

ACE Variable Frequency Drive System

Installation & Maintenance Information

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE

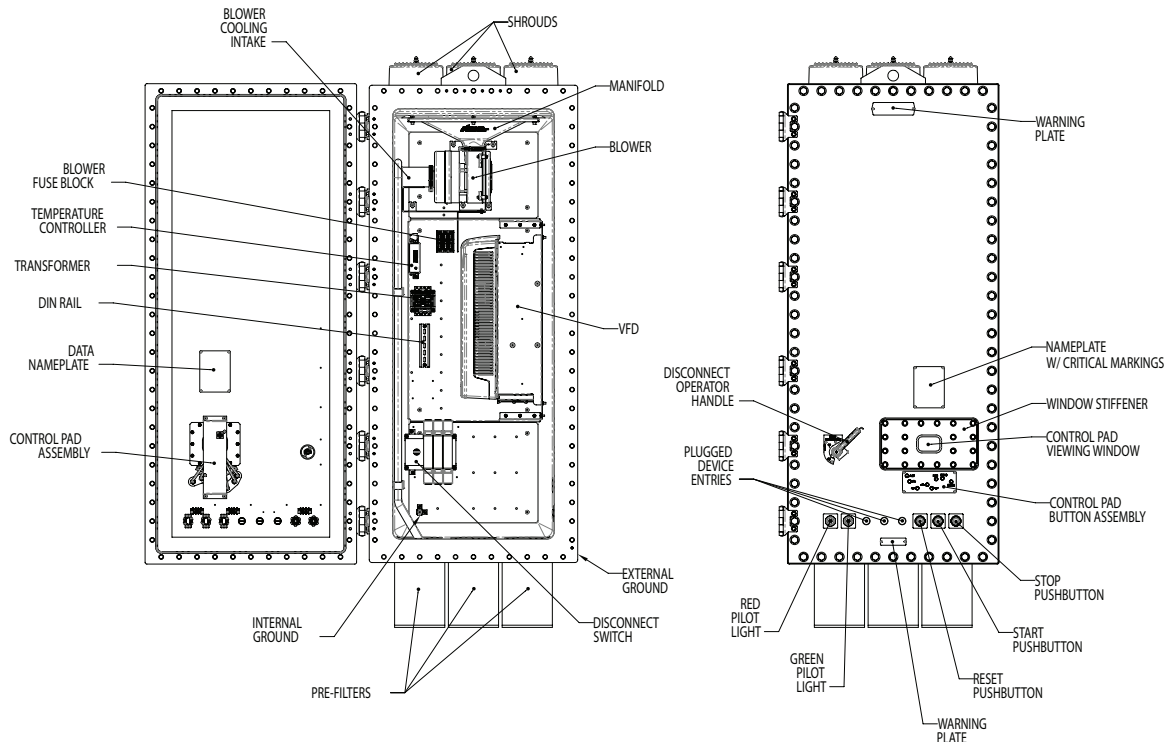


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1. SAFETY INSTRUCTIONS

The ACE Explosionproof VFD should be installed, inspected, and maintained by qualified and competent personnel.

1.1 APPROVED APPLICATIONS

The ACE Explosionproof VFD is classified Class I, Divisions 1 and 2 for use in hazardous environments, and is designed to match the strict requirements of pumps, compressors, fans, separators, and mixers in such process industries as:

- Oil and gas / refineries
- OEM skid builders
- Petrochemical
- Water / waste water
- Pharmaceutical
- Food and beverage manufacturing

1.2 ELECTRICAL SAFETY

WARNING: HIGH VOLTAGE

Electrical power must be OFF before and during inspection or service. Ensure electrical supply to the enclosure is disconnected, locked out and tagged out. Personnel injury or damage to equipment can occur if all power upstream from the enclosure is not fully disconnected prior to opening.

Before commissioning the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the speed provided by connecting the motor directly to the line power.

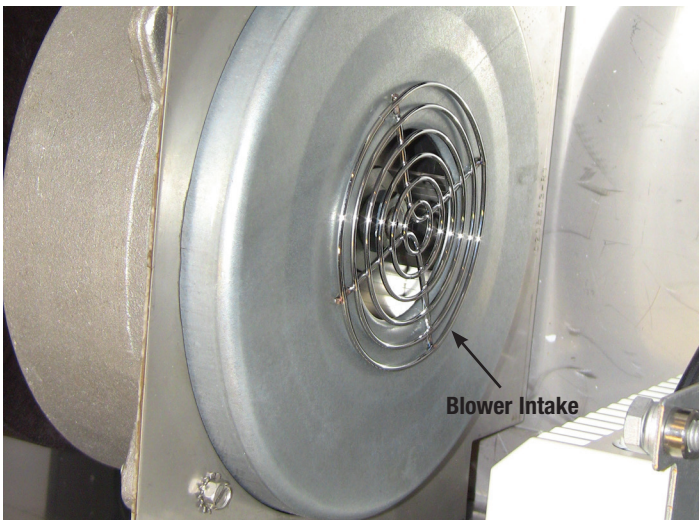
CAUTION

To ensure safety and VFD performance, grounding provisions for the enclosure, blower, and VFD must be made before operating.

1.3 BLOWER SAFETY

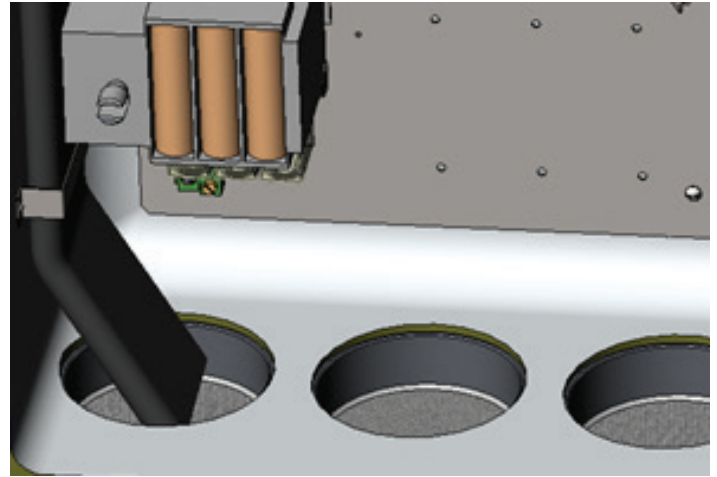
WARNING

To avoid cooling system malfunction, cooling system failure, and personnel injury, close and seal the enclosure before energizing.



WARNING: HIGH SPEED

To avoid personnel injury, DO NOT handle the blower or service the enclosure while energized.



WARNING

To avoid cooling system malfunction, cooling system failure, and personnel injury, remove all loose debris and deposits before energizing.

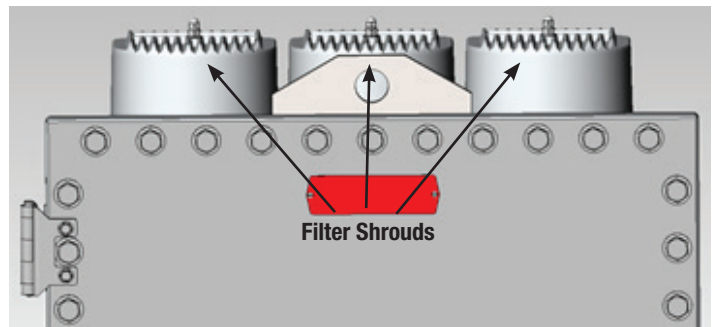
These blowers comply with EN 61800-5-1 safety standards.

The blower is non-serviceable. Refer to ACE KIT 6, Section 8.3, for replacement instructions.

1.4 HOT SURFACES

WARNING: BURN HAZARD

To avoid personnel injury, use appropriate personnel protective equipment before handling and operating the device.



1.5 ENCLOSURE SAFETY

WARNING

To avoid personnel injury and property damage, clean dirt and debris from flat ground joint surfaces before the cover is closed. NEVER energize this equipment if the flat ground joint has been scratched or damaged.

All pipe threaded connections into the enclosure require a minimum of five (5) full threads of engagement. All straight threaded connections into the enclosure require a minimum of eight (8) full threads of engagement. Personnel injury or equipment damage can result from threaded joints containing less than the minimum thread engagement required.

All unused conduit openings must be plugged. UL Listed plug must engage a minimum of five (5) full threads and be a minimum of 1/8" thick.

Conduit sealing fittings **MUST** be installed in each attached conduit run (within eighteen (18) inches of the enclosure) to comply with the latest edition of the National Electrical Code® (NEC) plus any other applicable code.

The cover must be properly fastened to the body with all cover bolts torqued to 40-45 ft.-lbs. (19.2-21.5 N-m). Personnel injury or equipment damage can result if the flat joint flame path is not properly fastened.

WARNING

To avoid cooling system malfunction and personnel injury, be sure to torque the first eight (8) cover screws sequentially per Figure 1 before torquing the remaining screws.

2. MECHANICAL INSTALLATION

2.1 AIRFLOW PROVISIONS - INSTALLATION DRAWING

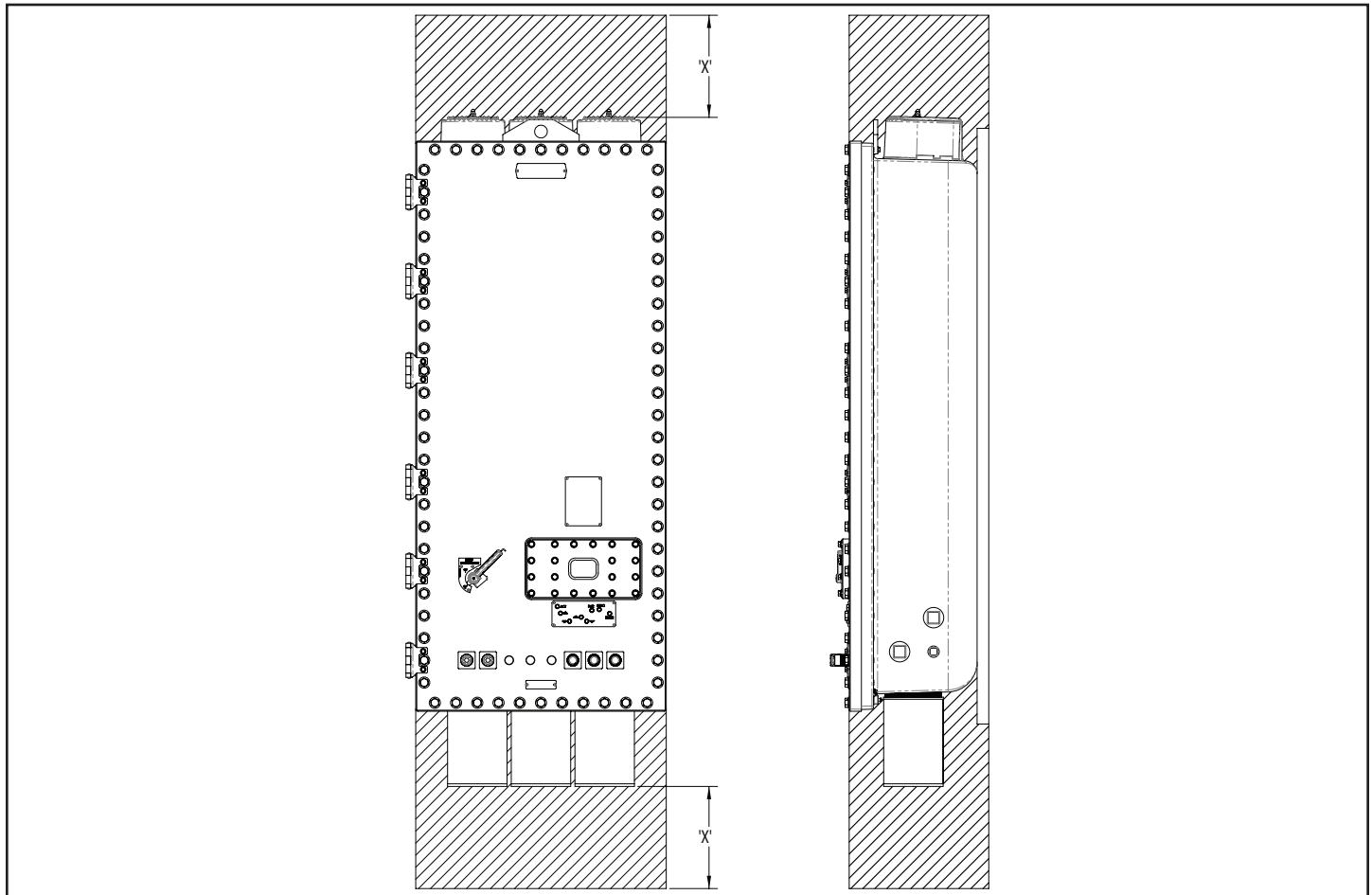


Figure 1

WARNING

To avoid personnel injury and property damage, DO NOT remove or modify the control pad viewing window or window stiffener.

It is imperative that the enclosure be well ventilated to ensure reliable performance. Adequate space around the intake and exhaust of the enclosure **MUST** be accommodated. Cooper Crouse-Hinds recommends 'X' be a minimum of 12 inches (0.3 meters).

2.2 WEIGHTS

Enclosure	Weight
60 HP	1,150 lbs.

2.3 LIFTING

1. Remove top and sides from shipping crate.
2. Remove lag bolts from enclosure mounting rails.

⚠ CAUTION

Do not attach shrouds or pre-filters until after enclosure is mounted.

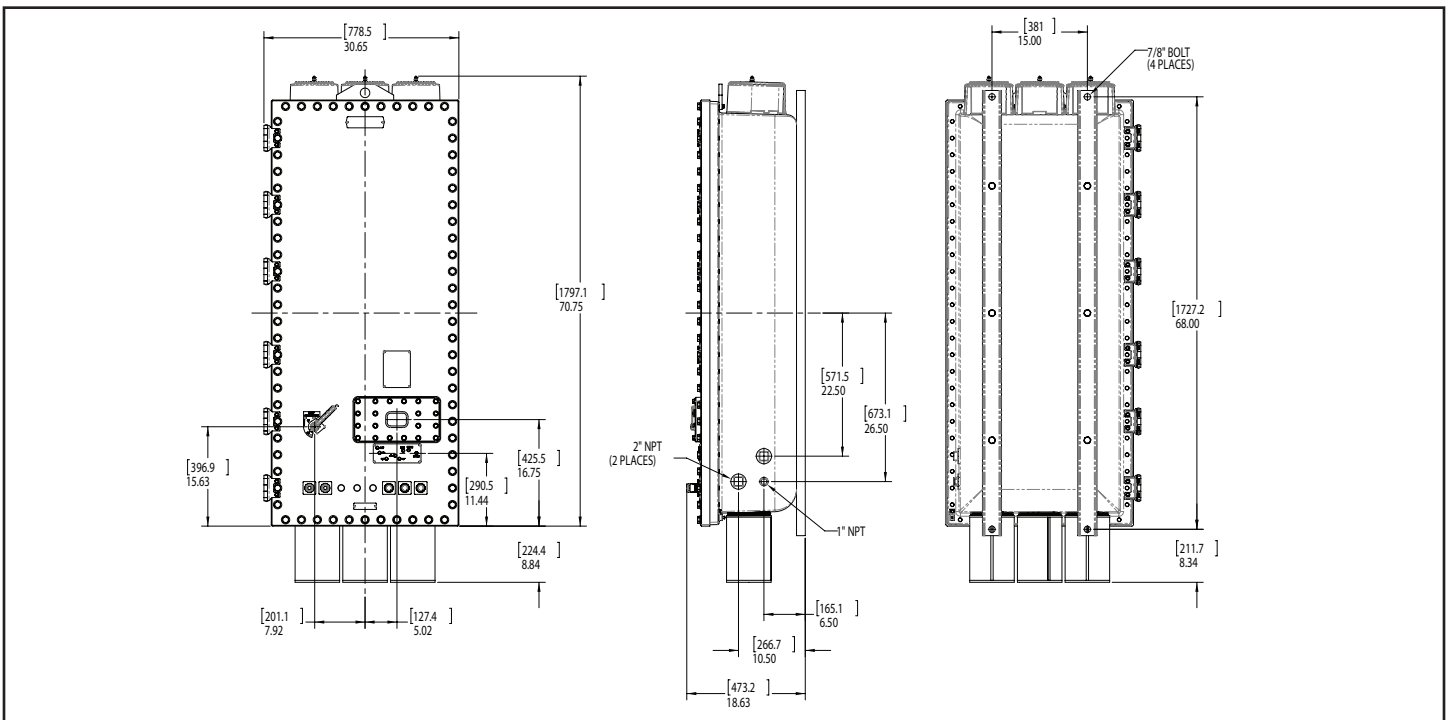


⚠ CAUTION: UNBALANCED LOAD

To avoid personnel injury, utilize the dedicated lifting eye and handle appropriately to ensure safe installation.

3. Use the dedicated lifting eye to mount enclosure on suitable mounting surface. Select a mounting location that will provide suitable strength and rigidity for supporting the enclosure and all components.

2.4 DIMENSIONAL DRAWINGS



2.5 MOUNTING

1. Select a mounting location that will provide suitable strength, rigidity, and space (per Section 2.1) for supporting the ACE Series system and all contained wiring.

CAUTION

To avoid cooling system malfunction, cooling system failure, and personnel injury, be sure to mount the enclosure as depicted in Section 2.4.

CAUTION

To avoid cooling system malfunction, cooling system failure, and personnel injury, be sure to mount the enclosure in a shaded area to avoid direct sunlight.

2. Refer to Section 2.2 for approximate weights and Section 2.4 for dimensions.
3. Install (4) 7/8" bolts.
4. After enclosure is positioned and secured in its permanent location, pull wires into the ACE Series system, making sure that they are long enough to make the required connections.

2.6 SHROUD INSTALLATION

1. Remove rubber caps from explosionproof filters.
2. Insert threaded rods into the explosionproof filters. Leave 3-4% of threaded rod exposed.
3. Place shroud over explosionproof filters and threaded rod, with shroud opening facing back of enclosure. See Figure 2.
4. Insert washer and nuts onto end of threaded rod and tighten securely until shroud is firmly contacting the top wall of the enclosure. See Figure 2.

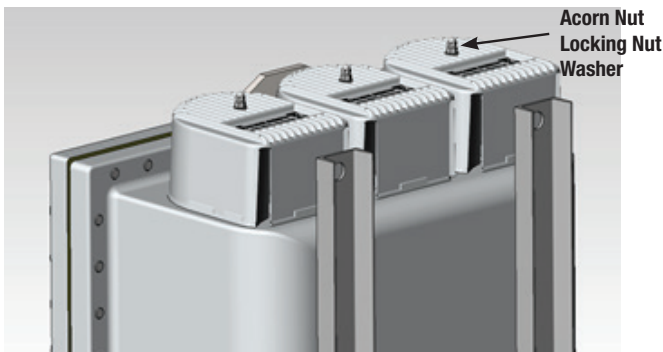


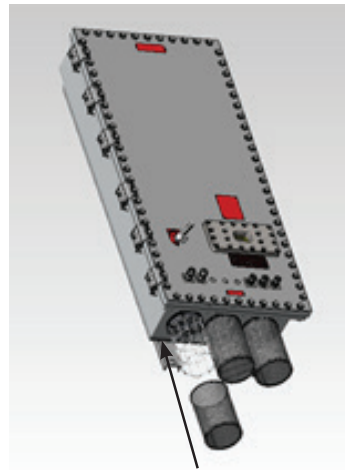
Figure 2

2.7 PRE-FILTER INSTALLATION

1. Remove rubber caps from explosionproof filters.
2. Install wire guard using the bracket, screw, and lock washer provided to the bottom filter(s).
3. Align guard with notches within the bracket as shown.



4. Tighten screw.
5. Slip pre-filter mesh over guard.



6. Be sure to stretch pre-filter elastic band completely around the explosionproof filter and seat the elastic band on the filter's threads. This will ensure all air flow to the bottom filters passes through the pre-filters.



3. ELECTRICAL INSTALLATION

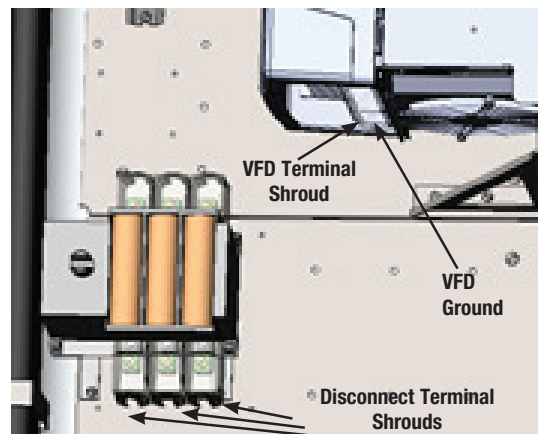
3.1 ENCLOSURE GROUNDING - INTERNAL/EXTERNAL

Grounding and bonding of the conduit and equipment is required by the National Electrical Code®. A grounding conductor must be connected to the grounding lug(s) furnished.

Determine the type of distribution systems to be used that will comply with NEC requirements and ensure grounding continuity.

All conductive equipment that enclose the electrical conductors or attached equipment or forming part of such equipment must be grounded. A permanent connection must be made between all such equipment and the earth. Refer to Section 5.3 for the torque requirements of all terminations within this device.

3.2 LINE FEED



This equipment is designed for line connection directly to the integral disconnect switch. Factory wiring transmits power to the variable frequency drive.

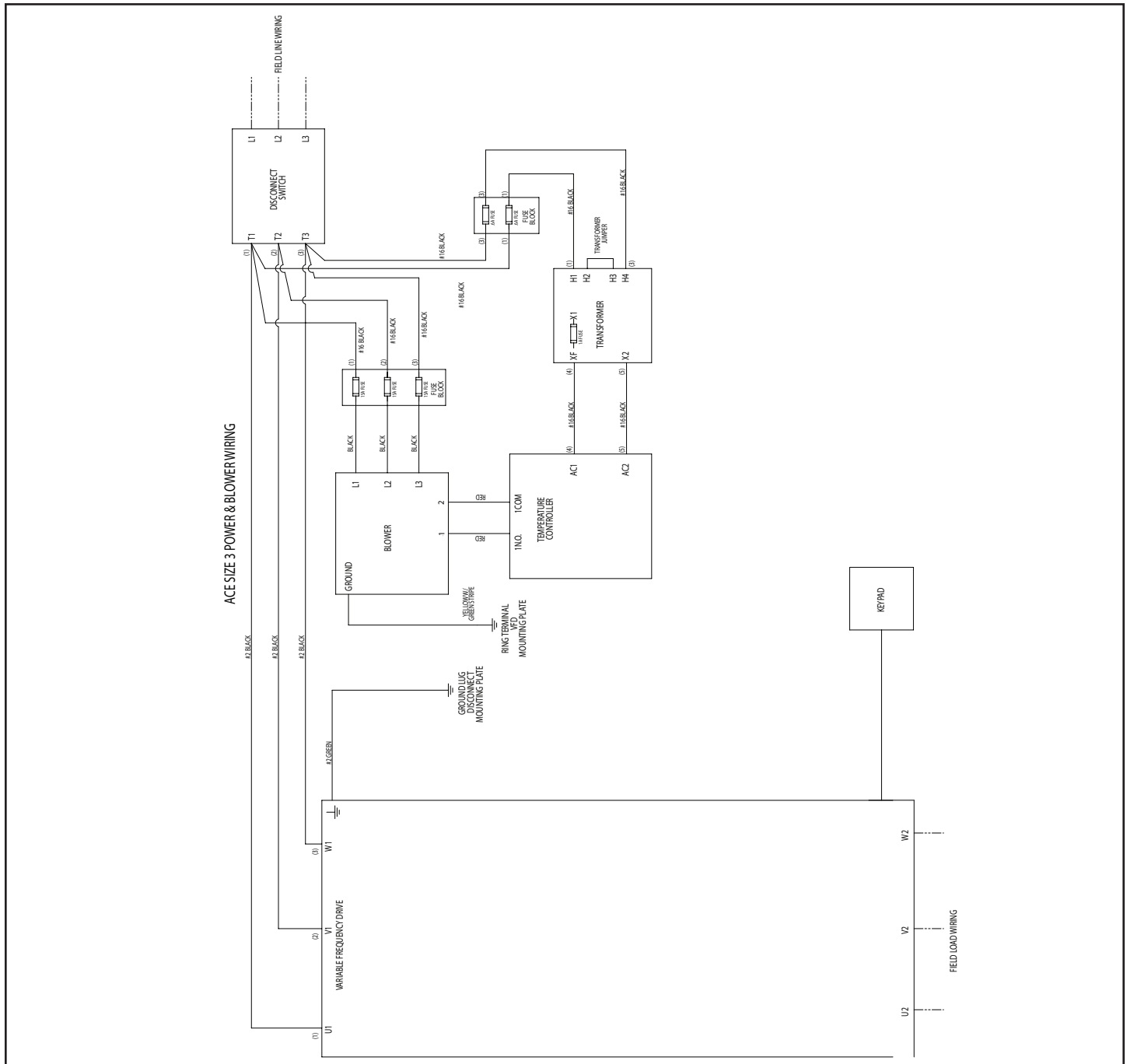
1. Remove disconnect terminal shrouds.
2. Attach line conductors with phase A on the left, B center, and C to the right (see Torque Table on page 8).
3. Re-install terminal shrouds.

3.3 LOAD FEED AND SHIELD GROUNDING TO DRIVE

This equipment is designed for load connection directly from the variable frequency drive, although, in the case of an oversized VFD for the given motor, use the VFD and motor manufacturer's recommendations for proper motor overload protection. In certain cases, it is required to include additional motor overload protection between the VFD and the motor for proper motor overload protection. Always be sure to shield load wiring from line and control wiring to reduce noise. Refer to the drive manufacturer's manual for further details.

1. Remove VFD terminal shroud.
2. Attach load conductors with phase A to U2, B to V2, and C to W2 (see Torque Table on page 8).
3. Attach motor cable shielding to VFD ground (see recommendations by drive manufacturer).
4. Remove terminal knock-outs and re-install VFD terminal shroud. Refer to the drive manufacturer's manual for further information regarding drive installation.

3.5 BLOWER AND SIGNAL SCHEMATIC



CAUTION

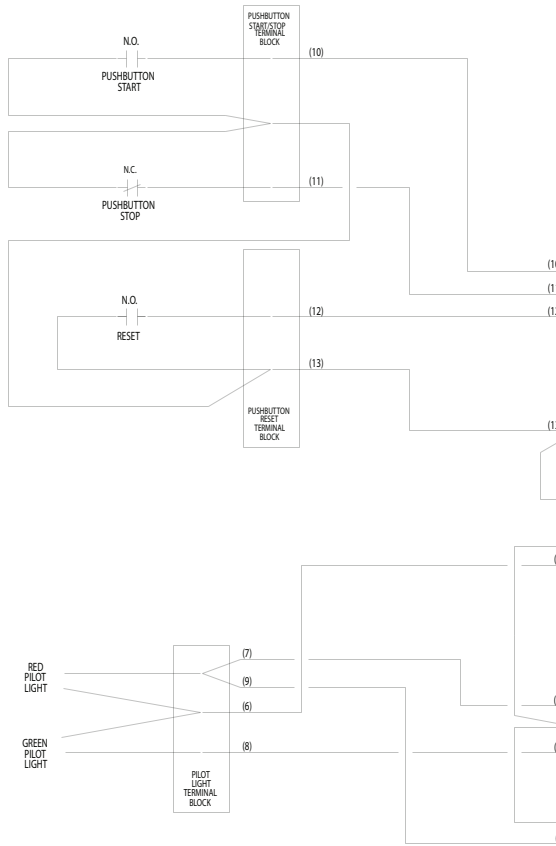
Failure to add additional motor overload protection between the VFD and motor when required can cause motor failure and equipment damage.

3.4 CONTROL WIRE ROUTING

CAUTION

To avoid the transmission of noise to/from the blower and/or the variable frequency drive load conductors, be sure to bundle all field control wiring and shield as necessary.

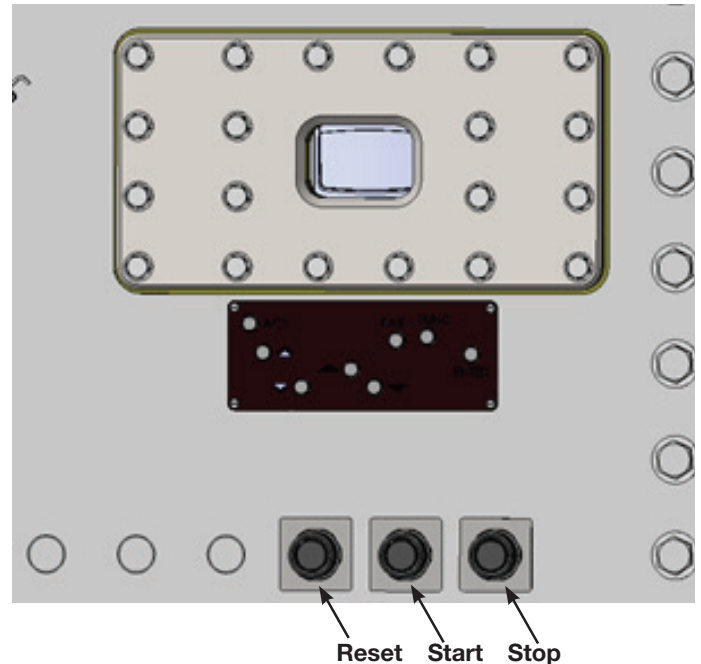
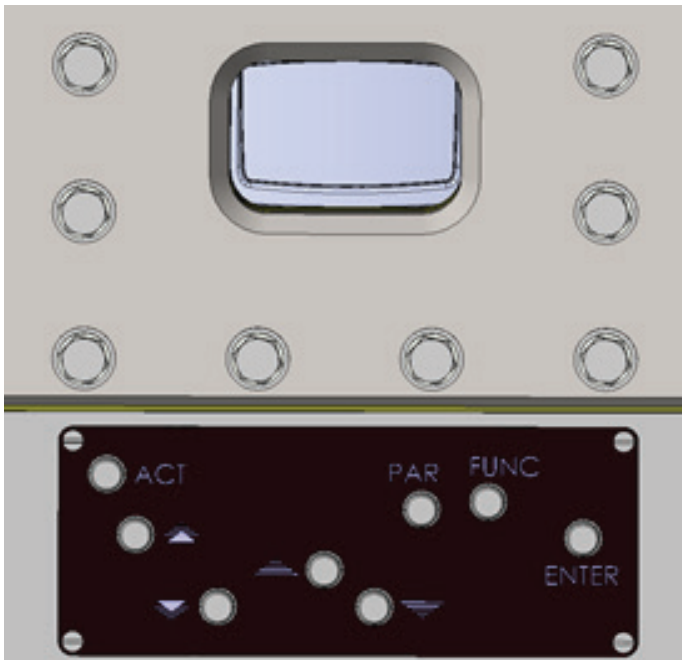
ACE SIZE 3 PUSHBUTTON/PILOT LIGHT WIRING & PROGRAMMING



X20		X20	
1	1	VREF-	Reference voltage -10 V DC, $1\text{ kohm} \leq R_L \leq 10\text{ kohm}$
2	2	AGND	
X21		X21	
1	1	VREF+	Reference voltage 10 V DC, $1\text{ kohm} \leq R_L \leq 10\text{ kohm}$
2	2	AGND	
3	3	AI1+	Speed reference 0(2) ... 10 V, $R_{in} = 200\text{ kohm}$
4	4	AI1-	
5	5	AI2+	By default, not in use. 0(4) ... 20 mA, $R_{in} = 100\text{ ohm}$
6	6	AI2-	
7	7	AI3+	By default, not in use. 0(4) ... 20 mA, $R_{in} = 100\text{ ohm}$
8	8	AI3-	
9	9	AO1+	Motor speed 0(4)...20 mA \approx 0...motor nom. speed, $R_L \leq 700\text{ ohm}$
10	10	AO1-	
11	11	AO2+	Output current 0(4)...20 mA \approx 0...rrotor nom. current, $R_L \leq 700\text{ ohm}$
12	12	AO2-	
X22		X22	
1	1	DI1	Start (┘)
2	2	DI2	Stop (└)
3	3	DI3	Reset
4	4	DI4	Acceleration & deceleration select ²⁾
5	5	DI5	Constant speed select ³⁾
6	6	DI6	Constant speed select ³⁾
7	7	+24VD	+24 V DC max. 100 mA
8	8	+24VD	
9	9	DGND1	Digital ground
10	10	DGND2	Digital ground
11	11	DIIL	Start interlock (0 = stop) ⁴⁾
X23		X23	
1	1	+24V	Auxiliary voltage output and input, non-isolated, 24 V DC 250 mA ⁵⁾
2	2	GND	
X25		X25	
1	1	RO1	Relay output 1: ready
2	2	RO1	
3	3	RO1	
X26		X26	
1	1	RO2	Relay output 2: running
2	2	RO2	
3	3	RO2	
X27		X27	
1	1	RO3	Relay output 3: alarm
2	2	RO3	
3	3	RO3	

4. GENERAL OPERATING

4.1 KEYPAD INTERFACE



REFER TO THE DRIVE MANUFACTURER'S MANUAL FOR INFORMATION AND INSTRUCTION REGARDING THE CONTROL PAD DISPLAY AND OPERATION. WHEN ENCLOSURE IS CLOSED, CONTROL PANEL MUST BE IN REMOTE MODE TO PROPERLY WORK WITHIN ENCLOSURE SYSTEM. CONTROL PANEL OPERATORS ARE TO BE USED ALONG WITH PUSHBUTTON OPERATORS TO GIVE PROPER EXTERNAL VFD CONTROL.

4.2 DISCONNECT AND LOCKOUT/TAGOUT

The disconnect handle is furnished with three (3) holes for lockout/tagout purposes.

1. Turn handle to the 'off' position.
2. Depress lockout tab at the end of the handle.
3. Install OSHA approved lock or tag.
4. Release lockout tab.

WARNING

To avoid ignition of explosive atmospheres, all circuits must be de-energized before opening cover.



CAUTION

To avoid damage to the integral disconnect operating mechanism, be sure the disconnect coupling is in the off position before closing cover.



5. MAINTENANCE

CAUTION

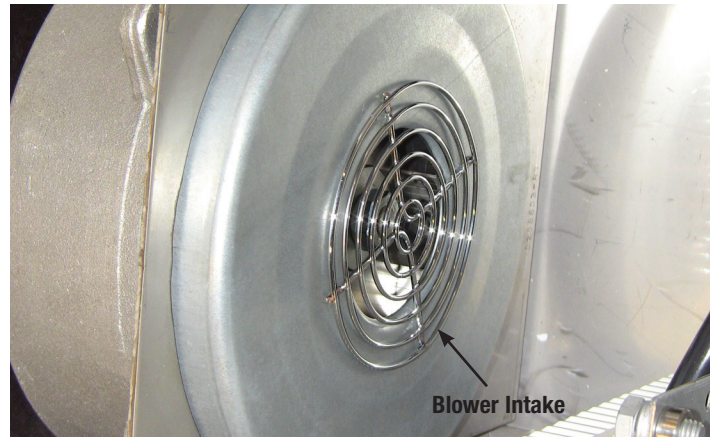
To avoid cooling system malfunction and cooling system failure, be sure to vacuum debris from the enclosure before energizing. NEVER use forced air for the removal of debris from this enclosure.

5.1 DRIVE MAINTENANCE

Periodic cleaning of the drive fan and heat sink is recommended. Removal of the drive from the enclosure is recommended to ensure debris does not obstruct the cooling system. Refer to the drive manufacturer's manual for additional maintenance recommendations and specific instructions.

5.2 COOLING SYSTEM MAINTENANCE

1. Clean pre-filter periodically (recommended when parameters 0112 (ACS800 TEMP) are above 80%). Remove pre-filter and rinse with water as needed.
2. Clean sintered filter as needed. Use of abrasives on the explosionproof filters may compromise the integrity of the cooling system.
3. Clean/inspect blower intake.



4. Perform visual, electrical, and mechanical checks on all components on a regular maintenance schedule. NFPA 70B recommends maintenance intervals not exceeding 2 months.
5. Visually check for any damage to the filter assemblies, flat joints, threaded joints, journal joints, and window.
6. Visually check for evidence of excessive heating within the enclosure.
7. Mechanically check that all parts are properly assembled and operating mechanisms are in proper working condition.
8. Verify airflow provisions are maintained per Section 2.1.

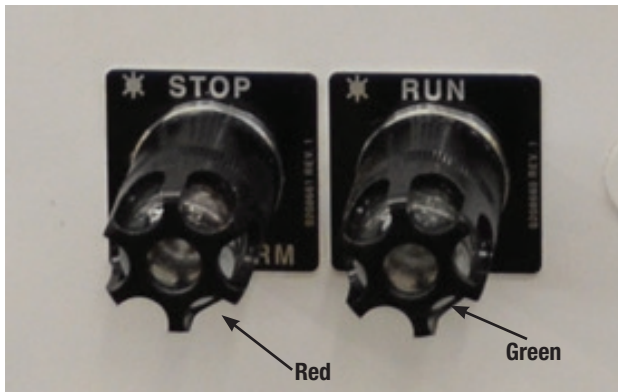
5.3 PERIODIC MECHANICAL MAINTENANCE (TORQUE VERIFICATION, PUSHBUTTON LUBRICATION, WINDOW CLEANING)

TORQUE REQUIREMENTS

ITEM DESCRIPTION	WIRE RANGE	TORQUE REQUIRED
ACS800 FRAME R5 DRIVE:		
LINE/LOAD	8-2/0 AWG (6-70 MM ²)	11 FT-LBS (15 N-M)
GROUND	8-2/0 AWG (6-70 MM ²)	11 FT-LBS (15 N-M)
DRIVE CONTROL:		
INPUT/OUTPUT	24-12 AWG (0.5-2.5 MM ²)	2.4-3.6 IN-LBS (0.2-0.4 N-M)
DISCONNECT:		
100 AMP	14-2/0 AWG (2.1-67 MM ²)	120 IN-LBS (13.5 N-M)
BLOWER FUSE BLOCK	18-10 AWG (0.9-5.2 MM ²)	20 IN-LBS (2.3 N-M)
TEMPERATURE CONTROLLER	24-12 AWG (0.2-3.3 MM ²)	5 IN-LBS (0.54 N-M)
TRANSFORMER	18-16 AWG (0.9-1.3 MM ²)	12 IN-LBS (1.4 N-M)
INTERNAL GROUND LUG	16-2/0 AWG (1.4-67.4 MM ²)	120 IN-LBS (13.5 N-M)
EXTERNAL GROUND LUG	6-1/0 AWG (13.3-53.4 MM ²)	50 IN-LBS (5.6 N-M)
BLOWER MANIFOLD	N/A	20 IN-LBS (2.3 N-M)
HOSE CLAMPS	N/A	20 IN-LBS (2.3 N-M)
COVER BOLTS	N/A	40-45 FT-LBS (61 N-M)

5.4 STATUS INDICATION - FILTER MAINTENANCE

There are two lights for the status indicator - a GREEN light to signify RUN and a RED light to signify STOP or ALARM condition.



Solid Red = Power On/Drive Stopped/Fault
 Solid Green = Drive Running
 Blinking Red = Drive Running in Alarm Mode - Maintenance Required
 Lights Off = Power Off

5.5 EXPLOSIVE EVENT REQUIRED MAINTENANCE

In the event of an explosion within the enclosure, the filter assemblies and pre-filters must be replaced. Personnel injury or equipment damage may result from failure to replace the filters with new filters after an explosion occurs within the enclosure. Inspect all other components and verify that they are in proper operating condition. Consult Crouse-Hinds for replacement parts as needed.



WARNING: BURN HAZARD

To avoid personnel injury, allow sufficient time for the enclosure to cool prior to servicing.

6. TECHNICAL DATA

6.1 TECHNICAL DATA CHART

CH Base Cat. #	Enc. Size	Max. Disc. Rating (Amps)	Disc. Fuse Type	Nominal HP	Input Rating (Amps)	Max. Output Rating (Amps)	Power Loss (Watts)	Temp. Rating	Temp. Derating Factor	ABB VFD Part #
ACE10 60 DR...	3	100	J	60	77	79	1564	T4A	FIGURE 1	ACS800-U1-0060-5+K458+L509+N655+P901

*Modified product designs may vary in terms of technical information. Contact factory for additional information.

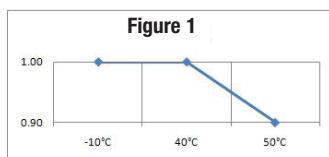
6.2 POWER LOSS (HEAT DISSIPATION)

When the ACE Series enclosure is not installed in a well ventilated area, provisions must be made to account for heat generation and ensure proper operation of the device.

6.3 DE-RATING FACTORS AND CURVES (AMBIENT TEMPERATURE, ALTITUDE, SWITCHING FREQUENCY)

The final drive output rating is a multiplication of all applicable de-rating factors.

Ambient Temperature De-rating



Altitude De-rating:

At altitudes from 1,000 to 4,000m (3,280 to 13,123 ft.) above sea level, the de-rating is 1% for every 100m (328 ft.).

7. CROUSE-HINDS DRIVE PARAMETERS

7.1 PARAMETER TABLE

PARAMETER NUMBER	PARAMETER GROUP NAME	PARAMETER DESCRIPTION	PARAMETER VALUE
1001	START/STOP/DIR	START/STOP 1	DI1P-2P
1409	RELAY OUTPUTS	RO3 POINTER	+084.014.00
1601	SYSTEM CTR INPUTS	FAULT RESET SEL	DI3
1604	SYSTEM CTR INPUTS	LOCAL LOCK	ON
8301	ADAPT PROG CTRL	ADAPT PROG CMD	RUN
8304	ADAPT PROG CTRL	TIME LEVEL SEL	100ms
8405	ADAPTIVE PROGRAM	BLOCK 1	TON
8406	ADAPTIVE PROGRAM	INPUT 1	+084.019.00
8407	ADAPTIVE PROGRAM	INPUT 2	+085.001.00
8410	ADAPTIVE PROGRAM	OUTPUT	SR
8411	ADAPTIVE PROGRAM	OUTPUT	+008.001.07
8412	ADAPTIVE PROGRAM	OUTPUT	+084.009.00
8415	ADAPTIVE PROGRAM	OUTPUT	TOFF
8416	ADAPTIVE PROGRAM	OUTPUT	+084.014.00
8417	ADAPTIVE PROGRAM	OUTPUT	+085.001.00
8501	USER CONSTANTS	CONSTANT 1	500
9510	HARDWARE SPECIFIC	TEMP INV AMBIENT	50
9902*	START-UP DATA	APPLICATION MACRO	PCP

*PCP MACRO MUST BE SETUP FIRST BEFORE OTHER PARAMETERS OTHERWISE ONCE PCP MACRO IS ENTERED OTHER PARAMETERES SET WILL BE OVERWRITTEN

To ensure cooling system performance, these parameters must be maintained at all times while observing the appropriate de-rating factors.

8. REPLACEMENT PARTS

ACE Series systems are designed to provide years of reliable service. However, should the need for replacement parts arise, they are available through your Crouse-Hinds Distributor. Assistance may also be obtained through your Crouse-Hinds Sales Representative or the Crouse-Hinds Customer Service Department.

8.1 PRE-FILTER KIT

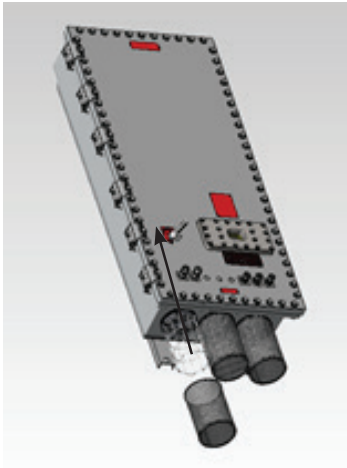
ACE KIT1: Pre-filter and Hardware (1 pc.)

8.1.1 PRE-FILTER INSTALLATION INSTRUCTIONS

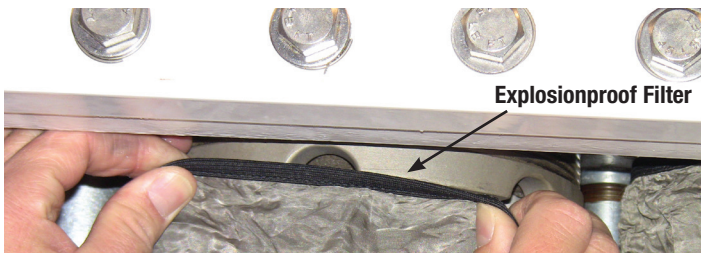
1. Remove rubber caps from explosionproof filters.
2. Install wire guard using the bracket, screw, and lock washer provided to the bottom filter(s).
3. Align guard with notches within the bracket as shown.



4. Tighten screw.
5. Slip pre-filter mesh over guard.



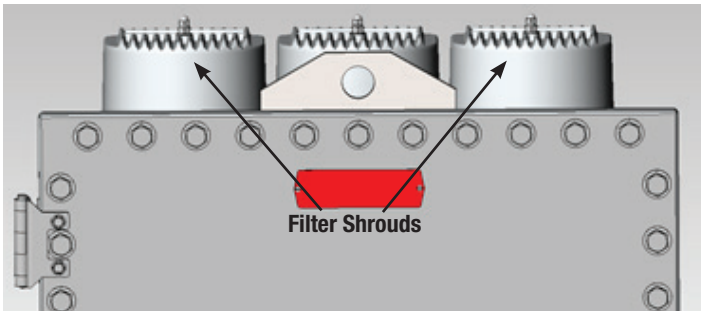
6. Be sure to stretch pre-filter elastic band completely around the explosionproof filter and seat the elastic band on the filter's threads. This will ensure all air flow to the bottom filters passes through the pre-filters.



8.2 SINTERED FILTER KIT

ACE KIT2: Filter Assembly (1 pc.)

8.2.1 SINTERED FILTER INSTALLATION INSTRUCTIONS



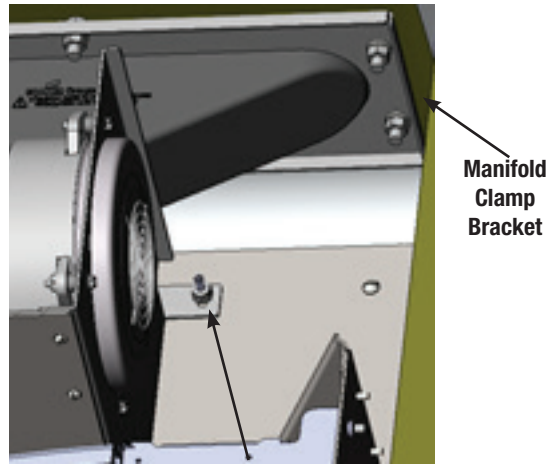
1. Remove shroud and pre-filters and place all parts in a secure area.
2. Using a 1" socket wrench, remove all filters from the enclosure (top and bottom).
3. Remove rubber caps from explosionproof filters.
4. Apply thread grease to threads of explosionproof filters.
5. Install new filters (top and bottom) and torque each to 133 ft.-lbs. (180 N-m).
6. Install pre-filters and shrouds; refer to Sections 2.6 and 2.7.

8.3 BLOWER KIT

ACE KIT6: Blower, Manifold, and Hardware (1 pc.)

8.3.1 BLOWER INSTALLATION INSTRUCTIONS

1. Disconnect blower power, ground, and control leads from fuse block terminals and mounting plate (refer to wiring diagrams in Section 3.5).
2. Loosen five (5) nuts holding blower bracket and baffle to mounting plate. DO NOT remove.
3. Loosen and remove (6) manifold clamp bracket nuts and lock washers. DO NOT remove jam nuts positioned behind the manifold clamp bracket.



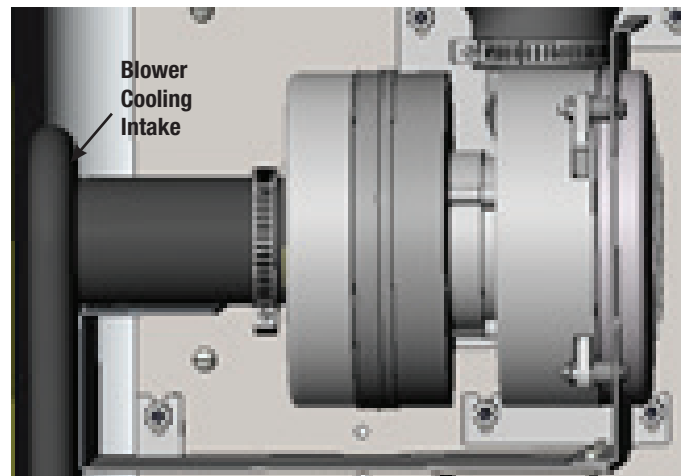
Loosen and DO NOT Remove Nut During Replacement

4. Remove blower and brackets.
5. Remove manifold and manifold clamp bracket.
6. Remove blower cooling intake and hose clamp from old blower assembly and hold for re-assembly.
7. Loosen and remove four (4) screws and washers holding the baffle and plug plate to the blower bracket. Remove baffle and plug plate and hold for re-assembly.
8. Attach baffle and plug plate to new blower bracket using the same four (4) screws and washers.
9. Align new manifold to enclosure wall.
10. Align new manifold clamp bracket to threaded studs. Be sure the manifold clamp bracket flanges point toward the interior of the enclosure.
11. Install six (6) lock washers and nuts on threaded studs hand tight before applying required torque. Tighten to 20 in.-lbs. DO NOT over-tighten.
12. Slide new blower/bracket assembly into place until fully seated, aligning to the threaded studs and the manifold.

CAUTION

To avoid system malfunction and electrical shock, be sure that all wires are aligned in the baffle's wire pass through.

13. Tighten nuts wrench tight.
14. Tighten manifold hose clamp, while compressing the manifold to the blower, to 20 in.-lbs.
15. Re-attach blower cooling intake and tighten hose clamp to 20 in.-lbs. Be sure to align bottom of blower cooling intake to the explosionproof filter at the bottom of the enclosure.



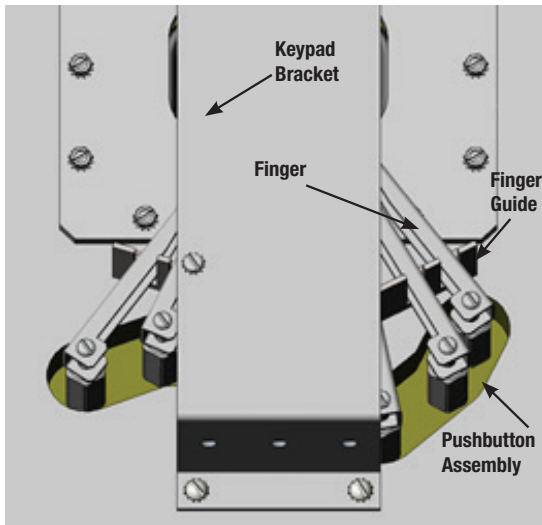
16. Terminate the blower power wires to the fuse block connections (refer to wiring diagrams in Section 3.5).
17. Perform a continuity check between each blower power terminal and each phase of the integral disconnect switch.
18. Terminate the blower control wires to the appropriate temperature controller connections (refer to wiring diagrams in Section 3.5).
19. Perform a continuity check between each blower control terminal and the temperature controller (refer to wiring diagrams in Section 3.5).
20. Terminate the blower ground wire to the mounting plate connection (refer to wiring diagrams in Section 3.5).
21. Perform a continuity check between the ground terminal and the ground lug adjacent to the integral disconnect switch and external ground connection.

8.4 PUSHBUTTON OPERATOR KIT

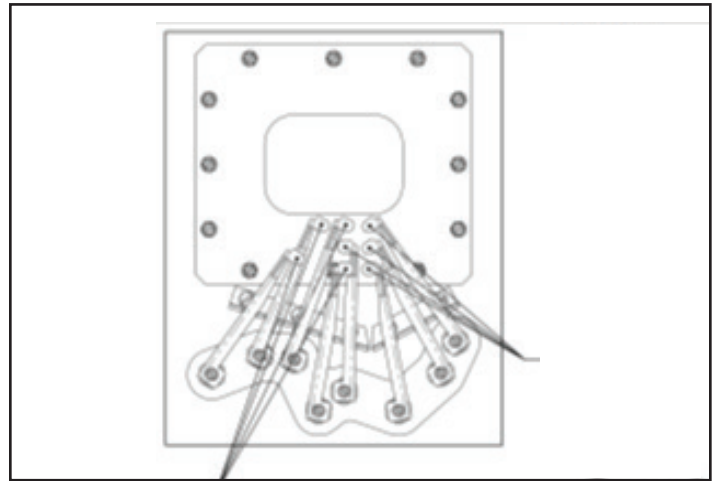
ACE KIT4: Pushbutton Operator, Finger and Hardware (8 pc.)

8.4.1 PUSHBUTTON INSTALLATION INSTRUCTIONS

1. Loosen and remove four (4) screws and lock washers from keypad bracket. Remove keypad and bracket.



2. Loosen and remove eight (8) screws and lock washers from keypad fingers. Remove fingers.
3. Loosen and remove pushbutton assemblies.
4. Apply Crouse-Hinds STL lubricant lightly to the external threads of the pushbutton assembly.
5. Install new pushbutton assemblies and tighten wrench tight.
6. Re-install keypad fingers and orient fingers as shown in Detail A.



Detail A

7. Install lock washers and screws retaining keypad fingers and tighten wrench tight.
8. Re-install keypad bracket and fasten using existing hardware. Tighten screws wrench tight.
9. Test keypad to ensure proper operation.

8.5 TEMPERATURE CONTROLLER

ACE KIT5: Temperature Controller

8.5.1 TEMPERATURE CONTROLLER INSTALLATION INSTRUCTIONS

1. Disconnect wire terminals from temperature controller. Do not remove wires from terminals.
2. Loosen two (2) screws and lockwashers holding the temperature controller to the mounting plate. Do not remove.
3. Remove temperature controller.
4. Insert new temperature controller into place on mounting plate and tighten two (2) screws and lockwashers down wrench tight.
5. Reconnect wire terminals to the temperature controller, ensuring terminals are fully inserted.

All statements, technical information and recommendations contained herein are based on information and tests we believe to be reliable. The accuracy or completeness thereof are not guaranteed. In accordance with Crouse-Hinds "Terms and Conditions of Sale," and since conditions of use are outside our control, the purchaser should determine the suitability of the product for his intended use and assumes all risk and liability whatsoever in connection therewith.