

Modular Isolated Power Panels

With LIM2010 Line Isolation Monitor
For Healthcare Facilities



MIP/ MIE series modular isolated power panels



Isolated power panels

Features

- Modular Isolated power systems in compliance with NEC and NFPA 99 requirements for wet procedure locations in healthcare facilities
- Designed, built, and tested in accordance with NFPA 70, NFPA 99, UL 1047, CSA C22.1 Part 1, CSA C22.2 No. 204, UL 1022, and UL 1047
- Available for flush- or surface-mounted applications
- Loadcenters available for use with plug-in or bolt-on applications
- Includes advanced LIM2010 line isolation monitor for monitoring total hazard current (THC) - includes self-testing, self-calibration, and a wide variety of additional monitoring points and features
- Field-upgradable or factory-upgradable options include integrated power and ground modules, communication, load monitoring, automatic fault location, and more

Approvals



Ordering Information

Refer to Ordering Information sheet for part number information and backbox dimensions.

Description

Bender isolated power systems are designed to provide isolated power to electrical systems in operating rooms, intensive care units, and other wet procedure locations in healthcare facilities. Designed in strict compliance with modern code and standards requirements including UL 1047, UL 1022, NFPA 99, and NFPA 70, Bender isolated power panels offer the most up-to-date technology for hospitals and other healthcare facilities.

The standard isolated power panel provides power for a single-voltage system with standard features, as well as compatibility with advanced features including fault location and communication. Built-in power receptacles and ground jacks are also available.

Standard features

- Single-phase isolation transformer
- Bender LIM2010 line isolation monitor (LIM)
- Reference ground bus
- Primary circuit breaker
- Branch circuit breakers
- Front trim with branch breaker door and concealed hinge

Backbox

All backboxes are fabricated from minimum 14GA galvanized steel. Surface mounted enclosures are finished with a coat of hospital ivory baked enamel or equivalent.

Front trim

Manufactured from minimum 14GA type 304 stainless steel with #4 brushed finish, the front trim contains a door with fully hidden barrel hinges and a flush mounted key lock covering the loadcenter. A flush mounted trim extends 1 inch on all sides of the backbox. For surface-mounted panelboards, the front trim has the same dimensions as the enclosure.

Isolation transformer

Isolation transformers are available with various primary and secondary, single-phase voltage ratings. Refer to ordering information for available voltages. Transformers include low-leakage, electrostatically shielded windings. Standard isolated power panels contain a single-system, single-output-voltage isolation transformer. The standard transformer frequency is 60 Hz, with 50 Hz options available.

Interior

The interior includes a copper bus loadcenter and primary circuit breaker providing protection for the isolation transformer. Each standard isolated power panel includes sixteen (16) secondary branch circuit breakers, configurable with either plug-in (snap-in) or bolt-on types.

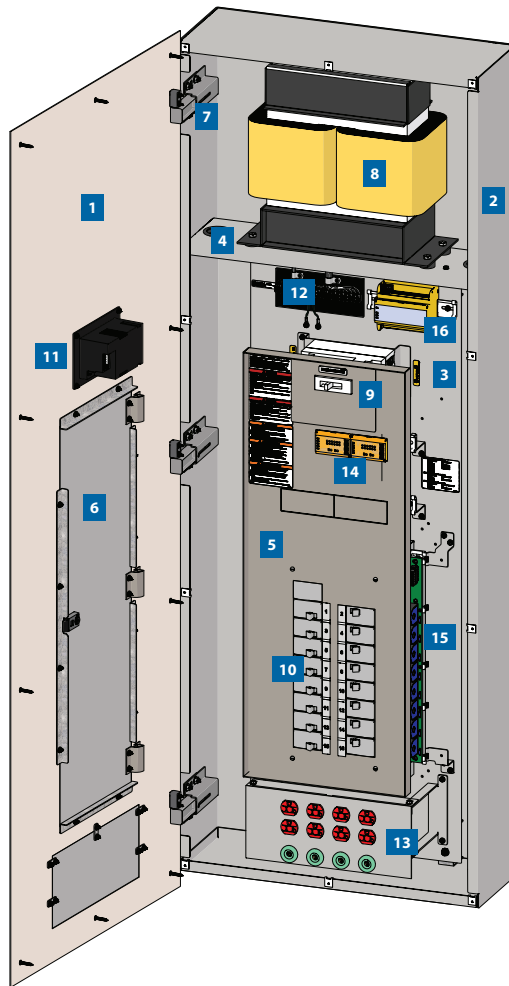
Line isolation monitor

The Bender LIM2010 series line isolation monitor provides both digital and analog displays. The LIM2010 has total hazard current (THC) response values of 2 mA or 5 mA, configured at the factory per regulatory requirements. The LIM2010 utilizes a unique measurement principle capable of detecting all combinations of capacitive and resistive faults, including balanced, unbalanced, and hybrid faults. Self-test and self-calibration functionality is included.

Advanced features

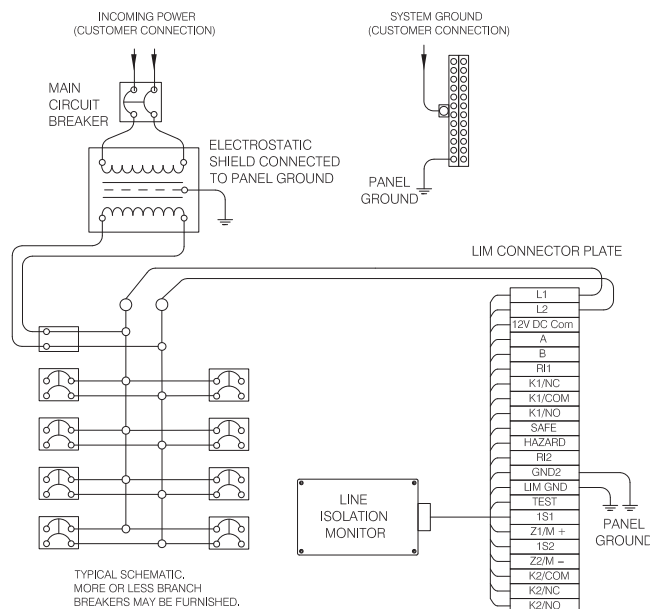
Isolated power panels can be upgraded in the field or at the factory with additional options, including automatic fault location, load monitoring, communication, and power receptacles and ground jacks. Options are upgradable in the field or at the factory.

Isolated power panel components (with optional add-on kits shown)



- 1:** Stainless steel front trim
- 2:** Backbox, galvanized steel
- 3:** Backplate, galvanized steel
- 4:** Transformer shelf
- 5:** Circuit breaker deadfront
- 6:** Stainless steel door with lock
- 7:** Concealed barrel hinge
- 8:** Isolation transformer
- 9:** Main circuit breaker, 2P
- 10:** Branch circuit breakers, 2P
- 11:** Line isolation monitor (LIM)
- 12:** LIM connector plate
- 13:** Receptacle add-on kit: Receptacle and ground jack assembly
- 14:** Fault location add-on kit: Fault location evaluation modules
- 15:** Fault location add-on kit: Branch circuit current transformer assemblies
- 16:** Communication add-on kit: Ethernet and Modbus/TCP gateway module

Sample wiring diagram



MIC series circuit control isolated power panels



Circuit control isolated power panels

Features

- Isolated power systems in compliance with NEC and NFPA 99 requirements for wet procedure locations in healthcare facilities
- Designed, built, and tested in accordance with NFPA 70, NFPA 99, UL 1047, CSA C22.1 Part 1, CSA C22.2 No. 204, UL 1022, and UL 1047
- Available for flush- or surface-mounted applications
- Loadcenters available for use with plug-in or bolt-on applications
- Includes advanced LIM2010 line isolation monitor for monitoring total hazard current (THC) - includes self-testing, self-calibration, and a wide variety of additional monitoring points and features
- Provides PLC-controlled circuit lockout

Approvals



Ordering Information

Refer to Ordering Information sheet for part number information and backbox dimensions.

Description

Bender isolated power systems are designed to provide isolated power to electrical systems in operating rooms, intensive care units, and other wet procedure locations in healthcare facilities. Designed in strict compliance with modern code and standards requirements including UL 1047, UL 1022, NFPA 99, and NFPA 70, Bender isolated power panels offer the most up-to-date technology for hospitals and other healthcare facilities.

Circuit control isolated power panels are designed to feed x-ray and laser receptacles at intervals up to 60 A (within the power rating of the panel). The system utilizes a PLC to lock-out circuits to ensure power consumed remains within the ratings of the system.

Standard features

- Single-phase isolation transformer
- Bender LIM2010 line isolation monitor (LIM)
- Reference ground bus
- Primary circuit breaker
- Branch circuit breakers
- Front trim with branch breaker door and concealed hinge
- Programmable logic controller (PLC)
- Contactors

Backbox

All backboxes are fabricated from minimum 14GA galvanized steel. Surface mounted enclosures are finished with a coat of hospital ivory baked enamel or equivalent.

Front trim

Manufactured from minimum 14GA type 304 stainless steel with #4 brushed finish, the front trim contains a door with fully hidden barrel hinges and a flush mounted key lock covering the loadcenter. A flush mounted trim extends 1 inch on all sides of the backbox. For surface-mounted panelboards, the front trim has the same dimensions as the enclosure.

Isolation transformer

Isolation transformers are available with various primary and secondary, single-phase voltage ratings. Refer to ordering information for available voltages. Transformers include low-leakage, electrostatically shielded windings. Circuit-controlled isolated power panels contain a single-system, single-output-voltage isolation transformer. The standard transformer frequency is 60 Hz, with 50 Hz options available.

Loadcenter

The interior includes a copper bus loadcenter and primary circuit breaker providing protection for the isolation transformer. Circuit controlled systems contain a quantity of branch circuits with varying ratings configured at the factory. A maximum of twelve (12) is supported.

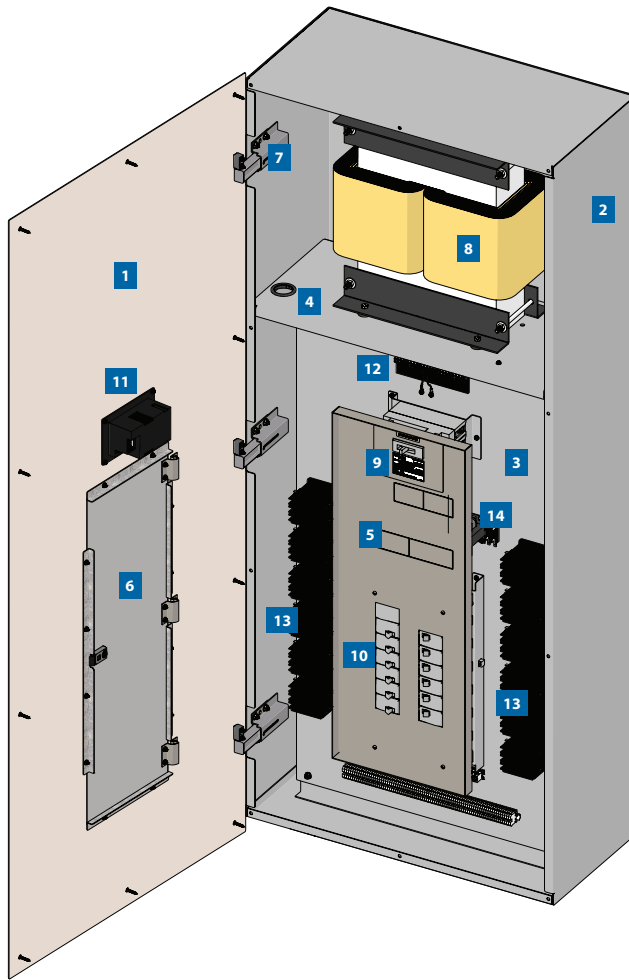
Line isolation monitor

The Bender LIM2010 series line isolation monitor provides both digital and analog displays. The LIM2010 has total hazard current (THC) response values of 2 mA or 5 mA, configured at the factory per regulatory requirements. The LIM2010 utilizes a unique measurement principle capable of detecting all combinations of capacitive and resistive faults, including balanced, unbalanced, and hybrid faults. Self-test and self-calibration functionality is included.

PLC-controlled circuit lockout

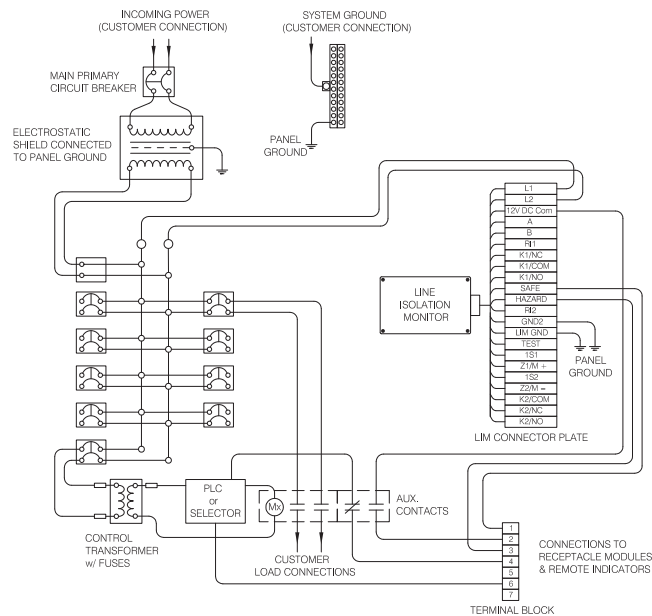
A PLC controls when circuits are available for use. The PLC's control logic is configured to specific system's requirements. Control wiring from push-buttons, door switches, etc. are permanently wired into the input section. Signals or contact closures from the output section may be used to actuate contactors and to apply power to the circuit.

Circuit control isolated power panel components



- 1: Stainless steel front trim
- 2: Backbox, galvanized steel
- 3: Backplate, galvanized steel
- 4: Transformer shelf
- 5: Circuit breaker deadfront
- 6: Stainless steel door with lock
- 7: Concealed barrel hinge
- 8: Isolation transformer
- 9: Main circuit breaker, 2P
- 10: Branch circuit breakers, 2P
- 11: Line isolation monitor (LIM)
- 12: LIM connector plate
- 13: Circuit contactors, 2P
- 14: Programmable logic controller (PLC)

Sample wiring diagram



MID series dual voltage isolated power panels



Isolated Power Panels

Features

- Isolated power systems in compliance with NEC and NFPA 99 requirements for wet procedure locations in healthcare facilities
- Designed, built, and tested in accordance with NFPA 70, NFPA 99, UL 1047, CSA C22.1 Part 1, CSA C22.2 No. 204, UL 1022, and UL 1047
- Available for flush- or surface-mounted applications
- Loadcenters available for use with plug-in or bolt-on applications
- Includes advanced LIM2010 line isolation monitor for monitoring total hazard current (THC) - includes self-testing, self-calibration, and a wide variety of additional monitoring points and features
- Provides two different output voltages simultaneously using a single isolation transformer
- Additional options include communication, load monitoring, automatic fault location, and more

Approvals



Ordering Information

Refer to Ordering Information sheet for part number information and backbox dimensions.

Description

Bender isolated power systems are designed to provide isolated power to electrical systems in operating rooms, intensive care units, and other wet procedure locations in healthcare facilities. Designed in strict compliance with modern code and standards requirements including UL 1047, UL 1022, NFPA 99, and NFPA 70, Bender isolated power panels offer the most up-to-date technology for hospitals and other healthcare facilities.

The dual voltage isolated power panel provides two separate voltages using a single isolation transformer. Dual voltage panels are compatible with advanced features including fault location and communication.

Standard features

- Single-phase, dual-output-voltage isolation transformer
- Bender LIM2010 line isolation monitor (LIM)
- Reference ground bus
- Primary circuit breaker
- Secondary main circuit breaker for low (120V) side
- Branch circuit breakers for low (120V) side
- Provisions for 2-pole branch circuit breakers for high (208V or 240V) side
- Front trim with branch breaker door and concealed hinge

Backbox

All backboxes are fabricated from minimum 14GA galvanized steel. Surface mounted enclosures are finished with a coat of hospital ivory baked enamel or equivalent.

Front trim

Manufactured from minimum 14GA type 304 stainless steel with #4 brushed finish, the front trim contains a door with fully hidden barrel hinges and a flush mounted key lock covering the loadcenter. A flush mounted trim extends 1 inch on all sides of the backbox. For surface-mounted panelboards, the front trim has the same dimensions as the enclosure.

Isolation transformer

Isolation transformers are available with various primary and secondary, single-phase voltage ratings. Refer to ordering information for available voltages. The transformer provides two separate output voltages. Typical configurations include one side with 208 or 240 VAC fixed at 15 kVA, with the second side configured for 120 VAC at 5, 7.5, or 10 kVA.

Loadcenter

The interior includes a copper bus loadcenter and primary circuit breaker providing protection for the isolation transformer. Typical dual voltage panels include the quantity of breakers listed above in the "Standard features" section.

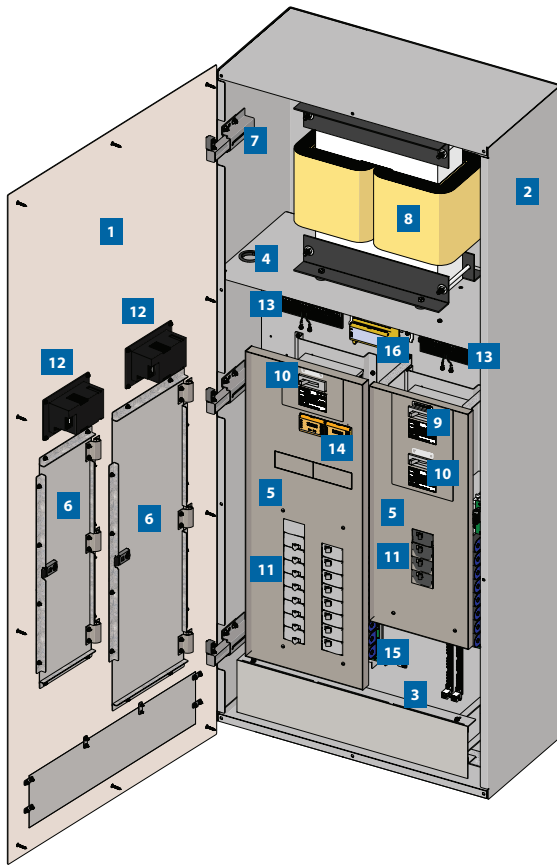
Line isolation monitor

The Bender LIM2010 series line isolation monitor provides both digital and analog displays. The LIM2010 has total hazard current (THC) response values of 2 mA or 5 mA, configured at the factory per regulatory requirements. The LIM2010 utilizes a unique measurement principle capable of detecting all combinations of capacitive and resistive faults, including balanced, unbalanced, and hybrid faults. Self-test and self-calibration functionality is included. Dual voltage systems contain two LIM2010 modules, each monitoring an output voltage.

Advanced features

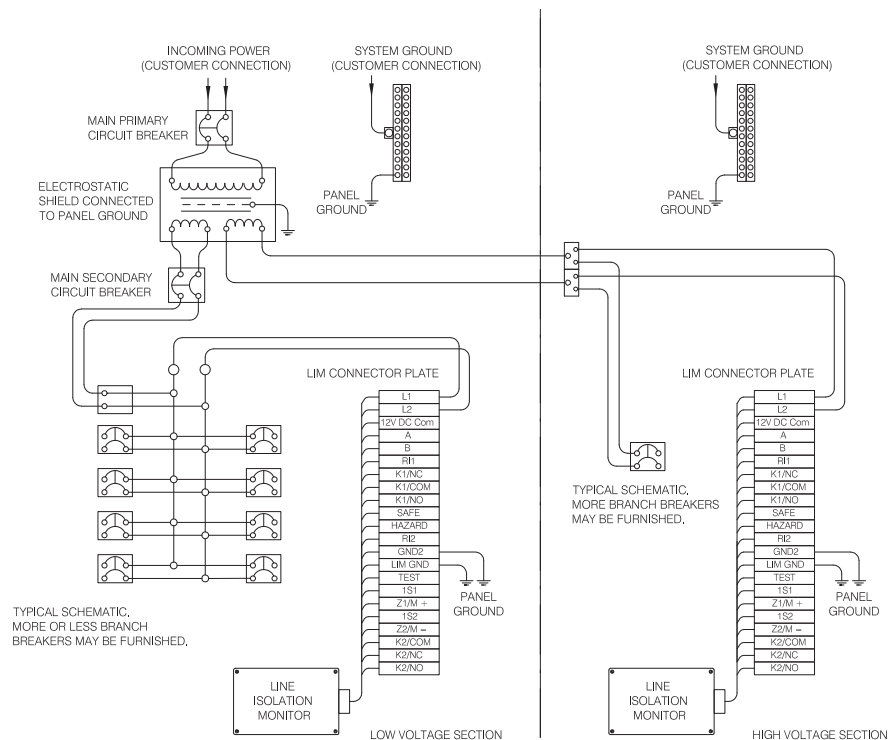
Standard isolated power panels are compatible with Bender's advanced expansion features, including automatic fault location and communication.

Dual voltage isolated power panel components (with optional add-on kits shown)



- 1:** Stainless steel front trim
- 2:** Backbox, galvanized steel
- 3:** Backplate, galvanized steel
- 4:** Transformer shelf
- 5:** Circuit breaker deadfronts
- 6:** Stainless steel doors with lock
- 7:** Concealed barrel hinge
- 8:** Isolation transformer
- 9:** Main, primary circuit breaker, 2P
- 10:** Main, secondary circuit breaker, 2P
- 11:** Branch circuit breakers, 2P
- 12:** Line isolation monitors (LIM)
- 13:** LIM connector plate
- 14:** Fault location add-on kit: Fault location evaluation modules
- 15:** Fault location add-on kit: Branch circuit current transformer assemblies
- 16:** Communication add-on kit: Ethernet and Modbus/TCP gateway module

Sample wiring diagram



MIX series dual system isolated power panels



Isolated Power Panels

Features

- Isolated power systems in compliance with NEC and NFPA 99 requirements for wet procedure locations in healthcare facilities
- Designed, built, and tested in accordance with NFPA 70, NFPA 99, UL 1047, CSA C22.1 Part 1, CSA C22.2 No. 204, UL 1022, and UL 1047
- Available for flush- or surface-mounted applications
- Loadcenters available for use with plug-in or bolt-on applications
- Includes advanced LIM2010 line isolation monitor for monitoring total hazard current (THC) - includes self-testing, self-calibration, and a wide variety of additional monitoring points and features
- Provides two separate power systems from two isolation transformers in one enclosure
- Additional options include integrated power and ground modules, communication, load monitoring, automatic fault location, and more

Approvals



Ordering Information

Refer to Ordering Information sheet for part number information and backbox dimensions.

Description

Bender isolated power systems are designed to provide isolated power to electrical systems in operating rooms, intensive care units, and other wet procedure locations in healthcare facilities. Designed in strict compliance with modern code and standards requirements including UL 1047, UL 1022, NFPA 99, and NFPA 70, Bender isolated power panels offer the most up-to-date technology for hospitals and other healthcare facilities.

Dual system isolated power panels provide power to two separate systems (using two isolation transformers) from the convenience of one enclosure. Dual system panels are compatible with advanced features including fault location and communication. Built-in power receptacles and ground jacks are also available.

Standard features

- Two separate systems, each containing the following:
 - Single-phase isolation transformer
 - Bender LIM2010 line isolation monitor (LIM)
 - Reference ground bus
 - Primary circuit breaker
 - Branch circuit breakers

Backbox

All backboxes are fabricated from minimum 14GA galvanized steel. Surface mounted enclosures are finished with a coat of hospital ivory baked enamel or equivalent.

Front trim

Manufactured from minimum 14GA type 304 stainless steel with #4 brushed finish, the front trim contains a door with fully hidden barrel hinges and a flush mounted key lock covering the loadcenter. A flush mounted trim extends 1 inch on all sides of the backbox. For surface-mounted panelboards, the front trim has the same dimensions as the enclosure.

Isolation transformer

Isolation transformers are available with various primary and secondary, single-phase voltage ratings. Refer to ordering information for available voltages. Dual system isolated power panels contain two single-system, single-output-voltage isolation transformers, each individually configurable.

Loadcenter

The loadcenter includes a primary circuit breaker providing protection for the isolation transformer. Each side of dual system isolated power panel includes sixteen (16) secondary branch circuit breakers, configurable with either plug-in (snap-in) or bolt-on types.

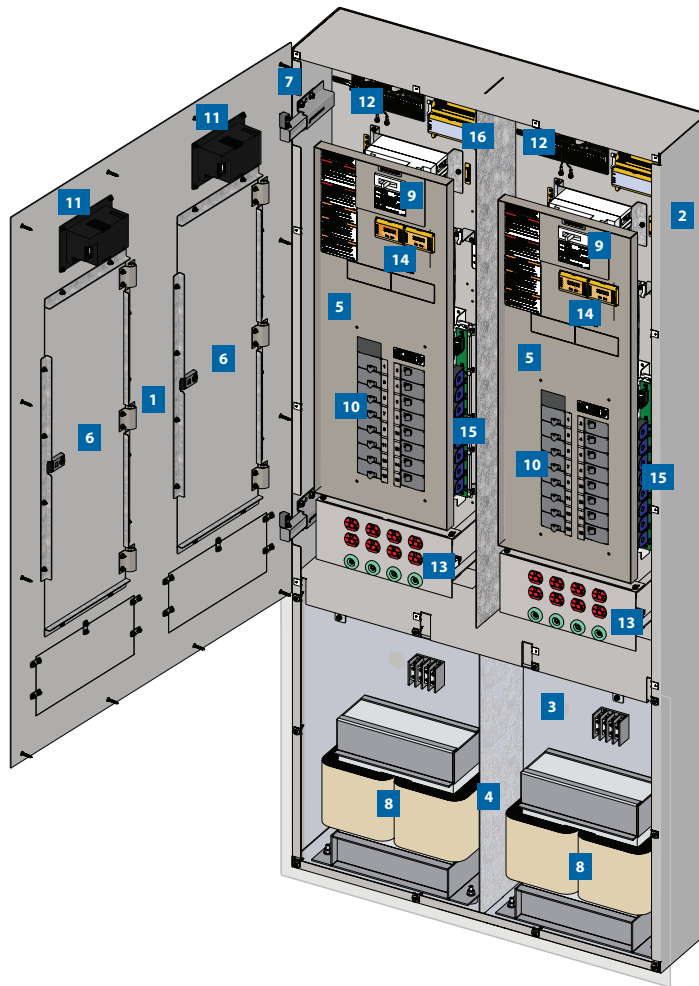
Line isolation monitor

The Bender LIM2010 series line isolation monitor provides both digital and analog displays. The LIM2010 has total hazard current (THC) response values of 2 mA or 5 mA, configured at the factory per regulatory requirements. The LIM2010 utilizes a unique measurement principle capable of detecting all combinations of capacitive and resistive faults, including balanced, unbalanced, and hybrid faults. Self-test and self-calibration functionality is included. Dual system panels include two LIM2010 modules, one monitoring each side.

Advanced features

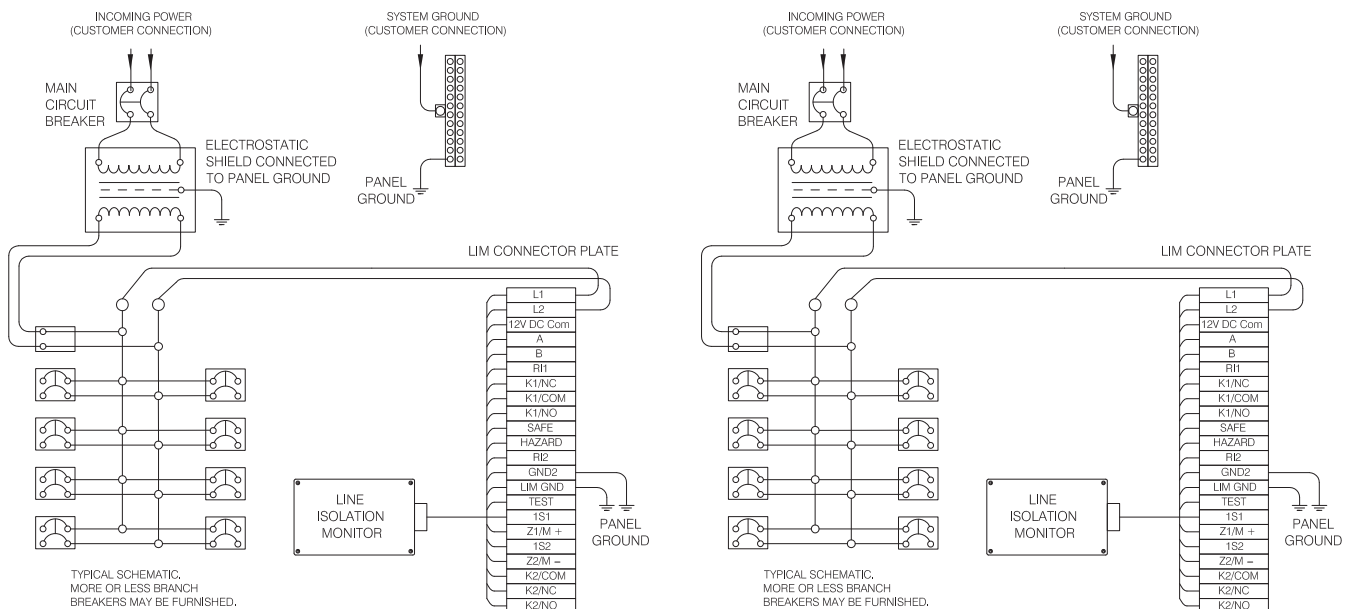
Dual system isolated power panels are compatible with Bender's advanced expansion features, including automatic fault location, communication, and power receptacles and ground jacks.

Dual system isolated power panel components (with optional add-on kits shown, only one system labeled)



- 1: Stainless steel front trim
- 2: Backbox, galvanized steel
- 3: Backplate, galvanized steel
- 4: Transformer shelf
- 5: Circuit breaker deadfront
- 6: Stainless steel door with lock
- 7: Concealed barrel hinge
- 8: Isolation transformer
- 9: Main circuit breaker, 2P
- 10: Branch circuit breakers, 2P
- 11: Line isolation monitor (LIM)
- 12: LIM connector plate
- 13: Receptacle add-on kit: Receptacle and ground jack assembly
- 14: Fault location add-on kit: Fault location evaluation modules
- 15: Fault location add-on kit: Branch circuit current transformer assemblies
- 16: Communication add-on kit: Ethernet and Modbus/TCP gateway module

Sample wiring diagram



Standard panel features

New barrel hinge

The new panel hinge is designed to completely conceal the hinge when closed. It allows for easy cleaning while preventing small debris from accumulating. The new hinge system allows for simple installation and removal by technicians. The knuckle of the hinge easily slides in and out of the backbox.



Modular isolation transformer kit

Each transformer kit includes one isolation transformer, one main circuit breaker, and mounting hardware. Transformer kits are adaptable to changing project demands without requiring complete uninstallation / removal of branch circuit conductors.

Achieving 0.1s selective coordination available on select configurations.

LIM2010 line isolation monitor

The Bender LIM2010 line isolation monitor uses the latest technology to monitor the system's total hazard current (THC) in isolated power systems. Alarm indications are shown on the device's seven segment display, LED bar graph, and digital display. A wide range of additional alarms are available, including transformer overload, transformer temperature, overvoltage / undervoltage, and more.

The LIM2010 operates universally on isolated power systems 100 to 240 VAC, 50 or 60 Hz. No auxiliary supply voltage is required.

Additionally, the LIM2010 supports Bender's advanced features including fault location and communication.



Advanced panel features



Remote communication and BMS integration

Adds remote communication capabilities to isolated power systems. The expansion kit can be added at the factory or post-installation with easy-to-install upgrade kits.

Bender's COM465IP gives technicians and staff the ability to see the status of their isolated power systems in real-time. An integrated web server can be accessed from any network-connected PC or smartphone.

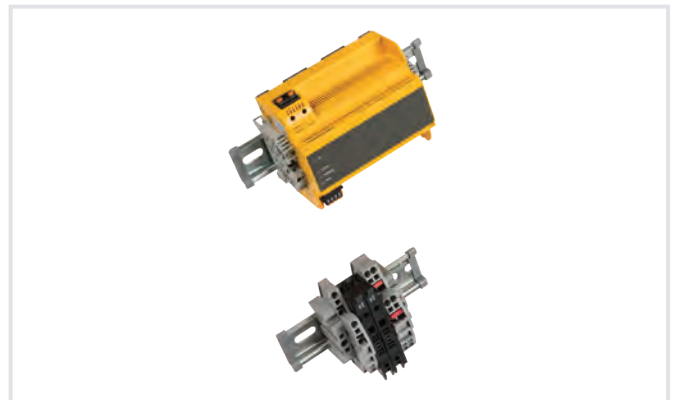
Additionally, the COM465IP acts as a Modbus TCP gateway, providing integration capabilities into building management systems.

Automated fault location

Adds Bender's EDS fault location system to isolated power systems. The expansion kit can be added at the factory or post-installation with easy-to-install upgrade kits.

Bender's EDS system provides automated location of faults down to the branch or receptacle level while the system remains online and without the need of shutting off breakers. Once a total hazard current alarm is detected, the system activates automatically. The faulty circuit is indicated on the fault location modules.

Communication is also supported to remotely notify staff of faulty equipment.



Power receptacles and ground jacks

Adds power receptacles and ground jacks, directly accessible from the isolated power panel. The expansion kit can be added at the factory or post-installation with easy-to-install upgrade kits.

Bender's receptacle and ground jack kit is highly configurable, allowing a customizable quantity and type of hospital grade receptacles and ground jacks.

System and branch load monitoring

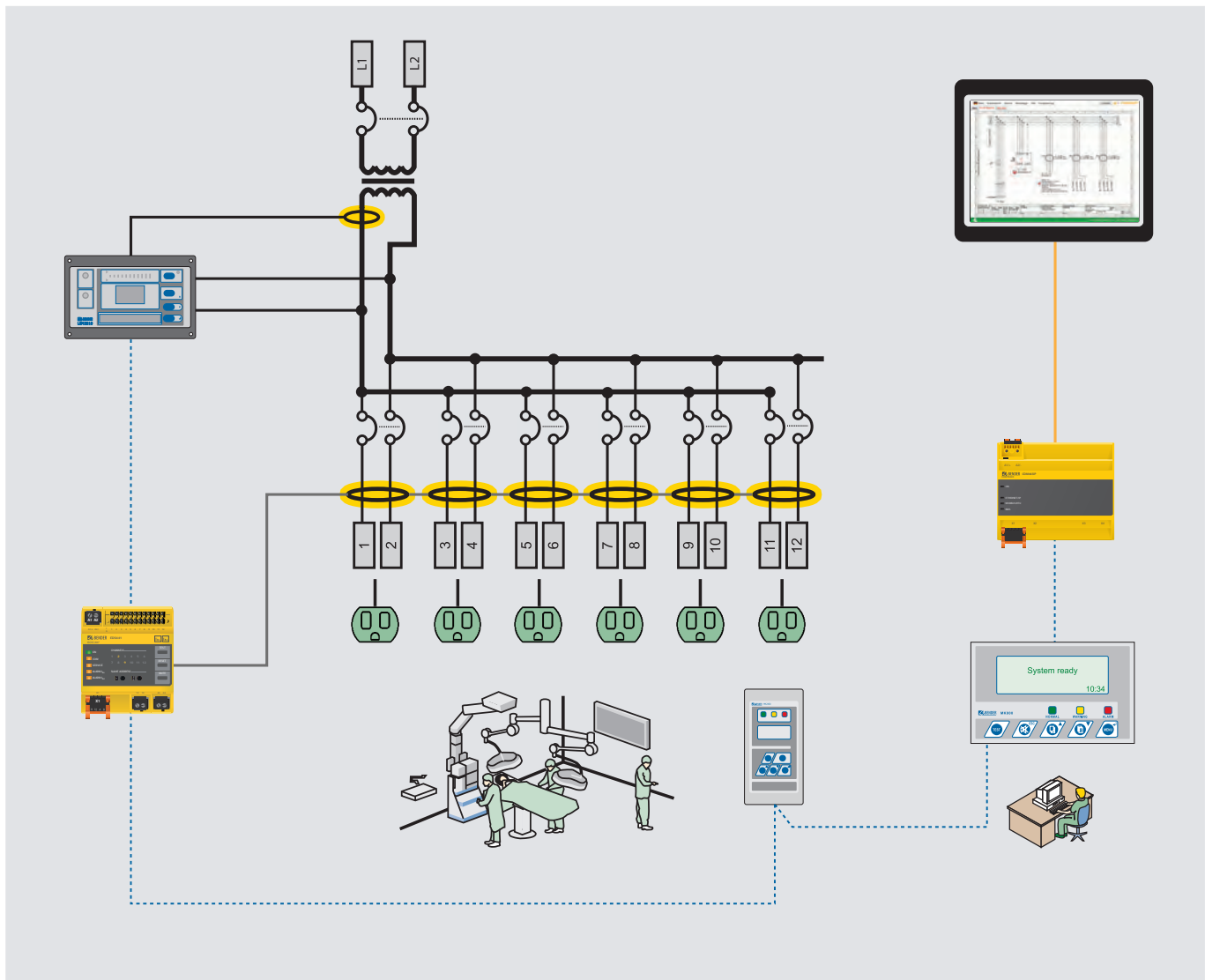
Two separate options add load monitoring capability to isolated power systems. The expansion kit can be added at the factory or post-installation with easy-to-install upgrade kits.

System load monitoring utilizes the STW3 current transformer. The STW3 connects to the LIM2010 and provides alarm notification when the total system load current reaches a set threshold.

Branch load monitoring is provided by two CMS460 relays. The load current of each individual branch is monitored. Independent alarm values can be set for each branch circuit.



Additional features: Automatic fault location

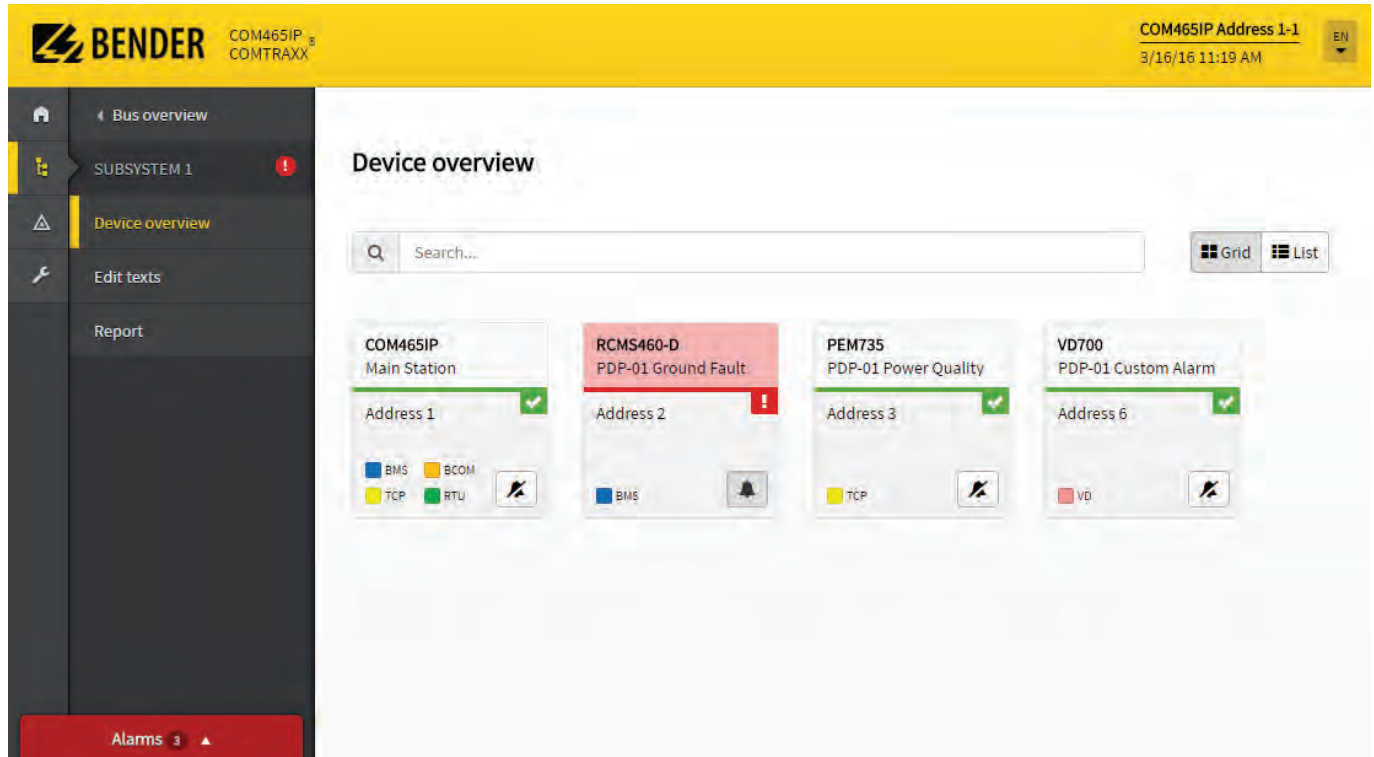


Automated fault location while the system remains online

- Fast, automated location of ground faults while the system remains online
- Reduced maintenance costs and downtime
- Available built into panel, modular design also allows for simple retrofitting and upgrading
- Indication of faulty circuit shown on module at panel (EDS441), at remote indicating station (MK2430 / MK800), and at remote station through web browser-based GUI or Modbus/TCP (COM465IP)
- Current transformers for fault location built into panel as option, simple landing terminals provided for branch wiring

Additional features: Communication

- Easy to use status indication for connected devices
- Unified status screen for devices connected across multiple communication buses (Bender RS-485 bus, Bender Ethernet bus, Modbus/RTU, Modbus/TCP)
- Drill-down for each device shows detailed readings information, including readings for all branches for multi-channel devices
- Configure compatible connected devices remotely
- Modern design - HTML5-based interface, works in most modern web browsers
- Responsive layout - touch-friendly layout for mobile devices
- Grid-type and list-type views available for viewing status
- Create custom system visualizations
- Custom alarms created using virtual setpoints appear in the same list as connected devices



Custom labeling and e-mail notifications - option A

- Create custom identification labels for devices and alarms
- E-mail notifications and reporting

Full Modbus/TCP communication - option B

- Acts as a gateway to Modbus/TCP networks for all connected Bender devices
- Supports two-way communication: Read data, and control devices from Modbus master (PLC, software, etc.)

Remote device settings and configuration - option C

- Configure connected Bender devices remotely from the COM465IP's web interface
- Reporting function for importing / exporting saved settings and measured values for connected Bender devices

System visualization - option D

- Fast, comprehensive system visualizations, no programming required
- Device status, alarms, and measured values can be arranged and displayed on a system plan image, such as a room layout
- Customizable to specific facilities or customer requirements

Virtual devices and alarms - option E

- Create custom alarms using mathematical operations or combinations of multiple devices / alarms

Third party device integration - option F

- Add up to 1600 data points from third-party Modbus devices and display them on the web interface

* One COM465IP can view up to 99 device addresses. Multiple COM465IP modules may be connected to add more.



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