PedSafety
PELCO SOLUTIONS

Guardian Duo Manual

906-0066

Revision A ● January 29, 2026

Guardian Duo Manual

906-0066

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2 Introduction

2.1 Safety Information

The equipment covered in this manual must be installed and operated as specified. If the equipment is installed and/or operated in a manner not specified by the manufacturer, its protective functions may be impaired.

Warning: Risk of electrical shock. The installer must be aware of hazardous voltages that may be exposed during installation.

2.2 Purpose

The purpose of this document is to present installation and operation of the Guardian Duo APB, Duo Controller, and Duo Power Supply. For details on how to configure settings and audio messages on the Guardian Duo APB, as well as descriptions of what settings are available, consult the PedConnex User Manual.

2.3 Warranty Information

PEDSAFETY WARRANTS THIS PRODUCT, WHEN PURCHASED NEW FROM AN AUTHORIZED PEDSAFETY DISTRIBUTOR, TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR A PERIOD OF THREE (3) YEARS FROM THE DATE OF ORIGINAL PURCHASE BY THE END-USER.

WHAT IS COVERED: THIS WARRANTY COVERS MANUFACTURING DEFECTS IN MATERIALS AND WORKMANSHIP.

THIS WARRANTY DOES NOT COVER:

- DAMAGE CAUSED BY ACCIDENT, ABUSE, MISUSE, NEGLECT, IMPROPER INSTALLATION, OR UNAUTHORIZED MODIFICATION
- DAMAGE CAUSED BY NATURAL DISASTERS, POWER SURGES, OR OTHER EXTERNAL CAUSES.
- PRODUCTS THAT HAVE BEEN OPENED, SERVICED, OR MODIFIED BY ANYONE OTHER THAN AN AUTHORIZED PEDSAFETY REPRESENTATIVE.
- MISHANDLING OF THE GUARDIAN CARD RACK CONTROLLER – USE ESD PROTOCOL WHEN HANDLING.
- DAMAGE CAUSED BY MISWIRING OF THE EQUIPMENT, INCLUDING CONNECTING 120VAC TO THE GUARDIAN DUO APB TERMINAL CONNECTIONS.
- DAMAGE CAUSED BY INSTALLING THE GUARDIAN DUO APB UPSIDE DOWN.

2.4 Contacting PedSafety Support

If you need assistance with your system, your first point of contact should always be the distributor from whom you purchased it. If you're unable to reach them, you can contact PedSafety directly.
Tech Support: 208.345.7459 option 2

3 Overview

3.1 Guardian Duo System

3.1.1 Summary of Operation and Function

The Guardian Duo is an Accessible Pedestrian Signal (APS) which combines a rich feature set with fast and simple installation.

Guardian Duo Accessible Push Buttons (APBs) operate over the existing 2 field wires for signalized intersections, and double as Audible Information Devices (AIDs) for RRFB crossings. Each unit can be factory-configured to customer specifications, or quickly field-configured using the PedConnex utility for Windows, iOS, and Android.

The Duo Controller interfaces up to 16 Guardian Duo APBs with any traffic cabinet using a robust powerline communication interface. It also provides a networkable Ethernet port for remote monitoring of the system.

The Duo Power Supply provides power to the entire system. The Guardian Duo APBs, Duo Controller, and Duo Power Supply form a galvanically isolated system which is not required to share a ground with the traffic controller, shielding sensitive cabinet equipment from electrical transients in the intersection environment.

3.1.2 Guardian Duo Accessible Push Button (APB)

The Guardian Duo APB is a fully featured 2-wire Accessible Push Button operable using only the existing field wires. MUTCD- and PROWAG-compliant APS functionality comes by default, with a range of customizable modes and settings to meet any local specification.

The Guardian Duo APB also features additional wiring connections to provide MUTCD- and PROWAG-compliant AID compatible with all RRFB systems. See **7 RRFB Operation** for more details.

The Guardian Duo APB provides simple wireless field programming over Bluetooth, with advanced security options. A USB-C port facilitates convenient power-off programming in the truck or warehouse.

3.1.2.1 Technical Specifications

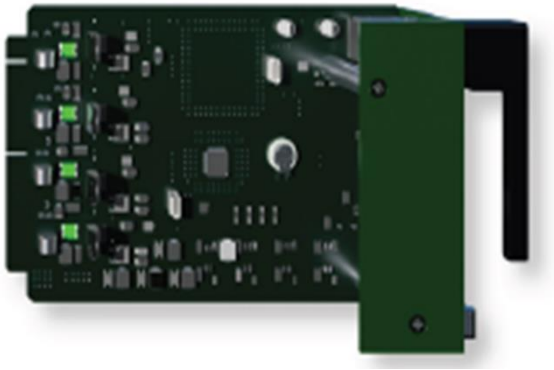
Operating Voltage: 12-24VDC, 15VDC Nom.
Power Consumption: 3W max.

External Connections:

- 2-wire powerline communication interface for connection to existing field wires
- 6-wire universal RRFB interface
- Bluetooth connectivity for iOS and Android programming
- USB-C connectivity for Windows and Android programming. No external power required!

Operating Temperature Range: -34°C to +74°C, 95% Relative Humidity
Storage Temperature Range: -40°C to +85°C
Push button Operating Force Range: 2 lb typ.
Hall Effect Switch Life: >25 million activations
Maximum Audio Output Level: 100 dBA @ 1 meter
Dimensions:13.26” x 4.98” x 2.35”
Weight: 4.0 lb

3.1.3 Duo Controller



The Duo Controller is a 4-channel card suitable for use in any detector rack. For cabinets using pedestrian isolator cards, the Guardian Duo Controller replaces two Type 242 isolators or one Type 244 isolator.

The Duo Controller provides unprecedented simplicity of installation by automatically detecting APB phasing and assigning IDs simply by pushing the “SET” button.

3.1.3.1 Technical Specifications

Operating Voltage: 16VDC Nominal
Power Consumption: 5W max.

PBS Output:

- 4 channel card connects to existing field wires through card edge connector.
- 15V nominal / 700mA max per channel.
- Each channel supports up to 4 Guardian Duo APBs.

Ped Walk / Don’t Walk Inputs: Optically isolated 80-150VAC, 2mA max.
Ped Outputs: Optically Isolated 36 Volts AC/DC peak, 300mA Solid State Fused Contact Closure.
Monitoring Interface: Ethernet – webpage and SNMP
***Operating Temperature Range:** -34°C to +74°C, 95%
Dimensions: 4.5” x 2.40” x 8.004”
Weight: 0.7 lb

3.1.4 Duo Power Supply

The Duo Power Supply provides fully isolated low voltage DC power to the entire Guardian Duo system including the Duo Controller and up to 16 Guardian Duo APBs.

3.1.4.1 Technical Specifications

Input Voltage: 89-134VAC
Output Voltage: 16 VDC nom.
Output Power: 40W max.
Dimensions: 7” x 3.25” x 2.25”
Weight: 1.32 lb

4 System Installation

4.1 Standard Components

- 1 ea. Guardian Duo Station
    - 2ea 1/4-20 x 1 ¼" Hex Head Cap – SS
    - 2ea Star Lock Washers – SS
  - 1 ea. Terminal Door
    - 2ea 6-32 x 3/8" FH Pinned Torx Screws – SS
  - 1 ea. 5x7.75", or 9x12, or 9x15 Al MUTCD Sign
    - 4ea. 8-32 x 3/8" PHP Screws – SS
  - Or 1ea 9x12" or 9x15" Adapter Plate and Sign
    - 4ea. 8-32 x 5/8" FHP Screws – SS
    - 4ea. 8-32 x 1/4" PHP Screws – SS
- 1 ea. Guardian Duo Controller
  - 1 ea. 16-pin W/DW Input Cable
  - 1 ea. DB9 Ped Call Output Cable (optional)
- 1 ea. Guardian Duo Power Supply
- 1 ea. USB C to C cable
- 1 ea. Bit Kit

4.2 Installation Sequence

For a smooth installation, follow the correct installation sequence:

1. Place pedestrian phases in recall and remove existing buttons.
2. Install Duo Controller and Duo Power Supply in the cabinet.
3. Install Guardian Duo APB buttons.

4.3 Installation of Cabinet Equipment

TO PREVENT RISK OF ELECTRIC SHOCK, PLACE INTERSECTION INTO FLASH WHILE INSTALLING CABINET EQUIPMENT.

4.3.1 Duo Controller

The Duo Controller is a standard 4-channel card suitable for use in a detector rack or input file. Connector pin assignments and the associated slot-channel mapping are shown below.

Pin	Function	Pin	Function
A	N/C	1	N/C
B	N/C	2	N/C
C	N/C	3	N/C
D	Channel 1 Field Wires	4	N/C
E	Channel 1 Field Wires	5	N/C
F	Channel 1 Output (+)	6	N/C
H	Channel 1 Output (-)	7	N/C
J	Channel 2 Field Wires	8	N/C
K	Channel 2 Field Wires	9	N/C
L	Chassis Ground	10	N/C
M	N/C	11	N/C
N	N/C	12	N/C
P	Channel 3 Field Wires	13	N/C
R	Channel 3 Field Wires	14	N/C
S	Channel 3 Output (+)	15	N/C
T	Channel 3 Output (-)	16	N/C
U	Channel 4 Field Wires	17	N/C
V	Channel 4 Field Wires	18	N/C
W	Channel 2 Output (+)	19	N/C
X	Channel 2 Output (-)	20	N/C
Y	Channel 4 Output (+)	21	N/C
Z	Channel 4 Output (-)	22	N/C

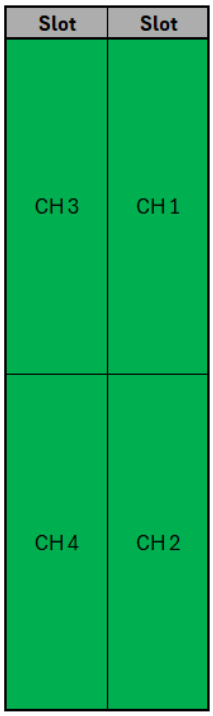


Figure 1. Duo Controller connector pin assignments and slot-channel mapping.

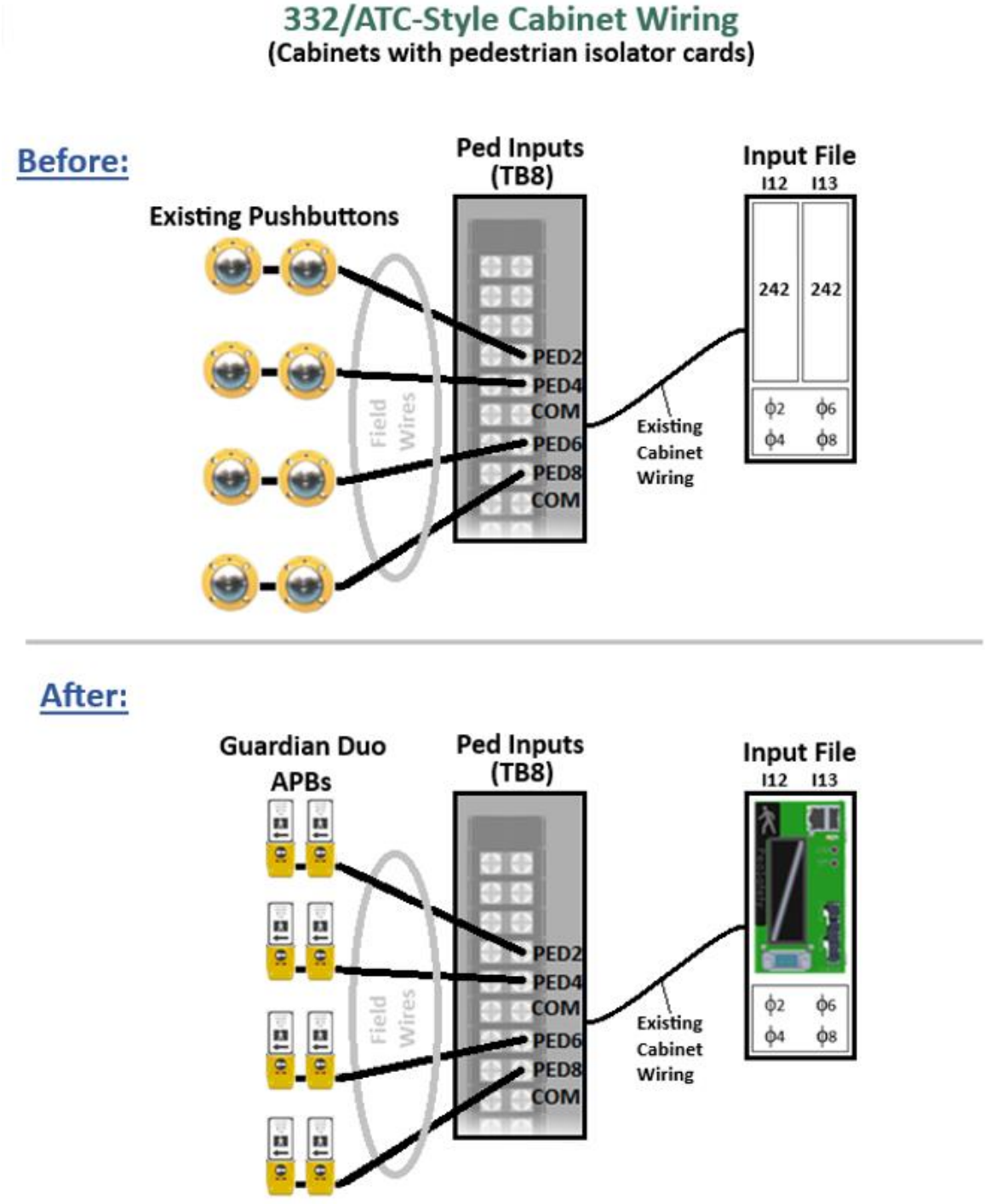
There are two possible installation scenarios:

1. Cabinets with pedestrian isolator cards such as Model 242s.
   ✓ Typical for 332 and ATC cabinets.

2. Cabinets without pedestrian isolator cards.
   ✓ Typical for NEMA cabinets.

4.3.1.1 Cabinets With Pedestrian Isolator Cards

The Duo Controller is suitable to replace two Model 242 DC isolator cards for pedestrian detection, typically installed in slots I12 and I13 of a Caltrans 332 or similar cabinet. The Duo Controller replaces both cards and should be installed in slot I13. The Duo Controller is already connected to the pushbutton field wiring and associated controller ped call inputs. Cabinet configuration before and after installation is shown below.



To determine which channels of the Duo Controller correspond to each pedestrian phase, identify which pedestrian phases are served by each Model 242 DC isolator card and compare it to the slot-channel mapping in Figure 1. The two most common configurations are shown below in Figure 2.

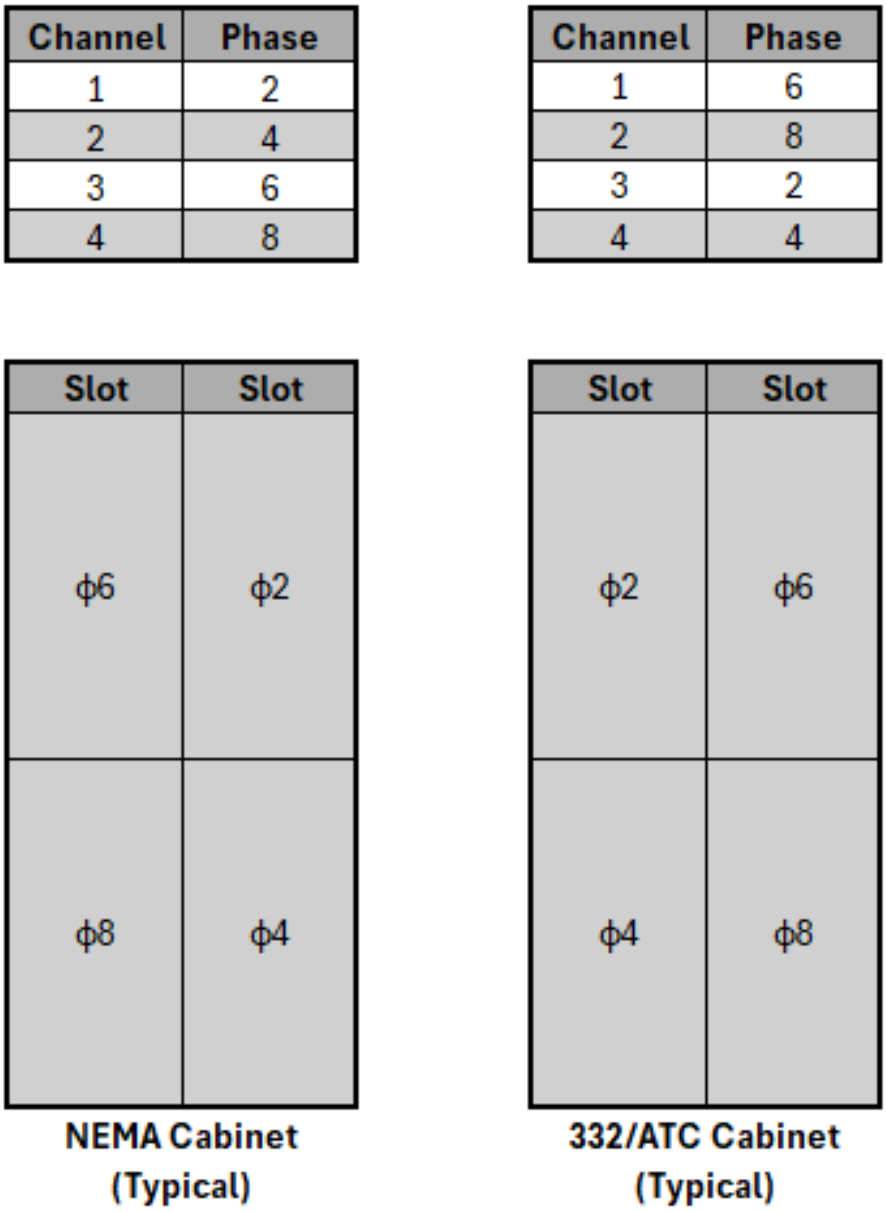
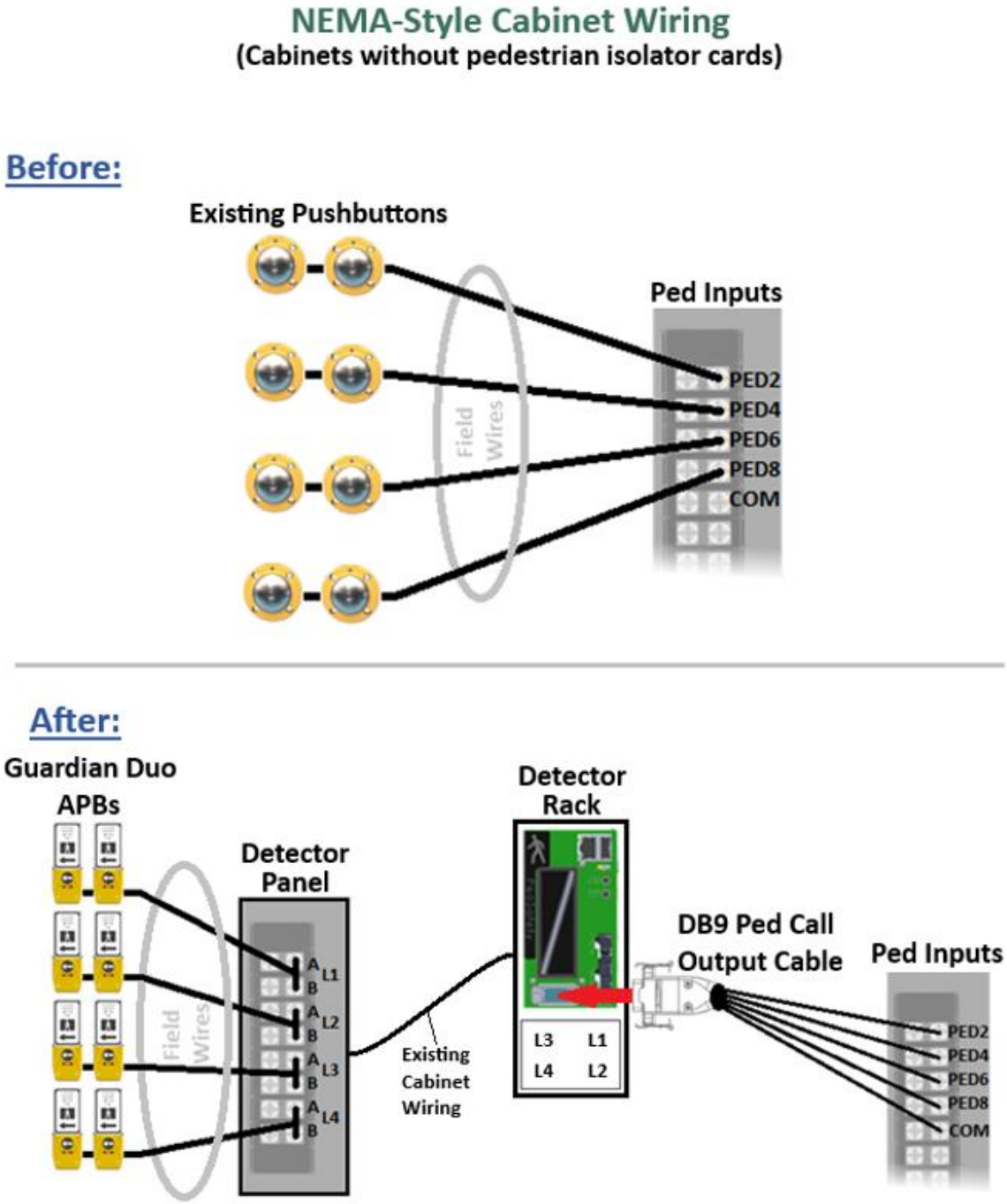


Figure 2. Common channel-phase mappings when replacing pedestrian isolator cards with the Duo Controller.

4.3.1.2 Cabinets Without Pedestrian Isolator Cards

For cabinets that do not use isolator cards for pedestrian detection, for example when BIU/SIU opto-inputs are used, the Duo Controller occupies two slots in the vehicle detector rack. Ped Calls may be placed through a DB9 Ped Call Output Cable if vehicle calls cannot be re-mapped to ped calls. Cabinet configuration before and after installation is shown below.



Pushbutton field wires connect to the detector panel terminals associated with the chosen rack slots, which are energized with 15VDC from the Duo Controller. It is recommended to wire the field wires such that pedestrian φ2 corresponds to Duo Controller CH1, φ4 corresponds to CH2, φ6 corresponds to CH3, and φ8 corresponds to CH4. In the example shown in Figure 3, φ2 is wired to L13, φ4 is wired to L14, φ6 is wired to L15, and φ8 is wired to L16.

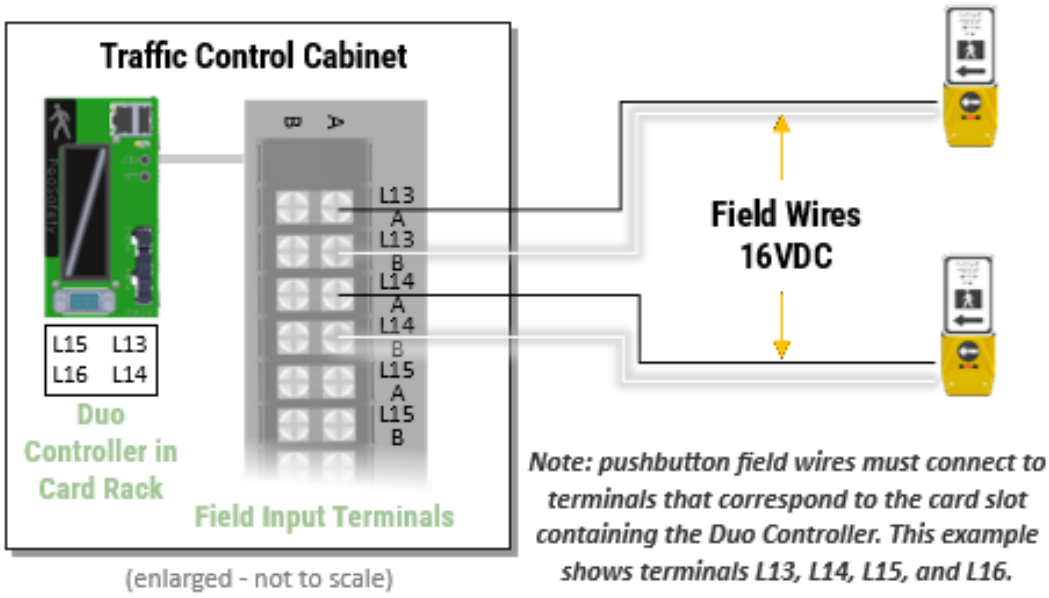


Figure 3. Duo Controller installed in the detector rack utilizing terminals L13, L14, L15, and L16.

If the cabinet is not equipped to accept pedestrian calls through the detector rack, a DB9 ped call output cable may be used. The cable plugs into the face of the Duo Controller as shown below in Figure 4, and wires to the pedestrian input terminals.

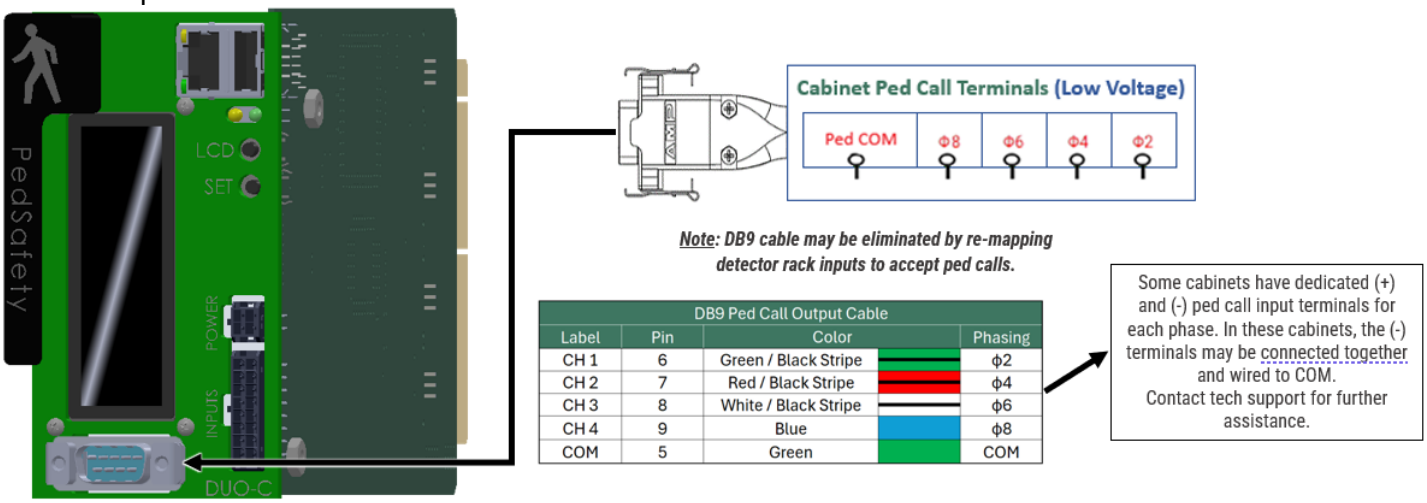


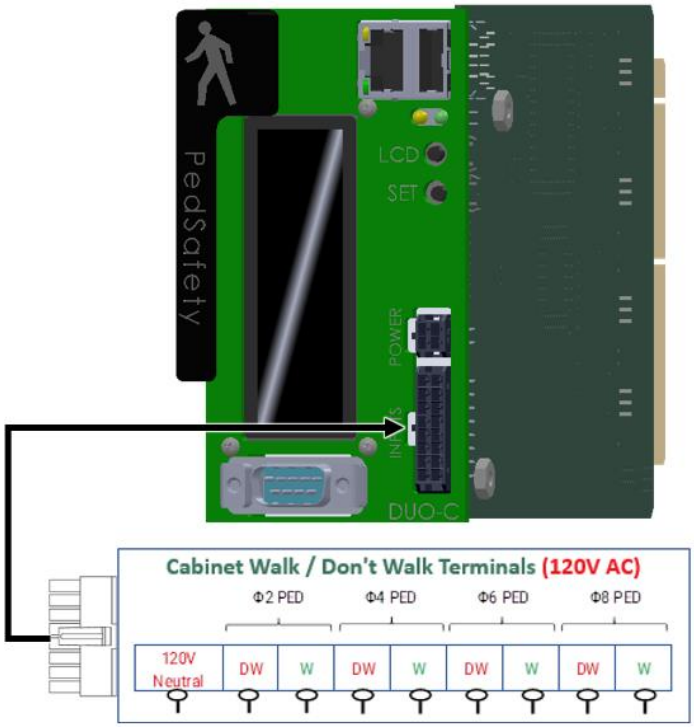
Figure 4. The Duo Controller may use a DB9 cable for ped call outputs with controllers that cannot accept ped calls through the detector rack.

4.3.1.3 Signal Input Cable

The Duo Controller receives pedestrian signal state information from a 14-pin cable plugged into the INPUTS terminal and wired to the cabinet's load switch outputs as shown below in Figure 5.

CAUTION – LOAD SWITCHES OPERATE AT 120VAC. ENSURE CABINET IS IN FLASH BEFORE PROCEEDING.

Ensure that the wires for each channel of the Duo Controller are connected to the correct pedestrian phase. Typical channel to phase mappings are different between NEMA and 332 or ATC cabinets as noted in Figure 2 and Figure 5.



***Note**: Channels may be assigned to any ped phase.*
CH1=ϕ2, CH2= ϕ4, CH3= ϕ6, CH4= ϕ8 is typical for NEMA cabinets.
CH1=ϕ6, CH2= ϕ8, CH3= ϕ2, CH4= ϕ4 is typical for 332 and ATC cabinets.
Proper operation must be verified at the time of installation.

Signal Input Cable (120 VAC)				
Label / Channel	Pin	Color	NEMA-Style Phasing	332-Style Phasing
NEUTRAL	1	White	AC Neutral	
	16	White / Black Stripe		
W1	5	Black	Φ2 WALK	Φ6 WALK
DW1	7	Black / White Stripe	Φ2 DON'T WALK	Φ6 DON'T WALK
W2	12	Green	Φ4 WALK	Φ8 WALK
DW2	6	Green / Black Stripe	Φ4 DON'T WALK	Φ8 DON'T WALK
W3	13	Orange	Φ6 WALK	Φ2 WALK
DW3	15	Orange / Black Stripe	Φ6 DON'T WALK	Φ2 DON'T WALK
W4	4	Blue	Φ8 WALK	Φ4 WALK
DW4	14	Blue / Black Stripe	Φ8 DON'T WALK	Φ4 DON'T WALK
AUXIN_A	9	Red / Black Stripe	PRE-EMPTION (LINE)	
AUXIN_B	10	Red / White Stripe	PRE-EMPTION (NEUT)	
INTER_FLASH	11	Green / White Stripe	(Reserved)	

Figure 5. Wiring the Duo Controller's Signal Input Cable to the load switch outputs.

4.3.2 Duo Power Supply

Plug the 120VAC plug from the Duo Power Supply into an open outlet. If no outlet is available, the head of the plug may be cut off and hard wired. **TO PREVENT RISK OF ELECTRIC SHOCK, ENSURE THAT THE DUO POWER SUPPLY HOUSING REMAINS EARTH GROUNDED.**

Plug the 2-position DC plug from the Duo Power Supply into the POWER receptacle on the Duo Controller as shown below. **REMOVE THE CABINET FROM FLASH AT THIS TIME.**

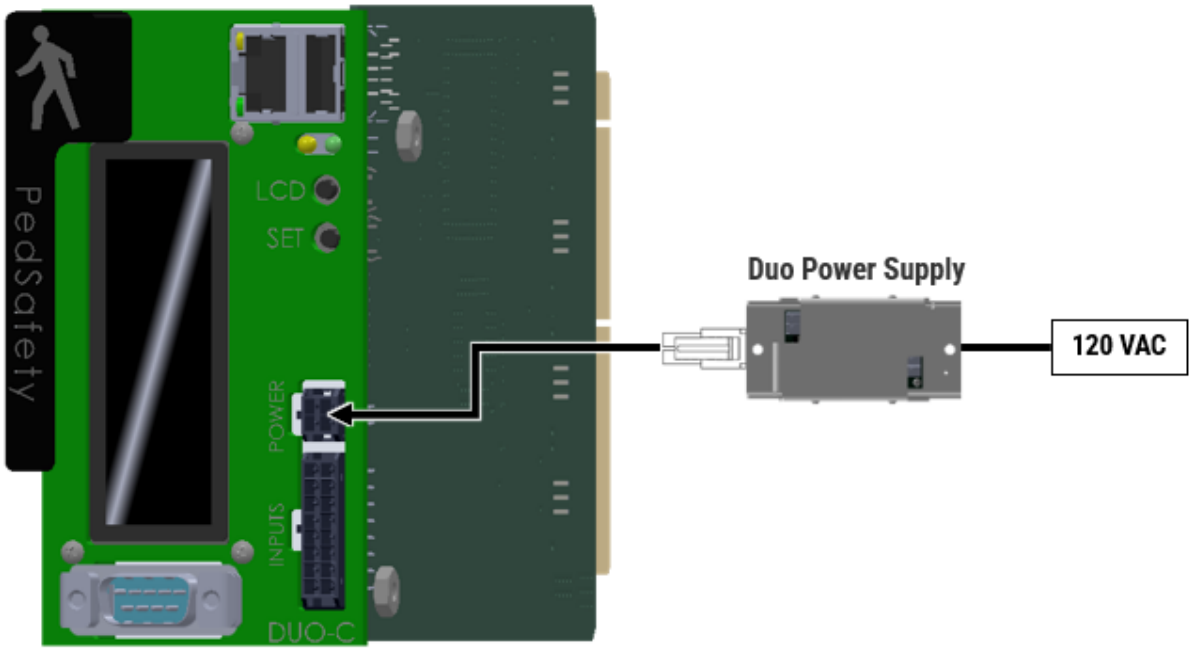


Figure 6. Installing the Duo Power Supply and connecting to the Duo Controller.

4.3.3 Guardian Duo APB Installation

Each Guardian Duo is pre-configured at the factory for a specific location unless ordered with Generic Audio messages: please reference the Intersection Planning Form. If the stations are not installed in the correct locations, the audio messages will not be accurate. Incorrect audio messages present a safety hazard and must not be left in this state. **Refer to the PedConnex User Manual or contact tech support for assistance in changing audio messages.**

Mounting the Guardian Duo Stations

1. Refer to the APS Mounting Template for hole specifications.
2. Mark the point where the center of the pushbutton on the Guardian Duo will be centered 42” to 48” from the ground.
3. Drill and tap for a ¼-20 screw 2” above APB center.
4. Drill and tap for a ¼-20 screw 8 1/2” above APB center.
5. Drill a 1” through hole. This hole can be anywhere from 2 1/4” to 5 1/2” below the lower of the 2 mounting holes (from step 3 above).
6. Loosely attach the Guardian Duo Station to the pole one of the two ¼ - 20 FHP screws in the top mounting hole. This will allow the station to hang freely while completing the wiring steps.
7. Route the wiring which provides power from the pole through the wire chase at the bottom of the Guardian Duo Station.
8. Connect cabinet field wires to the middle pair of screw terminals as shown below in Figure 7. The left and right terminal pairs are not used. **Ensure that the Guardian Duo APB boots up. If not, flip the wiring polarity.**

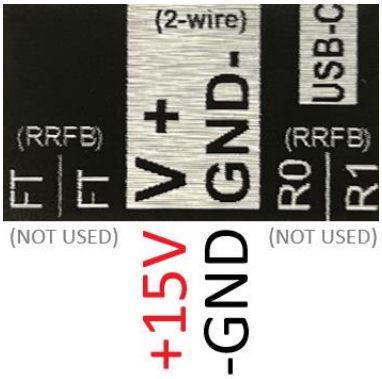


Figure 7. Guardian Duo APB wiring for 2-wire applications.

9. Install and tighten the second ¼ - 20 FHP mounting screw, and tighten the screw loosely installed in step 6 above.
10. Secure the terminal door, adapter plate (if applicable), and sign with the provided hardware.

4.3.4 Tactile Arrow Orientation

Proper installation of the Guardian Duo requires the tactile arrow to point directly towards the intended crossing destination. This orientation is crucial for pedestrian safety. The tactile arrow is field-selectable; it can be adjusted to point left or right by loosening the Torx bit on the actuator plate and rotating the arrow accordingly. A bit kit is included with your shipment to facilitate this adjustment.

4.3.5 APB Discovery

Press the SET button on the Duo Controller. This will automatically detect all Guardian Duo APBs and assign their IDs and phases. Upon pressing SET, arrows will start to fill in on the LCD screen as stations are detected. When discovery is complete, the arrows will flip UP indicating normal operation. This process is shown below in Figure 8. Verify that the Duo Controller's LCD screen displays an UP arrow for all Guardian Duo APBs.

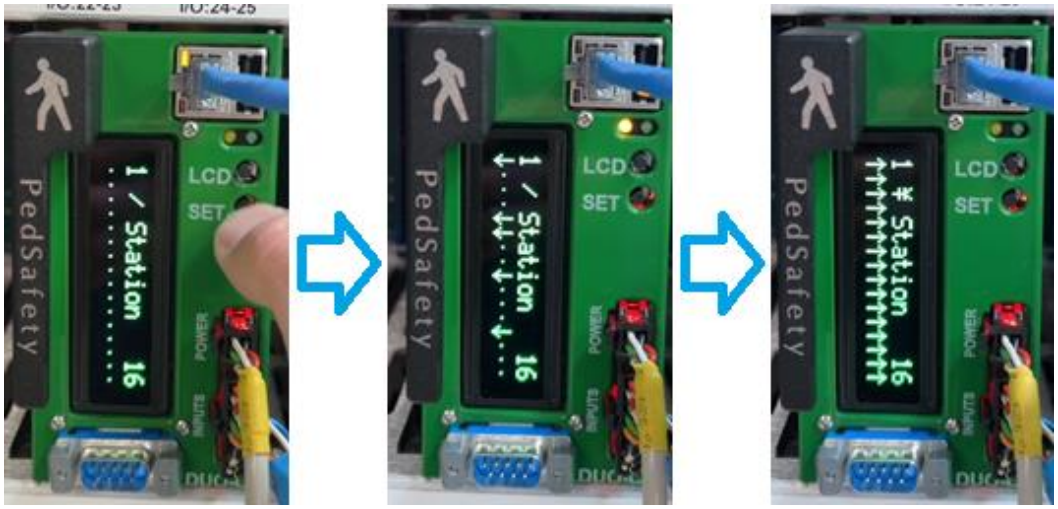


Figure 8. The Duo Controller automatically detects phase assignments for up to 16 Guardian Duo APBs.

4.4 Operational Check

1. The Guardian Duo APBs come fully configured from the factory. After the discovery process is complete, they will begin playing a locator tone.
2. Depress the push button for less than one second (known as a "momentary" press) and verify the red LED turns on with an audible acknowledgement message "Wait." Verify that the pedestrian call is transmitted to the traffic controller.
3. Following a momentary press, verify the Walk message is present and the vibro-tactile button vibrates concurrently with the walk sign.
4. Repeat again with an extended press and verify the red LED turns on and an audible location message plays.
5. After the Walk message, verify an audible locator tone is present during the clearance interval (Flashing Don't Walk).

6. Recheck all units for a full cycle to ensure all options and features operate as desired.
7. Depending on intersection location, factory default settings for volume, AGC, and vibro-tactile settings may require modifications.

4.5 Wave Operational Check

After completing the above operational check, and if the Guardian Duo is a Guardian Duo Wave, proceed to check the operation of the Wave sensor. This can be done in the following way.

1. Wave a hand in front of the Wave sensor. Verify the red LED turns on with an audible acknowledgment message “Wait.” Verify that the pedestrian call is transmitted to the traffic controller.
2. Following a momentary press, verify the Walk message is present and the vibro-tactile button vibrates concurrently with the walk sign.
3. Repeat again with an extended press by holding a hand in front of the unit for the extended press time. Verify that the red LED turns on and an audible location message plays.
4. After the Walk message, verify an audible locator tone is present during the clearance interval (Flashing Don’t Walk).
5. If you experience any Wave sensor settings during the operational check, contact PedSafety Tech Support at 208-345-7459 option 2.

5 Connectivity

The Guardian Duo system provides multiple modes of connectivity for configuration and monitoring. The Guardian Duo APB includes Bluetooth and USB-C connectivity for configuration and audio management. The Duo Controller features a networkable Ethernet port for remote system monitoring.

5.1 Guardian Duo APB Configuration

The Guardian Duo APB normally comes factory-configured according to customer specifications. However, sometimes field configuration may be required. Bluetooth and USB-C interfaces are provided for this purpose. **Refer to the PedConnex User Manual for details.**

5.1.1 Bluetooth Connectivity

The Guardian Duo APB's Bluetooth interface provides an interface for wireless programming in the field using PedConnex for iOS and Android.

The Bluetooth connection defaults to Advanced Security mode, providing a balance of convenience and security. In Advanced Security mode, the Bluetooth transceiver remains powered off in normal operation. Holding the pushbutton down for at least 8 seconds powers the transceiver on for 60 seconds, during which a Bluetooth connection may be initiated. Once connected, there is no time limit to make changes. After disconnecting, or if the 60 second time window ends, the Bluetooth transceiver is powered back off.

If Advanced Security mode is disabled, the Bluetooth transceiver always remains powered on and available for connection.

5.1.2 USB-C Connectivity

The Guardian Duo APB's USB-C port provides an interface for hard-wired programming using PedConnex for Windows and Android. The USB-C connection is capable of sourcing power to the Guardian Duo APB, allowing the unit to be configured without external power. This provides a convenient option for deploying updates prior to installation in the truck or the warehouse.

5.2 Network Setup for Remote Monitoring

The Duo Controller features a networkable Ethernet port which facilitates remote monitoring through a graphical web interface, SNMP trap messages, and an API.

5.2.1 Web Interface

By default, the Duo Controller's web interface is accessible at IP address https://192.168.1.101. Some browsers may require **https://** to be specified in the URL.

Upon connecting to the Web Interface, a "first login" interface prompts the user to set an administrator password, set network time, and upload an intersection planning sheet if desired.

Once logged in, the Duo Dashboard shows the Walk/Don't Walk and Ped Call status of each channel, as well as the Up/Down status of all connected buttons. System time and health metrics are also displayed.

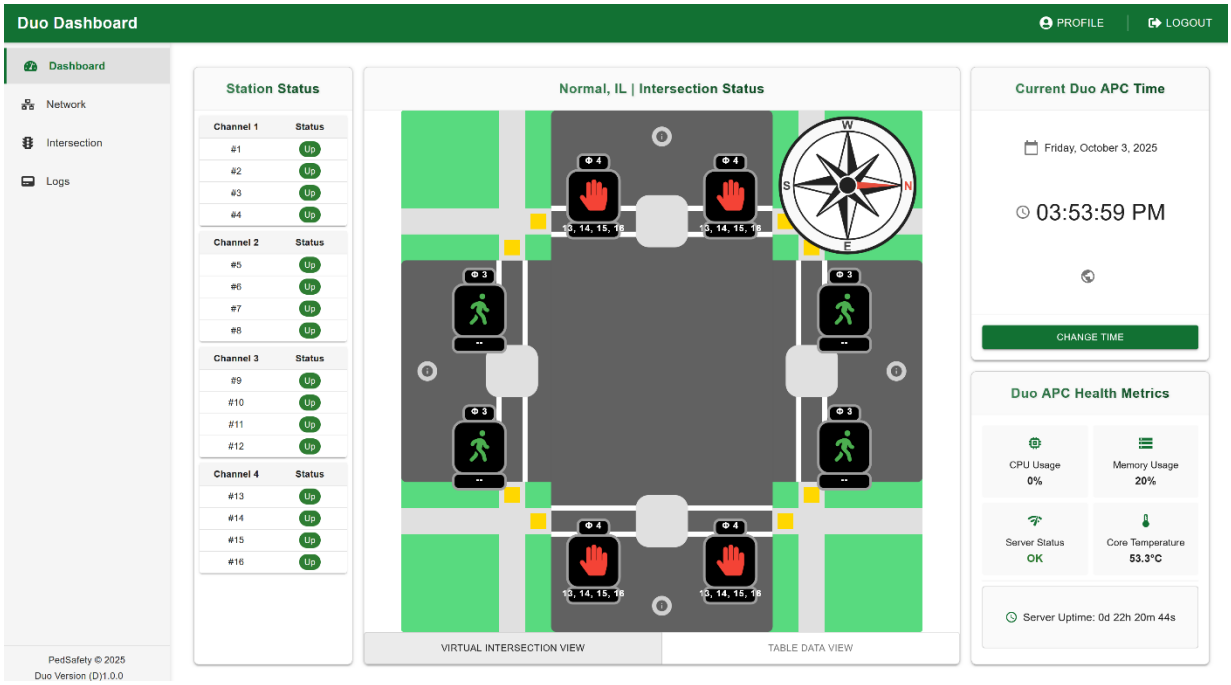


Figure 9. The Duo Dashboard shows intersection health and status at a glance.

The Duo Dashboard may be customized to a wide range of intersection configurations using the Intersection tab. This may be done manually, or automatically by uploading an intersection planning sheet PDF.

Network connectivity parameters such as the IP address may be reconfigured from the Network tab.

5.2.1.1 HTTPS

The webpage is served over HTTPS, providing end-to-end encryption on the connection. HTTPS requires an SSL Certificate to authenticate the webpage. Third party SSL Certificates must be updated at reoccurring intervals, which would require either an outside internet connection or the periodic manual upload of a new certificate. Neither of these scenarios are practical, so the Duo Controller uses a self-signed certificate. Some

browsers may flag the connection as “Not Private”. If this occurs, select “Advanced” and then proceed to the IP address.

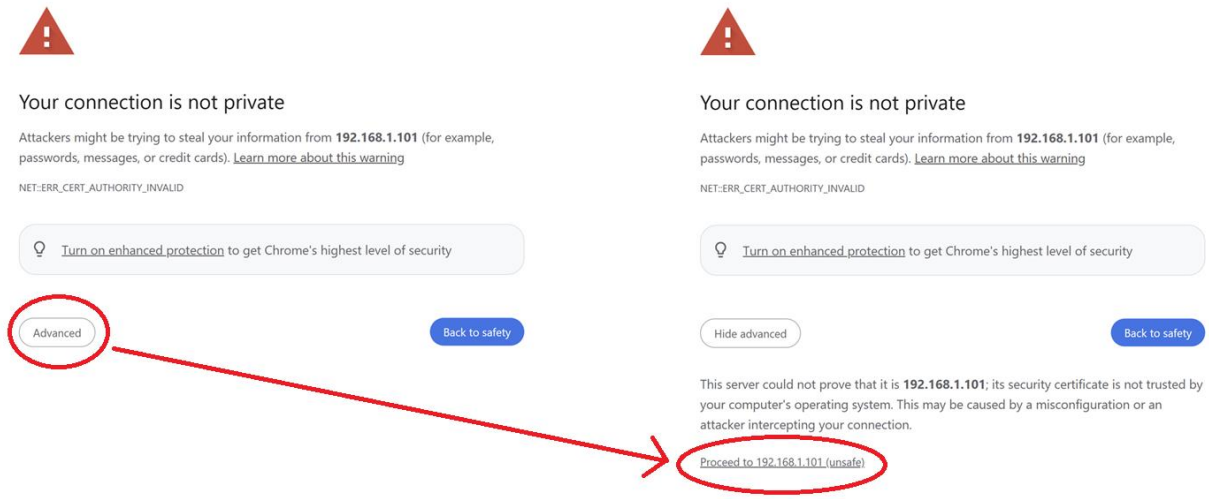


Figure 10. If presented with "Your connection is not private" in a browser connection to the Duo Controller, click "Advanced" and proceed to the IP address.

5.2.2 SNMP Traps

The Guardian Duo may be configured to send SNMP Trap messages based on critical system events. The SNMP Manager IP address and Community String may be configured from the Network tab. The following events trigger an SNMP Trap:

- Guardian Duo APB lost communication
- Guardian Duo APB re-stablished communication
- Channel went into ped recall
- Channel came out of ped recall
- Software reboot
- Power cycle reboot

6 Wiring Recommendations

2-wire APS systems are exposed to long cable runs, splices, interference sources, and other factors which adversely affect traditional communication systems. The Guardian Duo is designed to tolerate many such conditions, but PedSafety advises the following best practices to ensure optimal performance.

1. For best results, a dedicated cable with at least two conductors should run from the Traffic Cabinet to each button. Shielded cabling or twisted pairs are acceptable but not required. IMSA 50-2 cable is recommended.
2. 14 AWG is generally acceptable for cable runs up to 1000’. For longer runs, 12 AWG is preferred.
3. Smaller wire gauges may be used for shorter cable runs. For example, 18 AWG typically works for cable runs shorter than 300’.
4. Daisy chaining buttons on the same channel is generally acceptable.
5. Spliced and branched wiring is generally acceptable provided that the splices do not present excessive resistance, and the total length of any single branch meets the requirements above.
6. If dedicated 2-conductor cables cannot be pulled to each button, a 3-conductor cable with a shared common typically works for buttons on the same corner. A higher probability of packet loss may be observed, particularly in longer runs.

CAUTION: A common wire for 120VAC equipment must never be shared as the button common.

7 RRFB Operation

The Guardian Duo APB also functions as an Audible Information Device for RRFB systems. For these applications, the button acts as a standalone device not requiring a Duo Controller or Duo Power Supply.

7.1 RRFB Wiring

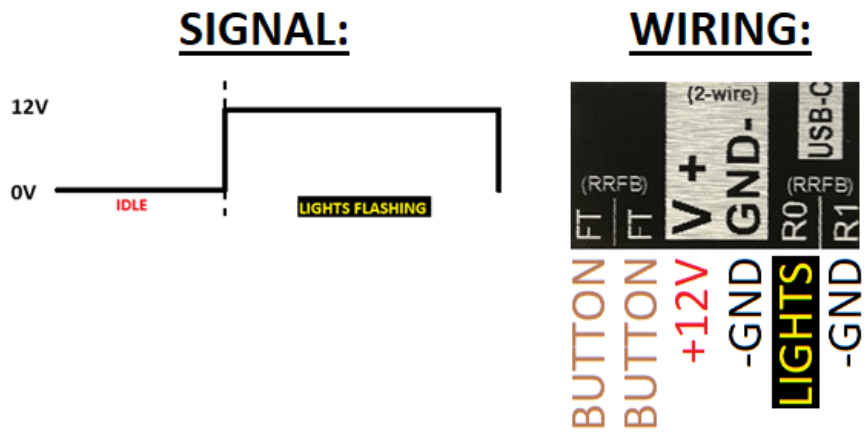
To interface with an RRFB, all 6 wiring terminals on the Guardian Duo APB must be used. These wiring terminals present a flexible signal interface compatible with virtually any RRFB controller on the market.

RRFB systems typically present one of four types of signal to notify an Audible Information Device that the lights are flashing:

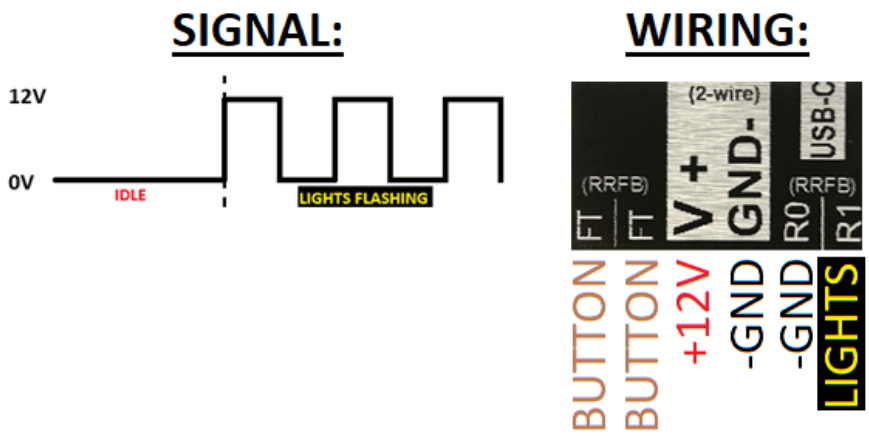
- Steady signals present a constant voltage level when active, while Flashing signals toggle between voltage levels when active.
- Active High signals rest at 0V and energize to 12V when active, while Active Low signals rest at 12V and ground to 0V when active.

Each of the four signal combinations can be accommodated based on wiring of the R0 and R1 terminals:

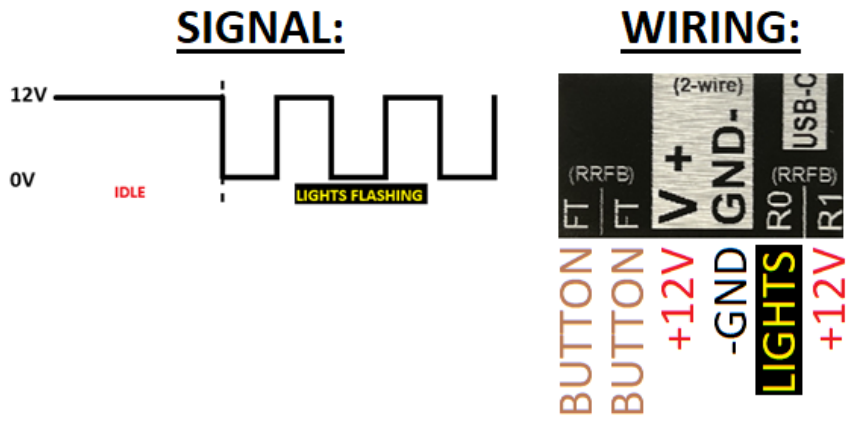
7.1.1 Steady Active High Signals



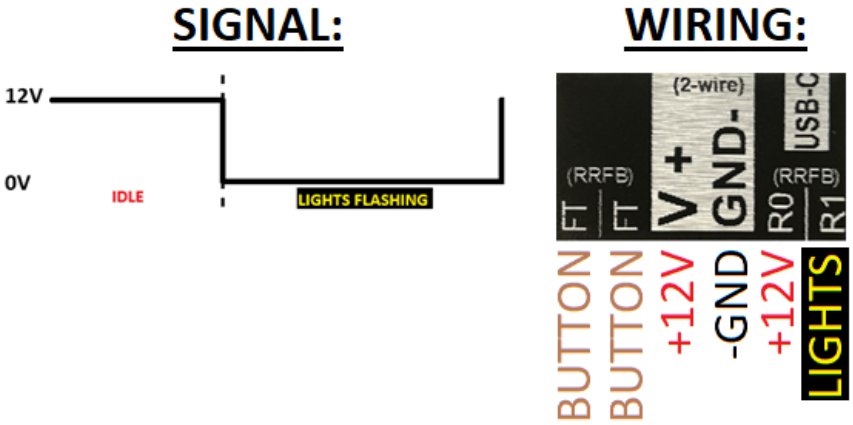
7.1.2 Flashing Active High Signals



7.1.3 Flashing Active Low Signals



7.1.4 Steady Active Low Signals



7.2 RRFB Power Consumption

Power consumption is a critical parameter for RRFB systems, which are often solar powered. This section characterizes the Guardian Duo APB's power consumption for RRFB applications, accounting for fluctuations due to audio messages at varying volumes.

Guardian Duo APB - RRFB Mode Power Consumption	
Idle Draw – Quiet Environment	20.4 mA
Idle Draw – Loud Environment	29.2 mA
Charge Consumption per Activation (Worst Case)	76.6 µA * Hr

Figure 11. Power draw characteristics of the Guardian Duo APB in RRFB mode.

The numbers shown in Figure 11 assume a supply voltage of 12V and an audio gain setting of Level 2. Lower audio gain settings result in lower power consumption, and higher gain settings result in higher power consumption.

7.2.1 Sample Calculation

The total charge, in Amp-Hours, consumed from a battery by the Guardian Duo APB can be calculated as follows. We start by making several assumptions about system operation:

1. 75% of idle time is spent at minimum volume.
2. 25% of idle time is spent at maximum volume.
3. The Guardian Duo APB is activated 300 times per day, always at maximum volume.

$$(75\% * 20.4\ mA * 24\ hrs) + (25\% * 29.2\ mA * 24\ hrs) + (300 * 76.6\ \mu A * \mathrm{Hr})$$
$$= (0.75 * .0204 * 24\ ) + (.25 * .0292 * 24) + (300 * .0000766)\ A * Hr$$
$$= 0.566\ A * Hr$$

Under these assumptions, the Guardian Duo APB consumes 0.566 Amp-Hours of battery charge per day. Given no additional draws on the system, it could run autonomously for 14 days on an 8 Amp-Hour battery.

8 Appendix A: Acronyms, Abbreviations & Definitions

Term	Meaning
Adapter Plate	An aluminum plate that mounts to the APB to display crosswalk signs.
Guardian Duo Station	A fully integrated accessible pedestrian station.
Guardian Duo Controller	Pedestrian Controller that manages the Guardian Duo Stations
Extended Press	On APS, holding the pedestrian push button down from 1-3 seconds may activate special features, including audible beaconing and extended pedestrian clearance interval.
Intersection Worksheet	Document containing the intersection specific information including where to install APBs.
Guardian Duo Power Supply	Circuit board that provides power to the Guardian Duo Stations and the Guardian Duo Controller.