

# TECHNICAL INSTRUCTION

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## NETWORK RAIL - SIGNAL ENGINEERING Amendments to HPSS Signalling Maintenance Specification

**Relevant Standard:** NR/SMS/PC51 NR/L3/SIG/10663 NR/SMS/PTS/HPSS/RC01  
NR/SMS/Test/004

### Purpose

As a result of feedback received from Signalling Maintenance Technicians and Workforce Development Specialists, a number of amendments have been made to improve and clarify the requirements of the maintenance specification for the High Performance Switch System (HPSS).

### Scope

This TI applies to Signalling Maintenance staff responsible for the maintenance of HPSS. The information contained within this TI supersedes the information published within NR/SMS/PC51 Issue 4.

### Amendments to the SMS

The fundamental requirements of the maintenance specification are unchanged. New steps have been added within Test 004 (Facing Point Lock) which include a requirement to insert a no go gauge (8mm CEN54 or 10mm NR60/RT60) between the switch and stock rail in line with the rearmost set of supplementary sensors.

The purpose of the additional steps are to verify that the correct number of sensors have been selected during the Datum Reset procedure. Therefore the requirement to monitor that detection is lost (by monitoring the KR circuit) need only to apply to one of the rearmost sensors.

This change has resulted in a modification being made to the HPSS Record Card (NR/SMS/PTS/HPSS/RC01) to allow the facility to record the result of the new additional test. Below is an extract from the new record card. This illustrates that the system being tested has successfully passed the facing point lock test and the Left Hand Rear Most Supplementary Sensor successfully passed the obstruction test using the 10mm gauge.

| HPSS FACING POINT LOCK TEST                                                 |                    |                                                              |
|-----------------------------------------------------------------------------|--------------------|--------------------------------------------------------------|
| Meter Reading on KR Lines with 3.5mm gauge                                  |                    | Meter Reading on KR Lines with <del>8mm</del> / 10mm gauge** |
| L/H Switch Closed*                                                          | R/H Switch Closed* | *L/H or <del>R/H</del> Switch Closed***                      |
| ✓                                                                           | ✓                  | ✓                                                            |
| *Insert tick if outgoing KR voltage is <u>not</u> present                   |                    |                                                              |
| ** Delete details of gauge not used *** Delete details of switch not tested |                    |                                                              |

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The feedback received also indicated that there is confusion when carrying out the Datum Reset procedure. During the procedure the technician is asked to verify that no gap exists between the Switch and Stock rails when the machine is called for a good extend and good retract. The no gap only applies at the toe of the points because throughout the planed length of the switch rail through to the heel, a residual switch opening may exist. There is no requirement to force this residual switch opening closed during the datum reset procedure.

For further information refer to the PowerLink Supplementary Drive Adjustment section within this Technical Instruction and /or the HPSS Handbook NR/L2/SIG/11400.

## **Action Required**

All staff responsible for the maintenance of HPSS shall comply with the Signalling Maintenance Specification as listed within this TI.

## **NR/SMS/PC51**

### **General**

The High Performance Switch System (HPSS) comprises the High Performance Switch Actuator (HPSA) and the PowerLink Supplementary Drive, plus Toe and Supplementary rail position sensors (LVDTs).

Further information and details of the O&M manuals can be found in the HPSS Handbook (NR/L2/SIG/11400)

### **Electronic Control Unit (ECU)**

There are 2 types of ECU, for the following rail types:

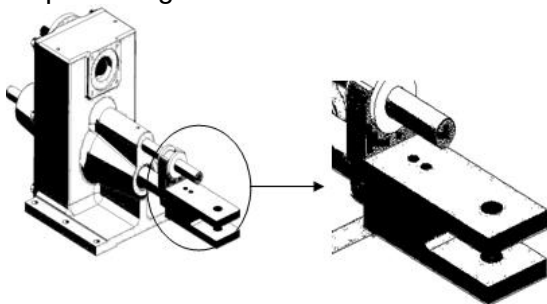
- NR60/RT60 rail.
- CEN54 rail (previously known as UIC 54).

Different plug connector keyways are provided for command cable (J1) and detection cable (J2) to prevent the wrong ECU being installed.

The NR60/RT60 and CEN54 ECUs differ due to the 15mm and 12mm obstruction detection requirements respectively.

### **Gearbox**

Inspect the gearbox to check that the clevis is pinned to the lead-screw as shown:



### **Rail Position Sensors (LVDTs)**

Rail Position Sensors (containing Linear Variable Differential Transformers, known as LVDTs) are fitted in pairs along the length of the switch.

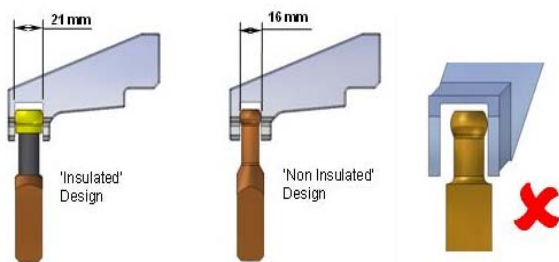
A pair of **primary** Toe Sensors is always fitted, one at the toe of each switch rail. Additional pairs of **secondary** Supplementary Sensors are fitted along the length of the switch to meet obstruction detection requirements (quantity of sensors determined by switch size length).

Toe Sensors are clamped to the foot of each stock rail and are driven to position by the motion of the switch rail drive brackets. Supplementary Sensors are mounted within the hollow bearers and driven via a switch rail interface bracket.

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.

**Warning: Do not install a Non-Insulated Sensor (Toe or Supplementary) with an 'Insulated' Drive Bracket, as shown below, as this can lead to detection performance issues.**



## Self-Locking Nuts & Bolts

The majority of mechanical connections in the HPSS use self-locking nuts or bolts. These do not need regular tightening (applying torque) as this will reduce their effectiveness.

If a self-locking fastener is removed it shall be replaced, as regular re-use will reduce the locking effectiveness. Any self-locking fastener that is found to be loose should be immediately replaced.

## Switch Rail Detection

The Toe Sensors shall detect that the closed switch rail is within 3.5mm of the stock rail, in order for the ECU to give detection.

Supplementary Sensor detection requirements are as follows:

- For CEN54, each Supplementary Sensor shall detect that the closed switch rail is less than 8mm from the stock rail, for the ECU to give detection
- For NR60/RT60, each Supplementary Sensor shall detect that the closed switch rail is less than 10mm from the stock rail, for the ECU to give detection

## HPSA Handset

The HPSA Handset is a pre-programmed portable computer that is used to set up the HPSS system (setting ECU Datum's / Datum Reset) and for faulting and maintenance (Data Download, also known as a Log Dump).

It is permissible to have the HPSA Handset connected to the ECU whilst attended, during the passage of rail traffic for on-site points monitoring.

**Safety: The Datum Reset procedure shall not be commenced during the passage of rail traffic.**

## PowerLink Supplementary Drive Adjustment

If any adjustment to the PowerLink Supplementary Drive is made, an ECU Datum Reset procedure (Appendix A) and a facing point lock test must be successfully completed.

For reliable operation, the system should be set up so that the closed rail gap is zero at the toe and between 2.5mm and 3.0mm at the rear drive position.

It is also very important the closed rail gap, in line with any Supplementary Sensor, is less than 2.0mm as this can affect detection performance.

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## Lubrication

The HPSS does not require any lubrication. Do not lubricate the low friction bushes (fitted to the carriage shaft), chair slides or any of the spherical bearings.

## Extend & Retract

The HPSA uses the above terms to refer to the movement and position of the leadscrew in relation to the gearbox:

'Extend' = leadscrew protrudes from the gearbox.

'Retract' = leadscrew is withdrawn into the gearbox.

These terms do not relate to the Normal or Reverse positions of the points, since the HPSA may be installed with the gearbox at either side of the rails.

## Run-Through

**Safety:** The gearbox contains the leadscrew, which performs the FPL function and shall be replaced following a run-through.

Other key drive-chain components listed overleaf shall also be replaced before the HPSA is returned to service, together with their associated fasteners, pins, and bearings. Guidance on HPSA component replacement is found in the HPSA O&M Manual.

The Shear Pin Module (which is a run-through detection feature that forms part of the PowerLink Supplementary Drive Torque Tube) shall be replaced following a run-through.

All other Supplementary Drive components shall be inspected for damage and replaced as necessary. An assessment of any other components shall be made then escalated to the local engineer. If you are in any doubt, ask your SM(S).

Guidance on component replacement is found in the PowerLink Supplementary Drive O&M Manual.

Note that ordering the 'run through kit' will provide you will all the components for each rail type detailed in the table shown:

| Run-Through: Component Replacement List |             |      |      |     |
|-----------------------------------------|-------------|------|------|-----|
| Description                             | Part Number |      |      | Qty |
|                                         | CEN54       | RT60 | NR60 |     |
| Run-Through Kit                         | 4080        | 4079 | 4108 | 1   |

| Run-Through: Component Replacement List |             |      |      |     |
|-----------------------------------------|-------------|------|------|-----|
| Description                             | Part Number |      |      | Qty |
|                                         | CEN54       | RT60 | NR60 |     |
| Gearbox Kit                             | 4001        | 4001 | 4001 | 1   |
| Switch Rail Drive Brkt Kit              | 4009        | 4009 | 4109 | 2   |
| Switch Rail Drive Arm Kit               | 4012        | 4012 | 4110 | 2   |
| Drive Shaft Assembly                    | 6035        | 6026 | 6225 | 1   |
| Shear Pin Module CEN54                  | 4052        | -    | -    | 1   |

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|                         |   |      |      |   |
|-------------------------|---|------|------|---|
| Shear Pin Module RT60C  | - | 4047 | -    | 1 |
| Shear Pin Module RT60D  | - | 4048 | -    | 1 |
| Shear Pin Module RT60E  | - | 4049 | -    | 1 |
| Shear Pin Module RT60F  | - | 4050 | -    | 1 |
| Shear Pin Module RT60SG | - | 4051 | -    | 1 |
| Shear Pin Module NR60   | - | -    | 4111 | 1 |

Note 1: The above kits contain all the relevant fasteners, pins etc to enable all HPSA components to be replaced.

Note 2: This list is limited to HPSA components and the Shear Pin Module only. Other PowerLink supplementary drive components shall be inspected and replaced if damaged.

Note 3: CEN54 and NR60 Shear Pin Module: Each design is common to all switch sizes.

Note 4: The gearbox and drive shaft assemblies are extremely heavy and require more than one person to lift them.

**Note:** There is no longer a requirement to carry out a Service A at the 13 weekly interval on this equipment. You are reminded that there is no change on PF01 & PA11 intervals (as mandated in NR/SP/SIG/10661) and the Regular Tests.

## **REGULAR TESTS**

### **1. Facing Point Lock**

#### **1.1 FACING POINT LOCK TEST (004)**

## **SERVICE B**

### **2. External Checks**

2.1 Check all the lids, plates, gaiters, covers and fixings.

2.2 Remove all potential obstructions and fire risks adjacent to the HPSA point machine and the PowerLink Supplementary Drive.

*This includes all hollow bearers*

*Check that no ballast is trapped between the Torque Tube and any bearers.*

2.3 Check the padlocks.

2.4 Examine the base-plate assemblies.

2.5 Check the dry slide chairs are clean and intact.

2.6 Check that the switch rail rollers are free to rotate and are in contact with the switch rail during operation.

*Any defects shall be classed as corrective maintenance (NR/SMS/Part/A02).*

2.7 Examine switch rails for hogging/dipping.

*Once initially set up, the rollers shall not normally need to be adjusted to compensate for hogging/dipping.*