Lynx® Smart Field Interface
User Guide, LSFI Models

Scan QR code for foreign language translations.

Scanner le code QR pour une traduction en langue étrangère.

Escanear código QR para traducción de idiomas extranjeros.

Scansiona il codice QR per la traduzione in lingua straniera.

QR-Code fur fremdsprachliche Übersetzung scannen.

Digitalizar código QR para tradução em língua estrangeira.

Browser? Navigateur? Navegador?
Go to https://www.toro.com/en/product/lsfi

TABLE OF CONTENTS

Introduction
- Overview ---- 2
- Inputs and Outputs ---- 3
- Power ---- 4
- Front Panel User Interface ---- 5
- Touchscreen Keyboard ---- 5
- Navigation Icons ---- 5

Operation
- OSMAC System Communication ---- 6
- Non OSMAC Systems / 2-way Communication ---- 6
- Installation ---- 6
- Handling the LSFI ---- 6
- Moisture Condensation ---- 7

LSFI System Installation
- Connecting LSFI to the Industrial Irrigation Controller ---- 7
- Connecting LSFI Radios and Satellites - New Install ---- 8
- Connecting LSFI Radios and Satellites - Existing Install ---- 10

Communication Setup ---- 11
Earth Ground Installation ---- 11

Initial Boot
- Icons and Colors Explained ---- 12

Screen Reference Guide
- Main Menu ---- 13
- Network Ethernet Settings ---- 13
- LSFI Settings ---- 14
- Radio Settings ---- 15
- Radio Information ---- 15
- Radio Configuration ---- 16
- Wireline Settings ---- 16
- USB Information ---- 17
- Micro SD Card Information ---- 17
- Micro SD Logging Settings ---- 17
- Diagnostics Menu ---- 18
- Ethernet Connection History ---- 18
- Radio 1 and 2 Diagnostics ---- 18
- Communication Activity Screen ---- 19
- Secondary Menu ---- 19
- Radio 1 and 2 Pager Interface ---- 19
- Sensor Input ---- 20
- Technical Support ---- 20
- LSFI Information ---- 20
- Firmware Updates ---- 20

Troubleshooting ---- 21
Maintenance ---- 22
Master Factory Reset ---- 22

Appendix A: OSMAC® Commands
- OSMAC Commands ---- 23
- OSMAC DTMF Commands ---- 25

Appendix B: HHRI Commands
- Area/Hole Commands ---- 25
- System Commands ---- 26
- OSMAC and Network VP® Station Group Multi-Manual Commands ---- 26
- Network GDC Station Group Multi-Manual Commands ---- 27
- Satellite Command ---- 27
- Gateway Command ---- 27
- OSMAC, Network VP and VPE Hardware Address Commands ---- 27

Appendix C: Static vs DHCP IP Adress for LSFI ---- 28

Appendix D: Command Codes
- Network GDC Hardware Address Commands ---- 29
- Network GDC Decoder Commands ---- 29

Appendix E : Specifications
- General ---- 30
- Radio ---- 30
- Transmitter ---- 30
- Receiver ---- 30
- User Input and Output Signals ---- 30

Antennas, Cables and Connectors Recommendations ---- 30
FCC/IC Statement ---- 31

INTRODUCTION

Overview

The Toro Lynx Smart Field Interface (LSFI) unit is the next generation of field interface products to facilitate communication between the industrial irrigation controller and golf course irrigation controllers. It is the combination of the Radio Interface Unit (RIU) and Field Interface Unit (FIU) legacy products into one "Smart" device.

The LSFI can be configured to function for any hardware configuration including OSMAC, Lynx Smart Satellite (LSS), Lynx Smart Hub (LSH), Fusion, Hand-Held Radio Interface (HHRI) or any combination of those listed. The LSFI is also compatible with legacy Toro systems using the VP protocol for communication as long as the proper version of the Lynx is installed (8.3 or newer). The LSFI is not compatible with legacy SitePro software. The LSFI has the advantage of Ethernet connectivity. This enables wired connection in any location on a local area network that is common with the industrial irrigation controller, allowing for optimization of radio performance.

The LSFI is intended to work with an industrial irrigation controller. It must be configured to the desired mode before use – All installed radios and wirelines need to be configured to operate correctly.

OSMAC Field Interface

The LSFI Communication Methods

- Manual and scheduled irrigation and switch activity through the industrial irrigation controller.
- OSMAC commands using a DTMF enabled hand-held radio.
- OSMAC commands at the unit via OSMAC proprietary radio commands.
- Automated communication as a result of a change (e.g., Rain Hold alarm response)

Hand-Held Radio Interface

- HHRI commands using a DTMF enabled hand-held radio.
- All HHRI commands are routed through and recorded in the industrial irrigation controller for a response.
- HHRI commands at the unit via proprietary radio commands.

Lynx Smart Satellite/Lynx Smart Hub

The LSFI can send messages using a variety of communication methods:

- Manual and scheduled irrigation and switch activity through the industrial irrigation controller.
- LSFI can be configured to have wireline, digital radio and HHRI functionality in one device
- The LSFI can be remote located (using a LAN connection on same network as the industrial irrigation controller) and installed to help optimize a radio system design on a golf course: e.g. in a club house.
- Automated communication as a result of a change (e.g., Rain Hold alarm response)

Non-OSMAC Systems/ 2-Way Communication

Note: Lynx must be version 8.3 or newer.

- Supports older VP products
- LTC+ products converted to VP
- Only Supports Digital Radio
- Does NOT support SitePro

Features:

- Depending on SKU/Configuration unit contains
  - Up to 2 wireline modems
  - Up to 2 UHF (450–470Mhz) radios with heat sink.
- Powder-coated metal cabinet design is both durable and attractive.
- Laser etched rear panel provides permanent labels for connections and features.
- Large easy to use color touch screen with intuitive icons and menu structure.
- Color "Activity Screen" showing real-time channel communication activity.
- Ethernet port connection to the industrial irrigation controllerthrough local network or direct connection.
- Cooling and power supply will support continuous 40 pages per minute paging. (See Specifications for details.)
- A user in the field can send commands using a hand-held radio and will receive audible DTMF lead tones as transmission feedback.
- Remote firmware updates or via USB memory stick.
- AC power supply accepts 100VAC to 240VAC inputs.

Inputs and Outputs

Front Features (Figure 1):

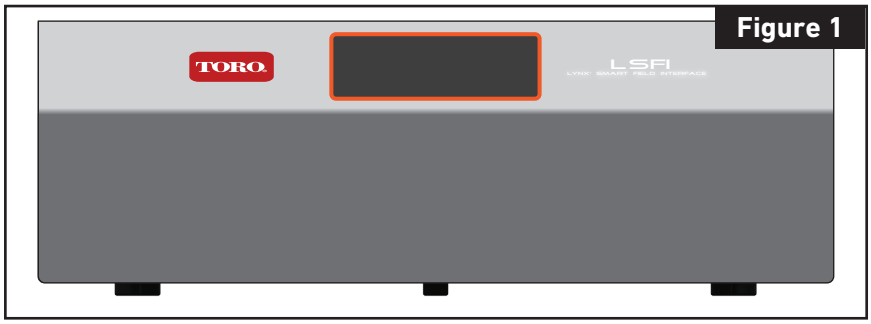


Figure 1

The front of the LSFI features a 4.3 inch, full-color LCD touchscreen display.

Rear Features (Figure 2):

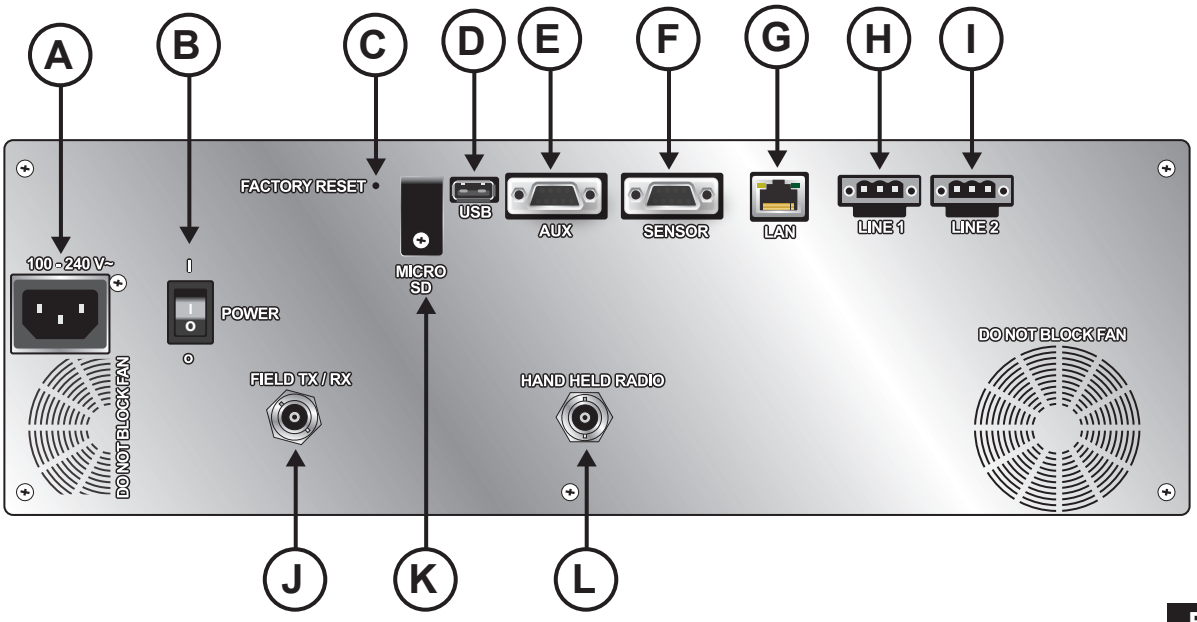


Figure 2

A. AC Power Input, 100–240VAC
B. System Power Switch
C. Factory reset button
D. USB - Used for firmware updates.
   DO NOT USE USB TO INTERFACE WITH THE INDUSTRIAL IRRIGATION CONTROLLER FOR FIELD INTERFACE AND HANDHELD REMOTE FUNCTIONS.
E. Debug port
F. Wired and Wireless open and closed sensor port
G. Ethernet port for connection to the industrial irrigation controller or an ethernet switch.
H. Wireline 1
I. Wireline 2
J. BNC Female RF Connector for Radio 1. Only one BNC connector on single radio models.
K. Micro SD card cover
L. BNC Female RF Connector for Radio 2. Two BNC connectors on two radio models.

WARNING: Peripheral devices such as mobile phones, tablets, etc., should not be plugged to the LSFI's USB port as it may have an adverse effect on the unit's performance.

Power

To turn the power ON, be sure the unit is connected to AC power then press the “|” side of the power switch on the rear of the unit. The unit will take about 30 seconds to boot up.

The boot splash screen

The unit is ready when the front panel displays the home screen. Icons along the top of the screen will continue to appear and change color as different devices are identified properly.

The Home screen

To turn the power OFF, press the “0” side of the power switch on the rear of the unit (**Figure 2, B**).
Note: The LCD screen will enter a “sleep” mode after fifteen minutes of non-operation.

Important: Ensure that the unit is connected to a good power source which is not controlled by a light switch or utilized by a high current load appliance such as a refrigerator or air conditioner.

The power source

- The LSFI operates on 100–240 VAC 50/60 Hz only.
- Plug all the power cords for the LSFI and its peripheral equipment into the same AC supply line. AC derived from different supply lines may result in voltage differences that can cause unstable operation or unwanted weak currents at the time of connection.
- Do not share the AC outlet with any other power-consuming equipment, such as copying machines or shredders.
- You can purchase a power strip with a surge protector. This device prevents damage to the LSFI caused by sudden power surges such as those that may occur during an electrical storm.
- If you live in an area that experiences frequent power fluctuations, you may want to purchase an Uninterrupted Power Supply (UPS) with surge protection. The surge protector prevents damage to the LSFI caused by power surges.
- Do not place heavy objects on the power cord.
- Do not operate the system with the cover removed. Always reinstall the cover before turning on the system.
- To disconnect the cord, pull it out by the plug. Never pull the cord itself.
- Unplug the LSFI from the wall outlet if you will not be using the unit for a long time.
- There are no user serviceable parts inside of LSFI unit. DO NOT OPEN. Only Toro authorized and trained personnel should be servicing the unit.
- To avoid personal injury or damage to your equipment, refer the repair or replacement of the power supply to qualified personnel only.

CAUTION: Only peripherals (computer input/output devices, terminals, printers, etc.) that comply with FCC Class B limits may be attached to this product. Operation with non-compliant peripherals is likely to result in interference to radio reception.

All cables used to connect peripherals must be shielded and grounded. Operation with cables (connected to peripherals) that are *not* shielded and grounded may result in interference to radio reception.

Front Panel User Interface

The full-color touchscreen LCD display on the front panel provides a user interface for accessing/setting certain configuration variables and interacting with DTMF commands, pages, etc. It has an integrated back-light.

Note: The LCD panel goes to sleep after 15 minutes of no user activity to preserve screen.

Touchscreen Keyboard

The touchscreen display offers an intuitive way to enter values for any variable, from IP addresses to DTMF commands. Simply press the field in question and the keyboard screen will appear. Enter the desired value/s and press the Done button DONE .

To toggle between a number keyboard and an alpha keyboard, press the ABC ABC / 123 123 button.

Press the alpha SHIFT ⇧ for a lower case alpha keyboard.

Press the number SHIFT 123 for a symbol keyboard.

Note: For best results with touchscreen data entry, use a light touch.

Note: The keyboard screen returns to the Home screen after two minutes of no activity.

Navigation Icons

Many screens feature icons on the bottom of the screen for navigation.

Icon	Function
	Return to the Home screen.
	Return to the Main Menu screen.
	Refresh screen data such as radio temperature.
	Return to the previous screen.
	Navigate to the next screen (in a series).

Icon	Function
	Power cycle (reset) the LSFI unit.
	Clears the current screen's fields
	Sends a page.

OSMAC Systems Communication

The LSFI is intended to work with the industrial irrigation controller. It must be configured to the desired mode before use. All installed radios and wirelines need to be configured to operate correctly. The LSFI is the combination of the RIU and the FIU combined into one. For LSFI customers who needs both OSMAC and HHRI radio functionality, they need the LSFI-KK models with 2 radios. The 1st radio will be configured for OSMAC and the 2nd radio to be configured for HHRI.

The functions of the Field Interface are sending manually input pages to decoder boards or pagers, sending pages manually input by a DTMF enabled hand-held radio, sending pages as a result of a change of state on the alarm inputs and sending pages input from the industrial irrigation controller.

The functions of the HHRI is to receive and decode DTMF commands from a DTMF enabled hand-held radio, communicate these to the industrial irrigation controller, and transmit the appropriate acknowledgment tones back to the hand-held radio.

Non OSMAC Systems / 2-way Communication

The LSFI can be configured with both wireline and digital radio 2-way communication capabilities. For wireline systems, the LSFI utilizes the Lynx Standard (LS) modem. The device can be equipped with up to two modems to provide design and growth flexibility. For designs that specify radios, the LSFI utilizes a digital UHF radio. The device can also be configured as a combination with both wireline and radio capabilities further enhancing the communication options.

Installation

The LSFI is designed for use in an indoor environment and to be on a desktop. Although this is a good location for ease of operation, it is not the best place to locate the antenna. It is necessary to locate the antenna away from the unit (at least 10 feet), and high enough to provide adequate coverage. See list of applicable antennas on Page 21.

CAUTION: Always use in-line surge protector for antenna. See the recommended surge protector on Page 30.

WARNING: Equipment requiring alternate means to facilitate communication must be professionally installed by trained or skilled personnel familiar with the operation and hazards involved. Effects against electromagnetic disturbances must be measured at the installation site. The installer shall be responsible for ensuring that the proper safeguards are employed so that the electromagnetic disturbances limits are within FCC guidelines. The purchaser of the LSFI unit is responsible for meeting FCC guidelines.

Handling the LSFI

- Do not place the LSFI in a location subject to:
  - Heat sources, such as radiators or air ducts
  - Direct sunlight
  - Excessive dust
  - Mechanical vibration or shock
  - Strong magnets or speakers that are not magnetically shielded
  - Ambient temperature exceeding 122°F (50°C) or less than 14°F (-10°C)
  - High humidity, moisture, or rain
- Provide adequate air circulation to prevent internal heat build-up. Do not place the LSFI on loose surfaces (such as rugs or blankets) or near materials (such as curtains or draperies) that may block its ventilation slots.
- Leave a space of at least 8 inches from the back panel of the LSFI. Do not block vents to prevent overheating.
- Keep liquids away from the unit.
- The socket outlet shall be installed near the equipment and shall be easily accessible.
- Clean the cabinet with a soft, dry cloth or a soft cloth lightly moistened with a mild detergent solution. Do not use any type of abrasive pad, scouring powder, or solvent such as alcohol or benzine, as it may damage the finish.

Moisture Condensation

If the LSFI is brought directly from a cold location to a warm one, moisture may condense inside the unit. In this case, allow at least an hour before turning on the LSFI. If any problem occurs, unplug the unit and contact Toro NSN.

Phone: 800-275-8676

Email: NSNTech@toro.com

To prevent fire or shock hazard, do not expose your desktop to rain or moisture. To avoid electrical shock, do not open the cabinet. Only Toro authorized and trained personnel should be servicing the unit.

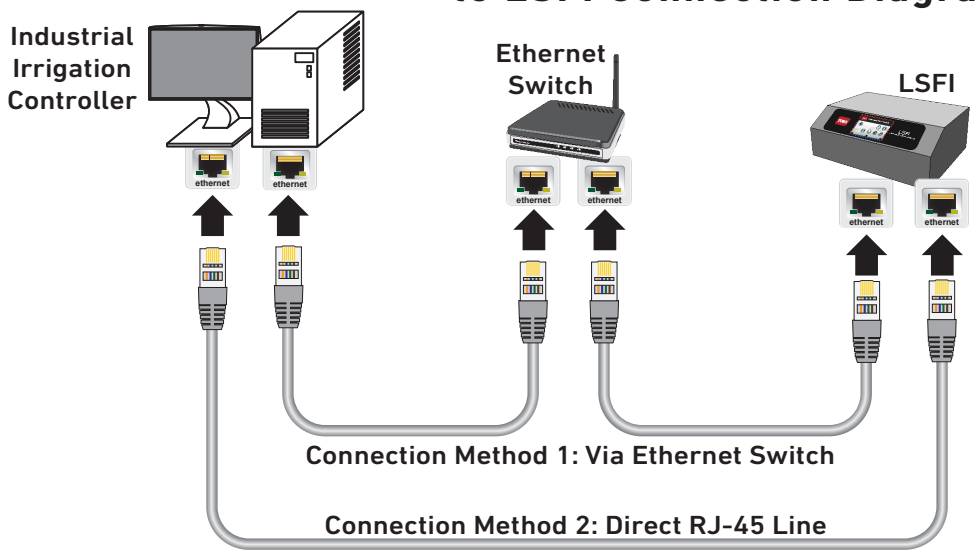
LSFI SYSTEM INSTALLATION

⚠ **WARNING:** Using a drill without proper eye protection may allow debris to enter the eye, causing injury. When drilling or carrying out other operations, always wear eye protection.

Connecting LSFI to the Industrial Irrigation Controller

Figure 3

Industrial Irrigation Controller to LSFI Connection Diagram



1. Set LSFI on stable surface with proper clearance around device.
2. Connect new LSFI to power using included cord.
3. Determine the method of communication from the central computer to the LSFI, either via an Ethernet switch (Method 1) or a direct RJ-45 cable (Method 2).
   See **Figure 3** for Connection method details.
   Note: The central computer must have proper version of Lynx software (8.3 or later) to communicate with the LSFI.
   Note: To configure the central computer to communicate via Ethernet, see page 13, **Network Ethernet Settings**.

4a. **Method 1: Via Switch** - Connect Ethernet switch to the incoming Ethernet cable.

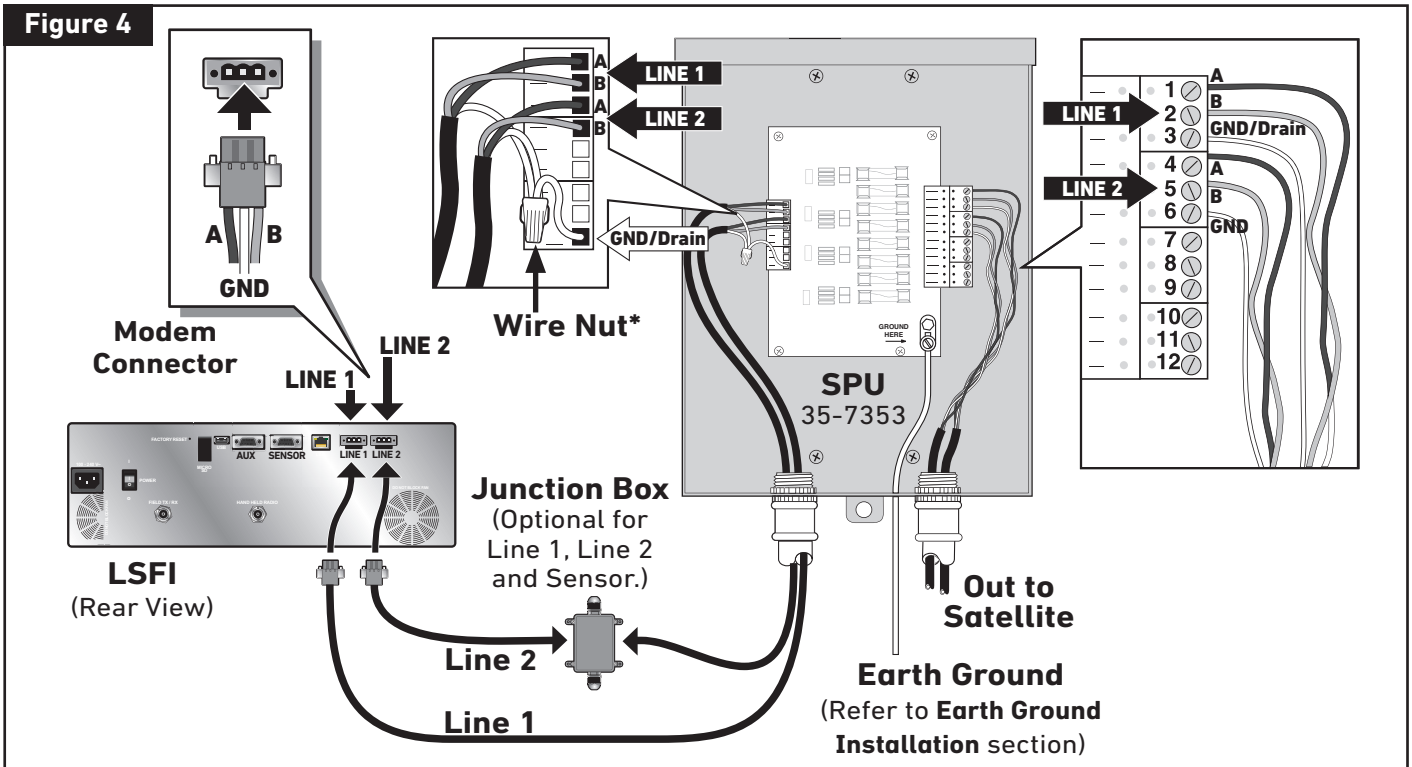
4b. **Method 2: Direct RJ-45 Line** - Directly connect the LSFI to the central computer using the RJ-45 cable.

5a. **Method 1: Via Switch** - Connect the LSFI to the switch using Ethernet cable and connect the switch to the central computer using a separate Ethernet cable.

5b. **Method 2: Direct RJ-45 Line** - Using separate Ethernet cable connect the LSFI directly to the central computer. The central should have two Ethernet ports. Plug it to one of the open port.

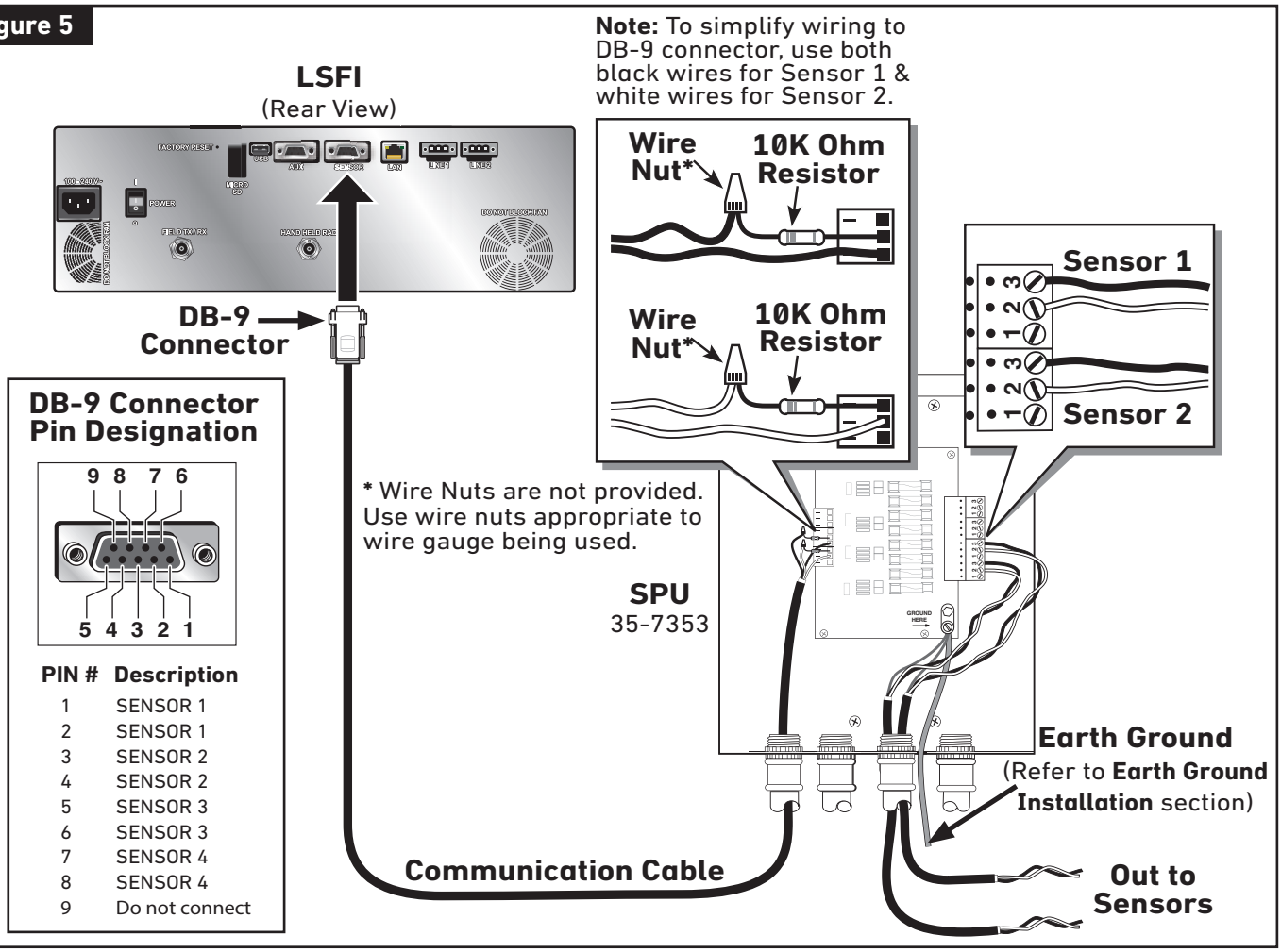
Connecting LSFI Radios, Wireline, Surge Protection Unit and Satellites - New Install

Figure 4



Note: Depending on Cable Assy., wires A & B could be Yellow & Gray or White & Black.

Figure 5



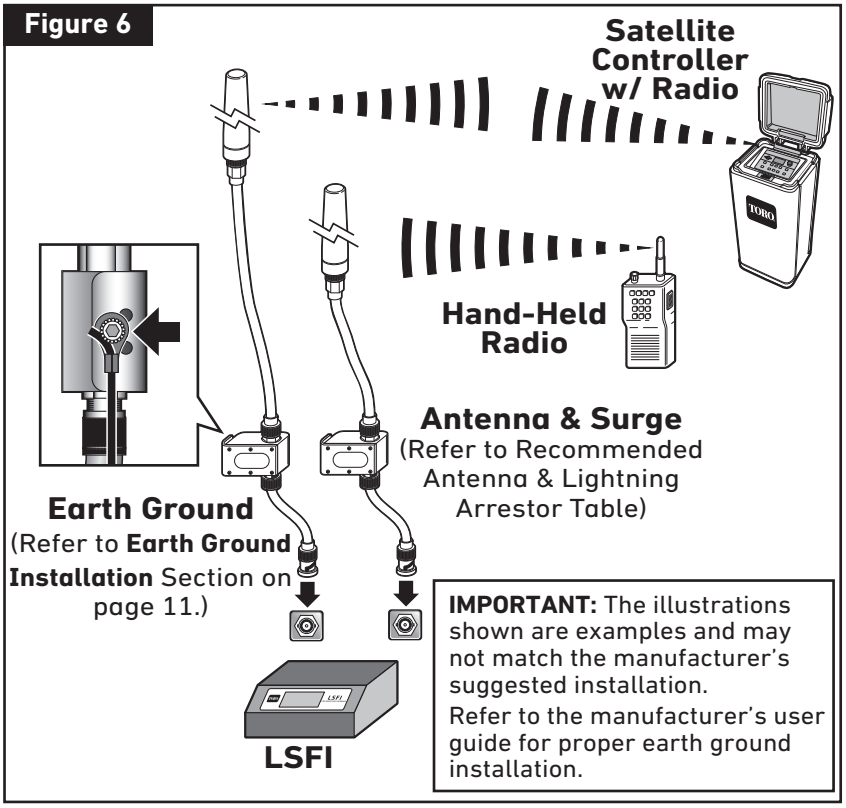
DB-9 Connector Pin Designation

PIN #	Description
1	SENSOR 1
2	SENSOR 1
3	SENSOR 2
4	SENSOR 2
5	SENSOR 3
6	SENSOR 3
7	SENSOR 4
8	SENSOR 4
9	Do not connect

1. Connect Line 1 and Line 2 from the LSFI to the SPU. Use provided Phoenix connector. Follow the same color code for Wires A, B and Ground to all terminal connections. See **Figure 4**.

   The use of an optional junction box between the LSFI and the SPU might be necessary. End user must use Waterproof box for electrical connections supplied by end user. Certified waterproof electrical junction body and conduit shall be in accordance with local jurisdiction and NFPA 70 National Electric Code (NEC).
2. Connect the sensor using a DB9 cable assembly. See **Figure 5** for reference.
3. In order for the antenna surge and SPU to protect the system properly, they must be grounded properly. See Earth Ground Installation section for proper grounding on page 11.
4. If the system is equipped with radios, install a recommended antenna and antenna surge to the LSFI. See **Figure 6**.

Figure 6



Connecting LSFI Radios and Satellites - Existing Install

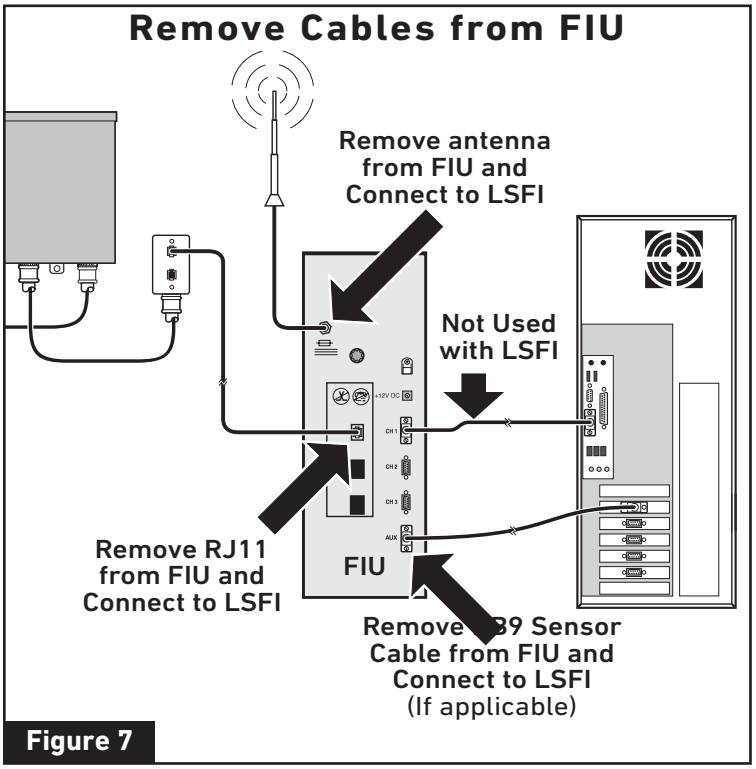


Figure 7

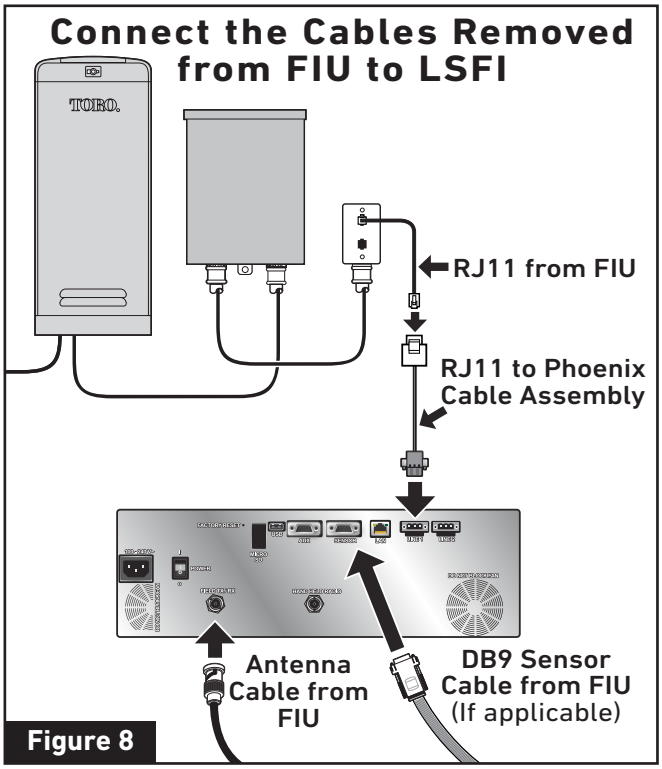


Figure 8

1. Remove the antenna, RJ11, and the two indicated DB9 connectors from the FIU. See **Figure 7**.
2. Install the antenna cable from the FIU to the LSFI.
3. Install the RJ11 cable from the FIU to the provided RJ11 to Phoenix cable assembly. Connect the phoenix end of the assembly to the LSFI. See **Figure 8**.
4. If sensor was being used, install the sensor DB9 cable to the LSFI sensor port.

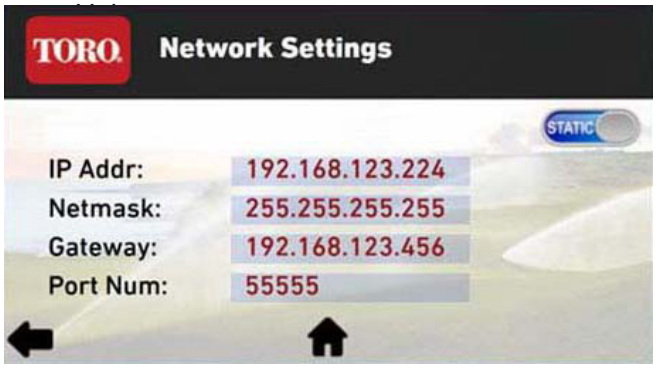
⚠ CAUTION:

The LSFI serviceable parts, (antennas, surge suppression, coupling hardware) shall be installed by qualified personnel familiar with the product and with local electrical and FCC code requirements. The LSFI is authorized for used with multiple antenna types. See Recommended Antenna Table for list of authorized antennas.

The system configuration is optimized with the recommended antennas on page 30. If necessary, adjust system configuration to accommodate site performance, the system configuration shall be professionally installed and the procedures specified in the Code of Federal Regulations, Tile 47, Section § 2.1043, § 15.31(d) must be followed. A site evaluation is required, and the installer shall be responsible for ensuring that the system configuration limits (radiated, conducted) are not exceeded. The system configuration output power must not exceed the maximum permitted output power in accordance with local code authorities having jurisdiction.

COMMUNICATION SETUP

1. Turn on LSFI and let the unit boot up. It will take a few moments. Once dynamic IP is establishe, the IP icons will turn green if connected to an ethernet switch or blue if using a direct connect method. See **Initial Boot** section, page 12.
2. Use the bottom navigation arrows to go to the Menu screen. Press the Ethernet icon to get IP address from **Network Settings** screen.
3. In Lynx, choose **Ethernet Connection** under the **Advanced Hardware Screens/Area**. Enter the IP address into Lynx.

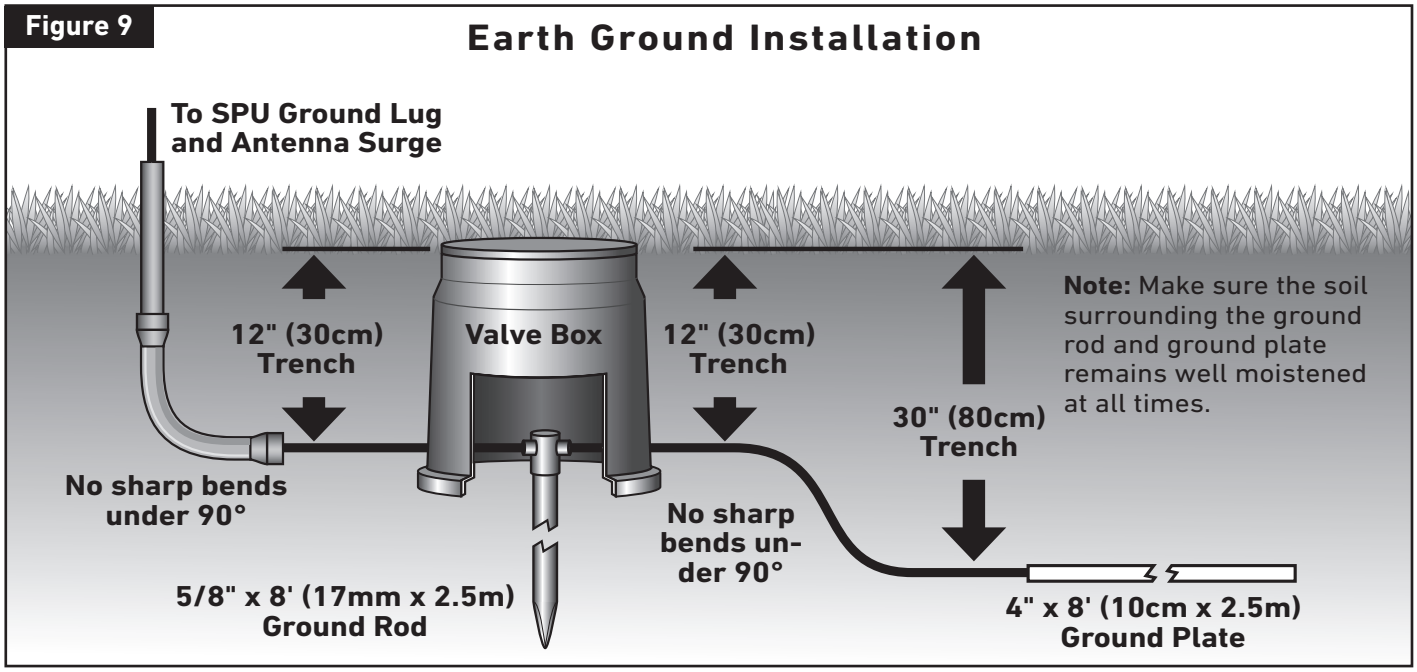


4a. **New Installation - Non-OSMAC Systems (Lynx Smart Satellite / Lynx Smart Hub)** - Restart Lynx. To check Lynx functionality, go to Utilities / Diagnostics / Comm Check and run a check. The results should return without any red warnings. Next, go to Daily Operations in Lynx and run a synchronization. Verify all satellites and hubs received download successfully. If desired, go to Utilities in Lynx and perform a Get Satellite and or Get Hub to also verify the LSFI is communicating to field hardware correctly. Manual irrigation can also be started through Lynx to verify proper communication through the central. To test field radios, send HHRI command for manual watering through radio and verify station has turned on and is logged in Lynx.

4b. **New Installation - OSMAC** - Restart Lynx. To check Lynx functionality, go to **Utilities / OSMAC diagnostics / Comm Check** and run a check. The results should return as "pass". Manual irrigation can also be started through Lynx to verify proper communication through the central. To test field radios, send OSMAC command for manual watering through radio and verify station has turned on.

EARTH GROUND INSTALLATION

Figure 9



⚠ **IMPORTANT!** Prior to excavating, digging, or trenching, consult with local utility locating service, site survey personnel, or authority having jurisdiction to prevent damage and protect utility infrastructure (gas, electrical, water, fuel, sewer, phone lines), dwelling, commercial structurer. Call 811, the national call-before-you-dig phone number, several business days before you plan to dig, to determine the approximate location of buried utilities.

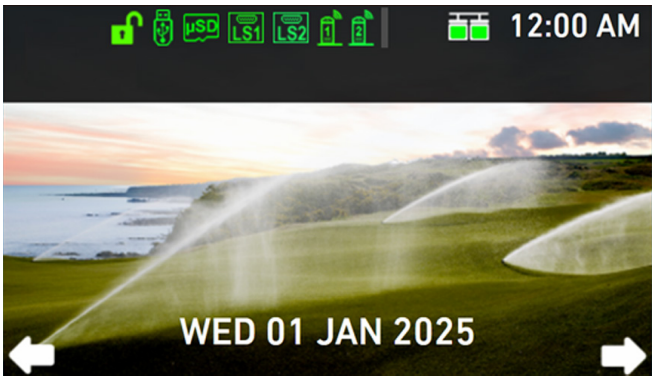
Drive a 5/8" by 8' (17mm x 2.5m) copper clad steel rod (Paige part# 182000) and install a 4" x 8' (10cm x 2.5m) copper ground plate (Paige part# 182199IC) into well moistened soil, not less than 8' (2.5m), but not more than 12' (3.7m) from the SPU or Antenna surge. See **Figure 9** for reference.

INITIAL BOOT

Upon booting the LSFI for the first time, the Home screen will display a series of icons across the top identifying what communication devices have been detected as well as the status of that device. The boot process can take up to thirty seconds for all devices to be identified.

If a particular icon does not appear, the device (board, radio, etc.) represented by that icon is not installed.

The icons additionally change color to provide more feedback to the operator.



Icons and Colors Explained

Icon	Function	Color Explanation
	Shows the lock status of the screen. If unlocked, menus are accessible. To lock the screen, tap the icon to change lock status.	Green - Screen is unlocked. **Note:** Visible only when Lock is enabled.
	Shows the lock status of the screen. If locked, menus are not accessible. To unlock the screen, navigate to the next screen and enter the pass code. The default pass code is 7531.	Green - Screen is locked.
	Shows whether a USB drive is inserted in the back of the LSFI unit.	Green - USB drive ready for I/O. Yellow - Initializing the USB drive. Red - Failed to initialize USB drive.
µSD	Shows whether a micro SD card is inserted in the back of the LSFI unit.	Green - micro SD card ready for I/O. Yellow - Initializing the micro SD card. Red - Failed to initialize micro SD card.
1 2	Shows the status of the installed radio(s).	Green - Radio is ready for communication. Blue - Receiving data from radio/handheld. Yellow - Receiving data from the central computer. Orange - LSFI processing changes from the central. Red - Failed to initialize radio
LS1 LS1	Shows the status of the installed wireline(s).	Green - Wireline(s) ready for communication. Blue - Receiving data from satellite. Yellow - Processing data from the central computer. Orange - LSFI processing changes from the central. Red - Failed to initialize wireline(s). White - Wireline(s) NOT connected.
	Shows the status of the Ethernet connection.	Green - LSFI unit connected via DHCP. Blue - LSFI unit connected via static IP address. Yellow - Ethernet trying to establish communication. Red - Failed to connect to network. White - LSFI unit NOT connected via Ethernet.

Main Menu

This screen shows all of the information screens available to your customized LSFI system. These icons are dynamic. Meaning, your LSFI unit will only display the icons for the methods of communication that exist. The screen to the right shows every icon currently available.

Note: Depending on LSFI model, icons on screen will vary.

Radios need to be enabled and communication established between the radio and LSFI before Radio icons will display. If the LSFI does not detect a handheld radio, for example, then the handheld radio icon (top right) would not display.

These icons are, from left to right:

(top row)

Ethernet / Network Settings

Wireline Settings

LSFI Radio Settings

or Radio 1: OSMAC or (HHRI) Settings

Radio 2 / handheld radio Settings

(bottom row)

USB Settings

SD Card Settings

Diagnostics

LSFI Settings.

Press ➡ to navigate to the **Secondary Icons** screen.

Network Ethernet Settings

Press the Ethernet icon to access the Network Settings screen. This screen will be used to configure the network.

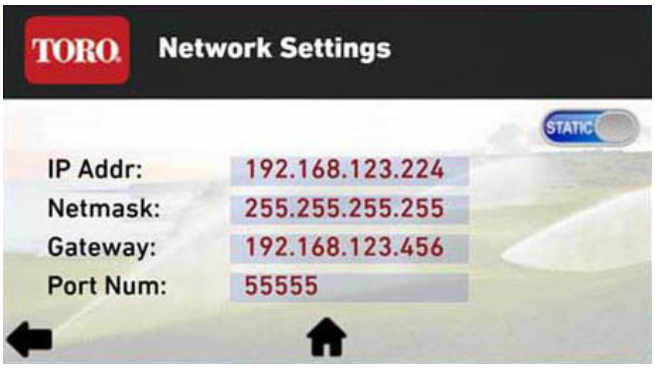
The sliding toggle button is used to switch between DHCP (green) and Static (blue) IP. (Default is DHCP.)

On the DHCP setting, the IP, Netmask, and Gateway address fields will be disabled.

When switched to Static IP, the user will be able to input values in the IP, Netmask, and Gateway fields.

For more information on static vs DHCP IP addressing, please see **Appendix C**.

Port number is available for both DHCP and Static.



Note: Network Settings will vary depending on your local network systems. Check with local network administrator and Toro NSN for further assistance.

13

LSFI Settings

Press the Settings icon to access the first LSFI Settings screen. This screen displays the languages available to the operator of the LSFI unit. Languages available are English, Spanish, French, German, Italian and Portuguese.

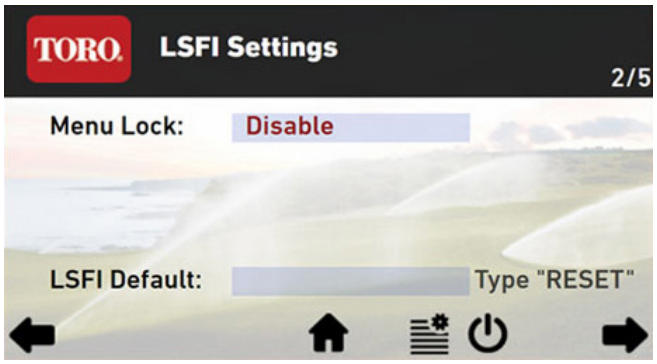
Press to power cycle (reset) the LSFI unit.

Press to navigate to the **second Settings** screen.

LSFI Settings (second)

The second LSFI Setting screen is used to set Lock Menu and reset the unit to factory default. When enabled, the Menu Lock prevents an unauthorized user from advancing to the menu screen and changing settings and parameters. Pressing the Menu Lock text field will toggle between Enabled and Disabled. Menu Lock is set to Disabled by default. Default pass code is 7531.

The LSFI Default field is used to reset the unit back to factory defaults. After a reset, all hardware settings will have to be reconfigured. To activate factory reset, press the LSFI Default text field and enter the word "RESET" (all caps). Upon completion, the unit will reset and all settings will be restored to factory defaults.

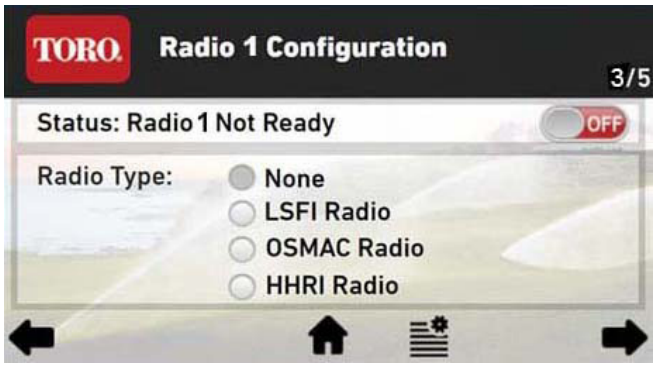


LSFI Settings (third)

The third LSFI Setting screen displays the type of installed radio. If radio is installed, LSFI will activate the Radio Configuration screen. The user must set the Status to **ON** and specify the **Radio Type**. Choices are None, LSFI Radio, OSMAC Radio, and HHRI Radio.

Press the Status slide toggle to turn the radio on and then select the type of radio installed.

Note: After a factory reset, the radios will need to be reconfigured again to the desired type.

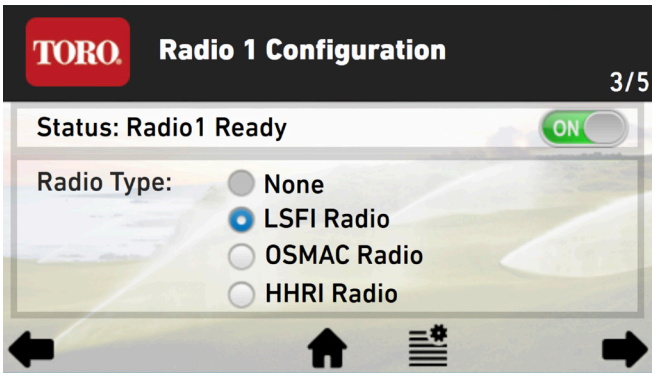


LSFI Settings (fourth)

The fourth LSFI Setting screen displays the type of radio installed for the second radio (for HHRI models). If radio is installed, LSFI will activate the Radio Configuration screen. The user must set the Status to **ON** and specify the **Radio Type**. Choices are None, LSFI Radio, OSMAC Radio, and HHRI Radio.

Press the Status toggle to detect the radio on and then select the type of radio installed.

Note: After a factory reset, this Radio Type field defaults to None and is not adjustable at that point.



Radio Settings

Radio Settings

Press the Radio 1 icon or the Radio 2 icon to access the Settings screen for that radio. (The radio type determines the icon displayed.) The radio Settings screens configures the designate Lead Delay, Hang Delay times, and Frequencies. At this point, the user has already enabled Radio 1 or Radio 2. The Type field will be populated as either LSFI, OSMAC, or HHRI Radio.

The chart below shows the default settings.

Parameter	LSFI Radio	OSMAC/HHRI
Lead Delay	30 ms	100 ms
Hang Delay	10 ms	200 ms
Baud Rate	38400	38400

Press ➡ to navigate to the next Radio Settings screen.

Radio 1 Information

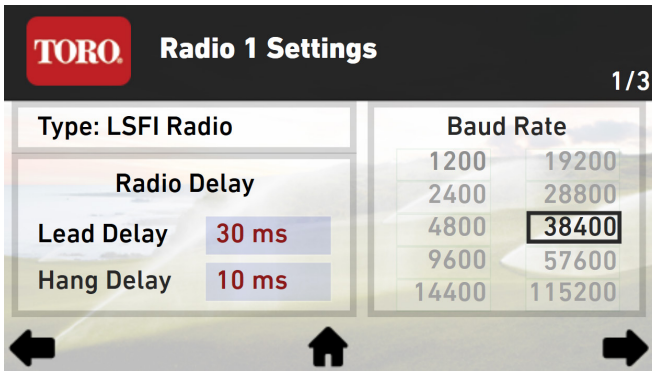
The second Radio 1 and 2 Settings screen displays radio information such as Model and Serial numbers and firmware version. The screen also displays read and write parameters such as the Address, Mode and whether RSSI(WMX) is enabled.

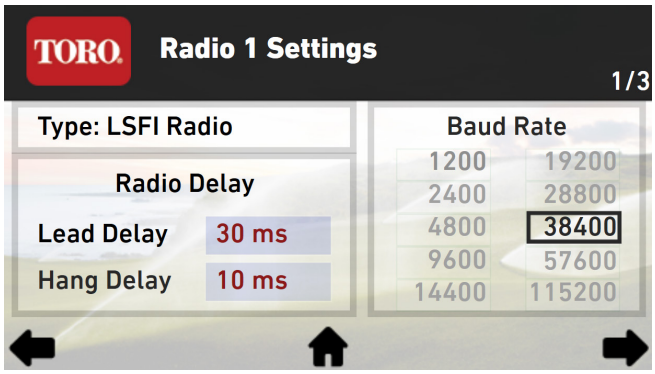
Press the Address text field to bring up a touchscreen keyboard to change the address.

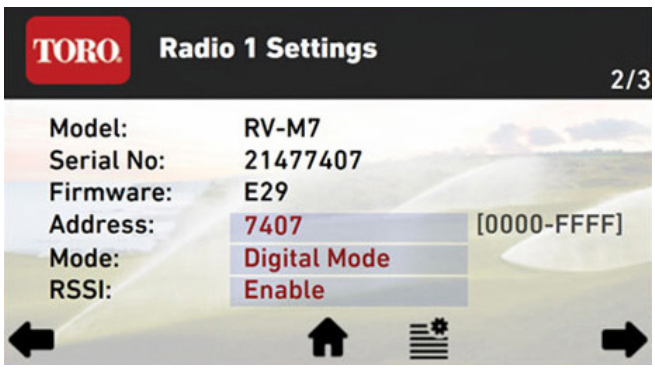
The Mode is always Digital Mode.

RSSI is always Enabled for OSMAC and HHRI radio types. RSSI is adjustable only for LSFI radio type.

Press ➡ to navigate to the next Radio Settings screen.







Radio 1 Configuration

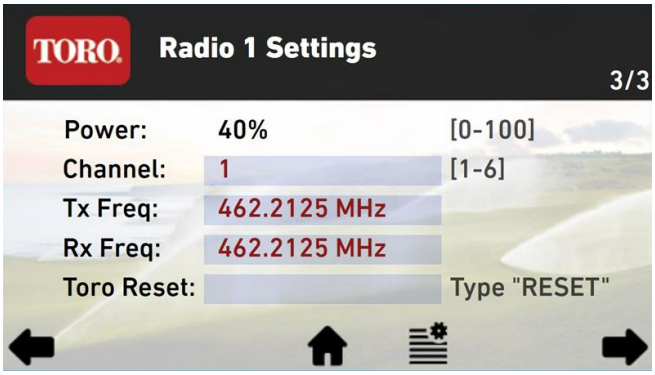
The third Radio 1 and 2 Settings screen displays the radio communication configuration: Power, Channel, TX and RX Frequency.

To change the radio frequency, simply press the Tx Freq: field and enter the correct frequency from the keyboard screen.

Identical process for the Rx Freq: field.

If the radio has been detected by the LSFI but cannot communicate with the field satellite, use the Toro Reset command to restore to Toro factory settings. Press the Toro Reset field. A keyboard will popup. Enter the phrase “RESET” (all cap) to reset the radio. Restart the configuration process after the reset.

All text fields on this screen activate a touchscreen keyboard.

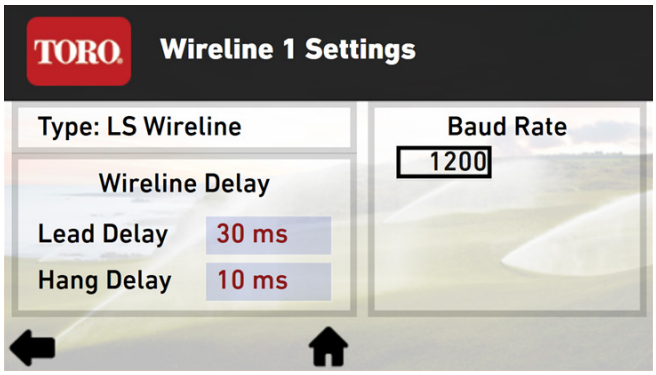


Wireline Settings

Press the Wireline 1or Wireline 2 icon to access the Settings screen for that Wireline. The Wireline Settings screens configures the designated Baud Rate, Lead Delay, and Hang Delay times.

Use the chart below to set the parameters for your particular wireline.

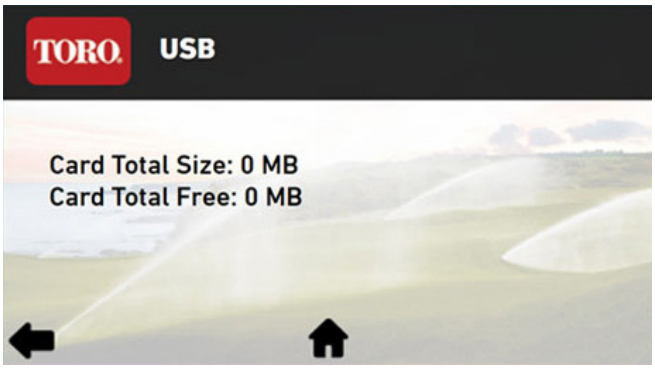
Parameter	LS Wireline
Lead Delay	30 ms
Hang Delay	10 ms
Baud Rate	1200



Note: The above parameters are default settings and under normal use, do not need to be adjusted.

USB Information

Press the USB icon to access the USB screen. This screen displays USB information. The USB port is only used for firmware updates. The USB icon only appears when a USB thumb drive is detected.



Micro SD Card Information

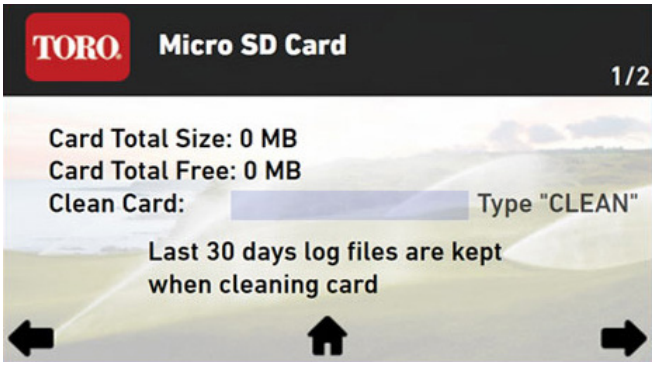
Press the Micro SD Card icon to access the Micro SD Card screen. This screen populates when a Micro SD card is inserted in the rear Micro SD Card slot, displaying the Micro SD card information. The Card is used o store log files. The text label Clean Card is used to clean up the storage space. When cleaning the storage space, only the last 30 days of log files are kept.

To clean the SD Card storage space, enter the phrase “CLEAN” (all caps) in the popup keyboard.

Note: LSFI supports FAT32 formatted cards up to 32 GB.

The SD Card icon only appears when a SD Card is detected.

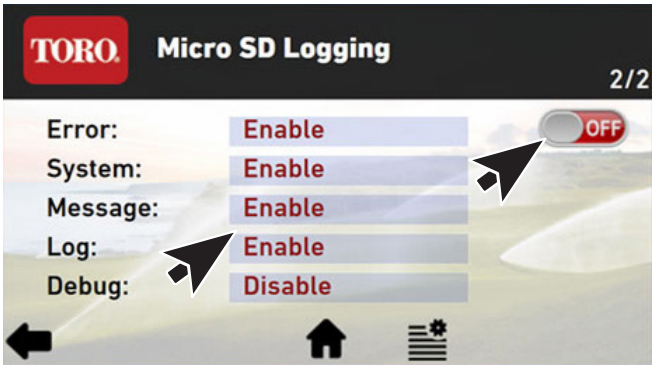
Press ➡ to navigate to the **Micro SD Logging** screen.



Micro SD Logging Settings

The Micro SD Logging Screen is used to specify what the LSFI unit should log. There is a ON-OFF toggle switch used to enable logging. The user can also tap the text field to enable or disable what the system should log. Log files are stored in an installed micro SD Card.

Note: Micro SD Logging is OFF by default. It should not be turned on unless it is needed for diagnostics. The SD card is used for diagnostics only. Use the USB port for Firmware updates.

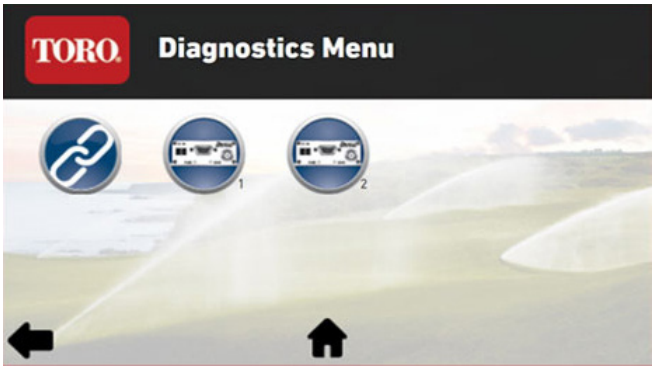


After a **RESET**, Radio Configuration must be reconfigured.

Diagnostics Menu

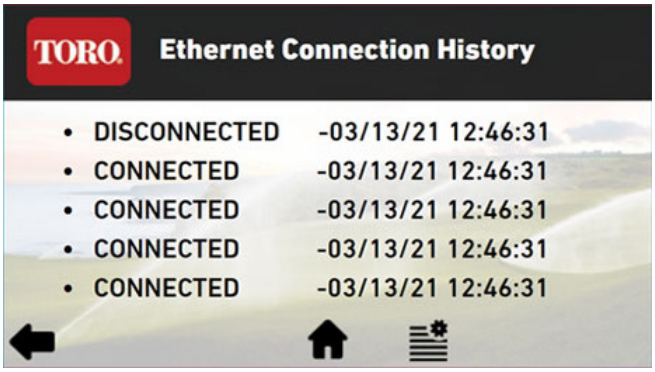
Press the Diagnostics icon to access the Diagnostics Menu screen. This screen shows the various elements in the LSFI that can have diagnostics run against them. The icons are, in order from left to right:

- Ethernet Connection History,
- Radio 1
- Radio 2



Ethernet Connection History

Press the Ethernet Connection History icon to access the Ethernet Connection History screen. This screen will show the last five connected and/or disconnected events followed by the date and time. The most recent event is displayed at the top of the list.



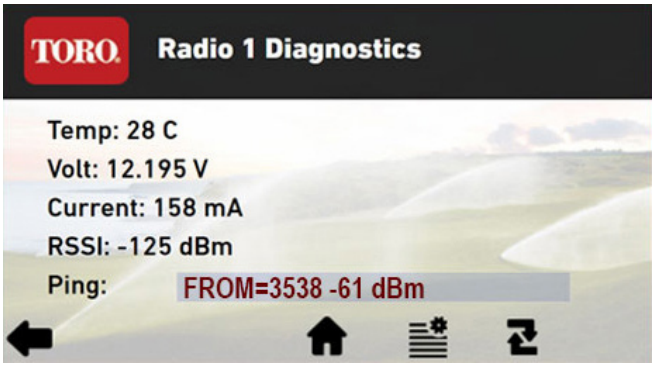
Radio 1 and 2 Diagnostics

Press the Radio 1 or Radio 2 icon to access the Diagnostics screen for that radio.

This Radio Diagnostics screen displays the initial temperature, voltage, current, and RSSI reading from either Radio 1 or Radio 2.

The Ping field only displays for LSFI radio type.

Press to retrieve the most recent readings.

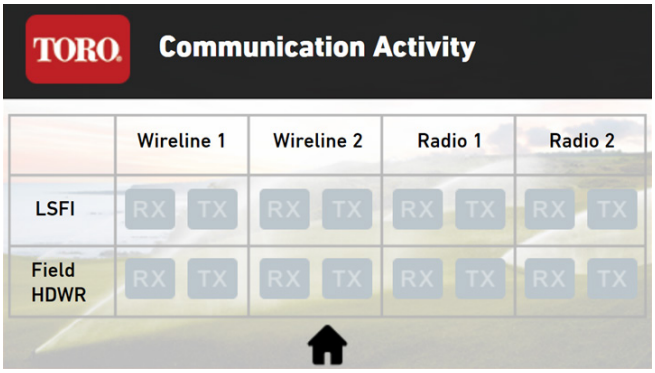


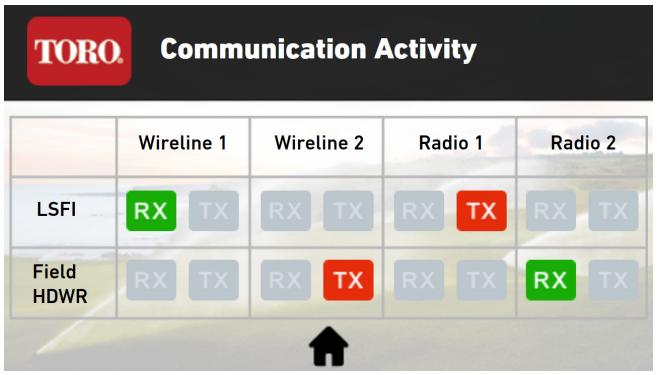
Note: To use "Ping" feature: Type PING XXXX (where XXXX is the ID of the modem to ping. If remote access is enabled on XXXX, it will respond. Response also shows the dB level of response.

Communication Activity Screen

Note: For shortcut to Activity Screens, press on icons at the top of the Home Page screen.

- The new "Communication Activity" screen was designed to show real time communication activity on the applicable channels inside of the LSFI
- This feature is similar to what the LED lights did on the front of the legacy FIU
- The RX and TX icons will only populate if the applicable hardware is detected during startup
- The RX (Green) and TX (Red) will flash when the LSFI detects communication on the active channel
- This screen can be used to determine/show if the LSFI is receiving communication from the central computer, communicating out to field hardware or receiving communications back from field hardware.





Secondary Menu

This screen shows the LSFI secondary icons for commands that might not be used as frequently.
These icons are, from left to right:
(top row)

Radio 2 Pager Interface

(bottom row)

Communication Activity

Sensor Input Status

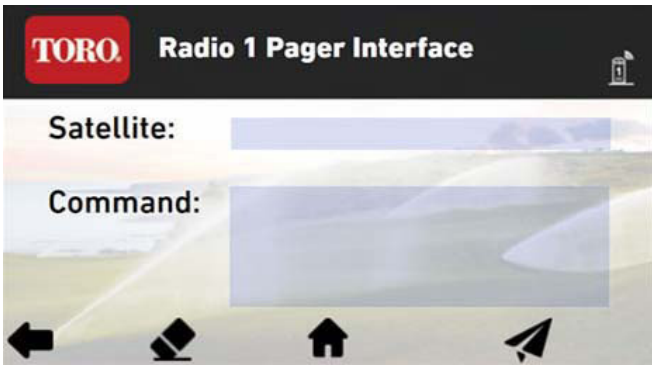
Toro Technical Support

LSFI Information

Radio 1 and 2 Pager Interface

HHRI commands work on both Radio 1 and Radio 2.
OSMAC commands only work on Radio 1.

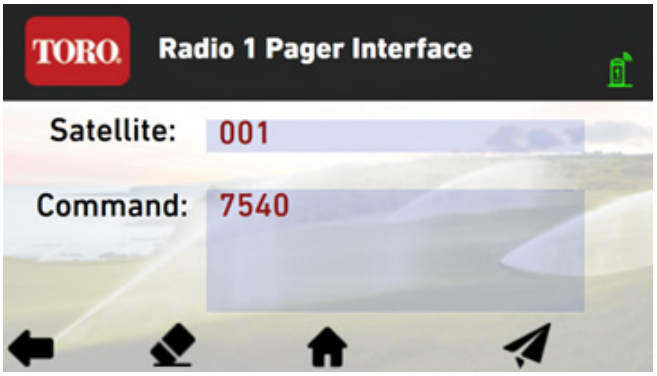
(OSMAC Mode Only)
Press the Radio 1 or Radio 2 Pager icon to access the Paging screen for that radio.
The Send page sequence mimics the original OSMAC page entry sequence. To Write:
Press the Command text field to bring up the on screen keyboard.



Method 1:
Enter Satellite Address in the Satellite field 001-256.
Enter Command. See **Appendix A** for OSMAC commands.
Example: Satellite: 001 and Command: 7540
Click Send to initiate command.

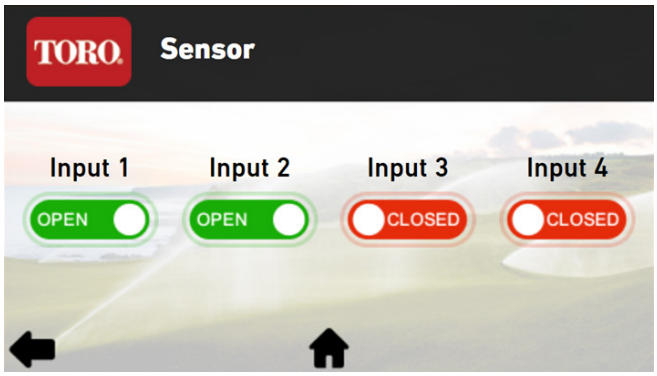
Method 2:
Enter in Command field like how you enter a Hand-Held Radio.
Example: Command: *90017540.
Click Send to initiate command.

Note: The Satellite field with address will gray out.



Sensor Input

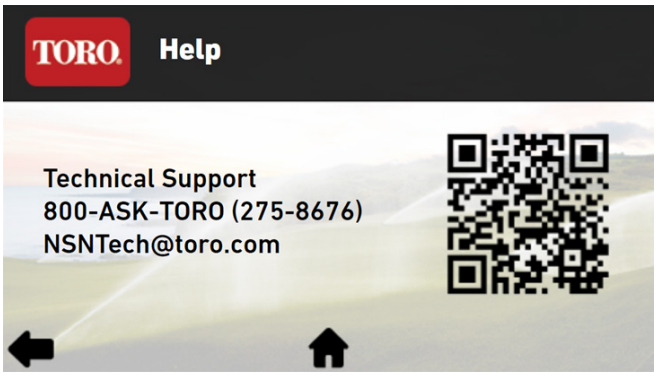
Press the Sensor icon to access the LSFI Sensor screen.
The Sensor screen is a read-only screen. It reads the 4 inputs of the motherboard sensors and display the output state.



Support and Information Screens

Technical Support

Press the Get Help icon to access Toro Technical Support phone numbers and email address for your LSFI unit.



LSFI Information

Press the Information icon to access the LSFI Information screen. This screen displays information about your LSFI unit such as serial number, firmware version, and more.

Firmware Updates

The LSFI supports firmware upgrades via USB. In order to update the firmware to the latest release, simply insert the Toro USB drive into the USB port on the back of the LSFI and recycle power. The boot loader will search for the update firmware (which is stored in the root directory of the USB drive) and will automatically install. When it is finished, remove the USB drive. The system will automatically reset to the LSFI application.

TROUBLESHOOTING

Symptom	Solution	Action
Unit will not receive RF and/or unit will not transmit.	Check the radio icon color on front of LSFI screen.	Refer to page 12, Initial Boot Section for the radio color code list.
	Verify Radio frequency settings to make sure the system is configured properly.	Refer to page 15, Radio Settings for the proper radio parameters.
	Check antenna connection.	a Verify all connectors are tight and clean. b. Make sure there are no drastic bends in the cables. c. If necessary, check the levels to the LSFI power supply and the impedance of the cables/antennas.
Unit functions erratically (shuts down suddenly, over heats, skips stations, etc.).	Verify that all cables are plugged-in properly.	Verify that all connectors are tight and clean.
	Check air vents in the rear and bottom of the unit.	Clean air vents as needed. Make sure the vents are unobstructed.
Unit experiences radio interference.	Relocate the antenna. See **Important Note** about antenna on page 22, under **Maintenance**, **Antenna**,	Verify that the antenna and all connectors are in proper order.
	Check the hand-held radio functionality.	Press the * and PTT button and verify that the radio icon on the LSFI LCD screen changes to a blue color.
LCD screen blanking out.	LCD screen goes to sleep after 15-minutes. This is normal operation.	Touch screen to wake up LSFI.
	Verify all external cables are plugged in properly.	
	Power cycle the unit using the power switch on the rear.	
	If persists, call Toro Technical Support: 800-275-8676.	
Unit is not communicating.	Check icons on home screens - All applicable icons should be green: radio icons/wireline LS icons.	
	Press icons at top of home screen - shortcut to Communication Activity Screen.	Look for green RX and red TX activity lights on the wireline 1-2 or radio 1-2 channels.
	Press radio or LS icons at the top of home screen - short cut to Communication Activity screen.	Look for green RX and red TX activity lights on the wireline 1-2 or radio 1-2 channels.
	If nothing is lighting up, try power cycling the unit.	
	Check the central computer hardware setup.	Go to Advanced Settings menu and verify “Ethernet” is the connection type and the proper IP address is listed.
	Check Radio Frequency.	Go to Radio Settings menu (Page 15) and verify that the radio frequency is correct.
	Check/Reset Radios.	Go to LSFI Settings menu (page 14) and reset radios and reconfigure.
	If communication is still not occurring, a factory reset can be performed.	Perform factory reset. See page 22, Master Factory Reset.

MAINTENANCE

Refer servicing the LSFI to qualified personnel only.

The following maintenance precautions are required to keep the LSFI under manufacturer's warranty.

Antenna

A broken antenna can cause severe damage to the internal radio modem(s). Before use, verify the antenna is installed properly

Important: The antenna must be greater than 6 feet away from the unit. It should be mounted as high as possible. Antenna equipment must be professionally installed by trained or skilled personnel familiar with the operation and hazards involved. Check the **Recommended Antenna and Surge Arrestor table** on page 30 for proper antennas to use. Effects against electromagnetic disturbances must be measured at the installation site. The installer shall be responsible for ensuring that the proper safeguards are employed so that the electromagnetic disturbances limits are within FCC guidelines.

Dust/Pollen

Install the LSFI in an area that will get as little dust as possible. Keep away from open windows and doorways.

Air Vents

The LSFI has two air vents on the back of the unit, one for air ingress, the other for air egress. Make sure these vents remain free from dust as dirty vents can decrease the performance of the device, especially at higher temperatures.

The LSFI also has vents on the bottom of the unit. Make sure these vents are not blocked as well.

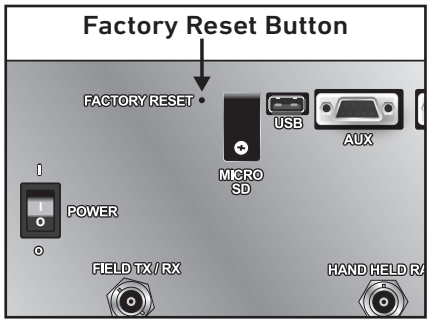
MASTER FACTORY RESET

There are two methods to accomplish a factory reset, using the GUI and using the rear reset button.

To reset the LSFI to the original factory settings, follow the steps below:

1. **Using GUI.**
   a. Navigate to LSFI settings menu screen 2/5 (See page 14).
   b. Activate the factory reset, press the LSFI Default text field and enter the word "RESET" (all caps).
   c. Upon completion, the unit will reset and all settings will be restored to factory settings.
   d. After the unit reboots, the IP address will need to be reconfigured and entered/verified in the industrial irrigation controller.
   e. If using radio communications, the radios will need to be configured to proper type (See page 15).
   f. Verify that the radio and/or wireline icons in the Home screen are green.
   g. Navigate to Activity screen by selecting the LS or radio icons at the top of the home screen.
   h. Verify that communication on all applicable channels are occurring as desired.

2. **Using Factory Reset button in the rear of the LSFI.**
   a. Use a paperclip or similar implement to press the Factory Reset button at the back panel of the LSFI.
   b. Hold the button down and power cycle the LSFI unit.
   c. Continue to hold down the button while the LCD screen flashes.
   d. When the LCD screen stops flashing, release the button.
   e. Upon completion, the unit will reset and all settings will be restored to factory settings.
   f. After the unit reboots, the IP address will need to be reconfigured and entered/verified in the industrial irrigation controller.



   g. If using radio communications, the radios will need to be configured to proper type (See page 15).
   h. Verify that the radio and/or wireline icons in the Home screen are green.
   i. Navigate to Activity screen by selecting the LS or radio icons at the top of the home screen.
   j. Verify that communication on all applicable channels are occurring as desired.

APPENDIX A: OSMAC COMMANDS

These commands are sent by the LSFI (in OSMAC mode) to control the operation of OSMAC satellites. They can be initiated automatically by the industrial irrigation controller, or entered manually using hand-held radios, or using the front panel.

Command Code	Operational Description
7510	Turns off individual stations: e.g., 7510 01 02 40 turns off stations 1, 2 and 40.
7511	Turns on individual stations; e.g., 7511 01 02 40 turns on stations 1, 2 and 40.
7512	Syringes individual satellite stations for a predetermined number of 30-second intervals (already defined in the satellite); e.g., 7512 01 02 turns on stations 1 and 2 for 30-second intervals.
7513	Disables individual stations; e.g., 7513 01 03 disables stations 1 and 3. After this command, on and off commands will be ignored for stations 1 and 3 until the stations are re-enabled.
7514	Enables individual stations; e.g., 7514 01 03 enable stations 1 and 3.
7515	Sequentially syringes a specified station number range; e.g., 7515 10 20 will syringe stations 10 through 20 sequentially.
7516	Sequentially syringes individual stations; e.g., 7516 10 11 will syringe stations 10 and 11. Multiple syringe groups can also be run. Enter two dashes between stations to designate separate syringe groups; e.g., 7516 10 11 - - 22 24 26 28 will run two syringes at the same time. First on stations 10 and 11, followed by stations 22, 24, 26 and 28.
7517	Turns on individual stations for a specified number of hours, minutes and seconds; e.g., 7517 01 30 00 23 24 25 turns stations 23, 24 and 25 for 1 hour, 30 minutes and no second.
7518	Turns on individual stations for a specified number of minutes; e.g., 7518 10 23 24 25 turns on stations 23, 24 and 25 for 10 minutes.
7520	Turns off a sequential station run operation (initiated by command code 7521).
7521	Turns on a sequential station run operation; e.g., 7521 01 turns on station 1. To step forward through the stations, press * 1; to step back through the stations, press * 2.
7522	Increment to the next predetermined station in a sequential; e.g., 7522 02 will add 02 to the station number of the currently running station and energize the new station number. The sequential run will stop when the new number exceeds 64.
7523	Decrement to the previous predetermined station in a sequential run; e.g., 7523 03 will run the station that is 3 stations before the one currently energized. The sequential run will stop when the station number reaches the new station number minus 1.
7524	Turns on individual stations as switches; i.e., does not simultaneously energize the pump. Note: Will not turn off the pump if already running. e.g., 7524 25 35 45 turns on stations 25, 35 and 45 without energizing the pump.
7525	Turns on individual stations as switches for a given time in minutes; i.e., does not simultaneously energize the pump in this command string, the run time is entered first, followed by the station numbers; e.g., 7525 25 05 42 turns on stations 5 and 42 for 25 minutes without energizing the pump.
7526	Turns on individual stations as switches for the time given in hours, minutes and seconds. In this command string, the run time is entered first, followed by the station numbers; e.g., 7526 02 30 45 25 26 27 turns on stations 25, 26 and 27 for 2 hours, 30 minutes and 45 seconds.

Command Code	Operational Description
7540	Turns off all stations (specified satellite only).
7542	Turns off all stations using the sequential shut-down procedure.
7543	Disables all stations in all satellites (rain shutdown). Note: Satellite address number is not used with 7543 or 7544 command codes. The station will not respond to any further commands until enabled.
7544	Enables operation of all stations in all satellites. See note above.
7546	Sequentially syringes all stations for a set length of time; e.g., 7546 turns on all stations for the predetermined number of 30 second intervals as defined in the syringe time.
8000	Disables pump start.
8001	Enables pump start to be assigned to a station; e.g., 8001 48 assigns pump start to station 48.
8003 00	Disables operation and turns off all stations in the satellite with sequential shutdown
8003 01	Enables operation of all stations in the satellite
8004	Changes the password; e.g., 8004 7531 6108 will change the factory default password (7531) to 6108.
8006 01	Sets the syringe time in 30-second intervals; e.g., 8006 01 0100 (without a password) or 8006 pppp 01 0100 (with a password) sets the syringe time to 100 intervals (50 minutes). The number of intervals must be given as four digits with leading zeros but can be no greater than 0255.
8006 02	Sets the time-out limit in 30-minute intervals. This must be specified using four digits with leading zeros and no greater value than 0255; e.g., 8006 02 0060 (without a password) or 8006 pppp 02 0060 (with a password) sets the time-out limit to 30 hours.
8006 03	Enables/disables the password. Use 8007 03 01 to enable password protection or 8007 03 00 to cancel password protection.
8007 03 00	Password disable command. Cancel the requirement of entering the password for every entered command.
8007 03 01	Password enable command. After activation, all commands will require the password to be entered.
8008	Configures stations as switches. Stations can be specified individually and in combination with a range of stations; e.g., 8008 01 12 50 - 60 configures stations 1, 12 and 50 through 60 as switches. Note: Only a single dash is used when entering a range of stations.
8009	Configures stations for irrigation. Stations can be specified individually and in combination with a range of stations; e.g., 8009 01 20 45 - 48 configures stations 1, 20 and 45 through 48 for irrigation.
8011	Resets EPROM to factory defaults.

Note: Do not use a terminating '#' symbol to complete an OSMAC command. The LSFI does not recognize that character for termination.

OSMAC DTMF Commands

These commands are used when sending commands to the LSFI (in OSMAC mode) using a hand held radio.

Command Code	Operational Description
*9	This is the command from the radio that announces to the LSFI that a DTMF command is coming. The format for the entire command is *9 AAA CCCC, where AAA is the three-digit satellite address, and CCCC is a command of arbitrary length. For example, the sequence *9 081 751101020304 will send a command to satellite 81 to turn on stations 1,2,3, and 4.
*0	This is the Readdress command. If *0 is used to initiate a command instead of *9, the address of the last satellite is used. For example, the command *9 095 751101 will turn on station 1 of satellite 95. Following this with *0 7540 will send the shut down all stations command to the last satellite addressed, in this case, satellite 95.
*1	Increment in increment/decrement mode. After the command 7521 has been sent to a satellite, it will be in increment/decrement mode. A shortcut command, *1, can be used from the hand-held radio to increment to the next station. When the LSFI receives *1, it will send 752201 to the last satellite addressed. A step size can be added after the *1 command to skip stations while incrementing. For example if the current station in the increment/decrement mode is station 6, a *1 04 command will increment to station 10 by instructing the LSFI to send the command 752204.
*2	Decrement in increment/decrement mode. This command works the same as *1, except it decrements, instead of incrementing. The decrement command sent by the LSFI is 75 23.
*4	Turn off all stations on the last satellite addressed. This command instructs the LSFI to send the command 7540 to the last addressed satellite.

APPENDIX B: HHRI COMMANDS

Notes: The Kenwood radio, model KSC-25L, is the approved hand-held radio for use with LSFI. See **Compatible Radio Models** listing for additional radio models that may be used with LSFI. Consistency may vary depending on models and manufacturers.

Compatible Radio Models

Manufacturer	Model	LSFI Compatible
Motorola	PR400	Yes
Kenwood	KSC-25L	Yes
Yaesu	FT-65	Yes
Yaesu	FT-60	Yes
Hytera	782	No

WARNING: Radio shall be certified to FCC Part 97 and registered to operate in the frequency band between 450-470 MHz

Notes: Optional parameters are enclosed in brackets []. The course number is required on Area/Hole commands for courses 2 and 3. Maximum Group, Satellite and Station limits are adjusted by field hardware type.

Note: All HHRI commands need to end with a '#' symbol at the end of the command.

Area/Hole Commands

Command	Begin	Course	Area/ Program	Hole	Stn Tag Begin	Stn Tag End	Run Time	Stns Per	Comments
Turn On	*860	[1-3]	001-999	01-48	[01-99]	[01-99]	-	01-99	Uses Water Plan Runtime.
Turn On Stn List	*861	[1-3]	001-999	01-48	[01-99]	[01-99]	01-99	-	Non Consecutive Stn List
Turn Off	*862	[1-3]	001-999	01-48	[01-99]	[01-99]	-	-	Also supports Non Consecutive Stn List
Turn On Runtime	*863	[1-3]	001-999	01-48	[01-99]	[01-99]	01-99	01-99	-
Percent Adjust	*867	[1-3]	001-999	01-48	[01-99]	-	000-900	-	Runtime=Percent Adjust. For stations only.
Cancel Last Command	*869	[1-3]	-	-	-	-	-	-	-
Test Mode by Area Hole	*871	[1-3]	001-999	01-28	[01-99]	-	-	-	Same as 851 but uses area/hole.
End Test Mode by Area Hole	*872	[1-3]	001-999	01-28	-	-	-	-	Same as 852 but uses area/hole.

System Commands

Command	Begin	Course	Comments
System Pause	*830	[1-3]	No course number then all courses.
System Resume	*831	[1-3]	-
System Cancel	*840	[1-3]	-
Rain Hold	*843	[1-3]	-
Rain Hold and Cancel	*844	[1-3]	-
Remove Rain Hold	*845	[1-3]	-

OSMAC, Network VP, and Lynx Smart Satellite Station Group Multi-Manual Commands

Command	Begin	Group	Satellite	Station Group	Comments
Station Group On	*875	01-50	001-255	01-99	-
Station Group Off	*876	01-50	001-255	01-99	-
Station Group Advance	*877	01-50	001-255	01-99	OSMAC only

Note: Lynx 8 does not recognize these group commands.

Network GDC Station Group Multi-Manual Commands

Command	Begin	Gateway	Daughter Board	Station Group	Comments
Station Group On	*875	1-4	1-2	01-99	-
Station Group Off	*876	1-4	1-2	01-99	-
Station Group Advance	*877	1-4	1-2	01-99	-

Satellite Command

Command	Begin	Group	Satellite	Comments
Turn Satellite Off	*855	01-50	001-255	OSMAC and Network VP and VPE

Gateway Command

Command	Begin	Gateway	Daughter Board	Comments
Turn Off	*855	1-4	1-2	Network GDC - resets daughter board

OSMAC, Network VP, VPE, and Lynx Smart Satellite Hardware Address Commands

Command	Begin	Group	Satellite	Program	Runtime	Code	Stations	Comments
Increment 1 Station	*1	-	-	-	-	-	-	Applies to 851 and 871.
Decrement 1 Station	*2	-	-	-	-	-	-	Applies to 851 and 871.
Turn Off Last Satellite	*4	-	-	-	-	-	-	Applies only to 861 (Test mode).
Manual Program Start	*810	01-50	001-255	Program ID	-	-	-	Program ID must be valid for operation.
MM with 1 Runtime	*820	01-50	001-255	-	01-99	-	1-6 Stations	-
MM with individual Runtimes	*821	01-50	001-255	-	-	-	1-6 Stations with Runtimes	-
Program Cancel	*841	01-50	001-255	Program ID	-	-	-	Program ID must be valid for operation.
Station Cancel	*842	01-50	001-255	Program ID	-	-	-	-
Control Code Request	*850	01-50						
	001-255							
	-	01-99	-	Network VP and OSMAC only.				
Test Mode by Sat	*851	01-50	001-255	-		-	01-64	Runtime is set to 99 minutes.
End Test Mode by Sat	*852	01-50	001-255	-	-	-	-	-

APPENDIX C: STATIC VS DHCP IP ADDRESS FOR LSFI

LSFI customers have the option of implementing DHCP or Static IP addressing for communication between their LSFI and the central computer.

DHCP Network - IP address is dynamic and assigned by the network.

LAN Static IP - IP address is fixed and is manually input by a person, as well as the Subnet Mask and Gateway.

The decision on which network configuration to utilize will be dictated by the IT network administrator. Each option has its own Pros and Cons that should be evaluated.

	PRO	CON	Toro Recommendation
DHCP	IP address, gateway address and netmask don't need to be manually input to the device.	A device could acquire a new IP address for multiple reasons from disconnection to routine network maintenance. Regardless the reason, the network could assign a new IP address to the LSFI.	Not Recommended (see **Note 1** below)
Static IP	If a device gets disconnected from the network and reconnected, the network settings don't change.	IP address, gateway address and netmask need to be manually input to the device.	Recommended

Note 1: The central computer software requires an IP address to communicate with network devices. Regardless of the use of a DHCP, DHCP Reservation, or static IP network, each network device must have its IP address input into the central computer software by the end user. If the network device's IP address changes, the central computer will not be able to communicate to that device until the new IP address is updated in the central computer software by the end user. For this reason, Toro recommends Static IP or DHCP Reservation networks.

For assistance with Static IP or DHCP IP addressing, please consult with your network administrator or Toro NSN support.

Phone: 800-275-8676
Email: NSNTech@toro.com

Configuring Lynx for Ethernet Communication

1. In the central computer, navigate to Advanced Setup, Hardware.
2. Click the "Connection" drop-down, and select "Ethernet".
3. Obtain the IP address and Port Number from the LSFI.
   a. To view the current IP address and port settings on the LSFI screen, press the right arrow on the LSFI screen then press the Ethernet icon.
4. Enter the IP address from the LSFI into the "IP Address" field.
5. Change the "Port Number" to match the Port Number in the LSFI (if needed).
6. Close, then restart the central computer (required).
7. Verify communication to the LSFI.
   a. In the central computer, navigate to Utilities, Diagnostics.
   b. Select "Communication check", then click the "Start" button.

APPENDIX D: COMMAND CODES

Network GDC Hardware Address Commands

Command	Begin	Gateway	Daughter Board	Program	Runtime	Stations	Comments
Increment 1 Station	*1	-	-	-	-	-	Applies to 851 and 871.
Decrement 1 Station	*2	-	-	-	-	-	Applies to 851 and 871.
Turn Off Last Satellite	*4	-	-	-	-	-	Applies to 85 1 and 871.
Manual Program Start	*810	1-4	1-2	Program ID	-	-	Program ID must be valid for operation.
MM with 1 Runtime	*820	1-4	1-2		01-99	1-6 Stations	-
MM with individual Runtimes	*821	1-4	1-2		-	1-6 Stations with Runtimes	-
Program Cancel	*841	1-4	1-2	Program ID	-	-	Program ID must be valid for operation.
Station Cancel	*842	1-4	1-2	Program ID	-	-	-
Test Mode by Station Group	*851	1-4	1-2	-	-	001-800	Runtime is set to 99 minutes.
End Test Mode by Station Group	*852	1-4	1-2	-	-	-	-

Network GDC Decoder Commands

Command	Begin	Gateway	Daughter Board	Decoder Address	Station Offset	Comments
Decoder Station On	*853	1-4	1-2	HHHHH	1-4	5 hex digits or 1 0 decimal digits for decoder address
Decoder Station Off	*854	1-4	1-2	HHHHH	1-4	-

The decoder address is a hexadecimal number which can contain the numbers 0–9 plus A–F.

If the decoder address does not contain A–F then the five digit address may be used. If the decoder address does contain A–F then the ten digit address must be used. Enter 10 for A, 11 for B, 12 for C, 13 for D, 14 for E and 15 for F.

Examples:

Decoder Address is 39123 then enter the five digit address 39123. Decoder Address is 39ABF then enter the ten digit address 03 09 10 11 15.

APPENDIX E: SPECIFICATIONS

General

Auto Switching Power Supply Voltage Input (Vin)	100VAC–240VAC 50/60 Hz 1.5A–0.75A
Operating temperature range	-10°C to 50°C
Storage temperature range	20°C to +50°C
Relative humidity	20–80%
Power on time to operational	<90s

Radio

Model RV-M7-UC-ST
Model RV-M7-UC-CE

Frequency:	450–470MHz

Transmitter

Channel spacing	Narrow Band (12.5kHz)
RF power output (programmable)	0.5–5W Capable, Set to 2W
Maximum transmit frequency deviation	± 2.25kHz
RF Bandwidth	8MHz
No -Tune Occupied bandwidth	11 kHz
TX spurious outputs	< -70dBc
Emissions designator	US - 8K20F1D / 9K50F1D
	Canada - 8K24F1D / 9K54F1D
Maximum Page Rate	40 Pages per Minute @ 5W, 50°C

Receiver

Typical RX sensitivity (1% BER)4800bps, 2 -level	116dBm
No -tune bandwidth	20MHz
RX selectivity	50dB (12.5kHz channel spacing)
Spurious and image rejection	-75dB
RX inter -modulation rejection	-70dB
Conducted spurious emissions	< -53dBm

User Input and Output Signals

Serial port baud rates	9600, 19200, 38400, 57600, 115200
Voltage levels	RS -232 compliant levels
RS232 handshake signals	all flow control
Transceiver RF	50-ohm BNC
USB	(1- back), USB device (x1)
Ethernet	802.3 10/100/1G Base T

ANTENNAS, CABLES AND CONNECTORS INFORMATION

Recommended Antenna & Lightning Arrestor (Surge) Table

Part Number	Antenna Specs
ROSA-450-3-SNF	440-470 MHz Omni Base Station, 3dBd with N-Female Connector
ROSA-450-5-SNF	440-470 MHz Omni Base Station, 5dBd with N-Female Connector
RY450-9-6-SNF	6 Element Yagi, 420-470 MHz, 9dBd Gain, comes with 3m of cable and N-Female Connector
RY450-6-3-SNF	3 Element Yagi, 420-470 MHz, 6dBd Gain, comes with 3m of cable and N-Female Connector
RSP-90-3-SNF-SNFBH	UL Certified Coaxial Surge Suppressor / Lightning Arrestor for RF Frequencies up to 3.5 GHz, N-Female to N-Female Bulkhead
PT400-050-SNM-SNM	50 Feet LMR-400 with N-Male (Antenna) to N-Male (Lightning Arrestor)
PT400-050-SNM-SBM	50 Feet LMR-400 with N-Male (Lightning Arrestor) to BNC Male (Toro Unit)

The use of the above antennas or antennas with the same specifications are recommended.

WARNING: Antennas similar in-band and out-of-band radiation patterns, as well as antenna that is of the same type and of equal or less directional gain as the antennas listed in the table, may be used.

The use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the antenna noted in the above table is not permitted unless the procedures specified in FCC Section § 2.1043 are followed.

FCC / IC STATEMENT

WARNING: The Federal Communications Commission warns that changes or modifications of the radio module within this device not expressly approved by The Toro Company could void the user's authority to operate the equipment

This product contains FCC ID: SRS-M7-UC and IC: 8386A-M7UC

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.
ICES-003(A)/NMB-003(A)

To comply with FCC's RF radiation exposure requirements, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 20 cm is maintained between the radiating element (antenna) & any user's or bystander at all times and must not be co-located or operating in conjunction with any other antenna or transmitter.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter IC: 8386A-M7UC has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio IC: 8386A-M7UC a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Note: Use the recommended antennas as part of this project. See page 30, **Recommended Antenna Table**.

Notes:

Notes:

Icon	Description
CE	The symbol “CE” indicates that this device complies with the European standards on safety, health, environment and user protection. Devices with the symbol “CE” are intended for sale in Europe.
	This symbol indicates that these types of electrical and electronic equipment must be disposed of separately in European countries. Do not dispose of this device with your household waste. Please use the collection and recycling points available in your Country when you no longer need this device.
	The symbol indicates that this device complies with the Australian standards on safety, health, environment and user protection. Devices with the symbol are intended for sale in Australia.
ICASA	The symbol ICASA indicates that this device complies with the relevant UK legislation standards on safety, health, environment and user protection. Devices with the symbol ICASA are intended for sale in South Africa.
NOM	The symbol NOM indicates that this device complies with the relevant standards on safety, health, environment and user protection. Devices with the symbol NOM are intended for sale in Mexico.

TORO®

WARNING: Cancer and Reproductive harm – www.P65Warnings.ca.gov.
For more information, please visit www.toro.com/CAProp65.

Patent: www.ttcopats.com

Part Number 373-1092 Rev. B