



NORDCO - INTERNATIONAL DEPARTMENT

4755 Technology Way, Suite 208 • Boca Raton, Florida, 33431 USA
Tel. (561) 997-2080 • Fax (561) 997-2110 • Email: info@ameco.net

NRS200
PRIME





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Equipment

The primary equipment for Main Line Rail Flaw Detection Services is the:

NRS200

PRIME



- Vehicle Test Speed up to 50 kilometers per hour under optimal rail conditions
- Optimal Test Speed is 32 kilometers per hour
- Testing temperature -29°C to 43°C
- Gross Vehicle Weight: 10,500 kilograms
- Freightliner M2 Crew Cab with 4 DOT approved seats
- Vehicle width is 3.0 meters with extended mirrors
- Vehicle Height is 3.8 meters on highway
- Vehicle Length is 9.9 meters with rear stairs retracted
- Cummins **International** Version 6.7 liter Diesel Engine, 149 kW @ 2300 RPM, 760 Nm @ 1600 RPM, **designed for use with non-ULSD fuel**
- Standard Brakes (non-air)
- 568 liters capacity for couplant
- 379 liters capacity for diesel fuel
- Full-size 4 passenger, high roof vehicle for greater operator comfort
- Full height pass through between front truck cab and rear body to allow all passengers to exit from rear of vehicle and onto center of track during rail testing/inspection
- 14" Hydraulic Hyrail Gear, with exterior hydraulic controls for lifting and lowering
- LED Rail Test and carriage light kits for night testing
- Exterior deck mounted, dual compartment storage box for accessories and large spare parts
- Two yellow beacon lights mounted on the front and rear of the work cabinet
- Air horns controllable by the driver and the chief operator
- Driver backup video camera and LED display
- 5 Channel video onboard surveillance system for monitoring of track front and rear, front carriage wheel on driver and passenger side and monitoring of the driver
- Vehicle Decals and lettering per customer specification



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Four Person Crew Cabin

- **Air seats** for driver and passenger; cup holders for all seats
- **Air Horn**
- **Special Controls** for Rail Shunt, Hyrail Break, Strobe Light, Emergency Pump, PTO Pump
- **Backup Camera Monitor**
- **Wiring for Railroad Radio** with external loudspeaker mounted on the rear deck (Radio supplied by customer)
- Front & Driver facing **cameras** (3MP)
- **Pilot Laptop workstation** with HDMI link to Operator Monitor 3
- **QSI Driver Input Device**





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Electronics System

- Advanced **48 channel Digital Platform** for precision ultrasonic testing applications
 - **Simultaneous Processing** of multiple test channels
 - **High-Pulse Densities** and **Testing Speeds**, for enhanced defect detection and throughput
 - **High Signal-to-Noise Ratios** and **Linear Reject** provided through the enhanced Digital Signal Processing techniques
 - Synthesized ultrasonic calibration standards digitally reproduce RF ultrasonic calibration signals for **Automated Calibration Processes**
 - **Automatic DAC Curve Generation** from Digitally Synthesized Standard Test Frame
 - Reconstructed **High-Resolution** Detected Video Display with **Selectable Filtering**
- **System Control Computer**
 - I7 Pentium Processor, 16GB RAM, 1TB SSD Storage, 1U Rackmount
- **SMART Power Distribution Unit** with Automatic Switching
- **SMART UPS**
- (2) **Pure SIN WAVE Inverters**, offering system power supply redundancy
- **Video Surveillance Controller**
- **Wireless Router** and **Mobile Router** with tracking capability (SIM cards provided by customer)
- **D-GPS** antenna (roof mounted)



Software

- The system utilizes the Nordco Rail Test Software which is a Windows based system that **processes and displays all Ultrasonic (UT) and relevant information**. It is capable of measuring signal amplitude, signal time and distance traveled
- The Software enables the **operator control of all channel gates, gains, and thresholds**.
- The Nordco system offers dual **independent display formats**; one format is the **Strip Chart Event Recorder** format and the other format is the Consolidated **B-Scan**.
- The Rail Test System allows the Chief Operator to **collect details about each action taken** during the Test Window (Movement Report), and details concerning defects (Defect Report).
- Nordco holds multiple patents for its **pattern recognition** engine is an adaptive learning system that allows the software to automatically recognize common rail conditions and to recognize and classify defects. New defect types can be added to the Pattern Recognition Library, allowing the system to recognize these new defects automatically.

Chief Operator Workstation and Work Box

- Ergonomically designed Operator workstation with **direct view of the tested rail**
- **Rear Rail Egress** with deck platform and retractable stairs
- **Rail testing controls integrated** in workstation allow:
 - Adjustment of LATERAL position (Driver and Passenger side)
 - Carriage gage FOLLOW and LOCK
 - Wheel Lube (Driver and Passenger side)
 - Buzzer for communication with Driver



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- Rear Air Horn
- Wheels DOWN/UP and Couplant ON/OFF
- Rear Rail Illumination ON/OFF
- Carriage UP
- Carriage Illumination ON/OFF
- **Triple Monitor Configuration**
 - Monitor 1: RailTest App with BScan and other views (34" Curved, Widescreen, 3440x1440, 5MS)
 - Monitor 2: SoftScope App with 4 Channel display (21.5", 1920x1080, 1MS)
 - Monitor 3: 5 Camera Video OR Pilot Display Mirror (21.5", 1920x1080, 1MS)
- **Ergonomic wireless keyboard and (2) trackball mice**
- **Ergonomic G13 BScan Icon input device**
- **Integrated USB Hubs**
- **Wireless Air Printer**
- **Integrated Cup holder, Pen Holder and whiteboard**
- **Internal Storage Cabinets**
- **Integrated Toolbox**
- **(3) tanks for couplant** 190 liter each with external and internal fill-up, plus (1) extra 75 liter under-sink tank for wheel lube or reserve couplant
- **On-Board Sink, Eye Wash Station and Safety Equipment**
- **Special Holders** for Spare RSU's and Membranes
- **Jump Seat** with seat belt for auditor or trainee
- **Thermo-Electric Cooler**, 12V, 40QT
- **Microwave oven**
- **Window Shades** and **Window Tinting**
- **Misc. Holders, Wall Mounted Trash Can**
- **Centrally mounted LED bar** on rear exterior and two lower **LED lights** for rail illumination





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NRS-260 PRIME Chief Operator's Workstation



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Carriage

Proprietary wheel probe designs: XL9-11 RSU, Sweeper RSU, Tracer RSU

(3) wheel probes per side of carriage

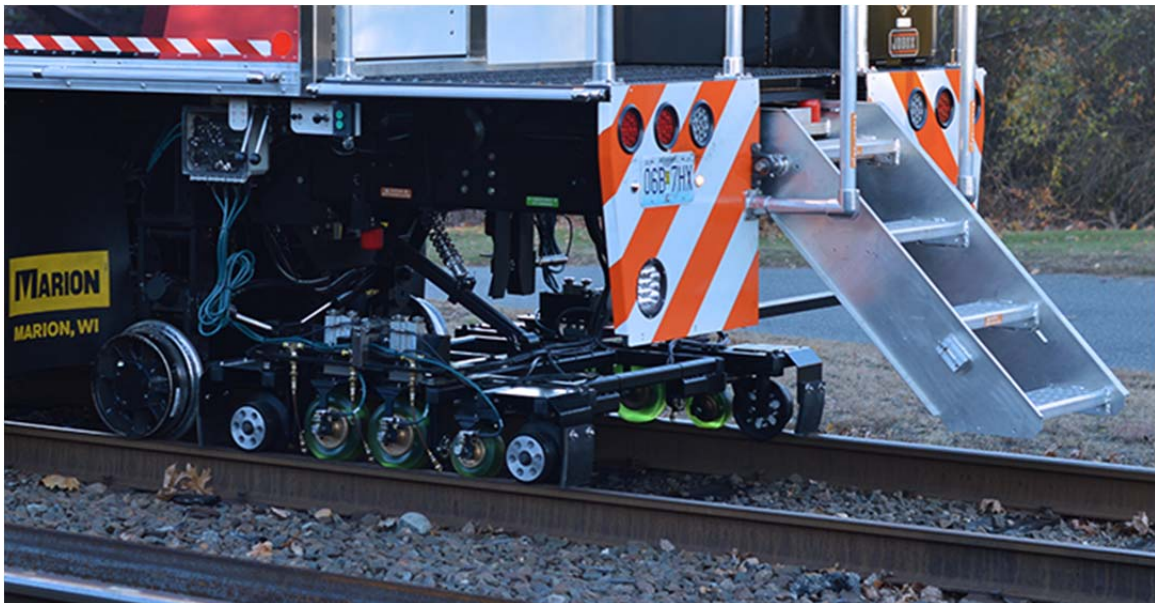
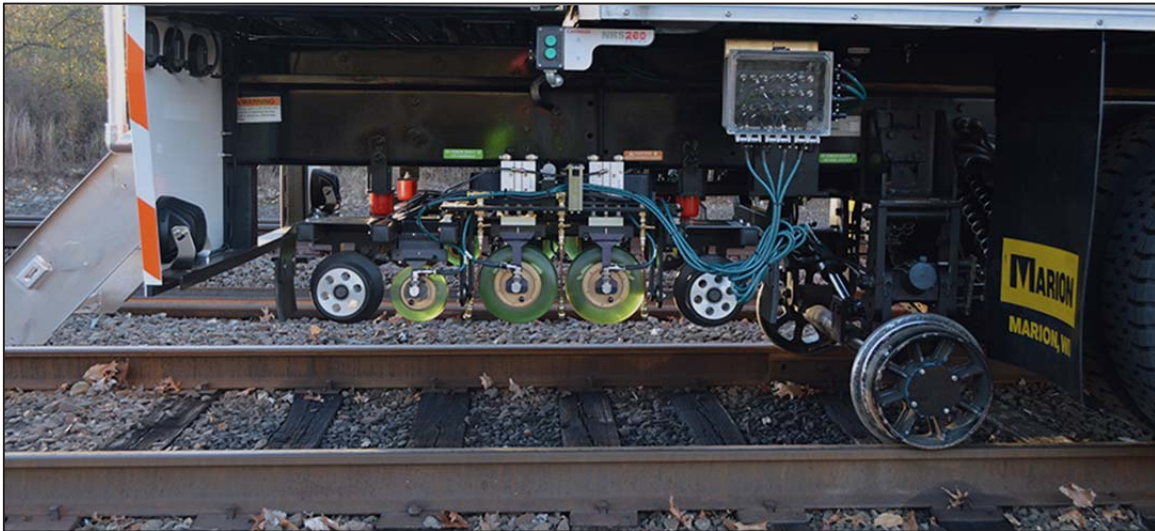
Dual-rail inspection - (6) wheel probes total

Hydraulic carriage lift mechanism can be raised and lowered from the outside of the vehicle.

The carriage can be lifted from the operator workstation

LED carriage work light kit

Carriage cameras (3MP) on each side, monitoring the front carriage wheel



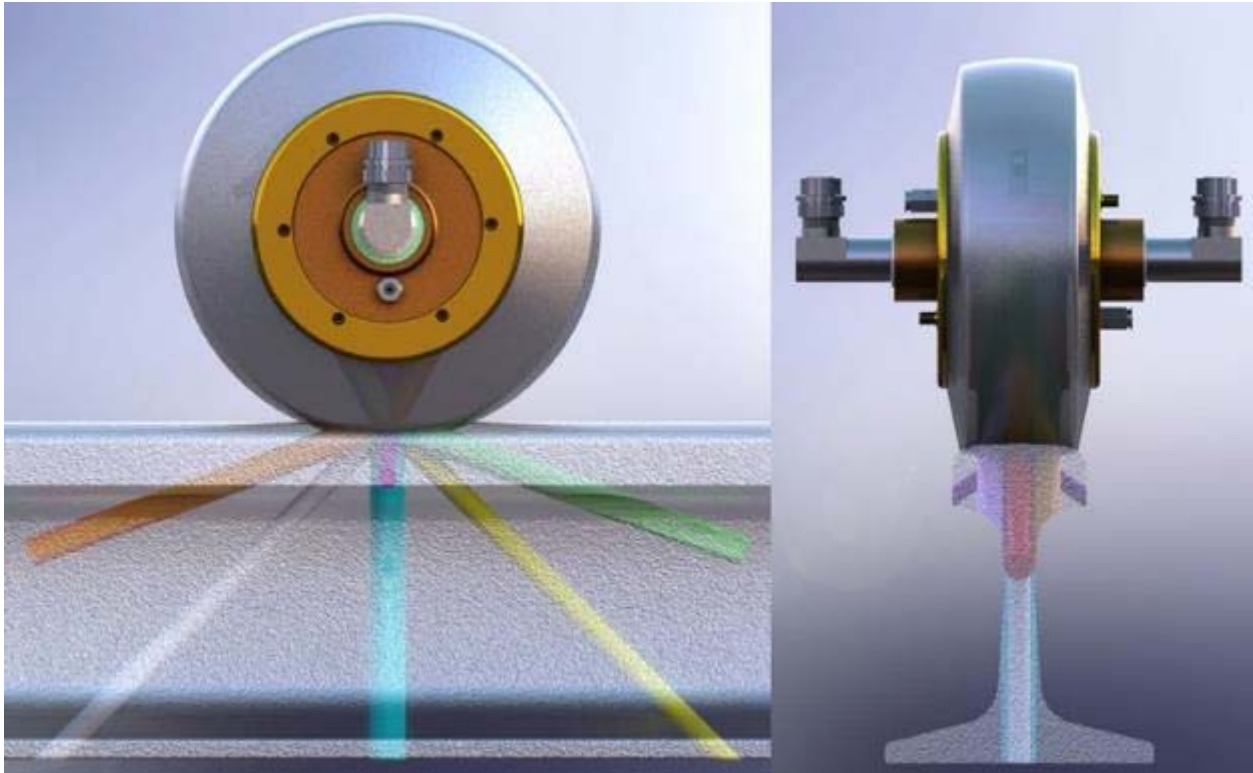


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XL9-11 RSU

- zero-degree crystal for both web coverage and base detection
- 37.5° crystals (forward and backward) for full rail web coverage
- (6) 70° crystals (3 forward (field, center, gage) and 3 backward) for full head coverage
- side-looking crystals (field, gage) for longitudinal cross-rail coverage



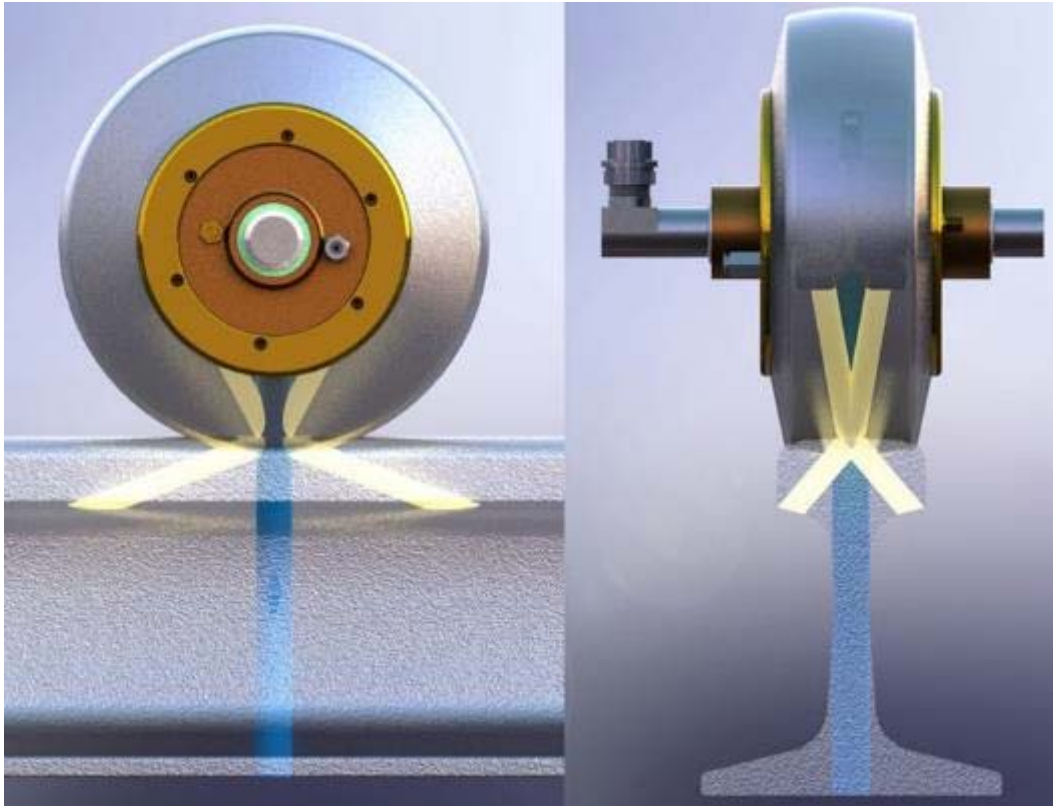


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Sweeper RSU

- Optimized to detect transverse detail fractures beneath sub-surface shelling where field or gage surface conditions are inadequate for traditional detection
- zero-degree crystal for both center head coverage and base detection
- (4) proprietary shear wave angle transducers focus on head inspection in the field and gage corners



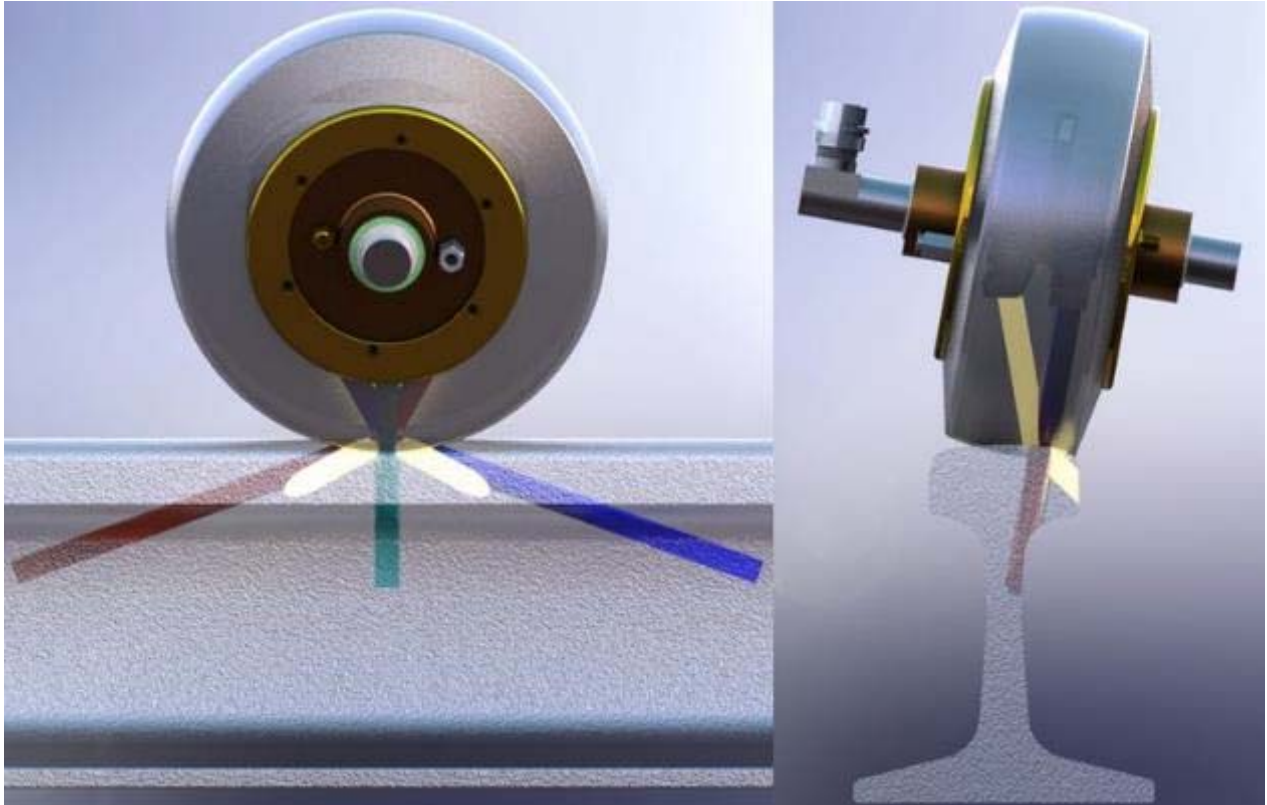


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Tracer RSU

- Optimized to inspect worn gage corners that cannot be sufficiently inspected with perpendicular oriented RSUs due to contact loss
- 0° degree transducer is used to detect compound features of gage defects that are typically caused by WRI mismatches
- shear wave transducers are aimed at the gage corner to detect defects in the gage volume of the rail head





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KLD Labs RailScope II LineScan System

Nordco offers the KLD Labs automated machine vision systems for capturing digital images of the rail head and web of all RailTest boxed indications.



KLD Labs' system incorporates the latest machine vision technology to collect and analyze high resolution images of the rail. The video cameras capture full longitudinal images of the rail section to aid in the capturing of defect detail.

The RailScope II sensor heads are mounted beneath the RFD vehicle either normal or at a 20 degree angle to view welds and joints on the gage side of the rail. The central computer and peripherals are housed inside the vehicle.

As the vehicle travels down the track, high-resolution images of the boxed indications are processed and stored on the system control computer. The image files will be transferred off the vehicle to cloud storage for data playback and analysis.

SmartHub

- Nordco's proprietary software which links the NRS-260 PRIME (VIU) to authorized users via web interface
- Project and Defect Tracking
- Provides online and web interface data management
- Analysis tools for remote access, tracking, and system status. Remote review and visualization of Ultrasonic Test data
- Run-On-Run 2.0 - analysis is now done offline, via SmartHub. This eliminates the onboard software lag associated with excessive run-on-run data
- Vehicle and system Dashboard
- Direct Cloud Upload from truck to SmartHub using 3G or WiFi
- Reporting Scheduler and Custom Reports
- Access Rail Test files in the SmartHub cloud
- Allows remote diagnostics and remote firmware upgrades
- Real time asset tracking
- Online training
- Data can be exported to Excel, CSV, PDF



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SmartHub

Smart Hub - BETA Rail Plan Track Learn Hello Admin! Log off

Rail Testing Summary

9/27/2015 - 10/3/2015

Collapse All | Expand All

Customer	Truck	Defects	Tested Miles	Avg Test Speed	Hours Worked	Testing Time	RunLite Time	Delay Time	Other Time	Equipment Up Time
Grand Total										
BNSF		10	0.0	0.00	18.0	8.8 (49%)	0.0	8.0	1.3	83.3%
DRS017										100.0%
DRS021										100.0%
DRS024										100.0%
DRS025										100.0%
DRS028										100.0%
DRS030	1	0.0	0.00	10.0	2.8 (28%)	0.0	5.2	2.1		100.0%
DRS031	8	0.0	0.00	20.0	8.1 (40%)	0.0	5.1	6.8		100.0%
DRS037	10	0.0	0.00	18.0	8.8 (49%)	0.0	8.0	1.3		83.3%
09/29/2015	7	0.00	0.00	8.5	3.8 (44%)	0.0	4.3	0.5		64.7%
09/28/2015	3	0.00	0.00	9.5	5.0 (53%)	0.0	3.8	0.8		100.0%
DRS310	0	0.0	0.00	16.0	6.1 (38%)	0.0	5.8	4.1		100.0%

Rail Defect Information Defect Map

BNSF DRS037 - 9/29/2015

Mile Post	Defect Type	Size	Length	Comments
1523.80	Detail Fracture	10.00		DF 10%
1527.34	Detail Fracture	40.00		DF 40%
1527.34	Detail Fracture	40.00		DF 40%
1527.34	Boutet Weld	20.00		DWF 20%
1527.35	Boutet Weld	20.00		DWF 20%
1534.39	Detail Fracture	20.00		DF 20%
1540.94	Pressure Electric Weld	20.00		DWP 20%

Rail Testing Summary

7/16/2016 - 7/24/2016

Collapse All | Expand All

Customer	Truck	Defects	Tested Miles	Avg Test Speed	Hours Worked	Testing Time	RunLite Time	Delay Time	Other Time	Equipment Up Time
Grand Total										
BNSF		31	205	6.5	125.8	31.8	3.5	57.7	32.7	95.5%
Canadian Pacific		4	119	5.7	54.0	20.8	11.8	17.3	4.0	100.0%
CSX		2	35	5.0	18.3	7.0	2.6	5.3	3.3	100.0%
MTQ-QC		7	24	3.8	27.5	6.3	17.0	0.0	4.3	100.0%
Watco		6	14	3.6	10.4	4.0	0.7	2.8	3.0	100.0%
DRS021		6	14.5	3.62	10.4	4.0 (38%)	0.7	2.8	3.0	100.0%
07/18/2016		6	14.47	3.62	10.4	4.0 (38%)	0.7	2.8	3.0	100.0%
WATCO-K&O		3	34	3.9	10.0	8.8	0.0	0.0	1.3	100.0%
Watco-KO		20	18	2.9	10.0	6.0	3.0	0.0	1.0	100.0%
Watco-WSOR		129	17	1.3	19.4	13.2	4.0	1.1	1.2	100.0%

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Project Details

7/18/2016 Watco DRS021

Defects 6 Activities 13 Test Efficiency 38.4%

Operator Name Tim Nance
 Operator Comment
 Distribution List

04:00 hours tested
 10:25 hours worked

Activity	Track Type	Duration	Time	Miles	Mile Posts	Comments
NWN - CINER - SIMN				4.04		
Track Travel	SIMN	0:30	8:30 AM - 9:00 AM	0.00	4.90 - 4.90	TO XING (CINER)
Train Delay	SIMN	1:05	9:00 AM - 10:05 AM	0.00	4.90 - 4.90	TRAFIC
Test	SIMN	0:50	10:05 AM - 10:55 AM	4.04	4.90 - 8.94	WATCO-OCI
NWN - WATCO-SOLVAY - SIMN				0.00		
RunLite	SIMN	0:40	10:55 AM - 11:35 AM	0.00	8.94 - 8.94	TO WATCO-SOLVAY
NWN - WATCO-SOLVAY - NO 1				6.40		
Train Delay	NO 1	0:35	11:35 AM - 12:10 PM	0.00	1.50 - 1.50	TRAFFIC
Test	NO 1	0:10	12:15 PM - 12:25 PM	0.50	1.50 - 2.00	MAIN 1
Test	NO 1	0:50	12:25 PM - 1:15 PM	2.32	2.00 - 4.32	MAIN 1
Test	NO 1	0:55	1:15 PM - 2:10 PM	2.97	4.32 - 7.29	MAIN 1
Test	NO 1	0:25	2:10 PM - 2:35 PM	0.60	7.29 - 7.89	MAIN 1
Track Travel	NO 1	2:00	2:35 PM - 4:35 PM	0.00	7.89 - 7.89	TRANSFER
NWN - OCI - SIMN				4.04		

Defect Center

Filter Customer: BNSF

Date: 07/04/2016 To: 07/06/2016

Customer: BNSF Operator: All Truck: All Division: All Subdivision: All Defect Type: All Track Type: All GPS (click to toggle)

Update

Defects 43 | 4 Assets 4 Operators 4

Date	Number	Defect	Size	Asset	Operators	Division	Sub Division	Track Type	Mile Post	GPS
7/5/2016	142343	98	54.00	DR5025	Anthony Jackson	NWN	SEATTLE	Main Line	17.451	47.1514 9955 -122.61 906915
7/5/2016	142342	61	10.00	DR5025	Anthony Jackson	NWN	SEATTLE	Main Line	13.123	47.2033 039833 333 -122.58 166593 3333
7/5/2016	142341	32	0.50	DR5025	Anthony Jackson	NWN	SEATTLE	Main Line	9.892	47.2457 274833 333 -122.55 411443 3333
7/5/2016	142337	13	20.00	DR5027	Jeff McClellan	SC	COMMERC E YARD	Yard	148.053	33.9923 264836 667 -118.14 771149 0667
7/5/2016	142336	13	20.00	DR5027	Jeff	SC	COMMERC	Yard	148.054	33.9923



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DefectDetails - Nordco

smarthub.nordco.com/Rail/Report/DefectDetails?defectId=136353

Nordco SmarHub Rail Track Learn Hello Jens! Log off

Defect Details

Location:	RailRoad: BNSF
	Division: NWE
	Subdivision: SPOKANE
	Line: 45
Rail:	Type: Welded
	Manufacturer: Rocky Mtn Steel
	Metallurgy: Premium Rail
	Side: Left
	Alignment: Tangent
Defect:	Severity: 0
	Type: Vertical Split Head
	Size: 4.00
	Length:
	Flange Wear: 0
	Head Wear: 0
	Distant End:
	Previously Marked: <input type="checkbox"/>
	Non Testable: <input type="checkbox"/>
	Comments: VSH
Stats:	Frequency Days: 31
	Average Miles Section: 21

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Equipment Tracker - Nordco

smarthub.nordco.com/Rail/FleetManagement/EquipmentTracker

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Equipment Tracker

Map List

Active:	0
Idle:	1
Extended Idle:	1
Down:	0
Construction:	0
Inactive:	13

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NRS260 PRIME Included Spare Parts

Critical Parts List carried on NRS260 PRIME RFD Vehicles:

Part Number	Description	Quantity
1103489	DSP QUAD CHANNEL CARD	1
1103490	QUAD PULSER	1
1103493	I/O BOARD	1

System Cables

1000696	RSU WHEEL CABLE 9'	5
1101628	J-BOX BNC TO DSP LEMO CABLE	1
3500010	ENCODER CABLE	1
7000530	ACTUATOR CABLE	1
1000947	CAT 5 PATCH CABLE	2

UT Probe Wheels

1100690	XL 9-11 RSU	1
4003008	6" TRACER RSU	1
1100995	9" SWEEPER RSU	1
1000545	WHEEL FLUID - GREEN	8
4000005	9" WHEEL MEMBRANE	10
4003046	6" WHEEL MEMBRANE	10
8001570	RSU MEMBRANE O-RING 6"	2
8001571	RSU MEMBRANE O-RING 9"	2
1103640	RSU WHEEL SCREWS 6/32 x .5"	1 Pack of 100
2000008	9" WHEEL BRACKET	1
1102160	6" WHEEL BRACKET	1
9500072	WHEEL FILLER TANK	2
9500068	RSU PRESSURE GAUGE	1

Carriage

2001088	COMPLETE SHOCK ASSY	1
1000049	CARRIAGE WHEEL	2
8001610	CARRIAGE ACTUATOR	1
2001007	3/4" TIMKEN FLANGE BEARING	2
2001006	CANT BEARING	2
1102131	CANT BEARING PIN	2
1102097	CANT BOX TURNBUCKLE ASSY	2
2001097	CANT BOX LINEAR BEARING ASSY	2
4003094	BRASS SPRAY NOZZLE ASSY	6

Miscellaneous

7000559	DIRECT DRIVE ENCODER	1
1103404	PORTABLE FLAW DETECTOR, USM GO+	1
1100726	HAND TEST KIT	1
7000533	6' BNC TO BNC HAND TEST CABLE	2
7000247	SHURFLO WATER PUMP	1
2003098	12 VOLT WHEEL LUBE SOLENOID	1
4100005	RUBBER SWEEPS	4
	UNIVERSAL PEAKING FIXTURE	1



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Chief Operator Training & Development

SAFETY	ASNT SNT-TC-1A Level I	Hand Testing	Rail Testing	ASNT SNT-TC-1A Level II
<ul style="list-style-type: none"> o E-Rail Safe o Certification o Canadian Railway Operating Rules (CROR) o Certification o On-Track Safety Training o Person Protective Equipment o Quiz 	<ul style="list-style-type: none"> o Introduction to Ultrasonic Testing o Quiz o Basic Principles of Acoustics o Quiz o Equipment o Quiz o Transducer Operation and Theory o Quiz o Basic Ultrasonic Testing Techniques o Quiz o General Written Examination o Specific Written Examination o Practical Examination 	<ul style="list-style-type: none"> o Rail Flaw Identification o Quiz o Identification of Rail Surface Conditions o Quiz o Performance Guideline <ul style="list-style-type: none"> o False Negatives o False Positives o Quiz o Recommended Procedures <ul style="list-style-type: none"> o Calibration o Inspection o Evaluation o Reporting o General Written Examination o Specific Written Examination o Practical Examination o Hand Testing – 60 hours 	<ul style="list-style-type: none"> o Introduction to Windows o Quiz o Introduction to Rail Test Software o Quiz o Channel Parameters & Setup o Quiz o B-Scan View o Quiz o Strip Chart View o Quiz o System Status o Quiz o Jobs o Quiz o Movement & Defect Reports o Quiz o Operating Procedures o Quiz o Specific Written Examination o Specific Written Examination o Practical Examination o Rail Testing – 160 hours 	<ul style="list-style-type: none"> o Principles of Ultrasonics o Quiz o Equipment Calibration o Quiz o Evaluation of Base Material Product Forms o Quiz o Ultrasonic Testing Applications o Quiz o Phased Array o Quiz o Time of Flight Diffraction o Quiz o Guided Wave o Quiz o Evaluation Standards o Quiz o General Written Examination o Specific Written Examination o Practical Examination

ASNT SNT-TC-1A Level 1 Training (Beacon Falls)
Hand Testing (Beacon Falls)
ASNT SNT-TC-1A Level II Training (Beacon Falls)
Rail Testing (Beacon Falls)

** Minimum of two Operators for Beacon Falls training*
**Travel, hotel, and meals are not included*





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Nordco's Training Center Virtual Chief Operator Workstation with fully functional DSP