

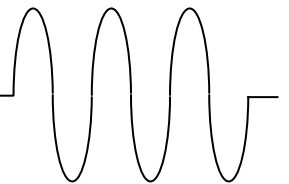
MTE Corporation

Sine Wave Filter

Series A

440- 600 VAC

USER MANUAL



PART NO. INSTR - 020
REL. 041116

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IMPORTANT USER INFORMATION

NOTICE

The MTE Corporation Sine Wave Filter is designed to convert output voltage wave forms produced by a wide variety of PWM inverters into a low distortion sine wave for drive and power conversion applications. The suitability of this filter for a specific application must therefore be determined by the customer. In no event will MTE Corporation assume responsibility or liability for any direct or consequential damages resulting from the use or application of this filter. Nor will MTE Corporation assume patent liability with respect to the use of information, circuits or equipment described in this instruction manual.

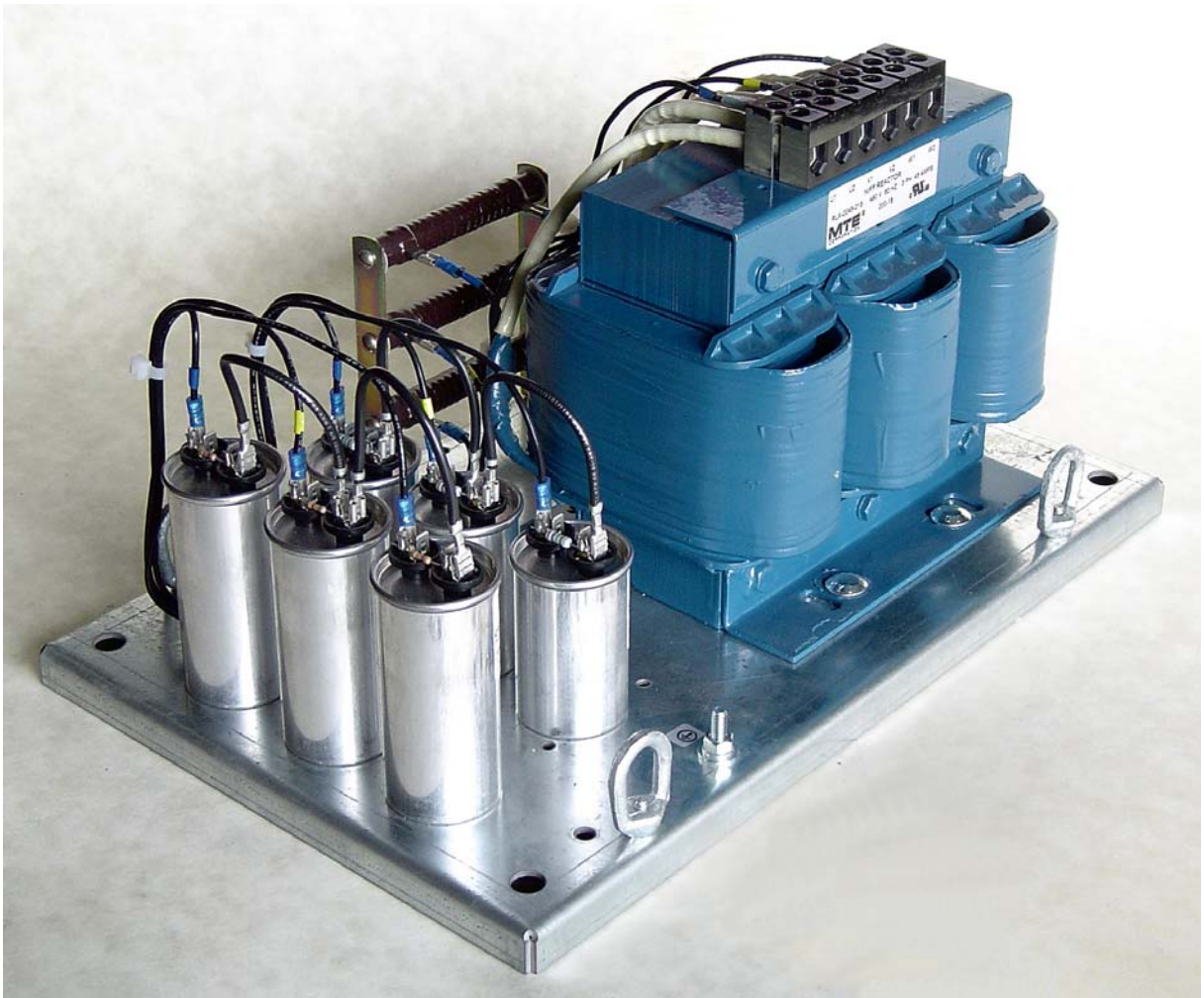


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1. IMPORTANT SAFETY INFORMATION

WARNING

ONLY A QUALIFIED ELECTRICIAN CAN CARRY OUT THE ELECTRICAL INSTALLATION OF THIS FILTER

WARNING

High voltage is used in the operation of this filter. Use Extreme caution to avoid contact with high voltage when operating, installing or repairing this filter. **INJURY OR DEATH MAY RESULT IF SAFETY PRECAUTIONS ARE NOT OBSERVED.**

After removing power, allow at least five minutes to elapse and verify that the capacitors have discharged to a safe level before contacting internal components. Connect a DC voltmeter across the capacitor terminals. Start with the meter on the highest scale and progressively switch to a lower scale as the indicated voltage falls below the maximum value of the next lower scale used.

WARNING

The opening of the branch circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electrical shock, current-carrying parts and other components of the filter should be examined and replaced if damaged.

WARNING

An upstream disconnect/protection device must be used as required by the National Electrical Code (NEC).

WARNING

Even if the upstream disconnect/protection device is open, the inverter up stream of the filter may feed high voltage to the filter. The drive safety instructions must be followed. **INJURY OR DEATH MAY RESULT IF THE DRIVE SAFETY PRECAUTIONS ARE NOT OBSERVED.**

WARNING

The filter must be grounded with a grounding conductor connected to all grounding terminals.

WARNING

Only spare parts obtained from MTE Corporation or an authorized MTE distributor can be used.

2. INTRODUCTION

This manual was specifically developed to assist in the installation, interconnection and operation of the MTE Corporation Sine Wave filter.

This manual is intended for use by personnel experienced in the operation and maintenance of electronic drives. Because of the high voltages required by the filter and drive and the potential dangers presented by rotating machinery, it is essential that all personnel involved in the operation and maintenance of this filter know and practice the necessary safety precautions for this type of equipment. Personnel should read and understand the instructions contained in this manual before installing, operating or servicing the filter and inverter to which it is connected.

Upon Receipt of this Filter:

The MTE Sine Wave Filter has been subjected to demanding factory tests before shipment. Carefully inspect the shipping container for damage that may have occurred in transit. Then unpack the filter and carefully inspect for any signs of damage. Save the shipping container for future transport of the filter.

In the event of damage, please contact and file a claim with the freight carrier involved immediately.

If the equipment is not going to be put into service upon receipt, cover and store the filter in a clean, dry location. After storage, ensure that the equipment is dry and that no condensation has accumulated on the internal components of the filter before applying power.

Repair/Exchange Procedure

MTE Corporation requires a Returned Material Authorization Number before it can accept any filters that qualify for return or repair. If problems or questions arise during installation, setup, or operation of the filter, please call us for assistance at :

Director of MTE corporate quality:
Phone: 262-253-8200 ex. 148

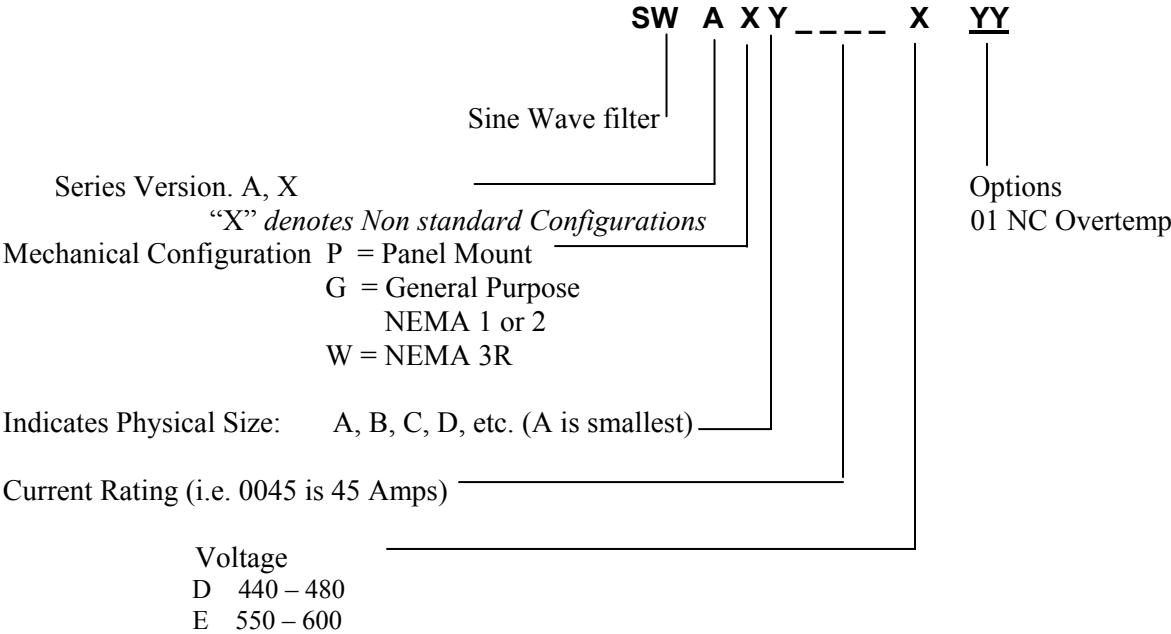
FAX: 262-253-8210

Quick view:

1. **Specification details: pg 4**
2. **Weights : pg 8**
3. **Interconnection diagram: pg 26**
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6. **Filter schematic / wiring: pg 32**
7. **Problem solutions: pg 34**

3. MODEL NUMBER CODES

Model Code Part Number Configuration



4. SPECIFICATIONS

Ratings

Table 1

Filter	440 - 480 VAC, 60 Hz Filter Ratings		550 - 600 VAC, 60 Hz Filter Ratings		
	Maximum Output Amps RMS	Efficiency (Typical) (%)	Power Dissipation @ Rated Current (Typical) (Watts)	Efficiency (Typical) (%)	Power Dissipation @ Rated Current (Typical) (Watts)
9		98.26	128	98.31	155
12		98.35	162	98.54	177
17		98.90	151	98.73	219
22		98.72	229	98.86	253
27		99.01	216	98.92	295
35		99.08	262	99.08	323
45		99.01	360	98.93	489
55		98.97	457	99.04	535
65		99.13	454	99.01	650
80		99.08	596	99.00	806
110		99.01	878	99.09	1014
130		99.20	836	99.12	1157
160		99.23	996	99.02	1589
200		99.20	1286	99.35	1315
250		99.29	1424	99.34	1655
305		99.31	1701	99.27	2237
365		99.37	1841	99.32	2489
415		99.40	2021	99.26	3098
515		99.29	2944	99.33	3229
600		99.24	3698	99.38	3406
720		99.33	4133	99.44	3935

4. SPECIFICATIONS

Sine Wave 2-8 kHz Series A Filter

Service Conditions

Input voltage: 440 – 600 VAC +/- 10%, 60Hz

Input voltage wave form: PWM

Switching Frequency: 2 – 8 kHz

Operating frequency: 6 – 60 Hz without de-rating

Ambient Temperature: 50 °C Open filters, 40 °C Enclosed filters

Altitude without de-rating: 1000 meters

Relative Humidity: 0 to 99% Non condensing

Agency Approvals

UL and cUL listed to UL508 and CSA-C22.2 No 14-95
File E180243 (3 – 1000 HP, 120VAC through 600 VAC
50. 50/60, 60 Hz Three Phase

Current Rating

Continuous current rating: 100% RMS

Intermittent current ratings: 150 % for 1 minute

Load : Conventional 3 phase motors
Standard step-up transformer with 4% minimum output impedance
“No load” continuous operation

Maximum motor lead length: 15,000 feet

Insertion loss: 10% of rated voltage maximum

Audible noise level at two meters for standard configuration: 76 DB-A

Performance

Harmonic voltage distortion feeding a transformer at full load and at 60Hz: 5% maximum

Harmonic voltage distortion feeding a motor at full load and at 60Hz: 5% typical

4. SPECIFICATIONS

Typical Performance Data

Fig.1

Raw drive output voltage

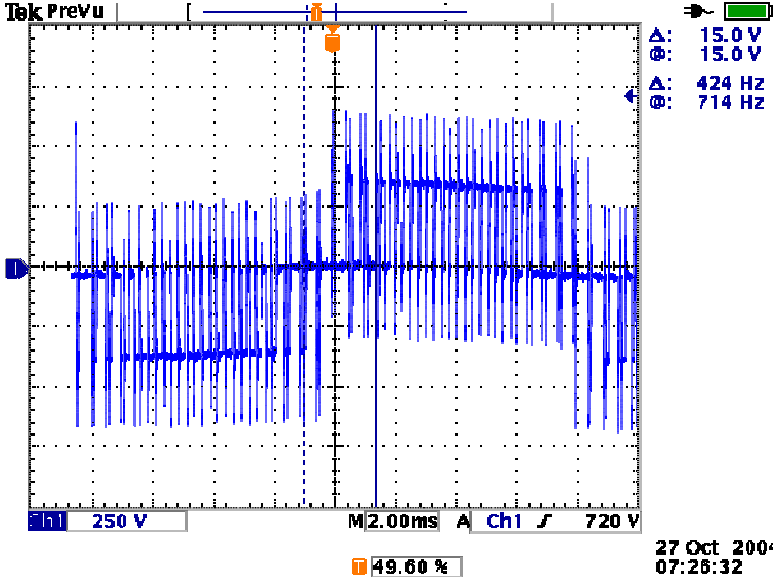
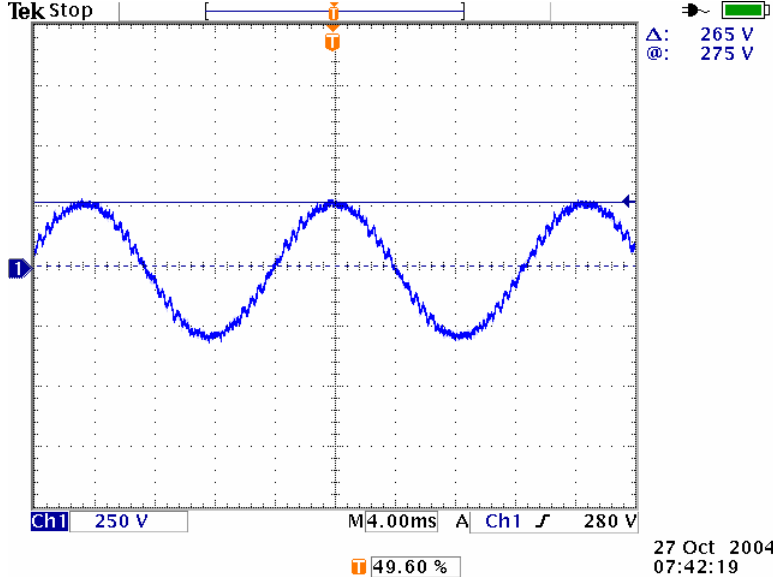


Fig. 2

Output voltage after sine wave filter



4. SPECIFICATIONS

Chart 1

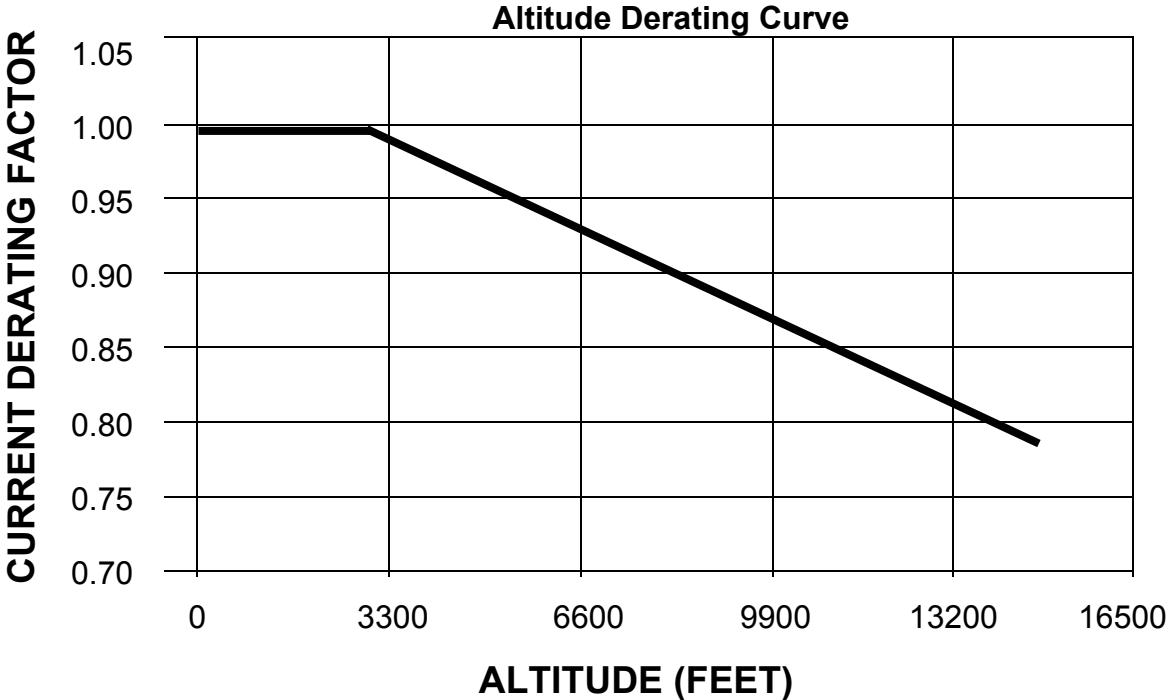
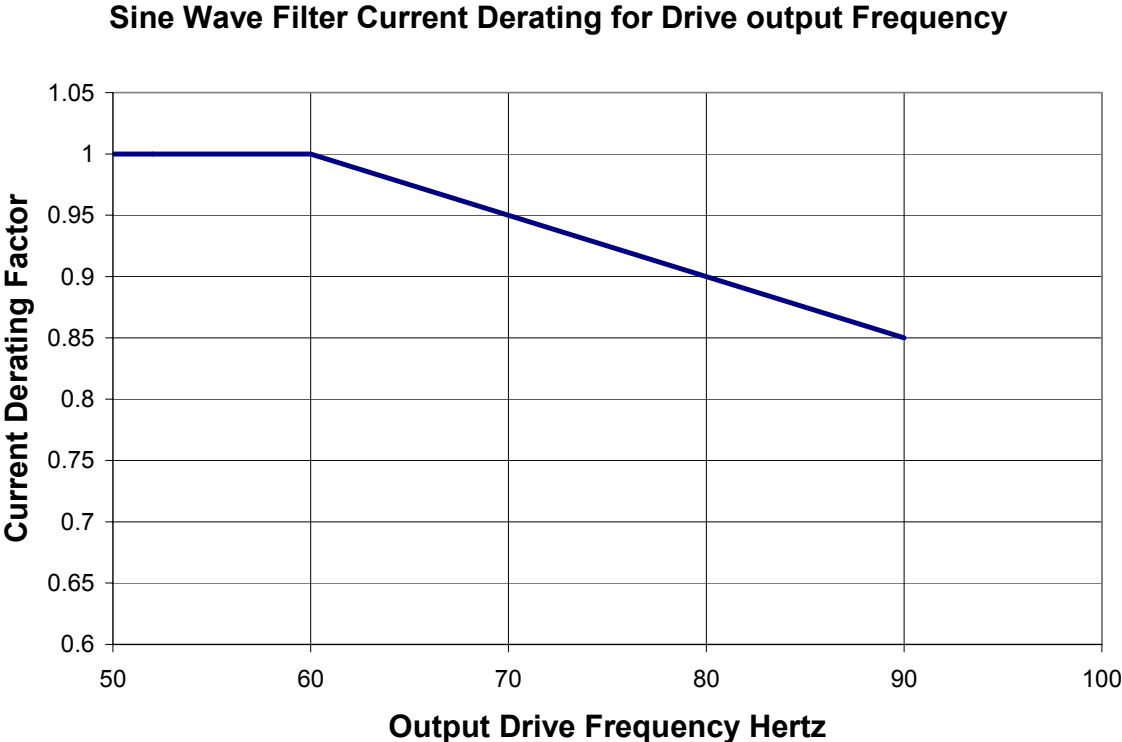


Chart 2



4. SPECIFICATIONS

Sine Wave 2-8 kHz Series A Filter 440 – 480 Volt Weights

Table 2

Filter Amps	Open			NEMA 1			NEMA 3R		
	Cat PN.	WT Lbs	Fig.	Cat PN.	WT Lbs	Fig.	Cat PN.	WT Lbs	Fig.
9	SWAP0009D	27	3	SWAGA0009D	94	8	SWAWA0009D	100	10
12	SWAP0012D	27	3	SWAGA0012D	94	8	SWAWA0012D	100	10
17	SWAP0017D	30	3	SWAGA0017D	94	8	SWAWA0017D	100	10
22	SWAP0022D	37	4	SWAGB0022D	122	9	SWAWB0022D	135	11
27	SWAP0027D	38	4	SWAGB0027D	123	9	SWAWB0027D	136	11
35	SWAP0035D	51	4	SWAGB0035D	131	9	SWAWB0035D	144	11
45	SWAP0045D	57	4	SWAGB0045D	137	9	SWAWB0045D	150	11
55	SWAP0055D	67	4	SWAGB0055D	147	9	SWAWB0055D	160	11
65	SWAP0065D	77	5	SWAGB0065D	157	9	SWAWB0065D	170	11
80	SWAP0080D	86	5	SWAGC0080D	246	12	SWAWC0080D	270	12
110	SWAP0110D	117	A1 & B	SWAGC0110D	277	12	SWAWC0110D	301	12
130	SWAP0130D	134	A2 & B	SWAGC0130D	294	12	SWAWC0130D	318	12
160	SWAP0160D	163	A3 & B	SWAGC0160D	323	12	SWAWC0160D	347	12
200	SWAP0200D	188	A4 & B	SWAGD0200D	471	13	SWAWD0200D	523	13
250	SWAP0250D	233	A6 & B	SWAGD0250D	516	13	SWAWD0250D	568	13
305	SWAP0305D	266	A7 & C	SWAGD0305D	549	13	SWAWD0305D	601	13
365	SWAP0365D	425	A8 & C	SWAGD0365D	631	13	SWAWD0365D	683	13
415	SWAP0415D	500	A10 & C	SWAGD0415D	700	13	SWAWD0415D	752	13
515	SWAP0515D	650	A12 & C	SWAGD0515D	814	13	SWAWD0515D	866	13
600	SWAP0600D	825	A13 & D	SWAGE0600D	1012	14	SWAWE0600D	1063	14
720	SWAP0720D	1125	A14 & D	SWAGE0720D	1128	14	SWAWE0720D	1179	14

4. SPECIFICATIONS

Sine Wave 2-8 kHz Series A Filter 550-600 Volts Weights

Table 3

Filter Amps	Open			NEMA 1			NEMA 3R		
	Cat PN.	WT Lbs	Fig.	Cat PN.	WT Lbs	Fig.	Cat PN.	WT Lbs	Fig.
9	SWAP0009E	27	3	SWAGA0009E	94	8	SWAWA0009E	100	10
12	SWAP0012E	27	3	SWAGA0012E	94	8	SWAWA0012E	100	10
17	SWAP0017E	37	4	SWAGB0017E	101	9	SWAWB0017E	107	11
22	SWAP0022E	38	4	SWAGB0022E	123	9	SWAWB0022E	136	11
27	SWAP0027E	45	4	SWAGB0027E	130	9	SWAWB0027E	143	11
35	SWAP0035E	58	4	SWAGB0035E	138	9	SWAWB0035E	151	11
45	SWAP0045E	63	4	SWAGB0045E	143	9	SWAWB0045E	156	11
55	SWAP0055E	75	5	SWAGB0055E	155	9	SWAWB0055E	168	11
65	SWAP0065E	86	5	SWAGB0065E	166	9	SWAWB0065E	179	11
80	SWAP0080E	117	A1 & B	SWAGC0080E	277	12	SWAWC0080E	301	12
110	SWAP0110E	146	A3 & B	SWAGC0110E	306	12	SWAWC0110E	330	12
130	SWAP0130E	166	A4 & B	SWAGC0130E	326	12	SWAWC0130E	350	12
160	SWAP0160E	194	A5 & B	SWAGC0160E	354	12	SWAWC0160E	378	12
200	SWAP0200E	236	A6 & B	SWAGD0200E	519	13	SWAWD0200E	571	13
250	SWAP0250E	280	A7 & B	SWAGD0250E	547	13	SWAWD0250E	599	13
305	SWAP0305E	425	A8 & C	SWAGD0305E	630	13	SWAWD0305E	682	13
365	SWAP0365E	490	A9 & C	SWAGD0365E	696	13	SWAWD0365E	748	13
415	SWAP0415E	726	A11 & D	SWAGD0415E	801	13	SWAWD0415E	853	13
515	SWAP0515E	750	A12 & C	SWAGD0515E	916	13	SWAWD0515E	968	13
600	SWAP0600E	1225	A15 & D	SWAGE0600E	1203	14	SWAWE0600E	1254	14
720	SWAP0720E	1375	A16 & D	SWAGE0720E	1327	14	SWAWE0720E	1378	14

5. INSTALLATION INSTRUCTIONS

Filter Installation

Sine Wave filters are supplied in the following mechanical configurations:

Panel mounted assemblies

Floor mounted general purpose NEMA 1 & 3R cabinets

Panel mounted filters are designed for mounting in the vertical plane in the customer's enclosure. Include the power dissipation of the filter along with all the other components located in the panel to determine the internal temperature rise and cooling requirements of the enclosure. An option NC temperature switch may be added to protect against filter over heating. Allow a minimum side clearance of four (4) inches and a vertical clearance of six (6) inches for proper heat dissipation and access within the enclosure. Panel mounted Sine Wave filters generate heat and should be positioned away from heat sensitive components. Ensure that proper panel orientation is maintained. Keep the capacitors away from reactor and resistor heat flow. Avoid locations where the filter would be subjected to excessive vibrations.

Figures 3 – 5 contain open panel outline drawings for the various current ratings and show proper panel mounting orientation. For filters above 80 amps refer to table 4 and Figure A & B for the dimensions of the separately mounted reactor and the RC panel.

The RC panel should be located away from the reactor and in the lowest temperature regions of the enclosure – generally toward the bottom.

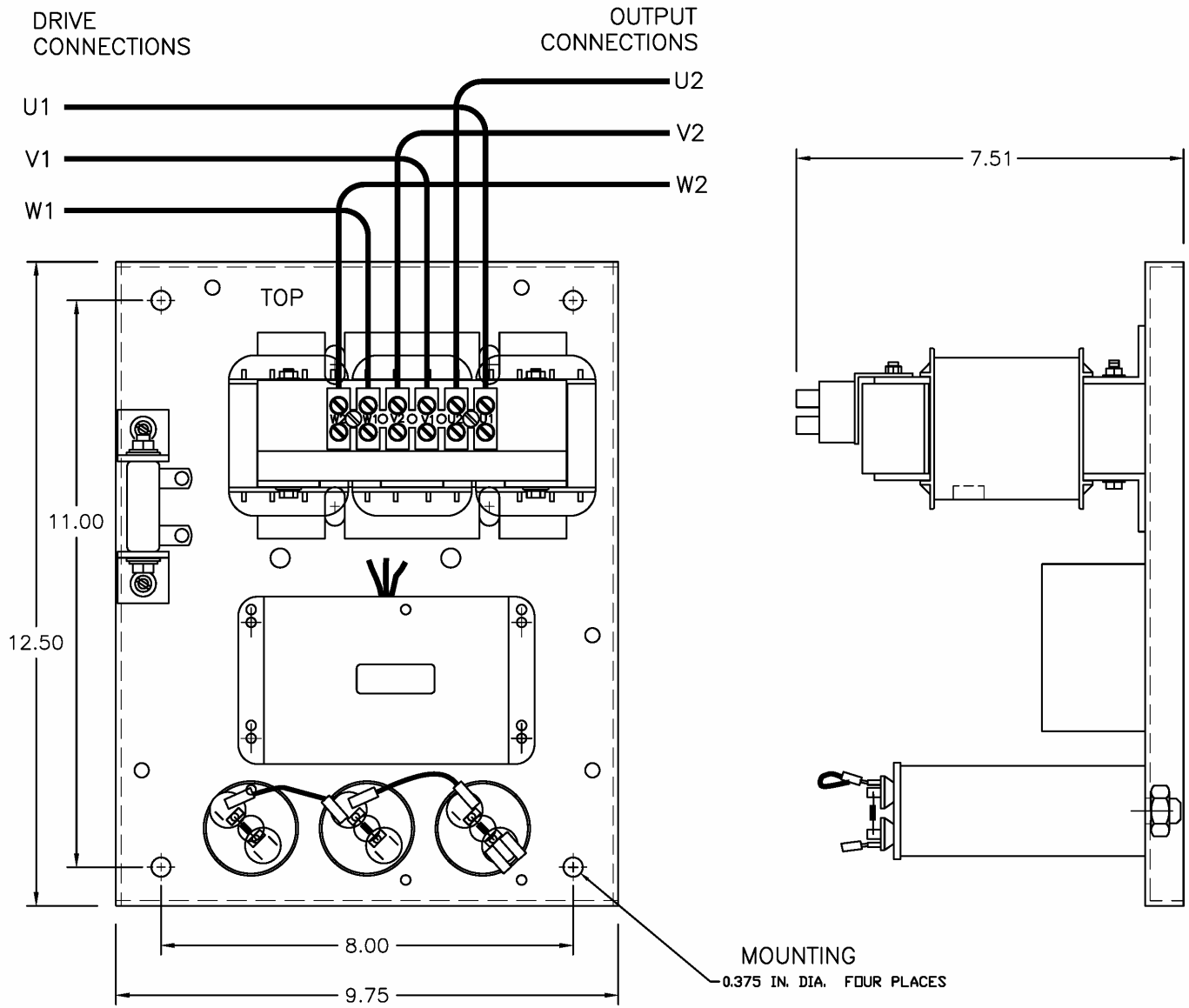
General purpose NEMA 1, 2 and 3R enclosed filters are designed for floor mounting in an environment suitable for the enclosure type. Do not install in or near a corrosive environment. Avoid locations where the filter would be subjected to excessive vibrations. Allow a minimum side and back clearance of eight (8) inches and front clearance of thirty-six (36) inches for proper heat dissipation and access. Page 20 will direct you to the appropriate outline drawings shown in fig. 8 through fig 14

Locate the filter as close to the inverter as possible. Do not exceed a maximum distance of 50 feet.

5. INSTALLATION INSTRUCTIONS

Open Panel: 9 - 17 AMPS 440 - 480 VAC
9 - 12 AMPS 550 - 600 VAC

Fig. 3

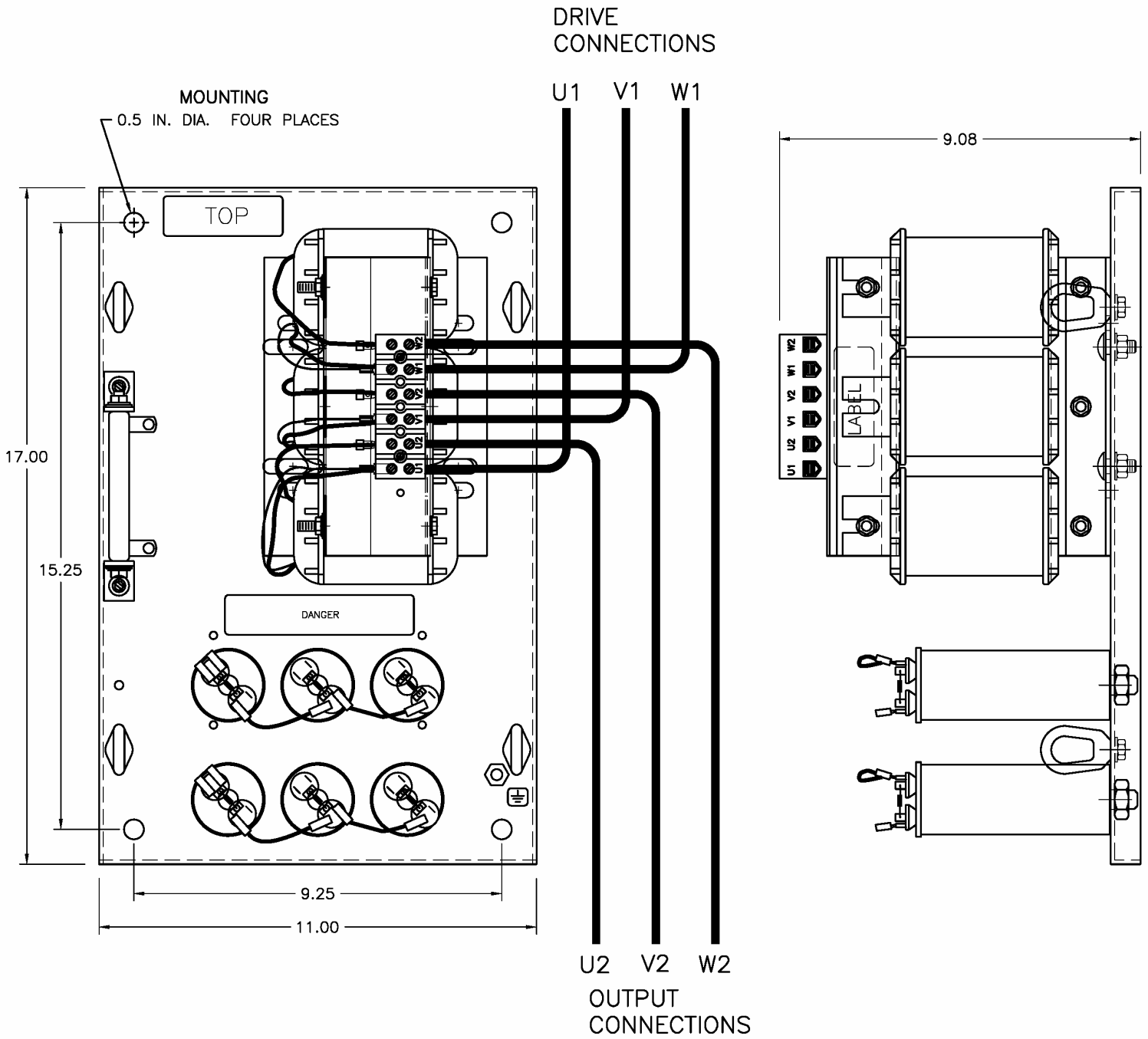


17 Amp Shown

5. INSTALLATION INSTRUCTIONS

Open Panel: 22 - 55 AMPS 440 - 480 VAC
17 - 45 AMPS 550 - 600 VAC

Fig. 4

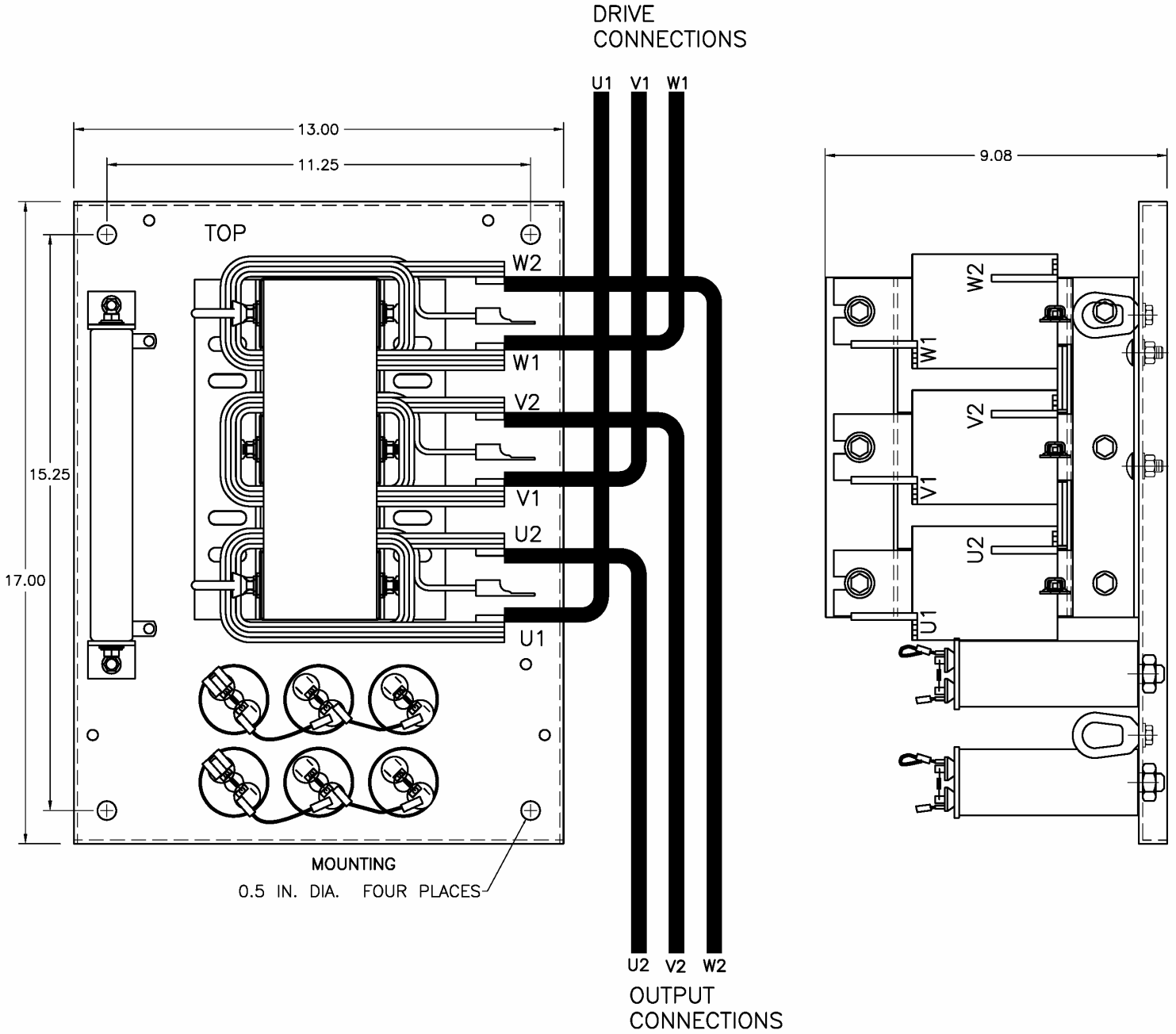


45 Amp shown

5. INSTALLATION INSTRUCTIONS

Open Panel: 65 - 80 AMPS 440 - 480 VAC
55 - 65 AMPS 550 - 600 VAC

Fig. 5



80 Amp Shown

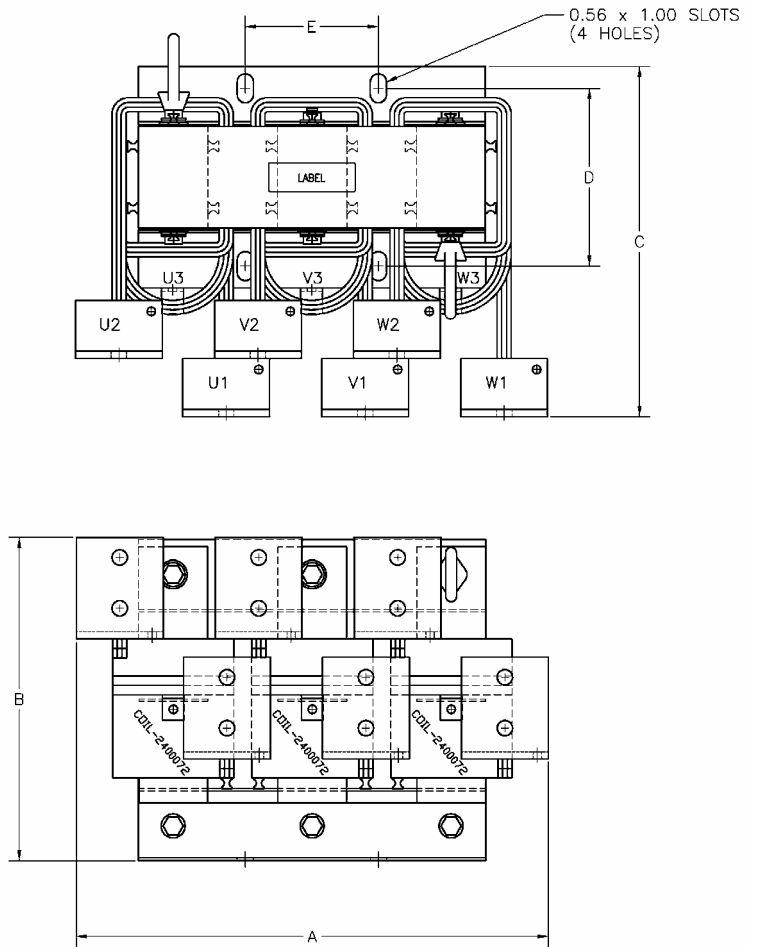
5. INSTALLATION INSTRUCTIONS

Sine Wave Filters rated 80 amps through 720 amps are made up of a reactor and a RC panel. These components are designed to be mounted vertically within an appropriate enclosure. The reactor generates heat and should be mounted away from components affected by heat. Align the reactor to allow cooling air to flow through it. A filter showing correct reactor alignment and placement is shown in figure 6. The RC panel should be located in the lowest temperature regions of the enclosure – generally toward the bottom. An example of an MCC application is shown in Figure 7

Table 4

Figure	DIMENSIONS Inches				
	A	B	C	D	E
A1	14	11.3	9.5	5.2	4.6
A2	14	11.3	10	5.6	4.5
A3	14	11.3	10.5	6.2	4.6
A4	14	11.3	11	6.6	4.6
A5	14	11.3	11.5	7.2	4.6
A6	14	11.3	12.5	8.2	4.6
A7	14	11.3	14.3	9.2	4.6
A8	22	17.0	11.8	6.7	7.2
A9	22	17.0	12.8	7.7	7.2
A10	22	17.0	15.5	8.2	7.2
A11	22	17.0	17.0	9.7	7.2
A12	22	17.0	18.5	11.2	7.2
A13	22	17.0	19.5	12.2	7.2
A14	33.5	30.3	19.5	11.0	15.0
A15	33.5	30.3	20.0	11.0	15.0
A16	33.5	30.3	21.0	11.0	15.0

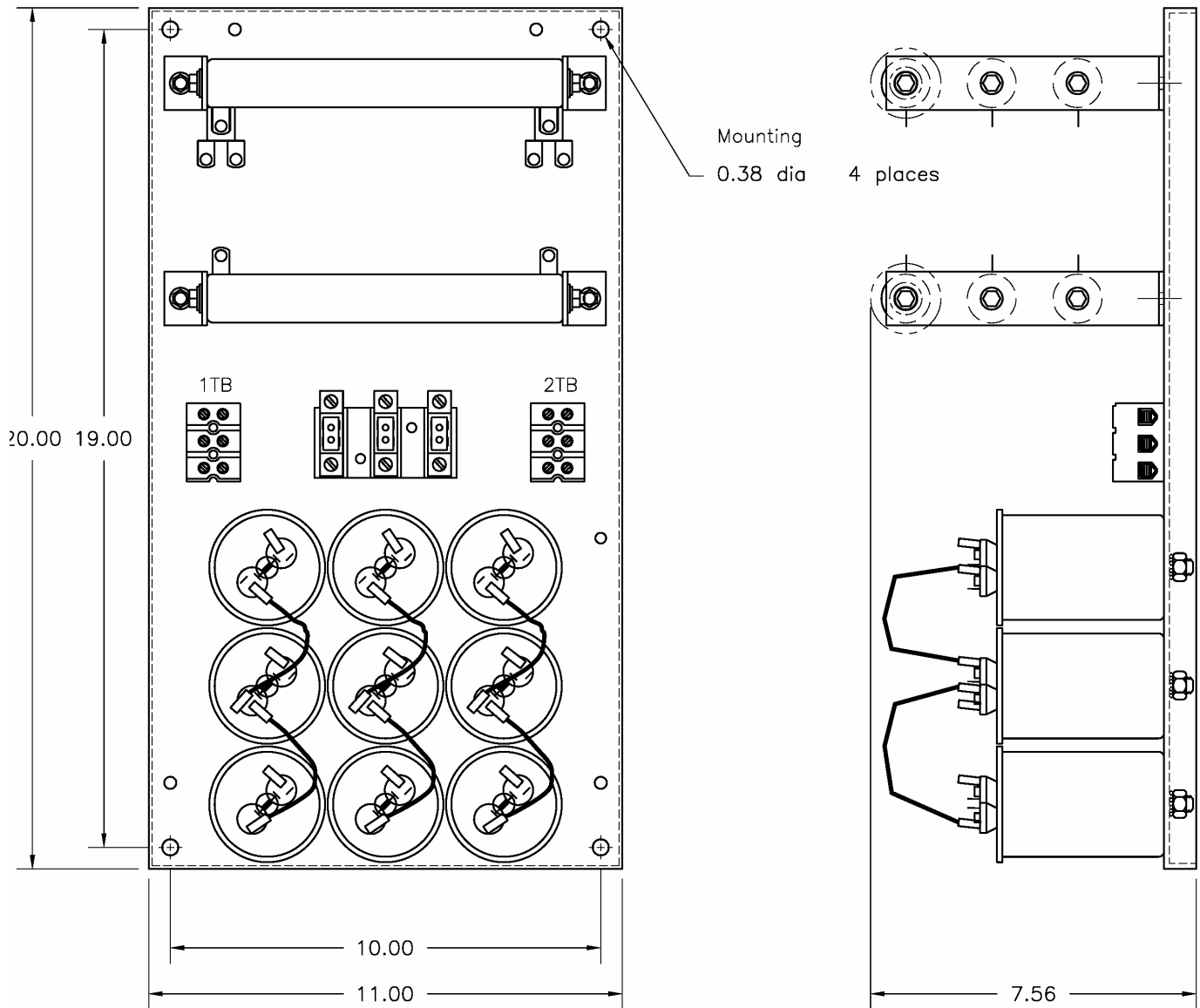
FIG. A



5. INSTALLATION INSTRUCTIONS

RC Panel: 110 - 250 AMPS 440 - 480 VAC
80 - 250 AMPS 550 - 600 VAC

FIG. B

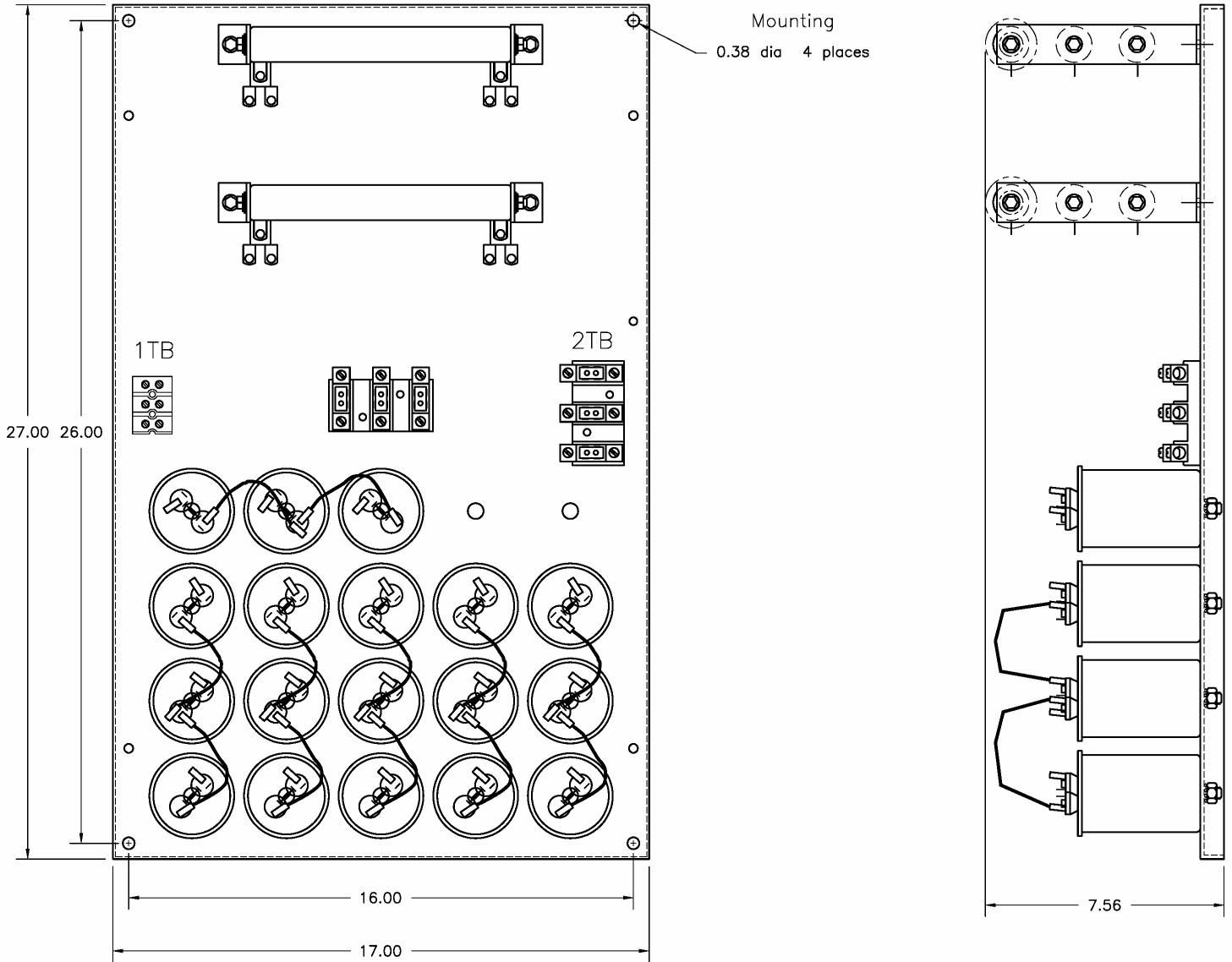


250 Amp Shown

5. INSTALLATION INSTRUCTIONS

RC Panel: 305 - 515 AMPS 440 - 480 VAC
305, 365, 515 AMPS 550 - 600 VAC

Fig. C

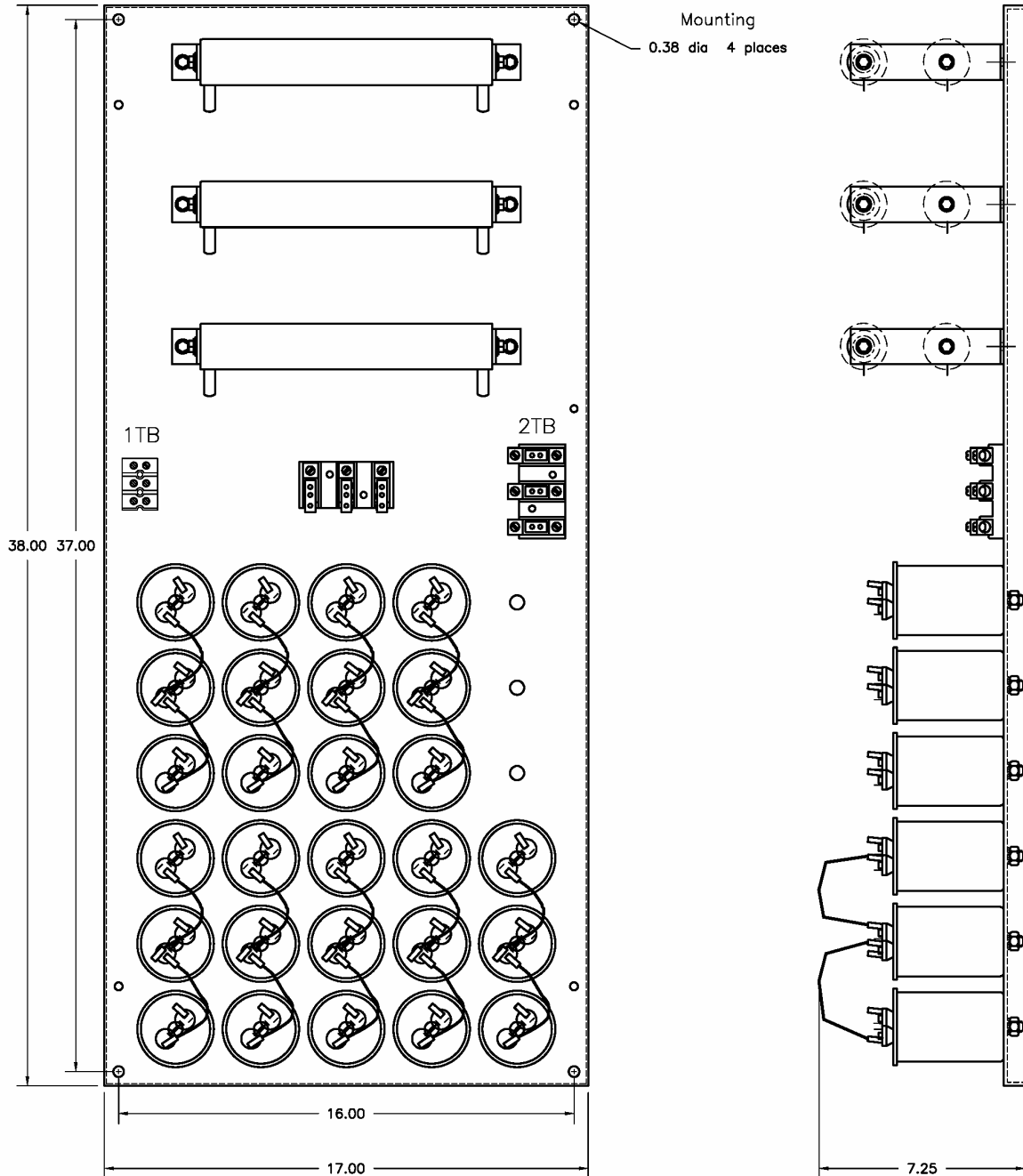


515 Amp shown

5. INSTALLATION INSTRUCTIONS

RC Panel: 600 - 720 AMPS 440 - 480 VAC
415, 600, 720 AMPS 550 - 600 VAC

Fig. D

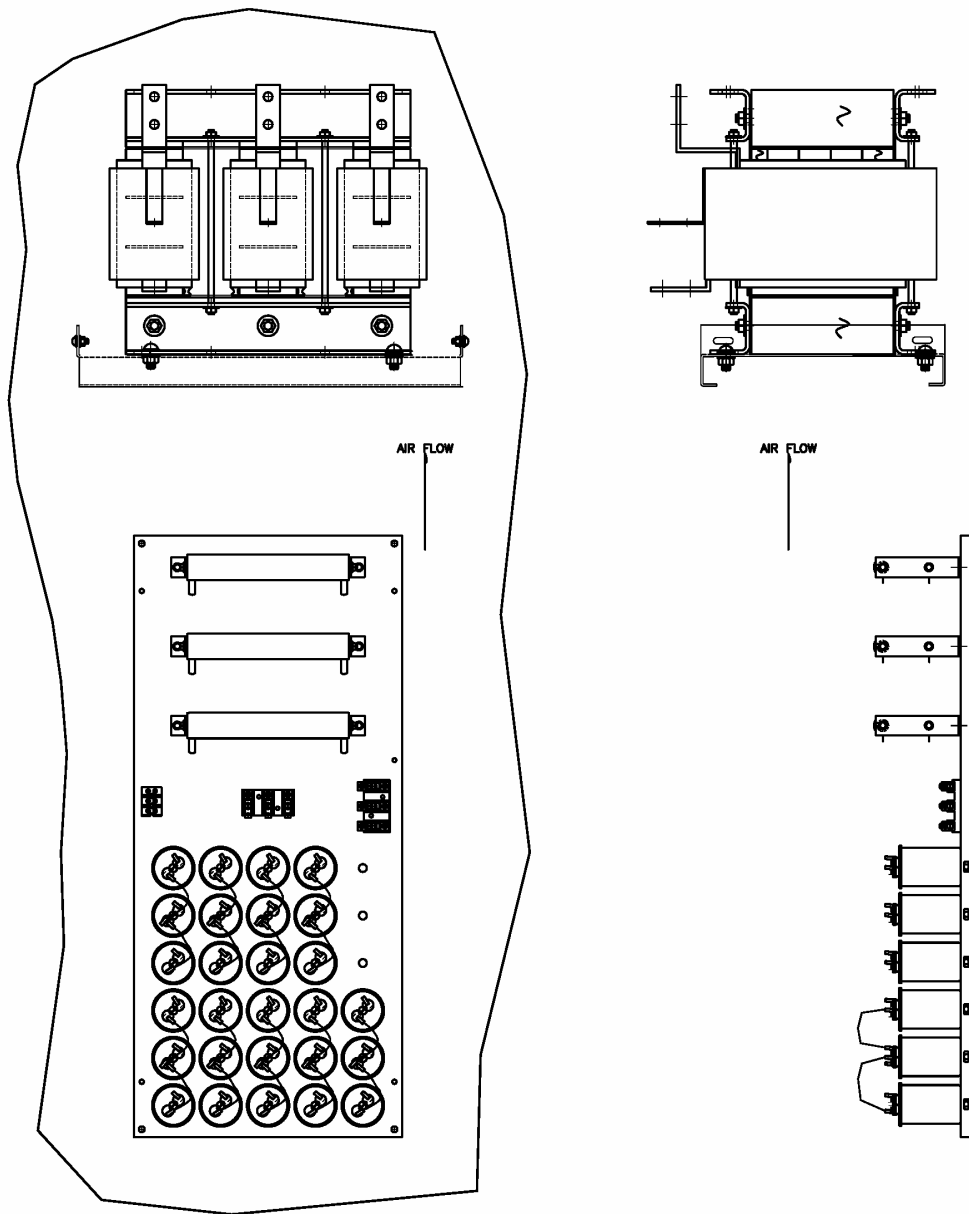


720 amp shown

5. INSTALLATION INSTRUCTIONS

Fig. 6

Vertical MOUNTING OF OPEN REACTOR & RC Panel



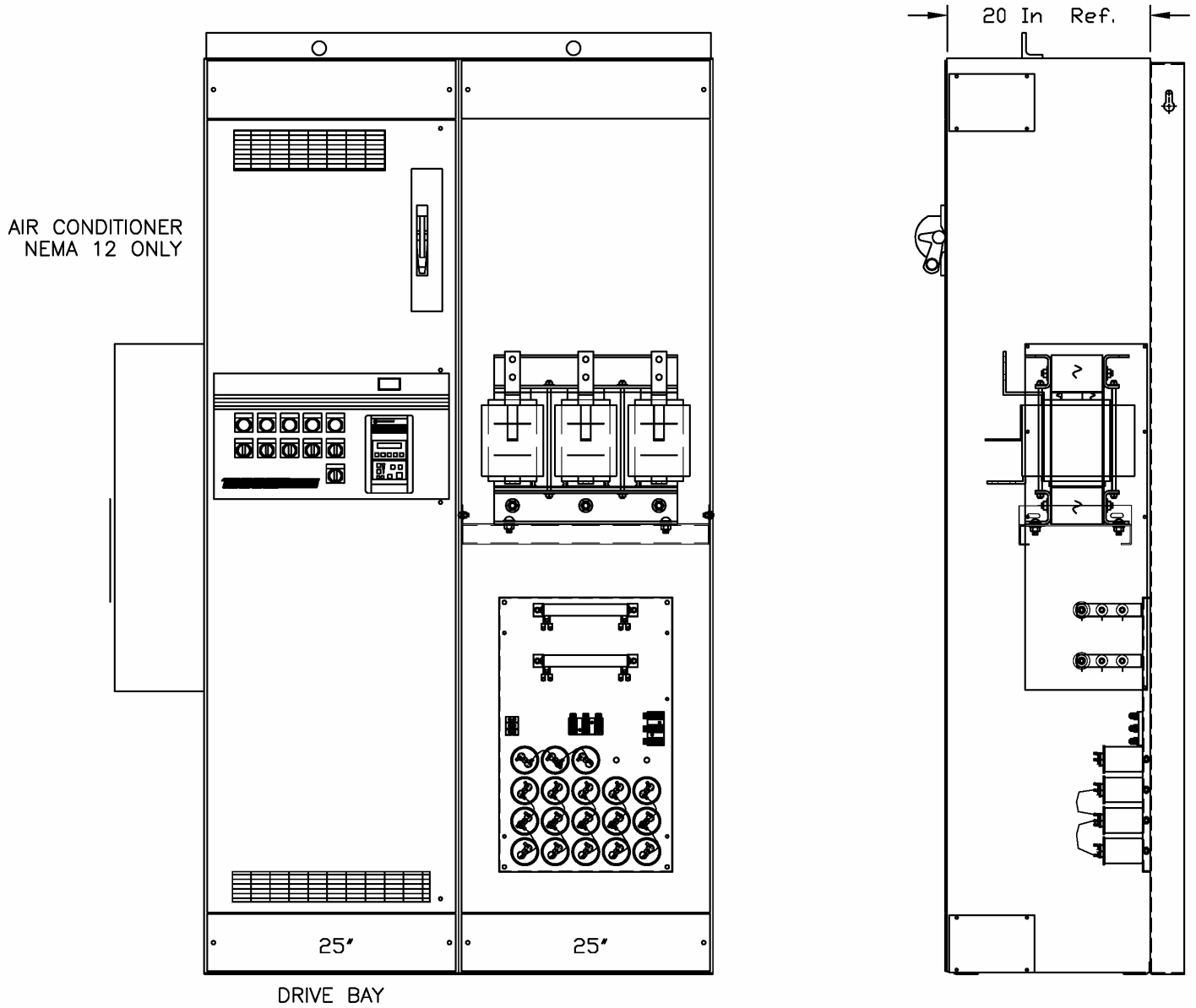
600 amp open reactor & RC panel shown in customer provided enclosure and mounting hardware.

NOTE: Maintain orientation as shown for proper component cooling. Do not place RC panel above reactor or position capacitors above resistors. RC panel may be mounted horizontally.

5. INSTALLATION INSTRUCTIONS

Fig. 7

350Hp MCC using optional bay for Sine Wave installation



Note: The above Sine Wave filter example is shown with customer provided support hardware. Other installation variations are at the customer's discretion as long as thermal guidelines are followed.

5. INSTALLATION INSTRUCTIONS

Enclosed Units

Table 5

Enclosure Indicator	Width	Height	Depth	Cab Part No.	NEMA Type	Figure
GA	13	13	13	Cab 13V	NEMA 1	8
GB	17	24	18	Cab 17V	NEMA 1	9
GC	26.5	47	25	Cab 26C	NEMA 1 -2	12
GD	26.5	47	25	Cab 30C	NEMA 1 -2	13
GE	26.5	47	25	Cab 42C	NEMA 1 -2	14
WA	12.5	24	18	Cab 12C	NEMA 3R	10
WB	17.5	31	21	Cab 17C	NEMA 3R	11
WC	26.5	47	25	Cab 26C	NEMA 3R	12
WD	30.5	72	31	Cab 30C	NEMA 3R	13
WE	26.5	47	25	Cab 42C	NEMA 3R	14

See table 2 & 3 on page 8 & 9 for enclosed weights.

Table 6

Filter Current Rating	General Purpose Cabinets 440 – 480 VAC		General Purpose Cabinets 550– 600VAC	
	NEMA 1	NEMA 3R	NEMA 1	NEMA 3R
9	CAB-13V	CAB-12C	CAB-13V	CAB-12C
12	CAB-13V	CAB-12C	CAB-13V	CAB-12C
17	CAB-13V	CAB-12C	CAB-17V	CAB-17C
22	CAB-17V	CAB-17C	CAB-17V	CAB-17C
27	CAB-17V	CAB-17C	CAB-17V	CAB-17C
35	CAB-17V	CAB-17C	CAB-17V	CAB-17C
45	CAB-17V	CAB-17C	CAB-17V	CAB-17C
55	CAB-17V	CAB-17C	CAB-26C	CAB-26C
65	CAB-17V	CAB-17C	CAB-26C	CAB-26C
80	CAB-26C	CAB-26C	CAB-26C	CAB-26C
110	CAB-26C	CAB-26C	CAB-26C	CAB-26C
130	CAB-26C	CAB-26C	CAB-30C	CAB-30C
160	CAB-26C	CAB-26C	CAB-30C	CAB-30C
200	CAB-30C	CAB-30C	CAB-30C	CAB-30C
250	CAB-30C	CAB-30C	CAB-30C	CAB-30C
305	CAB-30C	CAB-30C	CAB-30C	CAB-30C
365	CAB-30C	CAB-30C	CAB-30C	CAB-30C
415	CAB-30C	CAB-30C	CAB-42C	CAB-42C
515	CAB-30C	CAB-30C	CAB-42C	CAB-42C
600	CAB-42C	CAB-42C	CAB-42C	CAB-42C
720	CAB-42C	CAB-42C	CAB-42C	CAB-42C

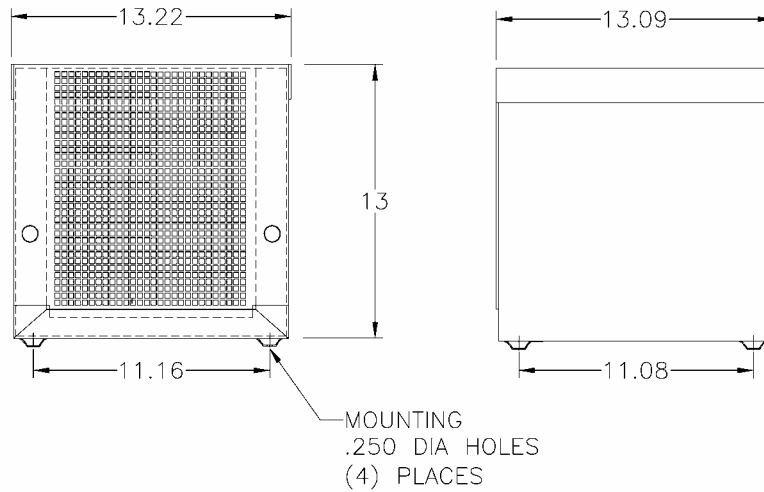
Mounting dimensions and outline drawings for filters mounted in NEMA 1, 3R Enclosures follow

5. INSTALLATION INSTRUCTIONS

Enclosed NEMA 1

9 – 12 Amp 440 - 600 Volts

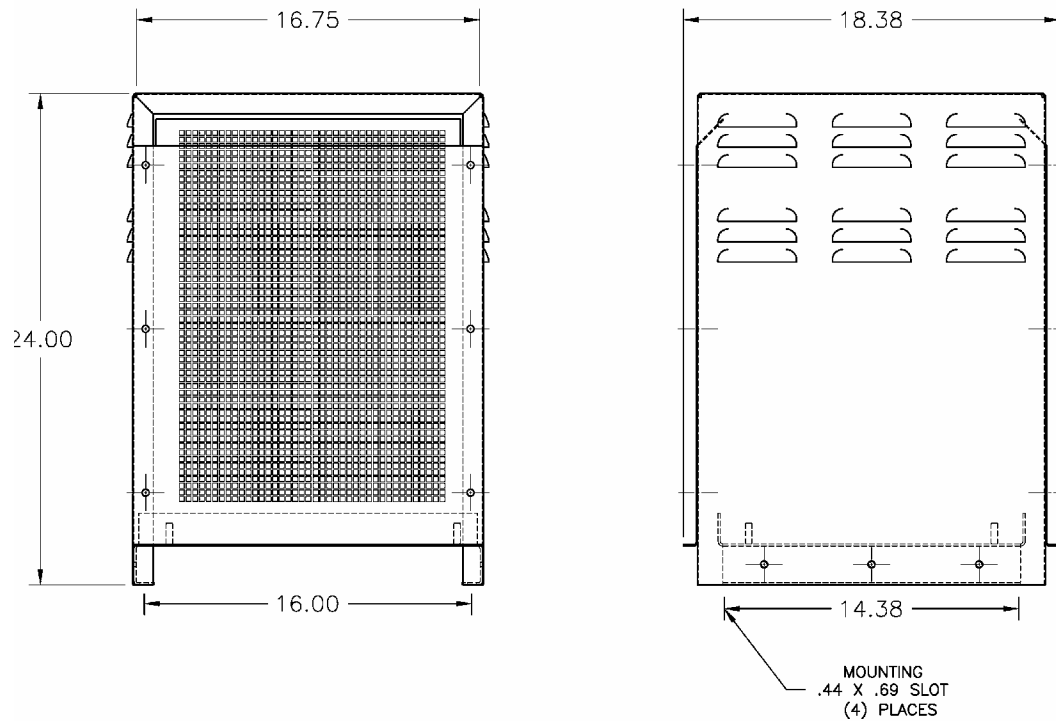
Fig. 8 Cab 13V



22 - 65 AMPS 440 – 480 VOLTS

17- 65 AMPS 550 – 600 VOLTS

Fig. 9 Cab 17V



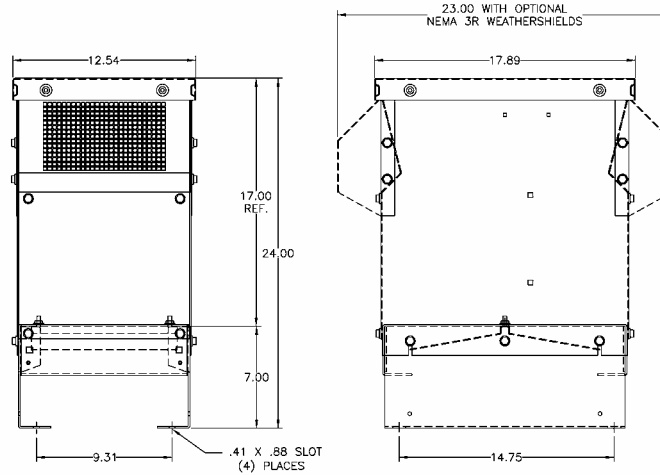
5. INSTALLATION INSTRUCTIONS

Enclosed NEMA 1-2 & 3R units

720 AMPS 440 – 480 VOLTS

720 AMPS 550 – 600 VOLTS

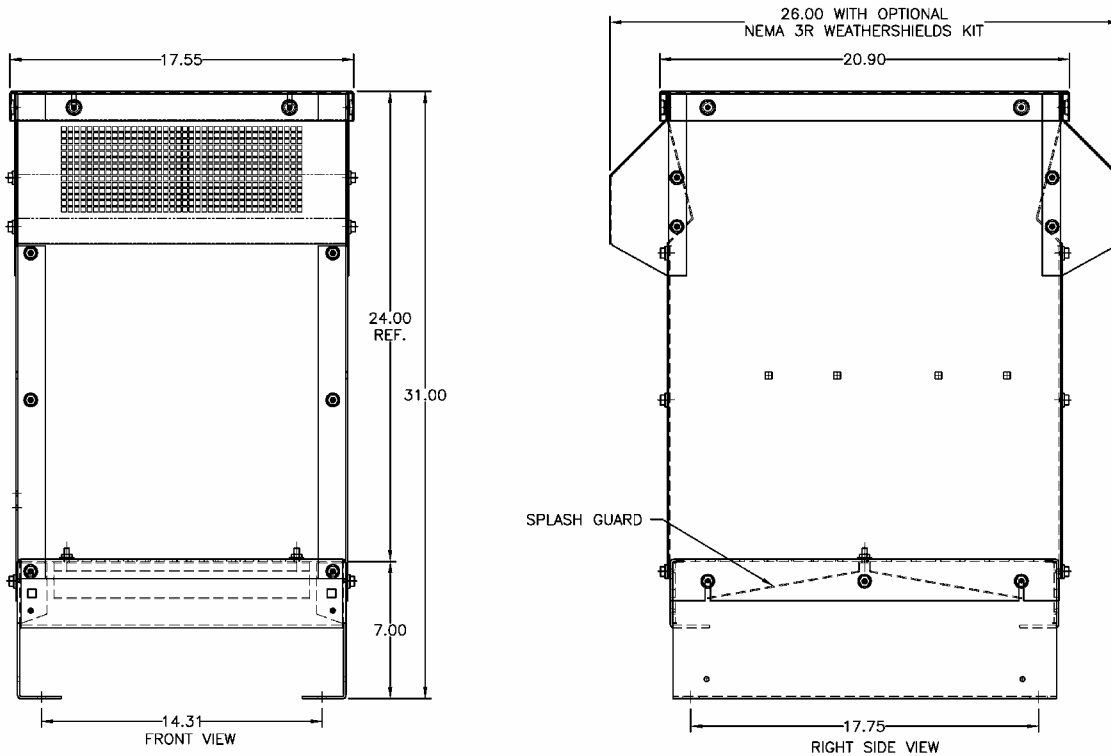
Fig. 10 Cab - 12C



720 AMPS 440 – 480 VOLTS

720 AMPS 550 – 600 VOLTS

Fig. 11 Cab - 17C



5. INSTALLATION INSTRUCTIONS

Enclosed Outline Drawings NEMA 1-2 and 3R Enclosures Enclosure Dimensions

Fig. 12 Cab - 26C

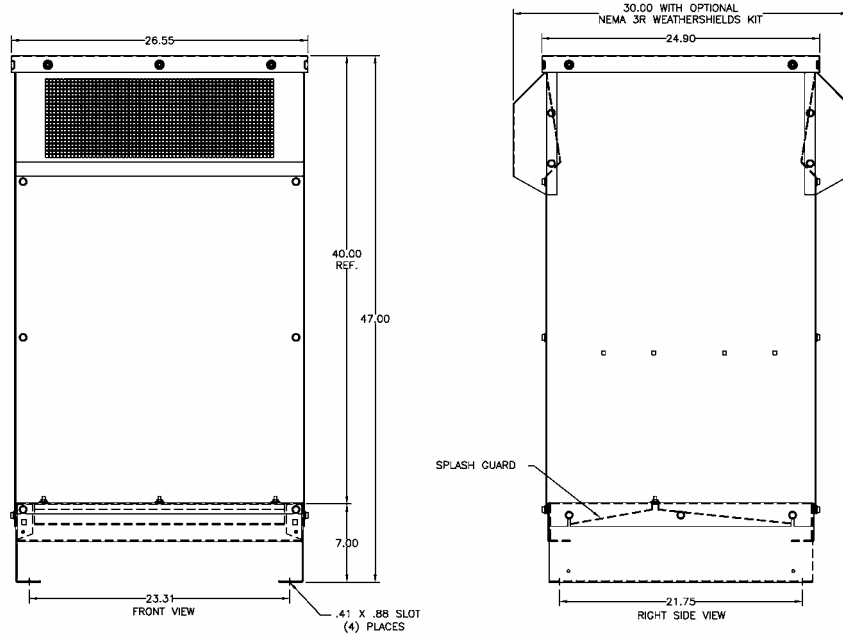
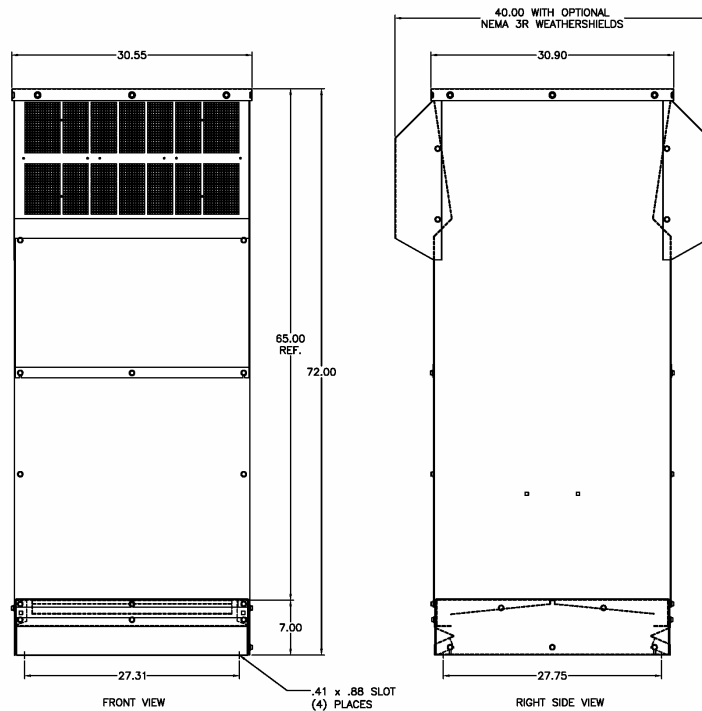


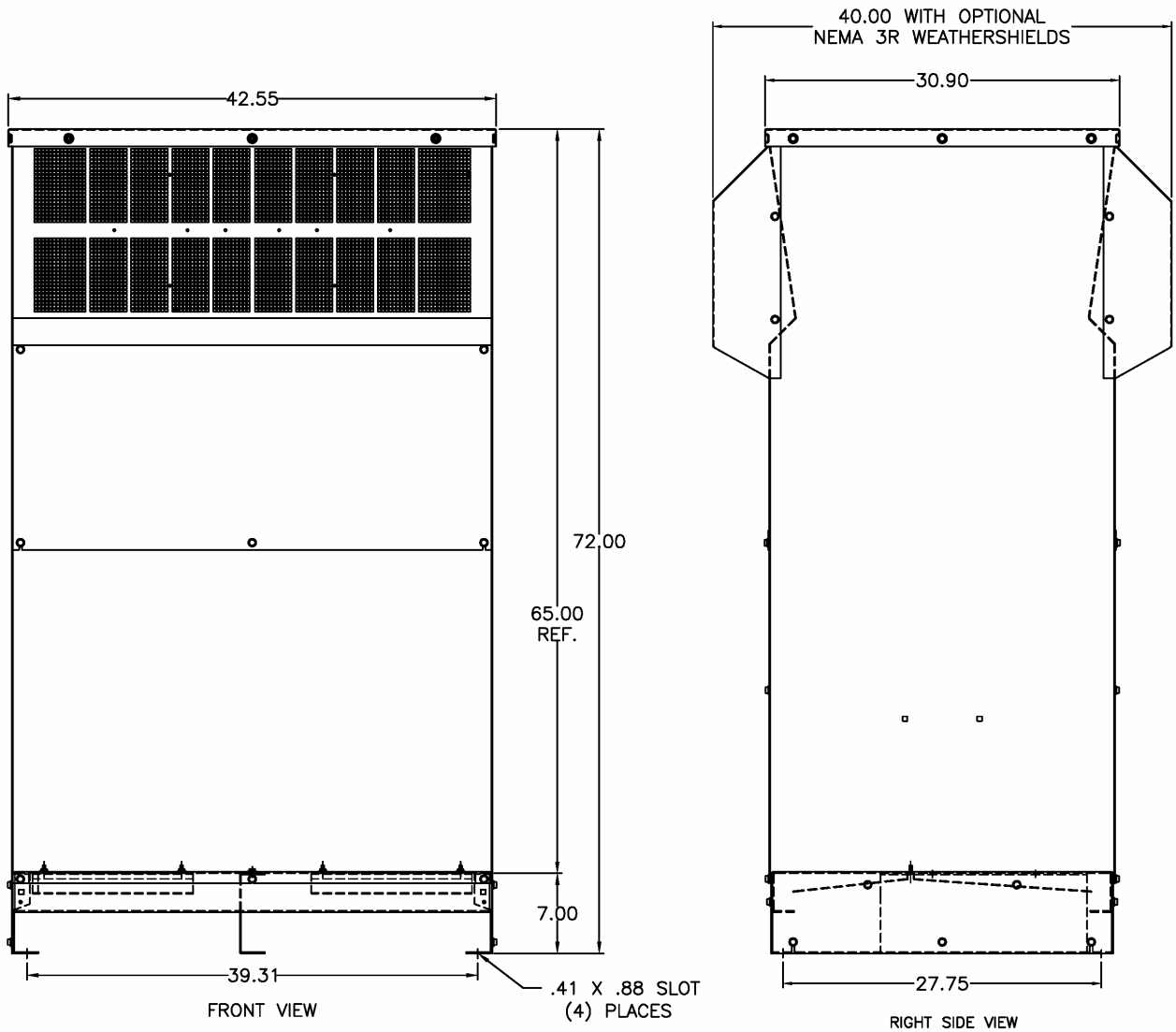
Fig. 13 Cab - 30C



5. INSTALLATION INSTRUCTIONS

Enclosed Outline Drawings NEMA 1-2 and 3R Enclosures Continued

Fig. 14 Cab - 42C



5. INSTALLATION INSTRUCTIONS

Wiring Connections

WARNING

Input and output wiring to the filter should be performed by authorized personnel in accordance with NEC and all local electrical codes and regulations.

Verify that the rating of the filter is compatible with the inverter to which it is to be connected. Follow all detailed inverter manufacturer installation and safety instructions. Inverter and load Cable selection / placement should be in accordance with the requirements of the NEC and all local electrical codes and regulations

The typical interconnection diagrams that follow are shown for a motor load but the load can be either a motor or a transformer. For enclosed filters supplied in general purpose NEMA1 and 3R cabinets and open panel filters rated less than 80 amperes, interconnection between the filter, motor and the inverter is shown in Figure 15 page 26 Refer to the inverter user manual for instructions on interconnecting the inverter and motor and the correct start-up procedures for the inverter.

The optional over temperature switch wiring is also shown on figure 15. The temperature switch is normally closed and will open when an internal reactor temperature of 180 °C is reached.

The filter is designed for use with copper conductors with a minimum temperature rating of 75 degrees C. **Table 7** lists the wire range and terminal torque requirements for the power input and output connections.

For panel mounted filters rated 80 amperes or more, the filter reactor is supplied loose and

the RC network is supplied as an RC panel assembly. Refer to figure 16 for a typical interconnection diagram. To select appropriate conductors for the wiring between the reactor and the RC panel refer to table 8. Table 7 contains the terminal specifications for these connections.

Use the cable recommended by the inverter manufacturer to connect the inverter to the filter and the filter to the motor. Make certain, that the selected cable size conforms to the requirements of the National Electric Code and all local codes.

For open filters refer to Figures 3 through 5 for the location of Input, output, and ground connections. For enclosed filters, ground terminals will be clearly marked. Power wiring terminations are clearly marked on the reactor.

Grounding

The filter must always be grounded with a grounding conductor connected to ground terminals.

For cable shield grounding follow the inverter manufactures recommendations. Fig 15 & 16 shows a typical shield ground connection.

Optional Over Temperature Interlock

The optional over temperature interlock can be used to turn off the inverter in the event it is setup to operate with a switching frequency outside of the range of the filter or an inverter malfunction. The interlock is a normally closed contact. Refer to table 9 for contact rating information and to the inverter user manual for interconnection information.

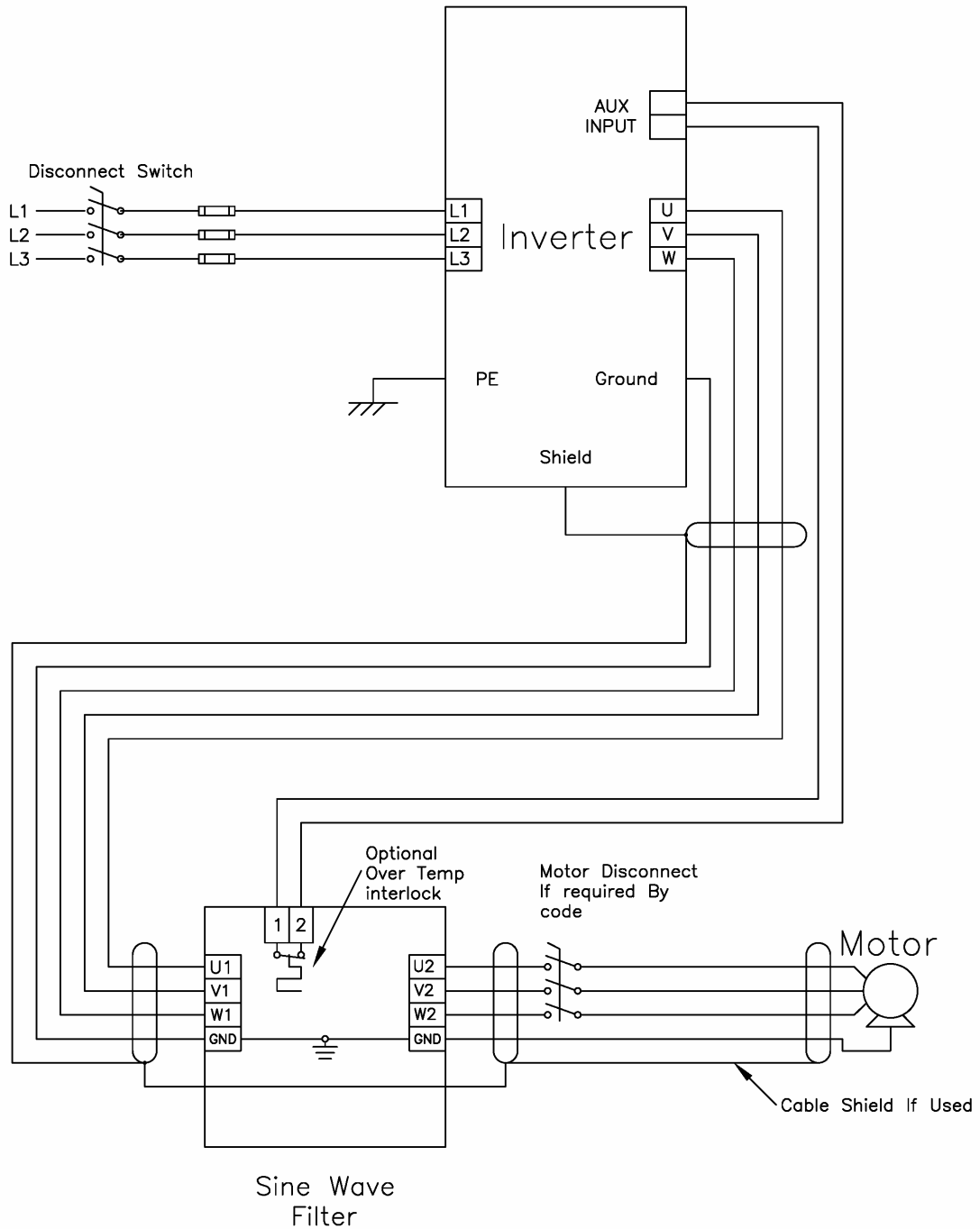
5. INSTALLATION INSTRUCTIONS

Sine Wave Interconnection diagram

Open Style 9 – 80 Amps

Enclosed 9 – 720 Amps

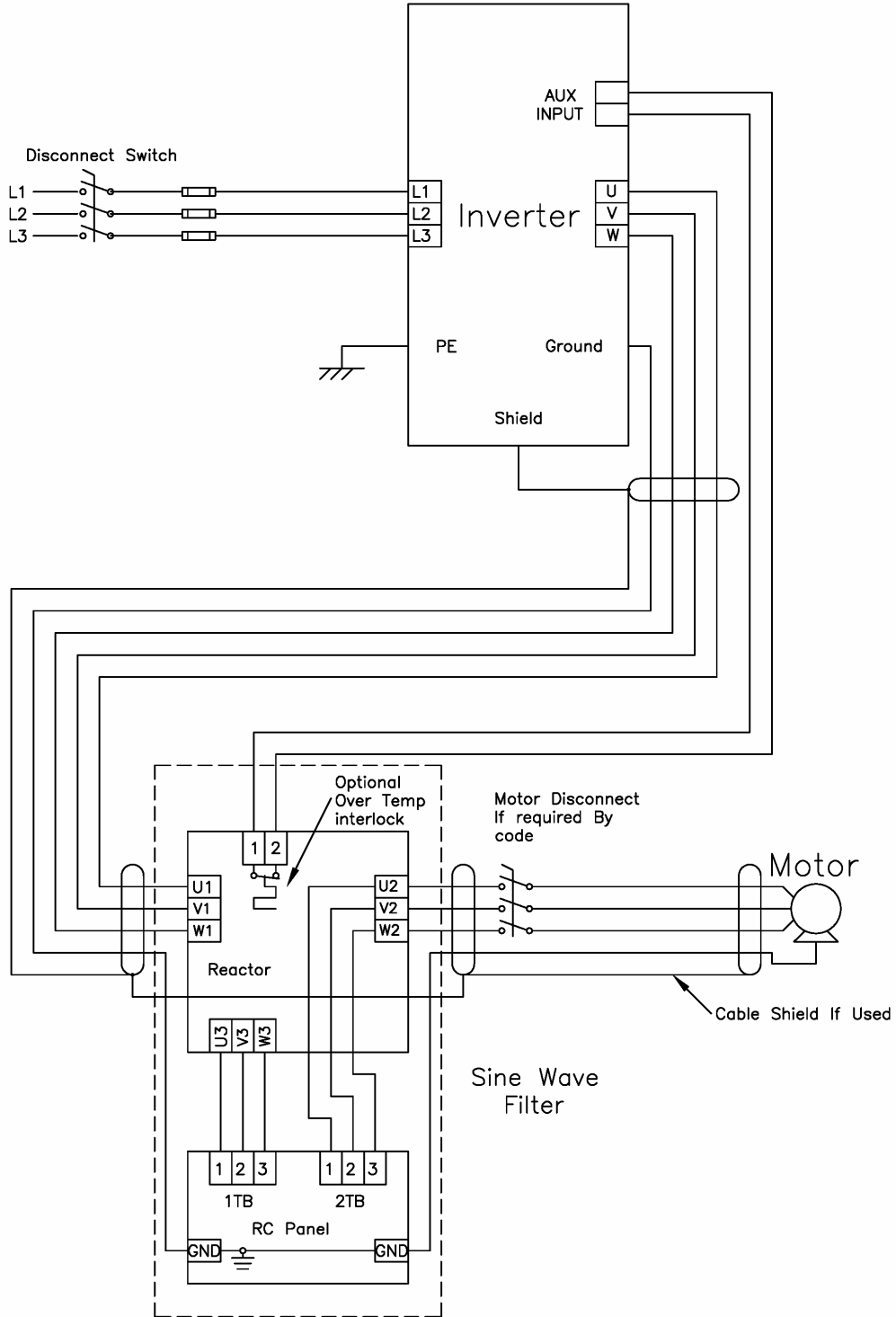
Fig. 15



5. INSTALLATION INSTRUCTIONS

Sine Wave Interconnection diagram Open Style 80 – 720 Amp

Fig. 16



5. INSTALLATION INSTRUCTIONS

Terminal Specifications

Table 7

Filter Rating	Input / Output Terminals		*Reactor to RC Panel Open style only
	Amps	Wire Range (AWG)	Terminal Torque (in-lbs)
3	22-14	16	N/R
4	22-14	16	N/R
7	22-14	16	N/R
9	22-14	16	N/R
12	22-5	16	N/R
17	22-5	16	N/R
22	22-5	16	N/R
27	22-5	16	N/R
35	22-5	16	N/R
45	18-4	20	N/R
55	18-4	20	N/R
65	6-4 & 2-0	50	N/R
80	6-4 & 2-0	50	12
110	3/0 75C	250	12
130	4/0 75C	250	12
160	3/0 90C	250	8
200	4/0 90C 250MCM 75C	325	8
250	400MCM 90C	375	8
305	600MCM 4/0 2X 90C	375	8
365	300MCM 2X 90C	375	8
415	350MCM 2X 90C	375	4
515	600MCM 2X 90C 300MCM 3X 90C	375	4
600	500MCM 3X 90C	375	1
720	500MCM 3X 90C	375	1

*See fig. 16 page 27 for customer wire connections.

*Size interconnecting wire to carry current shown on table 8 page 29.

5. INSTALLATION INSTRUCTIONS

Maximum RC PANEL Current for Open Wiring

Table 8

Filter Rating	460 Vac Units	575 Vac units
Amps	Maximum Amps RMS	Maximum Amps RMS
80	11	11
110	16	16
130	17	17
160	22	21
200	27	23
250	33	29
305	40	37
365	49	46
415	54	54
515	66	66
600	80	75
720	86	80

See figure 4 on page 16 for interconnection details. Each of the six interconnection wires should be rated for the current from the above RC panel wiring table. See table 10 on page 33 for 75 °C wire examples.

5. INSTALLATION INSTRUCTIONS

OPTIONAL OVER TEMPERATURE INTERLOCK CONTACT RATINGS

Table 9

TYPE	BI – METAL THERMAL SWITCH
CONTACT	(NC) NORMALLY CLOSED
RATINGS	6A 120 VAC RESISTIVE 3A 240 VAC RESISTIVE 5A 120 VAC INDUCTIVE 2.5A 240 VAC INDUCTIVE
TEMPERATURE CONTACTS OPEN	180°C

6. FILTER DESCRIPTION

The MTE Series A Sine Wave Filter is a low pass filter containing proprietary technology, which makes it particularly useful for filtering the output of PWM inverters. The filter consists of a reactor and a resistor capacitor network. Figure 17 shows a block diagram of the filter. The PWM output from the inverter is connected to the input terminals of the reactor. The load, which can be either a motor or a transformer, is connected to the output terminals of the reactor.

MTE Series A sine-wave filters are designed to provide a sine wave output voltage when driven from PWM inverters with switching frequencies from 2 kHz to 8 kHz. For drive applications, these filters eliminate the problem of motor insulation failures and they also reduce electromagnetic interference by eliminating the high dv/dt associated with inverter output wave forms. For alternate energy applications where an inverter is used to return power to the utility distribution system through a step up transformer these filters meet the requirements of IEEE 519.

Sine wave filters are available in open panel, NEMA 1, 2, and 3R mechanical configurations. For both variable torque and constant torque applications, select filters based on the horsepower rating of the motor. Filter current ratings have been designed to meet the requirements of NEC motor current ratings. For applications that use motors with current ratings that exceed NEC values selected a filter with a current rating equal to or greater than that of the load.

For inverters feeding isolation transformers select a filter with a current rating equal to or greater than that of the transformer primary current.

Typical applications for Series A sine-wave filters are submersible pumps, low voltage drives feeding medium voltage motors, HVAC equipment, wind turbines and applications where the distance between the motor and inverter is up to 15,000 feet.

Note: Series A sine-wave filters can only be used with PWM inverters with switching frequencies set between 2 and 8 kHz.

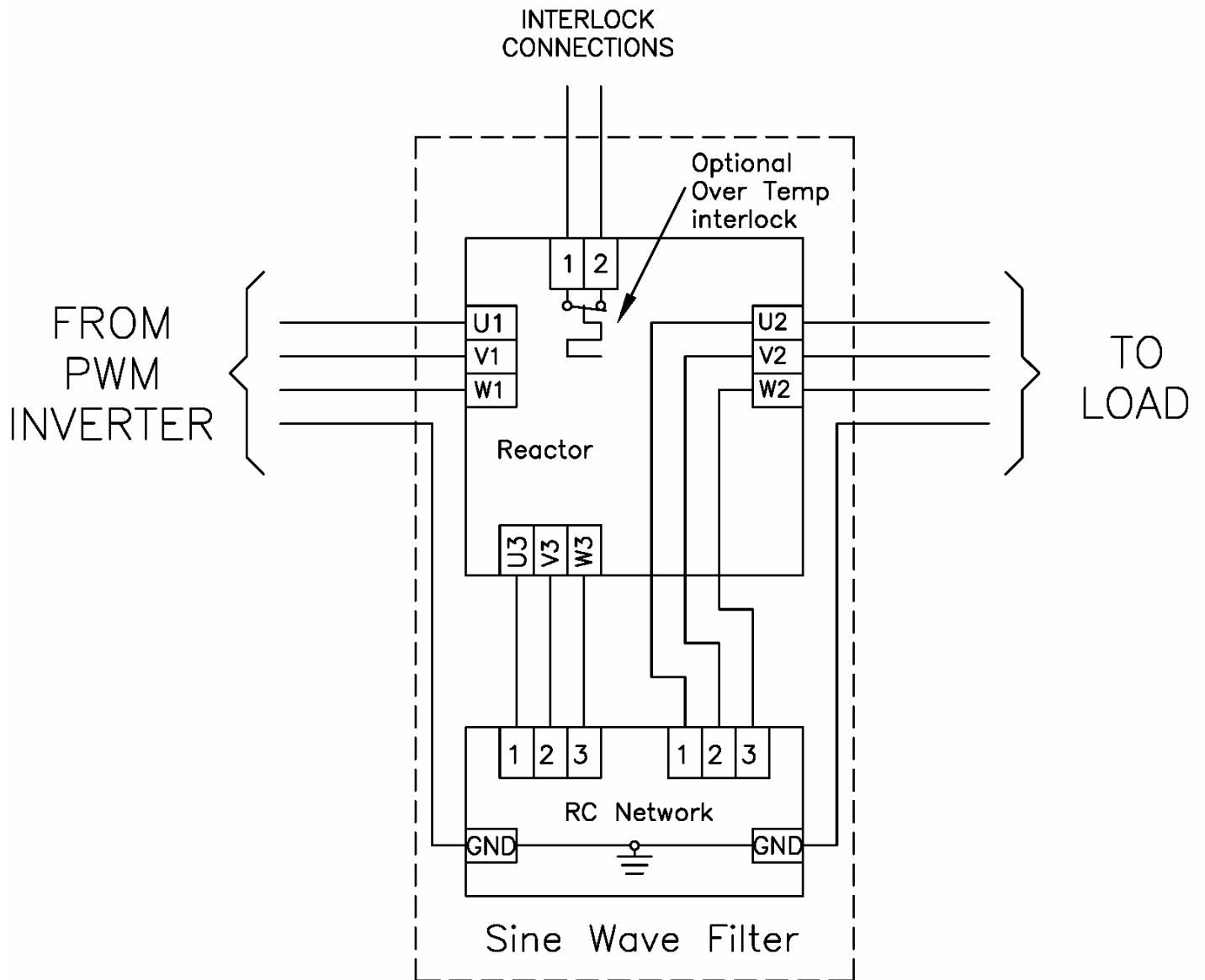
For voltages other than 440-480, 550-600 VAC, contact the factory.

Filters for motors that will be operated above 60 Hz should be selected based on the frequency de-rating curve (Chart 2) shown on page 7.

6. FILTER DESCRIPTION

440 V – 600 VAC SINE WAVE FILTER BLOCK DIAGRAM

FIGURE 17



7. Startup

Safety Precautions

Before startup, observe the following warnings and instructions:

WARNING

Internal components of the filter are at line potential when the filter is connected to the drive. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.

WARNING

After disconnecting the utility power, wait at least 5 minutes before doing any work on the filter connections. After removing power, allow at least five minutes to elapse and verify that the capacitors have discharged to a safe level before contacting internal components. Connect a DC voltmeter across the capacitor terminals. Start with the meter on the highest scale and progressively switch to a lower scale as the indicated voltage falls below the maximum value of the scale used.

Sequence of Operation

1. Read and follow safety precautions. Including those of drive manufactures.
2. After installation, ensure that:
 - All filter ground terminals are connected to ground.
 - Power wiring to the utility, inverter, filter and motor is in accordance with the installation and connection instructions in Chapter 5.
3. Check that moisture has not condensed on the filter components. If moisture is present, do not proceed with startup until the moisture has been removed.

WARNING

Use extreme caution to avoid contact with line voltage when checking for power. INJURY OR DEATH MAY RESULT IF SAFETY PRECAUTIONS ARE NOT OBSERVED.

4. Refer to the inverter user manual for the inverter startup procedure. Observe all safety instructions in the inverter user manual.
5. Disconnect filter output terminals from the motor.
6. Set the inverter switching frequency between 2 kHz and 8 kHz. Refer to the inverter user manual.

CAUTION

Damage to the filter may occur if the inverter frequency is not set between 2 kHz and 8 Khz.

7. Turn the inverter ON
8. Confirm that inverter voltage is present at the input terminals (U1, V1, W1) of the filter.
9. Confirm that inverter voltage is present at the output terminals (U2, V2, W2) of the filter.
10. Disconnect the inverter from the AC Line and wait 5 minutes.
11. Connect the filter output to the motor.
12. Refer to the inverter user manual for the motor startup procedure.

WARNING

INJURY OR DEATH MAY RESULT IF THE INVERTER SAFETY PRECAUTIONS ARE NOT OBSERVED.

CAUTION

Damage to equipment or serious injury may occur if the inverter startup procedures are not observed.

8. TROUBLESHOOTING

WARNING

When properly installed, this equipment has been designed to provide maximum safety for operating personnel. However, hazardous voltages and elevated temperatures exist within the confines of the enclosure. Servicing should therefore be performed by qualified personnel only and in accordance with OSHA Regulations.

To aid in troubleshooting a block diagram is shown in figure 17 and interconnection diagrams are shown in figures 15 and 16. A list of potential problems and solutions are listed below.

WARNING

High voltage is used in the operation of this filter. Use Extreme caution to avoid contact with high voltage when operating, installing or repairing this filter. INJURY OR DEATH MAY RESULT IF SAFETY PRECAUTIONS ARE NOT OBSERVED.

After removing power, allow at least five minutes to elapse and verify that the capacitors have discharged to a safe level before contacting internal components. Connect a DC voltmeter across the capacitor terminals or terminals U1, V1 or V1, W1. Start with the meter on the highest scale and progressively switch to a lower scale as the indicated voltage falls below the maximum value of the scale used.

8. TROUBLESHOOTING

PROBLEM:	Voltage is not present at the filter Input terminals.
Possible cause:	Power to the inverter is turned off or shut down.
Solution:	Turn power on, check inverter errors.
Possible cause:	One or more external line fuses are blown.
Solution:	Verify the continuity of line fuses in all phases. Replace as necessary.
Possible cause:	Inverter is defective
Solution:	Refer to inverter user manual.
Possible cause:	Inverter does not have a run signal
Solution:	Refer to inverter user manual.

PROBLEM:	Sine Wave filter runs Hot
Possible cause:	Normal operation reactor and resistors are > 100 °C
Solution:	Caution parts are very hot and may cause burns. Follow installation guidelines for clearances and check for adequate air flow.
Possible cause:	Inverter switching frequency is not set between 2 kHz and 8 kHz
Solution:	Set switching frequency between 2 kHz and 8 kHz
Possible cause:	Heat buildup within enclosure
Solution:	Provide clearance and venting for filter components