

Throughout this manual, there are a number of HAZARD WARNINGS that must be read and adhered to in order to prevent possible personal injury and/or damage to equipment. Three signal words "DANGER", "WARNING", and "CAUTION" are used to indicate the severity of a hazard and are preceded by the safety alert symbol.



DANGER

Indicates the most serious hazard and is used when serious injury or death WILL result from misuse or failure to follow specific instructions.



WARNING

Used when serious injury or death MAY result from misuse or failure to follow specific instructions.



CAUTION

Used when minor or moderate injury or product / equipment damage MAY result from misuse or failure to follow specific instructions.

NOTICE

Indicates information considered important, but not hazard-related.

It is the responsibility of all personnel involved in installation, operation and maintenance to fully understand the  Danger,  Warning, and  Caution procedures by which hazards are to be avoided.

Receiving, Inspection & Unpacking

When the equipment is received all items should be carefully checked against the bill of lading to be sure all crates and cartons have been received. Before accepting delivery, carefully inspect each carton or crate for visible shipping damage. If any damage is noticed, the carrier should make the proper notation on the delivery receipt acknowledging the damage. Make notations of all damage on all copies of the bill of lading and have all copies countersigned by the delivering carrier. The carrier should also fill out a Carrier Inspection Report. The factory Traffic Department should then be contacted. File claim for damage with the carrier. Physical damage to the unit after acceptance is not the responsibility of Twin City Fan Companies, Ltd.

Unpack each carton or crate and verify that all required parts and proper quantities of each item have been received. Refer to drawings for part descriptions. Report shortages or missing items to your local representative to arrange for replacement parts.

Due to availability of carriers and truck space, it is not possible to guarantee that all items will be shipped together. Verification of shipments must be limited to only those items on the bill of lading.

The unit nameplate must be checked to make sure the voltage agrees with the power supply available.

FAN ASSEMBLY

The BCRFS supply fan is shipped with the intake hood stored in the fan housing. Remove housing cover. Remove Intake Hood parts and assemble with hardware provided. Attach Filter Rails to Hood sides. Insert Filters. Install Hood Top. Attach Hood to inlet side of fan housing.

MOTOR INSTALLATION

Motor 213T frame and larger are shipped loose to avoid damage. Mount to motor plate with hardware provided.



Installation

Roof ventilators should always be mounted to a flat level, solid and rigid structure. Particular caution should be exercised when installing fans on metal buildings. Be sure roof is capable of supporting the fan(s). Fans mounted on roofs that are not supported correctly will cause vibration that could cause damage or injury.

Use guy wires to help secure roof units if excessively windy conditions prevail.

1.  **CAUTION**

This fan contains rotating parts and requires electrical service. Appropriate safety precautions should be taken during installation, operation and maintenance.

2.  **WARNING**

Do not install or operate this fan in an environment or atmosphere where combustible or flammable materials, gasses or fumes are present unless it was specifically designed and manufactured for use in that environment. Explosion or fire can result. Explosive, corrosive, high temperature, or other extreme conditions may require special construction, inspection and maintenance. It is necessary to observe the fan manufacturer's recommendations and limitations concerning the type of material to be handled by the fan and its application to special conditions.

3. The roof supply fan is designed to be mounted on a curb, which should be securely installed prior to fan installation.

4.  **CAUTION**

All electrical work must be done in accordance with local and/ or national electrical codes as applicable. If you are unfamiliar with methods of installing electrical wiring, secure the services of a qualified electrician.

5.  **WARNING**

This product must be grounded.

6.  **DANGER**

Make sure power is turned off and locked in the OFF position at the service entrance before installing, wiring or servicing the fan.

7.  **CAUTION**

Before wiring the motor, check the supply voltage against the motor nameplate voltage. High or low voltage can damage the motor and void the motor warranty.

8.  **WARNING**

Be sure to keep all wiring clear of rotating or moving parts.

9.  **WARNING**

Before starting the fan, turn the wheel to assure it rotates freely. If needed, adjust the wheel/shaft/bearing/motor position as required to achieve necessary clearances.

10. On belt driven units, assure belts are tensioned and aligned properly. See Maintenance section, Page 5.

11. Check all setscrews and keys. Tighten as necessary prior to fan start-up.

12. Anchor the fan securely to the roof curb. Anchoring through the vertical portion of the curb cap flange is recommended. Use a minimum of eight lag bolts or other suitable fasteners.

BACKDRAFT DAMPER INSTALLATION (OPTIONAL ACCESSORY)

Dampers are available only with the Inlet Extension accessory. Dampers are to be positioned in the damper rails located in the extension near the fan housing, under the Access Door. Make sure the damper blades open towards the fan.

Electrical Connection

1. Connect supply wiring to the disconnect switch (non-fused standard). Check the wiring diagrams on the motor for connections.
2. The motor is factory set at the voltage marked on the fan nameplate. Check the line voltage with the nameplate voltage and wiring diagrams.
3. The main power wiring should be sized for the ampacity shown on the dataplate. Size wires in accordance with the ampacity tables in Article 310 of the National Electrical Code. If long wires are required, it may be necessary to increase wire size to prevent excessive voltage drop. Wires should be sized for a maximum of 3% voltage drop.
4. Disconnect switches are not fused. The power leads must be protected at the point of distribution in accordance with the fan dataplate.
5. On fans without a thermal protector integral to the motor (refer to unit or motor dataplate to determine if protector is present) a separate overload device is required. Refer to Sections 430-32 of the N.E.C. for sizing.
6. All units must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code (ANSI/NFPA 70). A ground lug is provided as standard in the unit terminal box. Size grounding conductor in accordance with Table 250-95 of the National Electrical Code. **DO NOT** use the ground lug for connecting a neutral conductor.
7. Supply voltage to the power ventilator should not vary by more than 10% of the value indicated on the unit dataplate. Phase unbalance must not exceed 2%.

 CAUTION
Use copper conductors only.

 CAUTION
Protect wiring from sharp edges. Leave some slack in the line to prevent damage.

 WARNING
Failure of motor due to operation on improper line voltage or with excessive phase unbalance constitutes product abuse and may cause severe damage to the unit's electrical components.

Check, Test & Start Procedure

1.

 WARNING
Disconnect power to the unit before servicing. Make sure power is turned off and locked in the OFF position.
2. Tighten all bolts and setscrews securely and, on belt driven fans, check sheave alignment and belt tension. Tighten belts if necessary. **NOTE THAT ALL BOLTS, SETSCREWS AND BELTS SHOULD BE RETIGHTENED AFTER TWO DAYS OF INITIAL OPERATION.**
3. Apply power to unit and check rotation of wheel with the directional arrow on the unit.
4. Electrical Input Check: Perform check of fan ampere draw and verify that motor nameplate amps are not exceeded. Take account of the service factor range if motor is nameplated above a 1.0 service factor.
5. Fan RPM Check: Fan RPM should be checked and verified with a tachometer.

 WARNING
Especially check three-phase units for rotation. For three-phase, rotation can be changed by interchanging any two of the three line leads. If the unit is checked on temporary wiring, it should be rechecked when permanently installed. Motor burn-out or tripped overload protection devices are usually the result of wrong rotation.

NOTICE
The fan was balanced at the factory to be within stringent vibration levels before shipment. However, there are several things that may cause vibration, such as rough handling in shipment and installation, weak foundations and alignments.

V-Belts

V-belts on these belt driven fans are oil, heat, and static resistant type and oversized for continuous duty. With proper installation and maintenance, years of operating efficiency can be added to the lifespan of the V-belt drive.

The condition of V-belts and the amount of belt tension should be checked prior to start-up (see Figure 1). When it becomes necessary to adjust belt tension, do not over-tension as bearing damage will occur. Recommended belt tension should permit $\frac{1}{64}$ " deflection per inch of span of the belt at the center of the belt span. To find this point, measure halfway between the pulley centerlines as shown in Figure 2. Extreme care must be exercised when adjusting V-belts as not to misalign the pulleys. Any misalignment will cause a sharp reduction in belt life and will also produce squeaky, annoying noises (see Figure 3). On units equipped with 2 groove pulleys, adjustments must be made so that there is equal tension on all belts (see Figure 4).

1. Where tensioning rods are not provided, adjustment is more easily obtained by loosening and adjusting one side of the motor bracket at a time.
2. Always loosen tension adjustment enough to place belts on sheaves without running belts over the edge of either sheave. A new belt may be seriously damaged internally by careless handling (see Figure 5).


WARNING

When removing or installing belts, never force belts over pulleys without loosening the motor first to relieve belt tension.

3. Fan speed can be increased by closing the adjustable motor pulley or decreased by opening it. Always check the load on the motor when increasing the fan speed.

Figure 1. Eliminate Slack

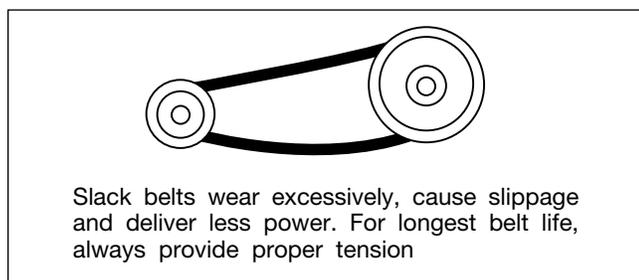


Figure 2. Belt Deflection

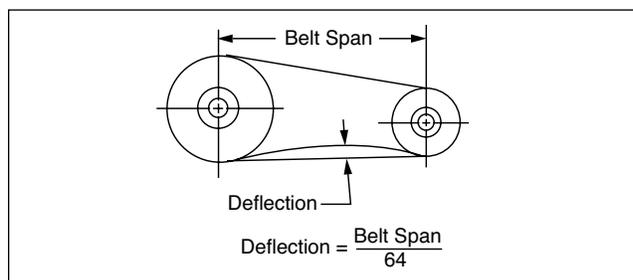


Figure 3. Alignment

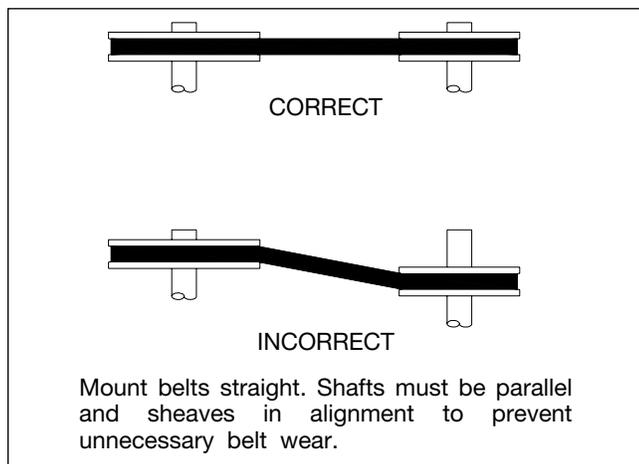


Figure 4. Two-Groove Sheaves (Pulleys)

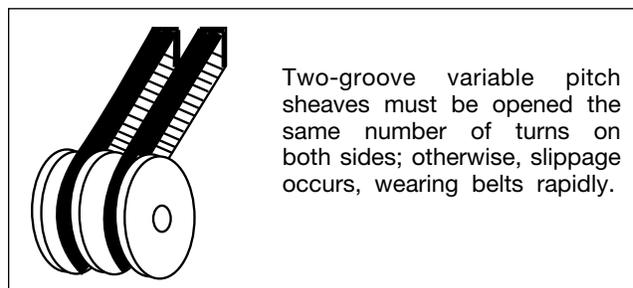
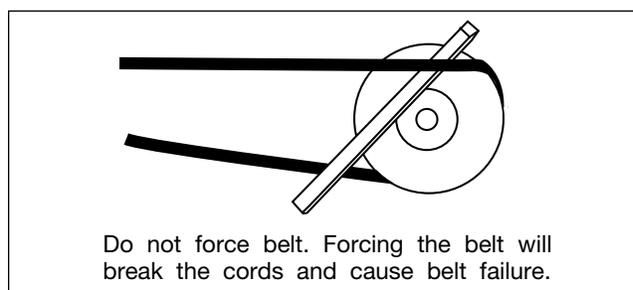


Figure 5. Belts



Maintenance

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and experienced with this type of equipment.

 **CAUTION**

Sheet metal parts, screws, clips and similar items inherently have sharp edges, and it is necessary that the installer and service personnel exercise caution.

 **WARNING**

Hazardous moving parts. Unit may contain protected fan motor which may start automatically and cause injury. Allow time for reset. Disconnect power before servicing.

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Start-up and routine maintenance should cover the following items:

- a. Tighten all setscrews, bolts and wire connections.
- b. Check belt tension and sheaves for wear.
- c. Lubricate fan bearings (see Tables 1 and 2 on page 6).
- d. Cleaning of unit, wheel and filters.

All motors containing ball bearings are permanently lubricated from the factory. No additional maintenance is required.

1. Before performing any maintenance on the fan, be sure power is turned off and locked in the OFF position at the service entrance.
2. Fans should be carefully checked at least once a year. For critical or rugged applications, a routine check every two or three months is suggested.
3. All **motors** supplied with Twin City Fan & Blower units carry a one-year limited warranty from date of shipment. For repairs within the warranty period, the motor must be taken to the motor manufacturer's authorized service dealer. Contact your representative for additional warranty details.
4. A periodic **motor** check should consist of spinning the motor shaft with the power off to be sure the motor turns freely and the bearings run smoothly. The belt on belt driven units should be removed from the motor sheave.
5. When removing or installing a **belt**, do not force the belt over the sheave. Loosen the motor mount so that the belt can be easily slipped over the sheave.
6. The **belt** on belt driven units should be removed and carefully checked for glazing, cracks, ply separation or irregular wear. A small irregularity in the contact surface of the belt will result in noisy operation. If any of these defects are apparent, the belt should be replaced. Check the sheaves also for chipping, dents or rough surfaces which could damage the belt.

7. The correct **belt tension** is important. Too tight of a belt will result in excess pressure on the motor bearings and fan bearings and may also overload the motor. Too loose of a belt will result in slippage which will quickly "burn" out belts. A belt should feel "live" when thumped, approximately ¼" belt deflection (3 to 5 lb.) when subject to finger pressure at midpoint between sheaves.
8. The **belt alignment** should also be checked to be sure the belt is running perpendicularly to the rotating shafts. Fan and motor shafts must be parallel. Improper alignment will result in excessive belt wear.
9. Check **sheave setscrews** to ensure tightness. Proper keys must be in keyways.
10. Do not readjust fan RPM. If sheaves are replaced, use only **sheaves** of identical size and type.
11. If unit is to be left idle for an extended period, it is recommended that **belts** be removed and stored in a cool, dry place to avoid premature belt failure.
12. Fan **bearings** on sizes 090 - 180 are permanently lubricated. The standard pillow block bearings on sizes 200 and 220 are factory lubricated and are provided with grease fittings. Annual relubrication is recommended, or more frequently if needed (see Table 1).
Do not over-grease. Use only 2 or 3 shots of a recommended lubricant with a hand gun in most cases (see Table 2). Maximum hand gun rating 40 P.S.I. Rotate bearings during lubrication where good safety practice permits.

 **CAUTION**

Greases of different soap bases (lithium, sodium, etc.) may not be compatible when mixed. Prevent such intermixing by completely purging the bearing of old greases.

The most frequent causes of bearing failure are not greasing often enough, using an excessive quantity of grease, or using incompatible greases. Excessive vibration, especially if the bearing is not rotating, will also cause bearings to fail. **Bearings** must also be protected from water and moisture to avoid internal corrosion.

13. During the first few months of operation it is recommended that the **bearing setscrews** be checked periodically to ensure that they are tight.
14. The rotating **wheel** requires particular attention since materials in the air being handled can build up on the blades to cause destructive vibration or weaken the structure of the wheel by corroding and/or eroding the blade metal. Regular inspection and corrective action at intervals determined by the severity of each application are essential to good service life and safety.

Table 1. Suggested Fan Bearing Greasing Intervals

INTERVAL (MONTHS)	TYPE OF SERVICE
12 to 18	Infrequent operation or light duty in clean atmosphere.
6 to 12	8 to 16 hrs./day in clean, relatively dry atmosphere.
3 to 6	12 to 24 hrs./day, heavy duty, or if moisture is present.
1 to 3	Heavy duty in dirty, dusty locations; high ambient temperatures; moisture laden atmosphere; vibration.

Table 2. Grease Manufacturers

MANUFACTURER	GREASE (NLGI #2)
Shell	Gadus S2 V100 2
Exxon/Mobil	Ronex MP

FILTER MAINTENANCE

Filters should be inspected and cleaned regularly, as dirty filters will cause fan performance to be reduced. Remove wing nuts and bolts from one side of the hood. Tilt filters forward and remove from the top. Filters should be cleaned with a mild detergent in warm water.

Storage

If fans are stored for any length of time, they should be stored in a clean, dry location to prevent rust and corrosion. Outdoor storage is not recommended. When outdoor storage is necessary, fans should be protected from the elements as completely as possible. Cover the fan inlet and outlet and keep motors dry and clean.

For extended storage (more than 3 months) motor shafts and bearings should be rotated monthly. If stored longer than 6 months, bearing grease in motor and fan should be purged and replaced with compatible grease. Belts should be rechecked for proper tension. Storage records should be kept to assure proper maintenance. The factory can advise warranty centers to provide motor and bearing service if needed.

Limitation of Warranties and Claims

Seller warrants to the original purchaser that the goods sold hereunder shall be free from defects in workmanship and material under normal use and service (except in those cases where the materials are supplied by the buyer) for a period of one year from the date of original installation or eighteen (18) months from the date of shipment, whichever occurs first. The liability of seller under this warranty is limited to replacing, repairing, or issuing credit (at cost, F.O.B. factory and at seller’s discretion) for any part or parts which are returned by buyer during such period provided that:

- a. Seller is notified in writing within ten (10) days following discovery of such defects by buyer, or within ten (10) days after such defects should reasonably have been discovered, whichever is less;
- b. The defective unit is returned to seller, transportation charges prepaid by buyer.
- c. Payment in full has been received by seller or said products; and
- d. Seller’s examination of such unit shall disclose to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair, alteration, act of God, or accident.

No warranty made hereunder shall extend to any seller product whose serial number is altered, effaced or removed. Seller makes no warranty, express or implied, with respect to motors, switches, controls, or other components of seller’s product, where such components are warranted separately by their respective manufacturers. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable to buyer for indirect, incidental collateral, or consequential damages of any kind. (BUYER’S FAILURE TO PAY THE FULL AMOUNT DUE WITHIN SIXTY (60) DAYS OF DATE OF INVOICE SHALL OPERATE TO RELEASE SELLER FROM ANY AND ALL LIABILITY OR OBLIGATION ARISING PURSUANT TO ANY WARRANTY, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, MADE IN CONNECTION WITH ANY CONTRACT FORMED HEREUNDER. BUYER AGREES THAT SUCH FAILURE TO PAY SHALL CONSTITUTE A VOLUNTARY WAIVER OF ANY AND ALL SUCH WARRANTIES ARISING PURSUANT TO SUCH CONTACT.)

Fan Troubleshooting Chart

PROBLEM	POSSIBLE CAUSES
FAN DOES NOT OPERATE	<ol style="list-style-type: none"> 1. Wrong voltage. 2. Electricity turned off or not wired properly. 3. Tripped overload protector. 4. Blown fuses. 5. Loose pulleys. 6. Broken belts.
TOO LITTLE AIR	<ol style="list-style-type: none"> 1. Wheel rotating in wrong direction. 2. Fan speed lower than design. 3. System is more restrictive (more static pressure) than expected. 4. Restricted fan inlet or outlet. 5. Filters are dirty or clogged.
TOO MUCH AIR	<ol style="list-style-type: none"> 1. Fan speed higher than design. 2. System is less restrictive (less static pressure) than expected.
EXCESSIVE HORSEPOWER	<ol style="list-style-type: none"> 1. Wheel rotating in wrong direction. 2. Wheel rubbing on inlet venturi. 3. Fan speed higher than design. 4. Worn fan bearings.
EXCESSIVE NOISE	<ol style="list-style-type: none"> 1. Wheel or sheaves loose. 2. Bearing or drive misalignment. 3. Accumulation of material on wheel. 4. Worn or corroded wheel. 5. Wheel out of balance. 6. Wheel hitting housing. 7. Bent shaft. 8. Bearings need lubrication. 9. Loose bearing bolts. 10. Loose or worn bearings. 11. Mismatched belts. 12. Belts too loose or too tight. 13. Belts oily or dirty. 14. Belts worn. 15. Loose fan mounting bolts. 16. Rattle of components in high velocity airstream. 17. Electrical noise. 18. Noise from high velocity air system. 19. Vibrating parts not isolated from building. 20. Vibrating ductwork.
EXCESSIVE VIBRATION	<ol style="list-style-type: none"> 1. Wheel or sheaves loose on shaft. 2. Wheel out of balance. 3. Excessive buildup of dirt/dust on wheel. 4. Belts too loose or too tight. 5. Mismatched belts. 6. Bent shaft. 7. Bearing or drive misalignment. 8. Loose or worn bearings. 9. Fan mounting bolts loose. 10. Weak mounting base for fan. 11. Curb not flat and level.

It is recommended that the users and installers of this shipment familiarize themselves with AMCA Publication #201, "Fans and Systems" and publication #202, "Troubleshooting" which are published by the Air Movement and Control Association (AMCA), 30 West University Drive, Arlington Heights, Illinois 60004. www.amca.org

