EUD-2014232-00

iCube

Wayside Monitoring System

User's Guide

20 August 2014

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 iCube System.
Failure to do so could result in damage to the equipment or serious injury to you.

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Contents

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

Chapter 1 — Introduction

This chapter summarizes the purpose of this guide, describes the iCube 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 iCube System. This guide describes that system.

This guide is for those who purchase, install, maintain, manage, or use the iCube System.

1.2 Description of the System

The iCube System monitors track hardware and reports certain dangerous conditions. It can monitor up to two 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, wind speed, bridge out, and power-off.

The iCube is installed in an appropriate wayside enclosure. The system is firmware driven. Internal firmware can be changed to meet the unique needs of a given railroad. Some parts of the system, such as track circuits and transducers, are installed on railroad tracks.

Each iCube System consists of:

- One iCube 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 iCube, the transducers, and temperature probe, if used. The customer provides the alarm-generating devices and the track circuits, if used.

The figure below shows the iCube System.

POWER SUPPLY
BATT
5 VDC
12 VDC

POWER

SD/MMC CARD
LOCAL RS-232

iCube
2700-010
Wayside Monitoring System

RADIO
PTT
CD
DTMF

TRK-1
TRK-2
I-3
I-4
COP
SYSTEM
CAN
TLKR

+12V
TO-1
TO-2
INPUT
PRES
SOTC
ALM-1
ALM-2
ALM-3
ALM-4
OUT-1
OUT-
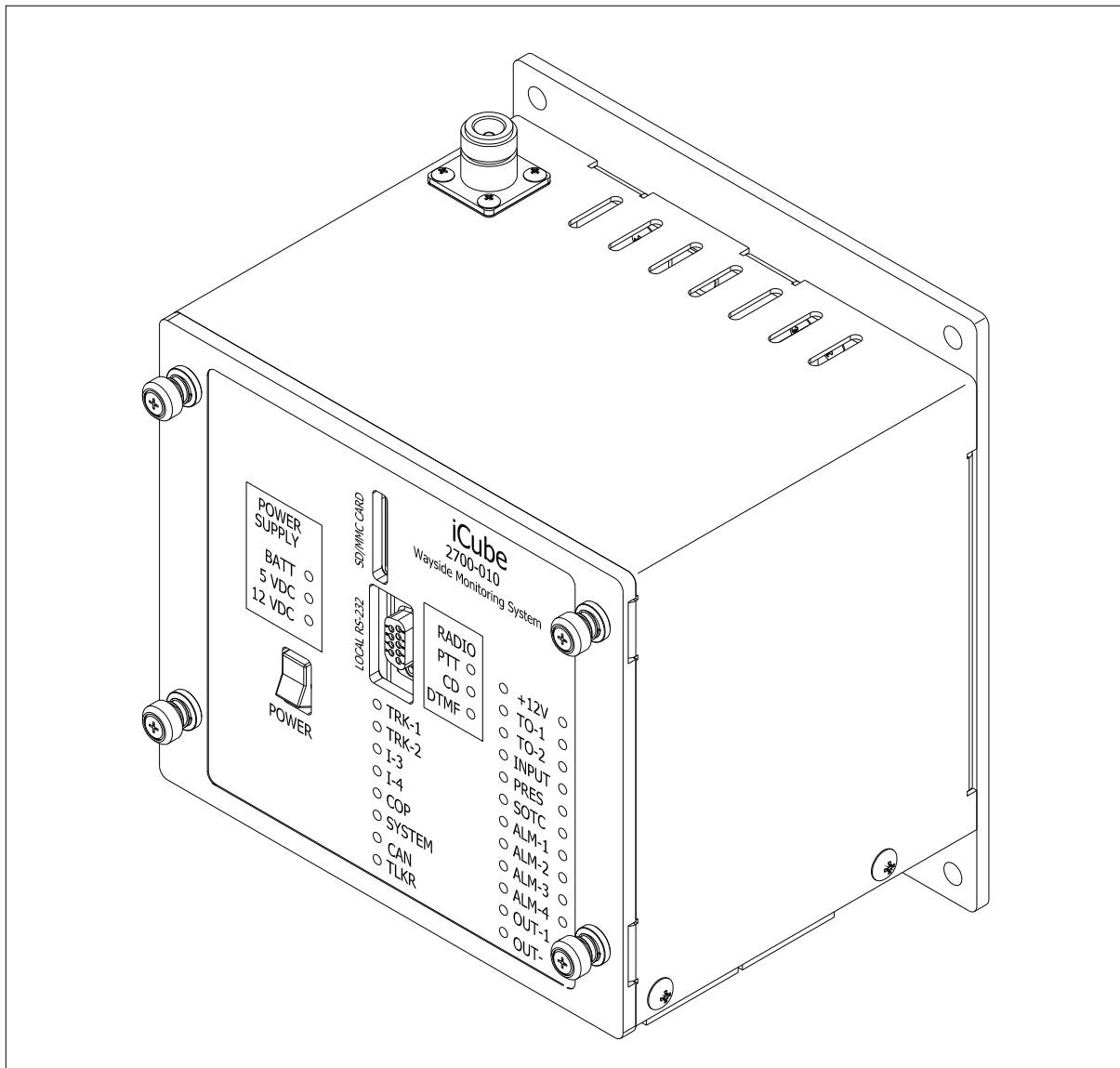
During train passage, the system:

- 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 iCube Features

Internal Radio: The iCube incorporates an internal radio module that includes a Ritron DTX-160 eight channel narrow band transceiver. The standard iCube software supports the following functionality through the radio module.

- Frequency programming – each of the 8 channels in the radio can be programmed for separate transmit and receive frequencies from 160.215 to 161.565MHz inclusive.
- The software supports selection of multiple sequential broadcast channels, eliminating the need for multiple radios.

DTMF Support: The iCube includes an internal DTMF encoder / decoder with software that supports several applications including the following.

- Rebroadcast of the last message from the Talker.

- Activation of relay drivers for external devices such as grade crossing protection and track switches.

- Broadcast of switch position.

- Switch position monitor and announcement.

- Remote activation of slide fence, high water or bridge out announcements on demand.

External Communications Support: The iCube system provides both RS 232 and RS 485 ports plus Ethernet communications ports. The system supports both analog and cellular modems. Modem interface support includes the full AT command set for analog modems and TCP/IP for cellular IP connections to remote host systems. Support for the Union Pacific – D3 protocol is resident in the iCube Communications Processor.

SD Card Operation: The iCube contains a slot for insertion of a SD memory card. All set up information, operating programs and train data is written to the SD card. In the event of a system failure, the SD card can simply be swapped to the replacement unit and all required information transferred to the replacement.

Isolated Power Supplies: The iCube has isolated internal power supplies that allow it to be co-located with signal equipment and operate from signal battery. The battery monitor input works through an isolation amplifier. The radio and CPU power supplies are isolated. The system includes a separate dedicated power supply that can be used to power external devices up to a capacity of .5 amps @ 12 VDC with isolation.

Software Configured Inputs: A standard iCube system provides up to 10 opto-isolated digital inputs that can be configured in the iCube operating software. Standard configurations allow a single iCube to function as a double track High / Wide / DED system. Many other standard combinations are available from the system set up parameters menu.

1.4   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.

1.5   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.

1.6   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 — iCube Wayside Monitoring System

The iCube monitors, processes, and reports certain conditions detected by the system's track hardware. Applications include dragging equipment detector, high load detector, wide load detector, slide fence detector, high water detector, and more. The iCube's compact enclosure is designed to fit the form factor of a B2 relay and can be mounted on a PTMW Swing Rack. It can also be wall-mounted.

The figure below shows a front view of the iCube with dimensions.
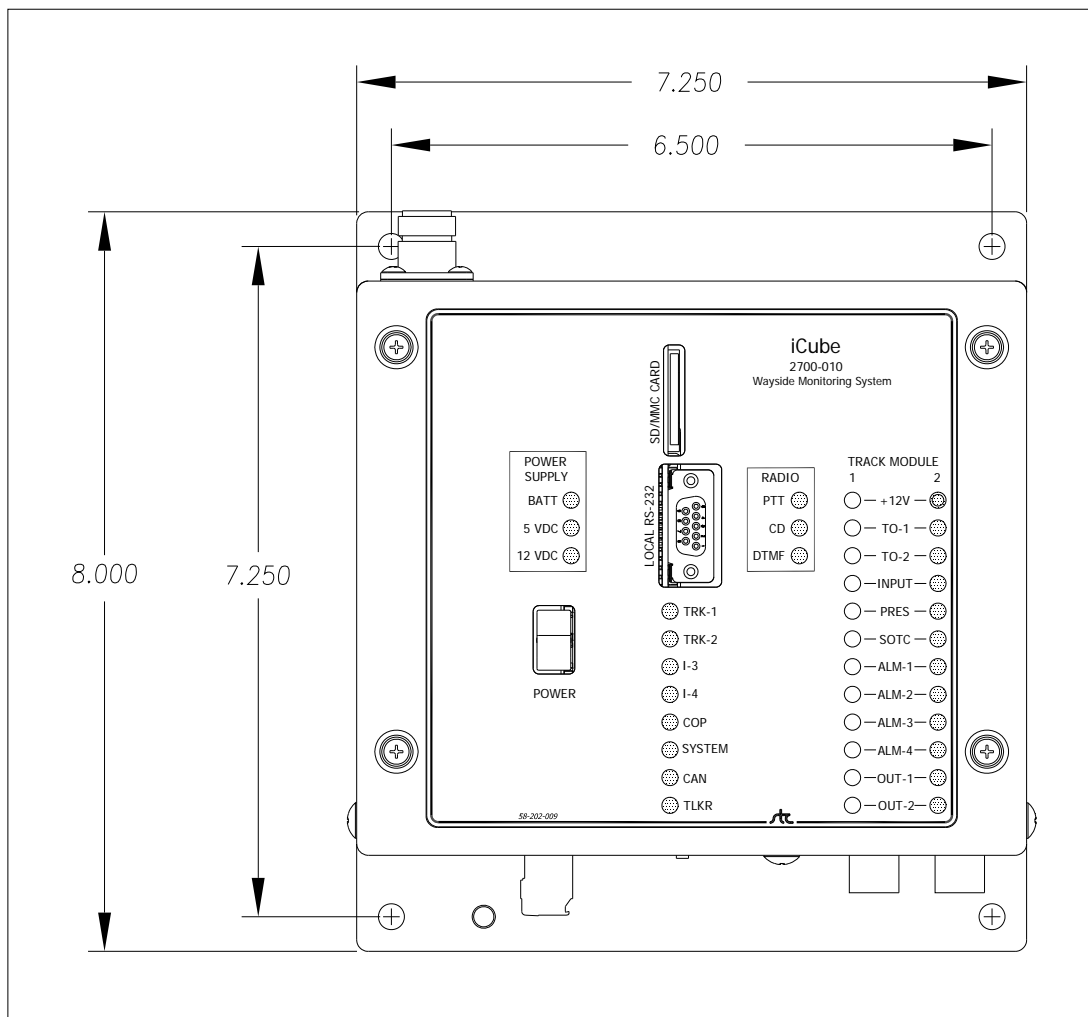
The figure below shows a side view of the iCube with dimensions.
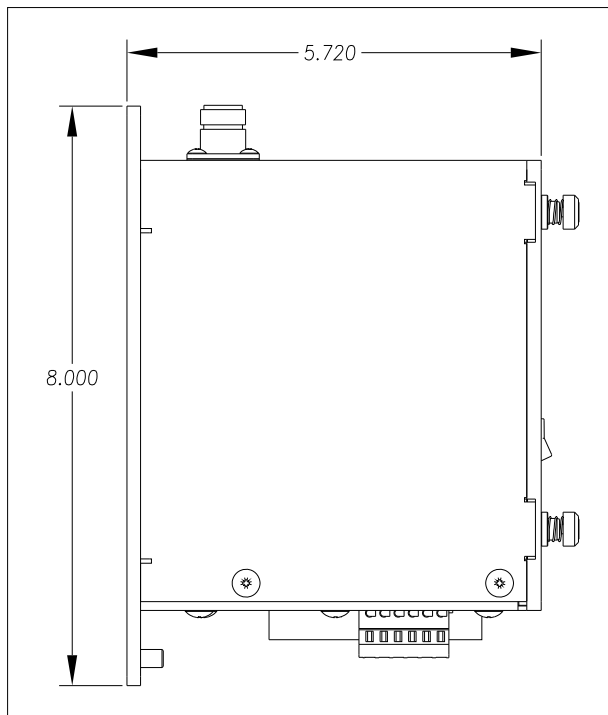
2.0 Technical Specifications

Below are the technical specifications for the Model iCube.

General Specifications	
Operating Input Voltage	9 – 18 VDC @ 0.85 Amps (Standby) / 2.70 Amps (Transmitting)
Input Voltage Protection	Reverse Polarity Diode / Self-Restoring Fuse
Internal Auxiliary Power Supply	12 VDC @ 0.50 Amps – 1600 Volt Isolation
Radio Power Supply	12 VDC @ 4 Amps – 1500 Volt Isolation
CPU Power Supply	5 VDC @ 3 Amps – 1500 Volt Isolation
Communications	Comm 1: External RS 232 Port Comm 2: RS 485 Port Comm 3: RJ45 Ethernet Port - Local Comm 4: RJ45 Ethernet Port – Network
Temperature Specification- Industrial	-40 + 70C fan-less operation.
Size	8.00" H x 7.25" W x 5.72" D
Weight	5.7 lbs.
Finish	White-Powder Coat Over 5052 Aluminum
I/0 Specifications	
Outputs	2 Per Track Module. 12 VDC @ 200 mA
Inputs	Ambient Temperature, Magnetic Transducer (2 per track), Contact Closure Alarm (4 per Track), Contact Closure Spare (1 per track), & Track Circuit (1per track)
Radio Specifications – Ritron DTX 160	
Number of Channels	8 – Programmable
RF Output Power	6 Watts Maximum
RF Load Impedance	50 ohms

CPU Module	
Main CPU	Coldfire – MOD 5282
Comms. CPU	Coldfire – MOD 5234
Track Module CPU	Coldfire – MOD 5213
Data Storage	SD Card – Up to 32 GB

2.1 Front Panel

The iCube front panel is secured to the enclosure with four captive fasteners. Slotted holes in the panel provide access to the power switch, a local RS232 port, and a SD/MMC card slot. Labeled LED windows allow viewing of the internal status indicators.

The figure below shows the front panel of the iCube.
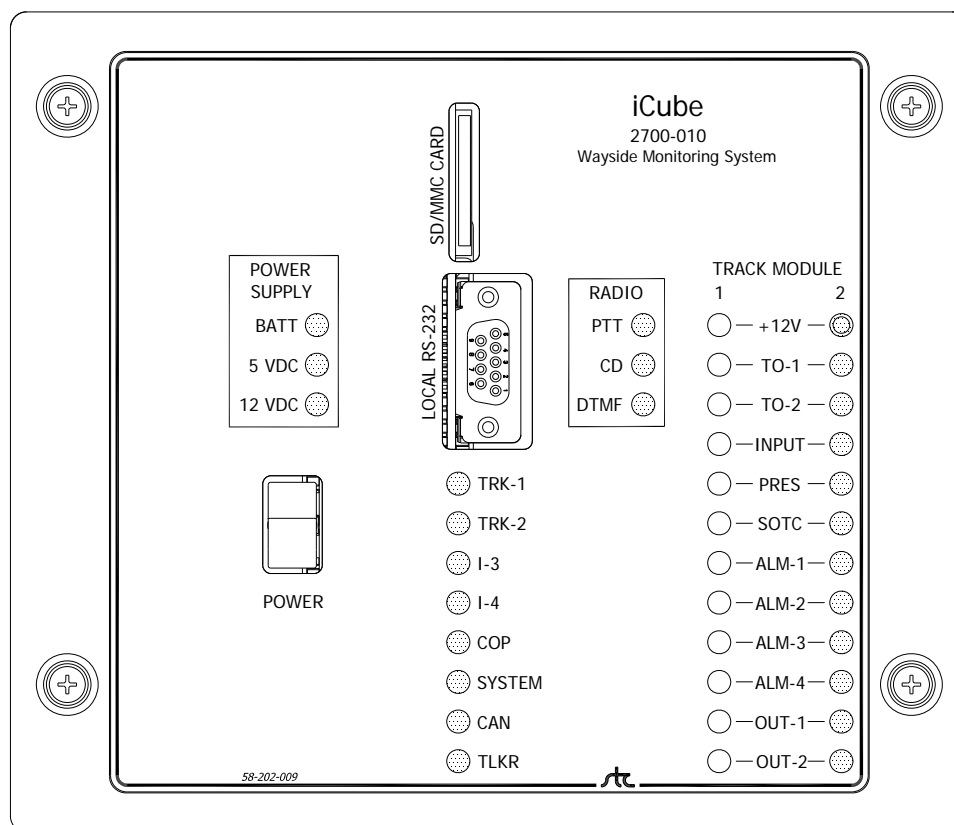
2.1.1 Status LEDs

The table below describes LED indicators for the Power Supply.

LED	Meaning when Lit
BATT	Lights when 12 VDC is being supplied from the battery to the input of the power supply.
5 VDC	Lights when 5 VDC is present.
12 VDC	Lights when 12 VDC is present.

The table below describes LED indicators for the Central Processor.

LED	Meaning when Lit
PTT	Push-to-talk. Lights when radio is transmitting.
CD	Carrier Detect. Lights when radio is receiving a signal.
DTMF	Lights when valid DTMF code is detected.
TRK-1	Lights when the Track-1 Track Module Card is installed and operating. Flashes when this card has a problem.
TRK-2	Lights when the Track-2 Track Module Card is installed and operating. Flashes when this card has a problem.
I-3	Currently not used.
I-4	Currently not used.
COP	Computer Operating Properly. Flashes when the Processor Card is operating properly.
SYSTEM	The system warning LED will blink on and off as long as the warning exists. This includes anything that would show up in the System Status Report under "System Warnings" with the exception of "Radio not responding".

In addition to the system warning LED, if the system boots up and recognizes incompatible software versions between the Talker, Central Processor, or Track modules, the iCube will sound 10 audible beeps. These version numbers appear in the System Status Report under "Software Versions". |
| CAN | Controller Area Network. Lights to indicate activity on the CAN bus. |
| TLKR | Lights to indicate communications with talker processor. |

The table below describes LED indicators for Track Modules 1 & 2.

LED	Meaning when Lit
+12V	Lights when 12 VDC is present on Track Module Card
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 there is a closed circuit at the SOTC input.
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.

2.1.2 Serial Port

On the front panel 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, and no parity. The default baud rate is 115,200 baud. A three-wire cable, which is required, should be wired as shown below.
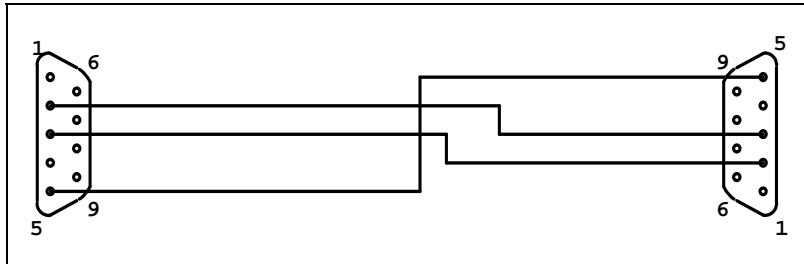
Only pins 2, 3, and 5 need to be connected for proper operation. However, a standard 9-pin-to-9-pin null-modem serial cable can be used.

2.1.3 SD/MMC Card Slot

The SD (Secure Digital) is a non-volatile memory card. The iCube 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 iCube front panel. 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. SDHC cards up to 32 GB can be used. Other types of memory cards such as miniSD, microSD, and CompactFlash cannot be used.

On the left side of some cards is a write-protection notch. If present, the card cannot 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 iCube front panel, be sure that the card is not write protected.

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

2.2   Bottom of iCube

On the bottom of the iCube enclosure are a reset switch, an Ethernet connector, a power connector (6-position), a temperature probe/RS485 connector (7-position), and up to four track module connectors (two 10-position sockets per track). A second RJ45 connector is currently unsupported.

The figure below shows a bottom view of the iCube and its connectors.
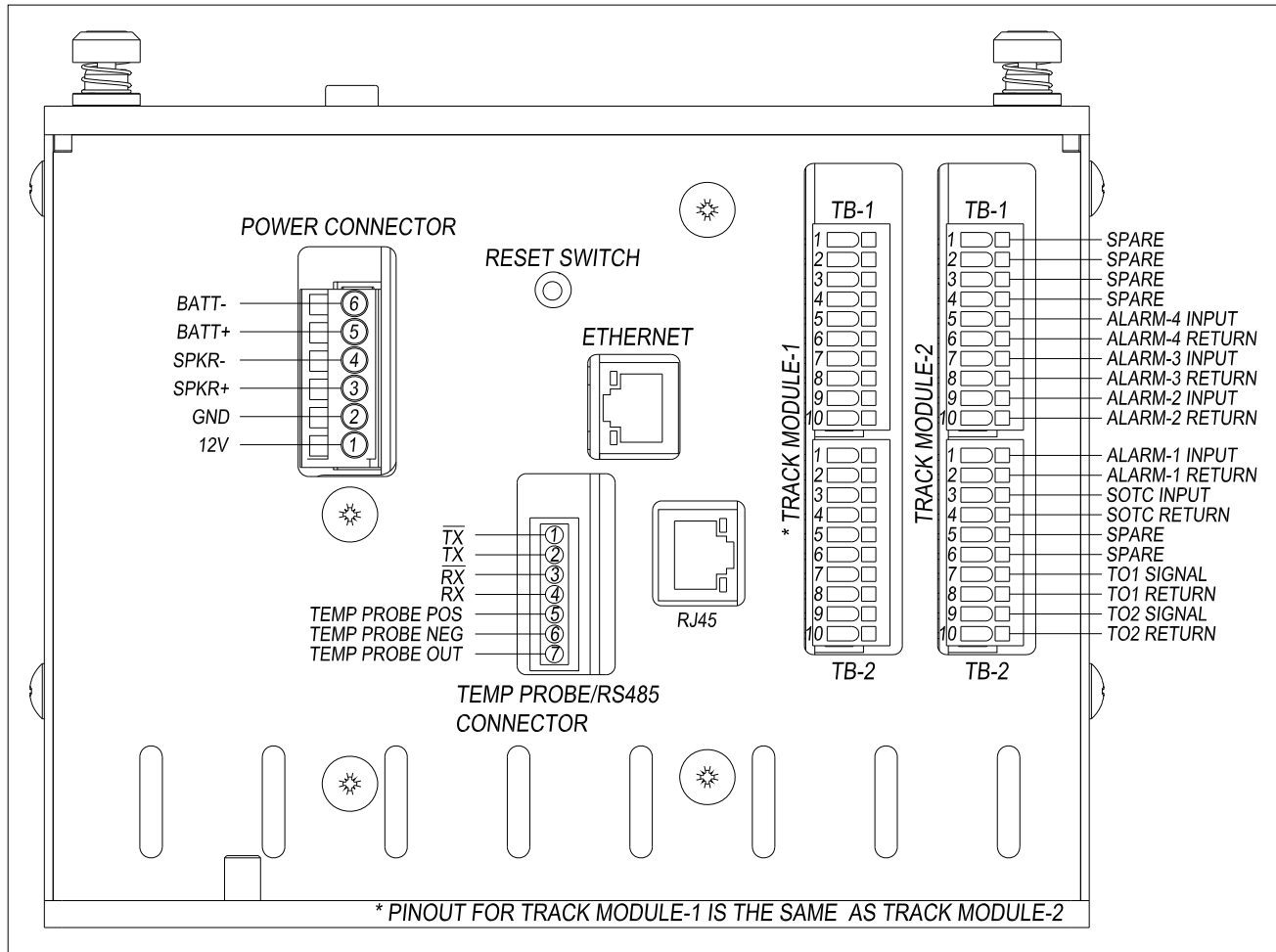
2.2.1   Reset Switch

On the bottom of the iCube is a reset switch. 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 when the system resets.

2.2.2   Ethernet Connection (RJ45 Jack)

On the bottom of the iCube are two RJ45 jacks. The one nearest to the Reset Switch is used to establish an Ethernet connection. You need a Category 5 (CAT5) 8-wire network cable for basic 10/100 functionality. The second RJ45 connector is not supported at this time.

2.2.3   Power Connector (6-Position)

On the bottom of the iCube is a 6-position socket. Its mating 6-position plug provides all necessary external connections to the Power Supply Card. The table below shows the pinout of this socket.

Pin #	Pin Name	Function
1	12V	Regulated +12 VDC Output
2	GND	Logic Ground
3	Spkr+	Audio Signal to External Speaker (8 Ohm)
4	Spkr-	Audio Signal RTN
5	BATT+	Battery Positive (+12 VDC)
6	BATT-	Battery RTN

2.2.4   Temperature Probe/RS485 Connector (7-Position)

On the bottom of the iCube is a 7-position socket. Its mating 7-position plug provides all necessary external connections to the Processor Card. The table below shows the pinout of this socket.

Pin #	Pin Name	Function
1	TX	RS485/422 TX -
2	TX	RS485/422 TX+
3	RX	RS485/422 RX -
4	RX	RS485/422 RX+
5	Temperature Probe Positive	Power (12 VDC) to the shielded temperature probe. Red wire. 200 mA maximum current.
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.

2.2.5 Track Module Connectors (10-Position)

There are two 10-position sockets per Track Module Card designated TB1 and TB2. Their mating plugs provide termination points for various track hardware. These connectors are accessible from the bottom of the iCube.

The table below shows the pinout of the 10-position **TB1** (track1 and/or track2) socket.

Pin #	Pin Name	Function
1	Out-2	*Currently not used.*
2	Out-2 RTN	*Currently not used.*
3	Out-1	*Currently not used.*
4	Out-1 RTN	*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** (track1 and/or track2) 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	Input	*Currently not used.*
6	Input RTN	*Currently not used.*
7	TO1 Signal	TO1 magnetic transducer signal.
8	TO1 Return	TO1 magnetic transducer return.
9	TO2 Signal	TO2 magnetic transducer signal.
10	TO2 Return	TO2 magnetic transducer return.

2.3 Top of iCube

On top of the iCube enclosure is a SO-239 RF connector. This connector is the antenna output for the internal radio.

The figure below is a top view of the iCube.

ANTENNA CONNECTOR
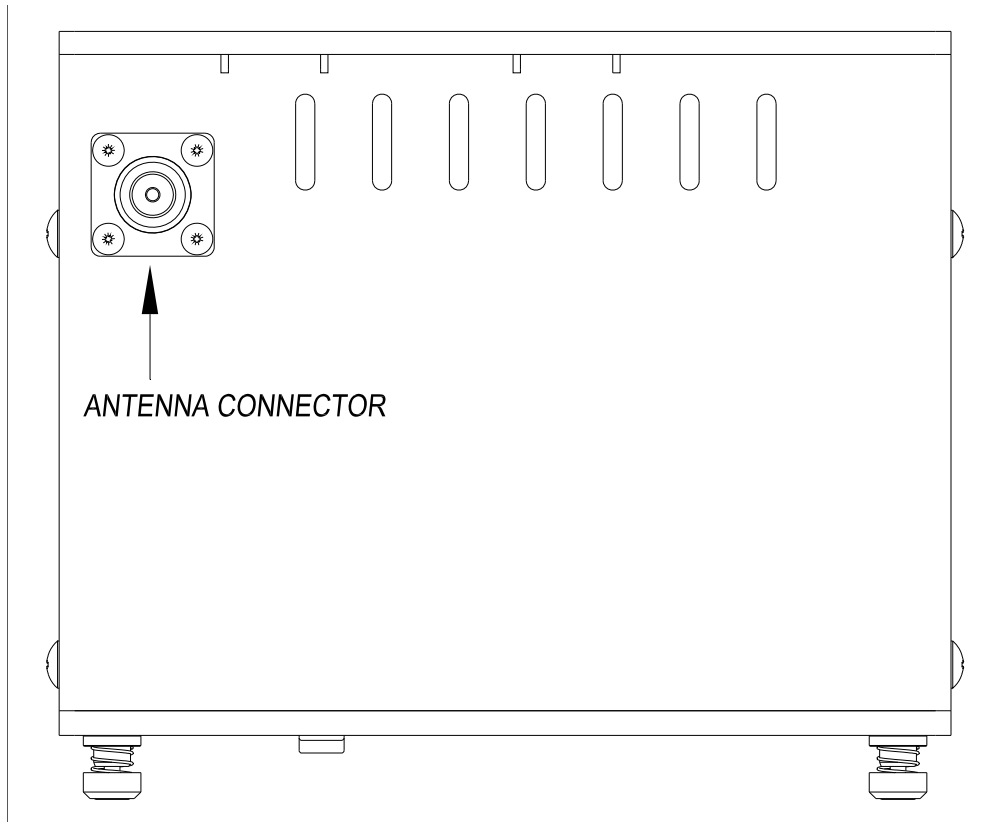
2.4 System Component Cards

The iCube consists of specialized component cards, each of which performs a specific system function. These cards are interconnected via a backplane. A minimum iCube system includes a Power Supply card, a Radio card, a Processor card, a Talker card, and a Track Module Card. An additional Track Module Card may be included to accommodate a second track.

2.4.1 Processor Card

The **processor** collects data from the Track Module, stores the data on a SD card, and generates speech commands for the Talker. On the edge of the Processor Card are eight status LEDs (described in Section 2.1.1) that can be viewed from the iCube front panel. The Processor also provides a serial user interface and monitors an ambient temperature input.

The figure below is a 2700-110 Processor Card.
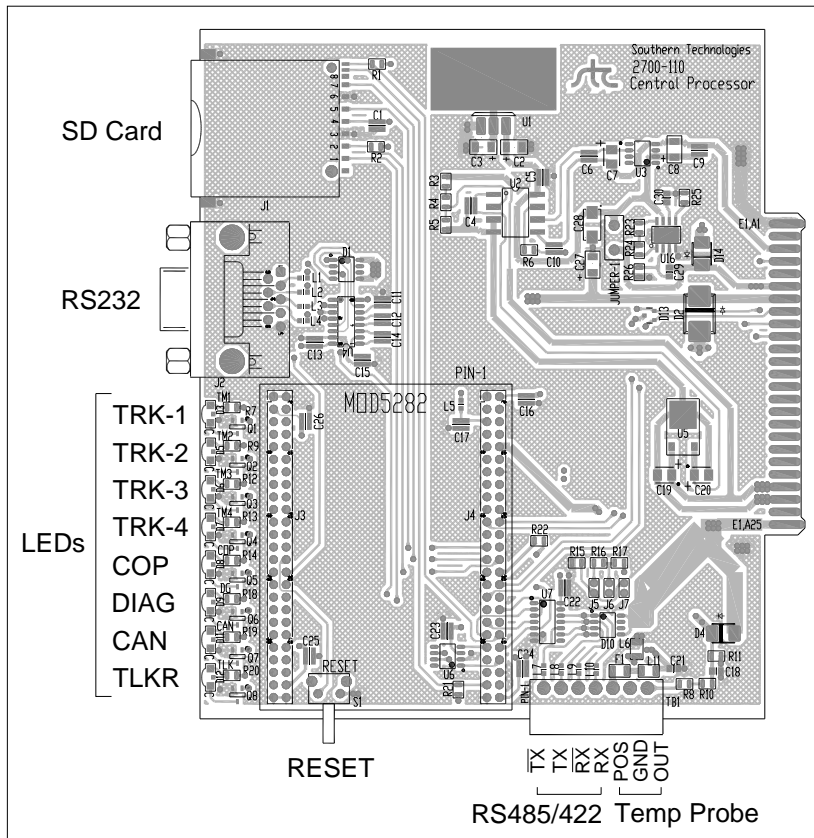
2.4.2 Talker Card

The **Talker** receives speech commands from the Processor Card and generates the appropriate announcement. It maintains system time, handles radio control functions, and listens for any DTMF (dual-tone multi-frequency) rebroadcast requests. On the edge of the Talker are three status LEDs (described in Section 2.1.1) that can be viewed from the iCube front panel.

The figure below is a 2700-140 Talker Card.
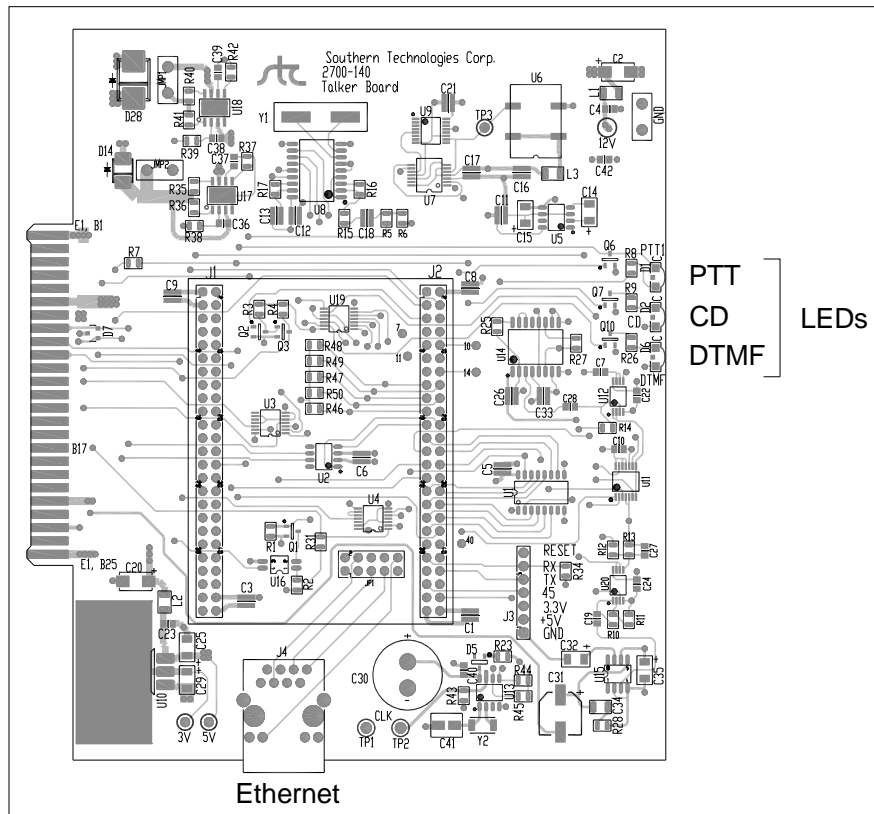
2.4.3 Power Supply Card

The **Power Supply** card provides 12 VDC at 5 amperes and 5 VDC at 3 amperes. These voltage output levels are set at the factory, but can be adjusted with potentiometers R7 and R12 respectively. Both of these outputs are isolated from the battery input. On the edge of the power supply card are three status LEDs (described in Section 2.1.1) that can be viewed from the iCube front panel.

The figure below is a 2700-240 Power Supply Card.
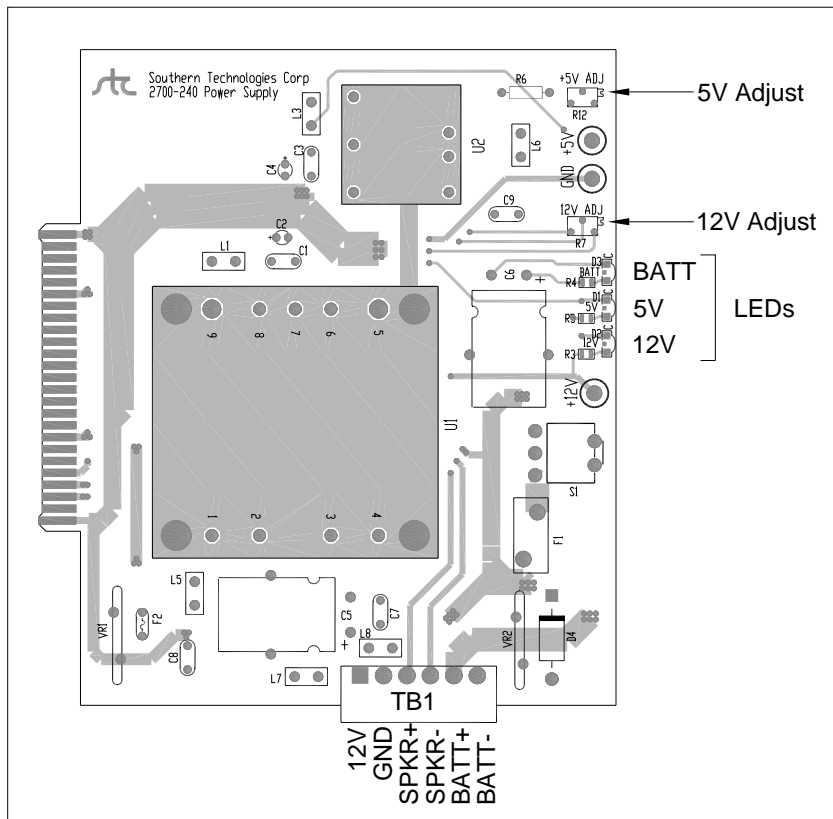
2.4.4 Track Module Card

The Track Module Card 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 Card. For longterm storage, that information is sent to the Processor Card via the CAN bus.

The Track Module Card 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 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 Card 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 Card can be configured to run in continuous-scan mode.

The iCube can be configured with either one or two Track Module Cards. Each Track Module Card provides twelve status LEDs (described in Section 2.1.1) which can be viewed from the iCube front panel. These indicators are arranged in vertical rows on the right-side of front panel and are designated as "Track Module 1" and "Track Module 2".

The figure below is a 2700-310 Track Module Card.
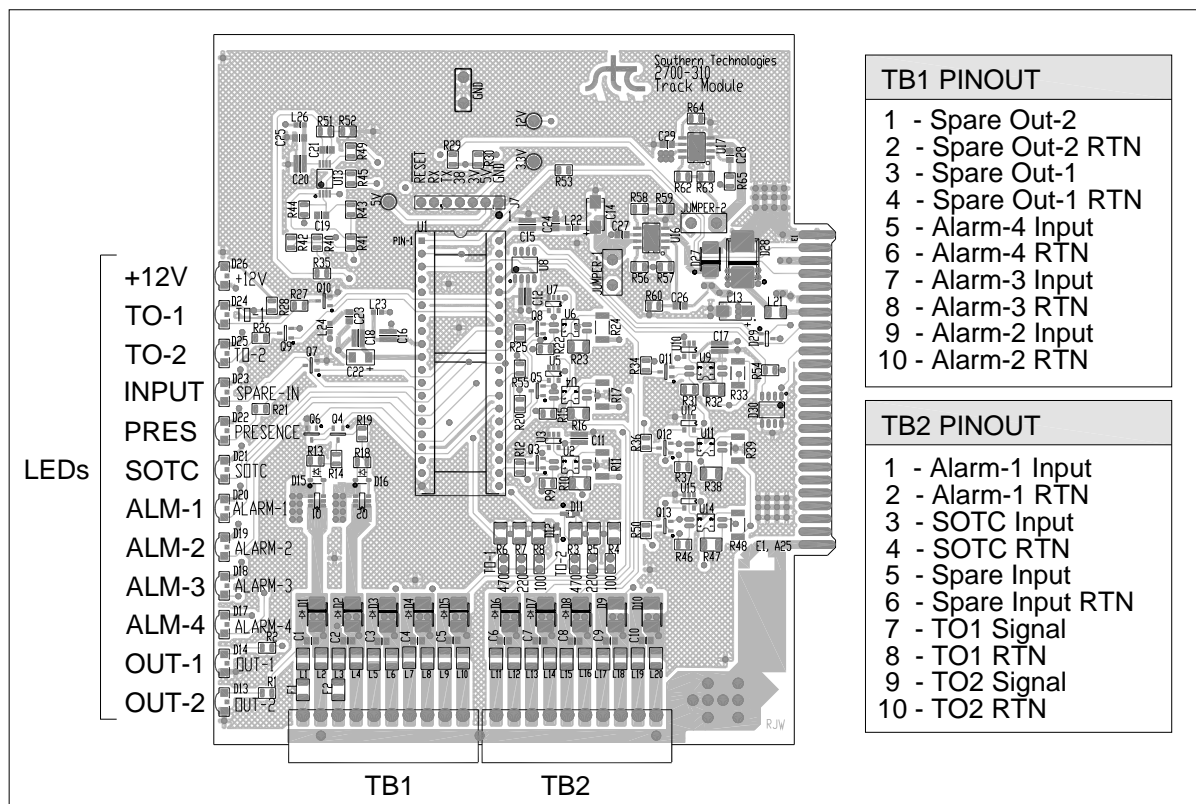
On the bottom of each Track Module Card are two terminal blocks that provide termination points for various track hardware. These pluggable connectors are accessible from the bottom of the iCube. All connections from Track-1 hardware will be terminated on TB1 & TB2 of Track Module-1. Likewise, connections from Track-2 will be terminated on TB1 & TB2 of Track Module-2.

2.4.5 Radio Card

The Radio Card consists of a radio and a radio interface board fastened to an aluminum mounting plate. The interface board provides all necessary connections to the radio via the system's backplane. A coaxial cable connects the radio's antenna output to a UHF connector on the top of iCube.

The radio can be configured to broadcast on only one frequency <u>or</u> sequentially on two different frequencies.

The figure below is a 2700-450 Radio Card.

PARTS LIST FOR 2700-450 RADIO MODULE			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	41-123-116	Radio Shield Assembly
2	2	01-118-001	ESNA 4-40
3	1	41-123-117	Thermal Filler Pads
4	1	39-103-021	Ritron DTX-Plus Radio
5	1	41-108-014	Radio Strap
6	2	01-108-016	PPH 6-32 x 1/4" S.Steel
7	3	01-108-023	PPH 8-32 x 1/4" S.Steel
8	1	2700-440	Radio Interface Board Asm.
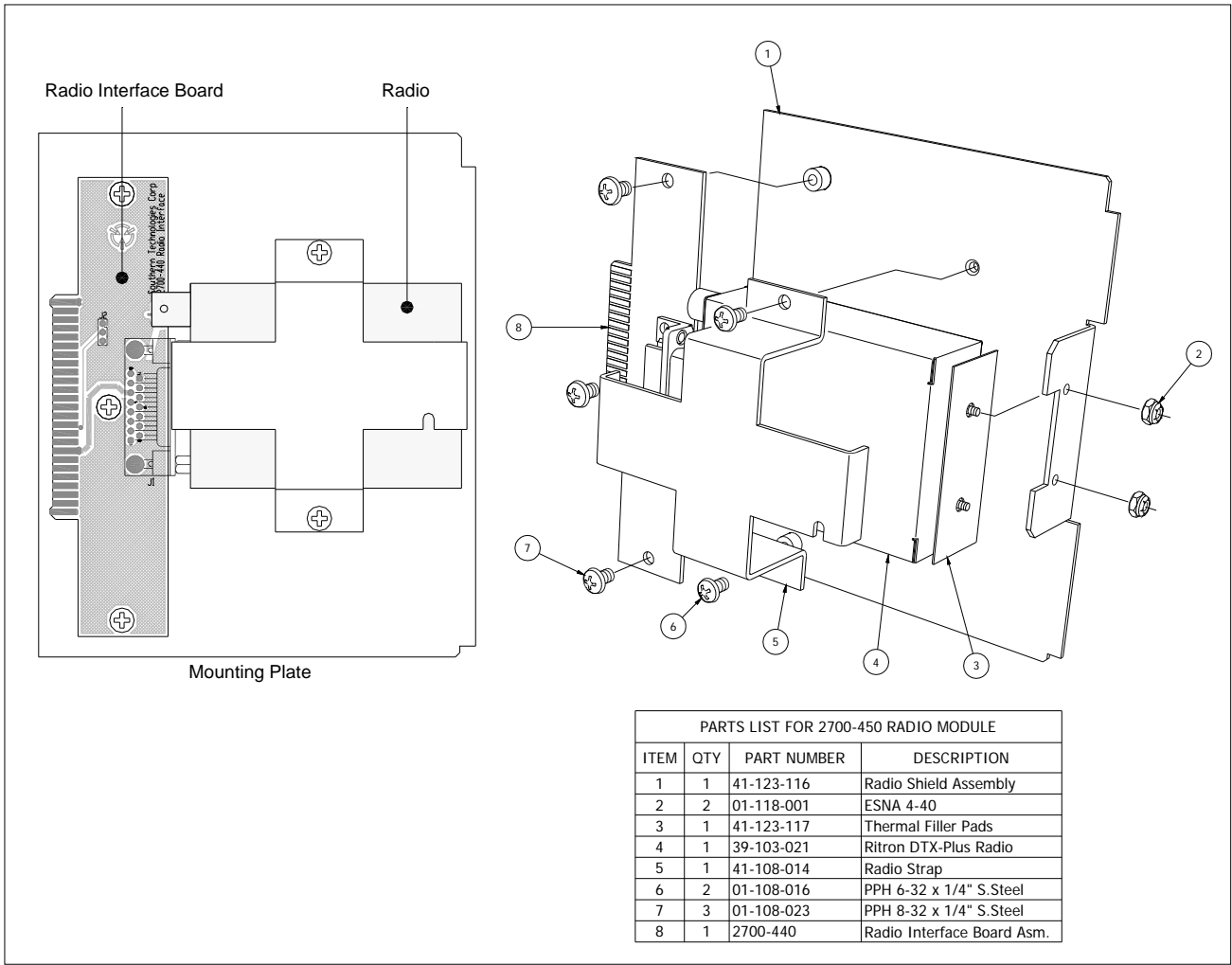
2.4.6 Backplane

The Backplane is mounted inside the iCube enclosure on the back panel. It distributes power and provides interconnections for each of the six system component cards. The figure below details the designations for the edge connectors of the backplane.

The figure below is a 2700-540 Back Plane.
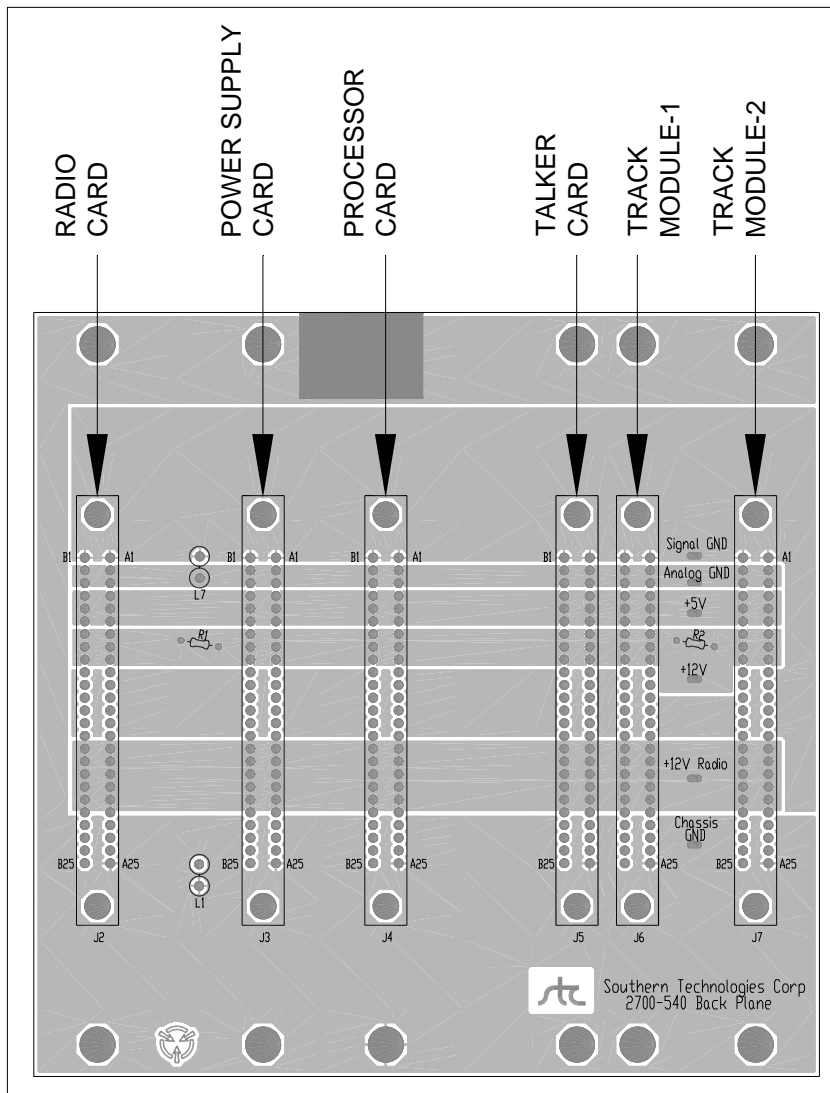
2.5 Installation or Removal of System Component Cards

⚠	**CAUTION!** System component cards are electrostatic-sensitive devices (ESD). Special care must be observed while handling these cards during installation or removal.

The figure below shows an exploded view of the iCube.

RADIO CARD POWER SUPPLY CARD PROCESSOR CARD TALKER CARD TRACK MODULE CARDS
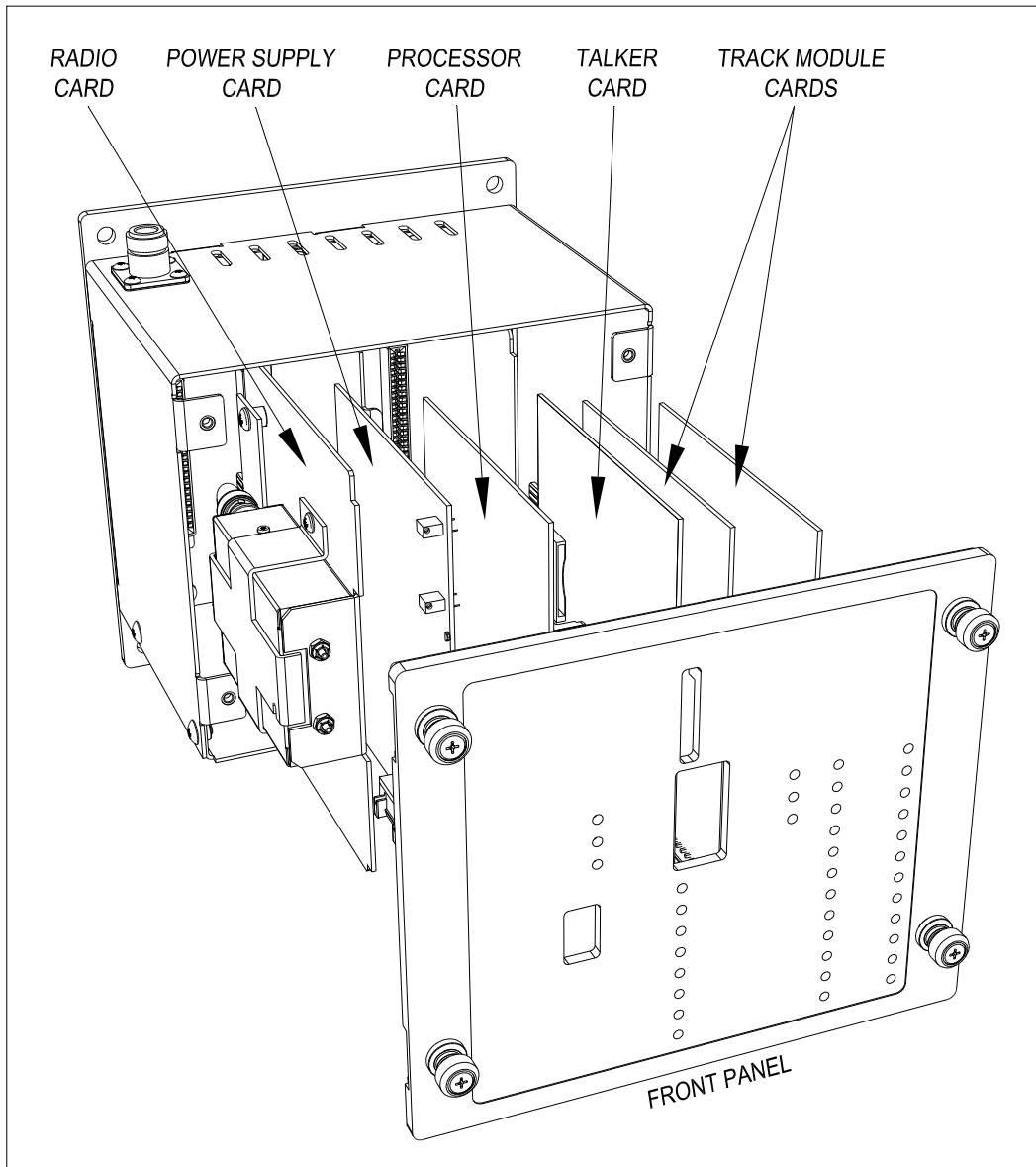
FRONT PANEL

Each system component card **must** be installed in its designated location on the back plane to ensure proper fit and functionality of the system. See figure above for assigned locations.

Temporary removal of the front panel provides easy access to the various system component cards. The front panel is secured to the chassis with four captive fasters.

To <u>remove</u> a system component card:
- Power system down. Remove the front panel.
- Disconnect all external mating connectors (if any) from the bottom of the card.
- Gently slide the card backward to uncouple from the edge connector on back plane. [For Radio Card only – disconnect the antenna cable from the radio.]
- Carefully remove the card from the enclosure and store in an ESD protective package before transporting.

To <u>install</u> a system component card:
- Power system down. Remove front panel.
- For Radio Card only – connect the antenna cable to the radio output.
- Observing proper orientation, slide the card into its appropriate slot in the enclosure.
- Align the fingered tab on the back edge of card with its respective edge connector on the back plane. Gently push forward until the card is firmly seated in the connector.
- Connect all external mating connectors (if any) to the bottom of the card.

Installation of Front Panel

The front edge of each system component card is held securely in place by aligned, indexed notches on the backside of the front panel. There are two notches for each card installed (see figure below). One captures and secures the top-front edge of card, the other the bottom-front edge. Verify all system component cards are properly aligned with their respective indents before securing front panel with captive fasteners.

The figure below shows a rear view of the front panel.

FRONT PANEL (REAR VIEW)

ALIGNMENT NOTCHES FOR UP TO SIX SYSTEM COMPONENT CARDS
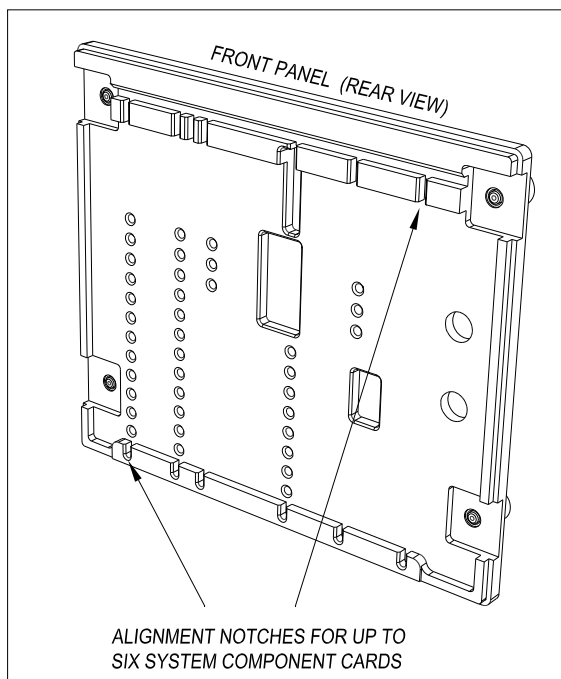
The figure below depicts the front panel as it contacts the front edge of the system component cards. Note how each card is secured by notches in panel. Improper alignment could result in damage to system cards.

DETAIL A

DETAIL B
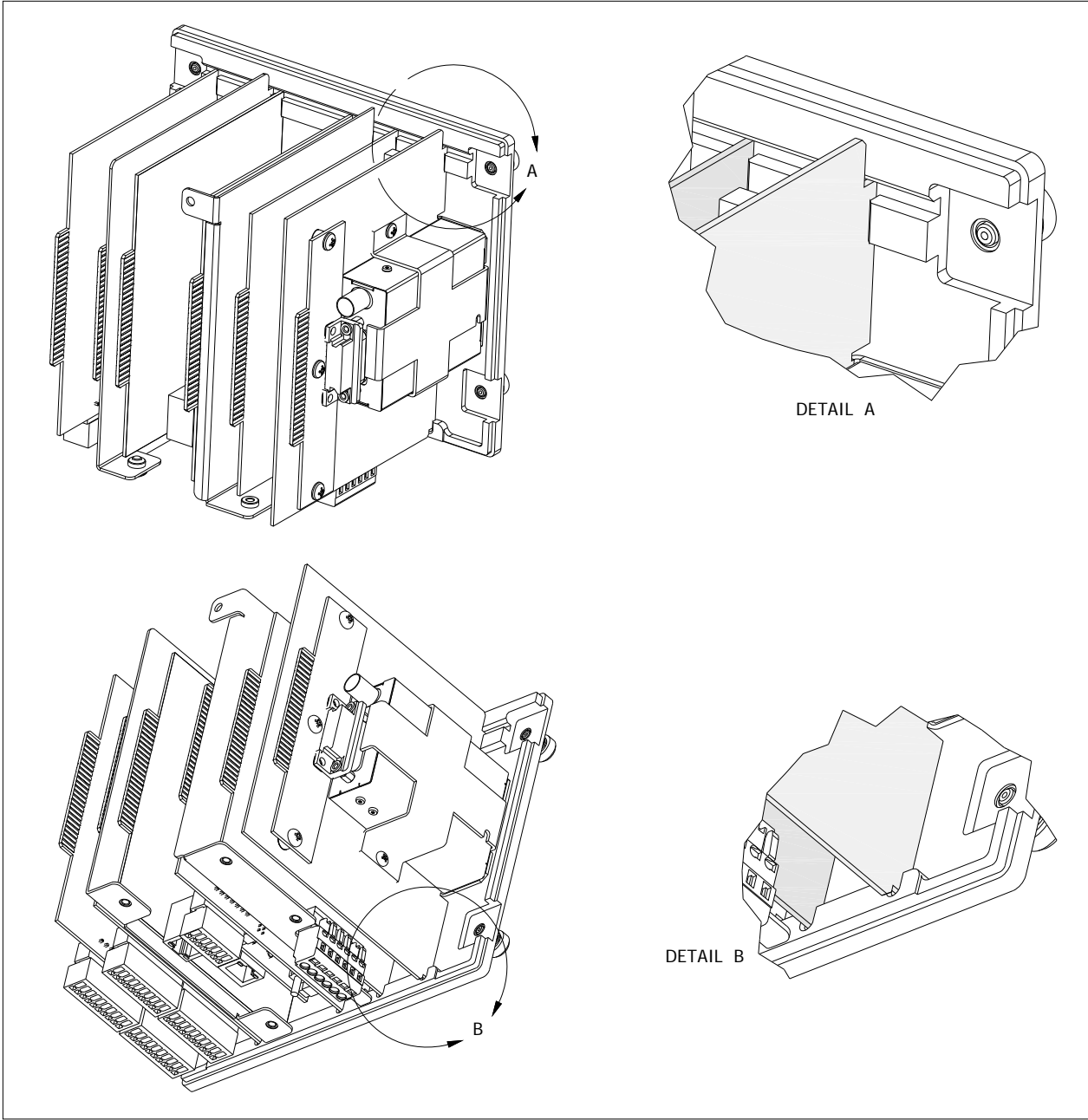
Chapter 3 — System Operation

This chapter describes the operation of an iCube system. Covered are train detection, axle counting, alarm detection, data storage, and speech generation.

3.1 Overview

The iCube can monitor up to two tracks with four alarm-generating devices on each track. Detected alarms are transmitted to affected train crews via radio road channel. Supported alarm types are shifted-load, dragging equipment, high load, wide load, slide-fence, slip, high water, collision, fire, and power off.

The iCube houses specialized component cards designed to perform various system functions. Each system includes a Radio Card, a Power Supply Card, a Processor Card, a Talker Card, and up to two Track Module Cards. These component cards interconnect via a backplane.

The Processor Card monitors the Track Modules via the CAN bus, and it communicates with the Talker Card via an RS232 connection. The processor collects train data from the Track Module when it is available, stores the data on a SD card, and generates speech commands for the Talker Card. The Processor Card provides a serial user interface. It monitors system battery voltage. It also determines ambient temperature and wind speed by monitoring external sensors.

The Talker Card stores all of the digitized speech required for voice announcements. Commands received from the Processor Card initiate the appropriate announcement from the talker. The Talker Card 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 Card.

The Track Module Card handles the task of scanning all track inputs. It looks for train presence, counts axles, and recognizes alarm conditions. Messages are sent to the Processor Card when a train arrives and when it leaves. If an alarm occurs during train passage, a message is sent to the 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 Card. After a train has passed, the data is sent to the Processor Card 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 a closed 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 closed circuit exists. When the closed 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 Card 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 Setup Track Module 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" 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 Setup Track Module 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 Setup Track Module menus. After the alarm-duration time expires, a detector malfunction announcement is made 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 Setup Track Module 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 Setup Track Module menus.

3.6 Stuck-Dragger and Blocked-Sensor Detection

For transducer and approach applications, any alarm input that is active before train arrival is considered a stuck dragger or blocked sensor condition. Train arrival is determined by the first axle pulse for transducer applications and by track circuit activation for approach applications. Any stuck dragger or blocked sensor condition will cause a Pre-train Alarm announcement at the beginning of the train. **Chapter 4 – Radio Announcements** describes this message. No alarms will be allowed for the malfunctioned input. A "Detector Malfunction" announcement is made at the end of the train.

While no train is present, If the alarm input becomes inactive for a period longer than the value set as the Advance Alarm Time, the detector malfunction clears and the system returns to normal operation. The default value for Advance Alarm Time is 10 seconds.

3.7 Train and Event Data Storage

Train and event data is saved to log files on the SD card. Each log can store a limited amount of records. As log space reaches capacity, the newest records overwrite the oldest. If no SD card is installed, the system can still scan trains, detect alarms, and make announcements, but it can't store the data for future reference.

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.

3.8 Low-Battery Detection

Terminals 5 and 6 of the six-position socket on the bottom of the iCube are the battery input. The Processor 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 Announcement 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 Setup Track Module menus). Note that on power-up or after a reset, the battery is assumed good.

3.9 Radio Control Logic

The iCube System radio has eight possible broadcast channels. The system can be configured to use a single channel broadcasting or up to two channels broadcasting sequentially. Section **5.4.6 – Radio Configuration Menu** 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 single channel or sequential operation.

In sequential operation, the talker firmware tries each of the two enabled channels, beginning with the first one, setting the radio to the entered channel and checking to see if the channel is busy. It makes a broadcast on the first channel found that is not busy. If a channel is found to be busy, a 20 second timer is started (a timer exists for each enabled channel selection). Broadcasts are made when 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:

- iCube System is powered up
- Reset button (on the bottom of the iCube) 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
Detector Malfunction

4.2   Arrival Announcements

Arrival announcements are allowed only if the Announcement Mode option in the Announcement Menu is set to arrival and departure, as shown below. *Chapter 5 - Serial Communications* tells how to do this. If transducer activation is selected, the arrival announcement won't be made until four axles are counted.

```
  Announcement Menu                  Current Setting
  ------------------------------------------------
  [A] - Announcement Mode ......... Arrival and departure messages
  [B] - Announce Detector Out ..... Yes
  [C] - Announce Low Battery ...... Yes
  [D] - Announce Ambient Temp ..... No
  [E] - Announce Train Speed ...... No
  [F] - Announce Train Length ..... No
  [X] - Exit
```

If the system is functioning normally, the format of the arrival announcement is:

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

If any alarm inputs are active on train arrival, a pre-train alarm announcement will be made regardless of the Announcement Mode setting. The format of this announcement is:

(Beep)
U-P Detector
Milepost (mile)
Track (track number)
(alarm type)
Detector Malfunction

(alarm type) can be dragging equipment, high load, wide load, or shifted load. The following example assumes both a stuck dragger and a blocked high load sensor on train arrival.

(Beep)
UP Detector
Milepost 1234.5
Track 1
Dragging equipment detector malfunction
High load detector malfunction

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 Announcement Menu. (***Chapter 5 - Serial Communications*** tells how to do this.) The figure below shows that the words "detector out" will be announced.

```
 Announcement Menu                  Current Setting
 --------------------------------------------------
 [A] - Announcement Mode ......... Arrival and departure messages
 [B] - Announce Detector Out ..... Yes
 [C] - Announce Low Battery ...... Yes
 [D] - Announce Ambient Temp ..... No
 [E] - Announce Train Speed ...... No
 [F] - Announce Train Length ..... No
 [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 "Detector Malfunction" if a stuck-dragger or blocked-sensor condition exists. This message can be enabled or disabled with the Announce Test Trains option on the Setup Track Module menus. *Chapter 5 - Serial Communications* tells how to do this. The figure below shows it enabled.

```
Setup Track Module 1                      Current Setting
------------------------------------------------------------
[A] - Track Number ...................... None
[B] - Maximum Alarms .................... 3
[C] - Number of Repeats ................. 2
[D] - Rebroadcast Time Limit (mins) ..... 10
[E] - System Activation ................. Two Transducers
[F] - Advance Alarm Time (secs) ......... 10
[G] - Announce Total Axles .............. No
[H] - Announce Test Trains .............. Yes
[I] - Rebroadcast Code .................. (none)
[J] - Configure Input 1 ................. Dragging Equipment
[K] - Configure Input 2 ................. Not used
[L] - Configure Input 3 ................. Not used
[M] - Configure Input 4 ................. Not used
[N] - Set Transducer Parameters
[O] - Repeat No Defects ................. No
[P] - D3 Poll Address ................... B
[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 Announcement Menu is the **Announcement Mode** option.

```
Announcement Menu                  Current Setting
-------------------------------------------------
[A] - Announcement Mode ......... Arrival and departure messages
[B] - Announce Detector Out ..... Yes
[C] - Announce Low Battery ...... Yes
[D] - Announce Ambient Temp ..... No
[E] - Announce Train Speed ...... No
[F] - Announce Train Length ..... No
[X] – Exit
```

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

```
Configure Input 1                    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
> (alarm type) Detector Malfunction

(alarm type) can be dragging equipment, high load, wide load, or shifted load.

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

If the Announce Total Axles option on the Setup Track Module 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
> Dragging Equipment Near Axle 9
> 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

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
> (alarm type) Detector Malfunction

(alarm type) can be dragging equipment, high load, wide load, or shifted load.
For any train with a defect or malfunction, the post-train announcement repeats for the number of times specified by the Number of Repeats setting of the Setup Track Module 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 Setup Track Module menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Setup Track Module menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Setup Track Module menus. After the alarm-duration time expires, a Detector Malfunction message is announced at intervals determined by the Alarm Interval Time setting until the alarm condition is cleared.

```
Setup Track Module 2                    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
[N] - Set Transducer Parameters
[O] - Repeat No Defects ................ No
[P] - D3 Poll Address .................. C
[X] - Exit
```

The alarm message is like this.

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

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.

```
  Configure Input 1                    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 Setup Track Module menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Setup Track Module menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Setup Track Module 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 Setup Track Module menus with a five-second interval between each announcement. Then the announcement repeats at intervals determined by the Alarm Interval Time setting of the Setup Track Module menus. Those repetitions continue for an amount of time determined by the Alarm Duration Time setting of the Setup Track Module 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.

```
Setup Track Module 1                     Current Setting
------------------------------------------------------------
[A] - Track Number ..................... None
[B] - Maximum Alarms ................... 3
[C] - Number of Repeats ................ 2
[D] - Rebroadcast Time Limit (mins) .... 10
[E] - System Activation ................ Two Transducers
[F] - Advance Alarm Time (secs) ........ 10
[G] - Announce Total Axles ............. No
[H] - Announce Test Trains ............. Yes
[I] - Rebroadcast Code ................. (none)
[J] - Configure Input 1 ................ Dragging Equipment
[K] - Configure Input 2 ................ Not used
[L] - Configure Input 3 ................ Not used
[M] - Configure Input 4 ................ Not used
[N] - Set Transducer Parameters
[O] - Repeat No Defects ................ No
[P] - D3 Poll Address .................. B
[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 Interface

This chapter describes the serial interface for the iCube 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 iCube 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 iCube 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 iCube front panel.

4 Press **[Esc]**.

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

```
STC Wayside Monitoring System
Wed  Aug 07 2013  11:03:24
Main Menu                    MP: 0159.0
---------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] - Setup Menu
[D] - Equipment Menu
[E] - System Log
[F] - System Status Report
[G] - System Functions Menu
[H] - D3 Error Log
[X] - Exit
```

5 Type the letter that corresponds to the desired option.

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

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

After a power-up or reset, the serial interface starts at 115200 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 115200 baud and either cycle power or press the reset button on the bottom of the iCube module. You should see the following message.

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

If you press the spacebar within 5 seconds, the baud rate will remain at 115200 and you can access the system with your computer set to 115200 baud. Alternatively, you could let the system switch to its programmed rate (in this case 9600) 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, select the **Display Data for Track-1** option.

```
Fri  Aug 23 2013   08:51:54
Main Menu                     MP: 0024.0
----------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] – Setup Menu


                  •
                  •
                  •
```

This option 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: 08/23/13  09:50
 Last record:  09/19/13  16:32

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

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

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

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

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

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

   44    09/18/13  15:50    40    0    40                 Sensor Blocked 2 3 4

   45    09/18/13  15:52    40    0    40                 No Defects

   46    09/19/13  11:52    18   18    18   36    E   Sensor Blocked 2 3 4

   47    09/19/13  11:53    28   28    28   44    E
                                       10                 Dragging Equipment

   48    09/19/13  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 08/23/13. 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 09/19/13.

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. To change setting, select the **Display Lines** setting
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 selecting one of the following options.

    [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. If you select the **Search for a date** option, 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 **08/23/13**, data will be displayed starting with the first record on or after **08/23/2013**. For days, for months, or for the last two digits of years from 1 through 9, type leading zeros. Thus, for 8 June 2013, type **06/08/13**.

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 while this train was passing. If this space is blank, there were no alarms. 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 2013. The system counted 62 total axles with a wide-load alarm at axle 13. 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 2013. The system counted 40 total axles with no alarms.

Train **46** passed the site at 11:52 on 19 September 2013. 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: 08/23/13  09:47
 Last record:  09/09/13  10:35

 Train#    Date      Time    TO1   TO2  Axles  Spd   Dir   Status
 ------------------------------------------------------------------------
   1     08/23/13  09:47                                   Dragging Equipment

   2     08/24/13  14:13                                   Dragging Equipment

   3     09/02/13  11:16                                   Dragging Equipment

   4     09/03/13  15:50                                   Dragging Equipment

   5     09/08/13  15:52                                   Dragging Equipment

   6     09/09/13  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, select the **Display Data for Track-2** option.

```
Fri  Aug 23 2013  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


              •
              •
              •
```

This option 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 Setup Menu

On the Main menu, select the **Setup Menu** option.

```
Fri  Aug 23 2013  08:51:54
Main Menu                  MP: 0024.0
--------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] - Setup Menu
[D] - Equipment Menu
[E] - System Log
[F] - System Status Report


              •
              •
              •
```

This option displays the Setup menu and other information. Below is a sample of the screen that contains that menu. The contents of your screen will be different.

```
Setup Menu                           Current Setting
---------------------------------------------------
[A] - Time and Date ............. Tue  Aug 13 2013  10:01:05
[B] - Milepost .................. 0159.0
[C] - Track Direction ........... East/West
[D] - Announcement Menu
[E] - Setup Track Module 1
[F] - Setup Track Module 2 - Not Installed
[G] - Load Default Setup
[H] - D3 Setup Menu
[I] - High Wind Limit ........... 50 mph
[J] - Time Zone ................. GMT/UTC
[K] - Telnet Port ............... 23
[L] - Save Settings
[M] - Change password
[N] - Show setup on SD card
[O] - Load from SD card
[P] - Save to SD card
[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 0159.0.

5.3.1 Set Time and Date

To change the current setting, select the **Time and Date** option from the Setup Menu.

```
Setup Menu                           Current Setting
---------------------------------------------------
[A] - Time and Date ............. Tue  Aug 13 2013  10:11:17
[B] - Milepost .................. 0159.0
[C] - Track Direction ........... East/West
                   •
                   •
                   •
```

Selecting this option displays a prompt for a new time.

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

Entry format is **hh:mm:ss**, 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 **15:49:26**. 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 **mm/dd/yyyy**, where **mm** is the month, **dd** is the day, and **yyyy** is the year. For days, for months type leading zeros. Thus, for 3 August 2013, type **08/03/2013**. To exit without changing the date, press **[Esc]**. After entering the complete date or pressing **[Esc]**, the Setup Menu reappears.

5.3.2 Milepost

To change this setting, select the **Milepost** option from the Setup Menu.

```
   Setup Menu                        Current Setting
   --------------------------------------------------
   [A] - Time and Date ............ Tue  Aug 13 2013  10:11:17
   [B] - Milepost ................. 0159.0
   [C] - Track Direction .......... East/West
                      •
                      •
                      •
```

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 **nnnn.n**, 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 **0087.0**. To exit without changing the milepost, press **[Esc]**. After typing five digits or pressing **[Esc]**, the Setup Menu reappears.

5.3.3 Track Direction

To change this setting, select the **Track Direction** option from the Setup Menu.

```
  Setup Menu                        Current Setting
  ---------------------------------------------------
  [A] - Time and Date ............. Tue  Aug 13 2013  10:11:17
  [B] - Milepost .................. 0159.0
  [C] - Track Direction ........... East/West
  [D] - Announcement Menu

                        •
                        •
                        •
```

Doing so toggles the current setting between East/West and North/South.

5.3.4 Announcement Menu

To view available announcement options, select the **Announcement Menu** option from the
Setup Menu.

```
  Setup Menu                        Current Setting
  ---------------------------------------------------
  [A] - Time and Date ............. Tue  Aug 13 2013  10:11:17
  [B] - Milepost .................. 0159.0
  [C] - Track Direction ........... East/West
  [D] - Announcement Menu

                        •
                        •
                        •
```

5.3.4.1 Announcement Mode

To change the setting, select the **Announcement Mode** option from the Announcement Menu.

```
Announcement Menu                  Current Setting
----------------------------------------------------
[A] - Announcement Mode ......... Arrival and departure messages
[B] - Announce Detector Out ..... Yes
[C] - Announce Low Battery ...... Yes
[D] - Announce Ambient Temp ..... No
[E] - Announce Train Speed ...... No
[F] - Announce Train Length ..... No
[X] - Exit
```

Selection of Announcement Mode option displays following prompt.

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

"Departure messages only" option allows the system to make all real-time and post-train announcements, including a "no defects" announcement when the train has no alarms.

"Arrival and departure messages" option 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 "Detector Malfunction," depending on the system status.

"Talk on defect only" option allows real-time and post-train announcements only if an alarm is detected. This setting doesn't allow a "no defects" message.

To exit without making any changes, press **[Esc]**. After selecting an option, the Announcement Menu reappears.

5.3.4.2 Announce Detector Out

On the Announcement Menu, the **Announce Detector Out** option lets you select if you want to add the words "*detector out*" to the end of each post-train announcement.

```
 Announcement Menu                  Current Setting
 ---------------------------------------------------
 [A] - Announcement Mode ......... Arrival and departure messages
 [B] - Announce Detector Out ..... Yes
 [C] - Announce Low Battery ...... Yes
 [D] - Announce Ambient Temp ..... No
 [E] - Announce Train Speed ...... No
 [F] - Announce Train Length ..... No
 [X] - Exit
```

The current setting shows whether "detector out" will be announced (Yes) or not announced (No). Selecting this option toggles the current setting between Yes and No. Press selection until the desired setting is shown.

5.3.4.3 Announce Low Battery

On the Announcement Menu, the **Announce Low Battery** 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.

```
 Announcement Menu                  Current Setting
 ---------------------------------------------------
 [A] - Announcement Mode ......... Arrival and departure messages
 [B] - Announce Detector Out ..... Yes
 [C] - Announce Low Battery ...... Yes
 [D] - Announce Ambient Temp ..... No
 [E] - Announce Train Speed ...... No
 [F] - Announce Train Length ..... No
 [X] - Exit
```

The current setting shows whether "low battery" will be announced (Yes) or not announced (No). Selecting this option toggles the current setting between Yes and No. Press selection until the desired setting is shown.

5.3.4.4 Announce Ambient Temperature

On the Announcement Menu, the **Announce Ambient Temperature** 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.

```
Announcement Menu                Current Setting
-------------------------------------------------
[A] - Announcement Mode ......... Arrival and departure messages
[B] - Announce Detector Out ..... Yes
[C] - Announce Low Battery ...... Yes
[D] - Announce Ambient Temp ..... No
[E] - Announce Train Speed ...... No
[F] - Announce Train Length ..... No
[X] – Exit
```

The current setting shows whether the ambient temperature will be announced (Yes) or not announced (No). Selecting this option toggles the current setting between Yes and No. Press selection until the desired setting is shown.

5.3.4.5 Announce Train Speed

On the Announcement Menu, the **Announce Train Speed** option lets you select if you want the train speed to be announced as part of each post-train announcement.

```
Announcement Menu                Current Setting
-------------------------------------------------
[A] - Announcement Mode ......... Arrival and departure messages
[B] - Announce Detector Out ..... Yes
[C] - Announce Low Battery ...... Yes
[D] - Announce Ambient Temp ..... No
[E] - Announce Train Speed ...... No
[F] - Announce Train Length ..... No
[X] – Exit
```

The current setting shows whether the train speed will be announced (Yes) or not announced (No). Selecting this option toggles the current setting between Yes and No. Press selection until the desired setting is shown.

Announcement format:
"Speed [speed] M P H"

5.3.4.6 Announce Train Length

On the Announcement Menu, the **Announce Train Length** option lets you select if you want the train length to be announced as part of each post-train announcement.

```
Announcement Menu                  Current Setting
----------------------------------------------------
[A] - Announcement Mode ......... Arrival and departure messages
[B] - Announce Detector Out ..... Yes
[C] - Announce Low Battery ...... Yes
[D] - Announce Ambient Temp ..... No
[E] - Announce Train Speed ...... No
[F] - Announce Train Length ..... No
[X] - Exit
```

The current setting shows whether train length will be announced (Yes) or not announced (No). Selecting this option toggles the current setting between Yes and No. Press selection until the desired setting is shown.

Announcement format:
"Length [length]"

5.3.5 Setup Track Module 1

From the Setup Menu, select the **Setup Track Module 1** option.

```
                    •
                    •
                    •

[D] - Announcement Menu
[E] - Setup Track Module 1
[F] - Setup Track Module 2

                    •
                    •
                    •
```

Below is a sample of the screen that contains that menu. The contents of your screen will be different.

```
Setup Track Module 1                      Current Setting
------------------------------------------------------------
[A] - Track Number ...................... None
[B] - Maximum Alarms .................... 3
[C] - Number of Repeats ................. 2
[D] - Rebroadcast Time Limit (mins) ..... 10
[E] - System Activation ................. Two Transducers
[F] - Advance Alarm Time (secs) ......... 10
[G] - Announce Total Axles .............. No
[H] - Announce Test Trains .............. Yes
[I] - Rebroadcast Code ..................
[J] - Configure Input 1 ................. Not used
[K] - Configure Input 2 ................. Not used
[L] - Configure Input 3 ................. Not used
[M] - Configure Input 4 ................. Not used
[N] - Set Transducer Parameters
[O] - Repeat No Defects ................. No
[P] - D3 Poll Address ................... B
[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 Setup Track Module menus change depending on the System Activation setting. The examples above are for a setting of **Transducer** activation. If the System Activation is changed to **Continuous Scan**, the Setup Track Module menu is like this.

```
Setup Track Module 1                      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
                    •
                    •
                    •
  [X] - Exit
```

Notice that the some options are no longer displayed, and two new parameters have been added to set the interval and duration of alarm announcements.

5.3.5.1 Track Number

From the Setup Track Module 1 menu, select the **Track Number** option.

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


                        •
                        •
                        •
```

Doing so displays this prompt.

```
Enter track number (1-9 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 Setup Track Module 1 menu reappears.

5.3.5.2 Maximum Alarms

From the Setup Track Module 1 menu, select the **Maximum Alarms** option.

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


                        •
                        •
                        •
```

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" 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.

5.3.5.3   Number of Repeats

From the Setup Track Module 1 menu, select the **Number of Repeats** option.

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


                              •
                              •
                              •
```

Doing so lets you set the number of times the system repeats an end-of-train 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.

5.3.5.4 Rebroadcast Time Limit

From the Setup Track Module 1 menu, select the **Rebroadcast Time Limit** option.

```
Setup Track Module 1                        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


                            •
                            •
                            •
```

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.

5.3.5.5 System Activation

From the Setup Track Module 1 menu, select the **System Activation** option.

```
Setup Track Module 1                     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


                        •
                        •
                        •
```

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.

5.3.5.6 Advance Alarm Time (Transducer or Approach)

For transducer or approach applications, on the Setup Track Module 1 menu, select the
Advance Alarm Time option.

```
                        •
                        •
                        •

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


                        •
                        •
                        •
```

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 before a stuck-dragger or
blocked-sensor condition has cleared. 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 – Stuck-Dragger and Blocked-Sensor Detection* describes how the advance
alarm time is used.

5.3.5.7 Announce Total Axles (Transducer or Approach)

For transducer applications, on the Setup Track Module 1 menu, select 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).
Select the **Announce Total Axles** option to toggle the current setting between Yes and No.

5.3.5.8 Announce Test Trains (Transducer or Approach)

For transducer applications, on the Setup Track Module 1 menu, select 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 "Detector Malfunction" will be announced at the end of test trains (Yes) or not announced (No). Select the **Announce Test Trains** option to change this setting. Doing so toggles the current setting between Yes and No.

5.3.5.9 Alarm Interval Time (Continuous Scan)

For continuous-scan applications**,** on the Setup Track Module 1 menu, select 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
```

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.

5.3.5.10 Alarm Duration Time (Continuous Scan)

For continuous-scan applications, on the Setup Track Module 1 menu, select the **Alarm Duration Time** option. 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.

5.3.5.11 Rebroadcast Code

The iCube 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 Setup Track Module 1 menu 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

                    •
                    •
                    •
```

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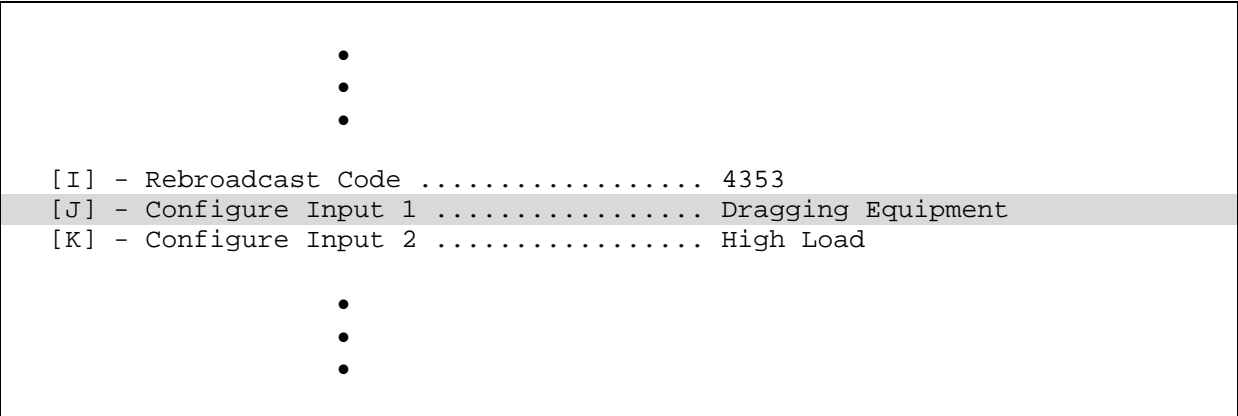
Leading zeros aren't required when entering the rebroadcast code. This code should be entered exactly as it will be keyed over the radio to request a rebroadcast. If the rebroadcast code is less than seven characters, press **[Enter]** to finish.

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.

5.3.5.12 Configure Input 1

On the Setup Track Module 1 menu 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

                    •
                    •
                    •
```

Select **Configure Input 1** to display menu options.

```
   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
   [5] - Direction .................. Bidirectional
   [0] - Exit
```
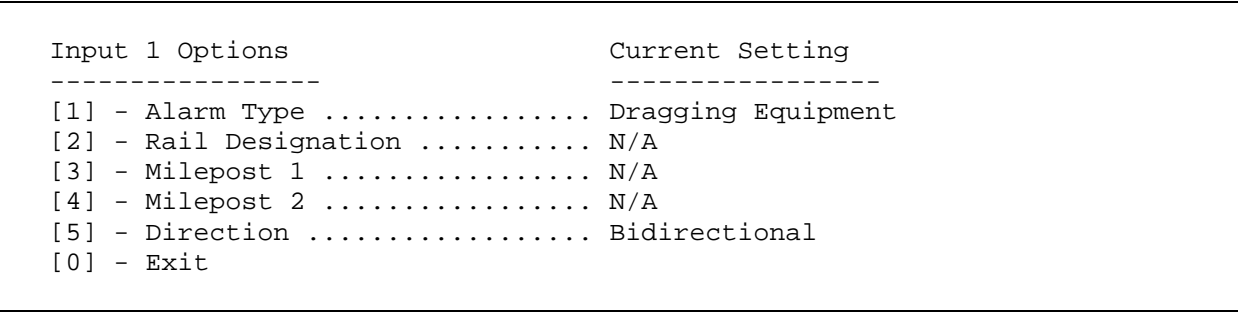
On the Input Options menu, the **Alarm Type** option allows the alarm type for input-1 to be set.

```
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
[5] - Direction .................. Bidirectional
[0] - Exit
```

From the Input Options menu, select the **Rail Designation option** to select the rail 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
  [5] - Direction ................. Bidirectional
  [0] - Exit
```

On the Input Options menu, select the **Milepost-1** option. 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 **nnnn.n**, 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 **0058.0**. To exit without changing the first milepost, press **[Esc]**.

On the Input Options menu, select the **Milepost-2** option. Doing so displays the current second 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 **nnnn.n**, 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 **0062.0**. To exit without changing the second milepost, press **[Esc]**.

On the Input Options menu, the **Direction** option allows an input to be configured to alarm in one direction only.

```
   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
   [5] - Direction .................. Bidirectional
   [0] - Exit
```

Select the **Direction** option to scroll between Bidirectional, North, South (or East/West depending on Track Direction setting in Setup Menu). If the Direction is set to South, alarms for this input will only be recorded if the train is traveling South.

5.3.5.13 Configure Input 2

On the Setup Track Module 1 menu, the **Configure Input 2** option configures alarm2.

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

                  •
                  •
                  •
```

Selecting **Configure Input 2** allows the alarm type for input-2 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.3.5.14 Configure Input 3

On the Setup Track Module 1 menu, the **Configure Input 3** option configures alarm3.

```
                    •
                    •
                    •
  [K] - Configure Input 2 ................ High Load
  [L] - Configure Input 3 ................ Wide Load
  [M] - Configure Input 4 ................ Wide Load
  [X] - Exit
```
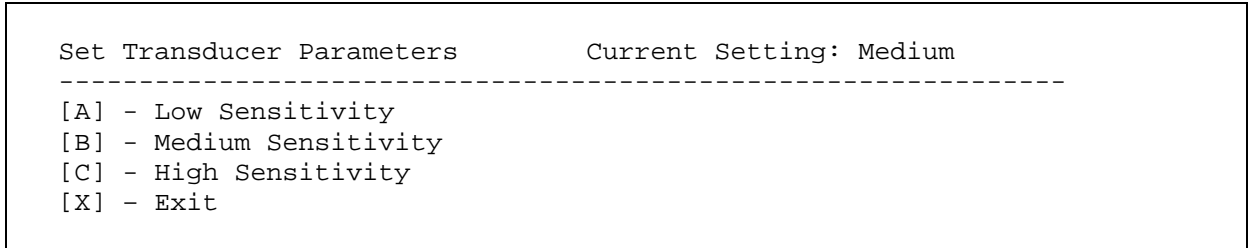
Selecting **Configure Input 3** allows the alarm type for input-3 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.3.5.15 Configure Input 4

On the Setup Track Module 1 menu, the **Configure Input 4** option configures alarm4.

```
                    •
                    •
                    •
  [L] - Configure Input 3 ................ Wide Load
  [M] - Configure Input 4 ................ Wide Load
  [N] - Set Transducer Parameters
  [O] - Repeat No Defects ................ No
  [P] - D3 Poll Address .................. B
  [X] - Exit
```

Selecting **Configure Input 4** allows the alarm type for input-4 to be set. The resulting screens look the same as those for configuring input-1 described above.

5.3.5.16 Set Transducer Parameters

On the Setup Track Module1 menu, select the **Set Transducer Parameters** option.

```
                        •
                        •
                        •

  [N] – Set Transducer Parameters
  [O] – Repeat No Defects ................. No
  [P] – D3 Poll Address ................... B
  [X] – Exit [X] – Exit
```
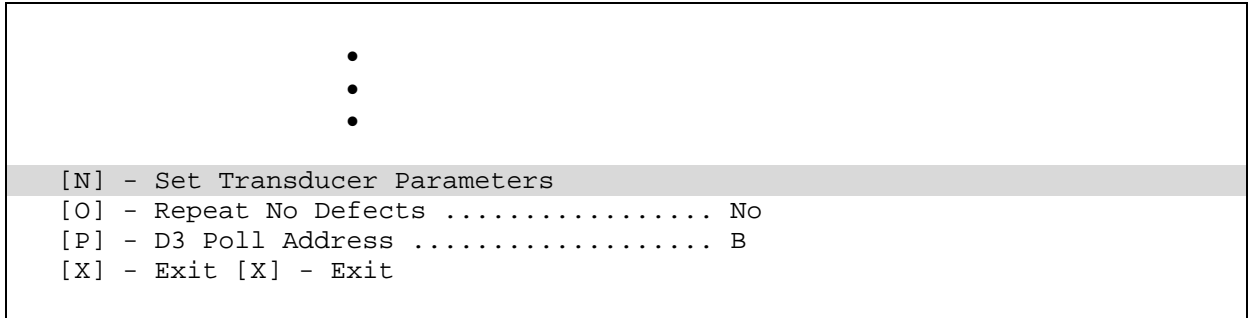
The following screen appears. The user can select Low, Medium, or High transducer sensitivity on each track. Select one of the available options to change current setting or "X" to return to previous menu.

```
  Set Transducer Parameters       Current Setting: Medium
  ------------------------------------------------------------
  [A] – Low Sensitivity
  [B] – Medium Sensitivity
  [C] – High Sensitivity
  [X] – Exit
```

5.3.5.17 Repeat No Defects

On the Setup Track Module1 menu, select the **Repeat No Defects** option to toggle current setting.

```
                        •
                        •
                        •

  [N] – Set Transducer Parameters
  [O] – Repeat No Defects ................. No
  [P] – D3 Poll Address ................... B
  [X] – Exit [X] – Exit
```
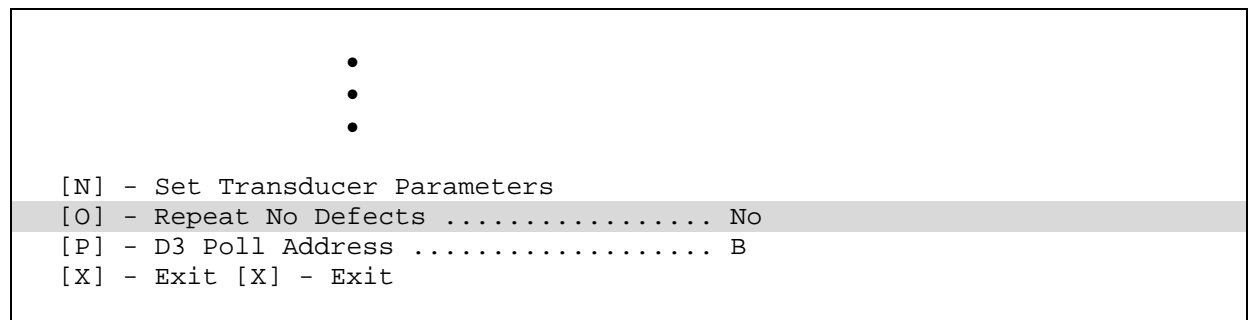
If this option is set to **Yes**, the "No Defects" message will be repeated as many times as is set in the Number of Repeats setting. If this option is set to **No**, the "No Defects" message will be announced only once.

5.3.5.18 D3 Poll Address

On the Setup Track Module1 menu, select the **D3 Poll Address** option to change current setting.

```
                    •
                    •
                    •
  [N] - Set Transducer Parameters
  [O] - Repeat No Defects ................. No
  [P] - D3 Poll Address .................. B
  [X] - Exit [X] - Exit
```

The following prompt appears.

```
  Enter poll address from A to Z (Esc to cancel):
```

5.3.5.19 Exit

On the Setup Track Module1 menu, option-X is the Exit option.

```
                    •
                    •
                    •
   [O] - Repeat No Defects ................. No
  [P] - D3 Poll Address .................. B
  [X] - Exit
```

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

5.3.6 Setup Track Module 2

On the Setup Menu select the **Setup Track Module 2** option.

```
                    •
                    •
                    •

  [E] - Setup Track Module 1
  [F] - Setup Track Module 2
  [G] - Load Default Setup

                    •
                    •
                    •
```
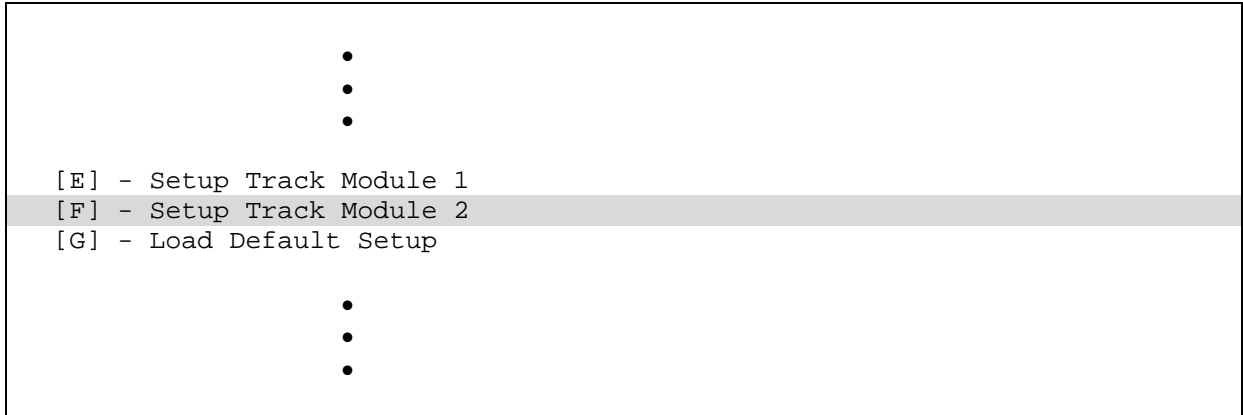
The resulting screens look the same as those for Track Module 1 described above.

5.3.7 Load Default Setup

On the Setup Menu is the **Load Default Setup** option.

```
                    •
                    •
                    •

  [F] - Setup Track Module 2
  [G] - Load Default Setup
  [H] - D3 Setup Menu
```
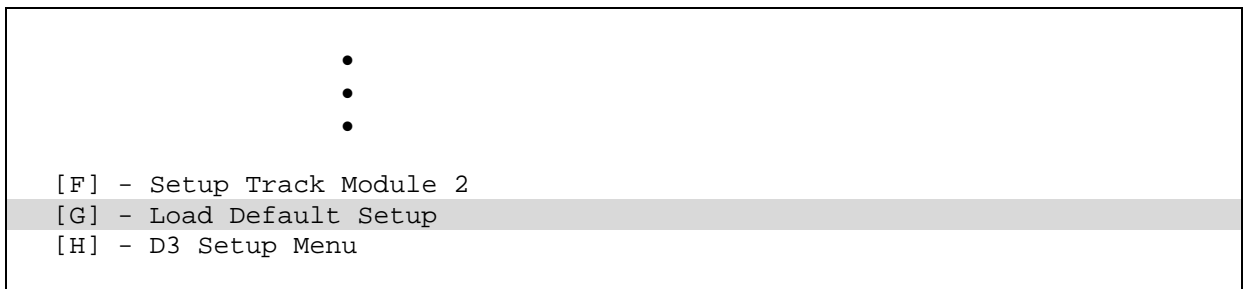
When this menu item is selected, the parameters listed below are assigned to the values listed below. A "yes" after a parameter means that it is "enabled." A "no" means that it is "disabled." This menu option is included to assist installers in setting up a new system. Selecting this option configures 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	115200
Temperature Probe	Disabled
Track Direction	East/West
Track Module 1	Disabled
Track Module 2	Disabled
D3	Port 3000
Telnet	Port 23
Time Zone	GMT/UTC
Site Name	ANNA
Dial Out Mode	No
Default Track Number	9
Default Poll Address	A
Password	none
Wind Monitor	Disabled
High Wind Limit	50
Display Wind Diagnostics	No

Default Radio Frequencies

Channel	Transmit	Receive
1	160.920	160.920
2	161.490	161.490
3	161.565	160.395
4	160.455	160.455
5	160.395	161.565
6	160.650	160.650
7	161.145	161.145
8	160.710	160.710

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
DTMF Code	None
Repeat No Defects	No
Transducer Sensitivity	Medium

Defaults for each input (four per track):

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

Select the **Load Default Setup** option. Doing so displays this prompt.

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

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

5.3.8 D3 Setup Menu

On the Setup Menu is the **D3 Setup Menu**.

```
                    •
                    •
                    •

  [G] - Load Default Setup
  [H] - D3 Setup Menu
  [I] - High Wind Limit .......... 50 mph
```

Select **D3 Setup Menu** to view current settings and make changes.

```
  D3 Setup Menu                    Current Setting
  -------------------------------------------------
  [A] - D3 Port ................... 3000
  [B] - Site Name ................. ANNA
  [C] - Default Poll Address ...... A
  [D] - Default Track Number ...... 9
  [E] - Dial-out Mode ............. No
  [F] - SYNC Mode ................. Yes
  [G] - Health-check period ....... 120 minutes
  [H] - Inter-call delay .......... 20 seconds
  [I] - Maximum retries ........... 3
  [J] - Inactivity interval ....... 30 seconds
  [K] - Weather alarm interval .... 5 minutes
  [L] - Primary Server Address .... 74.95.110.76:5062
  [M] - Secondary Server Address .. 10.14.22.187:10007
  [X] - Exit
```

The iCube supports D3 protocol. D3 may be run in 1 of 2 modes, Dial-out and Polled mode. When the system is in Polled mode (not likely to be used) it will listen on the D3 Port for data requests from the D3 server. Each track will be addressed by its D3 Poll Address and the character '1'. If track 1's D3 Poll Address is set to 'A' then track 1 will be addressed by the D3 server as 'A1'. D3 Messages that are not track specific will use the Default Poll Address. This will apply to Wind Monitor reporting. When the system is set to Dial-out mode, it will contact the D3 server using the connection parameters it retrieves from the D3 support server. The system will identify itself to the server using the Site Name and each track will be addressed by its Track Number rather than its D3 Poll Address. For example, if the first track module's track number is set to 4 the track will be addressed as "04" by the D3 server. Messages that are not track specific such as the Wind Monitor will use the Default Track Number. If SYNC Mode is enabled, the system will transmit 4 bytes before every message to attempt to synchronize speed with the D3 server (not likely to be used). The Time Zone in the Setup Menu is only used to report to the D3 server the current time zone setting. No other functions use it.

5.3.9 High Wind Limit

On the Setup Menu is the **High Wind Limit** option. Select this option to change current setting. The following prompt will appear.

```
  Enter high wind limit between 30 and 100 mph (Esc to cancel):
```

5.3.10 Time Zone

On the Setup Menu is the **Time Zone** option. Select this option to change current setting. The following prompt will appear.

```
  Time Zone
  ---------------------------------------------
  [0] - GMT/UTC
  [1] - EST: Eastern Standard Time
  [2] - EDT: Eastern Daylight Time
  [3] - CST: Central Standard Time
  [4] - CDT: Central Daylight Time
  [5] - MST: Mountain Standard Time
  [6] - MDT: Mountain Daylight Time
  [7] - PST: Pacific Standard Time
  [8] - PDT: Pacific Daylight Time

  Choose a time zone:
```

5.3.11 Telnet Port

On the Setup Menu is the **Telnet Port** option. Select this option to change current setting.
The following prompt will appear.

```
   Enter new port number from 1024 to 65535:
```

A user may connect to the iCube through a telnet connection on the port designated in the
setup menu. This connection will present a user with a menu exactly the same as the serial
interface. There may be up to 3 separate telnet users connected to the device at the same
time. Only one user may have permission to save settings at any given time. If the user is
inactive for 4 minutes, they will be disconnected from the device.

5.3.12 Save Settings

On the Setup Menu is the **Save Settings** option. The user can select the Save Settings option
to save without leaving the setup menu. The user will still be prompted to save any unsaved
changes when exiting the setup menu. Only one user is allowed to save at any given time if
multiple users are connected simultaneously. This will be the first user to enter the setup
menu. Any other user who tries to save changes will be informed that he does not have
permission. When the user who has save permission attempts to save, he will be informed
that the setup data may have been altered by another user.

Select this option to save changes to flash memory. If there are unsaved changes to settings,
the following prompt will appear.

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

5.3.13 Change Password

For security, a password can be set for the user interface. If a password is set. then anyone
attempting to gain access to the Main Menu will be prompted for that password. If a session
times out, the user will be prompted for the password again.

On the Setup Menu is the **Change Password** option. Select this option and the following
prompt will appear.

```
   Enter old password:

   Enter new password:
```

If a password currently exists, a prompt will ask you to "Enter old password". The old password must be entered successfully before you can change to a new password. Passwords are case sensitive and can be up to 20 characters in length.

5.3.14 Show setup on SD card

On the Setup Menu is the **Show setup on SD card** option. Select this option to view the settings as saved on the SD card. Example of system setup is shown below. Your setup will look different.

```
  Current setup on SD card: ([0x__] represents a hexadecimal byte that
cannot be printed)
  ------------------------
  Milepost = "0159.0"
  Announce Mode = Departure messages only
  Announce Detector Out = Yes
  Announce Low Battery = Yes
  Track Dir = East/West
  Temperature Probe Installed = No
  Announce Ambient Temperature = No
  Radio Channels Selected:
       Radio 1 announces on channel 3 first
  Serial Baud Rate = 115200
  Display Lines = 35
  Firmware Version = "CP1.02  03/03/11"
  Default Poll Address = 'A'
  Default Track Number = 9
  Time Zone = 0
  Sync Mode = Yes
  D3 Port = 3000
  Telnet Port = 23
  DialOutMode = No
  Site Name = "ANNA  "
  Dialout Retries = 3
  Dialout Retry Delay = 20
  D3 Heartbeat Interval = -1
  Wind Monitor Installed = No
  High Wind Limit = 50
  Wind Diagnostics = No
  Radio Deviation Pot Setting = 65535
  Radio Volume Pot Setting = 65535

  D3 Servers
  ----------
  Server #1
  IPAddress = "74.95.110.76";
  Host Name = "";
  Port = 5062;

  Server #2
  IPAddress = "10.14.22.187";
  Host Name = "";
  Port = 10007;
```

```
Radio Frequency Settings
-------------------------------
              Transmit   Receive
              --------   -------
Channel 1     160.920    160.920
Channel 2     161.490    161.490
Channel 3     160.395    161.565
Channel 4     160.455    160.455
Channel 5     161.565    160.395
Channel 6     160.650    160.650
Channel 7     161.145    161.145
Channel 8     160.710    160.710


Track #1 Setup
--------------
Is Installed = Yes
Track Number = 0
Max Alarms = 3
Number Repeats = 2
Rebroadcast Timeout = 10
System Activation = Two Transducers
Advance Alarm Time = 10
Announce Total Axles = No
Announce Test Trains = Yes
Alarm Interval = 10
Alarm Duration = 60
DTMF Code = "4353"
Transducer Sensitivity = Medium
Poll Address = 'B'
Repeat No Defects = No


Input #1 for Track 1
--------------------
Dragging Equipment



Input #2 for Track 1
--------------------
Not used



Input #3 for Track 1
--------------------
Not used



Input #4 for Track 1
--------------------
Not used
```

```
   Track #2 Setup
   --------------
   Is Installed = Yes
   Track Number = 1
   Max Alarms = 3
   Number Repeats = 2
   Rebroadcast Timeout = 10
   System Activation = Continuous scan
   Advance Alarm Time = 10
   Announce Total Axles = No
   Announce Test Trains = Yes
   Alarm Interval = 10
   Alarm Duration = 60
   DTMF Code = ""
   Transducer Sensitivity = Medium
   Poll Address = 'C'
   Repeat No Defects = No

   Input #1 for Track 2
   --------------------
   Not used


   Input #2 for Track 2
   --------------------
   Not used


   Input #3 for Track 2
   --------------------
   Not used


   Input #4 for Track 2
   --------------------
   Not used



   -------------------------
   End of setup
```

5.3.15 Load from SD card

On the Setup Menu is the **Load from SD card** option. This feature allows the user to load the settings from the SETUP.bin file. Select **Load from SD card** and the following prompt will appear.

```
   This will load the current settings from the SD card and save them.
   Are you sure? (Y or N)
```

5.3.16 Save to SD card

On the Setup Menu is the **Save to SD card** option. This feature saves the current settings to a file on the SD card called SETUP.bin. This file can then be used to load settings onto other devices.   In addition, this feature also creates and stores a human readable file called SETUP.ini. Select **Save to SD card** and the following prompt will appear when operation is successfully completed.

```
  Saved config file to SD card

  Saved binary config file to SD card
```

5.3.17 Exit

On the Setup Menu, option-X is the Exit option.

```
                    •
                    •
                    •

  [O] - Load from SD card
  [P] - Save to SD card
  [X] - Exit
```

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

5.4 Equipment Menu

On the Main menu, select the **Equipment Menu** option.

```
 STC Wayside Monitoring System
 Tue  Aug 13 2013  11:00:23
 Main Menu                  MP: 0159.0
 ---------------------------------------
 [A] - Display Data For Track 1
 [B] - Display Data For Track 2
 [C] - Setup Menu
 [D] - Equipment Menu
 [E] - System Log
 [F] - System Status Report
 [G] - System Functions Menu
 [H] - D3 Error Log
 [X] - Exit
```

Doing so displays the **Equipment menu**.

```
Equipment Menu                        Current Setting
--------------------------------------------------
[A] - Track Module 1 ............ Enabled
[B] - Track Module 2 ............ Enabled
[C] - Temperature Probe ......... Disabled
[D] - Serial Baud Rate .......... 115200
[E] - Display Lines ............. 35
[F] - Radio Configuration Menu
[G] - Change Network Settings
[H] - Temperature probe type .... 2090-100 Standard Probe
[I] - Wind Monitor Menu
[J] - Save Settings
[X] - Exit
```

5.4.1 Track Module 1

On the Equipment menu is the **Track Module 1** option. Selecting it allows the Track Module Card plugged into the TRACK-1 slot to be enabled or disabled. Once a Track Module Card is installed and powered up, it must be enabled in this menu to function properly. A Track Module Card 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. Selecting this option toggles the setting for the corresponding Track Module between enabled and disabled.

5.4.2 Track Module-2

On the Equipment menu is the **Track Module 2** option. Selecting it allows the Track Module Card plugged into the TRACK-2 slot to be enabled or disabled. Once a Track Module Card is installed 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. Selecting this option toggles the setting for the corresponding Track Module between enabled and disabled.

5.4.3 Temperature Probe

On the Equipment menu 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. Selecting this option will toggle the setting between enabled and disabled.

5.4.4 Serial Baud Rate

On the Equipment menu is the **Serial Baud Rate** option. Selecting it lets you set the baud rate that is used for the Local RS232 port. Below are the possible 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.

5.4.5   Display Lines

On the Equipment menu 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 entered here.

Select **Display Lines** 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.

5.4.6   Radio Configuration Menu

On the Equipment menu is the **Radio Configuration Menu**. This menu includes submenus that allow you to select active radio channels, program the operating frequencies, adjust audio deviation levels, and select carrier detect levels.

Select **Radio Configuration Menu** and this prompt appears.

```
Radio Configuration Menu
-----------------------------------------------------
[A] - Active Channel Select Menu
[B] - Radio Frequency Setup
[C] - Radio Transmit Audio Adjustment Menu
[D] - Carrier Detect On Level (-dBm) ........ 100.0
[E] - Carrier Detect Off Level (-dBm) ....... 105.0
[F] - Display Digital Pot Settings
[X] - Exit
```

5.4.6.1 Active Channel Select Menu

The radio has eight programmable operating channels. Up to two of these channels can be made active for sequential broadcast. Select **Active Channel Select Menu** from the Radio Configuration Menu. The following prompt appears. Choose options 1 and 2 and follow the prompts to activate channel(s).

```
 Active Channel Select Menu
 --------------------------
 All announcements are made on each channel sequentially.

 [1] - First Active Channel - 1
 [2] - Second Active Channel - 2
 [X] - Exit

Select a radio channel between 1 and 8 or 0 to disable the channel (Esc to cancel):
```

5.4.6.2 Radio Frequency Setup

On the Radio Configuration Menu is the **Radio Frequency Setup** option. The transmit and receive frequencies can be programmed for each of the eight available channels. Select the **Radio Frequency Setup** option to view current settings.

```
 Radio Frequency Setup
 Radio Type: Unknown      Serial Number:
 Firmware Ver:   MIN: 160.215    MAX: 161.565
 ---------------------------------------------------
                  Transmit  Receive
                  --------  -------
 [1] - Channel 1 - 160.920   160.920
 [2] - Channel 2 - 161.490   161.490
 [3] - Channel 3 - 160.395   161.565
 [4] - Channel 4 - 160.455   160.455
 [5] - Channel 5 - 161.565   160.395
 [6] - Channel 6 - 160.650   160.650
 [7] - Channel 7 - 161.145   161.145
 [8] - Channel 8 - 160.710   160.710
 [X] - Exit
```

Select the channel number to change its frequency designations. For example, type **1** to modify Channel 1 settings. This prompt will appear.

```
            Transmit   Receive
            --------   -------
 Channel 1 - 160.920   160.920

 Enter new transmit frequency (###.###):
 Enter new receive frequency (###.###):
```

Input format **###.###** where '#' may be 0-9. Include leading and trailing zero's. These values must be between 160.215 and 161.565. Once you have made your changes, you must exit the radio menu and the equipment menu and save the settings. The radio will then begin programming the new frequencies. If you attempt to enter the Radio Frequency Menu when the radio is not plugged in or is not responding, you will receive the message "Radio channels not available, radio not responding". You can also check to see if the Radio is not responding by looking at the System Status Report under System Warnings. After booting up, the system takes about a minute to recognize the radio.

5.4.6.3 Radio Transmit Audio Adjustment Menu

On the Radio Configuration Menu is the **Radio Transmit Audio Adjustment Menu.** Available options include a feature to activate or deactivate a continuous 1 KHz test tone. This tone is broadcast through the speaker and through the radio and will automatically time out after 30 seconds. Other menu options allow user to adjust audio deviation levels or load default audio settings.

```
Radio Transmit Audio Adjustment Menu
-------------------------------------------------
[A] - Transmit 1KHz Test Tone
[B] - Stop 1KHz Test Tone
[C] - Increase Transmit Audio Deviation Level
[D] - Decrease Transmit Audio Deviation Level
[E] - Load Default Transmit Audio Setting
[F] - Display Digital Pot Settings
[X] - Exit
```

5.4.6.4 Carrier Detect On/Off Level

On the Radio Configuration Menu are the **Carrier Detect On Level** option and the **Carrier Detect Off Level** option. The CD (Carrier Detect) LED is an indication that the system is experiencing radio traffic. It operates similar to squelch. If the CD LED is lit when there is no activity on the frequency, then it is recommended that the sensitivity be reduced by changing the Carrier Detect On and Off levels. The factory default settings are -100 dBm for carrier detect on and -105 dBm for carrier detect off. These settings rarely need to be adjusted and should be done so only by a qualified radio technician. For proper operation, the carrier detect on value should always be <u>higher</u> than the carrier detect off value. The difference between the two values represent the squelch hysteresis and is used to prevent squelch chatter when the receive signal is near the squelch setting values. Typical hysteresis should be 5 dB.

```
 Radio Configuration Menu
 -------------------------------------------------
 [A] - Active Channel Select Menu
 [B] - Radio Frequency Setup
 [C] - Radio Transmit Audio Adjustment Menu
 [D] - Carrier Detect On Level (-dBm) ........ 100.0
 [E] - Carrier Detect Off Level (-dBm) ....... 105.0
 [X] - Exit
```

To change current settings, select **Carrier Detect On Level** option. This prompt appears.

```
 The default value for Carrier Detect On is 100.0 -(dBm)
 Enter new Carrier Detect On (-dBm) value between 080.0 and 115.0 (###.#):
```

To change current settings, select **Carrier Detect Off Level** option. This prompt appears.

```
 The default value for Carrier Detect Off is 105.0 -(dBm)
 Enter new Carrier Detect Off (-dBm) value between 080.0 and 115.0 (###.#):
```

Examples of Carrier Detect Levels

Carrier Detect On	Carrier Detect Off	Sensitivity
105.0	110.0	High – Relatively weak signal will illuminate the Hold-Off LED.
100.0	105.0	Medium
95.0	100.0	Low
90.0	95.0	Lower – Stronger signal required to light the Hold-Off LED.

The system permits a range from 80 to 115. A setting of 80 for Carrier On represents the least sensitive setting.

5.4.7   Change Network Settings

From the Equipment Menu, select **Change Network Settings** to change the Static IP or the Mask. The following prompt appears:

```
Current settings:
      Static IP: 192.168.1.2
      Mask: 255.255.255.0
Enter new IP in the form '###.###.###.###'
```

Follow the prompts to change the current settings. Both the Static IP and Mask are formatted as follows:

###.###.###.###

Each pound symbol represents a numeric character from zero to nine. All twelve digits must be entered for a valid IP address. Insert leading zeroes as necessary.

5.4.8   Wind Monitor

Current wind monitor settings can be viewed from the Equipment Menu. Select the **Wind Monitor** option to toggle its setting. Select **Display Wind Diagnostics** to toggle its setting.

```
Wind Monitor Menu
------------------------------------
[A] - Wind monitor installed ..................... No
[B] - Display wind diagnostics ................... No
[C] - Slow wind speed (test for suspicious data) .. 2
[D] - Max Interval Identical Data (slow) .......... 360
[E] - Max Interval Identical Data ................ 30
[F] - Gust Interval .............................. 5
[G] - Wind monitor poll interval ................. 15
[X] - Exit
```

The wind monitor collects the current wind speed and direction every **Wind monitor poll interval** seconds while the **Wind monitor installed** option is enabled. It maintains these values for the past **Gust Interval** minutes. If the wind speed exceeds the High Wind Limit which can be set from the Setup menu, then an alarm is generated. This alarm is only reported through the D3 protocol. No announcements will be broadcast. If **Display wind diagnostics** is enabled, the current wind speed and direction is displayed through the serial port every time it is collected.

If the wind speed or direction does not change for a long period of time, a suspicious wind speed or direction warning will be sent via the D3 protocol. The period of time before speed or direction becomes suspicious is **Max Interval Identical Data** minutes if the wind speed is above **Slow wind speed (test for suspicious data)** otherwise the period of time is **Max Interval Identical Data (slow)** minutes.

5.4.9   Save Settings

From the Equipment Menu, select **Save Settings** to save changes to flash memory. The following prompt will appear.

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

5.4.10   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 and not yet saved, this prompt will appear.

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

5.5   System Log

On the Main menu is the **System Log** option.

```
STC Wayside Monitoring System
Wed  Aug 14 2013  14:00:14
Main Menu                    MP: 0159.0
----------------------------------------
[A] - Display Data For Track 1
[B] - Display Data For Track 2
[C] - Setup Menu
[D] - Equipment Menu
[E] - System Log
[F] - System Status Report
[G] - System Functions Menu
[H] - D3 Error Log
[X] - Exit
```

The iCube System maintains a record of selected events that might be an indicator of system health or aid in troubleshooting. To view these events, select the **System Log** option. Doing so produces a report of the system log. Below is a sample of that report. The contents of your report will be different.

```
 System Log          206 records
 First event: 08/06/13 16:29  Power-up or reset
 Last event:  08/14/13 11:37  New settings saved to flash

 08/12/13 14:21  Track module 1 initialized
 08/12/13 14:25  Power-up or reset
 08/12/13 14:25  Talker Health Check - OK
 08/12/13 14:25  Track module 2 initialized
 08/12/13 14:25  Track module 1 initialized
                      •
                      •
                      •
 08/13/13 16:36  New settings saved to flash
 08/13/13 16:37  Power-up or reset
 08/13/13 16:37  Talker Health Check - OK
 08/13/13 16:38  New settings saved to flash
 08/14/13 08:07  Power-up or reset
 08/14/13 08:07  Talker Health Check - OK
 08/14/13 08:07  New settings saved to flash
 08/14/13 11:37  New settings saved to flash


 [E] - Entire log        [F] - First page         [L] - Last page
 [N] - Next page         [P] - Previous page       [S] - Search by date
 [X] - Exit              [D] - Display lines (35)
```

In this case, the file has 206 events. The oldest event was recorded at 4:29 pm on 08/06/13. The newest was recorded at 11:37 am on 08/14/13. 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 **08/12/2013**, data will be displayed starting with the first record on or after 08/12/2013. For days or months, type leading zeros.

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 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	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	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	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	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	Any time new firmware is flashed into a Track Module, one of these messages will be saved in the system log.

5.6 System Status Report

On the Main menu is the **System Status Report** option.

```
                    •
                    •
                    •

    [E] - System Log
    [F] - System Status Report
    [G] - System Functions Menu
```

Selecting this option 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 top half of a System Status report. The contents of your report will be different.

```
                      Southern Technologies Corporation
                        Wayside Monitoring System
                          System Status Report
 ===============================================================================
  Ambient: N/A      Wind Avg: N/A       Battery: 13.5v    Wed  Aug 14 2013  14:30:47
 -------------------------------------------------------------------------------

  Milepost ............... 0159.0    Track Direction ........ East/West

  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 ........... 35
  Radio Channels .......... R1:3


  Track Module 1 Setup
  ------------------------------------------------
  Track Number .................... Track 1
  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
  Input 1 ......................... Dragging Equipment
  Input 2 ......................... Not used
  Input 3 ......................... Not used
  Input 4 ......................... Not used
  Transducer sensitivity: Medium
 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, or 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 Setup
  --------------------------------------------------
  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
  Rebroadcast Code ................
  Input 1 ......................... Dragging Equipment
  Input 2 ......................... Not used
  Input 3 ......................... Not used
  Input 4 ......................... Not used


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


  Network Settings
  --------------------------------------------------
  MAC address = 00:03:f4:03:be:72

  Number of addresses: 3

        IP   : 10.14.22.250
        Mask : 255.255.255.0

        IP   : 169.254.52.156
        Mask : 255.255.0.0

        IP   : 192.168.1.2
        Mask : 255.255.255.0


  Software Versions
  --------------------------------------------------
  Current Package   ..... STUP100A.PKG
  Central Processor ..... CP2 1.00A  08/14/13
  Talker ................ TK2 1.00A  08/14/13
  Speech Data ........... UP3.06A 07/17/13
  Track Module 1 ........ TM2 1.00A  08/14/13
  Track Module 2 ........ TM2 1.00A  08/14/13

 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 iCube front panel. 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 iCube front panel 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 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 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.

No response from Talker:

Communications have failed between the central processor board and the talker board.

Radio not responding:

The Talker is unable to retrieve programmed channel frequencies from the radio.

Track Module 1 (or 2) not responding:

Communications have failed between the central processor board and one of the track module boards.

Track Module 1 (or 2), Input (1,2,3, or 4) malfunctioned:

A stuck dragger or blocked sensor condition exists at one of the alarm inputs.

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.

5.7 System Functions Menu

On the Main menu is the **System Functions Menu** option.

To execute one or more system functions:

1   Be sure that the Main menu is displayed.

The Main menu looks like this.

```
                         •
                         •
                         •

    [F] - System Status Report
    [G] - System Functions Menu
    [H] - D3 Error Log
```

2   Select the **System Functions Menu**.

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

```
    System Functions Menu
    --------------------------------------
    [A] - Radio Test
    [B] - Vocabulary Test
    [C] - Raise Speaker Volume
    [D] - Lower Speaker Volume
    [E] - Reinitialize Track Modules
    [F] - Toggle Diagnostic Messages
    [G] - Force Reboot
    [H] - Load New Software
    [I] - Diagnostic messages sent here: Yes
    [J] - Erase train data
    [K] - Erase system log
    [L] - DHCP Server: On
    [M] - Print Radio Settings
    [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.

5.7.1 Radio Test

On the System Functions menu 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.

5.7.2 Vocabulary Test

On the System Functions menu 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, detector malfunction."

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.

5.7.3 Adjust Speaker Volume

On the System Functions menu are the **Raise Speaker Volume** and **Lower Speaker Volume** options. The volume can be set from a range of 0 to 256. The current level is incremented by 3 each time the **Raise Speaker Volume** option is selected. Resulting prompt shown below.

```
   Raise Volume

   Raise Volume

   Raise Volume
```

Likewise, the current level is decremented by 3 each time the **Lower Speaker Volume** option is selected.

5.7.4 Reinitialize Track Modules

On the System Functions menu 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.

5.7.5 Toggle Diagnostic Messages

On the System Functions menu 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.

5.7.6 Force Reboot

On the System Functions menu 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.

5.7.7 Load New Software

Firmware files for the central processor, talker processor, and the track modules are zipped into a single file with extension "PKG". This ensures compatibility between the various firmware versions. On the System Functions menu is the **Load New Software** option.

```
Load New Software
Select a file to load from the SD card.
---------------------------------------
[A] - SMTLK7.PKG.......08/10/2013
[B] - SMTLK8.PKG.......08/12/2013
[C] - SMTLK9.PKG.......08/15/2013
[X] - Exit without loading new software.
```

Select the firmware package 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. Each module will restart when programming of that module is finished.

5.7.8 Diagnostic messages sent here

On the System Functions menu is the **Diagnostic messages sent here** option. This option allows a telnet user to redirect diagnostic messages to his connection that would normally go out the serial port, since only one user can receive these diagnostic messages at a time. Whenever a telnet user connects, the value is automatically set to **"Yes"** for him. He can toggle the option to send the diagnostic messages back to the serial port.

5.7.9 Erase train data

On the System Functions menu is the **Erase train data** option. This option allows the user to delete all stored train records on the SD card.

5.7.10 Erase system log

On the System Functions menu is the **Erase system log** option. This option allows the user to clear all events from the event log.

5.7.11 DHCP Server

On the System Functions menu is the **DHCP Server** option. The iCube can act as a DHCP server with one client when this setting is set to "**On"**. This allows a user to connect to the iCube with a crossover cable and telnet into the menu using the iCube's static IP address. When this option is changed the device must be restarted for the changes to take effect. The DHCP server option is defaulted to **"OFF"**. The user's computer must have the network settings configured to dynamically retrieve an address for this to work.

On startup, the iCube automatically attempts to dynamically retrieve an address, no matter what the network settings are. At the same time the iCube will also assign itself a static IP address based on the Change Network Settings menu, giving it 2 IP addresses. All of the iCube's IP addresses are displayed through the serial port on startup.

Configured IP = 0.0.0.0
Configured Mask = 0.0.0.0
MAC Address= 00:03:f4:03:9d:1a

No static IP, attempting DHCP
*** DHCP Failed

Total number of interface addresses: 3

```
--------------------------
Address #1
IP Address: 0.0.0.0
Mask     : 0.0.0.0
--------------------------
Address #2
IP Address: 169.254.131.171
Mask     : 255.255.0.0
--------------------------
Address #3
IP Address: 192.168.1.2
Mask     : 255.255.255.0
--------------------------
```

CAN system initialized....listening on channel 0
SD/MMC drive initialized
Getting RTC time from Talker

5.8 D3 Error Log

On the Main Menu is the **D3 Error Log** option. Selecting this option will generate a list of all recorded D3 diagnostic errors as well as network communication errors. Those errors related to the Remote Update capability will be labeled as "FTP Error" rather than "D3 Error". Below is an example of a D3 Error Log.

```
 D3 Error Log
 ------------
 08/12/13 14:22
 FTP Error
 Received unexpected packet

 08/12/13 14:28
 FTP Error
 File transfer aborted

 08/13/13 13:42
 FTP Error
 Checksum error in packet

 08/27/13 16:41
 D3 Error on track 5
 D3 defined error:
 ERROR: Failed to connect to server.  Too many tries.  Will try with next
 train.
                     •
                     •
                     •
```

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 or credit card number (to be charged) with its expiration date.
- Complete address where the parts are to be shipped.
- Complete address where the invoice is to be mailed.
- Name and 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.

Appendix A – iCube Solar Package

A.1 Solar Package Components

The figures below show the parts of the iCube Solar Package, with their respective part numbers.

CONNECTOR, 1/2" STRAIGHT LIQUIDTITE
P/N 49-100-007, 2-REQ.

CONDUIT, 1/2" LIQUIDTITE
P/N 49-100-003, 20' LONG

PHOTOVOLTAIC PANEL
P/N 61-990-137

CABLE, 10GA STRANDED RED
P/N 44-101-039, 25' LONG

CABLE, 10GA STRANDED BLACK
P/N 44-101-038, 25' LONG

ALUMINUM SPACER
P/N 41-123-058, 8-REQ.

SOLAR PANEL SHIELD
P/N 41-123-050

1/4 FLAT WASHER
P/N 01-121-005, 8-REQ.

1/4 LOCK WASHER
P/N 01-122-005, 8-REQ.

HHC 1/4-20 X 1-3/4"
P/N 01-113-039, 8-REQ.

TOWER MOUNT STRUT R/H
P/N 41-123-056

TOWER MOUNT BRACKETS
P/N 41-123-055, 2-REQ.

"U"BOLT 5/16-18 x 1-3/8"
P/N 01-130-008, 4-REQ.

5/16 FLAT WASHER
P/N 01-121-016, 8-REQ.

5/16-18 ESNA NUT
P/N 01-118-012, 4-REQ.

TOWER MOUNT
P/N 41-123-054

5/16-18 ESNA NUT
P/N 01-118-012, 4-REQ.

5/16 FLAT WASHER
P/N 01-121-016, 8-REQ.

TOWER MOUNT STRUT L/H
P/N 41-123-057

5/16-18 ESNA NUT
P/N 01-118-012, 8-REQ.

5/16 FLAT WASHER
P/N 01-121-016, 8-REQ.

HHC 5/16-18 X 1"
P/N 01-113-040, 8-REQ.

TOWER TUBING SIDE RAILS

SOUTHERN tECHNOLOGIES CORP.
2060-500AAK ANGLE ADJUSTMENT KIT

3/8 FLAT WASHER
P/N 01-121-011

COTTER PIN 1" X 1/16"
P/N 01-124-020

HHC 1/4-20 X 1/2"
P/N 01-113-030

ANGLE MOUNTING ASM.
P/N 41-123-045

ESNA NUT 1/4-20
P/N 01-118-006

HHC 1/4-20 X 1-1/4"
P/N 01-113-041

CONDUIT HANGER BRACKET
P/N 12-131-005

The figure below shows the inside of an assembled enclosure.
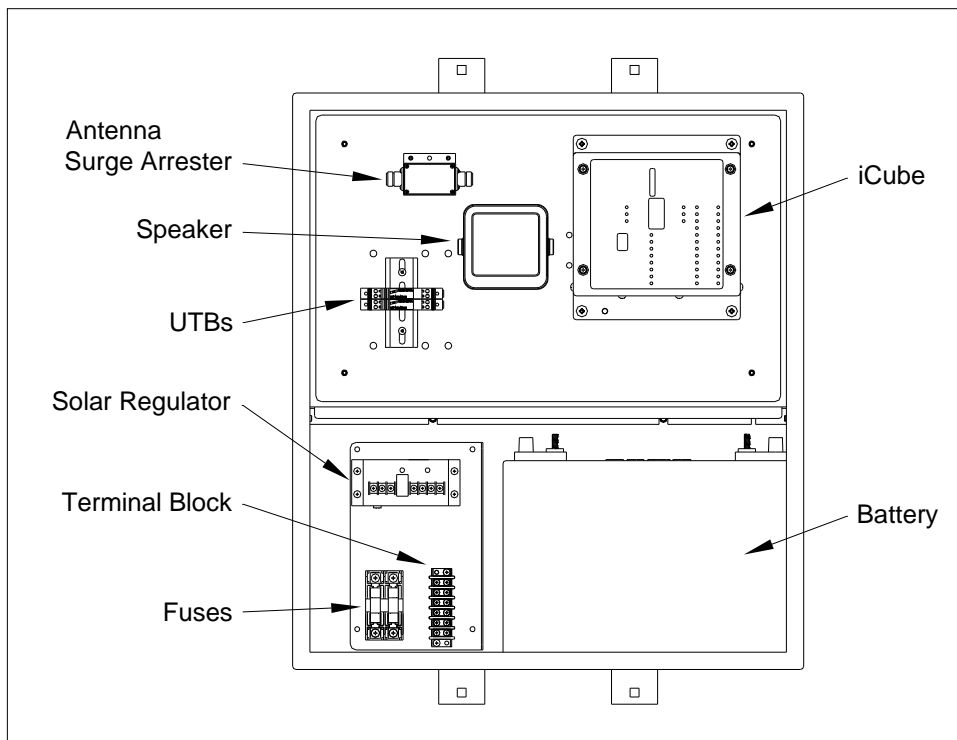
The figure below shows the back of an assembled enclosure.
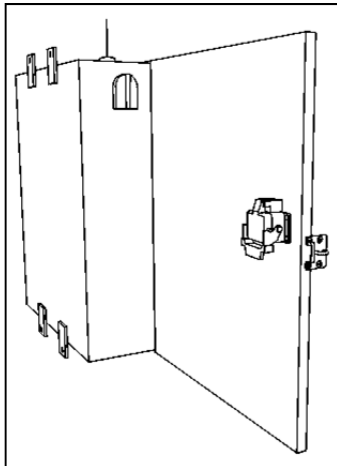
The figure below shows the solar iCube wiring.
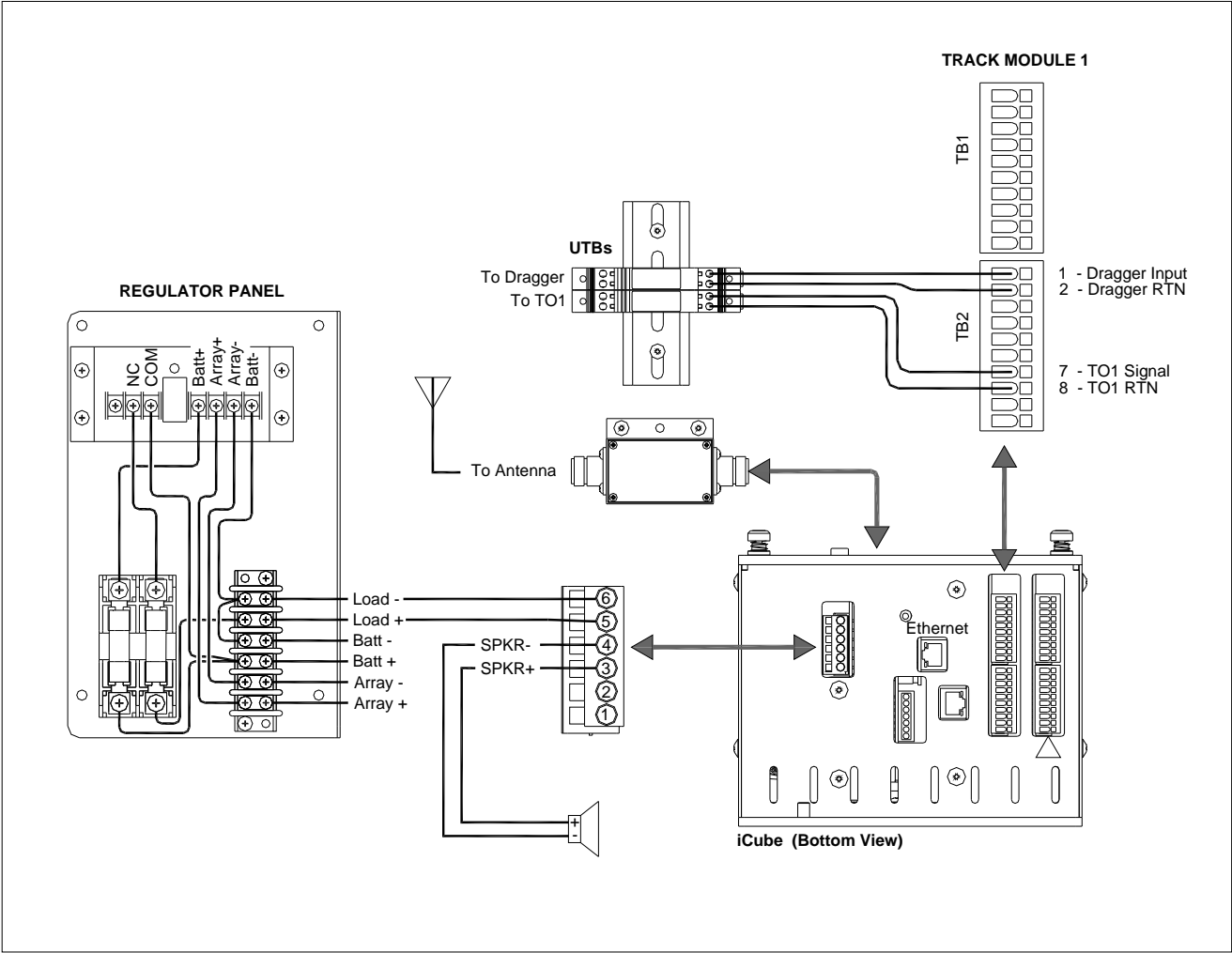
Regulator Panel

The figure below shows the major parts of a Regulator panel. The location and connection of the temperature sensor on your regulator might be different.
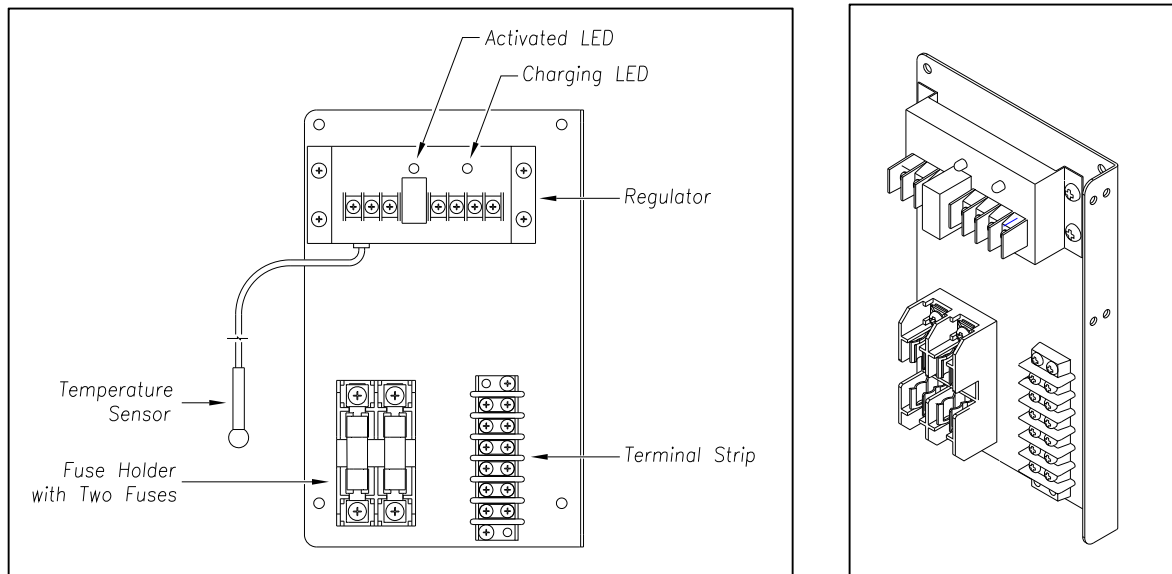
Regulator

The regulator (also called the automatic sequencing charger) is a solid-state battery charge controller. It starts charging when the battery voltage drops below 13.5 VDC and stops charging when the battery voltage reaches 14.3 VDC. It provides overcharge protection to the solar-powered iCube system's battery and reverse leakage protection, which prevents battery discharge through the solar panels at night.

Temperature Sensor

From the regulator, at the end of a 10-foot cable is a sensor that attaches to the battery. This sensor is used to adjust the charging thresholds according to battery temperature. The charge set-point will be higher in cold weather and lower in hot weather. The regulator won't function with a missing or damaged sensor.

Activated LED

On the regulator, the Activated LED is lit when the battery voltage drops below 11.5 VDC. When lit, power is cut to the rest of the system. The battery charges. When the battery voltage exceeds 11.5 VDC, the light goes out and power is restored to the whole system.

Charging LED

On the regulator, the Charging LED is lit when there is voltage from the solar panel and the battery is charging. When the battery is at a low state of charge, the LED is lit continuously. When the battery is at a high state of charge (that is, when it is close to full charge), the LED alternates between being lit and not being lit.

Fuses

There are two 10-ampere fuses on the Regulator panel. They protect the whole system from excessive DC. They should be removed when attaching the solar panel and the battery to the system.

Terminal Strip

The 12-position terminal strip connects the Regulator panel to the solar panel, the battery, and the iCube.

The drawing below shows the wiring on the Regulator panel.
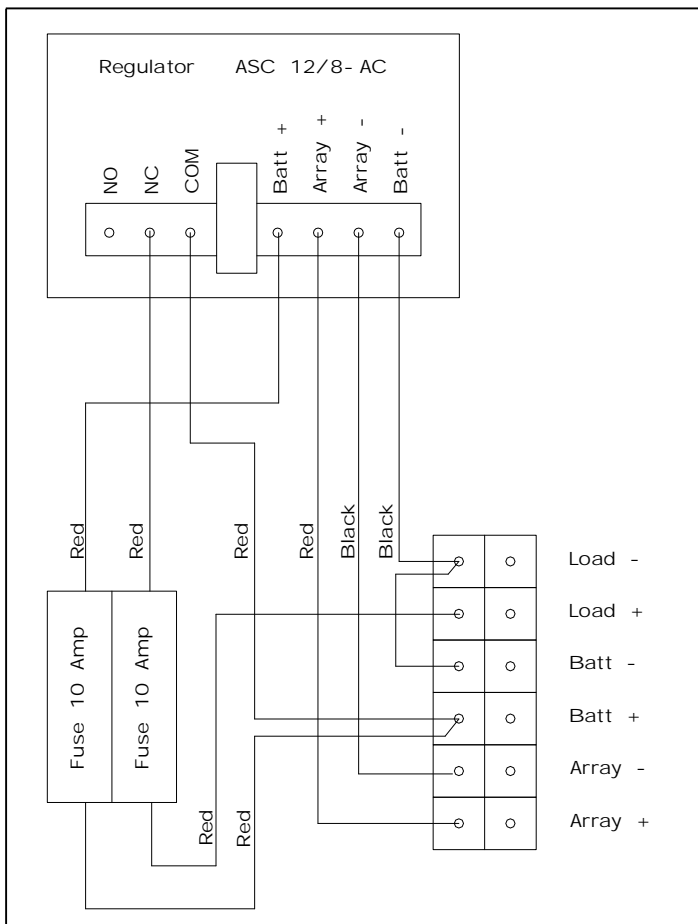
Battery

The solar-powered iCube system uses a 12-volt 92-ampere-hour maintenance-free, deep-cycle battery. The use of a smaller battery reduces the amount of time that the system can operate after solar power is removed. The use of a larger battery or more than one battery may exceed the charging capacity of the system and could result in its failure.

UTB Surge Suppression

The figure below shows the DIN mounted UTBs (Universal Transient Barrier). They protect the transducer input and the dragging-equipment input from surges in voltage.
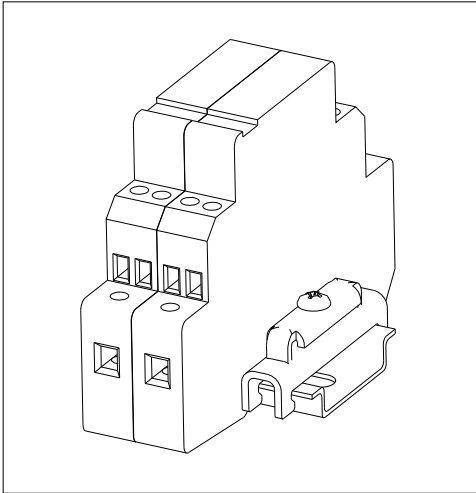
Coaxial Surge Protector

The Coaxial Surge Protector is an arrester that protects the RF transmitter from surges in voltage (such as from a lightning strike) through the antenna. This bidirectional arrester is inline between the antenna and the RF transmitter.

A.2   Solar Panel Installation

1. Using the dimensions below, dig a hole and add ballast. Lower concrete footer
    into hole, rotating it until two adjacent studs are parallel to the track. Install the
    footer so that it's plumb and its center is 15 or more feet from the edge of the
    nearest rail.

Concrete Footer

Two adjacent mounting studs

15' [4.6M]

36" [.9M]

36" [.9M]

2" [5.1cm] of ballast
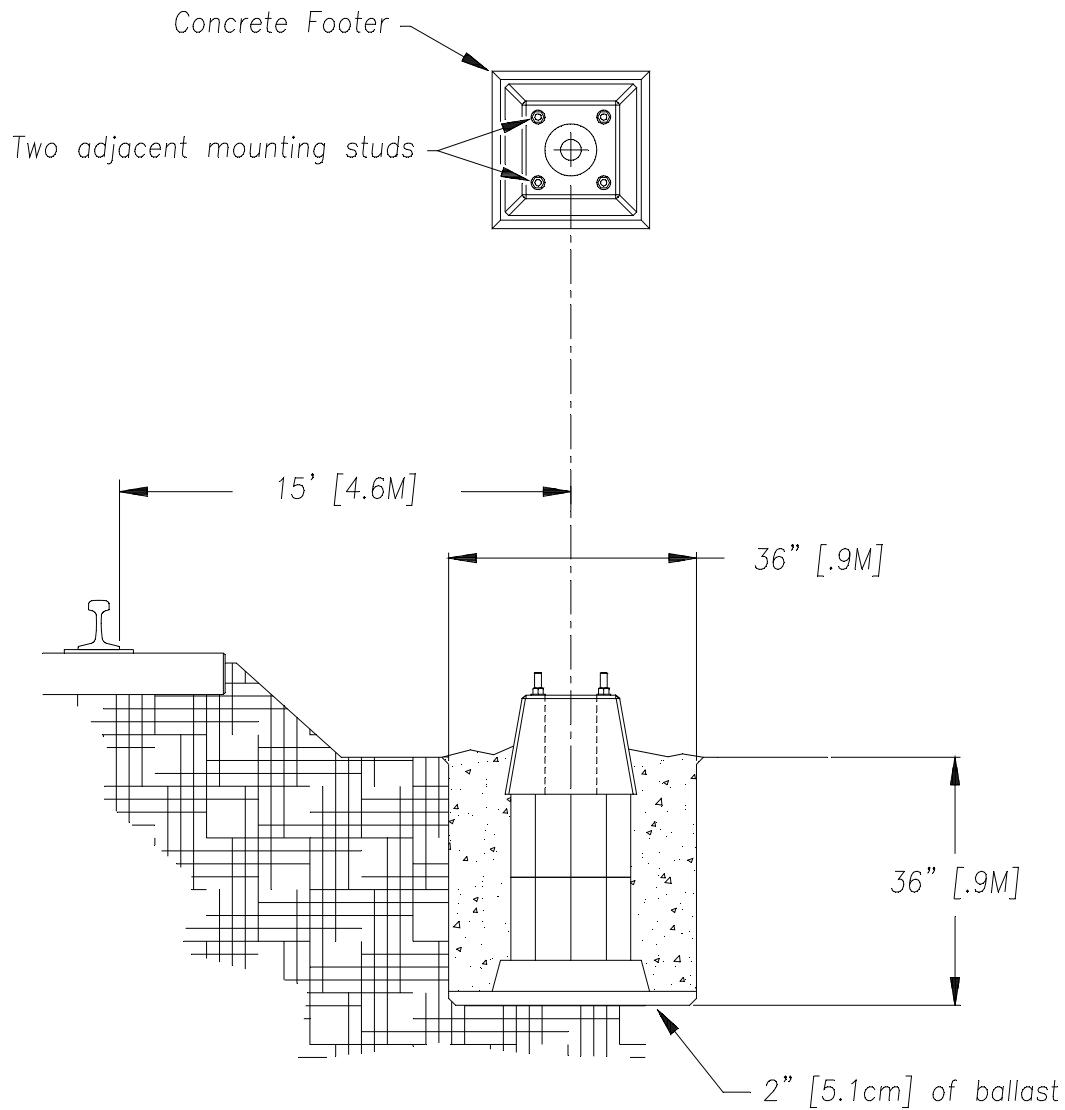
2. Install a 1-inch jam nut on each footer stud. Screw each jam nut until it touches the stud nut.

Base Plate

Jam Nut

Stud Nut

Stud Washer
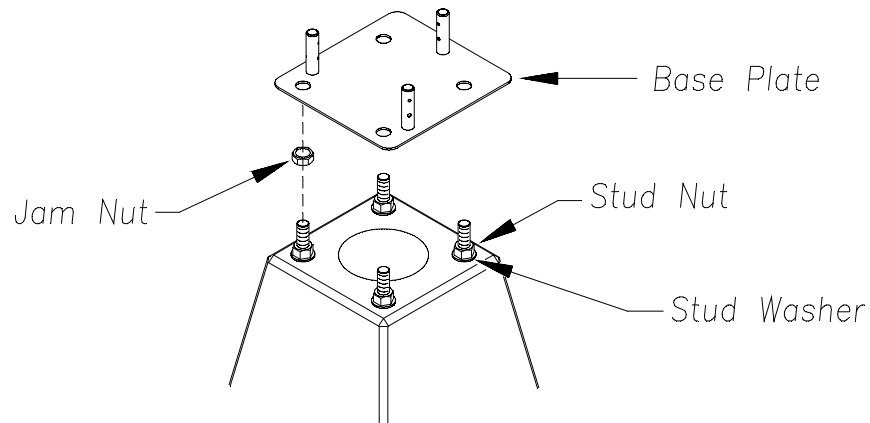
3. Lower the base plate onto the footer. Make the side of the base plate, with the two mounting posts, parallel to the rails. Level the base plate by adjusting the jam nuts. Remove the base plate from the footer.

Mounting Posts

Stud

Rail
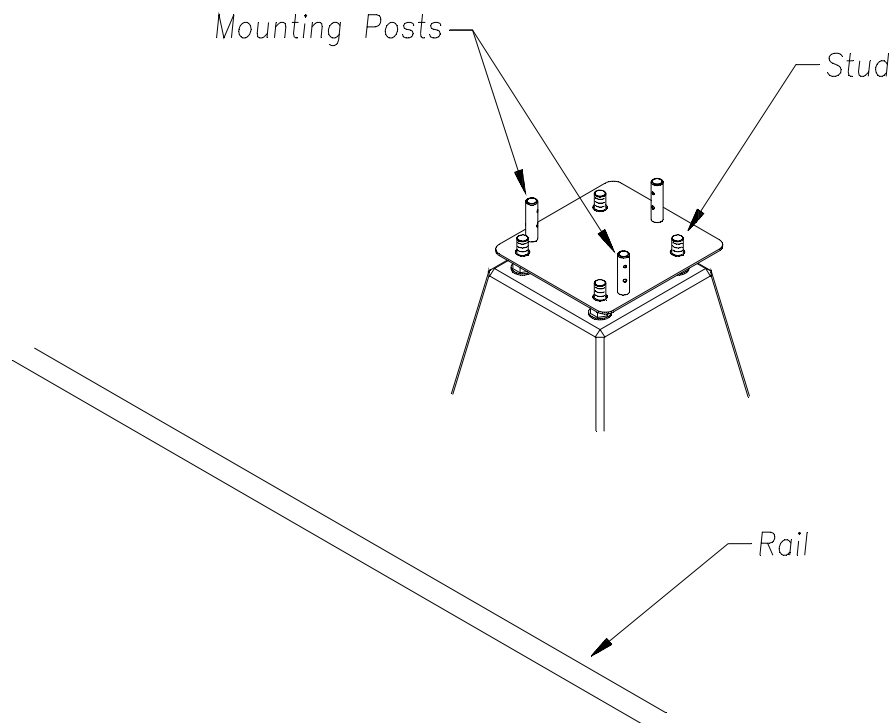
4. Using the supplied six bolts and nuts, secure the base plate to the lower tower section.
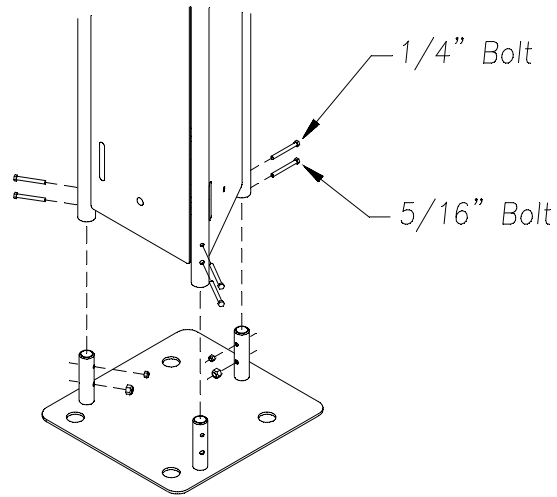
5. Using the supplied six bolts and nuts, secure the upper tower section to the lower tower section.
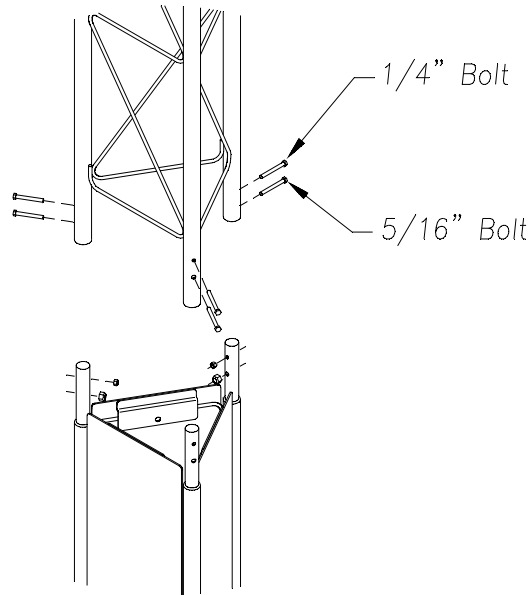
6. Familiarize yourself with the major parts of your supplied compass.

Index Line

Travel Arrow

Orienting Arrow

Dial

Magnetic Needle
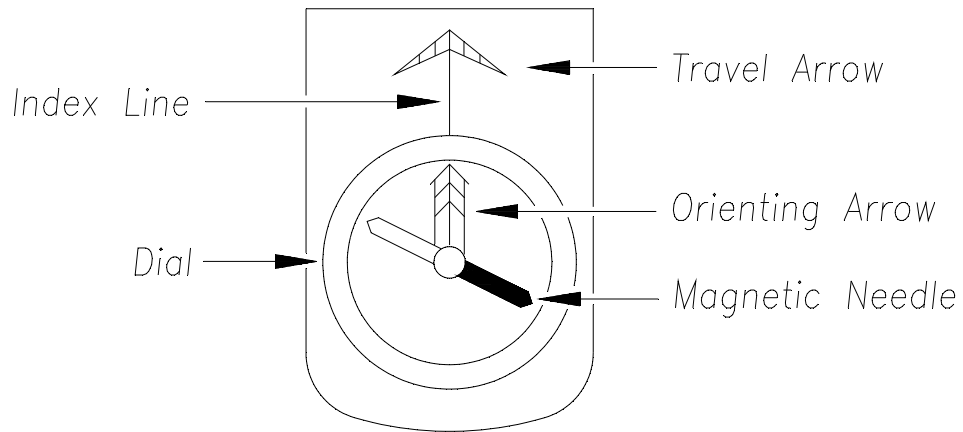
7. Facing in the direction of the track, hold the compass with the travel arrow in front of you. Be sure the compass is at least four feet from any ferrous metal. Keeping the travel arrow in front of you, rotate the blue dial until the red orienting arrow is directly under the white part of the magnetic needle.

Track Direction ———⟶
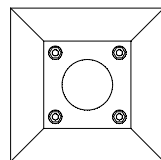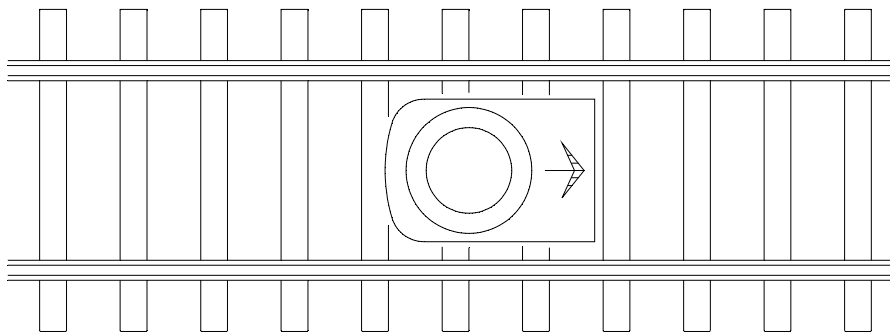
Right—Side of Footer⟶

8. "Add" your local declination adjustment to the value pointed to by the index line of your compass. Write this value down for later reference.

For example, if the site is in Maine, your declination might be -21. If your compass reading were 52, the adjusted value would be 31. The drawing below shows a compass reading of 52.

Index Line

20 40 60 80

52
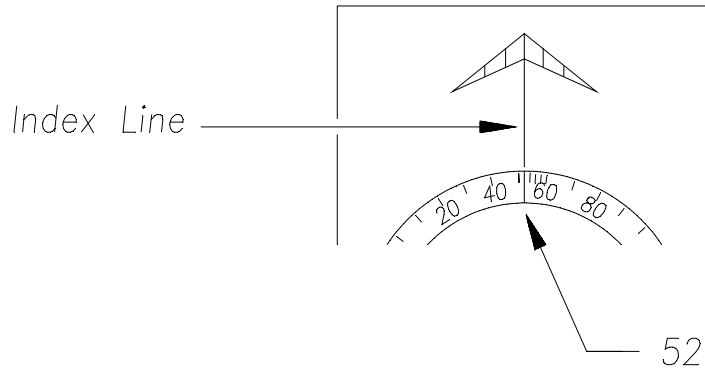
9. Looking at the figure below, find the adjusted value, which you calculated in the prior step. Moving from the inner circle to the outer circle, find the leg of the tower on which the solar panel will be mounted and the leg of the tower on which the bracket will be mounted.

For example, if your adjusted value is 44, the panel is mounted on leg-A and the bracket is mounted to leg-B. If your adjusted value is 330, no bracket is used. Instead, the panel is mounted only on leg-A and leg-C.
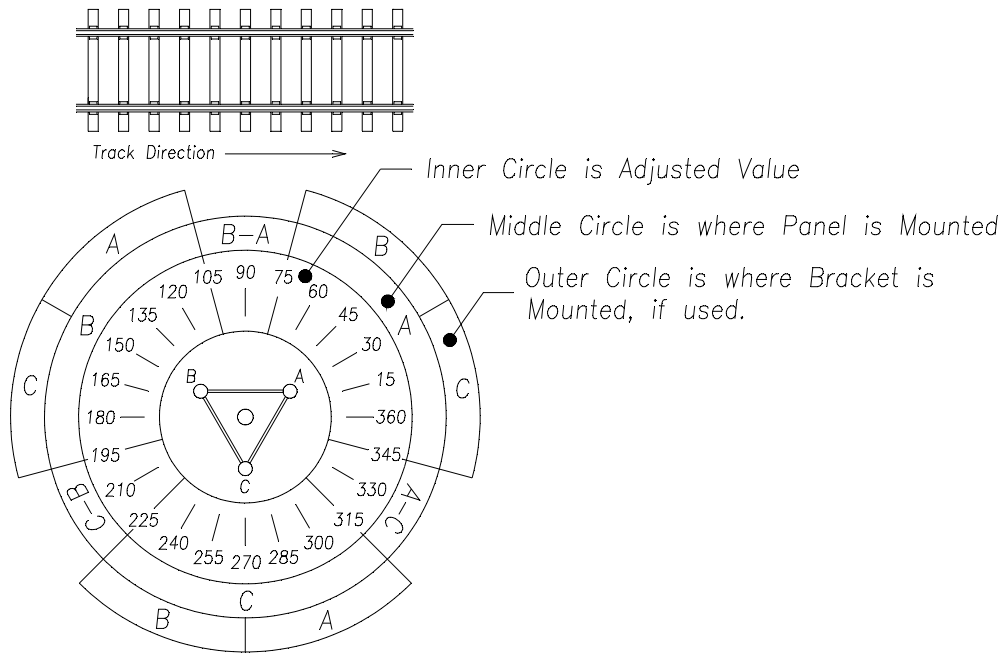
10. If your adjusted value is 75 through 105, 195 through 225, or 315 through 345, go to step **11**.

If your adjusted value is 1 through 30, 106 through 150, 226 through 270, or 346 through 360, go to step **12**.

If your adjusted value is 31 through 74, 151 through 194, or 271 through 314, go to step **14**.

11. If your adjusted value is 75 through 105, 195 through 225, or 315 through 345, install the tower-mount channel as shown below. After tightening all the nuts, go to step **16**.
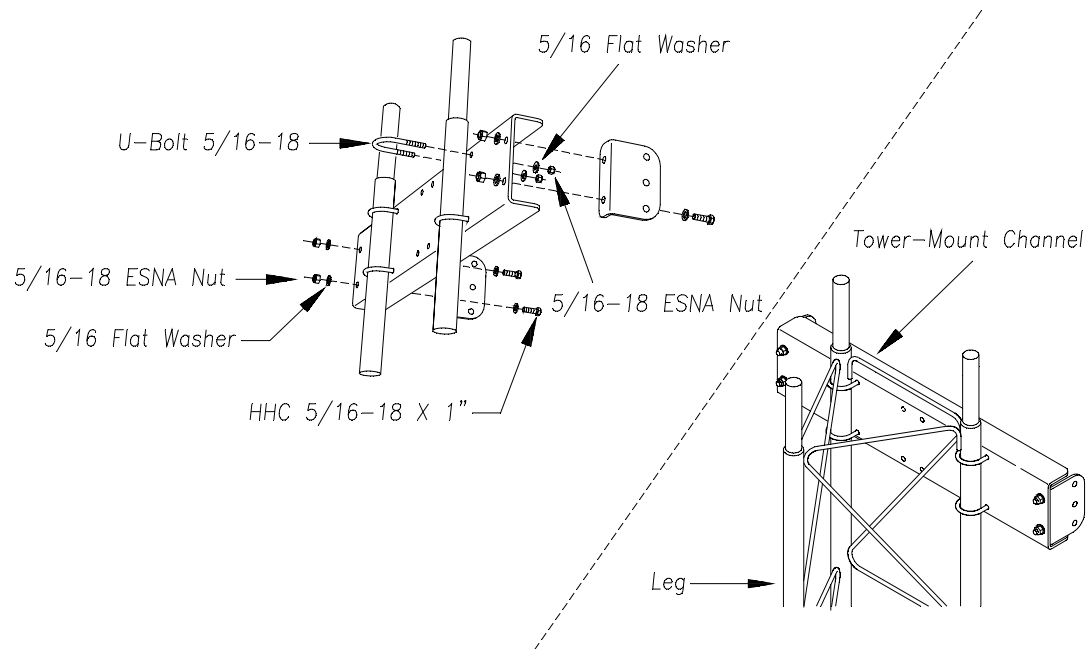
12. If your adjusted value is 1 through 30, 106 through 150, 226 through 270, or 346 through 360, install the tower-mount channel and angle-adjustment bracket as shown below. Tighten the four nuts holding the two U-bolts just enough to hold the channel in place, but not too tight to keep it from moving.
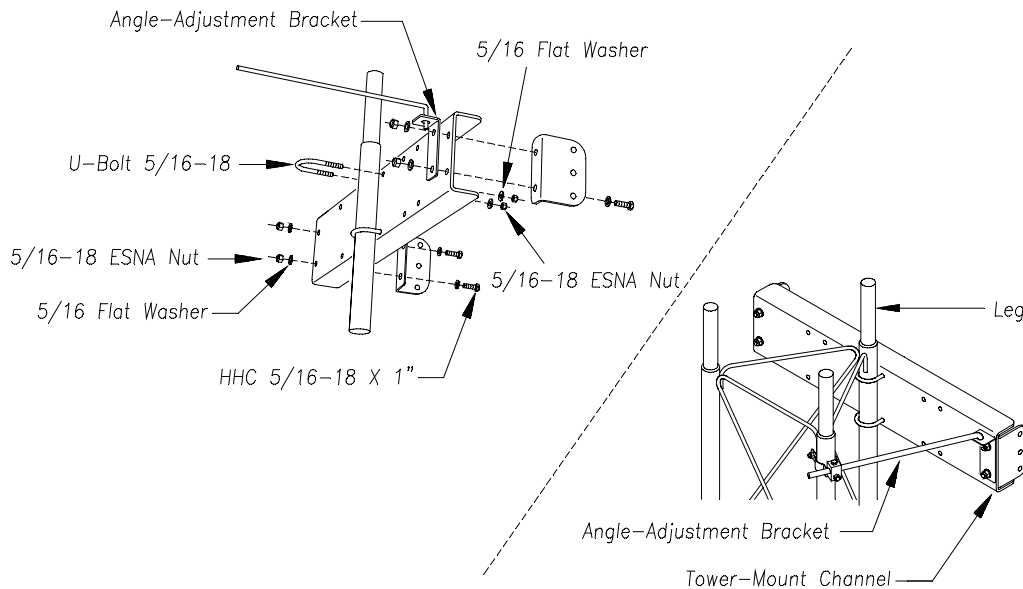
13. Calculate the degrees of rotation as follows:
- If your adjusted value is 1 through 30, subtract 1 from it.
- If your adjusted value is 106 through 150, subtract 106 from it.
- If your adjusted value is 226 through 270, subtract 226 from it.
- If your adjusted value is 346 through 360, subtract 346 from it.

Multiply the degrees of rotation you just calculated by 0.1875. Add 1.5 to this value. The result is the number of inches from the end of the adjustment arm to the end of the arm clamp. Move the arm clamp until this measurement is achieved. After tightening the nuts that hold the U-bolts and the arm clamp in place, go to step **16**.
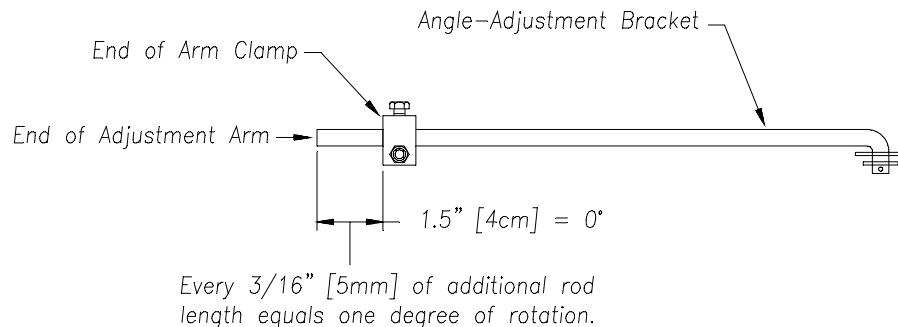
14. If your adjusted value is 31 through 74, 151 through 194, or 271 through 314, install the tower-mount channel and angle-adjustment bracket as shown below. Tighten the four nuts holding the two U-bolts just enough to hold the channel in place, but not too tight to keep it from moving.
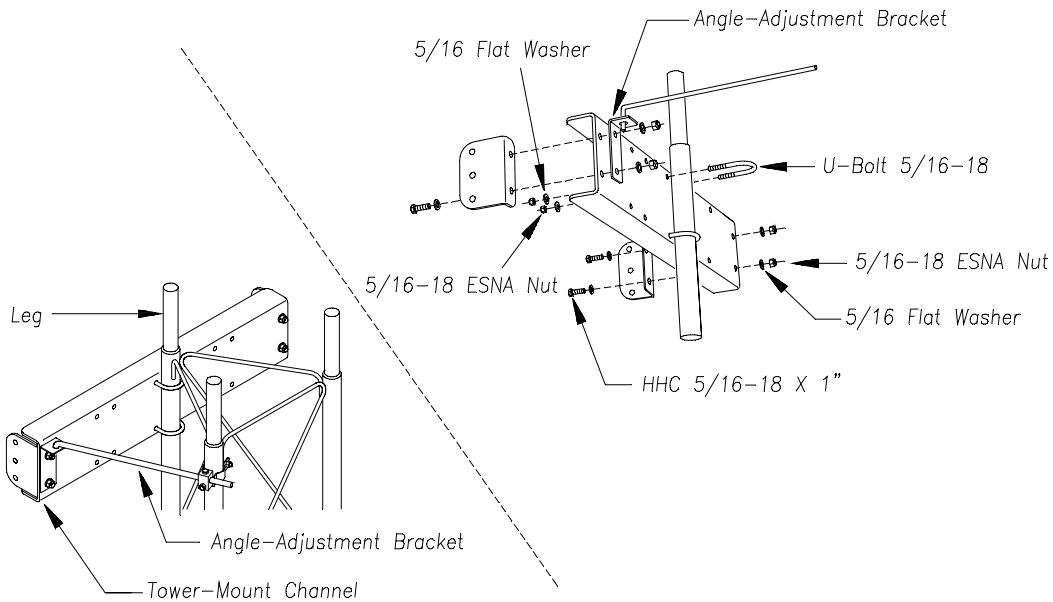
15. Calculate the degrees of rotation as follows:
- If your adjusted value is 31 through 74, subtract 31 from it.
- If your adjusted value is 151 through 194, subtract 151 from it.
- If your adjusted value is 271 through 314, subtract 271 from it.

Multiply the degrees of rotation you just calculated by 0.1875. Add 1.5 to this value. The result is the number of inches from the end of the adjustment arm to the end of the arm clamp. Move the arm clamp until this measurement is achieved. Tighten the nuts that hold the U-bolts and the arm clamp in place.
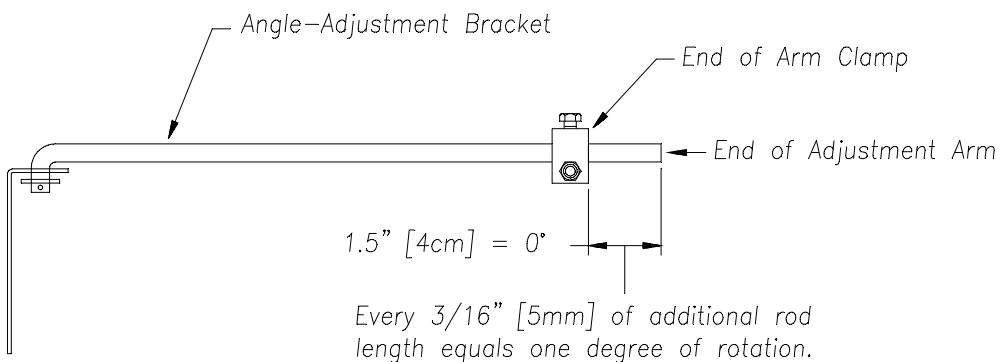
16. Assemble the solar panel as shown below.

Aluminum Spacer

Solar Panel Shield

1/4 Flat Washer

1/4 Lock Washer

HHC 1/4-20 X 1-3/4"

Tower-Mount Strut R/H

Tower-Mount Strut L/H
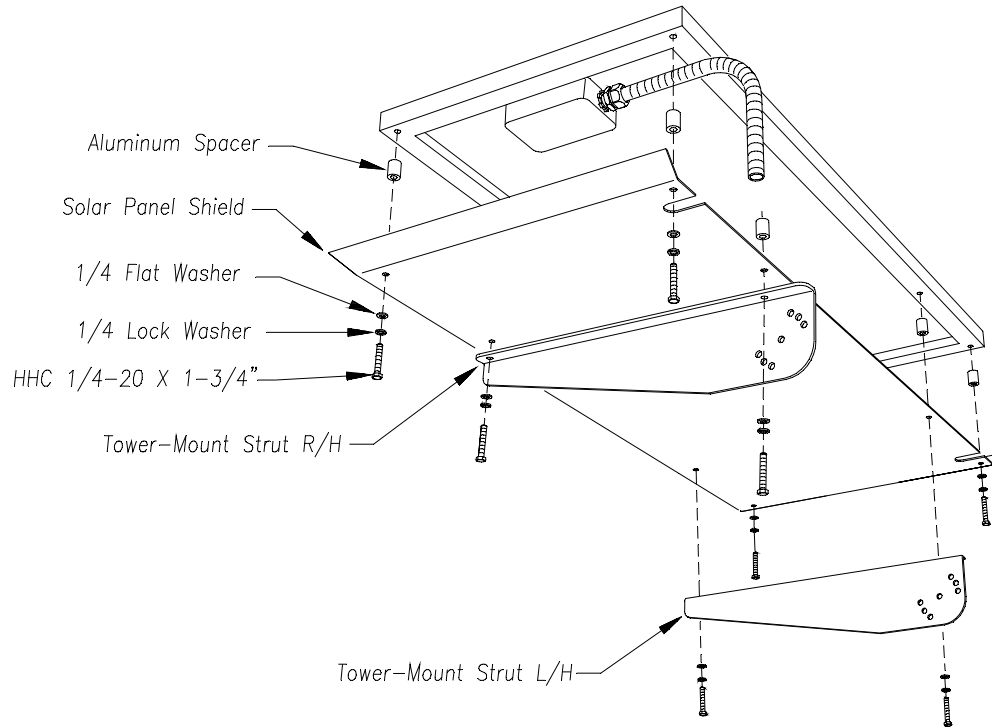
17. Calculate the tilt correction by adding 20 degrees to the site latitude. Using the results of this calculation, attach the solar panel to the tower-mount channel as shown below.

Tower-Mount Strut

Tower-Mount Channel

1 2 3

3 2 1
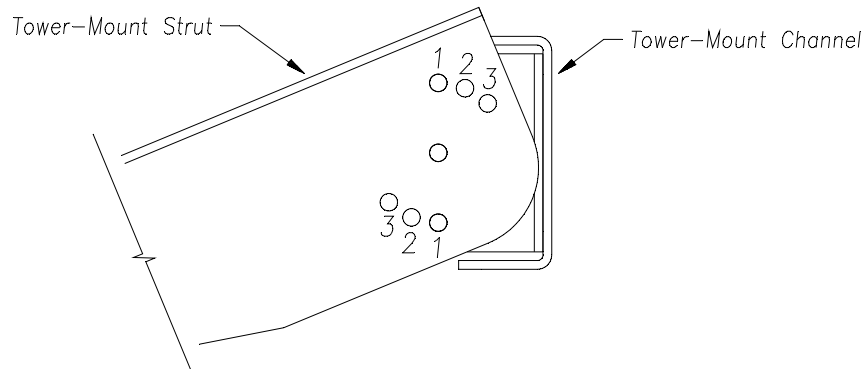
If tilt correction is 33 or less degrees, use holes labeled 1
If tilt correction is 34-56 degrees, use holes labeled 2
If tilt correction is 57 or more degrees, use holes labeled 3

18. Be sure that the conduit from the solar panel is inside the tower. With cable ties, attach conduit to the tower as shown below.

SOLAR PANEL

CONDUIT

CABLE TIES
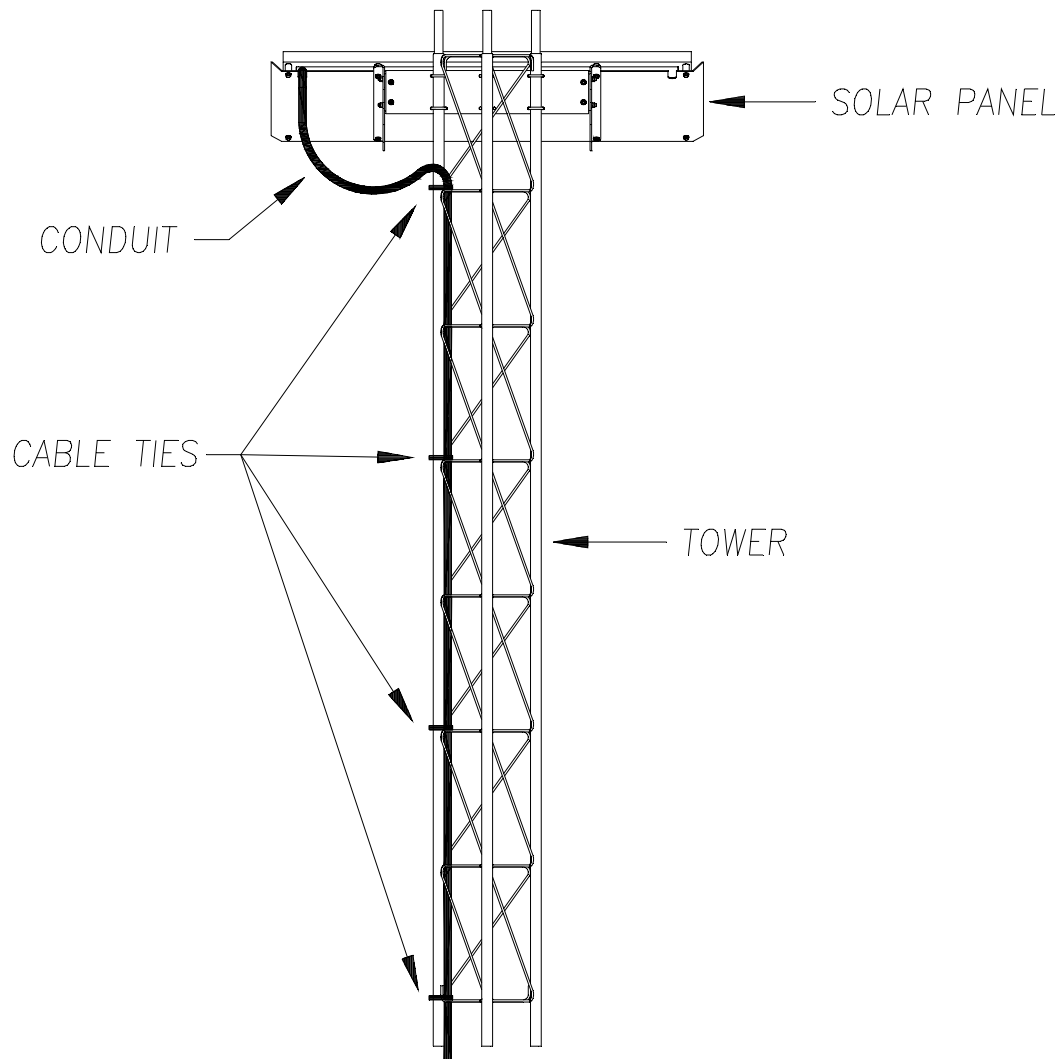
TOWER

NOTE:
In the next section, you will attach the two wires (from the solar panel) to the appropriate terminals on the Regulator panel.

19. Carefully upend the tower. Attach the base plate (with attached tower) to the concrete footer. Be sure that the side of the base plate, with the two mounting posts, is parallel to the rails. Be sure the solar panel is facing due south. Plumb the tower by adjusting the jam nuts on the footer.

LEVEL

RAIL
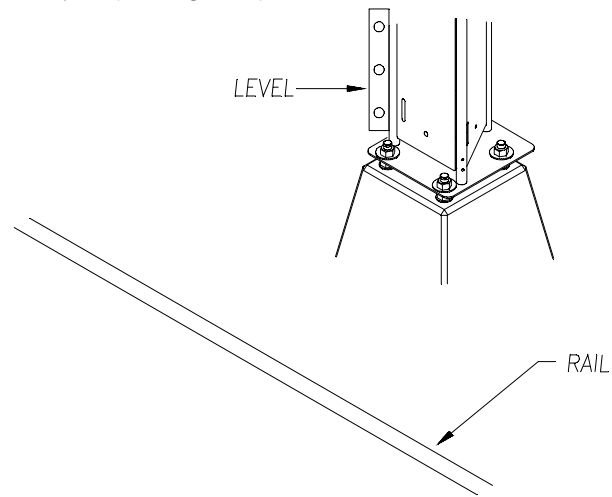
20. On the side of the tower, drive the 8-foot (2.4-meter) rod into the ground, attach the rod clamp to the rod, and the ground wire to the clamp. Looping the ground wire, attach it to one of the studs on the footer, between the top washer and the top nut. Tighten the nut.

NUT
WASHER
GROUND WIRE
GROUND ROD CLAMP
GROUND ROD
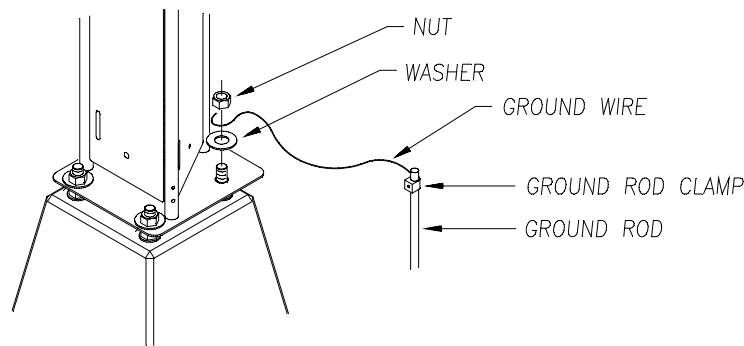
NOTE:
You're done installing the Solar Panel/Tower. If installed correctly, the tower should be level, grounded, and attached to the footer. The solar panel should be tilted to the correct angle and facing due south.

While exposed to light, the solar panel generates DC electricity. Therefore, before connecting the wires from the solar panel to the Regulator panel, be sure that unauthorized persons cannot access the wires. Also, until connecting the wires, secure the end of the conduit in such a way that it points toward the ground.

A.3 Electronics Cabinet Installation

To install the enclosure onto the anti-climb panel that is facing the track:

1 If the anti-climb panel that is facing the track isn't properly attached to the tower, do so before going to the next step.

2 If not already done, remove one of the other anti-climb panels.

3 Store the panel and its attachment bolt in a safe place until you replace them.

4 As shown in the figure below, attach the enclosure to the anti-climb panel that is facing the track.
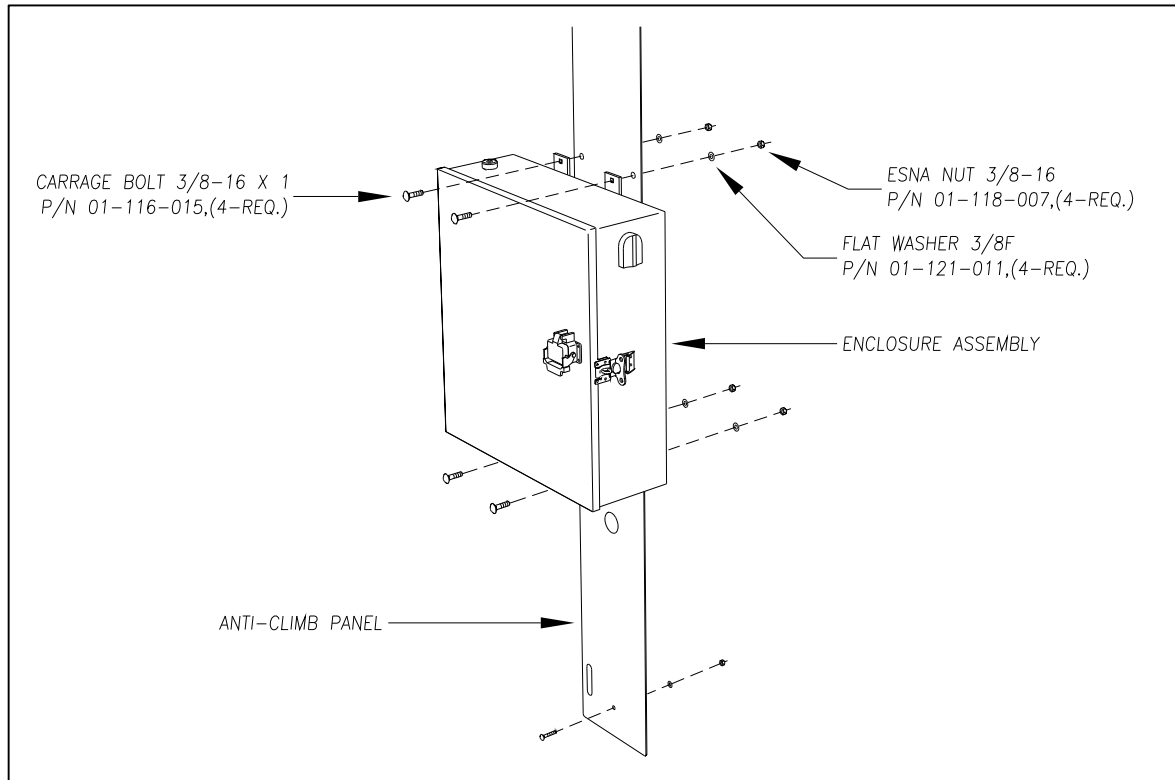
5 Using a 3/8-inch wrench, tighten each nut.

6 Replace the removed panel and secure it to the tower.

7 Using the supplied split-bolt connector and ground wire, attach the ground terminal on the bottom of the enclosure to the ground wire coming from the ground rod.

Antenna

To install the antenna mast:

1   Remove the coupling nut.

2   Slide antenna mast through coupling nut.
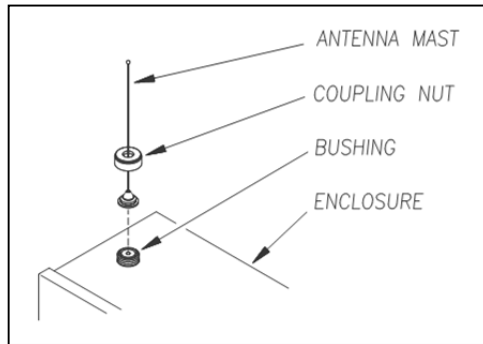
3   Place mast-nut combination over bushing.

4   Tighten coupling nut in place.

Battery

> **WARNING**
>
> **Battery posts, terminals, and related accessories contain lead and lead components, chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. So, as a minimum, wash your hands after handling the batteries.**

To install the battery and connect it to the iCube system:

1   Be sure you have on hand a 1/2-inch nut driver.

2   If they're installed, remove both 10-ampere fuses from the lower left front of the Regulator panel.

3   With the battery terminals to the back of the enclosure, place the battery on the mat in the lower-right corner of the enclosure.

   A black wire and a red wire are attached to the terminal strip on the Regulator panel. Each wire is about a foot long.

4   Connect the red wire to the positive side of the battery.

5   Connect the black wire to the negative side of the battery.

   Do <u>not</u> reverse wiring connections. Doing so may harm the system.

WARNING

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

Solar Panel

WARNING

Do <u>not</u> touch any unshielded wire coming from the solar panel. Do <u>not</u> let two unshielded wires touch. Do <u>not</u> let any unshielded wire touch the enclosure or tower. Do <u>not</u> reverse wiring connections. Doing so may harm you, the system, or both.

To connect the solar panel to the iCube system:

1 Be sure you have on hand a wire stripper, a #2 Phillips head screwdriver, and a pliers-type crimping tool.

2 If they're installed, remove both 10-ampere fuses from the lower left front of the Regulator panel.

3 Using a wire stripper, remove 1/2 inches of insulation from the end of each solar panel wire.

4 Crimp a spade terminal to the end of each wire from the solar panel.

5 As shown in the figure below, attach the solar panel to the terminal strip on the Regulator panel.

Black Wire from Solar Panel

Red Wire from Solar Panel
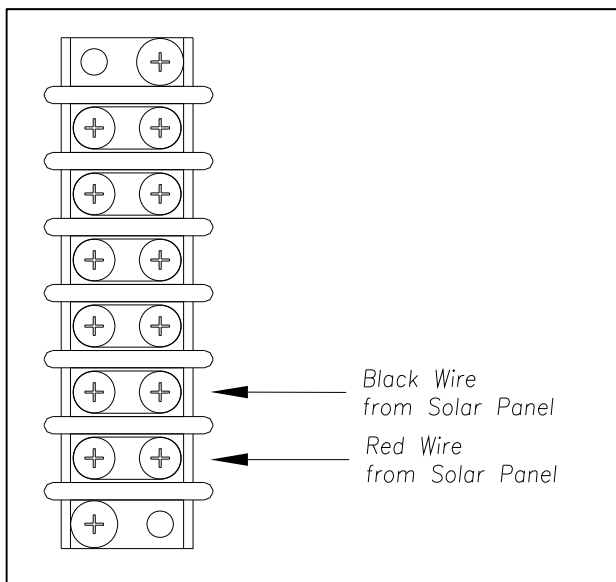
A.3.4 Final Checks

To check the electrical integrity of the system and then power up the system:

1 Be sure you have on hand a multimeter.

2 To verify that the battery is installed correctly and that it is generating voltage:

    a Switch the multimeter to the DC volts scale.

    b On the terminal strip on the Regulator panel, place the leads as shown below, checking for a positive reading of about +12 VDC.
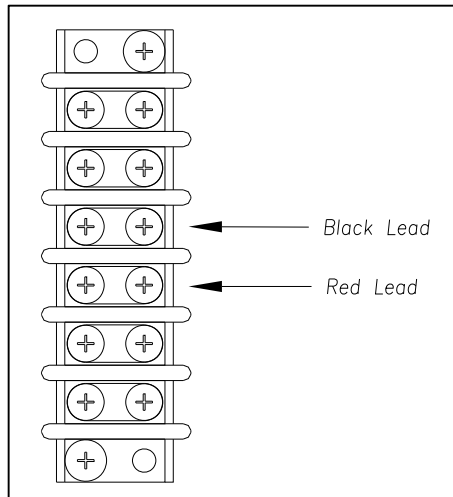
    c If the reading isn't positive or voltage isn't displayed, fix this problem before proceeding.

The next step should be done when sun-energy is reaching the solar panel.

3 To verify that the solar panel is installed correctly and that it is generating voltage:

    a Switch the multimeter to the DC volts scale.

    b On the terminal strip on the Regulator panel, place the leads as shown below, checking for a positive reading of at least +17 VDC.
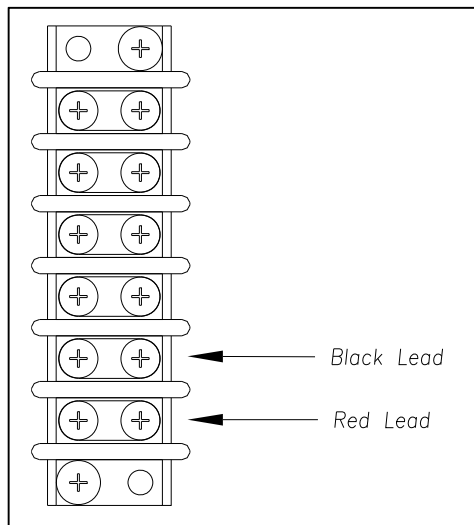
c If the reading isn't positive or voltage isn't displayed, fix this problem before proceeding.

4 While listening to the speaker, replace the 10-ampere fuses (on the Regulator panel). Replace the fuse on the left first.

5 If you don't hear a startup announcement coming from the speaker, call STC for help in isolating the problem.

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