S&C Recommended Practice 1058
Hot Box Detector Installation

1.0 Scope

a. This Recommended Practice describes how to install and adjust Hot Box Detector Systems, including How Wheel Detectors and Dragging Equipment Detectors.

b. This Recommended Practice does NOT cover Southern Technologies Corp. (STC) hot box detector systems.

c. This Recommended Practice describes the recommended way to perform certain tests. The intervals at which these tests are to be performed are specified in the S&C Requirements Documents. In the case of a disagreement between this Recommended Practice and the Requirements Documents on the interval between tests, the S&C Requirements document shall govern.

d. This Recommended Practice applies to both Canada and USA, where the equipment is in service, except where it applies to only a specific area, the item may be marked "Canada only" or "SOO only" or "NEUS only". Note: SOO refers to the former St. Paul and Chicago Service Areas.

e. This Recommended Practice applies to the DM&E as information only.

f. It is recommended that Signals and Communications (S&C) employees engaged in the installation, testing, maintenance and inspection of S&C systems on Canadian Pacific follow these procedures.

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2.0 Contents

3.0 General

a. Work that could impact the movement of trains must not be started until train movements have been fully protected. Installation, maintenance, test and repair work must not interfere with the safe operation of trains.

b. The following hot box detector systems and hot wheel detectors were in service on Canadian Pacific in 2010. Please note that Servo was bought by Harmon, and then Harmon was bought by GE Transportation Global Signalling (GETS). In 2010 GETS sold their HBD product line to Progress Rail. To avoid confusion, the original Servo equipment is referred to as "Servo".

	Canada	SOO	NEUS
Servo System 9000 HBD Single Port Configurations	X		
Servo System 9000 HBD Dual Port Configurations	X		
Servo / Harmon WCO-75 Overlay		X	
Harmon Model 32			X
GETS (Harmon) Micro Hot Bearing Detector	X		X
Servo Analog Hot Wheel Detector	X	X	
Servo Digital Hot Wheel Detector	X		

c. There are also several STC (Southern Technologies Corporation) hot box detector systems under test or in service on Canadian Pacific; however they aren't covered in this document.

d. Canada only: There are two software versions of model 9000 hot box detectors in operation, the single port and the dual port 9000, and each has a unique software revision. To display the current version of software use the command "N".

e. Power must be off when replacing cards or trackside equipment.

f. Alarm level and other settings for hot box detector and hot wheel detector systems must be in accordance with the tables of settings at the end of S&C Requirements Section 14 – Inspection & Test Intervals Hot Box Detector Systems. Any deviation from the standard setting shall require written approval from the General Manager ES S&C.

g. Where applicable, please refer to S&C Requirements Section 15 – Hot Box Detector Testing after a Replacement, Repair, or Change.

h. Please refer to S&C Recommended Practice 1055 Hot Box Detector Calibration Procedures for information on calibration procedures for hot box detector systems, including hot wheel detectors and dragging equipment detectors.

i. Please refer to S&C Recommended Practice 1061 Hot Box Detector Site Settings for information on the site specific dip-switch and other settings for hot box detector systems.

j. Please refer to S&C Recommended Practice 1057 Hot Box Detector Inspection & Test Record Form for a hot box detector system inspection and test check list.

4.0 Documentation

a. Canada only: S&C employees responsible for the installation of HBD sites must have the following documentation accessible:
   i. CP Standard Track Plans: R-14-79-4, R-14-79-5, and R-14-79-6.
   ii. SERVO Publication No. 85-12-15 (White Binder).
   iii. Harmon Supplement No. 290101-11-298, System No. 200101-03-XX for dual and single port, or current document describing last software changes.
   iv. Dip Switch Map - see S&C Recommended Practice 1061 Hot Box Detector Site Settings.
   v. The applicable HWD manual, one of the following:
      - Harmon Digital Hot Wheel Detective 400078-58, or:
      - SERVO HWD manual 400039-98, or:
      - ServoTherm HWD manual 400073-50.
   vi. Universal Alignment Fixture manual. TM-83-02-08.
   vii. The applicable DED manual, Dragging Equipment Detector Manual Harmon IM 133, or OTP Acoustic Detector manual.

b. SOO only: S&C employees responsible for the maintenance of HBD sites must have the following documentation accessible:
   i. CP Standard Track Plans: R-14-79-4, R-14-79-5, and R-14-79-6.
   ii. SOO Line Standard Plan SDB-6-38-1 Rail Diagram Servo /Harmon WCO-75 Overlay.
   iii. Servo Scanner Manual P/N 400076-18-XXX TM 89-05-09.
   iv. WCO-75 Manual IM 275-1.
   v. CP DCP3 Document HPN: 080726-562.
   vi. CP Hot Box Detector Document HPN: 080726-561.
   vii. Servo P/N 400073-50-XX Publication Number 85-02-15, R90-09 HW Detective.
   viii. Dip Switch Map - see S&C Recommended Practice 1061 Hot Box Detector Site Settings.
   ix. Universal Alignment Fixture 200099-81-X, TM83-02-08, R88-10.
   x. Dragging Equipment Detector Manual Harmon IM 133.

c. NEUS Only
   i. Applicable Harmon Micro HBD installation documentation.

4.1 Site Document Requirements

a. Each HBD site must have:
   i. A maintenance manual with site schematics.
   ii. Site Specific Information Sheet. For more information please refer to S&C Recommended Practice 1061 Hot Box Detector Site Settings.
   iii. A copy of the Radio License, where required.
   iv. A site Log Book.
   v. Inspection Records from previous inspections.

4.2 Radio License

a. Canada Only: Hard copies of radio licences are not required at field sites. Radio licenses are available for viewing on-line through an Industry Canada website.

b. SOO Only: The original of the radio license is kept at the Communication Control Centre (CCC).

c. USA Only: Each HBD site containing a radio transmitter must have a copy of the radio license or a document noting where the original license may be found, or both, as per FCC 90.437. FCC 90.437 Posting station licenses states, in part:
   i. The current original authorization for each station shall be retained as a permanent part of the station records but need not be posted.
   ii. Entities authorized under this part must make available either a clearly legible photocopy of the authorization for each base or fixed station at a fixed location at every control point of the station or an address or location where the current authorization may be found.

4.3 Site Log Book

a. An S&C repair and maintenance logbook is required at each site.

b. Each time installation or other work is performed at a HBD site by an S&C employee, an entry must be made in this logbook. The entry must include:
   i. Date, time and initials of employee.
   ii. Any peculiarities that were detected on the system.
   iii. Any work that was done to the system.
   iv. Additional work required by Other than by S&C should be noted.

4.4 Hot Box Detector Database Record Keeping

a. A record is being kept of all Defect Detector's and associated equipment on a Master database. Send corrections and updates to the Director S&C Operations. Updates are required when an HBD is installed, removed, moved or replaced, and for equipment changes at the HBD site such as radio, modem, charger type, etc. It is the responsibility of the local S&C Employee to ensure that the information on the database is checked and updated as necessary.

b. This HBD database can be viewed by accessing the query screen on the intranet (CP network) at: http://scsdweb:81/config/HBD/.

c. The HBD database can also be viewed on the ESOD reports page through http://esodreports/ using the following:
   i. Territory-IVR-TTP Information
   ii. Equipment Report On-Demand
   iii. View
   iv. Select Service Area(s)
   v. Select Subdivision
   vi. Select Asset Type (HBD in this case)
   vii. Select order to display assets
   viii. OK

5.0 Notification When Placing In Service / Removing From Service

5.1 Removing an HBD System From Service

a. An on-site inspection of the HBD location must be made by the S&C employee before determining that the site must removed from service.

b. In the event the HBD system or any component of the system needs to be taken out of service:
   i. Canada Only: The S&C employee must inform the ESOD - Engineering Services Operations Desk in Calgary.
   ii. SOO and NEUS Only: The S&C employee must inform the CCC - Communications Control Center in Minneapolis and the Dispatcher.
   iii. The S&C employee must identify the reason why the HBD system is removed from service.
   iv. The S&C employee must notify the Manager S&C Maintenance.

c. The HBD system may only be declared out of service under the following circumstances:
   i. If HBD equipment must be removed due to maintenance work.
   ii. The HBD system is inoperable or is alarming for every train and repairs are not immediately possible.

d. Note: The site must remain in service if the HWD and/or DED are inoperable but the HBD equipment is operating as intended. The S&C employee would disable the DED or HWD alarms if they were stopping trains.

5.2 Placing an HBD System Back in Service

a. When an HBD System is repaired and placed back in service:
   i. Canada Only: The S&C employee must inform the ESOD - Engineering Services Operations Desk in Calgary.
   ii. USA Only: The S&C employee must inform the CCC - Communications Control Center in Minneapolis and the Dispatcher.
   iii. The S&C employee must notify the Manager S&C Maintenance.

6.0 Installation Details

6.1 Track Installation

a. The track section must be installed and maintained in accordance with the following Standard Plans:
   i. Canada and SOO: R-14-79-4, R-14-79-5 and R-14-79-6.
   ii. SOO only: Soo Line Standard Plan SDB-6-38-1 Rail Diagram Servo /Harmon WCO-75 Overlay.

6.2 Transducer Installation

a. **Canada only**: Servo transducers must be installed so that a train traveling in direction 1 will trigger (stroke) the transducers in the order C-A-B-D, where Direction 1 is defined as:
   i. Single Track: The direction of increasing mileage.
   ii. Double Track: The dominant direction of travel; usually East for the South Track and West for the North track; or North for the East Track and South for the West Track.

b. The "A" transducer is closest to the scanner housing.

c. Install the transducers as follows:
   i. Between the centre line of the scanner and the centreline of the "A" Transducer – 8 inches ± ¼ inches.
   ii. Between the centreline of the "A" Transducer and the centreline of the "B" transducer – 24 inches ± ½ inches.
   iii. Between the centreline of the "A" Transducer and the centreline of the "C" transducer - 40 feet ± 6 inches.
   iv. Between the centreline of the "B" Transducer and the centreline of the "D" transducer - 40 feet ± 6 inches.

d. **SOO only:** Servo transducers must be installed so that a train traveling EAST will trigger (stroke) the transducers in the order B-Advance, B-Gate, A-Gate, and A-Advance.

e. The "B-Gate" transducer is closest to the scanner housing.

f. Install the transducers as follows:
   i. Between the centre line of the scanner and the centreline of the "B-Gate" Transducer – 10 inches for old type scanners
   ii. Between the centre line of the scanner and the centreline of the "B-Gate" Transducer – 10 inches for ACS Phase II Scanners
   iii. Between the centre line of the "B-Gate " Transducer and the centreline of the "A-Gate " transducer – 20 inches
   iv. The center line of the "A-Advance" transducer should be approximately 125 feet from the centerline of the scanner.

v. The center line of the "B-Advance" transducer should be approximately 125 feet from the centerline of the scanner.

g. Refer to SOO Line Standard Plan SDB-6-38-1 Rail Diagram Servo /Harmon WCO-75 Overlay

h. Canada and SOO: Ensure correct transducer polarity wiring.

i. When placing a Hammer/Large metal object on top of the transducer, the transducer should generate a positive+ pulse.

j. When removing the Hammer/Large metal object, the transducer should generate a negative- pulse.

6.3 Scanner Installation

a. The Servo type scanners must be installed directly across from each other (within 1/4 inch) as measured from the centre of the track and at a distance of not less than 15 feet from the scanners. This 15 foot distance is for triangulating: A wire is tied to a screw placed in the center of the tie between the rails about 15 feet from the center of the scanners to check the physical alignment of the scanners on the track. The center of one scanner is marked on the wire. Then the scanner center on the other side is checked. The scanners must be opposite each other within a 1/4 inch.

b. The Servo type scanner cant must be adjusted so that the reading on the Universal Alignment Fixture is within:
   i. Old type scanners: 6-1/2 to 7 inches with 6-3/4 inches being the optimum distance.
   ii. ACS Phase II scanners: 6 to 7 inches, with 6-3/4 inches being the optimum distance.

c. Servo type ACS Phase II Scanner mounted on 115 Lbs Rail require the scanner adapter kit HPN/ 200088-61-1 (Kit does one scanner only).

6.4 Hot Wheel Detector (HWD) Orientation

a. The Servo Hot Wheel Detector must be installed between 52 and 72 inches from the nearest rail.

b. The Servo Hot Wheel Detector vertical (tilt) look angle must be set to be parallel with the top of the rails at a height of 2.5 inches above the top of the rails to the centre of the lens.

c. The measurement is often made by sighting through a "pea shooter" tube to 4.5 inches above the rail. There is no tolerance supplied in the Servo manual. The 2.5 inch measurement is a direct-sighting method to the center of the lens. 2.5" above rail to Centre of Lens (Pea shooter 4.5" above rail)

d. The Servo Hot Wheel Detector horizontal (pan) look angle on new installations should be set at 31 degrees to the rails. On older installations in Canada, some use 90 degrees to the rail.

e. The Servo Hot Wheel Detector should be aimed across the center point between the A and B transducers.

6.5 Dragging Equipment Detector (DED)

a. The dragging equipment detector must be installed in accordance with standard plans R-14-79-4 or R-14-79-5 as well as the site-specific plans, and should be typically installed within 5 ties of the Scanner between the C and A transducers.

6.6 Wiring

a. Wires and cables from the bungalow to the trackside equipment must be in accordance with Manufacturer's recommendations.

b. If cables are replaced or disturbed, verify that the Rail 1 and Rail 2 designations are correct

6.7 Dipswitch Settings

a. Information on settings can be found in S&C Recommended Practice 1061 Hot Box Detector Site Settings.

6.8 Temperature Sensors

a. Temperature Sensors must be mounted on the north most side of the Bungalow, away from direct sunlight and combined with sun shields if necessary. Sensors should not be mounted direct to the skin of the bungalow

6.9 Radio and Antenna

a. The radio at the HBD site must be adjusted as follows:
   i. Canada and SOO: Check RF power and set to 10 watts maximum.
   ii. NEUS only: Check RF power and set to 5 watts maximum or as required.
   iii. Check reflective power is less than 10% of radio output power.
   iv. Check deviation and adjust the transmitter modulation from the radio for a maximum (peak) deviation of 4 KHz.
   v. Check RF frequency and set radio carrier frequency to +/- 500Hz of channel frequency.
   vi. Check that activating the Squelch Delay circuit delays radio transmission for **30 seconds.**
   vii. Check / set the radio receiver sensitivity to avoid setting off the HBD squelch delay from radio conversations farther away.

7.0 NEUS - MicroHBD - Trackside Installation Information

a. Scanner centreline distance to Transducer A (Dsa): This is the height that the scanner sees over the interval from transducer gate A to gate B. This distance is 8 in.

b. Axle Window Size (Dab): This is the physical distance between the magnetic center of transducer A and the magnetic center of transducer B. This distance is 24 in.

c. TRIP Transducer Magnetic Centerline - TRIP transducers have their magnetic centerline located close to, but not coincident with, the transducer physical centerline. Perform the following steps to locate the magnetic centerline:
   i. Tie a nail to a piece of string 4 or 5 feet long.
   ii. If not already done, remove the keeper from the magnet (see figure below).
   iii. Gradually lower the nail to the magnet.
   iv. Repeat last step until the nail consistently clings to one spot on top of the transducer.
   v. Mark the spot found in last step. This is the magnetic centerline of the transducer.

8.0 Testing Required

a. When Placed in Service inspections and tests must be carried out in accordance with S&C Requirements Section 14 – Inspection & Test Intervals Hot Box Detector Systems.

b. As a part of the testing procedure, fill out the checklist forms contained in S&C Recommended Practice Hot Box Detector 1057 Inspection & Test Record Form. A copy of the completed checklist should be PRINTED and left at the site.

9.0 Partial Listing of Applicable Standard Plans

Plan #	Name
R-14-79-4	Servo Hot Box Detector General Layout and Assembly
R-14-79-5	Servo Hot Box Detector Harmon Dragging Equipment Detector General Layout and Assembly for use on Concrete Ties
R-14-79-6	Servo Hot Box Detector Wheel Detector Mounting Details
SDB-6-38-1	SOO Line Standard Plan Rail Diagram Servo /Harmon WCO-75 Overlay