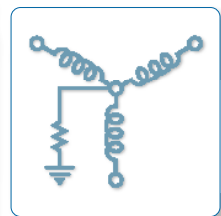
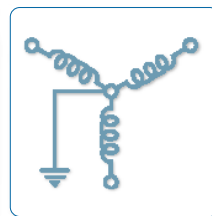
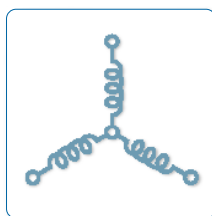
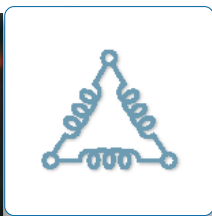




i-AVT-R

Absence of Voltage Tester

Installation & Operation Manual



ABOUT I-GARD

I-Gard's commitment to electrical safety provides both industrial and commercial customers with the products needed to protect their electrical equipment and the people that operate them.

As the only electrical-safety focused company whose product portfolio includes neutral grounding resistors, high-resistance grounding systems and optical arc mitigation, we take pride in our technologies that reduce the frequency and impact of electrical hazards, such as arc flash and ground faults.

For those customers who have purchased from us over the last 30 years, you know us for the quality and robustness of our products, our focus on customer service and technical leadership. We build on this foundation by investing in developing new products in electrical safety education by actively participating in the IEEE community programs on technical and electrical safety standard, and working with local universities at discovering new technologies. We remain unrelenting in our goal of improving electrical safety in the workplace.

Our commitment to excellence is validated by long-standing relationships with industry leaders in fields as diverse as petroleum and gas, hospitals, automotive, data centers, food processing, aerospace, water and waste water plants, and telecommunications. We provide our customers with the product and application support required to ensure that their electrical distribution system is safe and reliable.

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1. GENERAL INFORMATION

This manual is intended for installation and maintenance of the i-AVT-R. Carefully read and make sure that you understand all instructions before you mount, connect, and configure the i-AVT-R.

The manual is available on:

<https://i-gard.com>

1.1 INTRODUCTION

The I-Gard i-AVT-R is an advanced panel accessory designed to enhance electrical safety by indicating the presence of hazardous voltage and verifying the absence of voltage in electrical circuits or equipment. By ensuring systems are de-energized and free from hazardous voltage before maintenance or repairs, the i-AVT-R significantly reduces the risk of electrical accidents, promoting a safer working environment.

Both CSA Z462 (Clause 4.2.5) and NFPA 70E (Section 120.6) highlight the importance of using adequately rated, permanently mounted absence of voltage testers to verify the absence of voltage in conductors or circuit parts at the work location.

The i-AVT-R meets these stringent safety and compliance requirements, making it a reliable solution for industrial applications.

Key features of the I-Gard i-AVT-R include:

- Powered directly from 3 phases with supercapacitor technology for offline power, ensuring continuous operation.
- Supervisory circuitry that monitors and ensures proper sensor connections to the system, offering an additional layer of reliability.
- Bright LEDs for clear and visible voltage indication.
- User-friendly TEST button for quick and simple operation.
- Compact display unit with a small footprint for easy installation.
- Re-chargeable through a USB port on the display unit.

1.2 SAFETY NOTES

In this user manual, these symbols are used:



WARNING

General warning symbol indicates the presence of a hazard which could result in personal injury and damage to equipment or property.



WARNING

Warning symbol indicated the presence of hazardous voltage which could result in personal injury.



WARNING

Approved personnel are allowed to install and make the electrical connection of the Softstarter in accordance with existing laws and regulations.



INFORMATION

Information sign tells the reader important facts and conditions.

2. PRODUCT DESCRIPTION

2.1 COMPONENTS

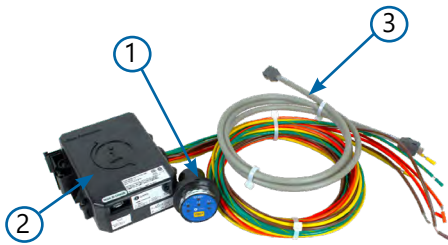


Figure 2.1: i-AVT-R Components

1. i-AVT-R Display Unit
2. Control Unit with lead connections (8 wires).
3. IX Cable.

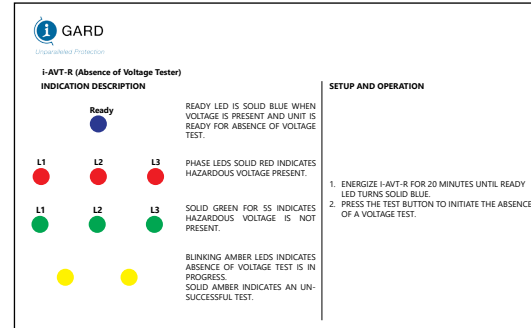


Figure 2.2: i-AVT-R Label

2.2 TECHNICAL SPECIFICATION

	I-AVT-R
Operational AC Voltage Range	Upto 600 VAC, 50/60 Hz
Operational Temperature Range	-20°C to +55°C
Storage Temperature Range	-40°C to +85°C
Wire Specifications	8 wire, 14 AWG, 8 Ft., PVC Insulated
Indication LEDs	(6) Indicating LEDs
Degree of Protection	IP66
Altitude of working	Up to 2000 meters
Country of Origin	Canada
Absence of Voltage Threshold	3 V AC/DC
Safety Integrity Levels	SIL3

2.3 CONFORMITY OF STANDARDS

UL 1436	Standard For Outlet Circuit Testers And Similar Indicating Devices
CSA C22.2#160	Voltage and Polarity Testers
IEC 61326-3-1	Electrical Equipment For Measurement, Control And Laboratory Use - EMC Requirements - Part 3-1: Immunity Requirements For Safety-Related Systems And For Equipment Intended To Perform Safety-Related Functions (Functional Safety) - General Industrial Applications
FCC 47CFR 15: 2013 Subpart B Class A	Radio Frequency Devices. Subpart B Unintentional Radiators
CISPR 16	Specification For Radio Disturbance And Immunity Measuring Apparatus And Methods. Radiated Emission Test. AC Mains Conducted Emissions Test
IEC 61000-4-2	Test Standard for Electrostatic Discharge (ESD) Immunity
IEC 61000-4-3	Electromagnetic Compatibility (EMC) - Part 4-3 : Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test
IEC 61000-4-4	Electromagnetic Compatibility (EMC) - Part 4-4: Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
IEC 61000-4-5	Electromagnetic Compatibility (EMC)- Part 4-5: Testing and Measurement Techniques - Surge Immunity Test
IEC 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
IEC 61000-4-11	Electromagnetic compatibility (EMC) - Part 4-11: Testing and Measurement Technique - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests for Equipment with input current up to 16 A per phase
UL 746C	Standard For Polymeric Materials - Use In Electrical Equipment Evaluations
IEC 61508-01 SIL 3	Standard for Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems – Part 1: General Requirements Safety Integrity Level 3- SIL 3

3. INSTALLATION INSTRUCTIONS

This chapter provides instructions on the mounting and electrical connections that must be completed before the i-AVT-R can be used.



WARNING

Mounting and electrical connection of the units must be made by authorized personnel and in accordance with existing laws and regulations



WARNING

Make sure that supply voltage is switched off before mounting and connecting the i-AVT-R



WARNING

Always follow safety and lockout/tagout procedures when working on or near electrical systems and equipment.



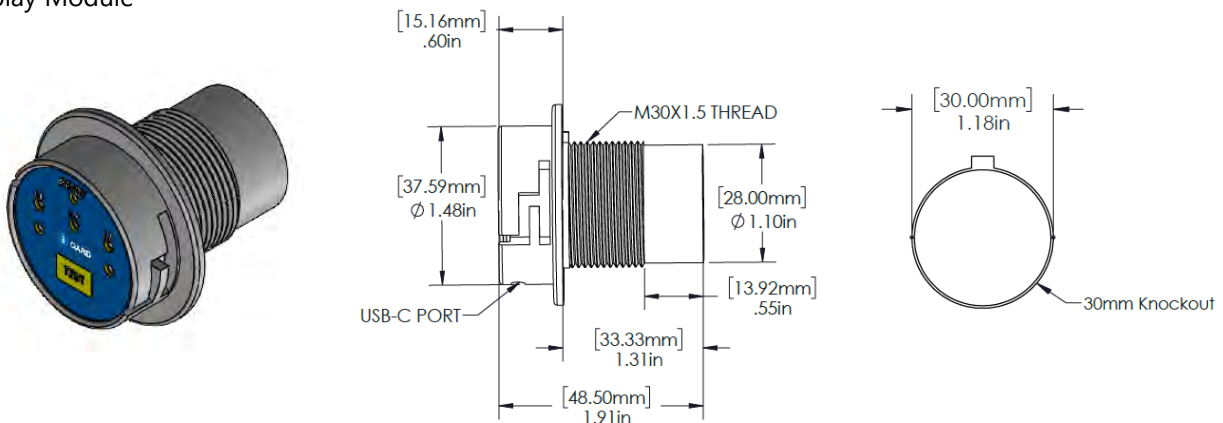
WARNING

If this product is used in a manner not herein prescribed, the protection provided may be impaired.

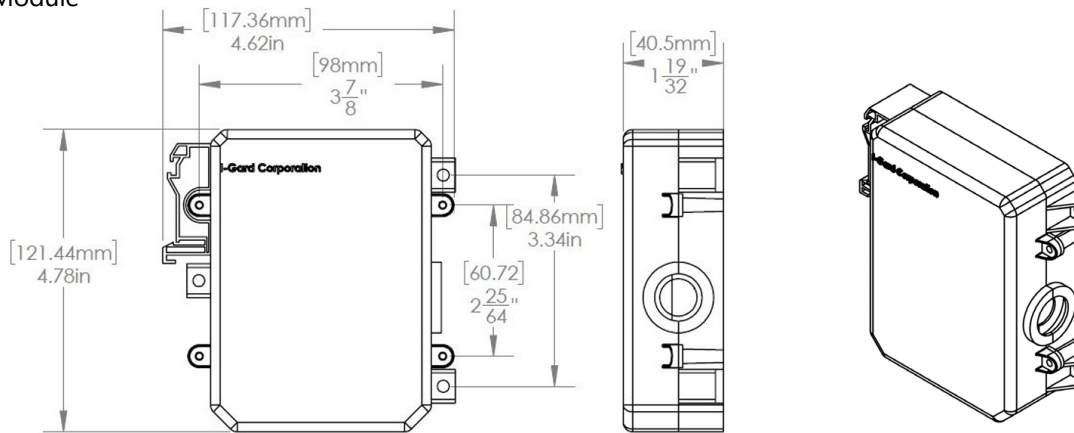
3.1 MOUNTING i-AVT-R

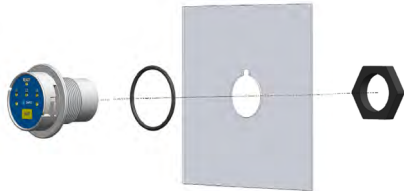
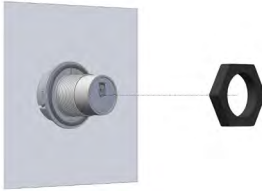
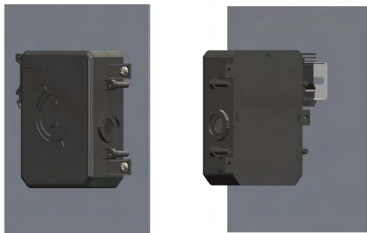
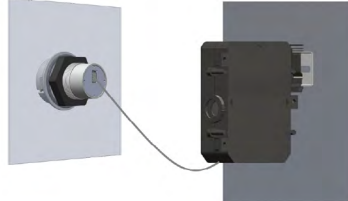
Dimensions

Display Module



Control Module



		
1. Insert the Display Module into the 30mm knockout hole with the O-Ring on the outside.	2. Install the panel nut.	3. Tighten the nut by hand until it and the washer fully contact the enclosure. Do not overtighten.
		
4. Mount the Control Unit inside the panel using either a DIN rail or screw mounting.	 5. Connect the Control Unit to the I-AVT-R using the IX cable supplied.	

3.1.2 I-AVT-R SENSOR LEAD CONNECTIONS (Refer the connection drawings)

Phase Sensor Leads:

- Each phase requires **two** sensor leads for redundancy.
- Connect the **Brown** leads to Phase L1, **Orange** leads to Phase L2, and **Yellow** leads to Phase L3.
- **Ensure that each pair of sensor leads is connected at two separate points on the respective phase** to improve accuracy and reliability.

Ground Sensor Leads:

- Each unit has **two green ground leads**, which must be **terminated at separate locations** on the panel ground.
- **Do not bundle or connect both ground leads to the same point** to avoid interference and ensure proper grounding.

3.1.3 INSTALLATION GUIDELINES FOR OPTIMAL PERFORMANCE

1. Separation & Insulation:

- Ensure that **phase sensor leads and ground sensor leads do not touch or overlap** with leads of different phases to **prevent interference**.

2. Secure Installation:

- Use **cable ties or insulated clamps** to organize the leads, preventing loose wiring.
- Avoid excessive bending or tension that could weaken the connections over time.

3. Follow the Correct Connection Layout:

- **Refer to the diagrams** provided in the manual for the proper wiring setup.
- Ensure **clear separation** between each phase and ground lead.



The image illustrates a properly connected setup.

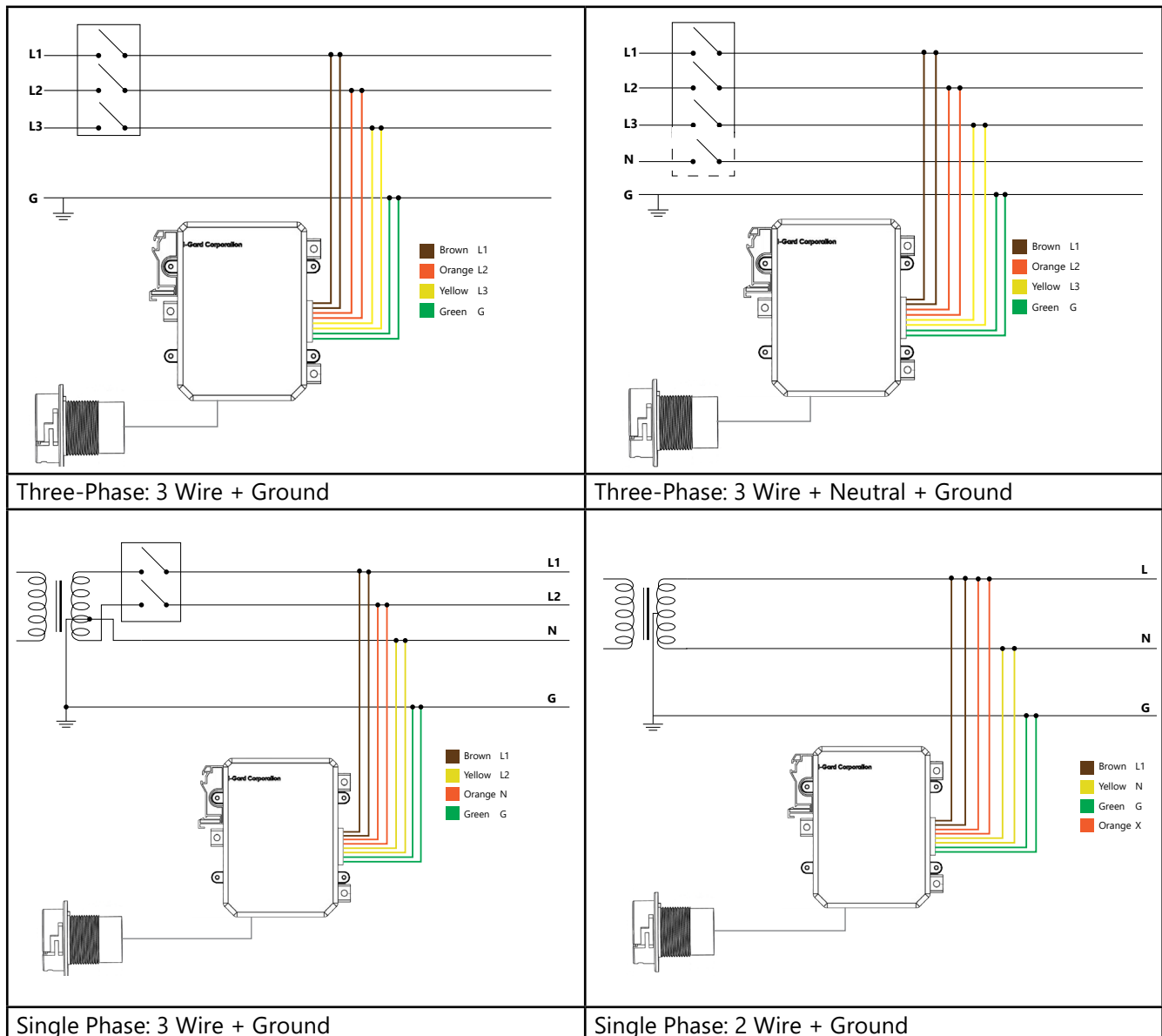
- Leads do not touch or overlap.
- All connections are properly insulated.
- No loose or exposed wiring.
- No excessive bending or tension in the leads.
- Leads are connected at separate points on the same phase.
- Ensure ground leads are also connected at separate ground points to ensure proper grounding.



The image illustrates a wrongly-connected setup.

- Leads are touching and overlapping.
- Connections are not properly insulated.
- Excessive bending weakens the connection.
- Leads are connected at the same point, causing interference.
- Improper grounding increases the risk of electrical issues.

3.2 CONNECTIONS



4. OPERATION INSTRUCTIONS

4.1 INITIAL SET-UP

The i-AVT-R Control Unit draws its operating power directly from the bus. When the bus is offline, the unit uses **supercapacitor technology** to continue powering its electronics.

1. **Power ON:** When the device is powered on, three RED lights will illuminate (see Fig. 4.1.a).
2. **Charging:** After a few minutes, the Ready LED will start flashing BLUE, indicating that the device is charging. Depending on the supply voltage, charging can take 5 minutes to 20 minutes.
3. **Fully Charged:** Once the supercapacitor is fully charged, the BLUE LED will turn SOLID (see Fig. 4.1.b).



Figure 4.1.a: Power ON

Figure 4.1.b: Fully charged

INFORMATION



The i-AVT-R Display Module also includes a USB-C charging port for charging its capacitor. Use a USB/C to C/C cable to connect the module to a power bank for charging (see Fig. 4.1.c).

4.2 VOLTAGE PRESENCE INDICATORS

When voltage is detected in one or more phases, the appropriate Voltage Presence Indicators will illuminate as shown in Figure 4.1.b.



WARNING

RED LEDs off does not confirm voltage absence. Always press the TEST button to verify the absence of voltage.



Figure 4.1.c: i-AVT-R C Type charging port connected

4.3 PERFORMING AN ABSENCE OF VOLTAGE TEST



WARNING

Ensure the Ready LED is solid BLUE before de-energizing the bus.

1. **Power OFF:** De-energize the bus and verify that the Phase LEDs are off, indicating no voltage is present (see Figure 4.3.a).
2. **Initiate the Test:** Press the TEST button to begin the absence of voltage test.
3. **Test in Progress:** Flashing AMBER LEDs will indicate that the test is in progress (see Figure 4.3.b).
4. **Test Results:** The test result will appear within 10 seconds (refer below).



Figure 4.3.a: Power OFF

Figure 4.3.b: Flashing AMBER LEDs

Safe Condition: If voltage is less than 3V AC/DC, three GREEN LEDs illuminate for 5 seconds, indicating it is safe to open the panel door.



Unsafe Condition: If the test fails, AMBER LEDs remain lit, signaling a potentially unsafe condition. In this case Verify the installation and Wait 10 seconds before retesting.



4.4 VISUAL CHECK AND LED INDICATIONS

i-AVT-R			
Ready LED is SOLID BLUE when Voltage is Present and unit is ready for Absence of Voltage Test.	 Ready		
Phases LEDs SOLID RED indicates hazardous Voltage Present.	L1 	L2 	L3 
SOLID GREEN for 5S indicates hazardous Voltage is not Present.	L1 	L2 	L3 
Blinking AMBER LEDs indicates Absence of Voltage TEST is in progress.	 		
SOLID AMBER LEDs indicates an unsuccessful Test.	 		

Table 4.4: LEDs Indications

4.5 TEST SEQUENCE

The i-AVT is equipped with sensor leads to continuously monitor the voltage on the bus system. It includes two leads for each phase, two for ground, and two for neutral.

The process begins with a built-in supervisory circuit that checks the continuity of all sensor connections to ensure they are secure and correctly installed.

Once the connections are verified, the system tests for the absence of both AC and DC voltage, including phase-to-ground and phase-to-phase measurements.

To ensure reliability, this test is repeated. The full test sequence is visually represented in Figure 4.4.

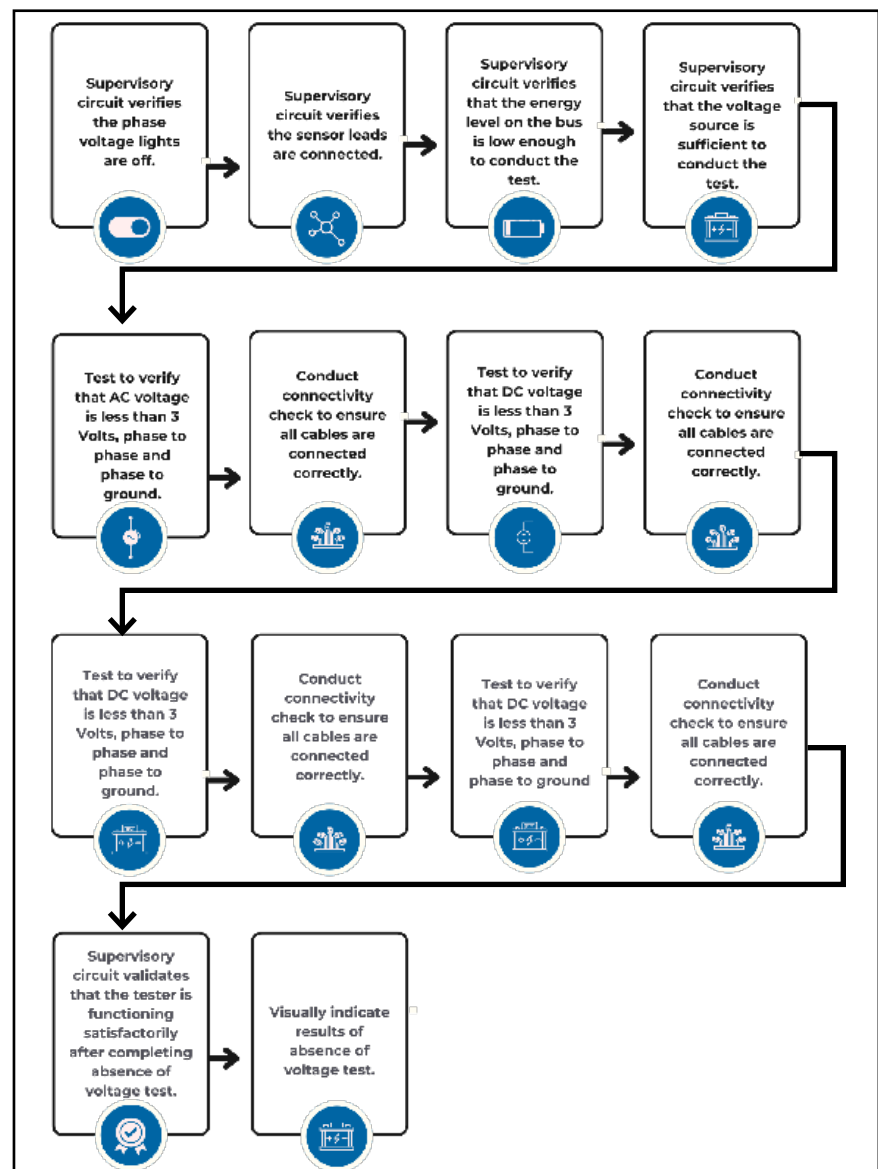


Figure 4.5: Flowchart for determining Absence of Voltage



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