XP21

INSTALLATION GUIDE

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Disclaimer: The advertised detection accuracy of the Wavetronix SmartSensor sensors is based on both external and internal testing, as outlined in each product's specification document. Although our sensors are very accurate by industry standards, like all other sensor manufacturers we cannot guarantee perfection or assure that no errors will ever occur in any particular applications of our technology. Therefore, beyond the express Limited Warranty that accompanies each sensor sold by the company, we offer no additional representations, warranties, guarantees or remedies to our customers. It is recommended that purchasers and integrators evaluate the accuracy of each sensor to determine the acceptable margin of error for each application within their particular system(s).

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Introduction

Welcome to the XP21 installation guide.

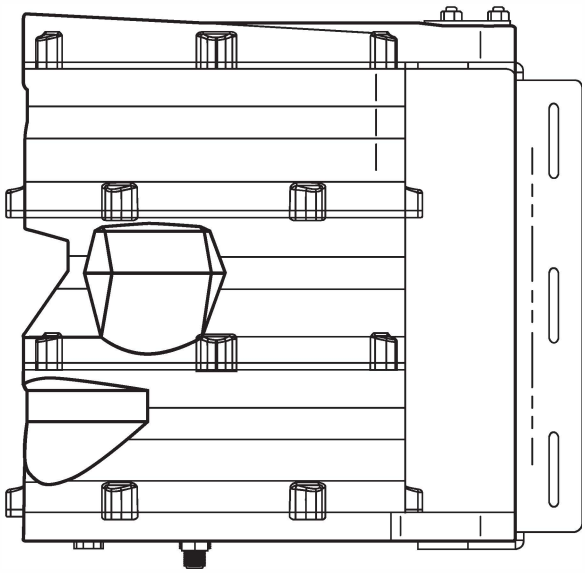

Figure 1. Caption (sentence case)

This guide will cover selecting a mounting location and installing an XP21 sensor. To find the instructions for specific tasks, see the table of contents or index. If your questions aren't answered in this guide, contact support@ wavetronix.com.

What you'll need

The sensor package includes the following:

- An XP21
- An XP21 mounting bracket
- An XP21 cable connector
- A tube of silicon dielectric compound
- An XP21 quick start guide

The following can be ordered separately and are necessary for installation:

- Arc
- Arc surge card
- Expanse Link cable

The Expanse system

The Expanse system is a new way to think about, plan for, and purchase traffic detection equipment. Traffic detectors, cabinet devices, and software are seamlessly integrated to make it easy to get high-quality stop bar detection.

The Expanse system starts with traffic detection, provided by world-class radar traffic sensors. The XP21 provides accurate, easy-to-use detection for a small intersection (up to four approaches with three lanes per approach), and features an onboard field-replaceable surge device.

In the traffic cabinet comes the Arc, an all-in-one cabinet interface device that provides communication (including SDLC), power conversion, and surge protection. The back of the device features slots for field-replaceable surge cards; these allow a single device to communicate with multiple sensors at once, and, in the event of a surge, getting the system back up and running is as easy as inserting a new card.

Back in the traffic operations center, the Expanse software runs on any PC and allows you to monitor and configure your system. From any computer on your network, you can view the status of all your devices and configure lanes, stop bars, and stations.

Service information

The field-replaceable surge devices on the XP21 and the Arc are designed to be user-tested and user-replaced in case of a surge event. Aside from the surge devices, don't try to service or repair these units. Attempting to open the XP21 or Arc units, unless expressly directed by Wavetronix, will void the customer warranty. Wavetronix is not liable for any bodily harm or damage caused if unqualified persons attempt to open or service these units. Refer all service questions to Wavetronix or an authorized distributor.

Important note

Failure to follow the installation guidelines laid out in this guide could result in decreased performance. If you believe it is necessary to deviate from these guidelines, contact support@wavetronix.com for assistance and recommendations.

Choosing an XP21 Mounting Location

XP21

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The Wavetronix XP21 is a stop bar detector capable of detecting traffic in up to four approaches with three lanes per approach of a small intersection. Using what is classified as frequency modulated continuous wave (FMCW) radar, the XP21 detects and reports real-time stop bar presence of vehicles at each stop bar.

The XP21 has a range of 120 feet (36.5 m) across the intersection.

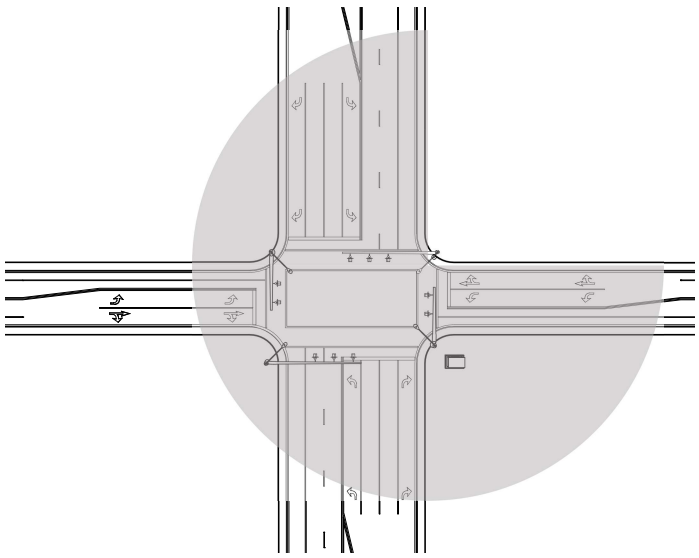

Figure 2. XP21 footprint's 120-ft. (36.5-m) range

As a radar detector, the XP21 is resistant to detection problems that can come from poor weather and lighting conditions. Also, because it is an above-ground detector, it requires minimal lane closure and you do not have to perform any road construction to install it.

Mounting considerations

Because every stretch of road is different, every sensor site will be different. This section will cover some guidelines to consider when you are designing your XP21 installation, but be aware that each site will have its own unique conditions to which you will have to adapt.

There are many possible mounting locations in a standard intersection, all of which will work. The one you choose for your sensor will depend on the layout of the intersection.

The information below will help you choose the best mounting

location for your sensor.

- **Proximity –** An important thing to consider when selecting a location is that the closer the XP21 is to the center of the intersection, the better the sensor's performance will be.
- **Clear view –** Make sure the sensor has a clear view of all the approaches. Pay particular attention to signs, poles, signal heads, and mast arms.
- **Sensor range –** Make sure the footprint extends several feet beyond the farthest stop bar.
- **Cable lengths –** Cable runs can be as long as 800 ft. (243.8 m) with the Expanse Link cable and 1500 ft, (457.2 m) with the Expanse Link S cable.
- **Obstacles –** The front of the sensor should be at least 10 ft. (3 m) away from suspended power lines and other electrical cables.

Height and offset

The offset is the distance between the sensor and the first lane of interest. Make sure the offset is no less than 6-ft. (1.8-m).

In general, the sensor should be mounted 15–20 ft. (4.5–6.1 m) above the surface of the road. Make sure that the mast arm is not occluding the sensor's view.

Occlusion

Occlusion occurs when one object blocks another object from the sensor's view, shown below. This can happen with:

- Tall vehicles like semitrucks
- Signs
- Barriers and sound walls
- Trees and more

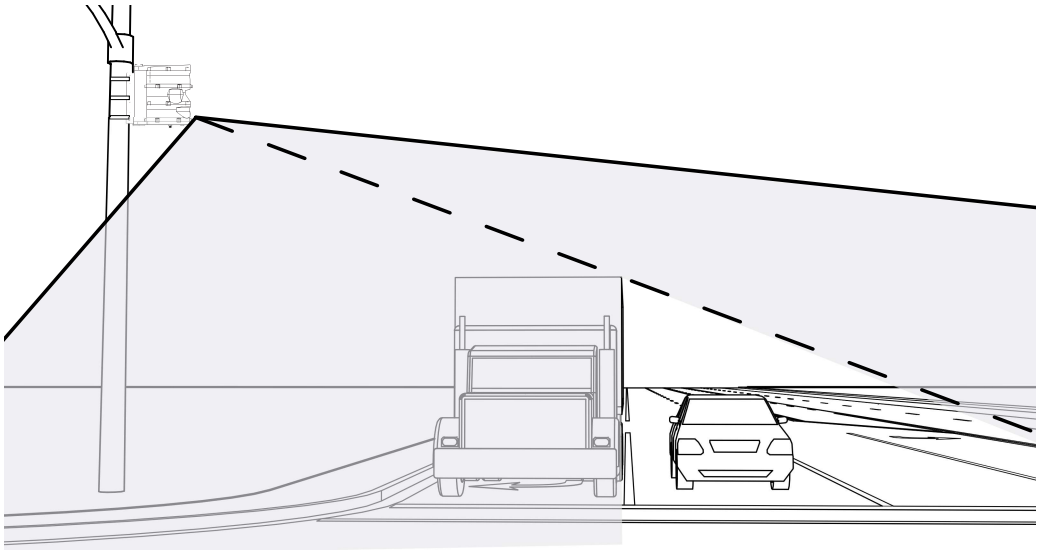

Figure 3. Occlusion

Fixing occlusion problems

- Move the sensor higher on the pole.
- Move the sensor to another spot if possible, away from obstructions.

Multipathing

Multipathing occurs when a large flat surface near the sensor interferes with detection. A radar signal can bounce around several times between the surface and any vehicles before returning to the sensor. This can make the sensor detect a vehicle where there is none.

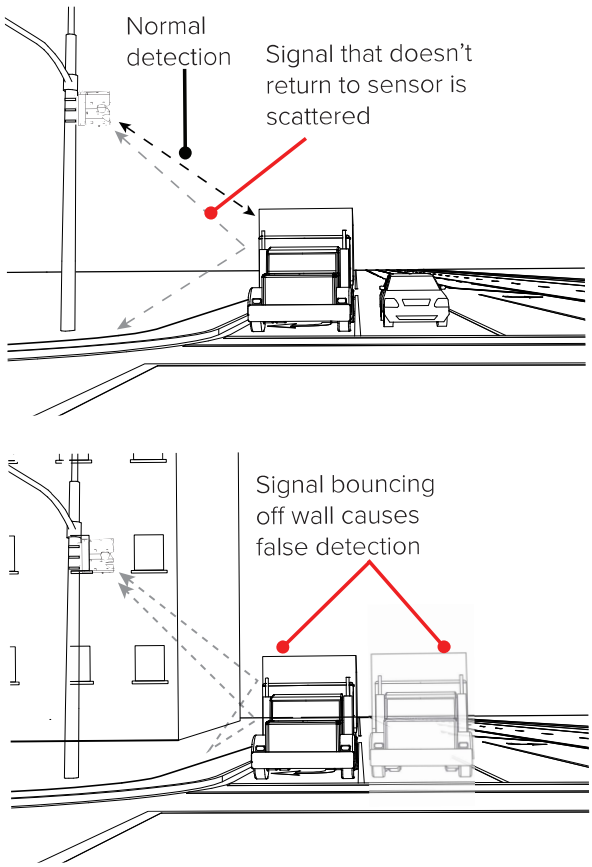

Figure 4. Top: direct path return; bottom: multipath return

Multipathing can happen with:

- Buildings
- Signs
- Guard rails
- Sounding walls and more

Fixing multipath problems

Move the sensor if possible; make sure it is separated from overhead signs, overpasses, parallel walls, etc. A 30-ft. (9.1-m) lateral separation is ideal, but even just a few feet can make a difference.

Installing the XP21

XP21

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After you've chosen the proper location to mount your XP21, it's time to install it following a few easy steps. First, the mount needs to be attached to a pole, then the sensor to the mount, some alignment, then finally connecting the cable.

Mounting the sensor

1 Use Band-It straps or a similar clamping system to attach the mount to the pole.

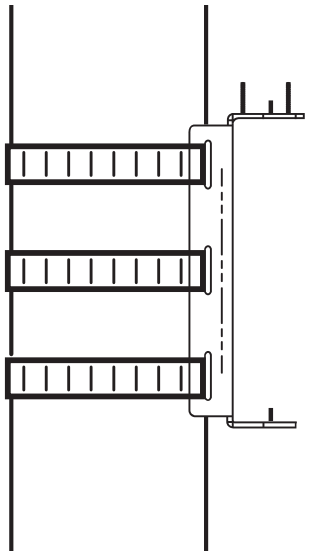

Figure 5. Attaching the mount

2 Rest the sensor on the bottom post and top three bolts and then use a wrench to tighten the nuts onto the bolts.

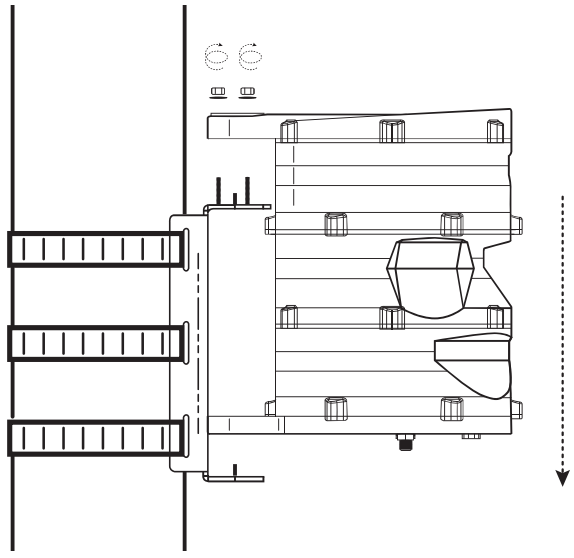

Figure 6. Mounting the sensor

3 Use a wrench to tighten the nuts onto the bolts.

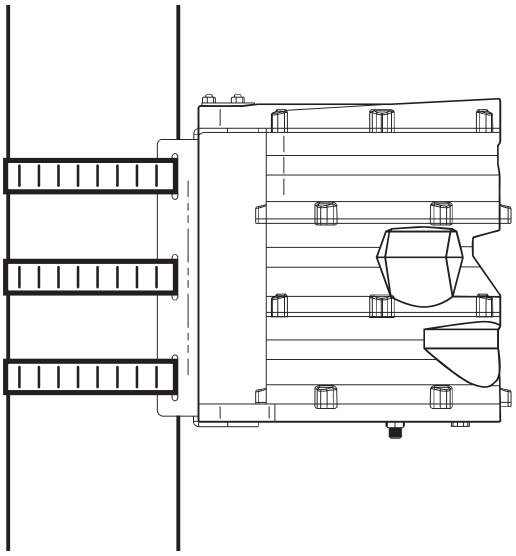

Figure 7. Tighten the nuts

Aligning the sensor to the intersection

Note. You can also pan the sensor by loosening the nuts on the top of the case and then retightening.

1 Pan the sensor side to side until it is pointed directly at the center of the intersection.

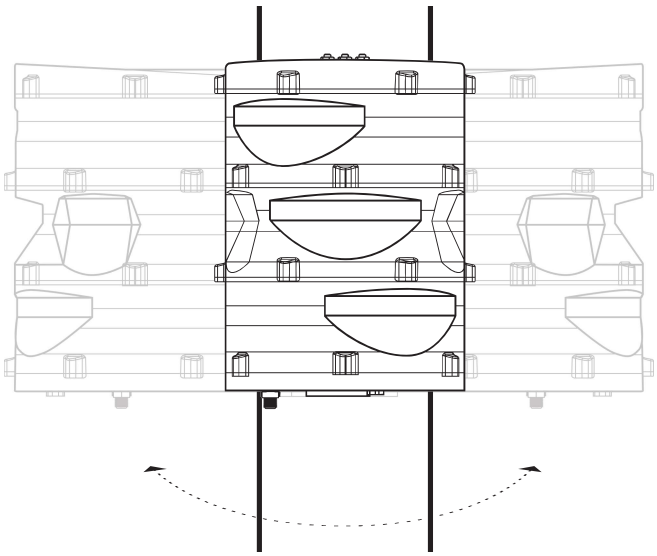

Figure 8. Aligning the sensor

2 Once it is aligned correctly, tighted the top screws using a wrench.

Cable connector

Your cable connector kit will come with the following parts:

- 1 metal back shell
- 1 metal front shell
- 2 rubber seals
- 1 plastic spacer
- 1 plastic cord grip
- 1 metal pin-housing assembly

You'll need two wrenches (20 mm and 21 mm) to assemble the cable connector.

Assembling the cable connector

1 Slide the metal back shell, the tightest-fitting rubber seal, the plastic spacer, and the plastic cord grip over the end of the cable in that order (see the image below).

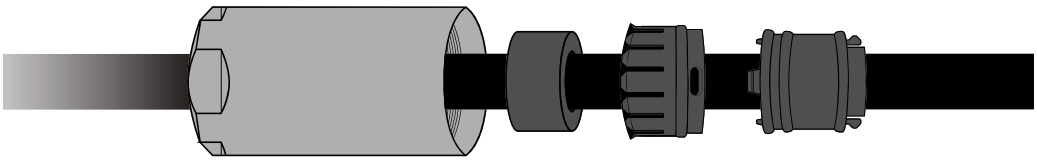

Figure 9. Cable with back shell, rubber seal, spacer, and cord grip

2 Slide the rubber seal into the slotted end of the spacer.

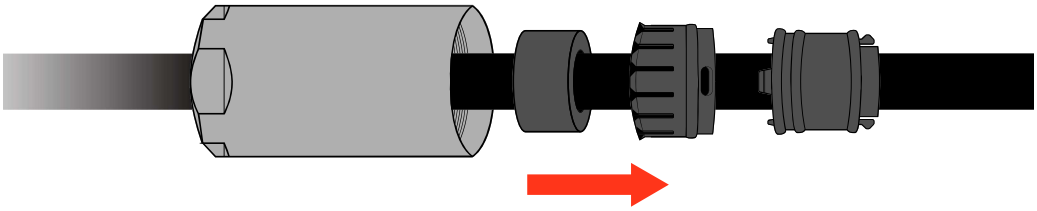

Figure 10. Slide rubber seal

3 Connect the cord grip and the spacer until the tab on the cord grip clicks into place.

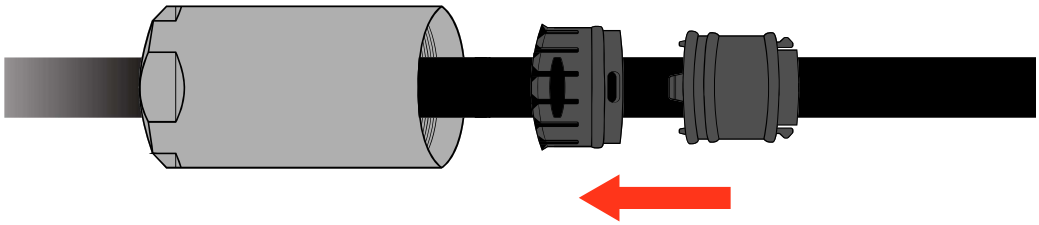

Figure 11. Slide cord grip

4 Slide the assembled seal, spacer, and cord grip into the metal back shell. Make sure the threads inside the back shell are cleared.

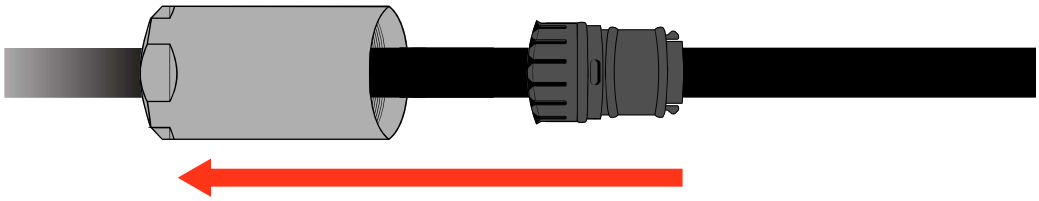

Figure 12. Slide assembly into back shell

5 Strip the cable insulation 39 mm.
6 Cut off the shield braid and foil, but do not remove the uninsulated drain wire.

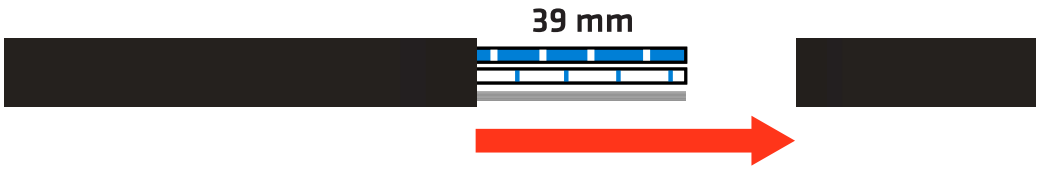

Figure 13. Strip casing

7 Strip the two insulated conductors 10 mm.

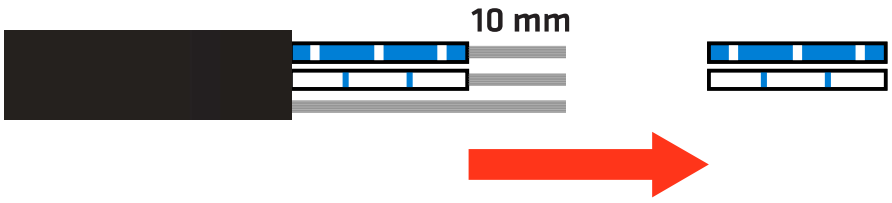

Figure 14. Strip conductors

8 Extend the pin housing from within the metal front shell, and open pin arms 2 (white), 3 (blue), and 4 (black).

9 Terminate the white conductor in pin 2, the blue conductor in pin 3, and the drain wire in pin 4.

Note. Pin arm 1 (brown) will not be used..

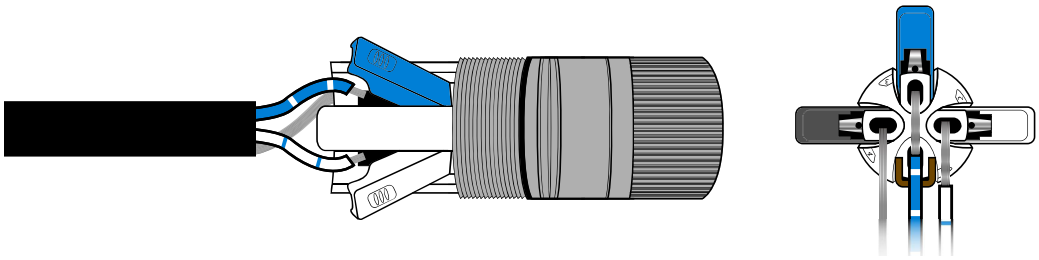

Figure 15. Terminate conductors in pin housing

10 Close the pin arms and lightly pull on the cable to make sure the conductors and drain do not come loose from the pin housing.

11 Slide the metal front shell over the pin housing.

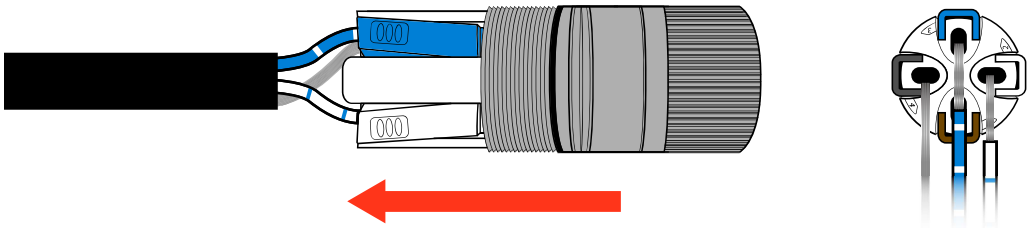

Figure 16. Slide front shell over pin housing

12 Hand tighten the back shell and front shell together and then finish tightening using the two wrenches.

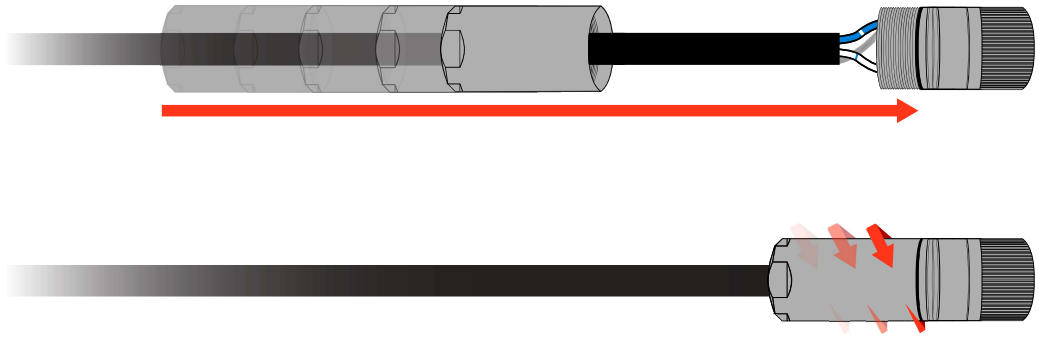

Figure 17. Tighten connector

Applying silicon dielectric compound

1. Tear the tab off the tube of silicon dielectric compound that came with the sensor.
2. Squeeze about half of the compound onto the connector at the base of the sensor.

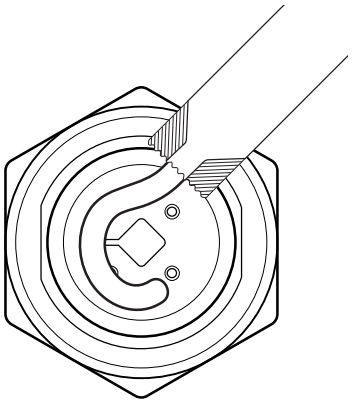

Figure 18. Applying the compound

Connecting the cable

1. Gently insert the cable connector into the sensor connector; the connectors are keyed and will only fit together one way.

Figure 19. Cable connector (left); sensor connector (right)

2. Tighten the ridged end of the cable connector while applying pressure.
3. Run the cable through the pole/conduit. Leave some slack at the top to reduce strain on the cable connector and create a drip loop. The recommended way to do this is shown below, including the use of a zip tie to secure the drip loop to the mount. This method also gives you something to work with should you someday need to move the sensor to a different spot on the pole, so don't cut any excess cable after installation is complete.

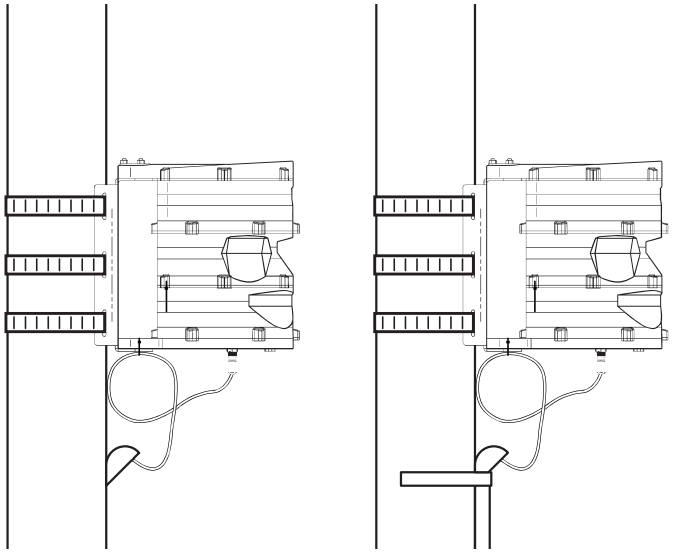

Figure 20. Cable run through pole (left) and through conduit (right)

Installing Power, Surge Protection, and Communication

XP21

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XP21 cabinet setup

Typical XP21 installations will follow the image below.

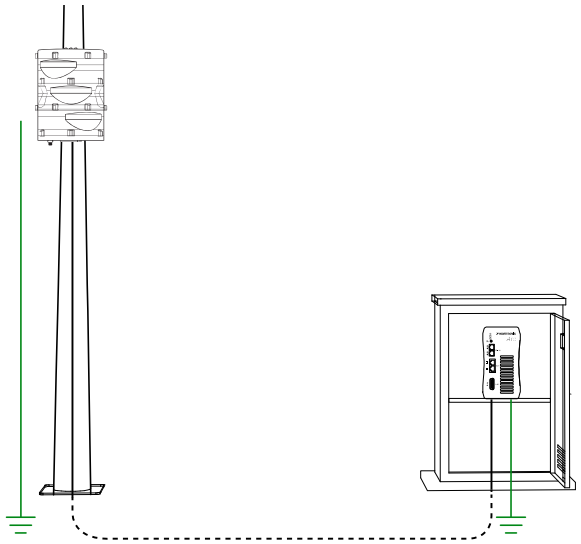

Figure 21. Typical XP21 installation

The XP21 is mounted on a pole, and a cable runs from the sensor down the pole and underground to a traffic cabinet, where it terminates in an Arc cabinet interface device.

No additional surge protection is needed, because in addition to the field-replaceable surge cards on the Arc, there's a field-replaceable surge device in each XP21 sensor.

Arc

The Arc provides surge protection, power, and communication for up to two sensors. Depending on your application, your model of Arc will accept AC or DC power.

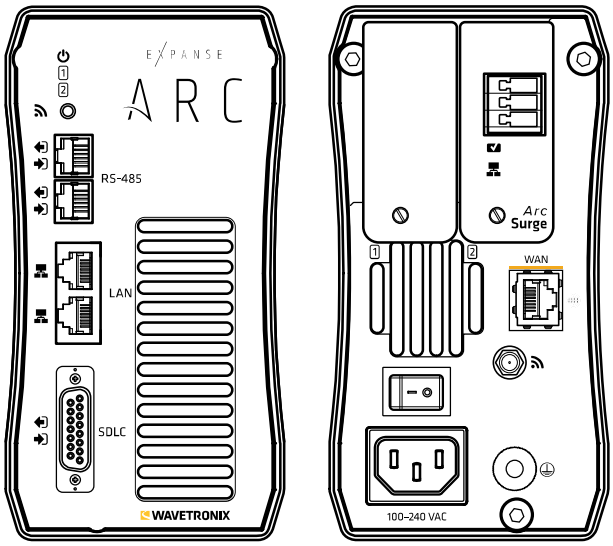

Figure 22. Arc faceplate (left) and backplate (right)

1. Put the Arc in the traffic cabinet. The device can be set on a shelf, or there are several mounting options, including a 2U rack mount.
2. Run the sensor cable into the traffic cabinet.
3. Connect the Arc to AC power by plugging the power cable into the inlet on the back of the Arc.
4. Plug the included Ethernet cable into the WAN port on the back of the Arc to connect the Arc to your Ethernet network. If your network is not configured to use DHCP to assign IP addresses, you'll need to manually assign a static IP address using the Expanse software (in this case, connect to the Arc via the LAN jacks on the faceplate).
5. Ground the Arc by connecting a grounding wire from the surge ground lug (⏚) on the back of the device to the cabinet's earth ground.

Terminating the sensor cable in the Arc

1. Run the sensor cable from the XP21 into the traffic cabinet.
2. Strip back the jacket and shield 1 in. (25 mm).
3. Strip back the insulation on the conductors 0.31 in. (8 mm).

4 Crimp ferrules onto the conductors.
5 Remove the terminal block plugs from the Arc Surge cards in the back of the Arc.

Note. If you are not using ferrules, make sure you carefully insert the wires and make sure all the strands are inside the spring cage.

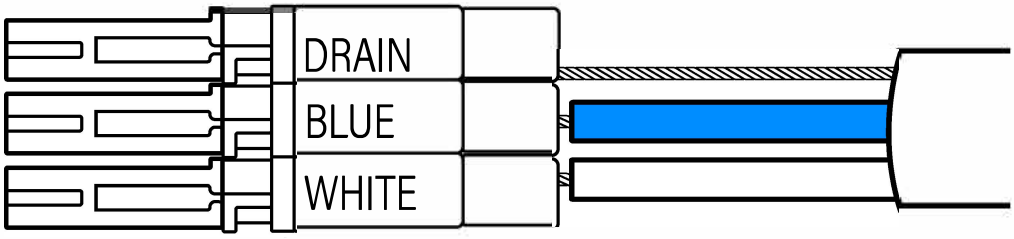

Figure 23. Terminating the cable in the terminal block plug

6 Use the label on the terminal block to connect the sensor cable conductors.
7 Insert the plug back into the Arc Surge card on the back of the Arc.

FCC statements for Class A digital device

FCC Compliance Statement

Wavetronix LLC declares under our sole responsibility that the equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, this equipment should be installed and operated with minimum distance 20 cm (7.9 inches) between the antenna and your body during normal operation.

Users must follow the specific operating instructions for satisfying RF exposure compliance.

ISED general statements

ISED non-Interference disclaimer

Wavetronix LLC declares under our sole responsibility that this device contains license-exempt transmitter(s) receiver(s) that comply with Innovation, Scence and Economic Development Canada;s license-exempt RSS(s). Operation is subject to the following two conditions.

- (1) this device may not cause harmful interference.
- (2) this device must accept any interference , including interference that may cause undesired operation of the device.

This device complies with the Canadian ICES-003 Class A specifications.
CAN ICES-003(A)/NMB-003 (A).

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempt de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil numérique de la Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

RF Exposure Statement

This equipment complies with ISED-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Users must follow the specific operating instructions for satisfying RF exposure compliance.

Cet équipement est conforme aux limites d'exposition aux radiations ISED CNR-102 établies pour un environnement non contrôlé. Une distance de séparation d'au moins 20 cm doivent être maintenue entre l'antenne de cet appareil et toutes les personnes.

Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.