

EUD-2016020-00

SmartScanNG Operator's Guide for Canadian Pacific

This manual provides an operational overview of the SmartScanNG detector as configured for the Canadian Pacific Railroad. The user interface is the primary focus of this guide. Detailed instructions are provided for:

- Navigating the system menus
- System setup
- Producing reports
- System Functions

The appendices of this manual include scheduled maintenance information and various SmartScanNG related job aids.

**DISTRIBUTION OF THIS DOCUMENT IS APPROVED IN PDF
FORMAT ONLY.**

20 January 2016

© 2016 Southern Technologies Corporation (STC). All rights reserved.
Printed in the USA.

Because products evolve and system configurations change, this manual may not be an exact representation of the products and systems that you are using.

Firmware Revisions at the time of this publication

Reader : CP2.38-P 02/03/2015

Comm : CP2.38-P 02/03/2015

Speech: CPR4.90

STC assumes no responsibility for errors or omissions in this document. Nor does STC make any commitment to update the information contained herein.

Product and company names mentioned herein are trademarks or registered trademarks of their respective owners.

WARNING!

Contact with electrically active parts could result in sparks, burns, and electric shock. Because of this, you should avoid all electrical hazards when installing, wiring, operating, and maintaining the SmartScanNG system. Failure to do so could result in damage to the equipment or serious injury to you.

**Southern Technologies Corporation
6145 Preservation Drive
Chattanooga, TN 37416
www.southern-tech.com**

email: stcemail@southern-tech.com

fax number: 423-499-0045

telephone number: 423-892-3029

Contents

This section lists the headings of this guide in sequential order with their page references.

Contents	3
1.0 Introduction	7
1.1 Purpose of This Guide	7
1.2 SmartScanNG - General Description	7
1.3 Cautions	8
1.4 Disclaimers	9
1.5 How to Comment on This Guide	9
1.6 How to Order More Copies of This Guide	9
1.7 Standard Warranty	10
2.0 Defect Detection	11
2.1 System Activation	11
2.2 System Deactivation	12
2.3 Speed Calculation	12
2.4 Train Direction	12
2.5 Transducer Pulse Processing	13
2.6 Axle Scanning	14
2.7 Hot Bearing Alarms	15
2.7.1 Bearing Scan Process	15
2.7.2 Referencing System	16
2.7.3 Pyrometer Linearity	17
2.8 Hotwheel Alarms	17
2.9 Auxiliary Alarms	19
2.10 AC Power Monitoring	20
3.0 Serial Interface	21
3.1 Main Menu	21
3.2 Setup Menu	23
3.2.1 Date and Time	25
3.2.2 Milepost/Kilometer Post (MP/KP) and Subdivision	25
3.2.3 Track Number	26
3.2.4 Alarm Limits	27
3.2.5 Equipment	33
3.2.6 Messages	40
3.2.7 AEI Reader Parameters	43
3.2.8 Load Default Setup Parameters	45
3.2.9 Units of Measure	46
3.2.10 Setup Password	47
3.2.11 COM1, COM2, COM3, & COM4	47
3.3 System Functions Menu	48
3.4 Replay EOT Announcement	57
3.5 Enter Pass-Through Mode	58
3.6 Straight-Through Communication	60
4.0 Producing Reports	61

4.1	Train Summary Report	63
4.2	Train Detail Report.....	68
4.3	Exception Summary Report.....	78
4.4	Extended Exception Detail Report.....	82
4.5	Abbreviated Exception Detail Report.....	92
4.6	System Status Report.....	95
4.7	Last Train Report.....	100
4.8	Last Test Train Report.....	101
4.9	AEI Diagnostic Detail Report	102
4.10	Event Log Report.....	111
4.11	Maintenance Report	113
4.12	Dynamic Scan Record Reports	116
4.13	Comma Separated Setup Parameters Report.....	121
5.0	Radio Announcements.....	123
5.1	Arrival Messages	123
5.2	Real-Time Messages.....	124
5.3	Post-Train Messages.....	125
5.3.1	Nothing Detected	127
5.3.2	Only an Integrity Failure Detected	128
5.3.3	Only Exception Alarms Detected	129
5.3.4	Both Exception Alarms and an Integrity Failure Detected	132
6.0	Scheduled Maintenance.....	135
7.0	Customer Service	147
7.1	Reaching STC	147
7.2	Returning Equipment for Repair	147
7.3	Reporting Problems or Suggestions	148
7.4	Ordering Spare Parts.....	148
7.5	Checking on Shipments and Orders.....	148
Appendix A	System Alarms: Non-Critical	149
A.1	Ambient Temperature Probe Unreliable Alarm	149
A.2	Cold Bearing Scanner Alarm.....	149
A.3	Cold Bearing Integrity Resistor Alarm	150
A.4	Cold Wheel Scanner Alarm	151
A.5	Cold Wheel Integrity Resistor Alarm	152
A.6	Highrange Transducer Miscounts Alarm	153
A.7	Integrity Failure Alarm	153
A.8	Low Battery Alarm	153
A.9	Midrange Transducer Miscounts Alarm.....	153
A.10	No Approach Track Alarm	154
A.11	Pyrometer Noise Filtered Rail Alarm	154
A.12	Pyrometer Noise Filtered Wheel Alarm	154
A.13	Rail Resistor Test Overridden Alarm.....	154
A.14	OnTime Greater Than OffTime Alarm	155
A.15	Short Train Alarm	155
A.16	Stuck Dragger During Train Passage Alarm	155
A.18	Stuck SOTC Alarm	156
A.19	Test Train Alarm.....	156

A.20	Train Too Slow alarm	156
A.21	Wheel Resistor Test Overridden Alarm	156
A.22	DSR:Recovered Correctly After Unexpected Gate Closure	157
A.23	DSR:Recovered Correctly After Unexpected Gate Opening	157
A.24	AEI System Alarms.....	157
Appendix B System Alarms: Critical.....		159
B.1	Cold Bearing Integrity Resistor Alarm.....	159
B.2	Cold Wheel Integrity Resistor Alarm.....	159
B.3	Dead Battery Alarm	160
B.4	Dead Bearing Integrity Resistor Alarm	160
B.5	Dead Wheel Integrity Resistor Alarm.....	161
B.6	Highrange Transducer Miscounts Alarm	161
B.7	Stuck Dragger During Train Passage Alarm.....	162
B.8	Stuck Dragger Pretrain Alarm.....	162
B.9	Stuck High-Load Detector Pretrain Alarm.....	162
B.10	Stuck Wide-Load Detector Pretrain Alarm.....	162
B.11	Successive Cold Bearing Scanner Exceeded Alarm	162
B.12	Successive Cold Bearing Resistors Exceeded Alarm	163
B.13	Successive Cold Wheel Scanner Exceeded Alarm	164
B.14	Successive Cold Wheel Resistors Exceeded Alarm.....	165
B.15	Train Present on Restart Alarm	165
Appendix C System Functions		167
C.1	Radio Test.....	168
C.2	Vocabulary Test	169
C.3	Radio Inhibit	169
C.4	Manual Test Mode.....	169
C.5	1KHz Test Tone	170
C.6	Auto-Calibration.....	170
C.7	Reset the COP Counters.....	170
C.8	Remote System Reset	170
C.9	Delete All Stored Train Data.....	171
C.10	Clear Event Log.....	171
C.11	Scanner Resistor Quick Check.....	171
Appendix D Replacement of Scanner Cover-and-Module Assemblies		173
D.1	Bearing Scanners.....	173
D.2	Wheel Scanners	175
Appendix E Calibration of Scanners		177
E.1	Bearing Scanners	177
E.2	Wheel Scanners	181
E.3	“Calibration Due” Indication on Heat Source	185
E.4	Heat Source: Power Cable Warning.....	186
Appendix F Lens Cleaning of Scanners		187
Appendix G Predictive Gate Scanning.....		189
G.1	Overview	189
G.2	Scanning Process	190
G.3	Reporting the Pyrometer Saturation Alarm	191

Appendix H Communications Ports	193
Appendix I System Diagnostic Indicators	195
Appendix J 2500-402 Spacer Kit Installation.....	197
Appendix K Baseline Resistor Test	199
K.1 Cover the Scanners.....	199
K.2 Bungalow Speaker Announcements	200
K.3 Processing Resistor Baseline Results.....	200
Appendix L DCI Digi Modem Connection	203
Appendix M SmartScanNG Port Communications Connections	207
Appendix N 2500-536 Red Filter Frame - New Design.....	209
Appendix O 12A Breaker Upgrade in SmartScanNG Chassis	211
Appendix P Scanner Base Drain Hole	213
Index	215

1.0 Introduction

This section summarizes the purpose of this guide, describes the SmartScanNG system, tells how to comment on this guide, tells how to order more copies of this guide, and covers STC's standard warranty. It also covers the cautions and disclaimers of which the customer should be aware.

1.1 Purpose of This Guide

The technical staff at Southern Technologies Corporation (STC) created the SmartScanNG Defect Detection system. It monitors moving trains and reports certain conditions detected on these trains. The SmartScanNG system is modular and firmware driven. Hardware and firmware can be changed to meet the unique needs of a given railroad. Thus, some of the components that make up a SmartScanNG system differ from railroad to railroad.

This guide is for the operators who maintain, troubleshoot, manage, or use the SmartScanNG system as configured for Canadian Pacific (CP). This guide focuses on functionality as controlled by system firmware. It provides a detailed explanation of the system's serial interface. It covers the setup of system parameters, producing reports, and the operation of various system functions. The installation, operation, and maintenance of SmartScanNG hardware components is not covered in this guide.

1.2 SmartScanNG - General Description

The SmartScanNG system is a full-featured detection and reporting system. It monitors moving trains, providing real-time detection of:

- Overheated bearings
- Overheated wheels, when wheel scanners are installed and enabled
- Dragging equipment, when dragging-equipment detectors are installed and enabled
- Shifted loads, when wide-load detectors are installed and enabled
- Oversized loads, when high-load detectors are installed and enabled
- Automatic Equipment Identification (AEI) tags, when AEI hardware is installed and enabled
- Direction of the train
- Exit speed of the train

The SmartScanNG system runs well in the harsh environments found along right of ways. It runs under the most adverse weather conditions, functioning over a temperature range of -40°C to +71°C (-40°F to +160°F). It runs in high vibration situations. It runs unattended, carrying out all tasks without human intervention.

The SmartScanNG system monitors trains traveling from 7 to 90 mph (11.3 to 145 kph). It monitors trains heading in either direction on the track.

When the SmartScanNG system detects a defect, it informs the crew of the affected train. This is done by a voice transmission over an assigned radio channel. The voice is computer generated from previously digitized human speech. It tells the crew the location of the reporting SmartScanNG system, a warning that a defect has been detected, and other defect-related information. When no defect is detected, the voice tells the crew that the train was scanned and found free of defects.

There are three types of messages. Real-time messages are announced as the train is passing over the site. Post-train messages are announced after the train has left the site and all the recorded train data has been processed by the SmartScanNG system. Arrival messages, when enabled, are announced as the train enters the site. The content and use of these three message types are railroad specific.

The results of train scans are also stored for later use. With this stored data, the system can create formatted reports. To get them at the site, you need a computer. With a modem and a computer, you can retrieve them remotely.

1.3 Cautions

Contact with electrically active parts could result in sparks, burns, and electric shock. Because of this, you should avoid all electrical hazards when installing, wiring, operating, and maintaining the SmartScanNG system. Failure to do so could result in damage to the equipment or serious injury to you.

In operation, batteries generate and release flammable hydrogen gas, which, if ignited by a burning cigarette, naked flame, or spark, may cause battery explosion with dispersion of casing fragments and corrosive liquid electrolyte. So, carefully follow manufacturer's instructions. Keep all sources of gas ignition away from the batteries and do not allow metallic articles to contact the negative and positive terminals of a battery at the same time.

Do not install any tower, pole, mast, or antenna on a wet or windy day. Do not install them near any type of power line. Be sure all parts of the system are out of falling range of any overhead wires, including the lead to any building. Once installed, do not climb any tower, pole, or mast. Failure to follow these instructions could result in injury or death.

1.4 Disclaimers

The correct use of this guide, the environmental conditions at the time of installation, the method of installation itself, and the installation of customer-supplied components are beyond the control of STC. So too are the correct use and maintenance of all or part of the SmartScan system. Therefore, the installer, user, and maintainer must assume the risk of any injury that might occur during installation, use, and maintenance of all or part of the SmartScan system. STC assumes no risk, liability, or responsibility for errors and omissions on the part of the installer, user, or maintainer.

1.5 How to Comment on This Guide

We want to hear from you. Tell us what you like or don't like about this guide. Send your comments to:

Southern Technologies Corporation
Technical Publications Department
6145 Preservation Drive
Chattanooga, Tennessee 37416-3638
USA

All comments become the sole property of STC and none will be returned.

1.6 How to Order More Copies of This Guide

When placing an order for more copies of this guide, refer to the order number shown on the cover of this guide. To request pricing and delivery, call 423-892-3029, fax 423-499-0045, or send email to stcemail@southern-tech.com. Electronic copies of this guide are also available.

1.7 Standard Warranty

Systems manufactured by Southern Technologies Corporation carry a 14-month warranty from date of shipment. Warranty is limited to repair or replacement at the sole discretion of STC, of any goods found to be defective in either materials or workmanship during the 14-month period following shipment. Warranty does not apply to product with signs of obvious abuse, or product that has been improperly installed.

STC warrants that goods represented by this warranty statement have been designed and manufactured with all reasonable care and attention to appropriate regulatory documents. STC makes no representation that the goods covered by this warranty are suitable for the application they are used for. Application of the goods is at the sole discretion of the purchaser.

Purchaser is responsible for shipment of the defective product to STC. STC will pay the return shipping charges.

Products purchased from others, but included in STC systems carry the original manufacturer's warranty, typically 12 months. Warranty claims for these products must be made directly to the original equipment manufacturer.

2.0 Defect Detection

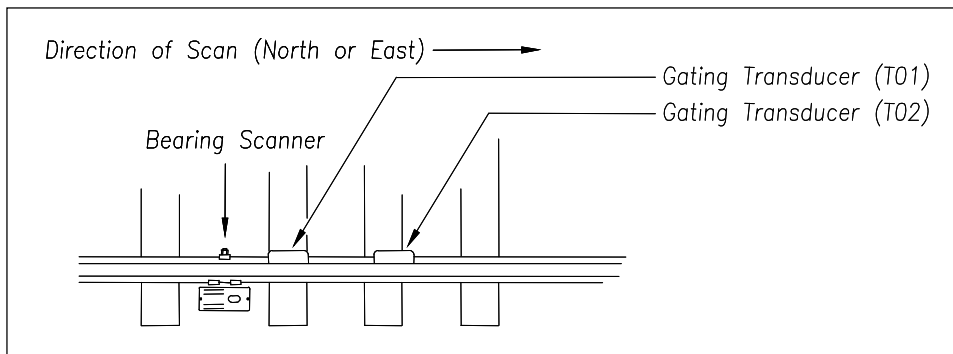
This section describes the Exception Alarms (aka defect alarms aka train alarms) and how they are detected. Miscellaneous train scanning features are also covered.

2.1 System Activation

System activation is the process used to detect train presence and to prepare for train scanning. It is during the scanning process that the system checks for defects.

The SmartScanNG system is equipped with a primary means of train arrival detection, which are the advance transducers or track circuit. In case of a failure in the primary detection method, the gating transducers act as a backup to detect train arrival. Once the system senses a train's presence, it enters scanning mode. In other words, the system has activated. It first opens the scanner's shutters and disables their heaters. It then waits for further evidence of a train at the site in the form of gating transducer activity.

Once the system is active, it reads pulses from the two rail-mounted gating transducers, which are designated TO1 and TO2. On the rail nearest the wayside enclosure, these transducers are mounted near and to the north or east of the bearing scanners. **TO1** is the southmost or westmost gating transducer. **TO2** is the northmost or eastmost transducer.



The signals from these gating transducers indicate to the system that passing wheels are in view of the scanners. Furthermore, the speed of the train is determined by using the known distance between TO1 and TO2 versus the time required for a given wheel to pass over them.

Four axles must pass over the gating transducers for the system to consider the event a valid train. This prevents maintenance equipment from generating alarms and causing unwanted voice messages on the road channel.

2.2 System Deactivation

System deactivation is the process used to detect the moment that the train exits the site. The system waits for ten seconds of inactivity from the gating transducers before deactivating.

2.3 Speed Calculation

A train's exit speed is the speed shown on the reports. The system calculates this speed by using timing from the last eight axles as provided by the gating transducers. The system calculates the speed by knowing the distance between the two transducers versus the time that it takes a given wheel to pass over them. Calculated speeds over 99 mph (159 kph) are reported as 99 mph (159 kph). If a train has fewer than eight axles, its speed is reported as 0 mph (0 kph).

Trains traveling at less than 7 mph (11.3 kph) are considered "too slow" for the magnetic wheel transducers to produce an accurate signals. If a passing train drops below this speed threshold, the detection of Differential alarms, Pyrometer Saturation alarms, and Carside Slope alarms isn't performed. After passage of these trains, the phrase "train too slow" is appended to the post-train message (when the **Announce Train Too Slow option** is enabled) and a diagnostic message is noted on the Train Detail and Exception Detail reports. Also, after passage of these trains, axle count, exit speed, length of train, and total number of cars isn't announced. This is true even when the **Announce Axles option**, **Announce Speed option**, **Announce Train Length option**, and **Announce Number of Cars option** are enabled.

The report fragment below, from the header section of a Train Detail report, shows the location of this message.

```
Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
                .
                .
System Alarms
-----
Train Too Slow
                .
                .
```

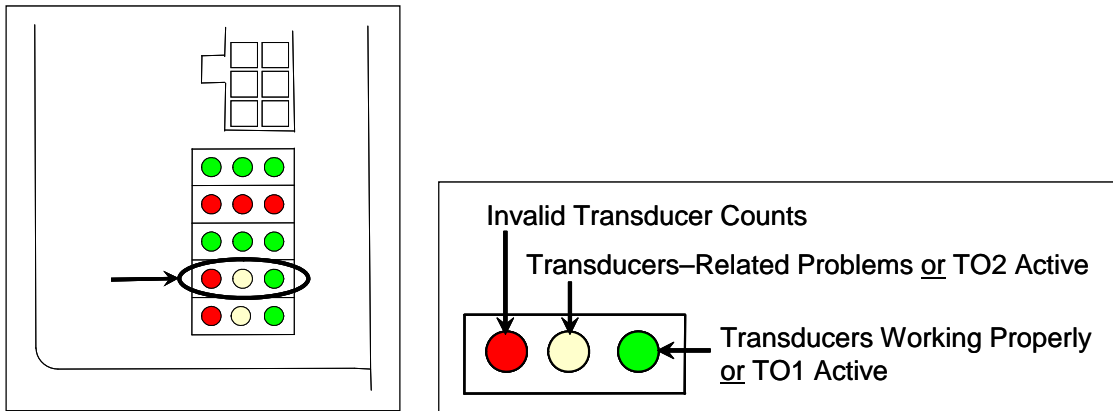
2.4 Train Direction

Train direction is based on whether TO1 or TO2 generated the first gating transducer pulse.

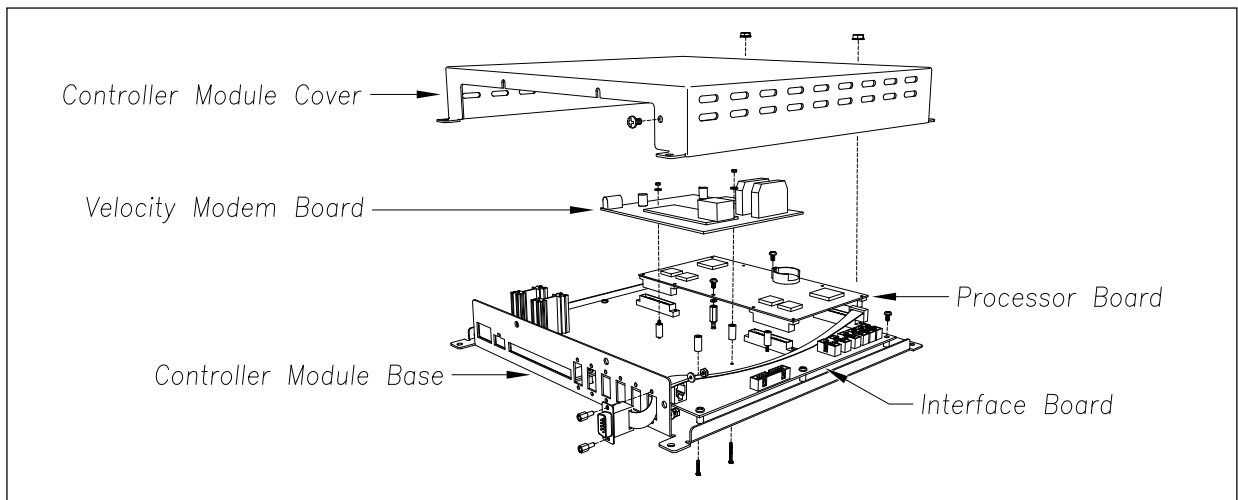
2.5 Transducer Pulse Processing

As a wheel enters the sensing range of a transducer, the transducer should respond with a positive going pulse. The polarization of the two wires from the transducer determines if this pulse is positive or negative.

Here is a simple test that you can use to verify the correct polarization of the gating transducers. While watching the TO1 and TO2 LEDs in row four on the status panel, have someone lay a metal wrench on one of the gating transducers. The corresponding LED should briefly light as the wrench touches the transducer. Then lift the wrench up. The LED shouldn't light as the wrench is lifted away. Repeat the test for the other transducer.



On the Interface board (in the Controller module), the transducer signals undergo RF filtering and amplification with a gain of 30. For validation, the amplified signals are fed into comparators, which create 5-VDC pulses lasting the period of time that the amplified signals remains above 620 millivolts. Processor-A (on the Processor board) receives these 5-VDC pulses through ports PA0 (TO1) and PA1 (TO2).



A firmware-controlled feature of the comparator circuit allows adjustment of the threshold voltage based on the speed of the train. Trains traveling less than 20 mph (32 kph) use the 620-millivolt threshold setting for maximum sensitivity. However, faster trains cause the transducers to generate a higher signal voltage, which allows the system to increase the threshold voltage. This improves the signal-to-noise ratio resulting in better signal validation.

Processor-A (on the Processor board) internally generates interrupts on the positive going and negative going edges of each transducer pulse coming from the comparator. The positive edge of each comparator pulse starts a timer. The timer stops with the detection of a negative going edge. The width of each pulse is a determining factor of signal validity. Three milliseconds or greater is considered to be a valid signal. The firmware rejects any pulse width shorter than 3 milliseconds. Rejected pulses don't increment the transducer counters.

In normal operation, the gating transducers fire in sequence, first one then the other. With 24 inch (61 centimeter) gating-transducer spacing, a wheel passes over both gating transducers before the next wheel passes over a gating transducer. Therefore, two consecutive pulses on the same gating transducer aren't physically possible. However, in the unlikely event that a gating transducer is ever caused to fire by another source, such as electrical interference from a locomotive's traction motor, a spike-counter for the gating transducer that misfired will be incremented by one. To increment the axle counter, one pulse from each gating transducer must occur in sequence.

2.6 Axle Scanning

Bearing Scanners:

When the train first enters the site, the SmartScanNG system begins reading the scanners for a heat signal when the wheel is at the center of the first gating transducer. Thereafter, it starts reading the scanners 16 inches (40.6 centimeters) before the center of the first gating transducer. (See **Appendix G - Predictive Gate Scanning** for more information about this 16 inch (40.6 centimeter) pre-gate scanning.) The system continues reading until the wheel is at the center of the second gating transducer. This is the period that the axle is in view of the scanner. A negative going edge of a transducer signal is an indication that the wheel is in the center of that transducer.

The firmware uses Dynamic Scan Rate (DSR) sampling between the centers of the two transducers (that is, between the gate), which means that heat readings taken every 1/2 inch (1.27 centimeters) of wheel movement are used to detect alarms, regardless of the speed of the train. As a result, the system takes 48 evenly spaced samples as the wheel rolls through the 24 inch (61 centimeter) detection zone that is established by the distance between the gating transducers.

Wheel Scanners:

The wheel scanning gate has been expanded to include samples of the areas just before and just after the gating transducers. Both the pre-gate and post-gate scanning areas are half as big as the *Gate Distance* setting. So if the *Gate Distance* is set to the default 24 inches, the pre-gate and post-gate scanning areas will each be 12 inches. This effectively makes the wheel scanning gate double the *Gate Distance* (48 inches when the *Gate Distance* is set to 24 inches). The hot wheel DSR now includes 24 samples both before and after the existing 48 for a total of 96 samples.

2.7 Hot Bearing Alarms

The SmartScanNG system checks for hot bearings during the scanning process. It detects and records every Hotbox alarm that occurs. However, it only announces a maximum of six per train. For example, if a train contains seven Hotbox alarms, the Train Detail report will show all seven, but only the first six are announced.

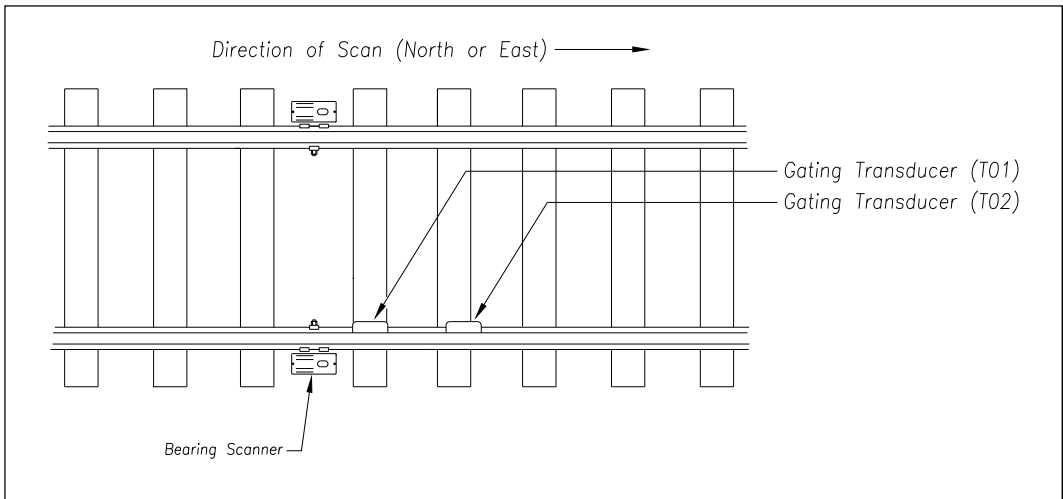
There are four types of Hotbox alarms.

- **Absolute.** To trigger an Absolute alarm, a bearing temperature must exceed the limit that was established using the **Absolute option** on the Alarm Settings menu. This alarm limit is an offset, in degrees Fahrenheit, above the ambient temperature.
- **Differential.** To trigger a Differential alarm, a bearing temperature must exceed the opposite side bearing temperature of the same axle by a differential amount established using the **Differential option** on the Alarm Settings menu.
- **Pyrometer Saturation.** To trigger a Pyrometer Saturation alarm, an alarm-level heat (established using the **Absolute option** on the Alarm Settings menu) must be detected in the 16 inch (40.6 centimeter) interval ahead of the alarmed axle. (See **Appendix G - Predictive Gate Scanning** for more information about this process.) If an Absolute alarm or a Differential alarm has already been triggered for the axle, a Pyrometer Saturation alarm isn't generated.
- **Carside Slope.** To trigger a Carside Slope alarm, a bearing temperature must meet or exceed a calculated alarm level and a minimum heat value. The bearing temperature must also be at least twice the opposite bearing's temperature. If an Absolute alarm or a Differential alarm has already been triggered for the axle, a Carside Slope alarm isn't generated. The minimum heat value is established using the **Carside Minimum option** on the Alarm Settings menu.

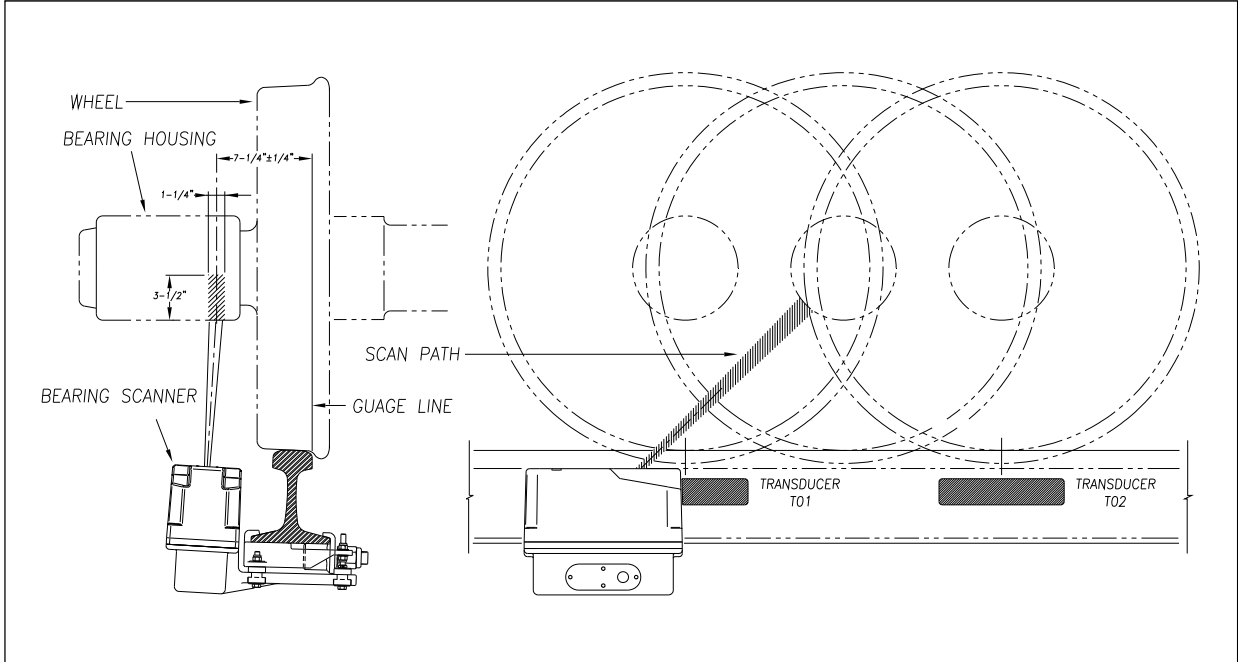
The system always checks for Absolute alarms. The system also checks for Differential alarms and Pyrometer Saturation alarms. However, their detection stops when the speed of the train drops below 7 mph (11.3 kph). In order for Carside Slope alarms to be processed, they must be enabled using the **Carside Slope option** on the Equipment menu. The detection of Carside Slope alarms also stops when the speed of the train drops below 7 mph (11.3 kph).

2.7.1 Bearing Scan Process

Bearing scanners are mounted in the center of the crib of two ties spaced at least 14 inches (35.6 centimeters) apart. Both bearing scanners are mounted in the crib immediately ahead of the gating transducers (that is, in the crib immediately to the south or west of the gating transducers). They are mounted directly opposite each other, one on each rail of the track. The hole on the top of the scanner covers faces north or east.



The bearing scanners are aligned to scan the bottom 3.5 inches (8.9 centimeters) of the bearing housing, about 7.25 inches (18.4 centimeters) from the gauge line.



Bearing temperatures are sampled for a short period before the gate opens, to support detection of Pyrometer Saturation alarms, and while the gate is open.

2.7.2 Referencing System

Pyrometers measure rapid changes in infrared energy emitted from objects passing through their field of view. The rail-mounted scanners are aligned to take advantage of this characteristic.

When no axle is present between the gating transducers, the scanner typically sees only the undersides of the cars passing over the site. The undersides of the cars are at or near ambient temperature, thus establishing the reference from which the elevated temperatures of bearings are measured. The pyrometers normalize during this time, producing a zero level signal.

Occasionally, the scanners are exposed to infrared emissions that are colder than the underside of the cars. Typically, this occurs in the gaps between cars when the scanners may reference on clear sky. This could present an erroneous reference if a bearing was scanned immediately following a sky shot, resulting in an abnormally high reading for the bearing. The pyrometers have internal circuitry to prevent the reference from shifting below the established zero reference.

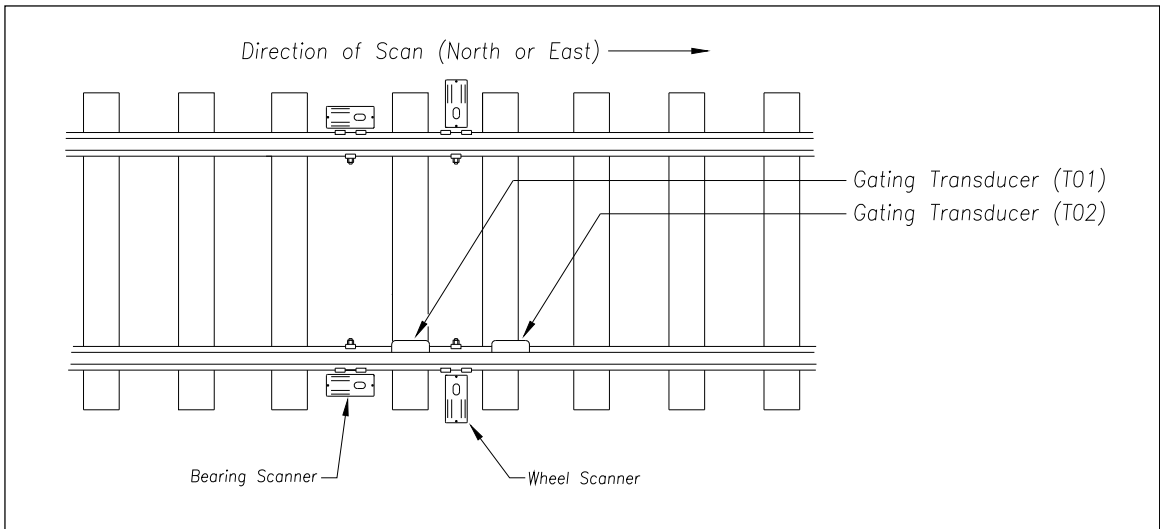
When a bearing passes through the field of view of the scanner, a rapid change in temperature is presented to the internal lithium tantalite crystal. This causes the signal level from the pyrometer to increase proportionally to the amount of exposed infrared energy. When an axle is between the gating transducers, the pyrometer signal is sampled at every 1/2 inch (1.27 centimeters) of wheel movement for a total of 48 samples and the maximum signal level is stored. This signal level measured in volts is converted to a digital value and expressed in degrees Fahrenheit above ambient temperature. This value is the basis for the alarm analysis done by the system.

2.7.3 Pyrometer Linearity

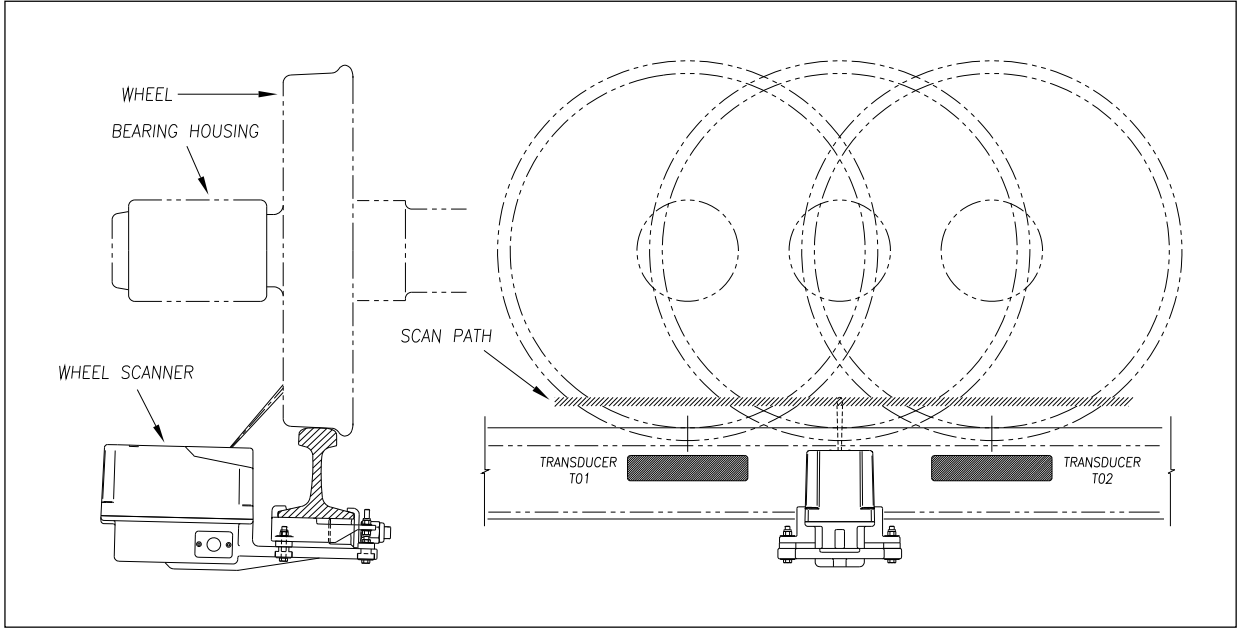
The output of the pyrometers is linear across most of the operating speed range of the system. However, the output of the pyrometers is nonlinear at either end of the operating speed range. To compensate for this nonlinear output, the firmware applies a correction factor to the sampled heat value. The correction factor applied to each bearing sample is based on the speed of the bearing (axle's ON time) as it passed through the gate and on the actual value read by the pyrometer. The correction factor is derived from a table that is keyed by the axle's ON time and heat value. Due to the fast nature of this lookup table, linearity compensation is done real-time so that detected alarms reflect the heat value after the linearity step has been done.

2.8 Hotwheel Alarms

When used, wheel scanners are mounted in the center of the crib of two ties spaced at least 14 inches (35.6 centimeters) apart. Both wheel scanners are mounted in the crib between the two gating transducers. They are mounted directly opposite each other, one on each rail of the track. The hole on the top of the scanner covers faces the center of the track.



The wheel scanners are aligned to scan about 4 inches (10.2 centimeters) above the rail.



The SmartScanNG system checks for hotwheels during the scanning process.

Wheel scanning alarms are limited to absolute only. To trigger a Hotwheel alarm, wheel scanners must be properly installed, hotwheel detection must be enabled, and a wheel temperature must exceed the limit that was established using the **Hotwheel option** on the Alarm Settings menu. This alarm limit is an offset, in degrees Fahrenheit, above the ambient temperature. Hotwheel detection is enabled using the **Hotwheel option** on the Equipment menu. When enabled, the SmartScanNG system detects and records every Hotwheel alarm that occurs. However, it only announces a maximum of six per train. For example, if a train contains nine Hotwheel alarms, the Train Detail report will show all nine, but only the first six are announced.

2.9 Auxiliary Alarms

The SmartScanNG system can support input from as many as four external alarm devices. Any device that provides an open relay contact upon alarm detection can be supported by the system. Auxiliary alarms supported by the SmartScanNG system are:

- **Dragging Equipment.** To trigger a Dragging-Equipment alarm, a dragging-equipment detector must be properly installed, dragging-equipment detection must be enabled, and the SmartScanNG system must sense an open relay contact from the dragging-equipment detector. Dragging-equipment detection is enabled using the **Dragger option** on the Equipment menu. When enabled, the SmartScanNG system detects and records every Dragging-Equipment alarm that occurs on a given train. However, the system only announces a maximum of six total alarms.
- **High Load (oversized loads).** To trigger a High-Load alarm, a high-load detector must be properly installed, high-load detection must be enabled, and the SmartScanNG system must sense an open relay contact from the high-load detector. High-load detection is enabled using the **High-Load option** on the Equipment menu.

When a high-load detector is configured for trip-wire operation, the SmartScanNG system only records one High-Load alarm, regardless of the high-load signal status. This is because you can only break a wire once.

When a high-load detector is configured for light-beam operation, the SmartScanNG system records every High-Load alarm that occurs. However, the system won't flag High-Load alarms on consecutive axles. At least one unalarmed axle must separate the alarmed axles. Regardless of the number of detected High-Load alarms, the system only announces a maximum of six total alarms. Also, all High-Load alarms are announced and reported as Dimensional Shipment.

The mode of operation (light beam or trip wire) isn't relevant when the SmartScanNG system finds a Stuck High-Load Detector Pretrain alarm. When this occurs, the system flags the pretrain condition as an integrity failure, disables high-load scanning for the remainder of the train, and doesn't assign a high-load condition to any of the axles.

- **Wide Load (shifted loads).** To trigger a Wide-Load alarm, two wide-load detectors (one on each side of the track) must be properly installed, wide-load detection must be enabled, and the SmartScanNG system must sense an open relay contact from either of the wide-load detectors. Wide-load detection is enabled using the **Wide-Load option** on the Equipment menu.

When a wide-load detector is configured for trip-wire operation, the SmartScanNG system only records one Wide-Load alarm, regardless of the wide-load signal status. This is because you can only break a wire once.

When a wide-load detector is configured for light-beam operation, the SmartScanNG system records every Wide-Load alarm that occurs. However, the system won't flag Wide-Load alarms on consecutive axles. At least one unalarmed axle must separate the alarmed axles. Regardless of the number of detected Wide-Load alarms, the system only announces a maximum of six total alarms. Also, all Wide-Load alarms are announced and reported as Dimensional Shipment.

The mode of operation (light beam or trip wire) isn't relevant when the SmartScanNG system finds a Stuck Wide-Load Detector Pretrain alarm. When this occurs, the system flags the pretrain condition as an integrity failure, disables wide-load scanning for the remainder of the train, and doesn't assign a wide-load condition to any of the axles.

Both high-load detectors and wide-load detectors must be either trip-wire detectors or light-beam detectors. The selection of trip wire or light beam is done using the **Clearance Type option** on the Equipment menu.

2.10 AC Power Monitoring

The SmartScanNG processor monitors the AC power input. If AC power is interrupted, a message will be posted to the Event Log and "AC Power Off" will appear just before the menu header in the Serial Interface. If AC power is off when a System Status report is requested, the message "AC Power Off" will be printed in the System Status Report. If AC power is off when a train passes the site, the message "AC Power Off" will appear in the System Alarms section of the Train Detail report.

3.0 Serial Interface

The serial interface allows **on-site** and **off-site** communication with the system. Using this interface is the only way to view reports and to change system parameters. If your site doesn't have telephone or Ethernet service, you cannot communicate with the system remotely (that is, **off-site**).

To use the interface locally, you need:

- A computer
- Communications software, which is installed on the computer
- A cable from the computer to a communications port on the Controller module

To use the interface remotely, you need:

- A computer
- Communications software, which is installed on the computer
- Other customer-provided hardware, software, and procedures

This section describes the serial interface for the SmartScanNG system. It covers how to enter or change the system parameters. The next section tells how to use the serial interface to produce reports.

It is necessary to go through a complete setup the first time a SmartScanNG system is installed at a new site. (If this is a double-track site, you need to do this for each SmartScanNG system.) After that, the Processor board (in the Controller module) retains the setup information. During a power outage, no setup information is lost if the battery on the Processor board is operative. If this battery isn't operative during the power outage, the only setup information that is lost is the date and time.

3.1 Main Menu

To display the Main menu:

- 1 If **on-site**, plug your computer into COM1 or COM2 (whichever is available) using a crossover (null-modem) cable.
- 2 If **off-site**, follow the customer-provided instructions.
- 3 Be sure that your computer has installed communications software, that it is set to use full duplex, and that the baud rate is set to 19,200.

Use your communications software to open a LOG file and capture the whole session to the file. When your session is complete, you may then view what you have done with an editor, print it with a printer, or store it for later retrieval.

- 4 On your computer, open a LOG file.
- 5 To get the serial interface to come up, press **[Esc]**.

The Main menu appears. Example below (yours may look different).

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 11:10
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
E) System Status
F) Last Train
G) Last Test Train
H) AEI Diagnostic Detail
I) Replay EOT Announcement - Local Only
J) Event Log
K) Maintenance Report
L) Setup
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

At the above prompt, you can:

- Produce one of the listed reports by selecting appropriate menu item. This is explained in the next section.
- Replay an EOT announcement. This is explained in this section.
- Access the Setup menu. This is explained in this section. It is from the Setup menu that you can set system parameters.
- Enter pass-through mode. This is explained in this section. Pass-through mode allows you to access two SmartScanNG systems with one modem.
- Access the System Functions menu. This is explained in this section.
- Communicate with an external device via **COM2**. This is explained in this section.

If a train is at the site when the Main menu is generated, "*** Train Is Present ***" is displayed just above the menu header for the Main menu and for every other menu.

- 6 When done, close the LOG file.
- 7 Select **Exit** to close the serial interface and return the system to normal operation.

When a session ends, if a modem was used, the system sends various commands to the modem to prepare it for future use. If at any time during the disconnect procedure, lines such as "+++ATH0" appear on your screen, these are merely commands preparing the modem for further use. They shouldn't be construed as anything that is meant for the user.

3.2 Setup Menu

To display the Setup menu:

- 1 Be sure that the Main menu is displayed.

Main menu example (yours may look different).

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 11:10
Main Menu
-----
      •
      •
K) Maintenance Report
L) Setup
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

- 2 Select the Setup menu

If the Setup menu is password protected, this prompt appears.

```
Enter Setup Password:
```

If necessary, contact STC Engineering or support desks for the default password. You are given three chances to type the correct password. When you don't type the correct password in three tries, the system returns to the Main menu.

Each time you incorrectly type the password, this error message appears.

```
Password Incorrect
```

If the password is less than 11 characters long, press **[Enter]** after typing the last character. If the password is the full 11 characters in length, pressing **[Enter]** isn't necessary.

The entry of the password is case sensitive. For example, the password "abc123" cannot be entered "ABC123."

This section tells how to create or change the password using the Setup Password submenu on the Setup menu.

If the Setup menu is not password protected, a menu and prompt like this appears. Also, after you type the password correctly for a password protected Setup menu, a menu and prompt like this appears (yours may look different).

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 11:21
Setup Menu
-----
A) Date and Time
B) MP/KP & Subdivision
C) Track Number
D) Alarm Limits
E) Equipment
F) Messages
G) AEI Reader Parameters
H) Load Default Setup Parameters
I) Units of Measure
J) Setup Password
K) Reassign Auxiliary Inputs
L) COM1 Tx 19200 / Rx 19200 N-8-1
M) COM2 Tx 19200 / Rx 19200 N-8-1
N) COM3 Tx 19200 / Rx 19200 N-8-1
O) COM4 Tx 19200 / Rx 19200 N-8-1
X) Exit
?
```

To access any of the Setup menu options, type the letter that corresponds to the desired menu option.

At any prompt, a timeout mechanism is in place to prevent the system from remaining in that state indefinitely. When a timeout occurs, the serial interface regresses to the previous menu. For example, if a timeout occurs in the Equipment menu, the system reverts to the Setup menu. If this menu times out, the system reverts to the Main menu. If this menu times out, the system disconnects the modem connection and resumes normal operation. At the Main menu, the timeout is set for five minutes. For all other prompts, the system uses several different timeout values.

If a train is at the site when the Setup menu is generated, "**** Train Is Present ****" is displayed just above the menu header for the Setup menu.

A message is posted to the event log each time a Setup Menu item or its sub-menu item is changed. Sub-menus include the Alarm Limits menu, the Messages menu, the Equipment menu, etc.

3 Select **Exit** to return to the Main menu.

Changes to the system parameters aren't reflected until after you have exited the Setup menu.

3.2.1 Date and Time

To set or change the date, the time, or both:

- 1 Be sure that the Setup menu is displayed.
- 2 Go to the Date and Time submenu

A prompt like this appears.

```
Current date is: 02/06/2015
Enter new date:
```

Depending on what was set by the **Date Format option** on the Units of Measure submenu, dates are in either **mm/dd/yyyy** or **dd/mm/yyyy** format, where **mm** is month, **dd** is day, and **yyyy** is year. You only type the last two digits of the year. The system automatically inserts the slashes and the first two digits of the year. For days, for months, or for the last two digits of years from 1 through 9, type leading zeros. Thus, for 6 February 2015, type **020615** when in **mm/dd/yyyy** format and **060215** when in **dd/mm/yyyy** format.

If you want to keep the displayed date, press **[Enter]**. If you don't, type a new date.

- 3 Type a new date or press **[Enter]**.

A prompt like this appears.

```
Current time is: 21:57:34
Enter new time:
```

Time is in 24-hour **hh:mm:ss** format, where 8 a.m. is 08:00:00, noon is 12:00:00, 8 p.m. is 20:00:00, and midnight is 00:00:00. Thus, for 17 seconds past 3:42 p.m., type **154217**. The system automatically inserts the colons. For hours, minutes, and seconds from 0 through 9, type leading zeros.

If you want to keep the displayed time, press **[Enter]**. If you don't, type a new time.

3.2.2 Milepost/Kilometer Post (MP/KP) and Subdivision

To set or change the milepost/kilometer post (MP/KP) and subdivision settings:

- 1 Be sure that the Setup menu is displayed.
- 2 Go to the MP/KP & Subdivision submenu.

A prompt like this appears.

```
MP/KP: 1794.5
New MP/KP:
```

MP/KP is in **nnnn.n** format. If the desired MP/KP has less than five digits, type leading zeros. If the desired MP/KP is an integer, type a trailing zero. Thus, for MP/KP 30, type **00300**. The system automatically inserts the decimal point.

- 3 Press **[Enter]** to keep the displayed MP/KP or type the new five-digit MP/KP.

The Select Service Area menu appears.

```
Select Service Area Menu
-----
A) None                B) Alberta
C) BC Interior         D) Chicago
E) DM&E               F) Manitoba
G) Montreal           H) NEUS
I) NOSA               J) Saskatchewan (A-M)
K) Saskatchewan (N-Z) L) Sosa
M) St. Paul           N) Vancouver
O) Great Sandhills Railway X) Exit
```

- 4 If the subdivision name is correct, press **[Esc]** and skip the remaining steps. If incorrect type the letter that corresponds to the service area you want.
- 5 Type the letter that corresponds to the subdivision name you want.

3.2.3 Track Number

To set or change the track number:

- 1 Be sure that the Setup menu is displayed.
- 2 Go to the Track Number submenu.

A prompt like this appears.

```
Track Direction is North/South, is this OK (Y/N)?
```

At this point, type either **Y** (yes) or **N** (no). If North/South is displayed (as it is above), typing **N** changes it to East/West. Typing **Y** keeps it North/South. If East/West is displayed, typing **N** changes it to North/South. Typing **Y** keeps it East/West.

This prompt appears.

```
Is this a multi-track site (Y/N)?
```

At this point, type either **Y** (yes) or **N** (no).

- 3 If you have only one track at this site:
 - a Type **N**
The Setup menu reappears.
 - b Skip the remaining steps.
- 4 If you have two or more tracks at this site, type **Y**

This prompt appears.

```
Select Track Designation Menu
-----
 1) North                2) South
 3) East                 4) West
 5) Connaught           6) Macdonald
 7) Siding              8) Number 1 Track
 9) Number 2 Track     10) Number 3 Track
11) Number 1 Main      12) Number 2 Main

Enter Number:
```

- 5 To not change the value, press **[Esc]** and skip the remaining steps.

The Setup menu reappears.

- 6 Type the digit or digits that correspond to the track designator you want.

Type three digits. Type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits. All typed nondigits are ignored.

If you did not type a number from 1 through 12, the message below appears followed by the above prompt. If this happens, return to step 7.

```
Invalid choice.
```

If you typed a number from 1 through 12, this prompt appears.

```
Is this correct ?
```

At this point, type either **Y** (yes) or **N** (no).

3.2.4 Alarm Limits

To set or change one or more of the alarm limits:

- 1 Be sure that the Setup menu is displayed.
- 2 Go to the Alarm Settings menu.

A menu and prompt like this appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 11:29
Alarm Settings Menu
-----
A) Absolute..... 180
B) Differential..... 150
C) Hot Wheel (North or East bound) 600
D) Hot Wheel (South or West bound) 600
E) Carside Slope..... 1.60
F) Carside Minimum..... 130
G) Cold Scanner Counter..... 3
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?
```

This menu option allows you to change the various alarm limits that affect system operations. The current setting for each limit is displayed. To change one of the alarm limit settings, start by typing the letter corresponding to the desired option. Then follow the prompts and enter desired settings.

3 To change the displayed absolute-alarm limit:

The Absolute setting is an offset in degrees Fahrenheit above the ambient temperature. When a bearing temperature exceeds this value, the system generates an Absolute alarm.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:34
Alarm Settings Menu
-----
A) Absolute..... 180
B) Differential..... 150
C) Hot Wheel (North or East bound) 600
      .
      .
      .
```

a Select **Absolute** from the Alarm Settings menu.

This prompt appears.

```
New Value ?
```

- b** If the new limit has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

A prompt like this appears. All typed nondigits are ignored.

```
New Value ? 200
Is this correct ?
```

- c** At this point, type either **Y** (yes) if correct or **N** (no) if incorrect.

If you type zero or a value greater than 300, this error message and prompt appear.

```
Minimum valid value is 1, Maximum valid value is 300
New Value ?
```

If you type an acceptable value, the **Absolute option** on the Alarm Settings menu changes and the Alarm Settings menu reappears.

- d** To leave the Alarm Settings menu and return to the Setup menu, select **Exit**.

The Setup menu reappears.

- 4** Select **Differential-alarm Limit** to change the displayed value :

The Differential setting is an offset in degrees Fahrenheit between that bearing temperature that is read by one bearing scanner and the one read by the other bearing scanner. One bearing temperature is compared to the other bearing temperature on the opposite end of the same axle. When the difference in temperatures exceeds the value on the screen, the system generates a Differential alarm. Checking for Differential alarms stops when the speed of the train drops below 7 mph (11.3 kph).

```
Minimum valid value is 1, Maximum valid value is 300
```

- 5** Select **Hotwheel-alarm Limit** (Alarm Settings Menu) to change the displayed value :

The Hot Wheel setting is an offset in degrees Fahrenheit above the ambient temperature. When a wheel temperature exceeds this value, the system generates a Hotwheel alarm. However, when the **Hotwheel option** on the Equipment menu is disabled, Hotwheel alarms aren't generated.

```
Minimum valid value is 1, Maximum valid value is 900
```

- 6** Select **Carside Slope** (Alarm Settings Menu) to change the displayed value:

The Carside Slope setting is the slope value used when doing carside slope analysis. In order for Carside Slope alarms to be processed, they must be enabled using the **Carside Slope option** on the Equipment menu. The detection of Carside Slope alarms stops if the speed of the train drops below 7 mph (11.3 kph).

Slope value is in **n.nn** format. If the new value has less than three digits, type leading zeros, trailing zeros, or both. Thus, for .98, type **098**. For 1.2, type **120**. The system automatically inserts a decimal point between the first and second digits.

Minimum valid value is 0.01, Maximum valid value is 2.55

7 Select **Carside Minimum** (Alarm Settings Menu) to change the displayed value:

The Carside Minimum setting is a minimum offset (in degrees Fahrenheit) used when doing carside-slope calculation/analysis. If the **Carside Slope option** on the Equipment menu is disabled during train passage, no carside-slope calculation/analysis is done and, thus, no Carside Slope alarms are generated. If the **Carside Slope option** on the Equipment menu is disabled when a Train Detail report is requested, no carside-slope calculation is done and, thus, no carside-slope alarm-limit lines are generated. The detection of Carside Slope alarms stops if the speed of the train drops below 7 mph (11.3 kph).

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 300

8 Select **Cold Scanner Counter** (Alarm Settings Menu) to change the displayed value:

The Cold Scanner Counter setting is the maximum number (per railside) of consecutive trains having:

- Cold Bearing Scanner alarms needed to generate a Successive Cold Bearing Scanners Exceeded alarm.
- Cold Wheel Scanner alarms needed to generate a Successive Cold Wheel Scanners Exceeded alarm.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 9

9 Select **Cold Scanner =< Temp** (Alarm Settings Menu) to change the displayed value:

The Cold Scanner =< Temp setting is an offset, in degrees Fahrenheit, above the ambient temperature. When no bearing on a given rail generates a delta temperature reading greater than or equal to this value, the system generates a Cold Scanner alarm for the given rail. There is a different Cold Scanner alarm for each rail. That is, there is a Cold North Scanner alarm and a Cold South Scanner alarm (or, depending on track direction, a Cold East Scanner alarm and a Cold West Scanner alarm).

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 30

10 Select **Cold Resistor Counter** (Alarm Settings Menu) to change the displayed value:

The Cold Res Counter is the maximum number (per raiiside) of consecutive trains, having Cold Resistor alarms, allowed before generating a Successive Cold Resistors Exceeded alarm. Under normal circumstances, cold resistor conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing identical Cold Resistor alarms equals or exceeds the **Cold Resistor Counter option** on the Alarm Settings menu, this condition becomes an Integrity Failure. If the number of consecutive trains bearing identical Cold Resistor alarms equals or exceeds the cold-resistor limit, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Resistors Exceeded."

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 9

11 Select **Bearing DSR Capture Temp** (Alarm Settings Menu) to change the displayed value:

The temperature samples collected by the system (as a bearing passes through the field of view of a scanner) are retained for those bearings that exceed the Bearing DSR Capture Temp. When the bearing temperature exceeds this value, it becomes part of a Dynamic Scan Rate (DSR) record. (Only 16 bearing-related DSR records are kept per train.) No alarm announcement is generated by the detection of a warm bearing.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 300

12 Select **Res Test: Minimum Rail Avg** (Alarm Settings Menu) to change the displayed value:

The Minimum Rail Avg is the value that the average heats for both bearings are tested against after a train leaves the site.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. The average heats for both bearings are tested against the value set by the **Resistor Test Minimum Rail Average option**.

If the average heats are less than the value set by the **Resistor Test Minimum Rail Average option**, the system generates a Cold Resistor alarm.

If the average heats are greater than or equal to this value, bearing temperatures are compared on an axle-by-axle basis. This second check determines if more than half of the temperatures read by the bearing scanner with the low-read resistor value are 70% or less than the temperatures read by the other bearing scanner on the same axle. If 50% or more of the axles are low, a Cold Resistor alarm is flagged. If not, a Cold Resistor alarm isn't flagged, but a Rail Resistor Test Overridden alarm is.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

```
Minimum valid value is 0, Maximum valid value is 50
```

13 Select Res Test: Minimum Wheel Avg (Alarm Settings Menu) to change the value:

The Minimum Wheel Avg is the value that the average heats for both wheels are tested against after a train leaves the site.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. The average heats for both wheels are tested against the value set by the **Resistor Test Minimum Wheel Average option**.

If the average heats are less than the value set by the **Resistor Test Minimum Wheel Average option**, the system generates a Cold Wheel Scanner Resistor alarm.

If the average heats are greater than or equal to this value, wheel temperatures are compared on an axle-by-axle basis. This second check determines if more than half of the temperatures read by the wheel scanner with the low-read resistor value are 70% or less than the temperatures read by the other wheel scanner on the same axle. If 50% or more of the axles are different, a Cold Wheel Scanner Resistor alarm is flagged. If not, a Cold Wheel Scanner Resistor alarm isn't flagged, but a Wheel Resistor Test Overridden alarm is.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

```
Minimum valid value is 0, Maximum valid value is 50  
New Value ?
```

14 Select Wheel DSR Capture Temp (Alarm Settings Menu) to change the displayed value:

The temperature samples collected by the system (as a wheel passes through the field of view of a scanner) are retained for those wheels that exceed the Wheel DSR Capture Temp. When the wheel temperature exceeds this value, it becomes part of a Dynamic Scan Rate (DSR) record. (Only 16 wheel-related DSR records are kept per train.) No alarm announcement is generated by the detection of a warm wheel.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits.

Minimum valid value is 1, Maximum valid value is 900

3.2.5 Equipment

To set or change one or more of the equipment parameters:

- 1 Be sure that the Setup menu is displayed.
- 2 Select the **Equipment Menu**.

A menu and prompt like this appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 11:31
Equipment Menu
-----
A) Dragger..... YES
B) Dragger Debounce..... 5
C) High Load..... NO
D) Wide Load..... NO
E) High/Wide Alarm Direction..... Both
F) Carside Slope..... YES
G) Hot Wheel..... YES
H) Clearance Type..... Light Beam
I) Clearance Mode..... Multiplexed
J) Winter Cycle..... YES
K) Transducer Gain..... Normal
L) AEI..... NO
M) GO TrainDetect..... NO
N) Gate Distance..... 24.0 inches
O) Resistor Test..... Enabled
P) Train Presence Hardware..... YES
Q) Wheel Scan Mode..... Rim (Peak)
R) Min TD Pulse Width..... 05mS
S) Bearing Scanner Orientation.. North
T) Sun-Shot Filter..... Disabled
U) Sun-Shot Filter Start Date..... n/a
V) AC Power Off Monitor..... Enabled
W) Selected Modem..... Velocity
X) Exit
```

The current setting for each menu option is displayed. For example, the screen above shows that Wide-Load alarm detection is inactive (NO). To change one of the settings, press the letter corresponding to the desired option. Except for the **Gate Distance option** and the **Dragger Debounce Time option**, which both require a value entry, all the options toggle between two settings. If you choose Alternate for the Selected Modem type, you can change any of the five available lines of modem setup commands.

3 Select **Dragger** (Equipment Menu) to toggle the current setting:

The Equipment menu shows whether Dragging-Equipment alarm detection is enabled (YES) or disabled (NO). When disabled, Dragging-Equipment alarms won't be announced nor stored and thus can't be printed. When enabled, Dragging-Equipment alarms are announced and stored. In the presence of a continuous Dragger signal, the system alarms consecutive axles. When the system reaches the fifth consecutive Dragger alarmed axle, it flags the Stuck Dragger condition.

4 Select **Dragger Debounce** (Equipment Menu) to change the current setting:

The Equipment menu shows the current dragger debounce time in milliseconds. The dragger debounce parameter provides a means for filtering false triggers that might be generated by the dragging-equipment detector. The dragger debounce parameter specifies the amount of time, in milliseconds, that the dragger input to the SmartScanNG system must be active before the system flags a Dragging-Equipment alarm.

If the new value has less than three digits, type leading zeros to make it three digits long or press **[Enter]** after typing one or two digits. The new value must be zero or a multiple of five up to a maximum value of 200. All typed nondigits are ignored. If you did not type a value that was a multiple of five, your value will be changed to the next larger value divisible by five.

5 Select **High Load** (Equipment Menu) to change the current setting:

The high-load setting toggles between active (YES) and inactive (NO). **To designate High-Load alarms**, YES must appear after the words High Load on the Equipment menu and Separate must appear after the words Clearance Mode on the Equipment menu. **To designate High-Wide alarms**, YES must appear after the words High Load on the Equipment menu and Multiplexed must appear after the words Clearance Mode on the on the Equipment menu.

High-Load, High-Wide, and Wide-Load alarms are not reported or announced. When one of these three alarms is flagged, **Dimensional Shipment** is reported and announced.

6 Select **Wide Load** (Equipment Menu) to change the current setting:

The wide-load setting toggles between active (YES) and inactive (NO). The **Wide-Load option** on the Equipment menu changes and the Equipment menu reappears.

7 Select **High/Wide Alarm Direction** to change the current setting. This menu has three settings: "North" or "East" (depending on track direction), "South" or "West", or "Both". This parameter affects the announcing of High/Wide alarms only. All alarms will still be flagged in the Train Detail Report. The default setting is "Both".

- When set to "North" or "East", only alarms from northbound or eastbound trains will be announced.
- When set to "South" or "West", only alarms from southbound or westbound trains will be announced.
- When set to "Both", all alarms will be announced regardless of direction.

- 8 Select **Carside Slope** (Equipment Menu) to change the current setting:

The carside-slope setting toggles between active (YES) and inactive (NO). If disabled (NO) during train passage, no carside-slope calculation/analysis is done and, thus, no Carside Slope alarms are generated. If disabled (NO) when a Train Detail report is requested, no carside-slope calculation is done and, thus, no carside-slope alarm-limit lines are generated.

- 9 Select **Hotwheel** (Equipment Menu) to change the current setting:

The hotwheel setting toggles between active (YES) and inactive (NO). When disabled, Hotwheel alarms won't be announced nor stored.

- 10 Select **Clearance Type** (Equipment Menu) to change the current setting:

The clearance-type setting toggles between **trip wire** and **light beam**. This option is only used for high-load detectors and wide-load detectors. Both high-load detectors and wide-load detectors must be either trip-wire detectors or light-beam detectors.

- 11 Select **Clearance Mode** (Equipment Menu) to change the current setting:

The clearance-mode setting toggles between **separate** and **multiplexed**. This option is only used for high-load detectors and wide-load detectors. When set to separate, the alarms coming from the high-load detectors are announced as High-Load alarms and the alarms coming from the wide-load detectors are announced as Wide-Load alarms. When set to multiplexed, the alarms coming from the high-load detectors and wide-load detectors are announced as High-Wide alarms.

- 12 Select **Winter Cycle** (Equipment Menu) to change the current setting:

The Equipment menu shows whether the winter-cycle feature is enabled (YES) or disabled (NO). To avoid errant heat readings caused by moisture on the pyrometer lenses, the scanners have heaters built into them. The heaters are made active, for varying periods of time, depending on an ambient temperature of 26.7°C (80°F) or less.

The table below lists the heater activation times for both normal and winter-cycle operation, grouped by ambient temperature.

Temperature Range in degrees Fahrenheit		Out of every ten seconds, the number of seconds the scanner heaters are active	
Low	High	Winter Cycle Disabled	Winter Cycle Enabled
--	16	4	8
17	35	3	7
36	51	2	2
52	80	1	1
80	--	Off	Off

The normal heater activation times aren't suitable for extremely cold climates, so the winter-cycle feature compensates for this. When this feature is disabled, the heater controls function normally. When enabled, the system increases the normal running time for the scanner heaters. The winter-cycle feature doesn't affect all the temperature ranges that the scanner heaters will activate on. It affects just the ones that are considered extremely cold. The winter-cycle setting toggles between enabled (YES) and disabled (NO).

- 13 Select **Transducer Gain** (Equipment Menu) to change the current setting:

The status of the transducer-gain setting toggles from **Normal** to **High** or from High to Normal, depending upon the current status of the option. Regardless of the setting, the SmartScanNG system starts every train with the transducer input comparator set to High mode. Then, if the train is traveling 20 mph (32 kph) or more and if the transducer gain was set to Normal mode, the transducer input comparator switches to Normal mode. This means that it is rarely necessary to set this option to High.

When the comparator is in High mode, the comparator converts lower voltage pulses from the transducer into output pulses. This causes the system to be more sensitive to transducer output. When the comparator is in Normal mode, the comparator has a better chance of filtering transducer pulses not caused by a wheel.

14 Select **AEI** (Equipment Menu) to change the current setting:

The status of the AEI setting toggles from YES (active) to NO (inactive) or from NO to YES, depending upon the current status of the option. When tag readers and attendant antennas and cabling are present, this parameter should be set to YES, so that the system knows to configure the readers and to use the AEI data transmitted from them. When there is no installed AEI subsystem attached to the SmartScanNG system, this parameter should be set to NO.

15 Select **GO TrainDetect** (Equipment Menu) to change the current setting:

The Equipment menu shows whether the **GO Train Detection option** is enabled (YES) or disabled (NO). This option, when enabled, inhibits the broadcasting of hotbox alarms when a train's consist has been identified as a GO Transit train. The AEI Interface module and associated equipment are required for this option to function correctly.

If the **AEI option** on the Equipment menu is set to **YES**, the status of the GO-train-detection setting changes. The status of the GO-train-detection setting toggles from YES (active) to NO (inactive) or from NO to YES, depending upon the current status of the option.

If the **AEI option** on the Equipment menu is set to **NO**, the status of the GO-train-detection setting does not change and this message appears.

```
-----  
AEI is required for GO Train functionality  
-----
```

After the above message appears, the Equipment menu reappears.

16 Select **Gate Distance** to change the current value for (aka gate width):

The Equipment menu shows the number of inches between the centers of the gating transducers.

The gate distance (aka gate width) is in **nn.n** format. If the new value has less than three digits, type leading zeros, trailing zeros, or both. Thus, for 2, type **020**. The system inserts the decimal point for you. The gate distance (it is usually 24.0) can be recorded in 1/10-inch increments to reflect the actual transducer spacing. Accurate gating-transducer spacing results in accurate speed calculations. All typed nondigits are ignored.

17 Select **Resistor Test** (Equipment Menu) to change the current setting:

The Equipment menu shows whether the resistor-test setting is enabled or disabled.

After a train clears a site, the system does an integrity test to verify that the scanners are operational and that the system can read alarm level heat. This test consists of reading the temperature of power resistors, mounted to the back of the scanner shutters, after the shutters close. The recorded temperature of the shutter resistors is compared against expected values, which are calculated using a combination of the amount of time the shutters were open and the system battery voltage.

When the resistor integrity test is in enabled mode, the existing algorithm is used to determine the minimum acceptable resistor temperature values for a given train. When in disabled mode, the resistor integrity test isn't performed.

The minimum required resistor temperatures for a given train are determined by the train's duration at the site and the resistor temperature baseline profile. This profile is established 20 minutes after the user calibrates the scanners with the autocalibration function. Twenty minutes is the cooling period required to allow the resistors to return to ambient temperature after autocalibration.

Typing the letter **N** toggles from one resistor test mode to another.

18 Select **Train Presence Hardware** (Equipment Menu) to change the current setting:

The status of the presence-hardware toggles from YES (active) to NO (inactive) or from NO to YES, depending upon the current status of the option. This option only affects whether, the No Approach Track alarm appears in reports. With this option set to NO (inactive), the No Approach Track alarm won't be reported. With this option set to YES (active), all detected advance-transducer failures will be reported with the appearance of the No Approach Track alarm in the System Alarms section of Train Detail reports.

19 Select **Wheel Scan mode** (Equipment Menu) to change the current setting:

The wheel-scan setting toggles from **Rim (peak)** to **Average**, or from **Average** to **Rim (peak)**. This option affects how the DSR is recorded. If Rim (peak) is selected, the maximum value of the DSR samples is recorded as the wheel's temperature. If Average is selected, the average of all the DSR samples is recorded as the wheel's temperature.

20 Select **Min Td Pulse Width** to change the current setting. Enter a 2 digit number. Minimum value of 03. Maximum value of 10.

21 Select **Bearing Scanner Orientation** to toggle through available options N, S, E, W, N/E, S/E, S/W, and N/W.

22 Select **Sun-Shot Filter** to change the current setting.

23 Select **Sun-Shot Filter Start** Date to change the current setting. The Sun-Shot Override feature allows the user to specify a 30 day period during which any alarm level pre-gate heat will be considered a “Sun-Shot” instead of a Pyro-Saturation bearing alarm. A “Sun-Shot” will not be considered a bearing alarm and no bearing alarm announcements will be made. In the event that a Sun-Shot Override happens during this 30-day period, the Train Detail report will contain a “Sun-Shot Override, [North|South|East|West] Rail” message for the axle, the train will be added to the Exceptions directory, and an event will added to the Event Log indicating that a Sun-Shot Override has occurred. Alarm level heat seen while the axle is between the gating transducers, in the gate, will still be flagged as bearing alarms. Only pre-gate heat will be considered sun-shots.

24 Select **AC Power Off Monitor** to change the current setting.

25 Choose **Selected Modem** (Equipment Menu) to change the setting:

The Equipment menu shows the current modem configuration. Support exists in the firmware for three modem types. Velocity provides support for the Velocity Modem board. Default provides a preset series of configuration commands for a standard (non-Velocity) modem. These commands cannot be altered. Alternate provides the ability to edit and customize the setup commands for a standard (non-Velocity) modem. This submenu also provides a method for forcing the initialization of the modem.

a From the Equipment menu

A prompt like this

```
The Default modem is selected, is this OK (Y/N)?
```

or like this

```
The Alternate modem is selected, is this OK (Y/N)?
```

or like this appears.

```
The Velocity modem is selected, is this OK (Y/N)?
```

b If the selected modem type is incorrect, type **N** until the value you want is shown.

The modem-configuration setting toggles from **default** to **alternate**, from **alternate** to **velocity**, or from **velocity** to **default**. The **Modem Type option** on the Equipment menu changes.

c If the selected modem type is correct, type **Y**

If you select Default, the system reverts to the default modem configuration.

d If the selected modem type is **Velocity**, return to step **3**.

e If the selected modem type is **Default**, go to step **i**.

- f If the selected modem type is **Alternate**, this prompt appears.

```
Are the setup commands OK (Y/N)?
```

- g If you need to modify one or more of the five displayed lines of modem setup commands, type **N**

This prompt appears.

```
Enter line number to change (1-5):
```

There are five available lines for setup command data, each line having a maximum of 25 characters of data. Entry of a line number is followed by a prompt for entry of the new modem setup data for the selected line number. Type in the desired modem commands, pressing **[Enter]** when done. If an entered command consumes the entire 25 characters of a line, the newly entered data is automatically saved upon entry of the 25th character. The contents of a line can be removed entirely by immediately pressing **[Enter]** when prompted for the new setup data. On the Equipment menu and on the System Status report, lines that have been cleared of data this way are left blank.

This screen fragment shows an example of changing the default baud rates, in the third line of setup data, from 9600 to 1200, and then erasing the fifth line of setup data. Pressing **[Enter]** to clear the fifth line is shown by **[Enter]** in the example.

```
Enter line number to change (1-5):3
Enter new setup commands (25 characters max):AT E0 X0 $SB1200 $MB1200
Are the setup commands OK (Y/N)?n

Enter line number to change (1-5):5
Enter new setup commands (25 characters max):[Enter]
Are the setup commands OK (Y/N)?
```

- h If you don't need to correct any of the five displayed lines of modem setup commands, type **Y**

If you plugged your computer into a serial port other than COM3 (the modem port), this prompt appears.

```
Initialize Modem now (Y/N)?
```

If you plugged into COM3 or have an **off-site** connection, this message appears.

```
The modem will initialize upon exiting the Main Menu.
```

- i If you plugged into COM3 or have an **off-site** connection, return to step 3.
- j If you want to initialize the modem now, type **Y**

The modem initialization routine uses the current modem setup data. A one second pause is placed between each line of setup commands as they are outputted to the modem. Empty setup command lines aren't outputted to the modem. After the modem is initialized, the Equipment menu reappears.

3.2.6 Messages

To set or change any of the message parameters:

- 1 Be sure that the Setup menu is displayed.
- 2 Go to the **Messages Menu**.

A menu and prompt like this appears. The options on the Messages menu are used to affect the phrases broadcast to a passing train or are used to modify the parameters associated with the rebroadcast function.

```

STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 13:09
Messages Menu
-----
A) Axles..... YES
B) Speed..... NO
C) Temperature..... YES
D) Length..... YES
E) Train Too Slow..... YES
F) Power Off (Low DC Voltage).... YES
G) Cars Count..... NO
H) Customer Name..... YES
I) Arrival Message..... NO
J) Lft/Rt Alarm Ref..... NO
K) Car ID With Alarm..... YES
L) US Speech Options..... NO
M) Detector Out..... YES
N) Request EOT Timer 0=no limit... 0
O) Rebroad DTMF Code..... 001
P) Primary Language..... English
Q) Secondary Language..... NONE
X) Exit
?

```

Enabling one or more of these options generates the ancillary messages: A (axle count), B (train speed), C (site ambient temperature), D (train length), E (train too slow), F (power off – low dc voltage), and G (number of cars). The other options of the Messages menu aren't used to generate ancillary messages.

- 3 Select **Axles** (Messages Menu) to toggle the setting:

The **Announce Axles option** on the Messages menu shows whether the total axle count is to be part of (YES) or not part of (NO) post-train announcements. When the Highrange Transducer Miscounts alarm or the Train Too Slow alarm occurs, the system won't announce axle count, even when this option is enabled.

- 4 Select **Speed** (Messages Menu) to toggle the setting:

The **Announce Speed option** on the Messages menu shows whether the exit speed of the train is to be part of (YES) or not part of (NO) post-train announcements.

Furthermore, if you selected mph with the **Speed Format option** on the Units of Measure submenu and the **Announce Speed option** on the Messages menu is enabled, the speed of the train will be announced in miles per hour. If you selected kph with the **Speed Format option** and the **Announce Speed option** is enabled, the speed of the train will be announced in kilometers per hour.

- 5 Select **Temperature** (Messages Menu) to toggle the setting:

The **Announce Temperature option** on the Messages menu shows whether the ambient temperature (taken at the site by the shielded temperature probe as the train leaves the site) is to be part of (YES) or not part of (NO) post-train announcements.

Furthermore, if you selected Celsius with the **Temperature Format option** on the Units of Measure submenu and the **Announce Temperature option** on the Messages menu is enabled, the ambient temperature will be announced in Celsius. If you selected Fahrenheit with the **Temperature Format option** and the **Announce Temperature option** is enabled, the ambient temperature will be announced in Fahrenheit.

If the temperature ancillary message is enabled and the temperature probe has been determined unreliable, "No Temperature" will be announced.

- 6 Select **Length** (Messages Menu) to toggle the setting:

The **Announce Train Length option** on the Messages menu shows whether the train length is to be part of (YES) or not part of (NO) post-train announcements. When the Highrange Transducer Miscounts alarm or the Train Too Slow alarm occurs, the system won't announce length of train, even when this option is enabled.

- 7 Select **Train Too Slow** (Messages Menu) to toggle the setting:

The **Announce Train Too Slow option** on the Messages menu shows whether a message indicating a very slow train (one going 7 mph (11.3 kph) or slower) is to be part of (YES) or not part of (NO) post-train announcements.

- 8 Select **Power Off** (Messages Menu) to toggle the setting:

The **Announce Power Off (Low DC Voltage) option** on the Messages menu shows whether the power-off message is to be part of (YES) or not part of (NO) post-train announcements. The generation of this message depends on battery voltage, not AC power. It is generated whenever the voltage coming from the battery is less than 12.6 VDC. AC power need never have been off to cause this to happen. However, most times it does indicate that AC power has been off, causing the battery to be drained.

- 9 Select **Cars Count** (Messages Menu) to toggle the setting:

The **Announce Number of Cars option** on the Messages menu shows whether the number of cars is to be part of (YES) or not part of (NO) post-train announcements.

- 10 Select **Customer Name** (Messages Menu) to toggle the setting:

The **Announce Customer Name option** on the Messages menu shows whether the customer's name is to be part of (YES) or not part of (NO) post-train announcements.

11 Select **Arrival Message** (Messages Menu) to toggle the setting:

The **Announce Arrival Message option** on the Messages menu shows whether the train-arrival message is to be announced (YES) or not announced (NO).

12 Select **Lft/Rt Alarm Ref** (Messages Menu) to change the setting:

The **Left-Right Alarm Reference option** on the Messages menu shows whether the alarm reference is announced as left or right (YES) or as north, south, east, or west (NO).

13 Select **Car ID With Alarm** (Messages Menu) to toggle the setting:

The **Announce Car Identification option** on the Messages menu shows whether the car-identification message is to be announced (YES) or not announced (NO). When this option is set to YES and an Exception Alarm is found on a car, the car-identification information is included in the post-train announcement for the train having the Exception Alarm. This, of course, will only happen if the **AEI option** on the Equipment menu is enabled (YES) and the AEI subsystem is functioning properly during train passage.

14 Select **Speech** (Messages Menu) to toggle the setting:

The **US Speech option** on the Messages menu shows whether the US-speech phraseology is used in announcements (YES) or not used in announcements (NO). When this option is set to YES, the words "Sticking Brake" and "Milepost" are used. When this option is set to NO, the words "Hotwheel" and "Mile" are used instead.

15 Select **Detector Out** (Messages Menu) to toggle the setting:

The **Announce Detector Out option** on the Messages menu shows whether the detector-out phraseology is to be used (YES) or not used (NO). When this option is set to YES, the words "Message Complete, Detector Out" are appended to the post-train announcement.

16 Select **Request EOT Timer** (Messages Menu) to change the setting:

The **Repeat Timeout Period option** on the Messages menu shows a value for the repeat-timeout-period setting. If a nonzero value is shown, the value is the number of minutes that you have to request a repeat of the last end-of-train (EOT) message. If zero is shown, the last EOT message is always available for rebroadcast. The train crew makes the actual request for rebroadcast. The repeated message has the word "rebroadcast" at the beginning and ending of the message.

Timeout value must be from 000 to 240. If less than three digits, include leading zeros.

17 Select **Rebroad DTMF Code** (Messages Menu) to change the setting:

The **Rebroadcast DTMF Code option** on the Messages menu shows the rebroadcast-DTMF-code setting. The stored DTMF code is the touchtone digits that trigger a rebroadcast. Up to seven characters may be entered into this setup parameter. However, the only allowable characters are the digits, the asterisk, and the pound sign. All other typed characters are ignored.

The SmartScanNG system monitors radio traffic. When it receives the proper DTMF code, it rebroadcasts the last end-of-train message, provided the request EOT timer hasn't expired.

This prompt appears.

```
Rebroadcast DTMF Code:
```

Type the new DTMF code. If you typed less than seven characters, press **[Enter]**.

- 18** Select **Primary Language** to change the setting. Valid values are “English” or “French”. The first instance of a radio announcement will be made in the Primary Language first, and then be followed by the same announcement made in the Secondary Language, if Secondary Language is not set to None.
- 19** Select **Secondary Language** to change the setting. Valid values are “English”, “French”, or “None”. The first instance of a radio announcement will be made in the Primary Language, and then be followed by the same announcement made in the Secondary Language, if Secondary Language is not set to None.

3.2.7 AEI Reader Parameters

The AEI reader parameters directly affect how the AEI readers operate to acquire tags while a train is passing the site.

To set or change any of the AEI reader parameters:

- 1** Be sure that the Setup menu is displayed.
- 2** Go to display the **AEI Reader Parameters Menu**.

A prompt like this appears.

```
STC SmartScanNG, MP/KP-1234.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
AEI Reader Parameters Menu
-----
A) ID Separation..... 2 IDs
B) Consecutive Reads..... 3 Reads
C) Decode As ASCII Tags..... Disabled
D) AEI Reader Interface.....
X) Exit
```

Shown above are the parameters currently defined in the system.

ID Separation specifies the number of intervening tags that must be read and reported before a given tag is reported again. Valid values are 1, 2, 3, and 4. The default is 2.

Consecutive Reads specifies the number of times that a tag must be read before it is considered a valid (reportable) tag. Valid values are 1, 2, 3, and 4. The default is 2.

Decode as ASCII Tags specifies whether the tag data is to be interpreted as ASCII characters or in the encoded format.

- 3 Select **ID Separation** to change the parameter.
Type **Y** to scroll through values 1 to 4. Type **N** to select.
- 4 Select **Consecutive Reads** to change the parameter.
Type **Y** to scroll through values 1 to 4. Type **N** to select.
- 5 Select **Decode as ASCII Tags** to change the setting.
The decode-as-ASCII-tags setting toggles between enabled (YES) and disabled (NO).
- 6 Select the **AEI reader interface option**.

This message appears.

```
Entering AEI Reader Interface
<Type EXIT to quit>
```

- 7 Type **EXIT** to leave the AEI reader interface:
- 8 To leave the AEI Reader Parameters menu and return to the Setup menu, type **X**

This prompt appears.

```
Initialize Reader now (Y/N)
```

- 9 To initialize the reader, type **Y**
The Setup menu reappears.

3.2.8 Load Default Setup Parameters

An option to load default setup parameters is included to assist installers in setting up a new system. When this menu item is selected, the parameters listed below are assigned the values listed below. A "yes" after a parameter means that it is "enabled." A "no" means that it is "disabled." Blanks after "Rebroad DTMF Code" mean that it is disabled.

<u>Alarms:</u>		<u>Equipment:</u>		<u>Messages:</u>	
Absolute	180	Dragger	Yes	Axles	Yes
Differential	130	Drag. Debounce Test	5 ms	Speed	No
Hotwheel	600	High Load	No	Temperature	Yes
Carside Slope	1.60	Wide Load	No	Length	No
Carside Minimum	130	High/Wide Alarm Det	Both	Train Too Slow	Yes
Cold Rails	3	Carside Slope	Yes	Power Off (Low VDC)	Yes
Cold Rail Temp	10	Hotwheel	Yes	Cars Count	No
Cold Res Counter	3	Clearance Type	Light Beam	Customer Name	Yes
Warm Bering Trigger	50	Clearance Mode	Multiplexed	Arrival Message	No
Minimum Rail Avg	25	Winter Cycle	Yes	Lft/Rt Alarm Ref	No
Minimum Wheel Avg	28	Transducer Gain	Normal	Car ID With Alarm	Yes
Warm Wheel Trigger	150	AEI	No	US Speech Options	No
<u>DCS Parameters:</u>		Go Train Detect	No	Detector Out	No
Auto Reporting	Disabled	Gate Distance	24.0	Request EOT Timer	0
Report Trains W/ ?Alarms	Yes	Resistor Test	Enabled	0 = No Limit	
Report Trains W/ Integ.	Yes	Train Presence Hdwr	Yes	Primary Language	English
Retry Attempts	5	Wheel Scan Mode	Rim Scan	Secondary Language	None
Retry Delay	180	Min Td Pulse Width	05 ms		
Phone #1	None	AC Power Off Mon	Enabled		
Phone #2	None	Selected Modem	Velocity	<u>AEI:</u>	
Phone #3	None	<u>Units Of Measure:</u>		ID Seperation	2
		Date	mm/dd/yy	Consecutive Reads	2
		Ambient Temperature	Celsius	Decode As ASCII Tags	Dis
		Speed	MPH		
		Length	Feet		

To load the default setup parameters:

- 1 Be sure that the Setup menu is displayed.

Select **Load Default Setup Parameters**

This prompt appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 13:47
Load Defaults
-----
A) Canadian
B) US
X) Exit
?
```

- 2 Select **Canadian** or **US** to load respective default setup parameters

If Canadian Defaults is selected, MSG:US Speech Options is set to NO, UOM:Ambient Temperature is set to Celcius, and MSG:Length is set to NO. If USA Defaults is selected, MSG:US Speech Options is set to YES, UOM:Ambient Temperature is set to Fahrenheit, and MSG:Length is set to YES.

Loading may take a few seconds. When finished, the Setup menu reappears.

3.2.9 Units of Measure

To set or change any of the units-of-measure parameters:

- 1 Be sure that the Setup menu is displayed.

- 2 Go to **Units of Measure Menu**.

A prompt like this appears.

```
STC SmartScanNG, MP/KP-1234.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Units of Measure Menu
-----
A) Date..... mm/dd/yyyy
B) Ambient Temperature..... Celsius
C) Speed..... MPH
D) Length..... Feet
X) Exit
```

Shown above are the parameters currently defined in the system. They define how the system will show the date, ambient temperature, speed, and length of train in the reports and how voice announcements are made.

Date is reported in either **dd/mm/yyyy** or **mm/dd/yyyy** format. Select **Date** to toggle between what is shown and its other possibility. This parameter doesn't affect the announcement of messages, but it does affect the format of the date shown on menus.

Ambient temperature is reported in either degrees **Celsius** (C) or degrees **Fahrenheit** (F). Select **Ambient Temperature** to toggle between what is shown and its other possibility. If you selected Celsius, the ambient temperature will be announced in Celsius. If you selected Fahrenheit, the ambient temperature will be announced in Fahrenheit.

Speed is reported in either miles per hour (**mph**) or kilometers per hour (**kph**). Select **Speed** to toggle between what is shown and its other possibility. If you selected mph, the speed of the train will be announced in miles per hour. If you selected kph, the speed of the train will be announced in kilometers per hour.

Length of train is reported in either **feet** (ft) or **meters** (m). Select **Length** to toggle between what is shown and its other possibility. If you selected feet, the length of the train will be announced in feet. If you selected meters, the length of the train will be announced in meters.

- 3 To leave the Units of Measure submenu and return to the Setup menu, type **X**.

3.2.10 Setup Password

To set or change the password needed to enter the Setup menu:

- 1 Be sure that the Setup menu is displayed.
- 2 To go to the Setup Password submenu.

A prompt like this appears.

Enter Setup Password:

This prompt allows you to enter a password into the system. A password can consist of from 1 to 11 characters. If it is less than 11 characters long, press **[Enter]** after typing the last character. If it is the full 11 characters long, pressing **[Enter]** isn't necessary. If you type no characters and just press **[Enter]**, the password function would be turned off. There would be no password required to access the Setup menu.

The entry of the password is case sensitive. For example, abc#123 isn't the same as ABC#123.

- 3 Type the password.
- 4 If the password is less than 11 characters, press **[Enter]**.

The Setup menu reappears.

3.2.11 COM1, COM2, COM3, & COM4

When **on-site**, you would normally plug your computer into COM1 or COM2 (whichever is available) using a crossover (null-modem) cable. You would normally not plug it into any other serial port.

To change the parameters for serial port COM1:

- 1 Be sure that the Setup menu is displayed.
- 2 To go to the COM1 submenu.

If COM1 is currently being used, this message appears.

```
Editing the settings of the port currently in use is not allowed.
```

If COM1 is currently not being used, the COM1 submenu appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/06/2015 14:35
Com1 Tx-19200/Rx-19200 N-8-1
-----
A) Increase Tx Baud
B) Decrease Tx Baud
C) Increase Rx Baud
D) Decrease Rx Baud
X) Exit
?
```

If necessary, make appropriate menu selection to either increase or decrease the transmit and/or receive baud rate for COM1. Depending on which letter you type and what baud rate was displayed when you typed it, the baud rate changes to either the next or the prior value from these values: 150, 300, 600,1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200. Type appropriate menu option to select comm settings (parity, data, and stop bits).

Type the letter of what you want to change. The COM1 submenu reappears.

- 3 If you aren't done changing the parameters for COM1, return to step 3.
- 4 If you are done changing the parameters for COM1, type X

The Setup menu reappears.

Com port settings for **COM2, COM3, & COM4** can be changed in like manner.

3.3 System Functions Menu

To execute one or more system functions:

- 1 Be sure that the Main menu is displayed.

The Main menu looks like this.

```

      .
      .
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
      .
      .

```


2 Select the **System Functions Menu**.

This prompt appears.

```
Type "System" :
```

You are given unlimited chances to type the word "system." The entry of this word is **not** case sensitive. After you type it, the System Functions menu appears.

To access any of the System Functions menu options, type the letter that corresponds to the desired menu option. A message is posted to the event log any time a menu item from the System Functions Menu is selected.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
System Functions Menu
-----
A) Radio Test - Speaker and Radio Broadcast Mess.
B) Vocabulary Test - Speaker Only
C) N/A
D) Radio Inhibit (3 min)
E) Manual Test Mode - 2 Min Test Train, No Radio O/P to train
F) 1KHz Test Tone - Speaker and Radio - (10 sec)
G) Auto-Calibration
H) Reset the Computer Operating Properly (COP) Counters
I) Remote System RESET
J) Delete All Stored Train Data
K) Clear Event Log
L) Scanner Resistor Quick Check
X) Exit
?
```

If a train is at the site when the System Functions menu is generated, ***** Train Is Present ***** is displayed just above the menu header for the System Functions menu. During that time, if you select any item on the System Functions menu, you'll be prompted with **"Train Is Present. Continue?"** You must type **Y** to continue. Note that most items on the Systems Functions menu should not be performed while a train is present at the site.

3 To execute the **radio test**:

The **Radio Test option** on the System Functions menu is used to broadcast a short message through the speaker (on top of the SmartScanNG enclosure) and through the radio. Using this option lets you verify that the speaker and radio are working properly.

"Mile" is announced in Canada and "milepost" is announced in the USA. The wording "G-S-R detector" (instead of "C-P detector") is announced if either subdivisions Burstall or Empress were selected.)

At single-track CP sites in Canada, the text of the message is usually "Testing, C-P-detector, mile (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track CP sites in Canada, the text of the message is usually "Testing, C-P-detector, mile (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

At single-track GSR sites in Canada, the text of the message is usually "Testing, G-S-R-detector, mile (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track GSR sites in Canada, the text of the message is usually "Testing, G-S-R-detector, mile (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

At single-track CP sites in USA, the text of the message is usually "Testing, C-P-detector, milepost (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track CP sites in USA, the text of the message is usually "Testing, C-P-detector, milepost (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:36
System Functions Menu
-----
A) Radio Test - Speaker and Radio Broadcast Mess.
B) Vocabulary Test - Speaker Only
C) N/A
   :
```

- a** Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in and its volume knob is turned to the middle position.
- b** From the System Functions menu, select **Radio Test**.

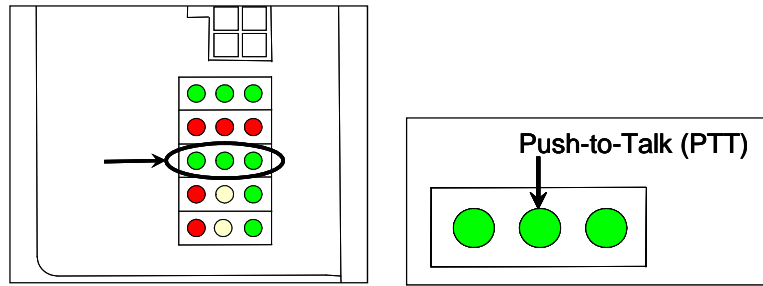
This message appears.

```
Starting Radio Test
```

If the system isn't currently making any other voice announcements, it begins the Radio Test announcement. After the announcement finishes, the System Functions menu reappears.

If the system is currently making a voice announcement, the firmware displays the message "System Is Currently Making Voice Announcements! Try Again Later" and redisplay the System Functions menu.

- c** While listening to the message, look at the **third row of LEDs** on the status panel. The **middle green LED** should be lit.



If this LED isn't lit, the system's ability to send a message to the radio might be inhibited by the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

4 To execute the **vocabulary test**:

The **Vocabulary Test option** on the System Functions menu is used to enunciate all of the stored speech phrases. This announcement is broadcast through the speaker (on top of the SmartScanNG enclosure), but not through the radio. Therefore, it isn't affected by the **Radio Inhibit option** being enabled.

The text of the message is usually "zero, one, two, three, four, five, six, seven, eight, nine, **2-second beep**, C-P-detector, mile, main, system-not-working, message-complete, dimensional-shipment, rebroadcast, hotwheel, defect, axle, dragging-equipment-near, north, south, rail, east, west, track, car-I-D, no, hotbox, more-than, alarms, number, siding, testing, train-to-slow, total-axles, speed, temperature, length, minus, point, power-off, repeat, detector-out, Macdonald, Connaught, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, first, second, third, fourth, fifth, sixth, left, right, side, load, inspect-entire-train-both-sides-from-first-alarm-to-rear-of-train-or-as-instructed, scanner-resistor-test-beginning-in, minutes, degrees, total-cars, milepost, sticking-brakes, sub, Aldersyde, Brechter, Breton, Brooks, Crowsnest, Hatton, Hoadley, Irricana, Lacombe, Laggan, Leduc, Macleod, Maple Creek, Montana, Pecten, Red Deer, Scotford, Shantz, Taber, Wetaskiwin, Willingdon, Boundary, Byron Creek, Cranbrook, Fording River, Mountain, Moyie, Nelson, Robson Spur, Rossland, Shuswap, Windermere, C-and-M, Elgin, Fox Lake, M-and-P, River, Tomah, Watertown, Arborg, Arcola, Bredenbury, Broadview, Carberry, Emerson, Estevan, Glenboro, Gretna, Ignace, Keewatin, La Riviere, Lac Du Bonnet, Minnedosa, Napinka, Rocanville, Winnipeg Beach, Adirondack, Brockville, Farnham Connection, Lacolle, M-and-O, Outremont, Parc, Seaway, South Bank Branch, Saint Luc Branch, Vaudreuil, Westmount, Winchester, Adirondack Running Track, Canadian Connector, Canadian Main Line, Colonie Main Line, Freight Main Line, Sunbury, Heron Bay, Kaministiquia, Nemegos, Nipigon, White River, Bromhead, Bulyea, Expanse, Gravelbourg, Hardisty, Indian Head, Kelvington, Kerrobert, Lanigan, Lloydminster, Macklin, Melfort, Outlook, Radville, Reford, Sutherland, Swift Current, Tisdale, Tyvan, Weyburn, Wilkie, Wynyard, Yarbo, Belleville, Canpa, Cartier, Dunnville, Galt, Hamilton, Havelock, Mactier, Montrose, Nephton, North Toronto, Parry Sound, Stevensville Spur, Waterloo, Windsor, Bemidji, Carrington, Detroit Lakes, Elbow Lake, Merriam Park, M-N-and-S Spur, Newtown, Noyes, Paynesville, Portal, Veblen, Withrow, Cascade, loco Spur, Marpole Spur, Mission, Page, Thompson, Van Horne Spur, Westminster, G-S-R Detector, Burstall, Empress."

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:36
System Functions Menu
-----
A) Radio Test - Speaker and Radio Broadcast Mess.
B) Vocabulary Test - Speaker Only
C) N/A
      :
```

Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in and its volume knob is turned to the middle position.

b From the System Functions menu, select **Vocabulary Test**.

This message appears.

```
Starting Vocabulary Test.
```

If the system isn't currently making any other voice announcements, it begins the Vocabulary Test announcement. After the announcement finishes, the System Functions menu reappears.

If the system is currently making a voice announcement, the firmware displays the "System Is Currently Making Voice Announcements! Try Again Later" message and the System Functions menu reappears.

c Return to step **3**.

5 Select **Radio Inhibit (3 min)** to execute the radio inhibit function.

The **Radio Inhibit option** on the System Functions menu is used to prevent radio activation for three minutes. During this time, any announcements generated by the system are broadcast through the speaker (on top of the SmartScanNG enclosure), but not through the radio. This feature may be overridden by recalling this submenu and then typing **N**. If you want to inhibit the radio (that is, you want to disable road channel broadcasts), type **Y**. If you don't want to inhibit the radio (that is, you want to enable road channel broadcasts), type **N**.

6 To initiate the **manual test mode** (System Functions menu):

The **Manual Test Mode option** on the System Functions menu is used to have the system open all the shutters and simulate transducer pulses for about two minutes. During this time, a person can check various aspects of the installed components. In this mode, the system runs the ramp function without generating heats. The train is marked as a test train. There won't be any voltage applied to the scanner inputs.

The test continues until 486 axles are simulated. You can stop this test by pressing **[Esc]**.

The data generated for this test train is stored in the Test Train directory, which contains data on the last test train only. The Last Test Train report gets its data from this directory. If you want to start manual test mode, type **Y**. If you don't want to start manual test mode, type **N**.

7 To generate the **1KHz test tone** (System Functions menu):

The **1KHz Test Tone option** on the System Functions menu is used to generate a continuous 1KHz tone for about 10 seconds. This test tone is to broadcast through the speaker (on top of the SmartScanNG enclosure) and through the radio.

a Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in and its volume knob is turned to the middle position.

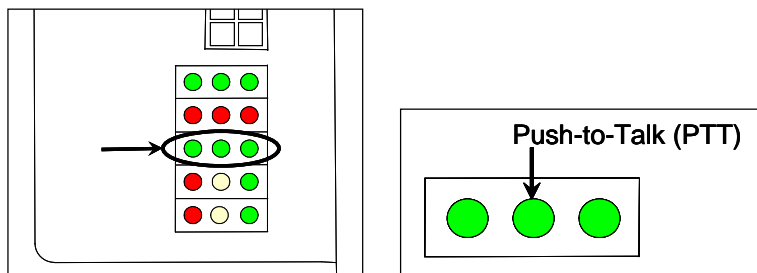
b From the System Functions menu, select **1KHz Test Tone**.

If the system isn't currently making any other voice announcements, it begins the tone. After the tone finishes, the System Functions menu reappears.

If the system is currently making a voice announcement, the firmware displays the message "System Is Currently Making Voice Announcements! Try Again Later" and redisplay the System Functions menu.

c While listening to the tone, look at the **third row of LEDs** on the status panel.

The **middle green LED** should be lit.



If this LED isn't lit, the system's ability to send a tone to the radio might be inhibited by the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

8 To start **autocalibration** (System Functions menu):

The SmartScanNG system self-calibrates its pyrometer interface circuitry. You need only put a preheated calibrated heat source on a scanner and place the system in autocalibration mode by using the **Auto-Calibration option** on the System Functions menu. The system then scans all pyrometer inputs until the signal from the calibrated heat source is located. The necessary adjustments to the related interface circuitry are automatically made while the system monitors its own progress by analyzing changes in the heat signals. Once the procedure has been completed, autocalibration mode is disengaged and the calibration results are displayed on your computer. For more details, see **Appendix E - Calibration of Scanners**.

a Place a preheated calibrated heat source on the scanner to be calibrated.

- b** From the System Functions menu, select **Auto-Calibration**.

The SmartScanNG system will now calibrate the channel associated with the scanner on which the heat source has been placed. Follow along on your computer screen until you see "Auto-Calibration Disengaged." This message is an indication that the system is done with the calibration procedure. To abort the process, press **[Esc]** (on your computer) or remove the heat source (from the scanner).

- c** When "Auto-Calibration Disengaged" is displayed on your computer, remove the calibrated heat source.

Upon completion of autocalibration, the system acquires the scanner resistor temperature baseline values. The process begins with a 20 minute wait period in which the resistors are allowed to cool down. The system counts down during this period, sounding a tone each minute. After the 20 minute cool down period, the system opens and closes the shutters for a period of 8 minutes.

- 9** To reset the **COP counters** (System Functions menu) :

Associated with each microprocessor on the Processor board is a Computer Operating Properly (COP) counter. The SmartScanNG system uses these counters to keep track of every time the system automatically resets itself or the customer manually resets it, via the **Remote System Reset option** on the System Functions menu. These counters are used for diagnostic purposes only. The current value of these counters appears on the System Status report. Selecting the **Reset the COP Counters option** resets each COP counter to zero.

- 10** To force a **system reset** (System Functions menu):

The **Remote System Reset option** on the System Functions menu allows you to force a system reset through a remote connection. It can also be used locally.

To reset the system, type **Y**

This message appears.

```
System RESET will occur 5 seconds after exiting from  
the Serial Interface!
```

- 11** To **delete all stored train data** (System Functions menu):

The **Delete All Stored Train Data option** on the System Functions menu allows you to erase all of the stored train data. This encompasses all of the data on the trains in the Trains directory, Exceptions directory, and Test Train directory. After deleting all train data, there isn't any way of regenerating it. The data is gone forever.

- 12** To **delete all events stored in the Event Log** (System Functions menu):

The **Clear Event Log option** on the System Functions menu is used to erase all of the events stored in the Event Log and displayed on the Event Log report. After deleting the log, there isn't any way of regenerating it. The data is gone forever.

13 To initiate **Scanner Resistor Quick Check** (System Functions menu):

Selection of the Scanner Resistor Quick Check option assists in diagnosing and correcting scanner resistor failures. It emulates a post train “Cold Resistor Alarm” check for a train that had the scanner shutter doors open for 31-seconds.

The following excerpt is the output of a successful Scanner Resistor Quick Check:

```
Starting Scanner Resistor Quick Check.

Opening Shutters!
Scanner Resistor Quick Check finished in NN seconds.
Closing Shutters!

Rail1  :Pass  [Read:130 Required: 74  Method:Baseline]
Rail2  :Pass  [Read:271 Required: 58  Method:Baseline]
Wheel1 :Pass  [Read:183 Required: 40  Method:Baseline]
Wheel2 :Pass  [Read:260 Required: 132 Method:Baseline]

*** All scanners passed Resistor Quick Check.

Ambient Temperature = +34
System Idle Battery Voltage = 13.0
Open Shutter Battery Voltage = 12.8
```

The statement “***** All scanners passed Resistor Quick Check**” indicates that the minimum scanner resistor cool-down period had elapsed and the resistor temperatures were in the acceptable range.

In order for Scanner Resistor Quick Check to be successful, a resistor cool-down period of at least 20 minutes must be observed. The user will be warned if the cool-down period has not elapsed, but given the option to proceed regardless. The following excerpt is the output of a Scanner Resistor Quick Check initiated during the cool-down period.

```

Starting Scanner Resistor Quick Check.

*** Warning: Resistors are not completely cool!
*** 18 minutes left in cool-down period!
*** Do you wish to proceed Y or N?

Opening Shutters!
Scanner Resistor Quick Check finished in NN seconds.
Closing Shutters!

Rail1  :Pass  [Read:131 Required: 74  Method:Baseline]
Rail2  :Pass  [Read:271 Required: 58  Method:Baseline]
Wheel1 :Pass  [Read:183 Required: 40  Method:Baseline]
Wheel2 :Pass  [Read:261 Required: 132 Method:Baseline]

All scanners resistor temperatures okay.
Resistors were not completely cool.

Ambient Temperature = +34
System Idle Battery Voltage = 13.0
Open Shutter Battery Voltage = 12.8

```

The statement “All scanners resistor temperatures okay. Resistors were not completely cool” indicates that the resistor temperatures were good enough to pass the resistor check but the minimum cool-down period of 20 minutes had not elapsed.

In addition, all clearance alarm inputs are monitored during quick check. If inputs are activated at any time during Scanner Resistor Quick Check, a message will be printed in the results. The following example is the output of a Scanner Resistor Quick Check where all of the clearance alarms were activated during the check:

```

Starting Scanner Resistor Quick Check.

Opening Shutters!
Scanner Resistor Quick Check finished in NN seconds.
Closing Shutters!

Rail1  :Pass  [Read:130 Required: 74  Method:Baseline]
Rail2  :Pass  [Read:271 Required: 58  Method:Baseline]
Wheel1 :Pass  [Read:183 Required: 40  Method:Baseline]
Wheel2 :Pass  [Read:260 Required: 132 Method:Baseline]

*** All scanners passed Resistor Quick Check.
*** Dragger activated during Resistor Quick Check.
*** High Load activated during Resistor Quick Check.
*** Wide Load 1 activated during Resistor Quick Check.
*** Wide Load 2 activated during Resistor Quick Check.

Ambient Temperature = +34
System Idle Battery Voltage = 13.0
Open Shutter Battery Voltage = 12.8

```


3.4 Replay EOT Announcement

The EOT message for every train that is stored in longterm memory can be replayed through the local speaker or printed as text. The replaying of the EOT message doesn't activate the PTT so it isn't broadcast over the radio. Trains can be selected from the Trains Directory or Exceptions Directory.

To replay the EOT announcement for a given train:

- 1 Be sure that the Main menu is displayed.

The Main menu looks like this.

```
      .  
H) AEI Diagnostic Detail  
I) Replay EOT Announcement - Local Only  
J) Event Log  
      .
```

- 2 From the Main menu, select **Replay EOT Announcement – Local Only**.

This prompt appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single  
Subdivision: Kaministiquia (6314)  
09/02/2015 14:48  
Select Directory  
-----  
A) Trains  
B) Exceptions  
X) Exit  
?
```

- 3 Select **Trains** or **Exceptions**.
- 4 Type the desired train number to get the following prompt. If you typed one or two digits, press **[Enter]**.

```
Text Version?
```

If the user selects “Y”, a text representation of the EOT announcement will be printed to the Serial Interface port. If “N” is selected, the EOT announcement is announced over the speaker. Due to code space limitations, the text version of the EOT announcement is only presented in English.

A sample text rebroadcast is shown below:

```
Text rebroadcast
-----
CP DETECTOR MILE ONE TWO THREE FOUR POINT EIGHT Kaministiquia TWO
ZERO DEGREES
AXLES ONE TWO SIX SYSTEM NOT WORKING LENGTH SEVEN NINE NINE MILE ONE
TWO THREE
FOUR POINT EIGHT OUT
-----
End Text rebroadcast
```

3.5 Enter Pass-Through Mode

The **Pass-Through option** on the Main menu allows you to access two or more SmartScanNG systems with one modem. To make this happen:

- At double-track sites, attach a crossover (null-modem) cable from **COM4 of system1** to **COM1 of system2**.
- System1 is the one with the telephone line or an Ethernet connection attached and the modem installed.
- Dial into system1.
- Keep selecting pass-through mode from the Main menus, until the system you want to communicate with is reached.

Pass-through mode is not available on SmartScanNG systems that communicate with a host computer over a distributed communication network.

To use pass-through mode at a double-track site:

- 1 Be sure that the Main menu for **system1** is displayed.

The Main menu looks like this.

```
      :
      :
L) Setup
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

- 2 From the Main menu, select **Enter Pass-Thru Mode**.

This prompt appears.

```
Type "Pass" :
```

You are given unlimited chances to type the word "pass." The entry of this word is **not** case sensitive.

If there is a response from the SmartScanNG system on COM4 within 5 seconds, this message appears.

```
Entering Pass-Thru Mode.
```

If there isn't a response from the SmartScanNG system on COM4 within 5-seconds, this message appears followed by the reappearance of the Main menu.

```
No detector attached to COM4!
```

- 3 After receiving the "entering pass-thru mode" message, press **[Esc]** to display the Main menu for system2.

You can now communicate with system2.

- 4 To return to system1, from the Main menu, type **X**

Upon leaving system2, this message appears followed by the Main menu for system1.

```
Leaving Pass-Thru Mode.
```

3.6 Straight-Through Communication

The **Straight-Through option** on the Main menu provides a means for communicating with a device that has been connected to the SmartScanNG system's COM2 serial port.

To use straight-through mode:

- 1 Be sure that the Main menu is displayed.

The Main menu looks like this.

```
      .
      .
      .
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

- 2 From the Main menu, select **Straight-Thru Comms (COM2)**.

This prompt appears.

```
Entering Pass-Thru Mode. Type "EXIT# $" to quit.
```

- 3 When you are done using pass-through mode, type **EXIT# \$**

The entry of this word is case sensitive.

After typing the word in correctly, this message appears followed by the Main menu.

```
Leaving Pass-Thru Mode.
```

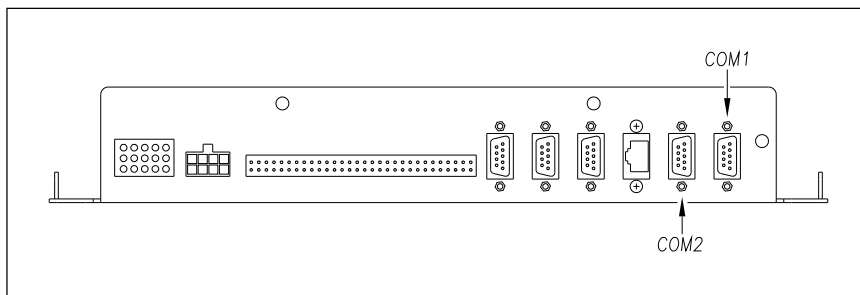
4.0 Producing Reports

The SmartScanNG system provides:

- Train Summary report
- Train Detail report
- Exception Summary report
- extended Exception Detail report
- abbreviated Exception Detail report
- System Status report
- Last Train report
- Last Test Train report
- AEI Diagnostic Detail report
- Event Log report
- Maintenance report
- DSR Records report from Trains Directory
- DSR Records report from Exceptions Directory
- Setup Parameters report

This section shows a sample of each report with a description of each field. It also lists step-by-step instructions on producing each report both **on-site** and **off-site**. The instructions for each report start with you being at the Main menu, which is described below.

- 1 If **on-site**, plug your computer into COM1 or COM2 (whichever is available) using a crossover (null-modem) cable.



- 2 If **off-site**, follow the customer-provided instructions.
- 3 Turn on your computer.
- 4 Be sure that your computer has installed communications software, that it is set to use full duplex, and that the baud rate is set to 19,200.

Use your communications software to open a LOG file and capture the whole session to the file. When your session is complete, you may then view what you have done with an editor, print it with a printer, or store it for later retrieval.

- 5 On your computer, open a LOG file.
- 6 To get the serial interface to come up, press **[Esc]**.

The Main menu appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:37
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
E) System Status
F) Last Train
G) Last Test Train
H) AEI Diagnostic Detail
I) Replay EOT Announcement - Local Only
J) Event Log
K) Maintenance Report
L) Setup
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

At the above prompt, you can produce one of the listed reports by selecting its menu option.

If a train is at the site when the Main menu is generated, "*** Train Is Present ***" is displayed just above the menu header for the Main menu.

- 7 When done, close the LOG file.
- 8 To exit the serial interface and return the system to normal operation, type **X**

When a session ends, if a modem was used, the system sends various commands to the modem to prepare it for future use. If at any time during the disconnect procedure, lines such as "+++ATH0" appear on your screen, these are merely commands preparing the modem for further use. They shouldn't be construed as anything that is meant for the user.

4.1 Train Summary Report

The Train Summary report lists all trains currently stored in the Trains directory. The buffer for the Trains directory holds data on about 140,000 axles, but no more than 100 trains. A train number is shown for each train entry so that a Train Detail report may easily be produced for any train listed on the summary.

The report is divided into a header section and a detail section. The header section contains general information about the site. The detail section contains summary information on each train that passed the site.

The SmartScanNG system calculates a checksum for each train. This checksum is stored with the train data. Later, when the system retrieves this data, it recalculates the checksum. If the two checksums don't match, the Train Summary report so states in the detail section. So, instead of getting a train record, you'll get a checksum-error line.

Below is a sample of part of a Train Summary report when Hotwheel alarm detection was disabled during report processing and when the AEI subsystem was disabled during train passage. (When the report is run, if the **Hotwheel option** on the Equipment menu is disabled, the hotwheel information is hidden. When the report is run, if the **AEI option** is disabled, the tag information isn't hidden.) When this sample report was run, temperature was set to Celsius (**C**) by the Units of Measure submenu on the Setup menu. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
TRAIN SUMMARY
=====
Reader: CP2.38-P 02/03/2015      Comm: CP2.38-P 02/03/2015      Speech: CPR4.90
MP/KP: 1234.8      Track: Single      Subdivision: Kaministiquia (6314)

Alarm Limits..      Absolute: 180      Carside Slope..... 1.60
                   Differential: 150      Minimum... 130
                   Hot Wheel NE: 600      Cold Scanner =< Temp.... 10
                   Hot Wheel SW: 600

-----
Train#  Date   Time  Cars  Axles  T01  T02  Tags  (MPH)  r  Rail  Wheel  Wheel  Amb  Bat
                               AEI Speed i  Average  Average  Temp
-----
W 29 I  02/06/15 10:56  41  166  166  166  0  51  E  18  43  360  250  +20C  13.3v
W 28 I  02/06/15 10:52  22  92  92  92  0  51  E  18  43  360  250  +20C  13.3v
W 27 I  02/06/15 10:47  21  86  86  86  0  39  W  25  48  360  254  +20C  13.3v
+ 26 B  02/06/15 10:41  91  366  366  366  0  44  W  20  43  360  254  +20C  13.3v
W 25 I  02/06/15 10:37  31  126  126  126  0  45  E  18  43  360  250  +20C  13.3v
+ 24 I  02/06/15 10:31  82  332  332  332  0  51  E  18  43  360  250  +20C  13.3v
W 23 I  02/06/15 10:26  41  166  166  166  0  51  E  18  43  360  250  +20C  13.3v
.
.
.

```

Below is a sample of part of a Train Summary report when the **Hotwheel option** on the Equipment menu is enabled. The contents of your report will be different.

```

      .
      .
      .
Alarm Limits..      Absolute: 180          Carside Slope.... 1.60
                  Differential: 150        Minimum... 130
                  Hot Wheel NE: 600      Cold Scanner =< Temp.... 10
                  Hot Wheel SW: 600
-----
Train#  Date  Time Cars Axles T01  T02  Tags  (MPH)  r  Rail  Wheel  Amb  Bat
                                AEI Speed i  Average  Average
                                North South North South Temp
-----
W 29 I  02/06/15 10:56  41  166  166  166   0   51  E   18   43  360  250  +20C  13.3v
W 28 I  02/06/15 10:52  22   92   92   92   0   51  E   18   43  360  250  +20C  13.3v
      .
      .
      .

```

Below is a sample of part of a Train Summary report with fields related to the **GO Transit Train functions** highlighted in gray. Also, hotwheel alarm detection was disabled during report processing and the AEI subsystem was disabled during train passage. The contents of your report will be different.

```

      .
      .
      .
Alarm Limits..      Absolute: 180          Carside Slope... 1.60
                  Differential: 110        Minimum... 130
                  Cold Scanner =< Temp... 20
-----
Train#  Date  Time Cars Axles T01  T02  Tags  (MPH)  r  Rail  Wheel  Amb  Bat
                                AEI Speed i  Average  Average
                                North South North South Temp
-----
 21 A  02/06/15 11:22  19   92   92   92   11   61  E   40   22  +14C  13.8v
 20 g+02/06/15 10:14  22   92   92   92    7   61  E   40   21  +14C  13.8v

 19 g 02/05/15 17:19  21   92   92   92   22   61  E   40   22  +14C  13.8v
 18 g 02/05/15 17:18  21   92   92   92   22   61  E   40   22  +14C  13.8v
 17  02/05/15 17:15  21   92   92   92   22   61  E   40   22  +14C  13.8v
 16 Ag+02/05/15 17:07  11   52   52   52   14   20  E   40   28  +14C  13.8v
 15  02/05/15 17:05  11   52   52   52   14   20  E   40   28  +14C  13.9v
      .
      .
      .

```

Between the Train# column and the Date column is a space that is used to flag trains on which an alarm or a system integrity issue was detected. Only those alarms that were broadcast by a site, for a given train, will cause the letter A to appear in this column. So, where the GO Transit train functionality has been enabled, if a bearing temperature is found to exceed the Absolute alarm threshold, the related alarm message will not be broadcast and the 'A' will not be printed in the Alarm/Integrity indicator column.

To the Alarm/Integrity indicator column, two columns have been added which are intended to convey information related specifically to the GO Transit train function. In the column immediately to the right of the Alarm/Integrity indicator column, for each train that was identified as a GO Transit train, the character 'g' will appear. In the column immediately to the right of this column, on those consists identified as GO Transit trains, where a bearing-related alarm was detected and suppressed a '+' character will be printed.

On the report shown above:

- Trains 16, 18, 19, and 20 were identified as GO Transit trains.
- On train 16, a non-bearing temperature related alarm was detected and an "excessive" bearing temperature was detected (but was suppressed from the broadcast messages).
- Train 21 wasn't identified as a GO Transit train and some alarm (bearing related or otherwise) was detected on it.

The table below lists the fields from the header section and the contents of each field.

Heading	Contents of Field
Reader Comm Speech	For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).
MP/KP	The five-digit milepost/kilometer post of the site.
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Subdivision	The subdivision name of the site.
Alarm Limits	These are the alarm parameters currently defined in the system setup. These values were in place when this report was run. <ul style="list-style-type: none"> • The value after Absolute is set by the Absolute option on the Alarm Settings menu. • The value after Differential is set by the Differential option on the Alarm Settings menu. • The heading Hot Wheel only appears if the Hotwheel option on the <u>Equipment menu</u> is <u>enabled</u>. The value after Hot Wheel is set by the Hotwheel option on the <u>Alarm Settings</u> menu. • The value after Carside Slope is set by the Carside Slope option on the Alarm Settings menu. • The value after Minimum is set by the Carside Minimum option on the Alarm Settings menu. • The value after Cold Rail Temp is set by the Cold Rail Temperature option on the Alarm Settings menu.

The table below lists the fields from the detail section and the contents of each field.

Train#	Date	Time	Cars	Axles	TO1	TO2	AEI Tags	Exit Speed (MPH)	DIR	Rail Avg North	Rail Avg South	Amb Temp	Bat
29	2/06/2015	21:46	94	422	422	422	0	53	E	45	41	+ 1C	14.1v
w 28	2/06/2015	20:06	117	488	488	488	0	48	E	44	38	+ 0C	14.2v
+ 27	2/06/2015	18:55	71	328	328	328	0	59	E	47	40	+ 0C	14.0v

Heading	Contents of Field
(Unlabeled)	There is an unlabeled column before the one labeled "Train#." It is used to flag trains that have DSR records stored for them. This column can contain B, P, W, S, + (plus sign), or nothing. If "B," at least one <u>bearing</u> was found on the train that was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the train was passing the site. If "W," at least one <u>wheel</u> was found on the train that was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu. If "S," a System Alarm was detected. If "+," more than one problem was detected (that is, some combination of B, P, and W was detected). If blank, no warm bearing, warm wheel, or pyrometer noise was detected.
Train#	The number that identifies the train in the Trains directory.
(Unlabeled)	The <u>first</u> unlabeled column after Train# can contain an * (asterisk) <u>or</u> nothing. If an asterisk, one of the resistor tests was overridden.
(Unlabeled)	The <u>second</u> unlabeled column after Train# can contain A, B, I, S, <u>or</u> nothing. If "A," an Exception Alarm was detected on the train. If "I," an Integrity Failure was detected. If "B," both an Exception Alarm and an Integrity Failure were detected. If S a System Problem Notification Alarm was detected. If blank, no Exception Alarm or Integrity Failure was detected.
(Unlabeled)	The <u>third</u> unlabeled column after Train# can contain g, g+, <u>or</u> nothing. If "g," a GO Transit train was identified. If "g+," a GO Transit train was identified <u>and</u> a bearing-related alarm was detected and suppressed
Date	The date the train arrived at the site. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu
Time	The time the train arrived at the site. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.
Cars	The total number of cars counted by the SmartScanNG system.
Axles	The total number of axles counted by the SmartScanNG system.
TO1	The total number of hits counted by gating transducer TO1. TO1 is the first gating transducer going north or east from the bearing scanner. It is the gating transducer <u>closest</u> to the bearing scanner.
TO2	The total number of hits counted by gating transducer TO2. TO2 is the second gating transducer going north or east from the bearing scanner. It is the gating transducer <u>farthest</u> from the bearing scanner.

Heading	Contents of Field
AEI Tags	The total number of AEI tags stored. The number of tag pairs found plus those single tags that lack a match. This heading always appears, even if the AEI subsystem is disabled using the AEI option on the Equipment menu.
Exit Speed	The train's exit speed. Speed is in either miles per hour (mph) or kilometers per hour (kph), depending on what was set by the Speed Format option on the Units of Measure submenu.
Dir	The direction the train was traveling. Valid values are N, S, E, and W.
Rail Average	Under this heading are two columns, one for each bearing scanner, containing the average temperature read by the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.
Wheel Average	Under this heading are two columns, one for each wheel scanner, containing the average temperature read by the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This field appears only when the Hotwheel option on the Equipment menu is enabled.
Amb Temp	The ambient temperature when the train arrived at the site. Temperature is in either degrees Celsius (C) or degrees Fahrenheit (F), depending on what was set by the Units of Measure submenu on the Setup menu when this report was printed.
Bat	The system battery voltage when the train arrived at the site.

To produce a Train Summary report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```

STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
      .
      .
      .

```

- 2 Select **Train Summary** report.

After the report is produced, the Main menu reappears.

- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.2 Train Detail Report

The Train Detail report provides detailed information on a single train. When choosing this report, you'll be prompted for a train number. When prompted, enter a train number from the Train Summary report. The train number appears under the column titled "Train#" in the detail section of the Train Summary report.

Carside Slope alarm detection is enabled/disabled using the **Carside Slope option** on the Equipment menu. Hotwheel alarm reporting is enabled/disabled using the **Hotwheel option** on the Equipment menu. The AEI subsystem is enabled/disabled using the **AEI option** on the Equipment menu.

Where wheel scanners are properly installed, wheel temperatures are always recorded, even if the **Hotwheel option** is disabled. On the other hand, if the **AEI option** is disabled during train passage, no AEI information is recorded. If the **Carside Slope option** is disabled during train passage, no Carside Slope alarms are generated. But, if it is enabled when a report is requested, a carside-slope alarm-limit line is generated for each car of the train.

Below is a sample of part of a Train Detail report when both the **AEI option** and the **Hotwheel option** were disabled when the report was requested. The **Carside Slope option** was enabled. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
Train#: 29          Exit Speed: 51MPH          MP/KP: 1234.8
Date: 02/06/15     Axles: 166          Track: Single
Time: 10:56        Direction: East     Temperature: + 20C
Length: 3452       Shutters Open: 57   Battery: 13.3v

Subdivision: Kaministiquia (6314)
=====
Resistor          Filters
Rail  Max Avg Read Req CF% Txdr Count  A  B Alarm      Limit  Carside Parm
-----
North 21 18 189 249B 24  TO1 166    0  0 Absolute    180   Slope: 1.60
South 45 43 280 92I  0  TO2 166    0  0 Differential 150   Minimum: 130
                                   Hot Wheel    600
                                   Cold Scanner =< Temp 10

DSW - BrgS:11 BrgE:37 WhlS:1 WhlE:96

Resistor
Wheel Max Avg Read Req CF%
-----
North 362 360 300 203B 0
South 260 250 224 45I  0
=====
Firmware Versions
-----
Reader: CP2.38-P 02/03/2015  Comm: CP2.38-P 02/03/2015  Speech: CPR4.90
-----

System Alarms
-----
Integrity Failure
Stuck Dragger Pretrain
Stuck Dragger During Train Passage

Axle Alarm Summary
-----
NONE
-----

Car Al Ax N_Brg S_Brg N_Wh S_Wh On Off Spng T1 T2 Alarms
-----
1 1 21 43 360 250 27 0 2.0 17 17
  W 2 20 43 362 250 27 72 7.4 13 14
  W 3 18 43 360 254 27 64 6.8 14 14
  W 4 18 43 360 250 27 684 53.3 13 14
  W 5 18 43 360 250 27 64 6.8 14 14
  W 6 18 43 360 250 27 64 6.8 14 14
  Carside Ave: North 18 South 43 Calculated CS Limits: North 160 South 200

2 W 7 18 44 362 250 27 193 16.5 14 14
  W 8 20 43 362 250 27 75 7.6 14 14
  W 9 18 42 362 254 27 684 53.3 13 14
  W 10 18 43 360 250 27 64 6.8 14 14
  Carside Ave: North 18 South 43 Calculated CS Limits: North 160 South 200
.
.
.

```

Below is a sample of part of a Train Detail report when both the **AEI option** and the **Hotwheel option** on the Equipment menu were enabled when the report was requested. The **Carside Slope option** on the Equipment menu was disabled. Also, both the **AEI option** and the **Hotwheel option** were enabled while the specified train was passing the site. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
Train#: 321           Speed: 48 KPH           MP/KP: 1234.5
Date: 02/06/15      Axles: 52           Track: Single
Time: 08:26         Direction: South     Temperature: + 21C
Length: 1013        Shuttters Open: 36   Battery: 14.2v
=====
Resistor           Filters
Rail  Max Avg Read Req  CF% Txdr Count  A  B Alarm      Limit  Carside Parm
-----
East  63 62  2 68I 0  TO1 86  0  0 Absolute    180   Slope: 1.60
West 232 64  2 68I 0  TO2 86  0  0 Differential 130   Minimum: 155
                                Hot Wheel    652
                                Cold Rail Temp 10

Resistor
Wheel Max Avg Read Req  CF%
-----
East  10 10  49 58I 0
West  14 14  48 58I 0

=====
AEI System Data

Tags Read           Tags Stored: 11
-----
Antenna 0: 12
Antenna 1: 0
=====
Firmware Versions
-----
Reader: CP2.38-P 02/03/2015   Comm: CP2.38-P 02/03/2015   Speech: CPR4.90
-----

System Alarms
-----
Cold East Resistor
Cold West Resistor
Successive Cold Resistors Exceeded
Integrity Failure

Axle Alarm Summary
-----
14 East Rail Absolute TTEX 354063 R2, B End Leading
16 West Rail Absolute TTEX 354063 L4, B End Leading
-----

Car Al Ax N_Brg S_Brg N_Wh S_Wh On Off Spng T1 T2 Alarms
-----
1      1 20  42 360 250 30  0  2.0 17 17
W      2 18  43 360 250 30  87  7.7 14 14
W      3 18  42 360 250 30  78  7.1 14 14
W      4 18  43 362 250 30  760 52.1 14 13
W      5 18  43 360 254 30  78  7.1 14 14
W      6 18  43 360 254 30  78  7.1 14 14
:
:

```

The Train Detail report is divided into three sections. The header section contains general information about the site (like the MP/KP) and some detail information about the specific train (like the train's exit speed) that passed the site. The detail section contains more detailed information (like the car number) about the specific train. In between these two sections is the system-events section, which contains all System Alarms and Exception Alarms associated with the train.

The SmartScanNG system calculates a checksum for each train. This checksum is stored with the train data. Later, when the system retrieves this data, it recalculates the checksum. If the two checksums don't match, the Train Detail report so states (as shown below).

```

Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
CHECKSUM ERROR: StartAddr 134879 EndAddr 134930

```

In addition, each axle has a checksum associated with it. If an axle is determined to have an invalid checksum, the Train Detail report so states in the associated axle's row (as shown below).

```

Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
Train#: 135                      Speed: 30 KPH                      MP/KP: 0246.8
.
.
.
-----
Car Al Ax N_Brg S_Brg N_Wh S_Wh On Off Spcng T1 T2 Alarms
1    1 20 42 360 250 30 0 2.0 17 17
W    2 18 43 360 250 30 87 7.7 14 14
W    3 18 42 360 250 30 78 7.1 14 14
4    CHECKSUM ERROR: StartAddr 136416 EndAddr 136427
W    5 18 43 360 254 30 78 7.1 14 14
W    6 18 43 360 254 30 78 7.1 14 14
Carside Ave: North 18 South 42 Calculated CS Limits: North 160 South 197
2 W 7 20 43 360 254 30 214 16.1 14 14
W 8 18 43 360 250 30 89 7.9 14 14
.
.
.

```

The table below lists the fields from the header section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Trains directory.
GO Train	If the train was identified as a GO Transit train, the wording "GO Train" appears. If the train was <u>not</u> a GO Transit train, this field is blank.
Date	The date the train arrived at the site. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu.
Time	The time the train arrived at the site. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.
Length	Length of train. Length is in either feet (ft) or meters (m), depending on what was set by the Units of Measure submenu on the Setup menu.
Speed	The train's exit speed. Speed is in either miles per hour (mph) or kilometers per hour (kph), depending on what was set by the Speed Format option on the Units of Measure submenu.
Axles	The total number of axles counted by the SmartScanNG system.
Direction	The direction the train was traveling. Valid values are North, South, East, and West.
Shutters Open	The number of seconds it took the train to pass over the site.
MP/KP	The five-digit milepost/kilometer post of the site.
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Temperature	The ambient temperature when the train arrived at the site. Temperature is in either degrees Celsius (C) or degrees Fahrenheit (F), depending on what was set by the Units of Measure submenu on the Setup menu.
Battery	The system battery voltage when the train arrived at the site.
Subdivision	The subdivision name of the site.
Rail	Location of the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west

Heading	Contents of Field
Max	The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the bearing scanner on a given rai1side. For example, if the ambient temperature (when the train arrived at the site) is 77°F (25°C) and the value in this field is 112, the maximum temperature would be 189°F (87.2°C).
Avg	The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the bearing scanner on a given rai1side. For example, if the ambient temperature (when the train arrived at the site) is 86°F (30°C) and the value in this field is 55, the average temperature would be 141°F (60.6°C).
Resistor Read	The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the bearing scanner on a given rai1side.
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the bearing scanner on a given rai1side to avoid a Cold Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field.
	<p>One of five uppercase letters follows the Resistor Req temperature.</p> <ul style="list-style-type: none"> B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. <p>For D, T, and V, the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.</p>
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
Txdr Count	The gating transducer designator (either TO1 or TO2) followed by the total number of hits on that transducer.
Filter A	The number of transducer pulses that were filtered by the pulse width filter (that is, those that were smaller than 3 milliseconds).
Filter B	The number of transducer pulses that were within 300 milliseconds of the previous transducer pulse.

Heading	Contents of Field
Alarm Limit	<p>The Hotwheel alarm level; the Hotbox alarm levels for Absolute and Differential; and the Cold Rail Temperature offset. These values were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Absolute is set by the Absolute option on the Alarm Settings menu. • The value after Differential is set by the Differential option on the Alarm Settings menu. • The value after Hot Wheel is set by the Hotwheel option on the Alarm Settings menu. • The value after Cold Rail Temp is set by the Cold Rail Temperature option on the Alarm Settings menu.
GO Train Processing Enabled	<p>If the GO Transit train functionality was <u>enabled</u> when the train crossed the site, the wording "GO Train Processing Enabled" appears. If the GO Transit train functionality was <u>disabled</u> when the train crossed the site, this field is blank.</p>
Carside Parm	<p>The Carside Slope alarm parameter values that were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Carside Slope is set by the Carside Slope option on the Alarm Settings menu. • The value after Minimum is set by the Carside Minimum option on the Alarm Settings menu.
Wheel	<p>Location of the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Max	<p>The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the wheel scanner on a given rai-side. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Avg	<p>The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the wheel scanner on a given rai-side. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Resistor Read	<p>The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the wheel scanner on a given rai-side. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>

Heading	Contents of Field
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the wheel scanner on a given railside to avoid a Cold Wheel Scanner Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.
	One of five uppercase letters follows the Resistor Req temperature. B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. For D , T , and V , the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
AEI System Data	The number of AEI tags read (by antenna0 and antenna1) and the total number of tags stored for the train. Where both tags of a tag pair are operational, each antenna will read one tag of the pair. The total number of tags stored represents the number of tag pairs found plus those single tags that lack a match. This heading and the columns under it appear only when the AEI subsystem is <u>enabled</u> using the AEI option on the Equipment menu.
Firmware Versions	For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).

The table below lists the fields from the system-events section and the contents of each field.

Heading	Contents of Field
System Alarms	Lists each condition that could affect the ability of the system to scan trains properly for defects. If none of these conditions were encountered, this header is followed by the word "none." Appendix A - System Alarms describes the conditions that the system flags as System Alarms.
Axle Alarm Summary	Lists each Exception Alarm found on the train and the axle on which it was found. If none were found, this header is followed by the word "none."

The table below lists the fields from the detail section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Al	This column can contain B , P , W , + (plus sign), or nothing. If "B," at least one <u>bearing</u> was found on the axle that was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the axle was passing the site. If "W," at least one <u>wheel</u> was found on the axle that was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu. If "+," more than one problem was detected (that is, some combination of B , P , and W was detected). If blank, no warm bearing, warm wheel, or pyrometer noise was detected.
Axle	The axle number.
Brg	Under this heading are two columns, one for each bearing scanner, containing the temperature read by the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.
Wh	Under this heading are two columns, one for each wheel scanner, containing the temperature read by the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This heading and the two columns under it appear only when the Hotwheel option on the Equipment menu is <u>enabled</u> .
ON	The number of milliseconds a bearing was scanned.
OFF	The number of milliseconds between axles (when no axle was between the gating transducers).
Spcng	This column contains the distance from the previous axle in feet with one decimal place precision.
T1	The recorded width of the pulse generated by gating transducer TO1. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
T2	The recorded width of the pulse generated by gating transducer TO2. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
Alarms	Any Exception Alarm found on the given axle.

To produce a Train Detail report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:38
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
      .
      .
      .
```

- 2 Select **Train Detail** to produce the report.

This prompt appears.

```
Train Number ?
```

- 3 Type the train number.

If you typed a three-digit invalid train number, the Main menu reappears. If you typed a three-digit valid train number, this prompt appears.

```
Abbreviated Listing ?
```

Type “**Y**” for abbreviated listing. Type “**N**” for full Train Detail report.

After the report is produced, the Main menu reappears.

- 4 If you typed one or two digits, press **[Enter]**.

If you typed an invalid train number, pressing **[Enter]** causes the Main menu to reappear. If the typed train number is valid, pressing **[Enter]** produces a report for it.

```
Abbreviated Listing ?
```

Type “**Y**” for abbreviated listing. Type “**N**” for full Train Detail report.

After the report is produced, the Main menu reappears.

- 5 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.3 Exception Summary Report

The Exception Summary report lists all trains currently stored in the Exceptions directory. The buffer for the Exceptions directory holds data on about 4,500 axles, but no more than 50 trains. A train is stored in the Exceptions directory if either an Exception Alarm or an Integrity Failure was detected on it as it passed the site. A train number is shown for each train entry so that an Exception Detail report may easily be produced for any train listed on the summary.

Below is a sample of part of an Exception Summary report when Hotwheel alarm detection was disabled during report processing and when the AEI subsystem was disabled during train passage. (When the report is run, if the **Hotwheel option** on the Equipment menu is disabled, the hotwheel information is hidden. When the report is run, if the **AEI option** is disabled, the tag information isn't hidden.) When this sample report was run, temperature was set to Celsius (**C**) by the Units of Measure submenu on the Setup menu. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTIONS SUMMARY
=====
Reader: CP2.38-P 02/03/2015      Comm: CP2.38-P 02/03/2015      Speech: CPR4.90
MP/KP: 1234.8      Track: Single      Subdivision: Kaministiquia (6314)

Alarm Limits..      Absolute: 180      Carside Slope..... 1.60
                   Differential: 150      Minimum... 130
                   Hot Wheel NE: 600      Cold Scanner =< Temp.... 10
                   Hot Wheel SW: 600

-----
Train#  Date  Time  Cars  Axles  T01  T02  Tags  (MPH)  r  Rail  Wheel  Wheel  Amb  Bat
                                AEI Speed i  Average  Average  Temp
                                (MPH)  r  North  South  North  South
-----
W 28 I  02/06/15 10:56  41  166  166  166  0  51  E  18  43  360  250  +20C  13.3v
W 27 I  02/06/15 10:52  22  92  92  92  0  51  E  18  43  360  250  +20C  13.3v
W 26 I  02/06/15 10:47  21  86  86  86  0  39  W  25  48  360  254  +20C  13.3v
+ 25 B  02/06/15 10:41  91  366  366  366  0  44  W  20  43  360  254  +20C  13.3v
:
:
:

```

Below is a sample of part of an Exception Summary report when the **Hotwheel option** on the Equipment menu is enabled. The contents of your report will be different.

```

:
:
Alarm Limits..      Absolute: 180      Carside Slope..... 1.60
                   Differential: 150      Minimum... 130
                   Hot Wheel NE: 600      Cold Scanner =< Temp.... 10
                   Hot Wheel SW: 600

-----
Train#  Date  Time  Cars  Axles  T01  T02  Tags  (MPH)  r  Rail  Wheel  Wheel  Amb  Bat
                                AEI Speed i  Average  Average  Temp
                                (MPH)  r  North  South  North  South
-----
:
:
:

```

The report is divided into a header section and a detail section. The header section contains general information about the site. The detail section contains summary information on each exception train (that is, on each train having an Exception Alarm, an Integrity Failure, or both) that passed the site.

The SmartScanNG system calculates a checksum for each train. This checksum is stored with the train data. Later, when the system retrieves this data, it recalculates the checksum. If the two checksums don't match, the Exception Summary report so states in the detail section. So, instead of getting a train record, you'll get a checksum-error line.

The table below lists the fields from the header section and the contents of each field.

Heading	Contents of Field
Reader Comm Speech	For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).
MP/KP	The five-digit milepost/kilometer post of the site.
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Subdivision	The subdivision name of the site.
Alarm Limits	<p>These are the alarm parameters currently defined in the system setup. These values were in place when this report was run.</p> <ul style="list-style-type: none"> • The value after Absolute is set by the Absolute option on the Alarm Settings menu. • The value after Differential is set by the Differential option on the Alarm Settings menu. • The heading Hot Wheel only appears if the Hotwheel option on the <u>Equipment menu</u> is <u>enabled</u>. The value after Hot Wheel is set by the Hotwheel option on the <u>Alarm Settings</u> menu. • The value after Carside Slope is set by the Carside Slope option on the Alarm Settings menu. • The value after Minimum is set by the Carside Minimum option on the Alarm Settings menu. • The value after Cold Rail Temp is set by the Cold Rail Temperature option on the Alarm Settings menu.

The table below lists the fields from the detail section and the contents of each field.

Heading	Contents of Field
	<p>There is an unlabeled column before the one labeled "Train#." It is used to flag trains that have DSR records stored for them. This column can contain B, P, W, + (plus sign), or nothing. If "B," at least one <u>bearing</u> was found on the train that was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the train was passing the site. If "W," at least one <u>wheel</u> was found on the train that was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu. If "+," more than one problem was detected (that is, some combination of B, P, and W was detected). If blank, no warm bearing, warm wheel, or pyrometer noise was detected.</p>
Train#	<p>The number that identifies the train in the Exceptions directory.</p>
	<p>There are three unlabeled columns between those labeled "Train#" and "Date."</p> <p>The <u>first</u> column can contain an * (asterisk) <u>or</u> nothing. If an asterisk, one of the resistor tests was overridden.</p> <p>The <u>second</u> column can contain A, B, I, or nothing. If "A," an Exception Alarm was detected on the train. If "I," an Integrity Failure was detected. If "B," both an Exception Alarm and an Integrity Failure were detected. If blank, no Exception Alarm or Integrity Failure was detected.</p> <p>The <u>third</u> column can contain g, g+, or nothing. If "g," a GO Transit train was identified. If "g+," a GO Transit train was identified <u>and</u> a bearing-related alarm was detected and suppressed</p>
Date	<p>The date the train arrived at the site. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu.</p>
Time	<p>The time the train arrived at the site. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.</p>
Cars	<p>The total number of cars counted by the SmartScanNG system.</p>
Axles	<p>The total number of axles counted by the SmartScanNG system.</p>
TO1	<p>The total number of hits counted by gating transducer TO1. TO1 is the first gating transducer going north or east from the bearing scanner. It is the southmost gating transducer.</p>
TO2	<p>The total number of hits counted by gating transducer TO2. TO2 is the second gating transducer going north or east from the bearing scanner. It is the northmost gating transducer.</p>

Heading	Contents of Field
AEI Tags	The total number of AEI tags stored. The number of tag pairs found plus those single tags that lack a match. This heading always appears, even if the AEI subsystem is disabled using the AEI option on the Equipment menu.
Speed	The train's exit speed. Speed is in either miles per hour (mph) or kilometers per hour (kph), depending on what was set by the Speed Format option on the Units of Measure submenu.
Dir	The direction the train was traveling. Valid values are N, S, E, and W.
Rail Average	Under this heading are two columns, one for each bearing scanner, containing the average temperature read by the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.
Wheel Average	Under this heading are two columns, one for each wheel scanner, containing the average temperature read by the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This field appears only when the Hotwheel option on the Equipment menu is enabled.
Amb Temp	The ambient temperature when the train arrived at the site. Temperature is in either degrees Celsius (C) or degrees Fahrenheit (F), depending on what was set by the Units of Measure submenu on the Setup menu when this report was printed.
Bat	The system battery voltage when the train arrived at the site.

To produce an Exception Summary report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```

STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
:
:

```

- 2 Select **Exception Summary** to produce the report.

After the report is produced, the Main menu reappears.

- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.4 Extended Exception Detail Report

The extended Exception Detail report provides detailed information on a single train. When choosing this report, you'll be prompted for a train number. When prompted, enter a train number from the Exception Summary report. The train number appears under the column titled "Train#" in the detail section of the Exception Summary report.

Carside Slope alarm detection is enabled/disabled using the **Carside Slope option** on the Equipment menu. Hotwheel alarm reporting is enabled/disabled using the **Hotwheel option** on the Equipment menu. The AEI subsystem is enabled/disabled using the **AEI option** on the Equipment menu.

Where wheel scanners are properly installed, wheel temperatures are always recorded, even if the **Hotwheel option** is disabled. On the other hand, if the **AEI option** is disabled during train passage, no AEI information is recorded. If the **Carside Slope option** is disabled during train passage, no Carside Slope alarms are generated. But, if it is enabled when a report is requested, a carside-slope alarm-limit line is generated for each car of the train.

Below is a sample of part of an extended Exception Detail report when Hotwheel alarm detection is disabled. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTION DETAIL
=====
Train#: 28          Exit Speed: 51MPH          MP/KP: 1234.8
Date: 02/06/15     Axles: 166              Track: Single
Time: 10:56        Direction: East         Temperature: + 20C
Length: 3452       Shutters Open: 57      Battery: 13.3v

Subdivision: Kaministiquia (6314)
=====
Resistor          Filters
Rail  Max Avg Read Req CF% Txdr Count  A  B Alarm      Limit  Carside Parm
-----
North 21 18 189 249B 24  TO1 166    0  0 Absolute    180   Slope: 1.60
South 45 43 280 92I  0  TO2 166    0  0 Differential 150   Minimum: 130
                               Hot Wheel      600
                               Cold Scanner =< Temp 10

DSW - BrgS:11 BrgE:37 WhlS:1 WhlE:96

Resistor
Wheel Max Avg Read Req CF%
-----
North 362 360 300 203B 0
South 260 250 224 45I  0
=====
Firmware Versions
-----
Reader: CP2.38-P 02/03/2015  Comm: CP2.38-P 02/03/2015  Speech: CPR4.90
-----

System Alarms
-----
Integrity Failure
Stuck Dragger Pretrain
Stuck Dragger During Train Passage

Axle Alarm Summary
-----
NONE
-----
Car  Al  Ax  N_Brg  S_Brg  N_Wh  S_Wh  On  Off  Spcng  T1  T2  Alarms
-----
1    1   21   43   360   250   27   0   2.0  17  17
   W   2   20   43   362   250   27   72   7.4  13  14
   W   3   18   43   360   254   27   64   6.8  14  14
   W   4   18   43   360   250   27  684  53.3 13  14
   W   5   18   43   360   250   27   64   6.8  14  14
   W   6   18   43   360   250   27   64   6.8  14  14
   Carside Ave: North 18 South 43  Calculated CS Limits: North 160 South 200

2    W   7   18   44   362   250   27  193  16.5 14  14
   W   8   20   43   362   250   27   75   7.6  14  14
   W   9   18   42   362   254   27  684  53.3 13  14
   W  10  18   43   360   250   27   64   6.8  14  14
   Carside Ave: North 18 South 43  Calculated CS Limits: North 160 South 200
.
.
.

```

Below is a sample of part of an extended Exception Detail report when both the **AEI option** and the **Hotwheel option** on the Equipment menu were enabled when the report was requested. The **Carside Slope option** on the Equipment menu was disabled. Also, both the **AEI option** and the **Hotwheel option** were enabled while the specified train was passing the site. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTION DETAIL
=====
Train#: 321           Speed: 48 KPH           MP/KP: 1234.5
Date: 02/06/15      Axles: 52             Track: Single
Time: 08:26         Direction: South      Temperature: + 21C
Length: 1013        Shutters Open: 36     Battery: 14.2v

Subdivision: South Bank Branch
=====
Resistor           Filters
Rail  Max Avg Read Req CF% Txdr Count  A  B Alarm      Limit  Carside Parm
-----
East  63  62   2  68I  0  TO1  86   0  0 Absolute    180   Slope: 1.60
West  232 64   2  68I  0  TO2  86   0  0 Differential 130   Minimum: 155
                               Hot Wheel    652
                               Cold Rail Temp 10

Resistor
Wheel Max Avg Read Req CF%
-----
East  10  10   49  58I  0
West  14  14   48  58I  0

=====
AEI System Data

Tags Read           Tags Stored: 11
-----
Antenna 0: 12
Antenna 1: 0

=====
Firmware Versions

Reader: CP2.38-P 02/03/2015   Comm: CP2.38-P 02/03/2015   Speech: CPR4.90
-----

System Alarms
-----
Cold East Resistor
Cold West Resistor
Successive Cold Resistors Exceeded
Integrity Failure

Axle Alarm Summary
-----
14 East Rail Absolute TTEX 354063 R2, B End Leading
16 West Rail Absolute TTEX 354063 L4, B End Leading

-----
Rail           Wheel
Car Al Ax N_Brg S_Brg N_Wh S_Wh On Off Spng T1 T2 Alarms
1  1  4  4  10  14 104  0 2.0 83 86 XYZ 8440 B End Leading
  2  4  4  10  14 100 103 7.4 82 84
  3  4  4  10  14 99 95 6.8 72 83
.
.
.

```

The extended Exception Detail report is divided into three sections. The header section contains general information about the site (like the MP/KP) and some detail information about the specific train (like the train's exit speed) that passed the site. The detail section contains more detailed information (like the car number) about the specific train. In between these two sections is the system-events section, which contains all System Alarms and Exception Alarms associated with the train.

The SmartScanNG system calculates a checksum for each train. This checksum is stored with the train data. Later, when the system retrieves this data, it recalculates the checksum. If the two checksums don't match, the extended Exception Detail report so states (as shown below).

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTION DETAIL
=====
CHECKSUM ERROR: StartAddr 134879 EndAddr 134930

```

In addition, each axle has a checksum associated with it. If an axle is determined to have an invalid checksum, the extended Exception Detail report so states in the associated axle's row (as shown below).

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTION DETAIL
=====
Train#: 135                      Speed: 30 KPH                      MP/KP: 0246.8
.
.
.
-----
Car Al Ax N_Brg S_Brg N_Wh S_Wh On Off Spcng T1 T2 Alarms
1   1 20 43 360 250 27 0 2.0 17 17
W  2 18 43 362 250 27 73 7.5 14 14
W  3 18 43 362 250 27 64 6.8 14 14
4   CHECKSUM ERROR: StartAddr 136416 EndAddr 136427
W  5 18 42 360 250 27 64 6.8 14 14
W  6 20 44 360 254 27 64 6.8 14 14
Carside Ave: North 18 South 43 Calculated CS Limits: North 160 South 200

2 W 7 20 43 360 250 27 193 16.5 14 14
W 8 18 44 360 254 27 75 7.6 14 14
W 9 20 43 360 260 27 684 53.3 13 14
W 10 18 43 360 250 27 64 6.8 14 14
.
.
.

```

The table below lists the fields from the header section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Exceptions directory.
GO Train	If the train was identified as a GO Transit train, the wording "GO Train" appears. If the train was <u>not</u> a GO Transit train, this field is blank.
Date	The date the train arrived at the site. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu.
Time	The time the train arrived at the site. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.
Length	Length of train. Length is in either feet (ft) or meters (m), depending on what was set by the Units of Measure submenu on the Setup menu.
Speed	The train's exit speed. Speed is in either miles per hour (mph) or kilometers per hour (kph), depending on what was set by the Speed Format option on the Units of Measure submenu.
Axles	The total number of axles counted by the SmartScanNG system.
Direction	The direction the train was traveling. Valid values are North, South, East, and West.
Shutters Open	The number of seconds it took the train to pass over the site.
MP/KP	The five-digit milepost/kilometer post of the site.
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Temperature	The ambient temperature when the train arrived at the site. Temperature is in either degrees Celsius (C) or degrees Fahrenheit (F), depending on what was set by the Units of Measure submenu on the Setup menu.
Battery	The system battery voltage when the train arrived at the site.
Subdivision	The subdivision name of the site.

Heading	Contents of Field
Rail	Location of the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west
Max	The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the bearing scanner on a given raiiside. For example, if the ambient temperature (when the train arrived at the site) is 77°F (25°C) and the value in this field is 112, the maximum temperature would be 189°F (87.2°C).
Avg	The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the bearing scanner on a given raiiside. For example, if the ambient temperature (when the train arrived at the site) is 86°F (30°C) and the value in this field is 55, the average temperature would be 141°F (60.6°C).
Resistor Read	The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the bearing scanner on a given raiiside.
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the bearing scanner on a given raiiside to avoid a Cold Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field.
	<p>One of five uppercase letters follows the Resistor Req temperature.</p> <ul style="list-style-type: none"> B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. <p>For D, T, and V, the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.</p>
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
Txdr Count	The gating transducer designator (either TO1 or TO2) followed by the total number of hits on that transducer.
Filter A	The number of transducer pulses that were filtered by the pulse width filter (that is, those that were smaller than 3 milliseconds).
Filter B	The number of transducer pulses that were within 300 milliseconds of the previous transducer pulse.

Heading	Contents of Field
Alarm Limit	<p>The Hotwheel alarm level; the Hotbox alarm levels for Absolute and Differential; and the Cold Rail Temperature offset. These values were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Absolute is set by the Absolute option on the Alarm Settings menu. • The value after Differential is set by the Differential option on the Alarm Settings menu. • The value after Hot Wheel is set by the Hotwheel option on the Alarm Settings menu. • The value after Cold Rail Temp is set by the Cold Rail Temperature option on the Alarm Settings menu.
GO Train Processing Enabled	<p>If the GO Transit train functionality was <u>enabled</u> when the train crossed the site, the wording "GO Train Processing Enabled" appears. If the GO Transit train functionality was <u>disabled</u> when the train crossed the site, this field is blank.</p>
Carside Parm	<p>The Carside Slope alarm parameter values that were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Carside Slope is set by the Carside Slope option on the Alarm Settings menu. • The value after Minimum is set by the Carside Minimum option on the Alarm Settings menu.
Wheel	<p>Location of the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Max	<p>The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Avg	<p>The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Resistor Read	<p>The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>

Heading	Contents of Field
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the wheel scanner on a given railside to avoid a Cold Wheel Scanner Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.
	One of five uppercase letters follows the Resistor Req temperature. B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. For D , T , and V , the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
AEI System Data	The number of AEI tags read (by antenna0 and antenna1) and the total number of tags stored for the train. Where both tags of a tag pair are operational, each antenna will read one tag of the pair. The total number of tags stored represents the number of tag pairs found plus those single tags that lack a match. This heading and the columns under it appear only when the AEI subsystem is <u>enabled</u> using the AEI option on the Equipment menu.
Firmware Versions	For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).

The table below lists the fields from the system-events section and the contents of each field.

Heading	Contents of Field
System Alarms	Lists each condition that could affect the ability of the system to scan trains properly for defects. If none of these conditions were encountered, this header is followed by the word "none." Appendix A - System Alarms describes the conditions that the system flags as System Alarms.
Axle Alarm Summary	Lists each Exception Alarm found on the train and the axle on which it was found. If none were found, this header is followed by the word "none."

The table below lists the fields from the detail section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Al	This column is used to flag axles that have DSR records stored for them. It can contain B , P , W , + (plus sign), or nothing. If "B," at least one <u>bearing</u> was found on the axle that was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the axle was passing the site. If "W," at least one <u>wheel</u> was found on the axle that was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu. If "+," more than one problem was detected (that is, some combination of B , P , and W was detected). If blank, no warm bearing, warm wheel, or pyrometer noise was detected.
Axle	The axle number.
Brg	Under this heading are two columns, one for each bearing scanner, containing the temperature read by the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.
Wh	Under this heading are two columns, one for each wheel scanner, containing the temperature read by the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This heading and the two columns under it appear only when the Hotwheel option on the Equipment menu is <u>enabled</u> .
ON	The number of milliseconds a bearing was scanned.
OFF	The number of milliseconds between axles (when no axle was between the gating transducers).
Spcng	This column contains the distance from the previous axle in feet with one decimal place precision.
T1	The recorded width of the pulse generated by gating transducer TO1. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
T2	The recorded width of the pulse generated by gating transducer TO2. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
Alarms	Any Exception Alarm found on the given axle.

To produce the extended Exception Detail report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
E) System Status
      .
      .
      .
```

- 2 Select the **Exception Detail** report.

This prompt appears.

```
Train Number ?
```

- 3 Type the train number.

If you typed a three-digit invalid train number, the Main menu reappears. If you typed a three-digit valid train number, the prompt below appears.

- 4 If you typed one or two digits, press **[Enter]**.

If you typed an invalid train number, the Main menu reappears. If you typed a valid train number, this prompt appears.

```
Abbreviated Listing ?
```

- 5 To produce the extended Exception Detail report, type **N**

If you typed an invalid train number, the Main menu reappears. If the typed train number is valid, a report for that train is produced.

After the report is produced, the Main menu reappears.

- 6 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.5 Abbreviated Exception Detail Report

The abbreviated Exception Detail report is like the extended Exception Detail report. However, the abbreviated report doesn't display all the recorded axle data. It only displays axle data for:

- The car immediately preceding a car with an alarmed axle.
- The car containing the alarmed axle.
- The car immediately following the car with the alarmed axle.

For example, assume that a train consisted of 3 locomotives and 20 cars, and Exception Alarms were found on cars 3, 10, 15, and 17. The Abbreviated Exception Detail report for this train would only list axle data for cars 2, 3, 4, 9, 10, 11, 14, 15, 16, 17, and 18. These car numbers comprise the alarmed cars themselves and all cars immediately before and immediately after them.

Like the extended Exception Detail report, the abbreviated Exception Detail report is divided into three sections. The header section contains general information about the site (like the MP/KP) and some detail information about the specific train (like the train's exit speed) that passed the site. The detail section contains more detailed information (like the car number) about the specific train. In between these two sections is the system-events section, which contains all System Alarms and Exception Alarms associated with the train.

Below is a sample of part of an abbreviated Exception Detail report when the **AEI option**, the **Carside Slope option**, and the **Hotwheel option** were all disabled when the report was requested. The contents of your report will be different.

Southern Technologies Corporation
 Next Generation Detector System
EXCEPTION DETAIL - ABBREVIATED

```

=====
Train#: 232                      Speed: 30 KPH                      MP/KP: 0611.1
Date: 02/06/15                  Axles: 31                       Track: Single
Time: 13:55                      Direction: South                 Temperature: + 77F
Length: 160                      Shutters Open: 16               Battery: 13.6V
  
```

Subdivision: Lac Du Bonnet

•
•
•

System Alarms

 Cold North Resistor

Axle Alarm Summary

```

-----
  6 North Rail Absolute
 27 Dragging Equipment
 28 Dragging Equipment
 37 North Rail Absolute
105 North Rail Differential
  
```

Car	Al	Ax	Trk	N_Brg	S_Brg	ON	OFF	Speng	T1	T2	Alarms
1	1	0	56	21	25	0	16.1	10	11		
	2	0	57	21	25	59	7.9	9	9		
	3	0	57	22	25	59	52.1	9	9		
	4	0	57	22	25	562	7.1	9	9		
2	5	0	56	22	25	162	16.1	9	9		
	6	0	189	110	25	641	7.9	9	9		North Rail Absolute
	7	0	57	22	25	59	52.1	8	9		
	8	0	57	22	25	562	7.1	9	9		
3	9	0	56	113	25	162	16.1	9	9		
	10	0	57	23	25	59	7.9	9	9		
	11	0	57	24	25	59	52.1	9	9		
	12	0	57	23	25	562	7.1	9	9		
6	21	0	56	23	25	162	16.1	9	9		
	22	0	57	23	26	58	7.9	9	9		
	23	0	57	23	26	561	52.1	9	9		
	24	0	57	22	26	58	7.1	9	9		
7	25	0	56	22	25	162	16.1	9	9		
	26	0	57	21	26	58	7.9	9	9		
	27	0	57	22	26	561	52.1	9	9		Dragging Equipment
	28	0	57	23	26	58	7.1	9	9		Dragging Equipment
8	29	0	56	22	25	162	16.1	9	9		
	30	0	57	22	26	58	7.9	9	9		

•
•
•

To produce the abbreviated Exception Detail report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
E) System Status
      .
      .
      .
```

- 2 Select the **Exception Detail** report.

This prompt appears.

```
Train Number ?
```

- 3 Type the train number.

If you typed a three-digit invalid train number, the Main menu reappears. If you typed a three-digit valid train number, the prompt below appears.

- 4 If you typed one or two digits, press **[Enter]**.

If you typed an invalid train number, the Main menu reappears. If you typed a valid train number, this prompt appears.

```
Abbreviated Listing ?
```

- 5 To produce the abbreviated Exception Detail report, type **Y**

If you typed an invalid train number, the Main menu reappears. If the typed train number is valid, a report for that train is produced.

After the report is produced, the Main menu reappears.

- 6 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.6 System Status Report

The System Status report contains the system's current setup configuration. Once a SmartScanNG system is set up properly, print this report and keep it in the wayside enclosure for future reference. Should you ever need to set up the system again, you'll have most of the information you'll need on this report. Below is a sample of the top half of a System Status report. The contents of your report will be different.

```

Southern Technologies Corporation
Next Generation Detector System
SYSTEM STATUS REPORT
=====
Date:02/06/15  Time:15:25      Battery: 13.3v      Ambient Temp.: +20C
-----
Mile Post... 1234.8      Track Dir... E/W      Track..... Single
Subdivision. Kaministiquia (6314)
Velocity detected on COM3

Alarm Settings
-----
Absolute..... 180      Differential..... 150
Hot Wheel (North or East bound) 600      Hot Wheel (South or West bound) 600
Carside Slope..... 1.60      Carside Minimum..... 130
Cold Scanner Counter..... 3      Cold Scanner =< Temp..... 10
Cold Res Counter..... 3      Bearing DSR Capture Temp..... 50
Res Test: Minimum Rail Avg..... 25      Res Test: Minimum Wheel Avg..... 28
Wheel DSR Capture Temp..... 150

Equipment
-----
Dragger..... YES      Dragger Debounce..... 5
High Load..... NO      Wide Load..... NO
High/Wide Alarm Direction..... Both      Carside Slope..... YES
Hot Wheel..... YES      Clearance Type..... Light Beam
Clearance Mode..... Multiplexed      Winter Cycle..... YES
Transducer Gain..... Normal      AEI..... NO
GO TrainDetect..... NO      Gate Distance..... 24.0 inches
Resistor Test..... Enabled      Train Presence Hardware..... YES
Wheel Scan Mode..... Rim (Peak)      Min TD Pulse Width..... 05mS
Bearing Scanner Orientation.. North      Sun-Shot Filter..... Disabled
Sun-Shot Filter Start Date..... n/a      AC Power Off Monitor..... Enabled
Selected Modem..... Velocity

Auxiliary Input Assignments
-----
Dragging Equipment..... DED      High Load..... HIGH
Wide Load-1..... WIDE1      Wide Load-2..... WIDE2
Scanner AC Monitor..... SPARE4

Messages
-----
Axles..... YES      Speed..... NO
Temperature..... YES      Length..... NO
Train Too Slow..... YES      Power Off (Low DC Voltage).... YES
Cars Count..... NO      Customer Name..... YES
Arrival Message..... NO      Lft/Rt Alarm Ref..... NO
Car ID With Alarm..... YES      US Speech Options..... NO
Detector Out..... YES      Request EOT Timer 0=no limit... 0
Rebroad DTMF Code..... 001      Primary Language..... English
Secondary Language..... NONE

      .
      .
      .

```

Below is a sample of the bottom half of a System Status report. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```

      .
      .
      .

Units of Measure
-----
Date..... mm/dd/yyyy      Ambient Temperature..... Celsius
Speed..... MPH            Length..... Feet

Scanner Calibration Date / Digital Potentiometer Settings
-----
Rail1.....00/00/2000 00:00:00 / 09      Rail2.....00/00/2000 00:00:00 / 00
Wheel1.....00/00/2000 00:00:00 / 00      Wheel2.....00/00/2000 00:00:00 / 00

Scanner Types
-----
Rail-1..... Type-III      Rail-2..... Type-III
Wheel-1..... Type-III      Wheel-2..... Type-III

Port Settings
-----
COM1 Tx/Rx Baud 19200/19200 N-8-1
COM2 Tx/Rx Baud 19200/19200 N-8-1
COM3 Tx/Rx Baud 19200/19200 N-8-1
COM4 Tx/Rx Baud 19200/19200 N-8-1

                COP
Software Versions          Resets
-----
Reader:  CP2.38-P 02/03/2015    1
Comm   :  CP2.38-P 02/03/2015    0
Speech:  CPR4.90

EPCC Data
-----
Date Tested:03/12/13  S/N: 020713          SICM Version 1.4

Resistor Data
-----
VOLTS AMB DATE      TIME STATUS   30  40  50  60  70  80  90 100 110 120 130
      140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480
-----
RAIL 1
14.4 -016 03/15/13 08:50 VALID  292,291,291,291,290,290,290,292,290,291,291
      '290,290,290,292,291,292,291,290,291,291,291,291,290,291,291,292,292,291
RAIL 2
14.4  067 01/01/92 01:01 INVALID 274,274,274,274,274,263,263,276,276,275,001
      '001,001,001,001,108,001,001,001,001,108,275,275,275,275,001,001,001,001
WHEEL 1
14.4  038 01/01/92 01:01 VALID  217,274,274,274,274,274,274,274,274,275,274
      '274,274,274,274,274,274,276,275,274,274,275,274,274,276,274,275,275,274
WHEEL 2
14.4 -017 145/03/92 01:01 INVALID 197,197,196,197,197,196,197,197,196,197,200
      '196,202,197,197,197,197,197,202,200,197,197,197,188,197,200,202,197
=====

```


The table below lists the fields on the System Status report and the contents of each field.

Heading	Contents of Field
Date	The date when this report was generated. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu.
Time	The time when this report was generated. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.
Battery	The system battery voltage when this report was generated.
Ambient Temp	The ambient temperature when this report was generated. Temperature is expressed in either degrees Fahrenheit or degrees Celsius, depending on what was set by the Units of Measure submenu.
Mile Post	The five-digit milepost/kilometer post of the site.
Track Dir	The track direction of the site. Valid values are N/S (for north/south) and E/W (for east/west).
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Subdivision	The subdivision name of the site.
Alarm Settings	The alarm parameters and limits as they are currently defined in the system setup.
Equipment	Equipment configuration as currently defined in system setup
Aux Input Assignments	Lists auxiliary inputs as they are currently assigned.
Messages	Message configuration as currently defined in system setup.
Units of Measure	How the system reports the date, ambient temperature, speed, and length of train.
Scanner Calibration Date	Date and time each scanner was last calibrated. The autocalibration function maintains these fields.
Scanner Types	Indicates scanner type for Rail1, Rail2, Wheel1, and Wheel2 scanners.
Port Settings	Communications port parameter settings as currently defined in system setup. These parameters reflect the baud rate and parity settings for each communications port

Heading	Contents of Field
AEI Reader Parameters Menu	<p>This heading always appears, even if the AEI subsystem is disabled using the AEI option on the Equipment menu.</p> <p>Below are the AEI Reader Parameters currently defined in the system setup. These values were in place when this report was run.</p> <p>ID Separation specifies the number of intervening tags that must be read and reported before a given tag is reported again. Valid values are 1, 2, 3, and 4. The default is 2.</p> <p>Consecutive Reads specifies the number of times that a tag must be read before it is considered a valid (reportable) tag. Valid values are 1, 2, 3, and 4. The default is 2.</p> <p>Decode as ASCII Tags specifies whether the tag data is to be interpreted as ASCII characters or in the encoded format.</p>
Software Versions	<p>For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).</p>
COP Resets	<p>Number of COP resets occurring since the last time the counters were cleared. The top value is for processor-A (aka Reader Processor) on the Processor board (2300-100). The middle value is for processor-B (aka Communications Processor) on the same board</p>
EPCC Data	<p>For EPCC, the date tested and serial number of the Processor board (2300-100). An automated testing station at STC tested this board. It is possible to have a board that was manufactured and tested before STC implemented automated testing. When this is the case, some obvious incorrect values, such as "255/255/255 S/N:255255," are usually displayed. These incorrect values are harmless and can be ignored.</p> <p>For SICM, the version number of the Interface board (2300-105). If your board is a version earlier than 1.3, this header and following number won't appear on the System Status report.</p>
Resistor Data	<p>See explanation below.</p>

For the resistor integrity test that is performed after train passage, there are two methods used to calculate the expected resistor temperature. The baseline resistor integrity test method requires the prerequisite of valid resistor baseline data to be stored in nonvolatile memory. Until the system acquires this data, it applies the interim resistor integrity test method to each train. The resistor data used in the baseline resistor integrity test method appears at the bottom of the System Status report, as shown below.

Resistor Data																			
VOLTS	AMB	DATE	TIME	STATUS	30	40	50	60	70	80	90	100	110	120	130				
	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	
RAIL 1																			
25.5	-001	01/31/12	01:01	INVALID	181,220,247,264,268,268,268,268,268,268,149														
					177,195,208,220,227,234,237,240,243,169,201,227,251,263,265,267,265,265														
RAIL 2																			
25.5	-001	01/31/12	01:01	INVALID	177,196,211,221,229,232,237,225,244,265,162														
					162, 1, 1, 1, 1, 1, 1, 1,108, 36, 4, 35, 1, 1, 1, 1, 1, 1, 1,108														

Included in the data above is a resistor heat profile of each scanner resistor, which covers a period of 30 to 480 seconds, in 10 and 20 second intervals. The differences in resistor heat between the two scanners are due to the cable lengths used in this example. A 65-foot (19.8-meter) cable for the rail1 bearing scanner and a 100-foot (30.5-meter) cable for the rail2 bearing scanner. Additional items in the data are the battery voltage measured with the shutters open, the date and time of the data acquisition, and the status of the heat profile data.

In this example, the status of both sets of resistor data is valid. Meaning they are being used in the baseline integrity test for each train. There are two other possibilities for status, pending and invalid. If the word PENDING appears in the status column, the system is waiting for the resistors to cool before acquiring resistor data or for the battery to charge to 13 volts. INVALID indicates that the system has tried twice and could not acquire valid resistor data. In either case, the system applies the interim integrity test to passing trains, which doesn't require resistor baseline data.

The system acquires the resistor data 20 minutes after the user calibrates the scanners with the autocalibration function. The resistor data acquisition runs unattended. Twenty minutes is the cooling period required to allow the resistors to return to ambient temperature after autocalibration. If a train should interrupt the cooling period, the resistor data acquisition runs 20 minutes after the shutters close following the passage of the train.

During the resistor-cooling period, the system announces through the speaker the following. These announcements aren't broadcast over the radio.

- A beep sounds once per minute until two minutes before the resistor test.
- At two minutes until the test, "Scanner resistor test beginning in 2 minutes" is voiced.
- At one minute until the test, "Scanner resistor test beginning in 1 minute" is voiced.

After the resistor cooling period:

- As the test begins, "Testing" is voiced. During this time, the word PENDING appears in the status column of the Resistor Data section.
- If the test was successful, "System working" is voiced. The word VALID appears in the status column of the Resistor Data section, signifying that the baseline test applies to each passing train.
- If the test wasn't successful, "Scanner resistor test beginning in two-zero minutes" is voiced, meaning that the system will try once more after 20 minutes to acquire an accurate resistor heat profile. During this time, the word PENDING appears in the status column of the Resistor Data section. If the test fails a second time, the word INVALID appears in the same column. The system applies the interim integrity test to each passing train while either PENDING or INVALID appears.

To produce a System Status report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
      .
      .
      .
D) Exception Detail
E) System Status
F) Last Train
      .
      .
      .
```

- 2 Select **System Status** to produce the report.
After the report is produced, the Main menu reappears.
- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.7 Last Train Report

The Last Train report is identical to the Train Detail report. There is a difference in the way you specify the train for which you want a report. For this report, you don't specify a train. A report on the most current train is produced.

To produce a Last Train report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
      :  
      :  
E) System Status  
F) Last Train  
G) Last Test Train  
      :  
      :
```

- 2 Select **Last Train** to get this prompt.

```
Abbreviated Listing ?
```

Type “Y” to produce an abbreviated report or type “N” for full report.

After the report is produced, the Main menu reappears.

- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type X

4.8 Last Test Train Report

The Last Test Train report is identical to the Train Detail report. There is a difference in the way you specify which train you want reported. For this report, you don't specify a train. A report on the most current test train is produced.

To produce a Last Test Train report:

- 1 Using the serial interface, display the Main menu.

```
      :  
      :  
F) Last Train  
G) Last Test Train  
H) AEI Diagnostic Detail  
      :  
      :
```

- 2 Select **Last Test Train** to get this prompt.

```
Abbreviated Listing ?
```

Type “Y” to produce an abbreviated report or type “N” for full report.

After the report is produced, the Main menu reappears.

- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type X

4.9 AEI Diagnostic Detail Report

The AEI Diagnostic Detail report provides detailed information on a single train. It contains information that can be useful in troubleshooting AEI related problems. When choosing this report, you'll be prompted for a train number. When prompted, type a train number from the Train Summary report. The train number appears under the column titled "Train#" in the detail section of that report.

Carside Slope alarm detection is enabled/disabled using the **Carside Slope option** on the Equipment menu. Hotwheel alarm reporting is enabled/disabled using the **Hotwheel option** on the Equipment menu. The AEI subsystem is enabled/disabled using the **AEI option** on the Equipment menu.

Where wheel scanners are properly installed, wheel temperatures are always recorded, even if the **Hotwheel option** is disabled. On the other hand, if the **AEI option** is disabled during train passage, no AEI information is recorded. If the **Carside Slope option** is disabled during train passage, no Carside Slope alarms are generated. But, if it is enabled when a report is requested, a carside-slope alarm-limit line is generated for each car of the train.

Below is a sample of part of an AEI Diagnostic Detail report when both the **AEI option** and the **Hotwheel option** on the Equipment menu were enabled when the report was requested. The **Carside Slope option** on the Equipment menu was disabled. Also, both the **AEI option** and the **Hotwheel option** were enabled while the specified train was passing the site. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

Like the Train Detail report, the AEI Diagnostic Detail report is divided into three sections. The header section contains general information about the site (like the MP/KP) and some detail information about the specific train (like the train's exit speed) that passed the site. The detail section contains more detailed information (like the car number) about the specific train. In between these two sections is the system-events section, which contains all System Alarms and Exception Alarms associated with the train.

Southern Technologies Corporation
Next Generation Detector System

TRAIN DETAIL

```

=====
Train#: 321                Speed: 48 KPH                MP/KP: 1234.5
Date: 02/06/15           Axles: 52                Track: Single
Time: 08:26              Direction: South         Temperature: + 21C
Length: 1013             Shutters Open: 36       Battery: 14.2v
=====

```

```

=====
Resistor                    Filters
Rail Max Avg Read Req CF% Txdr Count  A  B Alarm      Limit  Carside Parm
-----
East  63  62   2  68I  0  TO1  86   0  0 Absolute    180   Slope: 1.60
West  232 64   2  68I  0  TO2  86   0  0 Differential 130   Minimum: 155
                               Hot Wheel    652
                               Cold Scanner =< Temp 10
=====

```

```

Resistor
Wheel Max Avg Read Req CF%
-----
East  10  10   49  58I  0
West  14  14   48  58I  0
=====

```

AEI System Data

Tags Read Tags Stored: 11

Antenna 0: 12
Antenna 1: 0

Firmware Versions

Reader: CP3.11-G 12/09/2011 Comm: CP3.22-G 12/09/2011 Speech: CP3.33

System Alarms

Cold East Resistor
Cold West Resistor
Successive Cold Resistors Exceeded
Integrity Failure

Axle Alarm Summary

14 East Rail Absolute TTEX 354063 R2, B End Leading
16 West Rail Absolute TTEX 354063 L4, B End Leading

```

=====
Rail      Wheel
Car Axle East West East West  ON  OFF PW1 PW2 Alarms
-----
1  6  1 B  0  0  0  0  0 E  ST:000985 ET:001713  0
   6 L? 5 XYZ      8440  0 P0  001568|000000 001|000 70

1  1  4  4  10  14  104  0 133  86  XYZ  8440 B End Leading
   2  4  4  10  14  100  103  82  84
   3  4  4  10  14  99  95  72  83
   4  5  5  10  14  101  95  79  83
   5  4  4  10  14  95  99  77  81
   6  4  4  10  14  110  94  96  74

2  6  1 B  0  0  0  0  0 S  ST:002855 ET:005041  0
   6 L? 5 XYZ      6064  0 P0  004652|000000 001|000 70

2  7  4  4  10  14  101  108  84  88  XYZ  6064 A End Leading
   8  4  4  10  14  100  102  83  85

.
.
.
=====

```

The table below lists the fields from the header section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Trains directory.
GO Train	If the train was identified as a GO Transit train, the wording "GO Train" appears. If the train was <u>not</u> a GO Transit train, this field is blank.
Date	The date the train arrived at the site. Date is in either dd/mm/yy or mm/dd/yy format, depending on what was set by the Date Format option on the Units of Measure submenu.
Time	The time the train arrived at the site. Time is in 24-hour hh:mm format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00.
Length	Length of train. Length is in either feet (ft) or meters (m), depending on what was set by the Units of Measure submenu on the Setup menu.
Exit Speed	The train's exit speed. Speed is in either miles per hour (mph) or kilometers per hour (kph), depending on what was set by the Speed Format option on the Units of Measure submenu.
Axles	The total number of axles counted by the SmartScanNG system.
Direction	The direction the train was traveling. Valid values are North, South, East, and West.
Shutters Open	The number of seconds it took the train to pass over the site.
MP/KP	The five-digit milepost/kilometer post of the site.
Track	The track designator of the site. For single-track sites, the value is Single. For double-track sites, valid values are Connaught, East, Macdonald, North, Number 1 Main, Number 1 Track, Number 2 Main, Number 2 Track, Number 3 Track, Siding, South, and West.
Temperature	The ambient temperature when the train arrived at the site. Temperature is in either degrees Celsius (C) or degrees Fahrenheit (F), depending on what was set by the Units of Measure submenu on the Setup menu.
Battery	The system battery voltage when the train arrived at the site.
Rail	Location of the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.

Heading	Contents of Field
Max	The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the bearing scanner on a given raiiside. For example, if the ambient temperature (when the train arrived at the site) is 77°F (25°C) and the value in this field is 112, the maximum temperature would be 189°F (87.2°C).
Avg	The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the bearing scanner on a given raiiside. For example, if the ambient temperature (when the train arrived at the site) is 86°F (30°C) and the value in this field is 55, the average temperature would be 141°F (60.6°C).
Resistor Read	The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the bearing scanner on a given raiiside.
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the bearing scanner on a given raiiside to avoid a Cold Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field.
	<p>One of five uppercase letters follows the Resistor Req temperature.</p> <ul style="list-style-type: none"> B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. <p>For D, T, and V, the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.</p>
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
Txdr Count	The gating transducer designator (either TO1 or TO2) followed by the total number of hits on that transducer.
Filter A	The number of transducer pulses that were filtered by the pulse width filter (that is, those that were smaller than 3 milliseconds).
Filter B	The number of transducer pulses that were within 300 milliseconds of the previous transducer pulse.

Heading	Contents of Field
Alarm Limit	<p>The Hotwheel alarm level; the Hotbox alarm levels for Absolute and Differential; and the Cold Rail Temperature offset. These values were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Absolute is set by the Absolute option on the Alarm Settings menu. • The value after Differential is set by the Differential option on the Alarm Settings menu. • The value after Hot Wheel is set by the Hotwheel option on the Alarm Settings menu. • The value after Cold Rail Temp is set by the Cold Rail Temperature option on the Alarm Settings menu.
GO Train Processing Enabled	<p>If the GO Transit train functionality was <u>enabled</u> when the train crossed the site, the wording "GO Train Processing Enabled" appears. If the GO Transit train functionality was <u>disabled</u> when the train crossed the site, this field is blank.</p>
Carside Parm	<p>The Carside Slope alarm parameter values that were in place when the train arrived at the site.</p> <ul style="list-style-type: none"> • The value after Carside Slope is set by the Carside Slope option on the Alarm Settings menu. • The value after Minimum is set by the Carside Minimum option on the Alarm Settings menu.
Wheel	<p>Location of the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Max	<p>The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Avg	<p>The average temperature, above the ambient temperature in degrees Fahrenheit, calculated from all recorded temperatures from the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>
Resistor Read	<p>The scanner resistor temperature (read after train passage), in degrees Fahrenheit, recorded by the wheel scanner on a given railside. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.</p>

Heading	Contents of Field
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the wheel scanner on a given railside to avoid a Cold Wheel Scanner Resistor alarm. This value was calculated using the amount of time the shutters were open and the Resistor Test Mode option in effect when the train exits the site. If the Resistor Test Mode option is <u>disabled</u> , a zero appears in this field. This field only appears when Hotwheel alarm reporting is <u>enabled</u> using the Hotwheel option on the Equipment menu.
	One of five uppercase letters follows the Resistor Req temperature. B The baseline resistor integrity test method was used for this train. D The resistor integrity test (that is, the Resistor Test Mode option) was disabled by the user. I The interim resistor integrity test method was used for this train. T For this train, the shutters were open for <u>less than</u> 30 seconds. V For this train, the battery voltage (measured with the shutters open) was <u>less than</u> 13 volts. For D , T , and V , the required resistor heat is set to zero (that is, a zero appears in the Resistor Read field). A T or V indicates that the integrity test was not performed due to low voltage or insufficient shutter open time, which could result in an invalid resistor integrity test if it was performed.
CF%	The percentage difference between the required resistor value and the value that was actually read. For example, if the required resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$), and 25 would appear in this field.
AEI System Data	The number of AEI tags read (by antenna0 and antenna1) and the total number of tags stored for the train. Where both tags of a tag pair are operational, each antenna will read one tag of the pair. The total number of tags stored represents the number of tag pairs found plus those single tags that lack a match. This heading and the columns under it appear only when the AEI subsystem is <u>enabled</u> using the AEI option on the Equipment menu.
Firmware Versions	For Reader and Comm, the version numbers of the firmware and their release dates, which are in mm/dd/yy format. This firmware resides on the Processor board (2300-100). For Speech, the version number of the speech data. This data resides on the Interface board (2300-105).

The table below lists the fields from the system-events section and the contents of each field.

Heading	Contents of Field
System Alarms	Lists each condition that could affect the ability of the system to scan trains properly for defects. If none of these conditions were encountered, this header is followed by the word "none." Appendix A - System Alarms describes the conditions that the system flags as System Alarms.
Axle Alarm Summary	Lists each Exception Alarm found on the train and the axle on which it was found. If none were found, this header is followed by the word "none."

The table below lists the fields from the detail section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Al	The alarm column is used to flag axles that have DSR records stored for them. It can contain B , P , W , + (plus sign), or nothing. If "B," at least one <u>bearing</u> was found on the axle that was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the axle was passing the site. If "W," at least one <u>wheel</u> was found on the axle that was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu. If "+," more than one problem was detected (that is, some combination of B , P , and W was detected). If blank, no warm bearing, warm wheel, or pyrometer noise was detected.
Axle	The axle number.
Brg	Under this heading are two columns, one for each bearing scanner, containing the temperature read by the bearing scanners. If the track orientation is east and west, the bearing scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west.
Wh	Under this heading are two columns, one for each wheel scanner, containing the temperature read by the wheel scanners. If the track orientation is east and west, the wheel scanners are labeled north and south. If the track orientation is north and south, they are labeled east and west. This heading and the two columns under it appear only when the Hotwheel option on the Equipment menu is <u>enabled</u> .
ON	The number of milliseconds a bearing was scanned.
OFF	The number of milliseconds between axles (when no axle was between the gating transducers).
Spcng	This column contains the distance from the previous axle in feet with one decimal place precision.
T1	The recorded width of the pulse generated by gating transducer TO1. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
T2	The recorded width of the pulse generated by gating transducer TO2. There is no fixed value for the pulse widths. Slower trains generate wider pulse widths (that is, they generate larger values) than faster moving trains.
Alarms	Any Exception Alarm found on the given axle.

Unlike the Train Detail report, the AEI Diagnostic Detail report has an additional two lines per car. Below is part of the sample AEI Diagnostic Detail report that dealt specifically with AEI diagnostic data. These two lines are representative of similar lines added for each vehicle in the train's consist.

```

1 6 1 B 0 0 0 0 0 E ST:000985 ET:001713 0 <- Vehicle related data
6 L? 5 XYZ 8440 0 P0 001568|000000 001|000 70 <- Tag related data

```

The first line above contains data that is associated with the vehicle that consists of the axle records that follow. The second line shown contains data that is related to an AEI tag that has been associated with the vehicle.

The table below defines the relevant fields in line one (vehicle related data).

Field Value	Field Definition	AAR Format Only
1	Vehicle number – the standing order number of the associated vehicle in relation to the train's consist.	No
6	Axle count – the number of axles recorded for the vehicle.	No
1	Tag count – the number of AEI tag records associated with the vehicle.	No
B	The orientation of the vehicle in the train's consist – A -end or B -end forward.	Yes
0 0 0 0 0	<i>Reserved for future diagnostics development.</i>	-----
E	The direction the vehicle traveled.	No
ST:000985	Vehicle starting timestamp – the timer starts when train presence is detected.	No
ET:001713	Vehicle ending timestamp.	No

The table below defines the relevant fields in line two (tag related data). For those items that contain "Yes" in the last column, when ASCII format AEI tags are being used, these fields aren't available from the tags or cannot be determined due to unavailable tag data. In reference to the track, **antenna0** is the northmost or eastmost antenna. **Antenna1** is the southmost or westmost antenna.

Field Value	Field Definition	AAR Format Only
6	Axle count – from tag data.	Yes
L	Tag pair read indicator – L = left tag missing, R = right tag missing G = both tags present.	Yes
?	<i>Reserved for future diagnostics development.</i>	-----
5	Equipment Group Code from tag data.	Yes
XYZ 8440	AEI vehicle identification.	No
0	<i>Reserved for future diagnostics development.</i>	-----
P0	Platform code – from tag data.	Yes
001568	Antenna0 tag read timestamp – in milliseconds from start of train.	No
000000	Antenna1 tag read timestamp – in milliseconds from start of train.	No
001	Antenna0 tag read "handshakes" – the number of times a tag was read.	No
000	Antenna1 tag read "handshakes" – the number of times a tag was read.	No
70	Vehicle length – from tag data.	Yes

To produce an AEI Diagnostic Detail report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
      .
      .
      .
G) Last Test Train
H) AEI Diagnostic Detail
I) Replay EOT Announcement
      .
      .
      .
```

- 2 Select **AEI Diagnostic Detail** to produce the report.

This prompt appears.

```
Train Number ?
```

- 3 Type the train number.

If you typed a three-digit invalid train number, the Main menu reappears. If you typed a three-digit valid train number, a report for that train is produced.

After the report is produced, the Main menu reappears.

- 4 If you typed one or two digits, press **[Enter]**.

If you typed an invalid train number, pressing **[Enter]** causes the Main menu to reappear. If the typed train number is valid, pressing **[Enter]** produces a report for it.

After the report is produced, the Main menu reappears.

- 5 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.10 Event Log Report

The Event Log report is used for diagnostics. As certain system events occur, entries are posted into the event log. Each time an entry is made into this log, it receives an event number, the date and time that the event was recorded, and an event description.

The entries are stored in a section of SRAM that can hold up to 300 separate entries. Each time an event is recorded which exceeds this maximum, the new one overwrites the oldest recorded event. The entries are saved during power outage, but can be deleted with the **Clear Event Log option** on System Functions menu. Producing the report at this time produces a "No Events" message. If events have been recorded and not cleared, they're listed in chronological order, beginning with the most recently recorded event.

Below is a sample of an Event Log report containing no events. The date/time at the top of the report is the system date/time when this report was generated. The contents of your report may be different.

```

Southern Technologies Corporation
Event Log

MP/KP: 0232.0   Track: Connaught   Subdivision: Connaught
Date: 02/06/2015   Time: 13:39:02

=====
No Events!

----- End of Report -----

```

Below is a sample of part of an Event Log report containing some events. The contents of your report will be different. The date/time at the top of the report is the system date/time when this report was generated. Each line of text (that is, each event) contains these fields.

- The sequential number assigned to the event as it was generated
- The date at which the event was recorded (date is in **mm/dd/yy** format)
- The time at which the event was recorded (time is in 24-hour **hh:mm:ss** format, where 8 a.m. is 08:00:00, noon is 12:00:00, 8 p.m. is 20:00:00, and midnight is 00:00:00)
- The event description

```

Southern Technologies Corporation
Event Log

MP/KP: 1234.8   Track: Single   Subdivision: Kaministiquia (6314)
Date: 06/02/2015   Time: 15:45:53

=====
49 06/02/15 15:41:06 <System Accessed ESC>
48 06/02/15 15:35:45 <System Exit ESC>
47 06/02/15 15:29:24 <Setup:COM2 Tx >
46 06/02/15 15:27:38 <Units of Measure:Date>
      .
      .
      .

----- End of Report -----

```


To produce an Event Log report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
      .
      .
      .
I) Replay EOT Announcement
J) Event Log
K) Maintenance Report
      .
      .
      .
```

- 2 Select **Event Log** to produce the report.
After the report is produced, the Main menu reappears.
- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.11 Maintenance Report

The Maintenance report provides a snapshot of a SmartScanNG system's health status by listing the installed and active subsystems and indicating whether they currently pass or fail established integrity criteria. Actions are suggested for remedying any failures.

Below is a sample of a Maintenance report. The contents of your report will be different.

```
=====
                        Southern Technologies Corporation
                        Next Generation Detector System
                        Maintenance Report
=====
Date: 02/06/15  Time:10:45      Battery: 13.5V      Ambient Temp.: +19C
MP/KP: 0232.0   Track: Connaught  Subdivision: Connaught

2 Days Since Last Calibration.

=====

                        Analysis Of Trains 40 Through 41

Hardware Status
-----
East Rail Scanner.....Pass
West Rail Scanner.....Pass
East Wheel Scanner.....Fail
Possible cause: Improper calibration or alignment, dirty optics,
stuck shutter, blocked scan path, or defective scanner.
100% had 'Cold East Resistor'
Successive Cold Wheel Resistors Exceeded
West Wheel Scanner.....Fail
Possible cause: Improper calibration or alignment, dirty optics,
stuck shutter, blocked scan path, or defective scanner.
100% had 'Cold West Resistor'
Successive Cold Wheel Resistors Exceeded
Gating Transducers.....Needs Attention
Possible cause: Slow train movements, improper loading of transducers
transducer connections intermittent, transducer not adjusted correctly
on rail, or defective transducer.
1% had 'OnTime Greater Than OffTime'
Ambient Temperature Probe....Fail
Possible cause: Malfunctioning temperature probe, cable disconnected,
or malfunctioning cable.
96% had 'Ambient Temperature Probe Unreliable'
Battery.....Pass
Presence Hardware.....Pass
Dragger.....Pass

Scanner Calibration Date
-----
Rail1.....02/04/2015 08:44:08      Rail2.....02/04/2015 08:47:18
Wheel1.....02/04/2015 08:54:56     Wheel2.....02/04/2015 08:57:39
=====

----- End of Report -----
```

The Hardware Status section of the Maintenance report reflects the results of evaluating a collection of trains for Integrity Failure or System Alarm occurrences. The collection of trains can either be the default suggested by the SmartScanNG system (when that the report is selected from the Main menu) or it can be defined by the user (also when the report is printed). The report will show, for the various hardware subsystems, whether each of these systems has passed the evaluation, has failed the evaluation, or that it needs attention. The table below indicates the criteria used to arrive at the Failure and Needs Attention conclusions.

Hardware Subsystem	Failure Criteria (needs to be fixed immediately)	Needs Attention Criteria (needs to be fixed soon)	Possible Cause
Rail Scanners	An occurrence of any one of these: <ul style="list-style-type: none"> - Successive Cold Rails Exceeded - Successive Cold Resistors Exceeded - Dead Resistor - Correction Factor Greater Than 40 - Pyrometer Noise - Trains with CF's Greater than 90% 	An occurrence of any one of these: <ul style="list-style-type: none"> - Rail Resistor Test Overridden - Wheel Resistor Test Overridden 	Improper calibration or alignment, dirty optics, stuck shutter, blocked scan path, or defective scanner
Wheel Scanners	An occurrence of any one of these: <ul style="list-style-type: none"> - Successive Cold Wheels Exceeded - Successive Cold Wheel Resistors Exceeded - Dead Wheel Scanner Resistor - Pyrometer Noise 	An occurrence of any one of these: <ul style="list-style-type: none"> - Rail Resistor Test Overridden - Wheel Resistor Test Overridden 	Improper calibration or alignment, dirty optics, stuck shutter, blocked scan path, or defective scanner
Transducers	Any occurrence of: <ul style="list-style-type: none"> - High Transducer Miscount 	An occurrence of any one of these: <ul style="list-style-type: none"> - Reverse Direction Detected - Midrange Transducer Miscount 	Slow train movements, improper loading of transducers, transducer connections intermittent, transducer not adjusted correctly on rail, or defective transducer
Battery	An occurrence of any one of these: <ul style="list-style-type: none"> - Low Battery - Dead Battery 	None	No AC power for an extended period, improperly adjusted float voltage, blown battery charger fuse, bad battery connection, or defective battery
Presence Detection	Any occurrence of: <ul style="list-style-type: none"> - No Approach Track 	None	Malfunctioning advance system, improperly installed advance system, malfunctioning cables or wires, or cable disconnected
Dragging-Equipment Detector	An occurrence of any one of these: <ul style="list-style-type: none"> - Stuck Dragger Pretrain - Stuck Dragger During Train 	None	Malfunctioning, improperly installed, malfunctioning cables or wires, or improperly connected cables or wires
High-Load Detector	Any occurrence of: <ul style="list-style-type: none"> - High-Load Pretrain 	None	Malfunctioning, improperly installed, malfunctioning cables or wires, or improperly connected cables or wires
Wide-Load Detector	Any occurrence of: <ul style="list-style-type: none"> - Wide-Load Pretrain 	None	Malfunctioning, improperly installed, malfunctioning cables or wires, or improperly connected cables or wires
Ambient Temperature Probe	Any occurrence of: <ul style="list-style-type: none"> - Temperature Probe Not Reliable 	None	Malfunctioning temperature probe, cable disconnected, or malfunctioning cable
SmartScanNG Enclosure	Any occurrence of: <ul style="list-style-type: none"> - Train Present on Restart 	None	Malfunctioning, improperly installed, damaged, or malfunctioning components in the SmartScanNG enclosure -- Call STC for help in resolving this problem

To produce a Maintenance report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
      .
      .
J) Event Log
K) Maintenance Report
L) Setup
      .
      .
```

- 2 Select **Maintenance Report** to produce the report.
After the Maintenance report is produced, the Main menu reappears.
- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.12 Dynamic Scan Record Reports

The temperature samples collected by the system (as a bearing or wheel passes through the field of view of a scanner) are retained for those bearings and wheels that exceed the Bearing/Wheel DSR Capture Temp. The samples for those bearings/wheels on which pyrometer noise has been detected are also retained.

The Bearing DSR Capture Temp is the value set by the **Bearing DSR Capture Temp option** on the Alarm Settings menu. Likewise, the Wheel DSR Capture Temp is the value set by the **Wheel DSR Capture Temp option** on the Alarm Settings menu.

The Dynamic Scan Rate (DSR) is a feature that ensures that the rate at which the temperature samples are taken adjusts to the speed of a train so that exactly 48 samples are collected for each bearing scan and 96 samples are recorded for each wheel scan. After an axle clears the gating transducers, the samples gathered for each bearing/wheel are evaluated to filter out possible microphonic induced spikes.

On a given train, the system has the capability to retain the DSR samples for up to sixteen bearings and up to sixteen wheels that exceed the Bearing/Wheel DSR capture or on which pyrometer noise has been detected. Where more than sixteen bearings/wheels on a train are found to exceed the Bearing/Wheel DSR Capture, the DSR samples for the warmest sixteen of the bearings/wheels are retained.

Below is a sample of a DSR Records report. The contents of your report will be different.

```

Train Number 29, Warm Brg Trg = 50F, Warm Wheel Trg = 150F
DSW - BrgS:11 BrgE:37 WhlS:1 WhlE:96
-----
[W] Axle:2, Rail:3, OnTime:26, Saved Value:362, Sample Count:96
  30, 24, 24, 14, 24, 14,
  84,162,218,242,274,292,306,324,324,334,338,344,344,352,352,352,352,352,352,356,356,356,356,356,
  356,362,356,356,356,360,352,360,352,360,360,362,356,356,356,356,334,310,282,246,222,186,164,148
  ,126,112, 84, 76, 70, 56, 56, 56, 30, 38, 24, 30, 30, 30, 24, 38, 24, 24, 14, 30, 24, 30, 14,
  24, 14, 14, 14, 14, 14, 24, 14, 14, 14, 24, 24, 24, 24, 30, 14, 24, 24, 24,
[W] Axle:7, Rail:3, OnTime:26, Saved Value:362, Sample Count:96
  24, 14, 14, 24, 24, 24,
  76,154,210,240,274,292,302,314,328,330,338,348,344,348,352,352,352,352,352,356,356,356,360,356,
  356,360,356,352,360,352,356,360,356,356,362,356,356,356,356,352,344,314,284,246,228,190,172,148
  ,126,104, 90, 76, 62, 44, 56, 44, 30, 30, 38, 30, 30, 38, 30, 30, 14, 30, 30, 24, 30, 24, 30,
  24, 30, 14, 24, 14, 14, 24, 24, 24, 24, 24, 30, 24, 14, 14, 24, 24, 14, 24,

```

The table below lists the fields on the DSR Records report and the contents of each field.

Heading	Contents of Field
Train Number	The number that identifies the train in the Trains directory.
Warm Brg Trg	The value set by the Bearing DSR Capture Temp option on the Alarm Settings menu.
Warm Wheel Trg	The value set by the Wheel DSR Capture Temp option on the Alarm Settings menu.
	The character within the brackets identifies the reason the DSR record was captured. This character can be B , P , or W . If "B," the saved value for the <u>bearing</u> scanner was warmer than the value set by the Bearing DSR Capture Temp option on the Alarm Settings menu. If "P," noise on a pyrometer input (from at least one scanner) was detected and filtered while the train was passing the site. If "W," the saved value for the <u>wheel</u> scanner was warmer than the value set by the Wheel DSR Capture Temp option on the Alarm Settings menu.
Axles	The axle number.
Rail	Identifies the scanner for which the DSR record was captured, where 1 is a North/East bearing scanner, 2 is a South/West bearing scanner, 3 is a North/East wheel scanner, and 4 is a South/West wheel scanner.
OnTime	The number of milliseconds a bearing or wheel was scanned.
Saved Value	The temperature, in degrees Fahrenheit, that was recorded from this scanner.
Sample Count	The number of DSR samples that were saved for this axle.
	The 48 temperature samples collected by the system from the indicated scanner as the bearing/wheel passed between the gating transducers.

To produce a DSR Records report for a train:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/06/2015 21:57
Main Menu
-----
      .
      .
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
```

- 2 Select the Print Dynamic Scan Records report.

This prompt appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/09/2015 9:18
Print Dynamic Scan Records Menu
-----
A) DSR Train Summary
B) DSR Train Detail
C) DSR Exception Summary
D) DSR Exception Detail
E) DSR Last Train
F) DSR Last Test Train
X) Exit
?
```

- 3 Select **DSR Train Summary** to produce a Train Summary – Dynamic Scan Records Only.

Below is a sample of a DSR Exceptions Summary report. The contents of your report will be different.

Southern Technologies Corporation Next Generation Detector System TRAIN SUMMARY - Dynamic Scan Records Only																			
=====																			
Reader: CP2.38-P 02/03/2015				Comm: CP2.38-P 02/03/2015				Speech: CPR4.90											
MP/KP: 1234.8				Track: Single				Subdivision: Kaministiquia (6314)											

Alarm Limits..		Absolute: 180				Carside Slope....				1.60									
		Differential: 150				Minimum...				130									
		Hot Wheel NE: 600				Cold Scanner =<				Temp....				10					
		Hot Wheel SW: 600																	

Train#	Date	Time	Cars	Axles	TO1	TO2	Tags	AEI	Speed	i	Exit	D	Rail	Average	Wheel	Average	Amb	Bat	

W 29	I	06/02/15	10:56	41	166	166	166	0	81	E	18	43	360	250	+20C	13.3v			
W 28	I	06/02/15	10:52	22	92	92	92	0	81	E	18	43	360	250	+20C	13.3v			
W 27	I	06/02/15	10:47	21	86	86	86	0	62	W	25	48	360	254	+20C	13.3v			
+	26	B	06/02/15	10:41	91	366	366	366	0	70	W	20	43	360	254	+20C	13.3v		

:																			
:																			

After the DSR Records report is produced, the Dynamic Scan Records menu reappears.

4 Select **DSR Train Detail** option to produce the DSR Records report for a specific train.

This prompt appears.

Train Number ?

a Type the train number.

If you typed a three-digit valid train number, a report for that train is produced. After the DSR Records report is produced, the Dynamic Scan Rate menu reappears. If you typed a three-digit invalid train number, the Dynamic Scan Records menu reappears.

b If you typed one or two digits, press **[Enter]**.

If you typed a valid train number, a report for that train is produced. After the DSR Records report is produced, the Dynamic Scan Records menu reappears. If you typed an invalid train number, the Dynamic Scan Records menu reappears.

5 Select **DSR Exception Summary** to produce this report.

Below is a sample of a DSR Exceptions Summary report. The contents of your report will be different.

```

Southern Technologies Corporation
Next Generation Detector System
EXCEPTIONS SUMMARY
=====
Reader: CP2.38-P 02/03/2015      Comm: CP2.38-P 02/03/2015      Speech: CPR4.90
MP/KP: 1234.8      Track: Single      Subdivision: Kaministiquia (6314)

Alarm Limits..      Absolute: 180      Carside Slope.... 1.60
                   Differential: 150      Minimum... 130
                   Hot Wheel NE: 600      Cold Scanner =< Temp... 10
                   Hot Wheel SW: 600

-----
Train#  Date   Time  Cars Axles TO1  TO2  Tags  (KPH)  r  North  South  Wheel  Wheel  Amb  Bat
                   Exit  D  Rail  Average  Average  Temp
                   AEI Speed i Average  Average
-----
W 28 I 06/02/15 10:56 41 166 166 166 0 81 E 18 43 360 250 +20C 13.3v
W 27 I 06/02/15 10:52 22 92 92 92 0 81 E 18 43 360 250 +20C 13.3v
W 26 I 06/02/15 10:47 21 86 86 86 0 62 W 25 48 360 254 +20C 13.3v
+ 25 B 06/02/15 10:41 91 366 366 366 0 70 W 20 43 360 254 +20C 13.3v
      .
      .
      .

```

6 Select DSR Exception Detail to produce a report for a specific train.

This prompt appears.

Train Number ?

a Type the train number.

If you typed a three-digit valid train number, a report for that train is produced. After the DSR Records report is produced, the Dynamic Scan Rate menu reappears. If you typed a three-digit invalid train number, the Dynamic Scan Records menu reappears.

b If you typed one or two digits, press **[Enter]**.

If you typed a valid train number, a report for that train is produced. After the DSR Records report is produced, the Dynamic Scan Records menu reappears. If you typed an invalid train number, the Dynamic Scan Records menu reappears.

7 Select DSR Last Train to produce the DSR Records report for the last train.

After the DSR Records report is produced, the Dynamic Scan Record menu reappears.

8 Select DSR Last Test Train to produce the DSR Records report for the last test train.

After the DSR Records report is produced, the Dynamic Scan Records menu reappears.

9 To return to the Main menu, type **X**

10 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

4.13 Comma Separated Setup Parameters Report

The Comma Separated Setup Parameters Report provides a comma-delimited list of setup parameters to be printed.

Below is a sample of part of a Setup Parameters report. The contents of your report will be different. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```
Date, 09/02/15
Time, 14:04
Analyzer Vers, CP2.38-P 02/03/2015
Comm Vers, CP2.38-P 02/03/2015
Speech Vers, CPR4.90
Mile Post, 1234.8
Subdivision, Kaministiquia (6314)
Subdivision Code, 6314
Track Dir, E/W
Track, Single
Alm:Absolute, 180
Alm:Differential, 150
Alm:Hot Wheel NE, 600
Alm:Hot Wheel SW, 600
Alm:Carside Slope, 1.60
Alm:Carside Minimum, 130
Alm:Cold Scanner Counter, 3
Alm:Cold Scanner =< Temp, 10
Alm:Cold Res Counter, 3
Alm:Bearing DSR Capture Temp, 50
.
.
.
Msg:Customer Name, YES
Msg:Arrival Message, NO
Msg:Lft/Rt Alarm Ref, NO
Msg:Car ID With Alarm, YES
Msg:US Speech Options, NO
Msg:Detector Out, YES
Msg:Request EOT Timer, 0
Msg:Rebroad DTMF Code, 001
Msg:Primary Language, English
Msg:Secondary Language, NONE
UOM:Date, dd/mm/yyyy
UOM:Ambient Temperature, Celsius
UOM:Speed, KPH
UOM:Length, Meters
AEI:ID Separation, 2
AEI:Consecutive Reads, 2
AEI:Decode As ASCII Tags, Disabled
DSW:Brg Start, 11
DSW:Brg End, 37
DSW:Whl Start, 1
DSW:Whl End, 96
```

To produce a Setup Parameters report:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track:Single
Subdivision: NONE
02/09/2015 21:57
Main Menu
-----
      .
      .
      .
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

- 2 Select **Comma Separated Setup Parameters** to produce the report.
After the Setup Parameters report is produced, the Main menu reappears.
- 3 To exit the serial interface and return the SmartScanNG system to normal operation, type **X**

5.0 Radio Announcements

Currently, the two ways of reporting defects are:

- Announcements made via the road channel
- Reports, which may be printed to provide detailed defect information

This section describes radio announcements. The prior section described reports.

Radio announcements consist of a set of predefined spoken messages with each message triggered by a particular event or set of events. The message formats and announcement criteria are covered below.

In the examples that follow, the wording "C-P Detector" is announced because the **Announce Customer Name option** on the Messages menu was enabled and neither subdivisions Burstall nor Empress were selected. (The wording "G-S-R Detector" would be announced if the **Announce Customer Name option** on the Messages menu was enabled and either subdivisions Burstall or Empress were selected.) **Section 3.0 - Serial Interface** tells how to enable and disable this wording. If the **US Speech option** on the Messages menu was enabled, the announcements shown below will be slightly different. Also, the milepost numbers and subdivision names (in the examples below) are fictitious.

Broadcast Delay is the amount of time a given SmartScanNG system delays the broadcasting of a message, after it has detected an inactive Holdoff input. Broadcast Delay is set to 1 second. **Maximum Holdoff** is the maximum amount of time a given SmartScanNG system delays broadcasting a message while waiting for the holdoff input to clear. If this timeout period expires and the holdoff input remains active, the detector will broadcast its pending message anyway. Maximum Holdoff is set to 30 seconds.

Anytime a message needs to be announced, the expanded holdoff logic kicks in, and the process is as follows:

- 1 Check the Holdoff line.
The Holdoff line is enabled when the road channel is busy.
- 2 If the Holdoff line is free, announce your messages and skip the remaining steps.
- 3 If the Holdoff line is currently in use, start the Holdoff timer, which is set to 30 seconds, and begin monitoring the Holdoff line.
- 4 If the Holdoff line frees up before the Holdoff timer expires, return to step 1.
- 5 If the Holdoff timer expires without the Holdoff line ever becoming free, announce your messages.

5.1 Arrival Messages

The arrival message is used to announce train arrival at the site. Its use is optional. You can enable or disable it using the **Announce Arrival Message option** on the Messages menu.

If you enabled the **US Speech option** on the Messages menu, the word "Milepost" is used. If you disabled the **US Speech option**, the word "Mile" is used instead.

The format of this announcement is:

[C-P Detector] Mile/Milepost (milepost number)
(subdivision name) Sub [track indicator]

At a double-track site, "track indicator" represents the position in the message text that the track designator (such as "East Track") is inserted into the announcements. At a single-track site, no message text is inserted for track indicator.

In the examples that follow, the **US Speech option** was disabled.

For example, at a single-track site, the announcement is like this. In this example, milepost 359.4 and subdivision name "Cool Waters" was used.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub

At a double-track site, the announcement is like this. In this example, milepost 297.1 and subdivision name "Hot Springs" was used.

C-P Detector
Mile 2-9-7 Point 1
Hot Springs Sub
South Track

The arrival message is only announced once per train.

5.2 Real-Time Messages

Real-time messages consist of announcements that occur as the train is passing over the site. The system can only announce Dimensional Shipment, Dragging-Equipment, Hotbox, and Hotwheel along with a one-second one-kilohertz tone. The format of this announcement is:

Tone
(type of alarm)

For example, at a single-track site, the announcement is like this. In this example, a problem was found with the wide-load detector. **Wide-Load** alarms are not announced as such. When this alarms is flagged, **Dimensional Shipment** is announced instead.

Tone
Dimensional Shipment

At a double-track site, the announcement is like this. In this example, a problem was found with the dragging-equipment detector.

Tone
Dragging Equipment

No matter how many defects are found, only the first six alarms are announced per train.

5.3 Post-Train Messages

Post-train (that is, end-of-train) announcements are given after the train has left the site and all the recorded train data has been processed by the SmartScanNG system.

These messages consist of four distinct scenarios, each with its own spoken message. The scenarios are:

- Exception Alarms not detected and Integrity Failures not detected
- Exception Alarms not detected and Integrity Failures detected
- Exception Alarms detected and Integrity Failures not detected
- Exception Alarms detected and Integrity Failures detected

Exception Alarms are associated with axles. When the **Clearance Mode option** on the Messages menu is set to separate, there are eight Exception Alarms. They are the Absolute, Carside Slope, Differential, Dragging-Equipment, **High-Load**, Hotwheel, Pyrometer Saturation, and **Wide-Load** alarms. When the **Clearance Mode option** is set to multiplexed, there are seven Exception Alarms. They are the Absolute, Carside Slope, Differential, Dragging-Equipment, **High-Wide**, Hotwheel, and Pyrometer Saturation alarms. **High-Load**, **High-Wide**, and **Wide-Load** alarms are not reported or announced. When one of these three alarms is flagged, **Dimensional Shipment** is reported and announced.

The four types of Hotbox alarms are Absolute alarms, Differential alarms, Pyrometer Saturation alarms, and Carside Slope alarms. When one of these four alarms occurs, a Hotbox alarm is announced. The system only announces Dimensional Shipment, Dragging-Equipment, Hotbox, and Hotwheel.

Integrity Failures are the Dead Battery, Dead Resistor, Dead Wheel Scanner Resistor, Stuck Dragger During Train Passage, Stuck Dragger Pretrain, Stuck High-Load Detector Pretrain, Stuck Wide-Load Detector Pretrain, Successive Cold Rails Exceeded, Successive Cold Resistors Exceeded, Successive Cold Wheel Resistors Exceeded, Successive Cold Wheels Exceeded, Train Present on Restart, and sometimes Cold Resistor alarms, Cold Wheel Scanner Resistor alarms, and Highrange Transducer Miscounts alarms.

The Highrange Transducer Miscounts alarm can be either a System Alarm or an Integrity Failure, depending on the presence of a Train Too Slow alarm. If a highrange transducer miscount occurs on a train that also contains a Train Too Slow alarm, the firmware treats the miscount condition as a System Alarm. If a highrange transducer miscount occurs on a train traveling faster than 7 mph (11.3 kph), the firmware treats the miscount condition as an Integrity Failure.

The Cold Resistor alarm and the Cold Wheel Scanner Resistor alarm are System Alarms. After a train has passed the site, a more accurate resistor value is calculated. This *new* value is then used to calculate a correction factor. The factor is the percentage difference between the *new* value and the value that was actually read. If the correction factor is less than 24%, no Cold Resistor alarm and no Cold Wheel Scanner Resistor alarm are generated. If the correction factor is in the range of 24% to 40%, the Cold Resistor alarm and the Cold Wheel Scanner Resistor alarm are considered a **system alarm**. If the correction factor for a given rail on any train is greater than 40%, the Cold Resistor alarm and the Cold Wheel Scanner Resistor alarm are considered an **integrity failure**.

Below is the Messages menu (yours may look different). The options on this submenu affect the phrases broadcast to a passing train or are used to modify the parameters associated with the rebroadcast function.

```

STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:40
Messages Menu
-----
A) Axles..... YES
B) Speed..... NO
C) Temperature..... YES
D) Length..... NO
E) Train Too Slow..... YES
F) Power Off (Low DC Voltage)..... YES
G) Cars Count..... NO
H) Customer Name..... YES
I) Arrival Message..... NO
J) Lft/Rt Alarm Ref..... NO
K) Car ID With Alarm..... YES
L) US Speech Options..... NO
M) Detector Out..... YES
N) Request EOT Timer 0=no limit... 0
O) Rebroad DTMF Code..... 001
P) Primary Language..... English
Q) Secondary Language..... NONE
X) Exit
?

```

Enabling one or more of these options generates the ancillary messages: Axles, train speed, site ambient temperature, train length, train too slow, power off – low dc voltage, and number of cars. The other options of the Messages menu aren't used to generate ancillary messages.

In the examples that follow, not all ancillary messages are shown. This is because only axle count and train speed were enabled. That is, only the **Announce Axles option** on the Messages menu and the **Announce Speed option** on the Messages menu were enabled.

If you selected mph with the **Speed Format option** on the Units of Measure submenu and the **Announce Speed option** on the Messages menu is enabled, the speed of the train will be announced in miles per hour. If you selected kph, the speed of the train will be announced in kilometers per hour.

Site ambient temperature, train length, number of cars, power off, and train too slow were disabled. **Section 3.0 - Serial Interface** tells how to enable and disable these messages using the Messages menu on the Setup menu.

If you selected Celsius with the **Temperature Format option** on the Units of Measure submenu and the **Announce Temperature option** on the Messages menu is enabled, the ambient temperature will be announced in Celsius. If you selected Fahrenheit, the ambient temperature will be announced in Fahrenheit. Neither the word Celsius nor the word Fahrenheit is announced.

If you selected feet with the **Length Format option** on the Units of Measure submenu and the **Announce Train Length option** on the Messages menu is enabled, the length of the train will be announced in feet. If you selected meters, the length of the train will be announced in meters. Neither the word feet nor the word meters are announced.

If you enabled the **US Speech option** on the Messages menu, the words "Sticking Brake" and "Milepost" are used. If you disabled the **US Speech option**, the words "Hotwheel" and "Mile" are used instead.

When the Highrange Transducer Miscounts alarm or Train Too Slow alarm occurs, the system won't announce axle count, train speed, train length, or number of cars (even if these messages are enabled).

In the examples that follow, the **Announce Detector Out option** on the Messages menu is disabled, the **Speed Format option** on the Units of Measure submenu is set to mph, and **US Speech option** on the Messages menu is disabled.

5.3.1 Nothing Detected

When neither an Exception Alarm nor an Integrity Failure is detected, the no-alarms message is announced. The format of this announcement is:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
No Alarms
[other ancillary messages] [Detector Out]

For example, at a single-track site, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
No Alarms
Speed 4-5

At a double-track site, the announcement is like this.

C-P Detector
Mile 2-9-7 Point 1
Hot Springs Sub
South Track
Axles 1-6-2
No Alarms
Speed 5-3

5.3.2 Only an Integrity Failure Detected

Integrity failures are caused when the system determines that a condition exists that could prevent proper scanning of a train. They indicate an unusual operating condition that may require train stoppage, later maintenance, or both. Integrity failures appear in the header of Train Detail reports and Exception Detail reports. **Section 4.0 - Producing Reports** tells how to produce these reports. **Appendix B - Integrity Failures** describes the conditions and events that the SmartScanNG system flags as Integrity Failures.

The format of this announcement is:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [ancillary messages] System Not Working [Detector Out]

For example, at a single-track site, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
Speed 4-5
System Not Working

At a double-track site, the announcement is like this.

C-P Detector
Mile 2-9-7 Point 1
Hot Springs Sub
South Track
Axles 9-2
Speed 5-3
System Not Working

5.3.3 Only Exception Alarms Detected

When one or more Exception Alarms are detected and an Integrity Failure isn't detected, the format of this announcement is one of the following three forms.

Where one Exception Alarm has been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
[alarm announcement]
[other ancillary messages]
[Detector Out]

Where more than one and less than seven Exception Alarms have been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
(alarm count) alarms
First alarm
[alarm announcement]
Second alarm
[alarm announcement]
Third alarm
[alarm announcement]
•
•
•
[other ancillary messages]
[Detector Out]

Where more than six Exception Alarms have been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
More than six alarms
First alarm, axle (number)
Inspect entire train, both sides from first alarm to rear of train, or as instructed
[other ancillary messages]
[Detector Out]

Per train, only the first six alarms are announced. When more than six total alarms are detected, the system broadcasts the "Inspect entire train ..." message for the train. The words Excessive Alarms will appear as an entry under the System Alarms column on a detail report for that train.

Hotwheel alarms use the same general format as Hotbox alarms. High-Load, High-Wide, and Wide-Load alarms use the same general format as Dragging-Equipment alarms.

The **Clearance Type option** on the Equipment menu is either trip wire or light beam. This option is only used for high-load detectors and wide-load detectors. Both high-load detectors and wide-load detectors must be either trip-wire detectors or light-beam detectors.

When a wide-load detector is configured for trip-wire operation, the system only records one Wide-Load alarm, regardless of the wide-load signal status. This is because you can only break a wire once.

When it is configured for light-beam operation, the system records every Wide-Load alarm that occurs. However, the system won't flag Wide-Load alarms on consecutive axles. At least one unalarmed axle must separate the alarmed axles. Regardless of the number of detected Wide-Load alarms, the system only announces a maximum of six total alarms. Also, all Wide-Load alarms are announced as Dimensional Shipment.

When a high-load detector is configured for trip-wire operation, the system only records one High-Load alarm, regardless of the high-load signal status. This is because you can only break a wire once.

When it is configured for light-beam operation, the system records every High-Load alarm that occurs. However, the system won't flag High-Load alarms on consecutive axles. At least one unalarmed axle must separate the alarmed axles. Regardless of the number of detected High-Load alarms, the system only announces a maximum of six total alarms. Also, all High-Load alarms are announced as Dimensional Shipment.

The **Announce Car Identification option** on the Messages menu shows whether car-identification information is to be announced (YES) or not announced (NO). When this option is set to YES and an Exception Alarm is found on a car, the car-identification information is announced right after the Exception Alarm is announced during the second pass through the end-of-train message. This, of course, will only happen if the **AEI option** on the Equipment menu is enabled (YES) and the AEI subsystem is functioning properly during train passage. In the examples that follow, the **Announce Car Identification option** was set to NO.

The **Left-Right Alarm Reference option** on the Messages menu shows whether the alarm reference is announced as left or right (YES) or north, south, east, or west (NO). In the examples that follow, this option was set to YES.

For example, at a single-track site having one Hotbox alarm and no Integrity Failure, the announcement is like this. This example assumes that the **Left-Right Alarm Reference option** on the Messages menu was enabled.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
Hotbox Left-Side Axle-7-5
Speed 4-5

At a double-track site having one Dragging-Equipment alarm and no Integrity Failure, the announcement is like this. This example makes no assumption as to whether the **Left-Right Alarm Reference option** was disabled or enabled. Either will result in the following.

C-P Detector
Mile 2-9-7 Point 1
Hot Springs Sub
South Track
Axles 8-8
Dragging-Equipment Near-Axle-8-4
Speed 4-5

At a single-track site having two Hotbox alarms and no Integrity Failure, the announcement is like this. This example assumes that the **Left-Right Alarm Reference option** was enabled.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-0
Two alarms
First alarm
Hotbox Left-Side Axle-7-5
Second alarm
Hotbox Left-Side Axle-8-0
Speed 4-5

The post-train announcement for a detected Hotwheel alarm uses the same general format: "First Alarm, Hotwheel Left-Side Axle-7-5."

At a single-track site having one Hotbox alarm, one Dragging-Equipment alarm, and no Integrity Failure, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
Two alarms
First alarm
Hotbox Left-Side Axle-7-5
Second alarm
Dragging-Equipment Near-Axle-8-4
Speed 4-5

At a single-track site having three Dragging-Equipment alarms and no Integrity Failure, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 1-0-8
Three alarms
First alarm
Dragging-Equipment Near-Axle-8-4
Second alarm
Dragging-Equipment Near-Axle-8-8
Third alarm
Dragging-Equipment Near-Axle-9-2
Speed 5-7

At a single-track site having ten Dragging-Equipment alarms and no Integrity Failure, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
More than six alarms
First alarm, axle 12
Inspect entire train, both sides from first alarm to rear of train, or as instructed
Speed 4-5

5.3.4 Both Exception Alarms and an Integrity Failure Detected

Integrity failures are caused when the system determines that a condition exists that could prevent proper scanning of a train. They indicate an unusual operating condition that may require train stoppage, later maintenance, or both. Integrity failures appear in the header of Train Detail reports and Exception Detail reports. **Section 4.0 - Producing Reports** tells how to produce these reports. **Appendix B - Integrity Failures** describes the conditions and events that the SmartScanNG system flags as Integrity Failures.

When one or more alarm conditions and an Integrity Failure are detected, the format of this announcement is one of the following three forms.

Where one Exception Alarm and an Integrity Failure have been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
[alarm announcement]
System Not Working [other ancillary messages]
[Detector Out]

Where more than one and less than seven Exception Alarms and an Integrity Failure have been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
(alarm count) alarms
First alarm
[alarm announcement]
Second alarm
[alarm announcement]
Third alarm
[alarm announcement]
•
•
•
System Not Working [other ancillary messages]
[Detector Out]

Where more than six Exception Alarms and an Integrity Failure have been detected been detected:

[C-P Detector] Mile (milepost number) (subdivision name) Sub
[track indicator] [temperature] [axle count]
More than six alarms
First alarm, axle (number)
Inspect entire train, both sides from first alarm to rear of train, or as instructed
System Not Working [other ancillary messages]
[Detector Out]

For the rest of the examples in this section, the **Left-Right Alarm Reference option** was set to YES. Also, the **Announce Car Identification option** was set to NO. **Section 3.0 - Serial Interface** tells how to change these options.

For example, at a single-track site having one Hotbox alarm and an Integrity Failure, the announcement is like this. This example assumes that the **Left-Right Alarm Reference option** on the Messages menu was enabled.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 9-8
Hotbox Left-Side Axle-7-5
System Not Working
Speed 4-5

At a double-track site having one Dragging-Equipment alarm and an Integrity Failure, the announcement is like this. This example makes no assumption as to whether the **Left-Right Alarm Reference option** was disabled or enabled. Either will result in the following.

C-P Detector
Mile 2-9-7 Point 1
Hot Springs Sub
North Track
Axles 8-6
Dragging-Equipment Near-Axle-2-4
System Not Working
Speed 5-7

At a single-track site having three Dragging-Equipment alarms and an Integrity Failure, the announcement is like this.

C-P Detector
Mile 3-5-9 point 4
Cool Waters Sub
Axles 1-0-8
Three alarms
First alarm
Dragging-Equipment Near-Axle-8-4
Second alarm
Dragging-Equipment Near-Axle-8-8
Third alarm
Dragging-Equipment Near-Axle-9-2
System Not Working
Speed 5-7

6.0 Scheduled Maintenance

This section lists the items that STC recommends be done during scheduled maintenance.

An up-and-running SmartScanNG system needs to be visited from time to time to do scheduled maintenance. The frequency of these visits is up to the customer. STC recommends visits every 30 to 90 days. Maintenance requirements change with environmental conditions. For example, if the system is installed in a damp or a dusty environment, it may be necessary to visit the location more frequently to clean the optics. The optical system is the item most likely to need periodic maintenance. If moisture or dust isn't a problem, you may not need to do scheduled maintenance more often than every 90 days.

What is done during a maintenance visit is up to the customer. However, STC does have some recommendations. For normal scheduled maintenance, STC recommends these steps.

- 1 Be sure that you have on hand a tape measure, a #2 Phillips head screwdriver, a small slotted screwdriver, a 9/16-inch torque wrench, a laptop computer, a multimeter, and the alignment fixture.
- 2 At trackside, check track conditions on all tracks.
- 3 If any track is pumping (vertical displacement of the rails) or running (lateral displacement of the rails) more than 2 inches (5 centimeters), have it repaired before proceeding.
- 4 At trackside, check for damaged transducers, damaged transducer cables, and other damaged components.
- 5 If you find any damaged components, repair or replace them before proceeding.

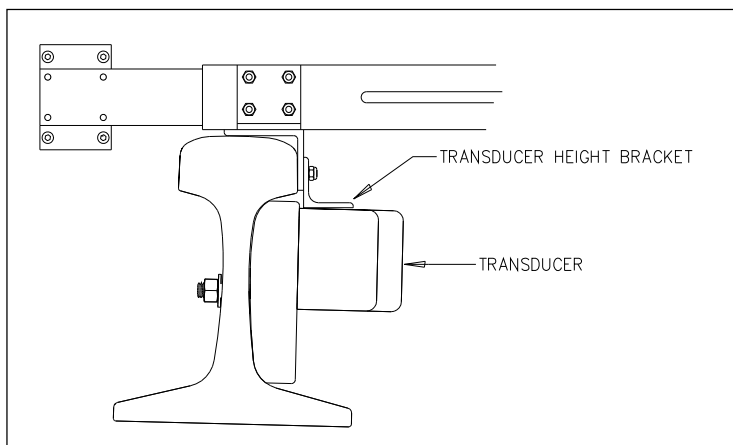
STC transducers don't require a lot of care and attention. Once installed correctly, you don't need to remove them from the rail for cleaning or readjustment.

- 6 At trackside, check all transducer-mounting bolts on all tracks to make sure that all transducers are snug against the rail.

Four bolts are needed to hold the transducer in place. Two square-head bolts go through the mounting plate and transducer body. Two hex-head bolts go through the mounting plate and rail. If any of these bolts are sheared or missing, they must be replaced with the correct replacement bolt. Also, if any washers or nuts are missing, they must be replaced.

- 7 Each installed transducer body should be 1-9/16 inches (3.97 centimeters) below the top of the rail and parallel to it. You can meet this requirement by using the transducer height bracket on the bottom of the alignment fixture.

- 8 Place the alignment fixture across both rails, centered over each transducer in turn.
- 9 Check if each transducer body just touches the bracket.



The fixture should be snug against the top and gauge of both rails. This may be impossible if the transducer body is less than 1-9/16 inches (3.97 centimeters) below the top of the rail or if the transducer body isn't parallel to the top of the rail.

- 10 If a transducer body doesn't just touch the bracket:
 - a Loosen the nuts holding the transducer body to its mounting plate.
 - b By sliding it up and down, adjust the transducer body to the proper height.
 - c Tighten each hex nut with a 9/16-inch torque wrench to a **torque of 12 to 15 foot-pounds (16.3 to 20.3 newton-meters)**.

Don't exceed a torque of 15 foot-pounds (20.3 newton-meters). Doing so can weaken or break a bolt, requiring the bolt to be replaced.

- 11 At the trackside, check all scanner-mounting bolts on all tracks.
- 12 If all scanner mounts aren't snug against the gauge side of the rail, fix this problem before proceeding.

If you need to tighten a scanner's clamping nut or locking nut, **don't exceed a torque of 50 foot-pounds (67.8 newton-meters)**. **Doing so can cause failure of the mount.**

- 13 From under all scanners, remove ballast that could damage the scanner during train passage.
- 14 Remove all obstructions to the scan path of each scanner.
- 15 Ensure the wayside enclosure and all equipment is properly grounded.

- 16 Inspect system batteries. If the battery is dead, damaged, or emitting a strong sulfurous odor, replace it before proceeding.

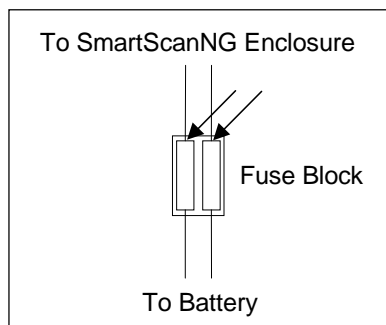
WARNING

In operation, batteries generate and release flammable hydrogen gas, which, if ignited by a burning cigarette, naked flame, or spark, may cause battery explosion with dispersion of casing fragments and corrosive liquid electrolyte. So, carefully follow manufacturer's instructions for installation and service. Keep all sources of gas ignition away from the batteries and do not allow metallic articles to contact the negative and positive terminals of a battery at the same time.

WARNING

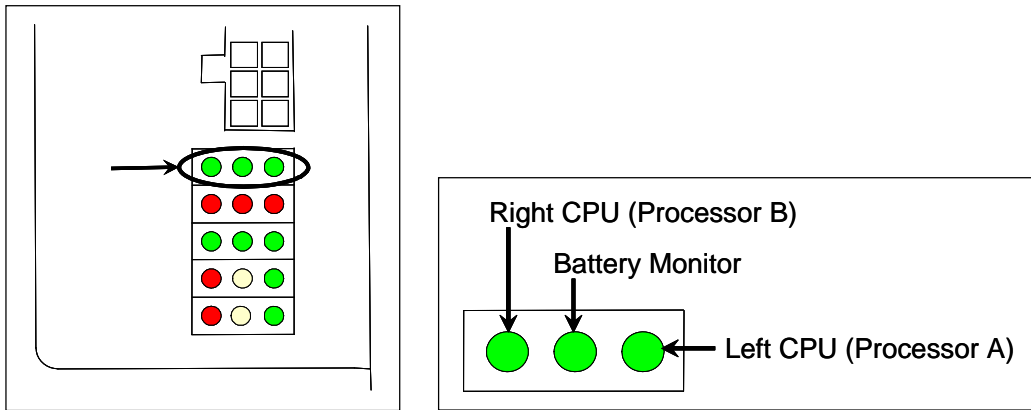
A damaged or aged battery, in combination with the connected battery charger, can pose a serious health threat. The battery can produce hydrogen sulfide gas, which is characterized by its unique "rotten egg" smell. So, when a strong sulfurous odor is detected, remove power to the battery charger and check the battery for excessive heating. Do not inhale the fumes.

- 17 At all outlets, check if the AC power is stable and at least 110 volts at 15 amperes.
- 18 Make sure vents on the top, bottom, and sides of the charger are clear. Blocking any of these vents could result in damage to the charger or battery.
- 19 On the front of the battery charger, if the red defective-temperature-probe LED is lit, fix the underlying problem before proceeding. One end of the battery temperature probe cable has a three-pin plug, which plugs into a receptacle on the front of the battery charger. The other end, which has a temperature sensor sealed in it, should be attached to the negative battery post. If the battery temperature probe is defective or not installed, the red defective LED is lit.
- 20 Switch the multimeter to the DC volts scale.
- The **equipment side** of the fuse block is directly wired to the SmartScanNG enclosure. The **battery side** of the fuse block is wired to the battery via the distribution block.
- 21 Touch the leads from the multimeter to the terminals on the equipment side of the fuse block.



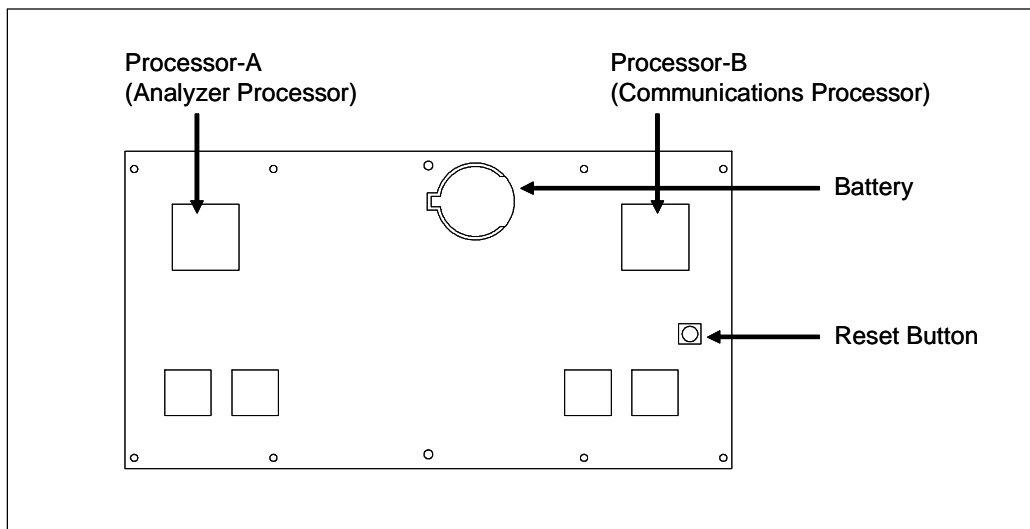
- 22 Voltage (on the equipment side of the fuse block) should measure between 12.7V and 14.5V.

23 On the status panel, look at the top row of LEDs.

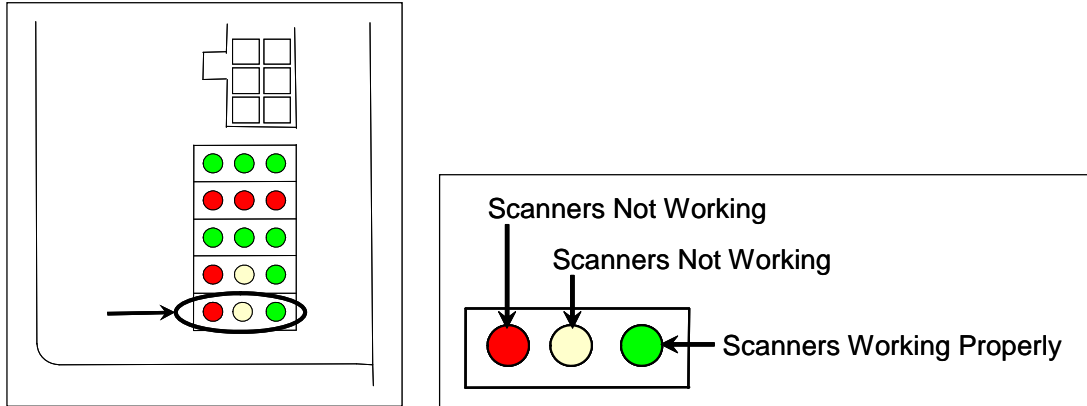


The top row of green LEDs indicates the condition of the CPUs and the battery on the Processor board. If both CPUs are running their programs correctly, their LEDs pulsate (that is, repeat the cycle off, dim, bright, dim). If a program isn't operating as expected, the LED for the affected CPU blinks on and off, is lit solid, or isn't lit at all.

- 24 If either or both of the **rightmost** and **leftmost LEDs** (on the top row) blinks on and off, is lit solid, or isn't lit at all, call STC for help in fixing this problem.
- 25 If the **middle LED** (on the top row) is lit, replace the battery on the Processor board. If care is taken, this can be done with the system powered up. Otherwise, **if you power down the system and remove the battery on the Processor board, the time, the date, and all train data will be lost.**

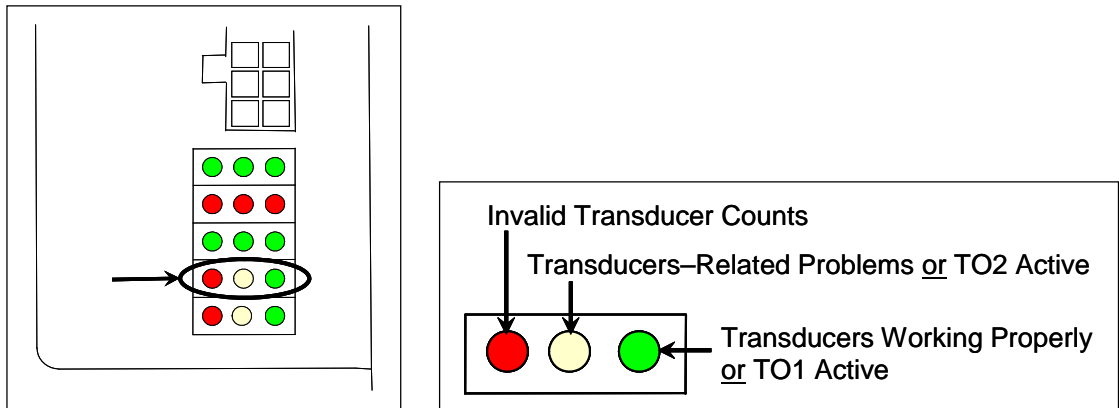


26 On the status panel, look at the bottom row of LEDs.



The bottom row of LEDs indicates the operational condition of the bearing and wheel scanners when the system is at rest (that is, when a train isn't present at the site). Several conditions are monitored and logged. The rightmost green LED flashes when all of the bearing and wheel scanners worked properly during passage of the last 20 trains. It's off when one or more scanners aren't performing as they should be. It's never lit solid.

27 On the status panel, look at the fourth row of LEDs when no train is present.



The fourth row of LEDs operates differently when a train is at the site and when it isn't.

When a train is present at the site, this row indicates the operational status of the gating transducers for the current train. The **rightmost green LED** will flash as a wheel travels over transducer TO1. The center yellow LED will flash when a wheel travels over transducer TO2. The **leftmost red LED** doesn't light during train passage.

The gating transducers are probably functioning properly when the **rightmost green LED** flashes, but, to be sure, you still need to examine a Train Summary report.

Verify that advance transducers are functional. Using a metal wrench, stroke the top of each transducer. The scanner shutters should open completely for 10 seconds. If one or both transducers are not functioning, the words "No Approach Track" will be indicated under the System Alarms section of the train reports.

28 Produce a Train Summary report.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Train Summary**.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:41
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
  .
  .
  .
```

The Train Summary report lists all trains currently stored in the Trains directory. A line of information is shown for each train entry. The report is divided into a header section and a detail section. The header section contains general information about the site. The detail section contains summary information on each train that passed the site.

29 On the Train Summary report, check the Axles column.

Axle count should be an even number. Odd numbered axle counts are possible indications of gating transducer problems. If at any time during train passage the train speed was less than or equal to 7 mph (11.3 kph), gating transducer problems probably don't exist. If the train speed was always above 7 mph (11.3 kph), gating transducer problems probably do exist.

The Train Too Slow alarm indicates that, at some point during train passage, four consecutive axles crossed the gating transducers at a speed of 7 mph (11.3 kph) or less. This alarm appears on a Train Detail report.

If there are many very slow trains (that is, many trains traveling less than 7 mph (11.3 kph) at this site, it may be necessary to relocate the scanners and other track hardware to a better location. Deciding to do this should be made in consultation with STC. Relocating a site is beyond the scope of this document.

30 If there is an even axle count and the values under "Axles", "TO1," and "TO2" are the same, things are probably working correctly.

31 In each scanner, check for dirty optics. Clean as necessary.

Appendix F - Lens Cleaning of Scanners tells how to clean the scanner optics.

32 Verify the date and time displayed on the top of the System Functions menu are correct.

Section 3.0 - Serial Interface tells how to change the date and time.

33 To check the operation of the speaker and the radio:

The **Radio Test option** on the System Functions menu is used to broadcast a short message through the speaker (on top of the SmartScanNG enclosure) **and through the radio**. Similarly, the **1KHz Test Tone option** on the System Functions menu is used to generate a continuous tone for about 10 seconds through the speaker and through the radio. Using either of these options will let you verify that the speaker and radio are working properly.

- a** Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in and its volume knob is turned to the middle position.
- b** From the System Functions menu, select test option.

If you selected **Radio Test**, this message appears.

Starting Radio Test

If you selected **1KHz Test Tone**, this message appears.

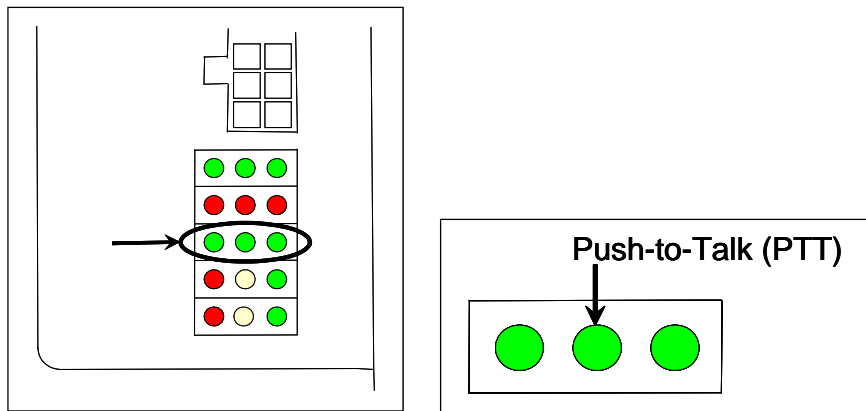
Starting 1kHz Test Tone

If the system isn't currently making any other voice announcements, it begins the message or tone. After the message or tone finishes, the System Functions menu reappears.

If the system is currently making a voice announcement, the firmware displays the message "System Is Currently Making Voice Announcements! Try Again Later" and redisplay the System Functions menu.

- c** While listening to the message or tone, look at the **third row of LEDs** on the status panel.

The **middle green LED** should be lit.



If this LED isn't lit, the system's ability to send a message or tone to the radio might be inhibited. This can happen when one uses the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

The **Radio Inhibit option** prevents radio activation for three minutes. During this time, any announcements generated by the system are broadcast through the speaker, but not through the radio.

- d If the **middle green LED** (on the third row) isn't lit and the radio isn't inhibited, call STC for help in fixing this problem.

34 To check the integrity of the speech data:

The **Vocabulary Test option** on the System Functions menu is used to enunciate all of the stored speech phrases. This announcement is broadcast through the speaker (on top of the SmartScanNG enclosure), but not through the radio. Therefore, it isn't affected by the **Radio Inhibit option** being enabled.

- a Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in and its volume knob is turned to the middle position.
- b From the System Functions menu, select **Vocabulary Test**.

This message appears.

```
Starting Vocabulary Test
```

If the system isn't currently making any other voice announcements, it begins the Vocabulary Test announcement. The SmartScanNG system outputs phrases through the speaker (on the top of the SmartScanNG enclosure), but not through the radio. After the announcement finishes, the System Functions menu reappears.

If the system is currently making a voice announcement, the firmware displays the "System Is Currently Making Voice Announcements! Try Again Later" message and the System Functions menu reappears.

- c If you hear nothing or speech that is too garbled to understand, call STC for help in fixing this problem.

35 To generate a test train to check number of axles:

- a Quickly stroke the top of each gating transducer with a metal wrench, alternating between TO1 and TO2.
- b Repeat step **a** nine more times, for a total of **ten** simulated axles.
- c Wait for the system to time out and the shutters to close.
- d Produce a Last Train report.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Last Train**.

```
      •
      •
E) System Status
F) Last Train
G) Last Test Train
      •
      •
      •
```

The Last Train report is identical to the Train Detail report. There is a difference in the way you specify the train on which you want a report. For this report, you don't specify a train. A report on the most current train is produced.

- e On the report, check that the number of axles agrees with the number of times that you stroked the gating transducers.
- f On the report, if the number of axles doesn't agree with the number of times that you stroked the gating transducers, call STC for help in fixing this problem.

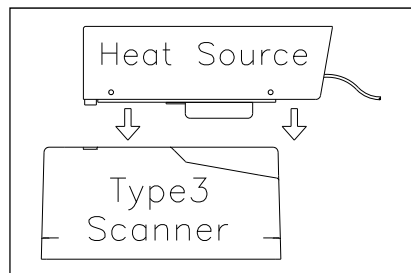
36 To generate a test train to check hot bearings:

STC recommends that you use the calibrated heat source (2100-810NG) only when the outside (ambient) temperature is above -18°C (0°F) and below 32°C (90°F). If you must use it at other times, do so only when the needle is centered on the front of the temperature meter. If the needle isn't stabilized within ± 2 degrees of set point, the heat source isn't operating properly.

- a Ready the calibrated heat source.

After powering it up, let the heat source sit in the shade and out of the wind for at least 8 minutes to stabilize. The heat source has reached operating temperature and stabilized when the temperature meter needle remains centered.

- b With the power cord to the front of the scanner, place the calibrated heat source on the bearing scanner that is on the rail with the gating transducers.



- c Quickly stroke the top of each gating transducer with a metal wrench, alternating between TO1 and TO2 for a total of **six** simulated axles.

You should hear the real-time defect message. No matter how many defects are found, the real-time defect message is only announced once.

- d Wait for the system to time out, which normally takes about 10 seconds.

You should hear an end-of-train message with three Hotbox alarms. Per train, only the first three Hotbox alarms are ever announced.

- e Listen to be sure that the Hotbox alarms are announced and that they are announced for the correct side.

If you do not hear anything, no alarm-level heat was recorded. No measurable heat from a bearing scanner may be due to loose connections, a scanner not being connected to the bottom of the SmartScanNG enclosure, a defective shutter motor in the scanner, or a damaged scanner.

- g If the Hotbox alarms are announced for the wrong side, switch the bearing scanner connections on the bottom of the SmartScanNG enclosure.

- h Repeat the test, this time placing the calibrated heat source on the bearing scanner on the opposite rail.
- i Verify the results as before.
If the results are correct, your system should function properly when scanning the bearings of real trains.
- j Remove and store the calibrated heat source.

37 On the Train Summary report, check the column marked "Average."

For each train, the values in the two columns under this heading should be within four degrees of each other.

38 If the columns aren't within four degrees and if the scanner optics are clean, recalibrate and realign the scanner.

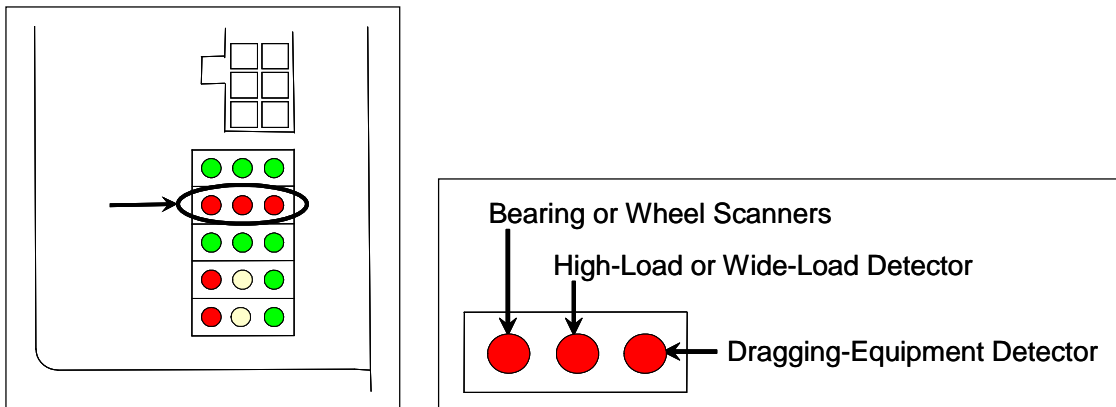
Appendix E - Calibration of Scanners tells how to calibrate the scanners.

39 On the Train Summary report, check the last column of the report.

The last column shows the battery voltage when each train passed the site. It should show values between 12.7 and 14.5 volts. Values outside this range may be caused by:

- No AC power for an extended period
- Improperly adjusted float voltage
- Defective battery
- Blown fuses
- Defective battery charger

40 On the status panel, look at the second row of LEDs.



The second row of red LEDs indicates stored defect alarms, including those for bearing/wheel scanners, dragging equipment, and clearance equipment. These LEDs are lit when a defect alarm (associated with one of those pieces of equipment) has been recorded in any of the last 40 trains. Each LED remains lit until there isn't a recorded defect alarm (for the equipment associated with it) in any of the last 40 trains.

41 If any LED (on the second row) is lit:

- a Produce an Exception Summary report.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Exception Summary**.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 15:41
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
   .
   .
```

The Exception Summary report lists all trains currently stored in the Exceptions directory. A train is stored in the Exceptions directory if either an Exception Alarm or an Integrity Failure was detected on it as it passed the site. A line of information is shown for each train entry.

- b** Produce an extended Exception Detail report for each train that is listed on the Exception Summary report, up to and including the most current 40 trains.

The extended Exception Detail report provides detailed information on a single train. When choosing this report, you'll be prompted for a train number. When prompted, enter a train number from the Exception Summary report. The train number appears under the column titled "Train#" in the detail section of the Exception Summary report.

- c** Looking in the detail section of each of the produced Exception Detail reports, note every recorded defect alarm.
- d** If a red LED (on the second row) is lit and there are one or more corresponding recorded defect alarms on half or less and not on the most current five of the produced Exception Detail reports, go to step **44**.
- e** If a red LED (on the second row) is lit and there are one or more corresponding recorded defect alarms on more than half or on the most current five of the produced Exception Detail reports, check the track hardware and the wiring to the wayside enclosure. Repair any defects.

42 If this is a multi-track site, repeat steps **22** through **42** for each track.

7.0 Customer Service

At STC, the customer is number one. STC is committed to products that work and customers that are satisfied. Nothing less is acceptable. This section tells how to get answers for questions, fixes for problems, and parts for spares.

7.1 Reaching STC

You can reach STC by mail, telephone, fax, and email. By mail, you can reach STC at:

Southern Technologies Corporation
6145 Preservation Drive
Chattanooga, Tennessee 37416-3638
USA

Mail and shipments are replied to as soon as possible, normally within one working day. Equipment repair usually takes longer.

By telephone, except on major holidays, you can reach STC at 423-892-3029, Monday through Friday, from 8:00 a.m. until 5:00 p.m. Eastern time. After business hours, a machine answers the calls. These calls are returned promptly the next business day. By fax, you can reach STC at 423-499-0045. The fax machine can receive faxes at all times. Faxes are replied to as soon as possible, normally within one working day. By email, you can reach STC at stcemail@southern-tech.com. Email is replied to as soon as possible, normally within one working day.

7.2 Returning Equipment for Repair

Return any damaged, defective, or malfunctioning equipment to STC for repair or replacement. You don't need a return authorization number. You don't even need to make a telephone call first. Just ship it directly to the **Repair Department** at the address above.

With the returned equipment, include:

- Complete address of where the equipment is to be returned.
- Name and telephone number of person who should be contacted to answer questions about the equipment.
- Written explanation of the equipment defect or malfunction.
- Any reports or other data that would be helpful in diagnosing the problem.
- If out of warranty, Purchase Order Number for the order or credit card number (to be charged) with its expiration date.

7.3 Reporting Problems or Suggestions

If you have any problems, suggestions, or questions related to STC equipment, telephone the **Engineering Department** at the telephone number above. When calling, state the equipment you're calling about. Your call will then be directed to the right person.

7.4 Ordering Spare Parts

If you need any spare parts to support STC equipment, telephone or fax the **Sales Department** at the telephone numbers above.

When calling, state that you're calling to order parts. Your call will then be directed to the right person. When placing the order, reference the STC part numbers listed in this guide. However, if you don't have the part numbers, the sales staff can obtain them for you and provide you with current pricing and availability.

When faxing, include:

- Purchase Order Number for the order or credit card number (to be charged) with its expiration date.
- Complete address where the parts are to be shipped.
- Complete address where the invoice is to be mailed.
- Name and telephone number of the person who should be contacted to answer questions about the order.
- Your fax number, if available.
- For each item ordered, part number, complete description, and quantity needed.

7.5 Checking on Shipments and Orders

If you need to check on the status of any shipment or order, telephone or fax the **Sales Department** at the telephone numbers above.

When calling, state that you're checking the status of a shipment or order. Your call will then be directed to the right person. Have your Purchase Order Number ready when you call. However, if you don't have the order number, the sales staff can locate your order number and provide you with the status of the shipment or order.

When faxing, include:

- Purchase Order Number for the shipment or order being checked.
- Name and telephone number of the person who should be contacted after the order status is checked.
- Your fax number, if available.

Appendix A

System Alarms: Non-Critical

This appendix describes the conditions and events that the SmartScanNG system flags as System Alarms. These alarms provide data about passing trains and system status. These alarms are listed under the System Alarms section of the Train Detail and Exception Detail reports. **Section 4.0 - Producing Reports** tells how to produce these reports.

A.1 Ambient Temperature Probe Unreliable Alarm

The Ambient Temperature Probe Unreliable alarm indicates that the temperature probe is giving unreliable readings.

A.2 Cold Bearing Scanner Alarm

The Cold Bearing Scanner alarm indicates that the temperatures of all bearings (of the train) on the designated rail were below a given temperature. When no bearing on a given rail generates a delta temperature reading greater than or equal to the temperature set by the **Cold Scanner =<Temp** option on the Alarm Settings menu, the system generates a Cold Bearing Scanner alarm. **Section 3.0 - Serial Interface** tells how to view or change the **Cold Scanner =< Temp** option.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
09/02/2015 15:39
Alarm Settings Menu
-----
A) Absolute..... 180
B) Differential..... 150
C) Hot Wheel (North or East bound) 600
D) Hot Wheel (South or West bound) 600
E) Carside Slope..... 1.60
F) Carside Minimum..... 130
G) Cold Scanner Counter..... 3
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?
```

There is a different Cold Bearing Scanner alarm for each rail. That is, there is a Cold North Bearing Scanner alarm and a Cold South Bearing Scanner alarm (or, depending on track direction, a Cold East Bearing Scanner alarm and a Cold West Bearing Scanner alarm).

The **maximum number** (per rai-side) of consecutive trains, having Cold Bearing Scanner alarms, allowed before generating a Successive Cold Bearing Scanner Exceeded alarm is set by the **Cold Scanner Counter** option on the Alarm Settings menu. If the number of consecutive trains bearing identical Cold Scanner alarms equals or exceeds the cold-scanner-alarm limit, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Bearing Scanners Exceeded." Successive Cold Bearing Scanners Exceeded alarms are covered in the next appendix. **Section 3.0 - Serial Interface** tells how to view or change the **Cold S option**.

```
      .
      .
F) Carside Minimum..... 155
G) Cold Scanner Counter..... 2
H) Cold Scanner =< Temp..... 10
      .
      .
```

A.3 Cold Bearing Integrity Resistor Alarm

A resistor is mounted to the inside of the bearing scanner's shutter. A voltage is applied to this resistor while the shutter is open, causing it to heat up. After a train has left a site and the shutters have closed, the temperature of the resistor is read by the scanner pyrometer. In this way, a check of the system's ability to read heat correctly is made. The Cold Bearing Integrity Resistor alarm indicates that the **minimum value** expected for the temperature of the resistor wasn't met. This minimum value is determined by the firmware and is dependent upon the time it takes a train to pass a site.

If the **minimum value** wasn't met, a second check compares the recorded resistor temperature against the limit that was established using the **Absolute option** on the Alarm Settings menu. (This alarm limit is an offset, in degrees Fahrenheit, above the ambient temperature.) If the recorded resistor temperature meets or exceeds the critical-alarm limit, the firmware cancels any previously flagged Cold Bearing Integrity Resistor alarms. **Section 3.0 - Serial Interface** tells how to view or change the **Absolute option**.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
09/02/2015 15:39
Alarm Settings Menu
-----
A) Absolute..... 180
B) Differential..... 150
C) Hot Wheel (North or East bound) 600
      .
      .
```

There is a different Cold Bearing Integrity Resistor alarm for each rail. That is, there is a Cold North Bearing Integrity Resistor alarm and a Cold South Bearing Integrity Resistor alarm (or, depending on track direction, a Cold East Bearing Integrity Resistor alarm and a Cold West Bearing Integrity Resistor alarm).

The **maximum number** (per rai1side) of consecutive trains, having Cold Bearing Integrity Resistor alarms, allowed before generating a Successive Cold Bearing Resistors Exceeded alarm is set by the **Cold Resistor Counter option** on the Alarm Settings menu. Successive Cold Bearing Resistors Exceeded alarms are covered in the next appendix. **Section 3.0 - Serial Interface** tells how to view or change the **Cold Resistor Counter option**.

```

      •
      •
      •
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?
```

After a train has passed the site, a more accurate *required* resistor value will be calculated, taking into account the ambient temperature. This new value is then used to calculate a correction factor. The factor is the percentage difference between the *required* resistor value and the value that was actually read. For example, if the *required* resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$).

If the correction factor is less than 24%, no Cold Bearing Integrity Resistor alarm is generated. If the correction factor is in the range of 24% to 40%, the Cold Bearing Integrity Resistor alarm is considered a **system alarm**. If the correction factor for a given rail on any train is greater than 40%, the Cold Bearing Integrity Resistor alarm is considered an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the *required* resistor value, two additional checks will be performed. Either of these checks can generate a Cold Bearing Integrity Resistor alarm. For more information on these checks, see **A.13 Rail Resistor Test Overridden Alarm**.

A.4 Cold Wheel Scanner Alarm

The Cold Wheel Scanner alarm represents the wheel scanner's equivalent of the bearing scanner's Cold Bearing Scanner alarm. When no wheel on a given rail generates a delta temperature reading greater than or equal to a preset minimum, the system generates a Cold Wheel Scanner alarm. The preset minimum temperature is determined by the firmware and is currently 9°F above ambient (5°C above ambient). The customer can't change this value. Just like Cold Bearing Scanner alarms, separate Cold Wheel Scanner alarms exist for each rai1side.

The **maximum number** (per rai1side) of consecutive trains, having Cold Wheel Scanner alarms, allowed before generating a Successive Cold Wheels Exceeded alarm is set by the **Cold Scanner Counter option** on the Alarm Settings menu. Successive Cold Wheel Scanner Exceeded alarms are covered in the next appendix. **Section 3.0 - Serial Interface** tells how to view or change the **Cold Scanner option**.

```

      .
      .
F) Carside Minimum..... 155
G) Cold Scanner Counter..... 2
H) Cold Scanner =< Temp..... 10
      .
      .
      .

```

A.5 Cold Wheel Integrity Resistor Alarm

The Cold Wheel Integrity Resistor alarm represents the wheel scanner's equivalent of the bearing scanner's Cold Bearing Integrity Resistor alarm. Evaluation of Cold Wheel Integrity Resistor alarm mimics the same logic used in the evaluation of Cold Bearing Integrity Resistor alarms. In this way, the system confirms the scanner's ability to read alarm level heat. Just like Cold Bearing Integrity Resistor alarms, separate Cold Wheel Integrity Resistor alarms exist for each rai1side.

The **maximum number** (per rai1side) of consecutive trains, having Cold Wheel Integrity Resistor alarms, allowed before generating a Successive Cold Wheel Resistors Exceeded alarm is set by the **Cold Resistor Counter option** on the Alarm Settings menu. Successive Cold Wheel Resistors Exceeded alarms are covered in the next appendix. **Section 3.0 - Serial Interface** tells how to view or change the **Cold Resistor Counter option**.

```

      .
      .
      .
H) Cold Rail Temp..... 10
I) Cold Res Counter..... 3
J) Res Test: Minimum Rail Avg... 25
K) Res Test: Minimum Wheel Avg.. 28
X) Exit

```

After a train has passed the site, a more accurate *required* resistor value will be calculated, taking into account the ambient temperature. This new value is then used to calculate a correction factor. The factor is the percentage difference between the *required* resistor value and the value that was actually read. For example, if the *required* resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% (1 - (135 / 180) = 0.25).

If the correction factor is less than 24%, no Cold Wheel Integrity Resistor alarm is generated. If the correction factor is in the range of 24% to 40%, the Cold Wheel Integrity Resistor alarm is considered a **system alarm**. If the correction factor for a given rail on any train is greater than 40%, the Cold Wheel Integrity Resistor alarm is considered an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. Either of these checks can generate a Cold Wheel Integrity Resistor alarm. For more information on these checks, see **A.21 Wheel Resistor Test Overridden Alarm**.

A.6 Highrange Transducer Miscounts Alarm

The Highrange Transducer Miscounts alarm indicates that the transducer counts for TO1 and TO2 differ by seven or more. This calculation is made after each axle crosses both gating transducers. When this alarm occurs, the system won't announce axle count, exit speed, length of train, or total number of cars (even if these messages are enabled).

The Highrange Transducer Miscounts alarm can be either a System Alarm or an Integrity Failure, depending on the presence of a Train Too Slow alarm. If a highrange transducer miscount occurs on a train that also contains a Train Too Slow alarm, the firmware treats the miscount condition as a System Alarm. This logic assumes that the train's slow rate of travel likely caused the transducer miscount condition. If a highrange transducer miscount occurs on a train traveling faster than 7 mph (11.3 kph), the firmware treats the miscount condition as an Integrity Failure.

A.7 Integrity Failure Alarm

The Integrity Failure alarm indicates that the SmartScanNG system determined that a condition exists that could prevent proper scanning of a train. In other words, this alarm indicates the existence of one or more conditions in which the integrity of the system, and its ability accurately to record train data, may be compromised. These unusual conditions, called Integrity Failures, may require train stoppage, later maintenance, or both. They are covered in the next appendix.

A.8 Low Battery Alarm

The **Low Battery alarm** indicates a float voltage of at least 11.8 volts, but less than 12.6 volts, on the standby battery. (The **Dead Battery alarm** indicates a float voltage of less than 11.8 volts on the standby battery.)

A.9 Midrange Transducer Miscounts Alarm

The Midrange Transducer Miscounts alarm indicates that the transducer counts for TO1 and TO2 differ by five or six. This calculation is made after each axle crosses both gating transducers.

A.10 No Approach Track Alarm

The No Approach Track alarm indicates that the system presence detection system (that is, the track circuit or the advance transducers) didn't detect the arrival of the train at the site. Instead, the system started the train scanning process when a gating transducer sensed the train.

A.11 Pyrometer Noise Filtered Rail Alarm

The Pyrometer Noise Filtered Rail alarm indicates that a pyrometer in a bearing scanner might be becoming unreliable. This alarm isn't considered an Integrity Failure and therefore won't result in "Not Working" being part of the post-train announcement.

There is a different Pyrometer Noise Filtered Rail alarm for each rail. That is, there is a Pyrometer Noise Filtered North Rail alarm and a Pyrometer Noise Filtered South Rail alarm (or, depending on track direction, a Pyrometer Noise Filtered East Rail alarm and a Pyrometer Noise Filtered West Rail alarm).

A.12 Pyrometer Noise Filtered Wheel Alarm

The Pyrometer Noise Filtered Wheel alarm indicates that a pyrometer in a wheel scanner might be becoming unreliable. This alarm isn't considered an Integrity Failure and therefore won't result in "Not Working" being part of the post-train announcement.

There is a different Pyrometer Noise Filtered Wheel alarm for each rail. That is, there is a Pyrometer Noise Filtered North Wheel alarm and a Pyrometer Noise Filtered South Wheel alarm (or, depending on track direction, a Pyrometer Noise Filtered East Wheel alarm and a Pyrometer Noise Filtered West Wheel alarm).

A.13 Rail Resistor Test Overridden Alarm

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. The average heats for both bearings are tested against the value set by the **Resistor Test Minimum Rail Average option** on the Alarm Settings menu.

	•
	•
	•
J) Bearing DSR Capture Temp.....	50
K) Res Test: Minimum Rail Avg.....	25
L) Res Test: Minimum Wheel Avg.....	28
	•
	•

If the average heats are less than the value set by the **Resistor Test Minimum Rail Average option**, the system generates a Cold Resistor alarm.

If the average heats are greater than or equal to this value, bearing temperatures are compared on an axle-by-axle basis. This second check determines if more than half of the temperatures read by the bearing scanner with the low-read resistor value are 70% or less than the temperatures read by the other bearing scanner on the same axle. If 50% or more of the axles are low, a Cold Resistor alarm is flagged. If not, a Cold Resistor alarm isn't flagged, but a Rail Resistor Test Overridden alarm is.

There is a different Rail Resistor Test Overridden alarm for each rail. That is, there is a North Rail Resistor Test Overridden alarm and a South Rail Resistor Test Overridden alarm (or, depending on track direction, an East Rail Resistor Test Overridden alarm and a West Rail Resistor Test Overridden alarm).

A.14 OnTime Greater Than OffTime Alarm

Trains that are being scanned correctly will have axles whose on times (that, axles between the gating transducers) are less than their off times (that, axles not between the gating transducers). For each axle of a passing train (except for the first axle), the system checks for an on time that is greater than the off time. If the axle's on time is greater than its off time, the system reverses the direction locked-in by the first gating pulse, reverses the opening and closing gate assignment for TO1 and TO2, and generates a false transducer pulse. The system considers the gate active for the next axle at the time it determines the current axle's opening gate pulse was missed.

The OnTime Greater Than OffTime alarm indicates that the system entered a state where it is scanning for bearing temperatures when the axles are outside the scanning gate. In this state, the transducer that should be opening the scanning gate is considered by the system to be the transducer that is closing the gate. Likewise, the transducer that should be closing the scanning gate is considered the transducer that is opening the gate.

A.15 Short Train Alarm

The Short Train alarm indicates that a train had fewer than 50 axles.

A.16 Stuck Dragger During Train Passage Alarm

The Stuck Dragger During Train Passage alarm indicates that the preset maximum number of consecutive axles have had Dragging-Equipment alarms during train passage. The maximum number is determined by the firmware and is currently five.

A.17 Stuck Dragger Recovered Alarm

The Stuck Dragger Recovered alarm indicates that a stuck dragger was detected during train passage and, at some point later, the dragging-equipment detector returned to its neutral position. After returning to its neutral position, the firmware must scan at least eight consecutive Dragger free axles before flagging this condition again.

A.18 Stuck SOTC Alarm

The Stuck SOTC alarm indicates that the track circuit is active when it shouldn't be. That is, it is active when no train is present at the site. Or, when a train is moving through the site and both transducers are inactive.

A.19 Test Train Alarm

The Test Train alarm indicates that a given train was generated by the SmartScanNG system. These trains are used for testing purposes and do not represent actual trains passing the site.

A.20 Train Too Slow alarm

The Train Too Slow alarm indicates that, at some point during train passage, four consecutive axles crossed the gating transducers at a speed of 7 mph (11.3 kph) or less. When this alarm occurs, the system won't announce axle count, exit speed, length of train, and total number of cars (even if these messages are enabled).

A.21 Wheel Resistor Test Overridden Alarm

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. The average heats for both wheels are tested against the value set by the **Resistor Test Minimum Wheel Average option** on the Alarm Settings menu.

If the average heats are less than the value set by the **Resistor Test Minimum Wheel Average option**, the system generates a Cold Wheel Scanner Resistor alarm.

If the average heats are greater than or equal to this value, wheel temperatures are compared on an axle-by-axle basis. This second check determines if more than half of the temperatures read by the wheel scanner with the low-read resistor value are 70% or less than the temperatures read by the other wheel scanner on the same axle. If 50% or more of the axles are different, a Cold Wheel Scanner Resistor alarm is flagged. If not, a Cold Wheel Scanner Resistor alarm isn't flagged, but a Wheel Resistor Test Overridden alarm is.

There is a different Wheel Resistor Test Overridden alarm for each rail. That is, there is a North Wheel Resistor Test Overridden alarm and a South Wheel Resistor Test Overridden

alarm (or, depending on track direction, a East Wheel Resistor Test Overridden alarm and a West Wheel Resistor Test Overridden alarm).

A.22 DSR:Recovered Correctly After Unexpected Gate Closure

"DSR:Recovered Correctly After Unexpected Gate Closure" indicates that a gate closure was detected before the expected number of wheel scanner samples was collected. The system processed the heat samples that it had collected up until the gate closed.

A.23 DSR:Recovered Correctly After Unexpected Gate Opening

"DSR:Recovered Correctly After Unexpected Gate Opening" indicates that the gate was already open at the time the last sample was collected for the previous axle.

A.24 AEI System Alarms

The following system alarms indicate defects of the AEI subsystem:

- AEI Subsystem Not Responding
- AEI Subsystem: No Tags
- AEI Subsystem: No Tags Ant 1
- AEI Subsystem: No Tags Ant 2

Appendix B

System Alarms: Critical

This appendix describes the conditions and events that the SmartScanNG system flags as Integrity Failures. These alarms indicate conditions in which the integrity of the system, and its ability to record train data accurately, may be compromised. These alarms are listed under the System Alarms section of the Train Detail and Exception Detail reports. **Section 4.0 - Producing Reports** tells how to produce these reports.

B.1 Cold Bearing Integrity Resistor Alarm

A resistor is mounted to the inside of the bearing scanner's shutter. A voltage is applied to this resistor while the shutter is open, causing it to heat up. After a train has left a site and the shutters have closed, the temperature of the resistor is read by the scanner pyrometer. In this way, a check of the system's ability to read heat correctly is made. The Cold Bearing Integrity Resistor alarm indicates that the minimum value expected for the temperature of the resistor wasn't met. This minimum value is determined by the firmware and is dependent upon the time it takes a train to pass a site. Separate Cold Resistor alarms exist for each railside.

After a train has passed the site, a more accurate *required* resistor value will be calculated, taking into account the ambient temperature. This new value is then used to calculate a correction factor. The factor is the percentage difference between the *required* resistor value and the value that was actually read. For example, if the *required* resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$).

If the correction factor is less than 24%, no Cold Bearing Integrity Resistor alarm is generated. If the correction factor is in the range of 24% to 40%, the Cold Bearing Integrity Resistor alarm is considered a **system alarm**. If the correction factor for a given rail on any train is greater than 40%, the Cold Resistor alarm is considered an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the *required* resistor value, two additional checks will be performed. Either of these checks can generate a Cold Bearing Integrity Resistor alarm. For more information on these checks, see **A.13 Rail Resistor Test Overridden Alarm**.

B.2 Cold Wheel Integrity Resistor Alarm

The Cold Wheel Integrity Resistor alarm represents the wheel scanner's equivalent of the bearing scanner's Cold Bearing Integrity Resistor alarm. Evaluation of Cold Wheel Integrity Resistor alarm mimics the same logic used in the evaluation of Cold Bearing Integrity Resistor alarms. In this way, the system confirms the scanner's ability to read alarm level heat. Just like Cold Bearing Integrity Resistor alarms, separate Cold Wheel Integrity Resistor alarms exist for each railside.

After a train has passed the site, a more accurate *required* resistor value will be calculated, taking into account the ambient temperature. This new value is then used to calculate a correction factor. The factor is the percentage difference between the *required* resistor value and the value that was actually read. For example, if the *required* resistor temperature is 180 and the actual resistor temperature is 135 the correction factor would be 25% ($1 - (135 / 180) = 0.25$).

If the correction factor is less than 24%, no Cold Wheel Integrity Resistor alarm is generated. If the correction factor is in the range of 24% to 40%, the Cold Wheel Integrity Resistor alarm is considered a **system alarm**. If the correction factor for a given rail on any train is greater than 40%, the Cold Wheel Integrity Resistor alarm is considered an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't greater than 76% of the required resistor value, two additional checks will be performed. Either of these checks can generate a Cold Wheel Integrity Resistor alarm. For more information on these checks, see **A.20 Wheel Resistor Test Overridden Alarm**.

B.3 Dead Battery Alarm

The **Dead Battery alarm** indicates a float voltage of less than 11.8 volts on the standby battery. (The **Low Battery alarm** indicates a float voltage of at least 11.8 volts, but less than 12.6 volts, on the standby battery.)

B.4 Dead Bearing Integrity Resistor Alarm

The bearing scanner's Dead Bearing Integrity Resistor alarm indicates the presence of two separate conditions. First, the train must contain a Cold Bearing Scanner alarm on a given rail. Second, the recorded temperature for the bearing scanner's resistor on that rail must fall below the value set by the **Cold Scanner =< Temp option** on the Alarm Settings menu.

Section 3.0 - Serial Interface tells how to view or change this value.

```

      .
      .
      .
G) Cold Scanner Counter..... 3
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?

```


There is a different Dead Bearing Integrity Resistor alarm for each rail. That is, there is a Dead North Bearing Integrity Resistor alarm and a Dead South Bearing Integrity Resistor alarm (or, depending on track direction, a Dead East Bearing Resistor alarm and a Dead West Bearing Resistor alarm).

B.5 Dead Wheel Integrity Resistor Alarm

The wheel scanner's Dead Wheel Integrity Resistor alarm indicates the presence of two separate conditions. First, the train must contain a Cold Wheel Scanner alarm on a given rail. Second, the recorded temperature for the wheel scanner's resistor on that rail must fall below the value set by the **Cold Rail Temperature option** on the Alarm Settings menu. **Section 3.0 - Serial Interface** tells how to view or change this value.

```

      •
      •
      •
G) Cold Scanner Counter..... 3
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?

```

There is a different Dead Wheel Integrity Resistor alarm for each rail. That is, there is a Dead North Wheel Integrity Resistor alarm and a Dead South Wheel Integrity Resistor alarm (or, depending on track direction, a Dead East Wheel Integrity Resistor alarm and a Dead West Wheel Integrity Resistor alarm).

B.6 Highrange Transducer Miscounts Alarm

The Highrange Transducer Miscounts alarm indicates that the transducer counts for TO1 and TO2 differ by seven or more. This calculation is made after each axle crosses both gating transducers. When this alarm occurs, the system won't announce axle count, exit speed, length of train, or total number of cars (even if these messages are enabled).

The Highrange Transducer Miscounts alarm can be either a System Alarm or an Integrity Failure, depending on the presence of a Train Too Slow alarm. If a highrange transducer miscount occurs on a train that also contains a Train Too Slow alarm, the firmware treats the miscount condition as a System Alarm. This logic assumes that the train's slow rate of travel likely caused the transducer miscount condition. If a highrange transducer miscount occurs on a train traveling faster than 7 mph (11.3 kph), the firmware treats the miscount condition as an Integrity Failure.

B.7 Stuck Dragger During Train Passage Alarm

The Stuck Dragger During Train Passage alarm indicates that the preset maximum number of consecutive axles have had Dragging-Equipment alarms during train passage. The maximum number is determined by the firmware and is currently five.

B.8 Stuck Dragger Pretrain Alarm

The Stuck Dragger Pretrain alarm indicates that the dragging-equipment detector was stuck before the scanners started scanning. That is, between the time of first receiving a pulse from the track circuit (or the advance transducers) and the time of first receiving a pulse from either gating transducer, the SmartScanNG system detected an open circuit from the dragging-equipment detector.

B.9 Stuck High-Load Detector Pretrain Alarm

The Stuck High-Load Detector Pretrain alarm indicates that, before the scanners started scanning, the high-load detector was stuck. That is, between the time of first receiving a pulse from the track circuit (or the advance transducers) and the time of first receiving a pulse from either gating transducer, the SmartScanNG system detected an open circuit from the high-load detector.

B.10 Stuck Wide-Load Detector Pretrain Alarm

The Stuck Wide-Load Detector Pretrain alarm indicates that, before the scanners started scanning, the wide-load detector was stuck. That is, between the time of first receiving a pulse from the track circuit (or the advance transducers) and the time of first receiving a pulse from either gating transducer, the SmartScanNG system detected an open circuit from the wide-load detector.

There is a different Stuck Wide-Load Detector Pretrain alarm for each rail. That is, there is a Stuck Wide-Load Detector Pretrain North Side alarm and a Stuck Wide-Load Detector Pretrain South Side alarm (or, depending on track direction, a Stuck Wide-Load Detector Pretrain East Side alarm and a Stuck Wide-Load Detector Pretrain West Side alarm).

B.11 Successive Cold Bearing Scanner Exceeded Alarm

The Successive Cold Bearing Scanner Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Bearing Scanner alarms on the same railside, have passed a site. The maximum number (per railside) of consecutive trains having Cold Bearing Scanner alarms allowed before generating an Integrity Failure alarm is set by the **Cold Scanner Counter** option on the Alarm Settings menu. **Section 3.0 - Serial Interface** tells how to view or change this value.

```

      •
      •
      •
G) Cold Scanner Counter..... 3
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
K) Res Test: Minimum Rail Avg..... 25
L) Res Test: Minimum Wheel Avg..... 28
M) Wheel DSR Capture Temp..... 150
X) Exit
?

```

Under normal circumstances, Cold Bearing Scanner conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Bearing Scanner alarm equals or exceeds the **Cold Scanner Counter option** on the Alarm Settings menu, this condition becomes an Integrity Failure. When this happens, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Bearing Scanners Exceeded."

B.12 Successive Cold Bearing Resistors Exceeded Alarm

The Successive Cold Bearing Resistors Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Bearing Resistor alarms on the same railside, have passed a site. The maximum number (per railside) of consecutive trains having Cold Bearing Resistor alarms allowed before generating an Integrity Failure alarm is set by the **Cold Res Counter option** on the Alarm Settings menu. **Section 3.0 - Serial Interface** tells how to view or change this value.

```

      •
      •
      •
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
      •
      •

```

Under normal circumstances, Cold Bearing Resistor conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Bearing Resistor alarm equals or exceeds the **Cold Res Counter option** on the Alarm Settings menu, this condition becomes an Integrity Failure. When this happens, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Bearing Resistors Exceeded."

B.13 Successive Cold Wheel Scanner Exceeded Alarm

The Successive Cold Wheel Scanner Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Wheel Scanner alarms on the same railside, have passed a site. The user determines the number of consecutive trains used in the comparison through the **Cold Scanner Counter option** on the Alarm Settings menu.

Section 3.0 - Serial Interface tells how to view or change this value.

	•
	•
	•
G) Cold Scanner Counter.....	3
H) Cold Scanner =< Temp.....	10
I) Cold Res Counter.....	3
	•
	•

Under normal circumstances, cold-wheel conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Wheel Scanner alarm equals or exceeds the **Cold Scanner Counter option** on the Alarm Settings menu, this condition becomes an Integrity Failure. When this happens, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Wheel Scanner Exceeded."

B.14 Successive Cold Wheel Resistors Exceeded Alarm

The Successive Cold Wheel Resistors Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Wheel Scanner Resistor alarms on the same railside, have passed a site. The user determines the number of consecutive trains used in the comparison through the **Cold Resistor Counter option** on the Alarm Settings menu. **Section 3.0 - Serial Interface** tells how to view or change this value.

```
      •
      •
      •
H) Cold Scanner =< Temp..... 10
I) Cold Res Counter..... 3
J) Bearing DSR Capture Temp..... 50
      •
      •
```

Under normal circumstances, cold-wheel-resistor conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Wheel Scanner Resistor alarm equals or exceeds the **Cold Res Counter option** on the Alarm Settings menu, this condition becomes an Integrity Failure. When this happens, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Wheel Resistors Exceeded."

B.15 Train Present on Restart Alarm

The Train Present on Restart alarm indicates that a train was present at the site when the system was starting up.

Appendix C

System Functions

This appendix lists the system functions provided by the SmartScanNG system.

To access the system functions:

- 1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 11:30
Main Menu
-----
A) Train Summary
B) Train Detail
C) Exception Summary
D) Exception Detail
E) System Status
F) Last Train
G) Last Test Train
H) AEI Diagnostic Detail
I) Replay EOT Announcement - Local Only
J) Event Log
K) Maintenance Report
L) Setup
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

- 2 Select the **System Functions** menu.

This prompt appears.

```
Type "System":
```

You are given unlimited chances to type the word "system." The entry of this word is **not** case sensitive. After you type it, the System Functions menu appears.

```
STC SmartScanNG, MP/KP-1234.8 , Track:Single
Subdivision: Kaministiquia (6314)
02/10/2015 11:32
System Functions Menu
-----
```

- A) Radio Test - Speaker and Radio Broadcast Mess.
- B) Vocabulary Test - Speaker Only
- C) N/A
- D) Radio Inhibit (3 min)
- E) Manual Test Mode - 2 Min Test Train, No Radio O/P to train
- F) 1KHz Test Tone - Speaker and Radio - (10 sec)
- G) Auto-Calibration
- H) Reset the Computer Operating Properly (COP) Counters
- I) Remote System RESET
- J) Delete All Stored Train Data
- K) Clear Event Log
- L) Scanner Resistor Quick Check
- X) Exit

?

No password is needed to select or run any of the above functions.

C.1 Radio Test

Selection of the **Radio Test option** broadcasts a short message through the speaker (on top of the SmartScanNG enclosure) and through the radio. Using this option lets you verify that the speaker and radio are working properly.

"Mile" is announced in Canada and "milepost" is announced in the USA. The wording "G-S-R detector" (instead of "C-P detector") is announced if either subdivisions Burstall or Empress were selected.)

At single-track CP sites in Canada, the text of the message is usually "Testing, C-P-detector, mile (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track CP sites in Canada, the text of the message is usually "Testing, C-P-detector, mile (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

At single-track GSR sites in Canada, the text of the message is usually "Testing, G-S-R-detector, mile (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track GSR sites in Canada, the text of the message is usually "Testing, G-S-R-detector, mile (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

At single-track CP sites in USA, the text of the message is usually "Testing, C-P-detector, milepost (*milepost number*), (*subdivision name*) sub, testing, one, two, three, four, five, four, three, two, one, testing." At double-track CP sites in USA, the text of the message is usually "Testing, C-P-detector, milepost (*milepost number*), (*subdivision name*) sub, track (track designation), testing, one, two, three, four, five, four, three, two, one, testing."

C.2 Vocabulary Test

Selection of the **Vocabulary Test option** enunciates all of the stored speech phrases. This announcement is broadcast through the speaker (on top of the SmartScanNG enclosure), but not through the radio. Therefore, it isn't affected by the **Radio Inhibit option** being enabled.

The text of the message is usually "zero, one, two, three, four, five, six, seven, eight, nine, **2-second beep**, C-P-detector, mile, main, system-not-working, message-complete, dimensional-shipment, rebroadcast, hotwheel, defect, axle, dragging-equipment-near, north, south, rail, east, west, track, car-I-D, no, hotbox, more-than, alarms, number, siding, testing, train-to-slow, total-axles, speed, temperature, length, minus, point, power-off, repeat, detector-out, Macdonald, Connaught, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, first, second, third, fourth, fifth, sixth, left, right, side, load, inspect-entire-train-both-sides-from-first-alarm-to-rear-of-train-or-as-instructed, scanner-resistor-test-beginning-in, minutes, degrees, total-cars, milepost, sticking-brakes, sub, Aldersyde, Brechter, Breton, Brooks, Crowsnest, Hatton, Hoadley, Irricana, Lacombe, Laggan, Leduc, Macleod, Maple Creek, Montana, Pecten, Red Deer, Scotford, Shantz, Taber, Wetaskiwin, Willingdon, Boundary, Byron Creek, Cranbrook, Fording River, Mountain, Moyie, Nelson, Robson Spur, Rossland, Shuswap, Windermere, C-and-M, Elgin, Fox Lake, M-and-P, River, Tomah, Watertown, Arborg, Arcola, Bredenbury, Broadview, Carberry, Emerson, Estevan, Glenboro, Gretna, Ignace, Keewatin, La Riviere, Lac Du Bonnet, Minnedosa, Napinka, Rocanville, Winnipeg Beach, Adirondack, Brockville, Farnham Connection, Lacolle, M-and-O, Outremont, Parc, Seaway, South Bank Branch, Saint Luc Branch, Vaudreuil, Westmount, Winchester, Adirondack Running Track, Canadian Connector, Canadian Main Line, Colonie Main Line, Freight Main Line, Sunbury, Heron Bay, Kaministiquia, Nemegos, Nipigon, White River, Bromhead, Bulyea, Expanse, Gravelbourg, Hardisty, Indian Head, Kelvington, Kerrobert, Lanigan, Lloydminster, Macklin, Melfort, Outlook, Radville, Reford, Sutherland, Swift Current, Tisdale, Tyvan, Weyburn, Wilkie, Wynyard, Yarbo, Belleville, Canpa, Cartier, Dunnville, Galt, Hamilton, Havelock, Mactier, Montrose, Nephton, North Toronto, Parry Sound, Stevensville Spur, Waterloo, Windsor, Bemidji, Carrington, Detroit Lakes, Elbow Lake, Merriam Park, M-N-and-S Spur, Newtown, Noyes, Paynesville, Portal, Veblen, Withrow, Cascade, loco Spur, Marpole Spur, Mission, Page, Thompson, Van Horne Spur, Westminster, G-S-R Detector, Burstall, Empress."

C.3 Radio Inhibit

Selection of the **Radio Inhibit option** prevents radio activation for three minutes. During this time, any announcements generated by the system are broadcast through the speaker (on top of the SmartScanNG enclosure), but not through the radio. This feature may be overridden by recalling this submenu and then typing **N**.

C.4 Manual Test Mode

Selection of the **Manual Test Mode option** opens all the shutters and simulates transducer pulses for about two minutes. During this time, a person can check various aspects of the installed components. In this mode, the system runs the ramp function without generating heats. The train is marked as a test train. There won't be any voltage applied to the scanner inputs.

The test continues until 486 axles are simulated. You cannot stop this test by pressing [**Esc**].

The data generated for this test train is stored in the Test Train directory, which contains data on the last test train only. The Last Test Train report gets its data from this directory.

C.5 1KHz Test Tone

Selection of the **1KHz Test Tone option** generates a continuous one-kilohertz tone for 15 seconds. This tone is broadcast through the speaker and through the radio. Using this option lets you verify that the speaker and radio are working properly.

C.6 Auto-Calibration

Selection of the **Auto-Calibration option** places the system in autocalibration mode.

The SmartScanNG system self-calibrates its pyrometer interface circuitry. You need only put a preheated calibrated heat source on a scanner and place the system in autocalibration mode. The system then scans all pyrometer inputs until the signal from the calibrated heat source is located. The necessary adjustments to the related interface circuitry are automatically made while the system monitors its own progress by analyzing changes in the heat signals. Once the procedure has been completed, autocalibration mode is disengaged and the calibration results are displayed on your computer. For more details, see **Appendix E - Calibration of Scanners**.

C.7 Reset the COP Counters

Selection of the **Reset the COP Counters option** resets each COP counter to zero.

Associated with each microprocessor on the Processor board is a Computer Operating Properly (COP) counter. The SmartScanNG system uses these counters to keep track of every time the system automatically resets itself or the customer manually resets it, via the **Remote System Reset option** on the System Functions menu. These counters are used for diagnostic purposes only. The current value of these counters appears on the System Status report.

C.8 Remote System Reset

Selection of the **Remote System Reset option** forces a system reset through a remote connection. It can also be used locally. If a train is present at the site when this function is selected, some train data will be lost.

No password is needed before this function can be activated.

C.9 Delete All Stored Train Data

Selection of the **Delete All Stored Train Data option** erases all of the stored train data. This encompasses all of the data on the trains in the Trains directory, Exceptions directory, and Test Train directory. After deleting all the train data, there isn't any way of regenerating it. The data is gone forever.

No password is needed before this function can be activated.

C.10 Clear Event Log

Selection of the **Clear Event Log option** erases all of the events stored in the Event Log and displayed on the Event Log report. After deleting the log, there isn't any way of regenerating it. The data is gone forever.

No password is needed before this function can be activated.

C.11 Scanner Resistor Quick Check

Selection of the **Scanner Resistor Quick Check option** assists in diagnosing and correcting scanner resistor failures. It emulates a post train "Cold Bearing Resistor Alarm" check for a train that had the scanner shutter doors open for 31 seconds. In order for Scanner Resistor Quick Check to be successful, a resistor cool-down period of at least 20 minutes must be observed. In addition, all clearance alarm inputs are monitored during quick check. If inputs are activated at any time during Scanner Resistor Quick Check, a message will be printed in the results.

Appendix D

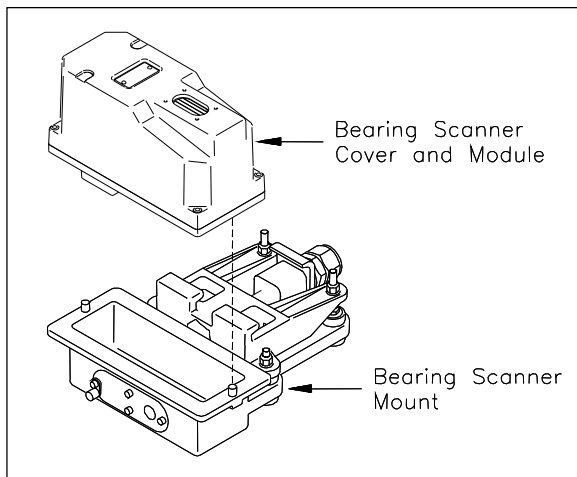
Replacement of Scanner Cover-and-Module Assemblies

There are bearing scanners and wheel scanners. Both contain two major parts. The top part is the cover-and-module assembly. The module and its protective cover are tightly integrated and rarely should be taken apart. Except for the change of **filter frames** in the wheel scanner module, both types of cover-and-module assemblies are identical and can be used interchangeably. The bottom part is the mount. Bearing scanner mounts and wheel scanner mounts are different in design. They can't be interchanged.

This appendix tells how to replace scanner cover-and-module assemblies. Replacement of scanner mounts isn't covered in this guide.

D.1 Bearing Scanners

The figure below shows the major parts of a bearing scanner.



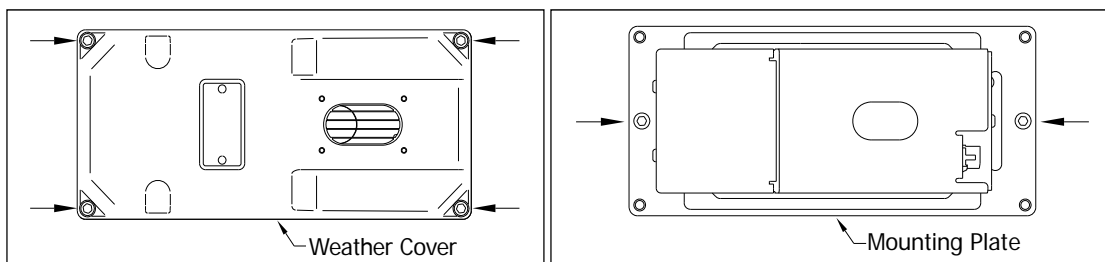
To replace a bearing scanner cover-and-module assembly:

- 1 Be sure that you have on hand a new scanner cover-and-module assembly.
- 2 Be sure that you have on hand a T-handle 1/4-inch hex-wrench.
- 3 Turn off all power to the scanners.

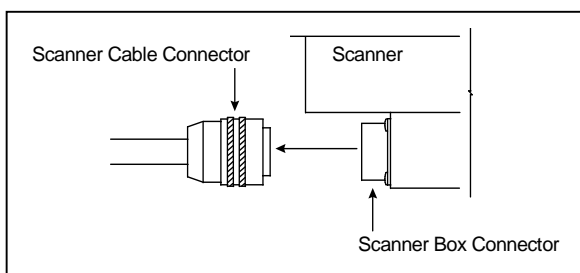
This requires turning off the DC power switch on the SmartScanNG enclosure and unplugging the AC power cord on the bottom of the SmartScanNG enclosure.

- 4 Using a T-handle 1/4-inch hex-wrench, loosen the six socket-head-cap screws on the cover of the bearing scanner.

Four screws attach the weather cover to the mounting plate and two screws attach the mounting plate to the mount.

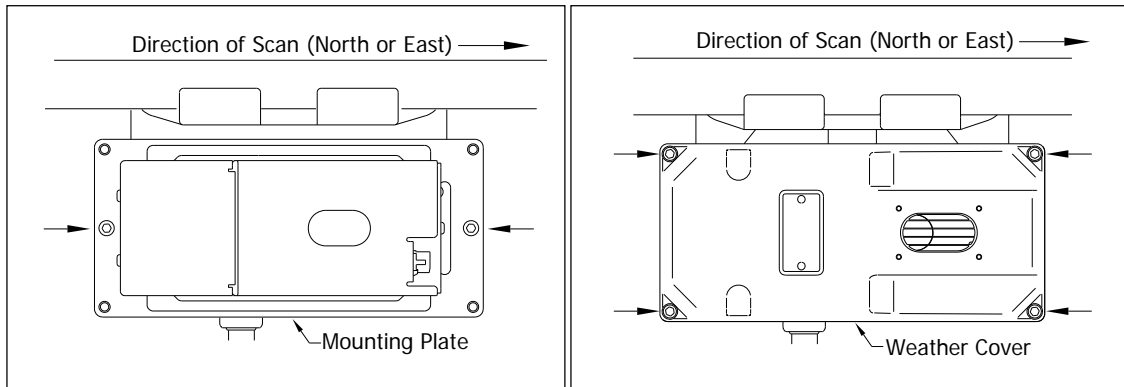


- 5 Separate the bearing scanner cover-and-module assembly from its mount.
- 6 Disconnect the heater wiring plug.
- 7 Disconnect the scanner cable connector from the scanner box connector.



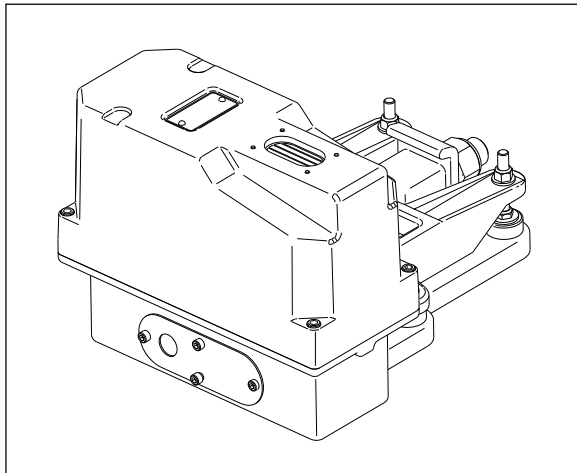
- 8 Store the removed scanner cover-and-module assembly in a safe place until you return it to STC for repair.
- 9 Attach the scanner cable connector to the scanner box connector of the new scanner cover-and-module assembly.
- 10 With the hole on top of the bearing scanner cover facing north or east, set the mounting plate back onto its scanner mount.
- 11 Using the T-handle 1/4-inch hex-wrench, uniformly tighten the two socket-head-cap screws.
- 12 Reconnect the heater wiring plug.
- 13 With the hole on top of the bearing scanner cover facing north or east, set the weather cover back onto its mounting plate.
- 14 Using the T-handle 1/4-inch hex-wrench, uniformly tighten the four socket-head-cap screws.

The top view of the bearing scanner mounting plate and weather cover is shown below.



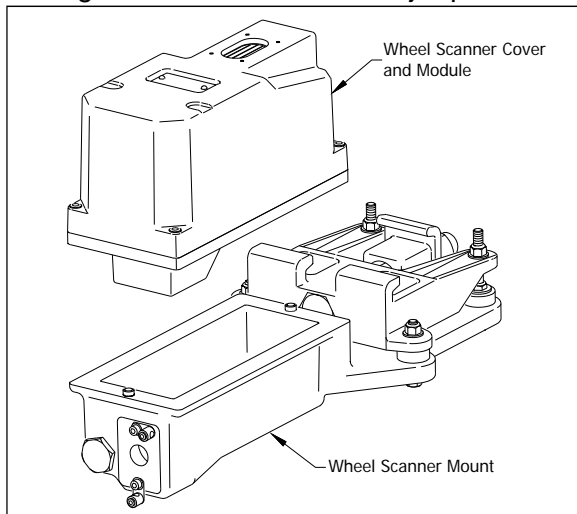
15 Turn on power to the scanners.

An assembled bearing scanner looks like this.



D.2 Wheel Scanners

The figure below shows the major parts of a wheel scanner.



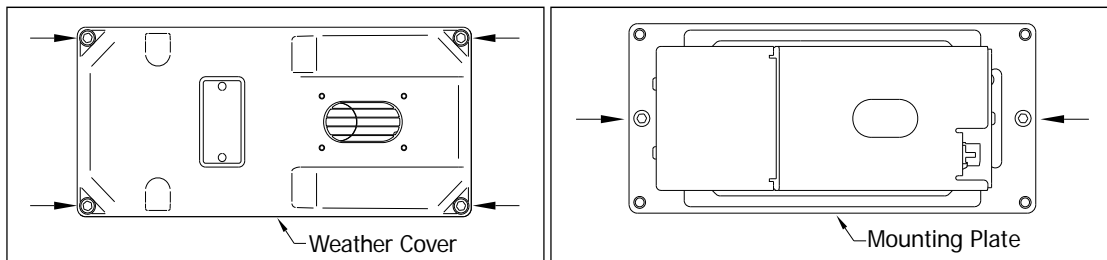
To replace a wheel scanner cover-and-module assembly:

- 1 Be sure that you have on hand a new scanner cover-and-module assembly.
- 2 Be sure that you have on hand a T-handle 1/4-inch hex-wrench.
- 3 Turn off all power to the scanners.

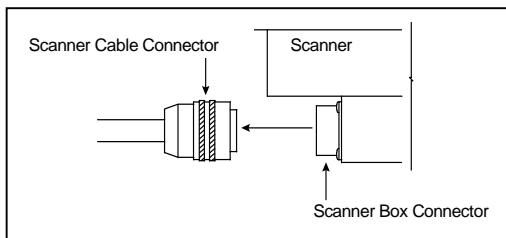
This requires turning off the DC power switch on the SmartScanNG enclosure and unplugging the AC power cord on the bottom of the SmartScanNG enclosure.

- 4 Using a T-handle 1/4-inch hex-wrench, loosen the six socket-head-cap screws on the cover of the wheel scanner.

Four screws attach the weather cover to the mounting plate and two screws attach the mounting plate to the mount.



- 5 Separate the wheel scanner cover-and-module assembly from its mount.
- 6 Disconnect the heater wiring plug.
- 7 Disconnect the scanner cable connector from the scanner box connector.



- 8 Store the removed scanner cover-and-module assembly in a safe place until you return it to STC for repair.
- 9 Attach the scanner cable connector to the scanner box connector of the new scanner cover-and-module assembly.
- 10 With the hole on top of the wheel scanner cover facing the center of the track, set the mounting plate back onto its scanner mount.
- 11 Using the T-handle 1/4-inch hex-wrench, uniformly tighten the two socket-head-cap screws.
- 12 Reconnect the heater wiring plug.
- 13 With the hole on top of the wheel scanner cover facing the center of the track, set the weather cover back onto its mounting plate.
- 14 Using the T-handle 1/4-inch hex-wrench, uniformly tighten the four socket-head-cap screws.
- 15 Turn on power to the scanners.

Appendix E

Calibration of Scanners

The SmartScanNG system self-calibrates its pyrometer interface circuitry. You need only put a preheated calibrated heat source on a scanner and place the system in autocalibration mode. The system then scans all pyrometer inputs until the signal from the calibrated heat source is located. The necessary adjustments to the related interface circuitry are automatically made while the system monitors its own progress by analyzing changes in the heat signals. Once the procedure has been completed, autocalibration mode is disengaged and the calibration results are displayed on your computer.

This appendix tells how to use the calibrated heat source to calibrate the scanners.

E.1 Bearing Scanners

STC recommends that you use the calibrated heat source (2100-810NG) only when the outside (ambient) temperature is above -18°C (0°F) and below 32°C (90°F). If you must use it at other times, do so only when the needle is centered on the front of the temperature meter. If the needle isn't stabilized within ± 2 degrees of set point, the heat source isn't operating properly.

To calibrate a bearing scanner:

- 1 Be sure that you have on hand a STC calibrated heat source (2100-810NG) and a laptop computer.
- 2 On the control panel of the calibrated heat source, toggle the **Gating** switch off.
- 3 Plug the proper end of the supplied 50-foot (15-meter) power cord into the **six**-contact circular connector on the front of the calibrated heat source.

Sixty Hz is critical for proper operation. For a site that doesn't have a 120-volt 60-Hz power source, the heat source should be powered from a true sine wave inverter capable of 250 watts with an output of at least 110 volts at 60 Hz. The inverter should operate from an input voltage of 10.5 VDC to 15 VDC. A 120-volt USA socket should be provided to match the heat source power cord. The inverter should be grounded according to the manufacturer's recommendations.

WARNING

Once plugged in, both function connectors will have live AC present.

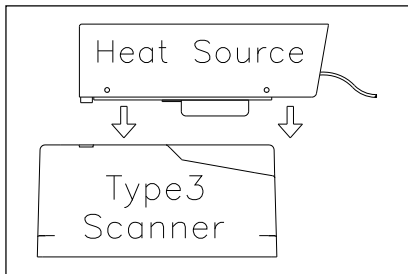
- 4 Using the supplied dust cap, cover the function connector that isn't being used.
- 5 Plug the other end of the power cord into the 120-volt USA socket.
- 6 On the control panel of the calibrated heat source, turn the temperature knob to **180°**.

- 7 Put the heat source in a shady area, out of direct sunlight and out of the wind.
- 8 Wait about 8 minutes for the heat source to reach operating temperature and stabilize.

The heat source has reached operating temperature and stabilized when the temperature meter needle remains centered.

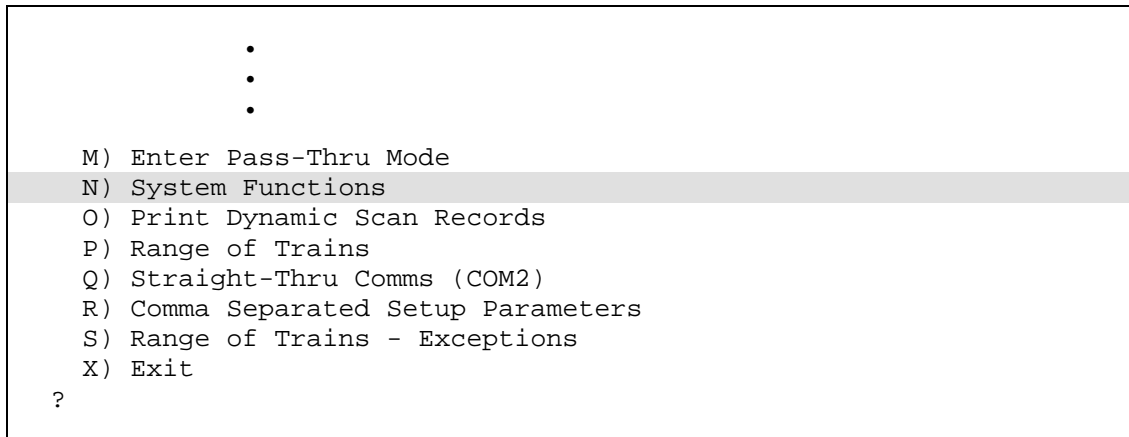
Once the temperature stabilizes, calibration may begin. Once stabilized, the temperature will change less than plus-or-minus one-degree Fahrenheit.

- 9 With the power cord to the front of the scanner, place the calibrated heat source on the bearing scanner.



- 10 To prepare your computer:
 - a Plug your computer into COM1 or COM2 (whichever is available) using a crossover (null-modem) cable.
 - b Turn on your computer.
 - c Be sure that your computer has installed communications software, that it is set to use full duplex, and that the baud rate is set to 19,200.
- 11 Using the serial interface, display the Main menu.

The Main menu looks like this.



12 Select the **System Functions** menu.

This prompt appears.

```
Type "System" :
```

You are given unlimited chances to type the word "system." The entry of this word is **not** case sensitive. After you type it, the System Functions menu appears.

```
      .
      .
      .
F) 1KHz Test Tone
G) Auto-Calibration
H) Reset the COP Counters
I) Remote System RESET
J) Delete All Stored Train Data
K) Clear Event Log
L) Scanner Resistor Quick Check
X) Exit
?
```

13 Select **Auto-calibration** to calibrate the system's pyrometer interface circuitry.

The SmartScanNG system will now calibrate itself. **Follow along on your computer screen until you see "Auto-Calibration Disengaged."** This message is an indication that the system is done with the calibration procedure. To abort the process, press **[Esc]** on your computer or remove the heat source from the bearing scanner.

On your computer screen, an acceptable calibration looks like this. Your values will be different.

```

Auto Calibration Selected
Scanner Types
-----
Rail-1..... Type-II   Rail-2..... Type-III
Wheel-1..... Type-III  Wheel-2..... Type-II

Is this correct ?

Signal levels in millivolts with closed shutters
      Rail1           Rail2           Wheel1           Wheel2
Min/Max/Average  Min/Max/Average  Min/Max/Average  Min/Max/Average
0  80  20  0  60  20  0  60  20  20  80  40

Opening the shutters.
Scanning for heat source. Press the 'Esc' key to abort.
Located 187F heat source at Rail1. Auto-calibration beginning in 0 secs.

.....Auto-Calibration Engaged.....

Testing Digital-Pot U-306. Stand by.
Digital-pot checks OK.
Previous calibrated digital-pot. setting was 38.
Adjusting digital-pot.
Temp = 225F  Pot = 59  Sec = 1  Pot. decremented by 1 step.
Temp = 224F  Pot = 58  Sec = 1  Pot. decremented by 1 step.
Temp = 221F  Pot = 57  Sec = 2  Pot. decremented by 1 step.
Temp = 219F  Pot = 56  Sec = 3  Pot. decremented by 1 step.

      .
      .

Temp = 183F  Pot = 35  Sec = 15  Pot. decremented by 1 step.
Temp = 182F  Pot = 34  Sec = 18  Pot. decremented by 1 step.
Temp = 181F  Pot = 33  Sec = 29  Pot. decremented by 1 step.
Temp = 179F  Pot = 33  Sec = 93  Monitoring heat source temperature.
Rail1 digital-pot setting of 33 was stored in EEPROM.
East Rail Scanner Calibration complete.
The setpoint is 180F. The calibrated temp. is 179F.
Closing the shutters.
Resistor test pending.

.....Auto-Calibration Disengaged.....

```

Before the shutters are opened, if you get a signal level greater than 200 millivolts, it usually means that there is noise on the scanner inputs, which most times is caused by an electrical problem with the scanner. If you cannot isolate and fix the cause of this problem, call STC for help.

```

Auto Calibration Selected

Signal levels in millivolts with closed shutters
      Rail1           Rail2           Wheel1           Wheel2
Min/Max/Average  Min/Max/Average  Min/Max/Average  Min/Max/Average
210 250 210  0  60  20  0  60  20  20  80  40

      .
      .

```

Before the shutters are closed, if you don't get a calibrated temperature in the range 178°F to 182°F, it means that the scanner wasn't calibrated. If cleaning the optics doesn't solve your problem, replace the scanner cover-and-module assembly. If this doesn't solve your problem, call STC for help in fixing the problem.

- 14 When "Auto-Calibration Disengaged" is displayed on your computer, remove the calibrated heat source.

Upon completion of autocalibration, the system acquires the scanner resistor temperature baseline values. The process begins with a 20 minute wait period in which the resistors are allowed to cool down. The system counts down during this period, sounding a tone each minute. After the 20 minute cool down period, the system opens and closes the shutters for a period of 8 minutes.

- 15 To return to the Main menu, type **X**
- 16 To exit the serial interface and return the system to normal operation, type **X**
- 17 Store the calibrated heat source and its power cord in the wayside enclosure.

E.2 Wheel Scanners

STC recommends that you use the calibrated heat source (2100-810NG) only when the outside (ambient) temperature is above -18°C (0°F) and below 32°C (90°F). If you must use it at other times, do so only when the needle is centered on the front of the temperature meter. If the needle isn't stabilized within ± 2 degrees of set point, the heat source isn't operating properly.

To calibrate a wheel scanner:

- 1 Be sure that you have on hand a STC calibrated heat source (2100-810NG) and a laptop computer.
- 2 On the control panel of the calibrated heat source, toggle the **Gating** switch off.
- 3 Plug the proper end of the supplied 50-foot (15-meter) power cord into the **six**-contact circular connector on the front of the calibrated heat source.

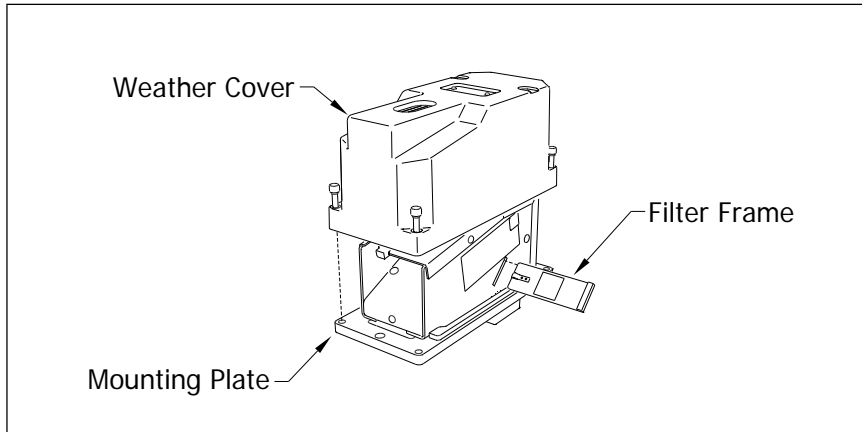
Sixty Hz is critical for proper operation. For a site that doesn't have a 120-volt 60-Hz power source, the heat source should be powered from a true sine wave inverter capable of 250 watts with an output of at least 110 volts at 60 Hz. The inverter should operate from an input voltage of 10.5 VDC to 15 VDC. A 120-volt USA socket should be provided to match the heat source power cord. The inverter should be grounded according to the manufacturer's recommendations.

WARNING

Once plugged in, both function connectors will have live AC present.

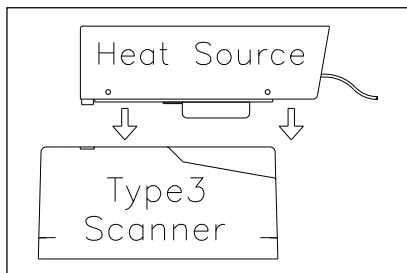
- 4 Using the supplied dust cap, cover the function connector that isn't being used.
- 5 Plug the other end of the power cord into the 120-volt USA socket.
- 6 On the control panel of the calibrated heat source, turn the temperature knob to **180°**.
- 7 Put the heat source in a shady area, out of direct sunlight and out of the wind.

- 8** Wait about 8 minutes for the heat source to reach operating temperature and stabilize. The heat source has reached operating temperature and stabilized when the temperature meter needle remains centered. Once the temperature stabilizes, calibration may begin. Once stabilized, the temperature will change less than plus-or-minus one degree Fahrenheit.
- 9** Replace the red filter frame with the black one during calibration.



You'll need to remove the weather cover before you can replace the filter frame. Four socket-head-cap screws attach the weather cover to the mounting plate. Before continuing, be sure that the black filter frame is securely in place and that the four socket-head-cap screws on the weather cover are completely tight.

- 10** With the power cord to the front of the scanner, place the calibrated heat source on the wheel scanner.



- 11** To prepare your computer:
- a** Plug your computer into COM1 or COM2 (whichever is available) using a crossover (null-modem) cable.
 - b** Turn on your computer.
 - c** Be sure that your computer has installed communications software, that it is set to use full duplex, and that the baud rate is set to 19,200.

12 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
      •
      •
      •
M) Enter Pass-Thru Mode
N) System Functions
O) Print Dynamic Scan Records
P) Range of Trains
Q) Straight-Thru Comms (COM2)
R) Comma Separated Setup Parameters
S) Range of Trains - Exceptions
X) Exit
?
```

13 Select the **System Functions** menu.

This prompt appears.

```
Type "System":
```

You are given unlimited chances to type the word "system." The entry of this word is **not** case sensitive. After you type it, the System Functions menu appears.

```
      •
      •
      •
F) 1KHz Test Tone
G) Auto-Calibration
H) Reset the COP Counters
I) Remote System RESET
J) Delete All Stored Train Data
K) Clear Event Log
L) Scanner Resistor Quick Check
X) Exit
?
```

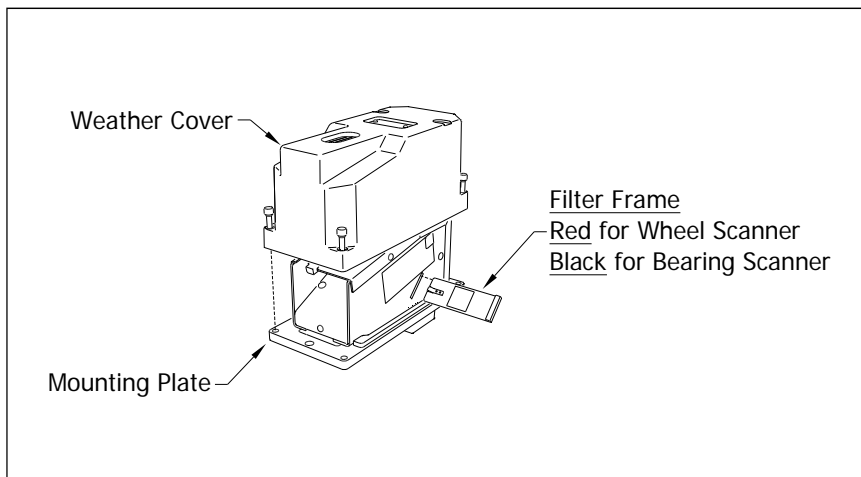
14 Select the **Auto-Calibration option** to calibrate the system's pyrometer interface circuitry.

The SmartScanNG system will now calibrate itself. **Follow along on your computer screen until you see "Auto-Calibration Disengaged."** This message is an indication that the system is done with the calibration procedure. To abort the process, press **[Esc]** on your computer or remove the heat source from the wheel scanner.

Before the shutters are opened, if you get a signal level greater than 200 millivolts, it usually means that there is noise on the scanner inputs, which most times is caused by an electrical problem with the scanner. If you cannot isolate and fix the cause of this problem, call STC for help.

Before the shutters are closed, if you don't get a calibrated temperature in the range $540^{\circ}\text{F} \pm 6^{\circ}\text{F}$, it means that the scanner wasn't calibrated. If cleaning the optics doesn't solve your problem, replace the scanner cover-and-module assembly. If this doesn't solve your problem, call STC for help in fixing the problem.

- 15 When "Auto-Calibration Disengaged" is displayed on your computer, remove the calibrated heat source.
- 16 To return to the Main menu, type **X**.
- 17 To exit the serial interface and return the system to normal operation, type **X**.
- 18 Replace the black filter frame with the red one immediately following the successful completion of the auto-calibration function.



Before continuing, be sure that the red filter frame is securely in place and that the four socket-head-cap screws on the weather cover are completely tight.

Upon completion of autocalibration, the system acquires the scanner resistor temperature baseline values. The process begins with a 20 minute wait period in which the resistors are allowed to cool down. The system counts down during this period, sounding a tone each minute. After the 20 minute cool down period, the system opens and closes the shutters for a period of 8 minutes.

NOTE: The red filter frame **MUST** be in place during the resistor temperature baseline acquisition process.

- 19 Store the calibrated heat source and its power cord in the wayside enclosure.

E.3 “Calibration Due” Indication on Heat Source

The heat source requires periodic calibration to ensure accurate performance. Whenever calibration is due, the temperature meter on the front panel will flip from HI to LO several times per second for one minute upon initial power-up. After one minute, the unit will continue operate normally. This indication will occur after the internal timer has logged 100 hours of operation since the previous calibration. When due, the heat source should be sent to an authorized repair center to be recalibrated.

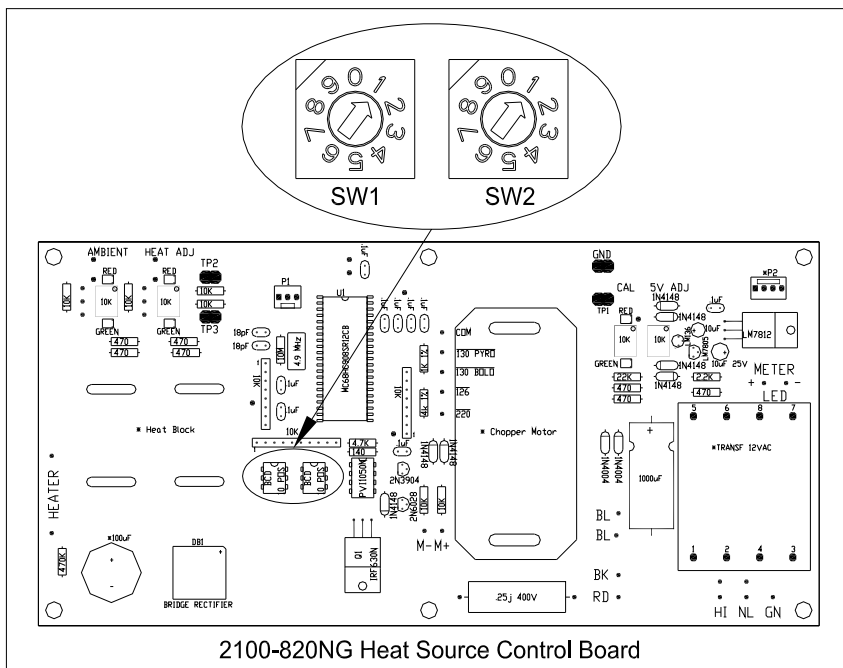
If 200 hours of operation is logged since the last calibration, the same warning will be indicated, but the heater element will now be disabled and remain so until the unit is recalibrated.

Override Heat Source Disable

Though **NOT** recommended by STC, the internal timer can be reset to re-enable the heater and allow for continued usage of a “past due” heat source.

Procedure:

1. Disconnect power to the unit.
2. Remove cover to expose the 2100-820NG Control Board.
3. Set BCD switches SW1 & SW2 to position “1” (see figure below).
4. Apply power to the unit for about 10 seconds and then power it down (this resets accumulated time stored in EEPROM since last calibration).
5. Set the BCD switches back to “00” and the unit is ready for operation.
6. Replace cover.



E.4 Heat Source: Power Cable Warning

Warning - Caution

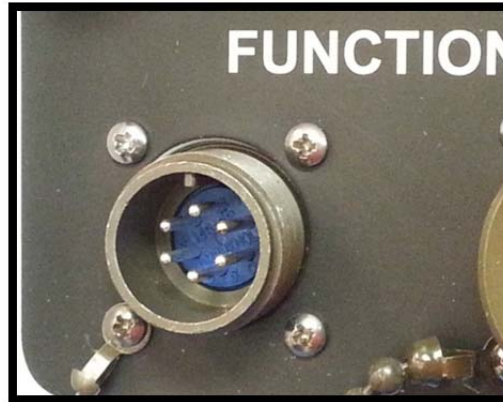
**PLEASE – ONLY USE THE POWER
CORD THAT WAS SHIPPED WITH
THIS HEAT SOURCE.**

USE OF THE OLD CORD WITH PINS IN
THE CONNECTOR WILL DAMAGE THIS
HEAT SOURCE

A few years ago the power cord connector was found to be a shock hazard because the connector had pins that might be easy to touch if someone were not paying attention. If the power cord were plugged in to AC that would be a startling experience! So the connectors on both the power cord and the heat source were changed. Because of that change a new power cord was and is shipped with each new heat source.



Old style plug with pins.



New heat source with pins.

As you can see, even though the connectors will fit together, they won't work together. When the connectors are screwed together the two sets of pins touch and cause a reverse polarity situation which damages the heat source.

Appendix F

Lens Cleaning of Scanners

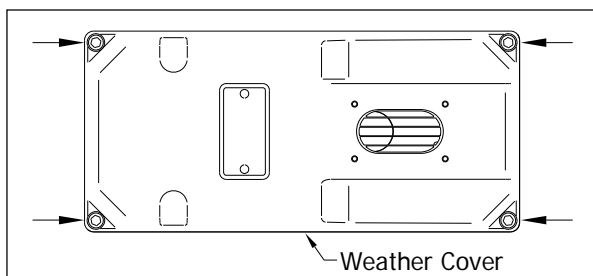
This appendix tells how to clean the optics in the scanners.

To clean the optics in the scanners:

- 1 Be sure that you have on hand a T-handle 1/4-inch hex-wrench.
- 2 Turn off all power to the scanners.

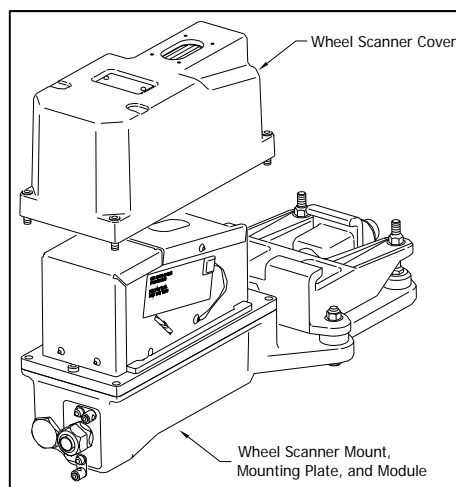
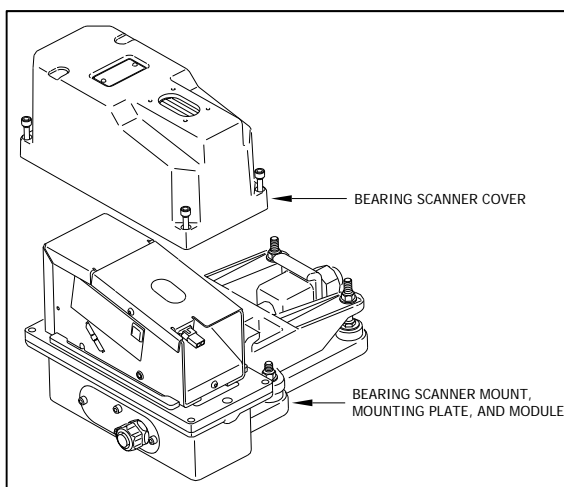
This requires turning off the DC power switch on the SmartScanNG enclosure and unplugging the AC power cord on the bottom of the SmartScanNG enclosure.

- 3 Using the T-handle 1/4-inch hex-wrench, loosen the four socket-head-cap screws that attach the weather cover to the mounting plate.



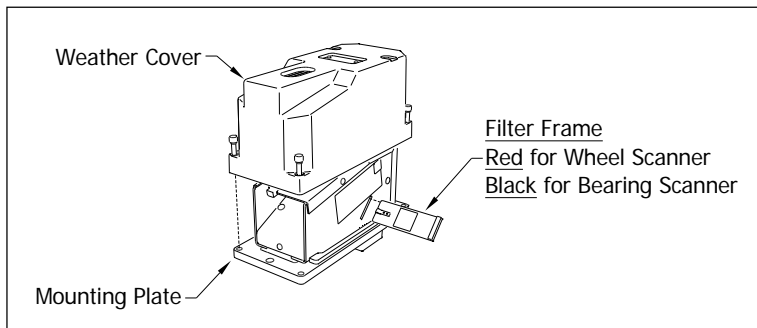
- 4 Remove the weather cover from its mounting plate.

Be careful not to damage the electrical connection for the cover heaters.



- 5 Disconnect the heater wiring plug.

On the side of the scanner module, you'll find a metal tab that protrudes about 1/4 inch outside the module.



- 6 Grasp the tab and pull the filter frame out of the scanner module.
- 7 Using the brush supplied with the tool kit, lightly dust any excess material from the filter frame glass.
Be careful not to abrade or scratch the surface of the lens.
- 8 Apply a small amount of Vallen V8L cleaning solution (included in the tool kit) directly to the glass filter to loosen any remaining contamination.
- 9 Gently polish the reflective glass surface of the filter to remove any remaining contamination.
Pay close attention to the area around the perimeter of the lens. It is important that the entire surface of the lens is clean.
- 10 Open the shutter by stroking one of the gating transducers with a piece of ferrous metal.
- 11 If the lens surface appears to have any dust on it, insert the brush from the tool kit through the baffle plates until it contacts the lens surface and apply a twisting motion to dislodge any accumulated dust.
- 12 Remove the brush and visually inspect the lens for cleanliness.
- 13 Reinstall the filter frame assembly properly - (The reflective surface will be facing the view port opening of the scanner) Reconnect the heater wiring plug.
- 14 Re-connect the scanner cover heater.
- 15 If this is a **bearing scanner**:
With the hole on top of the bearing scanner cover facing north or east, set the weather cover back onto its mounting plate. Using the T-handle 1/4-inch hex-wrench, uniformly tighten the four socket-head-cap screws.
- 16 If this is a **wheel scanner**:
With the hole on top of the wheel scanner cover facing the center of the track, set the weather cover back onto its mounting plate. Using the T-handle 1/4-inch hex-wrench, uniformly tighten the four socket-head-cap screws.
- 17 Turn on power to the scanners.

Appendix G

Predictive Gate Scanning

This appendix describes predictive gate scanning of bearings.

G.1 Overview

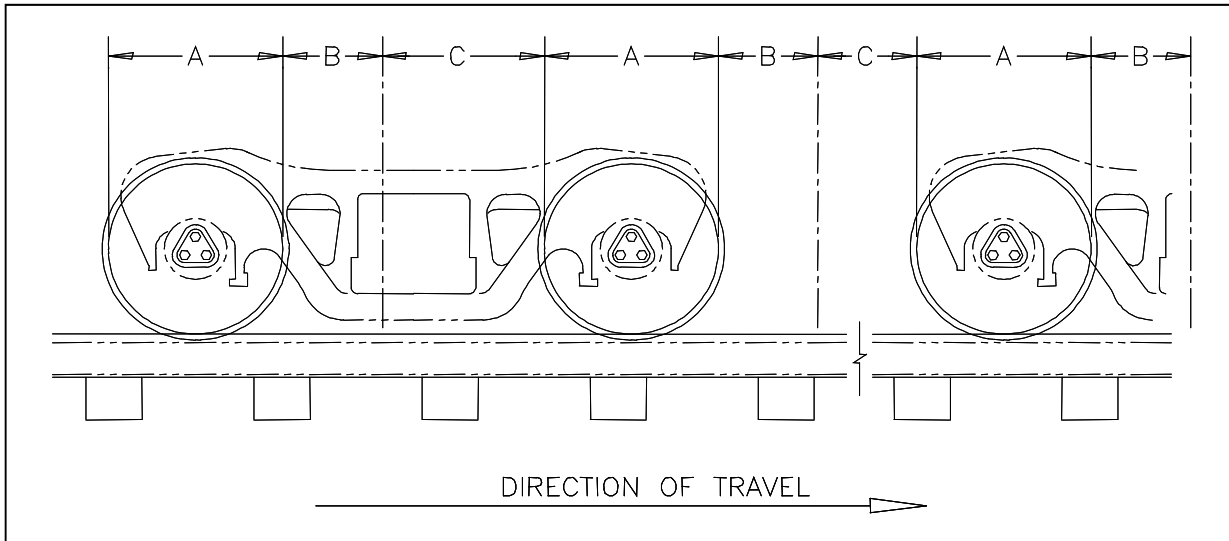
If a pyrometer is exposed to extreme infrared energy emission, the device itself can be driven into a saturated state. When this happens, it is blinded to subsequent changes in infrared energy emission. This blinded state can last up to 1-1/2 seconds.

Under certain circumstances, a pyrometer may be driven into saturation before the opening of the gate for a given axle. If the open-gate period was the only time during which pyrometer readings were sampled and processed, the system might miss an overheated bearing due to a device that was blinded before the opening of the gate. This can happen when a bearing is so overheated that it gives off infrared energy that can be seen by the pyrometer long before the bearing enters the pyrometer's field of view.

To compensate for this, the SmartScanNG system includes special logic for processing heat seen by the pyrometers as they scan between the axle gates. The interval between axles has been divided into two parts.

The first part of this interval is the 16 inches (40.6 centimeters) that immediately precede the axle as it approaches the bearing scanners. This interval is treated as a "predictive gate" region in which the actual gate period (the time a bearing is physically in the pyrometer's field of view) is extended by 16 inches (40.6 centimeters). The remainder of the "between gate" interval forms the second part. Heat values read during this second interval are ignored.

The figure below depicts the three distinct scanning intervals (the in-gate period plus the two between-gate intervals).



The table below defines the intervals.

Interval	Description
A	The normal bearing scanning interval of about 24 inches (61 centimeters), depending on the transducer spacing.
B	A distance of about 16 inches (40.6 centimeters) before a given wheel.
C	The distance between wheels that doesn't fall within interval-B.

G.2 Scanning Process

Interval-A is the normal bearing scanning interval. Interval-B is an extension of interval-A. The greatest value read in either of these two intervals is recorded as the temperature for the axle. This value is checked for alarm levels in the same manner that scanned bearing temperatures are normally handled.

For interval-A: Heat values read during interval-A are processed normally.

For interval-B: Heat values read during interval-B that don't meet or exceed the Absolute alarm threshold are ignored. Values that meet or exceed the Absolute alarm threshold are handled as follows:

- If the interval-A heat value meets or exceeds the Absolute alarm threshold, it is processed normally and the interval-B heat reading is ignored.
- If the interval-A heat value doesn't meet or exceed the Absolute alarm threshold, but interval-B heat value does, a Pyrometer Saturation alarm is flagged and the interval-B heat value is stored and reported for the alarmed axle.

For interval-C: Heat values read during interval-C are ignored.

The Train Too Slow alarm indicates that, at some point during train passage, four consecutive axles crossed the gating transducers at a speed of 7 mph (11.3 kph) or less. The firmware doesn't check for Pyrometer Saturation alarms if the train has been flagged with a Train Too Slow alarm.

G.3 Reporting the Pyrometer Saturation Alarm

If a Pyrometer Saturation alarm is detected and assigned to an axle, a printed message will appear on Detail reports.

The figure below shows part of a Train Detail report with a Pyrometer Saturation alarm. The contents of your report will be different.

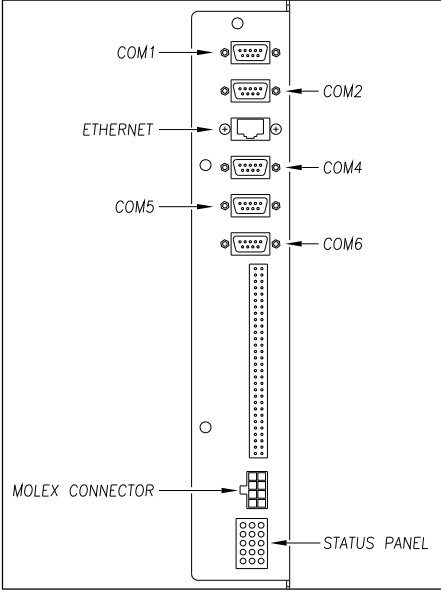
```

Southern Technologies Corporation
Next Generation Detector System
TRAIN DETAIL
=====
      .
      .
      .
-----
Car  Al  Ax  N_Brg  S_Brg  N_Wh  S_Wh  On  Off  Spcng  T1  T2  Alarms
  1    1   20    43   360   250  27   0   2.0  17  17
    2   18    43   362   250  27   73   7.5  14  14
    3   18    43   362   250  27   64   6.8  14  14 East Rail Pyro Saturation Alarm
    4   18    43   360   250  27  684  53.3  13  14
    5   18    42   360   250  27   64   6.8  14  14
    6   20    44   360   254  27   64   6.8  14  14

  2    7   20    43   360   250  27  193  16.5  14  14
    8   18    44   360   254  27   75   7.6  14  14
      .
      .
      .

```


Appendix H Communications Ports

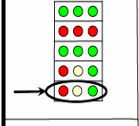
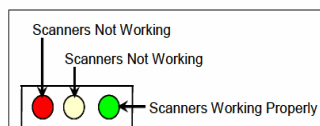

	<p>COM1 or COM2 – To use the serial interface, connect a local computer (DTE) using a crossover (null-modem) cable and set the communications software to use full duplex with a baud rate of 19,200. Note: Leave STC ports at 19,200 baud. These are the standard local access ports.</p>
	<p>ETHERNET – To establish an Ethernet connection, you need a network interface card (NIC) in your computer and a Category 5 (CAT5) 8-wire network cable for basic 10/100 functionality.</p>
	<p>COM4 - At double-track sites, to communicate remotely with system 2, attach a crossover (null-modem) cable from COM4 of system1 (DTE) to COM1 (DTE) of system2,</p>
	<p>COM5 – At systems with AEI, attach a crossover (null-modem) cable from the AEI (DTE) Interface Module to COM5 (DTE) of the Controller module.</p>
	<p>COM6 – Used to communicate with the Velocity Modem board's instruction set and database. COM6 is connected to Port 2 on the Velocity Modem board..</p>

DCE (Data Circuit-Terminating Equipment) Modem				Connecting Cable	DTE (Data Terminal Equipment) Computer			Connecting Cable	DTE (Data Terminal Equipment) Computer		
Pins on the Modem		Name and Abbreviation		Inside the Straight-Through Connecting Cable	Abbr.	Pins on the Computer		*Inside the Crossover Null-Modem Connecting Cable	Abbr	Pins on the Computer	
Female DB25	DB9					Male DB25	DB9			Male DB25	DB9
1	-	Frame Ground (Chassis)	FG	————	FG	1	-	————	FG	1	-
2	3	Transmitted Data (TD)	TxD	←————	TxD	2	3	↔	TxD	2	3
3	2	Received Data (RD)	RxD	————→	RxD	3	2	↔	RxD	3	2
4	7	Request to Send	RTS	←————	RTS	4	7	↔	RTS	4	7
5	8	Clear to Send	CTS	————→	CTS	5	8	↔	CTS	5	8
6	6	Data Set Ready	DSR	————→	DSR	6	6	↔	DSR	6	6
7	5	Signal Ground	SG	————	SG	7	5	— · · · —	SG	7	5
8	1	Data Carrier Detect	DCD or CD	————→	DCD or CD	8	1	— · · · —	DCD or CD	8	1
20	4	Data Terminal Ready	DTR	←————	DTR	20	4	↔	DTR	20	4
22	9	Ring Indicator	RI	————	RI	22	9	————	RI	22	9

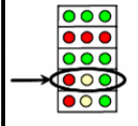
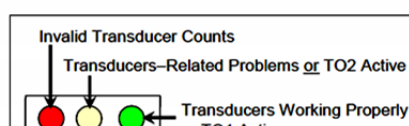

*Note: DB25 wires 7 and 8 are straight through.

Note: The DTE to DTE interface cable is also called a null-modem, modem eliminator, or crossover cable.

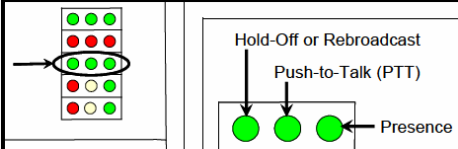
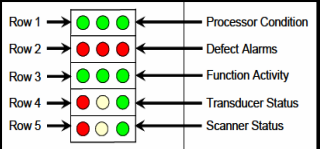
Appendix I System Diagnostic Indicators

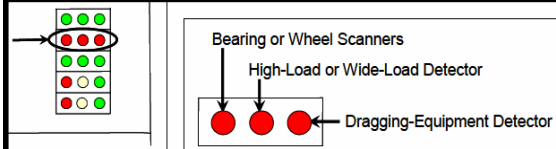
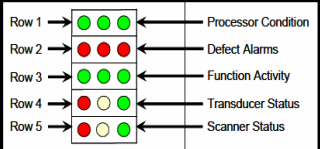
<p>Scanner Status - The bottom row of LEDs indicates the operational condition of the scanners when a train isn't present at the site.</p>			
---	---	--	---

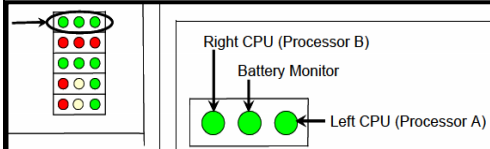
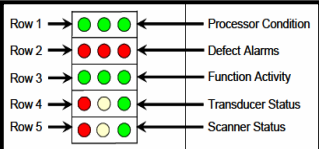
Left Red LED	Integrity Check Passed or Failed
Not lighted	The last 20 trains have passed integrity
Lighted solid	In the last 20 trains, if both bearing scanners or both wheel scanners failed the integrity check
Flashing	In the last 20 trains, if just one bearing scanner or one wheel scanner failed the integrity check
Flashing on for 0.5 sec, off for 1.0 sec. - For a scanner on the north or east rail	
Flashing on for 0.5 sec, off for 0.5 sec, on for 0.5 sec, off for 2.0 sec. - For a scanner on the south or west rail	
Failed integrity test would result from: <ul style="list-style-type: none"> • Insufficient heat from one or both bearing scanners or from one or both wheel scanners was detected. • Shutter resistor check failed. The minimum value expected for the temperature of the resistor wasn't met. • For any five consecutive trains, the difference between the average recorded temperatures for both bearing scanners or for both wheel scanners was more than a delta limit. 	
Middle Yellow LED	Average Temperature Imbalance for 20 Consecutive Trains
Not lighted	No trains, or less than 20 consecutive trains have a temperature imbalance between two bearing scanners or two wheel scanners
Flashing	20 or more consecutive trains have a temperature imbalance between two bearing scanners or two wheel scanners
Flashing on for 0.5 sec, off for 1.0 sec. - For a scanner on the north or east rail	
Flashing on for 0.5 sec, off for 0.5 sec, on for 0.5 sec, off for 2.0 sec. - For a scanner on the south or west rail	
Within the scanner pairs, the scanner with the lower temperatures is considered the problem scanner. The flashing LED can indicate a problem with either the bearing or the wheel scanner on the indicated rail or a problem with both of them.	
Right Green LED	Average Temperature Imbalance for 20 Consecutive Trains
Not lighted	One or more scanners aren't performing as they should be
Flashing	All the bearing and wheel scanners worked properly during passage of the last 20 trains.
Lighted solid	Never

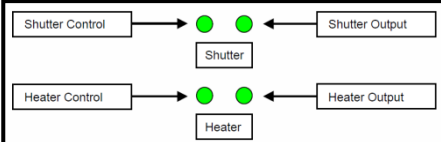
<p>Transducer Status - The fourth row of LEDs operates differently when a train is at the site and when it isn't.</p>			
--	---	--	---

Right Green LED	Transducer Status
Flashing	When a train is present at the site, as a wheel travels over transducer TO1.
Flashing	When a train isn't present at the site, when the count between TO1 and TO2 varies by three or less. Under those conditions, this LED will still flash even when the axle count is odd or the train speed falls below 10 mph (16 km/h).
Middle Yellow LED	Transducer Status
Flashing	When a train is present at the site, as a wheel travels over transducer TO2.
Lighted	When a train isn't present at the site, when a gating transducer has generated more than 20 pulses on a train that the SmartScanNG system considers to be noise, OR the gating transducers are activating the system.
Left Red LED	Transducer Status
Not lighted	Normal, when a train is present at the site.
Lighted	When a train is present at the site, when both transducers fail integrity tests.
Lighted solid	When a train isn't present at the site, for any train in the last 20 trains, if the count between TO1 and TO2 varies by four or more, the speed of the train remains above 10 mph (16 km/h) AND the train has an odd axle count. The 3 conditions must be present.
Lighted solid	When a train isn't present at the site, in the last 20 trains, if there's a possible fault with TO1 on one train and TO2 on another train
Flashing	When a train isn't present at the site, in the last 20 trains, if there's a possible fault with just one gating transducer on a given train
Flashing on for 0.5 sec, off for 1.0 sec. - For transducer TO1	
Flashing on for 0.5 sec, off for 0.5 sec, on for 0.5 sec, off for 2.0 sec. - For transducer TO2	
The gating transducer with fewer hits is considered the bad one.	

<p>Function Activity - The middle row of green LEDs indicates system activities, including train presence, push-to-talk (PTT), and hold-off or re-broadcast</p> 		
Left Hold-off LED	Lights during the reception of radio traffic. It will blink when there is radio traffic and the system is waiting to make an announcement.	
Middle PTT LED	Lights during radio transmissions made by the system.	
Right train presence LED	Lights when the system senses the presence of a train. Turns off after the train leaves the site.	

<p>Defect Alarms - The second row of red LEDs indicates stored defect alarms, including those for bearing scanners, wheel scanners, dragging-equipment detectors, and high wide load detectors.</p> 		
Left - HBD or HWD	Lighted when a bearing or wheel scanner defect alarm has been recorded in any of the last 40 trains.	
Middle - HWLD	Lighted when a high wide load detector defect alarm has been recorded in any of the last 40 trains.	
Right - DED	Lighted when a dragging-equipment detector defect alarm has been recorded in any of the last 40 trains.	
Each LED remains lighted until there isn't a recorded defect alarm for the equipment associated with it in any of the last 40 trains.		

<p>Processor Condition - The top row of green LEDs indicates the condition of the CPUs and the battery on the Processor board.</p> 		
Left LED - Right CPU Processor B	Pulsates (repeats the cycle off, dim, bright, dim) when CPU is running its programs correctly. Blinks on and off, is lighted solid, or isn't lighted at all if a program isn't operating as expected.	
Middle LED - Battery	Lighted if the processor board coin-cell battery is low or dead. Replace with the system powered up to avoid losing train data. Otherwise, it isn't lighted.	
Right LED - Left CPU Processor A	Pulsates (repeats the cycle off, dim, bright, dim) when CPU is running its programs correctly. Blinks on and off, is lighted solid, or isn't lighted at all if a program isn't operating as expected.	

<p>Chassis Mounted LEDs - There are four green status LEDs on the lower right side of the chassis (located between the DC power switch and the status panel LEDs). These LEDs show the operation of the solid-state relays used to control the scanner shutters and heaters, and indicate problems with the relays if they fail to operate.</p> 	
--	--

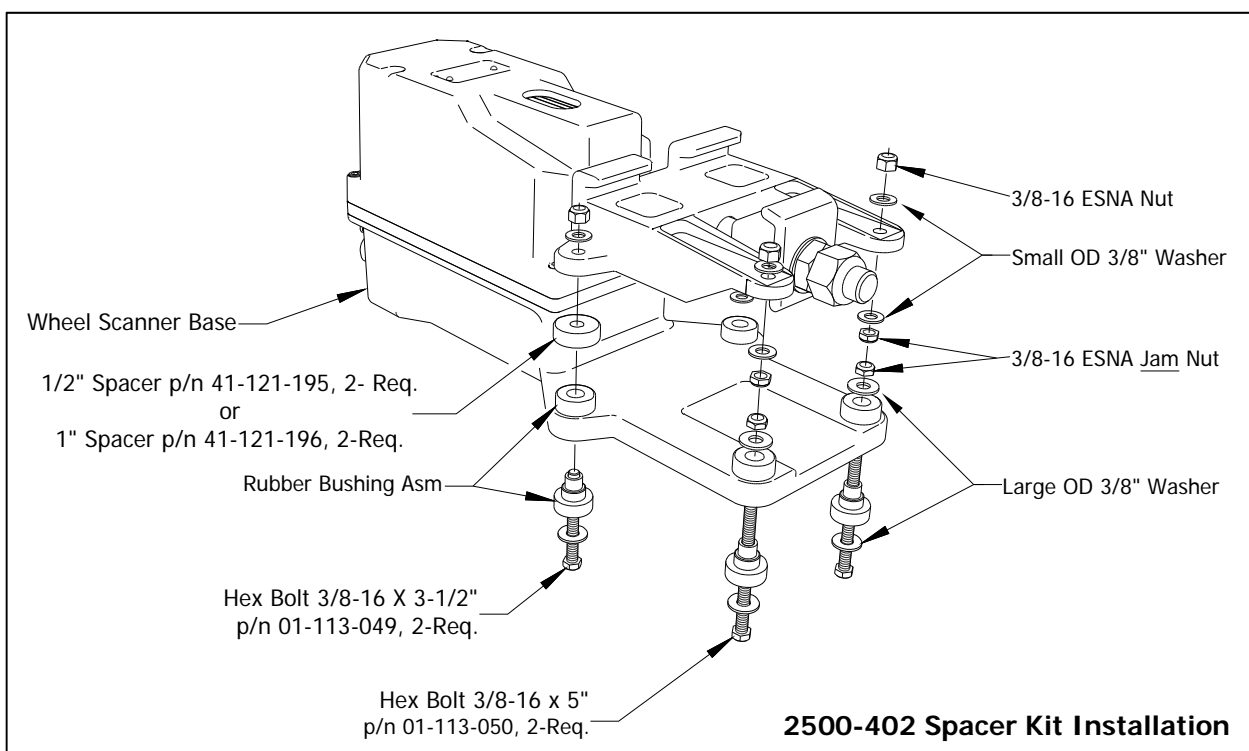
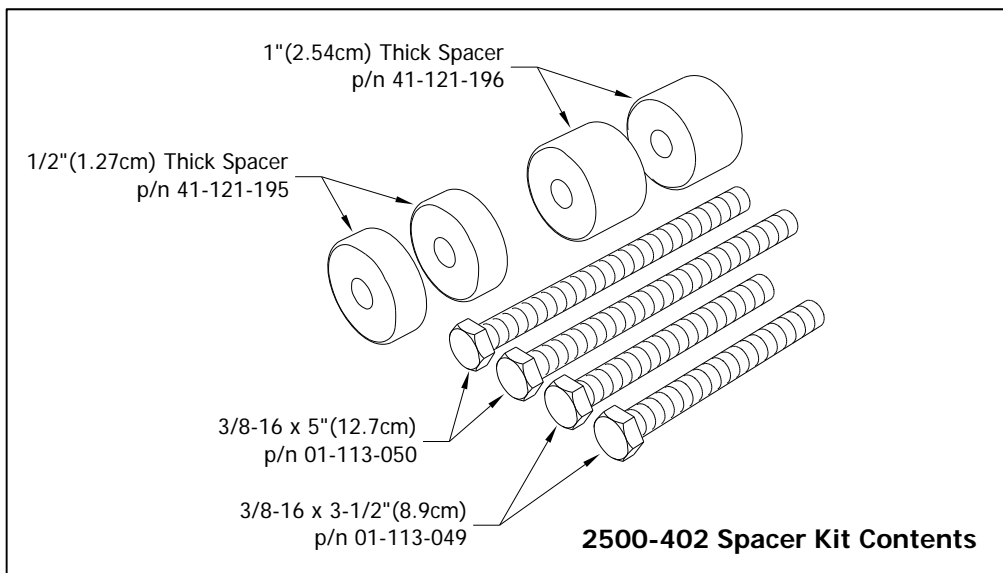
Shutter Control LED Top Right	Shutter Output LED Top Left	Heater Control LED Bottom Right	Heater Output LED Bottom Left	Explanation
On	Off	Off	Off	Invalid. The shutters are being commanded to open, but the relay isn't responding with shutter voltage.
On	On	Off	Off	Normal if a train is present. Invalid if a train isn't present.
Off	On	Off	Off	Invalid. No shutter signal, but shutter voltage is present.
Off	Off	On	On	Normal if a train isn't present and the outside temperature is cold. Invalid if a train is present or if the outside temperature is warm.
Off	Off	On	Off	Invalid. The heaters are being commanded to turn on, but the relay isn't responding with heater voltage.
Off	Off	Off	On	Invalid. No heater signal, but heater voltage is present.
Off	Off	Off	Off	Normal if a train isn't present and the outside temperature is warm. Invalid if a train is present or if the outside temperature is cold.

Note: A shaded area means that a LED is not lighted. Any time the shutters are open, the heaters should be off. Two of the LEDs are wired directly to the relays input terminals to indicate when a control signal has been sent from the controller. The other two LEDs are wired to the relay output to indicate when power is being applied to the scanner.

Appendix J

2500-402 Spacer Kit Installation

The 2500-402 Spacer Kit provides hardware necessary to lower the Type III Hotwheel Scanner assembly by either ½" or 1" for those applications that require additional rail clearance.



Appendix K

Baseline Resistor Test

Upon completion of autocalibration (see Appendix E – Calibration of Scanners), the system will acquire the scanner resistor temperature baseline values. The process begins with a 20-minute wait period in which the resistors are allowed to cool down. The system counts down during this period, sounding a tone each minute. After the 20-minute cool down period, the system opens and closes the shutters for a period of 8 minutes.

NOTE: For wheel scanners, it is imperative that the red filter frame be replaced immediately after autocalibration has disengaged and before resistor baseline acquisition begins.

The reason for establishing the baseline tables at the end of the Auto-Cal cycle is the assumption that the system is then at its peak operating efficiency. The system is freshly calibrated and the lenses are clean. With the baselines established, the system can then recognize and compensate for slight degradations of the lens caused by moisture or dirt accumulation on the lens surface.

K.1 Cover the Scanners

Covering the openings of all four scanners during the baseline establishment routine should result in a more accurate baseline measurement because the reference for the scanner is stable when covered. If you initiate a baseline measurement on a partly sunny day or partly cloudy night, the odds are that for one part of the test you will see clear sky, and for another part of the test you may well be looking at a cloud. Clouds are warmer than clear sky. When clear sky is the reference for the scanner, the recorded heat values tend to be higher than when the scanner references off of a cloud. STC has observed as much as 40 degrees difference. This condition can result in an unusable baseline. If you block the scanners view of the sky completely, you wind up with a very stable reference and a resulting stable baseline.

Unless it is a very windy day, a piece of corrugated cardboard or a small piece of 1/4 inch plywood about 6 inches square placed over the scanner openings does a pretty good job of providing a stable reference and it will simply blow away if a train slips up on you. A 6 inch 2x4 block laid on the opening will work on windy days, and will probably vibrate off if a train catches you. This is a helpful hint for improving performance of the baseline acquisition process, not a requirement.

WARNING: Extreme caution must be taken to avoid a situation where field personnel are trying to quickly clear 4 scanners in front of a train.

K.2 Bungalow Speaker Announcements

During the resistor-cooling period, the system announces through the speaker the following. These announcements aren't broadcast over the radio.

- A beep sounds once per minute until two minutes before the resistor test.
- At two minutes until the test, "Scanner resistor test beginning in 2 minutes" is voiced.
- At one minute until the test, "Scanner resistor test beginning in 1 minute" is voiced.

After the resistor cooling period:

- As the test begins, "Testing" is voiced. During this time, the word PENDING appears in the status column of the Resistor Data section.
- If the test was successful, "System working" is voiced. The word VALID appears in the status column of the Resistor Data section, signifying that the baseline test applies to each passing train.
- If the test wasn't successful, "Scanner resistor test beginning in two-zero minutes" is voiced, meaning that the system will try once more after 20 minutes to acquire an accurate resistor heat profile. During this time, the word PENDING appears in the status column of the Resistor Data section of the System Status Report. If the test fails a second time, the word INVALID appears in the same column. The system applies the interim integrity test to each passing train while either PENDING or INVALID appears.

K.3 Processing Resistor Baseline Results

Here are two rules the system uses:

- If any of the temperatures in the baseline table are less than or equal to 40°F, we consider the baseline to be invalid.
- The next sequential temperature has to increase or be no less than 6°F cooler than the last temperature. That is, if a temperature is 100°F, for example, the next temperature has to be greater than 100, equal to 100, but not less than 94.

If the system gets an invalid baseline, it will automatically try a second time. If it gets interrupted it will also try a second time. The 300° F temperatures that show up in the baselines occasionally are more a reflection of the duty cycle controller for the shutter resistor. Some controllers cause the shutter resistors to heat up more quickly and sometimes overshoot the desired set point, whereas a controller that is operating at its optimum efficiency will ramp up to a value slightly below 300° F. Effective with software version 2.26 L, temperatures above 300° F do not result in an invalid baseline.

Look at the Resistor Data section of the System Status Report. INVALID indicates that the system has tried twice and could not acquire valid resistor data. If any of the baseline results for a scanner show INVALID, the only way to capture a new baseline is to run the Auto Cal process again. If the word PENDING appears in the status column, the system is waiting for the resistors to cool before acquiring resistor data or for the battery to charge to 13 volts. INVALID indicates that the system has tried twice and could not acquire valid resistor data. In either case, the system will apply the interim integrity test to passing trains, which doesn't require resistor baseline data.

Examples: Resistor Baseline Results

Resistor Data																	
VOLTS	AMB	DATE	TIME	STATUS	30	40	50	60	70	80	90	100	110	120	130		
140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480
RAIL 1																	
15.3	-008	01/11/12	12:53	INVALID	300	300	300	300	300	300	300	300	300	300	300	300	300
RAIL 2																	
15.3	-008	01/11/12	12:53	INVALID	300	300	300	300	300	300	300	300	300	300	300	300	300
WHEEL 1																	
15.3	-009	01/11/12	12:26	VALID	155	152	155	152	150	150	149	149	148	147	147		
WHEEL 2																	
15.3	-009	01/11/12	12:26	VALID	160	156	157	162	157	157	155	155	156	155	156	155	156

Resistor Data																	
VOLTS	AMB	DATE	TIME	STATUS	30	40	50	60	70	80	90	100	110	120	130		
140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480
RAIL 1																	
13.4	057	09/30/11	11:59	INVALID	285	285	289	294	289	288	289	288	287	287	288		
RAIL 2																	
13.4	055	09/30/11	10:50	VALID	272	271	274	280	277	275	270	264	262	264	271		
WHEEL 1																	
13.4	055	09/30/11	10:50	VALID	145	148	154	155	156	157	156	156	157	160	158		
WHEEL 2																	
13.4	055	09/30/11	10:50	VALID	128	132	137	137	138	137	141	138	138	141	140		

Resistor Data																	
VOLTS	AMB	DATE	TIME	STATUS	30	40	50	60	70	80	90	100	110	120	130		
140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480
RAIL 1																	
13.5	061	05/25/11	15:25	VALID	242	251	258	263	264	265	267	268	268	270	271		
RAIL 2																	
13.5	061	05/25/11	15:25	VALID	262	268	274	282	282	282	282	283	284	285	285		
WHEEL 1																	
13.7	063	06/27/11	14:09	INVALID	112	116	117	117	116	116	114	114	112	112	111		
WHEEL 2																	
13.7	063	06/27/11	14:09	INVALID	135	2	2	2	2	2	148	2	2	2	2		

Appendix L

DCI Digi Modem Connection

Follow the procedure below to verify that Digi modem is properly connected to cellular network.

1. Check the IP address of the Computer when connected to the DIGI. Should be 10.255.255.X. Go to dos- cmd.exe and type Ipconfig to check the IP address when your computer is connected directly to Digi via Ethernet cable.
2. Log into a DIGI at 10.255.255.254 via internet explorer- basically <http://10.255.255.254>.
3. From the DIGI Home page:
 - Verify the host name. Should be a HX-CPRS... name
 - Verify the ETH0 IP Address. Should be 10.255.255.254
 - Verify the WAN Address. Should be a 10.199.X.X address (Same as Label)

TransPort WR44 (SN: 204036) Configuration and Management

Home

[Getting Started](#)

Not sure what to do next? Click [here](#) for the Quick Start wizard

[System Summary](#)

Model: TransPort WR44
Part Number: WR44-HX00-DE1-XX

Hostname: HX-CPRS-06223-022-70-1

[Eth 0:](#)
IP Address: 10.255.255.254
MAC Address: 00:04:2D:03:1D:04

PPP 1 (W-WAN)
IP Address: 10.199.8.39

Description: HX-CPRS-06223-022-70-1
Contact: CPR S&C
Location: HX-CPRS-06223-022-70-1

Device ID: 00000000-00000000-00042DFF-FF031D04

4. Go to Management -Network Status > Interfaces > Mobile
 - IP Address should be a 10.199.X.X address (Same as Label).
 - Check the Signal Strength? Should be greater than -80 dBm.
 - Check GPRS Registration - Should say "Registered, home network..."
 - Network should show Telus or Verizon.
 - Check the MDN Number. This is a phone number (it doesn't always show up)..


Management - Network Status > Interfaces > Mobile

Interfaces

- ▶ Ethernet
- ▼ Mobile

The following information and statistics can be used to manage and monitor your mobile connection. This information may also be helpful in troubleshooting problems with the mobile network.

Mobile Connection

Registration Status: Registered, home network lac:2BC4 ci:04BA4F53
 Signal Strength:  (-60 dBm)

Mobile Statistics

IP Address: 10.199.8.39
 Primary DNS Address: 0.0.0.0
 Secondary DNS Address: 0.0.0.0
 Data Received: 340725639 bytes
 Data Sent: 492078041 bytes

Mobile information

Results of Last Module Status Poll at 16 Nov 2012 16:22:37
 Outcome: Got modem status OK

Outcome: Got modem status OK

SIM status: Ready (PIN checking disabled)
 Signal strength: -60 dBm
 Radio technology: UMTS
 Radio band: WCDMA 850
 Manufacturer: Qualcomm Incorporated
 Model: Qualcomm Gobi 2000
 IMEI: 980038000193783
 ESN: 804D12D5
 MEID: A100001779C030
 IMSI: 302220005304169
 MDN: Not provisioned
 ICCID: 8912230000062442454
 Firmware: D1025-STUTABGD-3600 1 [Jan 14 2010 14:00:00]
 Bootcode: D1025-STUTABMD-3599
 Hardware version: C01B2000
 GPRS Attachment Status: Attached
 GPRS Registration: Registered, home network lac:2BC4 ci:04BA4F53
 Network: TELUS, 302220
 Preferred system: Auto

- Go to Management – Connections > Virtual Private Networking (VPN) > IPsec Tunnels. You should see one Outbound V1 SAs and one Inbound V1 SAs. It should be 10.2.104.xxx. If there is a problem with DNS lookup, you can go directly to the 10.2.104.xx IP via ProComm in toolbox.

TransPort WR44 (SN: 204301) Configuration and Management

Management - Connections > Virtual Private Networking (VPN) > IPsec > IPsec Tunnels

- ▶ IP Connections
- ▶ PPP Connections
- ▼ Virtual Private Networking (VPN)
 - ▼ IPsec
 - ▼ IPsec Tunnels

Outbound V1 SAs

#	Peer IP Addr	Local Network	Remote Network	AH	ESP Auth	ESP Enc	IP Comp	D
0	10.2.96.9	10.2.104.117/32	0.0.0.0/0	N/A	MD5	3DES	N/A	

Remove All

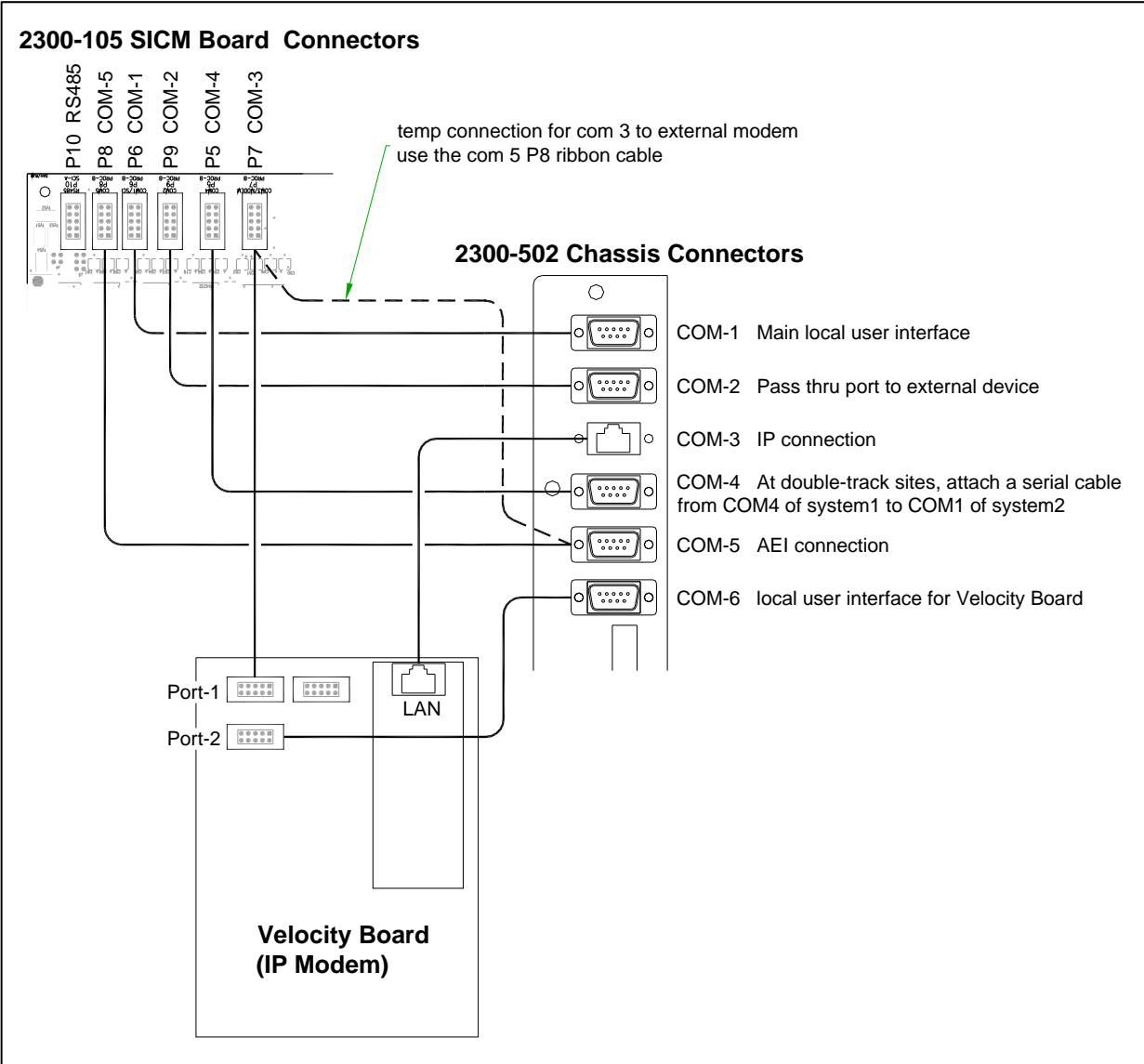
Inbound V1 SAs

#	Peer IP Addr	Local Network	Remote Network	AH	ESP Auth	ESP Enc	IP Comp	D
0	10.2.96.9	10.2.104.117/32	0.0.0.0/0	N/A	MD5	3DES	N/A	

Remove All

Appendix M

SmartScanNG Port Communications Connections



Appendix N

2500-536 Red Filter Frame - New Design

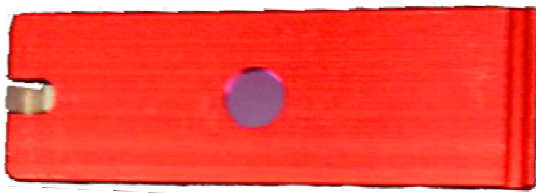
The STC hot wheel scanner application utilizes the specialized red filter frame. The “old style” red filter frames (manufactured prior to 2012) can be identified by their round openings. A design flaw in this version can result in the reporting of overinflated heat values.

The new revision of red filter frame (manufactured in 2012 and after) has a slotted aperture. This new design has proven to provide much greater accuracy thus reducing the possibility of errant temperature readings.

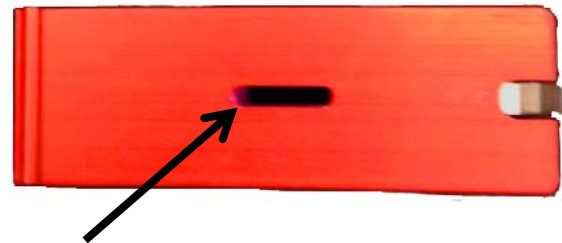
Replacement of any “old style” red filter frames should be considered a high priority. Upgrade as soon as possible to reduce the possibility of generating a false hot wheel alarms which could result in unnecessary train stops and crew inspections.

Identification:

Old Red Filter Frame – **DO NOT USE!**



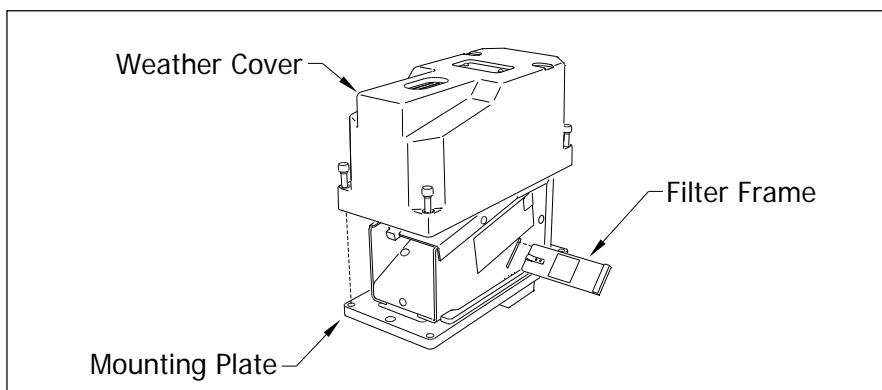
New Red Filter Frame



Slotted Aperture

Installation:

- Recalibrate the wheel scanner (see **Appendix E** for procedural instructions).
- Replace the old red filter frame with the new red filter frame.
- Return old red filter frames to STC for salvage.



Appendix O

12A Breaker Upgrade in SmartScanNG Chassis

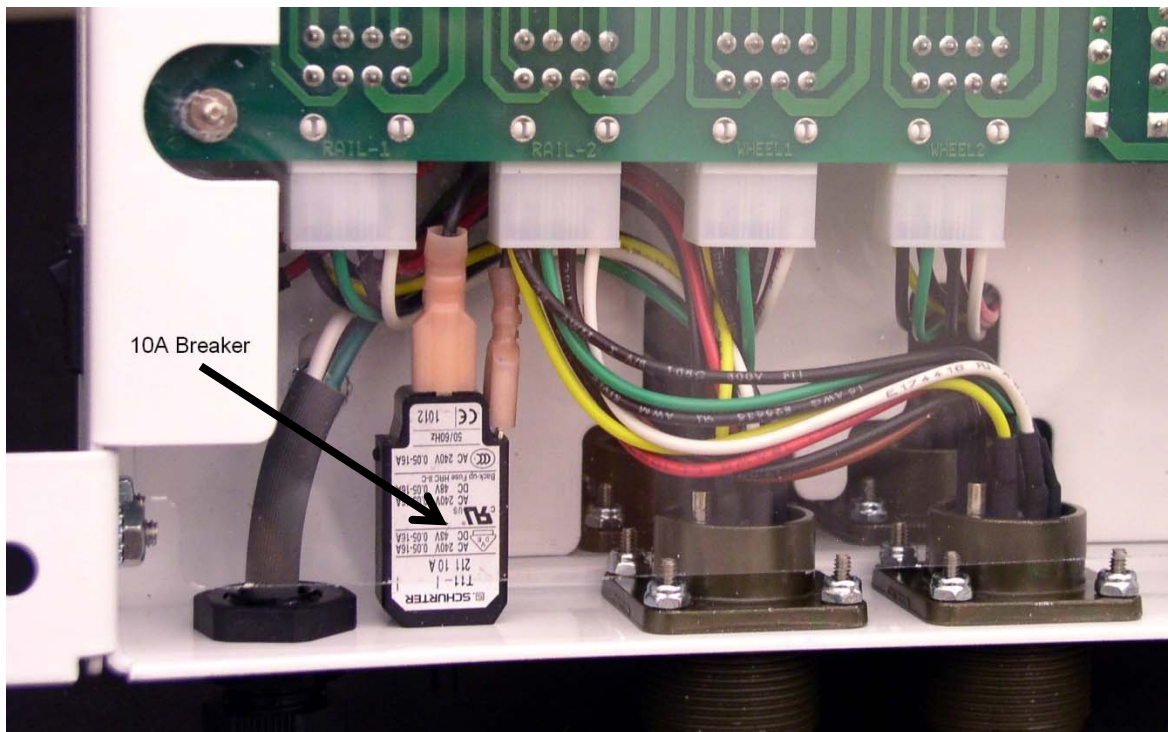
This Upgrade applies only to those SmartScanNG systems manufactured prior to 2012.

In 2012, the STC scanner heaters were upgraded to include three 100W heaters per scanner. The SmartScanNG systems produced thereafter were subsequently modified to handle the additional current requirements of the new heaters.

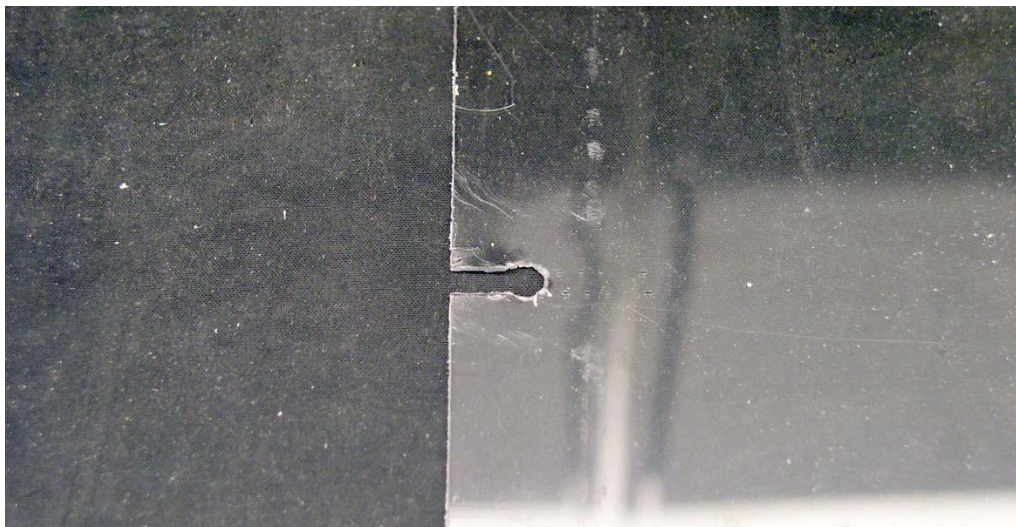
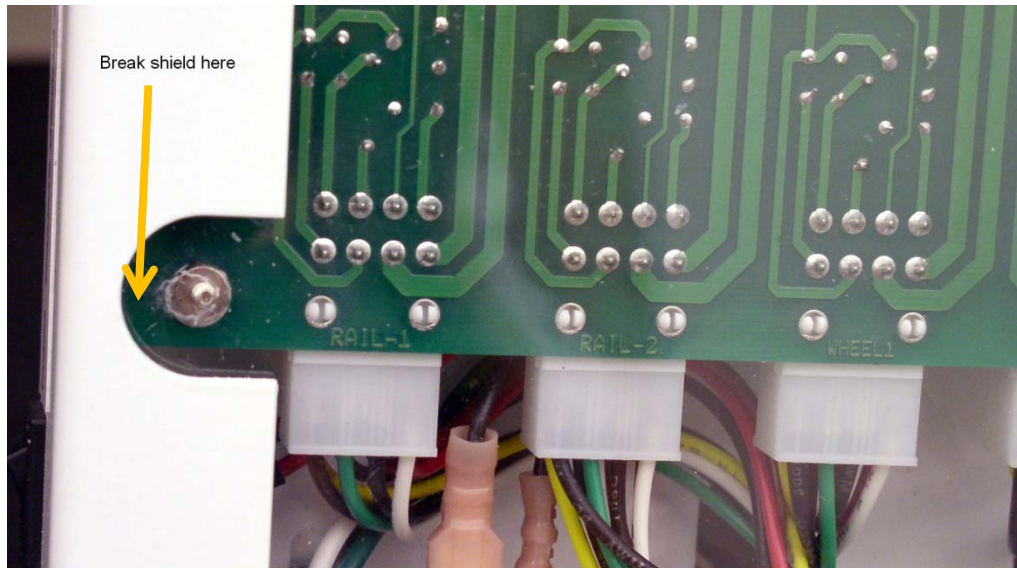
The SmartScanNG chassis built prior to 2012 has a 10A breaker that is subject to failures and nuisance tripping when connected to late model scanners. STC recommends installing the 2300-542 12A Breaker Kit in any NG chassis that currently has a 10A breaker.

Installation Instructions:

1. Access to the rear of the SmartScanNG chassis will be required in order to replace the circuit breaker. Begin by powering down the SmartScanNG and dismounting it from the rack or wall to which it is attached. When the chassis is placed face down, the circuit breaker should be visible through the clear plastic safety shield as shown below.



2. Note: If the chassis does not have a safety shield, skip to step 3. Using a ¼" nutdriver, remove the two nuts retaining the safety shield and then remove the safety shield. You may have to break the safety shield in order to remove it from the left hand retaining screw. Try to break a small section near the left hand mounting screw. You can then cut a slot in the shield to make it easier to reinstall (see photos below).



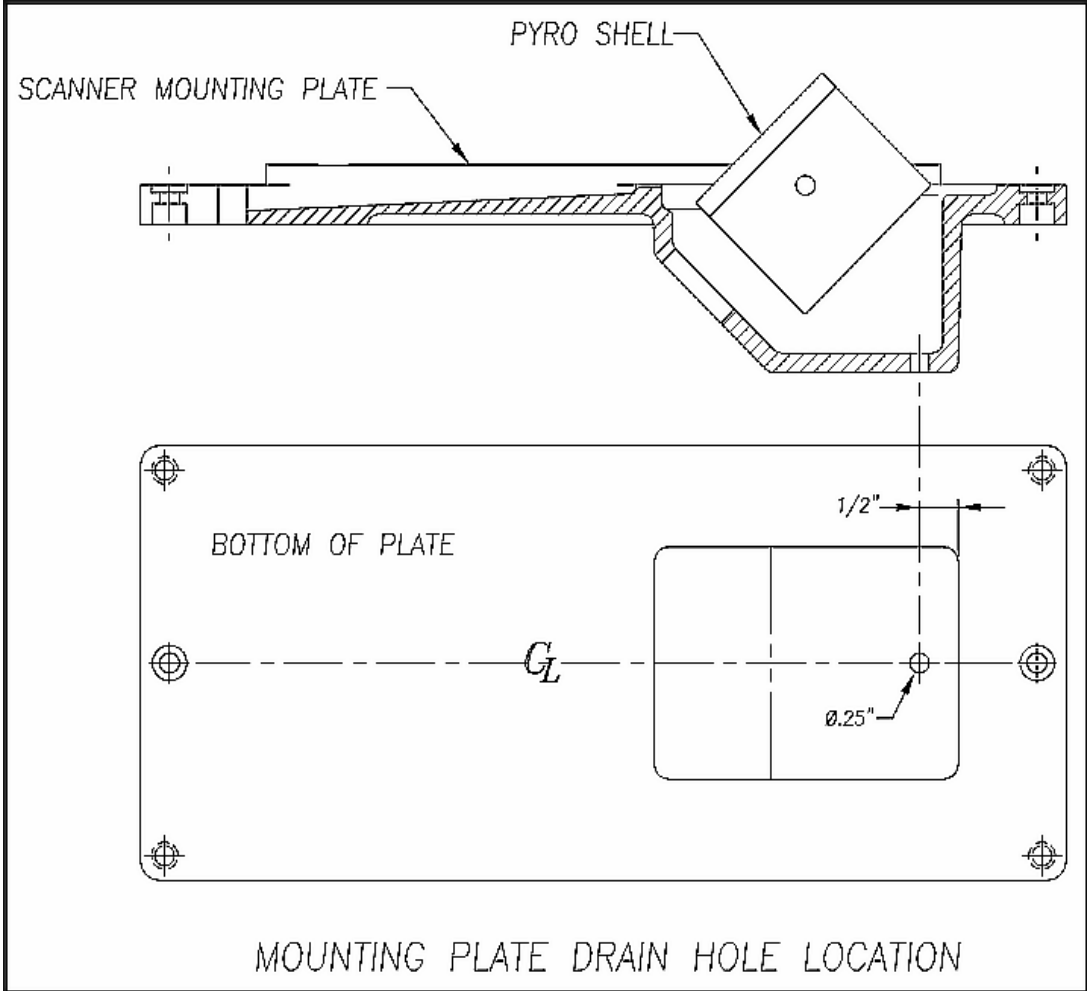
3. Using a 9/16" socket, remove the nut from the circuit breaker. Disconnect the wires from the circuit breaker and remove it from the chassis.
4. Attach the wires to the replacement breaker and install it into the NG chassis.
5. Reinstall the safety shield and install the two safety shield retaining nuts.
6. Remount the SmartScanNG chassis and apply power. Verify that the scanner heater LED's are cycling on and off.

Appendix P

Scanner Base Drain Hole

For scanners manufactured prior to 2013:

Where required due to water accumulation, a 0.25" drain hole can be drilled in the bottom of the scanner base.



Index

This section lists the page numbers for keywords and phrases used in this guide.

A

AAR, 109, 110
advance transducers, 154, 162
AEI Interface module, 36
AEI reader parameters, 43
AEI tags, 67, 75, 81, 89, 107, 110
Alarm Settings menu, 15, 18, 27, 28, 29, 30, 31, 65, 66, 74, 76, 79, 80, 88, 90, 106, 108, 116, 117
Alarms
 Absolute, 15, 28, 29, 64, 65, 70, 74, 79, 84, 88, 93, 103, 106, 125, 190
 Carside Slope, 12, 15, 29, 30, 35, 64, 65, 68, 69, 70, 74, 79, 82, 84, 88, 92, 102, 106, 125
 Cold Rail, 149, 150, 151, 160, 163
 Cold Rail alarms, 30
 Cold Resistor, 150, 151, 152, 155, 159, 163
 Cold Resistor alarms, 31, 125
 Cold Wheel Scanner alarm, 151, 161, 164
 Cold Wheel Scanner Resistor, 152, 153, 156, 159, 160, 165
 Cold Wheel Scanner Resistor alarm, 32, 75, 89, 107, 126
 Dead Battery, 153, 160
 Dead Resistor, 160, 161
 Dead Wheel Scanner Resistor, 161
 Differential alarm, 12, 15, 29, 125
 Dragging Equipment alarm, 19, 34, 131, 134
 Exception Alarm, 42, 66, 75, 76, 78, 79, 80, 89, 90, 107, 108, 127, 129, 130, 132, 145
 High Wide alarms, 34, 35
 High-Load alarm, 19, 130
 Highrange Transducer Miscounts, 153, 161
 Highrange Transducer Miscounts alarm, 40, 41, 125, 127
 Hotbox alarms, 15, 125, 129, 131, 143
 Integrity Failure, 153, 162, 163
 Low Battery, 153, 160
 Midrange Transducer Miscounts, 153
 No Approach Track, 154
 No Approach Track alarm, 37
 Pyrometer Noise Filtered Rail, 154
 Pyrometer Noise Filtered Wheel, 154
 Pyrometer Saturation alarms, 12, 15, 16, 125, 191
 Rail Resistor Test Overridden, 151, 154, 159
 Rail Resistor Test Overridden alarm, 32
 Reverse Direction Detected, 155
 Short Train, 155
 Stuck Dragger During Train Passage, 162
 Stuck Dragger During Train Passage alarm, 155
 Stuck Dragger Pretrain, 162
 Stuck Dragger Recovered, 156
 Stuck High Load Detector Pretrain, 19, 125, 162
 Stuck Wide Load Detector Pretrain, 20, 125, 162
 Successive Cold Rails Exceeded, 150, 162
 Successive Cold Rails Exceeded alarm, 30
 Successive Cold Resistors Exceeded, 151, 163

- Successive Cold Resistors Exceeded alarm, 31
- Successive Cold Wheel Resistors Exceeded, 152, 165
- Successive Cold Wheels Exceeded, 152, 164
- Successive Cold Wheels Exceeded alarm, 30
- Test Train, 156
- Train Present on Restart, 165
- Train Too Slow, 12, 40, 41, 45, 95, 125, 126, 127, 140, 153, 156, 161, 191
- Wheel Resistor Test Overridden, 156, 157
- Wheel Resistor Test Overridden alarm, 32
- Wide Load alarms, 19, 34, 35, 124, 125, 129, 130
- alignment fixture, 135, 136
- ancillary messages, 40, 126, 127, 128, 129, 132, 133
- Announcements, 50, 52, 53, 123, 141, 142
- autocalibration, 37, 53, 54, 97, 99, 170, 177, 179, 181, 183, 184
- axle count, 12, 40, 126, 127, 129, 132, 133, 140
- Axle Scanning, 14

B

- ballast, 136
- baseline resistor integrity test method, 73, 75, 87, 89, 99, 105, 107
- batteries, 8, 137
- battery charger, 115, 137, 144
- battery temperature probe, 137
- baud rate, 21, 48, 61, 97, 178, 182
- bearing scanners, 11, 15, 16, 67, 72, 76, 81, 87, 90, 104, 108, 173, 189

C

- calibrated heat source, 53, 54, 143, 144, 170, 177, 178, 181, 182, 184
- COM1, 21, 47, 48, 58, 61, 178, 182
- COM2, 21, 22, 47, 60, 61, 62, 178, 182
- COM3, 39
- COM4, 58, 59
- COP resets, 98
- correction factor, 17, 73, 75, 87, 89, 105, 107, 126, 151, 152, 153, 159, 160
- Customer Service, 147

D

- date and time, 21, 99, 111, 140
- default setup parameters, 45, 46
- dirty optics, 114, 115, 140
- distribution block, 137
- dragging-equipment detectors, 7
- DSR, 14, 31, 32, 37, 61, 66, 76, 80, 90, 108, 116, 117, 118, 119, 120
- DTMF-code, 42

E

- Equipment menu, 15, 18, 19, 20, 24, 29, 30, 33, 34, 35, 36, 37, 38, 39, 40, 42, 63, 64, 65, 67, 68, 70, 74, 75, 76, 78, 79, 81, 82, 84, 88, 89, 90, 98, 102, 106, 107, 108, 130
- Ethernet, 21, 58
- Event Log, 54, 55, 57, 61, 62, 111, 112, 113, 116, 171
- exit speed, 12, 41, 67, 71, 72, 81, 85, 86, 92, 102, 104, 153, 156, 161

F

float voltage, 115, 144
Functions menu, 22, 49, 50, 51, 52, 53, 54, 112, 140, 141, 142, 167, 170, 179, 183
fuse block, 137
fuses, 144

G

gate distance, 36
gating transducers, 11, 12, 13, 14, 15, 17, 36, 76, 90, 108, 116, 117, 139, 140, 143, 153, 155, 156, 161, 191
GO Train Detection option, 36

H

heaters, 11, 35, 187
High Load, 19, 34
high-load detector, 19, 130
Holdoff, 123
host computer, 58
Hotwheel alarms, 18, 29, 35, 129

I

Integrity Failure, 153, 154, 161, 162, 163, 164, 165

L

Last Train, 61, 62, 100, 101, 142, 143
Lens Cleaning, 140, 187

M

Main menu, 21, 22, 23, 24, 48, 57, 58, 59, 60, 61, 62, 67, 77, 81, 91, 94, 100, 101, 111, 113, 115, 116, 118, 120, 122, 140, 142, 145, 167, 178, 181, 183, 184
maintenance, 9, 11, 128, 132, 135
manual test mode, 52, 53
Messages menu, 40, 41, 42, 123, 124, 125, 126, 127, 130, 133
microprocessor, 54, 170
milepost/kilometer post, 25, 65, 72, 79, 86, 97, 104
modem, 8, 21, 22, 23, 24, 33, 38, 39, 40, 47, 58, 61, 62, 178, 182
mounting plate, 135, 136, 174, 175, 176, 182, 187, 188
multiplexed, 35, 125

O

optics, 135, 140, 144, 181, 184, 187

P

parity, 48, 97
Pass-Through Mode, 58
password, 23, 24, 47, 168, 170, 171
post-train message, 12
Processor board, 13, 14, 21, 54, 65, 75, 79, 89, 98, 107, 138, 170
PTT, 57
pyrometer, 17, 35, 53, 66, 76, 80, 90, 108, 116, 117, 170, 177, 179, 183, 189

R

Radio Inhibit, 51, 52, 53, 141, 142, 169
Radio Test, 49, 50, 141, 168
ramp function, 52, 169
rebroadcast, 40, 42, 51, 126, 169
Remote System Reset, 54, 170

S

scanner cover, 173, 174, 176, 181, 184, 188
serial interface, 21, 22, 24, 62, 67, 77, 81, 91, 94, 100, 101, 111, 113, 116, 118, 120, 122, 167, 178, 181, 183, 184
serial port, 39, 47, 60
Setup menu, 22, 23, 24, 25, 26, 27, 29, 33, 40, 43, 44, 46, 47, 48, 63, 67, 72, 78, 81, 86, 104, 127
shutters, 11, 37, 52, 54, 73, 75, 87, 89, 99, 105, 107, 140, 142, 150, 159, 169, 180, 181, 183, 184
speaker, 49, 50, 51, 52, 53, 57, 99, 141, 142, 168, 169, 170
SRAM, 112
standard warranty, 7
status panel, 13, 50, 53, 138, 139, 141, 144
Sticking Brake, 42, 127
stuck shutter, 114, 115
System activation, 11
System Alarms, 12, 31, 37, 70, 71, 75, 84, 85, 89, 92, 93, 102, 103, 107, 129, 140
System deactivation, 12
System Functions menu, 49, 141
system parameters, 21, 22, 24
System Status, 39, 54, 61, 62, 91, 94, 95, 96, 97, 98, 99, 100, 101, 142, 170
Systems Functions menu, 49

T

tag data, 44, 98, 110
temperature probe, 41, 114, 115, 137
test tone, 53
test train, 52, 53, 101, 142, 143, 169, 170
timeout, 24, 42, 123
TO1, 11, 12, 13, 64, 66, 70, 73, 76, 80, 84, 87, 90, 103, 105, 108, 139, 140, 142, 143, 153, 155, 161
TO2, 11, 12, 13, 64, 66, 70, 73, 76, 80, 84, 87, 90, 103, 105, 108, 139, 140, 142, 143, 153, 155, 161
track circuit, 154, 156, 162
Train Detail, 12, 15, 18, 30, 31, 35, 37, 61, 62, 63, 67, 68, 69, 70, 71, 77, 81, 91, 94, 100, 101, 102, 109, 128, 132, 140, 143, 191
Train Summary, 61, 62, 63, 64, 67, 68, 77, 81, 91, 94, 102, 139, 140, 144
Trains directory, 54, 63, 66, 72, 104, 117, 118, 140, 171
transducer gain, 36
transducer pulse, 12, 14, 73, 87, 105
trip wire, 19, 20, 35, 130
troubleshooting, 102

V

Vocabulary Test, 51, 52, 142, 169
volume, 50, 52, 53, 141, 142

W

wayside enclosure, 11, 95, 136, 145, 181, 184
wheel scanners, 7, 17, 18, 67, 68, 74, 76, 81, 82, 88, 90, 102, 106, 108, 139, 144, 173
Winter Cycle, 35

Z

zero level signal, 17
zero reference, 17