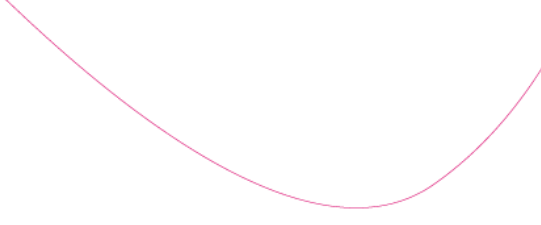


Assure Rugged Validator

Installation Guide

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Document History

REVISION	REVISION DATE	DESCRIPTION	AUTHOR
0.1	19 Apr 2022	Initial Draft.	Carrie Huang
0.2	02 May 2022	Addressed review comments: Minor wording adjustments; Clarified some instructions.	Carrie Huang
0.3	09 Jun 2022	Added rear cover opening instructions to obtain access to SAM/SIM card slots.	Carrie Huang
0.4	06 Sep 2022	Added FCC & ISED compliance statements; Removed GPS; Removed GPIOs; Removed multiprotocol; Added installation procedure overview and BoM; Updated rear cover screw type in various photos; Updated pole kit information; Replaced CKIT0142 with KIT1000 and added more installation instructions; Added rubber boot fitting instructions; Added hood installation, the hood is now a part of the installation kit but not the device itself; Added quality assurance and testing section; Confirmed ferrites should be added in installation but not provided by VIX; Added adaptor kit VIX part numbers for using PCP pole.	Carrie Huang
0.5	19 Oct 2022	Added more info and photos for the PCP pole mounting; Changed Ethernet cable to shielded; Added ferrite installation.	Carrie Huang
1.0	05 Jan 2023	Added torque settings for cradle installation; Released for use.	Carrie Huang

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1 Safety Precautions

This document presents important information that is intended to ensure the safe and effective use of this device. Please read this information carefully and store it in an accessible location near your installation.

1.1 Warnings and Cautions

Warnings and cautions are used to call attention to potential hazards. Failure to observe the information provided with the warnings and cautions may result in personal injury or property damage. Be sure that you understand the meaning of each before you proceed.

Warning:	Indicates a potentially lethal hazard. Failure to observe a WARNING may result in severe injury or death.
Caution:	Failure to observe a CAUTION may result in personal injury or damage to the device or other property.
Warning:	The device should only be opened and repaired by a qualified service technician. Improper repair work can be dangerous. Tampering with this device may result in injury, fire, or electric shock.
Warning:	Be sure to use the specified power source. Connection to an improper power source may cause fire or electric shock.
Warning:	Disconnect all power before carrying out repairs or service.
Warning:	Risk of fire or explosion if incorrect fuses are used. Fuses should only be replaced with new fuses of the same rating.
Caution:	The mounting pole must be earthed (grounded).
Caution:	The device is relatively heavy (2.5kg), caution needs to be used when carrying the device to avoid damage or injury.

1.2 EMC and Safety Standards Applied

The following standards have been applied to this device:

- CE/FCC Marking
- UKCA
- ISED
- Safety: EN62368-1

1.2.1 FCC RF Radiation Exposure Statement

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

Après examen de ce matériel aux conformité ou aux limites d'intensité de champ RF, les utilisateurs peuvent sur l'exposition aux radiofréquences et la conformité and compliance d'acquérir les informations correspondantes. La distance minimale du corps à utiliser le dispositif est de 20cm.

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

1.2.2 FCC Compliance 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 or more 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.

1.2.3 ISED Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). 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.

CAN ICES-003 (B)/NMB-003(B)

This product meets the applicable Innovation, Science and Economic Development Canada technical specifications.

Le présent produit est conforme aux spécifications techniques applicables d'Innovation, Sciences et Développement économique Canada.

1.3 Safety

All installation work must be carried out in accordance with State and Federal Safety Codes and Codes of Practice as well as recognized industry standards. The appropriate protective clothing must be worn where necessary. Tools must be used in accordance with manufacturers' instructions and suitable for the task.

Personnel attempting to perform any work on the electrical wiring must be trained and suitably qualified in the appropriate electrical codes of practice and must work in accordance with those codes.

2 Introduction

2.1 Purpose

This document describes the Rugged Validator installation for general and expanded use.



Figure 1: Picture of Rugged Validator

2.2 Scope

This document details the recommended installation for the Rugged Validator. It describes the mechanical and electrical interfaces and how to interconnect the Rugged Validator into the target environment. This document defines some of the system interfaces but does not provide in depth details, description is limited to function and potential use.

The scope of this document is limited to the following Rugged Validator models, and the installation kits for the pole mounting options. Details on surface mounting will be added in a future revision. x below denotes cosmetic options.

Table 1: Valid Devices

VIX PART NUMBER	DESCRIPTION
RUGGED-AAAx	Rugged standard
RUGGED-AACx	Rugged standard + Full COMMs (WIFI/4G/Bluetooth)

2.3 References

The following materials are to be used in conjunction with or are referenced by this document.

[1] DPU-00088 Assure Rugged Validator Maintenance Manual

2.4 Glossary/Acronyms

Table 2: Terminology

TERM	DEFINITION
CAT6	Category 5/6
CE marking	CE marking is an administrative marking with which the manufacturer or importer affirms its conformity with European health, safety, and environmental protection standards
COMMS	Communications
DC	Direct Current
EMC	Electromagnetic Compatibility
EN	European Standards abbreviated to ENs (literal translation as European Norms).
FCC	Federal Communications Commission
GPO	General Purpose Output
Hot Plugging	Changing components whilst system is operating.
IP	Ingress Protection
ISED	Innovation, Science and Economic Development Canada
NC	Not Connected
OTG	On the Go
PCD	Pitch Circle Diameter
PCP	Platform Card Processor
PoE	Power over Ethernet
RTC	Real Time Clock
RF	Radio Frequency
SAM	Secure Access Module
SIM	Subscriber Identity Module
USB	Universal Serial Bus
uSD	Micro Secure Digital

3 Installation Overview

3.1 System Architecture

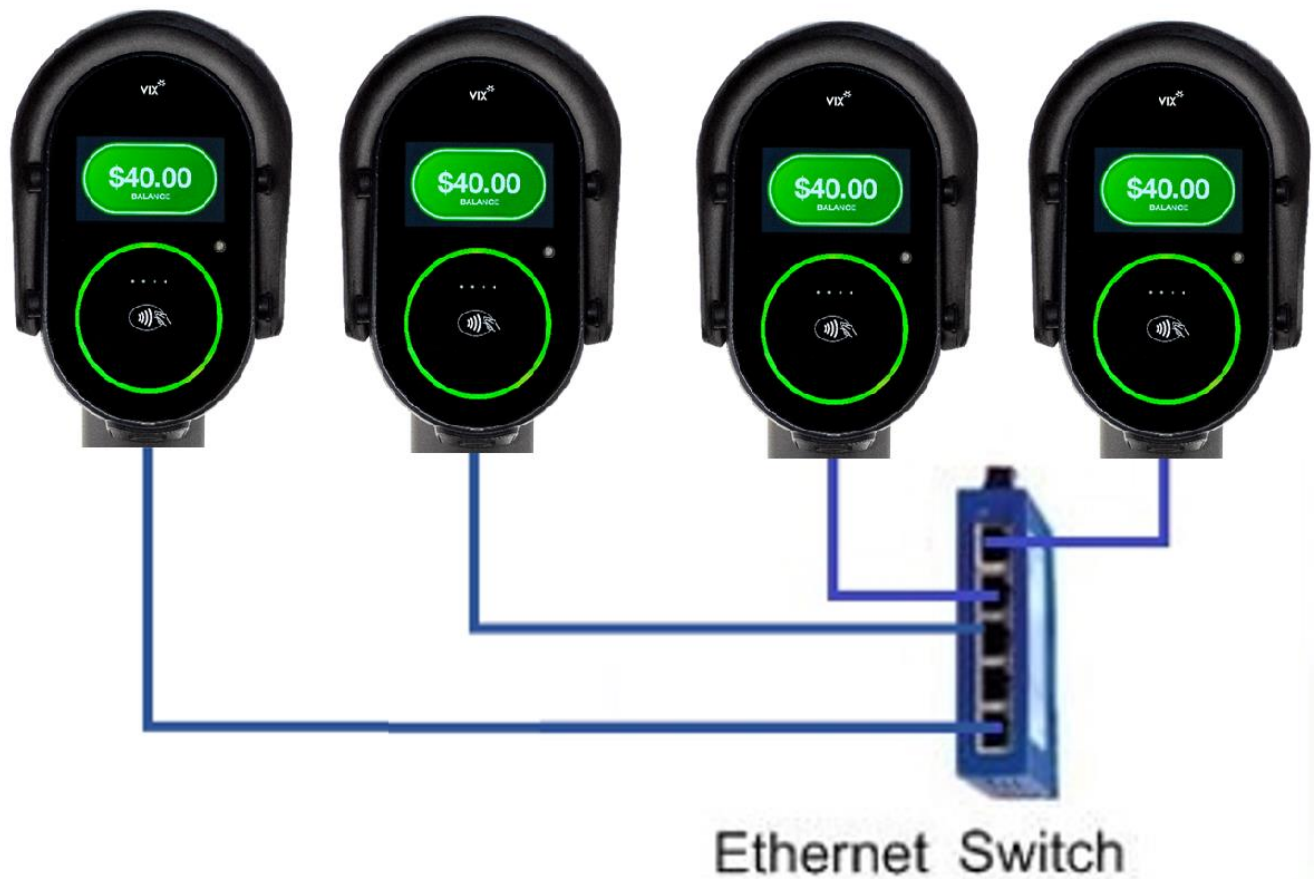


Figure 2: Rugged Validator Typical System Architecture

3.2 Power Supply

Rugged Validator can be powered either by Power-Over-Ethernet or by 24V DC power supply.

Table 3: Power Supply Specification

PARAMETER	MIN.	TYP.	MAX.	UNIT
Input Supply Voltage	9	24	36	V
Specified Input Current on power-up (@24V)	-	-	1	A
Specified Input Current steady state (@24V)	0.25 (6W)	0.35 (8.4W)	0.7 (16.8W)	A
Reverse Voltage Protection	-	-	-100	V

3.3 Installation Example

Mechanically the Rugged Validator is mounted in two ways:

1. Onto a pole with an installation kit obtained from VIX.



Figure 3: Picture of a Pole-Mounted Rugged Validator

2. Onto a surface (e.g. wall at train stations or roadside).

This will be through an adaptor designed and provided by VIX. Details will be given in a later revision of the document.

3.4 Installation Procedure and BoM

The below table presents an overview of the installation process for using VIX's 101.6mm pole and VIX's cradle installation kit, and the required materials in each step. For tools to be used, refer to the corresponding section.

Table 4: Procedure Overview

STEP	ACTIVITY	MATERIAL	REFERENCE
1.	SAMs/SIM/uSD Fitment & Battery Check	<ul style="list-style-type: none">• SAMs/SIM/uSD and/or Battery	Section 4
2.	Cable Preparation	<ul style="list-style-type: none">• 240V AC core• CAT6a Ethernet cable• Other cables, if needed	Section 5
3.	Pole Installation	<ul style="list-style-type: none">• Pole kit (ASMF1000-x)• 4x M10 x 125mm deep anchors for fixing pole to floor	Section 6.2
4.	Cradle Installation	<ul style="list-style-type: none">• Cradle installation kit, PSU included (KIT1000-x)• M5 insulated ring terminal, for AC Earth wire• RJ45 plug• Ferrites for each group of connections• 1-wire assembly (CBL0429)	Section 6.3
5.	Validator Mounting	<ul style="list-style-type: none">• RUGGED-xxxx	Section 6.4

The below table presents an overview of the installation process for using existing VIX's PCP pole with VIX's adaptor kit, and the required materials in each step. For tools to be used, refer to the corresponding section.

Table 5: Procedure Overview

STEP	ACTIVITY	MATERIAL	REFERENCE
1.	SAMs/SIM/uSD Fitment & Battery Check	<ul style="list-style-type: none"> SAMs/SIM/uSD and/or Battery 	Section 4
2.	Cable Preparation	<ul style="list-style-type: none"> Existing 24V DC core Existing CAT6a Ethernet cable Other existing cables, if needed 	N/A
3.	Pole Installation	<ul style="list-style-type: none"> Existing PCP pole 	N/A
4.	Cradle Installation	<ul style="list-style-type: none"> Adaptor kit, pre-terminated cable harness included (KIT6100-x) RJ45 plug, if Ethernet cable not already terminated Ferrites for each group of connections Existing 1-wire assembly (CBL0429) 	Section 6.3
5.	Validator Mounting	<ul style="list-style-type: none"> RUGGED-xxxx 	Section 6.4

4 Accessories

4.1 SAMs / SIM / uSD

Prior to installation, if the SAMs or SIM need to be inserted or replaced, only the rear cover and the access plates need to be removed. Below provides a general guide, refer to [1] for full details.

Place the validator on top of the working surface with the display facing downwards. Remove the 6 countersunk screws from the rear of the validator and carefully remove the mounting plate and the rear cover from the validator. Keep all screws safe and do not lose them.

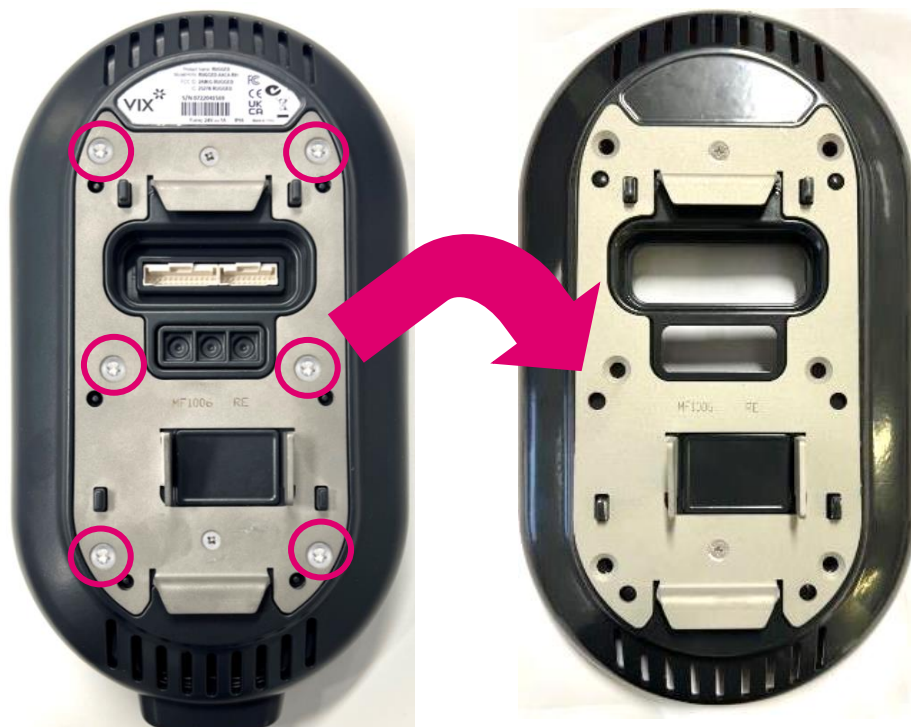


Figure 4: Removal of Mounting Plate and Rear Cover

Depending on which card slot needs access, open the corresponding rear access plate by removing the 2 countersunk screws.

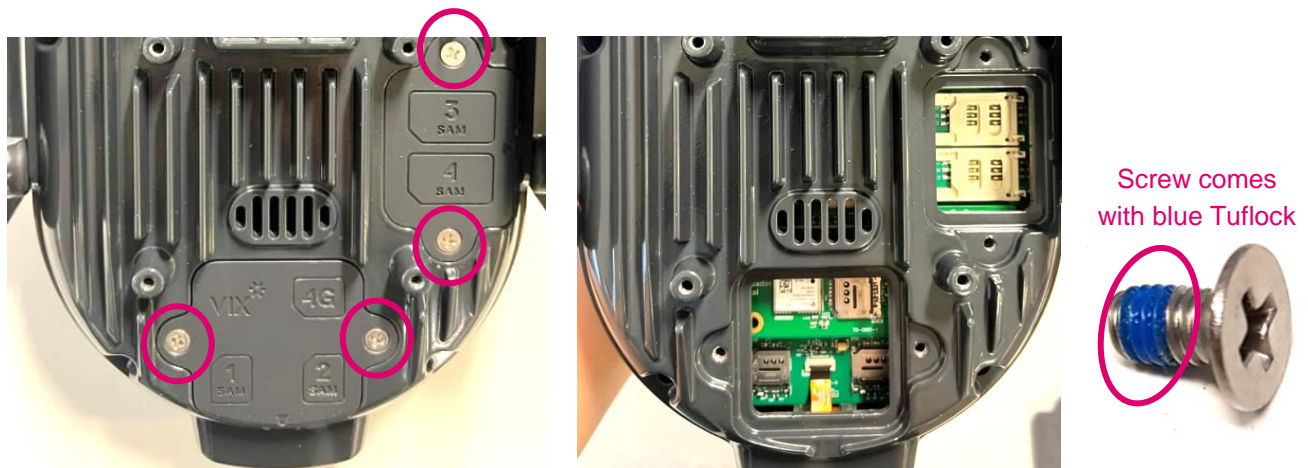


Figure 5: SAMs & SIM Access

If the uSD card needs to be inserted or replaced, the Rugged Validator needs to be opened by removing further 6 screws at the rear of the unit. Special care needs to be taken when opening the validator to avoid damaging the on-board connectors. Follow strictly the instructions given in [1] to obtain access to the uSD card slot, which is located on the top side of the main board as shown below (Left = RUGGED -AAAx, Right = RUGGED -AACx).

Note: *The Rugged Validator is not supplied with any of the above-mentioned accessory by default.*

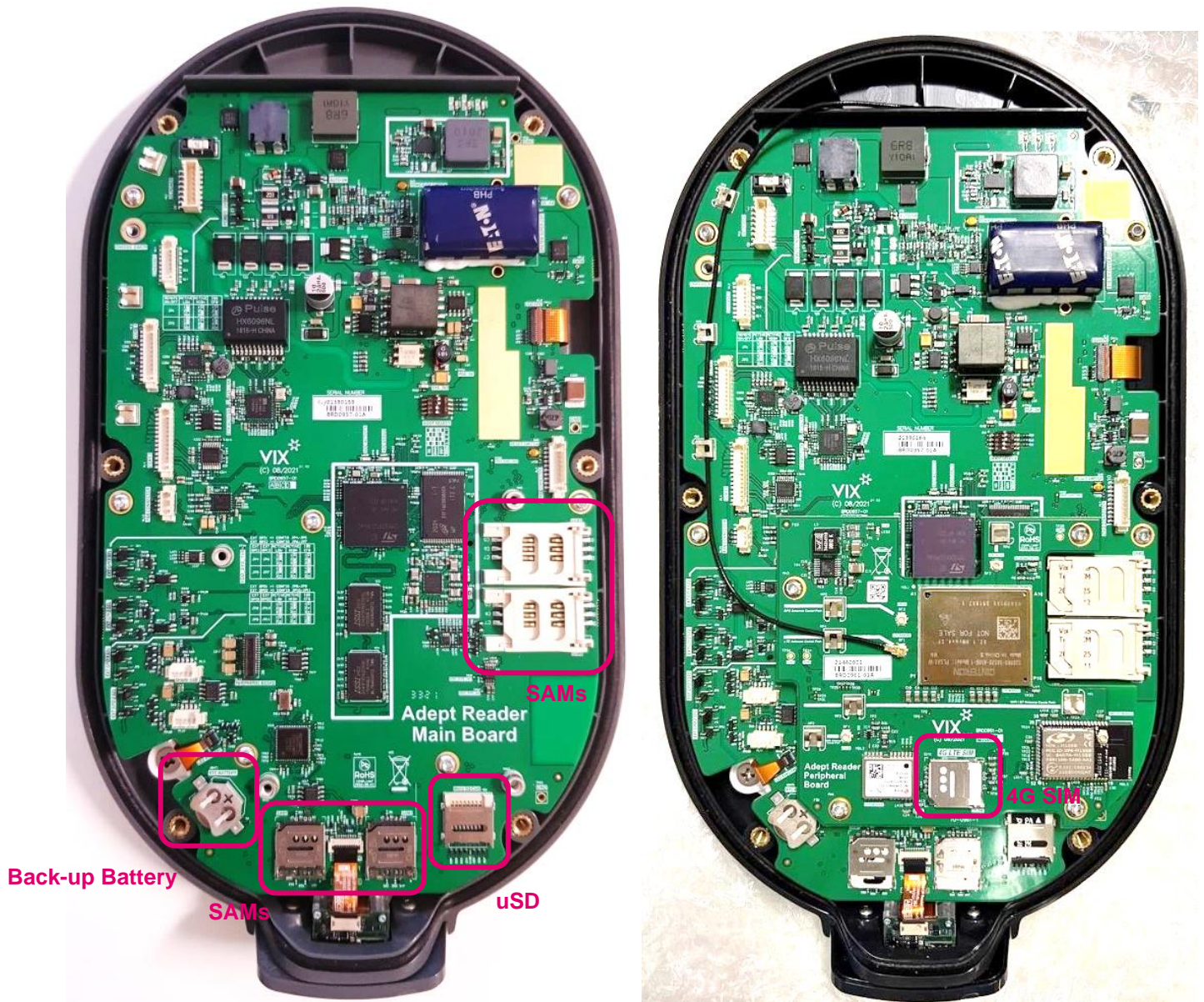


Figure 6: Picture of Rugged Validator Internal

4.2 Back-up Battery

The rechargeable battery on the main board provides backup power to the real time clock when the unit is disconnected from the main power.

The battery usually comes with 90% charge when new, and it gets charged further during production testing, so it should be sufficient to power the RTC for approximately half a year, when out of the factory.

If the elapsed time between manufacturing and installation is more than half a year, there is a chance that the battery gets deeply discharged and the performance is not guaranteed.

If the device needs to be opened for the uSD insertion, it is recommended to use this opportunity to measure the battery voltage, to ensure it is above 2V, replace it otherwise.

Refer to [1] and Figure 6 for details on how to obtain access to the main board back-up battery if replacement is required.

4.3 1-Wire Assembly (CBL0429)

The 1-wire assembly comes with a connector which could be directly mated with a connector from VIX's cradle installation kit without any crimping required. Refer to section 5 for the connector and crimps used on the installation kit.

Note: *Crimping might be required if not using the cradle installation kit but via an adaptor. For example, refer to section 6.3.2 for the use of VIX's PCP pole with an adaptor.*

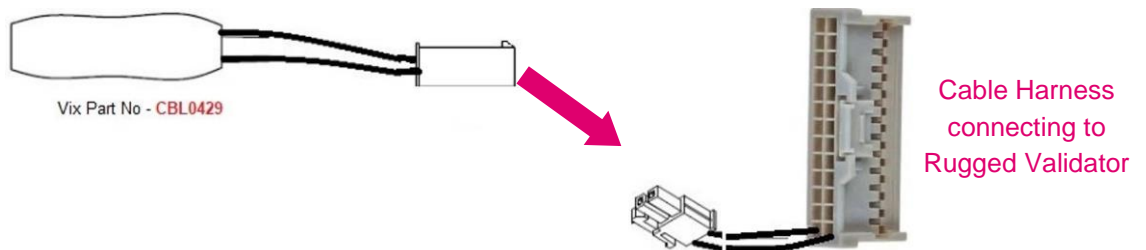


Figure 7: 1-Wire Assembly Connection

5 Wiring and Terminations

5.1 Example Wiring Diagram

The following drawing shows a Rugged Validator installed in isolation, with only general reference to external devices. It is for the Rugged Validator with the use of VIX's cable mounting bracket version A (ASS1026-A) from the cradle installation kit (KIT1000-x), any other extra/different connection needs to be discussed and confirmed between the customer and VIX. There will be consideration on the current, temperature, EMC and IP requirements.

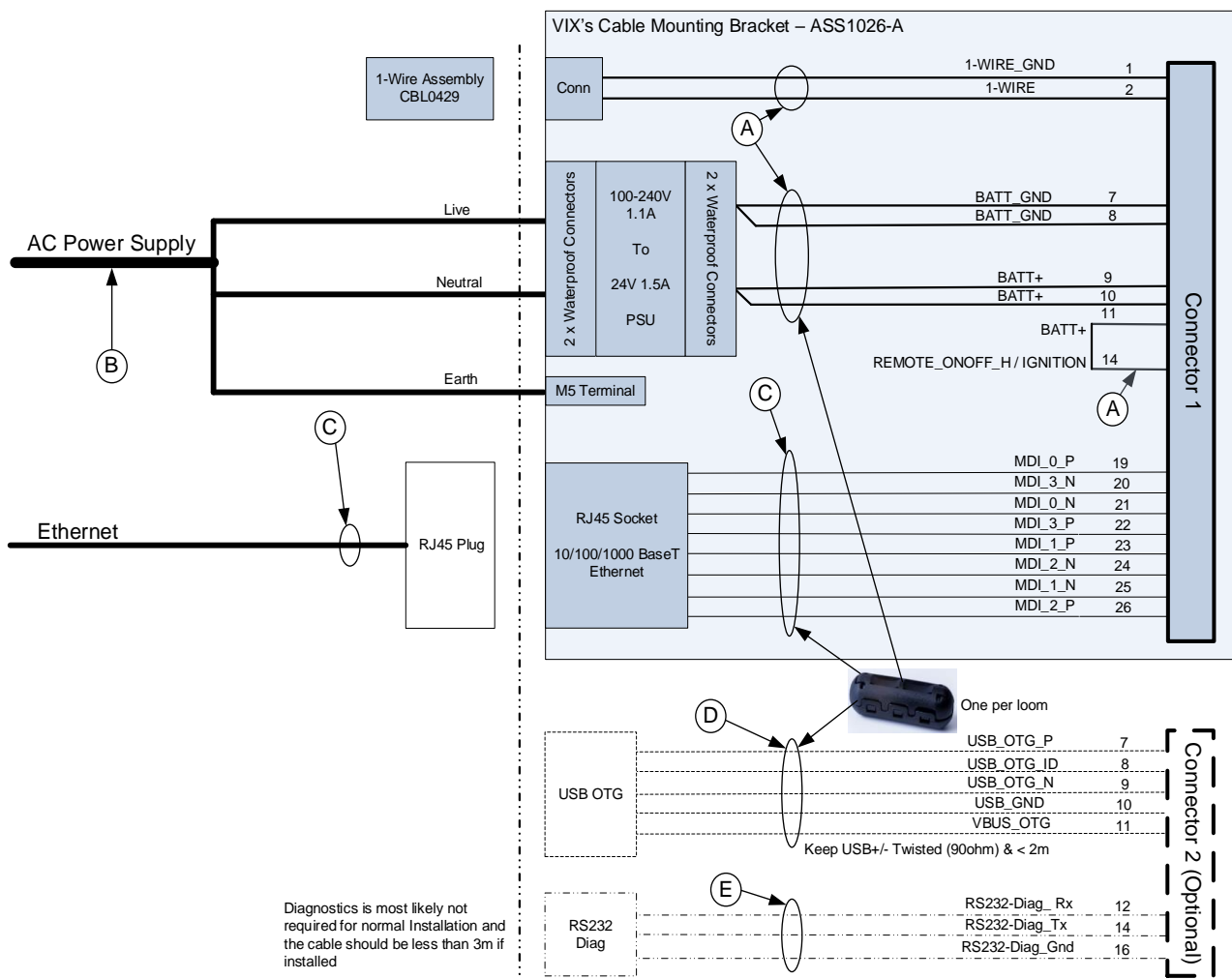


Figure 8: Example Wiring Diagram

Refer to section 5.2 for the connectors and crimps to be used at the Rugged Validator end. Refer to section 5.3 for cable recommendations. Refer to section 6.3 for information on the cradle installation kit, which is obtained from VIX and is supplied with connector #1 terminated and ready for easy connection and mounting.

In most installations only connector #1 is required to be terminated onto the cable. Connectors #2 will be required only if USB is required in the installation. Connectors #2 and its connections may be added to the cradle installation kit as well, discuss with VIX on the availability. Otherwise, follow sections 5.2 and 5.3 for the recommendations and confirm with VIX before installation.

Note: The above diagram is for a 24V system. Refer to section 5.4 for information on the power cable selection, if not using VIX's pre-assembled cable mounting bracket.

Caution: For any connected signal group (power, Ethernet or USB), a ferrite **MUST** be added on the cable at the Rugged Validator end to ensure EMC performance. The recommendation is Laird Technologies # 28A0593-0A2 (shown in the above diagram), but any ferrite with similar impedance characteristics and size could be submitted to VIX for approving its use.

Note: The ferrites could be offset in position and should be secured in place on its cable group with cable ties or other means. They need to be installed on the cables prior to fitting through the cradle/pole as it might be difficult to position/fit them through the pole/cradle afterwards.

Interconnection connectors are recommended to be used between the validator end and the end terminal/device. This provides flexibility in installation and removal, but IP requirement must be considered. The below table presents the above wiring in a table format with the interconnection recommendations, but they could be altered, based on the actual application/requirement.

Table 6: Cable Connection Mapping

END TERMINATION		CABLE ID	PIN NAME	PIN	RUGGED END CONN
Included on cable mounting bracket: Molex # 39012020 + crimps	PIN 2	A	1-WIRE-GND	1	1 Included on cable mounting bracket: Molex # 5016462600
	PIN 1	A	1-WIRE	2	
		NC	NC	3	
		NC	NC	4	
Included on cable mounting bracket: PSU + waterproof connectors		NC	BATT_GND	5	
		NC	BATT_GND	6	
		A	BATT_GND	7	
		A	BATT_GND	8	
Connect cable B (see 6.3.1.2): Live & Neutral to AC side of AC/DC converter via waterproof connectors		A	BATT+	9	
		A	BATT+	10	
		A	BATT+	11	
		NC	BATT+	12	
Earth to bracket via M5 ring terminal		NC	REMOTE_ONOFF_L	13	
		A	REMOTE_ONOFF_H / IGNITION	14	
		NC	CHASSIS	15	
		NC	CHASSIS	16	
		NC	CHASSIS	17	
		NC	CHASSIS	18	
Included on cable mounting bracket: RJ45 socket Terminate cable C with RJ45 plug then connect to RJ45 socket provided	C		MDI_0_P (Gigabit Ethernet)	19	
			MDI_3_N (Gigabit Ethernet)	20	
			MDI_0_N (Gigabit Ethernet)	21	
			MDI_3_P (Gigabit Ethernet)	22	
			MDI_1_P (Gigabit Ethernet)	23	
			MDI_2_N (Gigabit Ethernet)	24	
			MDI_1_N (Gigabit Ethernet)	25	
			MDI_2_P (Gigabit Ethernet)	26	

END TERMINATION	CABLE ID	PIN NAME	PIN	RUGGED END CONN
	NC	DO NOT USE	1	2 Molex # 5016462000 (Optional)
	NC	DO NOT USE	2	
	NC	DO NOT USE	3	
	NC	DO NOT USE	4	
	NC	DO NOT USE	5	
	NC	DO NOT USE	6	
Suitably IP rated USB connector	D	USB_OTG_P	7	
		USB_OTG_ID	8	
		USB_OTG_N	9	
		GND	10	
		VBUS_OTG	11	
Suitably IP rated connector	E	DIAG_RX232 (Diagnostic RS232)	12	
		DIAG_TX232 (Diagnostic RS232)	14	
		DIAG_GND (Diagnostic RS232)	16	
	NC	GND	13	
	NC	DO NOT USE	15	
		DO NOT USE	17	
		DO NOT USE	18	
		DO NOT USE	19	
		DO NOT USE	20	

5.2 Connector Termination

The design incorporates two robust Molex iGrid automotive connectors, that are easy to crimp large or small cables using a variety of readily available crimps.

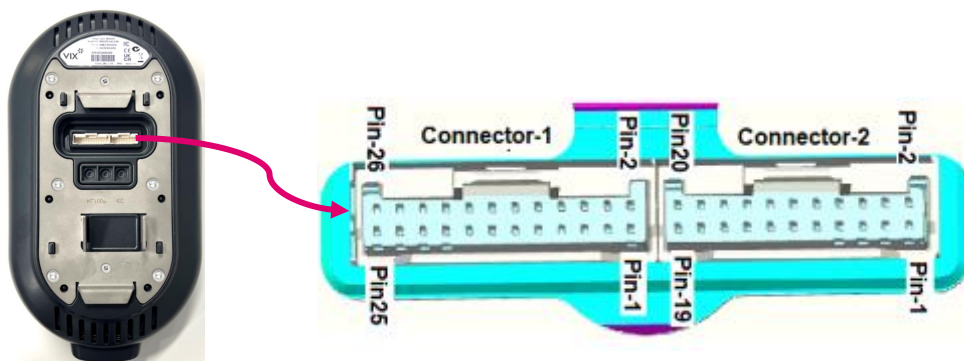


Figure 9: Rugged Validator Rear Connectors

The following defines the mating connectors/crimps and tooling requirements used on the **cable harness** that connects to the Rugged Validator.

- Refer to the below two tables for the recommended connectors and crimps. The crimps should be selected based on the connecting cable size and the current rating requirement.
- Approved alternative connectors, that are compatible with the defined interfaces, can be used.
- Defined tools should be used to ensure good termination coupling in both the cable manufacture and installation.

Table 7: Mating Female Connector Housings 1 & 2

CONN ID	SIZE	MOLEX PART NUMBER	PITCH	MATERIAL	POLARISED
1	26WAY	5016462600	2mm	Nylon	Yes
2	20WAY	5016462000	2mm	Nylon	Yes

Table 8: Mating Female Crimps for Connectors 1 & 2

SIZE	MOLEX PART NUMBER	RATING	MATERIAL	PLATING	WIRE
22-26 AWG	5016471000	2A	Copper Alloy	Tin	0.95-1.50mm
22-24 AWG	5030952201	2A	Copper Alloy	Gold	0.85-1.50mm
26-28 AWG	5016481000	1.5A	Copper Alloy	Tin	0.85-1.40mm
26-28 AWG	5030952200	1.5A	Copper Alloy	Gold	0.85-1.50mm

5.3 Cable Recommendations

VIX recommends using the following cables for the **Rugged Validator end**. Cables between the interconnections and the end terminal/devices should be chosen appropriately, depending on the distances, current ratings and IP requirements.

Local and statutory regulations should be followed for fire proofness and cable material content (i.e. RoHS), which may override these recommendations.

Note: *Cables must be suitably strain relieved at all times and in appropriate locations.*

Table 9: Cable Recommendations

CABLE ID	DESCRIPTION	MPN	FUNCTION
A	24 AWG Stranded Unshielded	Belden # 9923	1-Wire DC Power Remote ON/OFF
B	240 AC Power Cord, outdoor use		AC Power
C	CAT5e Cable, 24AWG Stranded Shielded Or CAT6a Cable, 24AWG Stranded Shielded (to ensure 1Gbit on 100m cable and EMC performance) For PoE application, a minimum of 24 AWG is required to support the temperature rise.		Ethernet
D	USB2.0 Cable (90 Ohm) 1 Twisted Pair + 2 x 24AWG Shielded		USB
E	1 Twisted Pair + 1 Core 24 AWG Stranded		RS232 Diag (Not required in normal installation)

After the primary interconnections, the signal cables can be further extended if required to reach switches, hubs and gate controllers as required. It is highly recommended that the maximum total length is not exceeded, as it may result in problematic operation. The performance is not guaranteed if the extension is achieved by a huge number of interconnections throughout the total allowed length. Signal extenders/amplifiers or additional transmitters could be considered to maintain the performance. IP rating needs to be considered on extenders/interconnections.

Table 10: Maximum Cable Length Recommendations

FUNCTION	CABLE DESCRIPTION	MAX TOTAL LENGTH
Ethernet	Ethernet extension	100m
RS232	Diagnostic extension	3m
USB	USB Host extension	2m

It is recommended that solid core cables be avoided where possible, to improve the connection reliability of the installed cable. If solid core is used for a CAT6a cable, extra care must be taken in crimping and restraining of wires, and sharp bending should be avoided.

5.4 Power Supply Cable

This section is only applicable if the Rugged Validator is connected to a DC power network, but not AC or PoE.

5.4.1 Requirements

Power supply cables wired to the input of a circuit breaker must be rated with respect to the previous circuit breaker or fuse from which they were derived. Adequate current de-rating should be applied to the cable as per the manufacturer's instructions.

5.4.2 Hierarchy for Power Supply

Figure 10 shows a typical wiring hierarchy for the equipment power supply cabling. Notice that the cable ratings are higher than the circuit breakers and fuse ratings. In this example the circuit breaker rating has been de-rated to 70% of the cable maximum continuous current rating. Also note that the current rating of the input side of the circuit breaker from the power bar. This cable must be rated to exceed the current rating of the power bar. In this case 70% de-rating has been applied.

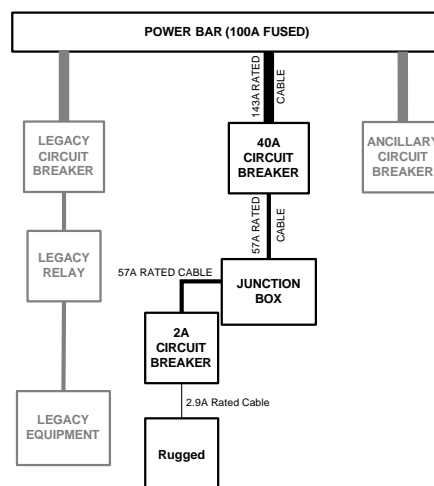


Figure 10: Typical Power Supply Circuit Breaker and Cable Rating

5.4.3 Length Versus Size

For power distribution it is critical that the cable is selected to minimise voltage drop. This selection process shall consider the peak currents generated during equipment start-up. As a guide, it is recommended that the cable voltage drop uses a peak current of 1A (in a 24V system) and a maximum voltage drop of 1V (including return, i.e. 0.5V each way) when selecting the cable.

All cables have resistance. When comparing cables of the same type and style, then generally, the thicker the copper the lower the resistance for the same length. If cables are to be used over long lengths, then it may be necessary to increase the cable size to reduce the voltage drop caused by the resistance of the wire and the load current.

For the Rugged Validator wiring in a 24V system, the following is provided as a guide to maintain an acceptable voltage drop.

Table 11: Cable Length

DISTANCE FROM START POINT	CONDUCTOR SIZE	EQUIVALENT CABLE
0m-20m	20 AWG	Belden 9408 (2 Conductors)
20m-40m	18 AWG	Belden 9409 (2 Conductors)
40m-50m	16 AWG	Belden 9410 (2 Conductors)

Note: *The highest rated cable (Belden 9410) can be used in all situations.*

5.4.4 Current Capacity

The maximum continuous current rating for a cable is limited by conductor size, number of conductors contained within the cable, maximum temperature rating of the cable, and environmental conditions such as ambient temperature and air flow. Use the below as a guide to select a cable with suitable current rating.

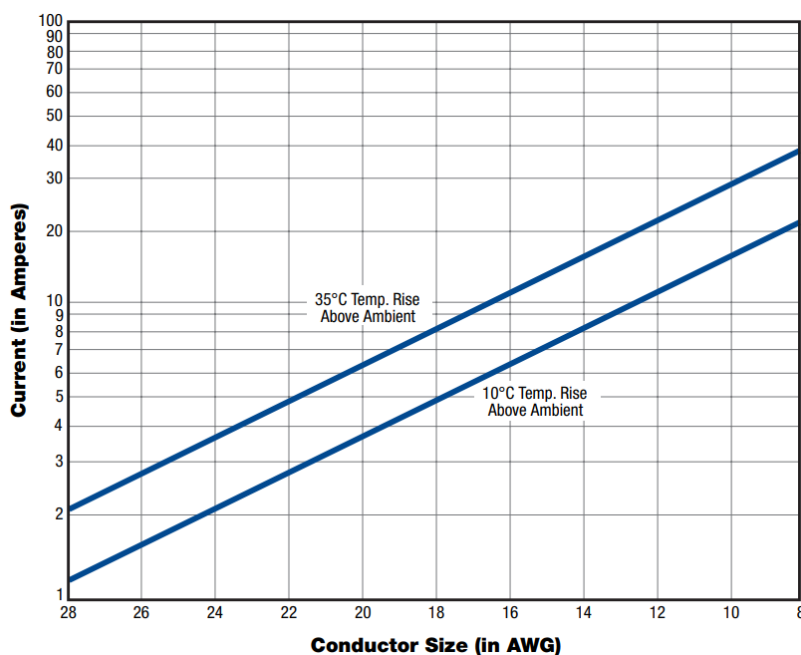


Figure 11: Cable Current Capacity Chart

For example: If a 4x 20AWG copper cable is used, the RMS current **per conductor** at 10°C rise above ambient

$$= 3.7\text{A (from chart)} \times 0.8 \text{ (from table)} \\ = 2.96\text{A}$$

Current Rating

No. of Conductors*	Factor
1	1.6
2 to 3	1.0
4 to 5	0.8
6 to 15	0.7
16 to 30	0.5

* Do not count shields unless used as conductor.

5.4.5 Ground Terminations

The star point for the power supply grounds (negative terminals) of the system units shares a common termination point, thus providing a controlled system ground reference point.

5.4.6 Ground Termination Checks

The ground connection resistances of all installed system units should be measured to ensure good conductivity.

Connection should be referenced to the Ground Star Point. The resistance from any negative power connection to the star point should be less than 0.5Ω .

5.5 Hot Plugging

- | | |
|-----------------|---|
| Warning: | It is strongly recommended that Hot Plugging (inserting / removing the Molex iGrid Connectors whilst power is connected) should be avoided where possible. |
| Warning: | If this is not possible, then it is also strongly recommended that the orientation on the connectors is double checked before inserting. |

6 Pole Mounting

Installation personnel should have a variety of tools available to cope with the different types of installation situations that may be encountered. Depending on station access, mounting surface construction, available power outlets, blocking of public thoroughfares for installation etc. Include items such as, safety barriers, warning signs and marking tape, safety vest etc.

The pole and validator should be installed in a manner that any standard design fixings are concealed and access to them is not available to the public.

The installation procedure is:

1. Install the pole on a level concrete pad with appropriate access for cables (section 6.2).
2. Connect or tie the cables to the cable mounting bracket and install the cradle on the pole with the cable mounting bracket (section 6.3).
3. Connect the cables to the rear of the validator and fit it to the pole cradle and lock it (section 6.3.2).

Before proceeding with pole and cradle installation, check that the pole, cradle installation kit are to the latest applicable revision. Table 4 shows the required materials for the installation.

6.1 Tools Required

The following tools are required to install the pole, the cable mounting bracket and the cradle for a pole-mounted Rugged Validator:

- Hilti TE 40-AVR rotary hammer drill or similar for drilling holes in concrete
- Masonry drills to suit selected anchor
- Extension lead
- RCD outlet
- Set of socket spanner to suit
- Ball-End hex long socket 6mm and corresponding driver
- ½" drive ratchet handle
- ¼" drive ratchet handle
- ¼" drive 100mm long extension
- Metric allen key set
- T30 Torx driver
- Selection of screw driver bits
- ½" drive torque wrench
- ¼" drive torque wrench
- Diagonal pliers (side cutters)
- Crimping tool to suit the M5 ring terminal
- Ethernet cable crimper
- Ethernet cable tester
- Multimeter
- Cable strippers

6.2 Pole Installation Instructions

6.2.1 Pole Kit

Note: The pole kit can be obtained from VIX or from another supplier. The metal pole chosen must not have a detrimental impact on the card reading range as there is sufficient clearance between the pole and the antenna. The below describes the installation of VIX's pole kit – ASMF1000-x.



Figure 12: VIX's Pole Kit – ASMF1000-x

The pole components are delivered as a kit (ASMF1000-x) and they are:

- 1x mounting pole – Manufactured from stainless steel pipe O.D.101.6mm, Grade 304, wall thickness 3.05mm, fabricated in accordance with relevant structural steel welding standards, then powder coated on the external surface. It includes a round flat base plate with 4 mounting slots for fixing, and 4 threaded mounting holes for securing the base cover.
- 1x base cover – Cast aluminium and powder coated. It covers the base plate and hides the mounting fasteners.
- 4x M8x25 socket head hex screws – already assembled to the base cover and base plate when delivered

6.2.2 Procedure

The pole should be installed on a suitable horizontal concrete substate. If the concrete pad is not levelled shims must be used to level the pole.

Note: Install the pole in a location that minimises direct sun penetration onto the Rugged Validator LCD display to avoid screen glare and overheating.

Note: The validator is to be located greater than 200 mm from other metal objects, specifically not to be adjacent to any to prevent antenna de-tuning & card reading range reduction.

1. Check that a conduit is emerging from the centre of the concrete pad at the pole installation location, and contains the cables (determined from Figure 8) to be connected to the validator. Carefully pull the cables from the conduit, with minimum cable length from the base being 1.5m.

2. Using the location of the conduit as the centre, drill 4 holes. The diameter and depth of the holes should be suitable for the chosen chemical anchor (or other anchor) of M10 dia. x 125mm deep. The holes should be equally spaced on 190mm PCD as shown below.

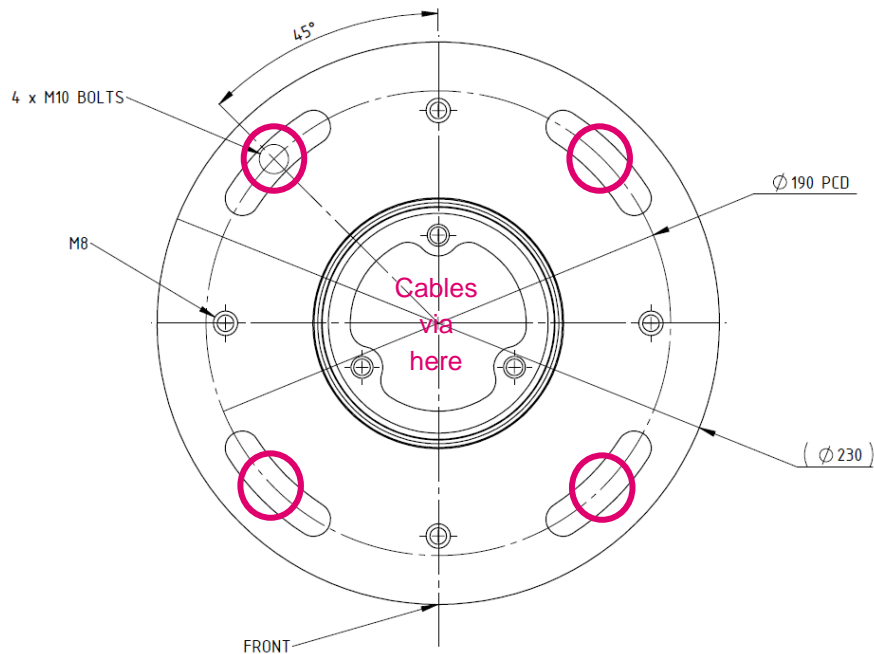


Figure 13: 190mm PCD

3. Install chemical anchors of M10 dia. 125mm deep into the drilled concrete holes. For procedures on the use of chemical anchors refer to the manufacturer's instructions supplied with the anchors.
4. The mounting pole is delivered with the base cover already assembled, refer to Appendix B for its packaging. Undo the 4x M8 screws to separate the base cover from the pole's base plate (see Figure 12).
5. Bring the mounting pole (after removing the base cover), pull and feed the cables through the pole. Pull the cables until there is sufficient slack for the Rugged Validator connection and mounting.
6. Position the pole on the concrete base in the desired direction and by aligning the 4x mounting slots with the 4 drilled concrete holes, while not damaging the cables. Fit 4x M10 bolts/nuts to the 4 mounting slots. Adjust the orientation of the pole and tighten the fasteners (as per fastener manufacturer's specified torque) to fix the pole to the floor.
7. Place the base cover onto the base plate, and secure the base cover to the base plate with the 4 previously removed M8x25 screws and tighten to 5Nm.

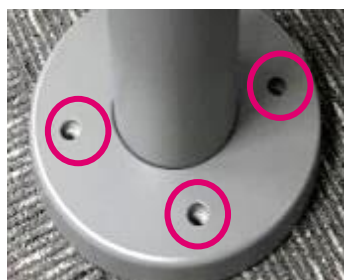


Figure 14: Base Cover

8. Keep the cables hanging out from the pole to be ready for connection in the next step.

6.3 Cradle Installation Instructions

The Rugged Validator can be installed on a standard 101.6mm pole as described in section 6.2, as well as on an existing pole for VIX's PCP validators, with an adaptor that can be obtained from VIX.

6.3.1 For VIX's 101.6mm Pole

6.3.1.1 Cradle Installation Kit – KIT1000-x

The cradle components are delivered as a kit designed for a standard 101.6mm pole and they are:

- 1x pre-assembled cradle with lock and key – ASS1015-x, refer to Appendix C for its assembly drawing

Note: *By default, the lock is on the right of the cradle viewing from the front, if the left side is preferred, inform VIX prior to order.*

- 1x cable mounting bracket – ASS1026-x (Check that the bracket has no sharp edges that may present a hazard to operators or installers) with the below:
 - 24V 1.5A PSU
 - pre-crimped validator cable harnesses
 - waterproof wire connectors for easy connections to the main AC power
 - cable tie slots and cable ties for cable retaining
- 4x M8x20 socket head hex screws for cradle fixing (1 is spare in case falling inside the pole during installation)
- 1x protective rubber boot – PM0226
- 1x hood (PM1001-x) with its fasteners

6.3.1.2 Procedure

1. Bring the cradle (ASS1015-x) over, remove the cradle plate by undoing the 4 screws and do not lose them.



Figure 15: Pre-assembled Cradle – ASS1015-x

- Carefully feed the cables from the pole through the cradle. Then align 3 chosen mounting holes on the cradle with the 3 threaded holes on the top of the pole, and finally secure the cradle in place with 2x M8 hex screws (washers included) provided in the cradle installation kit (The third screw will be installed in a later step with the cable mounting bracket), to 14Nm.

Note: Multiple holes on the cradle allow it to be rotated to a variety of positions. Choose an orientation that minimises direct sun penetration onto the Rugged Validator LCD display to avoid screen glare and overheating. The centre hole of each group of 3 might be the easiest to mount.

Note: It is very easy to drop the screws inside the pole and they must be handled with care. Remove the lock temporarily if it is deemed easier for the screw installation.

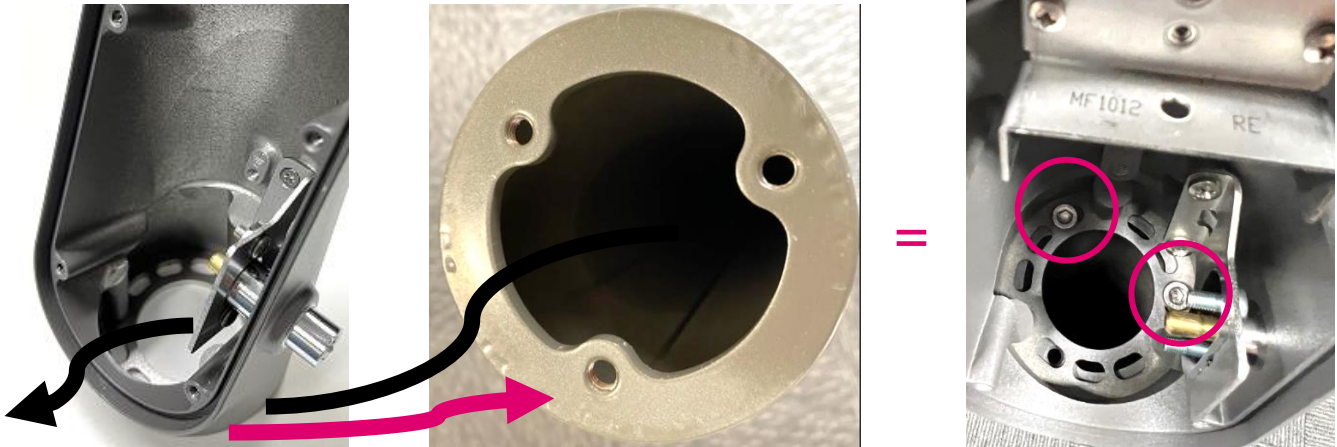


Figure 16: Cradle Mounting

- Terminate the Ethernet cable with an RJ45 plug to the T-568B standard, as a straight through cable.

Table 12: Ethernet Termination

RJ45 PIN #	WIRE COLOR
1	White/Orange
2	Orange
3	White/Green
4	Blue
5	White/Blue
6	Green
7	White/Brown
8	Brown

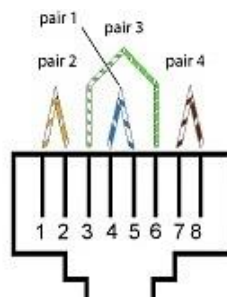


Figure 17: Diagram of Ethernet Termination

Note:

A bracket is assembled at the top of the cradle, the provided cable tie slots could be used to temporarily tie the cable harness to avoid it falling in the pole during the termination process.

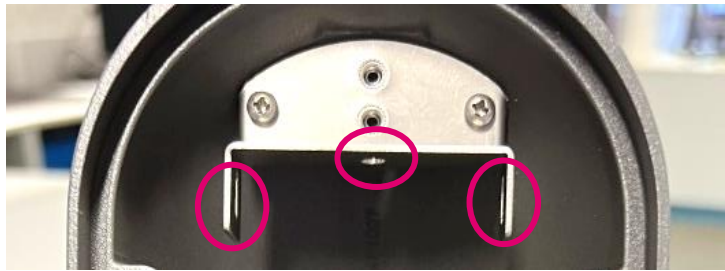


Figure 18: Cable Temporary Retaining

4. Using an Ethernet cable tester, test the Ethernet cable.
5. Obtain the cable mounting bracket (ASS1026-x) which looks similar to Figure 19, then:
 - a. Connect AC Live and Neutral from the pole to the waterproof wire connectors provided loose in the cradle installation kit. The part number of the connector is IDEAL Industries # 30-1161A and refer to Appendix D for the installation instructions.
 - b. Crimp the AC Earth wire to an M5 ring terminal and mount it on the bracket in the following order with the fasteners provided in the cradle installation kit: screw from the bottom => M5 washer on top => M5 nut (Tighten to 2.5Nm) => M5 ring terminal (with Earth wire crimped) => M5 washer => M5 nut (Tighten to 0.6Nm).

Note:

The M5 insulated ring terminal is not supplied in the cradle installation kit and will need to be sourced by the installer, with an appropriate crimping tool.

- c. Connect the Ethernet cable (terminated in step 3) to the RJ45 socket.
- d. Connect others (if any) by direct mating or via an adaptor.
- e. Secure the cables with cable ties provided in the kit, through the cable tie slots provided on the bracket. There should be 2 per cable, i.e. 2 for the Neutral, 2 for the Live, 2 for the AC core, 2 for any other.

Note:

The photo below is for illustration only, the design differs depending on the model purchased.

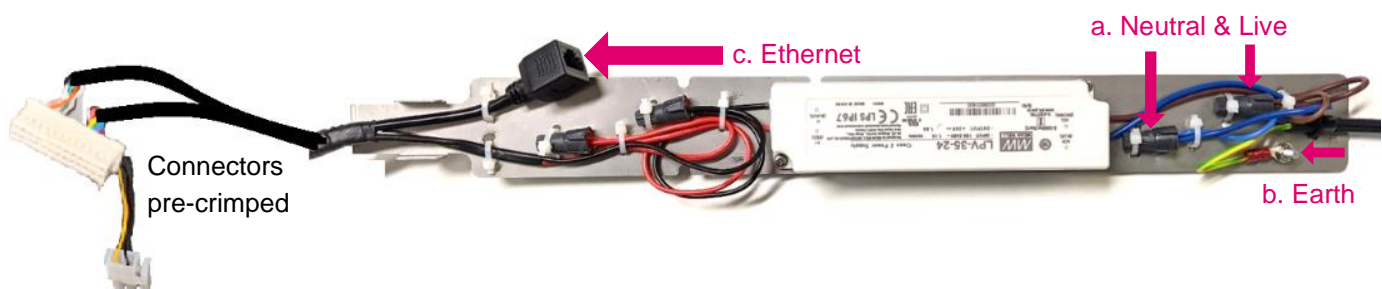


Figure 19: Cable Mounting Bracket – ASS1026-x



Figure 20: AC Side Zoomed-in

6. Carefully feed the connected cable mounting bracket through the cradle and secure the bracket to the cradle by tightening the last M8 hex screw provided in the cradle installation kit, to 14Nm.

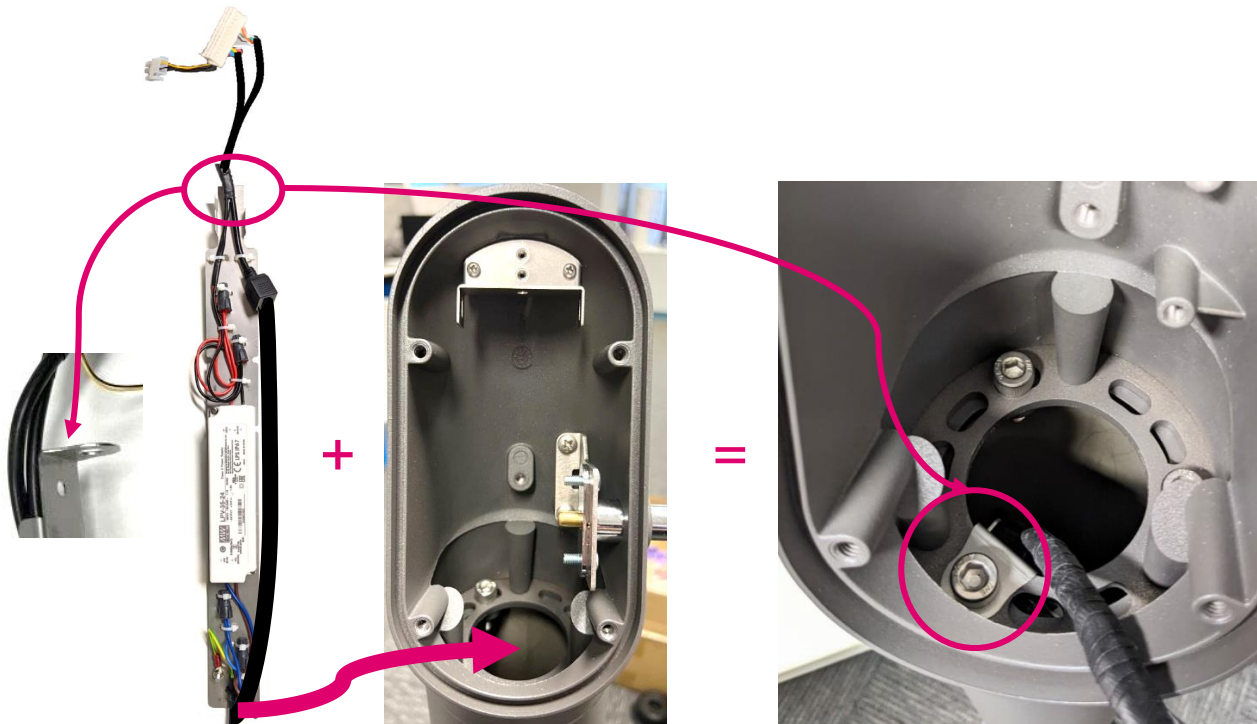


Figure 21: Cable Mounting Bracket Mounting

7. Install the ferrites on the cables (approximately 200mm away from the validator connector) according to the requirements in section 5.1, and push them into the pole along with the cables, leaving sufficient slack for the Rugged Validator connection and mounting.

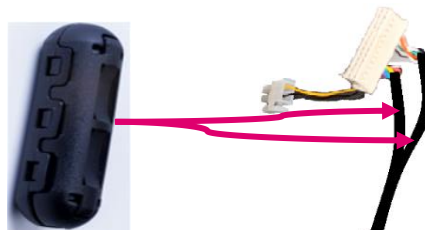


Figure 22: Ferrite Installation

8. Connect the 1-wire assembly (see section 4.3) obtained from VIX to the 2-way connector from the cable mounting bracket. Tie the connected 1-wire assembly to the bracket at the top of the cradle, as shown below, with a cable tie provided in the cradle installation kit.



Figure 23: 1-Wire Assembly Mounting

9. Bring the previously removed cradle plate and screws, carefully feed the connector and cables through its centre aperture and secure the plate to the cradle with the 4 screws to 7Nm. Feed the cables through the protective rubber boot (PM0226) provided in the cradle installation kit.

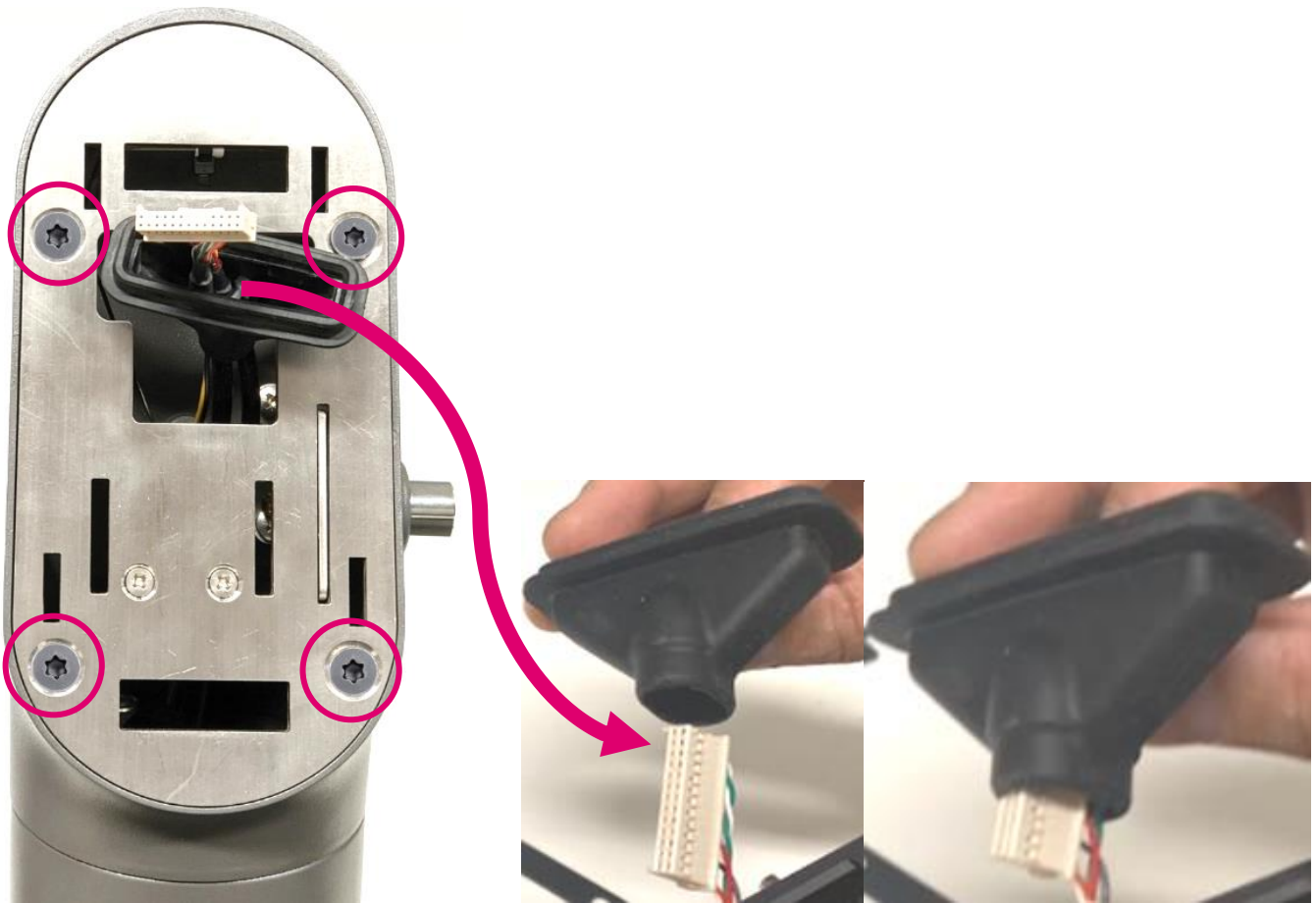


Figure 24: Cradle Plate and Rubber Boot Installation

6.3.2 For VIX's PCP Pole

6.3.2.1 Adaptor Kit – KIT6100-x

The adaptor components are delivered as a kit designed for a PCP pole and they are:

- 1x pre-assembled adaptor with lock and key – ASS1027-x

Note: *By default, the lock is on the right of the adaptor viewing from the front, if the left side is preferred, inform VIX prior to order.*

- 1x cable assembly – CBL1121 (or other models) with the below:
 - pre-terminated validator, 1-wire and Ethernet connectors
 - flying leads for connections to the main DC power
 - grommet for cable retaining
- 3x M8x16 socket head hex screws for adaptor fixing
- 1x protective rubber boot – PM0226
- 1x hood (PM1001-x) with its fasteners
- 1x single-sided adhesive gasket – DCUT0013

6.3.2.2 Procedure

1. Carefully bring the cables from the pole.

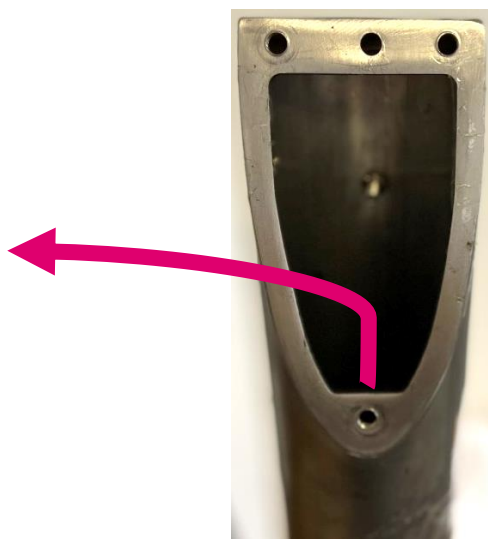


Figure 25: VIX's PCP Pole

2. The cable harness provided in the adaptor kit, comes with flying leads for the DC power connections, determine a method of connection and terminate the DC power cables brought within the pole.
3. If not already done, terminate the Ethernet cable with an RJ45 plug to the T-568B standard, as a straight through cable.

Table 13: Ethernet Termination

RJ45 PIN #	WIRE COLOR
1	White/Orange
2	Orange
3	White/Green
4	Blue
5	White/Blue
6	Green
7	White/Brown
8	Brown

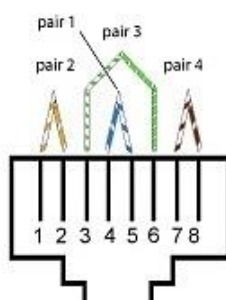


Figure 26: Diagram of Ethernet Termination

4. Using an Ethernet cable tester, test the Ethernet cable.

5. Obtain the cable harness (CBL1121 or other models) provided in the adaptor kit which looks similar to Figure 27, then:
 - a. Connect DC power from the pole (terminated in step 2) to flying leads provided on the cable harness.
 - b. Connect the Ethernet cable (terminated in step 3) to the RJ45 socket.
 - c. Connect the 1-wire assembly (see section 4.3) obtained from VIX to the 2-way connector.
 - d. Connect others (if any) by direct mating or via an adaptor.

Note: The photo below is for illustration only, the design differs depending on the model purchased.

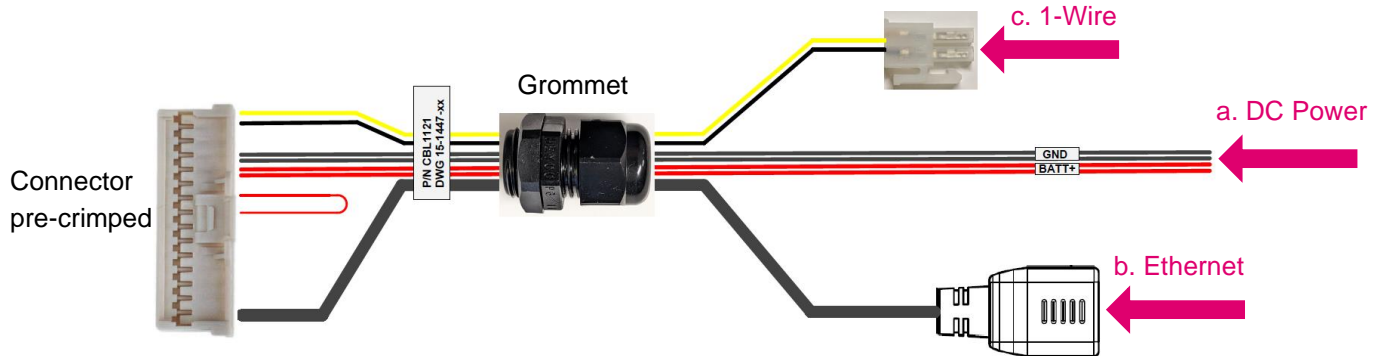


Figure 27: Cable Harness

6. Bring the adaptor (ASS1027-x) over, adhere the gasket (DCUT0013) to the back of the adaptor evenly.



Figure 28: Application of DCUT0013 on ASS1027-x

7. Remove the adaptor plate on the front by undoing the 4 screws and do not lose them.

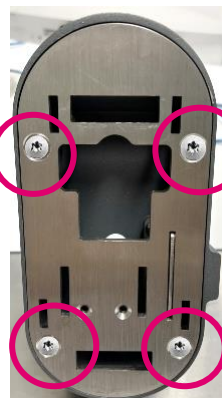


Figure 29: Removal of Adaptor Plate

8. Feed the cable harness through the adaptor by following the below steps:
 - a. Gently remove the nut from the grommet on the cable harness and put it aside.

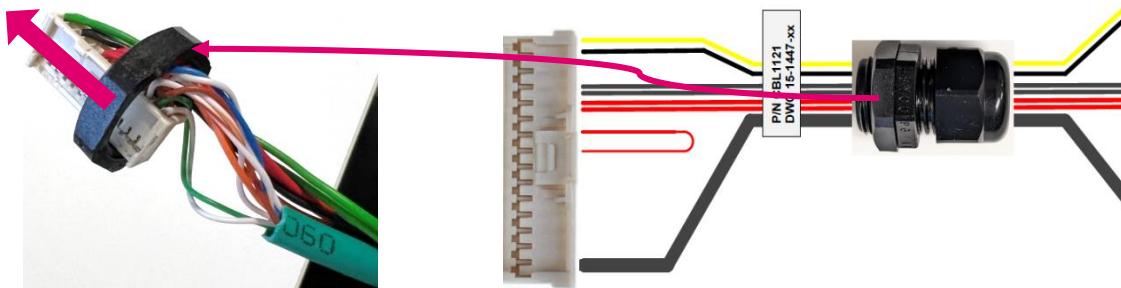


Figure 30: Nut Removal

- b. Carefully feed the cable harness through the adaptor slot and make sure the wires are not damaged by the slot (which might be sharp).



Figure 31: Cable Feeding

- c. Reinstall the nut tightly.



Figure 32: Nut Reinstalling

9. Install the ferrites on the cables according to the requirements in section 5.1, and push them into the pole along with the excess cables. Then secure the adaptor to the PCP pole with 3x M8 hex screws provided in the adaptor kit, to 14Nm.



Figure 33: Adaptor Installation

10. Bring the previously removed adaptor plate and screws, carefully feed the cables through its centre aperture and secure the plate to the adaptor with the 4 screws to 7Nm. Feed the cables through the protective rubber boot (PM0226) provided in the adaptor kit.



Figure 34: Cradle Plate and Rubber Boot Installation

6.4 Validator Mounting Instructions

The validator mounting process requires no tool.

Check that the Rugged Validator casing has no corners, sharp edges, or exposed fixings (nuts/bolts) that may present a hazard to personnel.

1. Carefully connect the cables to the rear of the validator (only 1 connector in most of the applications).



Figure 35: Rugged Validator Cable Connection

2. Press the rubber boot into the connector groove and ensure it sits within evenly.



Figure 36: Rubber Boot Fitting

3. Mate the Rugged Validator to the cradle/adaptor by aligning the 4 metal plates at the rear of the device (see Figure 35) with the 4 slots on the cradle/adaptor plate, and pushing in, then pushing down to clip in. While doing this, push in any excess cables but make sure the rubber boot does not dislodge from the groove.



Figure 37: Rugged Validator Mounting on Cradle

4. Press the lock button (on the cradle or cradle adaptor) to secure the device in place.



Figure 38: Device Locking

Note:	Once the device is locked in place, a key is required to unlock it from the cradle. One key is supplied along with the cradle installation kit.
Note:	Whenever field installation or maintenance is complete, remember to lock the device.

5. Fit the hood (PM1001-x) to the validator by securing the 4 supplied screws from the outside, on the 2 sides.

Note: The Rugged Validator might have been supplied with 4 pre-fitted screws already, if that's the case, replace these screws with the ones supplied in the cradle installation kit prepared for the hood.

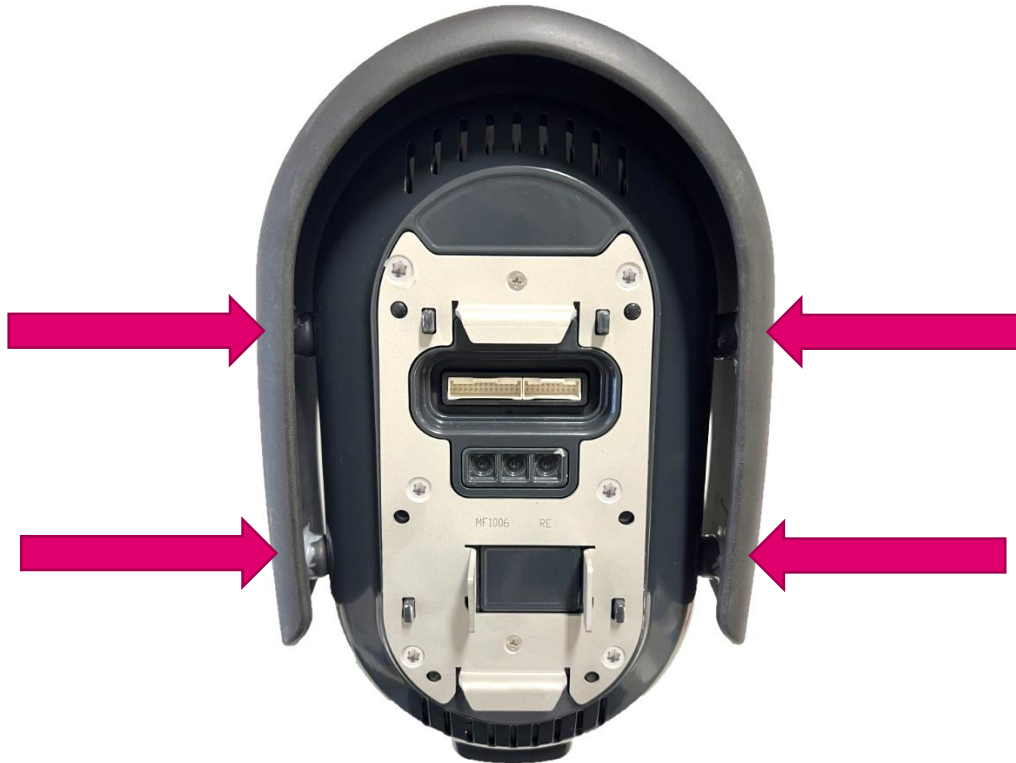


Figure 39: Hood Assembly

6.5 Validator Demounting Instructions

Caution: The unit connectors present a low risk of accidental short circuit or electric shock if the unit is removed when powered, hence it is recommended the power is turned off prior to disconnection.

1. Unlock the cradle lock by pushing in the key slightly and rotating anti-clockwise or clockwise until the lock button bounces out.



Figure 40: Device Unlocking



OUT = Unlocked

2. Push the device upwards and then slowly pull forward.



Figure 41: Rugged Validator Removal

3. Press the locking clips on the connectors and carefully disconnect the cables.

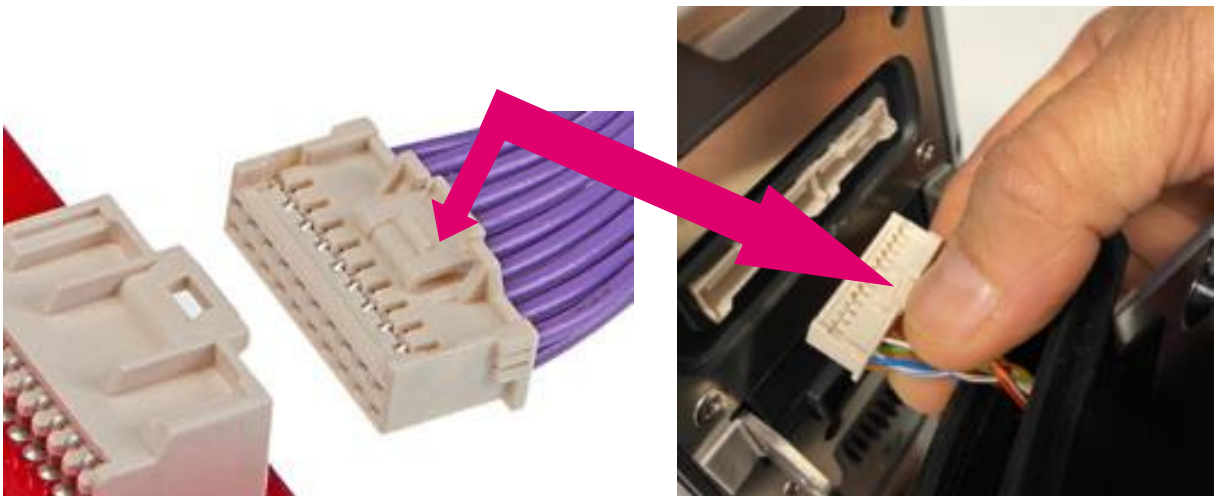


Figure 42: Cable Disconnection

Note:	Care must be taken not to damage the cables/connectors during unit removal.
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7 Quality Assurance and Testing

A Quality Assurance Technician will conduct a separate review of the installation to confirm the installation was completed successfully. Any issues will be immediately addressed, and the QA Technician will re-inspect.

7.1 Installation Review

1. Make sure the Ethernet cable passed testing from section 6.3.1.2, step 3, prior to connecting to VIX's cradle installation kit
2. Make sure other cables are terminated properly
3. Make sure the cables are properly connected to the Rugged Validator
4. Make sure the rubber boot sits securely
5. Make sure the Rugged Validator is properly secured to the pole with the lock in locked position
6. Make sure the key is not left in the lock

7.2 Testing

1. Does the device boot up/have power?
2. Depending on the available software application, does the device ping the back office and download CD?
3. Depending on the available software application, does the device read cards?
4. Put the device out of service after installation unless it's ready for revenue service

7.3 Sign-off

Once the installation and testing has been completed and inspected/tested by the Quality Assurance Technician, the QA Technician will sign off on the transit agency Platform Installation Acceptance document.

A transit agency representative will need to be present while the Quality Assurance Technician inspects/tests the installation.

The transit agency representative will need to raise any issues at the time of inspecting/testing that will be addressed immediately.

Once the transit agency representative is satisfied the work was completed correctly they will sign off on the Platform Installation Acceptance document.

Appendix A Dimensions and Weight

The Rugged Validator's physical dimensions are approximately 163mm(w) x 285mm(h) x 90mm(d), without a hood.

Unit's weight is approximately 2.5 kg, with a hood.

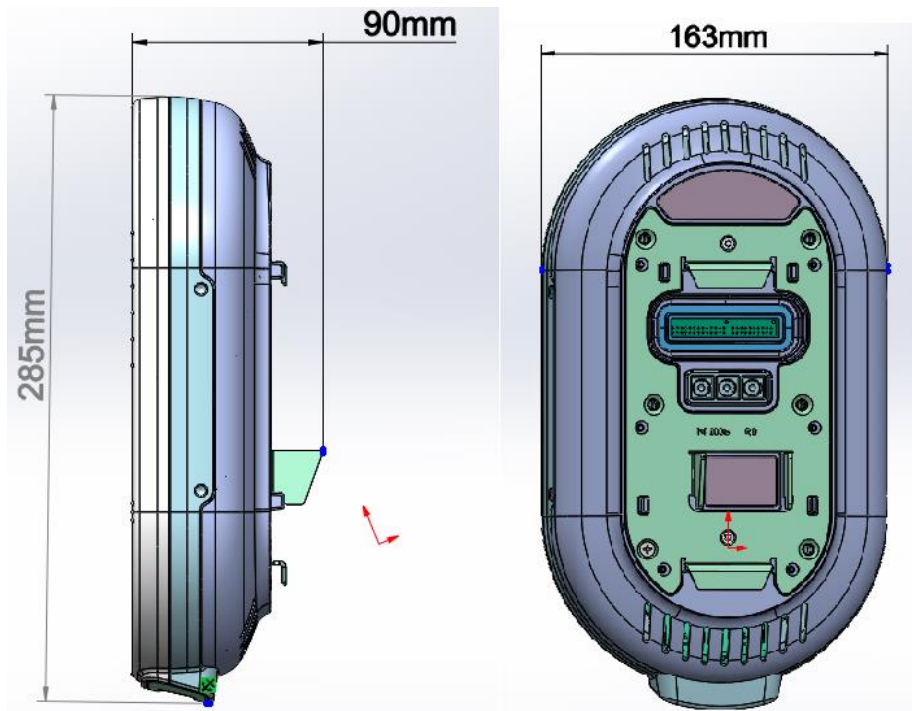


Figure 43: Rugged Validator Dimensions without Hood

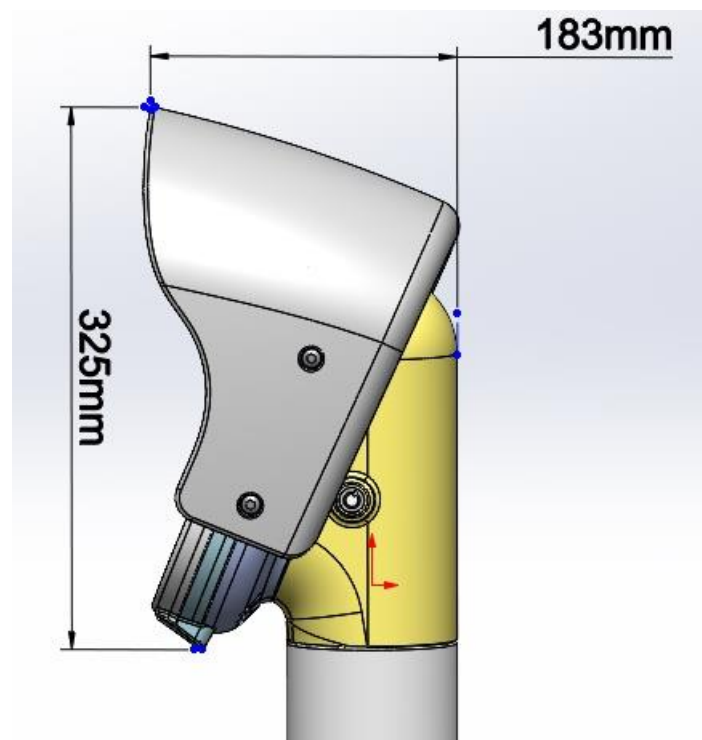


Figure 44: Rugged Validator Dimensions on Pole

Appendix B Pole Kit Packaging

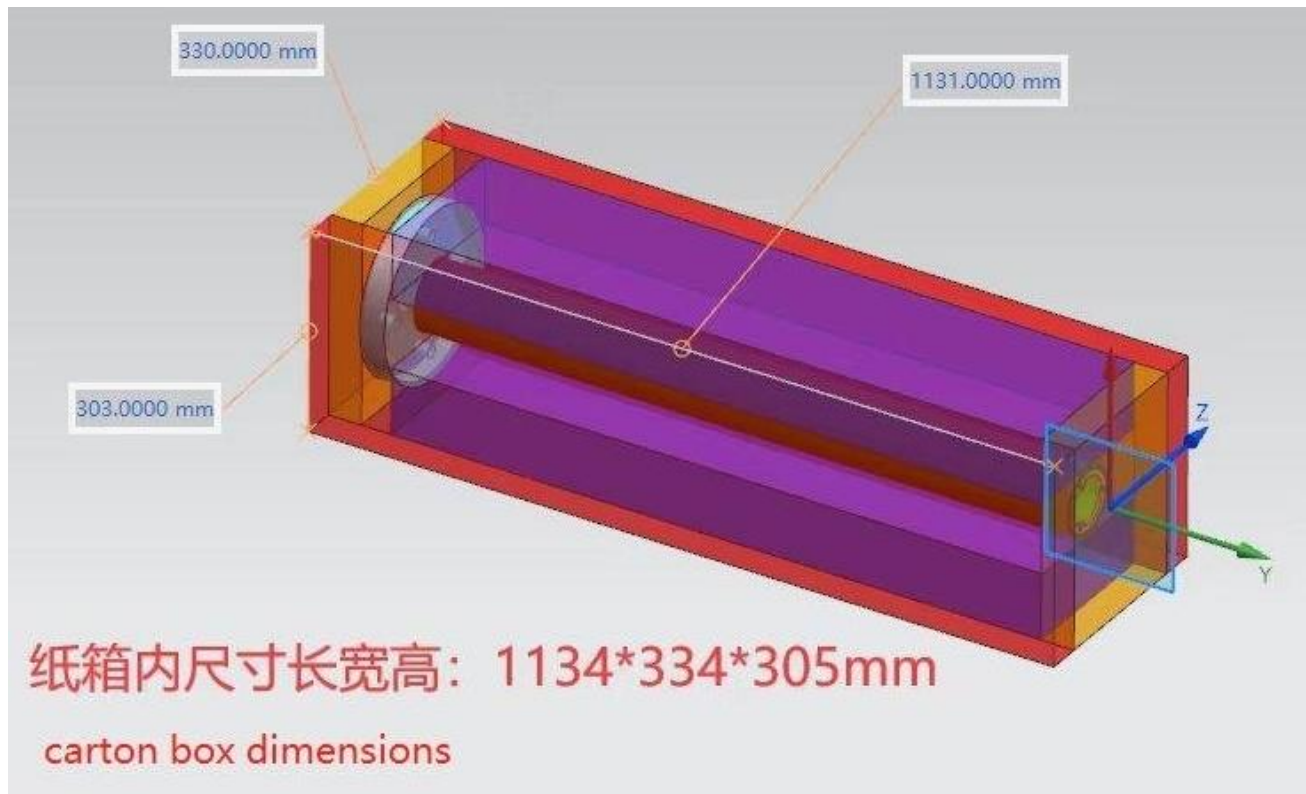


Figure 45: Pole Kit Packaging

Appendix C Rugged Pole Junction

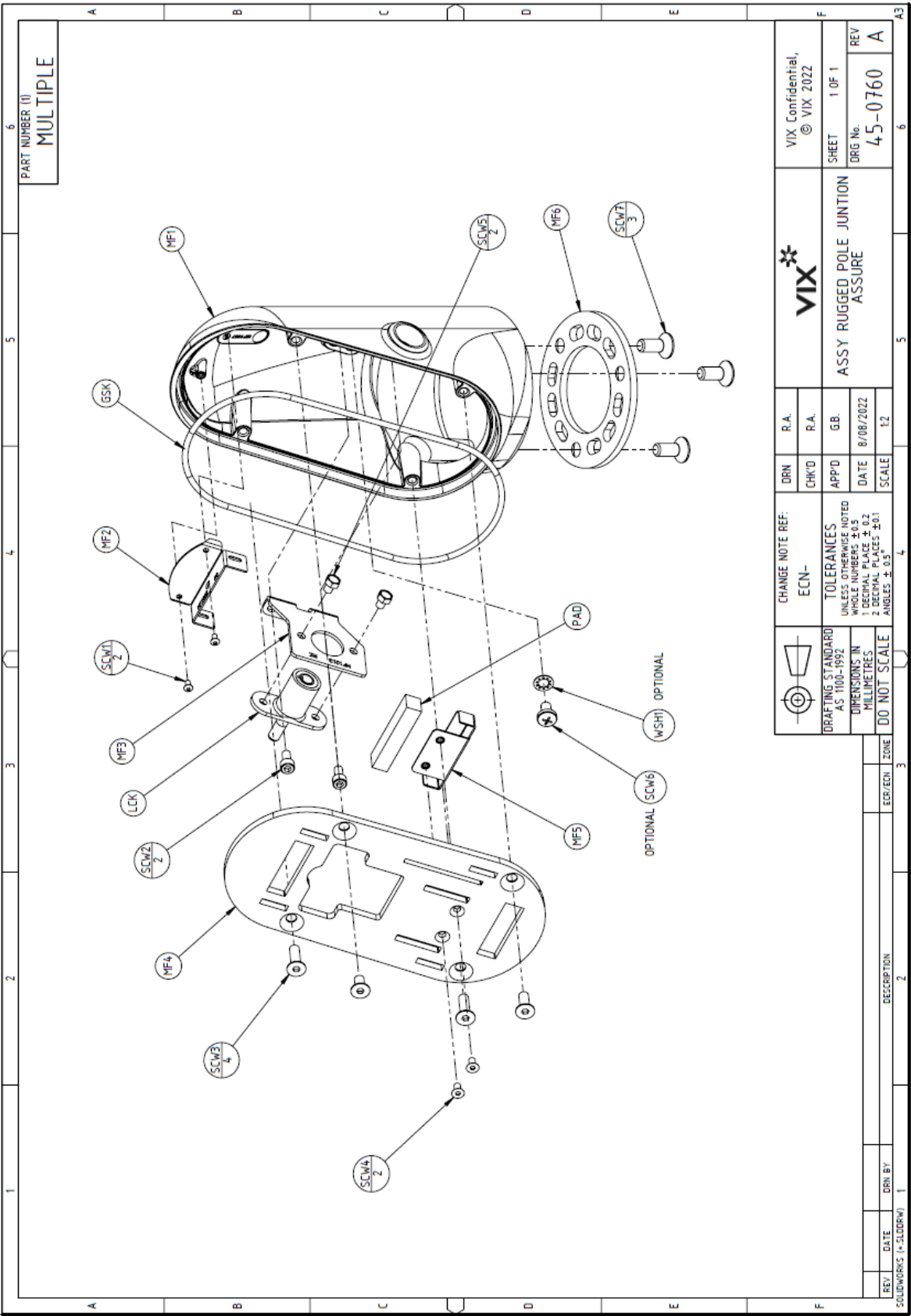


Figure 46: 45-0760 Ass'y Rugged Pole Junction

Appendix D IDEAL # 30-1161A

Information



Figure 47: IDEAL # 30-1161A Information