# PART #: NETB14PIV
# User Manual and Installation Guide

**The PivotProxy® (Part # NETB14PIV) is designed for the monitoring of electrically driven pivots only. For hydraulically driven pivots, please refer to the user manual and installation guide for part # NETB13TL.**



**Revision History**

| Rev | Date | Description |
|---|---|---|
| A | May 7, 2015 | Initial release of manual. |
| B | June 15, 2015 | Wiring Diagram updates |
| | | |
| | | |
| | | |

**Customer Support:**
Email: help@netirrigate.com
Phone: (800) 961-9549 x 2
www.netirrigate.com

**Business Address:**
Net Irrigate, LLC
2356 W Industrial Park Dr, Ste. B
Bloomington, IN 47404

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b. Disruption of services. Customer acknowledges and agrees that net irrigate shall have the right to disrupt or otherwise suspend services integral to the hardware and software functions if payment is not received by its distributors or dealers or end users. Net irrigate shall have no liability for any damages arising from or related to such disruption or suspension.

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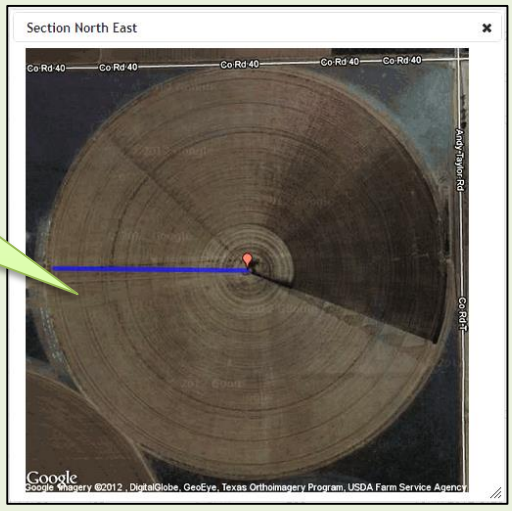
# Contents

## Applications

Part # NETB14PIV (branded the PivotProxy®) is specifically designed to be mounted on the end tower of any brand of electrically driven center pivot. Once installed and properly configured, the NETB14PIV provides the following remote monitoring functions:

| | |
|---|---|
| **Span Cable Theft Notifications** | WireRat® 4.0 technology, utilized by the NETB14PIV, is the only copper theft alarm product that works seamlessly with all brands of pivots and requires *no external power*. The NETB14PIV patented technology(U.S.Patent 7,880,612) utilizes a supervisory circuit that works strickyy on lithium battery power for an estimated 7 years(based on typical usage of product)). When a pivot's span cable is cut or tampered with, the NETB14PIV sends instant text, voice, or email notifications that a possible theft is occurring. |
| **Pivot Safety Stop Notifications** | When a pivot transitions from walking to stopped, the NETB14PIV can send text, voice, or email notifications that the pivot's safety circuit has opened. |
| **Remote Shutdown** | The NETB14PIV contains a normally closed relay which can be wired in series with the pivot's safety circuit. Once configured, the normally closed relay can be actuated via mobile app, website or a phone calling 800-961-9549x7. |
| **GPS Monitoring and Virtual Stop-In-Slot Notifications** | The NETB14PIV facilitates graphically monitoring the heading of a center pivot via our website and mobile applications. In addition, the NETB14PIV can be used to provide *virtual stop-in-slot alerts* such that text, voice, email notifications are sent, and the pivot may be set to shut down when a pivot reaches desired field headings. |

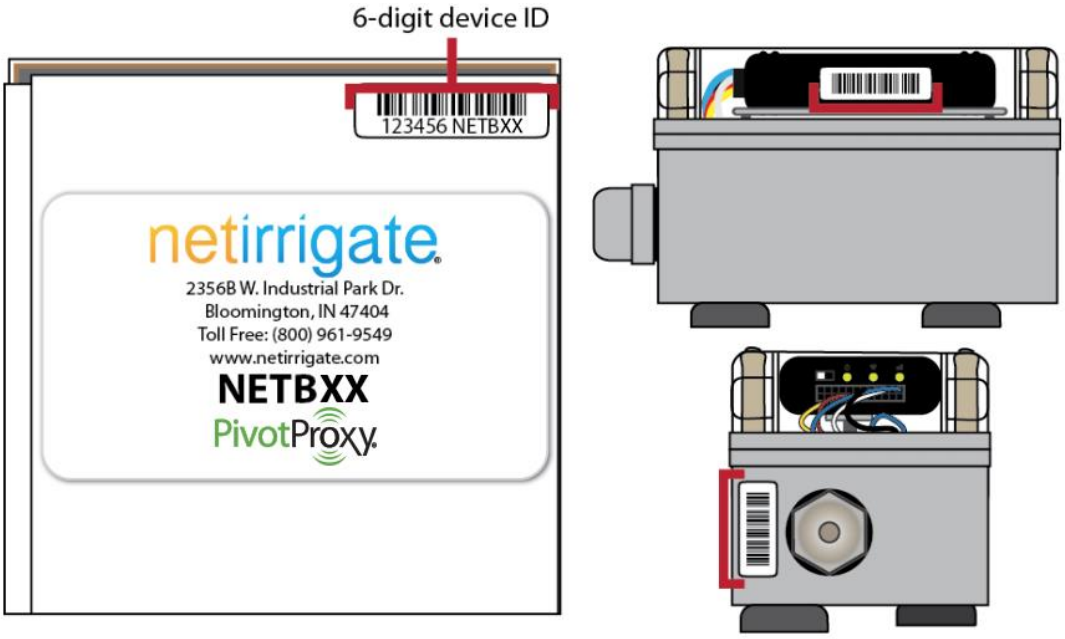
**Example:** *The NETB14PIV can send notifications or stop the pivot when the heading is at 270 degrees*.



# Getting Started

## Identifying the Device Id

All NETB14 products are uniquely identified by a 6 digit serial number which is barcoded on both the packaging carton and the physical unit. Net Irrigate refers to this number as the "Device Id".

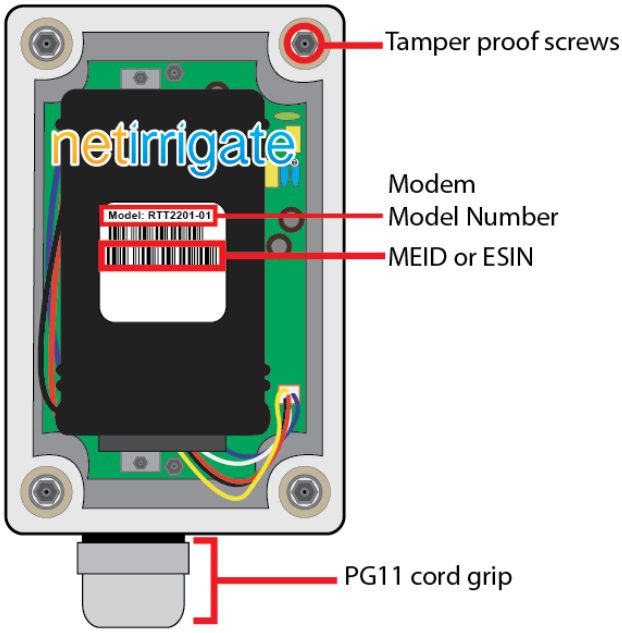


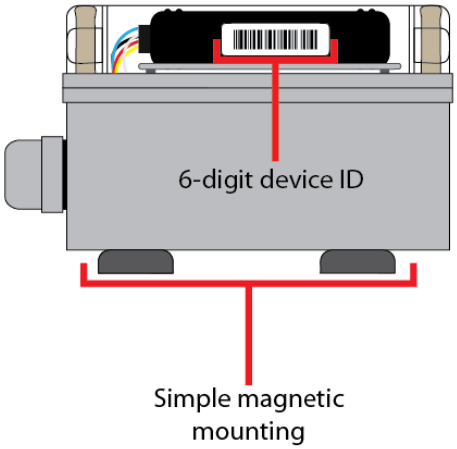

## Package Contents

All NETB14PIV units ship with:

1. A ½" NPT Cord Grip to be used with the knock out on the pivot's end tower box.
2. Magnetic mounts which come pre-installed on the enclosure.
3. A 24" clamp pipe ideal band for safety-securing the unit.
4. A wire nut which may need to be used if wiring the NETB14PIV up for remote shutdown purposes.
5. An extra *Device Id* bar code sticker which can be placed on the panel of the center pivot so the associated *Device Id* can be identified at the pivot pad.

## NETB14PIV Overview



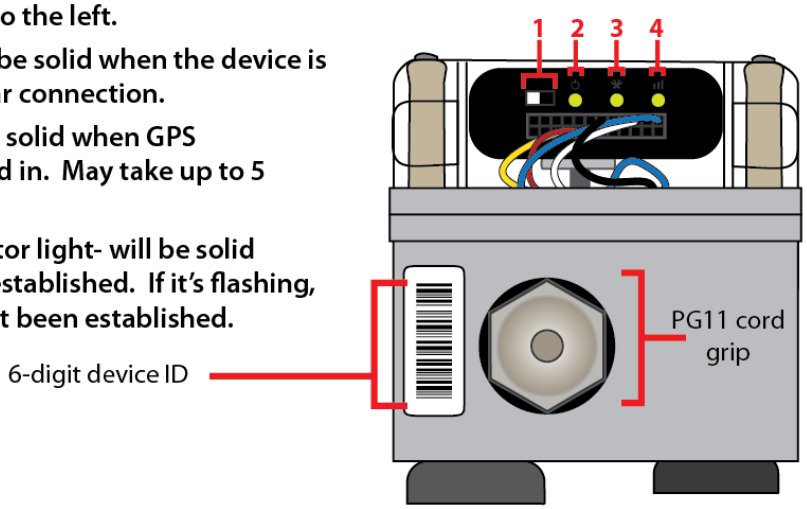




**1.** Internal battery switch- only applicable to devices with model #: RTT2201-00. If the model number ends in '-00' the switch should be to the left.

**2.** Power indicator light- will be solid when the device is powered up and has a cellular connection.

**3.** GPS indicator light- will be solid when GPS coordinates have been locked in. May take up to 5 minutes to initialize.

**4.** Cellular connection indicator light- will be solid when cellular connection is established. If it's flashing, then a connection has not yet been established.

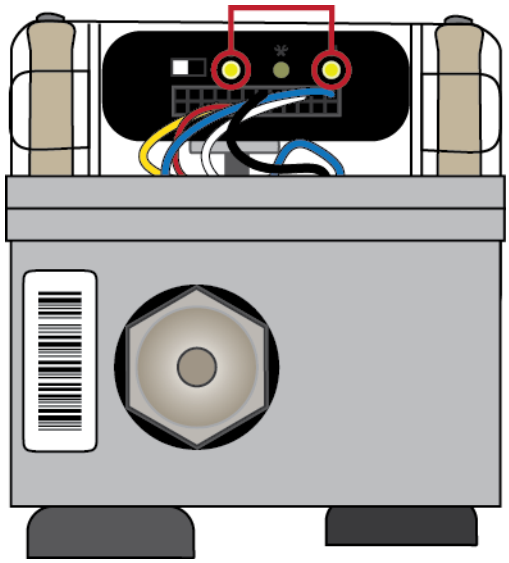



| | |
|---|---|
| **Black** | AC Line (90-240VAC) |
| **Blue** | AUX AC Line (90-240VAC) |
| **Red** | NC Relay Common |
| **White** | Neutral |
| **Green** (Ground) | NO Relay Contact |

**PivotProxy® Wire Guide**

## Bench Testing

**Bench test the NETB14PIV at your shop, and at the pivot before installation.** A simple bench test ensures a properly functioning unit and adequate wireless coverage. Bench testing involves the following procedure:



1. Identify the Device Id of the NETB14PIV. Recall that the serial number is barcoded on unit next to the cord grip and also on the modem inside the clear cover.
2. Log into the NetIrrigate® iPhone or Android app or netirrigate.net and create the new site for the customer.
3. Set up you Phone list of contacts to be alerted of the different notifications.
4. Link the device to the new site, and *denote the site name on the device's cardboard box*.
5. Remove the wire nut from the green wire. Touch the green and white wires together, and hold for **10 seconds**. Separate the wires, and watch for the two outside lights on the modem to flash and then become solid.
6. Check the Event Log in the NetIrrigate® app or the Incoming Events on www.netirrigate.net for a code '103'.
7. If you do not see an incoming '103' within 3 minutes, or do not have a computer, iPad, or iPhone available, please contact dealer support at (800) 961-9549 x3.

### Text message Bench Test Method

1. Identify the Device Id of the NETB14PIV. Recall that the serial number is barcoded on the bottom of the unit to the right of the cord grip.
2. Use your cell phone to text the phrase "TEST XXXXXX" to **317-602-1732**. Where XXXXXX is the serial number of the unit. Example "**TEST 333001**".
3. You should receive a text message back from our server within 60 seconds that says: "*333001 is ready for bench testing. Hold White and GND wire together and then break bond. You will be notified in three minutes when test completes.*"
4. Follow the instructions texted to you by holding the White and GND (green) wires together and then breaking the circuit. This action will initiate a diagnostic test on the unit and will text you when complete. The entire test should take about 3 minutes.
5. Within 3 minutes, you should receive the text message: "*Bench test successful. Device 333001 is functioning properly and registered on the NetIrrigate network.*"
6. If you receive an error message from our server or do not receive a text message indicating success within 3 minutes, please contact dealer support at (800) 961-9549 x3.

## Customer and Site Setup

Before installing the NETB14PIV on a pivot, it is best to setup the customer information, the irrigation site details, and the intended notification recipients in the NetIrrigate® system. Additionally, you will need to link this information to the *Device Id* you intend to mount. Setup is fast and easy and can be accomplished through one of three possible ways:

1. Login to the NetIrrigate® App. NetIrrigate® is available in the App Store and Android Google Play Market. To find it search 'netirrigate' with no space. You may use the same login information as you would use to login to www.netirrigate.com.

2. Login to www.netirrigate.com. If you do not yet have a username and password for your dealership, please contact dealer support at (800) 961-9549 or email help@netirrigate.com. For details on how to utilize the dealer portal on www.netirrigate.com, click on the Support tab, and review the document entitled "*Net Irrigate Software Guide for Dealers*".

3. If you do not have access to a computer or the mobile app, just contact dealer support at (800) 961-9549 and an agent will setup the customer, site, and notification recipients for you.

# Functional Principles

## How the PivotProxy® Works

The NETB14PIV utilizes the cellular network to communicate with Net rrigate's server. When Net Irrigate's server receives codes from the device, it is able to translate the code into useful information and send the corresponding notifications. When installed correctly, the device functions as a circuit disruption monitor and a remote relay, enabling the device to alert our server when the circuit is disrupted and also to open and close the circuit.

## Battery Backup

The NETB14PIV utilizes a custom designed lithium battery pack which is designed to operate the internal cellular radio modem for at least 3 years. Expected battery life could be as long as seven years depending on environmental conditions and frequency of pivot operation. A working battery is imperative for proper functionality. The battery can be tested by following the bench testing procedures on the previous page. You can also check the battery life of the unit by clicking on the reports page, and checking the battery life tab. This is estimated based on events occurred on the device.

## Span Cable Theft Detection

The NETB14PIV checks for cut wire by sending a small supervisory current through the neutral and ground conductors of the pivot's span cable regardless of whether AC power is present or not. When this supervisory current is interrupted, an alarm code is triggered. The supervisory current is generated by the internal NETB14PIV battery and works seamlessly with normal pivot operation.

WireRat® 4.0 technology will self-test, by simulating span cable cuts on a fixed periodic basis. This will ensure the alarm is not compromised and reduces the risk of becoming disarmed due to pivot maintenance and eliminates the need for physical testing.

## Safety Stop Alerts

The NETB14PIV transmits safety stop notifications when it detects a *closed-to-open* transition in a pivot's 120VAC safety circuit. The NETB14PIV must see the circuit open for at least 40 seconds before transmitting a wireless notification that the circuit transitioned from *closed-to-open*. The time delay is to prevent false alarms due to loose wires, pivot jogging, and auto-reverse functionality. On non-standard pivots, paralleling off of any 120VAC control circuit that is hot when the pivot is running (in both forward and reverse) will suffice in monitoring for safety stops.

## Remote Shutdown

If the NETB14PIV is wired correctly, it may be used to remotely stop a center pivot. Each NETB14PIV is equipped with a *normally closed* control relay. When a remote shutdown call is initiated, the coil on this control relay is wirelessly picked up, thereby interrupting the normally closed safety circuit. When the NETB14PIV senses the 120VAC supplied by the pivot panel has dropped out, the coil of the relay de-energizes, and the contact closes again thereby allowing the pivot to restart.

For remote shutdown functionality to properly work, the NETB14PIV must remain ON until the pivot completely drops out. The NETB14PIV must still receive 120VAC from the main pivot panel until the delay timer in the pivot drops out.

The remote-shutdown functionality utilizes the red wire in the NETB14PIV connection cord. If wiring for remote shutdown is not desired, tape off the red wire and do not put the safety circuit in series with the NETB14PIV. Instead, just parallel the black wire in the NETB14PIV connection cord to the appropriate 120VAC safety circuit OR connect the black and blue wires to the respective forward and reverse terminals of the pivot. **To avoid shorts, be sure to properly tape or cap off the red wire on the NETB14PIV if the unit is not being wired for remote shutdown purposes.**

## GPS Monitoring

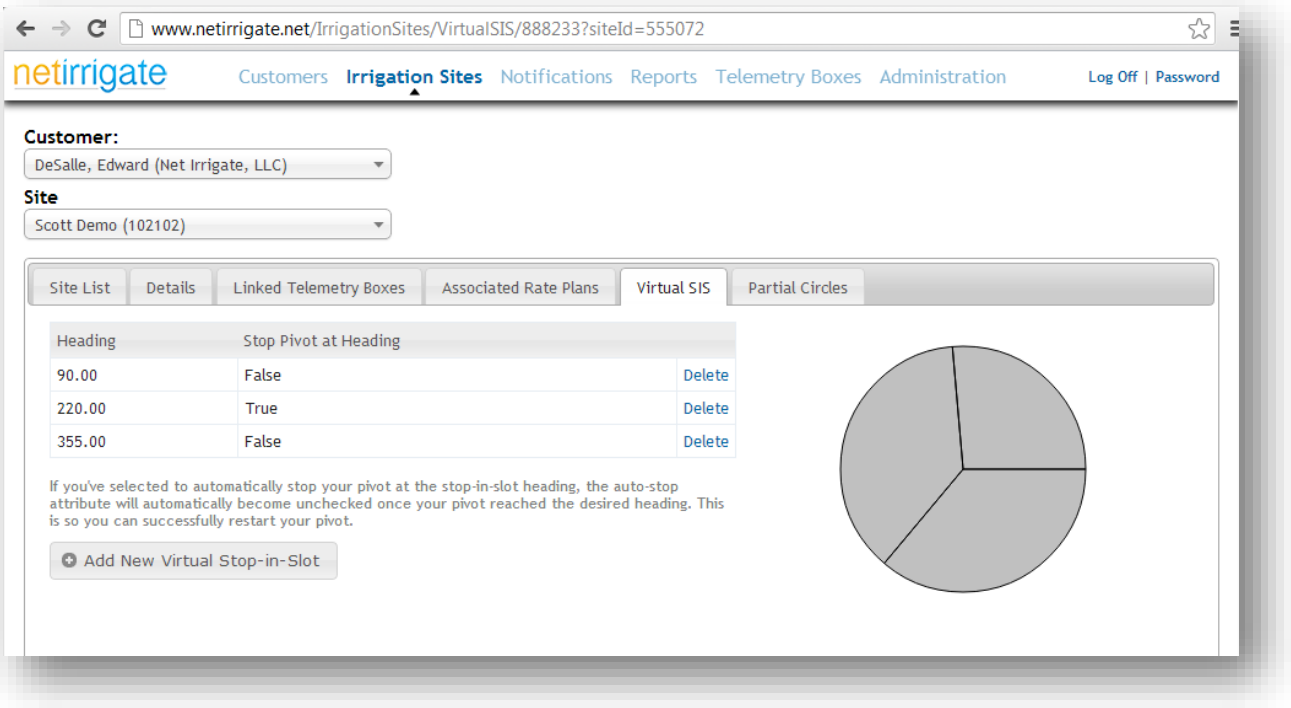
### Pivot Heading

The NETB14PIV sends longitude and latitude coordinates to the NetIrrigate® servers every 15 minutes. If the longitude and latitude coordinates of the pivot pad are properly entered as part of the site details, the software on the server will use basic trigonometry to determine the angle or "heading" of the pivot. Determining the longitude and latitude coordinates of the pivot pad can be accomplishes with several smart phone apps, most consumer GPS devices, or even the mobile apps. Alternatively, you may contact customer support at (800) 961-9549 and an agent will attempt to locate the pad of the pivot using Google Earth.

## Virtual Stop-In-Slots

Because the NetIrrigate® servers monitor the heading of the pivot, notifications can be configured when the pivot reaches a desired a heading. Likewise, the pivot can be configured to automatically shut down when a desired heading is met. Up to 16 different virtual stop-in-slot points can be configured. Virtual stop-in-slot points can be configured via the NetIrrigate® webportal, mobile apps, or by calling customer support at (800) 961-9549.

*Sample Virtual Stop-In-Slot Configuration Screen on netirrigate.com*



## Mounting and Wiring the NETB14PIV

Ideally, the NETB14 should be mounted on the end tower of a pivot. This provides for greatest accuracy when utilizing GPS services. Likewise, mounting on the end tower provides for maximum protection for span cable cut notifications.

1. **Ensure power to the pivot is completely off and the control panel is locked.**
2. Climb the tower of the pivot and allow the powerful magnets on the back of the NETB14PIV to adhere to the angle iron of the pivot. The NETB14PIV should be positioned vertically and above the junction box.

3. Remove the cover from the tower electrical box.
4. If the bottom of the tower box is not equipped with a standard ½" NPT knock-out, drill an appropriate hole to fit the black ½" NPT cord grip which is included in the NETB14PIV packaging.
5. Install the supplied cord grip and lock nut.
6. Run the tray cable from the NETB14PIV through the cord grip and into the tower box.
7. Follow the appropriate wiring diagram found in the appendices if you wish to utilize remote shutdown. Refer to the tables below if you would **NOT** like to utilize remote shutdown. If installing on a pivot brand not listed, please contact customer support at (800) 961-9549.

**For setups WITHOUT implementation of remote-shutdown functionality**

| | | NETB14PIV Wire Color | | | | |
|---|---|---|---|---|---|---|
| | | **Black (120VAC In)** | **Blue (120VAC In)** | **Red (NC Relay Out – 120VAC)** | **White (Neutral)** | **Green (GND)** |
| **Pivot Brand Wire Color** | **Valley** | Yellow | Unused (Tape Off) | Unused (Tape Off) | White | Grounding Bar |
| | **Zimmatic** | Brown | Unused (Tape Off) | Unused (Tape Off) | White | Grounding Bar |
| | **Reinke** | Purple | Pink | Unused (Tape Off) | White | Grounding Bar |
| | **Lockwood*** | Yellow | Orange | Unused (Tape Off) | White | Grounding Bar |
| | **Pierce** | Yellow | Unused | Unused (Tape Off) | White | Grounding Bar |

***** Please refer to our wiring diagrams at help.netirrigate.com or contact us at 800-961-9549*****

| For setups in which remote-shutdown functionality WILL be implemented, see wiring diagram in the respective Appendix listed below | | | |
|---|---|---|---|
| **Pivot Brand** | **Additional Relays Needed?** | **Appendix** | **Page #** |
| **Valley** | **No** | **A** | **15** |
| **Zimmatic** | **No** | **B** | **16** |
| **Reinke** | **Yes (only required for remote shutdown)** | **C** | **17** |
| **Lockwood** | **Yes (only required for remote shutdown and theft)** | **D** | **18** |
| **Pierce** | **No** | **E** | **19** |

8. Once the NETB14PIV wires are connected to the appropriate terminals, replace the cover on the tower box.
9. If necessary, zip-tie the NETB14PIV tray cable away from the mechanical levels beneath the tower electrical box to avoid kinks or obstructions.
10. Wrap the included 24” ideal band around the NETB14PIV unit for added security. While the mounting magnets are extremely strong, the ideal band is designed to protect against extremely severe weather.
11. Proceed to the testing procedure on the following page.

# Testing Procedures

## Setting up Notification Recipients

In order to successfully test span cable and safety stop alerts, one or more phone numbers must be associated with the respective alert on our website. You may easily set up notification recipients on the mobile apps or our website. For detailed instructions on the adding a notification recipient via the mobile app, please visit our support site, help.netirrigate.com.

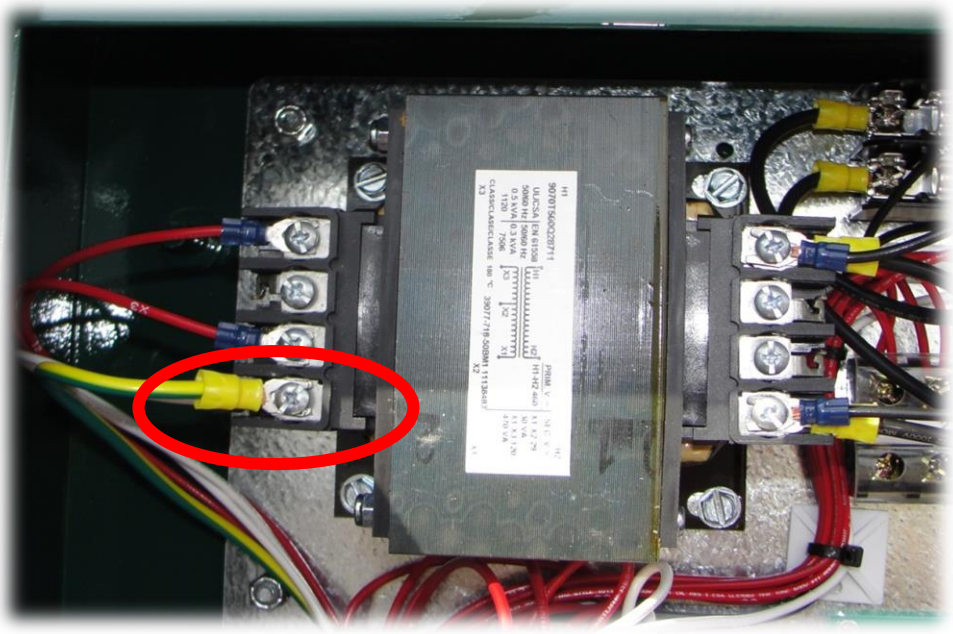
## Simulating Span Cable Cuts

Before testing the cut wire alarm, at least one notification recipient should be configured for the site in question. If this has not been done, please see previous section Customer and Site Setup. Once it is determined that a notification has been configured for a span cable cut event, follow the procedure below:

### Primary Method

1. Go to the main panel at the pad and **ensure the power to the panel is completely off**.
2. Open both panel doors such that the control transformer within the pivot panel can be accessed.
3. If the pivot panel is equipped with a relay board, disconnect the clip to the relay board which may contain a neutral and ground conductor.

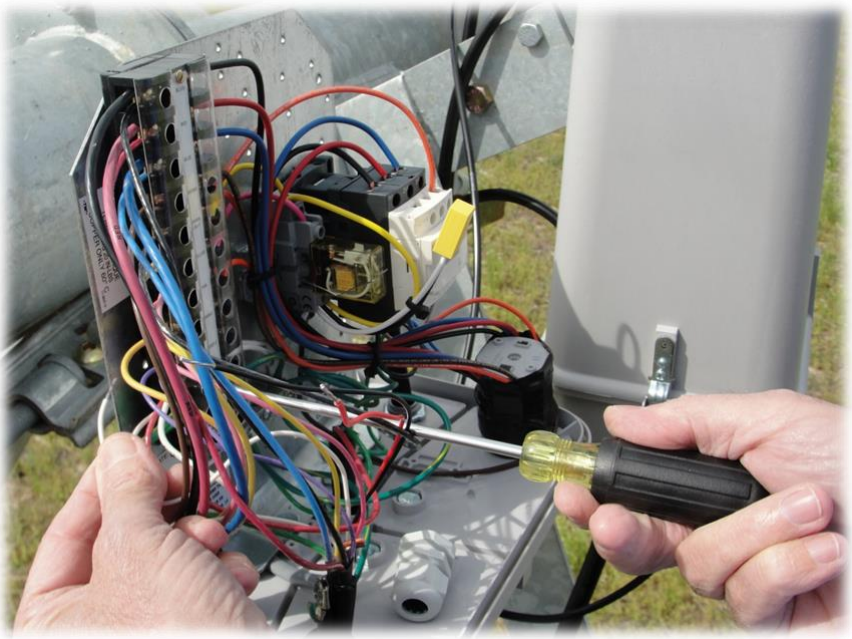
   3.1- Check to see if there are pump control wires. Remove them accordingly has they could prevent as successful test.
4. Locate X-2 on the control transformer. This is where the white and green wires are bonded.



5. Remove the terminal screw and separate the white wire and the ground wire for at least 30 seconds.
6. Replace the all wires and be sure to re-tighten the terminal screw.
7. Wait at least 3 minutes for a text, voice, or email alert which indicates a possible theft is occurring. If an alert is not received, try testing with the alternative method on the following page.

### Alternative Method

1. **Ensure power to the pivot is off and the control panel is locked**.
2. Walk to the first drive tower, climb it, and remove the tower box cover.
3. Note the terminal numbers of where each wire is connected. There are two gauges of wire in the tower box. The smaller wire is what you will be working with. The span cable heading out toward the end tower is what will need to be disconnected sequentially.
4. Remove each 120VAC control circuit wire. (ensure the wires are not touching anything) This includes: safety, forward, reverse, percent timer, and end gun. **REMOVE THE WHITE NEUTRAL CONDUCTOR LAST**.
5. Wait at least 30 seconds and replace the wires to their respective terminals.
6. Replace the tower box cover.
7. Wait at least 3 minutes for a text, voice, or email alert which indicates a possible theft is occurring. If an alert is not received please contact customer support at (800) 961-9549.



## Testing Safety Stop Notifications

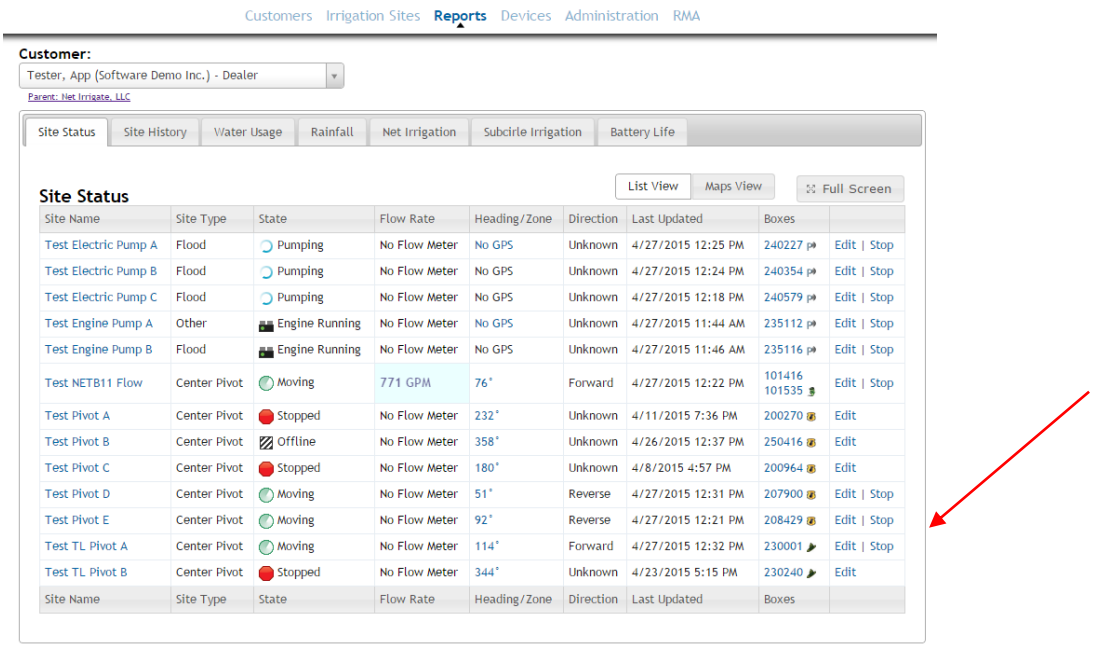
Before testing for safety stop notifications, at least one notification recipient should be configured for the site in question. If this has not been done, please see previous section Customer and Site Setup.

If desired, safety stop notifications can be configured for when the pivot both starts up and stops walking. Once it is determined that notification recipients have been configured for each respective alert, follow the procedure below:

1. Start the pivot walking in either forward or reverse.
2. In about three minutes, you should receive a message that says "*{NetIrrigate Site Name} is now running.*" Where *{NetIrrigate Site Name}* is the alias you've given to the irrigation site.
3. Once you receive the notification that the system is running, stop the pivot.
4. Within three minutes, you should receive a message that says "*{NetIrrigate Site Name} has stopped walking."*
5. Repeat the process by walking the pivot in the opposite direction. To ensure proper functionality, **it is important to walk the pivot in BOTH directions**.
6. If any of the notifications fail, please contact customer support at (800) 961-9549.

## Testing Remote Shutdown

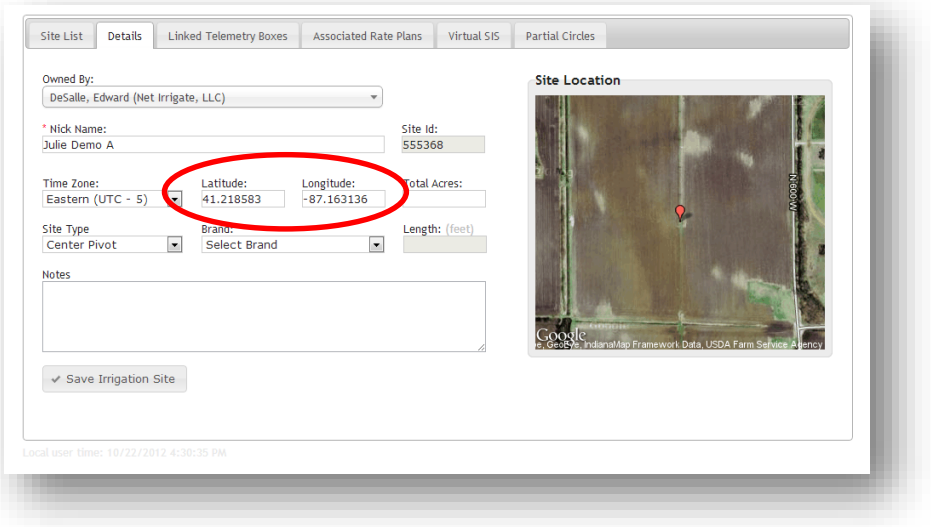
Remotely shutting down the pivot is accomplished through the NetIrrigate® website, mobile apps, or Remote Shutdown Line.
To use the website, navigate to **Reports**, and select Stop from the far right column. The Net Irrigate app also has the power to remotely shutdown your pivot. You will receive a safety stop notification if a remote shutdown issued by any means is successful. Wait 4 mins before restarting.



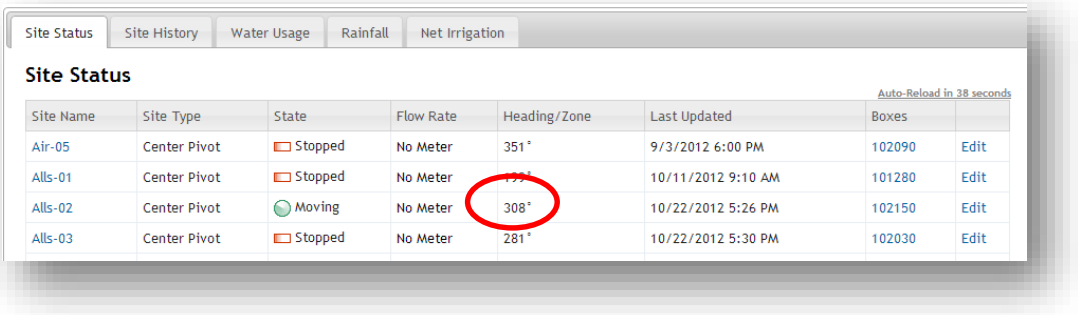

| Site Name | Site Type | State | Flow Rate | Heading/Zone | Direction | Last Updated | Boxes | |
|---|---|---|---|---|---|---|---|---|
| Test Electric Pump A | Flood | Pumping | No Flow Meter | No GPS | Unknown | 4/27/2015 12:25 PM | 240227 | Edit \| Stop |
| Test Electric Pump B | Flood | Pumping | No Flow Meter | No GPS | Unknown | 4/27/2015 12:24 PM | 240354 | Edit \| Stop |
| Test Electric Pump C | Flood | Pumping | No Flow Meter | No GPS | Unknown | 4/27/2015 12:18 PM | 240579 | Edit \| Stop |
| Test Engine Pump A | Other | Engine Running | No Flow Meter | No GPS | Unknown | 4/27/2015 11:44 AM | 235112 | Edit \| Stop |
| Test Engine Pump B | Flood | Engine Running | No Flow Meter | No GPS | Unknown | 4/27/2015 11:46 AM | 235116 | Edit \| Stop |
| Test NETB11 Flow | Center Pivot | Moving | 771 GPM | 76° | Forward | 4/27/2015 12:22 PM | 101416 101535 | Edit \| Stop |
| Test Pivot A | Center Pivot | Stopped | No Flow Meter | 232° | Unknown | 4/11/2015 7:36 PM | 200270 | Edit |
| Test Pivot B | Center Pivot | Offline | No Flow Meter | 358° | Unknown | 4/26/2015 12:37 PM | 250416 | Edit |
| Test Pivot C | Center Pivot | Stopped | No Flow Meter | 180° | Unknown | 4/8/2015 4:57 PM | 200964 | Edit |
| Test Pivot D | Center Pivot | Moving | No Flow Meter | 51° | Reverse | 4/27/2015 12:31 PM | 207900 | Edit \| Stop |
| Test Pivot E | Center Pivot | Moving | No Flow Meter | 92° | Reverse | 4/27/2015 12:21 PM | 208429 | Edit \| Stop |
| Test TL Pivot A | Center Pivot | Moving | No Flow Meter | 114° | Forward | 4/27/2015 12:32 PM | 230001 | Edit \| Stop |
| Test TL Pivot B | Center Pivot | Stopped | No Flow Meter | 344° | Unknown | 4/23/2015 5:15 PM | 230240 | Edit |
| Site Name | Site Type | State | Flow Rate | Heading/Zone | Direction | Last Updated | Boxes | |

## Testing GPS

Successful GPS monitoring begins by ensuring the latitude and longitude of the pivot pad have been entered into the NetIrrigate® website. The latitude and longitude of the pad may either be entered via the mobile app or via the site details tab in the NetIrrigate® web portal:



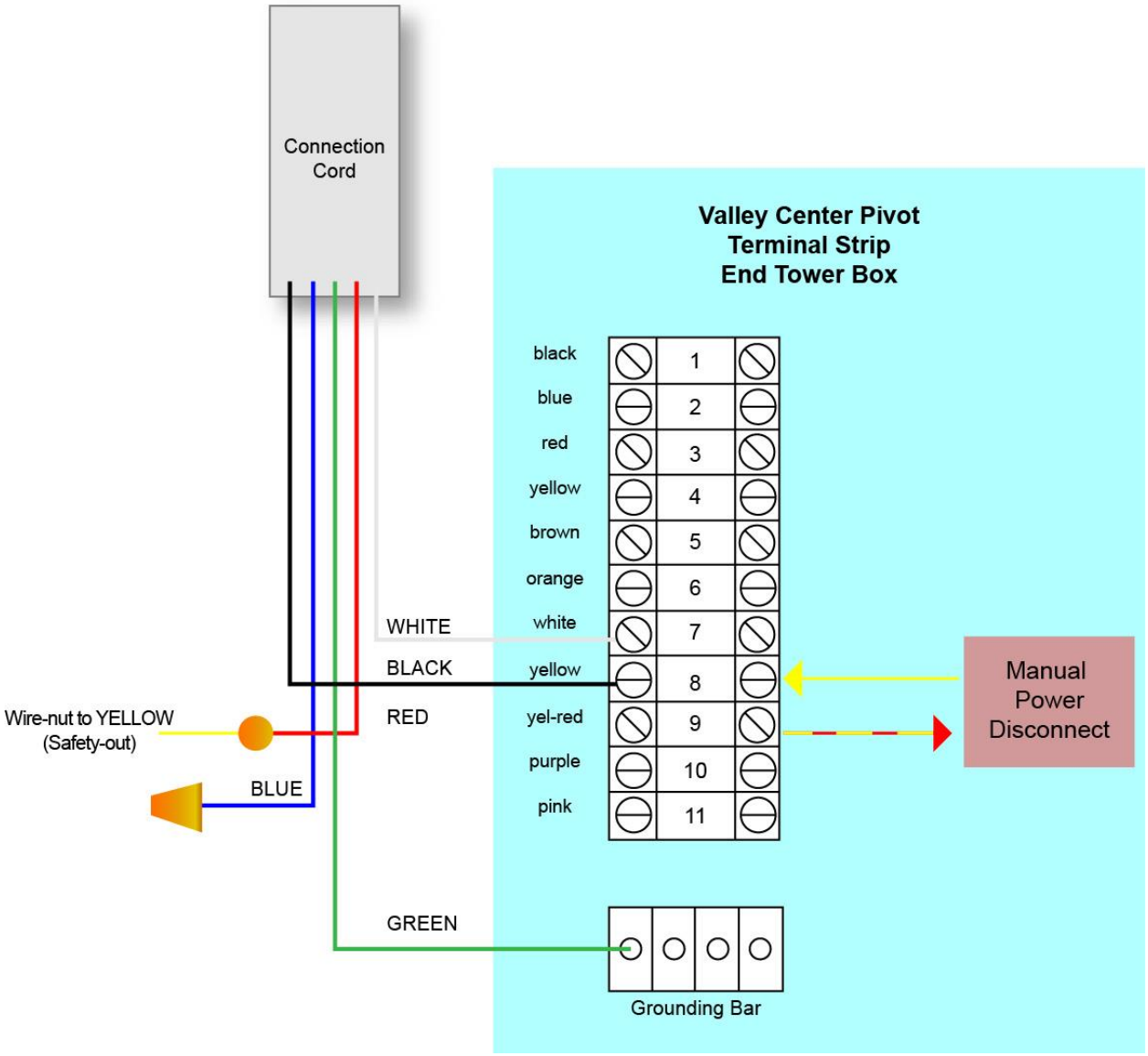

To acquire an initial pivot heading, **run the pivot for at least 6 minutes**. Once a GPS fix is established, the pivot heading should update on the Site Status report within the NetIrrigate® web portal.




If a virtual stop-in-slot alert is configured, the notification will trigger when the pivot is within 5° of either side of the configured heading. For example, if a virtual stop-in-slot notification is configured at 90°, the stop-in-slot notification will occur when the NETB14PIV periodically reports latitude and longitude which results in the heading of the pivot to be between 85° and 95°. The tolerance window is designed to compensate for the wide variance in pivot speeds and percent timer settings.

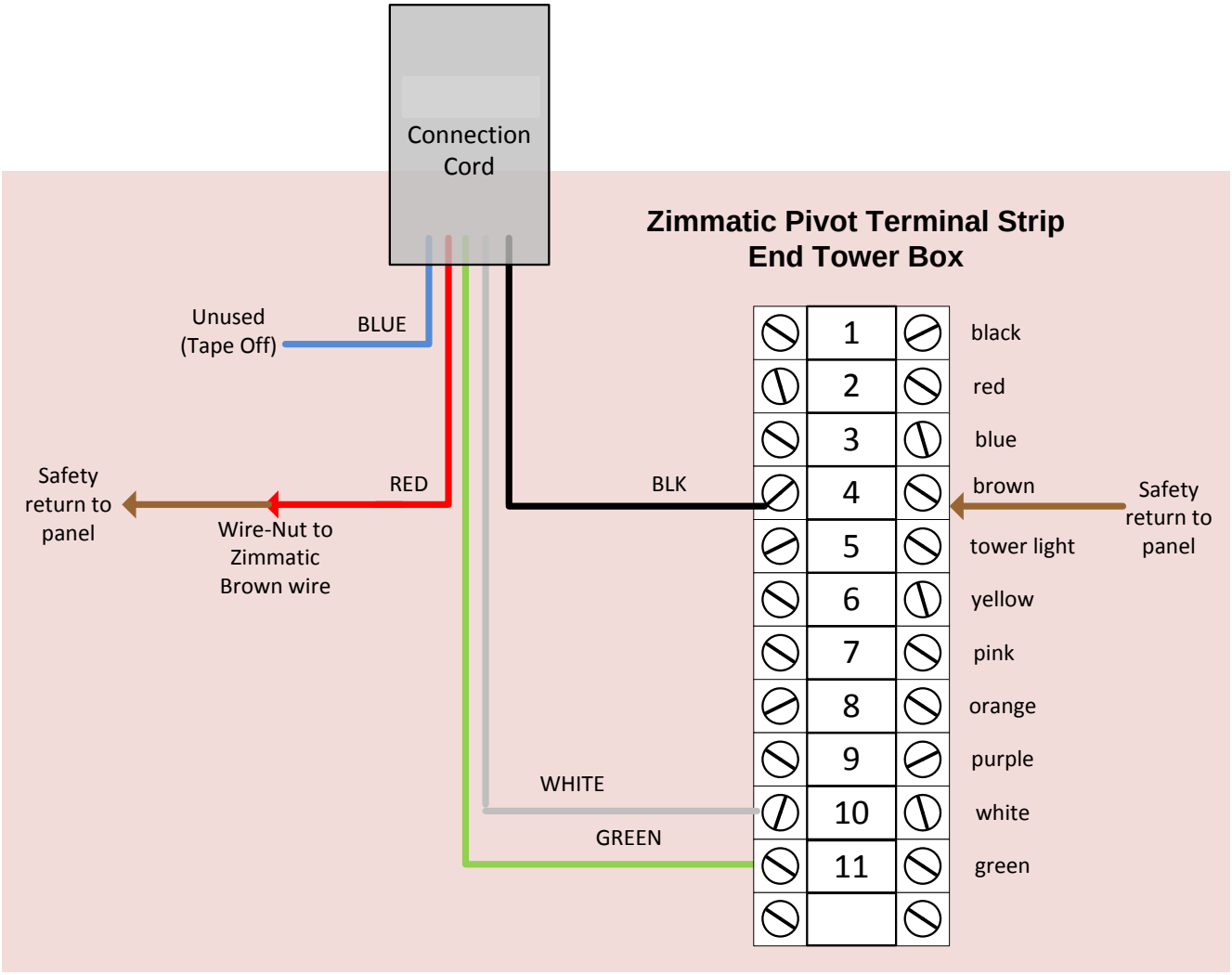
## Appendix A – Valley Branded Pivots Wiring Diagram

1. Remove the yellow wire from the load side of the terminal strip.
2. Connect the black wire from the NETB14pivto terminal 8, where the yellow was.
3. Wire-nut the removed yellow wire to the red wire on the NETB14PIV.
4. Connect the white wire on the NETB14PIV to terminal 7 (neutral).
5. Connect the green wire on the NETB14PIV to Ground.
6. The blue wire on the NETB14PIV is unused and should be taped off.



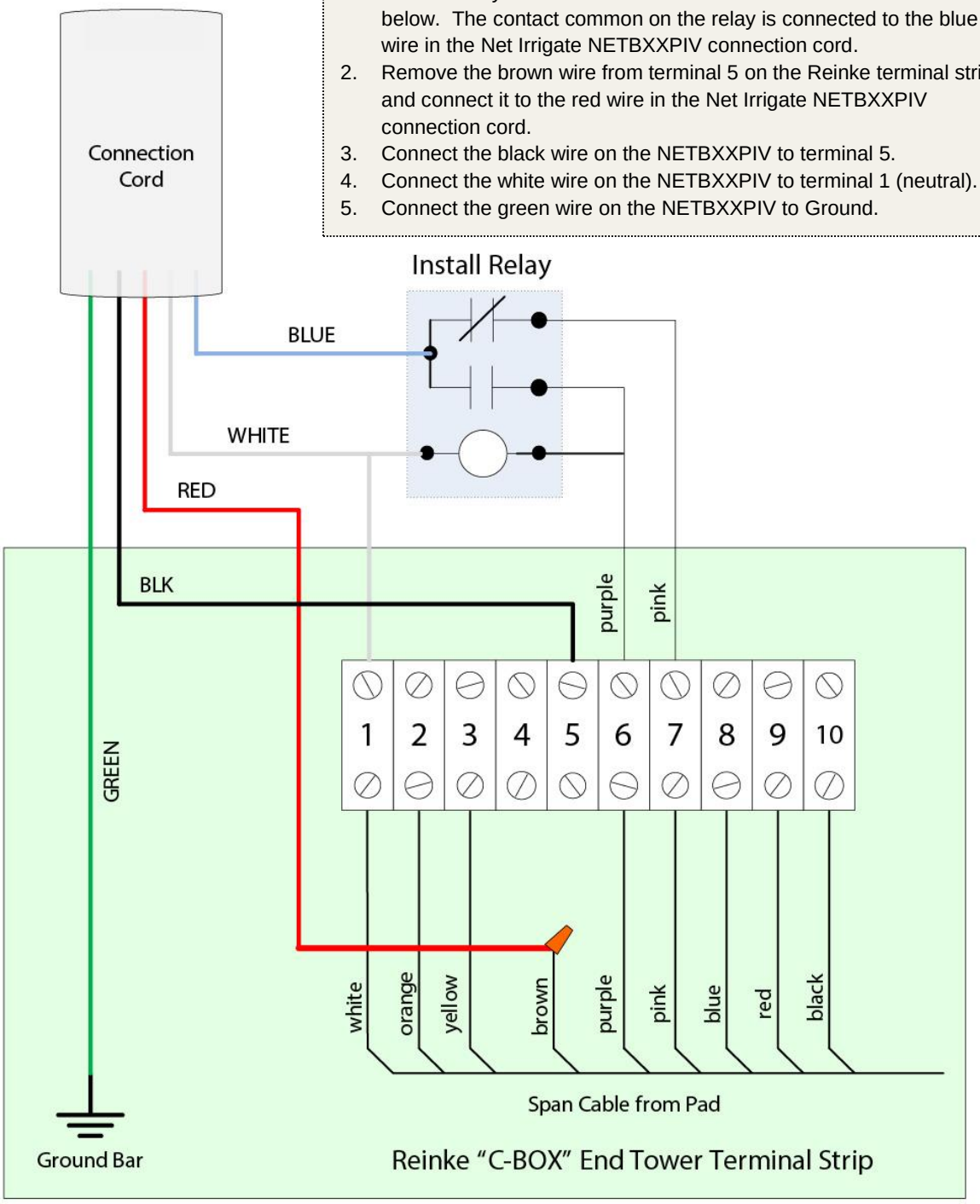
## Appendix B – Zimmatic Branded Pivots Wiring Diagram

1. Remove the brown wire that is heading in the direction of the pivot pad from terminal 4.
2. Connect the black wire from the NETB14PIV to terminal 4 where the brown wire was.
3. Wire-nut the removed brown wire to the red wire on the NETB14PIV.
4. Connect the white wire on the NETB14PIV to terminal 10 (neutral).
5. Connect the green wire on the NETB14PIV to Ground.
6. The blue wire on the NETB14PIV is unused.



## Appendix C - Reinke Branded Pivots without Auto Reverse

1. Install a relay with 120VAC coil and NC/NO contacts as shown below. The contact common on the relay is connected to the blue wire in the Net Irrigate NETBXXPIV connection cord.
2. Remove the brown wire from terminal 5 on the Reinke terminal strip and connect it to the red wire in the Net Irrigate NETBXXPIV connection cord.
3. Connect the black wire on the NETBXXPIV to terminal 5.
4. Connect the white wire on the NETBXXPIV to terminal 1 (neutral).
5. Connect the green wire on the NETBXXPIV to Ground.

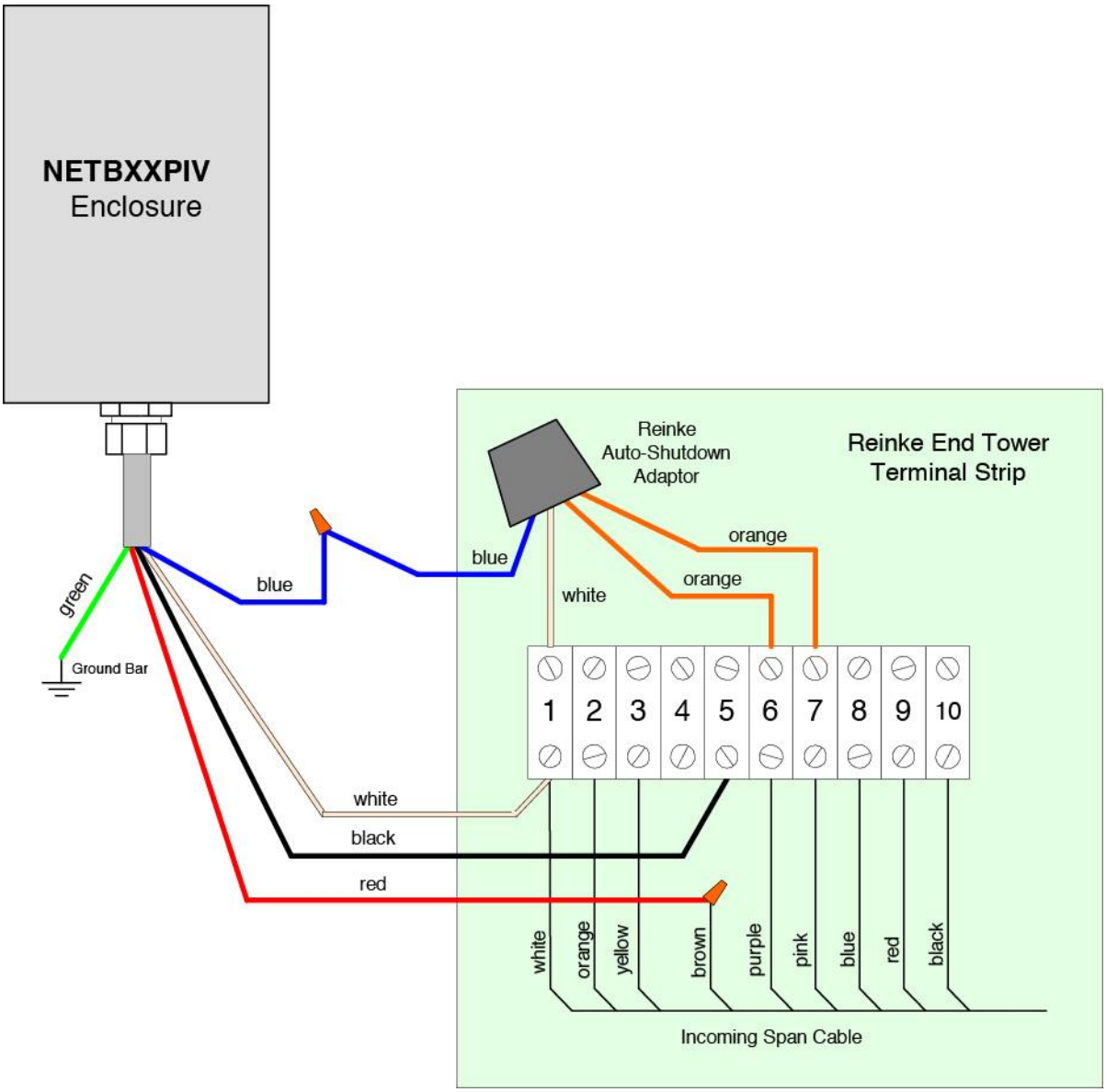



* When the selector switch on the Reinke control panel is set to the "auto reverse" position a Net Irrigate auto-shutdown call will reverse the pivot.

## Appendix D- Reinke without AutoReverse (using Diode Fork)

**Installation Instructions for NETBXXPIV at end Tower C- Box**

1. Mount the Unit outside the End Tower C-Box
2. Install the NetIrrigate connection cord through a knock out using a water proof connector into the End Tower Box
3. Connect the 2 orange wires from the Reinke Auto-Shutdown Adapter (contact Net Irrigate for part number) to terminals 6(purple) and 7(pink) on the terminal strip. Connect the white wire from the Reinke Auto-Shutdown Adaptor to the blue wire in the Net Irrigate connection cord.
4. Remove the brown wire on terminal 5 of the terminal strip and splice it to the red wire in the Net Irrigate connection cord. Connect the black wire from the Net Irrigate connection cord to Terminal 5.
5. Connect the white wire from the Net Irrigate connection cord to terminal 1 and the green wire to the ground bar.

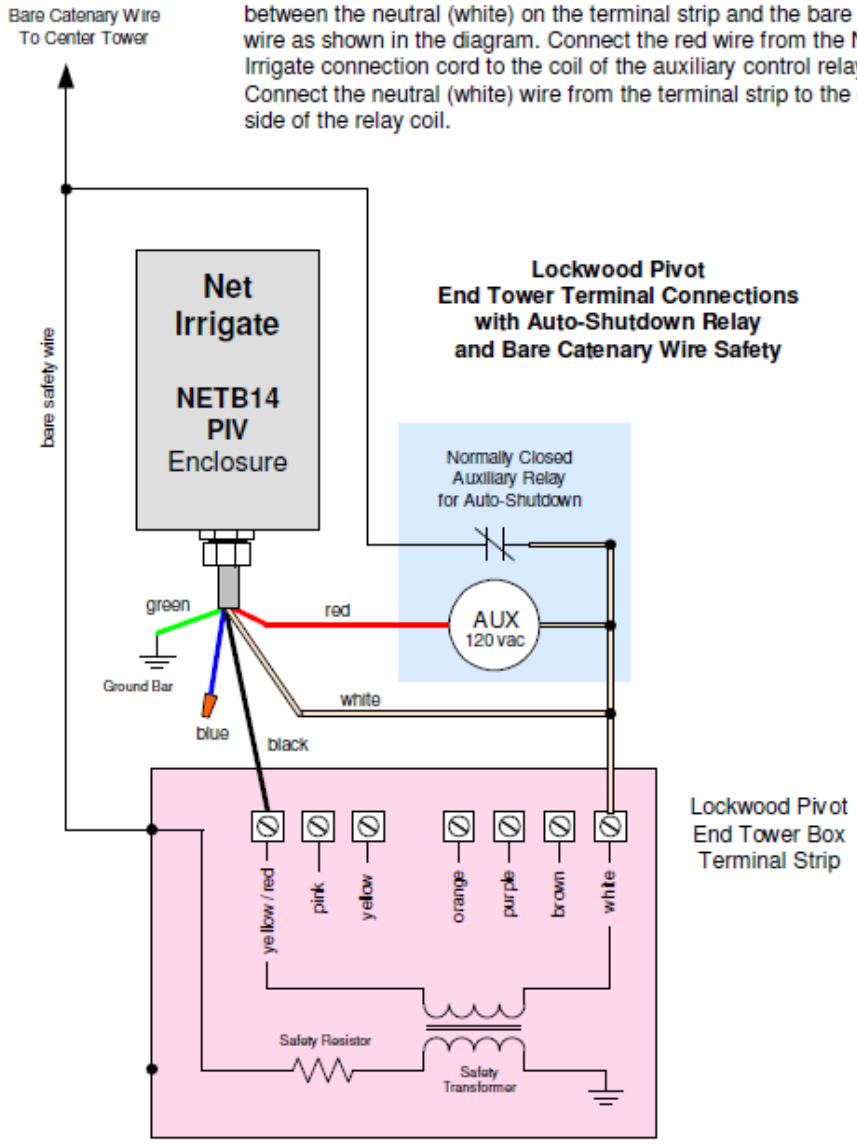


## Appendix E – Lockwood Pivots Wiring Diagram

### Lockwood Pivot Wiring Diagram

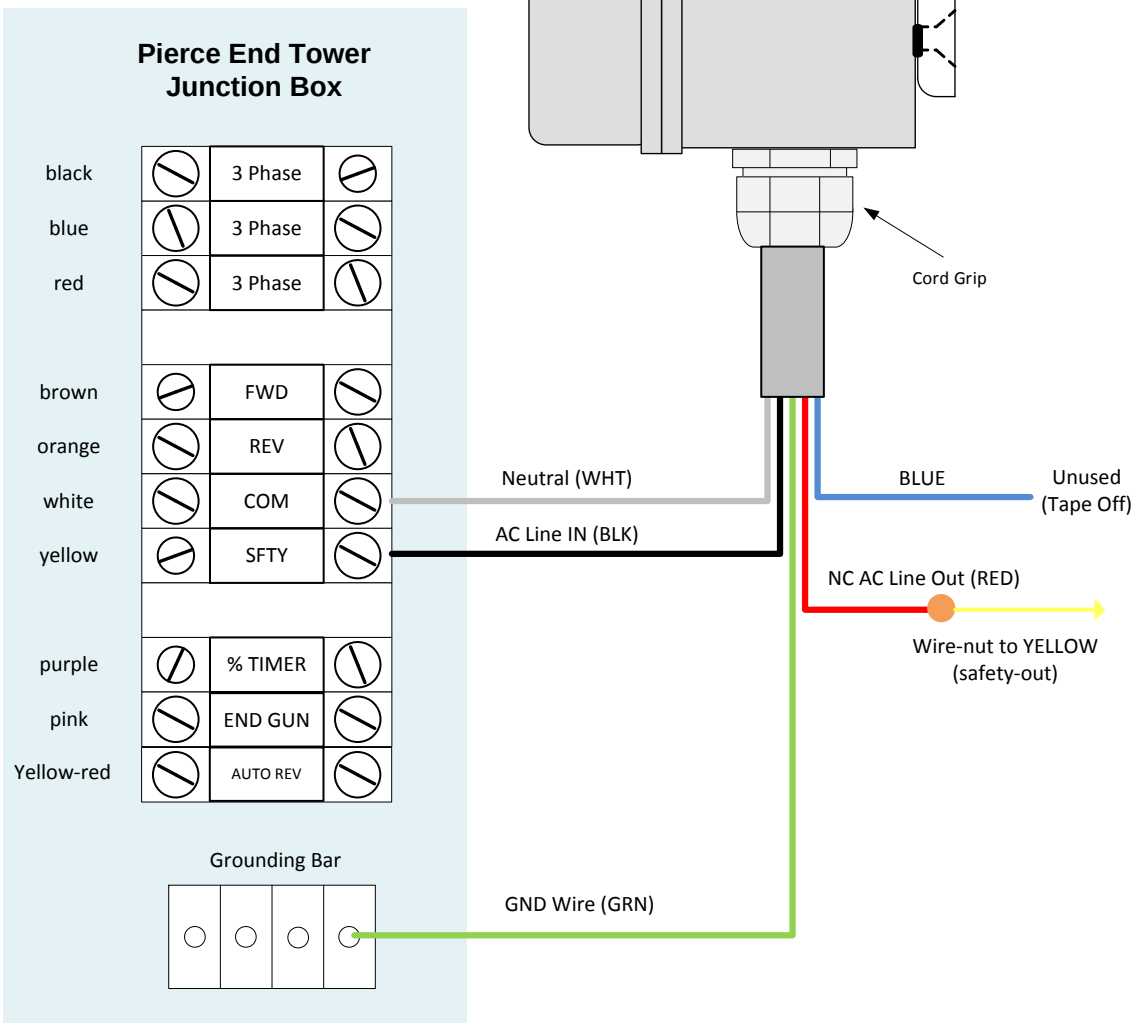
1. Connect the black, white and green wires from the Net Irrigate connection cord to the Lockwood End Tower Terminal Strip as shown in the diagram.

2. If Auto-Shutdown of the pivot is desired an auxiliary control relay must be added. Connect the Normally Closed (NC) contact of the relay between the neutral (white) on the terminal strip and the bare catenary wire as shown in the diagram. Connect the red wire from the Net Irrigate connection cord to the coil of the auxiliary control relay. Connect the neutral (white) wire from the terminal strip to the other side of the relay coil.



## Appendix F – Pierce Branded Pivots Wiring Diagram

1. Remove yellow wire from outgoing side of the safety-out terminal and connect the black wire on the NETB14PIV to the terminal instead.
2. Wire-nut the removed yellow wire to the red wire on the NETB14PIV.
3. Connect the white wire on the NETB14PIV to terminal 7 (neutral).
4. Connect the green wire on the NETB14PIV to GND.
5. The blue wire on the NETB14PIV is unused.



# Appendix G – Troubleshooting Span Cable Theft Alarms

## PROBLEM: ALARM DOES NOT TRIGGER

If the span cable alarm does not trigger, it must be determined if the problem exists within the pivot or the NETB14PIV. The simplest way to determine if the NETB14PIV is functioning properly is to perform a bench test on the unit. If the NETB14PIV has already been installed, do the following:

1. Remove the NETB14PIV white wire from the tower box terminal strip. A red led light within the NETB14PIV enclosure should illuminate. If the red led light is lit, the problem is within the pivot. If it is not, proceed to #2.
2. Remove the NETB14PIV green wire from the tower box terminal strip or grounding bar. Hold the green wire tightly to the NETB14PIV white wire for 10 seconds and release. The red led light within the NETB14PIV enclosure should illuminate and the issue clearly lies within the pivot wiring. If the red LED light *does not* illuminate, the NETB14PIV is defective. Please call (800) 961-9549 for RMA procedures.
3. Successful operation of the span cable alarm requires at least 20,000 ohms of resistance between the neutral and ground conductors of the pivot. Locate the control transformer in the pivot control panel. Remove the bonding wire (green) from terminal X2 on the control transformer. Re-tighten the terminal screw to hold the remaining neutral wires (white) in place on X2.
4. If the pivot is equipped with a modern relay board, disconnect the clip to the relay board that contains ground and neutral conductors.
5. Using an **analog ohmmeter**, measure the resistance between the bonding wire (green) and terminal X2 (white) on the control transformer. The measured resistance should be greater than 20k (20,000) ohms. If the measured resistance is less than 20k ohms see Appendix H entitled "Common Causes of Low Ground Resistance".

   **NOTE: We strongly recommend using an analog ohm meter with a 10K ohm scale (such as the Simpson meter pictured) to measure ground resistance. In our tests, digital meters often provide erroneous results in measuring ground resistance which may exceed 10,000 ohms.**

### PROBLEM: FALSE ALARMSWHILE RUNNING OR IDLE

False alarms may be triggered when the circuit resistance between the span cable neutral conductor (white) and the span cable ground conductor (green) rapidly increases to more than 50K ohms. Large changes in circuit resistance CAN be tolerated without triggering the alarm. For example:

- Abrupt changes in circuit resistance from near 0 ohms to 20K ohms *will not* trigger the alarm. The circuit resistance can repeatedly be changed from 0 ohms to 20K ohms without triggering the alarm.
- Gradual changes in circuit resistance from near 0 ohms to 50K ohms *will not* trigger the alarm.

| Symptom | Probable Cause and Remedy |
|---|---|
| *False alarms randomly occur when pivot is sitting idle* | • Dirty collector ring (most common on Zimmatic pivots). Clean collector ring with emery cloth.<br>• Corroded rotary brush assembly at collector ring. Install a 2000 ohm 5 watt resistor between the neutral conductor and ground conductor across the outbound span cables at the collector ring.<br>• Loose connection on ground or neutral terminals in tower boxes. This may occur due to deteriorating span cable cord grips on tower boxes. |
| *False alarms occur on pivot start-up only* | • Barricade stop is holding safety circuit open longer than expected, thus NETB14PIV cannot see AC Line signal until pivot moves completely off the barricade. Rewire to junction box before barricade stop switch.<br>• Barricade stop switch is opening neutral conductor.<br>• Transient voltage spikes from generator. Leave pivot panel in the OFF position while starting up generator. |
| *False alarms when pivot stops* | • Loose neutral or ground on pivot.<br>• NETB14PIV box not securely mounted and rattling. |

## Appendix H – Common Causes of Low Ground Resistance

Three different types of digital multi-meters were field tested for measuring span cable resistance. All three digital meters gave erroneous readings. We assume that the capacitance between the span cable shield and the span cable conductors produce unreliable digital meter readings. The PivotProxy®span cable alarm will function if the ‘open’ circuit resistance is

20,000 ohms or higher. If the 'open' circuit resistance is lower than 20K ohms locating the source of the grounds can be both difficult and time consuming. Some of the most likely causes of low ground resistance measurements are as follows:

**I. Running Lights**

a. Flexible cords to the running lights are cracked and water logged.
b. Running light lamp sockets are deteriorated and leak to ground.

**II. Collector Rings**

a. Corrosion and debris on brush holders.
b. Corrosion and deterioration on shaft assembly.

**III. Causes Specific to Valley Branded Pivots**

a. **Tower Boxes**
    i. The neutral wire that supplies the relay coil circuit chaffs on the sharp edge of the relay back plate. Newer tower boxes have a nylon cable strap to prevent chaffing.
    ii. Moisture, corrosion and debris build up on the terminals of the micro-switches mounted to the bottom plate of the tower box.
b. **Neutrals -** *although the alarm connects to the neutral wire (white) of the span cable, most of the other conductors in the cable become part of the supervisory circuit.*
    i. At each intermediate tower box the neutral (white) is connected to the forward and reverse conductors (brown, orange) through each motor contactor relay coil and micro-switch (600 ohms).
    ii. The de-watering timer at the second to last tower connects the neutral wire (white) to the safety out (yellow-red), and safety return (yellow) through the timer clock motor (1200 ohms).
    iii. The percent timer (purple) is connected to the neutral through the relay coil in the end tower (600 ohms).
    iv. The end gun circuit (pink) is connected to the neutral through the solenoid coils.
c. **Corner Arms -** depending on methodology at install time, certain Valley branded corner arm pivots may require an isolation relay in the end tower to disconnect the neutral conductor from the corner arm when the pivot is off. The relay coil can be supplied by safety out (yellow-red). If an isolation relay is not used the span cable to the corner arm will not be protected by the span cable alarm.

## Appendix I- Incoming Event Code Overview

Understanding the codes sent by the PivotProxy® can be helpful during installation and troubleshooting. Below is an overview of codes you may encounter regularly when testing, installing, and troubleshooting PivotProxies®.

| Event Code | Description |
|---|---|
| 53 | Periodic GPS reporting |
| 66 | IP address established |
| 101 | PivotProxy® has powered up, indicates the pivot is running |
| 102 | PivotProxy® has powered down, indicates the pivot has shutdown |
| 103 | Cut wire detected |
| 104 | Incoming command received to pick up relay coil |
| 105 | Remote relay coil energized |
| 106 | Incoming command received to drop out relay coil |
| 107 | Remote relay coil not energized |
| 108 | Normally open cut wire alarm |
| 109 | Ground or neutral wire loose while pivot running |
| 150 | Initialization event |
| 110 | Battery Saver Event |

You may see these codes for a given device two ways:

I. The mobile app: locate the irrigation site to which the device is linked on the app. At the bottom navigation bar, select the Events tab. Here you can view the incoming events, associated messages, the timestamp, and how many notifications were triggered.

II. The www.netirrigate.net website: select Devices from the top navigation bar. Type the six digit device ID into the Device ID dropdown box. Select 'Incoming Events' from the secondary navigation bar.