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1. Introduction

General Description

This manual is intended to provide basic instruction to qualified personnel on the proper installation, operation, and maintenance of hospital Isolated Power Systems (IPS) as manufactured by PG LifeLink.

Isolated Power Systems protect patients and attending medical personnel from the electric shock hazards of common ground faults, without disconnecting power to critical electro-medical equipment. They are intended for installation inside any Category 1 Space of a Health Care Facility that may be subject to wet procedures, including all Operating Rooms and many other Critical Patient Care Areas.

In the event that a piece of line-powered equipment fed from the IPS experiences a first fault to ground, an integral hospital isolation transformer safely limits the otherwise hazardous fault current to a comparably low level. Unlike other ground fault protection methods such as GFCI, which trip the circuit after an actual fault current is detected, a properly installed and maintained IPS impedes the flow of high level fault currents by eliminating the return circuit path from ground back to the voltage source. This key feature is the reason that Isolated Power Systems are the preferred protection method for all branch circuits serving critical patient related equipment where loss of power cannot be tolerated.

The Line Isolation Monitor (LIM) is another standard component of Isolated Power Systems. It continuously monitors the line-to-ground impedance of all isolated branch circuits including any connected device loads, and alarms to notify medical staff whenever the system’s Total Hazard Current (THC) exceeds a predetermined value. Activation of this alarm indicates that a fault path has likely developed somewhere in the system between one of the two energized conductors and ground. However, because both lines are isolated from ground, the IPS will continue to provide protection, allowing staff to safely complete critical procedures. Upon completion of the case and safe removal of the patient from the area, the LIM can be used to help identify the device or wiring fault.

More detailed technical information related to the design and application of Isolated Power Systems, including specifications, engineering support, and applicable code references can be found in the Technical Resources section of our website, www.pglifelink.com. Technical assistance is also available by calling +1 800-287-4123 or via email at techsupport@pglifelink.com

Note that the information provided in this document is based primarily on standard installations in North and Central America. For international application, consult applicable local codes and standards for additional requirements. For design, installation, and testing requirements specific to your region, consult your national and local Codes.

- Canada – CSA C22.1—Canadian Electrical Code, Part 1; and CSA Z32 - Electrical safety and essential electrical systems in health care facilities
- Mexico – Mexico Official Norm NOM-SEDES-2012; and NOM-197-SSA1-2000
Model Types
This manual covers installation of the following models manufactured by PG LifeLink:

- **IPP** Isolated Power Panel
  Standard IPS with single isolated output
- **IPA** Accessory Isolated Power Panel
  Standard IPS with built-in power and ground receptacles
- **IPX** Duplex Isolated Power Panel
  Two single voltage IPS panels installed side by side in a single enclosure
- **IPD** Dual Output Isolated Power Panel
  Specialty IPS with dual outputs (120 and 208 or 240 VAC) for supplying a medical laser in addition to typical line powered equipment in a single room
- **IPL** Laser Isolated Power Panel
  Specialty IPS with single high-voltage (208-240 VAC) output and programmable control of individual circuits for supplying portable medical laser devices in up to twelve locations

System Components
Each IPS includes the following standard components. Consult PG LifeLink’s website or equipment catalog for detailed model information or product selection guides. Features such as enclosure size, electrical ratings, number of circuits, and available accessories vary by model type and are often unique to customer’s project requirements. In addition to this document, always review the PG LifeLink shop drawings submitted with each Sales Order for specific information.

- **Backbox**
  Backboxes are fabricated of galvanized steel and are designed and tested as NEMA Type 1, general-purpose enclosures in accordance with UL 50. Flush-mounted type is standard, but surface-mounted option is available. Contractor may request that backboxes be shipped for rough-in phase ahead of remaining items. Note, additional shipping charges may apply.

- **Interior Equipment Chassis**
  The factory assembled interior chassis module includes all circuit breakers, equipment ground bus, Line Isolation Monitor, and associated accessories. For IPP, IPA, and IPX type panels, the isolation transformer is also pre-assembled to the interior chassis, which mounts to four threaded studs on inside of backbox with provided hardware.

- **Line Isolation Monitor**
  A Mark V Line Isolation Monitor is supplied with each IPS to monitor the Total Hazard Current (THC) of the system and signal an alarm if this value exceeds 5 mA. For units installed in Canada, the alarm threshold is set for 2 mA. Each LIM includes a wiring harness and terminal block for field connection of optional remote annunciators and other accessories. IPX and IPD type panels each include two separate LIMs. Note that for IPD panels, one LIM will be set for low voltage (120V) operation and the other LIM will be set for high voltage (208-240V) operation based on panel configuration. Be sure not to switch the location of these units as severe damage can occur if LIM is improperly connected to the wrong line voltage. Refer to Mark V User Manual supplied with each unit for detailed instructions on installing, operating and maintaining the Line Isolation Monitor.
• **Circuit Breakers**
  Each IPS includes a primary main circuit breaker which provides overcurrent protection for the entire system. The primary main breaker is sized at 125% of rated full load amps of the isolation transformer primary winding. The secondary winding is connected directly to the lugs of the branch circuit panelboard which includes up to sixteen 2-pole bolt-on branch circuit breakers. Branch breakers are factory installed according panel schedule(s) or other project documents provided. Type IPD panels also include secondary main circuit breakers to protect each of the dual secondary windings independently.

• **Isolation Transformer**
  Most panels are shipped from the factory with the transformer mounted and pre-wired to the interior chassis. On some models, the transformer is shipped on a separate skid and must be installed in the top of the enclosure by the contractor. When shipped separately, ensure that the correct transformer is matched with the panel interior, and refer to manufacturer’s shop drawings for proper wiring.

• **Front Trim**
  The Front Trim Panel is fabricated from type 304 brushed stainless steel and mounts to the backbox with 1/4-20 stainless steel hardware provided. Front trim includes a lockable hinged door for access to circuit breakers as well as a full-length hinged, “door-in-door” feature which allows the entire front to swing open for testing or maintenance. The LIM is flush mounted through an opening next to the access door.

2. **Receiving, Handling, and Storage**
   Customer should inspect all crates and packages immediately upon receipt. Document any apparent damage or missing items, and notify PG LifeLink and/or carrier as soon as possible to initiate a claim if necessary.

   PG LifeLink Isolated Power Systems are typically packaged as three separate components: back box, pre-wired equipment chassis with transformer(s), and front trim. Note that the transformers for some larger capacity systems (such as IPX and IPL) may be packaged or delivered separately.

   Equipment chassis plates are supplied by the factory packaged in cardboard containers and may be stacked 2-3 per skid, along with associated front trim panels. Pay careful attention when moving or unpacking skids, as the front trim panels may be located in a shallow wooden crate beneath the cardboard containers.

   PGL recommends that interior chassis, trim panels, and other parts be stored in a clean, dry, indoor location. Protect equipment from exposure to dust, liquids, paint, and other construction materials before, during, and after installation.

3. **Environmental Conditions**
   PG LifeLink Isolated Power Systems are designed for indoor installation only. Normal placement is inside of or adjacent to the room being supplied by the system. Ambient temperature of the area surrounding the panel should normally be between 10° - 25°C (50° - 77°F). The following are the maximum recommended environmental conditions.
   - **Operating temperature range:** 0° - 50°C (32° - 122°F)
   - **Humidity:** 5% - 95% RH
4. Safety Precautions

**Danger! Hazard of Electric Shock, Explosion, Burn, or Arc Fault**

- Hazardous voltages are present inside the Isolation Panel! Disconnect all power sources supplying this equipment and verify system is completely de-energized before installation or servicing. Follow proper lock-out procedures to prevent accidental re-connection or energizing of equipment.

- Ensure all devices and conductors are properly installed and terminated, and all barriers and covers are in place and secured before energizing panel.

- Follow electrical work safety practices and use appropriate personal protective equipment (PPE) in accordance with NFPA 70E and local site requirements.

- Only qualified personnel shall operate, maintain, and/or service this equipment.

- Improper installation or operation of this equipment, or failure to follow these precautions will result in serious injury or death.

- PG LifeLink assumes no responsibility for any consequences arising from the use or mis-use of this document.

**Caution! Hazard of Equipment Damage**

- Proper operation of this equipment is dependent on correct installation and setup.

- Do not modify this equipment or use in a manner for which it is not intended.

- Use only with PG LifeLink recommended accessories.

- Failure to adhere to the instructions contained in this document can result in personal injury, equipment malfunction, or serious damage to connected equipment.

**Caution! Hazard of Heavy Equipment**

- Customer/Installer is responsible for providing suitable equipment for safely lifting, transporting, and/or installing heavy loads.

- Failure to follow safe lifting/handling procedures, including use of proper safety equipment can result in personal injury or equipment damage.
5. Installation Instructions

General Installation Guidelines

A major goal when designing and installing Isolated Power Systems is to minimize the cumulative leakage current of the installed system. Carefully reviewing and following these guidelines will help ensure that the installation passes all required startup and commissioning test criteria, and safely operates as intended.

- Chapter 6 of NFPA 99 - Health Care Facility Code defines the performance maintenance and testing requirements for electrical systems in health care facilities including hospitals and ambulatory surgery centers. Among these is the requirement that the insulation impedance of all newly installed IPS be tested prior to being placed into service. The minimum allowable insulation impedance from each energized line to ground, including all branch circuit wiring and receptacles, is 200,000 ohms. For a 120V system, this equates to a maximum of 0.6mA of leakage current. Limiting the baseline leakage of the installed system ensures that adequate headroom is available for connecting a suitable number of device loads without exceeding the 5.0mA Hazard Current alarm threshold.

- Verification of baseline system leakage is included with startup/commissioning testing service and is performed by factory authorized technician for all new installations. Contact PG LifeLink Field Service at 800-287-4123 to schedule testing; advanced notice is required. Note that activation of standard factory warranty is contingent on completion of startup testing by a factory authorized technician.

- In the United States, installers should thoroughly review and be familiar with NFPA 70 - National Electric Code, Article 517 (Health Care Facilities) before attempting to install or wire an Isolated Power System. There are several installation requirements specific to health care occupancies that must be followed. Pay special attention to Parts I, II, and VII. The following sections specifically address installation requirements related to Isolated Power Systems:
  - 517.13 Grounding of Receptacles and Fixed Electrical Equipment
  - 517.14 Panelboard Bonding
  - 517.19 Critical Care Areas
  - 517.20 Wet Procedure Locations
  - 517.160 Isolated Power Systems

- Canadian installers should review and be familiar with the specific installation requirements for Isolated Power Systems found in CSA C22.1 - Canadian Electrical Code, Part 1, Section 24 (Patient care areas).

- Isolated Power Systems should be located as close as possible to the point of use to reduce leakage current associated with the circuit conductors. Generally, panels are installed inside the room being served, or just outside in an adjacent corridor. An IPS is only permitted to serve one room (with the exception of high voltage x-ray/ laser panels). When installed outside of the room, a remote annunciator is required inside of the room to notify staff of an alarm from the Line Isolation Monitor.

- The Patient Care Vicinity is the primary focus for personnel fault protection. This area centers on the normal location of the surgical table/patient bed, extending 6 feet horizontally beyond the patient perimeter and vertically from the floor up to
the ceiling. Line powered, portable or ceiling mounted equipment which may extend into this area such as service booms, pendants, monitors, C-arms, and surgical lights should be fed from an un-grounded isolated power system for protection against line-to-ground faults without power interruption. Fixtures and equipment which do not extend down below the ceiling including overhead lighting should not be connected to IPS. Non-medical equipment such as personal computers, monitors, communication, and A/V equipment that is not intended to enter the patient care vicinity should be fed from regular grounded power circuits with GFCI protection instead of IPS.

• Note that, as with all transformer loads, the inrush current of the isolation panel may be up to 8X its rated primary current and may take up to one or two seconds to subside, based on site conditions. PGL recommends installing adjustable time delay feeder breakers upstream of isolation panel to avoid possible tripping due to inrush.

• Avoid connecting devices with commercial-grade power supplies including low pass filter networks or surge protection circuits (TVSS or MOV line to ground) on IPS. These devices have high levels of capacitive coupling from line to ground and can raise the system Total Hazard Current. If in doubt, verify with device manufacturer if equipment is compatible with medical isolated power systems. In general, only “Medical Grade” equipment should be connected.

• Do not supply general lighting loads from IPS branch circuits. Permanently wired overhead ceiling fixtures are considered outside of the Patient Care Vicinity and do not pose a fault risk to the patient. Typical circuitry contained in these fixtures will contribute a disproportionately high level of leakage current to the system, leading to a reduced operating range. However, certain boom mounted or otherwise adjustable lighting devices such as surgical and exam lights, as well as wall mounted x-ray film view boxes are accessible to patients and staff and therefore do require IPS protection.

• Certain devices are not compatible with IPS and therefore should not be installed on IPS branch circuits. These include:
  • GFCI, AFCI, Surge Protected, and Isolated Ground type receptacles, as well as some receptacles with integral USB charging capability
  • Certain Medical-Grade power strips with loss-of-neutral or loss-of-ground sensing circuits

• For additional information regarding system compatibility, contact PG LifeLink’s engineering team at +1 800-287-4123 or techsupport@pglifelink.com

• Upon completing installation, installer should complete the Contractor Isolated Power System Start-Up Procedure. A copy of this procedure is included with each panel and may also be downloaded from our website at http://www.pglifelink.com/technical-resources.
Back Box Installation

- Installation of PG LifeLink Isolated Power Panels is the responsibility of the installation contractor including selection of a suitable support structure and attachment hardware. The size and maximum weight for each panel type is listed in Table 1.

- PGL recommends securing panels to a rigid support structure such as channel-strut using minimum 5/16” commercial grade hardware. Three mounting holes are located on each side of the back box for this purpose. If necessary, use shims between the back box and support anchorage to ensure that the sides of the enclosure are not distorted as the mounting bolts are tightened, which may result in mis-alignment of the front trim mounting hardware.

**NOTE:** Do not locate any mounting hardware or conduit entry points on the rear surface of the back box. This will interfere with installation of the interior equipment chassis.

- When installing flush-mount type panels, position the bottom edge of the back box approximately 30 inches above the surface of the finished floor, and ensure that the front edge is recessed approximately 1/8” behind the final finished wall surface. If the backbox protrudes beyond the wall, or is recessed too far behind the surface, this may cause difficulty when securing and aligning the front trim. Keep in mind that final finished wall and floor dimensions may change significantly after rough-in depending on the types of finishes applied.

- For panels weighing 500 pounds or more, PG LifeLink recommends installing a lower horizontal brace to support the underside of the backbox in addition to the vertical side supports.

- A label is affixed inside the backbox indicating the correct orientation. Be sure to install with the top side facing up so that the interior chassis will align properly when installed. A raised chassis support ledge is located along the bottom interior of the backbox.

- Different models of backboxes look similar. Verify that the part number marked on the backbox matches the associated equipment chassis and front trim.

- Install conduit prior to installing equipment chassis assembly. Remove all metal shavings and clean interior to avoid contamination of equipment.

<table>
<thead>
<tr>
<th>Model</th>
<th>Total kVA</th>
<th>Size (H x W x D)</th>
<th>Weight (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP</td>
<td>3</td>
<td>45” x 24” x 6”</td>
<td>235</td>
</tr>
<tr>
<td>IPA</td>
<td>5</td>
<td>54” x 24” x 6”</td>
<td>350</td>
</tr>
<tr>
<td>IPA</td>
<td>7.5</td>
<td>54” x 24” x 6”</td>
<td>350</td>
</tr>
<tr>
<td>IPA</td>
<td>10</td>
<td>54” x 24” x 6”</td>
<td>350</td>
</tr>
<tr>
<td>IPX</td>
<td>5/5</td>
<td>54” x 36” x 6”</td>
<td>500</td>
</tr>
<tr>
<td>IPX</td>
<td>7.5/7.5</td>
<td>54” x 36” x 6”</td>
<td>550</td>
</tr>
<tr>
<td>IPX</td>
<td>10/10</td>
<td>54” x 36” x 6”</td>
<td>575</td>
</tr>
<tr>
<td>IPD</td>
<td>10/15</td>
<td>54” x 36” x 12”</td>
<td>600</td>
</tr>
<tr>
<td>IPL</td>
<td>25</td>
<td>54” x 30” x 12”</td>
<td>600</td>
</tr>
</tbody>
</table>

*Table 1: Weights and Dimensions*
• All conduit should enter from the top of the enclosure to allow proper clearance for installation of the equipment chassis assembly. Installer may locate and install branch circuit conduits as convenient along the top surface of the back box, being careful to maintain adequate separation between isolated branch circuit conductors and non-isolated feeder conductors, as well as low-voltage signal wires connected to the remote terminal block. Location of primary main and remote terminal connection points vary by model type. Always refer to specific project drawings when locating conduit entry points.

• If site conditions require locating conduit on the sides or bottom of the enclosure, it is recommended that installer first pre-install the equipment chassis (and transformer if shipped separate from the chassis) to ensure proper clearance can be maintained.

• Conduit runs for branch circuits should be as short and direct as possible to minimize accumulated leakage current in the circuit conductors. Generally, the maximum recommended cumulative length of for all branch circuit conductor pairs from a single transformer is 450-500 feet. Avoid unnecessary bends and junctions where possible.

• In accordance with NEC 517.13 (A), all branch circuit conduit shall be metallic and “shall itself qualify as and equipment grounding conductor in accordance with [NEC] 250.118”.

• In Canada, branch circuit conduit must be non-metallic in accordance with CEC Part 1 Section 24-204(2)(f).
Interior Equipment Chassis Installation

- The equipment chassis has four mounting slots which align with four threaded studs on the inside rear of the backbox. A mounting ledge is also provided along the bottom of the backbox which supports the weight of the chassis and aligns it vertically with the front trim.

- When removing the chassis from its packaging, transporting, and lifting into place in the enclosure do not place pressure on or use any of the components or brackets for lifting. Use only the sides of the main chassis plate for lifting. Note that the equipment chassis is extremely heavy and can weigh up to several hundred pounds. Do not attempt to lift or install chassis assembly or transformer without proper safety equipment.

- To install the chassis, first rest its bottom edge on the mounting ledge and align the lower slots and studs, then tilt up and into place over the upper studs. Secure with four 5/16-18 nuts and washers provided, ensuring that chassis is flush against the rear of backbox.

- An identification label is affixed to each equipment chassis as well as the circuit breaker dead-front barrier. Ensure that the serial numbers are the same on both labels and do not switch barriers with another panel.

- The Line Isolation Monitor(s) and wiring harness is included with the equipment chassis and is packaged independently to protect it during shipping and storage. A bracket is included for mounting the LIM directly to the rear of the Front Trim (see Front Trim Section). Do not remove the LIM from its packaging until final assembly stage. Ensure that LIM is installed only on the equipment chassis with which it was originally packaged. Note that connecting a LIM to a panel with the wrong voltage will cause severe damage to the device and will void the warranty.

- Certain model types, including IPL, and IPD panels require installation of a separate transformer in the upper portion of the backbox. These components are typically very heavy and require suitable lifting equipment. Use only the lifting points on either side of the top support rail when lifting or transporting transformers. Do not exert pressure on the windings or wire leads while lifting or manipulating.
To install floor mounted transformers, use appropriate lifting equipment to remove from crate and carefully suspend bottom surface approximately 12” above the floor. Inspect lower rails and mounting holes. Install rubber vibration isolation grommets in each of the four mounting holes (see Figure 4) and then carefully lower over the four mounting studs at the bottom of the backbox. Ensure that transformer and grommets seat properly and confirm that neither the coils or insulation material is contacting the rear surface of the enclosure. Install top side rubber washers, fender washers, and 5/16-18 hex nuts provided. Tighten until rubber isolators compress approximately 1/8”.

Figure 3: Equipment Chassis Assembly

Figure 4: Floor Mounted Transformer Installation
Wiring

- Isolated Power Systems require a 3-wire incoming power feed (H,H,G or H,N,G). Verify that the incoming voltage matches the Primary Voltage listed on the isolation transformer as well as the project drawings. Both of the incoming power conductors are connected directly to the line side terminals of the Primary Main Circuit Breaker. This 2-pole breaker is sized to protect the isolation transformer windings. Terminate the grounding conductor on the ground bus.

- The primary and secondary leads of the isolation transformer are pre-wired to the main circuit breaker and panelboard lugs for IPP, IPA, and IPX type panels. Installer must terminate the transformer leads for IPD, and IPL type panels. Carefully review the project shop drawings for each panel to verify the proper transformer ratings (kVA, primary and secondary voltages), and compare to the data label on the front of the transformer. Note the wire designators on the label and at the end of each lead. Connect the primary winding (H1/H2) to the load side of the primary main circuit breaker. Connect the secondary winding (X1/X2) directly to the panelboard lugs and connect the transformer grounding lug to the chassis ground bus with the provided green insulated conductor. Reference Figure 5 for typical connections. For IPD panels with dual secondary winding transformers, the secondary leads (X1/X2 & X3/X4) will connect to secondary main circuit breakers instead of directly to the panelboard. Be certain to connect the correct set of leads to the side of the correct side of the panel based on the voltage. **Note that mis-wiring the transformer leads can create an extremely hazardous situation and may cause catastrophic damage to the panel as well as any connected equipment.**

Figure 5 Typical Isolated Circuit Wiring
• Special low leakage wire should always be used for branch circuit wiring of isolated power systems. Cross-linked, polyethylene type insulation with a dielectric constant of less than 3.5, such as XHHW or XHHW-2 is highly recommended. Standard construction type wiring such as THHN may be used for the incoming primary feeds and equipment ground wires only. Refer to Informational Note No. 2 of NEC 517.160(A)(6).

• For installations in Canada, PG LifeLifeLink recommends the use of RW 90 XPLE type insulation for all branch circuit conductors. Refer to CEC Part 1 - Section 24-204(2)(b).

• As noted in the previous section, the total length of branch circuit conductors fed from each isolation transformer should be kept as short as possible to minimize accumulated leakage current of the system. The recommended maximum cumulative length for all branch circuits of each leg (L1 or L2) is 450-500 feet per transformer. Avoid unnecessary runs where possible, minimize the number of connection points, and limit additional “slack” conductor coiled up inside junction and device boxes. Note that in Canada, due to the lower 2mA alarm threshold, the maximum recommended branch circuit length is limited to 200 feet.

• All Isolated Power System branch circuits are protected by two-pole circuit breakers because there is no grounded neutral on the secondary output side of the transformer. Up to a maximum of 16 branch circuit breakers may be installed on each transformer. Refer to Figure 5.

• The National Electric Code (NFPA 70) requires isolated branch circuit conductor insulation to be colored orange and brown, with a distinctive stripe running its length in a contrasting color (other than white, green, or gray). Orange wires (L1) are connected to the upper pole of each branch breaker and to the silver terminal screw (typical neutral side) of each NEMA receptacle in the circuit. Brown wires (L2) are connected to the associated lower pole of each breaker and the brass terminal screw (typical hot side) of each receptacle. Consistent polarity should be maintained throughout the installation. Reference NEC 517.160(A)(5) or CEC Part 1 24-204(2)(c-d). See Figure 5 for a typical installation wiring diagram.

• Do not use pulling compounds to lubricate inside of conduit. This will break down the insulation properties and raise leakage current. A dry talc powder may be used. It is typical to use conduit with a slightly larger diameter to ease pulling and avoid damage to wire insulation. An interior coating of PVC may also be used. Reference NEC 517.160(A)(6).

• Isolated power circuits must be kept separate from other circuits and may not share conduit or raceway with non-isolated circuits, or isolated circuits from another system. Reference NEC 517.160(A)(1).

• The grounding terminals of each receptacle and hardwired device fed from the system must be connected to the Reference Ground Bus inside Isolation Panel. When multiple panels serve the same room or space, they must be bonded together locally with a minimum #10 AWG insulated equipment bonding conductor. This includes circuits from panels installed outside of the room, as well as non-isolated (grounded) circuits present in the room. Reference NEC 517.13 , 517.14, and 517.19.
- Where listed, follow component manufacturer’s specified tightening torque for all circuit breaker and bus lug electrical connections. Where component manufacturer specs are not available, torque all electrical connections according to the values listed in Table 2.

<table>
<thead>
<tr>
<th>Wire Size (AWG)</th>
<th>18-10</th>
<th>8</th>
<th>6-4</th>
<th>3-1/0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque (lb-in)</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
</tr>
</tbody>
</table>

*Table 2: Torque specs*

- The Line Isolation Monitor connection harness and remote terminal block are pre-wired on the equipment chassis. To connect, with the harness wires facing the rear of the LIM carefully align the plastic connector with the 15-pin header on the bottom of the case and fully insert. Refer to the User Manual for the LIM specific to the panel being installed for detailed information on the proper installation, wiring, operation, and maintenance of the LIM, including any remote annunciators or accessories.

- Always confirm that the same LIM that was originally shipped with the equipment chassis is installed in that panel. In the case of IPD panels with dual 120/208-240VAC outputs, ensure that each LIM is installed in the correct side of the panel, based on the voltage. Each of the two LIMs supplied with IPD panels each are labeled with their respective system voltages.

- Note that improperly connecting a LIM that is configured for 120VAC operation to a panel with 208-240VAC output will catastrophically damage the LIM. Similarly, connecting a 208-240VAC configured LIM to a 120VAC panel will cause the LIM to operate incorrectly. Consult the LIM User Manual for details on identifying and configuring LIM operating voltage.

- Wiring for low voltage remote annunciators and accessories should enter through conduit at the top of the enclosure terminate on the appropriate poles of the Remote Terminal Block. Route and secure wires to maintain adequate separation from power conductors and terminals. Consult LIM User Manual for recommended type, gauge, and length of remote wiring. Do not use control cabling that includes a shield or drain conductor. When pulling and terminating remote wiring, ensure that no conductors come in contact with the metal enclosure, conduit, or earth ground. This can adversely affect operation of the remote device as well as the LIM.
Front Trim Installation

- A stainless steel front trim assembly is included with each panel. Trim is shipped with protective covering to protect the finished surface. Prior to installation, store flat and avoid leaning cover against wall to prevent bowing.

- Verify that the front trim matches the installed backbox and there is adequate clearance between it and internal equipment such as transformer coils and circuit breaker trip handles.

- A set of 1/4-20x1” Philips truss head stainless steel screws and clip-on u-nuts are provided for securing the front trim to the backbox. Use a #3 Philips bit to avoid stripping screw heads.

- Use the two alignment studs located at the top and bottom of the hinge side (left) on the front trim to align with associated holes on backbox flange. Install four screws on hinge side, but do not tighten.

- Remove LIM from packaging and install onto four threaded studs provided on front trim (see figure 7). Secure with four #6-32 KEPS nuts provided. Carefully connect wiring harness to header J2 on bottom of LIM. Refer to Mark V LIM Manual for correct orientation of connector.

- Carefully close front trim, ensuring that no wires are pinched, and install remaining screws. Beginning with hinged side, hand-tighten all screws to secure trim. Do not over-tighten to avoid stripping during future maintenance and testing.

- Fill out panel schedule with circuit information and place in clear pocket behind breaker access door.

- Two keys are provided for each door latch. Collect all keys as well as manuals and other documentation for delivery to Owner.
6. Normal Operation

Refer to Line Isolation Monitor instruction manual supplied with panel for complete system operation guidelines.

System Startup - After system has been properly installed and all wiring connections have been verified, energize the Primary Main Circuit Breaker in the Isolated Power System panel. The LIM will undergo the following initialization process each time unit is energized:

1. After power is applied unit will perform a “lamp test”, illuminating all LED indicators and segments, as well as signaling audible alarm. The LCD screen displays current firmware version and serial number of the unit. If any problem is noted with LEDs or displays, or if the audible alarm signal is not present, contact technical support.

2. After “lamp test” is complete, the unit will enter self-calibration mode for approximately 30 seconds. “R” is displayed on the LED screen, and the LCD display indicates “Status: Calibration”.

3. Upon completion of self-calibration, unit will enter normal operation mode.

4. If this is the first time LIM has been energized, or if unit has been turned off for more than two weeks, a reminder to set the system time will appear. Refer to User Menu section of the LIM manual.

Normal Operation - Under normal operating conditions the LIM will exhibit the following:

1. The green “SAFE” indicator is illuminated, indicating unit is energized and condition is normal.

2. The red “HAZARD” and amber “SILENCED” indicators are extinguished. *(Exception: if “Alarm Volume” has been set to “Mute” in the configuration menu, the amber “SILENCED” indicator will be continuously illuminated)*

3. The 2-digit mA display, along with the 16-segment bar graph will indicate the calculated Total Hazard Current for the Isolated Power System, including any connected equipment.

4. The LCD display screen indicates “Status: System OK” along with the current time, measured line-voltage, and (if activated) % of system full load.

THC Measurement - The primary function of the Mark V Line Isolation Monitor is to continuously monitor the line-to-ground impedance of both line conductors of a single phase, ungrounded, Isolated Power System. A “fault” condition exists when a piece of connected equipment causes this impedance to drop significantly, causing a proportional rise in the calculated Total Hazard Current (THC). When the THC exceeds the selected alarm threshold value of 5 mA or 2 mA, audible and visual alarms are triggered on the front of the LIM as well as on any connected remote annunciators.

7. Troubleshooting

Refer to Line Isolation Monitor instruction manual supplied with panel for tips on troubleshooting common problems. For additional technical support, contact PG LifeLink at +1 800-287-4123, or via email at techsupport@pglifelink.com.
8. Maintenance

PG LifeLink recommends annual testing of all Isolated Power Systems and Line Isolation Monitors in accordance with the requirements located in NFPA 99 - Health Care Facilities Code. Recommended testing includes:

- Measurement of secondary output voltage(s)
- Measurement of system Total Hazard Current (THC)
- Verification of Line Isolation Monitor alarm points using simulated fault impedance
- Verification of all other Line Isolation Monitor and Remote Annunciator alarm signals
- Verification of ground system integrity

Panels are covered by a standard two (2) year manufacturer’s warranty from date of purchase. If the unit is determined to be non-conforming, contact PG LifeLink immediately at +1 800-287-4123, or via email at techsupport@pglifelink.com. A technical support associate will assist in troubleshooting the issue, and if necessary, arrange for return of the item via our standard RMA process. PG LifeLink will analyze the equipment to verify non-conformance and determine the root cause. At its option, PG LifeLink will either repair or replace returned equipment during this period, provided that no abuse or damage to the product has occurred, and unit has been properly installed and operated in accordance with this manual. PG LifeLink reserves the right to modify this policy.

Replacement circuit breakers and Line Isolation Monitors are available. Contact sales at +1 800-287-4123 for current pricing and availability. Have the Sales Order (SO) and panel serial numbers available to assist in verifying compatibility.

The IPS does not contain any user-serviceable parts. Tampering by personnel without prior written authorization from the factory voids the warranty, and may also void applicable agency certifications.
# 9. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Issued</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>00</td>
<td>09/26/2016</td>
<td>Initial Release</td>
</tr>
<tr>
<td>01</td>
<td>07/10/2018</td>
<td>Included updated panel configurations</td>
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**Notes:**

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PG LifeLink

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Experts in Isolated Power Systems since 1957