SYSTEM OVERVIEW

Description: A DC-DC Converter Mounting Shelf designed to mount in a 19” or 23” (nominal) equipment mounting rack. The shelf is configured for 19” mounting unless otherwise specified. The Converter Mounting Shelf, when equipped with up to eight separately ordered Converter Modules, provides a DC-DC Converter System that operates from –48VDC to provide +24VDC load power.

Spec. No.:	588249700
Model:	MHSB160CAB
Output Voltage:	+24 Volts DC
Output Capacity:	
DC-DC Converter Module:	20 Amperes
Converter Shelf:	160 Amperes
Agency Approval:	UL 60950 Recognized
Mounting Type:	19” or 23” Relay Rack
Access:	Front and Rear for Installation, Front for Operation and Maintenance
Color:	Off-White Front
Environment:	+65°C for factory wiring applications +40°C for field wiring applications

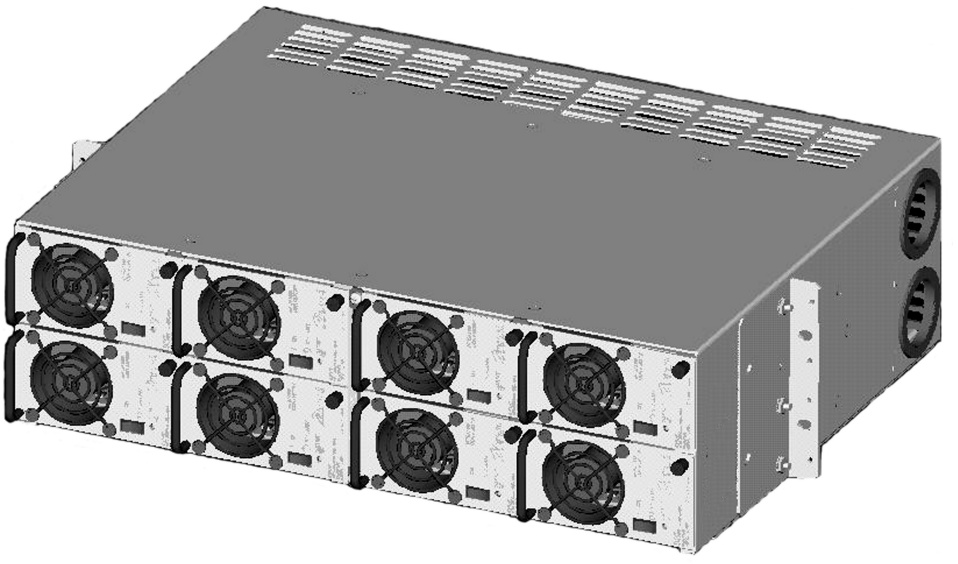


TABLE OF CONTENTS

System Overview | Picture | Specifications | Physical Size Information | Related Documentation

ORDERING INFORMATION

Use the following information to order a Model MHSB160CAB DC-DC Converter System for field installation.

When equipment described in this document is ordered as part of a Vortex Power System, refer to the Power System documentation for ordering information.

Converter Mounting Shelf (Model MHSB160CAB)

Features

- The mounting shelf accepts up to (8) DC-DC Converter Modules.
- Alarm wire harness, Part No. 520343, included. This pre-assembled wire harness mates with the external alarm connector (J11) on the Converter Mounting Shelf. The harness provides 10-ft. long 20 AWG conductors suitable for splicing.

Ordering Notes

1) For each Converter Shelf required, specify (1) Spec. No. 588249700.
2) Order Converter Modules separately. (See below.)

Converter Modules (Model MHSB20A)

Ordering Notes

1) Order up to (8) Spec. No. 486800128 DC-DC Converter Modules for each Converter Mounting Shelf ordered.

Lug and Wire Size Selection – Field Wiring Applications

Note: *The input and output terminations have been evaluated for field wiring connections at a maximum operating ambient temperature of +40°C. For ambient operating temperatures between +40°C and +65°C these terminations are intended only for connection of internal wiring inside the end-use equipment. In such applications, the acceptability of the wire connections relative to secureness, insulation materials, and temperature shall be considered.*

All lugs for customer connections must be ordered separately.

For lug selection, refer to the following tables.

For lug mounting hole size and spacing dimensions, refer to the DIMENSIONS section.

Frame Ground

1/4-20 studs and hardware are provided for installation of a customer-furnished, lug-terminated frame ground lead. The table below lists the recommended crimp lugs for the recommended wire size.

Recommended Wire Size[1]	Recommended Crimp Lug[2]	
	Vendor	Part No.
8 AWG	T & B	256-30695-251
	Burndy	YA8CL-2TC38
	Emerson	245349800

[1] This terminal must be connected to earth ground, not power system neutral. Equipment grounding conductor size is based on recommendations of the National Electrical Code Table 250-122 for copper wire. If aluminum or copper clad aluminum grounding conductor is used, refer to Table 250-122 for increased conductor size.

[2] Refer to the installation section of the instruction manual for lug crimping information.

DC Input (Dual Feed - Two DC Input Circuits)

1/4-20 studs and hardware are provided for installation of customer provided DC input lugs and leads. The table below lists the recommended crimp lugs for the recommended wire size.

Operating Ambient Temperature [1]	Feed	Recm Branch Circuit Protection [2]	Loop Length [3]	Recm 90°C Wire Size [1]	Recommended Crimp Lug [4]	
					Vendor	Part No.
30°C	#1	70 Amperes	47 ft.	4 AWG	T & B	54206
					Burndy	YA4CL-2TC14
					Emerson	245346800
	#2	70 Amperes	47 ft.	4 AWG	T & B	54206
					Burndy	YA4CL-2TC14
					Emerson	245346800
40°C	#1	70 Amperes	47 ft.	4 AWG	T & B	54206
					Burndy	YA4CL-2TC14
					Emerson	245346800
	#2	70 Amperes	47 ft.	4 AWG	T & B	54206
					Burndy	YA4CL-2TC14
					Emerson	245346800

[1] Recommendations for typical operating ambient temperatures of 30°C and 40°C are provided. Conductor sizes are based on recommendations of the National Electrical Code Table 310-16 for copper wire rated at 90°C. For other operating ambient temperatures, refer to the National Electrical Code.

[2] The DC input branch circuit protective device should be of the time-delay or high inrush type.

[3] Wire sizes listed are sufficient to restrict voltage drop to 1.0 volt or less at rated full load output current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

[4] Refer to the installation section of the instruction manual for lug crimping information.

DC Output

1/4-20 studs and hardware are provided for installation of customer provided DC output lugs and leads. The table below lists the recommended crimp lugs for the recommended wire size.

Operating Ambient Temperature [1]	Loop Length [2]	Recm 90°C Wire Size [1]	Recommended Crimp Lug [3]	
			Vendor	Part No.
30°C	47 ft.	(2) 4 AWG	T & B	54206
			Burndy	YA4CL-2TC14
			Emerson	245346800
40°C	47 ft.	(2) 4 AWG	T & B	54206
			Burndy	YA4CL-2TC14
			Emerson	245346800

[1] Recommendations for typical operating ambient temperatures of 30°C and 40°C are provided. Conductor sizes are based on recommendations of the National Electrical Code Table 310-16 for copper wire rated at 90°C. For other operating ambient temperatures, refer to the National Electrical Code.

[2] Wire sizes listed are sufficient to restrict voltage drop to 1.0 volt or less at rated full load output current for the loop lengths shown. Loop length is the sum of the lengths of the positive and negative leads.

[3] Refer to the installation section of the instruction manual for lug crimping information.

External Alarms (J11)

The following table lists the recommended mating connector for J11.

EXTERNAL ALARMS (J11)					
Recommended Wire Size	**Recommended Mating Plugs**				
	Vendor	**Housing**	**Contact**		
			Capacity	**Part No.**	**Hand Crimping Tool [1]**
18-20 AWG	Tyco	172158-1	18-22 AWG	770904-3 or 170362-3	Tyco 90711-2 (18-22 AWG)
	Emerson	247873700	18-22 AWG	245381600	

[1] Contacts should be crimped to the specifications given in the manufacturer's instructions furnished with crimp tool or connector.

SPECIFICATIONS

1.1 Output Ratings

1.1.1 Voltage: Nominal +24 volts DC, Negative Ground.

1.1.2 Current: 20 amperes per DC-DC Converter Module, up to a total of 160 amperes per shelf with eight modules installed.

1.1.3 Regulation

(A) Static: Steady state output voltage remains within ±0.5 volt of the pre-adjusted voltage for any load current from no load to full load and over the specified input voltage range.

(B) Dynamic: For a step load change of 50% within the range of 10% to 100% of full rated current, the maximum voltage transient will not exceed 5% of the initial steady state voltage.

1.1.4 Filtering: With at least 10% of rated full load on the output (-20 °C to +65 °C)

(A) Voice band noise is less than 32 dBrnC when measured with a noise meter using 600 ohm bridged input and C-message weighting.

(B) Wide band noise does not exceed 150 millivolts peak to peak over the frequency range of 0 Hz to 20 MHz.

(C) Wide band noise does not exceed 15 millivolts rms over the frequency range of 0 Hz to 20 MHz (as measured with an HP3400A true rms voltmeter).

(D) Noise below –20°C is slightly higher.

1.2 Input Ratings

1.2.1 Voltage: -48 volts DC nominal, with a range of from -42 to -60 volts DC.

1.2.2 Filtering: Noise reflected back to the central office battery is less than 32 dBrnC.

1.2.3 Typical Input Data - When equipped with **one** Converter Module.

(A) The output voltage of the DC-DC Converter Module is initially adjusted to 24 volts at 50% load and 48 volts DC input.

Input Voltage	Percent of Full Load	Input Current (Amps)	Efficiency (%)	Typical Heat Dissipation (BTU/Hr)
42 VDC	0	0.29	---	15
	25	3.37	84.2	61
	50	6.49	88.1	98
	75	9.68	88.3	144
	100	12.99	87.3	206
48 VDC	0	0.27	---	15
	25	2.96	84.9	62
	50	5.68	88.0	98
	75	8.47	88.3	144
	100	11.33	87.6	202
60 VDC	0	0.25	---	15
	25	2.56	84.1	66
	50	4.89	87.6	101
	75	7.26	88.2	144
	100	9.71	87.6	201

(B) Maximum Current: Input current is 13 amperes at full load (20 amperes) and 42 volts DC input.

1.2.4 Typical Input Data - When equipped with **eight** Converter Modules.

(A) The output voltage of the DC-DC Converter Modules is initially adjusted to 24 volts at 50% load and 48 volts DC input.

Input Voltage	Percent of Full Load	Total Input Current (Amps)	Efficiency (%)	Typical Heat Dissipation (BTU/Hr)
42 VDC	0	1.96	---	120
	25	27.06	84.9	497
	50	52.67	86.8	865
	75	78.26	87.3	1241
	100	105.02	86.4	1767
48 VDC	0	1.68	---	120
	25	23.76	84.6	507
	50	45.75	87.4	823
	75	68.39	87.4	1230
	100	91.66	86.6	1739
60 VDC	0	1.52	---	120
	25	20.52	83.9	530
	50	39.40	87.0	850
	75	58.67	87.3	1240
	100	78.39	86.8	1718

(B) Maximum Current: Total input current is 105 amperes at full load (160 amperes) and 42 volts DC input.

1.3 Environmental Ratings

1.3.1 Operating Ambient Temperature Range:

a) Field Wiring Applications (per NEC Table 310-16): -20°C to +40°C (-4°F to +104°F).

b) Wiring Contained within End-Use Equipment: -20°C to +65°C (-4°F to +149°F).

1.3.2 Storage Ambient Temperature Range: -40°C to +85°C (-40°F to +185°F).

1.3.3 Humidity: This DC-DC Converter System is capable of operating in an ambient relative humidity range of 0 to 95%, non-condensing.

1.3.4 Altitude: The maximum operating ambient temperature should be derated by 10°C at an elevation of 10,000 feet. For elevations between sea level and 10,000 feet, derate the maximum operating ambient temperature linearly.

1.3.5 Ventilation Requirements: Each Converter Module is fan cooled, using front to back ventilation. The Converter Mounting Shelf must be located such that ventilation openings are not blocked and temperature of the air entering the cabinet is not above or below the Operating Ambient Temperature Range stated in this document.

1.3.6 Audible Noise: With eight Converter Modules installed and operating, the audible noise at any point 5 feet from any vertical surface of the equipment shelf does not exceed 60 dBA when measured with a sound level meter conforming to ANSI S1.4.

1.3.7 EMI/RFI Suppression: This DC-DC Converter System conforms to the requirements of FCC rules Part 15, Subpart B, Class A, for radiated and conducted noise.

Home

1.3.8 Filtering: Noise reflected back to the central office battery is within the parameters set forth in Telcordia Technical Reference TR-TSY-000009, paragraph 5.0, using test measurements in Telcordia Technical Reference PUB 43802, pages 5 and 6.

1.3.9 Safety Compliance:

(A) This unit meets the requirements of UL 60950, Standard for Information Technology Equipment, and is UL Recognized as a power supply for use in Telephone, Electronic Data Processing or Information Processing Equipment.

(B) This unit meets the requirements of CAN/CSA 22.2, No. 60950-00 and is tested and Certified by UL ("c UR") as a Component Type Power Supply.

1.4 Standard Features

1.4.1 Type of Power Conversion Circuit: High Frequency.

1.4.2 Input Protection:

(A) Fusing: A 20-ampere non-user replaceable fuse is located in the negative input lead of each Converter Module.

(B) Low Input Voltage Inhibit: Operation of the Converter Modules will inhibit if the input voltage drops to within the range of 38.5 to 41.0 volts. While operation is inhibited, the Converter Shelf will draw no more than 20 mA per input bus. Operation will automatically resume after the input voltage returns to within normal operating limits.

1.4.3 Output Protection:

(A) Overvoltage Protection: Operation of a DC-DC Converter Module will automatically shut down and lock out if the output voltage of the module exceeds 115% to 125% of the nominal voltage. Manual restart is necessary after the overvoltage condition is corrected.

(B) Overcurrent Protection: When the output current of a DC-DC Converter Module increases to a preset overcurrent value between 102.5% and 115% of rated full load, the output voltage of the module will automatically decrease to limit current to this value. The output will recover to within specified limits when the overload condition is removed.

(C) Over Temperature Protection: The operation of a DC-DC Converter Module will automatically shut down and lock out if the internal temperature of the module exceeds a predetermined value. Operation will automatically resume after the over-temperature condition is corrected.

1.4.4 Series Paralleling Output Diode: A series paralleling output diode is provided in each Converter Module. This allows the Converter Modules to be paralleled for redundancy.

1.4.5 External Alarm Circuits: Alarm relay contacts are rated for 1 ampere at 30 volts DC or 0.3 ampere at 60 volts DC.

(A) Minor Alarm: A single set of Form C relay contacts changes state in the event of an alarm condition in one Converter Module. Contacts remain closed in the event of a major alarm condition. Alarm conditions include:

- Converter output increases above 26 volts DC or decreases below 22 volts DC for any reason, including converter failure, High Voltage Shutdown, input voltage below 42 volts DC (low input inhibit), or an overload or overtemperature condition.
- Cooling fan slows or stops due to fan failure or blocked rotor.

(B) Major Alarm: A single set of Form C relay contacts changes state in the event of an alarm condition in more than one Converter Module. Alarm conditions are as in (A) above.

1.4.6 External Control Inputs:

(A) Emergency Stop1: Operation of all Side 1 Converter Modules (left-hand side as viewed from front) can be inhibited through application of an external signal (system ground). Major/Minor Alarms will be activated. Upon removal of the ground signal, converters will resume normal operation.

(B) Emergency Stop 2: Operation of all Side 2 Converter Modules (right-hand side as viewed from front) can be inhibited through application of an external signal (system ground). Major/Minor Alarms will be activated. Upon removal of the ground signal, converters will resume normal operation.

1.4.7 Local Controls (See Operation section of *Installation and User Instructions* for a complete description.)

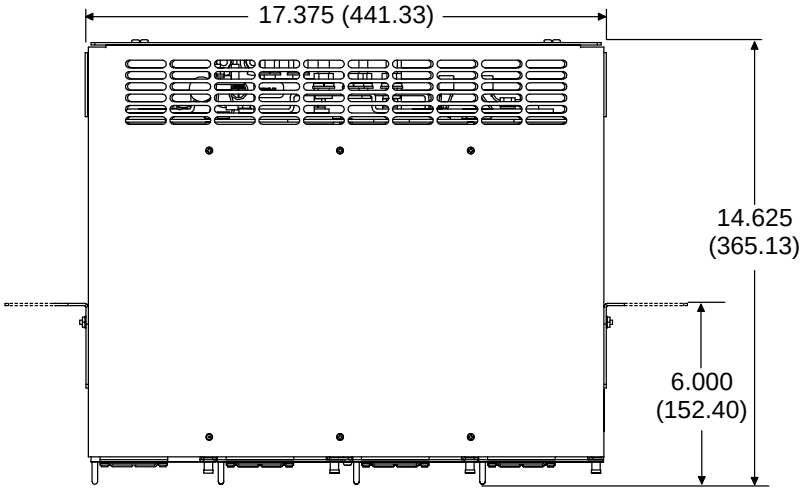
Location	NAME/Description	Type
Converter Module	ON / STANDBY (I / ⏻)	Rocker Switch

1.4.8 Local Status and Alarm Indicators: (See Operation section of *Installation and User Instructions* for a complete description.)

Location	NAME/Description	Type
Converter Module	OUTPUT OK	LED – green
Converter Mounting Shelf	INPUT OK	LED – green
	MINOR ALARM	LED – yellow
	MAJOR ALARM	LED – red

PHYSICAL SIZE INFORMATION

Overall Dimensions



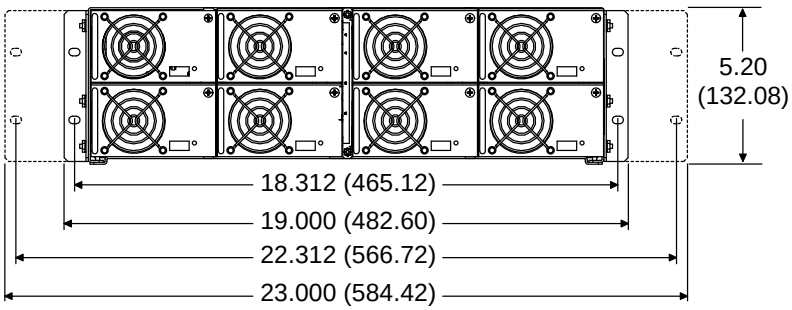
TOP VIEW

NOTES :

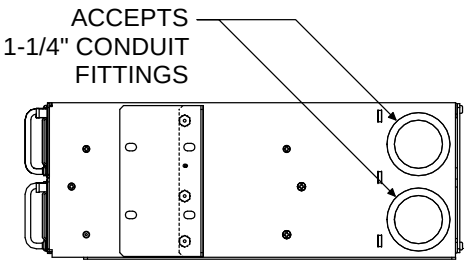
1. ALL DIMENSIONS IN INCHES AND (MILLIMETERS).
2. WEIGHT IN LBS AND (KILOGRAMS).

	Net	Shipping
Shelf	18 (8.2)	22.4 (10.2)
DC-DC Converter Module	3.2 (1.5)	5 (2.3)

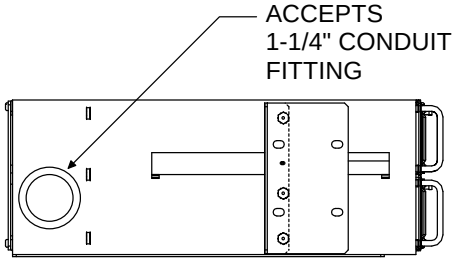
3. FINISH :
   SHELVES: GALVANNEAL.
   CONVERTER
   MODULE
   FRONT
   PANELS: OFF WHITE



FRONT VIEW

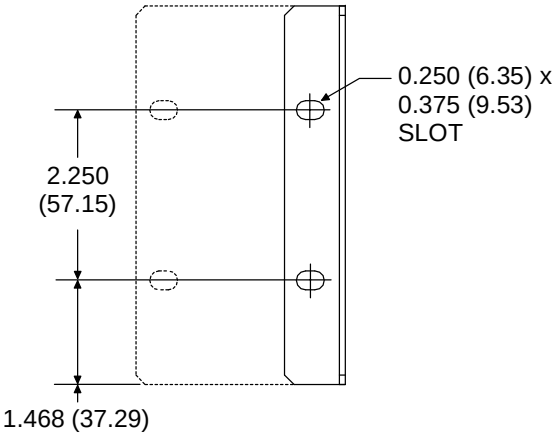


RIGHT SIDE VIEW

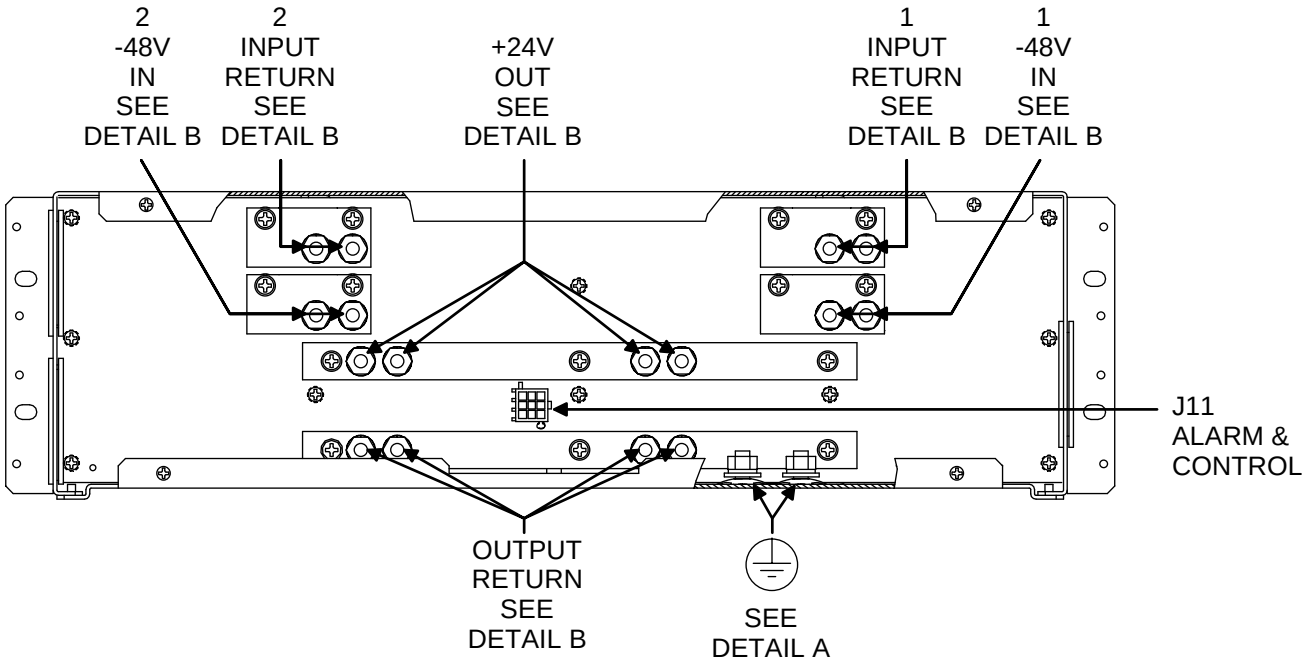


LEFT SIDE VIEW

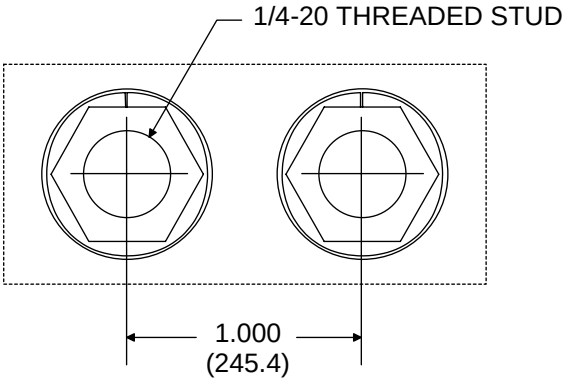
MOUNTING ANGLE DETAIL



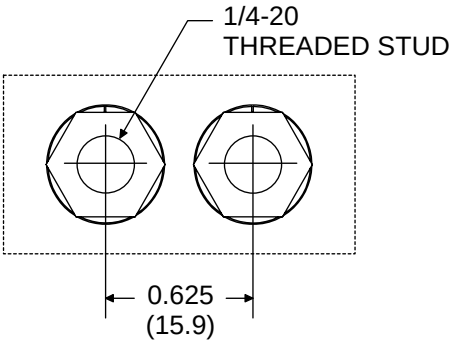
Electrical Connection Locations, Lug Mounting Dimensions



DETAIL A



DETAIL B



RELATED DOCUMENTATION

Schematic Diagram: SD588249700

Installation and User Instructions: Section 5906

Home

APPENDIX (a record of changes made to this document)

Issue	Change Number (ECO)	Description of Change	Date	Approved
AA	LLP034491	New.	9/1/04 9/1/04	J. Kirkpatrick R. Schroeder
AB	LLP202639	Updated corporate references.		 1/4/05  1/4/2005

Emerson Network Power / 1122 F Street / Lorain, Ohio 44052-2293 / (440) 288-1122

In Canada:
Emerson Electric Canada Limited
122 Edward St. / St. Thomas, Ontario N5P 1Z2 / (519) 637-4900
In Mexico:
Emerson Network Power de Mexico S.A. de C.V.
Apartado Postal 77001 / Mexico 10 D.F., MX 11200 / (525) 576-8277