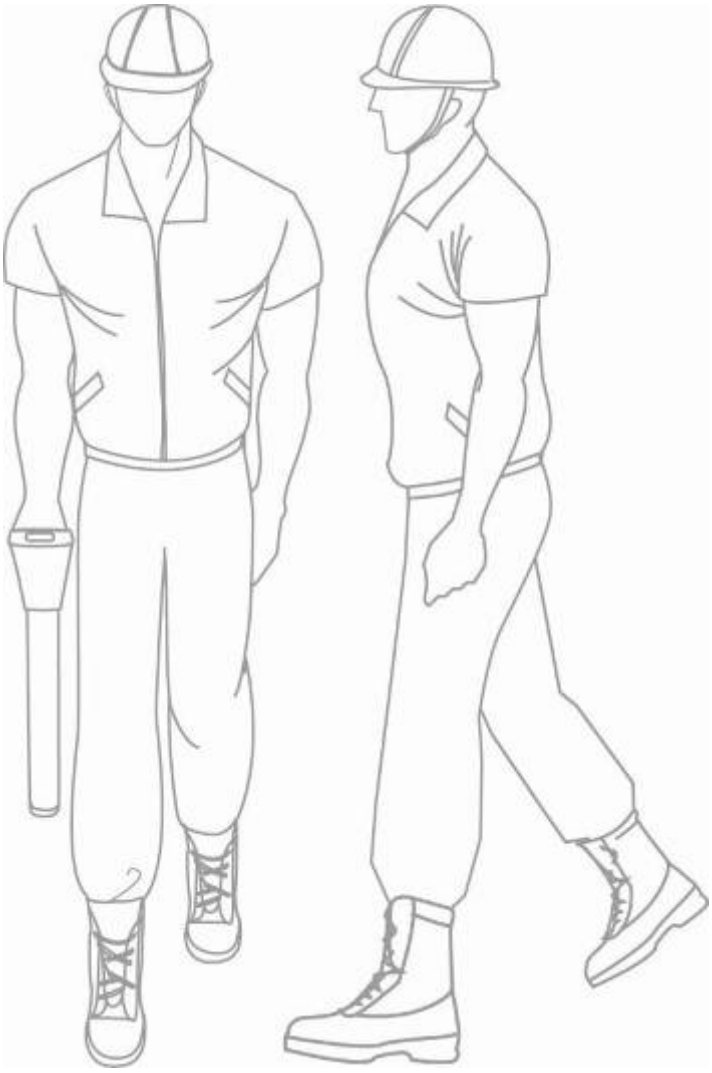
VIVAX
METROTECH

Utility Locating System

FLS Transmitter

(English Edition)

Version 1.2



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CE

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General Safety

This document contains basic advice for the installation and operation of the Vivax-Metrotech FLS™ transmitter. Always follow these safety instructions when handling the transmitter and its modules, or when troubleshooting.

NOTE

The manufacturer is not liable for damage to material or humans due to non-observance of the instructions and safety advice provided in this document. Therefore, this document should be provided and reviewed by all personnel associated with its installation and use.

- *Intended personnel*
  Vivax-Metrotech utility line locators are intended for use by utility and contractor professionals. Safety hazards for underground utility access areas include electrical shock, explosive gases, and toxic fumes as well as potential influence on communications and control systems such as traffic control and railroad crossings.

- *Intended application*
  Safe operation is only achieved by using the transmitter for its intended purpose. Using the transmitter for other purposes may lead to human danger and equipment damage. Do not exceed the limits described in this document.

- *Output Signal and fiber optic cables*
  The transmitter output signal is high voltage. When the transmitter sends a signal, the fiber optic cable sheath and its connections may be energized up to 300V AC TO 450V DC. Keep a safe distance form these cables and connections.

- *Lightning strikes*
  The transmitter must be installed with proper lightning protection. Damage to the transmitter may occur if it is not properly installed and protected from lightning strikes. We do not recommend that you operate or perform maintenance on the transmitter if there is a pending electrical storm near the transmitter or the buried cable.

- *Modules*
  Before removing any modules, turn the rear power switch off. The modules were not designed to be hot-swappalbe.

- *Malfunctioning behavior*
  Use the transmitter only when it is working properly. When irregularities or malfunctions appear that this document cannot resolve, the transmitter must immediately be put out of operation and marked as not functional. Contact technical support. Only operate the transmitter after resolving the malfunction.

- *Repair and maintenance*
  Repairs and service must only be done by Vivax-Metrotech Corporation.

Document Conventions

This section describes the document text conventions, document icons and symbols and the icons and symbols that appear on the hand-held display screens.

Document Convention	Description
Bold type	Command names, keywords, and button names

Table 2-1 Document Covention Description

There are several symbols used in this document that highlight important notes, functional purposes, or potential hazards that could cause serious injury or death. Pay attention to these symbols when you see them.

Symbol	Meaning	Descriptions
	Warning	This symbol appears next to important information indicating a hazardous situation that could cause serious injury or death if ignored. Take every precaution to follow these statements
	Caution	This symbol appears next to important information indicating a potentially hazardous situation for you or the system if ignored. Take every precaution to follow these statements.
	Note	This symbol appears next to useful or important information.
	Telephone connection	This symbol appears on the rear of the chassis next to the RJ11 modem connector. It also appears on the hand-held display screen when the transmitter is being controlled by a touch-tone telephone or the telemetry interface.

Table 2-2 Symbol Descriptions in User Handbook

2 Document Conventions

The hand-held display unit shows graphic icons and symbols on several screens. For your convenience, they are summarized here.

Symbol	Meaning	Descriptions
	Mode disabled	The button for an enabled mode appears dimmed, having gray text over a black background.
	Mode enabled	When the Active button has a blue background, this mode is available, meaning the transmitter is currently in Standby mode. When the Standby button has a green background, this mode is available, meaning the transmitter is currently in Active mode.
	Option enabled	The button for an enabled option appears dimmed, having white text over a black background.
	Command unavailable	The button for an unavailable command appears dimmed, having gray text over a blue background.
	Command available	The button for an available command appears with white text over a blue background.
	Clear	Clear the entire entry.
	Delete	Delete one digit at a time.
	Large number adjustments	Large adjustments up or down for the programmable number.
	Small number adjustments	Small adjustments up or down for the programmable number.

Table 2-3 Symbol Description in Hand-Held Screen Display

Introduction

This chapter contains the following sections:

- System Overview
- Features
- Transmitter Signals
- Modular Design
- Specifications

3.1 System Overview

The Vivax-Metrotech FLS transmitter and receiver worked together to locate underground fiber optic cables. This document provides instructions only for the FLS transmitter. For instructions about using the vLocPro receiver, see its operations manual.

The FLS transmitter sends a predefined signal that is less than 10 kHz along the metallic sheath surrounding the fiber optic cable, generating an electromagnetic field for the length of the signal.

The receiver is used outside to locate the electromagnetic field emitted around the underground cable. By using one of the predefined transmitter signals, the receiver can estimate the relative position and path of the cable.

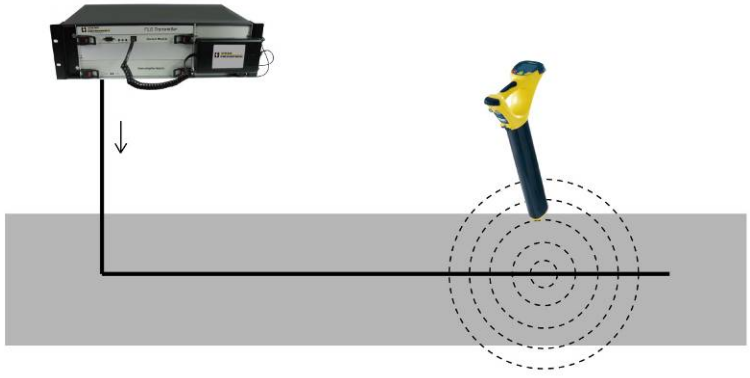


Figure 3-1 FLS Transmitter and Receiver

3.2 Features

The FLS design provides easy access to all major modules and operating features.

The following are the features of the FLS transmitter:

- Attached hand-held display unit with touch screen.
- Front-accessible pull-out modules.
- Compatible with 19 inches, 23 inches, and 24 inches, wide racks by attaching the applicable mounting brackets provided with the transmitter. Also provided are multi-Positional (adjustable) brackets that allow front-to-back horizontal positioning within the rack.
- Front LEDs give the operational status of the modules.
- Programmable signal frequencies and alarm threshold settings.
- Programmable active signal duration.
- Local control access by using the
  - Attached hand-held display unit.
  - Front RS-232 connector and a computer.
- Remote control access by using any touch-tone telephone (land line or mobile).
- Includes an internal modem to connect to the telephone line. This connection allows you to remotely control the transmitter, download the firmware updates, and monitor the transmitter operation.
- Includes a telemetry interface for remote control, monitoring, and reporting,

3.3 Transmitter Signals

The transmitter is a signal generator that consists of one or more programmed frequencies that allow you to locate and trace the fiber optic cable. The predefined frequencies are:

Signal Direction (SD):	SD512 (256/512)		SD400 (400/800)	
	SD560 (280/560)		SD460 (460/920)	
	SD640 (320/640)		SD484 (484/968)	
	SD340 (340/680)		SD584 (584/1168)	
	SD760 (380/760)		SD624 (624/1248)	
Locate Signal (LS):	273Hz	460Hz	548Hz	624Hz
	340Hz	484Hz	560Hz	760Hz
	400Hz	512Hz	640Hz	8 kHz (8192Hz)
Extremely Low Frequencies (ELF):	• ELF4 • Other ELF available upon request			

Table 3-1 Predefined Transmitter Frequencies

3.4 Modular Design

The transmitter is a 3U chassis that contains removable front and rear modules. Figure 3-2 shows the locations of the front-accessible modules and where to store the hand-held display unit when not being used.

NOTE

For information about the modules, see section 4.4 "Overview of the Modules."

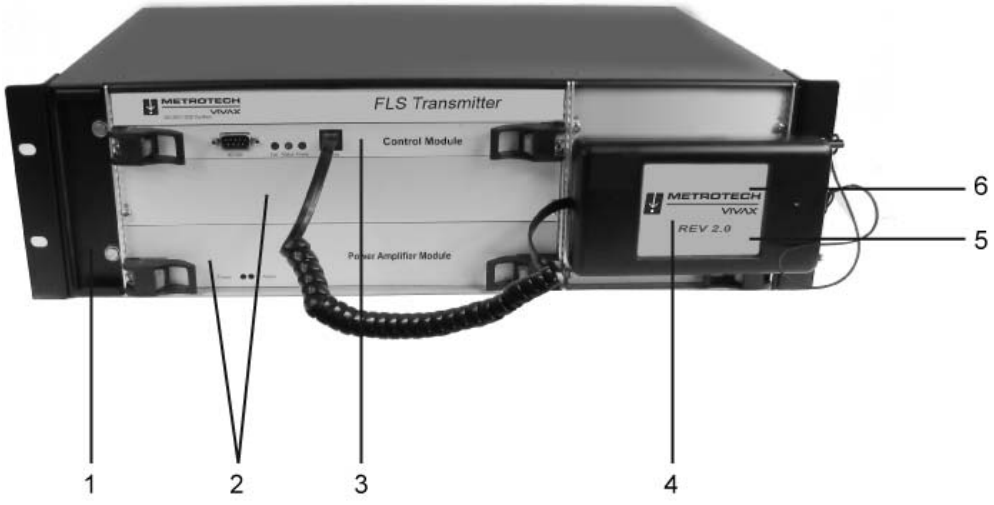


Figure 3-2 FLS Transmitter – Front and Side View

No.	Description
1	Fan module
2	Power Amplifier modules (Maximum 2)
3	Control module
4	Hand-Held display unit
5	DC Power Supply module (not visible)
6	AC Power Supply module (not visible for AC systems only)

Figure 3-3 shows the locations of the rear-accessible modules and where to connect the external ground conductor for DC systems.

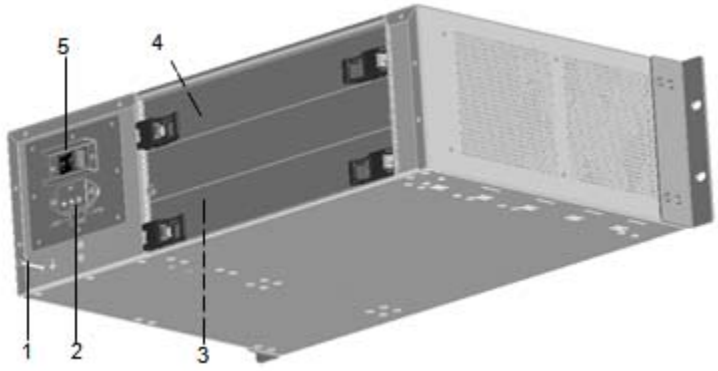


Figure 3-3 FLS Transmitter - Rear and Bottom View (Empty Right Slots)

No.	Description
1	Ground stud
2	Input connector (AC or DC, depending on configured system)
3	Rear MUX module (not shown)
4	Rear Comms module (not shown)
5	Power switch

3.5 Specifications

Table 3-2 FLS Transmitter Specifications

A. Configurations

Item	Parameter
2 way FLS	Will send signal in 2 different directions (FLS-TX2W)
4 way FLS	Will send signal in 4 different directions (FLS-TX4W)
16 way FLS	Will send signal in 16 different directions (FLS-TX16W)

B. Output Signal Specifications

Item	Parameter
Output Waveforms	- Sine waves in the rage of 200Hz – 8 kHz - Complex waveforms possible (ELF)
Output Current	Maximum 1 A RMS, plus 300mA with enabled ELF signal
Output Power	Maximum 50 W on LS
Output Voltage	Maximum 100 V RMS

C. Power Requirements

Item	Parameter
Building Circuit Breaker	AC system: minimum 10A DC system: minimum 10A
Electrical Ratings	AC system: 120V AC (3.0A 60Hz) DC system:-48V DC, 6.0A
Operating Voltage	AC system: 100 to 256V AC DC system:-40 to -60V DC
Power Draw	AC system: 360W at 120V AC and 288W at 240V AC DC system: 288W

D. Telemetry Interface

Item	Parameter
Alarm Relay Type	Isolated
Contact Resistance	10ohm (typical)
Control Relays	Accepts From A and C type
Response Time	500ms

E. Environmental Requirement

Item	Parameter
Altitude	Operating: 10,000ft (3.048m)
Humidity	Operating: 20-55%, non-condensing
Internal Cooling	Fan: Maximum 93 CFM (2.63CMM)
Temperature	Operating: 32^0F to 104^0F *(0^0C to 40^0C)* Storage: -4^0F to 158^0F *(-20^0C to 70^0C)*

F. Physical

Item	Parameter
Weight	AC system: 22-24lbs *(10-11kg)* DC system: 20-22lbs *(9-10kg)*
Dimension	5.25 inches (H) x 17.44 inches (W) x 11.81 inches (D) *(133.4mm (H) x 443mm (W) x 300mm (D))*
Hand-held Display Unit	Touch LCD display screen with attached coiled cable and stylus
Modem, Internal	V.92 (57,600bps)
RS-232 Ports	DB9-type connectors; one in front and six in rear. Terminal setting: 57,600bps, 8 data bits, no parity, and 1 stop bit

G. Rack Mounting Brackets

Item	Parameter
Sizes	Standard bracket: 19 inch Rack adaptor brackets: 23 inches and 24 inches Multi-Position brackets: 19 inches, 23 inches and 24 inches allows for maximum 5.25 inches *(133.4mm)* front-to back horizontal positioning in the rack, using 0.5 inches *(12.7mm)* increments.

H. Telephone Access

Item	Parameter
Tone Duration	Minimum 50ms
Tone Type	Standard tones from land line or mobile telephone

I. Approvals

Item	Parameter
Approvals	• FCC Part15, Class A devices • EN61000-3-2 (2006) • EN61000-6-2 (2005) • EN61000-3-3 (1995) • EN55011 Group 1, Class A devices

- Weight includes the hand-held display unit, its cord, and the standard 19inches in mounting brackets. The range indicates one or two installed Power Amplifier modules.
- Provided with reverse polarity protection.

Overview

This chapter contains the following sections:

- Operating Modes
- Methods for Controlling the Transmitter
- Hand-Held Display Unit
- Overview of the Modules
- LED Status Indicators

4.1 Operating Modes

Table 4-1 lists the transmitter's operating modes. You can trigger the modes locally and remotely.

NOTE

In this document, the term "local control" refers to the use of either the attached hand-held display unit or an optionally connected computer at the front RS-232 port. "Remote control" refers to the use of a touch-tone telephone.

Table 4-1 FLS Transmitter Operating Modes

Mode	Description
Active	Normal operation
Standby	In Standby mode, the high-voltage circuit on the Power Amplifier module and the output signal are off.

4.2 Method for Controlling the Transmitter

Figure 4-1 shows the various methods for controlling the transmitter. For details, see Chapter 6, "Local Transmitter Control," and Chapter 7, "Remote Transmitter Control."

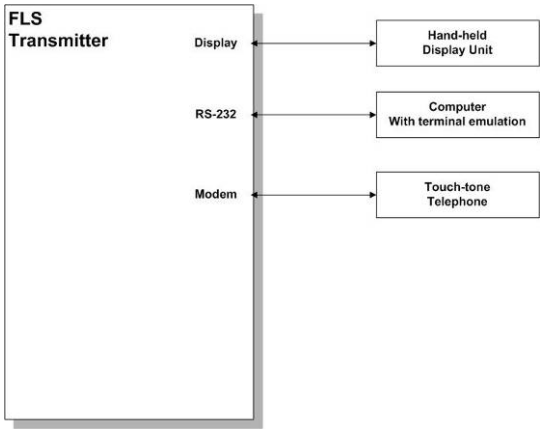


Figure 4-1 Methods of Controlling the Transmitter

4.3 Hand-Held Display Unit

The hand-held display unit controls the transmitter through its touch screen. The display unit's coiled cord plugs into the "Display" RJ11 connector on the front of the control module, as shown in Figure 4-3. When not in use store the display unit on the bar that is in front of the AC Power Supply module.

NOTE

For information about using the attached hand-held display unit, see section 6.1, "Using the Hand-Held Display Unit".

4.4 Overview of the Modules

This section briefly describes the transmitter modules,including differences for the AC and DC systems. For information about removing or installing the modules, see section 10.2, "Removing or Installing Modules."

4.4.1 Fan Module

The transmitter has one Fan module installed vertically in the front left side slot. It is secured by screws. Figure 4.2 shows the Fan module with the fan located toward the front of the module.

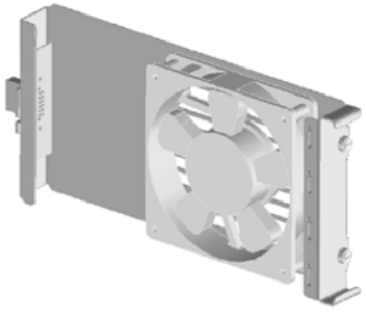


Figure 4-2 Fan Module

4.4.2 Control Module

The transmitter has one control module insalled horizontally in the front top center slot. It is secured by screws and two ejectors's handles. Figure 4-3 shows the front panel for the control module.

This module controls the transmitter, including the Power Amplifier module. It contains the fireware, memory, and modem circuit. The front connectors are for an optional computer and the hand-held display unit. The modem circuit connects to the telephone line through the rear RJ11 connector.

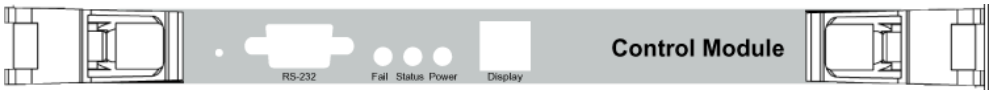


Figure 4-3 Control Module

4.4.3 Power Amplifier Module

The transmitter has one Power Amplifier module. This module, it is installed horizontally in the front bottom center slot. Each is secured by screws and two ejectors' handles. Figure 4-4 shows the front panel for the Power Amplifier module.

This module generates and amplifies the signal transmitted along the fiber optic cable. The receiver can search for the transmitted signal in two opposite directions or lines, which are referred to as East and West. With proper hardware (MUX) installed the output signal can be sent up to 4 directions (FLS-TX4W) OR 16 directions (FLS-TX16W).

Figure 4-4 Power Amplifier Module

4.4.4 AC Power Supply Module

For AC systems, the transmitter has one AC Power Supply module installed horizontally in the front right side center slot. It is secured by screws and one ejector handle.

For DC systems, the module slot is empty and covered with a blank face plate.

4.4.5 DC Power Supply Module

All transmitters have one DC Power Supply module installed horizontally in the front right side bottom slot. It is secured by screws and one ejector handle.

4.4.6 Rear Comms Module (Commnication Module)

The transmitter has one Rear Comms module installed horizontally in the rear top slot. It is secured by screws and two ejectors' handles. Figure 4-5 shows the front panel for the Comms module.

This module has the RJ 11 phone line connector for the modem and six RS-232 connectors (COM1-COM6) that allow the interconnection of up to four transmitters.

Figure 4-5 Rear Telecom Port Module

4.4.7 Rear MUX Module

The transmitter has the options of 3 MUX modules (MUX-2 / MUX-4 / MUX-16). The system only can accommodate one MUX at a time. Figure 4-6 shows the front panel for the Rear MUX module.

This module contains the high-voltage output connector, relay interface and the telemetry connector. For information about the telemetry connector, see section 5.8. “Telemetry interface.”

WARNING

Turn the rear power switch off before handling this module’s connectors. The high-voltage output may be at 300V AC or 450V DC.

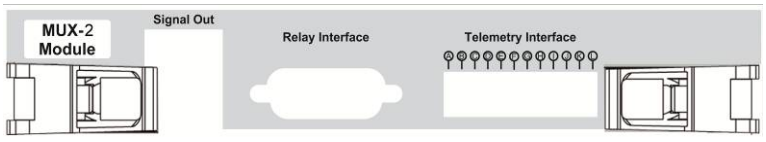


Figure 4-6 Rear MUX Module

4.5 LED Status Indicators

Table 4-2 Describes the module status indicated by the displayed LEDs. Before removing any module, turn the rear power switch off.

Module	LED Colors	Description
Control	None	Module is off.
	Solid green	Module is on.
	Solid yellow and green	Module is busy and an alarm was triggered. **NOTE** **For detail, see Chapter 6 “Alarm Messages”**
	Flashing yellow and solid green	Transmitter is booting up or flash programming.
	Solid red and green	System failure.
Power Amplifier	None	Module is off.
	Solid green	Module is on.
	Solid red	System failure.
	Solid green and flashing red	Alarm condition triggered. **NOTE** **For detail, see Chapter 6 “Alarm Massages”.**
	Alternating flashing green and red	Download firmware.
DC Power Supply	None	Module is off.
	Solid green	Module is on.
	Solid red	Power supply failure.

Table 4-2 LED Status Indicator

The LED colors shown are after the system boot up, which takes approx. 30 sec. There may be some flashing or changing LEDs during the system boot up.

Installing and Transmitter

This chapter contains the following sections:

- Installation Site
- Required Tools and Test Equipment
- Unpacking the Transmitter
- Output Connector Pin-Out
- Attaching the Rack Mounting Brackets Installing or Replacing the Transmitter Testing the Transmitter.
- Telemetry Interface

NOTE

Before installing the transmitter, first read the General Safety instructions and this entire chapter.

5.1 Installation Site

The installation site for the transmitter should meet the environment and power requirements listed in Table 3-1, “FLS transmitter Specifications”.

5.2 Required Tools and Test Equipment

Before installing the transmitter, ensure that you have the items listed in Table 5-1.

Name	Image
Crescent wrench, or 7/16 in wrench or nut drive	
Pliers	
Screwdriver, Philips-head #2	
Volt meter	

Table 5-1 Tools and Test Equipment

5.3 Unpacking the Transmitter

Bring the boxed transmitter to the installation site. Carefully remove the contents from the shipping container. Verify that you have the following items:

- FLS transmitter (1)
- Standard rack mounting bracket kit, one set each of 19in. 1, 23in., and 24in. (6)
- Adjustable rack mounting bracket kit, consisting of 19in. Brackets, 23inches. And 24 inches. Adaptor plates (6), and assembly hardware (16).
- Hand-held display unit with coiled cable and stylus.(3)
- AC or DC power cord, depending on the ordered configuration (1) Modem cable, 6ft (1)
- Telemetry connector, female, 12-pin (1)

NOTE

If there are any missing or damaged parts, contact technical support. If you need to return the transmitter, carefully repack all items, and then contact technical support for an RMA number.

5.4 Output Connector Pin-Out

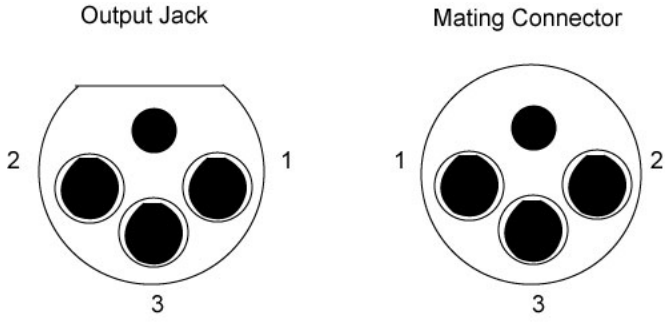
Figure 5-1 shows the pin-out for the high-voltage output jack and its mating connector. Determine the conductor length needed to connect the transmitter output to the external signal protection relay and ground control unit assemblies. Use minimum 18 AWG conductors rated minimum 600 V, minimum 80ºC, and the colors specified in Figure 5-1.

NOTE

Discharge the above if relay box is installed.

WARNING

Turn the rear power switch off before handling this module's connectors. The high-voltage output may be at 300V AC or 450V DC.



Pin	Connection	Wire color
1	Signal High	Blue
2	Signal Low	White
3	N.C.	----

Figure 5-1 Pin-Out for the Output Jack and Mating Connector

5.5 Attaching the Rock Mounting Brackets

The transmitter ships with three different sizes of standard and adjustable racks mounting brackets that allow installation in a 19 inches, 23 inches, or 24 inches rack. The 19 inches standard rack mounting brackets are already attached. The adjustable rack mounting bracket kit allows you to adjust the horizontal front-to-back position of the transmitter up to 5.25 inches (*133.4mm),* using 0.5 inches (*12.7mm*) increments. Figure 5-2 shows the left bracket for the adjustable brackets.

Measure the rack width and use the following instructions if you need to change the bracket size.

To remove and install the rack mounting brackets:

1. Remove the attached mounting brackets by using the Philips-head screwdriver, and save the flat-head screws.
2. Attach the new brackets in the same place with the flat-head screws.

To attach the adjustable rack mounting brackets:

1. Assemble the adjustable brackets by using the wrench and appropriate adaptor plate that is compatible with the rack width.
2. After placing the two metal pieces together, attach to the stud first the flat washer, lock washer, and then the nut.
3. Remove the attached mounting brackets by using the Philips-head screwdriver, and save the flat-head screws.
4. If not attaching the new brackets to the same front location, remove the two pan-head screws from the side center locations and secure them in the side front screw locations.
5. Attach each bracket to the center screw openings with the flat-head screws. Verify that the installed bracket position is the same for both sides.

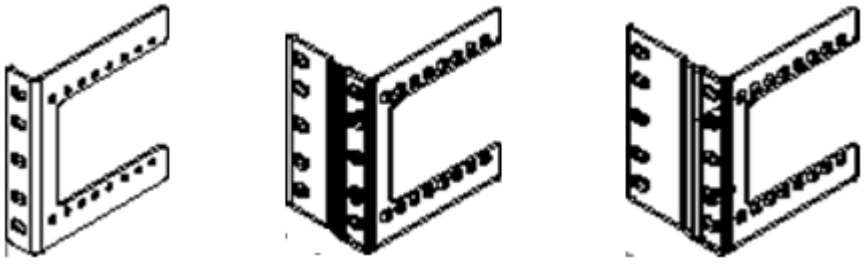


Figure 5-2 Adjustable Rack Mounting Brackets (19 inches, 23 inches, and 24 inches.)

5.6 Installing or Replacing the Transmitter

This section describes how to install a new FLS transmitter or replace an already installed transmitter.

CAUTION

We recommend that two people install or remove the transmitter. To help prevent injury when lifting the transmitter, bend your knees and keep your back straight.

5.6.1 Installing the Transmitter

Follow these instructions when installing the transmitter into a rack.

To install the transmitter:

1. Attach the rack mounting brackets compatible with the rack width.
2. For instructions, see section 5.5, “Attaching the Rack Mounting Brackets”. Have one person lift and hold the transmitter in the selected rack position.
3. Have the second person secure each mounting bracket to the rack by using the Philips-head screwdriver and two screws per bracket.

To attach the cables and cords:

1. Turn the rear power switch off.
2. Connect an external ground conductor to the rear ground stud between the second and third lock-washer

CAUTION

The ground stud is secured to the chassis by the first lock washer and nut – do not loosen or remove these. The external ground conductor should be minimum 12 AWG.

Figure 5-3 Rear DC Ground Connection of Ground Stud

4. Plug the connector end of the input power cord into the rear input connector.
5. Use the AC or DC cord shipped with the system.
6. Plug or attach the other end of the input power cord to the appropriate power source. Attach the coiled cord for the hand-held display unit to the front “Display” connector, and
7. Then place the unit on the front storage bracket.
8. Attach the modem cable form the rear phone line connector to the telephone line.
9. Attach the connector end of the assembled output cable to the rear high-voltage output connector. If not using the relay box.
10. Figure 5-1 shows the output connector pin-out.

5.6.2 Replacing a Rack Mounted Transmiteer

Follow these instructions when removing an already installed transmitter and replacing it with a new transmitter

To replace a transmitter:

1. Turn the rear power switch off.
2. Carefully disconnect all cables and cords.
3. Have one person hold the transmitter while the second person removes the mounting brackets by using the Philips-head screwdriver.
4. Lift the old transmitter out of the rack and move it to a designated area.
5. Install the new transmitter by following the instructions in section 5.5, “Attaching the Rack Mounting Brackets” and section 5.6.1 “Installing the Transmitter”.

5.7 Testing the Transmitter

After installing the transmitter and the line protection and control equipment, conduct the following tests to ensure that the transmitter operates properly;

- Check the modules’ LEDs for normal operation per section 4.5, “LED Status Indicators.”
- Use a receiver to locate the energized line to ensure that the signal transmits correctly.

5.8 Telemetry Interface

Table 5-2 lists the pin designations of the rear telemetry interface connector. The connections are in pairs, such as A-B, C-D, and so on. using insulated conductors sized 14-28 AWG. This document excludes instructions for wiring the mating connector and its end-use connections.

NOTE

When the telemetry interface controls the transmitter, the hand-held display screen shows a telephone icon. 

Pin	Description
A	West Relay
B	Ground
C	East Relay
D	Ground
E	Fault High
F	Fault Low
G	Active High Auxiliary
H	Active Low Auxiliary
I	Remote Enable High
J	Remote Enable Low
K	I_{EXT} High
L	I_{EXT} High

Table 5-2 Telemetry Connections

Local Transmitter Control

This chapter contains the following sections：

- Using the Hand-Held Display Unit.
- Using the RS-232 Port.

NOTE

If someone tries to remotely control the transmitter while being controlled locally, only the local user can control the transmitter.

6.1 Using the Hand-Held Display Unit

This section describes how to program the transmitter and view the status of its functions by using the hand-held display unit.

After turning on the transmitter, the following appears on the welcome screen for approximately 20 sec: product model (FLS), product type (Vivax-Metrotech Utility Transmitter), ISO 9001: 2000 Certified, and the firmware version number. The Main Operation screen appears next and is the Home page for the display unit.

NOTE

After 3 min. Of inactivity, the display unit enters Sleep mode with a dimmed screen. Touch the screen to resume use.

The section discusses the following:

- Main Operating Screen.
- Operating Mode Menu.
- Installation Sequence.
- Utilities Menu.
- Edit Menu.

6.1.1 Main Operating Screen

The Main Operating screen is the home page for the display unit. From here, you can program the Menu, Lines and also change the operating mode between Standby and Active. When in Active mode, the center displays the voltage, current, power and resistance values for the locate signal. (LS).

When the transmitter's line configuration is W&E (FLS-TX2W), press the **Lines** button to toggle the display among the West, East, and W&E line parameters. If the configuration is not W&E, the button is dimmed.

For 4 ways (FLS-TX4W) and 16 ways (FLS-TX16W), press the **Lines** button to go into the **Select Lines** screen.

To select an operational mode

The transmitter has two operating modes; see section 4.1 “Operating Modes”. The transmitter enters Standby mode when powered up. To determine the transmitter’s operational mode, look for the status name (Standby or Active) on the Main Operating screen.

- On the Main Operating screen, click either **ACTIVE** or **STANDBY**. The status changes to the enabled mode.

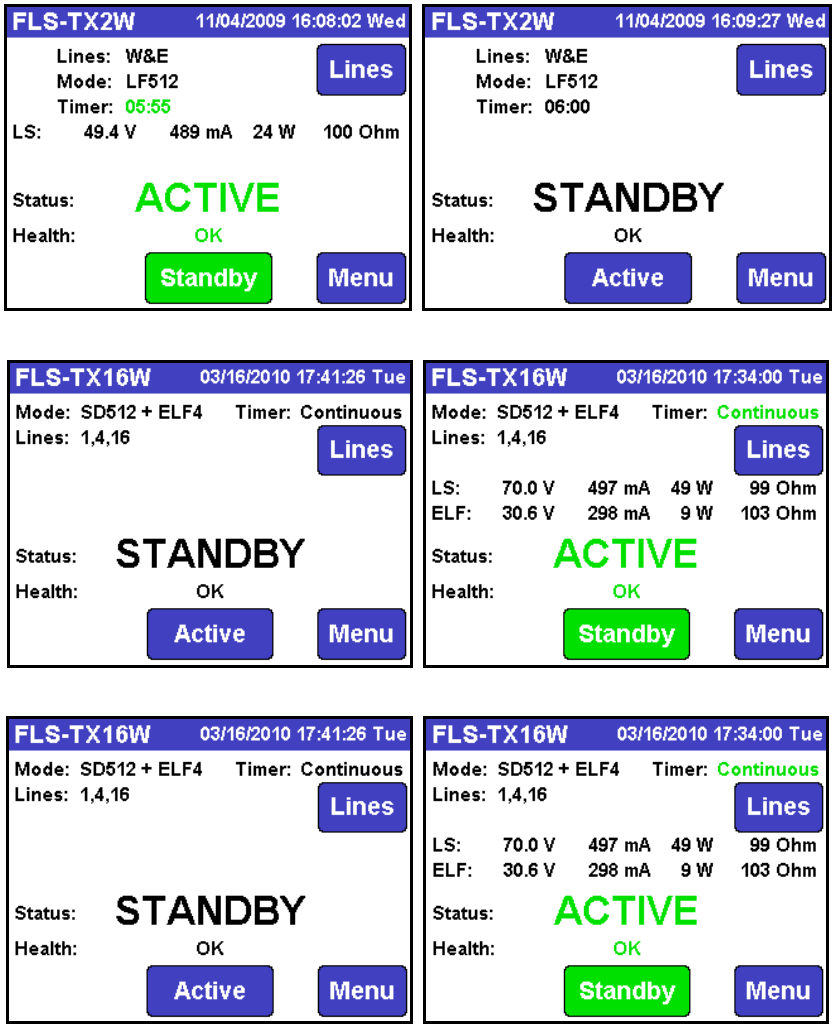


Figure 6-1 Main Operating Screen (Standby Mode and Active Mode)

NOTE

The active and standby buttons appear differently than the buttons on the other screens. For a description of the various buttons, see “Document Conventions” on page 4.

Main Operating Screen – Alarm Screen status

- When the current exceeding/below the preset limit the display will show an Alarm Screen.

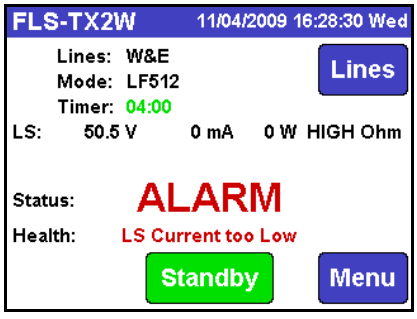


Figure 6-2 Alarm Screen

Main Operating Screen during DTMF connection

- The Phone icon will appear on the bottom left side of the screen when it is operating thru DTMF Phone.

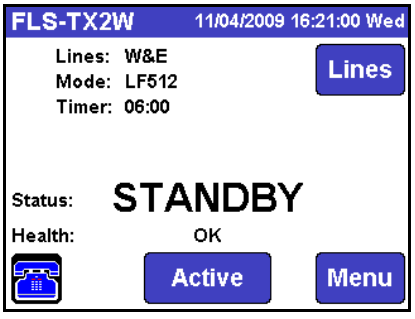


Figure 6-3 Main Operating Screen – Phone icon

Main Operating Screen during RS-232 connection

- The remote terminal icon will appear on the bottom left side of the screen when it is operating thru RS-232 locally.

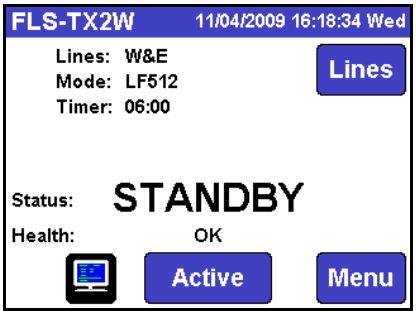


Figure 6-4 Main Operating Screen – Phone icon

Main Operating Screen during modem dials in connection

- The modem icon will appear on the bottom left side of the screen when it is operating through modem dial in connection.

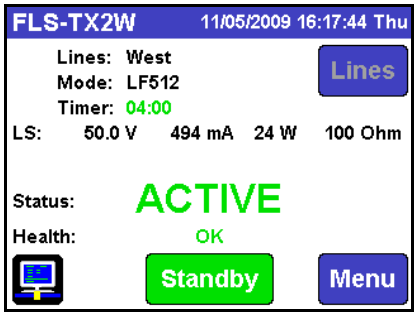


Figure 6-5 Main Operating Screen – Modem Icon

To select a line

- On the Main Operating screen, click **Lines**, and then select the line. Click **OK** to confirm and return to the Main Operating screen.

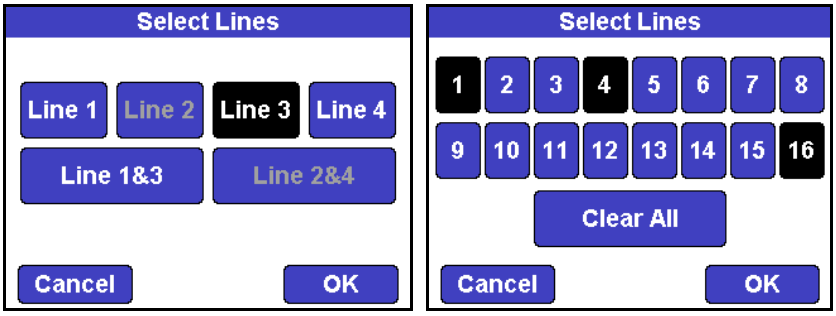


Figure 6-6 Select Lines (FLS-TX4W) / (FLS-TX16W).

6.1.2 Operating Mode Menu

In this section, you learn how:

- To select a line frequency
- To set timer
- To set the line alarm levels
- To set the line output current level
- To load user setup

NOTE

These instructions are written using the common abbreviated method to move you from one screen to another. For example, click Start > Control Panel > Printers.

To select a line frequency

1. On the Main Operating screen, click **Menu**, and then select the frequency. The display unit automatically saves the selection when switching screens.

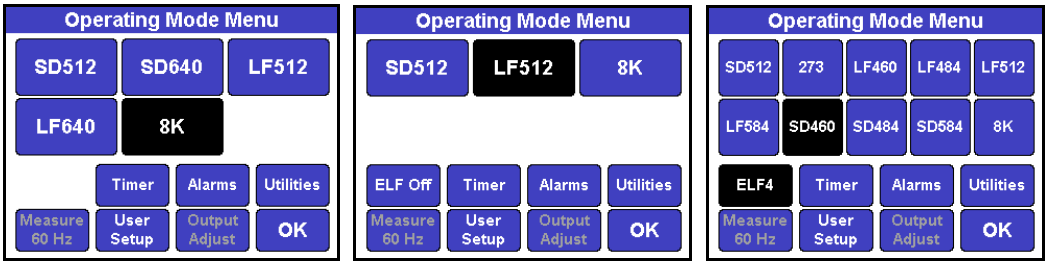


Figure 6-7 Operating Mode Menu – 3, 5 and 10 frequencies

1. Do one of the following:

- Click **OK** to return to the Main Operating screen.
- Program the other setup functions.

To set timer

1. On the Main Operating screen, click **Menu > Timer**.

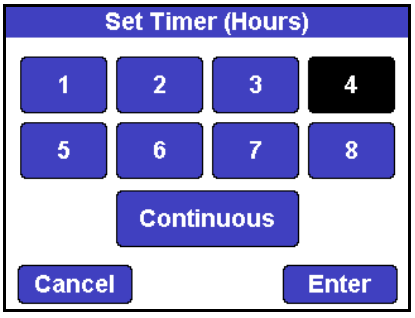


Figure 6-8 Set Timer (Hours)

2. Select the hours for the FLS to operate. For non-stop operating click **Continuous**.
3. Click **Enter** to confirm the selection.

To set the line alarm levels

1. On the Main Operating screen, click **Menu > Alarm**.

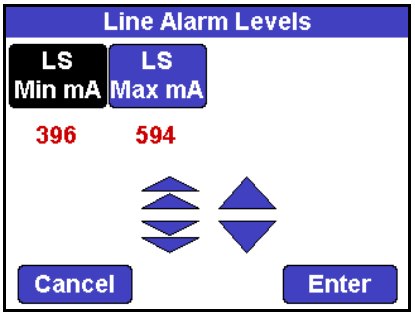


Figure 6-9 Line Alarm Levels

2. Program each alarm current value by doing the following:
   a) Click the alarm name.
   b) Click the double (greater change) and single (smaller change) arrow icons to set the value.
   c) Click **Enter** to save or **Cancel** to exit without saving.
3. Do one of the following:
   a) Click OK to return to the Main Operating screen.
   b) Program the other setup features.

To set the line output current level

1. On the Main Operating screen, click **Menu > Output Adjust**.

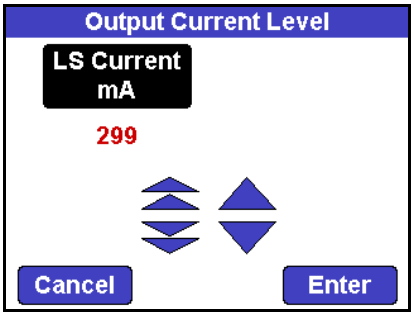


Figure 6-10 Output Current Level

2. Program output current valve by clicking the double and single arrow icons.

3. Click Enter to save and go to Set Output Current screen or **Cancel** to exit without saving.

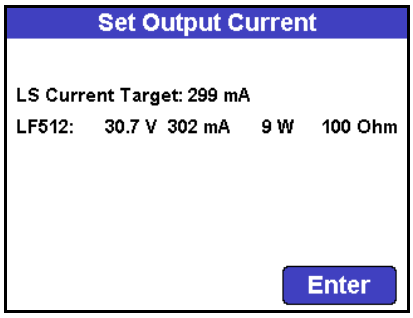


Figure 6-11 Set Output Current

4. Do one of the following:
   a) Click **OK** to return to the Main Operating screen.
   b) Program the other setup features.

To load user setup

1. On the Main Operating screen, click **Menu > User Setup**.

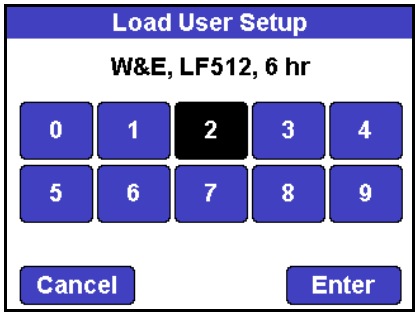


Figure 6-12 Load User Setup

2. Click on the numeric number to load the saved user setup. The setting description will display on top while clicking each setup.
3. Click **Enter** to load or **Cancel** to exit without loading.
4. Do one of the following:
5. Click **OK** to return to the Main Operating screen.
6. Program the other setup features.

6.1.3 Installation Sequence

The Install menu has two options:

- Select **Reinstall** to reinstall the system. The Reinstall sequence has two steps.
- Select **Install** for a new installation, a new telecom line connection, or if the line changed. The Install sequence displays the hardware status followed by 13 steps.

NOTE

After entering the Install sequence, you must repeatedly click prev to return to the Main Operating screen,

To select the line frequencies (Reinstall)

1. On the Main Operating screen, click **Menu > Install Menu**.

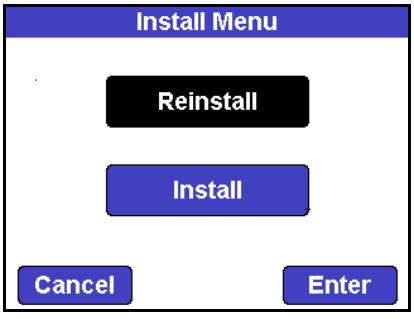


Figure 6-13 Install Menu

2. Click **Reinstall > Enter**, and then select one or more frequencies.

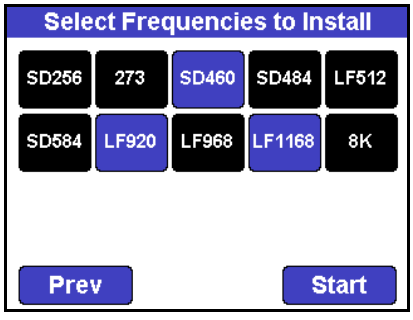


Figure 6-14 Select Frequencies to Install

3. Click **Start** to install

4. When the bottom counter stops, it will automatically go back to the Main Operating screen. You must complete this step to install the frequency selection.

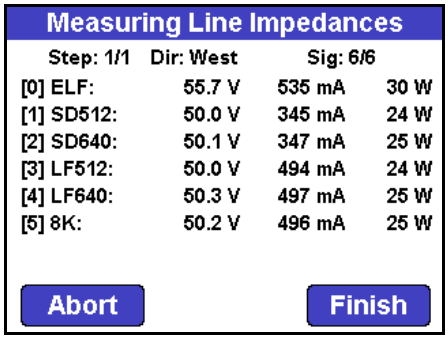


Figure 6-15 Measuring Line Impedances

To install the station ID and name (Install)

1. A new system will prompt user for installation. You will see “Unit is not installed”. Click **Install** to start Installation process

Figure 6-16 Unit not installed

2. On the Main Operating screen, click **Menu > Utilities > Install** will bring you to the following screen.

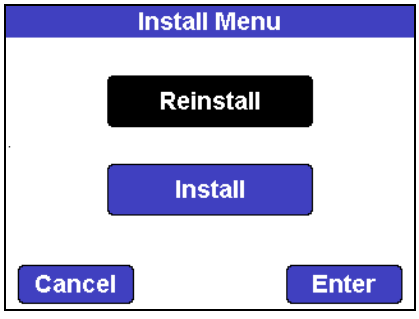


Figure 6-17 Install Menu

3. Click **Install > Enter**, then the **Check Hardware** screen appears.

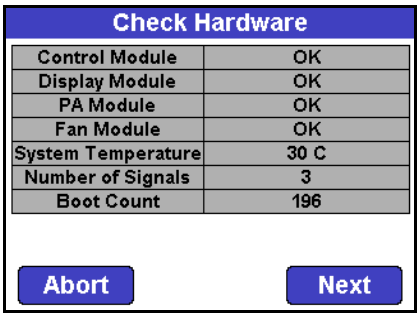


Figure 6-18 Check Hardware

4. Click **Next** to reach the **Install Station ID** screen.

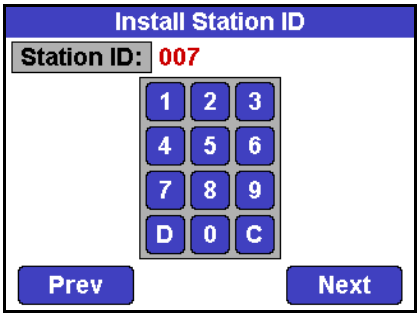


Figure 6-19 Install Station ID

5. Enter the station ID, using **C** to clear the entry or **D** to delete the last digit, and then click **Next**.

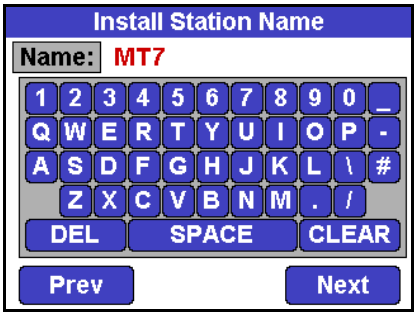


Figure 6-20 Install Station Name

6. Enter the station name, and then click **Next**..

To install the line direction, voltage

1. On the Main Operating screen, click **Menu > Utilities > Install Menu > Install > Enter**.
2. Click **Next** until you reach the **Configure Lines(s) to Drive** screen.

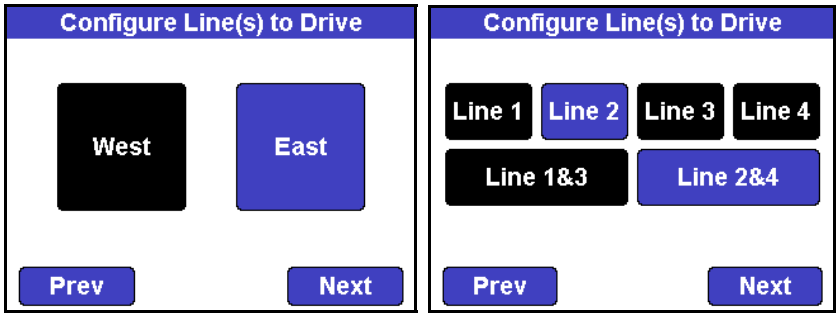


Figure 6-21 Configure Line(s) to Drive 2 ways (FLS-TX2W) and 4 ways (FLS-TX4W)

3. Select **West**, East, or **West** and **East** together, and then click **Next**.
4. Select the maximum line voltage and click **Next**.

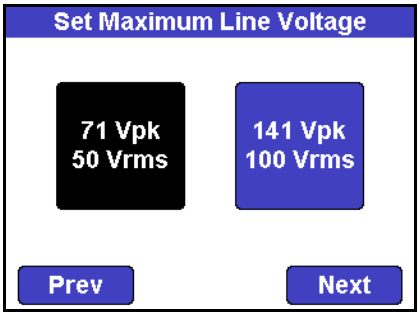


Figure 6-22 Set Maximum line Voltage

5. Click **Yes** to install Extremely Low Frequency (ELF), click **No** for not installing ELF (Only available for modules with ELF).

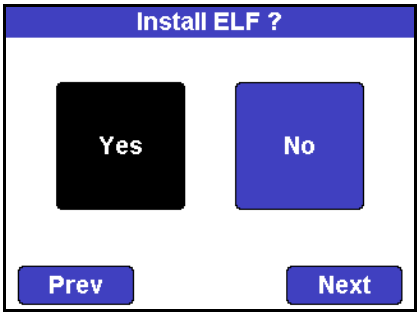


Figure 6-23 ELF installation confirmation screen

To install the local time

1. On the Main Operating screen, click **Menu > Utilities > Install Menu > Install > Enter**.
2. Click **Next** until you reach the **Install Local Time Settings** screen.

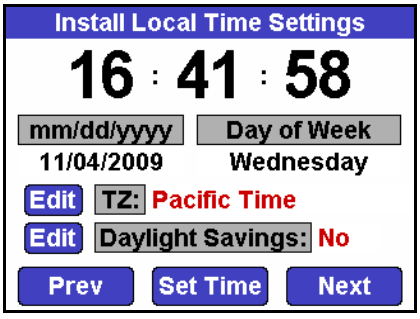


Figure 6-24 Install Local Time settings

3. Click **Edit** next to Time Zone, click **Up** or **Down** to select the time zone, and then click **Enter**.
4. Click **Edit** next to Daylight Savings, and then click **No** or **Yes**. Click **Next**.

To install the telephone numbers and number of rings

1. On the Main Operating screen, click **Menu > Utilities > Install Menu > Install > Enter**.
2. Click **Next** until you reach the **Install FLS-TX Phone** #screen.
3. Enter the phone number, using **C** to clear the entry, **D** to delete the last digit, or a comma to add a minimal time delay, and then click **Next**.

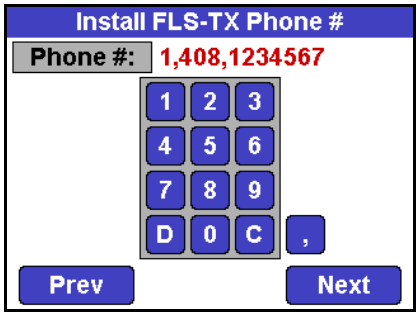


Figure 6-25 Install FLS-TX Phone #

4. Enter the number of rings before answering the call, using **C** to clear the entry to **D** to delete the last digit and then click **Next**.

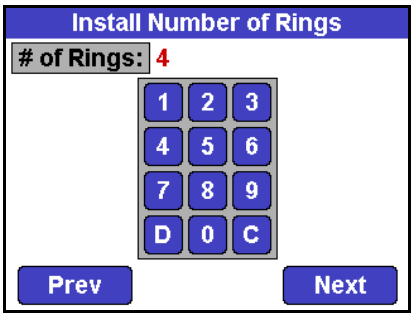


Figure 6-26 Install Number of Rings

5. Enter the number of rings before answering the call, using **C** to clear the entry to **D** to delete the last digit and then click **Next**.

NOTE

The System summary screen appears after the Install Number of Rings screen. It summarizes all of the install settings.

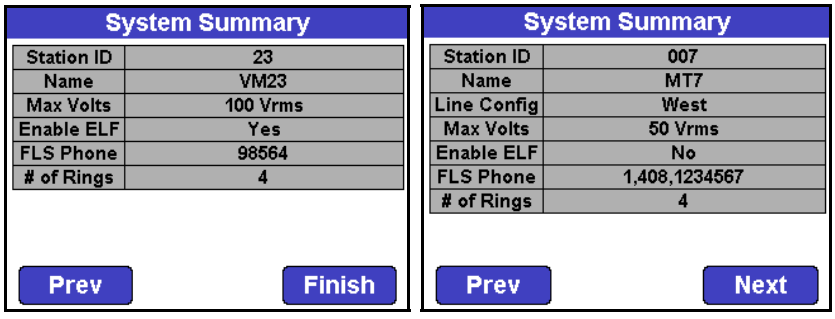


Figure 6-27 System Summary (FLS-TX2W or FLS-TX4W and FLS-TX16W)

6. Click **Next** to go to the **Select Frequencies to Install** screen.

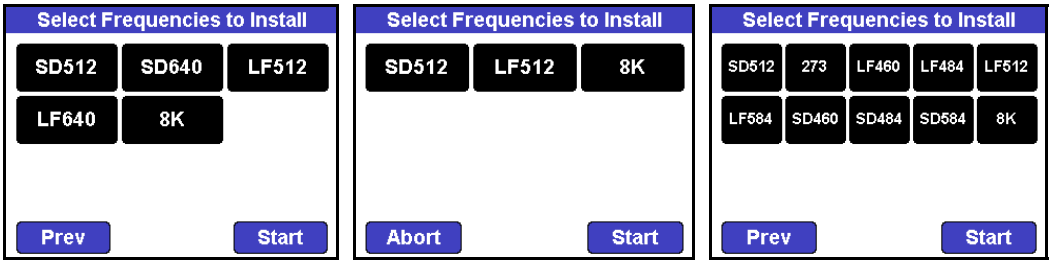


Figure 6-28 Select Frequencies to Install

7. Select one or more frequencies, and then click **Next**.

8. Click **Start** to measure the line impedances. If you click **Abort** after starting, you return to the Main Operating screen.
9. When the bottom counter stops, it will automatically go back to the Main Operating screen. You must complete this step to install the frequency selection.

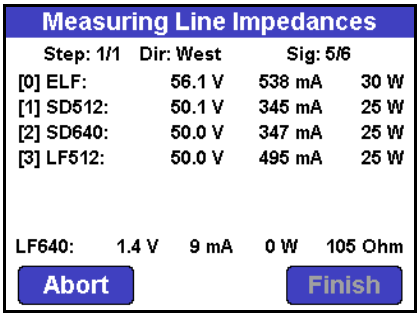


Figure 6-29 Measuring Line Impedances (Finish)

6.1.4 Utilities Menu

You can program all Utilities Menu functions in either operating mode, except Install Menu, Factory Reset, Locator Software and Factory Menu. To program the Install Menu, Factory Reset, Locator Software and Factory Menu, the transmitter must be in Standby mode. Figure 4-29 shows the top level functions of the System Menu, which are:

- Edit Menu
- Install Menu
- Save Setup
- Factory Reset
- Locator Software
- Factory Menu (For factory personal only)
- Calibrate Screen
- About FLS-TX

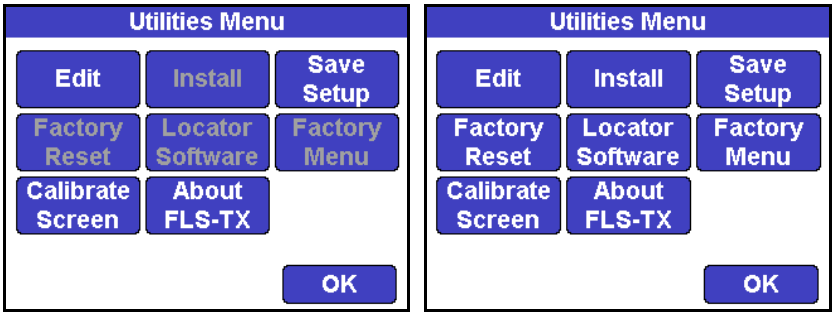


Figure 6-30 Utilities Menu (Standby Mode and Active Mode)

6.1.4.1 Edit Menu

You can edit Station ID, Station Name, FLS-TX Phone #, Number of Rings and Local time in this menu. Use these instructions to edit the station information, telephone numbers, number of rings to answer the call, and the local time settings.

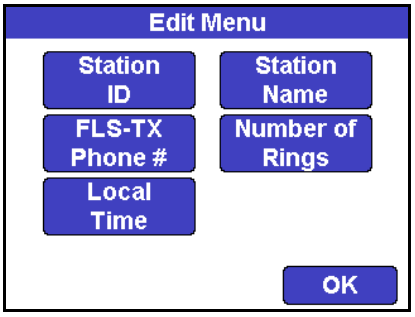


Figure 6-31 Edit Menu

To edit station ID

1. On the Main Operating screen, click **Menu > Utilities > Edit > Station ID**.

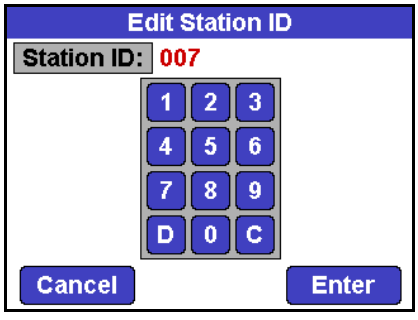


Figure 6-32 Edit Station ID

2. Enter the station ID, using **C** to clear the entry or **D** to delete the last digit, and then click **Enter**.

NOTE

The station ID is also the normal access code for the station.

To edit the station name

1. On the Main Operating screen click **Menu > Utilities > Edit > Name**.

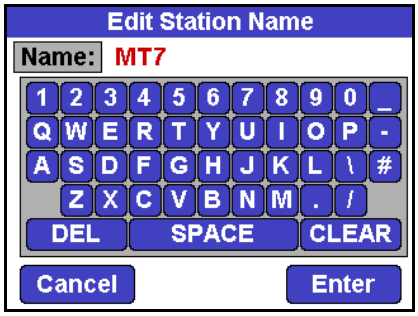


Figure 6-33 Edit Station Name

2. Enter the station name, and then click **Enter**.

To edit the telephone number

1. On the Main Operating screen, click **Menu > Utilities > Edit > Phone Number**.

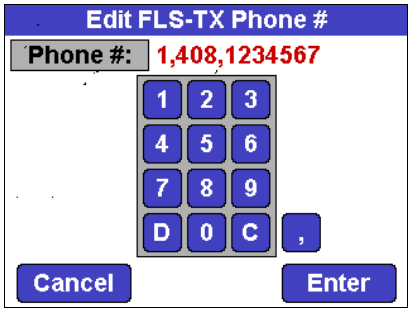


Figure 6-34 Edit Phone Number

2. Enter the phone number, using **C** to clear the entry, **D** to delete the last digit, or a comma to add a minimal time delay, and then click **Enter**.

To edit the number of rings

1. On the Main Operating screen, click **Menu > Utilities > Edit > Number of Rings**.

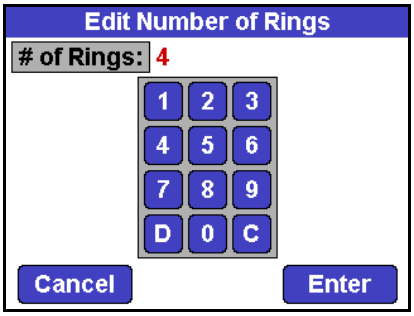


Figure 6-35 Edit Number of Rings

2. Enter the phone number, using **C** to clear the entry, **D** to delete the last digit and then click **Enter**.

To edit the local time local time zone and daylight savings settings

1. On the Main Operating screen, click **Menu > Edit Menu > Local Time**.

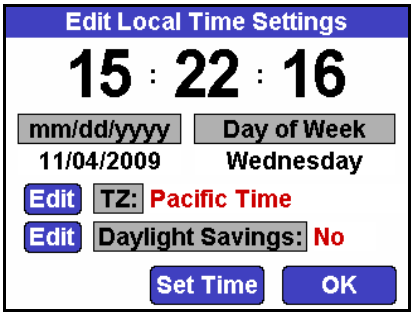


Figure 6-36 Edit Local Time Settings

2. Click **Set Time** to change the local time clock.
3. Click on the month (**MM**), day (**DD**), year (**YY**), hour (**hh**), minute (**mm**), or second (**ss**) to select the setting you want to adjust.

4. Click the double (greater change) and single (smaller change) arrow icons to set the values, and then click **Enter**.

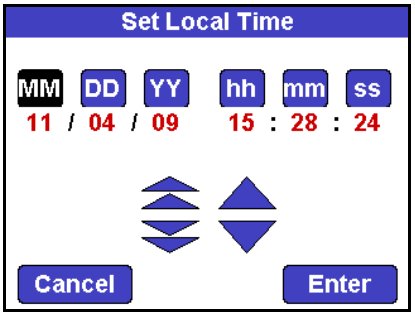


Figure 6-37 Set Local Time

5. Click **Edit** next to Time Zone.

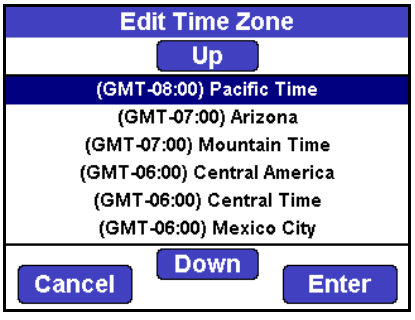


Figure 6-38 Edit Time Zone

6. Click **Up** or **Down** to select the time zone, and then click **Enter**.
7. Click **Edit** next to Daylight Savings.

Figure 6-39 Edit Daylight Savings

8. Click No or Yes, and then click Back.

6.1.4.2 Install Menu

The Install menu has two options:

- Select **Reinstall** to reinstall the system.
- Select **Install** for a new installation, a new telecom line connection, or if the line changed.

Please refer to 6.1.3 Installation Sequence for more details.

6.1.4.3 Save Setup

Use these instructions to save the new programmed values as the prefix. User could save up to 10 prefix storage in the FLS system.

To save the settings as the prefix

1. On the Main Operating screen, click **Menu > Utilities > Save Setup**.
2. Select one of the prefix storage, click **Enter** to save the current settings.

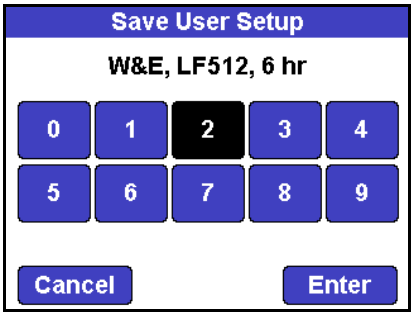


Figure 6-40 Save User Setup

6.1.4.4 Factory Reset

Use these instructions to return the transmitter to the default (factory setup) configuration.

NOTE

You cannot undo this change. After enabling the Factory Reset, run the Install sequence.

To confirm the Factory Reset

1. On the Main Operating screen, click **Menu > Utilities > Edit > Factory Reset**.

2. Select all the letters “confirm” below, click **Yes** to perform factory reset.

Figure 6-41 Factory Reset

6.1.4.5 Locator software (Currently not available future features)

To update the receiver software:

1. Connect the external locating device (vLocPro) to transmitter’s front RS-232 port by using a female-female DB9 null modem cable and an adaptor.
2. On the Main Operating screen, Click **Menu >Utilities > Locator Software**.

Figure 6-42 Locator Software

3. Click the button for the locating device connected to the transmitter.
4. Click **OK** when done.

6.1.4.6 Calibrate Screen

Use these instructions to calibrate the display unit's touch screen.

To calibrate the touch screen

1. On the Main Operating screen, click **Menu > Utilities > Calibrate Screen**.

Figure 6-43 Calibrate Screen

2. Use the stylus to click the marker where it appears on the screen. These are two tests with the marker placed in different corners.

6.1.4.7 About FLS-TX

Use these instructions to learn more about the FLS transmitter. To return to the System menu, click **Back**.

To view the FLS transmitter settings

1. On the Main Operating screen, click **Menu > Utilities > About FLS-TX**.

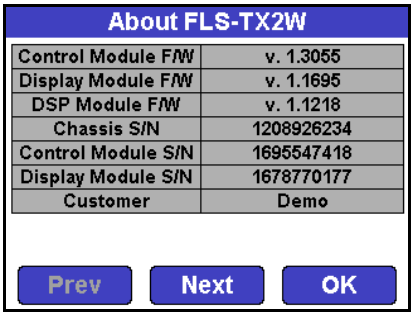


Figure 6-44 About FLS-TX Transmitter (Screen 1 of 3)

2. Click **Next** for the module status.

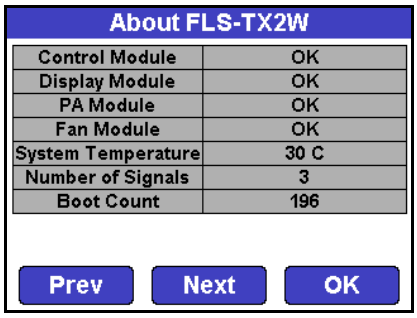


Figure 6-45 About FLS-TX Transmitter (Screen 2 of 3)

3. Click **Next** for the transmitter settings.

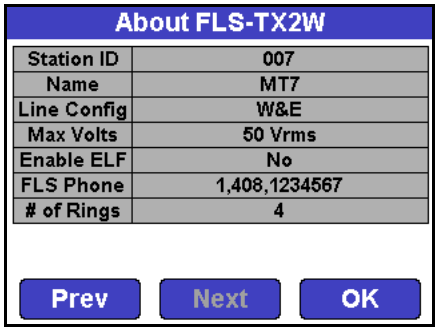


Figure 6-46 About FLS-TX Transmitter (Screen 3 of 3)

4. Click **OK** to go back to Utilities Menu.

6.2 Using the RS-232 Port

This section describes how to program the transmitter and view the status of its functions by using the front RS-232 port, a female-female DB9 null modem cable, and a computer with terminal emulation, such as HyperTerminal™.

NOTE

Be aware that Windows Vista™ does not include the HyperTerminal program.

This section discusses the following:

- Configuring Hyper Terminal
- Select an Operational Mode
- Programming the Line Setup Features
- Using the Menu.

6.2.1 *Configuring Hyper Terminal*

Use these instructions to configure HyperTerminal.

To configure HyperTerminal

1. Click **File > Properties**, and then select 57,600 bps, 8 data bits, no parity, 1 stop bit, and no flow control.

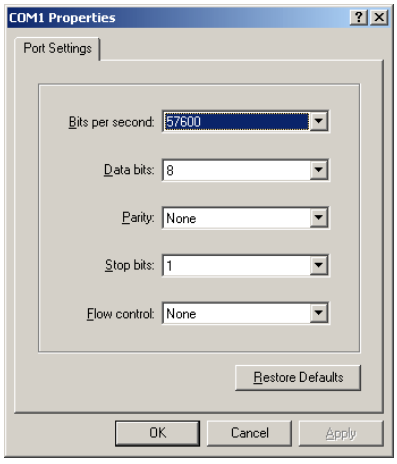


Figure 6-47 HyperTerminal Connection Properties

2. After connecting to the transmitter by using a terminal emulator, such as HyperTerminal, press ENTER to go to the Main Operating screen. To select a command, press the underlined letter or number for that command. Figure 6-48 shows the Main Operating screen.

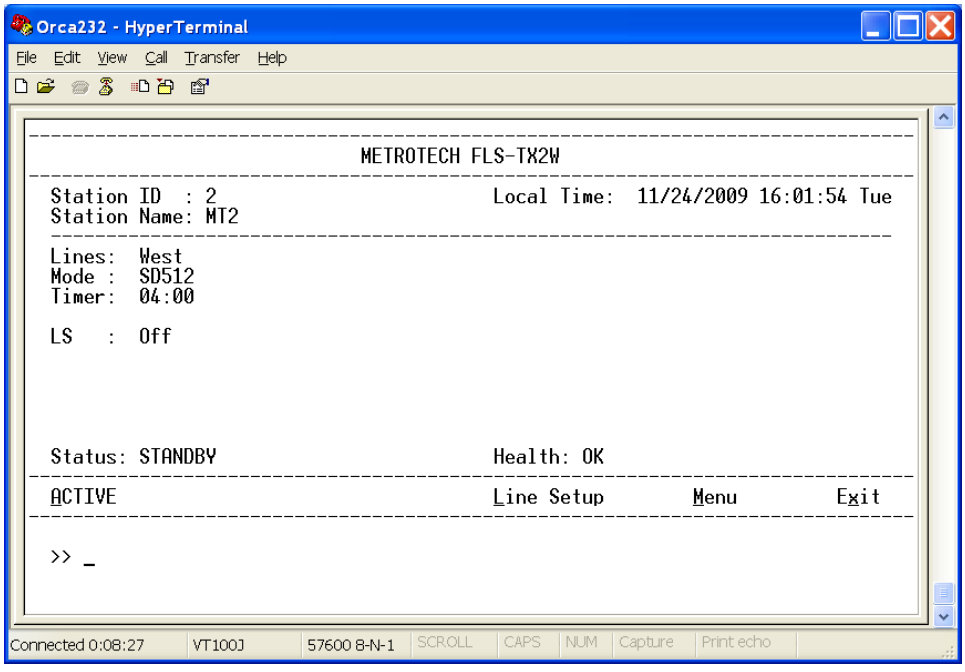


Figure 6-48 Main Operating Screen (Standby Mode)

6.2.2 *Selecting an Operational Mode*

The transmitter has two modes, see section 4.1, “Operating Modes”. The transmitter enters Standby mode when powered up. To determine the transmitter’s operational mode, look for the status name (Standby or Active) on the Main Operating screen.

To select an operational mode

On the Main Operating screen, press **A** for Active mode. The status name changes to the enabled mode.

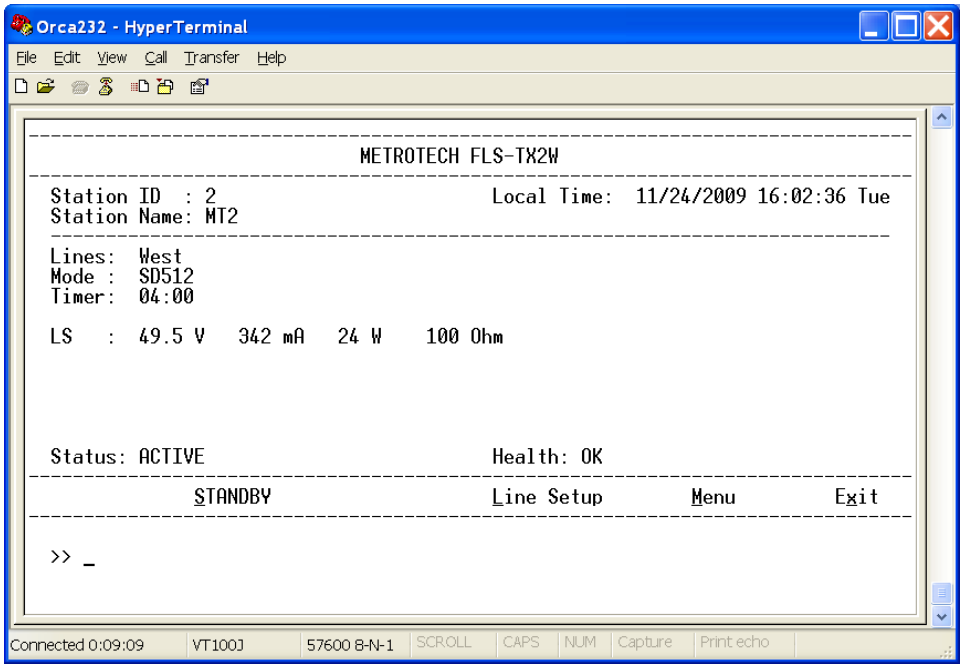


Figure 6-49 Main Operating Screen (Active Mode)

6.2.3 Programming the Line Setup Featues

To go to the line Setup screen, shown in Figure 6-50, from the Main Operating screen, press **L.** From this screen, you can program the **Line direction, Timer, Line frequencies, Alarms and Adjust Output** (by pressing **L, T, S, E** or **A**).

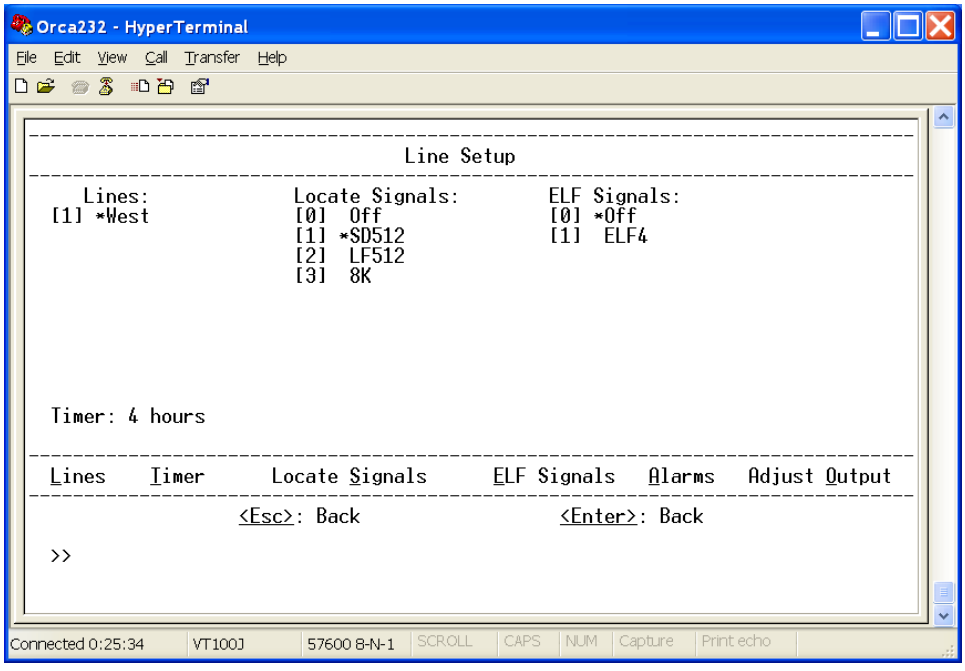


Figure 6-50 Line Setup (Active Mode)

To	Do This
Go to Edit Line Direction	Press L > L enter number > ENTER
Set Timer	Press L > T > enter hours > ENTER
Select a line frequency	Press L > S > enter number > ENTER
Select a ELF signal	Press L > E > enter number > ENTER
Set alarm level	Press L > A > enter number > enter value > ENTER
Adjust output (Active mode only)	Press L> O > enter selection> enter value > ENTER

Table 6-1 Key Sequence for Line Setup Screen

To program Line Alarm Levels

On the Main Operating Screen press **L > A > enter number > enter value > ENTER** Figure 6-51 shows the **Line Alarm Levels** screen. From this screen, program the minimum, nominal and maximum alarms currents for the locate signal.

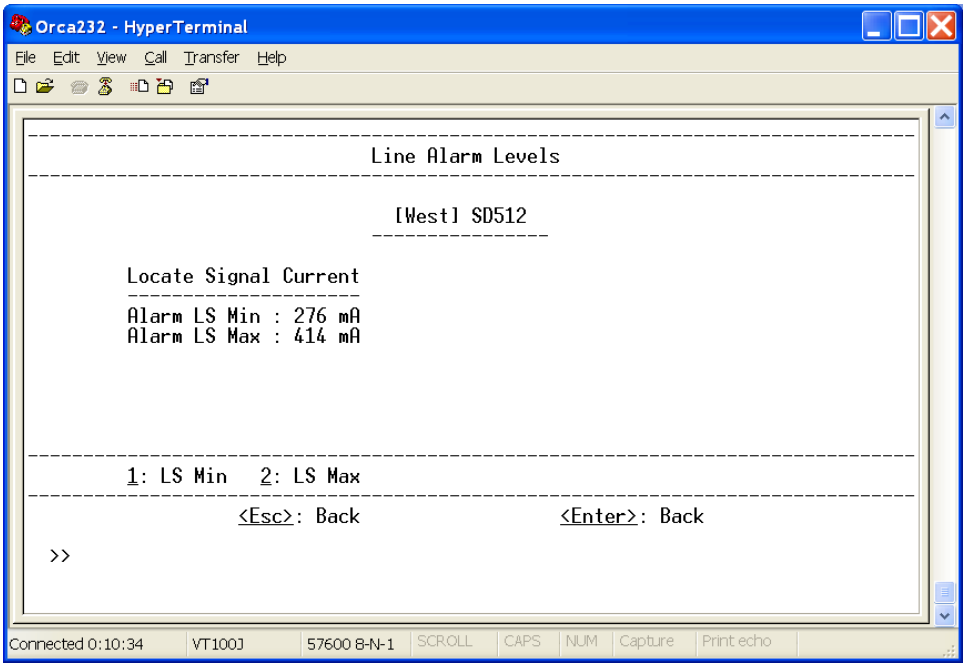


Figure 6-51 Line Alarm Levels

To program the Output level (Active Mode Only)

On the Main Operating Screen press **L > O > enter value.**

NOTE

If you want to use the default ±20% tolerances for the minimum and maximum values, program the LS and ES outputs first to automatically adjust the minimum and maximum values. If you program the minimum and maximum values first, you must manually program the output values.

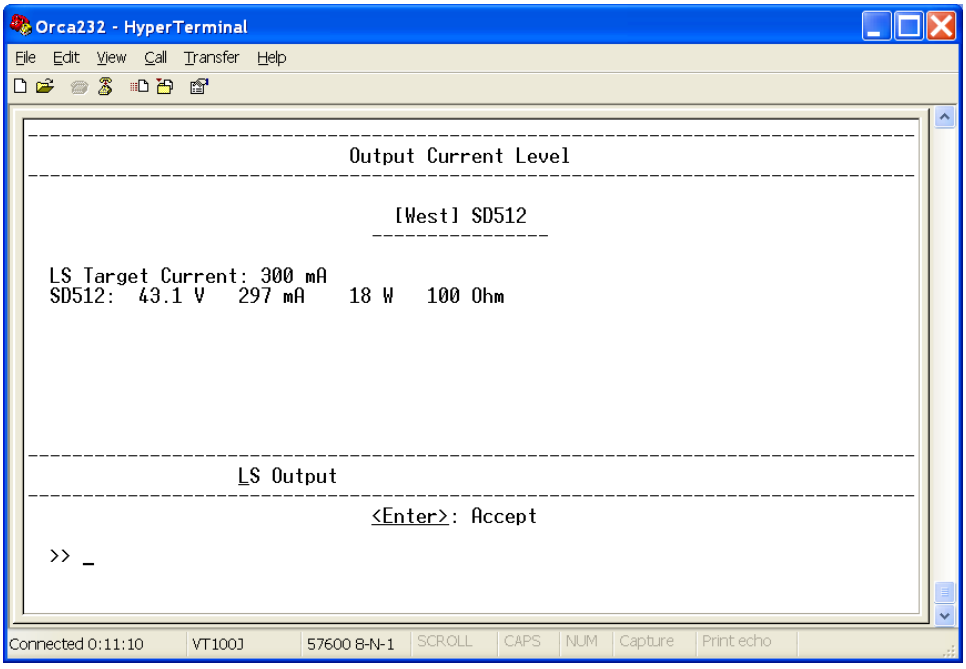


Figure 6-52 Output Current Level

6.2.4 Using the Menu

The System Menu screen, shown in Figure 6-53, has the following functions:

- Edit Menu
- Factory Reset (Standby Mode Only)
- Locator Software (Standby Mode Only)
- Install (Standby Mode Only)
- Reinstall (Standby Mode Only)
- Save Setup
- About FLS-TX

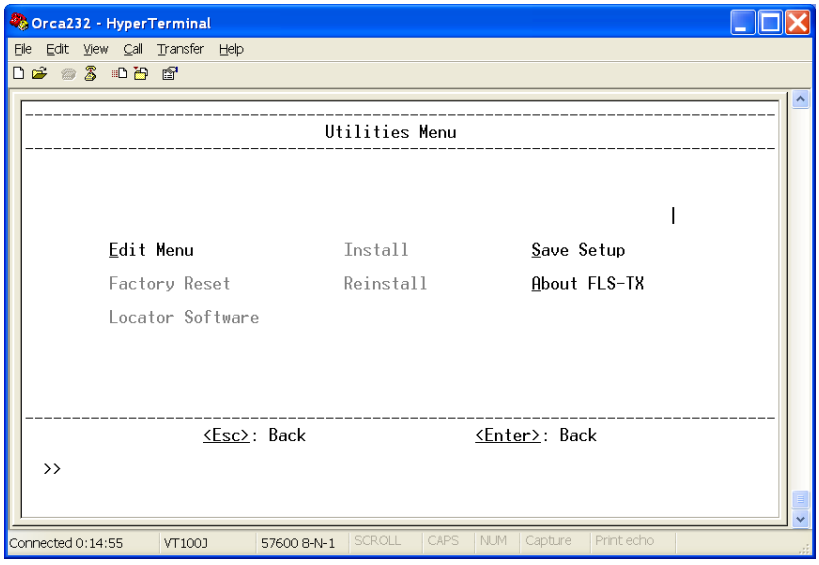


Figure 6-53 Utilities Menu (Active)

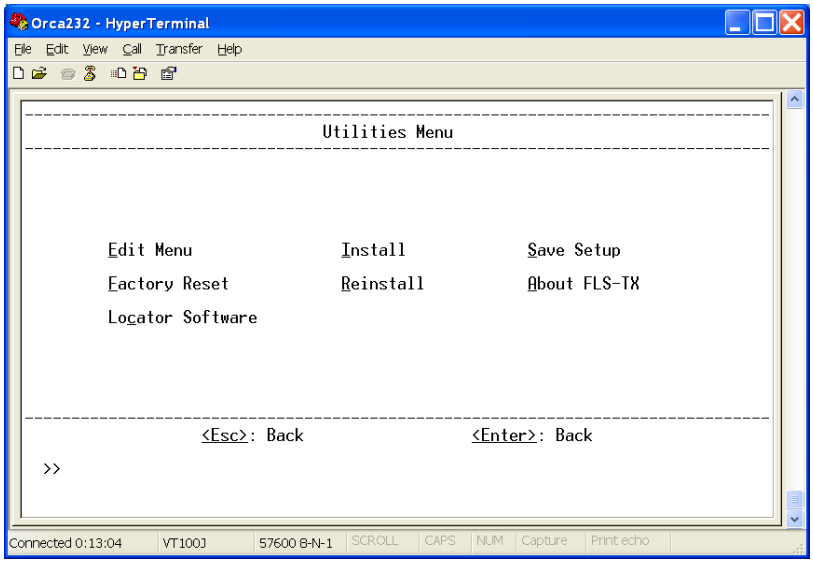


Figure 6-54 Utilities Menu (Standby)

6.2.4.1 Locator software (Currently not available future features)

Figure 6-55 shows the Edit Menu screen. Use this screen to edit the **Station ID, Number of Ring, Station Name, Local Time and FLS-TX Phone #.**

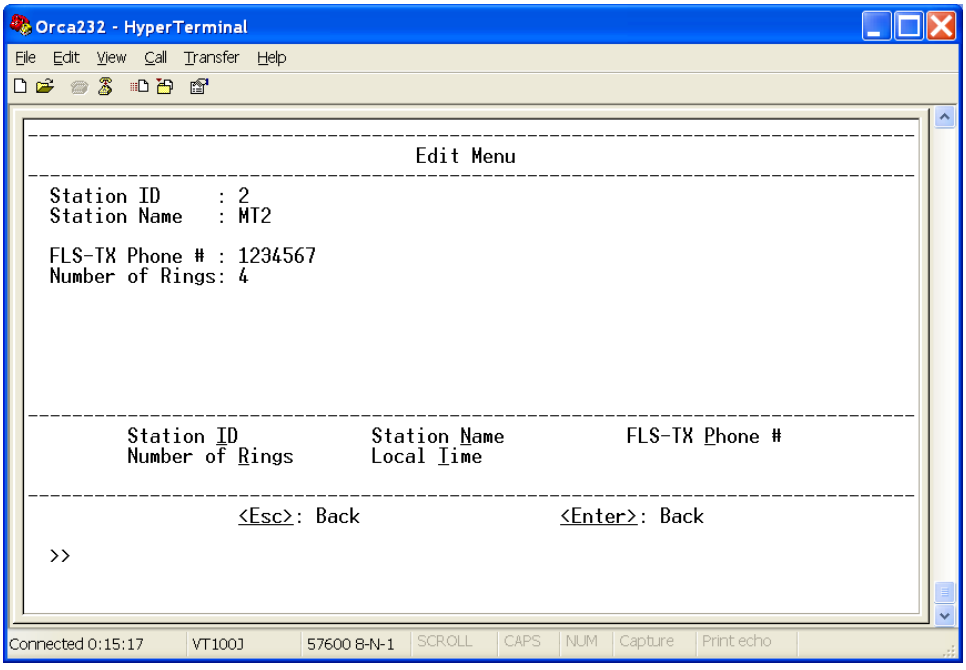


Figure 6-55 Edit Menu

Table 6-2 lists the sequence of pressed keys associated with each edit task, starting form the Main Operating screen.

After entering the applicable data, press **ENTER** to save and return to the Edit menu.

To	Do This
Edit Station ID	Press M> E > R > enter ID > ENTER
Edit Number of Rings	Press M > E > R > enter number > ENTER
Edit Station Name	Press M > E > N > enter name > ENTER
Edit Local Time • Edit Time Zone • Edit Daylight Savings • Edit Date • Edit Time	Press M > E > T >enter selection • Press M > E > T > Z > enter number > ENTER • Press M > E > T > S > enter value > ENTER • Press M > E > T > D > enter date > ENTER • Press M > E > T > T > enter time > ENTER
Edit FLS-TX Phone #	Press M > E > P > enter number > ENTER

Table 6-2 Key Sequence for Edit Menu Screen

6.2.4.2 Factory Reset

Use these instructions while in Standby mode to return the transmitter to the factory default configuration.

NOTE

You cannot undo this change. After enabling the factory reset, run the Install sequence.

To reset the transmitter

1. On the Main Operating screen, press **M > F**.

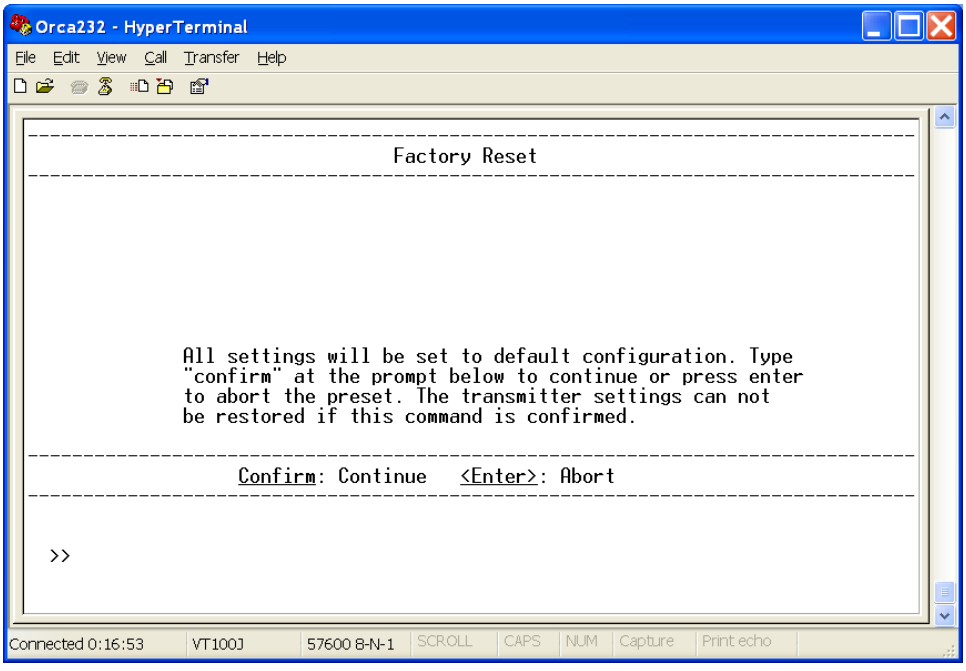


Figure 6-56 Factory Reset

2. Type **confirm**, and then press **ENTER**.

6.2.4.3 Locator Software (Standby Mode Only)

Use these instructions while in Standby mode to sync firmware.

To sync the firmware or logs to accessory equipment

1. From the Main Operating Screen, press **M > C**.

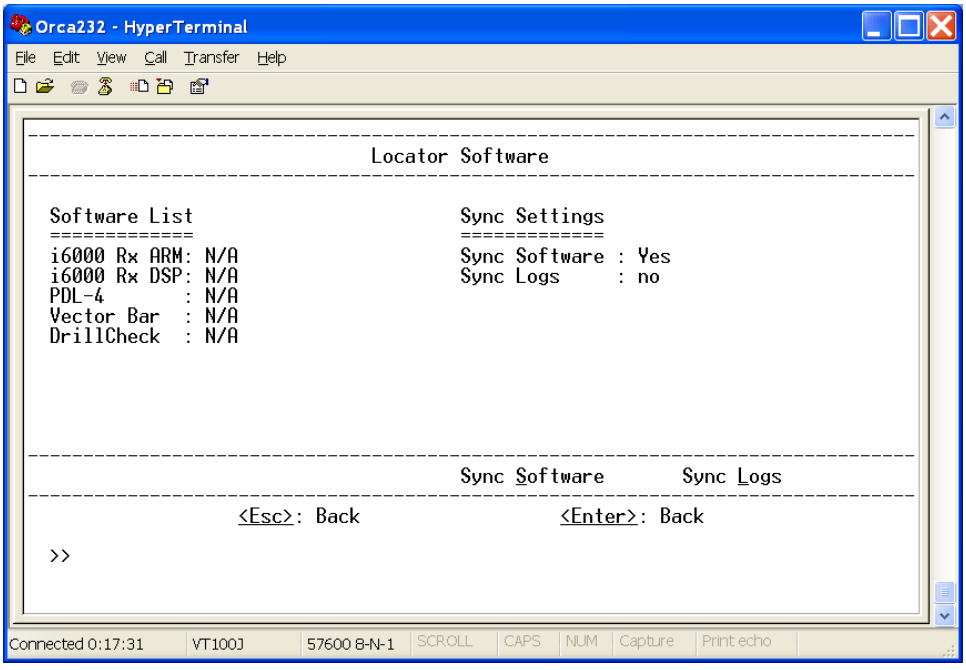


Figure 6-57 Locator Software

2. Do one of the following:
   - Press **S** to sync the Software.
   - Press **L** to sync the logs.
3. Press **ESC** or **ENTER**.

6.2.4.4 Install (Standby Mode Only)

Use these instructions while in Standby mode to install the station parameters and measure the line impedances.

To install the station parameters

1. A new system which is not installed will look like the following screen.

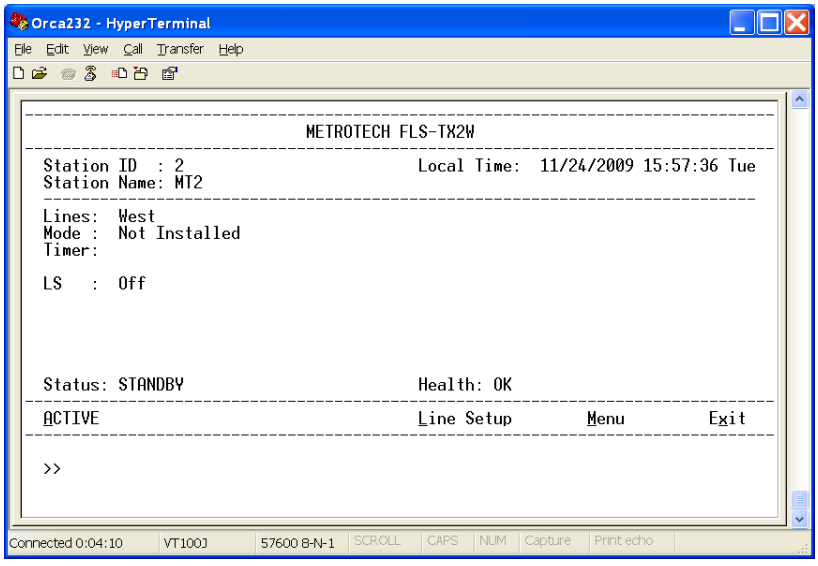


Figure 6-58 Installation Screen (Not yet install)

2. On the Main Operating screen, press **M > I.**

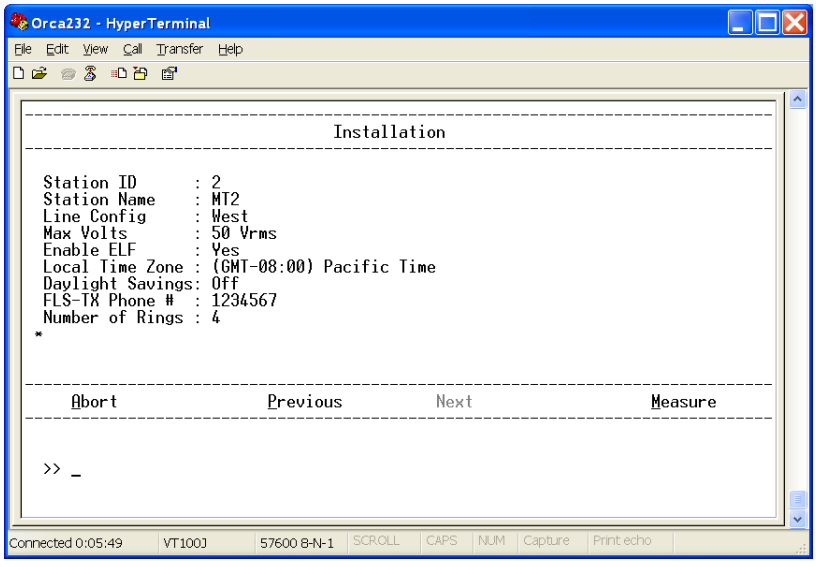


Figure 6-59 Installation Screen

3. Press **N** or **ENTER** to move down the parameter list.
4. Enter the data for each parameter, and then press **ENTER**.
5. Press **M** to select the frequencies to install.

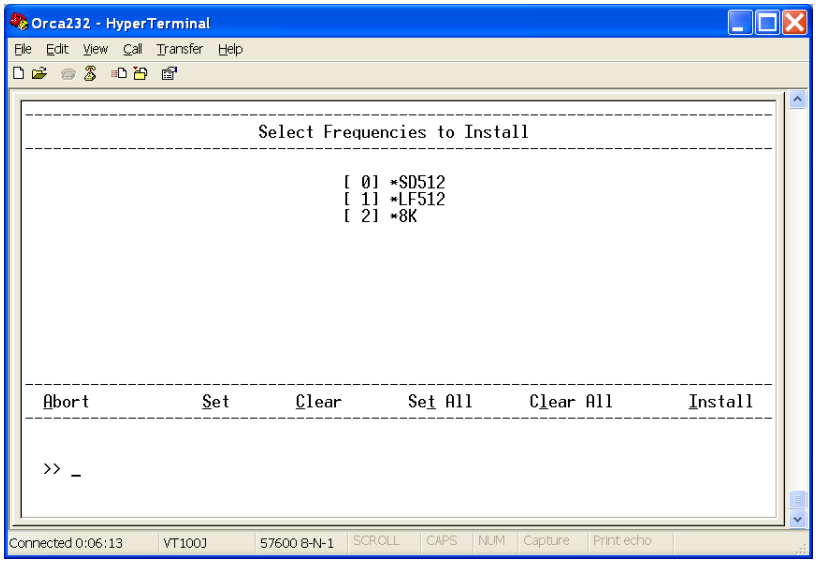


Figure 6-60 Select Frequencies to Install

6. Press **I** to start and measuring the line impedances.

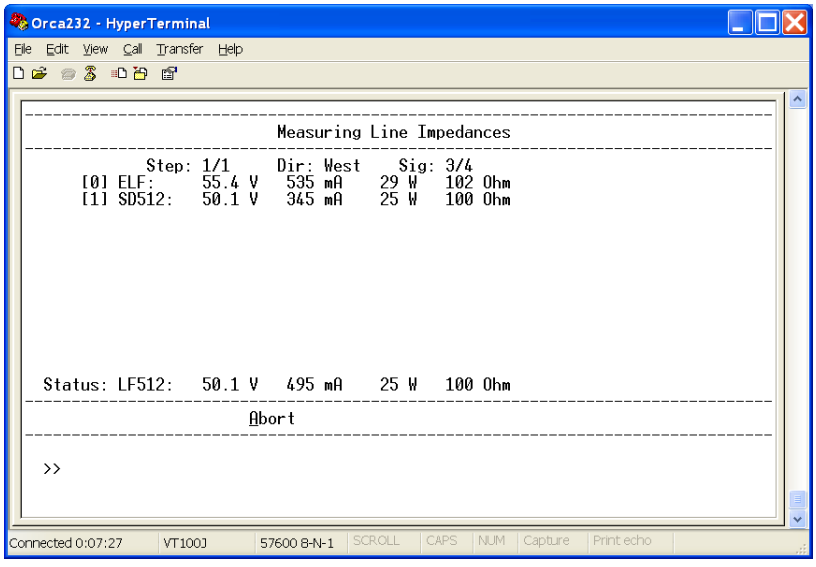


Figure 6-61 Measuring Line Impedances

7. Press **F** > **ENTER** after the status becomes Done, or press **A** to abort the measurement.

6.2.4.5 Reinstall (Standby Mode Only)

Use these instructions while in Standby mode to reinstall the line frequencies and measure the line impedances.

To reinstall the line frequencies

1. On the Main Operating screen, press **M > R**.

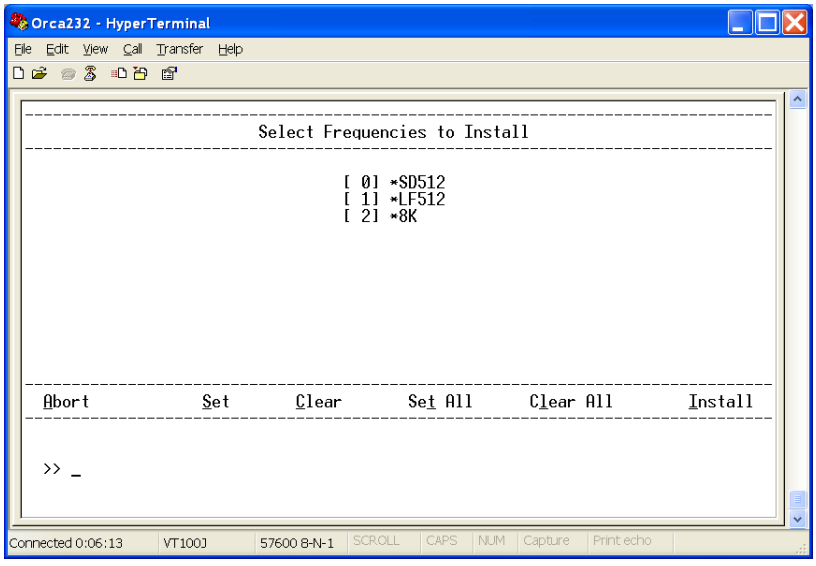


Figure 6-62 Reinstall – Select Frequencies to Install

2. Set or clear one or more frequencies, and then press **N**.

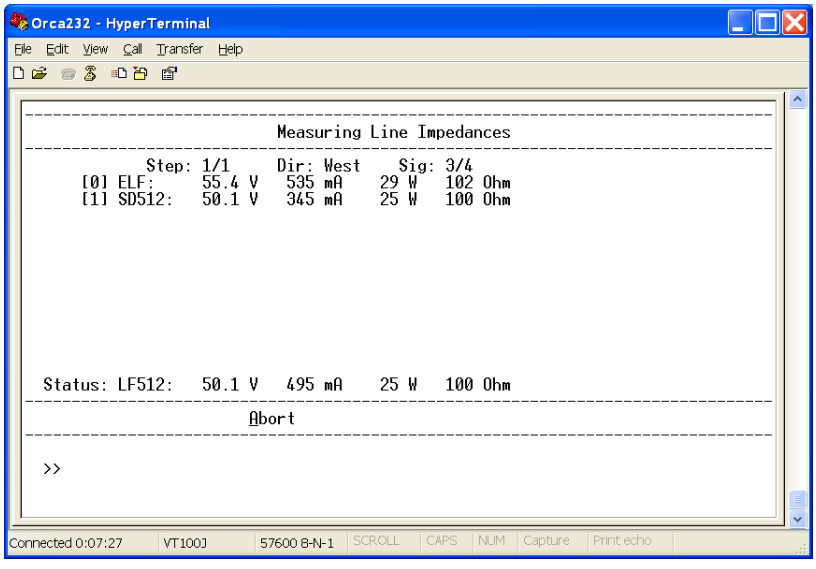


Figure 6-63 Reinstall – Measuring Line Impedances

3. Press **S** to start measuring the line impedances.
4. Press **F > ENTER** after the status becomes Done.

6.2.4.6 Save Setup

Use these instructions to save the programmed line direction, signals, and timers as the user setup settings. It can save up to 10 user setup in the system.

To save the programmed values as defaults

1. On the Main Operating screen, press **M > S**.
2. Enter the prefix number to save the settings (prefix 0-9).

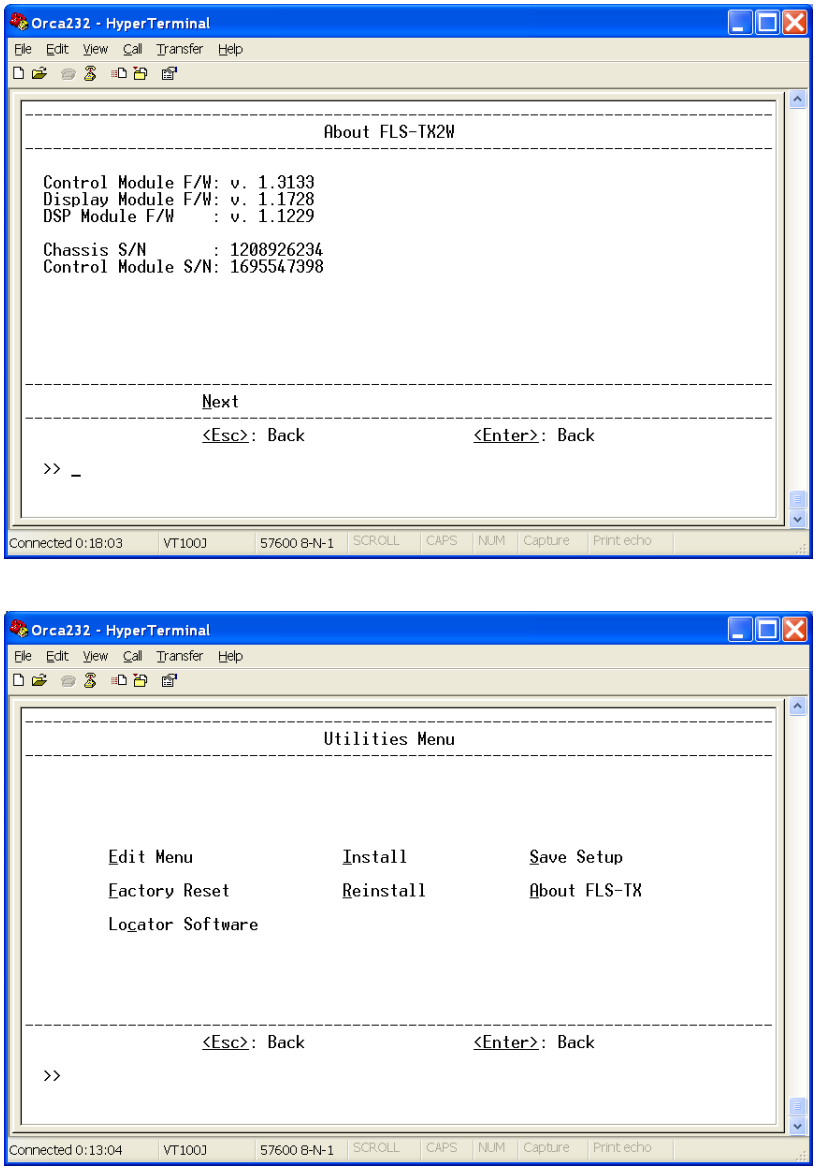


Figure 6-64 Save Setup

6.2.4.7 About FLX-TX

Use these instructions to view the transmitter firmware version, serial numbers.

To view the transmitter parameters

1. On the Main Operating screen, press **M > A** to view the transmitter firmware version and serial numbers.

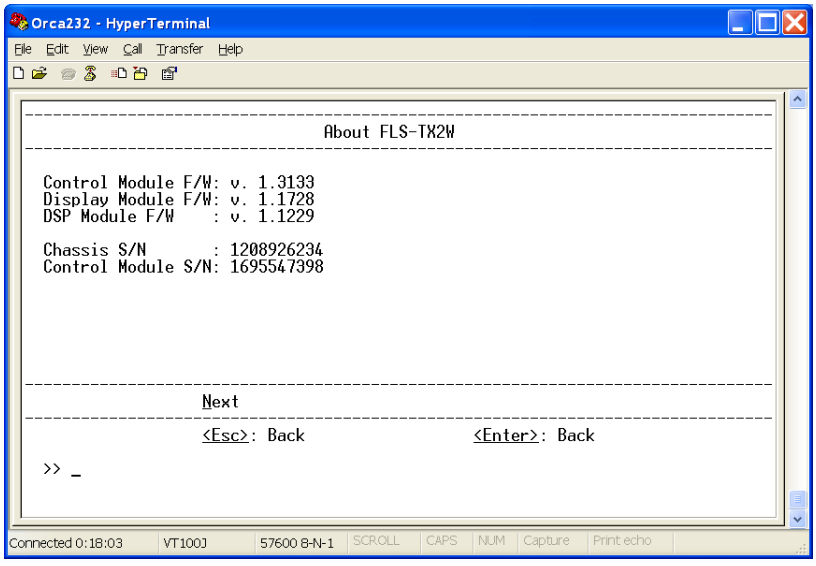


Figure 6-65 About FLS-TX (Screen 1 of 3)

2. Press **N** to view the status of the modules.

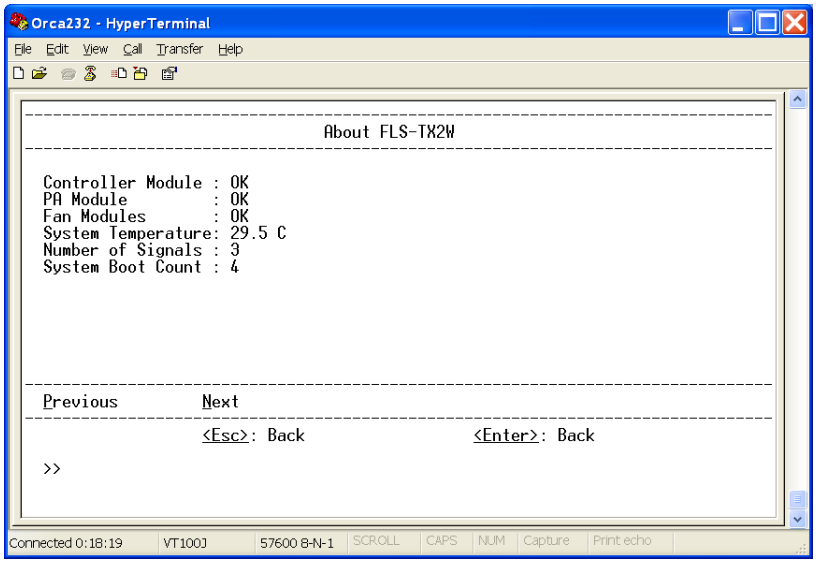


Figure 6-66 About FLS-TX (Screen 2 of 3)

3. Press **N** to view the station parameters.

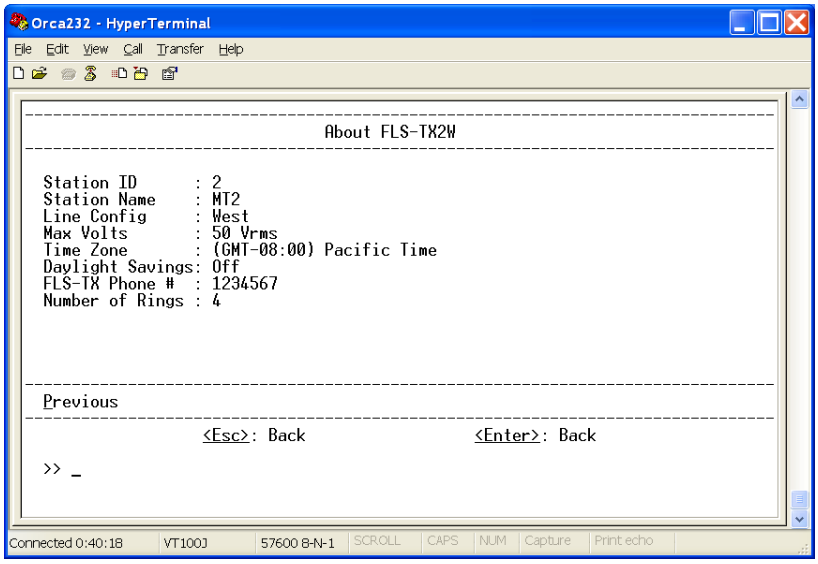


Figure 6-67 About FLS-TX (Screen 3 of 3)

4. Press **ESC** or **ENTER**.

Remote Transmitter Control

You can use any touch-tone telephone (land line or mobile) to remotely control the transmitter. Table 7-1 lists the telephone command codes for 2 ways FLS (FLS-TX2W) and Table 7-2 list for 4 ways FLS (FLS-TX4W). After entering the command code(s), you receive the indicated voice response(s) confirming the command.

NOTE

When controlling the transmitter with a touch-tone telephone, the hand-held display screen shows a telephone icon.

7.1 FLS-TX2W Telephone Remote Control

To control the FLS-TX2W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS, using a touch-tone telephone. The FLS will generate 3 beeps when it answers the call.
2. Enter the Station ID assigned to this FLS, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS confirms all functions with voice messages.
4. Enter further Function Codes.
5. Hang up (logout) phone by pressing the # key.
6. Disconnect your telephone call.

Function	Code	Speech
Login, Station ID followed by the * key Security access feature	xxxx*	“Welcome to the FLS unit” “Station xxxx” Report Unit Status “Enter Code” OR “FLS not available”
Toggle Active/Standby	00	“FLS {Standby / On}”
Select East Line	01	“East {Connection / not installed}”
Select West Line	02	“West {Connection / not installed}”
Select West & East Line	03	“West & East {Connection / not installed}”
Select LF1 (512Hz)	04	“Low Frequency one”
Select 8K (8192Hz)	05	“High Frequency Mode”
Select SD1 (256/512Hz)	06	“SD one Mode”
Select SD2	07	“SD two Mode”
Report Line Parameters	08	“FLS Standby” or “[Report Alarm], [xx volts, xxx milliamps], [xx ELF volts, xxx ELF milliamps], Resistance 123 Ohms”

Table 7-1 Telephone Remote Control Commands (FLS-TX2W)

Function	Code	Speech
Report Timer Value	09	“Timer 4 hours” or “Timer off” or “Time remaining x hours xx minutes”
Report Software Versions	10	“ARM Version x.xxxx, DSP Version x.xxxx, Handheld Version x.xxxx”
Select LF2	11	“Low Frequency two”
Select LF3	13	“Low Frequency three”
Select LF4	14	“Low Frequency four”
Select 273Hz	15	“Low Frequency 273”
Select SD3	18	“SD three Mode”
Select SD4	19	“SD four Mode”
Toggle ELF on / off	35	“ELF-x on” OR ELF {off / not available / no installed}”
Switch ELF ONLY on for 2h	62	“ELF-x Mode for 2 hours” OR “ELF not installed”
Switch ELF ONLY on for 4h	64	“ELF-x Mode for 4 hours” OR “ELF not installed”
Report Unit Status	*	“FLS Standby, {East / West / West & East} Connection, {Frequency / Mode}, [{ELF-x on / ELF off}]” OR “[Report Alarm], FLS On, Time remaining x hours xx minutes, {East / West / West & East} Connection, {Frequency / Mode}, [{ELF-x on / ELF off}]”
Hang-up	#	Goodbye
	Other	“Code not available / Invalid”

Table 7-1 Telephone Remote Control Commands (FLS-TX2W) (Cont’d)

7.2 FLS-TX4W Telephone Remote Control

To control the FLS-TX4W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS, using a touch-tone telephone. The FLS will generate 3 beeps when it answers the call.
2. Enter the Station ID assigned to this FLS, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS confirms all functions with voice messages.
4. Enter further Function Codes.
5. Hang up (logout) phone by pressing the # key.
6. Disconnect you telephone call.

Function	Code	Speech
Login, Station ID followed by the * key, Security access feature	xxxx*	“Welcome to the FLS unit” “Station xxxx” Report Unit Status “Enter Code” or “FLS not available”
Toggle Active / Standby	00	“FLS {Standby / On}”
Select LF1 (512Hz)	04	“Low Frequency one”

Table 7-2 Telephone Remote Control Commands (FLS-TX4W)

Function	Code	Speech
Select 8K (8192Hz)	05	“High Frequency Mode”
Select SD1 (256/512Hz)	06	“SD one Mode”
Select SD2	07	“SD two Mode”
Report Line Parameters	08	“FLS Standby” Or “[Report Alarm], [xx volts, xxx milliamps], [xx ELF volts, xxx ELF milliamps], Resistance 123 Ohms”
Report Timer Value	09	“Timer 4 hours” or “Timer off” or “Tim remaining x hours xx minutes”
Report Software Version	10	“ARM Version x.xxxx, DSP Version x.xxxx, Handheld Version x.xxxx”
Select LF2	11	“Low Frequency two”
Select LF3	13	“Low Frequency three”
Select LF4	14	“Low Frequency four”
Select 273Hz	15	“Low Frequency 273”
Select SD3	18	“SD three Mode”
Select SD4	19	“SD four Mode”
Toggle ELF on / off	35	“ELF on” or “ELF {off / not available / not installed}”
Select Line 1	21	“Line 1 {Connection / not installed}”
Select Line 2	22	“Line 2 {Connection / not installed}”
Select Line 3	23	“Line 3 {Connection / not installed}”
Select Line 4	24	“Line 4 {Connection / not installed}”
Select Line 1 & 3	25	“Line 1 & 3 {Connection / not installed}”
Select Line 2 & 4	26	“Line 2 & 4{Connection / not installed}”
Switch ELF ONLY on for 2h	62	“ELF Mode for 2 hours” or “ELF not installed”
Switch ELF ONLY on for 4h	64	“ELF Mode for 4 hours” or “ELF not installed”
Report Unit Status	*	“FLS Standby Line Connection, {Frequency / Mode},[ELF {on / off}” Or “[Report Alarm], FLS On Time remaining x hours xx minutes, Line Connection, {Frequency / Mode}, [ELF {on / off}]”
Hang-up	#	Goodbye
	other	“Code not available / Invalid”

Table 7-2 Telephone Remote Control Commands (FLS-TX4W) (Cont’d)

7.3 FLS-TX16W Telephone Remote Control

To control the FLS-TX16W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS, using a touch-tone telephone. The FLS will generate 3 beeps when it answers the call.
2. Enter the Station ID assigned to this FLS, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS confirms all functions with voice messages.
4. Enter further Function Codes.
5. Hang up (logout) phone by pressing the # key.
6. Disconnect your telephone call.

Function	Code	Speech
Login, Station ID followed by the * key Security access feature	xxxx*	"Welcome to the FLS unit" "Station xxxx" Report Unit Status "Enter Code" Or "FLS not available"
Toggle Active / Standby	00	"FLS {Standby / On}"
Select LF1	04	"Low Frequency one"
Select MF (8192Hz)	05	"High Frequency Mode"
Select SD1 (256/512Hz)	06	"SD one Mode"
Select SD2	07	"SD two Mode"
Report Line Parameters	08	"FLS Standby" Or "[Report Alarm], [xx volts, xxx milliamps], [xx ELF volt s, xxx ELF milliamps], Resistance 123Ohms"
Report Timer Value	09	"Timer {off / 4 hours}" or "Timer off" or "Time remaining x hours xx minutes"
Report Software Versions	10	"ARM Version x.xxxx, DSP Version x.xxxx, Hand-held Version x.xxxx"
Select LF2	11	"Low Frequency two"
Select LF3	13	"Low Frequency three"
Select LF4	14	"Low Frequency four"
Select 273Hz	15	"Low Frequency 273"
Select SD3	18	"SD three Mode"
Select SD4	19	"SD four Mode"
Toggle ELF on / off	35	"ELF-x on "or "ELF {off / not available / not installed}"
Line Status (individual)	401-416	"MUX N {on / off}" N=1…16
Turn all lines off	500	"MUX Line off"
Toggle line on / off	501-516	"MUX N {on/ off}",N=1…6
Line Status (identify all lines that are on)	520	"MUX Line {N1,N2,…} on", Nx = 1...16 OR "MUX Line Off"

Table 7-3 Telephone Remoter Control Commands (FLS-TX16W)

Function	Code	Speech
Switch ELF ONLY on for 2h	62	“ELF-x Mode for 2 hours” or “ELF not installed"
Switch ELF ONLY on for 4h	64	“ELF-x Mode for 4 hours” or “ELF not installed”
Report Unit Status	*	“FLS Standby, MUX Line Connection, {Frequency / Mode}, [ELF-x {on / off}]” Or “[Report Alarm], FLS On, Time remaining x hours xx minutes, MUX Line Status, {Frequency / Mode}, [ELF-x {on / off}]”
Hang-up	#	Goodbye
	other	“Code not available / Invalid”

Table 7-3 Telephone Remote Control Commands (FLS-TX16W) (Cont’d)

Alarm Messages

When an alarm condition occurs, the abbreviated alarm message listed in Table 8-1 appears on the hand-held display screen.

Screen message	Description
60Hz too High	The 60Hz noise voltage on the line exceeds 50 V.
ELF Current too High	The ELF signal current is too high.
ELF Current too Low	The ELF signal current is too low.
ELF Resistance too High	The resistance of the elf signal is too high.
ELF Resistance too Low	The resistance of the elf signal is too low.
Fan Failed	The Fan Module failed.
LS Current too low	The locate signal current is too low.
LS Resistance too High	The resistance of the locate signal is too high.
LS Resistance too low	The resistance of the locate signal is too high.
PA Current Overload	The current output of Power Amplifier module is overload.
Temperature too High	The transmitter's internal temperature is too high.

Table 8-1 Alarm Messages

Troubleshooting

This chapter describes the more common operational issues with possible solutions. Contact technical support if your situation is not described and you need further assistance.

WARNING

The high*voltage output and cable sheath may be at 300V AC or 450V DC. Be extremely careful when troubleshooting an energized transmitter.

Issue	Possible solution
Cable sheath has no signal.	• Verify that the transmitter is Active mode. • Verify that the programmed setting was not changed. • Verify that the output is designated for the correct line (East or West). • Turn the rear power switch off, and then carefully check the rear panel connections. • Verify that the external relays for the signal protection and ground control unit are energized. • Inspect the cable splice box to see if there is a signal on both sides of the splices. If not found, the problem might be in the splice area.
Hand-held display unit is blank.	• Touch the screen to resume. After 3 minutes of inactivity, the display screen turns off. • Verify that the cord connects to the “Hand-Held Display” connector.
LED status indicators change.	• For status definitions, see section 4.5, “LED Status Indicators.”
LEDs are off.	• Verify that the sear power switch is turned on. • Verify that the input cord is fully connected. • Verify that the AC or DC power source is working.
RS-232 port control fails.	• Verify that the correct type of cable connects to the RS-232 port. Direct connection to a computer requires a cross-over or null modem cable. • Verify that the computer port setting is 57,600bps, 8 data bits, no parity, and 1 stop bit. • Verify that the computer has a terminal emulator.
Fan Failed	The Fan Module failed.
LS Current too low	The locate signal current is too low.
LS Resistance too High	The resistance of the locate signal is too high.
LS Resistance too low	The resistance of the locate signal is too high.
PA Current Overload	The current output of Power Amplifier module is overload.
Temperature too High	The transmitter’s internal temperature is too high.

Table 9-1 troubleshooting Guidelines

Issue	Possible solution
Telephone remote access fails.	• Verify that you entered the correct telephone number and unit ID. • Verify that the transmitter is not being locally controlled or downloading firmware. These actions disconnect any attempts for remote control. • Verify that the telephone line connects to the modem. ()

Table 9-1 Troubleshooting Guidelines (Cont'd)

Maintenance

This chapter contains the following sections:

- Calibration
- Removing or Installing Modules
- Cleaning

NOTE

Read the General Safety instructions before starting any maintenance procedure.

10.1 Telemetry Interface

Only the Amplifier Channel module requires calibration. For information, contact technical support.

10.2 Removing or Installing Modules

This section describes how to remove and install the transmitter modules.

CAUTION

These modules are sensitive to electrostatic discharge (ESD). Do not touch the board components.

To remove a module

1. Turn the transmitter's rear power switch off.
2. Use a Philips-head screwdriver to loosen to two side screws.
3. Open (unlock) the module's ejector handles by pressing in the red tabs and then moving the handles to the outside position. The fan module has top and bottom brackets built into the face plate.
4. Hold the handles and slowly pull out the module.

To install a module

1. Turn the transmitter's rear power switch off.
2. Open (unlock) the module's ejector handles by pressing in the red tabs and then moving the handles to the outside position
3. Hold the handles and carefully place the module into the proper slot's side guide rails.
4. Slowly push the module into the slot opening until the face plate is flush with the classics.
5. Lock the handles by moving them to the inside position against the face plate.
6. Use a Philips-head screw driver to attach the two side screws.

10.3 Cleaning

Routine cleaning should not be necessary because of the installation environment. However, if cleaning is necessary, turn the rear power switch off and then use a slightly damp cloth. Do not let water drip into the chassis or the hand-held display unit. Do not use cleaning chemicals.

Technical Support

Before contacting Vivax-Metrotech technical support, have the following information available: station ID, station name, and chassis serial number (optional).

	Contact info
Address	3251 Olcott Street Santa Clara, CA 95054
Tel (Toll Free)	1-800-446-3392
Tel (Direct)	408-734-1400
Fax	408-734-1415
E-mail	techsupport@metrotech.com
Hours	8:00 A M to 5:00 P M (PST)

United State of America

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Email: sales@vxmt.com

Application Support:
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Email : applications@vxmt.com

Service & Repairs:
T/Free : +1-800-638-7682
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All Other Department:
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Website : www.leidi.com
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Acronyms

This chapter defines the acronyms used in this document.

ELF	Extreme Low Frequency signals
FLS	Fiber Locating System
LS	Locate Signal
SD	Signal Direction Signals

Glossary

This chapter defines useful terms.

Active locating	Locating an underground line by means of signals generated by the transmitter.
Center line	The imaginary line that extends along the ground directly over the line to be traced. Also, the center of the display that indicates the locator is to the left or right of the line.
Line direction	East, West, or Line 1…16
Common-bonded conductors	Lines or ground conductors, such as telephone lines, power cables or pipes that are electrically connected together at some point. Conductors common-bonded to the target conductor carry the signal, making it difficult to locate the target beyond the common-bond.
Current measurement	A feature on the receiver, whereby an indication is given of the current in the target line. The indication of current does not change as the depth of the line changes. Although the indicated current decreases slowly as the distance of the receiver from the transmitter increase, an abrupt change in the indicated current may be caused by a lateral, “T” or damage to the line. Current measurement may also be used in a crowded environment to confirm the signal is on the target line rather than coupled to an adjacent utility.
Frequency	The electromagnetic field produced by the transmitter reverses its direction itself many times each second. The frequency of the signal is the number of these cycles completed in one second. Proper frequency selection is important for successful locating.
Frequency allocation and maximum power	The permissible use of the electromagnetic frequency spectrum mandated by the Federal Communications Commission (FCC). As given in the Code of Federal Regulations, 47 (Telecommunications), Part 15 section 15.213. The FCC regulates the frequencies and power levels that may be used in the equipment for locating underground lines. Below 9 kHz any power level may be used. For 9-45 kHz a maximum of 10 watts of power may be generated by the transmitter. For 45-490 kHz a maximum of 1 watt of power may be generated by the transmitter.
Gain	The amount the signal at the antenna of the receiver increases before it is processed and displayed. The signal generated by the current in the target line is very small, and it must be increased in size many times before it can generate a perceptible indication on the display or sound in the receiver.

13 Glossary

Grounding	A return path for electrical current through the soil. For example, in the direct connect mode grounding is accomplished by pushing a grounding rod into the ground. In other cases a line or pipe that is sticking out of the ground may be used. Grounding provides a continuous and complete path for the signal current to travel over the line and back to the transmitter. Without such a path the current does not flow, and the receiver receives no signal.
Job	A scheduled task, such as updating the firmware.
Magnetic field	The force field around a permanent magnet or a conductor in which is flowing electrical current. It is the magnetic field that is detected by most electromagnetic locators.
Station	Transmitter unit.
Target line	The underground facility that is the target of the location activity. It may be a power line, gas line, water pipe, telephone line, or other conducting medium buried in the ground.
Transmitter	A device that generates a current in an underground line. The transmitter is used with a receiver that is tuned to the same frequency.
VT100	This is the terminal emulator (modem).

Illustrations used in the preparation of this manual will inevitably show some resemblance to similar illustrations from other Manufacturers-some manufacturers have given permision for the use of their graphics (Vivax-Metrotech &Seba) other manufacturers such as Radiodetection is given credit for these use. This statement is intended to attribute such credit.

Disclaimer: All product availability or product accessory information is subject to change without notice.

Notes: