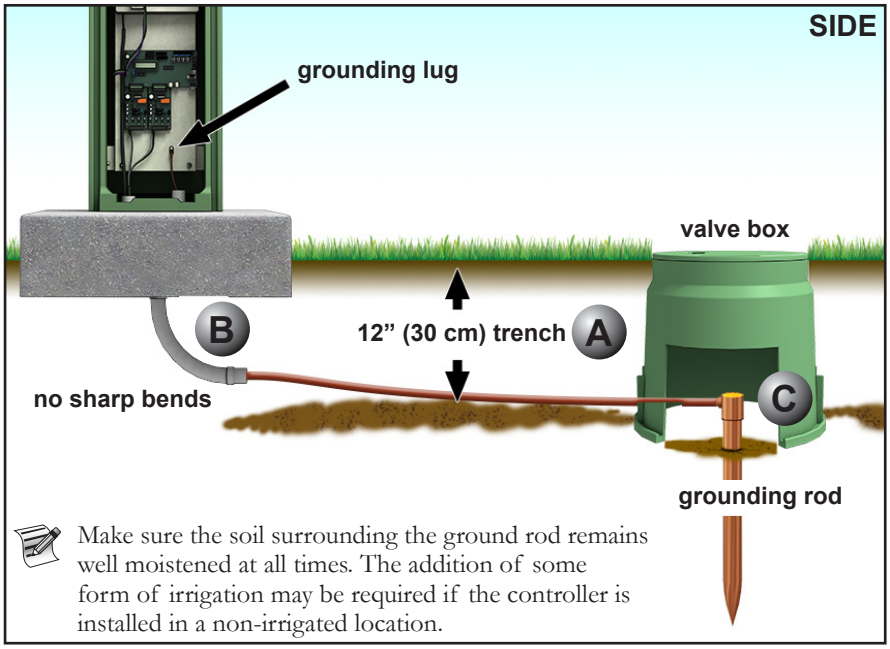
Grounding a Toro Controller
Installation Guide

Proper grounding of a controller is important to ensure a high probability of surviving a nearby lightning strike as well as other possible electrical surges. Toro has developed these guidelines to facilitate proper grounding.

Steps

1. Drive a 5/8" by 10' (17mm x 3m) copper-clad steel rod into well-moistened soil, not less than 10' (3 m) or more than 12' (3.7 m) from the controller. The top of the ground rod should be buried approximately 12" (30.5cm) below grade (A).
2. Route a 6 AWG (13,0mm2) solid copper wire connected to the earth ground device into the controller cabinet through the access hole provided below the copper ground lug. Insert and secure the copper wire to the ground lug. To provide the most efficient path to earth ground, route the ground wire between the ground rod and controller with the least amount of bending possible. There should be no tight radius bends, nicks or deep scratches on the entire length of the wire (B).



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

3. For optimum connectivity, secure the ground wire to the ground rod using a Cad-Weld™ (or equivalent) metal-fusion connection method (C).
4. Using an earth-ground resistance tester; i.e., Meggor® or equivalent, confirm the resistance reading between the controller and ground rod is 10 ohms or less. Contact your local Toro distributor for assistance in obtaining the earth ground-resistance test device. Periodically retest the earth ground connection to confirm that resistance remains at 10 ohms or less.

Spacing

Figures 1 and 2 below show minimum distances of controller to grounding rod. Note that all other electrical equipment, such as solenoids and power and communication cables, must *not* be within a 10' radius of the grounding rod.

Figure 1

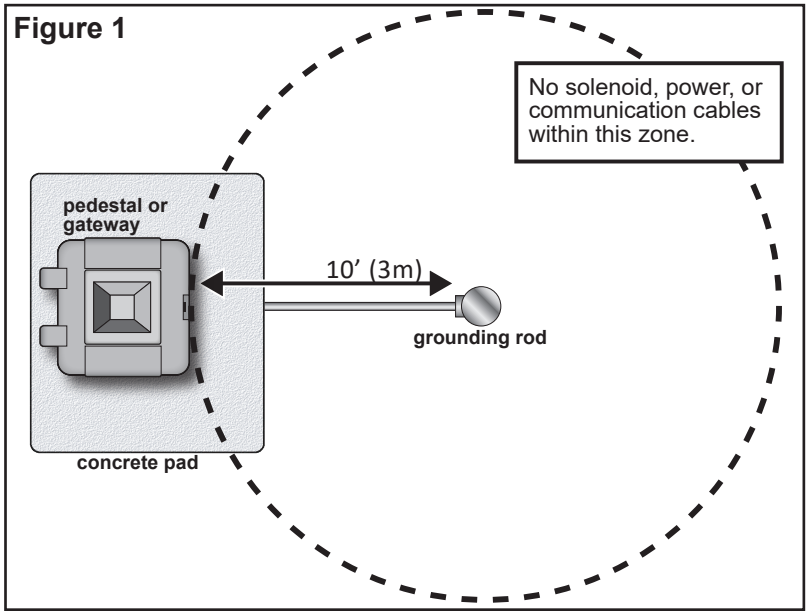
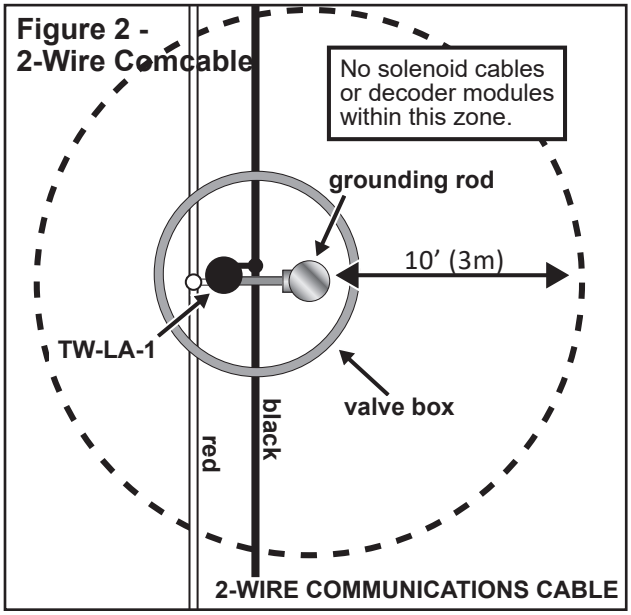
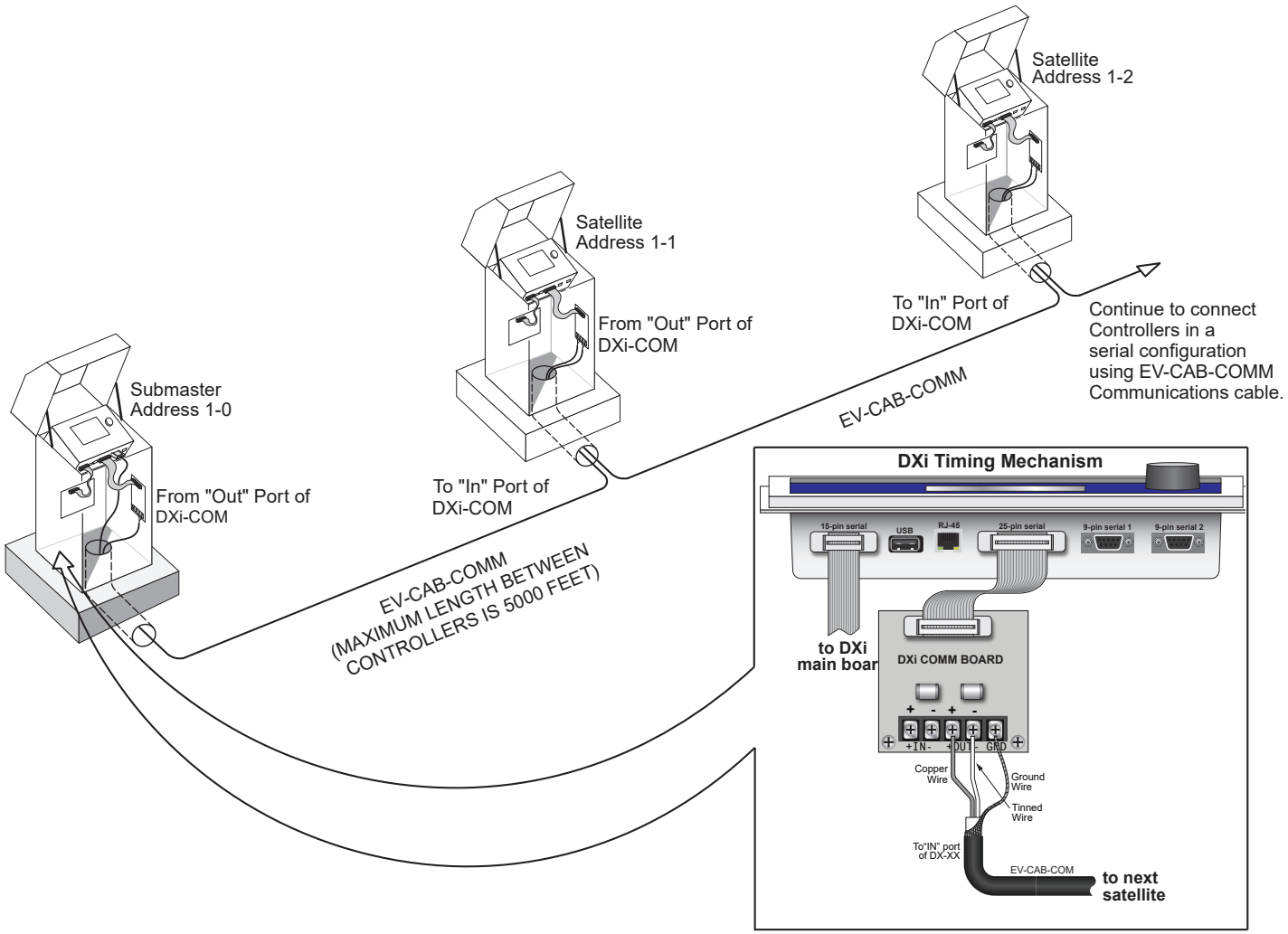


Figure 2 - 2-Wire Comcable




Satellite
Address 1-2
Satellite
Address 1-1
From "Out" Port of
DXi-COM
To "In" Port of
DXi-COM
Continue to connect
Controllers in a
serial configuration
using EV-CAB-COMM
Communications cable.
EV-CAB-COMM
Submaster
Address 1-0
From "Out" Port of
DXi-COM
To "In" Port of
DXi-COM
EV-CAB-COMM
(MAXIMUM LENGTH BETWEEN
CONTROLLERS IS 5000 FEET)
DXi Timing Mechanism
15-pin serial
USB
RJ-45
25-pin serial
9-pin serial 1
9-pin serial 2
to DXi
main boar
DXi COMM BOARD
+IN-
+OUT-
GND
Copper
Wire
Ground
Wire
Tinned
Wire
To"IN" port
of DX-XX
EV-CAB-COM
to next
satellite

Grounding the Communications Wire

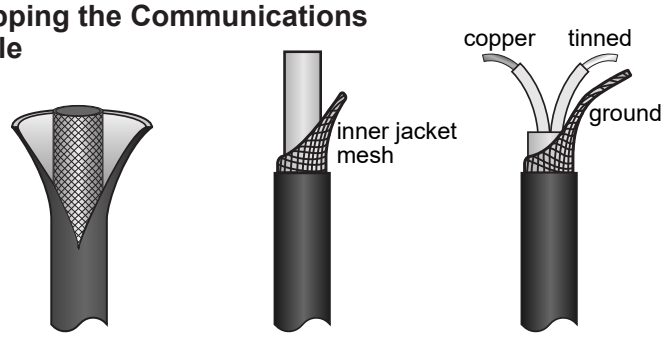
The first page of this document covered grounding the controller chassis.

On this page, we cover grounding the DX3 / DXi communication cable. Adequate grounding for the communication cable is essential.

The cable connecting each DX3 / DXi controller (part number EV-CAB-COMM) contains one twisted pair and one mesh outer shield. By exposing the twisting the mesh shield, it can serve as the ground connection between controllers. The ground connection can be attached to:

- the GND input on the DX Comm board (Method 1 - one ground wire only)
- grounding screw/s mounted in the chassis (Methods 2 and 3).

Prepping the Communications Cable

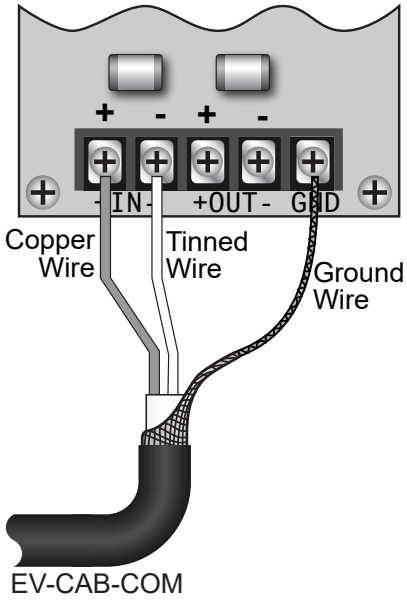


1) Slice outer jacket of COM wire to reveal wire mesh.

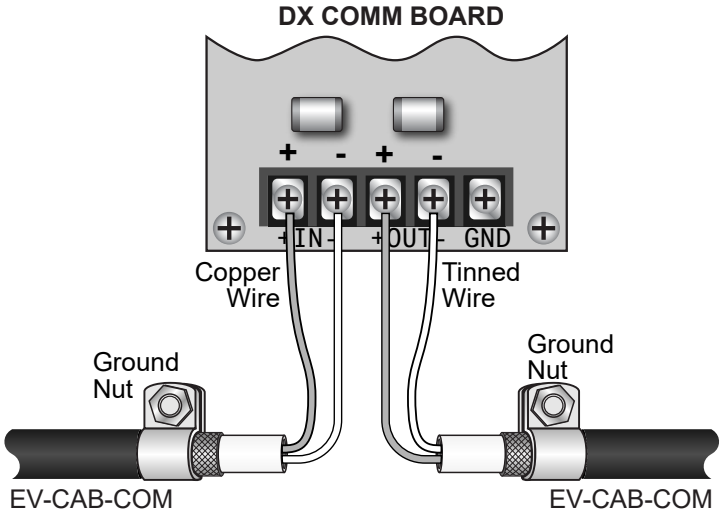
2) Trim away outer layer. Twist mesh to form ground wire.

3) Trim inner jacket to expose copper and tinned wires.

Method 1 - Ground to Comm Board

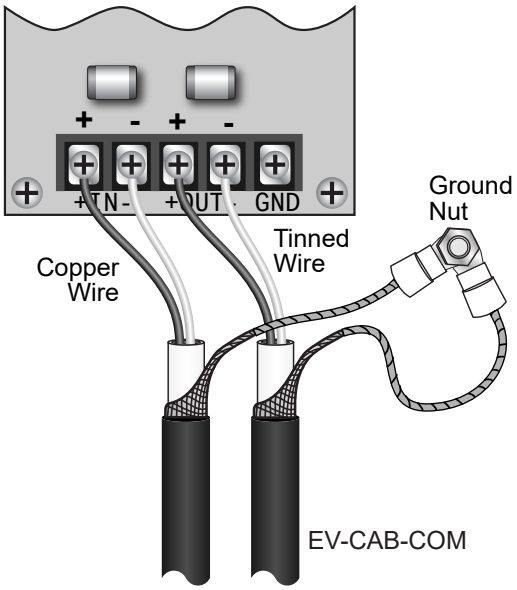


Method 2 - Ground to Ground Screw



NOTE: For methods 2 and 3, ground nut screws might have to be added by drilling holes in the controller chassis. See "Prepping the Chassis", page 4, for complete instructions.

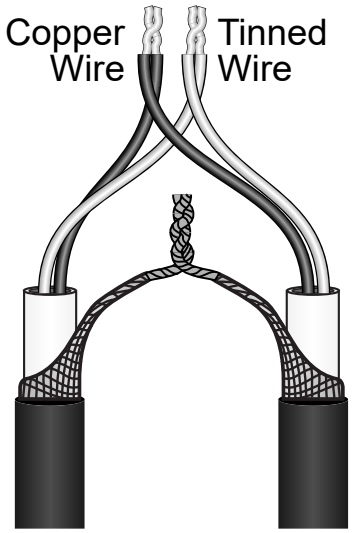
Method 3 - Two COM wires ground to Ground Screw



Splicing COM Ground Wires

It is possible to splice two COM wires together. Be sure to splice the ground wires together as well.

Spliced ground wires can be terminated in a ground nut.



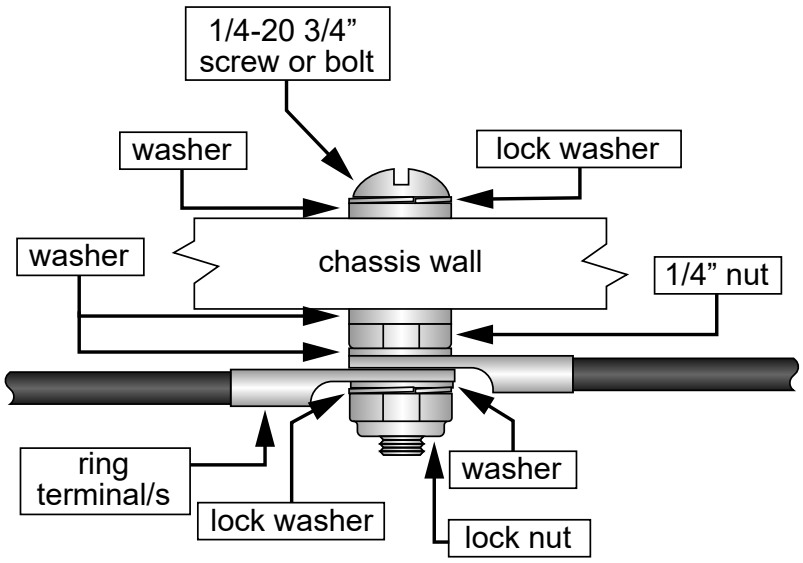
Prepping the Chassis

Methods 2 and 3 might require installing a ground nut into the controller chassis. Follow these directions carefully to ensure grounding and chassis water rating are not compromised.

1. Drill hole location. The ground nut should be installed within 12 cm of the terminal blocks of the DX output board. On the interior, the drill hole should be as unobstructed and clear of interior cards and cables as possible.
2. Drill a 1/4” hole. Have on hand a stainless-steel flathead machine screw (1/4-20) x 3/4” that engages at least two full threads.
3. Use the diagram, right, to install the screw and the various washers, lock washers, ring terminals, and nuts.

   To crimp the ground wires into the ring terminals, follow **Ring Terminal** instructions, right.

   Be sure that washers are installed on both sides of the chassis wall to ensure water cannot ingress.
4. Secure ring terminals with washer, lock washer, and lock nut.



Ring Terminal Specifications

Crimping Instructions:

1. Mount the terminal (Insulated Ring Terminal McMaster PN 7113K24 or equivalent) on a threaded screw or stud for a secure connection.
2. Use manufacturer’s recommended wire crimper (or equivalent) to fasten ground leads to wire. Place crimp end into the die of the tool with ground leads passing through. Apply pressure on the crimp until ground leads are securely fastened into the crimping end of the terminal.

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For more information, please visit www.toro.com/CAProp65.

Patent: www.ttcopats.com

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