



HMS HIGH MOUNTING SERIES

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

ATTENTION: READ THIS MANUAL AND ALL LABELS ATTACHED TO THE UNIT CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THIS UNIT! CHECK UNIT DATA PLATE FOR STEAM OR HOT WATER REQUIREMENTS AND ELECTRICAL SPECIFICATIONS AND MAKE CERTAIN THAT THESE AGREE WITH JOB SPECIFICATIONS. RECORD THE UNIT MODEL AND SERIAL NO. IN THE SPACE PROVIDED. RETAIN FOR FUTURE REFERENCE.

WING Model No. _____

Serial No. _____

SAVE THIS MANUAL

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been tested and inspected. It has been shipped free of defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. **It is the installer's responsibility to inspect and correct any problems that may be found.**

ATTENTION: READ CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THIS EQUIPMENT. RETAIN THIS MANUAL FOR FUTURE REFERENCE.

POST AND MAINTAIN THESE INSTRUCTIONS IN LEGIBLE CONDITION

4830 TRANSPORT DRIVE, DALLAS, TEXAS 75247
TEL.: (214) 638-6010 FAX: (214) 905-0806
<http://www.ljwing.com>

SAFETY INFORMATION

1. Do not wear loose clothing or jewelry when servicing this equipment.
2. Keep hands away from motor, drive belt, and fan during unit operation.
3. Disconnect power to unit at locally mounted disconnect before attempting to service.
4. Be aware of revolving discharge nozzle when approaching unit.
5. Shut off water or steam supply to coils before servicing coils. The supply water or steam temperature is above 150°F or 65°C. Contact with this water or steam can result in severe burns.

GLOSSARY OF DEFINITIONS

1. **HEATING ELEMENT** The highly efficient heating element is a fin and tube extended surface type. The return-bends and tubes can expand and contract individually without damage to the heater connections.
2. **FINNED TUBES** Tubes are seamless drawn copper. Fins are corrugated aluminum. The fins are properly spaced (9 Fins Per Inch) onto the tubes by automatic machinery. The tubes are then expanded to create a tight mechanical bond between the fins and tubes.
3. **TUBE CONNECTIONS** Tubes are brazed into the copper headers.
4. **STEAM AND RETURN HEADERS** Headers are copper pipe with NPT connections.
5. **CFM** Cubic feet per minute. A unit of air flow.
6. **BTU/HR** British Thermal Units per hour. A rate of heat output.
7. **TEFC** Totally enclosed, fan cooled. The type of fan motor supplied on these heaters.
8. **EAT** Entering Air Temperature.
9. **LAT** Leaving Air Temperature.
10. **RPM** Revolutions per minute

SYSTEM DESCRIPTION

1. O & M Concept and Theory

This section is designed to provide the maintenance technician with an operations and maintenance manual detailed enough in such that he can properly operate, maintain, repair, trouble shoot and procure parts for Wing unit heaters.

2. Maintenance Policy Overview

A permanent record should be kept of the periodic inspections and maintenance performed on the heaters. This recognition of maintenance procedure will keep the heaters in good working condition, and prevent costly breakdowns.

OPERATING INSTRUCTIONS

1. Functional Description of Equipment

Wing model HMS-20 unit heaters are designed to heat high bay hangars with a minimum amount of stratification and maximum amount of coverage. This objective is accomplished by drawing air from the truss area of the hangar with a centrifugal double width double inlet fan through hot water coils located at each inlet of the fan. This heated air is then discharged at a high enough velocity to force it to the floor of the hangar through a revolving discharge nozzle. The high velocity discharge allows for maximum projection, while at the same time allowing for an even air distribution with its slow revolving motion. Pulling the air from the ceiling area and blowing it to the floor eliminates virtually all stratification.

2. Emergency and Special Instructions

- a. If unusual and bearing noise from the fan is heard, disconnect power to fan immediately and inspect fan wheel. Disconnect switch is located next to unit.
- b. If water is leaking from a hot water coil, shut off the isolation valves on the supply and return lines, and repair leaks. These shut off valves are typically located at the coil connections on each coil. **Note: Each unit heater has two separate coils.**
- c. If revolving discharge revolves at a higher rpm than normal, disconnect power supply and inspect gear motor, gear connections, and spring tension. **Note: Do not place unit back into service until problem has been repaired.**

OPERATING PROCEDURE

Initial startup of your Wing heater is an important part of the installation. Observe the following carefully:

1. Before connecting hot water lines to coils, **PURGE ALL HOT WATER LINES OF FOREIGN MATTER**. Dirt lodged or trapped in the heating element can greatly affect the heater's performance.
2. Preheat heating element prior to turning on the fan. Open the hot water isolation valves located near the unit to allow free flow of hot water until the entire heating element is hot. **DO NOT ENERGIZE THE FAN UNIT UNTIL THE ENTIRE COIL IS HOT.**
3. Hot water should be in the heating coil at least ten minutes before the fan unit is energized.
4. On units with a revolving discharge: remove the wood shipping block between the revolving discharge motor and the casing so that the geared wheel makes contact with the corrugated band provided on the discharge. **DO NOT TURN DISCHARGE OR GEAR BY HAND.**
5. All discharge outlets are equipped with adjustable vanes or deflectors, which permit adjustment of outlet air flow pattern. Best results can be achieved by trial of different adjustments under operating conditions. The most satisfactory adjustment is one that delivers the warm air just above the heads of the occupants. Deflectors are adjusted by loosening the bolts attaching the deflector to the discharge nozzle and rotating the deflector to the desired position. The deflector is then locked in place by retightening these bolts.
6. Check for proper rotation: About 1 RPM in all cases. The proper fan rotation for a type HMS heater will force the air from the ceiling toward the floor.
7. Ambient air around the heater must be above freezing and hot water or steam flowing through each coil before starting unit, or freeze-up can occur.
8. Unit is controlled by a thermostat mounted at floor level. In case of emergency, fan can be stopped by disconnect switch, which is mounted on the unit.

TOOLS AND TEST EQUIPMENT

1. Disassembly and Reassembly
 - a. Screwdriver
 - b. Common socket set
2. Testing
 - a. Tachometer to measure fan rpm
 - b. Digital thermometer
 - c. Digital amp probe
3. Service Adjust and Calibration
 - a. Socket set to adjust belt tension and tighten guard
4. Routine and Preventative Maintenance
 - a. Grease gun to lubricate fan bearings
 - b. Fin brush, high pressure air gun, or industrial duty vacuum cleaner to clean hot water coils
5. Trouble shooting
 - a. Voltmeter
 - b. Tachometer
 - c. Amp probe
 - d. Digital thermometer

PERFORMANCE TESTING AND ADJUSTMENTS

1. Performance Specifications
See Wing certified data sheet
2. Instructions
 - a. Establish air flow by:
 - 1) Measure fan rpm with hand held tachometer by attaching tachometer to end of fan shaft and reading rpm while fan is rotating.
 - 2) Measure motor voltage with voltmeter across hot and ground connections.
 - 3) Calculate break horsepower with following equation:
$$\text{BHP} = \text{voltage} \times \text{amperage} \times .00134$$
 - 4) Enter attached fan curve at established BHP and rpm to determine airflow.
 - b. Establish heating performance by:
 - 1) Measure entering air temperature (EAT) with digital thermometer at entering side of hot water coil.
 - 2) Measure leaving air temperature (LAT) with digital thermometer at fan discharge.
 - 3) Calculate capacity by using following equation:

$$\text{BTUH} = \text{CFM} \times (\text{LAT} - \text{EAT}) \times 1.09$$

3. Adjustments and Alignments

- a. Once actual flow is determined, adjust fan rpm as required to deliver specified CFM by varying motor and fan pulley diameters.
- b. If heating performance does not meet specifications:
 - 1) Check hot water temperature entering unit heater. The EWT can be adjusted at the hot water boiler.

4. Frequency of Testing

Performance should be tested at start up and once per year thereafter, unless a reduction in capacity is noticed.

PREVENTATIVE MAINTENANCE

1. Tasks

- a. Regular inspection
- b. Motors: clean, lubricate, check voltage
- c. Hot water coils: clean fin tube heating element
- d. Fan wheel: clean
- e. Casing: inspect and clean
- f. Fan bearings: lubricate and check set screws for tightness
- g. Replace drive belts

2. Preventative Maintenance Instructions

See pages 7 – 11.

3. Frequency of Maintenance

The following are the minimum maintenance intervals. These intervals may be shortened if conditions warrant.

- | | |
|--|----------------|
| a. Regular Inspection | every 6 months |
| b. Motors: clean, lubricate, check voltage | every year |
| c. Clean Hot water coils | every year |
| d. Clean fan wheel | every year |
| e. Inspect and clean casing | every year |
| f. Lubricate fan bearings | every year |
| g. Replace fan drive belts | as required |

4. Time Requirements

- a. Each unit can be lubricated in 20 minutes
- b. Cleaning times will vary with amount and type of dirt.
- c. Allow one hour to change out drive belts.

5. Lubricants and Fluids List

a. Fan bearing lubricant

Use high quality NLG No. 2 or No. 3 multi-purpose ball bearing grease having rust inhibitors and anti-oxidant additives. Some grease having these properties is:

Shell – Alvania No. 2

Mobile – Mobilegrease 28

American – Rykon Premium 2

Texaco – Premium RB2

PREVENTATIVE MAINTENANCE INSTRUCTIONS

INSPECT REGULARLY

Under average conditions, it is recommended that unit heaters be inspected before every heating season. . . more often in locations where air is contaminated with corrosive fumes, dust, soot or oil spray. Check for dirty, clogged fin tube heating element, excessive vibrations and loose connections.

MOTORS

A. Cleaning

Remove grease and dirt on motor during each inspection or lubrication. TEFC motors should be blown clean every heating season, or whenever fin tube heating element is cleaned, whichever is sooner.

B. Lubrication

1. Lubricate motor according to manufacturer's instructions located on the motor.
2. Motors should be thoroughly cleaned and maintained in accord with specific motor manufacturer's recommendations.
3. Some motors do not have grease fittings. These motors have permanently lubricated bearings for long life and do not require further lubrication.

C. Overload Protection

A change in line voltage higher or lower than motor nameplate rating may cause overheating and serious motor damage. Check plant voltage conditions. A separate manual starter with thermal overload protection device is recommended for those units that do not have motors with built-in overload protection.

FIN TUBE HEATING ELEMENT

A. Cleaning

Clean fin tube heating element at least once a year; more often under unfavorable conditions, unless heating element is kept reasonably free of dirt, lint and grease, it's original heating capacity will be reduced . . . to a serious degree, and motor damage may result.

Three commonly used cleaning methods are:

1. Loosen dirt by brushing fins on side where air enters heating element and then turn on fan to blow dirt from unit.
2. Use high-pressure air hose to loosen dirt by blowing from side where air leaves heating element.
3. Vacuum Cleaning: Thoroughly vacuum intake side of fan and vacuum cleaner. For thorough cleaning of heating element, remove motor and fan and spray a mild alkaline cleaning solution over the heating element. After a few minutes, follow by a hot water rinse. (A steam gun can be used for spraying cleaning solution and hot water).

FAN WHEEL

The fan wheel should be cleaned to avoid unbalance that would damage the motor bearings.

CASINGS

A. Cleaning

Periodic cleaning of casings is recommended to remove dirt, grease and corrosive substances that may injure finish. Rusted or corroded spots should be cleaned and repainted.

B. General Inspection

Tighten fan guard and motor bracket. Check fan for proper clearance, free rotation and firm connection to shaft. When servicing is complete, tag unit to indicate date of inspection, lubrication and cleaning.

BALDOR BLOWER MOTOR

MAINTENANCE

1. Remove all power services and allow machine to reach standstill prior to servicing.
2. Do not by-pass or render in-operative any safeguard or protective devices.

LUBRICATION

This is a ball and/or roller bearing equipped bearing motor. The motors have been given initial lubrication at the factory. Motors without regreasing capability are factory lubricated for normal bearing life.

RELUBRICATION RECOMMENDATIONS

A high-grade ball and roller bearing grease. Recommended greases for standard service conditions are:

SHELL DOLIUM R or CHEVRON SRI

If other greases are preferred, check with a local Baldor Service Center for recommendations

RELUBRICATION INTERVALS – The following relubrication intervals are suggested as a guide for long operating life.

Recommended relubrication intervals at standard service conditions.

NEMA / (IEC) FRAME SIZE	RATED SPEED – RPM			
	3600	1800	1200	900
Up to 210 Incl. (132)	5500 hrs.	12000 hrs.	18000 hrs.	22000 hrs.
Over 210 to 280 Incl. (180)	3600 hrs.	9500 hrs.	15000 hrs.	18000 hrs.
Over 280 to 360 Incl. (225)	2200 hrs.	7400 hrs.	12000 hrs.	15000 hrs.

SERVICE CONDITIONS

SEVERITY OF SERVICE	AMBIENT TEMPERATURE MAX	ATMOSPHERIC CONTAMINATION	TYPE OF BEARING
Standard	40 Degrees C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50 Degrees C	Moderate Dirt Corrosion	Ball Thrust Roller
Extreme	>50 Degrees C* or class H Insulation	Severe, Dirt Abrasive Dust Corrosion	All Bearings
Low Temperature	<- 30 Degrees C**		

* Special high temperature grease is recommended

** Special low temperature grease is recommended

PROCEDURE

1. Clean grease fittings.
2. Remove grease outlet plug.
3. Add recommended amount of grease. Be sure grease to be added is compatible with grease already in motor. Consult your Baldor Distributor or an authorized Baldor Service Center if grease other than recommended is to be used. If motor is to be greased while running, a somewhat larger quantity of grease will have to be used. Stop when new grease appears at shaft hole in the endplate or purge outlet plug.
4. Replace plug.

CAUTION

Keep grease clean. Lubricate motor at standstill. Remove and replace drain plugs at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

FAN BEARING LUBRICATING INSTRUCTIONS

The most common cause of premature bearing failure is improper lubrication. All fans are equipped with decals indicating relubrication intervals for normal operating conditions. However, every installation is different, and frequency of relubrication should be established accordingly.

Decal No. 2 is for solid pillow block spherical roller bearings, which are supplied on this fan. Observation of the condition of the grease expelled from the bearings at the time of lubrication is the best guide as to whether regreasing intervals and amount of grease added should be altered. This observation is particularly important when bearings operate continuously over 160°F (71.1°C).

Greases are made with different bases. There are synthetic base greases, lithium base, sodium base, etc. Avoid mixing greases with different bases. They could be incompatible, and result in rapid deterioration or breaching down of the grease.

Puddle corrosion is often encountered in failed bearings, particularly if the fan has been shut down for a period. Moisture caused by condensation will accumulate in the bearings and cause corrosion in the raceways. If the fans are to be shut down or stored for more than 30 days, it is important that the bearings are filled with grease and the fan rotated by hand from time to time so that the grease can be spread on bearing components. All bearings are filled with grease before leaving the factory. When the fans are started, the bearings may discharge grease through the seals after a short period of operation, but do not replace this initial discharge because leakage will cease when the excess grease has worked out. Sometimes the bearing has a tendency to run hotter during this period and one should not get alarmed unless it lasts over 48 hours or gets very hot. When relubricating, use sufficient amount of grease to purge the seals. Rotate bearings during relubrication where good safety practice permits.

Lube lines are extended from fan bearings to motor side of casing for ease of lubrication. Attach lube gun to these extended lube lines to add lubricant.

Relubrication Schedule (Months)* Ball Bearing Pillow Blocks									
Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft Dia.									
½" thru 1 11/16"	6	6	5	3	3	2	2	2	1
1 15/16" thru 2 7/16"	6	5	4	2	2	1	1	1	1
2 11/16" thru 2 15/16"	5	4	3	2	1	1	1		
3 7/16" thru 3 15/16"	4	3	2	1	1	1			

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

REPLACING FAN DRIVE BELTS AND DRIVE MAINTENANCE

V-Belt drives need periodic inspection and occasional belt replacement. When inspecting drives, look for dirt buildup, burrs or obstructions which can cause premature belt or drive replacement. If burrs are found, use fine emery cloth or a stone to remove the burr. Be careful that dust does not enter the bearings.

Check the sheaves for wear. Excessive slippage of belts on sheaves can cause wear and vibration. Replace worn sheaves with new ones. Carefully align sheaves to avoid premature sheave failure.

Observe belts for wear. If fraying or other wear is observed to mostly on one side of the belts, the drives may be misaligned. Never use belt dressing on any belts.

1. Disconnect power to unit with the unit mounted disconnect switch.
2. Remove belt guard with socket set.
3. Loosen bolts holding motor to motor base
4. Slide motor in adjustable slots to loosen tension in belts.
5. Remove old belts.
6. Install new belts.
7. Tighten belts by sliding motor back in adjustment slots
8. Replace belt guard.

TROUBLE SHOOTING

FAILS TO MAINTAIN TEMPERATURE

1. Undersized heater, boiler, pump or piping.
2. Excessive exhaust air (exhaust fans may have been added since heating installed).
3. Unit heater mounted too high – heated air not delivered to floor level.
4. Thermostat – improper location or setting, or not functioning.
5. Dirty or clogged fin tube heating element

UNIT BLOWS COLD AIR

1. Manual shut-off valve closed.
2. Insufficient steam pressure or lack of hot water.
3. Aquastat not functioning.
4. Improper venting.
5. Steam trap not functioning.
6. Drip leg too short (steam system).
7. Return line plugged (steam system).
8. Pump undersized or not operating (hot water system).

DOES NOT OPERATE WHEN HEAT NEEDED

1. Defective motor or electrical connections.
2. Thermostat, aquastat or pressure limit control not functioning.

FAILS TO DELIVER HEAT TO FLOOR

1. Unit mounted too high.
2. Final air temperature too high.
3. Louvers not adjusted properly.
4. Undersized unit heater (insufficient air delivery).
5. Cross ventilation or drafts.
6. Obstructions to air flow.

NOISY UNIT

1. Loose bolts or screws.
2. Fan blade bent, out of balance.
3. Dirt accumulation on fan blades.
4. Fan hub loose.
5. Motor shaft thrust bearing worn.
6. Motor mounting bent, fan not positioned properly in venturi.
7. Unit mounted too rigidly, transmits vibration noise.
8. Conduit too rigid transmits vibration noise.
9. BX cable touching unit heater, chatters as casing vibrates.

UNIT LEAKS

1. Internal corrosion.
2. Crack in brazed connection.

EMPLOYEES COMPLAIN OF HOT BLAST

1. Air stream aimed directly at employees.
2. Louvers not adjusted properly.
3. Excessive final air temperature.
4. Revolving discharge not revolving.

UNIT OPERATES TOO LONG

1. Thermostat installed on cold wall or otherwise improperly located.
2. Heavy exhaust fan load. (May have been increased since heating system was laid out.)
3. Aquastat or pressure limit control not functioning properly.
4. Unit is under sized.

FREQUENT MOTOR FAILURE

1. Voltage fluctuations too high or too low.
2. Excessive or insufficient lubrication.
3. Wiring to motor undersized.
4. Improper electrical connections.
5. Motor operating in too high air temperature.
6. Restricted airflow through unit due to clogged fin tube heater elements, closed louvers, too much ductwork connected to unit.
7. Fan out of balance.
8. Unbalanced voltage on 3-phase power.

PREMATURE FAILURE

1. Severe internal corrosion due to condition of boiler water.

FIN TUBE HEATING ELEMENT FAILURE

1. Severe internal corrosion from feed water.
2. Type of boiler treatment.
3. Entrained air causing water hammer.
4. Too much outdoor air portion in freezing temperatures.

REPAIR INSTRUCTIONS

1. COMPONENT REPAIR AND REPLACEMENT

- a. MOTOR Do not attempt to repair motor in field. Motor must be taken to an Authorized Baldor motor repair center.

Remove motor as follows:

- 1) Disconnect power wiring at motor.
- 2) Remove belt guard with socket wrench.
- 3) Loosen motor from mounting plate and slide towards fan to loosen belt.
- 4) Slip fan belt off motor pulley.
- 5) Unbolt motor from mounting plate and remove.
- 6) Reverse procedure to install repaired or new motor.

- b. COIL To replace coil, unbolt at flange and bolt new coil section on:

c. GEAR TYPE ROTATION MOTOR

This motor must be replaced upon failure. This motor may be removed and replaced simply by unbolting faulty motor and bolting new motor to unit housing. Care must be taken to be sure that motor gear meshes with track on nozzle when installing new motor.

2. REPAIR SAFETY

- a. Before servicing or repairing unit heaters, electrical power must be disconnected to avoid electrical shock and injury from fan wheel or rotating discharge.
- b. Before servicing or repairing unit heaters, hot water supply must be shut off and hot water coils must be allowed to cool to avoid injury.

DISASSEMBLY AND REASSEMBLY

Wing model HMS unit heaters are shipped to the installation site in two pieces. The nozzle section must be bolted in the field to the fan and coil section. No special tools other than a standard socket set are required for this operation. If desired, the coils can be unbolted from the fan section for replacement. The motor and drives are factory mounted on an adjustable base and can be unbolted and removed using the following procedure:

1. Disconnect power wiring at motor.
2. Remove belt guard with socket wrench.
3. Loosen motor from mounting plate and slide towards fan to loosen belt.
4. Slip fan belt off motor pulley.
5. Unbolt motor from mounting plate and remove.
6. Reverse procedure to install repaired or new motor.

The gear drive motor for the nozzle rotation can also be removed by unbolting as follows:

1. Remove power wiring
2. Unbolt motor from unit housing and remove.
3. Replace motor by reversing procedure, being sure that gear meshes with discharge nozzle drive track.



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