



NEVADA

NEVADA

LEADER IN EVASION MANAGEMENT AT TOLL PLAZAS

| Installation

Pumatronix Equipamentos Eletrônicos Ltda.

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Change History

Date	Revision	Updated content
11/22/2022	1.0	Initial Version
07/01/2024	1.1	Detail of Sensor Signal Connections in Pass Boxes; improvements to connection diagrams;
09/13/2024	1.2	Update on connection diagrams; Details on fixing the ITSLUX Illuminator;

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1. Infrastructure Installation for the Track



The correct operation of the NEVADA is directly related to the quality of the images that are captured, so the equipment has its lenses and illuminator sized at the specified standard distances. Variations in distances are tolerated, however recognition results may be affected. Contact Pumatronix Technical Support when it is not possible to meet the technical specifications.

- 1) Install the prerequisite infrastructure, providing the toll site resources for the track in which the NEVADA system will be implemented:
 1. *Cable Protection Pipe*: All connections between posts and with the concessionaire are underground and must be duly protected by tubes of at least 30 mm, to protect the ducts. The installation is carried out from the track cabin to the post, and the channels available in the current installation of the plaza and/or new electroducts can be used. Wiring protection is necessary to prevent wear generated by exposure to the elements, in addition to protecting professionals and vehicles traveling in the toll plaza against accidents. For the post installed on asphalt, the demand is a cut in the floor at least 10 centimeters wide by 15 centimeters deep, to facilitate the connection of the conduit with the base of the post;
 2. *Location appropriate in the Control Panel*, enough to hold the *Supervisor Board* and all components used in the electrical and data connection;
 3. *AC power supply 127 or 220 Volts*, for be connected to an AC-DC source, which provides 24Vdc for NEVADA equipment;
 4. *Cables*, to make the power connections, of the sensors of the track, with the ITSCAM VIGIA+ and the data network;
 5. *Surge protector, Circuit Breaker and Relay*, to protect the elements of circuit against damage from the appearance of electrical surges;
 6. *Signals* of the sensors that identify the presence of a vehicle on the track (to be connected to the *Supervisory Board*);
 7. *Net data communication*, for the transmission of data collected between the track and the Processing Unit;
 8. *PoE Switch* (IEEE 802.3af standard), to power and connect ITSCAM VIGIA+ devices to the data network.
- 2) Consider the recommended distances for the installation of the posts that will receive the image capture equipment, whose point of origin is the position of the *Optical Barrier* sensor, which identifies the presence of the vehicle:

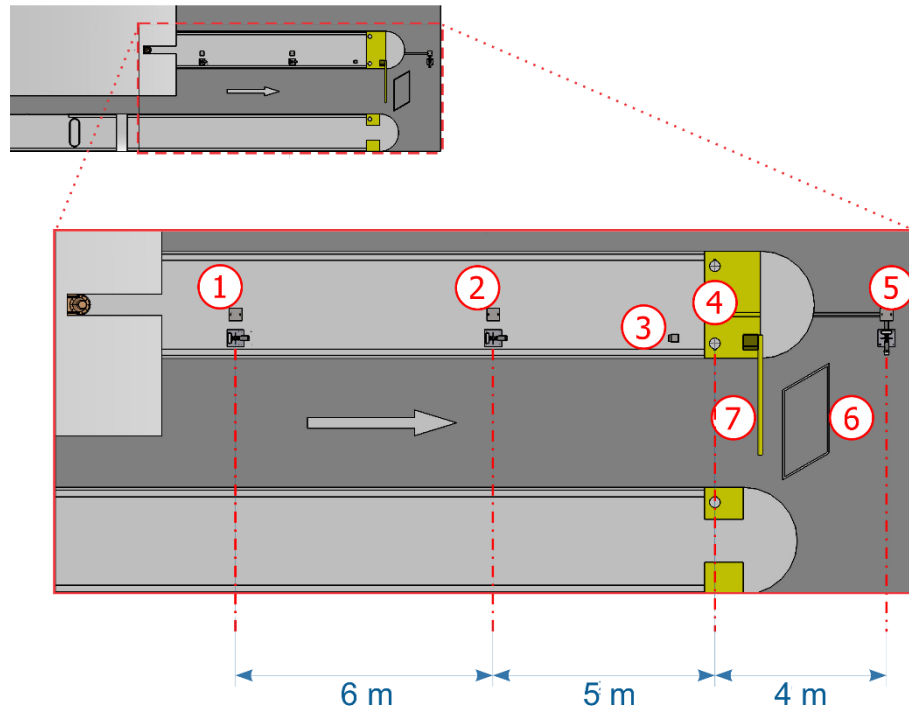


Figure 1 - Top view of the installation in an autocharge track (AVI): 1) Panoramic capture post, 2) Rear capture post, 3) Traffic light from track, 4) Track optical barrier 5) Front capture post, 6) Track Loop, 7) Track Barrier

- 3) Consider the direction of the vehicle passageway indicated for the installation of the *Inductive Loop* sensor, which may be located after the barrier (model adopted in all the images of the track of the generic toll plaza presented in this document), but it may be installed before the barrier;

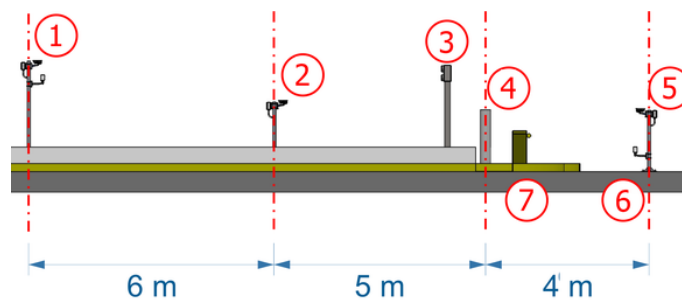


Figure 2 - Side view of the installation in an autocharge track (AVI): 1) Panoramic capture post, 2) Rear capture post, 3) Traffic light from track, 4) Track optical barrier 5) Front capture post, 6) Track Loop 7) Track Barrier



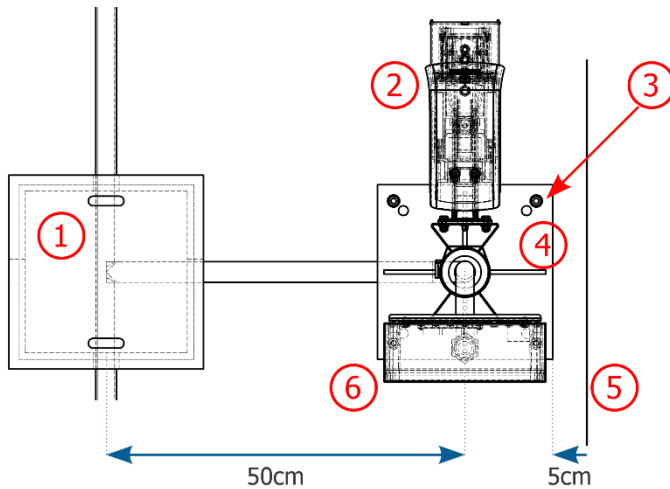
Alignment with the sides of the track: During the installation, it is important to observe the alignment to the sides of the track, so that a safe spacing is maintained so that large vehicles can travel normally. Similarly, the chosen location must allow operators to safely maintain the system.



Positioning of the front post: The installation of the post that captures the frontal images of the vehicles must be manufactured in a region that does not interfere with the exit of the vehicles from the track collection region.

2. Infra Set Installation

Fixation of Posts in Concrete



Description	Quantity
Anchor 5/16"x100 with Stainless steel Stud (Panoramic Post)	4
Anchor 5/16"x100 with Stainless Steel Stud (Rear Post)	4

Figure 1 - Positioning of the Panoramic or Rear capture post: 1) Inspection box with cast iron cover, 2) ITSCAM VIGIA+ fixed to the post, 3) Parabolt type anchors, 4) Base of the post, 5) Existing curb, 6) Terminal Box fixed to the post

- 4) Place the base of the post at least 5 cm from the beginning of the curb and 50 cm from the axis of the inspection box;
- 5) Drill the concrete with a minimum depth of 73 mm, in the positions marked at the base of the post;
- 6) Secure the base of the post by attaching with the 5/16" Anchor.

Fixation of Posts in Asphalt

When the Front Capture Post is installed on the tarmac, the 190mm anchor must be installed.

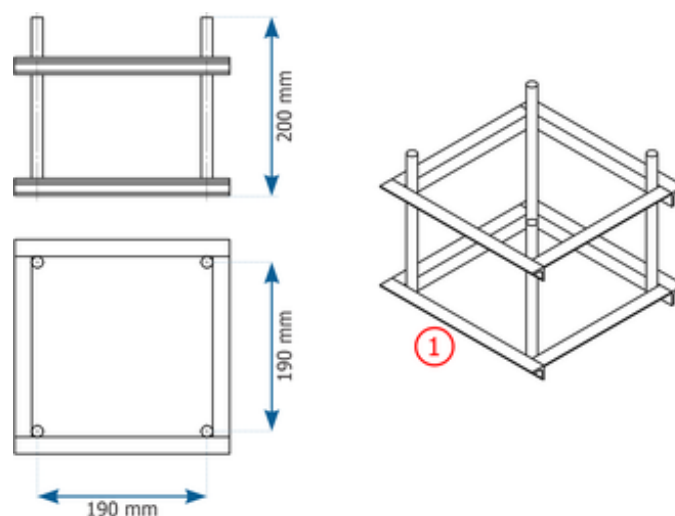


Figure 4 - Dimensions of Anchor 190mm (1)

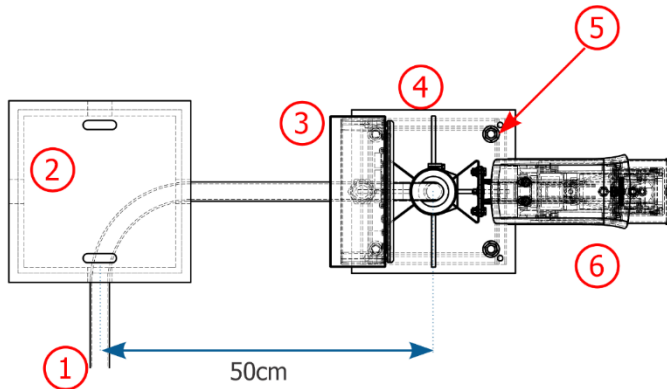


Figure 2 - Positioning of the Front capture post on asphalt: 1) Cable protection pipe, 2) Inspection Box with cast iron cover, 3) Terminal Box fixed to the post, 4) Base of the post, 5) Fixation point to the 190 mm anchor, 6) ITSCAM VIGIA+ fixed to the post

Description	Quantity
Anchor 190mm	1
Plain washer 1/2"	4
Hex nut 1/2"	4

- 7) Align the front post 50 cm from the axis of the inspection box;
- 8) Make a cutout on the asphalt of approximately 40x40cm. The depth of this cut must be sufficient to insert the 190mm anchor and ensure that the base of the post is leveled to the asphalt;
- 9) Carry out the concreting procedure for the 190 mm anchor using graute;
- 10) Secure post base to anchor with 4 1/2" nuts and 4 1/2" washers.

Terminal Box Assembly

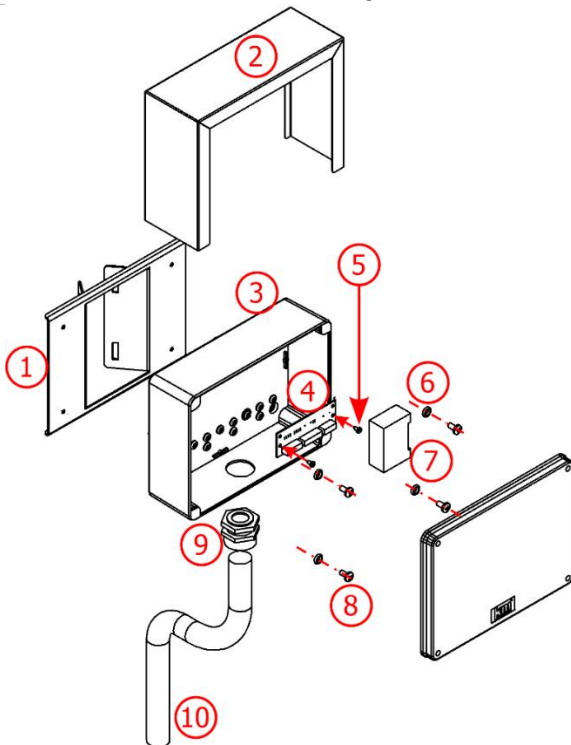


Figure 3 - Terminal Box Components

Article	Description	Quantity
1	Rev02 Terminal Box Bracket	1
2	Protective cover	1
3	Terminal Box 5 holes	1
4	Board cxPassagem_Poste	1
5	AAT PAN PH 3.5x9.5 screw stainless steel 304	2
6	O-ring 5,94 3,53 ref. 2202	4
7	Network Surge Protector	1
8	MAQ PAN PH screw M6 x 12 stainless steel	4
9	1" Cable Press	1
10	Tuboflex PP 1" x 450	1

* The connections of the equipment of the *Optical Set* appear on the *Terminal Box* board and are presented in [Electrical and Data Installation](#).



The installation of the wiring that reaches the *Terminal Box* must be carried out using conduit (avoiding exposed wires).



Seal: Each *Terminal Box* has a protection additional called *Protective Cover*, which protects the box and increases the degree of protection against liquid infiltration. This *Protective cover* must be permanently installed on the outside of the casing, except in situations where it is necessary to open it to perform a maintenance procedure.

3. Optical Set Installation

ITSCAM VIGIA+ device Assembly

- 11) Assemble the ITSCAM VIGIA+ device on its respective support, following the steps indicated in the Product Installation Guide to fix the *VIGIA+ Bracket* and using the parts:

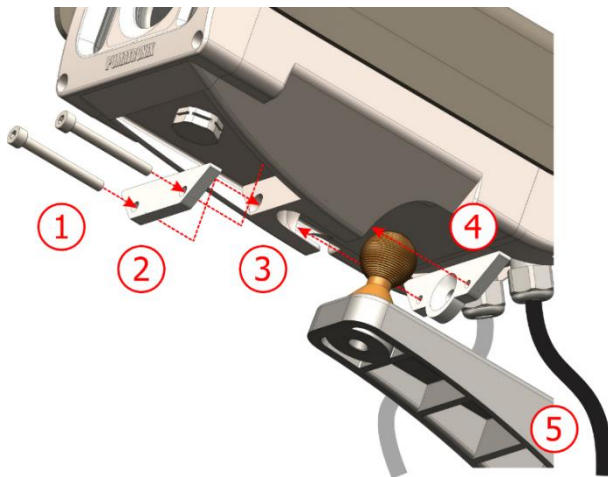


Figure 4 - VIGIA+ Bracket Parts

Article	Description	Quantity
1	ALLEN M4 x 30 stainless steel screw	2
2	Sphere Support	1
3	ITSCAM VIGIA+ cavity	1
4	Sphere Fastener	1
5	VIGIA+ Bracket	1

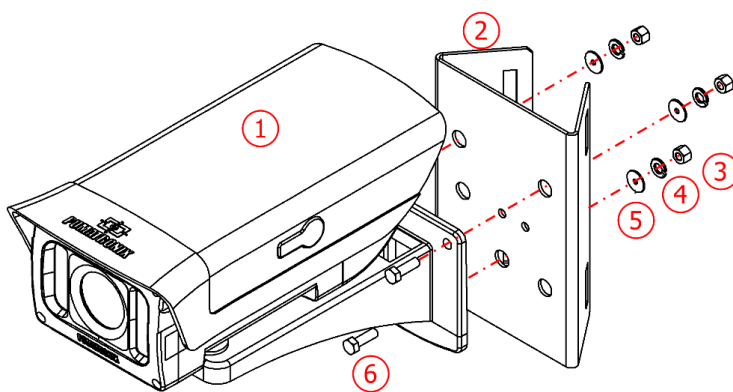


Figure 5 - ITSCAM VIGIA+ Device Cela Bracket Parts

Article	Description	Quantity
1	VIGIA+ Bracket with ITSCAM VIGIA+ device	1
2	Cela Bracket 40mm	1
3	Hex Nut M5 Stainless Steel	3
4	Plain washer 3-16 stainless steel	3
5	Pressure washer M5 stainless steel	3
6	Hexagonal screw M5 x 16 Stainless steel	3

Fixing the ITSLUX Illuminator

- 12) Assemble the ITSLUX Support, inserting the ITSLUX illuminator and closing it with the indicated Protective Acrylic, using the parts indicated in the image:

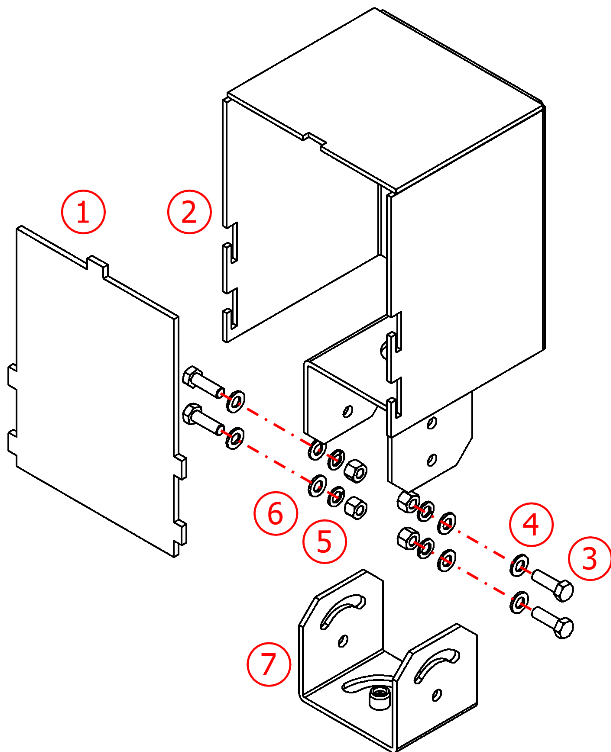


Figure 6 - ITSLUX Bracket Parts

Article	Description	Quantity
1	Acrylic Protection	1
2	Bracket ITSLUX NEVADA	1
3	Hexagonal screw M5 x 16 Stainless steel	4
4	Plain washer M5 stainless steel	8
5	Hex Nut M5 Stainless Steel	4
6	Lock Washer M5 Stainless Steel	4
7	Bracket base	1

- 13) Assemble the CPV12 Aluminum Support, using the parts indicated in the image:

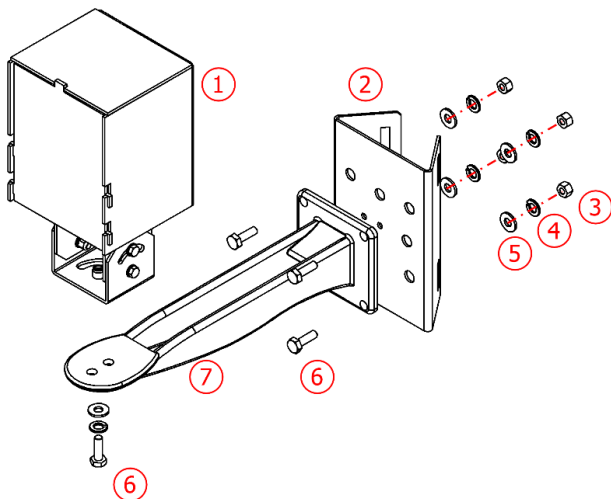


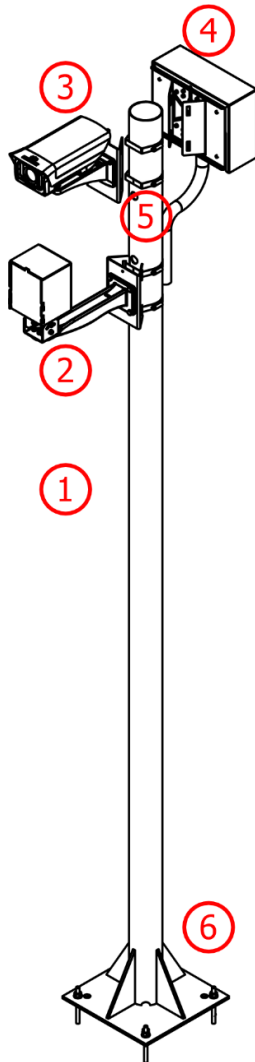
Figure 7 - ITSLUX illuminator Cela
Bracket Parts

Article	Description	Quantity
1	ITSLUX Bracket with illuminator	1
2	Cela Bracket 40mm	1
3	Hex Nut M6 Stainless Steel	4
4	M6 Stainless Steel Lock Washer	5
5	Smooth washer M6 stainless steel	5
6	Hexagonal screw M6 x20 Stainless steel	5
7	Aluminum Bracket CPV12	1

- 14) Attach the ITSLUX Support (1) with illuminator to the CPV12 Aluminum Support (7), using the Sext Screw. M6 x 20 stainless steel (6) indicated;
- 15) Secure the equipment set to the selected infrastructure, close to the respective Secondary Module device, using 2 clamps on the Cell Support (2).

Positioning of Devices on Posts

- 16) Assemble the *Optical Set* kit to the respective Bracket, using the specific parts;
- 17) Fix the ITSCAM VIGIA+ and Terminal Box devices near the cable passage holes located at the top of the post using 2 clamps;
- 18) Attach the ITSLUX illuminator to the bottom of the Front Post near the cable routing hole.



Article	Description	Quantity
1	2.5m post (Ø3")	1
2	ITSLUX illuminator (optional)	1
3	Panoramic ITSCAM VIGIA+	1
4	Terminal Box	1
5	Clamps*	2
6	Concrete Fixation Mechanism	1

*Fix the Cella Bracket of each unit to the post using the clamps, with a total of 2 (two) clamps for the ITSCAM VIGIA+ device and the Terminal Box. If the ITSLUX illuminator is installed, two additional clamps will be required.

Figure 11 - Panoramic Image Capture Post

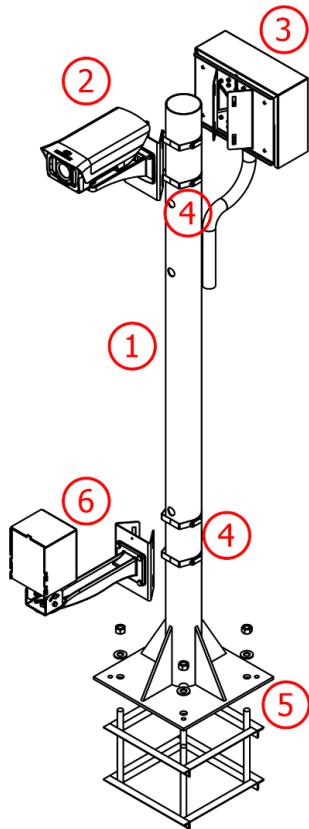


Figure 12 - Front Image Capture Post

Article	Description	Quantity
1	1.5m post (Ø3")	1
2	Front ITSCAM VIGIA+	1
3	Terminal Box	1
4	Clamps*	4
5	Asphalt Fixing Mechanism (190mm anchor)	1
6	ITSLUX Illuminator	1

*Fix the Cela brackets to the post with a total of 4 (four) clamps, 2 (two) for the ITSCAM VIGIA+ device and Terminal Box and 2 (two) for the ITSLUX illuminator.

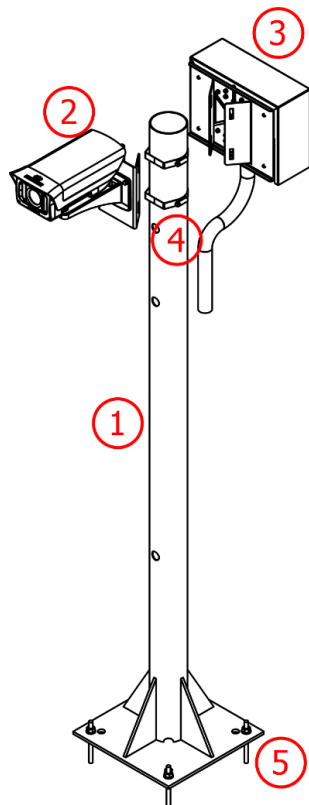


Figure 3 - Rear Image Capture Post

Article	Description	Quantity
1	1.5m post (Ø3")	1
2	Rear ITSCAM VIGIA+	1
3	Terminal Box	1
4	Clamps*	2
5	Concrete Fixation Mechanism	1

*Place the Brackets of ITSCAM VIGIA+ device and Terminal Box using 2 (two) clamps.

Network Interface Parameterization

- 19) Check the configuration of the network where the ITSCAM VIGIA+ image capture and processing device will be installed and carry out the necessary parameterization, in advance of the local connections of the equipment, referring to the steps indicated in the Installation Guide ITSCAM VIGIA+ product.



Capture equipment network configuration: ITSCAM VIGIA+ devices have the same factory network configuration. Installation of more than one device requires individual access to imaging equipment and data changes to default network settings.

4. Electrical and Data Installation

- 20) Consider the NEVADA installation diagram in a track as a general guideline towards carrying out the connection of the signals of the track sensors with the *Optical Set* devices through the connections with the *Supervisor Board*:

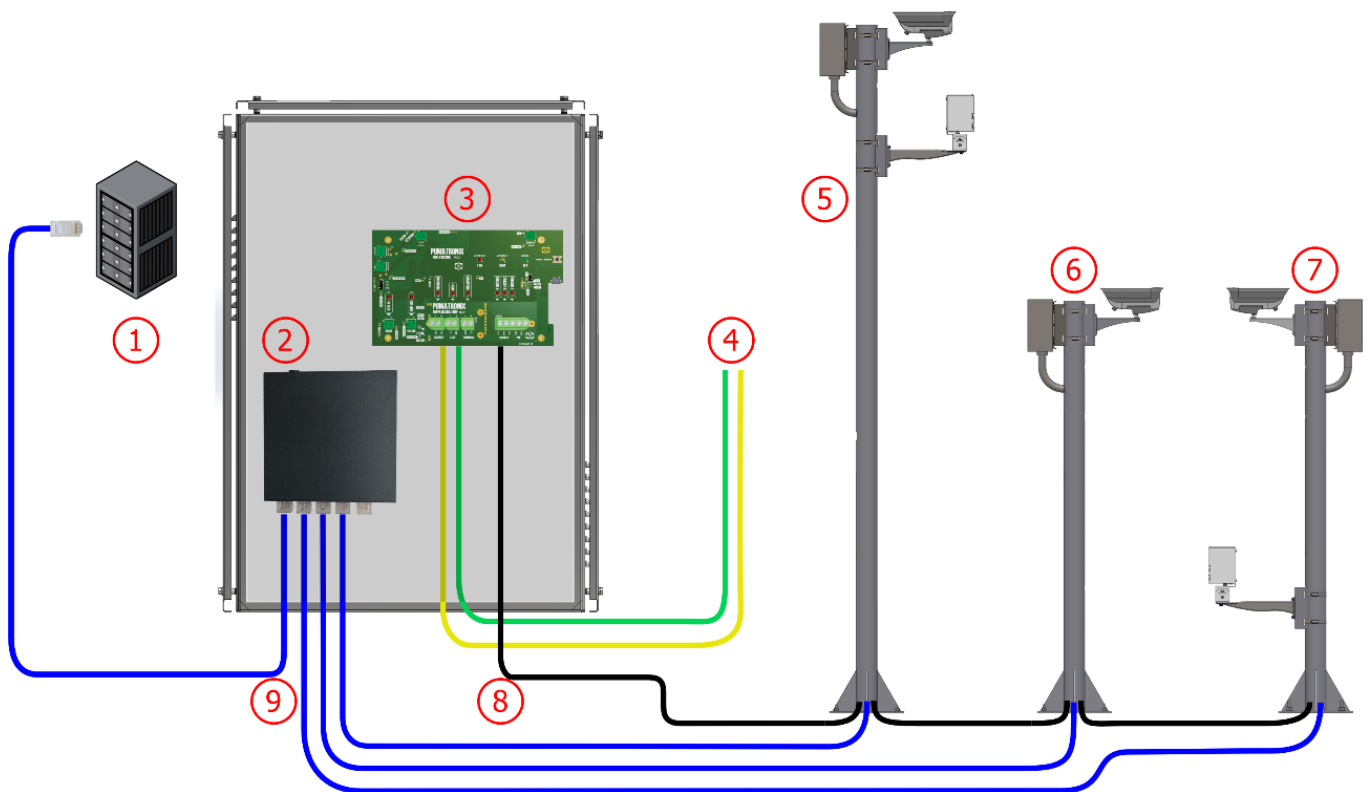


Figure 4 - Installation diagram of NEVADA in a track: 1) Track processing unit, 2) Switch, 3) Supervisor Board in the Control Panel, 4) Signals from a Track Sensor, 5) Panoramic Image Post, 6) Rear Image Post, 7) Front Image Post, 8) 8x22AWG Shielded Multi-way Cable, 9) External Furukawa Cat-5E Cable

- 21) [Connect the devices of Optical Set](#) to the *Terminal Box* of each post
- 22) Do the [connections of sensor signals](#) in the *Terminal Box* from each post using the specified jumper positions;
- 23) Install the 8x22AWG Multi-way cable with sufficient length for the distances applied in the installation, connecting to the *Terminal Box* of each post, using the specified cables in [Connections between posts](#);
- 24) Do the [Installation of the Supervisor Board](#);

- 25) Power the NEVADA system by connecting through the *Supervisor Board*, as indicated in the installation of the *Supervisor Board*;
- 26) Continue with the [Network Configuration](#) for the track;
- 27) Adjust the [framing](#) of each ITSCAM VIGIA+, taking into account the position of the device on the track.

Optical Set Connections in Terminal Box

- 28) Connect the ITSCAM VIGIA+ device cables to the *Terminal Box* board, on the bus named *Vigia*, using the colors indicated in the Connection Diagram of the respective post;
- 29) Connect wires from the ITSLUX Illuminator cable (when used) to the *Terminal Box* board, on the bus named *Illuminator*, using the colors indicated in the Connection Diagram of the respective post.

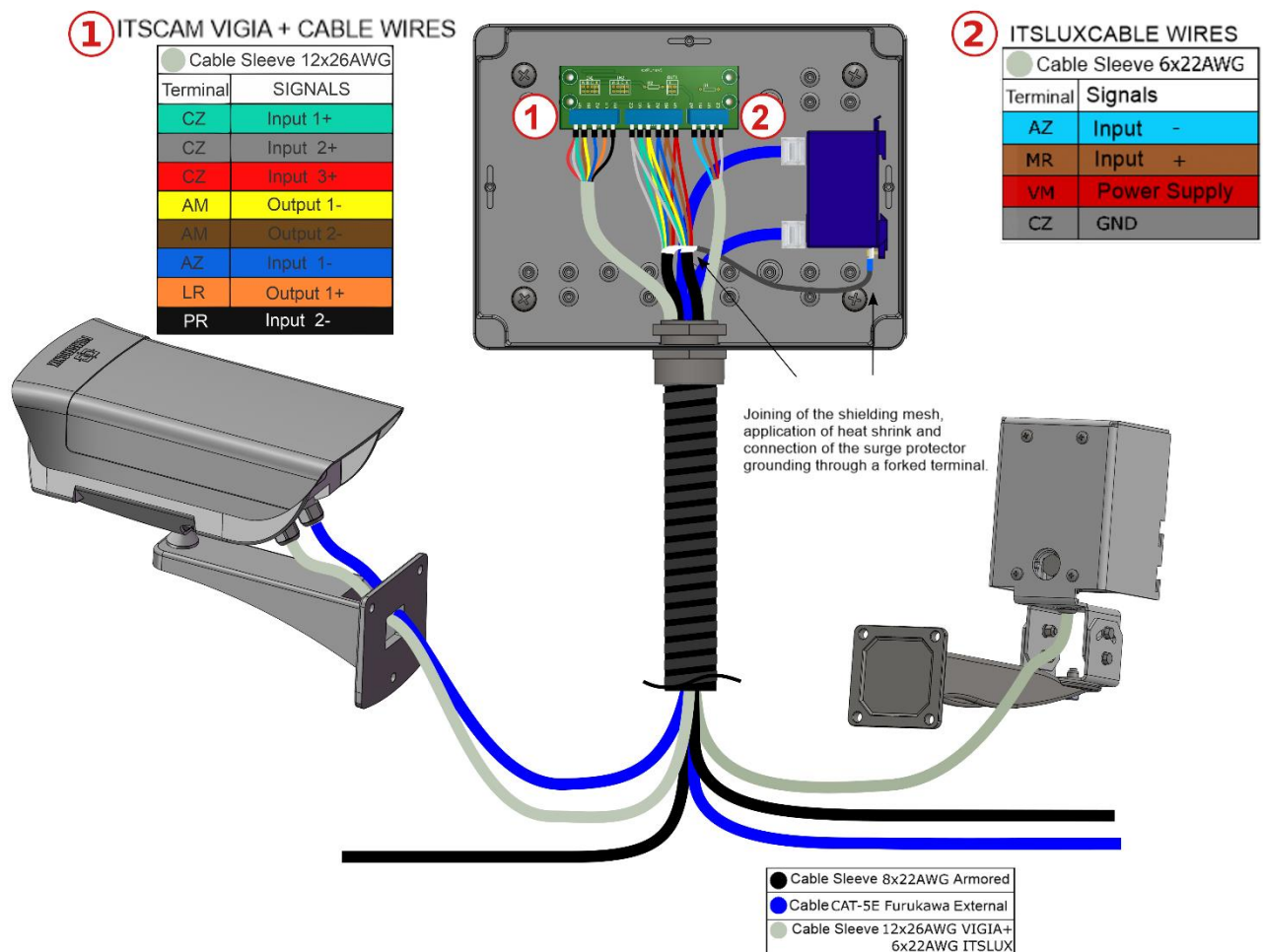


Figure 5 - Connections of the ITSCAM VIGIA+ device and ITSLUX on the Panoramic Post (with illuminator)

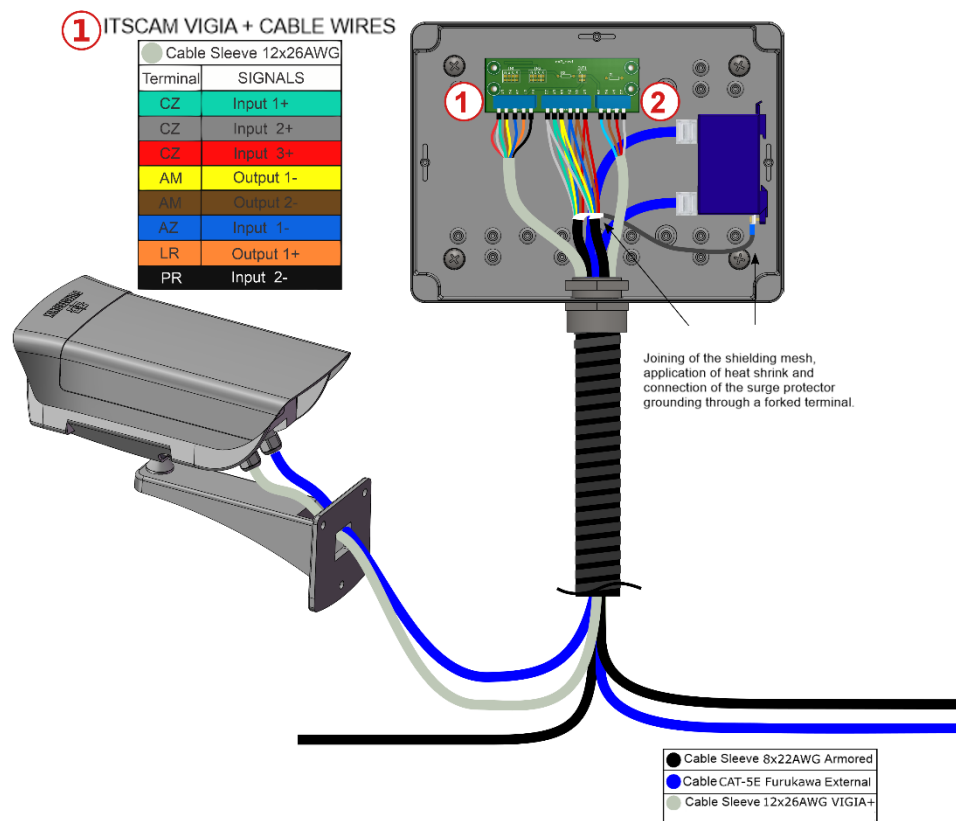


Figure 6 - Connecting the ITSCAM VIGIA+ device to the Rear or Panoramic Post (without illuminator)

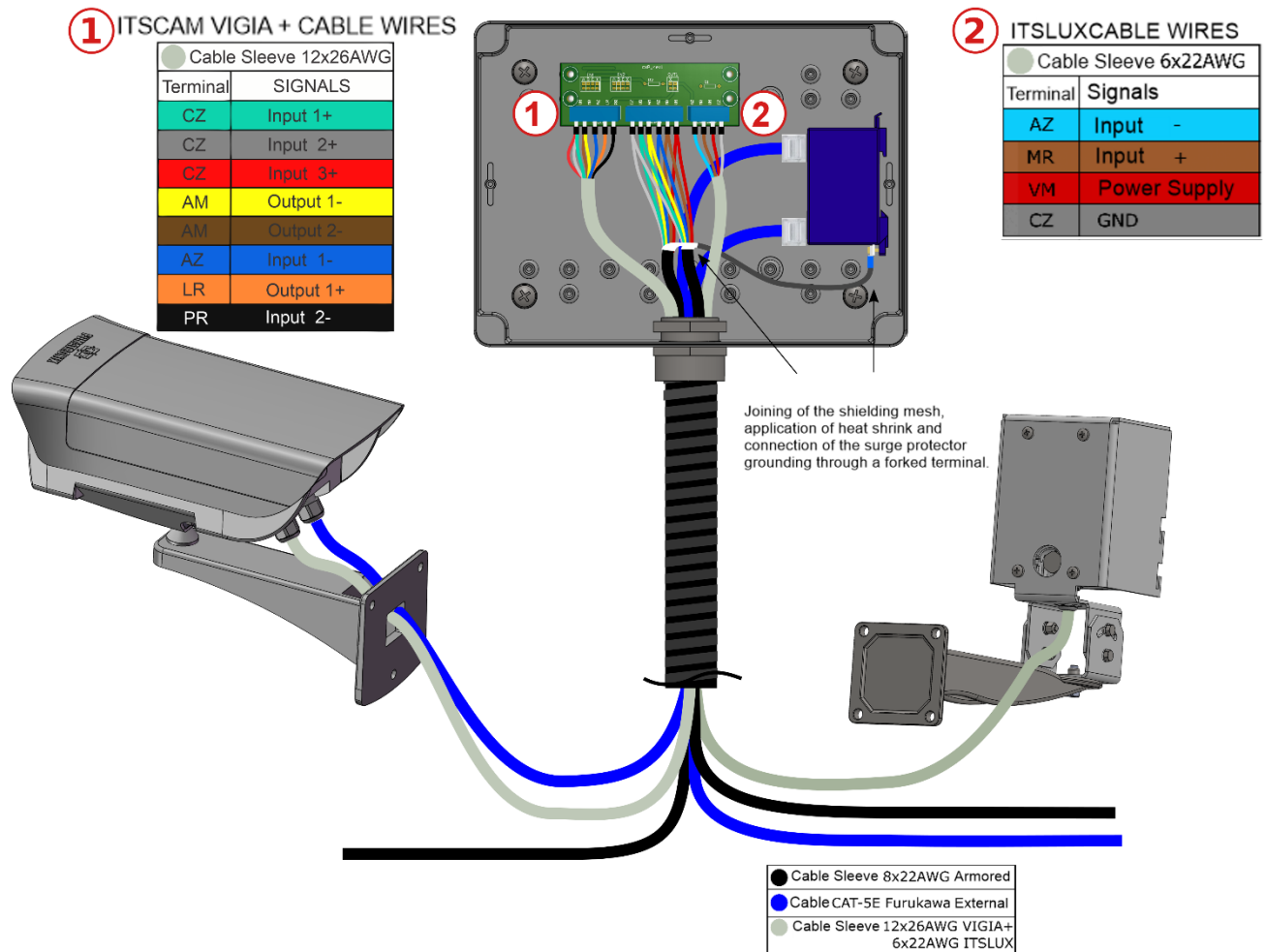


Figure 7 - Connection of the ITSCAM VIGIA+ and ITSLUX device to the Front Post

Connections Between Posts

- 30) Prepare the ends of the wires from 8-way multi-way cable that will be used in the connections between posts, using a tubular terminal with diameter between 1 and 1.5mm;
- 31) Connect the prepared wires of the multi-way cable to board connections of the *Terminal Box* in the bus called *Maleta* as shown in the diagram:

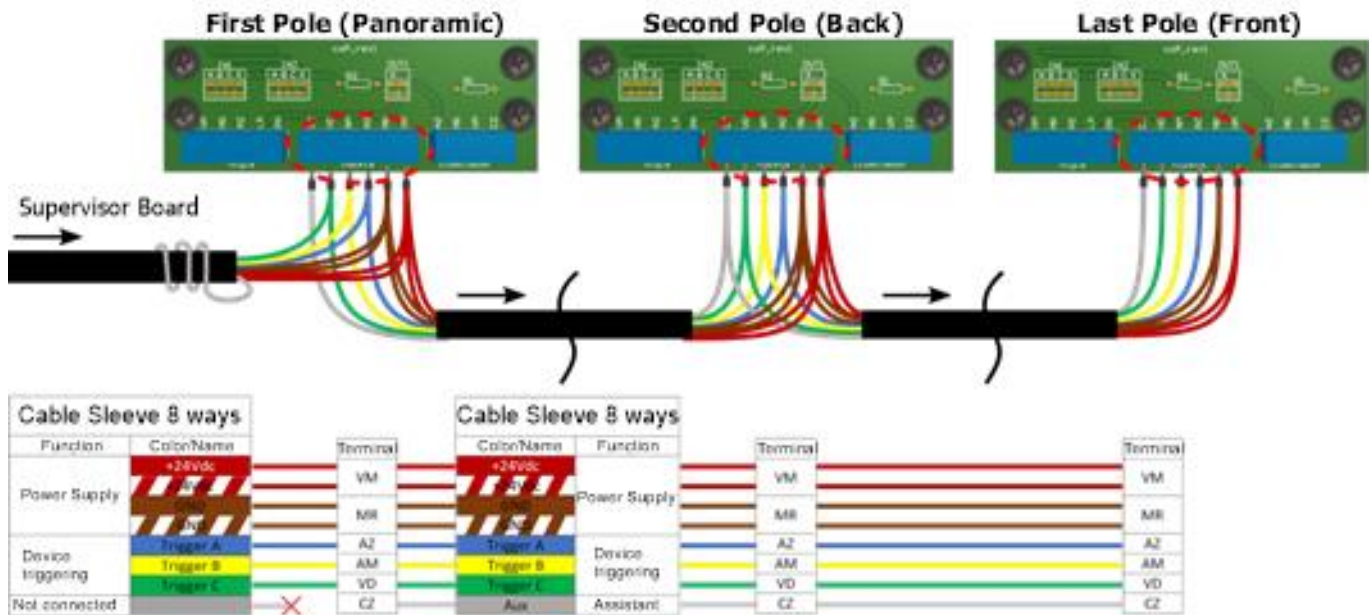


Figure 8 - 8-way sleeve cable connections in the junction boxes of the respective posts



The gray track of the **Supervisor Board** is **not** connected. must be wrapped around of the cable and tied with insulating tape. The gray track between the posts is connected and has auxiliary function.

Connections of Sensor Signals in the Terminal Box

- 32) Place the bridges that will handle of forward the signals of track to the corresponding ITSCAM VIGIA device, connected to the *Terminal Box*, applying one in each series IN1 and IN2 (input signals) or OUT1 (output signal), existing in the connection board of each post:

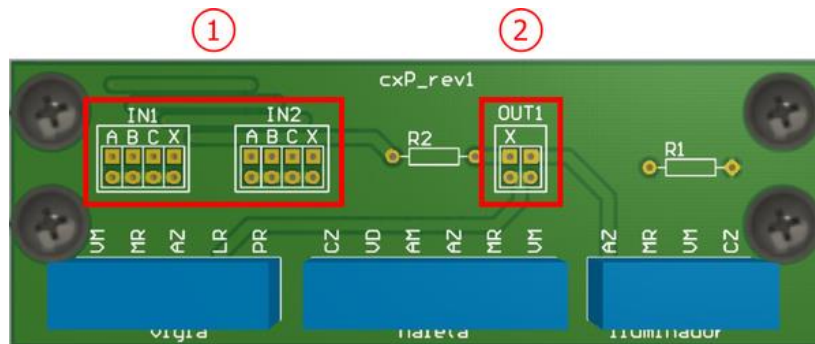


Figure 9 - Connections available on the Terminal Box board: 1) Input Signals, 2) Output Signal

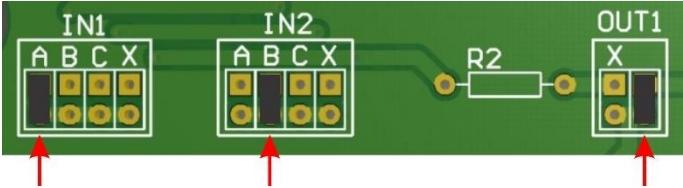
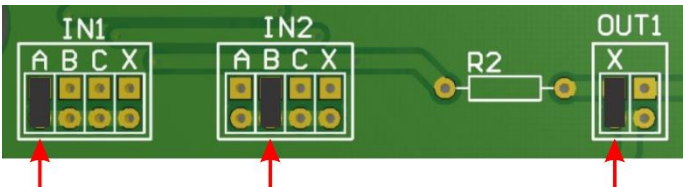
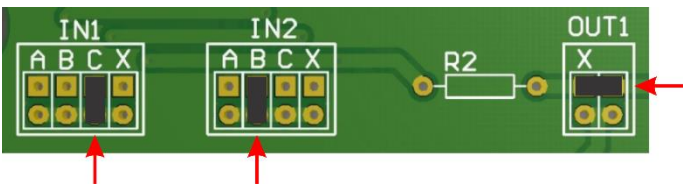
- 33) Connect the input signals located in the EN1 and EN2 assemblies of the board to receive the signals from track, while only one jumper can be connected to each assembly (*The input cables are connected to the central terminals of the board in the bus named *Maleta*):

	A	B	C	X
Sign	TRIGGER A	TRIGGER B	TRIGGER C	TRIGGER X
Corresponding Thread*	Blue	Yellow	Green	Gray

- 34) Connect the jumper to the contacts in OUT1 to establish the sending location of the ITSCAM VIGIA+ device output signals:

	Vertical left	Horizontal up*	Vertical right
Signal destination	X TRIGGER	X TRIGGER on illuminator	Illuminator

*When the *jumper* is horizontal, the only position it can be connected to is the horizontal above.

	Examples of <i>jumpers</i> positions		
	 <p>Figure 2010 - Example of Junction Box board configuration for Front image capture device</p>		
Result:	TRIGGER A at IN1	TRIGGER B at IN2	OUT1 on illuminator
	 <p>Figure 21 - Junction Box Board Configuration for Rear Image Capture Device</p>		
Result:	TRIGGER A at IN1	TRIGGER B at IN2	TRIGGER X on illuminator
	 <p>Figure 22 - Junction Box Board Configuration for Panoramic Image Capture Device</p>		
Result:	TRIGGER C at IN1	TRIGGER B at IN2	TRIGGER X on illuminator

Supervisor Board Installation

- 35) Secure the *Supervisor Board* to the existing Control Panel for the track, ensuring enough space for positioning and connections;
- 36) Install the electrical components indicated in the Electrical Specifications of the NEVADA Product Manual in the connection protection by connecting them to the respective cables indicated in the connection diagram:

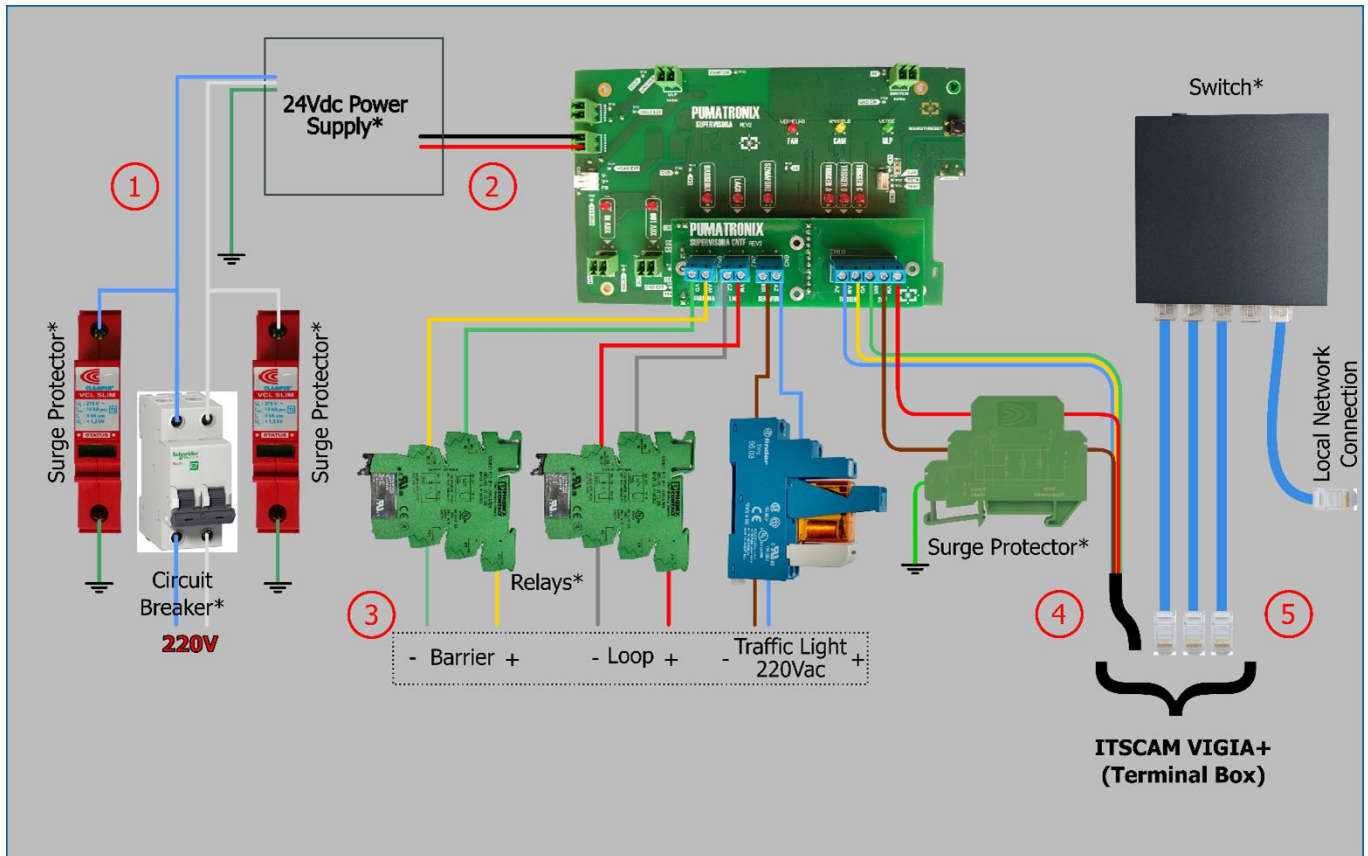


Figure 11 - Connections Diagram to the Supervisor Board (220 Vac traffic light)

- 37) Prepare the connection of the red (+24Vdc) and brown (GND) cables of the cable numbered 4 (8x22AWG shielded multi-way cable) with the DC Surge Protector;
- 38) Connect the ITSCAM VIGIA+ devices to the *Supervisor Board* through the cable numbered 4 (8x22AWG shielded multi-way cable);
- 39) Prepare the connection of the cables numbered 3 (1 2-way wire for each sensor) with the relays specified in the NEVADA Product Manual;
- 40) Connect the sensor signals to the *Supervisor Board* using the wires numbered as 3 (1 2-way wire for each sensor);
- 41) Connect the network cables of the switch connected to the Processing Unit, specified in the NEVADA Product Manual, which guarantee the data communication of the ITSCAM VIGIA+ devices;
- 42) Connect the numbered wire 2 (cable of 2 ways) to terminal 24 V from the *Supervisor Board* with the power supply purchased with the electrical specifications indicated in the NEVADA Product Manual;
- 43) Connect the wire ground point numbered 1 to a location closest to the NEVADA control panel;
- 44) Make the power connection of the NEVADA system after installing and configuring the devices, connecting the cable numbered 1 (cable type Pp 3 ways 0.75) to the existing electrical network for the track.

Network Configuration

- 45) Carry out Network Interface Parameterization, connecting the ITSCAM VIGIA+ device to an auxiliary device, after having been correctly fixed to the respective post and disconnected from the local network in which the equipment will be installed, by means of an Ethernet cable;

- 46) Access through the browser to the web interface of the ITSCAM VIGIA+ image capture device, which offers the available settings for its operation, using the factory standard data indicated in the ITSCAM VIGIA+ device Installation Guide;
- 47) Define a new IP address for the NEVADA equipment, considering the data local network from the toll road concessionaire;



Capture equipment network configuration: ITSCAM VIGIA+ devices have the same factory network configuration. Installation of more than one NEVADA device requires individual access to the Image capture equipment and change of standard network configuration data.

- 48) Access the NEVADA Software for the first time using the standard factory data indicated in the NEVADA Product Manual;
- 49) Include in the NEVADA system each ITSCAM VIGIA+ device configured individually and connected to the network, accessing the menu *Registrations>Equipment* at NEVADA Software.

5. Framing Adjustments

- 50) Make the framing adjustments, connecting the ITSCAM VIGIA+ device to an auxiliary device, after having been correctly connected to the respective post, using an Ethernet cable;
- 51) Adjust the positioning of the ITSCAM VIGIA+ devices on the bracket both during the day or at night, but it is recommended that the track is opened to be tested with both light and heavy vehicles;
- 52) Adjust the zoom and focus by putting the track in hold mode during this activity, closing the track and positioning a car in the direction of the track;
- 53) See the advanced image configuration available in the web interface of the equipment and specified in the Integration Manual of ITSCAM devices.

Framing for Panoramic ITSCAM VIGIA+

- 54) Adjust the frame for the Panoramic ITSCAM VIGIA+ for it to show the context of infraction committed, displaying in a single image all the elements that allow the characterization of evasion: the red lamp of the *Traffic Light* (which should be clear in the image) and the *Barrier* of the track. In addition to this, the road on which the vehicle is traveling must be centered in the panoramic image, as in the example:



Figure 12 - Example image of framing for Panoramic ITSCAM VIGIA+ device

Framing for Front and Rear ITSCAM VIGIA +

- 55) Adjust the framing of ITSCAM VIGIA+ devices located on the *Front* and *Rear* posts of capture in a way that favors the identification of the vehicle plate, the best frame being the one in which the plates of the monitored vehicles are centered in the image, with the *Barrier* on top of the picture and the *Optical Barrier* in the center of the captured region;
- 56) Please refer to the ITSCAM VIGIA+ device Installation Guide for the steps to adjust the images through the web interface to ensure that the vehicle license plate is horizontally aligned and not tilted;
- 57) Change the inclination of the equipment on the spherical Bracket if necessary, making sure that the vehicle plates are with little horizontal inclination, that is, there is no significant difference between the vertical positioning of the first and last character of the plate in the image:



Figure 13 - Example image of framing for Front ITSCAM VIGIA+ device

58) Rear image framing allows you to validate the violation when the brand and model are visible in the image, as well as both headlights/flashlights:



Figure 14 - Example image of framing for Rear ITSCAM VIGIA+ device

6. Image Settings

- 59) Make advanced adjustments for the image, suitable for the installation location and applicable for devices responsible for reading license plates of offending vehicles that capture the front and rear images of the vehicles and must present the best results of OCR detection;
- 60) Access in the NEVADA Integration Manual the suggested values for the *Image Adjustments* applicable to the framing and ITSCAM VIGIA+ models and available through the web interface of the device.



See the ITSCAM VIGIA+ device Product Manual for additional instructions on image framing adjustments.



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