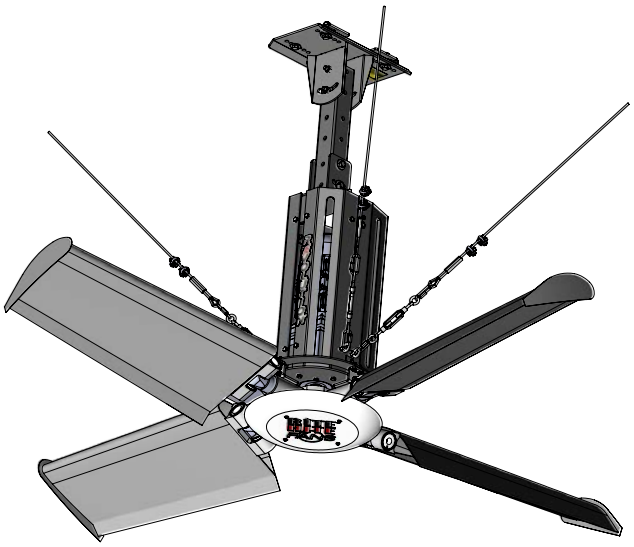
RITE-HITE®
ALWAYS LOOKING AHEAD

Revolution® HVLS Fan
Rogue® HVLS Fan

Installation/Service/Owner's Manual

This manual covers units shipped October 2017 to date.



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NOTICE TO USER

READ AND SAVE THESE INSTRUCTIONS.

Thank you for purchasing a Rite-Hite product.

The Revolution and Rogue Fans are high-volume/low-speed (HV/LS) industrial fans that provide more consistent air circulation and ventilation with better energy efficiency than traditional high-speed ceiling fans or industrial floor fans.

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

Rite-Hite reserves the right to substitute and/or modify parts and drawings (electrical and architectural) from those contained in this manual. Separate prints may be included with the unit.

For best results, have this product serviced by an authorized Rite-Hite representative.

A Planned Maintenance Program (P.M.P.), customized to your specific operation is available and recommended. For a P.M.P., contact your local Rite-Hite representative or Rite-Hite technical support at (U.S.) 1-563-589-2722, (S.A.) +55 21 99616 4421, (E.U.) +49-5693 98700.

The Rite-Hite® products in this manual are covered by one or more of the following U.S. patents: US76588232, US8622712, US8142156, D631536, US7726945 and may be covered by additional pending U.S. and foreign patent applications.

SAFETY

Safety Identifications

DANGER

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

Indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner la mort ou de graves blessures.

WARNING / AVERTISSEMENT

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

Indique une situation dangereuse qui, si elle n'est pas évitée, *peut entraîner la mort ou des blessures graves.*

CAUTION / ATTENTION

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

Indique une situation dangereuse qui, si elle n'est pas évitée, *peut entraîner des blessures légères à modérées.*

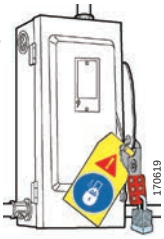
NOTICE

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

NOTE: A note is used to inform you of important installation, operation, or maintenance information

SAFETY

Lockout Procedure



Barricade work area and post safety warnings.

Power supply/control must:

- Be disconnected or locked in OFF position using a lockout device approved by local codes.
- Have signage that:
  - Clearly states repairs are being made.
  - Identifies person responsible for lockout condition.
    NOTE: Only this person should be able to remove warnings and lockout device.
  - Withstands environmental conditions (weather, wet, and damp, etc.) and remains readable.

General

DANGER

Installation to be completed in accordance with the National Electric Code, ANSI/NFPA 709-1999, and local codes.

L'installation doit être effectuée conformément au Code national de l'électricité, à la norme ANSI/NFPA 709-1999, et aux codes locaux.

DANGER

A qualified electrician should install the wiring in accordance with local electrical codes.

Use lockout procedures to prevent death or severe personal injury.

L'installation du câblage doit être effectuée par un électricien qualifié, conformément aux normes électriques nationales et locales.

Afin de réduire le risque de blessures graves ou mortelles, utilisez des procédures de verrouillage.

CAUTION / ATTENTION

Barricade the work area until the unit(s) have been completely installed.

Barricader la zone de travail jusqu'à ce que l'unité(s) ont été complètement installé.

WARNING / AVERTISSEMENT

Rotating fan blades can cause serious injury.

Les lames rotatif du ventilateur peut causer des blessures graves.

INSTALLATION

Components

Before installation, verify all components were received. Notify your Rite-Hite representative if parts are missing or damaged.

- 1 box: Motor, hub assembly, remote mounted control switch and disconnect switches. ≈ 160lb [73kg]
- 1 box: Mounting hardware and cables. ≈ 50lb [23kg]
- 1 box: Control box, ≈ 35lb [16kg]
- Revolution Fan: 2 boxes of fan blades (packed 2 per box/total of 4 blades). ≈ 50lb [23kg] per box

  Rogue Fan: 1 box of fan blades (packed 2 per box). ≈ 50lb [23kg] per box

Required Tools

2	7/16in wrenches	(1 can be socket/driver)
2	1/2in wrenches	
2	9/16in wrenches	
2	3/4in wrenches	
1	Vice grip	
2	Flat screwdrivers (large and small)	
1	Small standard screwdriver	
1	Medium Phillips screwdriver	
1	Torque wrench, minimum 200-ft-lb (270 Nm), 1/2in drive	
1	1/2in to 3/4in socket adapter	
1	1/2in socket extender	
1	Metric 7mm deep well socket – or Driver	
1	1/4in cable cutter	
4	Crimp on ring terminals, M4 (#8) stud, for motor wiring	
1	Torpedo level	
1	Drill and 1/2in drill bit. If mounting to support angles that span building joists	

Specifications

Diameter (Ø)	8ft, 12ft, 16ft, 20ft and 24ft [2440mm, 3660mm, 4880mm, 6100mm and 7320mm]
Blades	Aluminum
Blade Finish	Mill-finish standard, custom colors optional
# of Blades	2 (Rogue) or 4 (Revolution)
Watts	75 (@ 10Hz) to 1750 (@ 60Hz) Typical
Frequency	50/60 Hz
Coverage	Up to 22,000sq ft [2046m^2] 85ft [26m] from the fan's center in all directions
Decibels	40 to 63 dBA depending on fan speed (measured 20ft [6100mm] below and 20ft [6100mm] from the fan's center)
Air Speed	Up to 7mph [3m/s] at full speed
Controls	Variable speed
Mounting Heights	15ft - 80ft [5m - 24m] from finished floor to bottom of blade
Weight	300 lb [136 kg]

Revolution and Rogue Fan - 2 HP (1.5 kW)

Voltage		**230V 1Φ**	**230V 3Φ**	**400V 3Φ**	**480V 3Φ**	**575V 3Φ**
VFD FLA		13.3	9.6	6.4	4.8	4.2
Motor FLA		5.8	5.8	3.3	3.0	2.6
CBox Fuse Amps		20	15	10	10	6
Min. Service Amps		20	15	10	10	10
VFD Nominal HP		2	2	2	2	2
Maximum Number of Fans per Branch Circuit						
Branch Circuit Amps	15	NA	1	1	2	2
	20	1	1	2	3	3
	25	1	2	3	4	4
	30	1	2	3	5	5
	35	2	2	4	5	6
	40	2	3	5	6	7

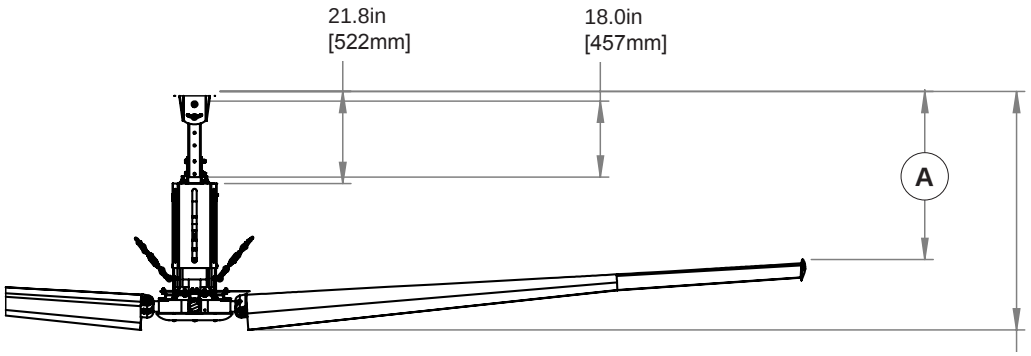
INSTALLATION

Specifications *Continued*

Fan Dimensions

"Figure 1" is shown with standard headroom.

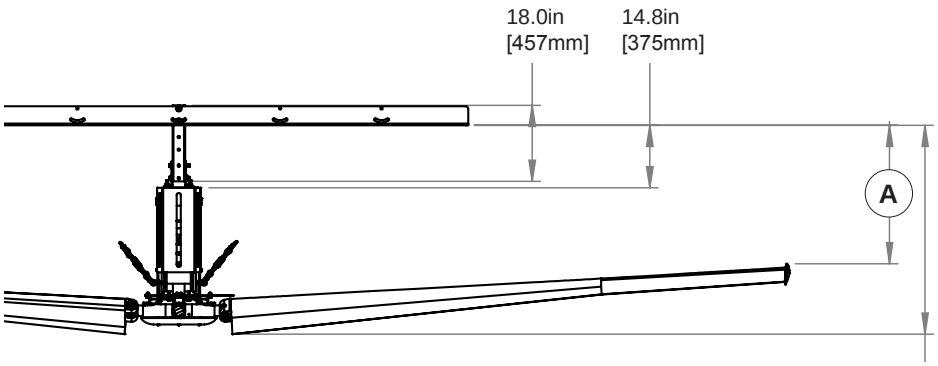
Beam Kit Mounted



Distance to Bottom of Blades:
55.25in [1403mm]

With Extension Tube removed:
41.75in [1060mm]

Truss Kit Mounted



Distance to Bottom of Blades:
48.8in [1240mm]

With Extension Tube removed:
34.3in [871mm]

			A = Distance to Blade Tip from Bracket/Truss*							
			Standard Headroom				Low Headroom			
			Beam Kit Mounted		Truss Kit Mounted		Beam Kit Mounted		Truss Kit Mounted	
Fan Ø ft [mm]	Speed RPM	Weight lb [kg]	At Rest in [mm]	Full RPM in [mm]	At Rest in [mm]	Full RPM in [mm]	At Rest in [mm]	Full RPM in [mm]	At Rest in [mm]	Full RPM in [mm]
8 [2440]	30-154	268 [122]	46 [1170]	46 [1170]	40 [1010]	40 [1020]	43 [1092]	43 [1092]	36 [920]	36 [920]
12 [3660]	18-98	276 [125]	44 [1120]	43 [1090]	37 [940]	36 [910]	43 [1092]	42 [1067]	36 [920]	35 [890]
16 [4880]	15-76	284 [129]	42 (1070]	39 [990]	35 [890]	32 [810]	43 [1092]	40 [1016]	36 [920]	33 [840]
20 [6100]	12-61	292 [133]	40 [1020]	35 [890]	33 [840]	28 [710]	43 [1092]	38 [965]	36 [920]	31 [785]
24 [7320]	10-53	300 [136]	38 [970]	31 [690]	31 [690]	24 [610]	43 [1092]	36 [914]	36 [920]	29 [735]

*Optional Extension Kit available to increase dimension from 18in [460mm] to 84in [2130mm]

Figure 1

INSTALLATION

Step 1 – Mounting Preparation

⚠ WARNING / AVERTISSEMENT

Mount directly to a structural framing member to reduce risk of fire, electric shock or injury.

Monter directement sur un membre de charpente pour réduire les risques d'incendie, d'électrocution ou de blessure.

NOTICE

For optimal/unrestricted air movement follow these guidelines:

If the ceiling support structure is a;

- Open-web design, take all hanging dimensions from the underside of the ceiling.
- Solid beam or solid channel, take all measurements from the bottom of the beam for the hanger dimension.

If the roof is pitched, this must be accounted for above the tips of the blades.

Fan Weight and Torque

NOTICE

The weight of the fan that will be suspended from the ceiling is ≈ 300lb [136.4kg] and will generate torque of up to 300ft-lb [407Nm].

Fan Clearance

NOTICE

Fan blades require safe clearance to operate.

The blades move upward to their operating position due to centrifugal force and air pressure.

Mount the fan according to **(Figure 1)**. Whenever possible allow 12in [305mm] additional clearance to existing obstructions.

Step 2 – Mounting

I-Beam (TYPICAL)

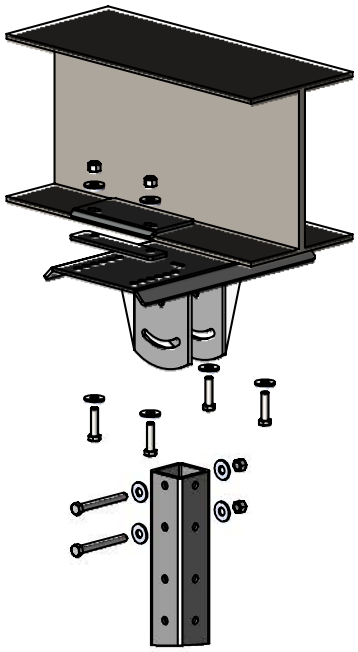


Figure 2

1. Mount fan directly to building support I-beam (6in – 13.5in [150mm – 350mm] wide) with provided brackets.
2. Clamp the brackets around the beam using the holes in the upper beam mounting bracket that are closest to the edge of the beam.

   NOTE: When the beam is larger than the bracket (greater than 13.5in [350mm] wide), clamp the bracket on 1 edge of the beam and drill holes through the beam to bolt the other side securely. Use only Grade 8 hardware.
3. Use a level to ensure the extension tube is hanging vertical.

INSTALLATION

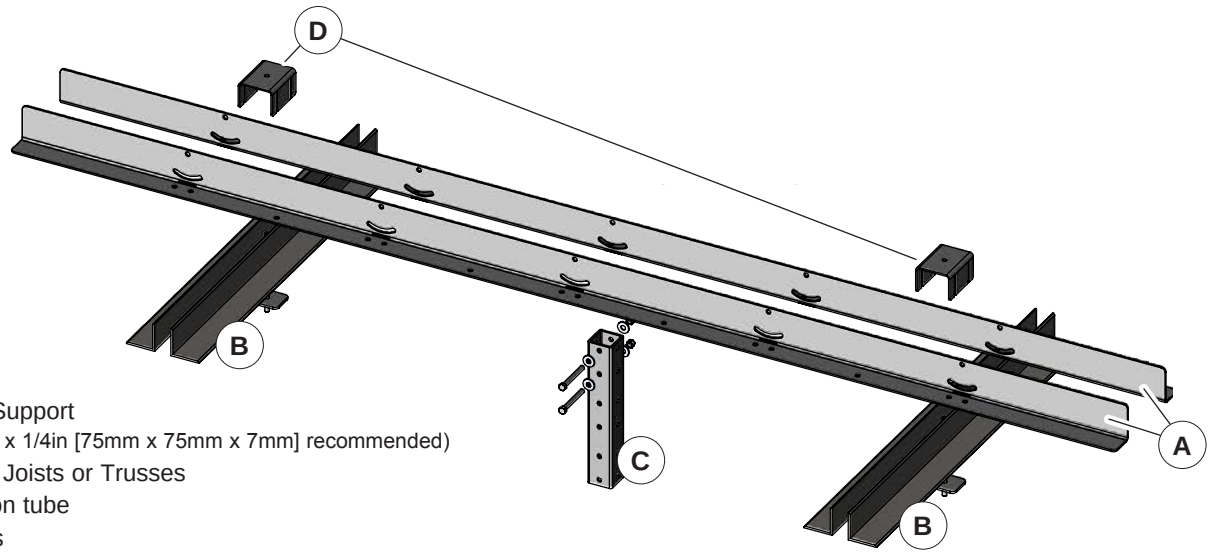
Step 2 – Mounting *Continued*

Ceiling Truss Kit (OPTIONAL)

⚠ WARNING / AVERTISSEMENT

Always mount the fan to 2 joists. 1 joist will not provide the rigidity and support necessary for the fan during operation, and may cause the fan to fall and cause injury.

Toujours monter le ventilateur sur deux solives. Une seule solive n'apportera pas la rigidité et le soutien nécessaire au ventilateur en marche ; cela pourrait entrainer la chute du ventilateur et causer des blessures.



A. Angles/Support
(3in x 3in x 1/4in [75mm x 75mm x 7mm] recommended)
B. Building Joists or Trusses
C. Extension tube
D. Brackets

Figure 3

1. Mount the angles to the building trusses/joists:
   - So fan can be hung using standard I-Beam mounting bracket **Figure 2 (page 6)** with a gap between the angles for the 3in x 3in [75mm x 75mm] drop tube.
   - Securely so the angles cannot move.
2. Use a level to ensure the extension tube is hanging vertical.

NOTE:

- I-beam ceiling brackets are not provided when a Ceiling Truss Kit is ordered.
- Several mounting positions have been cut into the angles for flexibility in positioning the fan.

INSTALLATION

Step 2 – Mounting *Continued*

Laminated Beam Kit (OPTIONAL)

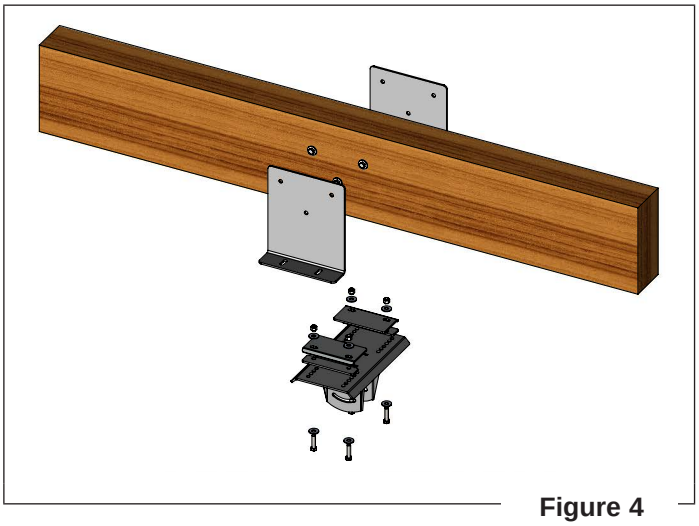


Figure 4

1. Through-bolt the laminated beam brackets with 1 bracket on each side of the laminated (or concrete) beam (**Figure 4**).
2. Attach the standard ceiling mounting bracket to this bracket in the normal manner.

Alternative Methods

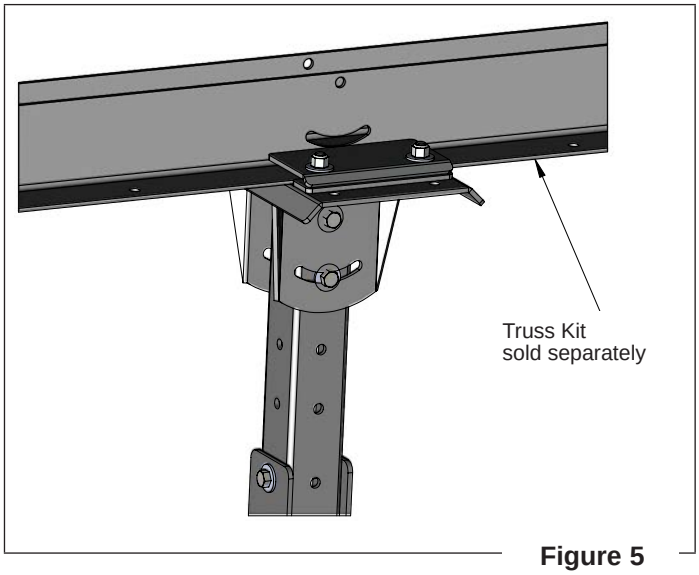


Figure 5

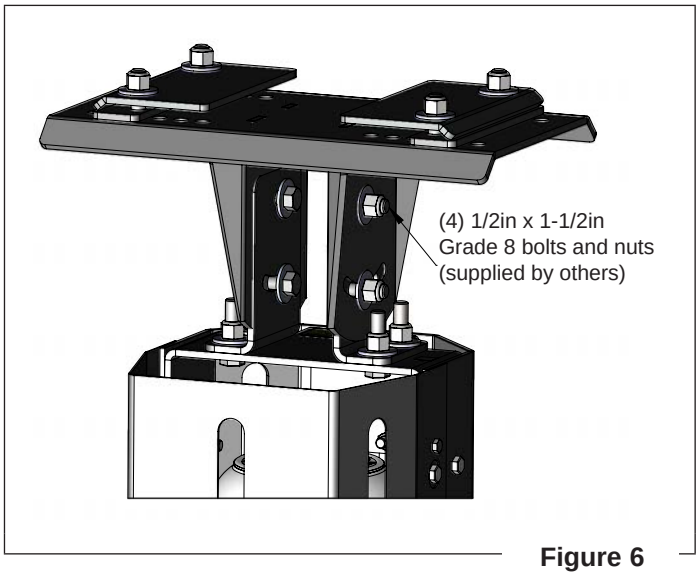


Figure 6

INSTALLATION

Step 3 – Motor Bracket

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

1. Position the motor bracket so that 1 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.

When an extended down tube is used:

The smaller square tubing (3in x 3in [75mm x 75mm]) will telescope inside the larger square tubing (3.5in x 3.5in [90mm x 90mm]). 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 3in x 3in [75mm x 75mm] tube should always bolt to the ceiling bracket.

When fan assembly is mounted directly to the ceiling:

Bracket without an extension tube, use 4 1/2in x 1-1/2in Grade 8 bolts (supplied by others) to bolt the brackets properly.

INSTALLATION

Step 4 – Safety Cables (INCLUDED WITH KIT)

⚠ WARNING / AVERTISSEMENT

Always use safety cables. **They protect against a fan fall in the event of a bolted joint loosening.**

Toujours utiliser des câbles de sécurité. **Ils protègent contre la chute d'un ventilateur dans le cas d'un relâchement de l'assemblage boulonné.**

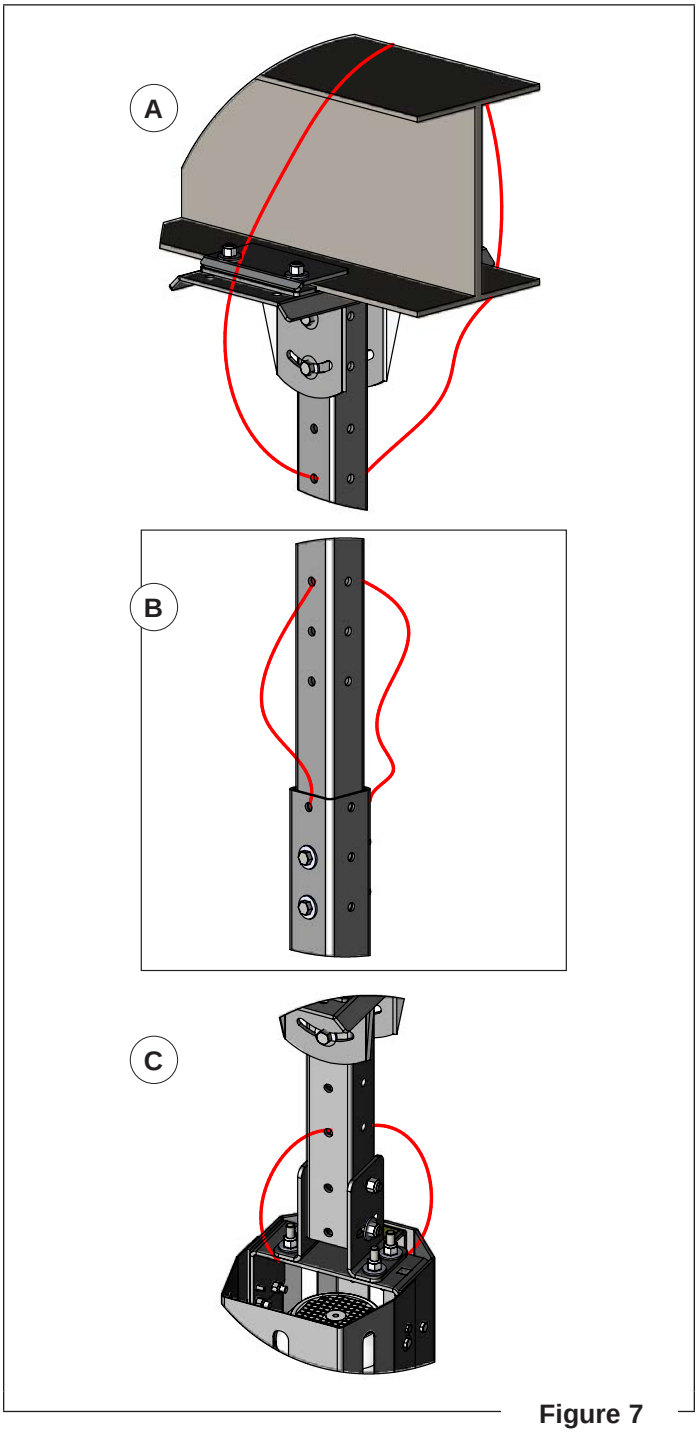


Figure 7

1. Wrap a safety cable around the bolted brackets at the ceiling and through the top of the extension tube (A).
2. If installing with adjustable-length extension tubes, use a third safety cable to secure the center bolted joint of the extension tubes (B).
3. Wrap a second safety cable through the bottom of the extension tube and through the top of the motor housing (C).
4. Secure the safety cables with the provided clamps.

INSTALLATION

Step 5 – Stabilization Cables (INCLUDED WITH KIT)

WARNING / AVERTISSEMENT

Always use stabilization cables. **They protect the fan from tilting and allowing the blades to impact a ceiling joist or object.**

Toujours utiliser des câbles de stabilisation. **Ils empêchent le ventilateur de basculer et ses pales d'entrer en contact avec une solive du plafond ou un objet.**

Stabilization cables anchor the fan for situations like cross winds or impacts that could tilt the fan, causing the blades to impact a ceiling joist or other object. Use these cables to attach the fan bracket to the ceiling.

1. For greatest support, 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 2 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 turnbuckle 1 turn past hand-tight.
6. Install stabilization cable clamp nuts away from turnback.

Step 6 – Attach Blades

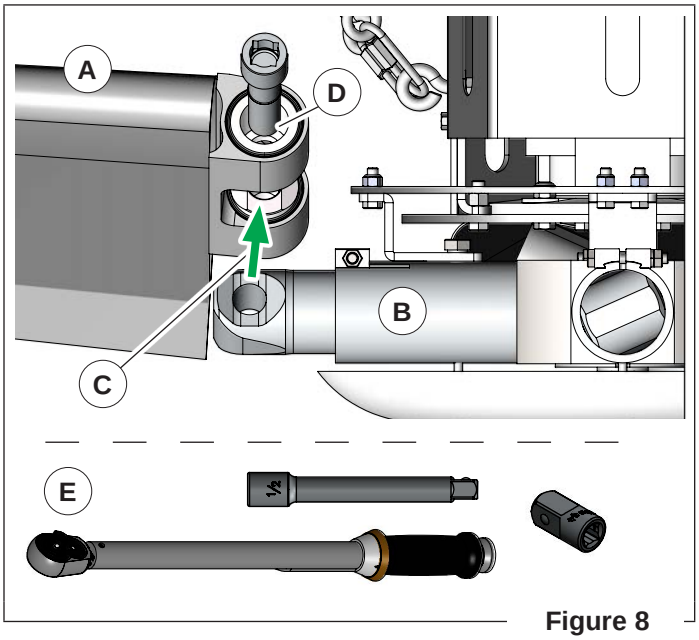


Figure 8

Clean each blade with a paper towel to remove fingerprints and dirt before the blades are installed.

To attach each fan blade to the fan hub:

1. Use a step ladder or lift as required
2. Raise the blade (A) above the arm of the hub (B) and allow the slot of the blade to slide onto the hub (C).
3. Insert (provided) 1in bolt (D). Use a torque wrench (E) with a 3/4in drive extension to tighten the bolt to 200 ft-lb. [271 Nm].

Step 7 – Level Hub

1. Hold a level across the center of the hub (all directions).
2. Make fine adjustments with the (turnbuckle clamped) stabilization cables.
3. **Run / Test (page 24)** the unit, then re-adjust fan level and cable tension.

INSTALLATION

Step 8 – Fan Electrical Installation (TYPICAL)

A. Mount Remote Control Box (Speed Control) at user accessible height.
B. Mount Fan Control Box (VFD Enclosure) at maintenance accessible height.
C. Mount disconnect at accessible height, according to local code.

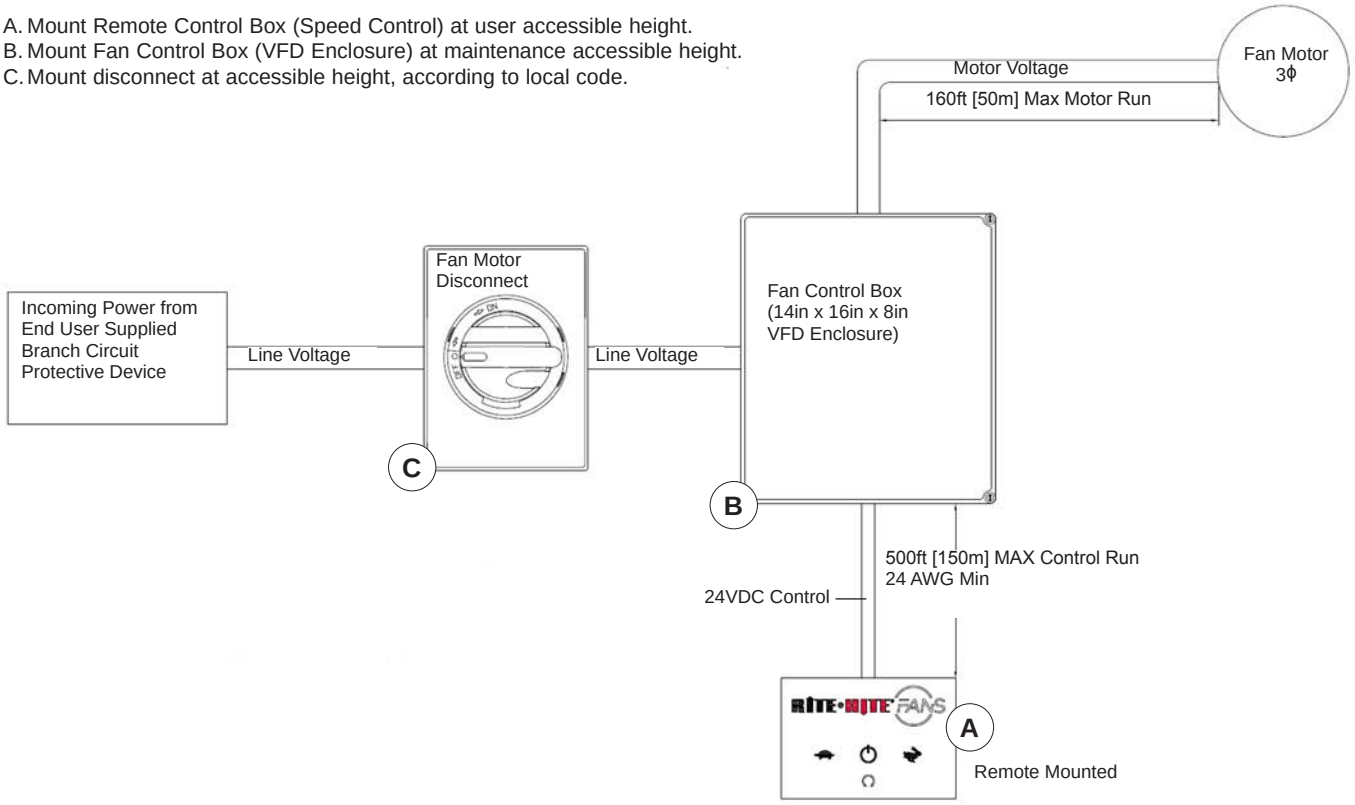


Figure 9

Field Wiring: Power

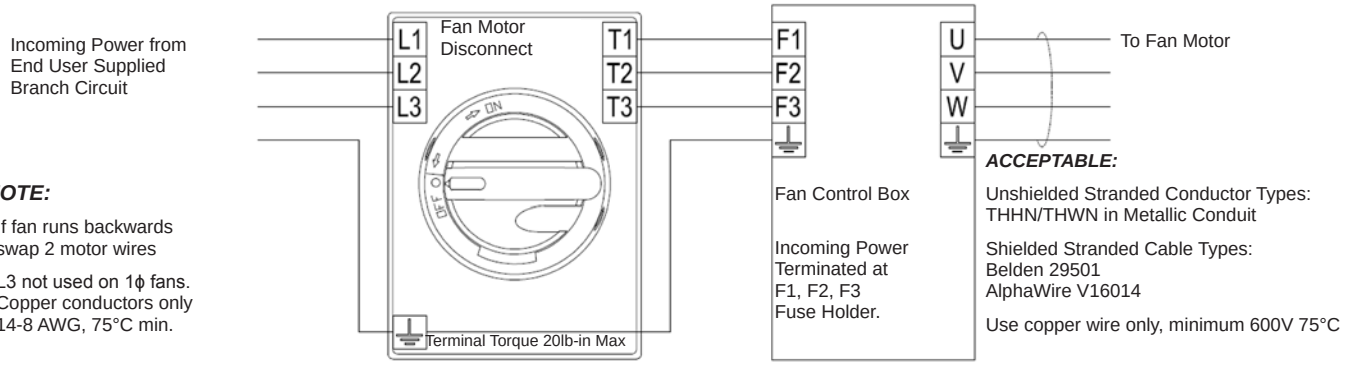


Figure 10

Field Wiring: Speed Control Station

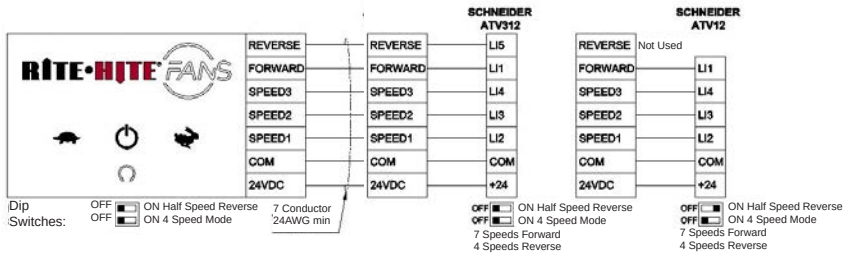


Figure 11

INSTALLATION

Step 9 – Control Box

⚠ CAUTION / ATTENTION

Mount control boxes outside of the fan diameter. A control box mounted above a fan or inside the fan diameter cannot be locked out safely.

Monter les boîtes de commande en dehors du diamètre du ventilateur. Une boîte de commande montée au-dessus ou dans le champ du ventilateur ne peut être verrouillée en toute sécurité.

Mount the 17.6in x 16in x 8.4in [447mm x 406mm x 212mm] control box:

- Securely to a wall or building column with appropriate anchors (supplied by others).
- Within 160ft [50m] from the fan it is controlling. The fan must be visible from the control box mounting location.

Step 10 – Label Plate

1. Attach the label plate mounting brackets to the bottom of the fan hub:
   a. Insert the 4 1/4-20 x 1.0in bolts with lock washers through the end with the round hole.
      NOTE: Do not tighten completely until the label plate is attached.
   b. Align the bracket so the slotted hole faces outward, toward the fan blade.
   c. Repeat this process for the remaining 3 brackets.
2. Attach the label plate to the label plate brackets:
   a. Insert the bolt up through the label plate and through the label plate bracket.
      NOTE: You may need to puncture a small hole through the label with a sharp object to insert the bolt.
   b. Install a 1/4-20in Nylock nut on the bolt to secure it in position.
   c. Repeat this process to attach the label plate to the remaining label plate brackets.
3. Tighten all the bolts holding the brackets and label plate securely.

Step 11 – Motor Cover

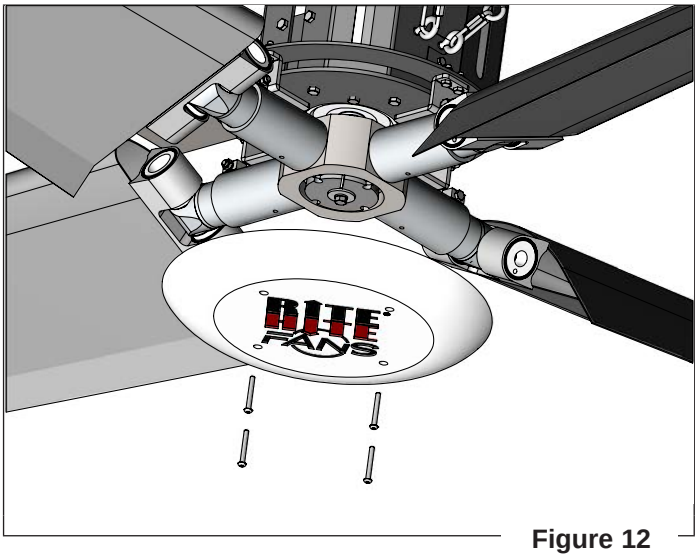


Figure 12

Attach the motor cover over the motor bracket:

1. Insert 4 1/4-20 x 1in bolts with locknut through the motor cover and motor bracket.
2. Secure bolts with a Nylock nut on the inside.
3. Tighten all 4 bolts securely.

Step 12 – Speed Control Station

Attach the 4.75in x 4.75in x 1.75in [120mm x 120mm x 45mm] Speed Control Station enclosure to a wall or column. The face of the controller may be removed and mounted flush in a standard double gang wall box.

The speed station uses a low voltage (24 VDC) control. A 7-conductor cable (24 AWG min/0.5mm 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 (500ft [152m] maximum length).

See **Figure 21 (page 22)** for Operation.

Fan Guarding

After installation, guard the fan when there is potential for a person or object to contact moving fan blades.

Guarding (supplied by others) can be a:

- Structure near the edge of the blades to deter fork trucks, objects or people from entering a danger area.
- Cage around the fan blades to protect moving fan blades.

  NOTE: Always mount cage(s) from the ceiling or columns and independent of the fan

ELECTRICAL

Motor Wiring

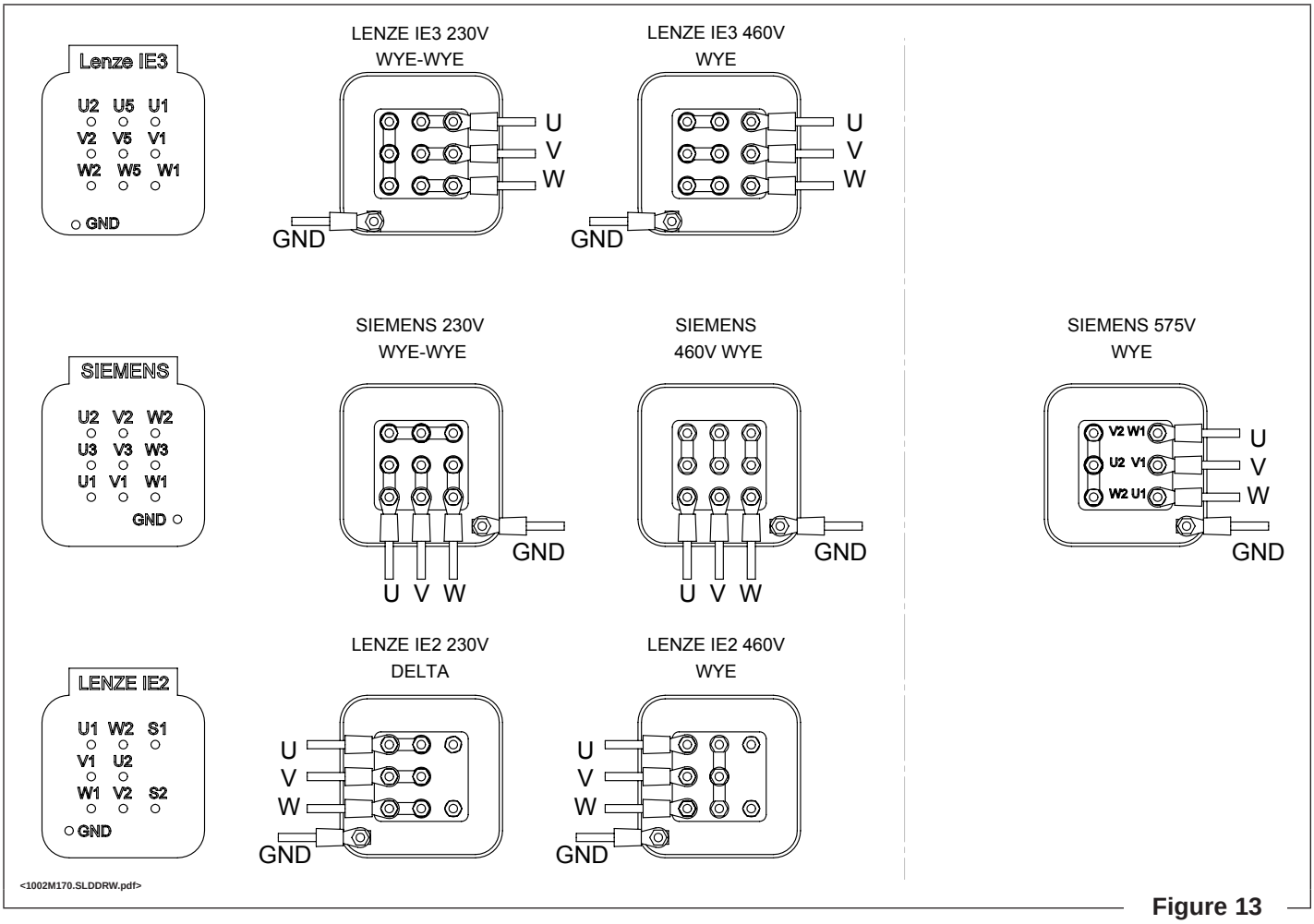


Figure 13

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 **(Figure 13)**.

NOTICE

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

To connect the fan control box to the motor use these (14AWG Minimum Gauge) acceptable wire types:

Unshielded cable:
- THHN/THWN Minimum 600V 90°C

Shielded XLPE VFD cable:
- Belden 29501
- AlphaWire V16014

Conduit Restrictions

NOTICE

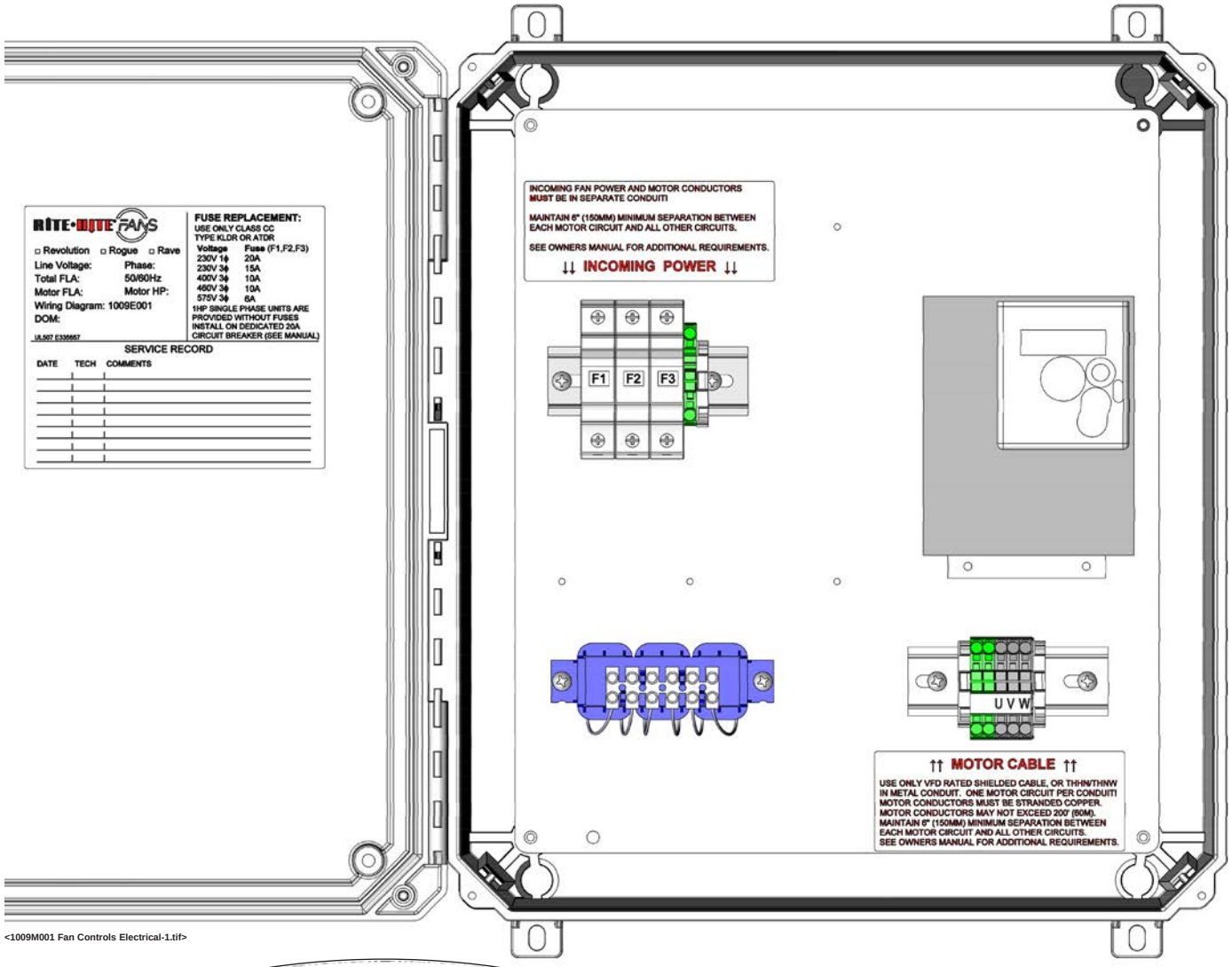
Power supply lines for a controller ***May*** share the same conduit with Power supply lines for 1 or more additional controllers.

Power supply lines for a controller and output/motor leads for the same controller or another controller ***May Not*** share the same conduit.

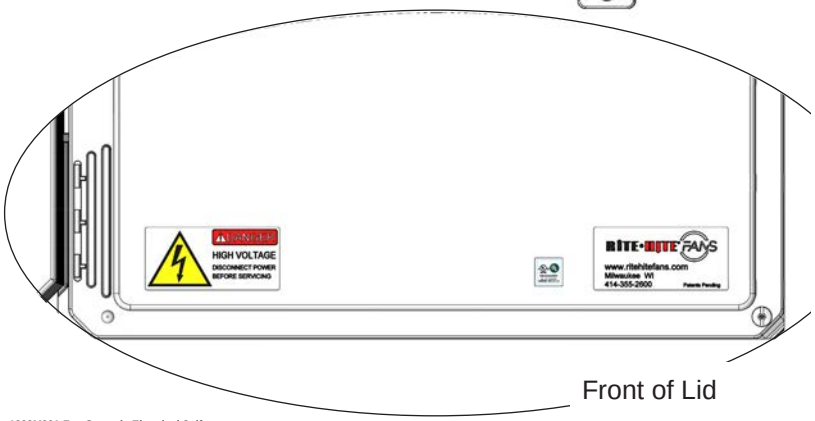
The conduit with the incoming power and the conduit with the power going to the motor should be separated by a minimum of 6in [150mm].

ELECTRICAL

Fan Control Box Layout



<1009M001 Fan Controls Electrical-1.tif>



Front of Lid

<1009M001 Fan Controls Electrical-2.tif>

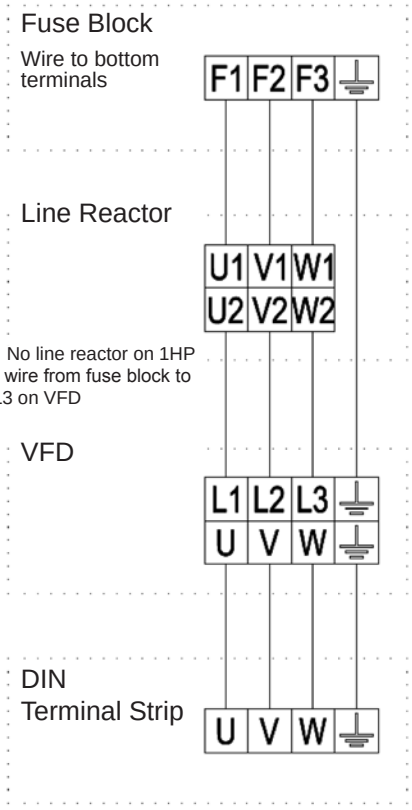
NOTE: Use stranded copper conductors only, minimum 75˚C. To maintain 4X rating, use only UL listed 4X fittings. Do not make conduit connections through the top of enclosure. To reduce risk of electric shock, an earth ground connection must be field installed to the Green/Yellow control box ground terminal.

Figure 14

ELECTRICAL

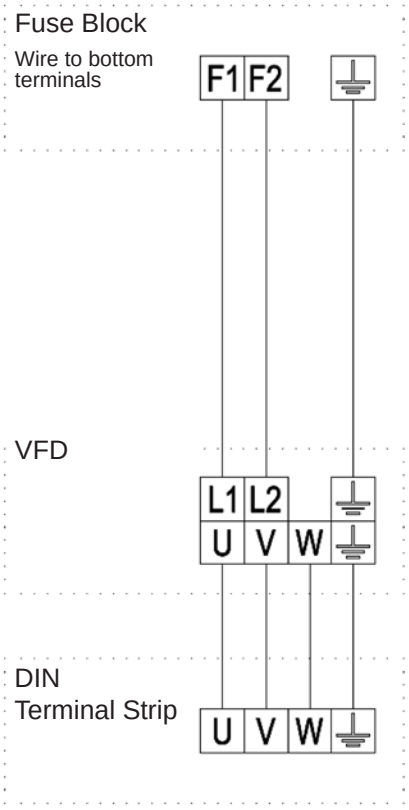
Control Box Wiring

3 Phase



NOTE: No line reactor on 1HP 230V 3ϕ wire from fuse block to L1, L2, L3 on VFD

Single Phase



- All wiring to be 14 AWG AVLV2/8
- Power wiring to be black
- Ground conductors to be Green/Yellow

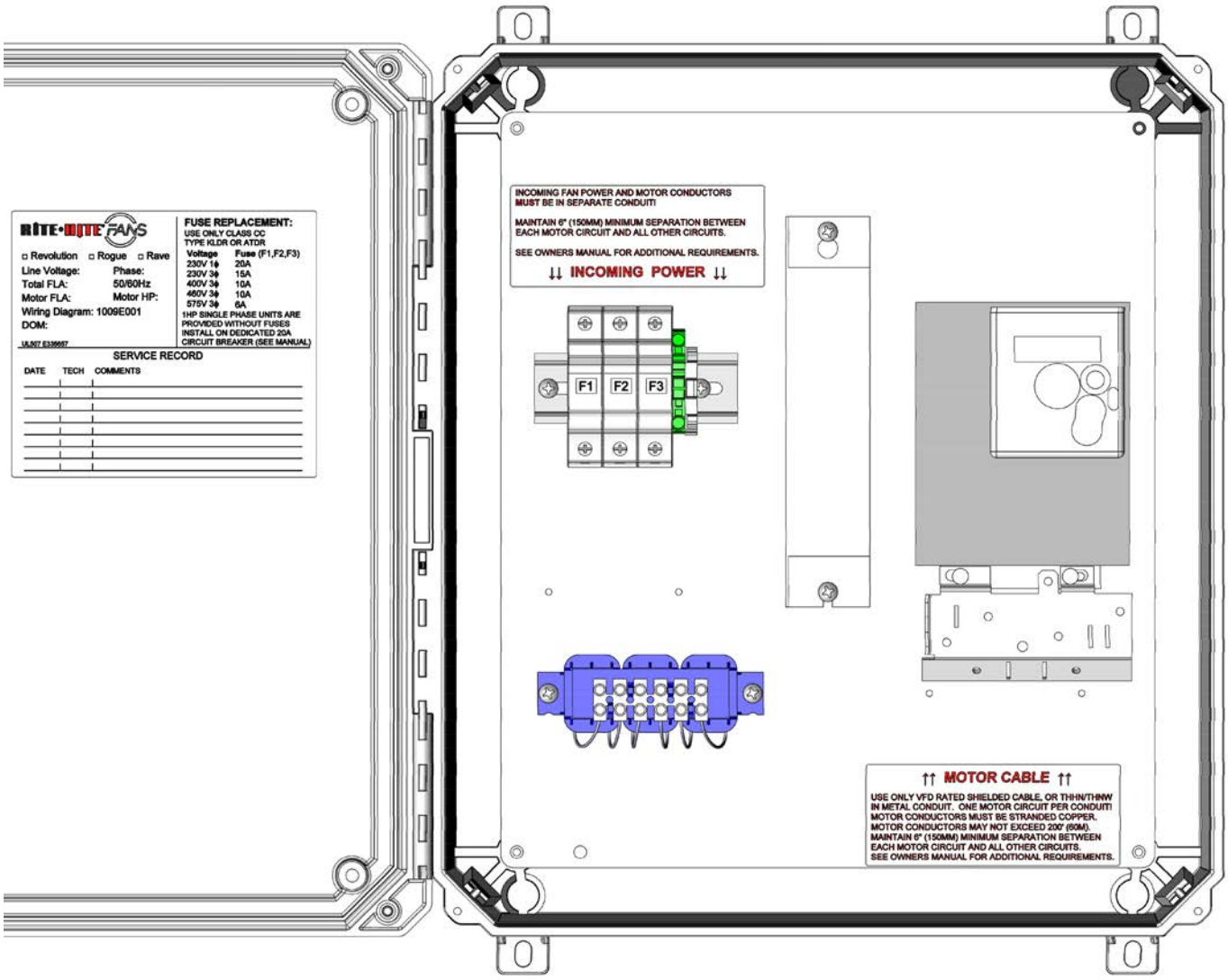
Control Wiring (All units)

Control wiring to be 16 AWG Yellow AVLV2/8

Figure 15

ELECTRICAL

Fan Control Box Layout – with EMC Filter (OPTIONAL)



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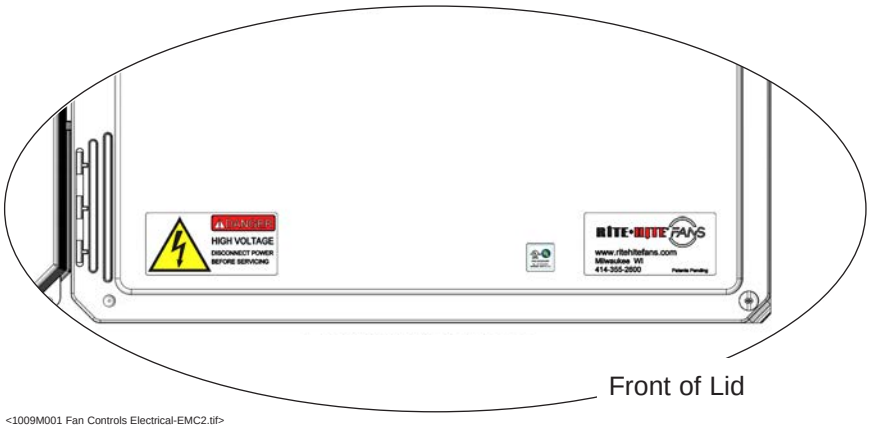


<1009M001 Fan Controls Electrical-EMC2.tif>

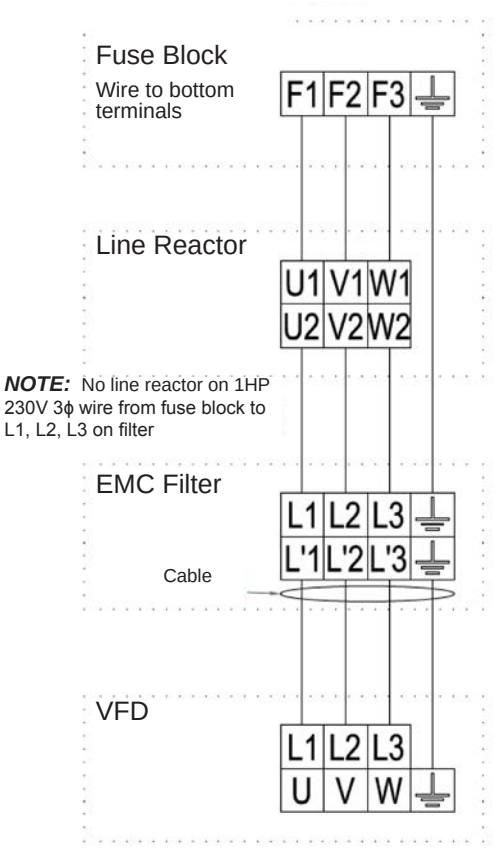
NOTE: Use stranded copper conductors only, minimum 75˚C. To maintain 4X rating, use only UL listed 4X fittings. Do not make conduit connections through the top of enclosure. To reduce risk of electric shock, an earth ground connection must be field installed to the Green/Yellow control box ground terminal.

Figure 16

ELECTRICAL

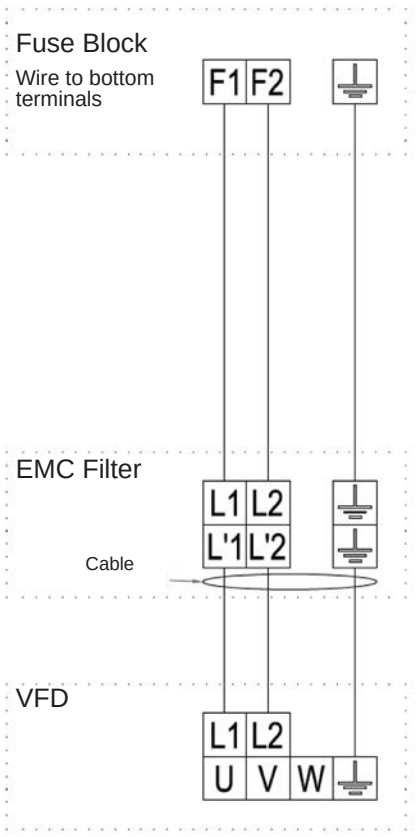
Control Box Wiring – with EMC Filter (OPTIONAL)

3 Phase



NOTE: No line reactor on 1HP 230V 3ϕ wire from fuse block to L1, L2, L3 on filter

Single Phase



- All wiring to be 14 AWG AVLV2/8
- Power wiring to be black
- Ground conductors to be Green/Yellow

Control Wiring (All units)

Control wiring to be 16 AWG Yellow AVLV2/8

Figure 17

ELECTRICAL

EMC Compliance (OPTIONAL)

The EMC Compliance Option adds an EMC filter on the line side of the VFD, and a grounding plate for bonding the motor cable shield.

To maintain IEC 61800-3 C2 compliance, you must observe the following installation guidelines:

- Ensure maximum physical separation between low voltage control cables and high voltage power cables (minimum 150mm or 6in).
- Ensure maximum physical separation between motor cable and all other circuits (minimum 150mm or 6in).
- Use shielded, low capacitance VFD cable with XLPE (Cross-linked Polyethylene) insulation.
  Example products:
  - Belden 29501
  - AlphaWire V16014
- Bond motor cable shield to the VFD plate on 1 end (using clamps) and to the motor frame on the other end (using EMC cable gland).
- For 400V and 460V applications, maximum motor cable length must not exceed 50m or 160ft.
  - 1.5kW VFD, 230V, 1Φ - 50m (160ft) maximum cable length
  - 1.5kW VFD, 230V, 3Φ - 5m (16ft) maximum cable length
  - 0.75kW VFD, 230V, 1Φ -10m (32fts) maximum cable length with internal filter if switching frequency (SFr) is set to 4, 8, or 12 kHz.

Clamp motor cable shield to EMC plate **(Figure 18)**.

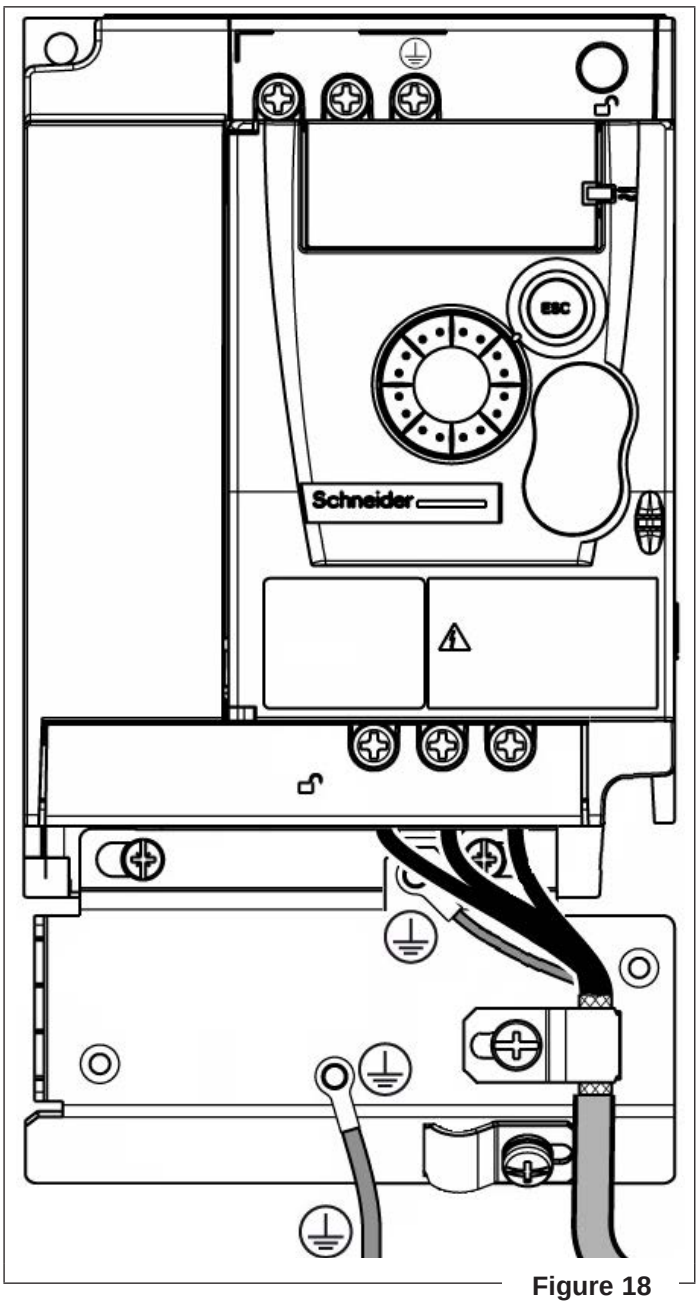


Figure 18

ELECTRICAL

Stop Circuit

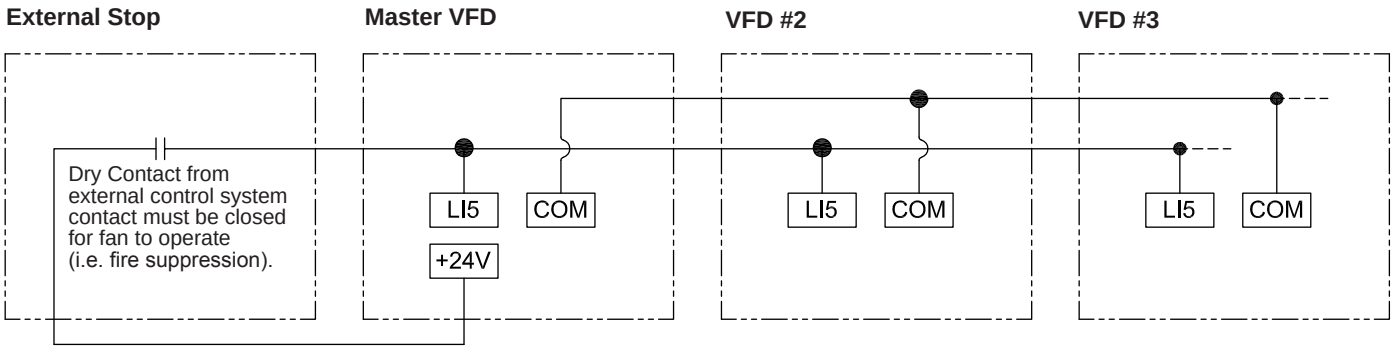


Figure 19

Field Wiring – Schneider 312 VFD

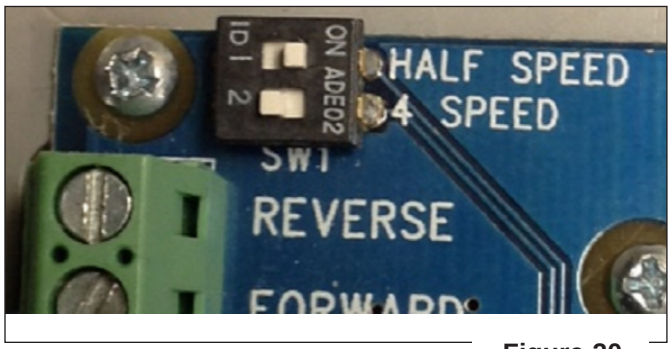
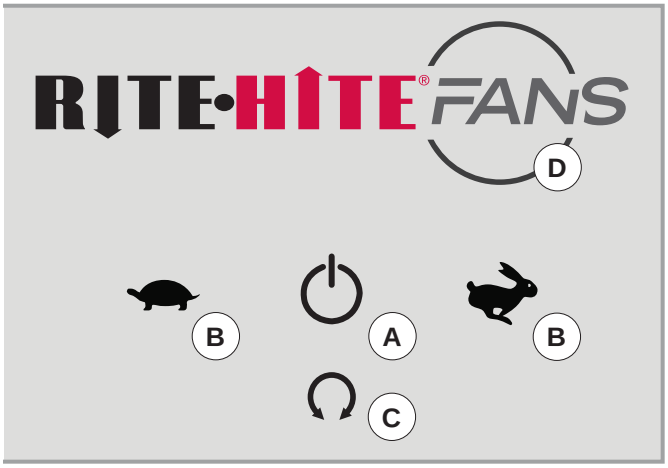


Figure 20

- If Speed Control Switch is currently wired to Terminal LI5:
  - Remove wire from LI5 and isolate.
  - On the back of the Speed Control Switch move the 'Half Speed' switch to the 'On' position.
- Verify that the 4 speed switch is in the 'Off' position. After this change, the fan will run full speed forward, half speed in reverse.
- Connect VFD Terminal COM in all standard boxes
- Connect VFD Terminal LI5 in all standard boxes
- Install a relay between +24V and LI5 on Master VFD only. All fans will stop when relay opens.
- Required ALTIVAR 312 VFD Parameter Changes:
  1. Change parameter I-O- tCt =PFO
  2. Change parameter I-O- rrS =LI2
  3. Change parameter FUn- StC- nSt =LI5
  4. Cycle power to the drive

OPERATION

Speed Control Station



A. Fan Power Button:
Turns Fan On and Off

B. Fan Speed Buttons:
Turtle = Decrease, Rabbit = Increase

C. Fan Direction Button:
Changes Fan Direction (Forward/Reverse)

D. Ring of LEDs in the Logo:
Visual Indication of Fan Speed and Direction (1 LED = Slowest, 7 LEDs = Fastest).

Figure 21

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 2 of the 3 motor wires (terminals U, V, W) to reverse fan direction.

Parameters

FAN SPEED INDICATION	DEFAULT FREQUENCY	SCHNEIDER ALTIVAR PARAMETER
0 LED	OFF	—
1 LED	10Hz	SP8
2 LEDs	18Hz	SP7
3 LEDs	26Hz	SP6
4 LEDs	35Hz	SP5
5 LEDs	44Hz	SP4
6 LEDs	52Hz	SP3
7 LEDs	60Hz	SP2

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.

Remote Stop

Fire Suppression

Any device with a relay output can stop the fan remotely by opening a contact. See **"Stop Circuit" on page 21.**

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. A wind speed control kit is available (part # 76210072).

MAINTENANCE

⚠ WARNING / AVERTISSEMENT

Follow lockout procedures before cleaning or re-torquing the fan.

Suivre les procédures de verrouillage avant le nettoyage ou le resserrage du ventilateur.

Planned Maintenance

PLANNED MAINTENANCE TASK	INSPECT AND PERFORM THE FOLLOWING:
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]).
	Inspect fan and mounting supports for wear and tear. Tighten any loose hardware.
Cables	Re-torque clamps.
	Check for fraying or wear.
Gear Reducer	Check for oil leaks. If leaks are present, contact factory.
	Check oil level. Add oil if necessary (oil type is marked on the gear case).
Motor	Check for dust and dirt. Remove using a brush or compressed air.
Fan Controller	Inspect all terminal connections inside the VFD control box. Tighten any loose connections.

TROUBLESHOOTING

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 60 Hz. Count the number of revolutions the fan makes in 1 minute. They should be:

24ft [7320mm] Fan ≈ 53 rpm

20ft [6100mm] Fan ≈ 61 rpm

16ft [4880mm] Fan ≈ 76 rpm

12ft [3660mm] Fan ≈ 98 rpm

8ft [2440mm] Fan ≈ 154 rpm

NOTE: If fan does not spin at these speeds, consult your Rite-Hite representative for assistance.

Fan Noise

High-Frequency Motor Noise

When installing a fan in an abnormally quiet area, you 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, the carrier frequency (SFr) 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 stop or reduce noise.

For optimal performance and component life, the maximum fan speed (HSP) should be limited such that the output current (LCr) does not exceed the maximum allowable drive current for the selected carrier frequency.

Maximum Drive Output Current (Amps)

	CARRIER FREQUENCY KHZ (SFR)							
	2	4	6	8	10	12	14	16
2HP 600V Altivar 312	2.7	2.7	2.5	2.4	2.2	2.1	1.9	1.7
2HP 400V Altivar 312	4.1	4.1	3.8	3.6	3.4	3.2	2.9	2.6
2HP 200V Altivar 312	8.0	8.0	7.6	7.2	6.8	6.4	5.8	5.2
1HP 200V Altivar 12	4.2	4.2	3.9	3.7	3.5	3.3	3.1	2.9

TROUBLESHOOTING

Speed Controller

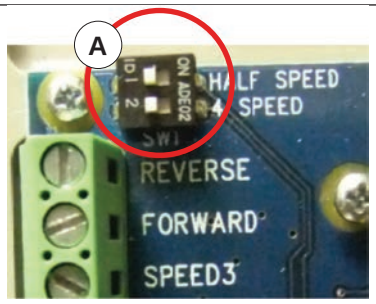


Figure 22

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

   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. 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.

3. 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 terminals 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 (1 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 SPEED2 > 20VDC)
SPEED3:	ON	(COM to SPEED3 > 20VDC)
FORWARD:	ON	(COM to FORWARD > 20VDC)
REVERSE:	OFF	(COM to REVERSE < 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 #**"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, contact 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.

TROUBLESHOOTING

Speed Controller *Continued*

I/O Check: Set Fan to Slowest Speed (1 LED), Forward Direction

Speed Control 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 SPEED2 >20VDC)	6	(4 to 6 >20VDC)	LI3	(COM to LI3 >20VDC)
SPEED3	(COM to SPEED3 >20VDC)	5	(4 to 5 >20VDC)	LI4	(COM to LI4 >20VDC)
FORWARD	(COM to FORWARD >20VDC)	2	(4 to 2 >20VDC)	LI1	(COM to LI1 >20VDC)

Figure 23

		AB PowerFlex 40 VFD Input Terminal				Schneider Altivar 12/312 VFD Input Terminal			
Set Speed	**HZ**	**7**	**6**	**5**	**Speed Preset**	**LI2**	**LI3**	**LI4**	**Speed 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 2	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

Figure 24

4. 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 (**Figure 23**):
   - 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), verify parameter settings (see # **"6.")**.
5. The speed controller uses 3 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 6 LEDs (Speed 6), it turns on input (LI3). When the VFD sees input LI3 on, with inputs LI2 and LI4 off, it runs the fan at the speed stored in parameter SP3 (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 LLI is on. If VFD input LI5 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. If the input states do not match the table (**Figure 24**), check for swapped wires.

   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., SP2 = 60 Hz, SP3 = 52 Hz, etc.).
6. 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

TROUBLESHOOTING

Schneider Electric VFD

<table>
<tr><th>PROBLEM</th><th>CAUSE</th><th>RESOLUTION</th></tr>
<tr><td rowspan="5">Display on VFD 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%.</td></tr>
<tr><td>Loose wires</td><td>Check for loose wires along path at locations where readings change.</td></tr>
<tr><td>Verify fuses are good</td><td>Replace if necessary.</td></tr>
<tr><td>Load Switch is not turned 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 VFD lights up + fan does not run.</td><td>No start command given</td><td>Turn fan control switch off and then back on.</td></tr>
<tr><td>Loose wire</td><td>Check for loose wires at frequency drive and switch.</td></tr>
<tr><td>Fire protection system Stop Signal</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.</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 is not programmed for correct control switch</td><td>If you are using the Speed Control Switch, set to these parameters:
<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-PS2</td><td>Preset Speed Bit</td><td>LI3</td></tr>
<tr><td>FUn-</td><td>PSS-PS2</td><td>Preset Speed Bit</td><td>LI2</td></tr>
<tr><td>I-O-</td><td>PSS-PS2</td><td>Reverse Direction</td><td>LI5</td></tr>
</table>
If you are using Analog Control Switches, set to these parameters:
<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">VFD faults when fan starts.</td><td rowspan="5">OLF Motor Overload</td><td>Check the fan for damage. Restart if no damage is found.
Consult factory if damage is found.</td></tr>
<tr><td>Verify that motor current (LCR) is no greater than motor rated FLA.</td></tr>
<tr><td>With power off check that gearbox spins smoothly.</td></tr>
<tr><td>Verify proper fan speed, "Run / Test" on page 24.
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>
<tr><td>Check to ensure motor wiring matches voltage provided.</td></tr>
<tr><td>Check to make sure all blades are locked in at the same angle, and that 1 or more did not turn.</td></tr>
<tr><td>OCF, OLF, OPF, OPF1, OPF2, SCF, SCF1, SCF3, SCF5
Motor Fault</td><td>See Motor (page 28).</td></tr>
<tr><td rowspan="2">Fan runs, but operation is not smooth.</td><td>Gearbox</td><td>Spin the fan blades by hand. Listen for gear issues/irregular noises.
Consult your Rite-Hite representative if irregular noises are present.</td></tr>
<tr><td>Incoming / Outgoing wiring not separated</td><td>Run incoming wire and outgoing wiring in separate conduit a minimum of 6in [150mm] apart.</td></tr>
</table>

TROUBLESHOOTING

Motor

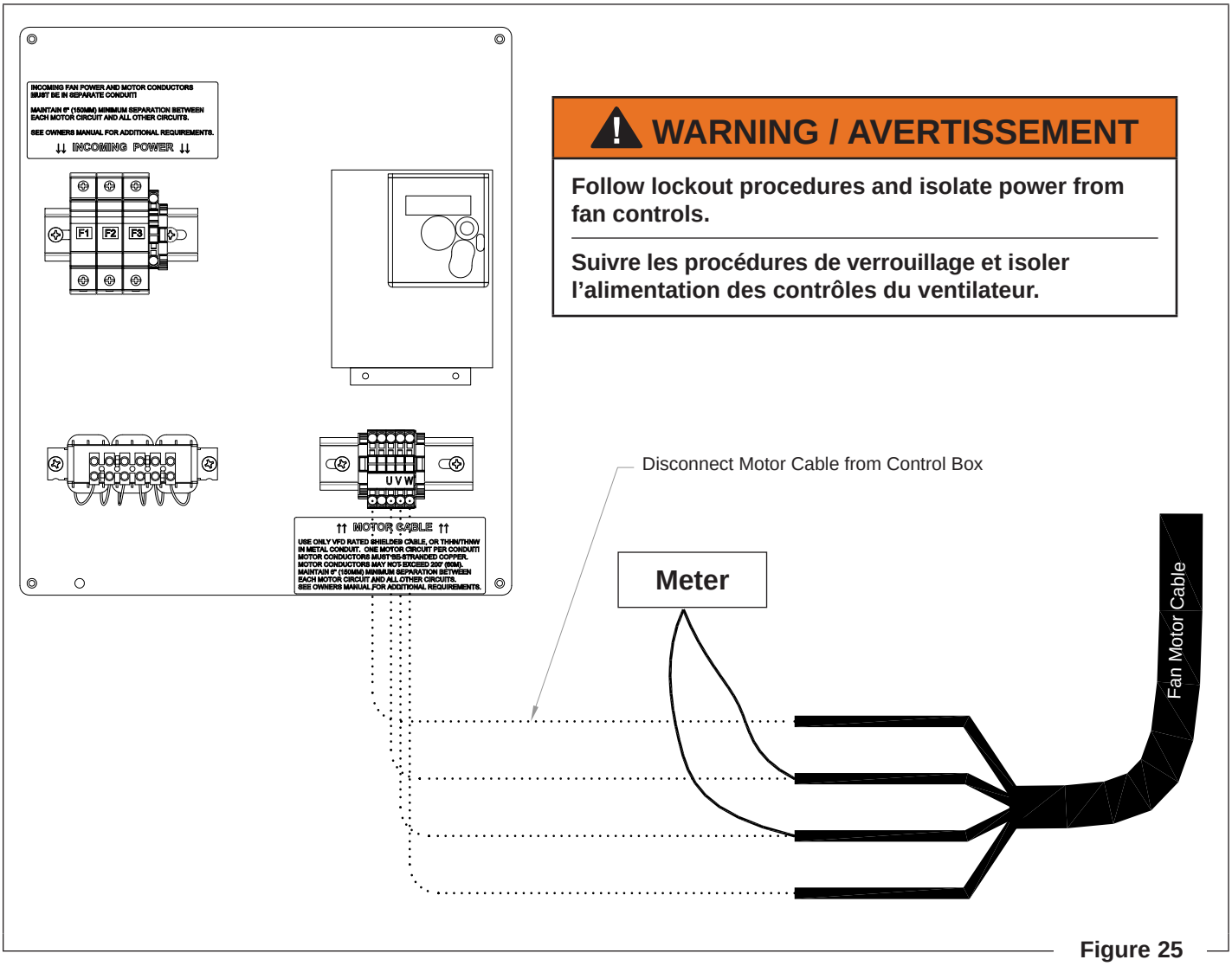


Figure 25

1. Disconnect fan motor cable from U, V, W, and ground terminals (GND).
2. Using electrical meter, measure resistance (ohms, Ω) between phase wand Phase V.

   Record the 6 resistance values:

   Phase W to V ☐ Ω Phase W to GND ☐ Ω

   Phase W to U ☐ Ω Phase V to GND ☐ Ω

   Phase V to U ☐ Ω Phase U to GND ☐ Ω

   Phase to phase values should be equal. (±5%).

   Phase to ground values should be infinite. (Open circuit - meter display "OL")

   If phase-phase values are not equal. Or, if phase-ground resistance is measured:

   - Disconnect motor cable from motor.
   - Repeat measurements at motor wiring terminals.

Motor Wobble

Verify:
- All hardware is tight.
- Stabilization Cables are taut.
- The motor bracket is installed vertically.

TROUBLESHOOTING

Before calling Rite-Hite Customer Service:

1. Make a note of any active faults diplays on the VFD.
2. Check the previous fault code (parameter SUP-LFt on a 312, dP1 on a 12).

Schneider Electric VFD Fault Codes

Altivar 312	Altivar 12	Fault Description	Cycle Power to VFD. *If Fault Persists:*
bLF		Brake Control	Reset VFD to Rite-Hite Defaults
CFF	CFF	Incorrect Parameters	Reset VFD to Rite-Hite Defaults
CF1	CF1	Invalid Parameters	Reset VFD to Rite-Hite Defaults
CnF		Com Card	Reset VFD to Rite-Hite Defaults
COF		CANopen	Reset VFD to Rite-Hite Defaults
CrF	CrF1	Capacitor Charge	Replace Drive
EEF		EEPROM	Replace Drive
EPF		Blade Impact Detected (LI6)	Call Customer Service
IF1	InF1	Unknown Rating	Replace Drive
IF2	InF2	Display/Power card	Replace Drive
IF3	InF3	EEPROM/Serial	Replace Drive
IF4	InF4	EEPROM	Replace Drive
	InF9	Current Measurement	Replace Drive
	----	Firmware	Replace Drive
	InFb	Thermal Sensor	Replace Drive
	InFE	CPU	Replace Drive
LFF	LFF1	4-20mA Loss	Reset VFD to Rite-Hite Defaults
nOF		No Code	Reset VFD to Rite-Hite Defaults
ObF	ObF	Bus Overvoltage	Verify line voltage and decel ramp
OCF	OCF	Overcurrent	Verify motor parameters and gear ratio, ohm motor
OHF	OHF	Drive Overheat	Reduce Carrier Hz, check VFD fan
	OLC	Blade Impact Detected	Call Customer Service
OLF	OLF	Motor Overload	Verify motor parameters and gear ratio, ohm motor
OPF	OPF1	Motor Phase Loss	Verify motor wiring, ohm motor at Cbox
	OPF2	Motor Phase Loss	Verify motor wiring, ohm motor at Cbox
OSF	OSF	Line Overvoltage	Verify line AC voltage
PHF	PHF	Line Phase Loss	Verify line AC voltage
SCF	SCF1	Motor Short Circuit	Ohm motor at Cbox and at motor Jbox
	SCF3	Motor Ground Fault	Ohm motor at Cbox and at motor Jbox
	SCF4	IGBT Short	Replace Drive
	SCF5	Motor Short Circuit	Ohm motor at Cbox and at motor Jbox
SLF	SLF1	Modbus	Verify Modbus wiring and Fan Commander settings
SOF	SOF	Motor Overspeed	Call Customer Service
	tJF	IGBT Overheat	Reduce Carrier Hz, check VFD fan
tnF	tnF	Auto-Tuning	Call Customer Service
	ULF	Process Underload	Reset VFD to Rite-Hite Defaults
USF	USF	Line Undervoltage	Verify line AC voltage

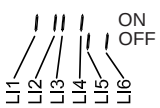
JBox = Junction Box CBox = Control Box

TROUBLESHOOTING

Altivar 312 Parameters

To access:

1. Press the navigation dial.
2. Turn the dial to scroll through parameter menus.
3. Press the dial to enter a menu.
4. Press the ESC key to return to the previous parent menu.

Menu	Parameter	Value*	Description
rEF-			
SEt-	ItH	30	Motor Nameplate Current: 3.0A*
	Ctd	50	Impact Detection Threshold: 5.0A
	SFr	40	Carrier Frequency: 4.0kHz
drC-	UnS	460	Motor Nameplate Voltage: 460V*
	FrS	600	Motor Nameplate Frequency: 60.0Hz*
	nCr	30	Motor Nameplate Current: 3.0A*
	nSP	1745	Motor Nameplate Speed: 1745 RPM*
	COS	075	Motor Nameplate PF: 0.75*
	FCS	rEC 1	Reset VFD to Rite-Hite Defaults
I_O-			
CtL-			
FUn-			
FLt-			
COM-	Add	1	Modbus Address: 1
	tbr	96	Modbus baudrate: 9600 baud
SUP- Monitoring (Read Only)	rFr		VFD Output Frequency
	LCr		Motor Current
	ULn		AC line voltage (calculated)
	tHd		Drive Thermal State (%)
	LFt		Last Fault Occurred
	Otr		Motor Torque (%)
	rtH		Motor Run Time (hours/kilo-hours)
	L IS	' ' ' , ,	Digital Input State Example shown is slow forward: • LI1, LI2, LI3, LI4 are ON (high) • LI5, LI6 are OFF (low) 

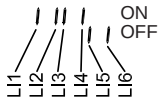
*Example values. *Always verify actual motor nameplate data.*

TROUBLESHOOTING

Altivar 12 Parameters

To access:

1. Press the navigation dial.
2. Turn the dial to scroll through parameter menus.
3. Press the dial to enter a menu.
4. Press the ESC key to return to the previous parent menu.

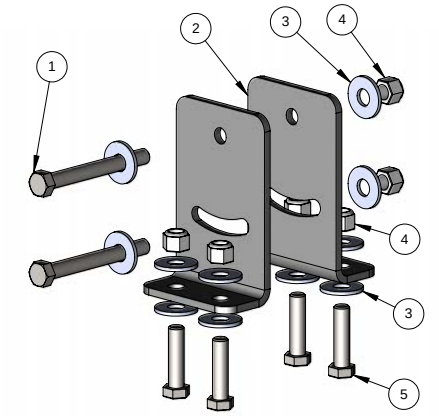
Menu 1	Menu 2	Menu 3	Menu 4	Parameter	Value*	Description
rEF						
MOn Monitoring (Read Only)				rFr		VFD Output Frequency
				LCr		Motor Current
				ULn		AC Line Voltage (calculated)
				tHd		Drive Thermal State (%)
				OPr		Motor Power (%)
	MA I-			L I S I	I I I I	Digital Input State Example shown is slow forward: • LI1, LI2, LI3, LI4 are ON (high) • LI5, LI6 are OFF (low) 
				dP I		Last Fault Code
CONF				Fr I	A I I	Speed Reference
				FCS	rEC I	Reset VFD to Rite-Hite Defaults
	FULL	I_O-				
		drC-		COS	070	Motor Nameplate PF: 0.70*
				UnS	230	Motor Nameplate Voltage: 230V*
				nCr	29	Motor Nameplate Current: 2.9A*
				FrS	500	Motor Nameplate Frequency: 50.0Hz*
				nSP	930	Motor Nameplate Speed: 930 RPM*
				SFr	40	Carrier Frequency: 4.0kHz
		CtL-				
		FUn-				
		FLt-	tHt-	ItH	29	Motor Nameplate Current: 2.9A*
		CON-		Add	1	Modbus Address: 1
				tbr	96	Modbus baudrate: 9600 baud

*Example values. Always verify actual motor nameplate data.

PARTS

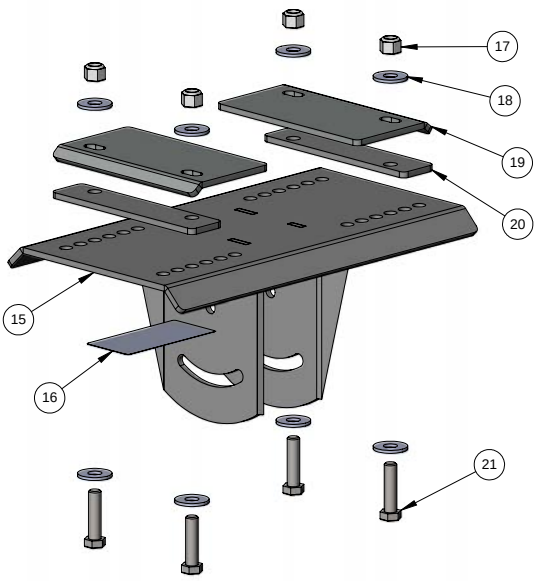
Mounting

Swivel Bracket



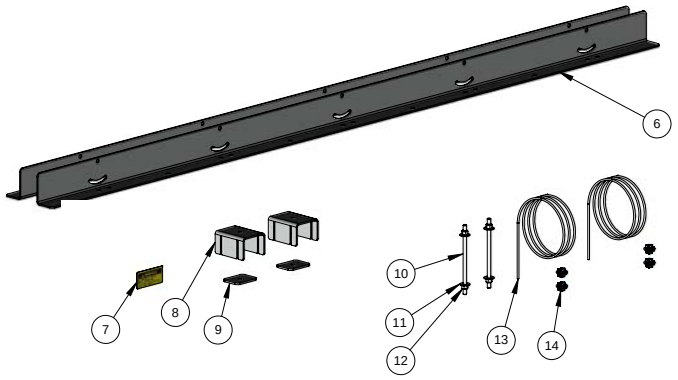
#	QTY	DESCRIPTION	PART #
–	1	BRKT,ASSY,SWVL,HOUSING,FAN,GY	14501306
1	2	SCR,HHMS,1/2-13X4-1/2,GR8,ZNC	–
2	2	BRKT,MNT,HOUSING,SWVL,FAN,GY	–
3	12	WSHR,FLAT,1/2X1-3/8X7/64,ZNC	–
4	6	NUT,HEX,NYL LOCK,1/2-13,GR8,Z	–
5	4	SCR,HHMS,1/2-13X2,GRD8,ZNC	–

I-Beam Kit



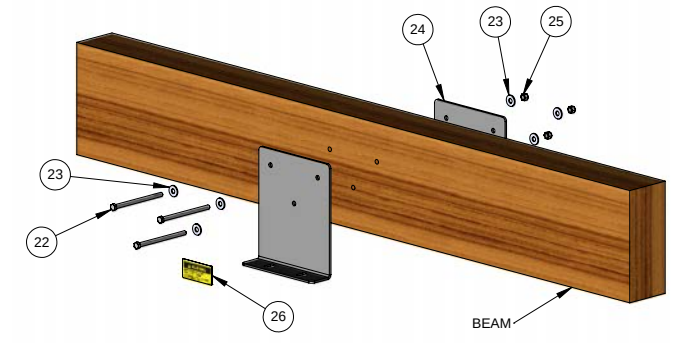
#	QTY	DESCRIPTION	PART #
–	1	BRKT,ASSY,SWVL,CLNG,FAN,GY	14501233
15	1	BRKT,WLDMNT,SWVL,FAN,GY	–
16	1	LABEL,DECAL,INSTL,SUPPORT,FAN	–
17	4	NUT,HEX,NYL LOCK,1/2-13,GR8,Z	–
18	8	WSHR,FLAT,1/2X1-3/8X7/64,ZNC	–
19	2	PLATE,CLAMP,MNT,FAN,GY	–
20	2	PLATE,SHIM,MNT,FAN,GY	–
21	4	SCR,HHMS,1/2-13X2,GRD8,ZNC	–

Truss Kit



#	QTY	DESCRIPTION	PART #
–	–	MOUNT,ASSY,TRUSS,FAN,GY	55290016
6	2	BRKT,MNT,TRUSS,FAN,GY	–
7	1	LABEL,DECAL,INSTL,SUPPORT,FAN	–
8	2	BRKT,CLAMP,TRUSS,FAN,GY	–
9	2	PLATE,CLAMP,TRUSS,FAN,GY	–
10	2	ROD,THRD,1/2-13X10",FLTD,STNLS	–
11	4	WSHR,FLAT,1/2X1-3/8X7/64,ZNC	–
12	4	NUT,HEX,NYL LOCK,1/2-13,GR8,Z	–
13	2	CABLE,AIRCRAFT,GLV,1/4,84"	–
14	4	CLAMP,CABLE,ZINC,1/4,SNGL SAD	–

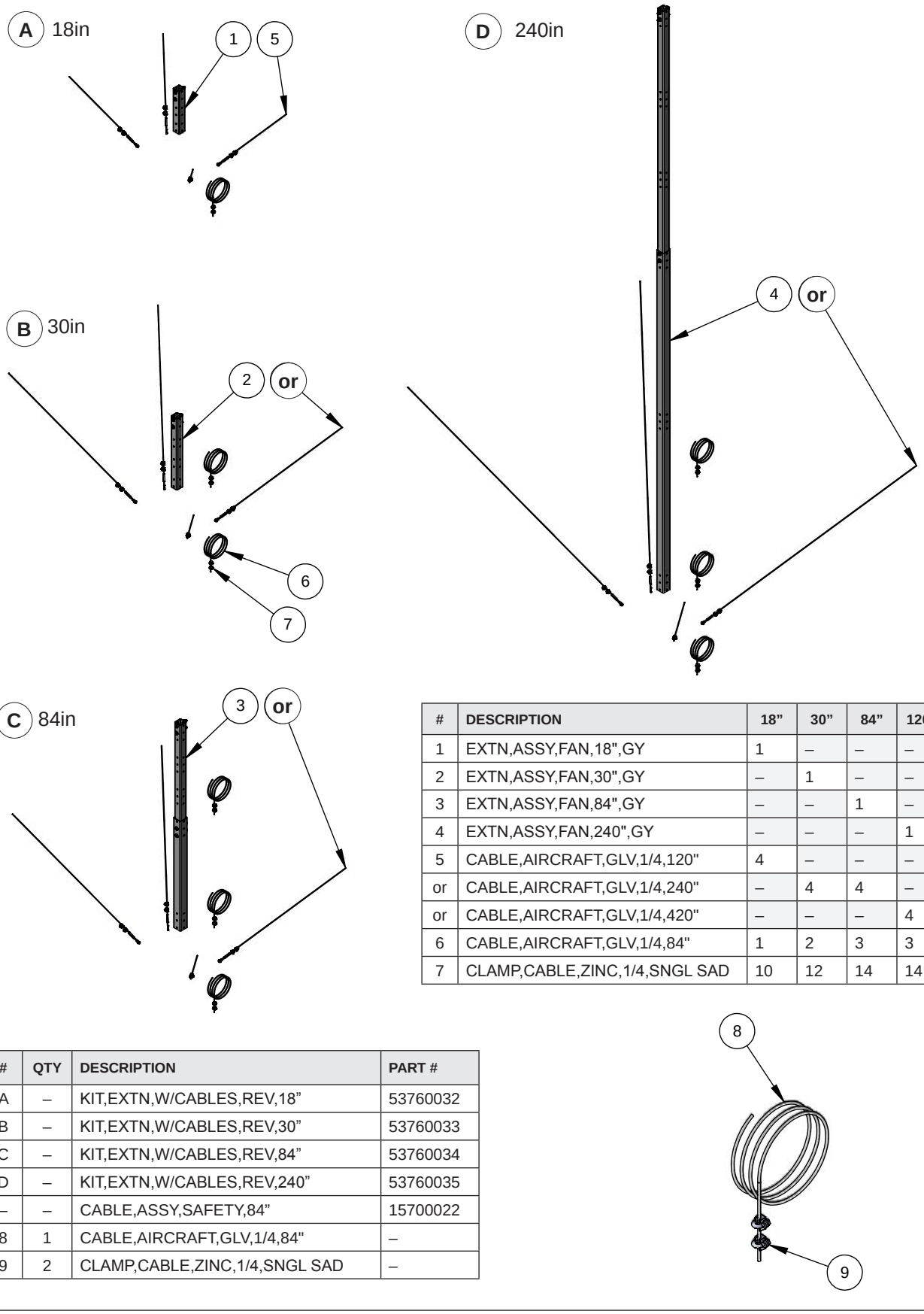
Laminated Beam Kit



#	QTY	DESCRIPTION	PART #
–	1	BRKT,ASSY,MNT,LAM BEAM,FAN,GY	14501239
22	3	SCR,HHMS,1/2-13X8,GRD8,ZNC	–
23	6	WSHR,FLAT,1/2X1-3/8X7/64,ZNC	–
24	2	BRKT,MNT,LMNTD BEAM,FAN,GY	–
25	3	NUT,HEX,NYL LOCK,1/2-13,GR8,Z	–
26	1	LABEL,DECAL,INSTL,SUPPORT,FAN	–

PARTS

Extension Tube Assemblies, Cables

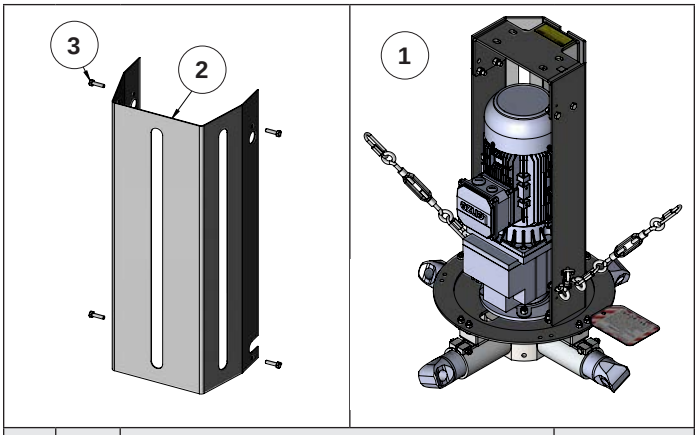


#	DESCRIPTION	18"	30"	84"	120"
1	EXTN,ASSY,FAN,18",GY	1	–	–	–
2	EXTN,ASSY,FAN,30",GY	–	1	–	–
3	EXTN,ASSY,FAN,84",GY	–	–	1	–
4	EXTN,ASSY,FAN,240",GY	–	–	–	1
5	CABLE,AIRCRAFT,GLV,1/4,120"	4	–	–	–
or	CABLE,AIRCRAFT,GLV,1/4,240"	–	4	4	–
or	CABLE,AIRCRAFT,GLV,1/4,420"	–	–	–	4
6	CABLE,AIRCRAFT,GLV,1/4,84"	1	2	3	3
7	CLAMP,CABLE,ZINC,1/4,SNGL SAD	10	12	14	14

#	QTY	DESCRIPTION	PART #
A	–	KIT,EXTN,W/CABLES,REV,18"	53760032
B	–	KIT,EXTN,W/CABLES,REV,30"	53760033
C	–	KIT,EXTN,W/CABLES,REV,84"	53760034
D	–	KIT,EXTN,W/CABLES,REV,240"	53760035
–	–	CABLE,ASSY,SAFETY,84"	15700022
8	1	CABLE,AIRCRAFT,GLV,1/4,84"	–
9	2	CLAMP,CABLE,ZINC,1/4,SNGL SAD	–

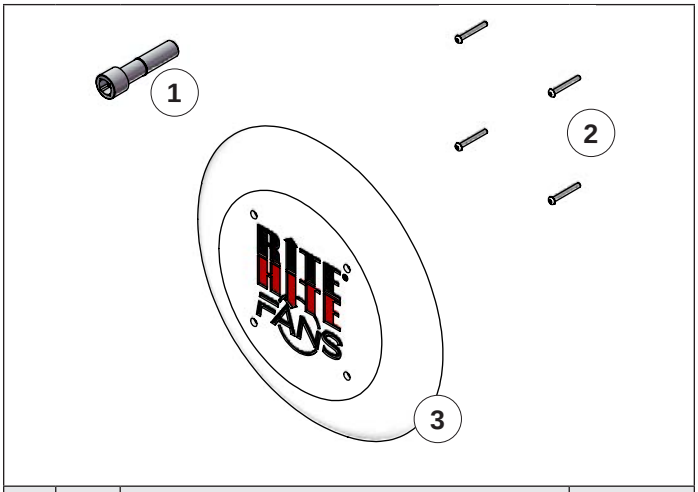
PARTS

Motor Cover, Motor Assembly



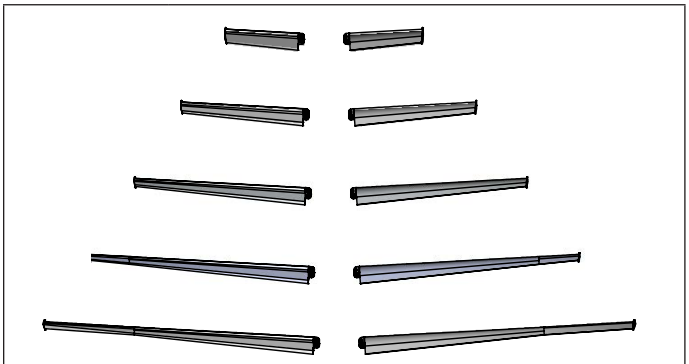
#	QTY	DESCRIPTION	PART #
1	1	MOT,ASSY,FAN,W/VOLTAGE	1012.XXX
–	–	CVR,KIT,HOUSING,MOTOR,W/HRDW	17900208
2	1	CVR,HOUSING,MOTOR,REV	–
3	4	SCR,HHMS,1/4-20X1,GR8,ZNC	–

Hub



#	QTY	DESCRIPTION	PART #
1	1	KIT,BLD,SCR,M24X100MM,AL	53760007
2	4	SCR,BHMS,SCKT,1/4-20X2,SS	67870130
3	1	CVR,HUB,DOME,RITEHITE,REV	17900203

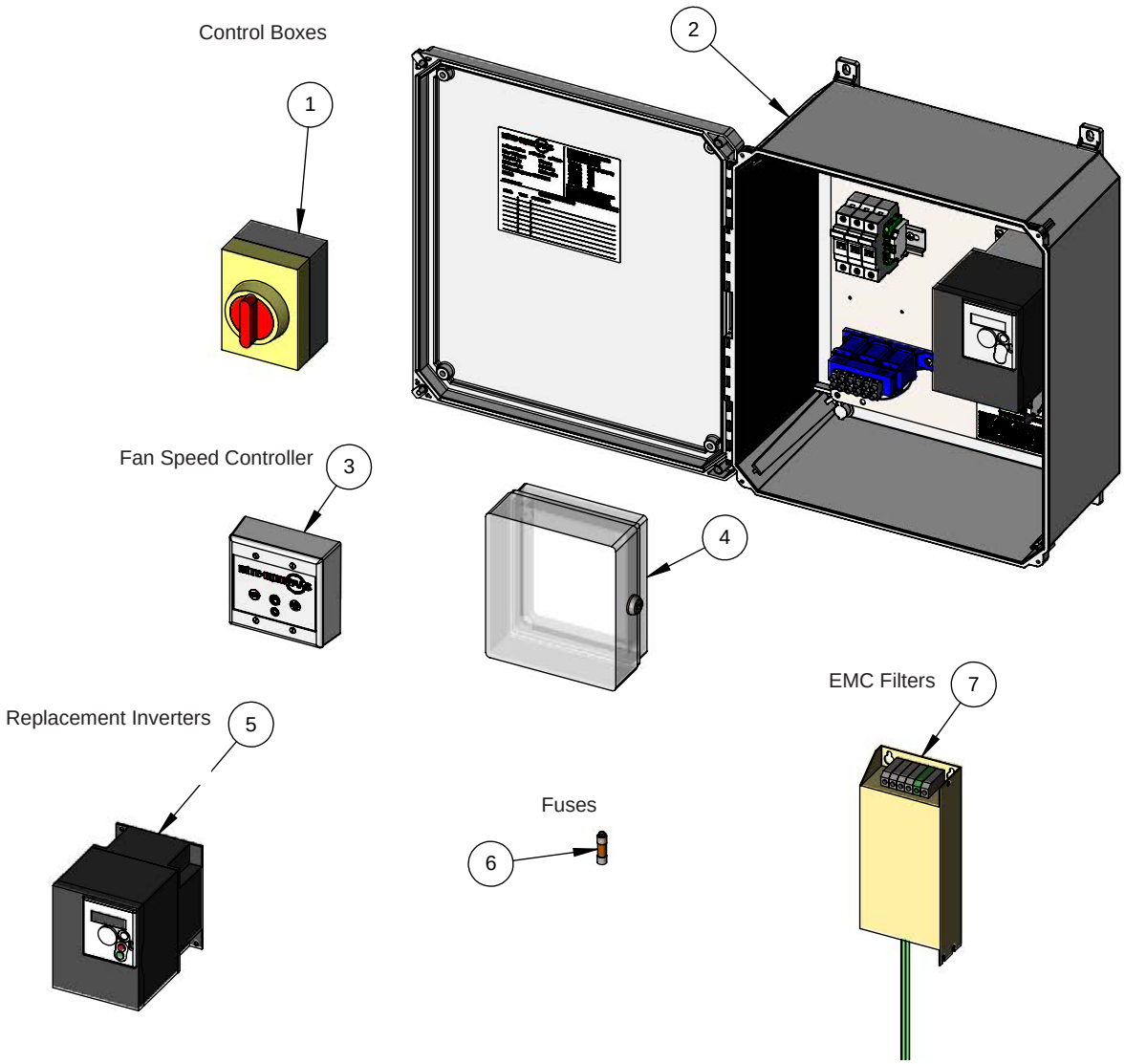
Blades



	DESCRIPTION	PART #
STANDARD HEADROOM	BLADE,SET(2),FAN,8'DIA	12510003
	BLADE,SET(2),FAN,12'DIA	12510002
	BLADE,SET(2),FAN,16'DIA	12510020
	BLADE,SET(2),FAN,20'DIA	12510019
	BLADE,SET(2),FAN,24'DIA	12510014
LOW HEADROOM	BLADE,SET(2),FAN,8'DIA,LHR	12510017
	BLADE,SET(2),FAN,12'DIA,LHR	12510016
	BLADE,SET(2),FAN,16'DIA,LHR	12510015
	BLADE,SET(2),FAN,20'DIA,LHR	12510018
	BLADE,SET(2),FAN,24'DIA,LHR	12510013

PARTS

Controls



#	DESCRIPTION	PART #
1	DISC,RTRY,MOT,25A	38400010
2	CONTROL BOX,HVLS FAN	1752.XXX
3	SW,ASSY,RH FAN	72700260
4	CVR,FAN CONTROL, LOCKING	17900188
5	VFD,FAN	7639.XXX
6	FUSE,6A,600V,CC,ATDR	51000065
	FUSE,10A,600V,CC,ATDR	51000066
	FUSE,15A,600V,CC,ATDR	51000067
	FUSE,20A,600V,CC,ATDR	51000068
7	FILTER,EMC,A312,2HP,1PH,230V	45500017
	FILTER,EMC,A312,1-2HP,3PH,230V-460V	45500018

Rite-Hite Company, LLC and its affiliates (collectively "Rite-Hite") warrant that the Product sold to the Owner will be free of defects in design, materials and workmanship (ordinary wear and tear excepted) for the periods set forth below ("Limited Warranty").

Three (3) Year(s) on all mechanical and electrical parts (non-prorated).
Three (3) Year(s) labor, based on approved travel and labor repair times.

REMEDIES
Parts: Rite-Hite's obligations under this Limited Warranty are limited to repairing or replacing, at Rite-Hite's option, any part which is determined by Rite-Hite to be defective during the applicable warranty period. Such repair or replacement shall be Rite-Hite's sole obligation and the Owner's exclusive remedy under this Limited Warranty.
Labor: Rite-Hite will provide warranty service without charge for labor per the specified warranty period. Thereafter, a charge will apply to any repair or replacement under this Limited Warranty.

CLAIMS Claims under this Limited Warranty must be made (i) within 30 (thirty) days after discovery and (ii) prior to expiration of the applicable warranty period. Warranty period commences on the date of shipment. Claims shall be made in writing or by contacting the representative from whom the Product was purchased directly. Owner must allow Rite-Hite or its agent, a reasonable opportunity to inspect any Product claimed to be defective and shall, at Rite-Hite's option, either (x) grant Rite-Hite or its agent access to Owner's premises for the purpose of repairing or replacing the Product or (y) return of the Product to the Rite-Hite, F.O.B. Rite-Hite's factory.

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RITE-HITE CHINA
First Floor, Building #3,
558 Tongxie Road,
Changning District
Shanghai 200335, China
+86-21-6237-6333

RITE-HITE LATIN AMERICA
Alameda Lorena, 800 - Conj. 401/402
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São Paulo/SP, CEP 01424- Brazil
011-55-11-3527-9590

RITE-HITE GMBH
Carl-Zeiss-Strasse 3
34471 Volkmarsen, Germany
+49-5693 98700