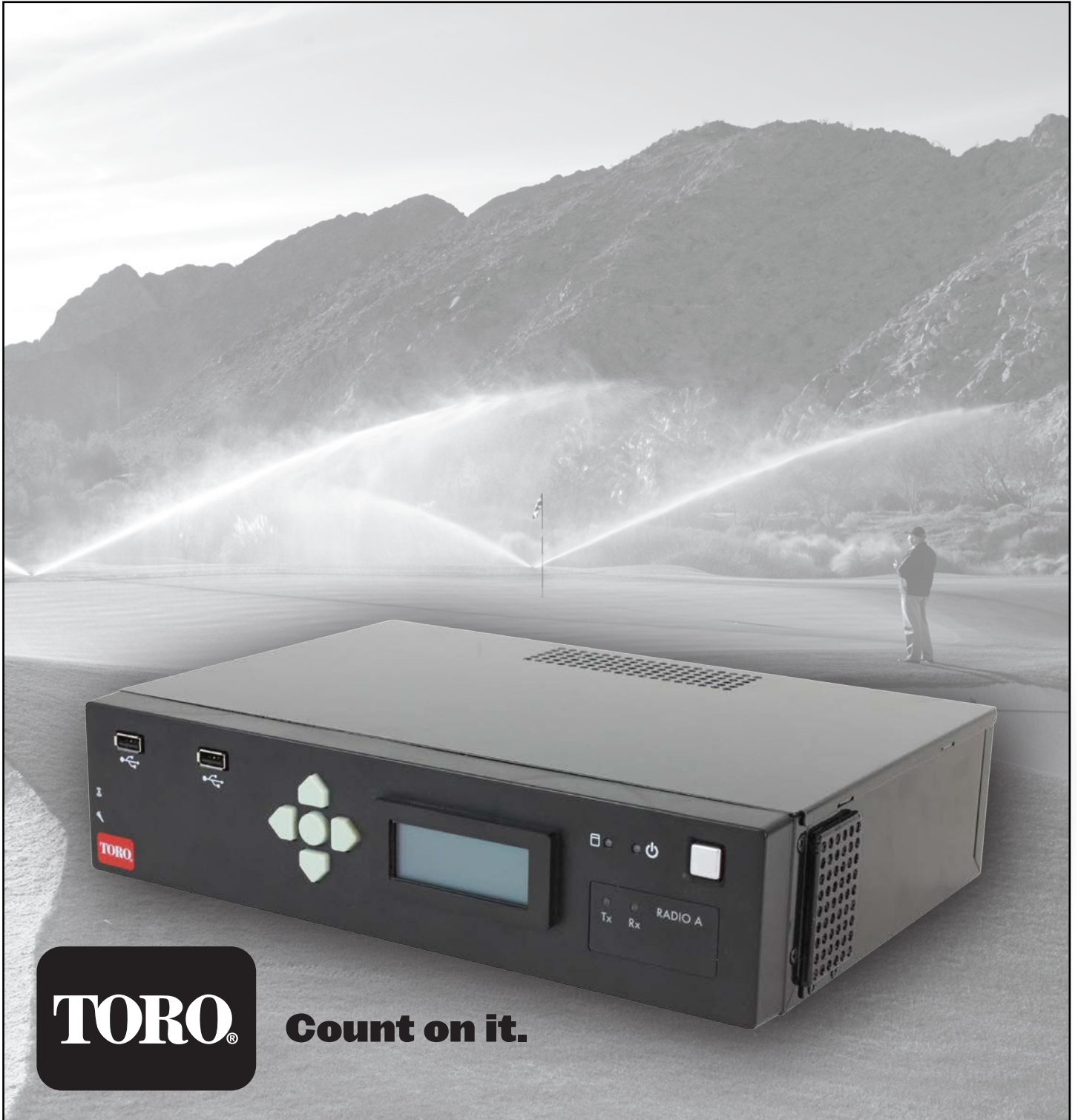


# Toro Radio Interface Unit (RIU) User Guide



**TORO**®

**Count on it.**

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## INTRODUCTION

### Overview

The Toro Radio Interface Unit (RIU) is a desktop unit that is used in conjunction with a Lynx or SitePro central computer to control golf course irrigation. It replaces the OSMAC Base Station and/or the Hand Held Remote Interface (HHRI). The RIU can be configured to function as either of these interface units, and the two radio versions can perform the functions of both units.

The RIU is available in three versions:

RIU-01 with one radio – This system can be configured as an OSMAC Base Station or as a HHRI.


RIU-02 with two radios – This system can be configured as an OSMAC Base Station and a HHRI in one unit.

RIU-00 with provisions for an external radio – This system can be configured as an OSMAC Base Station or as a HHRI. It is used in regions requiring a different radio than the one installed in the RIU. It is intended to be used with **Motorola GM340** radio.

### Features:

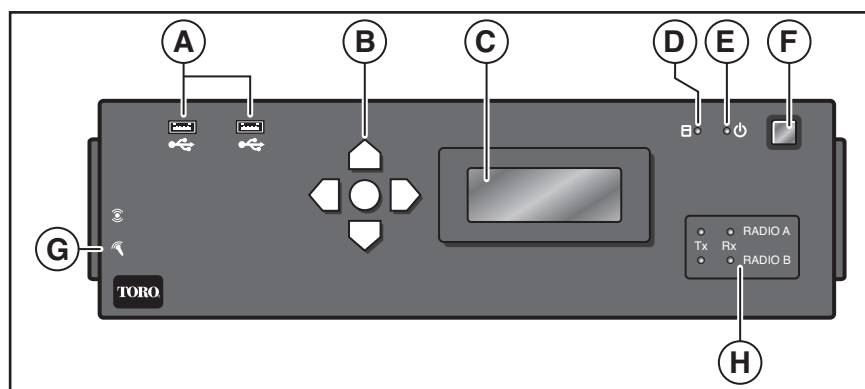
- Completely self-contained unit with internal CPU, radio, and power supply.
- AC power supply accepts 110VAC to 240VAC inputs.
- Unit contains a UHF (450-470Mhz) radio with continuous duty heat sink (RIU-01 and RIU-02 only).
- Dual Ethernet ports, one to connect to a LAN (no hub/switch required), and the other to connect to the central computer.
- Front USB ports can interface a USB keypad/keyboard to be used along with the LCD to change settings or initiate a POCSAG page
- CTCSS decoder – DTMF commands not accepted if the correct CTCSS tone is not present
- Cooling and power supply will support continuous 40 pages per minute paging for 24 hours per day (See Specifications for details.).
- Communication to the central via serial port (DB-9), USB device connector, or Ethernet (future feature).
- A Web User Interface allows a user with a web browser to configure the RIU and monitor its operation.
- A user in the field can send DTMF commands using a hand-held radio.
- External radio connection for international customers (RIU-00 Only).
- Firmware updates via USB memory stick.
- Two external alarm inputs for automatic generation of pre-programmed pages.

### Licensing

 **CAUTION:** The FCC states that licensure of frequencies used by the RIU and hand held radios are the responsibility of the end-user. Unlicensed sites are subject to fines and prosecution under federal law.

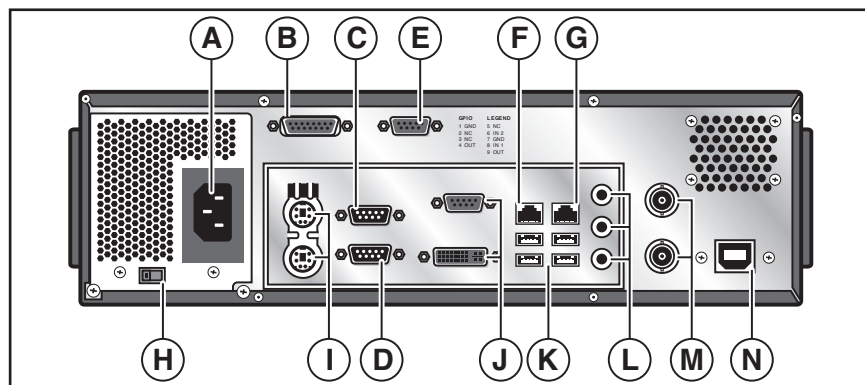
## Inputs and Outputs

### Front Features:



- A. USB x2 - Used for diagnostics and future support. (May be used for a keypad, keyboard or external drive.)  
**DO NOT USE TO INTERFACE WITH THE CENTRAL COMPUTER FOR BASE STATION AND HANDHELD REMOTE FUNCTIONS.**
- B. Navigation Buttons (Up, Down, Left, Right and Enter)
- C. LCD (4 X 20 Character Display)
- D. Hard Drive LED Indicator
- E. Power ON LED Indicator
- F. System Power Switch
- G. Audio In/Out (For future use.)
- H. Radio Status LED Indicators

### Rear Features:

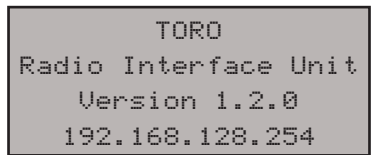


- A. AC Power Input, 100–240VAC
- B. 15-Pin D Sub Connector. Used for external radio connection. (RIU-00 Only)
- C. RS232 Serial Port 1. Used to connect to a central computer. Paired with “RF A”.(RIU-01 and RIU-02 Only)
- D. RS232 Serial Port 2. Used to connect to a central computer. Paired with “RF B” (RIU-02 Only).
- E. Alarms Connector
- F. Bridged Ethernet Port 1, 10/100/1G Base T Ethernet connection.
- G. Bridged Ethernet Port 2, 10/100/1G Base T Ethernet connection.
- H. 115/230 AC Power Selector (Models with Autoswitching power supply will not have the selector)
- I. Keyboard and Mouse PS/2 Ports
- J. VGA/DVI. (For future use.)
- K. USB x4 - Used for diagnostics and future support. (May be used for a keypad, keyboard or external drive.)  
**DO NOT USE TO INTERFACE WITH THE CENTRAL COMPUTER FOR BASE STATION AND HANDHELD REMOTE FUNCTIONS.**
- L. Audio In/Out. (For future use.)
- M. BNC Female RF Connector for Radio 1 and Radio 2. (Not used on RIU-00, only one BNC connector on RIU-01)
- N. USB connector which provides the device a USB connection to a central computer.

**⚠ WARNING:** Peripheral devices such as mobile phones, tablets, etc. should not be plugged into the Radio Interface Unit’s USB ports as it may have an adverse effect on the unit’s performance.

## Power

To turn the power ON, press the silver button at the top-right corner of the front panel. The unit will take about 30 seconds to boot up. The unit is ready when the front panel displays the home screen with the software version and IP address of the unit.



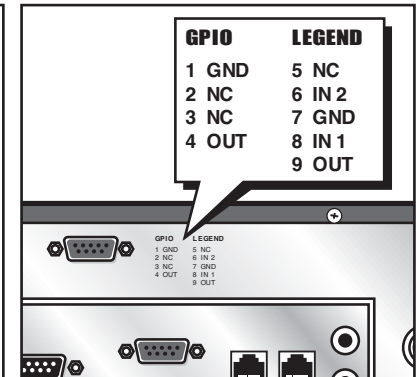
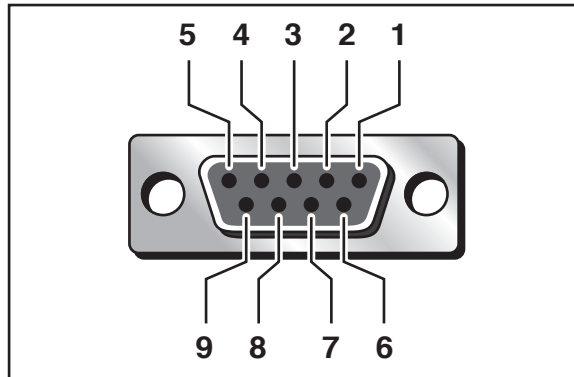
To turn the power OFF, press the same power button at the top-right corner of the front panel. Give the system about 5-10 seconds to gracefully shut down. To manually turn the power OFF, hold the silver power button for about 5 seconds (this method is not recommended).

**⚠ 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.

## Alarms

The female DB9 connector on the back panel (Item E on page 4) is used for Alarm inputs. There are two digital inputs which can be mapped to trigger a page to be sent out. These lines, "IN1" and "IN2" as labeled on the back panel, are active low inputs which are pulled up by an internal resistor to 3.3V. In order to trigger an input signal, simply connect the INx line to the ground pin on the DB9 using an external switch or relay contacts. The pin designation for this connector are the following:

Pin #	Description
1	GND
2	Do not connect
3	Do not connect
4	Do not connect
5	Do not connect
6	Digital Input 2
7	GND
8	Digital Input 1
9	Do not connect



## Front Panel User Interface

The LCD and keypad on the front panel make up a user interface for accessing/setting certain configuration variables and interacting with DTMF commands, pages, etc. It is a 4-line, 20 character/line display with integrated back-light. The keypad is comprised of left, right, up, down and enter buttons to navigate through the menus shown on the LCD.

## LEDs

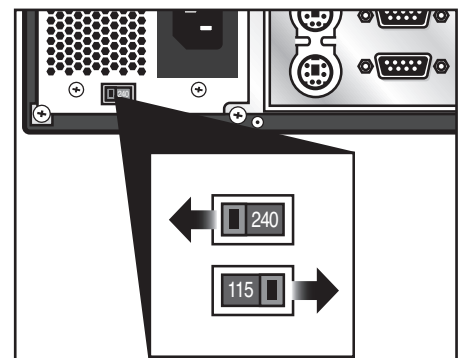
The radio LEDs indicate the current Tx/Rx status of the radio.

There is a Tx and an Rx LED associated with each radio inside the unit. Tx is on the left and glows red whenever the associated radio transmits. The LED on the right is for Rx and will flicker green whenever RF energy is detected.

There is also a power LED that lights blue when the system is on and a hard drive activity LED that blinks orange when SSD data is being accessed/written.

## AC Power (For Models with Non-autoswitching Power Supply)

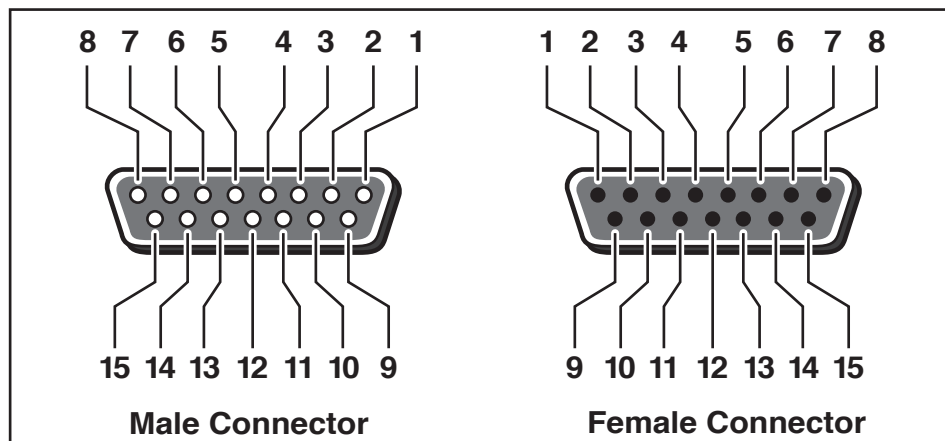
The unit takes AC power from 100-240VAC on the back of the unit. There is a switch (shown below) to choose between 115 and 230VAC. Make sure to correctly set this switch based on the input voltage.





## External Radio Interface (RIU-00)

The interface for an external radio transceiver is a male 15-pin D sub connector. The female is the connector on the cable that goes to the external radio.



### External Radio Interface Pin Functions

Pin Number	Function	Description
1	Ground	Connection to chassis and electrical ground
2	B+	Radio B+. 11-13VDC. Radio must not draw more than 2.5 amps from this pin.
3	D-PTT	Digital PTT. 0=RX mode, 1= TX mode. 5V logic.
4	+5VRX	Regulated 5V RX power. 0V in TX mode. 4.5-5.5V in RX mode. Maximum current draw 125mA.
5	+5VRF	Regulated 5V radio power. 4.75-5.25V. Maximum current draw 125mA.
6	TX Audio	TX audio modulation. 2.5V DC bias. 1.0V P-P for full system deviation.
7	PTT	Transmit Enable/Push-to-talk. Open collector output. Pulls low when transmitter should be enabled. 50mA maximum current sink.
8	PLL-LE	PLL chip latch enable. Reserved for future radio control. Do not connect for current configuration. 3.3V logic.
9	PLL-D	PLL chip data. Reserved for future radio control. Do not connect for current configuration. 3.3V logic.
10	PLL-CLK	PLL chip clock. Reserved for future radio control. Do not connect for current configuration. 3.3V logic.
11	TX Data	Transmit digital data. Pre-filter TX-Audio signal. 1.6V bias (approx)
12	RSSI In	Receiver Signal Strength Input. DC level proportional to signal strength. Analog input. 10K ohm input impedance.
13	RX Audio In	Receive audio input. 1–2VDC Bias. 1.5–5.0V P-P for a signal with full system deviation.
14	Unused	(Possibly optional PA Bias)
15	DO	Digital Output. Spare pin for future use. 3.3V logic. Do not connect.

The external radio may be powered off pins 1 and 2 of this connector, as long as the external radio is a low-power radio, less than or equal to 2 watts. **The external radio should never draw more than 2.5 amps from this connector.**

When using an external radio, it will act solely as the physical layer of the system. All of the interaction between the radio and motherboard will happen inside the enclosure by way of a specially designed MODEM that will handle the logic of the RF signals. This MODEM will then send/receive audio to/from the external radio.

The operation of the RIU will be exactly the same as that with an internal radio except for the lack of control over certain radio functions such as power output setting and frequency; these will have to be set manually on the external radio. All functions that are supported with an internal radio are also available to users with an external MODEM. CTCSS and DTMF will still work as long as the audio is fed into the respective pin on the DB15 connector.

### Overview

The RIU is intended to work with a Toro Lynx or SitePro system. It must be configured to the desired mode before use – either an OSMAC Base Station or HHRI.

The functions of the Base Station 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 central.

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

### Installation

The RIU is designed for use in an indoor environment. Operation outside of this range may cause damage to the unit.

The RIU is designed 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. “Base Station” type antennas will provide improved coverage over the “rubber duck” type antennas.

### Configuration

To access the front panel menu, press any key while the Status screen is showing. To access the Configuration, Test Page and Factory Reset sub-menus, a password will be required. The password is “**7531**”. The password can be entered using either the arrow keys or a keyboard.

## Front Panel Menus

1. Send Page
  - A. Pager Number
    - a. Enter Message
2. Configuration
  - A. Radio A
    - a. Mode – Select HHRI or OSMAC.
    - b. TX Frequency - Enter the desired Frequency.
    - c. RX Frequency - Enter the desired Frequency.
    - d. TX CTCSS  
Select from preprogrammed frequencies from XZ (67.0 Hz) through OZ (254.1 Hz) or DISABLED.
    - e. RX CTCSS  
Select from preprogrammed frequencies from XZ (67.0 Hz) through OZ (254.1 Hz) or DISABLED.
    - f. Output Power  
Set an output power from 1.0–4.0 Watts in 0.1-Watt increments.
    - g. Connection Mode  
Select from Serial, USB or IP Server
    - h. Serial Baud  
Select from 1200, 4800, 9600, 19200, 38400, 57600 and 115200.
    - i. Serial Parity - Select from None, Even or Odd.
    - j. Serial Data Bits - Select 7 or 8.
    - k. Serial Stop Bits - Select 1 or 2.
    - l. Serial Flow Control - Select None or Hardware.
    - m. Internal Audio Gain  
Set the dB value from selection.
    - n. Page Data Invert - Select True or False
    - o. Tone Respond Delay  
Select from 1000-4000 ms delay.
  - B. Radio B (if included)
    - a. (See Radio A)
  - C. Alarm Page 1
    - a. Enable Page - Select True or False.
    - b. Pager ID - Enter the pager ID.
    - c. Page Message - Enter the command code.
  - D. Alarm Page 2
    - a. (See Alarm Page 1)
  - E. IP Address - Enter the IP Address.
  - F. Netmask - Enter Netmask number.
  - G. OSMAC DTMF Timeout - Enter 1000-60000 ms delay before timeout in 1 ms increments.
  - H. HHRI DTMF Timeout - Enter 1000-60000 ms delay before timeout in 1 ms increments.
3. Test Page Mode - Select to Enable or Disable.
4. Factory Reset - Select OK to Reset all settings to factory default.

## Navigating Using the Front Panel Buttons

To navigate through menus, the up and down buttons will move between menu items (and scroll if necessary). The right arrow or center button will select the menu item and the left arrow will move up a level.

Once an item is selected, a screen will show to modify the setting or function. Each editor varies slightly based on what is being edited.

## Navigating Using a USB Keyboard

If connected, a USB number pad (or the number pad on a full keyboard) can be used to interact with the front panel. The “+” and “-“ keys can be used to move up and down through the menu while the “Enter” key selects the menu item. The “Del” (or “.”) key can be used to go up a menu level.

Once an editor is selected, the numeric keys can be used to enter values along with the “Del” key to delete characters that have been entered. The Enter key will change from editing the value to choosing between “OK” or “Cancel” and the “+” and “-“ keys can be used to choose between the two options.

If connecting a full keyboard, only the number pad (right most area) will interact with the front panel.

## Send Page Sequence (OSMAC Mode Only)

The send page sequence mimics the original OSMAC page entry sequence. To accommodate users without a keypad, numbers may also be entered using the arrow keys by cycling through them one at a time.



## Front Panel Editors

When editing a value, a display like the following is shown. The highlighted field or button is indicated by an arrow.

```
Configuration
IP Address:
→192.168.128.254
[OK] [Cancel]
```

The third line indicates the value being input. This line is customized to the type of parameter being modified. When editing, a blinking cursor indicates which character is being changed, where appropriate. Use the Up and Down arrows to change individual values, and right and left to navigate around the screen.

## Test Page

The test page mode is used to check the range of the system or test receivers. When this mode is enacted, the RIU will automatically generate a page to pager number “0” every ten seconds, transmitting on any radio that is operating in OSMAC mode.

## Manual Pages

Manual pages can be initiated by a hand-held radio with DTMF functionality or through the base station user interfaces (web GUI or front panel LCD/keypad interface).

## Alarm Pages

The RIU has alarm inputs. These digital inputs are used to generate pages, each with its own configurable message, to any pager. These may be used for alarms, but they may also be used to simply generate pre-programmed pages. A common example is a rain switch that will disable all satellites when rain is detected, and re-enable the satellites when rain is no longer detected. The inputs are connected to normally open switches or contacts. When any input is pulled low to ground, it will generate its pre-programmed page.

## CTCSS Squelch

The RIU supports Continuous Tone Coded Squelch System (CTCSS) privacy functions. CTCSS allows the receiver to block the reception of signals that are not encoded with predefined sub-audible tones. With CTCSS enabled, handheld commands will not be accepted or responded to unless the proper CTCSS tone is presented to the RIU. Please note that for the RIU, CTCSS applies only to handheld radio activity and that CTCSS tones are not utilized for OSMAC communication to the field controllers.

## Software Updates

The RIU supports software upgrades via USB. In order to update the software to the latest release, simply insert the Toro USB drive into any of the USB ports on the front or back of the RIU, and reboot the system. The OS will search for the update software (which is stored in the root directory of the USB drive) and will automatically install. When it is finished, the system will start up as usual. It is safe to remove the USB drive once the “Toro Radio Interface” screen shows up on the front panel LCD.

## WEB USER INTERFACE

All configuration and manual paging that is available through the front panel interface can also be performed using the web GUI. With the IP and Network Mask properly configured, simply enter the IP into any modern web browser to configure the unit.

To view any information beyond the status screen, password entry will be required. The password is “7531”.

### System Status

The screenshot shows the TORO web interface. At the top left is the TORO logo with the slogan "Count on It." and a HOME icon at the top right. Below the logo is a navigation bar with three tabs: "Status", "Configuration", and "Send a Command". The "Status" tab is active, displaying the word "Home" in large red font. Below this, the system status is listed: "Site Name: Toro RIU", "Radio A Temp: 25 C (Highest: 25 C)", and "System Time: Mon Sep 09 2013 23:10:27 GMT-0700 (Pacific Daylight Time)". At the bottom, there are links for "License", "Support", and "Updates", and a copyright notice: "Copyright © 2013 The Toro Company. All Rights Reserved."

The system status gives basic information about the RIU’s health and welfare, including current and maximum temperatures. This is the page that is displayed when the GUI is first accessed. Links along the top of the page navigate to the other two sections of the GUI.

### Configuration

The screenshot shows the TORO web interface Configuration page. At the top left is the TORO logo with the slogan "Count on It." and HOME and LOG OUT icons at the top right. Below the logo is a navigation bar with three tabs: "Status", "Configuration", and "Send a Command". The "Configuration" tab is active, displaying the word "Configuration" in large red font. Below this, there are four sub-tabs: "General", "Radio A", "System Tests", and "Factory Reset". The "Radio A" sub-tab is active. To the right of the sub-tabs are "Cancel" and "Save" buttons. The main content area is divided into two sections: "Wireless" and "Central Connection". The "Wireless" section includes: "Mode" (OSMAC (Inbound/Outbound)), "Frequency (TX)" (462.4375 MHz), "Frequency (RX)" (462.4375 MHz), "Output Power" (1 Watts), and "CTCSS Squelch" (2B (118.8 Hz)). The "Central Connection" section includes: "Connection Mode" (USB), "Serial Settings" (9600, 7, Even, 1), and "Serial Flow Control" (None). At the bottom, there are links for "License", "Support", and "Updates", and a copyright notice: "Copyright © 2013 The Toro Company. All Rights Reserved."

The configuration screen gives access to all radio and system settings. It also provides access to enable Test Page Mode and perform a factory reset.

## Send a Command

**TORO.** Count on It. HOME LOG OUT

Status Configuration **Send a Command**

### Send a Command

Radio A ▾

Satellite

Command

Send

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The command screen allows manually sending pages through any radio currently configured in OSMAC mode. Use the top right drop-down to select which radio to send the page through, then use the form to send the page. The page will be sent immediately.

## TROUBLESHOOTING

### Symptom: Unit will not receive RF

1. Verify all system settings to make sure the system is configured properly
  - a. Frequency
  - b. CTCSS squelch frequency
2. Check antenna connection
  - a. Verify all connectors are tight and clean
  - b. Make sure there are no drastic bends in the cabling
  - c. If necessary, check the power levels on the input to the RIU and the impedance of the cabling/antenna.

### Symptom: Unit will not transmit

1. Verify all system settings to make sure the system is configured properly
  - a. Frequency
  - b. CTCSS squelch frequency
2. Check antenna connection
  - a. Verify all connectors are tight and clean
  - b. Make sure there are no drastic bends in the cabling
  - c. If necessary, check the power levels on the output of the RIU and the impedance of the cabling/antenna.
3. Check the Tx LED on the front of the unit for the associated radio under question. This light should glow red whenever the radio thinks it is transmitting. If the LED never lights then the radio is not logically being told to transmit so check the software settings.

### Symptom: Unit functions erratically (shuts down suddenly, over heats, skips stations, etc.).


1. Verify all external cables are plugged-in properly.
2. Check the air filter and change it accordingly.

## MAINTENANCE

The following maintenance precautions are required to keep the RIU 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.

### Dust/Pollen

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

### Air filters

The RIU is designed to use two air filters at all times. Install an air filter for each of the side vents where air enters. Air will then exit through the rear corner vents. Make sure these filters remain clean as dirty filters can decrease the performance of the device, especially at higher temperatures.

Under normal conditions, filters should be replaced once a year. Dirty filters can impede airflow through the unit and may cause the unit to display a thermal error message on the LCD screen. If this happens, replace the filters.



## APPENDIX A: OSMAC COMMANDS

These commands are sent by the RIU (in OSMAC mode) to control the operation of OSMAC satellites. They can be initiated automatically by the central computer (Lynx or SitePro) or entered manually using the front panel, USB keyboard or the web GUI.

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.
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.

<b>Command Code</b>	<b>Operational Description</b>
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 switch-es. 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.



## OSMAC DTMF Commands

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

### Command Code Operational Description

*9	This is the command from the radio that announces to the RIU 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 RIU 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 RIU 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 RIU is 75 23.
*4	Turn off all stations on the last satellite addressed. This command instructs the RIU to send the command 7540 to the last addressed satellite.

## APPENDIX B: HHRI COMMANDS

**Notes:** The Motorola radio, model GM-340, is the approved hand-held radio for use with RIU-00. Other external radios may work with the RIU-00 but consistent performance is not guaranteed.

**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.

### 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 and Network VP 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

## 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 and VPE 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 to 851 and 871.
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	-	-	-	-	-

## 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 10 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 C: SPECIFICATIONS

### General

All measurements made per TIA-603-B

Frequency: Model RV-MAX-UC	450-470MHz
Size	12.5" X 8.75" X 3"
Weight (single radio)	6.8LBS (3.08kg)
Weight (dual radio)	7.2LBS (3.27kg)
Weight (no radio)	6.4LBS (2.90kg)
Voltage Input (Vin)	110VAC/220VAC 50/60 hz
Operating temperature range	10°C to 50°C @ 2 Watts 10°C to 40°C @ 4 Watts
Storage temperature range	20°C to +50°C
Relative humidity	-20-80%
Power on time to operational	<90s
Paging Format	POCSAG
Serial Port Protocol	TAP
Pager database maximum size	1000 individual pagers
Maximum page length	250 characters
Maximum number of pages buffered	-150

### Transmitter

Channel spacing	Narrow Band (12.5kHz)
RF power output (programmable)	1-4 watts (0.1W increments)
Maximum transmit frequency deviation	± 2.25kHz
RF Bandwidth	8MHz No-Tune
Occupied bandwidth	11 kHz
TX spurious outputs	< -70dBc
Emissions designator	11K0F1D
Maximum Page Rate	40 Pages per Minute @ 2W, 50°C Ambient or @ 4W, 40°C Ambient

### 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 complaint levels
RS232 handshake signals	all flow control
Transceiver RF	50 ohm BNC
USB	1.0 and 2.0 (2-front, 4-back), USB device (x1)
Ethernet	802.3 10/100/1G Base T



**Count on it.**