



Count on it.

OSMAC® RDR Low-voltage Retrofit Kit

Part Number RDR0160LVN0

User's Guide

Installation of the RDR (Radio Data Receiver) low-voltage unit will enable you to remotely operate your existing Vari-Time 4000 satellite controller using a hand-held DTMF radio and/or OSMAC base station. This document covers recommended installation procedures for the RDR unit and operation of the completed system.



WARNING
ALL WIRING TO THE EXISTING SATELLITE CONTROLLER MUST COMPLY WITH LOCAL AND NATIONAL ELECTRICAL CODE STANDARDS. TORO IS NOT RESPONSIBLE FOR INJURIES OR EQUIPMENT DAMAGE DUE TO IMPROPER CONTROLLER INSTALLATION.

DISCONNECT 120/240 V A.C. INPUT POWER WHEN SERVICING THE EXISTING IRRIGATION SYSTEM. THE IRRIGATION SYSTEM INCLUDES SPRINKLERS, VALVES, SOLENOIDS, PIPING, WIRING BETWEEN SYSTEM COMPONENTS AND CONTROLLER. FAILURE TO COMPLY CAN RESULT IN SERIOUS INJURY OR ELECTROCUTION.

CAUTION: Unless there is a separate agreement between Toro and the original end-user purchaser, Toro does not warrant the installation, maintenance or service of the system in which the RDR unit is utilized. Toro assumes no obligation for system design, installation and maintenance. Consult a licensed electrician for installation and design.

End-user purchaser is responsible for obtaining an FCC license for the operation of this equipment.

Installing the RDR Unit

1. Unlock and remove the front access cover of the satellite cabinet.
2. Remove the provided RDR mounting template located on the back of this document. Use **Figure 13** template if installing the RDR unit on the back of the satellite cabinet (the preferred method), or **Figure 14** template if installing the RDR unit inside the satellite cabinet on the rear mounting plate (alternate method).
Note: The RDR unit utilizes a built-in antenna located on the frequency module assembly. If the RDR unit is installed inside the satellite cabinet or site conditions are such that an alternate antenna is required, an optional antenna adapter kit (P/N 102-1204) is available.
3. Position the template according to the indicated measurements. Locate and drill holes as indicated on the template.
4. Locate the removable mounting bracket on the back of the RDR unit. Release the latch and slide the mounting bracket out.
5. If installing the mounting bracket on the back of the satellite cabinet, use the provided 10-32 machine screws, washers and nuts as shown in **Figure 1**. For installation inside the cabinet, secure the mounting bracket on the rear plate using the provided self-tapping sheet metal screws as shown in **Figure 2**.
6. Slide the RDR unit onto the mounting bracket until the bracket latch engages the RDR enclosure.

Figure 1

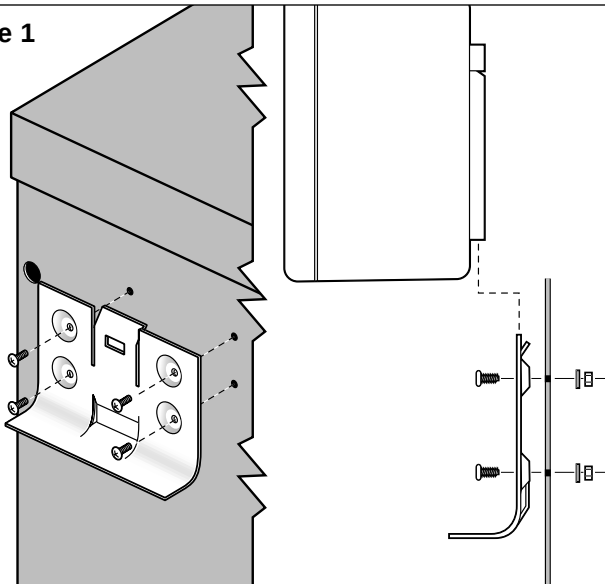


Figure 2

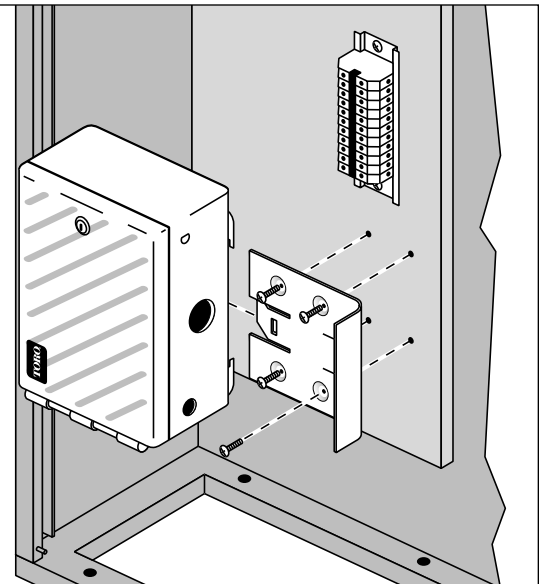
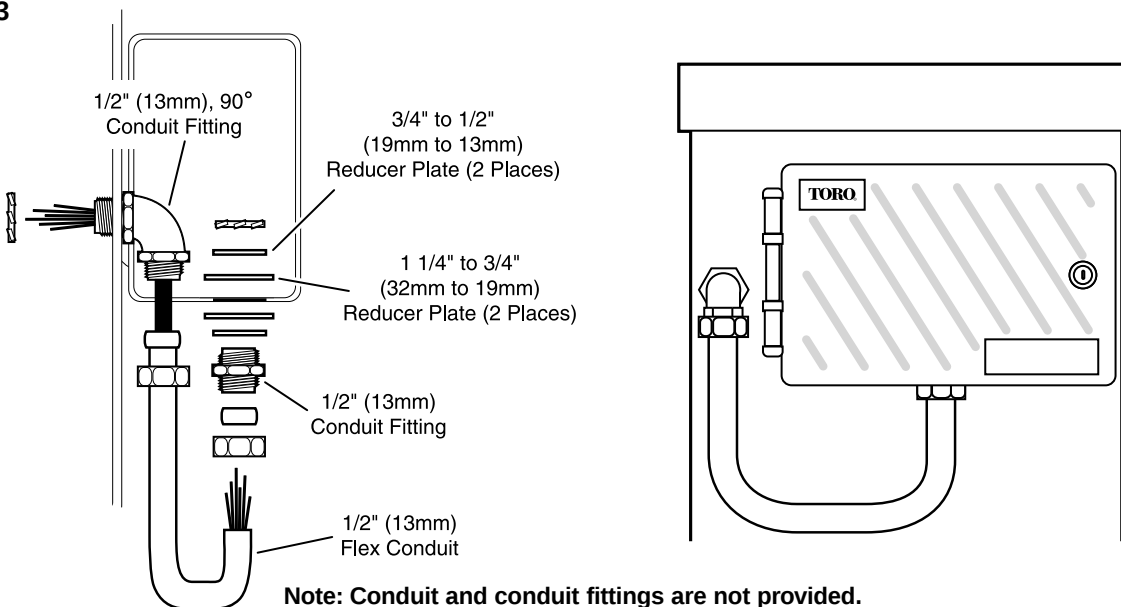


Figure 3



Installing the Station Wires and Power Wires

1. Disconnect the primary power source to the existing satellite controller.
2. Unlock the satellite cabinet front cover and the RDR unit door to access the station terminals.
3. For exterior installation, install 1/2" (13mm) flexible water-proof conduit between the satellite cabinet and the RDR unit. See **Figure 3**.

Note: Conduit and fittings are not provided but must be installed as required to comply with local and National Electrical Code.

4. Using 14–16 AWG (2.5–1.5mm²) stranded copper wire, route individual station wires, common wire and 24 V a.c. power wire from the satellite terminal strip into the RDR unit. Label each wire for identification.
5. Secure each station wire to its associated RDR station terminal; i.e., satellite station 1 connected to RDR unit station 1, etc. Refer to **Figure 4** for the satellite terminal configuration and **Figure 5** for the RDR unit terminal configuration.
6. Secure the 24 V a.c. and common wires to the RDR transformer terminals. See **Figure 5**.

⚠ CAUTION: Up to three valve solenoids can be connected to each station, not to exceed 0.75A maximum output per station. During operation, a maximum of four solenoids can be operated simultaneously, not to exceed 1.0A maximum current draw. Exceeding these limits can cause equipment damage.

Figure 4

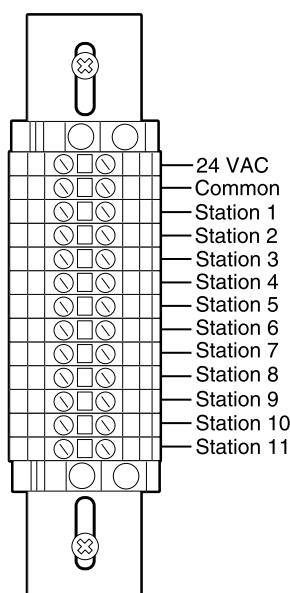
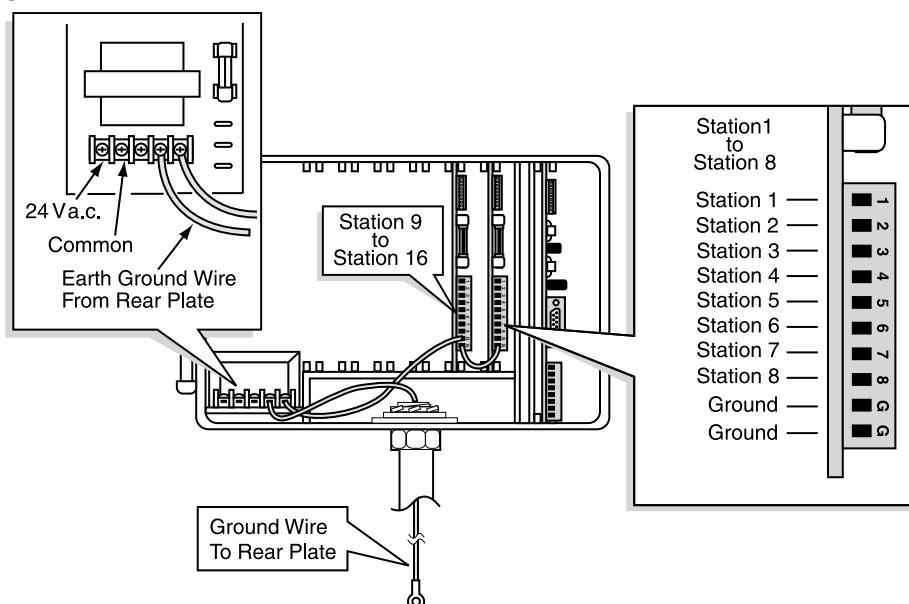


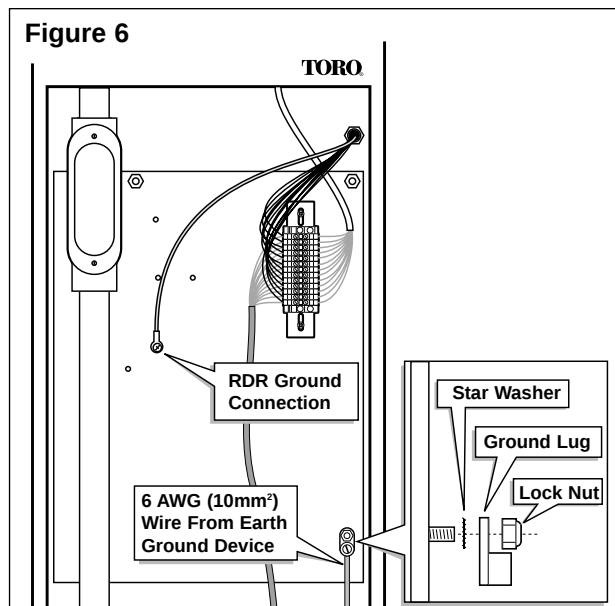
Figure 5



Installing the Earth Ground

1. Route the green ground wire from the RDR unit transformer terminal block to the cabinet rear plate. Secure the ground wire ring terminal to the rear plate using the provided self-tapping sheet metal screw. See **Figure 6**.
2. Remove the lock nut from the lower right corner of the rear plate. Install the provided star washer, copper ground lug and lock nut. Tighten securely. See **Figure 6**.
3. Connect the satellite copper ground lug to an earth grounding device using 6 AWG (10mm²) bare copper wire. Avoid bends in the ground wire of less than 8" (20cm) radius.

⚠ Important: Make sure the satellite is properly connected to an earth ground device such as a 5/8" x 8' (16mm x 2.5m) copper clad rod driven into the earth at a distance from the satellite from 8' to 12' (2.5–3.7m). The top of the ground rod should be buried 12" (30.5cm) below grade level. Using an earth ground resistance testing device, a reading of 0 ohms is optimum, up to 10 ohms is good and 11–30 ohms is acceptable in most cases. If the resistance exceeds the acceptable limit, an additional ground rod can be installed at a distance equal twice the length of first rod; i.e., 16' (4.9m). Connect the ground rods using 6 AWG (10mm²) bare copper wire and test again. If the ground resistance remains high, contact your local Toro distributor for further assistance and recommendations.



Selecting the Decoder Radio Frequency

The narrow-band frequency decoder module stores four user-selectable radio frequencies. The frequencies are programmed at the factory or by the distributor prior to delivery of the RDR unit. A set of jumper pins, located on the RDR frequency decoder module enables the frequency to be selected by placing the jumper on the appropriate channel pin set. See **Figure 7**.

The pre-programmed frequencies are as follows:

Channel #1 = 462.2125 MHz

Channel #2 = 462.4375 MHz

Channel #3 = 467.2125 MHz

Channel #4 = 467.4375 MHz

Note: There will be cases where the four pre-programmed frequencies are not suitable for use in the area. The frequency programming kit (P/N 102-1208) can be used to program any available user-defined frequency.

⚠ Important: The base station transmitter, hand-held radio and the RDR frequency decoder module must be set to the same frequency to enable communication.

Assigning the Satellite Address Number

Each satellite requires a three-digit address number to enable communication with the central controller and/or a hand-held radio. The address numbers range from 1 (001) through 255 and is set by the DIP switches located on the frequency decoder module assembly. See **Figure 8**.

In the down position, the switch is Off (open) and represents a value of 0 (zero). In the On position, the closed and represents the following address number:

Sw 1 = 1	Sw 2 = 2	Sw 3 = 4	Sw 4 = 8
Sw 5 = 16	Sw 6 = 32	Sw 7 = 64	Sw 8 = 128

To set the satellite address number, first locate the desired satellite address in **Table 1** on page 4. Next, position each switch On or Off as indicated on the chart.

Example: To set satellite address number 50 (050), start with all eight DIP switches in the Off (open) position, then set switch numbers 2, 5 and 6 to the On position ($2 [2] + 16 [5] + 32 [6] = 50$). See **Figure 8**.

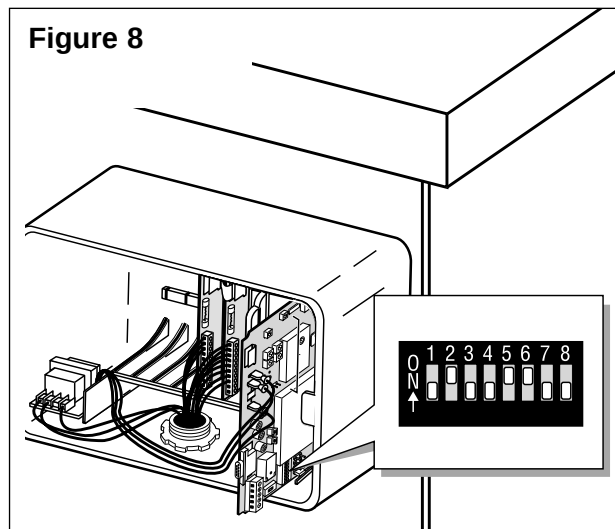
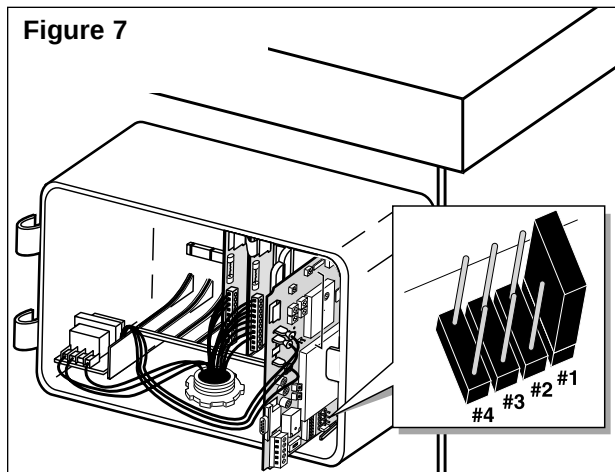


Table 1 - DIP Switch Address Configurations

DIP Switch Number								☒ = ON	☐ = OFF																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Electromagnetic Compatibility

Domestic: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a FCC Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the irrigation controller with respect to the receiver.
- Move the irrigation controller away from the receiver.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

Performing a Control Circuit Self Test

A self-test feature is provided to check the functionality of various key satellite control circuits.

The test is initiated by positioning the **TEST/RESET** switch, located on the frequency decoder module, to the **TEST** position as shown in **Figure 9**. Testing will begin immediately. The test will repeat continuously until the **TEST/RESET** switch is positioned to the **NORMAL** position.

Note: The **RESET** position resets the frequency decoder microprocessor to factory defaults. To take affect, the satellite must be powered up with the switch in the **RESET** position. The switch should be placed in the **NORMAL** position after 15 seconds of operation.

Remote Relay Function and Connection

The RDR unit frequency decoder module is equipped with a single-pole, double-throw 5.0 amp relay. The relay is intended for use in irrigation installations which have two different irrigation systems. Upon transmitted command from the base station or a hand-held radio, the relay can be energized. This will stop all OSMAC RDR functions and turn power on to the alternate irrigation system. Another command can be sent to the RDR to turn off the relay, de-energizing the alternate system and returning control to the OSMAC RDR. Additionally, a command is provided to disable this feature so it cannot be accidentally activated and a different command to enable the feature. See the **Command Code** list for specifics. See **Figure 10** for the terminal locations.

Fuse Replacement

⚠ CAUTION: For continued protection against risk of fire, replace the fuse with the same type and rating only.

The RDR unit transformer assembly and the terminal output boards are equipped with fuses to protect the unit from damage due to power surges and excessive current draw from the station terminals. Before replacing the fuse, check for the probable cause, such as a shorted or improperly connected station or common wire, then replace the fuse as follows:

1. Disconnect the primary power source to the satellite.
2. Unlock the RDR unit to access the transformer assembly and/or terminal output boards.
3. Carefully remove the blown fuse from its retaining clip.
4. Install a replacement fuse to the retaining clip. Use a 2 amp slow-blow fuse for the transformer assembly and a 4 amp slow-blow fuse for the terminal output boards.
5. Reconnect power to the RDR unit.
6. Test for proper operation
7. Lock the RDR unit.

Satellite Operations Using a Hand-Held Radio

Satellite operations can be initiated using a hand-held radio with DTMF keypad. The operation command codes are listed in **Table 2** below and page 6.

⚠ Important: The base station transmitter/hand-held radio and the RDR frequency decoder module must be set to the same frequency to enable communication.

Note: All operation commands must begin with the following keypad sequence: **★9** followed by the three-digit satellite address number. The command code is then entered, followed by additional digits which represent selected stations and/or run time values. The **#** key is pressed at the end of the command sequence. All station numbers from **1–9** must be entered with a preceding **0**; i.e., station 1 is entered as **01**.

Example: Confirm communication to the satellite by issuing a manual station start command as follows: Press **★9**, the three-digit satellite address code, command code **7521 01** (station 1) and **#**. Check for sprinkler operation. To step forward through the stations, press **★1**; to step back through the stations, press **★2**. To terminate the test, press **★9**, the three-digit satellite address code and command code **7520 #**.

Table 2 - Hand-Held Radio Command Codes (continued on p. 6)

Code	Operation Description
7510	Turns off individual stations; e.g., 7510 01 02 11 turns off stations 1, 2 and 11.
7511	Turns on individual stations; e.g., 7511 01 02 11 turns on stations 1, 2 and 11.

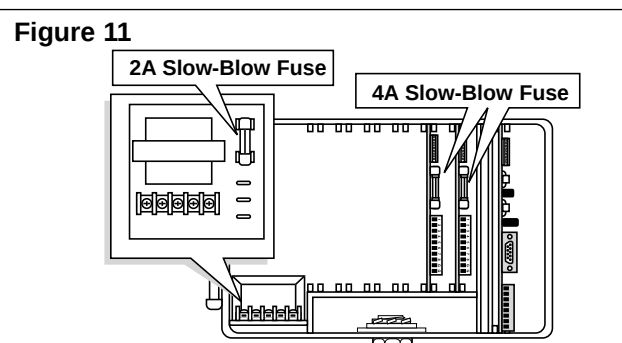
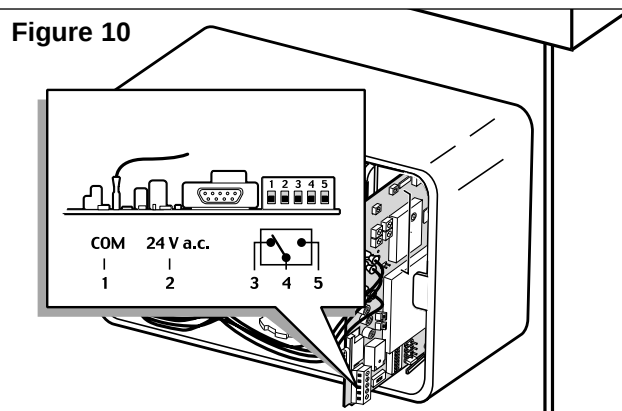
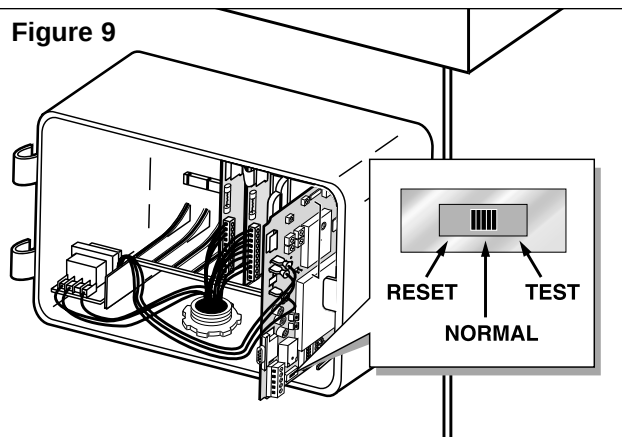


Table 2 - Hand-Held Radio Command Codes (continued from p. 5)

Code	Operation Description
7512	Syringes individual stations for a predetermined time. Use command 8006 01 to set the syringe time; e.g. 7512 01 02 turns on stations 1 and 2 for the specified time.
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. (See 7514.)
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 05 11 will syringe stations 5 through 11 sequentially. Command 8006 01 sets the syringe time.
7516	Sequentially syringes individual stations ; e.g., 7516 10 11 will syringe stations 10 and 11. Note: Multiple syringe groups can also be run. Enter two stars 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 individuals stations for a specified number of hours, minutes and seconds ; e.g., 7517 01 30 00 05 06 09 turns stations 5, 6 and 9 on for 1 hour, 30 minutes and no seconds.
7518	Turns on individual stations for a specified number of minutes ; e.g., 7518 10 05 06 turns on stations 5 and 6 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 run ; 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 running. The sequential run will stop when 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 01 03 11 turns on stations 1, 3 and 11 without energizing the pump.
7525	Turns on individual stations as switches for a time given 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 11 turns on stations 5 and 11 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 05 06 07 turns on stations 5, 6 and 7 for 2 hours, 30 minutes and 45 seconds.
7540	Turns off all stations (this satellite only).
7542	Turns off all stations using the sequential shut down feature.
7543	Disables all stations in all satellites (rain shutdown) . Note: Satellite address code 256 is used with 7543 or 7544 command codes. The stations 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.
7800	Disable the remote relay on the frequency decoder module.
7801	Enable the remote relay on the frequency decoder module.
7810	Turns off the remote relay on the decoder module. Resumes function to the satellite unit.
7811	Turns on the remote relay on the decoder module. Disables function to the satellite unit.
8000	Disables pump start.
8001	Enables pump start to be assigned to a station ; e.g., 8001 10 assigns pump start to station 10.
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 . Must be specified using four digits with leading zeros and no greater value than 0255; e.g., 8006 02 0060 (without password) or 8006 pppp 02 0060 (with 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; by using the star key; e.g., 8008 01 03 08 ★ 11 configures stations 1, 3 and 8 through 11 as switches.
8009	Configures stations for irrigation . Stations can be specified individually and in combination with a range of stations; by using the star key; e.g., 8008 01 03 08 ★ 11 configures stations 1, 3 and 8 through 11 for irrigation.
8011	Resets EPROM to factory defaults.
★ 1	Sends command 752201 to the last satellite addressed . Increments station number in test mode by one.
★ 2	Sends command 752301 to the last satellite addressed . Turns off current station be tested and decrements station number in test mode by one.
★ 4	Sends command 7540 to the last satellite addressed . Turns off all stations

Figure 13 - RDR Mounting Template
For Satellite Exterior Installation

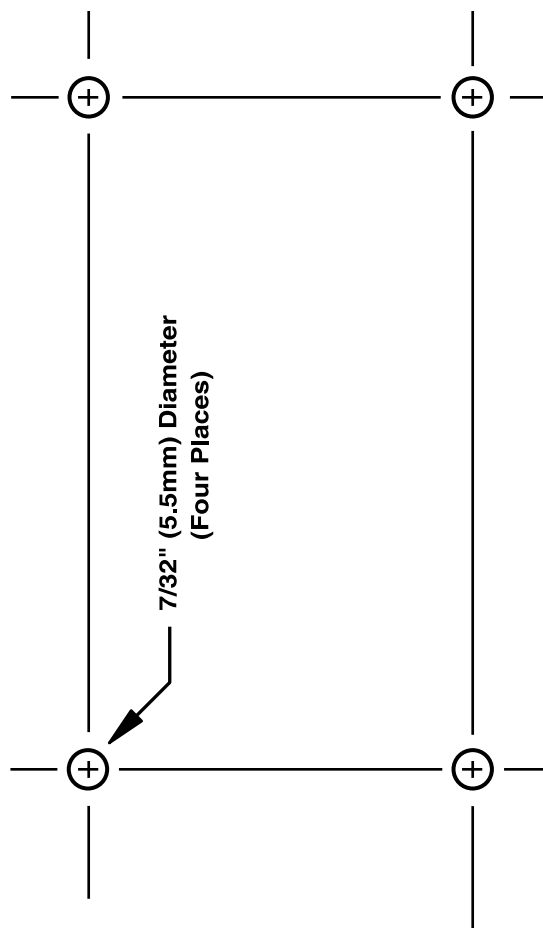
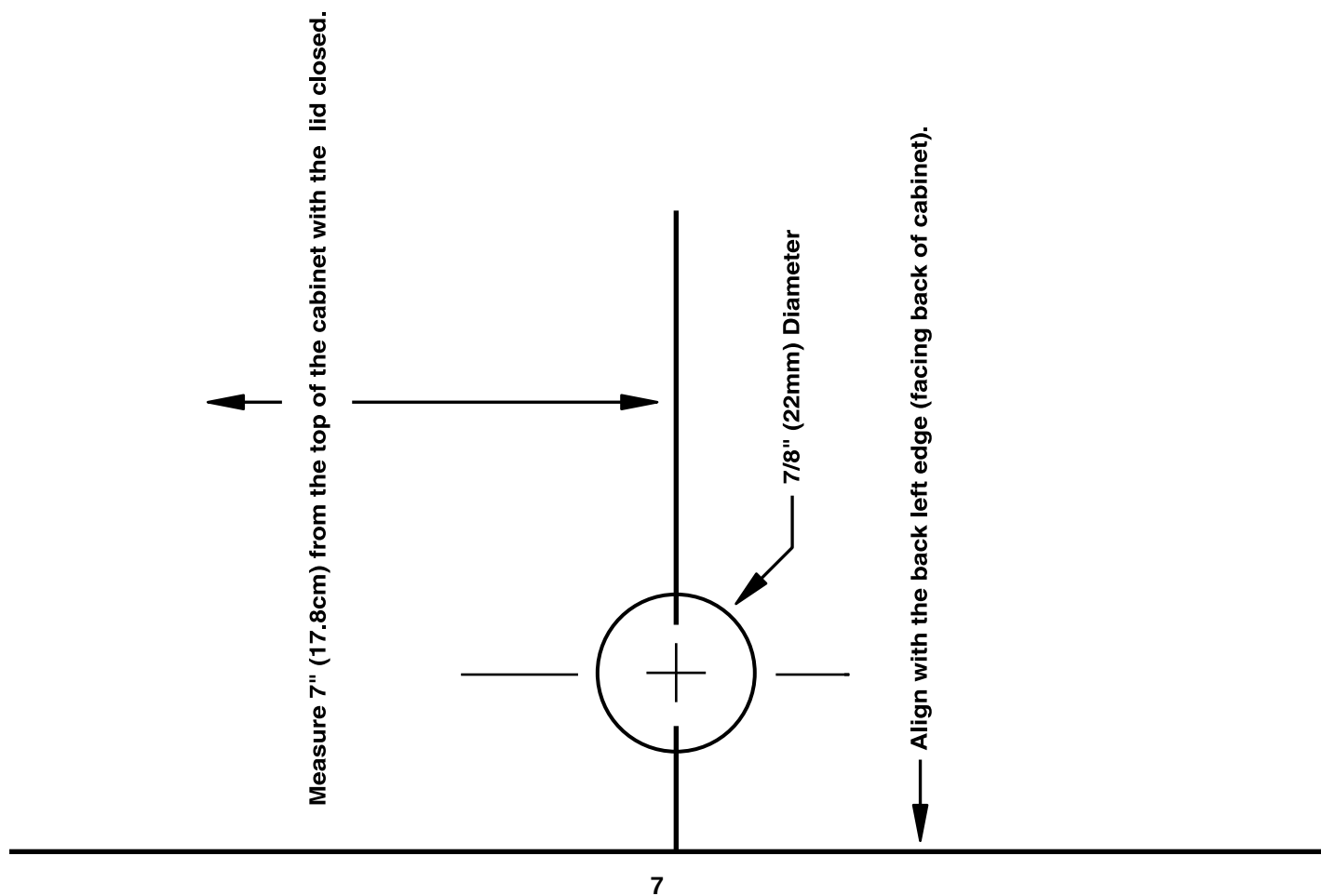
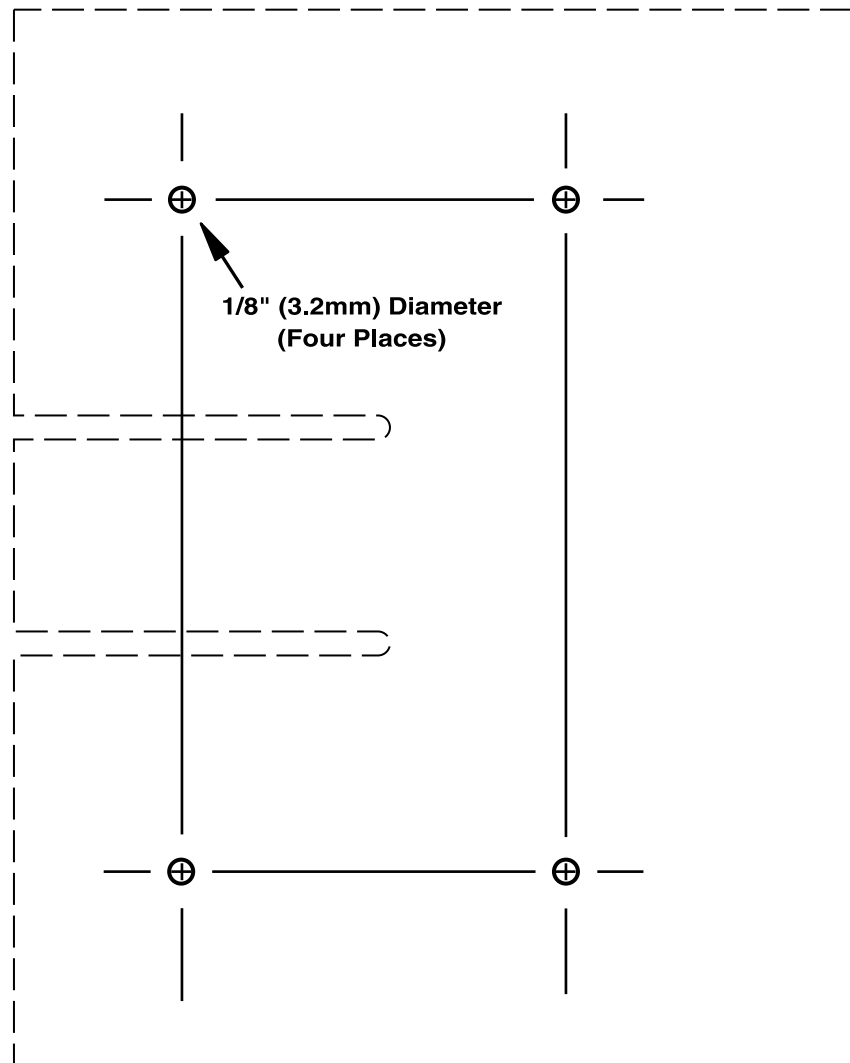


Figure 14 - RDR Mounting Template For Satellite Interior Installation



Align with the lower right corner of the rear plate.

