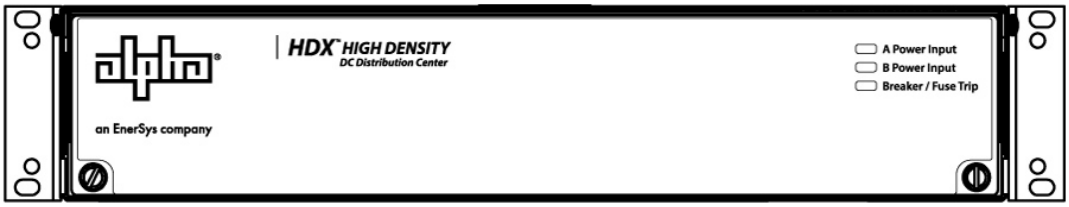
an EnerSys® company

HDX™

Compact DC Power Distribution
Technical Manual

Effective: April 2020



Safety Notes

Alpha Technologies Services, Inc. considers customer safety and satisfaction its most important priority. To reduce the risk of injury or death and to ensure continual safe operation of this product, certain information is presented differently in this manual. Alpha® tries to adhere to ANSI Z535 and encourages special attention and care to information presented in the following manner:

WARNING! GENERAL HAZARD

GENERAL HAZARD WARNING provides safety information to PREVENT INJURY OR DEATH to the technician or user.

WARNING! ELECTRICAL HAZARD

ELECTRICAL HAZARD WARNING provides electrical safety information to PREVENT INJURY OR DEATH to the technician or user.

WARNING! FUMES HAZARD

FUMES HAZARD WARNING provides fumes safety information to PREVENT INJURY OR DEATH to the technician or user.

WARNING! FIRE HAZARD

FIRE HAZARD WARNING provides flammability safety information to PREVENT INJURY OR DEATH to the technician or user.

There may be multiple warnings associated with the call out. Example:

WARNING! ELECTRICAL & FIRE HAZARD

This WARNING provides safety information for both Electrical AND Fire Hazards

CAUTION!

CAUTION provides safety information intended to PREVENT DAMAGE to material or equipment.

***NOTICE**:*

NOTICE provides additional information to help complete a specific task or procedure.

ATTENTION:

ATTENTION provides specific regulatory/code requirements that may affect the placement of equipment and /or installation procedures.

The following sections contain important safety information that must be followed during the installation and maintenance of the equipment and batteries. Read all of the instructions before installing or operating the equipment, and save this manual for future reference.

HDX™
Compact DC Power Distribution
Technical Manual

C048-693-30 R02, Rev. B

Effective: April 2020

Disclaimer

Images contained in this manual are for illustrative purposes only. These images may not match your installation. Operator is cautioned to review the drawings and illustrations contained in this manual before proceeding. If there are questions regarding the safe operation of this powering system, please contact Alpha Technologies or your nearest Alpha representative.

Alpha® shall not be held liable for any damage or injury involving its enclosures, power supplies, generators, batteries or other hardware if used or operated in any manner or subject to any condition not consistent with its intended purpose or is installed or operated in an unapproved manner or improperly maintained.

Contact Information

Sales information and customer service in USA (7AM to 5PM, Pacific Time):	1 800 322 5742
Complete Technical Support in USA (7AM to 5PM, Pacific Time or 24/7 emergency support):	1 800 863 3364
Sales information and Technical Support in Canada:	1 888 462 7487
Website:	www.alpha.com

Contents

1.0 Purpose and Applicability 5
1.1 Product Model 5

2.0 Theory of Operation 5
2.1 Introduction 5
2.2 Features 5

3.0 Unpacking and Inspection 5
3.1 Package Contents 5

4.0 Installation 6
4.1 Installation Preparation 6
4.1.1 Elevated Operating Ambient Temperature 6
4.1.2 Reduced Air Flow 6
4.1.3 Mechanical Loading 6
4.1.4 Circuit Overloading 6
4.1.5 Reliable Earthing 6
4.1.6 Disconnect Device 6
4.2 Mounting 7
4.3 Chassis Ground 7
4.4 Alarm Wiring 7
4.5 Input Connections 8
4.6 Output Connections 9
4.7 Rear Safety Cover Installation 10
4.8 Installing Breakers 10

5.0 Operation 11
5.1 Panel Status 11
5.1.1 Front Panel LED Identification 11
5.2 Breaker Inventory **(HDX ABC 10 Model) 11**
5.3 Breaker Inventory **(All Other Models) 11**

6.0 Product Specifications 12

7.0 Models and Accessories 13

Appendix A: Mechanical Drawings 15
A.1 Connection Detail HDX 400 A/B Isolated Input Model (C016-450-10) 15
A.2 Rear Detail HDX 400 A/B Isolated Input Model (C016-450-10) 16
A.3 Top and Bottom View HDX 400 A/B Isolated Input Model (C016-450-10) 17
A.4 Connection Detail HDX 400 A/B Single Input Model (C016-451-10) 18
A.5 Rear Detail HDX 400 A/B Single Input Model (C016-451-10) 19
A.6 Top and Bottom View HDX 400 A/B Single Input Model (C016-451-10) 20
A.7 Connection Detail HDX A/B/C Diode Routed Input Model (C016-452-10) 21
A.8 Top and Bottom View HDX A/B/C Diode Routed Input Model (C016-452-10) 22

1.0 Purpose and Applicability

The purpose of this document is to detail the installation and operation instructions for the HDX Compact DC Power Distribution Center.

1.1 Product Model

This document applies to the following configurations of the HDX Compact DC Power Distribution Center:

Table 1. HDX Model Configurations

PART NUMBER	DESCRIPTION
C016-450-10	HDX 400 Isolated A/B Input
C016-451-10	HDX 400 Single Input A/B
C016-452-10	HDX ABC 10 Isolated Diode Routed Input

2.0 Theory of Operation

2.1 Introduction

The HDX product is a compact DC distribution center for rack-mount telecom and broadband applications.

2.2 Features

- High-reliability breaker distribution
- Supports AM style bullet terminal breakers
- Up 100A max per breaker channel (see electrical specifications)
- LEDs indicate status at a glance
- Form C alarm contacts
- Adjustable brackets for 19 in. or 23 in. rack mount installation

3.0 Unpacking and Inspection

The HDX Compact DC Power Distribution Center was carefully packaged at the factory to withstand the normal rigors of shipping. However, you should carefully inspect the box and contents to confirm that no damage has occurred in transit. Most shipping carriers require notification of shipping damage within twenty-four hours of delivery, and it is the responsibility of the recipient to inspect the shipment immediately upon receipt.

3.1 Package Contents

Included with your product are the following items:

- HDX DC Distribution Center
- Mounting hardware kit with necessary screws and washers
- Rear plastic bus bar safety shield

4.0 Installation

***NOTICE**:*

THIS PRODUCT MUST BE INSTALLED WITHIN A RESTRICTED ACCESS LOCATION WHERE ACCESS IS THROUGH THE USE OF A TOOL, LOCK AND KEY, OR OTHER MEANS OF SECURITY, AND IS CONTROLLED BY THE AUTHORITY RESPONSIBLE FOR THE LOCATION. THIS PRODUCT MUST BE INSTALLED AND MAINTAINED ONLY BY QUALIFIED TECHNICIANS.

4.1 Installation Preparation

When selecting an installation location, ensure that all of the following conditions are met before proceeding.

4.1.1 Elevated Operating Ambient Temperature

If you install the panel in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, take care to install the equipment in an environment compatible with the maximum ambient temperature (TMA).

4.1.2 Reduced Air Flow

Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

4.1.3 Mechanical Loading

Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

4.1.4 Circuit Overloading

Give consideration to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Use appropriate consideration for equipment nameplate ratings when addressing this concern.

4.1.5 Reliable Earthing

Maintain reliable earthing of rack-mounted equipment. Pay particular attention to supply connections other than direct connections to the branch circuit (e.g., use of power strips).

4.1.6 Disconnect Device

A readily accessible disconnect device must be incorporated in the building installation wiring.

4.2 Mounting

The HDX product can be mounted in a 19 in. or 23 in. rack configuration, in a front flush or mid-mount orientation.

Step 1. Attach the two (2) front mounting ears in the appropriate configuration using the included 1/4 in.-20 hardware as shown in Figure 1.

4.3 Chassis Ground

CAUTION!

DO NOT ENERGIZE THE PANEL BEFORE CHASSIS GROUND IS CONNECTED.

The chassis ground is located in the side of the panel (see Figure 2). A two hole lug landing position is provided. See table below for termination information screw is provided for attaching a chassis ground cable. A minimum of #4 AWG chassis ground cable is required for C016-452-10 model; a minimum of #2 AWG chassis ground cable is required for all other models.

IMPORTANT: Grounding hardware not included. A properly-sized grounding conductor must be installed per NEC (250.122).

Table 2. Ground Termination Summary

TWO HOLE LANDING TYPE	HOLE/ STUD SIZE	CENTER TO CENTER	RECOMMENDED TORQUE VALUE
Threaded Insert	1/4 in.-20	5/8 in.	90 in·lbs

Step 1. Connect the lug to the chassis with 1/4 in.-20 hardware. Make sure heat shrink and no-oxide compound are applied appropriately prior to attachment.

Step 2. Torque the fasteners to 90 in·lbs.

4.4 Alarm Wiring

On the rear of the panel, there is an 8p8c modular jack (RJ-45) for alarm connections. Plug a Cat 5/5e/6 UTP cable with a TIA/EIA T568B termination into the alarm jack. Refer to Table 3 below for alarm pin out. See drawings in Appendix A for the locations of these alarm connections for further detail. The following models feature an additional RJ-45 jack to allow for daisy chaining:

- C016-450-10, C016-451-10

Table 3. Alarm Contact Pin Out

Major			Minor (Not Used)		
PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6
COM	N.C.	N.O.	COM	N.C.	N.O.

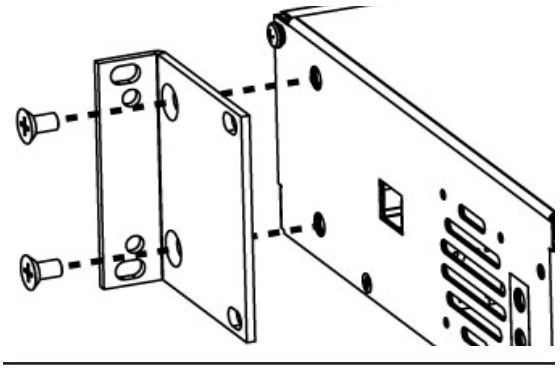


Figure 1. Mounting Ears (19 in. shown)

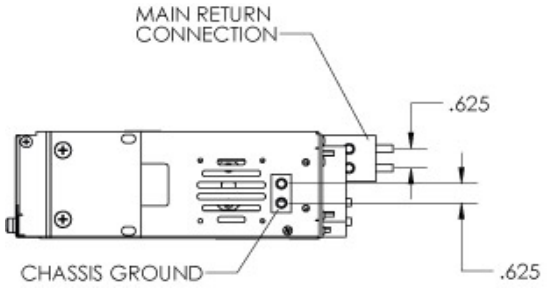


Figure 2. Chassis Ground Connection

4.5 Input Connections

WARNING! ELECTRICAL HAZARD

INPUTS MUST BE PROTECTED BY A LISTED CIRCUIT BREAKER OR BRANCH RATED FUSE. REFER TO TABLE 4 BELOW FOR MAXIMUM FUSE AND BREAKER SIZES.

MULTIPLE POWER SOURCES ARE PRESENT, ENSURE ALL INPUT POWER FEEDS ARE NOT ENERGIZED BEFORE INSTALLING THEM. ELECTRICAL INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL WITH PROPER TOOLS AND PROTECTIVE SAFETY EQUIPMENT.

NOTICE:

MAKE SURE THAT ALL FEEDER CABLES HAVE HEAT SHRINK APPLIED PRIOR TO TERMINATION, AND THAT NO-OXIDE COMPOUND IS APPLIED TO ALL COPPER-TO-COPPER CONNECTIONS. USE ONLY COMPONENTS AND CRIMPING TOOLS APPROVED BY AGENCIES OR CERTIFYING BODIES RECOGNIZED IN YOUR COUNTRY OR REGION.

IF USING A 350KCMIL LUG OR LARGER, A C016-1651-10 ADAPTER KIT IS REQUIRED TO ALLOW PROPER CONNECTION.

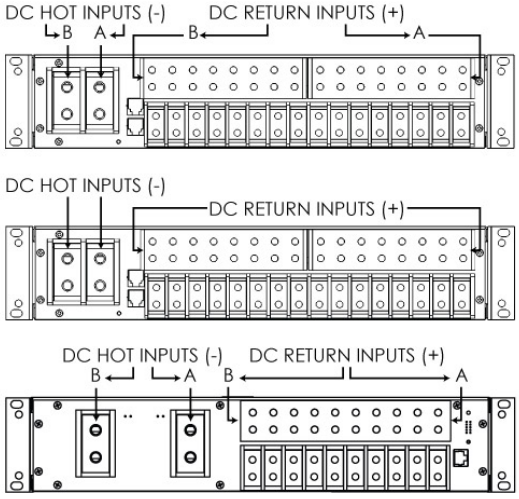


Figure 3. Panel Inputs From Top to Bottom: C016-450-10, C016-451-10, C016-452-10

Table 4. Input Breaker and Fuse Ratings Per Panel Rating

MODEL RATING	MAX INPUT FUSE/CIRCUIT BREAKER SIZE
200A	250A
400A	500A

Table 5. Input Termination Information

INPUT	TERMINATION TYPE	HOLE/ STUD SIZE	CENTER TO CENTER	MAX. LUG WIDTH	RECOMMENDED TORQUE VALUE
Hot	Threaded Insert	3/8 in.-16	1 in.	1 in.	225 in·lbs
Return	Through Hole	1/4 in.-20	5/8 in.	1 in.	70 in·lbs

Step 1. Install the incoming DC feeder cables/lugs for the power inputs and power returns. Secure into place by tightening included hardware to recommended torque values. Refer to Table 5 for input termination information. See Appendix A for more detail.

4.6 Output Connections

CAUTION!

DO NOT PERFORM THIS STEP ON CIRCUITS WITH BREAKERS INSTALLED. ENSURE NO POWER IS PRESENT ON THE CIRCUIT BEING WIRED BEFORE PROCEEDING.

***NOTICE**:*

MAKE SURE THAT ALL CABLES HAVE INSULATED TERMINALS OR HEAT SHRINK APPLIED PRIOR TO TERMINATION, AND THAT NO-OXIDE COMPOUND IS APPLIED TO ALL COPPER-TO-COPPER CONNECTIONS.

SEE SECTION 7 FOR TERMINAL SPECIFICATION, TOOLING, AND ORDERING INFORMATION.

Table 6. Output Termination Information

TERMINATION TYPE	HOLE/ STUD SIZE	CENTER TO CENTER	MAX. LUG WIDTH	RECOMMENDED TORQUE VALUE
Threaded Stud	1/4 in.	3/8 in.	.62 in.	70 in·lbs

- C016-450-10 has a total of 16 AM breaker positions (8A/8B)
- C016-451-10 has a total of 16 AM breaker positions
- C016-452-10 has a total of 10 AM breaker positions

Step 1. Install output feeds. First, land the return cable/lug to its corresponding position on the return bus bar, then land the hot cable/lug to the corresponding position below. Secure into place by tightening included hardware to recommended torque values.

4.7 Rear Safety Cover Installation

WARNING! ELECTRICAL HAZARD

FAILURE TO INSTALL THE PLASTIC SAFETY SHIELDS PROPERLY MAY CREATE AN ELECTRICAL HAZARD.THE PANEL MAY BE ENERGIZED WHEN INSTALLING THE REAR PLASTIC SAFETY COVERS.

The HDX product includes a rear safety cover which is to be installed around the rear eletrical terminations. The cable knockout points in the plastic will need to be trimmed to match your input/output cable configuration. Once this has been completed, proceed to the following steps:

Step 1. Install the included #8-32 panhead screws into the threaded holes on the sides of the panel.

Step 2. Slide the cover onto the screws installed, then tighten down the screws to secure the cover.

4.8 Installing Breakers

Refer to Table 11 on Page 13 for a list of supported breakers.

Step 1. Ensure breaker to be used is in the OFF position.

Step 2. Ensure that connected loads are in the OFF position.

Step 3. Insert a breaker of sufficient ampacity into the position to be fed.

Step 4. Ensure that the breaker is fully seated.

Step 5. Turn on the connected load.

Step 6. Inventory the breakers (See Section 5.2 "Breaker Inventory For HDX ABC 10" and Section 5.3 "Breaker Inventory For All Other Models" on Page 11).

5.0 Operation

5.1 Panel Status

Bright front panel LEDs allow the overall status of the panel to be determined at a glance.

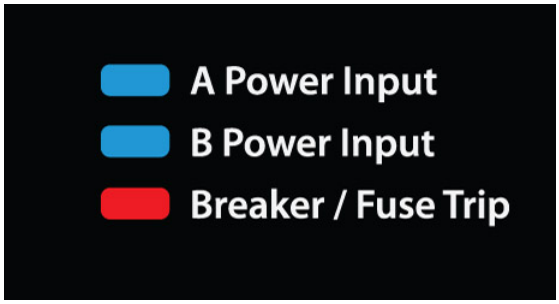


Figure 4. HDX Front LED Status Indicators

5.1.1 Front Panel LED Identification

The HDX product provides status information illuminated LED on the front of the panel (see Figure 4).

A Power Input

This LED will illuminate BLUE when power is present on the A input.

B Power Input

This LED will illuminate BLUE when power is present on the B input.

Breaker Trip/Alarm

This LED will illuminate RED if a breaker has tripped or any other alarm condition exists. Under normal operating conditions it is not illuminated.

5.2 Breaker Inventory (HDX™ ABC 10 Model)

Upon first power up there will be a red LED flashing to indicate breaker inventory needs to be performed. Anytime the circuit breaker compliment is changed, you will need to update the breaker inventory for correct monitoring of breaker status.

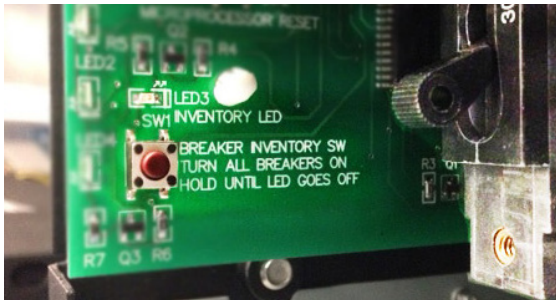


Figure 5. Breaker Inventory Button and LED

Step 1. Lift the breaker compartment door. Turn on any circuit breakers you wish to have monitored.

Step 2. Press and hold the blue button (See Figure 5 for breaker inventory button location). Hold the button until the red BREAKER INVENTORY LED turns on and subsequently turns off. This should take about 5 seconds.

Step 3. Breaker inventory will remain in the controller memory even if power is lost.

NOTE: If a new breaker is installed and turned on after an inventory has been taken, it will cause an alarm until the breaker inventory is updated.

5.3 Breaker Inventory (All Other Models)

Anytime the circuit breaker compliment is changed, you will need to update the breaker inventory for correct monitoring of breaker status.

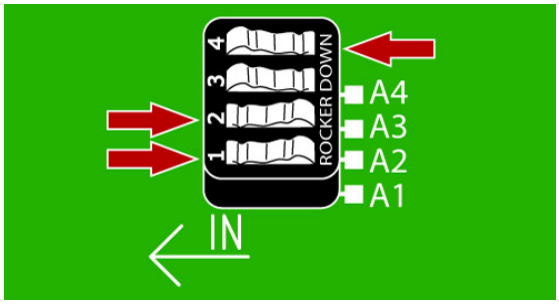


Figure 6. Setting a Dip Switch

Step 1. Lift the breaker compartment door. The circuit board on the inside of the door has a series of dip switches that are used to inventory breakers. Each switch is labeled with a silk screen on the board indicating which channel the switch will inventory.

Step 2. Locate an arrow printed near the dip switch labeled "IN". To inventory a breaker press the dip switch so that side facing the "IN" arrow is depressed. In Figure 6, A1 and A2 (switch 1 and 2) are inventoried breakers. A3 and A4 (switch 3 and 4) are not in inventory.

6.0 Product Specifications

Table 7. Technical Specifications Per Model

	C016-450-10	C016-451-10	C016-452-10
Type of Input	A/B Isolated Input	Single Input	Diode Redundant Routing Circuit
Circuits	16 (8A/8B)	16	10
Input Voltage	-48VDC	-48VDC	-48VDC
Input Current	400A Max	400A Max	200A Max
Maximum Input Interruption Device	500A	500A	250A
Interrupt Rating	10kA	10kA	10kA
Maximum GMT Fuse Size	N/A	N/A	N/A
Maximum per Circuit Current (GMT)	N/A	N/A	N/A
Maximum AM Breaker Size	100A	100A	100A
Maximum per Circuit Current (AM Breaker)	100A	100A	100A
Maximum Continuous Load on 8-15A GMT Fuses	N/A	N/A	N/A
Maximum Continuous Load on <8A GMT Fuses	N/A	N/A	N/A
Max Operating Altitude	2000m	2000m	2000m
Max Ambient Temperature	45° C	45° C	45° C
Width	17 in.	17 in.	17 in.
Height	3.5 in. (2RU)	3.5 in. (2RU)	3.5 in. (2RU)
Depth	12.5 in.	12.5 in.	12.5 in.
Weight	10 lbs (without breakers)	10 lbs (without breakers)	10 lbs (without breakers)

Table 8. Agency Certifications

UL	
UL File Number	E473904
UL Standard	ANSI/UL 60950-1

7.0 Models and Accessories

Table 9. HDX™ Model Configurations

DESCRIPTION	PART NUMBER
HDX 400 Isolated A/B Input	C016-450-10
HDX 400 Single Input A/B	C016-451-10
HDX ABC 10 Isolated Diode Routed Input	C016-452-10

Table 10. Accessories

DESCRIPTION	PART NUMBER
Return adapter for large lug support (350kcmil and larger) - Allows termination of 3/8 in. on 1 in. CTC input lugs	C016-1651-10

Table 11. Supported Circuit Breakers

DESCRIPTION	PART NUMBER
5A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-401-10
10A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-235-10
15A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-409-10
20A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-402-10
25A AM breaker; plug-in type; midtrip(5/16 in. bullet terminals)	C470-412-10
30A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-403-10
35A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-267-10
40A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-407-10
45A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-408-10
50A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-405-10
60A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-400-10
70A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-411-10
80A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-406-10
90A AM breaker; plug-in type; aux switch pin only; midtrip (5/16 in. bullet terminals)	C470-476-10
100A AM breaker; plug-in type; midtrip (5/16 in. bullet terminals)	C470-404-10

Table 12. Supported Lugs for Chassis Ground Connections

WIRE GAUGE	ALPHA PART NUMBER	MANUFACTURER	MANUFACTURER PART NUMBER	CRIMP DIE REQUIRED
#2 AWG	C538-089-10	Burndy	YAZV2C2TC14FX, Brown, 10	Burndy U4CRT, W2CVT, W2CRT, X2CRT

Table 13. Supported Lugs for Input Connections

WIRE GAUGE	ALPHA PART NUMBER	MANUFACTURER	MANUFACTURER PART NUMBER	CRIMP DIE REQUIRED
HOT INPUT CONNECTIONS				
#1 AWG	C538-021-10	Burndy	YAZV1C2TC38FX	Burndy U1CRT, W1CRT1, W1CVT, X1CRT1
#0 AWG	C538-127-10	Burndy	YAZV252TC38FX	Burndy U25RT, W25RT, W25VT, X25RT
#00 AWG	C538-099-10	Burndy	YAZV262TC38FX	Burndy U26RT, W26RT, W26VT, X26RT
#000 AWG	C538-296-10	Burndy	YAZV272TC38FX	Burndy U27RT, W27RT, W27VT, X27RT
#0000 AWG	C538-220-10	Burndy	YAV28L2NT38FX	Burndy U28RT, W28RT, W28VT, X28RT
350 kcmil	C538-070-10	Burndy	YAZ342NT38FX, Blue, 19	Burndy U32RT, W32RT, W32VT, Y81KFT
500 kcmil	C538-131-10	Burndy	YA38L2NT38FX	Burndy U38XRT(2), Pink, L99
RETURN INPUT CONNECTIONS				
#1 AWG	C538-298-10	Burndy	YAZV1C2TC14FX	Burndy U1CRT-1, W1CRT1, W1CVT, X1CRT1
#0 AWG	C538-243-10	Burndy	YAZ252TC14	Burndy U2CABT, W25RT, W25VT, X25RT
#00 AWG	C538-114-10	Burndy	YAZV262TC14FX	Burndy U26RT, W26RT, W26VT, X26RT
#000 AWG	C538-297-10	Burndy	YAZV272TC14FX	Burndy U27RT, W27RT, W27VT, X27RT
#0000 AWG	C538-124-10	Burndy	YAV28L2ENT14FX	Burndy U28RT, W28RT, W28VT, X28RT

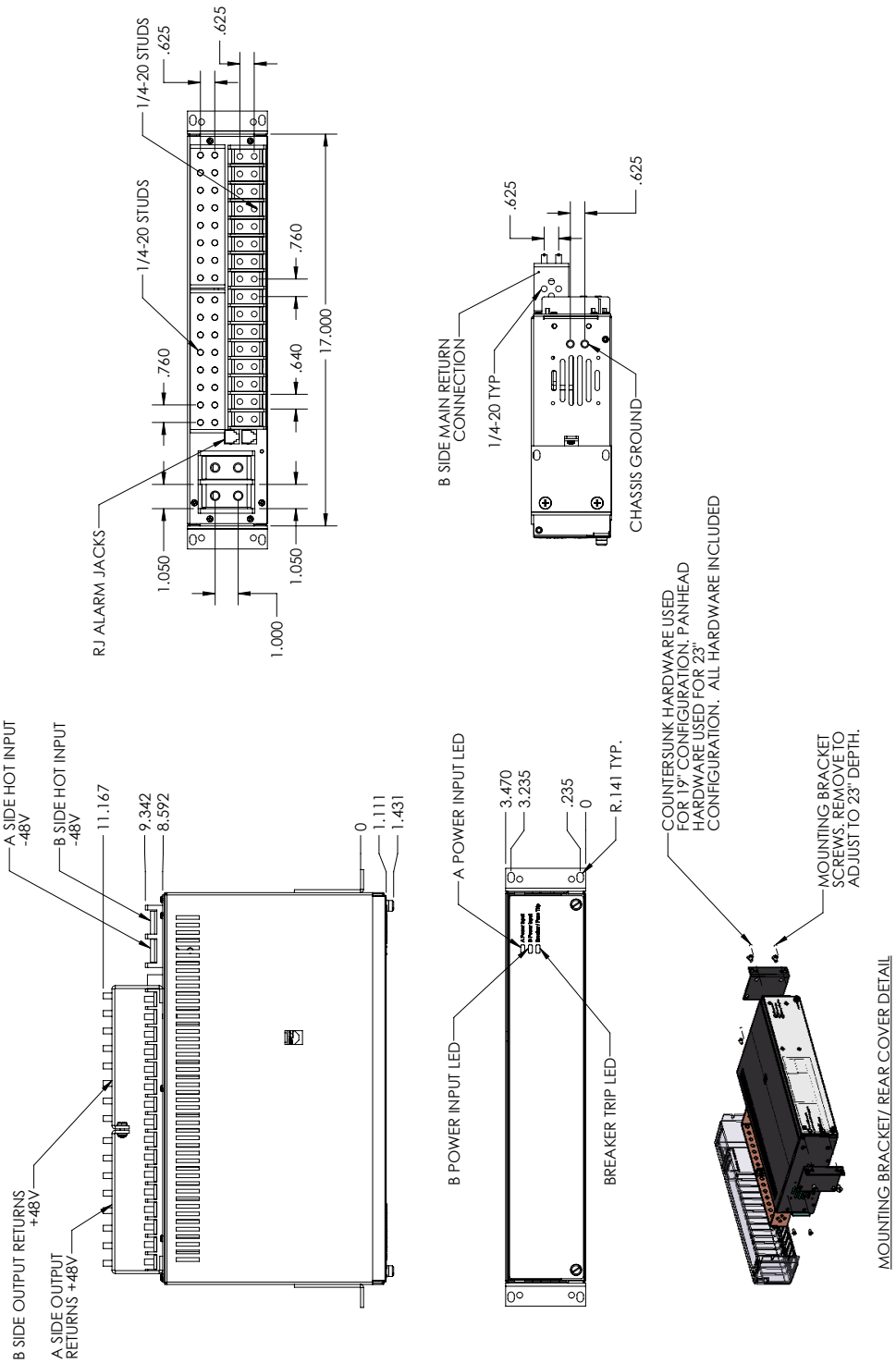
Table 14. Supported Lugs for Output Connections

WIRE GAUGE; TERMINAL TYPE	ALPHA PART NUMBER	MANUFACTURER	MANUFACTURER PART NUMBER	CRIMP DIE REQUIRED
#8 AWG	C538-018-10	Burndy	YAZ8C2TC14FX, Red, 49	Burndy U8CRT, W8CVT, W8CRT, X8CRT
#6 AWG	C538-094-10	Burndy	YAZV6C2TC14FX, Blue, 7	Burndy U5CRT, W5CVT, W5CRT, X5CRT
#6 AWG	C538-165-10*	Burndy	YAZV6C2TC14FX90, Blue, 7	Burndy U5CRT, W5CVT, W5CRT, X5CRT
#4 AWG	C538-085-10	Burndy	YAZV4C2TC14FX, Gray, 8	Burndy U4CRT, W2CVT, W2CRT, X2CRT
#2 AWG	C538-173-10	Burndy	YAV2CL2NT14FX, Brown, 10	Burndy U2CRT, W4CVT, W4CRT, X4CRT
#2 AWG	C538-275-10	Burndy	YAV2CL2NT14FX90, Brown, 10	Burndy U2CRT, W4CVT, W4CRT, X4CRT
#2 AWG	C538-284-10	Burndy	YAZV2C2NT14FX90, Brown, 10	Burndy U2CRT, W4CVT, W4CRT, X4CRT

Appendix A: Mechanical Drawings

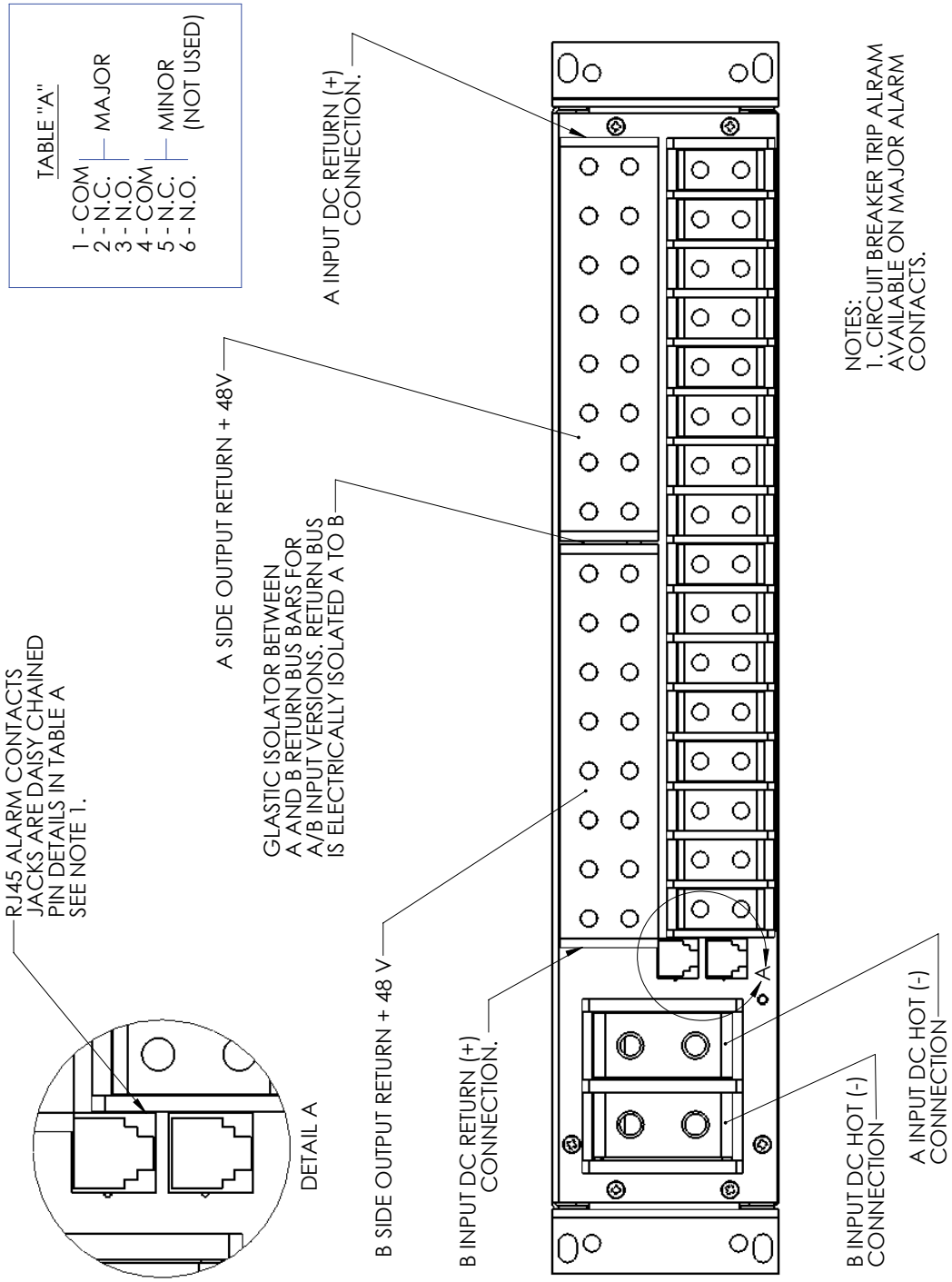
A.1 Connection Detail

HDX 400 A/B Isolated Input Model (C016-450-10)

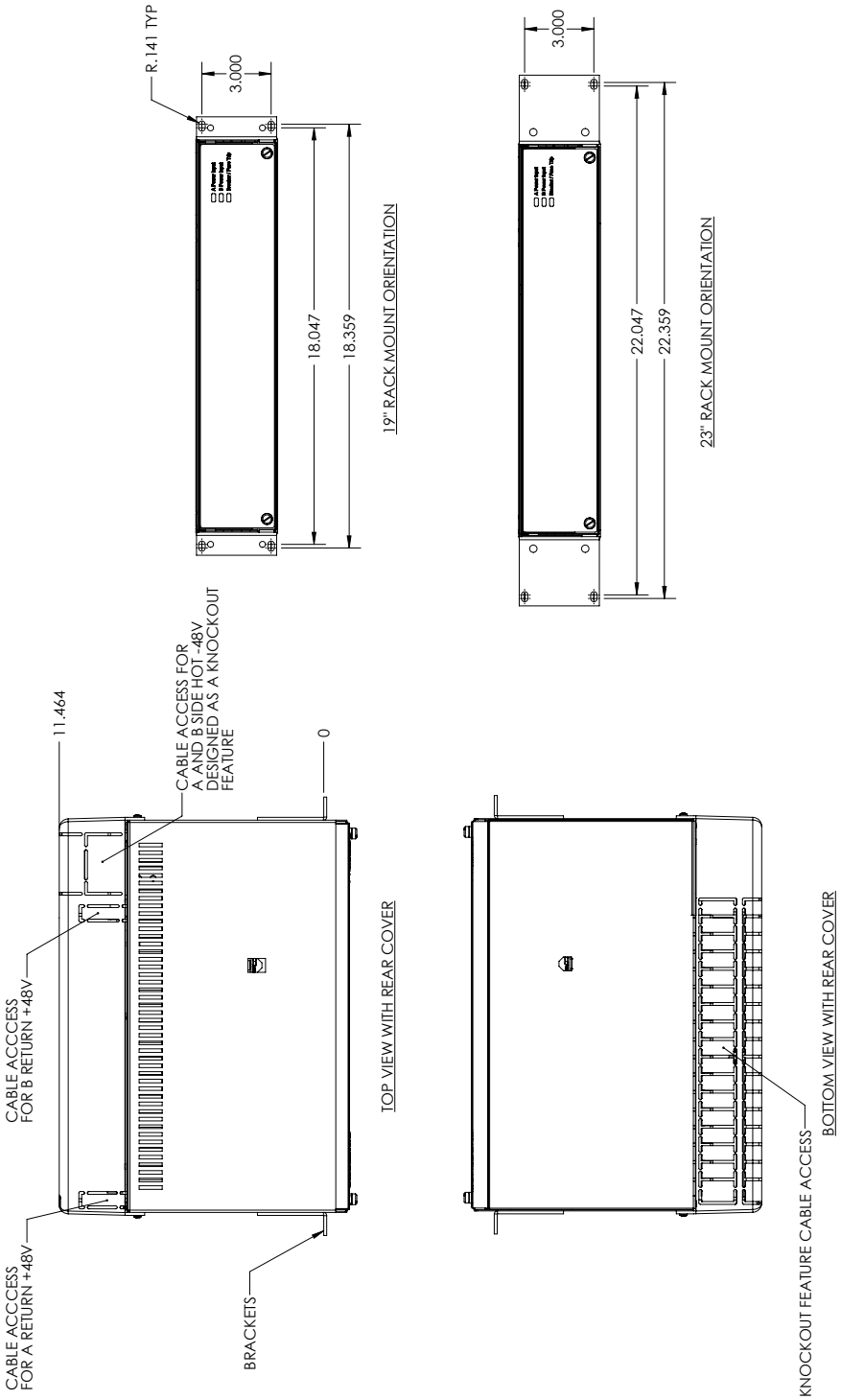


A.2 Rear Detail

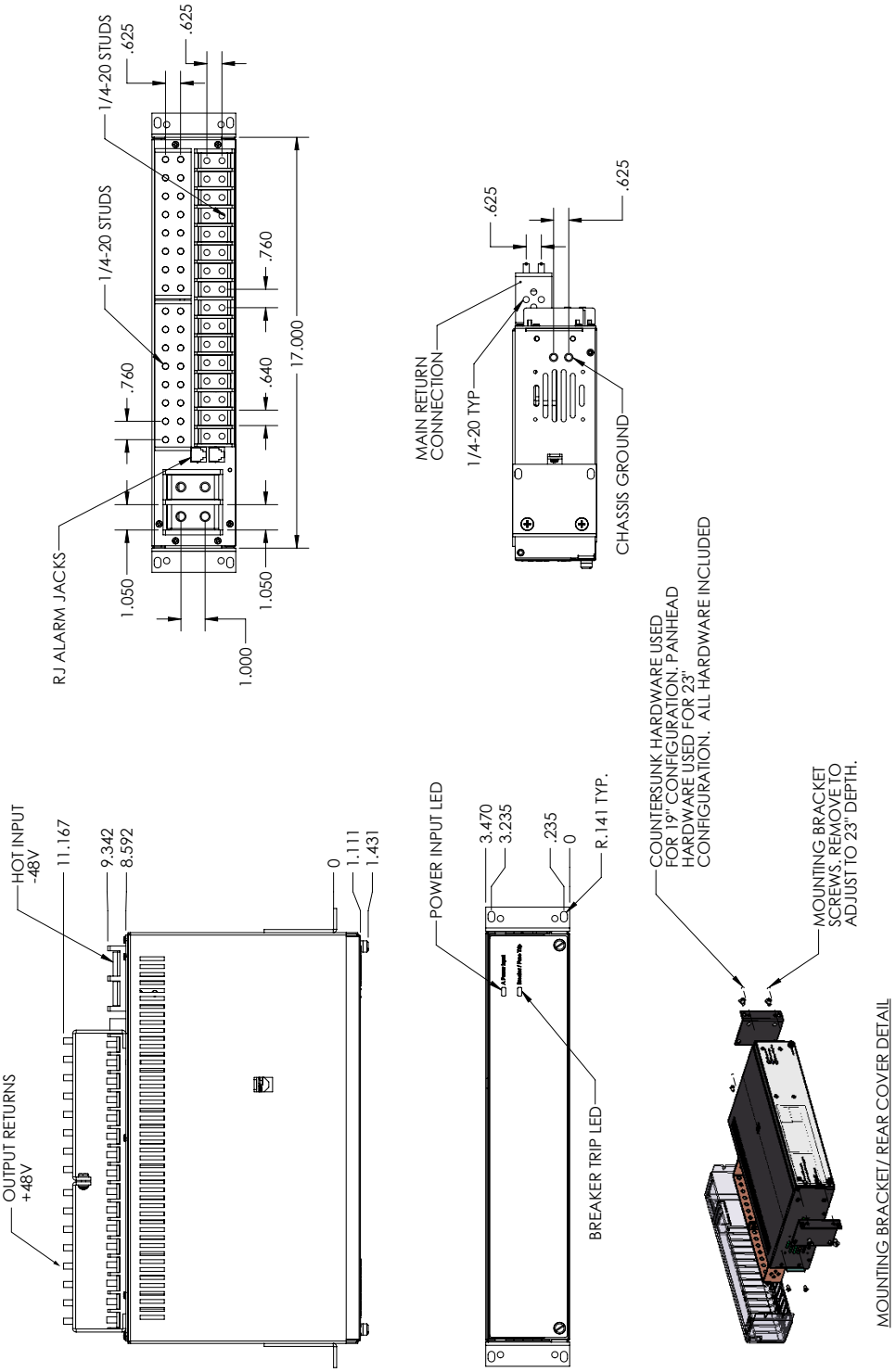
HDX 400 A/B Isolated Input Model (C016-450-10)



A.3 Top and Bottom View
HDX 400 A/B Isolated Input Model (C016-450-10)

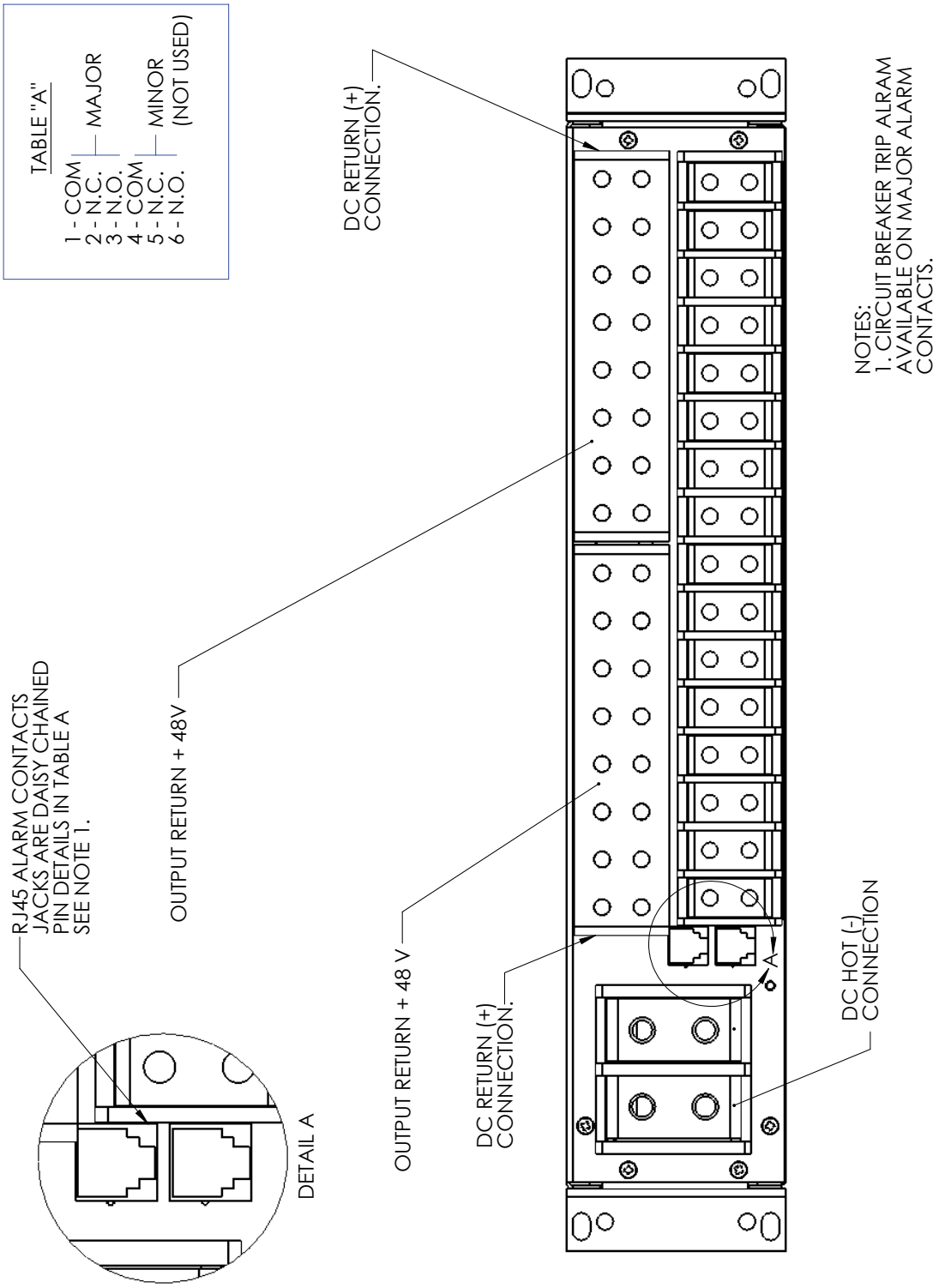


A.4 Connection Detail
HDX 400 A/B Single Input Model (C016-451-10)

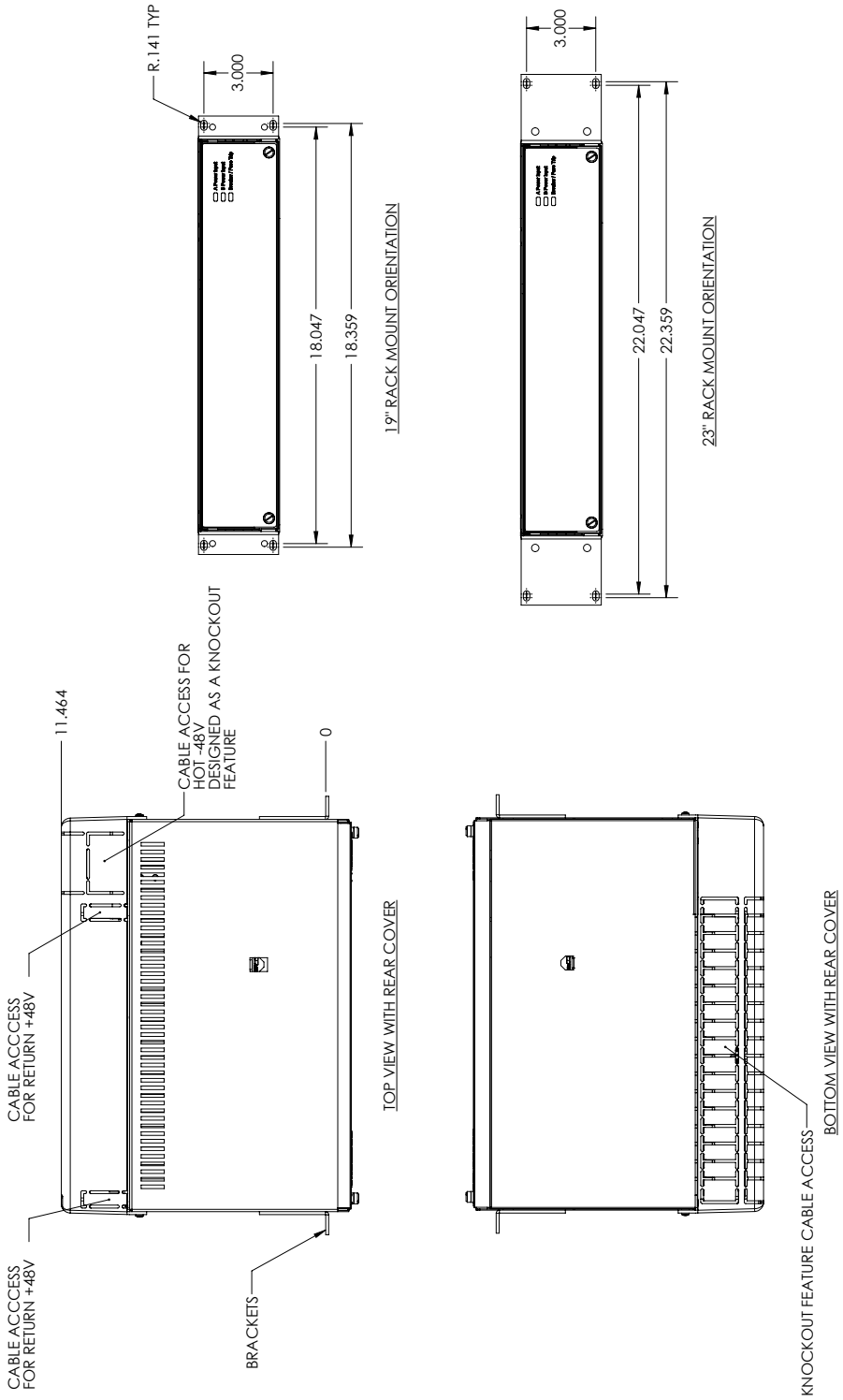


A.5 Rear Detail

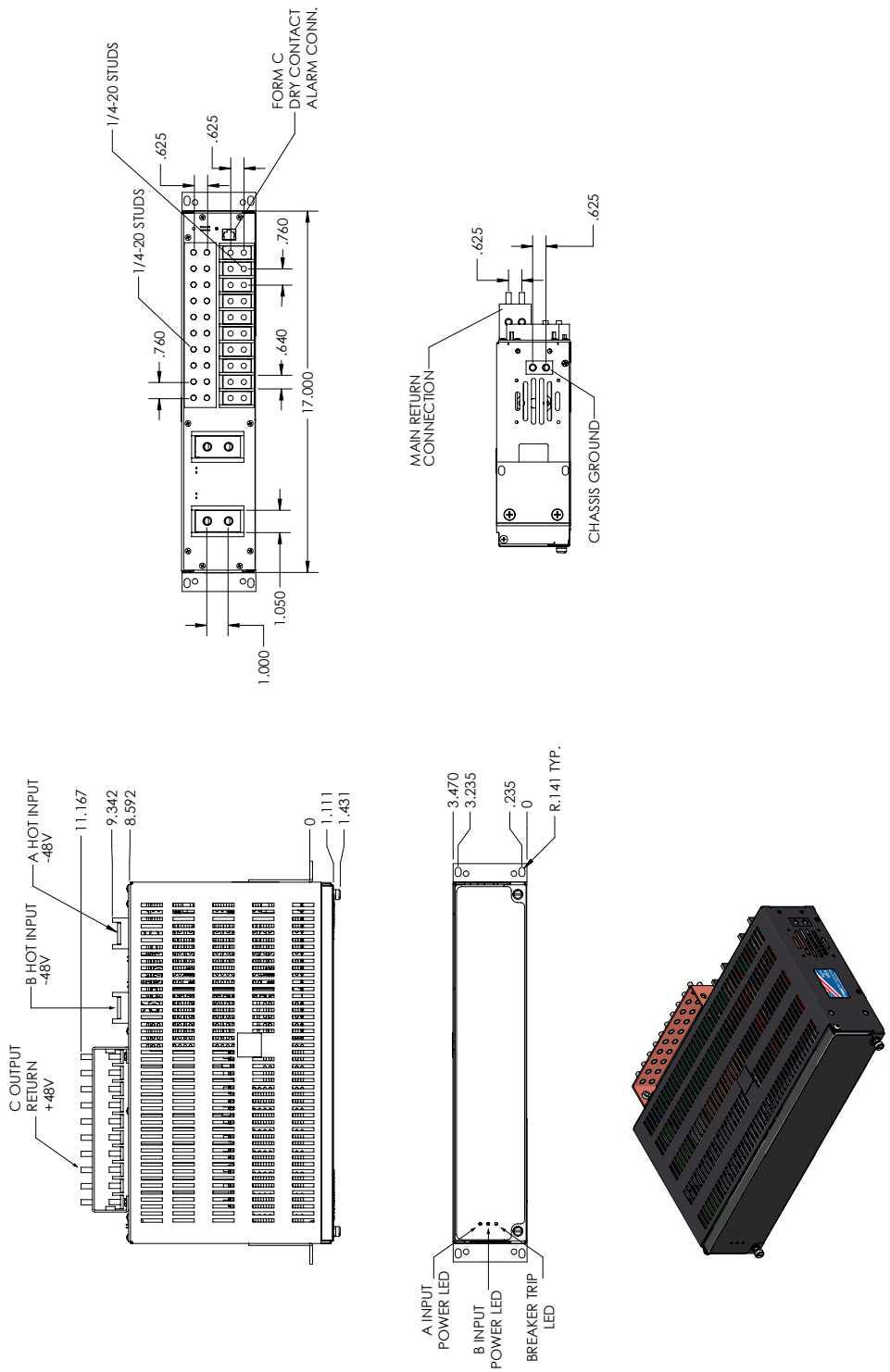
HDX 400 A/B Single Input Model (C016-451-10)



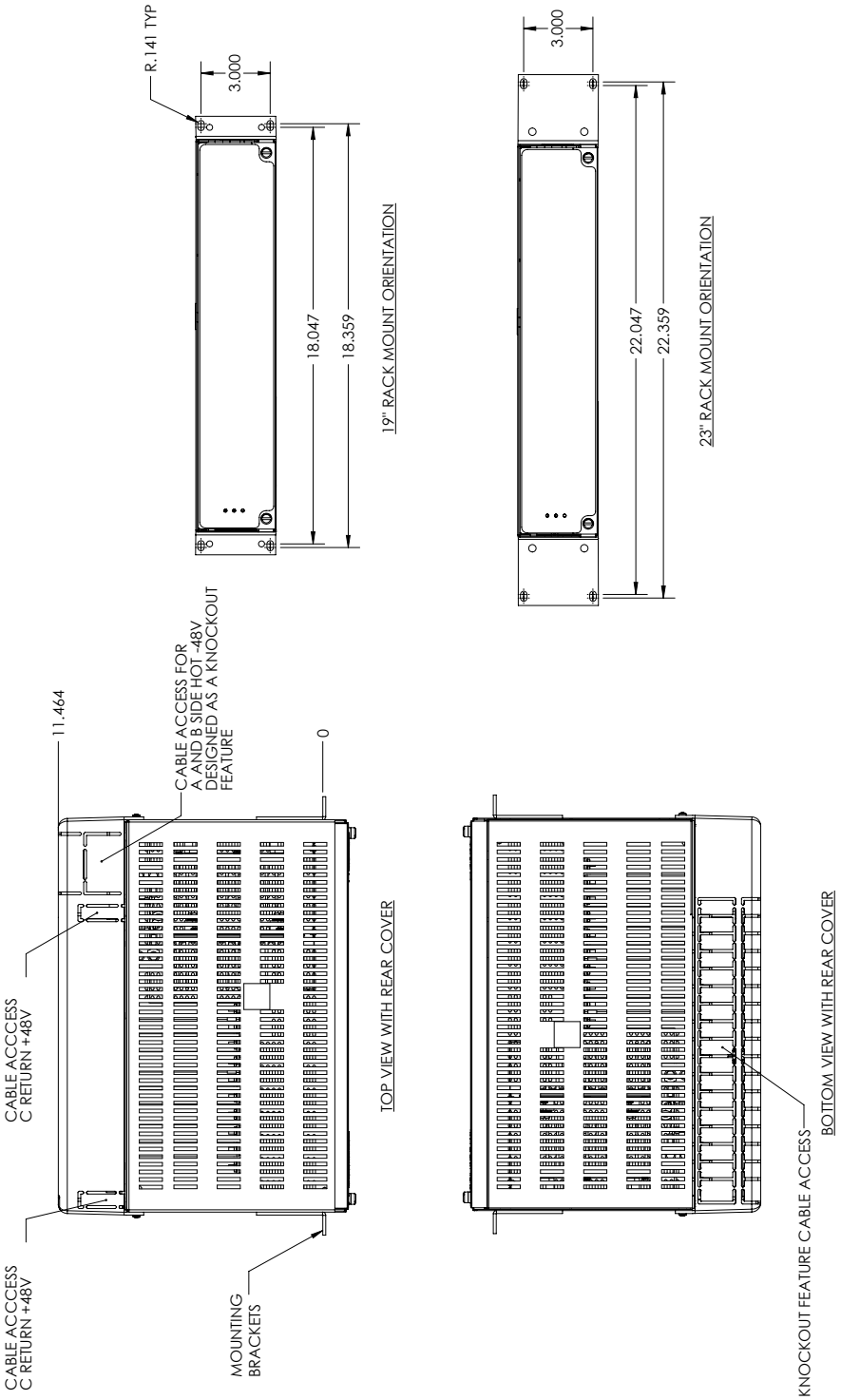
A.6 Top and Bottom View
HDX 400 A/B Single Input Model (C016-451-10)



A.7 Connection Detail
HDX A/B/C Diode Routed Input Model (C016-452-10)



A.8 Top and Bottom View
HDX A/B/C Diode Routed Input Model (C016-452-10)



an EnerSys® company

Alpha Technologies Services, Inc. | 3767 Alpha Way, Bellingham, WA 98226, USA
Tel.: Toll Free North America: +1 800 322 5742 | Outside US: +1 360 647 2360 | Technical Support: +1 800 863 3364
For more information visit our website at: www.alpha.com

C048-693-30 R02, Rev. B (04/2020)

an EnerSys® company