ARKTIC™ · SSC



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Installation Guide

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ARKTIC SSC Installation Guide
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Please read the entire instruction manual before starting the installation.

Safety Considerations

The following definitions are used as safety considerations on the ARKTIC SSC motor and in this manual. Please read and observe all of these safety concerns.

SAFETY SYMBOLS

⚠WARNING Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Installation and service of this motor should be attempted only by trained service technicians familiar with the ARKTIC SSC Instructions and training manual.

This motor should be installed in accordance with accepted practices and installation instructions, and in compliance with all national and local codes.

⚠WARNING

- Disconnect power and lock out driven equipment before installing, servicing, or repairing electrical components including motors. Observe all warning notices posted on the existing equipment, ARKTIC SSC motor, and in these installation instructions. It is also a good practice to confirm power is disconnected with a meter.
- The ARKTIC SSC motor can be used to replace existing shaded pole and PSC induction motors. Proper wiring selection and installation is critical to provide proper operation and maintain the proper operation of the HVACR system it is used in.
- Always keep hands and clothing away from moving parts
- Discharge all capacitors before servicing single phase motors
- Never attempt to measure the temperature rise of a motor by touch. Temperature rise must be measured by thermometer, resistance, imbedded detector or thermocouple.
- Operation of a motor at levels in excess of its nameplate rating may result in fire, damage to equipment or serious injury to personnel.

Safety Considerations (CONTINUED)

The following definitions are used as safety considerations on the ARKTIC SSC motor and in this manual. Please read and observe all of these safety concerns.

SAFETY SYMBOLS

⚠WARNING Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

⚠WARNING

- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.

- Improper installation, adjustment, alternation, service, maintenance, or use of a motor other than for its intended application or in excess of its nameplate rating can cause explosion, fire, electrical shock, or other conditions which may cause personal injury, death, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use the supplied or recommended parts when installing or servicing this product.

⚠CAUTION

- Use of the wires provided with or recommended in this kit is required for proper operation of the motor. Should additional wires be needed, use equivalent size wire gauge and rated insulation.

- Make sure the motor is properly secured and aligned before operation.

What is ECM Technology

ECM (Electronically Commutated Motor) technology is based on a brushless DC (Direct Current) permanent magnet design that is inherently more efficient than the AC (Alternating Current) shaded-pole and permanent-split-capacitor (PSC) motors commonly found in air handlers, furnaces, heat pumps, air conditioners and refrigeration applications throughout the HVACR industry. By combining electronic controls with brushless DC motors, ECMs can maintain efficiency across a wide range of operating speeds. Plus, the electronic controls make most ECM's configurable, allowing for advanced characteristics that are impossible to create using conventional motor technologies.

ARKTIC SSC motors combine state of the art ECM technology with the reliable and quiet unit bearing design used for over 50 years in shaded pole and PSC motors. Unlike residential HVAC ECM products that have separate line voltage and communication voltage connections, these motors simply have a line voltage connection to operate the motor at the factory configured speed(s). This connection could be individual leads or the more common 2-pin refrigeration plug. This provides the energy savings of ECM with the simplicity of shaded pole.



Value of ECM Technology

The HVACR marketplace is changing rapidly. Energy efficiency standards from both manufacturers and the government require higher efficiency motors. ECM technology provides high efficiency and reliability in commercial refrigeration applications that are designed for near continuous operation. More manufacturers are utilizing ECM in their new cases, coolers and freezers every day. Aftermarket retrofit offers huge savings and profit potential.

The ARKTIC SSC significantly outperforms both shaded pole and PSC technology with efficiencies averaging 300% higher than shaded pole motors and 45% higher than PSC. This also decreases the amount of waste heat produced by the motor(s), decreasing the load on the refrigeration system.

With over 10 years of experience, ARKTIC SSC motors include the following reliability improvements:

- Conformal coated electronics to protect against moisture damage
- Available moisture shield to protect against moisture damage
- Locked rotor protection (Stall Detect) allows the motor control to protect the motor if the fan blade is restricted by product, ice or debris, and then restart automatically if the restriction clears itself or is cleared. The control will make continuous automatic restart attempts.
- Electronic current trip protection (automatic restart) if significant over-current condition occurs)
- Inrush current limiting on some models
- RoHS compliant
- TEAO (Totally Enclosed Air Over), Non-vented
- Unit Bearing system utilizing a hardened shaft rotating in a journal machined into the motor housing. The closed lubrication system provides for continuously recirculating oil that is cooled in a reservoir and filtered by the virgin wool felt wicks. A variety of oils are available to meet the range of temperatures encountered in the application.
- Design life 10 years, 80,000+ hours on time
- Starting is robust to windmilling

Introduction/Applications

This installation/service manual enables a qualified technician to install, service, repair and maintain the ARKTIC SSC motor. The ARKTIC SSC is in its third generation. The first two generations were called SSC (Introduced in 2003) and SSC^2 (Introduced in 2006). ARKTIC SSC is backward compatible to both of these models in OEM applications. To date, these motors have been predominantly used in OEM applications. However, they are growing in retrofit replacement of existing induction motors due to their high efficiency.

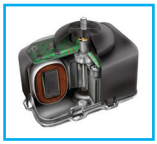
ARKTIC SSC motors are designed primarily for evaporators and condensers (direct drive propeller type fan) in reach-in coolers, display cases, bottle coolers, vending machines, and similar air-moving applications with output ratings up to 38 watts.

The most common retrofit application in commercial refrigeration is drop in replacement of shaded pole and PSC 1550 RPM (typical 4 pole) induction motors with the following specifications:

- 115Vac or 208-230Vac (60Hz and 50Hz)
- 3.5" diameter cast frame
- 2 – 38 Watt
- ¼" x 20 thread shaft
- Multiple mounting configurations
- Single speed
- Typical 2-pin refrigeration plug

The ARKTIC SSC can also be used to replace the out of production 44 Frame ECM motor (introduced in 1997 for OEM use only) and the 58mm ECM motor/fan/shroud package (introduced in 2001 for OEM and retrofit use) in refrigeration applications. However, these motors are still available (in limited quantities; while supplies last) for OEM replacement. See the "Special Applications" section on page 8 for more information on motor/fan/shroud assemblies like the 58mm.

44 Frame



58mm



Many other applications are possible with the ARKTIC SSC due to a variety of factory design features.

- Factory configured speed(s) from 1000 – 3600 RPM
- Factory configured rotation per speed
- Multiple shaft lengths and designs

Introduction/Applications (CONTINUED)

- Multiple length cord sets and terminations
- Multiple mounting designs
- Multiple motor/fan/shroud assembly designs

Overview of ARKTIC SSC specifications and applications:

Voltage: 115 (90-132) or 208-230 (180-264) Vac (60 or 50 Hz)
- These are not dual voltage motors, motors are built unique to their voltage requirement.

Available Output: 2 – 38 watts.

Speed Range: 1000-3600 RPM
- 3600 RPM is not available on all models
- Motors are available factory configured for a specific speed
- The operating speed of the motor is regulated to ± 2% of its configured speed

Speeds: 1 or 2 fixed speeds

Rotation: CW, CCW, or CW/CCW
- Rotation is determined from lead end
- Motors can be ordered factory configured for either direction on single speed or two directions on two speed

Motor Dimensions: 3.5" diameter across frame
- Standard shaft is 1/4" x 20 thread top out single shaft
- Available shafts include 1/4" with or w/o flat, 5/16" with or w/o flat, dual shaft and bottom out shaft

Electrical Connections: The power cord is available in almost any length required. Stock motors are typically supplied with a 2-pin refrigeration plug or 1/4" fast on
- Available cord terminations include 90° 2-pin refrigeration plug, 1/4" or 1/8" quick connect (fast-on) male or female, bare wire strip, molded plugs, eyelets, and fork.

Temperature Rating: Dependent upon oil selection:
- Storage -40°C to +85°C
- Operating -40°C to +55°C

Selection Guide

ARKTIC SSC motors are designed for replacement of existing OEM SSC, SSC², ARKTIC SSC, 44 Frame and 58mm motors (used in refrigeration applications), and for drop in replacement of existing shaded pole or PSC induction motors.

Replacing existing ECM

Stock motors can be used to replace most existing 1550 RPM, OEM SSC, SSC², ARKTIC SSC, 44 Frame or 58mm motors (used in refrigeration applications). However, 44 Frame and 58mm motors are still available (in limited quantities; while supplies last) from Morrill Motors and the OEM. For replacement of any of these OEM motors other than 1550 RPM, contact the OEM or Morrill Motors.

Replacing existing Shaded Pole or PSC

Stock motors are available to replace most common 4 pole, 1550 RPM motors by voltage, Watts (Output), speed and direction (CW or CCW).

Stock ARKTIC SSC Motors

- See the "Mounting" section on page 9 for drawings of each stock model for motor dimensions and mounting specifications
- All stock motors are provided with a ¼" x 20 thread top out single shaft
- All stock motors are provided with oil good for all high and low temperature applications
- END BELL denotes Aluminum (AL) painted, or Cast Iron (CI) painted.
- BOSSED denotes the design of the motor housing.
- MTG POS denotes the position the motor can be mounted in.
  All = Vertical Shaft Up (VSU), Vertical Shaft Down (VSD) and horizontal (±15°)
  VSU = Vertical Shaft Up or horizontal (±15°)
- REAR HOLES denotes if the motor has three rear mounting holes
- MOIST SCHD denotes motors with moisture shield
- CORD denotes the power cord termination. For complete description and drawings of the cords see the "Electrical Connections" section on page 12.
- Model 12CSHBV1 (gray highlight) is a motor/fan/shroud assembly. For more information on this application please contact Morrill Motors.
- ARKTIC SSC model numbers are listed as SSC²B

Selection Guide (CONTINUED)

SSC²B		SUPPLIER					END		MTG	REAR	MOIST	
MODEL	Watts	STOCK NO	HZ	VOLT	RPM	ROT	BELL	BOSSED	POS	HOLES	SCHD	CORD
12CSHEMA1	12	5R016	60/50	115	1550	CW	AL	YES	ALL	YES	YES	2PIN
18AHEMAR1	38	5R017	60/50	115	1550	CCW	CI	YES	ALL	YES	NO	FO
19AHEMAR2	38	5R018	60/50	208-230	1550	CCW	CI	YES	ALL	YES	NO	FO
15CSHEMA2	12	5R019	60/50	208-230	1550	CW	AL	YES	ALL	YES	YES	2PIN
13CSHEMA1	16	5R020	60/50	115	1550	CW	AL	YES	ALL	YES	YES	2PIN
16CSHEMA1	25	5R021	60/50	115	1550	CW	AL	YES	ALL	YES	YES	2PIN
18AHMAR1	38	5R022	60/50	115	1550	CCW	CI	YES	ALL	NO	NO	2PIN
19AHMAR2	38	5R023	60/50	208-230	1550	CCW	CI	YES	ALL	NO	NO	2PIN
12CSHBV1	12	5R024	60/50	115	1550	CW	AL	NO	VSU	YES	YES	2P90
12CSHEMV1	12	5R025	60/50	115	1550	CW	AL	YES	VSU	YES	YES	2P90

ARKTIC SSC motors are configured for Constant Speed. The speed listed on the motor name plate is the speed the motor will operate at within ± 2%. Induction shaded pole and PSC motors do not always operate at their name plate rating. Since airflow is directly proportional to RPM, replacing a motor that is either rated or measured to operate at +/-100 RPM of 1550 RPM (the stock ARKTIC SSC speed) will typically not affect most closed case (cases with doors) applications. In open case applications it is recommended that the rated RPM of the ARKTIC SSC be as close as possible to the operating speed of the induction motor (within ±50 RPM) it is replacing. See the “Airflow/RPM Tests” section on page 13 for more information on how to measure the operating speed of the motor. If the measured operating RPM is greater than ±50 RPM of the stock motor, contact Morrill Motors for replacement options. These guidelines should also be followed if replacing the 44 Frame motor with a stock motor. 44 Frame motors were not built with constant speed and operate more like an induction motor.

Special Applications

If the existing application has a measured or rated RPM outside of the range of the stock motors as described in the previous section, or a specific output is required, ARKTIC SSC motors can be factory configured to adjust the speed (from 1000-3600RPM) and direction of rotation. Speed and output (from 2-38 watts) can be optimized for most applications to achieve maximum efficiency.

Complete motor/fan/shroud assemblies are available in many sizes to increase the ease of drop in replacement of existing shaded pole motors or 58mm motors. These assemblies are design built to match the airflow requirement of the application.

For more information on replacement of OEM SSC series motors, 44 Frame motors and 58mm motors or special application replacement of induction motors including motor/fan/shroud assemblies please contact Morrill Motors at 888-743-7001. Information on our motors can also be found on our website at www.morrillmotors.com.

Mounting

Mounting should take into consideration the original location of the fan blade in its shroud orifice. If the new motor is not the same length as the replaced motor, the position of the fan blade, in the orifice may change. This could change the designed airflow of the application.

Motors should be mounted in their originally manufactured location to assure proper air over the motor for cooling.

All stock ARCTIC SSC motors are built with a 1/4" x 20 thread top out single shaft.

Aluminum motor mounting holes are not tapped. Thread forming screws are provided (where noted).

Cast Iron motor mounting holes are tapped and drilled through. Do not use screws longer than those provided (where noted) to prevent damage to the motor. To provide additional moisture protection, fill any unused holes with provided screws or similar #8-36 screws no longer than 3/8".

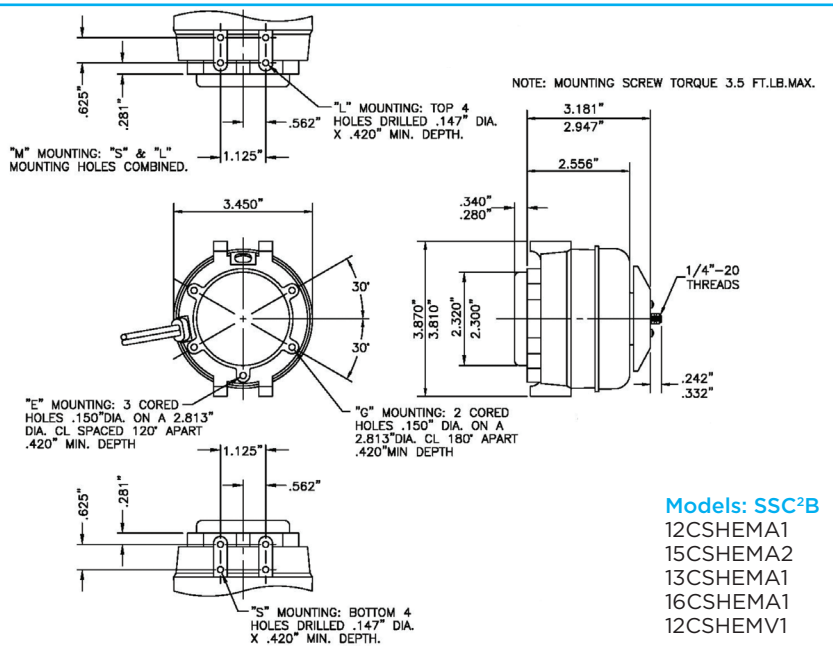
Stock ARKTIC SSC motors are available in four basic designs based on the following criteria located in the stock motor chart on page 8:

END BELL – Aluminum (AL) or Cast Iron (CI)
BOSSED or BOSSLES – Four Top and Four Bottom holes
REAR HOLES – Three rear holes 120° apart
MOISTURE SHIELD – with or without

Each drawing will specify the applicable motor by model number.

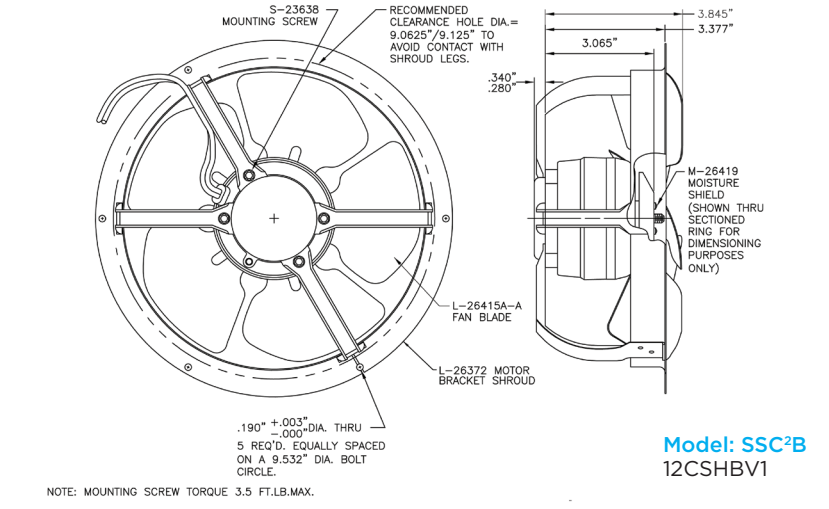
Mounting (CONTINUED)

Stock ARKTIC SSC – Aluminum Bossed w/rear holes and moisture shield, (4) #8-36 thread forming screws provided



Models: SSC²B
12CSHEMA1
15CSHEMA2
13CSHEMA1
16CSHEMA1
12CSHEMV1

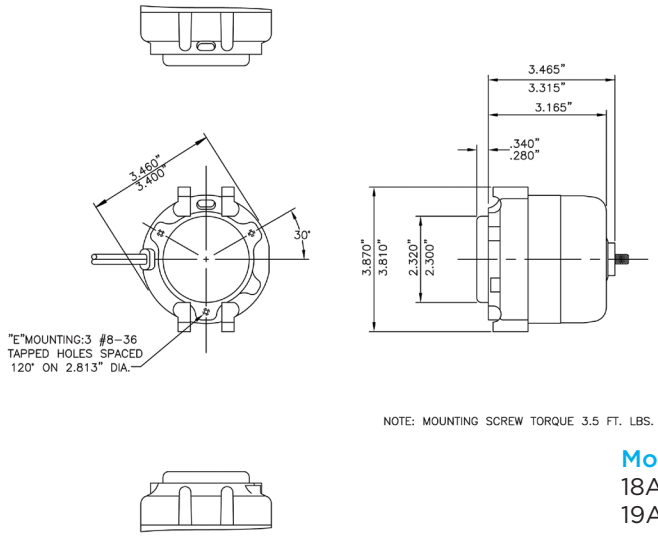
Stock ARKTIC SSC – Aluminum Bossles w/rear holes and moisture shield, assembled as shown, no additional screws provided



Model: SSC²B
12CSHBV1

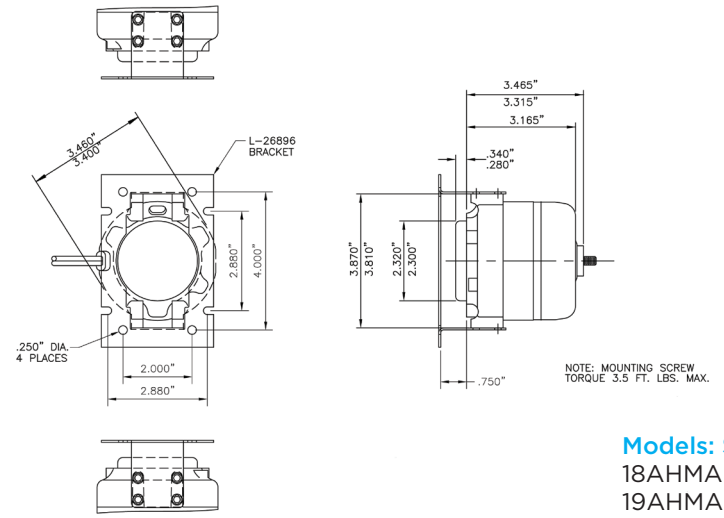
Mounting (CONTINUED)

Stock ARKTIC SSC – Cast Iron Bossed w/rear holes, no moisture shield, (4) #8-36 screws provided, no mounting holes in bossing



Models: SSC²B
18AHEMAR1
19AHEMAR2

Stock ARKTIC SSC – Cast Iron Bossed w/o rear holes, no moisture shield, assembled as shown with bracket, no additional screws provided



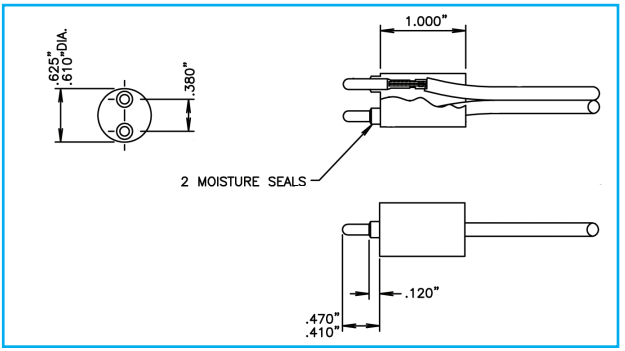
Models: SSC²B
18AHMAR1
19AHMAR2

Electrical Connections

The stock ARKTIC SSC is shipped with the electrical cable hard wired into the motor.

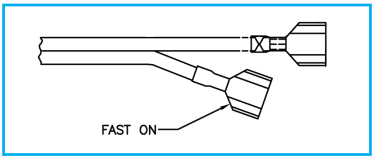
(2PIN) 2-pin refrigeration plug, 13” length

Models: SSC²B
12CSHEMA1
15CSHEMA2
13CSHEMA1
16CSHEMA1
18AHMAR1
19AHMAR2



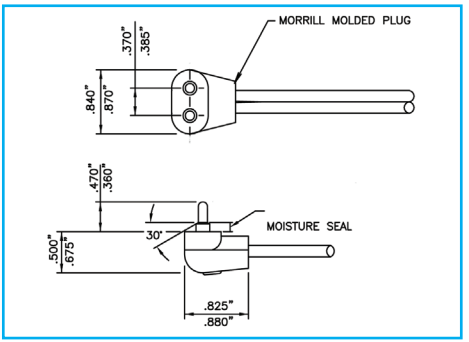
(FO) 1/4” male fast on, 11.25” length

Models: SSC²B
18AHEMAR1
19AHEMAR2



(2P90) 90° 2-pin refrigeration plug, 12.5” length

Models: SSC²B
12CSHBV1
12CSHEMV1



Safety Ground Connection

The user is responsible for the safety ground connection. Proper connection of the original case ground should be made to any of the mounting holes provided on the motor housing. The motor mounting bracket is an acceptable ground if it is not isolated.

Final Electrical Connection/Operation Notes

When finished connecting the ARKTIC SSC cable/wires to the system, use cable ties (if needed) to create the recommended drip loop, and assure it will not interfere with the fan or other system devices (especially sharp edges and hot surfaces like defrost coils) that could damage the insulation.

Before applying power to the motor, confirm that the voltage at the case receptacle matches the voltage rating of the motor. Permanent damage will result from operating 115Vac motors at 208-230Vac. Operation of a 208-230Vac motor at 115Vac will not damage the motor. However the motor will not be able to achieve its design speed.

Do not connect the cord from the motor to the case receptacle unless the power to the receptacle is off to prevent arcing.

Verify the system operation upon completion of installation including direction of rotation.

Airflow/RPM Tests

ARKTIC SSC motors are configured for Constant Speed. The speed listed on the motor name plate is the speed the motor will operate at within ± 2%. Induction shaded pole and PSC motors do not always operate at their name plate rating. Since airflow is directly proportional to RPM, replacing a motor that is either rated or measured to operate at +/-100 RPM of 1550RPM (the stock ARKTIC SSC speed) will typically not affect most closed case (cases with doors) applications. In open case applications it is recommended that the rated RPM of the ARKTIC SSC be as close as possible to the operating speed of the induction motor (within ±50 RPM) it is replacing. If the measured operating RPM is greater than ±50 RPM of the stock motor, contact Morrill Motors for replacement options. These guidelines should also be followed if replacing the 44 Frame motor with a stock motor. 44 Frame motors were not built with constant speed and operate more like an induction motor.

To check/verify the actual RPM of the motor use a handheld (digital) tachometer (available in contact and/or non-contact laser). RPM must be checked with a load on the motor (i.e. fan attached). No load operation (without fan attached) will result in a pulsing type operation. For best results, coils should be clean with no ice buildup.

Operation

ARKTIC SSC motors are configured with Constant Speed, meaning they simply maintain the speed (RPM) they are configured for in each application. This reduces the effect dirty coils and product load have on the operation of the motor, unlike PSC and shaded pole motors. The motor simply uses only the power (current) necessary to operate at its programmed speed, and automatically has the ability to increase or decrease power to maintain that speed.

ARKTIC SSC motors turn on and off with line voltage power.

Start up

During start up, motor current is slowly applied to motor windings. This provides a controlled smooth start up. The motor/fan will attain a speed of 300RPM in 15 seconds, and then ramp up to its rated speed. It may be up to 5 seconds before the motor has sustained rotation in the correct direction; during which time it may rock (rotate in each direction), give a partial turn and stop, or do nothing at all. This is all normal operation. Start-up is also designed to handle wind milling effect from other motors.

Stall Detect (Locked Rotor Protection)

This feature protects the motor from external obstructions in the event it does not achieve 300 RPM within 15 seconds of applying voltage or if the RPM drops below 500 RPM during operation.

The ARKTIC SSC will try to start three times. If it fails to start on the third attempt it will turn off and cool for 15 seconds, then try three more start attempts. This operation can continue indefinitely without damage to the motor or the case power source until service is performed due to the minimal current drawn during start-up.

Shut down

When power is removed, motor will coast to a stop.

Maintenance

The ARKTIC SSC motor is permanently lubricated and requires no maintenance.

Troubleshooting Guidelines

Do not try to troubleshoot the ARKTIC SSC motor out of the case or without the fan blade attached. No load operation (without fan attached) will result in a pulsing type operation.

Vibration or audible noises

Step 1: Check fan blade clearance to wiring harness and/or any obstacles

- Replace fan blade if necessary

Step 2: Check all mounting hardware

- Tighten any loose hardware and/or replace mount if worn

The ARKTIC SSC motor has built in over current protection. Under extreme influences, if the over current trip limit is exceeded, the motor will shutoff and then attempt to restart. See the “Operation” section on page 14 to understand how motor starts. There is also a non- repairable open circuit condition under really significant fault conditions.

If the motor is not running, follow the guidelines in the next section. Do not assume the motor is failed. ARKTIC SSC motors should not stop and require power to be cycled to work.

Motor does not operate at rated speed

Step 1: Check for obstructions to the shaft and/or fan blade

- Remove obstructions and reapply power

Step 2: Check supply voltage to the motor at the case receptacle.

- Make repairs to case power supply if voltage is below the ratings listed here. Motors rated at 115Vac will operate properly with a supply voltage between 90-132Vac. Motors rated at 208-230Vac will operate properly with a supply voltage between 180-264Vac.

Troubleshooting Guidelines (CONTINUED)

Motor does not start or runs intermittently

If the motor is trying to start, check for obstructions to the shaft and/or fan blade. See the "Operation" section on page 14 to understand how motor starts.

- Remove obstructions and reapply power.

If the motor is not trying to start or runs intermittently, do not replace the motor without following all of the guidelines in this section.

Step 1: Check the cabinet wiring diagram and the supply voltage at the case receptacle (end of the ARKTIC SSC cord set).

- Make repairs to the case if needed to restore voltage to the receptacle. Follow the next step before reconnecting the motor.
- Confirm the supply voltage measured matches the voltage rating on the motor. Motors rated at 115Vac will operate properly with a supply voltage between 90-132Vac. Motors rated at 208-230Vac will operate properly with a supply voltage between 180-264Vac. All ARKTIC SSC motors will operate properly at 60 or 50 Hz.
- Permanent damage will result from operating 115Vac motors at 208-230Vac. Replace the motor with proper voltage rating and/or continue to the next step if the motor rating matches the supply voltage.

Step 2: Check the case receptacle for wear, fit and/or damage

- Replace the case receptacle if worn, loose or damaged. The female terminal in the case receptacle can get expanded due to "wiggling" of plug or removal/insertion of plug at aggressive angles during motor removal or connection.

Step 3: Check the power cord between the case receptacle and the motor for damage.

- Replace power cord if damaged and/or secure away from fan blade, sharp edges; defrost coils and any other system components that could cause damage

If the troubleshooting guidelines provided here do not solve the problem or you have a problem not listed here please follow your standard motor replacement procedures. As always, Morrill Motors is committed to the continuous improvement of our products; please ask your replacement part supplier if there are procedures to return the motor to Morrill Motors.

Notes:

Notes:

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Brand Evolution

In 1997 General Electric began building ECM products for commercial refrigeration applications, utilizing their current ECM technology that had been used in residential and light commercial HVAC applications since 1987.

In 2004 the Regal Beloit Corporation acquired the ECM division from General Electric and continued to build commercial refrigeration products under the name GE ECM by Regal Beloit. In 2007 the Regal Beloit Corporation acquired Morrill Motors. Morrill has been producing commercial refrigeration motors in an ECM design called SSC (Solid State Commutated) since 2003.

In 2009, Regal Beloit announced the rebranding of GE ECM by Regal Beloit commercial refrigeration products as Morrill Motors.

Since 1946, Morrill Motors has earned the trust of customers around the world. Combining over 20 years of GE ECM by Regal Beloit experience with Morrill Motors commitment to value, quality, and service we are now offering the most efficient electronically commutated motor (ECM) available. Working with you and your team, we will ensure exacting specifications and performance standards whether you select one of our many current production models, or choose to have us customize features and specifications to meet your special requirements.

We are pledged to ensure your success. Expect only the best service, quality and value when you specify Morrill Motors.

The initial focus of ECM technology in commercial refrigeration applications was on evaporator fan motors, due to their near continuous run time and low efficiency. Today there is an ECM application for almost all evaporator and condenser motors used in commercial refrigeration from 9 watt unit bearing motors to fractional horse power NEMA 48 frame motors in OEM applications and aftermarket drop-in replacement of existing shaded pole and PSC motors.

For more information on all Morrill Motors products please visit www.morrillmotors.com.

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