



Toro OSMAC® RDR Field Satellite Electric Actuation Models Installation Instructions

Introduction

The OSMAC RDR Satellite Controller is designed for installation on a substantial concrete foundation with imbedded conduit of various diameters to enable power, field and earth ground wiring to be routed into the cabinet for connection. A mounting bolt positioner and basic mounting hardware components are included with each controller. Additional materials required to complete the installation must be obtained separately. A material list can be compiled by reading through the instructions completely prior to starting the installation.

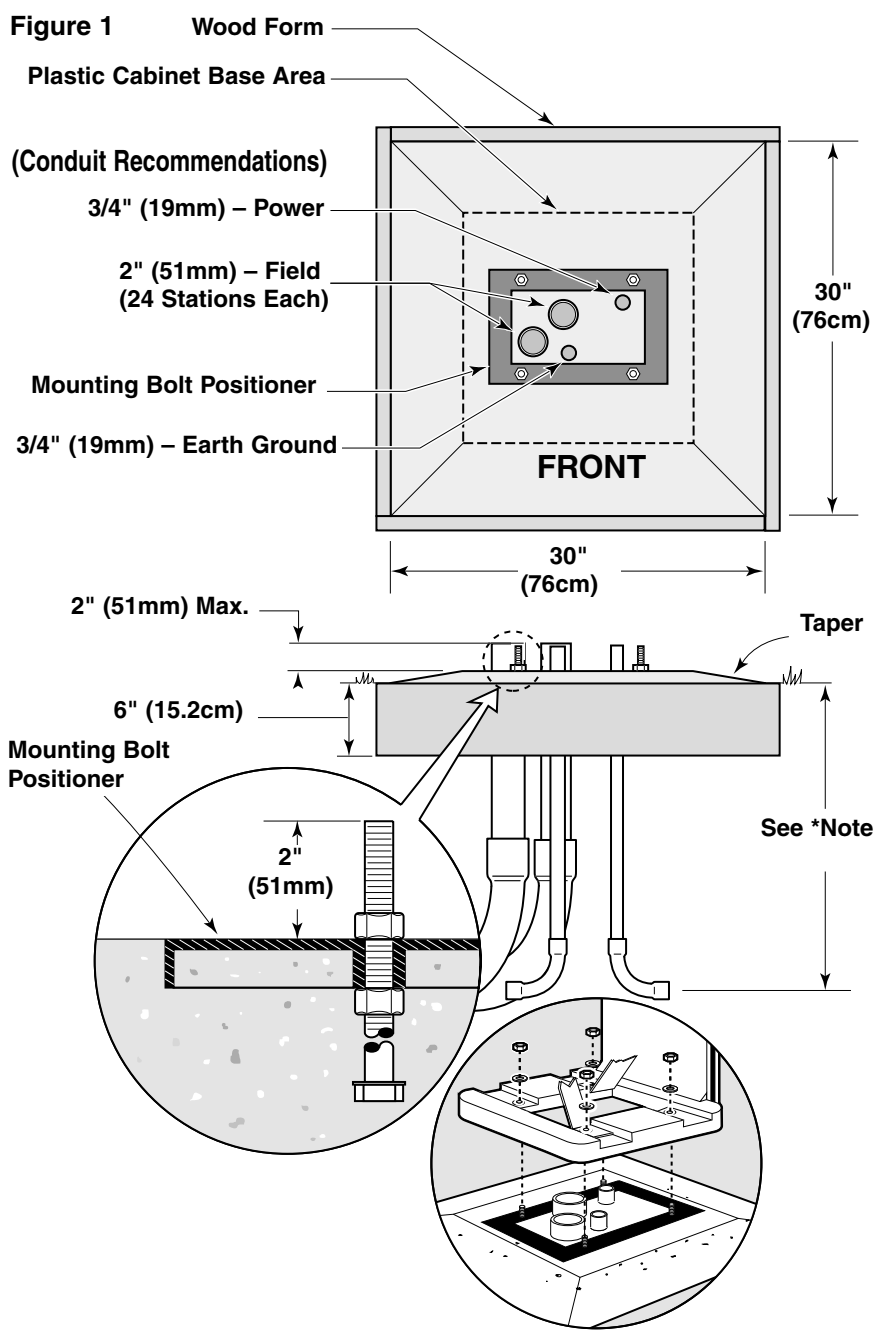
⚠ CAUTION: For your protection and the safety of the product user, comply with all Caution and Warning statements within this document. All installation practices must comply with all applicable national and/or local electrical and construction codes.

Foundation Construction

1. Prepare a hole for the foundation and wiring conduit using the minimum recommended dimensions shown in **Figure 1**.

Note: Refer to local electrical codes for required depth of buried wiring.

2. Trench to the foundation site as required for each wiring run.
3. Position straight and sweep elbow conduit sections in foundation hole as shown. Tape the conduit ends to seal out dirt. Backfill soil to form a 6" (15.2cm) foundation depth. Conduit should not extend more than 2" (51mm) above the finished top surface of the foundation.
4. Prepare the sides of the foundation hole with wood forms.
5. Prepare the mounting bolt positioner with the 5/16 x 4-1/2" bolts and nuts (provided) as shown in **Figure 1**. The threads should extend 2" (51mm) from the top surface of the bolt positioner.
6. Pour concrete into the formed foundation hole. Press the mounting bolt positioner into the concrete until it is **flush and level with the foundation surface** and aligned with the conduit.
7. Finish the concrete with a level flat area of 16" x 16" (41cm x 41cm) for the pedestal base. To prevent pooling at the base of the pedestal, add a slight taper away from the cabinet base contact area. Allow concrete to sufficiently harden before continuing.
8. Remove the hex nuts from the mounting studs. Remove the cabinet cover and doors. Carefully position the controller onto the studs. Install a flat washer and a hex nut on each stud and tighten securely.



Earth Ground Installation

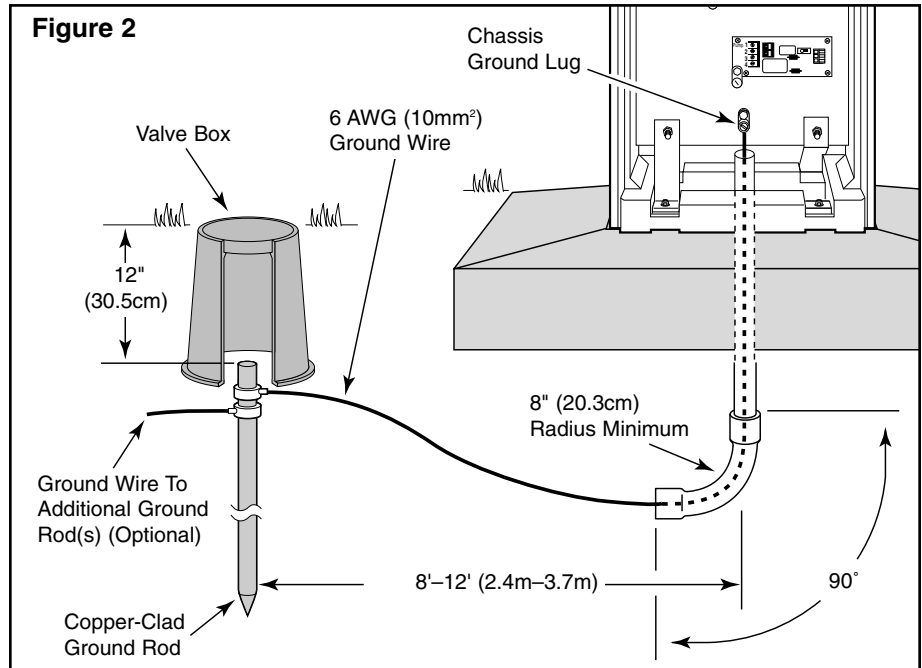
⚠ Important: The satellite surge protection components cannot properly function unless an efficient pathway to earth ground is provided. The ground path must be as direct as possible, without sharp bends and must not exceed 30 ohms resistance (when measured with an earth ground resistance test device). A resistance reading of 0–10 ohms is considered excellent, 11–20 ohms is acceptable and 21–30 is considered marginal. All electrical components throughout the irrigation system should be grounded in a manner which provides the same ground potential.

The following instructions depict one of several acceptable earth grounding methods. Due to variables in soil composition and terrain, the method shown may not be suitable for your installation site. Contact your local Toro distributor for assistance and availability of the required earth ground resistance test instrument. Recommended ground testers are: AEMC Instruments, model 3710 clamp-on tester, or Biddle Megger, model 250260 (or equivalent).

Procedure

1. Drive a 5/8" (16mm) by 8' (2.5m) copper-clad steel rod into well-moistened soil not less than 8' (2.5m) or more than 12' (3.7m) from the satellite. The top of the ground rod should be 12" (30.5cm) below grade level.
2. Using a 5/8" (16mm) clamp or "Cad weld" fastener, attach a length of 6 AWG (10mm²) solid-core, bare copper wire near the top of the ground rod. Avoiding wire bends of less than 8" (2.3cm) radius, route the wire through the foundation into the controller cabinet. Secure the wire to the large copper ground lug provided on the rear plate assembly. See **Figure 2**.

Note: The ground lugs provided on the surge protection assemblies (if installed) are not used in this application.



3. Ensure the soil surrounding the ground rod remains well moistened at all times. Measure the ground resistance per the instructions provided with the ground test instrument. 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 to twice the buried depth of the 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.

Connecting Power and Equipment Ground Wires

⚠ CAUTION: When installing multiple controllers, polarity of the Line and Neutral connections must be properly maintained throughout the irrigation system. Reversed polarity may cause damaging potentials to exist at one or more controller locations.



WARNING:

AC Power wiring must be installed and connected by qualified personnel only.

All electrical components and installation procedures must comply with all applicable local and national codes. Some codes may require a means of disconnection from AC power source, installed in the fixed wiring, having a contact separation of at least 0.120" (3mm) in the line and neutral poles.

Ensure the AC power source is OFF prior to connecting to the controller.

1. Place the controller's main power switch in the OFF position. See **Figure 3**.
2. Position the input voltage select switch to the 115V or 230V position as required.
3. Remove the power supply cover located in back of the RDR unit.
4. Connect the provided 3/4" (19mm) electrical conduit in the satellite to the 3/4" (19mm) electrical conduit installed in the foundation.
5. Route three insulated solid copper wires from the power source, through the conduit, and into the controller power supply.

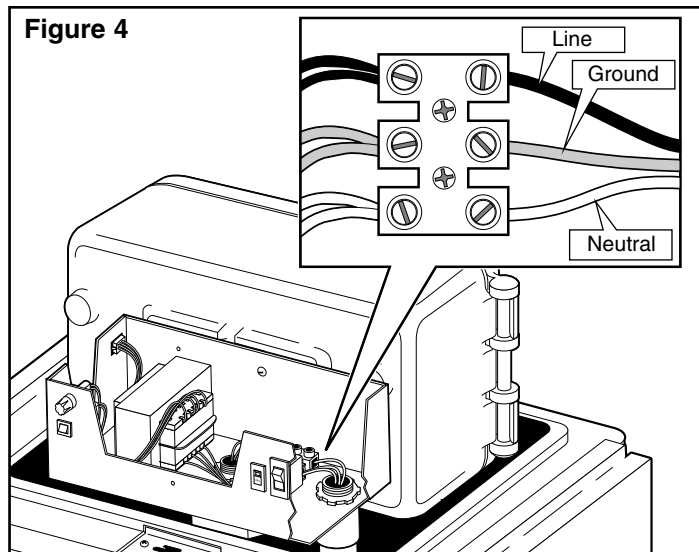
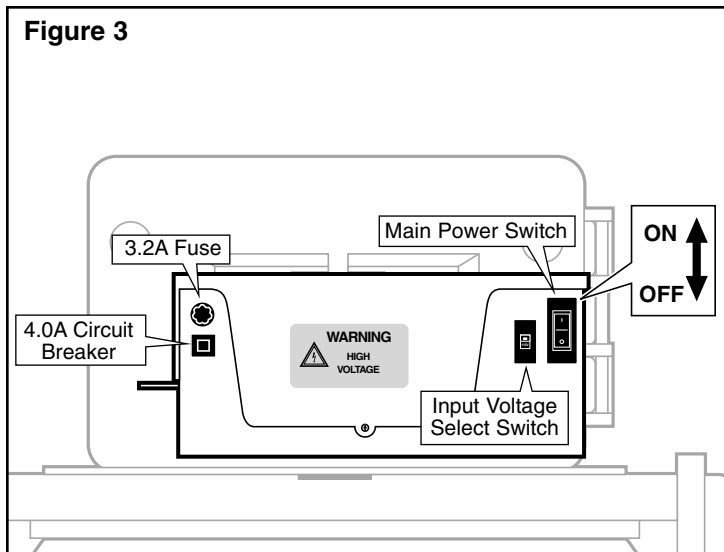


Table 1 – Power Wire Connection

AC Service Type	Line	Equipment Ground	Neutral
115 V a.c. (Domestic)	Hot (Black)	Green	Neutral (White)
230 V a.c. (3-Phase)	Hot (Black)	Green/Yellow	Hot (Blue or Red)

- Reference **Table 1** for the appropriate type of power connection. Secure the wires to the terminal block as indicated in **Figure 4**.
- Reinstall the power supply cover.
- Apply power to the controller.

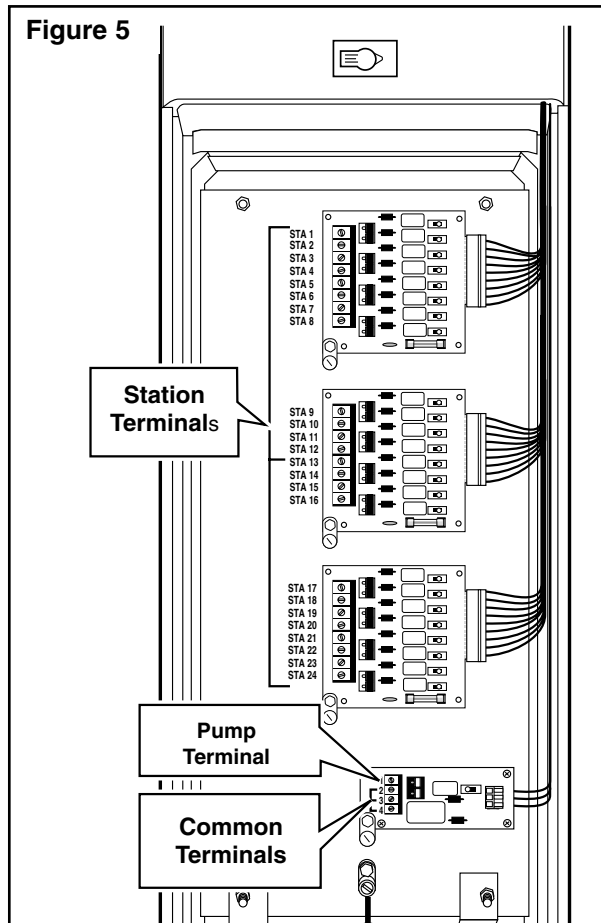
Connecting Control Valve Wiring

- Attach a control wire to one lead of each valve solenoid. Attach a common wire to the remaining lead of all valve solenoids. Waterproof all field wire connections using an approved waterproof splicing method.
- Label control wires and common wire(s) for identification during installation. Route the wires through the 2" (51mm) conduit into the controller cabinet.
- Secure valve control wires to station terminals in desired operating sequence. Secure common wire(s) to COM terminals of pump/common surge module. (Three common terminals are provided.) See **Figure 5**.

Note: The 24-station model is shown in the illustration. Models with 32–48 stations have additional surge modules located on the rear chassis plate.

All station outputs are labeled with the appropriate station number.

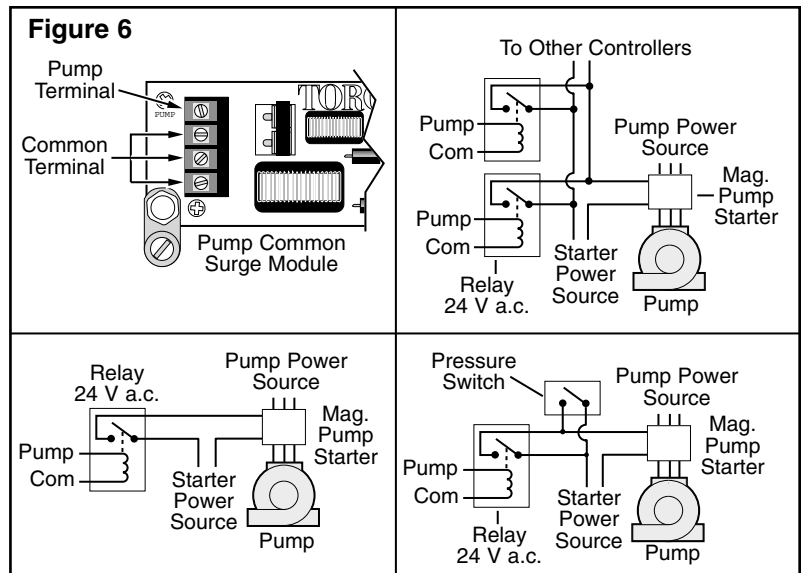
CAUTION: If connecting more than one valve per station, do not exceed 0.75A (18 VA) maximum.



Connecting A Master Valve or Pump Relay

1. Secure a wire pair from the master valve or pump relay and route it into the satellite pedestal with the field wires. See **Figure 6** for pump relay configurations.
2. Connect one wire to the pump terminal of the pump/common surge module.
3. Connect the remaining wire to one of the common terminals.

CAUTION: Do not connect the pump starter directly to the controller's pump start circuit. Damage to the controller will result. Use a 24 V a.c., 0.75 Amp (max) pump start relay.



Selecting Operating Mode

The valve station and pump/common surge protection modules incorporate slide switches which enable three operating modes to be selected for each valve station. Set switches to the type of operation mode required:

- **AUTO** position enables the station circuit to function automatically per controller operation.
- **OFF** position disables the station until the switch is moved to AUTO or ON.
- **ON** position manually activates the station until the switch is moved to AUTO or OFF.

CAUTION: When operating stations manually, do not exceed 3.0A maximum current draw. Controller component damage can result.

Note: The pump/common switch on the surge module controls the pump circuit only – the valve common circuit is not affected by switch position.

Selecting the Narrow-band Decoder Radio Frequency

Note: Wide-band radio models only – Install the wide band frequency module into the RDR unit at this time. Refer to Installation Instruction (form number 371-0002) provided with the frequency module for proper installation procedure.

The narrow-band satellite frequency decoder module provides four preprogrammed frequencies, one of which is selected for use by the placement of a movable jumper located on the module board as shown in **Figure 8**.

The pre-programmed frequencies are as follows:

Channel 1=462.2125 Mhz

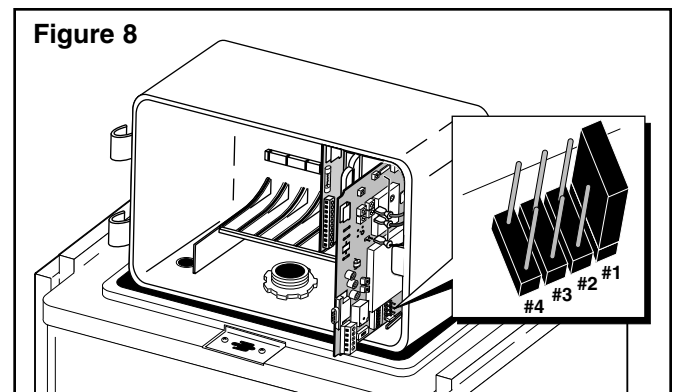
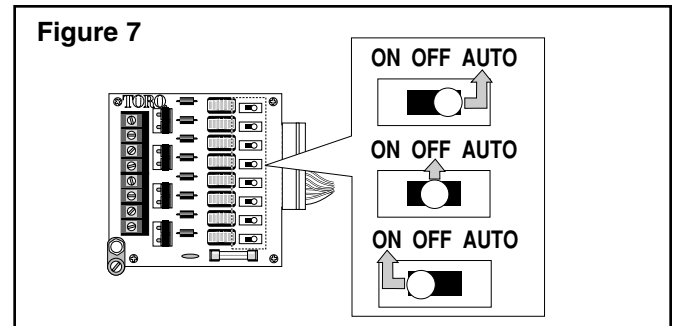
Channel 2=462.4375 Mhz

Channel 3=467.2125 Mhz

Channel 4=467.4375 Mhz

Note: The decoder module utilizes a programmable frequency synthesizer which enables each of the preprogrammed frequencies to be changed as needed for the irrigation site conditions. Contact your local Toro distributor for additional information regarding frequency reprogramming.

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



Assigning the Satellite Address Number

Each satellite requires a 3-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 are selected using an array of eight DIP switches located on the frequency decoder module assembly. See **Figure 9**. In the down position, the switch is Off (open) and represents a value of 0 (zero). In the up position, the switch is On (closed) and represents one of the following binary numbers:

1, 2, 4, 8, 16, 32, 64 and 128.

The **wide-band** DIP switch array is configured as follows:

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

The **narrow-band** DIP switch array is configured as follows:

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, place the switch or combination of switches to the On position which provides the numerical equivalent of the desired address number.

Example for wide-band radio: To set satellite address number 50 (050), start with all eight DIP switches in the Off (open) position, then close switch numbers 3, 4 and 7; i.e., $32 \text{ (Sw 3)} + 16 \text{ (Sw 4)} + 2 \text{ (Sw 7)} = 50$. See switch address code matrix in **Table 2**.

Example for narrow-band radio: To set satellite address number 50 (050), start with all eight DIP switches in the Off (open) position, then close switch numbers 2, 5 and 6; i.e., $2 \text{ (Sw 2)} + 16 \text{ (Sw 5)} + 32 \text{ (Sw 6)} = 50$. See switch address code matrix in **Table 2**.

Note: The narrow band satellite utilizes a built-in antenna located on the frequency module assembly. If site conditions are such that an alternate antenna is required, the optional antenna adapter kit (P/N 102-1204) is required.

Testing Satellite Operation (narrow-band models only)

• Performing a Control Circuit Self Test

A self-test feature is provided to check the functionality of various key satellite control circuits. Before performing the test, ensure the Pump/Common module and the Valve Station module switches are set to the **AUTO** position.

The test is initiated by positioning the **TEST/RESET** switch, located on the frequency decoder module, to the **TEST** position as shown in **Figure 10**. Testing will begin immediately. The test will repeat continuously until the **TEST/RESET** switch is positioned to the center (normal operation) position.

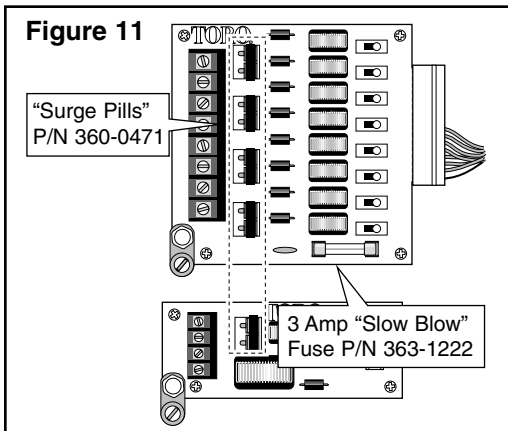
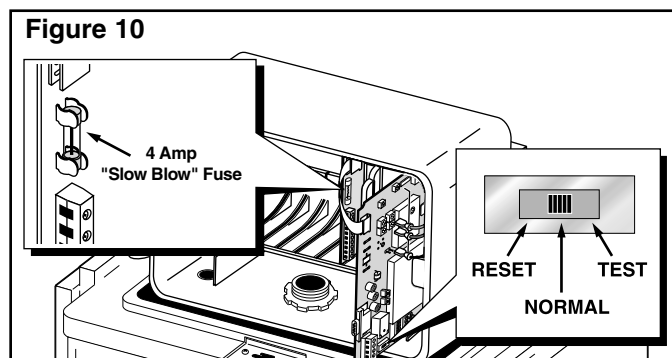
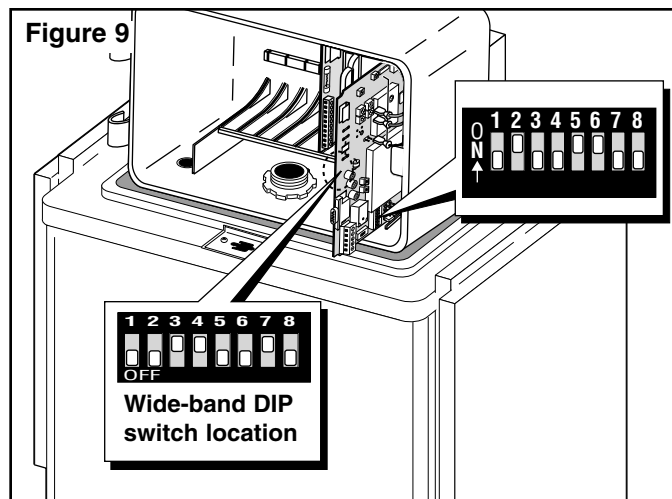
Note: The **RESET** position resets the frequency decoder microprocessor to factory defaults. To take affect, the satellite must be powered up with the switch in the **RESET** position. The switch should be placed in the **NORMAL** position after 15 seconds of operation.

• Performing a Station Output Test

Ensure the Pump/Common module switch is in the **ON** position. Position each Valve Station module switch to the **ON** position one at a time and confirm sprinkler operation.

Service Components

Surge Devices – The surge protection modules utilize replaceable, clip-mounted surge protection devices for each Valve Station and Pump/Common terminal. The surge protection devices installed are quick reaction, gas ionization type, commonly called “surge pills,” which momentarily shunt high voltage directly to earth ground. Depending on the frequency and severity of lightning strikes incurred, the surge pills can generally withstand several high voltage surges before malfunction occurs. To ensure proper surge pill condition, a periodic test schedule should be established and maintained. Contact an authorized Toro distributor for service assistance.



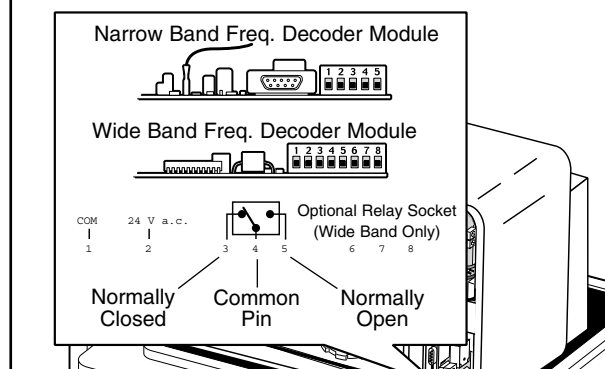
Fuse – A 3 Amp “Slow Blow” fuse is utilized on the Valve Station modules and a 4 Amp “Slow Blow” fuse is utilized on the Station Output modules.

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

Remote Relay Function And Connection

The OSMAC RDR frequency decoder module is equipped with a single-pole, double throw relay that is rated at 5 amps. The relay is intended for use in irrigation installations that have two different irrigation systems. Upon command transmitted 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 invoked and a different command to enable the feature. See the **Command Code** list for specifics. See **Figure 12** for terminal locations.

Figure 12



Satellite Operations Using a Hand-Held Radio

Satellite operations can be initiated in the field using a hand-held radio keypad. All operation commands must begin with the following keypad sequence: *9 followed by the 3-digit satellite address number. The command code is then entered, followed by additional digits which represent selected stations and/or run time values. All station numbers from 1–9 must be entered with a preceding 0; i.e., station 1 is entered as 01. Refer to **Table 2** for command codes and operation descriptions

Example: Confirm communication to the satellite by issuing a manual station start command as follows: Press *9, the 3-digit satellite address code, command code 7521 and 01 (station 1). Visually check for sprinkler operation. To step forward through the stations, press *1; to step back through the stations, press *2. To terminate the test, use command code 7520.

Table 2 – Hand-held Radio Command Codes

Command Code	Operation 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 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. (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 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. Note: Multiple syringe groups can also be run (base station command only - not applicable to hand-held radio). 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 individuals 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 on for 1 hour, 30 minutes and no seconds.
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.
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.

Table 2 – Hand-held Radio Command Codes (continued)

Command Code	Operation Description
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 42 turns on stations 5 and 45 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 (this satellite only).
7543	Disables all stations in all satellites (rain shutdown). Note: Satellite address code 256 is used with 7543 and 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 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.
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.

Specifications

Line Voltage: 115/230 V a.c. 50/60 Hz (switchable),
130 VA (100W)
Current Draw (no load): 0.07A @ 115V, 60 Hz,
0.09A @ 230V, 50 Hz
Current Draw (maximum load): 0.76A @ 115V, 60 Hz,
0.41A @ 230V, 50 Hz
Secondary Voltage Output: 24 V a.c., 50/60 H,
3.0A (72 VA)
Maximum Load Per Station Output:
0.75A (18 VA)
Maximum Load Per Pump/Master Valve Output:
0.75A (18 VA)
Maximum Total Load: 3.0A (72 VA)

Hardware Features

Plastic: 44 1/2" x 16" x 15" (113.0 cm x 40.6 cm x 38.1 cm)
Top Locking Cover

Fuses and Circuit Breakers

Power Supply:
1.5A On/Off Switch/Circuit Breaker – Main Power Input
3.2A Fuse (Slow-Blow) – Field Output
4.0A Fuse (Slow Blow) – Station Output Module
4.0A Circuit Breaker – Control Functions
Pump/Common & Communication Surge Protection Module:
0.5A Fuse

Table 3 – Satellite Address DIP Switch Matrix

◼=On ◻=Off WB=Wide Band NB=Narrow Band

WB	8	7	6	5	4	3	2	1	WB	8	7	6	5	4	3	2	1	WB	8	7	6	5	4	3	2	1	WB	8	7	6	5	4	3	2	1	WB	8	7	6	5	4	3	2	1
NB	1	2	3	4	5	6	7	8	NB	1	2	3	4	5	6	7	8	NB	1	2	3	4	5	6	7	8	NB	1	2	3	4	5	6	7	8	NB	1	2	3	4	5	6	7	8
001	•								052		•		•	•				103	•	•				•	•		154		•		•	•			•	205	•	•	•				•	•
002		•							053	•		•		•	•			104			•			•	•		155	•	•		•	•			•	206		•	•				•	•
003	•	•							054		•	•		•	•			105	•		•			•	•		156			•	•	•			•	207	•	•	•				•	•
004			•						055	•	•	•		•	•			106		•		•			•		157	•		•	•	•			•	208				•			•	•
005	•		•						056				•	•	•			107	•	•				•	•		158	•	•	•	•	•			•	209	•						•	•
006		•	•						057	•			•	•	•			108			•	•			•		159	•	•	•	•	•			•	210		•		•			•	•
007	•	•	•						058		•		•	•	•			109	•		•	•			•	•	160					•			•	211	•	•		•			•	•
008				•					059	•	•		•	•	•			110		•	•	•			•	•	161	•				•			•	212			•				•	•
009	•			•					060			•	•	•	•			111	•	•	•	•			•	•	162		•			•			•	213	•		•				•	•
010		•		•					061	•		•	•	•	•			112					•			•	163		•						•	214		•	•				•	•
011	•	•		•					062		•	•	•	•	•			113	•					•	•	•	164			•					•	215	•	•		•			•	•
012			•	•					063	•	•	•	•	•	•			114		•			•	•	•	•	165	•	•			•			•	216			•				•	•
013	•		•	•					064							•		115	•	•			•	•	•	•	166		•	•			•		•	217	•		•				•	•
014		•	•	•					065	•						•		116			•		•	•	•	•	167	•	•	•			•		•	218			•				•	•
015	•	•	•	•					066		•					•		117		•			•	•	•	•	168				•				•	219	•	•		•			•	•
016					•				067	•	•							118		•	•			•	•	•	169	•			•				•	220			•				•	•
017	•				•				068			•				•		119	•	•	•			•	•	•	170		•		•				•	221	•		•				•	•
018		•			•				069	•		•				•		120				•	•	•	•	•	171	•	•		•				•	222		•		•			•	•
019	•	•			•				070		•	•				•		121	•			•	•	•	•	•	172			•	•				•	223	•	•	•				•	•
020			•		•				071	•	•	•				•		122		•			•	•	•	•	173	•		•	•				•	224							•	•
021	•		•		•				072				•					123	•	•			•	•	•	•	174		•	•					•	225	•						•	•
022		•	•		•				073	•			•			•		124			•	•	•	•	•	•	175	•	•	•					•	226		•					•	•
023	•	•	•		•				074		•		•					125	•		•	•	•	•	•	•	176					•			•	227	•	•					•	•
024				•	•				075	•	•		•			•		126		•	•	•	•	•	•	•	177	•				•			•	228			•				•	•
025	•			•	•				076			•	•			•		127	•	•	•	•	•	•	•	•	178		•			•			•	229	•						•	•
026		•		•	•				077	•	•	•	•					128								•	179	•	•			•			•	230		•					•	•
027	•	•		•	•				078		•	•	•			•		129	•							•	180			•					•	231	•	•	•				•	•
028			•	•	•				079	•	•	•	•			•		130		•						•	181	•		•					•	232			•				•	•
029	•		•	•	•				080				•			•		131	•	•						•	182		•	•					•	233	•		•				•	•
030		•	•	•	•				081	•				•		•		132			•					•	183	•	•	•					•	234			•				•	•
031	•	•	•	•	•				082		•			•		•		133	•		•					•	184				•				•	235	•	•					•	•
032						•			083	•	•					•		134			•					•	185	•			•				•	236			•				•	•
033	•					•			084			•				•		135	•	•	•					•	186		•		•				•	237	•		•				•	•
034		•				•			085	•		•				•		136				•				•	187	•	•		•				•	238		•					•	•
035	•	•				•			086		•	•				•		137	•			•				•	188			•	•				•	239	•	•	•				•	•
036			•			•			087	•	•	•				•		138		•		•				•	189	•		•	•				•	240				•			•	•
037	•		•			•			088				•	•				139	•	•		•				•	190		•	•	•				•	241	•						•	•
038		•	•			•			089	•			•	•		•		140			•					•	191	•	•	•	•				•	242		•					•	•
039	•	•	•			•			090		•		•	•				141	•		•	•				•	192								•	243	•	•					•	•
040				•		•			091	•	•		•	•		•		142		•	•					•	193	•							•	244			•				•	•
041	•			•		•			092			•	•	•		•		143	•	•	•	•				•	194		•						•	245	•						•	•
042		•				•			093	•		•	•	•		•		144					•			•	195	•	•						•	246		•					•	•
043	•	•				•			094		•	•	•	•		•		145	•				•			•	196			•					•	247	•	•					•	•
044			•			•			095	•	•	•	•	•		•		146		•			•			•	197	•		•					•	248			•				•	•
045	•		•			•			096							•	•	147	•	•			•			•	198		•	•					•	249	•			•			•	•
046		•	•			•			097	•						•	•	148			•					•	199	•	•						•	250		•					•	•
047	•	•	•			•			098		•					•	•	149		•		•				•	200				•				•	251	•						•	•
048					•	•			099	•	•					•	•	150			•					•	201	•							•	252			•				•	•
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