

Sentinel Field Controller

The Sentinel control module is a powerful product offering, with many standard features. Among these is the ability to operate as a stand-alone unit, or as a satellite control module without the addition of any field circuit boards or other hardware. This simply means that the Sentinel can function completely on its own, or can easily be under the control of a central computer.

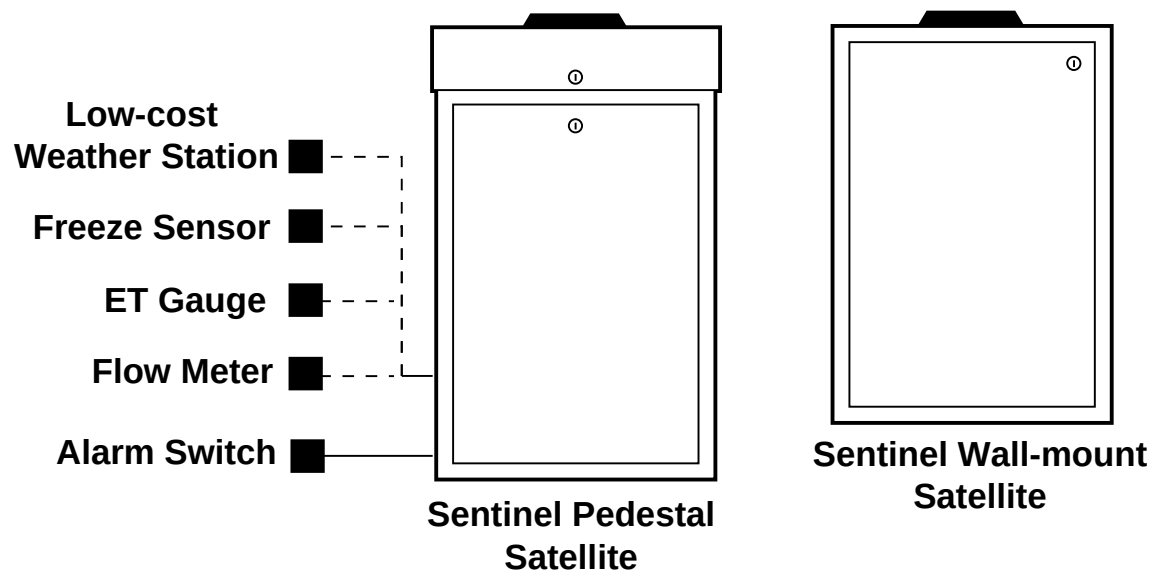
Let's look at some of the standard features:

- Station counts available in 12-, 24-, 36- and 48-station counts
- Two levels of surge protection are available, based on regional or customer requirements
- Heavy-gauge stainless-steel, vandal-resistant enclosures are available in three configurations
- Sentinel has open- and/or close-contact inputs for various sensors
- Sensors include, but are not limited to:
 - Low-cost weather station
 - Rain switch
 - Freeze sensor
 - Wind sensor
 - ET Gauge
 - Moisture sensor
- Sentinel has the ability to control a second field satellite within radio range with the "Map to Universal" feature
- System features voice-capable, or data five-watt hand-held radio transceiver with exceptional range
- Primary communication mode is FCC narrow-band compliant, digital radio
- Products are UL- and FCC-approved for agency applications

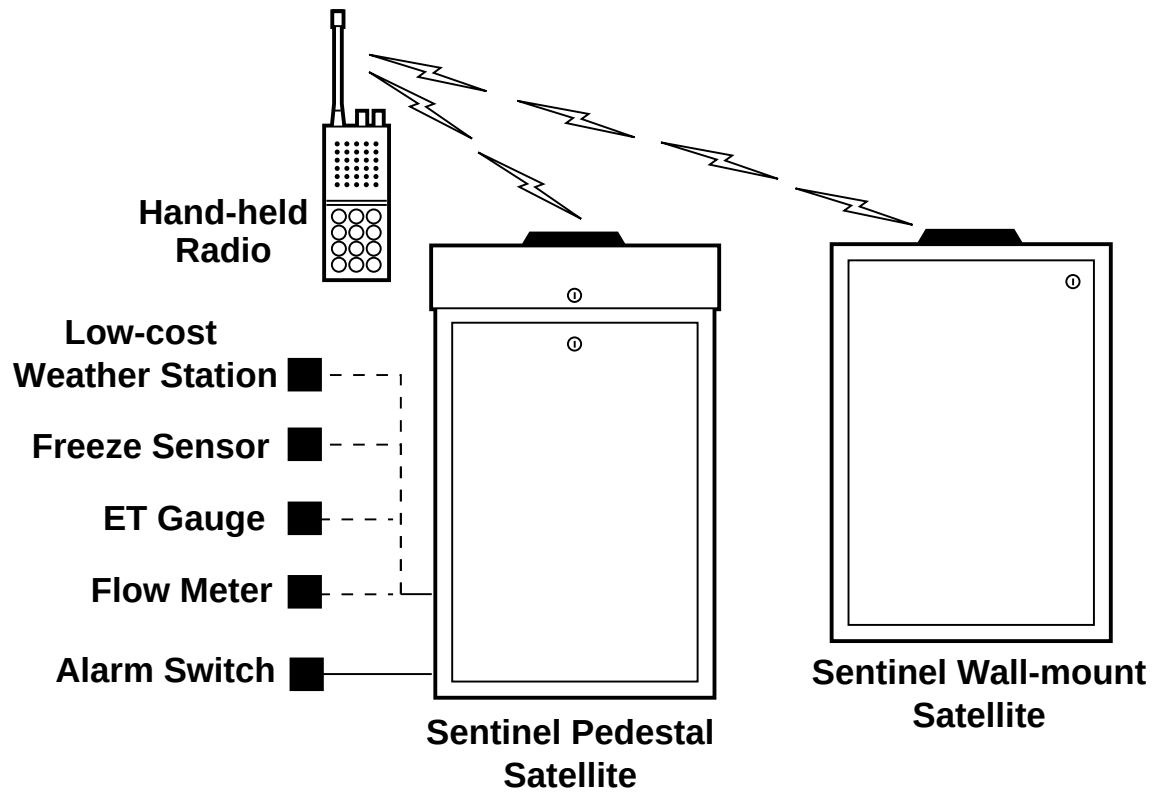
Other specific field controller features are:

- Non-volatile memory—will retain time, day and all programming in the event of a power failure
- Programmable module, via on-board keypad or laptop computer
- Complete central capability without any additional field hardware
- 16 independent programs with eight start times and multiple repeats
- Seasonal adjustment by individual station, program or entire control module
- Ability to easily use more than one hand-held radio, to control multiple field modules on a contiguous site

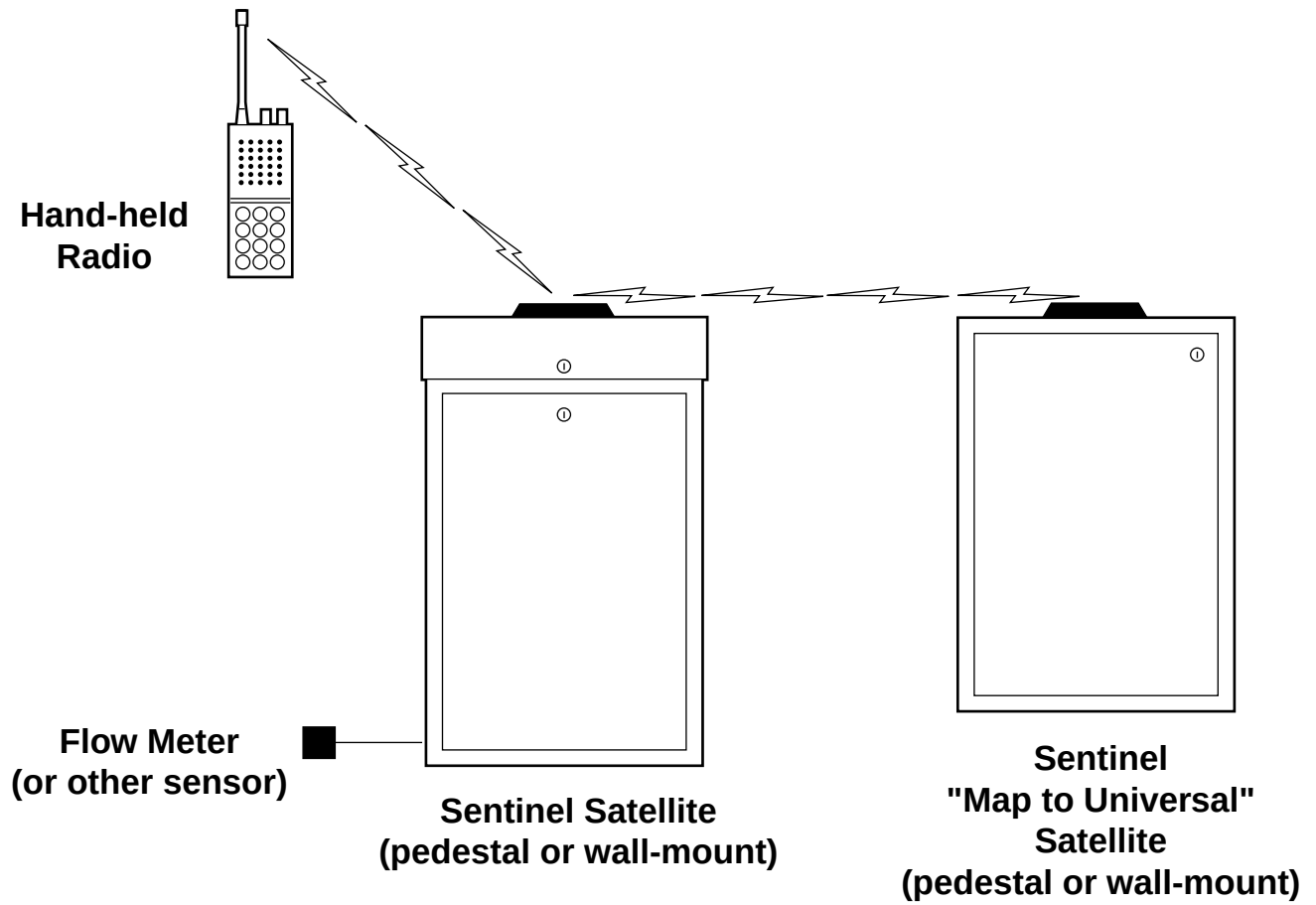
Stand-alone System



Stand-alone with Hand-held Radio



Stand-alone with Map to Universal Satellite





Sentinel Field Satellite Controller Installation Instructions

▲ Important: For your protection and the safety of the product user, please comply with all Caution and Warning statements within this document. All installation practices must comply with all applicable national and/or local electrical and building codes and be performed by qualified personnel only.

Introduction

The pedestal-mount satellite controller unit is designed for installation on a substantial concrete pad with embedded conduit of various diameters to enable wiring connections for power, field, earth ground, sensor and optional external antenna. Pedestal anchor bolts and a steel bolt pattern template are supplied with the controller.

The wall-mount satellite unit is designed for installation on a structurally-sound building wall. The stainless steel cabinet is moisture resistant and suitable for outdoor installation. The cabinet has upper and lower support attachments and is supplied with a mounting bracket which attaches directly to the wall. Refer to wall mount installation procedures on page 2.

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.

Pedestal Installation

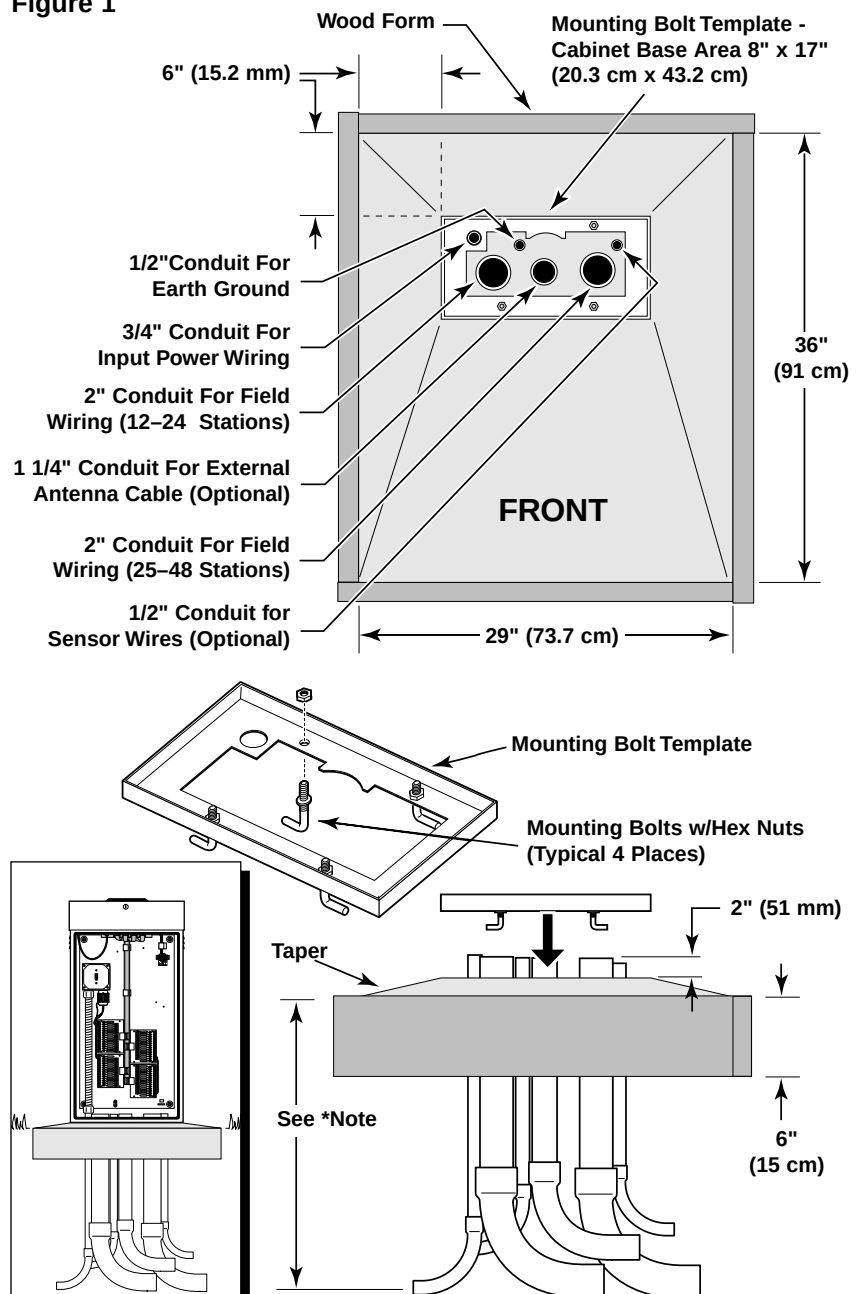
1. Prepare a hole for the pad and wiring conduit using the minimum recommended dimensions shown in **Figure 1**. This size pad requires approximately four cubic feet of concrete.
***Note:** Refer to local electrical codes for the required wire burial depth.

2. Position straight and sweep elbow conduit sections in foundation hole as shown.

Note: Placing the controller toward the back of the pad as shown protects the ground near the front of the controller from wear.

3. Tape the conduit ends to seal out dirt. Backfill soil to form a 6" (15 cm) foundation depth. The conduit should not extend more than 2" (51 mm) above the finished top surface of the foundation.
4. Form the perimeter of the pad area using 2 x 6 boards or 3/4" (19 mm) plywood.
5. Prepare the mounting bolt template with the provided L-shaped bolts and hex nuts as shown in **Figure 1**.
6. Pour concrete into the formed area and trowel smooth. Finish the concrete pad with a level flat area for the pedestal base approximately 8" x 17" (20 cm x 43 cm).
7. Aligning the mounting bolt template with the conduit, press the L-shaped bolts into the concrete until the template makes contact. To prevent pooling at the base of the pedestal, add a slight taper away from the template. Allow the concrete to sufficiently harden before continuing.
8. Remove the mounting bolt hex nuts.
Remove and discard the mounting bolt template. Place the pedestal on the pad ensuring all bolts are inserted into the pedestal base. Install a flat washer and a hex nut on each bolt and tighten securely.

Figure 1



Wall-Mount Cabinet Installation

1. Position the upper support bracket on the wall with the joggle edge up to accept the mating upper cabinet bracket. The support bracket must be level and at a height approximately 2" (51 mm) above eye level to enable the Sentinel control module display to be easily viewed.

2. Mark the two mounting screw hole locations and drill pilot holes for the screws or screw anchors.

Note: Use 3/8" (10 mm) diameter fasteners to attach the cabinet support brackets. If installing the cabinet on dry wall or masonry, install the appropriate size and type screw anchors.

3. Secure the support bracket to the wall. Hang the cabinet on the wall by engaging the upper cabinet bracket and the support bracket.
4. Draw a pencil line the entire length of the lower support bracket.
5. Remove the cabinet from the wall and remove the lower support bracket from the cabinet.
6. Place the lower support bracket on the wall aligning it with the pencil mark.
7. Mark the two screw hole locations and drill pilot holes for the mounting screws or screw anchors.
8. Secure the bottom support bracket to the wall.

***Note:** On early model cabinets, conduit access holes are only provided for power and one field wire conduit. Additional conduit access holes for earth ground, additional field wire conduit, optional sensor wires and optional external antenna must be cut or punched by the installer. All conduit access holes and knock-outs are provided on current production cabinets.

9. Remove optional conduit knock-outs as required for installation. See ***Note** above.
10. Hang the cabinet on the the wall mount support bracket. The bottom edge of the cabinet should now rest squarely on the lower support bracket.
11. Secure the cabinet to the lower support bracket using the carriage bolts and nuts removed in Step 5 above.
12. Install electrical conduit for all wiring connections per local and national code. See **Figure 3**.

Figure 2

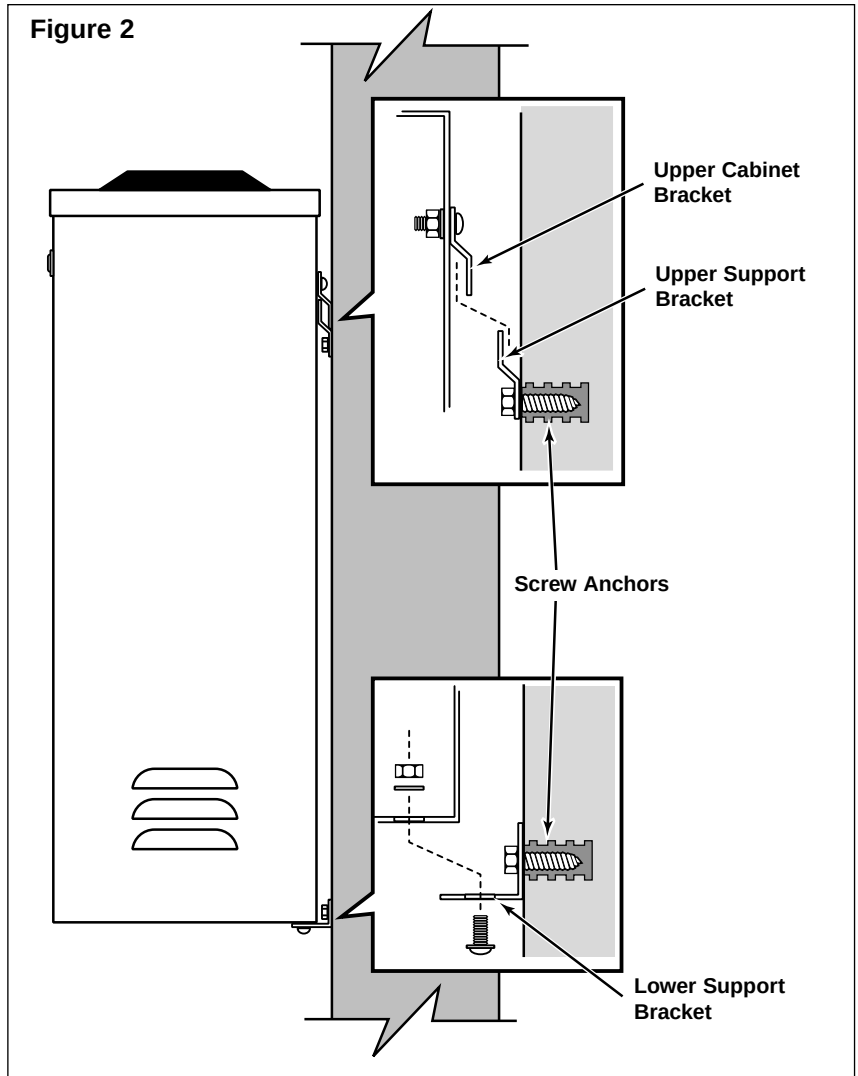
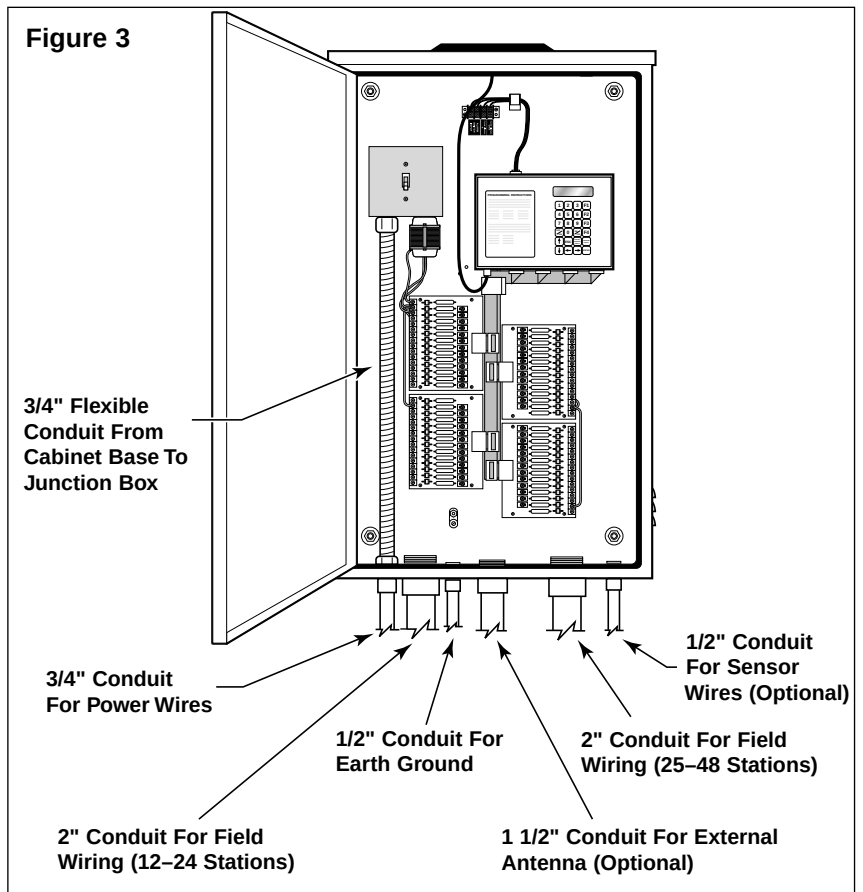


Figure 3



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).

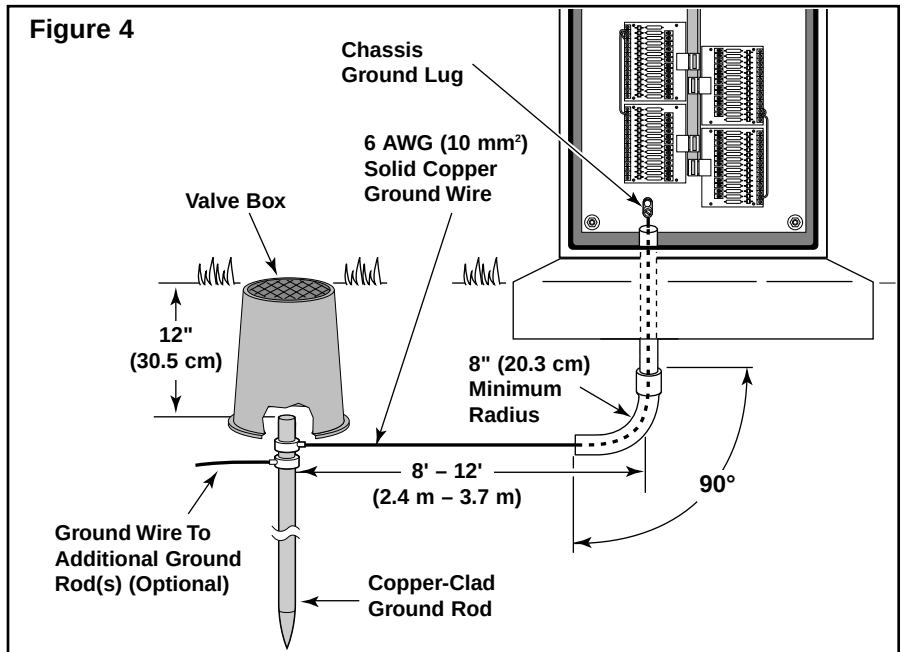
Procedure

1. Drive a 5/8" by 8' (17 mm x 2.4 m) copper-clad steel rod into well moistened soil not less than 8' (2.5 m) or more than 12' (3.7 m) from the satellite. The top of the ground rod should be 12" (30.5 cm) below grade level. See **Figure 4**.
2. Using a 5/8" (17 mm) clamp or "Cad weld" fastener, attach a 6 AWG (10 mm²) solid copper wire near the top of the ground rod. Avoiding wire bends of less than 8" (20.3 cm) radius and more than 90°, route the wire through conduit into the controller cabinet. Secure the wire to the large copper ground lug. See **Figure 4**.

Note: Make sure the soil surrounding the ground rod(s) remains well moistened at all times. The addition of some form of irrigation may be required if the satellite is installed in a non-irrigated location.

3. Measure the ground resistance per the instructions provided with the ground test instrument. If the resistance exceeds the acceptable limit, additional ground rod(s) can be installed at a distance equal to twice the buried depth of the first rod; i.e., 16' (4.9 m). Interconnect the ground rods using 6 AWG (10 mm²) solid copper wire and test again. If the measured ground resistance continues to read above the acceptable limit, contact your local Toro distributor for further assistance and recommendations.

Note: Installing a round valve box over the ground rod enables the ground rod to be easily located as well as providing access to the ground wire connection(s).



Input Power Installation

⚠ 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. An equipment ground wire from the power source must be connected to each satellite controller.

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 electrical codes. Some codes may require a means of disconnection from the AC power source, installed in the fixed wiring, having a contact separation of at least 0.120" in the line and neutral poles.

The wire used for connection to the controller must have insulation rated at 105°C minimum.

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

Input Power Installation (continued)

Note: Refer to **Figure 5** for the following procedure.

1. Ensure the controller power source is off.
2. Remove the switch cover plate and switch from the input power junction box.

Note: The switch is attached to the black transformer wire. Use care when removing the switch to prevent straining this connection.

3. Remove the conduit access knock-out plug in the bottom left corner of the junction box and install 3/4" electrical conduit to as shown.

Note: The access opening in the junction box is for 1/2" conduit. A 1/2" to 3/4" conduit adapter will be required.

4. Route the Hot, Neutral and Equipment Ground wires from the power source into the junction box.
5. Strip 1/2" (13 mm) insulation from the Hot (black) wire and secure to the remaining switch terminal. Using insulated wire connectors, splice the Neutral (white) wire to the white transformer wire and the Equipment Ground (green) wire to the green transformer wire.
6. Reposition and secure the switch and cover plate. Ensure the switch is set to the Off (down) position.

Field Wire Installation

1. To provide a field common wire, attach one wire to either solenoid lead of all valves to be operated by the controller.
2. Attach a separate power wire to each remaining solenoid lead. Label these wires for identification at the station output modules.
3. Using an approved waterproof splicing method, properly insulate all valve solenoid wire connections.
4. Route the field wires into the controller cabinet through 2" conduit. Remove approximately 3/8" (10 mm) insulation from the ends of each wire.
5. Connect the valve common wire(s) to terminal "C" of any station output module.
6. Connect each valve power wire to the appropriate station number terminal. See **Figure 6**.

⚠ Caution: Maximum current load per station must not exceed 0.5A.

7. If a 24 V a.c. pump start relay or master valve is used, connect the power wire to terminal "M" of station output module number 1 and the common wire to terminal "C" of any station output module.

Note: The Master (M) terminal on station output modules 2–4 is inoperative.

⚠ Caution: The pump start relay current load must not exceed 0.5A. Do not connect the pump starter directly to the controller—damage to the controller will result.

Figure 5

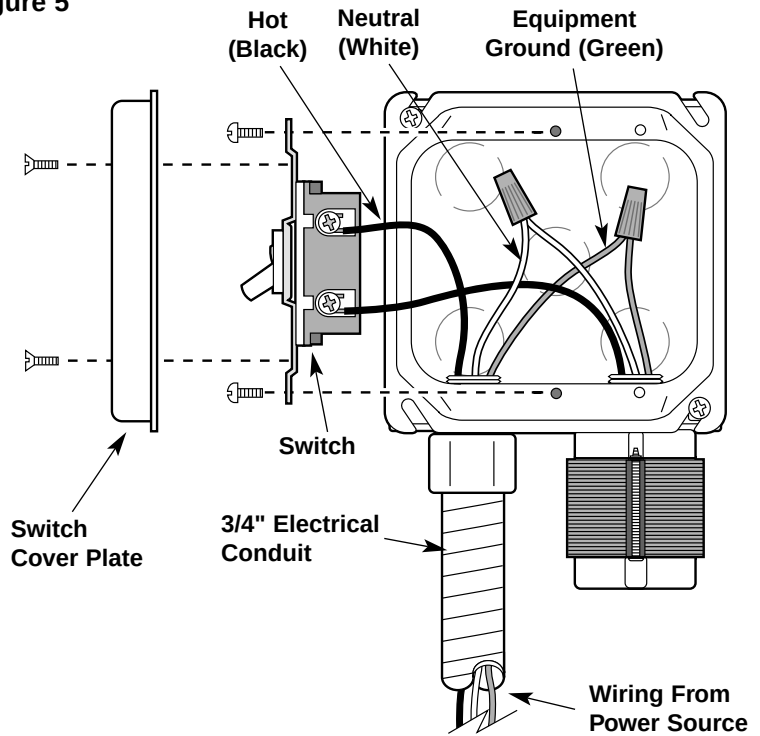
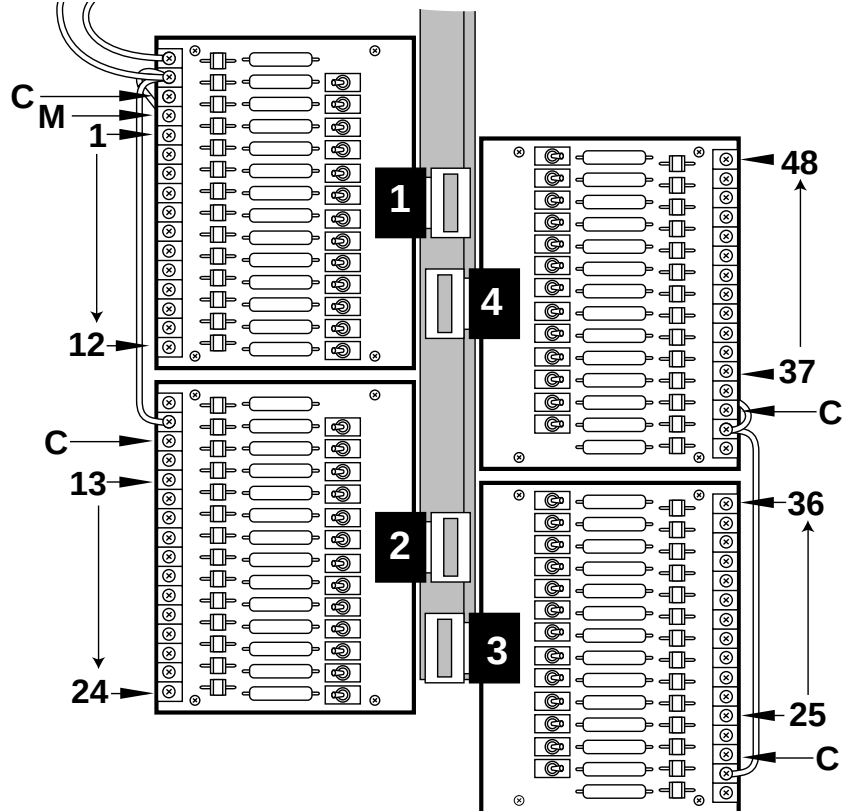


Figure 6



Output Switch Operation

The 3-position switches provided on the station output module enables local control of the station and master valve* output.

***Note:** The master valve terminal and switch are functional only on station output module number 1.

The switch positions are as follows:

ON – Manually activates the terminal. The terminal will remain on until the switch is moved to the **AUTO** or **OFF** position. An indicator LED will illuminate when the switch is on the ON position.

OFF – Shuts off the terminal. The terminal will be inoperative (for both automatic and manual operation while the switch is in the OFF position.

AUTO – Enables the terminal to be automatically controlled during automatic or manual operation.

⚠ Caution: To prevent controller damage, do not operate more than six stations concurrently (1.75A total load maximum) during either manual or automatic operation.

Alarm and Sensor Connections

The Alarm Switch is designed to monitor a dry contact switch and the alarm functionality is programmable in the system software. The Alarm Switch input can be programmed to start or stop programs of your choice and even follow the contact status if desired.

The "Flow Signal" is designed to read "shorting pulse output" from a Data Industrial flow meter (or equivalent). Or, if a rain tipping bucket or evapotranspiration (ET) gauge is used, this would be a normally open contact type. The controller measures the timing of the contact closures to determine if it is a flow pulse, rain pulse or ET pulse.

1. Connect a wire pair to the alarm switch and/ or flow measuring device and route into the controller through 1/2" conduit.
2. Connect the wire pair to the appropriate terminals as shown in **Figure 8**.

Note: Refer to Sentinel Field Satellite Controller User's Guide for operating instructions.

Figure 7

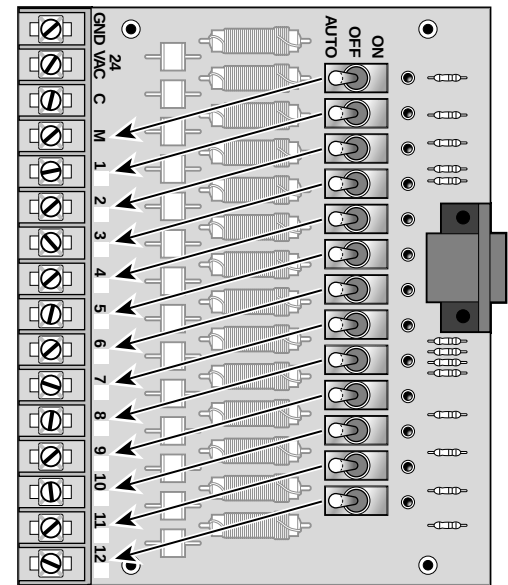
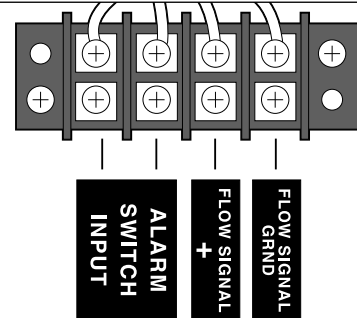


Figure 8



Specifications

Pedestal-Mount Cabinet

Stainless steel, type UL 3R

Key-actuated locking front panel and top control panel cover

17 1/8" W x 8 5/8" D x 34 1/2" H

(43.5 cm W x 22 cm D x 88 cm H)

Weight – 55 lbs. (24.9 kg)

Wall-Mount Cabinet

Stainless steel, type UL 3R

Key-actuated locking front panel

17 1/8" W x 8 5/8" D x 30 3/4" H

(43.5 cm W x 22 cm D x 78 cm H)

Weight – 47 lbs. (21.3 kg)

Temperature Range:

Operating – 14°F to 140°F (-10°C to 60°C)

Storage – -22°F to 158°F (-30°C to 70°C)

Power:

Input – 120 V a.c., 60 Hz, 1.0A

Output – 24 V a.c., 60 Hz, 1.75A (max. total),

0.5A (max. per station)

0.5A (max. master valve/pump start relay)

Fuses:

250V, 2.0A Slow-Blow - 24 V a.c.

250V, 2.0A Slow-Blow - Common

Sensor Input:

Alarm Switch – Dry contact switch

Flow Signal – Normally Open switch

Radio:

Equipment Type – Data radio, MAXON, model SD-125 U2

Frequency Band – UHF

RF Output Power – 2 watts

Current Consumption:

Standby (Muted) – < 65 mA

Transmit 2 watts RF power – < 1.0A

FCC License:

FCC ID # MNT - PC - UC

CSA License:

Canadian Certification # 153195333A

Electromagnetic Compatibility

Radio complies with FCC Part 22 and Part 90 of the FCC Rules

This equipment has been tested and found to comply with the limits for a FCC 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. The 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 the radio communications. Operation in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

