESTLOCK FEP PM Backplane		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	FEP Housing Backplane and PM Backplane WESTRACE Mk2 PM Backplane B47000/299AA WESTRACE Mk2 PM Backplane Shield B52217/1
Excludes:	Any other type or make of Housing, Backplane or Shield

GENERAL

Before undertaking this task, permission shall be sought from SFI level 2.

The affected FEP sub-system shall be powered down during this procedure.

Backplanes are inherently very reliable. Before deciding to replace a backplane, eliminate all other possible causes of the fault e.g., fuses and faulty cables.

The PM backplane fits to the lower half of the FEP Housing behind each Processor Module and contains the site-specific data for the FEP. It is therefore necessary to re-programme the PM after changing a PM backplane.

BEFORE INSTALLATION WORK

1. Check the replacement backplane is not damaged and is correct type.
2. Check the cables connected to the FEP Housing to be replaced are correctly labelled.
3. [WIRE COUNT](#) all cables and connectors.

AFTER INSTALLATION WORK

4. Check replacement unit is correctly installed.
5. Check wiring and cables are replaced as labelled.
6. [WIRE COUNT](#) all cables and connectors.
7. Arrange for the PM to be reprogrammed by a competent person. Follow the Site PC User Instructions for downloading the FEP data in the WESTLOCK First Line Maintenance manual.
8. Wait for the PMs to boot up. If both PMs are available, the Primary PM in Slot 1 will become active. Check that the active PM has a green flashing active indication and that both PMs indicate no fault, Standby OK and Ethernet activity.
9. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL13		
Replace a Siemens FEP/ZC Addressing Plug		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens FEP/ZC Addressing Plug C52928/1
Excludes:	Any other type or make of Housing or Addressing Plug

GENERAL

Before undertaking this task, permission shall be sought from SFI level 2.

Only one Addressing Plug shall be removed at any one time.

The affected housing shall be powered down during this procedure.

The Addressing Plug identifies the housing to the interlocking. Check the housing and installation addresses are set in accordance with the site-specific documentation. An incorrect address might lead to a wrong side failure.

The Addressing Plug is fitted inside the ZC housing behind the blanking panel.

Addressing Plugs are inherently very reliable. Before deciding to replace an Addressing Plug, eliminate all other possible causes of the fault.

BEFORE INSTALLATION WORK

1. Check the replacement Addressing Plug is not damaged and is correct type.
2. Check the site-specific documentation is available and defines the correct setting for the Addressing Plug.

AFTER INSTALLATION WORK

3. Check that each LOM110 or SOM110 in the housing has a green flashing active indication. Check that both SMB activity indications are flashing on all LOM110 or SOM110 in all housings in the Zone Controller.
4. Perform a correspondence check on each IOM in housing.
5. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL14		
Replace a Siemens Zone Controller Housing		
Issue No: 02	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Equipment Housing C52927/1
Excludes:	Any other type or make of Housing

GENERAL

The Zone Controller Equipment Housing is supplied without backplanes or Surge Interface boards fitted. If spare backplanes and Surge Interface Boards are fitted to the housing before going on site, use a spare module of the correct type into the appropriate slot in the housing when fitting each backplane to check the backplane aligns with the module support rails.

The Addressing Plug from the existing housing should be used in the new housing unless it is known to be damaged or faulty.

BEFORE INSTALLATION WORK

1. Check the replacement Zone Controller Equipment Housing is not damaged and is the correct type.
2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.

AFTER INSTALLATION WORK

3. Power up each RSA, MAU and LOM110 or SOM110 module by raising the lower handle until the red button clicks into place. Wait for the module to boot up. Check that the module is operating normally.
4. Check that each module in the housing has a green flashing active indication. Check that both SMB activity indications are flashing on all I/O modules in all housings in the Zone Controller.
5. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL15		
Replace a Siemens Zone Controller Power Distribution Housing		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Power Distribution Housings, Power Distribution Housing with one EMI filter E26440/1, Power Distribution Housing with two EMI filters E26440/2 and Power Distribution Housing with three EMI filters E26440/3
Excludes:	Any other type or make of Housing

⋮ The Power Distribution Housing contains two 24VDC Power Cassettes (C52986/1) and between one and three 110VAC Power Cassettes (C52986/2). See [NR/SMTH/Part04/WL14](#) (Replace a Siemens Zone Controller Housing).

BEFORE INSTALLATION WORK

1. Check the replacement Power Distribution Housing is not damaged and is the correct type.
2. Turn off ALL circuit breakers on the front of the Power Cassettes.
3. Turn off the upstream circuit breakers appropriate to the Power Cassettes (lockout procedures apply).

AFTER INSTALLATION WORK

4. Verify each down-stream circuit is functioning correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL16		
Replace a Siemens FEP/ZC Power Supply Modules		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens FEP/ZC Power Supply Modules, 24VDC Power Supply Module C52986/1 and 110VAC Signalling Supply Module C52986/2
Excludes:	All other type or make of Power Supply

GENERAL

The affected Housing and Units shall be powered down during this procedure otherwise lethal voltages could be present.

During normal operation, the Power Supply Modules should not get hot, however, they may be warm to the touch.

BEFORE INSTALLATION WORK

1. Check the replacement Power Supply Module is not damaged and is the correct type.
2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.
3. Turn off all circuit breakers on the front of the Power Supply Module.
4. Turn off the upstream circuit breaker relevant to the Power Supply Module (lockout procedures apply).

AFTER INSTALLATION WORK

5. Check replacement unit is correctly installed.
6. Check cables are replaced as labelled.
7. Turn on the upstream circuit breaker.
8. Turn on each circuit breaker on the front panel of the Power Supply Module.
9. If fitting a 24VDC Power Supply Module part number C52986/1, verify the green "DC Ok" status indicator is illuminated.
10. Check the corresponding effected equipment is operating correctly by observing the indication LED's.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL17		
Replace a Siemens Zone Controller Power Buffer Unit		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller Power Buffer Units, 12kWs Power Buffer Unit C52986/3 and 6kWs Power Buffer Unit C52986/4
Excludes:	All other type or make of Power Buffer Unit

GENERAL

The Power Buffer Units contain large super-capacitors to provide the buffer function. These units can retain charge, even when disconnected (like a battery). The connections in the plug coupler are shielded to prevent accidental contact. However, direct insertion of probes/tools could result in injury.

These units connect to the 24VDC Power Supply module (part number C52986/1). They are provided to back up the logic supply to the Zone Controller modules, so equipment is not affected by short power interruptions of up to 30 seconds.

BEFORE INSTALLATION WORK

1. Check the replacement Power Buffer Unit is not damaged and is the correct type.
2. Check the cables connected to the Power Buffer Unit to be replaced are correctly labelled.
3. Turn off all circuit breakers on the front of the associated power supply module.
4. Turn off the upstream circuit breaker relevant to the power supply module (lockout procedures apply).

AFTER INSTALLATION WORK

5. Check replacement unit is correctly installed.
6. Check cables are replaced as labelled.
7. Turn on the upstream circuit breaker.
8. Turn on the circuit breakers on the front of the power supply module.
9. Check the status indicator on the front of the buffer unit. The indicator shows "charging" or "ready".

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL18		
Replace a Siemens Zone Controller TPWS Circuit Breaker		
Issue No: 04	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller TPWS Circuit Breakers MCB Single Pole Mounting Plate C53013/1 MCB Double Pole Mounting Plate C53013/2
Excludes:	Any other type or make of Circuit Breaker or Mounting Plate

The connections to the circuit breakers are shrouded. Test these circuits to check they are not live before commencing maintenance activities. Lethal voltages are present.

Single pole versions have two wires and two retaining fixings and are attached to mounting plate P/N C53013/1.

Double pole versions have four wires and four retaining fixings and are attached to mounting plate P/N C53013/2.

BEFORE INSTALLATION WORK

1. Check the replacement TPWS Circuit breaker is not damaged and is the correct type/rating.
2. [WIRE COUNT](#) existing MCB to the wiring diagram.
3. Check the cables connected to the equipment to be replaced are correctly labelled.
4. Turn off the upstream circuit breaker associated with the faulty TPWS circuit breaker. If other circuit breakers are present on the plate, isolate these circuit breakers as well (lockout procedures apply).

AFTER INSTALLATION WORK

5. Check replacement MCB is correctly installed.
6. Check wiring has been replaced as labelled.
7. [WIRE COUNT](#) the new MCB to the wiring diagram.
8. Turn on the upstream circuit breakers associated with circuit breaker plate.
9. Turn on the circuit breakers on the plate.
10. Carry out [NR/SMS/PartB/Test/230](#) (Train Protection and Warning System (TPWS) Tests).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL19		
Replace a Siemens Zone Controller I/O Cable		
Issue No: 02	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Zone Controller I/O Connection Cable and SOM110 I/O Connection Cable C53038/1
Excludes:	Any other type or make of Connection Cable

GENERAL

- Zone Controller I/O Connection Cables are supplied as a single Line Replaceable Unit. The Connector is factory tested after assembly and should not be dismantled.
- If the cable is faulty the whole cable assembly should be replaced.

BEFORE INSTALLATION WORK

1. Check the replacement I/O Connection Cable not damaged and is correct type.
2. Check the cables connected to the Zone Controller equipment to be replaced are correctly labelled.

AFTER INSTALLATION WORK

3. Power up the IOM by raising the lower handle until the red button clicks into place. Wait for the module to boot up. Check that the module is operating normally.
4. Correspond the connections from the affected IOM to the Signaller.
5. Check or arrange for correct labelling of the unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL20		
Replace a Siemens Ethernet Switch Power Supply		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Ethernet Switch Power Supply Unit P/N 615990339
Excludes:	Any other type or make of Power Supply

GENERAL

The Power Supply is free wired to the Buffer Unit. The Buffer Unit is provided to back up the power supply to the Ethernet Switch, so it is not affected by a short power interruption of up to 30 seconds.

BEFORE INSTALLATION WORK

1. Check the replacement Power Supply Unit is not damaged and is the correct type.
2. Check the cables connected to the Power Supply Unit to be replaced are correctly labelled.
3. [WIRE COUNT](#) the wires connecting the Power Supply Unit to the 110V AC supply and to the Buffer unit.
4. Turn off the upstream circuit breaker relevant to the power supply (lockout procedures apply).

AFTER INSTALLATION WORK

5. Check the replacement Power Supply Unit is secure and correctly fitted.
6. Check wiring is replaced as labelled.
7. [WIRE COUNT](#) the wires connecting the Power Supply Unit to the 110V AC supply and to the Buffer unit.
8. Turn on the upstream circuit breaker.
9. Check the status indicator on the front of the buffer unit. The indicator shows "charging" or "ready".
10. Verify power supply to the Ethernet Switch is functioning correctly.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL21		
Replace a Siemens Ethernet Switch Power Buffer Unit		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens Ethernet Switch Power Buffer Unit P/N 6153806161
Excludes:	Any other type of Power Buffer Unit

GENERAL

The Power Buffer Units contain large super-capacitors to provide the buffer function. These units can retain charge, even when disconnected (like a battery). The connections are shielded to prevent accidental contact. However, direct insertion of probes/tools could result in injury. Take care when disconnecting the output wires so not to short the wires.

The Buffer Unit is free wired to the 24VDC Ethernet Switch Power Supply Unit P/N 615990339. It is provided to back up the power supply to the Ethernet Switch, so it is not affected by a short power interruption of up to 30 seconds.

BEFORE INSTALLATION WORK

1. Check the replacement Power Buffer Unit is not damaged and is the correct type.
2. Check the cable connecting the Power Buffer Unit to be replaced to the Power Supply is correctly labelled.
3. [WIRE COUNT](#) the wires connecting the Buffer Unit to the Power Supply Unit and to the Ethernet Switch.
4. Turn off the upstream circuit breaker relevant to the power supply (lockout procedures apply).

AFTER INSTALLATION WORK

5. Check the Buffer Unit is secure and correctly fitted.
6. Check wiring is replaced as labelled.
7. [WIRE COUNT](#) the wires connecting the Buffer Unit to the Power Supply Unit and to the Ethernet Switch.
8. Turn on the upstream circuit breaker.
9. Check the status indicator on the front of the buffer unit. The indicator shows "charging" or "ready".

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL22		
Replace a Siemens AMI-SRA Modular Technicians Facility PC		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens: AMI-SRA Modular Technicians Facility PC (LOCAL)
Excludes:	All other types of Technician Facility / Technicians Terminal

GENERAL

- | Liaise with the Signaller before carrying out this work.
- | Relevant electrostatic precautions shall be taken when handling the evaluation board and / or the board rack.

IDENTIFICATION

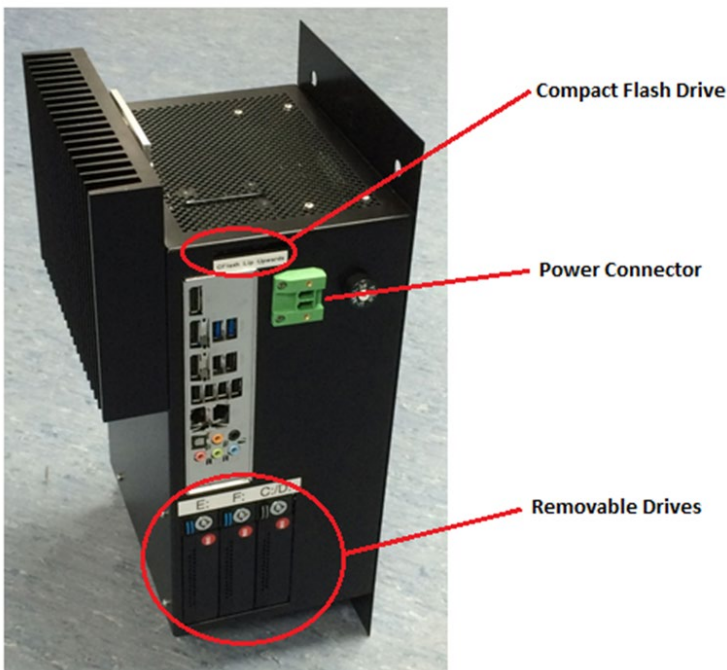


Figure 1 - Siemens AMI-SRA Modular Technicians Facility PC

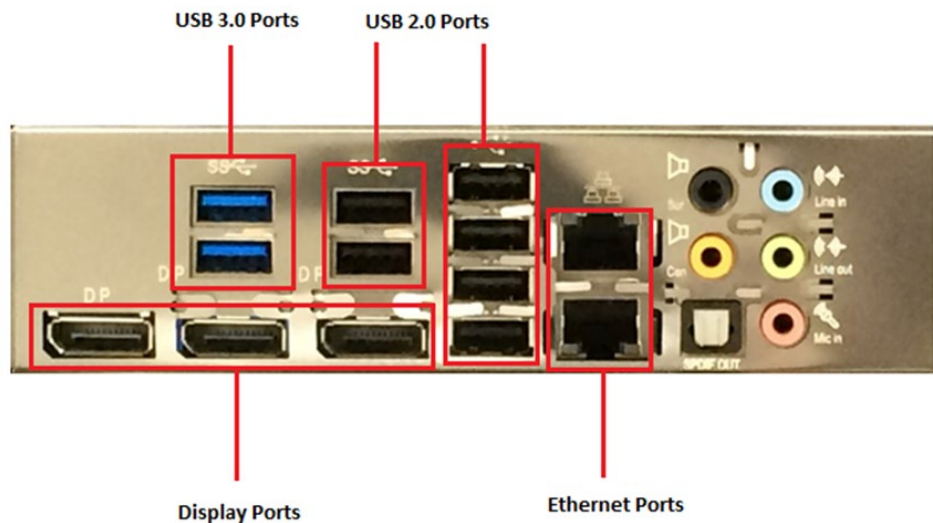


Figure 2 - Ports

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL22		
Replace a Siemens AMI-SRA Modular Technicians Facility PC		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

BEFORE INSTALLATION WORK

1. Check that the replaced PC is of the correct type and not damaged. Include a check of the Mod state to confirm it is the same or later.
2. Record the serial number of the replacement unit.
3. Note the positions of all cables and which ports they are connected to.
4. Check the cables and wires are correctly labelled.

AFTER INSTALLATION WORK

5. Check the replacement PC is correctly installed.
6. Check wiring is replaced as labelled.
7. Perform the required test to confirm that the system is operational.
8. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL23		
Replace a Siemens BlueChip C110 Technicians Facility PC		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

Includes:	Siemens: BlueChip C110 Technicians Facility PC
Excludes:	All other types of Technician Facility / Technicians Terminal

GENERAL

- | Liaise with the Signaller before carrying out this work.
- | Relevant electrostatic precautions shall be taken when handling the evaluation board and / or the board rack.
- | Lithium batteries shall be disposed of in line with company policy. If you are unsure, ask your SM(S).

IDENTIFICATION

Note:
 Filter located on back of hinged access door.
 Fan assembly accessible when access door open.
 Lithium Battery located behind fan assembly.

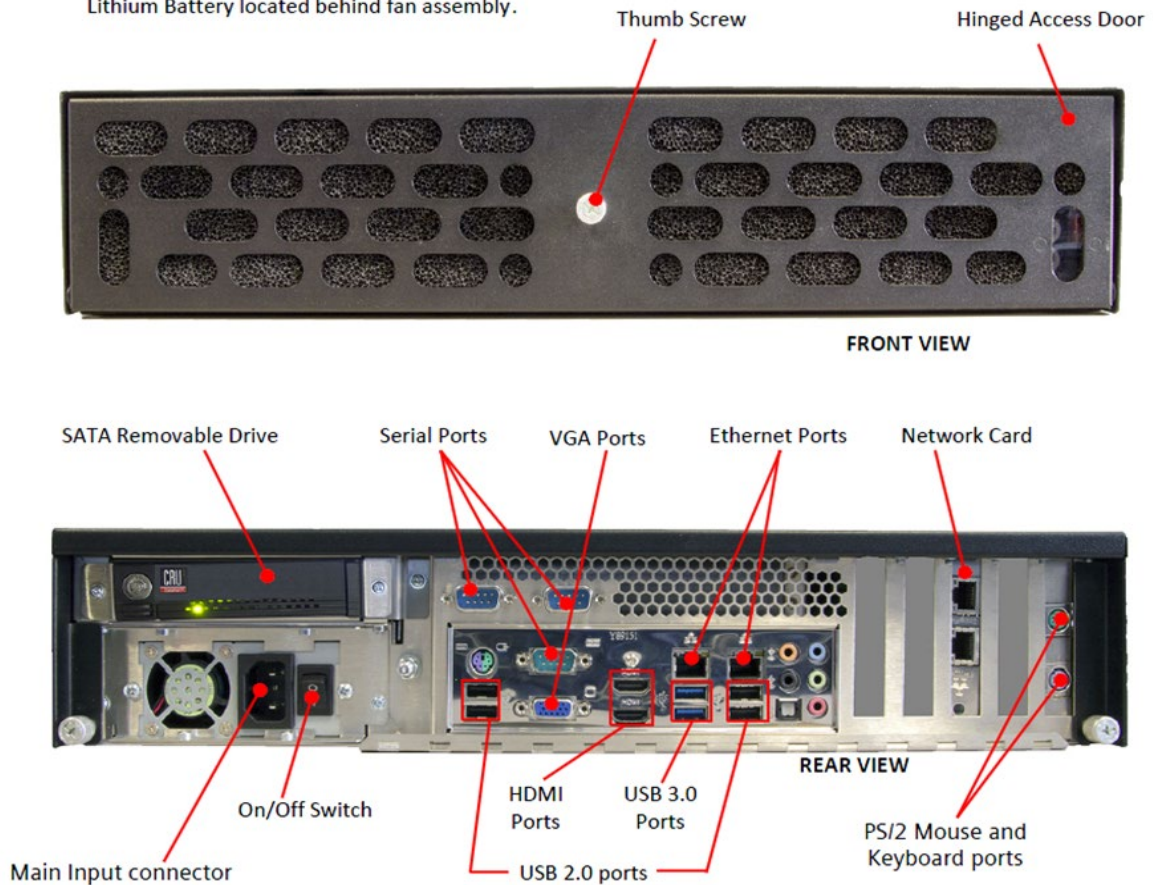


Figure 1 – Front View and Rear View

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WL23		
Replace a Siemens BlueChip C110 Technicians Facility PC		
Issue No: 03	Issue Date: 04/03/2023	Compliance Date: 03/06/2023

BEFORE INSTALLATION WORK

1. Check that the replaced PC is of the correct type and not damaged.
2. Check that the Mod state is the same or later version.
3. Record the serial number of the replacement unit.
4. Note the positions of all cables and which ports they are connected to.
5. Check the cables and wires are correctly labelled.

AFTER INSTALLATION WORK

6. Check the replacement PC is correctly installed.
7. Check cables and wiring is replaced as labelled.
8. Perform the required test to confirm that the system is operational.
9. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WP01		
Replace a WESTPLEX Module		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	WESTPLEX HD/LINK and HD COMMUNICATOR modules
Excludes:	WESTPLEX end of line unit, interface unit, PSU assembly, WAGO connector and its integral external configuration device

- ⋮ For replacement of a PSU Assembly, or a WAGO Connector and/or its integral
- ⋮ External Configuration Device (ECD), refer to the Maintenance and Repair Manual.

***** INDEPENDENCE EXEMPT *****

BEFORE INSTALLATION WORK

1. Check replacement module is not damaged and is correct type.
2. Retrieve the event log and check for cause of failure.
3. Check existing module is isolated from its power supply.

AFTER INSTALLATION WORK

4. Check replacement module is correctly installed and WAGO Connector retaining screw is tightened.
5. Power up module.
6. Check that module LEDs are showing the correct status for details see [NR/SMS/PartC/RC05](#) (Remote Control System – Westplex) Appendix A.
7. Check new module for correct operation.
 - ⋮ Check correct operation means observing for an HD/LINK module, the change of state of one controlled function's operated by it,
 - ⋮ or for an HD COMMUNICATOR module, the change of state of one controlled function operated by any HD/LINK module attached to the same Echelon LAN.
 - ⋮ For example, a signal's aspect can be changed, points operated normal and reverse, etc.
8. For a replaced HD COMMUNICATOR module, access the Line 1 and Line 2 web pages and check that the values for Signal to Noise and Loop Attenuation are the same/similar to those prior to changeover.
 - ⋮ If there is deterioration, investigate and correct defects.
9. Check or arrange for, setting of the date and time in the replaced module. For a HD/LINK module also check or arrange for the resetting of the communicating

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WP01		
Replace a WESTPLEX Module		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

statistics for all modules in the system that the replaced HD/LINK module was communicating with.

10. Check or arrange for correct labelling of unit.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WP02		
Divert a Faulty WESTPLEX Cable Core		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	WESTPLEX system
Excludes:	The diversion of a cable core on any other system of circumstances

General

- This test plan shall be used in conjunction with [NR/SMTH/Part04/CA05](#) (Divert a Faulty Cable Core).

BEFORE INSTALLATION WORK

1. Carryout steps 01 to 07 of test plan [NR/SMTH/Part04/CA05](#) (Divert a Faulty Cable Core).
2. Using Laptop connected to the LAN port of the HD COMMUNICATOR and Microsoft Explorer Note the Signal/Noise value and Loop attenuation value.

AFTER INSTALLATION WORK

3. Carryout steps 08 to 15 of test plan [NR/SMTH/Part04/CA05](#) (Divert a Faulty Cable Core).
 - **NOTE:** Steps 16 and 17 of test plan [NR/SMTH/Part04/CA05](#) (Divert a Faulty Cable Core) are not relevant to WESTPLEX
4. Check Line 1 and Line 2 LEDs on HD COMMUNICATOR are ON and steady (approximately 15 seconds after restoring the connection of diverted core).
5. Using Laptop running Microsoft Explorer connected to the LAN port of the HD COMMUNICATOR. Check that the Signal/Noise value is better (HIGHER) than previous value and Loop Attenuation value is better (LOWER) than previous value.
6. Check WESTPLEX System Monitor is indicating 'OK'.
7. Carryout steps 18 and 19 of test plan [NR/SMTH/Part04/CA05](#) (Divert a Faulty Cable Core).

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part04/WP03		
Replace a WESTPLEX LAN End of Line (EOL) Unit		
Issue No: 02	Issue Date: 05/12/2020	Compliance Date: 05/06/2021

Includes:	WESTPLEX LAN end of line unit
Excludes:	Any make or type of LAN unit

BEFORE INSTALLATION WORK

1. Connect Laptop running HD Linker to the DIAGNOSTIC port of the HD/LINK module that is wired closest to HD COMMUNICATOR and obtain Communications Statistics (using the Configures utility [C53201.exe]).
2. Check replacement EOL unit is not damaged and is correct type and free of contamination.
3. [WIRE COUNT](#) existing EOL unit to the wiring diagram.
4. Check existing wiring has safe insulation.
5. Check existing wiring is correctly labelled.

AFTER INSTALLATION WORK

6. Check replacement EOL unit is correctly installed.
7. [WIRE COUNT](#) Replacement EOL unit to the wiring diagram.
8. Reset Communications Statistics and wait for approximately 10 to 15 minutes.
9. Collect Communications Statistics and check there are no missed messages.
10. Check or arrange for correct labelling of unit.

END