



SOFTWARE VERSION 5.0

WWW.PRG.COM

PRG SERIES 400[®] POWER & DATA DISTRIBUTION SYSTEM

USER MANUAL

AutoPar®, Bad Boy®, Best Boy®, Followspot Controller™, Mbox®, Mini Node™, Nocturne®, Series 400®, ReNEW®, Super Node™, UV Bullet™, V476®, V676®, Virtuoso®, and White Light Bullet™, are trademarks of Production Resource Group, LLC, registered in the U.S. and other countries.

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PRG Series 400® Power and Data Distribution System User Manual

Version as of: September 30, 2015

PRG part number: 02.9680.0001 E

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PRG Series 400® Power and Data Distribution System User Manual
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FOREWORD

Safety Notice

It is extremely important to read ALL safety information and instructions provided in this manual and any accompanying documentation before installing and operating the products described herein. Heed all cautions and warnings during installation and use of this product.

Safety symbols used throughout this manual are as follows:



CAUTION advising of potential damage to product.



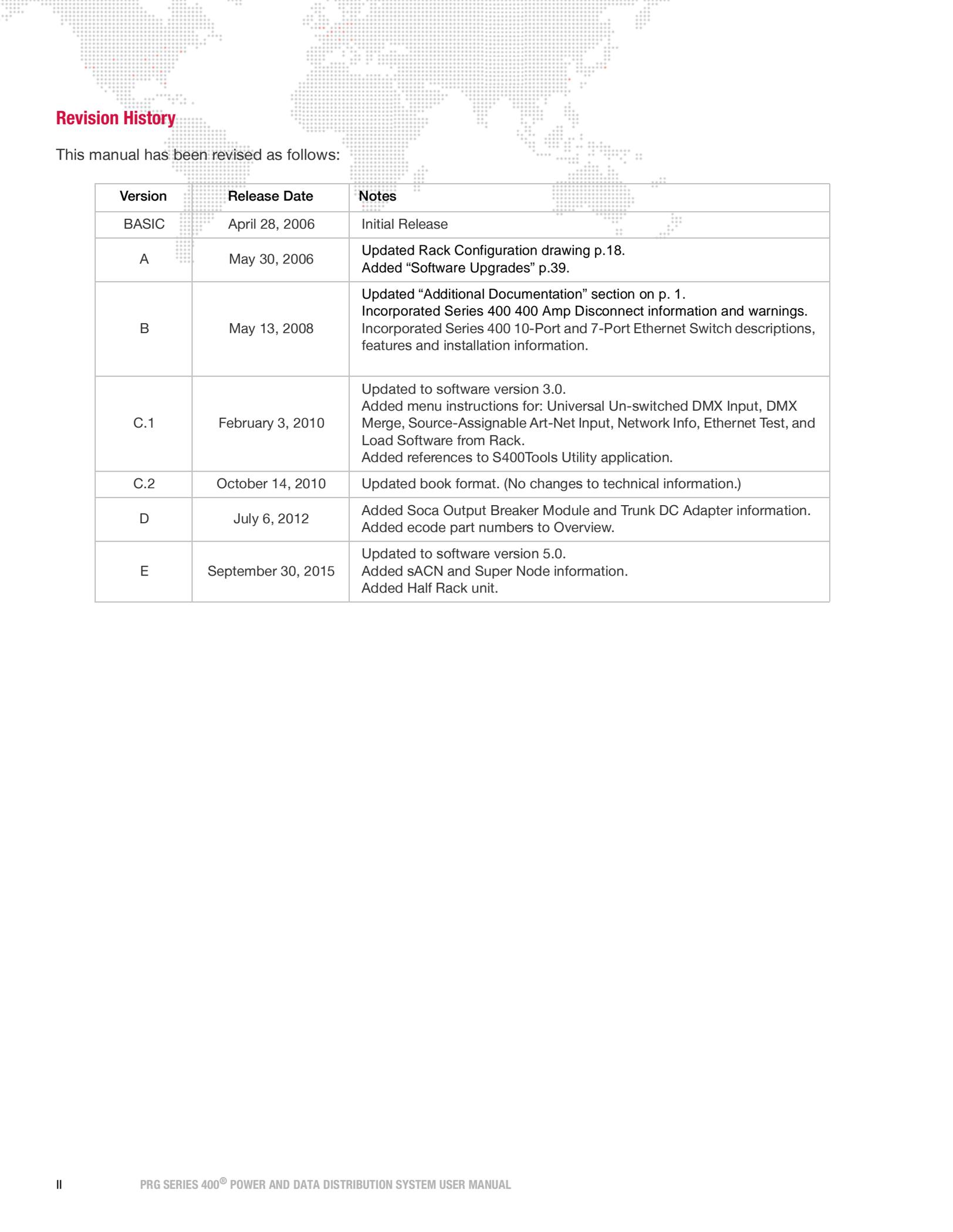
WARNING advising of potential injury or death to persons.

WARNING: INSTRUCTIONS FOR CONTINUED PROTECTION AGAINST ELECTRICAL SHOCK

- 1) This equipment is designed for dry locations only. Exposure to rain or moisture may damage the equipment and/or cause injury to persons.
- 2) Ensure house service mains breaker and rack Master Switch are OFF before connecting mains power cables to rack.
- 3) Follow mains power cable Cam-Lok connection order as specified on rack and in this manual.
- 4) Disconnect power before servicing.
- 5) Servicing to be performed by qualified PRG personnel only.

WARNING: RF INTERFERENCE

- 1) This is a Class A product. In a domestic environment this product may cause radio interference, in which case, the user may be required to take adequate measures.



Revision History

This manual has been revised as follows:

Version	Release Date	Notes
BASIC	April 28, 2006	Initial Release
A	May 30, 2006	Updated Rack Configuration drawing p.18. Added "Software Upgrades" p.39.
B	May 13, 2008	Updated "Additional Documentation" section on p. 1. Incorporated Series 400 400 Amp Disconnect information and warnings. Incorporated Series 400 10-Port and 7-Port Ethernet Switch descriptions, features and installation information.
C.1	February 3, 2010	Updated to software version 3.0. Added menu instructions for: Universal Un-switched DMX Input, DMX Merge, Source-Assignable Art-Net Input, Network Info, Ethernet Test, and Load Software from Rack. Added references to S400Tools Utility application.
C.2	October 14, 2010	Updated book format. (No changes to technical information.)
D	July 6, 2012	Added Soca Output Breaker Module and Trunk DC Adapter information. Added ecode part numbers to Overview.
E	September 30, 2015	Updated to software version 5.0. Added sACN and Super Node information. Added Half Rack unit.

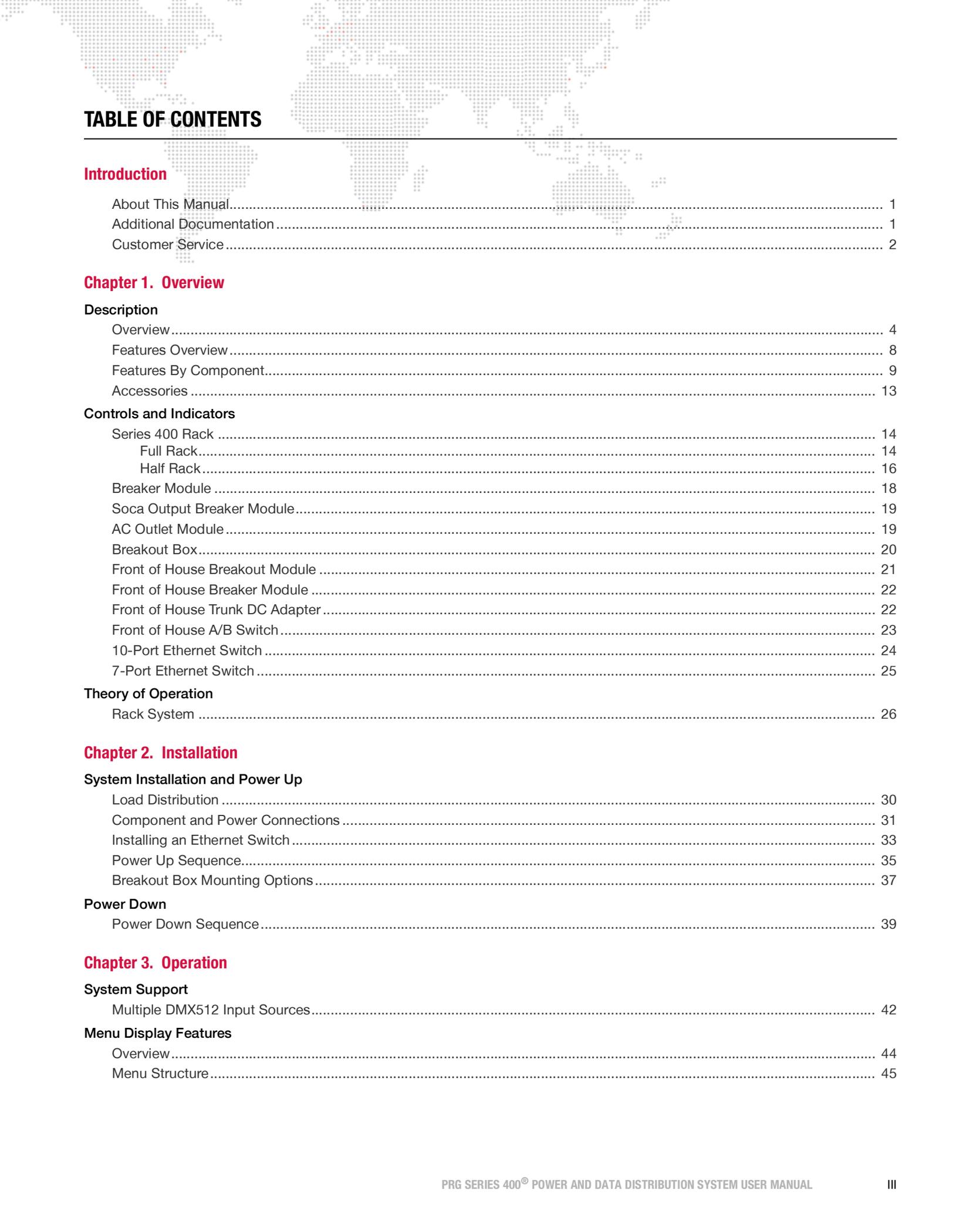


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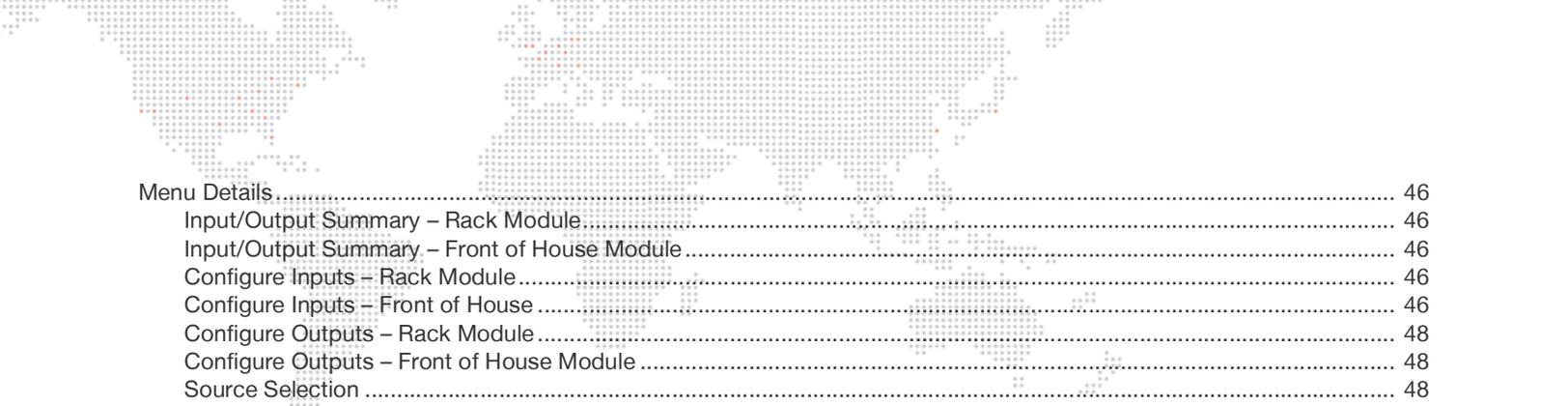
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INTRODUCTION

About This Manual

This manual provides necessary information regarding product safety, installation, and operation for the following PRG equipment:

- + PRG Series 400® Power and Data Distribution System - 120/208V Model (U.S. / Canada)

This manual applies to S400 software version 5.0.

Familiarizing yourself with this information will help you get the most out of your PRG product.



WARNING: It is important to read ALL accompanying safety and installation instructions to avoid damage to the product and potential injury to yourself or others.

Additional Documentation

For more information on PRG Series 400® components and systems, refer to the following PRG manuals:

- + PRG Series 400® 400 Amp Disconnect User Manual (02.9680.0200)
- + PRG Series 400® Ethernet Switch User Manual (02.9801.0001)
- + PRG Super Node™ User Manual (02.9821.0001)
- + PRG Node Plus User Manual (02.9801.0301)
- + PRG Node User Manual (02.9669.0001)
- + PRG Lighting Systems Networking Guide (02.3004.1000.0)
- + S400Tools Utility User Manual (02.9680.0020.10)
(S400Tools Utility is an offline application used for remote control, configuration, and monitoring of Series 400 systems.)

For extended service information, refer to the following PRG manual:

- + PRG Series 400® Power and Data Distribution System Service Manual (02.9680.0010)

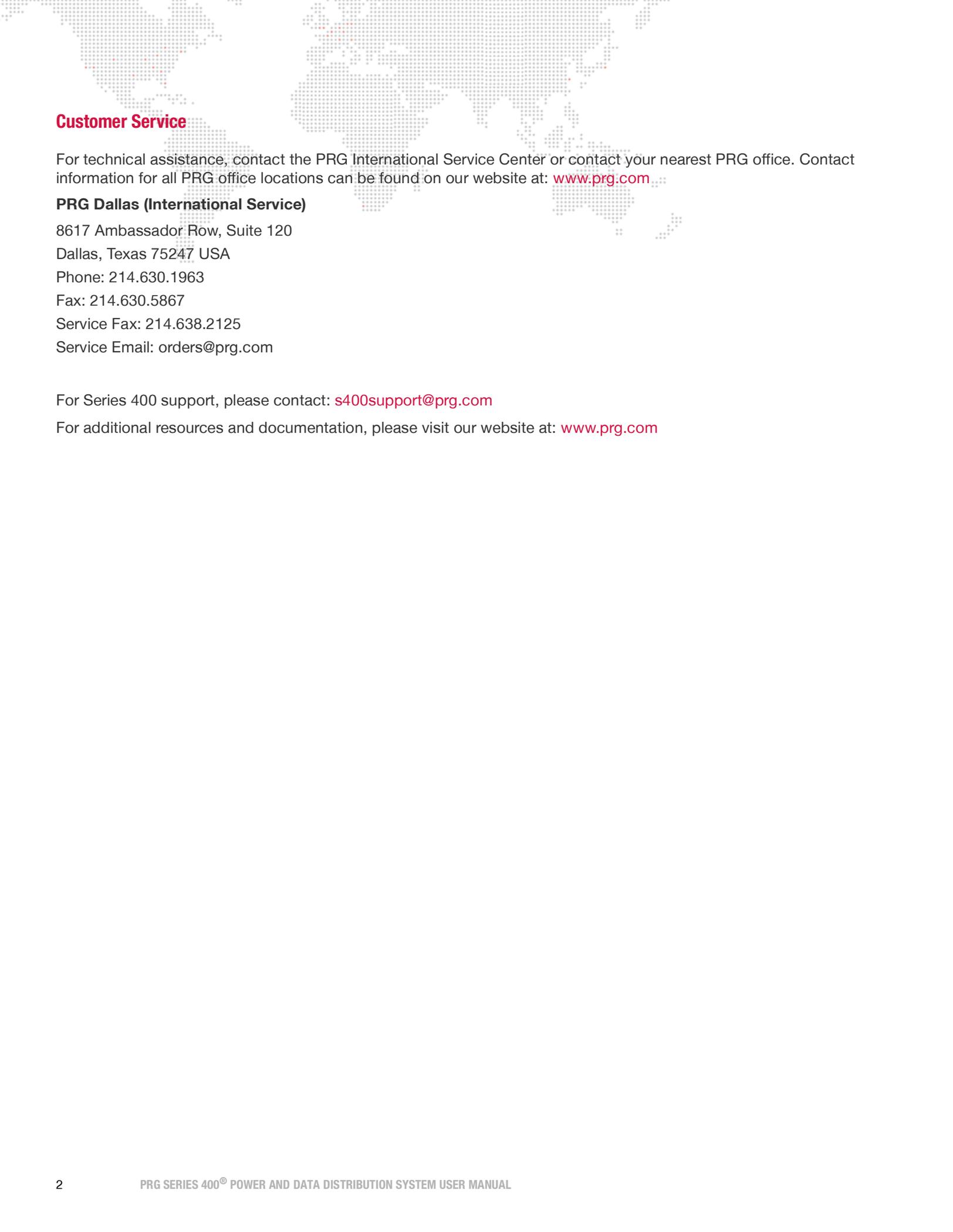
For more information about DMX512 and sACN protocols, refer to the following documents available from the American National Standards Institute (ANSI) at www.ansi.org:

- + ANSI E1.11 - 2008 (R2013)
Entertainment Technology - USITT DMX512-A, Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories
- + ANSI E1.31 - 2009
Entertainment Technology – Lightweight streaming protocol for transport of DMX512 using ACN
- + ANSI E1.20 - 2010
Entertainment Technology-RDM-Remote Device Management over USITT DMX512 Networks

The above documents are also available for free in electronic format at tsp.plasa.org

For more information about Art-Net, refer to the following document available from Artistic Licence Engineering at www.artisticlicence.com:

- + Specification for the Art-Net Ethernet Protocol



Customer Service

For technical assistance, contact the PRG International Service Center or contact your nearest PRG office. Contact information for all PRG office locations can be found on our website at: www.prg.com

PRG Dallas (International Service)

8617 Ambassador Row, Suite 120

Dallas, Texas 75247 USA

Phone: 214.630.1963

Fax: 214.630.5867

Service Fax: 214.638.2125

Service Email: orders@prg.com

For Series 400 support, please contact: s400support@prg.com

For additional resources and documentation, please visit our website at: www.prg.com



1.

OVERVIEW

This chapter provides an overview of product features, components, and system configurations.

- + DESCRIPTION
- + CONTROLS AND INDICATORS
- + THEORY OF OPERATION

DESCRIPTION

Overview

The standard Series 400 System consists of a Rolling Rack unit (either full rack or half rack), up to six 3U Breaker Modules, and associated Breakout Boxes connected by Trunk Cables. The rack is designed to distribute house power service and control signals for the purpose of operating automated luminaires or other remote devices up to 500 feet away.

Optional components include the Front of House (FOH) Breaker and Breakout Modules, which provides a convenient method of connecting consoles and accessories at the mix riser position. The FOH Breaker Module sources two sets of six 15-Amp circuits of AC line power and provides system control data inputs for up to 10 USITT DMX512 universes along with inputs for two 10/100BaseT Ethernet signals at the associated FOH Breakout Module.

The FOH A/B Switch is connected to the FOH Breakout Module and can be used to input and track multiple DMX512 universes. The Trunk DC Adapter can be used to power the internal circuit boards in all versions of the FOH Breakout Modules. This will enable multiple DMX512 Universes to be converted to Ethernet outputs.

Note: Refer to "Controls and Indicators" on page 14 for more specifics on component operation.

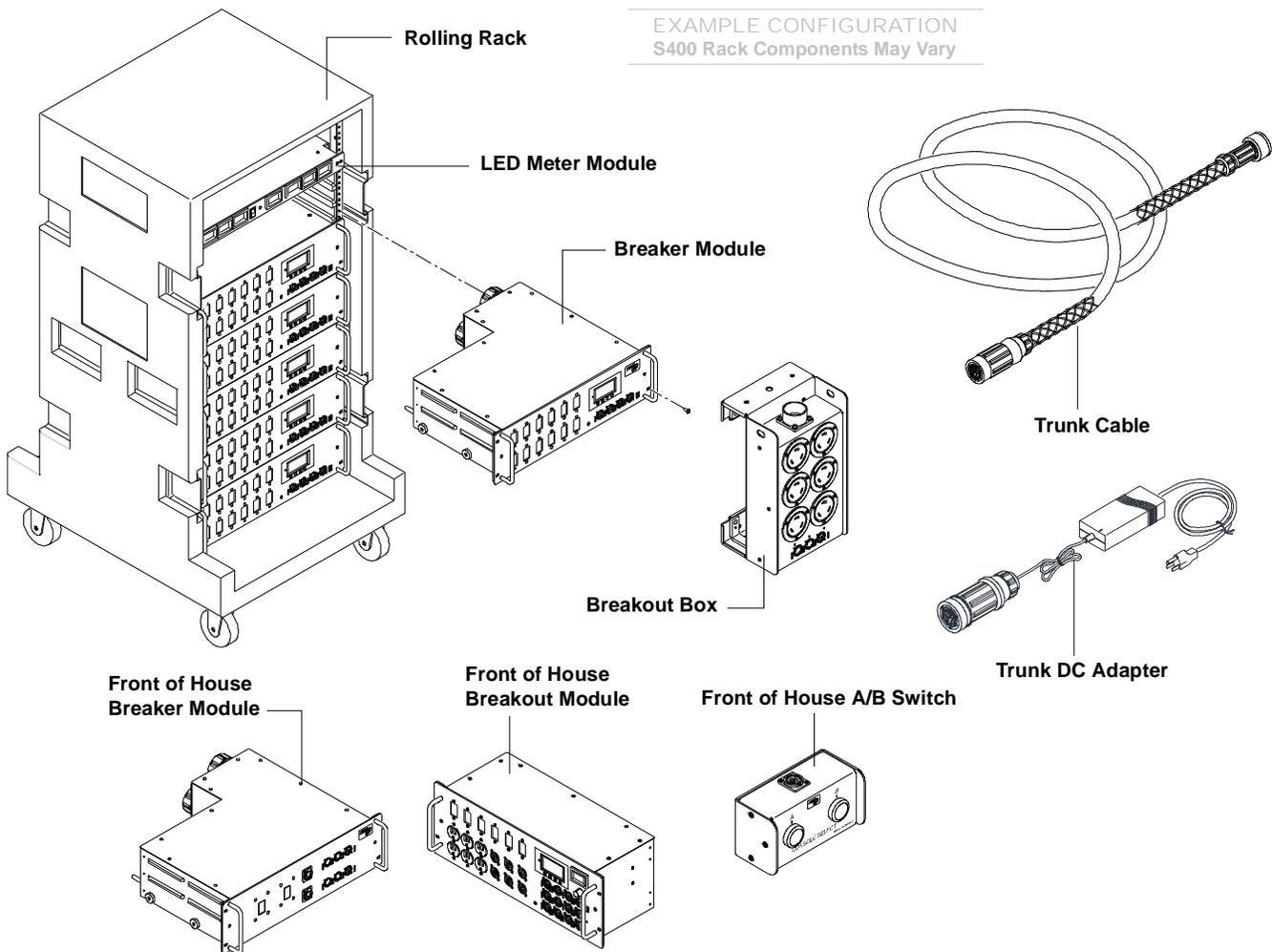


Figure 1-1: Series 400 Rack Components Overview

There are two types of rolling rack units:

- + **Full Rack** - includes a standard LED Meter Module and will accept up to six 3U Breaker Modules. Includes a variety of built-in convenience outlets for powering additional components.
- + **Half Rack** - includes a standard LED Meter Module and will accept up to three 3U Breaker Modules. An optional AC Outlet Module can be used with the Half Rack to provide convenience outlets for powering additional components.

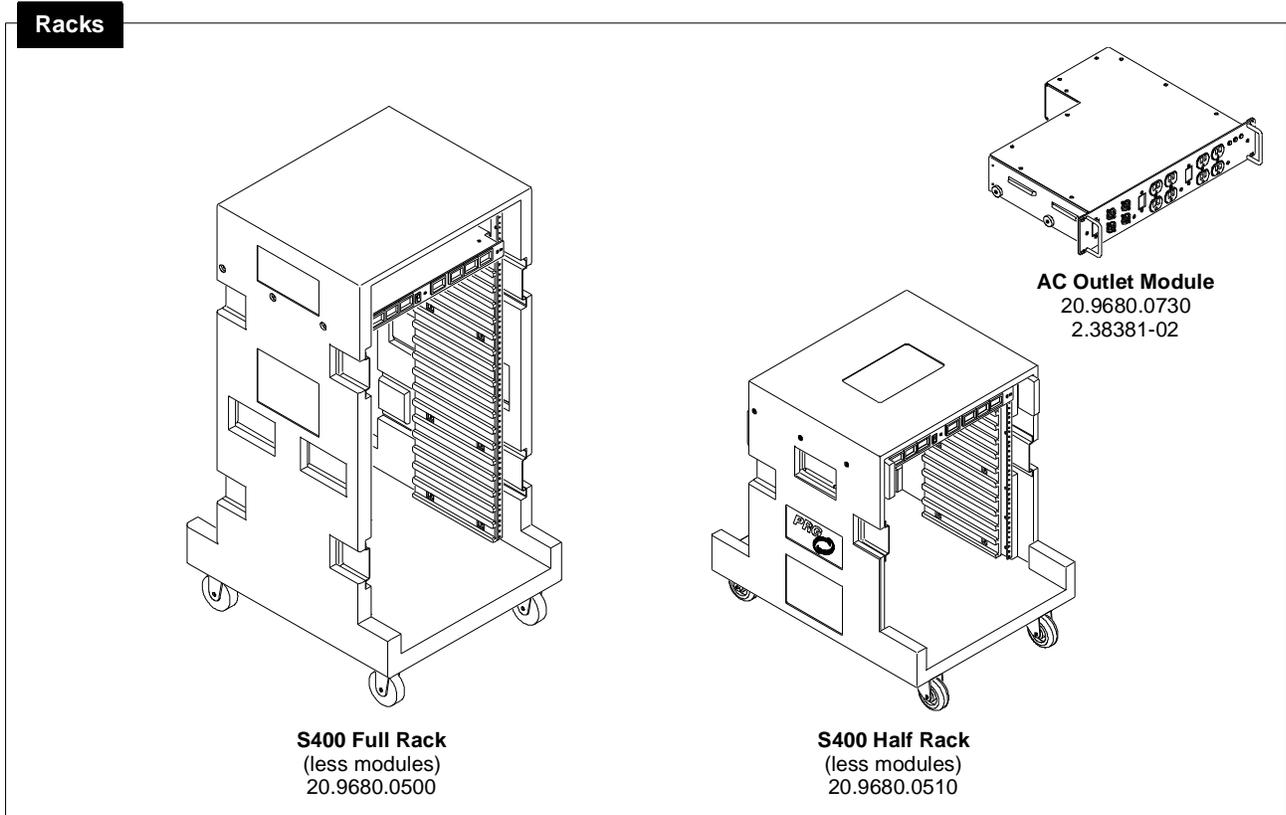


Figure 1-2: S400 Rack Units

A 400 Amp Disconnect is also available.

The Series 400 400 Amp Disconnect interrupts the 3-phase current flow under fault conditions, preventing dangerous overloads of the feeder cables. The Series 400 Disconnect may be used with the PRG Series 400 Power and Data Distribution System, other power distribution systems, and with portable power sources (generators) as long as its ratings are not exceeded and an adequate Earth ground has been established.

For more information about the use of this component, refer to the PRG Series 400 400 Amp Disconnect User Manual (02.9680.0200).

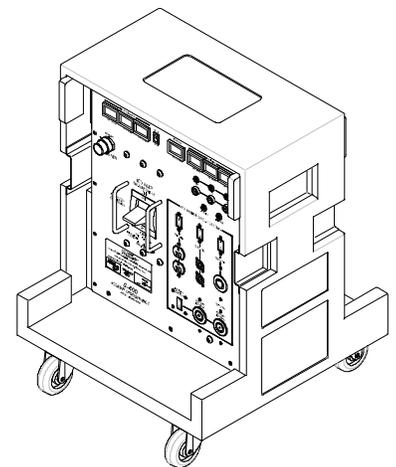
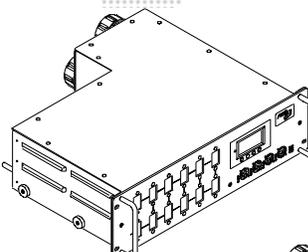


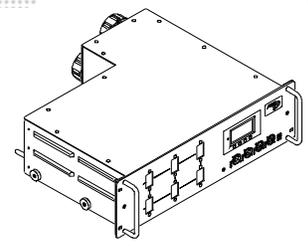
Figure 1-3: S400 Disconnect

Depending on the application, there are several model types available for Series 400 Breaker Modules and Breakout Boxes. Models are as follows:

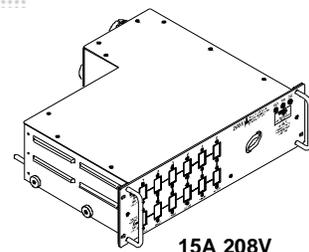
Breaker Modules



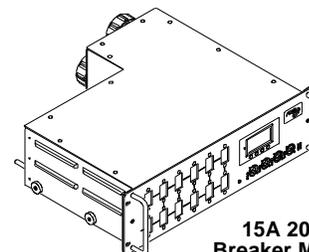
**15A 120V
Breaker Module**
20.9680.1915
2.38380-05



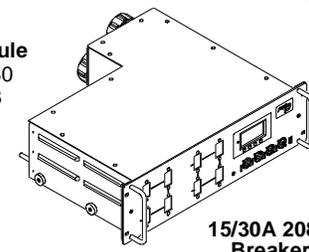
**30A 208V
Breaker Module**
20.9680.2630
2.38380-18



**15A 208V
Soca Output
Breaker Module**
20.9680.2715
2.38380-16

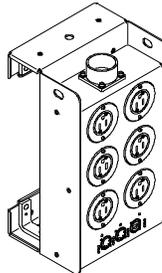


**15A 208V
Breaker Module**
20.9680.2915
2.38380-15

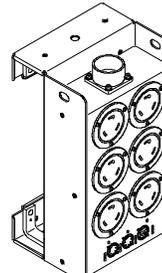


**15/30A 208V (mixed)
Breaker Module**
20.9680.2815
2.38380-17

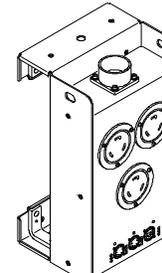
Breakout Boxes



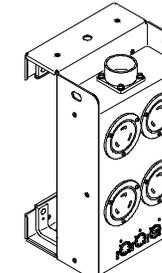
**15A 120V
Breakout Box**
20.9680.5615
2.38380-25



**15A 208V
Breakout Box**
20.9680.6615
2.38380-35

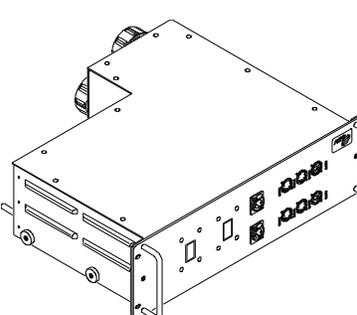


**30A 208V
Breakout Box**
20.9680.6330
2.38380-38

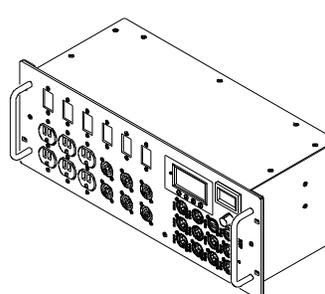


**15/30A 208V
Breakout Box**
20.9680.6415
2.38380-37

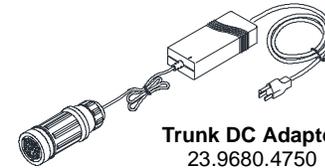
Front of House (FOH) Components



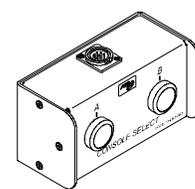
Front of House Breaker Module
20.9680.2245
2.38380-19



Front of House Breakout Module
20.9680.8615
2.38380-39



Trunk DC Adapter
23.9680.4750
2.38380-3M



Front of House A/B Switch
20.9680.8200
2.38380-40

Figure 1-4: Series 400 Components

Several types of data distribution devices are available for expansion of the Series 400 System.

Ethernet Switches

The Series 400 Ethernet Switches provide a powerful and convenient 10/100Mb interface between Vx76, Virtuoso® or DMX512 control consoles and their control equipment. For complete installation and operation instructions, refer to the following manual:

- + Series 400 Ethernet Switch User Manual (02.9801.0001).

Nodes

PRG Node units provide a powerful and convenient interface between Vx76, Virtuoso®, Art-Net, or sACN compatible control consoles, pixel mapping from media servers, and subsequent control equipment which require either Art-Net or sACN (PRG Super Node™ and Node Plus only) or DMX512 control signals (PRG Node Plus and PRG Node). For complete installation and operation instructions, refer to the following manuals:

- + PRG Super Node™ User Manual (02.9821.0001)
- + PRG Node Plus User Manual (02.9801.0301)
- + PRG Node User Manual (02.9669.0001)

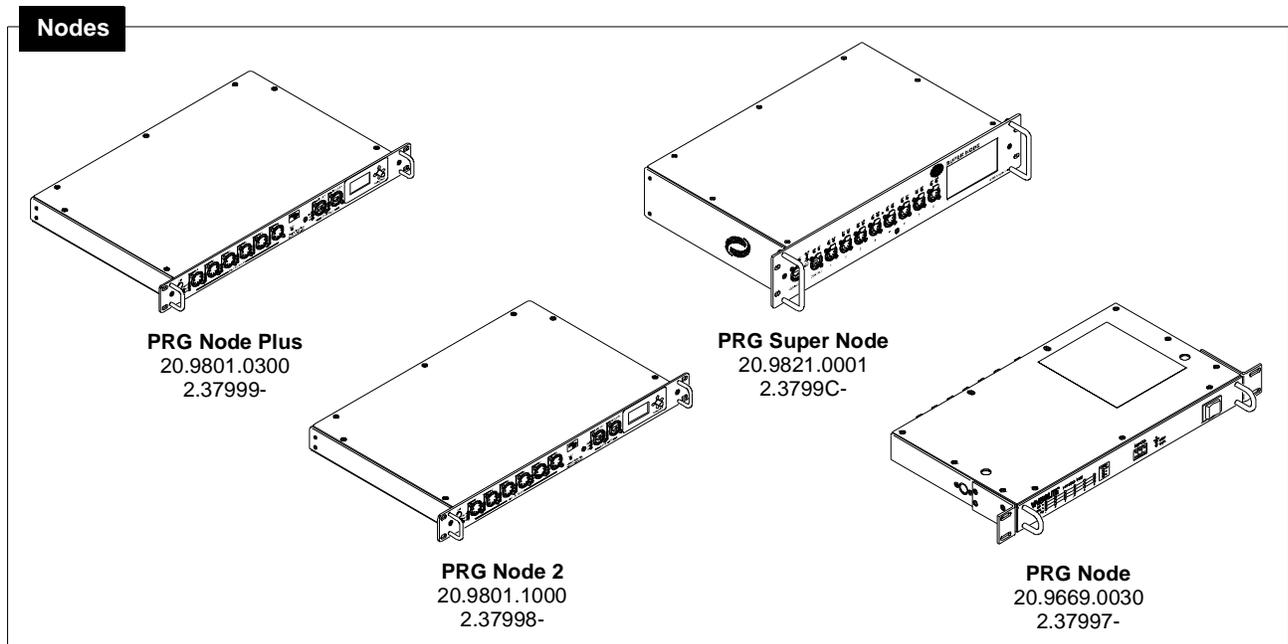
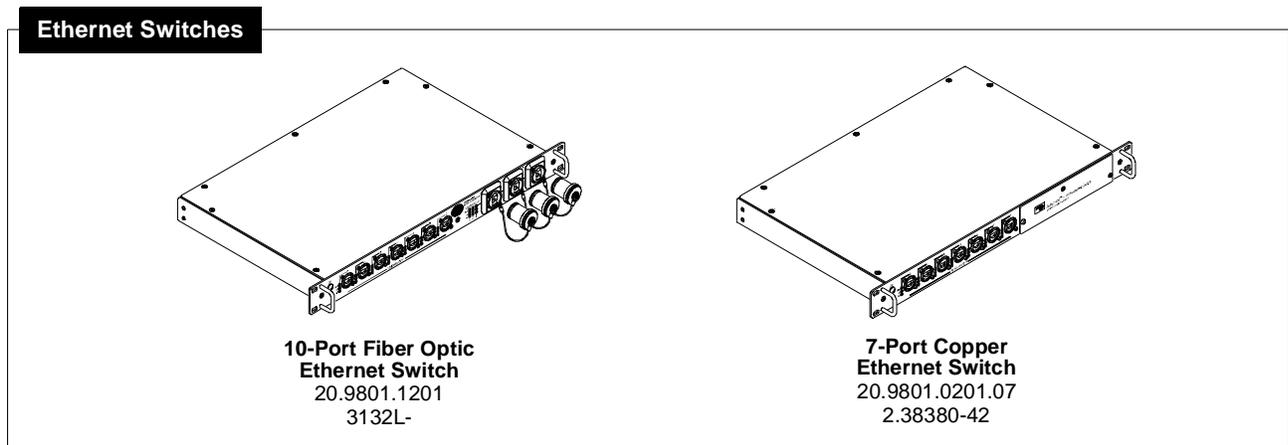
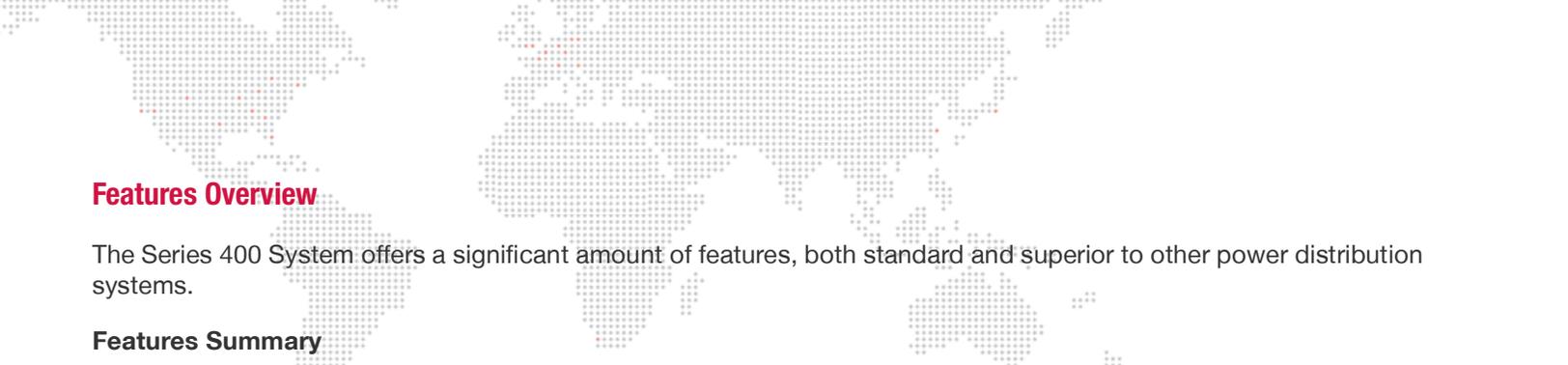


Figure 1-5: Switches and Nodes



Features Overview

The Series 400 System offers a significant amount of features, both standard and superior to other power distribution systems.

Features Summary

- + Supports up to 72, 1.2k Watt Devices (full rack) or 36, 1.2k Watt Devices (half rack)
- + Single, Dual, and 3-Phase Outputs
- + 400 Amp Cam-Loks In and Out
- + 120V and 208V Outputs
- + Digital Current and Voltage Metering
- + Safety Interlock with Breakout Boxes
- + System Master Switch
- + Front Panel Flush Rocker Circuit Breakers
- + Hot-Swappable Breaker Modules
- + 10/100BaseT Ethernet and DMX512 Inputs
- + DMX Merging
- + Signal Routing Control and Display
- + Rear 120V Convenience Outlets
- + L6-20 and Neutrik® 208V Outputs
- + Front and Back LED Lighting
- + 3U of additional rack space for adding third-party signal processing devices
- + Cable Testing Capabilities
- + Modular Design
- + Weighs a maximum of 305 lbs. when fully loaded.
- + Remote control, configuration, and monitoring of the system from a computer using the S400Tools software application.
- + Supports ANSI E1.31 Streaming ACN

Safety Features

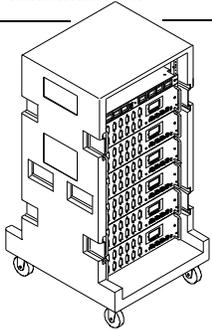
The Series 400 System provides a greater level of safety than other power distribution systems.

- + The number of internal current carrying connections is minimized. The Series 400 design uses far fewer screws, clamps, and crimps which can heat and work loose over time. The few connections that remain are secured with locking hardware.
- + Solid copper rigid bus bars replace much of the internal wiring, eliminating flex failures and soft crimp connections, which are responsible for most electrical fires. Rigid buses replace most flexible high current wiring, providing solid, low-loss connections between components.
- + A simple interlock system applies power to the branch circuits only when a compatible Breaker Module and Breakout Box are connected by a Trunk Cable. Additionally, the interlock system applies power only after ALL connections are made, protecting stage workers from shock during installation.

Features By Component

Rolling Rack Unit

- Supports up to 72, 1.2k Watt Devices (full rack) or 36, 1.2k Watt Devices (half rack)
- Neon Phase Indicators
- System Master Switch
- 120V Convenience Outlets
- L6-20 208V Power Outlet
- Neutrik 208V Outlets
- 400A Cam-Loks In & Out
- Digital Current & Voltage Metering
- Front & Back LED Lighting
- Test Point Jacks



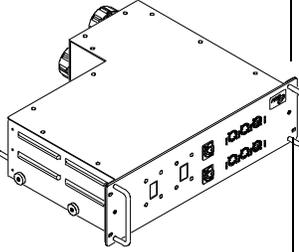
Trunk Cable

- Works with All Module Types
- 12 AWG Power Conductors
- Redundant Ground Circuits
- Integrated Ethernet Cable
- Proven Industrial Connector & Envirotec Shell
- 7-Year Lifetime Construction
- Connects up to 500' of Cable



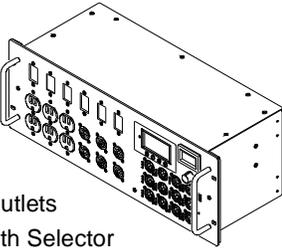
Front of House Breaker Module

- Two Intercom Inputs
- Two 100BaseT Ethernet Output
- Four DMX512 Outputs
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability
- Safety Interlock with FOH Breakout Modules



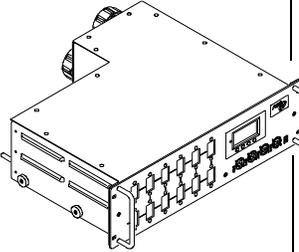
Front of House Breakout Module

- Ten standard DMX512 Inputs
- Two 100BaseT Ethernet Inputs
- Six Edison Style 120V Outlets
- Six Neutrik 208V Outlets
- Digital Voltmeter with Selector Switch
- Signal Routing Control and Display
- Front Panel Flush Rocker Circuit Breakers
- Safety Interlock with FOH Breaker Module



15A 120V Breaker Module

- Twelve 15A 120V Outputs
- Two DMX512 Inputs
- Two 100BaseT Ethernet Inputs
- Signal Routing Control and Display
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability
- Safety Interlock with Breakout Boxes



Front of House A/B Switch

- XLR Output for Connection to FOH Breakout Module
- Two Lighted Source Selector Switches



15A 120V Breakout Box

- Power and Signal for up to Six Devices
- Six 5-15 Output Connectors
- DMX512 and 100BaseT Ethernet Outputs
- Compact Package for Truss Mounting
- Rugged Construction
- Safety Interlock with Breaker Modules

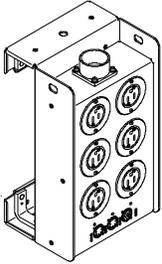
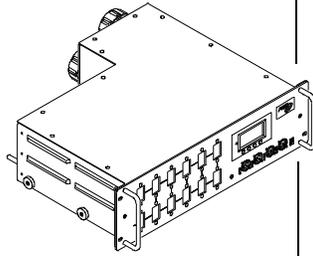


Figure 1-6: Features By Component (Part 1)

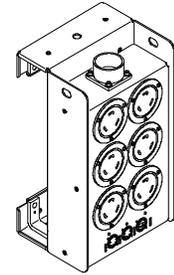
15A 208V Breaker Module

- Twelve 15A 208V Outputs
- Two DMX512 Inputs
- Two 100BaseT Ethernet Inputs
- Signal Routing Control and Display
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability
- Safety Interlock with Breakout Boxes



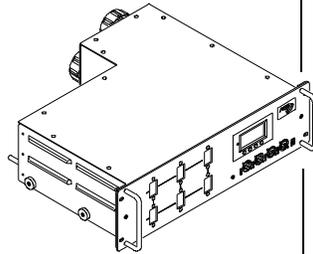
15A 208V Breakout Box

- Power and Signal for up to Six Devices
- Six L6-20 Output Connectors
- DMX512 and 100BaseT Ethernet Outputs
- Compact Package for Truss Mounting
- Rugged Construction
- Safety Interlock with Breaker Modules



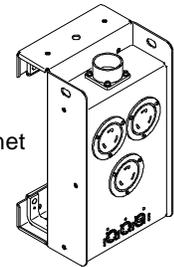
30A 208V Breaker Module

- Six 208V Outputs
- Two DMX512 Inputs
- Two 100BaseT Ethernet Inputs
- Signal Routing Control and Display
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability
- Safety Interlock with Breakout Boxes



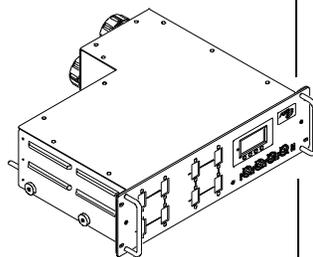
30A 208V Breakout Box

- Power and Signal for up to Three Devices
- Three L6-30 Output Connectors
- DMX512 and 100BaseT Ethernet Outputs
- Compact Package for Truss Mounting
- Rugged Construction
- Safety Interlock with Breaker Modules



15/30A 208V Breaker Module

- Four 15A 208V Outputs
- Four 30A 208V Outputs
- Two DMX512 Inputs
- Two 100BaseT Ethernet Inputs
- Signal Routing Control and Display
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability
- Safety Interlock with Breakout Boxes



15/30A 208V Breakout Box

- Power and Signal for up to Four Devices
- Two L6-20 and Two L6-30 Output Connectors
- DMX512 and 100BaseT Ethernet Outputs
- Compact Package for Truss Mounting
- Rugged Construction
- Safety Interlock with Breaker Modules

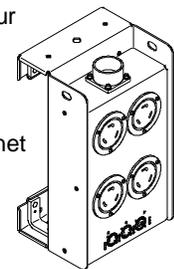
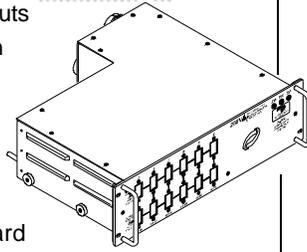


Figure 1-7: Features By Component (Part 2)

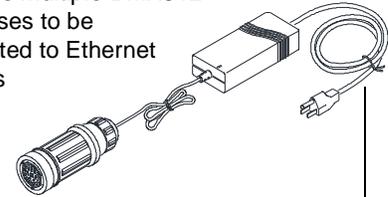
15A 208V Soca Output Breaker Module

- Twelve 15A 208V Outputs
- Two VEAM VSC 19-Pin Connectors
- 15A Long-Time Delay Trip Curve Circuit Breakers designed to handle Strokes
- Compatible with Standard Socapex Trunk Cables and Fan-Outs
- Neon Power Indicators for each of three phases
- Master Switch Controls Contactors
- Front Panel Flush Rocker Circuit Breakers
- Hot-Swapping Capability



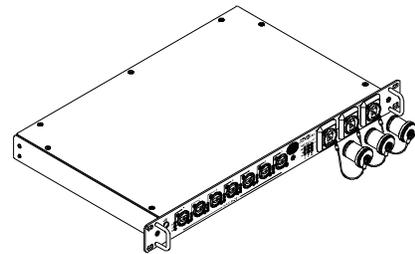
Front of House Trunk DC Adapter

- Used in place of standard Trunk Cable to power internal circuit boards in all versions of S400 Front of House Breakout Modules
- Enables multiple DMX512 Universes to be converted to Ethernet outputs



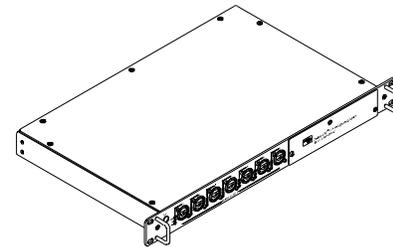
10-Port Ethernet Switch

- Seven isolated copper Ethernet ports for input of 10Base-T and 100Base-TX standard signal (Neutrik etherCON connectors).
- Three Neutrik opticalCON fiber optic Ethernet ports for transmission of 100Base-FX standard signal.
- Automatic detection and configuration of input signal speed.
- Link, Transmission, and Reception status LEDs for all ports.
- Neutrik powerCON connector for input AC supply (90-240V).
- DC power status LED.
- Standard 1U 19" rack mount chassis.



7-Port Ethernet Switch

- Seven isolated copper Ethernet ports for input of 10Base-T and 100Base-TX standard signal (Neutrik etherCON connectors).
- Automatic detection and configuration of input signal speed.
- Link, Transmission, and Reception status LEDs for all ports.
- Neutrik powerCON connector for input AC supply (90-240V).
- DC power status LED.
- Standard 1U 19" rack mount chassis.



AC Outlet Module

- Eight 120V Edison Outlets
- Four 208V Neutrik Outlets
- One 208V L6-20 Outlet
- On/Off Breaker Switch for each type/group of outlets
- Neon Power Indicators for each of three phases
- Standard 2U 19" rack mount chassis.

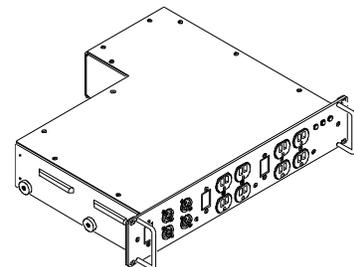
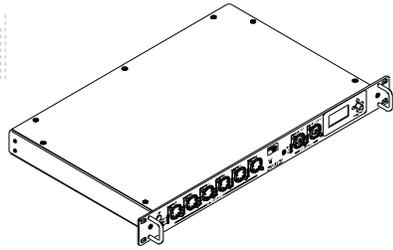


Figure 1-8: Features By Component (Part 3)

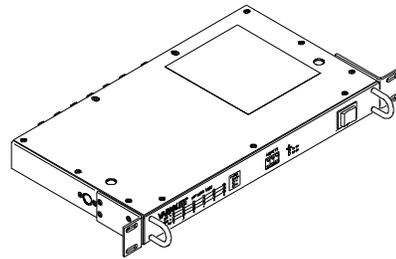
PRG Node Plus

- Accepts Virtuoso, Art-Net, and sACN control protocols.
- Compatible with 10Base-T or 100Base-TX standard signals.
- One Ethernet (Art-Net or sACN) output port supporting up to six DMX512 universes.
- Six DMX512 serial output ports supporting one DMX512 universe each.
- LEDs indicating Link, TX data, and RX data status for all Ethernet ports.
- LEDs indicating DMX Tx, RDM Tx, and RDM Rx data status for all DMX ports.
- Display support for configuration of Virtuoso address, configuration of Art-Net/sACN outputs in Series 400 Mode, real-time monitoring of DMX512 data on each output, display of network error information, and display of current software version.
- Neutrik powerCON connector for input AC supply.
- Front panel DC power status LED.
- Standard 1U 19" rack mount chassis.



PRG Node

- Accepts Virtuoso and Art-Net control protocols.
- Compatible with 10Base-T or 100Base-TX standard signals.
- When used with consoles running Virtuoso SV 4.4 or greater, the operating mode is automatically configured according to the input signal type.
- Six DMX512 serial output ports supporting one DMX512 universe each.
- Address thumbwheel for mapping a block of Art-Net universes to the six DMX512 outputs.
- LEDs indicating DMX Tx, RDM Tx, and RDM Rx data status for all DMX ports.
- Front panel DC power status LED.
- Standard 1U 19" rack mount chassis.



PRG Super Node

- Accepts Vx76, Virtuoso, Art-Net, and sACN control protocols.
- Compatible with 10Base-T, 100Base-T, 1000Base-T signals.
- Automatic detection and mode configuration according to input signal type.
- One (1) Ethernet output port supporting up to sixteen (16) DMX512-A universes.
- One (1) Ethernet input port supporting Vx76, Art-Net, and sACN protocols.
- Eight (8) DMX512-A serial output ports supporting one (1) DMX512-A universe each.
- One (1) DMX512-A input port (located on the back of the unit).
- LEDs indicating link/activity status for all Ethernet ports, and DMX and RDM status for all DMX ports.
- Display support for configuration of Node address, configuration of Ethernet inputs in Series 400 Mode, real-time monitoring of DMX512-A data on each output, display of network error information, and display of current software version.
- Standard 2U 19" rack mount chassis.

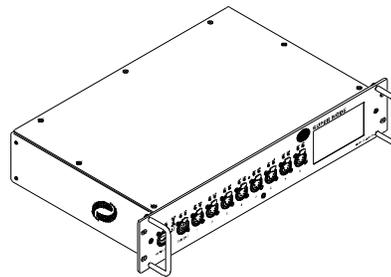


Figure 1-9: Features By Component (Part 4)

400 Amp Disconnect

- Six Cam-Lok Series E1016 high-current connections for power input.
- Two sets of six Cam-Lok Series E1016 high-current connections for power output.
- Double Neutral connectors to handle excessive neutral current generated by low power factor loads.
- Seven digital LED meters to monitor power flow - three voltmeters to measure phase voltages and four current meters to measure current flowing in each phase and the neutral.
- Neon indicators to show when feed cable is energized.
- Adjustable control for setting inrush limit.
- Five color coded, insulated test points for metering output voltages.
- Multiple local convenience outlets.
- Solid copper rigid bus bars and two thermostatically controlled cooling fans allow operation at 100% of Rated current.
- Suitable for use in the U.S. and Canada, or any locality with a 5-wire, 120/208V power grid.

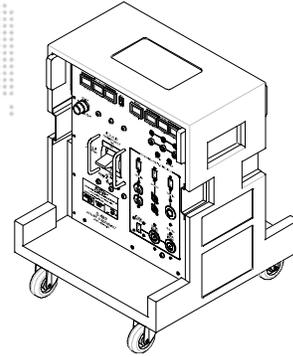


Figure 1-10: Features By Component (Part 5)

Accessories

The following optional and/or replacement items can be ordered directly from PRG. (Please order by PRG part number.)

PRG P/N	TEAM eCode	Accessory
22.9620.0194	2.38380-75	Safety Cable Assembly
55.6841.0001	2.38380-72	Mega-Claw Truss Hook (for 2" Round Pipe)
21.9680.0661	-	1U Safety Cover Plate Assembly
21.9680.0662	-	2U Safety Cover Plate Assembly
21.9680.0660	-	3U Safety Cover Plate Assembly
25.9680.9001	2.38380-48	Ethernet Patch Cable, 1 Ft., Black Shark Fin
25.9680.9002	2.38380-49	Ethernet Patch Cable, 2 Ft., Black Shark Fin
<i>Breakout Box Clamp Bracket Mounting Parts:</i>		
22.9961.1636	-	Clamp Bracket (Rail)
10.9661.1249	-	Bushing
10.9679.1206	-	Nut
53.6653.0009	-	1/4-20 Screw

CONTROLS AND INDICATORS

Series 400 Rack

The PRG Series 400 Rack unit is the main power and data distribution hub for the system. The Full Rack houses up to six Breaker Modules of any type, while the Half Rack houses up to three Breaker Modules, which can include a Front of House Breaker Module. The Rack provides a built-in LED Meter Module that monitors system current and voltage, and additional space for installing optional expansion components such as Series 400 Ethernet Switches and/or PRG Nodes. System-wide functions can be controlled at the Rack, including power up, power down and testing.

Full Rack

The following illustrations provide a detailed description of standard full rack connections, controls and indicators in an example configuration.

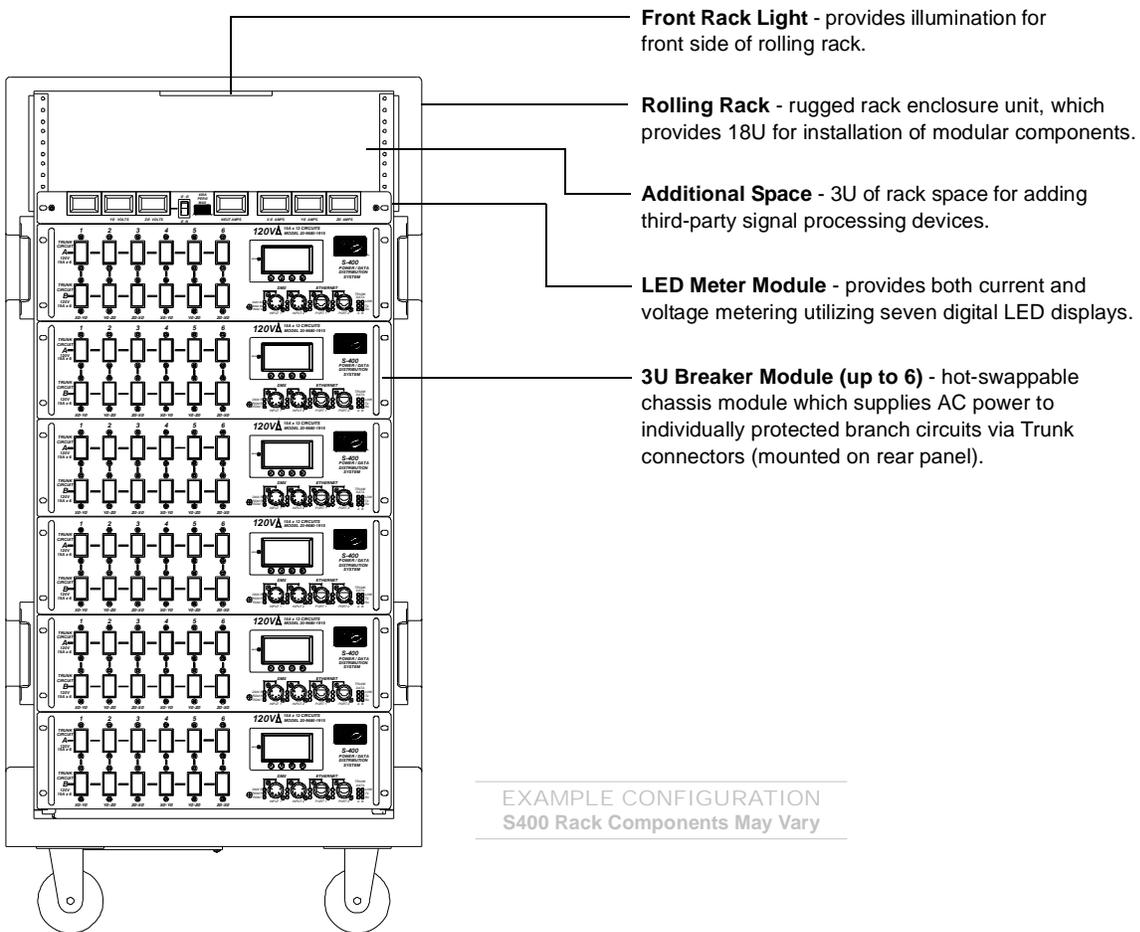


Figure 1-11: S400 Full Rack Components / Front View

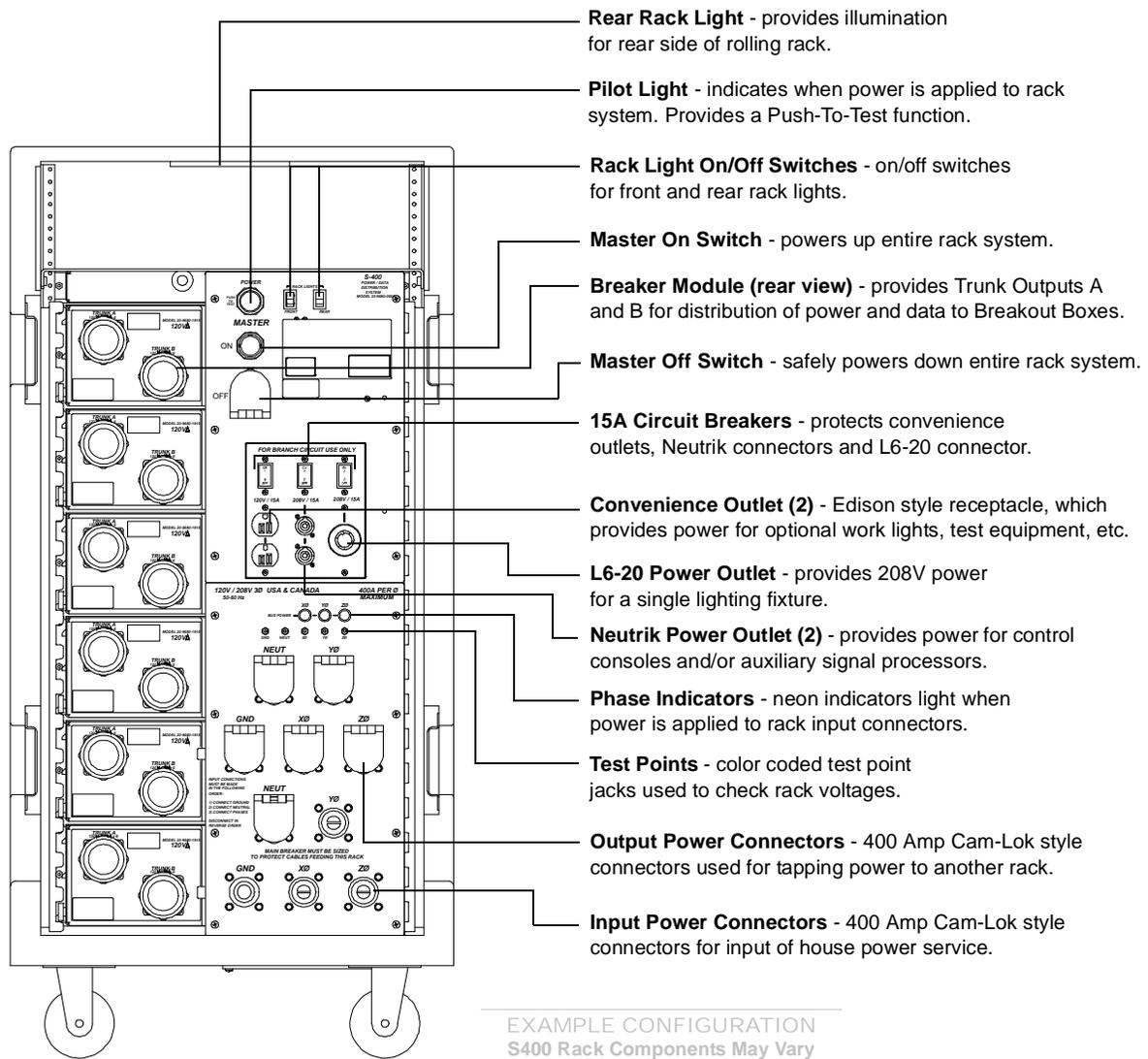


Figure 1-12: S400 Full Rack Components / Rear View

Half Rack

The following illustrations provide a detailed description of standard half rack connections, controls and indicators in an example configuration.

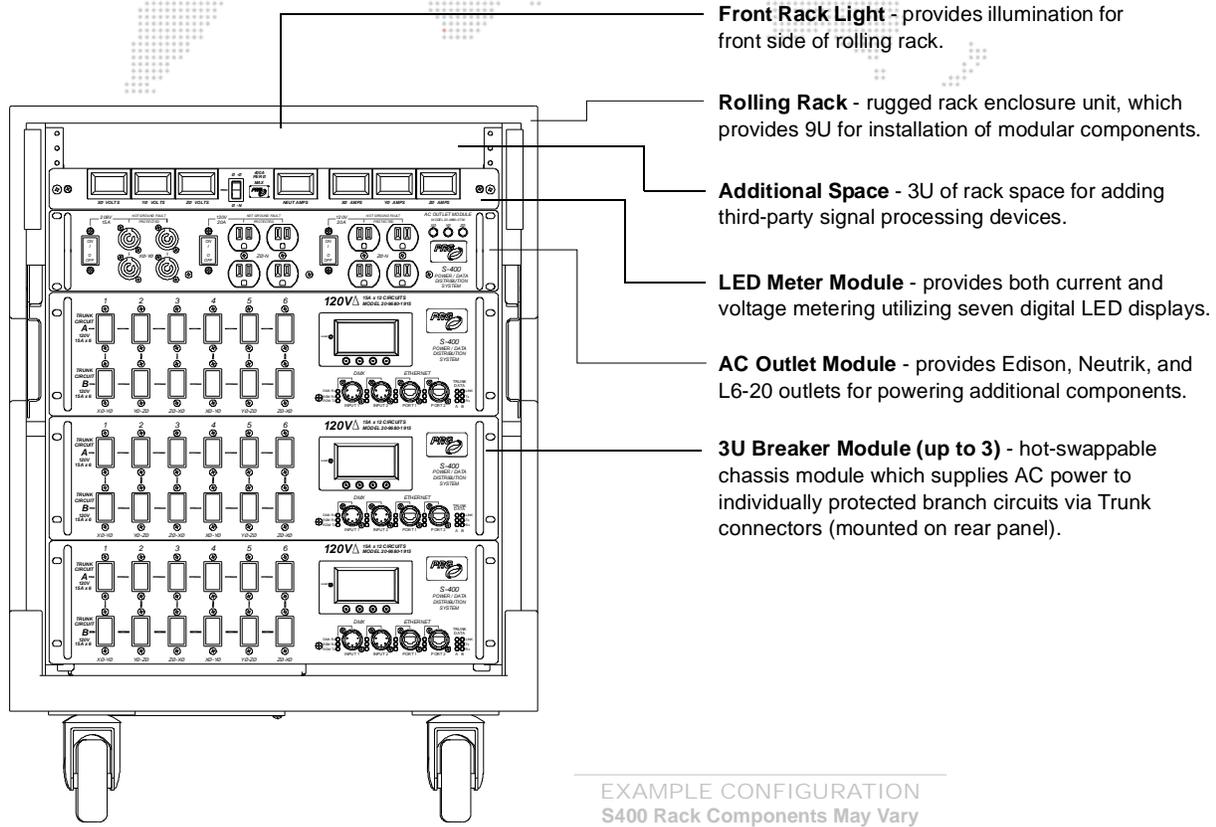
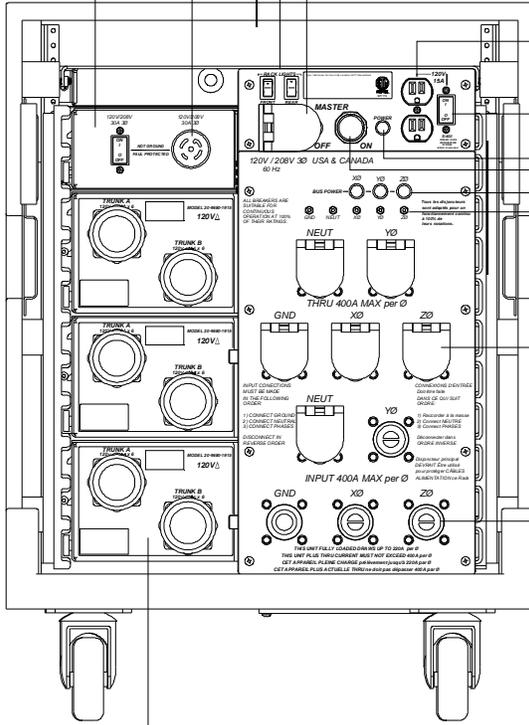


Figure 1-13: S400 Half Rack Components / Front View

L6-20 Power Outlet - provides 208V power for a single lighting fixture.

AC Outlet Module (rear view)



Breaker Module (rear view)

Rear Rack Light - provides illumination for rear side of rolling rack.

Rack Light On/Off Switches - on/off switches for front and rear rack lights.

Master Off Switch - safely powers down entire rack system.

Convenience Outlet (2) - Edison style receptacle, which provides power for optional work lights, test equipment, etc.

15A Circuit Breaker - protects convenience outlets.

Pilot Light - indicates when power is applied to rack system. Provides a Push-To-Test function.

Master On Switch - powers up entire rack system.

Phase Indicators - neon indicators light when power is applied to rack input connectors.

Test Points - color coded test point jacks used to check rack voltages.

Output Power Connectors - 400 Amp Cam-Lok style connectors used for tapping power to another rack.

Input Power Connectors - 400 Amp Cam-Lok style connectors for input of house power service.

EXAMPLE CONFIGURATION
S400 Rack Components May Vary

Figure 1-14: S400 Half Rack Components / Rear View

Breaker Module

The Breaker Module provides two trunk outputs, with each circuit protected by an individual circuit breaker, for the purpose of routing power and control to the system. The total number of circuits depends on the model. The module accepts 100BaseT Ethernet and DMX512 inputs, and features a Menu Display which provides control and configuration of the signal routing to all connected Breakout components. The Breaker Module is installed directly into the Rack unit.

The following illustration provides a detailed description of Breaker Module connections, controls and indicators.

Note: The 15A 208V model is shown here, however, these components are typical of all Breaker Module models except the Soca Output Breaker Module (which is shown on the following page).

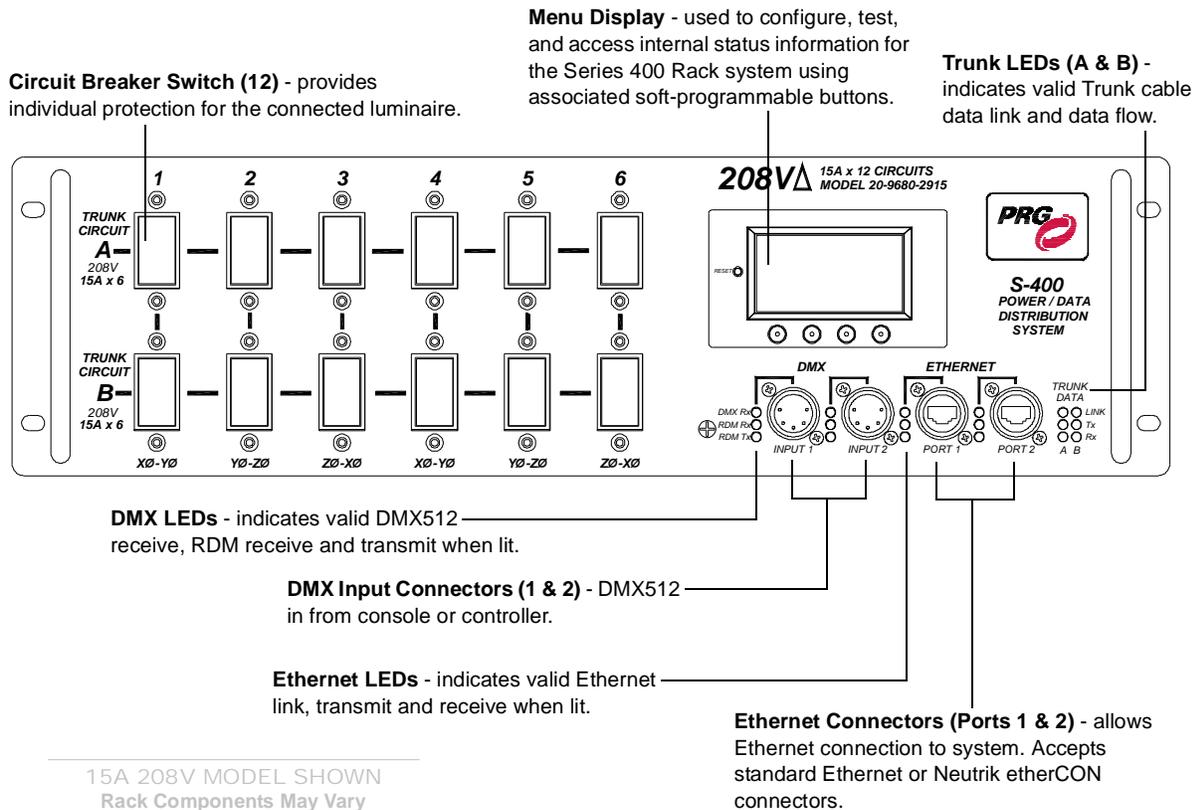


Figure 1-15: Breaker Module Connections, Controls and Indicators

Model Configurations

Several Breaker Module configurations are available, based on power requirements:

- + 12-Channel 15A 120V Module
- + 12-Channel 15A 208V Module
- + 6-Channel 30A 208V Module
- + 8-Channel 15/30A 208V Module (mixed)

Soca Output Breaker Module

The Soca Output Breaker Module allows Socapex-compatible trunk cables and fan-outs to be used with the Series 400 system. The module provides twelve 15A outputs for two Socapex-compatible trunk cables (six circuits each). During operation, all trunk outputs will be on if the Rack Master Switch is enabled, since there are no key lines to disable the outputs.

Special Notes:

- + Unlike other S400 Breaker Modules, the Soca Output Breaker Module does not have any displays, DMX or Ethernet connections since Socapex-compatible trunks do not contain data cables.
- + No S400 Breakout Boxes are necessary with this unit.
- + There are no key lines to distinguish 120V from 208V at the fan-outs.

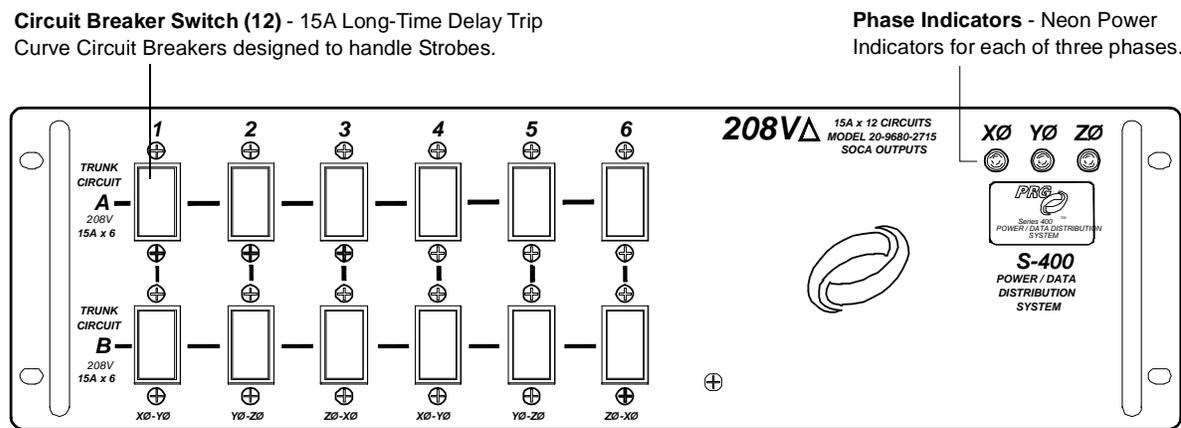


Figure 1-16: Soca Output Breaker Module Connections, Controls and Indicators

AC Outlet Module

The AC Outlet Module is typically used with the S400 Half Rack to provide convenience outlets for powering additional components. The module can be used in a Full Rack with the addition of a 1U blank plate.

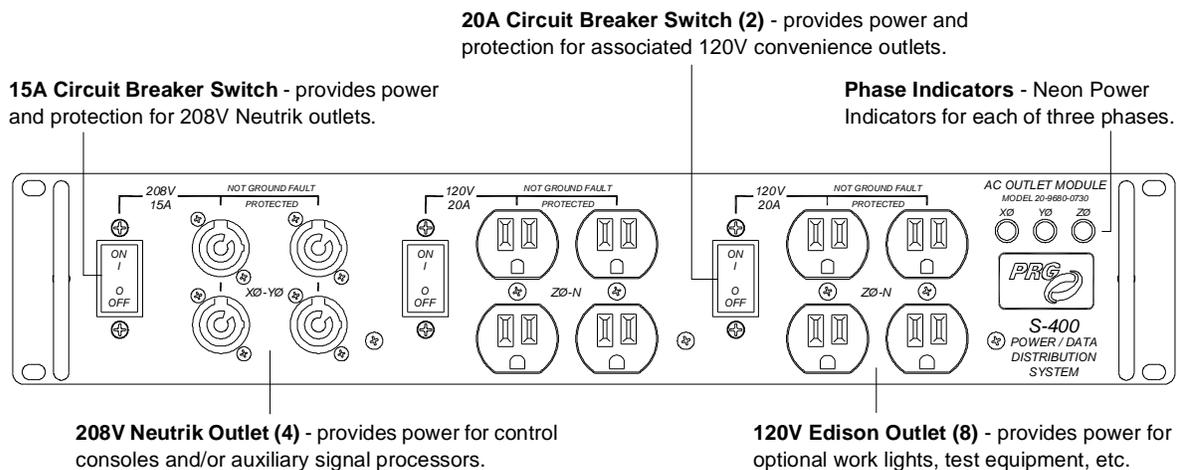


Figure 1-17: AC Outlet Module

(Rear of unit includes one 208V L6-20 power outlet.)

Breakout Box

The Breakout Box supplies power and control signal for three, four or six devices, depending on the model. LEDs provide verification of the power and data signals. The Breakout Box can be installed in a truss with a choice of several mounting hardware options, providing a convenient location for connecting system devices.

The following illustration provides a detailed description of the Breakout Box connections, indicators and mounting hardware options. (The 15A 208V model is shown here, however, these components are typical of all Breakout Box models.)

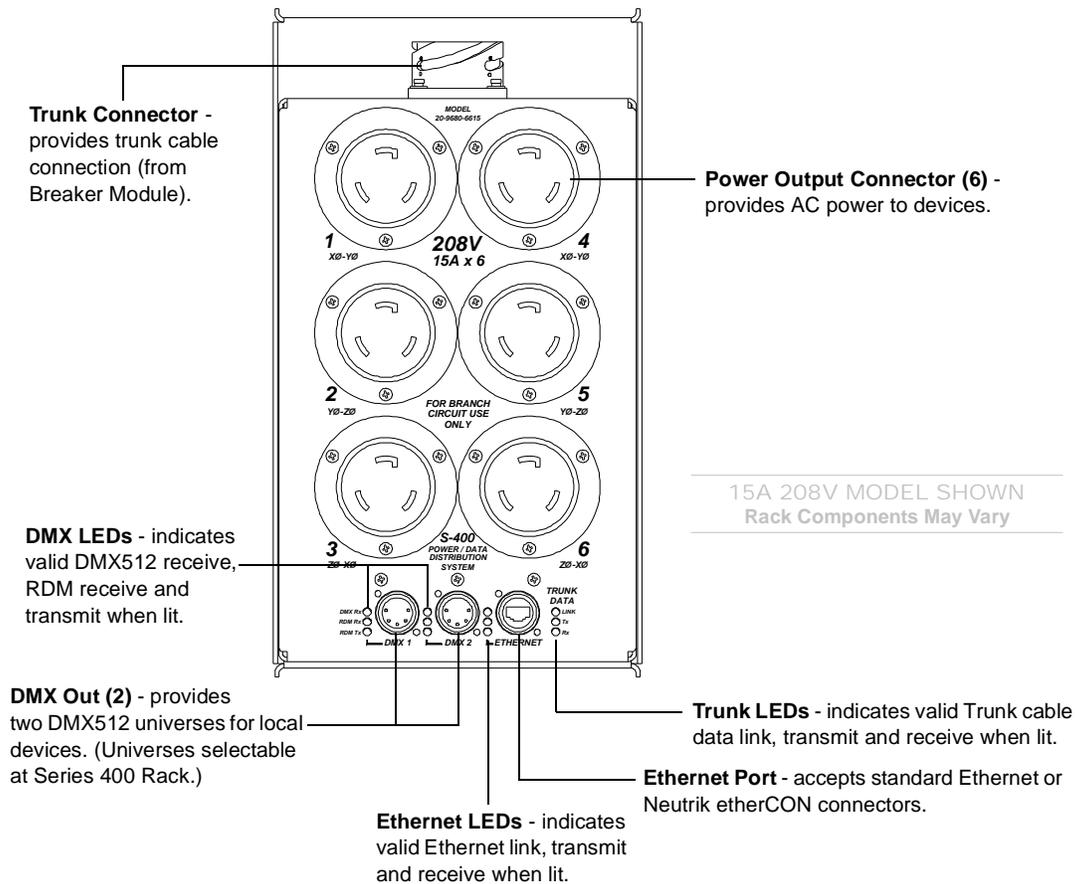


Figure 1-18: Breakout Box Connections and Indicators

Model Configurations

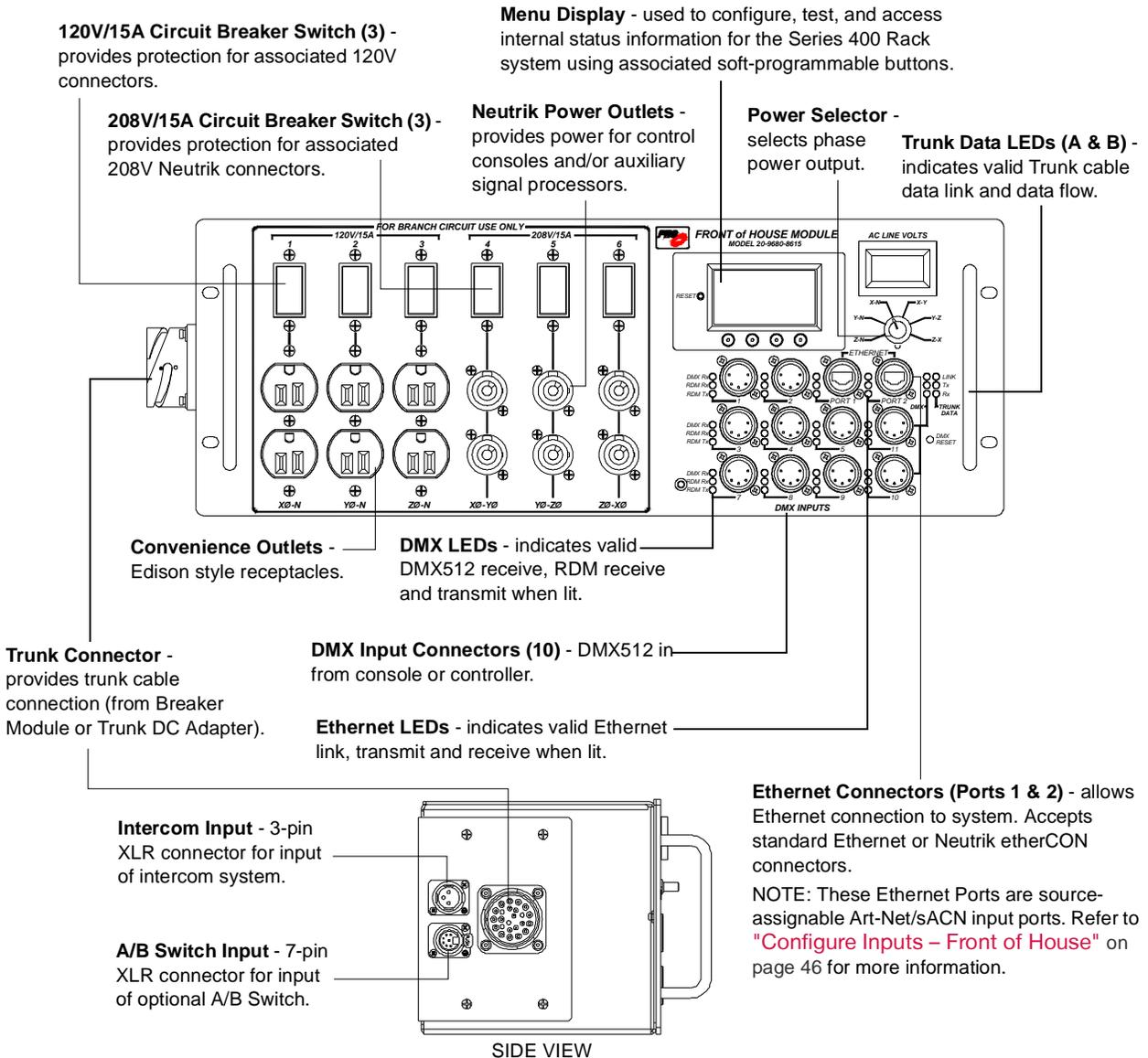
Several Breakout Box configurations are available, based on power requirements:

- + 6-Channel 15A 120V Module
- + 6-Channel 15A 208V Module
- + 3-Channel 30A 208V Module
- + 4-Channel 15/30A 208V Module (mixed)

Front of House Breakout Module

The Front of House (FOH) Breakout Module provides a convenient method for connecting consoles and accessories at the mix riser position. It provides power outlets for up to 12 devices, each of which are protected by an individual circuit breaker. Using the FOH Breakout Module, both a primary and backup console can be connected to the system. The module provides 10 standard DMX512 inputs for inputting console data into the Ethernet stream and two Ethernet inputs for any 10/100Base-T Ethernet signal such as Art-Net. DMX512 universes can be selected and controlled using the built-in Menu Display.

The following illustration provides a detailed description of the Front of House (FOH) Breakout Module connections, controls and indicators.



Front of House Breaker Module

The Front of House (FOH) Breaker Module provides two trunk outputs, with each circuit protected by an individual circuit breaker, for the purpose of routing power and control to FOH Breakout Modules. Unlike the standard Breaker Modules, the FOH Breaker Module does not offer a Menu Display, which is instead located at the FOH Breakout Module itself. The FOH Breaker Module is installed directly into the Rack unit.

The following illustration provides a detailed description of the Front of House (FOH) Breaker Module connections, controls and indicators.

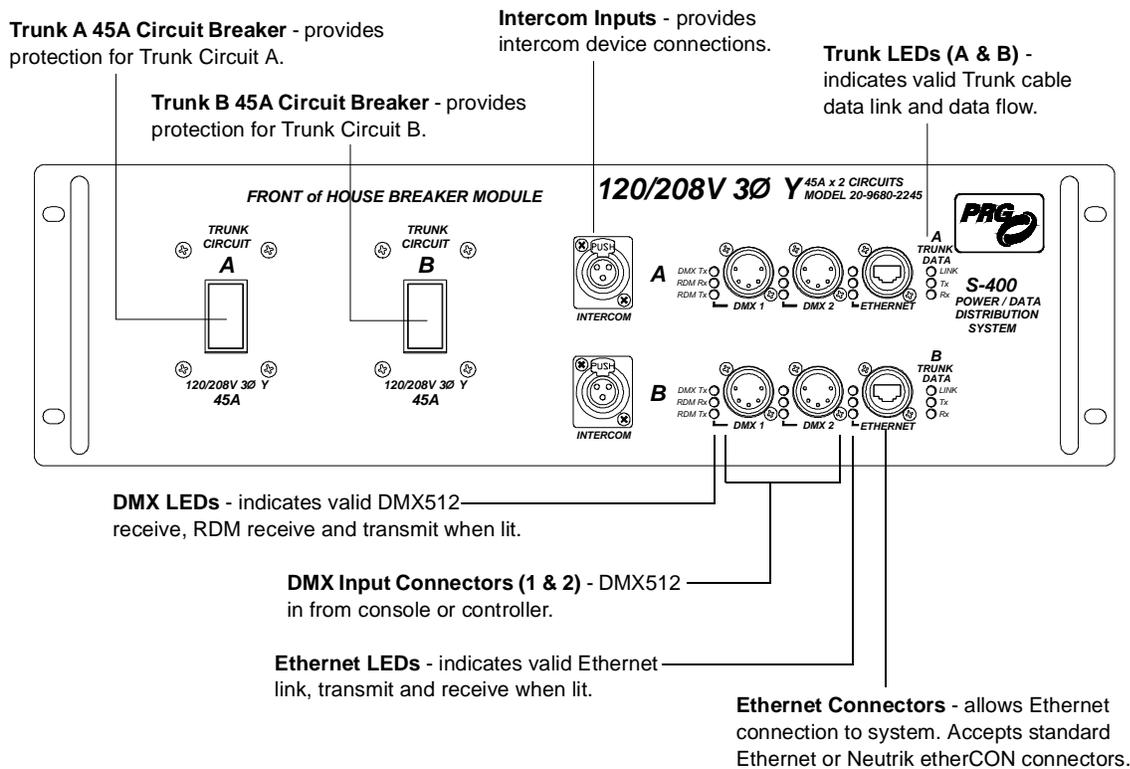


Figure 1-20: Front of House Breaker Module Connections and Indicators

Front of House Trunk DC Adapter

The purpose of the Trunk DC Adapter is to power the internal circuit boards in all versions of S400 Front of House Breakout Modules without using a Trunk Cable. This enables multiple DMX512 Universes to be converted to Ethernet outputs.

The Truck DC Adapter is connected to the standard Trunk Connector on the side of the FOH Breakout Module as shown in **Figure 1-21**.

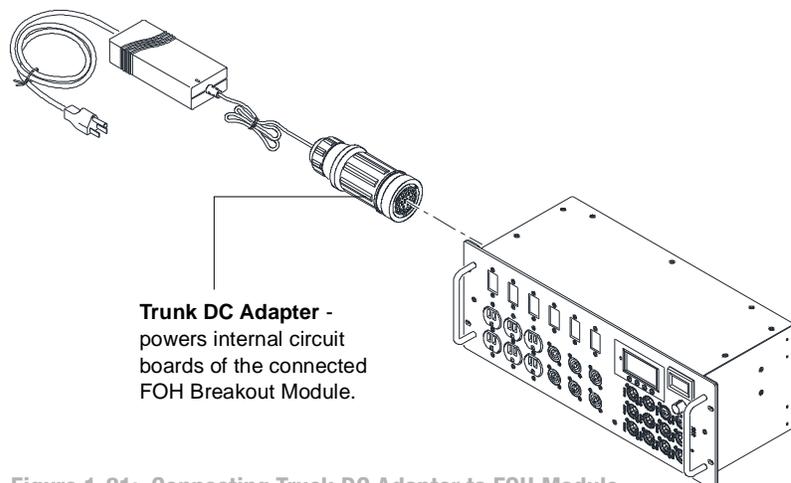


Figure 1-21: Connecting Truck DC Adapter to FOH Module

Front of House A/B Switch

The Front of House A/B Switch is connected to a FOH Breakout Module to provide a convenient method for switching between two sets of DMX512 universes (A and B). All input universes are given a Source Identifier, in addition to a Universe Number. The default is Source A. Sources A, B, C or * can be selected at a Breaker Module's Menu Display (refer to "**Menu Display Features**" on page 44). Sources A or B can be toggled by pressing the appropriate selector button at the A/B Switch. (Source C is normally reserved for system testing and/or setup and is not selectable at the A/B Switch. System Source * is omnipresent and is also not selectable at the A/B Switch.)

As an example, two universes from a primary console could be input into the FOH Breakout Module and labeled 0a and 1a. Two (mirrored) universes could be added from a backup console and labeled 0b and 1b. The system outputs would be assigned 0 or 1 as appropriate. All universes from both consoles are active on the network all the time, making it possible to verify that both desks are up and running by checking the source status. A third source (C) has been provided for an additional input, such as a tech console.

The A/B Switch indicates the current source with state of its backlit selector switches, even if this is changed elsewhere (i.e., using the Menu Display feature). The selector states indicate the following:

- + A Selector lit - Source A universes are selected.
- + B Selector lit - Source B universes are selected.
- + Both A and B Selectors lit - Source C universes are selected.

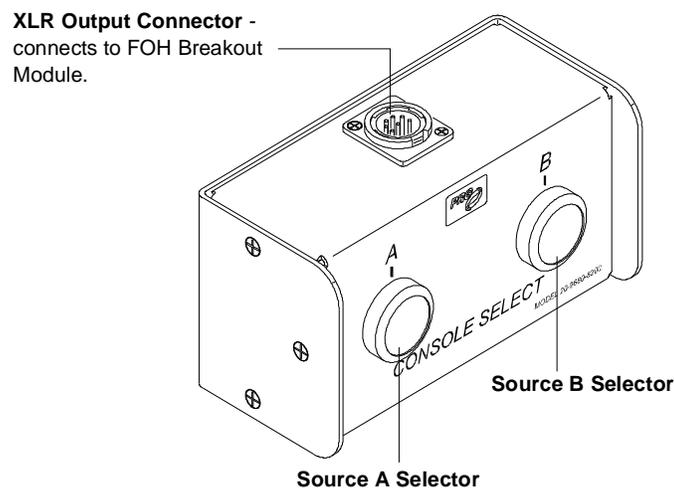


Figure 1-22: Front of House A/B Switch Connections and Indicators



CAUTION: Connecting or disconnecting an A/B Switch while the system is powered up can cause an apparent switch closure resulting in a change to the source. This action is not recommended during a show-critical situation.

Note: The A/B Switch requires a S400 7-pin cable.

10-Port Ethernet Switch

The PRG Series 400 10-Port Ethernet Switch provides a powerful and convenient interface between Vx76, Virtuoso® or DMX512 control consoles and their control equipment. The 10-Port Ethernet Switch offers two types of connections: isolated copper Ethernet ports and fiber optic ports. The fiber optic ports provide the ability to send fast and reliable information up to 2 kilometers away without the need for repeaters using Fiber Optic Cable. The copper Ethernet connections offer the ability to combine standard copper connections with fiber optic transmissions.

Note: Copper connections are limited to a maximum distance of 300 feet. PRG recommends using fiber optic cable if going further than 100 feet.

The 10-Port Ethernet Switch automatically determines the speed of each network connection based on the equipment connected to the switch and supports multiple connections with transmission and reception occurring simultaneously.

The following illustrations provide a detailed description of Series 400 10-Port Ethernet Switch connections, controls and indicators.

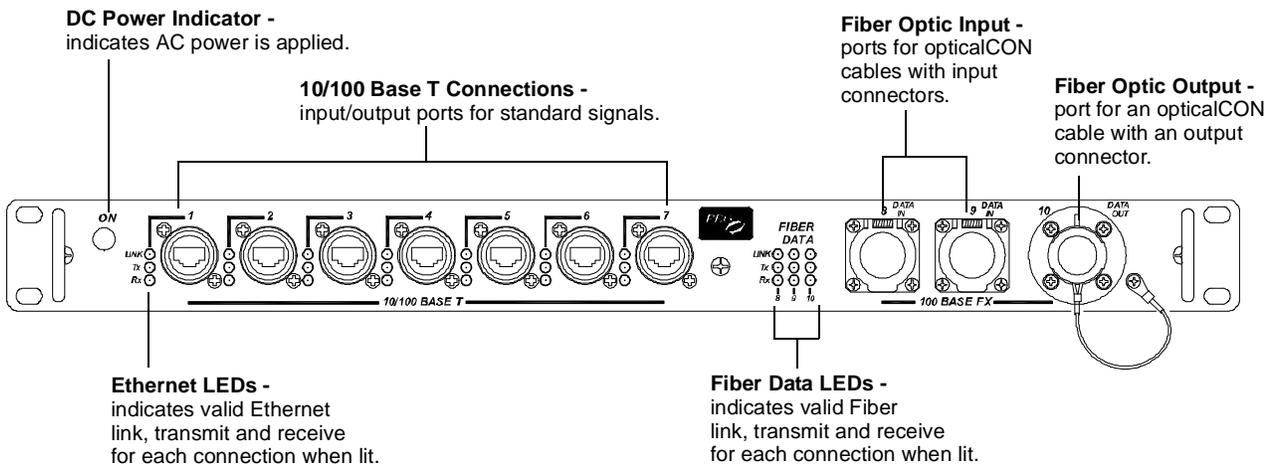


Figure 1-23: 10-Port Ethernet Switch Front Panel

Note: Fiber connections can be used as input or output.

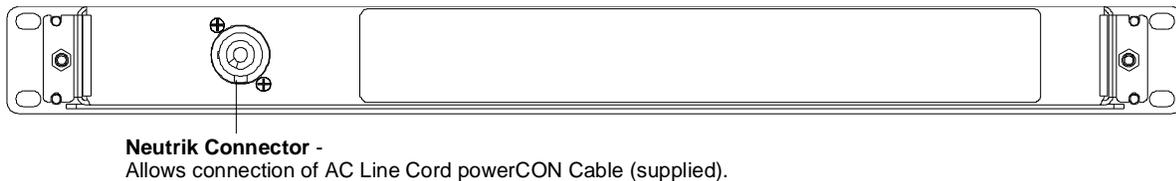


Figure 1-24: 10-Port Ethernet Switch Rear Panel

7-Port Ethernet Switch

The PRG Series 400 7-Port Ethernet Switch provides a powerful and convenient interface between Vx76, Virtuoso® or DMX512 control consoles and their control equipment. The 7-Port Ethernet Switch provides seven isolated copper Ethernet ports.

Note: Copper connections are limited to a maximum distance of 300 feet. PRG recommends using fiber optic cable if going further than 100 feet.

The 7-Port Ethernet Switch automatically determines the speed of each network connection based on the equipment connected to the switch and supports multiple connections with transmission and reception occurring simultaneously.

The following illustrations provide a detailed description of Series 400 7-Port Ethernet Switch connections, controls and indicators.

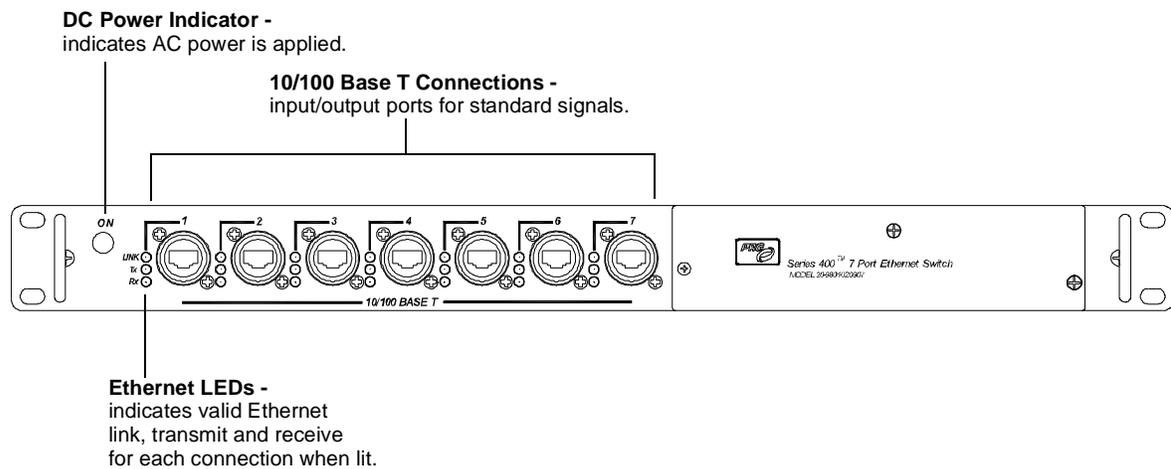


Figure 1-25: 7-Port Ethernet Switch Front Panel

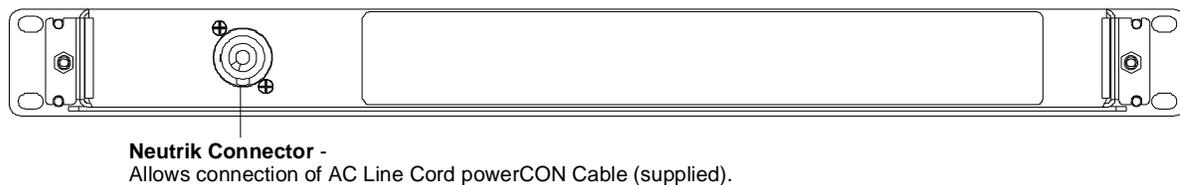


Figure 1-26: 7-Port Ethernet Switch Rear Panel

THEORY OF OPERATION

Rack System

A Rolling Rack houses an internal 3-phase, 400 Amp bus bar system which is connected to the house power service by 4/0 Cam-Lok cables. The Rack accepts hot-swappable chassis modules that automatically connect to the internal power bus. These Breaker Modules supply various types of AC power to individually protected branch circuits. The branch circuits are conducted to remote Breakout Boxes by custom Trunk Cables and connectors capable of powering 1200 watt luminaires at distances of up to 500 feet.

An integrated Signal Distribution System is provided where control data is applied at the Series 400 Rack. This data is transmitted by the Trunk Cables to the remote Breakout Boxes where it is available for luminaires or other devices. The Signal System will accept 10/100Base-T Ethernet signal, USITT DMX512, Art-Net and sACN, and will handle all protocols simultaneously. The DMX512 universes are available at each of two outputs on the Breakout Boxes. The Menu Display on each Breaker Module can be used to configure which universe is output to each connector (refer to "[Menu Display Features](#)" on page 44).

The Series 400 rack supports multiple input systems and DMX merging. All DMX512 inputs are configured with a Universe Number and a Source (A, B, C, *). (Outputs are only assigned with a Universe Number.) The output device will send the numbered universe for the currently selected source, i.e., if configured for universe 0 it will send either universe 0a, 0b, or 0c depending on which input is selected. For complete instructions on setting up system input/ outputs, refer to "[Menu Display Features](#)" on page 44.

Note: sACN starts at Universe 1, whereas Art-Net starts at Universe 0.

The Front of House Breakout Module is connected by up to 500 feet of Trunk Cable to the Series 400 Rack where a FOH Breaker Module sources power for the FOH System. Source-assignable Art-Net and sACN input using the Ethernet connectors can replace functionality of the top two DMX inputs on a Front of House (FOH) Breakout Module. This allows assignment of an Ethernet port to a source so that it can be switched over with the rest of the A, B, C sources.



WARNING: A 400 Amp Disconnect *must be used* when house service is greater than 400 amps and more than 10 feet from rack. 4/0 feeders are rated for 400 amps or less. It is recommended that a PRG Series 400 400 Amp Disconnect be used. Refer to the Series 400 400 Amp Disconnect User Manual (02.9680.0200).

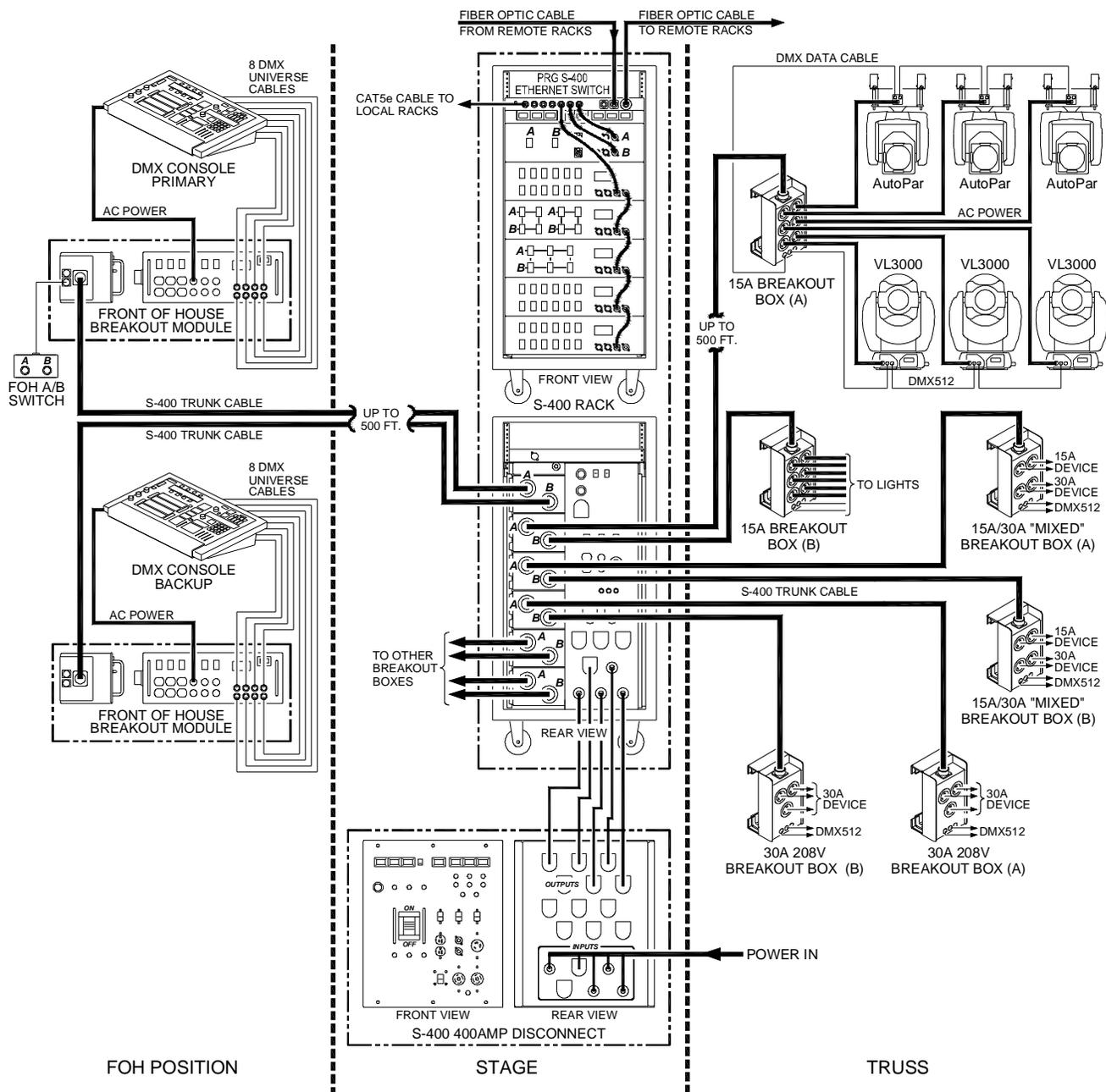


Figure 1-27: Sample Rack Configuration Diagram

Note: For additional installation diagrams, refer to the PRG Lighting Systems Networking Guide (02.3004.1000.0).



Notes



2.

INSTALLATION

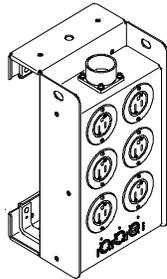
This chapter provides instructions for connecting rack components and powering up the system.

- + SYSTEM INSTALLATION AND POWER UP
- + POWER DOWN

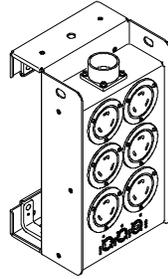
SYSTEM INSTALLATION AND POWER UP

Load Distribution

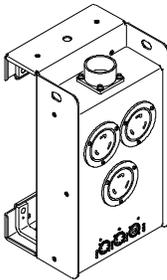
Consideration for proper load distribution should be followed when connecting devices. Be sure to evenly distribute the load across the phases. Refer to the following charts.



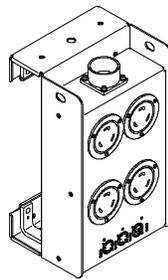
15A 120V Breakout Box	
Connector	Phase
1	X - N
2	Y - N
3	Z - N
4	X - N
5	Y - N
6	Z - N



15A 208V Breakout Box	
Connector	Phase
1	X - Y
2	Y - Z
3	Z - X
4	X - Y
5	Y - Z
6	Z - X



30A 208V Breakout Box	
Connector	Phase
1	X - Y
2	Y - Z
3	Z - X



15A/30A Mixed Breakout Box	
Connector	Phase
1 (15A)	X - Y
2 (15A)	X - Y
3 (30A)	Y - Z
4 (30A)	Z - X

For convenience, these phase specifications are printed on the front panel of each Breakout Box.

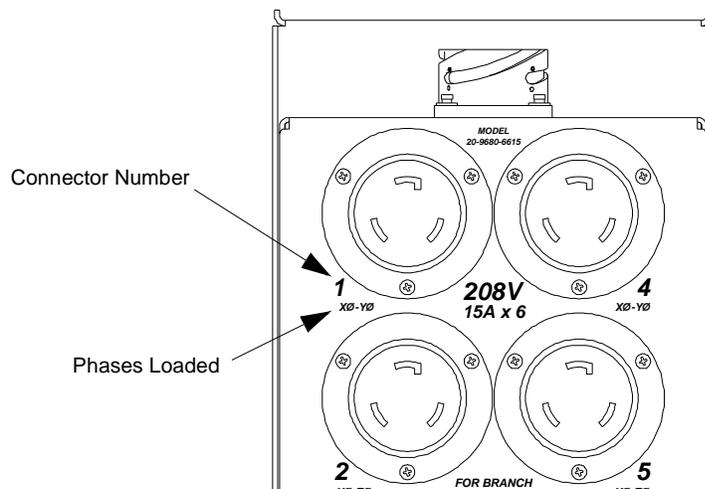


Figure 2-1: Phase Specifications

Component and Power Connections

For examples of basic system configurations, refer to "Theory of Operation" on page 26.

Use the following procedure to connect rack components:

Step 1. Place rack in desired location and remove front and back covers (**Figure 2-2**).

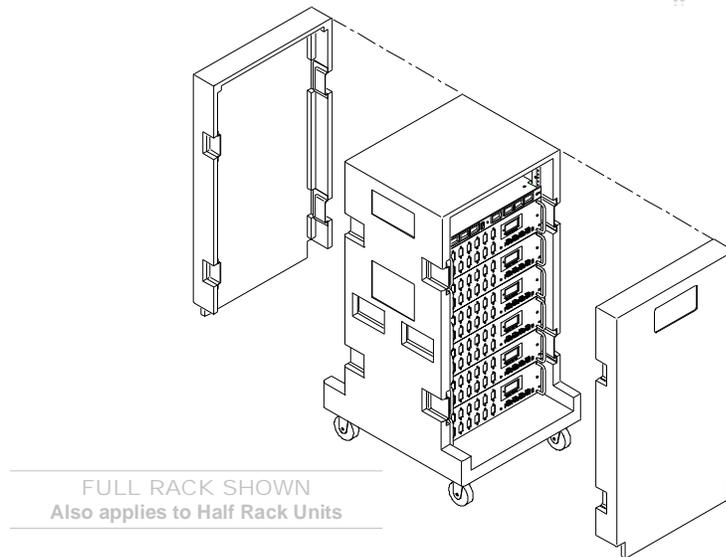


Figure 2-2: Removing Rack Covers

Step 2. Turn OFF all breakers at Rack and Breakout Boxes.

Step 3. Turn OFF Mater Switch.



CAUTION: Always use safety cables when installing Breakout Boxes in truss.

Step 4. Install Breakout Boxes in truss or other location near fixtures. Refer to "Breakout Box Mounting Options" on page 37 for mounting options. Attach safety cable.

Step 5. Connect appropriate length Trunk Cables to Breakout Box trunk connectors and route towards rack (**Figure 2-3**).

Step 6. Connect required fixtures and data devices to Breakout Boxes. Refer to "Breakout Box" on page 20 for detailed connection diagram.



CAUTION: Evenly distribute the load across phases. Refer to "Load Distribution" on page 30.

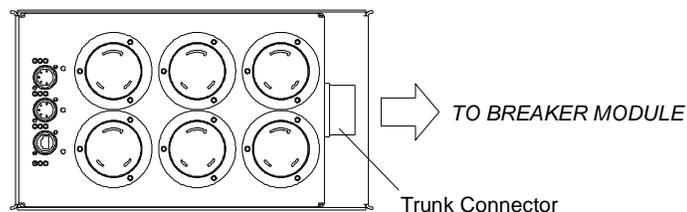


Figure 2-3: Breakout Box Trunk Connection

Step 7. If required, place Front of House Breakout Box near lighting control console. Connect appropriate length Trunk Cable to trunk connector and route towards rack (**Figure 2-4**).

Step 8. Connect console and other auxiliary devices to Front of House Breakout Box. Refer to "**Front of House Breakout Module**" on page 21 for detailed connection diagram.

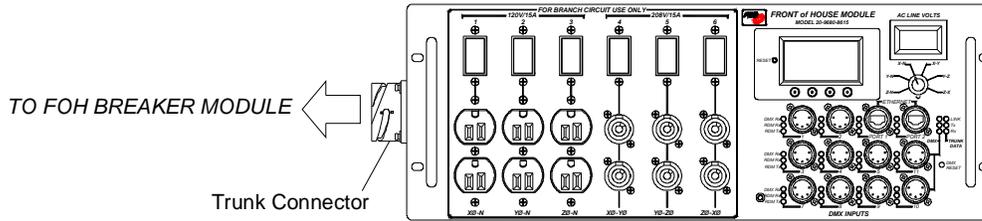


Figure 2-4: FOH Module Trunk Connection



WARNING: A 400 Amp Disconnect *must be used* when house service is greater than 400 amps and more than 10 feet from rack. 4/Ø feeders are rated for 400 amps or less. It is recommended that a PRG Series 400 400 Amp Disconnect be used. Refer to the Series 400 400 Amp Disconnect User Manual (02.9680.0200).



WARNING: Ensure house service mains breaker and rack Master Switch are OFF before connecting mains power cables to rack. Ground should *always* be connected first.

Step 9. At house service mains breaker (or 400 Amp Disconnect), turn power OFF.

Step 10. At Series 400 Rack, ensure Master Switch is OFF. To disengage Master Switch, pull down red protective cover and press red button (**Figure 2-5**).

Step 11. Connect mains power cable Cam-Loks in the following order:
1) Ground, 2) Neutral 3) X Phase, 4) Y Phase, and 5) Z Phase.

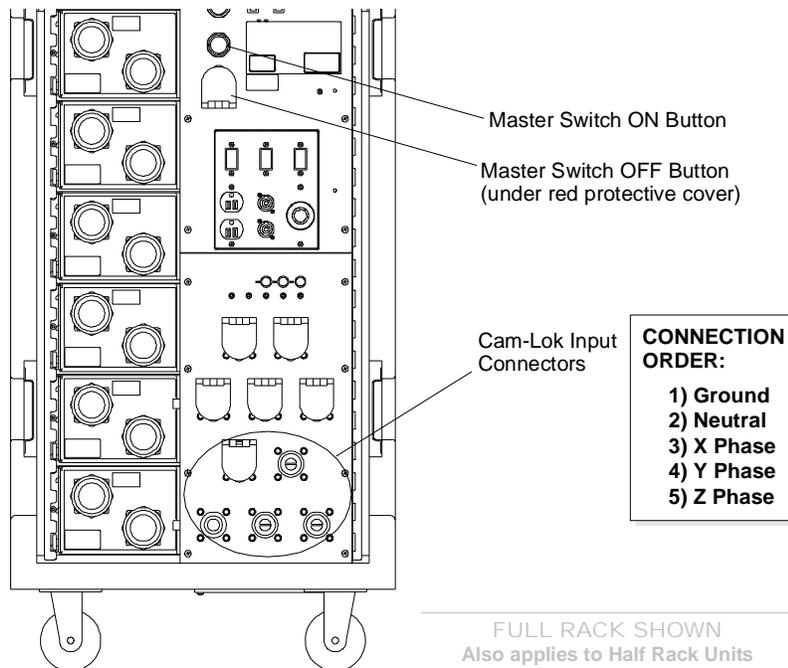


Figure 2-5: Disengaging Master Switch and Connecting Cam-Loks

Step 12. Proceed to next section for **Power Up** instructions.

Installing an Ethernet Switch

A Series 400 Ethernet Switch can be used independently or installed directly in a Series 400 rack chassis, using the blank space above the LED Meter Module.

To install in Series 400 rack:

- Step 1. Install Ethernet Switch as required in top portion of rack chassis (**Figure 2-6**).
- Step 2. At Ethernet Switch rear panel, connect AC Line Cord 208V powerCON Cable (supplied) to Neutrik connector.
- Step 3. After power is applied, verify that ON indicator is lit.
- Step 4. At front panel, connect data cables as required.

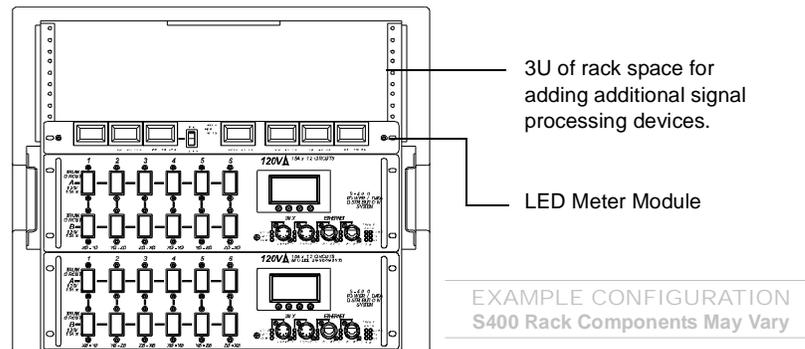


Figure 2-6: Additional Rack Space

The Series 400 10-Port Ethernet Switch connects Ethernet devices using *both* CAT5e copper wire *and* armored fiber optic cable. Copper wire communication ports conform to 10/100Base-Tx standards and the fiber ports conform to 10/100Base-Fx standards. The Series 400 7-Port Ethernet Switch connects Ethernet devices using *only* CAT5e copper wire.

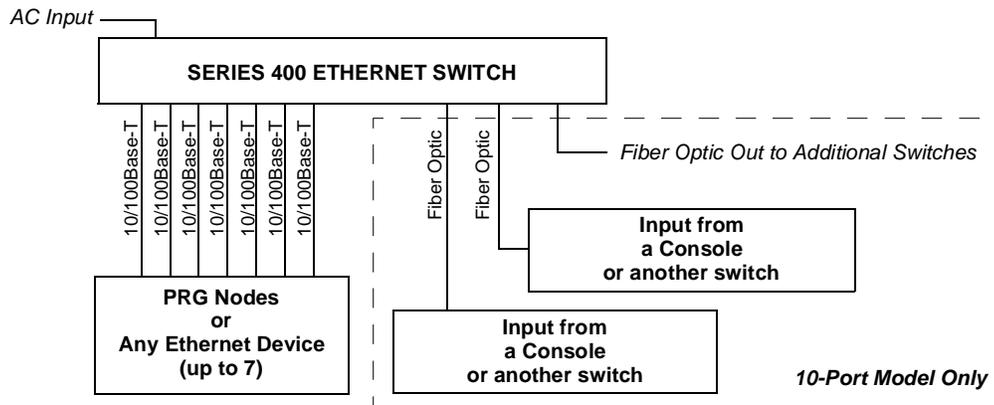


Figure 2-7: Ethernet Switch Connection Options

The following example system diagrams illustrate an Ethernet Switch being used with a Series 400 Power and Data Distribution Rack.

Note: Fiber optic connections are available only with the 10-Port Ethernet Switch.

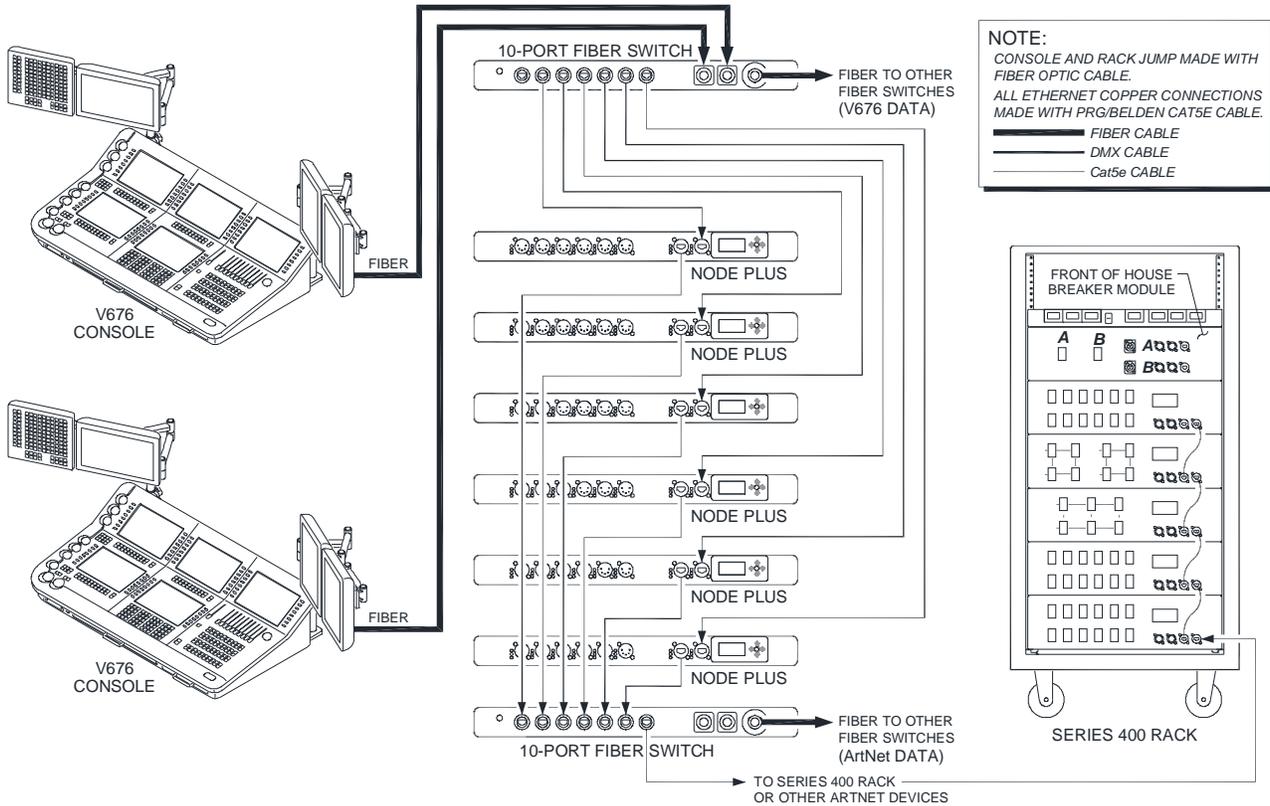


Figure 2-8: Sample Ethernet Switch Connection Diagram 1

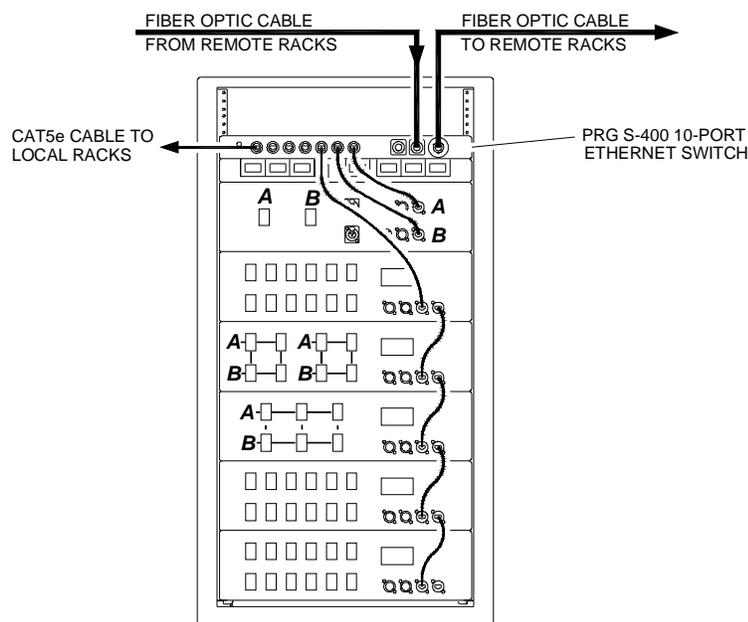


Figure 2-9: Sample Ethernet Switch Connection Diagram 2

Power Up Sequence

Use the following procedure to power up rack system:

- Step 1. At house service mains breaker (or 400 Amp Disconnect), turn power ON.
- Step 2. At rear of rack, verify all phase indicators are lit (**Figure 2-10**).

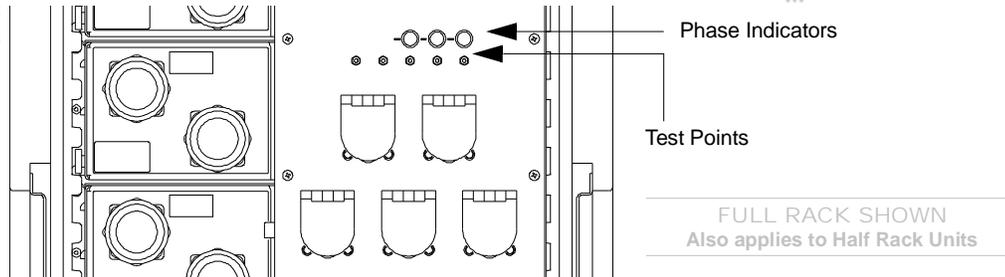


Figure 2-10: Phase Indicator and Test Point Locations

- Step 3. Using AC voltmeter, check voltages at test points. Voltages should read as follows:

Test Connection	Voltage
Neutral to X	120V ± 5V
Neutral to Y	120V ± 5V
Neutral to Z	120V ± 5V
X to Y	208V ± 5V
X to Z	208V ± 5V
Y to Z	208V ± 5V
Neutral to Ground	0 to 1V

- Step 4. If meter readings are normal, turn rack ON by pressing green Master Switch button (**Figure 2-10**).
- Step 5. Verify that front panel LED meter readings match test point readings for proper voltage.
- Step 6. Connect Trunk Cables (routed from Breakout Boxes and Front of House Breakout Box) to appropriate trunk connectors at rear of Breaker Modules. When properly connected, a click inside the Breaker Module will be heard as the Trunk Cable key engages. If there is no click, then components are not correctly configured. Refer to "**Troubleshooting**" on page 58.

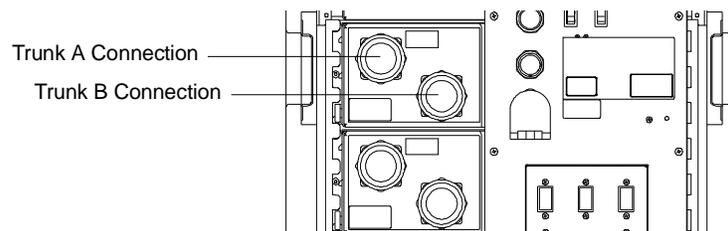
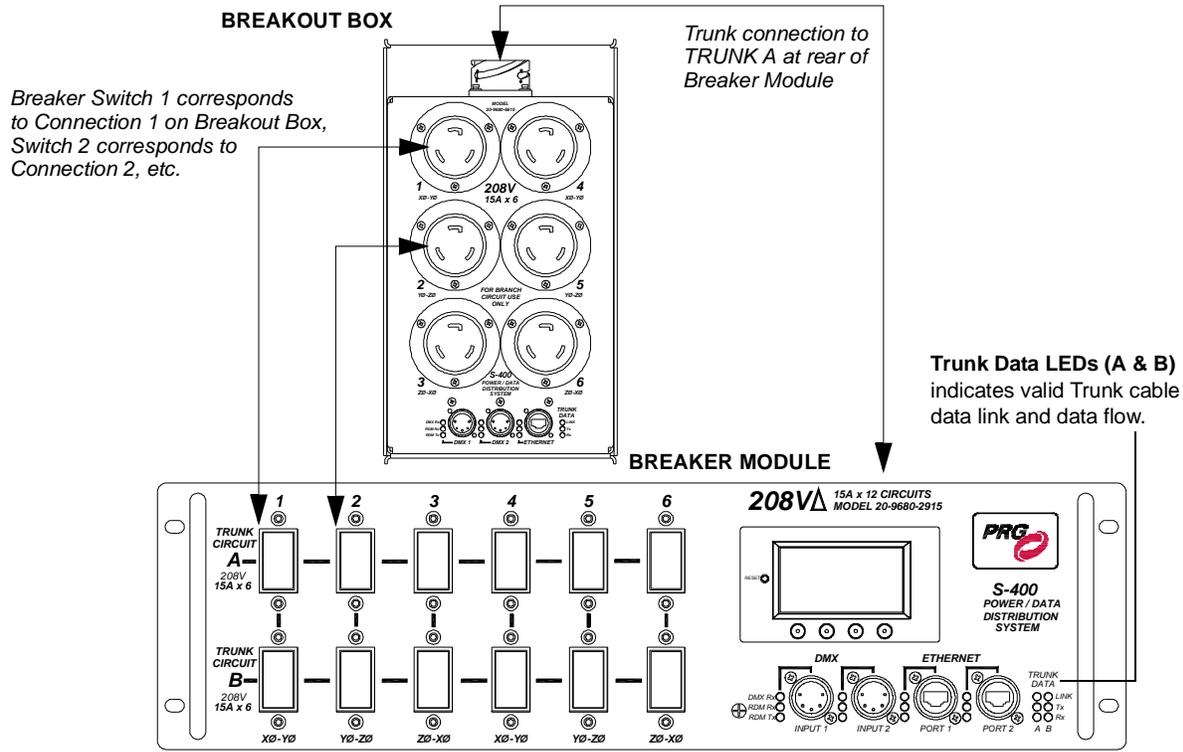


Figure 2-11: Breaker Module Rear Trunk Connectors

- Step 7. Connect auxiliary equipment to convenience outlets as required.
- Step 8. Connect data devices as required.
- Step 9. Using Menu Displays, configure DMX universes as required. Refer to "**Menu Display Features**" on page 44.
- Step 10. At Breaker Modules, switch breakers ON to provide power and data to connected fixtures (**Figure 2-12**).

Notes:

- + When properly connected, a click inside the Breaker Module will be heard as the Trunk Cable key engages.
- + When properly connected, the green Trunk Data LINK indicator will be lit.
- + Connecting or disconnecting an A/B Switch while the system is powered up can cause an apparent switch closure resulting in a change to the source system.
- + Connector numbers on the Breakout Boxes correspond to breaker switch numbers on the associated Breaker Module. A Breakout Box connected to TRUNK A corresponds to the breaker switches for Trunk Circuit A, while a Breakout Box connected to TRUNK B corresponds to the breaker switches for Trunk Circuit B. Refer to the following diagram:



15A 208V MODELS SHOWN
Rack Components May Vary

Figure 2-12: Breaker Switch and Connector Numbering Scheme

Breakout Box Mounting Options

Breakout Boxes can be hung horizontally or vertically from any appropriate truss or structure. The Breakout Box provides threaded holes for mounting by wingbolts, along with two additional holes for attaching a clamp bracket or a variety of other hooks. The Mega-Claw truss hook is shown in these examples, however, other compatible truss hooks are available from different manufacturers.



CAUTION: A safety cable should be used in all mounting configurations. Attach as shown.

Wingbolt

Wingbolts are provided for mounting on standard 2-inch round truss pipe.

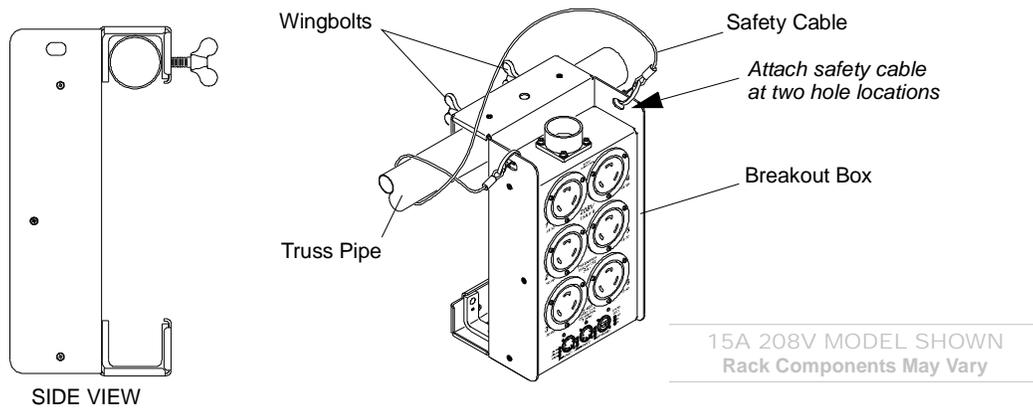


Figure 2-13: Wingbolt Mounting Method

Clamp Bracket Rail

In order to accommodate other mounting hooks, a clamp bracket rail (also used with VARI*LITE® Series 1000™, 2000™ and 3000™ luminaires) can be attached. The bracket requires two bushings, screws, nuts and the bracket itself (refer to "Accessories" on page 13 for part numbers).

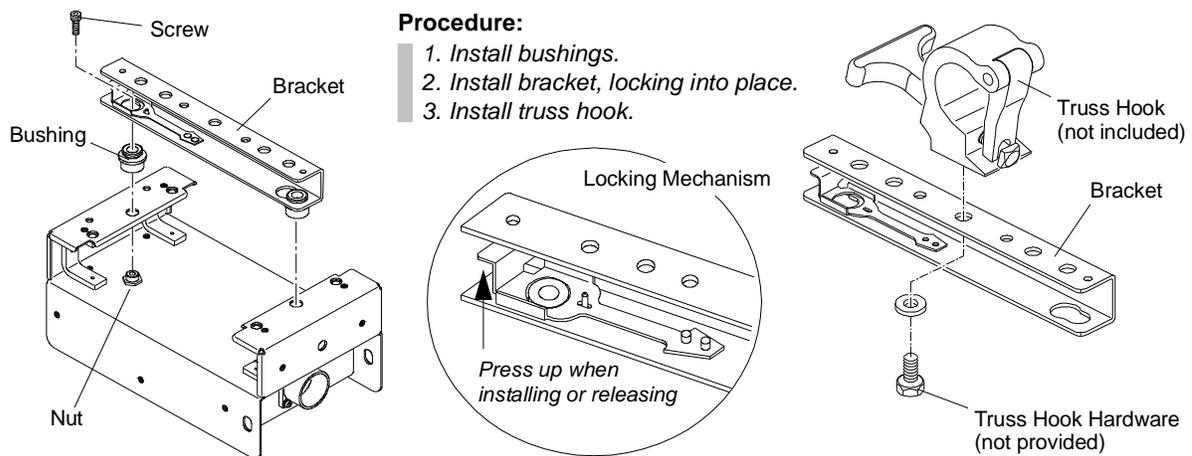


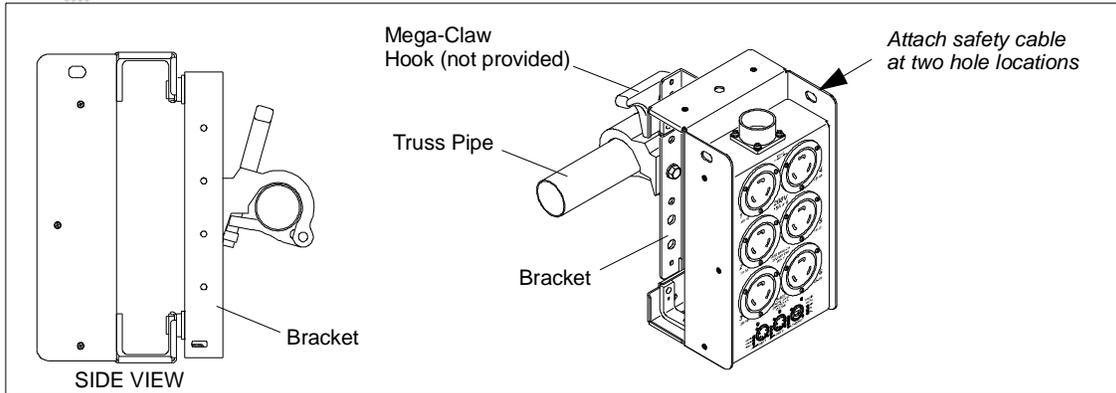
Figure 2-14: Installing Clamp Bracket

Mega-Claw

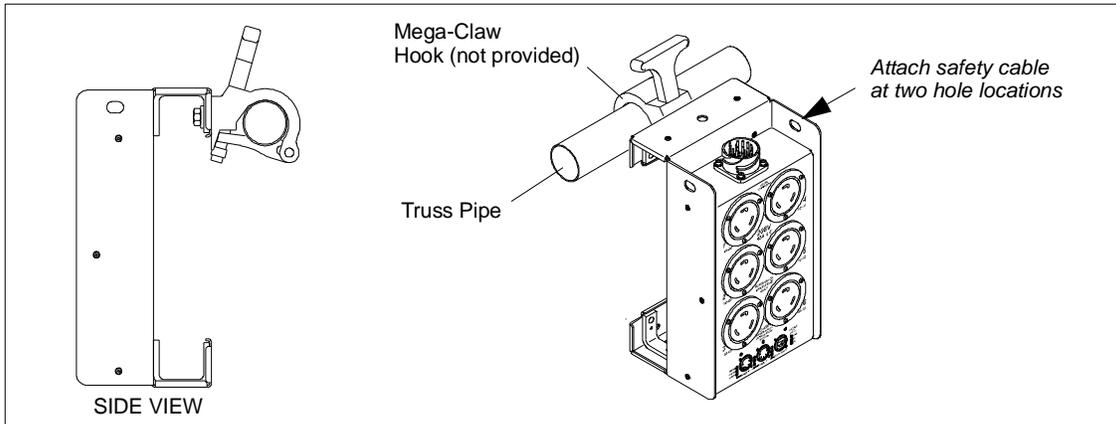
A Mega-Claw truss hook can be attached by several methods: directly onto the Breakout Box mounting flange *or* onto a clamp bracket. Refer to previous procedure for installing the clamp bracket. Install a Mega-Claw hook as follows:

208V MODEL SHOWN
Rack Components May Vary

Mounting With Clamp Bracket



Mounting Without Clamp Bracket - Back Mount



Mounting Without Clamp Bracket - Top Mount

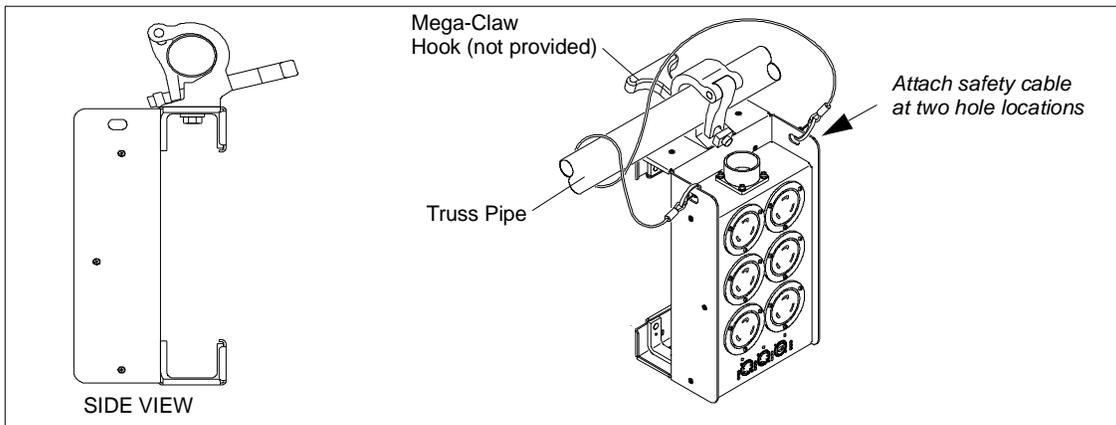


Figure 2-15: Mega-Claw Mounting Methods

POWER DOWN

Power Down Sequence

Use the following procedure to power down and disconnect rack components:

- Step 1. At Series 400 Rack, turn Master Switch OFF. To disengage Master Switch, pull down red protective cover and press red button (**Figure 2-5**).
- Step 2. At house service mains breaker (or 400 Amp Disconnect), turn power OFF.
- Step 3. At rear of rack, verify all phase indicators are off (**Figure 2-10**).



WARNING: Ensure house service mains breaker and rack Master Switch are OFF before disconnecting mains power cables from rack. Verify this by checking phase indicators on the rear rack panel. Ground should *always* be disconnected last.

- Step 4. Disconnect mains power cable Cam-Loks in the following reverse order:
 - 1) Z Phase, 2) Y Phase, 3) X Phase, 4) Neutral, and 5) Ground.

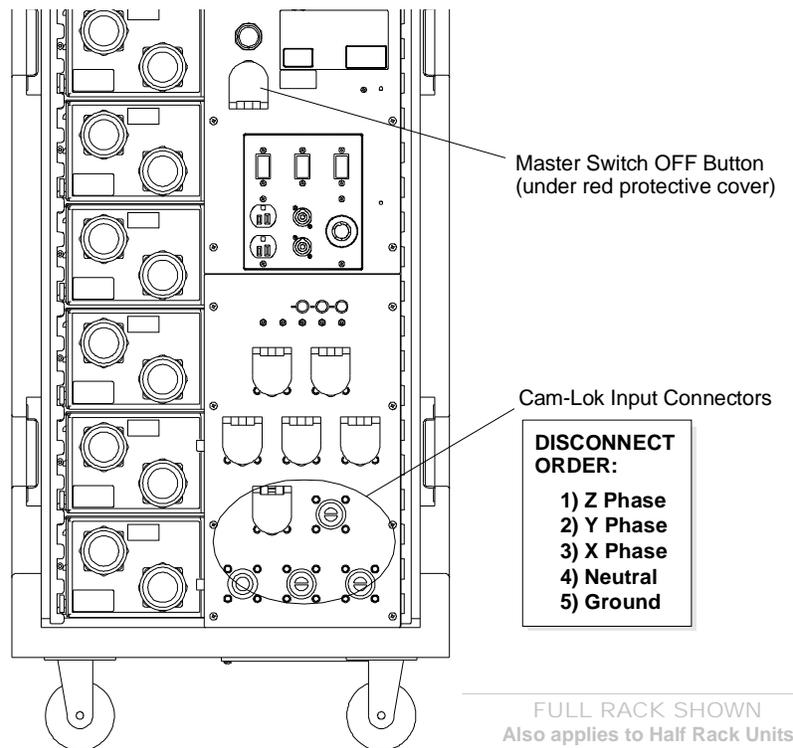


Figure 2-16: Disengaging Master Switch and Disconnecting Cam-Loks

- Step 5. At Breaker Modules, disconnect Trunk Cables.
- Step 6. Disconnect Trunk Cables from all peripheral equipment such as Breakout Boxes and Front of House Modules.



Notes



3.

OPERATION

This chapter provides detailed instructions for configuring source inputs and using the Menu Display features.

- + SYSTEM SUPPORT
- + MENU DISPLAY FEATURES
- + SOFTWARE UPGRADES

SYSTEM SUPPORT

Multiple DMX512 Input Sources

The Series 400 rack supports multiple input sources and DMX merging. All DMX512 inputs are configured with a Universe Number and a Source Identifier (A, B, C, *). (Outputs are only assigned with a Universe Number.) The output device will send the numbered universe for the currently selected source, i.e., if configured for Universe 0, it will send either Universe 0a, 0b, 0c or 0* depending on which input is selected. A fourth, omnipresent input source labeled "*" (asterisk) provides a universal, un-switched DMX512 input. In this case, no matter which source you choose, A, B, or C, the * sources will always be active. If enabled, DMX Merge provides the ability to have more than one DMX source for a universe combined to produce the output for that universe.

For sACN universes, Series 400 supports the priority feature in the protocol, so the highest priority source(s) of a universe will be merged and output on a port configured for that universe. Incoming DMX that is translated to sACN will be set to a priority based on the system set for the input. The default priorities are 90 for system A, 80 for system B, and 70 for system C. However, the universes for the current system will be increased to priority 110. For example, if system B is the currently selected system, system A inputs will be sent at priority 90, system B inputs will be sent at priority 110, and system C will be sent at priority 70. Inputs set as the universal (*) source are always sent at priority 100, which is the default sACN priority that will likely be used by external sources of sACN unless configured otherwise. External sACN sources should be set to priority 110 to merge with DMX512/sACN inputs, or higher than 110 to override DMX512/sACN inputs.

Series 400 handles a mixture of Art-Net and sACN universes by merging the highest priority source(s) of sACN for a universe with the current system source(s) of Art-Net for that universe.

Note: System source selection for sACN is only available for DMX512 inputs and will not apply to sACN Ethernet data.

The source is selected via the Menu Display at a Breaker Module or Front of House Module (refer to "[Menu Display Features](#)" on page 44), via an A/B Switch (refer to "[Front of House A/B Switch](#)" on page 23) or via the S400Tools Utility application (refer to the separate S400Tools User Manual). The Menu Display and A/B Switch both indicate the current source. To change the source from the SOURCE SELECTION menu, select the src:x menu item, pick the desired source, then press **exit** (refer to "[Source Selection](#)" on page 48 for complete menu instructions). The numbers shown by each source are the number of DMX512 universes active on the network for that system.

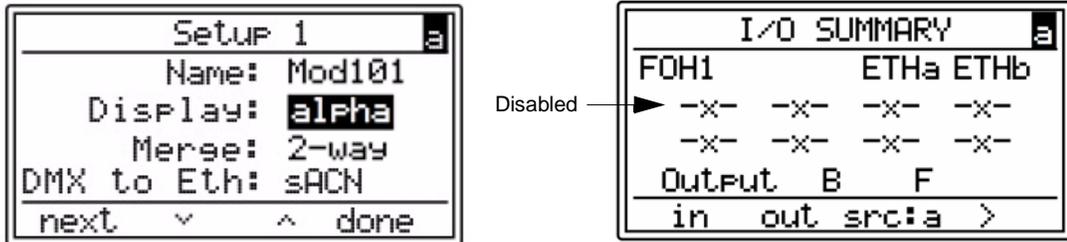
The A/B Switch allows instant selection of Source A or B, and also indicates the current source via the backlighting on the A and B selectors. If Source C is active, both selectors will be lit. System Source * is omnipresent and is not selectable at the A/B Switch.



CAUTION: Connecting or disconnecting an A/B Switch while the system is powered up can cause an apparent switch closure resulting in a change to the source system. This action is not recommended during a show-critical situation.

DMX Universes Display Preference

DMX512 universes are displayed as either alpha (A-IV) or numeric (000-255). This preference can be configured in the SETUP 1 menu. DMX512 inputs or outputs can also be disabled, shown as -x-. By default, all inputs and outputs are unassigned.

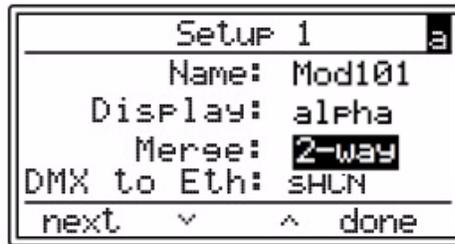


DMX Merge

DMX Merge capability has been implemented which provides the ability to have more than one DMX universe input specified for the same universe. Options include 2-Way, 3-Way and 4-Way which allows up to four inputs per universe. Multiple sources of the same universe will be merged using the Highest Takes Precedence (HTP) rule and is a system-wide option. Once enabled, all inputs have merge capability.

sACN merging occurs automatically if two or more signals are set to the same priority. To merge sACN data with source-selected Art-Net data, the priority level must be set to 110.

The Merge options can be configured in the SETUP 1 menu.



Note: S400 will not output DMX512 for a universe if the number of sources for that universe exceeds the merge limit.

MENU DISPLAY FEATURES

Overview

The Menu Display, located on each Rack Breaker Module, is used to configure, test and access internal status information for the PRG Series 400 Comm System. The soft-programmable buttons are used with the dynamic menu options, while the Reset button performs a hard rest of the module's processor.

Note: Pressing the Reset button may interrupt any DMX512 universes on the network briefly, since the switch will also go into a reset state while the button is held down.

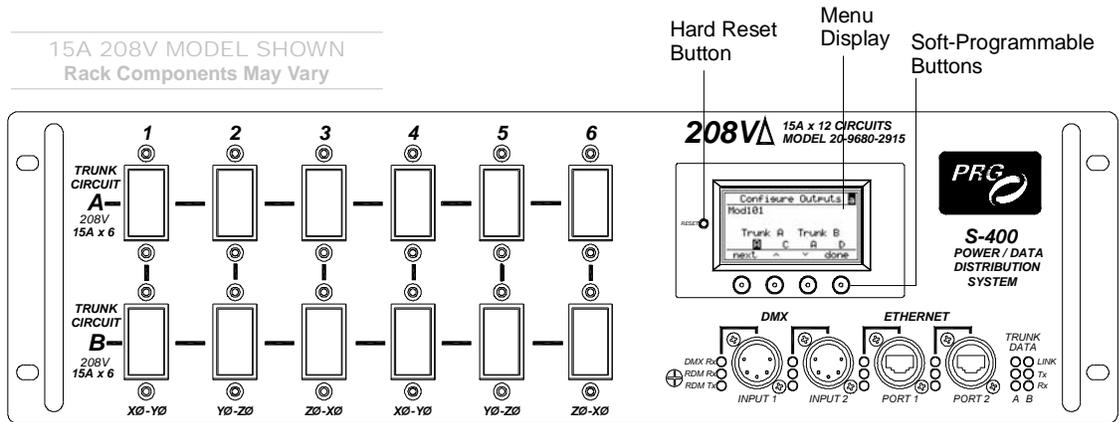


Figure 3-1: Menu Display Controls

The top line of the window displays the title of the current menu, while the center section displays the menu-specific information. The bottom line provides the button functions applicable to that particular menu page. The right arrow (>) symbol in the last button position indicates that there are more options available. These options will cycle through as the right arrow (>) button is pressed.

Note: The buttons will auto-repeat if held down.



Figure 3-2: Menu Layout

Menu Structure

The complete menu structure is as follows:

```
I/O (Input/Output) Summary
  ↳ in (configure inputs)
  ↳ out (configure outputs)
  ↳ src (configure system input source)
  ↳ sys (system overview)
      ↳ univ - System: Universes
      ↳ mod - System: Rack Modules
      ↳ foh - System: FOH
  ↳ Setup 1 (configure system-wide settings)
      ↳ Name
      ↳ Display
      ↳ Merge
      ↳ DMX to Eth
  ↳ Setup 2 (configure system-wide settings)
      ↳ Light
      ↳ Config
      ↳ Reset
      ↳ S/N
  ↳ dmx (DMX monitor)
  ↳ info (software info)
      ↳ i/f (stored breakout/node info)
  ↳ net (network info)
  ↳ ethernet tests (trunk and ethernet cable tests)
      ↳ Ethernet Cable
      ↳ Trunk A
      ↳ Trunk B
```

Figure 3-3: Menu Structure Diagram

Menu Details

Input/Output Summary – Rack Module

This menu shows the configuration of the two DMX512 rack inputs and the two DMX512 outputs on each of the two Trunk Breakout Boxes. In this case, Input 1 (Ca) is Universe 1 from Source A and Input 2 (Cb) is Universe 2 from Source B. The system source default is Source A, indicated by src:a in the last line.

I/O SUMMARY			
Mod101	Ca	Cb	
	Trunk A	Trunk B	
	A C	A D	
in	out	src:a	>

Input/Output Summary – Front of House Module

This menu shows the configuration of the ten DMX512 rack inputs (-x-) and the two outputs of the Front of House (FOH) Module (ETHa and ETHb). The letter after the input universe number indicates which of the three sources is being used for that particular universe. The letter after "src" in the last line, src:a, indicates that Source A is the current system default source.

I/O SUMMARY			
FOH1	ETHa	ETHb	
-x-	-x-	-x-	-x-
-x-	-x-	-x-	-x-
Output	B	F	
in	out	src:a	>

Configure Inputs – Rack Module

This menu allows configuration of the two rack inputs.

The highlighted universe (Aa) can be changed by selecting the down arrow (v) or up arrow (^). Move to the next universe by selecting next. Pressing done will prompt a confirmation screen that allows for changes to be committed or discarded. Note that if no changes were made, or the menu was changed but all items were returned to their initial value, pressing done will result in a simple exit to the I/O SUMMARY menu.

Configure Inputs			
Mod101	Aa	Ba	
next	^	v	done

Configure Inputs – Front of House

This menu allows configuration of the ten Front of House (FOH) Module inputs.

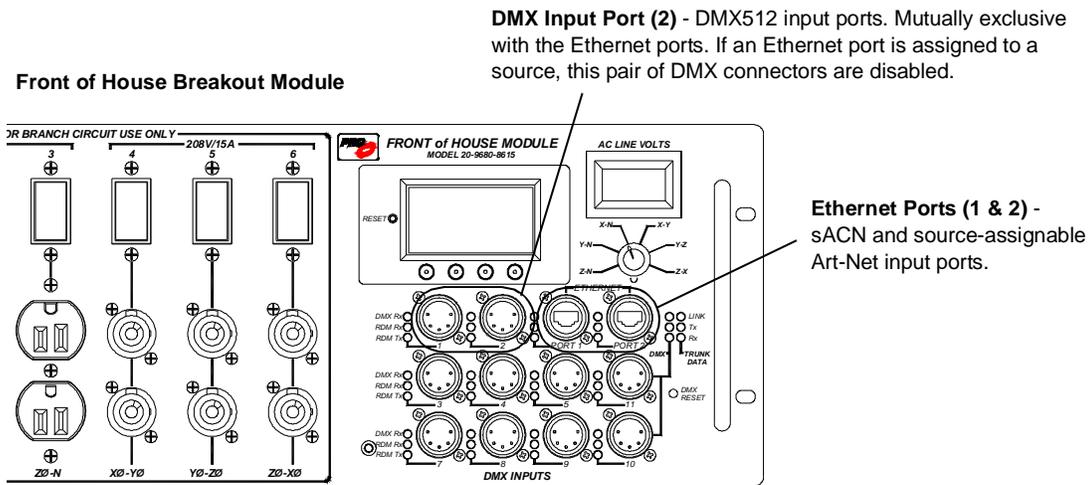
The highlighted universe can be changed by selecting the down arrow (v) or up arrow (^). Move to the next universe by selecting next. Pressing done will prompt a confirmation screen that allows for changes to be committed or discarded. Note that if no changes were made, or the menu was changed but all items were returned to their initial value, pressing done will result in a simple exit to the I/O SUMMARY menu.

Configure Inputs			
FOH1	ETHa	H*	
Aa	Ba	Ca	Da
Ab	Bb	Cb	Db
next	^	v	done

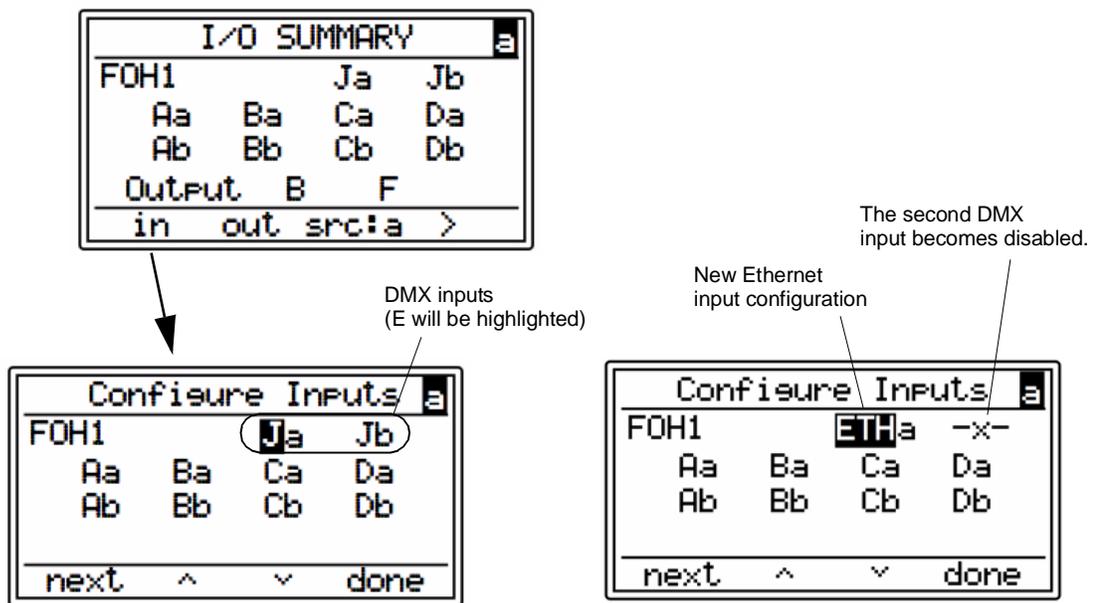
Source-Assignable Art-Net Input

An Ethernet input on a Front of House (FOH) module can be mapped to a particular Art-Net system source. Standard Art-Net corresponds to System A, so it doesn't need to be re-mapped. A standard Art-Net output can be mapped to a different system (B, C, or *) by enabling that option on the FOH module. When Ethernet remapping is enabled on a module, the corresponding DMX inputs are disabled due to the increased processing requirements for handling the network packets.

Note: sACN system source is only managed by hard-line DMX512 input. Priority level 110 is the active S400 sACN system source, which must be assigned and changed on the external sources/consoles to swap sources (refer to "Multiple DMX512 Input Sources" on page 42). When inputting sACN through a FOH box, the port should remain unassigned (noted by -x-).



For example, access the I/O SUMMARY menu. Select "in" to open CONFIGURE INPUTS menu. At the first DMX input, change **Ja** to **ETHa** by scrolling with arrows and then pressing "done." Once the input is set to ETHa (Ethernet), the second DMX input becomes disabled (noted by -x-).



Configure Outputs – Rack Module

This menu allows configuration of the two DMX512 outputs on each of the two Trunk Breakout Boxes.

The highlighted universe can be changed by selecting the down arrow (v) or up arrow (^). Move to the next universe by selecting next. Pressing done will prompt a confirmation screen that allows for changes to be committed or discarded. Note that if no changes were made, or the menu was changed but all items were returned to their initial value, pressing done will result in a simple exit to the I/O SUMMARY menu.

```
Configure Outputs a
Mod101

Trunk A   Trunk B
  A       C   A   D
next    ^     v   done
```

Configure Outputs – Front of House Module

This menu allows configuration of the two DMX512 outputs on the associated Rack Module.

The highlighted universe can be changed by selecting the down arrow (v) or up arrow (^). Move to the next universe by selecting next. Pressing done will prompt a confirmation screen that allows for changes to be committed or discarded. Note that if no changes were made, or the menu was changed but all items were returned to their initial value, pressing done will result in a simple exit to the I/O SUMMARY menu.

```
Configure Outputs a
FOH1

Output    A   D
next    ^     v   done
```

Source Selection

This menu allows a choice of the module input system (source) and shows the number of active universes for each specified input source.

The highlighted source is the current source for this module. This can be changed by selecting the a, b, or c entry from the last row of the menu. When finished, pressing exit will bring up a confirmation that allows for a source change to be committed or discarded. Note that if no change was made, or the source was changed but it was returned to its initial value, pressing exit will return to the I/O SUMMARY menu.

```
Source Selection a
System a: 11
System b: 11
System c: 0
  a     b     c   exit
```

System Overview

This menu shows a summary of system activity and devices, displaying racks in alphabetical order. The information is as follows:

- + **ArtN** - the number of Art-Net universes currently active on the network. The four columns represent universes from system sources A, B, C, and *.
- + **sACN** - the number of sACN universes currently active on the network. The four columns represent universes from system sources A, B, C, and other.
- + **Rack** - the number of Rack Modules on the network.
- + **BOB** - the number of Breakout Boxes on the network.
- + **FOH** - the number of Front of House modules on the network.
- + **Node** - the number of Node devices on the network.

The three menu options at the bottom of the screen (univ, mod, and foh) access the SYSTEM:UNIVERSES, SYSTEM:MODULES, and SYSTEM:FOH sub-menus described below.

```
System Overview a
ArtN:  10  10  0  0
sACN:   2
Rack:   6  Node: 5
BOB:   9  FOH:  2
univ  mod  foh  exit
```

System: Universes

This menu shows all active universes on the network.

Up to four universes are displayed at a time. The display consists of the universe number and source (Aa), the location where that universe is being input/generated (FOH1), and the port used for the input to be connected to the device (p0). The column on the left indicates "A" for Art-Net and "s" for sACN universes. For sACN data, the priority number will be shown.

The left (<) and right (>) arrows allow the previous and subsequent universes to be displayed. Pressing exit will return to the SYSTEM OVERVIEW menu.

System: Universes			
A	Aa	FOH1	p0
A	Ba	FOH1	p1
s	Ca	ModSR1	p1
s	Da	ModSR1	p3
< >			exit

System: Rack Modules

This menu displays the Input/Output configuration of the Rack Modules on the network.

One Rack Module is displayed at a time (Mod101). The left (<) and right (>) arrows allow the previous and subsequent Racks to be displayed. Pressing exit will return to the SYSTEM OVERVIEW menu.

System: Modules			
Mod101	Ca	Cb	
Trunk A		Trunk B	
A	C	A	D
< >			exit

System: FOH

This menu displays the Input/Output configuration of the Front of House (FOH) Modules on the network.

One FOH Module is displayed at a time (FOH1). The left (<) and right (>) arrows allow the previous and subsequent FOH Modules to be displayed. Pressing exit will return to the SYSTEM OVERVIEW menu.

System: FOH			
FOH1	ETHa	ETHb	
-x-	-x-	-x-	-x-
-x-	-x-	-x-	-x-
Output	B	F	
< >			exit

Setup 1 and 2

These menus allow configuration of system options and reset to defaults.



The highlighted option can be changed by selecting the down arrow (v) or up arrow (^). Move to the next universe by selecting next. Pressing done will save changes and return to the main menu.

Name

- + Displays the current module device name.
- + To edit the device name, first select one of the arrow buttons, (v) or (^), while the Name menu entry is selected. This selection will open the module name characters as fields and allow for editing. Press next to move to the character(s) to be modified. The allowed characters are: letters 'a' - 'z', numerals '0' - '9', and the blank or space character ' '. The arrow buttons will scroll through the allowed characters in the order: letters, blank, numerals (assuming that the Up button is pressed and the initial value is the letter 'a'). If the first character of the name is a letter, it is uppercase. All other letters are lowercase.
- + Once name editing is initiated, pressing next will cycle through all of the available name character positions, followed by moving to the Display field, which closes name editing. The other menu entries follow as normal, before returning to the name field. Upon returning to the name field, it will be necessary to again initiate name editing if further modification is required. Until name editing is initiated, pressing next will simply cycle through the menu items in order, starting with the name entry.

Display

- + Sets DMX512 universe display to either alpha (A-IV) or numeric (000-255).

Merge

- + Enables the ability to have more than one DMX universe input specified for the same universe. Options include 2-Way, 3-Way and 4-Way which allows up to four inputs per universe. Merging operates under the Highest Takes Precedence (HTP) rule and is a system-wide option. Once enabled, all outputs have merge capability.

DMX to Eth (Ethernet)

- + Selects which protocol incoming DMX512 will be converted to; either Art-Net or sACN.

Light

- + The Light option (page 2) allows the display backlight to be turned on or off. This is accomplished by pressing either arrow button (v) or (^) when the On/Off indication is selected. The backlight will go off (entering the off mode) and the indicator will be changed to Off. To return to the on mode, press either arrow button when the Off indication is selected. The backlight will be turned on and the indication will change to On.
- + If the backlight is in the off mode, pressing a button will turn on the light for 10 seconds, at which time it will automatically turn itself off. Note that pressing a button while the light is temporarily on, will reset the timer. If the light is in the on mode, it will stay on permanently unless it is manually turned off as described above.
- + When the backlight is in the off mode, the light will be turned on for about ten (10) seconds every time a button is pressed or the module is reset. The mode is saved whenever done is pressed. In order to change the mode, go to the SETUP 2 screen and explicitly change the mode by pressing an arrow button (v) or (^) and exiting by pressing the done button.

Config (Configure)

- + Allows the device to be switched between *rack* and *foh* modes. Note: The interface will automatically switch to *foh* mode if a DMX512 input board is detected on one of the Ethernet ports.

Reset

- + The **Reset** option allows reset of all the input and outputs to the default settings. To reset to defaults, select **default** in this field and then press **done** while the reset option is still selected.

S/N

- + Displays the module's Serial Number.

Network Info

This menu displays errors, status information and network identification information. The menu will display information for Ethernet (mod), Trunk 1 (out1) and Trunk 2 (out2) communications.

```
Out1 Net Info a
RxOK 5673 err 0%
RxOK 956 err 0%
HW 00:1C:A0:01:00:00
IP 10.1.16.76
mod out2 exit
```

DMX Monitor

This menu shows the current data for a DMX512 universe.

The DMX universe number is shown in the title line (Aa). Press next to go to the next universe.

The first number of each line is the channel offset, followed by five channels of DMX512 data. Press the arrow buttons (v) or (^) to see another twenty of the 512 channels. Press exit to return to the main menu.

```
DMX Monitor: Aa a
001: 000 000 091 164 023
006: 000 037 255 000 000
011: 000 000 000 255 000
016: 000 000 000 091 143
next v ^ exit
```

Note: The data is live, but only refreshes approximately every two seconds.

Software Info

This menu shows the current software version and boot version for the Series 400 system.

Note: The following is an example screen and may differ from the current released software version.

```
Software Info a
-----
Version: 5.0      r20
Date: 11/12/14  14:07
Boot: 1.1        r4
Date: 06/27/05  12:10
-----
i/f  A    B    exit
```

- + **Version** - shows the system software version number.
- + **Date (top)** - the top Date field shows the system software date and time.
- + **Boot** - shows the version number and date for the boot loader module.
- + **Date (bottom)** - the bottom Date field shows the boot loader date and time.

Pressing **A** will display the software version information for the device connected to Trunk A, while pressing **B** will display the software version information for the device connected to Trunk B. (The title line will indicate the type of device connected.) Press **i/f** to return to the SOFTWARE INFO menu for the interface device.

Pressing **i/f** while in the main SOFTWARE INFO menu will open the STORED BO/NODE INFO menu. This menu displays the software version information for the Breakout Boxes and Nodes (which store the software in their flash memory). It will also explicitly load Breakout or Node software from the Rack module.

- + The **>BO** button sends the stored Breakout version.
- + The **>Nod** button sends the stored Node version.
- + Pressing **i/f** while in the STORED BO/NODE INFO menu returns to the SOFTWARE INFO menu.

```
Software Info a
-----
Version: 5.0      r20
Date: 11/12/14  14:07
Boot: 1.1        r4
Date: 06/27/05  12:10
-----
i/f  A    B    exit
```

```
Stored BO/Node Info a
-----
Version: 5.0      r119
Date: 12/22/14   16:29

Node: 11/12/14   14:36
-----
i/f  >BO >NOD exit
```

Sends stored Breakout software version

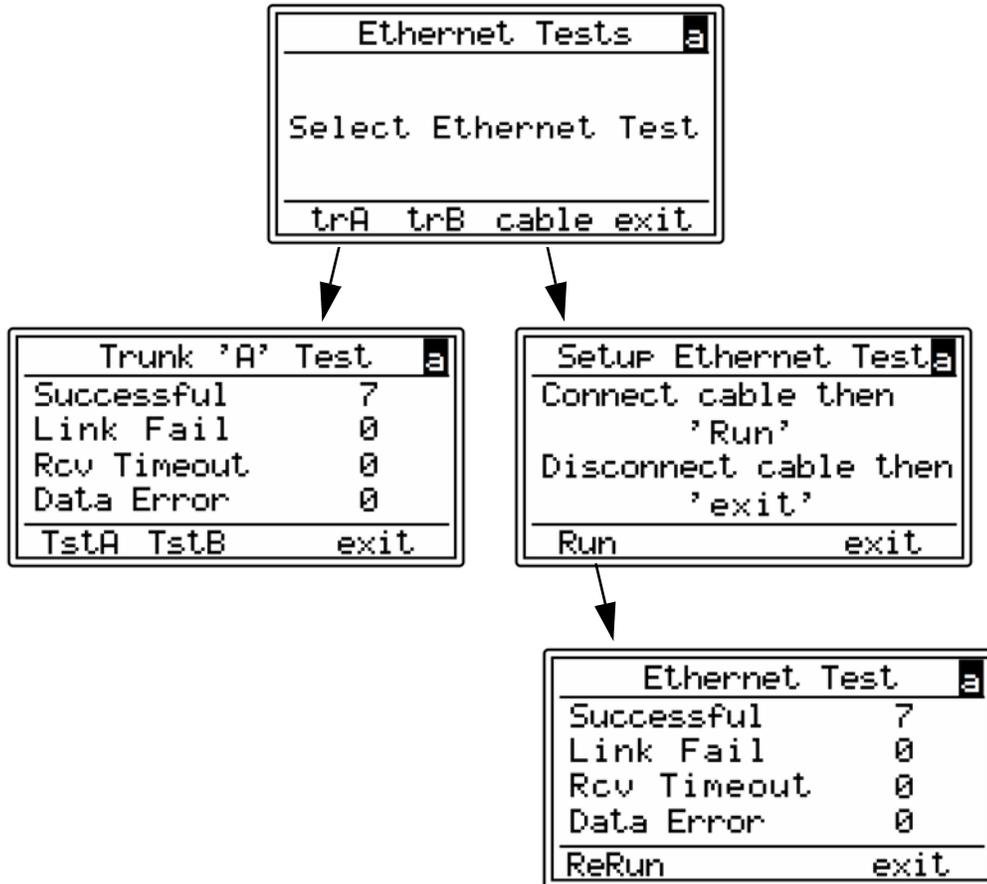
Sends stored Node software version

Press **exit** to return to the main menu.

Ethernet Tests

This menu provides the ability to test Trunk and Ethernet cables.

- + A Trunk test (trA and trB) sends a round-trip test packet to the attached Breakout Box and back over the specified trunk cable.
- + Cable test (cable) is used to verify a RJ-45 style cable using the connectors on the front panel. It sends a test packet from one of the ports on the front panel and expects to receive it on the other port.



Note: To avoid a potential module lock-up, do not link RJ-45 cable between two ports until you enter the "Setup Ethernet Test" window .

SOFTWARE UPGRADES

Installing a New S400 Software Version

The S400Tools Utility is used to update the software in all S400 devices. S400Tools can be run on any Mac® or Windows® computer running Java 6 or later. It may be necessary to install or upgrade Java on the computer before using S400Tools. Java is available at: <http://java.com/getjava/>.



S400Tools

Requirements:

- + Mac® or Windows® computer with Java version 6 or later installed
- + CAT5e Ethernet Cable

To install S400 Tools Utility:

- Step 1. Download or copy S400Tools jar file to computer.
- Step 2. Connect CAT5e Ethernet Cable from computer to Series 400 system.
- Step 3. Configure network connection. The application looks for a port with an IP address in the pre-defined Series 400 subnet (10.66.x.x). Configure the IP address of the port to be used to an address in that range, such as 10.66.200.1, and the subnet mask to 255.255.0.0.

If an active 10.66 port is not found, the following message will be displayed:

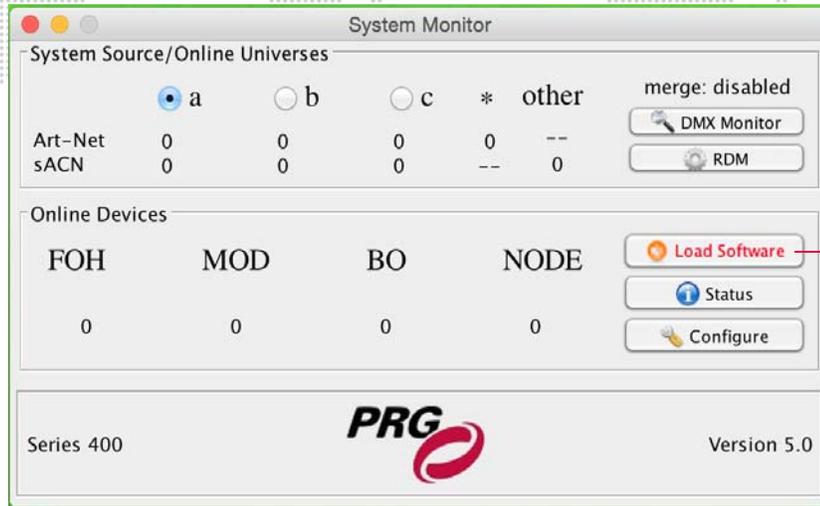


- Step 4. At computer, locate S400Tools application icon. Double-click icon to launch program.
- Step 5. After startup, the software will ask if the previous configuration file should be loaded. Click Yes or No as required.



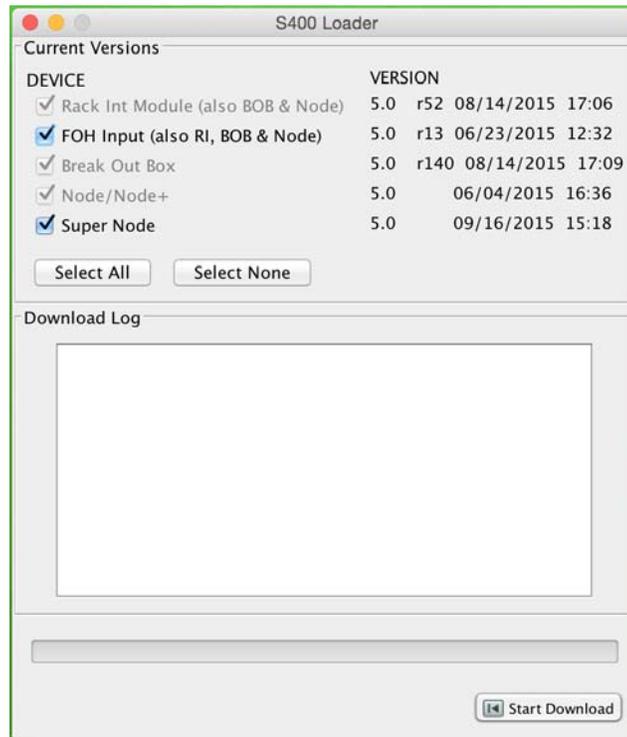
To update S400 system software:

Step 1. At S400Tools System Monitor window, click **Load Software** button. (The button will only be visible if software updates are needed.)



Step 2. At S400 Loader window, select devices to update by clicking their checkbox.

Step 3. Click **Start Download** button to begin update. All device software versions will be updated sequentially. Progress of the update will be shown via the text display and the progress bar.





Notes



4.

TROUBLESHOOTING & MAINTENANCE

This chapter provides a basic troubleshooting guide, along with procedures for reconfiguration and extended care of the rack.

- + TROUBLESHOOTING
- + ROUTINE MAINTENANCE
- + RECONFIGURING COMPONENTS

TROUBLESHOOTING

Basic Troubleshooting Guide

Symptom(s)	Solution(s)
No power to rack. Phase indicators not lit.	<ol style="list-style-type: none">1. Ensure Mains Cable Cam-Loks are connected to Inputs.2. Turn on breaker at 400 Amp Disconnect.3. Check for LVS failure (see below).
No power to connected devices or convenience outlets.	<ol style="list-style-type: none">1. Engage green Master Switch button.
Power to convenience outlets, but not to connected fixtures (via Trunk Cable).	<ol style="list-style-type: none">1. Switch breakers at front of Breaker Module(s) to ON position.2. Ensure Trunk Cables are mated to matching Breakout Box.
No "clicking" sound when a Trunk Cable is connected to Breaker Module.	<ol style="list-style-type: none">1. Ensure Breakout Box rating matches Breaker Module rating (120V or 208V) .
No control of connected fixtures.	<ol style="list-style-type: none">1. Ensure DMX data sources and merge settings are properly configured.

Checking For Proper LVS Operation

Inspection holes are provided at the rear of the rack in order to verify whether the two rack power supply (LVS) units are working properly. Each LVS has a green LED indicator which should be lit when power is applied to the rack.

At rear of rack, ensure proper operation of LVS units by checking LED status as follows:

Both LEDs lit: Status okay, both LVS units operating properly.

One LED lit: Status okay, but indicates that one LVS unit is not working and should be replaced.

No LEDs lit: Failure situation, both LVS units need to be replaced.

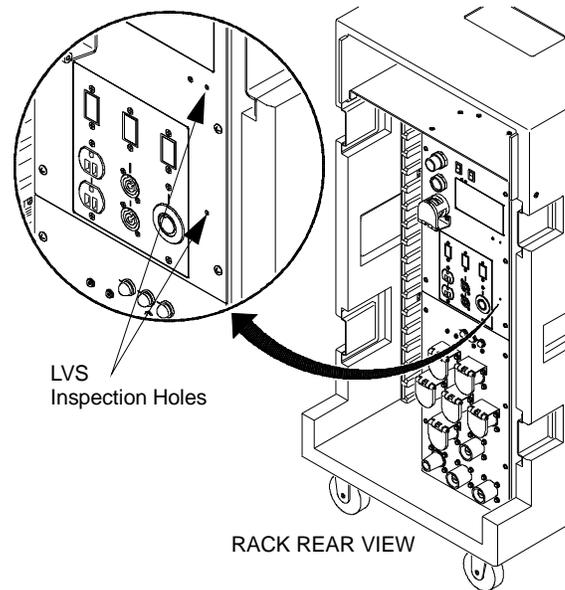


Figure 4-1: LVS Inspection Holes

ROUTINE MAINTENANCE

Cleaning/Replacing Air Filters

Air filters are located on the bottom of the rack tower and in each Breaker Module. These filters may need to be cleaned periodically, depending on amount of use and/or exposure to dusty environments.

Rack Filter

Parts:

40.7153.0001.0 AIR FILTER, SERIES 400 RACK

Tools:

#2 Phillips screwdriver



WARNING: Remove power from rack before performing any maintenance procedures.

To clean the rack air filter:

- Step 1. Disconnect power to rack.
- Step 2. Carefully tilt rack onto one side.
- Step 3. Remove four screws securing filter bracket and remove bracket and filter (**Figure 4-2**).
- Step 4. Clean filter with soap and water. Dry thoroughly.
- Step 5. Re-install filter and bracket.

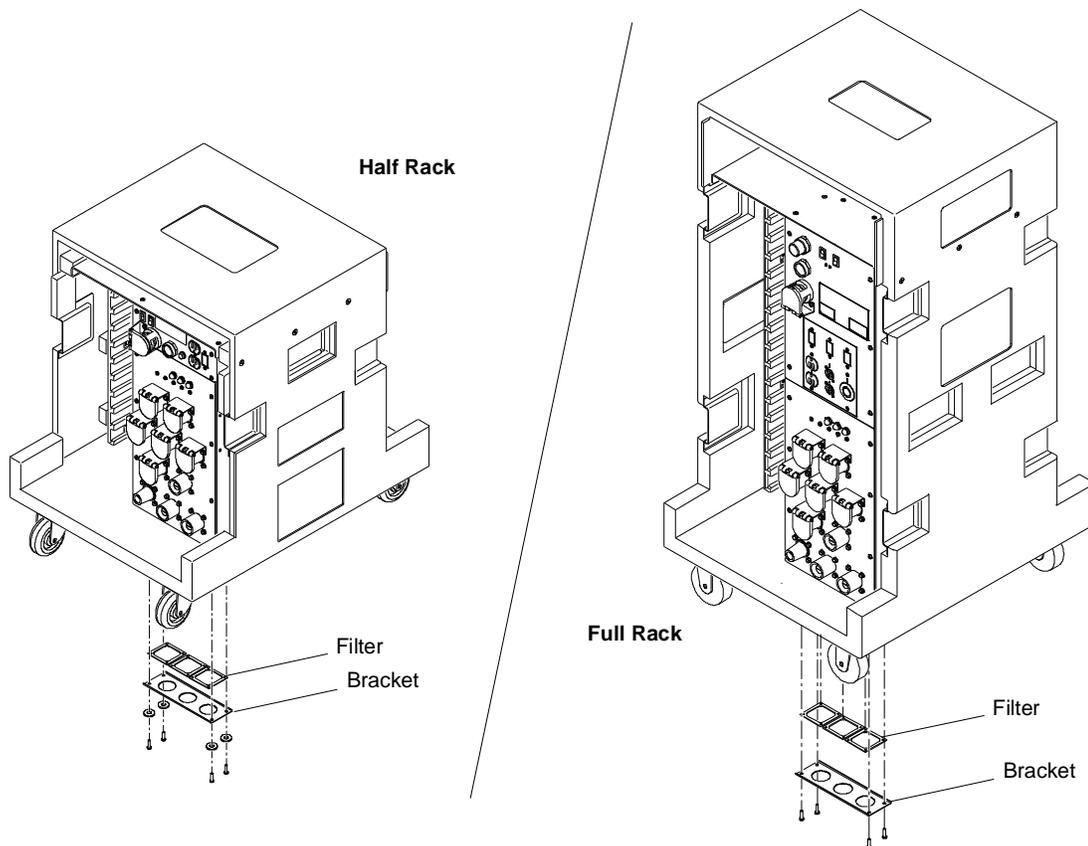


Figure 4-2: Removing Rack Air Filter

Breaker Module Filter

Parts:

40.7154.0001.0 FILTER, FAN

Tools:

Screwdriver



WARNING: Remove power from rack before performing any maintenance procedures.

To clean a Breaker Module air filter:

- Step 1. Disconnect power to rack.
- Step 2. If required, remove Breaker Module from rack. Refer to "Swapping a Breaker Module" on page 61.
- Step 3. Using screwdriver, remove filter as shown in **Figure 4-3**.
- Step 4. Clean filter with soap and water. Dry thoroughly.
- Step 5. Re-install filter.

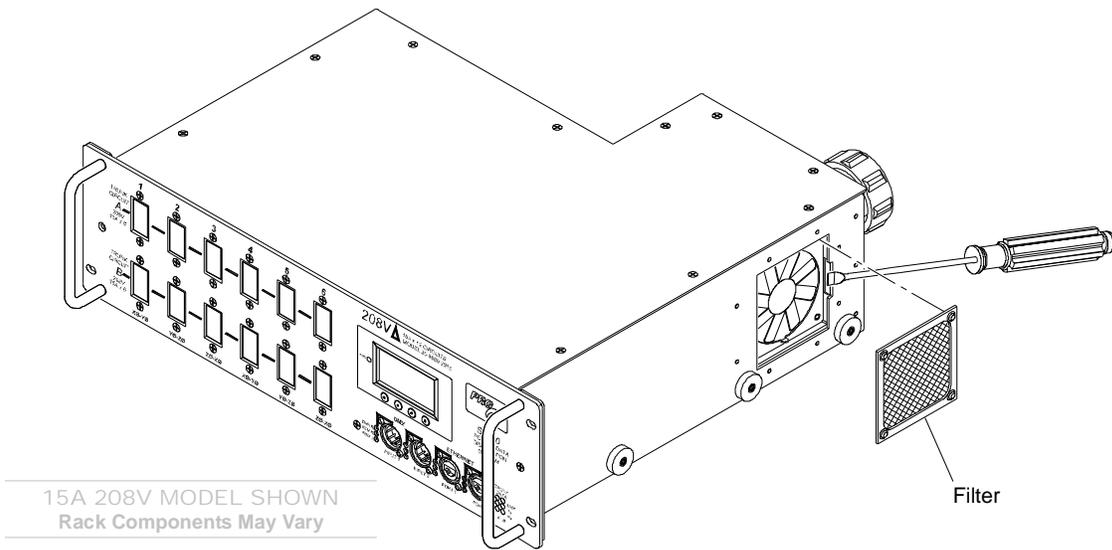


Figure 4-3: Removing Breaker Module Air Filter

Note: The Breaker Module fan is triggered thermostatically and will only turn on if the ambient temperature inside the chassis is too high.

RECONFIGURING COMPONENTS

About Reconfiguring

The rack and other system components are configurable depending on system requirements. For example, the rack can contain various types and quantities of Breaker Modules such as 120V and/or 208V or additional auxiliary equipment. The Front of House Breakout Module can be installed independently or in a rack unit itself.



WARNING: In any configuration, the rack should *never* have any unfilled gaps. Special 1U, 2U and 3U safety covers are available to cover any gaps in the rack tower due to custom configurations.

Swapping a Breaker Module

The Breaker Modules are hot-swappable, allowing the components to be changed quickly even while the system is under operation. In the event a module needs to be swapped or the rack needs to be reconfigured, use the following procedure.



WARNING: Every space in the rack *must* be filled with either a module or a rack spacer cover *at all times*. For spacer cover part numbers, refer to "**Accessories**" on page 13.

Tools:

#2 Phillips Screwdriver

To replace a Breaker Module:

- Step 1. At rear of Breaker Module, disconnect any trunk cables.
- Step 2. At front of module, disconnect any data cables.
- Step 3. Remove four screws securing module (**Figure 4-4**). Using handles, pull module straight out of rack.
- Step 4. Install new module and reconnect cabling.

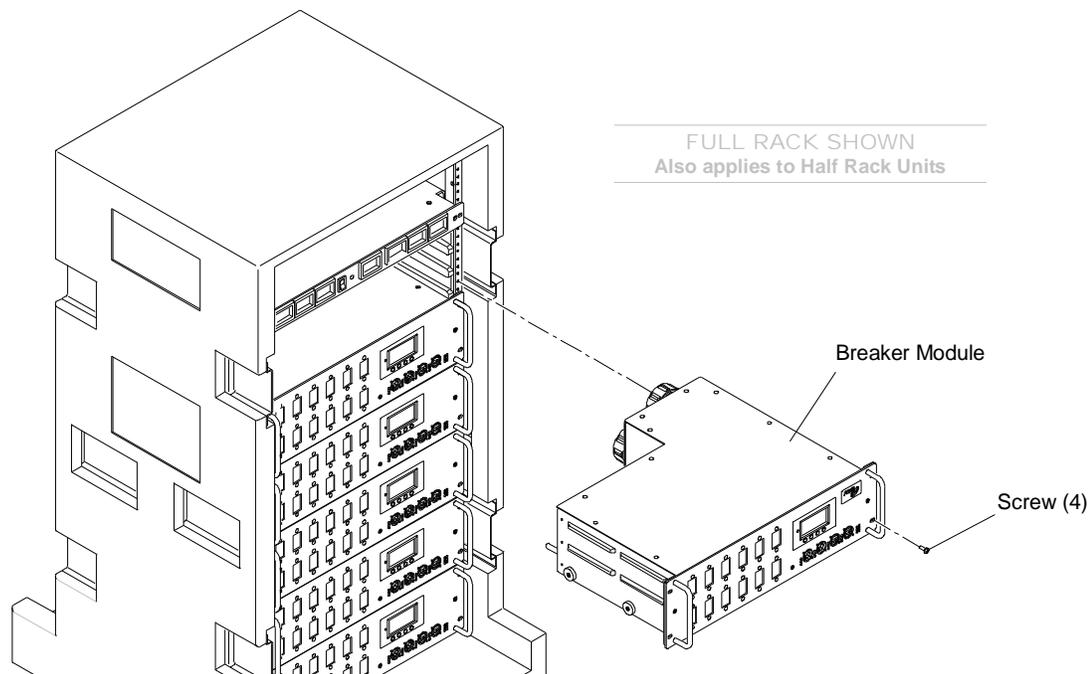


Figure 4-4: Replacing a Breaker Module

Repositioning Front of House Trunk Connector

The trunk connector on the Front of House Breakout Module can be positioned in one of two locations depending on whether the unit is to be installed in a rack or used as a stand-alone enclosure.

Parts:
none

Tools:
#2 Phillips screwdriver



WARNING: Remove power before performing any maintenance procedures.

To reposition FOH trunk connector:

- Step 1. Disconnect power from Front of House Breakout Module.
- Step 2. At trunk connector mounting plate, remove eight screws and pull connector loose (**Figure 4-5**). (Plate will still be connected by wiring.)
- Step 3. Rotate mounting plate into new position and re-install screws.

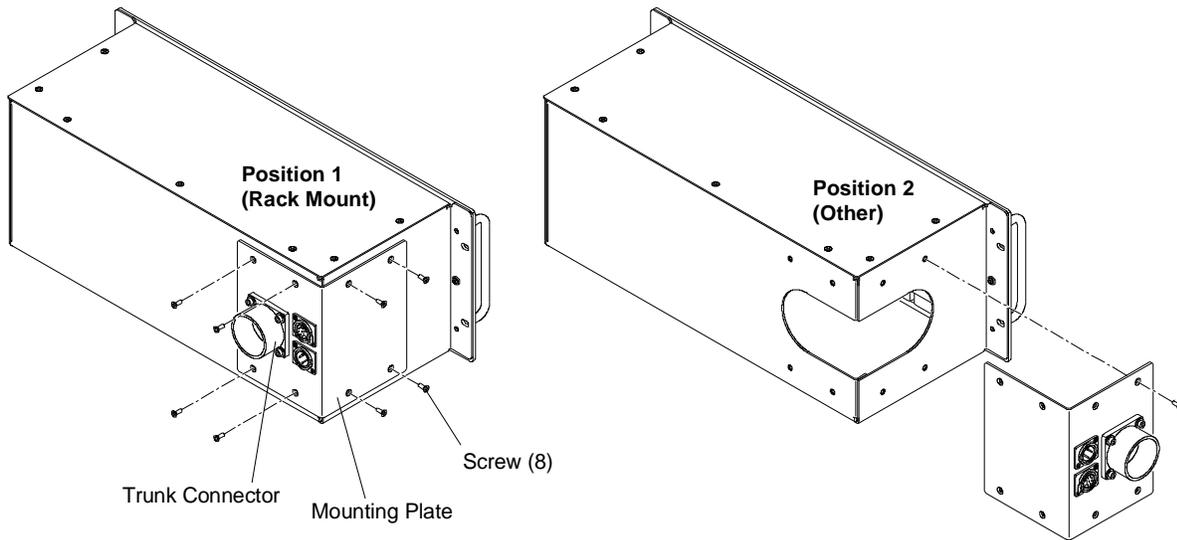


Figure 4-5: Repositioning FOH Breakout Module Trunk Connector

Installing Safety Cover Plates

In the event there are gaps in rack components, an appropriate safety cover plate(s) must be installed to prevent contact with the live bus bars. The size of the safety cover is dependent upon the size of the unused rack space. For example, if there is 3U of empty space, then a 3U cover plate is used. If there is 4U of empty space, then both a 3U and 1U cover would be used.

Parts:

21.9680.0661	ASSY, SAFETY COVER PLATE, 1U
21.9680.0662	ASSY, SAFETY COVER PLATE, 2U
21.9680.0660	ASSY, SAFETY COVER PLATE, 3U

Tools:

#2 Phillips screwdriver



WARNING: Remove power before removing or installing any safety cover plates.

To install a safety cover:

- Step 1. Determine which size safety cover plate(s) is required.
- Step 2. Fit 1/4-turn fasteners into cover plate, then fit ends of fasteners fit through small, square cut-outs in rack tower as shown in **Figure 4-6** (full rack) and **Figure 4-7** (half rack).
- Step 3. Once cover plate is installed, turn fasteners to secure in place.

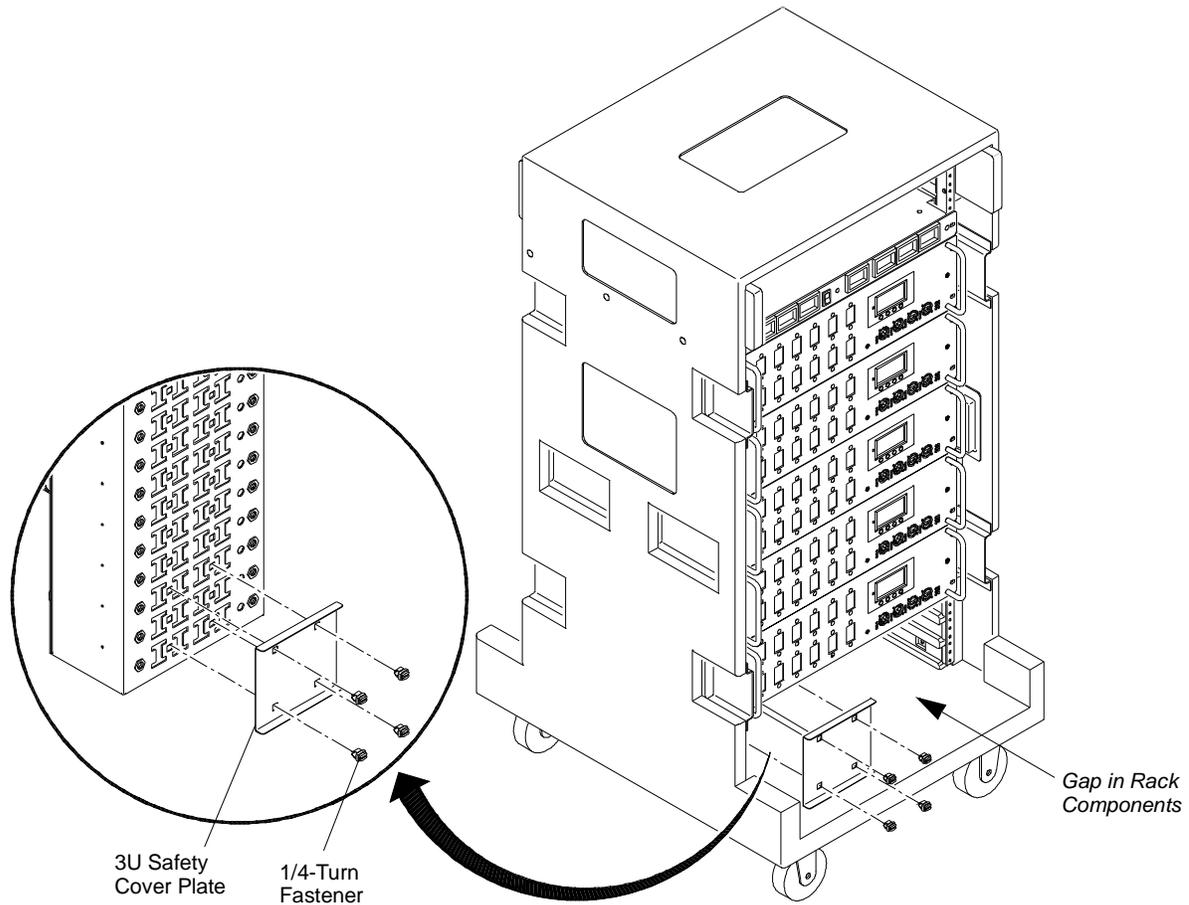


Figure 4-6: Installing a Safety Cover Plate (Full Rack)

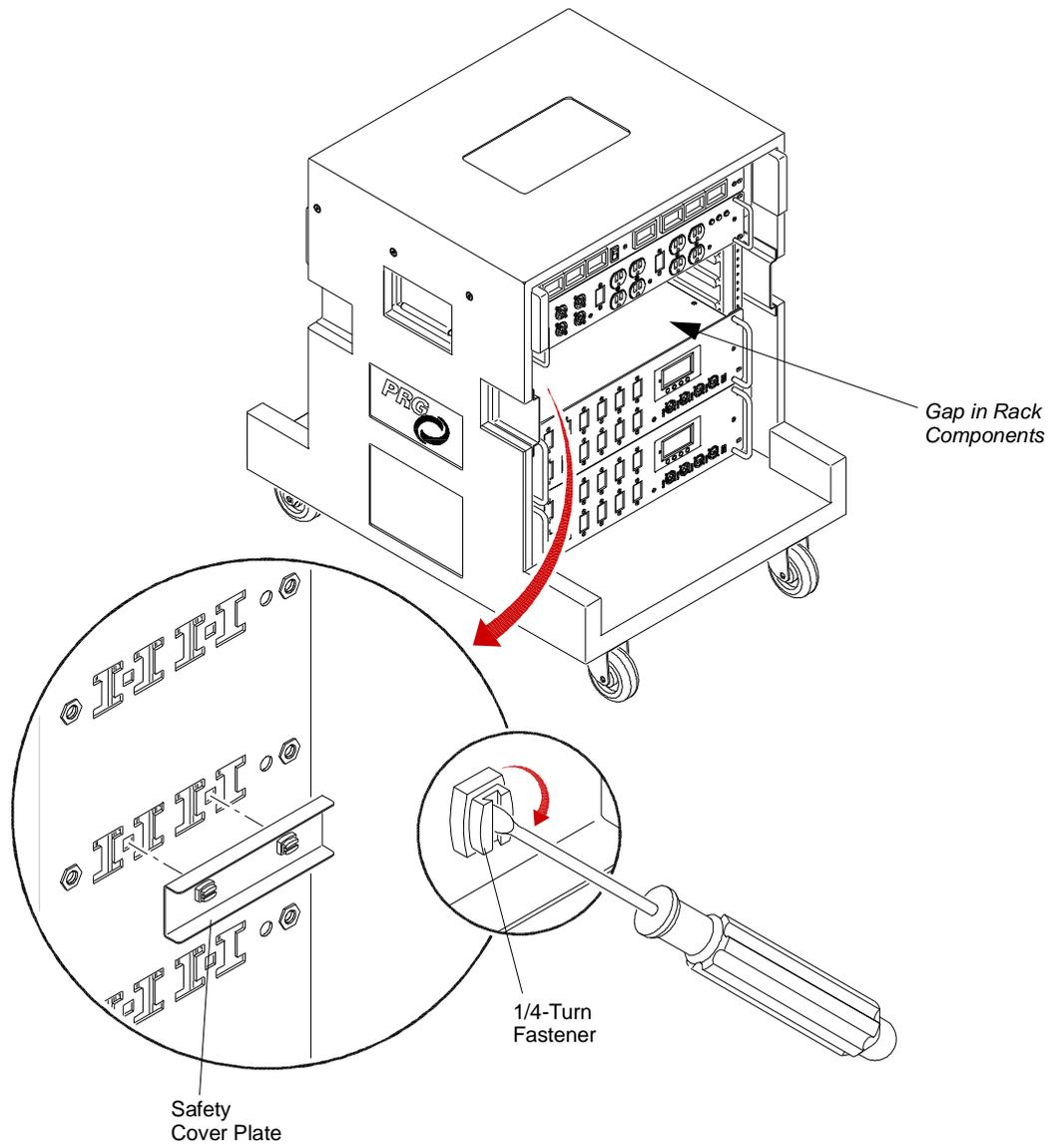


Figure 4-7: Installing a Safety Cover Plate (Half Rack)



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