EUD-2011034-00

Wayside Inspection System User's Guide for Union Pacific

3 February 2011

CAUTION
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, maintaining, and using the Wayside Inspection System.
Failure to do so could result in damage to the equipment or serious injury to you.

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their fax number is 423-499-0045

their phone number is 423-892-3029

Contents

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

Chapter 1 — Introduction

This chapter summarizes the purpose of this guide, describes the Wayside Inspection System, tells how to comment on this guide, and tells how to order more copies of this guide.

1.1 Purpose of This Guide

The technical staff at Southern Technologies Corporation (STC) created the Wayside Inspection System. This guide describes that system.

The Wayside Inspection System monitors track hardware and reports certain dangerous conditions. It can monitor up to four tracks with four alarm-generating devices on each track. Supported alarm types are shifted-load, dragging-equipment, high-load, wide-load, slide-fence, slip, high-water, collision, fire, and power-off.

Some parts of the system, such as track circuits and transducers, are installed on railroad tracks. Other parts of the system, such as system modules, are installed near the tracks. The system is firmware driven. Internal firmware can be changed to meet the unique needs of a given railroad.

This guide is for those who purchase, install, maintain, manage, or use Wayside Inspection Systems at Union Pacific.

1.2 Description of the System

Each Wayside Inspection System consists of:

- One docking base module per site

- Four to seven pluggable system modules per site

- One temperature probe per site, if used

- One track circuit per track, if used

- Up to two transducers per track, if used

- Up to four alarm inputs for switch-closure-type alarm-generating devices per track

Southern Technologies Corporation (STC) provides the system modules, the transducers, and temperature probe, if used. Union Pacific provides the alarm-generating devices and the track circuits, if used.

The figure below shows the modules of the Wayside Inspection System.

2700-500 Docking Module

2700-300 Track 1 Module

2700-100 Processor Module

2700-400 Radio Module

2700-200 Power Supply Module
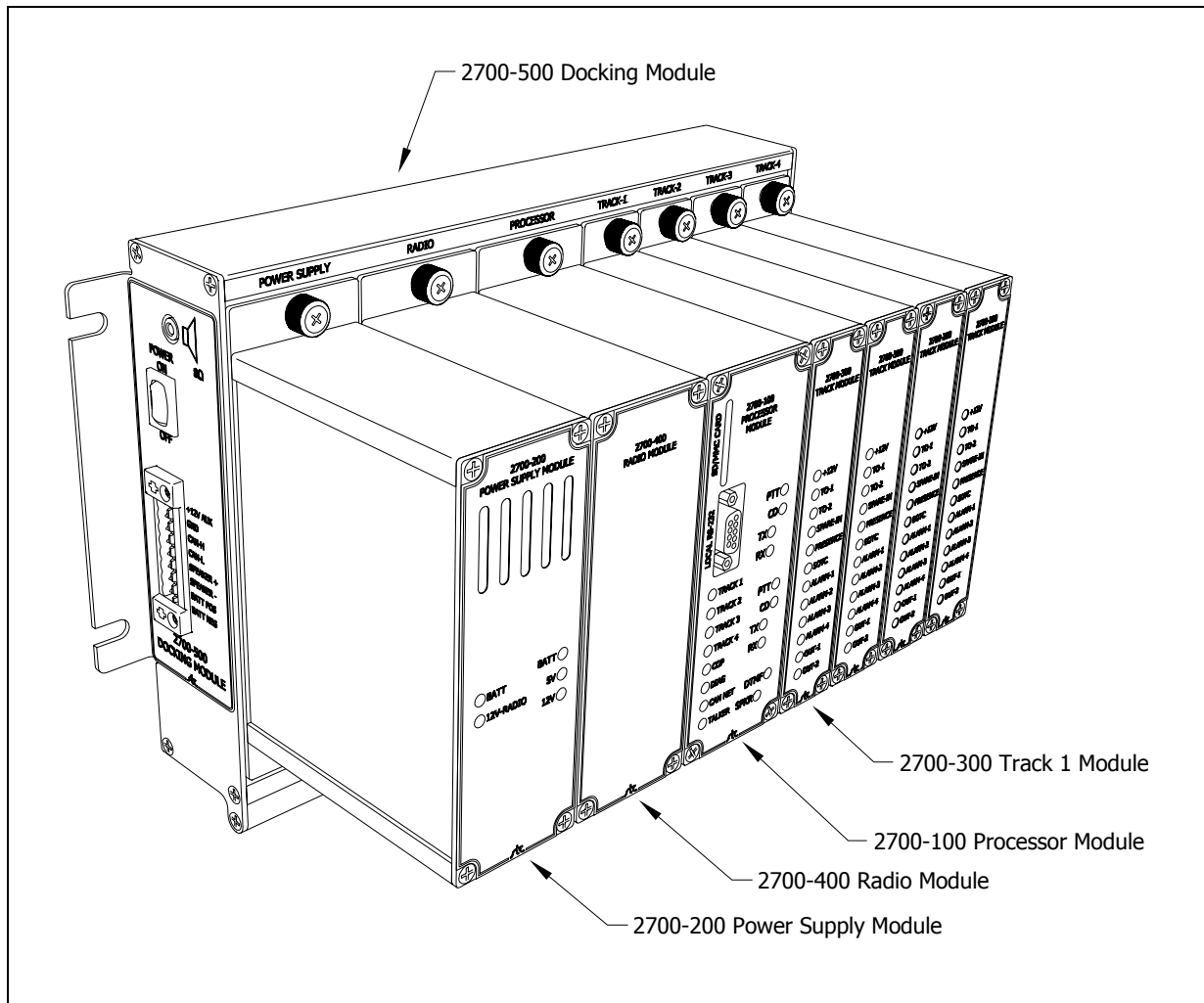
During train passage, the system:

- Examines the signals from the alarm-generating devices
- Determines if an alarm condition exists
- Announces any alarm condition in a digitized human voice via the radio

When no train is present, the system:

- Monitors the alarm inputs for any malfunction (such as, for a stuck dragger or a blocked sensor)
- Notifies the next train, when such a malfunction exists

1.3　How to Comment on This Guide

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

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

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

1.4　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.

1.5　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.

Chapter 2 — Modules

Each Wayside Inspection System consists of up to eight system modules per site. A minimum system includes a Docking Module, a Power Supply Module, a Radio Module, a Processor Module, and at least one Track Module. Up to three additional Track Modules may be included to accommodate four tracks.

The figure below shows the front of the Wayside Inspection System.
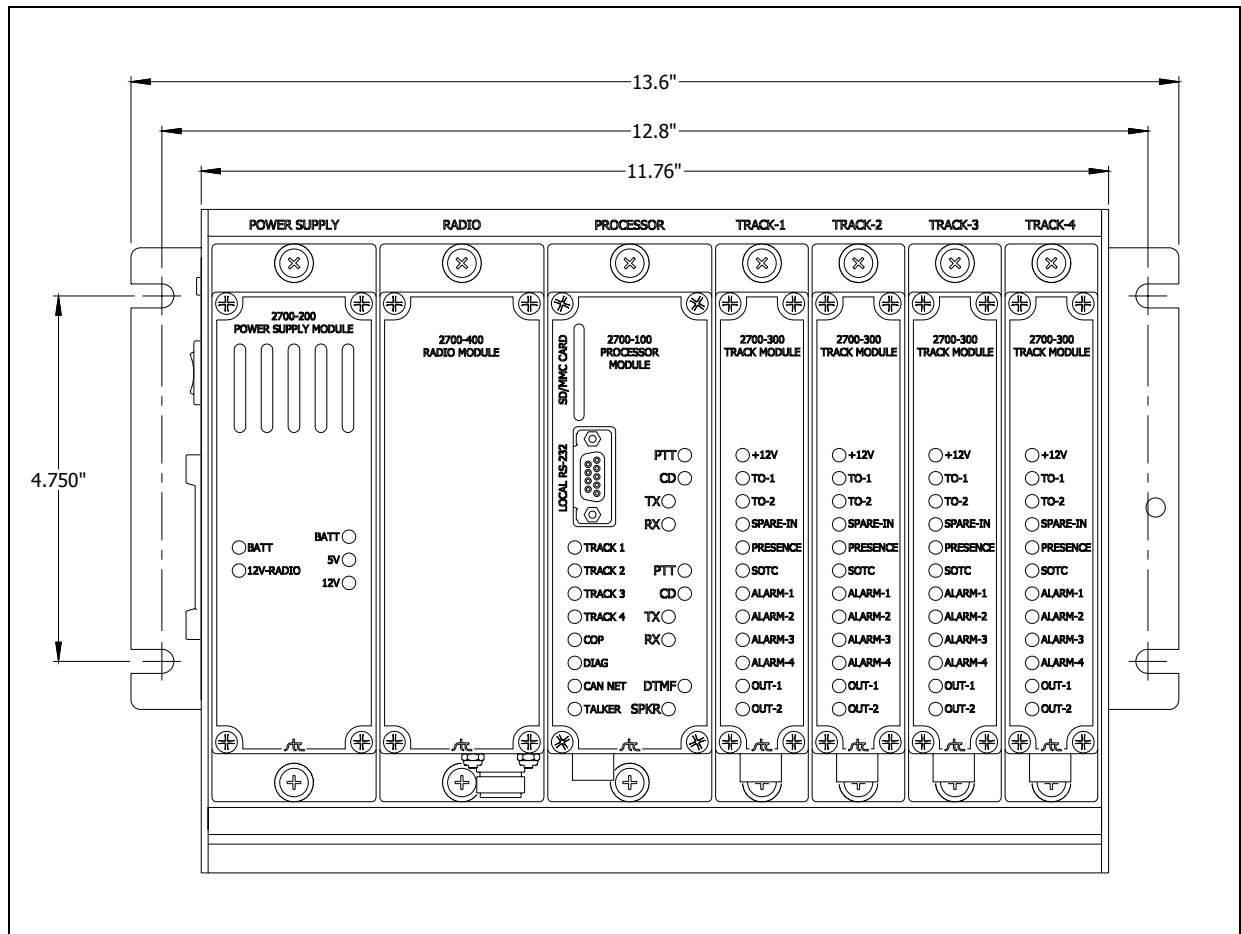
The figure below shows the left side of the Wayside Inspection System.
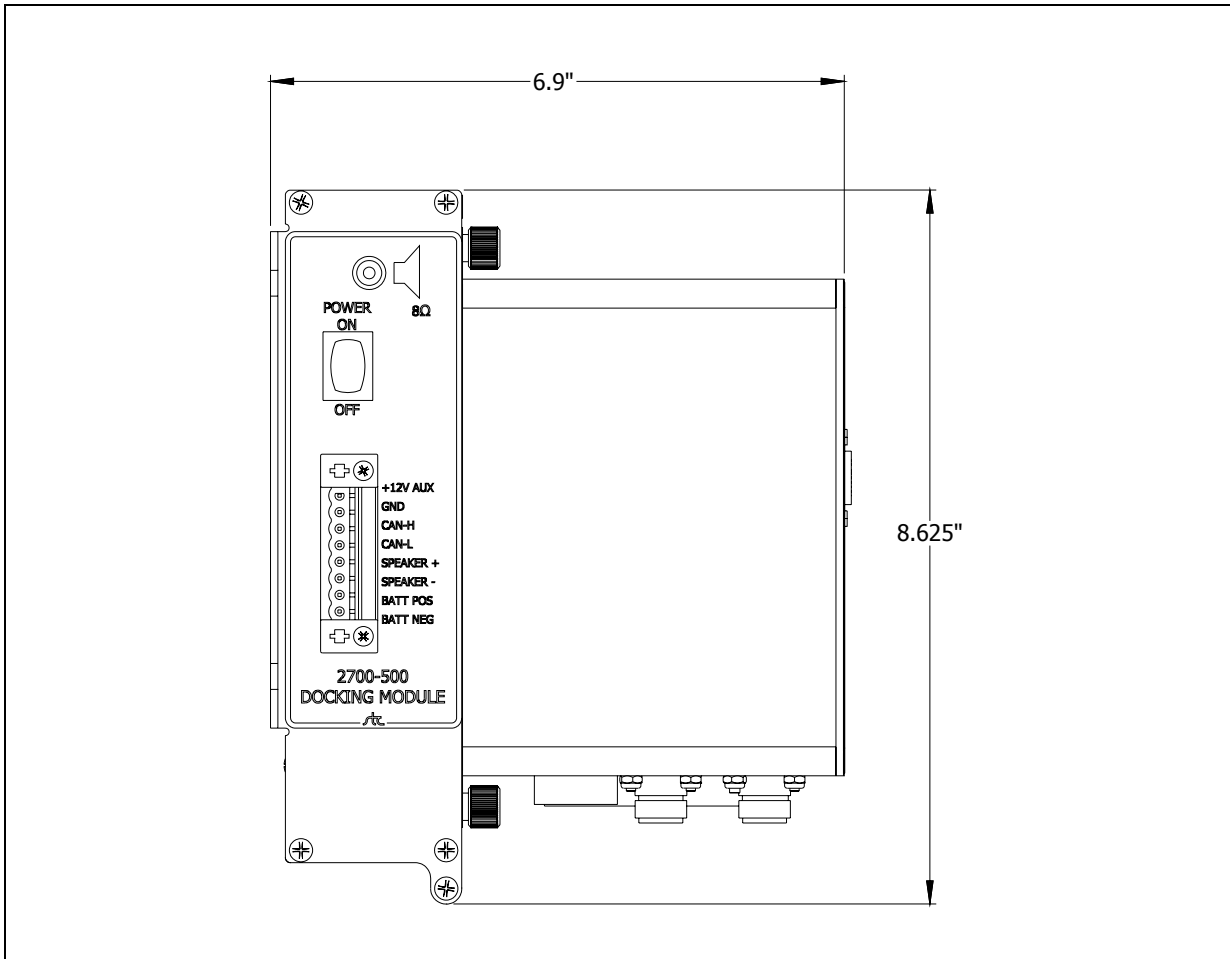
2.1 2700-100 Processor Module

There is one Processor Module per site. This module houses the central processor board and the talker processor board.

The **central processor** collects data from the Track Modules, stores the data on a SD card, and generates speech commands for the talker processor. It also provides a serial user interface and monitors an ambient temperature input.

The **talker processor** receives speech commands from the central processor and generates the appropriate announcement. It handles all radio control functions and listens for any DTMF (dual-tone multi-frequency) rebroadcast request. Also, the talker processor maintains system time.

2.1.1 Front of Module

On the front of the Processor Module are 5 potentiometers, 13 status LEDs, a local RS232 port, and a SD/MMC card slot.
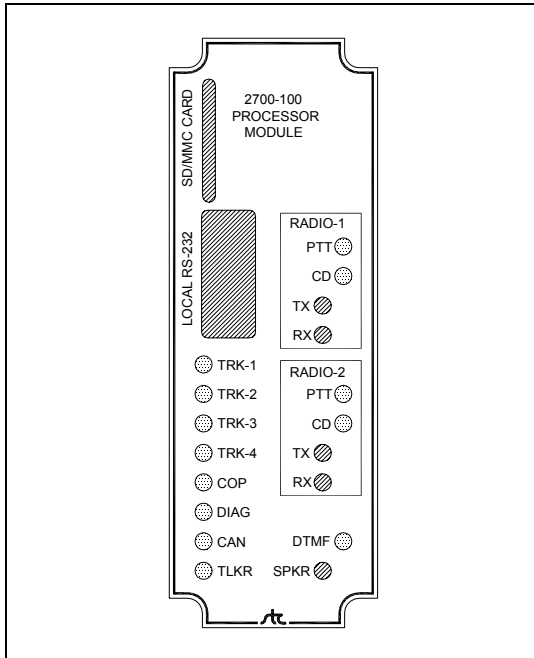
2.1.1.1 Status LEDs

The table below describes what each <u>lit</u> LED means.

LED	Meaning when Lit
PTT *(Radio-1)*	Push-to-talk. Lights when radio-1 is transmitting.
CD *(Radio-1)*	Carrier Detect. Lights when radio-1 is receiving a signal.
PTT *(Radio-2)*	Push-to-talk. Lights when radio-2 is transmitting.
CD *(Radio-2)*	Carrier Detect. Lights when radio-2 is receiving a signal.
TRK-1	Lights when the Track-1 Module is installed and operating. Flashes when this module has a problem.
TRK-2	Lights when the Track-2 Module is installed and operating. Flashes when this module has a problem.
TRK-3	Lights when the Track-3 Module is installed and operating. Flashes when this module has a problem.
TRK-4	Lights when the Track-4 Module is installed and operating. Flashes when this module has a problem.
COP	Computer Operating Properly. Flashes when the Processor Module is operating properly.
DIAG	*Currently not used.*
CAN	Controller Area Network. Lights to indicate activity on the CAN bus.
TLKR	Lights to indicate communications with talker processor.
DTMF	Lights when a valid DTMF tone is received.

2.1.1.2 Potentiometers

The table below describes the function of each potentiometer.

Potentiometer	Function
TX *(Radio-1)*	Adjusts level of transmit audio to radio-1.
RX *(Radio-1)*	Adjusts level of receive audio from radio-1.
TX *(Radio-2)*	Adjusts level of transmit audio to radio-2.
RX *(Radio-2)*	Adjusts level of receive audio from radio-2.
SPKR	Adjusts the volume of the attached speaker. Turn the potentiometer clockwise to increase the volume. Turn it counterclockwise to decrease the volume.

2.1.1.3 Serial Port

On the front of the Processor Module is a communications port, which connects the system to an external serial (RS232) device. Use it to retrieve the stored data and set system parameters.

The table below shows which signals are present on the serial port.

PIN Number	I/O	PIN Function
2	I	Receive data (Rxd)
3	O	Transmit data (Txd)
5	--	Signal ground (Gnd)

To access the system through the serial port, you need a computer with an installed communications program, such as ProComm or HyperTerminal. Communications parameters should be set at eight data bits, one stop bit, no parity, and Xon/Xoff flow control. The baud rate is fixed at 115,200 baud. A three-wire cable, which is required, should be wired as shown below.
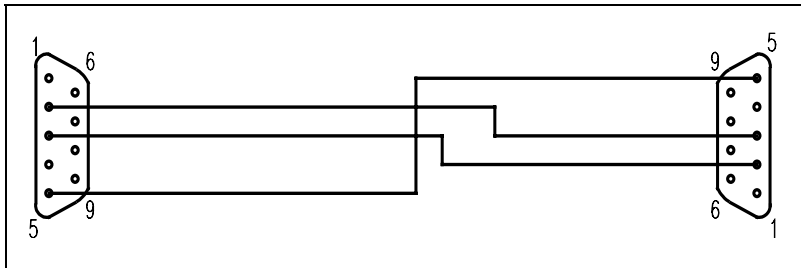
Only pins 2, 3, and 5 need to be connected for proper operation. However, a standard 9-pin-to-9-pin null-modem serial cable can be used.

2.1.1.4 SD/MMC Card Slot

The SD (Secure Digital) is a non-volatile memory card. The Wayside Inspection System uses it for storing train data and system logs and for loading new software.

A SD card should be inserted in the SD/MMC slot on the Processor Module. If no card is present, the system can still scan trains, detect alarms, and make announcements, but it cannot store the data for future reference.

Any standard SD card up to 2GB can be used. Other types of memory cards such as miniSD, microSD, SDHC, and CompactFlash cannot be used.

On the left side of some cards is a write-protection notch. If present, the card <u>cannot</u> be written on. If the notch is absent or covered by a sliding write-protection tab, the card can be written on. Before inserting the card into the SD/MMC slot on the Processor Module, be sure that the card is not write protected.

The Wayside Inspection System creates files and folders on the SD card, as it needs them.

2.1.2 Bottom of Module

On the bottom of the Processor Module are a reset button, an Ethernet connection, and a 7-position socket.
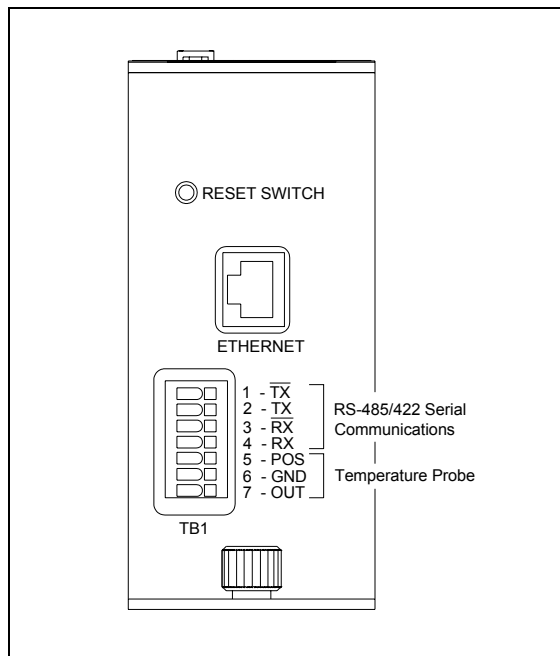
2.1.2.1 Reset Button

On the bottom of the Processor Module is a reset button. Pressing it causes a hardware reset for the entire system, which has the same effect as if power was turned off and back on. You can use it to recover from an apparent microprocessor malfunction. You can also use it to mimic a system startup. Train data isn't lost.

2.1.2.2 Ethernet Connection (RJ45 Jack)

On the bottom of the Processor Module is a RJ45 jack. 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. On each end of the cable should be a RJ45 plug. This plug is an 8-position modular connector that looks like a large phone plug.

Currently this connection is not functional.

2.1.2.3 Seven-Position Socket

On the bottom of the Processor Module is a 7-position socket. The table below shows the pinout of this socket.

Pin #	Pin Name	Function
1	$\overline{\text{TX}}$	RS485/422 $\overline{\text{TX}}$ -
2	TX	RS485/422 TX+
3	$\overline{\text{RX}}$	RS485/422 $\overline{\text{RX}}$ -
4	RX	RS485/422 RX+
5	Temperature Probe Positive	Power (12 VDC) to the shielded temperature probe. Red wire.
6	Temperature Probe Ground	Ground return from the shielded temperature probe. Black wire.
7	Temperature Probe Out	Signal from the shielded temperature probe. 0 to 5 VDC represents an outside air temperature of about -50° to +150°F (-45.6° to +65.6°C). White wire.

2.2   2700-200 Power Supply Module

There is one Power Supply Module per site. On the front of the module are 5 status LEDs.

```
      2700-200
 POWER SUPPLY MODULE


  RADIO        MAIN
  POWER        POWER

              BATT+ ◎
 ◎ BATT+      5 VDC ◎
 ◎ 12 VDC     12 VDC ◎
```
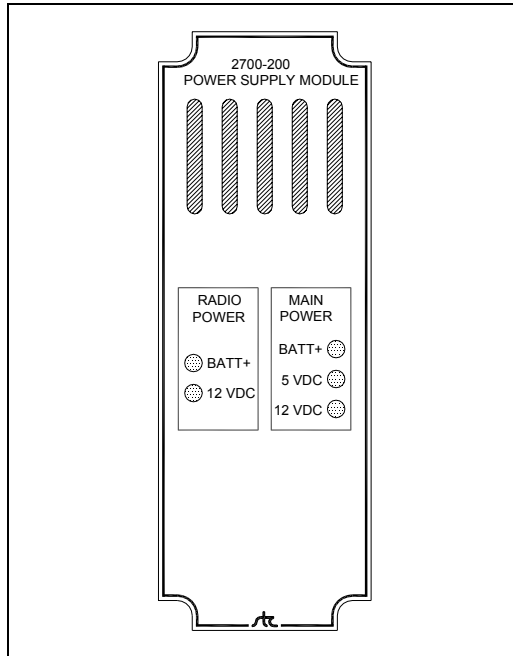
There are two power supplies within the Power Supply Module. The radio power supply is dedicated to the radios and the main power supply is dedicated to the rest of the system.

The radio power is 12 VDC at 5 amperes. The main power is 12 VDC at 1.6 amperes and 5 VDC at 3 amperes. All of these outputs are isolated from the battery input.

2.2.1   LEDs on Left Side (Radio Power)

On the front of the left side of the Power Supply Module are 2 status LEDs. These give information about the power supply dedicated to the radios. The table below describes what each lit LED means.

LED	Meaning when Lit
BATT+	Lights when 12 VDC is being supplied from the battery to the input of the radio power supply.
12 VDC	Lights when 12 VDC is being supplied to the radios.

2.2.2 LEDs on Right Side (Main Power)

On the front of the right side of the Power Supply Module are 3 status LEDs. These give information about the power supplies dedicated to the non-radio components of the system. The table below describes what each <u>lit</u> LED means.

LED	Meaning when Lit
BATT+	Lights when 12 VDC is being supplied from the battery to the input of the main power supply.
5 VDC	Lights when 5 VDC is being supplied to any non-radio component of the system.
12 VDC	Lights when 12 VDC is being supplied to any non-radio component of the system.

2.3 2700-300 Track Module

There is one Track Module per track. Each contains 2 terminal blocks on its bottom and 12 status LEDs on its front.

The Track Module handles the task of scanning all track inputs. It looks for train presence, counts axles, and recognizes alarm conditions. Train and alarm data is stored temporarily on the Track Module. For longterm storage, that information is sent to the Processor Module via the CAN bus.

The Track Module has inputs for two transducers and four alarm sensors. The alarm inputs accept a normally closed contact that opens to indicate an alarm. The transducer inputs are designed to work with magnetic transducers. There are also two outputs capable of driving a relay and one spare input.

There is also a SOTC input that can be used with a track circuit to detect when a train is present. The SOTC input is designed to work with a normally open contact that closes to indicate train presence.

Each Track Module can be configured through firmware to activate the alarm inputs from one or both of the transducer inputs or from the SOTC input. If no transducers or track circuits are used, the Track Module can be configured to run in continuous-scan mode.

Up to four Track Modules can be installed in one Wayside Inspection System.

2.3.1 Front of Module

On the front of the Track Module are 12 status LEDs.
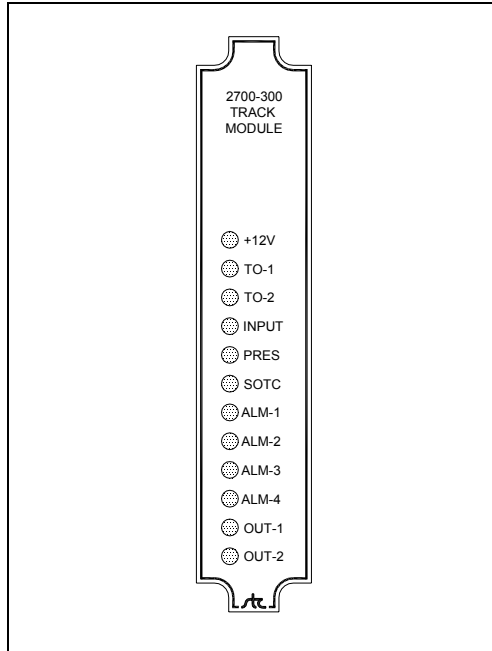
The table below describes what each <u>lit</u> LED means.

LED	Meaning when Lit
+12V	Lights when 12 VDC is being supplied to the Track Module.
TO-1	Lights when **transducer TO1** is active. Flickers as each wheel passes over transducer TO1 during train passage.
TO-2	Lights when **transducer TO2** is active. Flickers as each wheel passes over transducer TO2 during train passage.
INPUT	Lights when there is an open circuit at the spare input.
PRES	Lights when a train is present.
SOTC	Lights when the **track circuit** is energized. When lit, the LED indicates a received signal from the track circuit.
ALM-1	Lights when there is an open circuit at the **alarm1** input.
ALM-2	Lights when there is an open circuit at the **alarm2** input.
ALM-3	Lights when there is an open circuit at the **alarm3** input.
ALM-4	Lights when there is an open circuit at the **alarm4** input.
OUT-1	Lights when **output1** is active.
OUT-2	Lights when **output2** is active.

2.3.2 Bottom of Module

On the bottom of the Track Module are two terminal blocks.

TB1
1 - Spare Out-2
2 - Spare Out-2 RTN
3 - Spare Out-1
4 - Spare Out-1 RTN
5 - Alarm-4 Input
6 - Alarm-4 RTN
7 - Alarm-3 Input
8 - Alarm-3 RTN
9 - Alarm-2 Input
10 - Alarm-2 RTN

TB2
1 - Alarm-1 Input
2 - Alarm-1 RTN
3 - SOTC Input
4 - SOTC RTN
5 - Spare Input
6 - Spare Input RTN
7 - TO1 Signal
8 - TO1 RTN
9 - TO2 Signal
10 - TO2 RTN
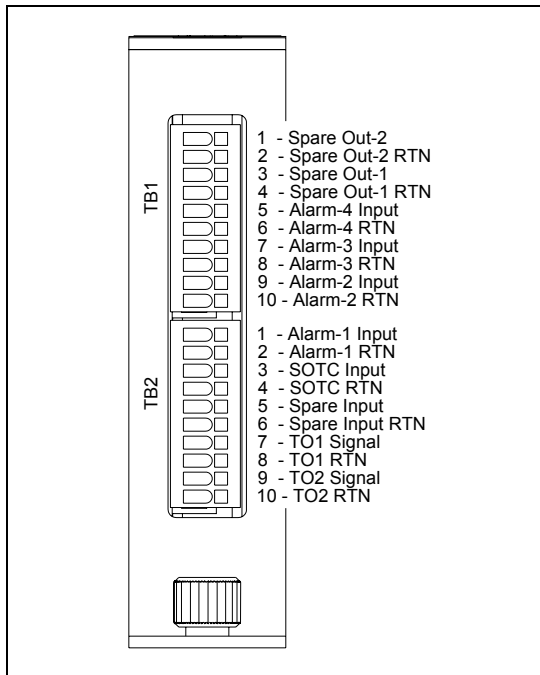
The table below shows the pinout of the 10-position **TB1** socket.

Pin #	Pin Name	Function
1	Spare	*Currently not used.*
2	Spare	*Currently not used.*
3	Spare	*Currently not used.*
4	Spare	*Currently not used.*
5	Alarm-4 Input	One wire from 4th alarm-generating device is wired here.
6	Alarm-4 Return	Other wire from 4th alarm-generating device is wired here.
7	Alarm-3 Input	One wire from 3rd alarm-generating device is wired here.
8	Alarm-3 Return	Other wire from 3rd alarm-generating device is wired here.
9	Alarm-2 Input	One wire from 2nd alarm-generating device is wired here.
10	Alarm-2 Return	Other wire from 2nd alarm-generating device is wired here.

The table below shows the pinout of the 10-position **TB2** socket.

Pin #	Pin Name	Function
1	Alarm-1 Input	One wire from 1st alarm-generating device is wired here.
2	Alarm-1 Return	Other wire from 1st alarm-generating device is wired here.
3	SOTC Input	One wire from track circuit is wired here.
4	SOTC Return	Other wire from track circuit is wired here.
5	Spare	*Currently not used.*
6	Spare	*Currently not used.*
7	TO1 Signal	TO1 magnetic transducer signal.
8	TO1 Return	TO1 magnetic transducer ground return.
9	TO2 Signal	TO2 magnetic transducer signal.
10	TO2 Return	TO2 magnetic transducer ground return.

2.4   2700-400 Radio Module

Each Radio Module contains one or two radios. If there is **one radio**, it can be configured to broadcast on only one frequency or sequentially on two different frequencies. If there are **two radios**, they broadcast simultaneously on different frequencies.

There is one Radio Module per site. On the bottom of the Radio Module are two coaxial antenna connectors, one for each radio.
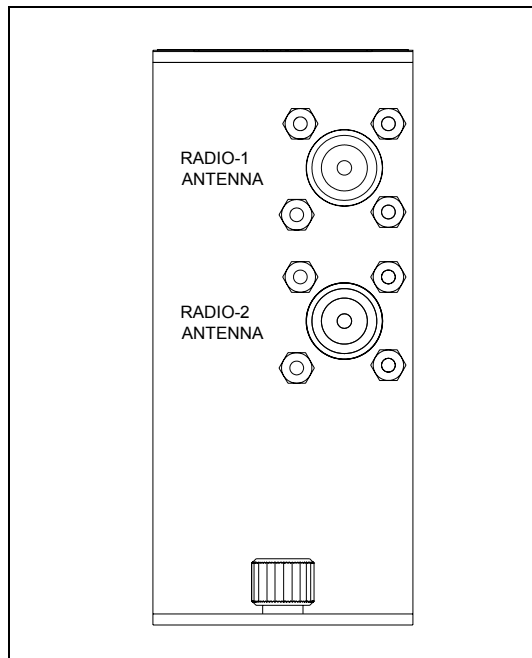
2.5 2700-500 Docking Module

There is one Docking Module per site. It can be attached to a rack or directly to the wall of the bungalow. The other system modules attach directly to the Docking Module.

On the left side of the module are a speaker jack, a rocker switch, and an 8-position socket.
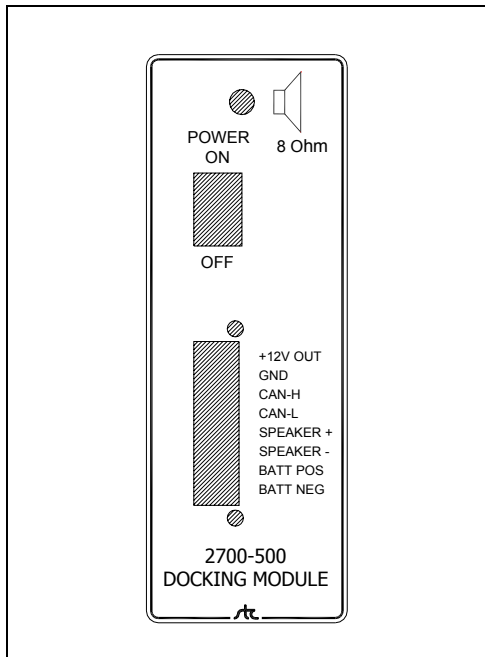
2.5.1 Rocker Switch

On the left side of the Docking Module is an on-off DC power switch.

2.5.2 Speaker Jack

On the left side of the Docking Module is a jack for an 8-ohm speaker. A speaker aids in verifying the operation of the system. If a speaker is plugged into this jack, the speaker terminals on the 8-position socket are disabled.

2.5.3 Eight-position Socket

The table below shows the pinout of the 8-position socket.

Pin #	Pin Name	Function
1	+12V OUT	Power (12 VDC) for an external device.
2	GND	Ground for an external device.
3	CAN-H	Controller Area Network - High bus output. *Currently not used.*
4	CAN-L	Controller Area Network - Low bus output. *Currently not used.*
5	SPEAKER+	Connected to the positive 8-ohm speaker terminal. *Is functional only when nothing is plugged into the speaker jack.*
6	SPEAKER-	Connected to the negative 8-ohm speaker terminal. *Is functional only when nothing is plugged into the speaker jack.*
7	BATT POS	Connected to the positive 12 VDC battery terminal.
8	BATT NEG	Connected to the negative 12 VDC battery terminal.

Chapter 3 — System Operation

This chapter describes the operation of a Wayside Inspection System. Covered are train detection, axle counting, alarm detection, data storage, and speech generation.

3.1 Overview

Each Wayside Inspection System consists of up to eight system modules per site. A minimum system includes a Docking Module, a Power Supply Module, a Radio Module, a Processor Module, and at least one Track Module. The Processor Module houses the central processor board and the talker processor board.

The **central processor** monitors the Track Modules via the CAN bus. It connects to the talker processor with a RS232 connection. The central processor collects train data from the Track Modules when it is available, stores the data on a SD card, and generates speech commands for the talker processor. It also provides a serial user interface and monitors an ambient temperature input and the system battery voltage.

The **talker processor** stores all of the digitized speech required for voice announcements. When an announcement needs to be made, the talker receives speech commands from the central processor and generates the appropriate speech. It also handles all radio control functions. When no announcement is in progress, the talker listens for any DTMF rebroadcast request. Also, system time is maintained on the talker processor board.

The Track Module handles the task of scanning all track inputs. It looks for train presence, counts axles, and recognizes alarm conditions. Messages are sent to the central processor when a train arrives and when it leaves. If an alarm occurs during train passage, a message is sent to the central processor, which sends the correct commands to the talker to cause a real-time announcement. Train and alarm data is stored temporarily on the Track Module. After a train has passed, the data is sent to the Processor Module for longterm storage.

3.2 Train Presence Detection

When transducer activation is selected, any positive going pulse at the transducer input causes the system to start scanning all alarm inputs that are enabled for that track. Scanning continues as long as transducer pulses occur at intervals less than 10 seconds. An absence of a transducer pulse for more than nine seconds is considered the end of the train. Anything generating at least four transducer pulses is considered a valid train. Anything generating a total axle count of two or three is logged as a test train. Anything generating a total axle count of one is ignored.

When approach activation is selected, any condition causing an open circuit at the SOTC input causes the system to start scanning all alarm inputs that are enabled for that track. Scanning continues as long as the open circuit exists. When the open circuit no longer exists at the SOTC input, it is considered the end of the train and scanning stops.

When continuous scan is selected for System Activation, that track is always active. The system is always scanning the alarm inputs for that track. It announces any alarms as they occur.

3.3   Alarm Detection

Each Track Module has four alarm inputs labeled ALM-1, ALM-2, ALM-3, and ALM-4. Each input can be configured as one of ten possible alarm types. The Configure Input options of the Track Options menus are used to set the alarm type. This setting determines what type of alarm is announced for that input. If an input isn't being used, the alarm type should be set to "not used." The alarm types that can be used depend on the System Activation setting for that track. If System Activation is set for Transducer or Approach, the alarm types can be dragging equipment, high load, wide load, or shifted load. If System Activation is set to Continuous Scan, the alarm type can be dragging equipment, high-load, wide-load, shifted load, slide fence, slip detector, high water, collision, fire, or power off.

3.4   Dragging-Equipment, High-Load, and Wide-Load Detection

If transducer activation or approach activation is used, while a train is passing, any condition causing an open circuit at the alarm input causes an alarm to be activated. For the first alarm, the system transmits a short 1000-hertz tone followed by a message announcing that a defect was detected. Additional alarms are indicated by only the tone.

When transducer activation is used and a dragging-equipment alarm occurs, another dragging-equipment alarm isn't allowed until the alarm contacts have closed and reopened and at least three axles have been counted since the previous alarm. This prevents multiple alarms being generated by one contact opening. For high-load and wide-load alarms, the alarm contacts must close for 50 milliseconds before another alarm is allowed. If approach activation is used, the alarm contacts must close for 50 milliseconds before another alarm is allowed regardless of alarm type. If the alarm contacts open while a train is passing the site and they remain open, there will only be one alarm at the axle where the contacts first opened.

After the train has passed, any alarms are announced in the order they occurred. If transducers are used, the alarms are announced along with the axle count at which they occurred. Any alarm occurring during an axle pulse is announced as being near that axle. Any alarm occurring between axle pulses is announced as being near the previous axle. If the number of alarms detected exceeds the maximum number of alarms, "multiple dragging equipment" or "integrity failure" is added to the post-train announcement. *Chapter 4 - Radio Announcements* describes this message.

If no alarms are detected and the Talk on Defects mode is selected, there is no post-train announcement. **Chapter 5 - Serial Communications** tells how to select this mode. If the Talk on Defects mode isn't selected, a "no defects" announcement is made (if there are no alarms). If more than one track is active at the same time, the announcements for all tracks are buffered and announced in the order they occur.

If continuous-scan mode is selected, any condition causing an open circuit at the alarm input activates an alarm and causes an announcement indicating that an alarm was detected. **Chapter 4 - Radio Announcements** describes this message. The announcement repeats at intervals determined by the Alarm Interval Time setting of the Track Options menus. This continues as long as the alarm condition exists <u>or</u> for an amount of time equal to the Alarm Duration Time setting of the Track Options menus. After the alarm-duration time expires, an Integrity Failure message is announced at intervals determined by the Alarm Interval Time setting until the alarm condition is cleared.

3.5 Auxiliary-Alarm Detection

The auxiliary alarms are slide-fence, slip, high-water, collision, fire, and power-off. When configured as one of these alarm types, an input only operates in continuous-scan mode. Any condition causing an open circuit at the alarm input causes an alarm to be activated and an announcement indicating that an alarm was detected. **Chapter 4 - Radio Announcements** describes this message. The announcement repeats at intervals determined by the Alarm Interval Time setting of the Track Options menus. This continues as long as the alarm condition exists or for an amount of time equal to the Alarm Duration Time setting of the Track Options menus.

3.6 Advance-Alarm Detection

The firmware allows dragging-equipment, high-load, wide-load, and shifted-load alarms before the first transducer pulse even when no track circuit is used. A parameter called Advance Alarm Time in the Track Options menus determines the amount of time before the first transducer pulse (when transducer activation is selected) to allow alarms. This parameter is also used to determine if a stuck-dragger or blocked-sensor condition has occurred when no train is present. The default value for Advance Alarm Time is 10 seconds.

If transducer activation is selected, the system continuously monitors the alarm inputs even if no train is present. When an alarm input is activated, an internal timer starts counting down from the value set up as the Advance Alarm Time. If a transducer pulse occurs before the timer reaches zero, an alarm is stored and announced as being near the first axle. If the timer reaches zero before any transducer pulse occurs, no alarm is announced.

If the System Activation option is set for Approach, no alarms are allowed before the approach input becomes active. Any alarm that occurs after the approach input becomes active, but before the first transducer pulse, is stored and announced as an alarm near the first axle.

3.7 Stuck-Dragger and Blocked-Sensor Detection

While no train is present, a stuck-dragger or blocked-sensor condition occurs when an alarm input becomes active and stays active for a period longer than the value set as the Advance Alarm Time. If a train passes the site while the stuck-dragger or blocked-sensor condition exists, no alarms are allowed. An "integrity failure" announcement is made at the end of the train. *Chapter 4 - Radio Announcements* describes this message. If the alarm input becomes inactive for a period longer than the value set as the Advance Alarm Time, the integrity failure clears and the system returns to normal operation.

3.8 Train and Event Data Storage

Train or event data is stored in a file on a SD card installed in the SD/MMC slot on the Processor Module. If no card is installed, the system can still scan trains, detect alarms, and make announcements, but it can't store the data for future reference.

A separate file is maintained on the SD card for each of the four possible tracks. Up to 30 days worth of train and event data can be stored for each track. Once a day, as soon as possible after midnight, the system checks each data file and deletes any records that are more than 30 days old. The system log file is also maintained for 30 days.

If transducer or approach activation is used, a record is stored for each train. For each train, the arrival time, date, total axles (if transducers are used), speed, and status are saved. For each alarm that occurs during train passage, the time, date, type of alarm, and axle count (if transducers are used) at which the alarm first occurred are saved. If the number of alarms during one train exceeds the maximum number of alarms, data is stored only for the alarms up to and including the maximum number.

If continuous-scan mode is selected, one record is stored for each alarm that occurs. For each alarm, the time, date, and type of alarm are stored.

3.9 Low-Battery Detection

Terminals 7 and 8 of the eight-position socket on the side of the Docking Module are the battery input. The Processor Module samples the voltage at the battery input once a minute. If the battery voltage falls below 10.5 volts, that is considered a low battery condition. The low battery condition exists as long as the battery voltage remains below 11.0 volts. If the battery voltage becomes greater than 11.0 volts, the low-battery condition is cleared.

In the Setup Options menu is an option labeled "Announce Low Battery." While a low-battery condition exists and the Announce Low Battery option is enabled, any end-of-train report has "low battery" added to the last repeat of the message after "total axles" and before "detector out." This is true for both transducer and approach activation. For continuous scan applications, "low battery" is added to the last repeat of the initial announcement and every repeat after that (determined by the Alarm Interval Time setting of the Track Options menus).

Note that on power-up or after a reset, the battery is assumed good.

3.10 Radio Control Logic

The 2700-000 Wayside Inspection System can support up to two radios, each having eight possible broadcast channels. The system can be configured to use a single channel broadcasting on a single radio, a single channel broadcasting on each radio (known as simultaneous operation), or up to two channels broadcasting on a single radio (known as sequential operation). Section *5.6.8 - Select Radio Channels* tells how to configure radio operation.

When the talker needs to make an announcement, it examines the radio channel settings to determine whether to use sequential or simultaneous operation. If both radios contain a channel selection, the talker processor operates in Simultaneous mode. Otherwise, it operates in Sequential mode. The two operating modes function as follows.

In **sequentia**l operation (one radio), the talker firmware tries each of the enabled channels, beginning with the first one, setting the radio to the entered channel and checking to see if the channel is busy. It queues a broadcast on the first channel found that is not busy. Any channels found to be busy start a 20 second timer (a timer exists for each enabled channel selection). After all selected channels are examined, any queued broadcast will begin. Once that broadcast finishes, this process is repeated for each channel still requiring a broadcast. Subsequent broadcasts are queued when either a channel is no longer busy or its 20-second timer expires.

In **simultaneous** operation (two radios), the talker firmware sets both radios to their selected channels and checks each channel to see if it is busy. If both channels are free, the announcement broadcasts over both radios simultaneously. Any busy channel starts a 20-second timer (a timer exists for each enabled channel selection). Once any broadcasts finish, examination of the selected channels continues until both radios make their announcement (that is, either a channel is no longer busy or its 20-second timer expires).

Chapter 4 — Radio Announcements

This chapter describes radio announcements, which consist of predefined spoken messages with each message triggered by a particular event or set of events. Covered are the message formats and the announcement criteria.

4.1 Startup Announcements

Startup announcements are given when:

- Wayside Inspection System is powered up

- Reset button (on the bottom of the Processor Module) is pressed

The format of this announcement is:

U-P Detector
Milepost (mile)
(message)

For example, if the system is working correctly, the announcement is like this.

U-P Detector
Milepost 3-1-6 Point 5
Detector Working

If the system is not working correctly, the announcement is like this.

U-P Detector
Milepost 3-1-6 Point 5
Integrity Failure

4.2 Arrival Announcements

Arrival announcements are allowed only if the Announcement Mode option in the Setup Options menu is set to arrival and departure, as shown below. **Chapter 5 - Serial Communications** tells how to do this.

```
Setup Options                     Current Setting
---------------                   ----------------
[A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
[B] - Milepost .................. 0024.0
[C] - Track Direction ........... East/West
[D] - Announcement Mode ......... Arrival and departure messages
[E] - Announce Detector Out ..... Yes
[F] - Announce Low Battery ...... Yes
[G] - Announce Ambient Temp ..... No
[H] - Setup Track Module 1
[I] - Setup Track Module 2
[J] - Setup Track Module 3 - Not Installed
[K] - Setup Track Module 4 - Not Installed
[L] - Load Default Setup
[X] - Exit
```

The format of the arrival announcement is:

    U-P Detector
    Milepost (mile)
    Track (track number)
    (message)

where (message) is "detector working" if the system is functioning normally or "integrity failure" if a stuck-dragger or blocked-sensor condition exists. If transducer activation is selected, the arrival announcement won't be made until four axles are counted.

4.3 Real-Time Announcements

Real-time announcements, if any, are given as the train is passing over the site.

For the **first alarm**, the format of the real-time announcement is:

> **beep** (that is, a short 1000-hertz tone)
> U-P Detector
> Milepost (mile)
> Track (track number)
> Defect Detected

Additional alarms are indicated by only the tone. This tone is broadcast for each alarm until the maximum number of alarms is exceeded.

4.4 Post-Train Announcements

Post-train announcements, if any, are given after the train has left the site. The format of this announcement is:

> U-P Detector
> Milepost (mile)
> Track (track number)
> (message)

If you want to **add the words** "detector out" to the end of a post-train announcement, use the Announce Detector Out option on the Setup Options menu. (***Chapter 5 - Serial Communications*** tells how to do this.) The figure below shows that the words "detector out" will be announced.

```
Setup Options                   Current Setting
---------------                 ----------------
[A] - Time and Date ............ Fri  Aug 27 2010  08:51:54
[B] - Milepost ................. 0024.0
[C] - Track Direction .......... East/West
[D] - Announcement Mode ........ Arrival and departure messages
[E] - Announce Detector Out ..... Yes
[F] - Announce Low Battery ...... Yes
[G] - Announce Ambient Temp ..... No
[H] - Setup Track Module 1
[I] - Setup Track Module 2
[J] - Setup Track Module 3 - Not Installed
[K] - Setup Track Module 4 - Not Installed
[L] - Load Default Setup
[X] - Exit
```

4.4.1 Test Trains

For a "train" (usually a maintenance vehicle) passing the site with an axle count of two or three, the announcement is like this.

    U-P Detector
    Milepost 3-1-6 Point 5
    Track 1
    (message)

where (message) is "detector working" if the system is functioning normally or "integrity failure" if a stuck-dragger or blocked-sensor condition exists. This message can be enabled or disabled with the Announce Test Trains option on the Track Options menus. *Chapter 5 - Serial Communications* tells how to do this. The figure below shows it enabled.

```
Track 1 Options                         Current Setting
-----------------                       -----------------
[A] - Track Number ...................... None
[B] - Maximum Alarms .................... 3
[C] - Number of Repeats ................. 2
[D] - Rebroadcast Time Limit (mins) ..... 10
[E] - System Activation ................. TO1 Transducer
[F] - Advance Alarm Time (secs) ......... 10
[G] - Announce Total Axles .............. No
[H] - Announce Test Trains .............. Yes
[I] - Rebroadcast Code .................. 4353
[J] - Configure Input 1 ................. Dragging Equipment
[K] - Configure Input 2 ................. High Load
[L] - Configure Input 3 ................. Wide Load
[M] - Configure Input 4 ................. Wide Load
[X] - Exit
```

4.4.2 No Defects Found

For a train passing the site with an axle count greater than three and without defects, the announcement is like this.

    U-P Detector
    Milepost 3-1-6 Point 5
    Track 1
    No Defects

On the Setup Options menu, option-D is the Announcement Mode option.

```
Setup Options                    Current Setting
---------------                  -----------------
[A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
[B] - Milepost .................. 0024.0
[C] - Track Direction ........... East/West
[D] - Announcement Mode ......... Arrival and departure messages
[E] - Announce Detector Out ..... Yes
[F] - Announce Low Battery ...... Yes
[G] - Announce Ambient Temp ..... No
[H] - Setup Track Module 1
[I] - Setup Track Module 2
[J] - Setup Track Module 3 - Not Installed
[K] - Setup Track Module 4 - Not Installed
[L] - Load Default Setup
[X] - Exit
```

If this option is set to "Talk on defect only," no announcement is made for trains having no alarms and no integrity failures. If "Arrival and departure messages" or "Departure messages only" is selected, the above no defects announcement is made.

4.4.3   Defects Found (Transducer Activation)

For a train passing the site with an axle count greater than three and with eight dragging-equipment alarms, the announcement is like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First Dragging Equipment Near Axle 9 From Head of Train
> Second Dragging Equipment Near Axle 1-4
> Third Dragging Equipment Near Axle 2-2
> - •
> - •
> - •
> Eighth Dragging Equipment Near Axle 1-0-1

The announcement for high-load, wide-load, and shifted-load alarms is the same except that "dragging equipment" is replaced with "high load," "wide load," or "shifted load."

Announcements start with the axle where the first alarm was discovered and continue until all alarms are announced or the maximum number of alarms is exceeded. If the maximum number of dragging-equipment alarms is exceeded, the alarm announcement includes a "**multiple dragging equipment**" message like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First Dragging Equipment Near Axle 9 From Head of Train
> Second Dragging Equipment Near Axle 1-4
> Multiple Dragging Equipment Detected From Axle 2-2 to End of Train

If the maximum number of high-load, wide-load, or shifted-load alarms is exceeded and the train doesn't have a dragging-equipment alarm, "**integrity failure**" is added to the announcement like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First High Load (or Wide Load) Near Axle 9 From Head of Train
> Second High Load (or Wide Load) Near Axle 1-4
> Integrity Failure

If the maximum number of high-load, wide-load, or shifted-load alarms is exceeded and the train also has a dragging-equipment alarm, the announcement will include a "**multiple dragging equipment and defects**" message like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First Dragging Equipment Near Axle 9
> Second Dragging Equipment Near Axle 1-4
> First Shifted Load Near Axle 2-2
> Multiple Dragging Equipment and Defects Detected
> From Axle 39 to End of Train

If the alarm type of an Input Options menu is **set to Wide Load**, an option allows a rail designation to be added to the wide-load announcement. This option is unavailable to other alarm types.

```
Input 1 Options                  Current Setting
----------------                 ----------------
[1] - Alarm Type ................ Wide Load
[2] - Rail Designation .......... None
[3] - Milepost 1 ................ N/A
[4] - Milepost 2 ................ N/A
[0] - Exit
```

The wide-load announcement is like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> Wide Load North Rail Near Axle 9 From Head of Train

For a train passing the site with a stuck dragger or blocked sensor, the announcement is like this.

> U-P Detector
> Milepost 3-1-6 point 5
> Track 1
> Integrity Failure

For any train with a defect or integrity failure, the post-train announcement repeats for the number of times specified by the Number of Repeats option in the Track Options menus with a five-second interval between each announcement.

If the Announce Total Axles option on the Track Options menus is enabled, the total axle count is added to the last repeat of the post-train announcement.

> U-P Detector
> Milepost 3-1-6 point 5
> Track 1
> Integrity Failure
> Total Axles 1-2-3

4.4.4   Defects Found (Approach Activation)

For a train passing the site with eight dragging-equipment alarms, the announcement is like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First Dragging Equipment Detected
> Second Dragging Equipment Detected
> Third Dragging Equipment Detected
> - •
> - •
> - •
>
> Eighth Dragging Equipment Detected

The announcement for high-load, wide-load, and shifted-load alarms is the same except that "dragging equipment" is replaced with "high load," "wide load," or "shifted load."

Announcements start with the first alarm discovered and continue until all alarms are announced or the maximum number of alarms is exceeded. If the maximum number of dragging-equipment alarms is exceeded, the alarm announcement includes a "**multiple dragging equipment**" message like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First Dragging Equipment Detected
> Second Dragging Equipment Detected
> Multiple Dragging Equipment Detected

If the maximum number of high-load, wide-load, or shifted-load alarms is exceeded, "**integrity failure**" is added to the announcement like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> First High Load (or Wide Load) Detected
> Second High Load (or Wide Load) Detected
> Integrity Failure

Wide-load alarms may also have a rail designation added to the announcement as specified by the Rail Designation option on the Input Options menu. The announcement is like this.

> U-P Detector
> Milepost 3-1-6 Point 5
> Track 1
> Wide Load North Rail Detected

For a train passing the site with a stuck dragger or blocked sensor, the announcement is like this.

> U-P Detector
> Milepost 3-1-6 point 5
> Track 1
> Integrity Failure

For any train with a defect or integrity failure, the post-train announcement repeats for the number of times specified by the Number of Repeats setting of the Track Options menus with a five-second interval between each announcement.

4.5   Continuous Scan Announcements

If continuous-scan mode is selected, announcements are only made when an alarm is detected. The announcement is like this.

    U-P Detector
    Milepost 3-1-6 Point 5
    Track 1
    Dragging-Equipment Detected
Or High-Load Detected
Or Wide-Load Detected
Or Shifted-Load Detected

This announcement repeats for the number of times specified by the Number of Repeats setting of the Track Options menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Track Options menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Track Options menus. After the alarm-duration time expires, an Integrity Failure message is announced at intervals determined by the Alarm Interval Time setting until the alarm condition is cleared.

```
 Track 2 Options                        Current Setting
 -----------------                      -----------------
 [A] - Track Number ..................... None
 [B] - Maximum Alarms ................... 3
 [C] - Number of Repeats ................ 2
 [D] - Rebroadcast Time Limit (mins) ..... 10
 [E] - System Activation ................ Continuous scan
 [F] - Alarm Interval Time (mins) ........ 10
 [G] - Alarm Duration Time (mins) ........ 60
 [I] - Rebroadcast Code ................. 4353
 [J] - Configure Input 1 ................ Slide Fence
 [K] - Configure Input 2 ................ Not used
 [L] - Configure Input 3 ................ Not used
 [M] - Configure Input 4 ................ Not used
 [X] - Exit
```

The Integrity Failure message is like this.

    U-P Detector
    Milepost 3-1-6 point 5
    Track 1
    Integrity Failure

4.6 Slide-Fence Announcements

If the alarm type of an Input Options menu is **set to Slide Fence**, two options allow two mileposts to be added to the slide-fence announcement. These options are unavailable to other alarm types.

```
  Input 1 Options                     Current Setting
  ----------------                    ----------------
  [1] - Alarm Type ................. Slide Fence
  [2] - Rail Designation ........... N/A
  [3] - Milepost 1 ................. 0316.5
  [4] - Milepost 2 ................. 0000.0
  [0] - Exit
```

If an input is configured as a slide-fence alarm, announcements are only made when an alarm is detected. The announcement is like this.

    U-P Slide Fence Activated
    Milepost 3-1-6 Point 5
    To Milepost 3-1-8 Point 0
    Track 1

If the Milepost-2 option on an Input Options menu is set to all zeros (0000.0), only the first milepost is announced.

    U-P Slide Fence Activated
    Milepost 3-1-6 Point 5
    Track 1

This announcement repeats for the number of times specified by the Number of Repeats setting of the Track Options menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Track Options menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Track Options menus. The announcements stop when the alarm-duration time expires or the alarm condition clears.

4.7   Auxiliary-Alarm Announcements

If an input is configured as a slip, high-water, collision, fire, or power-off alarm, announcements are only made when an alarm is detected. The announcement is like this.

    U-P Detector
    Milepost 3-1-6 Point 5
    Track 1
    Slip Detector Activated
Or High-Water Detector Activated
Or Collision Detector Activated
Or Fire Detector Activated
Or Power-Off

This announcement repeats for the number of times specified by the Number of Repeats setting of the Track Options menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Track Options menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Track Options menus. The announcements stop when the alarm-duration time expires or the alarm condition clears.

4.8   Rebroadcast Announcements

Following train passage, recorded post-train announcements are saved and made available for rebroadcast until the period defined by the Rebroadcast Time Limit option expires. The Rebroadcast Time Limit option can be set for a period of 0 to 240 minutes. A setting of 0 allows indefinite rebroadcasts. For multitrack sites, there is a separate Rebroadcast Time Limit setting for each track.

```
Track 1 Options                          Current Setting
-----------------                        -----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2
[D] - Rebroadcast Time Limit (mins) .... 10
[E] - System Activation ................ TO1 Transducer
[F] - Advance Alarm Time (secs) ........ 10
[G] - Announce Total Axles ............. No
[H] - Announce Test Trains ............. Yes
[I] - Rebroadcast Code ................. 4353
[J] - Configure Input 1 ................ Dragging Equipment
[K] - Configure Input 2 ................ High Load
[L] - Configure Input 3 ................ Wide Load
[M] - Configure Input 4 ................ Wide Load
[X] - Exit
```

Only a train's post-train announcements are recorded. Arrival messages and Real-Time Alarm messages are ignored. Post-train announcements for Test Trains or trains with two or three axles are recorded. When rebroadcasting a recorded post-train announcement, the word "rebroadcast" is used at the beginning and end of the message. Here is an example.

    Rebroadcast
    U-P Detector
    Milepost 3-1-6 Point 5
    Track 1
    No Defects
    Rebroadcast, Detector out

When no recorded post-train message exists or the time limit has expired, the detector handles rebroadcast requests by announcing a default message. The default message is:

    Rebroadcast
    U-P Detector
    Milepost 3-1-6 Point 5
    No rebroadcast
    Detector out

As the detector generates rebroadcast announcements, it replays the speech tokens that made up the original saved message. Because of this, changes made to the Setup parameters after a train has passed have no effect on the rebroadcast announcement. In other words, enabling or disabling message options such as Total Axles or Low Battery has no effect on the message that is rebroadcast. It is the same as the message recorded following train passage.

For sites operating in Talk-On-Defect-Only mode, defect-free trains passing the site generate no post-train announcements. Requesting a rebroadcast in this situation yields the default message (that is, "No Rebroadcast").

In continuous-scan mode, the last repeat of the announcement is saved for any alarm that occurs. That recorded announcement is available for rebroadcast until the Rebroadcast Time Limit expires or another alarm occurs on that track. If no recorded announcement is available or the time limit has expired, the default rebroadcast message is announced.

Chapter 5 — Serial Communications

This chapter describes the serial interface for the Wayside Inspection System. It covers how to set the system parameters and how to display stored train data.

Connecting a computer directly to the system accesses the serial interface. To do this, you will need a computer with a RS232 serial port and a null modem cable. The computer should be running communications software set to eight data bits, one stop bit, no parity, and full duplex. If there is a terminal emulation setting, use ANSI.

The baud rate of the Wayside Inspection System is adjustable from 300 to 115200 using the Setup Equipment option on the Main menu. You should set the baud rate of your computer to match the baud rate setting of the Wayside Inspection System.

To access the system:

1   Be sure your computer has appropriate communications software installed.

2   Be sure your communications software is set to use full duplex.

3   Connect your computer to the RS232 connector on the Processor Module.

4   Press **[Esc]**.

    The Main menu appears. The contents of your screen will be different.

```
 Fri  Aug 27 2010  08:51:54
 Main Menu                   MP: 0024.0
 --------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3
 [D] - Display Data For Track 4
 [E] - Set System Parameters
 [F] - Set Up Equipment
 [G] - Display System Log
 [H] - Show System Status
 [I] - System Functions
```

5   Type the letter that corresponds to the desired option.

    For example, if you want to display the system log, press **[G]**.

6   Repeat step **5** until you are done.

After a power-up or reset, the serial interface starts at 9600 baud and then switches to the programmed baud rate after 5 seconds. If you don't know the baud rate of a system you are trying to connect to, set your computer to 9600 baud and either cycle power or press the reset button on the bottom of the Processor module. You should see the following message.

```
 Press spacebar to keep the default baud rate of 9600
 Loading the programmed rate of 115200 in 5 seconds
```

If you press the spacebar within 5 seconds, the baud rate will remain at 9600 and you can access the system with your computer set to 9600 baud. Alternatively, you could let the system switch to its programmed rate (in this case 115200) by not pressing any keys. Then change your computer to that baud rate and wait a few seconds for the system to finish booting. Then press the Esc key and you should see the Main menu.

5.1 Display Data for Track-1

On the Main menu, option-A is the Display Data for Track-1 option.

```
 Fri  Aug 27 2010   08:51:54
 Main Menu                    MP: 0024.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3


                  •
                  •
                  •
```

To select this option, press **[A]**. Doing so produces a report of the train and alarm data stored for track-1. Below is a sample of that report. The contents of your report will be different.

```
File: STTRACK1.DAT       48 records
First record: 08/23/10  09:50
Last record:  09/19/10  16:32

Train     Date      Time     TO1    TO2  Axles  Spd   Dir   Status
----------------------------------------------------------------------------
 38     09/12/10  14:34     62      0    62
                                         13                 Wide Load

 39     09/13/10  13:43     40      0    40                 No Defects

 40     09/13/10  13:44    328      0   328
                                        143                 Wide Load

 41     09/13/10  13:49     62      0    62
                                         24                 Wide Load

 42     09/13/10  14:13     84      0    84
                                         17                 Dragging Equipment

 43     09/13/10  14:16     62      0    62
                                         17                 Dragging Equipment

 44     09/18/10  15:50     40      0    40                 Sensor Blocked 2 3 4

 45     09/18/10  15:52     40      0    40                 No Defects

 46     09/19/10  11:52     18     18    18    36     E    Sensor Blocked 2 3 4

 47     09/19/10  11:53     28     28    28    44     E
                                         10                 Dragging Equipment

 48     09/19/10  16:32     20     20    20    37     E    No Defects

[E] - Entire log       [F] - First page        [L] - Last page
[N] - Next page        [P] - Previous page      [S] - Search for a date
[X] - Exit             [D] - Display lines (30)
```

The above sample has 48 records, but not all are shown. The **oldest record** was recorded at 9:50 am on 08/23/10. This record is <u>not</u> shown because, when there are more records than can be displayed at one time, only one screen of the most recent data will be displayed. In this case, the last 11 records are displayed. The **newest record** was recorded at 4:32 pm on 09/19/10.

In the above sample, the **amount of data** to display on one screen is 30 lines. These 30 lines are sandwiched between the three lines of header information and the three lines of trailing options.

The amount of data to display at one time is determined by the Display Lines setting. The Display Lines setting can be changed by choosing option **[D]**. If you press **[D]** above, this prompt appears.

```
  Enter new value (05 – 99):
```

You may type a number from 05 to 99, which is the number of lines of data to display. If the number is less than 10, type a leading zero.

Changing the Display Lines setting with option-D affects only this report. If you want to change the amount of data displayed for all reports, use the Display Lines option on the Equipment menu.

Other parts of the file can be displayed by pressing the following keys.

   [E] – Dumps the entire log to the screen at one time.
   [F] – Displays the first page of data (oldest data).
   [L] – Displays the last page of data (newest data).
   [N] – Displays the next page of data from the current position.
   [P] – Displays the previous page of data from the current position.

You may also search for a specific date using option-S. If you press **[S]** above, this prompt appears.

```
  Enter date (mm/dd/yyyy):
```

You can now type a date, and data will be displayed starting with the first record on or after that date. For example, if you type **082310**, data will be displayed starting with the first record on or after **08/23/2010**. When typing in the date, 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 8 June 2011, type **060811**.

Press **[X]** <u>or</u> **[Esc]** to exit the Display Data function and return to the Main menu.

The table below lists the fields from the data display and the contents of each field.

Heading	Contents of Field
Train #	The number that identifies the train or alarm record in the file.
Date	The date the train arrived at the site or the date the alarm occurred. Date is in **mm/dd/yy** format, where **mm** is month, **dd** is day, and **yy** is year.
Time	The time the train arrived at the site or the time the alarm occurred. 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.
TO1	The total number of hits counted by transducer TO1. TO1 is the first transducer crossed by a train traveling north or east.
TO2	The total number of hits counted by transducer TO2. TO2 is the first transducer crossed by a train traveling south or west.
Axles	For trains, the total number of axles counted for this train. For alarms, the axle count where the alarm was detected.
Spd	The train's exit speed in miles per hour. Speed is only available when System Activation is set to Two Transducers.
Dir	The direction the train was traveling. Valid values are N, S, E, and W. Direction is only available when System Activation is set to Two Transducers.
Status	Indicates any alarms or integrity failures while this train was passing. If this space is blank, there were no alarms or integrity failures. Possible status messages include the following. • **DED Stuck**, which indicates that a stuck dragger condition occurred before train arrival. • **Dragging Equipment**, which indicates a dragging-equipment alarm was detected. • **Excessive Alarms**, which indicates that the maximum number of alarms was exceeded. • **High Load**, which indicates a high-load alarm was detected • **Low Battery**, which indicates that a low battery condition existed during train passage. • **Sensor Blocked**, which indicates that a high-load or wide-load sensor was blocked before train arrival. • **Shifted Load**, which indicates a shifted-load alarm was detected. • **Test Train**, which indicates a train with an axle count of two or three. • **Wide Load**, which indicates a wide-load alarm was detected.

The speed (Spd) and direction (Dir) fields are blank when System Activation is not set to "Two transducers." The TO1, TO2, and Axles fields are blank when System Activation is set to "Continuous scan" or "Approach."

If System Activation is set to anything but Continuous scan, each record represents a train passing over the site. If any alarms are detected, each is printed on a separate line with the axle count and type of alarm shown.

In the sample report above, Train **38** passed the site at 2:34 pm on 12 September 2010. The system counted 62 total axles with a wide-load alarm at axle 13. There were no integrity failures. No speed or direction is shown and no TO2 hits were counted indicating that System Activation was set to TO1 Transducer Only.

Train **39** passed the site at 1:43 pm on 13 September 2010. The system counted 40 total axles with no alarms or integrity failures.

Train **46** passed the site at 11:52 on 19 September 2010. There were no alarms, but the status column shows that high-load or wide-load sensors were blocked on input-2, input-3, and input-4. Speed and Direction are shown indicating that System Activation was set to Two Transducers.

If System Activation is set to "Continuous scan," each record represents an alarm and only one line is printed for each alarm. Below is a sample of such a report.

```
 File: STTRACK1.DAT        6 records
 First record: 08/23/10  09:47
 Last record:  09/09/10  10:35

 Train#    Date     Time    TO1   TO2  Axles  Spd   Dir   Status
 ---------------------------------------------------------------------------
    1    08/23/10  09:47                                  Dragging Equipment

    2    08/24/10  14:13                                  Dragging Equipment

    3    09/02/10  11:16                                  Dragging Equipment

    4    09/03/10  15:50                                  Dragging Equipment

    5    09/08/10  15:52                                  Dragging Equipment

    6    09/09/10  10:35                                  Dragging Equipment

[E] - Entire log       [F] - First page        [L] - Last page
[N] - Next page        [P] - Previous page      [S] - Search for a date
[X] - Exit             [D] - Display lines (30)
```

Below are the possible contents of the Status field in continuous-scan mode.

- **Collision**, which indicates that the collision detector was activated.
- **Dragging Equipment**, which indicates a dragging-equipment alarm was detected.
- **Fire**, which indicates that the fire detector was activated.
- **High Load**, which indicates a high-load alarm was detected.
- **High Water**, which indicates that the high-water detector was activated.
- **Power Off**, which indicates a power off condition.
- **Shifted Load**, which indicates a shifted-load alarm was detected.
- **Slip**, which indicates that the slip detector was activated.
- **Wide Load**, which indicates a wide-load alarm was detected.

5.2 Display Data for Track-2

On the Main menu, option-B is the Display Data for Track-2 option.

```
 Fri  Aug 27 2010  08:51:54
 Main Menu                    MP: 0024.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3


                    •
                    •
                    •

```

To select this option, press **[B]**. Doing so produces a report of the train and alarm data stored for track-2. These reports are like those for track-1 described above.

5.3 Display Data for Track-3

On the Main menu, option-C is the Display Data for Track-3 option.

```
 Fri  Aug 27 2010  08:51:54
 Main Menu                    MP: 0024.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3
 [D] - Display Data For Track 4

                    •
                    •
                    •

```

To select this option, press **[C]**. Doing so produces a report of the train and alarm data stored for track-3. These reports are like those for track-1 described above.

5.4 Display Data for Track-4

On the Main menu, option-D is the Display Data for Track-4 option.

```
 Fri  Aug 27 2010  08:51:54
Main Menu                  MP: 0024.0
---------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] - Display Data For Track 3
[D] - Display Data For Track 4
[E] - Set System Parameters


                  •
                  •
                  •

```

To select this option, press **[D]**. Doing so produces a report of the train and alarm data stored for track-4. These reports are like those for track-1 described above.

5.5 Set System Parameters

On the Main menu, option-E is the Set System Parameters option.

```
 Fri  Aug 27 2010  08:51:54
Main Menu                  MP: 0024.0
---------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] - Display Data For Track 3
[D] - Display Data For Track 4
[E] - Set System Parameters
[F] - Set Up Equipment


                  •
                  •
                  •

```

To select this option, press **[E]**. Doing so displays the Setup Options menu and other information. Below is a sample of the screen that contains that menu. The contents of your screen will be different.

```
Setup Options                    Current Setting
----------------                 ----------------
[A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
[B] - Milepost .................. 0024.0
[C] - Track Direction ........... East/West
[D] - Announcement Mode ......... Arrival and departure messages
[E] - Announce Detector Out ..... Yes
[F] - Announce Low Battery ...... Yes
[G] - Announce Ambient Temp ..... No
[H] - Setup Track Module 1
[I] - Setup Track Module 2
[J] - Setup Track Module 3 - Not Installed
[K] - Setup Track Module 4 - Not Installed
[L] - Load Default Setup
[X] - Exit
```

On the left of the above screen is the option letter followed by its name. For example, the Milepost option is option-B. On the right are the current settings of the options. For example, the current setting of the Milepost option is 0024.0.

5.5.1 Set Time and Date

On the Setup Options menu, option-A is the Time and Date option.

```
Setup Options                    Current Setting
----------------                 ----------------
[A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
[B] - Milepost .................. 0024.0
[C] - Track Direction ........... East/West

              •
              •
              •
```

To select this option, press **[A]**. Doing so displays a prompt for a new time.

```
   Enter time (hh:mm:ss):
```

Type the time with no spaces between digits. Entry format is **hhmmss**, where **hh** is hours, **mm** is minutes, and **ss** is seconds. Time is in 24-hour format, where 8 a.m. is 08:00, noon is 12:00, 8 p.m. is 20:00, and midnight is 00:00. Thus, for 26 seconds past 3:49 p.m., type **154926**. To exit without changing the time, press **[Esc]**. After typing six digits or pressing **[Esc]**, the system prompts for the date as shown below:

```
   Enter date (mm/dd/yyyy):
```

Type the date with no spaces between digits. Entry format is **mmddyy**, where **mm** is the month, **dd** is the day, and **yy** is 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 3 August 2009, type **080309**. To exit without changing the date, press **[Esc]**. After either typing six digits or pressing **[Esc]**, the Setup Options menu reappears.

5.5.2 Milepost

On the Setup Options menu, option-B is the Milepost option.

```
   Setup Options                    Current Setting
   ---------------                  ----------------
   [A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
   [B] - Milepost .................. 0024.0
   [C] - Track Direction ........... East/West

                       •
                       •
                       •
```

To select this option, press **[B]**. Doing so displays the current milepost (that is announced with each message) with a prompt for a new one. This Milepost is announced with all messages except the slide-fence alarm.

```
   Enter new milepost:
```

Type the milepost with no spaces between digits. Entry format is **nnnnn**, where **n** is a digit 0 through 9. If the desired milepost has less than five digits, type leading zeros. If the desired milepost is an integer, type a trailing zero. Thus, for milepost 87, type **00870**. The system automatically inserts the decimal point. To exit without changing the milepost, press **[Esc]**. After typing five digits or pressing **[Esc]**, the Setup Options menu reappears.

5.5.3 Track Direction

On the Setup Options menu, option-C is the Track Direction option.

```
  Setup Options                   Current Setting
  ---------------                 ----------------
  [A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
  [B] - Milepost .................. 0024.0
  [C] - Track Direction ........... East/West
  [D] - Announcement Mode ......... Arrival and departure messages

                    •
                    •
                    •
```

The current setting shows whether the track direction is East/West or North/South. To change this setting, press **[C]**. Doing so toggles the current setting between East/West and North/South. Press **[C]** until the desired setting is shown.

5.5.4 Announcement Mode

On the Setup Options menu, option-D is the Announcement Mode option.

```
  Setup Options                   Current Setting
  ---------------                 ----------------
  [A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
  [B] - Milepost .................. 0024.0
  [C] - Track Direction ........... East/West
  [D] - Announcement Mode ......... Arrival and departure messages
  [E] - Announce Detector Out ..... Yes

                    •
                    •
                    •
```

To select this option, press **[D]**. Doing so lets you select if you want announcements to be made for trains having no alarms and no integrity failures and if you want arrival announcements to be made.

```
Announcement Mode
------------------------------
(1) - Departure messages only
(2) - Arrival and departure messages
(3) - Talk on defect only
```

Pressing **[1]** allows the system to make all real-time and post-train announcements, including a "no defects" announcement when the train has no alarms or integrity failures. Pressing **[2]** allows all real-time and post-train announcements as well as an arrival message at the beginning of a train. The arrival message is either "system working" or "integrity failure," depending on the system status. Pressing **[3]** allows real-time and post-train announcements only if an alarm or integrity failure are detected. This setting doesn't allow a "no defects" message. No matter what is selected above, all real-time messages <u>and</u> all integrity-failure arrival messages are announced.

To exit without making any changes, press **[Esc]**. After pressing **[1]**, **[2]**, **[3]**, **[Esc]**, the Setup Options menu reappears.

5.5.5 Announce Detector Out

On the Setup Options menu, option-E is the Announce Detector Out option. This option lets you select if you want to **add the words** "detector out" to the end of each post-train announcement.

```
Setup Options                    Current Setting
----------------                 ----------------
[A] - Time and Date ............. Fri  Aug 27 2010  08:51:54
[B] - Milepost .................. 0024.0
[C] - Track Direction ........... East/West
[D] - Announcement Mode ......... Arrival and departure messages
[E] - Announce Detector Out ..... Yes
[F] - Announce Low Battery ...... Yes

                     •
                     •
                     •
```

The current setting shows whether "detector out" will be announced (Yes) or not announced (No). To change this setting, press **[E]**. Doing so toggles the current setting between Yes and No. Press **[E]** until the desired setting is shown.

5.5.6 Announce Low Battery

On the Setup Options menu, option-F is the Announce Low Battery option. This option lets you select if you want to **add the words** "low battery" to the end of each post-train announcement when a low battery condition exists.

```
                        •
                        •
                        •

  [E] - Announce Detector Out ..... Yes
  [F] - Announce Low Battery ...... Yes
  [G] - Announce Ambient Temp ..... No

                        •
                        •
                        •
```

The current setting shows whether "low battery" will be announced (Yes) or not announced (No). To change this setting, press **[F]**. Doing so toggles the current setting between Yes and No. Press **[F]** until the desired setting is shown.

5.5.7 Announce Ambient Temperature

On the Setup Options menu, option-G is the Announce Ambient Temperature option. This option lets you select if you want the ambient temperature (taken at the site by the shielded temperature probe) to be announced as part of each post-train announcement.

```
                        •
                        •
                        •

  [F] - Announce Low Battery ...... Yes
  [G] - Announce Ambient Temp ..... No
  [H] - Setup Track Module 1

                        •
                        •
                        •
```

The current setting shows whether the ambient temperature will be announced (Yes) or not announced (No). To change this setting, press **[G]**. Doing so toggles the current setting between Yes and No. Press **[G]** until the desired setting is shown.

5.5.8 Setup Track-1 Module

On the Setup Options menu, option-H is the Setup Track-1 Module option.

```
                    •
                    •
                    •

   [G] - Announce Ambient Temp ..... No
   [H] - Setup Track Module 1
   [I] - Setup Track Module 2

                    •
                    •
                    •
```

To display the Track-1 Options menu, press **[H]**. Below is a sample of the screen that contains that menu. The contents of your screen will be different.

```
   Track 1 Options                       Current Setting
   ----------------                      -----------------
   [A] - Track Number ...................... None
   [B] - Maximum Alarms .................... 3
   [C] - Number of Repeats ................. 2
   [D] - Rebroadcast Time Limit (mins) ..... 10
   [E] - System Activation ................. TO1 Transducer
   [F] - Advance Alarm Time (secs) ......... 10
   [G] - Announce Total Axles .............. No
   [H] - Announce Test Trains .............. Yes
   [I] - Rebroadcast Code .................. 4353
   [J] - Configure Input 1 ................. Dragging Equipment
   [K] - Configure Input 2 ................. High Load
   [L] - Configure Input 3 ................. Wide Load
   [M] - Configure Input 4 ................. Wide Load
   [X] - Exit
```

On the left of the above screen is the option number followed by its name. For example, the Maximum Alarms option is option-B. On the right are the current settings of the options. For example, the current setting of the Maximum Alarms option is 3.

The options available on the Track Options menus change depending on the System Activation setting. The two examples above are for a setting of **Transducer** activation. If the System Activation is changed to **Approach**, the current setting will be blank for the two announcement options. Those options aren't available if transducers aren't used.

```
 Track 1 Options                            Current Setting
 ----------------                           ----------------
 [A] - Track Number ..................... None
 [B] - Maximum Alarms ................... 3
 [C] - Number of Repeats ................ 2
 [D] - Rebroadcast Time Limit (mins) ..... 10
 [E] - System Activation ................ Approach
 [F] - Advance Alarm Time (secs) ........ 10
 [G] - Announce Total Axles .............
 [H] - Announce Test Trains .............
 [I] - Rebroadcast Code ................. 4353
 [J] - Configure Input 1 ................ Dragging Equipment
 [K] - Configure Input 2 ................ High Load
 [L] - Configure Input 3 ................ Wide Load
 [M] - Configure Input 4 ................ Wide Load
 [X] - Exit
```

If the System Activation is changed to **Continuous Scan**, the Track Options menu is like this.

```
 Track 1 Options                            Current Setting
 ----------------                           ----------------
 [A] - Track Number ..................... None
 [B] - Maximum Alarms ...................
 [C] - Number of Repeats ................ 2
 [D] - Rebroadcast Time Limit (mins) ..... 10
 [E] - System Activation ................ Continuous scan
 [F] - Alarm Interval Time (mins) ........ 10
 [G] - Alarm Duration Time (mins) ........ 60
 [I] - Rebroadcast Code ................. 4353
 [J] - Configure Input 1 ................ Slide Fence
 [K] - Configure Input 2 ................ Not used
 [L] - Configure Input 3 ................ Not used
 [M] - Configure Input 4 ................ Not used
 [X] - Exit
```

Notice that Maximum Alarms is no longer available, the Advance Alarm option is no longer displayed, and two new parameters have been added to set the interval and duration of alarm announcements.

5.5.8.1 Track Number

On the Track-1 Options menu, option-A is the Track Number option.

```
Track 1 Options                       Current Setting
-----------------                     -----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2


                        •
                        •
                        •

```

To select this option, press **[A]**. Doing so displays this prompt.

```
Enter track number (1-6 or 0=none):
```

Type the digit that corresponds to the desired track designation. For example, if you want to select track-1, press **[1]**. To have no designation announced for the track connected to track-1, press **[0]**. To exit without making any changes, press **[Esc]**. After typing a digit or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.2 Maximum Alarms

On the Track-1 Options menu, option-B is the Maximum Alarms option.

```
Track 1 Options                       Current Setting
-----------------                     -----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2


                        •
                        •
                        •

```

To select this option, press **[B]**. Doing so lets you set the number of alarms the system allows during each train's passage.

```
Enter new value (1-9):
```

Type a digit from **1** to **9** to set the maximum number of alarms. If a train has more than the maximum number of alarms, "multiple dragging equipment" or "integrity failure" is added to the post-train announcement. The alarms, up to and including the maximum, are announced with the axle number at which they occurred. ***Chapter 4 - Radio Announcements*** describes this message. To exit without making any changes, press **[Esc]**. After typing a digit or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.3 Number of Repeats

On the Track-1 Options menu, option-C is the Number of Repeats option.

```
Track 1 Options                         Current Setting
----------------                        ----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ............... 2
[D] - Rebroadcast Time Limit (mins) ..... 10

                        •
                        •
                        •
```

To select this option, press **[C]**. Doing so lets you set the number of times the system repeats an end-of-train announcement <u>or</u> an alarm announcement.

```
Enter new value (2-5):
```

Type a digit from **2** to **5** to set the number of repeats. This applies to the post-train announcement for transducer and approach-activated inputs and to the initial announcement for continuous-scan inputs. There is a five-second interval between repeats. ***Chapter 4 - Radio Announcements*** describes this message. To exit without making any changes, press **[Esc]**. After typing a digit or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.4   Rebroadcast Time Limit

On the Track-1 Options menu, option-D is the Rebroadcast Time Limit option.

```
Track 1 Options                         Current Setting
-----------------                       -----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2
[D] - Rebroadcast Time Limit (mins) .... 10
[E] - System Activation ................ TO1 Transducer

                          •
                          •
                          •
```

To select this option, press **[D]**. Doing so lets you set the amount of minutes after a train passes a site that a rebroadcast is allowed. The current setting will be shown along with a prompt for a new value.

```
Enter new value (001-240) in minutes:
or 000 to always allow rebroadcasts.
```

Type a three-digit value representing the amount of **minutes** to allow the last post-train announcement to be rebroadcast. If the value is less than 100, type any leading zeros. If you type a value from 001 through 240, the value is the number of minutes that a crew has to request a repeat of the last post-train announcement. If you type 000, the last post-train announcement is always available for rebroadcast. To exit without changing the time, press **[Esc]**. After either typing three digits or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.5 System Activation

On the Track-1 Options menu, option-E is the System Activation option.

```
Track 1 Options                        Current Setting
----------------                       ----------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2
[D] - Rebroadcast Time Limit (mins) .... 10
[E] - System Activation ................ TO1 Transducer
[F] - Advance Alarm Time (secs) ........ 10


                          •
                          •
                          •
```

To select this option, press **[E]**. Doing so lets you select the way in which track-1 detects train presence.

```
System Activation
---------------------
(1) - Continuous scan
(2) - Two transducers
(3) - TO1 transducer only
(4) - TO2 transducer only
(5) - Approach
```

Type a digit from **1** to **5** to set the type of system activation. To exit without making any changes, press **[Esc]**. After typing a digit or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.6   Advance Alarm Time (Transducer or Approach)

For transducer or approach applications, on the Track-1 Options menu, option-F is the Advance Alarm Time option.

```
                    •
                    •
                    •

 [E] - System Activation ................. TO1 Transducer
 [F] - Advance Alarm Time (secs) ........ 10
 [G] - Announce Total Axles ............. No


                    •
                    •
                    •
```

To select this option, press **[F]**. Doing so lets you set the Advance Alarm Time option.

```
 Enter new value (01-99):
```

Type a two-digit value representing the amount of **seconds** to allow alarms before the first transducer pulse. This parameter is also used to determine if a stuck-dragger or blocked-sensor condition has occurred when no train is present. The advance alarm time may be set from 1 second to 99 seconds, but for values less than ten, type a leading zero. To exit without changing the time, press **[Esc]**. After typing two digits or pressing **[Esc]**, the Track-1 Options menu reappears.

Section *3.6 - Advance-Alarm Detection* describes how the advance alarm time is used.

5.5.8.7 Announce Total Axles (Transducer or Approach)

For transducer or approach applications, on the Track-1 Options menu, option-G is the Announce Total Axles option. This option lets you select if you want to announce total axles at the end of each post-train announcement.

```
                         •
                         •
                         •

   [F] - Advance Alarm Time (secs) ......... 10
   [G] - Announce Total Axles .............. No
   [H] - Announce Test Trains .............. Yes


                         •
                         •
                         •
```
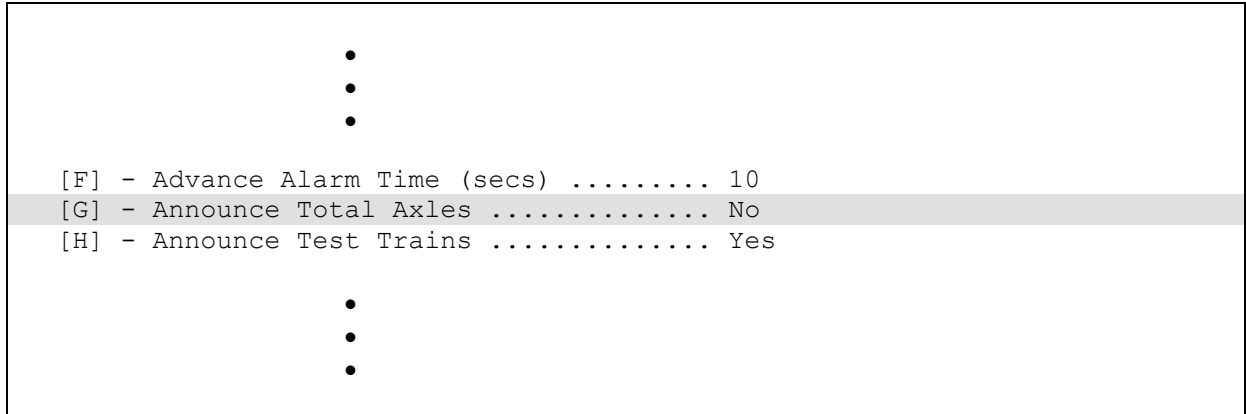
The current setting shows whether total axles will be announced (Yes) or not announced (No). To change this setting, press **[G]**. Doing so toggles the current setting between Yes and No. Press **[G]** until the desired setting is shown under the Current Setting column.

5.5.8.8 Announce Test Trains (Transducer or Approach)

For transducer or approach applications, on the Track-1 Options menu, option-H is the Announce Test Trains option. This option lets you select if you want a make an announcement for trains with an axle count of 2 or 3.

```
                         •
                         •
                         •

   [G] - Announce Total Axles .............. No
   [H] - Announce Test Trains .............. Yes
   [I] - Rebroadcast Code .................. 4353


                         •
                         •
                         •
```
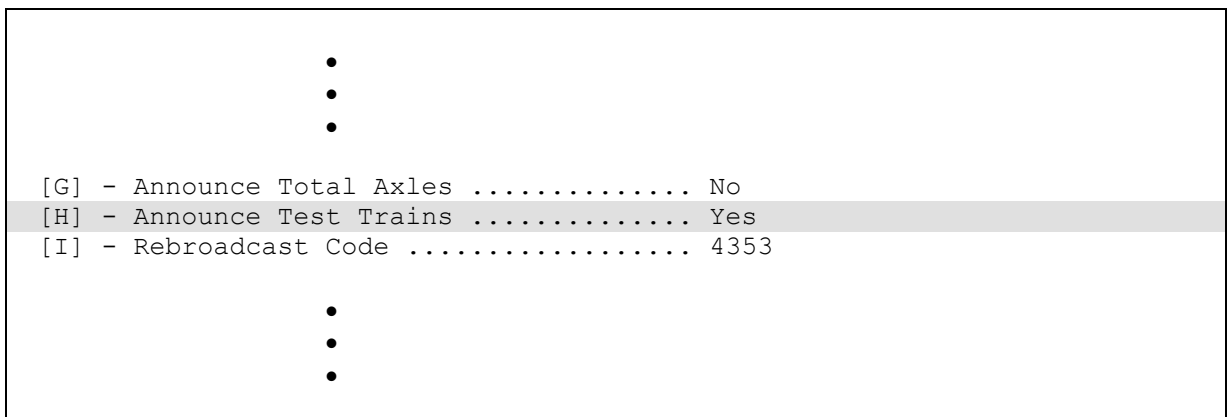
The current setting shows whether "system working" or "integrity failure" will be announced at the end of test trains (Yes) or not announced (No). To change this setting, press **[H]**. Doing so toggles the current setting between Yes and No. Press **[H]** until the desired setting is shown under the Current Setting column.

5.5.8.9 Alarm Interval Time (Continuous Scan)

For continuous-scan applications, on the Track-1 Options menu, option-F is the Alarm Interval Time option.

```
                    •
                    •
                    •

[D] - Rebroadcast Time Limit (mins) ..... 10
[E] - System Activation ................. Continuous scan
[F] - Alarm Interval Time (mins) ........ 10
[G] - Alarm Duration Time (mins) ........ 60
[I] - Rebroadcast Code .................. 4353
[J] - Configure Input 1 ................. Slide Fence
[K] - Configure Input 2 ................. Not used
[L] - Configure Input 3 ................. Not used
[M] - Configure Input 4 ................. Not used
[X] - Exit
```

To select this option, press **[F]**. Doing so lets you set the Alarm Interval Time.

```
   Enter new value (02-60):
```

Type a two-digit value representing the amount of **minutes** to allow between repeats of the alarm announcement for continuous-scan inputs. (*Chapter 4 - Radio Announcements* describes the continuous scan announcements.) The Alarm Interval Time may be set from 2 minutes to 60 minutes, but for values less than ten, type a leading zero. To exit without changing the time, press **[Esc]**. After typing two digits or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.10 Alarm Duration Time (Continuous Scan)

For continuous-scan applications, on the Track-1 Options menu, option-G is the Alarm Duration Time option. To select this option, press **[G]**. Doing so lets you set the Alarm Duration Time.

```
Enter new value (0005-9999):
```

Type a four-digit value representing the amount of **minutes** to allow the alarm announcement for continuous-scan inputs to be made. (*Chapter 4 - Radio Announcements* describes the continuous-scan announcements.) The Alarm Duration Time may be set from 5 minutes to 9999 minutes, but for values less than one thousand, type all leading zeros. To exit without changing the time, press **[Esc]**. After typing four digits or pressing **[Esc]**, the Track-1 Options menu reappears.

5.5.8.11 Rebroadcast Code

The 2700 Wayside Inspection System has the ability to monitor the active radio channels for a rebroadcast request. When it receives the correct DTMF (or touchtone) code, it will rebroadcast the last end-of-train message (or alarm message for continuous-scan alarms), provided the rebroadcast time limit hasn't expired.

On the Track-1 Options menu, option-I is the Rebroadcast Code option. This option shows the series of DTMF digits that will trigger a rebroadcast.

```
                     •
                     •
                     •
  [H] - Announce Test Trains .............. Yes
  [I] - Rebroadcast Code .................. 4353
  [J] - Configure Input 1 ................ Dragging Equipment

                     •
                     •
                     •
```

To change the rebroadcast code, press **[I]**. Doing so displays this prompt.

```
  Enter up to seven characters for the rebroadcast code.
  Characters may be #, *, 0 through 9, and A through D.
```

A rebroadcast code may be from 1 to 7 characters in length. Valid characters are any DTMF code, which contains the digits 0 through 9, *, #, and the letters A through D.

Leading zeros aren't required when entering the rebroadcast code. This code should be entered exactly as it will be keyed over the radio to request a rebroadcast. If the rebroadcast code is less than seven characters, press **[Enter]** to finish.

Pressing **[Enter]** without entering any DTMF characters clears the rebroadcast code and prevents any announcements from being rebroadcast.

While entering characters, press **[Esc]** at any time to exit without changing the rebroadcast code. Press the backspace key to delete a character.

5.5.8.12 Configure Input-1

On the Track-1 Options menu, option-J is the Configure Input-1 option. This option configures alarm1.

```
                    •
                    •
                    •

    [I] - Rebroadcast Code .................. 4353
    [J] - Configure Input 1 ................. Dragging Equipment
    [K] - Configure Input 2 ................. High Load

                    •
                    •
                    •
```

Pressing **[J]** displays the Input Options menu.

```
    Input 1 Options                 Current Setting
    ----------------                ----------------
    [1] - Alarm Type ................. Dragging Equipment
    [2] - Rail Designation ........... N/A
    [3] - Milepost 1 ................. N/A
    [4] - Milepost 2 ................. N/A
    [0] - Exit
```

On the Input Options menu, option-1 is the Alarm Type option. This option allows the alarm type for input-1 to be set.

```
  Alarm Type
  ----------------
  (0) - Not used
  (1) - Dragging Equipment
  (2) - High Load
  (3) - Wide Load
  (4) - Shifted Load
  (5) - Slide Fence
  (6) - Slip
  (7) - High Water
  (8) - Collision
  (9) - Fire
  (A) - Power Off
```

Alarm types 5 through A must operate in continuous-scan mode. Those alarm types cannot be selected unless System Activation for that channel is set to continuous scan. If one of those alarm types is selected and System Activation isn't set to continuous scan, a warning will be displayed indicating that the System Activation needs to be changed.

Likewise, if one of those alarm types is already selected and is setup for continuous mode, the System Activation cannot be changed as long as any alarm type used by that track requires continuous scan. If System Activation is selected, a warning will be displayed indicating that it cannot be changed.

For some alarm types, an additional menu with other options will be presented. **For wide-load alarms**, an option to set the Rail Designation will be shown.

```
  Input 1 Options                    Current Setting
  -----------------                  -----------------
  [1] - Alarm Type ................. Wide Load
  [2] - Rail Designation ........... North
  [3] - Milepost 1 ................. N/A
  [4] - Milepost 2 ................. N/A
  [0] - Exit
```

On the Input Options menu, option-2 is the **Rail Designation option**. To select this option, press **[2]**. Doing so lets you select the rail designation (or side) to be announced for wide-load alarms. Five choices are available.

```
Rail Designation
----------------
(0) - None
(1) - North
(2) - South
(3) - East
(4) - West
```

Type the digit that corresponds to the desired rail designation. For example, if you want to select east, press **[3]**. To exit without making any changes, press **[Esc]**.

For slide-fence alarms, options to set the first and second milepost designations are shown.

```
Input 1 Options                 Current Setting
-----------------               -----------------
[1] - Alarm Type ................ Slide Fence
[2] - Rail Designation .......... N/A
[3] - Milepost 1 ................ 0056.1
[4] - Milepost 2 ................ 0057.4
[0] - Exit
```

On the Input Options menu, option-3 is the **Milepost-1** option. To select this option, press **[3]**. Doing so displays the current <u>first</u> milepost with a prompt for a new one. (The first milepost is always announced with each message.)

```
Enter new milepost:
```

Type the milepost with no spaces between digits. Entry format is **nnnnn**, where **n** is a digit 0 through 9. If the desired milepost has less than five digits, type leading zeros. If the desired milepost is an integer, type a trailing zero. Thus, for milepost 58, type **00580**. The system automatically inserts the decimal point. To exit without changing the first milepost, press **[Esc]**.

On the Input Options menu, option-4 is the **Milepost-2** option. To select this option, press **[4]**. Doing so displays the current <u>second</u> milepost with a prompt for a new one. If the second milepost is set to all zeros, it won't be announced. (***Chapter 4 - Radio Announcements*** describes the slide-fence announcements.)

```
   Enter new milepost:
```

Type the milepost with no spaces between digits. Entry format is **nnnnn**, where **n** is a digit 0 through 9. If the desired milepost has less than five digits, type leading zeros. If the desired milepost is an integer, type a trailing zero. Thus, for milepost 62, type **00620**. The system automatically inserts the decimal point. To exit without changing the second milepost, press **[Esc]**.

5.5.8.13   Configure Input-2

On the Track-1 Options menu, option-K is the Configure Input-2 option. This option configures alarm2.

```
                       •
                       •
                       •

   [J] - Configure Input 1 .................. Dragging Equipment
   [K] - Configure Input 2 ................. High Load
   [L] - Configure Input 3 ................. Wide Load

                       •
                       •
                       •
```

Pressing **[K]** allows the alarm type for input-2 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.5.8.14 Configure Input-3

On the Track-1 Options menu, option-L is the Configure Input-3 option. This option configures alarm3.

```
                    •
                    •
                    •
  [K] - Configure Input 2 ................. High Load
  [L] - Configure Input 3 ................. Wide Load
  [M] - Configure Input 4 ................. Wide Load
  [X] - Exit
```

Pressing **[L]** allows the alarm type for input-3 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.5.8.15 Configure Input-4

On the Track-1 Options menu, option-M is the Configure Input-4 option. This option configures alarm4.

```
                    •
                    •
                    •
  [L] - Configure Input 3 ................. Wide Load
  [M] - Configure Input 4 ................. Wide Load
  [X] - Exit
```

Pressing **[M]** allows the alarm type for input-4 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.5.8.16 Exit

On the Track-1 Options menu, option-X is the Exit option.

```
                    •
                    •
                    •
  [L] - Configure Input 3 ................. Wide Load
  [M] - Configure Input 4 ................. Wide Load
  [X] - Exit
```

To select this option, press **[X]**. Doing so returns you to the Setup Options menu.

5.5.9 Setup Track-2 Module

On the Setup Options menu, option-I is the Setup Track-2 Module option.

```
                    •
                    •
                    •
  [H] - Setup Track Module 1
  [I] - Setup Track Module 2
  [J] - Setup Track Module 3
  [K] - Setup Track Module 4
  [L] - Load Default Setup
  [X] - Exit
```

To display the Track-2 Options menu, press **[I]**. The resulting screens look the same as those for track-1 described above.

5.5.10 Setup Track-3 Module

On the Setup Options menu, option-J is the Setup Track-3 Module option.

```
                    •
                    •
                    •
  [I] - Setup Track Module 2
  [J] - Setup Track Module 3
  [K] - Setup Track Module 4
  [L] - Load Default Setup
  [X] - Exit
```

To display the Track-3 Options menu, press **[J]**. The resulting screens look the same as those for track-1 described above.

5.5.11 Setup Track-4 Module

On the Setup Options menu, option-K is the Setup Track-4 Module option.

```
                    •
                    •
                    •
  [J] - Setup Track Module 3
  [K] - Setup Track Module 4
  [L] - Load Default Setup
  [X] - Exit
```

To display the Track-4 Options menu, press **[K]**. The resulting screens look the same as those for track-1 described above.

5.5.12 Load Default Setup

On the Setup Options menu, option-L is the Load Default Setup option.

```
                    •
                    •
                    •

   [K] - Setup Track Module 4
   [L] - Load Default Setup
   [X] - Exit
```
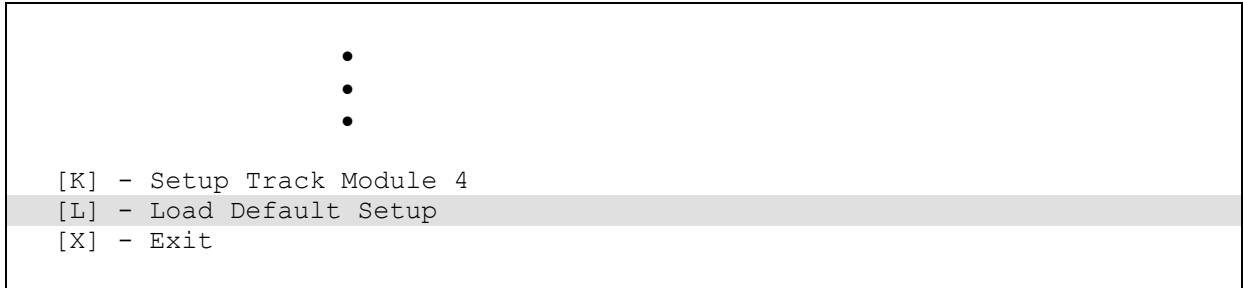
When this menu item is selected, the parameters listed below are assigned to the values listed below. A "yes" after a parameter means that it is "enabled." A "no" means that it is "disabled." This menu option is included to assist installers in setting up a new system. Selecting this option configures the system with all alarm inputs turned off and Track Modules disabled, which places the system in a "safe" state until it can be properly configured.

Defaults for entire system:

Announce Ambient Temp	No
Announce Detector Out	Yes
Announce Low Battery	Yes
Announcement Mode	Departure messages only
Display Lines	35
Radio Channels	None selected
Serial Baud Rate	9600
Temperature Probe	Disabled
Track Direction	East/West
Track Module 1	Disabled
Track Module 2	Disabled
Track Module 3	Disabled
Track Module 4	Disabled

Defaults for each track:

Advance Alarm Time	10 seconds
Alarm Duration Time	60 minutes
Alarm Interval Time	10 minutes
Announce Test Trains	Yes
Announce Total Axles	No
Maximum Alarms	3
Number of Repeats	2
Rebroadcast Timeout	10 minutes
System Activation	Continuous scan
Track Number	None

Defaults for each input (four per track):

Alarm Type	Not used
Milepost 1	0000.0
Milepost 2	0000.0
Rail Designation	None

To select the Load Default Setup option, press **[L]**. Doing so displays this prompt.

```
    Current settings will be lost...
    Press Y to continue:
```

Press **[Y]** to load the default setup <u>or</u> press any other key to exit without changing the current setup information.

5.5.13 Exit

On the Setup Options menu, option-X is the Exit option.

```
                    •
                    •
                    •

    [K] - Setup Track Module 4
    [L] - Load Default Setup
    [X] - Exit
```

To select this option, press **[X]**. Doing so returns you to the Main menu.

5.6 Setup Equipment

On the Main menu, option-F is the Setup Equipment option.

```
 Fri  Aug 27 2010  08:51:54
 Main Menu                    MP: 0024.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3
 [D] - Display Data For Track 4
 [E] - Set System Parameters
 [F] - Set Up Equipment
 [G] - Display System Log
 [H] - Show System Status
 [I] - System Functions
```

To select this option, press **[F]**. Doing so displays the Equipment menu.

```
 Equipment                      Current Setting
 -------------------------------------------------
 [A] - Track Module 1 ............ Enabled
 [B] - Track Module 2 ............ Enabled
 [C] - Track Module 3 ............ Enabled
 [D] - Track Module 4 ............ Enabled
 [E] - Temperature Probe ......... Enabled
 [F] - Serial Baud Rate .......... 115200
 [G] - Display Lines ............. 30
 [H] - Select Radio Channels ..... R1:  R2:
 [X] - Exit
```

5.6.1 Track Module-1

On the Equipment menu, option-A is the Track Module-1 option. Selecting it allows the Track Module plugged into the TRACK-1 slot to be enabled or disabled. Once a Track Module is installed on the Docking Module and powered up, it must be enabled in this menu to function properly. A Track Module that is not enabled will not be initialized and will not scan trains or alarms.

The current setting shows whether the Track Module is enabled or disabled. Pressing **[A]** toggles the setting for the corresponding Track Module between enabled and disabled. Press **[A]** until the desired setting is shown.

5.6.2   Track Module-2

On the Equipment menu, option-B is the Track Module-2 option. Selecting it allows the Track Module plugged into the TRACK-2 slot to be enabled or disabled. Once a Track Module is installed on the Docking Module and powered up, it must be enabled in this menu to function properly. A Track Module that is not enabled will not be initialized and will not scan trains or alarms.

The current setting shows whether the Track Module is enabled or disabled. Pressing **[B]** toggles the setting for the corresponding Track Module between enabled and disabled. Press **[B]** until the desired setting is shown.

5.6.3   Track Module-3

On the Equipment menu, option-C is the Track Module-3 option. Selecting it allows the Track Module plugged into the TRACK-3 slot to be enabled or disabled. Once a Track Module is installed on the Docking Module and powered up, it must be enabled in this menu to function properly. A Track Module that is not enabled will not be initialized and will not scan trains or alarms.

The current setting shows whether the Track Module is enabled or disabled. Pressing **[C]** toggles the setting for the corresponding Track Module between enabled and disabled. Press **[C]** until the desired setting is shown.

5.6.4   Track Module-4

On the Equipment menu, option-D is the Track Module-4 option. Selecting it allows the Track Module plugged into the TRACK-4 slot to be enabled or disabled. Once a Track Module is installed on the Docking Module and powered up, it must be enabled in this menu to function properly. A Track Module that is not enabled will not be initialized and will not scan trains or alarms.

The current setting shows whether the Track Module is enabled or disabled. Pressing **[D]** toggles the setting for the corresponding Track Module between enabled and disabled. Press **[D]** until the desired setting is shown.

5.6.5 Temperature Probe

On the Equipment menu, option-E is the Temperature Probe option. Selecting it allows the ambient temperature probe to be enabled or disabled.

If a temperature probe is connected to the system, it should be enabled using this menu. When this setting is enabled, the ambient temperature reading is displayed on the System Status report and can be added to any voice announcements. If the temperature probe is disabled, the ambient temperature won't be displayed or announced.

The current setting shows whether the temperature probe is enabled or disabled. Pressing **[E]** will toggle the setting between enabled and disabled. Press **[E]** until the desired setting is shown.

5.6.6 Serial Baud Rate

On the Equipment menu, option-F is the Serial Baud Rate option. Selecting it lets you set the baud rate that is used for the Local RS232 port. Pressing **[F]** presents the following options.

```
 Baud Rate
 ----------------
 (0) - 300
 (1) - 600
 (2) - 1200
 (3) - 2400
 (4) - 4800
 (5) - 9600
 (6) - 19200
 (7) - 38400
 (8) - 57600
 (9) - 115200
```

Type the digit that corresponds to the desired baud rate. For example, the following message will be displayed when **[5]** was pressed, causing 9600 to be selected.

```
 Baud rate will be changed to 9600 in 3 seconds
 Set terminal to 9600 baud and press ESC for menu
```

At this point, you must change your terminal program to the new baud rate and press **[Esc]** to return to the Equipment menu.

5.6.7 Display Lines

On the Equipment menu, option-G is the Display Lines option. Selecting it lets you set a value for the Display Data option, Display System Log option, and the Show System Status option on the Main menu. This parameter can also be changed from within the Display Data option, but after a power-up or reset, the setting will always revert to the value typed here.

Press **[G]** and this prompt appears.

```
Enter new value (05 – 99):
```

You may type a number from 05 to 99, which will be the number of lines to display at one time. If the number is less than 10, type a leading zero.

5.6.8 Select Radio Channels

On the Equipment menu, option-H is the Select Radio Channels option. Selecting it lets you configure radio operation. The 2700-000 Wayside Inspection System can support up to two radios, each having eight possible broadcast channels. The system can be configured to use a single channel broadcasting on each radio (known as Simultaneous operation), or up to two channels broadcasting on a single radio (known as Sequential operation).

Press **[H]** and the Select Radio Channels prompt appears.

```
Select Radio Channels
---------------------
You may enter two channels for Radio 1 to transmit sequentially,
or two channels for Radio 2 to transmit sequentially.
or one channel for each radio to transmit simultaneously.
Channel numbers can be 1 through 8 in any order.
Press ESC to exit without changing channel numbers.
Use TAB or SPACE to move cursor.

                  Radio 1        Radio 2
                  -------        -------
 First Channel #     _              _
Second Channel #     _              _
```

The cursor will be flashing at the field for the first channel number of radio-1. You may type a digit from 1 to 8, which represents the radio channel to be used. Or, you may press the spacebar or **[Tab]** to move to the next field without typing a digit. You may also press **[Esc]** at any time to exit without changing the radio channels. When a digit is typed or **[Tab]** or the spacebar is pressed, the cursor will move to the first channel number field for radio-2.

```
                     Radio 1        Radio 2
                     -------        -------
   First Channel #      _              _
  Second Channel #      _              _
```

If a first channel number is typed for both radio-1 and radio-2, no second channels will be typed. In this mode, one channel on radio-1 and one channel on radio-2 will broadcast simultaneously. The example below will broadcast simultaneously on channel 3 of radio-1 and channel 7 of radio-2.

```
                     Radio 1        Radio 2
                     -------        -------
   First Channel #      3              7
  Second Channel #      _              _
```

If a first channel number is typed for only radio-1 or only radio-2, you will be prompted to type a second channel number for that radio. In this mode, two channels will broadcast sequentially on one radio. Either radio-1 or radio-2 can be used in this mode, but not both at the same time. The example below will broadcast sequentially on channels 1 and 2 of radio-1.

```
                     Radio 1        Radio 2
                     -------        -------
   First Channel #      1              _
  Second Channel #      2              _
```

This example will broadcast sequentially on channels 5 and 8 of radio-2.

```
                     Radio 1        Radio 2
                     -------        -------
   First Channel #      _              5
  Second Channel #      _              8
```

You may also type only one channel for either radio-1 or radio-2 and only that single channel will be used for announcements. If no channels are typed at all, no announcements will be broadcast over either radio. Announcements can still be heard through the local speaker even if no radio channels are selected.

5.6.9 Exit

On the Equipment menu, option-X is the Exit option. Selecting it causes the system to leave the Equipment menu and return to the Main menu. If any parameters have been changed, your will be asked if you want to save those changes.

```
 Current settings have changed.
 Press Y to save these changes to flash.
```

Press **[Y]** to save the changes. Press any other key to discard the changes and return to the Main menu.

5.7 Display System Log

On the Main menu, option-G is the Display System Log option.

```
 Fri  Aug 27 2010  08:51:54
 Main Menu                   MP: 0024.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Display Data For Track 3
 [D] - Display Data For Track 4
 [E] - Set System Parameters
 [F] - Set Up Equipment
 [G] - Display System Log
 [H] - Show System Status
 [I] - System Functions
```

The 2700 Wayside Inspection System maintains a record of selected events that might be an indicator of system health or aid in troubleshooting. To view these events, press **[G]**. Doing so produces a report of the system log. Below is a sample of that report. The contents of your report will be different.

```
 File: STSYSTEM.LOG        206 records
 First event: 11/23/10 09:36  Power-up or reset
 Last event:  12/22/10 15:17  Talker Health Check - OK

 12/22/10 10:05  Power-up or reset
 12/22/10 10:05  Talker Health Check - OK
 12/22/10 10:05  Track module 2 initialized
 12/22/10 10:05  Track module 3 initialized
 12/22/10 10:05  Track module 4 initialized
 12/22/10 10:05  Track module 1 initialized
 12/22/10 10:18  Track module 1 programmed
 12/22/10 10:20  Track module 2 programmed
 12/22/10 10:22  Track module 3 programmed
 12/22/10 10:24  Track module 4 programmed
 12/22/10 10:24  Track module 2 initialized
 12/22/10 10:24  Track module 3 initialized
 12/22/10 10:24  Track module 4 initialized
 12/22/10 10:24  Track module 1 initialized
 12/22/10 10:25  Track module 3 comms down
 12/22/10 10:25  Track module 3 comms OK
 12/22/10 10:34  Power-up or reset
 12/22/10 10:34  Talker Health Check - OK
 12/22/10 10:34  Track module 4 initialized
 12/22/10 10:34  Track module 1 initialized
 12/22/10 10:34  Track module 2 initialized
 12/22/10 10:34  Track module 3 initialized
 12/22/10 11:34  Old records deleted from Train Data 1
 12/22/10 11:34  Old records deleted from Train Data 2
 12/22/10 11:34  Old records deleted from Train Data 3
 12/22/10 11:34  Old records deleted from Train Data 4
 12/22/10 11:34  Old records deleted from System Log
 12/22/10 13:28  new settings saved to flash
 12/22/10 15:16  Talker did not respond
 12/22/10 15:17  Talker Health Check - OK

 [E] - Entire log        [F] - First page        [L] - Last page
 [N] - Next page         [P] - Previous page      [S] - Search for a date
 [X] - Exit              [D] - Display lines (30)
```

In this case, the file has 206 events. The oldest event was recorded at 9:36 am on 11/23/10. The newest was recorded at 3:17 pm on 12/22/10. If there are more events than can be displayed at one time, only the most recent data is displayed.

The amount of data to display at one time is determined by the Display Lines setting. The Display Lines setting can be changed by choosing option **[D]**. If you press **[D]** above, this prompt appears.

```
Enter new value (05 - 99):
```

You may type a number from 05 to 99, which is the number of lines of data to display. If the number is less than 10, type a leading zero.

Changing the Display Lines setting with option-D affects only this report. If you want to change the amount of data displayed for all reports, use the Display Lines option on the Equipment menu.

Other parts of the file can be displayed by pressing the following keys.

    [E] – Dumps the entire log to the screen at one time.
    [F] – Displays the first page of data (oldest data).
    [L] – Displays the last page of data (newest data).
    [N] – Displays the next page of data from the current position.
    [P] – Displays the previous page of data from the current position.

You may also search for a specific date using option-S. If you press **[S]** above, this prompt appears.

```
Enter date (mm/dd/yyyy):
```

You can now type a date, and data will be displayed starting with the first record on or after that date. For example, if you type **082310**, data will be displayed starting with the first record on or after **08/23/2010**. When typing in the date, 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 8 June 2011, type **060811**.

Press **[X]** <u>or</u> **[Esc]** to exit the Display Data function and return to the Main menu.

These events may be stored in the System Log.

New settings saved to flash	A parameter in either the Setup Options menu or the Equipment menu was changed and the new settings were saved to flash.
Old records were deleted from Train Data 1 Old records were deleted from Train Data 2 Old records were deleted from Train Data 3 Old records were deleted from Train Data 4	Train data for each enabled track module is retained for thirty days. Once a day, the central processor checks each train data file and purges any records older than thirty days. If any records are deleted, one of these messages will be saved in the system log.
Old records were deleted from System Log	Events are retained in the system log for thirty days. Once a day, the central processor will check the system log file and purge any records older than thirty days. If any records are deleted, this message will be saved in the system log.
Power-up or reset	The system was powered up (power switch) or the central processor was reset (reset button).
Talker did not respond	The Central Processor board was unable to communicate with the talker processor board.
Talker Health Check – OK	The Central Processor board has established communications with the talker processor board. This will typically happen after a power-up or reset event, but could also occur if communication with the talker processor board is lost and then re-established.
Track module 1 comms **down** Track module 2 comms down Track module 3 comms down Track module 4 comms down	These messages happen if the central processor for some reason is unable to communicate with a Track Module.
Track module 1 comms **OK** Track module 2 comms OK Track module 3 comms OK Track module 4 comms OK	These messages happen when the central processor establishes communications with a Track Module that it had previously been unable to communicate with. Usually there should be a corresponding "Track module x comms down" message.
Track module 1 **initialized** Track module 2 initialized Track module 3 initialized Track module 4 initialized	These messages happen when the central processor establishes communications with and configures any installed and enabled Track Modules. This should happen after any power-up or reset event.
Track Module 1 **programmed** Track Module 2 programmed Track Module 3 programmed Track Module 4 programmed	Any time new firmware is flashed into a Track Module, one of these messages will be saved in the system log.

5.8 Show System Status

On the Main menu, option-H is the Show System Status option.

```
                             •
                             •
                             •

    [G] - Display System Log
    [H] - Show System Status
    [I] - System Functions
```

To select this option, press **[H]**. Doing so produces a report of the current system configuration and the status of system components.

At the beginning of the report are the current temperature (if available) and the battery voltage. Next, all global settings are displayed followed by the settings for each enabled Track Module.

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

```
                     Southern Technologies Corporation
                        Wayside Inspection System
                          System Status Report
==============================================================================
Ambient: 70.0F          Battery: 13.4v              Wed  Jun 23 2010  14:52:08
------------------------------------------------------------------------------

Milepost ............... 0012.3    Track Direction ........ North/South

Announcement Mode ....... Departure messages only
Announce Detector Out ... Yes
Announce Low Battery .... Yes
Announce Ambient Temp ... No

Temp Probe Enabled ...... No
Serial Baud Rate ........ 115200
Display Lines ........... 30
Radio Channels ......... R1:  R2:


Track Module 1 Setup
--------------------------------------------------
Track Number ................... None
Maximum Alarms ................. 3
Number of Repeats .............. 2
Rebroadcast Time Limit (mins) ... 10
System Activation .............. Two Transducers
Advance Alarm Time (secs) ....... 10
Announce Total Axles ........... No
Announce Test Trains ........... Yes
Rebroadcast Code ............... 4353
ESC = end, C = continuous, any key to continue
```

Only a part of this report is displayed at one time. The amount of the report that is displayed is determined by the Display Lines option on the Equipment menu. After the first part of the report is displayed, press **[Esc]** to end the report, **[C]** to show the rest of the report uninterrupted, <u>or</u> any other key to show the next part of the report.

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. The version information in the sample below is for illustrative purposes only. It doesn't represent any real release of the firmware.

```
Track Module 2
----------------------------------------------------
Track Number .................... Track 2
Maximum Alarms .................. 3
Number of Repeats ............... 2
Rebroadcast Time Limit (mins) ... 10
System Activation ............... Continuous scan
Alarm Interval Time (mins) ...... 10
Alarm Duration Time (mins) ...... 60
Input 1 ......................... Slide Fence
Input 2 ......................... Not used
Input 3 ......................... Not used
Input 4 ......................... Not used


Track Module 3
--------------------------------------------------
Not Enabled


Track Module 4
--------------------------------------------------
Not Enabled


System Warnings
--------------------------------------------------------------------------
None


Software Versions
--------------------------------------------------------------------------
Central Processor ..... CP0.99  02/22/10
Talker ................ TK0.99  02/03/10
Speech Data ........... UP3.99  01/23/10
Track Module 1 ........ TM0.99  02/17/10
Track Module 2 ........ TM0.99  02/17/10

End of Report
Press ESC for Main menu
```

The <u>System</u> <u>Warnings</u> <u>section</u> of the System Status report may show any of these messages.

SD card not installed:

This message appears when the system doesn't detect a SD card in the SD/MMC card slot on the Processor Module. The SD card is used for long-term data storage. If no card is installed, the system can still scan trains, detect alarms, and make announcements, but it cannot store the data for future reference.

SD card is write protected:

This message appears when the system detects that the SD card in the SD/MMC card slot on the Processor Module is write protected. If the system cannot write to the SD card, no train data or system log entries will be saved.

System time is not set:

This message appears when the Processor Module cannot read the current time from the onboard real-time clock. When this happens, the time and date defaults to midnight on 1 January 1970. The system continues to scan trains and make announcements, but the time and date on all stored data will be incorrect until the time and date are correctly set with the Time and Date option on the Setup Options menu.

Low battery:

This message appears when a low battery condition exists. A low battery condition exists when the battery voltage drops below 10.5 volts. The low battery condition will clear when the battery voltage rises to above 11.0 volts.

The <u>Software</u> <u>Versions</u> <u>section</u> of the System Status report shows the installed firmware versions for the central processor, talker, speech data, and all enabled Track Modules.

5.9   System Functions

On the Main menu, option-I is the System Functions option.

To execute one or more system functions:

1   Be sure that the Main menu is displayed.

The Main menu looks like this.

```
                          •
                          •
                          •

   [G] - Display System Log
   [H] - Show System Status
   [I] - System Functions
```

2   To go to the System Functions menu, type **I**

This menu appears. To access any of the System Functions menu options, type the letter that corresponds to the desired menu option.

```
   System Functions
   ---------------------------------------
   [A] - Radio Test
   [B] - Vocabulary Test
   [C] - Start Test Tone
   [D] - Cancel Test Tone
   [E] - Reinitialize Track Modules
   [F] - Toggle Diagnostic Messages
   [G] - Force Reboot
   [H] - Load New Software
   [X] - Exit
```

3   To leave the System Functions menu and return to the Main menu, type **X**

The options available on the System Functions menu are discussed below.

5.9.1 Radio Test

On the System Functions menu, option-A is the Radio Test option. Selecting it causes a short message to be broadcast through the speaker and through the radio. Using this option lets you verify that the speaker and radio are working properly.

The text of the message is "Testing, U-P detector, milepost (*milepost number*), testing, one, two, three, four, five, four, three, two, one, testing, detector-out."

If the system isn't currently making any other announcements, it begins the Radio Test announcement. If the system is currently making another announcement, the firmware stores the Radio Test announcement until the other announcement is finished before broadcasting it.

5.9.2 Vocabulary Test

On the System Functions menu, option-B is the Vocabulary Test option. Selecting it causes all of the stored speech phrases to be announced. This announcement is broadcast through the speaker, but not through the radio.

The text of the message is "Zero, one, two, three, four, five, six, seven, eight, nine, no-defects, U-P detector, milepost, point, dragging-equipment-near, axle, first, second, third, multiple dragging equipment, detected from axle, to end of train, fourth, fifth, *beep*, defect-detected, sixth, seventh, eighth, ninth, integrity failure, wide load, detector out, detector-working, track, rail, north, south, east, west, high load, total axles, power off, slide-fence-activated, and, testing, from-head-of-train, low-battery, no, rebroadcast, collision, detector-activated, slip, fire, high water, shifted-load, degrees, minus, temperature."

If the system isn't currently making any other announcements, it begins the Vocabulary Test announcement. If the system is currently making another announcement, the firmware stores the Vocabulary Test announcement until the other announcement is finished before broadcasting it.

5.9.3 Start Test Tone

On the System Functions menu, option-C is the Start Test Tone option. Selecting it generates a continuous one-kilohertz tone for 30 seconds. This tone is broadcast through the speaker and through the radio. Using this option lets you verify that the speaker and radio are working properly.

5.9.4 Cancel Test Tone

On the System Functions menu, option-D is the Cancel Test Tone option. Selecting it stops generation of the one-kilohertz tone. This option can be used to stop the tone before its 30-second time limit expires.

5.9.5 Reinitialize Track Modules

On the System Functions menu, option-E is the Reinitialize Track Modules option. Selecting it causes the central processor to send a new copy of the setup parameters to and request the firmware version from all enabled Track Modules. This same initialization process happens after a power-up or reset.

5.9.6 Toggle Diagnostic Messages

On the System Functions menu, option-F is the Toggle Diagnostic Messages option. Selecting it toggles system diagnostic messages between on and off. One of these two messages will be displayed to indicate the new setting.

```
diagnostics on
```

```
diagnostics off
```

The option controls various messages related to communications between the central processor and the talker, communications between the central processor and the Track Modules, and write operations to the SD card.

5.9.7 Force Reboot

On the System Functions menu, option-G is the Force Reboot option. Selecting it causes the entire system to restart. This has the same effect as cycling the power. The central processor, talker, and all Track Modules will reset. The central processor will then re-establish communications with the talker and reinitialize all enabled Track Modules.

5.9.8 Load New Software

On the System Functions menu, option-G is the Load New Software option. Selecting it displays the Load New Software menu.

```
Load New Software
---------------------------------------
[A] - Central Processor
[B] - Talker Module
[C] - Track Module(s)
[D] - Speech Files
[X] - Exit
```

From this menu, <u>new</u> <u>software</u> can be programmed into the central processor, talker processor, or Track Modules. <u>New</u> <u>speech</u> <u>data</u> can also be loaded into the talker processor. The new software to be loaded must be located on the SD card installed in the SD/MMC card slot on the Processor Module. It must also be located in the correct folder on the SD card according to the following list. More than one version of firmware for each module may be stored on the SD card.

Folder	File Description
SOFTWARE	Central Processor program files. The names of these files must begin with "CP_".
SPEECH	Speech data files. These files must have an extension of SPH.
TALKER	Talker program files. The names of these files must begin with "TK_".
TRACKMOD	Track Module program files. The names of these files must begin with "TM_".

From the Load New Software menu, press either **[A]**, **[B]**, **[C]**, or **[D]**, depending on the module to be programmed. A list of the files available for the selected module will be displayed. The sample below is for the central processor (option-A), but the other modules will be similar.

```
Select a software file to load from the SD card.
---------------------------------------
[A] - CP_V050.S19.......12/03/2009
[B] - CP_V051.S19.......12/09/2009
[C] - CP_V052.S19.......12/22/2009
[X] - Exit without loading new software.
```

Select the version that you wish to install. You will be asked to confirm your selection, then the programming will begin. The onscreen prompts will indicate when programming is finished. If a new program is loaded into the central processor, talker processor, or a Track Module, that module will restart when programming is finished. If the Track Modules are selected for updating, all enabled Track Modules will be reprogrammed one at a time, and each will restart when programming of that module is finished.

Chapter 6 — 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 chapter tells how to get answers for questions, fixes for problems, and parts for spares.

6.1 Reaching STC

You can reach STC by mail, phone, 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>phone</u>, 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.

6.2 Returning Equipment for Repair

Return any 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 phone call first. Just ship it directly to the **Repair Department** at the address above.

With the returned equipment, include:

- Complete address where the equipment is to be returned.

- Name and phone number of person who should be contacted to answer questions about the equipment.

- Written explanation of the equipment defect or malfunction.

- Any reports or other data that would be helpful in diagnosing the problem.

- If out of warranty, Purchase Order Number for the order <u>or</u> credit card number (to be charged) with its expiration date.

6.3 Reporting Problems or Suggestions

If you have any problems, suggestions, or questions related to STC equipment, phone the **Engineering Department** at the phone number above. When calling, state the equipment about which you are calling. Your call will then be directed to the right person.

6.4 Ordering Spare Parts

If you need any spare parts to support STC equipment, phone or fax the **Sales Department** at the phone numbers above.

When calling, state that you are 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 <u>or</u> 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 phone number of the person who should be contacted to answer questions about the order.
- Your fax number and email address, if available.
- For each item ordered, part number, complete description, and quantity needed.

6.5 Checking on Shipments and Orders

If you need to check on the status of any shipment or order, phone or fax the **Sales Department** at the phone numbers above.

When calling, state that you are 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 obtain it for you 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 phone number of the person who should be contacted after the order status is checked.
- Your fax number and email address, if available.

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