

**P3Mobility
RCOC SMART Grant Project**

Intelligent Transportation System

Intersection Equipment Installation Plan

Version: 0.2



Prepared By: INTEGRAL BLUE

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Overview

The P3Mobility / RCOC SMART project will be installing devices at 5 intersections:

1. Cabinet #31 – Greenfield & 10 Mile
2. Cabinet #41 – 10 Mile & Church
3. Cabinet #115 – Greenfield & Lincoln
4. Cabinet #1395 – 12 Mile Northwood Elementary Crosswalk
5. Cabinet #1397 – 12 Mile & Main

Ownership and Sequence of Deployment Steps

RCOC, P3Mobility, and Integral Blue will each play specific roles with different levels of Responsibility, Approval, Support, Information, and Consultation (RASiC) expected of them. The RASiC table below maps each project partner to the specific steps of the installation process.

Task	RCOC	Integral Blue	P3Mobility
FCC Site Registration	I	S	R
Site Survey	S	R	A
RSU Software Provisioning		S	R
RSU Configuration		S	R
Edge Processor Software Provisioning		S	R
Edge Processor Configuration		S	R
Hardware Installation	R	A	I
Installation Inspection	S	R	S
Local Validation	S	R	S
Remote Validation	S	S	R
Installation Documentation	R	S	A

R = Responsible, A = Approval, S = Supporting, I = Informed, C = Consulted

Installation Materials

These intersections feature a mixture of pole and cabinet types and will require different installation approaches. This document details how to install the requisite equipment at each type of location.

Each intersection will receive the same set of typical equipment:

Provided by the Project:

- One (1) Cohda Roadside Unit (RSU)
- One (1) Neurosys Edge Processor and power supply
- One (1) Transition Networks PoE+ injector and power supply

Provided by RCOC:

- One (1) NETIO Managed IP Power Distribution Unit (PDU)
- One (1) CITEL Power over Ethernet (PoE+) Surge Protector for the RSU
- One (1) TRENDNET Unmanaged Ethernet Switch (ESW)

- Four (4) C14 to C13 Power Cables
- Gridsmart FE3 Cameras
- Gridsmart GS3 Processors
- Incidental mounting bracket equipment
- Incidental Outdoor CAT5e cable
- Incidental CAT5e patch cables
- Incidental grounding cables

RSU Assembly

The RSU must be assembled before installation. RSU assembly includes:

1. Connection of antennas to the RSU body
2. Weatherproofing of RSU antennas
3. Termination of the M12 Ethernet connector

RSU Antenna Assembly

The RSU includes 4 varieties of antenna:

- Four (4) C-V2X/DSRC antennas
- Two (2) LTE antennas
- Two (2) Bluetooth (BT) antennas
- One (1) GPS antenna

The antennas are easily distinguished by size:

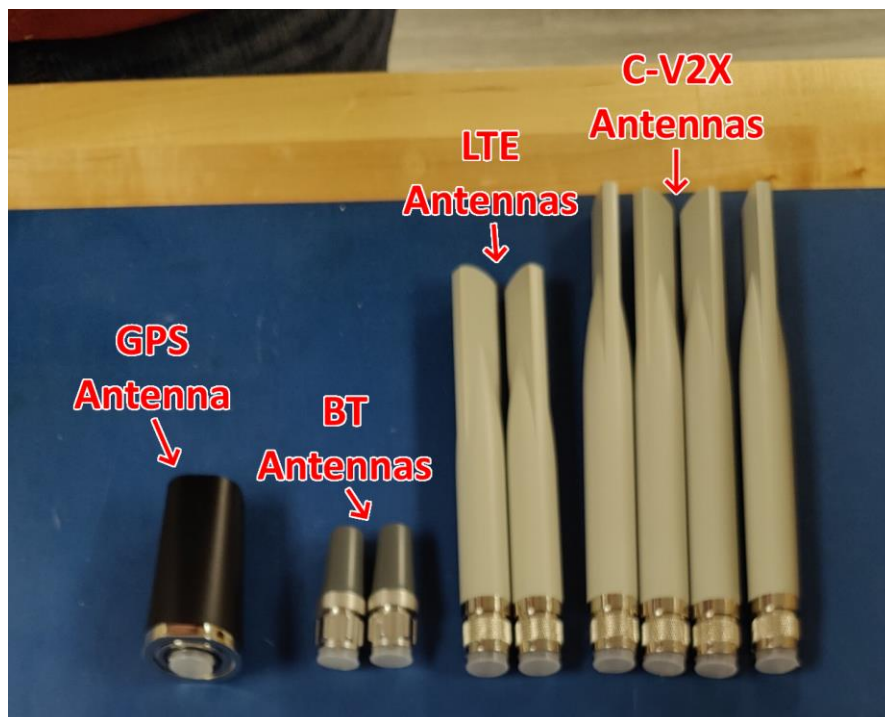


Figure 1 - RSU Antennas

Attach the antennas to the RSU as depicted below:

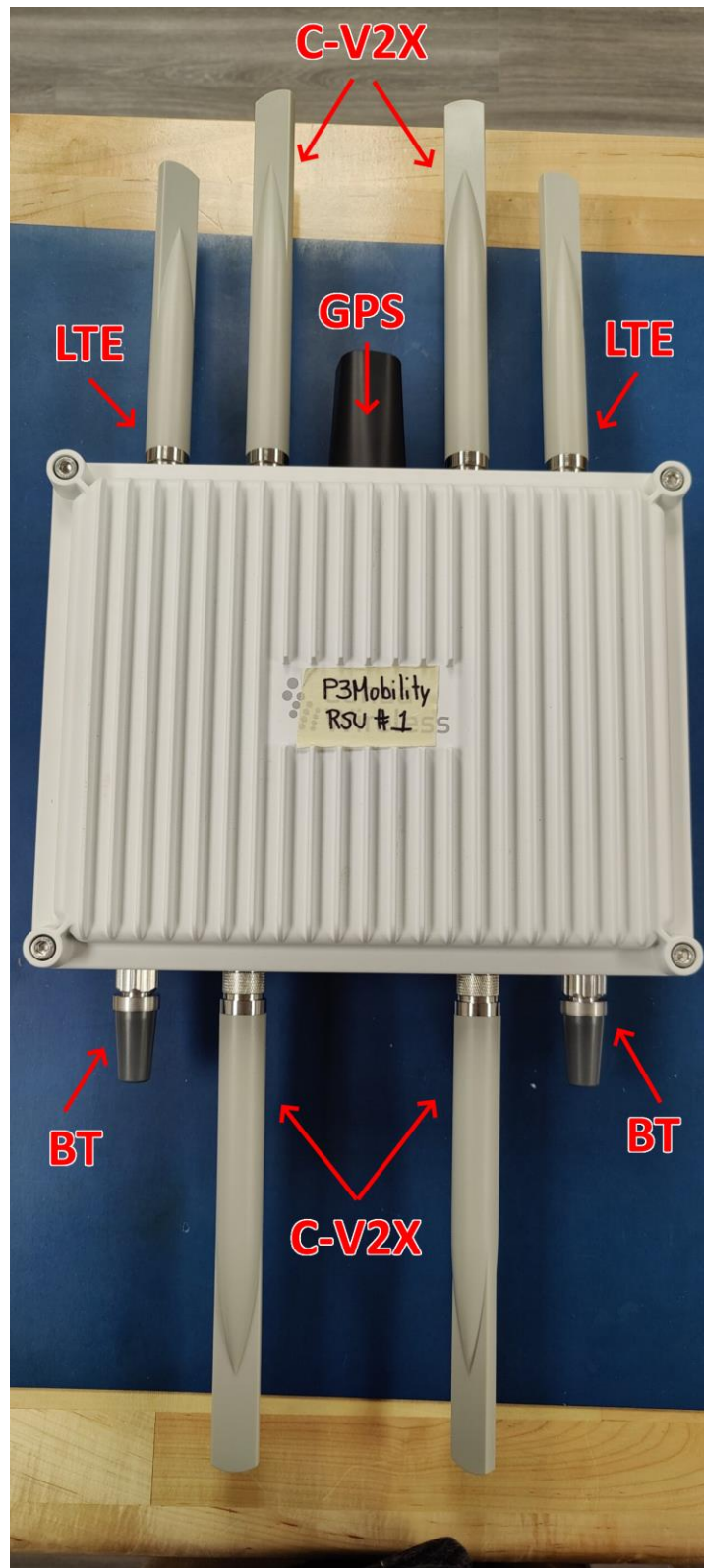


Figure 2 - RSU Antenna Locations

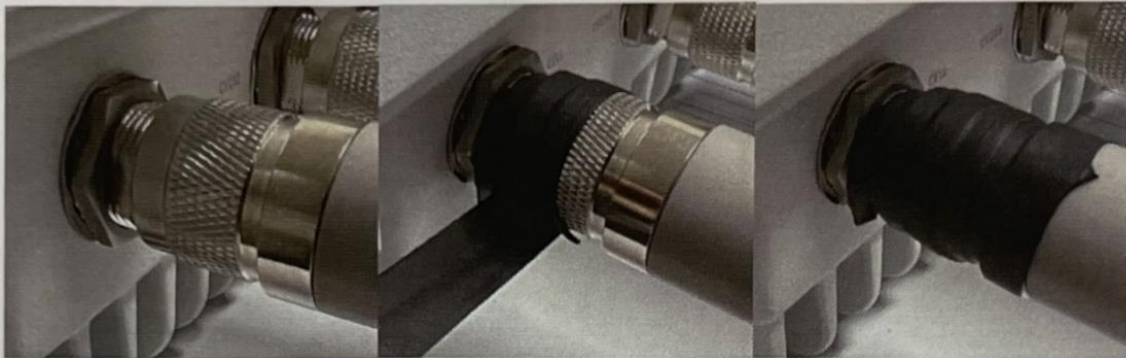
Antenna Weatherproofing

The RSU comes with self-fusing rubber tape that should be applied to the antennas to prevent water intrusion. Please follow the instructions below as outlined in the Cohda RSU Quick Start User Guide (Appendix E).

Note: Be careful NOT to wrench the antenna around while applying tape. Harsh movements can loosen or damage the RSU's N-connector interface or even break the antenna.

4.3 Wrap the N-connector and antenna joints with provided Self-Fusing Rubber Tape to prevent water intrusion.

- Cut a small length (10cm) of Self-Fusing tape.
- Remove backing film.
- Begin wrapping Self-Fusing tape around the N-connector and antenna joint. Stretch tape to 300% and wrap it spirally around the object with a 50% overlap.
- Repeat steps and ensure at least one complete wrap is applied.
- Cut off any excess.



Ensure the surface
is clean

Stretch tape
and wrap

Done

Figure 3 - RSU Antenna Weatherproofing

The Cohda RSUs come with a special M12 Field Attachable Connector. The RSU is **not** compatible with a typical RJ45 Ethernet connector, the M12 connector must be used. Instructions for termination are included with each connector.

Note that when attaching the terminated connector to the RSU, wrench tightening will be required to create a complete connection.

A figure showing the connector parts can be found below.



Prior to development of this Installation Plan, site surveys were performed by Integral Blue with support from RCOC to analyze the intersections for risks related to: RSU line of sight to all intersection approaches; available pole space; available cabinet space; estimated cable distance from proposed mounting pole to cabinet; power availability; and network access availability. Results of this survey were compiled as a set of per-site recommendations submitted on February 6th to the P3Mobility and RCOC teams. After review from the group, the Site Survey was approved and used to develop this Installation Plan and its supporting Appendices. A copy of the Site Survey can be found in Appendix D. Note that any recommendations given by this Installation Plan **supersede** those given in the Site Survey, should discrepancies exist.

The RSUs will be installed on existing strain pole and/or signal masts at each intersection following the Pole Elevation Details found in Appendix B.

Bracket Types

Depending on the location, different types of brackets will be used as shown below.

Strain Pole Installations

Locations where the RSU is installed on the strain pole will use a Pelco offset bracket. An SH-0561 bracket will be threaded onto a 24" SH-0527 pipe with 90-degree elbow and banding foot. The banding foot will then be banded to the pole at the appropriate height as indicated by the diagrams in Appendix B.

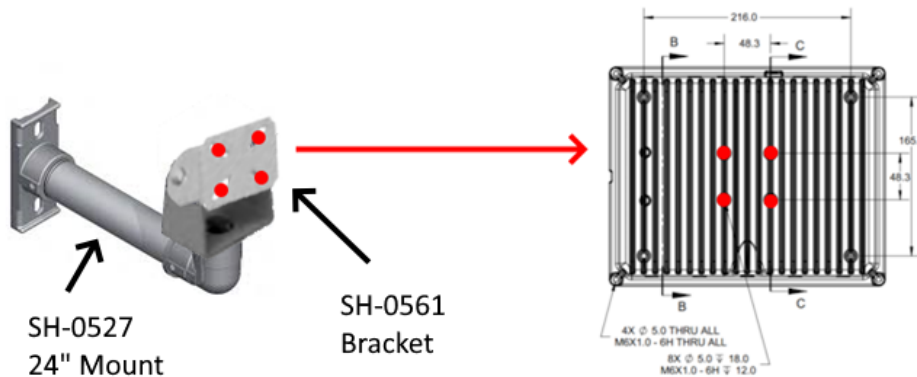


Figure 5 - Pelco Offset Bracket RSU Attachment Illustration

The SH-0561 must be attached to the RSU using the screws provided with the RSU's mounting kit, with the SH-0561 oriented "forward" as shown below. This installation method will be used at Cabinets #41, #115, and #1397.

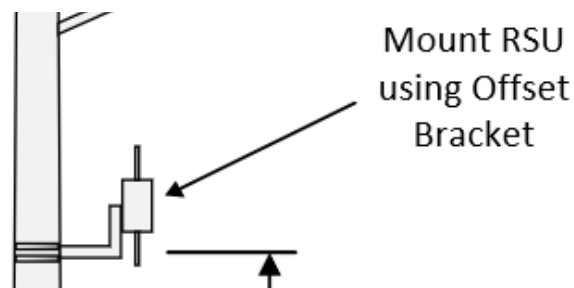


Figure 6 - Offset Bracket Strain Pole Illustration

Luminaire Mast Installations

Locations where the RSU is installed on a luminaire mast will use a Pelco articulated clamp kit and descending pipe mount. An AS-3010 clamp kit will attach to the luminaire mast and grasp an AS-0629 37" vertical pipe mount to which an SH-0561 mounting bracket will attach. The RSU will then be attached to the SH-0561 just as it is for strain pole installations.

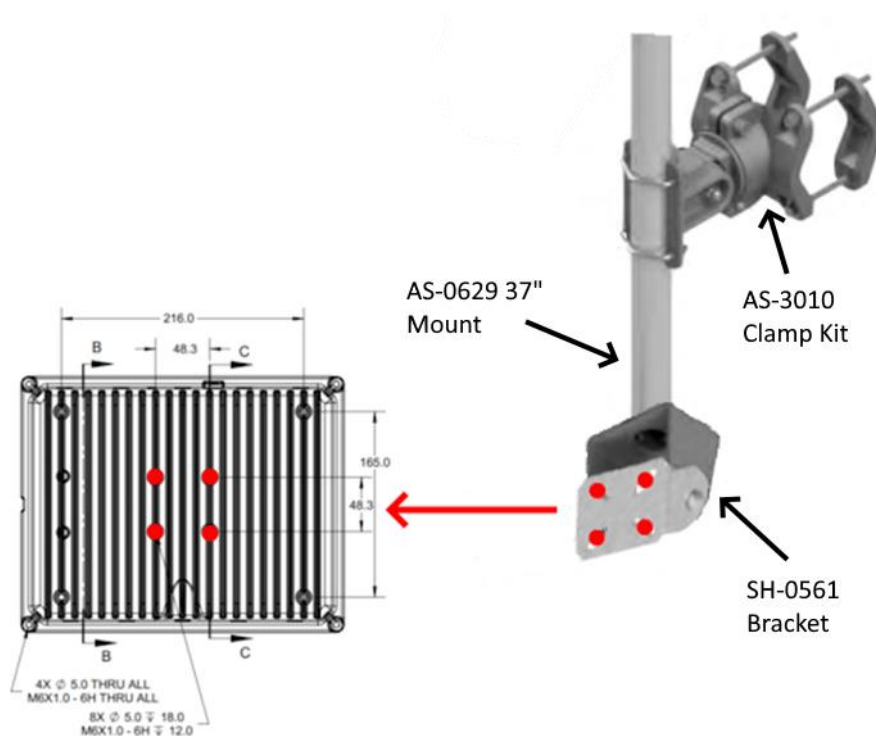


Figure 7 – Pelco Clamp Kit and Mounting Bracket RSU Attachment Illustration

The SH-0561 must be attached to the RSU using the screws provided with the RSU's mounting kit, with the SH-0561 oriented "forward" as shown below. This installation method will be used at Cabinet #31. The RSU must be mounted no higher than 26ft AGL, as shown in Appendix B.

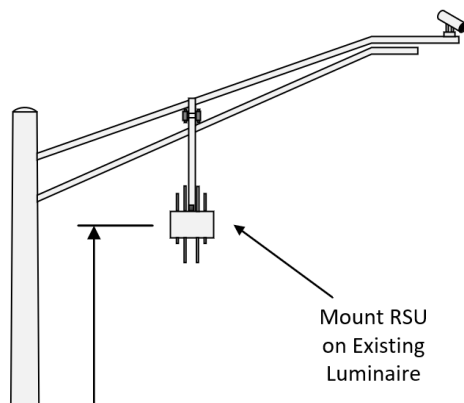


Figure 8 - RSU Luminaire Mount Diagram

Traffic Mast Arm Installations

Locations where the RSU is installed on the traffic mast arm will use the mounting kit that comes with the Cohda RSU, as shown in this illustration from the Cohda MK6 RSU Specification:

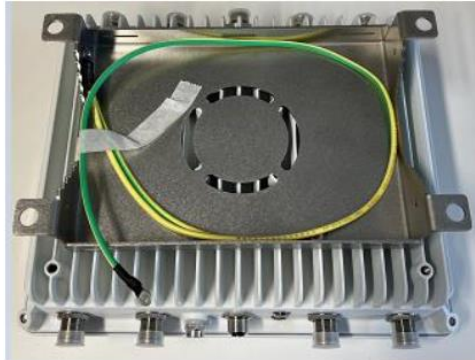


Figure 9 - Cohda RSU Mounting Kit

The mounting bracket will be attached to the RSU using the provided screws. The mounting bracket includes slots that will accommodate $\frac{3}{4}$ " steel banding. Use three bands to attach the RSU to the mast arm as illustrated in the Appendix B diagrams. This installation method will be used at Cabinet #1395.

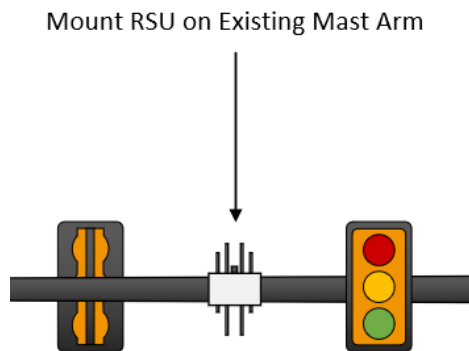


Figure 10 - RSU Mast Arm Attachment Diagram

Grounding

Each RSU, PoE+ surge protector, and PoE+ injector must be appropriately grounded. The RSU mounting kits come with a short grounding cable but this may not be sufficient depending on the location.

Orientation

At all locations **except** Cabinet #1395 (12 Mile Northwood Elementary Crosswalk) will install the RSU so that it is “facing” into the center of intersection, as indicated in the Appendix B diagrams. Azimuth measurements are included for reference. An example is shown below:

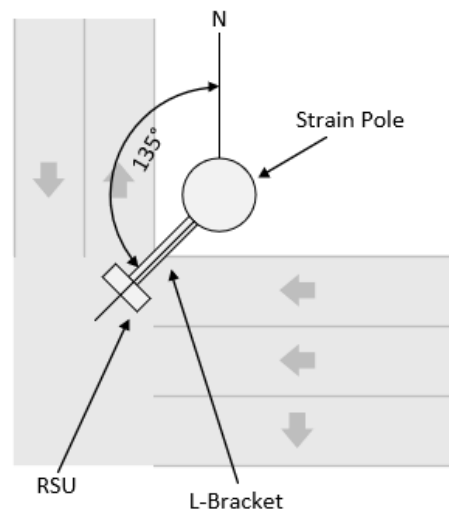


Figure 11 - Typical RSU Orientation

Cabinet #1395 will install the RSU facing westbound traffic as shown in Appendix B and below:

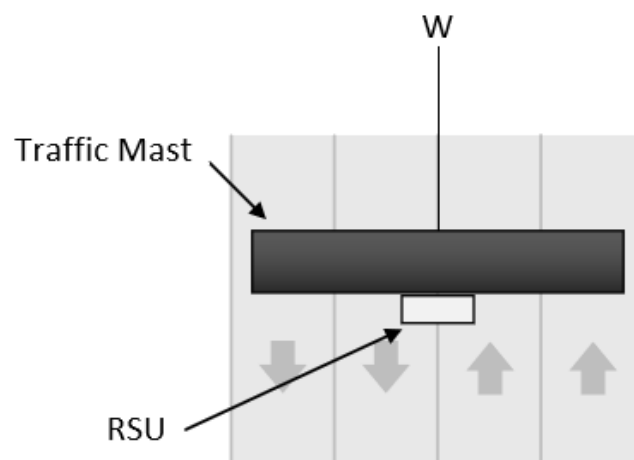


Figure 12 - Cabinet #1395 RSU Orientation

Mounting Location

The RSUs are assigned for installation on specific intersection poles. In some cases, the RSU will not be installed on the closest pole to the cabinet, but no RSU will be installed any farther away than the pole immediately across the street from the cabinet. Estimated cable lengths are all within the 100m CAT6 distance limit but a PoE+ extender has been purchased if needed.

Appendix C – Top-Down Intersection Views – contains aerial images of each intersection and markers showing where the proposed RSU will be installed relative to the existing cabinet.

Cabinet Device Installation

Equipment Mounting

Each location targeted for installation has either a traditional Traffic Cabinet or a newer Traffic/ITS Combination cabinet:

1. Cabinet #31 – Greenfield & 10 Mile (Traditional Traffic Cabinet)
2. Cabinet #41 – 10 Mile & Church (Traffic/ITS Combo Cabinet)
3. Cabinet #115 – Greenfield & Lincoln (Traditional Traffic Cabinet)
4. Cabinet #1395 – 12 Mile Northwood Elementary Crosswalk (Traffic/ITS Combo Cabinet)
5. Cabinet #1397 – 12 Mile & Main (Traffic/ITS Combo Cabinet)

The sites with Traffic/ITS Combination cabinets have plenty of available space to accommodate the new equipment in the upper “ITS” portion of the cabinet as shown below:

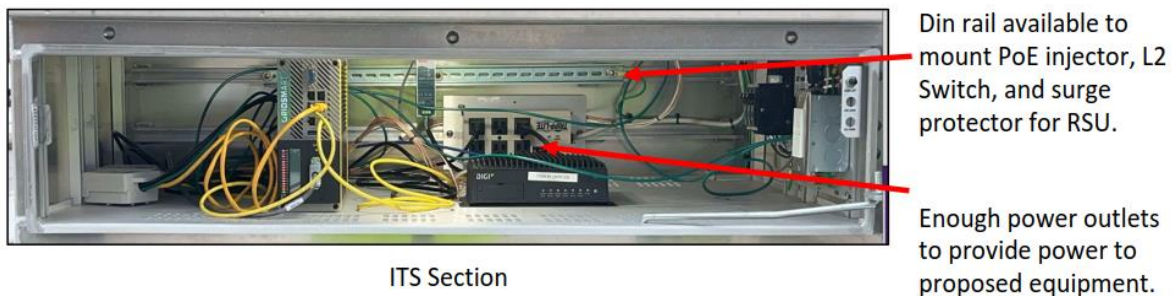


Figure 13 - Traffic/ITS Combo Cabinet Shelf Example

However, the sites with older traditional Traffic Cabinets will require some rearranging of equipment to fit everything:

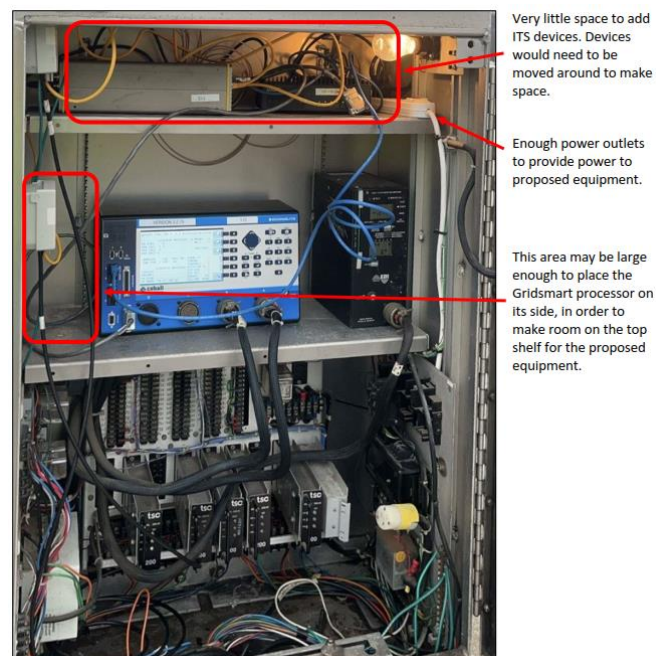


Figure 14 - Traditional Traffic Combo Arrangement Example

Power Assembly

This project will be introducing a new network-enabled Power Distribution Unit (PDU) into each of the 5 cabinets. This device enables remote and automated management of power outlets. The following devices will be connected to the new PDU in each cabinet:

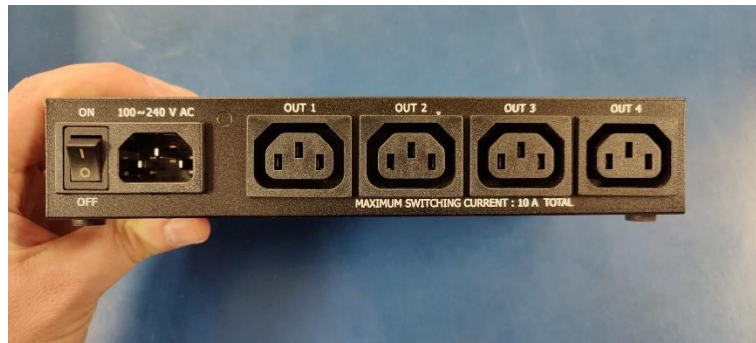
1. The existing Digi cellular modem
2. The existing Gridsmart processor
3. The new Cohda Roadside Unit's PoE injector
4. The new P3Mobility Neurosys Edge Processor

The power input (leftmost port, 100-240VAC) will be connected to utility power in the cabinet using a standard C13 to 3-prong power cable provided with the PDU.

Four (4) 6ft C14 to C13 cables will also be supplied with each PDU. These cables must be connected to the above four devices for them to fit the PDU outputs, which only accept C14 plugs.



Figure 15 - C14 to C13 Cable



PDU only accepts C14 cable ends
for power outputs.

Figure 16 - PDU Ports

The other end of the cable must then connect to the device being powered. Some devices natively support the C13 connector, but others will require modification by removing the C13 end and connecting bare conductors to terminal blocks on the device for power. The following pages provide instructions for each device being powered by the PDU.

1. The existing Digi cellular modem does not support a C13 connector so its cable **will require modification**.
 - The existing Digi cellular modems are powered by a Mean Well 24VDC DIN-mounted power supply, currently connected to utility power by a blunt cut NEMA 5-15 wired into the AC input on the power supply and connected to an available cabinet outlet.
 - The existing NEMA 5-15 cable will be removed and replaced by taking a C14 to C13 cable. Cut the C13 end off to expose the bare conductors and wire the conductors into the Mean Well AC inputs while connecting the C14 end to the PDU on Outlet 1.

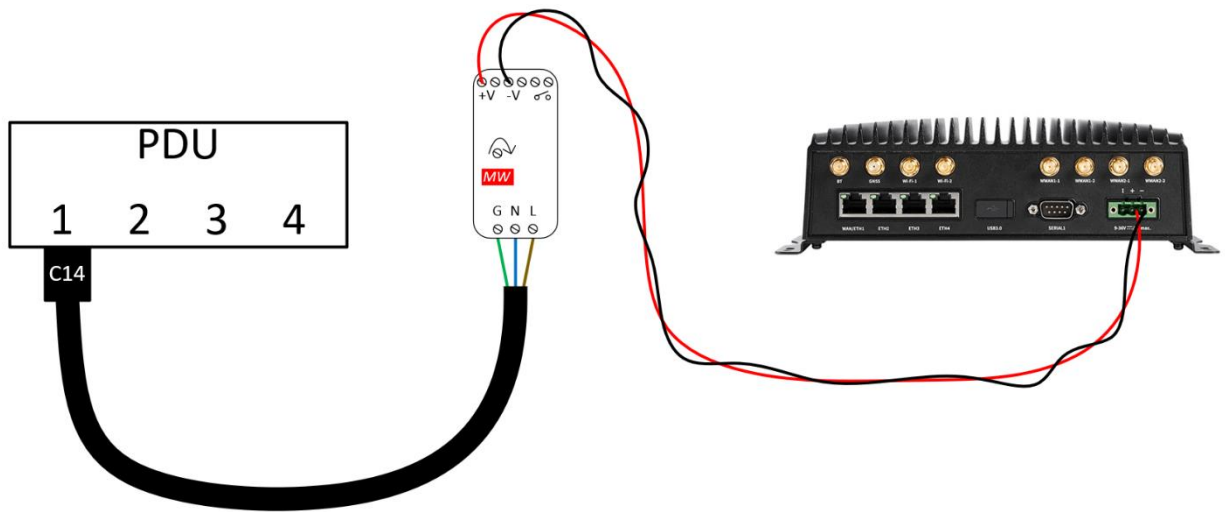


Figure 17 - Digi Modem Power Diagram

2. The existing Gridsmart processor accepts a C13 connector natively and **will not require modification**.
 - Simply connect the C13 end to the Gridsmart power receptacle and the C14 end to Outlet 2 on the PDU.

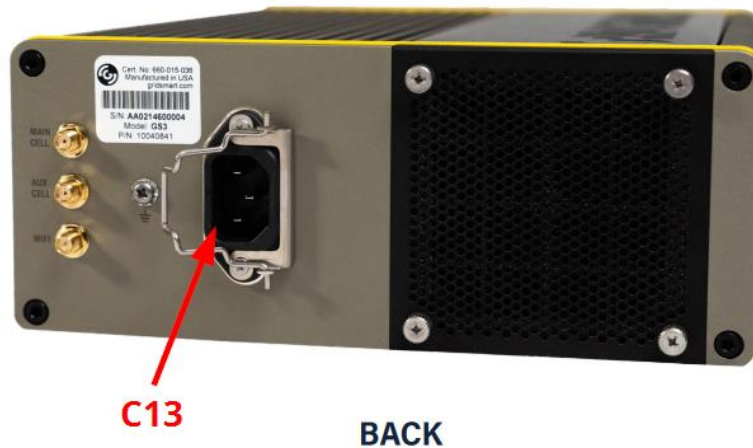


Figure 18 - Gridsmart Processor Power Port

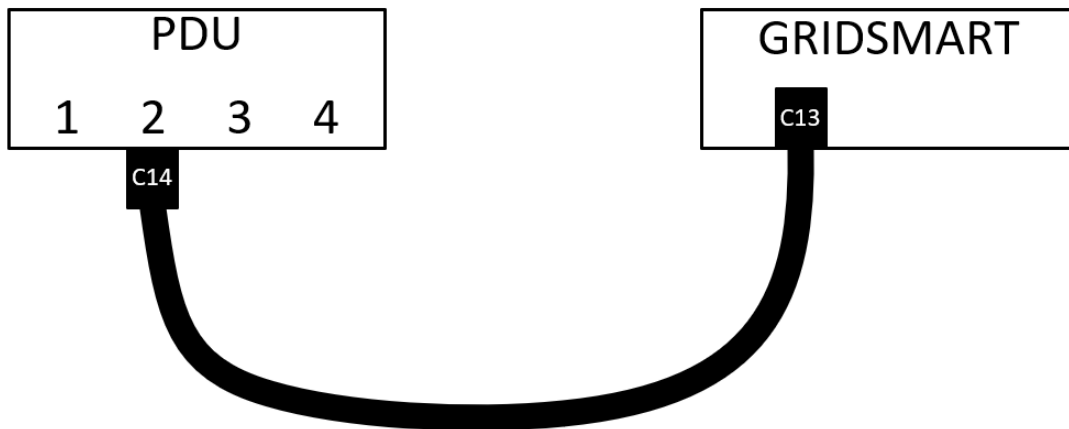


Figure 19 - Gridsmart Power Diagram

3. The new Cohda RSU PoE+ injector does not support a C13 connector so its cable **will require modifications**.
- The PoE+ injector is a Transition Networks injector powered by a Mean Well 48VDC DIN-mounted power supply. It will connect to a CITEL surge protector and power the RSU.
 - The Mean Well supply will be connected to the PDU by taking a C14 to C13 cable, cutting the C13 end off to expose the bare conductors, and wiring the conductors into the Mean Well AC inputs while connecting the C14 end to the PDU on Outlet 3. DC power to the PoE+ injector will be connected using two conductors terminated in the Mean Well and Transition Networks terminal blocks. Note: a simple twisted-pair conductor may be needed for this if the Transition Networks PoE+ injector doesn't include one.
 - The Transition Networks injector has two network ports: one that supplies PoE+ power (bottom) and one that connects to the network switch (top). Connect the **PoE+ OUT** port to the CITEL DIN-mounted surge protector.
 - Finally, connect the CITEL surge protector's other port to the outdoor CAT6 cable servicing the RSU.

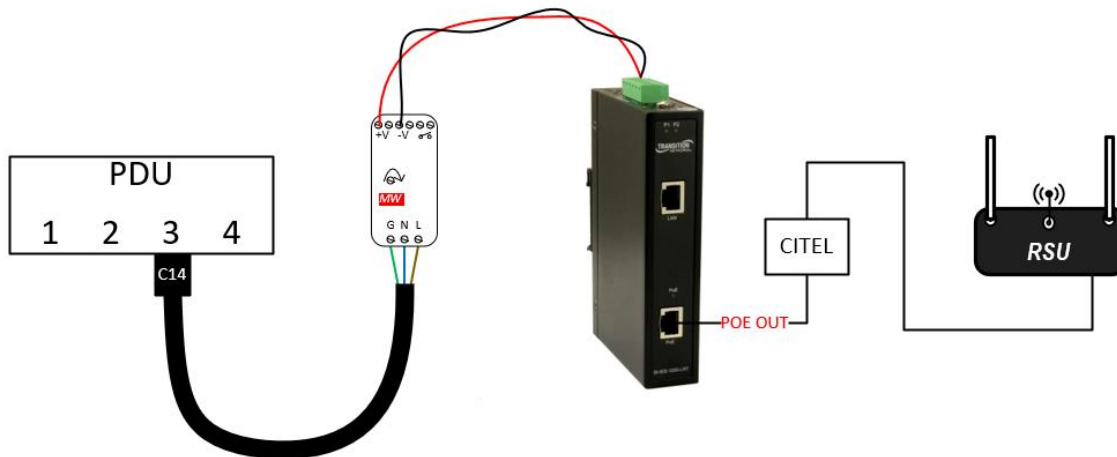


Figure 20 - RSU Power Diagram

4. The new P3Mobility Neurosys Edge Processor does not support a C13 connector so its cable **will require cable modification and specific connection steps.**
- Each Edge Processor package will include the Edge Processor itself, a brick-shaped power supply, and a double-Y shaped power cable with ferruled conductors on one end and a terminal block on the other end.
 - Connect the Y cable terminal block to the **top-right terminal receiver (NOT the bottom block)** on the back of the Edge Processor.
 - Connect the ferruled conductors to the VDC terminals on the power supply:
 - Both red conductors should terminate to a VDC(+) terminal
 - Both black conductors should terminate to a VDC(-) terminal
 - Take a C14 to C13 cable. Cut the C13 end off to expose the bare conductors and terminate the conductors to the Line, Neutral, and Ground terminals on the power supply for AC input power.
 - Finally, connect the C14 connector to the PDU on Outlet 4.

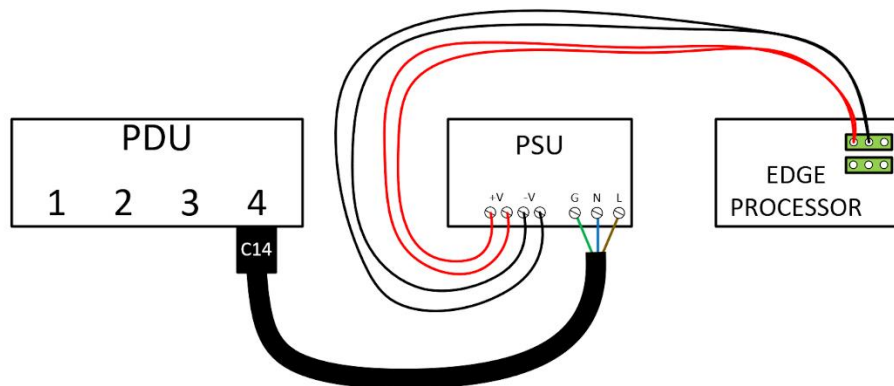
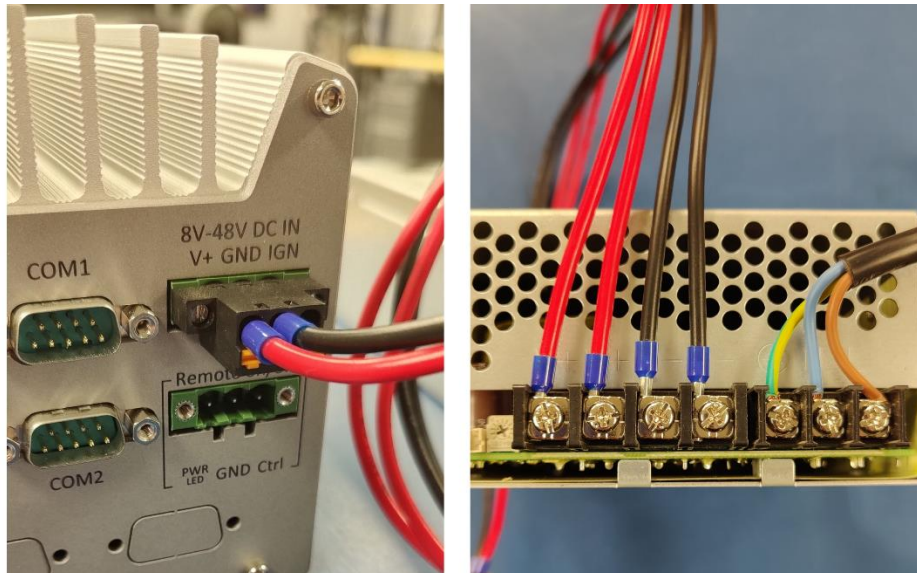


Figure 21 - Edge Processor Power Photos and Diagram

Network Assembly

All devices in the cabinet, including existing devices such as the modems, traffic controllers, and Gridsmart processors as well as the new devices, must be connected via Ethernet patch cables to the unmanaged TRENDNET switch.

All of the above connections are shown in the Installation Interconnect Diagrams in Appendix A.

Validation Checks

After physical installation and interconnect of the devices, a series of checks should be performed to ensure all devices are at least minimally functional.

Local Validation Checks

Integral Blue will attend and support each field installation of RSUs and cabinet hardware. After installation is performed, IB will in turn perform the following local validation checks:

- Visual inspection of devices for installation craftsmanship, placement of devices in the cabinet, and orientation/height of the RSU on the pole.
- Visual confirmation that devices boot and exhibit normal LED status light behavior.
- Local ping responses from all existing and new devices on site through the new TRENDNET Ethernet switch.
- Gateway ping responses from the “field” interface of RCOC’s firewall through the new TRENDNET Ethernet switch.

Any failure experienced when performing the above tests will be locally investigated before leaving the site until either the issue is resolved or determined to be caused by something outside of the local cabinet/pole.

Remote Validation Checks

After local validation checks are performed, P3Mobility and RCOC will perform remote validation checks from P3Mobility’s AWS instance and RCOC’s TOC:

- P3M tests of each network port expected to be available via port forwarding.
- P3M remote login to the RSU via SSH.
- P3M remote login to the Edge Processor via SSH.
- P3M remote login to the PDU via HTTP.
- P3M remote access to Gridsmart camera feed(s) via VLC or equivalent RTSP client.
- RCOC remote access to Gridsmart cameras via Gridsmart application.
- RCOC remote visibility of traffic signal controller in central management software.
- RCOC remote login to the PDU via HTTP.

Any failure experienced when performing the above tests will be locally investigated before leaving the site until either the issue is resolved or determined to be caused by something outside of the local cabinet/pole.

Appendix A – Interconnect Diagram






















P3Mobility

RCOC SMART Project Integration



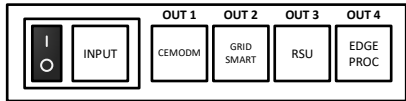
ITS Cabinet Drawing Legend

Cables and Connectors

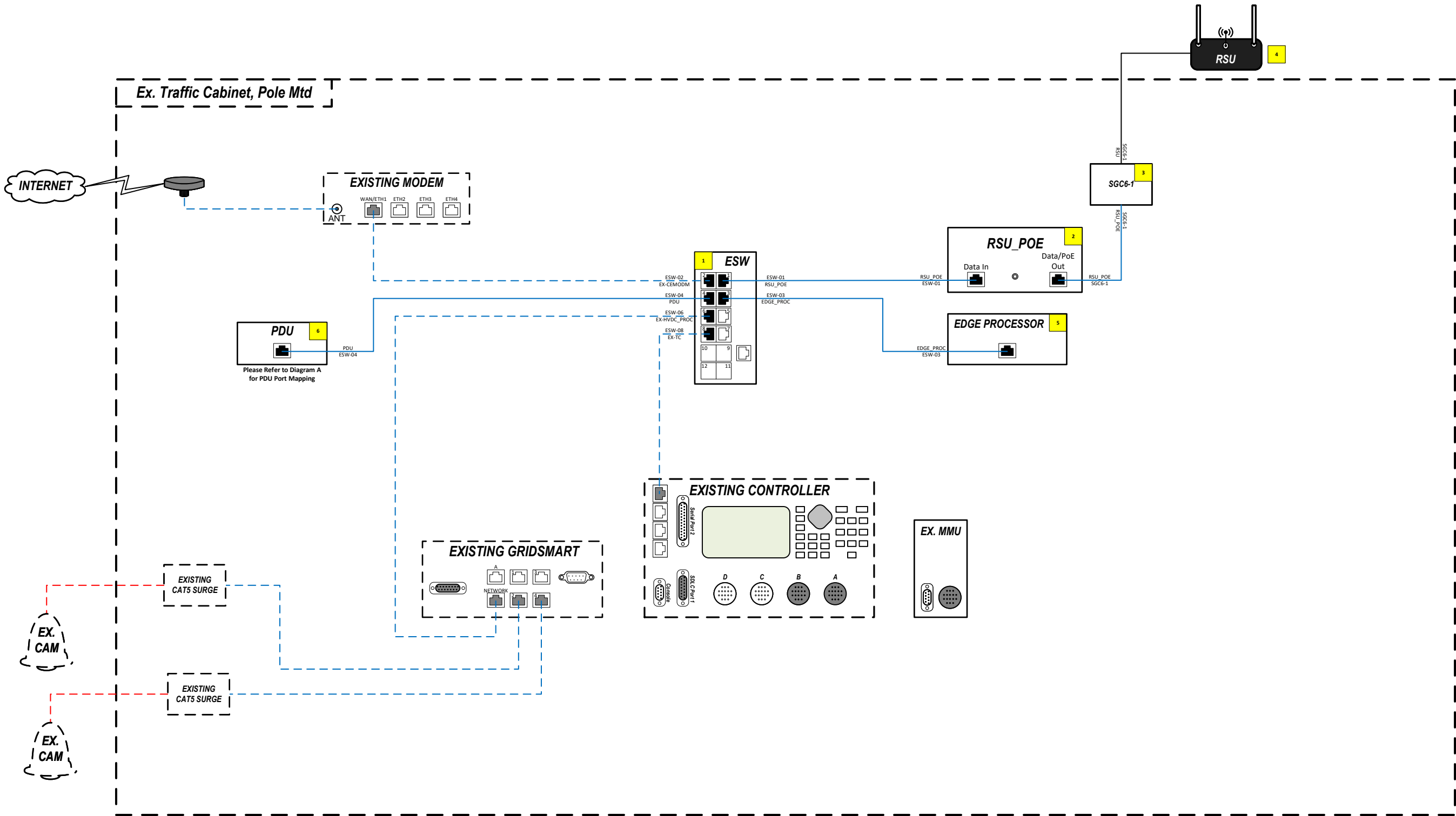
Proposed	Existing	Cable Type	Connector Types	
		Fiber Optic Cable, Single Mode		SFP Port
		Fiber Optic Cable, Multi Mode		Fiber Port
		Indoor Shielded CAT5E/CAT6 Cable		Filled Fiber Port
		Outdoor Shielded CAT5E/CAT6 Cable		Existing Filled Fiber Port
		Serial Cable		Copper Port
		Coax Cable		Filled Copper Port
				Existing Filled Copper Port
				Fiber Optic Fusion Splice
				Bare Fiber Left Coiled in Splice Tray

Cabinet #31

Diagram A:



1	ESW	LANTRONIX SISPM1040-384-LRT-C
2	RSU_POE	TBD
3	SGC6	CITEL MJ8-POE-A
4	RSU	COHDA MK6 RSU
5	EDGE PROCESSOR	NEUROSYS 9166
6	PDU	GRIDCONNECT GC-NETIO-PDU4KS-US



NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION



NO SCALE

FILE:

DATE: 3/14/2024

DESIGN UNIT:

TSC:

CS:

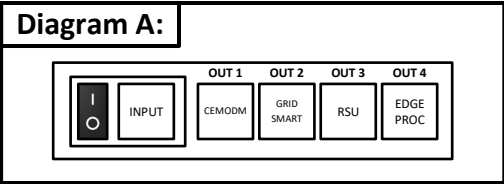
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Cabinet #31
Cabinet Interconnect Drawings
IB: 24001

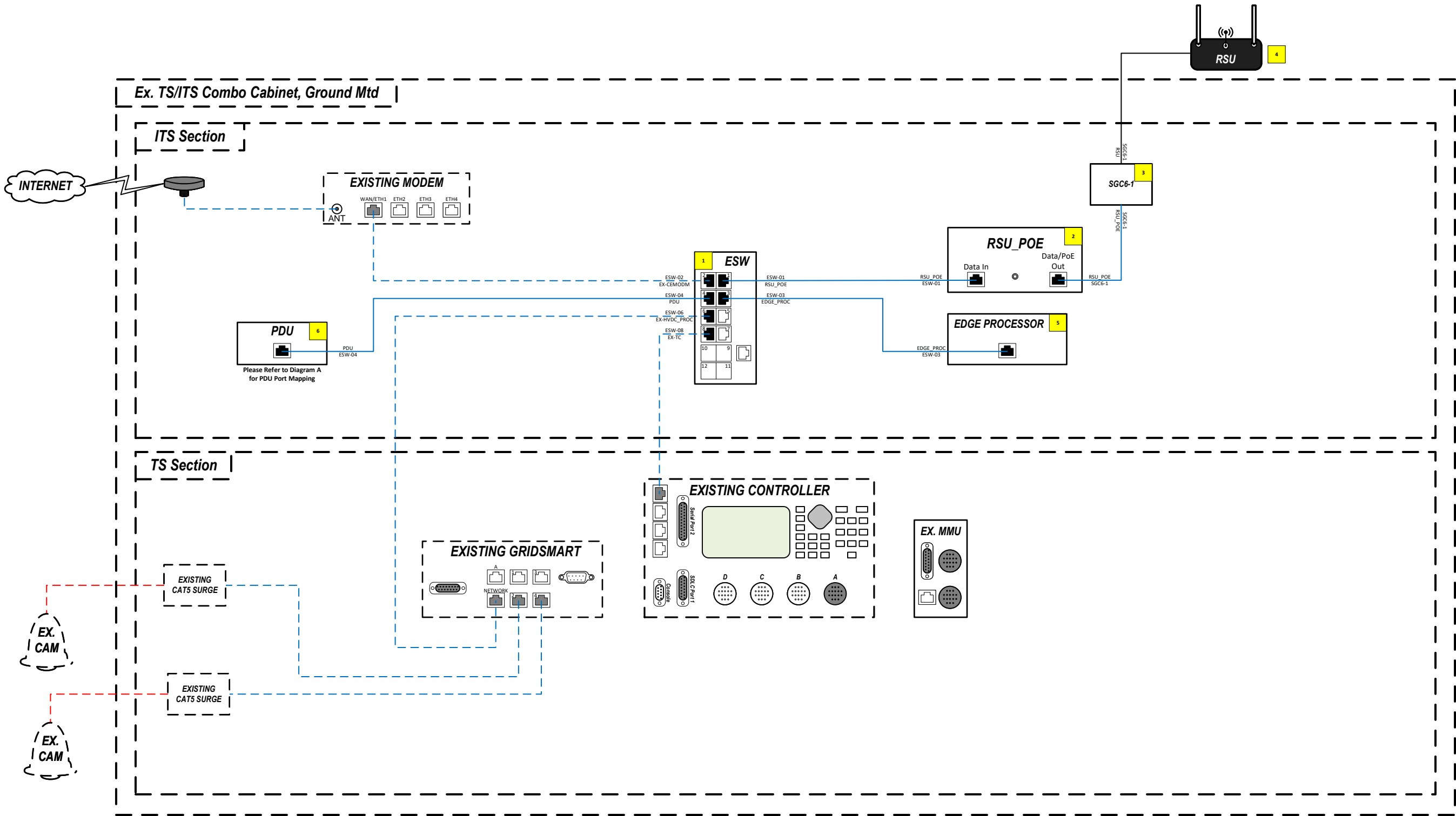
DRAWING SHEET

3

Cabinet #41



1	ESW	LANTRONIX SISPM1040-384-LRT-C
2	RSU_POE	TBD
3	SGC6	CITEL MJ8-POE-A
4	RSU	COHDA MK6 RSU
5	EDGE PROCESSOR	NEUROSYS 9166
6	PDU	GRIDCONNECT GC-NETIO-PDU4KS-US



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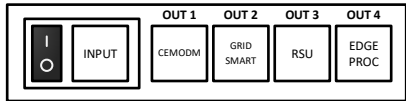
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CS:
JN:

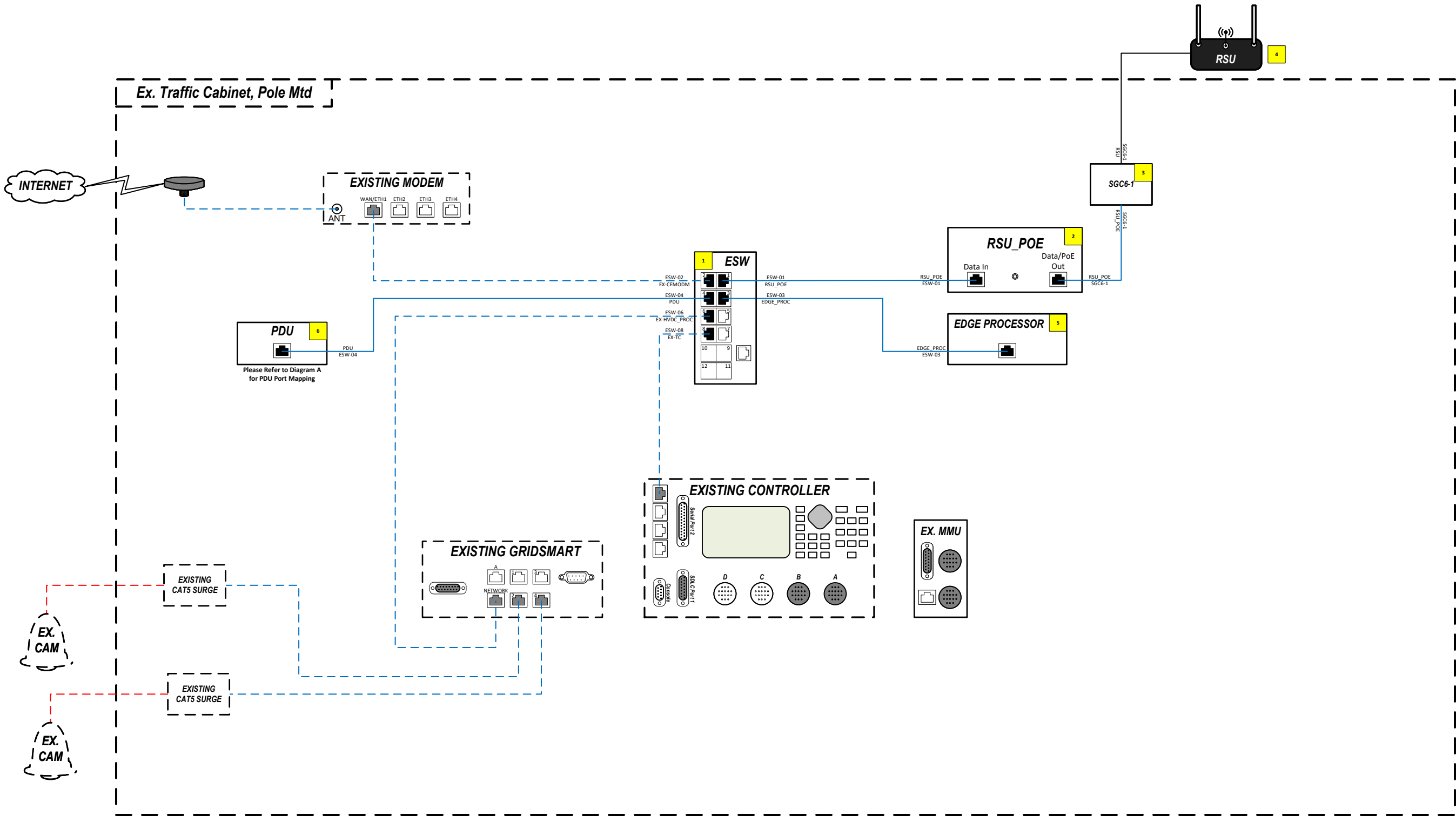
Cabinet #41
Cabinet Interconnect Drawings
IB: 24001

DRAWING	SHEET
	4

Diagram A:



1	ESW	LANTRONIX SISPM1040-384-LRT-C
2	RSU_POE	TBD
3	SGC6	CITEL MJ8-POE-A
4	RSU	COHDA MK6 RSU
5	EDGE PROCESSOR	NEUROSYS 9166
6	PDU	GRIDCONNECT GC-NETIO-PDU4KS-US



NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION



NO SCALE

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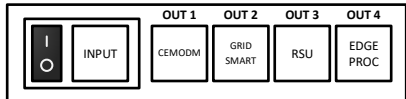
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DESIGN UNIT:
TSC:

CS:
JN:

Cabinet #115
Cabinet Interconnect Drawings
IB: 24001

DRAWING SHEET
5

Diagram A:



1	ESW	LANTRONIX SISPM1040-384-LRT-C
2	RSU_POE	TBD
3	SGC6	CITEL MJ8-POE-A
4	RSU	COHDA MK6 RSU
5	EDGE PROCESSOR	NEUROSYS 9166
6	PDU	GRIDCONNECT GC-NETIO-PDU4KS-US

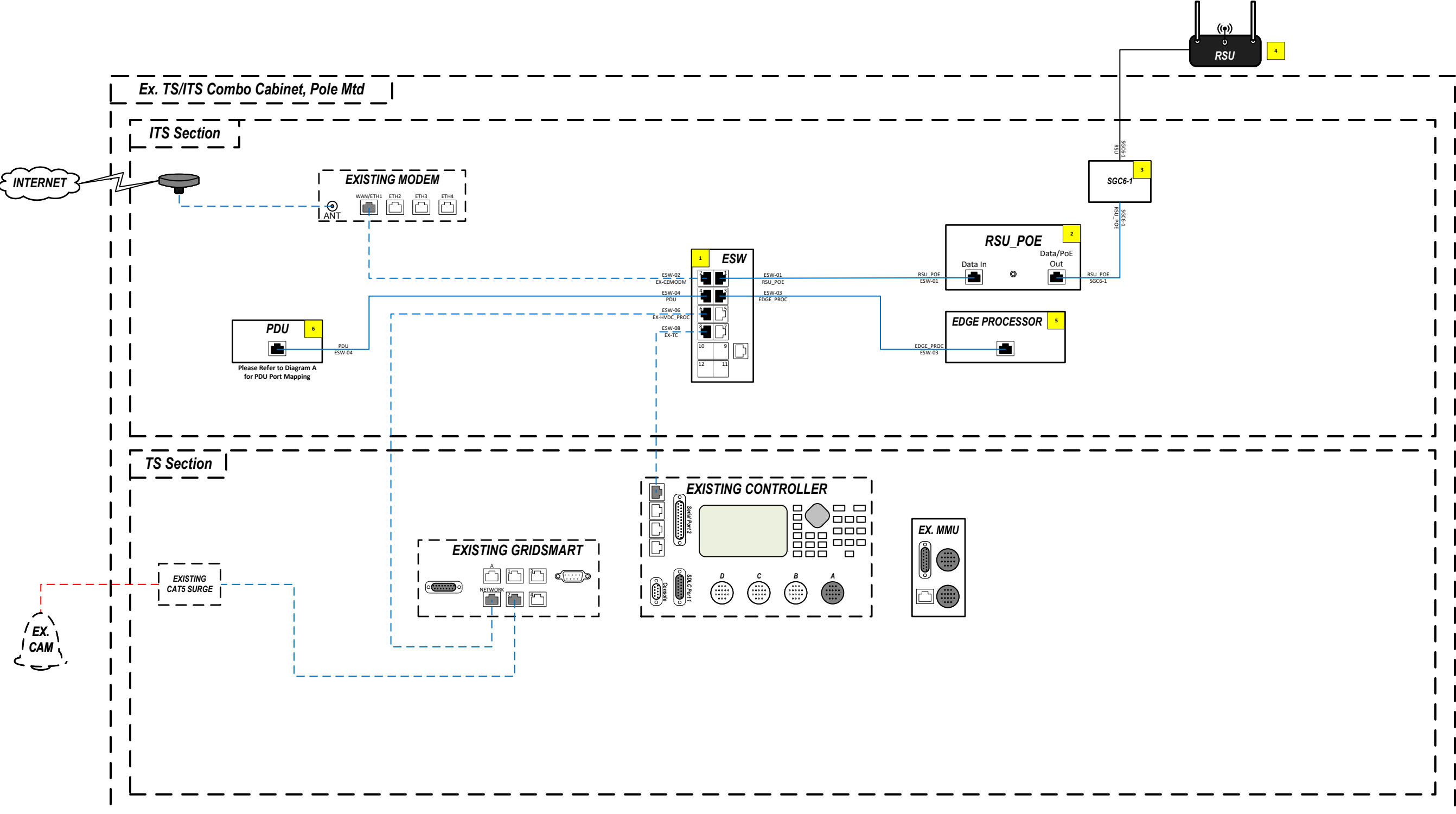
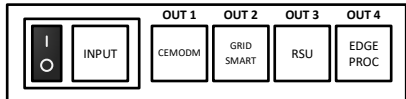
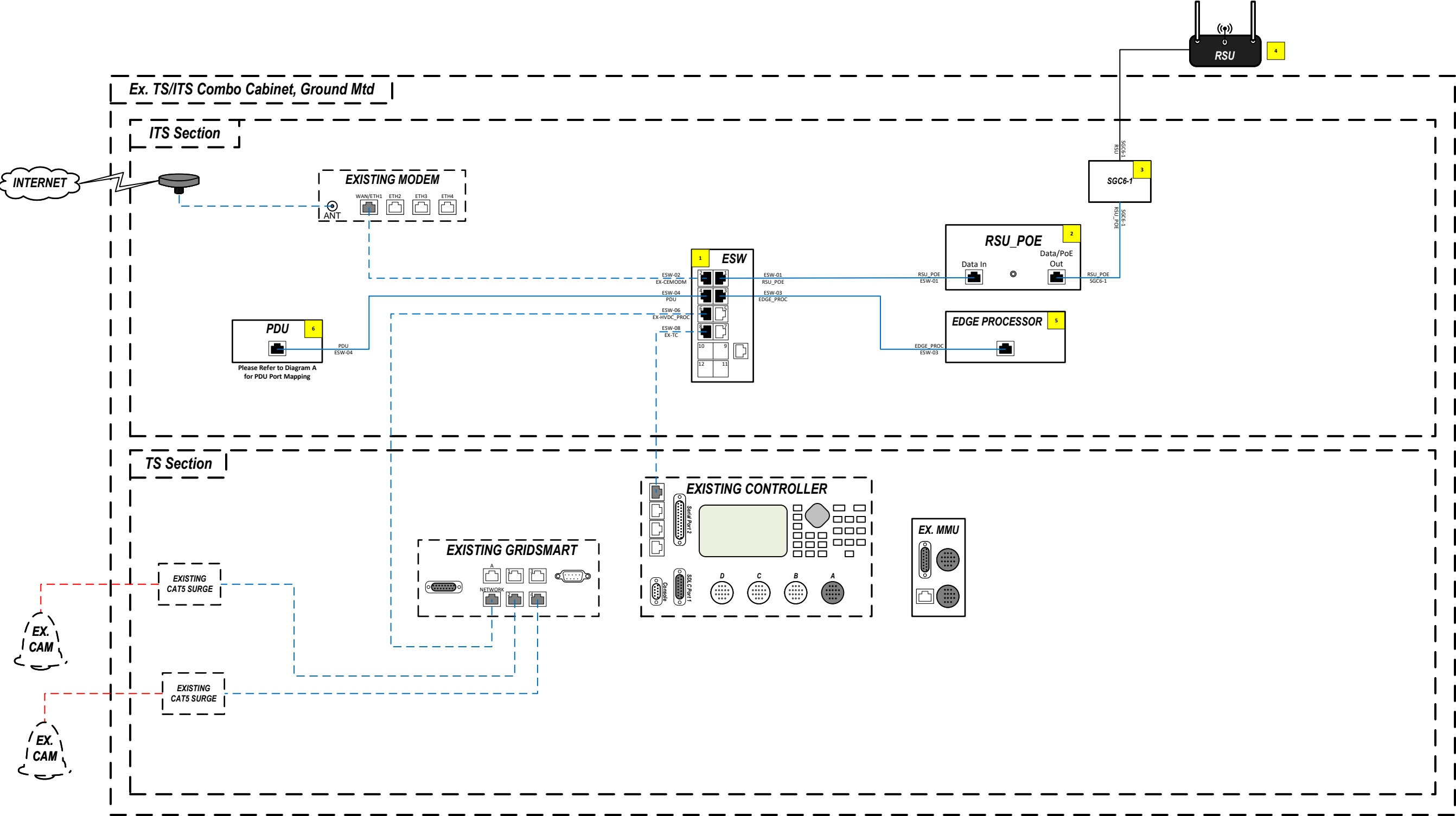


Diagram A:

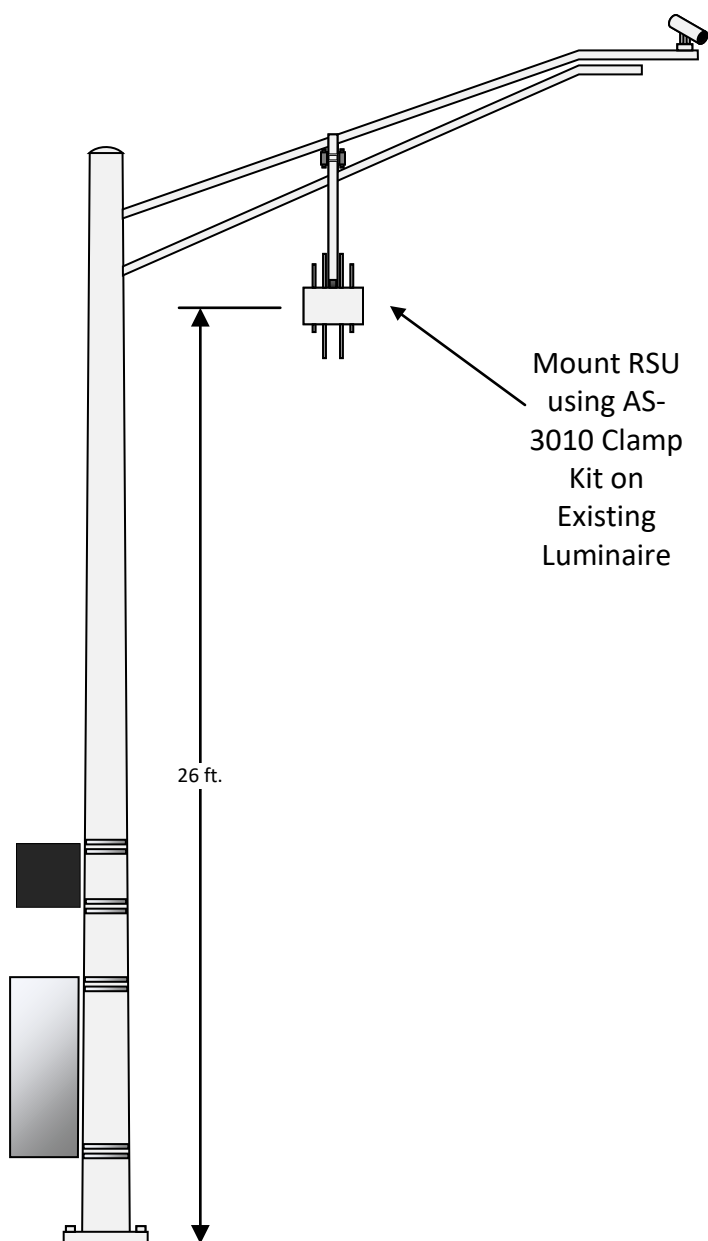


1	ESW	LANTRONIX SISPM1040-384-LRT-C
2	RSU_POE	TBD
3	SGC6	CITEL MJ8-POE-A
4	RSU	COHDA MK6 RSU
5	EDGE PROCESSOR	NEUROSYS 9166
6	PDU	GRIDCONNECT GC-NETIO-PDU4KS-US

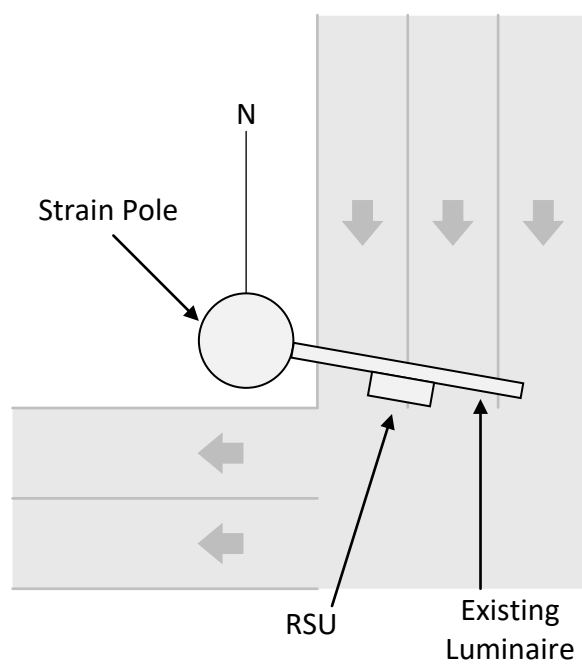


Appendix B – Pole Elevation Details

Cabinet #31: Greenfield and 10 Mile

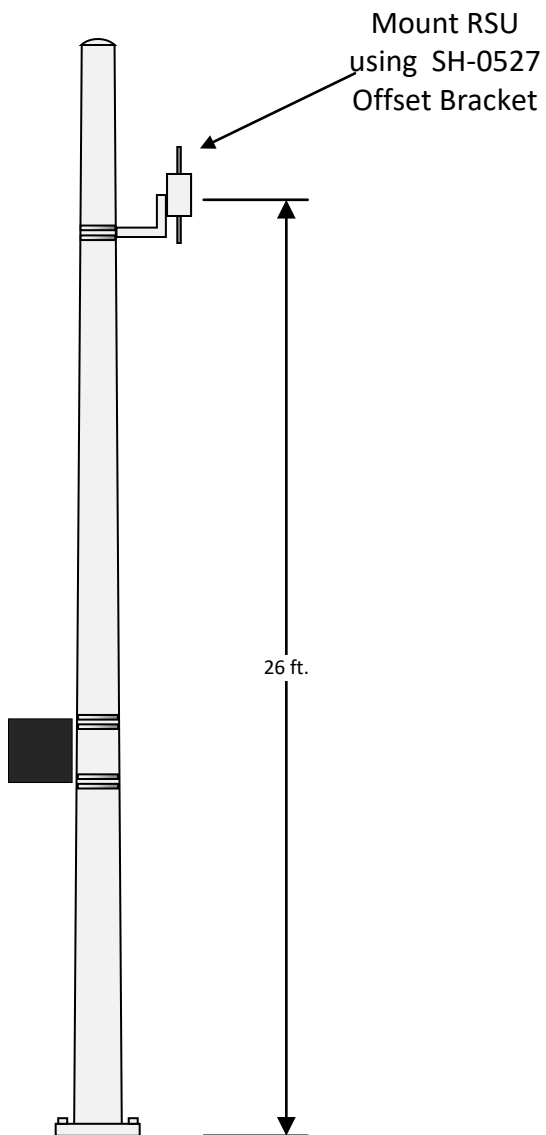


Detail A
Mounting Location

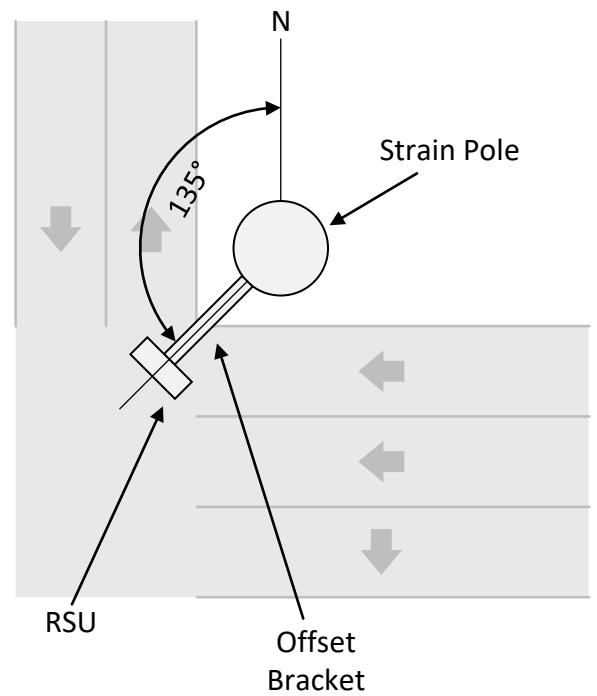


Detail B
RSU Orientation

Cabinet #41: 10 Mile and Church

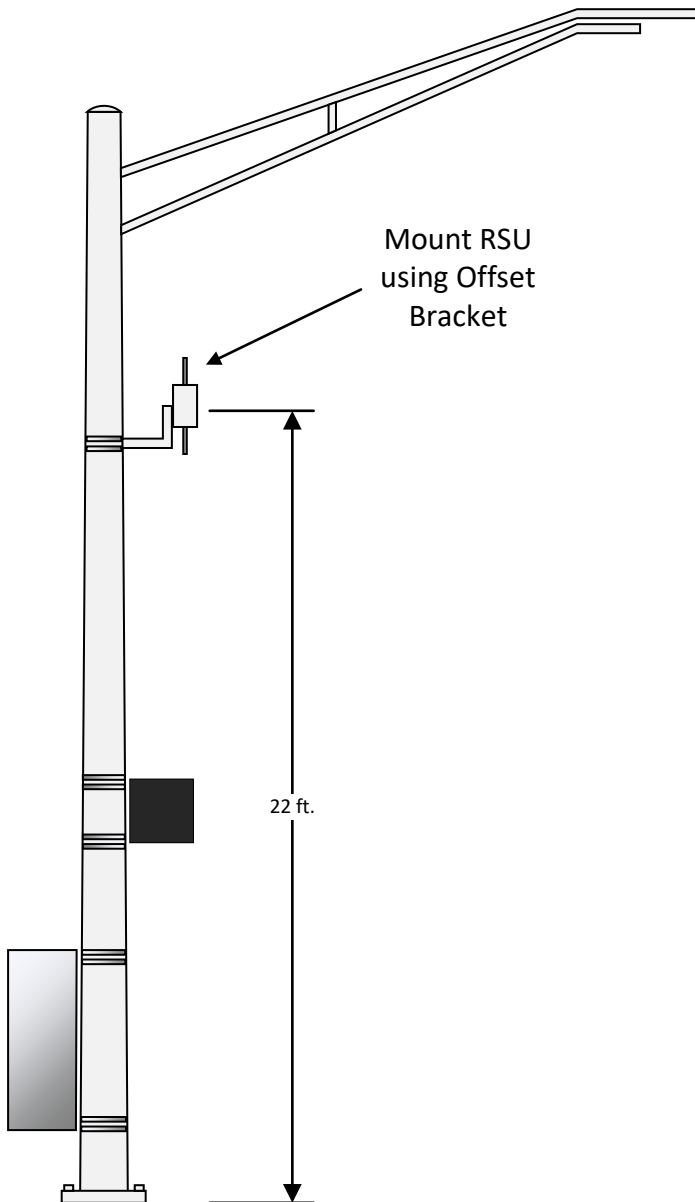


Detail A
Mounting Location

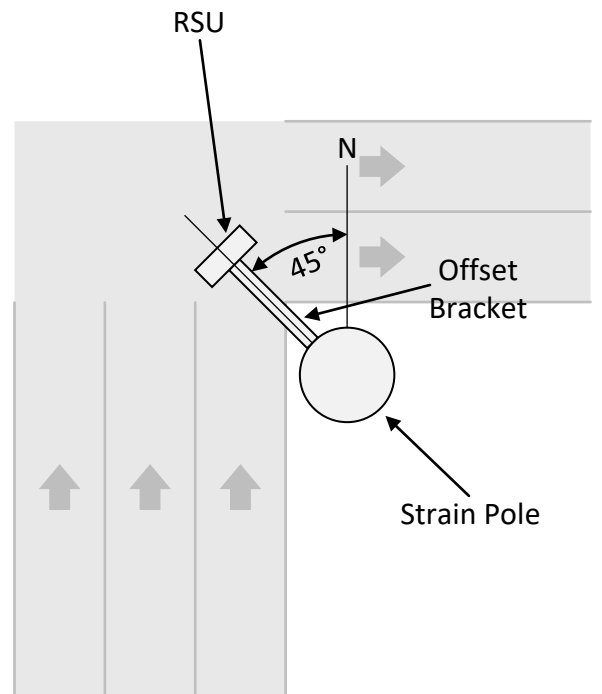


Detail B
RSU Orientation

Cabinet #115: Greenfield and Lincoln

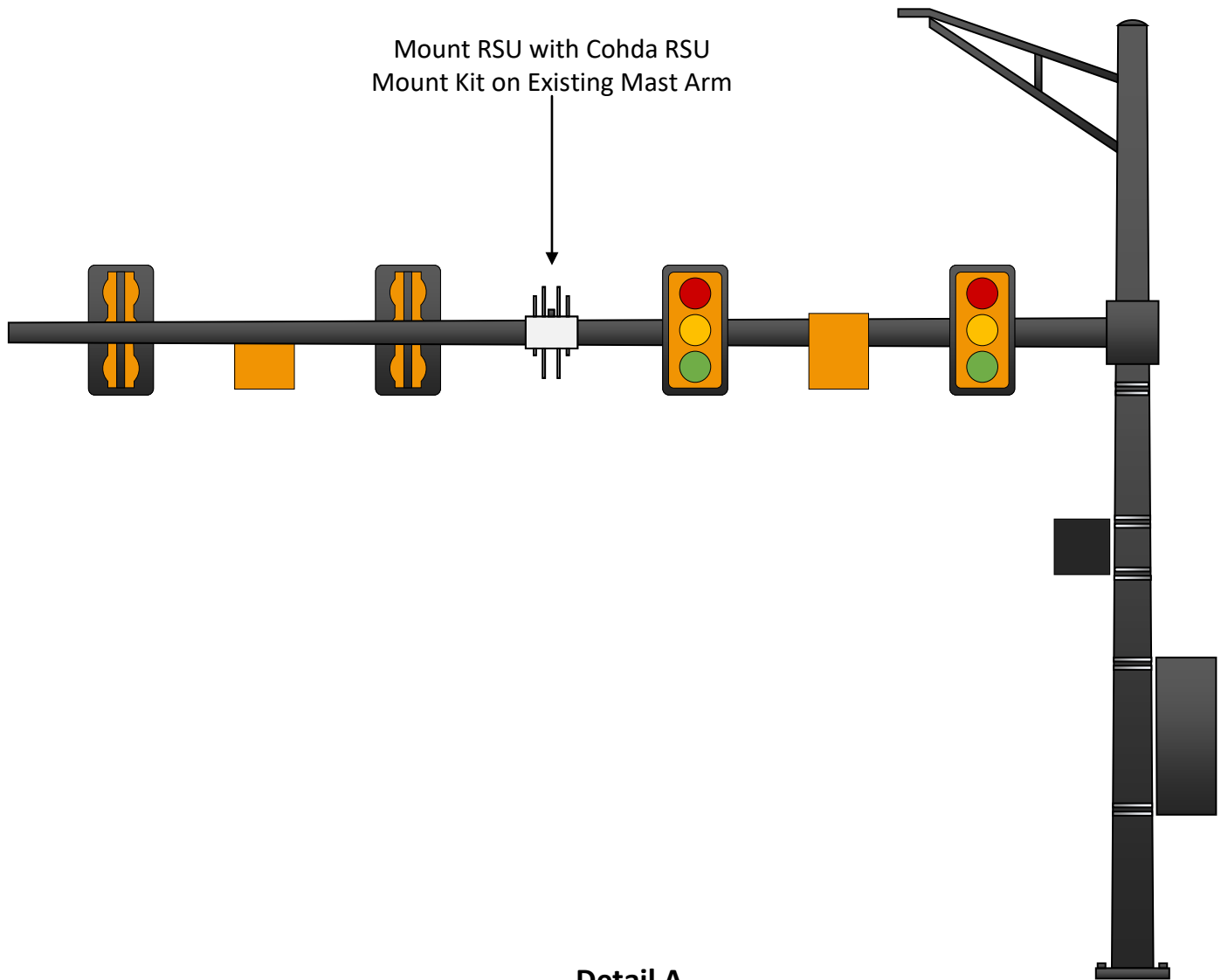


Detail A
Mounting Location

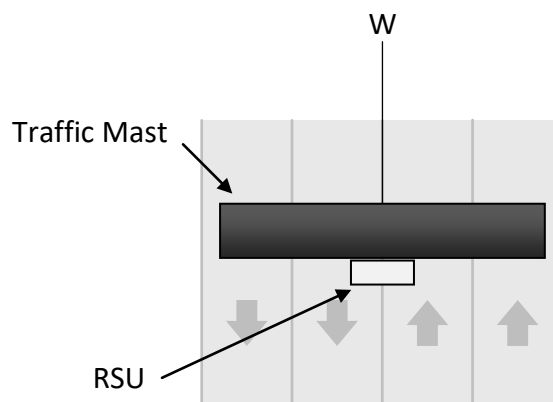


Detail B
RSU Orientation

Cabinet #1395: 12 Mile and Northwood Elementary

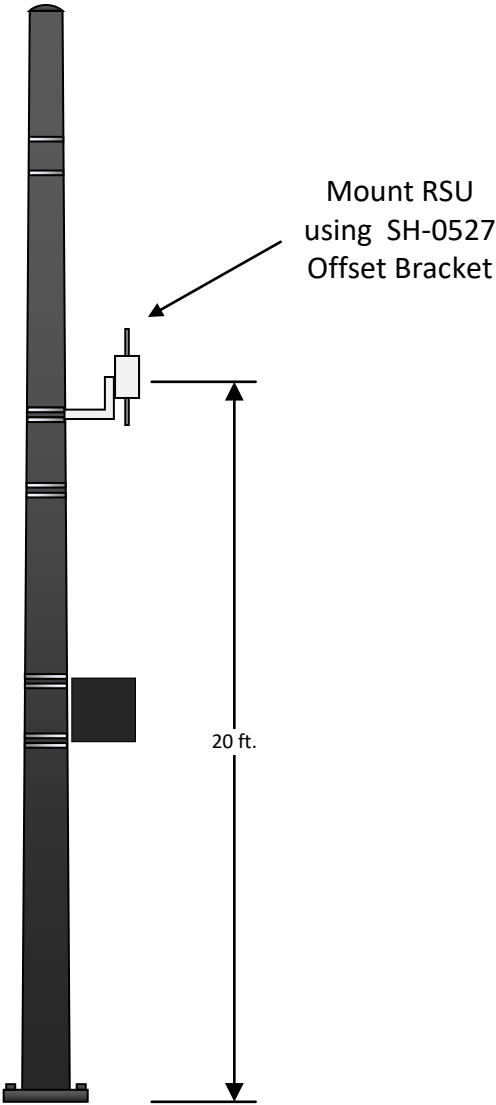


Detail A
Mounting Location

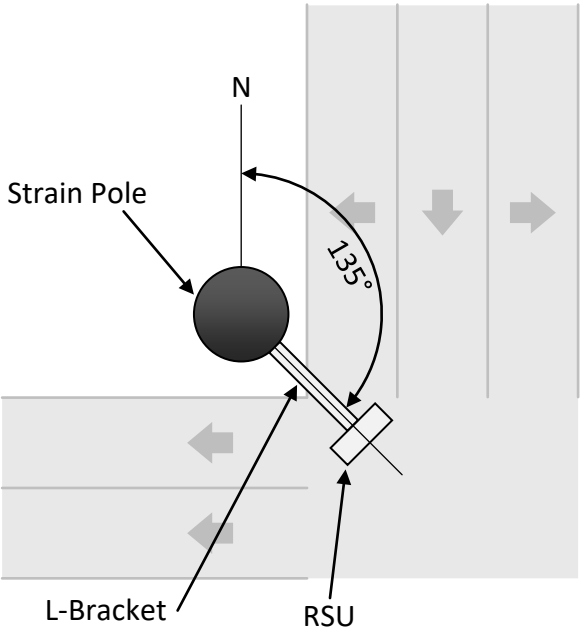


Detail B
RSU Orientation

Cabinet #1397: 12 Mile and Main

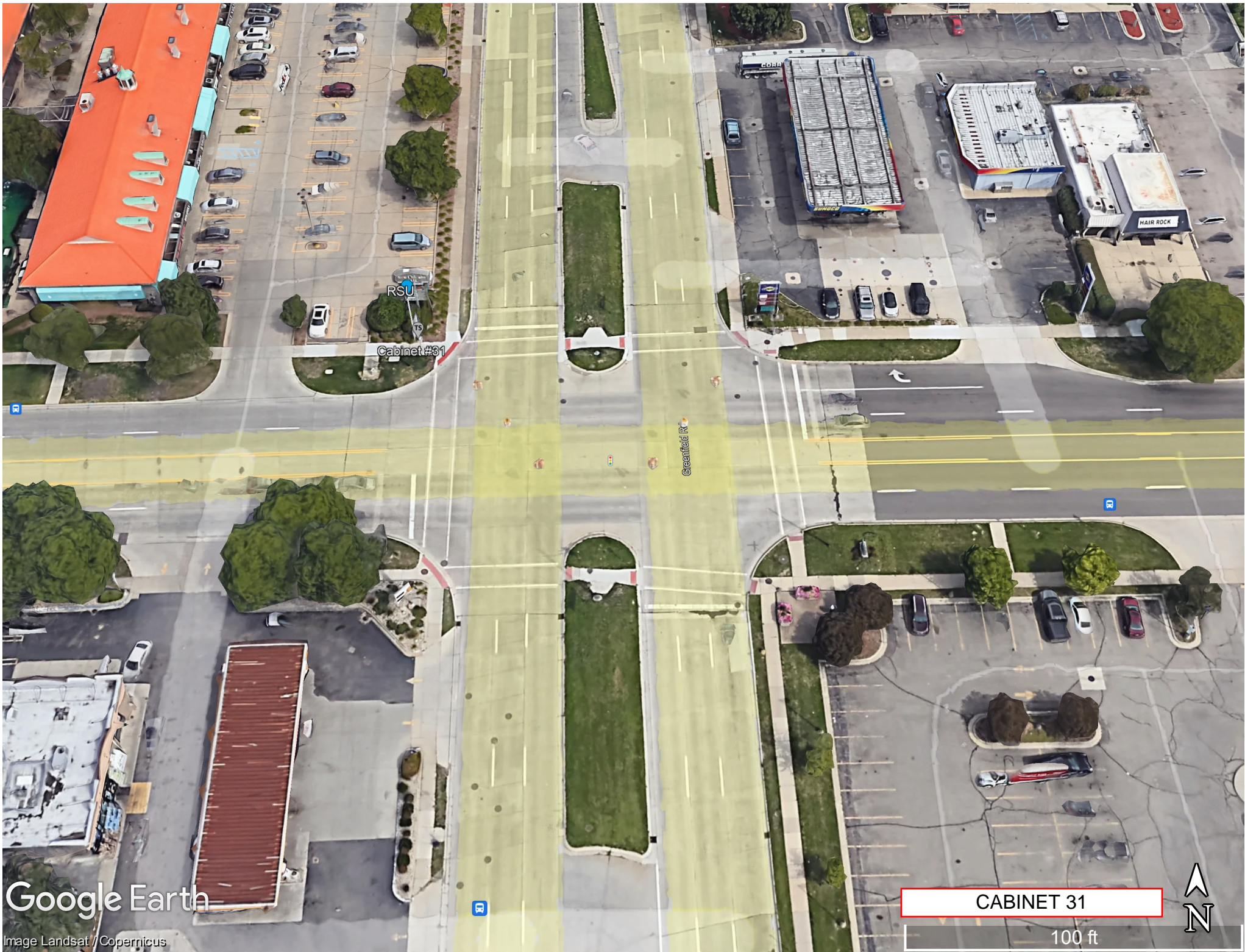


Detail A
Mounting Location



Detail B
RSU Orientation

Appendix C – Top-Down Intersection Views



Google Earth

Image Landsat / Copernicus

CABINET 31

100 ft





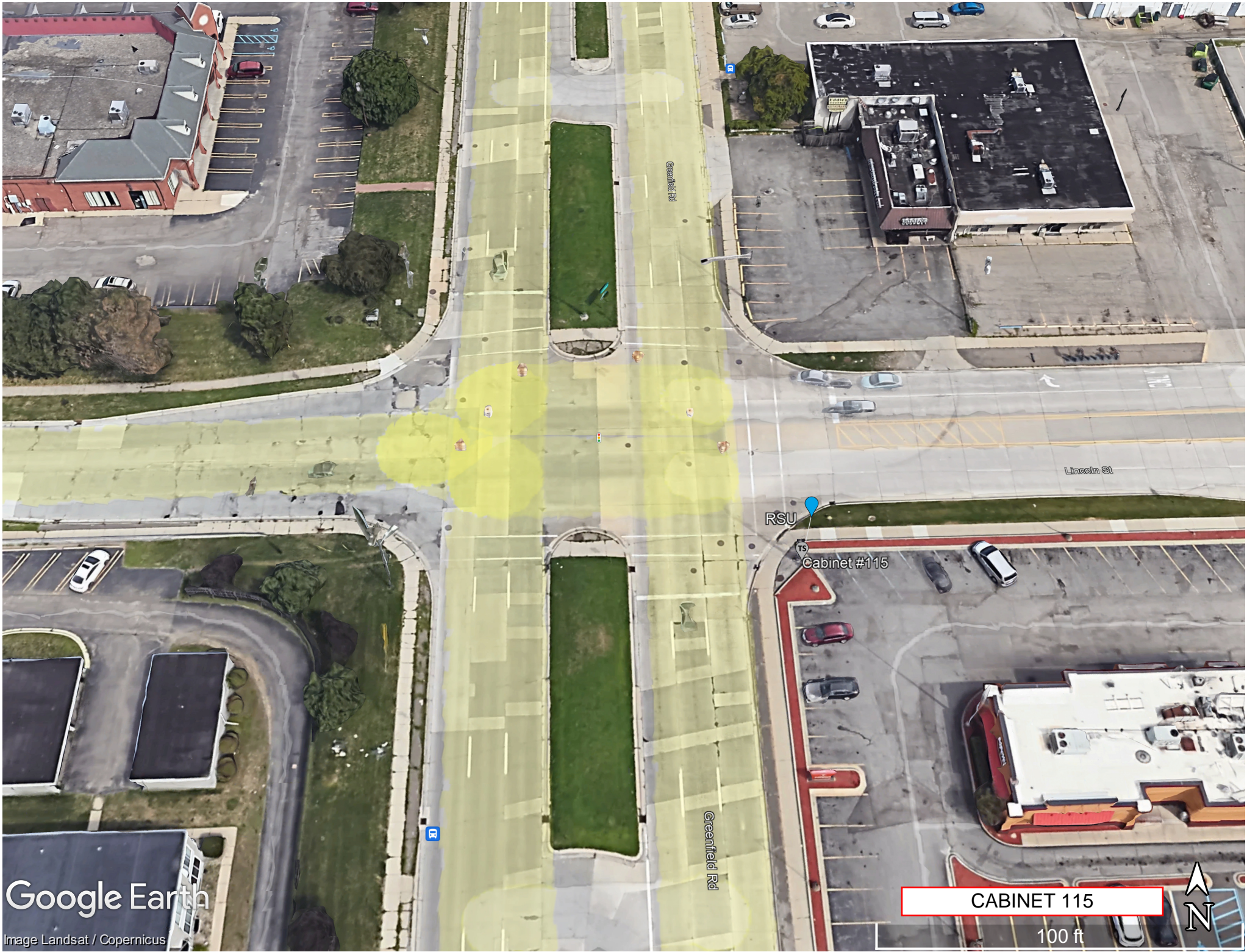
Google Earth

Image NOAA
Image Landsat / Copernicus

CABINET 41

100 ft





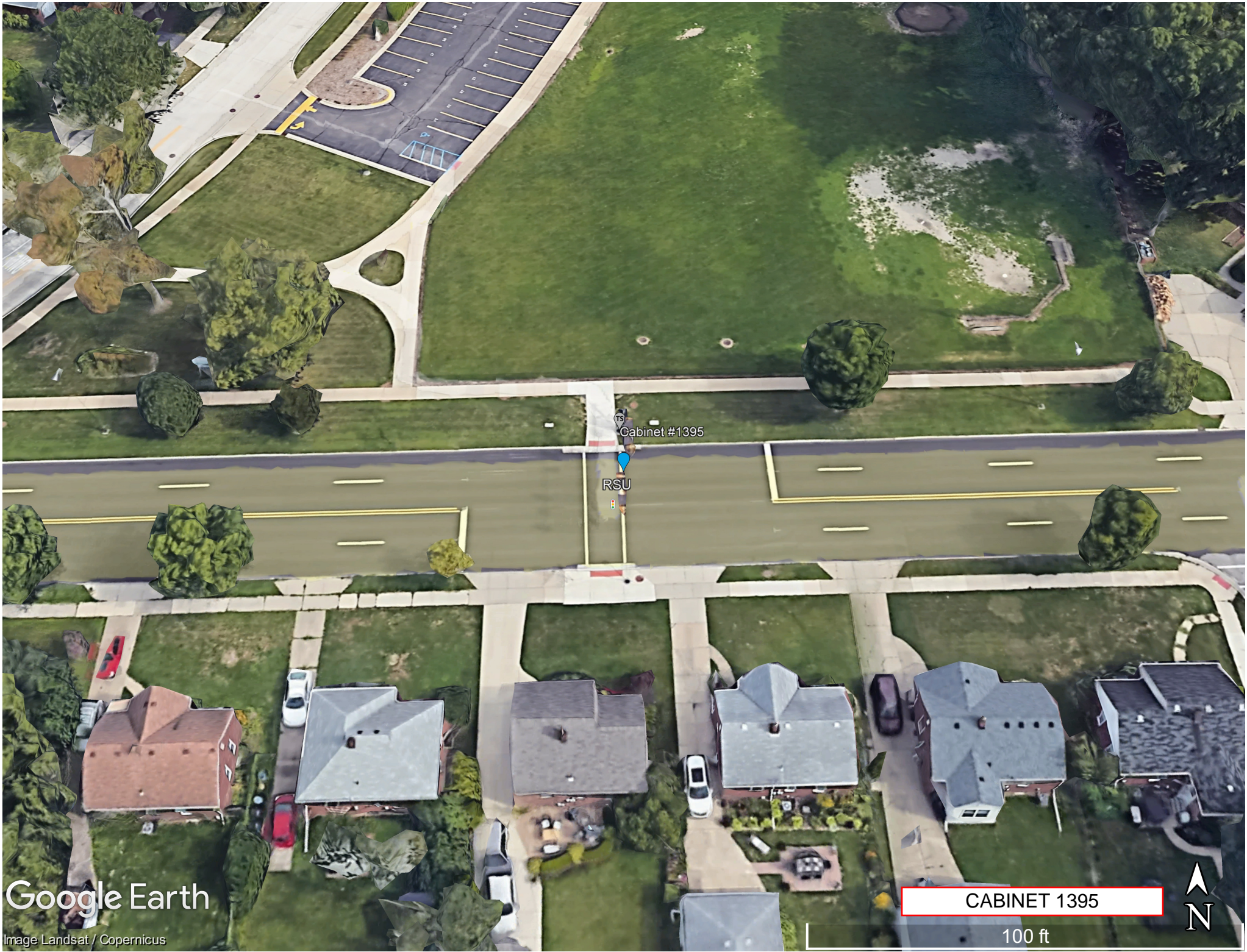
Google Earth

Image Landsat / Copernicus

CABINET 115

100 ft





Google Earth

Image Landsat / Copernicus

CABINET 1395

100 ft





Google Earth

Image Landsat / Copernicus

CABINET 1397

100 ft



Appendix D – Site Survey Report

P3Mobility

RCOC SMART Project Integration

Site Survey Report

Survey Performed on 1/25/2024



Prepared By: INTEGRAL BLUE

Table of Contents

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Power over Ethernet (PoE) Extenders	4
Proposed Model Selections	4
Location Survey Details	5
Cabinet #31: Greenfield and 10 Mile	6
Cabinet #41: 10 Mile and Church	10
Cabinet #115: Greenfield and Lincoln	13
Cabinet #1395: 12 Mile and Northwood Elementary	15
Cabinet #1397: 12 Mile and Main St	18

Power and Networking Considerations

As shown in the location detail sections to follow, site survey identified the following limitations affecting installation of the proposed P3M equipment:

- All cabinet devices are connected to Digi TX54 modems, which only have 4 Ethernet ports. Those ports will be consumed by the P3M edge processor, Gridsmart edge processor, traffic signal controller, and RSU.
- 2 of the 5 cabinets are older style cabinets without dedicated ITS equipment space or DIN rail and will have problems accommodating the proposed equipment without moving things around.

P3Mobility has also identified a use case for installing network-connected power distribution units (PDUs) to facilitate remote power cycling of devices in the event of network or device failure without needing to make local site visits. However, the TX54 modems will not accommodate additional Ethernet connections after the originally planned equipment is installed, meaning a new Ethernet switch would also need to be installed, compounding the space availability problem. To help identify a workable solution that also takes the aforementioned space issues into consideration, Integral Blue has prepared the following options for P3M/RCOC team review and discussion:

- **Option 1:** Use GPIO inputs on the edge processor to trigger a board reset.
 - The TX54 includes an RS232 port. GPIO on the edge processor (if it exists) may permit RESET signals over serial.
 - This option will require a lot of out-of-scope engineering on IB's part (or P3M's) to determine if it's even possible.
 - This option would only enable power cycling of the edge processor and not the RSU or any other equipment.
- **Option 2:** Use a PoE+ managed switch to manage remote power cycles of the RSU.
 - This option would only enable power cycling of the RSU and not the edge processor or any other equipment.
 - This option does have the added convenience of network-level diagnostic abilities in the cabinet, depending on what model of switch you buy.
- **Option 3: (Recommended)** Use a network-managed power strip device to facilitate remote power cycles of the RSU, P3M edge processor, Ethernet switch, and RCOC modem, and use a simple unmanaged switch for the additional network connections.
 - This option would require buying a Layer 2 switch of some kind (managed or unmanaged) to facilitate the additional required Ethernet port.
 - This option provides the highest flexibility for power management; watchdog capabilities can even automate cycling specific ports based on lack of ping responses. For example, one could automatically cycle the RSU if it suddenly stopped responding to pings or cycle the modem if ping responses from an external Internet IP stopped being received.
 - However, this option is the most space-consuming, as it would involve adding two new devices in the cabinets.

Power over Ethernet (PoE) Extenders

P3M expressed interest in recommended PoE extender models, in case of Ethernet cable length issues for the RSUs. IB strongly advises avoiding PoE extenders in general, as they create points of failure that are difficult to manage and tend to fail regularly. The location detail sections to follow include observations about proposed RSU mounting poles, none of which are estimated to exceed the 100-meter distance limitation for Gigabit Ethernet over CAT5e or CAT6. Regardless, if needed, IB has provided a recommended model in the section below.

Proposed Model Selections

The below models of PDUs, Ethernet switches, PoE extenders, and PoE surge protectors have been identified and recommended by Integral Blue. Cutsheets for each can be found in the Attachments section of this report.

- **Network-Managed PDU: GC-NETIO-PDU4KS-US**
 - Provides 4 outlets, which IB recommends be used for the RCOC modem, P3M edge processor, P3M RSU, and the newly proposed Ethernet switch.
 - Industrial grade temp/humidity ratings.
 - Shelf-mountable but could sit on its side.
 - Includes web interface and watchdog capabilities.
- **Layer 2 PoE+ Managed Switch: Lantronix (Transition Networks) SISPM1040-384-LRT-C**
 - Robust PoE power management and monitoring capabilities.
 - 8 Gigabit RJ45 ports and 4 Gigabit SFP ports.
 - Industrial grade temp/humidity ratings.
 - On-board network monitor and topology visualizer.
 - Per-port PoE power cycling capabilities.
 - DIN-mountable or shelf-mountable.
 - Powered using DC terminal block.
- **Layer 2 Unmanaged Switch: TRENDNET TI-G80**
 - Simple and affordable.
 - Small form factor.
 - 8 Gigabit RJ45 ports.
 - Industrial grade temp/humidity ratings.
 - DIN-mountable or shelf-mountable.
 - Powered using DC terminal block.
- **PoE+ Extender: Mikrotik GPeR (with IP67 Case)**
 - Simple and affordable.
 - Can be mounted to pole if needed.
 - Passive device, no external power needed besides PoE.
 - Repeats PoE/Ethernet for an additional 100m.
- **PoE+ Surge Protector: CITEL MJ8-POE-A**
 - Very small form factor.
 - PoE++ compatible.
 - Gigabit Ethernet compatible.
 - Recommended for all RSUs.

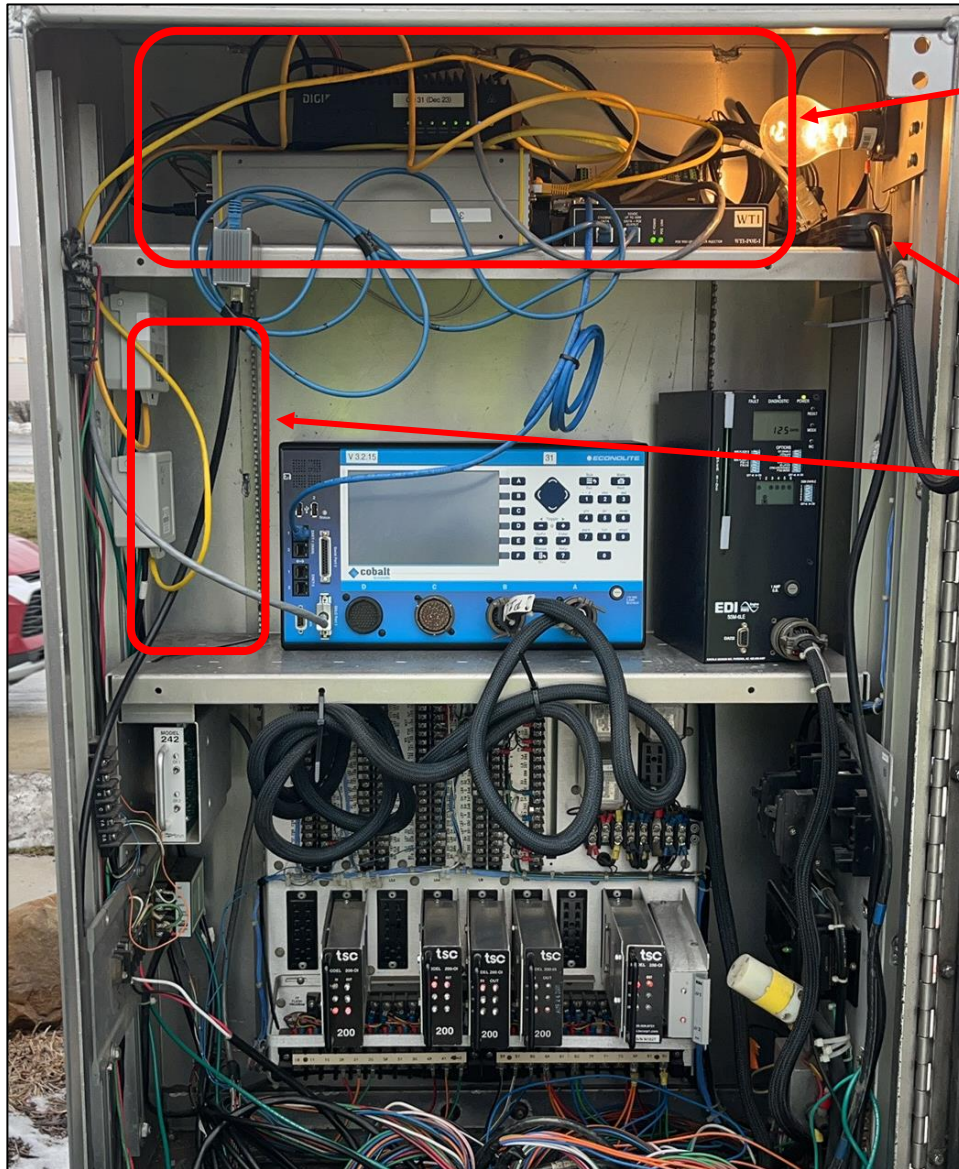
Location Survey Details

The sections to follow detail the cabinet space, existing equipment capability, and RSU mounting pole observations and recommendations, including photos.

Cabinet #31: Greenfield and 10 Mile

Cabinet Type: Pole Mounted, Single Door

Cabinet Space:



Very little space to add ITS devices. Devices would need to be moved around to make space.

Enough power outlets to provide power to proposed equipment.

This area may be large enough to place the Gridsmart processor on its side, in order to make room on the top shelf for the proposed equipment.

Line of Sight Analysis:

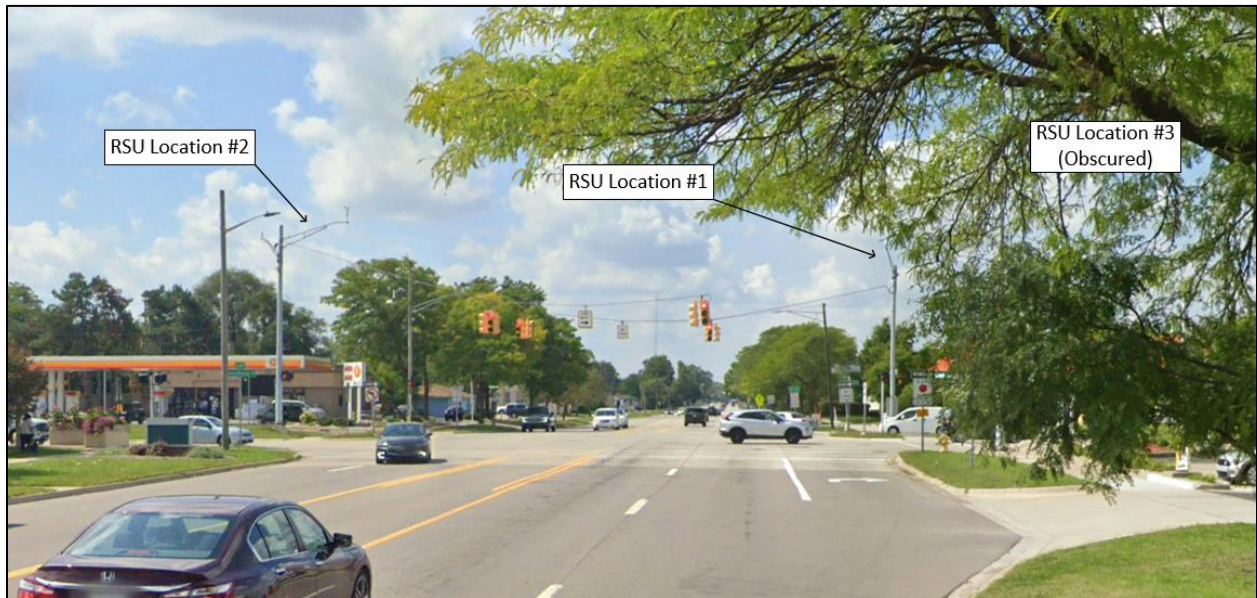
There are three possible mounting locations for the RSU at this intersection. Each location was considered since no option had great line-of-sight (LOS) for each approach towards the intersection. Three directions of traffic are clear for all three location options but each leaves one direction partially obstructed. IB believes that mounting the RSU on the same pole to which the cabinet is mounted (RSU Location #1) will provide the best results, as the tree in the northeast quadrant provides the least obstruction to westbound traffic compared with other obstructions at other mounting locations.



Eastbound Approach LOS:

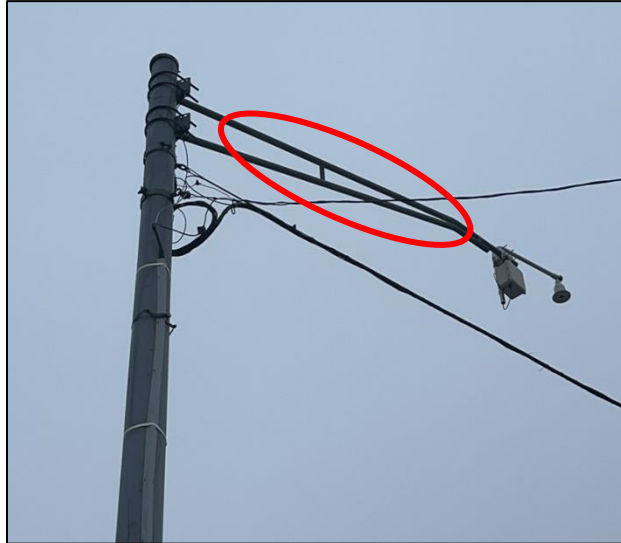


Westbound Approach LOS:



RSU Mounting Recommendation:

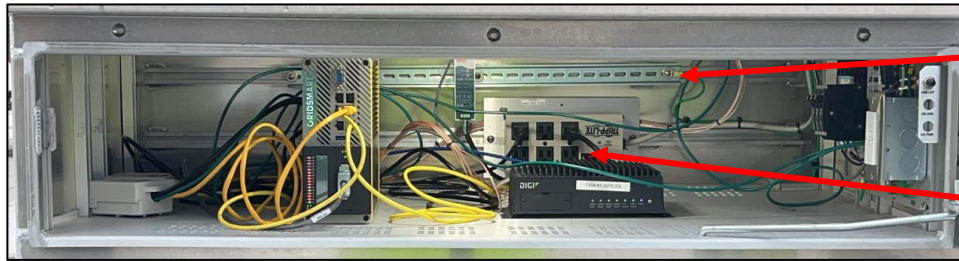
IB recommends installing the RSU on the existing strain pole at Location #1, mounted to the existing arm using a Pelco Astro-Brac mount.



Cabinet #41: 10 Mile and Church

Cabinet Type: Ground Mounted, Combo Cabinet with ITS and TS Sections

Cabinet Space:



ITS Section

Din rail available to mount PoE injector, L2 Switch, and surge protector for RSU.

Enough power outlets to provide power to proposed equipment.

Plenty of room to add proposed equipment to ITS section.



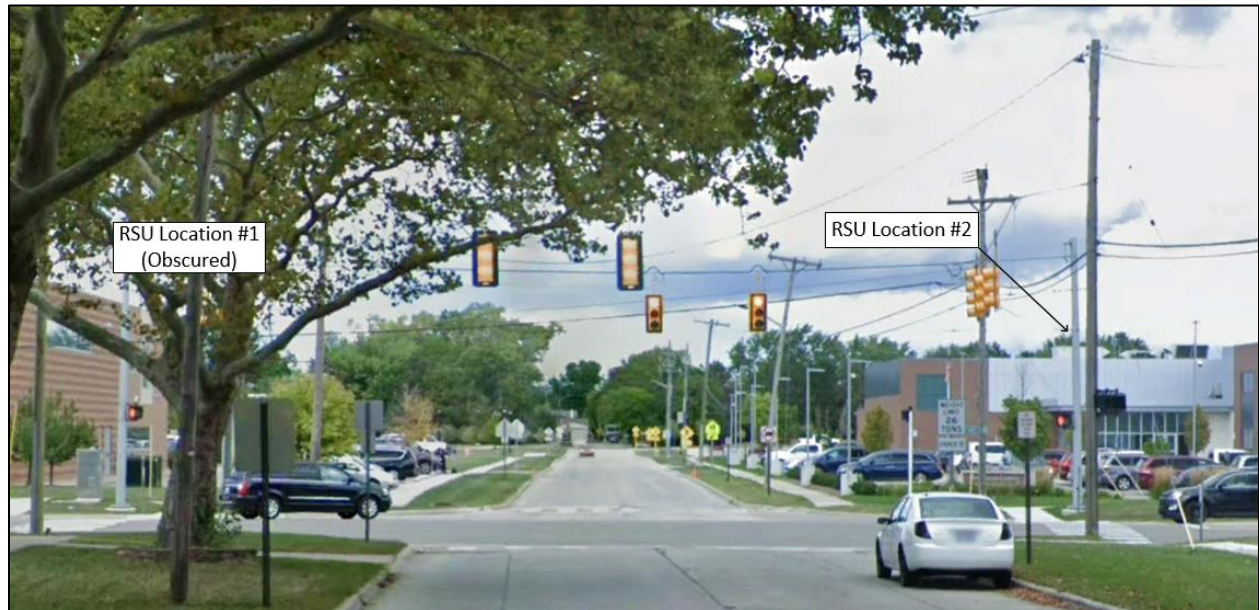
TS Section

Line of Sight Analysis:

There are two possible mounting locations for the RSU at this intersection. Both locations were considered due to the trees along Church street providing LOS obstructions. IB believes that mounting the RSU on the pole in the northeast quadrant of the intersection (RSU Location #2) will provide the best results, as the LOS for northbound traffic is slightly better than the LOS achieved when installing at RSU Location #1.



Northbound Approach LOS:



RSU Mounting Recommendation:

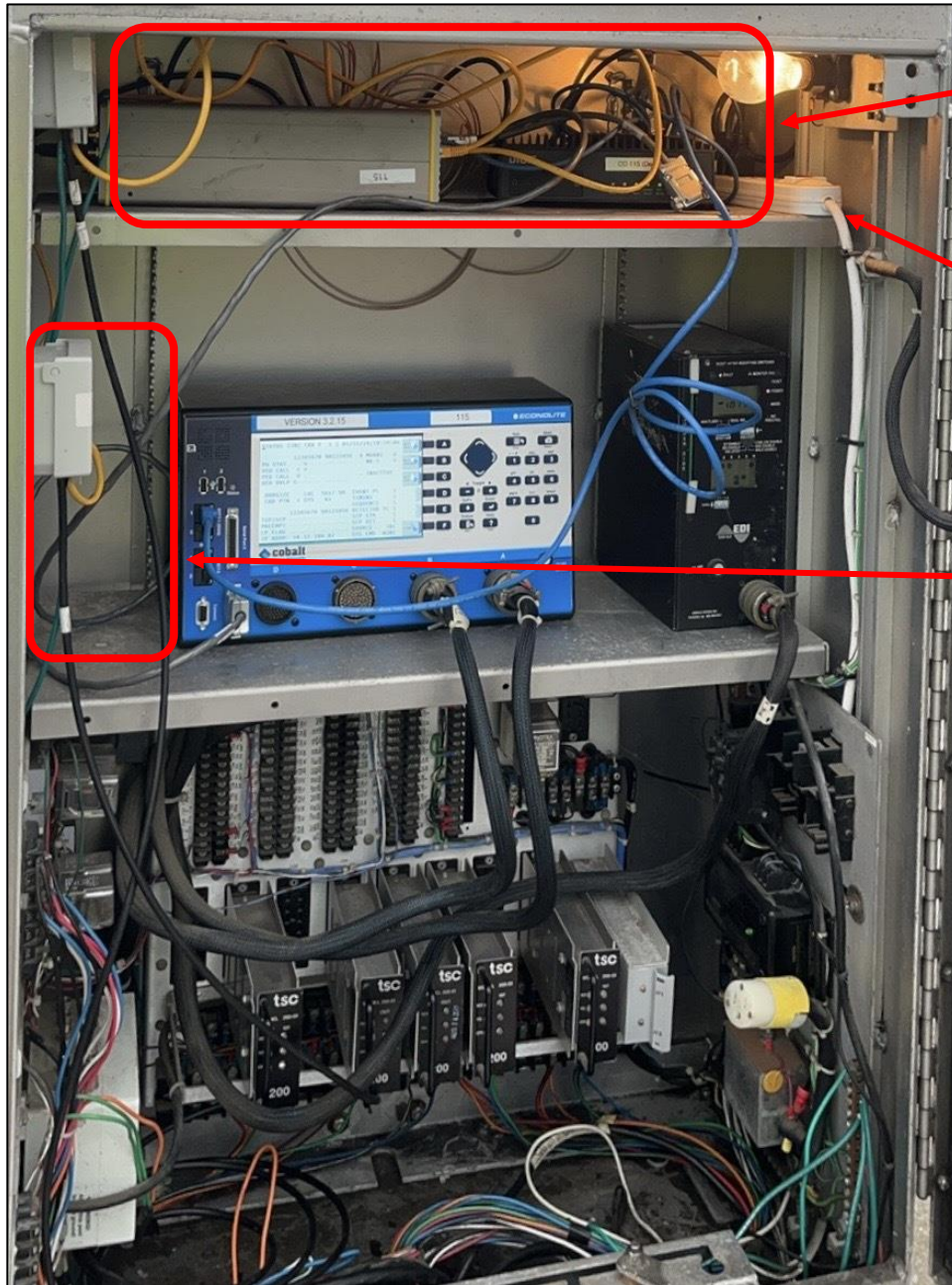
IB recommends installing the RSU on the existing strain pole at Location #2, mounted at 26' using an L bracket in combination with the RSU mounting bracket.



Cabinet #115: Greenfield and Lincoln

Cabinet Type: Pole Mounted, Single Door

Cabinet Space:



Very little space to add ITS devices. Devices would need to be moved around to make space.

Enough power outlets to provide power to proposed equipment.

This area may be large enough to place the Gridsmart processor on its side, in order to make room on the top shelf for the proposed equipment.

Line of Sight Analysis:

The pole on which the cabinet is mounted has great LOS for each direction of traffic.



RSU Mounting Recommendation:

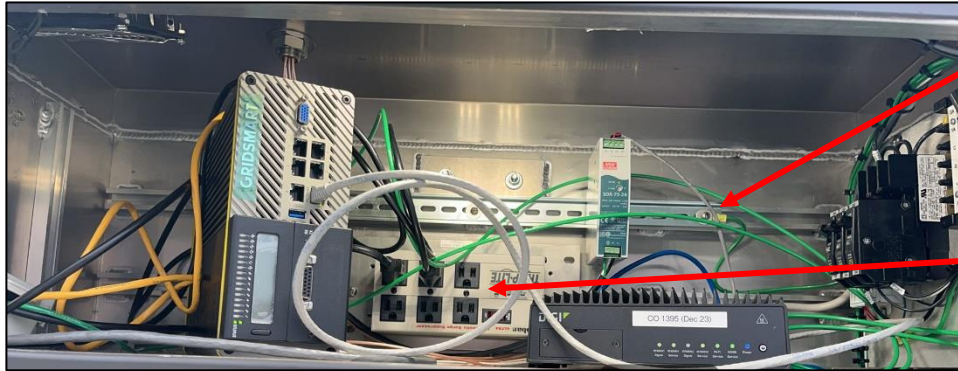
IB recommends that the RSU is installed on the strain pole at Location #1, mounted at 26' using an L bracket in combination with the RSU mounting bracket.



Cabinet #1395: 12 Mile and Northwood Elementary

Cabinet Type: Pole Mounted, Combo Cabinet with ITS and TS Sections

Cabinet Space:

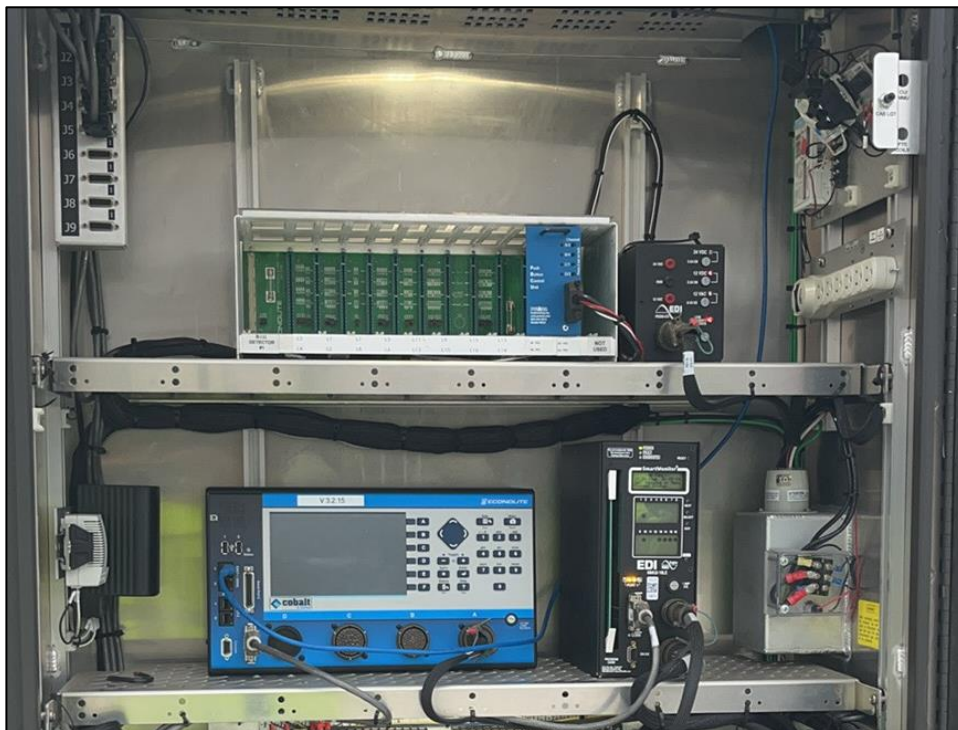


ITS Section

Din rail available to mount PoE injector, L2 Switch, and surge protector for RSU.

Enough power outlets to provide power to proposed equipment.

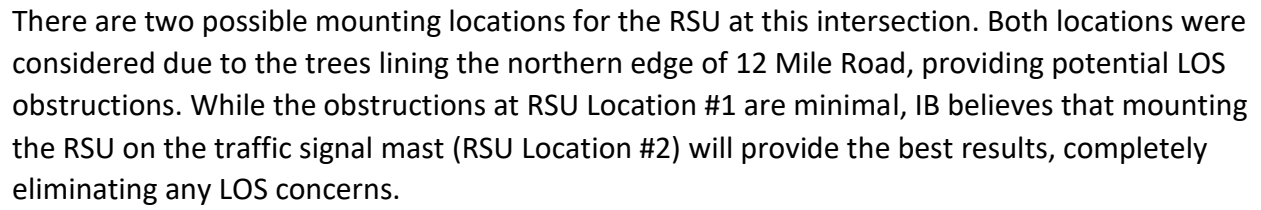
Plenty of room to add proposed equipment to ITS section.



TS Section

Additional Notes: ITS section cannot be easily accessed from ground level. A ladder will be required to install and integrate devices in this section of the cabinet.

There are two possible mounting locations for the RSU at this intersection. Both locations were considered due to the trees lining the northern edge of 12 Mile Road, providing potential LOS obstructions. While the obstructions at RSU Location #1 are minimal, IB believes that mounting the RSU on the traffic signal mast (RSU Location #2) will provide the best results, completely eliminating any LOS concerns.



Eastbound Approach LOS:



Note: Google Earth Streetview does not show the view for westbound traffic using the correct lanes, and therefore does not show the LOS obstruction. An alternate view is shown here to indicate that the trees do affect the LOS for the westbound lanes of traffic.

RSU Mounting Recommendation:

IB recommends mounting to the signal mast using a Pelco Astro-Brac mount.



Cabinet #1397: 12 Mile and Main St

Cabinet Type: Ground Mounted, Combo Cabinet with ITS and TS Sections

Cabinet Space:

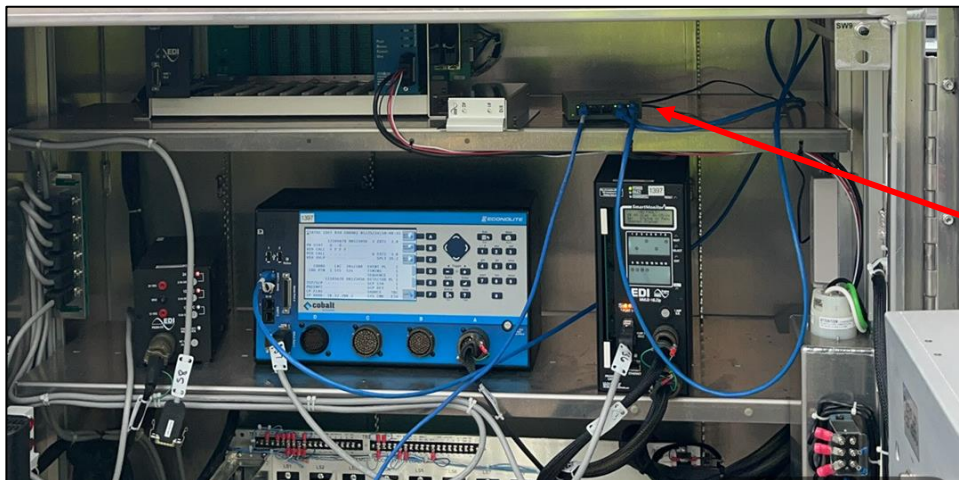


ITS Section

Enough power outlets to provide power to proposed equipment.

Din rail available to mount PoE injector, L2 Switch, and surge protector for RSU.

Plenty of room to add proposed equipment to ITS section.



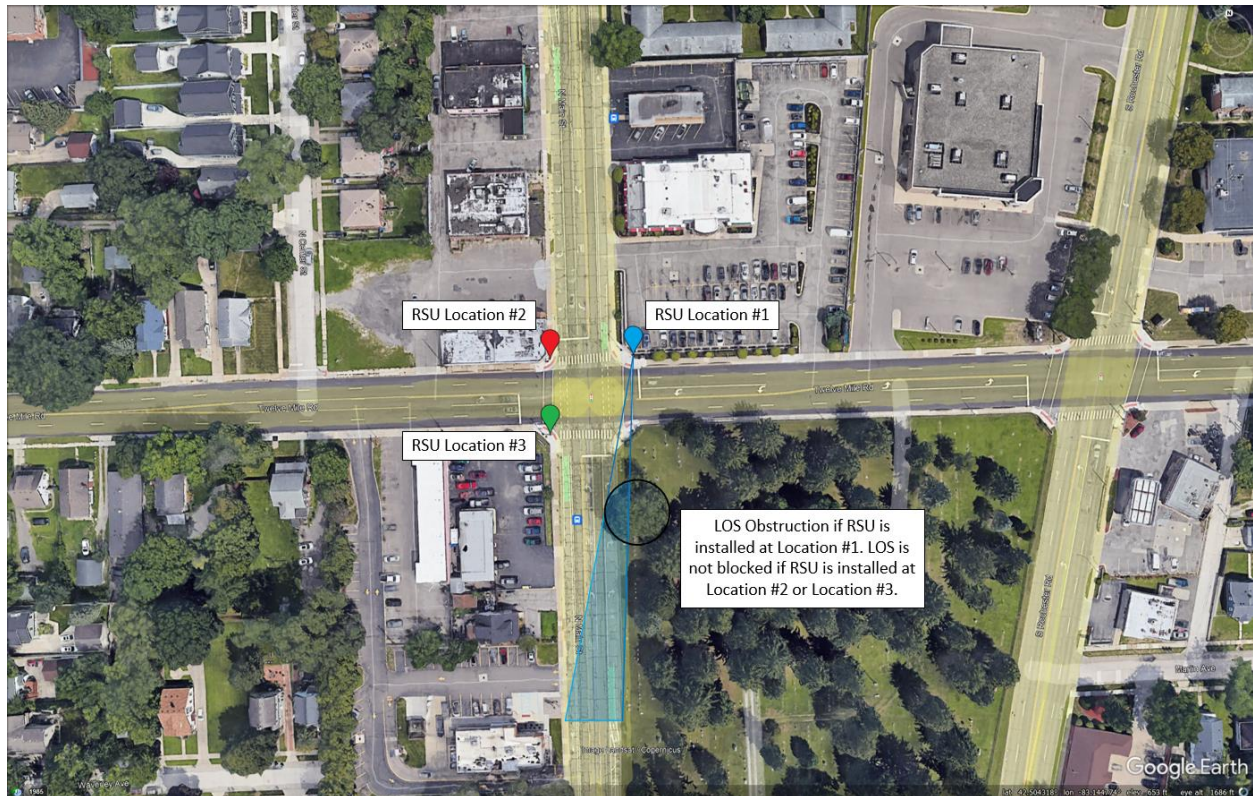
TS Section

4-port hub, IB recommends that this is replaced with proposed L2 switch due to lack of environmental hardening.

Additional Notes: Gridsmart processor will be installed in this cabinet, but this will still leave enough space for the installation of the proposed equipment in the ITS section of the combo cabinet.

Line of Sight Analysis:

There are three possible mounting locations for the RSU at this intersection. Multiple locations were considered due to the potential LOS concern for northbound traffic. Both Location #2 and Location #3 provide good LOS for all directions of traffic. IB recommends that Location #2 is chosen, as the length of cable required for installation would be much less compared to installation at Location #3, and there is no advantage to installing at Location #3 to offset this difference.

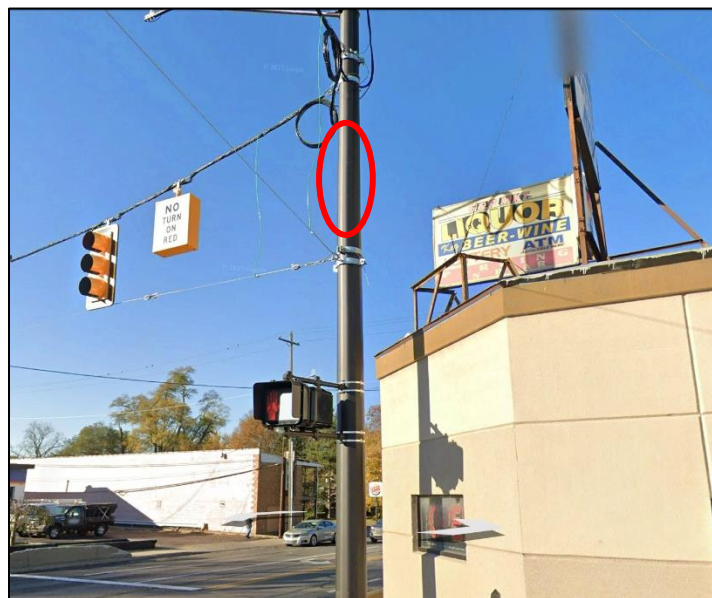


Northbound Approach LOS:



RSU Mounting Recommendation:

IB recommends that the RSU is installed on the existing strain pole at Location #2, mounted at 26' using an L bracket in combination with the RSU mounting bracket.



Appendix E – Cohda RSU Quick Start User Guide



www.cohdawireless.com

MK6 RSU Quick Start User Guide

Version: 3.01



CE

The MK6 RSU complies to Radio Equipment Directive 2014/53/EU. A copy of the Declaration of conformity is available on request.

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



FCC Caution:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.



RF Radiation Exposure Statement Caution:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.



WARNING: Modifications not approved by manufacturer could void compliance.

Others

The MK6 RSU is RoHS and Lead-Free compliant. It complies with the "Directive 2011/65/EU of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).



These instructions are for use by qualified skilled personnel only. Only professional Skilled person should Install, Start-up and Service this device as

1. Only approved antenna shown under Section 1 and section 4.2 can be used with this device.
2. It is to be installed and mounted on Traffic Poll or other device on height.
3. It takes power from Power Over Ethernet devices and to be connected with complex networks.
4. It requires to install and pack device properly to maintain its IP rating.

This device is not sold via retail or mail for normal public use.

1 Kit Contents

Unpack the MK6 RSU Kit

Following items are included in the MK6 RSU Kit shipment.



RSU Unit



4x 5.9GHz Antennas
2 for DSRC, 2 for C-V2X



2x LTE Antennas



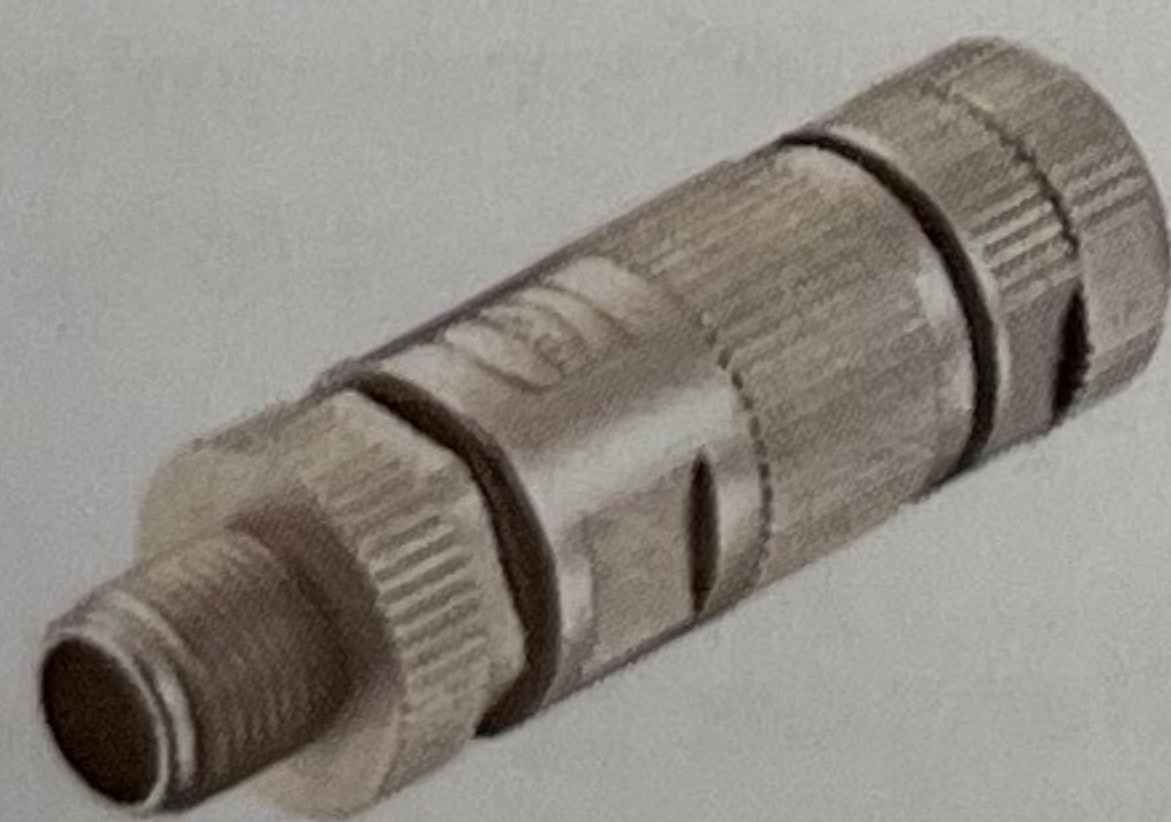
2x Bluetooth/WLAN
Antenna



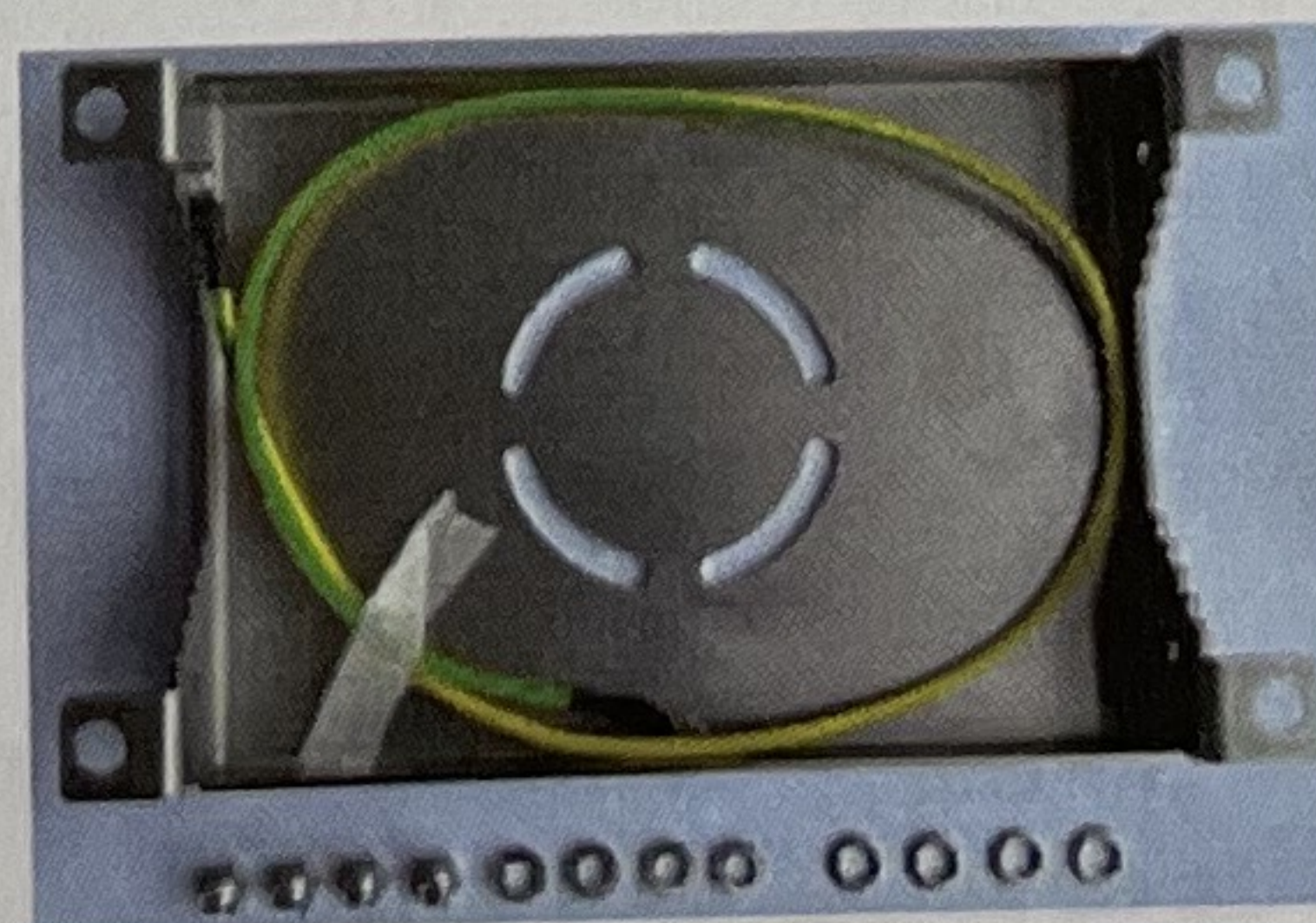
GNSS Antenna



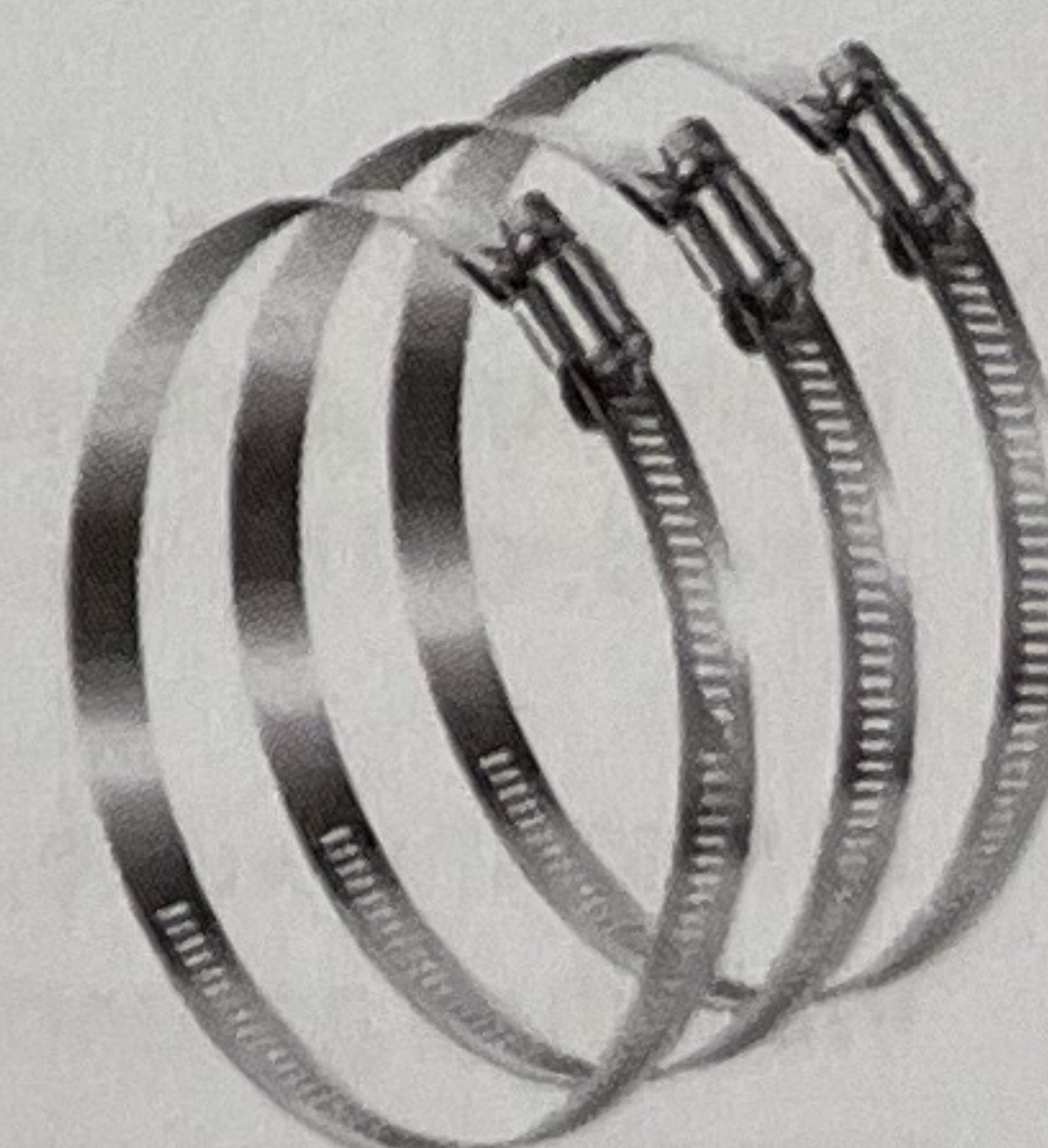
Self-Fusing Rubber Tape



M12 Connector



Pole Mount Bracket,
Earth wire, bolts, flat &
spring washers



3x Stainless Steel Straps

2 Warnings, Symbols and Marking

2.1 Warning



Improper handling may lead to serious injury or even death.

2.2 Caution



Be sure to follow the instructions.

2.3 Attention



Improper handling may lead to injury or property damage.

2.4 Protective Earth



Product must be connected to proper protective Earth.

To ensure the system benefits from optimum electromagnetic interference immunity, the individual system components, and the connection cables in particular, need to be shielded. The shield must be connected to the ground reference plane.

In systems without equipotential bonding or with potential differences between the individual grounding points or multiple instances of shield grounding, can result in transient currents at system frequency. These may affect performance of the device.

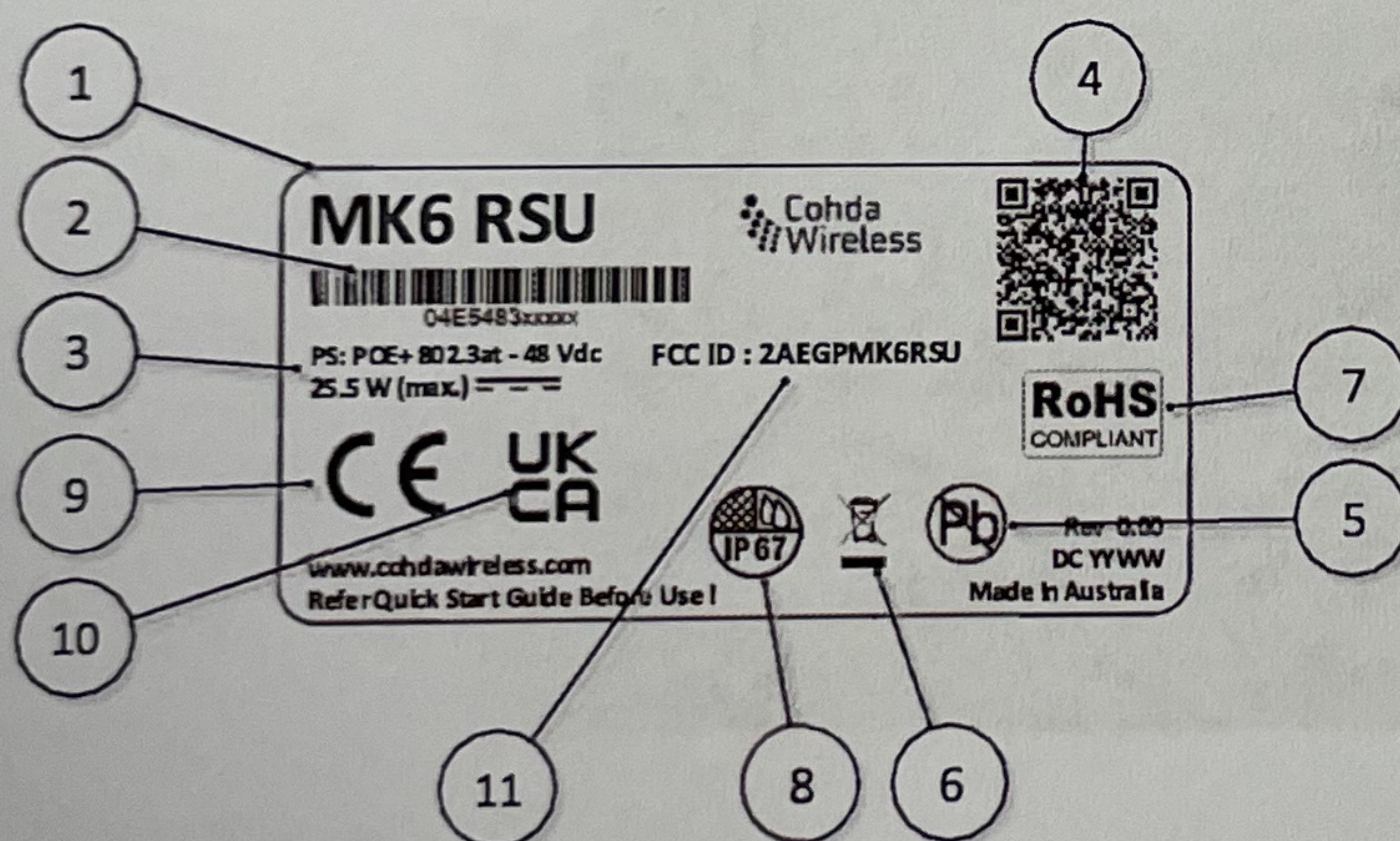
2.5 Product Disposal



Products that are marked with the above symbol may not be disposed of as unsorted municipal waste (domestic waste). They should be disposed of through separate collection of electronic devices. This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies. The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.

2.6 Product Identification

MK6 RSU Product Label (Enclosure) – Label information.



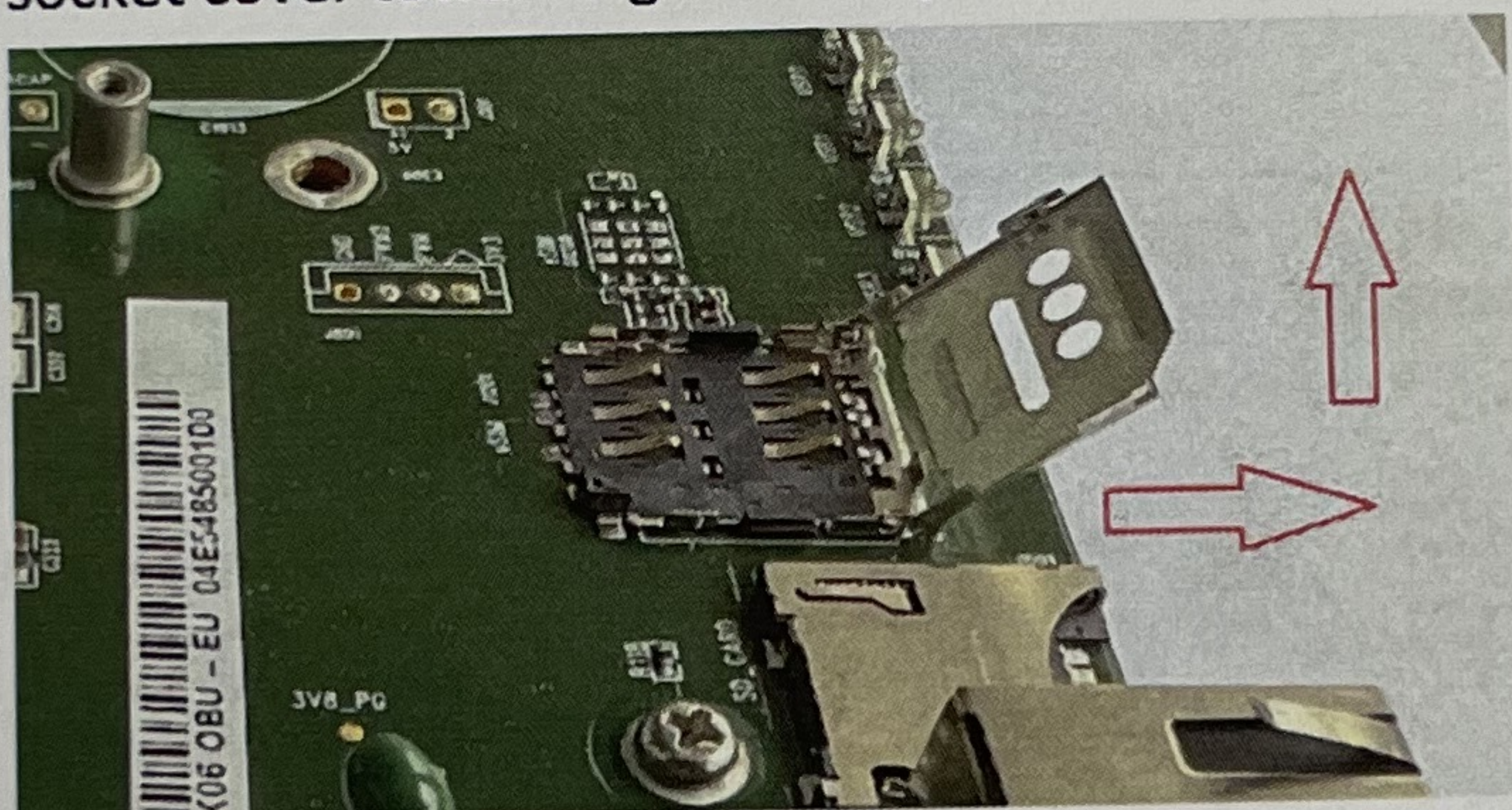
1. Product Model No.
2. Product Sr. No. Bar code information
3. Power supply Rating
4. Product Ordering Code QR Code info
5. Product is manufactured using Lead Free Materials
6. Product Disposal Symbol
7. Product is ROHS complaint
8. Product is IP 67 rated
9. CE Mark Symbol
10. UKCA Mark Symbol
11. FCC ID

3 SIM card installation

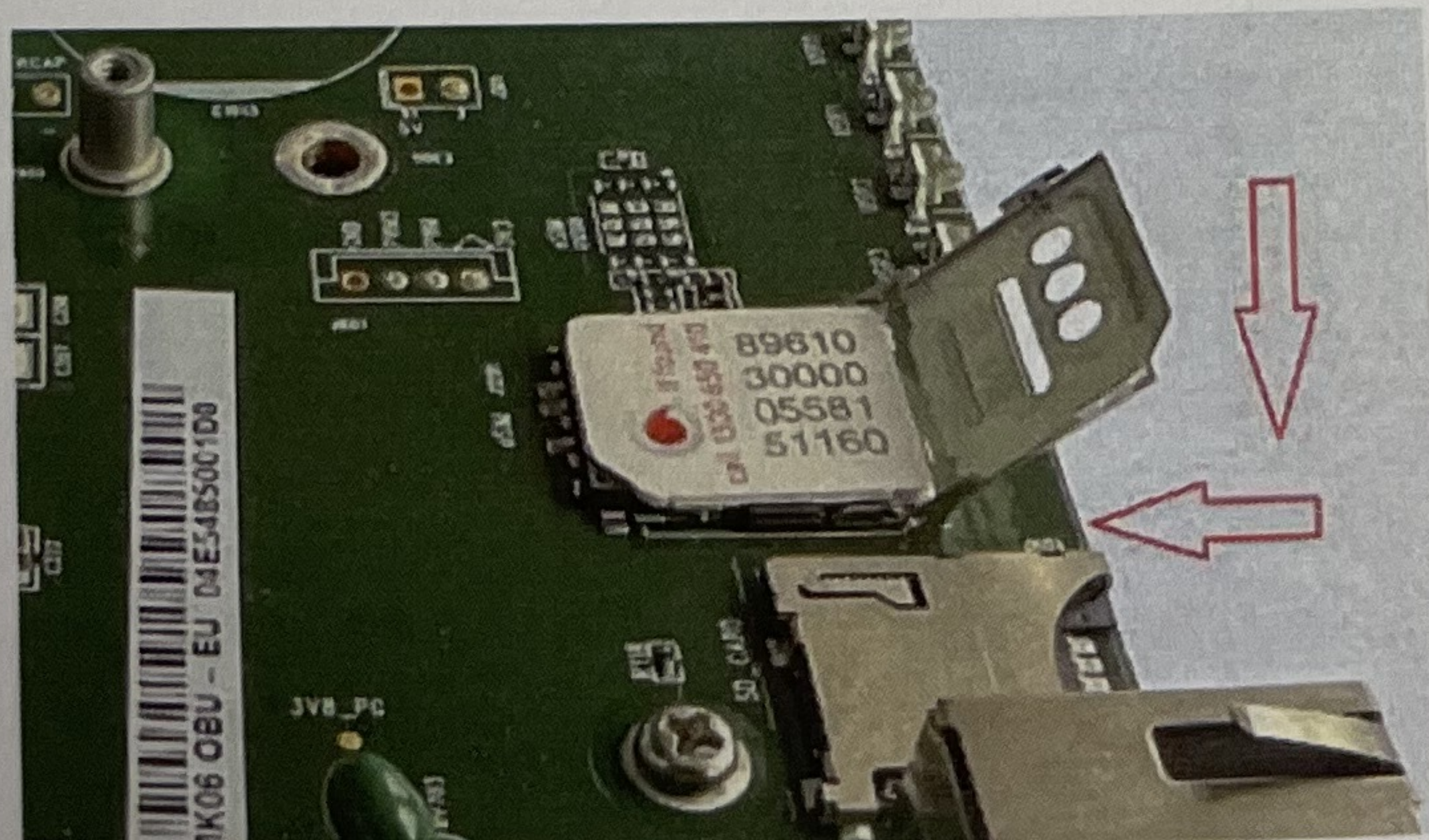
3.1 Unscrew 4x Socket head cap screws with size 5 Allan key. Lift enclosure lid carefully.



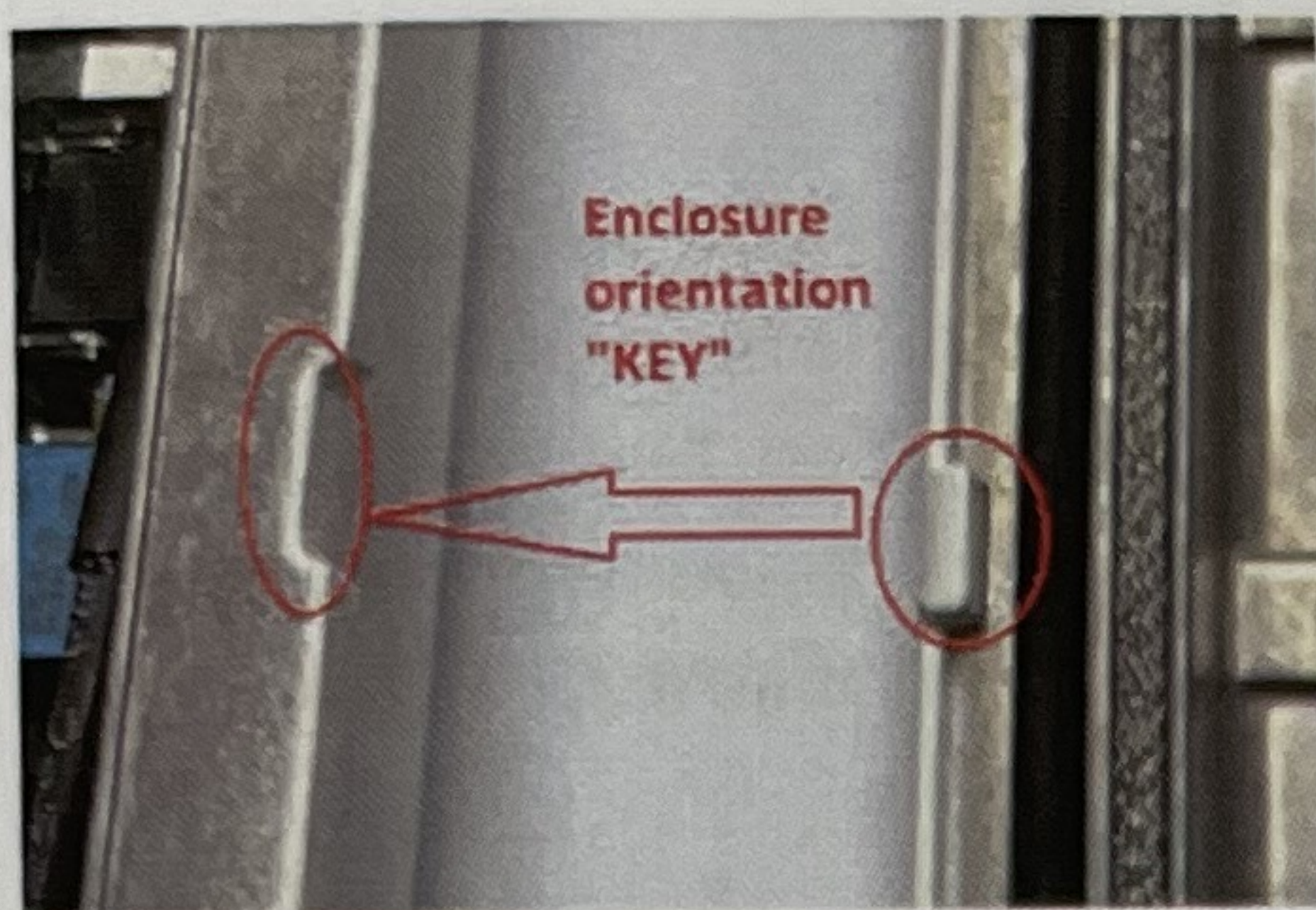
3.1 Slide SIM socket cover toward right and slip it up.



3.2 Insert micro SIM card onto socket. Slip socket cover down and slide it toward left.



3.3 Close the top enclosure. Ensure the enclosure orientation 'KEY' is matched.

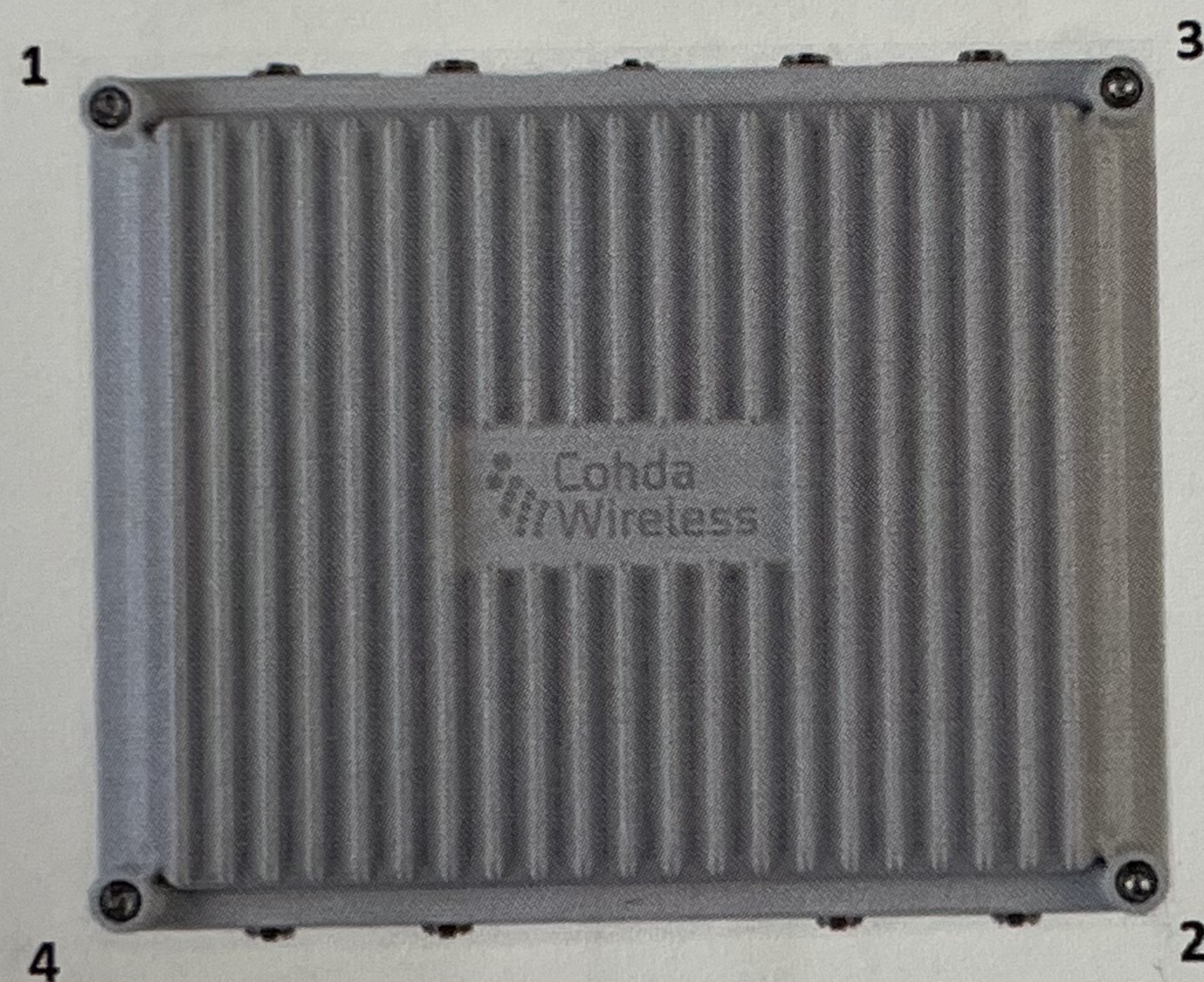


3.4 Fasten 4x Socket head cap screws with size 5 Allan-key. Following steps and torques **MUST** be followed to ensure enclosure is sealed properly.

Fasten screw at location 1, 2, 3 and 4 with torque 10kgf.cm

Fasten screw at location 1, 2, 3 and 4 with torque 20kgf.cm

Fasten screw at location 1, 2, 3 and 4 with torque 30kgf.cm



4 Connecting MK6 RSU

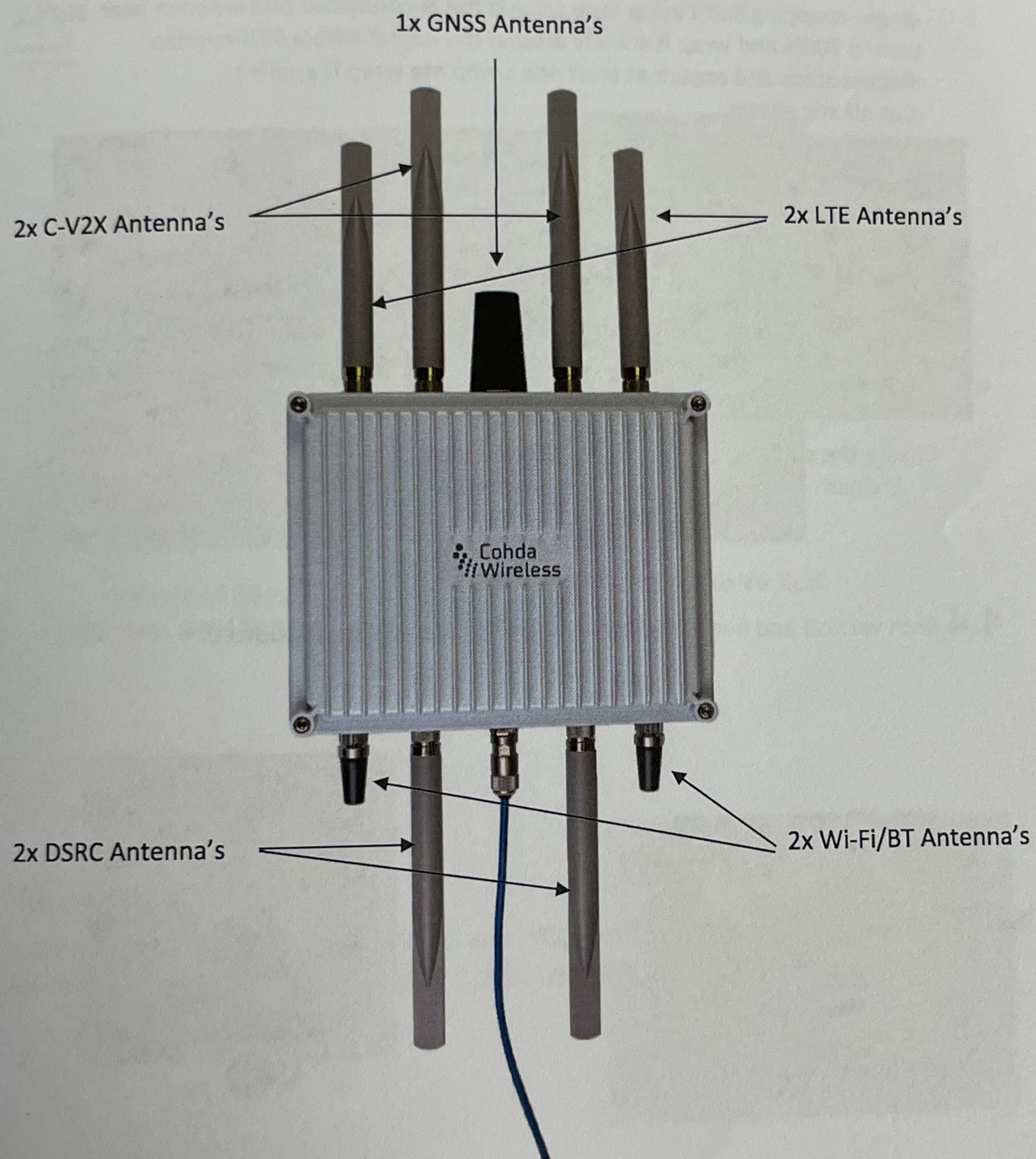
- 4.1** Assemble Ethernet connector using M12 X-Coded field attachable Ethernet connector. The MK6 RSU can only be powered through the Ethernet port, it supports either Mode A (Endspan) or Mode B (Midspan). The Field-Attachable Ethernet connector suits 7.7-9.0mm diameter cable by default. Please use the correct alternative grommet supplied for smaller (5.5-6.7mm or 6-7.7mm) diameter cable.



Please refer to the instruction sheet that comes with M12 connector when assembling the M12 Ethernet field attachable connector!

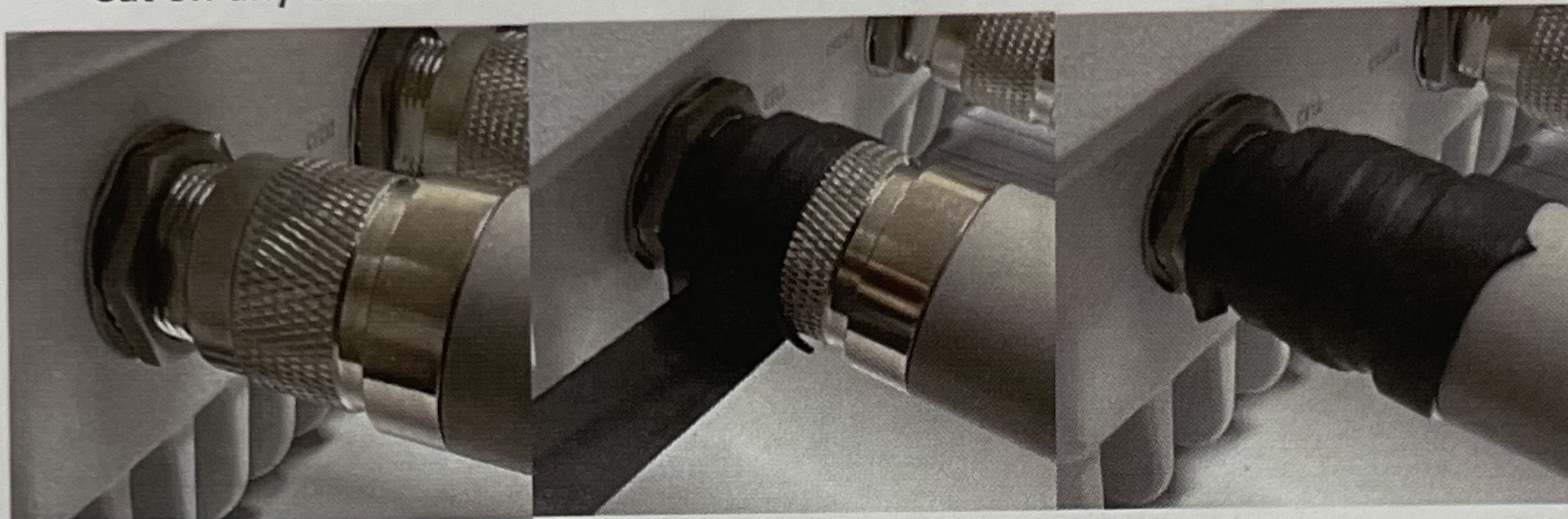


4.2 Connect DSRC, C-V2X, LTE, Bluetooth/WLAN and GNSS antennas and M12 Ethernet connector.



4.3 Wrap the N-connector and antenna joints with provided Self-Fusing Rubber Tape to prevent water intrusion.

- Cut a small length (10cm) of Self-Fusing tape.
- Remove backing film.
- Begin wrapping Self-Fusing tape around the N-connector and antenna joint. Stretch tape to 300% and wrap it spirally around the object with a 50% overlap.
- Repeat steps and ensure at least one complete wrap is applied.
- Cut off any excess.

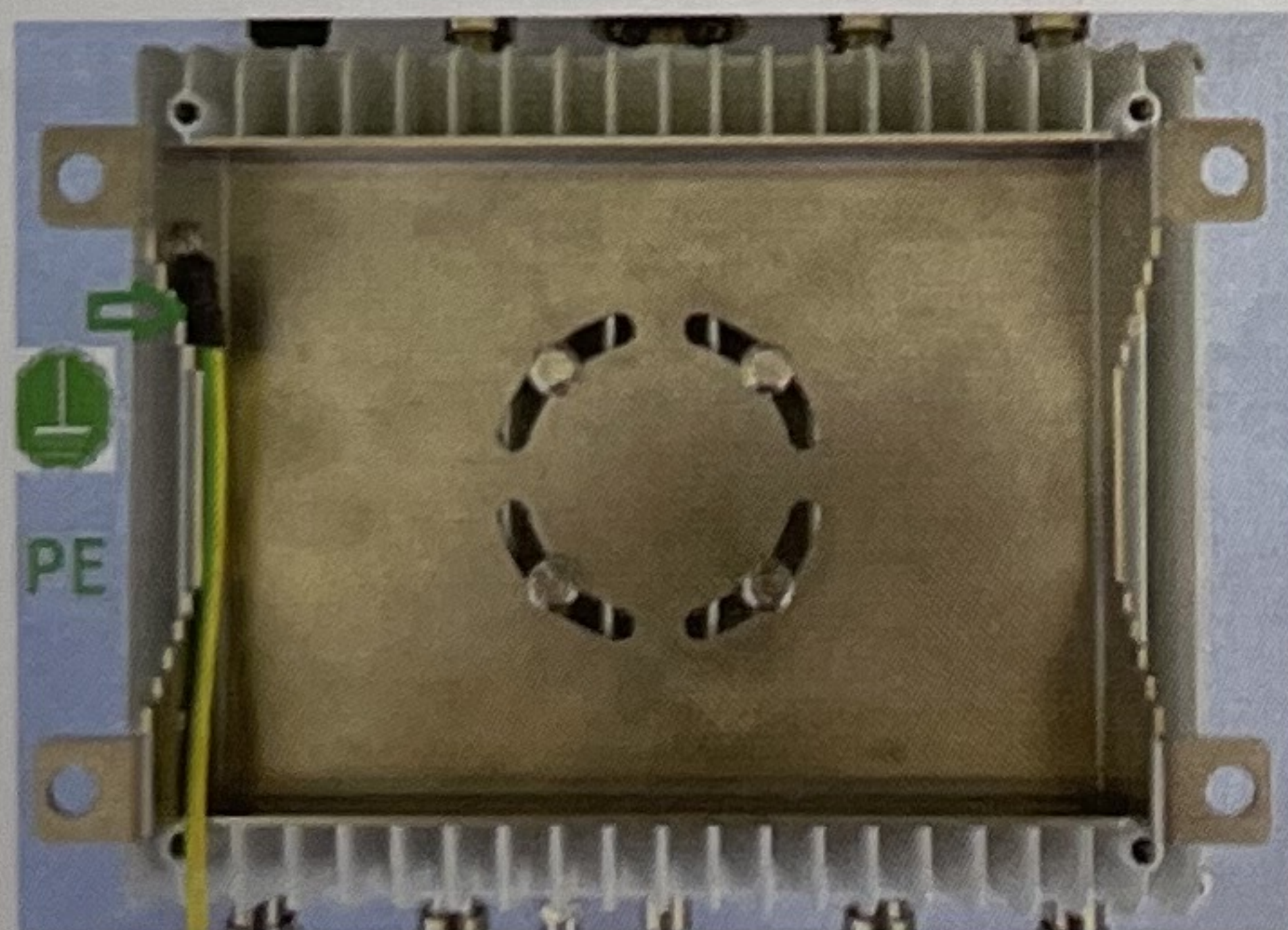


Ensure the surface
is clean

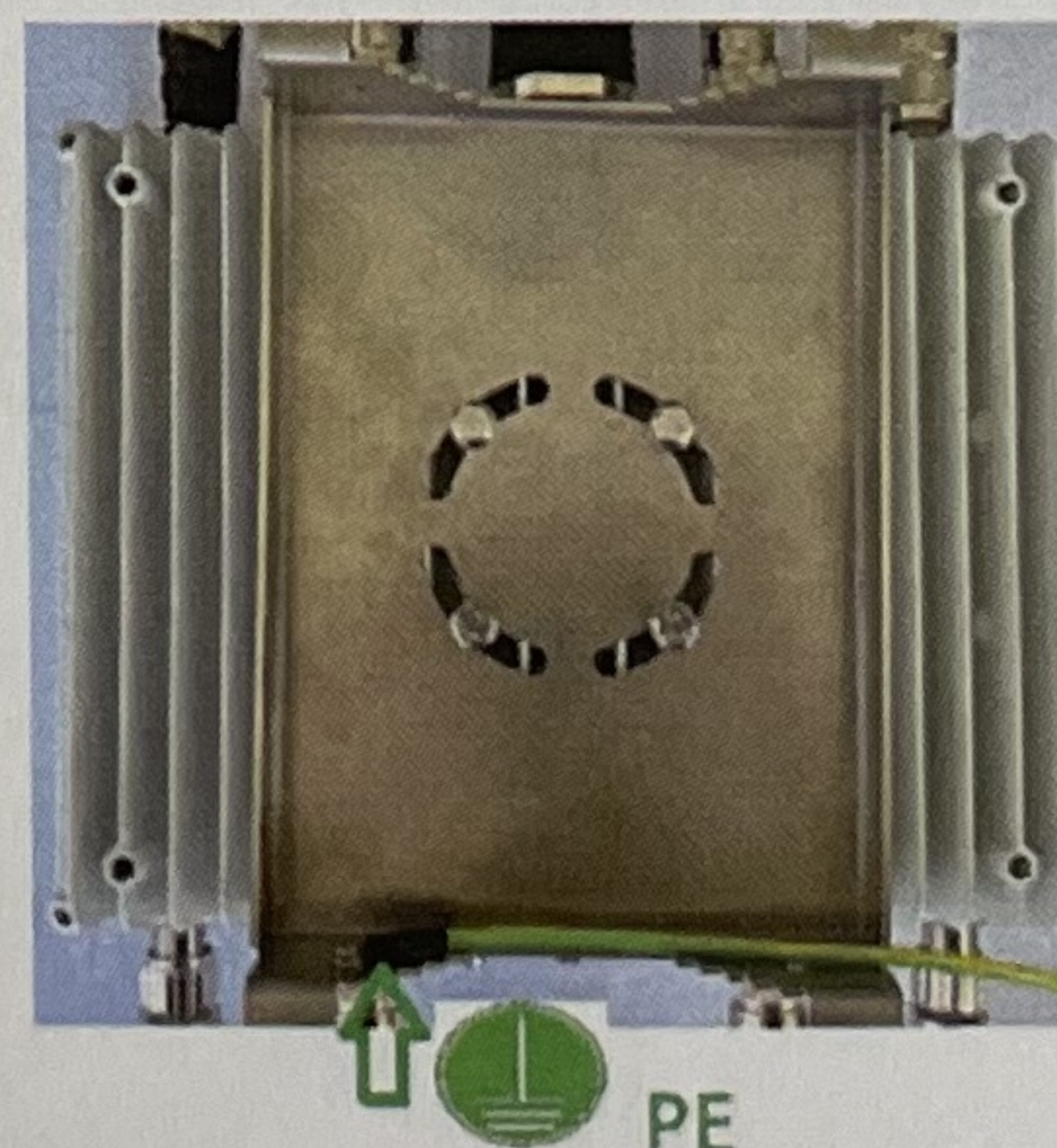
Stretch tape
and wrap

Done

4.4 Both vertical and horizontal mounting with bracket are supported.

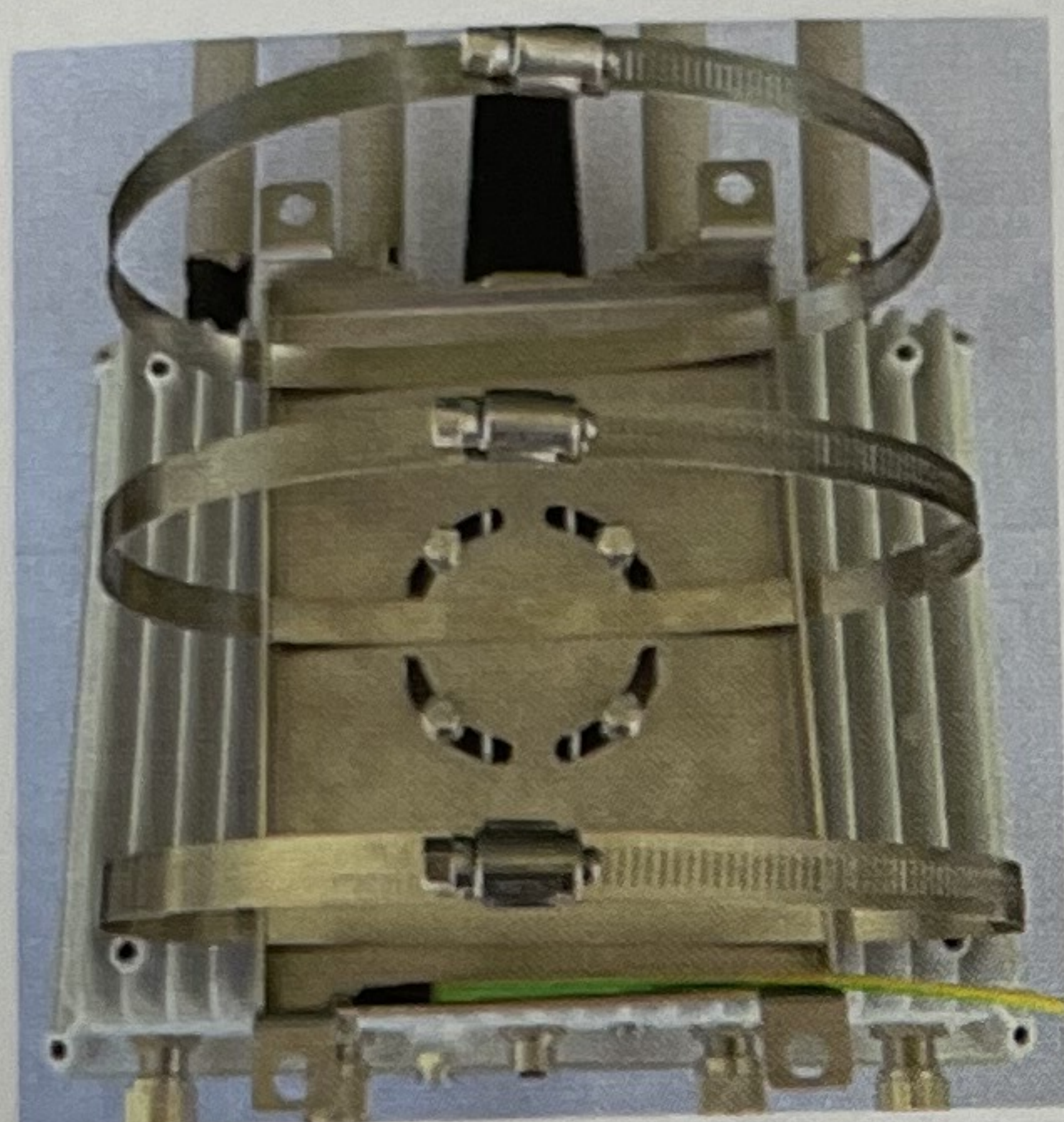


Horizontal Mount



Vertical Mount

- 4.5** Bracket can be mounted to a Pole using the provided Stainless Steel straps, or can be bolted to a wall through four mounting holes in the bracket. The ground wire is recommended to be connected to a good common earth point.



Example of using
Stainless Steel Straps.



RSU attached to Vertical
pole.

5 RF bands

All Details related to Cellular Bands (4G, 5G and WCDMA), Wi-Fi Bands, Blue Tooth, C-V2X and DSRC bands are available at <https://support.cohdawireless.com> on relevant pages.

6 Link to Documentation and Software Support

Please register at Cohda Wireless Support Website

It can be accessed in two ways:

- Directly via <https://support.cohdawireless.com>
- Through clicking on the "Support" tab on the Cohda Wireless website www.cohdawireless.com

On the signup page that opens, enter your name and email address in order to register for Support and access to technical documentation.

Your email address **has to be the Company email address** and not your personal email address.

Please submit a support request by clicking on the button "Submit a request" to ensure your account is validated.

Once your account has been validated and you have logged into the Customer Support website, you will have access to the information on all Cohda products, how to develop applications and FAQs.

If you have purchased the SDK license, this will be made available to you via the Cohda Wireless Support website upon account validation.