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NR/L3/SIG/11231

NR/SMTH/Part/06

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NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part/06		
Index - Test Plans for Telecoms, DOO and RETB		
Issue No: 07	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

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NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/CAB001		
Replace or Repair a Telecoms Tail Cable		
Issue No: 05	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	Telecoms tail cables having a maximum of 4 conductors and of a telecoms type construction.
Excludes:	Any other type of tail cable.

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

BEFORE INSTALLATION WORK

1. Check identity of existing cable by physically tracing or alternative methods.
2. Check for intermediate breakout points or terminations.
3. Check cable terminations are not damaged and are correctly labelled.
4. Check that the replacement cable is not damaged and is correct type.
5. Check that tail cable to be worked on is fully isolated.
6. Where cables are to be jointed, check that all joint enclosure component parts are available.

AFTER INSTALLATION WORK

7. Check that the cable is not damaged, is correctly installed and protected to the standards.
8. Check all physical connections. Check that all cable connections are firm, robust and mechanically sound.
9. [CONTINUITY TEST](#) all cable conductors.
10. [INSULATION TEST](#) all cable conductors.
11. Check the cable has been secured.
12. Check that the replacement tail cable has been correctly labelled.
13. Check any line fuses or links are replaced and any lightning protection is restored.
14. The Maintenance Test Plan/s for the equipment fed by the cable/s shall be checked and any requirement marked with an asterisk “*“ carried out.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO001		
Removal, Replacement and Adjustment of a CCTV Camera		
Issue No: 05	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	DOO CCTV Chilterns ONLY
Excludes:	All other DOO

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

Preliminary Considerations

The following testing protocol shall be adopted when replacing and/or adjusting a DOO CCTV camera or a part/component.

A part/component could be any or all of the following:

- Complete camera assembly.
- Camera lens.
- Printed Circuit Boards.
- Tube or equivalent.
- Mounting assembly.
- Cables or leads.

Use of Operationally Equivalent Equipment

Operational equivalence requires:

- The use of a camera, parts or components which provide the same or improved picture quality and field of view.
- That the output signal is compatible with other equipment in the system.

Independence of Testing from Installation Work

This Test Plan shall be used by a Technician/Engineer who is qualified in the Signalling or Telecoms maintenance testing process.

Independence of testing is not required.

BEFORE INSTALLATION

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).

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO001		
Removal, Replacement and Adjustment of a CCTV Camera		
Issue No: 05	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

2. Check availability of set up and alignment information.
3. Check the replacement or part/component is compatible with that previously in service and is not damaged.
4. Check that the replacement camera is of the same size and the lens of the same size and type as that being replaced.
5. Check that the camera mountings and enclosure are in sound condition.
6. Check the condition of all equipment, wiring, connectors and labels.

AFTER INSTALLATION

7. Check that any replacement component is securely fixed and electrically connected.
8. Check the camera is properly secured in the camera housing, free of any movement and set to any alignment marks.
9. Check all physical connections. Check that plug and cable connectors are firm, correctly connected and mechanically sound.
10. Check earth bonding of enclosure.
11. Check the lens is correctly locked in position.
12. Check that the lens focus is set to infinity and the grub screw is tight.
13. Check power supply is properly restored.
14. Check the lens operating solenoid is working correctly (if fitted).
15. Check the lens auto iris operates correctly (if fitted).
16. Check the heater unit operates correctly.
17. Check video output signal is present.
18. Check that a complete and unobscured picture is present on all associated monitors.
19. Check for picture stability, clarity and focus, and that moving objects do not smear.
20. Check that the correct image of platform is shown in accordance with markers or drawings.
21. Check that a complete image of the viewing target appears in at least one monitor for all points covered by the system.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO001		
Removal, Replacement and Adjustment of a CCTV Camera		
Issue No: 05	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

22. Check using the black side of the resolution target that the image size is more than 10% of the picture size.
23. Check using the chequered side of the resolution target that each individual white rectangle can be detected.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO002		
Realign a CCTV Camera		
Issue No: 4	Issue Date: 03/03/2018	Compliance Date: 12/06/2018

Includes:	DOO CCTV Chilterns ONLY
Excludes:	All other DOO

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

Preliminary Considerations

The following testing protocol shall be adopted when replacing and/or adjusting a DOO CCTV camera or a part/component.

Independence of Testing from Installation Work

This Test Plan shall be used by a technician / engineer who is qualified in the signalling or telecoms maintenance testing process.

Independence of testing is not required.

BEFORE INSTALLATION WORK

1. Check the condition of all equipment, wiring, connectors and labels.
2. Check the camera mountings, enclosure and other visible components are in sound condition.
3. Check for availability of alignment information.

AFTER INSTALLATION WORK

4. Check the camera is properly secured in the camera housing and free of any movement.
5. Check earth bonding of enclosure.
6. Check that the correct image of the platform area is shown in accordance with markers or drawings.
7. Check that a complete image of the viewing target appears in at least one monitor for all points covered by the system.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO003		
Remove and Replace a DOO CCTV Coaxial Cable		
Issue No: 4	Issue Date: 03/03/2018	Compliance Date: 12/06/2018

Includes:	DOO CCTV Chilterns ONLY
Excludes:	All other DOO

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

Preliminary Considerations

The following testing protocol shall be adopted when replacing and/or adjusting a DOO CCTV camera or a part/component.

A part/component could be any or all of the following:

- Complete Cable
- Cable Connector

Use of Operationally Equivalent Equipment

Operational equivalence shall require:

- The use of a cable or connectors which provide the same or improved picture quality.
- That the signal delivered is compatible with other equipment in the system.

Independence of Testing from Installation Work

This Test Plan shall be used by a technician / engineer who is qualified in the signalling or telecoms maintenance testing process.

Independence of testing is not required.

BEFORE INSTALLATION WORK

1. Check the replacement cable or connector is compatible with that previously in service and is not damaged.

AFTER INSTALLATION WORK

2. Check that any replacement cable or connector is securely fixed.
3. Check all physical connections. Make certain that plug and cable connectors are firm, correctly connected and mechanically sound.
4. Check earth bonding of enclosure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO003		
Remove and Replace a DOO CCTV Coaxial Cable		
Issue No: 4	Issue Date: 03/03/2018	Compliance Date: 12/06/2018

- * | 5. Check that a picture is present on the monitor.
- * | 6. Check for a complete picture on the monitor.
- * | 7. Check for picture stability, clarity and focus.
- | 8. Check the picture is free of any streaks, flaring or negative images.
- | 9. Check that a complete image of the viewing target appears in at least one monitor for all points covered by the system.
- | 10. Check cable is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO004		
Removal, Replacement and Adjustment of a DOO CCTV Monitor		
Issue No: 05	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	DOO CCTV Chilterns ONLY
Excludes:	All other DOO

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

Preliminary Considerations

The following testing protocol shall be adopted when replacing and/or adjusting a DOO CCTV camera or a part/component.

A part/component could be any or all of the following:

- Complete monitor assembly.
- Printed Circuit Boards.
- Tube or equivalent.
- Mounting assembly.
- Cables or leads.

Use of Operationally Equivalent Equipment

Operational equivalence shall require:

- The use of a monitor, parts or components which provide the same or improved picture quality and size.
- That the signal delivered is compatible with other equipment in the system.

Independence of Testing from Installation Work

This Test Plan shall be used by a Technician/Engineer who is qualified in the Signalling or Telecoms maintenance testing process.

Independence of testing is not required.

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 or part/component is compatible with that previously in service and is not damaged.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO004		
Removal, Replacement and Adjustment of a DOO CCTV Monitor		
Issue No: 05	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

3. Check that the mountings and enclosure are in sound condition.
4. Check the condition of all equipment, wiring, connectors and labels.

AFTER INSTALLATION WORK

5. Check that any replacement component is securely fixed and electrically connected.
6. Check the monitor is properly secured in the housing and free of any movement.
7. Check all physical connections. Check that plug and cable connectors are firm, correctly connected and mechanically sound.
8. Check power supply is properly restored.
9. Check earth bonding of enclosure.
10. Check the termination switch is correctly set (through/terminated).
11. Check that a picture is present on the monitor.
- * 12. Check for a complete picture on the monitor.
- * 13. Check for picture stability, clarity and focus.
- * 14. Check the picture is free of any streaks, flaring or negative images.
15. Check that the monitor is correctly aligned.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO005		
Remove and Replace a DOO CCTV Train Detection Unit		
Issue No: 4	Issue Date: 03/03/2018	Compliance Date: 12/06/2018

Includes:	DOO CCTV Chilterns ONLY
Excludes:	All other DOO

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

Preliminary Considerations

The following testing protocol shall be adopted when replacing a track circuit trigger feed or part/component or complete replacement of a Mass Detector in a DOO CCTV system.

A part/component could be any or all of the following:

- Complete Mass Detector
- Printed Circuit Boards
- Mounting assembly
- Cables or leads
- Track Circuit Trigger Feed

Use of Operationally Equivalent Equipment

Operational equivalence shall require:

- The use of detection which provides the same level of timing and control.
- That the signal delivered is compatible with other equipment in the system.

Independence of Testing from Installation Work

This Test Plan shall be used by a technician / engineer who is qualified in the signalling or telecoms maintenance testing process.

Independence of testing is not required.

BEFORE INSTALLATION WORK

1. Check the replacement or part / component is compatible with that previously in service and is not damaged.
2. Check the mountings and brackets are in sound condition.
3. Check the condition of all equipment, wiring, connectors and labels.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOO005		
Remove and Replace a DOO CCTV Train Detection Unit		
Issue No: 4	Issue Date: 03/03/2018	Compliance Date: 12/06/2018

AFTER INSTALLATION WORK

4. Check that any replacement component is securely fixed and electrically connected.
5. Check the Mass Detector is properly secured, free of any movement, correctly aligned and adjusted.
6. Check all physical connections. Make certain that plug and cable connectors are firm, correctly connected and mechanically sound.
7. Check correct picture is present on the monitors

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOOTFI001		
Failure Investigation for Driver Only Operation (DOO) CCTV		
Issue No: 6	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Includes:	DOO CCTV Chilterns and Western Routes ONLY
Excludes:	All other DOO

Preliminary considerations

This guide shall be used to investigate reported failures on all types of DOO CCTV systems with the failure symptoms listed.

Use of this guide is not mandatory for other symptoms.

Where a single, obvious cause is apparent steps shall be taken to rectify the problem immediately. Rectification work shall be carried out using the relevant Telecommunications Failure Investigation Guide.

Maintenance Test Plan.

Both non-destructive testing and destructive testing shall be carried out by a Technician or Engineer certified as competent in the Maintenance Testing Process and authorised to work on the specific type of equipment which has failed.

There is no requirement to carry out the escalation processes during the investigation of failures in accordance with this test guide.

NON DESTRUCTIVE TESTS

- N01 Check whether the problem only appears on one monitor.
- N02 Check whether the problem only appears on one bank of monitors.
- N03 Check whether the problem appears on all monitors associated with one camera.
- N04 Check whether the problem appears on all monitors on this system.
- N05 Check if the monitors give incomplete coverage of the required platform edge.
- N06 Is the problem associated with sunlight or station lighting?
- N07 Check for any recent disturbance.
- N08 Check for any damage.

DESTRUCTIVE TESTS

- D01 Test any power feed to the affected equipment.
- D02 Check that all connections to the affected equipment are correctly terminated and secure.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/DOOTFI001		
Failure Investigation for Driver Only Operation (DOO) CCTV		
Issue No: 6	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

- D03 Check that any control signal (Mass Detector/Track Circuit) is triggering the system correctly.
- D04 Check that any T.V. Monitor hoods are secure.
- D05 Check that the fixings of the affected equipment are secure.
- D06 Check that each camera is correctly aligned.
- D07 Check that the affected equipment is in the correct alignment.
- D08 Check that the affected equipment is correctly terminated.
- D09 Check that the monitor adjustments are correctly set.
- D010 Check that the camera adjustments are correctly set.
- D011 Test any cables connected to the affected equipment.

Other considerations

If, following investigation, the reported failure condition cannot be identified; the engineer can carry out the work described in Maintenance Test Plans DOO001 and DOO002 covering adjustment and alignment of cameras.

Exercise caution when using manufacturer's handbooks to avoid inadvertently carrying out destructive testing before non-destructive testing is complete.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR67		
Replace a Power Supply Module and Battery Pack		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	Power Supply Module and Battery Pack
Excludes:	RETB Base Station Radio Modules

- This unit contains a 230V AC Supply.
- Battery packs (figure 1) used in the Invensys Modular Signalling System are very heavy.
- Correct Manual handling procedures should be used.



Figure 1 – Power Supply Module and Battery Pack

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and the correct type. Correlation check connections to the site diagram.
2. Check existing cables and connections are not damaged/corroded and have safe insulation.
3. Check existing cables and connections are correctly labelled.
4. Isolate main power supply and units as required.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR67		
Replace a Power Supply Module and Battery Pack		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER RE-INSTALLATION WORK

5. Check replacement unit is correctly installed and secured.
6. Check all connections are replaced correctly to the diagram.
7. Check or arrange correctly labelling of the unit and connections.
8. Restore main power supply.
If the main AC supply has been lost during the work, [Test \(064\)](#) is to be completed after power resumption.
9. Check status of the battery and power supply module and normal indications are illuminated.
10. Carry out [NR/SMS/Part B/Test 064](#).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR68		
Replace a Base Station Radio Modules		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	LINK Radio, CELL Radio and Site Interface modules
Excludes:	UPS, Power Supply and Battery Modules



Figure 1 – Base Station Radio Modules

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and the correct type.
2. Correlation check modules and connections to the site diagram.
3. Check existing cables and connections are not damaged and safe insulation.
4. Check existing cables and connections are correctly labelled.
5. Isolate power supply as required.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR68		
Replace a Base Station Radio Modules		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER RE-INSTALLATION WORK

6. Check replacement module is correctly installed and secured.
7. Check all connections are replaced correctly to the diagram.
8. Check or arrange correctly labelling of the unit and connections.
9. Restore power supply.
10. Check replaced module's normal indications are illuminated.
11. Connect Maintenance Laptop to Site Interface Unit and Undertake systems configuration checking correct Network ID and unit type.
12. Carry out [NR/SMS/Part B/Test 066](#) as applicable.

End

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NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR69		
Replace a system Control Radio Rack Card/Module		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	RETB System Control Radio Rack Card/Module
Excludes:	RETB Base Station Radio Modules, UPS, Power Supply and Battery Modules

Anti-static precautions shall be observed.

Cards can be plugged and unplugged with voltage applied when replacing cards. It is recommended that you remove only one card at a time from the system, as this will prevent one card being mistaken for another.



Figure 1 – RETB System Control Radio Rack

BEFORE INSTALLATION WORK

1. Check the replacement cards/modules are not damaged and the correct type.
2. Correlation check cards/modules and connections to the site diagram.
3. Check existing cables and connections are not damaged and safe insulation.
4. Check existing cables and connections are correctly labelled.
5. Isolate power supply as required.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR69		
Replace a system Control Radio Rack Card/Module		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER RE-INSTALLATION WORK

6. Check replacement card/ module is correctly installed and secured.
7. Check all connections are replaced correctly to the diagram.
8. Check or arrange correctly labelling and connections.
9. Restore power supply.
10. Check replaced card/module's normal indications are illuminated.
11. Carry out [NR/SMS/Part B/Test 063.](#)

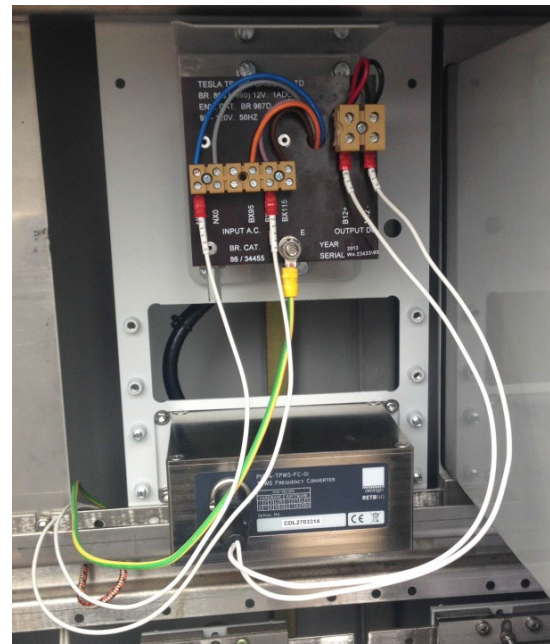
End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR70		
Replace a RETB TPWS Frequency Converter		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

Includes:	RETB TPWS Frequency Converter
Excludes:	RETB Base Station Radio Modules, RETB TRCU/TRCM Modules, RETB System Control Radio Rack Card/Module



Front View



Rear View with PSU

Figure 1 – RETB TPWS Frequency Converter

BEFORE INSTALLATION WORK

1. Check the replacement unit is not damaged and the correct type.
2. Correlation check connections to the site diagram.
3. Check existing cables and connections are not damaged/corroded and safe insulation.
4. Check existing cables and connections are correctly labelled.
5. Isolate power supply to the unit as required.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part 06/IR70		
Replace a RETB TPWS Frequency Converter		
Issue No. 01	Issue Date: 03/03/18	Compliance Date: 31/05/18

AFTER RE-INSTALLATION WORK

6. Check replacement unit is correctly installed and secured.
7. Check all connections are replaced correctly to the diagram.
8. Check or arrange correctly labelling of the unit and connections.
9. Restore power supply.
If the main AC supply has been lost during the work, [Test \(064\)](#) is to be completed after power resumption.
10. Configure required channels using switch settings.
Switch covers shall be retained and replaced securely.
11. Check status of the LED indications. (The centre LED will blink periodically to show that the unit is operational).
12. Carry out [NR/SMS/Part B/Test 066](#).

End

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/TEL001		
Replace an Operational Telephone		
Issue No: 05	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<p>Lineside Telephones such as, Signal Post Telephones, Crossing Telephones, Point Zone Telephones.</p> <p>Operational building telephones, including, signal boxes (Magneto telephones only), token huts, GF huts and shunters cabins etc.</p>
Excludes:	<p>Phones located in the following places:</p> <ul style="list-style-type: none"> • Non-operational rooms situated in operational buildings. • PETS units in Signalling/Operating Centres. • Lineside plug points and telephones connected to Tunnel Emergency Communication Systems. • GSM/GSM-R Crossing Phones. • GSM-R HMI's. • Concentrator HMI's.

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

BEFORE INSTALLATION WORK

1. Check that the replacement part is compatible with the telephone system and is not damaged.
2. Check the mountings, brackets and fixings are in good operational condition.
3. Check the condition of all equipment, wiring and connectors.
4. Check the condition of any weatherproofing/protection used.
5. Check any telephone specific configuration settings are correct for application.

AFTER INSTALLATION WORK

6. Check that any replacement component is securely fixed/safely mounted and electrically connected.
7. Check the telephone handset cord is properly secured and not in a position to be fouled.
8. Check any tail cable is properly secured and that all insulation is sound, and the line jack connection box is properly secured.
- * 9. Check all physical connections are correct and mechanically sound.
10. Check correct operation of call set-up in accordance with calling instructions pertinent to the telephone.
11. Check correct operation of engaged tone by calling a telephone that is already in use (if applicable) to the system.
- * 12. Check correct operation of sounder/bell by receiving a test call.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/TEL001		
Replace an Operational Telephone		
Issue No: 05	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

- * 13. Check speech quality to make certain that speech level is acceptable.
- * 14. Check that there is no noise or unwanted interference or excessive side tone.
- 15. Check functionality for all telephones associated with the same service. This is essential at level crossings and point zones where multiple telephones are used.
- * 16. Check that the telephone is correctly labelled.

END

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part06/TELTFI001		
Operational Telephones		
Issue No: 05	Issue Date: 04/06/2022	Compliance Date: 03/09/2022

Includes:	<p>Lineside Telephones such as, Signal Post Telephones, Crossing Telephones, Point Zone Telephones.</p> <p>Operational building telephones, including, signal boxes (Magneto telephones only), token huts, GF huts and shunters cabins etc.</p>
Excludes:	<p>Phones located in the following places:</p> <ul style="list-style-type: none"> • Non-operational rooms situated in operational buildings. • PETS units in Signalling/Operating Centres. • Lineside plug points and telephones connected to Tunnel Emergency Communication Systems. • GSM/GSM-R Crossing Phones. • GSM-R HMI's. • Concentrator HMI's.

NON-DESTRUCTIVE TESTS

- N.1 Check for damaged or missing equipment.
- N.2 Check security of associated equipment, cables, location cupboards and relay rooms.

DESTRUCTIVE TESTS

- D.1 Check if the telephone operates correctly.
- D.2 For IP telephones confirm the I/P address is correct for that location.
- D.3 Check continuity of cables, links and jumpers.
- D.4 Check the tail cable or local wiring for damage.
- D.5 Check for any missing, links or jumpers.
- D.6 Replace the telephone or associated equipment if it does not work correctly.
- D.7 Check the telephone label is in place, compliant and legible.

OTHER CONSIDERATIONS

- O.1 Care should be exercised when using manufacturer's handbooks to avoid inadvertently carrying out destructive testing before non-destructive testing is complete.

END