PX150®

Traffic Radar
User Manual and Installation Guide

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Safety, Notices, and Compliance

European Union — CE / EMC

PX150 has been evaluated for electromagnetic compatibility using the following harmonized ETSI standards:

ETSI EN 301 489-1 V2.2.3
ETSI EN 301 489-3 V2.3.2

The EMC test report identifies the tested emissions classification as **Class A**. Class A equipment is intended for commercial, industrial, traffic-control, and similar non-residential environments. Equipment meeting Class A requirements may not provide adequate protection to broadcast services in a residential environment.

United States — Federal Communications Commission

FCC ID: **TIAPX150**

This device complies with part 15 of the FCC Rules, including part 15.255 for field disturbance sensors. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Houston Radar LLC could void the user's authority to operate the equipment.

FCC RF Exposure

This equipment complies with FCC radiation exposure limits for an uncontrolled environment when installed and operated as instructed.
This equipment must be installed and operated with a minimum separation distance of **20 cm** between the radiator and all persons.
The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.
End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Canada — Innovation, Science and Economic Development

ISED Certification No. / IC: **21838-PX150**
HVIN: **PX150**
PMN: **PX150**

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s), including RSS-210. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

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 exempts 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.

ISED RF Exposure

This device complies with ISED RSS-102 RF exposure requirements for an uncontrolled environment when installed and operated as instructed. This equipment must be installed and operated with a minimum separation distance of **20 cm** between the radiator and all persons.

Cet appareil est conforme aux exigences d’ISDE RSS-102 relatives à l’exposition aux radiofréquences dans un environnement non contrôlé lorsqu’il est installé et utilisé conformément aux instructions. Cet équipement doit être installé et utilisé avec une distance minimale de **20 cm** entre le radiateur et toute personne.

Canada — RSS-210 57–71 GHz Aircraft and Satellite Restrictions

PX150 is not intended for aircraft or satellite use. For devices certified under RSS-210 Annex J, the following restrictions apply:

Devices certified under this annex are not permitted to be used on satellites. Devices used on aircraft are permitted only under the following conditions:

1. Except as allowed below, devices are only to be used when the aircraft is on the ground.
2. Devices used in-flight are subject to the following restrictions:
    1. They shall be used within closed, exclusive on-board communication networks within the aircraft.
    2. They shall not be used in wireless avionics intra-communication (WAIC) applications where external structural sensors or external cameras are mounted on the outside of the aircraft structure.
    3. They shall not be used on aircraft equipped with a body/fuselage that provides little or no RF attenuation, except when installed on unmanned air vehicles (UAVs) and complying with RSS-210 Annex J requirements.
    4. Devices operating in the 59.3–71.0 GHz band shall not be used unless they meet all of the following conditions:
        1. They are field disturbance sensors (FDS).
        2. They are installed within personal portable electronic devices.
        3. They comply with the relevant requirements in RSS-210 J.3.2(a), J.3.2(b), and J.3.2(c).

Environmental and Reliability Testing

PX150 and compatible Houston Radar field interface boxes have been tested for environmental and traffic-control installation requirements as follows:

Ingress protection: Tested to IEC 60529:2020 IP66. The tested units passed IP6X dust testing and IPX6 water-jet testing with no dust intrusion and no water intrusion observed.

Traffic-control environmental testing: Tested to NEMA TS-2-2021 v03.08. The tested PX150, FIB-100-0007, and FIB-100-0008 configurations completed the documented temperature, vibration, shock, and transient tests with no failures.

NEMA 250 enclosure testing: Tested to NEMA 250-2008. The tested PX150, FIB-100-0007, and FIB-100-0008 configurations passed outdoor dust, external icing, hose down, and 600-hour salt-spray corrosion testing, with no dust or water intrusion observed.

Surge immunity: Tested to NEMA TS-2: 2.2.7.2 Test B: Transient Tests (Power Service), and IEC 61000-4-5—Surge Immunity Testing.

Notes

Specifications are subject to change without notice.
Houston Radar is not liable for typographical errors or omissions.

LIMITATIONS OF LIABILITY; NOT A FAIL-SAFE OR LIFE-SAFETY DEVICE

IMPORTANT SAFETY NOTICE: The Houston Radar PX150 radar product, including any related hardware, firmware, software, documentation, outputs, data, detections, measurements, or communications, **is not designed, manufactured, certified, warranted, or intended for use as a fail-safe device or as a component of any fail-safe, life-safety, emergency-response, medical, aviation, nuclear, hazardous-location, personal-protection, collision-avoidance, or other safety-critical system**.

The Product must **not be used** in any application, installation, environment, or system where **failure of the Product, inaccurate detection, delayed detection, missed detection, false detection, degraded performance, loss of communication, power loss, software error, configuration error, environmental interference, or other malfunction could reasonably be expected to result in personal injury, bodily harm, death, property damage, environmental damage, or other catastrophic loss**.

The Product is intended only for the applications expressly described in this User Manual and applicable product documentation. The Product does not replace the need for trained personnel, engineering judgment, independent verification, redundant safety systems, physical safeguards, signage, barriers, alarms, interlocks, supervision, maintenance, or compliance with applicable laws, codes, regulations, and industry standards.

Users, installers, integrators, resellers, and system designers are solely responsible for determining whether the Product is suitable for any particular use or application, for properly installing and configuring the Product, for validating Product performance under actual operating conditions, and for implementing any necessary backup, redundancy, monitoring, warning, maintenance, and safety measures.

To the fullest extent permitted by applicable law, **Houston Radar and its officers, directors, employees, agents, suppliers, distributors, and affiliates shall not be liable for any direct, indirect, incidental, special, consequential, exemplary, punitive, or other damages arising out of or related to the selection, installation, configuration, use, misuse, inability to use, malfunction, failure, or performance of the Product, including without limitation damages for personal injury, death, property damage, lost profits, loss of data, loss of business, downtime, interruption of operations, or claims by third parties, even if Houston Radar has been advised of the possibility of such damages.**

Except to the extent expressly stated in a written warranty issued by Houston Radar, the **Product is provided "AS IS" and "WITH ALL FAULTS."** To the fullest extent permitted by applicable law, **Houston Radar disclaims all warranties, express, implied, statutory, or otherwise, including without limitation any implied warranties of merchantability, fitness for a particular purpose, non-infringement, accuracy, reliability, uninterrupted operation, or suitability for safety-critical, fail-safe, or life-safety applications.**

No employee, agent, distributor, reseller, installer, system integrator, or other person is authorized to modify this limitation or to make any representation, warranty, or guarantee that the Product is suitable for fail-safe, life-safety, or safety-critical use unless expressly stated in a written agreement signed by an authorized officer of Houston Radar.

Some jurisdictions do not allow the exclusion or limitation of certain warranties or damages. In such jurisdictions, the foregoing exclusions and limitations shall apply only to the maximum extent permitted by applicable law.

WRONG-WAY DRIVING APPLICATION LIMITATION; SECONDARY, SUPPLEMENTAL DETECTION AND DATA COLLECTION ONLY

The Houston Radar PX150 radar product may be used in wrong-way driving ("WWD") applications **only as a secondary, supplemental, non-exclusive detector for traffic monitoring, event logging, data collection, statistical analysis, engineering studies, and post-event WWD analysis**.

The Product is **not designed, manufactured, certified, warranted, or intended to prevent, mitigate, avoid, intercept or stop wrong-way driving events. The Product is not a WWD crash-prevention device, WWD mitigation device, WWD avoidance device, life-safety device, or fail-safe device**.

The Product must not be used as the sole, primary, or authoritative detector or decision source for any WWD prevention, mitigation, avoidance, warning, enforcement, emergency-response, or traffic-control function. Without limiting the foregoing, the Product must not be used as the sole or primary means to activate or control warning signs, flashing beacons, dynamic message signs, ramp gates, barriers, signals, traffic-control devices, law-enforcement alerts, emergency-response alerts, vehicle-control systems, or any other action intended to prevent, mitigate, avoid, or respond to a WWD incident or crash.

Any use of the Product in or near a WWD system is at the sole risk and responsibility of the purchaser, installer, integrator, system designer, operator, and

end user. Such parties are solely responsible for determining whether the Product is suitable for their intended use; designing the overall system architecture; providing independent detection, verification, redundancy, supervision, maintenance, and fail-safe mechanisms; validating system performance under actual operating conditions; and complying with all applicable laws, regulations, standards, specifications, agency requirements, and engineering practices.

The Product **may fail to detect a wrong-way vehicle, may generate false detections, may generate delayed detections, may lose communication, may be affected by installation conditions, configuration, alignment, weather, obstructions, environmental interference, adjacent traffic, roadway geometry, power loss, software or firmware errors, maintenance condition, or other factors. No detection, output, message, relay, data stream, or other signal from the Product should be relied upon as proof that a WWD event has or has not occurred, or as the basis for any action where failure, delay, or error could result in personal injury, death, property damage, or roadway hazard.**

To the fullest extent permitted by applicable law, Houston Radar disclaims any and all responsibility and liability arising out of or related to any WWD crash, WWD incident, failure to prevent or mitigate a WWD event, failure to warn a wrong-way driver or other motorists, failure to notify law enforcement or emergency responders, failure or delay of any traffic-control or warning device, or any use of the Product in a WWD prevention, mitigation, avoidance, warning, enforcement, emergency-response, or traffic-control system.

No person or entity is authorized to represent that the Product is suitable for WWD crash prevention, WWD mitigation, WWD avoidance, life-safety use, fail-safe use, or any other safety-critical use unless such representation is expressly stated in a separate written agreement signed by an authorized officer of Houston Radar.

All references in this User Manual to wrong-way driving, "WWD," WWD detection, WWD configuration, WWD outputs, WWD events, WWD alarms, WWD alerts, or similar terms are subject to and limited by this Wrong-Way Driving Application Limitation. Such references are provided solely to describe secondary detection, supplemental monitoring, event logging, data collection, statistical analysis, engineering-study, and post-event analysis capabilities, and shall not be construed as representing, authorizing, or implying that the Product is suitable for, or may be used for, WWD crash prevention, WWD mitigation, WWD avoidance, life-safety use, fail-safe use, warning control, enforcement, emergency response, traffic control, or any other safety-critical function except as expressly stated in a separate written agreement signed by an authorized officer of Houston Radar.

Product Overview

What PX150 Is

The Houston Radar PX150 is a non-intrusive traffic detection sensor designed for intersection and roadway monitoring and data collection applications. PX150 tracks vehicle position, speed, and direction of travel. It is designed for both portable and permanent above-ground installations where reliable vehicle detection and traffic data collection are required.

Examples of Supported Applications

Typical PX150 applications include:

- Stop bar vehicle detection
- Vehicle queue detection and queue length measurement
- Wrong-way driver (WWD) detection except as WWD mitigation or avoidance system. See disclaimer above.
- Turning movement counting
- Traffic data collection including per lane counts and speed (classification in future).
- Event-based camera triggering including speeding and stop light violation

Key Capabilities

- **Long-range, wide-area tracking**
  Tracks vehicles up to 300 ft (90 m) away with a 100° horizontal field of view.
- **Reliable operation in challenging visibility conditions**
  Operates independently of ambient lighting and performs consistently in rain, fog, dust, sun glare, and heavy shadows.
- **High traffic capacity**
  Detects and tracks up to 256 vehicles simultaneously, making it suitable for complex, high-volume intersections.
- **Flexible lane and zone configuration**
  Supports up to 16 user-defined lanes with up to 8 detection zones per lane, for a total maximum of 128 detection zones.
- **Exclusion zones**
  Allows users to mask areas that should be ignored by the sensor.
- **Comprehensive traffic data**
  Logs individual vehicle position, speed, direction, and lane assignment, while also calculating aggregate statistics such as counts, occupancy, headway, gap, and average speed.
- **Stand-alone data storage**
  Stores traffic data for up to 1,000,000 vehicles locally, allowing continued data collection even when a continuous network connection is not available.
- **Integrated camera**
  Includes a built-in HD camera for snapshots, visual verification during installation and event recording during operation. Live video is available when supported network options are installed.

System Architecture and Operation

The PX150 is a self-contained unit that integrates radar sensing, onboard processing, detection logic, local data storage, a sighting camera, and communications into a single compact housing.

Once mounted above or beside the roadway, the sensor detects vehicles entering its field of view and processes all target tracking, lane assignment, and zone activation internally. No external processor is required for normal operation. Based on this onboard logic, the PX150 can activate user-defined outputs, log historical traffic data, and trigger external devices.

Interfaces and Connectivity

The PX150 provides flexible connectivity to support a variety of installation and integration requirements.

Standard interfaces

- RS232 / RS422 / RS485 serial communications
- Bluetooth for local setup and maintenance
- Two hardware trigger outputs

Optional interfaces

- Ethernet with passive Power over Ethernet (PoE)
- Wi-Fi
- 4G cellular modem with GPS

Software and Deployment Ecosystem

Users configure lanes and zones, verify alignment, and monitor real-time targets using the companion Windows software. A light-weight Android app is also available for field installation and maintenance access.

For deployments requiring centralized management, the PX150 can integrate with the optional Tetryon cloud platform to send data to a central server or cloud-hosted system for storage, reporting, and remote access.

Typical deployment models include:

- **Stand-alone local**
  Installed at the roadside and accessed locally for setup, monitoring, and periodic data retrieval.
- **Connected field**
  Connected directly to customer systems or local traffic controllers through serial, trigger, or Ethernet interfaces.
- **Remote managed**
  Uses optional network connectivity to transmit real-time and historical data to remote management platforms such as Tetryon.

How PX150 Detects Traffic

MIMO FMCW Radar Operation

PX150 uses **60 GHz-band MIMO FMCW radar** to detect and track vehicles within its field of view. **FMCW** stands for **frequency-modulated continuous wave**. In this type of radar, the transmitted signal changes frequency in a controlled linear pattern over time.

When the transmitted signal reflects from a vehicle and returns to the radar, it arrives with a time delay relative to the transmitted signal. PX150 compares the transmitted and received signals to measure that delay and determine the target's **distance** from the radar. If the target is moving, the returned signal also contains a **Doppler shift**, which is used to determine the target's **speed** and **direction of travel**.

PX150 uses multiple transmit and receive antennas to form a **virtual antenna array**. By comparing the phase of the received signal across this array, the radar estimates the **azimuth angle** of each target, or its horizontal position within the field of view. This allows PX150 to determine not only how far away a vehicle is, but also where it is located across the roadway.

By combining **range**, **speed**, and **angle** measurements, PX150 can locate and track multiple vehicles at the same time.

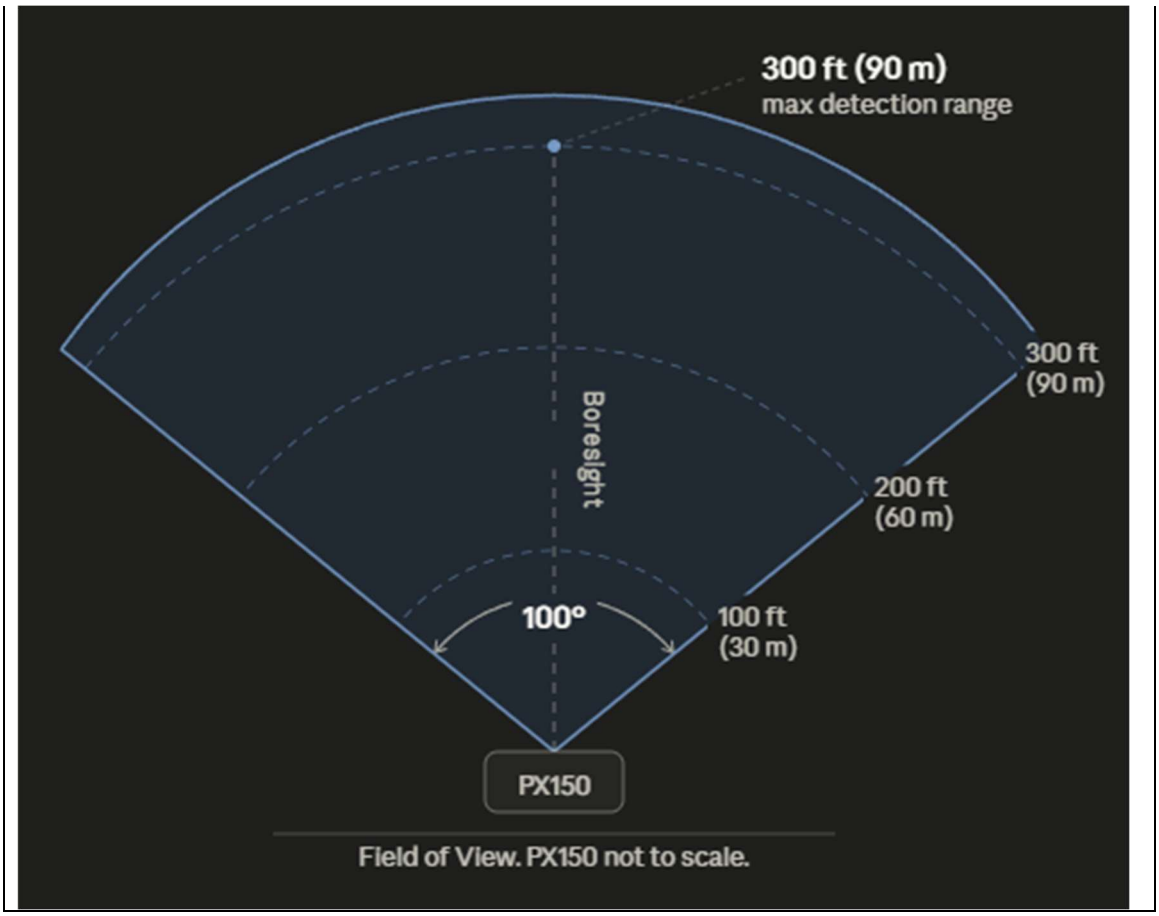
Radar Field of View (FOV)

PX150 detects both moving and stationary vehicles within its field of view. The field of view is approximately a sector-shaped coverage area with:

- a 100° horizontal coverage angle
- a 30° vertical coverage angle
- a maximum detection range of 300 ft (90 m)

This coverage area extends outward from the radar **boresight**, or forward pointing direction, and covers the roadway area in front of the sensor. Actual usable coverage depends on the mounting location, aiming, roadway geometry, and the reflectivity of the vehicles being detected.

Figure 1



Radar Pointing and Camera View

PX150 includes an integrated camera to assist with installation and alignment. During setup, the camera view should include all roadway areas where vehicle detection is required.

The camera image is an alignment aid, but radar coverage is not identical to the visible camera image. Final confirmation of coverage should always be based on observed radar targets and detection performance.

Target Tracking

PX150 does not simply report raw radar echoes. It uses sophisticated onboard target-tracking algorithms to combine repeated radar measurements over time into stable vehicle tracks.

This allows the sensor to:

- Detect and follow multiple vehicles simultaneously
- Estimate each vehicle's position, speed, and direction
- Distinguish separate vehicles within the same field of view

- Maintain vehicle tracks as they move through the monitored area
- Support lane assignment, detection zones, and traffic-data generation

Tracking performance is especially important in intersection applications, where vehicles may stop, start, queue, turn, or move through adjacent lanes at the same time. Because PX150 detects and tracks both moving and stationary vehicles, it is well suited for applications involving queueing traffic, stop bar presence, and turning movement monitoring.

From Tracking to Traffic Detection

After vehicles are detected and tracked, PX150 applies user-defined lane and detection zone logic to determine traffic events and statistics. This processing is performed onboard in the sensor. The resulting data can then be used for local outputs, data logging, external integration, or remote reporting.

What Affects Detection Performance

The following factors influence how well a target is detected under real-world conditions.

Target Reflectivity

Different vehicles reflect microwave energy differently. This is commonly described by **radar cross section (RCS)**. Large vehicles such as trucks typically reflect more energy than smaller vehicles such as motorcycles, bicycles, or vehicles viewed at less favorable angles. As a result, larger targets may be detected more easily near the outer edges of the field of view than smaller targets.

Maximum Detection Range

PX150 has a fixed maximum detection range determined by its radar design. Even very strong targets cannot be detected beyond this limit. The maximum range is **300 ft (90 m)**.

Mounting and Aiming

Sensor height, setback, tilt, and horizontal aiming all affect how the field of view overlaps the roadway. Improper mounting or pointing may reduce usable coverage or cause areas of interest to fall outside the effective detection region. Utilizing unstable mounting platform may also have detrimental effect on tracking performance.

Roadway Environment

Detection performance can also be affected by roadside objects, guardrails, tunnels, gantries, signs, parked vehicles, large reflective surfaces, and other sources of unwanted reflections or blockage.

Definitions

Targets

A **target** is an object detected and tracked by the radar.

In traffic applications, a target is usually a vehicle, motorcycle, or bicycle. In some situations, the radar may also detect pedestrians or other objects.

The PX150 tracks targets while they are within the radar's field of view. For each target, the radar can report information such as its position, speed, and direction of travel.
A target may be moving or stopped. Once the radar is tracking a target, it will continue to report that target as long as the target remains detectable.

Tracks
A **track** is the historical record of a target's position, heading, and speed over time. Rather than treating each radar return as a separate event, the radar associates repeated measurements to form a stable track for each target. This allows the radar to follow a target as it moves through the field of view, whether it remains within a single lane or moves from one lane to another.
Tracks allow the radar to distinguish between multiple targets simultaneously and support higher-level functions such as lane assignment, zone activation, queue detection, and turning movement counting.

Lanes
A **lane** is a user-defined traffic path on the roadway.
During setup, lanes are drawn in the configuration software to match the actual paths followed by vehicles through the radar's field of view. For best performance, the configured lanes should match the real roadway lanes and traffic paths as closely as practical.
Lanes provide the roadway reference used when placing detection zones. The radar's user-facing outputs, such as presence, counts, stop-bar detection, queue detection, and triggers, are reported by **detection zones** placed within and associated with lanes.
This allows the radar to report activity based on the specific area being monitored, even when vehicles turn, cross lane boundaries, or change lanes within the radar's field of view.

Detection Zones
A **detection zone** is a user-defined area placed within a lane to detect and report traffic activity. Each zone spans the full width of its containing lane, and its length is user configurable.
A detection zone may be vehicle-activated, based on individual tracked vehicles parameters, or interval-activated, based on aggregate measurements such as occupancy or average speed.
The configuration software includes track filtering tools that show regions where vehicles come to a stop and regions where vehicles are moving. These displays help the user identify where to place zones for monitoring traffic activity.
Detection zones support applications such as stop bar detection, queue detection, wrong-way detection, turning movement counting, and traffic data collection.
Zone activations can be transmitted to a traffic controller or external equipment using one of the supported communication or hardware interfaces.
In this manual, when we use "zone" without qualifier, it is assumed to be a "detection zone".

Exclusion Zones

An **exclusion zone** is a user-defined area that tells the radar to ignore detections originating from a specific part of the field of view. Exclusion zones are used to reduce nuisance detections from areas that are not part of the intended traffic monitoring area.
Typical uses for exclusion zones include:

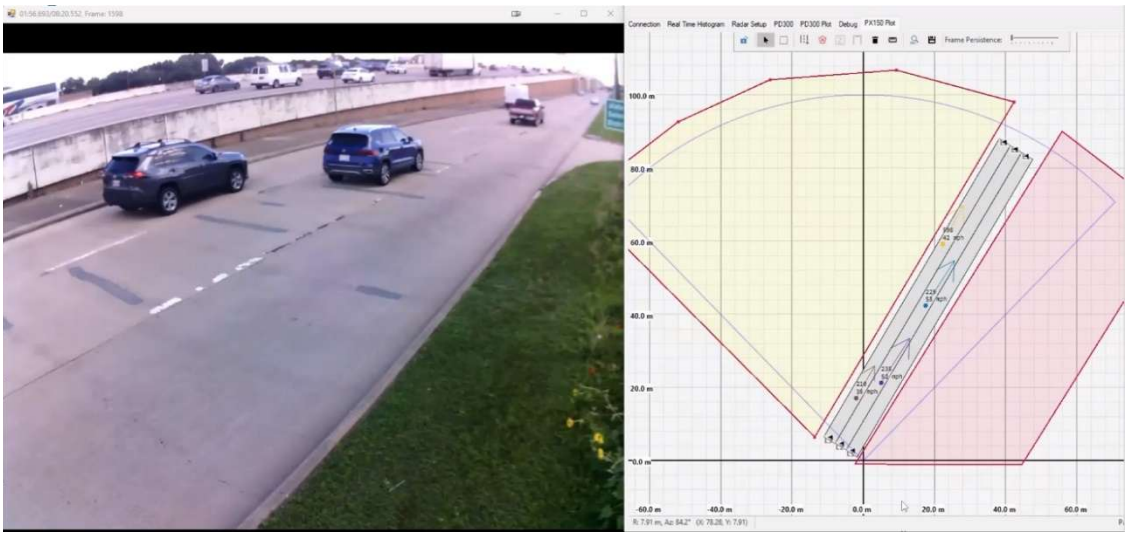
- nearby driveways or gas stations
- roadside activity outside the roadway of interest
- strong reflections from large flat surfaces
- known areas of unwanted or misleading detections

Exclusion zones improve system performance by preventing unwanted targets from interfering with lane-based detection and traffic data collection.

Note: Targets originating in an exclusion zone continue to be excluded even if they travel outside of the exclusion zone and into detection zones.

Figure 2

Typical exclusion-zone example. The configured exclusion zones limit monitoring to the feeder road while excluding the main lanes, multipath reflections from the concrete wall behind the feeder, and reflections from the large traffic sign on the right



Stop Bars

A **stop bar** is a user-defined reference line in the configuration software that represents the stopping location for vehicles at an intersection approach. Stop bars are used as a visual and setup aid when defining lanes and detection zones.
The stop bar itself does not affect radar operation. Instead, it provides a convenient reference for placing zones and configuring applications such as stop bar presence detection and queue monitoring.

Practical Relationship Between These Elements

These terms are related as follows:

- The radar detects **targets**.
- Repeated detections of the same target form a **track**.

- Tracks are associated with user-defined **lanes**.
- **Detection zones** are placed within lanes to monitor traffic activity.
- **Exclusion zones** are used to ignore unwanted areas.
- **Stop bars** provide a visual reference for placing lanes and zones.

Understanding these elements is important before proceeding to alignment, lane setup, and application configuration.

Site Planning and Installation Design

Achieving full PX150 performance depends on proper site planning and sensor placement. Before installation, review the roadway geometry, available mounting locations, expected traffic patterns, power availability, communications method, and any external systems that must interface with the sensor.

PX150 should be installed where it has a clear view of the traffic movements to be monitored and where the mounting structure is rigid enough to prevent excessive movement. The sensor is intended to observe vehicles over a usable track length rather than only at a single point. In most traffic applications, better results are obtained when the radar is aimed into the traffic flow at an oblique angle rather than directly across it. During site planning, verify that the selected mounting location provides:

- a stable mounting structure
- adequate height to reduce occlusion
- a clear view of all lanes or movements of interest
- practical cable routing and access for service
- available power and communications infrastructure
- a suitable integration path to any controller, recorder, or cloud-connected system

The integrated camera is a useful planning aid. As a practical rule, if the camera view does not adequately show the vehicles or roadway area of interest, radar performance is also likely to be limited at that location.

PX150 is intended for above-ground roadside and intersection monitoring applications. It should not be installed in tunnels or other enclosed environments where strong microwave reflections can create persistent ghost targets.

When to Use One, Two, or Four Sensors

The number of PX150 sensors required for an installation depends on the size and geometry of the intersection, the number of approaches to be monitored, and the specific applications to be supported. In general, PX150 deployments follow three common patterns.

One-Sensor Installations

A single PX150 sensor may be sufficient when monitoring a limited area or a single traffic movement. This type of installation is commonly used for applications such as:

- wrong-way driver detection (see important section “WRONG-WAY DRIVING APPLICATION LIMITATION; SECONDARY DETECTION AND DATA COLLECTION ONLY”)

- monitoring a single approach
- mid-block or partial-intersection coverage
- targeted data collection for a specific traffic movement

A one-sensor installation is most appropriate when the required coverage area is limited and all lanes or movements of interest can be observed reliably from one mounting location.

Two-Sensor Installations

Small to medium-sized four-way intersections can often be covered using two PX150 sensors in a diagonal (catty-corner) arrangement, with each sensor monitoring two approaches.

This arrangement can reduce system cost and simplify installation while still providing broad intersection coverage. It is often a practical choice when:

- the intersection is compact enough for each sensor to view two approaches effectively
- mounting locations provide clear visibility across the intersection
- the required applications do not demand a dedicated sensor for every approach

Figure 3

Catty-Corner Installation

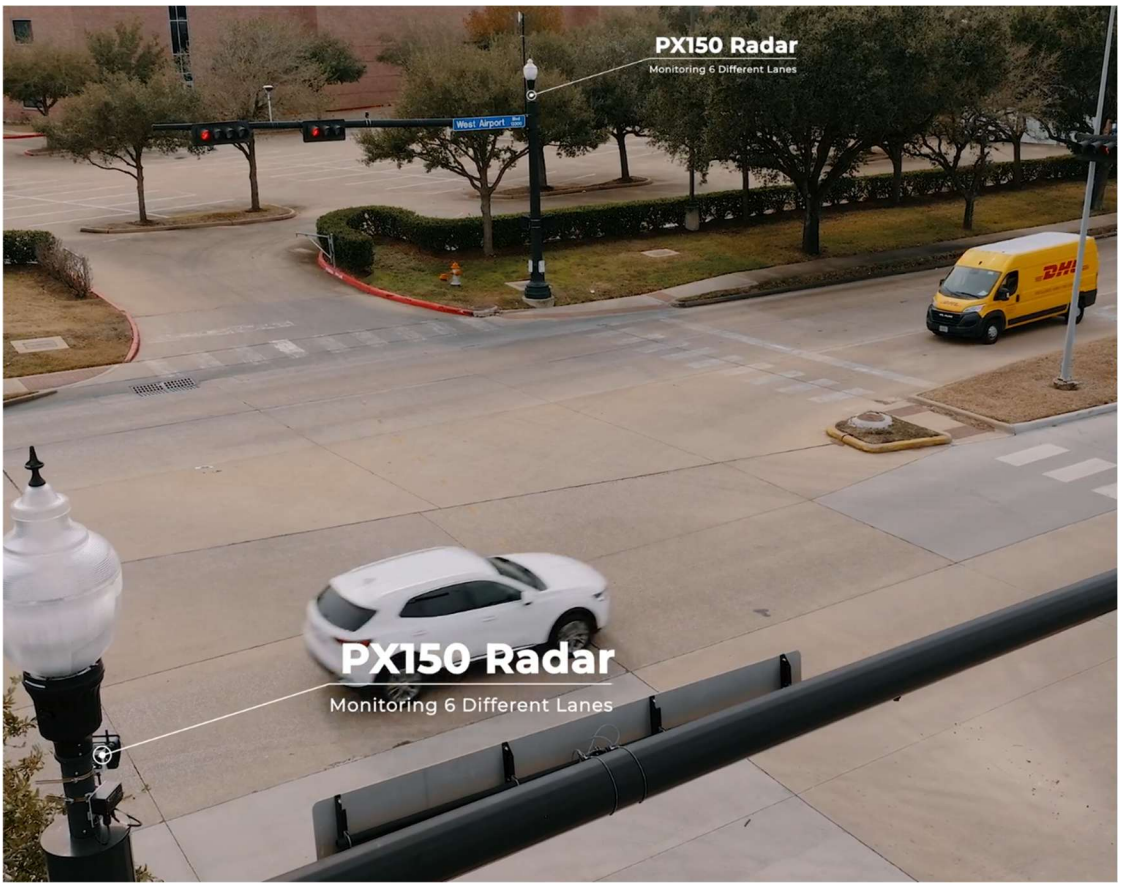
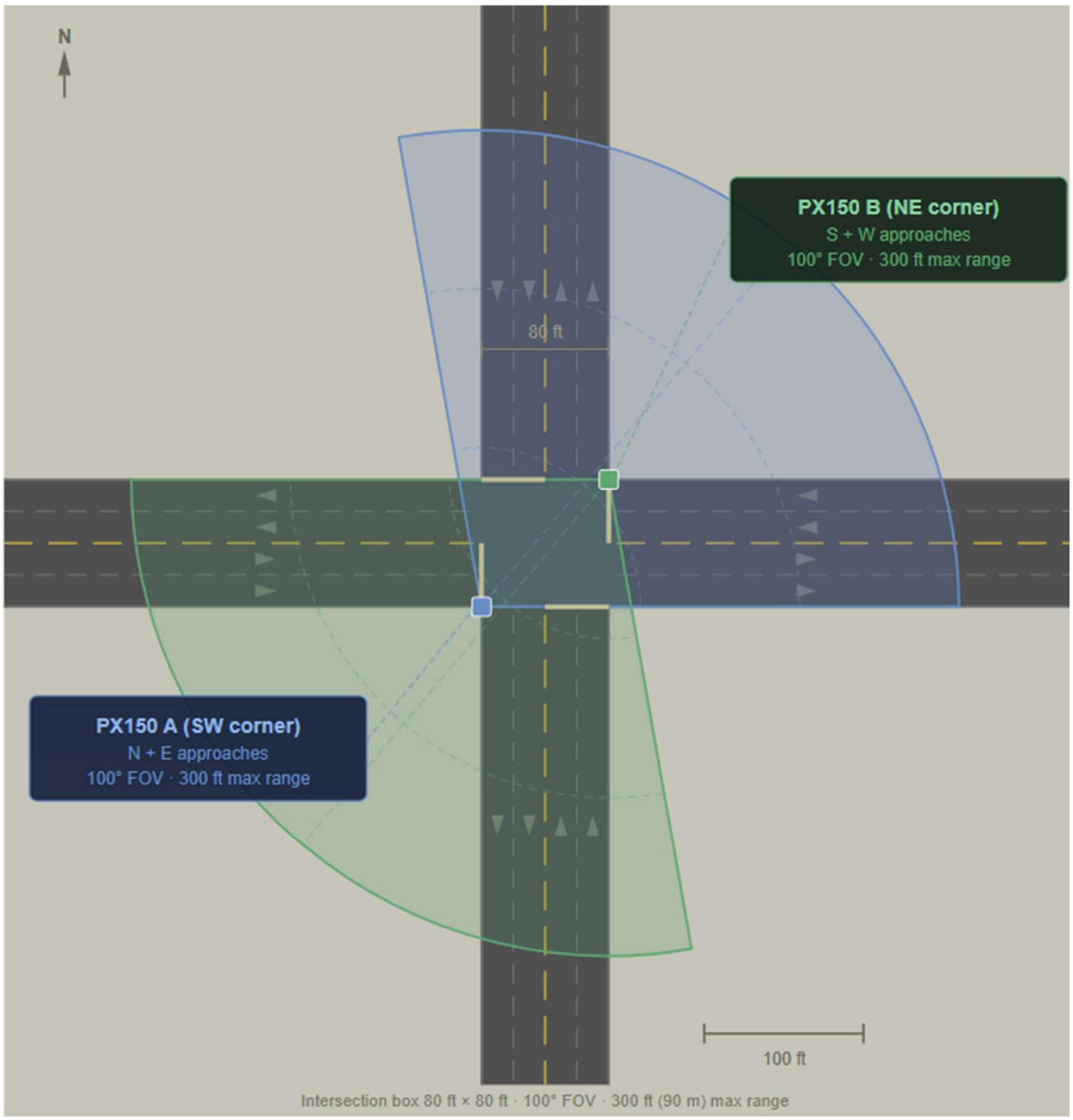


Figure 4



Four-Sensor Installations

Large intersections typically require four sensors, with one sensor assigned to each approach. This provides the best coverage and the greatest flexibility for lane definition, zone placement, and application setup.

A four-sensor layout is generally recommended when:

- the intersection has wide or multiple approaches
- long detection range is needed on each approach
- visibility across the intersection is limited
- precise per-approach coverage is required

Figure 5

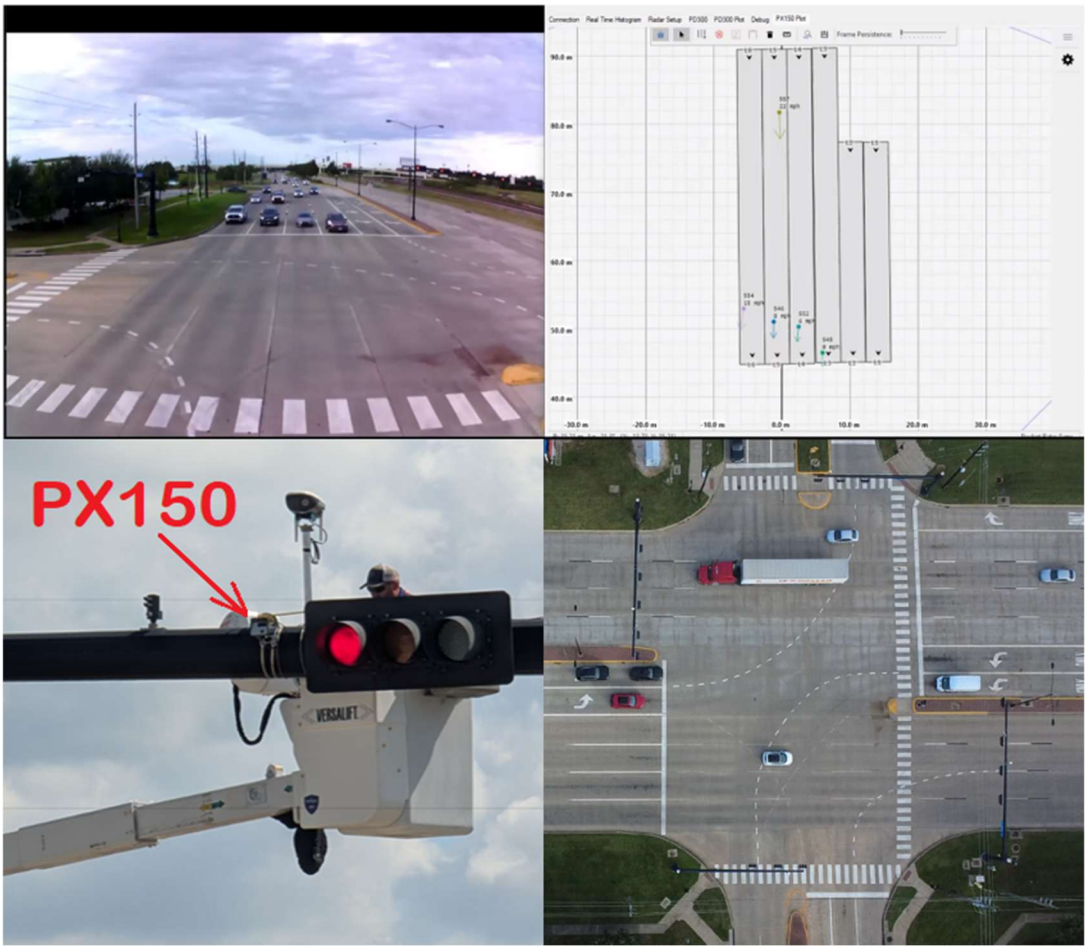
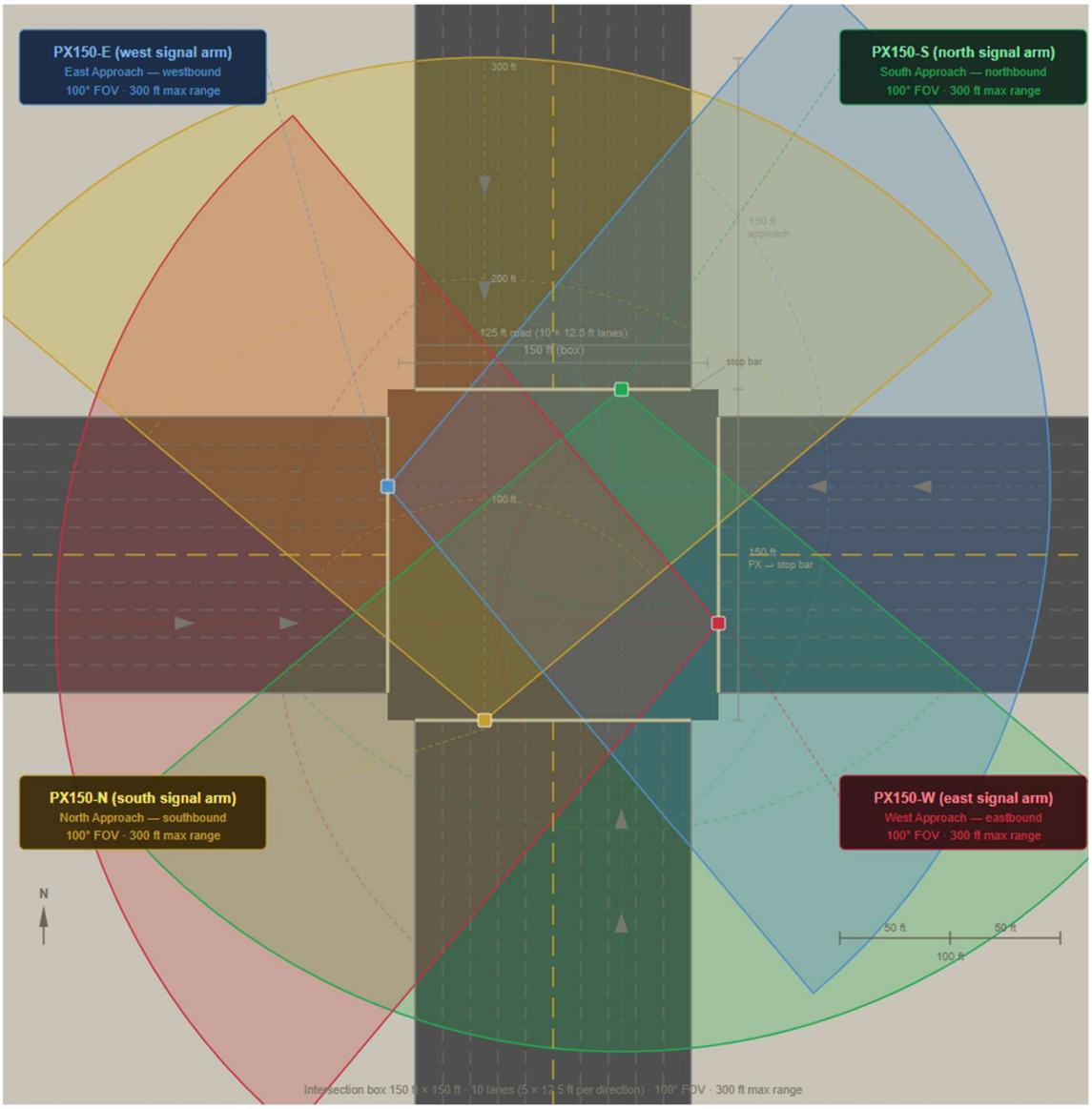


Figure 6



Choosing the Right Configuration

The examples above are typical deployment models, but the correct number of sensors should always be based on the actual site conditions. Important factors include:

- intersection size and shape
- number of lanes and turning paths
- available mounting locations
- required coverage distance
- presence of obstructions or clutter
- required applications, such as stop bar detection, queue detection, turning movement counting, or wrong-way detection

As a general rule, use the fewest sensors that still provide reliable coverage of all required traffic movements. If one sensor cannot clearly observe all required areas, additional sensors should be used.

Recommended Mounting Locations

PX150 may be mounted in a variety of field locations, provided the mounting structure is rigid and the sensor has a clear view of the required traffic area. Acceptable mounting locations may include signal poles, mast arms, roadside poles, lighting poles, and similar fixed roadside structures.

The most important requirement is mounting stability. Avoid mounting locations that sway, vibrate excessively, or shift in the wind. For example, swaying wire-mounted installations are not supported because sensor motion can severely degrade tracking performance and create inconsistent detections.

For intersection applications, mounting positions should be selected to maximize visible vehicle track length while minimizing blockage from large vehicles, roadside structures, or nearby objects. In some cases, a short extension pole mounted above a mast arm can improve visibility and reduce occlusion.

Do not select mounting locations that place the sensor in enclosed or highly reflective environments, such as tunnels, where multipath reflections are difficult to control.

Height, Setback, Offset, and Field of View

For most intersection applications, a mounting height of **20 to 25 ft (6 to 7.5 m)** is recommended. This height range usually provides good visibility of approaching traffic while reducing occlusion caused by tall vehicles such as trucks and buses. In some applications, lower mounting heights may still be acceptable. For example, installations as low as approximately **12 ft (3.7 m)** may perform reasonably in certain wrong-way detection applications where coverage requirements are limited.

If additional height is needed, a **3 to 6 ft extension pole** above the mounting structure may improve visibility and usable track length.

PX150 should generally be aimed to observe traffic at an oblique angle rather than in an exact side-fire orientation. A viewing angle of **0-45 degrees into the traffic flow** often provides longer target tracks and more useful detection geometry than a purely side-looking installation.

The minimum detectable range is approximately **5 ft (1.5 m)**. Targets closer than this are outside the normal detection region and are not detected.

The sensor should be tilted downward so that the available vertical field of view is used efficiently. For many situations, a tilt of about -9° represents a good starting point. If the sensor is not tilted enough, a large portion of the usable radar field of view may be wasted above the roadway. If it is tilted too much, distant track length may be reduced.

The integrated camera can assist with aiming, but the camera's vertical field of view is wider than the radar's vertical field of view. For that reason, final aiming should be confirmed using observed radar targets and target tracks, not camera view alone.

Occlusion, Clutter, Reflections, and Non-Ideal Geometry

PX150 performs best when it has a clear, unobstructed view of the roadway area being monitored. Objects that block the camera view often also reduce radar visibility, although the exact effect may depend on the object and installation geometry.

Occlusion

Occlusion occurs when an object blocks the radar's view of vehicles or roadway areas behind it. Common sources of occlusion include:

- trucks and buses in near lanes
- signal poles and mast-arm hardware
- large roadside signs
- cabinets
- tree branches or vegetation
- pedestrian signal heads and similar roadside equipment

Installing the sensor at a higher elevation usually helps reduce occlusion and improves visibility into farther lanes or across the intersection.

Clutter and Reflections

Radar clutter and multipath reflections can create nuisance detections or ghost targets. Strong reflection sources include:

- large flat metal signs
- guardrails
- fences
- metal cabinets
- flat building surfaces
- parked trucks or trailers
- curb and wall combinations
- two surfaces meeting at approximately 90 degrees, which can act as a corner reflector

Large flat metal objects can behave like mirrors for microwave energy and create reflected detections away from the true target location. Corner-like structures can produce especially strong reflected returns. Large trucks can also contribute to multipath effects because their sides provide strong reflections that can interact with nearby scene features. PX150 includes multipath mitigation filtering to reject most ghost targets, but no radar installation is completely immune to strong reflection environments. Good mounting location and aiming remain important.

Non-Ideal Geometry

Installations with unusual roadway geometry may require additional aiming adjustment or additional sensors to achieve full coverage. Final sensor placement should always be confirmed using live target displays and observed vehicle tracks.

Practical Guidance

To reduce nuisance detections:

- avoid aiming directly at large reflective surfaces
- avoid enclosed environments such as tunnels
- use exclusion zones where needed to mask nuisance areas
- choose mounting locations that maximize roadway visibility and minimize nearby reflective clutter
- verify performance during setup using live target displays and recorded target tracks

Pre-Installation Site Survey Checklist

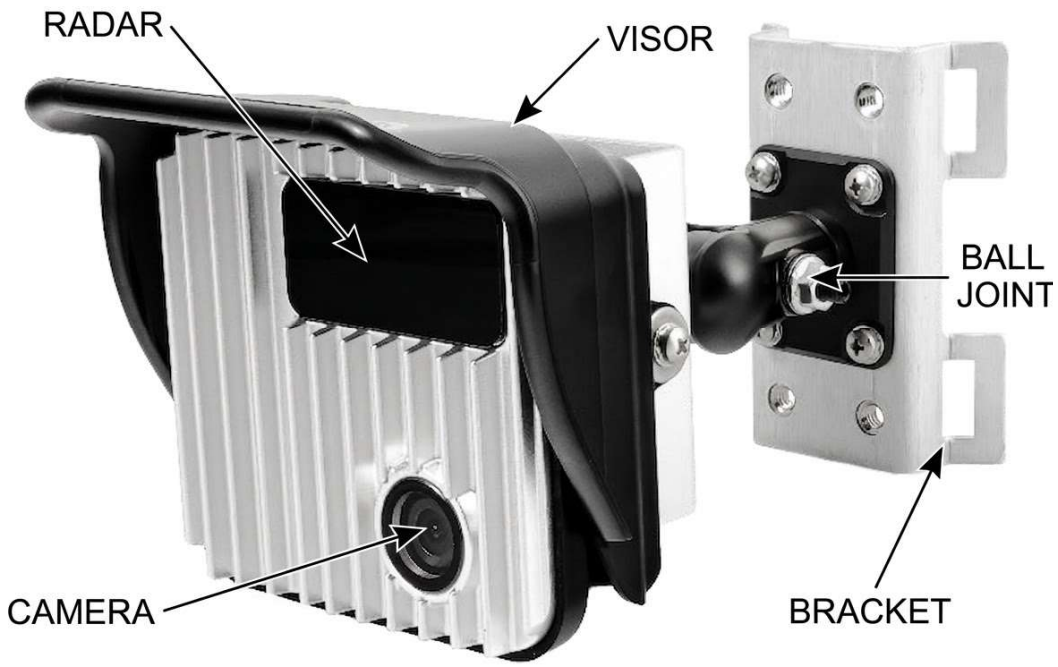
Before installing PX150, confirm the following:

- rigid mounting location is available
- mounting height is suitable for the application, typically **20 to 25 ft (6 to 7.5 m)** for intersection coverage
- selected location provides a clear view of the lanes or movements to be monitored
- camera view reasonably covers the roadway area of interest
- planned aiming direction provides adequate vehicle track length
- no tunnel or similarly enclosed reflective environment is involved
- major sources of occlusion have been identified
- major reflective clutter sources have been identified
- power is available:
    - **12 to 24 VDC** (nominal) direct power, or
    - local AC mains for the AC/DC power supply, or
    - passive PoE injector where applicable
- communications method has been selected:
    - serial
    - Bluetooth
    - Ethernet
    - cellular
    - hardware triggers
- cable routing path and interface-box location have been identified
- any controller, external camera, or trigger-output integration needs have been identified
- safe access is available for installation and future service

PX150 Hardware

This chapter provides a brief overview of the PX150 hardware. It describes the sensor enclosure, primary external interface, physical size, and available junction-box options. Detailed mounting, wiring, and pin assignments are covered in later chapters and appendices.

Figure 7



Sensor Exterior and Mechanical Features

PX150 is housed in a compact outdoor enclosure designed for roadside traffic-monitoring installations. The enclosure is intended for above-ground mounting on suitable field structures and protects the internal radar, camera, and electronics during normal operation.

The exterior of the sensor is designed to serve several purposes:

- weather protection
- practical field installation and aiming
- heat dissipation
- a single external connection point for power and communications

The sensor housing includes an integrated heatsink with radar window (radome), camera window, backshell with mounting interface, single M12 connector for external electrical connections and a sun/rain visor.

Connector

PX150 is equipped with a high-reliability, weatherproof **12-pin M12 female connector**. This connector carries DC power, serial communications, trigger I/O and optional Ethernet signals. Detailed pin assignments and signal descriptions are provided in **Appendix C**.

Dimensions and Mounting Interfaces

PX150 is a compact unit with dimensions of **4.2 in × 3.8 in × 2.4 in** (**106 mm × 96 mm × 62 mm**). The sensor weighs approximately **0.6 lb (270 g)**.
Its small size and low weight allow installation on a wide range of rigid roadside structures using the appropriate bracket and mounting hardware.

Junction Box Options

In many installations, it is beneficial to use a junction box mounted a short distance from the radar. A junction box provides convenient field cable termination and surge protection and allows the installer to pull bare cable, such as **CAT5e** or **Houston Radar 12-conductor cable**, instead of a pre-terminated cable.

Depending on the selected connectivity method, the following junction-box options may be used:

- **FIB-100-0007** for Ethernet-based installations
- **FIB-100-0008** for 12-conductor cable terminations and custom field wiring
- **FIB-100-0006** for cabinet-side cable termination of any cable

Alternatively, the installer may use a single end-to-end **40 ft 12-conductor cable (P/N 900-0086)** and omit the junction box. In that case, external surge protection should be added for all communication lines.
Figure 9 shows the **FIB-100-0007** Ethernet field interface box.
Figure 10 shows the **FIB-100-0008** cable field interface box.

Figure 8

PX150 Field Interface Box (FIB)

Selector Guide

	FIB-100-0007	FIB-100-0008
Used in	SDLC kits	LRC kits
Connections	Ethernet	12 Position Terminal Block
Power Source	Passive PoE	8V to 30V DC
Maximum Distance	300ft (Ethernet Standard)	4,000ft (RS422 Standard)
Connects to	Passive PoE Injector and Ethernet Switch	FIB-100-0006, Serial, Ethernet, Power
Surge Protection	Included	Included
Attachment Method	Banding	Banding
Attaches to	Mast Arm or Pole	Mast Arm or Pole
Tools Required	#2 Philips Screwdriver, RJ45 Crimper, Banding Hardware	#2 Philips Screwdriver, Mini Slotted Screwdriver (included), Banding Hardware
Cables	Customer suppled outdoor Ethernet	900-0079 or customer supplied 12 conductor outdoor cable

Figure 9

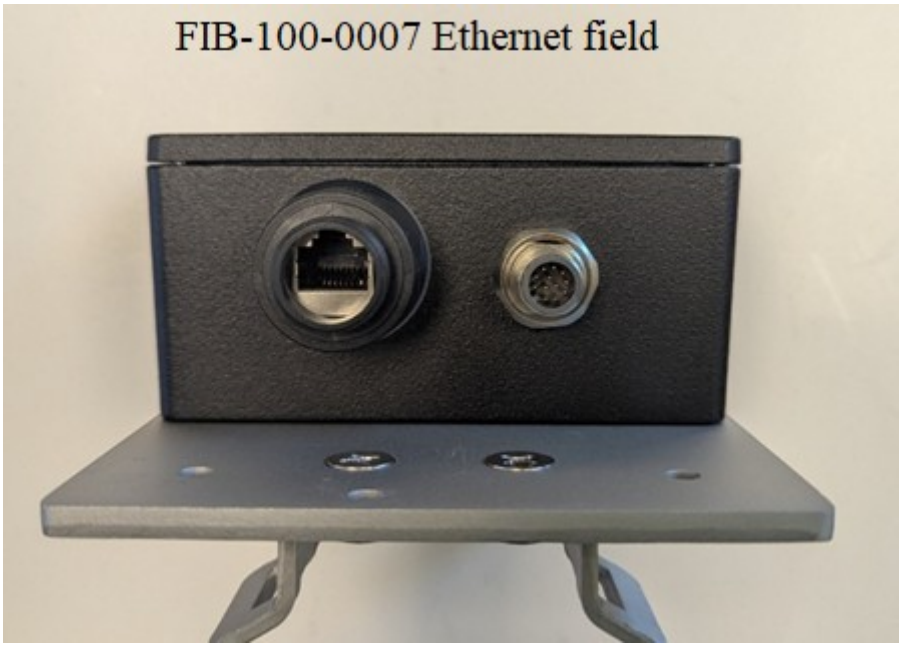
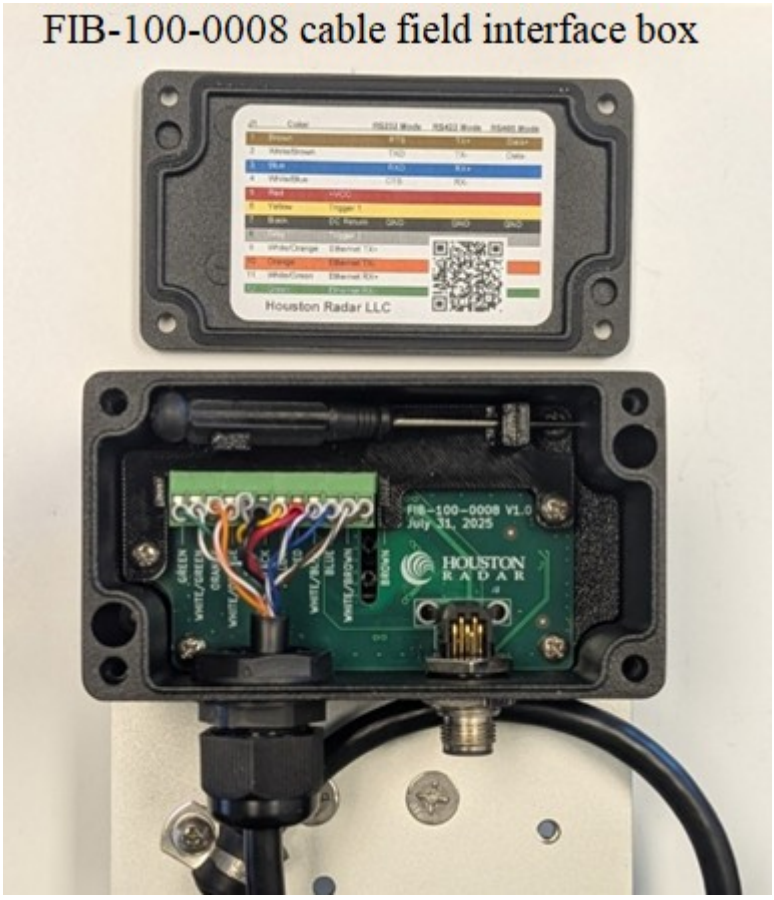


Figure 10



Mechanical Installation

This chapter describes the mechanical installation and alignment of the PX150 sensor. It covers bracket selection, mounting location, sensor orientation, field interface box placement, and mechanical alignment. Electrical wiring and software setup are covered in later chapters.
In most installations, final alignment is completed only after electrical setup is finished and the radar can be checked using the camera view, level sensor, and live vehicle tracks.
PX150 is designed for above-ground installation on rigid roadside structures such as signal poles, mast arms, lighting poles, and similar supports. For best performance, the mounting location should provide a clear view of the roadway area to be monitored and enough height to reduce occlusion from trucks, buses, signs, and other roadside objects.

Mechanical Pre-Installation Checklist

Before installing the sensor, confirm the following:

- the selected mounting structure is rigid and stable
- the planned mounting height is appropriate for the application
- the sensor will have a clear view of all lanes or movements to be monitored
- safe access is available for installation and future service
- cable routing has been planned
- any required bracket, field interface box, cable, power supply, or PoE hardware is available
- the site is not an enclosed or highly reflective environment, such as a tunnel

For most intersection applications, a mounting height of **20 to 25 ft (6 to 7.5 m)** is recommended. In some applications, such as certain wrong-way detection deployments, lower mounting heights may still be acceptable if the roadway area of interest remains clearly visible. If additional height is needed, a short extension pole above the mounting structure may improve visibility and reduce occlusion.

Mounting Hardware Options

PX150 may be supplied with either of the following pole-mount bracket options:

- **Optional small bracket (P/N KIT-PX150-0001)** for poles up to **1.5 in (38 mm)** diameter, secured using two U-bolts
- **Standard large bracket (P/N 110-0065)** for larger poles, secured using two straps

Figure 11

KIT-PX150-0001

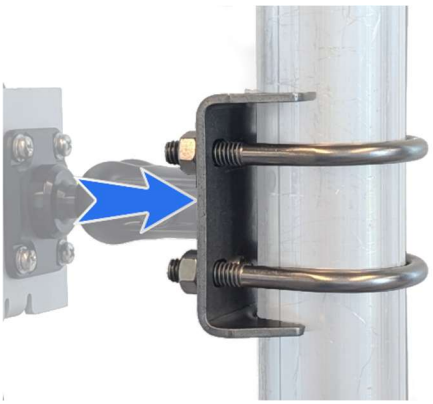
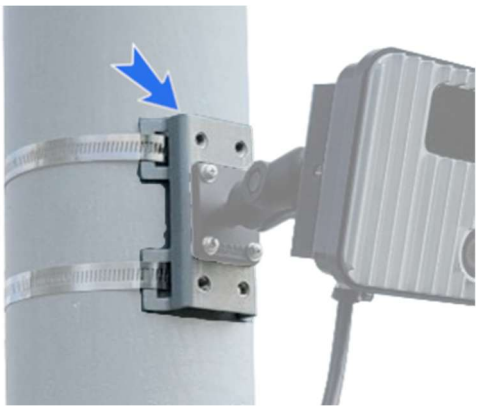


Figure 12

110-0065



The radar attaches to the bracket using the included **ball joint**, which allows adjustment of:

- horizontal pointing (**azimuth**)
- vertical pointing (**tilt**)
- roll angle

A video demonstrates how to manipulate the ball joint to point the radar in the direction you need. After alignment, the ball joint is locked using a **10 mm nut**. For temporary installations, the included thumb screw may be used instead.

Selecting the Mounting Position

Choose a mounting position that gives the sensor the clearest possible view of the intended traffic area while minimizing blockage and reflections.
When selecting the final position:

- avoid mounting on structures that sway or vibrate excessively
- avoid mount on span wires or other unstable supports if possible
- do not install the sensor in tunnels or other enclosed environments where strong reflections may create ghost targets
- select a position that maximizes visible vehicle track length
- minimize blockage from large vehicles, poles, cabinets, signs, and tree branches
- make sure the cable can be routed safely and protected from strain

As a practical rule, if the integrated camera does not adequately show the roadway area of interest, radar performance is also likely to be limited at that location.

Mounting the Sensor

Because of the PX150's compact size, the bracket, ball joint, and radar are typically installed as a pre-assembled unit.
To mount the sensor:

- secure the complete assembly using the appropriate U-bolts or straps

- tighten the mounting hardware enough to support the sensor, while still allowing final aiming adjustments
- rotate the bracket on the pole to establish the approximate pointing direction
- use the ball joint for fine adjustment of azimuth, tilt, and roll
- route the sensor cable so it is protected from abrasion, sharp edges, and unnecessary strain

The sensor face and camera window must remain unobstructed after installation. Do not position the sensor where nearby hardware or cabling can block the field of view.
The PX150 M12 connector is rated **IP67 only when properly mated** to the corresponding cable or approved mating connector. Do not leave the connector exposed after installation. If the sensor is mounted before final wiring is completed, protect the connector from moisture, dirt, and physical damage until the cable is attached. Once installation is complete, ensure the connector is fully mated and tightened properly to maintain the environmental seal.

Mounting an Optional Field Interface Box

A field interface box provides a convenient way to connect long cable runs to the radar using screw terminals or a standard RJ45 connector. Where a field interface box is used, mount it on the same pole or structure near the sensor so that the short sensor cable can reach the enclosure without tension.
The enclosure should be mounted where it remains accessible for service and where cable routing can be completed cleanly.
When mounting a field interface box:

- position it below, or approximately level with, the sensor where practical
- allow enough room to open the enclosure for service
- leave enough cable slack to allow final adjustment of the sensor position
- provide a drip loop below the sensor and below the enclosure
- use strain relief so cable weight is not carried by the connector or gland

Figure 13

Figure 14

Initial Aiming

PX150 should be aimed so that it can observe all intended traffic movements over the longest practical vehicle tracks.

Initial alignment is typically done in two stages:

- **coarse alignment** by rotating the bracket around the pole
- **fine alignment** by adjusting the ball joint

The ball joint provides three degrees of freedom: azimuth, tilt, and roll. In some cases, the ball joint body may need to be rotated to achieve the desired final pointing position.

As an initial aiming guide:

- point the sensor toward the center of the roadway area to be monitored
- tilt the sensor downward so the available vertical field of view is used efficiently
- avoid aiming too high, which wastes coverage above the roadway
- avoid aiming too low, which may reduce distant track length

A good starting point is to aim the center of the radar coverage roughly midway into the desired monitoring area. Final aiming should always be confirmed using live radar targets and target tracks.

Using the Camera for Alignment

PX150 includes an integrated camera that can be used during installation to verify pointing direction. Use the **Take Photo** function in the configuration software to capture a snapshot of the roadway scene. If the unit is equipped with Ethernet, Wi-Fi, or cellular connectivity, **live video** will also be available. **Live video** is not available through serial or Bluetooth connection.

Use the camera to confirm that:

- the intended lanes are visible
- the sensor is pointed in the correct direction
- nearby structures are not blocking the monitored area
- you are talking to a correct sensor

The camera is an important installation aid, but it is not a substitute for radar verification. The camera’s vertical field of view is wider than the radar’s vertical field of view, so final acceptance should always be based on observed radar targets and configured detection performance.

Figure 15 - View From PX150 Camera

Using the Level Sensor for Alignment

PX150 includes an onboard electronic level sensor that can be read through the configuration software. This feature should be used during installation to level the sensor relative to the roadway surface before final tightening.

To level the sensor:

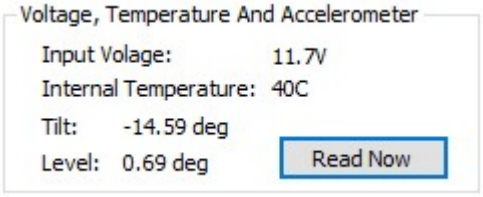
1. Connect to the PX150 using Houston Radar software.
2. Read the current level and tilt values from the onboard sensor.
3. Adjust the mounting position until the unit is level relative to the roadway.
4. If required, loosen the mounting hardware and rotate the sensor until the reported level is within the acceptable range.

As a general installation target, keep the level error within approximately **2 to 3 degrees** before final tightening. Proper leveling improves tracking performance and helps maximize usable field of view.

The level sensor interface can be accessed from **PX150 Setup > Advanced** tab.

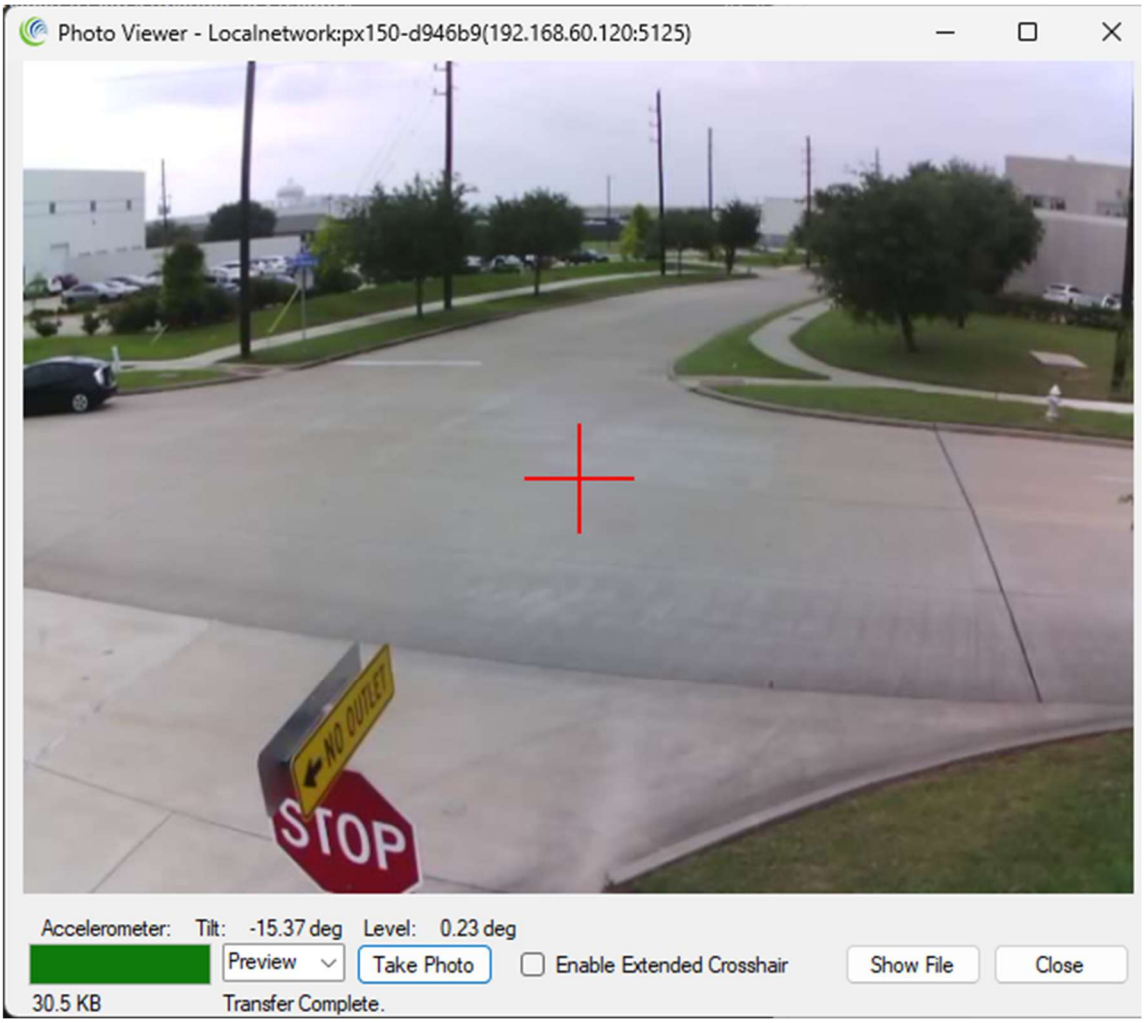
Figure 16

Level Sensor User Interface under the "PX150 Setup" -> "Advanced" tab.



The level sensor interface can also be accessed from the **Photo Viewer** (**PX150 Setup > Take Photo**).

Figure 17



Finalizing Mechanical Setup

Before leaving the site, verify the following:

- the bracket is secure
- the ball joint is locked
- the sensor is pointed in the intended direction
- the sensor is level
- the field interface box, if used, is secure and accessible
- drip loops and strain relief are in place
- cables are protected and not under tension
- the sensor face and camera window are clean and unobstructed

After completing the mechanical installation and preliminary alignment, proceed to the **Electrical Installation** chapter for power, communications, and interface wiring.

Electrical Installation

This chapter describes how to power the PX150 and connect it to external equipment for communications, triggering, and optional network access. PX150 supports several electrical installation options, including direct DC power, optional passive PoE, serial communications, optional Ethernet, Bluetooth, hardware trigger outputs, and optional wireless or cellular connectivity.
The sensor uses a single **12-pin M12 connector** to carry power, communications, Ethernet, and trigger signals. Some connector pins are multiplexed and change function depending on the selected serial-port mode. For that reason, the installation method should be selected before field wiring begins.

Electrical Pre-Installation Checklist

Before making electrical connections:

- de-energize all wiring
- verify the selected power source and polarity
- confirm which communications interface will be used
- confirm whether the unit includes optional Ethernet, Wi-Fi, PoE, or cellular/GPS hardware
- decide whether the installation will use a field interface box or a direct cable run
- verify that all cables, connectors, and cabinet-side hardware are available
- confirm that the installation method matches the site requirements for cable length, surge protection, and controller integration

All field wiring should follow applicable local electrical codes and traffic-signal cabinet practices.

ESD, Grounding, and Surge Protection

Because the PX150 is installed in exposed outdoor environments on traffic poles and mast arms, it is susceptible to electrical transients, nearby lightning-induced surges, and electrostatic discharge (ESD). Proper handling, grounding, and surge protection are critical to ensure long-term reliability of the sensor and to prevent damage to the radar and connected traffic cabinet electronics.

This chapter describes installation practices for reducing ESD risk and for properly routing, grounding, and protecting the sensor's power and communication circuits in traffic cabinet installations.

ESD Handling Precautions
Electrostatic discharge can permanently damage sensitive internal components of the PX150 and cabinet interface electronics. Technicians shall observe standard anti-static precautions during installation and maintenance:

Discharge Static:
Before handling bare wire ends, opening a Field Interface Box, or touching exposed connector pins, touch a grounded, unpainted metal surface such as the traffic cabinet chassis to discharge static electricity from your body.

Use ESD Protective Gear:
When working inside the traffic signal cabinet, especially when installing or removing loop replacement cards, SDLC modules, or other cabinet electronics, wear a properly grounded anti-static wrist strap when practical.

Handle by Edges:
If handling exposed circuit boards, hold them by their non-conductive edges. Avoid touching components, connector contacts, or exposed traces.

Weather Conditions:
Avoid terminating cables or opening junction enclosures during electrical storms or in extremely dry and windy conditions where static charge buildup is more likely.

Grounding and Isolation
Traffic signal cabinets governed by Caltrans TEES and NEMA TS 2 maintain separate grounding domains for AC grounded conductor (neutral), equipment/chassis ground, and DC logic ground. These grounding domains shall remain isolated within the cabinet in accordance with the applicable cabinet standard.

Do Not Bond PX150 DC Return to Equipment Ground:
The PX150 DC Return (Black wire, Pin 2) shall not be bonded to the cabinet chassis, equipment-ground bus, or AC neutral. Bonding the PX150 DC return to chassis/equipment ground or AC neutral defeats the required cabinet isolation between DC logic ground, equipment ground, and AC grounded conductor.

Intentional DC Reference:
If the PX150 DC return is intentionally referenced within the cabinet, it shall be referenced only to the cabinet DC logic ground domain. No additional bond shall be made from PX150 DC return to equipment/chassis ground or to AC neutral.

Case 1: Serial Interface / Loop Replacement Card Integration
When the PX150 is connected to a loop replacement card or other serial interface that requires a common signal reference, the PX150 DC return may be referenced to the cabinet DC logic ground domain through the interface wiring. In this configuration, do not make any separate bond from the PX150 DC return to cabinet chassis or equipment ground.

Case 2: Ethernet / SDLC Integration
When the PX150 is connected through an isolated Ethernet interface to an SDLC module or other isolated cabinet interface, no common DC ground reference is required for communications. In this configuration, the PX150 power supply output may remain floating.

Cable Shielding and Drain Wires
Houston Radar standard 12-conductor cable assemblies used with the PX150 do not include an overall shield or drain wire. For these standard cable assemblies, no shield or drain-wire termination is required.

If a customer-supplied communication cable is used and that cable includes a shield or drain wire, the shield or drain wire shall be terminated in accordance with the applicable cabinet and communication-interface requirements. Such shield or drain-wire terminations shall be bonded to the appropriate equipment/earth-ground termination point, not to the PX150 DC return.

Shields and drain wires, where present, are part of the surge and noise-control path and shall not be used as a substitute for DC logic return conductors.

Surge Protection Integration
Voltage surges from nearby lightning activity or other electrical transients can travel on power and communication conductors and damage the radar or cabinet equipment. Surge protection shall be selected and installed according to the wiring method used.

Using a Field Interface Box (Recommended)
Houston Radar recommends using a Field Interface Box (FIB) for installations with long field cable runs. Available FIB products provide surge protection intended to divert transient energy before it reaches cabinet electronics.

Direct Cable Installations
If the 40 ft 12-conductor cable (P/N 900-0086) is run directly from the radar to the cabinet without an intermediate FIB, external surge protection shall be installed as required for the power and communication circuits in use.

- Install surge suppressors inside the traffic cabinet on all utilized power and communication circuits before they connect to the cabinet power supply, controller, loop replacement card, SDLC module, or other cabinet equipment.

- Surge suppressor grounding conductors, shield terminations, and drain-wire terminations, where used, shall be bonded to the appropriate cabinet equipment/earth-ground point in accordance with cabinet practice. They shall not be bonded to the PX150 DC return.

• Keep surge-protector grounding conductors as short and direct as practical to minimize transient impedance.

Cabinet-Side Protection
Regardless of field wiring method, ensure that the traffic signal cabinet is equipped with a properly functioning surge-protection system on incoming AC mains and on any cabinet terminations required by the installation design.

Maintain the required isolation within the cabinet between AC grounded conductor, equipment ground, and DC logic ground. Do not bond these grounding domains together within the cabinet except where specifically required by the cabinet design and applicable electrical code.

Choosing a Wiring Method

PX150 may be installed using one of three common wiring approaches.

Direct Cable Installation
A direct installation may be completed using the **40 ft 12-conductor cable (P/N 900-0086)**, which provides a breakout to **RJ45**, **DB9**, and **barrel power** connectors. This is a simple installation method when the cable length is sufficient and no field interface box is required.
If this method is used, Houston Radar recommends adding external surge protection for all communication lines.
In some situations, it may be difficult to pull a cable with attached connectors through conduit or other tight spaces. In such cases, using a field interface box may be a better option.

Installation with a Field Interface Box
Where field termination, surge protection, or cabinet integration is needed, install a field interface box close to the sensor.
Use the appropriate interface box based on the selected wiring approach:

- **FIB-100-0007** for Ethernet-based installations
- **FIB-100-0008** for 12-conductor field cable terminations and custom wiring

Field interface boxes simplify cable termination and provide built-in surge protection. They are especially useful when long field cables must be run back to a cabinet or when controller integration is required.

Power Connection

Direct DC Power
PX150 operates from a **12 to 24 VDC** power source. In a typical installation, it may be powered from a nominal **24 VDC** supply. Base system power consumption is approximately **4 W**, but actual power draw depends on the installed options and operating mode. Refer to the **Specifications** chapter for detailed power-consumption values.
For direct DC installations:

- connect the positive supply to **VDC+**

- connect the supply return to **VDC- / DC Return**
- verify polarity before power is applied

Power over Ethernet (PoE)
PX150 may also be powered using **passive 24 V PoE**, but only when the unit has been ordered with the Ethernet option. Use only supported passive PoE hardware for this configuration.
Houston Radar offers a compatible passive PoE injector, **P/N 120-0040**. A separate power supply is required for use with the injector. Houston Radar also offers a compatible **24 VDC power supply, P/N 110-0073**.
Only **passive 24 VDC PoE over spare pairs** is supported. Do **not** connect active **802.3af/at PoE** equipment.

Power-Planning Note

Power demand may increase when optional features such as Ethernet video streaming or the cellular modem are used. Always size the power supply for the specific configuration installed in the sensor.

M12 Connector

PX150 uses a single **12-pin M12 connector** for all wired electrical interfaces. The connector carries:

- DC power
- serial communications
- Ethernet, if installed
- Trigger I/O

Because the connector combines multiple functions, some pins are shared between serial-interface modes. Exact pin assignments are provided in the M12 pinout and wire-signal reference tables elsewhere in the manual.
At a high level, the connector functions are:

- **Power:** VDC+ and DC Return
- **Trigger I/O:** two digital I/O lines
- **Ethernet:** two transmit and two receive conductors
- **Serial:** RS232, RS422, or RS485 depending on configuration

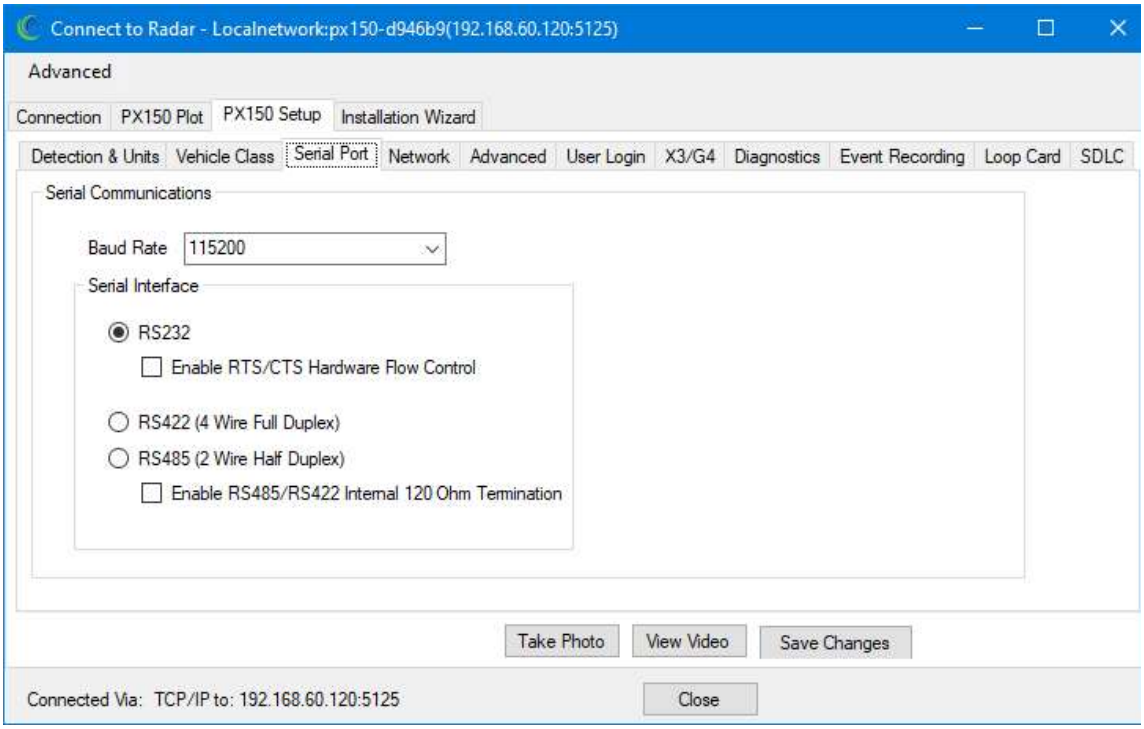
The PX150 M12 connector provides its environmental seal only when fully mated. During installation, do not leave the connector exposed or unmated for extended periods. After wiring, ensure the connector is fully engaged and tightened to maintain the IP67 seal.

Serial Communications

PX150 provides a configurable serial interface that may be set to **RS232**, **RS422**, or **RS485**. All serial modes share the same connector pins, so only one serial mode can be used at a time. Supported baud rates are 9600, 19200, 57600, 115200 and 230400.

All serial parameters are configured in software; no physical jumpers are required in the radar. Serial settings are accessed from **PX150 Setup > Serial Port**.

Figure 18



RS232

RS232 at **115200 baud** is the factory default serial mode. When RS232 is selected, the interface may optionally use **CTS/RTS hardware flow control**. RTS/CTS is not required by the radar itself and should only be enabled if the host device requires it. RS232 is best suited for short cable runs or bench/lab testing. For longer or electrically noisy field installations, RS422 or RS485 is generally a more robust choice.

RS422

For long cable runs, up to approximately **2000 ft**, **4-wire full-duplex RS422** is recommended. This is the preferred serial method when the field cable run exceeds approximately **100 ft**. It is also the required configuration when connecting to **LRC22x** loop replacement cards.

Cable termination may be enabled or disabled in software, but for longer cable runs it is generally recommended to leave termination enabled unless an external terminator is already present.

RS485

PX150 also supports RS485 operation. RS485 may be configured for either half-duplex or full-duplex use, depending on the installation. Termination may be enabled or disabled in software.

Half-duplex RS485 may be used for legacy applications, but it is generally less desirable than full-duplex serial for configuration and real-time monitoring. Where possible, use a higher baud rate and a full-duplex configuration to support live target display and faster data transfer.

Ethernet and Passive PoE

PX150 may be equipped with an optional **100Base-TX Ethernet** interface. When installed, Ethernet provides high-speed TCP/IP connectivity for configuration, data transfer, live video, and cloud-connected features.

Ethernet Installation

For Ethernet installations:

- ensure that Ethernet option is installed in the radar
- use CAT5E or Houston Radar P/N 900-0079 12-conductor cable
- use standard Ethernet wiring practices
- keep total cable length within normal Ethernet limits, such as **328 ft (100 m)**
- provide an external surge suppressor when connecting directly without a field interface box

Field interface boxes include surge protection and remove the need for a separate external surge suppressor.

Ethernet with FIB-100-0007

When Ethernet is used in the field, **FIB-100-0007** is typically the preferred interface-box option. This box provides a convenient Ethernet termination point and surge protection. Where passive PoE is used, place the approved passive PoE injector in the cabinet or other protected location.

Trigger I/O Connections

PX150 provides **two digital I/O lines** that may be used for simple external device interfacing where a full controller interface, such as input-file cards or SDLC, is not required. A common application is triggering an external camera, recorder, or warning device based on radar events.

Each Trigger I/O line has a maximum rating of:

- **30 V**
- **0.5 A**

These limits must not be exceeded.

The trigger lines are **not galvanically isolated**. They are referenced to the radar power ground. When configured as outputs and activated, they pull the signal to radar ground. Any connected external device must therefore be compatible with a **ground-referenced driver**.

When connecting Trigger I/O:

- Verify that the external device accepts a ground-referenced trigger signal
- Verify voltage and current compatibility
- Use appropriate external protection where required
- Do not assume isolation between the radar and connected equipment

- Provide an external pull-up resistor if the connected device expects a pulled-up logic signal

Firmware supports trigger **output** operation. PX150 hardware is capable of accepting external trigger signals, but that function is not enabled in the production firmware.

Trigger Output Configuration

PX150 firmware includes support for configurable **hardware trigger outputs**. These outputs are intended for applications where the radar must activate external equipment, such as cameras, recorders, warning devices, or other compatible systems.

At present, hardware trigger configuration is **not yet exposed through the current StatsAnalyzer user interface**. As a result, this manual does not currently provide a GUI-based procedure for assigning trigger events, selecting output behavior, or configuring pulse timing.

A detailed trigger-output configuration procedure will be added in a future revision of this manual when full GUI support becomes available.

Using the Correct Field Interface Box

Select the field interface box that matches the installation method.

Use **FIB-100-0007** when the installation is Ethernet-based and requires a rugged field Ethernet transition with surge protection.

Use **FIB-100-0008** when the installation requires custom field termination of the 12-conductor cable for power, serial, trigger, or other direct-wire connections. This is typically the better choice when non-Ethernet wiring must be landed in the field enclosure.

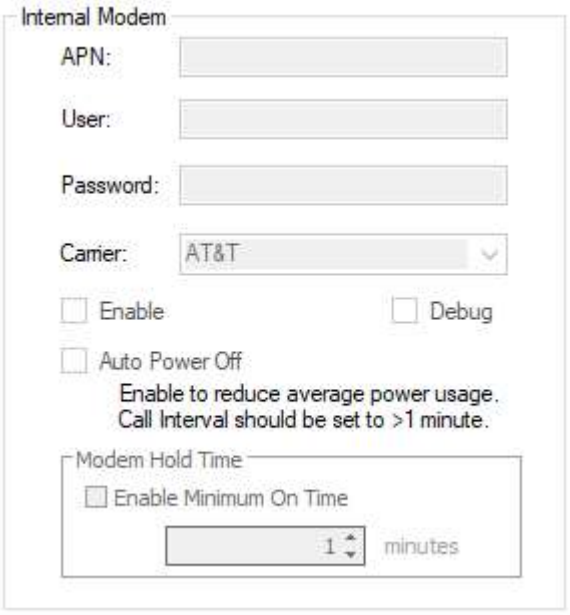
Wireless, Cellular, and GPS Options

PX150 includes **Bluetooth** as a standard feature for local configuration and maintenance access. For practical purposes, a Bluetooth connection behaves like a serial interface, and camera functionality is limited to still images.

Optional **Wi-Fi** hardware may also be installed for wireless network connectivity. Because these are built-in wireless interfaces, they do not require separate field signal wiring beyond normal sensor power.

PX150 may also be equipped with an optional **4G cellular modem** with integrated **GPS**. The modem provides remote communications, and the GPS receiver may be used for geolocation and map-based display in the Tetryon cloud platform. As with other built-in wireless options, no additional external communications wiring is required beyond the normal power connection. A valid data plan is required for cellular service.

Figure 19



Final Electrical Checks

Before applying power, verify the following:

- the correct wiring method has been selected
- all cable entries are tightened and sealed
- power polarity is correct
- the selected serial mode matches the intended wiring
- the selected serial communication parameters match host expectations
- Ethernet pairs are correctly landed if Ethernet is used
- any passive PoE hardware is compatible with the installed option
- trigger connections are compatible with the external device
- surge protection is present where required
- no loose strands or exposed conductors remain

After power is applied:

- allow the radar sufficient time, typically **35 to 40 seconds**, to boot
- verify that the intended communications interface can discover or connect to the sensor
- confirm that there are no communication or power faults before proceeding to software setup

After completing electrical installation, proceed to **Traffic Controller Integration** or, if controller interfacing is not required, to **First Power-Up and Initial Setup**.

First Power-Up and Initial Setup

Software and System Requirements

To configure and monitor the PX150, a computer running **Microsoft Windows 11** is required. The computer must have at least **8 GB of RAM** and enough available storage to install and run the **Houston Radar StatsAnalyzer** software and save any downloaded data or event files. Install StatsAnalyzer before attempting to connect to the radar. Additional software prerequisites may be introduced in future software releases; refer to the latest Houston Radar installer package or release notes.

Boot Sequence

After power is applied, PX150 begins its internal startup sequence. The complete boot process typically requires **35 to 40 seconds** before the radar is ready for communications and normal operation. PX150 does not have external status LEDs. Instead, the unit provides audible startup indication through an internal speaker. One tone is produced when power is first applied, and a second, different tone is produced when the boot sequence has completed successfully. Users should wait for the boot-complete tone, or allow at least **40 seconds** after power-up, before attempting to connect to the radar.

Initial Setup

PX150 is configured using the **Houston Radar StatsAnalyzer** application on a Windows computer. The radar supports several communication interfaces, including **serial (RS232, RS422, and RS485)**, **Bluetooth**, optional **Ethernet**, optional **4G modem** and optional **Wi-Fi**.

After connecting to the radar through the selected communication interface, the general configuration workflow is the same in most cases. The main exception is **video**, which requires a **TCP/IP connection**. Live video is available only when the radar is connected through **Ethernet**, **Wi-Fi**, or the **cellular modem**. When connected through **serial** or **Bluetooth**, camera functionality is limited to still images.

After communications have been established, configure the radar for the intended application by defining lanes, detection zones, and, if needed, exclusion zones.

Bluetooth Pairing and Connection

PX150 supports **Bluetooth Classic** and appears to the host computer as a **serial-profile wire replacement** device. Initial Bluetooth connection is performed using the standard **Windows 11 Bluetooth pairing procedure**.

To connect to PX150 over Bluetooth:

1. Apply power to the radar and allow the unit to complete boot-up.
2. On the Windows computer, open the standard **Bluetooth** settings panel.
3. Start the normal Windows device-pairing process.
4. Select the PX150 device from the list of available Bluetooth devices.
5. Complete pairing. **No PIN code is required.**
6. After pairing is complete, open **Houston Radar StatsAnalyzer**.
7. In the **Connect To Radar** dialog, select the Bluetooth connection option.

StatsAnalyzer automatically filters the available Bluetooth devices and shows only supported Houston Radar devices. Other nearby Bluetooth devices will not appear in the radar connection list.
Bluetooth is intended for local setup, maintenance, and troubleshooting. Class 1 Bluetooth adapter is recommended and can be supplied by Houston Radar. For practical purposes, a Bluetooth connection behaves like a serial connection. Live video is not available over Bluetooth, and camera access is limited to still images.

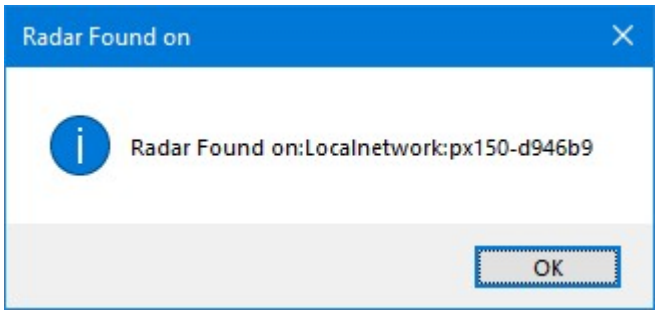
Connecting to the Radar

1. Install the **Houston Radar StatsAnalyzer** application on a Windows computer, if it is not already installed.
2. Apply power to the radar and wait at least **40 seconds** for the unit to complete boot-up.
3. Launch **StatsAnalyzer**
4. Click the **Connect To Radar** button
5. Select the desired communication interface from a drop-down menu:

Figure 20

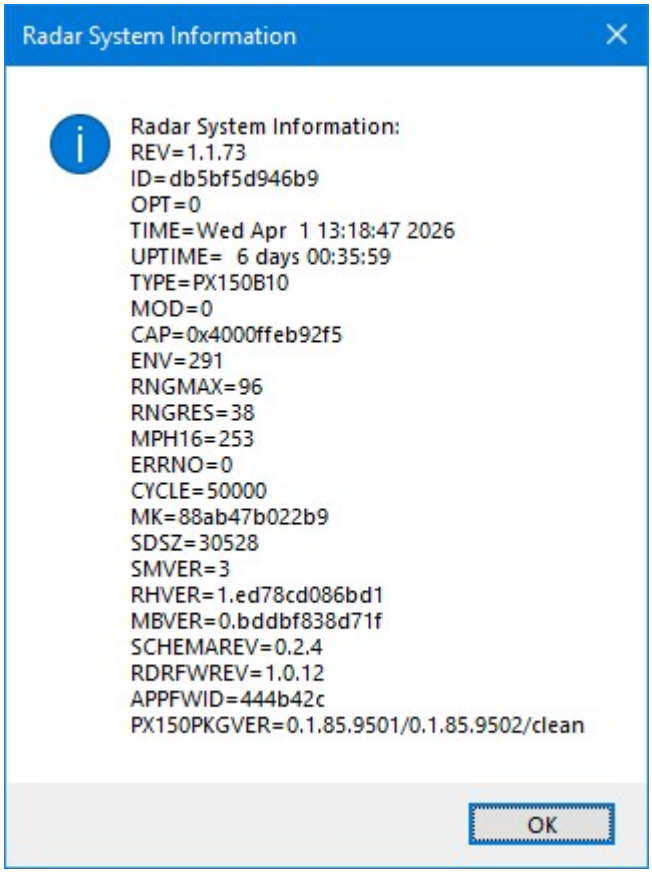
6. Click **Connect To Radar** to initiate the connection
7. When the connection is successful, a confirmation dialog will appear:

Figure 21



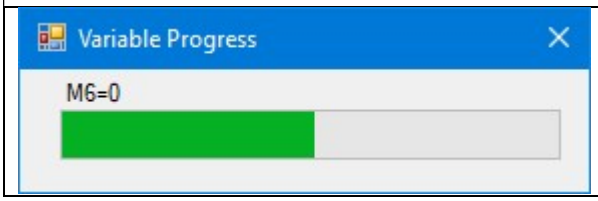
8. Click **OK** to dismiss the connection dialog. StatsAnalyzer will then retrieve and display radar system information.

Figure 22



9. Click **OK** again to dismiss the system-information dialog. StatsAnalyzer will then read the radar's current configuration variables.

Figure 23



Once this process is complete, the radar is ready for lane, zone, and application configuration.

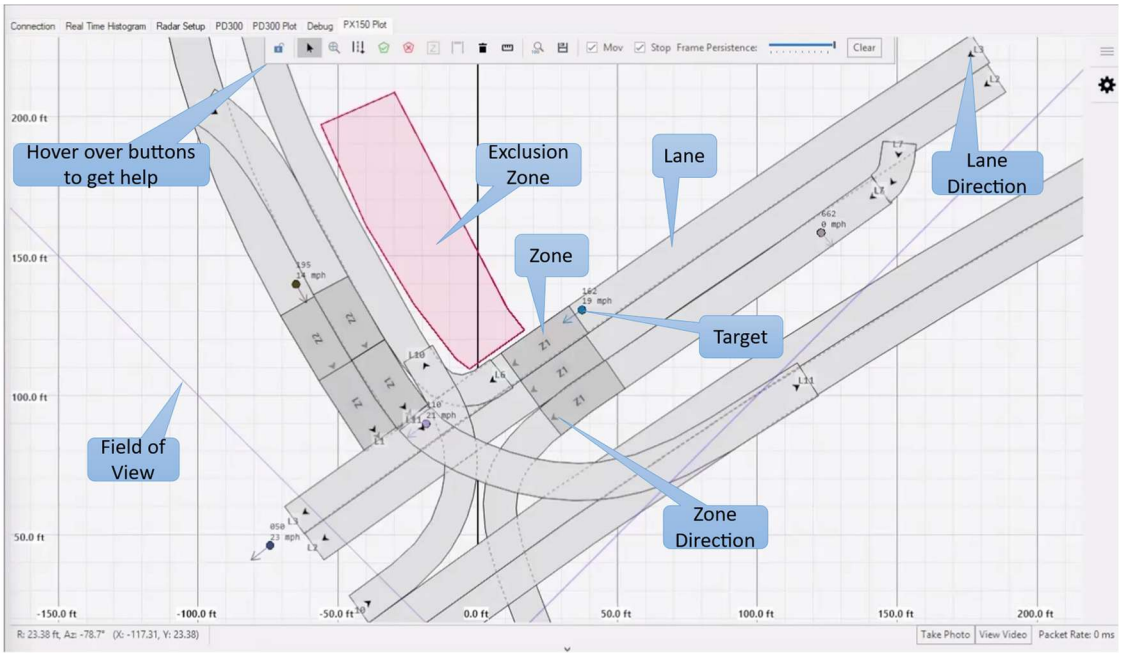
Lane and Detection Zone Configuration

After connecting to the radar, open the **PX150 Plot** tab to begin lane and zone configuration.

Range Plot GUI

The **Range Plot** represents the physical intersection in a Cartesian, or bird's-eye-view, coordinate system. On the plot, the radar field of view appears as a purple sector-shaped area.

Figure 24



All **detection zones** must be placed inside the radar field of view. Lanes may extend beyond the displayed field-of-view boundary, but radar performance is guaranteed only within the defined field of view. Targets may occasionally appear outside this boundary, but those detections should not be relied upon for normal operation.
All lane and zone configuration controls are located in the ribbon at the top of the plot.

Figure 25

Layer visibility can be controlled from the **hamburger menu** ☰. For example, you may choose to show or hide lanes, target tracks, zones, and target headings.

Lane Configuration

Lanes must be established before detection zones can be created. Vehicle tracks should be used as a guide when locating lanes in the range plot. The integrated camera can also be used as a visual aid to confirm the number of lanes, traffic patterns, and general roadway layout.
Lanes can be created in two ways:

- **manual drawing**

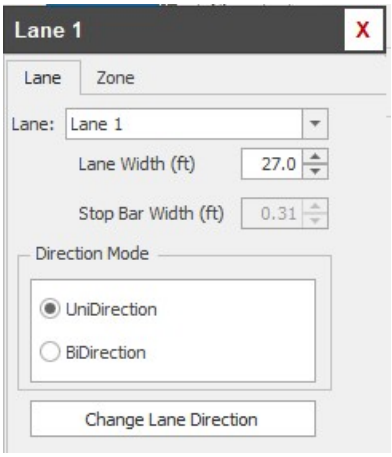
- **automated lane creation based on an existing track**

Manual Lane Drawing

1. Set **Frame Persistence** to a high value, such as **10,000 frames**, so that enough track history is retained.
2. Allow enough traffic to pass until the plot shows representative tracks for all lanes to be configured at this time.
3. Click the **Pause** button to freeze the displayed tracks.
4. If the display becomes too cluttered, click the **Clear Tracks** button Clear and repeat the process until the track history is useful and easy to interpret.
5. Click the **Draw Lane** icon.
6. Click along the desired vehicle path to create lane control points.
7. Double-click the final point to complete the lane.
8. Right-click during drawing to cancel the lane if needed.

After the lane is drawn, a lane-properties dialog will appear:

Figure 26



This dialog allows you to set lane parameters such as width, direction, and number of zones before finalizing the lane.

Lane Editing

To edit an existing lane:

1. Make sure lane editing is unlocked.
2. Right-click the lane to open the context-sensitive editing menu.
3. Double-click the lane to reveal its control points.
4. Drag the control points as needed to adjust the lane shape.

Automated Lane Creation

PX150 also supports automated lane creation based on observed vehicle tracks.
To create a lane from a track:

1. Find a representative track in the plot.
2. Right-click the track.
3. Select **Create Lane Over Tracks**.

To create an adjacent lane:

1. Hover over the **edge** of an existing lane until it turns blue.
2. Right-click the edge.
3. Select **Create Lane Adjacent to Edge** from the context menu.

This is often the fastest method for creating multiple adjacent lanes after the first lane has been defined.

Detection Zone Setup

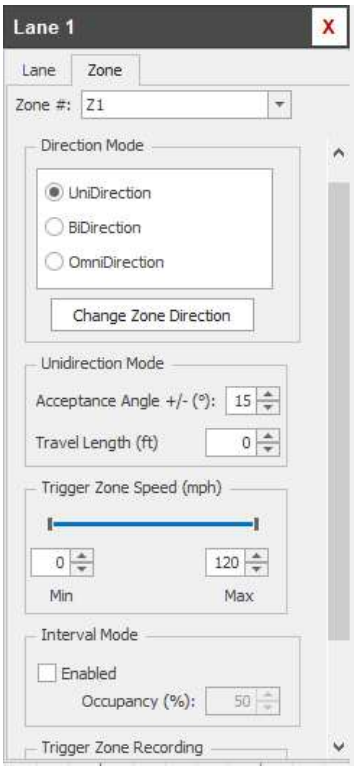
Detection zones are created within previously defined lanes.

To create a detection zone:

1. Select the lane where the zone will be placed.
2. Click the **Draw Zone** button [Z].
3. Draw the zone within the lane boundaries.

A useful setup technique is to clear the track data, disable ☐ Mov and enable the display mode that highlights where vehicles come to a stop ☑ Stop. This makes it easier to place stop bars and detection zones accurately. Once a zone has been placed within the lane, you may click it to edit the zone parameters:

Figure 27



This dialog allows you to filter zones events by specifying conditional zone activation. For example, you may setup zone to activate only for a wrong way vehicle or for a vehicle exceeding speed limit. You may also enable event recording.
Warning: Only enable recording for infrequent events such as wrong way vehicle as triggering on every vehicle will generate massive amounts of data.

Detection Zone Parameters

After a detection zone is created, the zone parameters dialog is used to define how and when that zone activates. These settings control directional filtering, speed filtering, travel requirements, and event behavior. Proper adjustment of these parameters is important for reducing nuisance activations and matching the zone behavior to the intended application.
The table below summarizes the most commonly used zone parameters.

Parameter	Description	Typical Use	Valid Range / Values	Default
Direction Mode	Defines the accepted direction of travel for vehicles that may activate the zone. Use “Change Lane Direction” button to flip zone direction.	Used to distinguish normal traffic from opposite-direction or wrong-way traffic.	UniDirection, BiDirection, OmniDirection	UniDirection
Acceptance Angle	Limits activation to vehicles whose travel path falls within the specified angular range relative to the zone direction.	Helps reject nuisance activations from adjacent traffic or crossing movements.	±1..89 degrees	30 degrees
Travel Length	Minimum distance a target must travel within the zone before the zone activates.	Helps reject nuisance activations from stopped vehicles, shifting queues, or short spurious tracks.	0 to Zone Length	0
Trigger Zone Speed	Speed range required for the zone to activate.	Used to reject very fast/slow targets.	0..120 mph	0..120 mph

Parameter	Description	Typical Use	Valid Range / Values	Default
Event Recording	Enables recording of an event when the zone activates.	Used for event logging, video clips, and later review.	Enabled / Disabled	Disabled
Interval Mode	Defines if activation logic is based on instantaneous data or interval data.	Normal detection or occupancy-based detection.	Enabled / Disabled	Disabled
Zone Length	Defines the length of the zone along the direction of travel.	Used to control the size of the zone	0.. Lane Length	No default
Zone Position	Defines the location of the zone within the lane.	Used to control where along the lane the zone begins and ends.	User-defined	No default
Stats Enabled	Enables Vehicle Statistics for that given zone. NOTE: Only 1 zone per lane may have “Stats Enabled”.	Vehicle Statistics	Enabled / Disabled	Enabled (only for first zone)

Wrong-Way Detection Setup

See important section “WRONG-WAY DRIVING APPLICATION LIMITATION; SECONDARY DETECTION AND DATA COLLECTION ONLY”.

Pursuant to the limitations noted in the section referenced above, PX150 can be configured to detect vehicles traveling in the wrong direction through a defined detection zone. For reliable operation, wrong-way detection should be configured using a dedicated zone and appropriate directional filtering.
To configure a wrong-way detection zone:

1. Set the zone to **UniDirection** mode.
2. Set the zone direction to trigger on **wrong-way vehicles** by setting zone direction opposite to normal/right-way traffic flow.
3. Set the **acceptance angle** to approximately **±45°** to reduce nuisance triggers from vehicles moving outside the intended travel path.

4. Set **Travel Length** to at least **10 ft** to reduce nuisance triggers from stopped or slowly shifting vehicles.
5. It is recommended to set **Trigger Zone Speed** to **5 mph or higher** to reduce nuisance triggers from stationary vehicles or very slow movement.

A wrong-way zone should be placed so that vehicles traveling in the prohibited direction will pass clearly through the zone for sufficient distance to satisfy the configured travel-length requirement.

Exclusion Zone Setup

Exclusion zones are used to mask areas that should be ignored by the radar.
To create an exclusion zone:

1. Click the **Exclusion Zone** button .
2. Draw the exclusion-zone polygon by clicking its corner points.
3. Double-click the final point to complete the polygon.

Saving Configuration

After placing and configuring all lanes and zones, it is recommended to lock the lane configuration to prevent unintended changes.
To save the configuration:

1. Click the **Save** button .
2. Wait for the configuration to be uploaded to the radar.

Warning: If you disconnect from the radar without saving the configuration to the device, all unsaved edits will be lost.

Traffic Controller Integration

Traffic signal controllers typically accept vehicle detector inputs in one of two ways. Older and mixed cabinet architectures often use **rack-mounted detector cards** or input files that expect detector-style channel outputs. Newer TS2 and ATC cabinet architectures often use **SDLC-based serial I/O**, where detector information is exchanged through BIU or SIU style cabinet interfaces rather than conventional input file cards. FHWA describes card-rack detector electronics as a standard cabinet approach, and BIU/SIU devices are widely used in TS2 and ATC cabinets to interface cabinet I/O and detector functions to the controller over SDLC.

PX150 supports both integration methods:

- **Loop Replacement Card integration**, where radar detections are converted into detector-style controller inputs
- **SDLC integration**, where radar detections are delivered to the controller through an SDLC cabinet interface module

This chapter explains when to use each method, how the hardware is typically connected, and how to configure the PX150 so that controller calls match the intended lane or zone behavior. Controller-specific cabinet wiring must always follow the cabinet manufacturer's documentation and local agency standards.

Choosing the Integration Method

Use **Loop Replacement Cards** when the controller cabinet expects conventional detector channels through rack-mounted detector hardware or similar contact-closure style inputs. This is commonly supported by TS1, TS2, 170, and 2070 style controllers, and for installations where agencies want radar detection to behave like familiar loop-detector channels. Houston Radar loop replacement cards are available in 2-channel and 4-channel versions, and a MIDAS-compatible variant is also available.

Use **SDLC integration** when the cabinet architecture is based on TS2 or ATC serial-bus I/O and the agency wants detector calls delivered through the cabinet SDLC path rather than through conventional detector rack outputs. In TS2 cabinets, BIUs interface cabinet I/O to the SDLC bus. In ATC cabinets, SIUs serve the same role, interfacing cabinet I/O and detector functions to Serial Bus #1.

As a rule of thumb:

- Choose **loop card integration** when the cabinet already uses detector cards or input files for vehicle detection
- Choose **SDLC integration** when the cabinet and controller are already organized around BIU/SIU style SDLC communications

Controller Integration Prerequisites

Before configuring controller integration, complete the following:

- Mechanical and electrical installation of the PX150
- Communications setup between PX150 and the configuration computer
- Lane and detection-zone configuration in StatsAnalyzer
- Identification of the exact controller input channels or SDLC addresses required by the agency
- Confirmation of the cabinet standard in use, such as TS2, ATC, 170/2070, or MIDAS

For best results, prepare a channel-assignment worksheet before configuration. Document each lane and zone, the intended controller channel, the operating mode, and any required timing or hold behavior.

Loop Replacement Card Integration

Loop Replacement Cards convert PX150 detections into contact-closure style outputs that the traffic controller can use in the same way it would use conventional loop detector channels. Houston Radar LRC cards provide either two or four controller channels per card, and multiple cards can be linked to a single radar for larger channel counts. The

cards provide contact-closure style outputs for controllers that use detector rack or input-file style detection channels.

Supported hardware

The supported loop-replacement family includes:

- **LRC222** – 2-channel loop replacement card
- **LRC224** – 4-channel loop replacement card
- **LRC224E** – 4-channel loop replacement card for MIDAS-compatible controller

The LRC222/LRC224 are compatible with TS-1, TS-2, 170, and 2070 controller environments, while the LRC224E is specific to MIDAS use.

Typical loop-card wiring arrangement

A typical installation includes:

- PX150 powered and connected normally
- PX150 serial connection to the loop card(s)
- Ethernet or other local connection for PX150 configuration
- One or more loop cards installed in the cabinet
- Daisy-chained card-to-card serial bus when multiple cards are used
- A termination plug installed on the final card on the serial bus

Houston Radar's loop-card setup guides recommend **RS422, 4-wire full duplex, 115200 baud**, with radar-side termination enabled in software and end-of-bus termination provided at the last card. Both LRC222/LRC224 and LRC224E use dual RJ25 ports so multiple cards can share the same RS422 bus.

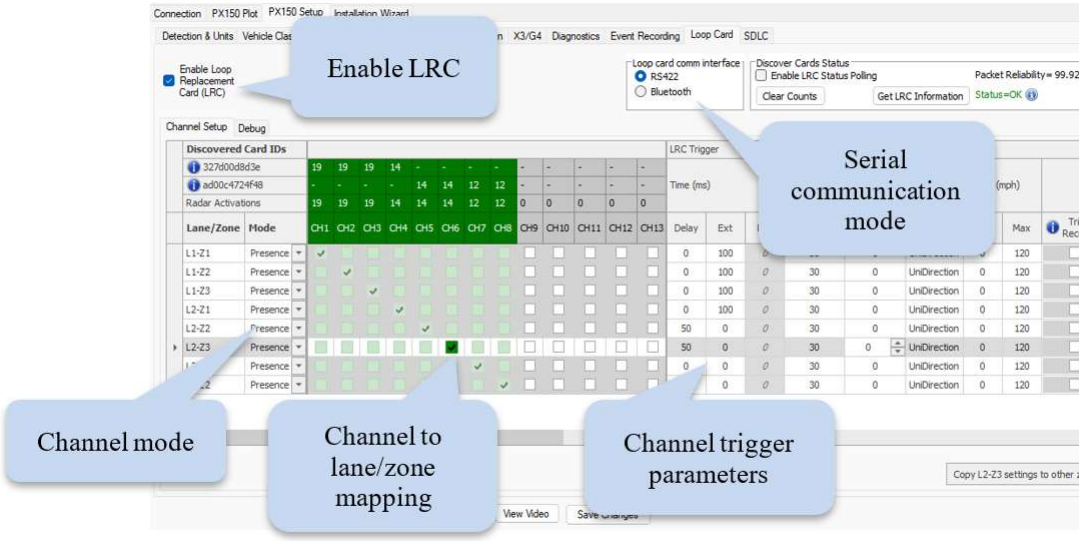
PX150 setup for loop cards

In StatsAnalyzer:

1. Connect to the PX150.
2. Define lanes, zones, and traffic directions.
3. Configure the PX150 serial port for the loop-card installation.
4. Open the Loop Card tab and enable the **Loop Replacement Card** function.
5. Open the **Channel Setup** tab, assign controller channels to lanes/zones, and select a mode for each.
6. Configure the required "LRC Trigger" parameters for the selected operating mode.
7. Save the configuration to the radar.

Note: You can also view and edit the Zone parameters here. These are the same zone options available on the "PX150 plotter" tab.

Figure 28



Loop-card channel modes

Loop-card channels can be assigned using several operating modes:

Disabled

No controller channels are activated for that lane/zone.

Presence

Used when the controller should receive a maintained detector call while a vehicle occupies the configured detection area. In Houston Radar's implementation, activation timing depends on zone location, zone length, vehicle speed, and vehicle length. Presence mode can use one or more channels. This aligns with common traffic-controller practice, where presence detection is used for continuous actuation rather than a short pulse.

Pulse

Used when the controller should receive a short actuation pulse rather than a maintained call. Pulse duration is configurable. Single and multi-channel configurations are supported.

LRC discovery and verification

The PX150 automatically discovers cards on the serial bus when the LRC system is enabled. The detected cards, and their configuration details, are displayed on the Channel Setup view.

Card information is refreshed:

- When the "Loop Card" tab is first opened and the LRC system is enabled
- When LRC functionality is first enabled
- After clicking the "Get LRC Information" button
- Periodically when "Enable LRC Status Polling" is checked

Any **channel conflicts** are highlighted in the Channel Setup view. A channel conflict occurs when more than one card is assigned the same controller channel.

During commissioning, verify the following:

- The loop card power LED is on
- The fault LED is off
- The radar communication LED is active
- The serial bus is properly terminated on both sides
- The intended controller channel activates when the corresponding lane or zone is occupied
- No channel conflicts or errors are reported
- Channel numbering in the controller matches the lane mapping configured in the PX150

SDLC Integration

Use SDLC integration when the traffic cabinet expects detector calls through the cabinet SDLC bus rather than through conventional detector rack channels. This is common in TS2 and ATC cabinet architectures, where BIU or SIU style devices interface the controller to cabinet I/O and detector-related functions. In TS2 cabinets, BIUs interface cabinet I/O to the SDLC bus. In ATC cabinets, SIUs serve the same role, interfacing cabinet I/O and detector functions to Serial Bus #1.

PX150 supports SDLC controller integration through an **optional SDLC interface module**. Additionally, PX150 should have Ethernet option installed as well. The module is configured to match the cabinet mode and addressing, and the PX150 sends detector call information to the module over Ethernet/TCP-IP for presentation to the controller over the SDLC side. The module supports both **TS2** and **ATC** operating modes and is configured by IP address, device mode, BIU/SIU addresses, and hold/release parameters. The module also supports any combination of 1 to 4 connected PX150 radars.

Typical SDLC setup

A typical SDLC installation includes:

- PX150 installed and connected to the site network.
- SDLC interface module installed in the controller cabinet.
- SDLC connection from the module to the controller cabinet bus/interface.
- Ethernet connection between PX150 and the SDLC module, directly or through the site network.
- Module power and network configuration completed.
- SDLC interface module mode set to **TS2** or **ATC** to match the controller environment.

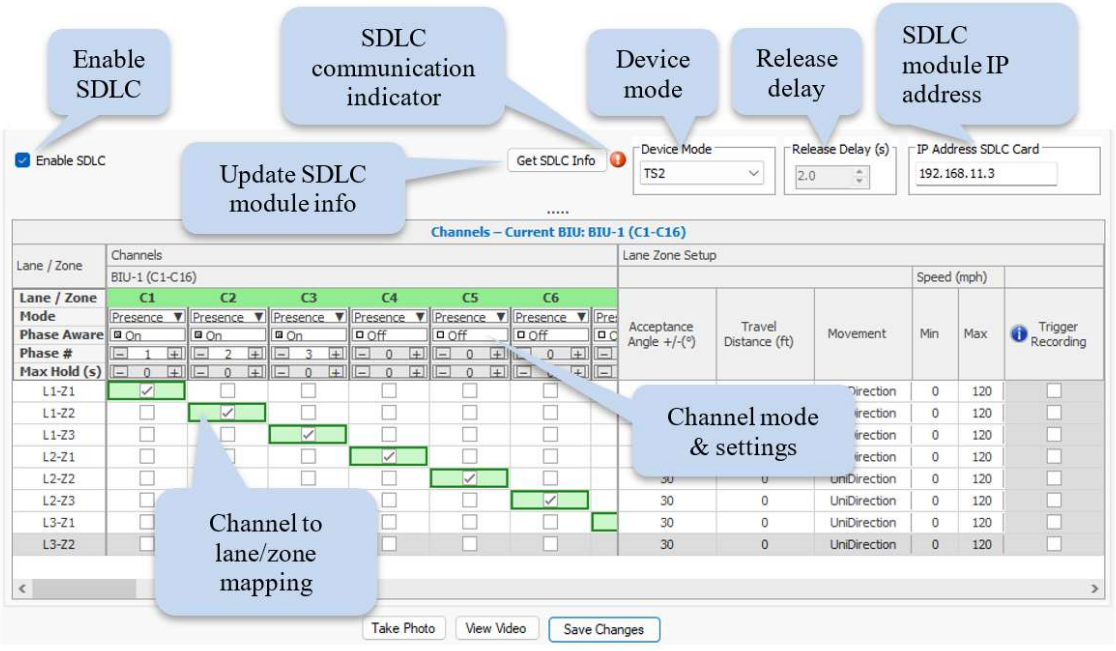
General TS2 and ATC cabinet practice is that the controller expects properly addressed BIU or SIU style interfaces on the serial bus. The SDLC module must therefore be configured with the correct cabinet mode and the correct address set before detector calls will be interpreted correctly by the controller.

PX150 setup for SDLC

In StatsAnalyzer:

1. Complete lane and zone configuration first.
2. Open the **SDLC** tab.
3. Enable SDLC output.
4. Enter the IP address of the SDLC interface module.
5. Select the device mode, **TS2** or **ATC**.
6. Save changes.
7. Retrieve module information to confirm communications, by clicking the "Get SDLC Info" button. Ensure there are no communication errors.
8. Map lane/zone calls to controller channels.
9. If required for your installation, enable Phase Awareness, set Max Hold Times and Release Delay. Max Hold Times and Release Delay will not be available if there are SDLC module communication problems. See Interface Module Settings below for descriptions of each option.
10. Save changes.

Figure 29



TS2 and ATC addressing

In TS2 environments, controller calls are typically organized by **BIU address and channel group**. In ATC environments, calls are typically organized through **SIU addressing** and a larger detector-channel space.

The SDLC module supports 64 BIU detector channels (16 per BIU) and 120 ATC detector channels (24 per SIU). BIU addresses 9-12 and SIU addresses 10-14 can be used as detector inputs. Document the address plan before commissioning. Incorrect addressing is one of the most common causes of "good radar, no controller call" problems in SDLC setups.

Interface Module Settings

Some SDLC applications require more than simple on/off detector calls. The required settings can be configured with Stats Analyzer.

The module supports advanced behaviors such as:

Failsafe

If communications are lost for more than 2 seconds, all configured channels are placed in the call state. This feature is always enabled by default. Contact Houston Radar if you need to disable this.

Phase Aware

When a channel is made phase aware, hold time and release delay settings are applied to channel activations and deactivations depending on the state of the configured phase.

Maximum Hold

For phase aware channels, the device will automatically hold a call indefinitely while that phase is RED (waiting to be served). Max Hold is the safety cap — it forces the call to clear after N seconds even if the phase was never served. This prevents a stuck detection from permanently locking up a phase. This option can be configured for each individual phase aware channel.

Release Delay

After the phase turns GREEN (the call is served), the SDLC module holds the call for this additional duration before releasing it. This option is universal for all phase aware channels.

SDLC verification

After configuration:

- Confirm the PX150 can reach the SDLC module by IP.
- Verify that the module reports the correct operating mode.
- Verify that the configured BIU/SIU address set matches the cabinet.
- Apply a known vehicle detection and confirm the expected controller channel changes state.
- Verify any hold, release-delay, or phase-aware behavior using live controller status.

Best Practices for Either Integration Method

- Start with a small number of channels and verify them before completing the full mapping.
- Keep a written channel-assignment table in the cabinet.

- Use descriptive lane and zone names in PX150 so the mapping is easy to audit later.
- For stop-bar and queue applications, begin with presence-style behavior unless the agency specifically requires pulse-style actuation.
- Verify controller behavior in the cabinet, not only in the radar software.
- If the controller integration depends on serial buses or networked modules, verify fault behavior and recovery after power cycling.
- Keep the loop-card or SDLC quick start guide with the cabinet documentation for future maintenance.

Related Documents
For detailed hardware-specific procedures, refer to:
- LRC222/LRC224 Quick Start Guide
- LRC224E Quick Start Guide
- LRC22x Cutsheet
- SDLC interface module cutsheet

Verification and Acceptance Testing

This chapter provides a basic commissioning procedure for confirming that the PX150 has been installed, configured, and integrated correctly before the site is accepted for service. The procedure is intended to support field verification by installers, agency staff, and system integrators.
Final acceptance should confirm:
- the radar is mounted securely and aimed correctly
- communications and controller integration are working
- configured lanes and zones match the roadway
- vehicle detection performs as expected
- controller channel mapping is correct
- reported traffic data is reasonable for the installation

Pre-Commissioning Checklist

Before beginning acceptance testing, confirm the following:
- mechanical installation has been completed
- electrical installation has been completed
- the radar powers up normally
- communications with the radar are working
- lane and zone configuration has been saved to the radar
- any controller integration hardware is connected and operational
- the monitored roadway area is visible in the camera and represented correctly in the radar plot
- live target tracks appear reasonable for the site

Detection Performance Verification

Verify that the radar detects vehicles correctly in each intended lane or movement.
At a minimum, observe the following vehicle types where available:

- passenger cars
- pickup trucks or vans
- large trucks or buses
- motorcycles, bicycles, or other smaller vehicles, if detection of those users is part of the intended application

For each lane or movement being commissioned:

1. Observe vehicles entering the monitored area.
2. Confirm that live tracks appear in the correct lane.
3. Confirm that the expected detection zones activate at the correct location.
4. Confirm that stop bar, queue, turning movement, or wrong-way functions operate as intended for that approach.
5. Confirm that nuisance detections are not occurring in excluded areas.

If detection is inconsistent, review radar aiming, lane geometry, zone placement, and exclusion zones before proceeding.

Volume Accuracy Spot Check

Perform a spot check to confirm that the radar is producing reasonable vehicle counts.
Recommended method:

1. Select a representative lane or approach.
2. Choose a short observation period, such as **15 minutes**.
3. Manually count vehicles passing through the lane or detection zone during the selected period.
4. Compare the manual count with the count reported by the radar for the same period.
5. Repeat for additional lanes or approaches as needed.

Spot checks should be performed during representative traffic conditions and should avoid periods where queues extend into unintended detection areas unless that is part of the intended application.

Speed Accuracy Spot Check

Perform a speed spot check where speed reporting is part of the intended application.
Recommended method:

1. Select a lane with stable traffic flow.
2. Compare PX150-reported vehicle speeds against an independent reference source, such as:
    - a calibrated handheld radar/lidar device
    - a trusted temporary field measurement setup
    - another approved agency reference method
3. Observe multiple vehicles covering the expected speed range.
4. Confirm that PX150-reported speeds are reasonable for the installation.

Where speed is used only as an internal parameter for zone logic rather than as a reported field metric, a simplified reasonableness check may be sufficient.

Wrong-Way Detection

See important section “WRONG-WAY DRIVING APPLICATION LIMITATION; SECONDARY DETECTION AND DATA COLLECTION ONLY”.

After configuration, verify wrong-way detection in the field by simulating or observing a controlled wrong-way movement where it is safe and permitted to do so. Confirm the following:

- the zone activates only for vehicles traveling in the prohibited direction
- normal traffic does not activate the wrong-way zone
- the output behavior matches the intended use of the installation
- nuisance activations are not occurring from stopped vehicles or adjacent traffic

If false activations are observed, review the zone direction, acceptance angle, travel-length setting, and speed threshold.

Controller Channel Mapping Verification

Where PX150 is interfaced to a traffic controller, confirm that each configured output is mapped correctly.

For each configured lane or zone:

1. Cause a known detection event in the lane or zone.
2. Confirm that the expected controller input or call is activated.
3. Confirm that no unintended channel is activated.
4. Repeat for all configured controller channels.
5. If loop replacement cards or SDLC interfaces are used, also confirm that the configured channel numbering matches the cabinet documentation.

This step should include any special application outputs such as stop bar detection, queue calls, or wrong-way alerts if those outputs are connected to external equipment.

Acceptance Record

At the completion of commissioning, record at least the following:

- site location
- radar serial number
- installation date
- software version
- communications method used
- controller integration method, if applicable
- lanes and approaches verified
- volume spot-check results
- speed spot-check results, if applicable
- controller channel mapping verified
- any corrective actions taken

- name of installer or inspector
- date of acceptance

Note

This procedure is intended as a practical field acceptance checklist. Individual agencies may require additional documentation, longer observation periods, or site-specific performance criteria.

Data, Events, Alerts, Video and Reporting

PX150 can calculate, record and report a variety traffic statistics information, events and alerts. This requires Stats option enabled.

All information is generated per zone. Any lane information that you may need, e.g. volume, must be retrieved from a zone that belongs to the lane of interest. A zone is configured as either *vehicle-activated* or *interval-activated*; the two modes are mutually exclusive for a given zone.
Each zone has three independent output pathways, any combination of which may be enabled: reporting status to the traffic controller, generating alerts to the Tetryon server, and contributing to statistics.

Vehicle-activated zones generate events from individual tracked vehicles entering and leaving the zone geometry. A vehicle generates an activation event on entry only if it satisfies the zone's vehicle filter at that moment. A vehicle generates a deactivation event on exit only if it previously generated the matching activation event for that zone — vehicles that did not activate the zone cannot deactivate it. A vehicle whose track is terminated inside the zone for any reason (occlusion, merge, range loss, classifier change) is treated as having exited and produces a deactivation event if it had previously activated.
Vehicles already present within a zone at radar startup do not generate activation events; the zone begins in the deactivated state and will activate normally when subsequent qualifying vehicles enter.

Interval-activated zones generate events from derived per-interval measurements such as occupancy or average speed. Events are emitted only on threshold crossings, so the source produces edge-triggered activations and deactivations rather than a continuous level. The aggregate filter specifies the measurement, the threshold direction (above or below), and hysteresis parameters (separate enter and exit thresholds, or a single threshold with a dwell time) sufficient to prevent flicker near the threshold.

Vehicle Filter

The vehicle filter is evaluated when a vehicle enters a vehicle-activated zone and determines whether the entry generates an activation event. The filter is a logical AND of the following conditions; any condition may be omitted (treated as always true):

- *Direction of travel* — a reference direction and an acceptance angle, used for direction-of-travel and wrong-way applications.
- *Speed range* — a minimum and maximum speed; the vehicle's speed at entry must fall within the range. Used for camera triggering, over-speed and under-speed applications.
- *Traversal length* — a minimum distance the vehicle must have traveled within the zone before the activation is recognized. Used to filter out vehicles that briefly clip the zone edge.
- *Traversed zones* — a set of other zones the vehicle must have previously entered. Each tracked vehicle carries a list of zones it has entered, populated on entry to each zone and cleared when the track terminates. This is the mechanism for turning movement count: the terminal zone of a movement filters on the presence of the corresponding origin zone in the vehicle's traversal list. Order is implicit in where the filter is checked — the terminal zone, by being the one that performs the check, is necessarily later than the origin zone in the vehicle's path.

Interval Filter

The interval filter applies only to interval-activated zones. It specifies which derived measurement is monitored (for example, zone occupancy, average zone speed), the threshold value, the threshold direction (above-threshold for queue and over-speed-aggregate applications, below-threshold for stalled-traffic applications), and the hysteresis configuration that prevents threshold flicker.

Alerts

Alerts notify the Tetryon server of unusual events that warrant operator attention, such as wrong-way drivers. Alerts affect the Tetryon server only and are independent of controller reporting.

When alert generation is enabled on a zone, each activation event produces one alert; deactivation events do not produce alerts. Alerts carry the full available context for the triggering vehicle or interval measurement. The system rate-limits alerts to two outstanding at a time; events that occur while the limit is reached are still recorded as events for statistics purposes but do not produce alert notifications or video clips.

Alerts are intended for zones whose filter is configured such that activations are inherently rare. Enabling alerts on a high-volume presence zone will saturate the rate limit on normal traffic and is not a supported configuration.

Statistics

Statistics are computed per zone, not per lane. Every vehicle entering a zone's geometry contributes to that zone's statistics regardless of whether it satisfied the zone's filter; the filter governs event generation only, not statistical inclusion. For lane-resolved statistics, configure at least one zone per lane.

Statistics include vehicle counts, average speed, occupancy, and other aggregate measures derived from all tracked vehicles passing through the zone. Statistics should be understood to be representative rather than exact metric.

Per-zone statistics are independent of whether the zone is configured to report status to the controller or to generate alerts.

Turning Movement Count

Turning movement count is implemented as an application of the standard zone and filter mechanisms rather than a separate construct. Each movement is configured as a terminal zone whose vehicle filter requires traversal of the corresponding origin zone. Vehicles that physically passed through both zones — in the implicit order enforced by where the filter is checked — are counted, regardless of elapsed time or intermediate stops between the two zones. This correctly handles vehicles that pause, stop, or park between origin and terminal zones, since the traversal record persists for the lifetime of the track. StatsAnalyzer configuration software facilitates simplified configuring of the zones for turning movement count.

Realtime Tracks and Zone Status

Target tracking information as well as detection zone status are all available in real-time to an attached computer via the external communication ports. Host computer communicates with the radar via the Houston Radar Binary protocol. The same protocol is used to communicate to all radars (Doppler and FMCW) produced by Houston Radar. Please contact us for a “C” or “C#” SDK (software development kit) if you wish to utilize this feature.

Events

Whenever a vehicle traverses through a zone, vehicle parameters such as speed, direction, etc. are checked against zone filter. If vehicle satisfies the filter it will generate zone activation event. When this vehicle leaves the zone, it will If zone has already been in active state, no change in zone status occurs. If zone was in inactive state it will change its status to activated. Whenever the last vehicle that generated activation even exits the zone, zone status changes to inactive.

Interval Data

PX150 keeps about 30,000 sets of interval data. This corresponds to 3 months of 5-minute intervals. The bin time is user selectable from 1 minute to 60 minutes. Obviously, interval time will affect the total time of historic interval data that radar keeps. Interval data can be retrieved via Houston Radar Binary protocol.

Legacy RTMS X3/G4 Interval Data

PX150 maintains a separate interval data in legacy RTMS X3/G4 format. This data is derived from the same source but is maintained and configured separately from native Houston Radar intervals. For example, user may configure different bin time intervals for RTMS bins and Houston Radar bins. Legacy interval data can be retrieved via X3/G4 protocol.

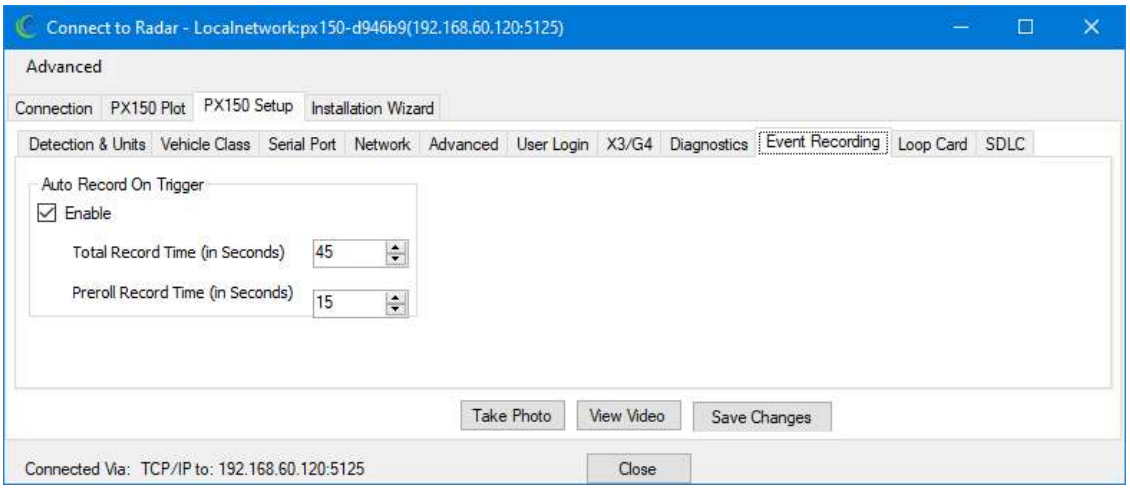
Individual Vehicle Data

PX150 radar logs individual vehicles. For each vehicle we store various parameters such as timestamp, Lane/Zone, speed, travel direction, etc. Radar keeps information about the last 1,000,000 vehicles. This information can be retrieved via Houston Radar Binary protocol. Contact us for further details or to obtain the SDK.

Zone Events

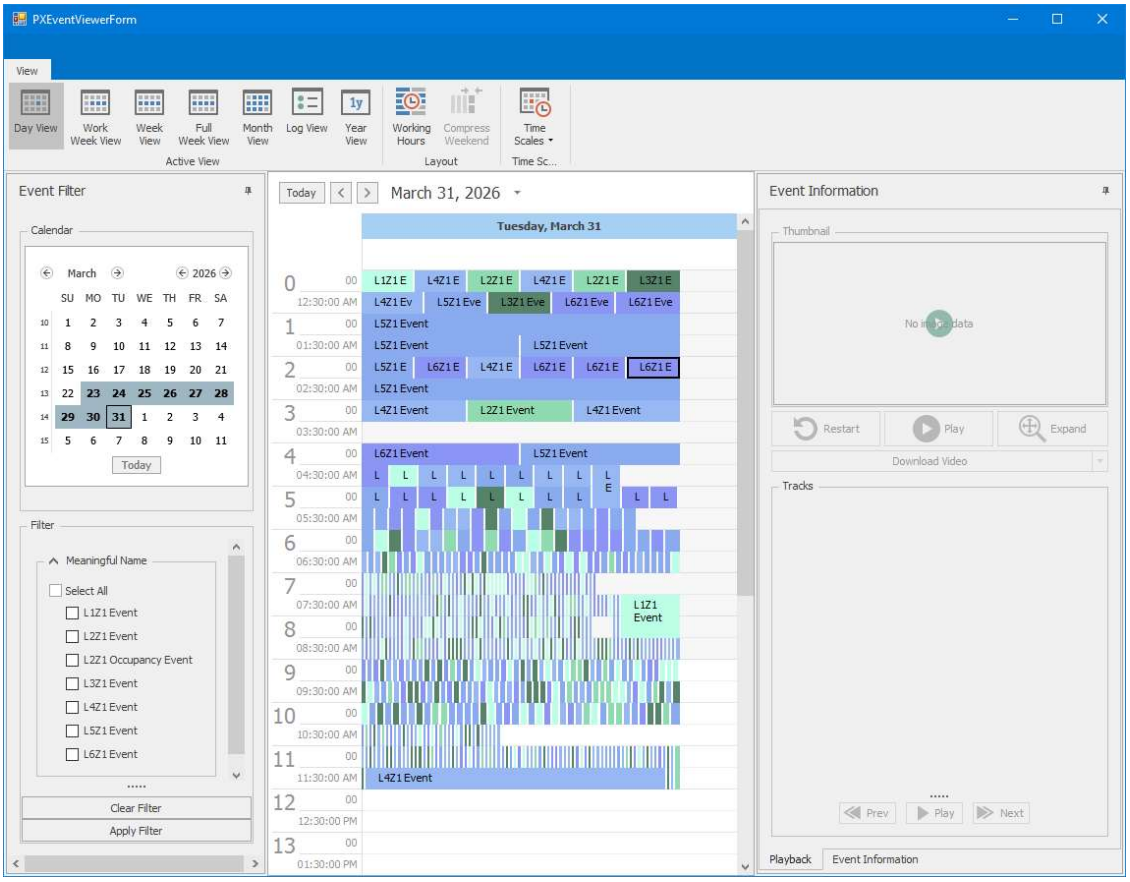
Each zone activation or deactivation generates an associated event. At a minimum, PX150 always records time and zone information. Additionally, the radar supports recording of extended event data such as video and vehicle track. Recording of event data must be enabled in “Event Recording” tab. Each event is recorded into internal memory and then pushed to Tetryon cloud server or downloaded at a later time.

Figure 30



An Ethernet, WiFi or a modem option must be purchased as well to allow a download interface for the recorded video. Events can be downloaded and viewed by clicking “Read PX Trigger Events” button on “Connection” tab.

Figure 31



Zone Alerts

Zone Events may be promoted to Zone Alerts for notifying cloud server. Typical Events that may be promoted are wrong way driver, speeding and high occupancy.

In-Radar Logs

The PX150 keeps a date/time stamped log of each of the last ***one million vehicles*** in an internal SQL database. For each vehicle, as a minimum the following information is stored:

- *Date/Time*
- *Vehicle speed in native units (mph or Km/h, configured via the UN variable or GUI)*
- *Vehicle travel direction*

Additionally, for each defined lane the following information is stored based on the value specified in seconds in the “BN” variable.

- *Total vehicle counts*
- *Average lane speed*
- *Average lane gap between vehicles*

- *Average lane occupancy*
- *85th percentile speed*
- *Counts of vehicles by user defined speed bins*
- *Counts of vehicles by direction*

This database may be queried by an external user/host using our binary protocol which is available under a no cost license. Please contact us for more information.

Analyzing Data in StatsAnalyzer

Data analysis and reporting feature are planned for release in Q2 2026.

Optional: Connecting PX150 to Tetryon

PX150 can optionally send traffic data and alerts to Tetryon, Houston Radar's cloud platform for centralized data collection, monitoring, and reporting. Tetryon is not required for normal local operation. If the PX150 is being used only for local detection, loop replacement card integration, SDLC integration, trigger outputs or local data logging, this section can be skipped.
This section covers only the minimal setup required for Tetryon connection. Detailed Tetryon operation, including reports, charts, alert review, alert acknowledgement, email notifications, and account administration, is covered in the separate **Tetryon Cloud User Guide**.

Before You Begin

Before configuring Tetryon, confirm the following:

- PX150 is installed, powered, aimed, and communicating with StatsAnalyzer.
- Lane and zone configuration has been completed and saved to the radar.
- The radar has a TCP/IP path to Tetryon server either via Internet or customer network.
- The radar is equipped with the required Ethernet, Wi-Fi, or 4G cellular option for the installation.
- Tetryon Activation has been purchased for the radar.
- The customer has provided the Tetryon server information and Customer ID.
- Any required traffic data or event recording options are enabled for the deployment.
- For cellular installations, confirm that the modem has an active SIM card, a valid data plan, and adequate cellular coverage at the site.

Information Needed from the Customer or Project Lead

Before going to the field, obtain the following:

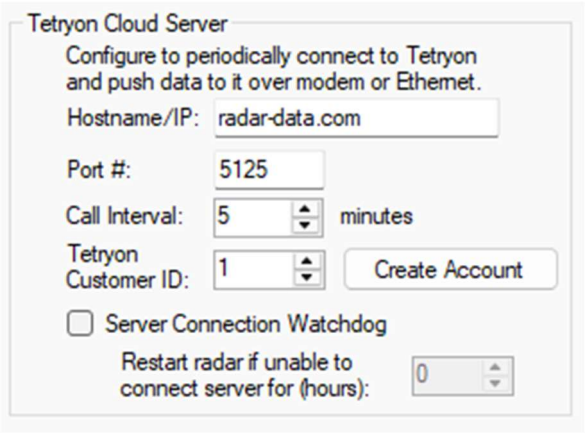
Item	Description
Tetryon server hostname or IP address	For Houston Radar shared hosting, use radar-data.com.
Port number	Default Tetryon port is 5125, unless instructed otherwise.
Customer ID	Unique ID assigned to the customer's Tetryon account.
Tetryon login information	Needed only to verify that the radar appears in the correct account.
Radar identity	Serial number or Silicon ID of the radar being installed.
Site/location name	Name that should be used when the radar is commissioned in Tetryon.

Configure the Radar to Call Tetryon

Connect to the PX150 using StatsAnalyzer.

1. Apply power to the radar and allow it to complete boot-up.
2. Open StatsAnalyzer.
3. Connect to the radar using Bluetooth, Ethernet, serial, Wi-Fi, or another supported local connection.
4. Open **PX150 Setup > Network**.

Figure 32



Enter the Tetryon connection settings.

Field	Setting
Hostname/IP	Enter the Tetryon server hostname or IP address. For Houston Radar shared hosting, use radar-data.com.
Port Number	Enter 5125, unless the project documentation specifies a different port.
Call Interval	Use 5 minutes for most installations. For cellular or power-sensitive installations, use a longer interval such as 15 minutes if specified by the project.
Customer ID	Enter the Customer ID assigned to the customer's Tetryon account.
Server Connection Watchdog	Recommended for cellular installations. Enable it and set the timeout to approximately 4 hours, unless instructed otherwise.

Do not use the **Create Account** button during normal field installation unless instructed by Houston Radar or the project lead. Tetryon account setup should normally be completed before field work begins.
After entering the settings, save the configuration to the radar.

Verify Network Connectivity

After saving the configuration, allow the radar to contact Tetryon.

The radar uploads data according to the configured call interval. For example, if the call interval is set to 5 minutes, it may take up to 5 minutes before the radar appears in Tetryon.

Before leaving the site, confirm the following:

- The radar has a working Ethernet, Wi-Fi, or cellular network path.
- The Tetryon hostname/IP, port number, and Customer ID are correct.
- The Tetryon settings have been saved to the radar.
- The radar has had enough time to complete at least one call interval.

Verify the Radar in Tetryon

Log into the customer's Tetryon account in a web browser.

1. Open the customer's Tetryon account page.
2. Log in using the provided credentials.
3. Check whether a new or unconfigured radar appears.
4. Verify that the radar's Silicon ID matches the PX150 being installed.
5. If required, assign the radar to the correct site or location name.
6. Wait for the next radar call interval and confirm that data begins updating.

Figure 33

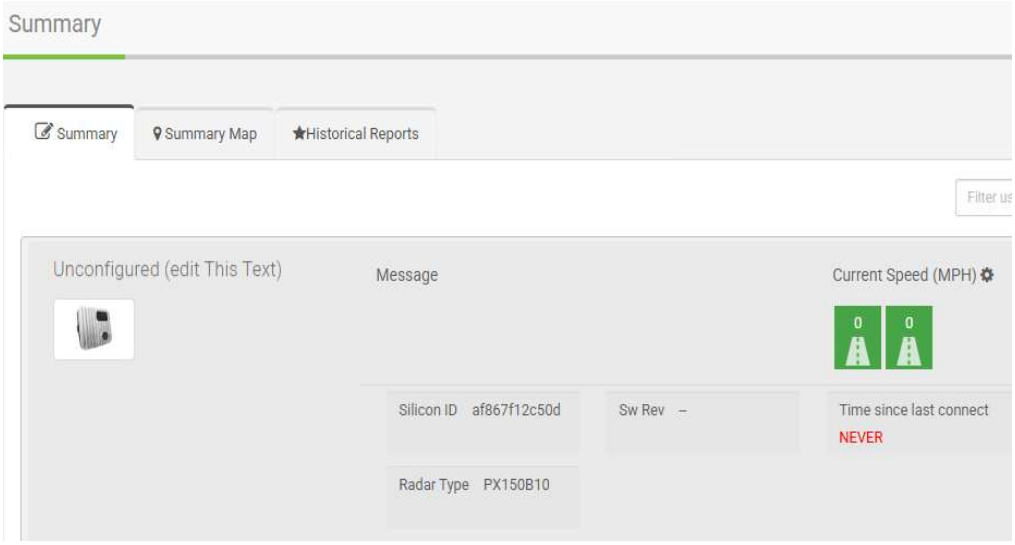
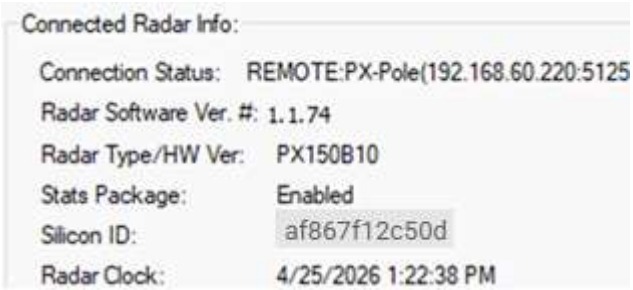


Figure 34



Always verify the Silicon ID before assigning or renaming a radar in Tetryon. This prevents the wrong field unit from being commissioned under the wrong location.

Optional: Alert Uploads
PX150 can upload recorded alerts to Tetryon when alert recording is enabled and the radar has the required options.
Use alert recording only when the project requires alert review, such as wrong-way detection, speeding events, or occupancy events.
To support event uploads:

1. Configure the required lanes and detection zones in StatsAnalyzer.
2. Enable alert recording only on the zones that should generate recorded alerts.
3. Save the configuration to the radar.
4. Confirm that the radar has a TCP/IP connection to Tetryon.
5. Confirm that event synchronization is enabled for the radar in Tetryon.

Do not enable alert recording for high-volume zones unless specifically required. Recording every vehicle can generate large amounts of data and may consume storage, bandwidth, and server resources quickly.
Detailed alert review, video playback, track playback, alert acknowledgement, and email notification setup are covered in the **Tetryon Cloud User Guide**.

Field Verification Checklist
Before leaving the site, verify the following:

Check	Expected Result
Radar is powered and configured	PX150 boots normally and communicates with StatsAnalyzer.
Lane and zone setup is saved	Radar detection configuration has been completed and saved.
Network path is available	Ethernet, Wi-Fi, or cellular connection is working.
Tetryon settings are entered	Hostname/IP, port, Customer ID, and call interval are correct.
Configuration is saved	Network/Tetryon settings have been saved to the radar.

Check	Expected Result
Radar appears in Tetryon	Radar appears after one call interval.
Silicon ID is verified	Tetryon Silicon ID matches the installed radar.
Location is assigned	Radar is associated with the correct Tetryon location.
Data updates	Tetryon shows new data after the radar calls in.
Event upload, if used	Test alerts appear after alert recording and alert sync are enabled.

Tetryon Troubleshooting

Radar Does Not Appear in Tetryon

If the radar does not appear after one full call interval:

1. Confirm that the radar has power and has completed boot-up.
2. Confirm that the radar has the Ethernet, Wi-Fi, or cellular option required for the installation.
3. Confirm that the radar has working TCP/IP connectivity.
4. Confirm that Tetryon Activation has been completed for the radar.
5. Confirm that the Hostname/IP is correct.
6. Confirm that the Port Number is correct.
7. Confirm that the Customer ID is correct.
8. Confirm that the site network allows outbound TCP communication to the Tetryon server.
9. For cellular installations, confirm SIM activation, data service, antenna connection, and signal quality.
10. Reconnect to the radar and confirm that the settings were saved.

For Houston Radar shared hosting, the typical settings are:

Field	Value
Hostname/IP	radar-data.com
Port Number	5125

Radar Appears but Data Does Not Update

If the radar appears in Tetryon but data is not updating:

1. Confirm that lanes and detection zones are configured and saved.
2. Confirm that traffic is passing through the configured lanes or zones.
3. Wait for the next configured call interval.
4. Confirm that the radar still has network connectivity.
5. Confirm that the required traffic data option is enabled.
6. Confirm that the call interval is no longer than expected.

Alerts Do Not Appear

If normal traffic data uploads but alerts do not appear:

1. Confirm that alert recording is enabled in the appropriate PX150 zone settings.
2. Confirm that the alert condition is actually being triggered.
3. Confirm that the radar has the required traffic data and alert recording option.

4. Confirm that alert synchronization is enabled in Tetryon.
5. Confirm that the network connection is suitable for uploading alert files.

Related Document

For all Tetryon user-interface procedures, reports, dashboards, event review, alert management, and email notifications, refer to the **Tetryon Cloud User Guide**.

Maintenance and Troubleshooting

Maintenance

PX150 is a fully digital traffic sensor with built-in self-calibration. Under normal operation, it does **not** require routine internal maintenance or periodic recalibration. Recommended maintenance is limited to the following:

Periodic Visual Inspection

At normal service intervals, inspect the installation for:

- loose mounting hardware
- damaged cables or connectors
- water intrusion or damaged enclosure seals
- physical obstruction of the radar face or camera window
- damage caused by impact, vandalism, or severe weather

Cleaning

The camera is an auxiliary feature and is **not required for vehicle detection**. However, if the user relies on:

- live video
- still images
- event video clips
- camera-based monitoring or alignment

then periodic cleaning of the **camera window/lens area** may be beneficial.
If dirt, dust, water spots, or road film accumulate on the front surface of the unit, clean it using a soft, non-abrasive cloth.
Warning: avoid harsh solvents, abrasive pads, or tools that may scratch the camera window or radar face. Do not use Windex or other ammonia-based cleaners as these can permanently damage radar enclosure. Use a soft, damp microfiber cloth with lukewarm water and mild, non-abrasive detergent.

Alignment Check

Routine re-aiming is normally not required. However, alignment should be checked if:

- the mounting structure has shifted
- the sensor has been struck or disturbed
- maintenance work has been performed on the pole or mast arm
- detection performance has changed unexpectedly
- roadway and traffic patterns changed

Internal Service

PX150 contains no user-serviceable internal components. Do not open the enclosure unless specifically instructed by Houston Radar.

Troubleshooting

General Approach

If a problem occurs, check the following in order:

1. Confirm that the radar has power.
2. Confirm that the unit has completed boot-up.
3. Confirm that communications are working.
4. Confirm that the radar is aimed correctly and that the monitored area is visible.
5. Confirm that lanes, zones, and application settings are configured and saved correctly.

Communication Troubleshooting

Bluetooth

Bluetooth can be used for troubleshooting as long as the radar has power. This is often the fastest way to communicate with the unit when wired communications are not available or a suspect.

Use Bluetooth to:

- confirm the radar is alive and responding
- review configuration settings
- retrieve IP configuration
- check level, camera snapshots, and live target activity

Ethernet

If Ethernet communication is not working:

- verify that the radar has power
- check the **link** and **activity** lights on the connected switch, router, injector, or computer Ethernet port
- verify the Ethernet cable and any field interface box connections
- confirm that the Ethernet option is installed
- verify that the correct PoE method is being used, if applicable
- ping the radar IP address
- if the IP address is unknown, retrieve it using Bluetooth or local discovery tools

Serial

If serial communication is not working:

- verify the selected serial mode (**RS232, RS422, or RS485**)
- verify the **baud rate**
- verify **full-duplex** or **half-duplex** mode as required
- verify termination settings for RS422/RS485 installations
- verify RTS/CTS handshake settings for RS232
- verify host-side wiring and pin assignments
- confirm that the host equipment is using the same serial settings as the radar

Detection Troubleshooting

Poor or Missing Detection

If vehicles are not being detected correctly:

- verify that the sensor is aimed at the correct roadway area
- confirm that the camera view includes the traffic area of interest
- check live radar tracks in the software
- confirm that lanes and zones are configured correctly
- confirm that the configuration has been saved to the radar
- inspect for occlusion from trucks, signs, poles, or vegetation
- inspect for changes in mounting position or tilt

False Detections or Ghost Targets

If false detections occur:

- inspect the scene for large reflective surfaces such as signs, walls, guardrails, or parked vehicles
- check for severe multipath conditions
- verify that the radar is not aimed into a tunnel or enclosed reflective space
- add or adjust **exclusion zones** as needed
- review radar aiming and mounting position

Video Troubleshooting

If camera functions are not working as expected:

- remember that **live video** requires **Ethernet, Wi-Fi, or cellular connectivity**
- when connected by **serial** or **Bluetooth**, camera access is limited to still images
- clean the camera window if image quality is poor
- confirm that event recording is enabled if video clips are expected
- confirm that a supported network interface is available for video download

When to Contact Support

Contact Houston Radar technical support if:

- the radar does not power up with a verified power source
- Bluetooth is unavailable even though the unit has power
- communications fail on all interfaces
- the unit shows persistent abnormal behavior after power cycling
- the enclosure, connector, or cable has been physically damaged
- you need assistance capturing debug information or reviewing logs

If support requests diagnostic information, record the observed symptoms, interface in use, power source, and any recent installation or configuration changes before contacting support.

PX150 SPECIFICATIONS

General

- **Radar technology:** 60 GHz-band FMCW MIMO radar
- **Operating band:** V-Band
- **Occupied frequency range:** 61.011 GHz to 61.489 GHz
- **RF power output:** 16mW max, each transmitter
- **Antenna beam pattern:** 30° × 100°
- **Maximum range:** 300 ft (90 m)
- **Range resolution:** 1 ft (0.3 m)
- **Polarization:** Linear
- **Nominal Supply voltage:** 12 to 24 VDC
- **Abs Max Supply voltage:** 9 to 28 VDC
- **Protection:** 8V undervoltage shutdown, 30V overvoltage shutdown
- **Operating temperature:** -40°F to +167°F (-40°C to +75°C)
- **Environmental protection:** NEMA 4X aluminum/polycarbonate enclosure with IP67 M12 connector

Power Consumption

- **Base system:** 4.1 W fully operational (typ. 340 mA @ 12 V or 170 mA @ 24V)
- **With Ethernet connected:** 4.3 W (typ. 360 mA @ 12 V or 180 mA @ 24V)
- **With camera enabled and streaming video over Ethernet:** 4.9 W (410 mA @ 12 V or 205mA @ 24 V)
- **With 4G modem online:** 4.5 W

Camera

- **Type:** 5 MP color
- **Field of view:** 90°
- **Supported resolutions:** 1280 × 960
- **Video recording/streaming:** H.264 1280 x 960 at 15 fps
- **RTSP Server** support with snapshot and video endpoints.
- **Clips:** video clip recording on triggers

Ethernet Option

- **Type:** 100Base-TX, full/half duplex, auto-MDIX
- **Connector:** 12-pin M12

PoE Option

- **Type:** Passive 24 VDC

Communications and Data Interfaces

- **Serial communications:** 1 software-configurable port supporting:
  - RS232, RS422, or RS485
  - CTS/RTS flow control on/off
  - full-duplex or half-duplex operation

    - 120 Ohm termination on/off
    - baud rates of 9600, 19200, 57600, 115200, and 230400
- **Bluetooth:** 1 × Bluetooth, 115200 Baud
- **Ethernet:** 1 × 100 Mbps Ethernet
- **Data and power connector:** 12-pin female M12 connector

Mechanical
- **Weight:** 0.6 lb (270 g)
- **Dimensions:** 4.2 in × 3.8 in × 2.4 in (106 mm × 96 mm × 62 mm)

Performance
Speed Accuracy
- **Per vehicle:** +/- 1 mph or km/h for approaching or receding vehicles.

Volume Accuracy
- **Per direction, typical:** 98 to 99%
- **Per direction, minimum:** 95%
- **Per lane, typical:** 98 to 99%
- **Per lane, minimum:** 95%

Stop Bar Stopped Vehicle Detection Accuracy
- **Per lane, minimum:** 98%
- **Detected Targets:** Motor Vehicles, Motorcycles, Bicycles

Measurement Speed Limits
- **Minimum:** 0 mph, km/h including true stopped presence
- **Maximum:** 113 mph, 182 km/h

Capacity
- **Maximum simultaneous tracked targets:** 256
- **Maximum number of lanes:** 16
- **Maximum number of detection zones in a lane:** 8
- **Maximum total number of detection zones:** 128

Approvals and Compatibility
- FCC
- CE Mark
- IC
- NEMA TS2 compatibility

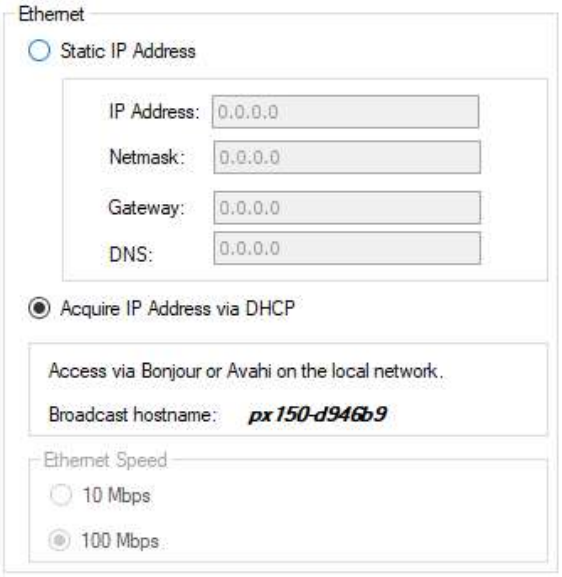
Specifications are subject to change without notice.

Appendix A: Ethernet Configuration

IP Address Configuration

Ethernet settings are configured in **PX150 Setup > Network**:

Figure 35



PX150 supports the following IP address configuration methods:

- **Static IP**
- **DHCP**
- **Automatic Private IP Addressing (Zeroconf)**

When DHCP is enabled, PX150 first attempts to obtain an IP address from a DHCP server on the network. It also makes a Zeroconf address available, so both the DHCP address and the Zeroconf address may be used for discovery and connection.
When a **static IP address** is configured, **Zeroconf is disabled**.

Zeroconf

PX150 supports **Zeroconf** networking, also known as **Bonjour** on Windows and **Avahi** on Linux. This allows the radar to be discovered and connected on a local network, or by direct Ethernet connection to a computer, without manually assigning IP addresses, provided static IP is not enabled.
Multiple PX150 units may be present on the same network at the same time. Each radar identifies itself using a unique hostname. In addition to Zeroconf discovery, PX150 also supports **Houston Radar Discover protocol**, which is built into the Windows StatsAnalyzer software.

If DHCP is enabled and a DHCP server is available, PX150 will obtain a DHCP address. It will also automatically assign itself a Zeroconf link-local address in the **169.254.0.0 to 169.254.1.255** range and respond to Bonjour, Avahi, and Houston Radar Discover requests. This allows the radar to remain discoverable even when a DHCP address is not available or when the host computer is directly connected.

If a static IP address is configured, Zeroconf is not active. In that case, the host computer must be able to reach the radar on the configured subnet. For a direct connection or isolated network, assign the computer a compatible static IP address on the same network segment.

Connecting to PX150 over Ethernet

Follow these steps to connect to PX150 over Ethernet:

1. Connect the PX150 Ethernet port to your network or directly to your computer.
2. Apply power to the radar.
3. Wait up to **45 seconds** for the radar to boot and become visible on the network.
4. Confirm that the **link** and **activity** lights on the connected router, switch, or computer Ethernet port are on. These lights are **not visible on the PX150 itself**.
5. Open **Houston Radar StatsAnalyzer**.
6. Select **Connect To Radar** and choose the **Local Network** option.
7. StatsAnalyzer will search for PX150 units using Bonjour, Avahi, or Houston Radar Discover.
8. Select the desired radar and connect.

Notes:

- If the radar does not appear on the network, verify power, Ethernet cabling, and the selected IP configuration method.
- If static IP addressing is used, make sure the host computer can communicate with the radar on the configured subnet.

Appendix B: Capturing Debug Data on the Road

PX150 includes the ability to collect diagnostic data from live field installations. From time to time, Houston Radar Technical Support may request diagnostic data to assist with troubleshooting communications, configuration, or detection-related issues.
At present, diagnostic-data collection is typically performed with assistance from Houston Radar Technical Support. Depending on the situation, Technical Support may request one of the following:

- a direct connection to the radar, or
- a remote desktop session to a customer computer that is connected to the radar

Technical Support will guide the customer through the required steps, collect the necessary diagnostic information, and assist with uploading the captured data if needed.

Diagnostic data collection is performed with assistance from Houston Radar Technical Support. Contact support at 1-888-602-3111 to initiate a diagnostic session.

Appendix C: Wire Signal Descriptions

This appendix provides reference information for the PX150 radar connector and the standard 40 ft cable assembly. Unless noted otherwise, signal names are listed from the **radar perspective**.

Some connector pins are **multiplexed** and assume different functions depending on the configured serial interface mode.

Radar Connector

PX150 uses a single **12-pin female M12 connector** to carry power, communications, trigger signals, and optional Ethernet connections.

Table 4. M12 Connector Pinout

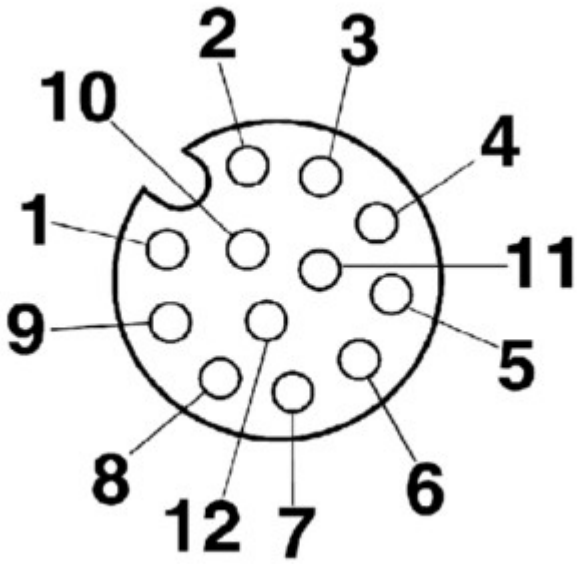
M12 Pin	Signal Name	Direction (Radar Perspective)	Color	Description
1	+VCC	Power	Red	+12 VDC to +24 VDC input
2	DC Return	Return	Black	Radar ground / DC return
3	Trig1	Input / Output	Yellow	Open-drain trigger / digital I/O
4	Ethernet RX-	Input	Green	Ethernet receive negative
5	Ethernet RX+	Input	Green/White	Ethernet receive positive
6	Ethernet TX-	Output	Orange	Ethernet transmit negative
7	Ethernet TX+	Output	Orange/White	Ethernet transmit positive
8	CTS / RX-	Input	Blue/White	Software-configurable: RS232 : CTS, RS422 : RX-, RS485 : N/A
9	Trig2	Input / Output	Grey	Open-drain trigger / digital I/O
10	Data+ / RTS / TX+	Output	Brown	Software-configurable: RS485 : Data+, RS232 : RTS, RS422 : TX+
11	Data- / TXD / TX-	Output	Brown/White	Software-configurable: RS485 : Data-, RS232 : TX, RS422 : TX-
12	RXD / RX+	Input	Blue	Software-configurable: RS232 : RX, RS422 : RX+, RS485 : N/A

Notes

- Pins **8, 10, 11, and 12** are shared by the serial interface and change function based on the configured serial mode.
- Pins **4 through 7** are used only when the radar is equipped with the **Ethernet option**.
- Trigger signals are **open-drain** and referenced to radar ground.

Figure 36

M12 Connector Pin Position (looking at the radar)



Standard 40 ft Cable

Houston Radar offers an optional **40 ft 12-conductor cable (P/N 900-0086)** for installations where a direct connection between the radar and cabinet or field electronics is preferred. A typical application is a sensor trailer or other installation where a junction box is not used.

The cable provides:

- a connector on the radar end
- an **RJ45** breakout for Ethernet
- a **DB9 female** connector for serial communications
- a **barrel DC power connector**

Figure 37

DB9 Connector on Standard 40 ft Cable

Table 5. DB9 Female Connector Installed on End of 12-Conductor Cable

DB9 Pin	Signal Name	Direction (with respect to Radar)	Description
1	+12V DC	Input	Radar power input. Connect to +12 VDC to +24 VDC supply
2	Data- / TXD / TX-	Output	Software-configurable: RS485 = Data-, RS232 = TX, RS422 = TX-
3	RXD / RX+	Input	Software-configurable: RS232 = RX, RS422 = RX+, RS485 = N/A
4	Reserved1	N/A	Do not connect
5	GND	Input	System ground / DC return
6	Reserved2	N/A	Do not connect
7	CTS / RX-	Input	Software-configurable: RS232 = CTS, RS422 = RX-, RS485 = N/A
8	Data+ / RTS / TX+	Output	Software-configurable: RS485 = Data+, RS232 = RTS, RS422 = TX+

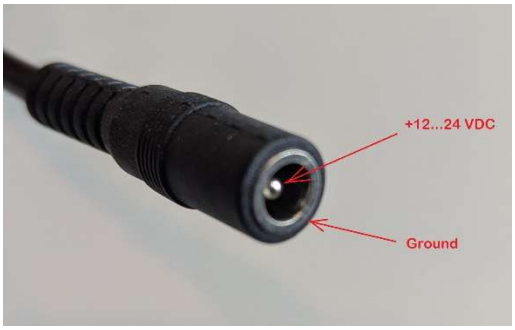
DB9 Pin	Signal Name	Direction (with respect to Radar)	Description
9	N/A	N/A	Do not connect

Note
When using the DB9 serial breakout, make sure the configured serial mode in the radar matches the intended wiring.

Barrel DC Power Connector on Standard 40 ft Cable
The barrel DC power connector on the standard cable is wired as follows:

- **Pin 1 (inner terminal):** +VCC
- **Pin 2 (outer terminal):** DC Return / Ground

Figure 38



Appendix D: Product options and accessories

Table 6. PX150 Product Options and Accessories

Part Number	Option / Accessory	Description	Notes
OPT-PX150-0001	Built-In Ethernet	Factory-installed Ethernet interface for wired communications, network configuration, data transfer, and live video streaming.	Requires external 12-24 VDC power unless used with approved passive PoE hardware.
OPT-PX150-0002	Built-In LTE 4G Cellular Modem with GPS	Factory-installed 4G cellular modem for remote communications and cloud connectivity, with integrated GPS for location reporting.	Customer must provide the SIM card for factory installation.
OPT-PX150-0003	Traffic Data and Event Recording	Enables onboard traffic data and event recording, including video clips.	Local download is included. Cloud upload storage may require a separate annual plan.
Tetryon/ALC	Tetryon Activation	Enables integration with the Tetryon cloud platform for centralized data aggregation, reporting, and remote access.	Use when cloud-based collection and management is required.
Tetryon Annual Maintenance	Tetryon Annual Maintenance and Technical Support	Annual maintenance plan for Tetryon software updates and technical support.	Available after the initial startup support period.
900-0086	PX150 40-feet Cable	40 ft interface cable with M12 right-angle female connector and breakout to RJ45, DB9, and barrel power connector.	Used for standard field installations.
900-0082	PX150 18-inch Cable	Short adapter cable with M12 right-angle female to M12 straight female connection.	Used with compatible field interface boxes.
110-0036	Bluetooth USB Adapter	Class 1 Bluetooth USB adapter for Windows-based setup computers.	Intended for use with supported Windows systems.

Part Number	Option / Accessory	Description	Notes
110-0073	Power Supply	AC-to-DC power supply providing 24 VDC output for PX150 systems.	Used when local AC mains power is available.
120-0040	External Passive PoE Injector	Single-port 10/100 Mbps Mode B passive PoE injector *.	Verify compatibility with the selected PX150 Ethernet/PoE configuration.
900-0079	12-Conductor Cable	Bulk 12-conductor black TPU cable for custom cable assemblies.	Sold per foot. No connectors installed.
FIB-100-0006	Field Interface Box, cabinet side	Field interface box for installations requiring custom cable lengths and field termination.	See applicable quick start guide.
FIB-100-0007	PX150 Ethernet Field Interface Box, radar side	Field interface box with internal surge protection and RJ45 Ethernet connection for PX150 Ethernet installations.	Used for Ethernet-based PX150 installations. See quick start and selector guides.
FIB-100-0008	PX150 Cable Field Interface Box, radar side	Field interface box with internal surge protection and terminal block for 12-conductor cable termination.	Used when field wiring is terminated directly in the interface box. See quick start and selector guides.
LRC222 / LRC224	2-Channel / 4-Channel Loop Replacement Card	Loop replacement card with contact-closure outputs for interfacing PX150 to TS-1, TS-2, 170, and 2070 traffic controllers.	Available in 2-channel and 4-channel versions. Multiple cards may be daisy-chained to a single radar. See quick start guide and cutsheet.
LRC224E	4-Channel Loop Replacement Card	4-channel loop replacement card for MIDAS-compatible controller environments.	See quick start guide.
CBL-100-0005	Adapter Cable	6 ft adapter cable with male DB9 to RJ25 connectors for use with compatible loop replacement cards.	Used with LRC interface hardware.

Part Number	Option / Accessory	Description	Notes
KIT-SpeedLanePro-Midblock	Mid-Block Kit	Accessory kit for PX150 mid-block traffic monitoring deployments.	See product cutsheet for application details.

Note:
* Does not include a 24 VDC power supply. Order separately.

Appendix E: Warranty

PX150 is supplied with a **standard one-year limited warranty** from the date of shipment. Extended warranty coverage may be purchased for an additional **1 to 4 years**, for a maximum total warranty period of **5 years**.
The warranty applies to defects in materials and workmanship under normal intended use. Warranty coverage does not apply to damage caused by improper installation, misuse, unauthorized modification, accident, or environmental conditions outside the specified operating limits.
For warranty service, repair evaluation, or questions regarding warranty coverage, contact **Houston Radar Technical Support** before returning any equipment.

Please refer to the Terms and Conditions of Sale document for the latest information. When in conflict, the Terms and Conditions of Sale document applies and overrides this paragraph.