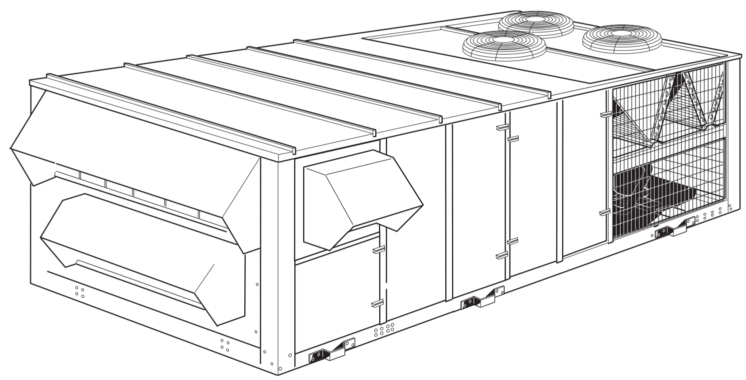
INSTALLATION INSTRUCTION

MILLENNIUM™ ROOFTOP



CONTENTS

Complete Table of Contents and List of Figures and Tables on following pages.

MODELS:

Y12

Y13

Y14

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

035-16682-000 REV A (500)Form 530.70-N1Y

TABLE OF CONTENTS (COMPLETE)

LIST OF FIGURES

TABLES

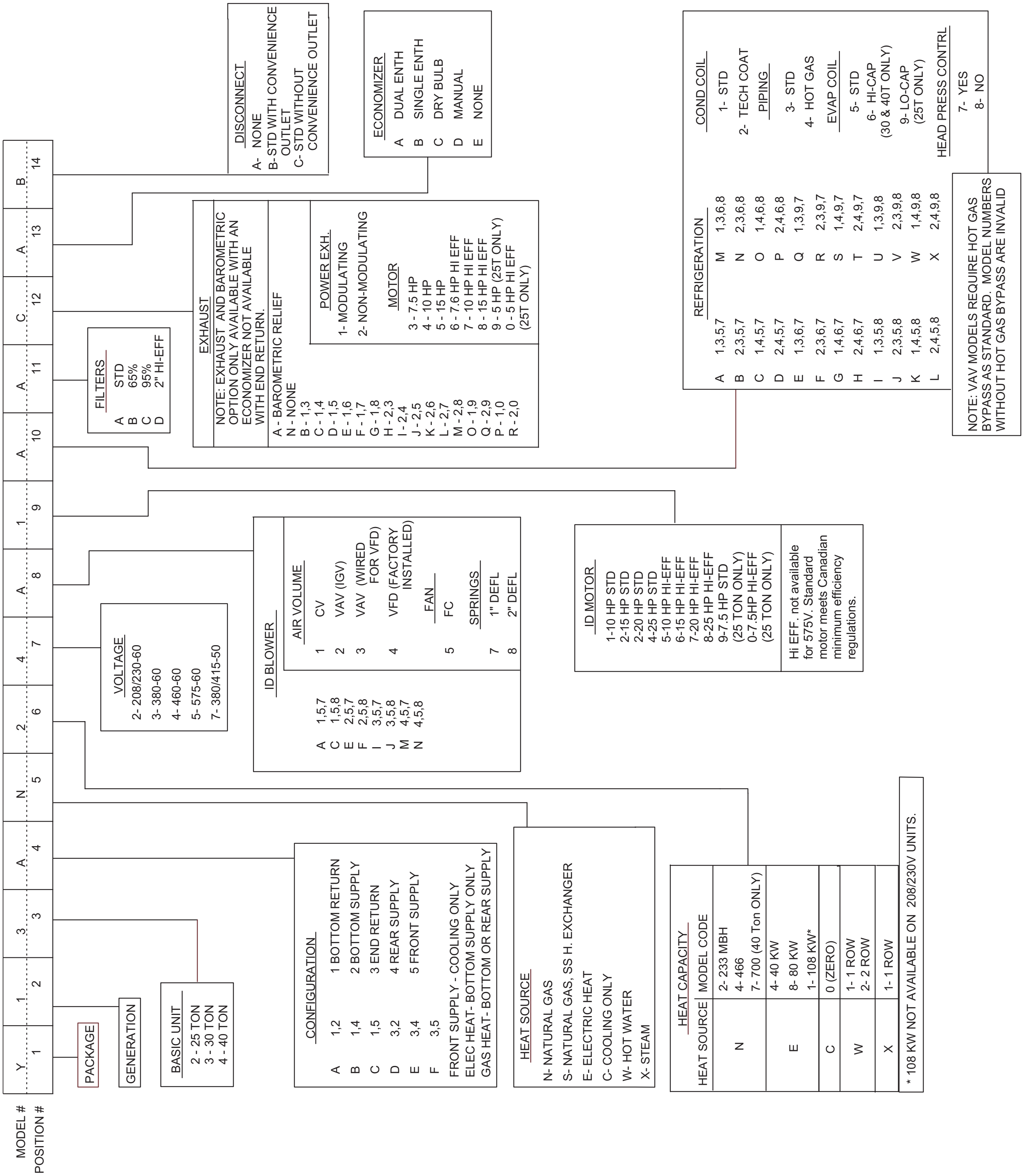


Figure 1: PRODUCT NOMENCLATURE

SAFETY CONSIDERATIONS

NOTES, CAUTIONS AND WARNINGS

Installer should pay particular attention to the words: *NOTE*, *CAUTION*, and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

GAS FIRED MODELS

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch. Do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

CAUTION

THE FURNACE AND ITS INDIVIDUAL SHUT-OFF VALVE MUST BE DISCONNECTED FROM THE GAS SUPPLY PIPING SYSTEM DURING ANY PRESSURE TESTING OF THAT SYSTEM AT TEST PRESSURES IN EXCESS OF 0.5 PSIG. PRESSURES GREATER THAN 0.5 WILL CAUSE GAS VALVE DAMAGE RESULTING IN A HAZARDOUS CONDITION. IF GAS VALVE IS SUBJECTED TO A PRESSURE GREATER THAN 0.5 PSIG, IT MUST BE REPLACED. THE FURNACE MUST BE ISOLATED FROM THE GAS SUPPLY PIPING SYSTEM BY CLOSING ITS INDIVIDUAL MANUAL SHUT-OFF VALVE DURING ANY PRESSURE TESTING OF THAT SYSTEM AT TEST PRESSURES EQUAL TO OR LESS THAN 0.5 PSIG.

WARNING

THIS FURNACE IS NOT TO BE USED FOR TEMPORARY HEATING OF BUILDINGS OR STRUCTURES UNDER CONSTRUCTION.

ALL MODELS

Installation and servicing of air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

Follow all safety codes, including ANSI Z223.1-Latest Edition: wear safety glasses and work gloves; use quenching cloth for unbrazing operations; have fire extinguisher available for all brazing operations.

WARNING

BEFORE PERFORMING SERVICE OR MAINTENANCE OPERATIONS ON UNIT, TURN OFF MAIN POWER SWITCH TO UNIT. ELECTRICAL SHOCK COULD CAUSE PERSONAL INJURY.

IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE. REFER TO THIS MANUAL. FOR ASSISTANCE OR ADDITIONAL INFORMATION CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

GENERAL

YORK Model Y12/Y13/Y14 units are single package cooling only or cooling with gas, electric, hot water or steam heating designed for outdoor installation on a rooftop and for non-residential use.

The units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas, steam, or hot water connections and duct connections. Gas fired units also require installation of a flue gas outlet hood.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

REFERENCE

Additional information is available in the following reference forms:

- 530.70-TG1Y - Technical Guide
- 530.70-RP1Y - Unit Replacement Parts List (25, 30 & 40 Tons)

All forms referenced in this instruction may be ordered from

Standard Register
2101 West Tecumseh Road
Norman, Oklahoma 73069
Toll Free Fax: (877) 379-7920
Toll Free Phone: (877) 318-9675

APPROVALS

Designed certified by CGA, ETL, CETL as follows:

1. For use as a forced air furnace with cooling unit (gas heat models).
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or Class A, Class B or Class C roof covering materials.
4. For use with natural gas (convertible to LP with kit).

Not suitable for use with conventional venting systems.

INSTALLATION

LIMITATIONS

The installation of this unit must conform to local building codes, or in the absence of local codes, with ANSI Z223.1 Natural Fuel Gas Code and /or CAN/CGA B149 installation codes.

In U.S.A.:

1. National Electrical Code ANSI/NFPA No. 70-Latest Edition.
2. National Fuel Gas Code Z223.1-Latest Edition.
3. Gas-Fired Central Furnace Standard ANSI Z21.47-Latest Edition.
4. Local gas utility requirements.

Refer to Table 1 for Cooling and Electrical Application Data and to Table 2 for Gas Heat Application Data.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

If components are to be added to a unit to meet local codes, they are to be installed at the contractor's and/or the customer's expense.

Size of unit for proposed installation should be based on heat loss / heat gain calculation made according to the methods of the Air Conditioning Contractors of America (ACCA).

LOCATION

Use the following guidelines to select a suitable location for these units:

TABLE 1: COOLING & ELECTRICAL APPLICATION

Unit Power Supply	Voltage Variations	
	Min. Volts	Max Volts
575-3-60	540	630
208/230-3-60	187	252
460-3-60	432	504

TABLE 2: COOLING & ELEC. APP. LIMITATIONS

Limitations	Model		
	Y12	Y13	Y14
Supply Air CFM (min./max)	6,000-12,5000	6,000-15,000	6,000-15,000
Entering Wet Bulb Temp (F°) (min./max)	57/75	57/75	57/75
Ambient Temp	40/120	40/120	40/120
Min. Air Temperature on Gas Fired Heat Exchangers (°F)			
Aluminized	25	25	25
Stainless	0	0	0

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for roof mount on curb.
4. Roof structures must be able to support the weight of the unit and its accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.
5. Maintain level tolerance to 3/4 inches across width and 2 inches along length.

TABLE 3: GAS APPLICATION DATA

Input Capacity (MBH)						Available On Models	Gas Rate[1] (Ft.3/Hr.)	Temp. Rise °F At Full Input[2 3]	
0 To 2,000 Feet Above Sea Level		3,000 Feet Above Sea Level[4]		4,000 Feet Above Sea Level[4]					
Max.	Min.	Max.	Min.	Max.	Min.			Min.	Max.
233	233	205	205	196	196	Y12, Y13, Y14	217	5	35
466	233	410	205	392	196	Y12, Y13, Y14	434	15	45
699[5]	233	615	205	587	196	Y14	650	20	50

1. Based on maximum input and 1075 Btu/Ft.^{3}
2. The air flow must be adjusted to obtain a temperature rise within the range shown.
3. On VAV units, individual room damper boxes must go full open in heating mode to ensure airflow falls within temperature rise range.
4. For operation at elevations above 2,000 feet and, in the absence of specific recommendations from local authority having jurisdiction, equipment ratings shall be reduced at the rate of 4% for each 1,000 feet above sea level.
5. Minimum heating CFM for 699 MBH input heat is 11,700 CFM.

CAUTION

IF A UNIT IS TO BE INSTALLED ON A ROOF CURB OTHER THAN A YORK ROOF CURB, GASKETING MUST BE APPLIED TO ALL SURFACES THAT COME IN CONTACT WITH THE UNIT UNDERSIDE.

IF A UNIT IS TO BE INSTALLED ON AN ANGLE IRON FRAME IT IS RECOMMENDED THAT IT BE SIZED TO ALLOW THE BOTTOM RAIL TO OVERHANG TO FACILITATE INSTALLATION OF CONDENSATE DRAINS (SEE FIG. 4).

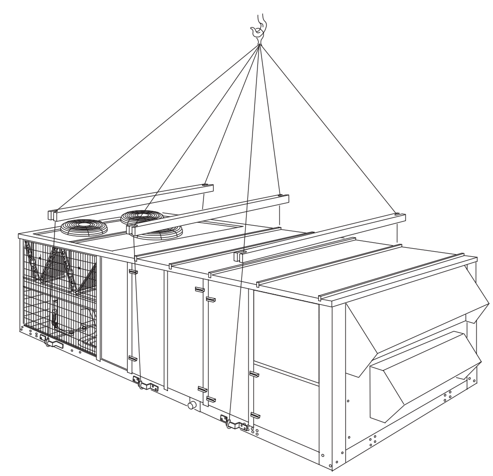


FIGURE 2 : TYPICAL RIGGING

TABLE 4: UNIT WEIGHTS

COMPONENT	25 Ton	30 Ton	40 Ton
Basic Unit[1]	4,300	4,600	5,100
Gas Heat			
233 MBH	90	90	90
466 MBH	180	180	180
699 MBH	270	270	270
Electric Heat			
40KW	75	75	75
80KW	90	90	90
108KW	100	100	100
Hot Water Heat			
Hot Water Coil 1 Row	71	71 lbs.	71 lbs
Hot Water Coil 2 Row	90	90 lbs.	90 lbs.
Steam Heat			
Steam Coil 1 Row	87 lbs.	87 lbs.	87 lbs.
Blower Motor (Std./Hi-eff)			
7.5hp	0/10	-	-
10hp	10/20	0/10	0/10
15hp	60/100	50/90	50/90
20hp	105/110	95/100	85/110
25hp	-	165/200	165/200
Inlet Guide Vanes w/ Actuator	175	175	205
Exhaust			
Barometric	40	75	75
Powered	180	325	325
Exhaust Motor (Std./Hi-eff)			
5hp	75/90	-	-
7.5hp	100/110	100/110	100/110
10hp	110/120	110/120	110/120
15hp	-	160/200	160/200
Low Ambient Head Pressure Control			
208/203V,460V & 380-3-50Hz	10	10	10
575V & 380-3-60 Hz	40	40	40
Filters			
6" Rigid	80	80	80
Refrigeration			
Hi Capacity Coil[2]	0	45	25
Coated Cond. Coil	32	30	40
Hot Gas Bypass	20	20	20
Disconnect			
Convenience Outlet	40/40	40/40	40/40
Accessories			
Partial Curb	385	385	385
Full Curb	545	545	545

1. Weight includes the 10HP motor and economizer.
2. Low Capacity on 25 Ton.

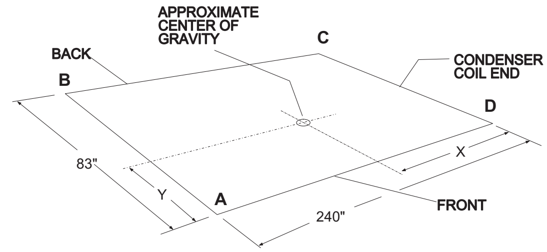


FIGURE 3 : CENTER OF GRAVITY[1]

1. Refer to Tables 5 and 6 for A, B, C, D and X and Y data respectively

⚠ CAUTION

ALL PANELS MUST BE SECURED IN PLACE WHEN THE UNIT IS LIFTED.

THE CONDENSER COILS SHOULD BE PROTECTED FROM DAMAGE BY THE RIGGING CABLES WITH PLYWOOD OR OTHER SUITABLE MATERIAL.

AN ADHESIVE BACKED COVER IS PROVIDED OVER THE OUTSIDE OF THE COMBUSTION AIR INLET OPENING ON GAS FIRED UNITS TO PREVENT MOISTURE FROM ENTERING THE UNIT WHICH COULD CAUSE DAMAGE TO ELECTRICAL COMPONENTS. ALLOW THIS CLOSURE LABEL TO REMAIN IN PLACE UNTIL THE COMBUSTION AIR HOOD IS TO BE INSTALLED (REFER TO FIGURES 8, 9, & 10).

RIGGING AND HANDLING

This unit is *not* designed to be handled with a fork-truck

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the holes provided in lifting lugs. Spreaders MUST be used across the top of the unit. Refer to Figure 2.

- Rig with six cables and spread with four 95-inch spreaders across width and two spreaders of length equal to A + B.
- Refer to Tables 4 and 5 for unit weight.
- Center of gravity includes economizer, exhaust or return air fan and inlet guide vanes (Refer to Table 6).

TABLE 5: UNIT CORNERWEIGHT

UNIT DESCRIPTION	25 TON				30 TON				40 TON			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Basic Unit	988	988	1162	1162	1011	987	1189	1213	1088	1088	1363	1363
Basic Unit With Economizer	1058	1058	1192	1192	1106	1080	1194	1220	1153	1153	1398	1398
Basic Unit With Economizer and Gas or Electric Heat	1107	1107	1232	1232	1131	1080	1259	1310	1203	1173	1437	1467
Basic Unit With Economizer and Gas or Electric Heat and Power Exhaust	1261	1261	1272	1272	1262	1206	1290	1346	1347	1317	1457	1487

TABLE 6: UNIT CENTER OF GRAVITY

MODEL	**25 TON**		**30 ton**		**40 ton**	
	X	**Y**	**X**	**Y**	**X**	**Y**
Basic Unit	99”	46”	98”	45”	93”	46"
Basic Unit /w Econ.	110”	46”	108”	45”	97”	46"
Basic Unit /w Econ. & Gas or Elect. Heat, Steam or Hot Water Heat	104”	45”	102”	44”	96”	45"
Basic Unit /w Econ. & Gas or Elect. Heat, & Power Exhaust	118”	45”	112”	44”	108”	45"

⚠ WARNING

(COOLING OPERATION) DO NOT PERMIT OVERHANGING STRUCTURES OR SHRUBS TO OBSTRUCT CONDENSER AIR DISCHARGE OUTLET, COMBUSTION AIR INLET OR VENT OUTLETS.

CLEARANCES

All units require certain clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3, Air for Combustion and Ventilation of the National Fuel Gas Code ANSI Z223.1 or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149 installation codes-Latest Edition and/or applicable provisions of the local building codes. Refer to Figure 11 for clearances required for combustible construction, servicing, and proper unit operation.

⚠ WARNING

(GAS HEATING OPERATION)

EXCESSIVE EXPOSURE TO CONTAMINATED COMBUSTION AIR WILL RESULT IN SAFETY AND PERFORMANCE RELATED PROBLEMS. TO MAINTAIN COMBUSTION AIR QUALITY, THE RECOMMENDED SOURCE OF COMBUSTION AIR IS THE OUTDOOR AIR SUPPLY.

THE OUTDOOR AIR SUPPLIED FOR COMBUSTION SHOULD BE FREE FROM CONTAMINANTS DUE TO CHEMICAL EXPOSURE THAT MAY BE PRESENT FROM THE FOLLOWING SOURCES:

- *Commercial buildings*
- *Indoor pools*
- *Laundry rooms*
- *Hobby or craft rooms*
- *Chemical storage areas*

THE FOLLOWING SUBSTANCES SHOULD BE AVOIDED TO MAINTAIN OUTDOOR COMBUSTION AIR QUALITY:

- *Permanent wave solutions*
- *Chlorinated waxes and cleaners*
- *Chlorine based swimming pool cleaners*
- *Water softening chemicals*
- *De-icing salts or chemicals*
- *Carbon tetrachloride*
- *Halogen type refrigerants*
- *Cleaning solvents (such as perchloroethylene)*
- *Printing inks, paint removers, varnishes, etc.*
- *Hydrochloric acid*
- *Cements and glues*
- *Antistatic fabric softeners for clothes dryers*
- *Masonry acid washing materials*

DUCTWORK

Ductwork should be designed and sized according to the methods in Manual Q of the Air Conditioning Contractors of America (ACCA).

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

When the unit is equipped with power exhaust fans or return air fan the return duct should have a 90 elbow before opening to the building space to abate noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

If the unit is equipped with hot water or steam heat then the supply air direction will be down only.

AIR HOODS FOR FIXED OUTSIDE AIR (UNITS WITHOUT ECONOMIZER)

These hoods are factory installed. The dampers may be adjusted by loosening the thumb screw, turning the lever to the desired position, and retightening the thumb screw.

AIR HOODS FOR ECONOMIZER

There are (3) economizer outside air intake hoods provided with the unit. The hood on the end of the unit is factory mounted. The (2) front and rear hoods are made operational per the following instructions.

Remove the screws holding the economizer hood shipping covers in place. Discard covers.

Rotate the hoods out (each hood is hinged in the lower corner). Secure the hoods with screws along the top and sides.

Apply a bead of RTV sealer along the edge of both hoods and each pivot joint to prevent water leakage.

Seal any unused screw holes with RTV or by replacing the screw.

AIR HOODS FOR EXHAUST AIR

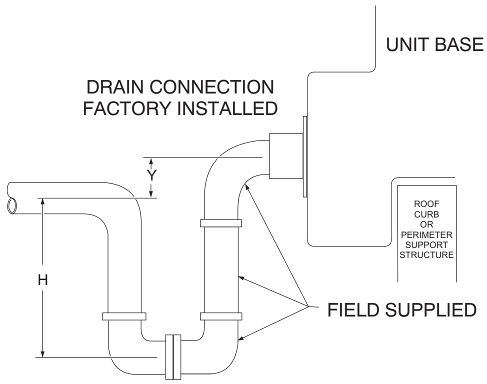
When furnished, these hoods and dampers are factory installed.

CONDENSATE DRAIN

There is one condensate drain connection. Trap the connection per Figure 4. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain lines from the 1-1/2 inch NPT female connections on the unit to an open drain.

.



Y - MINIMUM 2"
H - 1/2" PLUS TOTAL STATIC PRESSURE - MINIMUM

FIGURE 4 : RECOMMENDED DRAIN PIPING

SERVICE ACCESS

Access to all serviceable components is provided by the following hinged doors:

- Furnace compartment
- Supply Air Fan compartment Evaporator Coil compartment (three doors)
- Filter compartment economizer compartment (two doors)
- Power Exhaust compartment (two doors)
- Main control panels (one door)

Refer to Figure 55 for location of these access panels.

⚠ CAUTION

MAKE SURE THAT ALL SCREWS AND PANEL LATCHES ARE REPLACED AND PROPERLY POSITIONED ON THE UNIT TO MAINTAIN AN AIR-TIGHT SEAL.

COMPRESSORS

Units are shipped with compressor mountings factory-adjusted and ready for operation.

⚠ CAUTION

DO NOT LOOSEN COMPRESSOR MOUNTING BOLTS.

FILTERS

Throwaway or rigid filters are supplied with each unit. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters will reduce the capacity of the unit and will result in frosted coils or safety shutdown. Required filter sizes are shown in Table 9. The unit should not be operated without filters properly installed.

THERMOSTAT (CONSTANT VOLUME UNITS)

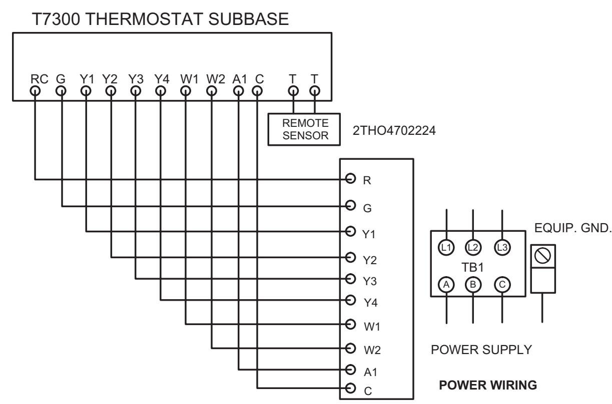


FIGURE 5 : TYPICAL THERMOSTAT WIRING

The thermostat, if used, should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with sensor for general installation procedure (See Figure 5). Refer to Table 7 for control wire sizing and maximum length.

TABLE 7: CONTROL WIRE SIZES

WIRE SIZE	MAXIMUM LENGTH
20 AWG	100 Feet
18 AWG	150 Feet

SPACE SENSOR (VARIABLE AIR VOLUME UNITS)

The space sensor, if used, should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with sensor for general installation procedure (See Figure 6).

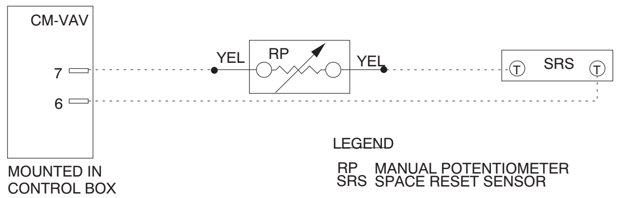


FIGURE 6 : TYPICAL SPACE SENSOR WIRING

POWER AND CONTROL WIRING

Field wiring to the unit must conform to provisions of National Electrical Code (NEC) ANSI / NFPA 70-Latest Edition and / or local ordinances. The unit must be electrically grounded in accordance with the NEC and / or local codes. Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Power supply to the unit must be NEC Class 1 and must comply with all applicable codes. A disconnect switch must be provided (factory option available). The switch must be separate from all other circuits. Wire entry at knockout openings requires conduit fittings to comply with NEC and/or Local Codes. Refer to Figures 17, 18, 19, and 20 for installation location of openings.

If installing a field mounted disconnect on the unit, refer to Figure 21 for the recommended mounting location. Unit-strutTM or equivalent rails should be mounted as shown to provide structure for mounting. The location of the rails should be adjusted to fit the disconnect within the dimensions shown. Conduit run from the disconnect to the power entry location in the baserail should be routed so that it does not interfere with the doors of the unit access panels.

⚠ CAUTION

USE CARE TO AVOID DAMAGE WHEN DRILLING HOLES FOR THE DISCONNECT MOUNTING.

NOTE: Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical wiring must be sized properly to carry the load. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

⚠ CAUTION

WHEN CONNECTING ELECTRICAL POWER AND CONTROL WIRING TO THE UNIT, WATERPROOF CONNECTORS MUST BE USED SO THAT WATER OR MOISTURE CANNOT BE DRAWN INTO THE UNIT DURING NORMAL OPERATION. THE ABOVE WATERPROOFING CONDITIONS WILL ALSO APPLY WHEN INSTALLING A FIELD-SUPPLIED DISCONNECT SWITCH.

Refer to Figure 5 and 6 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

Power Wiring Detail

Units are factory wired for the voltage shown on the unit nameplate. The main power block requires copper wires. Refer to Electrical Data Tables 11 through 22 to size power wiring, fuses and disconnect switch. All field supplied wiring, fuses and disconnects must comply with applicable NEC codes.

Power wiring is brought into the unit through the side of the baserail or the bottom of the unit/control box inside the curb. The baserail has a 2-1/2” diameter hole for field wiring and a 3-5/8” hole is provided for a through-the-curb connection. A removable patch plate covers both the openings.

⚠ CAUTION

WATERPROOF CONNECTIONS MUST BE USED TO ENSURE THAT WATER CANNOT PENETRATE THE ROOF OR ROOF CURB.

GAS HEATING

WARNING

ON VAV UNITS WITH GAS FIRED FURNACE, ALL INDIVIDUAL ROOM DAMPER BOXES MUST BE CONTROLLED FULL OPEN DURING HEATING OPERATION TO ENSURE PROPER AIRFLOW OVER THE FURNACE. A CONTROL CONTACT BETWEEN D1 AND D2 ON TB3 IS PROVIDED FOR THE DAMPER BOX INTERLOCK. THIS CONTACT IS NORMALLY OPEN, THUS IS CLOSED DURING HEATING OPERATION.

GAS PIPING

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. National Fuel Gas Code Z223.1-Latest Edition should be followed in all cases unless superseded by local codes or gas company requirements. Refer to Table 8.

The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

TABLE 8: PIPE SIZES

Length in Feet	Nominal Iron Pipe, Size		
	1-1/4 in.[1]	1-1/2 in.[1]	2 in.[1]
10	1,050	1,600	3,050
20	730	1,100	2,100
30	590	890	1,650
40	-	760	1,450
50	-	-	1,270
60	-	-	1,150
70	-	-	1,050
80	-	-	990

1. Maximum capacity of pipe in cubic feet of gas per hour (based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas.

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 1-1/4 inch pipe connection at the entrance fitting. Line should not be sized smaller than the entrance fitting size.

GAS CONNECTION

The gas supply line should be routed within the space and penetrate the roof at the gas inlet connection of the unit. Refer to Fig. 13 -- 16 to locate the access opening. Typical supply piping arrangements are shown in Figure 5.

.

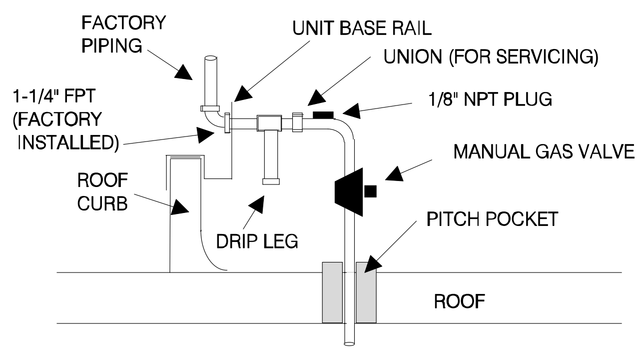


FIGURE 7 : TYPICAL GAS PIPING CONNECTION

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.
2. When required by local codes, a manual shut-off valve will have to be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only.

WARNING

NATURAL GAS MAY CONTAIN SOME PROPANE. PROPANE, BEING AN EXCELLENT SOLVENT, WILL QUICKLY DISSOLVE WHITE LEAD OR MOST STANDARD COMMERCIAL COMPOUNDS. THEREFORE, A SPECIAL PIPE DOPE MUST BE APPLIED WHEN WROUGHT IRON OR STEEL PIPE IS USED. SHELLAC BASE COMPOUNDS SUCH AS GASKOLAC OR STALASTIC, AND COMPOUNDS SUCH AS RECTORSEAL #5, CLYDE'S OR JOHN CRANE MAY BE USED.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose particles. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under

Limitations. After the gas connections have been completed, open the main shutoff valve admitting normal gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. NEVER USE A FLAME

6. The furnace and its individual manual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psig.

> **⚠ CAUTION**
>
> *DISCONNECT GAS PIPING FROM UNIT WHEN LEAK TESTING AT PRESSURES GREATER THAN 0.5PSIG. PRESSURES GREATER THAN 0.5 PSIG WILL CAUSE GAS VALVE DAMAGE RESULTING IN A HAZARDOUS CONDITION. IF GAS VALVE IS SUBJECTED TO PRESSURE GREATER THAN 0.5PSIG, IT MUST BE REPLACED.*

7. A 1/8 inch N.P.T. plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace.

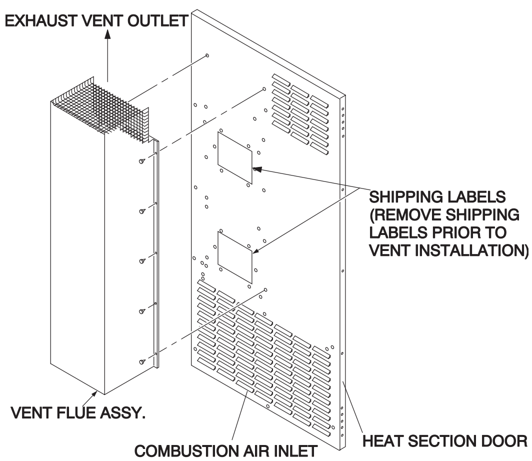


FIGURE 8 : VENT AND COMBUSTION AIR HOODS

VENT AND COMBUSTION AIR

NOTE: All the hoods and hardware are shipped within the evaporator section. Each hood must be properly attached to the furnace doors to assure proper operation and compliance with CSA/ETL safety certification. (Refer to Figure 8 and 9)

.

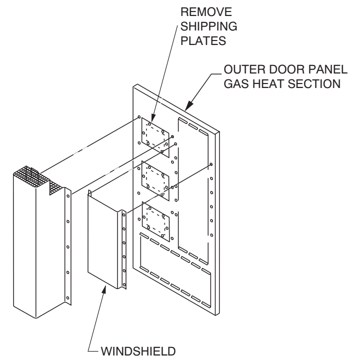


FIGURE 9 : 669 MBH HEAT VENT

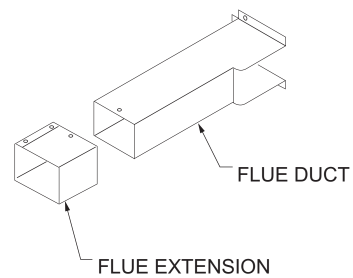


FIGURE 10 : FLUE EXTENSION

The products of combustion are discharged horizontally through hooded openings in the gas heat access doors.

233 & 466 MBH HEAT

(Figure 8)

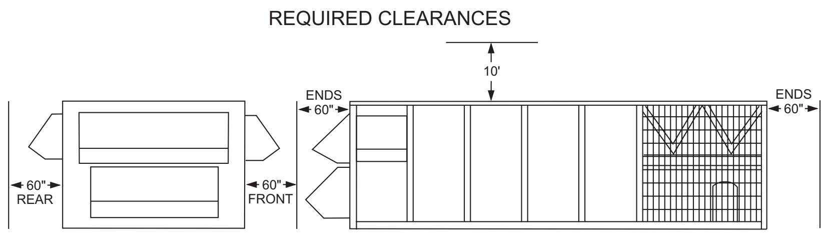
1. Remove the shipping covers that are attached to the heat section door covering the flue outlets.
2. Locate the flue which is shipped in the evaporator section.
3. Place the flue over the flue outlet with the diverter angles facing up toward the top of the unit and attach with screws provided.
4. Refer to the Gas Furnace Operation Instruction in the Start-up Section of this manual for further instructions.

699 MBH Heat

(Figure 9)

1. Remove the shipping covers that are attached to the heat section door covering the flue outlets.
2. Locate the flue duct extensions and flue which are shipped between the evaporator and filter section.

3. Place the flue extension (Figure 10) on the flue duct of each furnace section and attach with screws provided.
4. Place the flue in position with the diverter angles facing up toward the top of the unit and attach with screws provided.
5. Place the wind shield over the louvers on the right side of the burner access door and attach with screws provided.
6. Refer to the Gas Furnace Operation Instructions in the Start-up Section of this manual for further information.



* Front is the side with access to the Electrical / Gas Controls.
* Right is the side with the Condenser Coils.

LEFT	60"
RIGHT	60"
REAR	60"
FRONT	60"
TOP	10'

NOTE: DO NOT use the unit roof to support any type of structure or bracing.

FIGURE 11 : CLEARANCES

ELECTRIC HEAT

Units with electric heat are fully wired and operational when shipped. Constant volume units are designed for two equal steps of capacity for 80 and 108 kWH heat; 40 kW heat is one step only. VAV units are one full step at full heat capacity.

HOT WATER HEAT

The YORK Millennium units (25, 30, and 40 Ton sizes) can be furnished with a YORK hot water coil as the heat source. One or two row coil units will be factory installed in the heating section.

NOTE: The hot water control valve will not be provided. The installer will need to purchase a hot water control valve, to connect the hot water piping and power wiring at the job site for the hot water heat section to be operational

⚠ CAUTION

DO NOT USE HOT WATER COILS AS STEAM COILS UNDER ANY CIRCUMSTANCES.

ALL PIPING, CONTROL VALVES, AND WIRING THAT IS FIELD INSTALLED MUST BE PROPERLY INSULATED AND CONFORM TO ALL LOCAL AND NATIONAL CODES.

⚠ CAUTION

THERE ARE NO PROVISIONS IN THE COIL OR CONTROL SEQUENCE TO PREVENT FREEZING OF CONDENSATE. THE CONTROL VALVE, PIPING AND FIELD INSTALLED WIRING CONNECTIONS ARE PARTICULARLY VULNERABLE BECAUSE THEY ARE INSTALLED IN THE VESTIBULE OUTSIDE OF THE CONDITIONED AIR STREAM. THE INSTALLING PARTY WILL BE RESPONSIBLE FOR PROPERLY INSULATING AND INSTALLING POWER AND CONTROL WIRING, TO THE ACTUATOR AND PIPING.

IN ONE ROW HOT WATER COIL SYSTEMS DO NOT EXCEED A 40 GALLONS PER MINUTE FLOW RATE.

IN TWO ROW HOT WATER COIL SYSTEMS DO NOT EXCEED A 80 GALLONS PER MINUTE FLOW RATE

CONDENSATE WILL FREEZE ON THE CONTROL VALVE AND PIPING IF THEY ARE NOT PROPERLY INSULATED. INSULATING THE CONTROL VALVE AND PIPING IS THE RESPONSIBILITY OF THE INSTALLING PARTY.

NOTE: For all hot water coils the entering water temperature should not exceed 200°F.

The hot water coil is located downstream of the supply air fan and just above the supply air opening in the bottom of the unit.

Refer to Tables 47 through 55 and Figures 34 through 47 for flow rate and capacity.

PIPING CONNECTIONS

The hot water pipping must enter the unit through the floor of the heat section compartment. The access doors to the compartment are gasketed so the compartment can be sealed. However, as added protection for water leakage into the space, the piping access holes should be sealed with a heat resistant mastic Figure 12 shows the location of the compartment and piping connections.

⚠ CAUTION

PIPING ACCESS HOLES SHOULD BE SEALED WITH A HEAT RESISTANT MASTIC TO PREVENT DAMAGE TO EQUIPMENT.

⚠ WARNING

DO NOT USE TIN BASED SOLDER. BRAZING WITH TIN BASED SOLDER COULD CAUSE EQUIPMENT DAMAGE OR POSSIBLE INJURY TO TENETS OF THE STRUCTURE THAT IS BEING CONDITIONED.

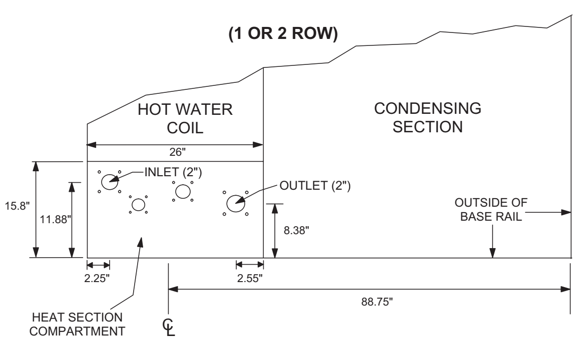


FIGURE 12 : HOT WATER PIPING CROSS-SECTION

STEAM HEAT

The YORK Millennium units (25, 30 and 40 Ton sizes) can be furnished with a YORK single row steam coil. YORK steam coils are a factory installed option.

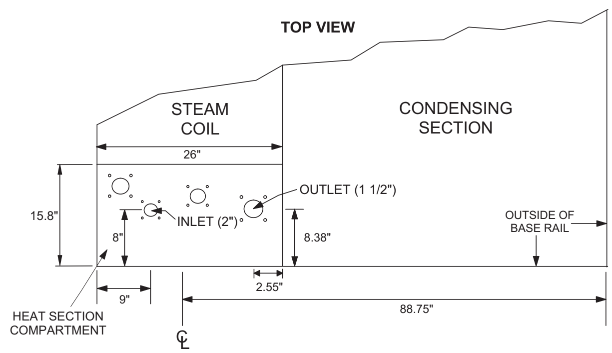


FIGURE 13 : STEAM PIPING CROSS-SECTION

NOTE: The steam control valve, power and control wiring to the actuator of the valve is the responsibility of the installing party.

⚠ CAUTION

ALL PIPING AND CONTROL VALVES, AND WIRING THAT IS FIELD INSTALLED MUST BE PROPERLY INSULATED AND CONFORM TO ALL LOCAL AND NATIONAL CODES.

THERE ARE NO PROVISIONS IN THE COIL OR CONTROL SEQUENCE TO PREVENT FREEZING OF CONDENSATE. THE CONTROL VALVE, PIPING AND FIELD INSTALLED WIRING CONNECTIONS ARE PARTICULARLY VULNERABLE BECAUSE THEY ARE INSTALLED IN THE VESTIBULE OUTSIDE OF THE CONDITIONED AIR STREAM. THE INSTALLING PARTY WILL BE RESPONSIBLE FOR PROPERLY INSULATING AND INSTALLING POWER AND CONTROL WIRING, TO THE ACTUATOR AND PIPING.

DO NOT USE STEAM COILS AS HOT WATER COILS UNDER ANY CIRCUMSTANCES.

IN STEAM COIL SYSTEMS, THE STEAM PRESSURE SHALL NOT EXCEED 15 PSI.

PIPING CONNECTIONS

Refer to Tables 43 through 46 and Figures 48 and 49 for flow rate and capacity.

The steam piping must enter the unit through the floor of the heat section compartment. The access doors to the compartment are gasketed so the compartment can be sealed. However, as added protection for condensate leakage into the space, the piping access holes should be sealed with a heat resistant mastic. The following figure illustrates the location of the compartment and piping connections.

⚠ CAUTION

PIPING ACCESS HOLES SHOULD BE SEALED WITH A HEAT RESISTANT MASTIC TO PREVENT DAMAGE TO EQUIPMENT.

⚠ WARNING

DO NOT USE TIN BASED SOLDER. BRAZING WITH TIN BASED SOLDER COULD CAUSE EQUIPMENT DAMAGE OR POSSIBLE INJURY TO TENETS OF THE STRUCTURE THAT IS BEING CONDITIONED.

ECONOMIZER SETPOINT ADJUSTMENT

This control is located in the upper portion of the control cabinet.

For Dry Bulb Economizer see Figure 15.

For Single Enthalpy Economizer see Figure 14 and 16.

For Dual Enthalpy Economizer set changeover switch fully clockwise (D).

See System Setpoints in the SYSTEM START-UP section for more information.

Checkout Procedure

Connect 620 ohm resistor across terminals SR and +.

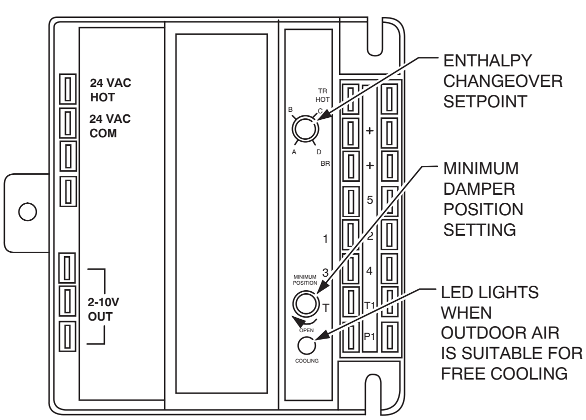
Connect 1.2K ohm checkout resistor (4074EJM) across terminals S0 and +.

Turn enthalpy setpoint to A -- LED turns ON.

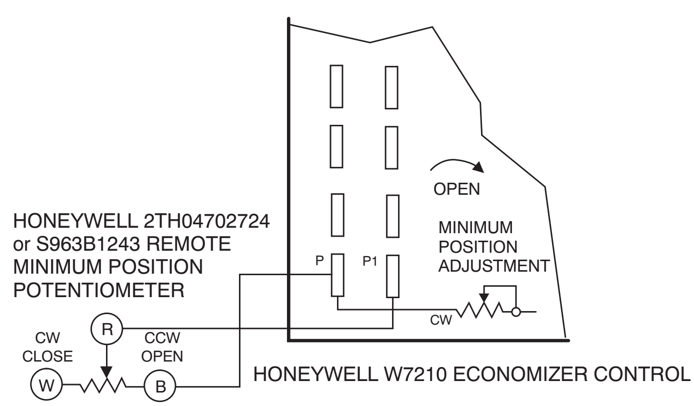
Turn enthalpy setpoint to D -- LED turns OFF.

STATIC PRESSURE CONTROL PLASTIC TUBING

On units with inlet guide vanes (IGV's) and variable frequency drives on the supply blower and/or power exhaust fans, pressure sensing tubing must be field supplied and installed from differential pressure switches or transducers to



Location of enthalpy setpoint potentiometer, minimum position potentiometer and LED.



**Remote Minimum Positon
Potentiometer used with Honeywell W7210 Control for remote damper control.**

FIGURE 14 : ENTHALPY CONTROLS

the locations in the building or ductwork where a constant pressure is desired, and to the atmosphere.

The supply air discharge static pressure switch or transducer is located in the blower compartment on the heat section partition panel. Plastic tubing (1/4") must be run from the high pressure tap of the transducer to a static pressure tap (field supplied) in the supply duct located at a point where constant pressure is desired. Tubing must also be run between the low pressure tap of the transducer to atmospheric pressure.

EXHAUST STATIC PRESSURE

The exhaust air side static pressure switch is located on a bracket mounted in the return air compartment. Plastic tubing (1/4") must be run from the high pressure tap of the static pressure switch to a static pressure tap located in the conditioned space or return air duct at a point where constant pressure is desired. Tubing must also be run between the low pressure tap of the switch to atmospheric pressure.

⚠ CAUTION

DO NOT RUN PLASTIC TUBES IN THE SUPPLY OR RETURN AIR DUCTS AS AIR MOVEMENT COULD CAUSE ERRONEOUS SENSING. IF TUBES PENETRATE BOTTOM OF UNIT BE SURE OPENINGS ARE SEALED AGAINST AIR AND WATER LEAKAGE.

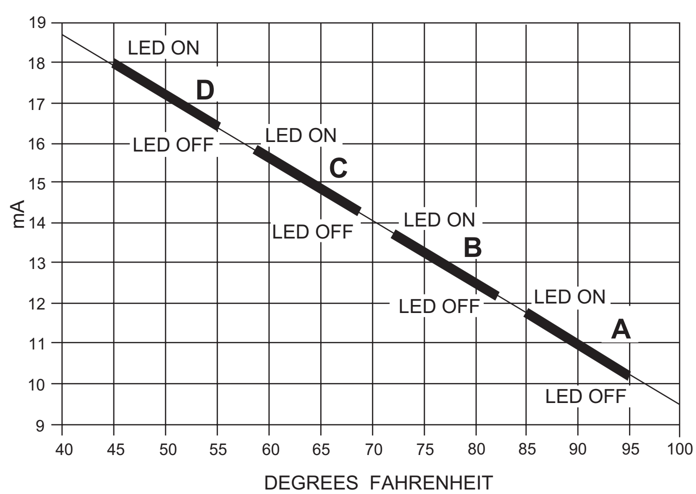
EXHAUST POSITIVE / NEGATIVE STATIC PRESSURE

The null pressure switch is factory wired to provide a positive pressure setpoint. In this configuration, connect the low side pressure switch port to the atmosphere and the high side switch port to the building pressure tap.

To set the control to a negative building static pressure the following changes are necessary:

1. Connect the low side port to the building pressure and high side to atmosphere.
2. The wires connected to the switch output must be reversed. Purple wire #323 (factory wired to HI terminal) must be moved to the LO terminal of SSP2. White wire #350 (factory wired to LO terminal) must be moved to the HI terminal of SSP2.

The static pressure switch only has positive setpoints. Making the above change enables negative control because the switch diaphragm detects a positive pressure when the ports are reversed.



NOTE: A, B, C, D, ARE 7210D SWITCHING SETPOINTS.
LED ON = FREE COOLING AVAILABLE (ECON)
LED OFF = USE MECHANICAL COOLING (NO ECON)

FIGURE 15 : DRY BULB SETPOINT ADJUSTMENT

CONTROL CURVE	CONTROL POINT (APPROX. DEG.) AT 50% RH
A	73 (23)
B	70 (21)
C	67 (19)
D	63 (17)

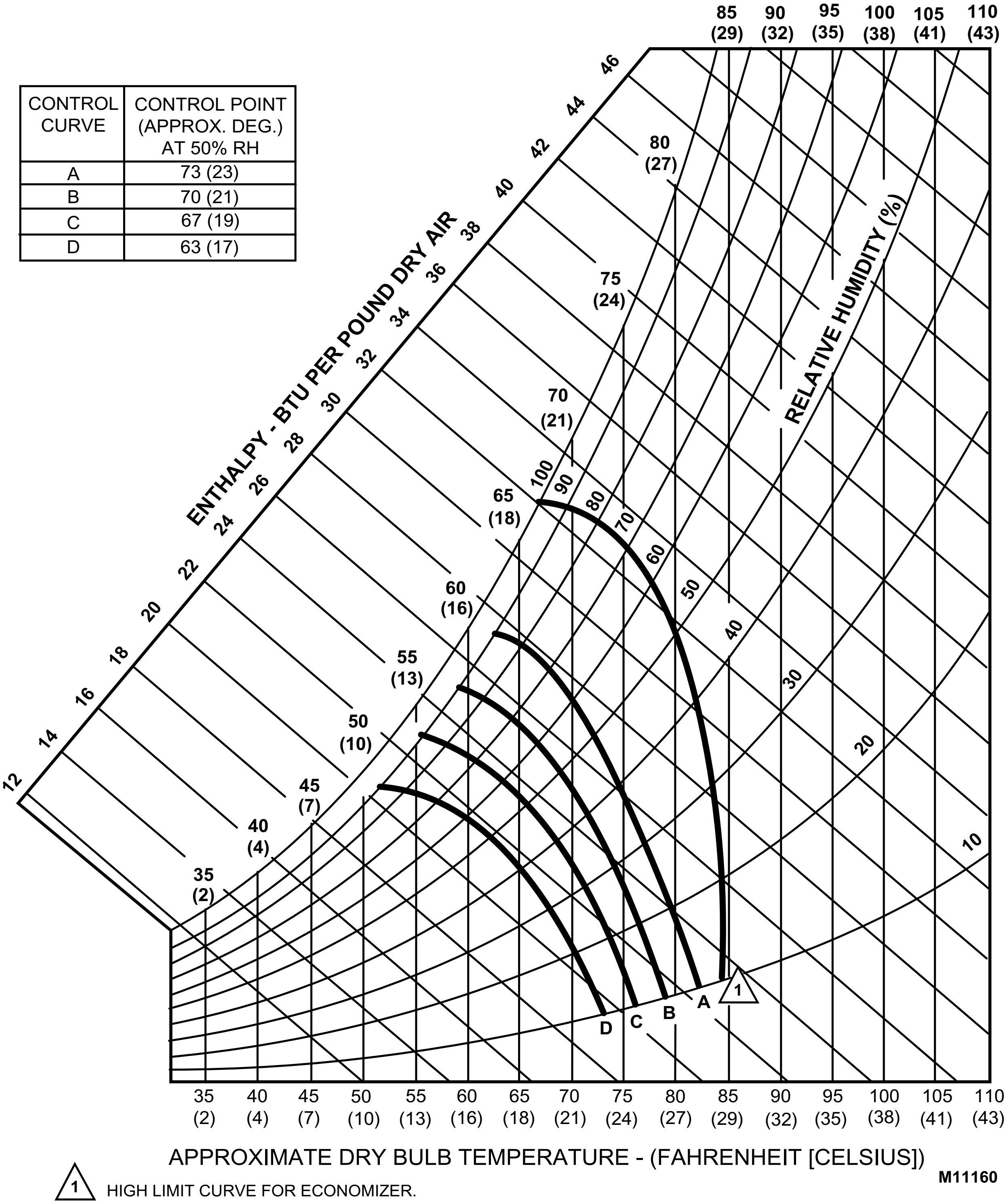


FIGURE 16 : SINGLE ENTHALPY SETPOINT ADJUSTMENT

TABLE 9: GENERAL PHYSICAL DATA

Unit Size	25 TON	30 TON	40 TON
Unit EER	10.0	9.5	9.5
Compressor Data			
Number/Size	2 x 13 Ton	3 x 10 Ton	4 x 10 Ton
Type	Scroll	Scroll	Scroll
Unit Capacity Steps	50%, 100%	33%, 67%, 100%	25%, 50%, 75%, 100%
Indoor Fan and Drive			
Number / Type	1 / FC	1 / FC	1 / FC
Diameter x Width (inches)	22 x20	22 x 20	25 x 22
HP Range	7.5 - 20	10 - 25	10 - 25
CFM Range (full load)	6,000 - 12,500	6,000 - 15,000	8,000 - 18,000
ESP Range	0.2” - 4.0”	0.2" - 4.0”	0.2" - 4.0"
Exhaust Fan			
Number/Size/Type	1/FC	2/FC	2/FC
HP Range (single motor)	5 - 10	7.5 - 15	7.5 - 15
CFM	3,000 - 9,000	4,000 - 18,000	4,000 - 18,000
Standard Evaporator Coil			
Size (sq. ft.)	26.0	26.0	30.4
Rows/FPI	3 / 13	3 / 16	4 / 13
High Capacity Evaporator Coil (Low on 25 Ton ONLY)			
Size (sq. ft.)	26.0	26.0	30.4
Rows/FPI	3/13	4 / 16	4 / 16
Condenser Coil			
Size (sq. ft.)	52.0	48.8	65.0
Rows/FPI	2/16	2 /16	2 /16
Condenser Fans			
Quantity / Diameter (inches)	4 / 24	3 / 24	4 / 24
Nominal CFM	4,600	6,800	6,800
Motor HP	3 / 4	1.0	1.0
Electric Heat			
kW Range	40 - 108	40 - 108	40 - 108
40 kW Capacity Steps	1	1	1
80 and 108 kW Capacity Steps (CV/VAV)	2 / 1	2 / 1	2 / 1
Natural Gas Heat			
233 MBH Capacity Steps (CV/VAV)	1 / 1	1 / 1	1 / 1
466 MBH Capacity Steps (CV/VAV)	2 / 1	2 / 1	2 / 1
699 MBH Capacity Steps (CV/VAV)	-	2 / 1	2 / 1
Hot Water Coil			
Size (inches)	22.5” X 65”	22.5" X 65"	22.5" X 65"
Capacity	25 Ton	30 Ton	40 Ton
Steam Coil			
Size (inches)	21" X 65"		

TABLE 9: GENERAL PHYSICAL DATA (Continued)

Type	Steam Coil		
Filters 2" Hi. Eff. TA			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. Ft.)	30.4	30.4	30.4
Filters 2" Pleated, 65%			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. Ft.)	30.4	30.4	30.4
Filters 65% Rigid w/ 2" TA Prefilters			
Number / Size	4 / 16 x 25 & 6 / 20 x 25	4 /16 x 25 & 6 / 20 x 25	4 / 16 x 25 & 6 / 20 x 25
Face Area (sq. Ft.)	30.4	30.4	30.4
Filters 95% Rigid w/ 2" TA Prefilters			
Number / Size	4 ea. 16 x 25 / 6 ea. 20 x 25	4 ea. 16 x 25 / 6 ea. 20 x 25	4 ea. 16 x 25 / 6 ea. 20 x 25
Face Area (sq. Ft.)	30.4	30.4	30.4

TABLE 10: REFIGERANT CHARGE

UNIT (Tons)	MODEL	TYPE	Factory/ Field Charged	Charge			
				SYS #1	SYS #2	SYS #3	SYS #4
25	wo/HGBP	R22	Factory	27 lb. / 0 oz.	26lb / 0oz	-	-
30	wo/HGBP	R22	Factory	13 lb. / 4 oz.	13 lb. / 8 oz.	13 lb. / 8 oz.	-
25	w/HGBP	R22	Factory	27 lb. / 8 oz.	26 lb. / 0oz	-	-
30	w/HGBP	R22	Factory	14 lb. / 0 oz.	13 lb. / 8 oz.	13 lb. / 8 oz.	-
40	wo/HGBP	R22	Factory	15 lb. / 5 oz.	15 lb. / 4 oz.	15 lb. / 5 oz.	15 lb. / 15 oz.
40	w/HGBP	R22	Factory	15 lb. / 13 oz.	15 lb. / 4 oz.	15 lb. / 5 oz.	15 lb. / 15 oz.
30	wo/HGBP	R22	Factory	14 lb. / 6 oz.	14 lb. / 10 oz.	14 lb. / 10 oz.	-
30	w/HGBP	R22	Factory	15 lb. / 2 oz.	14 lb. / 10 oz.	14 lb. / 10 oz.	-

TABLE 11: ELECTRICAL DATA BASIC UNIT - 25 TON

Voltage	Compressors			Cond. Fan Motor		Supply Air Motor		Basic Unit	
	Qty.	RLA	LRA	Qty	FLA	HP	FLA	MCA	Max Overcurrent Protection Device
208-3-60	2	45.7	350	4	7.6 ea.	7.5	24.2	157	200
						10	30.8	164	200
						15	46.2	180	225
						20	59.4	196	250
230-3-60	2	45.7	350	4	6.9 ea.	7.5	22.0	152	175
						10	28.0	158	200
						15	42.0	172	200
						20	54.0	187	225
460-3-60	2	24.3	158	4	3.5 ea.	7.5	11.0	80	100
						10	14.0	83	100
						15	21.0	90	110
						20	27.0	96	110
575-3-60	2	19.3	125	4	3.0 ea.	7.5	9.0	64	80
						10	11.0	66	80
						15	17.0	72	90
						20	22.0	78	100

TABLE 12: ELECTRICAL DATA BASIC UNIT - 30 TON

Voltage	Compressors			Cond. Fan Motor			Supply Air Motor		Basic Unit	
	Qty.	RLA	LRA	Qty.	FLA	Total	HP	FLA	MCA	**Max.** Overcurrent Protection Device
208-3-60	3	38.5	228	3	4.0 ea.	12.0	10	30.8	168	200
							15	46.2	185	225
							20	59.4	202	250
							25	74.8	221	250
230-3-60	3	38.5	255	3	3.6 ea.	10.8	10	28	164	200
							15	42	179	200
							20	54	194	225
							25	68	211	250
460-3-60	3	18.8	127	3	1.8 ea.	5.4	10	14	81	90
							15	21	88	100
							20	27	96	110
							25	34	104	125
575-3-60	3	15.7	100	3	1.4 ea.	4.2	10	11	66	80
							15	17	73	80
							20	22	79	100
							25	27	85	110

TABLE 13: ELECTRICAL DATA BASIC UNIT - 40 TONS

Voltage	Compressors			Cond. Fan Motor			Supply Air Motor		Basic Unit Overcurrent Protection Device	
	Qty.	RLA	LRA	Qty.	FLA	Total	HP	FLA	MCA	Max. Overcurrent Protection Device
208-3-60	4	38.5	228	4	4.0 ea.	12.0	10	30.8	210	225
							15	46.2	228	250
							20	59.4	244	300
							25	74.8	264	300
230-3-60	4	38.5	255	4	3.6 ea.	14.4	10	28	206	225
							15	42	221	250
							20	54	236	250
							25	68	253	300
460-3-60	4	18.8	127	4	1.8 ea.	7.2	10	14	101	110
							15	21	109	125
							20	27	116	125
							25	34	125	150
575-3-60	4	15.7	100	4	1.4 ea.	5.6	10	11	83	90
							15	17	90	100
							20	22	96	110
							25	27	102	125

TABLE 14: ELECTRICAL DATA BASIC UNIT WITH ELECTRIC HEAT - 25 TON

Voltage	Electric Heat		Supply Air Motor		Basic Unit w/ Electric Heat	
	Nominal kW	Applied kW	HP	FLA	MCA	Max Overcurrent Protection Device
208-3-60	40	30	7.5	24.2	157	200
			10	30.8	164	200
			15	46.2	180	225
			20	59.4	196	250
	80	60.1	7.5	24.2	197	225
			10	30.8	205	225
			15	46.2	225	250
			20	59.4	241	300
230-3-60	40	40	7.5	22.0	152	175
			10	28.0	158	200
			15	42.0	172	200
			20	54.0	187	225
	80	80	7.5	22.0	212	250
			10	28.0	219	250
			15	42.0	237	250
			20	54.0	252	300
460-3-60	40	40	7.5	11.0	80	100
			10	14.0	83	100
			15	21.0	90	110
			20	27.0	96	110
	80	80	7.5	11.0	106	125
			10	14.0	110	125
			15	21.0	118	125
			20	27.0	126	150
	108	108	7.5	11.0	138	150
			10	14.0	142	175
			15	21.0	151	175
			20	27.0	158	175
575-3-60	40	40	7.5	9.0	64	80
			10	11.0	66	80
			15	17.0	72	90
			20	22.0	78	100
	80	80	7.5	9.0	92	110
			10	11.0	94	110
			15	17.0	102	110
			20	22.0	108	125
	108	108	7.5	9.0	120	150
			10	11.0	122	150
			15	17.0	130	150
			20	22.0	136	150

TABLE 15: ELECTRICAL DATA BASIC UNIT WITH ELECTRIC HEAT - 30 TON

Voltage	Electric Heat		Supply Air Motor		Basic Unit with Electric Heat	
	Nominal kW	Applied kW	HP	FLA	MCA	Max Overcurrent Protection Device
208-3-60	40	30	10	30.8	210	225
			15	46.2	228	250
			20	59.4	244	300
			25	74.8	264	300
	80	60.1	10	30.8	210	225
			15	46.2	228	250
			20	59.4	244	300
			25	74.8	264	300
230-3-60	40	40	10	28	206	225
			15	42	221	250
			20	54	236	250
			25	68	253	300
	80	80	10	28	227	250
			15	42	245	250
			20	54	260	300
			25	68	277	300
460-3-60	40	40	10	14	101	110
			15	21	109	125
			20	27	116	125
			25	34	125	150
	80	80	10	14	114	125
			15	21	122	125
			20	27	130	150
			25	34	139	150
	108	108	10	14	147	175
			15	21	156	175
			20	27	164	175
			25	34	172	200
575-3-60	40	40	10	11	83	90
			15	17	90	100
			20	22	96	110
			25	27	102	125
	80	80	10	11	94	110
			15	17	102	110
			20	22	108	125
			25	27	114	125
	108	108	10	11	122	150
			15	17	130	150
			20	22	136	150
			25	27	142	150

TABLE 16: ELECTRICAL DATA BASIC UNIT WITH ELECTRIC HEAT - 40 TON

Voltage	Electric Heat		Supply Air Motor		Basic Unit with Electric Heat	
	Nominal kW	Applied kW	HP	FLA	MCA	Max. Overcurrent Protection Device
208-3-60	40	30	10	30.8	210	225
			15	46.2	228	250
			20	59.4	244	300
			25	74.8	264	300
	80	60.1	10	30.8	210	225
			15	46.2	228	250
			20	59.4	244	300
			25	74.8	264	300
230-3-60	40	40	10	28.0	206	225
			15	42.0	221	250
			20	54.0	236	250
			25	68.0	253	300
	80	80	10	28.0	227	250
			15	42.0	245	250
			20	54.0	260	300
			25	68.0	277	300
460-3-60	40	40	10	14.0	101	110
			15	21.0	109	125
			20	27.0	116	125
			25	34.0	125	150
	80	80	10	14.0	114	125
			15	21.0	122	125
			20	27.0	130	150
			25	34.0	139	150
	108	108	10	14.0	147	175
			15	21.0	156	175
			20	27.0	164	175
			25	34.0	172	200

TABLE 16: ELECTRICAL DATA BASIC UNIT WITH ELECTRIC HEAT - 40 TON (Continued)

Voltage	Electric Heat		Supply Air Motor		Basic Unit with Electric Heat	
	Nominal kW	Applied kW	HP	FLA	MCA	Max. Overcurrent Protection Device
575-3-60	40	40	10	11.0	83	90
			15	17.0	90	100
			20	22.0	96	110
			25	27.0	102	125
	80	80	10	11.0	94	110
			15	17.0	102	110
			20	22.0	108	125
			25	27.0	114	125
	108	108	10	11.0	122	150
			15	17.0	130	150
			20	22.0	136	150
			25	27.0	142	150

TABLE 17: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 25 TON

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit w/ Exhaust Fan	
	HP	HP	FLA	MCA	Max Overcurrent Protection Device
208-3-60	7.5	5	16.7	174	200
		7.5	24.2	182	225
		10	30.8	188	225
	10	5	16.7	181	225
		7.5	24.2	188	225
		10	30.8	195	225
	15	5	16.7	196	225
		7.5	24.2	204	225
		10	30.8	210	250
	20	5	16.7	213	250
		7.5	24.2	220	250
		10	30.8	227	250
230-3-60	7.5	5	15.2	168	200
		7.5	22.0	174	200
		10	28.0	180	225
	10	5	15.2	174	200
		7.5	22.0	180	225
		10	28.0	186	225
	15	5	15.2	188	225
		7.5	22.0	194	225
		10	28.0	200	225
	20	5	15.2	202	250
		7.5	22.0	209	250
		10	28.0	215	250
460-3-60	7.5	5	7.6	87	110
		7.5	11.0	91	110
		10	14.0	94	110
	10	5	7.6	90	110
		7.5	11.0	94	110
		10	14.0	97	110
	15	5	7.6	97	110
		7.5	11.0	101	110
		10	14.0	104	125
	20	5	7.6	104	125
		7.5	11.0	107	125
		10	14.0	110	125

TABLE 17: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 25 TON (Continued)

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit w/ Exhaust Fan	
	HP	HP	FLA	MCA	Max Overcurrent Protection Device
575-3-60	7.5	5	6.1	71	80
		7.5	9.0	74	90
		10	11.0	76	90
	10	5	6.1	73	90
		7.5	9.0	76	90
		10	11.0	78	90
	15	5	6.1	79	90
		7.5	9.0	82	100
		10	11.0	84	100
	20	5	6.1	84	100
		7.5	9.0	87	100
		10	11.0	89	110

TABLE 18: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 30 TON

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit with Exhaust Fan	
	HP	HP	FLA	MCA	Max. Overcurrent Protection Device
208-3-60	10	7.5	24.2	192	225
		10	30.8	199	225
		15	46.2	216	250
	15	7.5	24.2	209	250
		10	30.8	216	250
		15	46.2	231	250
	20	7.5	24.2	226	250
		10	30.8	233	250
		15	46.2	248	300
	25	7.5	24.2	245	300
		10	30.8	252	300
		15	46.2	267	300
230-3-60	10	7.5	22.0	186	200
		10	28.0	192	225
		15	42.0	207	225
	15	7.5	22.0	201	225
		10	28.0	207	225
		15	42.0	221	250
	20	7.5	22.0	216	250
		10	28.0	222	250
		15	42.0	236	250
	25	7.5	22.0	233	300
		10	28.0	239	300
		15	42.0	253	300

TABLE 18: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 30 TON (Continued)

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit with Exhaust Fan	
	HP	HP	FLA	MCA	Max. Overcurrent Protection Device
460-3-60	10	7.5	11.0	92	110
		10	14.0	95	110
		15	21.0	102	110
	15	7.5	11.0	99	110
		10	14.0	102	110
		15	21.0	109	125
	20	7.5	11.0	107	125
		10	14.0	110	125
		15	21.0	117	125
	25	7.5	11.0	115	125
		10	14.0	118	150
		15	21.0	125	150
575-3-60	10	7.5	9.0	75	90
		10	11.0	77	90
		15	17.0	84	100
	15	7.5	9.0	82	90
		10	11.0	84	100
		15	17.0	90	100
	20	7.5	9.0	88	100
		10	11.0	90	110
		15	17.0	96	110
	25	7.5	9.0	94	110
		10	11.0	96	110
		15	17.0	102	125

TABLE 19: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 40 TON

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit with Exhaust Fan	
	HP	HP	FLA	MCA	Max. Overcurrent Protection Device (MOPD)
208-3-60	10	7.5	24.2	235	250
		10	30.8	241	250
		15	46.2	259	300
	15	7.5	24.2	252	300
		10	30.8	259	300
		15	46.2	274	300
	20	7.5	24.2	268	300
		10	30.8	275	300
		15	46.2	290	300
	25	7.5	24.2	288	350
		10	30.8	294	350
		15	46.2	310	350
230-3-60	10	7.5	22	228	250
		10	28	234	250
		15	42	249	250
	15	7.5	22	243	250
		10	28	249	250
		15	42	263	300
	20	7.5	22	258	300
		10	28	264	300
		15	42	278	300
	25	7.5	22	275	300
		10	28	281	300
		15	42	295	350
460-3-60	10	7.5	11	112	125
		10	14	115	125
		15	21	123	125
	15	7.5	11	120	125
		10	14	123	125
		15	21	130	150
	20	7.5	11	127	150
		10	14	130	150
		15	21	137	150
	25	7.5	11	136	150
		10	14	139	150
		15	21	146	175

TABLE 19: ELECTRICAL DATA BASIC UNIT WITH POWER EXHAUST - 40 TON (Continued)

Voltage	Supply Air Motor	Exhaust Fan Motor		Basic Unit with Exhaust Fan	
	HP	HP	FLA	MCA	Max. Overcurrent Protection Device (MOPD)
575-3-60	10	7.5	9	92	100
		10	11	94	110
		15	17	101	110
	15	7.5	9	99	110
		10	11	101	110
		15	17	107	110
	20	7.5	9	105	125
		10	11	107	125
		15	17	113	125
	25	7.5	9	111	125
		10	11	113	125
		15	17	119	125

TABLE 20: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 25 TON

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan Motor		Basic Unit w/ Exhaust Fan	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection Device
208-3-60	40	30	7.5	5	16.7	174	200
				7.5	24.2	182	225
				10	30.8	188	225
			10	5	16.7	181	225
				7.5	24.2	188	225
				10	30.8	195	225
			15	5	16.7	196	225
				7.5	24.2	204	225
				10	30.8	210	250
			20	5	16.7	213	250
				7.5	24.2	220	250
				10	30.8	227	250
	80	60.1	7.5	5	16.7	218	225
				7.5	24.2	227	250
				10	30.8	236	250
			10	5	16.7	226	250
				7.5	24.2	236	250
				10	30.8	244	250
			15	5	16.7	245	250
				7.5	24.2	255	300
				10	30.8	263	300
			20	5	16.7	262	300
				7.5	24.2	271	300
				10	30.8	280	300
230-3-60	40	40	7.5	5	15.2	168	200
				7.5	22.0	174	200
				10	28.0	180	225
			10	5	15.2	174	200
				7.5	22.0	180	225
				10	28.0	186	225
			15	5	15.2	188	225
				7.5	22.0	195	225
				10	28.0	203	225
			20	5	15.2	202	250
				7.5	22.0	210	250
				10	28.0	218	250
	80	80	7.5	5	15.2	231	250
				7.5	22.0	239	250
				10	28.0	247	250
			10	5	15.2	238	250
				7.5	22.0	247	250
				10	28.0	254	300
			15	5	15.2	256	300
				7.5	22.0	264	300
				10	28.0	272	300
			20	5	15.2	271	300
				7.5	22.0	279	300
				10	28.0	287	300

TABLE 20: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 25 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan Motor		Basic Unit w/ Exhaust Fan	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection Device
460-3-60	40	30	7.5	5	7.6	87	110
				7.5	11.0	91	110
				10	14.0	94	110
			10	5	7.6	90	110
				7.5	11.0	94	110
				10	14.0	97	110
			15	5	7.6	97	110
				7.5	11.0	101	110
				10	14.0	104	125
			20	5	7.6	104	125
				7.5	11.0	107	125
				10	14.0	110	125
	80	80	7.5	5	7.6	115	125
				7.5	11.0	120	125
				10	14.0	123	125
			10	5	7.6	119	125
				7.5	11.0	123	125
				10	14.0	127	150
			15	5	7.6	128	150
				7.5	11.0	132	150
				10	14.0	136	150
			20	5	7.6	135	150
				7.5	11.0	140	150
				10	14.0	143	150
	108	108	7.5	5	7.6	148	175
				7.5	11.0	152	175
				10	14.0	156	175
			10	5	7.6	151	175
				7.5	11.0	156	175
				10	14.0	159	175
			15	5	7.6	160	175
				7.5	11.0	164	175
				10	14.0	168	175
			20	5	7.6	168	175
				7.5	11.0	172	175
				10	14.0	176	200

TABLE 20: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 25 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan Motor		Basic Unit w/ Exhaust Fan	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection Device
575-3-60	40	40	7.5	5	6.1	71	80
				7.5	9.0	74	90
				10	11.0	76	90
			10	5	6.1	73	90
				7.5	9.0	76	90
				10	11.0	79	90
			15	5	6.1	79	90
				7.5	9.0	83	100
				10	11.0	85	100
			20	5	6.1	85	100
				7.5	9.0	89	100
				10	11.0	91	110
	80	80	7.5	5	6.1	99	110
				7.5	9.0	103	110
				10	11.0	105	110
			10	5	6.1	102	110
				7.5	9.0	105	110
				10	11.0	108	110
			15	5	6.1	109	110
				7.5	9.0	113	125
				10	11.0	115	125
			20	5	6.1	115	125
				7.5	9.0	119	125
				10	11.0	122	125
	108	108	7.5	5	6.1	127	150
				7.5	9.0	131	150
				10	11.0	133	150
			10	5	6.1	130	150
				7.5	9.0	133	150
				10	11.0	136	150
			15	5	6.1	137	150
				7.5	9.0	141	150
				10	11.0	143	150
			20	5	6.1	144	150
				7.5	9.0	147	150
				10	11.0	150	175

TABLE 21: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 30 TON

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
208-3-60	40	30	10	7.5	24.2	192	225
				10	30.8	199	225
				15	46.2	216	250
			15	7.5	24.2	209	250
				10	30.8	216	250
				15	46.2	231	250
			20	7.5	24.2	226	250
				10	30.8	233	250
				15	46.2	248	300
			25	7.5	24.2	245	300
				10	30.8	252	300
				15	46.2	267	300
	80	60.1	10	7.5	24.2	236	250
				10	30.8	244	250
				15	46.2	263	300
			15	7.5	24.2	255	300
				10	30.8	263	300
				15	46.2	282	300
			20	7.5	24.2	271	300
				10	30.8	280	300
				15	46.2	299	300
			25	7.5	24.2	291	350
				10	30.8	299	350
				15	46.2	318	350
230-3-60	40	40	10	7.5	22	186	200
				10	28	192	225
				15	42	208	225
			15	7.5	22	201	225
				10	28	208	225
				15	42	225	250
			20	7.5	22	216	250
				10	28	223	250
				15	42	240	250
			25	7.5	22	233	300
				10	28	240	300
				15	42	258	300
	80	80	10	7.5	22	255	300
				10	28	262	300
				15	42	280	300
			15	7.5	22	272	300
				10	28	280	300
				15	42	297	300
			20	7.5	22	287	300
				10	28	295	300
				15	42	312	350
			25	7.5	22	305	350
				10	28	312	350
				15	42	330	350

TABLE 21: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 30 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
460-3-60	40	40	10	7.5	11	92	110
				10	14	95	110
				15	21	104	110
			15	7.5	11	100	110
				10	14	104	110
				15	21	113	125
			20	7.5	11	108	125
				10	14	111	125
				15	21	120	125
			25	7.5	11	116	125
				10	14	120	150
				15	21	129	150
	80	80	10	7.5	11	127	150
				10	14	131	150
				15	21	140	150
			15	7.5	11	136	150
				10	14	140	150
				15	21	149	150
			20	7.5	11	144	150
				10	14	147	150
				15	21	156	175
			25	7.5	11	152	175
				10	14	156	175
				15	21	165	175
	108	108	10	7.5	11	161	175
				10	14	165	175
				15	21	174	175
			15	7.5	11	170	175
				10	14	174	175
				15	21	182	200
			20	7.5	11	177	200
				10	14	181	200
				15	21	190	200
			25	7.5	11	186	200
				10	14	190	200
				15	21	199	225

TABLE 21: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 30 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
575-3-60	40	40	10	7.5	9	75	90
				10	11	78	90
				15	17	85	100
			15	7.5	9	83	90
				10	11	85	100
				15	17	93	100
			20	7.5	9	89	100
				10	11	91	110
				15	17	99	110
			25	7.5	9	95	110
				10	11	98	110
				15	17	105	125
	80	80	10	7.5	9	105	110
				10	11	108	110
				15	17	115	125
			15	7.5	9	113	125
				10	11	115	125
				15	17	123	125
			20	7.5	9	119	125
				10	11	122	125
				15	17	129	150
			25	7.5	9	125	150
				10	11	128	150
				15	17	135	150
	108	108	10	7.5	9	133	150
				10	11	136	150
				15	17	143	150
			15	7.5	9	141	150
				10	11	143	150
				15	17	151	175
			20	7.5	9	147	150
				10	11	150	150
				15	17	157	175
			25	7.5	9	153	175
				10	11	156	175
				15	17	163	175

TABLE 22: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 40 TON

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
208-3-60	40	30	10	7.5	24.2	235	250
				10	30.8	241	250
				15	46.2	259	300
			15	7.5	24.2	252	300
				10	30.8	259	300
				15	46.2	274	300
			20	7.5	24.2	268	300
				10	30.8	275	300
				15	46.2	290	300
			25	7.5	24.2	288	350
				10	30.8	294	350
				15	46.2	310	350
	80	60.1	10	7.5	24.2	236	250
				10	30.8	244	250
				15	46.2	263	300
			15	7.5	24.2	255	300
				10	30.8	263	300
				15	46.2	282	300
			20	7.5	24.2	271	300
				10	30.8	280	300
				15	46.2	299	350
			25	7.5	24.0	291	350
				10	30.8	299	350
				15	46.2	318	350
230-3-60	40	40	10	7.5	22	228	250
				10	28	234	250
				15	42	249	250
			15	7.5	22	243	250
				10	28	249	250
				15	42	263	300
			20	7.5	22	258	300
				10	28	267	300
				15	42	278	300
			25	7.5	22	275	300
				10	28	281	300
				15	42	295	350
	80	80	10	7.5	22	255	300
				10	28	262	300
				15	42	280	300
			15	7.5	22	272	300
				10	28	280	300
				15	42	297	300
			20	7.5	22	287	300
				10	28	295	300
				15	42	312	350
			25	7.5	22	305	350
				10	28	312	350
				15	42	330	350

TABLE 22: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 40 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
460-3-60	40	40	10	7.5	11	112	125
				10	14	115	125
				15	21	123	125
			15	7.5	11	120	125
				10	14	123	125
				15	21	130	150
			20	7.5	11	127	150
				10	14	130	150
				15	21	137	150
			25	7.5	11	136	150
				10	14	139	150
				15	21	146	175
	80	80	10	7.5	11	127	150
				10	14	131	150
				15	21	140	150
			15	7.5	11	136	150
				10	14	140	150
				15	21	149	150
			20	7.5	11	144	150
				10	14	147	150
				15	21	156	175
			25	7.5	11	152	175
				10	14	156	175
				15	21	165	175
	108	108	10	7.5	11	161	175
				10	14	165	175
				15	21	174	175
			15	7.5	11	170	175
				10	14	174	175
				15	21	182	200
			20	7.5	11	177	200
				10	14	181	200
				15	21	190	200
			25	7.5	11	186	200
				10	14	190	200
				15	21	199	225

TABLE 22: ELECTRICAL DATA BASIC UNIT W/ POWER EXHAUST & ELECTRIC HEAT - 40 TON (Continued)

Voltage	Electric Heat		Supply Air Motor	Exhaust Fan		Basic Unit with Exhaust Fan and Electric Heat	
	Nominal kW	Applied kW	HP	HP	FLA	MCA	Max. Overcurrent Protection
575-3-60	40	40	10	7.5	9	92	100
				10	11	94	110
				15	17	101	110
			15	7.5	9	99	110
				10	11	101	110
				15	17	107	110
			20	7.5	9	105	125
				10	11	107	125
				15	17	113	125
			25	7.5	9	111	125
				10	11	113	125
				15	17	119	125
	80	80	10	7.5	9	105	110
				10	11	108	110
				15	17	115	125
			15	7.5	9	113	125
				10	11	115	125
				15	17	123	125
			20	7.5	9	119	125
				10	11	122	125
				15	17	129	150
			25	7.5	9	125	150
				10	11	128	150
				15	17	135	150
	108	108	10	7.5	9	133	150
				10	11	136	150
				15	17	143	150
			15	7.5	9	141	150
				10	11	143	150
				15	17	151	175
			20	7.5	9	147	150
				10	11	150	150
				15	17	157	175
			25	7.5	9	153	175
				10	11	156	175
				15	17	163	175

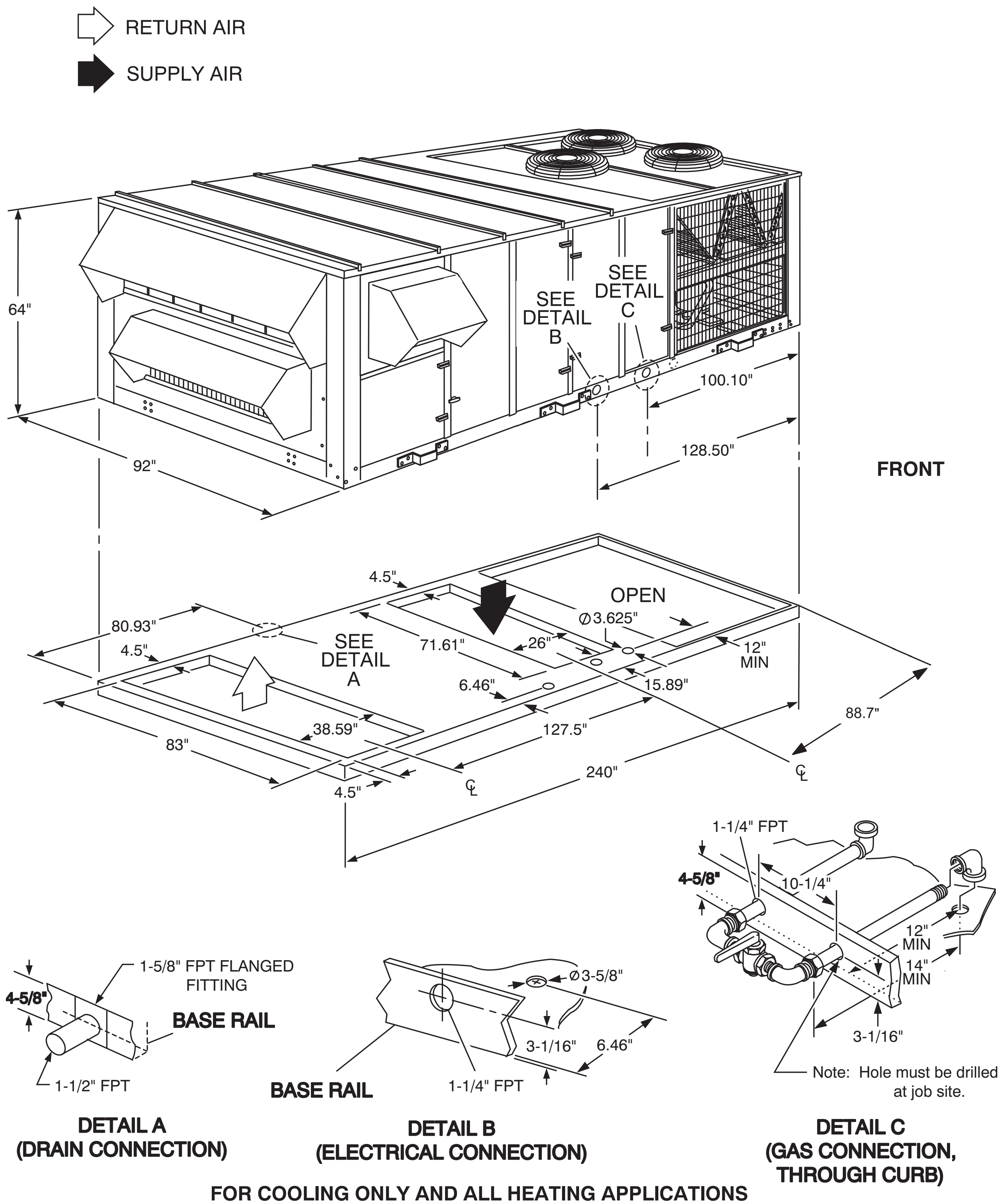


FIGURE 17 : BOTTOM SUPPLY AND RETURN

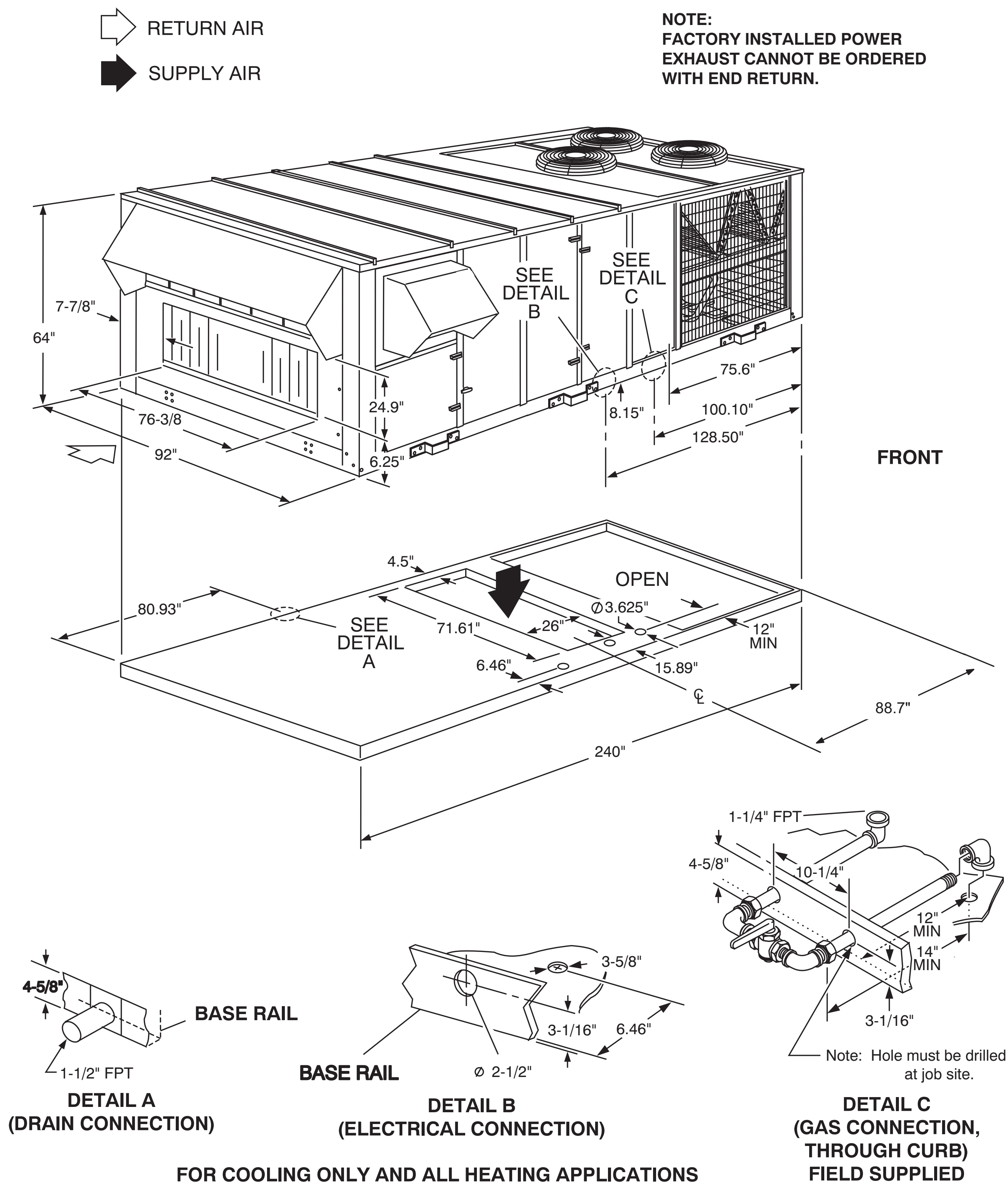


FIGURE 18 : END RETURN, BOTTOM SUPPLY

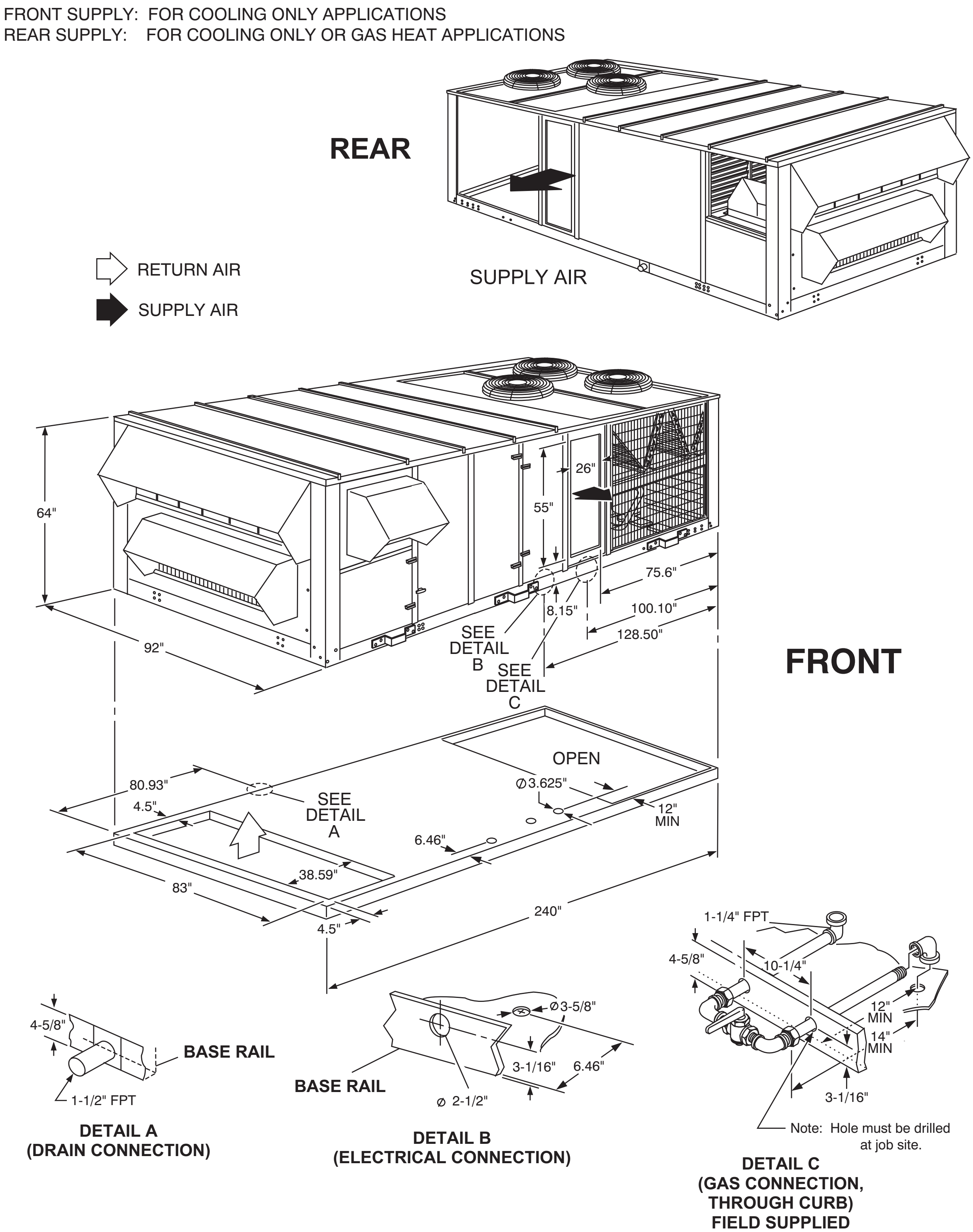


FIGURE 19 : BOTTOM RETURN, FRONT & REAR SUPPLY

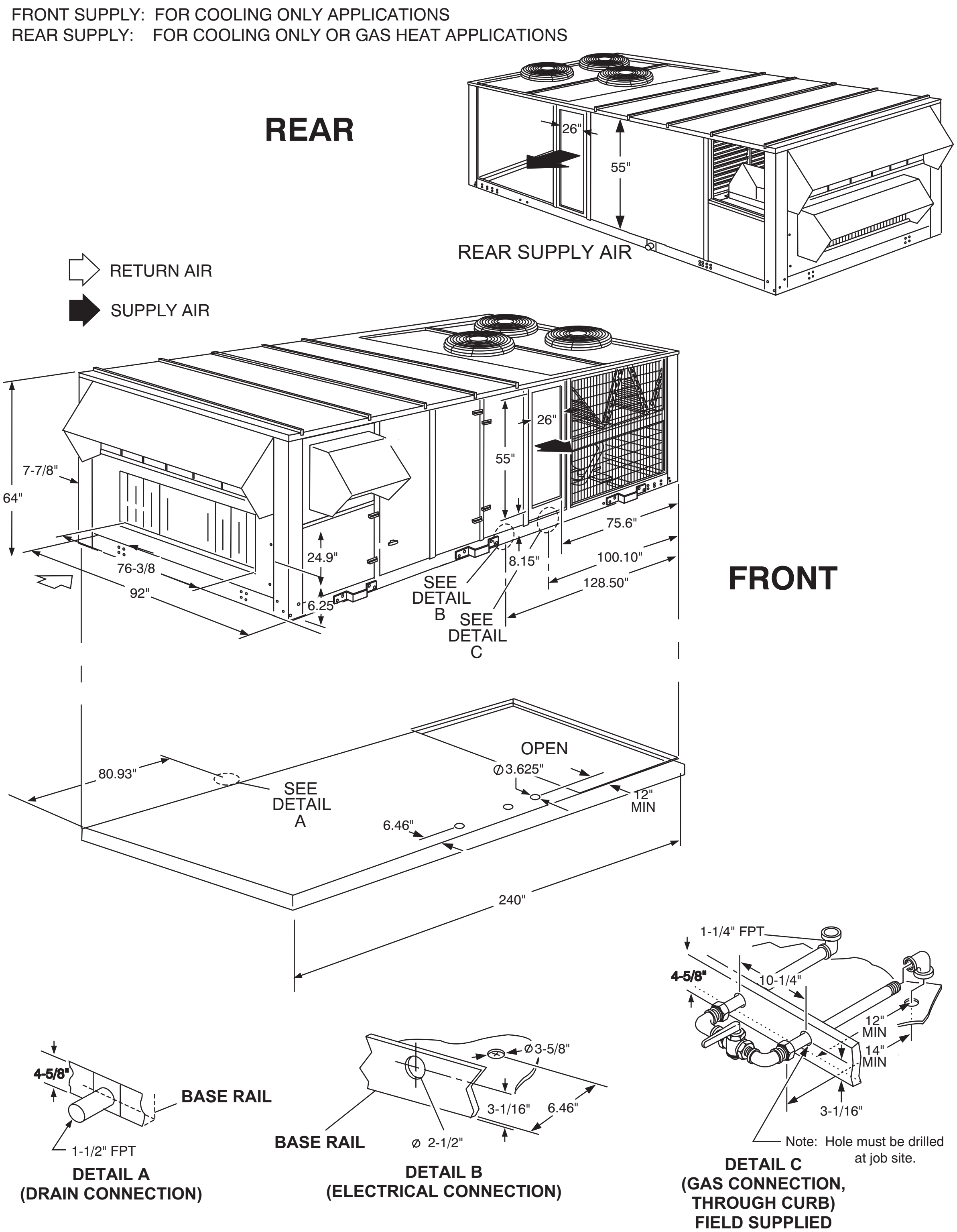
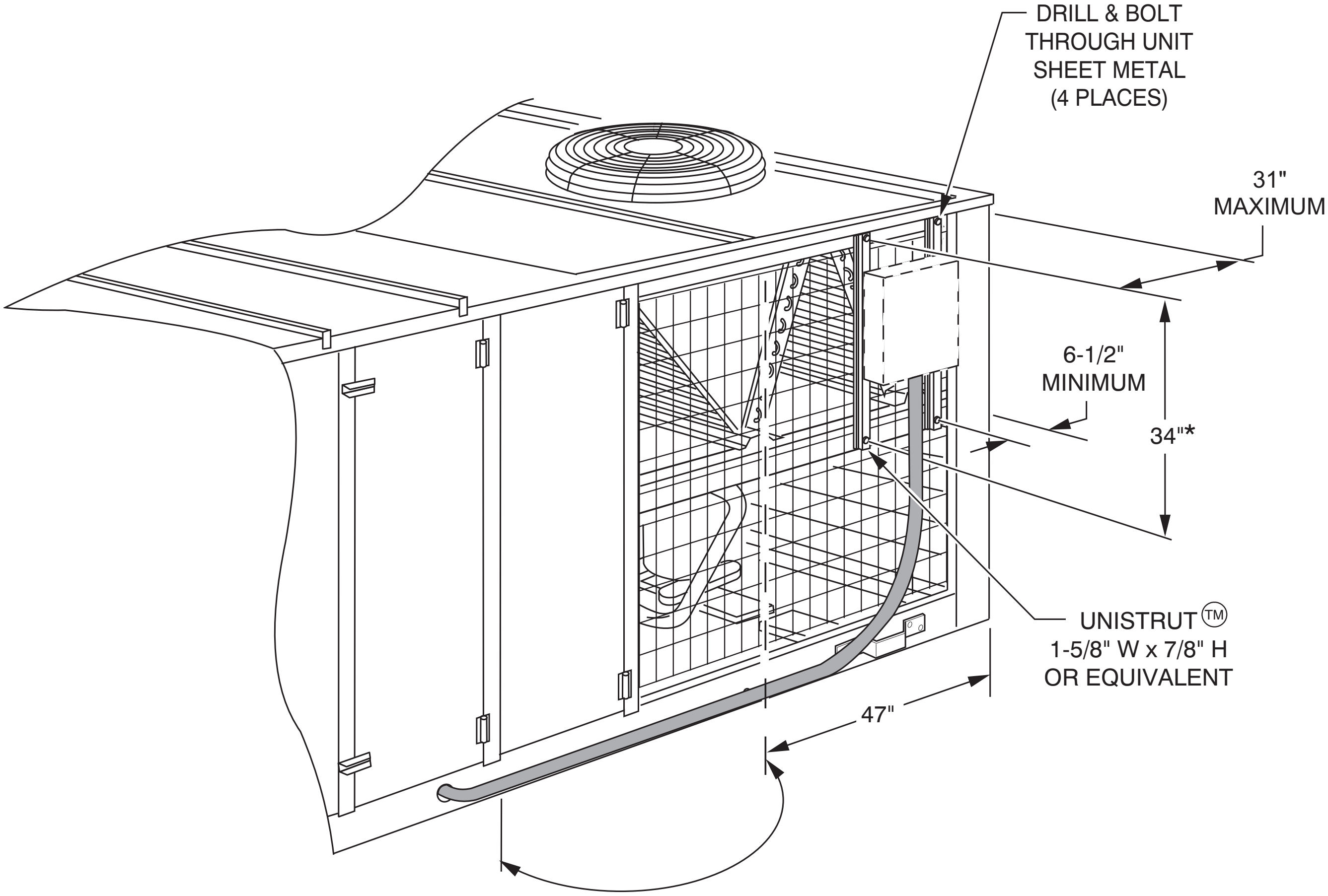


FIGURE 20 : END RETURN, FRONT & REAR SUPPLY



*34 INCHES IS THE MINIMUM LENGTH REQUIRED TO MOUNT TO THE FOUR POINTS SHOWN. THE RAILS CAN BE EXTENDED TO MOUNT A TALLER DISCONNECT SWITCH, BUT THESE FOUR POINTS SHOULD BE USED TO MOUNTTHE RAILS TO THE UNIT.

FIGURE 21 : FIELD INSTALLED DISCONNECT

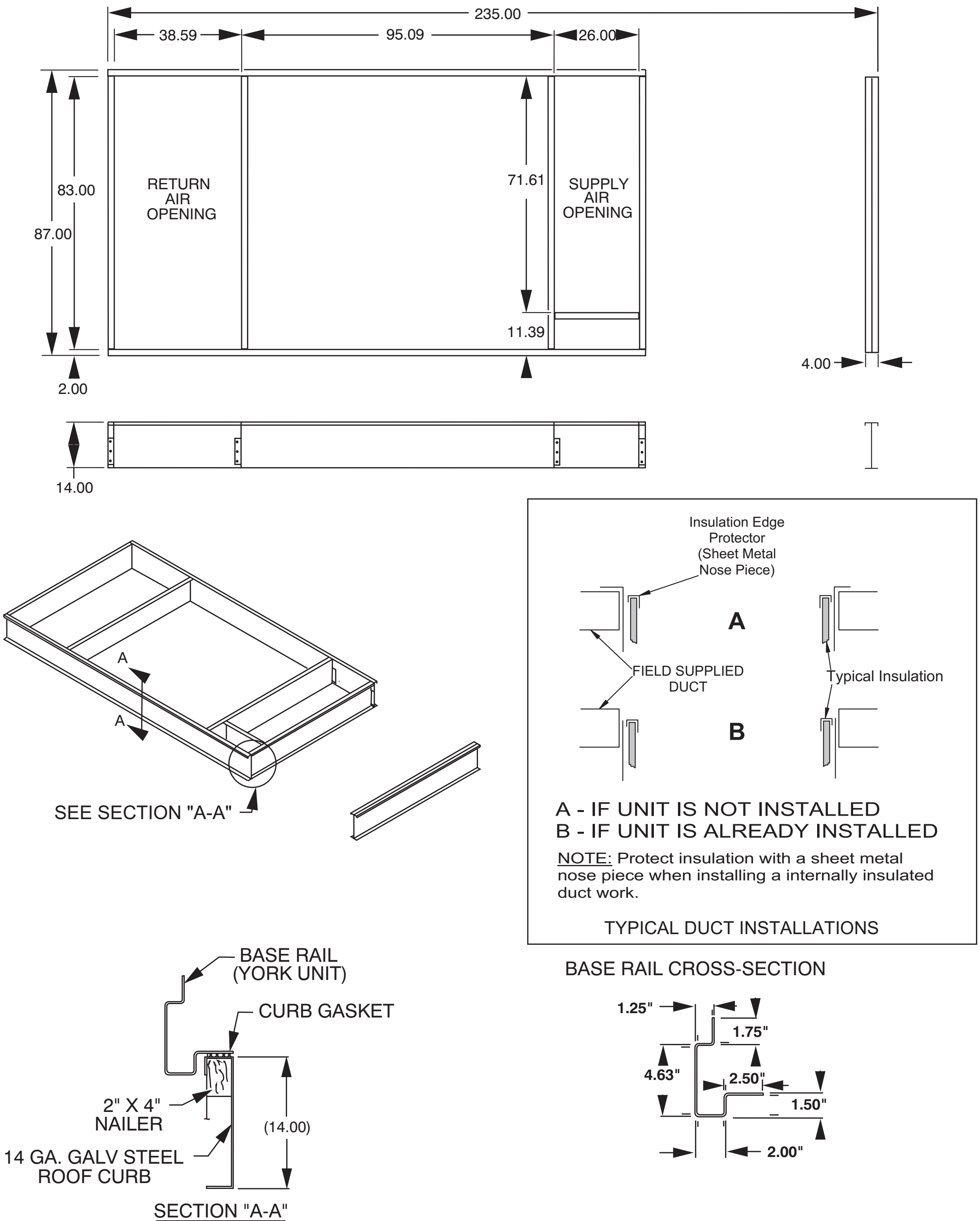


FIGURE 22 : PARTIAL ROOF CURB MODEL 1RC0455P

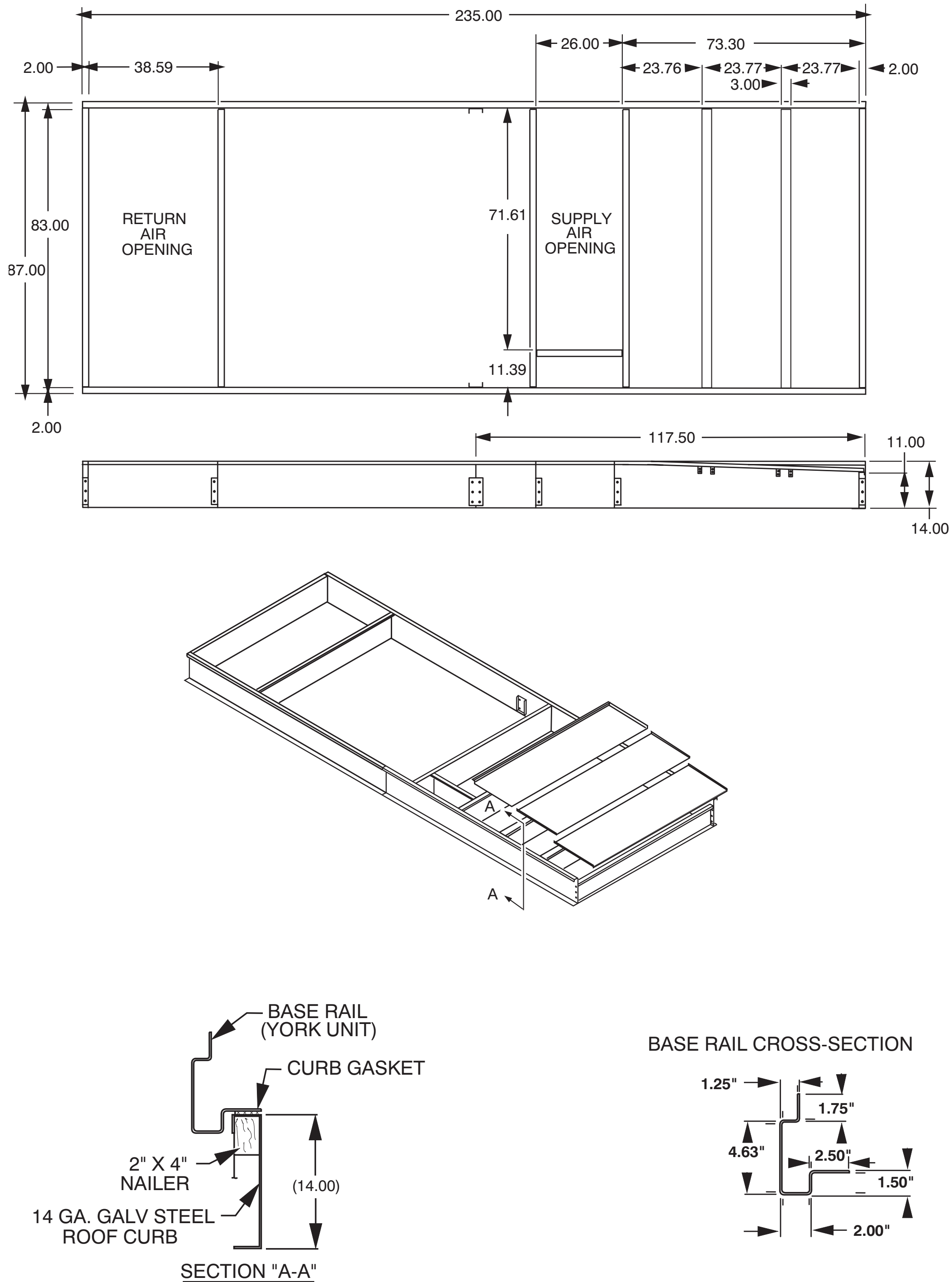


FIGURE 23 : FULL ROOF CURB MODEL 1RC0455F

TABLE 23: FAN PERFORMANCE - 25 TON[1 2]

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	-	-	342	0.59	404	0.82	456	1.08	506	1.35
5000	306	0.62	362	0.83	415	1.08	465	1.36	512	1.66
6000	337	0.93	387	1.17	433	1.43	478	1.72	521	2.04
7000	370	1.34	415	1.60	456	1.88	497	2.20	535	2.54
8000	408	1.88	446	2.17	484	2.49	520	2.80	555	3.15
9000	444	2.56	480	2.86	514	3.21	547	3.58	579	3.96
10000	481	3.40	514	3.76	545	4.11	576	4.47	606	4.83
11000	520	4.38	550	4.74	579	5.12	608	5.54	635	5.97
12000	557	5.55	585	5.96	612	6.37	638	6.78	664	7.19
13000	596	6.90	622	7.32	647	7.76	671	8.22	696	8.69

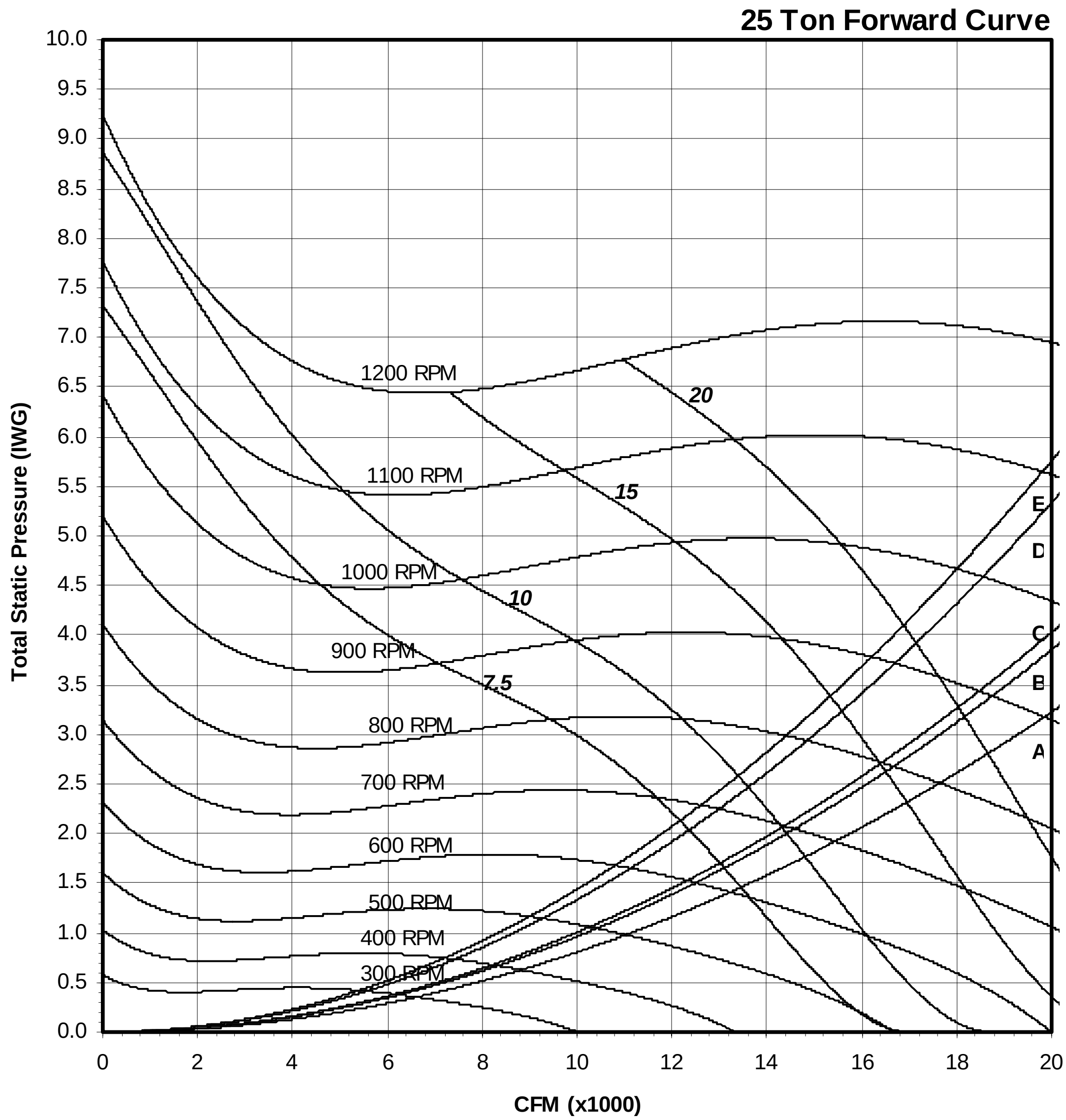
AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	549	1.63	591	1.93	628	2.23	663	2.55	698	2.86
5000	555	1.97	597	2.31	634	2.66	670	3.00	705	3.38
6000	562	2.39	602	2.74	638	3.11	674	3.52	709	3.92
7000	573	2.88	610	3.27	645	3.68	679	4.09	713	4.50
8000	591	3.55	624	3.95	657	4.35	689	4.76	720	5.19
9000	611	4.34	642	4.72	673	5.12	703	5.59	732	6.06
10000	634	5.23	663	5.68	692	6.13	719	6.58	747	7.03
11000	662	6.39	689	6.82	715	7.25	741	7.70	766	8.21
12000	690	7.62	714	8.10	739	8.59	763	9.07	787	9.55
13000	720	9.15	743	9.61	766	10.09	789	10.65	811	11.20

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	728	3.19	757	3.53	787	3.87	814	4.21	839	4.55
5000	736	3.75	767	4.13	798	4.50	825	4.88	851	5.28
6000	740	4.32	772	4.73	803	5.14	830	5.58	858	6.03
7000	744	4.92	775	5.37	805	5.84	833	6.31	861	6.78
8000	751	5.67	781	6.15	810	6.63	837	7.11	865	7.60
9000	760	6.53	789	7.00	817	7.48	843	8.01	870	8.55
10000	774	7.48	801	8.01	826	8.54	852	9.07	878	9.60
11000	792	8.72	817	9.24	841	9.75	865	10.30	890	10.90
12000	811	10.05	834	10.63	857	11.21	880	11.79	903	12.38
13000	833	11.76	855	12.32	877	12.87	899	13.43	921	13.99

TABLE 23: FAN PERFORMANCE - 25 TON[1 2] (Continued)

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
4000	864	4.90	890	5.26	913	5.64	935	6.01	957	6.39
5000	878	5.69	904	6.10	927	6.51	950	6.92	973	7.33
6000	885	6.47	911	6.91	935	7.36	959	7.82	983	8.29
7000	889	7.25	914	7.74	939	8.24	964	8.75	988	9.25
8000	892	8.13	918	8.66	942	9.18	967	9.71	992	10.26
9000	897	9.09	921	9.63	946	10.18	970	10.78	995	11.37
10000	903	10.15	927	10.76	951	11.36	975	11.97	999	12.57
11000	913	11.50	936	12.10	959	12.70	983	13.30	1005	13.90
12000	926	12.96	948	13.54	970	14.12	992	14.70	1013	15.33
13000	942	14.55	963	15.12	984	15.79	1005	16.45	1025	17.11

1. Fan performance is based on wet evaporator coils, clean 2-inch throwaway filters and system/cabinet effects at standard air density and 0 degree elevation.
2. Refer to Tables 26, 45, and 54 for component additions and deductions to fan performance tables.
3. BHP does not include drive losses. Multiply BHP by 1.05 for drive losses.



A - Standard Unit
B - Standard Unit + Economizer
C - Standard Unit + Economizer + Low Heat
D - Standard Unit + Economizer + High Heat
E - Standard Unit + Economizer + High Heat + Power Exhaust
Note: Standard Unit includes wet evaporator coil, clean 2 inch throwaway filters, system and cabinet effects at standard air density and 0 degree elevation.

FIGURE 24 : FAN PERFORMANCE - 25 TON

TABLE 24: FAN PERFORMANCE -30 TON [1] [2]

Airflow (CFM)	Available External Static Pressure (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	321	0.9	373	1.1	422	1.5	469	1.8	513	2.1
7000	357	1.3	404	1.6	447	1.9	490	2.2	529	2.6
8000	398	1.8	437	2.1	477	2.5	515	2.9	551	3.3
9000	436	2.5	473	2.8	509	3.2	543	3.6	577	4.0
10000	477	3.2	511	3.7	543	4.1	575	4.5	606	5.0
11000	519	4.2	549	4.7	579	5.1	609	5.6	637	6.1
12000	560	5.4	589	5.9	617	6.4	643	6.9	670	7.4
13000	603	6.8	629	7.3	654	7.8	680	8.4	705	8.9
14000	645	8.4	669	8.9	694	9.5	718	10.0	741	10.7
15000	688	10.2	711	10.8	733	11.5	755.6	12.1	778	12.7

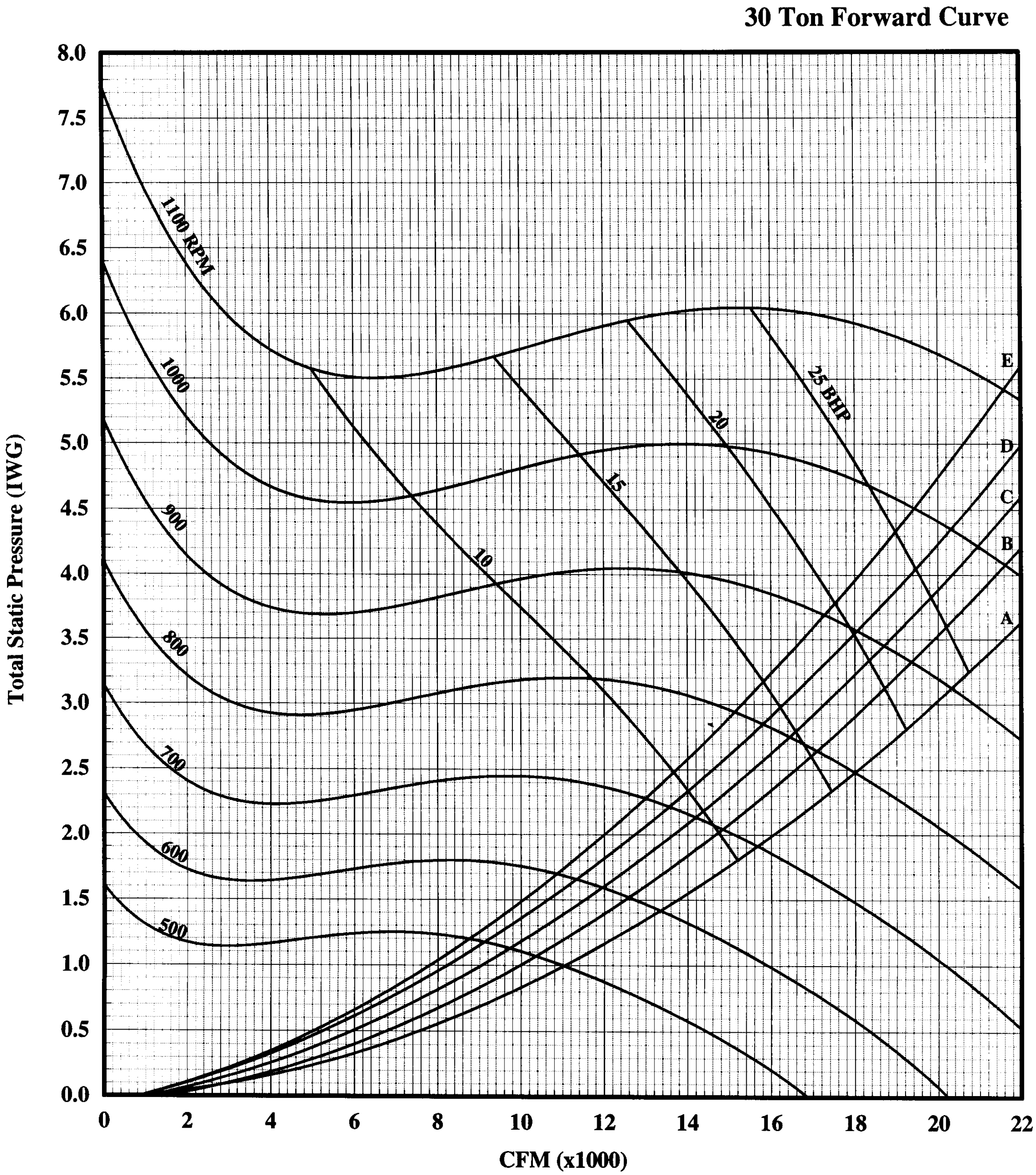
Airflow (CFM)	Available External Static Pressure (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	554	2.4	596	2.8	632	3.2	668	3.5	703	3.9
7000	568	3.0	607	3.4	642	3.8	676	4.2	710	4.6
8000	587	3.7	622	4.1	655	4.5	689	5.0	720	5.4
9000	610	4.5	642	4.9	673	5.4	704	5.9	734	6.4
10000	636	5.5	666	6.0	695	6.5	723	7.0	751	7.5
11000	665	6.6	693	7.1	720	7.6	746	8.2	773	8.8
12000	697	7.9	722	8.5	747	9.1	772	9.6	797	10.2
13000	729	9.5	753	10.0	777	10.7	801	11.3	824	11.9
14000	764	11.3	787	11.9	809	12.6	831	13.2	853	13.8
15000	800	13.3	821	13.9	842	14.6	863	15.2	884	15.9

Airflow (CFM)	Available External Static Pressure (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	734	4.3	765	4.7	796	5.1	824	5.5	850	6.0
7000	741	5.0	772	5.5	803	6.0	830	6.4	858	6.9
8000	750	5.9	781	6.4	810	6.9	837	7.4	865	7.9
9000	763	6.9	792	7.4	820	7.9	847	8.5	873	9.0
10000	779	8.0	807	8.6	833	9.1	859	9.7	885	10.3
11000	799	9.3	824	9.9	849	10.5	874	11.1	899	11.7
12000	821	10.8	845	11.5	869	12.1	893	12.7	916	13.4
13000	847	12.6	869	13.2	892	13.9	914	14.5	936	15.1
14000	874	14.5	896	15.1	917	15.8	938	16.5	959	17.2
15000	904	16.6	924	17.4	944	18.1	964	18.8	984	19.5

TABLE 24: FAN PERFORMANCE -30 TON [1] [2] (Continued)

Airflow (CFM)	Available External Static Pressure (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
6000	877	6.4	904	6.8	928	7.3	951	7.7	975	8.2
7000	885	7.3	911	7.8	935	8.3	959	8.8	984	9.2
8000	892	8.4	917	8.9	942	9.4	966	9.9	991	10.4
9000	900	9.5	925	10.1	949	10.6	974	11.2	998	11.8
10000	910	10.9	934	11.5	958	12.1	982	12.7	1006	13.3
11000	923	12.4	946	13.0	970	13.6	993	14.2	1015	14.8
12000	939	14.0	961	14.6	984	15.3	1006	16.0	1028	16.7
13000	958	15.8	980	16.5	1001	17.2	1022	17.9	1043	18.6
14000	980	17.9	1001	18.7	1021	19.4	1040	20.1	1060	20.8
15000	1004	20.2	1023	21.0	1043	21.8	1062	22.5	1081	23.3

1. Fan performance is based on wet evaporator coils, clean 2-inch throwaway filters and system/cabinet effects at standard air density and 0 degree elevation.
2. Refer to Tables 26, 45, and 54 for component additions and deductions to fan performance tables.
3. BHP does not include drive losses. Multiply BHP by 1.05 to account for drive losses.



A - Standard Unit
B - Standard Unit + Economizer
C - Standard Unit + Economizer + Low Heat
D - Standard Unit + Economizer + High Heat
E - Standard Unit + Economizer + High Heat + Power Exhaust
Note: Standard Unit includes wet evaporator coil, clean 2-inch throwaway filters, system and cabinet effects at standard air density and 0 degree elevation.

FIGURE 25 : FAN PERFORMANCE - 30 TON

TABLE 25: FAN PERFORMANCE - 40 TON[1 2]

Airflow (CFM)	Available External Static Pressure (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	304	1.3	348	1.7	393	2.1	431	2.5	469	2.9
9000	329	1.8	371	2.2	411	2.6	448	3.0	484	3.5
10000	356	2.3	396	2.7	432	3.2	467	3.7	502	4.2
11000	385	2.9	421	3.4	454	3.9	488	4.5	519	5.0
12000	414	3.7	446	4.3	479	4.8	510	5.4	539	5.9
13000	442	4.6	473	5.2	504	5.8	532	6.4	560	7.0
14000	472	5.7	502	6.3	529	6.9	556	7.6	583	8.2
15000	503	6.9	529	7.6	555	8.2	581	8.9	607	9.6
16000	532	8.3	557	9.0	583	9.7	607	10.4	631	11.2
17000	562	9.9	587	10.6	611	11.4	633	12.1	656	12.9
18000	593	11.7	616	12.5	638	13.2	660	14.0	682	14.7

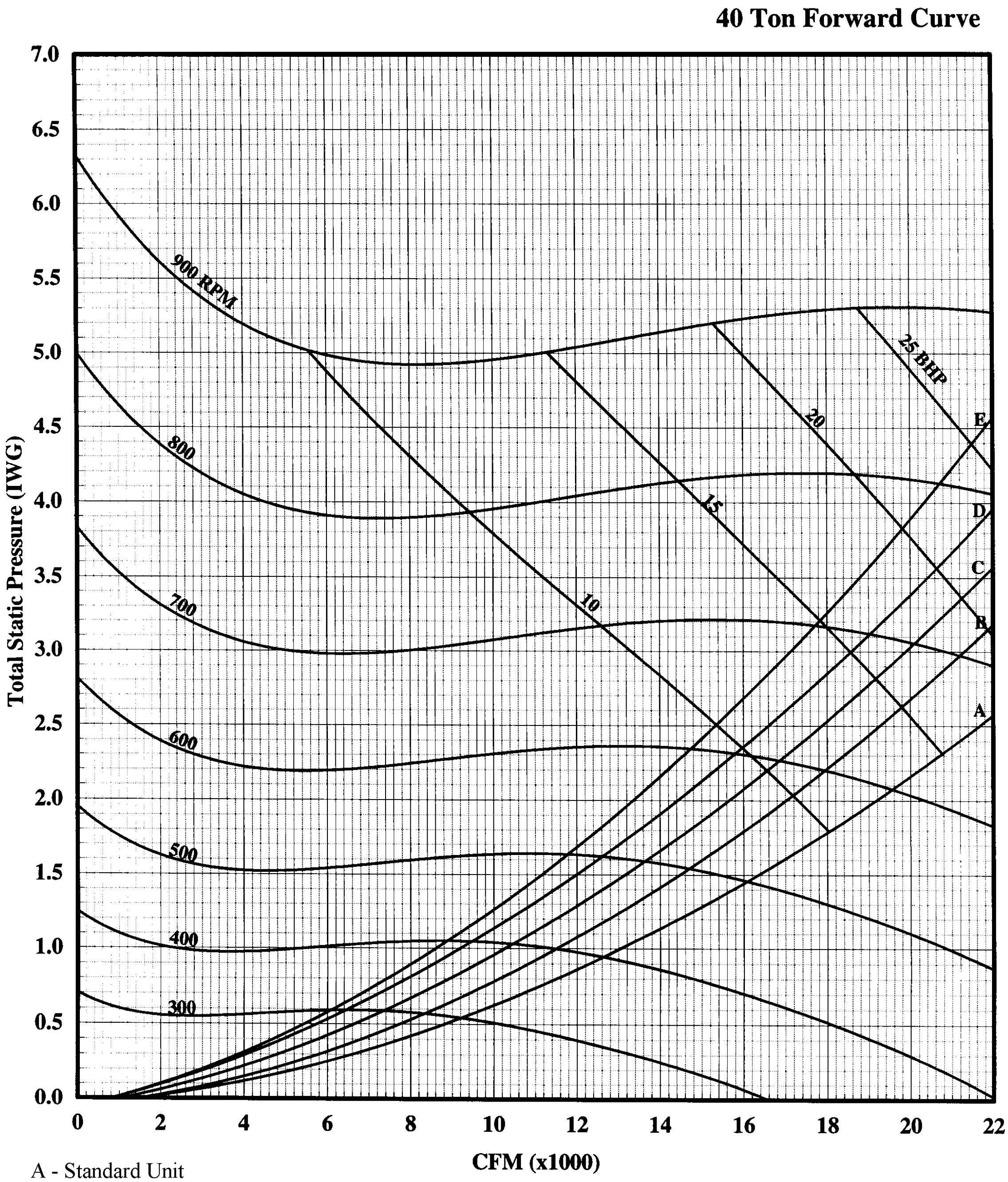
Airflow (CFM)	Available External Static Pressure (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	506	3.3	537	3.8	569	4.2	601	4.7	627	5.2
9000	518	4.0	549	4.4	581	4.9	610	5.5	637	6.0
10000	532	4.7	563	5.2	594	5.8	621	6.3	648	6.8
11000	549	5.5	579	6.1	608	6.7	634	7.2	661	7.8
12000	568	6.5	596	7.1	623	7.7	649	8.3	675	9.0
13000	588	7.6	614	8.2	640	8.9	665	9.5	690	10.2
14000	609	8.9	634	9.5	658	10.2	683	10.9	707	11.6
15000	631	10.3	655	11.0	679	11.7	702	12.5	724	13.2
16000	654	11.9	677	12.6	700	13.4	722	14.1	743	14.9
17000	678	13.6	701	14.4	722	15.2	742	16.0	763	16.8
18000	703	15.6	724	16.4	744	17.2	764	18.1	785	18.9

Airflow (CFM)	Available External Static Pressure (IWG)									
	2.2		2.4		2.6		2.8		3.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	654	5.7	681	6.2	706	6.7	729	7.2	752	7.7
9000	664	6.5	691	7.0	715	7.6	738	8.1	761	8.7
10000	675	7.4	701	8.0	725	8.6	748	9.1	771	9.7
11000	687	8.4	712	9.0	735	9.7	758	10.3	781	10.9
12000	700	9.6	723	10.2	747	10.9	770	11.6	793	12.3
13000	714	10.9	737	11.6	760	12.3	782	13.0	805	13.7
14000	729	12.4	752	13.1	774	13.8	796	14.5	817	15.2
15000	746	13.9	768	14.7	790	15.4	811	16.2	831	17.0
16000	764	15.7	786	16.5	807	17.3	826	18.1	846	18.9
17000	784	17.6	805	18.5	824	19.3	843	20.1	863	21.0
18000	805	19.7	824	20.6	843	21.5	862	22.4	881	23.3

TABLE 25: FAN PERFORMANCE - 40 TON[1] [2] (Continued)

Airflow (CFM)	Available External Static Pressure (IWG)									
	3.2		3.4		3.6		3.8		4.0	
	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]	RPM	BHP[3]
8000	774	8.3	797	8.8	817	9.4	837	9.9	857	10.5
9000	784	9.3	806	9.8	826	10.4	846	11.0	866	11.6
10000	794	10.3	815	11.0	836	11.6	856	12.3	876	12.9
11000	804	11.6	824	12.2	845	12.9	865	13.6	886	14.2
12000	814	12.9	835	13.6	855	14.3	876	15.0	896	15.7
13000	825	14.4	846	15.1	866	15.8	886	16.6	906	17.3
14000	837	16.0	858	16.8	878	17.5	898	18.3	917	19.1
15000	851	17.8	871	18.6	891	19.4	910	20.2	928	21.0
16000	866	19.7	886	20.5	905	21.4	923	22.2	941	23.1
17000	882	21.9	901	22.7	919	23.6	937	24.5	-	-
18000	900	24.2	-	-	-	-	-	-	-	-

1. Fan performance is based on wet evaporator coils, clean 2-inch throwaway filters and system/cabinet effects at standard air density and 0 degree elevation.
2. Refer to Tables 26, 46 and 55 for component additions and deductions to fan performance tables.
3. BHP does not include drive losses. Multiply BHP by 1.05 to account for drive losses.



A - Standard Unit
B - Standard Unit + Economizer
C - Standard Unit + Economizer + Low Heat
D - Standard Unit + Economizer + High Heat
E - Standard Unit + Economizer + High Heat + Power Exhaust
Note: Standard Unit includes wet evaporator coil, clean 2-inch throwaway filters, system and cabinet effects at standard air density and 0 degree elevation.

FIGURE 26 : FAN PERFORMANCE - 40 TON

TABLE 26: COMPONENT STATIC RESISTANCE[1 2]

COMPONENT COIL LOSSES	CFM						
	6,000	8,000	10,000	12,000	14,000	16,000	18,000
Std. 25 Ton, Dry	-0.06	-0.08	-0.10	-0.13	-	-	-
Std. 25 Ton, Wet	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Std. 30 Ton, Dry	-0.045	-0.075	-0.112	-0.157	-0.207	-0.264	-0.326
Std. 30 Ton, Wet	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Hi Cap 30 Ton, Dry	-0.019	-0.035	-0.052	-0.073	-0.098	-0.124	-0.155
Hi Cap 30 Ton, Wet	0.042	0.069	0.103	0.142	0.186	0.236	0.290
Std. 40 Ton, Dry	-0.030	-0.051	-0.076	-0.106	-0.140	-0.177	-0.219
Std. 40 Ton, Wet	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Hi Cap 40 Ton, Dry	-0.020	-0.033	-0.050	-0.069	-0.092	-0.116	-0.144
Hi Cap 40 Ton, Wet	0.023	0.038	0.057	0.079	0.105	0.133	0.164
Filter Losses							
2” TA or HI Eff.	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Rigid 6”, 65%	0.048	0.080	0.119	0.165	0.217	0.274	0.338
Rigid 6”, 95%	0.189	0.308	0.448	0.609	0.790	0.988	1.205
IGV Losses							
30 Ton	0.048	0.085	0.132	0.190	0.259	0.338	0.428
40 Ton	0.027	0.049	0.076	0.110	0.149	0.195	0.246
Gas Heat							
233 MBH Heat	0.106	0.141	0.177	0.212	0.247	0.283	0.318
466 MBH Heat	0.212	0.283	0.353	0.424	0.495	0.566	0.636
699 MBH Heat	0.318	0.423	0.531	0.636	0.741	0.849	0.954
Electric Heat	0.050	0.100	0.150	0.310	0.430	0.530	0.680
Economizer*	0.063	0.104	0.153	0.210	0.276	0.349	0.429
Power Exhaust*	0.046	0.081	0.127	0.182	0.248	0.324	0.410

1. Baseline losses based on system/cabinet effects, wet standard coil and 2-inch throwaway filters at 70°F, 0 degree elevation with standard air.
2. See Tables 45, 46, 54, and 55 for steam and hot water coil static resistance.

TABLE 27: SUPPLY FAN MOTOR AND DRIVE DATA

Model	Blower RPM Range	Motor				Motor Pulley		Blower Pulley		Belts	
		HP	Frame Size	Motor Efficiency (Std. Motor)	Motor Efficiency (Ultra Hi Eff Opt)	Pitch Dia (Inches)	Bore (Inches)	Pitch Dia (Inches)	Bore (Inches)	Designation	Qty
25 Ton	568	7.5	215T	88.5	91.7	5.3	1-3/8	15.7	2-3/16	BX63	2
	705	10	215T	89.5	91	6.5	1-3/8	15.7	2-3/16	BX63	2
	795	15	254T	91	91.7	7.7	1-5/8	15.7	2-3/16	BX63	2
	909	20	256T	91	93	8.3	1-5/8	15.7	2-3/16	BX63	2
30 Ton	758	10	215T	89.5	91	5.5	1/3/08	12.7	2/3/16	BX58	2
	868	15	254T	91	91.7	6.3	1/5/08	12.7	2/3/16	BX58	2
	966	20	256T	91	93	6.9	1/5/08	12.5	2/3/16	5VX580	2
	“1,050”	25	284T	91.7	93.6	7.5	1/7/08	12.5	2/3/16	5VX580	2
40 Ton	667	10	215T	89.5	91	5.3	1/3/08	13.9	2/7/16	BX68	2
	760	15	254T	91	91.7	6.1	1/5/08	13.9	2/7/16	BX68	2
	830	20	256T	91	93	6.5	1/5/08	13.7	2/7/16	5VX710	2
	881	25	284T	91.7	93.6	6.9	1/7/08	13.7	2/7/16	5VX710	2

TABLE 28: EXHAUST FAN DRIVE DATA

Model	Blower RPM Range	Motor				Motor Pulley		Blower Pulley		Belts	
		Hp	Frame Size	Motor Eff (Std. Motor)	Motor Eff (Hi Eff opt)	Pitch Dia (Inches)	Bore (Inches)	Pitch Dia (Inches)	Bore (Inches)	Designation	Qty
25 Ton	732	5	213T	87.5	89.5	4.9	1-3/8	11.3	2-3/16	BX63	2
	827	7.5	215T	88.5	91.7	5.5	1-3/8	11.3	2-3/16	BX63	2
	955	10	215T	89.5	91	6.3	1-5/8	11.3	2-3/16	BX63	2
30 Ton	852	7.5	213T	84	86.5	5.5	1-3/8	11.3	1-11/16	B65	2
	976	10	215T	86.5	89.5	6.3	1-3/8	11.3	1-11/16	B65	2
	1069	15	254T	85.7	89.5	6.9	1-3/8	11.3	1-11/16	B65	2
40 Ton	852	7.5	184T	84	86.5	5.5	1-3/8	11.3	1-11/16	B65	2
	976	10	215T	86.5	89.5	6.3	1-3/8	11.3	1-11/16	B65	2
	1069	15	254T	85.7	89.5	6.5	1-3/8	11.3	1-11/16	B65	2

TABLE 29: POWER EXHAUST - ONE FORWARD CURVED FAN 25 TON[1]

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]
2000	---	---	---	---	524	0.32	609	0.42	685	0.54
3000	---	---	450	0.41	531	0.51	605	0.64	672	0.77
4000	442	0.63	496	0.74	562	0.87	626	1.00	687	1.16
5000	524	1.15	566	1.29	609	1.43	663	1.58	717	1.74
6000	612	1.84	646	2.08	679	2.25	717	2.43	762	2.60
7000	703	2.86	731	3.16	759	3.37	787	3.57	820	3.78
8000	791	3.63	821	4.09	844	4.54	868	4.99	892	5.23
9000	877	5.53	911	5.88	932	6.22	953	6.57	974	6.92
10000	967	8.02	1004	8.34	1022	8.66	1041	8.98	1059	9.30

AIRFLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE (IWG)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]	RPM	BHP[2]
2000	754	0.66	819	0.78	878	0.90	933	1.03	986	1.16
3000	736	0.92	797	1.08	854	1.24	909	1.41	961	1.58
4000	743	1.32	799	1.47	850	1.66	900	1.84	948	2.04
5000	768	1.90	818	2.08	865	2.28	911	2.48	955	2.68
6000	806	2.78	850	2.95	895	3.17	937	3.40	978	3.62
7000	857	3.98	895	4.19	933	4.39	972	4.60	1010	4.80
8000	921	5.47	953	5.71	985	5.95	1018	6.19	1052	6.43
9000	995	7.27	1020	7.59	1048	7.86	1075	8.13	1103	8.39
10000	1077	9.62	1096	9.94	-	-	-	-	-	-

1. Fan performance is based on system/cabinet effects and backdraft damper effects at standard air density and 0° elevation.
2. BHP does not include drive losses. Multiply BHP by 1.05 to account for drive losses.

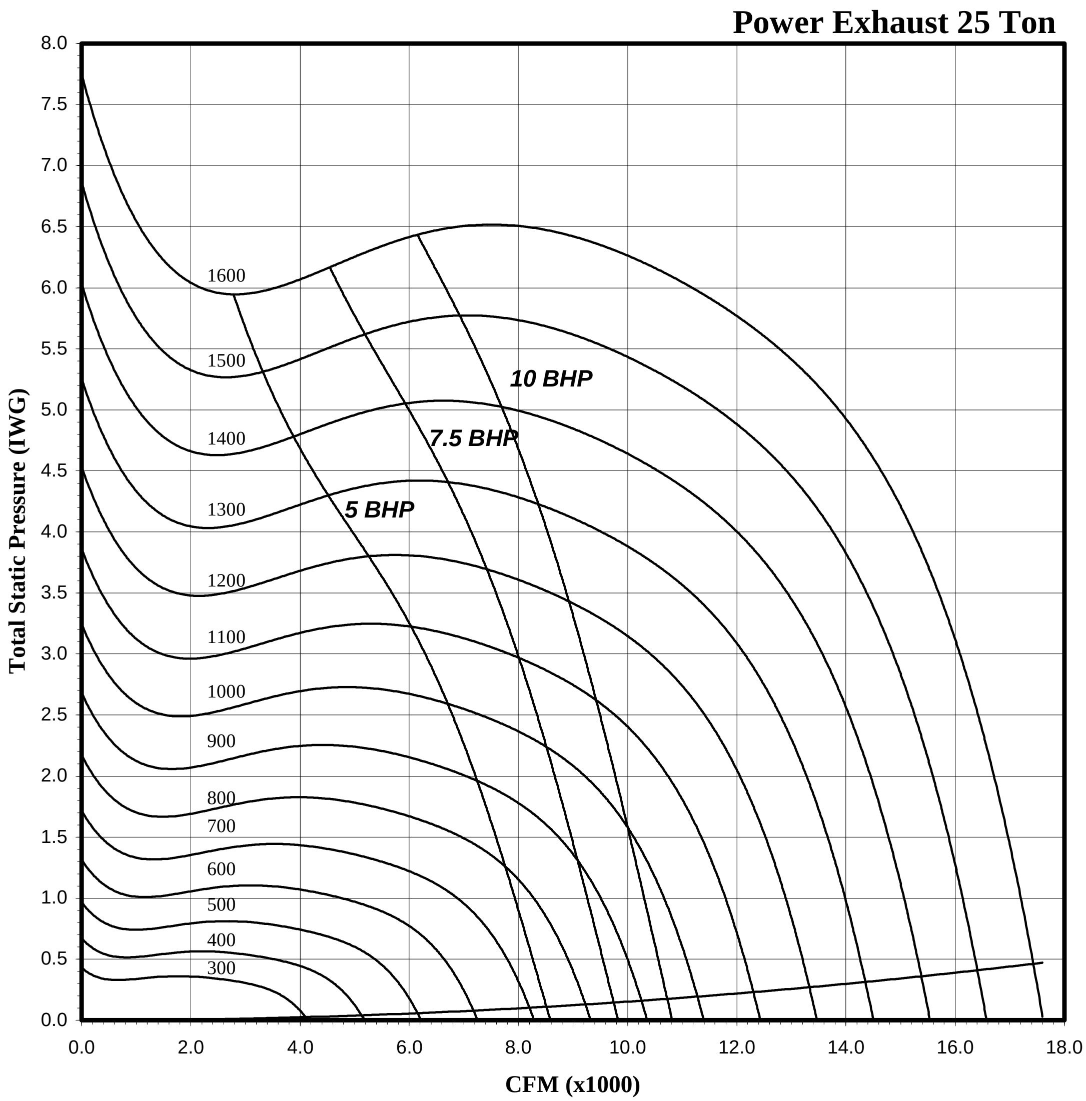


FIGURE 27 : POWER EXHAUST - ONE FORWARD CURVE FAN - 25 TONS

TABLE 30: POWER EXHAUST - TWO FORWARD CURVED FANS - 30 & 40 TON[1]

Airflow CFM	Available External Static Pressure (IWG)									
	0.2		0.4		.06		0.8		1.0	
	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]
4000	363	0.3	468	0.5	560	0.7	641	0.9	716	1.1
5000	402	0.5	494	0.7	576	1.0	652	1.2	722	1.4
6000	445	0.8	527	1.0	602	1.3	670	1.6	735	1.9
7000	494	1.2	565	1.5	633	1.7	697	2.0	757	2.4
8000	544	1.7	609	2.0	670	2.3	729	2.6	784	3.0
9000	597	2.3	654	2.7	711	3.0	765	3.3	817	3.7
10000	651	3.1	703	3.5	754	3.8	805	4.2	853	4.6
11000	705	4.1	753	4.5	801	4.9	847	5.3	893	5.7
12000	761	5.2	805	5.6	849	6.0	893	6.5	934	6.9
13000	817	6.6	858	7.0	899	7.4	939	7.9	979	8.4
14000	874	8.1	912	8.6	950	9.1	988	9.5	1025	10.0
15000	932	9.9	967	10.4	1002	11.0	1037	11.5	1072	12.0
16000	989	12.0	1022	12.6	1055	13.1	1088	13.6		

Airflow CFM	Available External Static Pressure (IWG)									
	1.2		1.4		1.6		1.8		2	
	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]	RPM	BHP[2 3]
4000	783	1.4	844	1.6	903	1.8	956	2.1	1008	2.3
5000	788	1.7	848	2.0	906	2.3	959	2.5	1011	2.8
6000	798	2.1	855	2.5	911	2.8	963	3.1	1014	3.4
7000	814	2.7	869	3.0	922	3.3	972	3.7	1021	4.0
8000	837	3.3	889	3.7	938	4.0	987	4.4	1033	4.8
9000	866	4.1	915	4.5	961	4.9	1007	5.3	1050	5.7
10000	900	5.0	945	5.4	989	5.9	1032	6.3	1073	6.8
11000	936	6.1	979	6.6	1020	7.0	1061	7.5	1101	7.9
12000	976	7.4	1016	7.9	1055	8.3	1094	8.8	1131	9.3
13000	1018	8.9	1055	9.4	1093	9.9	1129	10.4	1165	11.0
14000	1061	10.6	1098	11.1	1133	11.7	1167	12.3	1202	12.8
15000	1107	12.6	1141	13.1	1175	13.7	1208	14.2	1240	14.8

1. Fan performance is based on system/cabinet effects and backdraft damper effects at standard air density and 0° elevation.
2. BHP includes the sum of both exhaust fan blowers.
3. BHP does not include drive losses. Multiply BHP by 1.05 to account for drive losses.

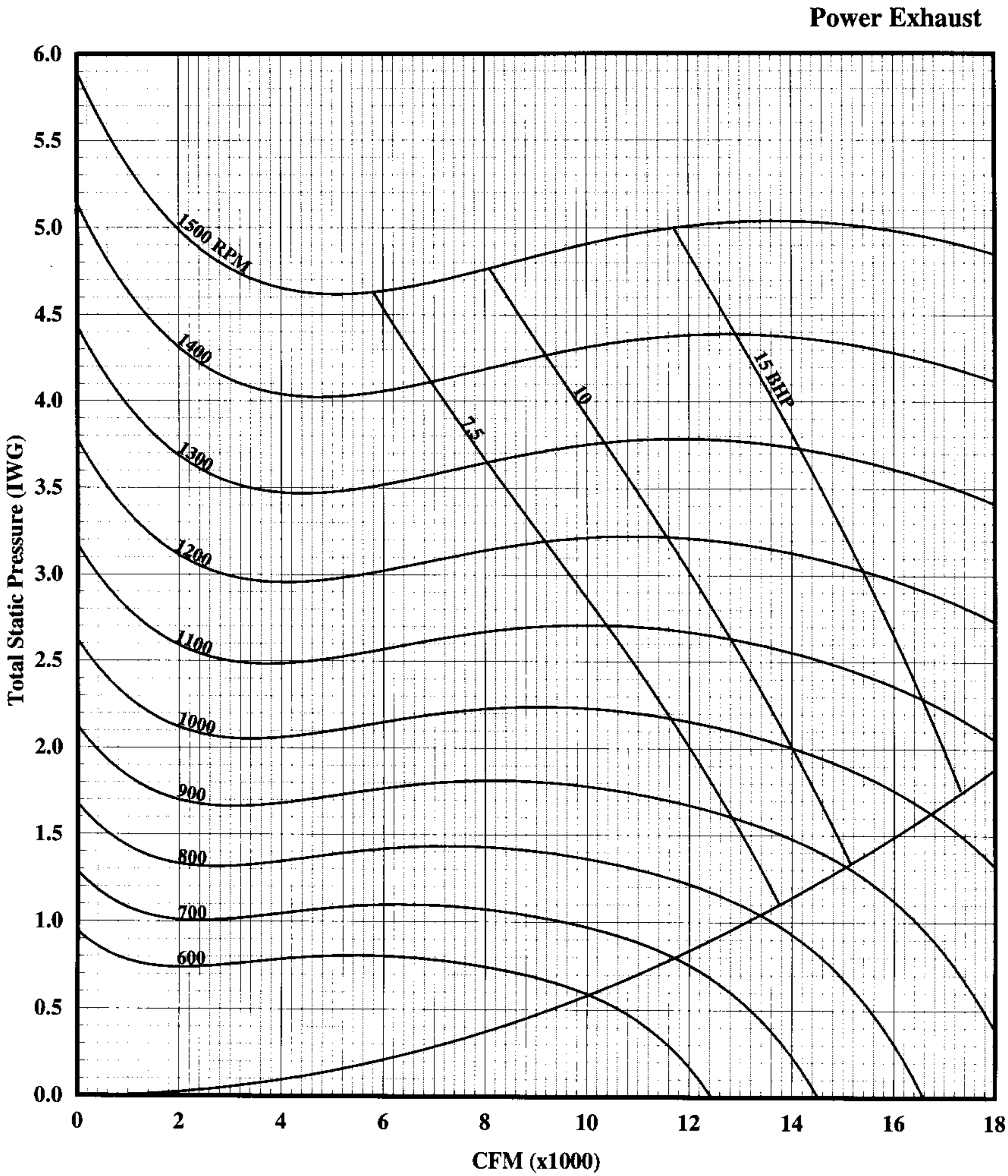


FIGURE 28 : POWER EXHAUST - TWO FORWARD CURVED FANS - 30 & 40 TONS

START-UP

COMPRESSOR ROTATION

COMPRESSOR ROTATION

Check for proper compressor rotation (See page 84 for symptoms of reverse compressor operations). Millennium units are properly phased at the factory. If the blower, condenser fan, or compressor, rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the incoming line connection phasing to obtain proper rotation.

⚠ CAUTION

SCROLL COMPRESSORS REQUIRE PROPER ROTATION TO OPERATE CORRECTLY. UNITS ARE PROPERLY PHASED AT THE FACTORY. DO NOT CHANGE THE INTERNAL WIRING TO MAKE THE BLOWER, CONDENSER FANS OR COMPRESSOR ROTATE CORRECTLY.

SUPPLY AIR FAN INSTRUCTIONS

CHECK BLOWER BEARING SET SCREWS

- The bearing set screws on the supply air blower are properly torqued before shipment. However, in transit they may loosen. Prior to start up they should be rechecked. The set screws are 3/8" and the torque range is 200 - 215 in.-lbs.

NOTE: If a unit is equipped with exhaust fans, those bearing set screws should also be rechecked. The set screws are 1/4 inch and the torque range is 70 - 87 in.-lbs.

CHECKING SUPPLY AIR CFM

The RPM of the supply air blower will depend on the required CFM, the static pressure resistances of the unit components (Tables 26, 45, 46, 54, and 55) and the static pressure resistances of both the supply and the return air duct systems. With this information, the RPM for the supply air blower can be determined from the blower performance data in Tables 23, 24, 25, 25, and 26. See Table 27 for pulley and drive information for the fixed pitch pulleys supplied on the unit.

The supply air CFM must be within the limitations shown in Table 2.

NOTE: If unit is equipped with power exhaust fans or return air fan see Tables 27, 30, and 28 for fan performance and for pulley and drive information see Table 28.

FAN ROTATION

Check for proper supply air blower rotation. If fans are rotating backwards the line voltage to unit point of power connection is misphased (see Compressor Rotation above.)

NOTE: If unit is equipped with power exhaust fans or return air fan also check them for proper rotation.

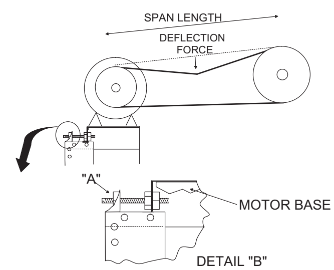
BELT TENSION

The tension on the belt should be adjusted as shown in Figure 29 and Table 31.

NOTE: If unit is equipped with power exhaust fans or return air fan check belt tension and adjust as necessary.

CAUTION

PROCEDURE FOR ADJUSTING BELT TENSION
1. Loosen four bolts holding motor base to channels
2. Adjust belt by turning nuts "A" (see detail "B").
3. Using a belt tension checker, apply a perpendicular force to one belt at the midpoint of the span as shown. The deflection force should be applied until a specific deflection distance of 1/64" per inch of span length is obtained.
4. To determine the deflection distance from normal position, use a straight edge from sheave to sheave as a reference line. Use the recommended deflection force per Belt Adjustment Table.



Tension new belts at the maximum deflection force recommended. Check the belt tension at least two times during the first 24 hrs. of operation. Any re-tensioning should fall between the min. and max. deflection force values.

5. After adjusting, retighten bolts holding motor base to channel.

FIGURE 29 : BELT TENSION ADJUSTMENT

AIR BALANCE

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

CHECKING AIR QUANTITY

NOTE: On VAV units, be certain all IGVs are full open, exhaust dampers are closed and individual space damper boxes are full open as applicable.

1. Remove the dot plugs from the two 5/16 inch holes in the blower motor and the filter access doors.
2. Insert at least 8 inch of 1/4 inch metal tubing into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.

TABLE 31: BELT ADJUSTMENT

FAN MOTOR HORSE POWER	5	7.5	10	15	20	25
30 TON FORWARD CURVED SUPPLY FAN	SIZE: 22 X 20					
Belt Deflection Force (lbs) new belts	-	-	10.5	12.6	15.2	22.1
Belt Deflection Force (lbs) old belts	-	-	7.1	8.5	10.2	14.8
40 TON FORWARD CURVED SUPPLY FAN	SIZE: 25 X 20					
Belt Deflection Force (lbs) new belts	-	-	10.5	12.6	15.2	15.2
Belt Deflection Force (lbs) old belts	-	-	7.1	8.5	10.2	10.2
30 & 40 TON POWER EXHAUST FAN	SIZE: (2) 15 X 15					
Belt Deflection Force (lbs) new belts	-	7.9	9.4	9.4	-	-
Belt Deflection Force (lbs) old belts	-	5.3	6.3	6.3	-	-
25 TON FORWARD CURVE SUPPLY FAN	SIZE: 22 X 20					
New Belt	-	10.5	10.5	12.6	15.2	-
Old Belt	-	7.1	7.1	8.5	10.2	-
25 TON POWER EXHAUST						
New Belt	10.5	10.5	12.6	-	-	-
Old Belt	7.1	7.1	8.5	-	-	-

NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Using an inclined manometer, determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To assure a dry coil, the compressors should be de-activated while the test is being run.
4. Knowing the pressure drop across a dry coil, the actual CFM through the unit with clean 2 inch filters, can be determined from the curve in Figure 59, and 60.

⚠ WARNING

FAILURE TO PROPERLY ADJUST THE TOTAL SYSTEM AIR QUANTITY CAN RESULT IN EXTENSIVE BLOWER DAMAGE.

After readings have been obtained, remove the tubes and reinstall the two 5/16 inch dot plugs.

NOTE: De-energize the compressors before taking any test measurements to assure a dry evaporator coil.

SUPPLY AIR DRIVE ADJUSTMENT

⚠ CAUTION

BEFORE MAKING ANY BLOWER SPEED CHANGES REVIEW THE INSTALLATION FOR ANY INSTALLATION ERRORS, LEAKS OR UNDESIRABLE SYSTEMS EFFECTS THAT CAN RESULT IN LOSS OF AIR FLOW.

EVEN SMALL CHANGES IN BLOWER SPEED CAN RESULT IN SUBSTANTIAL CHANGES IN STATIC PRESSURE AND BHP. BHP OR AMP DRAW OF THE BLOWER MOTOR WILL INCREASE (SEE TABLE 32) BY THE CUBE RATIO OF THE BLOWER SPEED. STATIC PRESSURE WILL INCREASE BY THE SQUARE RATIO OF THE BLOWER SPEED. TABLES 24 AND 25 ARE FOR REFERENCE ONLY. ALL BLOWER SPEED CHANGES MUST BE MADE BY QUALIFIED PERSONNEL WITH STRICT ADHERENCE TO THE FAN LAWS.

At unit start-up the measured CFM based on Figures 59 and 60 may be higher or lower than the specified CFM. To achieve the specified CFM, the speed of the drive may have to be decreased or increased by changing the pitch diameter (PD) of the motor sheave as outlined below:

- (Specified CFM/Measured CFM) X PD of standard sheave = PD of new sheave.

Use the following tables and the PD calculated per the above equation to select a new motor sheave.

EXAMPLE

- A 30 ton unit was selected to deliver 12,000 CFM with a 20 HP motor and a 966 RPM drive, but the unit is only delivering 11,000 CFM per Table X!
- Use the equation to determine the required PD for the new motor sheave (12,000 CFM/11,000 CFM X 6.9” = 7.53 inch).
- Use the 30 ton table (WHAT TABLE) To select a Browning 2B5V74 which will increase the speed of the unit’s drive and its supply air CFM 108.7%.
- New drive speed = 1.087 X 966 = 1,050 RPM
- New supply air = 1.087 X 11,000 = 11,957 CFM
- Re-use the existing belts and blower sheave.

.

TABLE 32: BLOWER SPEED RATE OF CHANGE

Change in RPM	Change in		
	CFM	TSP	BHP and Motor AMPS
.90	.90	.81	.73
.93	.93	.86	.79
.95	.95	.90	.86
.98	.98	.95	.93
1.00	1.00	1.00	1.00
1.03	1.03	1.05	1.08
1.05	1.05	1.10	1.16
1.08	1.08	1.16	1.24
1.10	1.10	1.21	1.33
1.13	1.13	1.27	1.42
1.15	1.15	1.32	1.52
1.18	1.18	1.38	1.62
1.20	1.20	1.44	1.73

New motor BHP = (speed increase) 3 X estimated motor BHP to original start-up with 11,000 CFM and 966 RPM = $(1.087)^3$ X 13.5BHP = 1.284 X 13.5 BHP = 17.3 BHP New motor amps = $(\text{speed increase})^3$ X measured motor amps at original start-up with 11,000 CFM and 966 RPM.

SYSTEM SETPOINTS

The following setpoints must be field adjusted prior to starting the unit (Refer to Table 33).

CONSTANT VOLUME UNITS (CV)

T7300 THERMOSTAT: cooling/heating setpoints and time schedule.

OPTIONAL ECONOMIZER: economizer setpoint and minimum position adjustment. (See page 18 Economizer Set Point Adjustment).

OPTIONAL BUILDING STATIC PRESSURE CONTROL (exhaust static pressure control): building setpoint.

VARIABLE AIR VOLUME (VAV)

W7100 DISCHARGE AIR CONTROLLER: setpoint, reset and control band adjustment.

NOTE: As shipped from the factory the reset adjustment has no effect. This adjustment is applicable ONLY when one of the reset kits is field installed.

DUCT STATIC PRESSURE - INLET GUIDE VANES ONLY: setpoint and minimum output potentiometer.

OPTIONAL ECONOMIZER: Economizer setpoint adjustment and minimum position adjustment (See page 18 Economizer Set Point Adjustment).

OPTIONAL BUILDING STATIC PRESSURE (EXHAUST STATIC PRESSURE CONTROL): building pressure setpoint.

MORNING WARM-UP-VAV UNIT ONLY: morning warm-up setpoint

.

TABLE 33: SUMMARY OF FIELD AND FACTORY SETPOINTS

SETPOINTS	CONTROL	FIELD SETPOINT	FACTORY SETPOINTS	UNIT TYPE
Thermostat Setpoints	Honeywell T7300	Heating Cooling Setpoints Occupied/Unoccupied times	Default Values	CAV
Discharge Air Control Setpoints	Honeywell W7100	Setpoint = 40 - 90°F Reset = 5 - 20°F Control Band = 2 - 16°F	55°F N/A 4°F	VAV
Economizer Setpoints	Honeywell W7210	Enthalpy SP = A,B,C,D Dual Enthalpy SP: Min. Position = 0 to 100%	A D 0%	VAV & CAV
Building Pressure Setpoints	Dwyer 1640-0 Series	Operating setpoint: .01 to .20 iwc null span setting 0.01 to 0.03 iwc	0.1 iwc 0.02 iwc	VAV & CAV
Building Pressure Setpoints non-modulating exhaust	Dwyer 1823-00 series	Operating Setpoint: 0.07 to 0.22 iwc Dead band 0.05 iwc	0.07 iwc	VAV & CAV
Duct Pressure Setpoints	Dwyer 1640-2 Series	Operating Setpoint: 1.0 to 4.0 null span setting 0.03 to 0.12 iwc	1.5 iwc 0.1 iwc	VAV With Inlet Guide Vanes Only
Duct Pressure Setpoints	JCI P352	Setpoint = .5 - 5.0 iwc Min. Output = 0 - 60% Throttling Range = .5 - 5.0 iwc	1.5 iwc 20% 0.5 iwc	VAV with VFD Only
Morning Warm-up Set-point	Honeywell T675	Setpoint = 0 - 100°F differential 3 - 10°F	70°F 10°F	VAV Only

TABLE 34: 25 TON DRIVE ADJUSTMENT

7.5 HP Motor & 568 RPM Drive			10 HP Motor & 705 RPM Drive			15 HP Motor & 795 RPM Drive			20 HP Motor & 909 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _
92	4.9	46	84	5.5	52	83	6.1	58	83	6.9	66
96	5.1	48	87	5.7	54	86	6.3	60	85	7.1	68
100	(Std.) 5.3	50	90	5.9	56	89	6.5	62	88	7.3	70
104	5.5	52	93	6.1	58	91	6.7	64	93	7.7	74
108	5.7	54	97	6.3	60	94	6.9	66	100	(Std.) 8.3	80
112	5.9	56	100	(Std.) 6.5	62	97	7.1	68	108	8.9	86
116	6.1	58	103	6.7	64	100	(Std.) 7.3	70	113	9.3	90
120	6.3	60	106	6.9	66	106	7.7	74	118	9.7	94
124	6.5	62	110	7.1	68	114	8.3	80	-	-	-
-	-	-	113	7.3	70	123	8.9	86	-	-	-
-	-	-	119	7.7	74	129	9.3	90	-	-	-
-	-	-	129	8.3	80	-	-	-	-	-	-

TABLE 35: 30 TON DRIVE ADJUSTMENT

10 HP Motor & 758 RPM Drive			15 HP Motor & 868 RPM Drive			20 HP Motor & 966 RPM Drive			"25 HP Motor & 1,050 RPM Drive"		
%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _
89.1	4.9	46	81.0	5.1	48	82.6	5.7	56	81.3	6.1	60
92.7	5.1	48	84.1	5.3	50	85.5	5.9	58	84.0	6.3	62
96.4	5.3	50	87.3	5.5	52	88.4	6.1	60	86.7	6.5	64
100.0	(std.) 5.5	52	90.5	5.7	54	91.3	6.3	62	89.3	6.7	66
103.6	5.7	54	93.7	5.9	56	94.2	6.5	64	92.0	6.9	68
107.3	5.9	56	96.8	6.1	58	97.1	6.7	66	94.7	7.1	70
110.9	6.1	58	100.0	(std.) 6.3	60	100.0	(std.) 6.9	68	100.0	(std.) 7.5	74
114.5	6.3	60	103.2	6.5	62	102.9	7.1	70	108.0	8.1	80
118.2	6.5	62	106.4	6.7	64	108.7	7.5	74	116.0	8.7	86
-	-	-	109.5	6.9	66	117.4	8.1	80	-	-	-
-	-	-	112.7	7.1	68	-	-	-	-	-	-
-	-	-	115.9	7.3	70	-	-	-	-	-	-

TABLE 36: 40 TON DRIVE ADJUSTMENT

10 HP Motor & 667 RPM Drive			15 HP Motor & 768 RPM Drive			20 HP Motor & 830 RPM Drive			25 HP Motor & 881 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2B5V_ _	% RPM & CFM	Req'd PD)	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _	%RPM & CFM	Req'd PD	Browning 2B5V_ _
92.5	4.9	46	80.3	4.9	46	81.5	5.3	52	82.6	5.7	56
96.2	5.1	48	83.6	5.1	48	84.6	5.5	54	85.5	5.9	58
100.0	(std.) 5.3	50	86.9	5.3	50	87.7	5.7	56	88.4	6.1	60
103.8	5.5	52	90.2	5.5	52	90.8	5.9	58	91.3	6.3	62
107.5	5.7	54	93.4	5.7	54	93.8	6.1	60	94.2	6.5	64
111.3	5.9	56	96.7	5.9	56	96.9	6.3	62	97.1	6.7	66
115.1	6.1	58	100.0	(std.) 6.1	58	100.0	(std.) 6.5	64	100.0	(std.) 6.9	68
118.9	6.3	60	103.3	6.3	60	103.1	6.7	66	102.9	7.1	70
-	-	-	106.6	6.5	62	106.2	6.9	68	108.7	7.5	74
-	-	-	109.8	6.7	64	109.2	7.1	70	117.4	8.1	80
-	-	-	113.1	6.9	66	115.4	7.5	74	-	-	-
-	-	-	116.4	7.1	68	-	-	-	-	-	-

TABLE 37: DRIVE ADJUSTMENT FOR POWER EXHAUST - 25 TON

5 HP Motor & 732 RPM Drive			7.5 HP Motor & 827 RPM Drive			10 HP Motor & 955 RPM Drive		
%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _	%RPM & CFM	Req'd PD	Browning 2b5v_ _
100	4.9	46	92	5.1	48	93	5.9	56
104	5.1	48	96	5.3	50	97	6.1	58
109	5.3	50	100	5.5	52	100	6.3	60
113	5.5	52	104	5.7	54	103	6.5	62
117	5.7	54	108	5.9	56	107	6.7	64
122	5.9	56	112	6.1	58	110	6.9	66

TABLE 38: DRIVE ADJUSTMENT FOR POWER EXHAUST - 30 & 40 TON

7.5 HP Motor & 852 RPM Drive			10 HP Motor & 976 RPM Drive			15 HP Motor & 1069 RPM Drive		
% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _	% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _	% RPM & CFM	REQ'D PD (in)	Browning 2B5V_ _
96.4	5.3	52	93.7	5.9	58	94.2	6.5	64
100.0	(Std.) 5.5	54	96.8	6.1	60	97.1	6.7	66
103.6	5.7	56	100.0	(Std.) 6.3	62	100.0	(Std.) 6.9	68
107.3	5.9	58	103.2	6.5	64	102.9	7.1	70
110.9	6.1	60	106.3	6.7	66	108.7	7.5	74
114.5	6.3	62	109.5	6.9	68	117.4	8.1	80

GAS FURNACE OPERATING INSTRUCTIONS

CAUTION

EACH FURNACE MODULE IS EQUIPPED WITH AN AUTOMATIC RE-IGNITION SYSTEM. DO NOT ATTEMPT TO MANUALLY LIGHT THE BURNERS.

TO LIGHT THE MAIN BURNERS

1. Turn off electric power to unit.
2. Turn space temperature sensor to lowest setting.
3. Turn gas valve knobs to on position (Refer to Figure 30).
4. Turn on electric power to unit.
5. On Constant Volume units, set space setpoint to warmer or cooler as desired. (If sensor set point temperature is above room temperature, the main burners will ignite). If a second stage of heat is called for, the main burners for second stage heat will ignite for the second stage heat. For VAV units set morning warm-up thermostat far above the return air temperature and cycle the time clock OFF, then ON.

TO SHUT DOWN

1. Turn off electric power to unit.
2. Depress knob of gas valve while turning to off position. (Refer to Figure 30).

POST-START CHECKLIST (GAS)

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.
2. Check for correct manifold gas pressures. See Checking Gas Input.
3. Check the supply gas pressure. It must be within the limits shown on rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 13 inches, nor the operating pressure drop below 6 inches. If gas pressure is outside these limits, contact the local gas utility for corrective action.

MANIFOLD GAS PRESSURE ADJUSTMENT

Small adjustments to the gas flow may be made by turning the pressure regulator adjusting screw on the automatic gas valve. Refer to Figure 30.

Adjust as follows:

1. Remove the cap on the regulator. It's located next to the push-on electrical terminals.
2. To decrease the gas pressure, turn the adjusting screw counterclockwise.
3. To increase the gas pressure, turn the adjusting screw clockwise.

NOTE: The correct manifold pressure for each furnace module is 3.50 IWG 0.3.

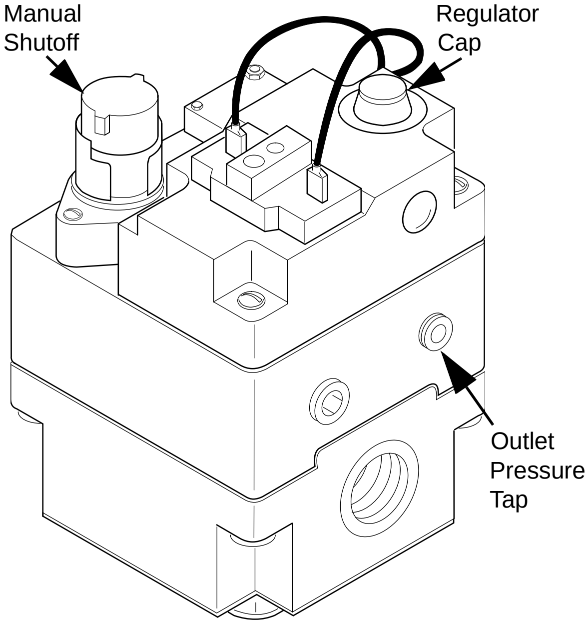


FIGURE 30 : TYPICAL GAS VALVE

BURNER INSTRUCTIONS

To check or change burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL POWER TO THE UNIT.

1. Remove the screws holding either end of the manifold to the burner supports.
2. Open the union fitting in the gas supply line just upstream of the unit gas valves and downstream from the main manual shut-off valve.
3. Disconnect wiring to the gas valves and spark ignitors. Remove the manifold-burner gas valve assemblies by pulling back.
4. Remove the heat shield on top of the manifold support.

Burners are now accessible for service.

Reverse the above procedure to replace the assemblies. Make sure that burners are level and seat at the rear of the gas orifice.

ADJUSTMENT OF TEMPERATURE RISE

The temperature rise (or temperature difference between the return air and the heated air from the furnace) must lie within the range shown on the CGA/ETL rating plate and the data in Table 3.

After the temperature rise has been determined, the CFM can be calculated as follows:

$$FM = \frac{Btuh \times 0.8}{1.08 \times F\ Degrees\ Temp\ Rise}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about six feet from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise. Refer to Table 27 for supply air blower motor and drive data. Minimum allowable CFM is 6,000 CFM. Limit will open below this rating.

CHECKING GAS INPUT

NATURAL GAS

1. Turn off all other gas appliances connected to the gas meter.
2. With the furnace turned on, measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter usually has a 1/2 or a 1 cubic foot test dial.
3. Using the number of seconds for each revolution and the size of the test dial increment, find the cubic feet of gas consumed per hour from Table 39.

If the actual input is not within 5% of the furnace rating (with allowance being made for the permissible range of the regulator setting), replace the orifice spuds with spuds of the proper size.

NOTE: To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information - it varies widely from city to city).

TABLE 39: GAS RATE - CUBIC FEET PER HOUR

Seconds for One Rev.	Size of Test Dial	
	1/2 cu. Ft.	1 cu. Ft.
2	900	1800
4	450	900
6	300	600
8	225	450
10	180	360

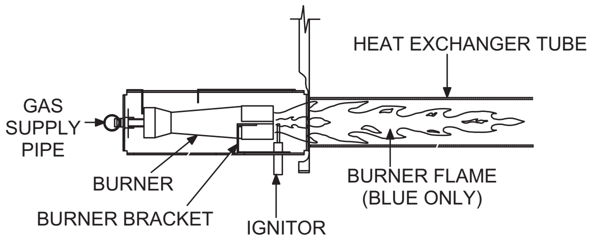


FIGURE 31 : TYPICAL FLAME APPEARANCE

Example: By actual measurement, it takes 7 seconds for the hand on the one cubic foot dial to make a revolution with just a 570,000 Btuh furnace running. Read across to the column in Table 24, headed 1 Cubic Foot where you will determine that 525 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 525 x 1050 (the Btu rating of the gas obtained from the local gas company). The result of 551,000 Btuh is within 5% of the 570,000 Btuh rating of the furnace.

ELECTRIC HEATING

The electric furnace is operational as shipped from the factory and does not receive any field adjustments.

COOLING OPERATING INSTRUCTIONS

COMPRESSOR

Compressors are factory mounted ready for operation (See page 66 Compressor Rotation).

OIL LEVEL - All compressors are factory charged with oil. Each compressor is equipped with an oil level sight glass. Check for proper oil level which is approximately to the center of the sight glass. Recheck oil level at startup.

INTERNAL WIRING

Check all electrical connections in the unit control box; tighten as required.

CONDENSER FANS

Check for proper condenser fan rotation; clockwise facing the air discharge. If condenser fans are rotating backwards, line voltage to unit single point power connection is misphased (See page 66 Compressor Rotation).

SEQUENCE OF OPERATION

CONSTANT VOLUME UNIT

Overview

The main control of the constant volume units is the programmable thermostat. The thermostat provides occupied / unoccupied scheduling, heating / cooling minimum stage ON / stage OFF times, automatic switching from heating to cooling modes, fan delay on power failure, and an economizer enable contact that disables the economizer in the unoccupied modes. Additionally, the thermostat is designed to ramp the space temperature from the unoccupied setpoints to the occupied setpoints. The thermostat determines when to start this morning warm-up / cool-down based upon the deviation from the occupied setpoints and the rate of temperature change.

To follow the sequence of operation, the thermostat cannot determine if an output function is available. For example, if the belt on the supply fan were to break, the thermostat will still call for the fan to operate and if space conditions require, heating or cooling calls will also be made. Separate relay logic is used to prevent undesired operation of heating and cooling stages. Our logic is designed such that airflow must be proven before any heating or cooling stage can operate and mechanical cooling is locked out below 40°F for all units without head pressure control. The thermostat provides contact closures to control the isolation relays for supply fan, each cooling stage, each heating stage, and the economizer availability. The thermostat is responsible for determining when calls for cooling and heating are given, while the isolation relays are responsible for executing these calls and protecting the unit through appropriate safety devices. The thermostat controls the supply fan and cooling stages by closing a relay contact between terminals RC and:

G - Supply Fan

Y1-1st Stage Cooling
Y2-2nd Stage Cooling
Y3-3rd Stage Cooling
Y4-4th Stage Cooling

Heating stages are controlled by a contact closure between terminals RH and:

W1-1st Stage Heating
W2-2nd Stage Heating

The economizer is enabled through the auxiliary economizer relay by contact closure between terminals A2 and A1. (The auxiliary economizer relay is a SPDT relay, so the contact between terminals A2 and A3 is simultaneously broken.)

Thermostat Sequence

The thermostat operates in one of three modes: Occupied, Unoccupied, and Recovery (Warm-up / Cool-down). The programmable thermostat allows two independent occupied / unoccupied schedules for each day of the week. In addition to the programmed schedule, the thermostat keyboard allows a single key press to provide a 3 hour schedule override into the occupied mode or a continuous (until key is pressed again) override into the unoccupied mode.

When unit power interruption occurs, the thermostat provides a fixed one minute delay before the supply fan will engage immediately. A four minute delay before the first heating stage may engage, and a four minute delay before the first cooling stage may engage. The thermostat maintains a minimum two minute run time for each heating stage and a two minute minimum off time between successive heating calls. The thermostat similarly maintains a four minute run time for each cooling stage and a minimum four minute off time between successive cooling calls. The thermostat will not simultaneously call for both cooling and heating stages.

The supply fan operates continuously in the OCCUPIED and RECOVERY modes. An auxiliary economizer contact closes to enable the economizer control (ELM) when the supply fan is engaged during the occupied mode. The thermostat cycles cooling / heating to maintain the space temperature to the occupied setpoints.

In the UNOCCUPIED MODE, the supply fan operates only with cooling / heating calls. The auxiliary economizer contact is always open and the economizer is disabled during the unoccupied mode except when free cooling may be used to condition the space. Cooling / heating stages are cycled to maintain the space temperature to the unoccupied setpoints.

The RECOVERY MODE is a special unoccupied mode which allows transition to occupied mode. The supply fan operates continuously and the economizer remains disabled. Instead of maintaining the unoccupied setpoints, the thermostat ramps the space temperature toward the occupied setpoints. Cooling stages (Cool-down) or heating stages (Warm-up) are cycled to slowly ramp the space temperature to the occupied setpoints. The thermostat uses a built in algorithm to determine the appropriate time to start space recovery based upon the deviation from the occupied setpoints and the rate of temperature change.

Unit Controls Sequence

The thermostat gives a call for heating or cooling, and this is acted upon by unit controls according to the sequence outlined below. Abbreviations for various components correspond to the labels on the wiring diagram.

1. On a call for the supply fan, terminal G powers the coil of MR (Supply Fan Motor Relay). When the MR-1 contacts close, the optional power exhaust system is activated, power is applied to the airflow proving switch (APS), and power is applied to the overload relay connected to starter 5M (Supply Fan Motor Starter). If the overload relay has not tripped, starter 5M closes and the supply fan motor is engaged. If the supply fan operates correctly (proper rotation) the pressure difference between the heating section and the supply fan section increases and APS closes to enable heating operation, power the auxiliary economizer relay, and the cooling lockout control.

   For units without optional head pressure control: If the outside air temperature rises above 50°F, cooling lockout switch 1 (CLO1) applies power to the coils of LOR1 and LOR2 (Low Ambient Cooling Lockout Relays) to enable all mechanical cooling stages by closing contacts LOR1-1, LOR1-2, LOR2-1, and LOR2-2. If the outside air temperature falls below 40°F, mechanical cooling stages are locked out.

   For units with head pressure control: Cooling lockout switch 1 (CLO1) applies power to the coil of LOR2 (Low Ambient Cooling Lockout Relay) to enable third and fourth (40 ton only) stage mechanical cooling by closing contacts LOR2-1 and LOR2-2 when the ambient temperature rises above 50°F. If the outside air temperature falls below 40°F, mechanical cooling stages 3 and 4 (40 ton only) are locked out. Cooling lockout switch 2 (CLO2) applies power to the coil of LOR1 to enable first and second stage mechanical cooling by closing contacts LOR1-1 and LOR1-2 when the ambient temperature rises above 10°F. If the outside air temperature falls below 0°F, all mechanical cooling stages are locked out.

   On units with optional heating, relay BR (Supply Fan Override Relay) is wired in parallel with terminal G on TB12, so that any call for heating engages the coil of MR. Operation of heating is still dependent upon the APS closure as described in the preceding paragraph.

2. A call for first stage cooling, Y1 powers the coil of CR1 (first stage cooling relay) signals the optional economizer logic module (ELM) that there is a call for cooling. On units with the optional economizer, ELM is also powered through the economizer auxiliary relay before becoming active. When conditions are suitable for economizer use, ELM powers the coil of staging relays RY1 and RY2 (Cooling Stage Control Relays). These relays shift the staging of mechanical cooling as listed in the table below. A call for second stage cooling powers terminal Y2, third stage powers Y3 and fourth stage powers Y4 of the coil on CR2, CR3, and CR4.

   The controlling RY1/RY2 contact is indicated in parentheses after the controlled device.

   For units without an economizer, the compressor operation corresponds to the Mechanical Cooling Mode listed above and RY1 and RY2 are not installed.

TABLE 40: COOLING STAGE RELAYS

CALL	ECONOMIZER MODE	MECHANICAL COOLING MODE
COOL 1	Economizer (N/A)	Compressor 1 (RY1- 2)
COOL 2	Compressor 1 (RY1-3)	Compressor 2 (RY1- 4)
COOL 3	Compressor 2 (RY2-1)	Compressor 3 (RY2- 2, 30 & 40 ton only)
COOL4	Compressor 3 (RY2-3)	Compressor 4 (RY2-4, 40 ton only)

NOTE: The economizer may function, but all mechanical cooling stages are locked out if LOR1 and LOR2 are de-energized

3. A call for Compressor 1 powers the high pressure safety switch (HP1), the coil of contactor 6M (contactor, condenser fan #1), and the coil of contactor 7M (contactor, condenser fan #2) through condenser fan cycling switch PS5 (PS5 disables condenser fan #2 operation based upon the discharge pressure of Compressor 1). If the system pressures are within HP1 and LP1 (high and low refrigerant pressure) switch settings and the solid state compressor motor protector (Compressor Module No. 1) is not tripped, contactor 1M is engaged to start scroll Compressor 1.
4. A call for Compressor 2 powers contactor 2M (contactor, compressor #2) if HP2, LP2 (high and low refrigerant pressure) and Compressor Module 2 (compressor motor protector) contacts are closed.
5. 30 and 40 ton only: A call for Compressor 3 powers the coils of contactors 8M (contactor, condenser fan #3) and 9M (contactor, condenser fan #4 - 40 ton only). If HP3, LP3 (high and low refrigerant pressure) and Compressor Module 3 contacts are closed, power is applied to the coil of Contactor 3M, which starts compressor 3.
6. 40 Ton Only: A call for Compressor 4 powers the coils of contactor 4M if HP4, LP4 (high and low refrigerant pressure) and Compressor Module 4 contacts are closed.
7. Gas Heat Option, Stage 1: A call for W1 energizes the WR1 coil, closing contact WR2-1, which engages Ignition Control 1 (IC1-terminal TH) and the coil of BR (Supply Fan Override Relay) which closes contacts BR-1 to assure that MR (Supply Fan Motor Relay) is engaged. Once APS (supply air proving switch) closes to acknowledge supply airflow, IC1 is powered. IC1 closes contacts between terminals L1 and IND to engage Draft Motor 1. The W1 call also routes to IC1 terminal PSW through PS1 (draft fan air proving switch) and LS1 (limit switch). Switch PS1 closes to prove combustion airflow and powers normally closed switch LS1 which opens only with excessive heat exchanger temperature. When LS1 and PS1 are closed, IC1 will attempt ignition. IC1 provides direct spark ignition with flame verification and controls the GV1 gas valve through manual reset switch RS1 (rollout switch). If RS1 has tripped, GV1 is locked out and IC1 will electronically lockout after three failed ignition attempts.

   When the W1 call is canceled, power is removed from the coil of BR1 and from IC1 terminals TH and PSW which directs IC1 to close GV1. As long as APS continues to prove supply fan airflow, IC1 remains powered and keeps the L1 to IND contacts closed for 45 seconds to maintain the operation of Draft Motor 1 for a post-purge of the heat exchanger.

8. Gas Heat Option, Stage 2: A call for W2 engages Ignition Control 2 (IC2-terminal TH). Once APS (supply air proving switch) closes to acknowledge supply airflow, IC2 is powered. IC2 closes contacts between terminals L1 and IND to engage Draft Motor 2. The W2 call also routes to IC2 terminal PSW through PS2 (draft fan air proving switch) and LS2 (limit switch). Switch PS2 closes to prove combustion airflow and powers normally closed switch LS2 which opens only with excessive heat exchanger temperature. When LS2 and PS2 are closed, IC2 will attempt ignition. IC2 provides direct spark ignition with flame verification and controls the GV2 gas valve through manual reset switch RS2 (rollout switch). If RS2 has tripped, GV2 is locked out and IC2 will electronically lockout after 3 failed ignition attempts.

   When the W2 call is canceled, IC1 directs GV1 to close. As long as APS continues to prove supply fan airflow, IC2 remains powered and keeps the L1 to IND contacts closed for 45 seconds to maintain the operation of Draft Motor 2 for a post-purge of the heat exchanger.

9. Electric Heat Option: A call for heat engages all stages of electric heat.

⚠ WARNING

DISCONNECT ALL POWER SUPPLIES BEFORE CHECKING OR SERVICING THE ELECTRIC HEAT SECTION.

On units with the Electric Heat Option, a call for heat (W1) will initiate the main blower. The blower will produce static in the supply and the Air Proving Switch (APS) contacts will close. The APS will complete the circuit to the first stage of electric heat. If additional heat is required, a signal (W2) will energize the second stage of electric heat. When the call for heat (W2) has been satisfied, W3 will be de-energized and de-energize second stage heat. As the call heat (W1) has been satisfied, W2 will be de-energized and the APS will open disconnecting power to the first stage of electric heat.

All electric heat modules have an auto-reset primary limit and non-restartable back-up limits. Dirty filters, broken belts, fan motor burn-out or running this unit below 6,000 CFM will cause the limit to trip on the auto-reset primary limit. In addition to the primary limit, back-up limits may trip under these conditions. The back-up limits are one-trip devices and will have to be replaced should they trip.

10. Electronic Economizer Option: ELM (Economizer Logic Module) directly controls the position of the outside air / return air dampers through a 2-10 VDC signal to ACT1 (economizer actuator). ELM is powered only after supply fan operation has been verified (APS closed) and the CM-CV Aux. Econo. Relay contact (A to Com) is closed. Remember that CM-CV engages the Aux. Econo. Relay only when CM-CV calls for the supply fan during the occupied mode. When ELM is not powered, the outside air dampers spring return closed. When ELM is powered and there is no Y1 call or if free cooling is unavailable, ELM opens the economizer dampers to the adjustable minimum position setting.

    With a Y1 call when the outside air is appropriate for free cooling (see below), ELM closes a contact between ELM terminals 3 and 5 to engage relay RY1 and RY2 (Cooling Stage Control Relays) and free cooling is used for first stage cooling. (Please see the compressor staging chart above.) ELM modulates the economizer dampers to maintain a Mixed Air Temperature (Return Air / Outside Air Mixture, sensed between the filters and the DX coil) between 50 and 56 °F.

    ELM uses one of three methods to determine when free cooling is available. The method used is determined by the unit wiring and each method functions as listed below.

DRY BULB CHANGEOVER: A dry bulb temperature sensor is wired to ELM terminals So and +, in place of the Outdoor Enthalpy sensor, and a 20W resistor is connected to terminals Sr and +, in place of the Return Air Enthalpy sensor. The dry bulb changeover point is set through a potentiometer on ELM labeled with specific points marked A, B, C, and D, with the following approximate correspondence: A [85,95°F], B [72,82°F], C [58,68°F], and D [45,55°F]. When the potentiometer is set to one of the reference points, ELM will allow free cooling when the outdoor temperature falls below the indicated temperature range. Free cooling will be available until the outdoor temperature rises above the indicated temperature range. Free cooling is disabled when the outdoor temperature rises above the temperature range and cannot be enabled until the outdoor temperature falls below the indicated temperature range. The changeover point may be set between the reference points, thus allowing customization for each application.

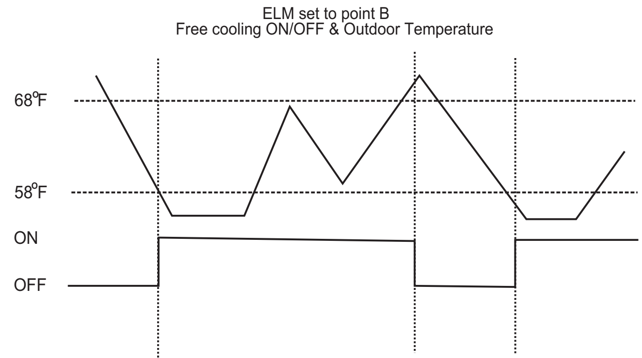


FIGURE 32 : ECONOMIZER RESPONSE EXAMPLE

SINGLE ENTHALPY CHANGEOVER: The Outdoor Air Enthalpy Sensor is connected and a 620W resistor is connected to terminals Sr and +, in place of the Return Air Enthalpy sensor. The enthalpy changeover point is set through a potentiometer on ELM labeled with specific points marked A, B, C, and D. At 50% relative humidity, these points correspond to the following temperatures: A [73°F], B [70°F], [C-67°F], and [D-63°F]. The changeover point may be set between the reference points, thus allowing customization for each application. When the outdoor enthalpy is below the changeover setpoint, free cooling is available.

DUAL ENTHALPY (Comparative/Differential Enthalpy) CHANGEOVER: Both the Outdoor Air Enthalpy and the Return Air Enthalpy sensors are connected to ELM. The changeover setpoint potentiometer is turned fully clockwise (past the D reference). When the outdoor air enthalpy is less than the return air enthalpy, free cooling is available. ELM is equipped with a high ambient lock-out that will disable free cooling and force compressorized cooling when the outside air temperature exceeds 75°F at 75% relative humidity. Free cooling will remain locked-out until the outdoor temperature drops below 73.5°F (also at 75% RH).

11. Power Exhaust Option with Modulating Dampers: The power exhaust controls are powered through relay MR (supply air motor relay) with a call for the supply fan. Once powered, null pressure switch SSP1 (Switch, Static Pressure - Building) provides floating point control of the exhaust dampers. A contact closure is provided (COM to HI) whenever the building pressure exceeds the building pressure setpoint of SSP1, which applies a 24 VAC signal to wire 4 of the power exhaust damper actuator (ACT2, OPEN damper). A contact closure is provided (COM to LO) whenever the building pressure falls below the building pressure setpoint minus the null span adjustment of SSP1, which powers wire 3 of ACT2 (Close Damper). As long as the building pressure floats within

the null range, neither contact is closed and ACT2 holds the damper in position. When ACT2 opens more than 5 an end switch (ACT2-1) closes to power the 10M starter and engage the power exhaust fan motor. When the power exhaust is disabled, ACT2's spring return closes the exhaust dampers and 10M opens to shut down the exhaust fans.

12. Non-modulating Power Exhaust Option: The power exhaust controls are powered on a call for the supply fan. Switch SSP1 (Switch Static Pressure - Building) closes whenever the building pressure exceeds setpoint. If the exhaust motor has been off for a minimum of five minutes, TDR (Time Delay Relay - five min. Anti-Short - Cycle Timer) power is applied to the 10M starter to engage the power exhaust fan motor. The outlet pressure of the power exhaust fan forces the barometric relief dampers open. Exhaust fan operation is continued until the building static pressure falls below the SSP1 setpoint or until the supply fan call is satisfied. Gravity closes the barometric relief dampers when the exhaust fans are off.

VARIABLE AIR VOLUME UNIT

OVERVIEW

The VAV units operate in one of three modes: Night Mode, Warm-up Mode, and Day Mode. The unit operational mode is determined by the status of a field supplied contact that switches between the Day and Night Modes. Day Mode operation is further segregated into a Warm-up Mode and a Cooling mode, depending upon the return air temperature. ***On all VAV units, heating is not available during the day or set-up mode. Heating is available in the night set back or morning warm-up mode.***

There are three sub-modes available in the Night Mode: Off, Set-back, and Set-up. When the field supplied contact is open for night mode operation, the unit is always in the NIGHT OFF MODE unless a field connected space thermostat calls for set-back or set-up operation.

In the NIGHT OFF MODE, the supply fan motor and optional exhaust fan motor are disengaged. The optional inlet guide vanes and optional exhaust dampers close. The optional economizer outside air dampers close while the return air dampers open. Heating and Cooling are disabled.

NIGHT SET-BACK MODE is engaged when a contact closure is made between unit terminals N and W1 during the NIGHT MODE. In this mode, the supply fan is operated at full volume, optional unit heating is engaged at full capacity, the optional power exhaust system is enabled, the economizer outside air dampers close (return air dampers open), cooling is disabled, and a contact closure is provided between terminals D1 and D2 to signal the remote VAV boxes to open. This operation continues until the N - W1 contact is broken or until the unit enters DAY MODE.

NIGHT SET-UP MODE is engaged when a contact closure is made between terminals N and Y1 during the NIGHT MODE. In this mode, the supply fan is engaged and its volume controlled to maintain the duct static pressure. The optional power exhaust system is enabled, the economizer is enabled, and heating is disabled. The economizer and mechanical cooling are used to maintain the discharge air temperature to the DAY MODE setpoint. This operation continues until the N - Y1 contact is broken or until the unit enters DAY MODE.

When the unit first enters DAY MODE, it enters a morning WARM-UP MODE. In this mode, the supply fan is operated at full volume, optional unit heating is engaged at full capacity, the optional power exhaust system is enabled, the economizer outside air dampers close (return air dampers open), cooling is disabled, and a contact closure is provided between terminals D1 and D2 to signal the remote VAV boxes to open. This operation continues until the return air temperature exceeds the adjustable setpoint of the Morning Warm-up bulb thermostat (MWUP). Once MWUP is satisfied, a lock-in relay engages to keep the unit in DAY COOLING MODE until the remote time clock calls for the NIGHT MODE. In the day cooling mode, the supply fan is engaged and its volume controlled to maintain the duct static pressure. The optional power exhaust system is enabled, the economizer is enabled, and heating is disabled. The economizer and mechanical cooling are used to maintain the discharge air temperature to the DAY MODE setpoint.

Unit Controls

1. When contact is made between unit terminals TC and R the unit enters DAY MODE operation as the time clock relay (TCR) is engaged. When the TCR-1 contacts close, the duct pressure controller is activated, the optional power exhaust system is activated, power is applied to the airflow proving switch (APS), and to the supply fan motor starter (5M) to engage the supply fan. If the supply fan operates correctly (proper rotation) the pressure difference between the heating section and the supply fan section increases and APS closes to enable heating operation and power the cooling lockout control.

   For units without optional head pressure control: If the outside air temperature rises above 50°F Cooling lockout switch 1 (CLO1) applies power to the coils of LOR1 and LOR2 (Low Ambient Cooling Lockout Relays) to enable all mechanical cooling stages by closing contacts LOR1-1, LOR 1-2, LOR2-1, and LOR2-2. If the outside air temperature falls below 40°F, then all mechanical cooling stages are locked out.

   For units with head pressure control: Cooling lockout switch 1 (CLO1) applies power to the coil of LOR2 (Low Ambient Cooling Lockout Relay) to enable third and fourth (40 Ton only) stage mechanical cooling by closing contacts LOR2-1 and LOR2-2 when the ambient temperature rises above 50°F. If the outside air temperature falls below 40°F, mechanical cooling stages 3 and 4 (40 Ton only) are locked out. Cooling lockout switch 2 (CLO2) applies power to the coil of LOR1 to enable first and second stage mechanical cooling by closing contacts LOR1-1 and LOR1-2 when the ambient temperature rises above 10°F. If the outside air temperature falls below 0°F, all mechanical cooling stages are locked out.

2. While the return air temperature remains below the adjustable setpoint of MWUP (Morning Warm-up), relays FR1 and FR2 (Fan Relays) are engaged. Contact FR1-1 closes to engage the unit heat (optional) at full capacity. Contact FR1-3 closes (FR1-2 opens) to replace the normal SSP2 (Switch, Static Pressure - Duct) damper open signal with a constant 24 VAC signal, thus forcing the inlet guide vane dampers to fully open during the warm-up cycle. Contact FR2 makes contact between terminals D1 and D2 to signal the remote VAV boxes to open. In this WARM-UP MODE, CM-VAV and ELM (optional) are disabled, so cooling is disabled and the optional economizer outside air dampers are closed.

TABLE 41: COOLING STAGE RELAYS

CALL	ECONOMIZER MODE	MECHANICAL COOLING MODE
COOL 1	Economizer (N/A)	Compressor 1 (RY1- 2)
COOL 2	Compressor 1 (RY1-3)	Compressor 2 (RY1- 4)
COOL 3	Compressor 2 (RY2-1)	Compressor 3 (RY2- 2, 30 and 40 ton only)
COOL4	Compressor 3 (RY2-3)	Compressor 4 (RY2-4, 40 ton only)

NOTE: The economizer may function, but all mechanical cooling stages are locked out if LOR1 and LOR2 are disengaged.

3. When the return air temperature climbs above the MWUP setpoint, relay HR2 (Morning Warm-up Lockout Relay) is engaged and relays FR1 and FR2 are disengaged. Contact FR-3 closes to restore SSP2 control, so that the fan volume is now controlled to maintain the duct pressure at setpoint. Heating is disabled, the CM-VAV (Control Module, VAV) and ELM (Economizer Logic Module) are powered. Contact HR2-1 closes to maintain DAY COOLING MODE operation while contact HR2-2 opens to disable heating should the return air temperature fall below the MWUP setpoint. CM-VAV calls for cooling stages to maintain the discharge air temperature.

4. A call for first stage cooling powers terminal Cool1, A and signals the optional economizer logic module (ELM) that cooling is required. When conditions are suitable for economizer use, ELM powers the coil of staging relays RY1 and RY2. These relays shift the staging of mechanical cooling as listed in the table below. A call for second stage cooling powers terminal Cool2, A, third stage powers Cool3, A and fourth stage powers Cool4, A of CM-VAV.

   The controlling RY1/RY2 contact is indicated in parentheses after the controlled device.

   For units without an economizer, the compressor operation corresponds to the Mechanical Cooling Mode listed above and relays RY1 and RY2 are not installed.

   The CM-VAV (Control Module) provides a minimum of 4 minutes between each cooling stage call, a 4 minute minimum ON time for each cooling stage and a 4 minute minimum OFF time for each cooling stage. As allowed by the staging timers, CM-VAV engages an additional stage of cooling each time the discharge air temperature rises more than 1°F above the discharge setpoint plus 1/2 the control band setpoint. As allowed by the staging timers, CM-VAV disengages a stage of cooling each time the discharge air falls more than 1°F below the discharge setpoint minus 1/2 the control band setpoint. When the supply air reset accessory is installed, the stage ON/OFF control points move upwards as the setpoint is reset by either the outside air temperature or the space temperature.

5. A call for Compressor 1 powers the high pressure safety switch (HP1), the coil of contactor 6M (condenser fan #1), and the coil of contactor 7M (contactor, condenser fan #2) through condenser fan cycling switch PS5 (PS5 disables condenser fan #2 operation based upon the discharge pressure of the Compressor 1). If the system pressures are within HP1 (high refrigerant pressure) and LP1 (low refrigerant pressure) switch settings and the solid state compressor motor protector (Compressor Module No. 1) is not tripped, contactor 1M is engaged to start scroll Compressor 1.

6. A call for Compressor 2 powers contactor 2M (contactor, compressor #2) if HP2, LP2 (high and low refrigerant pressure) and Compressor Module 2 (compressor motor protector) contacts are closed.

7. 30 and 40 ton only: A call for Compressor 3 powers the coils of contactors 8M (contactor, condenser fan #3) and 9M (contactor, condenser fan #4 - 40 ton only). If HP3, LP3 (high and low refrigerant pressure) and Compressor Module 3 contacts are closed, power is applied to the coil of Contactor 3M, which starts compressor 3.

8. 40 Ton Only: A call for Compressor 4 powers the coils of contactor 4M if HP4, LP4 (high and low refrigerant pressure) and Compressor Module 4 contacts are closed.

9. When the time clock contact made between TC and R is broken, the unit enters night mode. Contact TCR-1

opens to disable the supply fan, the optional power exhaust, cooling, heating, and the economizer. The optional outside air dampers are closed with the optional inlet guide vanes. Contact TCR-2 closes to power terminal N and enable the field installed night mode thermostat (NSB STAT).

10. When the space temperature falls below the NSB STAT (Night Setback) heating setpoint, NSB STAT makes contact between terminals N and W1, which powers relay HR1 (NSB Heat Relay). When the HR1-1 contacts close, the duct pressure controller is activated, the optional power exhaust system is activated, power is applied to the airflow proving switch (APS), and power is applied to starter 5M to engage the supply fan motor. If the supply fan operates correctly (proper rotation) the pressure difference between the heating section and the supply fan section increases and APS closes to enable heating operation. Contact HR1-3 closes to engage relays FR1 and FR2. Contact FR1-1 closes to engage the unit heat (optional) at full capacity. Contact FR1-3 closes (FR1-2 opens) to replace the SSP2 (Switch, Static Pressure - Duct) damper open signal with a constant 24 VAC signal, thus forcing the inlet guide vane dampers to fully open. Contact FR2 makes contact between terminals D1 and D2 to signal the remote VAV boxes to open. Contacts HR1-2 opens to disable the CM-VAV and ELM (optional Economizer Logic Module), so cooling is disabled and the optional economizer outside air dampers are closed. This operation is maintained until the space temperature rises above the NSB STAT heating setpoint or DAY MODE is engaged.

    <u>Gas Heat Option, Stage 1:</u> A call for heat engages Ignition Control 1 (IC1-terminal TH). Once APS (supply air proving switch) closes to acknowledge supply airflow, IC1 is powered. IC1 closes contacts between terminals L1 and IND to engage Draft Motor 1. The W1 call also routes to IC1 terminal PSW through PS1 (draft fan air proving switch) and LS1 (limit switch). Switch PS1 closes to prove combustion airflow and powers normally closed switch LS1 which opens only with excessive heat exchanger temperature. When LS1 and PS1 are closed, IC1 will attempt ignition. IC1 provides direct spark ignition with flame verification and controls the GV1 gas valve through manual reset switch RS1 (rollout switch). If RS1 has tripped, GV1 is locked out and IC1 will electronically lockout after 3 failed ignition attempts.

    When the W1 call is canceled, power is removed from IC1 terminals TH and PSW which directs IC1 to close GV1. As long as APS continues to prove supply fan airflow, IC1 remains powered and keeps the L1 to IND contacts closed for 45 seconds to maintain the operation of Draft Motor 1 for a post-purge of the heat exchanger.

11. <u>Gas Heat Option, Stage 2:</u> A call for W2 engages Ignition Control 2 (IC2-terminal TH). Once APS (supply air proving switch) closes to acknowledge supply airflow, IC2 is powered. IC2 closes contacts between terminals L1 and IND to engage Draft Motor 2. The W2 call also routes to IC2 terminal PSW through PS2 (draft fan air proving switch) and LS2 (limit switch). Switch PS2 closes to prove combustion airflow and powers normally closed switch LS2 which opens only with excessive heat exchanger temperature. When LS2 and PS2 are closed, IC2 will attempt ignition. IC2 provides direct spark ignition with flame verification and controls the GV2 gas valve through manual reset switch RS2 (rollout switch). If RS2 has tripped, GV2 is locked out and IC2 will electronically lockout after 3 failed ignition attempts.

    When the W2 call is canceled, IC2 directs GV2 to close. As long as APS continues to prove supply fan airflow, IC2 remains powered and keeps the L1 to IND contacts closed for 45 seconds to maintain the operation of Draft Motor 2 for a post-purge of the heat exchanger.

12. Electric Heat Option: A call for heat engages all stages of electric heat.

⚠ WARNING

DISCONNECT ALL POWER SUPPLIES BEFORE CHECKING AND OR SERVICING THE ELECTRIC HEAT SECTION.

    On units with the Electric Heat Option, a call for heat (W1) will initiate the main blower. The blower will produce static in the supply and the Air Proving Switch (APS) contacts will close. The APS will complete the circuit to the first stage of electric heat. If additional heat is required, a signal (W2) will energize the second stage of electric heat. When the call for heat (W2) has been satisfied, W3 will be de-energized and de-energize second stage heat. As the call heat (W1) has been satisfied, W2 will be de-energized and the APS will open disconnecting power to the first stage of electric heat.

    All electric heat modules have an auto-reset primary limit and non-restartable back-up limits. Dirty filters, broken belts, Fan motor burn-out or running this unit below 6,000 CFM will cause the limit to trip on the auto-reset primary limit. In addition to the primary limit. Back-up limits may trip under these conditions. The back-up limits are one-trip devices and will have to be replaced should they trip.

13. When the space temperature rises above the NSB STAT cooling setpoint, NSB STAT makes contact between terminals N and Y1, which powers relay CCR (Night Set-up Cooling Relay). When the CCR-1 contacts close, the duct pressure controller is activated, the optional power exhaust system is activated, power is applied to the airflow proving switch (APS) and to the coil of starter 5M to

engage the supply fan motor. If the supply fan operates correctly (proper rotation) the pressure difference between the heating section and the supply fan section increases and APS closes to allow mechanical cooling operation. Contact CCR-2 closes to engage relay HR2 and power CM-VAV and ELM (optional). The unit operates as though it were in the DAY COOLING MODE (see above) until the space temperature falls below the cooling setpoint or DAY MODE is engaged.

14. Duct Pressure Control - Inlet Guide Vane Option: The duct pressure controls are powered with a call for the supply fan. Once powered, null pressure switch SSP2 (Switch, Static Pressure - Duct) provides floating point control of the inlet guide vanes. A contact closure is provided (COM to HI) whenever the duct pressure exceeds the adjustable setpoint of SSP2, which applies a 24 VAC signal to wire 3 of the Inlet guide vane actuator (ACT3, Open vanes). A contact closure is provided (COM to LO) whenever the duct pressure falls below the duct pressure setpoint minus the null span adjustment of SSP2, which powers wire 2 of ACT3 (Close vanes). As long as the duct pressure floats within the null range, neither contact is closed and ACT3 holds the inlet guide vanes in position. When a call for heating is signaled by relay FR1, ACT3 - terminal #3 is powered and the inlet guide vanes fully open, regardless of the duct pressure or the status of the ACT3 - terminal #2 input (an input at terminal #3 always overrides any input at terminal #2).

    Duct Pressure Control - Variable Frequency Drive Option: The duct pressure controls are powered with a call for the supply fan. Once powered, PC2 (Pressure Controller - Duct) provides proportional integral control of the remotely installed variable frequency drive via a 2-10 VDC control signal. PC2 is configured to provide fast integration (3 minutes) and react inversely with the duct pressure detected through SSP2 (Static Pressure Transducer - Duct). A 10 segment LED bar provides a visual indication of the PC2 output and the minimum output voltage can be adjusted through a potentiometer located in the PC2 case. Also inside the PC2 case are potentiometers to control the duct static setpoint (0 to 5 w.c.) and the throttling range for the proportional control. In this application the throttling range should be set to the maximum value which will allow the internal integrator to control the output signal. As the duct pressure exceeds setpoint, the output signal ramps downwards to decrease the fan volume. As the duct pressure falls below setpoint, the fan volume is increased. In the heating mode, the 0 to 5 VDC SSP2 pressure signal is replaced with a 24 VAC signal force the fan to full volume.

15. Electronic Economizer Option: ELM (Economizer Logic Module) directly controls the position of the outside air / return air dampers through a 2-10 VDC signal to ACT1 (economizer actuator). ELM is powered only after supply fan operation has been verified (APS closed) and when CM-VAV is powered. When ELM is not powered, the outside air dampers spring return closed. When ELM is powered and there is no Y1 call or if free cooling is unavailable, ELM opens the economizer dampers to the adjustable minimum position setting.

    With a Y1 call where the outside air is appropriate for free cooling (see below), ELM closes a contact between ELM terminals 3 and 5 to engage relay RY1 and RY2 (Cooling Stage Control relays) and free cooling is used for first stage cooling. (Please see the compressor staging chart above.) ELM modulates the economizer dampers to maintain a Mixed Air Temperature (Return Air / Outside Air Mixture, sensed between the filters and the DX coil) between 50°F and 56 °F.

    ELM uses one of three methods to determine when free cooling is available. The method used is determined by the unit wiring and each method functions as listed below.

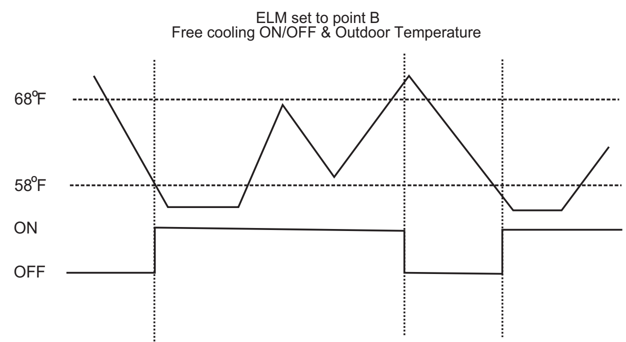


FIGURE 33 : ECONOMIZER RESPONSE EXAMPLE

    Dry Bulb Changeover: A dry bulb temperature sensor is wired to ELM terminals So and +, in place of the Outdoor Enthalpy sensor and a 620W resistor is connected to terminals Sr and +, in place of the Return Air Enthalpy sensor. The dry bulb changeover point is set through a potentiometer on ELM labeled with specific points marked A, B, C, and D, with the following approximate correspondence: A [45,55°F], B [58,68°F], C [72,82°F], and D [85,95°F]. When the potentiometer is set to one of the reference points, ELM will allow free cooling when the outdoor temperature falls below the indicated temperature range. Free cooling will be available until the outdoor temperature rises above the indicated temperature range. Free cooling is disabled when the outdoor temperature rises above the temperature range and cannot be enabled until the outdoor temperature falls below the indicated temperature range. The changeover point may be set between the reference points, thus allowing customization for each application.

    Single Enthalpy Changeover: A 620W resistor is connected to terminals Sr and +, in place of the Return Air

Enthalpy sensor. The enthalpy changeover point is set through a potentiometer on ELM labeled with specific points marked A, B, C, and D. At 50% relative humidity, these points correspond to the following temperatures: A-73°F, B-70°F, C-67°F, and D-63°F. The changeover point may be set between the reference points, thus allowing customization for each application. When the outdoor enthalpy is below the changeover setpoint, free cooling is available.

Dual Enthalpy (Comparative/Differential Enthalpy) Changeover: Both the Outdoor Air Enthalpy and the Return Air Enthalpy sensors are connected to ELM. The changeover setpoint potentiometer is turned fully clockwise (past the D reference). When the outdoor air enthalpy is less than the return air enthalpy, free cooling is available. ELM is equipped with a high ambient lockout that will disable free cooling and force compressorized cooling when the outside air temperature exceeds 75°F at 75% relative humidity. Free cooling will remain locked-out until the outdoor temperature drops below 73.5°F (also at 75% RH).

16. Power Exhaust Option with Modulating Dampers: The power exhaust controls are powered through relay MR (supply air motor relay) with a call for the supply fan. Once powered, null pressure switch SSP1 (Switch, Static Pressure - Building) provides floating point control of the exhaust dampers. A contact closure is provided (COM to HI) whenever the building pressure exceeds the building pressure setpoint of SSP1, which applies a 24 VAC signal to wire 4 of the power exhaust damper actuator (ACT2, OPEN damper). A contact closure is provided (COM to LO) whenever the building pressure falls below the building pressure setpoint minus the null span adjustment of SSP1, which powers wire 3 of ACT2 (Close Damper). As long as the building pressure floats within the null range, neither contact is closed and ACT2 holds the damper in position. When ACT2 opens more than 5° an internal end switch (ACT2-1) closes to power the 10M starter and engage the power exhaust fan motor. When the power exhaust is disabled, ACT2's spring return closes the exhaust dampers and 10M opens to shut down the exhaust fans.

17. Non-Modulating Power Exhaust Option: The power exhaust controls are powered through with a call for the supply fan. Switch SSP1 (Switch Static Pressure - Building) closes whenever the building pressure exceeds setpoint. If the exhaust motor has been off for a minimum of 5 minutes, TDR (Time Delay Relay -5 minutes Anti-Short-Cycle Timer) power is applied to the 10M starter to engage the power exhaust fan motor. The outlet pressure of the power exhaust fan forces the barometric relief dampers open. Exhaust fan operation is continued until the building static pressure falls below the SSP1 setpoint or until the supply fan call is satisfied. Gravity closes the barometric relief dampers when the exhaust fans are off.

TABLE 42: SYSTEM MOISTURE INDICATOR

INDICATOR COLOR	75°	100°	125°
Green (Dry)	Below 30	Below 45	Below 60
Chartreuse	30 - 90	45 - 130	60 - 180
Yellow (Wet)	Above 90	Above 130	Above 180

HEAD PRESSURE CONTROL

DESCRIPTION

The head pressure control option controls the speed of condenser fan #1 for low ambient mechanical cooling operation of systems #1 and #2. System #3 on a 30 ton and system #3 and #4 on a 40 ton are locked out below 45°F ambient.

The option includes tow pressure transducers, a proportional integral sequence controller and a one horsepower variable frequency drive.

The pressure transducers are connected to the discharge line of system #1 and #2. Each pressure transducer is equipped with a switching diode on the white signal wire to eliminate feedback through the transducer.

The proportional integral sequence controller (PI controller), provides 13.9 VDC power from terminal "VDC" to each pressure transducer. The transducer has an output signal of 0-10 VDC, which connects to the PI controller at terminal "SN". The PI controller regulates the output signal to the variable frequency drive based on a fixed setpoint of 240 PSI. The output signal from the PI controller is 4-20ma at the "I" terminal. The input terminal on the variable frequency drive is the "II" terminal. The PI controller will vary the output to maintain a minimum discharge pressure of 240 PSI.

The Proportional Integral Sequence controller is factory set for direct acting operation (the signal output increases as the pressure signal increases). DIP switch setting is factory set for C1 (switch 4 is in the ON position, all others are in the OFF position). This is the fastest integration time available, designed to compensate for extremely rapid rates of change. The Throttling range is factory set to 20 PSIG factory set for 2VDC (20%) which is adjustable from 0 to 6VDC (0 to 60%).

NOTE: Altering the factory settings could result in poor control or operation of the system.

No special motor is required on the 208-230/460 volt units. The 208-230 volt variable frequency drive requires single-phase input power and it produces three-phase variable output power to condenser fan motor #1. The 460-volt variable frequency drive requires three-phase input power and produces three-phase variable output power to condenser fan motor #1. On the 575-volt and 380-volt 60-hertz units a transformer is used to reduce line voltage to 230 volts.

The variable Frequency Drive is pre programmed at the factory and the keypad locked out.

SEQUENCE OF OPERATION

A call for the first stage cooling powers the 6M contactor energizing the variable frequency drive. The drive will ramp to the pre programmed minimum speed of 10 hertz immediately upon start up. The drive is pre programmed for a minimum speed of 10 hertz and a maximum speed of 60 hertz.

As the discharge pressure on system #1 or #2 compressor rises above 240 PSI upon start up the PI controller will increase the output signal to the variable frequency drive. The drive will increase the speed of condenser #1 fan accordingly.

The scroll compressor produces a rapid rise in discharge pressure upon start up and this, usually will result in full speed operation of condenser fan #1. After the discharge pressure has settled out, the speed of condenser #1 may decrease especially during times when the ambient temperature is below 80°F. After the #1system has stabilized and compressor #2 is energized, the speed of condenser Fan #1 will increase to compensate for the discharge pressure rise.

As the discharge pressure begins to fall below the 240-PSI setpoint, the drive will reduce the speed of condenser fan #1.

As the ambient temperature drips below 40°F the #1 condenser fan will slow to the minimum speed. The #2 condenser fan will disengage when the discharge pressure drops below 180 PSIG as the ambient temperature falls. The discharge pressure of system #1 and/or #2 will increase when condenser fan #2 stops consequently causing an increase in the speed of condenser fan #1.

SERVICE

REFRIGERATION SYSTEM

CHARGE: Each system is fully factory charged with R-22. The correct charge appears on the unit nameplate.

Thermal Expansion Valves: The 30 ton unit has 3 and the 40 ton unit has 4 independent refrigeration systems. These TXVs are set to maintain 15°F superheat leaving the evaporator coil. The superheat on each valve is adjustable, however, adjustments should only be made if absolutely necessary.

MOISTURE/LIQUID SIGHT GLASS: Each system has a moisture/liquid sight glass. These are located on the liquid lines in the condenser section.

A clear flow of liquid indicates the unit is properly charged. Any bubbles indicates the system is undercharged or non-condensables may exist. Corrective action should be taken.

A change in color of the moisture indicator shows the approximate moisture content of the system in parts per million. If moisture is indicated, corrective action should be taken.

FILTER DRIER: Each system is equipped with a filter drier. The drier should be replaced whenever moisture is indicated in the system.

COMPRESSORS

Each compressor is inherently protected from over current and over temperature. High and low pressure switches are installed on the discharge and suction lines respectively for high and low

pressure protection. Scroll compressor operate in only one direction. If the compressor is experiencing:

- low amperage draw
- similar discharge and suction pressure
- increased noise level

it is operating in reverse. Switch two line voltage connections to correct (See Compressor Rotation page 66).

MOTORS

INDOOR BLOWER MOTORS

All indoor blower motors are non-inherently protected three phase motors. Overcurrent protection is provided by a manual reset starter/overload relay and short circuit protection is provided by fuses.

POWER EXHAUST OR RETURN AIR FAN MOTORS

All motors are non-inherently protected three phase motors. Overcurrent protection is provided by a manual reset starter/overload relay and short circuit protection is provided by fuses.

CONDENSER FAN MOTORS

All condenser fan motors are inherently protected three phase motors. Short circuit protection is provided by fuses.

DRAFT MOTOR (GAS FURNACE)

All draft motors are line voltage, inherently protected, single phase PSC motors. Short circuit protection is provided by fuses.

TABLE 43: STEAM COIL (1 ROW, 25 & 30 TON)[1]

CFM	Capacity (MBH) at Steam Pressure (PSI)			
	2	6	10	15
6000	194.1	207.9	219.8	232.6
8000	221.1	236.9	250.4	265.0
10000	243.2	260.5	275.4	291.4
12000	261.9	280.6	296.6	313.9
15000	285.6	306.0	323.5	342.4

1. Based on 60°F entering air temperature, 2.00" maximum air pressure drop across the coil.

TABLE 44: STEAM COIL (1 ROW, 40 TON)[1]

CFM	Capacity (MBH) at Steam Pressure (PSI)			
	2	6	10	15
8000	221.1	236.9	250.4	265.0
11000	252.9	271.0	286.4	303.1
14000	278.2	298.0	315.0	333.4
17000	299.4	320.7	339.0	358.8
20000	317.6	340.2	359.6	380.6

1. Based on 60°F entering air temperature, 2.00" maximum air pressure drop across the coil.

TABLE 45: STATIC RESISTANCE STEAM COIL (25 & 30 TON)

CFM	6000	8000	10000	12000	15000
Air Pressure Drop	0.11	0.18	0.26	0.36	0.54

TABLE 46: STATIC RESISTANCE STEAM COIL (40 TON)

CFM	8000	11000	14000	17000	20000
Air Pressure Drop	0.18	0.31	0.48	0.67	0.88

TABLE 47: HOT WATER COIL (1 ROW 25 & 30 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
10	6000	91.4	115.3	139.3	163.6
	8000	102	128.8	155.8	182.9
	10000	110.4	139.5	168.8	198.4
	12000	117.3	148.4	179.6	211.2
	15000	125.9	159.2	192.9	226.9
20	6000	103	129.4	156	182.7
	8000	116.8	147	177.2	207.7
	10000	128.2	161.3	194.7	228.2
	12000	137.8	173.6	209.5	245.6
	15000	150	189	228.2	267.8
30	6000	107.6	135	162.5	190.1
	8000	122.8	154.3	185.8	217.5
	10000	135.5	170.3	205.1	240.2
	12000	146.4	184	221.8	259.7
	15000	160.3	201.6	243	284.8
40	6000	110.1	138	166	194.1
	8000	126.1	158.2	190.5	222.8
	10000	139.6	175.2	210.9	246.8
	12000	151.2	189.8	228.5	267.5
	15000	166.1	208.6	251.3	294.1

1. Based on 60°F entering air temperature, 2.00" maximum pressure drop across the hot water coil.

TABLE 48: HOT WATER COIL (1 ROW, 40 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
10	8000	102	128.8	155.8	182.9
	11000	114	144.1	174.4	205.1
	14000	123.2	155.9	188.8	222.1
	17000	130.6	165.4	200.4	235.8
	20000	136.8	173.3	210.1	247.3
20	8000	116.8	147	177.2	207.7
	11000	133.2	167.7	202.3	237.2
	14000	146.2	184.2	222.4	260.8
	17000	157	197.9	239	280.5
	20000	166.2	209.6	253.2	297.3
30	8000	122.8	154.3	185.8	217.5
	11000	141.2	177.4	213.8	250.3
	14000	155.9	196.1	236.4	276.9
	17000	168.3	211.8	255.4	299.3
	20000	179.1	225.3	271.8	318.6
40	8000	126.1	158.2	190.5	222.8
	11000	145.6	182.7	220	257.5
	14000	161.4	202.6	244.1	285.8
	17000	174.7	219.5	264.5	309.7
	20000	186.3	234.2	282.3	330.6

1. Based on 60°F entering air temperature, 2.00” maximum pressure drop across the hot water coil.

TABLE 49: WATER PRESSURE DROP (1 ROW, 25 & 30 TON)

GPM	10	20	30	40
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 50: WATER PRESSURE DROP (1 ROW, 40 TONS)

GPM	10	20	30	40
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 51: HOT WATER COIL (2 ROW, 25 & 30 TON)[1]

GPM	CFM	Capacity (MBH) at Entering Water Temperature			
		140 °F	160 °F	180 °F	200 °F
20	6000	177.5	223.8	270.4	317.3
	8000	203.8	257.2	311.1	365.5
	10000	224.8	284.1	343.9	404.2
	12000	242.2	306.4	371.1	436.4
	15000	263.6	333.8	404.6	476.1
40	6000	198.1	248.9	300.0	351.3
	8000	232.2	292.0	352.2	412.7
	10000	260.7	328.1	395.9	464.1
	12000	285.0	359.0	433.4	508.3
	15000	316.0	398.4	481.3	564.8
60	6000	206.1	258.7	311.4	364.2
	8000	243.6	305.9	368.4	431.1
	10000	275.3	345.9	416.8	488.0
	12000	302.9	380.7	458.9	537.6
	15000	338.4	425.7	513.4	601.7
80	6000	210.5	263.9	317.4	371.1
	8000	249.8	313.3	377.1	441.1
	10000	283.3	355.6	428.2	501.0
	12000	312.7	392.7	473.0	553.6
	15000	351.0	440.9	531.3	622.1

1. Based on 60°F entering air temperature, 2.00” maximum pressure drop across the hot water coil.

TABLE 52: WATER PRESSURE DROP (2 ROW, 25 & 30 TON)

GPM	20	40	60	80
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 53: WATER PRESSURE DROP (2 ROW, 40 TON)

GPM	20	40	60	80
Water Pressure Drop	0.9	3.0	6.0	10.0

TABLE 54: STATIC RESISTANCE HOT WATER COIL (25 & 30 TON)

CFM	6000	8000	10000	15000
Air Pressure Drop 1 Row	0.07	0.11	0.16	0.32
Air Pressure Drop 2 Row	0.14	0.23	0.33	0.65

TABLE 55: STATIC RESISTANCE HOT WATER COIL (40 TON)

CFM	8000	11000	14000	20000
Air Pressure Drop 1 Row	0.11	0.19	0.29	0.52
Air Pressure Drop 2 Row	0.23	0.39	0.58	1.06

NOTE: Water pressure drop numbers are based on 60°F entering air temperature, 2.00” maximum air pressure drop across the hot water coil(s). ARI certified ratings at covering other conditions are available upon request. Hot water coils are approved for use with glycol (rates available upon request.

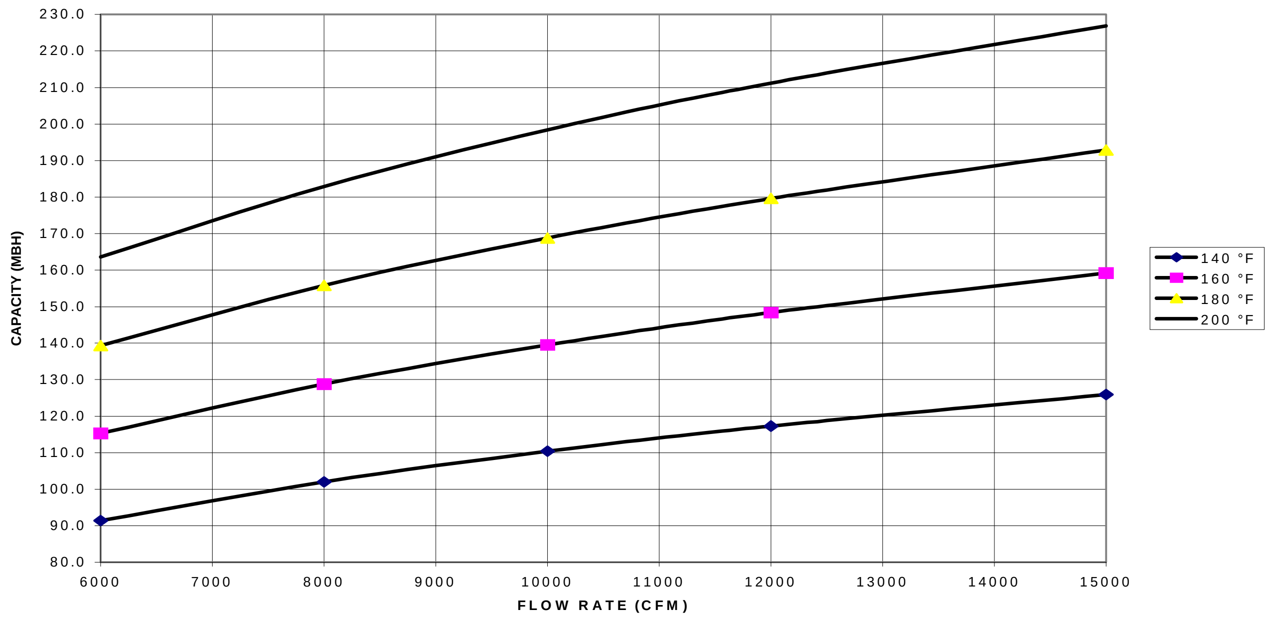


FIGURE 34 : HOT WATER COIL - 25 & 30 TON 1 ROW, AT 10 GPM

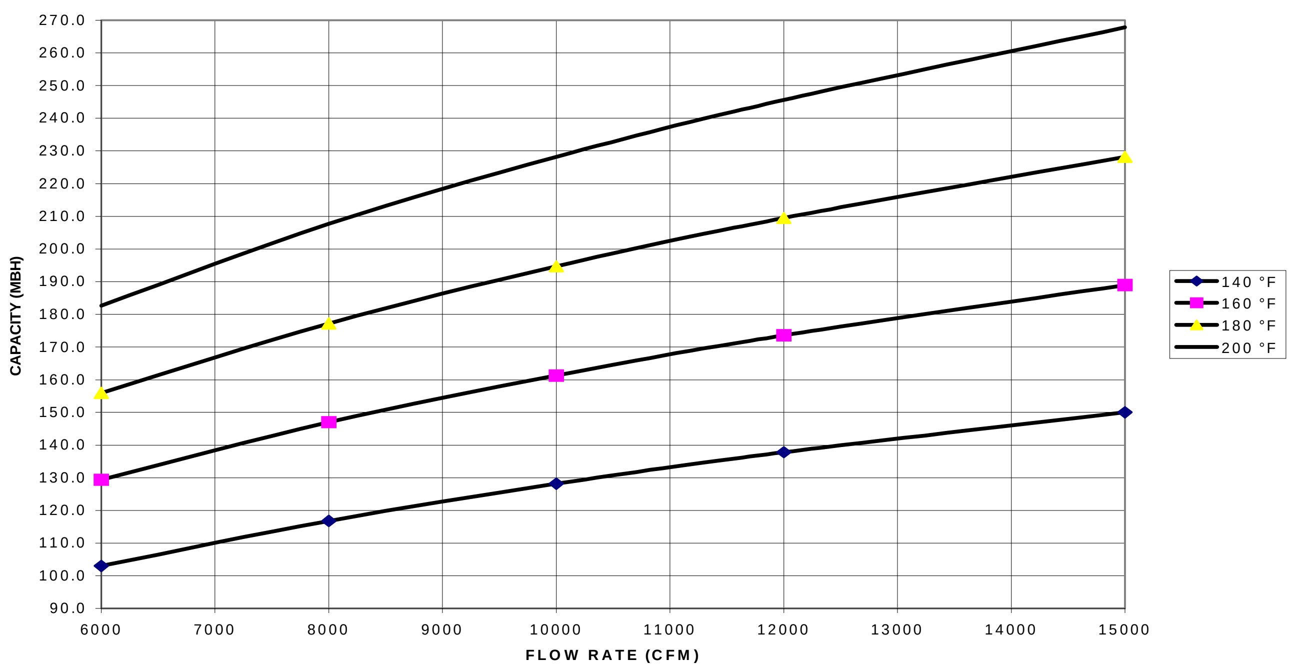


FIGURE 35 : HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 20 GPM

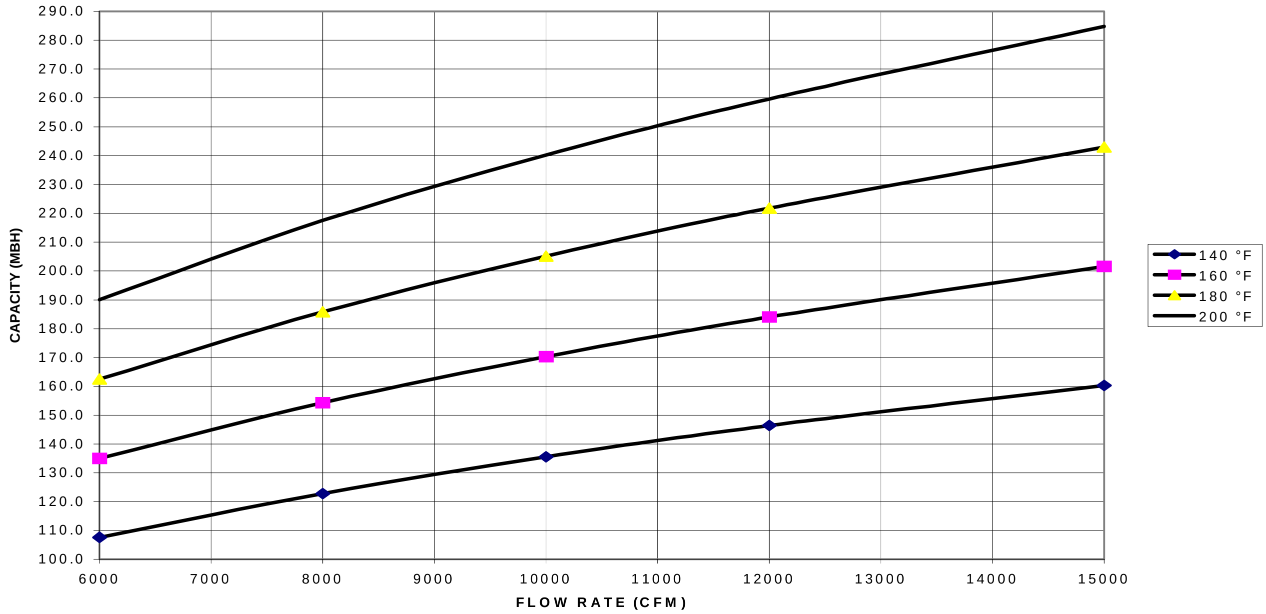


FIGURE 36 : HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 30 GPM

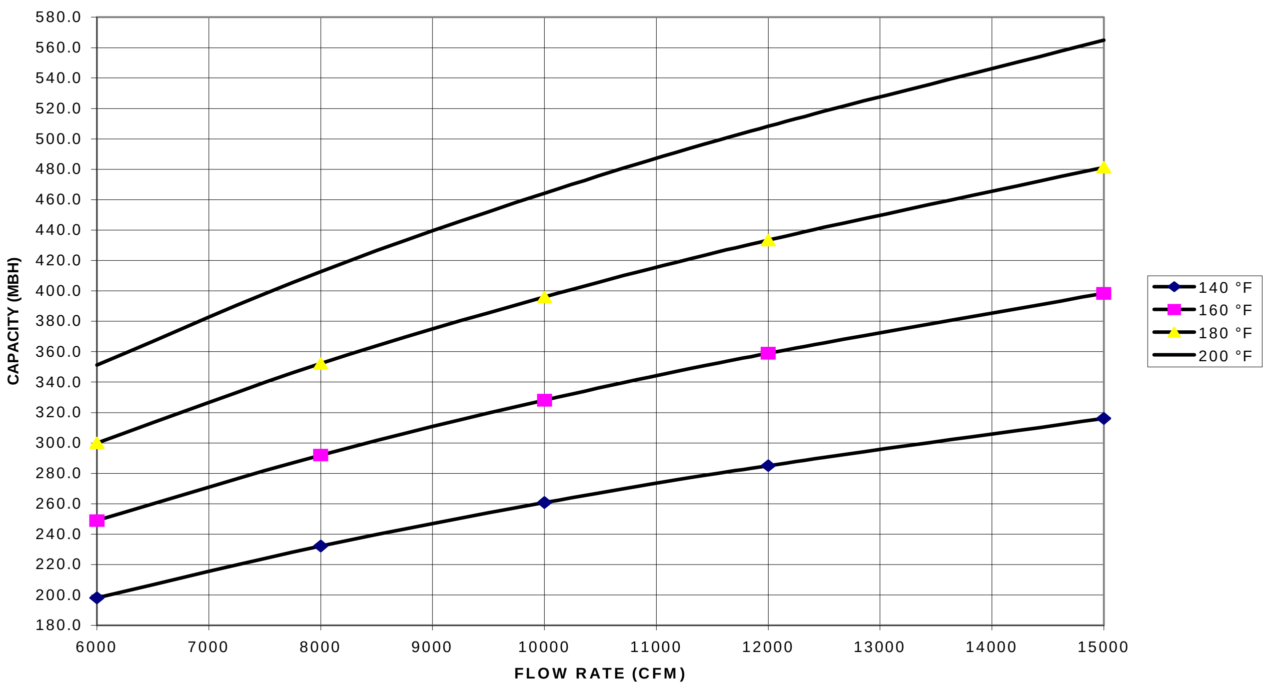


FIGURE 37 : HOT WATER COIL - 25 & 30 TON, 1 ROW, AT 40 GPM

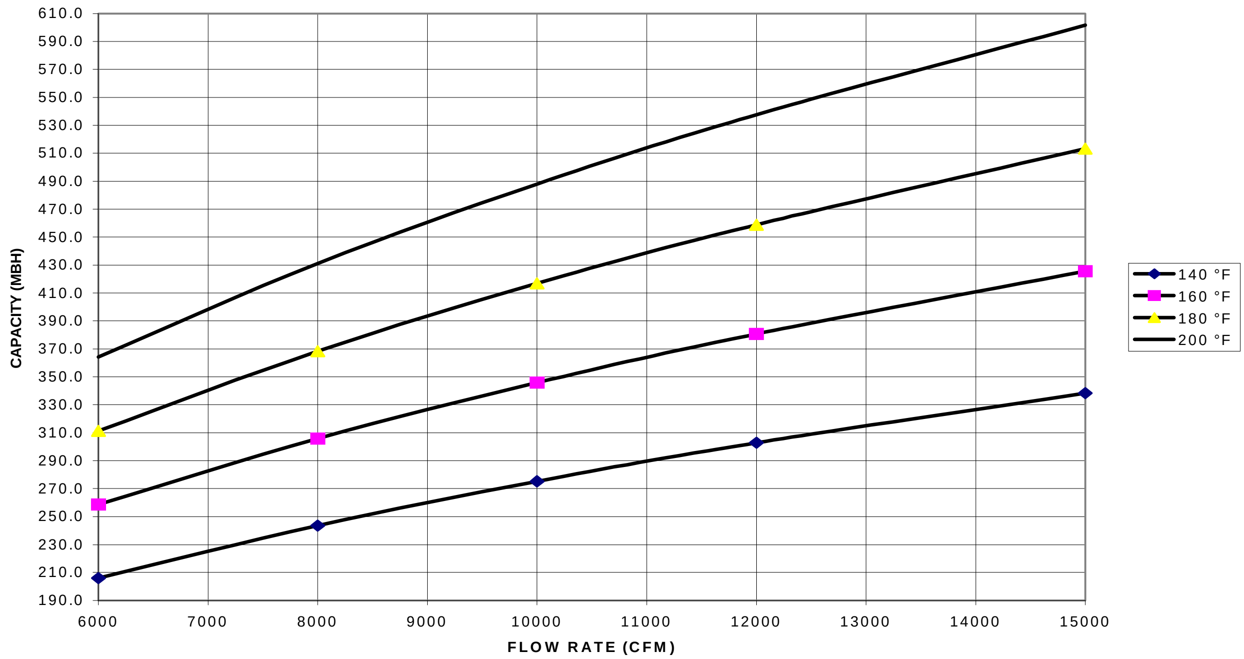


FIGURE 38 : HOT WATER COIL - 25 & 30 TON, 2 ROW, AT 60 GPM

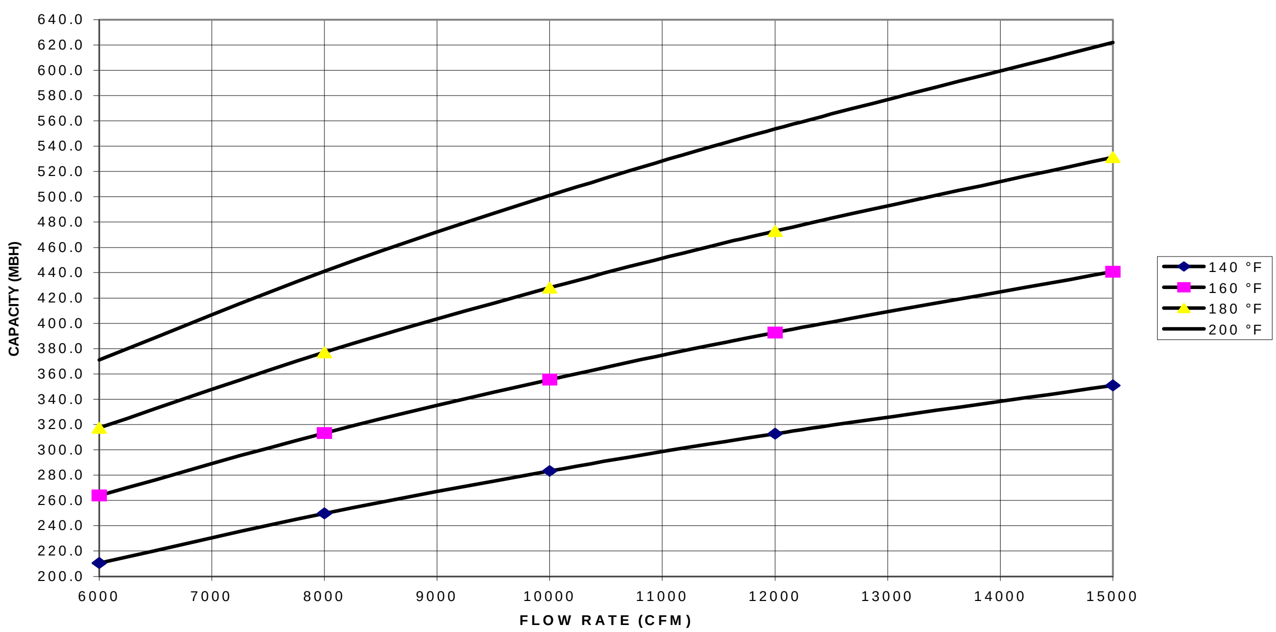


FIGURE 39 : HOT WATER COIL - 25 & 30 TON, 2 ROW, AT 80 GPM

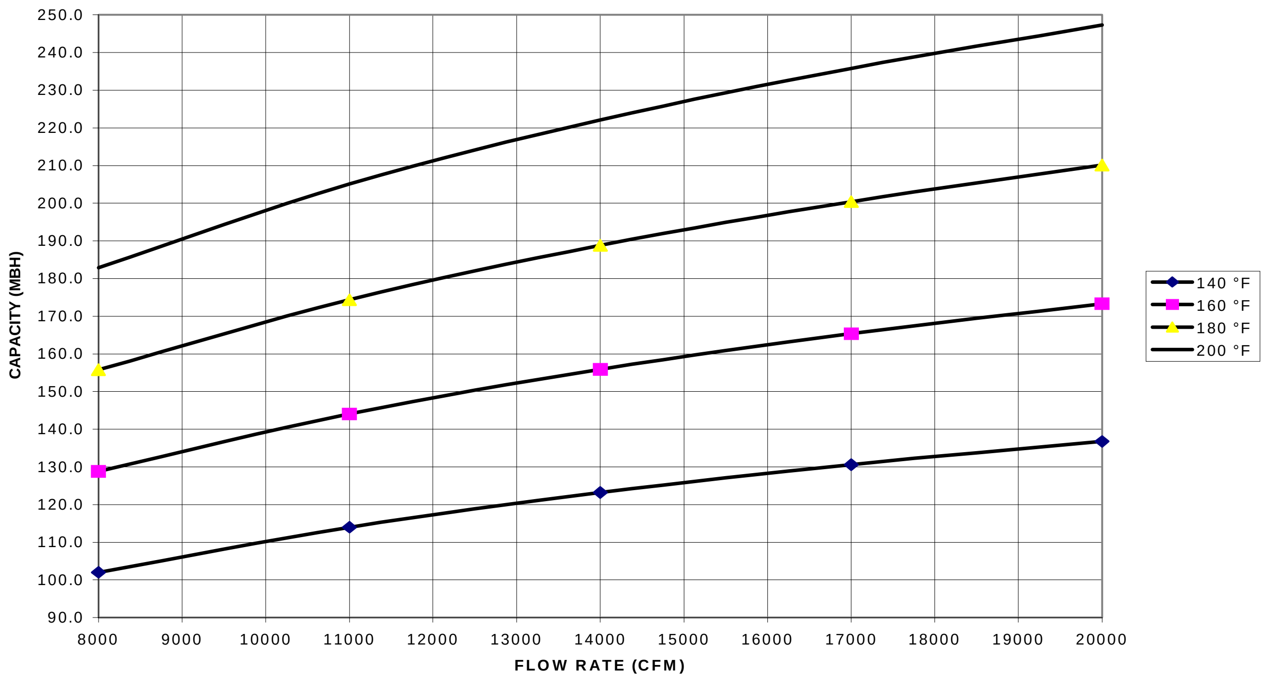


FIGURE 40 : HOT WATER COIL - 40 TON, 1 ROW, AT 10 GPM

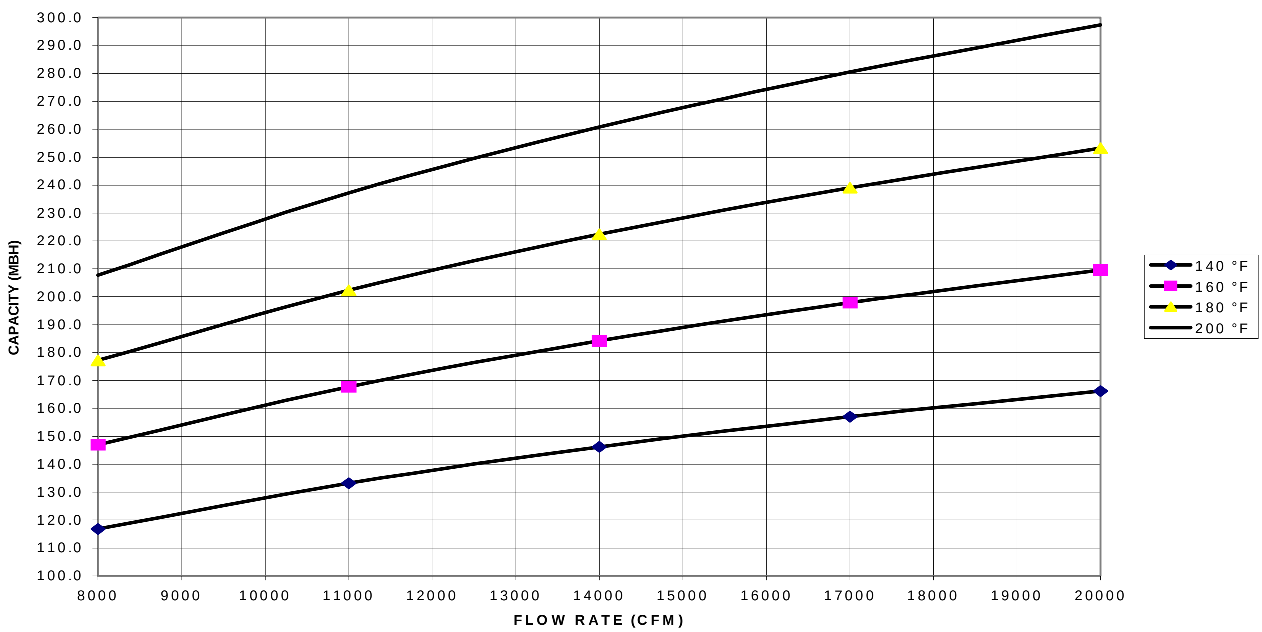


FIGURE 41 : HOT WATER COIL - 40 TON, 1 ROW, AT 20 GPM

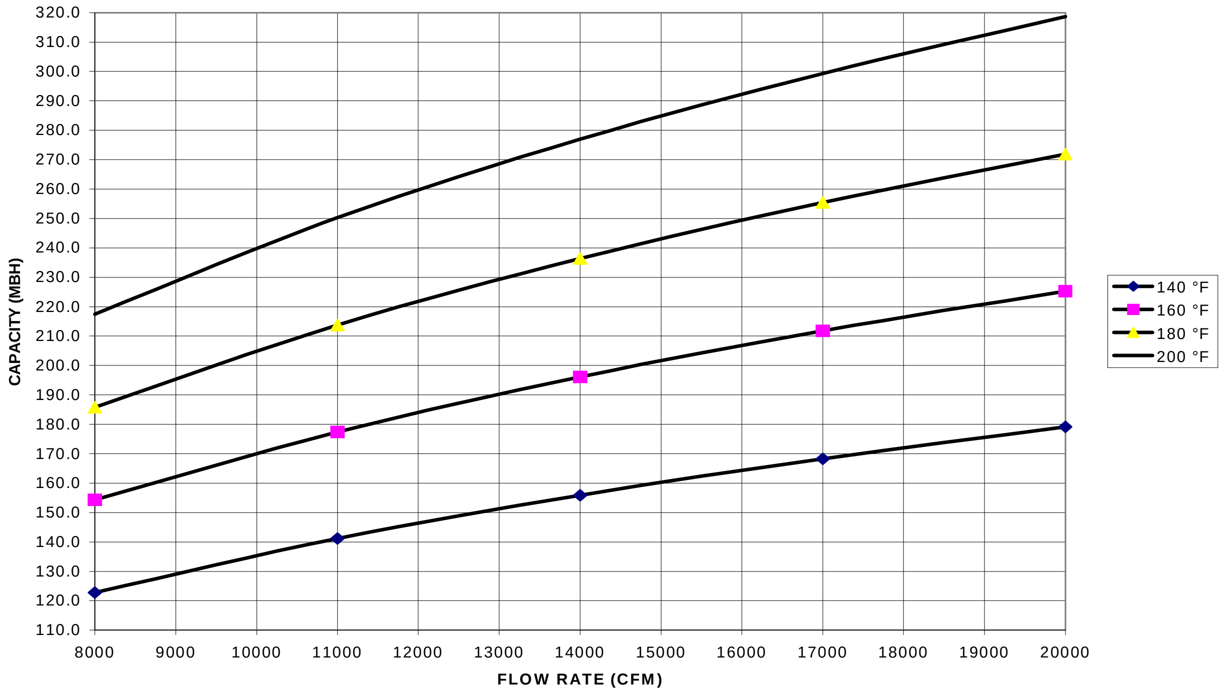


FIGURE 42 : HOT WATER COIL - 40 TON, 1 ROW, AT 30 GPM

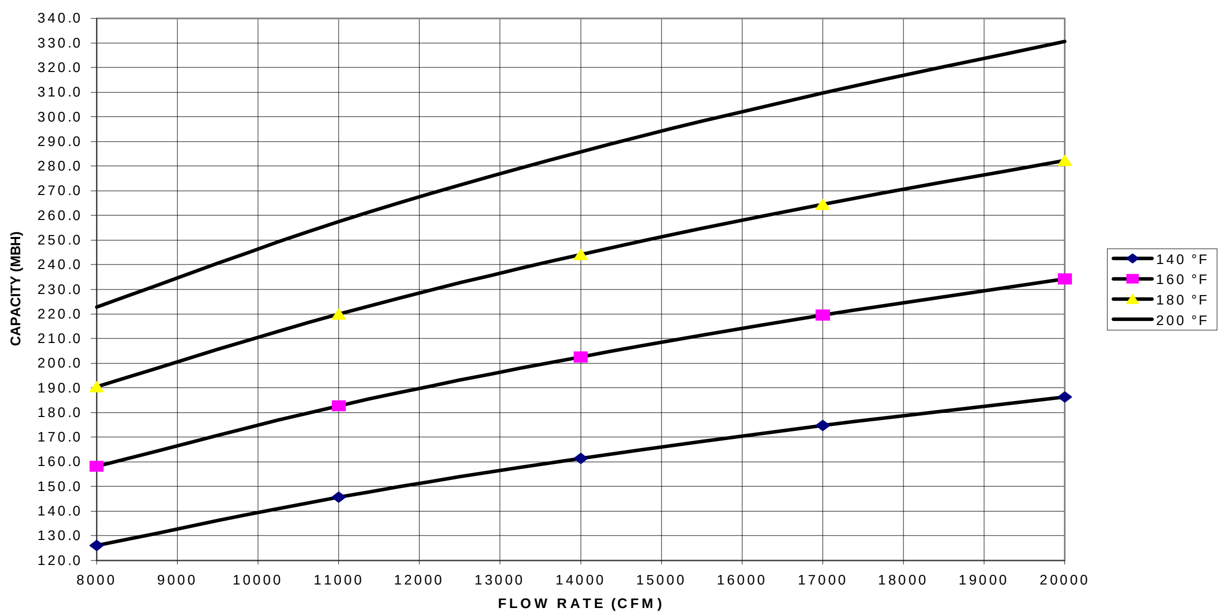


FIGURE 43 : HOT WATER COIL - 40 TON, 1 ROW, AT 40 GPM

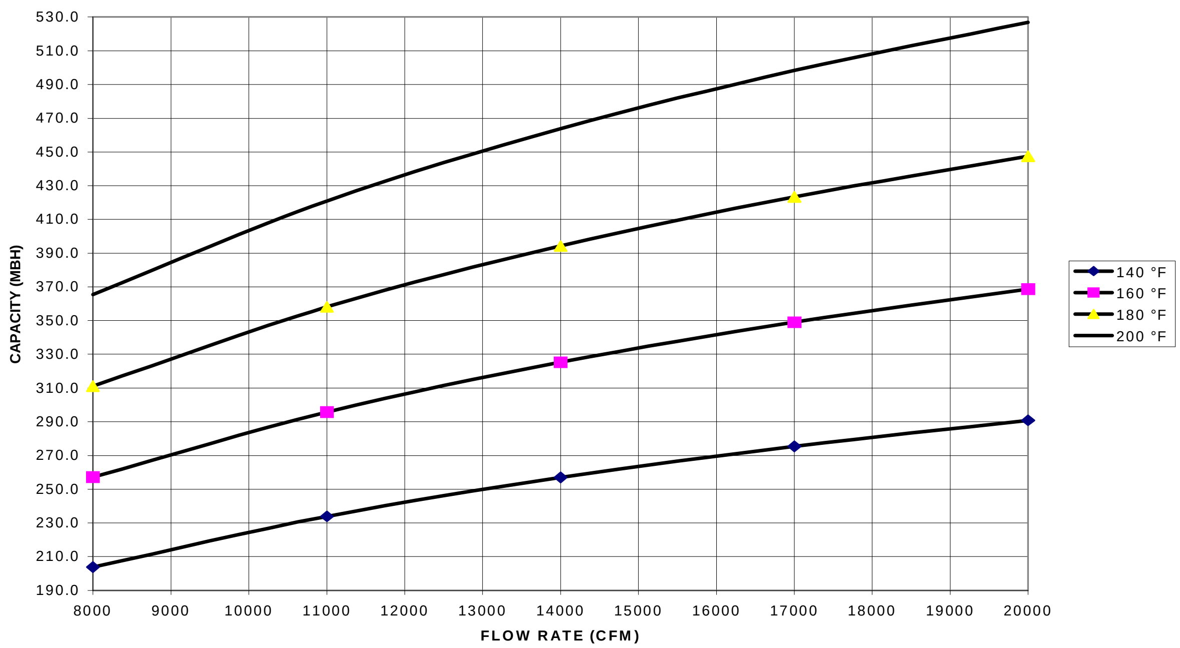


FIGURE 44 : HOT WATER COIL - 40 TON, 2 ROW, AT 20 GPM

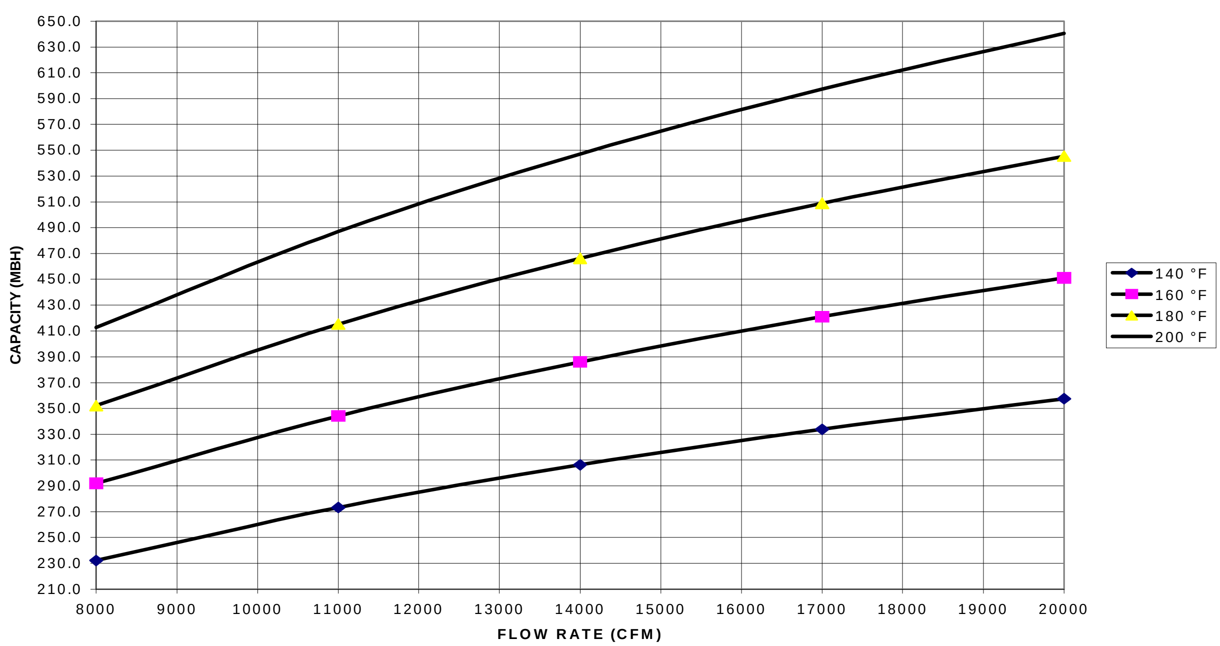


FIGURE 45 : HOT WATER COIL - 40 TON, 2 ROW, AT 40 GPM

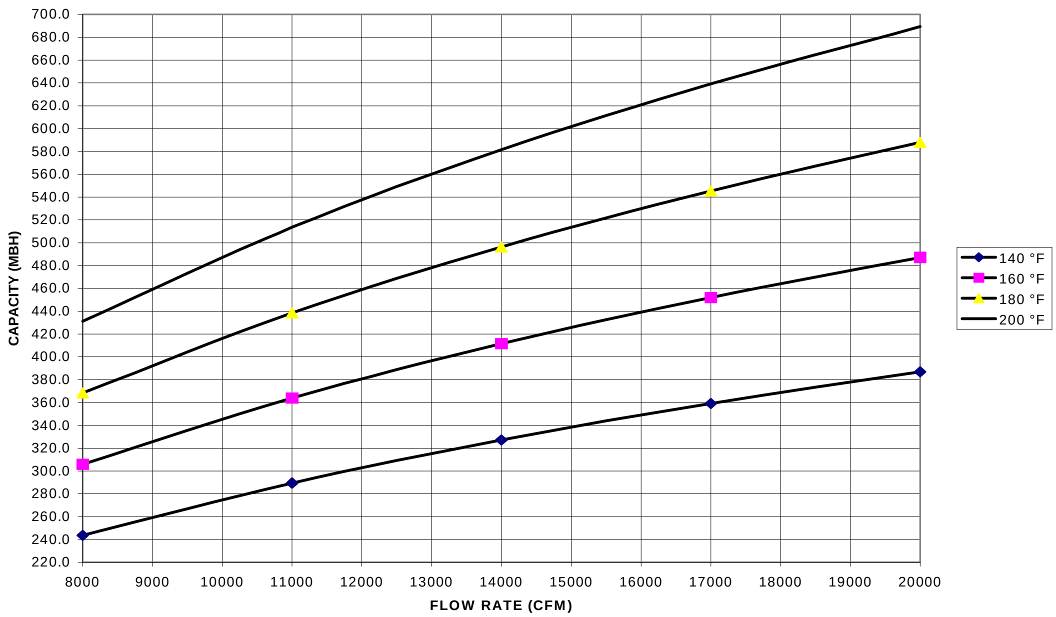


FIGURE 46 : HOT WATER COIL - 40 TON, 2 ROW, AT 60 GPM

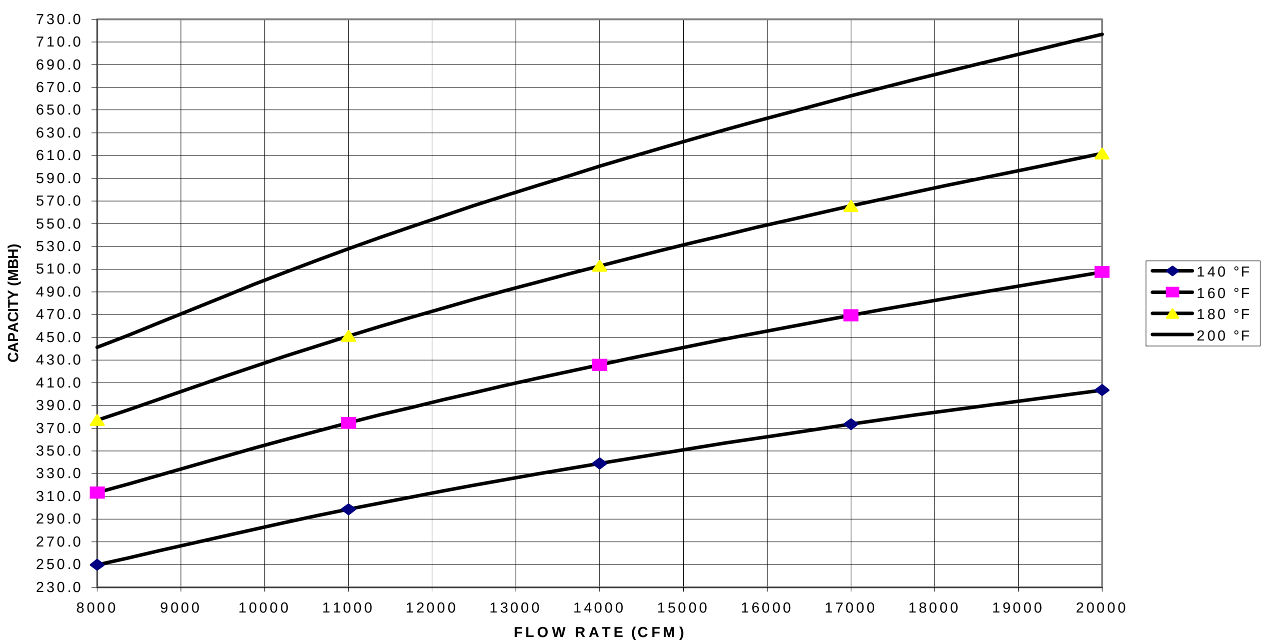


FIGURE 47 : HOT WATER COIL - 40 TON, 2 ROW, AT 80 GPM

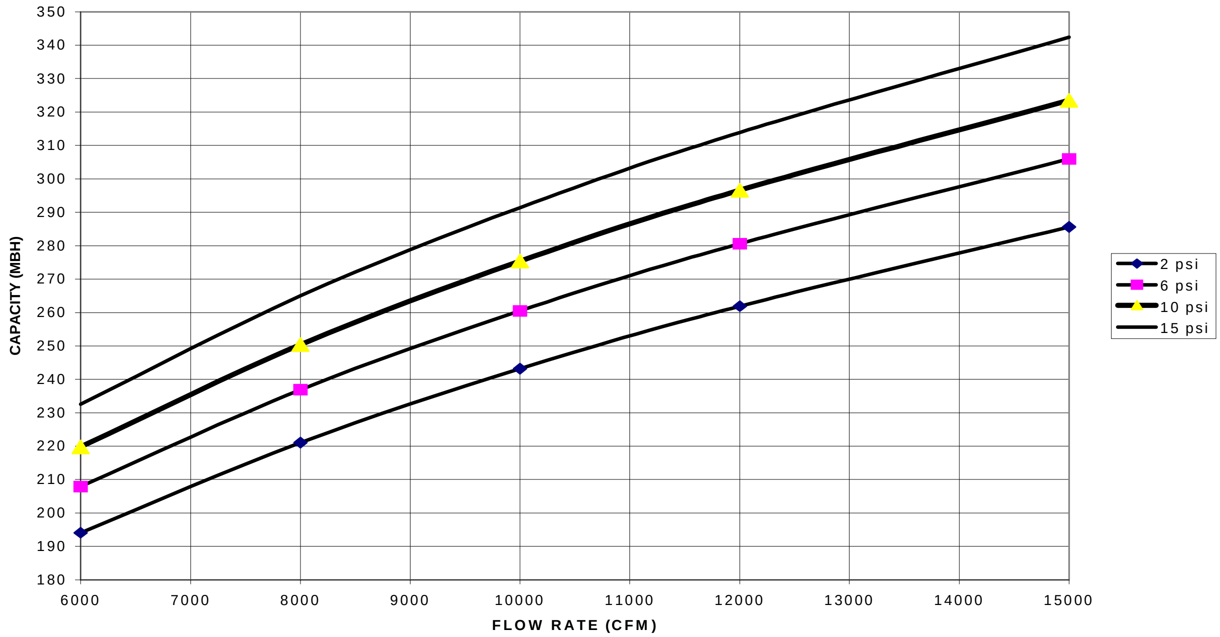


FIGURE 48 : STEAM COIL - 25 & 30 TON (1 ROW)

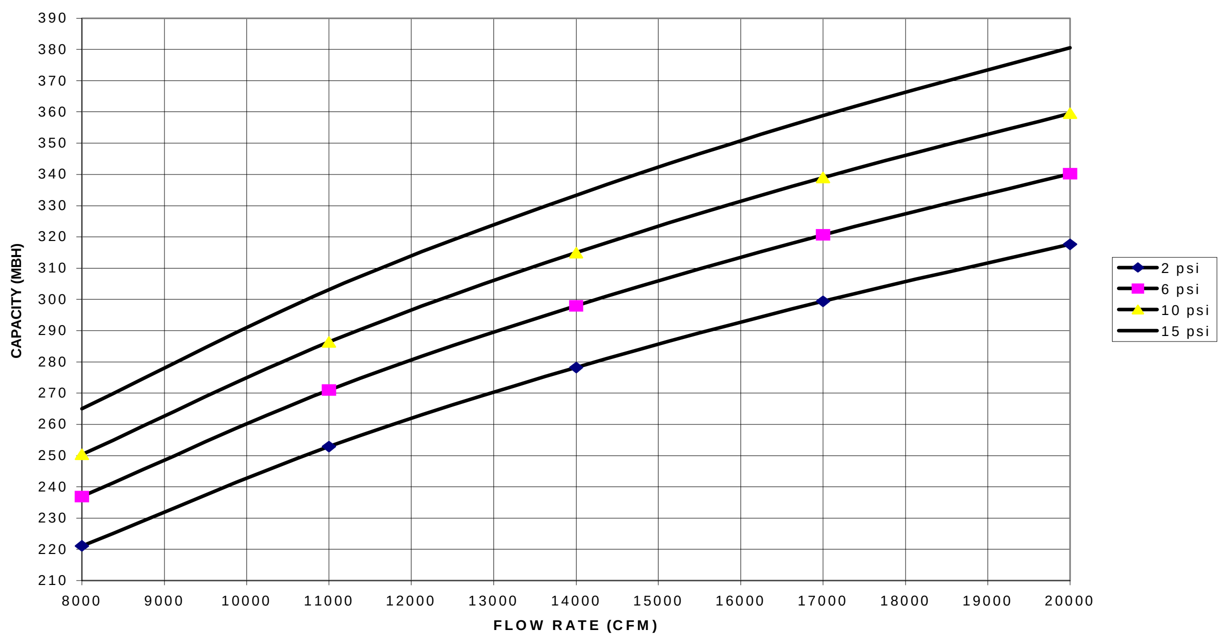
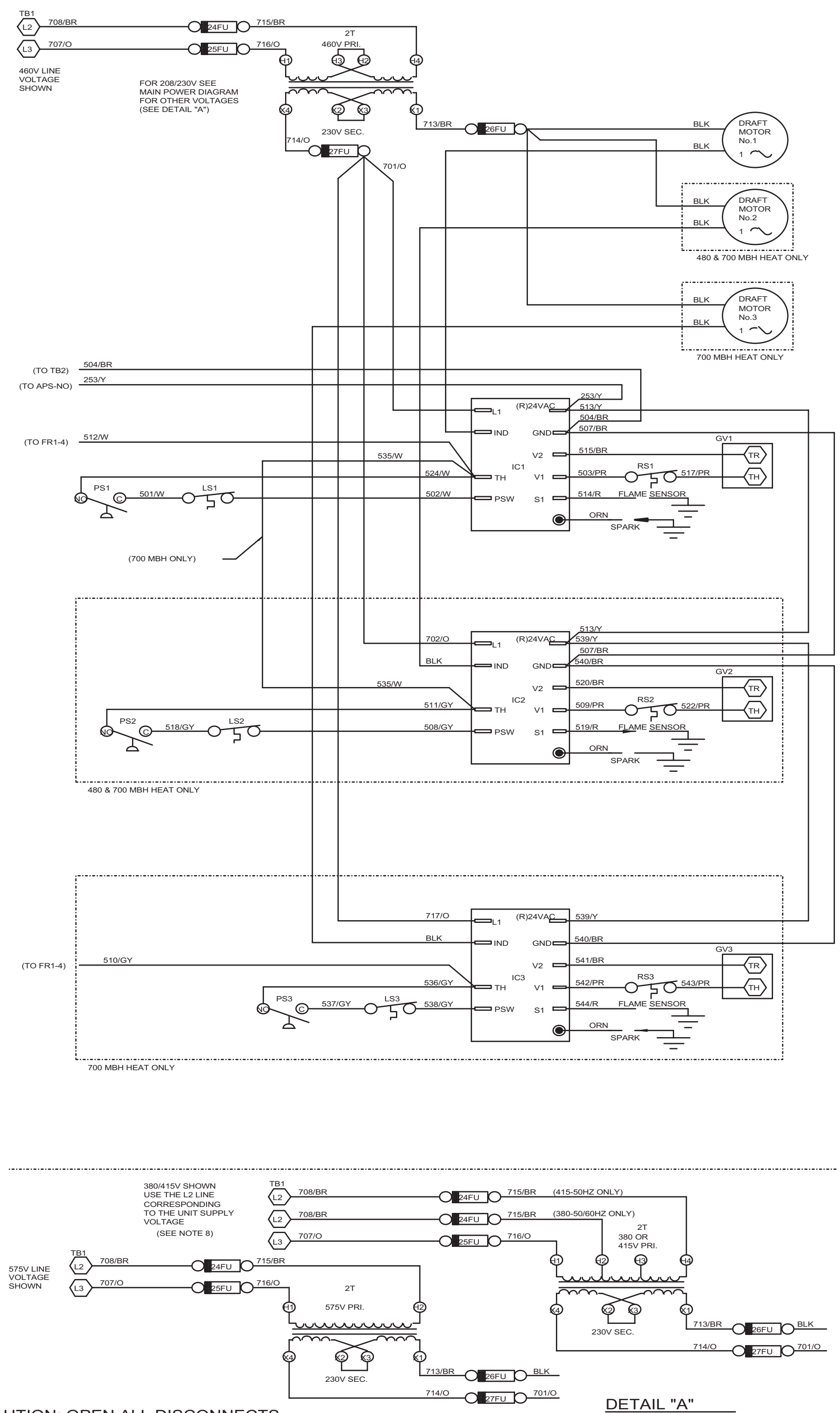


FIGURE 49 : STEAM COIL - 40 TON (1 ROW)

GAS HEAT-VAV UNIT ELEMENTARY DIAGRAM



CAUTION: OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT

035-15564D000 REV. B

FIGURE 50 : TYPICAL WIRING FOR VAV UNIT WITH GAS HEAT

LEGEND

1M	CONTACTOR, COMPRESSOR No.1
2M	CONTACTOR, COMPRESSOR No.2
3M	CONTACTOR, COMPRESSOR No.3
4M	CONTACTOR, COMPRESSOR No.4
5M	STARTER, INDOOR BLOWER
6M	CONTACTOR, CONDENSER FAN No.1
7M	CONTACTOR, CONDENSER FAN No.2
8M	CONTACTOR, CONDENSER FAN No.3
9M	CONTACTOR, CONDENSER FAN No.4
10M	STARTER, POWER EXHAUST FAN
2CB	BREAKER, CIRCUIT 20.0 AMP
1-30FU	FUSES (SEE CHART FOR AMP.)
1T	TRANSFORMER, 24V SEC.
2T	TRANSFORMER, 240V SEC. (GAS HEAT)
4T	TRANSFORMER, 120V OUTLET
5T	TRANSFORMER, ISOLATION (1:1)
ACT1	ACTUATOR, ECONOMIZER
ACT2	ACTUATOR, POWER EXHAUST DAMPERS
ACT3	ACTUATOR, INLET GUIDE VANES
APS	SWITCH, AIR PROVING
BR1	RELAY, SUPPLY FAN INTERLOCK (HEAT)
CCR	RELAY, COOLING CONTROL-NIGHT SETUP
CLO1-2	SWITCH, COOLING LOCKOUT
CM-VAV	MODULE, CONTROL
DAS	SENSOR, DISCHARGE AIR
DM	MOTOR, DRAFT FAN (GAS HEAT)
DS	SWITCH, POWER DISCONNECT
ELM	MODULE, ECONOMIZER LOGIC
FR1-2	RELAY, FAN AND HEAT CONTROL
GV1-3	GAS VALVE (GAS HEAT)
HP1-4	SWITCH, HIGH PRESSURE CONTROL
HR1	RELAY, HEATING CONTROL-NIGHT SETBACK
HR2	RELAY, LOCK-IN FOR DAY COOLING MODE
IC1-3	MODULE, IGNITION CONTROL
LOR1-2	RELAY, LOCKOUT
LOR3-6	RELAY, LOW PRESSURE LOCKOUT
LP1-4	SWITCH, LOW PRESSURE CONTROL
LS1-3	SWITCH, LIMIT (GAS HEAT)
MAT	SENSOR, MIXED AIR TEMPERATURE
MR	RELAY, INDOOR MOTOR
MWUP	SWITCH, MORNING WARM UP
PC1	CONTROL, DUCT PRESSURE
PS1-3	SWITCH, PRESSURE - MAKES @ 0.33 IWC (GH)
PS5	SWITCH, HEAD PRESSURE (FAN CYCLING/SYS.1)
PS6	SWITCH, HEAD PRESSURE (FAN CYCLING/SYS.2)
RCSPP	POTENTIOMETER, REMOTE COOLING SET POINT
RP	POTENTIOMETER, REMOTE
RS1-3	SWITCH, ROLLOUT (GAS HEAT)
RY1-2	RELAY, STAGING
SSP1	PRESSURE, BUILDING STATIC
SSP2	PRESSURE, SUPPLY AIR DUCT STATIC
SRS	SENSOR, OUTSIDE AIR RESET
TB1	TERMINAL BLOCK, MAIN POWER
TB2	TERMINAL BLOCK, 24V COMMON
TB3	TERMINAL BLOCK
TB4	TERMINAL BLOCK
TB5	TERMINAL BLOCK
TB6	TERMINAL BLOCK
TCR	RELAY, TIME CLOCK
TDR	RELAY, TIME DELAY 5 MINS a20%
VFD	VARIABLE FREQUENCY DRIVE

———————— FACTORY WIRING AND DEVICES
——— - - ——— OPTIONAL WIRING AND DEVICES
— — — — — FIELD WIRING AND DEVICES

FURNAS- OVERLOAD HEATER ELEMENT PART No.S					
	60 HZ				50HZ
MOTOR H.P.	208/230V	460V	575V	380-60HZ	380/415
7.5 HP	K67	K54	K50	K56	K54
10 HP	K70	K57	K54	K60	K58
15 HP	K74	K63	K61	K67	K64
20 HP	K77	K69	K63	K70	K70
25 HP	K83	K72	K69	K73	K73

(3 REQUIRED PER 5M OR 10M STARTER)

PRESSURE CONTROLS				
DEVICE	OPERATING PRESSURE (PSIG)			
	OPEN	+/-	CLOSE	+/-
HP1 - 4	430	10	MANUAL	
LP1 - 4	38	5	23	5
PS5	150	10	320	10

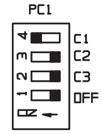
TEMPERATURE CONTROLS				
DEVICE	CONTROL SETPOINT (DEG F)			
	OPEN	+/-	CLOSE	+/-
RS1-2	200	12	---	---
LS1-2	150	5	130	7
LS1-3 700 MBH	160	6	130	9
CLO1	40	5	50	6
CLO2	0	5	10	6

CAUTION: OPEN ALL DISCONNECTS
BEFORE SERVICING THIS UNIT

NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT TIME OF INSTALLATION OF THIS UNIT.
2. CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION . IF ANY OF THE WIRE AS SUPPLIED WITH THIS UNIT MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 DEGREE C, 600 VOLT WIRE OR EQUIVALENT CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. ALL MOTORS ARE PROTECTED UNDER PRIMARY, SINGLE PHASE CONDITION, ALL CONDENSER FAN MOTORS ARE INTERNALLY PROTECTED. COMPRESSORS ARE PROTECTED BY A SOLID STATE DEVICE MOUNTED IN THE COMPRESSOR TERMINAL BOX. THE POWER EXHAUST AND SUPPLY FAN MOTORS ARE PROTECTED THROUGH THE 5M, 10M STARTERS SEE THE CHART BELOW FOR THE MANUFACTURER AND PART NUMBER OF THE OVERLOAD HEATERS.
4. SEE UNIT NAMEPLATE FOR MAXIMUM OVERCURRENT PROTECTIVE DEVICE SIZE AND MINIMUM CIRCUIT AMPACITY.
5. REMOVE FACTORY INSTALLED JUMPER (6-7) WHEN INSTALLING SPACE/O.A. RESET SENSOR AND REMOTE POTENTIOMETER.
6. REMOVE FACTORY INSTALLED JUMPER (P-P1) FOR REMOTE COOLING SETPOINT POTENTIOMETER.
7. GROUND CASE OF REMOTE SETPOINT POTENTIOMETER TO PREVENT PROBLEMS DUE TO STATIC ELECTRICITY.
8. 208/230V UNIT TRANSFORMERS ARE FACTORY WIRED FOR 230V, SEE BELOW FOR 208V
380V-60HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 380V
380/415-50HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 415V.SEE BELOW FOR 380V
FOR A 208V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
FOR A 208V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
FOR A 380V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
FOR A 380V SUPPLY, MOVE WIRE 715/BR TO TERMINAL H2 ON 2T.
FOR A 380V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
9. FACTORY SETTING FOR SSP1; PRESSURE SETPOINT IS 0.1 I.W.C., NULL SPAN IS 0.02 I.W.C.. FOR NEGATIVE BUILDING STATIC PRESSURE SETPOINT, SWAP THE HIGH/LO PRESSURE CONNECTIONS SO THAT THE HIGH PRESSURE PORT IS CONNECTED TO THE ATMOSPERE AND THE LOW PRESSURE PORT IS CONNECTED TO THE BUILDING. (CONNECT WIRE 316/W TO "SSP1-HI" AND WIRE 317/O TO SSP1-LO")
10. FACTORY SETTING FOR SSP2; PRESSURE SETPOINT IS 1.5 I.W.C., NULL SPAN IS 0.1 I.W.C..
11. SET THE A/B SWITCH ON ACT3 TO THE "B" POSITION. WHEN ECONOMIZER IS INSTALLED, SET THE L/R SWITCH ON ACT1 TO THE "R" POSITION, SET THE ELM MINIMUM POSITION POTENTIOMETER FULLY COUNTER-CLOCKWISE (0%), AND SET THE CHANGEOVER SETPOINT TO "A" FOR ALL ECONOMIZERS, EXCEPT DUAL ENTHALPY WHICH SHALL BE SET TO "D."
12. JUMPER TERMINAL Y AND 9 WITH A 510 OHM,1/4 WATT,5 PERCENT RESISTOR.
13. FOR SINGLE ENTHALPY USE 620 OHM RESISTOR ACROSS TERMINAL SR AND + ON ELM (ECONOMIZER LOGIC MODULE).
14. FOR DRY BULB CONNECT OUTSIDE AIR SENSOR TO TERMINAL SO AND +. WITH A 620 OHM RESISTOR ACROSS TERMINAL SR AND +.
15. WHEN USING THE Q769 CO2 OVERRIDE. THE CO2 SENSOR MUST BE POWERED BY AN ISOLATED TRANSFORMER.
16. FACTORY CONTROL MODULE SETPOINT IS 55ΣF, CONTROL BAND 4ΣF.
17. MORNING WARM UP SWITCH FACTORY SET @ 70ΣF, 10Σ DIFFERENTIAL.
18. ON TB4 TERMINAL "S" IS FACTORY WIRED TO PROVIDE A 0-10 VDC (WITH RESPECT TO EARTH GROUNDED TERMINAL C) SPEED SIGNAL. FOR A 0-20 mA OUTPUT, MOVE 403/BL FROM PC1 TERMINAL "V" TO TERMINAL "I" AND ADJUST THE MININUM OUTPUT POTENTIOMETER AS NECCESSARY.
19. PC1 IS FACTORY CONFIGURED: 1.5" SETPOINT, 3 MINUTE INTEGRATION, REVERSE ACTING, MINIMUM OUTPUT POTENTIOMETER TO 2 VOLTS, THROTTLING RANGE POTENTIOMETER FULL COUNTER-CLOCKWISE.

PC1



INTEGRATION DIP SWITCH POSITIONS

FUSE SIZE (AMPS)**SEE NOTE 4**							
60 HZ						50HZ	
FUSE	HP	208/230V	460V	575V	380V	380/415	CLASS
1-12FU	--	50	25	20	35	25	RK-5
13-15FU	10	45	20	15	25	20	RK-5
" "	15	70	30	25	35	35	RK-5
" "	20	80	40	30	45	45	RK-5
" "	25	100	50	40	60	60	RK-5
16-18FU(30TON)	--	15	8	8	12	8	RK-5
16-18FU(40TON)	--	25	12	8	15	12	RK-5
19-21FU	7.5	35	15	15	20	20	RK-5
" "	10	45	20	15	25	20	RK-5
" "	15	70	30	25	35	35	RK-5
22-23FU	--	3	1.5	1.5	1.5	1.5	CC-600V
24-25FU	--	4	3	2.5	3	3	CC-600V
28-29FU	--	30	15				CC-600V
26-27FU	--	3 (250V)					*SPL1
30FU	--	10 (250V)					*SPL2

ALL CLASS RK-5 FUSES ARE RATED AT 250V FOR 208/230V UNITS AND AT 600VAC FOR ALL OTHER VOLTAGES.
ALL CLASS CC FUSES ARE RATED AT 600VAC
*SPL2- REPLACE 30FU (10A, 250V) WITH BUSSMAN MDL10, GOULD SHAWNUT GDL10
*SPL1- REPLACE 26-27FU (3A, 250V) WITH BUSSMAN MDL3, GOULD SHAWNUT GDL3, LITTLEFUSE 313003

FIGURE 51 : LEGEND FOR VAV UNITS

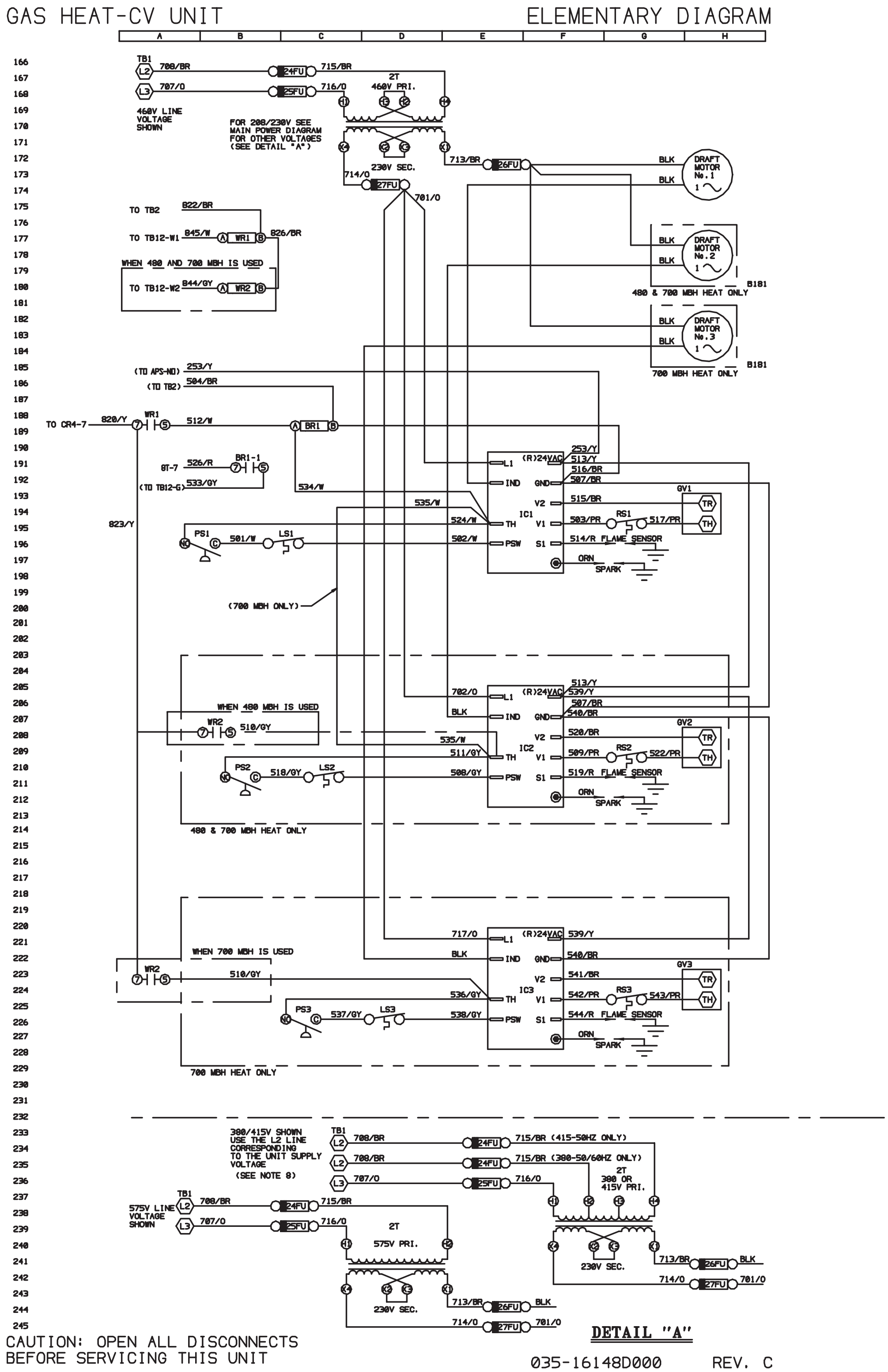


FIGURE 52 : TYPICAL WIRING FOR CV UNIT w/ GAS HEAT

CV UNIT

LEGEND

1M CONTACTOR, COMPRESSOR No.1
2M CONTACTOR, COMPRESSOR No.2
3M CONTACTOR, COMPRESSOR No.3
4M CONTACTOR, COMPRESSOR No.4
5M STARTER, INDOOR BLOWER
6M CONTACTOR, CONDENSER FAN No.1
7M CONTACTOR, CONDENSER FAN No.2
8M CONTACTOR, CONDENSER FAN No.3
9M CONTACTOR, CONDENSER FAN No.4
10M STARTER, POWER EXHAUST FAN
2CB BREAKER, CIRCUIT 20.0 AMP
1-30FU FUSES (SEE CHART FOR AMP.)
1T TRANSFORMER, 24V SEC.
2T TRANSFORMER, 240V SEC. (GAS HEAT)
4T TRANSFORMER, 120V OUTLET
6T TRANSFORMER, HEAD PRESSURE CONTROL
7T TRANSFORMER, 2KVA
8T TRANSFORMER, 24V TO 24V
ACT1 ACTUATOR, ECONOMIZER
ACT2 ACTUATOR, POWER EXHAUST DAMPERS
APS SWITCH, AIR PROVING
BR1 RELAY, SUPPLY FAN INTERLOCK (HEAT)
CLO1 SWITCH, COOLING LOCKOUT 40° F
CLO2 SWITCH, COOLING LOCKOUT 0° F
CM MODULE, CONTROL
CR1 RELAY, CONTROL COOLING
CR2 RELAY, CONTROL COOLING
CR3 RELAY, CONTROL COOLING
CR4 RELAY, CONTROL COOLING
DM MOTOR, DRAFT FAN (GAS HEAT)
DS SWITCH, POWER DISCONNECT
ELM MODULE, ECONOMIZER LOGIC
GV1-3 GAS VALVE (GAS HEAT)
HP1-4 SWITCH, HIGH PRESSURE CONTROL
IC1-3 MODULE, IGNITION CONTROL (GAS HEAT)
LOR1-2 RELAY, LOW AMBIENT LOCKOUT
LOR3-6 RELAY, LOW PRESSURE LOCKOUT
LP1-4 SWITCH, LOW PRESSURE CONTROL
LS1-3 SWITCH, LIMIT (GAS HEAT)
MAT SENSOR, MIXED AIR TEMPERATURE
MR RELAY, BLOWER MOTOR
OL OVERLOAD (SEE CHART FOR DESIGNATIONS)
OR RELAY, ECONOMIZER
PS1-3 SWITCH, PRESSURE MAKES @ .33 I.W.C. MAX. (GAS HEAT)
PISC PROPORTIONAL INTEGRAL SEQUENCE CONTROLLER
PS5 SWITCH, HEAD PRESSURE (FAN CYCLING SYS.1)
PS6 SWITCH, HEAD PRESSURE (FAN CYCLING SYS.2)
PT1-2 TRANSDUCER, PRESSURE
RS1-3 SWITCH, ROLLOUT (GAS HEAT)
RY1-2 RELAY, STAGING
SSP1 PRESSURE, BUILDING STATIC
TB1 TERMINAL BLOCK, MAIN POWER
TB2 TERMINAL BLOCK, 24V COMMON
TB6 TERMINAL BLOCK
TB7-8 TERMINAL BLOCK HEAD PRESSURE CONTROL
TB9 TERMINAL GROUNDING
TB10 TERMINAL BLOCK
TB12 TERMINAL BLOCK, THERMOSTAT
TDR1 RELAY, TIME DELAY MAKE @ 8-12 MIN, BREAK @ 2-4 MIN
TH1 SWITCH, TEMPERATURE SET @ 55 F DEG, CLOSE ON RISE
TR RELAY, AUTO FAN POST PURGE (GAS HEAT OPTION)
WR1 RELAY, CONTROL HEAT
WR2 RELAY, CONTROL HEAT
VFDC VARIABLE FREQUENCY DRIVE CONTROL HEAD PRESSURE

FACTORY WIRING AND DEVICES
OPTIONAL WIRING AND DEVICES
FIELD WIRING AND DEVICES

FUSE SIZE (AMPS)**SEE NOTE 4**							
	60 HZ					50HZ	
FUSE	HP	208/ 230V	460V	575V	380V	380/ 415	CLASS
1-12FU	--	50	25	20	35	25	RK-5
13-15FU	10	45	20	15	25	20	RK-5
" "	15	70	30	25	35	35	RK-5
" "	20	80	40	30	45	45	RK-5
" "	25	100	50	40	60	60	RK-5
16-18FU(30TON)	--	15	8	8	12	8	RK-5
16-18FU(40TON)	--	25	12	8	15	12	RK-5
19-21FU	7.5	35	15	15	20	20	RK-5
" "	10	45	20	15	25	20	RK-5
" "	15	70	30	25	35	35	RK-5
22-23FU	--	3	1.5	1.5	1.5	1.5	CC-600V
24-25FU	--	4	3	2.5	3	3	CC-600V
28-29FU	--	30	15				CC-600V
26-27FU	--	3 (250V)					*SPL1
30FU	--	10 (250V)					*SPL2

CAUTION: OPEN ALL DISCONNECTS
BEFORE SERVICING THIS UNIT

NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT TIME OF INSTALLATION OF THIS UNIT.
2. CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION . IF ANY OF THE WIRE AS SUPPLIED WITH THIS UNIT MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 DEGREE C, 600 VOLT WIRE OR EQUIVALENT CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. ALL MOTORS ARE PROTECTED UNDER PRIMARY, SINGLE PHASE CONDITION, ALL CONDENSER FAN MOTORS ARE INTERNALLY PROTECTED. COMPRESSORS ARE PROTECTED BY A SOLID STATE DEVICE MOUNTED IN THE COMPRESSOR TERMINAL BOX. THE POWER EXHAUST AND SUPPLY FAN MOTORS ARE PROTECTED THROUGH THE 5M, 10M STARTERS SEE THE CHART BELOW FOR THE MANUFACTURER AND PART NUMBER OF THE OVERLOAD HEATERS.
4. SEE UNIT NAMEPLATE FOR MAXIMUM OVERCURRENT PROTECTIVE DEVICE SIZE AND MINIMUM CIRCUIT AMPACITY.
5. REMOVE JUMPER J3 (P-P1) WHEN USING THE Q769 CO2 OVERRIDE. THE CO2 SENSOR MUST BE POWERED BY AN ISOLATED TRANSFORMER.
6. FOR SINGLE ENTHALPY USE 620 OHM RESISTOR ACROSS SR AND +.
7. FOR DRY BULB CONNECT TO SO AND + WITH 620 OHM RESISTOR ACROSS SR AND +.
8. 208/230V UNIT TRANSFORMERS ARE FACTORY WIRED FOR 230V, SEE BELOW FOR 208V
   380V-60HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 380V
   380/415-50HZ UNIT TRANSFORMERS ARE FACTORY WIRED FOR 415V.SEE BELOW FOR 380V
   FOR A 208V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
   FOR A 208V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
   FOR A 380V SUPPLY, MOVE WIRE 132/R TO TERMINAL H2 ON 1T.
   FOR A 380V SUPPLY, MOVE WIRE 715/BR TO TERMINAL H2 ON 2T.
   FOR A 380V SUPPLY, MOVE WIRE 710/R TO TERMINAL H2 ON 4T.
9. FACTORY SETTING FOR SSP1; PRESSURE SETPOINT IS 0.1 I.W.C., NULL SPAN IS .02 I.W.C.. FOR NEGATIVE BUILDING STATIC PRESSURE SETPOINT, SWAP THE LOW/HIGH PRESSURE CONNECTIONS SO THAT THE HIGH PRESSURE PORT IS CONNECTED TO THE ATMOSPERE AND THE LOW PRESSURE PORT IS CONNECTED TO THE BUILDING. (CONNECT WIRE 316/W TO "SSP1-HI" AND 317/O TO "SSP1-LO")
11. WHEN ECONOMIZER IS INSTALLED, SET THE L/R SWITCH ON ACT1 TO THE "R" POSITION. WHEN POWER EXHAUST IS INSTALLED, SET THE L/R SWITCH ON ACT2 TO THE "R" POSITION, SET THE ELM MINIMUM POSITION POTENTIOMETER FULLY COUNTER-CLOCKWISE (0%), AND SET THE CHANGEOVER SETPOINT TO "A" FOR ALL ECONOMIZERS, EXCEPT DUAL ENTHALPY WHICH SHALL BE SET TO "D."
12. REMOVE WIRE 319/BL WHEN HEAD PRESSURE CONTROL OPTION IS INSTALLED.

FURNAS- OVERLOAD HEATER ELEMENT PART No.S					
	60 HZ				50HZ
MOTOR H.P.	208/ 230V	460V	575V	380- 60HZ	380/ 415
7.5 HP	K67	K54	K50	K56	K54
10 HP	K70	K57	K54	K60	K58
15 HP	K74	K63	K61	K67	K64
20 HP	K77	K69	K63	K70	K70
25 HP	K83	K72	K69	K73	K73

(3 REQUIRED PER 5M OR 10M STARTER)

TEMPERATURE CONTROLS				
DEVICE	CONTROL SETPOINT (DEG F)			
	OPEN	+/-	CLOSE	+/-
RS1-2	200	12	---	---
LS1-2	150	5	130	7
LS1-3 700 MBH	160	6	130	9
CLO1	40	5	50	6
CLO2	0	5	10	6

PRESSURE CONTROLS				
DEVICE	OPERATING PRESSURE (PSIG)			
	OPEN	+/-	CLOSE	+/-
HP1 - 4	430	10	MANUAL	
LP1 - 4	38	5	23	5
PS5	180	10	320	10

ALL CLASS RK-5 FUSES ARE RATED AT 250V FOR 208/230V UNITS AND AT 600VAC FOR ALL OTHER VOLTAGES.
ALL CLASS CC FUSES ARE RATED AT 600VAC
*SPL2- REPLACE 30FU (10A, 250V) WITH BUSSMAN MDL10, GOULD SHAWNUT GDL10
*SPL1- REPLACE 26-27FU (3A, 250V) WITH BUSSMAN MDL3, GOULD SHAWNUT GDL3, LITTLEFUSE 313003

035-16113D000 REV. B

FIGURE 53 : LEGEND FOR CV UNIT

GAS FURNACE SAFETY FEATURES

COMBUSTION AIR PROVING

Combustion air proving is provided by a pressure switch. As the motor approaches full speed, this switch closes before any other circuit or gas component can be energized.

ROLLOUT

Rollout protection is provided by a switch mounted on the heat shield of each furnace module. The switch senses any flame or excessive heat in the burner compartment. When the switch opens, the furnace module is immediately locked out until there is a break in power to the specific furnace module and the manual itch is reset. Note that only the module with the open rollout switch will be locked out, the remaining modules will continue to operate although all should be inspected.

A trip of the rollout switch likely indicates a flue restriction, an opening in the flue passageway, defective pressure switch or a loose combustion blower wheel. Corrective action should be taken accordingly.

MAINTENANCE

NORMAL MAINTENANCE

⚠ CAUTION

PRIOR TO ANY OF THE FOLLOWING MAINTENANCE PROCEDURES, SHUT OFF ALL POWER TO THE UNIT. FAILURE TO DO SO COULD CAUSE PERSONAL INJURY.

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. VERIFY PROPER OPERATION AFTER SERVICING.

Periodic maintenance normally consists of changing or cleaning filters and (under some conditions) cleaning the main burners.

FILTERS

Inspect once a month. Replace disposable or clean permanent type as necessary. The dimensional size of the replacement filter must be the same as the replaced filter (Refer to Table 9).

MOTORS

Outdoor fan motors are permanently lubricated and require no maintenance. Lubrication, if desired, is to be performed by a qualified service agency.

Ventor motors are factory lubricated for an estimated 10-year life.

Indoor Fan Motors - The indoor blower motor features ball-bearings that do not require periodic lubrication. Periodic lubrication of the motor bearings can extend the life but is optional.

⚠ CAUTION

DAMAGE CAN OCCUR IF THE BEARINGS ARE OVER LUBRICATED. USE GREASE SPARINGLY.

⚠ WARNING

PERFORM ALL MAINTENANCE OPERATIONS ON THE BLOWER MOTOR WITH POWER DISCONNECTED FROM THE UNIT. DO NOT ATTEMPT TO LUBRICATE BEARINGS WITH THE UNIT IN OPERATION.

TABLE 56: INDOOR BLOWER BEARING LUBRICATION SCHEDUALE

haft Size (Inches	Operating Speed (RPM)			
	500	1000	1500	2000
	Relubrication Cycle (Months)			
1-1/16 - 1-7/16	6	6	6	6
1-1/2 - 1-3/4	6	6	6	4
1-7/8 - 2-3/16	6	6	4	4
2 -1/4 - 3	6	4	4	2

On an annual basis, check the motor for accumulations of dust, etc. That may block the cooling slots in the motor shell. Check for loose, damaged or misaligned drive components.

Check that all mounting bolts are tight. Replace defective parts as required.

If desired, every three years remove both pipe plugs at each end shell and clean out any hardened grease or foreign matter. Replace one plug on each end with a clean grease fitting. Using a low pressure grease gun, pump grease (Chevron SRI-2 or equivalent) into the bearing cavity until new grease shows at the open port. Do not over-lubricate. Run the motor for ten minutes until excess grease is purged from the cavity. Replace the plugs.

FAN DRIVES

Units are supplied with fan shaft bearings that do not require maintenance but may be relubricated per Table 56.

Lubricate with a premium quality NLGI 2 grade multi-purpose roller bearing grease having corrosion inhibitors, anti-oxidant additives and mechanical stability for high speed operation. The grease should also have a minimum base oil viscosity of 500 SUS at 100°F. Do not use a heavy, long fibered grease.

The presents of dirt, moisture or chemical fumes around the bearings requires more frequent lubrication.

Fill bearings with lubricant prior to extended shutdown or storage. Rotate the shaft monthly during idle periods.

Avoid excessive grease purging from seals during lubrication, this reduces the life of the bearing.

OUTDOOR COIL

Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean coil, be sure power to the unit is shut off prior to cleaning.

NOTE: Exercise care when cleaning the coil so that the coil fins are not damaged.

Do not permit the hot condenser air discharge to be obstructed by overhanging structures or shrubs.

GAS BURNER

Periodically (at least annually at the beginning of each heating season) make a visual check of the main burner flame. If necessary, adjust main burner primary air shutters to give a distinct, sharp blue flame as explained under BURNER INSTRUCTIONS.

TO CLEAN BURNERS

Remove them from the furnace as explained in BURNER INSTRUCTIONS. Clean burners with hot water applied along top of the burner.

COMBUSTION AIR DISCHARGE

Visually inspect discharge outlet periodically to make sure that the buildup of soot and dirt is not excessive. If necessary, clean to maintain adequate combustion air discharge.

CLEANING FLUE PASSAGES AND HEATING ELEMENTS

With proper combustion adjustment, the heating element of a gas fired furnace will seldom need cleaning. If the element should become sooted, it can be cleaned as follows:

1. Remove the burner assembly as outlined in BURNER INSTRUCTIONS.
2. Remove the screws holding the top of the flue collector box. Carefully remove the top of the flue collector box. The draft wheel, housing, and draft motor can remain assembled to the flue box top, if cleaning of these components is not required.
3. This will provide access to flue baffles, then remove the flue baffles from the tube interiors. To remove, the flue baffles, remove the stainless steel screws from the vest panel. Refer to Figure 54.
4. Using a wire brush on a flexible wand, brush out the inside of each heat exchanger from the burner inlet and flue outlet ends.
5. Brush out the inside of the flue collector box, and the flue baffles.
6. Run the wire brush down the vent hoods from the flue collector end.
7. If soot build-up is particularly bad, remove the vent motor and clean the wheels and housings. Run the wire brush down the flue extension at the outlet of the vent housings.
8. After brushing is complete, blow all brushed areas with air or nitrogen. Vacuum as needed.
9. Replace parts in the order they were moved in steps 1 to 4.
10. Assure that all seams on the vent side of the combustion systems are air tight. Apply a high temperature (+500°F) sealing compound where needed (Dow Corning, Silastic 736, Loctite Superflex 596 or equivalent).

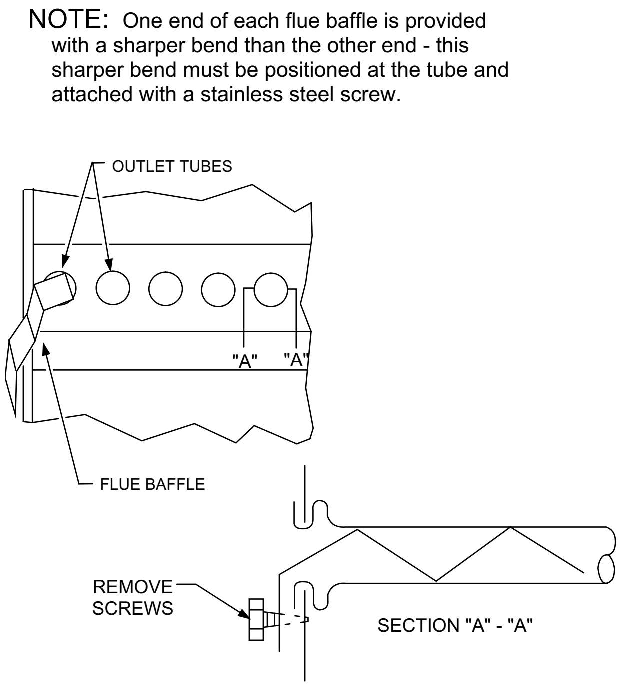


FIGURE 54 : TYPICAL FLUE BAFFLE

The restrictor plate must also be sealed to furnace tube sheet.

SECURE OWNERS APPROVAL

When the system is functioning properly, secure the owner's approval. Show him the location of all disconnect switches and the room temperature sensors. Teach him how to start and stop the unit and how to adjust the temperature settings within the limitations of the system.

REPLACEMENT PARTS

A list of replacement parts may be found in the York Publication, York Millennium Rooftops (Form 530.70-RP1Y).

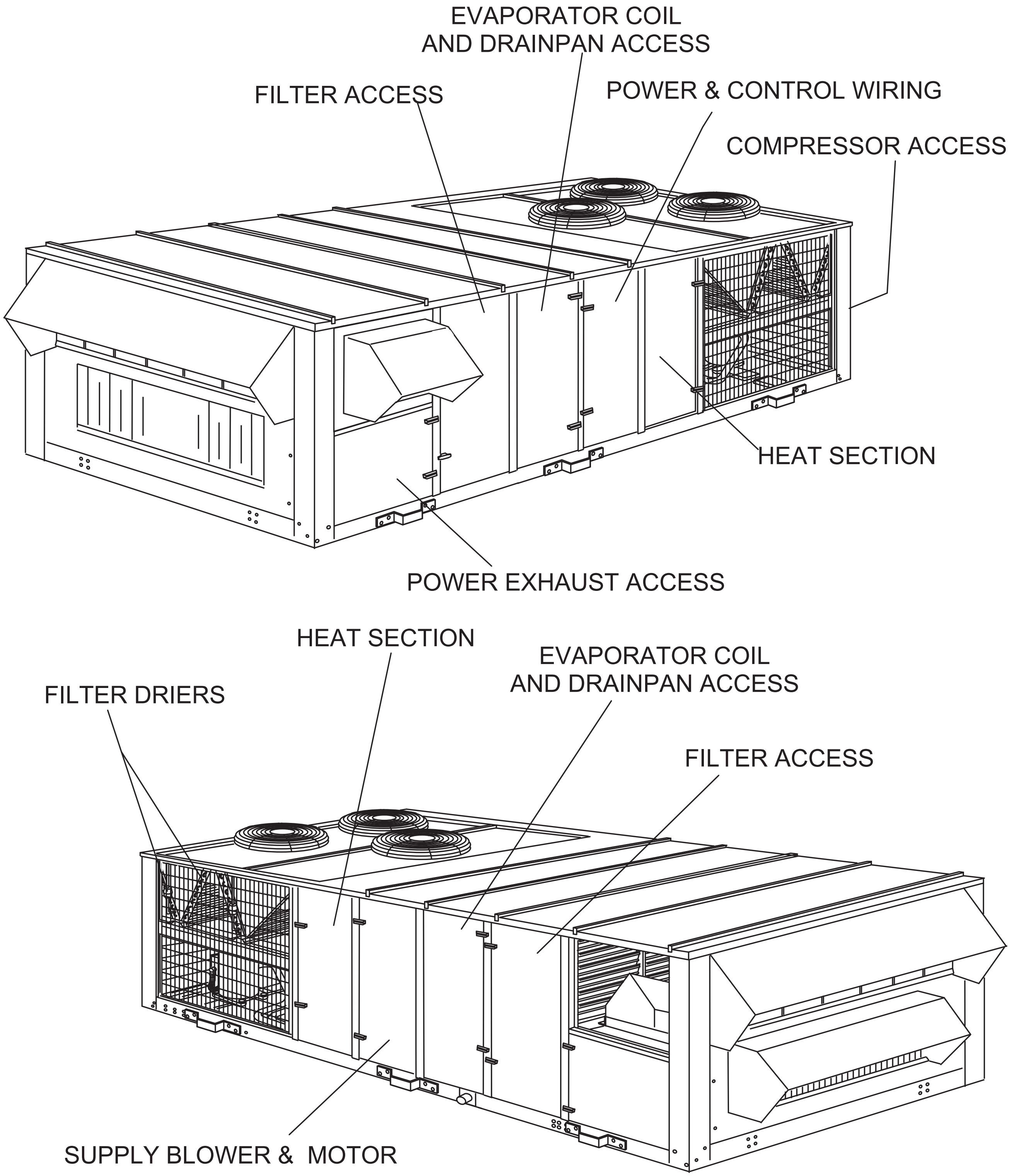


FIGURE 55 : COMPONENT LOCATION

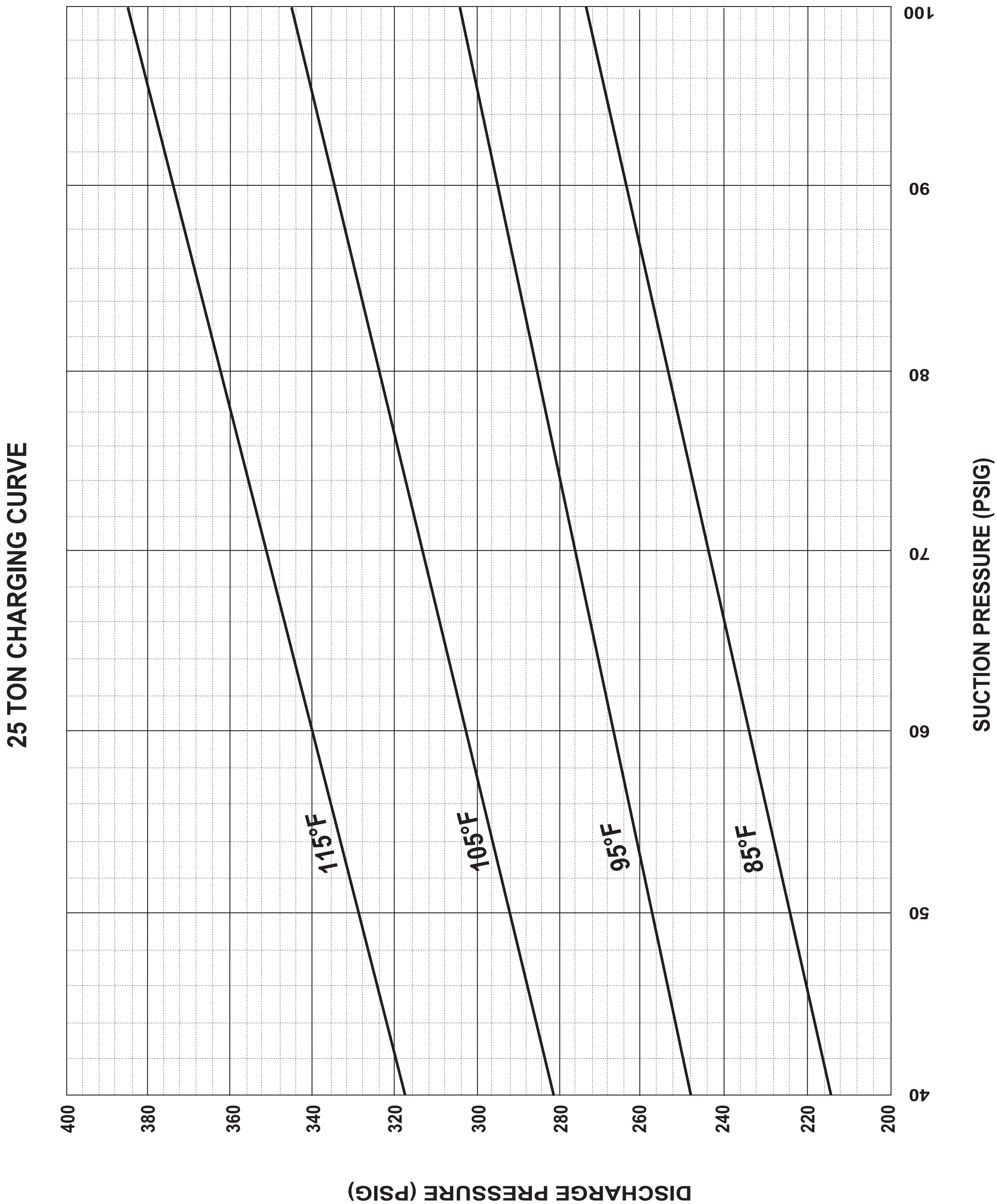


Figure 56: 25 TON CHARGING CURVE

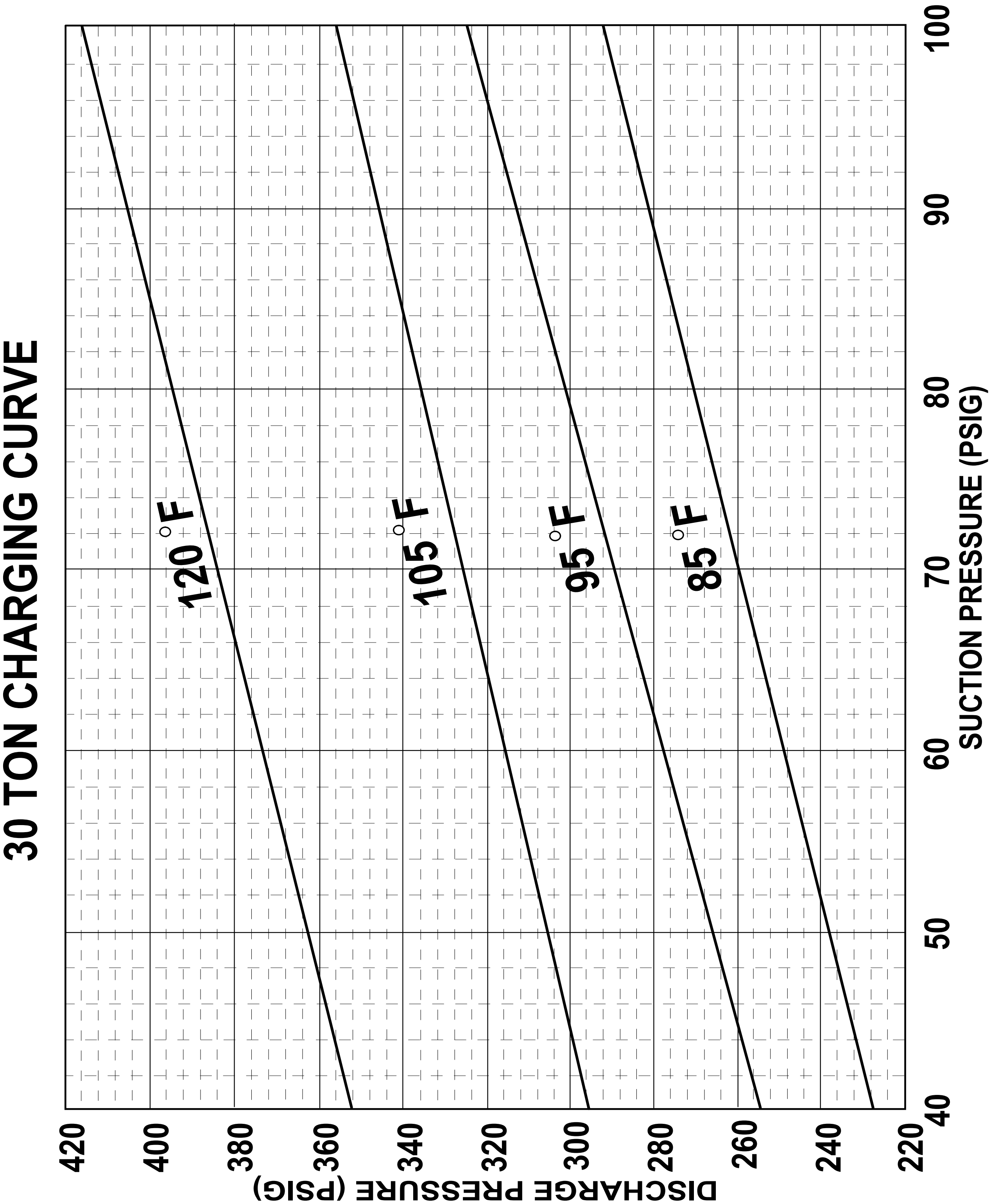


FIGURE 57 : 30 TON CHARGING CHART

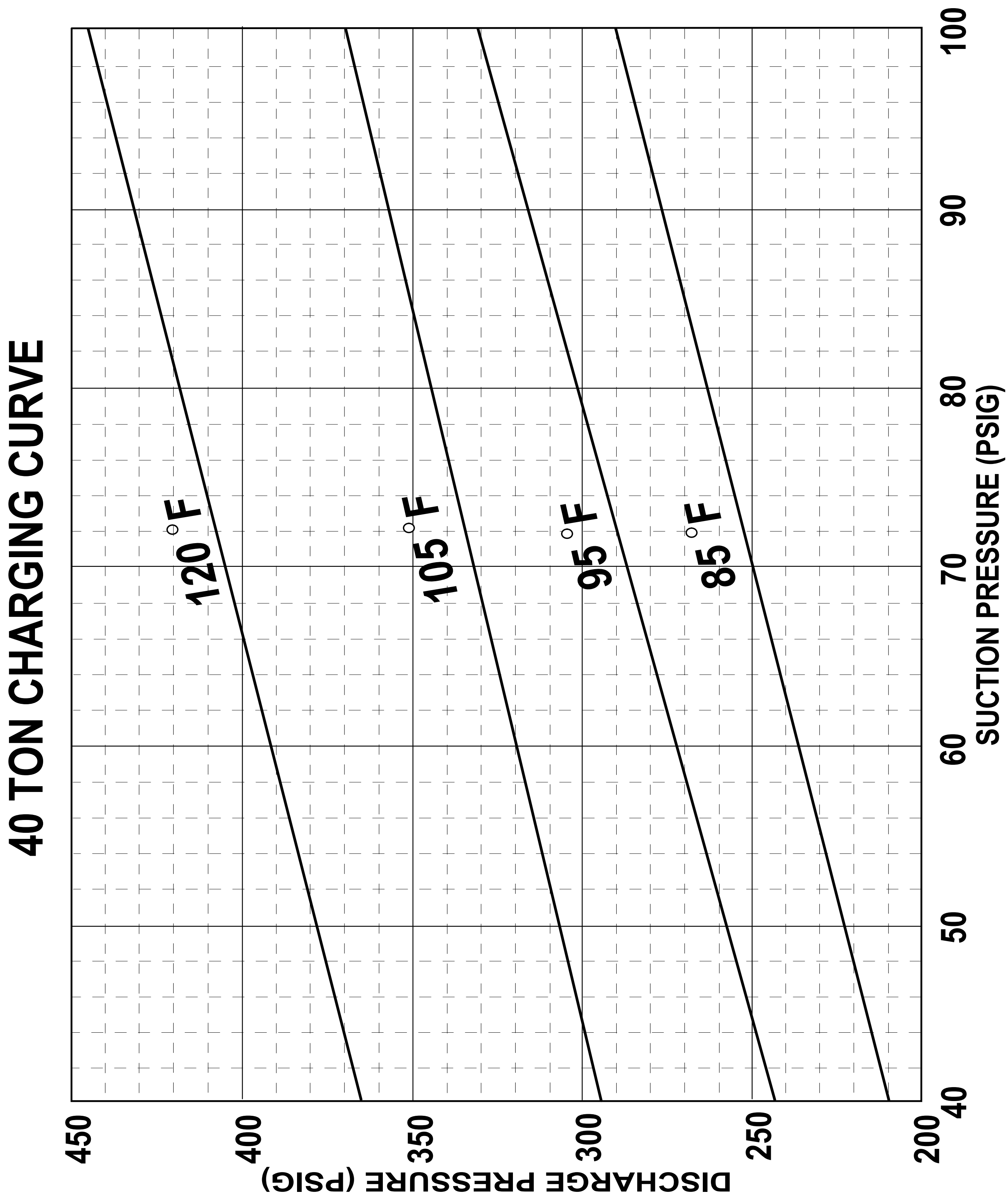


FIGURE 58 : 40 TON CHARGING CURVE

PRESSURE DROP ACROSS A DRY EVAPORATOR COIL VS SUPPLY AIR CFM

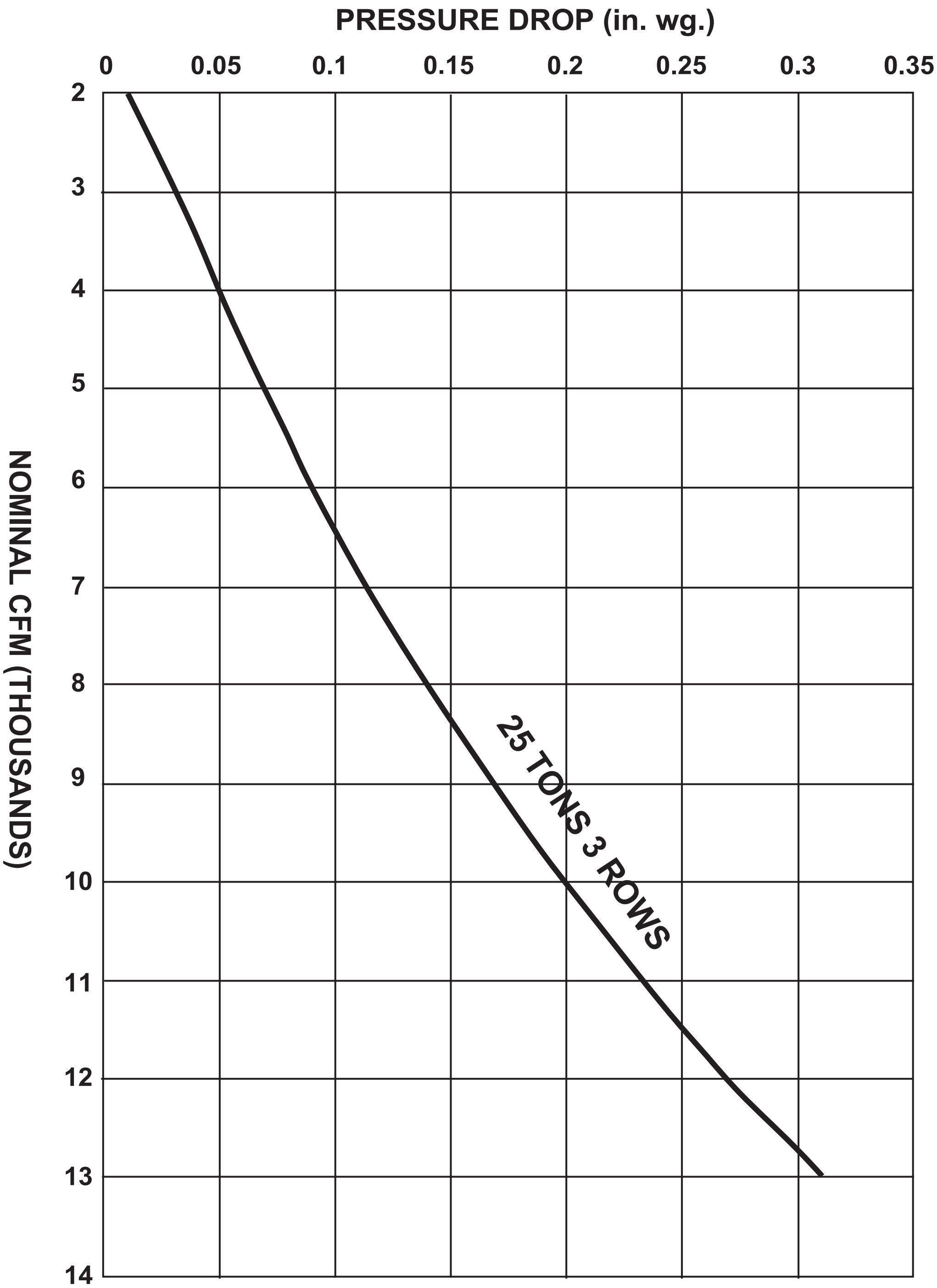


FIGURE 59 : PRESSURE DROP DRY EVAPORATOR COIL VS SUPPLY AIR CFM - 25 TON

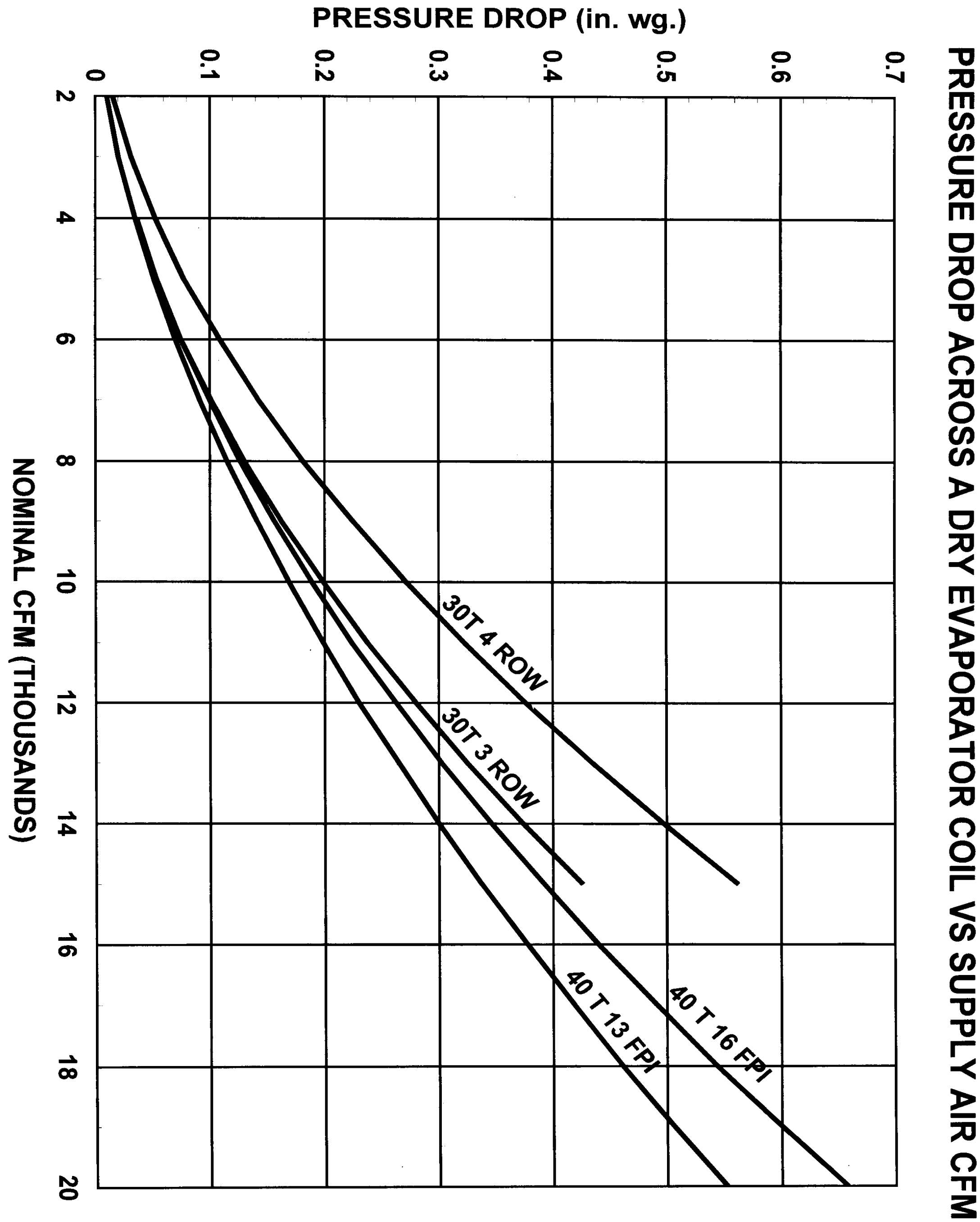


FIGURE 60 : PRESSURE DROP DRY EVAPORATOR COIL VS SUPPLY AIR CFM - 30 & 40 TON

Supersedes: 530.70-N1Y(599)

Unitary Products Group
5005 York Drive
Norman OK 73069