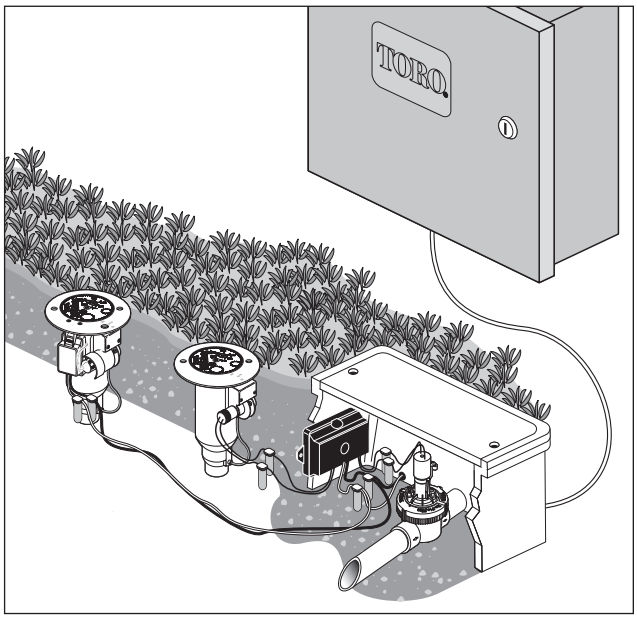
TORO Count on it.

GDC 200 Installation Instructions Stand-Alone Model



Specifications:

- Controls up to 200 stations for the Stand-Alone model
- Input power supply:
  100 VAC, 50/60 Hz
  120 VAC, 50/60 Hz
  240 VAC, 50/60 Hz
- GDC output voltage: 40 VDC max.
- GDC output power: 75 VA max.
- Storage temperature: -22ºF–140ºF (-30°C–60°C)
- Operating temperature: 32ºF–140ºF (0°C–60°C)
- Cabinet Type: Non-corrosive, lockable wall mount, indoor/outdoor installation
- Six 1" (25.4mm) conduit openings and one 1 1/2" (38mm) conduit opening

Cabinet Installation

Selecting the proper installation site for the GDC is essential to safe and reliable operation. The GDC features a weather resistant cabinet designed for indoor or outdoor installation.

The GDC should be installed on a vertical wall or other sturdy structure near a grounded power source. Select a location that shades the controller during the hottest hours of the day and provides as much protection from direct sunlight, rain, wind and snow as possible. DO NOT mount the controller where it is exposed to direct spray from the irrigation system.

For easy operation and better view of the display, install the GDC so that the display is at or slightly below eye level.

Step 1 – Drill two pilot holes 6" (15.25cm) apart for the top keyholes of the controller cabinet.

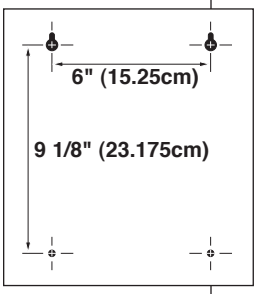
Step 2 – Install the top screws leaving approximately 1/4" (5–6mm) of exposed screw to accommodate the cabinet.

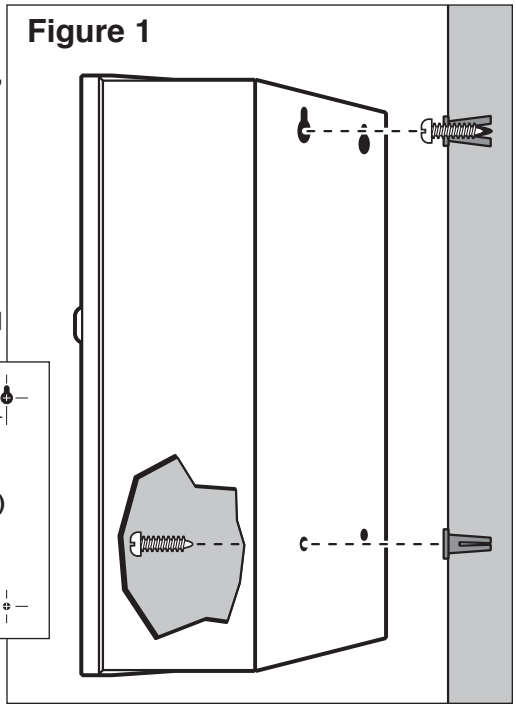
Note: If mounting the cabinet on dry wall or masonry, install the appropriate type of screw anchors or fasteners to ensure secure installation.

Step 3 – Hang the cabinet using the top keyhole slots. See **Figure 1**.

Step 4 – Open the cabinet door and install the bottom two screws to secure the cabinet.

Figure 1





Earth Ground Installation

IMPORTANT! The GDC 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 Ohm resistance (when measured with an earth ground resistance device). All electrical components throughout the irrigation system should be grounded similarly to provide 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.

Step 1 – Drive a 5/8" x 8' (17mm x 2.5m) copper-clad steel rod into well moistened soil not less than 8' (2.5m) or not more than 12' (3.7m) from the controller cabinet. The top of the ground rod should be flush with or below ground level, should be protected from damage using a valve box. See **Figure 2**.

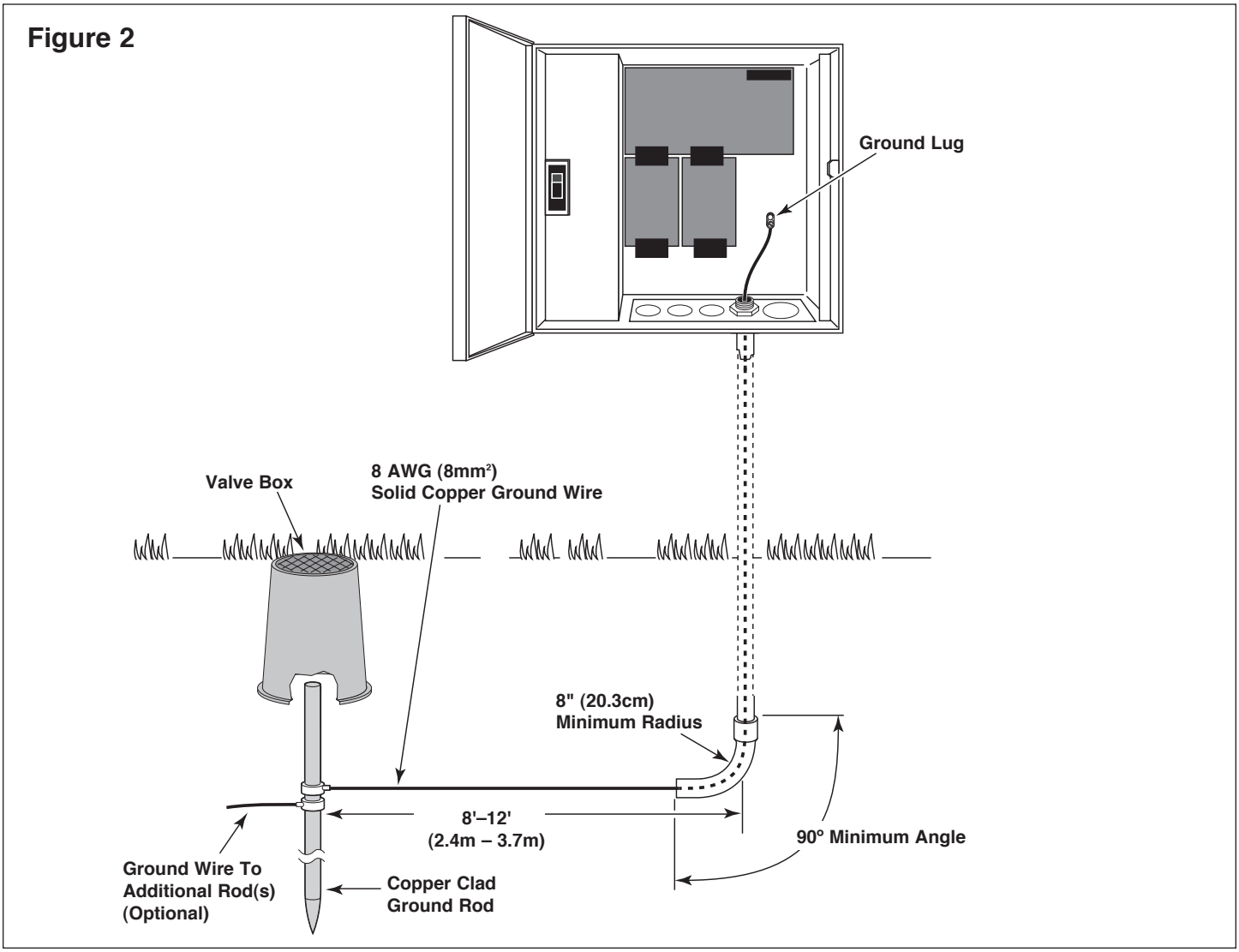
Step 2 – Using a 5/8" (17mm) clamp or "Cad weld" fastener, attach an 8 AWG (8mm²) solid copper wire near the top of the ground rod. Avoiding wire bends of less than 8" (20.3cm) radius and more than 90º, route the wire through conduit and into the cabinet. Secure the wire to the copper ground lug.

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 cabinet is installed in a non-irrigated location.

Step 3 – Measure the ground resistance per the instructions provided with the ground test instrument. A reading of 0.0 Ohm is optimum, up to 10 Ohm is good and 11–30 Ohm is acceptable in most cases. 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 8 AWG (8mm²) 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).

Figure 2



Power Source Installation

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 3mm IN THE LINE AND NEUTRAL POLES.

ENSURE THE AC POWER SOURCE IS OFF PRIOR TO SERVICING. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY DUE TO ELECTRICAL SHOCK HAZARD.

Step 1 – Turn off the power at the power source location and place the controller's power switch to OFF. Connect and route the appropriate size 3-conductor cable (14 AWG [2.5mm^2] maximum) from the power source to the controller cabinet.

The provided power cable access hole can accommodate a 1" (25mm) conduit fitting. If conduit is required, install a section of flexible 1" (25mm) electrical conduit from the power source conduit box to the cabinet's access hole.

Step 2 – Open the cabinet door and remove the two retaining screws from the power supply cover.

Step 3 – Strip the power cables and secure them to the terminal block. Reference **Table 1** for the appropriate type of power connection.

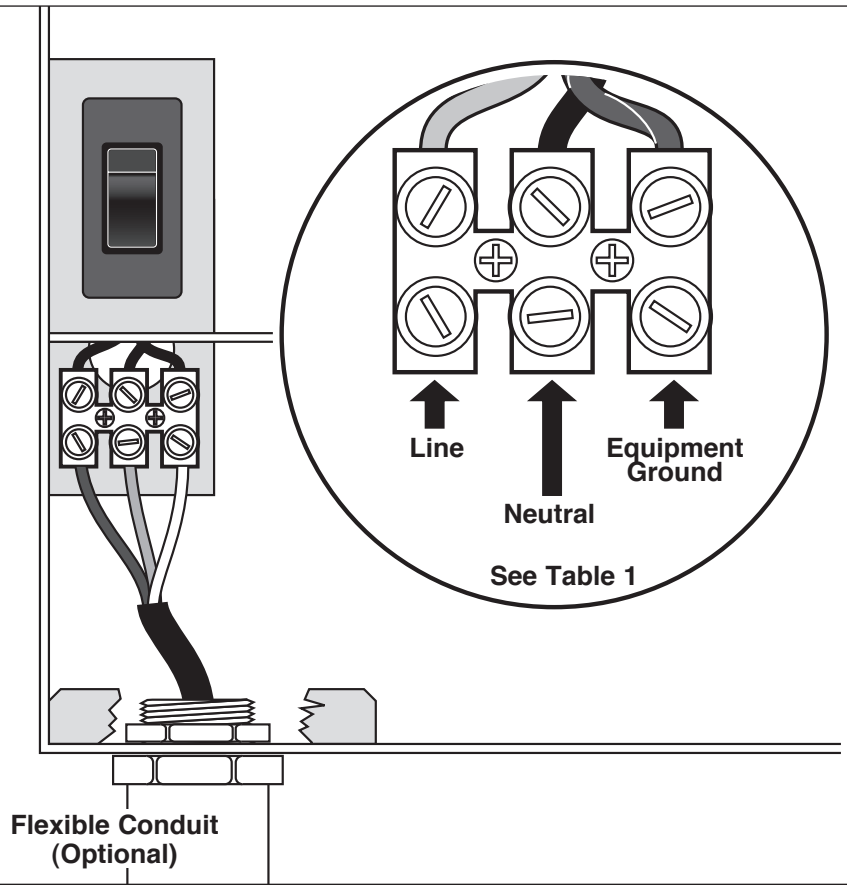
Step 4 – Reinstall the power supply cover.

Step 5 – Apply power to the controller.

Table 1

AC Service Type	Line	Neutral	Equipment Ground
100 – 120 VAC (Domestic)	Hot (Black)	Neutral (White)	Green
220 – 240 VAC (International)	Hot (Brown)	Neutral (Blue)	Green / Yellow

Figure 3



Station Decoder Installation

The station decoder module is available in 1-station, 2-station, or 4-station configuration.

The stand-alone GDC model can handle up to 100 stations per output board. These stations can be connected to the output board terminals in any configuration (25 stations connected to each of the four terminal pairs or 100 stations connected to one terminal pair, etc.). The decoder modules can be connected in parallel anywhere on the two-wire communication line connected to the station terminals. Each station can activate up to two solenoids.

Note: When a Tri-Comm Cellular modem is installed in the 2nd output board position, the maximum number of stations on the 1st output board is increased up to 200 stations.

It is recommended that the decoder modules are installed in an approved valve box to provide easy access to the wiring. Use 3M DBR/Y to waterproof all connectors.

Recommended Controller-to-Decoder cable: 14 AWG (2.5mm^2), solid copper, jacketed 2-conductor, direct burial. The preferred wire make and model is the Paige Irrigation Wire, Spec P7350D.

Recommended Decoder-to-Solenoid cable: 14 AWG (2.5mm^2), solid copper, 2-conductor, direct burial. The preferred wire make and model is the Paige Irrigation Wire, Spec P7351D.

Burial Depth

Toro recommends that the Controller-to-Decoder and Decoder-to-Solenoid cables should have a minimum cover of 6" (150mm). The irrigation plan may specify additional depth to be consistent with the depth of mainline or lateral pipe work and/or soil conditioning procedures such as aeration. Installation procedures must comply with all applicable local and national electrical codes.

- Use only wire approved for direct burial if installing the wires underground without conduit.
- All field wiring splices must be accessible to facilitate troubleshooting and/or service.

Step 1 – Route communication cable from the controller to the station decoder module installation location.

Note: The maximum wire length between the controller and the decoder module is 15,000' (4500m).

Step 2 – Secure the communication wires to terminal 1 of the GDC output board. White wire onto the 1st terminal and black wire onto the second terminal. See **Figure 4**.

Step 3 – Install the decoder module in a valve box. Record the decoder module's address number found on the side label. This address number identifies the station(s) that the decoder module control.

Step 4 – Secure the communication wires to the decoder module's black and white wires. Connect the black communication wire to the black decoder module wire. Connect the remaining communication wire (red or white) to the white decoder module wire. Use 3M DBR/Y to properly water-proof all wire connections.

Step 5 – Route output wires from the decoder module to the solenoid.

Note: The maximum wire length between the decoder module and the solenoid is 410' (125m).

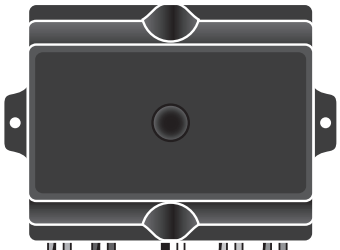
Step 6 – Connect the solenoid wires to the decoder module's station wires. The station wires are color coded for easy identification. Connect the solid colored (red, green, orange or blue) station wire to the red/white solenoid wire. Connect the similar color station wire with black stripe to the black solenoid wire. Use 3M DBR/Y to properly water-proof all wire connections.

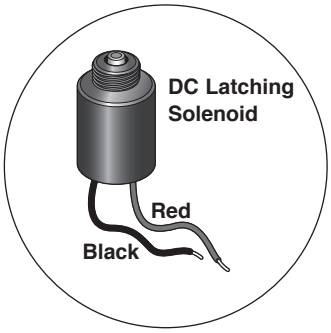
Step 7 – Connect an additional solenoid to the station wire as necessary.

Note: Each station has a maximum load of two solenoids.

Step 8 – Repeat Steps 3–8 for additional decoder modules.

Figure 4





Station 1
Solid Red Station Wire - Connect to the Red/White solenoid wire
Red with Black Stripe Station Wire - Connect to the Black solenoid wire

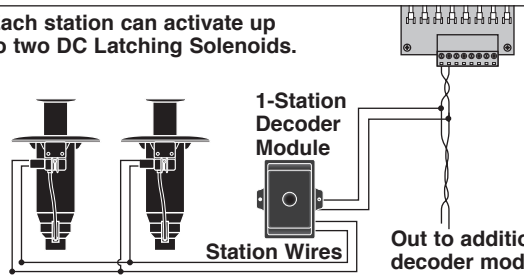
Station 2
Solid Green Station Wire - Connect to the Red/White solenoid wire
Green with Black Stripe Station Wire - Connect to the Black solenoid wire

White Power/Communication Wire
Black Power/Communication Wire

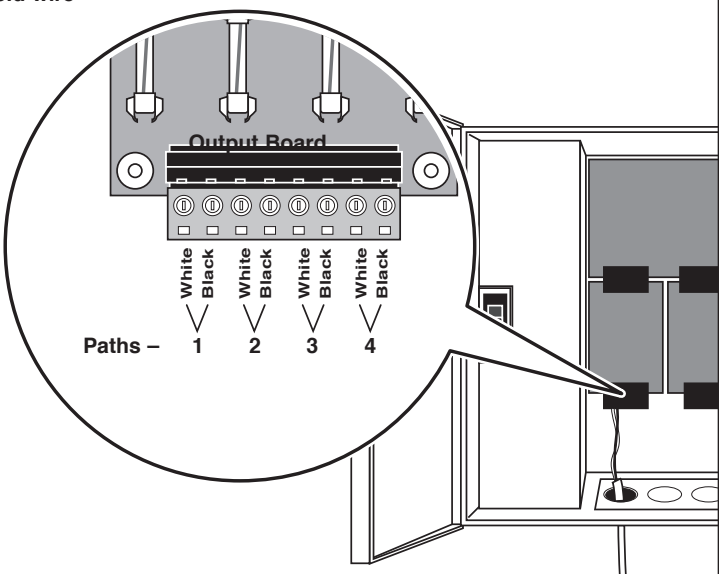
Station 3
Solid Orange Station Wire - Connect to the Red/White solenoid wire
Orange with Black Stripe Station Wire - Connect to the Black solenoid wire

Station 4
Solid Blue Station Wire - Connect to the Red/White solenoid wire
Blue with Black Stripe Station Wire - Connect to the Black solenoid wire

Each station can activate up to two DC Latching Solenoids.



The GDC output board can accommodate up to 100 stations-. The decoder modules can be connected in any configuration using the four output paths.

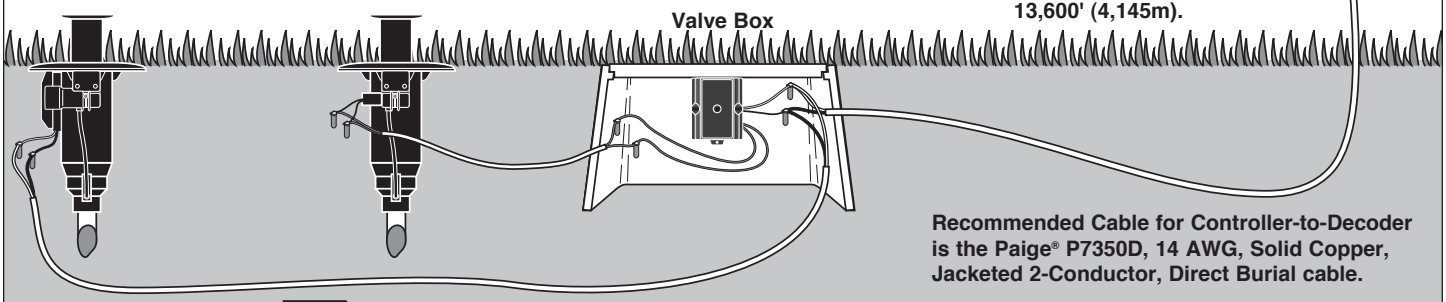


The maximum communication wire length between the decoder module and the solenoid is 410' (125m).

Recommended Cable for Decoder-to-Solenoid is the Paige® P7351D, 14 AWG, Solid Copper, 2-Conductor, Direct Burial cable.

Note: **To easily identify stations for troubleshooting, install wires with the same color code as the station wires.**

Maximum communication wire length between the controller and the farthest decoder is 13,600' (4,145m).



Recommended Cable for Controller-to-Decoder is the Paige® P7350D, 14 AWG, Solid Copper, Jacketed 2-Conductor, Direct Burial cable.

Note: **When possible, install the decoder module in a valve box for ease of service.**

Grounding Communication Cable

The lightning arrester (Toro P/N DEC-SG-LINE) is required to protect the decoder module from lightning. Without lightning arresters, the decoders are vulnerable to lightning damage. In order for these arrester to discharge lightning energy efficiently, they must be properly grounded. To be effective, a resistance of 10 Ohms or less must be achieved at each earth ground point. **Figure 5** illustrates the proper grounding and wiring of the arrester.

Step 1 – Locate decoder's power/communication wires (black and white wires).

Step 2 – Strip the insulation from lightning arrester's white wire and connect it to the white wires from the decoder and controller-to-decoder cable. Use 3M DBR/Y to properly water-proof all wire connections. (See **Figure 5**.)

Step 3 – Strip the insulation from lightning arrester's black wire and connect it to the black wires from the decoder and controller-to-decoder cable. Use 3M DBR/Y to properly water-proof all wire connections. (See **Figure 5**.)

Step 4 – Connect the lightning arrester's ground wire to the ground rod or plate's wire. If the ground rod or plate is not pre-wired, use a 10 AWG bare copper wire. (See **Figure 5**.)

IMPORTANT! If using a ground rod, verify that the straight line distance between the lightning arrester/ decoders and the ground rod is 8' (2.5m) +/– 10%. If using a 3' (1m) ground plate, the straight line distance should be 3' (1m) +/– 10%.

Step 5 – If necessary, use ground enhancement material (GEM) to attain a resistance of 10 Ohms or less.

Step 6 – Check the system for proper operation.

Figure 5

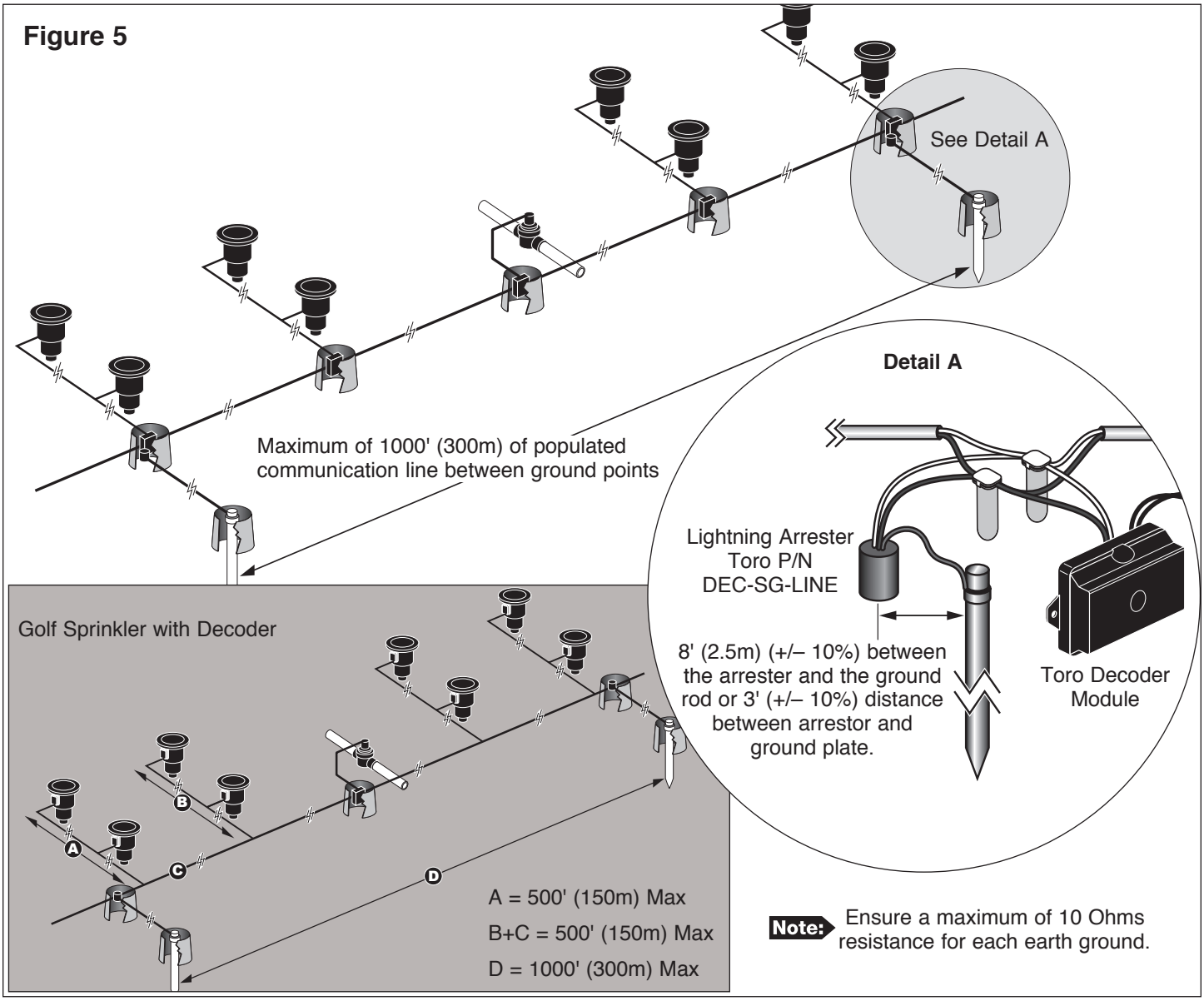
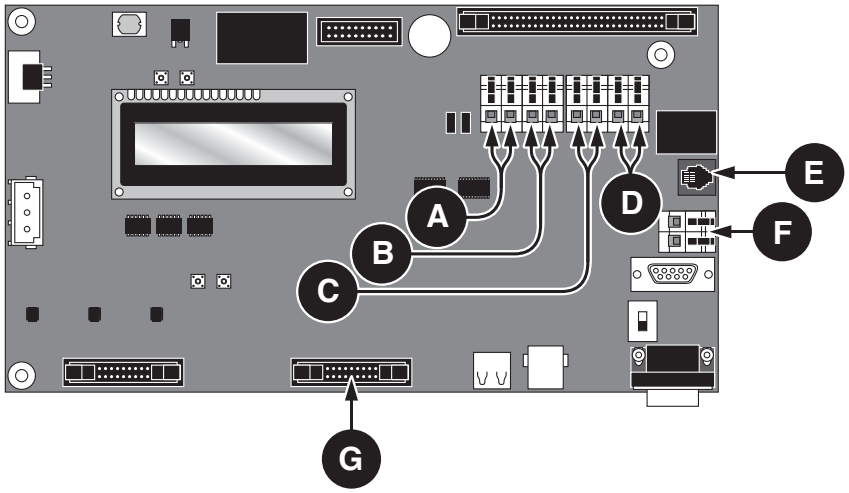


Figure 6

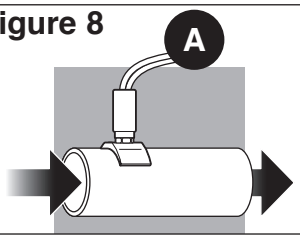


Pressure Sensor Installation

The GDC controller is designed to accept both normally-open and normally-closed pressure sensor. Set the pressure sensor model in GDC controller preference menu.

Step 1 – Place the controller's power switch to OFF.
Step 2 – Route the pressure sensor's cable into the controller.
Step 3 – Connect the cable wires to the Pressure Sensor Terminals labeled **A** in **Figure 6**.
Step 4 – Place the controller's switch to ON.

Figure 8

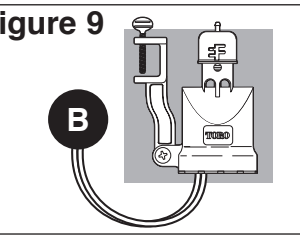


Rain Sensor Installation

The GDC controller is designed to accept both normally-open and normally-closed rain switch. Set the rain switch model in GDC controller preference menu.

Step 1 – Place the controller's power switch to OFF.
Step 2 – Route the rain sensor's cable into the controller.
Step 3 – Connect the cable wires to the Rain Sensor Terminals labeled **B** in **Figure 6**.
Step 4 – Place the controller's switch to ON.

Figure 9

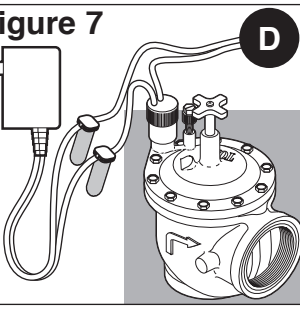


Master Valve / Pump Relay Installation

GDC provide switch terminals to control a master valve or a pump relay if the system requires it.

Step 1 – Place the controller's power switch to OFF.
Step 2 – Connect the Positive/Hot wire of the power source that controls the master valve or the pump relay to the Master valve/Pump relay switch terminal. See **Figure 6, D**.
Step 3 – Route another wire from the Master Valve / Pump terminal and connect it to the master valve solenoid or pump relay.
Step 4 – Connect the Negative/Equipment ground wire of the power source to the master valve solenoid or pump relay.
Step 5 – Place the controller's switch to ON.

Figure 7

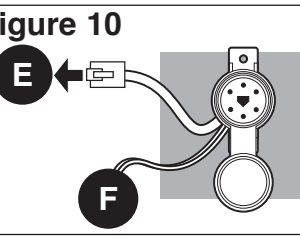


Toro Maintenance Remote (TMR) Receiver Plug Installation

The GDC controller is fully ccompatible with the TMR remote. See TMR's User's Guide for operating and mounting instructions.

Step 1 – Place the controller's power switch to OFF.
Step 2 – Route the TMR's receiver plug cable into the controller.
Step 3 – Connect the RJ45 plug into the socket labeled **E** in **Figure 6**.
Step 4 – Connect the power wires into the +24 VDC terminals labeled **F** in **Figure 6**.
Step 5 – Place the controller's switch to ON.

Figure 10



Tri-Comm Cellular Modem Installation

The GDC with Tri-Comm has the ability to accept commands through the Tri-Comm cellular Modem. Through a web interface, users can have the ability to operate the stand-alone GDC remotely.

Step 1 – Place the controller's power switch to OFF.

Step 2 – Using the 2nd daughter board socket (**Figure 6**, **G**) install the Tri-Comm modem.

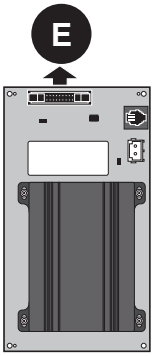
Step 3 – Secure the modem onto the cabinet with four retaining screws.

Step 4 – Route the Tri-Comm antenna to the outside of the cabinet. Peel the antenna adhesive and install on the side of the cabinet.

Step 5 – Place the controller's switch to ON.

Note: When the Tri-Comm Cellular modem is installed in the 2nd output board position, the maximum number of stations on the 1st output board is increased up to 200 stations.

Figure 11



Lithium Battery Replacement

A 3.9V Lithium battery (P/N 363-2200) is installed in the timing mechanism to sustain the controller's clock time and date for approximately 10-years with no additional power applied.

WARNING! DANGER OF EXPLOSION IF BATTERY IS INSTALLED INCORRECTLY. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE OF BATTERY. ALWAYS DISPOSE OF USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

Step 1 – Place the controller's power switch to OFF.

Step 2 – Remove the ribbon cable from the rear of the timing mechanism.

Step 3 – Remove timing mechanism's circuit board by pushing the retaining clip downward while carefully pulling the PCB board. See **Figure 12**.

Step 4 – Secure the Lithium battery into the battery socket. See **Figure 13**.

Step 5 – Reattach the circuit board to the timing mechanism.

Step 6 – Secure the ribbon cable back to the timing mechanism socket.

Step 8 – Place the controller's switch to ON.

Figure 12

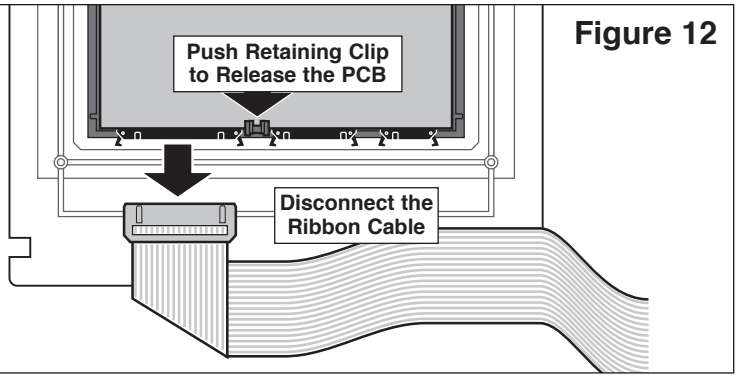
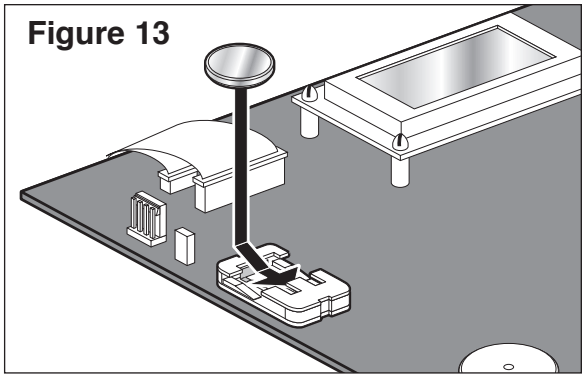


Figure 13



Electromagnetic Compatibility

Domestic: 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.

International: This is a CISPR 22 Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.Each stations can activate up to two solenoids.

This product, utilizing a Class 2 transformer tested to UL1585, satisfies the requirements of a Class 2 Power Source as defined in the NFPA 70 (NEC), Article 725.121(A)(3).