

⚠ 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 metal or plastic 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.

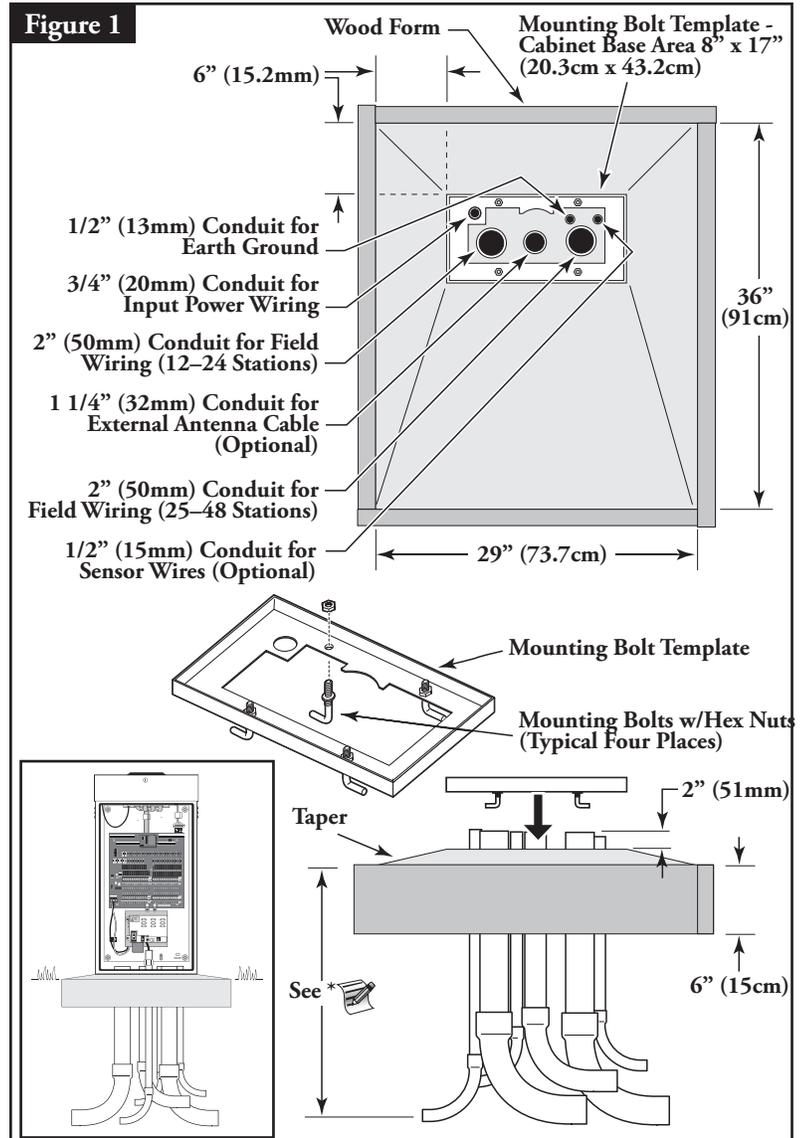
Installation

I. Metal Pedestal (PS1)

1. Prepare a hole for the pad and wiring conduit using the minimum recommended dimensions shown in **Figure 1**. This size pad requires approximately 4 cu ft (122cu cm) of concrete.

* Refer to local electrical codes for the required wire burial depth.

2. Position straight and sweep elbow conduit sections in foundation hole as shown.
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" (15cm) foundation depth. The conduit should not extend more than 2" (51mm) above the finished top surface of the foundation.
4. Form the perimeter of the pad area using 2 x 6 boards or 3/4" (19mm) 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" (20cm x 43cm).
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.



II. Plastic Pedestal (PP1, PP2, PP3)

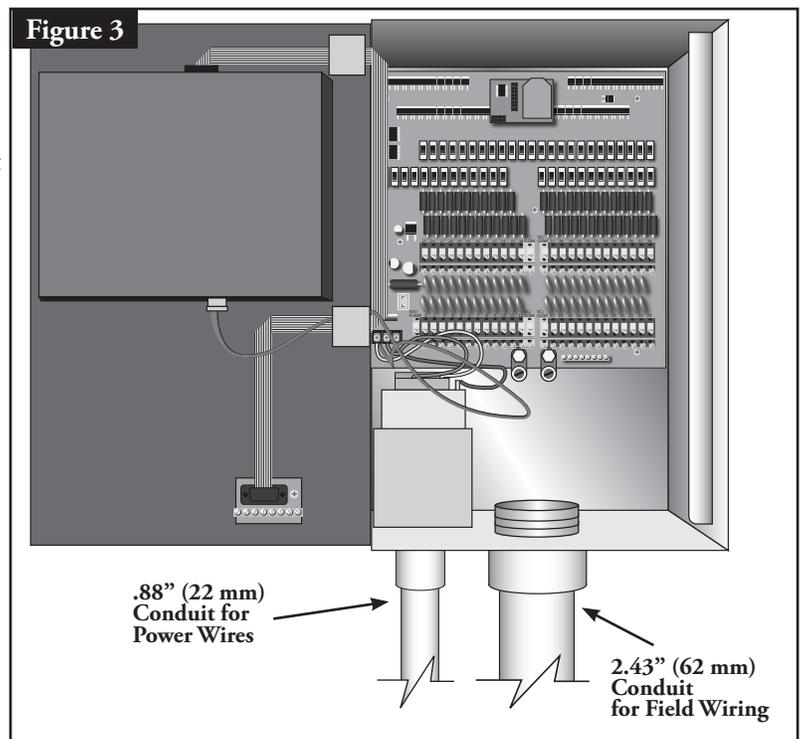
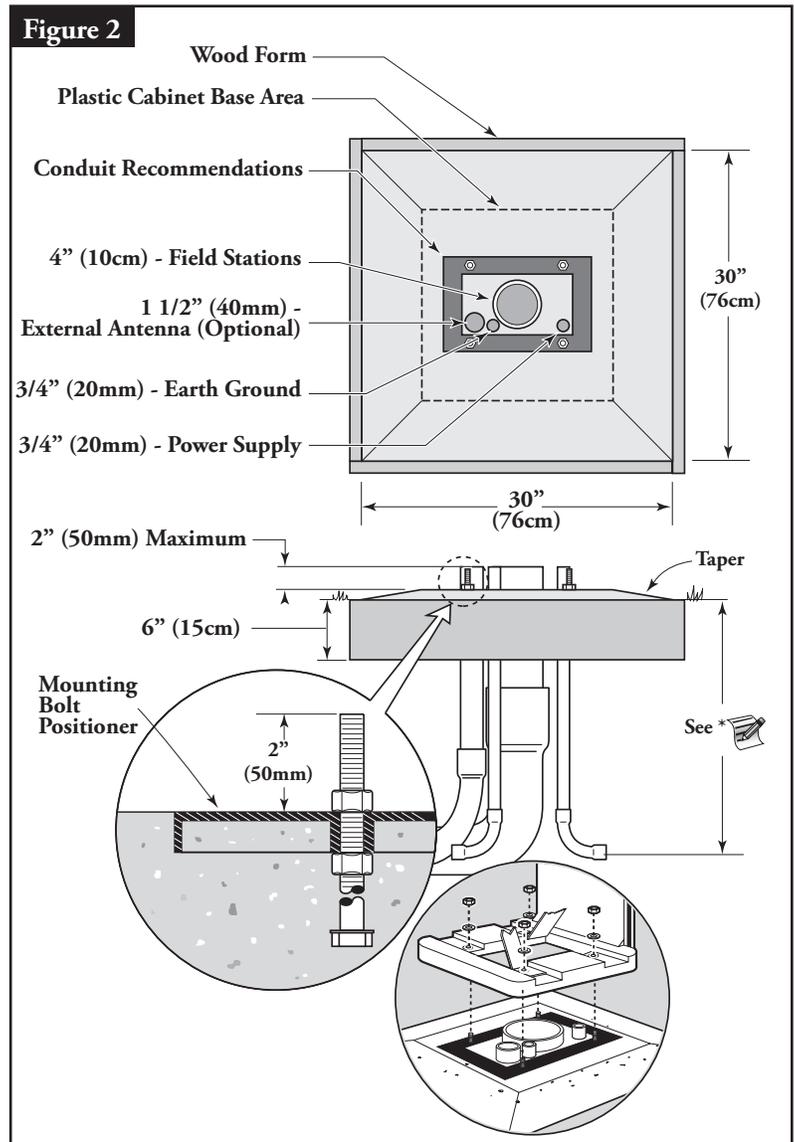
1. Prepare a hole for the foundation and wiring conduit using the minimum recommended dimensions shown in **Figure 2**.

*  Refer to local electrical codes for required wire burial depth.

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 2**. 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.

III. Powder-coated Wall-Mount Cabinet (WS1)

Cabinet installation for the WS1 cabinet is similar to the WS5 wall-mount cabinet (Section IV following). Refer to **Figure 3** for electrical conduit and wiring connections.



IV. Stainless Wall-Mount Cabinet (WS5)

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" (51mm) 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.



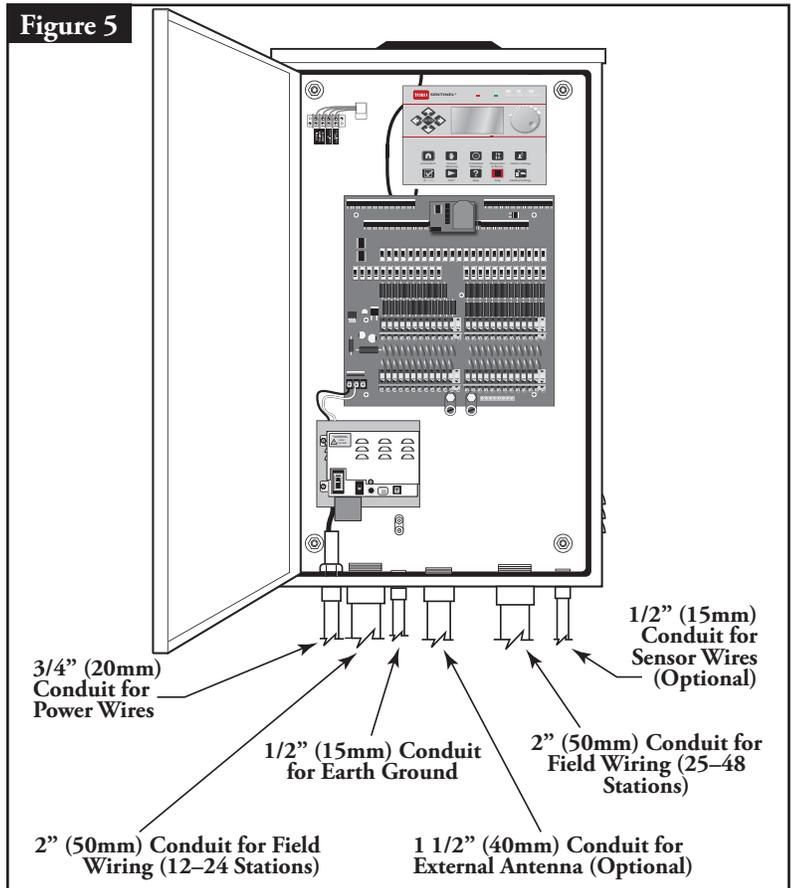
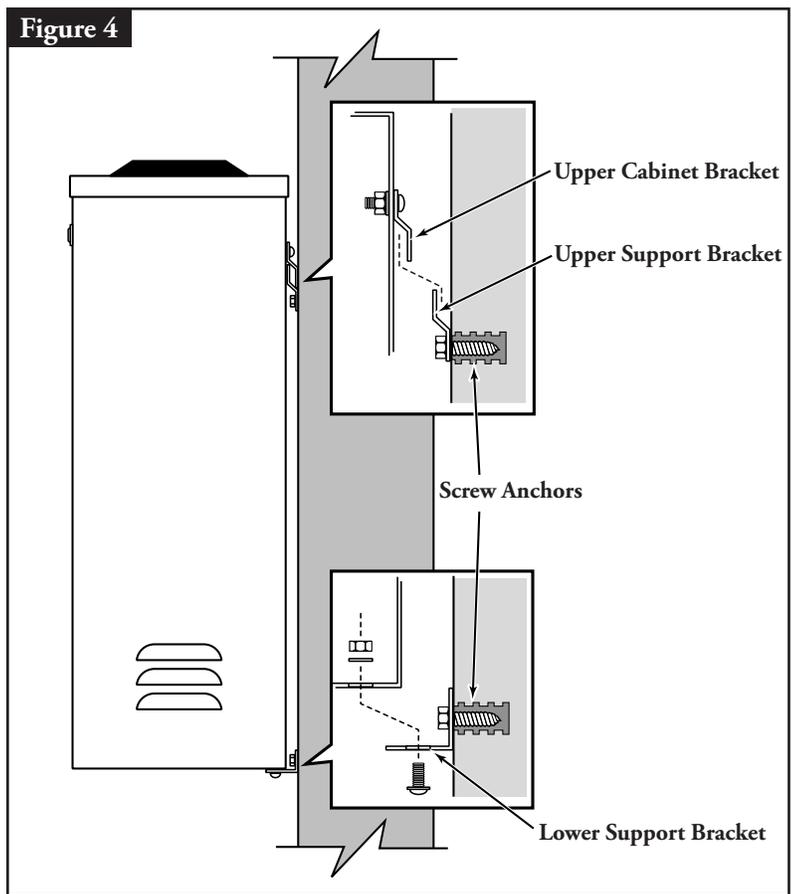
Use 3/8" (10mm) diameter fasteners to attach the cabinet support brackets. If installing the cabinet on dry wall or masonry, install the appropriate size and type screw anchors.

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.



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 * above.
10. Hang the cabinet on 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 5.



V. Earth Ground

⚠ 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).

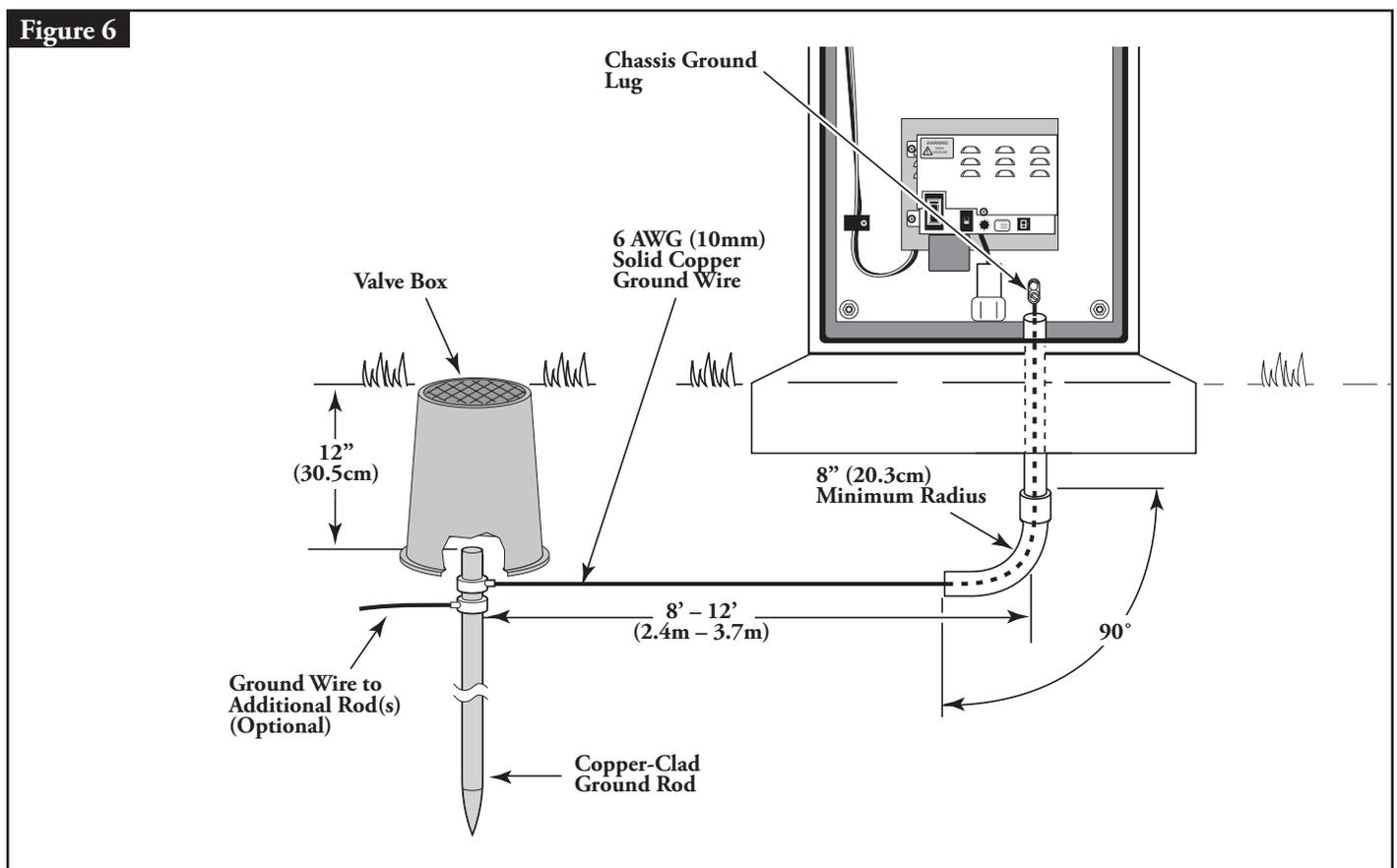
Procedure

1. Drive a 5/8" by 8' (17mm x 2.4m) 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. See **Figure 6**.
2. Using a 5/8" (17mm) clamp or "Cad weld" fastener, attach a 6 AWG (10mm²) solid copper wire near the top of the ground rod. Avoiding wire bends of less than 8" (20.3cm) 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 6**.

 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' (4.9m). Interconnect the ground rods using 6 AWG (10mm²) 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.

 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).



VI. Input Power

⚠ 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.

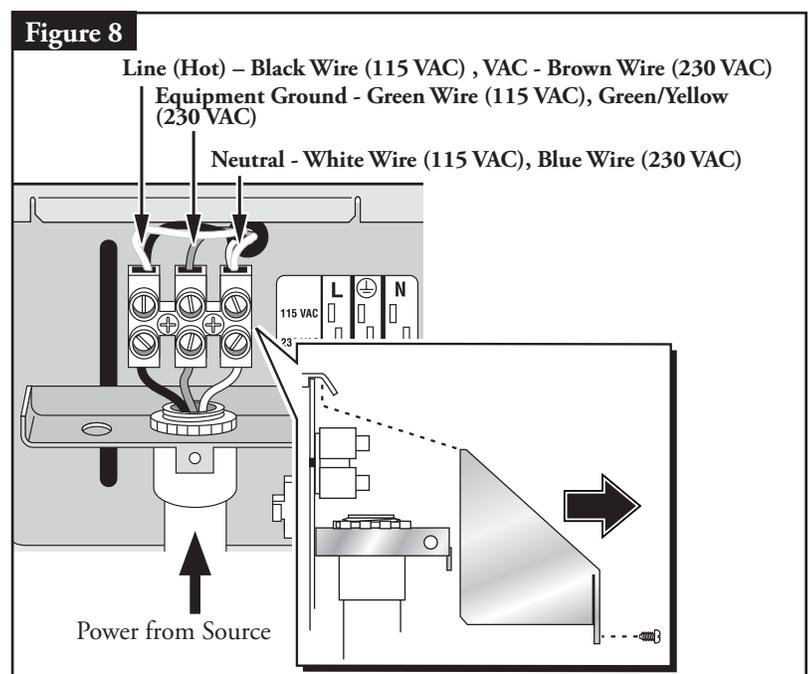
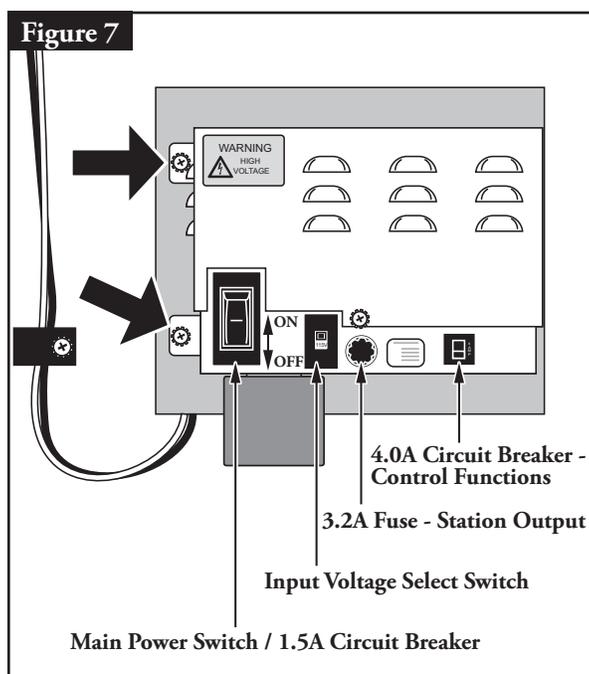
All electrical components and installation procedures must comply with all applicable local and national electrical codes. Some codes may require a means of disconnection from the AC power source, installed in the fixed wiring, having a contact separation of at least 0.120" in the line and neutral poles.

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.

Procedure

1. Place the controller's main power switch in the Off position. See **Figure 7**.
2. Position the input voltage select switch to the 115V or 230V position as required.
3. It is necessary to remove the transformer assembly from the bracket to access the power supply terminals located at the back of the assembly. Remove the two retaining screws indicated by the arrows in **Figure 8**. Disengage the transformer assembly from the bracket by lifting it upwards. Once disengaged, pull it outwards. Remove the power socket to free the power assembly from the Sentinel Unit.
4. Remove the terminal cover to access the transformer terminals block by removing the retaining screw. See **Figure 8**.
5. Route the appropriate size 3-conductor cable (10 AWG [2.5mm²] maximum) from the power source location to the terminal block.
Leave at least 12" (30.5cm) of extra 3-conductor cable to allow maneuvering of the transformer assembly. Install a 3/4" (19mm) clamp connector to retain the cable.
6. Secure the wires to the terminal block as indicated in **Figure 8**.
7. Reinstall the terminal cover, reinstall the power socket and reinstall transformer assembly to the bracket.
8. Apply power to the controller.

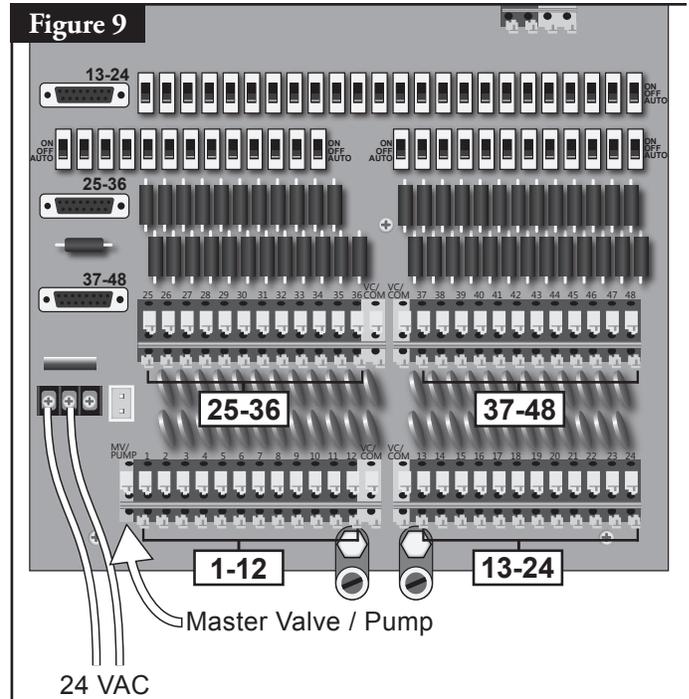


Wire Connections

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" (50mm) conduit. Remove approximately 3/8" (10mm) insulation from the ends of each wire.
5. Connect the valve common wire(s) to terminal marked "VC / COM".
6. Connect each valve power wire to the appropriate station number terminal. See **Figure 9**.

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



7. If a 24 VAC pump start relay or master valve is used, connect the power wire to terminal "MV/Pump" in bottom left corner and the common wire to any "VC/COM" terminal.

⚠ 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.

Output Switch Operation

The 3-position switches provided on the station output module (**Figure 10**) enables local control of the station and master valve output.

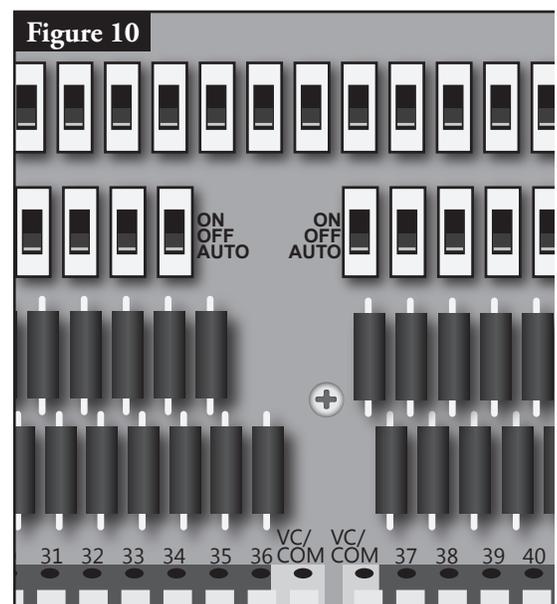
The switch positions are as follows:

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.



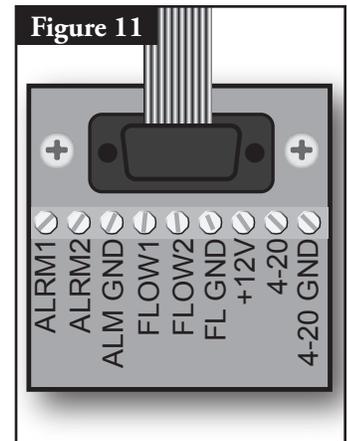
Alarm and Sensor Connections

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). 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" (15mm) conduit.
2. Connect the wire pair to the appropriate terminals as shown in **Figure 11**.



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



Alternate Communication Device Connection – Optional

The Sentinel Satellite is designed to work with various communication devices such as cellular modem. Refer to the recommended communication device listing at your local dealer for a list of approved devices. These devices may require the optional DC Power Supply unit.

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.

Specifications

Pedestal-Mount Plastic Cabinet (PP1, PP2, PP3)

Key-actuated locking front, back and top covers
16" W x 16" D x 43 1/2" H
(41cm W x 41cm D x 127cm H)
Weight – 70 lbs. (32.8kg)

Pedestal-Mount Metal Cabinet (PS1)

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
(43.5cm W x 22cm D x 88cm H)
Weight – 55 lbs. (24.9kg)

Stainless Wall-Mount Cabinet (WS5)

Stainless steel, type UL 3R
Key-actuated locking front panel
17 1/8" W x 8 5/8" D x 30 3/4" H
(43.5cm W x 22cm D x 78cm H)
Weight – 47 lbs. (21.3kg)

Powder-coated Wall Mount (WS1)

Key-actuated locking front panel
10 1/2" W x 5 1/2" D x 30 15/2" H
(26.8 cm W x 14.1 cm D x 39.6 cm H)
Weight – 19.8 lbs. (9 kg)
IP rating for enclosure: IP44

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- 115–120 or 230–240 VAC, 50/60 Hz
Output- 24 VAC, 2.0A (max. total)
0.5A (max. per station)
0.5A (max. master valve/pump start relay)

Fuses:

250V, 2.0A Slow-Blow - 24 VAC
250V, 2.0A Slow-Blow - Common

Sensor Input:

Alarm Switch – Dry contact switch
Flow Signal – Normally Open switch

Radio:

Radio Equipment used with the Sentinel controller must comply with all applicable national and/or local electrical codes.