NLP™ CONTROLLER

INSTALLATION MANUAL

NLP™

TUCOR, INC.

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Contents

1 Introduction

The NLP-C assembly is comprised of the Tucor NLP two-wire irrigation controller, local touchscreen display, a cellular or Ethernet communication device, and a power supply assembly.

Content related to other topics such as general use, troubleshooting, or the developers API, will be found in other manuals.

2 Mounting

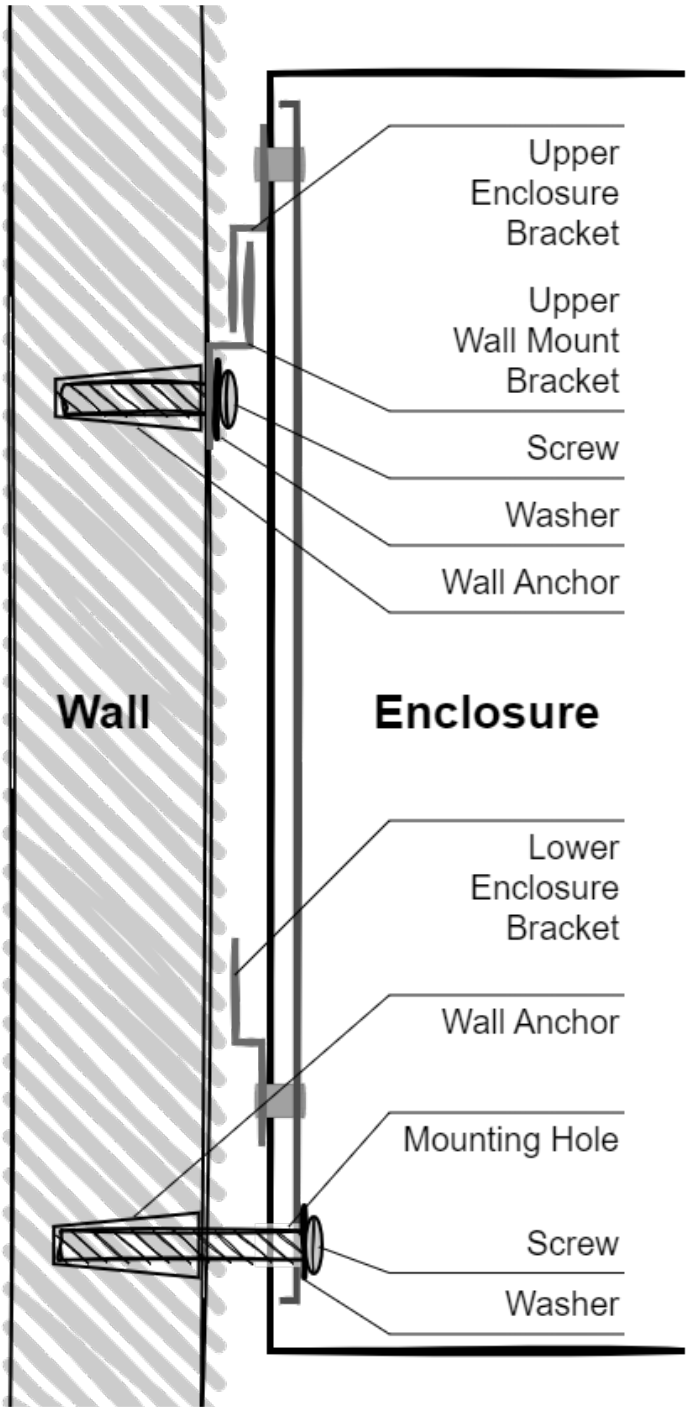
Though the NLP enclosure is designed to resist both water and direct sunlight, you should place it in a friendlier environment if possible. Installing it inside a utility room or a shed is the perfect solution, but if this is not possible, try to place it somewhere dry and out of sight. Furthermore, make sure that you place the controller in a location that meets these requirements:

- The controller must have access to 100-220VAC, 50/60Hz, 3 Amps (max). The included 3-prong cable has an approximate length of 5.5 feet.
- You must be able to connect the 2-wire path to the controller at the desired location.
- To minimize electromagnetic interference, make sure that the controller is placed at least 15 feet away from any high-draw motors like air conditioners, refrigerators, pool pumps, etc.
- Reliable cell service and decent signal quality OR access to a router (DHCP server) with an Ethernet connection.

The enclosure comes with an attached upper enclosure bracket and a loose upper wall mount bracket. Also attached is a lower enclosure bracket if you wish to mount a lower wall mount bracket (sold separately) and slide the enclosure onto the wall mounts.

1. Determine the mounting height for easy viewing of the touchscreen display.
2. Place the upper wall mount bracket against the wall so that it is level, and the open joggle is facing up.
3. Mark the mounting location on the wall.
4. For drywall or masonry, drill through the wall at the marked positions and insert an anchor.
5. Mount the upper wall mount bracket by inserting two screws through the round holes in the bracket and fastening into the wall/anchor.
6. Hang the enclosure on the wall by placing the upper enclosure bracket into the upper wall mount bracket.
7. Mark the lower mounting hole location on the wall.

8. For drywall or masonry:
    a. Remove the enclosure from the wall.
    b. Drill into the wall at the mark position.
    c. Insert an anchor.
    d. Re-hang the enclosure on the wall.
9. Insert a screw through a washer and into mounting hole.
10. Fasten the screw into the wall/anchor.



3 Connections

3.1 AC Power

The NLP-C has a built-in power supply which must be connected directly to a grounded, 3-wire, 100-240 VAC power source. For your convenience, a 3-wire power cable comes pre-wired on the NLP-C. The power cable should only be used if the enclosure is being installed indoors. If installed outdoors, local building and electrical codes usually require that approved electrical conduit and fittings be used to connect exterior, wall-mounted equipment to AC power. This connection should be made by a licensed electrical contractor in accordance with all requirements of the National Electrical Code and applicable state and local codes.

3.1.1 Indoor

1. Plug the included polarized 3-conductor power cable into an electrical outlet supplying 100-240VAC, 50/60Hz, 3A max.

3.1.2 Outdoor / Alternate Wiring

If you are installing the NLP outdoors or local codes require hard wiring, proceed with the following instructions:

WARNING: Connecting the NLP controller to primary power should be done by a licensed electrician following all national, state, and local codes. To prevent electrical shock, make sure all supply power is turned OFF at the breaker before connecting these wires. Electrical shock can cause severe injury or death.

Important: The ground lug on the NLP must be connected to both electrical and Earth ground.

NOTE: All high voltage connections should be made inside the ½" conduit body fitting or a UL approved junction box.

1. Loosen and remove the screws that secure the conduit body fitting access panel.
2. Disconnect the existing power cable wires connected to the power supply wires.
3. To use with conduit, remove the clamp from the conduit body fitting and replace with a ½" conduit fitting.
4. Install the conduit and associate fittings.
5. Install and connect the electrical wiring.
6. Replace the conduit body fitting access panel and secure with the screws.

	US	Europe
Neutral	White	Blue
Line (Hot)	Black	Brown
Ground	Green	Yellow/Green

3.1.3 Controller Grounding

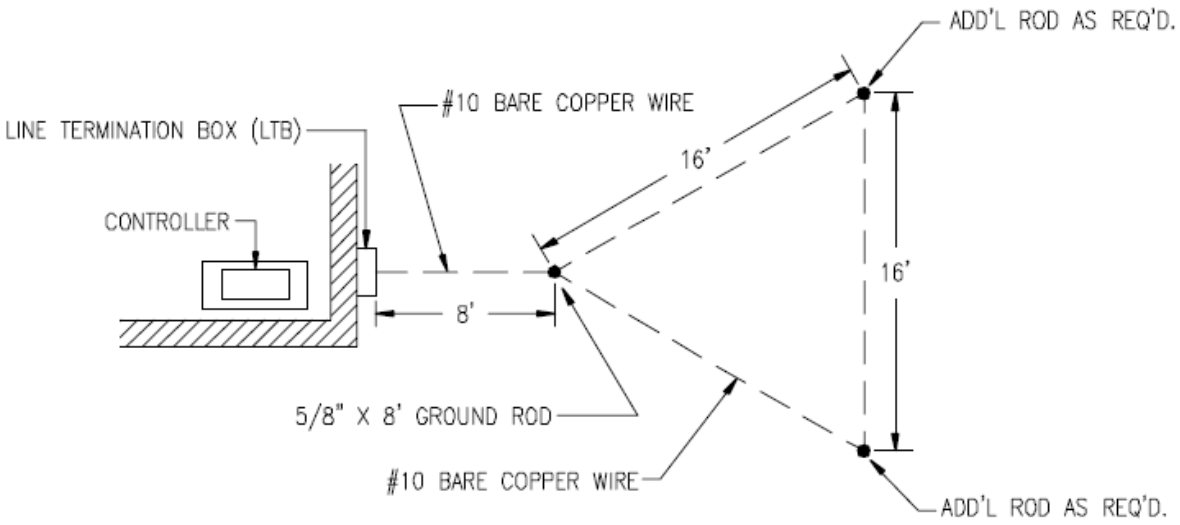
In addition to electrical ground, the NLP's ground lug must be connected to Earth ground via grounding rod(s)/plate(s) with less than 10Ω (Ohms) of resistance.

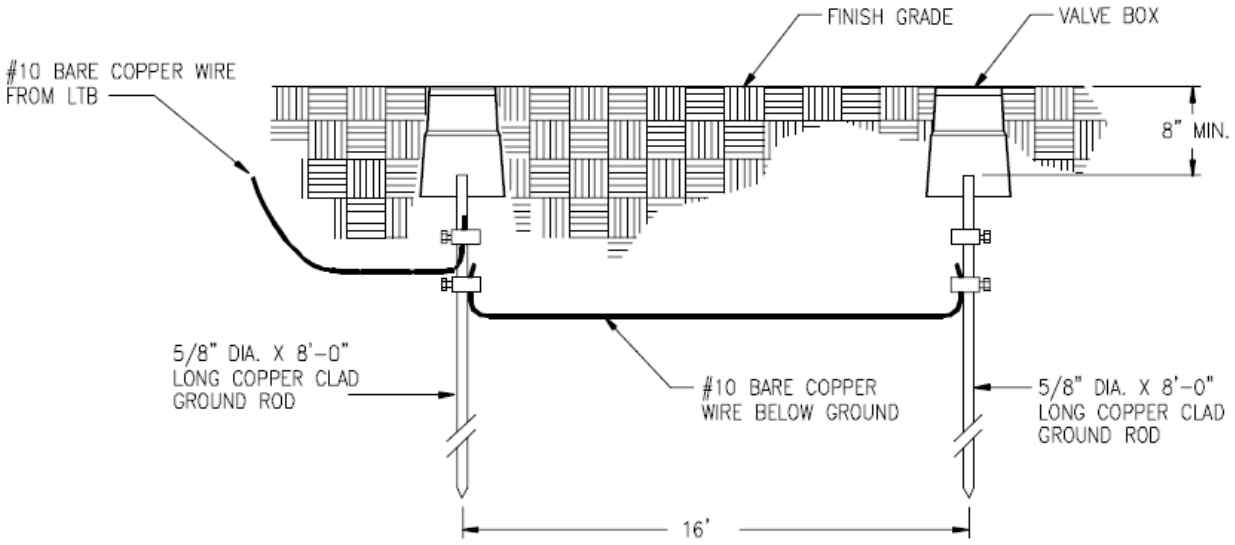
WARNING: Failure to connect to Earth ground will negate the galvanic protection of the two-wire path.

WARNING: Failure to connect to electrical ground may cause irreversible damage in event of a surge.

Important: The ground lug on the NLP must be connected to both electrical and Earth ground.

1. Drive a 5/8" by 8' copper ground rod into well moistened soil not less than 8' or more than 12' from the controller. The top of the ground rod should be 12" below grade level.
2. Using a 5/8" (17mm) ground clamp or Cadweld fastener, attach a 10AWG solid copper wire near the top of the ground rod. Avoiding wire bends of less than 8" radius and more than 90°, route the wire through conduit into the controller cabinet. Secure the wire to the NLP's ground lug. 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 controller is installed in a non-irrigated location.
3. Measure the ground resistance per the instructions provided with your 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'. Interconnect the ground rods using 10AWG solid copper wire and test again. If the measured ground resistance continues to read above the acceptable limit, contact your local Tucor 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).


ADD'L ROD AS REQ'D.
#10 BARE COPPER WIRE
LINE TERMINATION BOX (LTB)
16'
CONTROLLER
16'
8'
5/8" X 8' GROUND ROD
#10 BARE COPPER WIRE
ADD'L ROD AS REQ'D.


FINISH GRADE
VALVE BOX
#10 BARE COPPER WIRE
FROM LTB
8" MIN.
5/8" DIA. X 8'-0"
LONG COPPER CLAD
GROUND ROD
#10 BARE COPPER
WIRE BELOW GROUND
5/8" DIA. X 8'-0"
LONG COPPER CLAD
GROUND ROD
16'

3.2 Two-Wire Path

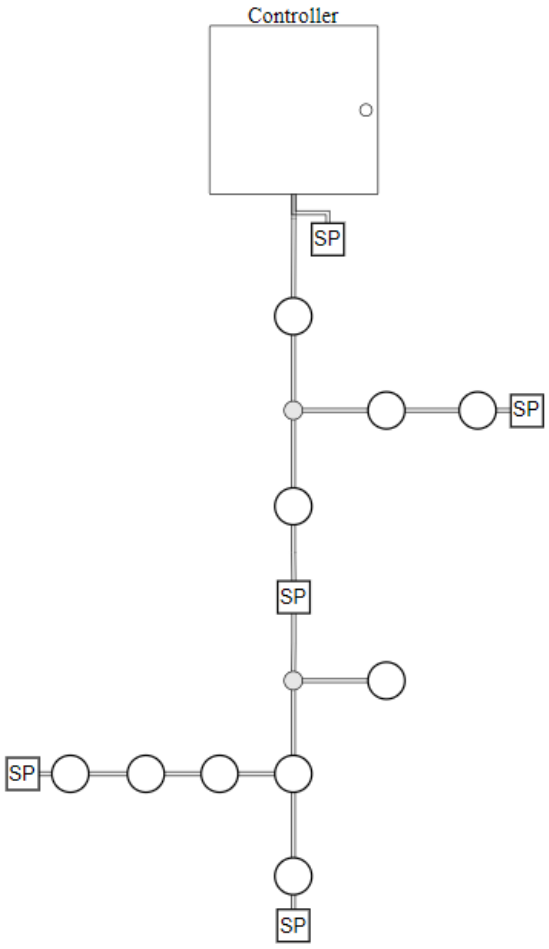
A 2-wire decoder controller system utilizes two conductors to provide both power and communication. There are two types of configurations that can be used for the layout of 2-wire paths: star or loop. For ease of troubleshooting, the star configuration is preferred.

> **Important:** Use only Tucor approved 2-wire. Failing to do so will void the warranty.

3.2.1 System Layout

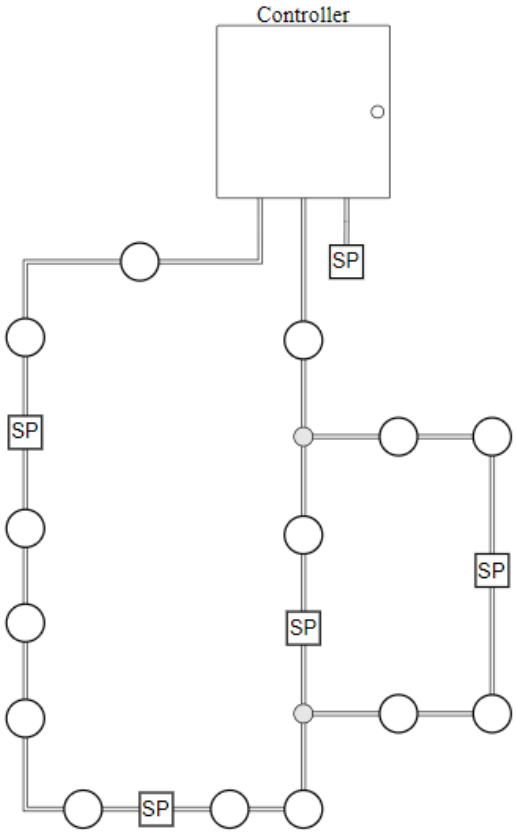
Star

For normal installations with 2-wire path runs that are not excessively long, the recommended layout for the 2-wire path is the star configuration.



Loop

If the installation requires longer wire runs than are possible with the star configuration then a loop configuration may be used. A loop configuration requires looping the 2-wire path out to the farthest decoder then back to the controller.



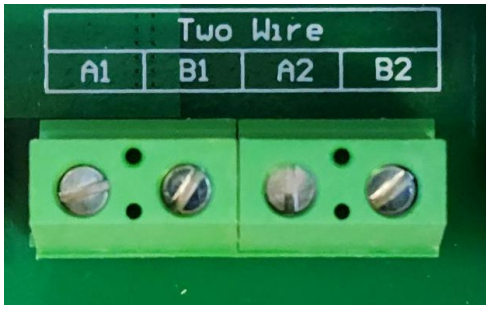
3.2.2 Recommended Max Wire Lengths

Wire Guage	Star	Loop
16AWG	3,600’	14,400’
14AWG	8,800’	35,200’
12AWG	14,000’	56,000’

3.2.3 Connection to Controller

There are two sets of line output screw terminals on the NLP-C labeled A1-B1 and A2-B2. Each numbered pair represents a possible two-wire path to the field.

Caution: Power off the controller or 2-wire path before connecting to the controller and/or installing decoders.



1. Route the red and black wire paths from the field up through the wire openings or conduit into the controller wiring compartment.
2. Insert the red wire from the two-wire path to a numbered ‘A’ terminal and secure using a flat head screwdriver.
3. Insert the black wire to the ‘B’ terminal with the same number and secure using a flat head screwdriver. Do not mix the red wire from one two-wire path with the black wire from another. Keep each path separate, red to red and black to black, until all pairs are connected to their numbered terminals.

3.2.4 Decoders (Line Units)

All Tucor decoders have designated colored wires for easy identification:

Blue wires connect to the two-wire path.

White wires (or other colors for output decoders) connect to the solenoid.

Green and yellow striped wires connect to Earth ground.

Red and black wires for sensor decoders connect to the sensor. The red wire can supply a positive DC voltage with the black wire being DC ground.

Using the proper tools is essential for a quality installation. NEVER use a knife!

- Tucor specified 2-wire (Regency Wire, P/N: R7296D)
- 3M-DBR/Y-6 wire connection kits (for decoder)
- 3M-B/O wire connection kits (for solenoid)
- Valve box – all wire connections must be installed in a valve box
- Lineman's pliers
- Wire strippers
- 2-wire stripper tool (King Gorilla UF cable stripper, P/N: 46200)

NG- (Output)

The NG- decoder is available in 1-station, 2-station, 4-station, or 6-station configurations. The decoders can be connected in parallel anywhere on the two-wire path.

1. Pull at least 18" of Tucor 2-wire above the top of the valve box.
2. Remove 8-10" of outside wire jacket using the designated 2-wire wire stripper.
3. Remove 1" of insulation from the red and black wires of the 2-wire path.
4. Remove an additional amount of insulation from the blue wires of the decoder so that 1" of bare wire is exposed.
5. Twist the red wires of the 2-wire path together.
6. Twist one blue wire from the decoder to red 2-wire. If there are multiple wires paths to be connected, only twist two wires together at a time. Once the first two wires are twisted together, twist the third wire in.
7. Twist Black 2- wire path together then twist (1) Blue wire to Black 2-wire.
8. Connect the 3M-DBR/Y-6 wire nut to twisted wires – DO NOT use the wire nut to twist wires together.
9. Insert the twisted wires with 3M Red/Yellow wire nut into the 3M grease cap, be sure to push the wire nut to the bottom of the grease cap and lock top caps down.
10. Connect the white wires to the solenoid using the 3M-B/O wire nut. Be sure to push the B/O wire nuts to bottom of grease caps and lock top caps down.

SD- (Input / Sensor)

The SD- decoder is available in a 1-sensor configuration. The decoders can be connected in parallel anywhere on the two-wire path.

Red and black wires for sensor decoders connect to the sensor. The red wire can supply a positive DC voltage with the black wire being DC ground.

1. Pull at least 12-18" of Tucor 2-wire above the top of the valve box.
2. Remove 8-10" of outside wire jacket using the designated 2-wire wire stripper.
3. Remove 1" of insulation from the red and black wires of the 2-wire path.
4. Remove an additional amount of insulation from the blue wires of the decoder so that 1" of bare wire is exposed.

5. Twist the red wires of the 2-wire path together.
6. Twist one blue wire from the decoder to red 2-wire. If there are multiple wires paths to be connected, only twist two wires together at a time. Once the first two wires are twisted together, twist the third wire in.
7. Twist Black 2- wire path together then twist (1) Blue wire to Black 2-wire.
8. Connect the 3M-DBR/Y-6 wire nut to twisted wires – DO NOT use the wire nut to twist wires together.
9. Insert the twisted wires with 3M Red/Yellow wire nut into the 3M grease cap, be sure to push the wire nut to the bottom of the grease cap and lock top caps down.
10. Connect the decoder's red and black wires to the sensor using 3M-B/O wire nuts. Be sure to push the B/O wire nuts to bottom of grease caps and lock top caps down.

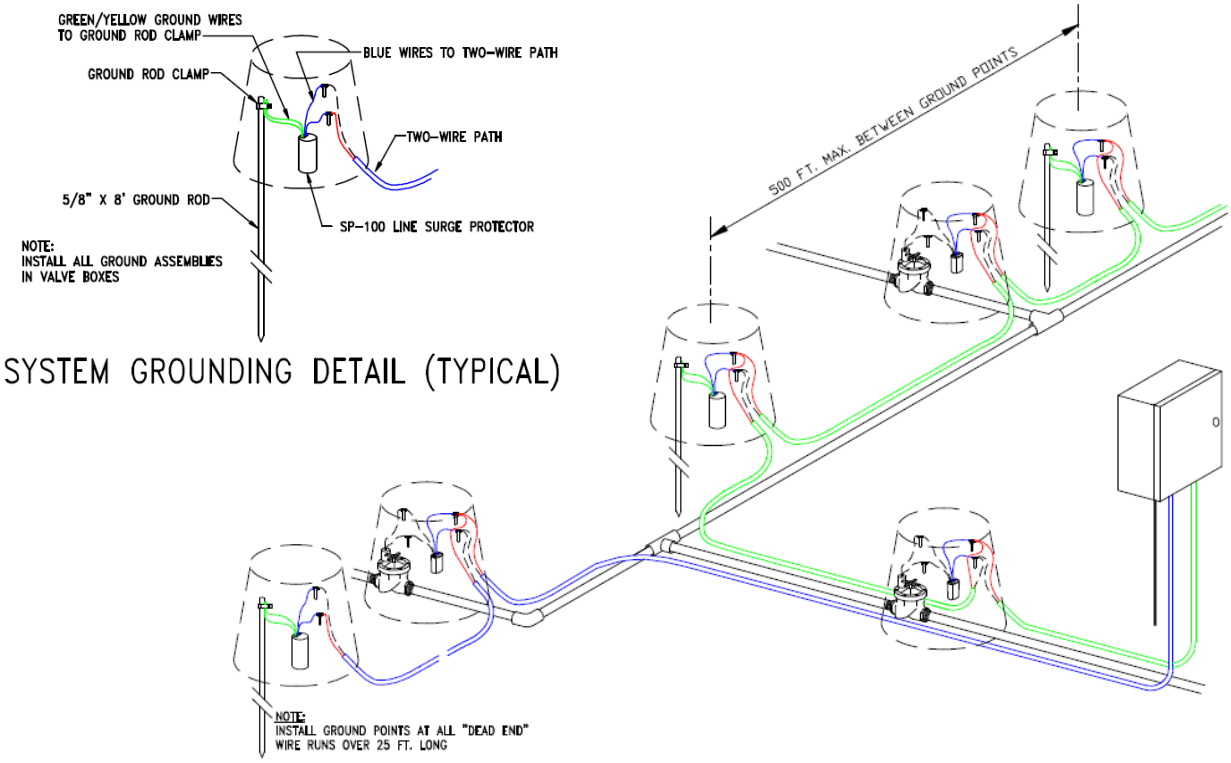
3.2.5 Grounding

Two-wire surge protection is required to protect the decoders, 2-wire path, and controller from electrical surges and lightning strikes. Without surge protection, the equipment is vulnerable to lightning damage.

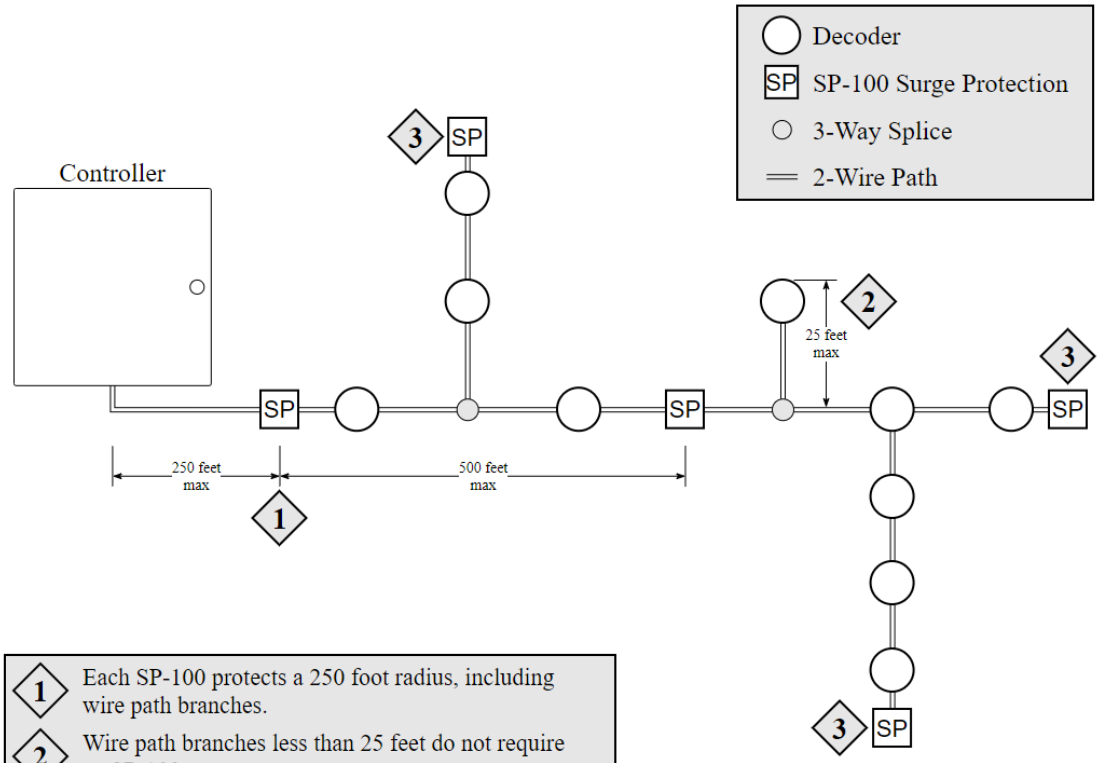
In order for these protectors to discharge lightning energy efficiently, they must be installed every 500', at the end of every wire run over 25' in length, and properly grounded to a ground rod/plate with a resistance of 50 Ohms or less.

Properly grounded 2-wire systems perform very well even in high-lightning regions. Poor grounding often results in irrigation down time and losses to equipment and plant material.

1. Pull at least 12-18" of Tucor 2-wire above the top of the valve box.
2. Remove 8-10" of outside wire jacket using the designated 2-wire wire stripper.
3. Remove 1" of insulation from the red and black wires of the 2-wire path.
4. Remove an additional amount of insulation from the blue wires of the decoder so that 1" of bare wire is exposed.
5. Twist the red wires of the 2-wire path together.
6. Twist one blue wire from the decoder to red 2-wire. If there are multiple wires paths to be connected, only twist two wires together at a time. Once the first two wires are twisted together, twist the third wire in.
7. Twist Black 2- wire path together then twist (1) Blue wire to Black 2-wire.
8. Connect the 3M-DBR/Y-6 wire nut to twisted wires – DO NOT use the wire nut to twist wires together.
9. Insert the twisted wires with 3M Red/Yellow wire nut into the 3M grease cap, be sure to push the wire nut to the bottom of the grease cap and lock top caps down.
10. Connect the decoder's green/yellow wires to the ground rod using a ground clamp.



SYSTEM GROUNDING DETAIL (TYPICAL)



1. Each SP-100 protects a 250 foot radius, including wire path branches.
2. Wire path branches less than 25 feet do not require an SP-100.
3. An SP-100 must be installed at the end of all wire path branches greater than 25 feet in length.

3.3 Communications

3.3.1 -Air (Cellular)

Ensure that the area surrounding the antenna is clear of metallic objects and equipment that may interfere with the signal.

No additional connections are required for the NLP-C-Air if cellular service and signal quality are adequate for controller communications. If the antenna needs to be mounted elsewhere for better signal quality, an extension cable and antenna mounting hardware can be purchased separately. It is recommended that the extension cable be routed out of the enclosure through a low-voltage conduit.

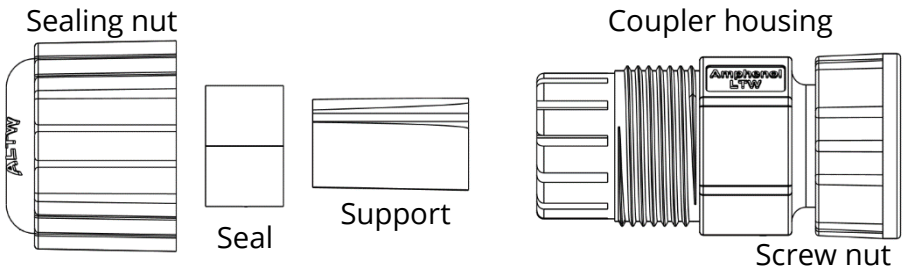
3.3.2 -E (Ethernet)

The NLP is set to DHCP mode and should automatically obtain an IP address when connected properly. In most cases, no further action is required.

For institutions with stricter network security protocols, you may need to submit a network access request for wired devices to the person(s) responsible for the network. They will require a MAC address, which can be found on the label on the front of the controller.

The NLP is equipped with a waterproof RJ-45 bulkhead connector and is designed for use with unshielded twisted pair (UTP) Category 5, CAT5e, or CAT6 (Ethernet) cable. A 5’ Ethernet cable with a waterproof coupler is included with the controller. If you require a longer cable, remove the waterproof coupler and install it on your cable following the directions below.

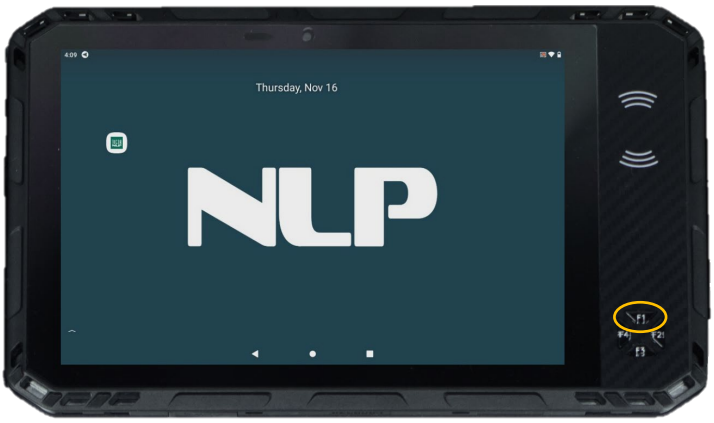
1. Loosen and remove the sealing nut.
2. Push on the RJ-45 connector from the screw nut side to remove the cable from the coupler. You may need a small flathead screwdriver to unclip the connector.
3. Insert your Ethernet through the sealing nut and seal.
4. If your Ethernet cable does not have a boot, slip the plastic support onto the cable.
5. Insert the RJ-45 connector into the coupler housing.
6. Place the seal around the cable and slide into the coupler housing.
7. Fasten and secure the sealing nut.
8. Place the coupler onto the bulkhead connector.
9. Fasten and secure the screw nut.



4 Powering On

1. To power the NLP-C on, first toggle on the circuit breaker located in the electrical sub-enclosure. To open the electrical sub-enclosure, press straight down on the door clasp and swing the door up.

2. Once the controller assembly has power, press and hold the F1 button located on the lower-right corner of the touchscreen to power the touchscreen on.



When the touchscreen powers on, the “NLP Discovery” app will automatically launch. The NLP Discovery app searches for locally connected NLP controllers and lists them by hostname & IP address. It may take a minute or two for controllers to appear while the modem/router initializes, and the touchscreen connects.

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2/19/2024