SmartScanNG
Operator's Guide
for Iowa Interstate

28 January 2016

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
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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.

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Contents

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

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 system. This guide describes that system.

The SmartScanNG system monitors moving trains and reports certain conditions detected on these trains. Parts of the system, like the bearing scanners, are installed on the tracks. Other parts of the system, like the controller module, are installed near the tracks.

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 those who purchase, install, maintain, troubleshoot, manage, or use the SmartScanNG system as configured for Iowa Interstate.

1.2 SmartScanNG

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

- Overheated bearings, when bearing scanners are installed and enabled
- 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°F to +160°F (-40°C to +71°C). 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 milepost 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 <u>not</u> allow metallic articles to contact the negative and positive terminals of a battery at the same time.

Do <u>not</u> install any tower, pole, mast, or antenna on a wet or windy day. Do <u>not</u> 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 <u>not</u> 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:

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    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 one of two primary means of train arrival detection, which are the track circuit or advance transducers. 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 then 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 gating transducer <u>closest</u> <u>to</u> the bearing scanner. **TO2** is the one <u>farthest</u> <u>from</u> the bearing scanner.
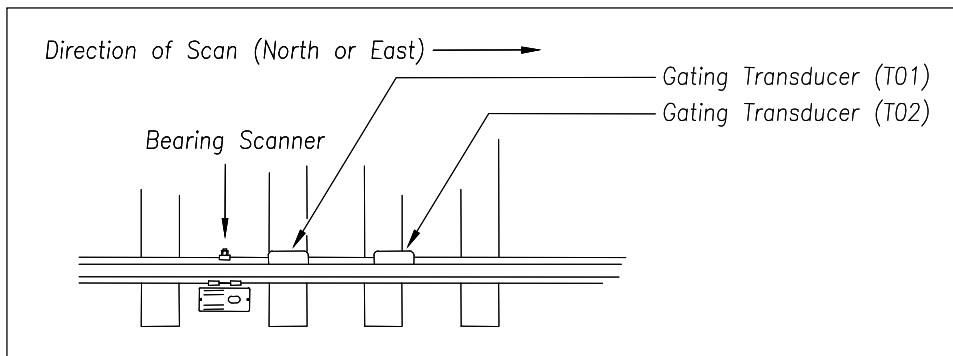
The signals from these gating transducers indicate to the system that passing wheels are in view of the scanners. Furthermore, the speed of the train is determined by using the known distance between TO1 and TO2 versus the time required for a given wheel to pass over them.

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. This happens in one of two ways, which is dependent upon whether the track circuit or one of the transducers has activated the system.

If the track circuit activated the system, the system waits for the track-circuit signal to be absent for ten seconds before deactivating. Likewise, if a transducer activated the system, 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. If a train has fewer than eight axles, its speed is reported as 0 mph.

Trains traveling at <u>less</u> <u>than</u> 7 mph (11.3 kph) are considered "very slow." 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 Slow Trains option** is enabled) <u>and</u> 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 <u>header</u> section of a Train Detail report, shows the location of this message.

```
                    Southern Technologies Corporation
                    Next Generation Detector System
                            TRAIN DETAIL
=============================================================================
                                  •
                                  •
System Alarms
-------------------------------------
VERY Slow Train
                                  •
                                  •

```

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.

Invalid Transducer Counts

Transducers–Related Problems or TO2 Active

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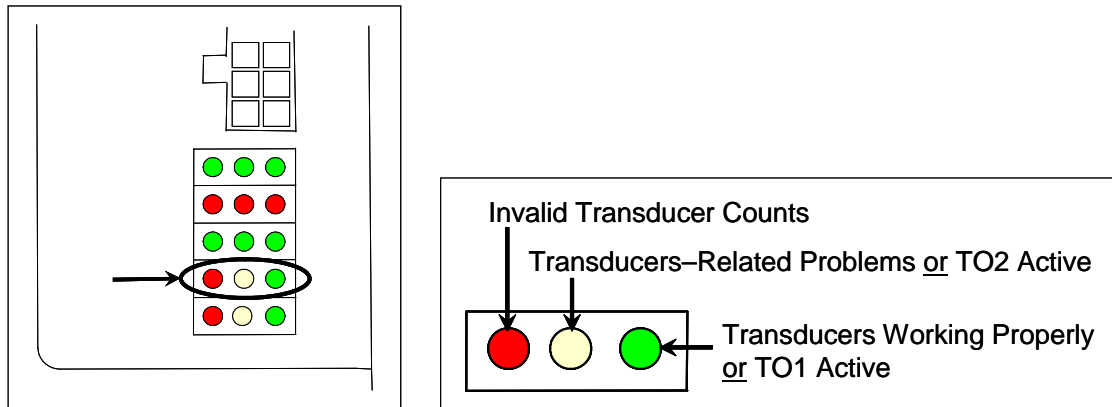
On the Interface board (in the Controller module), the transducer signals undergo RF filtering and amplification with a gain of 30. For validation, the amplified signals are fed into comparators, which create 5-VDC pulses lasting the period of time that the amplified signals remains above 620 millivolts.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

Controller Module Cover

Modem Board

Processor Board

Controller Module Base

Interface Board
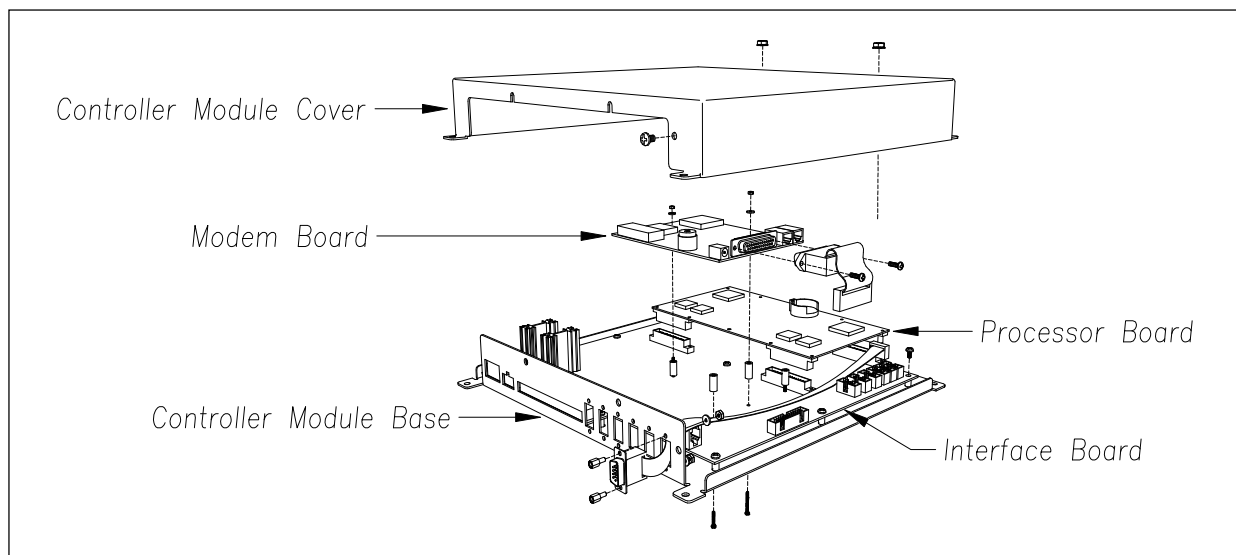
A firmware-controlled feature of the comparator circuit allows adjustment of the threshold voltage based on the speed of the train. Trains traveling <u>less</u> <u>than</u> 20 mph (32 kph) use the 620-millivolt threshold setting for maximum sensitivity. However, faster trains cause the transducers to 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

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) pregate 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 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.

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 <u>three</u> <u>per</u> <u>train</u>. For example, if a train contains seven Hotbox alarms, the Train Detail report will show all seven, but only the first three will be announced.

There are five 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 interaxle bearing temperature must exceed the limit that was established using the **Absolute option**. 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.

- Warm. To trigger a Warm alarm, a bearing temperature must exceed the limit that was established using the **Warm option** on the Alarm Settings menu. This alarm limit is an offset, in degrees Fahrenheit, above the ambient temperature.

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.
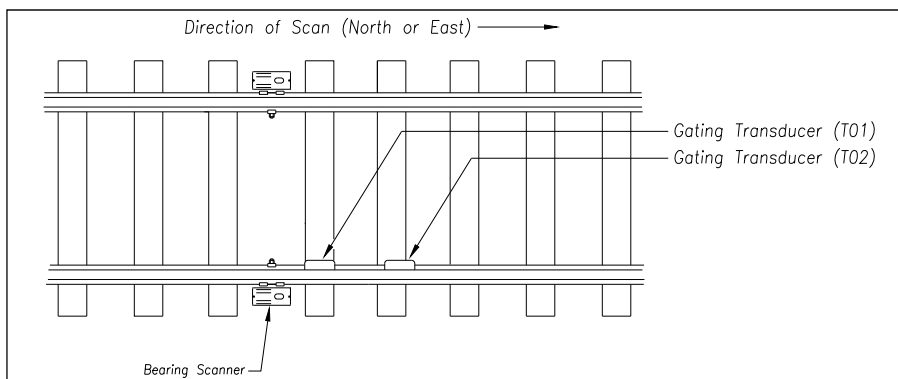
The **type2** bearing scanners are aligned to scan the bottom 3.5 inches (8.9 centimeters) of the bearing housing, about 7.25 inches (18.4 centimeters) from the gauge line.
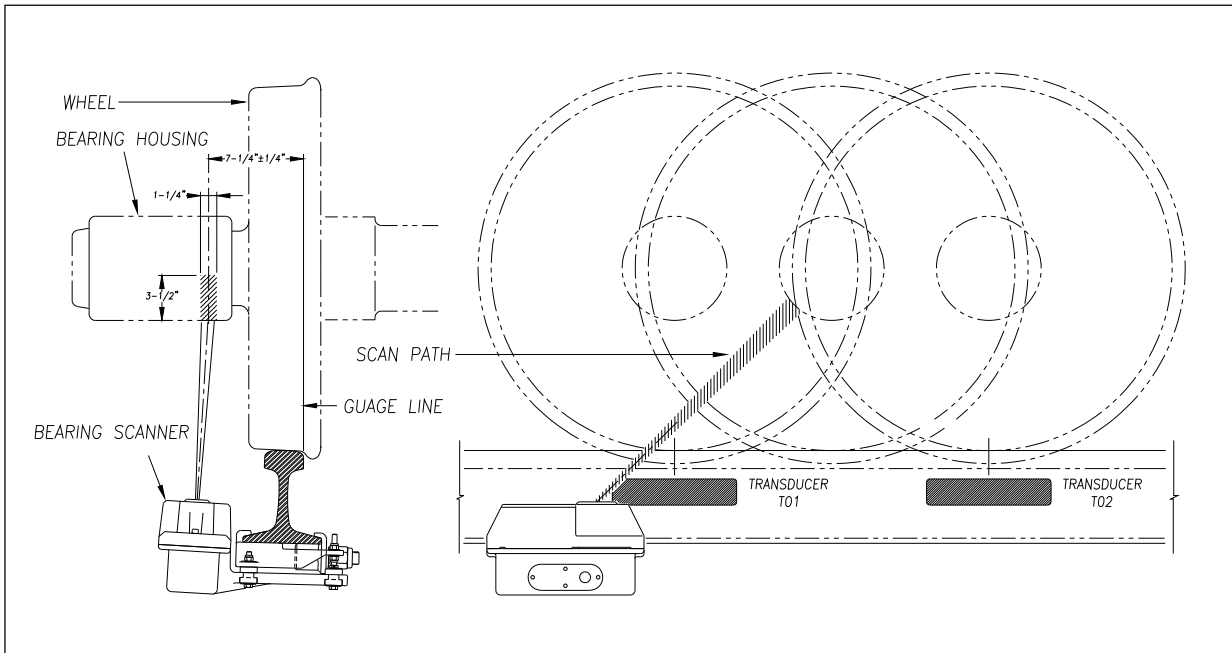
The **type3** bearing scanners are aligned to scan the bottom 3.5 inches (8.9 centimeters) of the bearing housing, about 7.25 inches (18.4 centimeters) from the gauge line.
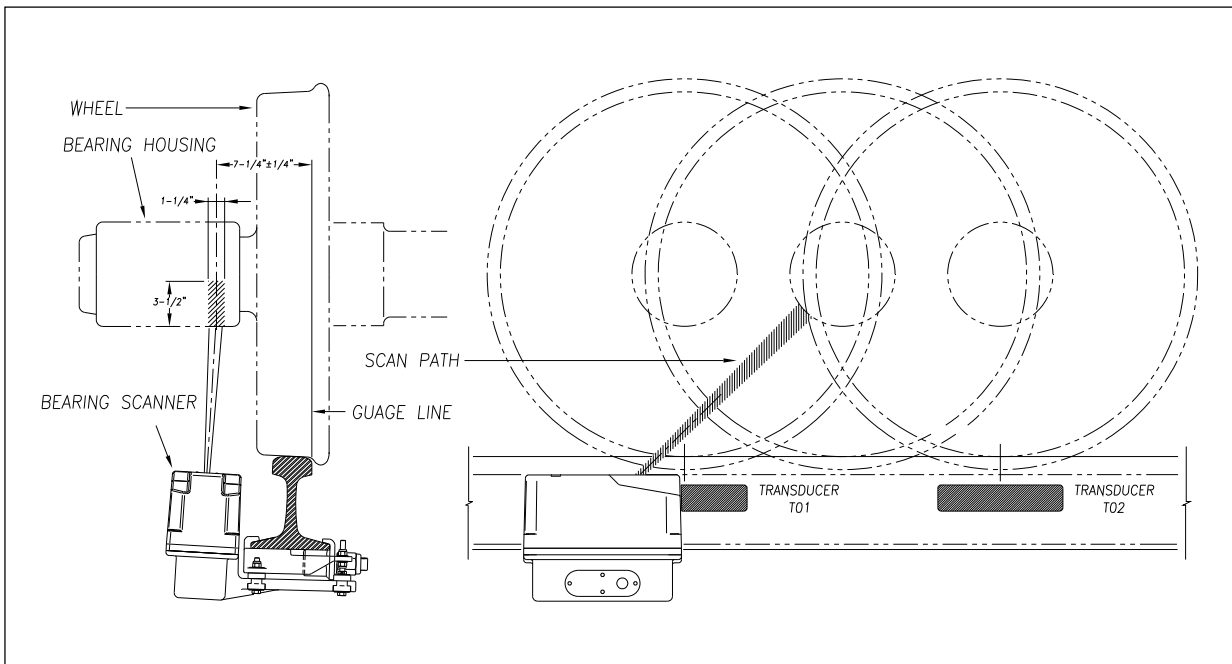
Bearing temperatures are sampled for a short period before the gate opens, to support detection of Pyrometer Saturation alarms, and while the gate is open.

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.
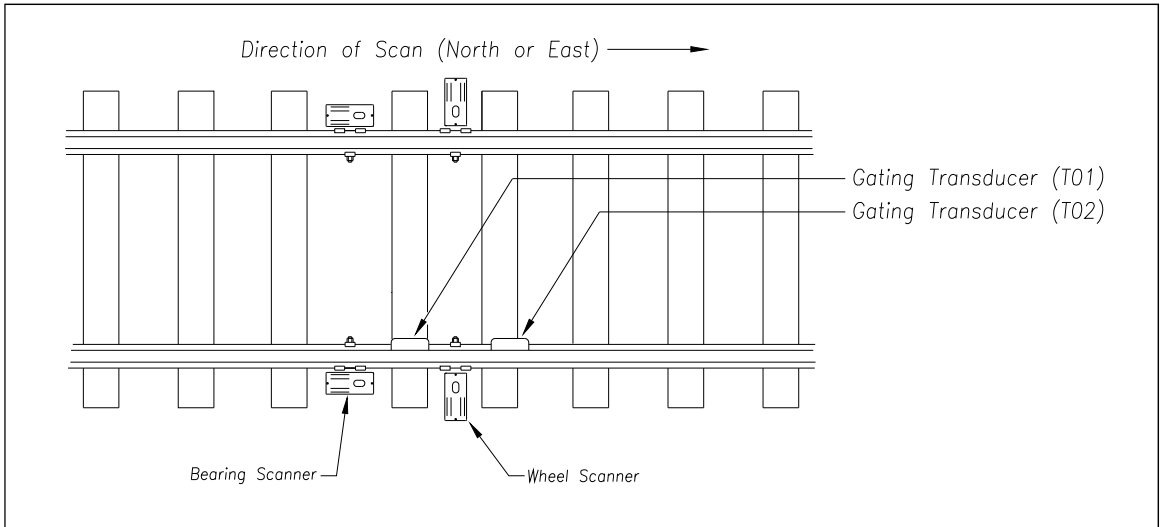
The **type2** wheel scanners are aligned to scan about 4 inches (10.2 centimeters) above the rail.
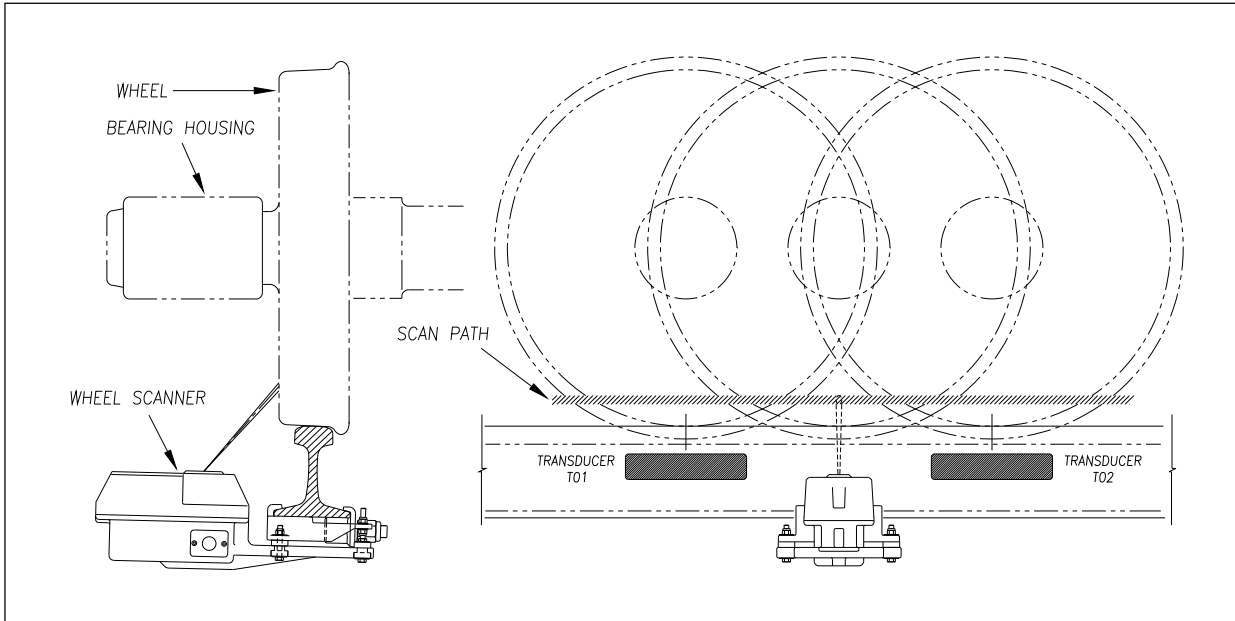
The **type3** wheel scanners are aligned to scan about 4 inches (10.2 centimeters) above the rail.
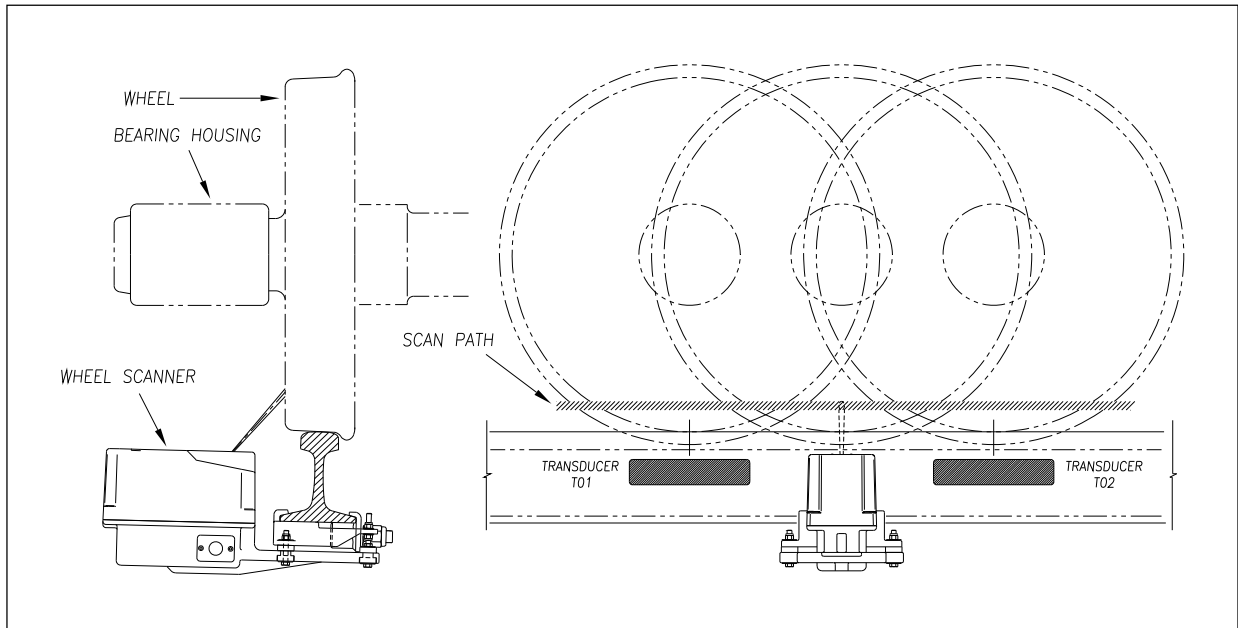
The SmartScanNG system checks for hotwheels during the scanning process.

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 three per train. For example, if a train contains nine Hotwheel alarms, the Train Detail report will show all nine, but only the first three 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, it only announces the first two.

- 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, it only announces a maximum of three.

  The mode of operation (light beam or trip wire) isn't relevant when the SmartScanNG system finds a pretrain High-Load 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, it only announces a maximum of three.

  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.

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 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

- A modem, which is connected to the computer

- A nonswitched analog telephone line, which is connected to the computer's modem

- Another modem, which is connected to COM3 on the Interface board (internally) or COM3 on the Controller module (externally)

- Another nonswitched analog telephone line, which is connected to the SmartScanNG's modem

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 multitrack 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.

2   If **off-site**, plug your computer into a modem that is plugged into a nonswitched analog telephone line.

3   Turn on your computer.

4   Be sure that your computer has installed communications software, that it is set to use full duplex, <u>and</u> 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   If **off-site**:

a   From your computer, dial and connect to the modem at the site to which you want to communicate.

b   Wait for the "connect" message from your modem.

7   Press **[Esc]**.

This prompt appears.

```
Enter "SmartSCAN" To Proceed:
```

8   Type **SmartSCAN**

The entry of this word is **not** case sensitive.

9 To get the serial interface to come up, press **[Enter]**.

The Main menu appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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
  J) Event Log
  K) Maintenance Report
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

At the above prompt, you can:

- Produce one of the listed reports. This is explained in the next section.

- Replay an EOT announcement. This is explained below.

- Access the Setup menu. This is explained below. It is from the Setup menu that you can set system parameters.

- Enter pass-through mode. This is explained below. Pass-through mode allows you to access two SmartScanNG systems with one modem.

- Access the System Functions menu. This is explained below.

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.

10 When done, close the LOG file.

11 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.

3.2 Setup Menu

To display the Setup menu:

1 Be sure that the Main menu is displayed.

The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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
  J) Event Log
  K) Maintenance Report
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

2 Select Setup menu.

If the Setup menu <u>is</u> <u>password</u> <u>protected</u>, this prompt appears.

```
  Enter Setup Password:
```

You are given <u>three</u> chances to enter the correct password. When you have an **off-site** connection and you don't enter the correct password in three tries, the system hangs up your modem. When you have an **on-site** connection and you don't enter the correct password in three tries, the system returns to the Main menu.

If the password is <u>less</u> <u>than</u> 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 **not** case sensitive. For example, the password "abc#123" can be entered "ABC#123," "aBc#123," and so forth.

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

If the Setup menu is <u>not</u> <u>password</u> <u>protected</u>, this prompt appears. Also, after you type the password correctly for a <u>password</u> <u>protected</u> Setup menu, this prompt appears.

```
Enter "Setup" To Proceed:
```

Each time you see the above prompt, you are given <u>three</u> chances to type the word "setup." The entry of this word is **not** case sensitive. After you type it, a menu and prompt like this appears. If you fail to type it in three tries, the Main menu reappears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
-------------------------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number
 D) Alarm Limits
 E) Equipment
 F) Messages
 G) AEI Reader Parameters
 H) DCS Parameters
 I) Load Default Setup Parameters
 J) Setup Password
 K) COM1  Tx  19200 / Rx 19200   N-8-1
 L) COM2  Tx  19200 / Rx 19200   N-8-1
 M) COM3  Tx  19200 / Rx 19200   N-8-1
 N) 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.

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

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 setting, the time setting, or both settings:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
---------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number

            .
            .
            .
```

2 Select the Date and Time submenu.

A prompt like this appears.

```
Current Date: 02/19/2015
Enter New Date:
```

Dates are in **mm/dd/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 13 Feb 2015, type **021915**.

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

3 Type a new date <u>or</u> press **[Enter]**.

A prompt like this appears.

```
Current Time: 08:27:34
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.

4 Type a new time <u>or</u> press **[Enter]**.

A prompt like this appears.

```
    Current Time Zone: Eastern
    Enter New Time Zone (E-Eastern,C-Central,M-Mountain,P-Pacific):
```

If you want to keep the displayed time zone, press **[Enter]**. If you don't, type the letter that corresponds to the time zone you want.

5 Type the letter that corresponds to the time zone you want <u>or</u> press **[Enter]**.

A prompt like this appears, stating whether the daylight-saving-time adjustment is currently disabled or enabled. Daylight-saving time is the period during which clocks are set one hour ahead of local standard time.

```
    Daylight Savings Time Enabled OK (Y/N)?
```

If disabled, all times throughout the year are in standard time. If enabled, all times between the second Sunday in March and the first Sunday in November are in daylight-saving time. All other times are in standard time. Any change takes effect immediately. Later, if enabled, at 2:00 a.m. on the second Sunday in March the system will adjust the system's clock forward an hour to 3:00 a.m. and at 2:00 a.m. on the first Sunday in November the system will adjust the system's clock backward to 1:00 a.m.

At this point, type **Y** (yes), type **N** (no), or press **[Enter]**. Pressing **[Enter]** has the same effect as typing **Y**. Typing **N** doesn't change the displayed time.

6 If you want to modify the adjustment, type **N**

Typing the letter **N** toggles between disabled or enabled. A message like this appears, stating whether the daylight-saving-time adjustment is <u>now</u> disabled or enabled.

```
    Daylight Savings Time Disabled OK (Y/N)?
```

7 If you don't want to modify the daylight-saving-time adjustment, type **Y**

The Setup menu reappears. Information like this appears on <u>line two of the Setup menu</u>, where EDT is the abbreviation for Eastern Daylight Time. If it were EST instead, it would be Eastern Standard Time.

```
    02/19/2015 22:47 EDT
```

3.2.2 Milepost/Kilometer Post (MP/KP)

To set or change the milepost/kilometer post (MP/KP) setting:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
--------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number

           .
           .
           .
```

2 Select the MP/KP 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 <u>less than</u> 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 To <u>keep</u> the displayed MP/KP:

a Press **[Enter]**.

The Setup menu reappears.

b Skip the remaining steps.

4 To <u>change</u> the displayed MP/KP, type the new five-digit MP/KP.

This prompt appears.

```
 Is this correct ?
```

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

5 If the MP/KP is <u>incorrect</u>:

a Type **N**

b Return to step **4**.

6 If the MP/KP is <u>correct</u>, type **Y**

The Setup menu reappears.

3.2.3 Track Number

To set or change the track number and track direction:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
--------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number
 D) Alarm Limits
           .
           .
           .
```

2 Select 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.

3 To <u>keep</u> the displayed track direction:

    a Type **Y**

    This prompt appears.

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

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

    b Go to step **5**.

4 To <u>change</u> the displayed track direction:

    a Type **N**

    The track direction toggles between east/west and north/south.

    b If the track direction is <u>incorrect</u>, go to step **a**.

    c If the track direction is <u>correct</u>, type **Y**

    This prompt appears.

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

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

5 If you have only <u>one</u> track at this site:

a Type **N**

The Setup menu reappears.

b Skip the remaining steps.

6 If you have <u>two</u> <u>or</u> <u>more</u> tracks at this site, type **Y**

This prompt appears.

```
1 = Track 1
2 = Track 2
3 = Track 3
4 = Track 4
5 = East
6 = West
7 = North
8 = South
Enter number:
```

7 To <u>not</u> change the value, press **[Esc]** <u>and</u> skip the remaining steps.

The Setup menu reappears.

8 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 <u>or</u> press **[Enter]** after typing one or two digits. All typed nondigits are ignored.

If you typed a digit from 1 through 8, the Setup menu reappears. If you typed something else, the message below appears followed by the above prompt. If this happens, retype the digit that corresponds to the track designator you want.

```
That was not one of the valid choices.
```

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.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
---------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number
 D) Alarm Limits
 E) Equipment

        .
        .
        .
```

2 Select the Alarm Settings menu.

A menu and prompt like this appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-South
02/19/2015 21:57 EST
Alarm Settings Menu
-------------------------------------------------
  A) Absolute.................... 200
  B) Warm....................... 170
  C) Differential................ 115
  D) Hot Wheel................... 702
  E) Carside Slope.............. 1.31
  F) Carside Minimum............ 155
  G) Cold Rails..................   5
  H) Cold Rail Temp.............. 10
  I) Cold Res Counter............   3
  J) Res Test: Minimum Rail Avg... 25
  K) Res Test: Minimum Wheel Avg.. 28
  L) Warm Bearing Trigger........  72
  M) Warm Wheel Trigger.......... 362
  N) Max Hot Bearings............   7
  O) Max Hot Wheels.............. 32
  P) Max Dragging Equipment....... 10
  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.

3 To leave the Alarm Settings menu <u>and</u> return to the Setup menu:

a Press **[Esc]** <u>or</u> type **X**

The Setup menu reappears.

b Skip the remaining steps.

4 To <u>change</u> the displayed **Absolute-alarm limit**：

The number after the word Absolute on the Alarm Settings menu is an offset <u>in</u> <u>degrees</u> <u>Fahrenheit</u> above ambient temperature. When a bearing temperature exceeds this value, the system generates an Absolute alarm.

```
STC SmartScanNG, MP/KP-1111.1, Track-South
02/19/2015 21:57 EST
Alarm Settings Menu
-------------------------------------------------
  A) Absolute.................... 200
  B) Warm....................... 170
  C) Differential............... 130

                •
                •
                •
```

a From the Alarm Settings menu, select **Absolute**.

This prompt appears.

```
    New Value ?
```

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

b To <u>not</u> change the limit, press **[Esc]** <u>and</u> return to step **3**.

c Type the new limit.

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

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

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

d If the new limit is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new limit is <u>correct</u>, type **Y**

If you type zero or a value <u>greater</u> <u>than</u> 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 <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

5 To <u>change</u> the displayed **warm-alarm limit**：

The number after the word Warm on the Alarm Settings menu is an offset <u>in degrees</u> <u>Fahrenheit</u> above ambient temperature. When a bearing temperature exceeds this value, the system generates a Warm alarm. If the value after the word <u>Warm</u> on the Alarm Settings menu is <u>greater</u> <u>than</u> the value after the word <u>Absolute</u> on the Alarm Settings menu, you will never get a Warm alarm.

```
    STC SmartScanNG, MP/KP-1111.1, Track-South
    02/19/2015 21:57 EST
    Alarm Settings Menu
    ------------------------------------------------
      A) Absolute.................... 200
      B) Warm....................... 170
      C) Differential............... 130
                    .
                    .
                    .
```

a From the Alarm Settings menu, select **Warm**.

This prompt appears.

```
    New Value ?
```

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

b To <u>not</u> change the limit, press **[Esc]** <u>and</u> return to step **3**.

c Type the new limit.

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

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

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

d If the new limit is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new limit is <u>correct</u>, type **Y**

If you type zero or a value <u>greater than</u> 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 **Warm option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

6 To <u>change</u> the displayed **differential-alarm limit**:

The number after the word Differential on the Alarm Settings menu is an offset <u>in degrees Fahrenheit</u> between the 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).

```
    STC SmartScanNG, MP/KP-1111.1, Track-South
    02/19/2015 21:57 EST
    Alarm Settings Menu
    ------------------------------------------------
      A) Absolute.................... 200
      B) Warm....................... 170
      C) Differential............... 130
      D) Hot Wheel.................. 652

                  •
                  •
                  •
```

a From the Alarm Settings menu, select **Differential**.

This prompt appears.

```
   New Value ?
```

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

b To <u>not</u> change the limit, press **[Esc]** <u>and</u> return to step **3**.

c Type the new limit.

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

```
   New Value ? 110
   Is this correct ?
```

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

d If the new limit is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new limit is <u>correct</u>, type **Y**

If you type zero or a value <u>greater than</u> 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 **Differential option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

7 To <u>change</u> the displayed **hotwheel-alarm limit**：

The number after the words Hot Wheel on the Alarm Settings menu is an offset <u>in degrees</u> <u>Fahrenheit</u> above the ambient temperature. When a wheel temperature exceeds this value, the system generates a Hotwheel alarm. However, when the **Hotwheel option** on the <u>Equipment</u> <u>menu</u> is disabled, Hotwheel alarms aren't generated.

```
   STC SmartScanNG, MP/KP-1111.1, Track-South
   02/19/2015 21:57 EST
   Alarm Settings Menu
   -------------------------------------------------
     A) Absolute.................... 200
     B) Warm........................ 170
     C) Differential................ 130
     D) Hot Wheel................... 652
     E) Carside Slope............... 1.60

                    .
                    .
                    .
```

a From the Alarm Settings menu, select **Hot Wheel**.

This prompt appears.

```
   New Value ?
```

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

b To <u>not</u> change the limit, press **[Esc]** <u>and</u> return to step **3**.

c Type the new limit.

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

```
   New Value ? 600
   Is this correct ?
```

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

d If the new limit is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new limit is <u>correct</u>, type **Y**

If you type zero or a value <u>greater than</u> 900, this error message and prompt appear.

```
   Minimum valid value is 1, Maximum valid value is 900
   New Value ?
```

If you type an acceptable value, the **Hotwheel option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

8 To <u>change</u> the displayed **carside slope value**:

The number after the words Carside Slope on the Alarm Settings menu is the slope value used when doing carside slope analysis. ***Section 2.0 - Defect Detection*** describes the Carside Slope alarm process. In order for Carside Slope alarms to be processed, they must be enabled using the **Carside Slope option** on the <u>Equipment menu</u>. The detection of Carside Slope alarms stops if the speed of the train drops below 7 mph (11.3 kph).

```
                  .
                  .
   D) Hot Wheel................... 652
   E) Carside Slope.............. 1.60
   F) Carside Minimum............ 300

                  .
                  .
```

a   From the Alarm Settings menu, select **Carside Slope**.

This prompt appears.

```
    New Value ?
```

Slope value is in **n.nn** format. If the new value has <u>less than</u> 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.

b   To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c   Type the new value.

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

```
    New Value ? 1.40
    Is this correct ?
```

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

d   If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e   If the new value is <u>correct</u>, type **Y**

If you type zero or a value <u>greater than</u> 2.55, this error message and prompt appear.

```
    Minimum valid value is 0.01, Maximum valid value is 2.55
    New Value ?
```

If you type an acceptable value, the **Carside Slope option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f   If you get an error message, return to step **b**.

g   If you don't get an error message, return to step **3**.

9   To <u>change</u> the displayed **carside minimum heat value**:

The number after the words Carside Minimum on the <u>Alarm Settings menu</u> is a minimum offset <u>in degrees Fahrenheit</u> used when doing carside-slope calculation/analysis. If the **Carside Slope option** on the Equipment menu is <u>disabled</u> 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 <u>disabled</u> at the time a Train Detail report is requested, no carside-slope calculation is done and, thus, no carside-slope alarm-limit lines are generated. ***Section 2.0 - Defect Detection*** describes the Carside Slope alarm process. The detection of Carside Slope alarms stops if the speed of the train drops below 7 mph (11.3 kph).

```
                          •
                          •
                          •
    E) Carside Slope.............. 1.60
    F) Carside Minimum............. 300
    G) Cold Rails.................  2

                        •
                        •
                        •
```

a From the Alarm Settings menu, select **Carside Minimum**.

This prompt appears.

```
    New Value ?
```

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

b To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c Type the new value.

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

```
    New Value ? 255
    Is this correct ?
```

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

d If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new value is <u>correct</u>, type **Y**

If you type zero or a value <u>greater</u> <u>than</u> 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 **Carside Minimum option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

10 To <u>change</u> the displayed **number of allowed consecutive cold rails**:

The number after the words Cold Rails on the Alarm Settings menu is the maximum number (per railside) of consecutive trains having:

- Cold Rail alarms needed to generate a Successive Cold Rails Exceeded alarm.

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

```
                     .
                     .
                     .
    F) Carside Minimum............. 300
    G) Cold Rails.................. 2
    H) Cold Rail Temp.............. 10
                     .
                     .
                     .
```

a   From the Alarm Settings menu, select **Cold Rails**.

This prompt appears.

```
    New Value ?
```

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

b   To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c   Type the new value.

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

```
    New Value ? 006
    Is this correct ?
```

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

d   If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e   If the new value is <u>correct</u>, type **Y**

If you type zero or a value <u>greater than</u> 9, this error message and prompt appear.

```
    Minimum valid value is 1, Maximum valid value is 9
    New Value ?
```

If you type an acceptable value, the **Cold Rails option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f   If you get an error message, return to step **b**.

g   If you don't get an error message, return to step **3**.

11   To <u>change</u> the displayed **cold rail temperature**:

The number after the words Cold Rail Temp on the Alarm Settings menu is an offset, <u>in degrees</u> Fahrenheit, above the ambient temperature. When no bearing on a given rail generates a delta temperature reading <u>greater than or equal to</u> this value, the system generates a Cold Rail alarm for the given rail. There is a different Cold Rail alarm for each rail. That is, there is a Cold North Rail alarm and a Cold South Rail alarm (or, depending on track direction, a Cold East Rail alarm and a Cold West Rail alarm).

```
                        •
                        •
                        •
      G) Cold Rails................... 2
      H) Cold Rail Temp............... 10
      I) Cold Res Counter............ 3
                        •
                        •
```

a From the Alarm Settings menu, select **Cold Rail Temp**.

This prompt appears.

```
      New Value ?
```

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

b To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c Type the new value.

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

```
      New Value ? 015
      Is this correct ?
```

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

d If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new value is <u>correct</u>, type **Y**

If you type a number <u>less than</u> 10 or <u>greater than</u> 30, this error message and prompt appear.

```
      Minimum valid value is 10, Maximum valid value is 30
      New Value ?
```

If you type an acceptable value, the **Cold Rail Temperature option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

12 To <u>change</u> the displayed **cold resistor counter**:

The number after the words Cold Res Counter is the maximum number (per railside) 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 <u>equals</u> <u>or</u> <u>exceeds</u> 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."

```
              .
              .
              .
   H) Cold Rail Temp............... 10
   I) Cold Res Counter............   3
   J) Res Test: Minimum Rail Avg... 25
              .
              .
```

a   From the Alarm Settings menu, select **Cold Res Counter**.

This prompt appears.

```
   New Value ?
```

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

b   To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c   Type the new value.

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

```
   New Value ? 015
   Is this correct ?
```

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

d   If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e   If the new value is <u>correct</u>, type **Y**

If you type zero or a value <u>greater</u> <u>than</u> 9, this error message and prompt appear.

```
   Minimum valid value is 1, Maximum valid value is 9
   New Value ?
```

If you type an acceptable value, the **Cold Resistor Counter option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f   If you get an error message, return to step **b**.

g   If you don't get an error message, return to step **3**.

13   To <u>change</u> the displayed **minimum rail average**:

The number after the words Res Test: Minimum Rail Avg is the value that the average heats for both <u>bearings</u> are tested against after a train leaves the site.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 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 <u>less</u> <u>than</u> the value set by the **Resistor Test Minimum Rail Average option**, the system generates a Cold Resistor alarm.

If the average heats are <u>greater</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> this value, bearing temperatures are compared on an axle-by-axle basis. This second check determines if <u>more</u> <u>than</u> half of the temperatures read by the bearing scanner with the low-read resistor value are 70% or <u>less</u> <u>than</u> 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.

a From the Alarm Settings menu, select **Res Test: Minimum Rail Avg**.

This prompt appears.

```
    New Value ?
```

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

b To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c Type the new value.

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

```
    New Value ? 025
    Is this correct ?
```

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

d If the new value is <u>incorrect</u>, type **N** <u>and</u> return to step **b**.

e If the new value is <u>correct</u>, type **Y**

If you type a number <u>greater</u> <u>than</u> 50, this error message and prompt appear.

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

If you type an acceptable value, the **Resistor Test Minimum Rail Average option** on the Alarm Settings menu changes <u>and</u> the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

14 To <u>change</u> the displayed **minimum wheel average**:

The number after the words Res Test: Minimum Wheel Avg is the value that the average heats for both <u>wheels</u> are tested against after a train leaves the site.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 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 <u>less</u> <u>than</u> 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.

a From the Alarm Settings menu, select **Res Test: Minimum Wheel Avg**.

This prompt appears.

```
    New Value ?
```

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.

b To not change the value, press **[Esc]** and return to step **3**.

c Type the new value.

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

```
    New Value ? 025
    Is this correct ?
```

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

d If the new value is incorrect, type **N** and return to step **b**.

e If the new value is correct, type **Y**

If you type a number greater than 50, this error message and prompt appear.

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

If you type an acceptable value, the **Resistor Test Minimum Wheel Average option** on the Alarm Settings menu changes and the Alarm Settings menu reappears.

f If you get an error message, return to step **b**.

g If you don't get an error message, return to step **3**.

15 To change the displayed **warm bearing trigger**:

Select **Warm Bearing Trigger** (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 warm-bearing trigger. 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
```

16 To change the displayed **warm wheel trigger:**

Select **Warm Wheel Trigger** (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 warm-wheel trigger. 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
```

17 To change the displayed **maximum hot bearing alarms:**

Select **Max Hot Bearings** (Alarm Settings Menu) to change the displayed value. This option is use to specify the maximum number of hot bearing (hotbox) alarms that will be announced in the End Of Train message broadcast for a given train. Select Warm Wheel Trigger (Alarm Settings Menu) to change the displayed value.

```
Minimum valid value is 1, Maximum valid value is 10
```

18 To change the displayed **maximum hot wheel alarms**:

Select **Max Hot Wheels** (Alarm Settings Menu) to change the displayed value. This option is use to specify the maximum number of hot wheel alarms that will be announced in the End Of Train message broadcast for a given train.

```
Minimum valid value is 1, Maximum valid value is 32
```

19 To change the displayed **maximum dragging equipment alarms**:

Select **Max Dragging Equipment** (Alarm Settings Menu) to change the displayed value. This option is use to specify the maximum number of dragging equipment alarms that will be announced in the End Of Train message broadcast for a given train.

```
Minimum valid value is 1, Maximum valid value is 10
```

3.2.5 Equipment

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

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
---------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number
 D) Alarm Limits
 E) Equipment
 F) Messages

                   .
                   .
```

2 Select the Equipment menu.

A menu and prompt like this appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Equipment Menu
-------------------------------------------------
 A) Dragger..................... YES
 B) High Load................... NO
 C) Wide Load................... NO
 D) High/Wide Alarm Direction.. Both
 E) AEI High/Wide Alarm Filter... NO
 F) Carside Slope................ NO
 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) Resistor Test.......... Enabled
 N) Gate Distance....... 24.0 inches
 O) Dragger Debounce Time.... 100 ms
 P) Pre-Train Dragger Dist..... 6 ft
 Q) Hot Bearing................ YES
 R) Sun-Shot Override........... NO
 S) Sun-Shot Ovrd Start Date.... n/a
 T) Selected Modem......... Velocity
         Modem Setup Line 1 = +++
         Modem Setup Line 2 = AT&F
         Modem Setup Line 3 = AT &D0 &E1 &E15 S0=1 V0
         Modem Setup Line 4 = AT E0 X4 &C4 $SB19200
         Modem Setup Line 5 = AT &W0
 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.

WARNING
Failure to disable input devices that are not present at your site will result in false alarms and integrity failures.

3   To leave the Equipment menu <u>and</u> return to the Setup menu:

a   Press **[Esc]** <u>or</u> type **X**

The Setup menu reappears.

b   Skip the remaining steps.

4   To <u>change</u> the current **dragger** (aka dragging-equipment detector) 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. Since they aren't stored, they can't be printed. When enabled, Dragging-Equipment alarms are announced and stored. Since they are stored, they can be printed. 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.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Equipment Menu
--------------------------------------------
 A) Dragger.................... YES
 B) High Load.................... NO
 C) Wide Load.................... NO
                   •
                   •
                   •
```

a   From the Equipment menu, select **Dragger**.

The dragging-equipment setting toggles between active (YES) and inactive (NO). The **Dragger option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

If you want Dragging-Equipment alarm detection to occur, YES must appear after the word Dragger on the Equipment menu.

b   Return to step **3**.

5   To <u>change</u> the current **high-load** setting:

The Equipment menu shows whether High-Load alarm detection is active (YES) or inactive (NO). **To designate High-Load alarms**, YES must appear after the words High Load on the Equipment menu <u>and</u> 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 <u>and</u> Multiplexed must appear after the words Clearance Mode on the on the Equipment menu.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Equipment Menu
------------------------------------------------
 A) Dragger..................... YES
 B) High Load................... NO
 C) Wide Load................... NO
                 .
                 .
                 .
```

a From the Equipment menu, select **High Load**.

The high-load setting toggles between active (YES) and inactive (NO). The **High-Load option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

If you want High-Load alarm detection to occur, be sure that YES appears after the word High-Load on the Equipment menu.

b Return to step **3**.

6 To <u>change</u> the current **wide-load** setting:

The Equipment menu shows whether Wide-Load alarm detection is active (YES) or inactive (NO). Currently, Iowa Interstate doesn't support a site with just a wide-load detector and no high-load detector. It only supports a site with both a wide-load detector and a high-load detector <u>or</u> a site with just a high-load detector. Therefore, it doesn't matter what this setting is set to.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Equipment Menu
------------------------------------------------
 A) Dragger..................... YES
 B) High Load................... NO
 C) Wide Load................... NO
 D) High/Wide Alarm Direction.. Both
                 .
                 .
                 .
```

a From the Equipment menu, select **Wide Load**.

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

If you want Wide-Load alarm detection to occur, be sure that YES appears after the word Wide-Load on the Equipment menu.

b Return to step **3**.

7 To <u>change</u> the current **high/wide-alarm-direction** setting:

The **High/Wide Alarm Direction option** on the Equipment menu has three settings.

When track direction, which is set using the Track Number submenu on the Setup menu, is North/South, the high/wide-alarm-direction parameter changes from North to South to Both. When track direction is East/West, the high/wide-alarm-direction parameter changes from East to West to Both.

- When the high/wide-alarm-direction setting is set to either North or East, High-Load, High-Wide, and Wide-Load alarms will be announced for trains traveling north or east only. Trains traveling south or west will not have alarm announcements for High-Load, High-Wide, and Wide-Load alarms.

- When the high/wide-alarm-direction setting is set to either South or West, High-Load, High-Wide, and Wide-Load alarms will be announced for trains traveling south or west only. Trains traveling north or east will not have alarm announcements for High-Load, High-Wide, and Wide-Load alarms.

- When the high/wide-alarm-direction setting is set to Both all High-Load, High-Wide, and Wide-Load events will result in an alarm announcement regardless of train direction.

Axles that have High-Load, High-Wide, or Wide-Load alarms will still be flagged in the Train Detail report regardless of how the high/wide-alarm-direction setting is set. Selecting the **Load Default Setup Parameters option** on the Setup menu will set the high/wide-alarm-direction parameter to Both. This parameter affects the announcing of High-Load, High-Wide, or Wide-Load alarms only.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Equipment Menu
-------------------------------------------------
 A) Dragger..................... YES
 B) High Load................... NO
 C) Wide Load................... NO
 D) High/Wide Alarm Direction.. Both
 E) AEI High/Wide Alarm Filter... NO

                 .
                 .
                 .
```

a From the Equipment menu, select **High/Wide Alarm Direction**.

The high/wide-alarm-direction setting toggles from North (or East) to South (or West), from South (or West) to Both, <u>or</u> from Both to North (or East). The **High/Wide Alarm Direction option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

8   To change the current **AEI high/wide-alarm-filter** setting:

The Equipment menu shows whether the AEI high/wide-alarm-filter is active (YES) or inactive (NO). This option provides a means for filtering from broadcast messages any detected clearance alarms using vehicle AEI identifiers to determine whether to filter the alarm messages or not.

If set to YES, clearance alarms are reported in the normal manner only for consists whereon the vehicle identifier of the consist's lead vehicle matches CEFX, CP, DH, DME, ICE, SOO, or STLH. When the vehicle identifier of the lead vehicle does not match any of the above listed vehicle identifiers, any detected clearance alarms will be suppressed from all broadcast messages.

```
                     .
                     .
                     .

   D) High/Wide Alarm Direction.. Both
   E) AEI High/Wide Alarm Filter... NO
   F) Carside Slope................ NO

                 .
                 .
                 .
```
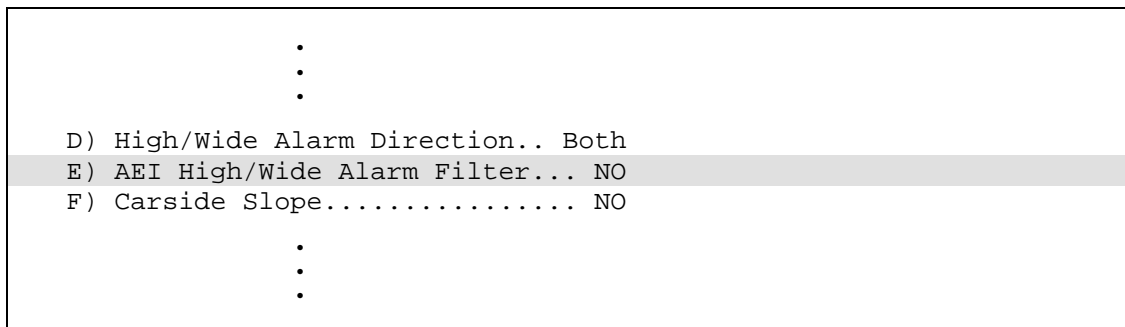
a   From the Equipment menu, select **AEI High/Wide Alarm Filter**.

The status of the AEI high/wide-alarm-filter setting toggles from YES (active) to NO (inactive) or from NO to YES, depending upon the current status of the option. The **AEI High/Wide Alarm Filter option** on the Equipment menu changes and the Equipment menu reappears.

If the **AEI option** on the Equipment menu is set to **NO**, the status of the AEI high/wide-alarm-filter setting does not change and this message appears.

```
   -----------------------------------------
   AEI is required for Clearance Alarm Filter functionality
   -----------------------------------------
```
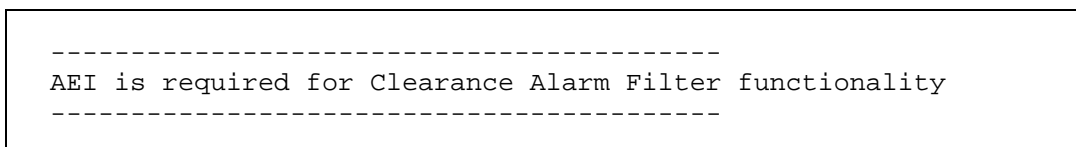
After the above message appears, the Equipment menu reappears.

b   Return to step **3**.

9 To <u>change</u> the current **carside-slope** setting:

The Equipment menu shows whether Carside Slope alarm detection is active (YES) or 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) at the time a Train Detail report is requested, no carside-slope calculation is done and, thus, no carside-slope alarm-limit lines are generated.

```
                     •
                     •
                     •
  E) AEI High/Wide Alarm Filter... NO
  F) Carside Slope................ NO
  G) Hot Wheel.................... YES

                  •
                  •
                  •
```

a From the Equipment menu, select **Carside Slope**.

The carside-slope setting toggles between active (YES) and inactive (NO). The **Carside Slope option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

10 To <u>change</u> the current **hotwheel** setting:

The Equipment menu shows whether Hotwheel alarm detection is enabled (YES) or disabled (NO). When disabled, Hotwheel alarms won't be announced nor stored. Since they aren't stored, they can't be printed. When enabled, Hotwheel alarms will be announced and stored. Since they are stored, they can be printed.

```
                     •
                     •
                     •
  F) Carside Slope................ NO
  G) Hot Wheel.................... YES
  H) Clearance Type....... Light Beam

                  •
                  •
                  •
```

a From the Equipment menu, select **Hot Wheel**.

The hotwheel setting toggles between active (YES) and inactive (NO). The **Hotwheel option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

11 To <u>change</u> the current **clearance-type** setting:

The Equipment menu shows whether clearance type is trip wire or light beam. This option is only used for high-load detectors and wide-load detectors. <u>Both</u> high-load detectors and wide-load detectors must be <u>either</u> trip-wire detectors or light-beam detectors.

```
                       •
                       •
                       •
   G) Hot Wheel................... YES
   H) Clearance Type....... Light Beam
   I) Clearance Mode...... Multiplexed
                   •
                   •
                   •
```
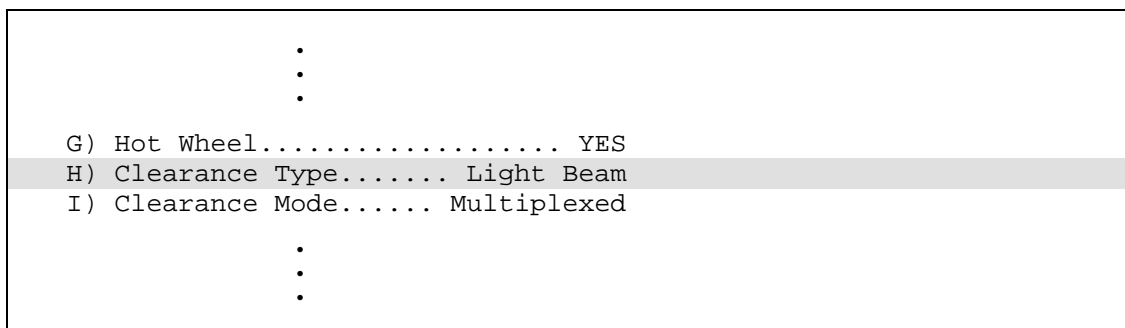
a From the Equipment menu, select **Clearance Type**.

The clearance-type setting toggles between **trip wire** and **light beam**. The **Clearance Type option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

12 To <u>change</u> the current **clearance-mode** setting:

The Equipment menu shows whether clearance mode is separate or multiplexed. This option is only used for high-load detectors and wide-load detectors. When set to <u>separate</u>, the alarms coming from the high-load detectors are announced as High-Load alarms <u>and</u> the alarms coming from the wide-load detectors are announced as Wide-Load alarms. When set to <u>multiplexed</u>, the alarms coming from the high-load detectors <u>and</u> wide-load detectors are announced as High-Wide alarms.

```
                       •
                       •
                       •
   H) Clearance Type....... Light Beam
   I) Clearance Mode...... Multiplexed
   J) Winter Cycle............... YES
                   •
                   •
                   •
```
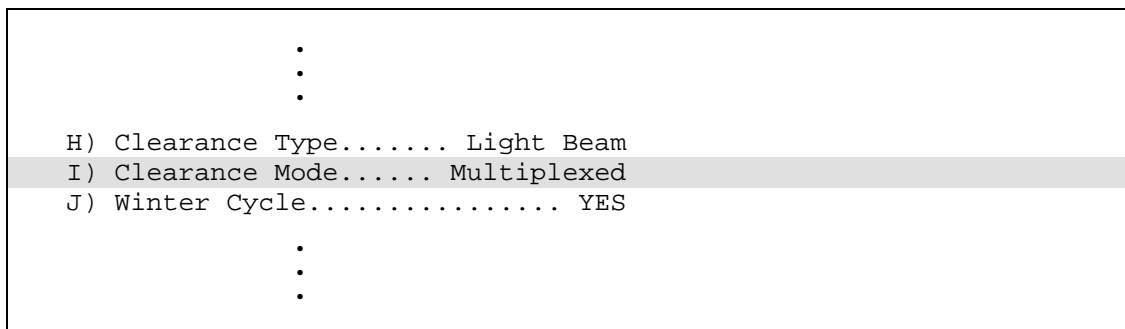
a From the Equipment menu, select **Clearance Mode**.

The clearance-mode setting toggles between separate and multiplexed. The **Clearance Mode option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

13 To change the current **winter-cycle** 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 80°F (26.7°C) 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.

```
                     .
                     .

   I) Clearance Mode...... Multiplexed
   J) Winter Cycle............... YES
   K) Transducer Gain.......... Normal

                     .
                     .
                     .
```

a From the Equipment menu, select **Winter Cycle**.

The winter-cycle setting toggles between enabled (YES) and disabled (NO). The **Winter Cycle option** on the Equipment menu changes and the Equipment menu reappears.

b Return to step **3**.

14 To change the current **transducer-gain** setting:

The Equipment menu shows whether the transducer-gain setting is normal or high. 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 <u>high</u> 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 <u>normal</u> mode, the comparator has a better chance of filtering transducer pulses not caused by a wheel.

```
                      .
                      .
                      .
   J) Winter Cycle................ YES
   K) Transducer Gain.......... Normal
   L) AEI......................... NO
                      .
                      .
                      .
```

a From the Equipment menu, select **Transducer Gain**.

The status of the transducer-gain setting toggles from **normal** to **high** <u>or</u> from high to normal, depending upon the current status of the option. The **Transducer Gain option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

15 To <u>change</u> the current **AEI** setting:

The Equipment menu shows whether the AEI subsystem is enabled (YES) or disabled (NO). When tag readers, 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.

```
                      .
                      .
   K) Transducer Gain.......... Normal
   L) AEI......................... NO
   M) Resistor Test........... Enabled
                      .
                      .
```

a From the Equipment menu, select **AEI**.

The status of the AEI setting toggles from YES (active) to NO (inactive) <u>or</u> from NO to YES, depending upon the current status of the option. The **AEI option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

16 To <u>change</u> the current **resistor-test** setting:

The Equipment menu shows whether the resistor-test setting is enabled <u>or</u> 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 <u>enabled</u> mode, the existing algorithm is used to determine the minimum acceptable resistor temperature values for a given train. When in <u>disabled</u> 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.

Selecting "Resistor Test" toggles from one resistor test mode to another.

```
                       .
                       .
    L) AEI......................... NO
    M) Resistor Test........... Enabled
    N) Gate Distance....... 24.0 inches
                   .
                   .
```

a From the Equipment menu, select **Resistor Test**.

The resistor-test setting toggles between **enabled** and **disabled**. The **Resistor Test Mode option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

17 To <u>change</u> the current value for **gate distance** (aka gate width):

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

```
                       .
                       .
                       .
    M) Resistor Test........... Enabled
    N) Gate Distance....... 24.0 inches
    O) Dragger Debounce Time.... 100 ms
                   .
                   .
                   .
```

a From the Equipment menu, select **Gate Distance**.

This prompt appears.

```
   Gate Distance:
```

The gate distance (aka gate width) is in **nn.n** format. If the new value has <u>less</u> <u>than</u> 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.

b To <u>not</u> change the value that appears on the Equipment menu, press **[Esc]** <u>and</u> return to step **3**.

c Type the new three-digit number.

The **Gate Distance option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

d Return to step **3**.

18 To <u>change</u> the **dragger-debounce** 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. The default value is 100 ms.

```
                        •
                        •
                        •
   N) Gate Distance....... 24.0 inches
   O) Dragger Debounce Time.... 100 ms
   P) Pre-Train Dragger Dist..... 6 ft
                        •
                        •
                        •
```

a From the Equipment menu, select **Dragger Debounce Time**.

This prompt appears.

```
     Dragger Debounce Time:
```

If the new value has <u>less</u> <u>than</u> three digits, type leading zeros to make it three digits long <u>or</u> press **[Enter]** after typing one or two digits. All typed nondigits are ignored.

b To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c Type the new value.

If you type a number <u>less</u> <u>than</u> 002, this error message and prompt appear.

```
    Minimum valid value is 2, Maximum valid value is 999
    Dragger Debounce Time:
```

If you type an acceptable value, the **Dragger Debounce Time option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

d If you get an error message, return to step **b**.

e If you don't get an error message, return to step **3**.

19 To <u>change</u> the current **pretrain-dragger-distance** setting:

The Equipment menu shows the current distance, in feet, ahead of the first axle in which a dragger input signal will be considered a Dragging Equipment alarm on the first axle instead of a Stuck Dragger Pretrain alarm. The default value is 6 feet.

```
                        .
                        .
    O) Dragger Debounce Time.... 100 ms
    P) Pre-Train Dragger Dist..... 6 ft
    Q) Hot Bearing................. YES
                    .
                    .
                    .
```

a From the Equipment menu, select **Pre-Train Dragger Dist**.

This prompt appears.

```
    Pre-Train Dragger Dist:
```

If the new value has <u>less</u> <u>than</u> two digits, type a leading zero <u>or</u> press **[Enter]** after typing one digit. All typed nondigits are ignored.

b To <u>not</u> change the value, press **[Esc]** <u>and</u> return to step **3**.

c Type the new value.

If you type a number <u>greater</u> <u>than</u> 15, this error message and prompt appear.

```
    Minimum valid value is 0, Maximum valid value is 15
    Pre-Train Dragger Dist:
```

If you type an acceptable value, the **Pretrain Dragger Distance option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

d If you get an error message, return to step **b**.

e If you don't get an error message, return to step **3**.

20 To <u>change</u> the current **hot bearing** setting:

The Equipment menu shows whether bearing temperature analysis will be performed during train scanning (YES) or not (NO). When disabled, bearing temperatures are stored and printed, but possible bearing-temperature-related alarms aren't announced or printed. When enabled, bearing temperatures are stored and printed, and possible bearing-temperature-related alarms are announced or printed.

```
                    .
                    .
  P) Pre-Train Dragger Dist..... 6 ft
  Q) Hot Bearing................. YES
  R) Sun-Shot Override............ NO

                 .
                 .
```

a From the Equipment menu, select **Hot Bearing**.

The hot bearing setting toggles between active (YES) and inactive (NO). The **Hot Bearing option** on the Equipment menu changes <u>and</u> the Equipment menu reappears.

b Return to step **3**.

21 To change Sun-Shot Override setting:

Select **Sun-Shot Override** to toggle setting. Feature is enabled when set to 'Y'. The Sun-Shot Override feature allows a user specified 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.

22 To change Sun-Shot Ovrd Start Date:

Select **Sun-Shot Ovrd Start Date.** Enter the beginning date (MM/DD) of the 30-day period during which the Sun-Shot Override feature will be active. If the Sun-Shot Override feature is activated, it will be deactivated by the SmartSCAN NG at the end of the 30-day Sun-Shot Override period.

23 To <u>change</u> the **modem-configuration** setting:

The Equipment menu shows the current modem configuration. Support exists in the firmware for three modem types – Default, Alternate, and Velocity. **Default** provides a preset series of modem configuration commands. These commands <u>cannot</u> be altered. **Alternate** provides the ability to edit and customize the modem setup commands. When the selected modem option is set to **Velocity**, the NG will expect that a Velocity device is connected to COM3 or COM4.   If a Velocity device is connected to COM3 or COM4, the NG should auto-detect it.   Note – the Velocity is a product of Rail Logic. This submenu also provides a method for forcing the initialization of the modem.

a   From the Equipment menu, choose **Selected Modem**.

A prompt like this

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

<u>or</u> like this appears.

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

b   If the selected modem type is <u>incorrect</u>, type **N**

The modem-configuration setting cycles between **default, alternate,** and **Velocity**. The **Modem Type option** on the Equipment menu changes.

c   If the selected modem type is <u>correct</u>, type **Y**

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

d   If the selected modem type is Default, go to step **h**.

e   If the selected modem type is Alternate, this prompt appears.

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

f   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 <u>and</u> on the System Status report, lines that have been cleared of data this way will be 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)?
```

g 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.

```
Do you want to initialize the 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.
```

h If you plugged into COM3 or have an **off-site** connection, return to step **3**.

i 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.

j If you don't want to initialize the modem now, type **N**

The Equipment menu reappears.

k Return to step **3**.

3.2.6 Messages

To set or change any of the messages parameters:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Setup Menu
---------------------------------
 A) Date and Time
 B) MP/KP
 C) Track Number
 D) Alarm Limits
 E) Equipment
 F) Messages
 G) Setup Password

              .
              .
```

2 Select 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-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
-----------------------------------------
  A) Axles..................... YES
  B) Speed...................... NO
  C) Temperature................ YES
  D) Length..................... NO
  E) Slow....................... YES
  F) Power Off.................. YES
  G) Repeat No Defects.......... YES
  H) Cars Count................. NO
  I) Customer Name.............. YES
  J) Arrival Message............ YES
  K) Lft/Rt Alarm Ref........... NO
  L) Request EOT Timer..........   5
  M) Rebroad DTMF Code.......... 001
  N) Announce Cold Rail......... YES
  O) Announce Differentials..... YES
  P) Announce Warm Bearings..... YES
  X) Exit
```

Enabling one or more of the highlighted options generates an ancillary message. The other options of the Messages menu aren't used to generate ancillary messages.

3 To leave the Messages menu <u>and</u> return to the Setup menu:

a Press **[Esc]** or type **X**

The Setup menu reappears.

b Skip the remaining steps.

4 To change the **announce-axles** 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 Very Slow Train alarm occurs, the system won't announce axle count, even when this option is enabled. Typing **A** toggles between what is shown and its opposite.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
-----------------------------------------
  A) Axles...................... YES
  B) Speed...................... NO
  C) Temperature................ YES

              .
              .
              .
```

a From the Messages menu, select **Axles**.

The announce-axles setting toggles between announce (YES) or not announce (NO). The **Announce Axles option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

5 To change the **announce-speed** 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. Typing **B** toggles between what is shown and its opposite.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
-----------------------------------------
  A) Axles...................... YES
  B) Speed...................... NO
  C) Temperature................ YES

              .
              .
              .
```

a From the Messages menu, select **Speed**.

The announce-speed setting toggles between announce (YES) or not announce (NO). The **Announce Speed option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

6 To change the **announce-temperature** 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. Typing **C** toggles between what is shown and its opposite.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
----------------------------------------
  A) Axles..................... YES
  B) Speed..................... NO
  C) Temperature............... YES
  D) Length.................... NO
                  .
                  .
                  .
```

a From the Messages menu, select **Temperature**.

The announce-temperature setting toggles between announce (YES) or not announce (NO). The **Announce Temperature option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

7 To change the **announce-train-length** 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 Very Slow Train alarm occurs, the system won't announce length of train, even when this option is enabled. Typing **D** toggles between what is shown and its opposite.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
----------------------------------------
  A) Axles..................... YES
  B) Speed..................... NO
  C) Temperature............... YES
  D) Length.................... NO
  E) Slow...................... YES
                  .
                  .
                  .
```

a From the Messages menu, select **Length**.

The announce-train-length setting toggles between announce (YES) or not announce (NO). The **Announce Train Length option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

8 To <u>change</u> the **announce-slow-trains** setting:

The **Announce Slow Trains option** on the Messages menu shows whether a message indicating a <u>slow</u> <u>train</u> (one going 7 mph or slower) is to be part of (YES) or not part of (NO) post-train announcements. Typing **E** toggles between what is shown and its opposite.

```
                    •
                    •
                    •
     D) Length.....................  NO
     E) Slow......................  YES
     F) Power Off.................  YES

                    •
                    •
                    •
```

a From the Messages menu, select **Slow**.

   The announce-slow-trains setting toggles between announce (YES) or not announce (NO). The **Announce Slow Trains option** on the Messages menu changes <u>and</u> the Messages menu reappears.

b Return to step **3**.

9 To <u>change</u> the **announce-power-off** setting:

The **Announce Power Off 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 when the voltage coming from the battery is <u>less</u> <u>than</u> 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. Typing **F** toggles between what is shown and its opposite.

```
                    •
                    •
                    •
     E) Slow......................  YES
     F) Power Off.................  YES
     G) Repeat No Defects.........  YES

                    •
                    •
                    •
```

a From the Messages menu, select **Power Off**.

   The announce-power-off setting toggles between enabled (YES) and disabled (NO). The **Announce Power Off option** on the Messages menu changes <u>and</u> the Messages menu reappears.

b Return to step **3**.

10 To <u>change</u> the **repeat-no-defect-message** setting:

The **Repeat No Defects option** on the Messages menu shows whether the no-defect message is to be repeated (YES) or not repeated (NO). Typing **G** toggles between what is shown and its opposite.

```
                  •
                  •
                  •
    F) Power Off.................. YES
    G) Repeat No Defects.......... YES
    H) Cars Count................. NO

                  •
                  •
                  •
```

a   From the Messages menu, select **Repeat No Defects**.

The repeat-no-defect-message setting toggles between enabled (YES) and disabled (NO). The **Repeat No Defects option** on the Messages menu changes <u>and</u> the Messages menu reappears.

b   Return to step **3**.

11 To <u>change</u> the **announce-number-of-cars** setting:

The **Announce Number of Cars option** on the Messages menu shows whether the <u>number</u> <u>of</u> <u>cars</u> is to be part of (YES) or not part of (NO) post-train announcements. Selecting this option toggles between what is shown and its opposite.

```
                  •
                  •
                  •
    G) Repeat No Defects.......... YES
    H) Cars Count................. NO
    I) Customer Name.............. YES

                  •
                  •
                  •
```

a   From the Messages menu, select **Cars Count**.

The announce-number-of-cars setting toggles between enabled (YES) and disabled (NO). The **Announce Number of Cars option** on the Messages menu changes <u>and</u> the Messages menu reappears.

b   Return to step **3**.

12 To change the **announce-customer-name** 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. Selecting this option toggles between what is shown and its opposite.

```
                       .
                       .
                       .
      H) Cars Count................. NO
      I) Customer Name.............. YES
      J) Arrival Message............ YES
      K) Lft/Rt Alarm Ref........... YES
      L) Request EOT Timer.......... 5
      M) Rebroad DTMF Code.......... 001
      N) Announce Cold Rail......... YES
      O) Announce Differentials..... YES
      P) Announce Warm Bearings..... YES
      X) Exit
```

a From the Messages menu, select **Customer Name**.

The announce-customer-name setting toggles between enabled (YES) and disabled (NO). The **Announce Customer Name option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

13 To change the **announce-arrival-message** 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). Typing **J** toggles between what is shown and its opposite.

```
                       .
                       .
                       .
      I) Customer Name.............. YES
      J) Arrival Message............ YES
      K) Lft/Rt Alarm Ref........... YES
      L) Request EOT Timer.......... 5
      M) Rebroad DTMF Code.......... 001
      N) Announce Cold Rail......... YES
      O) Announce Differentials..... YES
      P) Announce Warm Bearings..... YES
      X) Exit
```

a From the Messages menu, select **Arrival Message**.

The announce-arrival-message setting toggles between announce (YES) or not announce (NO). The **Announce Arrival Message option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

14 To change the **left-right-alarm-reference** setting:

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).

```
                     .
                     .
                     .
     J) Arrival Message............  YES
     K) Lft/Rt Alarm Ref...........  YES
     L) Request EOT Timer...........   5
     M) Rebroad DTMF Code........... 001
     N) Announce Cold Rail.........  YES
     O) Announce Differentials......  YES
     P) Announce Warm Bearings......  YES
     X) Exit
```

a From the Messages menu, select **Lft/Rt Alarm Ref**.

The left-right-alarm-reference setting toggles between YES and NO. The **Left-Right Alarm Reference option** on the Messages menu changes and the Messages menu reappears.

b Return to step **3**.

15 To change the **repeat-EOT-message-timeout-period** 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.

```
                     .
                     .
                     .
     L) Request EOT Timer...........   5
     M) Rebroad DTMF Code........... 001
     N) Announce Cold Rail.........  YES
     O) Announce Differentials......  YES
     P) Announce Warm Bearings......  YES
     X) Exit
```

a From the Messages menu, select **Request EOT Timer**.

This prompt appears.

```
   Request EOT Timer:
```

If the new repeat-timeout period has less than three digits, type leading zeros.

b Type the three-digit value.

If you type 000, the last EOT message is always available for rebroadcast. If you type 240, the train crew has four hours (that is, 240 minutes) to request a repeat of the last EOT message.

If you type a value <u>greater</u> <u>than</u> 240, this error message and prompt appear.

```
      Value must be less than 241 minutes.
      Request EOT Timer:
```

If you type an acceptable value, the **Repeat Timeout Period option** on the Messages menu changes and the Messages menu reappears.

c If you get an error message, return to step **b**.

d If you don't get an error message, return to step **3**.

16 To <u>change</u> the **rebroadcast-DTMF-code** setting:

The **Rebroadcast DTMF Code option** on the Messages menu shows rebroadcast-DTMF-code setting. The stored DTMF code is the touchtone digits that trigger a rebroadcast. Up to three digits may be entered into this setup parameter. The SmartScanNG system monitors radio traffic. When it receives the proper DTMF code, it will rebroadcast the last end-of-train message, provided the request EOT timer hasn't expired.

```
                    .
                    .
                    .
    M) Rebroad DTMF Code........... 001
    N) Announce Cold Rail......... YES
    O) Announce Differentials...... YES
    P) Announce Warm Bearings...... YES
    X) Exit
```

a From the Messages menu, select **Rebroad DTMF Code**.

This prompt appears.

```
  Rebroadcast DTMF Code: 456
```

b Type the new DTMF code or press **[Esc]**.

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

The **Rebroadcast DTMF Code option** on the Messages menu changes and the Messages menu reappears. If you typed only nondigits <u>and</u> then pressed **[Enter]**, the rebroadcast function would be turned off (that is, disabled). Blanks after the words "Rebroad DTMF Code" mean that it is disabled.

d Return to step **3**.

17 To <u>change</u> the **announce-cold-rail** setting:

The **Announce Cold Rail option** on the Messages menu shows whether an Integrity Failure message is to be announced when the cold-rail criteria was met (YES) or not announced (NO). Selecting this option toggles between what is shown and its opposite.

```
                    .
                    .
                    .
    N) Announce Cold Rail.......... YES
    O) Announce Differentials...... YES
    P) Announce Warm Bearings...... YES
    X) Exit
```

a From the Messages menu, select **Announce Cold Rail**.

The announce-cold-rail setting toggles between announce (YES) or not announce (NO). The **Announce Cold Rail option** on the Messages menu changes <u>and</u> the Messages menu reappears.

b Return to step **3**.

18 To <u>change</u> the **announce-differential-alarms** setting:

The Announce Differentials option on the Messages menu shows whether a hotbox alarm is to be announced (YES) when the Differential Alarm limit is exceeded, or not announced (NO). Selecting this option toggles the setting between "YES" and "NO".

a From the Messages menu, select **Announce Differentials**.
The announce-differential-alarms setting toggles between announce (YES) or not announce (NO). The **Announce Differentials option** on the Messages menu changes and the Messages menu reappears.

b Return to step 3.

19 To <u>change</u> the **announce-warm-bearing-alarms** setting:

The Announce Warm Bearings option on the Messages menu shows whether a hotbox alarm is to be announced (YES) when the Warm Bearing Alarm limit is exceeded, or not announced (NO). Selecting this option toggles the setting between "YES" and "NO".

a From the Messages menu, select **Announce Warm Bearings**.
The announce-warm-bearing-alarms setting toggles between announce (YES) or not announce (NO). The **Announce Warm Bearings option** on the Messages menu changes and the Messages menu reappears.

b Return to step 3.

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.

The Setup menu looks like this.

```
                      .
                      .
                      .
     F) Messages
     G) AEI Reader Parameters
     H) DCS Parameters
     I) Load Default Setup Parameters
     J) Setup Password
     K) COM1  Tx  19200 / Rx 19200   N-8-1
     L) COM2  Tx  19200 / Rx 19200   N-8-1
     M) COM3  Tx  19200 / Rx 19200   N-8-1
     N) COM4  Tx  19200 / Rx 19200   N-8-1
     X) Exit
```

2 To display the AEI Reader Parameters menu, select **AEI Reader Parameters**.

A prompt like this appears.

```
   STC SmartScanNG, MP/KP-1794.5, Track-Single
   02/19/2015 22:47 EDT
   AEI Reader Parameters Menu
   ------------------------------------------------
     A) ID Separation............  2 IDs
     B) Consecutive Reads......  2 Reads
     C) Decode As ASCII Tags.... Enabled
     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 AAR encoded format.

   AEI Reader Interface provides a means for communicating directly with the tag reader equipment connected to the NG.

3 Select the **ID-separation** parameter to <u>change</u> value.

A prompt like this appears.

```
Current ID Separation: 2
Modify ? (Y/N):
```

a Type **Y** until the value you want is shown.

Typing the letter **Y** toggles from 1 to 2, from 2 to 3, from 3 to 4, <u>or</u> from 4 to 1.

b Type **N**

4 Select the **consecutive-reads** parameter to <u>change</u> value.

A prompt like this appears.

```
Current Consecutive Reads: 2
Modify ? (Y/N):
```

a Type **Y** until the value you want is shown.

Typing the letter **Y** toggles from 1 to 2, from 2 to 3, from 3 to 4, <u>or</u> from 4 to 1.

b Type **N**

5 Select the **decode-as-ASCII-tags** setting to <u>change</u> value.

The decode-as-ASCII-tags setting toggles between enabled and disabled. The AEI Reader Parameters menu reappears.

6 Select **AEI reader interface** to communicate directly with the connected AEI tag reader equipment.

This message appears.

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

7 To leave the AEI reader interface:

a Type **EXIT**

b Press **[Enter]**.

8 To <u>leave</u> the AEI Reader Parameters menu <u>and</u> 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.

10 To <u>not</u> initialize the reader, type **N**

The Setup menu reappears.

3.2.8   DCS Parameters

The SmartScan NG can forward train data and system status information to a central server via the Rail Logic, Velocity device. The DCS Parameters menu is used to inform the NG as to which serial port the Velocity device is connected.

To set or change any of the DCS parameters:

1   Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
                          .
                          .
                          .
     G) AEI Reader Parameters
     H) DCS Parameters
     I) Load Default Setup Parameters
     J) Setup Password
     K) COM1  Tx  19200 / Rx 19200   N-8-1
     L) COM2  Tx  19200 / Rx 19200   N-8-1
     M) COM3  Tx  19200 / Rx 19200   N-8-1
     N) COM4  Tx  19200 / Rx 19200   N-8-1
     X) Exit
```

2   Select the **DCS Parameters** menu.

A prompt like this appears.

```
   STC SmartScanNG, Milepost-1234.5, Track-West
   02/19/2015  2:48 EST
   DCS Parameters Menu
   -------------------------------------------------
     A) Comport.................... COM3
     X) Exit
```

Comport is the SmartScanNG communication port through which communications with the customer's DCS server takes place.

3   Select **Comport** to <u>change</u> the port through which communications with the DCS server takes place.

A prompt like this appears.

```
   Current Comport: COM3
   Modify ? (Y/N):
```

a   Type **Y** until the value you want is shown.

Typing the letter **Y** toggles from COM2 to COM3, from COM3 to COM4, <u>or</u> from COM4 to COM2. COM1 and COM5 aren't options.

b   Type **N**

The **Communication Port option** on the DCS Parameters menu changes <u>and</u> the DCS Parameters menu reappears.

3.2.9 Load Default Setup Parameters

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

Alarms:		**Equipment:**		**Messages:**	
Carside Minimum	155	AEI	No	Announce Cold Wheels	Yes
Carside Slope	1.31	Carside Slope	No	Announce Differentials	Yes
Cold Rail Temp	10	Clearance Mode	Multiplexed	Announce Warm Bearings	Yes
Cold Rails	2	Clearance Type	Light Beam	Arrival Message	No
Cold Res Counter	3	Dragger	Yes	Axles	No
Absolute	200	Drag Debounce Test	100 ms	Car ID With Alarm	No
Differential	115	Gate Distance	24.0	Cars Count	No
Hotwheel	700	High Load	Yes	Cold Rail	Yes
Minimum Rail Avg	25	High/Wide Direction	Both	Customer Name	Yes
Minimum Wheel Avg	28	Hot Bearing	Yes	Length	No
Warm	170	Hotwheel	Yes	Lft/Rt Alarm Ref	No
Warm Bearing Trigger	72	Resistor Test	Enabled	Power Off	Yes
Warm Wheel Trigger	361	Selected Modem	Default	Rebroad DTMF Code	001
Max Hot Bearings	10	Transducer Gain	Normal	Repeat No Defects	Yes
Max Hot Wheels	32	Wide Load	Yes	Request EOT Timer	5
Max Dragging Equip	10	Winter Cycle	Yes	Slow Train	Yes
		Sun-Shot Override	No	Speed	No
DCS Parameters:		Pretrain Dragger Dist	6 ft	Temperature	No
Comport	Com3				

You must disable input devices that are not present at your site. Failure to do so will result in false alarms and integrity failures. Section *3.2.5 Equipment* tells how to enable and disable input devices.

To load the default setup parameters:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
    H) DCS Parameters
    I) Load Default Setup Parameters
    J) Setup Password
    K) COM1  Tx  19200 / Rx 19200   N-8-1
    L) COM2  Tx  19200 / Rx 19200   N-8-1
    M) COM3  Tx  19200 / Rx 19200   N-8-1
    N) COM4  Tx  19200 / Rx 19200   N-8-1
    X) Exit
```

2 Select **Load Default Setup Parameters**.

This prompt appears.

```
Load Default Setup Parameters?
```

3 To <u>not</u> <u>load</u> default setup parameters, type **N**

This message appears followed by the Setup menu.

```
Default Setup Parameters Not Loaded...
```

4 To load default setup parameters, type **Y**

This message appears.

```
Loading Default Setup Parameters...
```

Loading takes about two seconds. When finished, the Setup menu reappears.

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.

The Setup menu looks like this.

```
                 •
                 •
                 •
    I) Load Default Setup Parameters
    J) Setup Password
    K) COM1  Tx  19200 / Rx 19200    N-8-1
    L) COM2  Tx  19200 / Rx 19200    N-8-1
    M) COM3  Tx  19200 / Rx 19200    N-8-1
    N) COM4  Tx  19200 / Rx 19200    N-8-1
    X) Exit
```

2 Select the **Setup Password** submenu.

This prompt 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 <u>less</u> <u>than</u> 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 **not** case sensitive. For example, the password "abc#123" can be entered "ABC#123," "aBc#123," and so forth.

3 Type the password.

4 If the password is <u>less</u> <u>than</u> 11 characters, press **[Enter]**.

The Setup menu reappears.

3.2.11 COM1

When on-site, you would normally plug your computer into COM1 or COM2, whichever is available. You would normally <u>not</u> plug it into COM3 or COM4.

To <u>change</u> the parameters for serial port COM1:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
                 .
                 .
                 .
    J) Setup Password
    K) COM1  Tx  19200 / Rx 19200    N-8-1
    L) COM2  Tx  19200 / Rx 19200    N-8-1
    M) COM3  Tx  19200 / Rx 19200    N-8-1
    N) COM4  Tx  19200 / Rx 19200    N-8-1
    X) Exit
```

2 Select the **COM1** submenu.

If COM1 is currently <u>being</u> <u>used</u>, this message appears.

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

If COM1 is currently <u>not</u> <u>being</u> <u>used</u>, the COM1 submenu appears.

```
    STC SmartScanNG, MP/KP-1794.5, Track-Single
    02/19/2015 21:57 EST
    COM1   Tx-19200/Rx-19200   N-8-1
    ------------------------------------------------
      A) Increase Tx Baud
      B) Decrease Tx Baud
      C) Increase Rx Baud
      D) Decrease Rx Baud
      E) N-8-1
      F) E-7-1
      X) Exit
```

Select option to increase or decrease the baud rate for COM1. 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. Select option for data settings (parity, data, and stop bit).

3 Type the letter of what you want to change.

The COM1 submenu reappears.

4 If you aren't done changing the parameters for COM1, return to step **3**.

5 If you are done changing the parameters for COM1, type **X**

The Setup menu reappears.

3.2.12 COM2, COM3, & COM4

When on-site, you would normally plug your computer into COM1 or COM2, whichever is available. COM3 is usually routed to the internal modem. COM4 is usually a customer-specified connection.

To change the parameters for serial communications port:

1 Be sure that the Setup menu is displayed.

The Setup menu looks like this.

```
                 .
                 .
                 .
  K) COM1  Tx  19200 / Rx 19200    N-8-1
  L) COM2  Tx  19200 / Rx 19200    N-8-1
  M) COM3  Tx  19200 / Rx 19200    N-8-1
  N) COM4  Tx  19200 / Rx 19200    N-8-1
  X) Exit
```

2 Select desired com port.

If COM(x) is currently being used, this message appears.

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

If COM(x) is currently <u>not</u> <u>being</u> <u>used</u>, the COM(x) submenu appears.

```
STC SmartScanNG, MP/KP-1234.5, Track:Single
02/19/2015 21:57 EST
COMx   Tx-19200/Rx-19200   N-8-1
-----------------------------------------------
  A) Increase Tx Baud
  B) Decrease Tx Baud
  C) Increase Rx Baud
  D) Decrease Rx Baud
  E) N-8-1
  F) E-7-1
  X) Exit
```

Select option to increase or decrease the baud rate for COM(x). 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. Select options for com settings (parity, data, and stop bit).

3 Type the letter of what you want to change.

The COMx submenu reappears.

4 If you aren't done changing the parameters for COM(x), return to step **3**.

5 If you are done changing the parameters for COM(x), type **X**

The Setup menu reappears.

3.3 System Functions

To execute one or more system functions:

1 Be sure that the Main menu is displayed.

The Main menu looks like this.

```
                  .
                  .
                  .
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

2 Select the **System Functions** menu.

A menu and prompt like this appears. To access any of the System Functions menu options, type the letter that corresponds to the desired menu option.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function
 D) Radio Inhibit
 E) Manual Test Mode
 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
 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 leave the System Functions menu <u>and</u> return to the Main menu:

   a Type **X**

      The Main menu reappears.

   b Skip the remaining steps.

4 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.

At single-track sites, the text of the message is usually "Testing, Iowa Interstate, milepost (*milepost number*), testing, one, two, three, four, five, four, three, two, one, testing." At multitrack sites, the text of the message is usually "Testing, Iowa Interstate, milepost (*milepost number*), track (*track designation*), testing, one, two, three, four, five, four, three, two, one, testing."

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function
            .
            .
            .
```

a Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in <u>and</u> 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 redisplays 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.
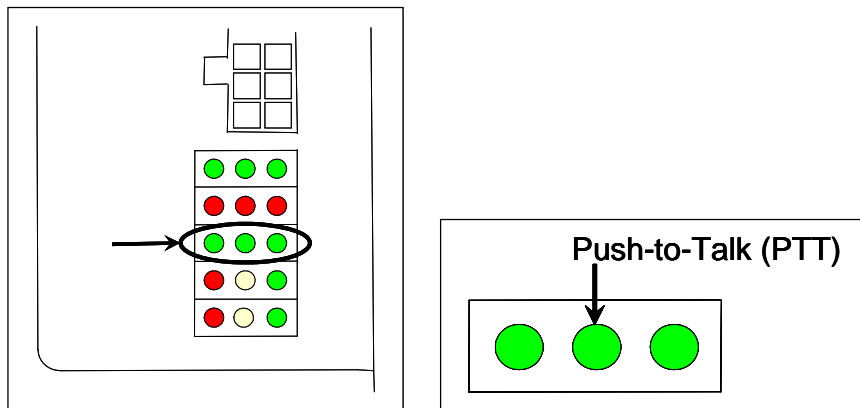
If this LED isn't lit, the system's ability to send a message to the radio might be inhibited by the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

d Return to step **3**.

5   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 <u>through</u> the speaker (on top of the SmartScanNG enclosure), but <u>not through</u> the radio. Therefore, it isn't affected by the **Radio Inhibit option** being enabled.

The text of the message is "zero, one, two, three, four, five, six, *beep*, seven, eight, nine, not-working, *beep*, Iowa Interstate, milepost, main-3, system-working, no-defects, main-1, main-2, rebroadcast, hotwheel, defect, axle, dragging-equipment-near, north, south, third, fourth, rail, east, west, track, through, hotbox, high-wide-near, you-have-a-defect, testing, inspect-from, train-too-slow, total-axles, speed, temperature, length, minus, point, first, second, inspect-remainder-of- train, left, right, side, load, middle, high-load, wide-load, power-off, excess-alarms, repeat, X, Y, Z, total-cars, detector-out, detector-alarm, scanner-resistor-test, beginning-in, minutes, 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, car-ID, no, critical-alarm."

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
-------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function

          .
          .
          .
```

a   Be sure that the speaker (on top of the SmartScanNG enclosure) is plugged in <u>and</u> 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**.

6   To execute the **ramp function**:

The **Ramp Function option** on the System Functions menu is used to generate a test train. It simulates at least two Absolute alarms, two Differential alarms, two Carside Slope alarms, and two Hotwheel alarms. It simulates the Carside and Hotwheel alarms even if detection for those alarms is disabled in the Equipment menu. However, disabled alarms don't appear on the Last Test Train report.

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.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function
 D) Radio Inhibit
                .
                .
                .
```

a From the System Functions menu, select **Ramp Function**.

This prompt appears.

```
Start Ramp Function?
```

b To not start the ramp function:

- Type **N**

  The System Functions menu reappears.

- Return to step **3**.

c To start the ramp function, type **Y**

This message appears.

```
Running Ramp Function...
```

The advance input is made active, gating transducer signals are simulated, and heat values are ramped up (increased) and ramped down (decreased) in a predictable sequence to simulate eight Exception Alarms. **This may take a few minutes.** You cannot stop the ramp function by pressing **[Esc]**. When finished, this message appears followed by the System Functions menu.

```
Running Ramp Function...Ramp Function Complete
```

d Return to step **3**.

7 To execute the **radio inhibit**:

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**.

a From the System Functions menu, select **Radio Inhibit**.

This prompt appears.

```
Inhibit Radio?
```

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**.

b To disable road channel broadcasts:

- Type **Y**   The System Functions menu reappears.

- Return to step **3**.

c To enable road channel broadcasts, type **N**

The System Functions menu reappears.

d Return to step **3**.

8 To initiate the **manual test mode**:

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 <u>cannot</u> 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.

a From the System Functions menu, select **Manual Test Mode**.

This prompt appears.

```
Start Manual Test Mode?
```

If you want to start manual test mode, type **Y**. If you don't want to start manual test mode, type **N**.

b To <u>not</u> <u>start</u> manual test mode:

- Type **N**

The System Functions menu reappears.

- Return to step **3**.

c To <u>start</u> manual test mode, type **Y**

This message appears.

```
Entering Manual Test Mode
You have about two minutes
```

After two minutes, this message appears followed by the System Functions menu.

```
Manual Test Mode Complete
```

d   Return to step **3**.

9   To generate the **1KHz Test Tone**:

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 <u>and</u> its volume knob is turned to the middle position.

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

This message appears.

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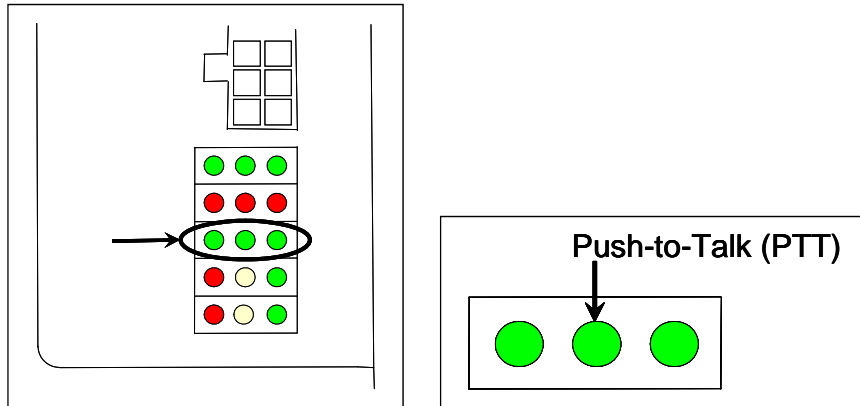
If this LED isn't lit, the system's ability to send a tone to the radio might be inhibited by the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

d   Return to step **3**.

10 To start **autocalibration**:

The SmartScanNG system self-calibrates its pyrometer interface circuitry. You need only put a preheated calibrated heat source on a scanner <u>and</u> 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 finished with the calibration procedure. To abort the process, press **[Esc]** on your computer <u>or</u> 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.

   d Return to step **3**.

11 To reset the **COP counters**:

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 this option resets each COP counter to zero.

   a From the System Functions menu, select **Reset the COP Counters.**

   The firmware clears the COP counter for both microprocessors.

   The System Functions menu reappears.

   b Return to step **3**.

12 To force a **system reset**:

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.

a   From the System Functions menu, select **Remote System Reset**.

This prompt appears.

```
Are You Sure?
```

b   To not reset the system:

-   Type **N**

The System Functions menu reappears.

-   Return to step **3**.

c   To reset the system, type **Y**

This message appears.

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

After three seconds, the System Functions menu reappears.

d   Return to step **3**.

13 To **delete all stored train data**:

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 trains in the Trains, Exceptions, and Ramp Trains directories. After deleting all train data, there isn't any way of regenerating it. The data is gone forever.

a   From the System Functions menu, select **Delete All Stored Train Data.**

This prompt appears.

```
Are You Sure?
```

b   To not delete all stored train data:

-   Type **N**

The System Functions menu reappears.

-   Return to step **3**.

c   To delete all stored train data, type **Y**

This message appears.

```
Clearing Stored Train Data...
```

Clearing the train data takes about two seconds. When finished, this message appears followed by the System Functions menu.

```
Clearing Stored Train Data...Done
```

d Return to step **3**.

14 To **delete all of the events stored in the Event Log**:

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.

```
                    .
                    .
                    .
  I) Remote System RESET
  J) Delete All Stored Train Data
  K) Clear Event Log
  X) Exit
```

a From the System Functions menu, select **Clear Event Log.**

This prompt appears.

```
Are You Sure?
```

b To not delete all of the events stored in the Event Log:

- Type **N**

The System Functions menu reappears.

- Return to step **3**.

c To delete all of the events stored in the Event Log, type **Y**

The System Functions menu reappears.

d Return to step **3**.

3.4 Replay EOT Announcement

The EOT message for every train that is stored in longterm memory can be replayed through the local speaker. The replaying of the EOT message doesn't activate the PTT so it isn't broadcast over the radio.

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
    J) Event Log

              .
              .
              .
```

2 From the Main menu, select **Replay EOT Announcement**.

This prompt appears.

```
    Train Number ?
```

3 Type the train number.

If you typed a three-digit valid train number, you'll hear the EOT announcement through the speaker.

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

If the typed train number is valid, pressing **[Enter]** produces the announcement.

3.5 Enter Pass-Through Mode

Pass-through mode allows you to access two or more SmartScanNG systems with one modem. To make this happen:

- At multi-track sites, attach a serial cable from **COM2** of system1 to COM1 of system2.

  System1 is the one with the telephone line 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.

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) DSR Records
    P) DSR Records - Exception Trains
    X) Exit
```

2   Select **Enter Pass-Through Mode**.

If there is a response from the SmartScanNG system on COM2 within five seconds, this message appears.

```
    Passing thru from COM5 on this NG to COM1 on another NG.
    Entering Pass-Thru Mode.
```

If there isn't a response from the SmartScanNG system on COM2 within five seconds, this message appears followed by the reappearance of the Main menu.

```
    No detector attached to COM5!
```

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, a message like this appears followed by the Main menu for system1.

```
    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

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. If your site doesn't have telephone service, you cannot communicate with the system remotely (that is, **off-site**).

1 If **on-site**, plug your computer into COM1 or COM2, whichever is available.

2 If **off-site**, plug your computer into a modem that is plugged into a nonswitched analog telephone line.

3 Turn on your computer.

4 Be sure that your computer has installed communications software, that it is set to use full duplex, <u>and</u> 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   If **off-site**:

   a   From your computer, dial and connect to the modem at the site to which you want to communicate.

   b   Wait for the "connect" message from your modem.

7   Press **[Esc]**.

This prompt appears.

```
Enter "SmartSCAN" To Proceed:
```

8   Type **SmartSCAN**

The entry of this word is **not** case sensitive.

9   To get the serial interface to come up, press **[Enter]**.

The Main menu appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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
  J) Event Log
  K) Maintenance Report
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

At the above prompt, you can produce one of the listed reports by selecting one of the highlighted options.

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.

10 When done, close the LOG file.

11 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 <u>header</u> section contains general information about the site. The <u>detail</u> 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 <u>disabled</u> during report processing <u>and</u> when the AEI subsystem was <u>disabled</u> during train passage. (When the report is run, if the **Hotwheel option** on the <u>Equipment</u> <u>menu</u> is disabled, the hotwheel information is hidden. When the report is run, if the **AEI option** is disabled, the tag information isn't hidden.) The contents of your report will be different.

```
                       Southern Technologies Corporation
                        Next Generation Detector System
                               TRAIN SUMMARY
================================================================================
Version Info.... Analyzer:  NSA3.03-P 02/01/15                  MP/KP: 0232.2
              Communicator:  NSA3.05-P 02/01/15                  Track: Track 2
                    Speech:

Alarm Limits..      Absolute: 200       Carside Slope..... 1.31
                        Warm: 170              Minimum... 155
                Differential: 115       Cold Rail Temp...  10


================================================================================
                                              D    Rail
                                 AEI Speed  i   Average      Amb
Train#    Date    Time  Cars Axles TO1 TO2 Tags (MPH) r North South  Temp  Bat
--------------------------------------------------------------------------------
 178    02/19/15 15:47   18    78   78  78    0    53  W    56    21  +77F  14.0v

 177 A  02/17/15 08:32   20    86   86  86    0    56  E    36    37  +68F  14.0v
 176 I  02/17/15 07:40   10    46   46  46    0    57  E    43     7  +66F  14.0v
 175 B  02/17/15 06:28   14    62   62  62    0    57  E    36    37  +60F  13.8v

 174    02/16/15 11:33   18    78   78  78    0    53  W    55    55  +73F  14.0v
 173    CHECKSUM ERROR:  StartAddr 134879 EndAddr 134930
 172    02/16/15 01:19   18    78   78  78    0    55  E    58    20  +59F  14.0v

 171    02/15/15 11:24   53   218  218 218    0    49  E    54    18  +72F  14.0v
 170 I  02/15/15 01:22    8    38   38  38    0    53  E    55    18  +60F  14.0v
                          •
                          •
                          •

END OF REPORT - Press any key...
```

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: 200       Carside Slope..... 1.31
                        Warm: 170              Minimum... 155
                Differential: 115       Cold Rail Temp...  10
                      Hot Wheel: 702


================================================================================
                                              D    Rail      Wheel
                                 AEI Speed  i   Average   Average     Amb
Train#   Date    Time Cars Axles TO1 TO2 Tags (MPH) r East West East West Temp  Bat
--------------------------------------------------------------------------------
  2 A  02/13/15 12:33   11   52   52  52   13   50  W   58   58  180    2  + 7C  13.5v
  1 A  02/13/15 11:25   12   52   52  52   12   50  W   58   58  180    2  + 7C  13.5v
                          •
                          •
                          •
```

Below is a sample of part of a Train Summary report when the **AEI High/Wide Alarm Filter option** on the Equipment menu is <u>enabled</u>. The contents of your report will be different.

```
                        .
                        .
                        .
    ----------------------------------------------------------------------------
    AEI High/Wide Alarm Filter: Enabled

    ============================================================================
                                           D    Rail
                                    AEI Speed i  Average      Amb
    Train#      Date    Time  Cars Axles TO1 TO2 Tags (MPH) r North South Temp  Bat
    ----------------------------------------------------------------------------
      38 S -02/18/15 15:47   18    78   78  78    0    53  W    56    21  +77F 13.5v
     +37 S +02/17/15 08:32   20    86   86  86    0    56  E    36    37  +68F 13.5v
      36 A o02/17/15 07:40   10    46   46  46    0    57  E    43     7  +66F 13.5v
     W35 A o02/17/15 06:28   14    62   62  62    0    57  E    36    37  +60F 13.8v
                        .
                        .
                        .
```

The table below lists the possible status codes that can be printed in the unlabeled column highlighted above. This column appears right before the Date column in the <u>detail</u> section of the Train Summary report.

Status Character	Definition
(blank)	The Clearance Alarm Filter (CAF) was disabled at the time this train was scanned.
-	The CAF was enabled at the time this train was scanned, but no clearance alarms were detected.
+	The CAF was enabled at the time this train was scanned, and a clearance alarm was detected.
o	The CAF was enabled at the time this train was scanned, but the filtering function was overridden because one of the specified vehicle identifiers was read on a lead vehicle.
C	A correction factor was used on this train.

The table below lists the fields from the <u>header</u> section and the contents of each field.

Heading	Contents of Field
Version Info	For Analyzer and Communicator, 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. *Section 3.0 - Serial Interface* tells how to change this value using the MP/KP submenu on the Setup menu.
Track	The track designator of the site. For single-track sites, the value is Single. For multitrack sites, valid values are North, South, East, West, Track 1, Track 2, Track 3, and Track 4. *Section 3.0 - Serial Interface* tells how to set this value using the Track Number submenu on the Setup menu.

Heading	Contents of Field
Alarm Limits	The alarm parameters currently defined in the system setup. These values were in place at the time this report was run. • The value after Absolute is set by the **Absolute option** on the Alarm Settings menu. • The value after Warm is set by the **Warm 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 when the **Hotwheel option** on the <u>Equipment</u> <u>menu</u> is <u>enabled</u>. The value after Hot Wheel is set by the **Hotwheel option** on the <u>Alarm</u> <u>Settings</u> <u>menu</u>. • 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. ***Section 3.0 - Serial Interface*** tells how to set these values.
AEI High/Wide Alarm Filter	Prints when the Clearance Alarm Filter is enabled. This line is not printed when this function is disabled.

The table below lists the fields from the <u>detail</u> section and the contents of each field.

Heading	Contents of Field

	The "DSR Capture Flags" field is in the space that immediately precedes the Train Number field.
	The possible values for the DSR Capture Flags field are:
	   B - Bearing DSR captured.
	   W - Wheel DSR captured.
	   P - Pyro-noise DSR captured.
	   + - more than one profile type was captured.

Train#	The number that identifies the train in the Trains directory.
	There are two unlabeled columns between those labeled "Train#" and "Date." The <u>first</u> <u>column</u> can contain **A**, **B**, **I**, **S**, 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 "S," a System Alarm was detected, but Exception Alarms and Integrity Failures weren't. If blank, no Exception Alarm, Integrity Failure, or System Alarm was detected. The <u>second</u> <u>column</u> displays the Clearance Alarm Filter (CAF) status or correction factor. Possible codes are **-**, **+**, **o**, **C**, or nothing. See table on previous page for explanation of these codes.
Date	The date the train arrived at the site. Date is in **mm/dd/yy** format. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.

Heading	Contents of Field
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. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.
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.
Lead ID	The vehicle identifier read on the <u>first</u> <u>vehicle</u> of the consist. Appears instead of columns TO1 and TO2 when requested.
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 (mph)	The train's exit speed in miles per hour.
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 <u>Equipment</u> <u>menu</u> is enabled.
Amb Temp	The ambient temperature, in degrees Fahrenheit, at the time the train passed the site.
Bat	The system battery voltage at the time the train passed the site.

To produce the **standard** <u>Train</u> <u>Summary</u> <u>report</u>, which contains the transducer pulse count columns, but <u>not</u> the "Lead ID" column:

1   Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
-------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
            .
            .
            .
```

2   Select **Train Summary** report.

The last line of the report reads: "END OF REPORT - Press any key..."

3   To return to the Main menu, press any key.

At this time, you can produce another report by selecting another menu option.

4   When done, close the LOG file.

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

To produce the **alternative** <u>Train</u> <u>Summary</u> <u>report</u>, which contains the "Lead ID" column, but <u>not</u> the transducer pulse count columns:

1   Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
-------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
            .
            .
            .
```

2 To produce the **alternative** Train Summary report, select **Train Summary**.

3 While the report header is printing, type **1**

Instead of the TO1 and TO2 columns, the Lead ID column appears. This column contains the vehicle identifier read on the first vehicle of the consist.

The last line of the report reads: "END OF REPORT - Press any key..."

4 To return to the Main menu, press any key.

At this time, you can produce another report by selecting another option.

5 When done, close the LOG file.

6 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. 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 at the time 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 **Hotwheel option** were disabled at the time the report was requested. The **Carside Slope option** was enabled. The contents of your report will be different.

```
                    Southern Technologies Corporation
                    Next Generation Detector System
                              TRAIN DETAIL
================================================================================
Train#: 321               Speed:  57MPH              MP/KP: 1111.1
  Date: 02/18/15          Axles:  86                 Track: Single
  Time: 08:41         Direction: East         Temperature: + 71F
Length:  1776       Shutters Open:  32             Battery: 13.4v
================================================================================
              Resistor
Rail  Max  Avg  Read  Req  CF    Txdr Counts  Alarm          Limit   Carside Parms
----------------------------    ----------   ------------------   -------------
North 258   49   87  68I  0       TO1  86     Absolute        200       Slope: 1.31
South 252   57   98  68I  0       TO2  86     Warm            170     Minimum: 155
                                              Differential    115
Resistor Test Mode: Enabled                   Hot Wheel       702
High/Wide Alarm Direction: Both        Cold Rail Temp         10
================================================================================
Firmware Versions
-----------------
Analyzer: NSA3.03-P 02/01/13   Comm: NSA3.05-P 02/01/13   Speech:
--------------------------------------------------------------------------------

System Alarms
---------------------------------------
Cold North Resistor
Cold South Resistor

Axle Alarm Summary
--------------------------------------------------------------------------------
 46  South Rail Hot Box
 77  South Rail Differential
143  North Rail Hot Box
143  South Rail Hot Box
144  North Rail Hot Box


--------------------------------------------------------------------------------
Car  Axle  Trk  North   South   ON    OFF   PW1 PW2  Alarms
--------------------------------------------------------------------------------
  1    1    0    56      21     25     0     6   6
       2    0    57      21     25    59     6   6
       3    0    56      21     25    59     8   8
       4    1    56      21     25   362     5   5
       5    1    56      21     25    59     6   6
       6    1    56      21     25    59     6   6
      Carside Ave: North  56 South  21   Carside Alarms: North 184 South 204


  2    7    2    56      20     25   162     6   6
       8    2    56      21     25    59     6   6

                         •
                         •
                         •

     143   66   186     181     25    59     6   6   North Rail Hot Box
                                                     South Rail Hot Box
     144   66   183     170     25   641     6   6   North Rail Hot Box

                         •
                         •
                         •

END OF REPORT - Press any key...
```

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 <u>enabled</u> at the time the report was requested. The **Carside Slope option** on the Equipment menu was <u>disabled</u>. Also, both the **AEI option** and the **Hotwheel option** were <u>enabled</u> 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#:  3                 Speed:  57MPH             MP/KP: 1111.1
  Date: 02/18/15           Axles:  86                Track: Single
  Time: 08:47           Direction: North       Temperature: + 54F
Length:  1793         Shutters Open:   35            Battery: 13.4v
==================================================================================
               Resistor
Rail  Max  Avg  Read  Req  CF    Txdr Counts  Alarm         Limit   Carside Parms
----------------------------     -----------  -----------------     -------------
East  50   49   87   68I  0      TO1  86      Absolute      200       Slope: 1.31
West  60   58   98   68I  0      TO2  86      Warm          170     Minimum: 155
                                              Differential  115
Resistor Test Mode: Enabled                   Hot Wheel     702
High/Wide Alarm Direction: Both            Cold Rail Temp   10

                Resistor
Wheel Max  Avg  Read  Req  CF
----------------------------
East  200  196   3   68I  0
West  10   6     2   68I  0
==================================================================================
AEI System Data

Tags Read        Tags Stored: 19
--------------
Antenna 0:  19
Antenna 1:   0
==================================================================================
Firmware Versions
-----------------
Analyzer: NSA3.03-P 02/01/13  Comm: NSA3.05-P 02/01/13   Speech:
----------------------------------------------------------------------------------

System Alarms
--------------------------------------
Successive Cold Wheel Resistors Exceeded
Integrity Failure
Cold North Wheel Scanner Resistor

Axle Alarm Summary
----------------------------------------------------------------------------------
 97  North Hot Wheel
 98  South Hot Wheel

                              •
                              •
----------------------------------------------------------------------------------

         Rail       Wheel
Car Axle East  West  East  West   ON   OFF PW1 PW2  Alarms
----------------------------------------------------------------------------------
                              •
                              •
                              •
```

The Train Detail report is divided into three sections. The <u>header</u> 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 <u>detail</u> section contains more detailed information (like bearing and wheel temperatures) about the specific train. In between these two sections is the <u>system-events</u> section, which contains all System Alarms and Exception Alarms associated with the train.

The SmartScanNG system calculates a checksum for <u>each</u> <u>train</u>. 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, <u>each</u> <u>axle</u> 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
 ==============================================================================

                              •
                              •
                              •

 ------------------------------------------------------------------------------
 Car  Axle  Trk  North   South   ON   OFF   PW1 PW2  Alarms
 ------------------------------------------------------------------------------
   1    1    0    56      21     25    0     6   6
        2    0    57      21     25    59    6   6
        3    0    56      21     25    59    8   8
        4        CHECKSUM ERROR: StartAddr 136416 EndAddr 136427
        5    1    56      21     25    59    6   6
        6    1    56      21     25    59    6   6

   2    7    2    56      20     25    162   6   6
        8    2    56      21     25    59    6   6

                              •
                              •
                              •

 END OF REPORT - Press any key...
```

The table below lists the fields from the <u>header</u> section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Trains directory.
Date	The date the train arrived at the site. Date is in **mm/dd/yy** format. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.
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. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.
Length	The length of train in feet.
Speed	The train's exit speed in miles per hour.
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. ***Section 3.0 - Serial Interface*** tells how to change this value using the MP/KP submenu on the Setup menu.
Track	The track designator of the site. For single-track sites, the value is Single. For multitrack sites, valid values are North, South, East, West, Track 1, Track 2, Track 3, and Track 4. ***Section 3.0 - Serial Interface*** tells how to set this value using the Track Number submenu on the Setup menu.
Temperature	The ambient temperature at the time the train arrived at the site. Temperature is in degrees Fahrenheit.
Battery	The system battery voltage at the time the train passed 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.
Max	The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the bearing scanner on a given railside. For example, if the ambient temperature (at the time 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 railside. For example, if the ambient temperature (at the time 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 railside.

Heading	Contents of Field
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the bearing scanner on a given railside 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 at the time the train exits the site. If the **Resistor Test Mode option** is <u>disabled</u>, a zero appears in this field.

	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</u> <u>than</u> 30 seconds.
	    V For this train, the battery voltage (measured with the shutters open) was <u>less</u> <u>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) = .25), and 25 would appear in this field.
Txdr Counts	The gating transducer designator (either TO1 or TO2) followed by the total number of hits on that transducer.

Alarm Limit	The Hotwheel alarm level; the Hotbox alarm levels for Absolute, Warm, and Differential; and the Cold Rail Temperature offset. These values were in place at the time the train arrived at the site.
	    • The value after Absolute is set by the **Absolute option** on the Alarm Settings menu.
	    • The value after Warm is set by the **Warm 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.
	Section 3.0 - Serial Interface tells how to set these values.

Heading	Contents of Field
Carside Parms	The Carside Slope alarm parameter values that were in place at the time the train arrived at the site. • 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. ***Section 3.0 - Serial Interface*** tells how to set these values.
Resistor Test Mode	The status of the post-train resistor integrity test at the time the train arrived at the site. Valid values (aka modes) are Enabled and Disabled. ***Section 3.0 - Serial Interface*** tells how to set this value using the **Resistor Test Mode option** on the Equipment menu.
High/Wide Alarm Direction	The high/wide-alarm-direction parameter that was in place at the time the train arrived at the site. This value is set by the **High/Wide Alarm Direction option** on the Equipment menu. When track direction, which is set using the Track Number submenu on the Setup menu, is North/South, the high/wide-alarm-direction parameter can be North, South, or Both. When track direction is East/West, the high/wide-alarm-direction parameter can be East, West, or Both.
AEI High/Wide Alarm Filter	Prints when the Clearance Alarm Filter is enabled. This line is not printed when this function is disabled.
Wheel	The 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.
Max	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.
Avg	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.
Resistor Read	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.

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 at the time 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</u> <u>than</u> 30 seconds. **V** For this train, the battery voltage (measured with the shutters open) was <u>less</u> <u>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) = .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 Analyzer 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 <u>system-events</u> section and the contents of each field.

Heading	Contents of Field
System Alarms	Lists any System Alarms and Integrity Failures detected at the time the train passed the site. If none were detected, this header is followed by the word "none." ***Appendix A - System Alarms*** describes the conditions and events that the system flags as System Alarms. ***Appendix B - Integrity Failures*** describes the conditions and events that the system flags as Integrity Failures.
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 <u>detail</u> section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Axle	The axle number.
Trk	The truck number. Each railroad vehicle has two or more trucks (that is, wheel assemblies). The trucks are numbered, starting with 0, and increasing from the beginning of the train to the end. Each axle record is associated with one of these trucks. The axles are assigned the number of the truck with which they've been associated. These assigned truck numbers appear in this field. If the **Hotwheel option** on the Equipment menu is <u>enabled</u>, this field doesn't appear.
Rail	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. If the **Hotwheel option** on the Equipment menu is <u>disabled</u>, the word "Rail" doesn't appear, but the two columns do.
Wheel	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).
PW1	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.
PW2	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 <u>Train</u> <u>Detail</u> <u>report</u>:

1   Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
--------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary

            .
            .
            .
```

2   Select **Train Detail** report.

This prompt appears.

```
Train Number ?
```

3   Type the train number.

If you typed a three-digit <u>invalid</u> train number, the Main menu reappears. If you typed a three-digit <u>valid</u> train number, a report for that train is produced. The last line of the report reads: "END OF REPORT - Press any key..."

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

If you typed an <u>invalid</u> train number, pressing **[Enter]** causes the Main menu to reappear. If the typed train number is <u>valid</u>, pressing **[Enter]** produces a report for it. The last line of the report reads: "END OF REPORT - Press any key..."

5   To return to the Main menu after a report is produced, press any key.

At this time, you can produce another report by selecting another option.

6   When done, close the LOG file.

7   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 40 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.

The report is divided into a header section and a detail section. The <u>header</u> section contains general information about the site. The <u>detail</u> 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 <u>detail</u> section. So, instead of getting a train record, you'll get a checksum-error line.

Below is a sample of part of an Exception Summary report when Hotwheel alarm detection was <u>disabled</u> during report processing <u>and</u> when the AEI subsystem was <u>disabled</u> 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.) The contents of your report will be different.

```
                        Southern Technologies Corporation
                        Next Generation Detector System
                             EXCEPTIONS SUMMARY
================================================================================
Version Info.... Analyzer:  NSA3.03-P 02/01/15              MP/KP: 1111.1
              Communicator:  NSA3.05-P 02/01/15             Track: Track 1
                   Speech:

Alarm Limits..      Absolute: 200        Carside Slope..... 1.31
                        Warm: 170              Minimum... 155
                 Differential: 115       Cold Rail Temp...  10


================================================================================
                                            D   Rail
                                 AEI Speed  i   Average      Amb
Train#    Date    Time  Cars Axles TO1 TO2 Tags (MPH) r  North South Temp   Bat
--------------------------------------------------------------------------------
 177 A  02/18/15 08:32   20    86   86  86    0   56   E    36    37  +68F  14.0v
 176 I  02/18/15 07:40   10    46   46  46    0   57   E    43     7  +66F  14.0v
 175 B  02/18/15 06:28   14    62   62  62    0   57   E    36    37  +60F  13.8v

 170 I  02/15/15 01:22    8    38   38  38    0   53   E    55    18  +60F  14.0v

            .
            .
            .

END OF REPORT - Press any key...
```

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

```
                        •
                        •
                        •
  Alarm Limits..     Absolute: 200        Carside Slope..... 1.31
                         Warm: 170             Minimum... 155
                 Differential: 115      Cold Rail Temp...  10
                    Hot Wheel: 702

  =============================================================================
                                              D   Rail        Wheel
                                   AEI Speed i  Average     Average    Amb
  Train#   Date    Time Cars Axles TO1  TO2 Tags (MPH) r East  West  East  West  Temp   Bat
  --------------------------------------------------------------------------------
                        •
                        •
                        •
  END OF REPORT - Press any key...
```

The table below lists the fields from the <u>header</u> section and the contents of each field.

Heading	Contents of Field
Version Info	For Analyzer and Communicator, 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. *Section 3.0 - Serial Interface* tells how to change this value using the MP/KP submenu on the Setup menu.
Track	The track designator of the site. For single-track sites, the value is Single. For multitrack sites, valid values are North, South, East, West, Track 1, Track 2, Track 3, and Track 4. *Section 3.0 - Serial Interface* tells how to set this value using the Track Number submenu on the Setup menu.

Heading	Contents of Field
Alarm Limits	These are the alarm parameters currently defined in the system setup. These values were in place at the time this report was run. • The value after Absolute is set by the **Absolute option** on the Alarm Settings menu. • The value after Warm is set by the **Warm 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 when the **Hotwheel option** on the <u>Equipment</u> menu is <u>enabled</u>. The value after Hot Wheel is set by the **Hotwheel option** on the <u>Alarm</u> <u>Settings</u> <u>menu</u>. • 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. *Section 3.0 - Serial Interface* tells how to set these values.
AEI High/Wide Alarm Filter	Indicates when the Clearance Alarm Filter is enabled. This line is not printed when this function is disabled.

The table below lists the fields from the <u>detail</u> section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Exceptions directory.
	There is one unlabeled column between those labeled "Train#" and "Date." This column can contain **A**, **B**, **I**, **S**, 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 "S," a System Alarm was detected, but Exception Alarms and Integrity Failures weren't. If blank, no Exception Alarm, Integrity Failure, or System Alarm was detected.
Date	The date the train arrived at the site. Date is in **mm/dd/yy** format. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.
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. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.

Heading	Contents of Field
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.
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 (mph)	The train's exit speed in miles per hour.
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, in degrees Fahrenheit, at the time the train passed the site.
Bat	The system battery voltage at the time the train passed the site.

To produce an <u>Exception</u> <u>Summary</u> <u>report</u>:

1   Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
-------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
  D) Exception Detail

              .
              .
              .
```

2   Select **Exception Summary** report.

The last line of the report reads: "END OF REPORT - Press any key..."

3   To return to the Main menu, press any key.

At this time, you can produce another report by selecting another option.

4   When done, close the LOG file.

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

4.4 Exception Detail Report

The 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 at the time 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 Exception Detail report when both the **AEI option** and **Hotwheel option** were <u>disabled</u> at the time the report was requested. The **Carside Slope option** was <u>enabled</u>. The contents of your report will be different.

```
                        Southern Technologies Corporation
                        Next Generation Detector System
                              EXCEPTION DETAIL
================================================================================
Train#: 321              Speed:  57MPH              MP/KP: 1111.1
  Date: 02/18/15         Axles:  86                 Track: Single
  Time: 08:41         Direction: East         Temperature: + 71F
Length: 1776       Shutters Open:  32              Battery: 13.4v
================================================================================
               Resistor
Rail  Max  Avg  Read  Req  CF    Txdr  Counts  Alarm          Limit   Carside Parms
----------------------------    ----------  -----------------       -------------
North 258   49   87   68I  0      TO1  86    Absolute        200       Slope: 1.31
South 252   57   98   68I  0      TO2  86    Warm            170    Minimum: 155
                                            Differential  115
Resistor Test Mode: Enabled                 Hot Wheel       702
High/Wide Alarm Direction: Both         Cold Rail Temp   10
================================================================================
Firmware Versions
-----------------
Analyzer: NSA3.03-P 02/01/15   Comm: NSA3.05-P 02/01/15   Speech:
--------------------------------------------------------------------------------


System Alarms
---------------------------------------
Cold North Resistor
Cold South Resistor

Axle Alarm Summary
--------------------------------------------------------------------------------
 46  South Rail Hot Box
 77  South Rail Differential
143  North Rail Hot Box
143  South Rail Hot Box
144  North Rail Hot Box


--------------------------------------------------------------------------------
Car  Axle  Trk  North  South   ON   OFF   PW1 PW2  Alarms
--------------------------------------------------------------------------------
  1    1    0    56     21    25     0     6   6
       2    0    57     21    25    59     6   6
       3    0    56     21    25    59     8   8
       4    1    56     21    25   362     5   5
       5    1    56     21    25    59     6   6
       6    1    56     21    25    59     6   6
      Carside Ave: North  56 South  21    Carside Alarms: North 184 South 204

  2    7    2    56     20    25   162     6   6
       8    2    56     21    25    59     6   6
                          •
                          •
                          •

     143   66   186    181    25    59     6   6    North Rail Hot Box
                                                    South Rail Hot Box
     144   66   183    170    25   641     6   6    North Rail Hot Box

END OF REPORT - Press any key...
```

Below is a sample of part of an Exception Detail report when both the **AEI option** and the **Hotwheel option** on the Equipment menu were <u>enabled</u> at the time the report was requested. The **Carside Slope option** on the Equipment menu was <u>disabled</u>. Also, both the **AEI option** and the **Hotwheel option** were <u>enabled</u> while the specified train was passing the site. The contents of your report will be different.

```
                        Southern Technologies Corporation
                        Next Generation Detector System
                                 EXCEPTION DETAIL
================================================================================
Train#:  73                  Speed:  57MPH              MP/KP:   432.1
  Date: 02/18/15              Axles:  86                Track: Single
  Time: 08:47             Direction: North         Temperature: + 69F
Length:  1793          Shutters Open:   35              Battery: 14.1v
================================================================================
                 Resistor
Rail  Max  Avg  Read  Req  CF    Txdr Counts  Alarm         Limit   Carside Parms
-----------------------------    -----------  ----------------    -------------
East   50   49    87   68I   0    TO1  86      Absolute        200     Slope: 1.31
West   60   58    98   68I   0    TO2  86      Warm            170   Minimum: 155
                                              Differential    115
Resistor Test Mode: Enabled                   Hot Wheel       702
High/Wide Alarm Direction: Both               Cold Rail Temp   10

                 Resistor
Wheel Max  Avg  Read  Req  CF
---------------------------
East  200  196    3   68I   0
West   10    6    2   68I   0
================================================================================
AEI System Data

Tags Read         Tags Stored: 19
--------------
Antenna 0:  19
Antenna 1:   0
================================================================================
Firmware Versions
-----------------
Analyzer: NSA3.03-P 02/01/13   Comm: NSA3.05-P 02/01/13   Speech:
--------------------------------------------------------------------------------

System Alarms
----------------------------------------
Successive Cold Wheel Resistors Exceeded
Integrity Failure
Cold North Wheel Scanner Resistor

Axle Alarm Summary
--------------------------------------------------------------------------------
 97  North Hot Wheel
 98  South Hot Wheel

                             •
                             •
                             •
--------------------------------------------------------------------------------

          Rail        Wheel
Car Axle East  West  East  West    ON   OFF PW1 PW2  Alarms
--------------------------------------------------------------------------------
                             •
                             •
                             •
```

The Exception Detail report is divided into three sections. The <u>header</u> 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 <u>detail</u> section contains more detailed information (like bearing and wheel temperatures) about the specific train. In between these two sections is the <u>system-events</u> section, which contains all System Alarms and Exception Alarms associated with the train.

The SmartScanNG system calculates a checksum for <u>each</u> <u>train</u>. 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 <u>extended</u> 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, <u>each</u> <u>axle</u> has a checksum associated with it. If an axle is determined to have an invalid checksum, the <u>extended</u> Exception Detail report so states in the associated axle's row (as shown below).

```
                     Southern Technologies Corporation
                      Next Generation Detector System
                              EXCEPTION DETAIL
 ===============================================================================

                            •
                            •
                            •

 -------------------------------------------------------------------------------
 Car  Axle  Trk  North   South   ON    OFF   PW1 PW2  Alarms
 -------------------------------------------------------------------------------
  1    1    0    56      21     25     0     6   6
       2    0    57      21     25     59    6   6
       3    0    56      21     25     59    8   8
       4     CHECKSUM ERROR: StartAddr 136416 EndAddr 136427
       5    1    56      21     25     59    6   6
       6    1    56      21     25     59    6   6

  2    7    2    56      20     25     162   6   6
       8    2    56      21     25     59    6   6

                            •
                            •
                            •

 END OF REPORT - Press any key...
```

The table below lists the fields from the <u>header</u> section and the contents of each field.

Heading	Contents of Field
Train#	The number that identifies the train in the Exceptions directory.
Date	The date the train arrived at the site. Date is in **mm/dd/yy** format. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.
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. ***Section 3.0 - Serial Interface*** tells how to change this value using the Date and Time submenu on the Setup menu.
Length	The length of train in feet.
Speed	The train's exit speed in miles per hour.
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. ***Section 3.0 - Serial Interface*** tells how to change this value using the MP/KP submenu on the Setup menu.
Track	The track designator of the site. For single-track sites, the value is Single. For multitrack sites, valid values are North, South, East, West, Track 1, Track 2, Track 3, and Track 4. ***Section 3.0 - Serial Interface*** tells how to set this value using the Track Number submenu on the Setup menu.
Temperature	The ambient temperature at the time the train arrived at the site. Temperature is in degrees Fahrenheit.
Battery	The system battery voltage at the time the train passed 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
Max	The maximum temperature, above the ambient temperature in degrees Fahrenheit, recorded by the bearing scanner on a given railside. For example, if the ambient temperature (at the time 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 railside. For example, if the ambient temperature (at the time 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 railside.

Heading	Contents of Field
Resistor Req	The resistor temperature, in degrees Fahrenheit, required by the bearing scanner on a given railside 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 at the time the train exits the site. If the **Resistor Test Mode option** is <u>disabled</u>, a zero appears in this field.
	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</u> <u>than</u> 30 seconds. **V** For this train, the battery voltage (measured with the shutters open) was <u>less</u> <u>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) = .25), and 25 would appear in this field.
Txdr Counts	The gating transducer designator (either TO1 or TO2) followed by the total number of hits on that transducer.
Alarm Limit	The Hotwheel alarm level; the Hotbox alarm levels for Absolute, Warm, and Differential; and the Cold Rail Temperature offset. These values were in place at the time the train arrived at the site. • The value after Absolute is set by the **Absolute option** on the Alarm Settings menu. • The value after Warm is set by the **Warm 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. ***Section 3.0 - Serial Interface*** tells how to set these values.

Heading	Contents of Field
Carside Parms	The Carside Slope alarm parameter values that were in place at the time the train arrived at the site. • 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. ***Section 3.0 - Serial Interface*** tells how to set these values.
Resistor Test Mode	The status of the post-train resistor integrity test at the time the train arrived at the site. Valid values (aka modes) are Enabled and Disabled. ***Section 3.0 - Serial Interface*** tells how to set this value using the **Resistor Test Mode option** on the Equipment menu.
High/Wide Alarm Direction	The high/wide-alarm-direction parameter that was in place at the time the train arrived at the site. This value is set by the **High/Wide Alarm Direction option** on the Equipment menu. When track direction, which is set using the Track Number submenu on the Setup menu, is North/South, the high/wide-alarm-direction parameter can be North, South, or Both. When track direction is East/West, the high/wide-alarm-direction parameter can be East, West, or Both.
Wheel	The 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.
Max	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.
Avg	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.
Resistor Read	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.

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 at the time 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</u> <u>than</u> 30 seconds. **V** For this train, the battery voltage (measured with the shutters open) was <u>less</u> <u>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) = .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 Analyzer 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 <u>system-events</u> section and the contents of each field.

Heading	Contents of Field
System Alarms	Lists any System Alarms and Integrity Failures detected at the time the train passed the site. If none were detected, this header is followed by the word "none." **Appendix A - System Alarms** describes the conditions and events that the system flags as System Alarms. **Appendix B - Integrity Failures** describes the conditions and events that the system flags as Integrity Failures.
Axle Alarm Summary	Lists each Exception Alarm found on the train and the axle on which it was found.

The table below lists the fields from the <u>detail</u> section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Axle	The axle number.
Trk	The truck number. Each railroad vehicle has two or more trucks (that is, wheel assemblies). The trucks are numbered, starting with 0, and increasing from the beginning of the train to the end. Each axle record is associated with one of these trucks. The axles are assigned the number of the truck with which they've been associated. These assigned truck numbers appear in this field. If the **Hotwheel optio**n on the Equipment menu is <u>enabled</u>, this field doesn't appear.
Rail	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. If the **Hotwheel option** on the Equipment menu is <u>disabled</u>, the word "Rail" doesn't appear, but the two columns do.
Wheel	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).
PW1	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.
PW2	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 Exception Detail report:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
-------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
  D) Exception Detail
  E) System Status

             .
             .
             .
```

2 Select **Exception Detail** report.

This prompt appears.

```
Train Number ?
```

3 Type the train number.

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

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

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

```
Abbreviated Listing ?
```

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

If you typed an <u>invalid</u> train number, the Main menu reappears. If the typed train number is <u>valid</u>, a report for that train is produced. The last line of the report reads: "END OF REPORT - Press any key..."

6 To return to the Main menu after a report is produced, press any key.

At this time, you can produce another report by selecting another option.

7 When done, close the LOG file.

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

4.5 Abbreviated Exception Detail Report

The <u>abbreviated</u> Exception Detail report is like the regular 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 regular Exception Detail report, the <u>abbreviated</u> Exception Detail report is divided into three sections. The <u>header</u> 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 <u>detail</u> section contains more detailed information (like the bearing and wheel temperatures) about the specific train. In between these two sections is the <u>system-events</u> section, which contains all System Alarms and Exception Alarms associated with the train.

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

```
                        Southern Technologies Corporation
                        Next Generation Detector System
                        EXCEPTION DETAIL - ABBREVIATED
===============================================================================
                                   •
                                   •
                                   •

System Alarms
--------------------------------------
Cold North Resistor

Axle Alarm Summary
-------------------------------------------------------------------------------
   6  North Rail Hot Box
  27  Dragging Equipment
  28  Dragging Equipment
  37  North Rail Hot Box
 105  North Rail Differential
 106  North Rail Differential


-------------------------------------------------------------------------------
Car  Axle  Trk  North   South   ON    OFF   PW1 PW2 Alarms
-------------------------------------------------------------------------------
  1    1    0    56      21      25     0     6   6
       2    0    57      21      25    59     6   6
       3    1    56      21      25    59     8   8
       4    1    56      21      25   562     5   5

  2    5    3    56      22      25   162     6   6
       6    3   189     110      25   641     6   6   North Rail Hot Box
       7    4    57      22      25    59     6   6
       8    4    57      22      25   562     6   6

  3    9    5    56     113      25   162     6   6
      10    5    57      23      25    59     6   6
      11    6    57      24      25    59     6   6
      12    6    57      23      25   562     6   6

  6   21   11    56      23      25   162     6   6
      22   11    57      23      26    58     6   6
      23   12    57      23      26   561     6   6
      24   12    57      22      26    58     6   6

  7   25   13    56      22      25   162     6   6
      26   13    57      21      26    58     6   6
      27   14    57      22      26   561     6   6   Dragging Equipment
      28   14    57      23      26    58     6   6   Dragging Equipment

  8   29   15    56      22      25   162     6   6
      30   15    57      22      26    58     6   6
                                   •
                                   •
                                   •

END OF REPORT - Press any key...
```

To produce the abbreviated Exception Detail report:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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. The last line of the report reads: "END OF REPORT - Press any key..."

6 To return to the Main menu after a report is produced, press any key.

At this time, you can produce another report by selecting another option.

7 When done, close the LOG file.

8 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. Then, 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.

```
                   Southern Technologies Corporation
                   Next Generation Detector System
                        SYSTEM STATUS REPORT
 ================================================================================
    Date:08/11/15  Time:16:05        Battery: 13.5v        Ambient Temp.: +47F
 --------------------------------------------------------------------------------
    Time Zone... Eastern        Daylight Savings Time..... Disabled
    MP/KP....... 1234.5    Track Dir... N/S   Track....... Single


    Alarm Settings
    --------------------------------------------------------------------------
    Absolute...................... 200      Warm.......................... 170
    Differential.................. 115      Hot Wheel..................... 702
    Carside Slope................ 1.31      Carside Minimum............... 155
    Cold Rails...................... 5      Cold Rail Temp................. 10
    Cold Res Counter................ 3      Res Test: Minimum Rail Avg..... 25
    Res Test: Minimum Wheel Avg.... 28      Warm Bearing Trigger.......... 72
    Warm Wheel Trigger............ 362      Max Hot Bearings............... 7
    Max Hot Wheels................. 32      Max Dragging Equipment........ 10


    Equipment
    --------------------------------------------------------------------------
    Dragger....................... YES      High Load..................... YES
    Wide Load..................... YES      High/Wide Alarm Direction..... Both
    AEI High/Wide Alarm Filter.... NO       Carside Slope................. NO
    Hot Wheel..................... NO       Clearance Type......... Light Beam
    Clearance Mode......... Multiplexed     Winter Cycle.................. YES
    Transducer Gain............ Normal      AEI........................... NO
    Resistor Test............. Enabled      Gate Distance......... 24.0 inches
    Dragger Debounce Time....... 100 ms     Pre-Train Dragger Dist....... 6 ft
    Hot Bearing................... YES      Sun-Shot Override............. NO
    Sun-Shot Ovrd Start Date....... n/a     Selected Modem............ Default


                  Modem Setup Commands
                  -------------------------------------------
                  Modem Setup Line 1 = +++
                  Modem Setup Line 2 = AT&F
                  Modem Setup Line 3 = AT &D0 &E1 &E15 S0=1 V0
                  Modem Setup Line 4 = AT E0 X4 &C4 $SB19200
                  Modem Setup Line 5 = AT &W0


    Messages
    --------------------------------------------------------------------------
    Axles......................... NO       Speed......................... NO
    Temperature................... NO       Length........................ NO
    Slow.......................... YES      Power Off..................... YES
    Repeat No Defects............. YES      Cars Count.................... NO
    Customer Name................. YES      Arrival Message............... YES
    Lft/Rt Alarm Ref.............. NO       Request EOT Timer............. 5
    Rebroad DTMF Code............. 001      Announce Cold Rail............ YES
    Announce Differentials........ YES      Announce Warm Bearings........ YES


    Scanner Types
    --------------------------------------------------------------------------
    Rail-1.................... Type-II      Rail-2.................... Type-II
    Wheel-1................... Type-II      Wheel-2................... Type-II
```

Below is a sample of the <u>bottom</u> <u>half</u> of a System Status report. The contents of your report will be different.

```
                              .
                              .
                              .
   Scanner Calibration Date
   --------------------------------------------------------------------------------
   Rail1..........07/09/2015 15:36:55    Rail2..........07/09/2015 15:40:25
   Wheel1.........07/09/2015 15:34:16    Wheel2.........07/09/2015 15:29:23

   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

   DCS Parameters
   --------------------------------------------------------------------------------
   Comport...................... COM3

   AEI Reader Parameters
   --------------------------------------------------------------------------------
   ID Separation.............. 2 IDs    Consecutive Reads........ 2 Reads
   Decode As ASCII Tags...... Disabled

                             COP
   Firmware Versions        Resets
   --------------------------------------------------------------------------------
   Analyzer: II1.01-A 08/18/14    0
   Comm    : II1.02-A 08/18/14    0
   Speech  : IAIS1.10

   EPCC Data
   --------------------------------------------------------------------------------
   Date Tested:12/04/14  S/N: 120414            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
13.7  073 07/09/15 16:07 VALID   163,197,223,244,261,272,283,291,298,300,300
     300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300
RAIL 2
13.7  073 07/09/15 16:07 VALID   185,218,243,262,277,289,296,296,296,296,296
     296,296,297,296,297,297,296,296,296,296,297,296,296,296,296,297,296,296
WHEEL 1
13.7  073 07/09/15 16:07 VALID   158,191,215,234,247,258,265,272,277,282,283
     288,291,297,298,300,300,300,300,300,300,300,300,300,300,300,300,300,300
WHEEL 2
13.7  073 07/09/15 16:07 VALID   135,164,189,208,224,234,242,249,255,260,263
     264,270,274,277,280,282,283,284,287,289,288,290,291,292,294,295,295,295
================================================================================

   END OF REPORT - Press any key...
```

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 **mm/dd/yy** format. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.
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. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.
Battery	The system battery voltage when this report was generated.
Ambient Temp	The ambient temperature when this report was generated. Temperature is in degrees Fahrenheit.
Time Zone	The time zone that is currently defined in the system setup. Valid values are Eastern, Central, Mountain, and Pacific. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.
Daylight Savings Time	Whether daylight-saving time is to be observed or not. If disabled, all times throughout the year are in standard time. If enabled, all times between the second Sunday in March and the first Sunday in November are in daylight-saving time. All other times are in standard time. *Section 3.0 - Serial Interface* tells how to change this value using the Date and Time submenu on the Setup menu.
MP/KP	The five-digit milepost/kilometer post of the site. *Section 3.0 - Serial Interface* tells how to change this value using the MP/KP submenu on the Setup menu.
Track Dir	The track direction of the site. Valid values are N/S (for north/south) and E/W (for east/west). *Section 3.0 - Serial Interface* tells how to change this value using the Track Number submenu on the Setup menu.
Track	The track designator of the site. For single-track sites, the value is Single. For multitrack sites, valid values are North, South, East, West, Track 1, Track 2, Track 3, and Track 4. *Section 3.0 - Serial Interface* tells how to change this value using the Track Number submenu on the Setup menu.
Alarm Settings	The alarm parameters and limits as they are currently defined in the system setup. *Section 3.0 - Serial Interface* tells how to change these parameters and limits using the Alarm Settings menu.
Equipment	Equipment configuration as currently defined in system setup. *Section 3.0 - Serial Interface* tells how to change this configuration using the Equipment menu.
Messages	Message configuration as currently defined in system setup. *Section 3.0 - Serial Interface* tells how to change this configuration using the Messages menu.

Heading	Contents of Field
Scanner Calibration Date	Date and time each scanner was last calibrated. The autocalibration function maintains these fields.
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. *Section 3.0 - Serial Interface* tells how to change these parameter settings using the Setup menu.
DCS Parameters	Below are the DCS Parameters currently defined in the system setup. These values were in place at the time this report was printed. **Comport** is the SmartScanNG communication port through which communications with the customer's DCS server takes place. *Section 3.0 - Serial Interface* tells how to change these parameter settings using the DCS Parameters menu.
AEI Reader Parameters	This heading always appears, even if the AEI subsystem is disabled using the **AEI option** on the Equipment menu. Below are the AEI Reader Parameters currently defined in the system setup. These values were in place at the time this report was run. **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 AAR encoded format. *Section 3.0 - Serial Interface* tells how to set these values using the AEI Reader Parameters menu on the Setup menu.

Heading	Contents of Field
Software Versions	For Analyzer 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).
COP Resets	Number of COP resets occurring since the last time the counters were cleared. The top value is for processor-A (aka Analyzer Processor) on the Processor board (2300-100). The middle value is for processor-B (aka Communications Processor) on the same board. *Section 3.0 - Serial Interface* tells how to clear the counters using the System Functions menu.
EPCC Data	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.

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. |
| Resistor Data | **See explanation below.** |

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
 13.7  073 07/09/15 16:07 VALID   163,197,223,244,261,272,283,291,298,300,300
      300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300,300
 RAIL 2
 13.7  073 07/09/15 16:07 VALID   185,218,243,262,277,289,296,296,296,296,296
      296,296,297,296,297,297,296,296,296,296,297,296,296,296,296,297,296,296
```

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.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
--------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
  D) Exception Detail
  E) System Status
  F) Last Train
            .
            .
            .
```

2 Select **System Status** report.

The last line of the report reads: "END OF REPORT - Press any key..."

3 To return to the Main menu, press any key.

At this time, you can produce another report by selection another option.

4 When done, close the LOG file.

5 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. The only difference is 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.

To produce a <u>Last</u> <u>Train</u> <u>report</u>:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
  D) Exception Detail
  E) System Status
  F) Last Train
  G) Last Test Train

            .
            .
            .
```

2 Select **Last Train** report.

The last line of the report reads: "END OF REPORT - Press any key..."

3 To return to the Main menu, press any key.

At this time, you can produce another report by selection another option.

4 When done, close the LOG file.

5 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. The only difference is the way you specify which train you want reported. For this report, you don't specify a train. A report on the most current ramp train (test train) is produced.

To produce a <u>Last</u> <u>Test</u> <u>Train</u> <u>report</u>:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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

          .
          .
          .
```

2 Select **Last Test Train** report.

The last line of the report reads: "END OF REPORT - Press any key..."

3 To return to the Main menu, press any key.

At this time, you can produce another report by selection another option.

4 When done, close the LOG file.

5 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 at the time 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 at the time 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.

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 bearing and wheel temperatures) 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 header and system-events sections of the AEI Diagnostic Detail report are identical to that of the regular Train Detail report.

```
                    Southern Technologies Corporation
                    Next Generation Detector System
                            TRAIN DETAIL
================================================================================
Train#:   5                   Speed:  57MPH              MP/KP: 1111.1
  Date: 02/18/15               Axles:  86                Track: Single
  Time: 09:38             Direction: North         Temperature: + 71F
Length: 1783           Shutters Open:  34              Battery: 13.3v
================================================================================
                  Resistor
Rail  Max  Avg  Read  Req  CF    Txdr  Counts   Alarm          Limit   Carside Parms
------------------------------   ----------   ------------------   -------------
East  234   51   87  68I   0     TO1   86      Absolute         200       Slope: 1.31
West   60   58   98  68I   0     TO2   86      Warm             170    Minimum: 155
                                              Differential     115
Resistor Test Mode: Enabled                   Hot Wheel        702
High/Wide Alarm Direction: Both          Cold Rail Temp        10

                  Resistor
Wheel Max  Avg  Read  Req  CF
----------------------------
East  900  208    3  68I   0
West   10    6    2  68I   0
================================================================================
AEI System Data

Tags Read         Tags Stored: 8
--------------
Antenna 0:   8
Antenna 1:   0
================================================================================
Firmware Versions
-----------------
Analyzer: NSA3.03-P 02/01/13   Comm: NSA3.05-P 02/01/13   Speech:
--------------------------------------------------------------------------------

System Alarms
---------------------------------------
Cold East Wheel Scanner Resistor
Cold West Wheel Scanner Resistor

Axle Alarm Summary
--------------------------------------------------------------------------------
   8   East Rail Hot Box TTEX 354063 R3, A End Leading
  56   East Hot Wheel

--------------------------------------------------------------------------------
          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   30   34    116     6    24     0  17  17
       2   50   60    200     6    24    66  14  14
       3   50   60    200     6    24    58  14  14
       4   50   58    200     6    24   623  14  14
       5   50   60    200     6    24    58  14  14
       6   50   60    200     6    24    58  14  14

  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   49   58    200     6    24   169  14  14
       8  234   60    200     6    24    69  14  14  East Rail Hot Box
       9   49   58    200     6    24   623  14  14
      10   50   60    200     6    24    58  14  14


              •
              •
              •
```

The table below lists the fields from the <u>detail</u> section and the contents of each field.

Heading	Contents of Field
Car	The car number as determined by the firmware.
Axle	The axle number.
Trk	The truck number. Each railroad vehicle has two or more trucks (that is, wheel assemblies). The trucks are numbered, starting with 0, and increasing from the beginning of the train to the end. Each axle record is associated with one of these trucks. The axles are assigned the number of the truck with which they've been associated. These assigned truck numbers appear in this field. If the **Hotwheel option** on the Equipment menu is <u>enabled</u>, this field doesn't appear.
Rail	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. If the **Hotwheel option** on the Equipment menu is <u>disabled</u>, the word "Rail" doesn't appear, but the two columns do.
Wheel	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).
PW1	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.
PW2	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 that are printed per car. Below is part of the sample AEI Diagnostic Detail report that deals specifically with AEI diagnostic data. These two lines are representative of similar lines added for each vehicle in the 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 <u>first</u> <u>line</u> above contains data that is associated with the vehicle that consists of the axle records that follow. The <u>second</u> <u>line</u> shown contains data that is related to an AEI tag that has been associated with (assigned to) the vehicle.

The table below defines the relevant fields in <u>line</u> <u>one</u> (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 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 consist – **A**-end or **B**-end forward.	Yes
0 0 0 0 0	*Reserved for future diagnostics development.*	-----
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 <u>line</u> <u>two</u> of the diagnostic data - tag related data. In reference to the track, **antenna0** is the northmost or eastmost antenna. **Antenna1** is the southmost or westmost antenna.

Field Value	Field Definition
6	Axle count – from tag data.
L	Tag pair read indicator – **L** = left tag missing, **R** = right tag missing **G** = both tags present.
?	*Reserved for future diagnostics development.*
5	Equipment Group Code from tag data.
XYZ 8440	AEI vehicle identification.
0	*Reserved for future diagnostics development.*
P0	Platform code – from tag data.
001568	Antenna0 tag read timestamp – in milliseconds from start of train.
000000	Antenna1 tag read timestamp – in milliseconds from start of train.
001	Antenna0 tag read "handshakes" – the number of times a tag was read.
000	Antenna1 tag read "handshakes" – the number of times a tag was read.
70	Vehicle length – from tag data.

To produce an <u>AEI</u> <u>Diagnostic</u> <u>Detail</u> <u>report</u>:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to 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** report.

This prompt appears.

```
   Train Number ?
```

3 Type the train number.

If you typed a three-digit <u>invalid</u> train number, the Main menu reappears. If you typed a three-digit <u>valid</u> train number, a report for that train is produced. The last line of the report reads: "END OF REPORT - Press any key..."

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

If you typed an <u>invalid</u> train number, pressing **[Enter]** causes the Main menu to reappear. If the typed train number is <u>valid</u>, pressing **[Enter]** produces a report for it. The last line of the report reads: "END OF REPORT - Press any key..."

5 To return to the Main menu after a report is produced, press any key.

At this time, you can produce another report by selection another option.

6 When done, close the LOG file.

7 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 the System Functions menu. Producing the report after the entries have been cleared 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

                              02/19/2015
                              08:26:02
===============================================================================
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

                              02/19/2015
                              08:26:02
===============================================================================
 219 02/19/15 14:57:19 <DCS: host: >
 218 02/19/15 14:57:19 <DCS: TO waiting for, OK, *POLL*>
 217 02/19/15 14:56:41 <DCS: Send Train #70 File>
 216 02/19/15 14:55:51 <DCS: Build Train #70 File >
 215 02/19/15 14:55:51 <Excep. Train Stored>
 214 02/19/15 14:55:42 <Store Excep. Train #45>
 213 02/19/15 14:55:41 <Train Stored>
 212 02/19/15 14:55:30 <Store Train #69>

                            •
                            •
                            •

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

To produce an <u>Event</u> <u>Log</u> <u>report</u>:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
                    .
                    .
                    .

    I) Replay EOT Announcement
    J) Event Log
    K) Maintenance Report

                    .
                    .
                    .
```
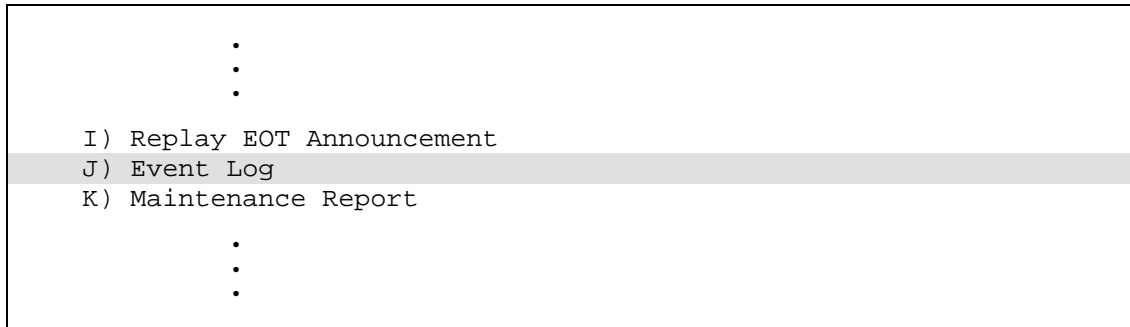
2 Select Event Log report.

The last line of the report reads: "END OF REPORT - Press any key..."

3 To return to the Main menu, press any key.

At this time, you can produce another report by selection another option.

4 When done, close the LOG file.

5 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:02/15/15  Time:10:45       Battery: 13.5V        Ambient Temp.: +67F

   11 Days Since Last Calibration.

================================================================================

                       Analysis Of Trains 40 Through 41

Hardware Status
--------------------------------------------------------------------------------
East Rail Scanner............Pass

West Rail Scanner............Pass

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 'Reverse Direction Detected'

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 16:39:54    Rail2..........02/04/2015 16:37:22

================================================================================

----------------------------- 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 (at the time that the report is selected from the Main menu) or it can be defined by the user (also at the time 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: - 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: - 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: - Successive Cold Wheels Exceeded - Successive Cold Wheel Resistors Exceeded - Dead Wheel Scanner Resistor - Pyrometer Noise	An occurrence of any one of these: - 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: - High Transducer Miscount	An occurrence of any one of these: - 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: - 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: - 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: - 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: - High-Load Pretrain	None	Malfunctioning, improperly installed, malfunctioning cables or wires, or improperly connected cables or wires
Wide-Load Detector	Any occurrence of: - Wide-Load Pretrain	None	Malfunctioning, improperly installed, malfunctioning cables or wires, or improperly connected cables or wires
Ambient Temperature Probe	Any occurrence of: - Temperature Probe Not Reliable	None	Malfunctioning temperature probe, cable disconnected, or malfunctioning cable
SmartScanNG Enclosure	Any occurrence of: - 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 <u>Maintenance</u> <u>report</u>:

1 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
                    •
                    •
                    •
      I) Replay EOT Announcement
      J) Event Log
      K) Maintenance Report
      L) Setup
      M) Enter Pass-Thru Mode

                    •
                    •
                    •
```
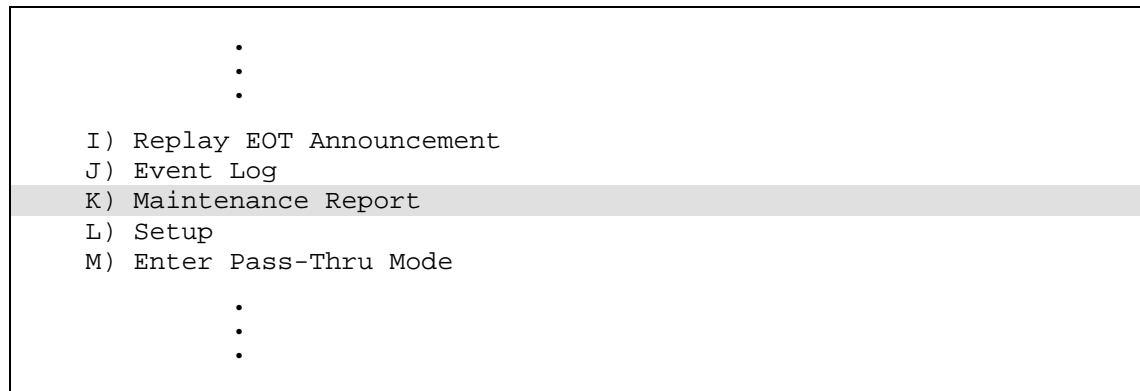
2 Select Maintenance report.

After the Maintenance report is produced, the Main menu reappears. At this time, you can produce another report by selection another option.

3 When done, close the LOG file.

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

4.12 DSR Records Report for any Train in the Trains Directory

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 warm-bearing/wheel trigger. The samples for those bearings/wheels on which pyrometer noise has been detected are also retained.

The warm-bearing trigger is the value set by the **Warm-Bearing Trigger option** on the Alarm Settings menu. Likewise, the warm-wheel trigger is the value set by the **Warm-Wheel Trigger 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 is capable of retaining the DSR samples for up to sixteen bearings <u>and</u> up to sixteen wheels that exceed the warm-bearing/wheel trigger <u>or</u> on which pyrometer noise has been detected. Where more than sixteen bearings/wheels on a train are found to exceed the warm-bearing/wheel trigger, the DSR samples for the warmest sixteen of the bearings/wheels are retained.

The DSR Records report provides information on any train in the Trains directory. You can either produce a report for the last train <u>or</u> for any other train in the **Trains directory**. If you choose not to produce a report for the last train, 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.

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

```
   Train Number 16,  Warm Brg Trg = 50F,  Warm Wheel Trg = 100F

   --------------------------------------------------------------------------
   [W]  Axle:117, Rail:4, OnTime:63, Saved Value:130, Sample Count:48
   28, 30, 44, 62, 80, 98,116,126,130,122,120,104, 84, 66, 48, 34, 24, 20, 10, 10, 10, 10,
   6, 10, 10, 10, 10,  6,  6,  6,  6,  6,  2, 10,  6, 10, 16, 30, 42, 56, 70, 70, 70, 66,
   44, 30, 24, 16,

   [W]  Axle:313, Rail:4, OnTime:55, Saved Value:130, Sample Count:96
   42, 52, 70, 88,102,112,126,130,130,122,104, 94, 76, 60, 42, 28, 16, 16, 14, 10,  6, 10,
   6,  6, 10, 10,  6, 10, 10,  6, 10,  6,  2,  6,  2, 10, 14, 24, 42, 52, 70, 76, 76, 74,
   62, 44, 34, 42, 52, 70, 88,102,112,126,130,130,122,104, 94, 76, 60, 42, 28, 16, 16, 14, 10,
   6, 10,6,  6, 10, 10,  6, 10, 10,  6, 10,  6,  2,  2,  6,  2, 10, 14, 24, 42, 52, 70, 76,
   76, 74, 62, 44, 34
```

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 **Warm-Bearing Trigger option** on the Alarm Settings menu.
Warm Wheel Trg	The value set by the **Warm-Wheel Trigger 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 **Warm-Bearing Trigger 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 **Warm-Wheel Trigger 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 <u>DSR</u> <u>Records</u> <u>report</u> for a train from the <u>Trains</u> <u>directory</u>:

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
02/19/2015 21:57
Main Menu
--------------------------------------------------
             .
             .
             .

  N) System Functions
  O) Dynamic Scan Records - Train Directory
  P) Dynamic Scan Records - Exception Directory
  X) Exit
```

2   Select the DSR Records report for a train in the <u>Trains</u> <u>directory</u>.

This prompt appears.

```
STC SmartScanNG, MP/KP-1794.5, Track:East
Subdivision: NONE
02/19/2015 21:57
Dynamic Scan Rate Menu
-------------------------------------------------
  A) Last Train
  B) Selected Train
  X) Exit
```

3   Select **Last Train** to produce the DSR Records report for the <u>last</u> <u>train</u>.

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

4   The **Selected Train** option produces the DSR Records report for a <u>specific</u> <u>train</u>.

This prompt appears.

```
  Train Number ?
```

a   Type the train number.

   If you typed a three-digit <u>valid</u> 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 <u>invalid</u> train number, the Dynamic Scan Rate menu reappears.

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

   If you typed a <u>valid</u> 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 an <u>invalid</u> train number, the Dynamic Scan Rate menu reappears.

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

6   When done, close the LOG file.

7   To exit the serial interface <u>and</u> return the SmartScanNG system to normal operation, type **X**

4.13   DSR Records Report for any Train in the Exceptions Directory

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 warm-bearing/wheel trigger. The samples for those bearings/wheels on which pyrometer noise has been detected are also retained.

The warm-bearing trigger is the value set by the **Warm-Bearing Trigger option** on the Alarm Settings menu. Likewise, the warm-wheel trigger is the value set by the **Warm-Wheel Trigger option** on the Alarm Settings menu.

The system takes 48 heat samples of a bearing and 96 samples of a wheel as it passes between the gating transducers. This feature is called the Dynamic Scan Rate (DSR) because the rate at which the temperature samples are taken adjusts to the speed of a train so that the exact number of samples are collected for each bearing/wheel. 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 is capable of retaining the DSR samples for up to sixteen bearings <u>and</u> up to sixteen wheels that exceed the warm-bearing/wheel trigger <u>or</u> on which pyrometer noise has been detected. Where more than sixteen bearings/wheels on a train are found to exceed the warm-bearing/wheel trigger, the DSR samples for the warmest sixteen of the bearings/wheels are retained.

The DSR Records report provides information on any train in the Exceptions directory. You can either produce a report for the last exception train <u>or</u> for any other train in the **Exceptions directory**. If you choose not to produce a report for the last exception train, 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.

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

```
   Train Number 16,  Warm Brg Trg = 50F,  Warm Wheel Trg = 100F

   ---------------------------------------------------------------------------
   [W]  Axle:117, Rail:4, OnTime:63, Saved Value:130, Sample Count:48
   28, 30, 44, 62, 80, 98,116,126,130,122,120,104, 84, 66, 48, 34, 24, 20, 10, 10, 10, 10,
    6, 10, 10, 10, 10,  6,  6,  6,  6,  6,  2, 10,  6, 10, 16, 30, 42, 56, 70, 70, 70, 66,
   44, 30, 24, 16,

   [W]  Axle:313, Rail:4, OnTime:55, Saved Value:130, Sample Count:96
   42, 52, 70, 88,102,112,126,130,130,122,104, 94, 76, 60, 42, 28, 16, 16, 14, 10,  6, 10,
    6,  6, 10, 10,  6, 10, 10,  6, 10,  6,  2,  2,  6,  2, 10, 14, 24, 42, 52, 70, 76, 76,
   74, 62, 44, 34, 42, 52, 70, 88,102,112,126,130,130,122,104, 94, 76, 60, 42, 28, 16, 16, 14,
   10,  6, 10,  6,  6, 10, 10,  6, 10, 10,  6, 10,  6,  2,  2,  6,  2, 10, 14, 24, 42, 52, 70,
   76, 76, 74, 62, 44, 34
```

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 Exceptions directory.
Warm Brg Trg	The value set by the **Warm-Bearing Trigger option** on the Alarm Settings menu.
Warm Wheel Trg	The value set by the **Warm-Wheel Trigger 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 bearing scanner was warmer than the value set by the **Warm-Bearing Trigger 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 wheel scanner was warmer than the value set by the **Warm-Wheel Trigger 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 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 from the Exceptions directory:

1 Using the serial interface, display the Main menu.

The Main menu looks like this.

```
              •
              •
              •
    O) Dynamic Scan Records - Train Directory
    P) Dynamic Scan Records - Exception Directory
    X) Exit
```

2 Select the DSR Records report for a train in the Exceptions directory.

This prompt appears.

```
STC SmartScanNG, MP/KP-1794.5, Track:East
Subdivision: NONE
02/19/2015 21:57
Dynamic Scan Rate Menu
-------------------------------------------------
  A) Last Train
  B) Selected Train
  X) Exit
```

3 Select **Last Train** to produce the DSR Records report for the last Exception train.

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

4 **Selected Train** option will produce the DSR Records report for a specific Exception 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 Rate 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 Rate menu reappears. If you typed an invalid train number, the Dynamic Scan Rate menu reappears.

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

6 When done, close the LOG file.

7 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 message "Iowa Interstate" is announced because it was <u>enabled</u> using the **Announce Customer Name option** on the Messages menu. *Section 3.0 - Serial Interface* tells how to enable and disable this message.

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 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. The format of this announcement is:

[customer name] Milepost (mile) [track indicator]

At a multitrack 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.

For example, at a single-track site, the announcement is like this. In this example, milepost 359.4 was used.

> Iowa Interstate
> Milepost 3-5-9 point 4

At a multitrack site, the announcement is like this. In this example, milepost 297.1 was used.

> Iowa Interstate
> Milepost 2-9-7 Point 1
> 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. These messages have two possible formats. The format used is determined by whether the alarm being reported is classified as an Absolute alarm.

At a single-track site, where an **Absolute** Hotbox alarm has been detected, the announcement is like this.

> Iowa Interstate
> Milepost 3-2-1 Point 4
> You have a defect

At a multitrack site, where a Dragging Equipment alarm has been detected, the announcement is like this.

> Iowa Interstate
> Milepost 3-2-1 Point 4
> South Track
> You have a defect

5.3 Post-Train Messages

Post-train (aka 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 <u>not</u> detected and Integrity Failures <u>not</u> detected
- Exception Alarms <u>not</u> detected and Integrity Failures detected
- Exception Alarms detected and Integrity Failures <u>not</u> 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 <u>separate</u>, there are <u>nine</u> Exception Alarms. They are the Carside Slope, Absolute, Differential, Dragging-Equipment, **High-Load**, Hotwheel, Pyrometer Saturation, Warm, and **Wide-Load** alarms. When the **Clearance Mode option** is set to <u>multiplexed</u>, there are <u>eight</u> Exception Alarms. They are the Carside Slope, Absolute, Differential, Dragging-Equipment, **High-Wide**, Hotwheel, Pyrometer Saturation, and Warm alarms.

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

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, <u>and</u> <u>sometimes</u> Cold Resistor alarms, Cold Wheel Scanner Resistor alarms, and Highrange Transducer Miscounts alarms.

The Highrange Transducer Miscounts alarm <u>can</u> <u>be</u> <u>either</u> a System Alarm or an Integrity Failure, depending on the presence of a Very Slow Train alarm. If a highrange transducer miscount occurs on a train that also contains a Very Slow Train 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 <u>and</u> the Cold Wheel Scanner Resistor alarm <u>can</u> <u>be</u> <u>either</u> a System Alarm or an Integrity Failure, depending on post-train calculated correction factor. 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 <u>less</u> <u>than</u> 24%, no Cold Resistor alarm <u>and</u> no Cold Wheel Scanner Resistor alarm is generated. If the correction factor is <u>in</u> <u>the</u> <u>range</u> of 24% to 40%, the Cold Resistor alarm <u>and</u> the Cold Wheel Scanner 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 and the Cold Wheel Scanner Resistor alarm is considered an **integrity failure**.

Below is the Messages menu. 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-1794.5, Track-Single
02/19/2015 21:57 EST
Messages Menu
-----------------------------------------
   A) Axles......................  YES
   B) Speed......................  NO
   C) Temperature................  YES
   D) Length.....................  NO
   E) Slow.......................  YES
   F) Power Off..................  YES
   G) Repeat No Defects..........  YES
   H) Cars Count.................  NO
   I) Customer Name..............  YES
   J) Arrival Message............  YES
   K) Lft/Rt Alarm Ref...........  YES
   L) Car ID With Alarm..........  NO
   M) Request EOT Timer..........  10
   N) Rebroad DTMF Code..........
   O) Announce Cold Rail.........  YES
   X) Exit
```

Enabling one or more of these highlighted options generates the ancillary messages. 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. Site ambient temperature, train length, number of cars, power off, and slow train were disabled. *Section 3.0 - Serial Interface* tells how to enable and disable these messages using the Messages menu.

When the Highrange Transducer Miscounts alarm or Very Slow Train alarm occurs, the system won't announce axle count, train speed, train length, or number of cars (even if these messages are enabled).

5.3.1 Nothing Detected

When neither an Exception Alarm nor an Integrity Failure is detected, the no-defect message is announced. If the **Repeat No Defects option** on the Messages menu is <u>disabled</u>, the format of this announcement is:

    [customer name] Milepost (mile) [track indicator] [speed indicator]
    No Defects [other ancillary messages]

If the **Repeat No Defects option** is enabled, the format of this announcement is:

    [customer name] Milepost (mile) [track indicator] [speed indicator]
    No Defects [other ancillary messages]

        (15-second pause)

    [customer name] Milepost (mile) [track indicator] [speed indicator]
    No Defects [other ancillary messages]
    Detector Out

For example, at a <u>single</u>-<u>track</u> <u>site</u>, the announcement is like this.

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    No Defects
    Total Axles 9-8

        (15-second pause)

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    No Defects
    Total Axles 9-8
    Detector Out

At a <u>multitrack</u> <u>site</u>, the announcement is like this.

    Iowa Interstate
    Milepost 2-9-7 Point 1
    South Track
    Speed 5-3
    No Defects
    Total Axles 1-6-2

        (15-second pause)

    Iowa Interstate
    Milepost 2-9-7 Point 1
    South Track
    Speed 5-3
    No Defects
    Total Axles 1-6-2
    Detector Out

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.

When no Exception Alarms are detected but an Integrity Failure is detected, "Detector Not Working" is announced. The format of this announcement is:

> [customer name] Milepost (mile) [track indicator] [ancillary messages]
> Detector Not Working
>
> *(15-second pause)*
>
> [customer name] Milepost (mile) [track indicator] [ancillary messages]
> Detector Not Working
> Detector Out

For example, at a double-track site, the announcement is like this.

> Iowa Interstate
> Milepost 3-9-9 Point 1
> South Track
> Detector Not Working
>
> *(15-second pause)*
>
> Iowa Interstate
> Milepost 3-9-9 Point 1
> South Track
> Detector Not Working
> Detector Out

5.3.3 Only Exception Alarms Detected

When one or more Exception Alarms are detected and an Integrity Failure is not detected, the Exception Alarms are announced.

The format of this announcement is:

[customer name] Milepost (mile) [track indicator] [speed indicator]
[alarm announcements] [other ancillary messages] [excessive-alarms indicator]

    (15-second pause)

[customer name] Milepost (mile) [track indicator] [speed indicator]
[alarm announcements] [other ancillary messages] [excessive-alarms indicator]
Detector Out

The maximum number of Hotbox alarms, Hotwheel alarms and Dragging Equipment alarms that can be announced for a given train can each be set via options available on the Alarm Settings menu (which is found on the Setup Menu).   The SmartSCAN NG can be configured to announce up to 10 Hotbox alarms, up to 32 Hotwheel alarms and up to 10 Dragging Equipment alarms. The values for these max-alarms options dictate the number of each of these types of alarms that will be announced for a given train. So, for instance, if the Max Hot Bearings option is set to 7 and the Max Hot Wheels option is set to 5 and the Max Dragging Equipment option is set to 3, then as many as 7 Hotbox alarms **and** 5 Hot Wheel alarms **and** 3 Dragging Equipment alarms will be announced for a given train – potentially a total of 15 alarms of these types per train.   For any train where any of these max-alarms settings is exceeded, the phrase, "Excessive Alarms", will be added to the end of the End of Train announcement.

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 three.

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 three.

The **Clearance Mode option** on the Equipment menu can be set to either separate or multiplexed. This option is only used for high-load detectors and wide-load detectors. When this option is 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 this option is set to multiplexed, the alarms coming from the high-load detectors and wide-load detectors are announced as High-Wide alarms.

Examples

For example, at a single-track site having one Hotbox alarm and no Integrity Failure, the announcement will have the following format. This example assumes that the **Left-Right Alarm Reference option** on the Messages menu was enabled.

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Hotbox Left-Side Axle-7-5
    Total Axles 9-8

        (15-second pause)

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Hotbox Left-Side Axle-7-5
    Total Axles 9-8
    Detector Out

At a double-track site having one Dragging-Equipment alarm and no Integrity Failure, the announcement will have the following format. This example makes no assumption as to whether the **Left-Right Alarm Reference option** was disabled or enabled. Either will result in the following.

    Iowa Interstate
    Milepost 2-9-7 Point 1
    South Track
    Speed 4-5
    Dragging-Equipment Near-Axle-8-4
    Total Axles 8-8

        (15-second pause)

    Iowa Interstate
    Milepost 2-9-7 Point 1
    South Track
    Speed 4-5
    Dragging-Equipment Near-Axle-8-4
    Total Axles 8-8
    Detector Out

At a single-track site having two Hotbox alarms and no Integrity Failure, the announcement will have the following format. This example assumes that the **Left-Right Alarm Reference option** was disabled.

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    First-Hotbox North-Side Axle-7-5
    Second-Hotbox North-Side Axle-8-0
    Total Axles 9-0

       (15-second pause)

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    First-Hotbox North-Side Axle-7-5
    Second-Hotbox North-Side Axle-8-0
    Total Axles 9-0
    Detector Out

At a double-track site having two Hotwheel alarms, one High-Wide alarm, and no Integrity Failure, the announcement will have the following format. This example assumes that the **Left-Right Alarm Reference option** was disabled.

    Iowa Interstate
    Milepost 2-9-7 Point 1
    Speed 4-5
    South Track
    First-Hotwheel North-Side Axle-6-5
    Second-Hotwheel North-Side Axle-7-0
    High-Wide From-Axle-8-4 To Axle-9-2
    Total Axles 1-4-4

       (15-second pause)

    Iowa Interstate
    Milepost 2-9-7 Point 1
    Speed 4-5
    South Track
    First-Hotwheel North-Side Axle-6-5
    Second-Hotwheel North-Side Axle-7-0
    High-Wide From-Axle-8-4 To Axle-9-2
    Total Axles 1-4-4
    Detector Out

In the above example, there was a condition generating a High-Wide alarm from axle 84 to axle 92. The "from" parameter is only used with High-Load, High-Wide, and Wide-Load alarms. It isn't used with Dragging-Equipment alarms. However, all four alarms can use the "near" parameter, as in "High-Wide Near-Axle-3-3."

At a single-track site having one Hotbox alarm, one Dragging-Equipment alarm, and no Integrity Failure, the announcement will have the following format. This example assumes that the **Left-Right Alarm Reference option** was enabled.

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    Hotbox Left-Side Axle-7-5
    Dragging-Equipment Near-Axle-8-4
    Total Axles 9-8

        (15-second pause)

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    Hotbox Left-Side Axle-7-5
    Dragging-Equipment Near-Axle-8-4
    Total Axles 9-8
    Detector Out

At a single-track site, where the Max. Dragging Equipment parameters have been set to 4, a train having four or more Dragging-Equipment alarms and no Integrity Failure, the announcement will have the following format.

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    First-Dragging-Equipment Near-Axle-1-2
    Second-Dragging-Equipment Near-Axle-1-4
    Third-Dragging-Equipment Near-Axle-2-0
    Total Axles 9-8
    Excessive Alarms

        (15-second pause)

    Iowa Interstate
    Milepost 3-2-1 Point 4
    Speed 4-5
    First-Dragging-Equipment Near-Axle-1-2
    Second-Dragging-Equipment Near-Axle-1-4
    Third-Dragging-Equipment Near-Axle-2-0
    Total Axles 9-8
    Excessive Alarms
    Detector Out

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 a train to be stopped, subsequent site/detector 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 <u>and</u> an Integrity Failure are detected, the alarm announcements are suppressed and only "Detector Not Working" is announced. The format of this announcement is:

[customer name] Milepost (mile) [track indicator] [speed indicator] [ancillary messages] Detector Not Working

(15-second pause)

[customer name] Milepost (mile) [track indicator] [speed indicator] [ancillary messages] Detector Not Working
Detector Out

For example, at a <u>single</u>-<u>track</u> <u>site</u> having <u>18</u> Dragging-Equipment alarms <u>and</u> <u>an</u> <u>Integrity Failure</u>, the announcement will have the following format

Iowa Interstate
Milepost 3-2-1 Point 4
Speed 4-5
Total Axles 9-8
Detector Not Working

(15-second pause)

Iowa Interstate
Milepost 3-2-1 Point 4
Speed 4-5
Total Axles 9-8
Detector Not Working
Detector Out

At a <u>double</u>-<u>track</u> <u>site</u> having <u>two</u> Hotbox alarms, <u>two</u> Dragging-Equipment alarms, <u>and</u> <u>an</u> <u>Integrity</u> <u>Failure</u>, the announcement will have the following format.

Iowa Interstate
Milepost 2-9-7 Point 1
Speed 4-5
South Track
Total Axles 1-0-8
Detector Not Working

(15-second pause)

Iowa Interstate
Milepost 2-9-7 Point 1
Speed 4-5
South Track
Total Axles 1-0-8
Detector Not Working
Detector Out

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 <u>not</u> 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 If all transducers aren't snug against the rail, fix this problem before proceeding.

   Each installed transducer body should be 1-9/16 inches (3.97 centimeters) below the top of the rail <u>and</u> 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.
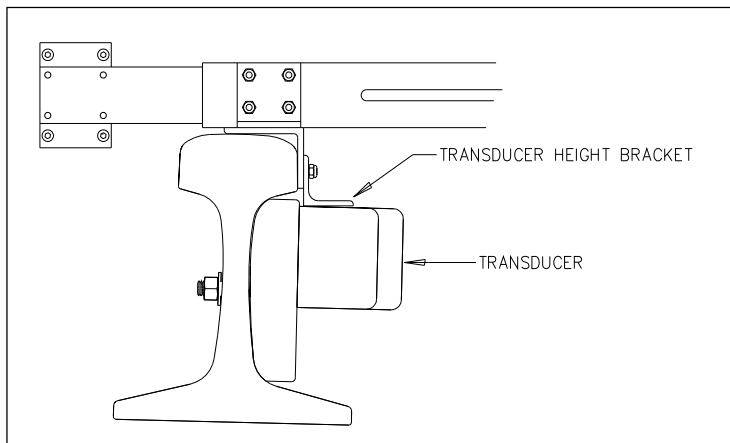
The fixture should be snug against the top and gauge of both rails. This may be impossible if the transducer body is less than 1-9/16 inches (3.97 centimeters) below the top of the rail or if the transducer body isn't parallel to the top of the rail.

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 If the wayside enclosure isn't attached to a properly installed outside grounding system, fix this problem before proceeding.

16 At all outlets, check if the AC power is stable and at least 110 volts at 20 amperes.

17 If the AC power isn't stable or if it isn't at least 110 volts at 20 amperes, fix this problem before proceeding.

18 If there isn't a **ground bus** inside the wayside enclosure that has been attached to a properly installed outside grounding system, fix this problem before proceeding.

19 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 <u>not</u> 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 <u>not</u> inhale the fumes.

20 If the battery charger hasn't been properly grounded to the ground bus, fix this problem before proceeding.

21 If the SmartScanNG enclosure hasn't been properly grounded to the ground bus, fix this problem before proceeding.

There are vents on the top, bottom, and sides of the charger. Blocking any of these vents could result in damage to the charger or battery.

22 Remove anything that is blocking the vents on the battery charger.

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.

23 On the front of the battery charger, if the red defective-temperature-probe LED is lit, fix the underlying problem before proceeding.

24 Switch the multimeter to the <u>DC</u> <u>volts</u> scale.

25 Touch the leads from the multimeter to the terminals on the <u>top</u> of the fuse block.
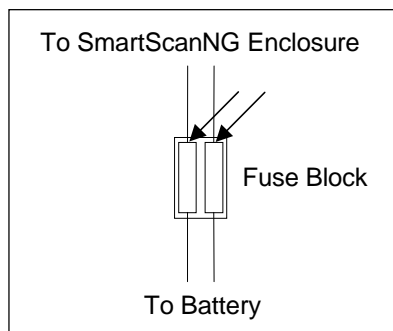
26 If voltage (on the <u>top</u> of the fuse block) is 12.7 through 14.5 VDC, go to step **30**.

27 If voltage (on the <u>top</u> of the fuse block) is 0 VDC:

   a Touch the leads to the terminals on the <u>bottom</u> of the fuse block.

   b If voltage (on the <u>bottom</u> of the fuse block) is <u>greater</u> <u>than</u> 0 VDC, replace each fuse in the fuse block with a BAF-25 (25-amp 250-volt) fast-acting fuse <u>and</u> return to step **25**.

   c If voltage (on the <u>bottom</u> of the fuse block) is 0 VDC, check the wiring between the fuse block and the battery <u>and</u> between the battery and the charger.

   d Return to step **25**.

28 If voltage is <u>less</u> <u>than</u> 12.7 VDC:

   a On the battery charger, check the input voltage switch for proper setting.
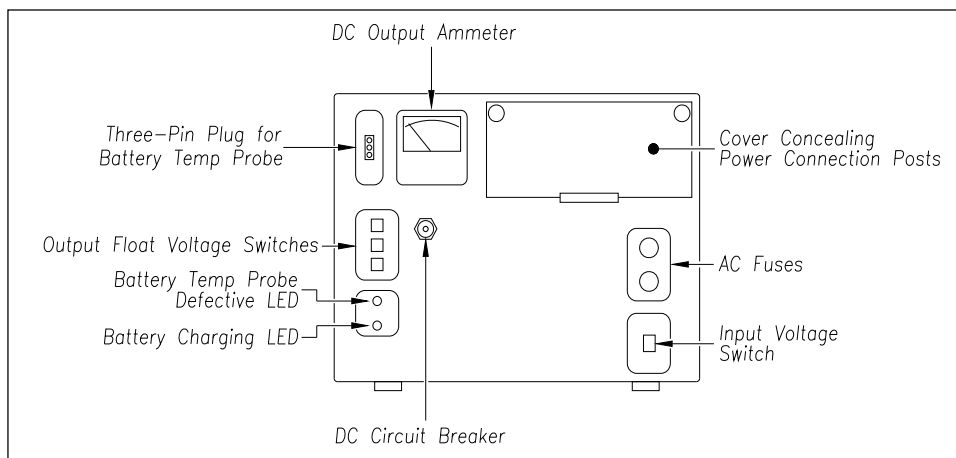
   The input voltage switch can be set to 115 VAC or 230 VAC. Use 115 for input voltages between 108 and 128. Use 230 for input voltages between 216 and 256.

   b On the battery charger, check the output float voltage switches.

   c If the switches are set <u>lower</u> <u>than</u> 12.70 VDC, reset them to 14.00 VDC.

   To reset the switches, use a small slotted screwdriver to turn each switch to the desired number. The ten's digit is always 1 and can't be changed. The top switch controls the unit's digit. The middle switch controls the tenth's digit. The bottom switch controls the hundredth's digit. The factory default is **14.00 VDC**, which is the **recommended setting**. To select 14.00 VDC, turn the top switch to 4, the middle switch to 0, and the bottom switch to 0.

   d Open the small door cover on the top-right corner of the front of the charger.

   Do not touch the uninsulated parts of the wires or the charger's binding posts. Doing so could result in sparks, burns, or electric shock.

   e Check that all binding posts nuts are tight <u>and</u> that all wiring is correct.

   f On the battery charger, check the AC fuses to see if either is blown.

   g If need be, replace with 4-amp 250-volt fast-acting fuses.

h On the battery charger, check the DC circuit breaker to see if it is open (tripped).

When closed, about 0.09 inch (0.23 centimeters) of the breaker's button is seen. When open, the button is popped out, showing about 0.25 inch (0.64 centimeters).

i If open (tripped), push the breaker's button in to reset the DC circuit breaker.

j Check to see if the battery charger is plugged in.

k If the battery charger isn't plugged in, plug it in.

l Check the battery-charging LED.

If the battery is charging properly, the yellow battery-charging LED is lit solid. If one or more of the output float voltage switches are set between numbers, the yellow battery-charging LED flashes.

m If the yellow battery-charging LED isn't lit, call STC for help in fixing this problem.

n If the yellow battery-charging LED is lit solid, monitor the voltage for ten minutes.

If the voltage is gradually increasing, the battery is probably charging. After the battery has charged for five hours, the battery voltage should be very near the float voltage setting. If the voltage isn't gradually increasing, the battery is probably not charging. This may indicate that the battery is defective and should be replaced.

29 If voltage is greater than 14.5 VDC:

a Check the output float voltage switches on the center-left edge of the battery charger.

b Be sure each switch is set on a number and not between numbers.

c If the switches are set to 14.00 VDC or less, cut all power to the SmartScanNG system and call STC for help in fixing this problem.

d If the switches are set higher than 14.50 VDC, reset them to 14.00 VDC and return to step **25**.

To reset the switches, use a small slotted screwdriver to turn each switch to the desired number. The ten's digit is always 1 and can't be changed. The top switch controls the unit's digit. The middle switch controls the tenth's digit. The bottom switch controls the hundredth's digit. The factory default is **14.00 VDC**, which is the **recommended setting**. To select 14.00 VDC, turn the top switch to 4, the middle switch to 0, and the bottom switch to 0.

30 On the status panel, look at the top row of LEDs.
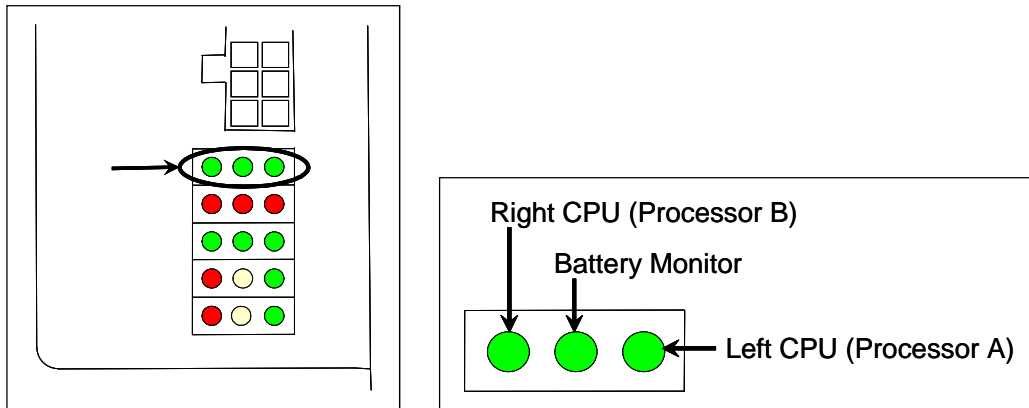
The top row of green LEDs indicates the condition of the CPUs and the battery on the Processor board. If both CPUs are running their programs correctly, their LEDs pulsate (that is, repeat the cycle off, dim, bright, dim). If a program isn't operating as expected, the LED for the affected CPU blinks on and off, is lit solid, or isn't lit at all.
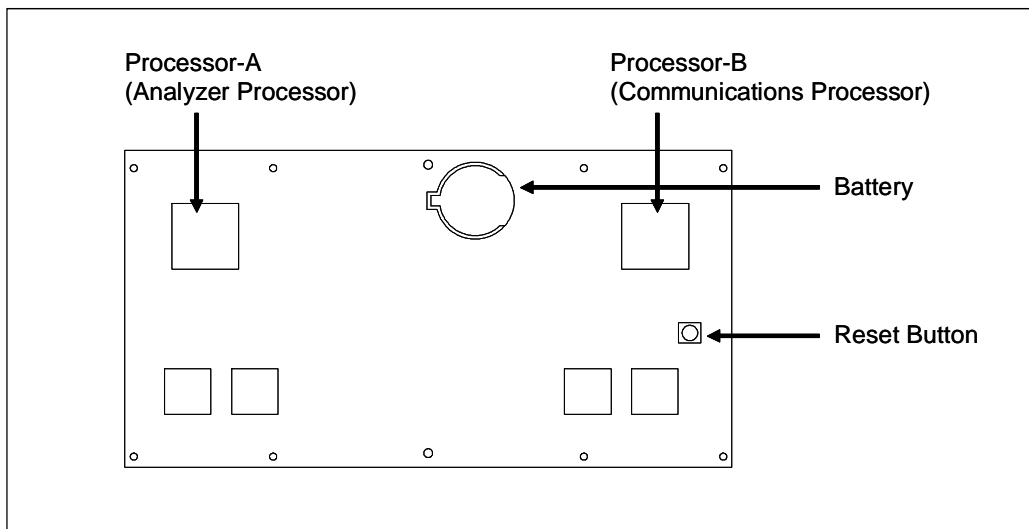
If the on-board coin cell battery is low or dead, the **middle LED** is lit. Otherwise, it isn't lit. During a power interruption to the Processor board, this battery keeps the stored train data from being lost and the time/date accurate. If the battery is low, there is no danger of losing train data unless the power to the system is lost. When the **middle LED** is lit, the battery should be replaced. 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**.

31 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.

32 If the **middle LED** (on the top row) is lit, replace the battery on the Processor board.

33 On the status panel, look at the bottom row of LEDs.
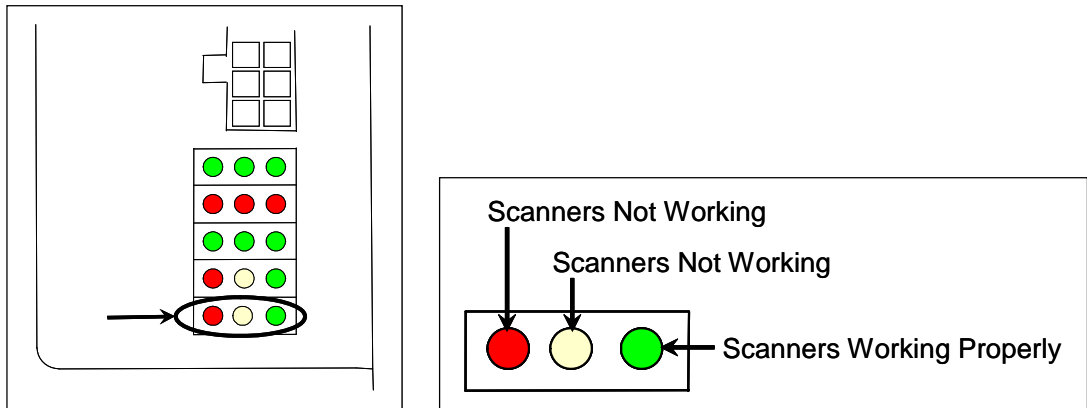
The bottom row of LEDs indicates the operational condition of the bearing and wheel scanners when the system is at rest (that is, when a train isn't present at the site). Several conditions are monitored and logged.

The **leftmost red LED** indicates whether the integrity check passed or failed. If a scanner failed integrity on any of the last 20 trains, this LED lights and remains lit until all trains with integrity failures are flushed from the log. Conditions that would trigger the lighting of this LED are:

- Insufficient heat from one or both bearing scanners or from one or both wheel scanners was detected. If either bearing scanner records less than 5°F (2.8°C) for an entire train or if either wheel scanner records less than 15°F (8.3°C) for an entire train.

- Shutter resistor check failed. The minimum value expected for the temperature of the resistor wasn't met. To cause the LED to light, this minimum value must be greater than the target resistor heat value that is calculated for each train. These requirements for lighting the LED are the same as for generating a Cold Resistor alarm.

- For any five consecutive trains, the difference between the average recorded temperatures for both bearing scanners was more than a delta temperature of 20°F (11.1°C) or the difference between the average recorded temperatures for both wheel scanners was more than a delta temperature of 120°F (66.7°C).

If all of the last 20 trains have passed integrity, the **leftmost red LED** isn't lit. In the last 20 trains, if both bearing scanners or both wheel scanners failed the integrity check, this LED is lit solid. In the last 20 trains, if just one bearing scanner or one wheel scanner failed the integrity check, this LED flashes. The rate and pattern of flashing is different for which rail the scanner was on. For a scanner on the north or east rail, the repeated pattern is on for a half second, off for a full second. For a scanner on the south or west rail, the repeated pattern is on for a half second, off for a half second, on for a half second, off for two seconds.

The **middle yellow LED** flashes when the difference between the average temperatures (recorded by the two bearing scanners or recorded by the two wheel scanners) isn't within acceptable balance limits for 20 consecutive trains. These limits are different for bearing and wheel scanners. For the bearing scanners this limit is 5°F (2.8°C) and for wheel scanners is 15°F (8.3°C). If the averages fall below these balance limits, the **middle yellow LED** will flash continuously until <u>less</u> <u>than</u> 20 consecutive trains have a temperature imbalance between the two bearing or the two wheel scanners.

Within the scanner pairs, the scanner with the lower temperatures is considered the problem scanner. Its identity is revealed by the rate and pattern of flashing of the **middle yellow LED**. For a scanner on the north or east rail, the repeated pattern is on for a half second, off for a full second. For a scanner on the south or west rail, the repeated pattern is on for a half second, off for a half second, on for a half second, off for two seconds. Since this LED makes no distinction between bearing and wheel scanners, 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.

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.

34 If the **rightmost green LED** (on the bottom row) isn't flashing, call STC for help in fixing this problem.

35 On the status panel, look at the fourth row of LEDs <u>when</u> <u>no</u> <u>train</u> <u>is</u> <u>present</u>.
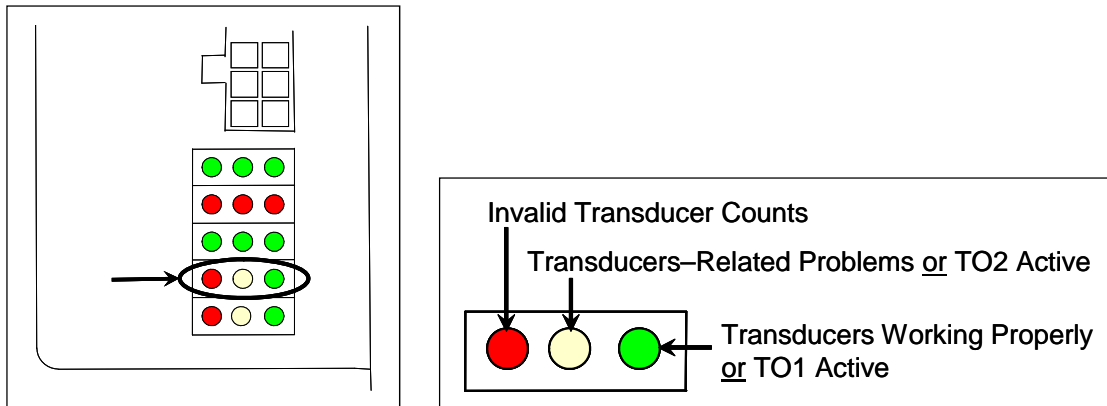
The fourth row of LEDs operates differently when a train is at the site and when it isn't.

When a train <u>is</u> <u>present</u> 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.

When a train isn't present at the site, this row indicates the operational status of the gating transducers for the last 20 trains. The **leftmost red LED** is lit when all the following conditions befall any given train.

- The count between TO1 and TO2 varies by four or more.

- The speed of the train remains above 10 mph (16 kph).

- The train has an odd axle count.

In the last 20 trains, if not all three fault conditions exist on each given train, the red LED is not lit. In the last 20 trains, if there's a possible fault with TO1 on one train and TO2 on another train, this LED is lit solid. In the last 20 trains, if there's a possible fault with just one gating transducer on a given train, this LED flashes. The gating transducer with fewer hits is considered the bad one. The rate and pattern of flashing is different for each transducer. For TO1, the repeated pattern is on for a half second, off for a full second. For TO2, the repeated pattern is on for a half second, off for a half second, on for a half second, off for two seconds.

When a train isn't present at the site, the **middle yellow LED** is lit when:

- A gating transducer experiences more than 20 filtered pulses on a train. In other words, a gating transducer experiences more than 20 pulses on a train that the SmartScanNG system considers noise.

- The gating transducers are activating the system.

When a train isn't present at the site, the **rightmost green LED** flashes 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 kph).

The gating transducers are probably functioning properly when the **rightmost green LED** flashes, the **leftmost red LED** isn't lit, and the **middle yellow LED** isn't lit. But, to be sure, you still need to examine a Train Summary report.

36 When a train isn't present at the site, if the **middle yellow LED** (on the fourth row) isn't lit, go to step **41**.

37 To see if the system is being activated by the gating transducers:

   a Produce a <u>Last</u> <u>Train</u> <u>report</u>.

      Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Last Train** report.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
Main Menu
-------------------------------------------------
  A) Train Summary
  B) Train Detail
  C) Exception Summary
  D) Exception Detail
  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.

   b On the Last Train report, check under the System Alarms section of the report for the words "No Approach Track."

      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.

   c If the words "No Approach Track" don't appear, go to step **41**.

38 If your system uses <u>advance</u> <u>transducers</u>, go to step **40**.

39 If your system uses a <u>track</u> <u>circuit</u>:

   a Toggle <u>off</u> the DC power switch on the right edge of the SmartScanNG enclosure.
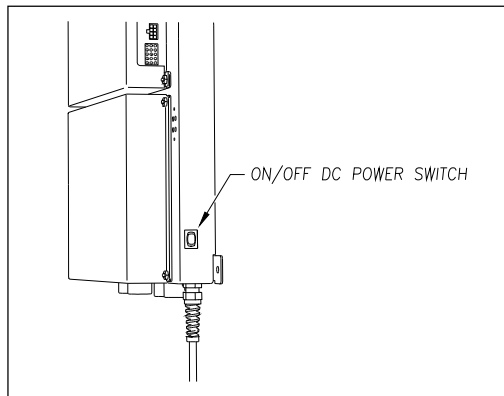
   b Unplug the Molex and ribbon cables from the Controller module.

   c Remove the four nuts that hold the Controller module to the rest of the SmartScanNG enclosure.
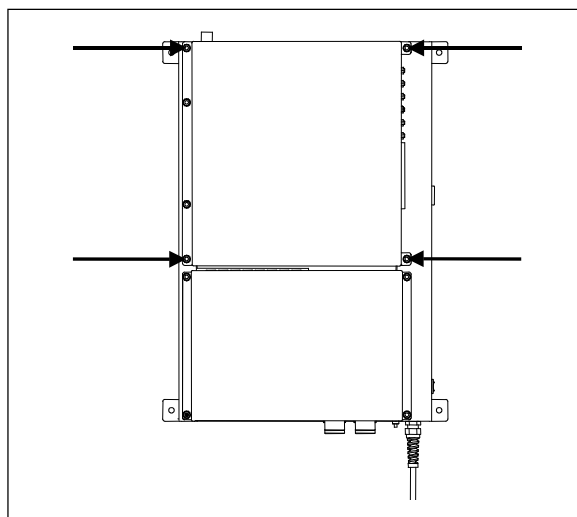
d Detach the Controller module from the rest of the SmartScanNG enclosure.

The SOTC board and the System-Interconnect board are now visible. On some System-Interconnect boards, the LED is to the right of the ribbon cable connector.

Switch — LED

Calibration Switch

SOTC Board
(ZEPIC III)

Ribbon Cable Connector

Edge Connector

System Interconnect Board
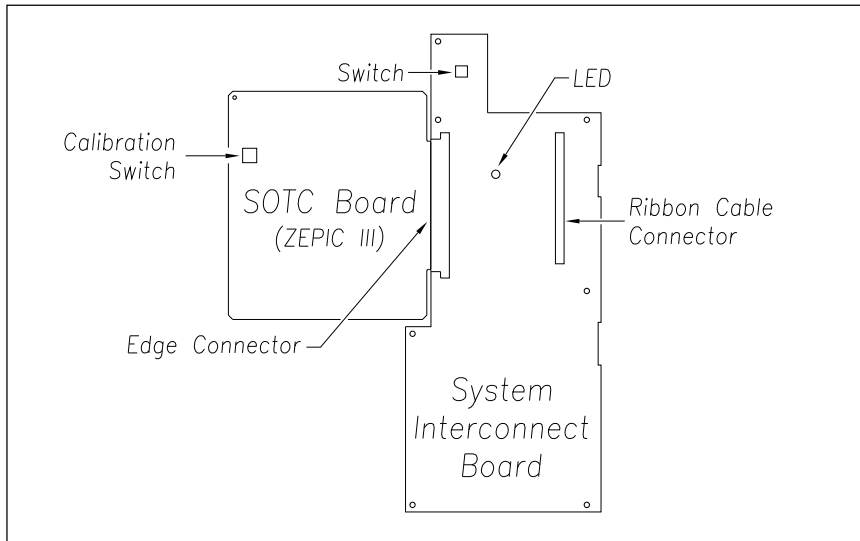
e Store the removed Controller module and nuts in a safe place until you replace them.

f Toggle on the DC power switch on the right edge of the SmartScanNG enclosure.

g From the center of the gating transducer farthest from the track circuit, measure the shortest distance you want the track circuit to pick up the presence of a train.

The distance must be at least 15 feet (4.6 meters) and no more than 150 feet (45.7 meters). You'll next shunt the track. The track must be shunted before the blue calibration switch on the SOTC board can be pressed and calibration can begin.

Shunting a track circuit could adversely affect adjacent signal-system track circuits or crossing warning systems. Ensure the proper protection is in place before shunting any track.

h At the point just measured, place a 0.06 ohm shunt across both rails.

When lit, the LED on the System-Interconnect board indicates a received signal from the track circuit.

i Press and hold down the blue calibration switch on the SOTC board until the LED on the System-Interconnect board starts blinking.

j Release the blue calibration switch on the SOTC board.

The LED on the System-Interconnect board will stop blinking and the system will automatically begin the calibration process. The track shunt must remain in place during the calibration process.

When the unit has successfully been calibrated, the LED on the System-Interconnect board will light again. This process can take up to 45 seconds to complete.

k   Remove the 0.06 ohm shunt.

The LED on the System-Interconnect board should go out.

l   Place the 0.06 ohm shunt across both rails at the point 5 feet (1.5 meters) beyond the measured point (that is, 5 feet farther from the gating transducer).

m   If the LED on the System-Interconnect board lights, return to step **j**.

n   Remove the 0.06 ohm shunt.

o   Toggle <u>off</u> the DC power switch on the right edge of the SmartScanNG enclosure.

p   Reattach the Controller module to the rest of the SmartScanNG enclosure.

q   Plug the Molex and ribbon cables into the Controller module.

r   Toggle <u>on</u> the DC power switch on the right edge of the SmartScanNG enclosure.

s   Go to step **41**.

40   If your system uses <u>advance</u> <u>transducers</u>:

You'll next verify that that each advance transducer is functional.

a   Using a metal wrench, stroke the top of one of the advance transducers.

The scanner shutters should open completely for 10 seconds.

b   On one of the bearing scanners, check to see if the shutter opens.

c   If the shutter didn't open, fix this problem before proceeding.

d   Using a metal wrench, stroke the top of the other advance transducer.

The scanner shutters should open completely for 10 seconds.

e   On one of the bearing scanners, check to see if the shutter opens.

f   If the shutter didn't open, fix this problem before proceeding.

41   Produce a <u>Train</u> <u>Summary</u> <u>report</u>.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, type **A**.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
ain 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 <u>header</u> section contains general information about the site. The <u>detail</u> section contains summary information on each train that passed the site.

42 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.

43 If there is an <u>odd</u> axle count <u>and</u> if train speed was <u>always</u> <u>above</u> 7 mph (11.3 kph), go to step **45**.

If at any time during train passage the train speed was <u>less</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> 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 Very Slow Train 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 <u>less</u> <u>than</u> 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.

44 If there is an <u>even</u> axle count <u>and</u> the values under "Axles," "T01," and "TO2" are the same, go to step **49**.

If things are working correctly, all three values for a given train should be equal. Do the next step <u>only</u> if things aren't working correctly.

45 Determine which gating transducer is recording incorrect information.

Determine which gating transducer is recording incorrect axle counts <u>and</u> whether it isn't counting all axles or counting extra ones. You may not be able to do this by just looking at the values under the Axles, T01, and TO2 columns of the Train Summary report. Sometimes, a transducer problem causes the number in the Axles column to be incorrect. Therefore, the true axle count may have to be determined from an alternate source such as the next detector the train with the transducer-count imbalance encountered.

After you determine which gating transducer is miscounting, you'll need to change a jumper setting on the Interface board. If TO1 is the problem, you'll change the setting for J201. If TO2 is the problem, you'll change the setting for J202. If both TO1 and T02 have a problem, both jumpers will need to be changed.

Changes to the jumpers should be made <u>only</u> after all external conditions that cause transducer miscounts have been corrected. Some of these external conditions are improperly installed transducers, loose transducer bolts, incorrect transducer heights, damaged transducers, damaged transducer cables, and loose wiring connections. You should have already checked and corrected for these external conditions in steps **4** through **10** above. If you think the corrections you made in those steps fixes gating transducer miscounting, you can skip some of the steps below.

The process of adjusting the transducer loading is trial and error. Generally, if you are having too many transducer counts, lower the loading resistance to make the transducer less sensitive. Likewise, too few counts suggest that the transducer isn't sensitive enough, so you would select a loading value with more resistance.

46 If you corrected all external conditions that negatively affect gating transducers <u>and</u> you think this fixes gating transducer miscounting, go to step **49**.

47 If the selected gating transducer appears to be <u>missing</u> <u>axles</u> (that is, the transducer that is showing a number of hits <u>less</u> <u>than</u> the true axle count):

    a   Toggle <u>off</u> the DC power switch on the right edge of the SmartScanNG enclosure.

    b   Remove the six nuts and three screws holding the cover over the Interface board.

The Interface board is now visible.

c To prevent the base assembly from falling, replace two of the just removed nuts onto the top two mounting studs on the SmartScanNG enclosure.

d Store the removed cover, three screws, and remaining four nuts in a safe place until you replace them.

The available loading sensitivities vary depending on which version of Interface board you have and whether resistors are attached to the jumpers or not. The version number is printed on the lower-left edge of the board.

e Note the version number of your Interface board.

The table below lists the highest, middle, and lowest sensitivity for transducer loading for current board versions. Highest is the most sensitive. The jumper's top position is the one closest to the external speaker.

J201 or J202 Jumper Position	Version 1.21 and 1.22 and 1.30 and 1.40 Board
Top	Lowest Sensitivity
Center	Middle Sensitivity
Bottom	Highest Sensitivity

This table above only covers board versions 1.21, 1.22, 1.30, and 1.40. Earlier versions of the board have different jumper positions for each sensitivity level. That is, the available loading sensitivities vary depending on which version of Interface board you have, whether the board was modified, and whether resistors are attached to the jumpers. The version number is printed on the lower-left edge of the board.

f If TO1 is the selected gating transducer and the J201 jumper is currently on the lowest sensitivity position, move it to the middle sensitivity position.

g If TO1 is the selected gating transducer and the J201 jumper is currently on the middle sensitivity position, move it to the highest sensitivity position.

h If TO1 is the selected gating transducer <u>and</u> the J201 jumper is currently <u>on</u> the <u>highest</u> sensitivity position, call STC for help in fixing this problem.

i If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>lowest</u> sensitivity position, move it <u>to</u> the <u>middle</u> sensitivity position.

j If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>middle</u> sensitivity position, move it <u>to</u> the <u>highest</u> sensitivity position.

k If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>highest</u> sensitivity position, call STC for help in fixing this problem.

l Remove the two nuts holding the base assembly to the SmartScanNG enclosure.

m Using the saved six nuts and three screws, reattach the cover over the Interface board.

n Toggle <u>on</u> the DC power switch on the right edge of the SmartScanNG enclosure.

48 If the selected gating transducer appears to be <u>counting</u> <u>extra</u> <u>axles</u> (that is, the transducer that is showing a number of hits more than the true axle count):

a Toggle <u>off</u> the DC power switch on the right edge of the SmartScanNG enclosure.

b Remove the six nuts and three screws holding the cover over the Interface board.

The Interface board is now visible.

c   To prevent the base assembly from falling, replace two of the just removed nuts onto the top two mounting studs on the SmartScanNG enclosure.

d   Store the removed cover, three screws, and remaining four nuts in a safe place until you replace them.

The available loading sensitivities vary depending on which version of Interface board you have and whether resistors are attached to the jumpers or not. The version number is printed on the lower-left edge of the board.

e   Note the version number of your Interface board.

The table below lists the highest, middle, and lowest sensitivity for transducer loading for current board versions. Highest is the most sensitive. The jumper's top position is the one closest to the external speaker.

J201 or J202 Jumper Position	Version 1.21 and 1.22 and 1.30 and 1.40 Board
Top	Lowest Sensitivity
Center	Middle Sensitivity
Bottom	Highest Sensitivity

This table above only covers board versions 1.21, 1.22, 1.30, and 1.40. Earlier versions of the board have different jumper positions for each sensitivity level. That is, the available loading sensitivities vary depending on which version of Interface board you have, whether the board was modified, and whether resistors are attached to the jumpers. The version number is printed on the lower-left edge of the board.

f If TO1 is the selected gating transducer <u>and</u> the J201 jumper is currently <u>on</u> the <u>highest</u> sensitivity position, move it <u>to</u> the <u>middle</u> sensitivity position.

g If TO1 is the selected gating transducer <u>and</u> the J201 jumper is currently <u>on</u> the <u>middle</u> sensitivity position, move it <u>to</u> the <u>lowest</u> sensitivity position.

h If TO1 is the selected gating transducer <u>and</u> the J201 jumper is currently <u>on</u> the <u>lowest</u> sensitivity position, call STC for help in fixing this problem.

i If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>highest</u> sensitivity position, move it <u>to</u> the <u>middle</u> sensitivity position.

j If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>middle</u> sensitivity position, move it <u>to</u> the <u>lowest</u> sensitivity position.

k If TO2 is the selected gating transducer <u>and</u> the J202 jumper is currently <u>on</u> the <u>lowest</u> sensitivity position, call STC for help in fixing this problem.

l Remove the two nuts holding the base assembly to the SmartScanNG enclosure.

m Using the saved six nuts and three screws, reattach the cover over the Interface board.

n Toggle <u>on</u> the DC power switch on the right edge of the SmartScanNG enclosure.

49 To use the serial interface to open the scanner shutters:

a Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2012 21:57 EST
Main Menu
-------------------------------------------------
                    .
                    .
                    .
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

b To go to the System Functions menu, type **N**

c To open the shutters by starting autocalibration, type **G**

The protective shutters in all scanners should open and stay open for three minutes. If it isn't enough time to check the shutters and optics, type **G** again.

50 In each scanner, check if its shutter opened.

51 If any shutter didn't open, fix this problem before proceeding.

52 In each scanner, check for dirty optics.

53 If dirty, clean the scanner optics.

Appendix F - Lens Cleaning of Scanners tells how to clean the scanner optics.

54 If the date and time displayed on the top of the System Functions menu are incorrect, fix them before proceeding.

Section 3.0 - Serial Interface tells how to change the date and time.

55 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 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 <u>and</u> its volume knob is turned to the middle position.

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

This message appears.

```
Starting Radio Test
```

Or select **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 redisplays 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.

Push-to-Talk (PTT)
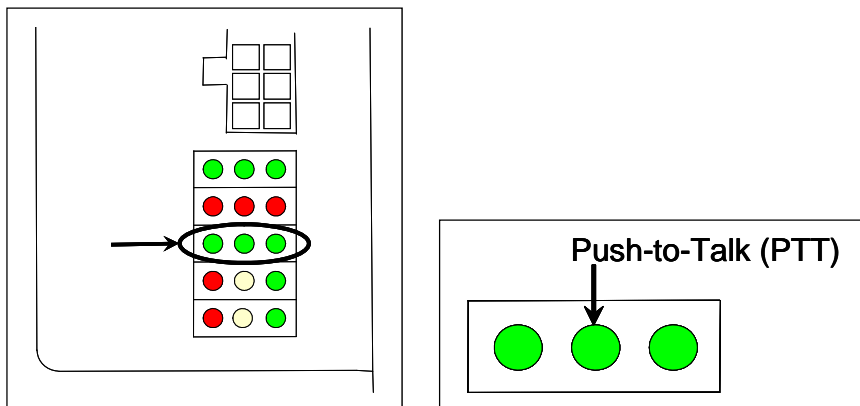
If this LED isn't lit, the system's ability to send a message or tone to the radio might be inhibited. This can happen when one uses the **Radio Inhibit option** on the System Functions menu. If the radio is inhibited, the results of this check are invalid.

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.

56 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.

57 To generate a test train to check simulated alarms:

a From the System Functions menu, select **Generate Test Train**.

This prompt appears.

```
Start Ramp Function?
```

b Type **Y**

The advance input is made active, gating transducer signals are simulated, and heat values are ramped up (increased) and ramped down (decreased) in a predictable sequence to simulate eight Exception Alarms. **This may take a few minutes.** You cannot stop the ramp function by pressing **[Esc]**. When finished, this message appears followed by the System Functions menu.

```
Running Ramp Function...Ramp Function Complete
```

The ramp function simulates two Absolute alarms, two Differential alarms, two Carside Slope alarms, and two Hotwheel alarms. It simulates the Carside and Hotwheel alarms even if detection for those alarms is disabled in the Equipment menu. However, disabled alarms don't appear on the Last Test Train report.

c   Wait until the two LEDs labeled **Shutter** go out.

There is a group of four status LEDs on the lower right side of the chassis. These LEDs show the operation of the solid-state relays used to control the scanner shutters and heaters. The top two are the LEDs labeled **Shutter**.
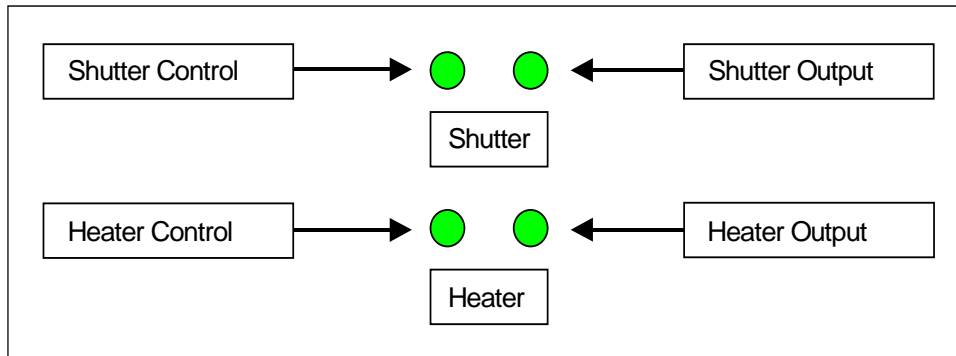
d   Produce a <u>Last</u> <u>Test</u> <u>Train</u> <u>report</u>.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Last Test Train**.

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. In this version of the report, you don't specify a train. The most current ramp train is produced.

e   On the report, check for two Absolute alarms and two Differential alarms.

f   If your report doesn't show two Absolute alarms and two Differential alarms, call STC for help in fixing this problem.

58 To generate a test train to check <u>number</u> <u>of</u> <u>axles</u>:

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 <u>Last</u> <u>Train</u> <u>report</u>.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **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 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.

59 To generate a test train to check <u>hot</u> <u>bearings</u>:

STC recommends that you use the calibrated heat source (2100-810NG) only when the outside (ambient) temperature is above 0°F (-18°C) and below 90°F (32°C). 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.

Heat Source — Type2 Scanner

Heat Source — Type3 Scanner
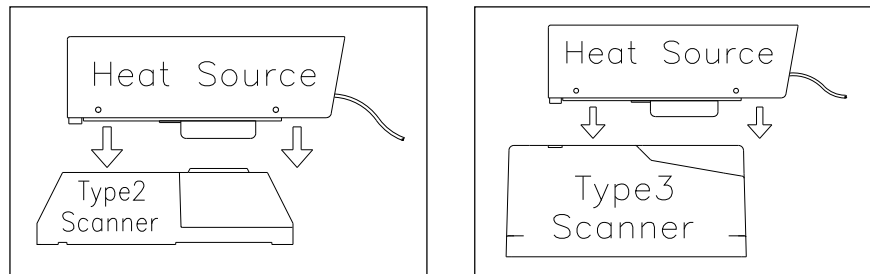
c Quickly stroke the top of each gating transducer with a metal wrench, alternating between TO1 and TO2 for a total of **six** simulated axles.

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 <u>and</u> that they are announced for the <u>correct</u> <u>side</u>.

If you do <u>not</u> 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.

f If you do <u>not</u> hear any Hotbox alarms being announced, fix this problem before proceeding.

g If the Hotbox alarms are announced for the <u>wrong</u> <u>side</u>, 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 the calibrated heat source.

k Store the calibrated heat source and its power cord in the wayside enclosure.

60 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.

61 If the columns aren't within four degrees <u>and</u> if the scanner optics are clean, recalibrate and realign the scanner.

Appendix E - Calibration of Scanners tells how to calibrate the scanners.

62 On the Train Summary report, check the last column of the report.

The last column shows the battery voltage at the time 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

63 If the most recent value isn't between 12.7 and 14.5 volts, investigate and fix any problems before proceeding.

64 On the status panel, look at the second row of LEDs.
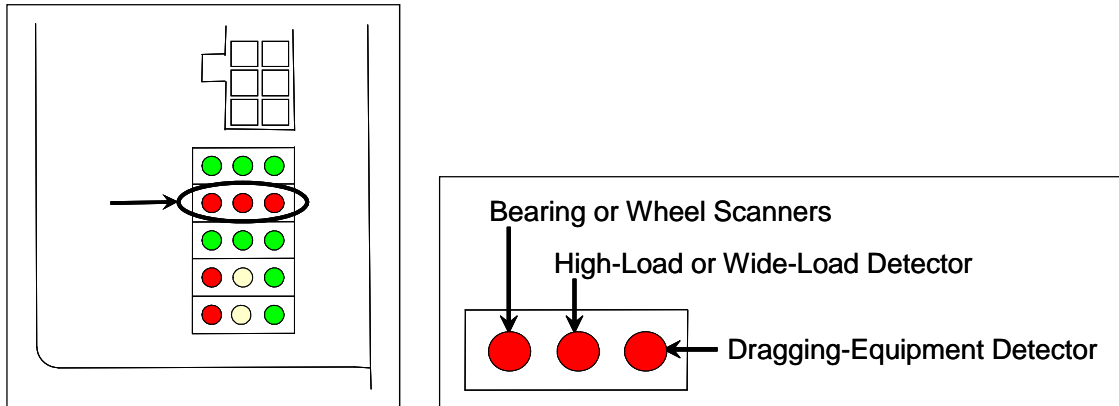
The second row of red LEDs indicates stored defect alarms, including those for bearing/wheel scanners, dragging equipment, and clearance equipment. These LEDs are lit when a defect alarm (associated with one of those pieces of equipment) has been recorded in any of the last 40 trains. Each LED remains lit until there isn't a recorded defect alarm (for the equipment associated with it) in any of the last 40 trains. Note, however, since this is a new installation, you might have <u>less</u> <u>than</u> 40 trains listed on the Exception Summary report. Or, you might have no trains listed. Also, you could have a lit LED and no trains listed if you ran a test train and didn't clear the results.

65 If any LED (on the second row) is lit:

a Produce an <u>Exception</u> <u>Summary</u> <u>report</u>.

Section 4.0 - Producing Reports tells how to produce this report. From the Main menu, select **Exception Summary** report.

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 If any red LED (on the second row) is lit <u>and</u> there are no train entries on the Exception Summary report, call STC for help in fixing this problem.

c Produce an <u>extended</u> <u>Exception</u> <u>Detail</u> <u>report</u> 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.

d Looking in the detail section of each of the produced Exception Detail reports, note every recorded defect alarm.

e If a red LED (on the second row) is lit <u>and</u> there is no corresponding recorded defect alarm on any of the produced Exception Detail reports, call STC for help in fixing this problem.

f If a red LED (on the second row) is lit <u>and</u> there are one or more corresponding recorded defect alarms on half or less <u>and</u> not on the most current five of the produced Exception Detail reports, go to step **66**.

g If a red LED (on the second row) is lit <u>and</u> there are one or more corresponding recorded defect alarms on more than half <u>or</u> on the most current five of the produced Exception Detail reports, check the track hardware and the wiring to the wayside enclosure.

h If problems are found with the hardware, wiring, or both, fix the problems and then go to step **66**.

i If no problems are found with the hardware and wiring, call STC for help in fixing this problem.

66 If this is a <u>multitrack</u> <u>site</u>, repeat steps **18** through **65** for each track (that is, for each SmartScanNG system).

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 <u>mail</u>, 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 may take longer.

By <u>telephone</u>, 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 <u>fax</u>, 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 <u>email</u>, 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, 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

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 Rail Alarm

The Cold Rail 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 <u>greater</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> the temperature set by the **Cold Rail Temperature option** on the Alarm Settings menu, the system generates a Cold Rail alarm. *Section 3.0 - Serial Interface* tells how to view or change the **Cold Rail Temperature option**.

```
STC SmartScanNG, MP/KP-1111.1, Track-South
02/19/2015 21:57 EST
Alarm Settings Menu
-------------------------------------------------
  A) Absolute.................... 200
  B) Warm....................... 170
  C) Differential............... 115
  D) Hot Wheel.................. 700
  E) Carside Slope............. 1.31
  F) Carside Minimum............ 155
  G) Cold Rails..................  2
  H) Cold Rail Temp.............. 10
  I) Cold Res Counter............  3
  J) Res Test: Minimum Rail Avg... 25
  K) Res Test: Minimum Wheel Avg.. 28
  L) Warm Bearing Trigger.......  72
  M) Warm Wheel Trigger......... 361
  X) Exit
```

The **maximum number** (per railside) of consecutive trains, having Cold Rail alarms, allowed before generating a Successive Cold Rails Exceeded alarm is set by the **Cold Rails option** on the Alarm Settings menu. If the number of consecutive trains bearing identical Cold Rail alarms equals or exceeds the cold-rail-alarm limit, the System Alarms section of the Train Detail and Exception Detail reports displays the message "Successive Cold Rails Exceeded." Successive Cold Rails Exceeded alarms are covered in the next appendix. *Section 3.0 - Serial Interface* tells how to view or change the **Cold Rails option**.

```
                    •
                    •
    F) Carside Minimum............. 155
    G) Cold Rails..................  2
    H) Cold Rail Temp.............. 10

                    •
                    •
                    •
```

A.3 Cold 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 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. If the recorded resistor temperature meets or exceeds the absolute-alarm limit, the firmware cancels any previously flagged Cold Resistor alarms. *Section 3.0 - Serial Interface* tells how to view or change the **Absolute option**.

```
    STC SmartScanNG, MP/KP-1111.1, Track-South
    02/19/2015 21:57 EST
    Alarm Settings Menu
    -----------------------------------------------
      A) Absolute.................... 200
      B) Warm....................... 170
      C) Differential............... 130

                    •
                    •
```

The **maximum number** (per railside) of consecutive trains, having Cold Resistor alarms, allowed before generating a Successive Cold Resistors Exceeded alarm is set by the **Cold Resistor Counter option** on the Alarm Settings menu. Successive Cold 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 and current battery voltage. 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 <u>less</u> <u>than</u> 24%, no Cold Resistor alarm is generated. If the correction factor is <u>in the range</u> of 24% to 40%, the Cold Resistor alarm is treated as a **system alarm**. If the correction factor for a given rail on any train is <u>greater</u> <u>than</u> 40%, the Cold Resistor alarm is treated as an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 76% of the *required* resistor value, two additional checks will be performed. Either of these checks can generate a Cold 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 Rail alarm. When no wheel on a given rail generates a delta temperature reading <u>greater</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> 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 **maximum number** (per railside) of consecutive trains, having Cold Wheel Scanner alarms, allowed before generating a Successive Cold Wheels Exceeded alarm is set by the **Cold Rails option** on the Alarm Settings menu. Successive Cold Wheels Exceeded alarms are covered in the next appendix. *Section 3.0 - Serial Interface* tells how to view or change the **Cold Rails option**.

```
                    •
                    •
                    •
    F) Carside Minimum............ 155
    G) Cold Rails..................  2
    H) Cold Rail Temp.............. 10
                    •
                    •
                    •
```

A.5 Cold Wheel Scanner Resistor Alarm

The Cold Wheel Scanner Resistor alarm represents the wheel scanner's equivalent of the bearing scanner's Cold Resistor alarm. Evaluation of Cold Wheel Scanner Resistor alarm mimics the same logic used in the evaluation of Cold Resistor alarms. In this way, the system confirms the scanner's ability to read alarm level heat.

The **maximum number** (per railside) of consecutive trains, having Cold Wheel Scanner 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 <u>less</u> <u>than</u> 24%, no Cold Wheel Scanner Resistor alarm is generated. If the correction factor is <u>in</u> <u>the</u> <u>range</u> of 24% to 40%, the Cold Wheel Scanner Resistor alarm is treated as a **system alarm**. If the correction factor for a given rail on any train is <u>greater</u> <u>than</u> 40%, the Cold Wheel Scanner Resistor alarm is treated as an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 76% of the required resistor value, two additional checks will be performed. Either of these checks can generate a Cold Wheel Scanner 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 <u>can</u> <u>be</u> <u>either</u> a System Alarm or an Integrity Failure, depending on the presence of a Very Slow Train alarm. If a highrange transducer miscount occurs on a train that also contains a Very Slow Train 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. 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 <u>float</u> <u>voltage</u> of at least 11.8 volts, but <u>less</u> <u>than</u> 12.6 volts, on the standby battery. (The **Dead Battery alarm** indicates a <u>float</u> <u>voltage</u> of <u>less</u> <u>than</u> 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.

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.

A.13 Rail Resistor Test Overridden Alarm

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

```
                    •
                    •
                    •
    I) Cold Res Counter.............  3
    J) Res Test: Minimum Rail Avg... 25
    K) Res Test: Minimum Wheel Avg.. 28
                    •
                    •
```

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

If the average heats are <u>greater</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> this value, bearing temperatures are compared on an axle-by-axle basis. This second check determines if <u>more</u> <u>than</u> half of the temperatures read by the bearing scanner with the low-read resistor value are 70% or <u>less</u> <u>than</u> 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.

A.14   Reverse Direction Detected Alarm

Trains that are being scanned correctly will have axles whose <u>on times</u> (when an axle is between the gating transducers) are <u>less than</u> their <u>off times</u> (when no axle is 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 <u>greater than</u> the off time. If the axle's on time is <u>greater than</u> 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 Reverse Direction Detected 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   Very Slow Train Alarm

The Very Slow Train 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 <u>greater</u> <u>than</u> 76% of the required resistor value, two additional checks will be performed. The average heats for both <u>wheels</u> are tested against the value set by the **Resistor Test Minimum Wheel Average option** on the Alarm Settings menu.

If the average heats are <u>less</u> <u>than</u> 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 <u>greater</u> <u>than</u> <u>or</u> <u>equal</u> <u>to</u> this value, wheel temperatures are compared on an axle-by-axle basis. This second check determines if <u>more</u> <u>than</u> half of the temperatures read by the wheel scanner with the low-read resistor value are 70% or <u>less</u> <u>than</u> 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.

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.

Appendix B
Integrity Failures

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 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 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.

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 <u>less</u> <u>than</u> 24%, no Cold Resistor alarm is generated. If the correction factor is <u>in</u> <u>the</u> <u>range</u> of 24% to 40%, the Cold Resistor alarm is treated as a **system alarm**. If the correction factor for a given rail on any train is <u>greater</u> <u>than</u> 40%, the Cold Resistor alarm is treated as an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 76% of the *required* resistor value, two additional checks will be performed. Either of these checks can generate a Cold Resistor alarm. For more information on these checks, see **A.13 Rail Resistor Test Overridden Alarm**.

B.2 Cold Wheel Scanner Resistor Alarm

The Cold Wheel Scanner Resistor alarm represents the wheel scanner's equivalent of the bearing scanner's Cold Resistor alarm. Evaluation of Cold Wheel Scanner Resistor alarm mimics the same logic used in the evaluation of Cold Resistor alarms. In this way, the system confirms the scanner's ability to read alarm level heat.

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 <u>less</u> <u>than</u> 24%, no Cold Wheel Scanner Resistor alarm is generated. If the correction factor is <u>in</u> <u>the</u> <u>range</u> of 24% to 40%, the Cold Wheel Scanner Resistor alarm is treated as a **system alarm**. If the correction factor for a given rail on any train is <u>greater</u> <u>than</u> 40%, the Cold Wheel Scanner Resistor alarm is treated as an **integrity failure**.

During the post-train resistor test, if a read resistor value isn't <u>greater</u> <u>than</u> 76% of the required resistor value, two additional checks will be performed. Either of these checks can generate a Cold Wheel Scanner 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 <u>float</u> <u>voltage</u> of <u>less</u> <u>than</u> 11.8 volts on the standby battery. (The **Low Battery alarm** indicates a <u>float</u> <u>voltage</u> of at least 11.8 volts, but <u>less</u> <u>than</u> 12.6 volts, on the standby battery.)

B.4   Dead Resistor Alarm

The bearing scanner's Dead Resistor alarm indicates the presence of two separate conditions. First, the train contains a Cold Rail alarm on a given rail. Second, the recorded temperature for the bearing scanner's resistor on that rail fell <u>below</u> 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 Rails.................  2
     H) Cold Rail Temp.............. 10
     I) Cold Res Counter............  3
     J) Res Test: Minimum Rail Avg... 25
     K) Res Test: Minimum Wheel Avg.. 28
     L) Warm Bearing Trigger........  72
     M) Warm Wheel Trigger......... 361
     X) Exit
```

B.5 Dead Wheel Scanner Resistor Alarm

The wheel scanner's Dead Wheel Scanner 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 <u>below</u> 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 Rails...................  2
    H) Cold Rail Temp............... 10
    I) Cold Res Counter............  3
    J) Res Test: Minimum Rail Avg... 25
    K) Res Test: Minimum Wheel Avg.. 28
    L) Warm Bearing Trigger........  72
    M) Warm Wheel Trigger.......... 361
    X) Exit
```

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 <u>can</u> be <u>either</u> a System Alarm or an Integrity Failure, depending on the presence of a Very Slow Train alarm. If a highrange transducer miscount occurs on a train that also contains a Very Slow Train 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/active before the first wheel on the train was detected by the gating transducers. This would indicate that the dragging equipment detector input to the SmartScan NG was active (e.g. open circuit) at the time that the track circuit (or advance transducer) was activated.

B.9   Stuck High-Load Detector Pretrain Alarm

The Stuck High-Load Detector Pretrain alarm indicates that, before the first wheel on the train was detected by the gating transducer, the high-load detector was stuck. This would indicate that the high-load detector input to the SmartScan NG was active (e.g. open circuit) at the time that the track circuit (or advance transducer) was activated. This would indicate that the high-load detector input to the SmartScan NG was active (e.g. open circuit) at the time that the track circuit (or advance transducer) was activated.

B.10   Stuck Wide-Load Detector Pretrain Alarm

The Stuck Wide-Load Detector Pretrain alarm indicates that, before the first wheel on the train was detected by the gating transducer, the wide-load detector was stuck. This would indicate that the wide-load detector input to the SmartScan NG was active (e.g. open circuit) at the time that the track circuit (or advance transducer) was activated.

B.11   Successive Cold Rails Exceeded Alarm

The Successive Cold Rails Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Rail alarms on the same railside, have passed a site. The maximum number (per railside) of consecutive trains having Cold Rail alarms allowed before generating an Integrity Failure alarm is set by the **Cold Rails option** on the Alarm Settings menu. *Section 3.0 - Serial Interface* tells how to view or change this value.

```
                  •
                  •
                  •
   F) Carside Minimum............. 155
   G) Cold Rails..................   2
   H) Cold Rail Temp...............  10
   I) Cold Res Counter.............   3
   J) Res Test: Minimum Rail Avg...  25
   K) Res Test: Minimum Wheel Avg..  28
   L) Warm Bearing Trigger........   72
   M) Warm Wheel Trigger.......... 361
   X) Exit
```

Under normal circumstances, Cold Rail conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Rail alarm equals or exceeds the **Cold Rails 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 Rails Exceeded."

B.12 Successive Cold Resistors Exceeded Alarm

The Successive Cold Resistors Exceeded alarm indicates that at least a preset maximum number of consecutive trains, all having Cold Resistor alarms on the same railside, have passed a site. The maximum number (per railside) of consecutive trains having Cold Resistor alarms allowed before generating an Integrity Failure alarm is set by 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 Rail Temp............... 10
   I) Cold Res Counter.............  3
   J) Res Test: Minimum Rail Avg... 25
                •
                •
```

Under normal circumstances, Cold Resistor conditions represent System Alarms, not Integrity Failures. However, if the number of consecutive trains bearing the same Cold Resistor alarm equals or exceeds the **Cold Resistor 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 Resistors Exceeded."

B.13 Successive Cold Wheels Exceeded Alarm

The Successive Cold Wheels 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 Rails option** on the Alarm Settings menu. *Section 3.0 - Serial Interface* tells how to view or change this value.

```
                •
                •
   F) Carside Minimum............. 155
   G) Cold Rails..................  2
   H) Cold Rail Temp.............. 10
                •
                •
```

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 <u>equals</u> <u>or</u> <u>exceeds</u> the **Cold Rails 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 Wheels 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 Rail Temp............... 10
    I) Cold Res Counter.............  3
    J) Res Test: Minimum Rail Avg... 25

                    •
                    •
```

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 <u>equals</u> <u>or</u> <u>exceeds</u> the **Cold Resistor 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.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
                        •
                        •
                        •
    M) Enter Pass-Thru Mode
    N) System Functions
    O) DSR Records
    P) DSR Records - Exception Trains
    X) Exit
```

2 To go to the System Functions menu, type **N**

You will be prompted to type in the word "system".

The System Functions menu appears.

```
    STC SmartScanNG, MP/KP-1794.5, Track-Single
    02/19/2015 21:57 EST
    System Functions Menu
    ------------------------------------------------
     A) Radio Test
     B) Vocabulary Test
     C) Ramp Function
     D) Radio Inhibit
     E) Manual Test Mode
     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
     X) Exit
```

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.

At single-track sites, the text of the message is "Testing, Iowa Interstate, milepost (*milepost number*), testing, one, two, three, four, five, four, three, two, one, testing." At multitrack sites, the text of the message is "Testing, Iowa Interstate, milepost (*milepost number*), 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**.

The text of the message is "zero, one, two, three, four, five, six, **beep**, seven, eight, nine, not-working, **beep**, Iowa Interstate, milepost, main-3, system-working, no-defects, main-1, main-2, rebroadcast, hotwheel, defect, axle, dragging-equipment-near, north, south, third, fourth, rail, east, west, track, through, hotbox, high-wide-near, you-have-a-defect, testing, inspect-from, train-too-slow, total-axles, speed, temperature, length, minus, point, first, second, inspect-remainder-of- train, left, right, side, load, middle, high-load, wide-load, power-off, excess-alarms, repeat, X, Y, Z, total-cars, detector-out, detector-alarm, scanner-resistor-test, beginning-in, minutes, 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, car-ID, no, critical-alarm."

C.3 Ramp Function

Selection of the **Ramp Function option** generates a test train. It simulates at least two Absolute alarms, two Differential alarms, two Carside Slope alarms, and two Hotwheel alarms. It simulates the Carside and Hotwheel alarms even if detection for those alarms is disabled in the Equipment menu.

You cannot stop the ramp function by pressing **[Esc]**.

The data generated for this test train is stored in the Test Train directory, which contains data for the last test train only. The Last Test Train report gets its data from this directory.

C.4 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 <u>not</u> <u>through</u> the radio. This feature may be overridden by recalling this submenu and then typing **N**.

C.5 Manual Test Mode

Selection of the **Manual Test Mode option** opens all the shutters and simulates transducer pulses for about one minute. 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 <u>cannot</u> stop this test by pressing **[Esc]** or any other key.

The data generated for this test train is stored in the Test Train directory, which contains data for the last test train only. The Last Test Train report gets its data from this directory.

C.6 1KHz Test Tone

Selection of the **1KHz Test Tone option** generates a continuous tone for about 10 seconds through the speaker and the radio. Using this option lets you verify that the speaker and radio are working properly.

C.7 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.8 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 <u>or</u> 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.9 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.

C.10 Delete All Stored Train Data

Selection of the **Delete All Stored Train Data option** erases all of the stored train data. This includes 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.

C.11 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.

Appendix D
Replacement of Scanner Cover-and-Module Assemblies

There are **type2** bearing scanners and **type2** 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 addition of a **plastic attenuation plug** on the wheel scanner cover, 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.

There are also **type3** bearing scanners and **type3** 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 **type2** bearing scanner.
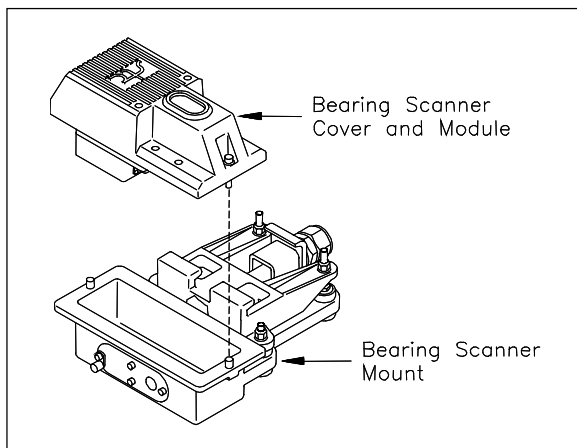
The figure below shows the major parts of a **type3** bearing scanner.

Bearing Scanner
Cover and Module

Bearing Scanner
Mount
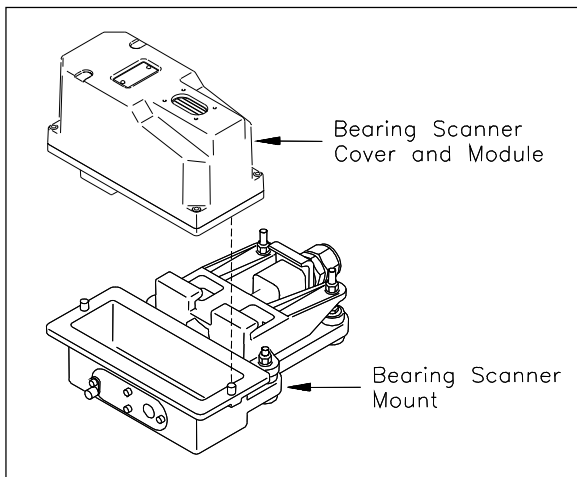
To <u>replace</u> a **type2/type3** bearing scanner cover-and-module assembly:

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 <u>Turn</u> <u>off</u> all power to the scanners.

This requires <u>turning</u> <u>off</u> the DC power switch on the SmartScanNG enclosure <u>and</u> <u>unplugging</u> the AC power cord on the bottom of the SmartScanNG enclosure.

4 Using a T-handle 1/4-inch hex-wrench, loosen the socket-head-cap screws on the cover of the bearing scanner.

The **type2** bearing scanner has <u>two</u> socket-head-cap screws that attach the weather cover to the mount.
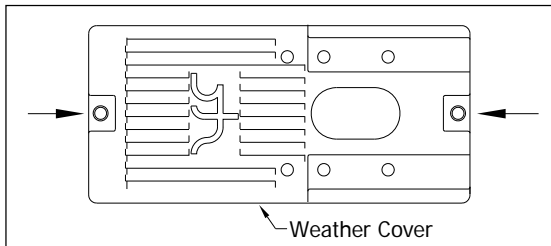
Weather Cover

The **type3** bearing scanner has six. <u>Four</u> that attach the weather cover to the mounting plate and <u>two</u> that attach the mounting plate to the mount.

Weather Cover

Mounting Plate
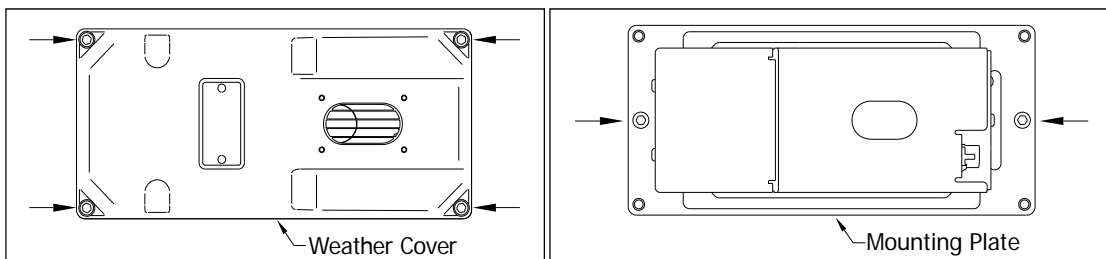
5 Separate the bearing scanner cover-and-module assembly from its mount.

6 If this is a **type3** bearing scanner, disconnect the heater wiring plug.

7 Disconnect the scanner cable connector from the scanner box connector.
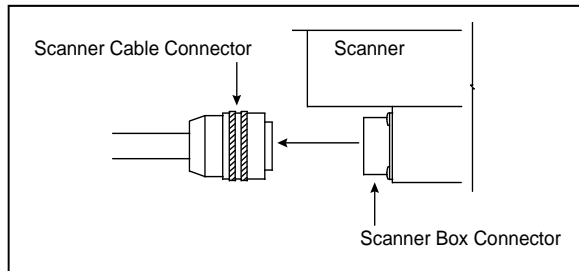
8 Store the removed scanner cover-and-module assembly in a safe place until you return it to STC for repair.

9 Attach the scanner cable connector to the scanner box connector of the new scanner cover-and-module assembly.

10 If this is a **type2** bearing scanner:

   a With the hole on top of the bearing scanner cover facing north or east, set the cover-and-module assembly onto its mount.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>two</u> socket-head-cap screws.

11 If this is a **type3** bearing scanner:

   a With the hole on top of the bearing scanner cover facing north or east, set the <u>mounting</u> <u>plate</u> back onto its scanner mount.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>two</u> socket-head-cap screws.

   c Reconnect the heater wiring plug.

   d With the hole on top of the bearing scanner cover facing north or east, set the <u>weather</u> <u>cover</u> back onto its mounting plate.

   e Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>four</u> socket-head-cap screws.

The top view of the **type2** bearing scanner weather cover is shown below.
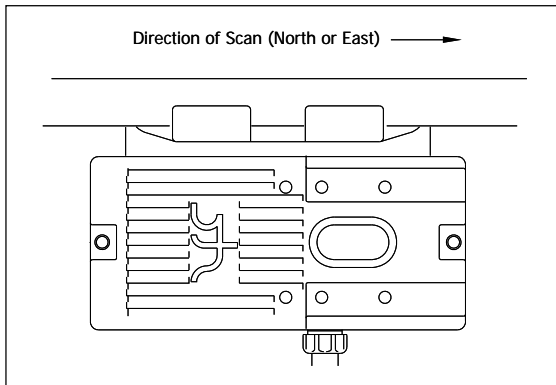
The top view of the **type3** bearing scanner mounting plate and weather cover are shown below.
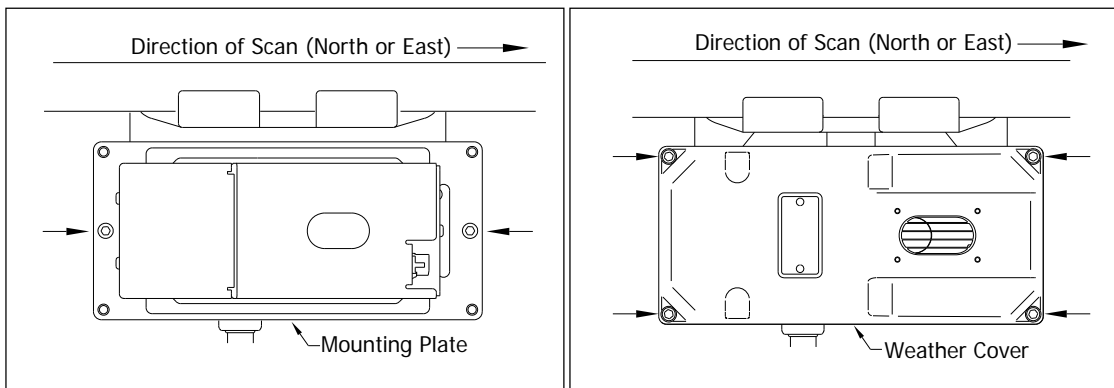
12 Turn on power to the scanners.

An assembled **type2** bearing scanner looks like this.
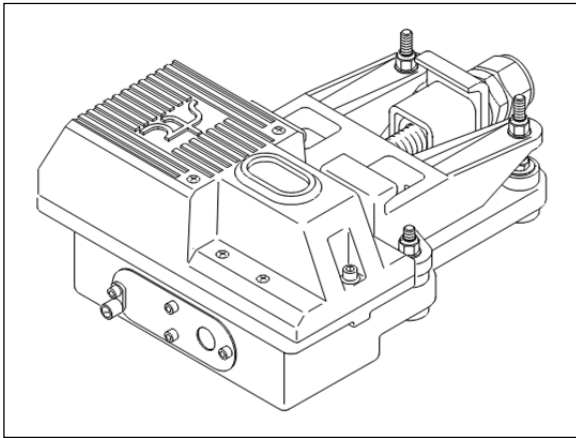
An assembled **type3** bearing scanner looks like this.
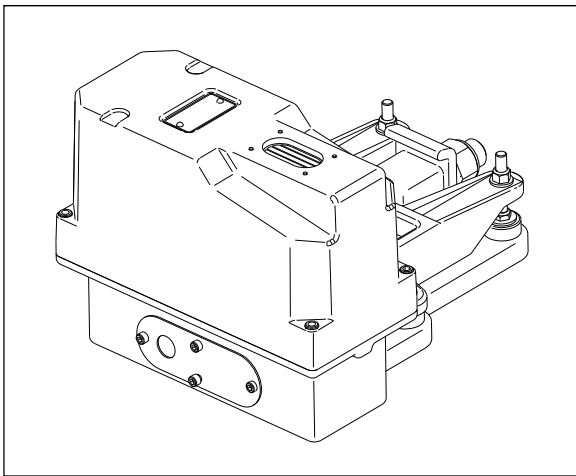
D.2   Wheel Scanners

The figure below shows the major parts of a **type2** wheel scanner.
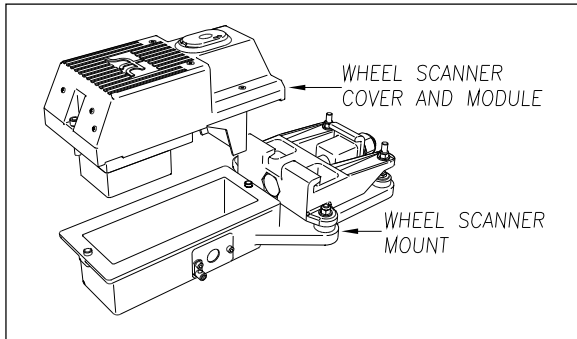
The figure below shows the major parts of a **type3** wheel scanner.
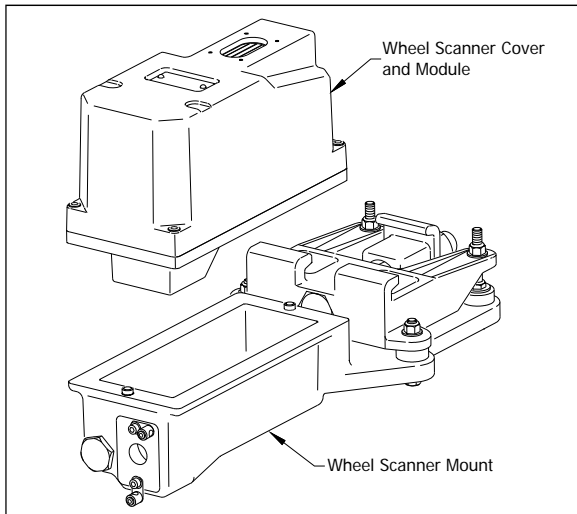
To replace a **type2/type3** wheel scanner cover-and-module assembly:

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 socket-head-cap screws on the cover of the wheel scanner.

The **type2** wheel scanner has two socket-head-cap screws that attach the weather cover to the mount.
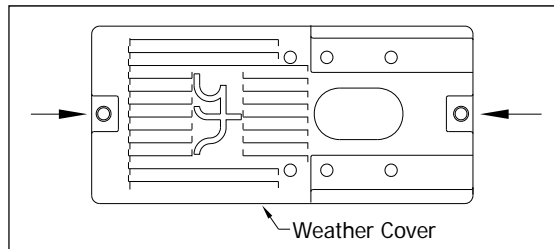
Weather Cover

The **type3** wheel scanner has six. Four that attach the weather cover to the mounting plate and two that attach the mounting plate to the mount.

Weather Cover
Mounting Plate
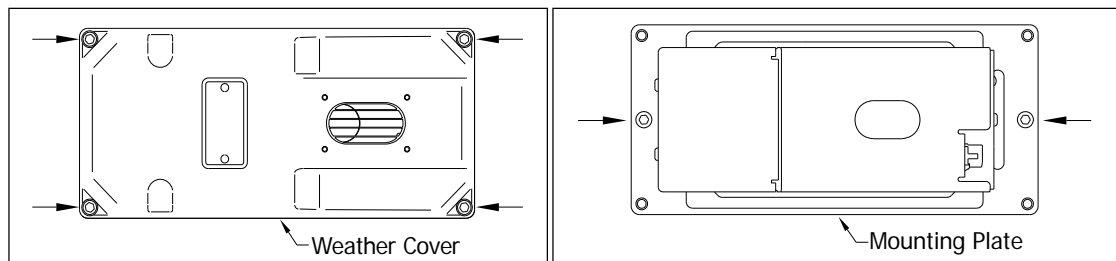
5 Separate the wheel scanner cover-and-module assembly from its mount.

6 If this is a **type3** wheel scanner, disconnect the heater wiring plug.

7 Disconnect the scanner cable connector from the scanner box connector.

Scanner Cable Connector
Scanner
Scanner Box Connector
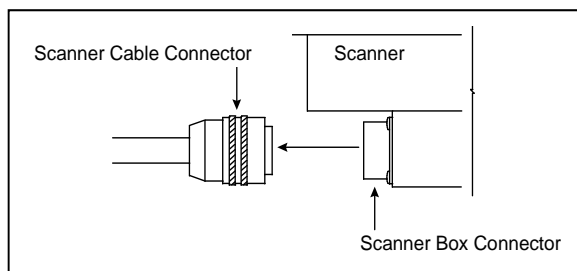
8 Store the removed scanner cover-and-module assembly in a safe place until you return it to STC for repair.

9 Attach the scanner cable connector to the scanner box connector (on the new scanner cover-and-module assembly).

10 If this is a **type2** wheel scanner:

    a With the hole on top of the wheel scanner cover facing the center of the track, set the cover-and-module assembly onto its mount.

    b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the two socket-head-cap screws.

11 If this is a **type3** wheel scanner:

   a With the hole on top of the wheel scanner cover facing the center of the track, set the <u>mounting plate</u> back onto its scanner mount.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>two</u> socket-head-cap screws.

   c Reconnect the heater wiring plug.

   d With the hole on top of the wheel scanner cover facing the center of the track, set the <u>weather cover</u> back onto its mounting plate.

   e Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>four</u> socket-head-cap screws.

12 <u>Turn on</u> power to the scanners.

An assembled **type2** wheel scanner looks like this.
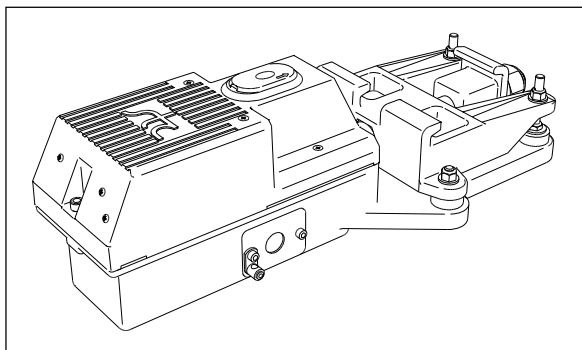
An assembled **type3** wheel scanner looks like this.
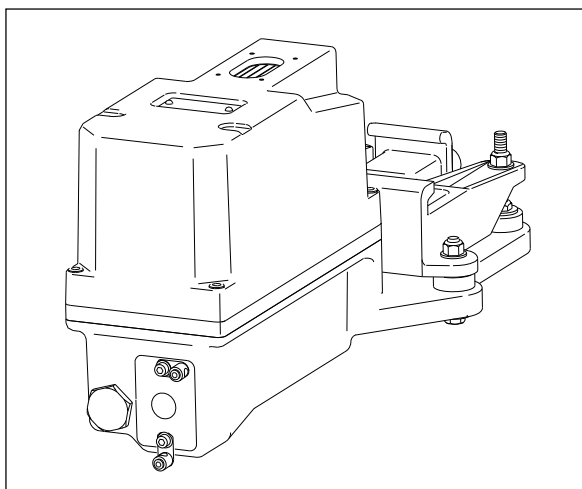
Appendix E
Calibration of Scanners

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 0°F (-18°C) and below 90°F (32°C). 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 <u>calibrate</u> a **type2/type3** 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 <u>off</u>.

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 <u>live</u> <u>AC</u> <u>present</u>.

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 <u>less</u> <u>than</u> 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.
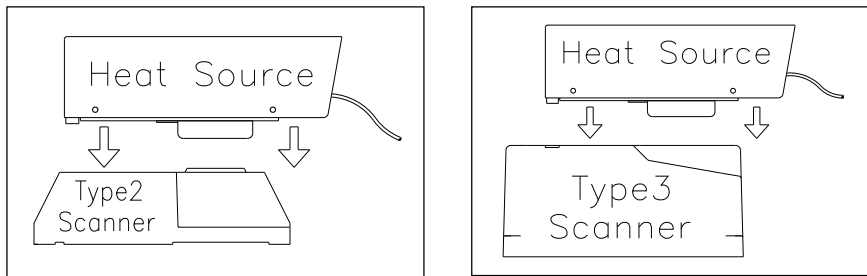
10 Be sure that a computer is plugged into COM1 (on the side of the Controller module), that it is turned on, that it has appropriate communications software installed, that the communications software is set to use full duplex, that the baud rate is set to 19,200, and that a LOG file is opened.

11 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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
  J) Event Log
  K) Maintenance Report
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

12 To go to the System Functions menu, type **N**

The System Functions menu appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
-------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function
 D) Radio Inhibit
 E) Manual Test Mode
 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
 X) Exit
```

The **Auto-Calibration option** is used to calibrate the system's pyrometer interface circuitry.

13 To start autocalibration, type **G**

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

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, <u>greater</u> <u>than</u> 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 178F to 182F, 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 0°F (-18°C) and below 90°F (32°C). 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 **type2/type3** 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 If you are calibrating a **type2** wheel scanner, remove the attenuation plug from the weather cover.
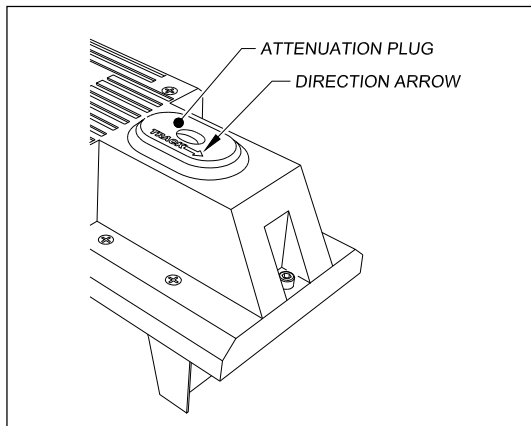
10 If you are calibrating a **type3** wheel scanner, replace the red filter frame with the black one.
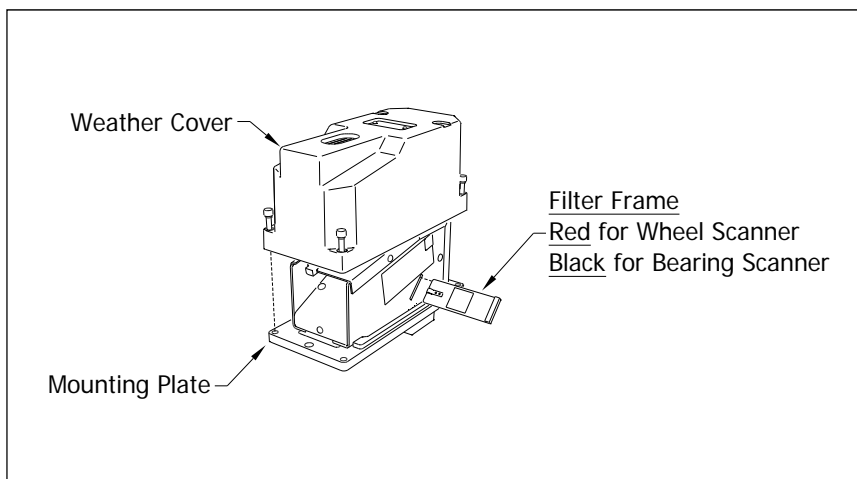
You'll need to remove the weather cover before you can replace the filter frame. Four socket-head-cap screws attach the weather cover to the mounting plate. Before continuing, be sure that the <u>black</u> filter frame is securely in place and that the four socket-head-cap screws on the weather cover are completely tight.

11 With the power cord to the front of the scanner, place the calibrated heat source on the wheel scanner.
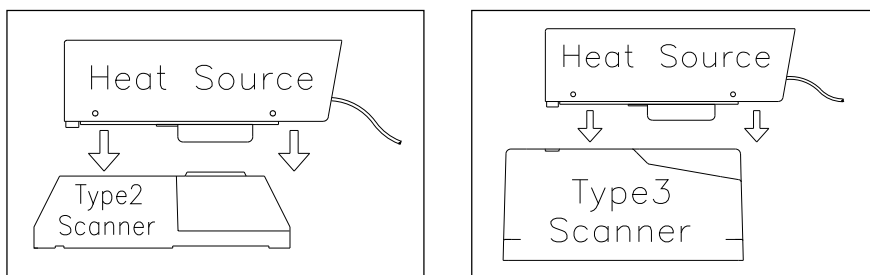
12 Be sure that a computer is plugged into COM1 (on the side of the Controller module), that it is turned on, that it has appropriate communications software installed, that the communications software is set to use full duplex, that the baud rate is set to 19,200, and that a LOG file is opened.

13 Using the serial interface, display the Main menu.

Section 3.0 - Serial Interface tells how to display the Main menu. The Main menu looks like this.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
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
  J) Event Log
  K) Maintenance Report
  L) Setup
  M) Enter Pass-Thru Mode
  N) System Functions
  O) DSR Records
  P) DSR Records - Exception Trains
  X) Exit
```

14 To go to the System Functions menu, type **N**

The System Functions menu appears.

```
STC SmartScanNG, MP/KP-1794.5, Track-Single
02/19/2015 21:57 EST
System Functions Menu
-------------------------------------------------
 A) Radio Test
 B) Vocabulary Test
 C) Ramp Function
 D) Radio Inhibit
 E) Manual Test Mode
 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
 X) Exit
```

The **Auto-Calibration option** is used to calibrate the system's pyrometer interface circuitry.

15 To start autocalibration, type **G**

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 <u>or</u> remove the heat source from the wheel scanner.

Before the shutters are opened, if you get a signal level, <u>greater than</u> 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°F ± 6°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.

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

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

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

19 If you just calibrated a **type2** wheel scanner, replace the attenuation plug.

The attenuation plug has a direction arrow molded into the top of the plug. This arrow should be pointing toward the rail.

20 If you just calibrated a **type3** wheel scanner, replace the black filter frame with the red one. 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.

NOTE: 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. **The red filter frame MUST be in place during resistor temperature baseline acquisition.**

21 Store the calibrated heat source and its power cord in the wayside enclosure.

Appendix F
Lens Cleaning of Scanners

This appendix tells how to clean the optics in the scanners.

F.1 Type2 Scanners

To clean the optics in the **type2** scanners:

1 Be sure that you have on hand a T-handle 1/4-inch hex-wrench and a 9/64-inch Allen 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 two socket-head-cap screws that attach the weather cover to the mount.
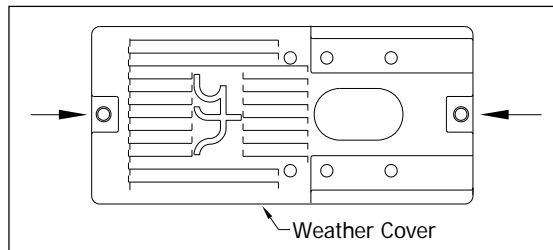
4 Separate the scanner cover-and-module assembly from its mount.

5 Disconnect the scanner cable connector from the scanner box connector.
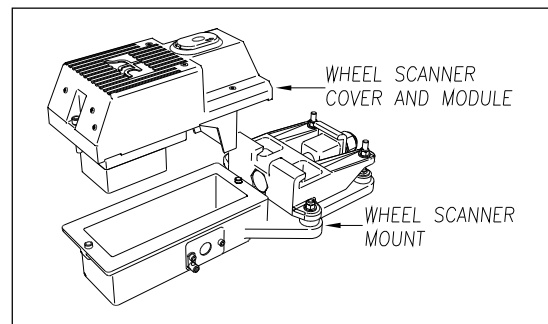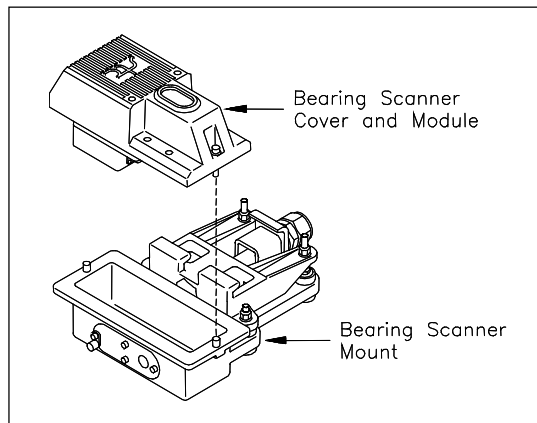
Scanner Cable Connector   Scanner

Scanner Box Connector
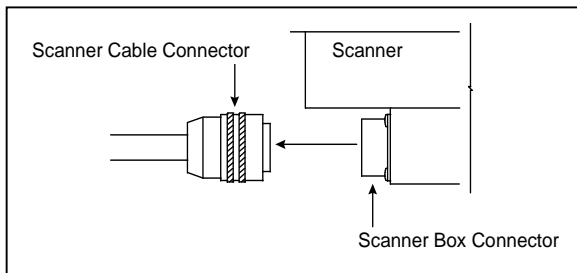
6 Turn the cover-and-module assembly upside down.

7 Using the 9/64-inch Allen wrench, remove the <u>four</u> socket-head-cap screws from the bottom panel.
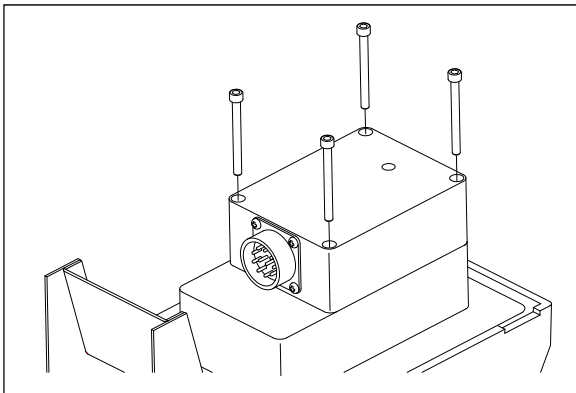
8 Store the socket-head-cap screws in a safe place until you replace it.

9 To expose the internal scanner module and lens assembly, separate the bottom panel of the scanner from the main body.
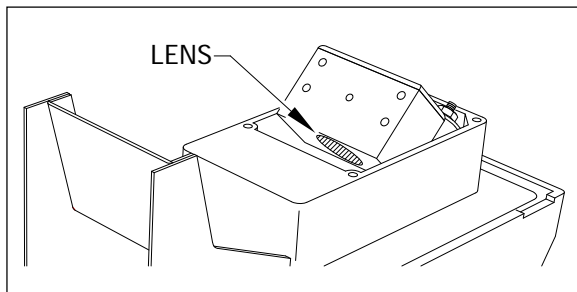
LENS

10 Using a <u>soft</u> <u>dry</u> <u>cloth</u>, remove any accumulated dirt or grit.

Be careful not to abrade or scratch the surface of the lens.

11 Using a <u>soft</u> <u>clean</u> <u>cloth</u>, apply a mild cleaning solution such a Vallen V8L or any similar solution that would typically be used for cleaning eyeglasses.

12 Gently wipe the lens surface.

Pay close attention to the area around the perimeter of the lens. It is important that the entire surface of the lens is clean.

13 To restore a uniform surface, gently polish the lens surface with a <u>clean</u> <u>dry</u> <u>cloth</u>.

14 Reposition the bottom panel.

15 Replace the <u>four</u> socket-head-cap screws and tighten by hand.

16 Using the 9/64-inch Allen wrench, tighten the <u>four</u> socket-head-cap screws until they are completely tight.

Be sure that the screws are uniformly tightened.

17 Attach the scanner cable connector to the scanner box connector.

18 If this is a **type2 bearing scanner**:

   a With the hole on top of the bearing scanner cover facing north or east, set the cover-and-module assembly onto its mount.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>two</u> socket-head-cap screws.

19 If this is a **type2 wheel scanner**:

   a With the hole on top of the wheel scanner cover facing the center of the track, set the cover-and-module assembly onto its mount.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>two</u> socket-head-cap screws.

20 <u>Turn</u> <u>on</u> power to the scanners.

F.2 Type3 Scanners

To clean the optics in the **type3** scanners:

1 Be sure that you have on hand a T-handle 1/4-inch hex-wrench.

2 <u>Turn</u> <u>off</u> all power to the scanners.

This requires <u>turning</u> <u>off</u> the DC power switch on the SmartScanNG enclosure <u>and</u> <u>unplugging</u> the AC power cord on the bottom of the SmartScanNG enclosure.

3 Using the T-handle 1/4-inch hex-wrench, loosen the <u>four</u> socket-head-cap screws that attach the weather cover to the mounting plate.
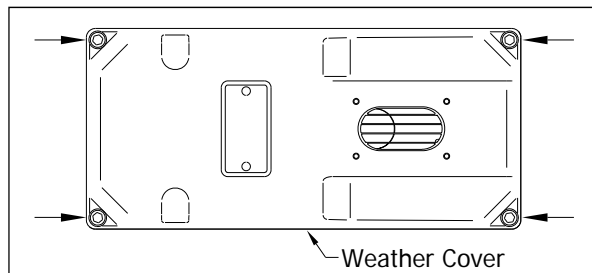
Weather Cover

4 Remove the <u>weather</u> <u>cover</u> from its mounting plate.

Be careful not to damage the electrical connection for the cover heaters.

BEARING SCANNER COVER

BEARING SCANNER MOUNT, MOUNTING PLATE, AND MODULE

Wheel Scanner Cover

Wheel Scanner Mount, Mounting Plate, and Module
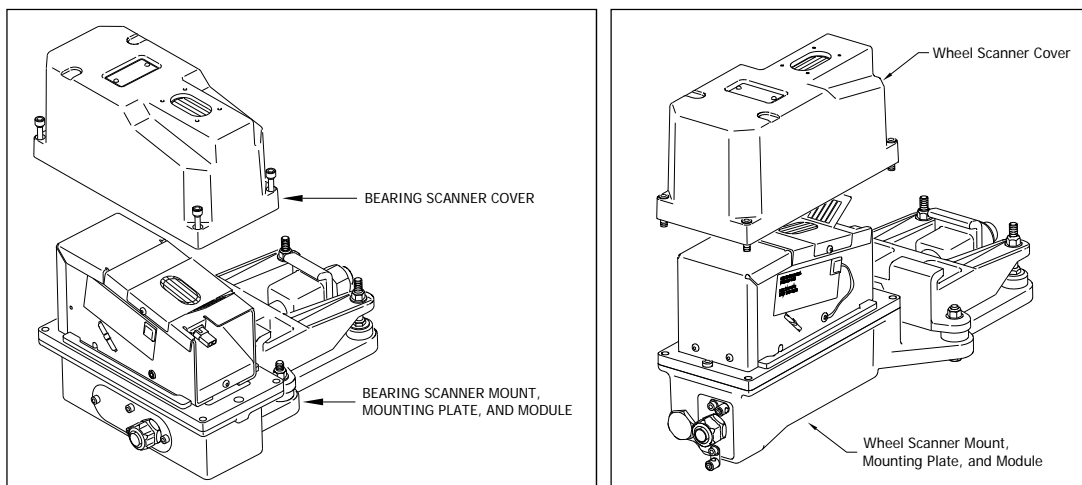
5 Disconnect the heater wiring plug.

On the side of the scanner module, you'll find a metal tab that protrudes about 1/4 inch outside the module.

Weather Cover

Filter Frame
<u>Red</u> for Wheel Scanner
<u>Black</u> for Bearing Scanner

Mounting Plate
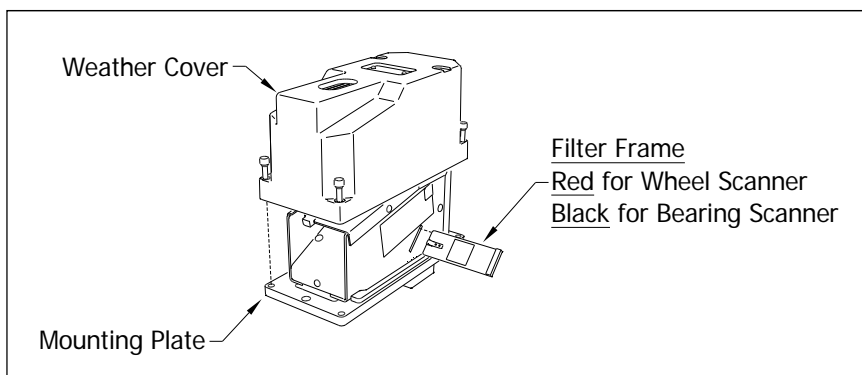
6 Grasp the tab and pull the filter frame out of the scanner module.

7 Using a <u>soft</u> <u>dry</u> <u>cloth</u>, remove any accumulated dirt or grit.

Be careful not to abrade or scratch the surface of the lens.

8 Using a <u>soft</u> <u>clean</u> <u>cloth</u>, apply a mild cleaning solution such a Vallen V8L or any similar solution that would typically be used for cleaning eyeglasses.

9 Gently wipe the lens surface.

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 To restore a uniform surface, gently polish the lens surface with a <u>clean</u> <u>dry</u> <u>cloth</u>.

11 Insert the filter frame back in its receptacle.

Be sure that the frame is inserted correctly. To assure proper insertion, look at the glass portion of the filter. The reflective side should be facing toward the opening in the top of the module.

12 Reconnect the heater wiring plug.

13 If this is a **<u>type3</u> bearing scanner**:

   a With the hole on top of the bearing scanner cover facing north or east, set the weather cover back onto its mounting plate.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>four</u> socket-head-cap screws.

14 If this is a **<u>type3</u> wheel scanner**:

   a 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.

   b Using the T-handle 1/4-inch hex-wrench, uniformly tighten the <u>four</u> socket-head-cap screws.

15 <u>Turn</u> <u>on</u> 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 <u>before</u> 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).
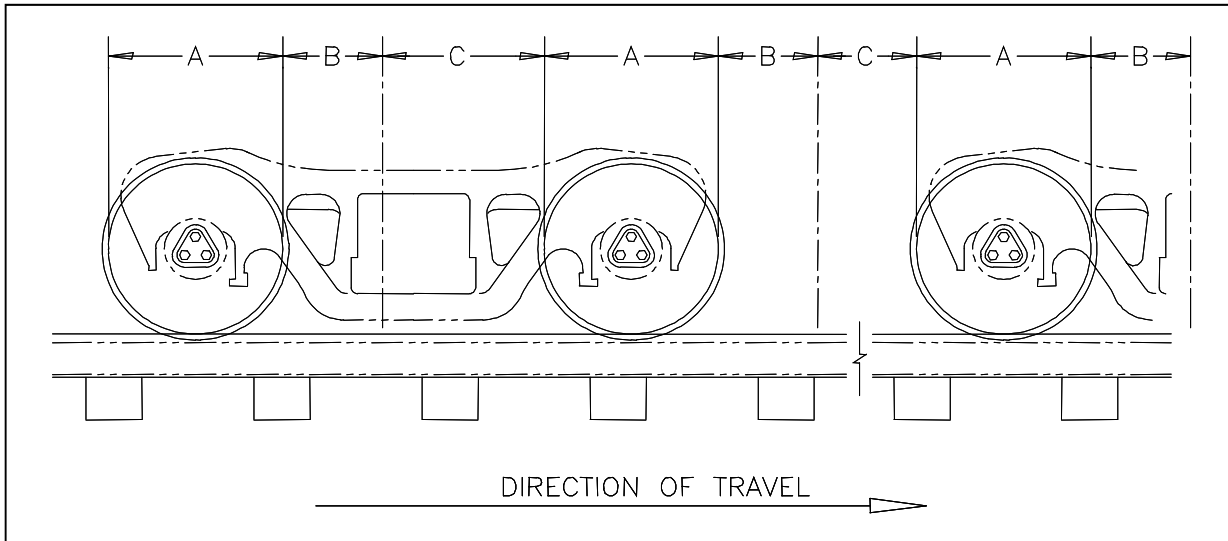
The table below defines the intervals.

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 Very Slow Train 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 Very Slow Train 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  Axle  Trk   East    West    ON    OFF   PW1 PW2  Alarms
-------------------------------------------------------------------------------
  1    1    0   176°    154°    25     0     17  18
       2    0   176°    186°    25    59     14  14
       3    0   176°    186°    25    59     14  14    East Rail Pyro Saturation Alarm
       4    1   186°    176°    25   562     14  14
       5    1   186°    172°    25    60     14  14
                                       •
                                       •
                                       •
```

Appendix H Communications Ports

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.

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.

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,

COM5 – At systems with AEI, attach a crossover (null-modem) cable from the AEI (DTE) Interface Module to COM5 (DTE) of the Controller module.

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..
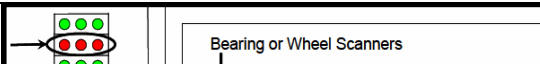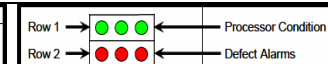
DCE (Data Circuit-Terminating Equipment) Modem			Connecting Cable	DTE (Data Terminal Equipment) Computer			Connecting Cable	DTE (Data Terminal Equipment) Computer		
Pins on the Modem		Name and Abbreviation	Inside the Straight-Through Connecting Cable	Abbr.	Pins on the Computer		*Inside the Crossover 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

<table>
<tr><td rowspan="2">Scanner Status - The bottom row of LEDs indicates the operational condition of the scanners when a train isn't present at the site.</td><td></td></tr>
</table>

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:
- 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

<table>
<tr><td rowspan="2">Transducer Status - The fourth row of LEDs operates differently when a train is at the site and when it isn't.</td><td></td></tr>
</table>

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

<div align="right">

Flashing on for 0.5 sec, off for 1.0 sec. - For transducer T01

Flashing on for 0.5 sec, off for 0.5 sec, on for 0.5 sec, off for 2.0 sec. - For transducer T02

The gating transducer with fewer hits is considered the bad one.

</div>

Function Activity - The middle row of green LEDs indicates system activities, including train presence, push-to-talk (PTT), and hold-off or re-broadcast		
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.	

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.	
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.	

Processor Condition - The top row of green LEDs indicates the condition of the CPUs and the battery on the Processor board.	
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.

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.	

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.				

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