

Backward Inclined Hinged Restaurant Exhaust Fan

IM-610 August 2014

INSTALLATION, OPERATION & MAINTENANCE MANUAL

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. Two signal words "WARNING" and "CAUTION" are used to indicate the severity of a hazard and are preceded by the safety alert symbol.

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

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 A Warning and A Caution procedures by which hazards are to be avoided.

Twin City Fan & Blower Catalog 610 provides additional information on this equipment, fan performance, optional accessories and construction features. This catalog can be found at www.tcf.com or by contacting your local Twin City Fan & Blower sales representative.

HEAVY DUTY RESTAURANT EXHAUST

Belt Drive Model: BHRE

Type: Centrifugal Roof Exhaust CFM to 9,043 (15,365 m³/hr) Static Pressure to 5.00 in. w.g. (1,245 Pa) **Maximum Continuous Operating Temperature:** 400°F (204.4°C)

Available in nine sizes: 105 - 245, nominal wheel diameter 10.5 to 24.5 inches (267-622 mm)



GENERAL INSTALLATION



Sheet metal parts, screws, clips and similar items inherently have sharp edges, and it is necessary that the installer and service personnel exercise caution. The installation of this equipment shall be in accordance with the regulations of authorities having jurisdiction and all applicable codes.

This equipment is to be installed by an experienced installation company and fully trained personnel. The mechanical installation of the exhaust ventilator consists of making final connections between the unit and building services.

CAUTION

Disconnect power and lock out power source before installing or servicing. Failure to disconnect power can result in electric shock, fire or serious injury.

- 1. Do not operate the fan beyond the maximum cataloged RPM. The current should be verified any time the RPM is adjusted to ensure it is below the nameplate amperage value.
- 2. Verify the equipment is compatible with the power source.
- 3. Allow motor to cool down before servicing to avoid injury.

RECEIVING

When the equipment is received, all items should be carefully checked against the bill of lading to ensure all items have been received. Inspect each package for shipping damage before accepting delivery.

If any damage occurred, notify the carrier, who will make proper notation on the delivery receipt acknowledging the damage. Damages should be noted on all copies of the bill of lading and have all copies countersigned by the delivering carrier. A Carrier Inspection Report should be filled out and forwarded to the Traffic Department.

If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. Twin City Fan is not responsible for damages incurred during shipment or after acceptance.

SHORT TERM STORAGE

If fan installation is to be delayed, store the unit in a protected area, preferably indoors. Protect fan bearings and motor from moisture and vibration.

LONG TERM STORAGE

Prior to storage, grease fan bearings and motor bearings per manufacturer's specifications. Note, motors which contain ball bearings are permanently lubricated as built. No additional lubrication is required. On belt drive units, belts should be removed or at least the belt tension reduced to prevent a sag/set from forming in the fan shaft and belts. Rotate wheel and shaft monthly and leave in a different position. When unit is to be removed from storage and activated, check for corrosion and damage. All bearing grease should be purged and replaced with fresh grease.

Verify that all required parts and proper quantities have been received for each item. Report shortages or missing items to your local representative to arrange for replacement parts.

Sometimes it is not possible for all items to ship together due to availability of carriers and truck space. Verification of shipments must be limited to only items on the bill of lading.



HANDLING

Lift fan using all lift points. Use spreader bars to ensure straps do not come in contact with unit. See Figure 1.

INSTALLATION

Refer to Table 2 for appropriate size roof opening. Follow curb manufacturer's recommended installation.

- 1. For lifting locations, see Figure 1.
- Position the fan with its wiring conduit in line with the wiring or external disconnect, towards the power supply. The location and placement of any supply fans should be considered.
- Center fan on roof curb, allow 3/4" (19 mm) space all around.
- 4. Attach hinge bracket to fan with 1/2" cap screw and nut. Adjust curb stop (bolted to fan) so hinge is flush with roof curb.

- 5. Rotate hinge bracket such that mounting holes are vertical and fasten curb hinge with hardware pack (p/n HWPACK-1) according to Figure 3.
- Screw fan to the roof curb using #12-14 dril-flex or equal 3" (76 mm) from each corner and one fastener centered. Add additional fasteners equally spaced to satisfy. See Figure 2 and Table 1.
- 7. Verify the power is de-energized. Run wires to the disconnect switch. Leave some slack in the wire in the motor compartment so the motor and wheel assembly can be lifted for inspection and cleaning.
- 8. Verify power source is compatible with the fan. Make connection to the disconnect switch.
- 9. Check tightness of all fasteners.
- 10. Verify wheel is centered and spins freely.
- 11. Restaurant fan installation must be in compliance with local codes and National Fire Protection Association's standard NFPA 96.

Table 1. Fan Mounting to Roof Curb

Size	Fasteners per Side	Total Fasteners
105	2	8
122 - 245	3	12

Figure 2.





All hardware found in package HWPACK-1

Table 2. Roof Curb Mounting to Building Structure

				Minimum Fastener	S	0	Deef	
Size	Curb Cab	Roof Curb	Steel Anchoring	Concrete Timber Anchoring Anchoring		Flange	Opening	
105	20 x 20 (508 x 508)	18 1/2 x 18 1/2 (470 x 470)	3	3	3	22 1/2 x 22 1/2 (571 x 571)	13 1/2 x 13 1/2 (343 x 343)	
122	23 x 23 (584 x 584)	21 1/2 x 21 1/2 (546 x 546)	3	3	3	25 1/2 x 25 1/2 (648 x 648)	16 1/2 x 16 1/2 (419 x 419)	
135	25 x 25 (635 x 635)	23 1/2 x 23 1/2 (597 x 597)	3	3	3	27 1/2 x 27 1/2 (698 x 698)	18 1/2 x 18 1/2 (470 x 470)	
150	27 1/2 x 27 1/2 (698 x 698)	26 x 26 (660 x 660)	3	3	3	30 x 30 (762 x 762)	21 x 21 (533 x 533)	
165	29 x 29 (737 x 737)	27 1/2 x 27 1/2 (698 x 698)	3	3	3	31 1/2 x 31 1/2 (800 x 800)	22 1/2 x 22 1/2 (571 x 571)	
182	31 1/2 x 31 1/2 (800 x 800)	30 x 30 (762 x 762)	3	3	4	34 x 34 (864 x 864)	25 x 25 (635 x 635)	
200	34 x 34 (864 x 864)	32 1/2 x 32 1/2 (825 x 825)	3	3	4	36 1/2 x 36 1/2 (927 x 927)	27 1/2 x 27 1/2 (698 x 698)	
222	38 x 38 (965 x 965)	36 1/2 x 36 1/2 (927 x 927)	3	4	5	40 1/2 x 40 1/2 (1029 x 1029)	31 1/2 x 31 1/2 (800 x 800)	
245	41 1/2 x 41 1/2 (1054 x 1054)	40 x 40 (1016 x 1016)	4	4	5	44 x 44 (1118 x 1118)	35 x 35 (889 x 889)	

Figure 4.

Concrete Anchoring Instructions for Roof Curbs



Wood Anchoring Instructions for Roof Curbs



GREASE BOX INSTALLATION

- 1. Position Grease Box under the 2" NPT pipe with approximately 1/2 3/4 in. (13-19 mm) overlap using the inside or outside hole patterns.
- 2. Mark mounting hole locations on curb cap.
- 3. Drill two 5/16 in. (8 mm) diameter holes in marked location.
- 4. Install 1/4 in. (6 mm) hardware to detail shown.





Table 3.											
	Dimensions							Bearing	Max	Approx.	
Size	Α	В	С	D	E	F	G	н	Size	HP	Weight (Ibs)
105	25.74	11.57	21.14	11.21	20.00	17.69	12.05	26.90	1.00	2	173
122	26.87	13.24	24.44	13.02	23.00	20.13	12.12	29.29	1.00	2	193
135	28.93	14.43	26.76	14.34	25.00	22.11	14.10	32.61	1.00	3	251
150	30.05	15.86	29.58	15.90	27.50	24.36	14.35	34.72	1.00	3	267
165	31.30	17.28	31.85	17.43	29.00	26.67	14.74	36.17	1.00	5	294
182	32.68	18.94	35.08	19.40	31.50	29.38	14.75	38.11	1.19	5	348
200	34.08	20.62	38.14	21.21	34.00	32.09	15.28	40.38	1.19	5	380
222	35.77	22.76	42.52	23.59	38.00	35.45	16.04	43.98	1.44	5	446
245	38.64	24.90	46.64	25.96	41.50	38.87	17.84	50.09	1.44	7.5	573

Figure 6.





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ELECTRICAL CONNECTION

- 1. Connect supply wiring to the disconnect switch (nonfused standard).
- 2. The motor is factory set at the voltage marked on the fan nameplate. Check the line voltage with the nameplate voltage.
- 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.



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

- 4. Disconnect switches are not fused. The power leads must be protected at the point of distribution in accordance with the fan dataplate.
- 5. 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.
- 6. 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%.

CHECK, TEST & START PROCEDURES

WARNING

Electric shock hazard. Could cause severe injury or death. Failure to bond the frame of this equipment to the building electrical ground by use of the grounding terminal provided or other acceptable means may result in electrical shock. Disconnect electric power before servicing equipment. Service to be performed only by qualified personnel.

1. Check all fasteners and setscrews for tightness.

NOTICE

The wheel position is set at the factory and the fan was balanced and vibration tested prior to shipment. Movement may have occurred during transport and realignment may be necessary.

- 2. Check that the wheel is centered and free to rotate. Centering can be changed by loosening isolator mounts and repositioning the drive frame.
- For optimum fan performance make sure that the wheel to inlet venturi gap or overlap is maintained per Figure 7. Height can be adjusted by loosening set screws on the wheel and reposition on the fan shaft, per the table.

- 4. Verify that the power supply matches the voltage on the fan data plate and is within the 10% utilization rate.
- 5. Apply power to unit and check rotation of wheel with the directional arrow on the unit. All fans are clockwise, as viewed from drive side, per Figure 8.

WARNING

Rotation is critical. If allowed to operate in the wrong direction, the motor will overload and burn out. For three-phase units, rotation can be changed by switching any two of the three line leads. If the unit is checked with temporary wiring, it should be rechecked when permanently installed. Motor burn out or tripped overload protection devices are usually the result of wrong rotation.

- 6. Electrical Input Check: Perform check of fan ampere draw and verify that motor nameplate amps are not exceeded. Take into account the service factor of the motor if it is above 1.0 S.F.
- 7. Fan RPM should be checked and verified with a tachometer.

Figure 7.



Figure 8.



View from drive side

INSPECTION

Inspection of the fan should be completed at the first 30 minutes, 8 hour and 24 hour intervals of satisfactory operation.

30-MINUTE INTERVAL

Inspect tightness of all hardware, setscrews and motor mounting bolts. Adjust and tighten as necessary.

8-HOUR INTERVAL

Inspect belt alignment and tension. See Belt Adjustment and tension as necessary

24-HOUR INTERVAL

Inspect belt tension, adjust as necessary.

MAINTENANCE

A maintenance program should be established to maintain the reliability and performance of the fan. The frequency of inspection depends on the location and operating conditions of the fan.

Maintenance is to be performed only by qualified personnel who are familiar with local codes and regulations and experienced with this type of equipment. Routine maintenance should cover the following:

- a. Tighten all setscrews and hardware.
- b. Check belt tension and sheaves for wear.
- c. Lubricate fan bearings (see Table 4 for recommended interval and Table 5 for grease types.
- d. Cleaning of unit, wheel and grease box.
- 1. Before performing any maintenance on the fan, be sure power is turned off and locked in the off position at the service entrance.
- Ventilators 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. Always follow the bearing manufacturer's recommended lubrication schedule. If not available, below is a general guideline:

Table 4.

Bearing Greasing Intervals					
Fan RPM	Interval (months)				
Up to 500	6				
500 - 1,000	6				
1,000 - 1,500	5				
1,500 - 2,000	3				
2,000 - 2,500	3				
2,500 - 3,000	2				

Divide the listed interval by 2 for vertical shaft applications or for 24 hour operation.

Relubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature and surrounding conditions will affect the relubrication frequency required.

- 4. All motors supplied with Twin City Fan & Blower ventilators 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 TCF representative for additional warranty details.
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- 5. A periodic motor check should consist of removing the belt, then spinning the motor shaft with the power off to be sure the motor turns freely and the bearings run smoothly.
- 6. 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. See Belt Adjustment, on page 8.
- The belt 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 defects are apparent, the belt should be replaced.
- 8. Check sheaves for chipping, dents or rough surfaces which could damage the belt. Always replace sheaves with identical size and type.
- 9. If the unit is left idle for an extended period, the belts should be removed and stored in a cool, dry place to avoid premature belt failure.
- 10. Check sheave setscrews to ensure tightness. Proper keys must be in keyways.
- 11. Check for proper belt alignment. See Figure 10. Improper alignment leads to excessive belt wear, vibration, noise and power loss.
- 12. For two-groove drives, matched belts must be used.
- 13. When replacing belts, use the same type & size as supplied on the unit.
- 14. The standard pillow block bearings on belt driven ventilators are factory lubricated and are provided with external grease fittings. Lubrication bi-annually is recommended, or more frequently if needed. (see Table 5). It is recommended to add fresh grease at start-up, but do not over-grease. Use only 1 or 2 shots of a recommended lubricant with a hand gun in most cases (see Table 5). Maximum hand gun rating of 40 psi. 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.

Table 5.

Grease Manufacturers					
Manufacturer	Grease (NLGI #2)				
Shell	Gadus S2 V100 2				
Exxon/Mobil	Ronex MP				

- 15. 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 isn't rotating, will also cause bearings to fail. Bearings must also be protected from water and moisture to avoid internal corrosion.
- 16. During the first few months of operation, it is recommended to periodically check the bearing setscrews to ensure tightness.
- 17. Wheels require attention when moving dirty or grease laden air. Regular cleaning is required to avoid imbalance caused by accumulation of grease or dust.
- 18. All fasteners should be checked for tightness during each maintenance.

MOTOR LUBRICATION

Motors which contain ball bearings are permanently lubricated from the factory. No additional maintenance is required. Motors supplied with grease fittings should be lubricated according to the manufacturer's recommendation.

Figure 9.







Swingout Fan





DRIVE INSPECTION

See Figure 9.

- 1. For inspection and belt tightening, remove motor cover lid.
- 2. For unrestricted access to motor and drives, remove motor cover.

BELT ADJUSTMENT

See Detail C.

- 1. Loosen screws (A) on motor plate; do not remove.
- 2. Turn jacking bolts (B) equally to proper belt tension. (Ref Figure 11).
- 3. Tighten screws (A).

V-BELTS

V-belts are oil, heat and static resistant type and oversized for continuous duty.

The condition and the amount of belt deflection should be checked prior to start-up. Do not over-tension as bearing damage may occur. Recommended belt tension is 1/64" multiplied by the center distance of sheaves (in inches). (See Figure 11.)

Extreme care must be exercised when adjusting V-belts as not to mis-align sheaves. Any misalignment will cause a reduction in belt life and will increase the likelihood of noise & vibration.

Figure 10.



Do not force belt. Forcing the belt will break the cords and cause belt failure.





Mount belts straight. Shafts must be parallel and sheaves in alignment to prevent unnecessary belt wear.



ACCESS FOR CLEANING

All models - Hinge fan open or remove outlet scoop held on by screw/nut. See Figure 12. It is recommended to use two people to open the fan.

Swingout - Remove wingnut(s). Lift handle and rotate prop rod onto stud. Secure with wingnut. See Figure 13.



Figure 13. Swingout Fan





PARTS LIST



Parts List

Refer to the TCF nameplate for model number and serial number to assist in ordering the correct replacement parts. Be sure the unit is locked out/tagged out before repairing.

Table 6.

Symptom	Cause	Corrective Action				
	Electrical Supply	Check disconnect switch, fuses/breakers. Check for correct supply voltage.				
Fan does not operate	Drive	Check for broken belts. Tighten loose belts, see Belt Adjustment				
	Motor	Check overload protection on motor. Verify correct motor horsepower.				
	Wheel rotating in wrong direction	Check wheel rotation, see Fig. 8, P.6				
	System resistance too high	Check system backdraft dampers, ductwork and filters.				
	Fan speed lower than design	Tighten belt; close variable speed sheave.				
	Dampers closed	Inspect and repair.				
Too little air	Improper wheel alignment	Center wheel on inlet, check wheel gap/overlap against Fig. 7, P.6				
	Excessive dirt/grease on wheel	Clean wheel.				
	Fan inlet/outlet is restricted	Remove obstruction, check for damage or unbalance.				
	Filters (if applicable) are dirty or clogged	Clean or replace filters.				
Too much air	System resistance lower than expected	Reduce fan speed to reach required operating point.				
	Fan speed higher than design	Adjust fan speed.				
	Wheel hitting inlet	Center wheel on inlet, check wheel gap/overlap against Fig. 7, P. 6				
	Loose sheave or wheel	Align and tighten.				
	Wheel out of balance	Clean wheel; check wheel balance.				
Excessive Noise or Vibra- tion	Bearings	Lubricate bearings, replace defective bearings; tighten setscrew or bearing bolt, align bearings.				
	V-belts	Mismatched belts, replace with matched belts; Adjust belt tension, replace worn belt.				
	Fan not properly anchored	Secure fan base, see Table 2, P. 3				
	Loose components	Tighten loose hardware.				
	Fan	Check wheel rotation; reduce fan speed.				
Excessive Horsepower	System resistance too high	Check dampers; re-size ductwork; check fan inlet conditions; check filter.				
Motor Overloads/ Overheats	Motor improperly wired	Check motor wiring against wiring diagram on motor nameplate.				
	Incorrect wheel rotation	Change wiring leads to correct rotation.				
	Undersized motor	Check motor ratings against cataloged performance.				
	Fan rpm too high	Check fan rpm; open variable pitch sheave on motor.				
	Over/Under line voltage Contact power company.					
	Fan	Check for bent shaft; check for proper belt tension: check for damaged bearings				

It is recommended that the users and installers of this equipment 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

LIMITATIONS 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 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 be 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.
- e. Seller cannot guarantee sound pressure levels or dBA.

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 damage 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 HEREUNDER. BUYER AGREES THAT SUCH FAILURE TO PAY SHALL CONSTITUTE A VOLUNTARY WAIVER OF ANY AND ALL SUCH WARRANTIES ARISING PURSUANT TO SUCH CONTRACT.)



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