RAVE™ FROM RITE-HITE® FANS

INSTALLATION AND OWNER'S MANUAL

RITE-HITE® FANS

CE

THIS MANUAL COVERS ALL UNITS SHIPPED JUNE 2012 TO DATE

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RITE-HITE PRINT SHOP

PUBLICATION NO. RAVE REV. 3

TABLE OF CONTENTS

PRODUCT INTRODUCTION

Thank you for purchasing the Rave™ Fan from RITE-HITE®.

IMPORTANT

Read and understand contents of this manual prior to installation or operation of this equipment.
For best results, have this product serviced by your authorized RITE-HITE® Representative.

NOTICE TO USER

Your local RITE-HITE® Representative provides the Planned Maintenance Program (P.M.P.) which can be fitted to your specific operation. Call your local representative or RITE-HITE® at 1-414-355-2600 or toll free at 1-800-456-0600.
In Europe, call +31-(0)571-277505

ORIGINAL INSTRUCTIONS (ENGLISH)

The English version of this manual shall prevail over any error in, or conflicting interpretation of, any translations.

Original Declaration of Conformity

EC Declaration of Conformity

According to the Machinery Directive

2006/42/EG Annex IIA

The Manufacturer: Rite-Hite Aftermarket Corporation
8900 North Arbon Drive
Milwaukee, WI 56223 USA

Hereby declares that the below mentioned products

CE

Ceiling Fan
Type : Revolution HVLS Fan and Rave HVLS Fan
Rouge HVLS Fan and Renegade HVLS Fan
Year : 2012

Comply with all relevant requirements of the Machine Directive.

The mentioned products comply with the demands of the following relevant European directives:

2006/42/EG	Machinery Directive
2006/95/EG	Low Voltage Directive
2004/108/EG	EMC Directive

The following European Standards were applied:

EN 60204-1	Safety of Machinery – Electrical Equipment of Machines. Part 1 General Requirements
EN 12100-1	Safety of Machinery – General Methodolgy. Risk Assessment and Risk Reduction
EN 12100-2	Safety of Machinery – Basic Concepts. General Principles for Design Part 2: Technical Principles
EN 13857	Safety of Machinery – Safety Distances to prevent hazard zones being reached by upper and lower limbs
EN 349	Safety of Machinery – Minimum Gaps to prevent crushing of parts of the human body
EN 953	Safety of Machinery – Guards. General Requirements for the design and construction of fixed and movable guards.
EN 954-1	Safety of Machinery - Safety related parts of control systems

Authorized:
Ron Snyder
Engineering Manger
Rite-Hite Aftermarket Corporation
4343 Chavenelle Drive
Dubuque, IA 52002 USA

Ron Snyder

Date: October 12, 2011

NOTES

SAFETY

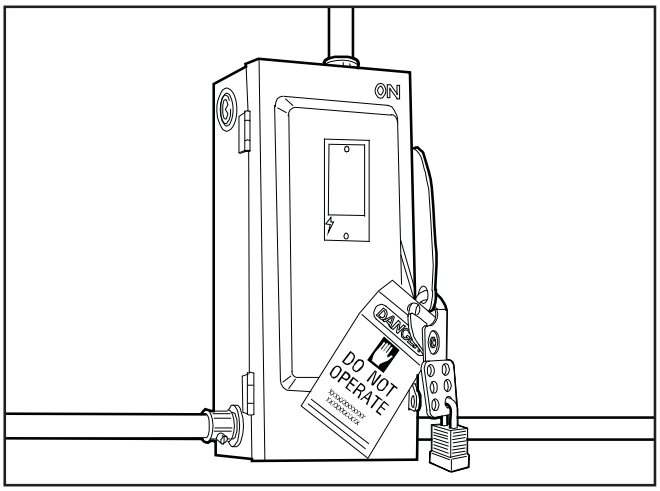


Figure 1

⚠ WARNING

When working with electrical or electronic controls, make sure that the power source has been locked out and tagged according to OSHA regulations or your country's local standards and approved local electrical codes.

LOCKOUT / TAGOUT PROCEDURES

The Occupational Safety and Health Administration (OSHA) requires that, in addition to posting safety warnings and barricading the work area, the power supply has been locked in the OFF position or disconnected. It is mandatory that an approved lockout device is utilized. An example of a lockout device is illustrated in Figure 1. The proper lockout procedure requires that the person responsible for the repairs is the only person who has the ability to remove the lockout device.

In addition to the lockout device, it is also a requirement to tag the power control in a manner that will clearly note that repairs are under way and state who is responsible for the lockout condition. Tagout devices have to be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or become unreadable.

RITE-HITE® Corporation does not recommend any particular lockout device, but recommends the utilization of a device that meets OSHA standards (refer to OSHA regulation 1910.147). RITE-HITE® Corporation also recommends the review and implementation of an entire safety program for the Control of Hazardous Energy (Lockout/Tagout). These regulations are available through OSHA publication 3120.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, *will* result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, *could* result in minor or moderate injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, *could* result in death or serious injury.

NOTICE

Indicates a situation which can cause damage to the equipment, personal property and/or the environment, or cause the equipment to operate improperly.

GENERAL INFORMATION

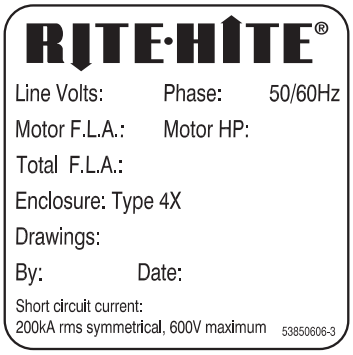
DESCRIPTION

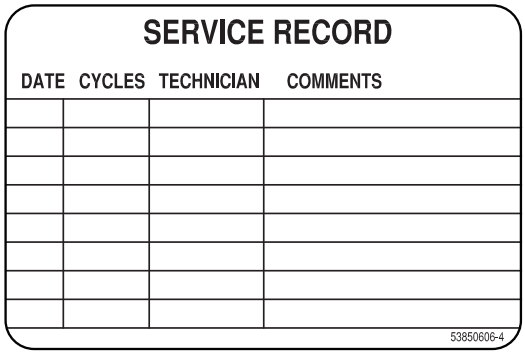
The Rave™ Fan is a high-volume/low-speed (HV/LS) industrial fan that provides more consistent air circulation and ventilation with better energy efficiency than traditional high-speed ceiling fans or industrial floor fans.

SERIAL LABEL

SAFETY LABELS

The safety labels have specific placement and must be replaced if they are defaced or removed for any reason.





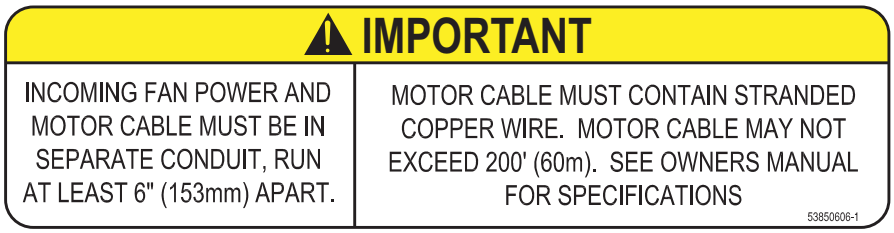


Table 1

LABEL	DESCRIPTION
53850527-1	WARNING For continued protection against fire, replace fuses with the same type and rating only. 208/230V: Phase Three; F1, F2, F3*: 15A KLDR 400V: Phase Three; F1, F2, F3*: 6A KLDR 460V: Phase Three; F1, F2, F3*: 10A KLDR 575V: Phase Three; F1, F2, F3*: 6A KLDR 220V: Phase Single; F1, F2, F3*: 20A KLDR * F3 not used on single phase Use copper conductors only rated at 60° or higher! Wiring must comply with local electrical codes. To maintain U.L. and NEMA 12 ratings, use conduit fittings approved at those ratings. All conduit connectors must be through the bottom of the control box only! For 208V thru 240V control boxes: To reduce risk of shock – do not connect to a circuit operating at more than 150 volts to ground. To reduce risk of injury or death an earth ground connection must be made to the green/yellow control box ground terminal. If metal conduit is used as the ground conductor, an N.E.C. approved ground bushing and green wire must be properly attached to the conduit for connection to the ground terminal.
53850527-2	RITE-HITE Line Volts: Motor F.L.A.: Total F.L.A.: Hz: Ph: Serial #: Enclosure: Type 12 Drawings: By: Date: Short circuit current: 5kA rms symmetrical, 600V maximum
53850527-3	SERVICE RECORD DATE CYCLES TECHNICIAN COMMENTS
53850606-1	IMPORTANT Incoming fan power and motor cable must be in separate conduit, run at least 6" (153mm) apart. Motor cable must contain stranded copper wire. Motor cable may not exceed 200' (60m). See owners manual for specifications.

LABEL	DESCRIPTION
53850606-5	IMPORTANT Incoming fan power and motor cable must be in separate conduit, run at least 6" (153mm) apart.
53850606-6	DANGER HIGH VOLTAGE Disconnect power before servicing!
53850606-7	www.ritehitefans.com Milwaukee WI,0 53223 414-355-2600 Patents Pending

SPECIFICATIONS

SPECIFICATIONS

Diameters:	8, 10, and 12 ft (2440 mm, 3050 mm, and 3660 mm)
Blades:	Aluminum
Blade Finish:	Polished and Mill-finish standard, custom colors optional
# of Blades:	4
CFM:	Up to 100,000 CFM (12 ft diameter, 4 blade) Up to 2,830 m^3/h (3,660 mm diameter, 4 blade)
Motor:	1.0 hp (.75 kW)
Voltages:	110, 230, 400, 480
Phase:	1 or 3
Amps:	2.9A @ 230V
Watts:	500 – 1000
Frequency:	50 or 60 Hz
Coverage:	Up to 7,800 sq ft (725 m^2) 50 ft (15.2 m) from the fan's center in all directions
Decibels:	40 to 63 dBA depending on fan speed (measured 20 ft [6100 mm] below and 20 ft [6100 mm] from the fan's center)
Air Speed:	Up to 5 mph (2.24 m/s) at full speed
Controls:	Variable speed
Mounting Heights:	10 to 80 ft (3.0 to 24.4 m) from finished floor to bottom of blade
Weight:	150 lb (68 kg)

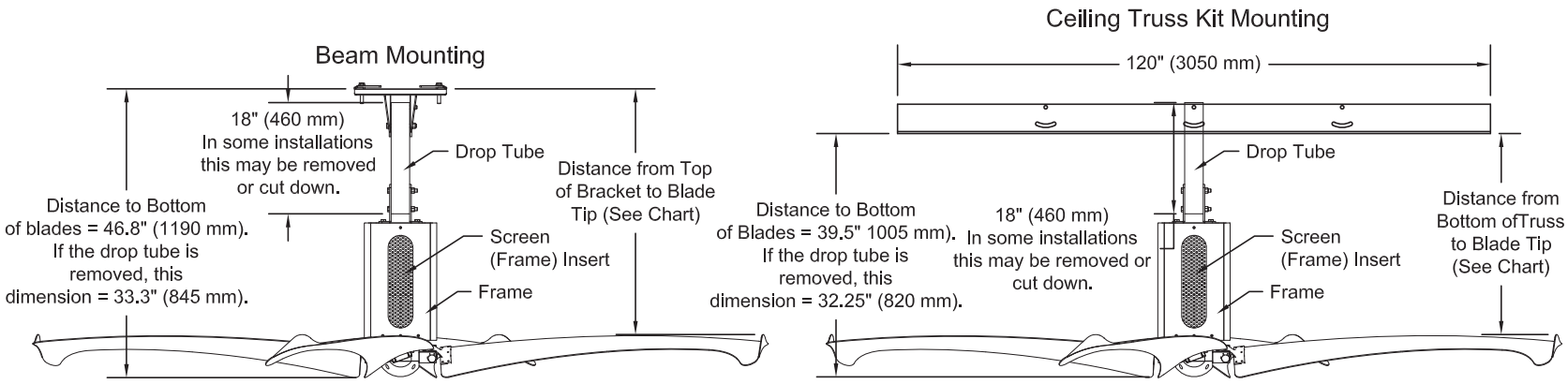


Figure 2

Table 2

Beam Mounting

				Distance From Top of Bracket to Blade Tip*	
Diameter	Airflow 4 Blade	Speed	Weight	At Rest	Full RPM
ft (mm)	cfm (cms)	rpm	lb (kg)	in (mm)	in (mm)
8' (2440)	50,000 (23.6)	20-120	140 (63.6)	40.0 (1015)	40.0 (1015)
10' (3050)	75,000 (35.4)	17-100	145 (65.9)	40.0 (1015)	39.25 (1000)
12' (3660)	100,000 (47.2)	13-80	150 (68.2)	40.0 (1015)	38.5 (980)

Table 3

Ceiling Truss Kit Mounting

Distance From Top of Bracket to Blade Tip*	
At Rest	Full RPM
in (mm)	in (mm)
32.75 (830)	32.75 (830)
32.75 (830)	32.0 (815)
32.75 (830)	31.25 (795)

* OPTIONAL EXTENSION KIT AVAILABLE TO INCREASE DIMENSION IF NECESSARY.

COMPONENTS AND TOOLS

UNPACKING OF THE COMPONENTS

You should have received the following items:
(2) boxes of fan blades, they are packed (2) per box for a total of (4) blades
– approximately 25 lb. (11.4 kg) per box.
(1) motor / hub assembly – approximately 80 lb. (36.4 kg)
(1) box containing miscellaneous mounting hardware and cables - approximately 25 lb. (11.4 kg)
(1) box containing the control box – approximately 35 lb. (15.9 kg)

Insure you have received all of the above items before installation begins. Notify the factory if parts are missing or damaged.

TOOLS REQUIRED:

(2) 7/16" wrenches
(2) ½" wrenches
(1) 1 ¼" box end wrench
(1) 1 1/16" box end wrench
(2) ¾" wrenches
(1) Vice grip
(1) Large standard screwdriver
(1) Small standard screwdriver
(1) Torque wrench capable of 50 ft-lb
(1) Metric 7mm deep well socket - Only required for motor voltage change
(1) ¼" cable cutter
(4) 10 AWG electrical terminals for motor terminations
(1) Torpedo Level

If you are mounting to support angles that span building joists, you will also need a drill and a 1/2 in. drill bit.

MOUNTING OF THE FAN

FAN WEIGHT AND TORQUE

NOTICE

The weight of the fan that will be suspended from the ceiling is approximately 150 lb (68.2 kg) and will generate torque of up to 150 ft-lb (204 Nm).

If the ceiling support structure is an open-web design, all hanging dimensions can be taken from the underside of the ceiling. If the ceiling's support structure is a solid beam or solid channel, all measurements must be taken from the bottom of the beam as the basis point for the hanger dimension. If the roof is pitched, this must be accounted for above the tips of the blades. Failure to follow these guidelines will result in limited air movement from the fan.

FAN DISTANCE FROM CEILING AND OBSTRUCTIONS

NOTICE

The standard blade design on the Rite-Hite Rave™ *Fan is angled upward to provide improved airflow. A combination of centrifugal force and air pressure causes the blades to move upward to their operating position. Measure the distance to possible obstructions and mount the fan accordingly using Table 2-3 to ensure the blades will have proper clearance in all areas when the fan is running. Whenever possible allow 12 in.*
(305 mm) additional clearance to existing obstructions.

Table 4

FAN DIAMETER ft (mm)	MINIMUM CLEARANCE DIMENSION AT FULL RPM ft (mm)
8 (2440)	2 (610)
10 (3050)	3 (915)
12 (3660)	3 (915)

I-BEAM AND TRUSS MOUNTING

I-BEAM MOUNTING

If the fan is being mounted to a building support I-beam (6 – 13-1/2 in. [150 – 350 mm] wide), mount the fan directly to the beam with the provided brackets. Clamp the brackets around the beam using the holes in the upper beam mounting bracket that are closest to the edge of the beam (see Figure 5).

If the fan is being mounted to a beam that is larger than the bracket (greater than 13-1/2 in. [350 mm] wide), clamp the bracket on one edge of the beam and drill holes through the beam to bolt the other side securely. Use only Grade 8 hardware.

Use a level to ensure the extension tube is hanging vertical.

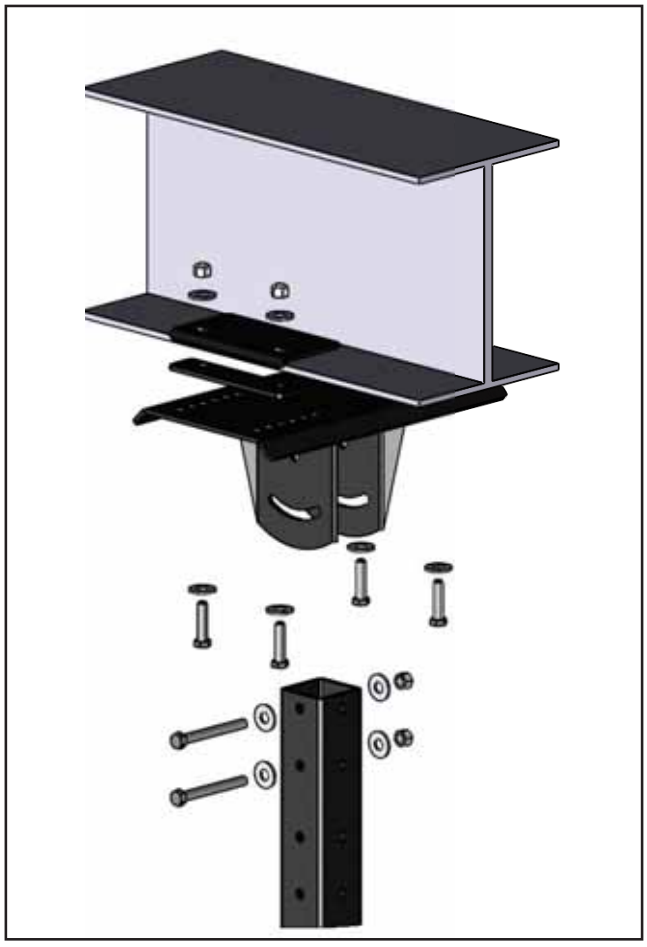


Figure 5

CEILING TRUSS MOUNTING

⚠ WARNING

Never mount the fan to only one building joist. Always mount the fan to two joists. One joist will not provide the rigidity and support necessary for the fan during operation, and may cause the fan to fall and cause injury.

When using a support channel to span two building joists, use material that will securely support the fan. Two pieces of 3 x 3 x 1/4 in. (75 x 75 x 7 mm) angle is recommended. Mount these angles in such a way that the fan can be hung using the standard I-beam mounting bracket (see Figure 6). Securely mount the angles to the building joists to ensure the angles cannot move. Use a level to ensure the extension tube is hanging vertical.

Figure 6

CEILING TRUSS MOUNTING (RITE-HITE–FORMED ANGLES)

⚠ WARNING

Never mount the fan to only one building joist. Always mount the fan to two joists. One joist will not provide the rigidity and support necessary for the fan during operation, and may cause the fan to fall and cause injury.

The truss kit supplied by Rite-Hite is designed to make installation of the kit easier.

The two formed angles span existing building trusses. Figure 7 shows how the brackets are used to secure the angles to the building trusses while setting the gap between the angles for the 3 x 3 in. (75 x 75 mm) drop tube.

Several mounting positions have been cut into the angles to allow for flexibility in positioning the fan.

NOTE: When the truss kit is ordered from Rite-Hite, the standard I-beam ceiling bracket will not be provided.

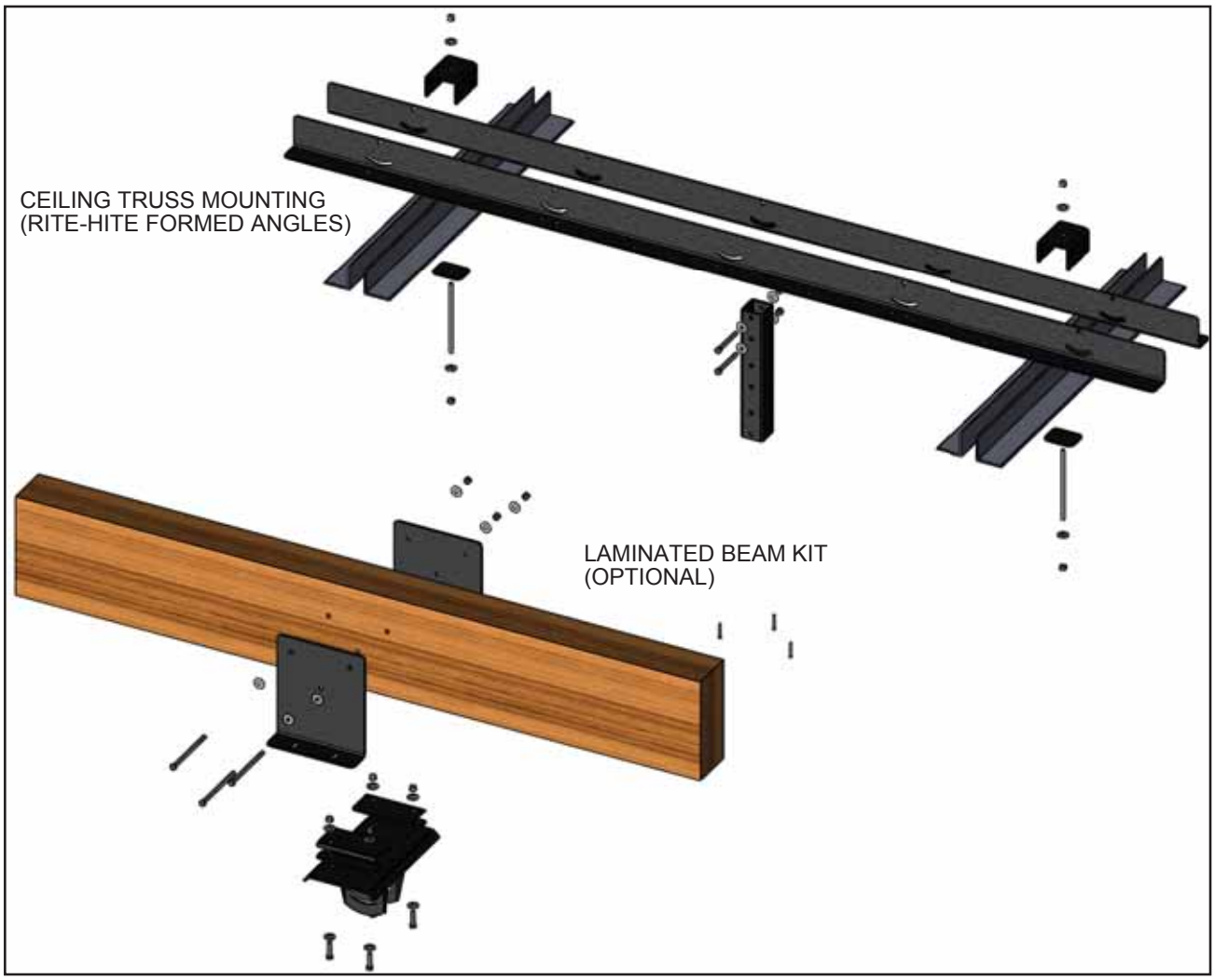


Figure 7

LAMINATED BEAM KIT (OPTIONAL)

LAMINATED BEAM KIT (OPTIONAL)

1. Through-bolt the laminated beam brackets with one bracket on each side of the laminated (or concrete) beam.
2. Attach the standard ceiling mounting bracket to this bracket in the normal manner.

MOTOR BRACKET

ATTACHMENT OF MOTOR BRACKET

The motor bracket attaches to the extension tube with two 1/2 x 4-1/2 in. Grade 8 bolts, washers, and locknuts.

1. Position the motor bracket so that one angle is on each side of the extension tube.
2. Insert the bolts through the holes in the angles at the top of the motor bracket and through the extension tube and back through the second angle.
3. Tighten both locknuts securely.
4. When an extended down tube is used, the smaller square tubing (3 x 3 in. [75 x 75 mm]) will telescope inside the larger square tubing (3-1/2 x 3-1/2 in. [90 x 90 mm]). The brackets on the top of the motor bracket are bolted in slots to allow the larger tube to bolt to the top of the motor. The 3 x 3 in. (75 x 75 mm) tube should always bolt to the ceiling bracket.
5. If the fan assembly is mounted directly to the ceiling bracket without an extension tube, use four 1/2 x 1-1/2 in. Grade 8 bolts (not provided) to bolt the brackets together properly.

Figure 8

SAFETY CABLES

⚠ WARNING

Always use safety cables. If safety cables are not used, the fan may fall and cause injury.

Safety cables, which support the fan to the ceiling if one of the bolted joints would come loose, are included with this kit.

1. Wrap a safety cable around the bolted brackets at the ceiling and at the top of the extension tube.
2. Wrap a second safety cable through the bottom of the extension tube and through the top of the motor housing.
3. If installing with adjustable-length extension tubes, use a third safety cable to secure the center bolted joint of the extension tubes.

Secure the safety cables with the provided clamps (see Figure 9).

Figure 9

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STABALIZATION CABLES

⚠ WARNING

Always use stabilization cables. If safety cables are not used, the fan may tilt and cause the blades to impact a ceiling joist or other object under certain conditions causing debris to fall.

Stabilization cables, which help to stabilize the fan for any situations such as cross winds or impacts which may otherwise be strong enough to tilt the fan and cause the blades to impact a ceiling joist or other object, are included with this kit. Use the stabilization cables to attach the fan bracket back to the ceiling in four locations.

1. For the most support possible, attach the stabilization cables to the ceiling at 90° to each other and as far away as possible from the point where the fan is mounted.
2. Secure the stabilization cables to the ceiling with two cable clamps, and tighten with a turnbuckle.
3. Cut stabilization cable to length as required.
4. Ensure that stabilization cables are attached in a position that does not allow the blades to hit the stabilization cables when the fan is operating.
5. Tighten the stabilization cables one turn past hand-tight.
6. Install stabilization cable clamp nuts away from turnback, as shown in Figure 11.

Figure 10

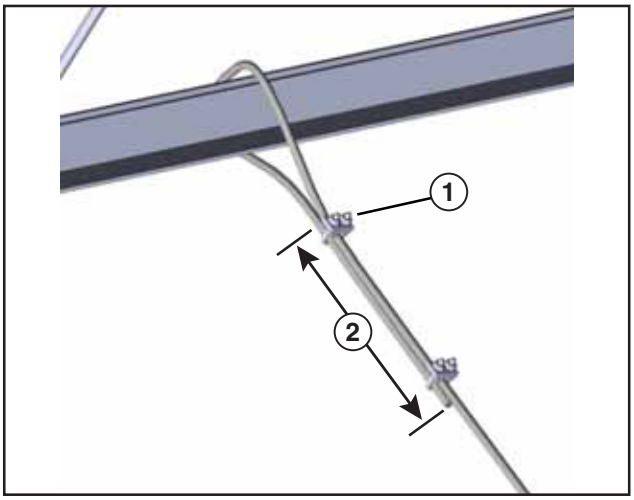


Figure 11

1 – Cable Clamp Nuts 2 – Turnback

Figure 12

BLADE ATTACHMENT

1. Clean each blade with a paper towel to remove fingerprints and dirt before the blades are installed.
2. Set the fan blades in place on the fan hub.
3. Raise the fan blade above the arm of the fan hub and allow the blade to slide into the slot provided on the fan hub.
4. Attach each fan blade to the fan hub with a 22 mm bolt (provided).
5. Use a torque wrench with a 3/4 in. drive extension to tighten the bolt to 75 ft-lb (102 Nm).

NOTE: In the event that a fan blade is damaged, both the damaged blade and the blade opposite must be replaced. Replacement blades are provided in pairs.

Figure 13

FAN LEVELING

Level the fan hub after blade attachment.

1. Hold a level across the center of the hub in all directions.
2. Make fine adjustments with the stabilization cables.
3. After run/test, go back and test level and cable tension.

GUARDING THE FAN

⚠ WARNING

Rotating fan blades can cause serious injury.

Guard the fan if there is potential for a person or object to come into contact with moving fan blades. In some cases, this guarding can be a structure built near the edge of the blades to keep fork trucks and other objects from entering a danger area. In other cases, such as when fans are mounted on low ceilings, it may be necessary to build a “cage” around the fan blades to ensure objects do not come into contact with the moving fan blades. It is best to mount this cage independent of the fan and support the cage from the ceiling or columns as necessary.

CONTROL BOX SIZE

The standard control box for the Rave™ Fan is 14 in. W x 16 in. H x 8 in. D (355 mm W x 405 mm H x 203 mm D).

REMOTE STOP INPUT FROM BUILDING CONTROL SYSTEM

The Rave™ Fan can be given an electronic stop command by removing the jumper wire across terminals LI4 and 24 on the Schneider Electric frequency drives and wiring a normally closed relay into these same terminals. A command to open the relay will stop the fan.

OPEN AIR ENVIRONMENT

When fans are used in open air environments, it is recommended that the fans be shut down during periods of high wind speed.

REMOTE STOP INPUT (FIRE SUPPRESSION, WIND SENSORS, BUILDING AUTOMATION, ETC.)

Any device with a relay output can stop the Rave™ Fan remotely by opening a contact.

SPEED CONTROL STATION

Figure 14

The fan control station is provided in a 4.75 x 4.75 x 1.75 in. (120 x 120 x 45 mm) enclosure suitable for mounting on a wall or column. The face of the controller may be removed and mounted flush in a standard double gang wall box.

The control station uses low voltage (24 VDC) control. A 7-conductor cable (24 AWG min/ 0.5 mm diameter min, 0.2 $mm^{\wedge 2}$ min) connects the control station to the variable-frequency drive (VFD) enclosure. CAT5 is acceptable for this run (500 ft [152 m] maximum length).

A power button is provided to turn the fan on and off.

The turtle and rabbit buttons incrementally decrease and increase fan speed.

Pressing the direction button causes the fan to change direction.

A ring of LEDs in the FANS logo provides a visual indication of fan speed (1 LED = slowest, 7 LEDs = fastest).

After turning the power on, or a direction change, the LEDs flash to indicate direction. Standing below the fan, looking up, the blades should turn clockwise (forward) when the LEDs flash in a clockwise pattern. If the rotation is counterclockwise, disconnect power to the control box and swap two of the three motor wires (terminals U, V, W) to reverse fan direction.

The VFD is factory-set to linearly increase fan speed to satisfy the majority of applications. By changing parameters in the drive, the speed curve can be modified for specific applications.

Table 4

Fan Speed Indication	Default Frequency	Allen Bradley PowerFlex40 Parameter	Schneider Altivar Parameter	AB PF4 (obsolete) Parameter
0 LED	**OFF**			
1 LED	**10Hz**	**A077**	SP8	A073
2 LEDs	**18Hz**	**A076**	SP7	N/A
3 LEDs	**26Hz**	**A075**	SP6	A072
4 LEDs	**35Hz**	**A074**	SP5	N/A
5 LEDs	**44Hz**	**A073**	SP4	A071
6 LEDs	**52Hz**	**A072**	SP3	N/A
7 LEDs	**60Hz**	**A071**	SP2	A070

MOTOR WIRING

The fan motor will receive three-phase power from the fan control box even if single-phase power is provided to the control box. Remove the cover from the motor junction box. Change the wire leads as necessary for high or low voltage. See Figure 15 for the appropriate wiring.

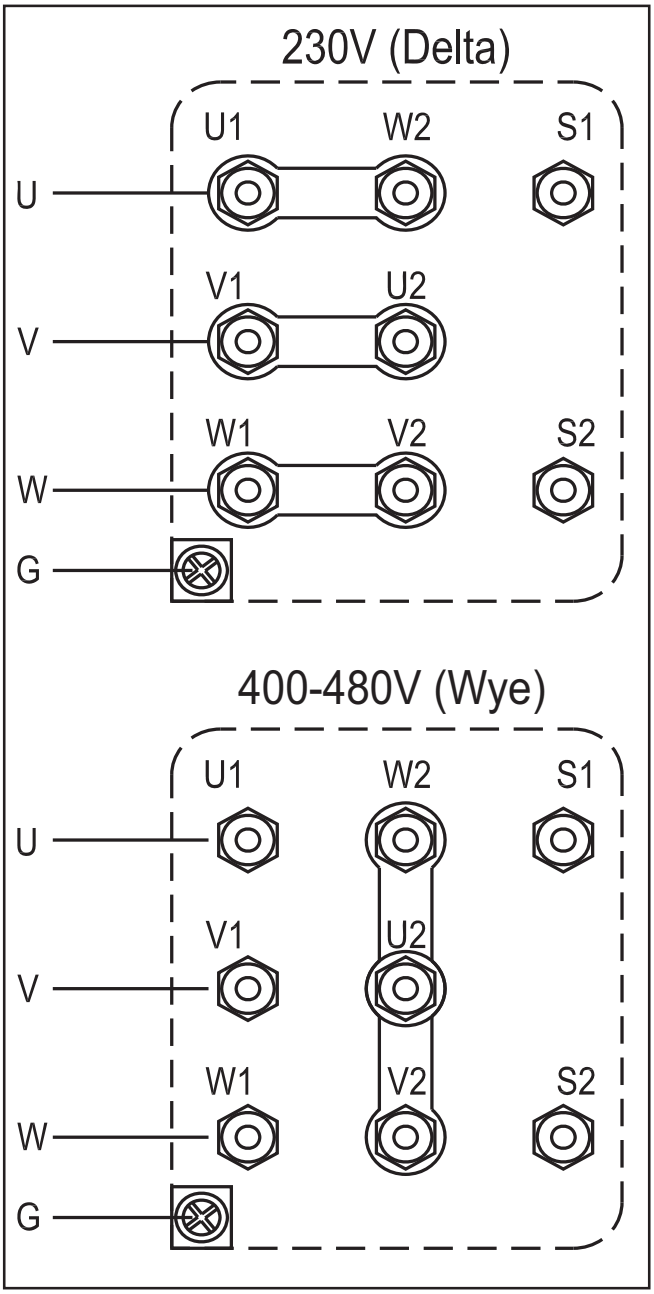


Figure 15

NOTICE

Use one of the wire types listed below to connect the fan control box to the motor.

Acceptable unshielded cable types:
THHN / THNW, rated for 600V and 75° to 90°C

Acceptable shielded cable types:
RHH / RHW-2, rated for 600V and 75° to 90°C
Belden 29501 through 29507
RHH / RHW-2, tray rated for 600V and 75° to 90°C
Shawflex Ölifex VFD 2ACD / 3ACD or equivalent.

Do not use solid core wiring of any size or insulation class for controller output/motor leads.

CONDUIT RESTRICTIONS

NOTICE

*AC supply lines for a controller **MAY** share the same conduit with AC supply lines for one or more additional controllers.*

*AC supply lines for a controller and output/motor leads for the same controller or another controller **MAY NOT** share the same conduit.*

The conduit with the incoming power and the conduit with the power going to the motor should be separated by a minimum of 6 in. (150 mm).

FIELD WIRING

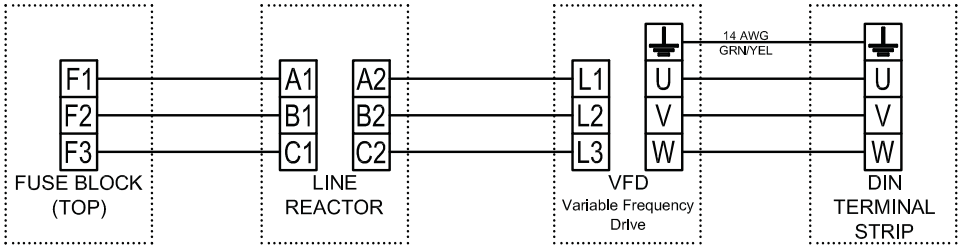
	Revolution 2 HP (1.5 kW) Fans				
Voltage	Cbox Fusing	Rec. Service Amps	Motor FLA	Total FLA Standard AB	Alternate Schneider FLA
230V 1Φ	20A	30A	6.6A	18A	15.8A
230V 3Φ	15A	20A	6.6A	9.5A	11.1A
400V 3Φ	10A	15A	3.8A	5.7A	6.4A
480V 3Φ	10A	15A	3.8A	5.7A	4.8A
575V 3Φ	6A	15A	2.5A	3.8A	4.2A

	SP 3/4 HP (0.6 kW) Fans				
Voltage	Cbox Fusing	Rec. Service Amps	Motor FLA	Alternate AB Total FLA	Total FLA Standard Schneider
120V 1Φ	25A	30A	2.9A	20.3A	18.9A
230V 1Φ	20A	20A	2.9A	12A	10.2A
230V 3Φ	10A	15A	2.9A	5.7A	6.3A
400V 3Φ	6A	15A	1.7A	3.2A	3.6A
480V 3Φ	6A	15A	1.7A	3.2A	2.7A
575V 3Φ	6A	15A	1.7A	2.3A	2.4A

CBOX WIRING DIAGRAM, LINE REACTOR

ALL WIRE 14 AWG BLACK UNLESS NOTED

230V 2HP (1.5 kW) 3ϕ
400V 2HP (1.5 kW) 3ϕ
480V 2HP (1.5 kW) 3ϕ
575V 2HP (1.5 kW) 3ϕ
400V 1HP (0.75 kW) 3ϕ
480V 1HP (0.75 kW) 3ϕ
575V 1HP (0.75 kW) 3ϕ

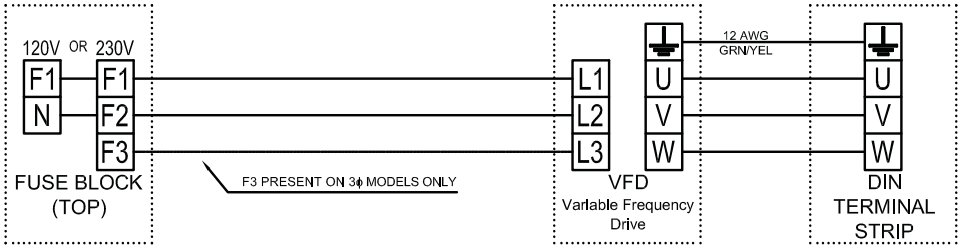


CBOX WIRING DIAGRAM, NO LINE REACTOR

ALL WIRE 12 AWG BLACK UNLESS NOTED

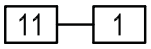
230V 2HP (1.5 kW) 1ϕ

120V 1HP (0.75 kW) 1ϕ
230V 1HP (0.75 kW) 1ϕ
230V 1HP (0.75 kW) 3ϕ



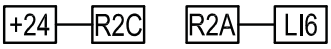
ALLEN BRADLEY CONTROL WIRING

DRIVE ENABLE: A JUMPER OR CLOSED CONTACT MUST BE PRESENT BETWEEN TERMINALS 11 (24VDC) AND 1 (ENABLE) FOR THE DRIVE TO RUN.



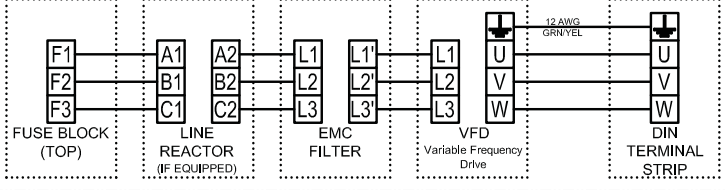
SCHNEIDER CONTROL WIRING (Altivar 312 only)

THE FOLLOWING JUMPERS MUST BE INSTALLED ON THE SCHNEIDER ALTIVAR 312 VFD:

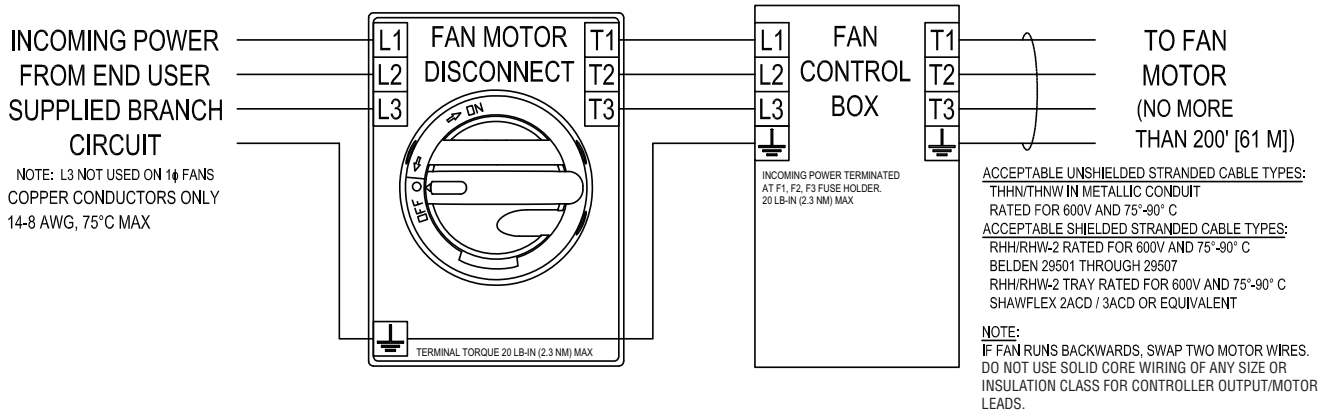


OPTIONAL EMC FILTER WIRING (FIELD INSTALLED)

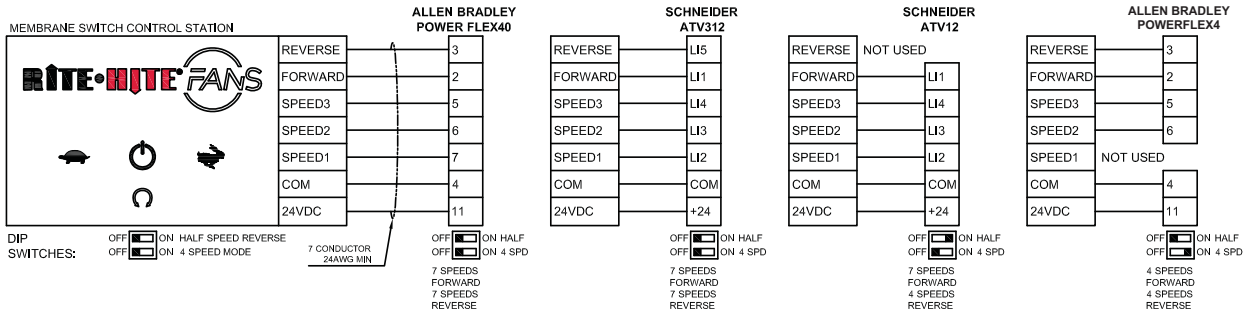
EMC FILTER MUST BE WIRED TO VFD INPUT



FIELD WIRING: POWER

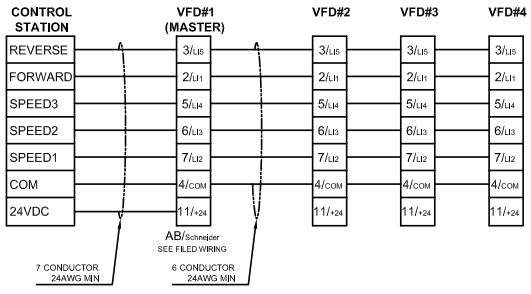


FIELD WIRING: CONTROL



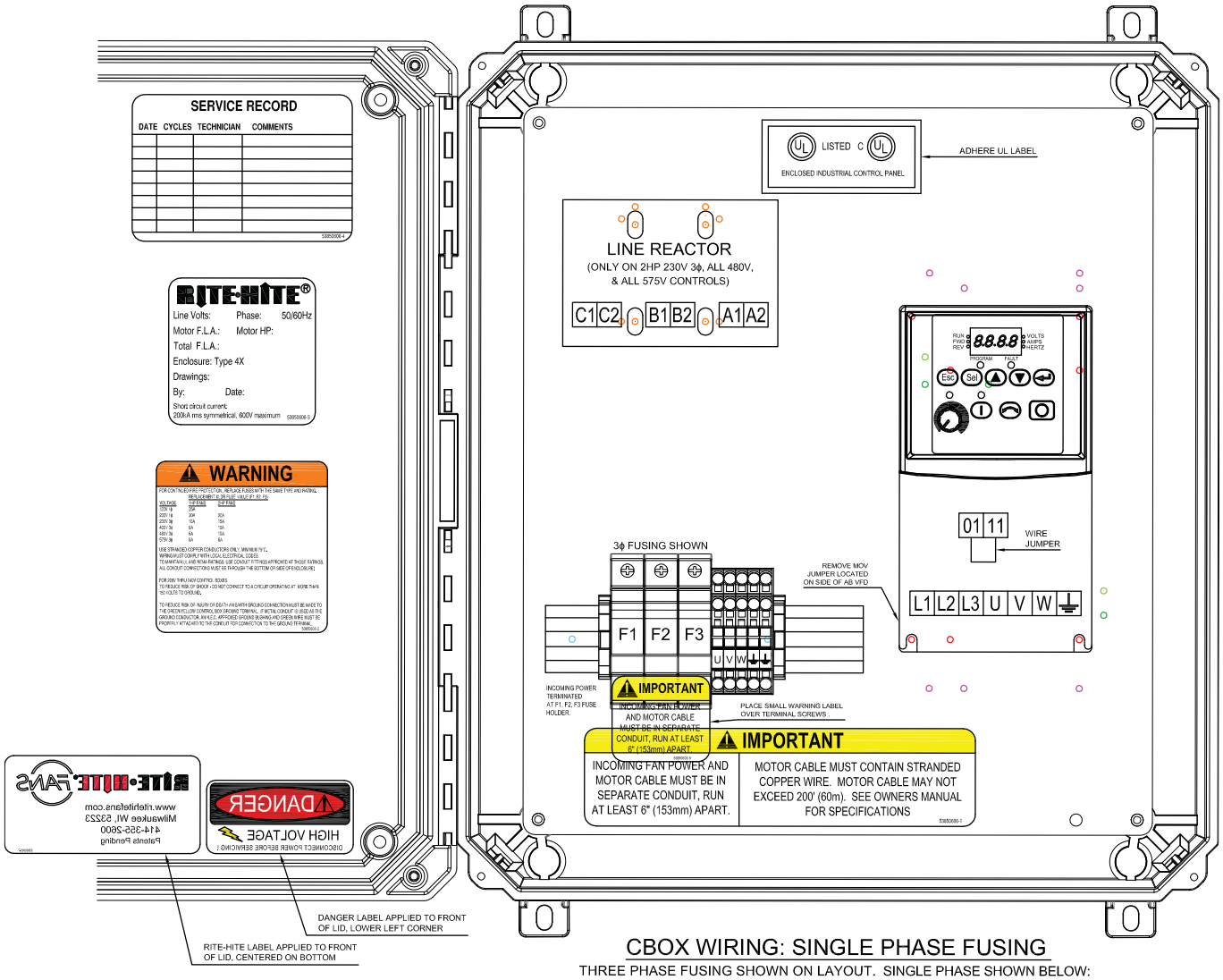
CONTROL UP TO 4 FANS WITH ONE MEMBRANE SWITCH

ALL FANS WILL OPERATE AT THE SAME PRESET



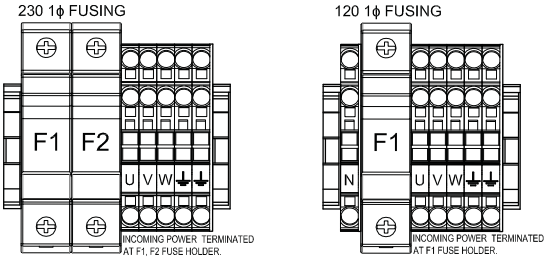
TO CONTROL MULTIPLE FANS WITH ONE MEMBRANE SWITCH CONTROL STATION:
WIRE ADDITIONAL FANS INPUTS AND LOGIC COMMON IN PARALLEL
DO NOT CONNECT THE VFDS' +24V TERMINALS (11 ON AB)

FAN CONTROLS LAYOUT



CBOX WIRING: SINGLE PHASE FUSING

THREE PHASE FUSING SHOWN ON LAYOUT. SINGLE PHASE SHOWN BELOW:



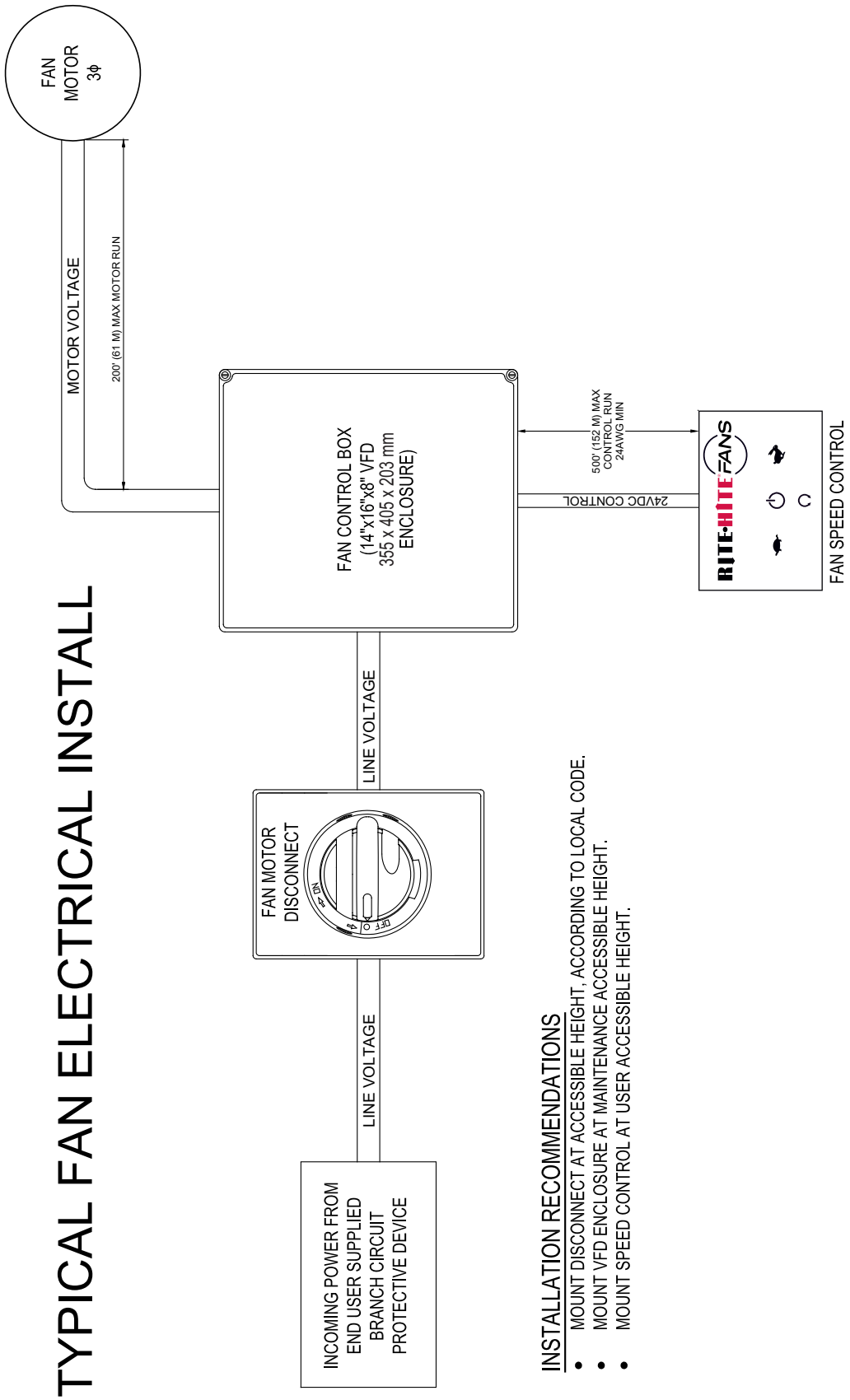
ITEM	ALL	Revolution & Rave™ Panels	
		Part	Description
1	1	12200079	BACKPANEL,FAN
2	1	38120006	DIN RAIL,LOW-PROFILE,6-1/2
3	1	43750013	ENCL,FBRGLS,16X14X8
4	1	53850606	LABEL,SET,FAN,ELECTRICAL
5	6	67850065	SCR,FHWH,#8X9/16BLK K-LATH
6	2	73100024	TERMINAL,END STOP,SCREWLESS
	3	73100089	TERMINAL,WA,CAGE,30A,3HOLE
	1	73100090	TERMINAL,WA,CAGE,30A,3HOLE,BAR
	2	73100091	TERMINAL,WA,CAGE,30A,3HOLE,GND

ITEM	Alternate Schneider Controls				Standard Controls				Revolution Fan Panels	
	230V,1Φ	230V,3Φ	400-480V	575V,3Φ	230V,1Φ	230V,3Φ	400-480V	575V,3Φ	Part	Description
10	1				1				51000003	FUSE HOLDER,2POLE,600V,30A
		1	1	1		1	1	1	51000013	FUSE HOLDER,3POLE,600V,30A
			3				3		51000033	FUSE,10AMP,600V,CC,KLDR
		3				3			51000051	FUSE,15AMP,600V,KLDR
				3				3	51000055	FUSE,6A,600V,CC,KLDR
	2				2				51950077	FUSE,20AMP,600V,KLDR
11							1		53300035	INV,2HP(1.5KW),480V,3PH,AB-FLEX40
					1				53300036	INV,2HP(1.5KW),230V,1PH,AB-FLEX40
						1			53300037	INV,2HP(1.5KW),230V,3PH,AB-FLEX40
								1	53300044	INV,2HP(1.5KW),575V,3PH,AB-FLEX40
	1								53300050	INV,2HP(1.5KW),230V,1PH,SQ D,ATV312
		1							53300051	INV,2HP(1.5KW),230V,3PH,SQ D,ATV312
			1						53300052	INV,2HP(1.5KW),460V,3PH,SQ D,ATV312
				1					53300053	INV,2HP(1.5KW),575V,3PH,SQ D,ATV312
12			1				1		55150174	REACTOR,LINE,460-480VAC,4A
		1				1			55150175	REACTOR,LINE,208-230VAC,8A
				1				1	55150179	REACTOR,LINE,575VAC,4A
		4	4	4		4	4	4	67850065	SCR,FHWH,#8X9/16BLK K-LATH
		4	4	4		4	4	4	74100004	WSHR,LOCK,INT/EXT,#10,ZNC
13		1	1	1		1	1	1	52000051	HARN,WIRE KIT,CBOX,FAN,REACTOR
	1				1				52000052	HARN,WIRE KIT,CBOX,FAN,NO LR

ITEM	Standard Controls					Rave™ Panels	
	120V,1Φ	230V,1Φ	230V,3Φ	400-480V	575V,3Φ	Part	Description
10		1				51000003	FUSE HOLDER,2POLE,600V,30A
			1	1	1	51000013	FUSE HOLDER,3POLE,600V,30A
	1					51000019	FUSE HOLDER,1POLE,600V,30A
	1					73100089	TERMINAL,WA,CAGE,30A,3HOLE
	1					73100090	TERMINAL,WA,CAGE,30A,3HOLE,BAR
			3			51000033	FUSE,10AMP,600V,CC,KLDR
		2				51950077	FUSE,20AMP,600V,KLDR
				3	3	51000055	FUSE,6A,600V,CC,KLDR
	1					51000062	FUSE,25AMP,600V,KLDR
11	1					53300055	INV,1HP(0.75KW),110V,1PH,ATV 12
		1				53300056	INV,1HP(0.75KW),220V,1PH,ATV 12
			1			53300057	INV,1HP(0.75KW),230V,3PH,ATV 12
				1		53300059	INV,1HP(0.75KW),460V,3PH,ATV 312
					1	53300060	INV,1HP(0.75KW),575V,3PH,ATV 312
12				1	1	55150044	REACTOR,LINE,400-575VAC,2A
				4	4	67850065	SCR,FHWH,#8X9/16BLK K-LATH
				4	4	74100004	WSHR,LOCK,INT/EXT,#10,ZNC
13				1	1	52000051	HARN,WIRE KIT,CBOX,FAN,REACTOR
	1	1	1			52000052	HARN,WIRE KIT,CBOX,FAN,NO LR

NOTE: STAR WASHER (74100004) TO BE INSTALLED BETWEEN LINE REACTOR (IF EQUIPPED) AND PANEL.

CONTROL BOX WIRING



TYPICAL FAN ELECTRICAL INSTALL

INSTALLATION RECOMMENDATIONS

- MOUNT DISCONNECT AT ACCESSIBLE HEIGHT, ACCORDING TO LOCAL CODE.
- MOUNT VFD ENCLOSURE AT MAINTENANCE ACCESSIBLE HEIGHT.
- MOUNT SPEED CONTROL AT USER ACCESSIBLE HEIGHT.

SCHNIEDER EMC PLATE AND SHIELDED CABLE

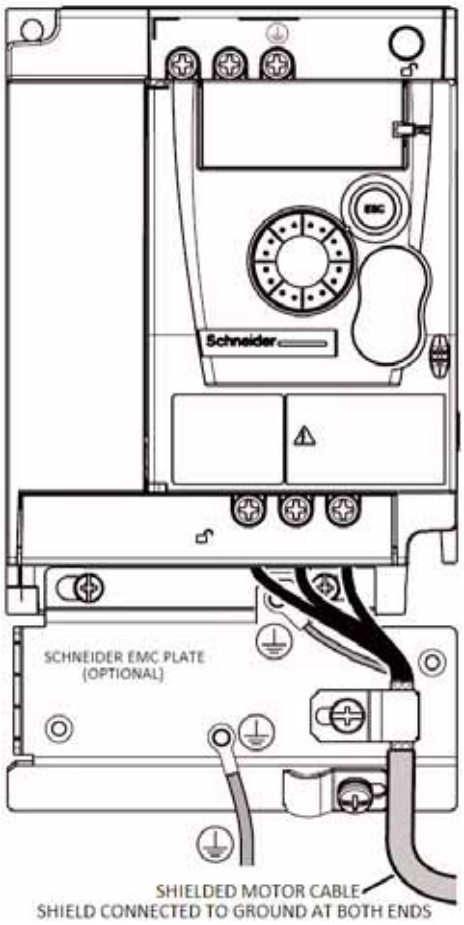


Figure 16

NOTICE

The U,V,W terminals provided in the control box need to be removed to utilize the EMC plate.

NOTICE

The shielded motor cable should be connected to ground at both the motor and control box.

WIRING WITH SHIELDED CABLE

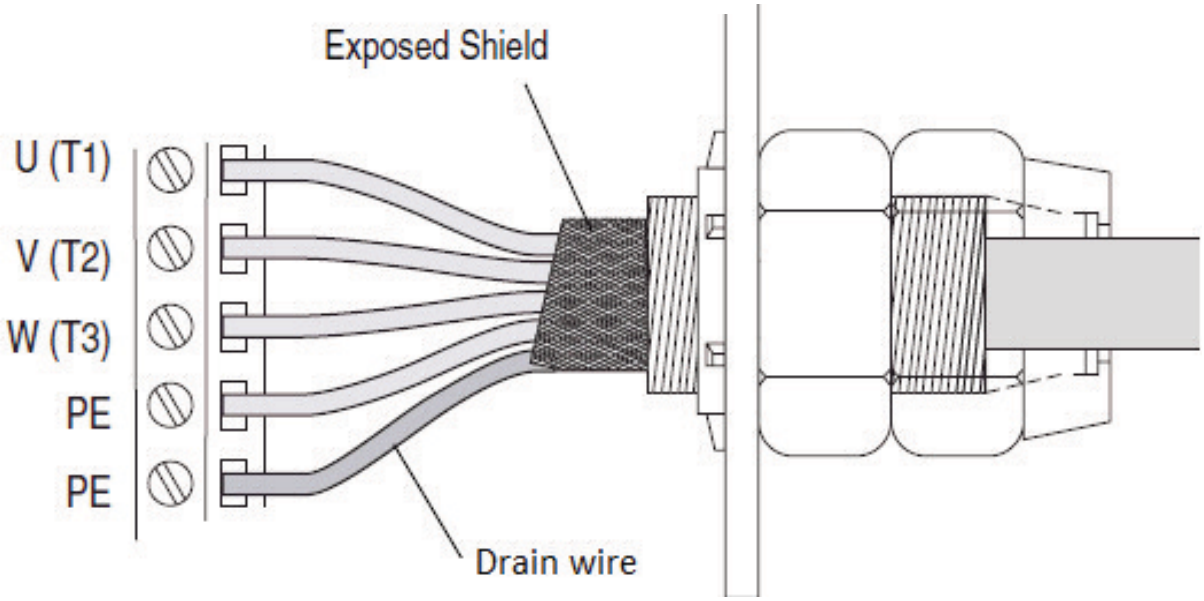


Figure 17

CONTROL BOX MOUNTING

⚠ CAUTION

Never mount ceiling-mounted standard control boxes inside the fan diameter. A control box mounted above a fan and inside the fan diameter cannot be locked out safely.

Mount the control box securely to a wall or building column with appropriate anchors (not provided). Mount the control box no farther than 200 ft (61 m) from the fan it is controlling. Ensure that the fan is visible from the control box mounting location.

An authorized electrician must verify the electrical system (ground system, insulation, etc.) before the fan is put into operation. The customer should record and store the verification data.

INPUT WIRING

1. Bring the input wires into the bottom of the fuse block.
2. Tighten the screws to secure the wires.
3. Insert the wires that are going to the motor into the contact blocks that are labeled U, V, W.
4. Insert the ground wire into the green contact block.

NOTICE

Increasing the speed of the fan beyond factory-set limits is not recommended and can shorten the life of the motor.

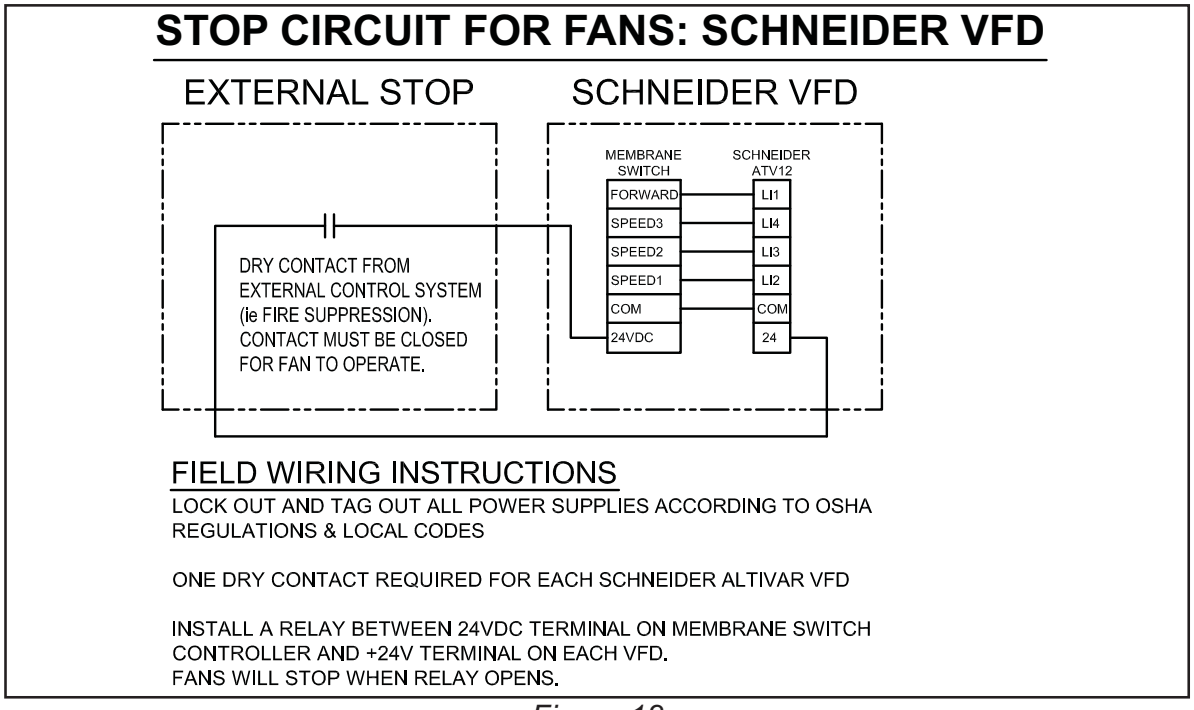


Figure 18

MOTOR WIRING CONT. / ANNUAL PLANNED MAINTENANCE

RUN / TEST

Turn the power disconnect switch on the control box to the ON position. Allow a few seconds for the frequency drive to power up.

Adjust the fan speed to 30 Hz. Count the number of revolutions the fan makes in 1 minute. They should be approximately the following:

12' (2440 mm) Fans = 40 rpm
10' (3050 mm) Fans = 50 rpm
8' (4880 mm) Fans = 60 rpm

If the fans do not spin at these speeds, consult factory for assistance.

FORWARD / REVERSE

The Rave™ Fan is the most efficient running in the forward direction (blowing air downward). For some installations where it is not desirable to move the air downward, or you do not want to feel as much air movement, the fan can be run in reverse.

FAN BLADE CLEANING

- Dirt and dust may be removed from the blades by using a cloth or soft nonmetallic brush.
- Stubborn stains may be removed with a cloth dampened with a mild detergent solution. Do not use strong solvents.

FAN MOUNTING

- Re-torque all fasteners (1/2-13 Grade 8 [98 ft–lb or 133 Nm], 5/16-18 Grade 8 [29 ft–lb or 39 Nm]).
- Check the fan, including mounting supports, to make sure all hardware is tight and shows no wear and tear.

CABLES

- Re-torque clamps.
- Check for fraying or wear.

GEAR REDUCER

- Check for oil leaks. If leaks are present, contact factory.
- Check oil level. The oil type is marked on the gear case. Add oil if necessary.

MOTOR

- Check motor for accumulated dust and dirt. Remove using a brush or compressed air.

FAN CONTROLLER

- Examine all terminal connections inside the VFD control box. Tighten any loose connections.

⚠ WARNING

When cleaning or attempting to re-torque, always follow lockout/ tagout procedures (see page 5).

- Use compressed air at 90 – 100 psi (621 – 689 kPa) to blow loose debris and dust out of the VFD enclosure.

FAN NOISE

Rave™ Fans are engineered to utilize the full output of a 1 hp (.75 kW) motor. So while they are quiet, they do generate noise. The noise can be characterized in these ways:

- Low-pitched “rumbling” noise is commonly from the gearcase. It will change pitch as the fan increases in speed. Once the fan reaches a set speed, the rumbling noise should turn to white noise and blend into its environment. Refer to SPECIFICATIONS on page 10 for the sound level operating range.
- High-pitched noise is typically electrical noise. This is the noise that many people will detect. It is caused by the frequency drive creating power for the fan motor, and it will always be present with a motor that is controlled by a variable-frequency drive. Simple programming allows this to be adjusted to a level that is acceptable. Field adjustments should be made during electrical installation with feedback from the customer.
- Wind noise will be present because the fan is moving a high volume of air. This will be more evident if there are obstructions to the airflow.
- The attachment hardware sometimes causes vibration noise. Take the necessary steps to identify and eliminate the vibration.

MAXIMUM SPEED CHANGES – SCHNEIDER ELECTRIC VFD

The maximum speed of the motor is limited by VFD parameters HSP and tFr. To ensure reliable operation in all applications, HSP is set to 60 at the factory.

To increase the maximum allowable fan speed, ensure that tFr is set to 70, and change the value of HSP to no more than 70.

The actual fan speed for each set point is determined by the values in parameters SP2 through SP8. See SPEED CONTROL STATION on page 22 to change speed set points.

Increasing fan speed may cause the VFD to fault in many applications. If this occurs, reduce the value of HSP.

As a reference, motor current is displayed in parameter LCr. When increasing speed, verify that LCr does not exceed the motor nameplate FLA.

Increasing blade speed will cause the blade tips to rise higher during operation. Ensure adequate overhead clearance before increasing speed.

TROUBLESHOOTING

MOTOR WOBBLE

Ensure all hardware is tight.

Ensure stabilization cables are taunt.

Ensure the motor bracket is installed vertical.

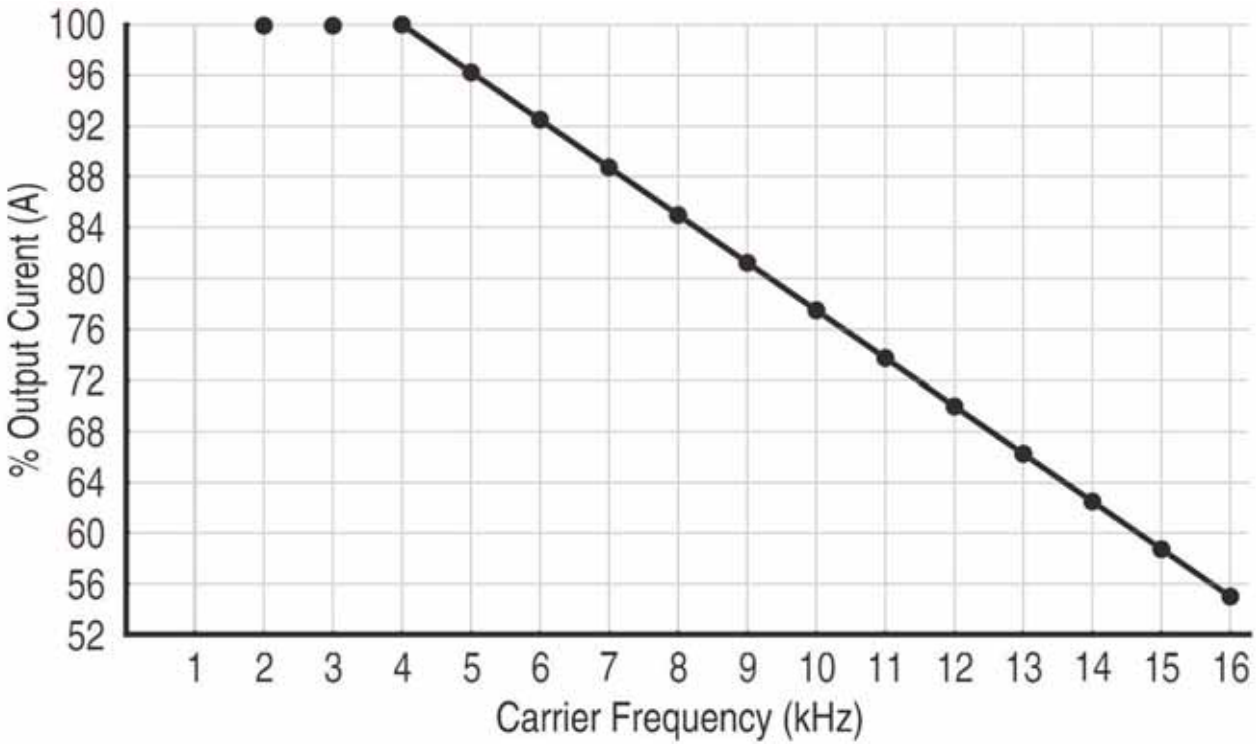
Tighten all mounting hardware and secure in the vertical position by tightening the appropriate stabilization cable.

HIGH-FREQUENCY MOTOR NOISE

When installing a fan in an abnormally quiet area, one may notice a high frequency noise from the motor. This noise is the VFD's carrier frequency. By default, the carrier frequency is set at 4 kHz to maximize the performance of the drive. To decrease audible noise on an Allen-Bradley drive, the carrier frequency (A091) may be increased up to 16 kHz. However, increasing the carrier frequency above 4 kHz results in decreased drive performance. Adjust this setting only as high as necessary to mitigate the objectionable noise.

For optimal performance and component life, the maximum fan speed (P035) should be limited such that the output current (d003) does not exceed the drive rated current times the derate percentage indicated below.

When increasing carrier frequency (SFr) on a Schneider drive, limit maximum speed (HSP), such that motor current (LCr) does not exceed the derated drive output current.



TROUBLESHOOTING

SPEED CONTROLLER

1. Verify proper DIP switch settings.
   For most applications, both DIP switches should be off (as shown).

   If your fan uses a Schneider Alitvar 12 VFD (model number on front of VFD starts with ATV12*), the “HALF SPEED” DIP switch on the top must be switched to the ON position.

2. If the VFD is an Allen-Bradley, verify that 24 VDC is present at the enable terminal. Using a DMM (Digital MultiMeter), set to DC Volts; measure the voltage between terminals 4 and 1 on the VFD. If 24 VDC is not measured, a fire suppression system may be preventing the fan from operating. Add a temporary jumper between 1 and 11 to bypass fire suppression (if installed) and enable the VFD.

3. The speed controller is powered by 24 VDC, supplied by the VFD.
   Using a DMM (Digital MultiMeter), set to DC Volts; measure the voltage between the COM and 24VDC terminals on the back of the speed controller.
   If this voltage is less than 22 VDC, check wiring for a short or open circuit.

4. The speed controller uses discrete outputs to communicate speed to the VFD.
   Each output is either on or off, and can be easily measured with a digital multimeter (set to measure DC Volts) at the terimals on the back of the speed controller.
   If the voltage from output to COM is less than 5 VDC, the output is off.
   If the voltage from output to COM is greater than 20 VDC, the output is on.
   If the voltage is between 5 VDC and 20 VDC, check wiring for a short or open circuit.
   At the slowest speed (one LED illuminated), in the forward direction (default at power up), the speed controller should have the following outputs:

SPEED1:	ON	(COM to SPEED1 > 20VDC)
SPEED2:	ON	(COM to SPEED1 > 20VDC)
SPEED3:	ON	(COM to SPEED1 > 20VDC)
FORWARD:	ON	(COM to SPEED1 > 20VDC)
REVERSE:	OFF	(COM to SPEED1 < 5VDC)

   If the correct voltages are measured, the speed controller is sending the proper signal, but the VFD is not receiving or interpreting the signal. Skip to Step 5.

   If the correct voltage is not observed, remove the wires from SPEED1, SPEED2, SPEED3, FORWARD, and REVERSE. With output wires disconnected, repeat the measurements at the terminals on the back of the speed controller.

   If correct voltages are still not measured, you may have a bad speed controller. Call Rite-Hite Customer Service.

   If correct voltages are measured with the output wires disconnected, a wiring error or short in the cable is likely causing the voltage to drop.

Verify that each wire is terminated at the proper VFD terminal.

With both ends of the cable disconnected and isolated, verify with a DMM that there is no continuity (open circuit indication in “ohms” mode) between conductors, and no continuity between any conductor and ground.

5. If the speed controller appears to be functioning properly, but the fan is not operating properly, the VFD may not be receiving the proper signal. With a DMM, measure the voltage at each corresponding VFD input:

I/O Check: Set fan to slowest speed (1 LED), Forward direction

Speed Controller Terminals	Proper DC Voltage at output of Speed Controller	AB Powerflex 40 Terminals	Proper DC Voltage at inputs of AB PowerFlex 40 VFD	Schneider Altivar Terminals	Proper DC Voltage at inputs of Schneider Altivar VFD
SPEED1:	(COM to SPEED1 > 20VDC)	7	(4 to 7 > 20VDC)	LI2	(COM to LI2 > 20VDC)
SPEED2:	(COM to SPEED1 > 20VDC)	6	(4 to 6 > 20VDC)	LI3	(COM to LI3 > 20VDC)
SPEED3:	(COM to SPEED1 > 20VDC)	5	(4 to 5 > 20VDC)	LI4	(COM to LI4 > 20VDC)
FORWARD:	(COM to SPEED1 > 20VDC)	2	(4 to 2 > 20VDC)	LI1	(COM to LI1 > 20VDC)

If the proper voltage is present at the speed controller, but not at the VFD, a wiring error or break in the cable is likely. Verify connections and test cable for continuity.

If the proper voltage is present at the VFD, but the VFD is not running at the commanded speed (10 Hz, forward), a parameter setting may have been changed. Go to Step 6.

6. The speed controller uses three VFD inputs to select a preset speed. The actual speed value (in Hz) corresponding to each preset speed is stored in the VFD parameters.
For example, when the speed controller displays six LEDs (Speed 6), it turns on input 6 (AB VFD). When the VFD sees input 6 on, with inputs 5 and 7 off, it runs the fan at the speed stored in parameter A072 (52 Hz by default).

Rotational direction is determined by the Forward and Reverse signals. For the previous example, the fan will run forward if VFD input 2 is on. If VFD input 3 is on, it will run in reverse.

If neither input is on, the fan will not operate.

Using a DMM, step through each of the seven speed settings and verify the proper input states. Check for swapped wires if the input states do not match the following table.

TROUBLESHOOTING

		AB PowerFlex 40				Schneider Altivar 12/312			
		VFD Input Terminal			Speed	VFD Input Terminal			Speed
Set Speed	Hz	7	6	5	Preset	LI2	LI3	LI4	Preset
Speed 7	60	OFF	OFF	ON	A071	OFF	OFF	ON	SP2
Speed 6	52	OFF	ON	OFF	A072	OFF	ON	OFF	SP3
Speed 5	44	OFF	ON	ON	A073	OFF	ON	ON	SP4
Speed 4	35	ON	OFF	OFF	A074	ON	OFF	OFF	SP5
Speed 3	26	ON	OFF	ON	A075	ON	OFF	ON	SP6
Speed 2	18	ON	ON	OFF	A076	ON	ON	OFF	SP7
Speed 1	**10**	ON	ON	ON	A077	ON	ON	ON	SP8

If all the I/O states match the table, it is possible the preset parameters were changed in the VFD. Verify that each preset matches the desired speed (i.e., A071 = 60 Hz, A072 = 52 Hz, etc.).

7. If any parameters have been changed from the factory settings, the speed controller may not work properly.
   Verify the following Allen-Bradley parameter settings:

   P034 = 10 P035 = 60 P036 = 2 P038 = 4 A051 = 4 A052 = 4 A053 = 4

   Verify the following Schneider parameter settings:

   FUn- PSS- PS2 = L4H/LI4 FUn- PSS- PS4 = L3H/LI3 FUn- PSS- PS8 = L2H/LI2

SCHNEIDER ELECTRIC FREQUENCY DRIVE

<table>
<tr><th>Problem</th><th>Cause</th><th>Resolution</th></tr>
<tr><td rowspan="5">Display on Frequency drive does not light up.</td><td>No power to control box</td><td>Use voltage meter on AC setting to determine if there is incoming power. Measure across L1/L2, L2/L3, L1/L3. All readings should be within 2 volts.</td></tr>
<tr><td>Loose wires</td><td>Check for loose wires along path at locations where readings change.</td></tr>
<tr><td>Check fuses to make sure they are good</td><td>Replace if necessary.</td></tr>
<tr><td>Check to make sure load switch is turned to on</td><td>Turn to ON position.</td></tr>
<tr><td>Frequency drive failure</td><td>Consult factory.</td></tr>
<tr><td rowspan="5">Display on Frequency drive lights up but fan not does run.</td><td>No start command given</td><td>Turn fan control switch off and then back on.</td></tr>
<tr><td rowspan="2">Loose wire</td><td>Check for loose wires at frequency drive and switch.</td></tr>
<tr><td>Check for loose jumper wire between LI4 and 24 on frequency drive.</td></tr>
<tr><td>Stop signal from fire protection system</td><td>If fan is wired to shut off with fire protection system, verify that fan is not getting signal to shut down from fire protection system. Test this by installing jumper wire between LI4 and 24 and turning fan control switch off and then on. If fan starts, check the fire protection system.</td></tr>
<tr><td>Reset from fault</td><td>Turn fan load switch off. Wait for 30 seconds, and then turn back on. Turn fan control switch off and then back on.</td></tr>
<tr><td>VFD program set for membrane switch controls and not separate control switches</td><td>If you are using the membrane switch shown in Figure 15, settings should be already set to the parameters below.
<table>
<tr><th>Menu</th><th>Parameter</th><th>Description</th><th>Value</th></tr>
<tr><td>FUn-</td><td>PSS-PS2</td><td>Preset Speed Bit</td><td>LI4</td></tr>
<tr><td>FUn-</td><td>PSS-PS4</td><td>Preset Speed Bit</td><td>LI3</td></tr>
<tr><td>FUn-</td><td>PSS-PS8</td><td>Preset Speed Bit</td><td>LI2</td></tr>
<tr><td>I-O-</td><td>rrS</td><td>Reverse Direction</td><td>LI5</td></tr>
</table></td></tr>
</table>

SCHNEIDER ELECTRIC FREQUENCY DRIVE

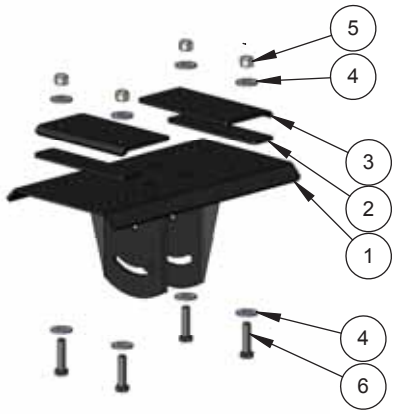
<table>
<tr><th>Problem</th><th>Cause</th><th>Resolution</th></tr>
<tr><td>Display on Frequency drive lights up but fan not does run. (continued)</td><td>VFD program set for membrane switch controls and not separate control switches (continued)</td><td>If you are using analog control switches, settings must be set to the parameters below.
<table>
<tr><th>Menu</th><th>Parameter</th><th>Description</th><th>Value</th></tr>
<tr><td>FUn-</td><td>PSS-PS2</td><td>Preset Speed Bit</td><td>nO</td></tr>
<tr><td>FUn-</td><td>PSS-PS4</td><td>Preset Speed Bit</td><td>nO</td></tr>
<tr><td>FUn-</td><td>PSS-PS8</td><td>Preset Speed Bit</td><td>nO</td></tr>
<tr><td>I-O-</td><td>rrS</td><td>Reverse Direction</td><td>LI2</td></tr>
</table></td></tr>
<tr><td rowspan="6">Frequency drive starts faults when fan starts.</td><td>Power Loss</td><td>Monitor incoming lines for low power or power up to a fault code or interruption.</td></tr>
<tr><td rowspan="2">USF Line Supply Under Voltage</td><td>Monitor incoming power lines for low power or power interruption.</td></tr>
<tr><td>Power down completely and restart.</td></tr>
<tr><td>OSF Line Supply Over Voltage</td><td>Monitor incoming power lines for high line voltage or transient conditions. Install step down transformer if voltage is high. Activate A092 / A093 if spikes are random and it is acceptable for the fan to restart itself from this fault.</td></tr>
<tr><td rowspan="3">OLF Motor Overload</td><td>Current trip was activated by something that physically stopped the fan movement. Check the fan for damage. Restart if no damage is found. Consult factory if damage is found.</td></tr>
<tr><td>This indicates the motor is drawing too much current. Check drive reading on LCR. This should not read more than FLA for the motor (3.2A@460V or 6.3A@230V). Under normal conditions this will not occur.</td></tr>
<tr><td>Count fan revolutions at 30 Hz. Verify that the revolutions per minute are approximately:
24' (7320 mm) fan = 25 rpm
20' (6100 mm) fan = 29 rpm
16' (4880 mm) fan = 35 rpm
12' (3660 mm) fan = 50 rpm
8' (2440 mm) fan = 75 rpm
If the fan rotates at a different speed than above, check the gearbox label to ensure the wrong size blades were not installed on the fan.</td></tr>
</table>

SCHNEIDER ELECTRIC FREQUENCY DRIVE

Problem	Cause	Resolution
Frequency drive starts faults when fan starts (continued).	OLF Motor Overload (continued)	Check to ensure motor wiring matches voltage provided.
		Check to make sure all blades are locked in at the same angle, and that one or more did not turn.
		Check input fuses to make sure that they are all good.
	Motor winding short	Disconnect wires going to motor from control box. Measure ohms across wires U/V, U/W, and V/W. All readings should be within 1 ohm. If readings are not close, you will need to repeat this test at the motor junction box.
	Gearbox issues	Spin the fan blades by hand. Listen for any irregular noises that could be related to gear issues. Consult factory if irregular noises are present.
	Incoming / Outgoing wiring not separated	Run incoming wire and outgoing wiring in separate conduit a minimum of 6 in. (150 mm) apart.

PARTS

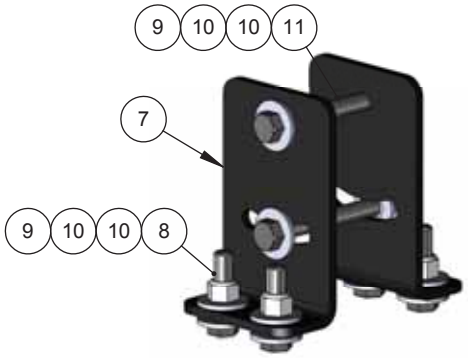
BRACKETING & HOUSING



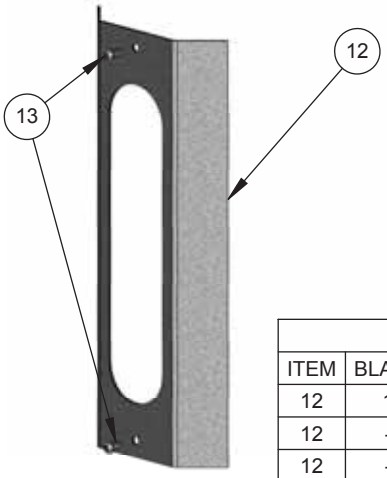
PART NUMBER	DESCRIPTION
14501232	BRKT,ASSY,SWVL,CLNG,FAN,BK
14501233	BRKT,ASSY,SWVL,CLNG,FAN,GY
14501234	BRKT,ASSY,SWVL,CLNG,FAN,WH

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
1	1	-	-	14501229	BRKT,WLDMNT,SWVL,FAN,BK
1	-	1	-	14501230	BRKT,WLDMNT,SWVL,FAN,GY
1	-	-	1	14501231	BRKT,WLDMNT,SWVL,FAN,WH
2	2	-	-	65000770	PLATE,SHIM,MNT,FAN,BK
2	-	2	-	65000771	PLATE,SHIM,MNT,FAN,GY
2	-	-	2	65000772	PLATE,SHIM,MNT,FAN,WH
3	2	-	-	65000776	PLATE,CLAMP,MNT,FAN,BK
3	-	2	-	65000777	PLATE,CLAMP,MNT,FAN,GY
3	-	-	2	65000778	PLATE,CLAMP,MNT,FAN,WH
4	8	8	8	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
5	4	4	4	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
6	4	4	4	67900062	SCR,HHMS,1/2-13X2,GRD8,ZNC

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
7	2	-	-	14501217	BRKT,MNT,HOUSING,SWVL,FAN,BK
7	-	2	-	14501218	BRKT,MNT,HOUSING,SWVL,FAN,GY
7	-	-	2	14501219	BRKT,MNT,HOUSING,SWVL,FAN,WH
8	4	4	4	67900062	SCR,HHMS,1/2-13X2,GRD8,ZNC
9	6	6	6	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
10	12	12	12	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
11	2	2	2	67900059	SCR,HHMS,1/2-13X4-1/2,GR8,ZNC



PART NUMBER	DESCRIPTION
14501243	BRKT,ASSY,SWVL,HOUSING,FAN,BK
14501244	BRKT,ASSY,SWVL,HOUSING,FAN,GY
14501245	BRKT,ASSY,SWVL,HOUSING,FAN,WH



MOTOR HOUSING COVER & SCREWS					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
12	1	-	-	17900194	CVR,HOUSING,MOTOR,RAVE,BK
12	-	1	-	17900195	CVR,HOUSING,MOTOR,RAVE,GY
12	-	-	1	17900196	CVR,HOUSING,MOTOR,RAVE,WH
13	2	2	2	67870127	SCR,BHMS,SCKT,5/16-18X5/8,BLK

MOTOR ASSEMBLY

1001.XXX MOT,ASSY,RAVE,W/VOLTAGE

PART NUMBER	DESCRIPTION	FINISH
67820002	SCREEN,ABS,CHROME PLATED	CHROME PLATE
67820001	SCREEN,ABS,PNTD SILVER	SILVER PAINT

BLADES, CLEVIS COVERS, & HUB PARTS

PART NUMBER	DESCRIPTION	FINISH
12510007	BLADE,SET(2),RAVE,8',MILL	MILL FIN
12510004	BLADE,SET(2),RAVE,8',POLISHED	POLISHED

PART NUMBER	DESCRIPTION	FINISH
12510005	BLADE,SET(2),RAVE,10',POLISHD	POLISHED
12510008	BLADE,SET(2),RAVE,10',MILL	MILL FIN

PART NUMBER	DESCRIPTION	FINISH
12510006	BLADE,SET(2),RAVE,12',POLISHD	POLISHED
12510009	BLADE,SET(2),RAVE,12',MILL	MIL FIN

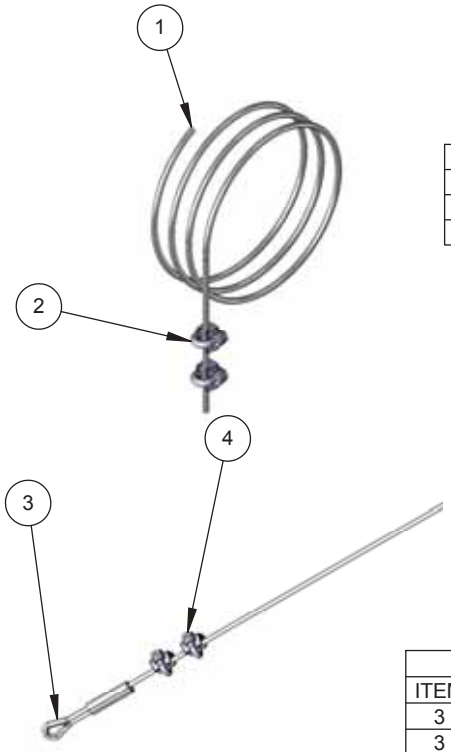
53760006
KIT,BLD,SCR/NUT,22MMX102MM,AL

PART NUMBER	DESCRIPTION	FINISH
17900198	CVR,CLEVIS,HUB,RAVE,MILL	MILL
17900199	CVR,CLEVIS,HUB,RAVE,POL	POL

67870128
SCR,SHCS,AL,5/16-18X1/2,NYL,SS

PART NUMBER	DESCRIPTION	FINISH
17900200	CVR,HUB,DOME,RAVE,CHROME	CHROME PLATED
17900202	CVR,HUB,DOME,RAVE,PNT	SILVER PAINT

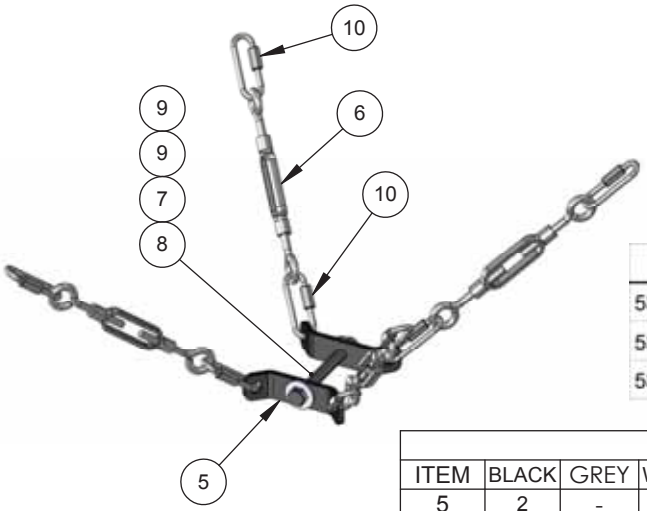
STABILIZATION & SAFETY



15700022 CABLE,ASSY,SAFETY,84"			
ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	15700029	CABLE,AIRCRAFT,GLV,1/4,84"
2	2	16700057	CLAMP,CABLE,ZINC,1/4,SNGL SAD

PART NUMBER	DESCRIPTION
15700024	CABLE,ASSY,STABILIZATION,120"
15700023	CABLE,ASSY,STABILIZATION,240"
15700027	CABLE,ASSY,STABILIZATION,420"

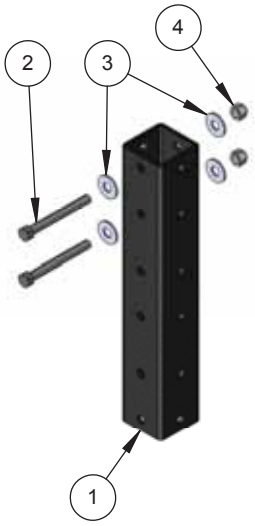
SEE TABLE					
ITEM	120"	240"	420"	PART NUMBER	DESCRIPTION
3	4	-	-	15700026	CABLE,AIRCRAFT,GLV,1/4,120"
3	-	4	-	15700025	CABLE,AIRCRAFT,GLV,1/4,240"
3	-	-	4	15700280	CABLE,AIRCRAFT,GLV,1/4,420"
4	8	8	8	16700057	CLAMP,CABLE,ZINC,1/4,SNGL SAD



PART NUMBER	DESCRIPTION
53760003	KIT,STABILIZATION,HARDWARE,RAVE,BK
53760004	KIT,STABILIZATION,HARDWARE,RAVE,GY
53760005	KIT,STABILIZATION,HARDWARE,RAVE,WH

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
5	2	-	-	14501226	BRKT,CABLE,STABLE,RAVE,BK
5	-	2	-	14501227	BRKT,CABLE,STABLE,RAVE,GY
5	-	-	2	14501228	BRKT,CABLE,STABLE,RAVE,WH
6	4	4	4	73950012	TURNBUCKLE,3/8X3,EYE-EYE,ZINC
7	1	1	1	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
8	1	1	1	67900061	SCR,HHMS,1/2-13X5,GRD8,ZNC
9	2	2	2	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
10	8	8	8	54400032	LINK,QUICK,1/4,ZNC

EXTENSION TUBES



PART NUMBER	DESCRIPTION
44750008	EXTN,ASSY,FAN,18",WH
44750007	EXTN,ASSY,FAN,18",GY
44750006	EXTN,ASSY,FAN,18",BK

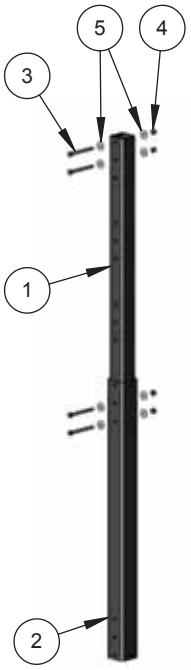
SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
1	1	-	-	44750003	EXTN,TUBE,18",BK
1	-	1	-	44750004	EXTN,TUBE,18",GY
1	-	-	1	44750005	EXTN,TUBE,18",WH
2	2	2	2	67900059	SCR,HHMS,1/2-13X4-1/2,GR8,ZNC
3	4	4	4	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
4	2	2	2	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z

PART NUMBER	DESCRIPTION
44750031	EXTN,ASSY,FAN,30",GY
44750030	EXTN,ASSY,FAN,30",BK
44750032	EXTN,ASSY,FAN,30",WH

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
5	1	-	-	44750027	EXTN,TUBE,3X30",BK
5	-	1	-	44750028	EXTN,TUBE,3X30",GY
5	-	-	1	44750029	EXTN,TUBE,3X30",WH
6	2	2	2	67900059	SCR,HHMS,1/2-13X4-1/2,GR8,ZNC
7	2	2	2	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
8	4	4	4	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC

EXTENSION TUBES

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
1	1	-	-	44750009	EXTN,TUBE,3X48",BK
1	-	1	-	44750010	EXTN,TUBE,3X48",GY
1	-	-	1	44750011	EXTN,TUBE,3X48",WH
2	1	-	-	44750012	EXTN,TUBE,3.5X46.5",BK
2	-	1	-	44750013	EXTN,TUBE,3.5X46.5",GY
2	-	-	1	44750014	EXTN,TUBE,3.5X46.5",WH
3	4	4	4	67900061	SCR,HHMS,1/2-13X5,GRD8,ZNC
4	4	4	4	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
5	8	8	8	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC



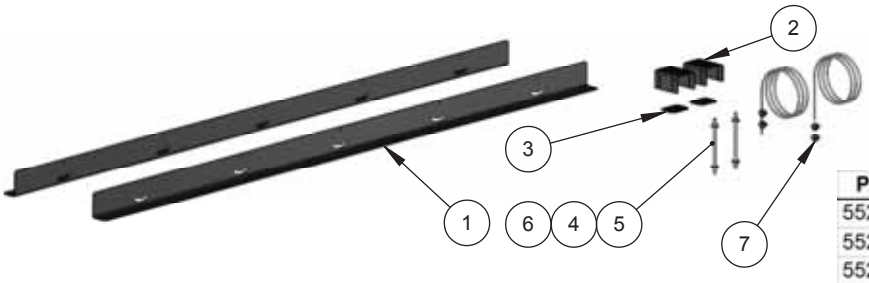
PART NUMBER	DESCRIPTION
44750015	EXTN,ASSY,FAN,84",BK
44750017	EXTN,ASSY,FAN,84",WH
44750016	EXTN,ASSY,FAN,84",GY

PART NUMBER	DESCRIPTION
44750025	EXTN,ASSY,FAN,240",GY
44750024	EXTN,ASSY,FAN,240",BK
44750026	EXTN,ASSY,FAN,240",WH

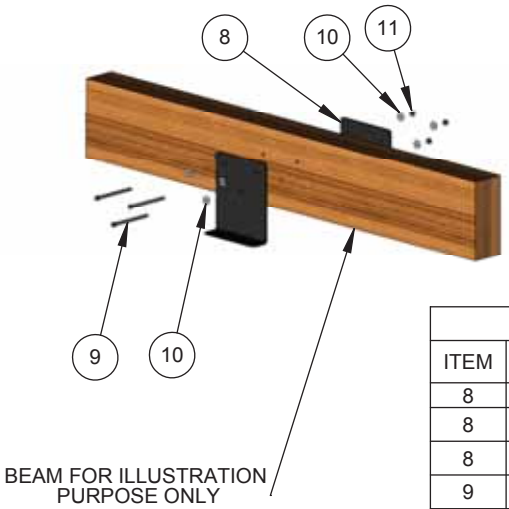
SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
6	1	-	-	44750021	EXTN,TUBE,3.5X144",BK
6	-	1	-	44750022	EXTN,TUBE,3.5X144",GY
6	-	-	1	44750023	EXTN,TUBE,3.5X144",WH
7	1	-	-	44750018	EXTN,TUBE,3X144",BK
7	-	1	-	44750019	EXTN,TUBE,3X144",GY
7	-	-	1	44750020	EXTN,TUBE,3X144",WH
8	4	4	4	67900061	SCR,HHMS,1/2-13X5,GRD8,ZNC
9	4	4	4	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
10	8	8	8	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC

TRUSS SUPORT & LAMINATED BEAM BRACKET

SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
1	2	-	-	14501220	BRKT,MNT,TRUSS,FAN,BK
1	-	2	-	14501221	BRKT,MNT,TRUSS,FAN,GY
1	-	-	2	14501222	BRKT,MNT,TRUSS,FAN,WH
2	2	-	-	14501223	BRKT,CLAMP,TRUSS,FAN,BK
2	-	2	-	14501224	BRKT,CLAMP,TRUSS,FAN,GY
2	-	-	2	14501225	BRKT,CLAMP,TRUSS,FAN,WH
3	2	-	-	65000782	PLATE,CLAMP,TRUSS,FAN,BK
3	-	2	-	65000783	PLATE,CLAMP,TRUSS,FAN,GY
3	-	-	2	65000784	PLATE,CLAMP,TRUSS,FAN,WH
4	4	4	4	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z
5	2	2	2	67900064	ROD,THRD,1/2-13X10",FLTD,STNLS
6	4	4	4	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
7	2	2	2	15700022	CABLE,ASSY,SAFETY,84"



PART NUMBER	DESCRIPTION
55290015	MOUNT,ASSY,TRUSS,FAN,BK
55290016	MOUNT,ASSY,TRUSS,FAN,GY
55290017	MOUNT,ASSY,TRUSS,FAN,WH



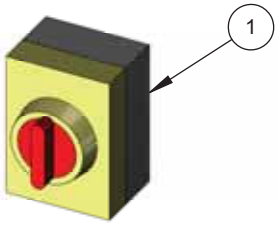
PART NUMBER	DESCRIPTION
14501240	BRKT,ASSY,MNT,LAM BEAM,FAN,WH
14501238	BRKT,ASSY,MNT,LAM BEAM,FAN,BK
14501239	BRKT,ASSY,MNT,LAM BEAM,FAN,GY

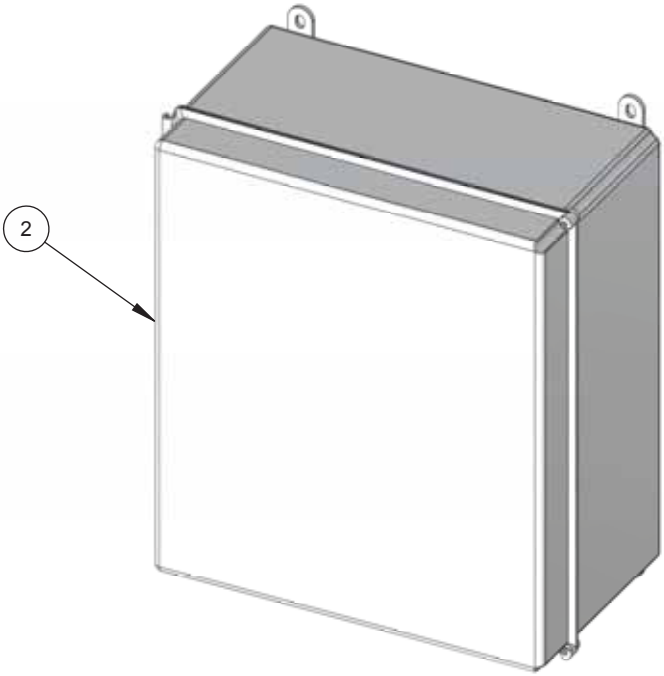
SEE TABLE					
ITEM	BLACK	GREY	WHITE	PART NUMBER	DESCRIPTION
8	2	-	-	14501235	BRKT,MNT,LMNTD BEAM,FAN,BK
8	-	2	-	14501236	BRKT,MNT,LMNTD BEAM,FAN,GY
8	-	-	2	14501237	BRKT,MNT,LMNTD BEAM,FAN,WH
9	3	3	3	67900063	SCR,HHMS,1/2-13X8,GRD8,ZNC
10	6	6	6	74150001	WSHR,FLAT,1/2X1-3/8X7/64,ZNC
11	3	3	3	55650021	NUT,HEX,NYL LOCK,1/2-13,GR8,Z

CONTROLS

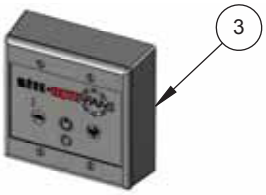
ITEM	PART NUMBER	DESCRIPTION
1	38400010	DISC,RTRY,MOT,25A
2	1752.XX	CBOX,[MODEL],[X]HP,[XXX]V,[X]PH,[BRAND]
3	72700260	SW,ASSY,RH FAN
4	17900188	CVR,FAN CONTROL, LOCKING
5	SEE TABLE	REACTOR,LINE,[XXX]VAC,[X]A

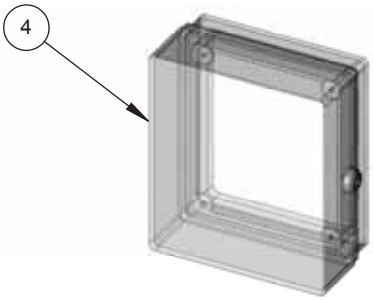
CONTROL BOXES



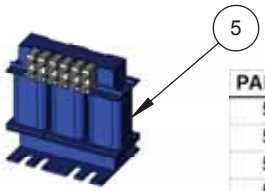


FAN SPEED CONTROLLER





LINE REACTOR



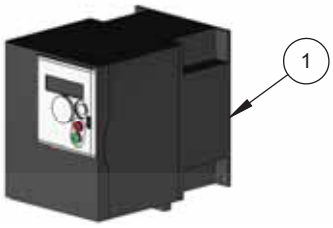
PART NUMBER	DESCRIPTION
55150174	REACTOR,LINE,460-480VAC,4A
55150175	REACTOR,LINE,208-230VAC,8A
55150179	REACTOR,LINE,575VAC,4A
55150044	REACTOR,LINE,400-575VAC,2A

GRAPHICAL REPRESENTATION. ACTUAL SIZE VARIES.

CONTROLS
(CONT'D)

ITEM	PART NUMBER	DESCRIPTION
1	SEE TABLE	INV,[X]HP,[XXX]V,[X]PH,ATV[XXX]
2	53300062	INV,EMC PLATE W/CLAMPS,SIZE 1
3	53300063	INV,EMC PLATE W/CLAMPS,SIZE 2
4	SEE TABLE	CB FAN CMNDR [TYPE]
5	16960089	CONN,RJ-45, 2-PIN TERMINALS
6	15650299	CABLE,RS485,MODBUS,1000FT
7	76210072	OPT,FAN,WIND SPEED CONTROL
7.1	17500023	CTRLR,WIND SWITCH,9-36V
7.2	68900009	SENSOR,ANEMOMETER

REPLACEMENT INVERTERS

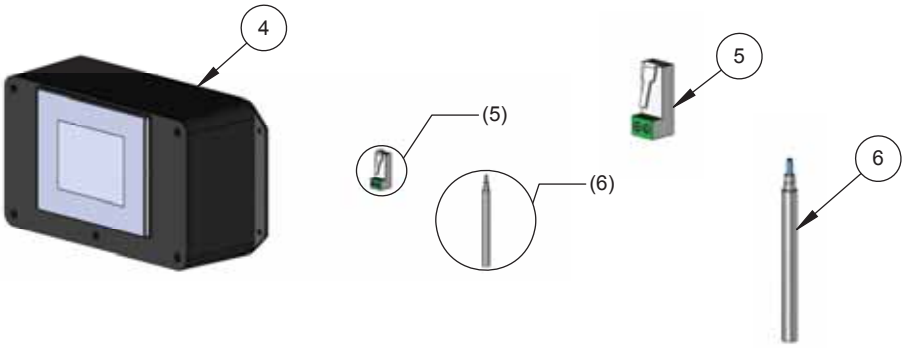


PART NUMBER	DESCRIPTION
53300055	INV,1HP,110V,1PH,ATV 12
53300056	INV,1HP,220V,1PH,ATV 12
53300057	INV,1HP,230V,3PH,ATV 12
53300058	INV,1HP,400V,3PH,ATV 312
53300059	INV,1HP,460V,3PH,ATV 312
53300060	INV,1HP,575V,3PH,ATV 312

EMC PLATES, (SCHNEIDER)

FAN COMMANDER

PART NUMBER	DESCRIPTION
135197	CB FAN CMNDR STD
135198	CB FAN CMNDR ETHRNT
135199	CB FAN CMNDR RELAY



WIND SPEED CONTROL

NOTE:
ITEM 7 (76210072, OPT,FAN,WIND SPEED CONTROL)
INCLUDES BOTH 7.1 & 7.2

NOTES

NOTES

RITE-HITE® WARRANTY

RITE-HITE® WARRANTY

RITE-HITE® warrants that its **Rave™ Fan**, will be free from defects in design, materials and workmanship for a period of three (3) years parts and three (3) year labor from the date of shipment. All claims for breach of this warranty must be made within thirty (30) days after the defect is or can, with reasonable care, be discovered to be entitled to the benefits of this warranty, the products must have been properly installed, maintained, operated within their rated capacities, and not otherwise abused. Periodic lubrication and adjustment is the sole responsibility of the owner. This warranty is RITE-HITE® exclusive warranty. RITE-HITE® EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. Non-standard RITE-HITE® warranties, if any, must be specified by RITE-HITE in writing.

In the event of any defects covered by this warranty, RITE-HITE® will remedy such defects by repairing or replacing any defective equipment or parts, bearing all of the costs for parts, labor, and transportation. This shall be the exclusive remedy for all claims whether based on contract negligence or strict liability. Neither RITE-HITE®, ANY OTHER MANUFACTURER WHOSE PRODUCTS ARE THE SUBJECT OF THIS TRANSACTION, NOR ANY RITE-HITE® REPRESENTATIVE, SHALL IN ANY EVENT BE LIABLE FOR ANY LOSS OR USE OF ANY EQUIPMENT OR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHETHER FOR BREACH OF WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. The application of a manufacturer's specifications to a particular job is the responsibility of the purchaser. RITE-HITE® SHALL NOT IN ANY EVENT BE LIABLE FOR ANY LOSS OF THE USE OF ANY EQUIPMENT OR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND.

RITE® HITE

AFTERMARKET CORPORATION

8900 N. Arbon Drive
P.O. Box 23043
Milwaukee, Wisconsin 53223
Sales: 414-362-6377
Toll Free: 888-423-0789
In Europe: +31-(0)571-277505

Representatives in All Major Cities
www.ritehitefans.com

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