



NATIONAL TRANSPORTATION SAFETY BOARD
Investigative Hearing

Norfolk Southern Railway general merchandise freight train 32N
derailment with subsequent hazardous material release and fires,
in East Palestine, Ohio, on February 3, 2023

GROUP	H
EXHIBIT	
5	

Agency / Organization

Brotherhood of Railroad Signalmen

Title

**Hot Bearing/ Wheel Temperature Detector
Systems**

MS- 404
HOT BEARING/WHEEL TEMPERATURE DETECTOR SYSTEMS
Initial date 05/25/93- Revised 05/19/2023

PURPOSE:

The purpose of this procedure is to ensure that the hot bearing detector and/or wheel temperature detector will notify a passing train about any (or no) defective equipment. This requires the detector to be properly maintained, calibrated, aligned, and all sensors working as intended.

FREQUENCY:

When system is placed in service, **modified, or disarranged**, and thereafter as instructed below (30, 90, 180, 365-day intervals).

NOTE: Hot Bearing/Wheel Temperature Detector locations may also include dragging equipment, height and/or clearance detectors and AEI. Refer to the appropriate test section for their tests.

WINTER OPERATIONS:

Insulated covers where provided should be installed and the winter cycle should be activated (Smartsan NG sites) before December 1st every year.

DESCRIPTION OF INSPECTIONS - FOLLOWING EVERY SNOW / ICE EVENT:

Inspect and clean detectors following any accumulation of snow or ice.

GENERAL:

1. Ensure FINAL OPERATIONAL TEST (located at end of MS 404) is completed prior to leaving location.

DESCRIPTION OF INSPECTIONS - Every 30 days:

1. Scanner heads (Wheel or Bearing):
 - a) Ensure proper and secure mounting
 - b) Clean any debris from drain plug/hole on bottom of scanner head
 - c) Clean lenses/mirror/filters
 - d) Verify shutters open and close fully when activating transducer
 - e) Check scanner head ground connections (Scanner head ground connection tied into house ground)
 - f) Check scanner heaters for proper operation (CAUTION: DO NOT BURN YOUR HAND)
 - g) Remove debris and ballast from under scanner head
 - h) Inspect inside of scanner head for loose/damaged wires
2. Transducers:
 - a) Ensure proper and secure mounting
 - b) Ensure no metal filings or debris on surface (exercise care when removing debris)
3. Message Checks Over Radio:
 - a) Generate test train, activate DED and verify message

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- b) Generate test train, activate clearance detector (if applicable), and verify message
- c) Generate test train and verify "No Defect" message
- 4. **Building and General:**
 - a) Inspect/repair - rodents and insects (bungalow, scanner heads, transducers, junction boxes, ramps, cable, conduit, etc.)
 - b) Inspect/repair - Damaged or loose hardware
 - c) Ensure flex-conduits/cabling shallow buried under ballast/hidden from view
 - d) Check track connections for damage per SP-2001
 - e) Check/repair visible ground rod connections, wiring, and lightning protection
 - f) Check bungalow interior and exterior lights
 - g) Check antenna and connections
 - h) Check AC service and connections
 - i) **Housekeeping**
 - i Ensure instrument house is kept clean and orderly
 - ii Clean equipment, shelves, and floor as needed
 - iii Place documentation, test equipment, fixtures, and spare equipment in the proper location
 - iv Check area, keep all weeds and natural growth removed, and see that all scrap material is removed
 - v Check that all gaskets, hinges, latches, and padlocks are in place and kept lubricated
 - vi Clean house air intake filter as needed, and vents are properly set for the season and protected
 - 1 Warm/Hot Weather – Check that air intakes are not obstructed, and exhaust fan operates properly and is set to 80 degrees F
 - 2 Cold Weather – Check operation of bungalow heater, ensure heater and exhaust fan do not operate at the same time

DESCRIPTION OF INSPECTIONS - Every 90 days:

- 1. **Complete all 30-day inspections**
- 2. **Standby Battery Checks**
 - a) Record results on battery card (MS-201 – Form 12075)
 - b) Check battery voltage with digital meter
 - c) Check the AC supply voltage
 - d) Disconnect the charger AC supply
 - e) Check battery voltage with digital meter
 - f) Restore AC power
 - g) Verify system shows AC power on
 - h) Disconnect batteries for float voltage check
 - i) Check battery float voltage
 - j) Reconnect batteries and verify
 - k) Check battery connections
 - l) Ensure that batteries are clean, dry and connections are tight. NO-OX-ID grease is recommended for all battery connections. (See SP-201 & MS-201)

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DESCRIPTION OF INSPECTIONS - Every 180 days:

1. Complete all 30 & 90-day inspections
2. Scanner heads (Wheel or Bearing):
 - a. Check for worn, loose, or defective pyro cable connector ends and clean
 - b. Alignment
 - i. Perform sensor alignment check on each sensor.
 - ii. To align scanner heads refer to:
 1. **Micro HBD/HWD:**
 - a. Micro HBD User's Manual
 - b. Micro Hot Wheel User's Manual
 2. **Smartsan NG and NG²**
 - a. SmartScanNG Track Hardware Guide
 - b. SmartScanNG2 Track Hardware Guide
 - c. Calibration
 - i. Perform calibration test with outside temperature between 0F-90F
 - ii. Perform heat calibration on each sensor including hot wheel sensor where equipped
 - iii. To calibrate scanners, refer to:
 1. **Micro HBD/HWD:**
 - a. Calibration Assistant Installation and Service Manual
 - b. Micro HBD User's Manual
 - c. Micro Hot Wheel User's Manual
 2. **Smartsan NG and NG²**
 - a. SmartScanNG Operators Guide
 - b. SmartScanNG² Operators Guide
 - d. Check for proper rail orientation
 - e. Check/test for proper track orientation (multi-track sites)
 - i. North/East compass orientation is recommended, and scanner head is facing into the transducer gate window.
 - ii. Sites susceptible to sun shot occurrences should be handled individually with C&S Engineering for proper orientation.
3. Transducers:
 - a. Check height of transducer:
 - i. Micro = 1.75" below top of rail
 - ii. NG adjusted to base of alignment Bracket
 - iii. Frauscher transducers – per manufacturer spec
 - b. Perform transducer cable resistance test and verify from manufacturers manual
 - c. Calibration of "Zero Speed" Frauscher transducers (RSR110-001 or -001)
 - i. To calibrate transducers, refer to:
 - a. SmartScanNG² Operators Guide
 - b. Comet Electronics TDA-205 Installation and Optimization

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DESCRIPTION OF INSPECTIONS - Every 365 days:

1. Complete all 30, 90 & 180-day inspections
2. Series overlay track circuits, if applicable:
 - a. Apply .06 shunt at 80 feet. Verify shutters open.
 - b. Apply .06 shunt at 100 feet. Verify shutters stay closed.
 - c. Adjust the circuit to 80 feet if necessary.
 - d. Reference manufacturer's manual for additional information.
3. General:
 - a. See that all equipment has sufficient paint to prevent rusting and deterioration
 - b. Ensure that circuit plans are correct and legible

FINAL OPERATIONAL TEST – ALL SYSTEMS

PURPOSE:

This test should be performed after all inspections, tests, and anytime repairs have been made. This should be the last test performed before leaving the site.

DESCRIPTION OF TEST:

To determine the hot bearing/hot wheel detector is left operating properly, the following sequence must be performed:

1. Initiate test train (refer to SmartScanNG Operators Guide or Micro User's Manual) or by simulating a train over transducer.
2. Heat source must be applied to scanner head
3. Complete test train (if utilizing transducer)
4. Heat must be verified (along with correct rail, track, and timetable direction) with the voice message and by reviewing detector log history.
 - a. Correct direction of travel must be verified by transducer test train method, or observing a train move over detector.