VIVAX METROTECH

Fiber Optic Locate System 2 (FLS-2) User Handbook

(English Edition)

Version V1.5

P/N:4.04.000052

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When hooking to live power through an inductive clamp, be certain the clamp connects around the power line, not directly onto the power line. Please follow your own company's safety standards and OSHA requirements.
This product complies with the Class A emission requirements of the FCC Part 15 and standard EN 55011. This product complies with the EMC requirements of standard EN 61000-6-2.

CE

Metrotech has received ISO 9001:2015 Quality Management System Certification. Metrotech adheres to the quality standard guidelines of ISO 9001:2015 and ensures quality in its design/development, production, installation, and service disciplines.

Table of Content

1. General Safety

This document contains basic advice for the installation and operation of the Vivax-Metrotech FLS-2 transmitter. Always follow these safety instructions when handling the transmitter, its modules, or when troubleshooting.

NOTE

The manufacturer is not liable for damages to materials or harm to 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 a potential influence on communications and control systems such as traffic control and railroad crossings.

- *Intended application*
  A 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 from 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-swappable.

- *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*
  Vivax-Metrotech Corporation must only do repairs and service.

2. Service and Support

2.1 Serial Number and Software Revision Number

Always quote your transmitter model number, station ID, station name, and chassis serial number (optional) and software revision number when requesting product support. They can be found as follows: (for reference only).

NOTE:

Serial Number: The transmitter serial number can be found on a label fitted on the lower-left corner of the top of the chassis. The serial number for the hand-held unit is found on the back of it.

Software Revision Number: Both the transmitters and hand-held units firmware revision can be found in the About section of the hand-held unit.

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

1	Serial number

2.2 Distributors and Service Centers Closest to You:

Worldwide Sales Offices and Service Centers

World Headquarters, United States of America

Vivax-Metrotech Corporation
3251 Olcott Street,
Santa Clara, CA 95054, USA
Website : www.vivax-metrotech.com

Sales & Sales Support:
T/Free : 800-446-3392
Tel : +1-408-734-1400
Fax : +1-408-734-1415
Email : SalesUSA@vxmt.com

Service & Repairs:
T/Free : 800-638-7682
Tel : +1-408-962-9990
Fax : +1-408-734-1799
Email : ServiceUSA@vxmt.com

Canada

Vivax Canada Inc.
41 Courtland Ave Unit 8,
Vaughan, ON L4K 3T3, Canada

Tel : +1-289-846-3010
Fax : +1-905-752-0214
Website : www.vivax-metrotech.com
Email : SalesCA@vxmt.com

Germany

Metrotech Vertriebs GmbH
Am steinernen Kreuz 10a
D-96110 Schesslitz

Tel : +49 954 277 227 43
Website : www.vivax-metrotech.de
Email : SalesEU@vxmt.com

Central/South America and the Caribbean

Ventas para América Latina
3251 Olcott Street,
Santa Clara, CA 95054, USA

T/Free : 800-446-3392
Tel : +1-408-734-1400
Fax : +1-408-743-5597
Website : www.vivax-metrotech.com
Email : LatinSales@vxmt.com

France

Vivax-Metrotech SAS
Technoparc - 1 allée du Moulin Berger,
69130 Ecully, France

Tel : +33(0)4 72 53 03 03
Fax : +33(0)4 72 53 03 13
Website : www.vivax-metrotech.fr
Email : SalesFR@vxmt.com

United Kingdom

Vivax-Metrotech Ltd.
Unit 1, B/C Polden Business Centre,
Bristol Road, Bridgwater,
Somerset, TA6 4AW, UK

Tel : +44(0)1793 822679
Website : www.vivax-metrotech.com
Email : SalesUK@vxmt.com

International Distributors and Service Centers

Australasia

Vivax-Metrotech AUS
Unit 1, 176 South Creek Road,
Cromer NSW 2099, Australia

Tel : +61-2-9972-9244
Fax : +61-2-9972-9433
Website : www.vivax-metrotechaus.com
Email : sales@vxmtaus.com
service@vxmtaus.com

China

Leidi Utility Supply (Shanghai) Ltd.
No. 780, Tianshan Rd,
Shanghai, China 200051

T/Free : 4008-206-719
Tel : +86-21-5235-3001
Fax : +86-21-5235-8365
Website : www.leidi.cn
Email : info@leidi.cn

3. 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 3-1 Document Convention 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 3-2 Symbol Descriptions Used

3 Document Conventions

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

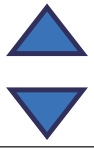
Symbol	Meaning	Descriptions
	Mode selected	The button will have gray text over a black background when the mode is selected.
	Mode enabled	When the Active button has a blue background, this mode is available, meaning the transmitter is currently in Standby mode. When the Standby button has a green background, this mode is available, meaning the transmitter is currently in Active mode.
	Option enabled	The button for an enabled option appears with 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 character 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.
	Shut down	When selected, the options to restart or power off the unit are shown.

Table 3-3 Symbol Descriptions in Hand-Held Screen Display

4. Introduction

This chapter contains the following sections:

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

4.1 System Overview

The Vivax-Metrotech FLS-2 transmitter and vLoc series receivers work together to locate underground fiber optic cables. This user manual covers the FLS-2 transmitter. For instructions about using the vLoc series receivers, see their instruction manuals.

The FLS-2 transmitter sends a predefined signal that is lower than 10 kHz along the metallic sheath surrounding the fiber optic cable, generating an electromagnetic field for the length of the cable.

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.

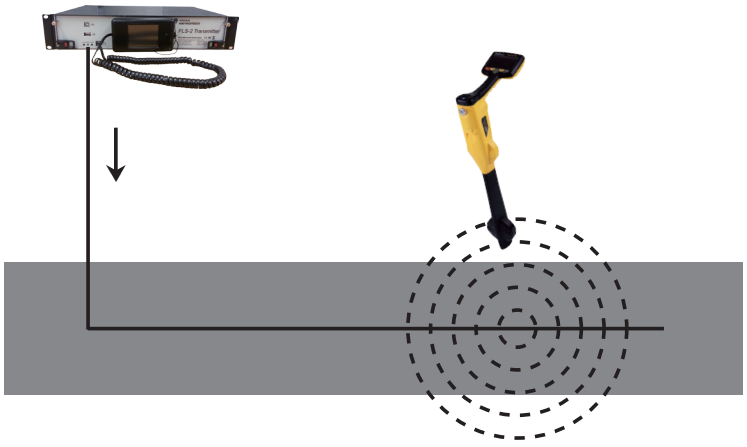


Figure 4-1 FLS-2 Transmitter and Receiver

4.2 Features

The FLS-2 design provides easy access to all major modules and operating features.

The following are the features of the FLS-2 transmitter:

- Attached hand-held display unit with a touch screen.
- One front-accessible pull-out module.
- Compatible with 19-inch, 23-inch, and 24-inch 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 system.
- 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.
  - Rear RJ-45 Ethernet connector, a LAN, and a computer.
- Remote control access by using:
  - Any touch-tone telephone (landline or mobile).
  - Remote control access via rear RJ-45 Ethernet connector, a LAN, and a computer or a Smart Phone.
- Includes an internal modem to connect to the telephone line. This connection allows you to remotely control the transmitter and monitor the transmitter operation by a computer.
- Includes a telemetry interface for remote control, monitoring, and reporting.

4.3 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 Hz and 512 Hz)
Locate Signal (LS):	LF512 (512 Hz)
Extremely Low Frequencies (ELF):	• ELF10 • Other ELFs available upon request

Note: Other frequencies available

Table 4-1 Predefined Transmitter Frequencies

4.4 What's in the Box

Figure 4-2 FLS-2 Transmitter – What's in the box

No.	Description
1	FLS-2 transmitter (with 19-inch brackets installed)
2	Hand-held Control Unit with Stylus
3	AC or DC power cord, per order
4	Mounting bracket sets for 23-inch or 24-inch installation (with hardware)
5	Operating manual

4.5 Modular Design

The transmitter is a 2U chassis that contains removable front and rear modules. Figure 4-3 shows the locations of the front-accessible module and where to store the hand-held display unit when not being used.

NOTE

For information about the modules, see section 5.4, "Overview of the Modules."

Figure 4-3 FLS-2 Transmitter – Front and Side View

No.	Description
1	RS232 Connector
2	USB Host connector (for future use)
3	USB Host connector cover
4	Hand-Held display unit
5	Main control module
6	LED • Fail (Red) • Status (Yellow) • Power (Green)

Figure 4-4 shows the locations of the rear-accessible modules and where to connect the external ground conductor for DC-powered systems.

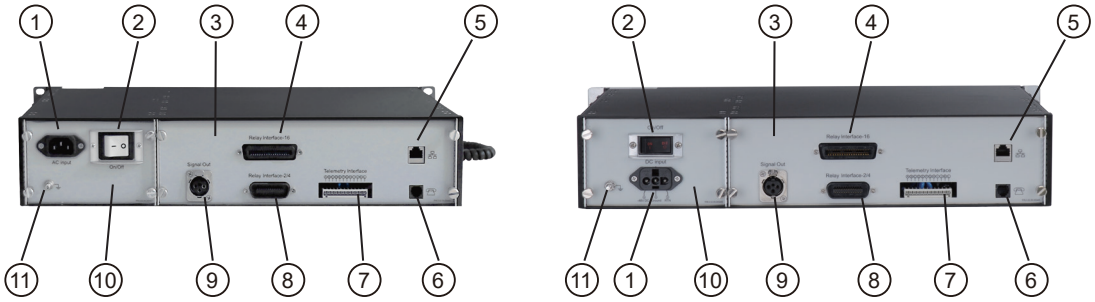


Figure 4-4 FLS-2 Transmitter Rear View (AC-Left Figure., DC-Right Figure.)

No.	Description
1	Power Input Connector
2	Power On/Off Switch
3	Rear Module
4	Relay Interface for 16-ways
5	RJ-45 Network Connector
6	RJ-11 Phone Line Connector
7	Telemetry Interface
8	Relay interface for 2-way or 4-way
9	Signal Output Connector
10	Power Module (AC or DC, depending on the configured system)
11	Ground Stud

5. 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

5.1 Operating Modes

Table 5-1 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 or Ethernet.

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

Table 5-1 FLS-2 Transmitter Operating Modes

5.2 Controlling the Transmitter

Figure 5-1 shows the various methods for controlling the transmitter. For details, see Chapter 6, "Local Transmitter Control," and Chapter 7, "Remote Transmitter Control."

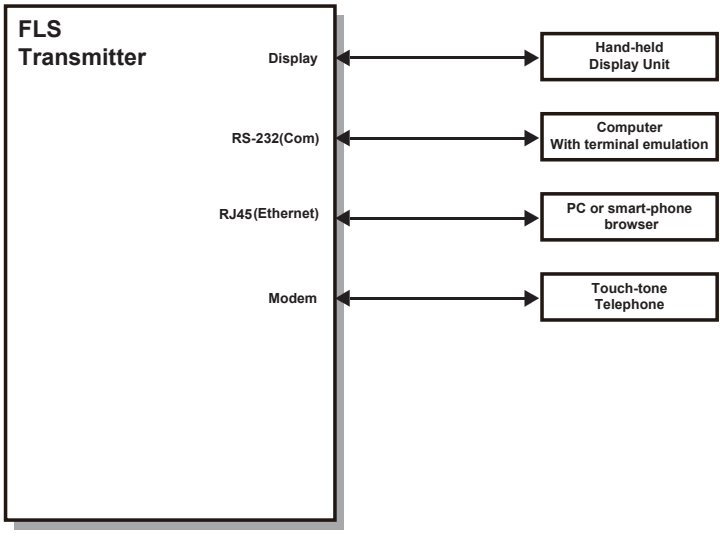


Figure 5-1 Methods of Controlling the Transmitter

5.3 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 5-2. When not in use, store the display unit on the bar that is in front of the Main Control module.

NOTE

For information about using the attached hand-held display unit, see section 7.1, "Using the Hand-Held Display Unit."

5.4 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 11.2, "Removing or Installing Modules."

5.4.1 Main Control Module

The transmitter has a main control module installed horizontally in the front of FLS-2. It is secured by two screws and two ejector's handles. Figure 5-2 shows the main control module.

This module mainly controls the transmitter. It contains the firmware, 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 5-2 Main Control Module

5.4.2 Power Supply Module

The FLS-2 provides the flexibility to choose either AC or DC power supply. It is located at the back of the transmitter and secured by screws.

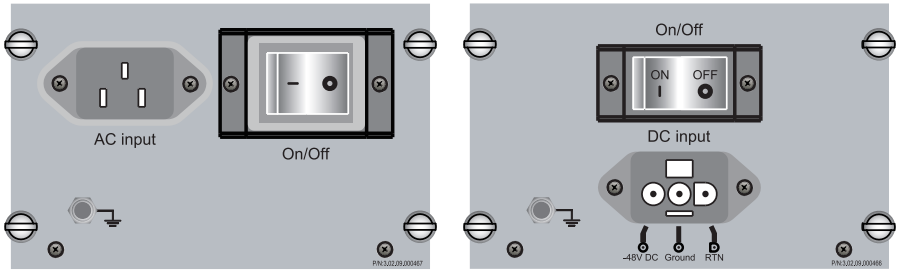


Figure 5-3 AC and DC Power Supply Module

5.4.3 Rear Module

The FLS transmitter has the option of 2-way, 4-way, or 16-way transmissions. This module has the RJ-11 phone line connector for the modem, RJ-45 network connector for local area network (LAN) connection, a connector for 2-way or 4-way relays, and the connector for the 16-way relay.

This module also contains the high-voltage output connector, relay interface, and the telemetry connector. For information about the telemetry connector, see section 6.8. "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.

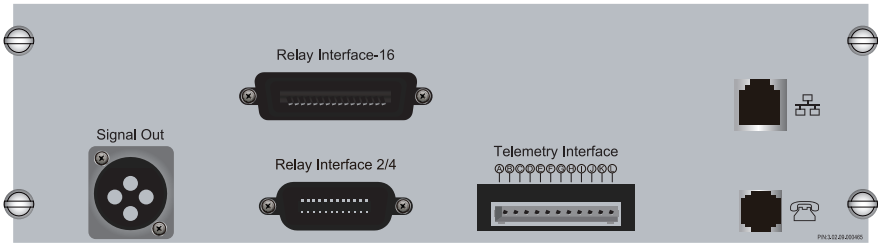


Figure 5-4 Rear Module

5.5 LED Status Indicators

Table 5-2 Describes the module status indicated by the displayed LEDs. Before removing any module, turn the rear power switch off.

LED	LED Colors	Description
Power	None	The module is off.
	Solid green	The module is on.
Status	Solid yellow	An alarm was triggered. **NOTE: For detail, see Chapter 6, "Alarm Messages."**
	Blinking yellow	Software updating or flash programming, the phone ringing.
Fail	Solid red	System failure – over current or temperature.

Table 5-2 LED Status Indicator

The LED colors shown are after the system boot up, which takes approximately. 30 to 60 seconds. There may be some flashing or changing LEDs during the system boot-up.

6. Installing the 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
Read the General Safety instructions and this entire chapter before installing the transmitter.

6.1 Installation Site

The installation site for the transmitter should meet the environmental and power requirements listed in section 4.6, “FLS-2 Transmitter Specifications” of this manual.

6.2 Required Tools and Test Equipment

Before installing the transmitter, ensure that you have the items listed in Table 6-1.

Name	Image
Crescent wrench, or 7/16 open-end wrench or nut drive	
Cutters	
#2 Philips-head Screwdriver	
Voltmeter	

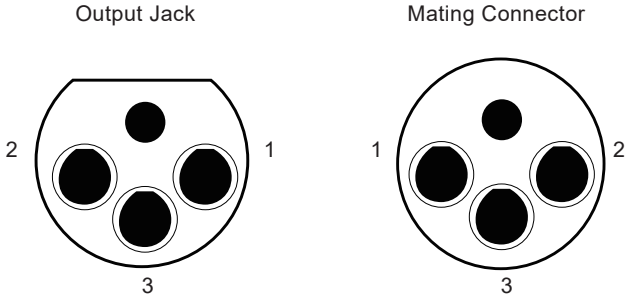
Table 6-1 Tools and Test Equipment

6.3 Output Connector Pin-Out

Figure 6-1 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 a minimum of 18 AWG conductors rated minimum 600 V, minimum 80ºC, and the colors specified in Figure 6-1.

NOTE
Discharge the above if the 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 6-1 Pin-Out for the Output Jack and Mating Connector

6.4 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-inch, 23-inch, or 24-inch rack. The FLS-2 transmitter will ship with the 19-inch standard rack mounting brackets 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-inch (12.7mm) increments. Figure 6-2 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.

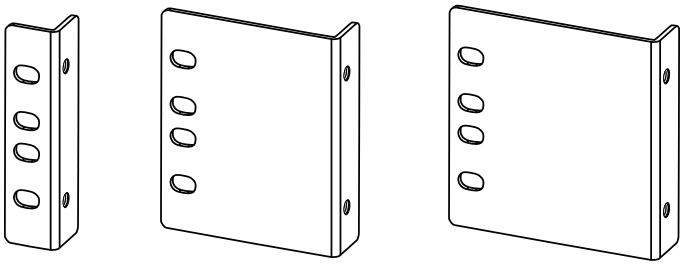


Figure 6-2 Adjustable Rack Mounting Brackets (19-inch, 23-inch, and 24-inch).

6.5 Installing or Replacing the Transmitter

This section describes how to install a new FLS-2 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.

6.5.1 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 6.4, “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 a minimum of 12 AWG.

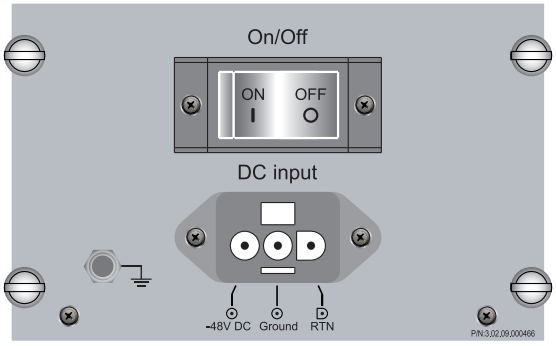


Figure 6-3 Rear DC Ground Connection of Ground Stud

3. Plug the connector end of the input power cord into the rear input connector.
4. Use the AC or DC cord shipped with the system.
5. Plug or attach the other end of the input power cord to the appropriate power source.

CAUTION
The connection of the transmitter to the power sources should be made ONLY by authorized personnel.

6. Attach the coiled cord for the hand-held display unit to the front “Display” connector, and then place the unit on the front storage bracket.
7. Attach the phone line to the RJ11 socket or the Ethernet cable to the RJ45 socket.
8. Attach the connector end of the assembled output cable to the rear high-voltage output connector if not using the relay box.
9. Figure 6-1 shows the output connector pin-out.

6.5.2 Replacing a Rack Mounted Transmitter

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 from the rack 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 6.4, “Attaching the Rack Mounting Brackets” and section 6.5.1 “Installing the Transmitter.

6.6 NEBS Specific Installation

NEBS (Network Equipment Building System) describes the environment of a typical United States RBOC Central Office. NEBS is the most common set of safety, spatial, and environmental design guidelines applied to telecommunications equipment in the United States. It is an industry requirement.

WARNING
The intra-building ports of the FLS-2 or subassembly are suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building ports of the FLS-2 or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 6) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

6.6.1 NEBS Installing the Transmitter with grounding

Follow these instructions when installing the transmitter into a rack with grounding:

1. Select the right bracket set for the rack width.
2. The unpainted sides (facing chassis and rack) of brackets should be cleaned and coated with an anti-oxidant solution.
3. Attach the bracket on each side of chassis with the supplied screws.
4. Attach the rack mounting brackets to the rack with paint piercing washer.
5. For instructions, see section 6.4, “Attaching the Rack Mounting Brackets.” Have one person lift and hold the transmitter in the selected rack position.
6. Have the second person secure each mounting bracket to the rack by using the Philips-head screwdriver and two thread forming screws per bracket.

Other details can refer to 6.5 Installing or Replacing the Transmitter.

6.6.2 NEBS Requirements

- The FLS-2 shall be located in a restricted access location were only crafts personnel are allowed access.
- The FLS-2 shall be installed and connected to the CBN (Common Bonding Network).
- The FLS-2 is suitable for connection to the Central Office.
- The battery returns of the FLS-2 shall be connected as DC-I (Isolated DC return).
- The FLS-2 shall be grounded via a copper ground conductor.
- All bare grounding connection points to the FLS-2 shall be cleaned and coated with an anti-oxidant solution before connections are made.
- All surfaces on the FLS-2 that are un-plated shall be brought to a bright finish and treated with, and anti-oxidant solution before connections is made.
- All non-conductive surfaces on the FLS-2 shall be removed from all threads and connection points to ensure electrical continuity.
- The FLS-2 utilizes two side rack mounting brackets with two thread-forming screws and two paint-piercing washers on each side to secure it on the frame. The grounding is through the rack frame.
- The FLS-2 is capable of operating from 48 Vdc at a maximum current level 3 A with a 10 A built-in circuit breaker protection.

6.7 Testing the Transmitter

After installing the transmitter, line protection, and control equipment, conduct the following tests to ensure that the transmitter is operating properly:

- Check the modules' LEDs for normal operation per section 5.5, "LED Status Indicators."
- Use a receiver to locate the energized line to ensure that the signal transmits correctly.

6.8 Telemetry Interface

Table 6-2 lists the pin designations of the rear telemetry interface connector. The connections are in pairs, such as A-B, C-D, and so on. Use 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

Table 6-2 Telemetry Connections

7. 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.

7.1 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 40 sec: product model (FLS-2), 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 three minutes of inactivity, the display unit enters a sleep mode with a dimmed screen. Touch the screen to resume use.

This section discusses the following:
- Main Operating Screen.
- Operating Mode Menu.
- Installation Sequence.
- Utilities Menu.
- Edit Menu.

7.1.1 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 signals.

When the transmitter's line configuration is W&E (FLS-2-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.

Four-way (FLS-2-TX4W) and 16-way (FLS-2-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 5.1 "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.

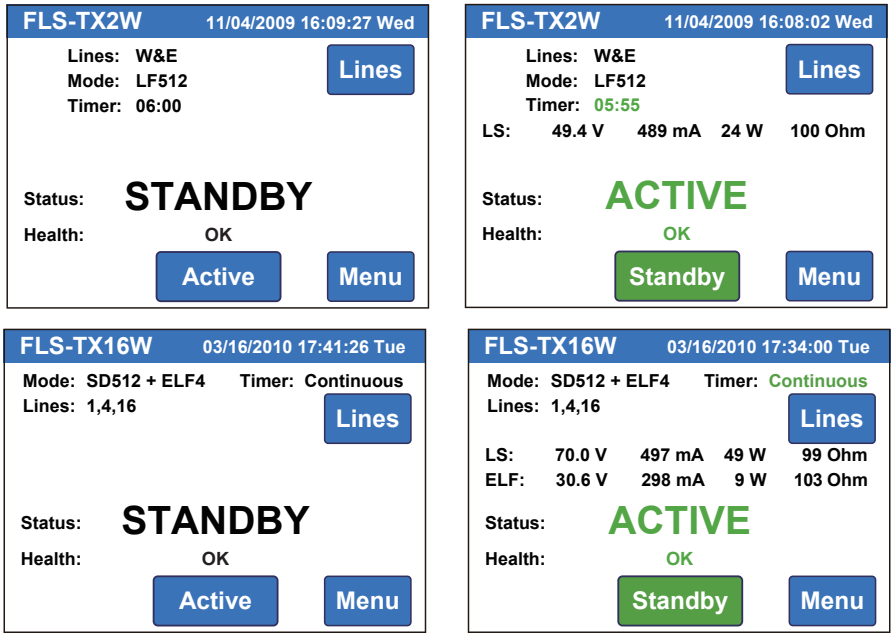


Figure 7-1 Main Operating Screen (Standby Mode and Active Mode)

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 exceeds or falls below the preset limits, the display will show an Alarm Screen.

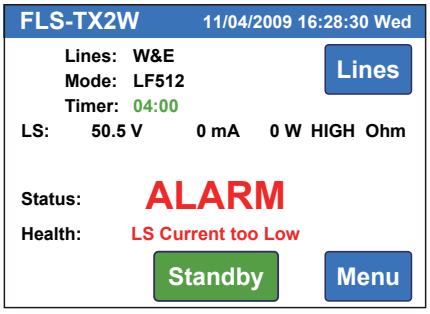


Figure 7-2 Alarm Screen

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.

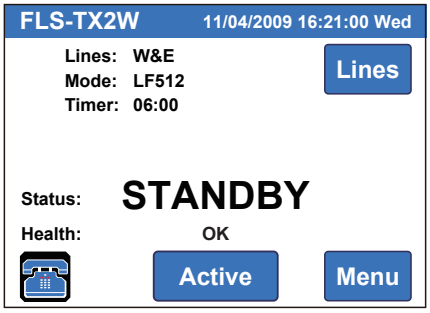


Figure 7-3 Main Operating Screen – Phone Icon

Main Operating Screen during RS-232 connection

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

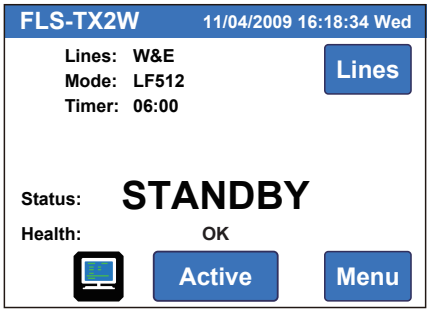


Figure 7-4 Main Operating Screen – Phone Icon

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 a modem dial-in connection.

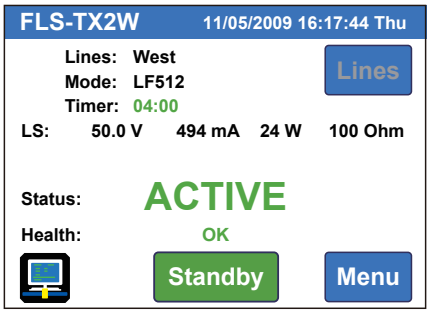


Figure 7-5 Main Operating Screen – Modem Icon

7.1.2 Operating Mode Menu

In this section, you learn how:

- To select a line
- 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

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

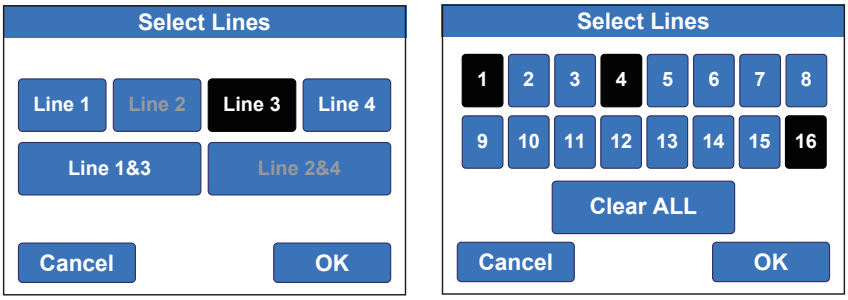


Figure 7-6 Select Lines (FLS-2-TX4W) / (FLS-2-TX16W).

For the two ways FLS, pressing “Lines” will toggle between the installed lines (East, West, or East & West).

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.

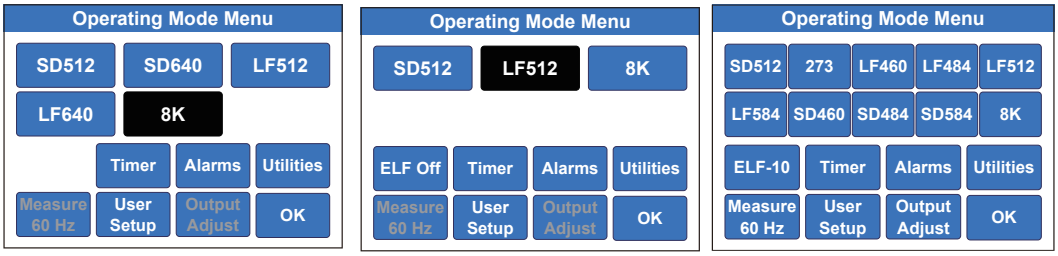


Figure 7-7 Operating Mode Menu – 5, 3, and 10 frequencies

2. 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**.

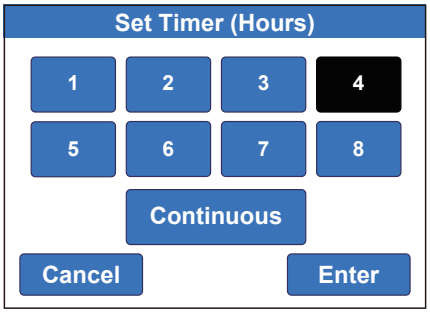


Figure 7-8 Set Timer (Hours)

2. Select the hours for the FLS-2 to operate. To select a 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**.

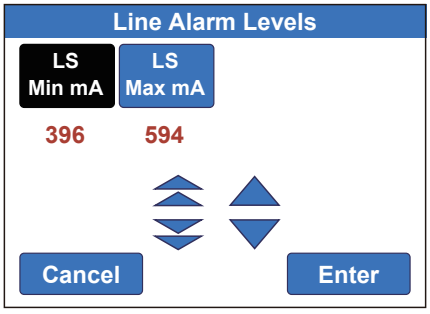


Figure 7-9 Line Alarm Levels

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**.

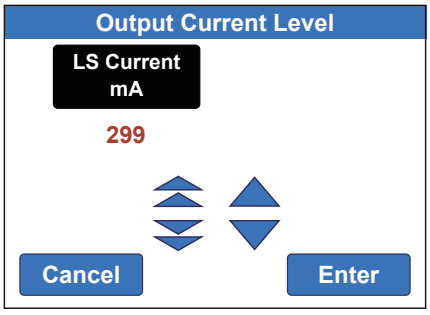


Figure 7-10 Output Current Level

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.

NOTE: This feature is available only in the ACTIVE mode!

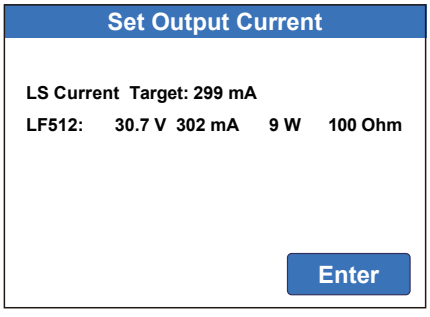


Figure 7-11 Set Output Current

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**.

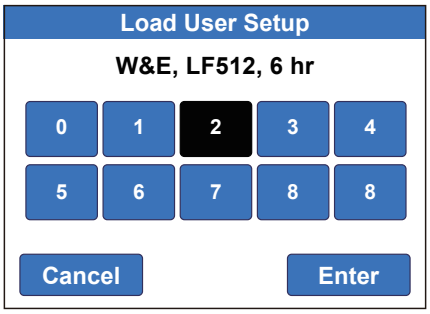


Figure 7-12 Load User Setup

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.

7.1.3 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 can repeatedly click Prev and Abort buttons to return to the Main Operating Screen.

To select the line frequencies (Reinstall)

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

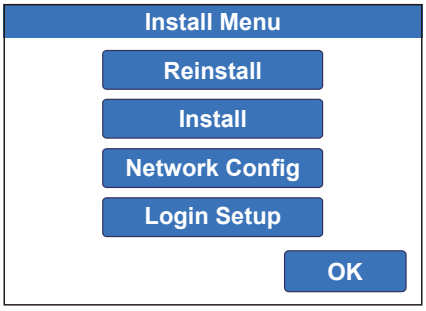


Figure 7-13 Install Menu

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

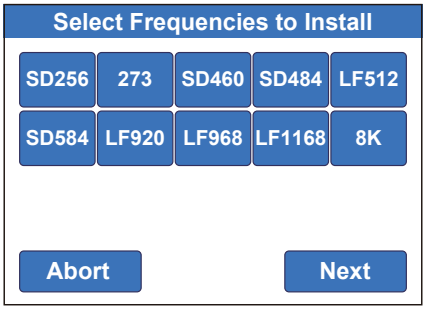


Figure 7-14 Select Frequencies to Install

3. Click **Start** to install.
4. When the bottom counter stops, it will automatically go back to the Main Operating Screen. You can also click the Abort button to abort the installation sequence at any time or click the Finish button to accept the installation manually when the button is enabled. You must complete this step to install the frequency selection.

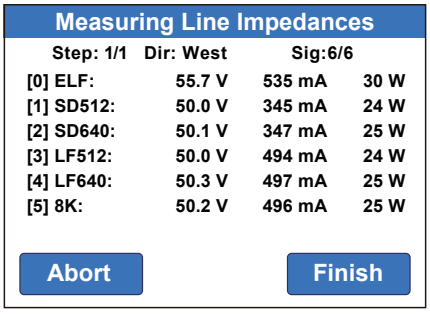


Figure 7-15 Measuring Line Impedances

NOTE: All the other setup information is kept the same.

To install the station ID and name (Install)

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

Figure 7-16 Unit not installed

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

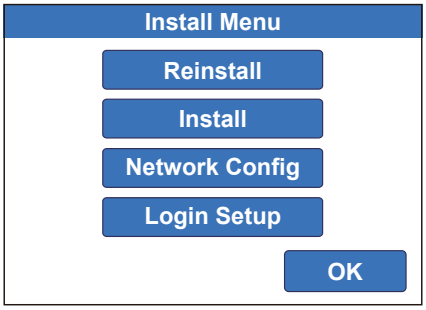


Figure 7-17 Install Menu

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

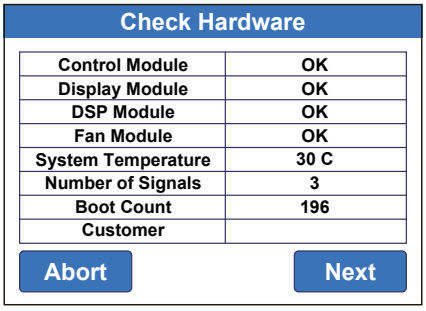


Figure 7-18 Check Hardware

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

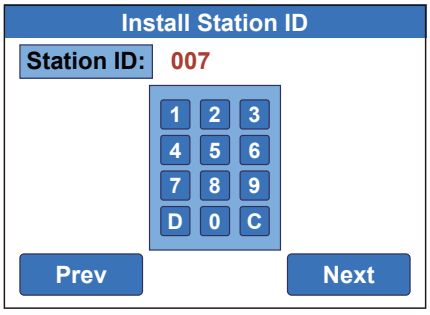


Figure 7-19 Install Station ID

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

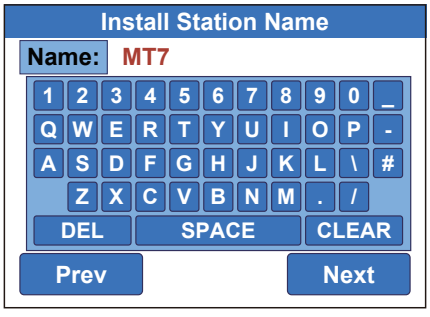


Figure 7-20 Install Station Name

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.

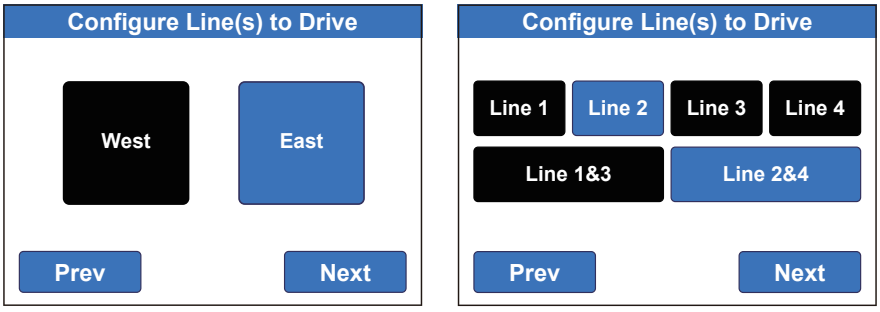


Figure 7-21 Configure Line(s) to Drive two ways (FLS-2-TX2W) and four ways (FLS-2-TX4W)

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

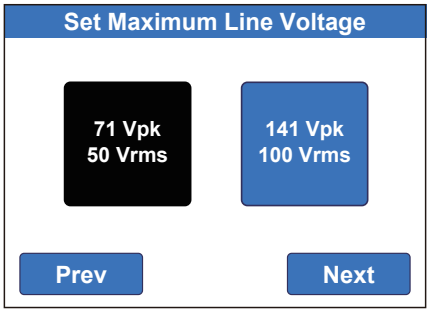


Figure 7-22 Set Maximum line Voltage

5. Click **Yes** to install Extremely Low Frequency (ELF), click **No** for not installing ELF (only available for system with ELF option installed).

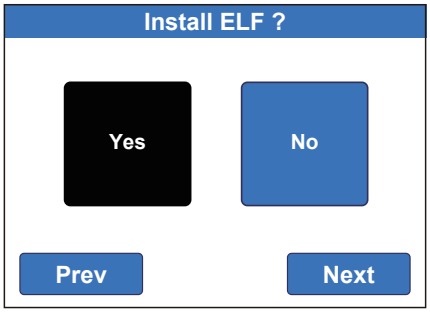


Figure 7-23 ELF Installation Confirmation Screen

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.
3. If the network cable is connected, you can click **Sync Time** to synchronize the time through the internet.

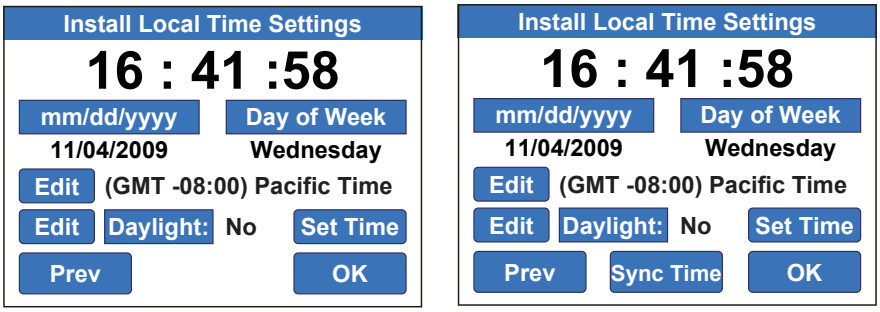


Figure 7-24 Install Local Time Settings

4. Click **Edit** next to Time Zone, click **Up** or **Down** to select the time zone, and then click **Enter.**
5. Click **Edit** next to Daylight Savings, and then click **No** or **Yes**.
6. Click **Set Time** to set the current time manually. A **Set Local Time** screen will display. 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-2-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**.

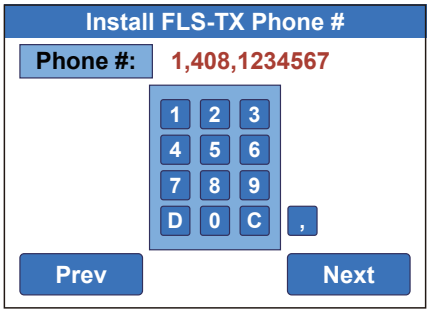


Figure 7-25 Install FLS-2-TX Phone #

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**.

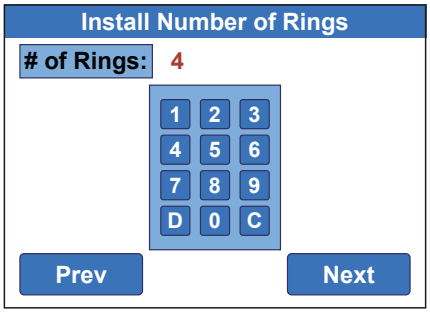
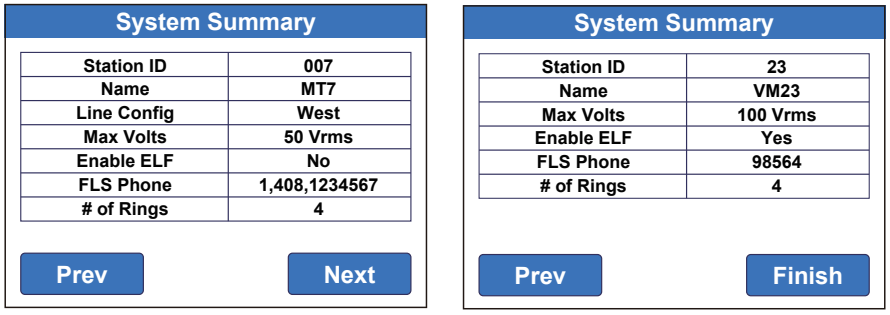


Figure 7-26 Install Number of Rings

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



FFLS-2 TX 2W / 4W FLS-2 TX 16W

Figure 7-27 System Summary

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

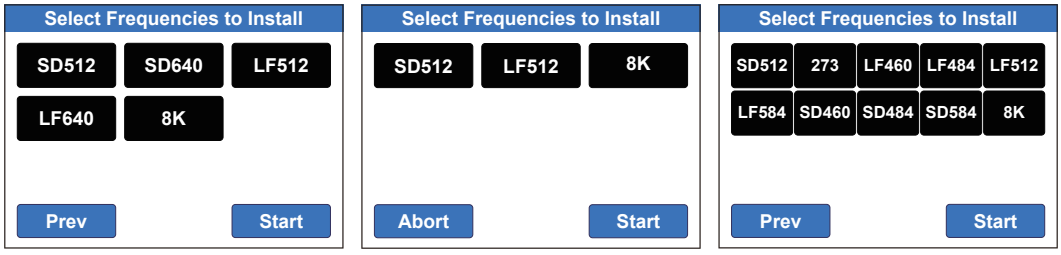


Figure 7-28 Select Frequencies to Install

6. Select one or more frequencies, and then click **Next**.
7. Click **Start** to measure the line impedances. If you click **Abort** after starting, you return to the Main Operating Screen.
8. 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.

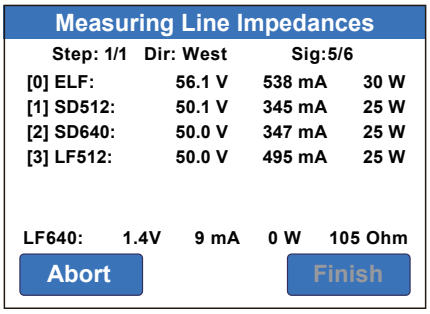


Figure 7-29 Measuring Line Impedances (Finish)

Network Configure

1. To Setup the network and IP address, please go to the **Utilities** menu, click **Install.**

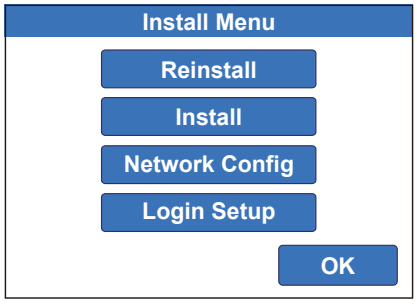


Figure 7-30 Install Menu

2. Click the **Network Config**, in this screen you can choose either DHCP or IP Address to configure the network

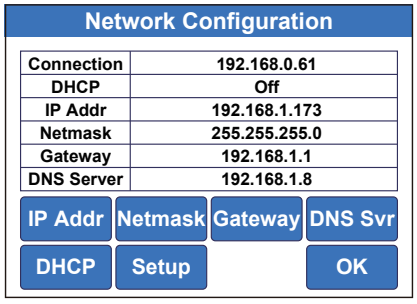


Figure 7-31 Network Configuration

3. Setup getting an IP address from the DHCP server.
   a. Click **DHCP**, click **Yes** to confirm.

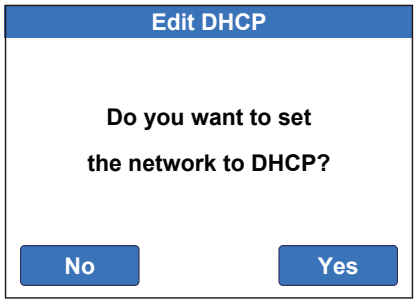


Figure 7-32 Edit DHCP

   b. Click **Yes** to confirm.

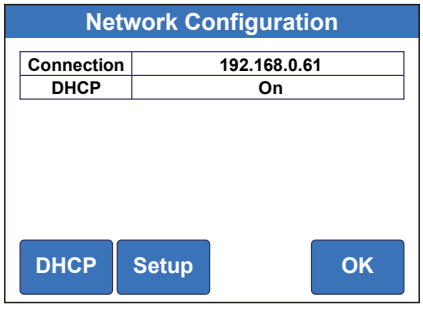


Figure 7-33 Network Configuration

4. To setup static IP address, follow steps 1 thru 2.
   a. Click **IP ADDRESS**. Key in the static IP address and click **Enter** to save.

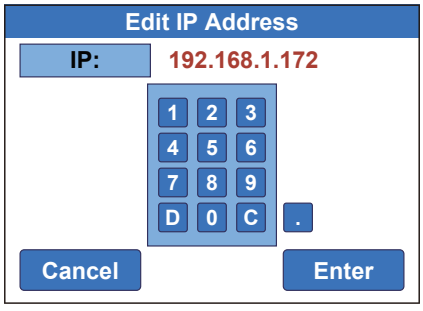


Figure 7-34 Edit IP Address

b. To Setup Sub Netmask address, follow steps 1 thru 2. Click **Netmask**. Key in the Sub Netmask address and click **Enter** to save.

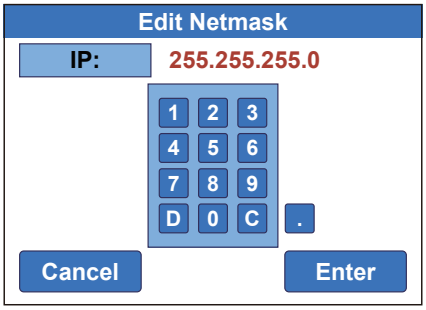


Figure 7-35 Edit Netmask

c. To Setup Gateway IP address, follow steps 1 thru 2. Click **Gateway**. Key in the Gateway IP address and click **Enter** to save.

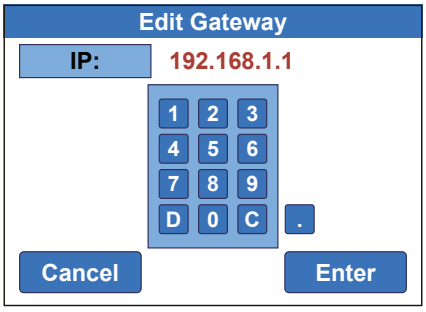


Figure 7-36 Edit Gateway

d. To Setup DNS Server, follow steps 1 thru 3. Click **DNS Svr.** Key in the DNS Server IP address and click **Enter** to save.

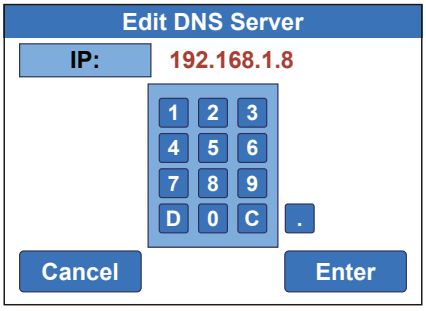


Figure 7-37 Edit DNS Server

e. After all the settings, click **Setup** to apply the Setup. Click **Yes** to continue.

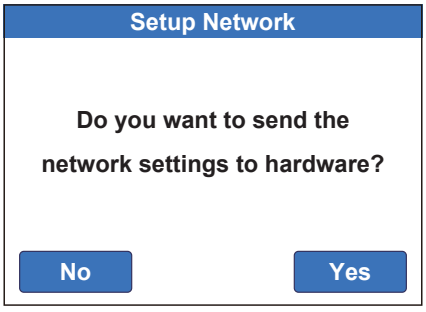


Figure 7-38 Setup Network

Login Setup

To be able to access the FLS unit remotely via Ethernet connection, user credentials have to be Setup in the Hand-Held unit's screen.

Navigate to the **Install Menu**, then select.

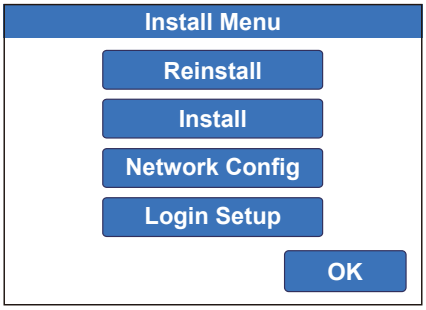


Figure 7-39 Install Menu

Once this button is pressed, the following screen will be displayed:

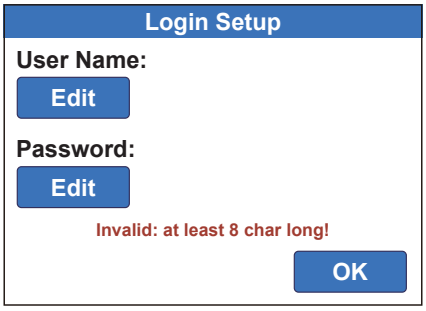


Figure 7-40 Login Setup

Enter a username and a password.

Note:

1. Both must be at least eight characters long.
2. Characters are not case sensitive.
3. Credentials can be entered only from the touch screen of the FLS-2.

Press **OK** and exit the screen.

The credential setup is finalized.

Remote Access

From a browser, enter the IP address that the FLS-2 is connected to. (see **Network Configure** on page 26)

Once connected, the below screen will be displayed:

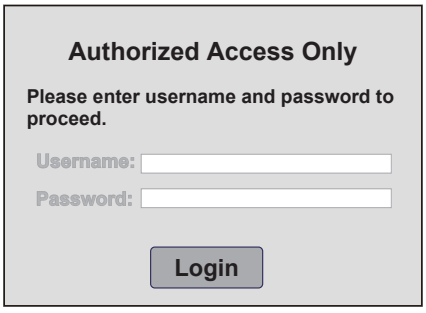


Figure 7-41

Enter the credentials that have been Setup from the front screen of the FLS-2.
Once access is granted, the main screen will be displayed:

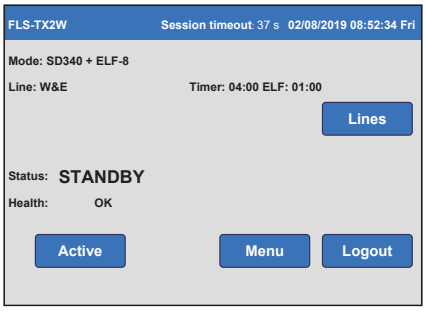


Figure 7-42

The unit can be operated by pressing the appropriate buttons, similar to operating the unit from the front screen.

Note:

1. Some menus are not available on the remote screen
2. If no buttons are pressed after 55 seconds, the session will time out automatically.
3. A LOGOUT button is also available for closing the session when done.

Note:
Connections to Ethernet networks should be made following all company policies and procedures. Connections behind company firewalls should offer the proper level of network safety. Connection through the company virtual private network (VPN) will further increase the security of communication.

Reboot

To reboot the system, go to the utilities menu and click **Install**. Click **Reboot** and **Yes** confirm the Reboot.

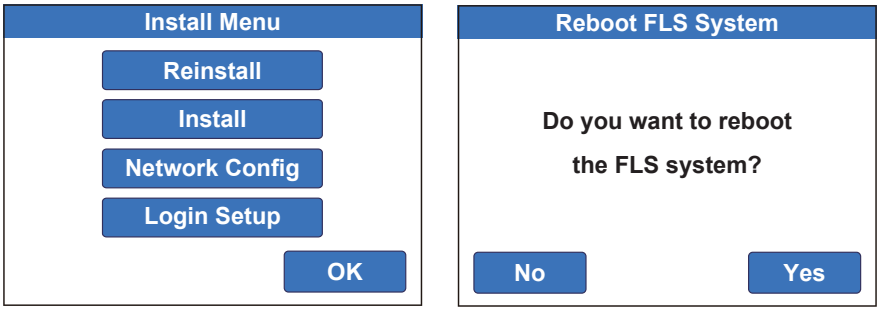


Figure 7-43 Reboot FLS System

7.1.4 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, Software Update, and Factory Menu, the transmitter must be in STANDBY mode. Figure 7-29 shows the top-level functions of the Utilities Menu, which are:

- Edit Menu
- Install Menu
- Save Setup
- Factory Reset
- Factory Menu (for factory personnel only)
- Calibrate Screen
- About FLS-2-TX

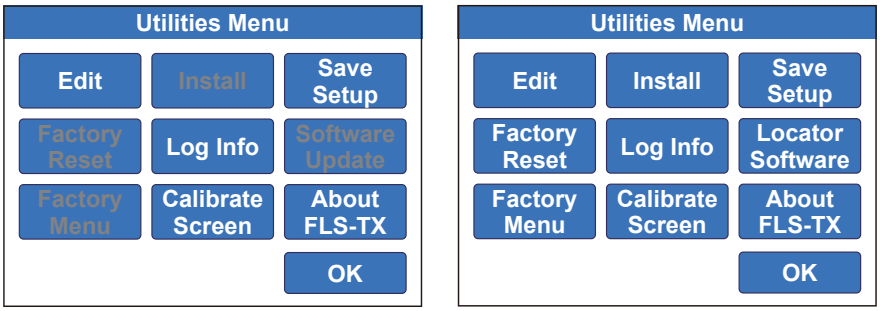


Figure 7-44 Utilities Menu (Active Mode and Standby Mode)

7.1.4.1 Edit Menu

You can edit Station ID, Station Name, FLS-2-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.

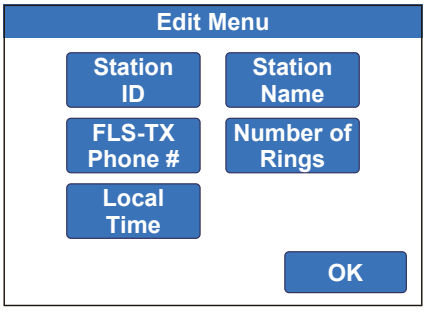


Figure 7-45 Edit Menu

To edit station ID

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

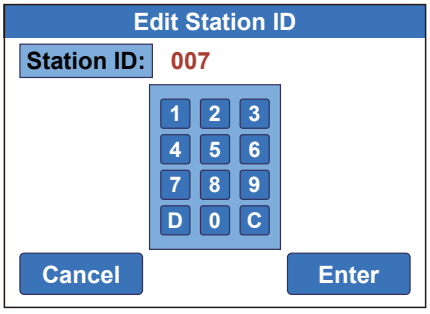


Figure 7-46 Edit Station ID

2. 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 when accessed via the phone line.

To edit the station name

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

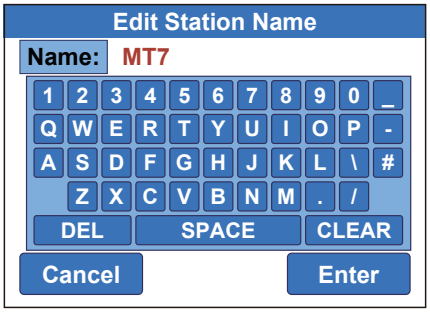


Figure 7-47 Edit Station Name

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

To edit the telephone number

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

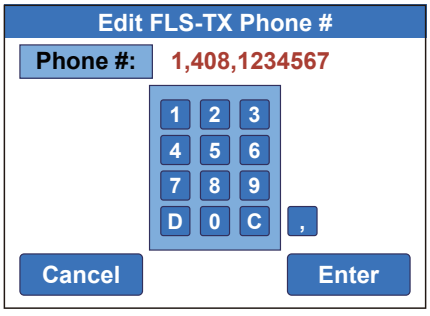


Figure 7-48 Edit Phone Number

2. Enter the phone number, use **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**.

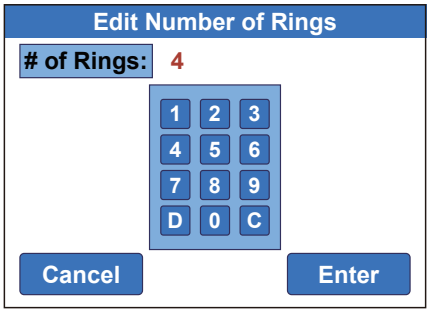


Figure 7-49 Edit Number of Rings

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

To edit the local time zone and daylight savings settings

1. On the Main Operating screen, click Menu > Edit Menu > Local Time. If the system is connected to the internet, you can click **Sync Time** to synchronize the time from the internet.

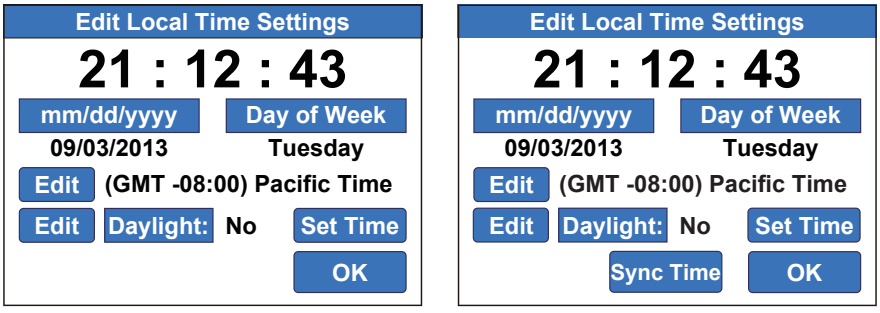


Figure 7-50 Edit Local Time Settings

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.

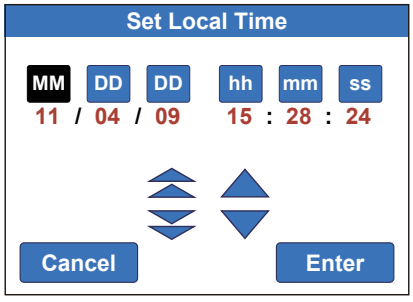


Figure 7-51 Set Local Time

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

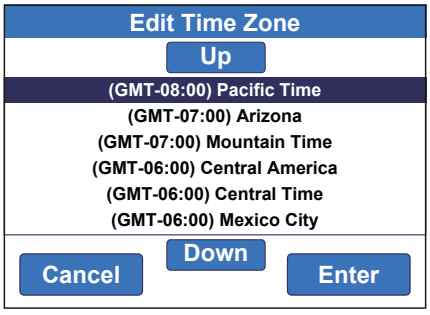


Figure 7-52 Edit Time Zone

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

Figure 7-53 Edit Daylight Savings

8. Click **No** or **Yes**, and then click **OK**.

7.1.4.2 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 7.1.3 Installation Sequence for more details.

- Select the **Network Config** to configure the network.
- Select **Reboot** to reboot the system.

7.1.4.3 Save Setup

Use these instructions to save the new programmed values as the prefix. Up to ten prefix storage units can be saved in the FLS-2 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.

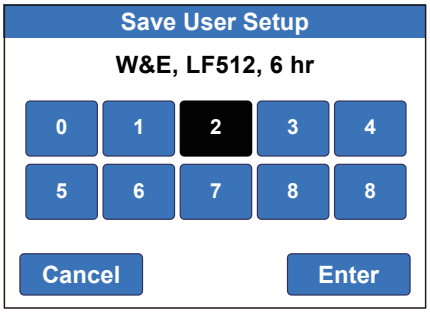


Figure 7-54 Save User Setup

7.1.4.4 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, the system will force you to run the Install sequence.

To confirm the Factory Reset

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

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

Figure 7-55 Factory Reset

7.1.4.5 Software Updates

To update the receiver software

1. Insert the USB memory stick, with the updated Software, into the front panels USB socket.
2. On the Main Operating screen, Click **Menu >Utilities > Software Update**.

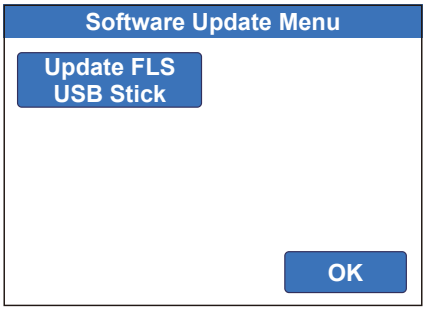


Figure 7-56 Software Update Menu

3. Click **Update FLS USB Stick** to update the Software. The update process will take one minute.

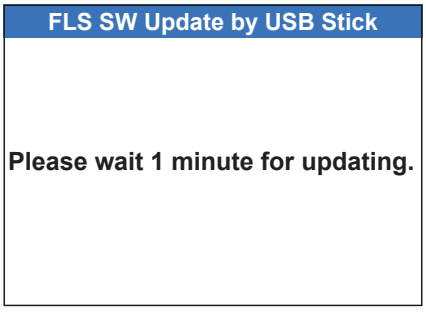


Figure 7-57 FLS SW Update by USB Stick

4. Once the update is finished, the system will reboot automatically.

7.1.4.6 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 7-58 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.

7.1.4.7 About FLS-2-TX

Use these instructions to learn more about the FLS-2 transmitter. To return to the System menu, click **OK**.

To view the FLS-2 transmitter settings

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

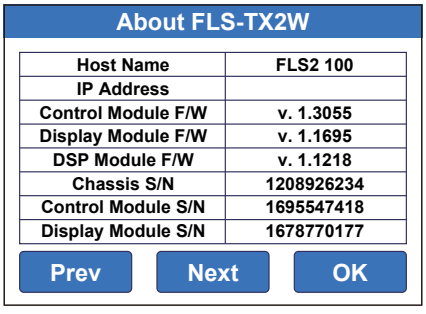


Figure 7-59 About FLS-2-TX Transmitter (Screen 1 of 3)

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

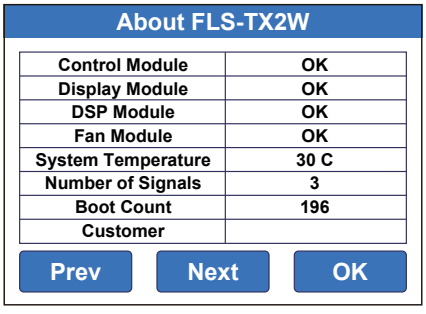


Figure 7-60 About FLS-2-TX Transmitter (Screen 2 of 3)

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

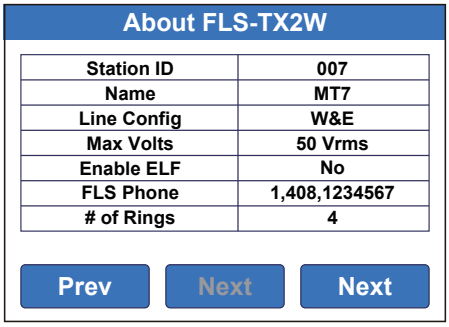


Figure 7-61 About FLS-2-TX Transmitter (Screen 3 of 3)

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

7.2 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 on Windows XP or Putty.

NOTE
Be aware that Windows Vista/Win7/8 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.

7.2.1 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.

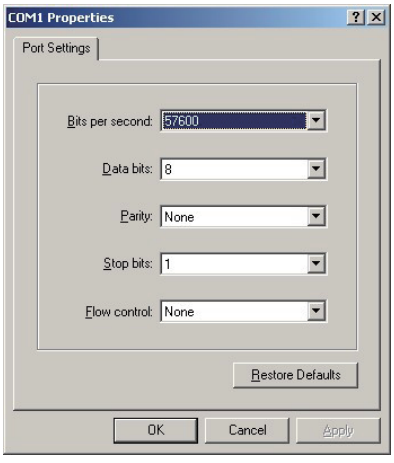


Figure 7-62 HyperTerminal Connection Properties

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 7-52 shows the Main Operating Screen.

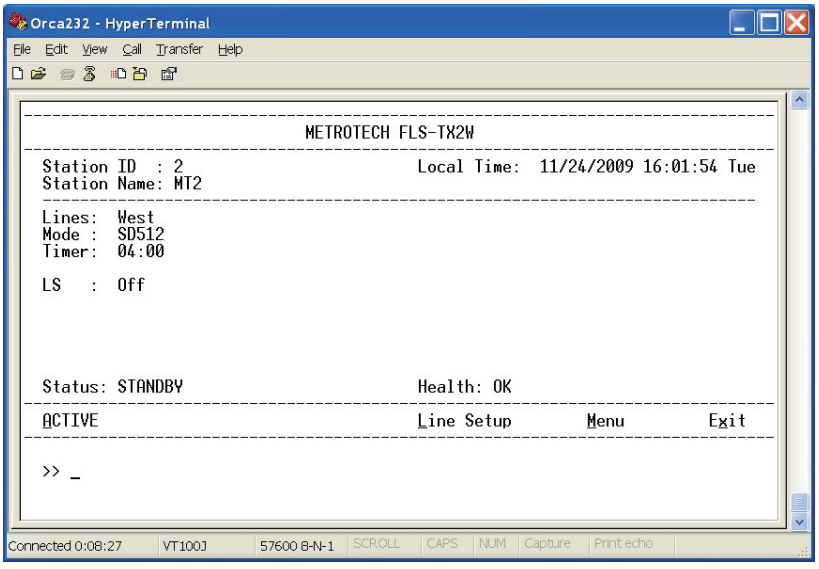


Figure 7-63 Main Operating Screen (Standby Mode)

7.2.2 Selecting an Operational Mode

The transmitter has two modes, see section 5.1, “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.

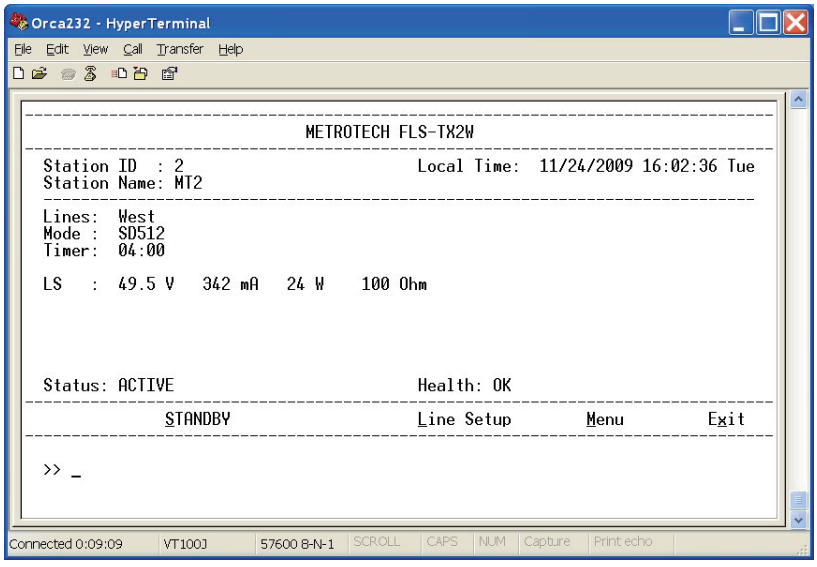


Figure 7-64 Main Operating Screen (Active Mode)

7.2.3 Programming the Line Setup Featues

To go to the line Setup screen, shown in Figure 7-50, 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**).

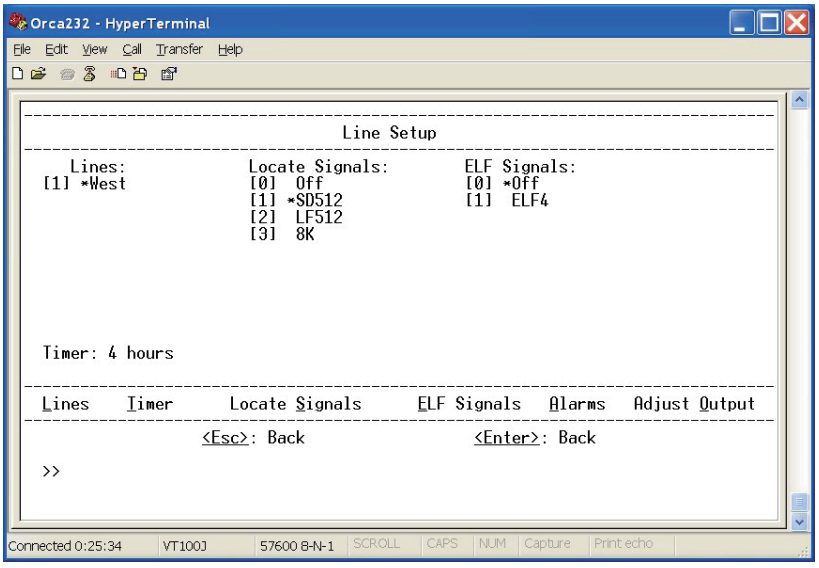


Figure 7-65 Line Setup (Active Mode)

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 an 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 7-1 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 7-54 shows the **Line Alarm Levels** screen. From this screen, program the minimum, nominal, and maximum alarms currents for the locate signal.

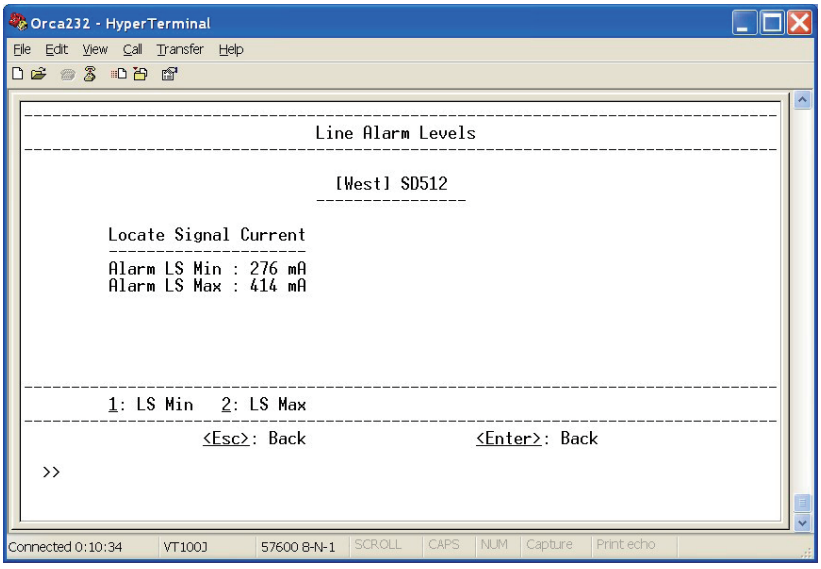


Figure 7-66 Line Alarm Levels

To program the Output level (Active Mode Only)

On the Main Operating Screen press, **L > O > enter a 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 adjust the minimum and maximum values automatically. After that, you can change the minimum and maximum values manually if necessary.

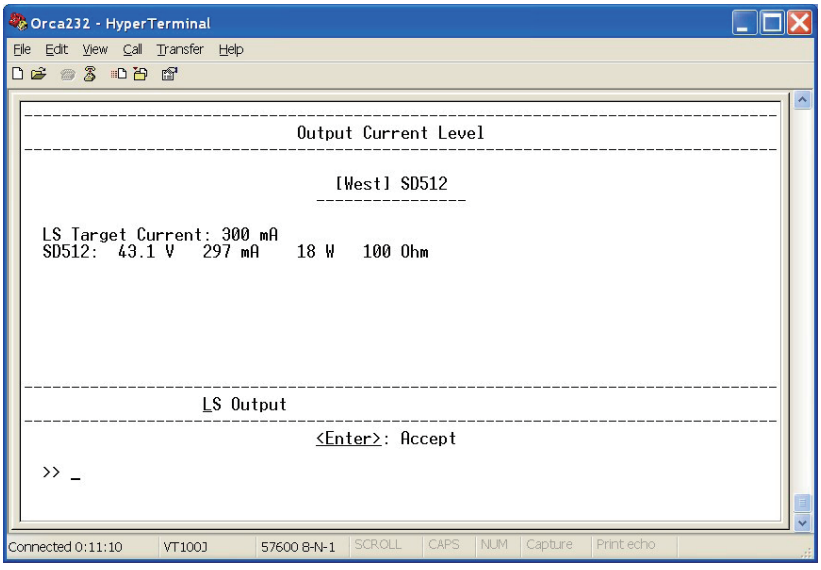


Figure 7-67 Output Current Level

7.2.4 Using the Menu

The System Menu screen, shown in Figure 7-57, 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-2-TX

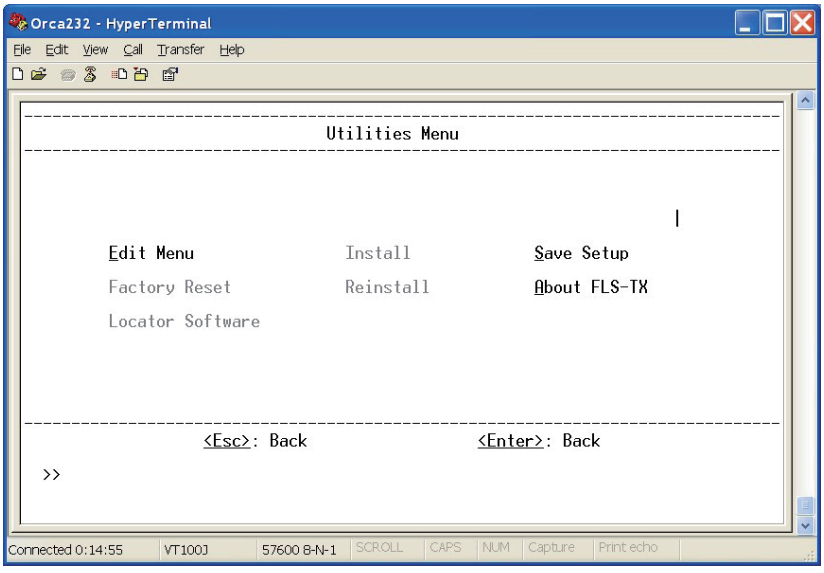


Figure 7-68 Utilities Menu (Active)

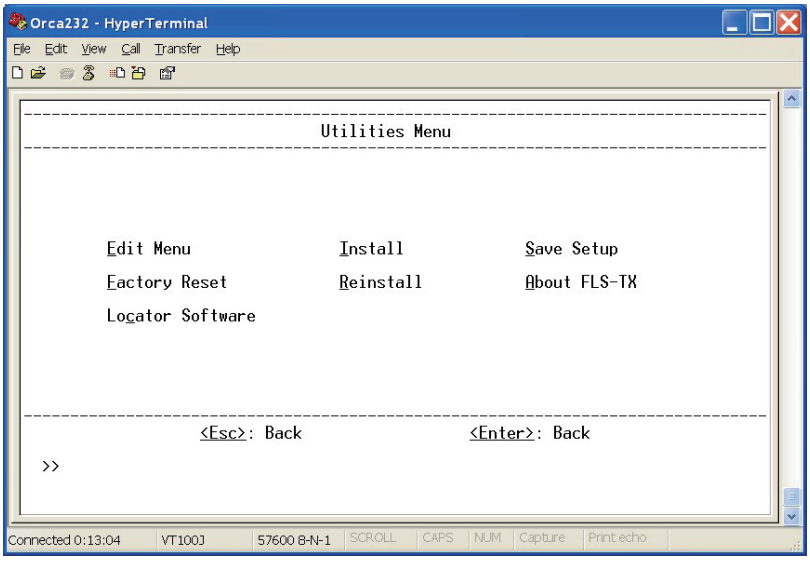


Figure 7-69 Utilities Menu (Standby)

7.2.4.1 Locator software

(Currently not available future features)

Figure 7-59 shows the Edit Menu screen. Use this screen to edit the **Station ID, Number of Rings, Station Name, Local Time, and FLS-2-TX Phone #**.

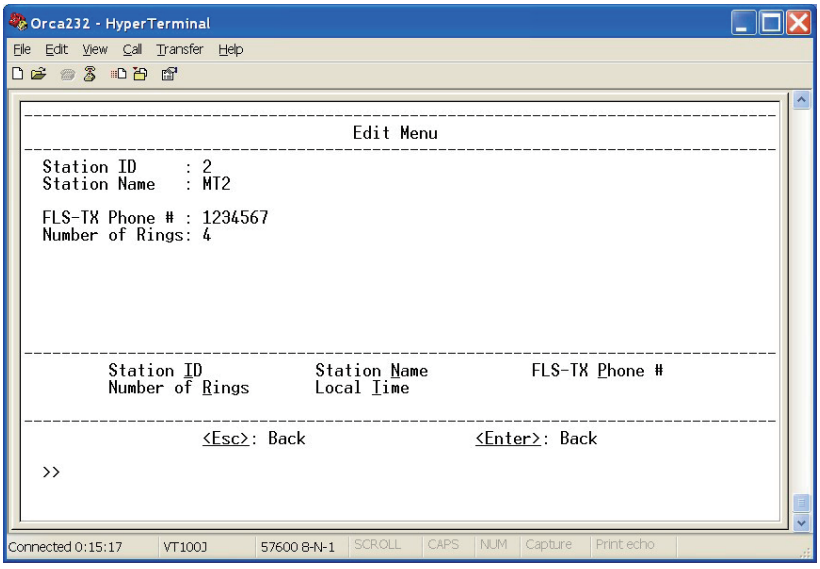


Figure 7-70 Edit Menu

Table 7-2 lists the sequence of pressed keys associated with each editing task, starting from 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 > I > 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-2-TX Phone #	Press M > E > P > enter number > ENTER

Table 7-2 Key Sequence for Edit Menu Screen

7.2.4.2 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, you have to run the Install sequence.

To reset the transmitter

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

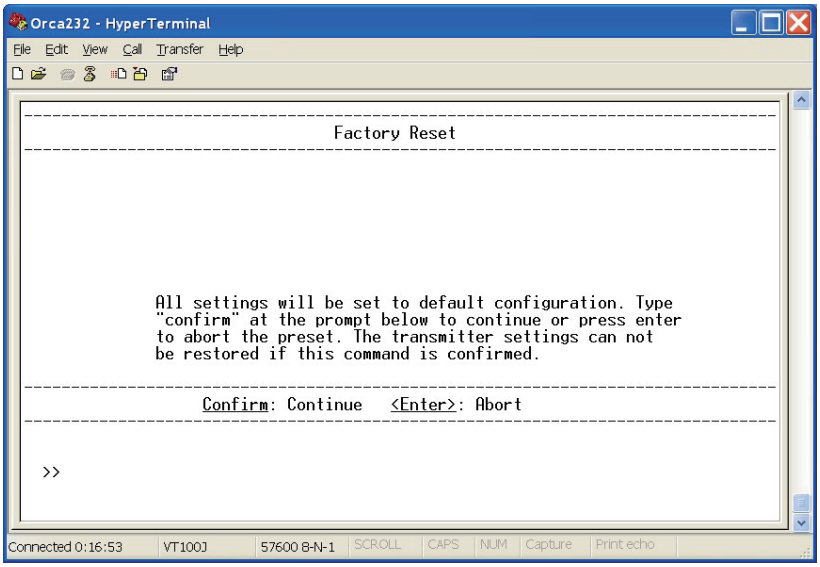


Figure 7-71 Factory Reset

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

7.2.4.3 Locator Software (Standby Mode Only)

(Currently not available, future features)

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**.

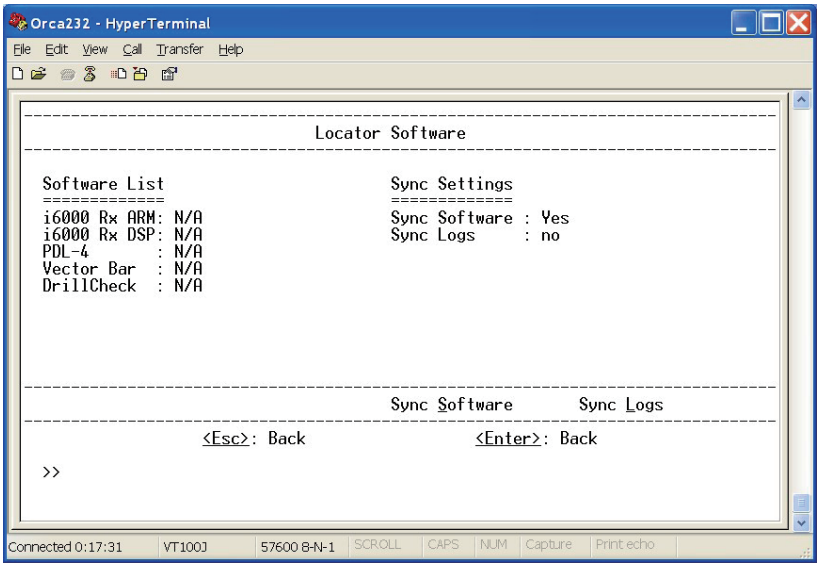


Figure 7-72 Locator Software

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

7.2.4.4 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 that is not installed will look like the following screen.

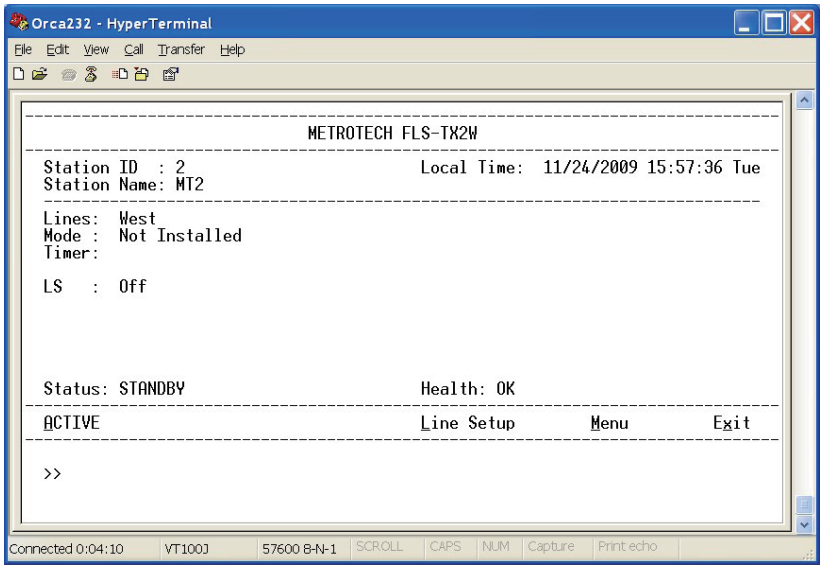


Figure 7-73 Installation Screen (Not installed)

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

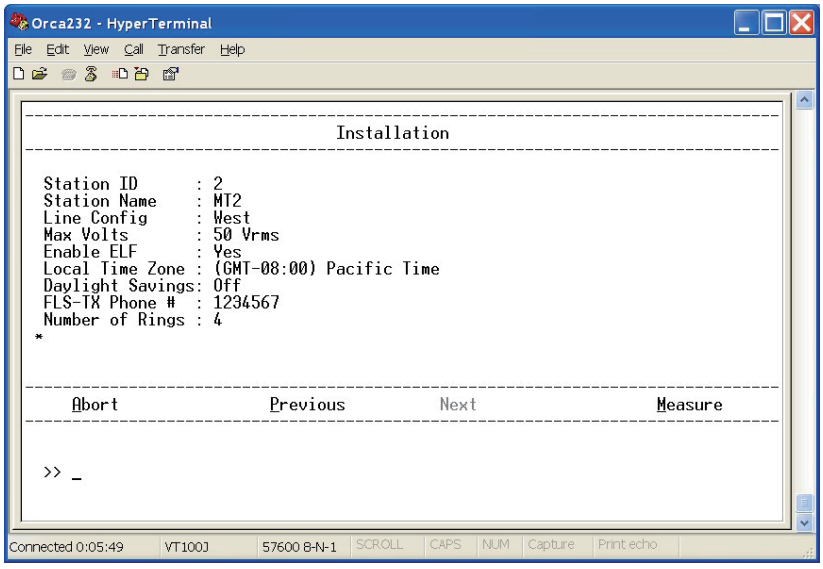


Figure 7-74 Installation Screen

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.

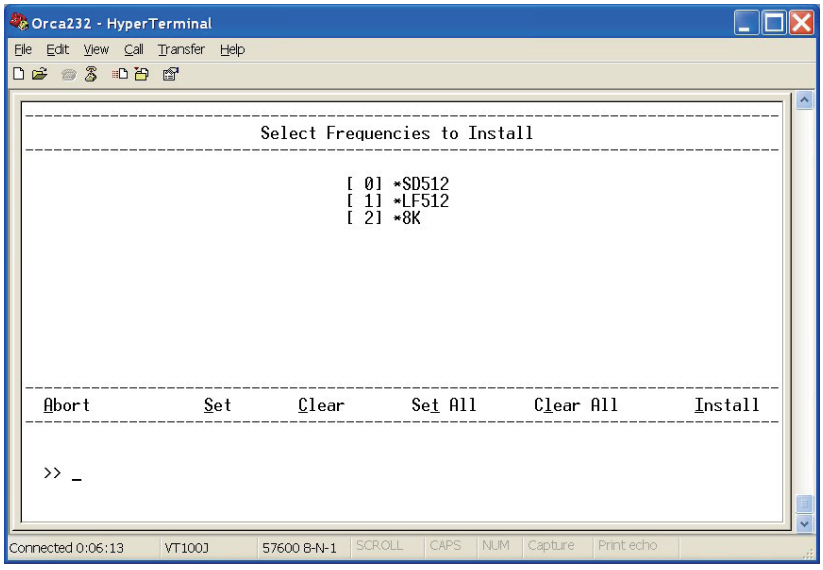


Figure 7-75 Select Frequencies to Install

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

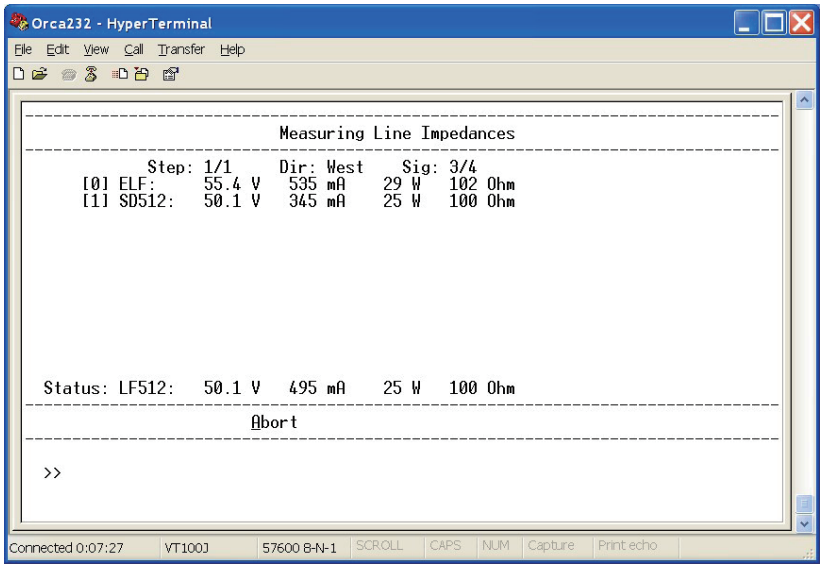


Figure 7-76 Measuring Line Impedances

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

7.2.4.5 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**.

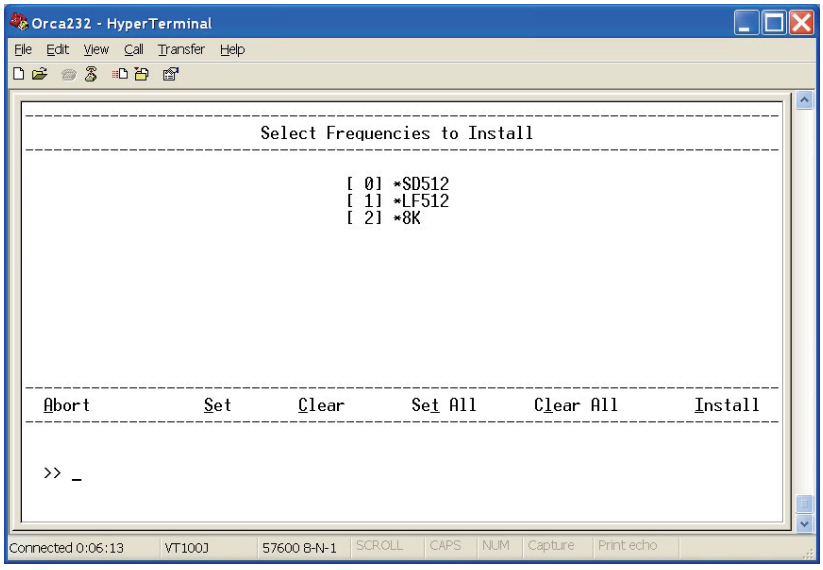


Figure 7-77 Reinstall – Select Frequencies to Install

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

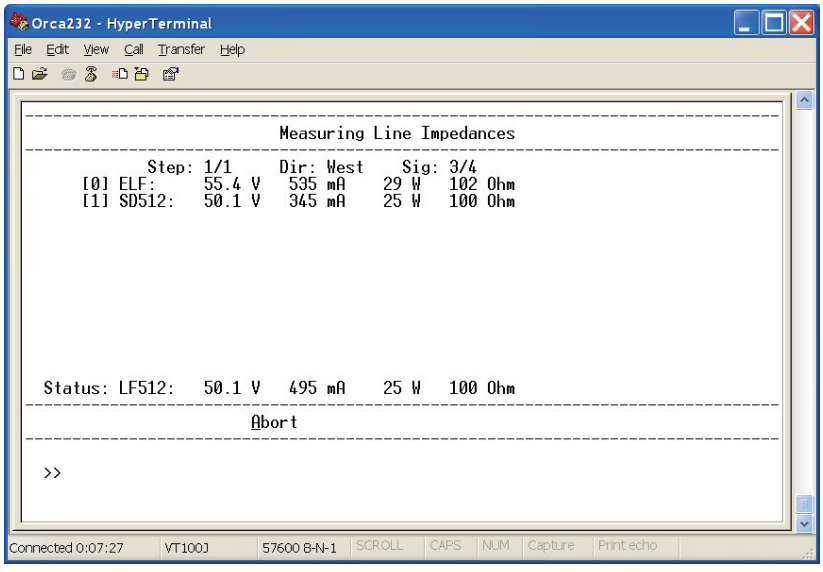


Figure 7-78 Reinstall – Measuring Line Impedances

3. Press **S** to start measuring the line impedances.
4. Press **F > ENTER** after the status becomes done or press **A** to abort the measurement.

7.2.4.6 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 setups 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).

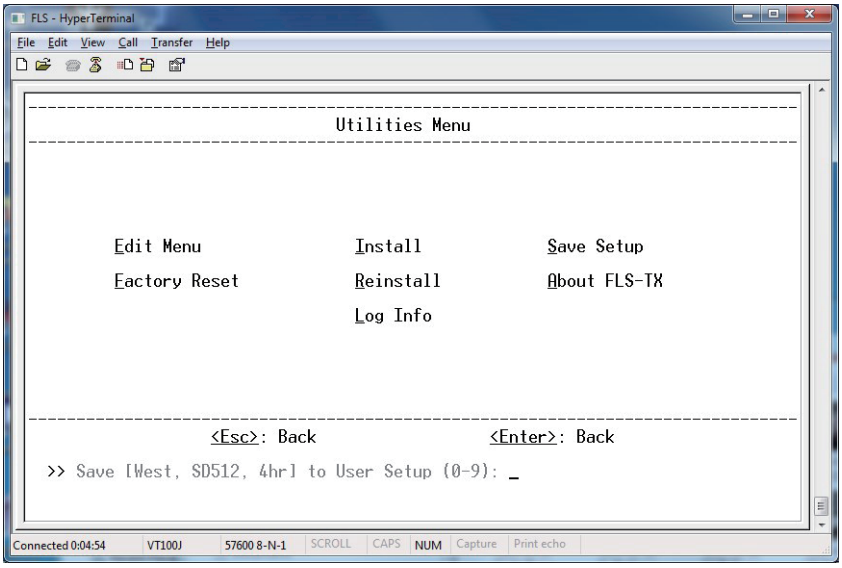


Figure 7-79 Save Setup

7.2.4.7 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.

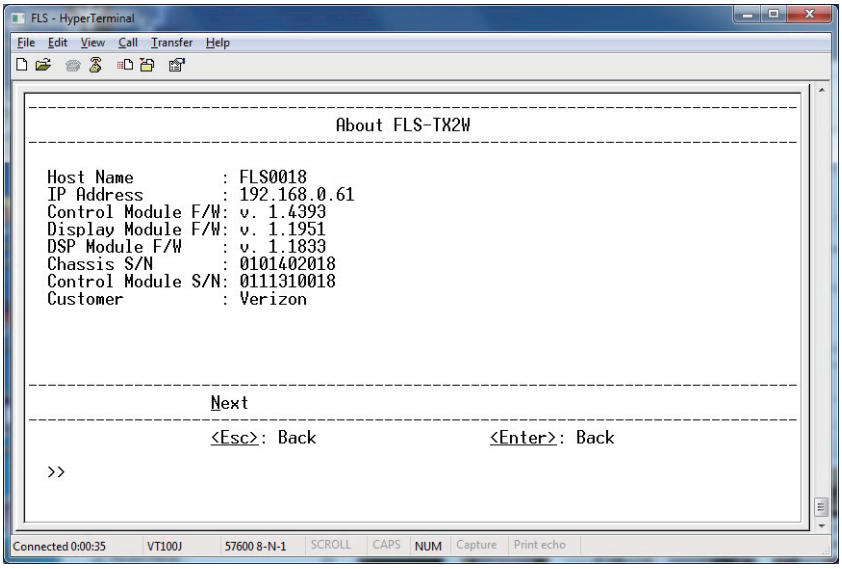


Figure 7-80 About FLS-2-TX (Screen 1 of 3)

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

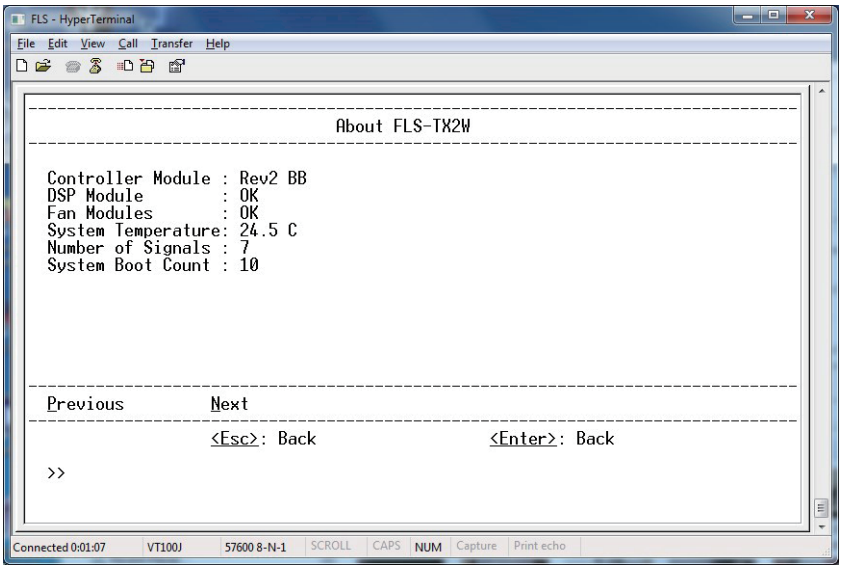


Figure 7-81 About FLS-2-TX (Screen 2 of 3)

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

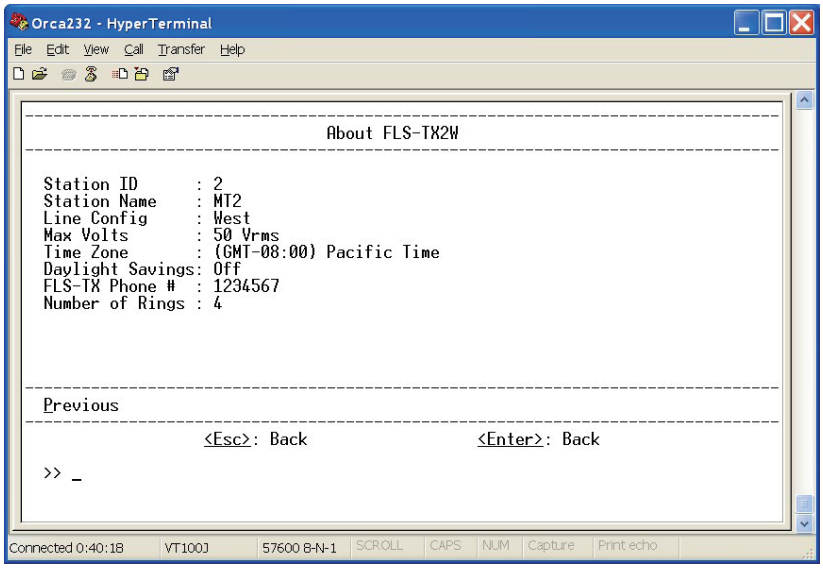
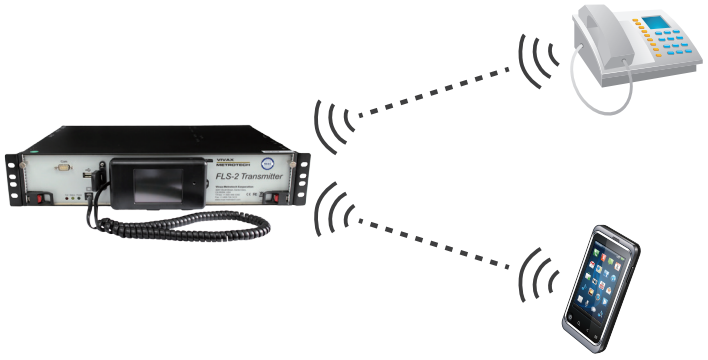


Figure 7-82 About FLS-2-TX (Screen 3 of 3)

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

8. Remote Transmitter Control Using a Phone Line



You can use any touch-tone telephone (landline or mobile) to control the transmitter remotely. Table 8-1 lists the telephone command codes for two ways FLS-2 (FLS-2-TX2W), Table 8-2 list for four ways FLS-2 (FLS-2-TX4W), and Table 8-3 list for 16 ways FLS-2 (FLS-2-TX16W). 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.

8.1 FLS-2-TX2W Telephone Remote Control

To control the FLS-2-TX2W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS-2, using a touch-tone telephone. The FLS-2 will generate three beeps when it answers the call.
2. Enter the Station ID assigned to this FLS-2, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS-2 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-2 unit.” “Station xxxx” Report Unit Status “Enter Code” OR “FLS-2 not available.”
Toggle Active/Standby	00	“FLS-2 {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” (if applicable)

Report Line Parameters	08	"FLS-2 Standby" or "[Report Alarm], [xx volts, xxx milliamps], [xx ELF volts, xxx ELF milliamps], [Resistance xxx Ohms]
Report Timer Value	09	"Timer x 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" (if applicable)
Select LF3	13	"Low Frequency three" (if applicable)
Select LF4	14	"Low Frequency four" (if applicable)
Select 273Hz	15	"Low Frequency 273" (if applicable)
Select SD3	18	"SD three Mode" (if applicable)
Select SD4	19	"SD four Mode" (if applicable)
Toggle ELF on / off	35	"ELF-x on" OR ELF {off / not available / not installed}"(if applicable)
Switch ELF ONLY on for 2h	62	"ELF-x Mode for 2 hours" OR "ELF not installed" (if applicable)
Switch ELF ONLY on for 4h	64	"ELF-x Mode for 4 hours" OR "ELF not installed" (if applicable)
Report Unit Status	*	"FLS-2 Standby, {East / West / West & East} Connection, {Frequency / Mode}, [{ELF-x on / ELF off}]" OR "[Report Alarm], FLS-2 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 8-1 Telephone Remote Control Commands (FLS-2-TX2W)

8.2 FLS-2-TX4W Telephone Remote Control

To control the FLS-2-TX4W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS-2, using a touch-tone telephone. The FLS-2 will generate three beeps when it answers the call.
2. Enter the Station ID assigned to this FLS-2, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS-2 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-2 unit" "Station xxxx" Report Unit Status "Enter Code" or "FLS-2 not available"
Toggle Active / Standby	00	"FLS-2 {Standby / On}"
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” (if applicable)
Report Line Parameters	08	“FLS-2 Standby” Or “[Report Alarm], [xx volts, xxx milliamps], [xx ELF volts, xxx ELF milliamps], Resistance xxx Ohms”
Report Timer Value	09	“Timer x 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” (if applicable)
Select LF3	13	“Low Frequency three” (if applicable)
Select LF4	14	“Low Frequency four” (if applicable)
Select 273Hz	15	“Low Frequency 273” (if applicable)
Select SD3	18	“SD three Mode” (if applicable)
Select SD4	19	“SD four Mode” (if applicable)
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” (if applicable)
Switch ELF ONLY on for 4h	64	“ELF Mode for 4 hours” or “ELF not installed” (if applicable)
Report Unit Status	*	“FLS-2 Standby Line Connection, {Frequency / Mode},[ELF {on / off}” Or “[Report Alarm], FLS-2 On Time remaining x hours xx minutes, Line Connection, {Frequency / Mode}, [ELF {on / off}]”
Hang-up	#	Goodbye
	other	“Code not available / Invalid”

Table 8-2 Telephone Remote Control Commands (FLS-2-TX4W)

8.3 FLS-2-TX16W Telephone Remote Control

To control the FLS-2-TX16W remotely from a touch-tone telephone, proceed as follows:

1. Dial the telephone number assigned to the FLS-2, using a touch-tone telephone. The FLS-2 will generate three beeps when it answers the call.
2. Enter the Station ID assigned to this FLS-2, followed by the * key. This is the login sequence.
3. Enter the Function Code. See the table below. The FLS-2 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-2 unit” “Station xxxx” Report Unit Status “Enter Code” Or “FLS-2 not available”
Toggle Active / Standby	00	“FLS-2 {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” (if applicable)
Report Line Parameters	08	“FLS-2 Standby” Or “[Report Alarm], [xx volts, xxx milliamps], [xx ELF volts, xxx ELF milliamps], Resistance xxx Ohms”
Report Timer Value	09	“Timer {off / x 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” (if applicable)
Select LF3	13	“Low Frequency three” (if applicable)
Select LF4	14	“Low Frequency four” (if applicable)
Select 273Hz	15	“Low Frequency 273” (if applicable)
Select SD3	18	“SD three Mode” (if applicable)
Select SD4	19	“SD four Mode” (if applicable)
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”
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-2 Standby, MUX Line Connection, {Frequency / Mode}, [ELF-x {on / off}]” Or “[Report Alarm], FLS-2 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 8-3 Telephone Remote Control Commands (FLS-2-TX16W)

9. Alarm Messages

When an alarm condition occurs, the abbreviated alarm message listed in Table 9-1 appears on the hand-held display screen, computer terminal screen, or phone line voice prompt.

Screen message	Description
60Hz too High	The 50/60Hz power 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 low.
PA Current Overload	The current Output of the Power Amplifier is overload.
Temperature too High	The transmitter's internal temperature is too high.

Table 9-1 Alarm Messages

10. 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.
The hand-held display unit is blank.	● Touch the screen to resume. After three 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 rear 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. A 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 low.
PA Current Overload	The current Output of the Power Amplifier is overload.
Temperature too High	The transmitter’s internal temperature is too high.
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 is connected to the modem. (☎)

Table 10-1 Troubleshooting Guidelines

11. Maintenance

This chapter contains the following sections:

- Calibration
- Removing or Installing Modules
- Cleaning

NOTE

Read the General Safety instructions before starting any maintenance procedure.

11.1 Calibration

Only the Main Control module requires calibration. For information, contact technical support.

11.2 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 the 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.
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 faceplate is flush with the classics.
5. Lock the handles by moving them to the inside position against the faceplate.
6. Use a Philips-head screwdriver to attach the two side screws

11.3 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.

12. Acronyms

This chapter defines the acronyms used in this document.

ELF	Extreme Low-Frequency signals
FLS-2	Fiber Locating System
LS	Locate Signal
SD	Signal Direction Signals

13. Glossary

This chapter defines useful terms.

Active locating	Locating an underground line through signals generated by the transmitter.
Centerline	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 the 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. A 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.
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 permitted the use of their graphics 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:

Vivax-Metrotech Corporation

3251 Olcott Street, Santa Clara, CA 95054, USA
Toll Free: (800) 446-3392
Phone: +1 (408) 734-1400
Website: www.vivax-metrotech.com