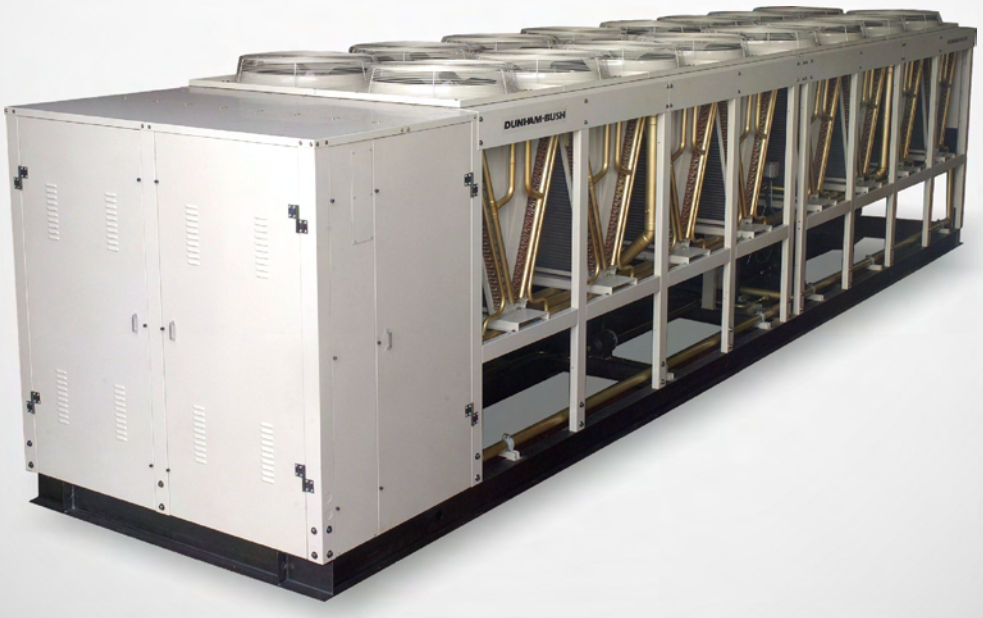
AFVX Series

Air Cooled Screw Flooded Chillers

Cooling Capacity: 85 to 521 Tons (299 to 1832 kW)



50Hz

R134a

DUNHAM-BUSH

Products that perform...By people who care

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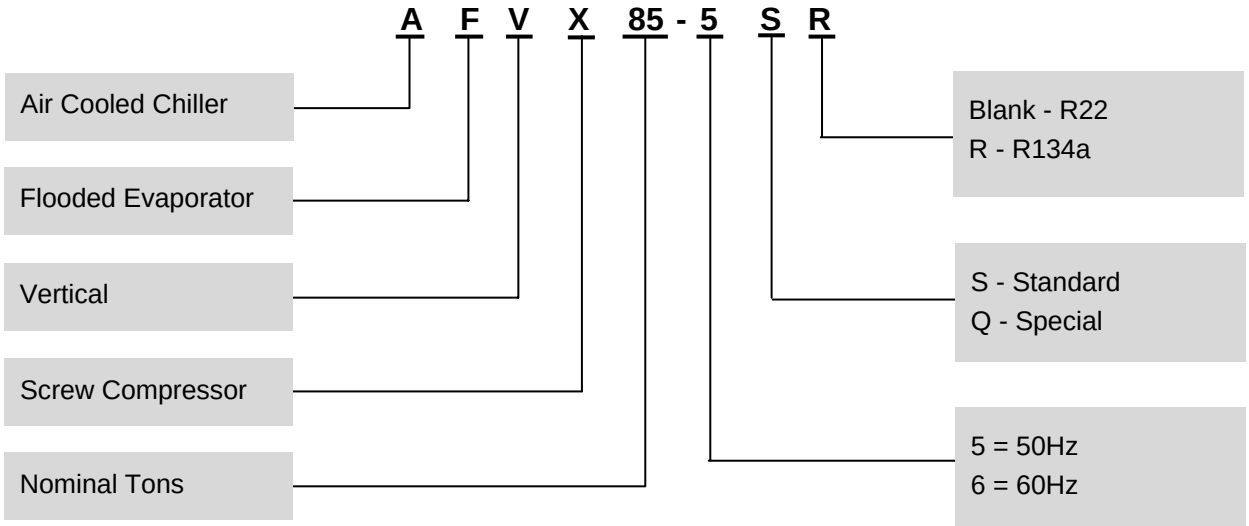
INTRODUCTION

The Dunham-Bush name is synonymous worldwide with the Rotary Screw Compressor Chillers technology; with almost 40 years of proven experience and track records in manufacturing and installation of Rotary Screw Compressors and chillers. There is no doubt that many of our major competitors who initially specialized in the manufacturing of high maintenance cost centrifugal compressor chillers are now producing Rotary Screw Chillers. Today, thousands of Dunham-Bush Rotary Screw Compressor chillers have clocked more than 100,000 operating hours without any compressor tear-out or overhaul!

As a pioneer and industry leader in the Rotary Screw compressor technology for refrigeration systems, Dunham-Bush now introduces the Air Cooled Screw Flooded Chillers with unsurpassed performance and reliability.

NOMENCLATURE



ADVANTAGES OF FLOODED CHILLER

In a flooded evaporator the refrigerant surrounds the tubes in the shell and the water to be cooled flows through the tubes. The level of liquid refrigerant in the shell is maintained by the combined action of an electronic level controller and a mod-motor actuated ball valve which modulates the subcooled liquid refrigerant into the evaporator. Thus ensure that all the evaporator tubes are completely immersed in the liquid refrigerant for better heat transfer efficiency.

For a Direct Expansion (DX) evaporator the refrigerant is expanded into the tubes while the chilled water is circulated through the shell. Thermostatic expansion valve is used to throttle the refrigerant in maintaining constant superheat of suction gas to the compressor.

The following are the advantages of using flooded chiller:

1. Higher Capacity and Higher EER Achievable with the Same Compressor

The flooded evaporator with all the copper tubes immersed in the "boiling" liquid refrigerant enable a small approach temperature between the "boiling" liquid refrigerant temperature in the shell and the outlet chilled water temperature in the evaporator tubes to be achieved. This approach temperature or temperature difference between the evaporating temperature of the boiling liquid refrigerant and the chilled water outlet temperature, for a flooded evaporator, is typically less than 3°F.

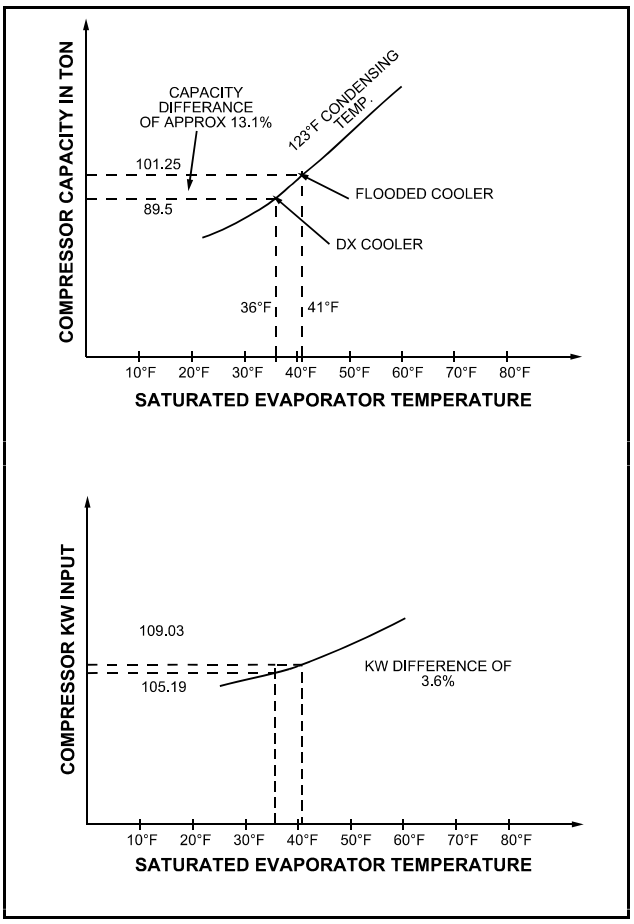
On the contrary, for a DX or Direct Expansion Evaporator, the typical approach temperature is between 8°F to 10°F. This simply means that for the same compressor in a flooded evaporator system will operate at a higher saturated evaporating temperature when compare to the same compressor in a DX-Evaporator system, when outlet chilled water temperatures in both cases are set at the same temperature.

Figure 1 shows the typical Dunham-Bush screw compressor capacity performance curve at a particular condensing temperature over saturated evaporating temperature of between 30°F to 50°F, and the typical power input curve over the same conditions. It can be noted that the same compressor when operating with a flooded evaporator will generates approximately 13.1% more cooling capacity while kW input increases negligibly of less than 3.6%. Therefore, same compressor when coupled to a flooded evaporator will typically achieve higher cooling capacity performance with correspondingly higher Energy Efficiency Ratio (EER) or (Btu/watt) or lower kW/Ton.

DX evaporator uses TXV throttling to maintain about 10 to 15°F suction superheat to prevent liquid flood back to compressor. In a flooded evaporator, the refrigerant boils off in the shell and gas only can be sucked out from the top of evaporator back to compressor. The suction superheat is usually about 3 to 5°F. Reduction in suction superheat will further increase the capacity performance of the compressor.

DX evaporators are typically designed with higher tube velocities to ensure proper oil return to compressor both at full load and at reduced load. This will contribute to higher refrigerant pressure drop through the evaporator. On the contrary, there is very little shell side pressure losses for a flooded evaporator. Therefore, lower suction pressure drop in flooded design will impose less capacity penalty on the compressor and this further enable the compressor in a flooded evaporator to general more capacity than one in a DX Evaporator.

FIGURE 1



ADVANTAGES OF FLOODED CHILLER

2. Better Part Load Performance

The Dunham-Bush Air Cooled Flooded Chiller with its sophisticated microcomputer control and patented oil management system ensure all evaporator tubes are completely immersed in the "boiling" liquid refrigerant to achieve superior heat transfer efficiency while ensuring adequate oil return to the compressor(s). This ensures superior full-load efficiency and even better part-load efficiency as the full heat transfer surface areas of the evaporator tubes are utilized even at part-load conditions. On the contrary, in the direct expansion evaporator, because of the need to maintain adequate refrigerant gas velocities in the evaporator tubes for proper oil return, it is typical for certain bundle of evaporator tubes to be "blocked" or "baffled off" at part-load conditions. Thus not utilizing the full-load transfer surface areas of the evaporator tubes and therefore lower efficiency when compare with flooded evaporator chiller at part-load conditions.

3. Flash Economizer/ Vapor Injection Cycle for Increase Capacity and Higher EER

The renowned Dunham-Bush vertical screw compressor allows for **flash economizer vapor injection cycle** to be incorporated, **increasing** capacity by as much as **25% with marginal 10% to 15% increase in kw-input.** Most of Dunham-Bush's competitors who produce Rotary Screw Chillers do not incorporate flash-economizer vapor injection cycle – not to mention flooded evaporator!

4. Excellent Capacity Modulation in Response to Building Loads

Dunham-Bush utilizes its state-of-the-art Vision 2020i microcomputer controller in combination with the electronic level controller and mod-motor actuated ball valve to ensure instantaneous and precise feeding of liquid refrigerant to the flooded evaporator in response to changes in building loads demand; and maintains precise (±1/2°F) preset outlet chilled water temperatures even at very low load conditions; whereas most of Dunham-Bush's competitors, in screw chillers, still utilizes the conventional "centrifugal chiller" method of using orifice plates to modulate refrigerant feed to the evaporator; and as such their machines does at function efficiently at low-load conditions and can encounter oil return problem!

5. Maximum Reliability and Redundancy

Today, the Dunham-Bush vertical screw compressors are increasingly accepted for its reliability. The 2-compressor, 3-compressor and 4-compressor models are designed to have 2 independent refrigerant circuits for redundancy. For the refrigerant circuits with 2-compressors (i.e. 3-compressor and 4-compressor models), individual compressor is provided with suction stop valve, suction check valve, discharge check valve and other isolating valves in the oil management system to allow complete isolation of an unlikely faulty compressor without contaminating the refrigerant system and further allows other compressors to continue to operate - thus ensuring maximum redundancy

6. Cleanable Evaporator

For single pass evaporator, the end plates at both ends of the water boxes (for 2 pass only at return ends) can be removed easily without dismantling the chilled water piping connections, for inspection and for mechanical tubes cleaning with brushes or auto-brush. This will enable low tube fouling factor in the evaporator to be maintained, thus maintaining system efficiency.

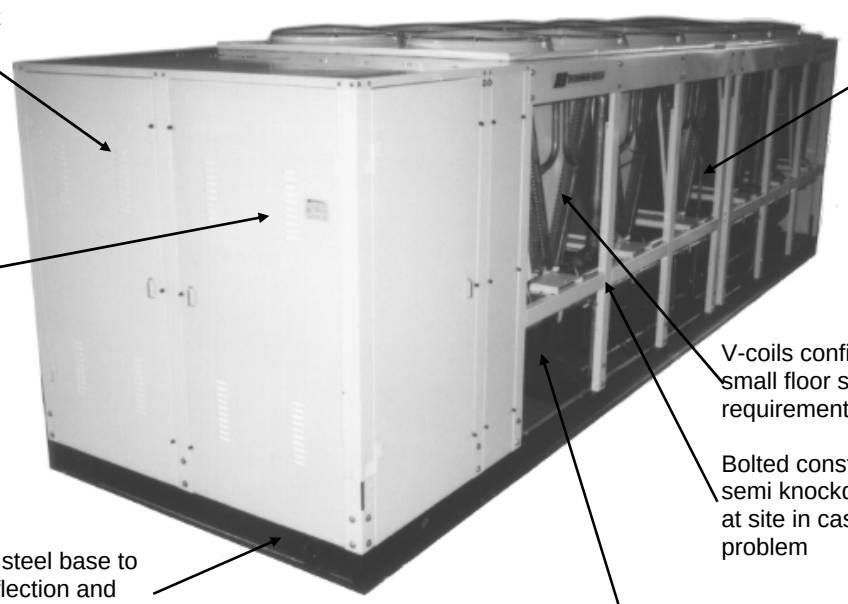
7. Lower Water Side Pressure Drop

In a DX evaporator, the water flows transversely over the outside of the tubes. The water flow is guided with vertical baffles. This will have higher-pressure drop as compared with the water flow in the tubes of a flooded evaporator. In other words, the flooded chillers will require smaller water pumps to operate at lower power consumption.

8. Commonly Use In Large Tonnage Chillers Where Efficiency Is Critical

As a general rule, the DX-evaporator are typically used in small and medium tonnage chillers where efficiency is not important and the low initial cost is the main consideration! However, with increasing energy cost and the drive to reduce **global warming, flooded evaporator chillers will increasingly become more popular not only in the large tonnage but also in the small and medium tonnage chillers. Dunham-Bush, again, leads the industry in this respect!**

COMPONENTS



STANDARD FEATURES

Size / Range

- 23 models from 85 to 521 tons at ARI standard conditions.
- Multiple compressor models provide redundancy, and superior part load efficiency.

Compressor(s)

- Quiet, reliable MSC Vertical Rotary Screw Compressors with integral oil separator.
- Compartmentalized to reduce noise breakout.
- Multiple rotary screw compressors design for better reliability and redundancy.
- Welded hermetic design with no requirement for internal parts service, no periodic compressor tear down and overhaul, and eliminates casing leakages.
- Consistent loading and unloading with dependable slide valve mechanism.
- No external oil pump required.
- Double-delta motor winding with 1/3 lock-rotor amps at start-up.
- Faulty or damaged compressors reworkable at minimal cost at various Dunham-Bush's authorized compressors reworked facilities. To ensure minimum downtime during rework of faulty or damaged compressor, Dunham-Bush provides a substitute reworked compressors while the faulty compressor is being reworked or repaired.
- Vapor injection cycle to increase capacity and improve efficiency.

Evaporator

- One pass for 2, 3 and 4 compressors models and 2 pass for single compressor models.
- Cleanable and removable integral fin copper tubes for easy serviceability.
- For a wide variety of applications.
- Removable water heads for service.
- Flange water connections for quick installation and/or service.
- Build according to ASME code, PED whenever required.
- JKKP approval.
- Relief valves(s) standard – 3/4" FPT.

STANDARD FEATURES

Controller/ Factory Packaged Power Panel

- Proactive advanced controller adapts to any abnormal operating conditions and for safety protections.
- Tolerant and accommodating of extreme conditions at start-up.
- Capable of controlling multiple chillers, pumps, and etc.
- Circuit breaker on each multiple compressors unit.
- Unit mounted step-start contactors and delay for reduced inrush starting current.
- Current and voltage transformers.
- Under and voltage phase protection relay.
- Indicator lights for compressor overloads, micro alarm, control power, compressor control circuit, and etc.

Condenser Coil/ Fans

- Constructed with seamless inner-grooved copper tubes expanded into die-formed aluminum fins in staggered configuration. Leaked and pressure tested to 450 psig.
- High efficiency low-noise condenser fan.
- "V" coil design to increase condensing surface area.
- "V" coil with internal baffle for fan cycling and fan staging.

UNIT FEATURES

Advanced Controller

Vision2020i a flexible and advance programmable electronic microcontroller designed specifically for the applications and precise control of Dunham-Bush Rotary Screw compressor chillers.

The controller board is provided with a set of terminals that connected to various devices such as temperature sensors, pressure and current transducers, solenoid valves, compressors and fans contactors, control relays and etc. Three sizes of controller boards are provided to handle different number of input and output requirements: DB3-S small board, DB3-M medium board and DB3-L large board.

The unit algorithm program and operating parameters are stored in FLASH-MEMORY that does not require a back-up battery. The program can be loaded through PC or programming key.

Vision2020i controller is equipped with a user friendly terminal with a semi-graphic display and dedicated keys that provides easy access to the unit operating conditions, control set points and alarm history.

Each unit's controller can be configured and connected to the local DBLAN network that allows multiple units sequencing control without additional hardware. The DBLAN is local area network made up of several chillers' controller.

Display and User Terminal

Vision2020i controller is design to work with a user friendly back-lit 132 by 64 pixels DBG1 semi-graphic Display panel connected with controller through telephone cable. The terminal allows carrying out all program operations. The user terminal allows displaying the unit working conditions, compressor run times, alarm history and modifying the parameters. The display also has an automatically self-test of the controller on system start-up. Multiple messages will be displayed by automatically scrolling from each message to the next. All of these messages are spelled out in English language on the display terminal.

UNIT FEATURES

There are 15 dedicated buttons enable user to access information, base on the security level of the password. For more detail operation of the DBG1 Display Terminal, please refer to the Unit Operation Manual.

Easily accessible measurements include:

- Leaving chilled water temperature
- Entering chilled water temperature
- Compressor discharge temperature
- Leaving chiller water temperature derivative
- Suction Pressure
- Discharge Pressure
- System voltage
- Compressor amp draw of each compressor
- Compressor elapsed run time of each compressor
- Compressor starts status
- Oil level sensor status
- Water temperature reset value
- Water flow switch status
- External start/stop command status

Optional ambient temperature is available. With this option the operator can quickly and accurately read all significant water temperatures and eliminate the need for often-inaccurate thermometers. Voltage readout is also offered as an optional feature.

Capacity Control

Leaving chilled water temperature control is accomplished by entering the water temperature setpoint and placing the controller in automatic control. The unit will monitor all control functions and move the slide valve to the required operating position. The compressor ramp (loading) cycle is programmable and may be set for specific building requirements. Remote adjustment of the leaving chilled water setpoint is accomplished through either direct connection of other Dunham-Bush control packages to the microcomputer through either the RS485 long distance differential communications port, via terminal or modem connected to the RS232 communication port, or from an external Building Automation System supplying a simple 4 to 20mA signal. Remote reset of compressor current limit may be accomplished in a similar fashion.

System Control

The unit may be started or stopped manually, or through the use of an external signal from a Building Automation System. In addition, the controller may be programmed with seven-day operating cycle or other Dunham-Bush control packages may start and stop the system through inter-connecting wiring.

System Protection

The following system protection controls will automatically act to insure system reliability:

- Low suction pressure
- High discharge pressure
- Freeze protection
- Low differential pressure
- Low oil level
- Compressor run error
- Power loss
- Chilled water flow loss
- High/Low system voltage
- Sensor error
- Compressor over current
- Compressor Anti-recycle

The controller can retains up to 99 alarm conditions complete with time of failure together data stamping on critical sensor readings in an alarm history. This tool will aid service technicians in troubleshooting tasks enabling downtime and nuisance trip-outs to be minimized.

Remote Monitoring

Vision 2020i controller can be completed with an optional RS485 communications card and NETVISOR software for remote monitoring and controlled from a PC terminal and optional phone modem.

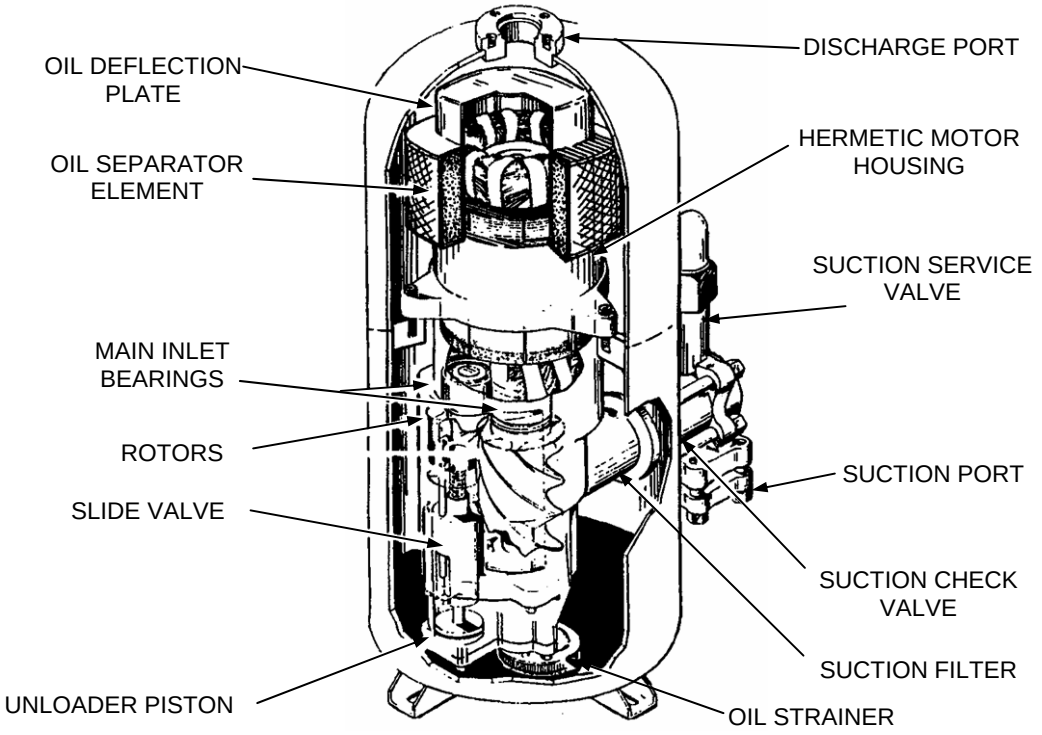
With various optional add-on cards the Vision2020i controller can also be interfaced directly to the Building Management System (BMS) with the standard communication protocols using MODBUS, LONWORKS, BACNET MSTP as well as over IP.

This sophisticated feature makes servicing easier and more convenient to the system. The controller as standard is additionally equipped with history files which may be used to take logs which may be retrieved via the phone modem or internet connection periodically. Now owners of multiple buildings have a simple and inexpensive method of investigating potential problems quickly and in a highly cost effective manner.

UNIT FEATURES

The Revolutionary Dunham-Bush Vertical Screw Compressor

Dunham-Bush introduced the revolutionary Vertical Screw Compressors in the early 1970's. Since then, the compressor has undergone several design changes to improve efficiency, and reliability! Today, The Dunham-Bush vertical screw compressors is not only the most efficient and reliable screw compressor in its capacity range; but it is the most completely "packaged" rotary Screw Compressors for use in flooded chillers! The Dunham-Bush vertical screw compressor and motor assembly is completely housed in an integral oil separator heavy-duty steel casing -- therefore eliminating the need for an external oil separator and its associated piping connections. The compressor does not require an external oil pump as it lubricates the bearing and rotors by use of the pressure differential between the discharge and suction cavities of the compressor. Thus, there is also no need for an external compressor oil evaporator and its associated piping connections. The compressor is completely sealed to prevent leakage and there is no need to service the few internal moving parts of the compressor.



Compressor Assembly

The Dunham-Bush rotary screw compressor is a positive displacement helical-axial design for use with high-pressure refrigerants.

- The compressor consists of two intermeshing helical grooved rotors, a female drive rotor and a male driven rotor, in a stationary housing with suction and discharge gas ports.
- Uniform gas flow, even torque and positive displacement, all provide by pure rotary motion contributes to vibration-free operation over a wide range of operating conditions. Intake and discharge cycles overlap, effectively producing a smooth, continuous flow of gas.
- No oil pump is required for lubrication or sealing purposes. Oil is distributed throughout the compressor by the pressure differential between the suction and the discharge cavities.

Simplified Capacity Control

The slide valve mechanism for capacity modulation and part load operation is outstanding feature:

- The moving parts are simple, rugged and trouble-free. The slide mechanism is hydraulically actuated.
- Package capacity reduction can be down to as low as 10% without HGBP by progressive movement of slide valves away from their stops.
- Capacity reduction is programmed by an exclusive electronically initiated, hydraulically actuated control arrangement.

UNIT FEATURES

Positive Displacement Direct Connected

The compressor is directly connected to the motor without any complicated gear systems to speed up the compressor and thus detract from the overall unit reliability.

Oil Separation

Each compressor is provided with an integral oil separator/impingement plate located below the discharge gas port.

- The separator is a multi-layered mesh element which effectively separates oil from the gas stream.
- The oil drains into sump and discharge gas passes around the deflection plate. An oil drain valve is located near the bottom of the oil sump.

Each rotor is fitted with a set of anti-friction tapered roller bearings. They carry both radial and thrust loads.

Rotors

The latest asymmetrical rotor profiles of patented Dunham-Bush design assure operation at highest efficiencies. Rotors are precision machined from AISI 1141 bar stock and case hardened.

Castings

All housings are manufactured of high grade and low porosity, cast iron.

Solid State Motor Protection

The motor winding protection module used in conjunction with sensors embedded in the compressor motor windings is designed to prevent the motor from operating at unsafe operating temperatures. The overloads for the motor are also solid state.

FIG. A

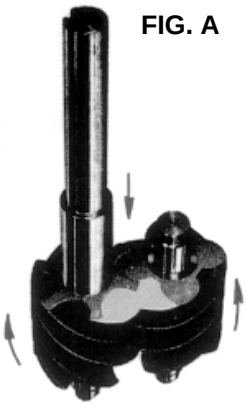


FIG. B

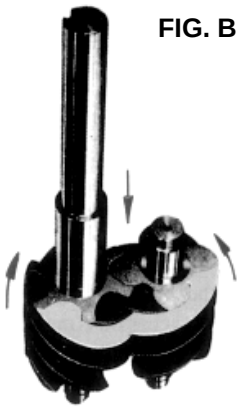


FIG. C

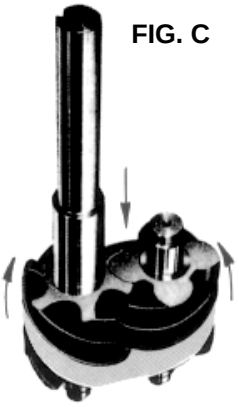


FIG. D

Compressor Operation

Note: For clarity reasons, the following account of the compressor operation will be limited to one lobe on the male rotor and one interlobe space of the female rotor. In actual operation, as the rotors revolve, all of the male lobes and female interlobe spaces interact similarly with resulting uniform, non-pulsating gas flow.

Suction Phase

As a lobe of the male rotor begins to unmesh from an interlobe space in the female rotor, a void is created and gas is drawn in tangentially through the inlet port-- Fig. A. --as the rotors continue to turn the interlobe space increases in size-- Fig. B. --and gas flows continuously into the compressor. Just prior to the point at which the interlobe space leaves the inlet port, the entire length of the interlobe space is completely filled with drawn in gas -- Fig. C.

Compression Phase

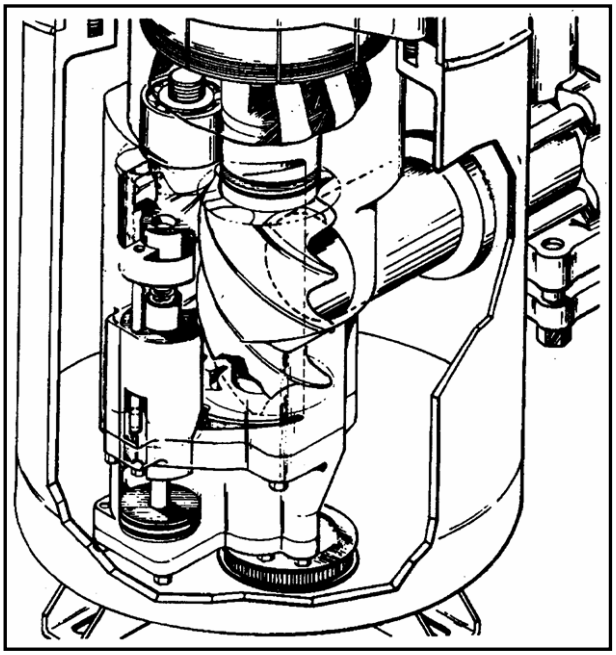
As rotation continues, the gas in the interlobe space is carried circumferentially around the compressor housing. Further rotation meshes a male lobe with the interlobe space on the suction end and squeezes (compresses) the gas in the direction of the discharge port. Thus the occupied volume of the trapped gas within the interlobe space is decreased and the gas pressure consequently increased.

Discharge Phase

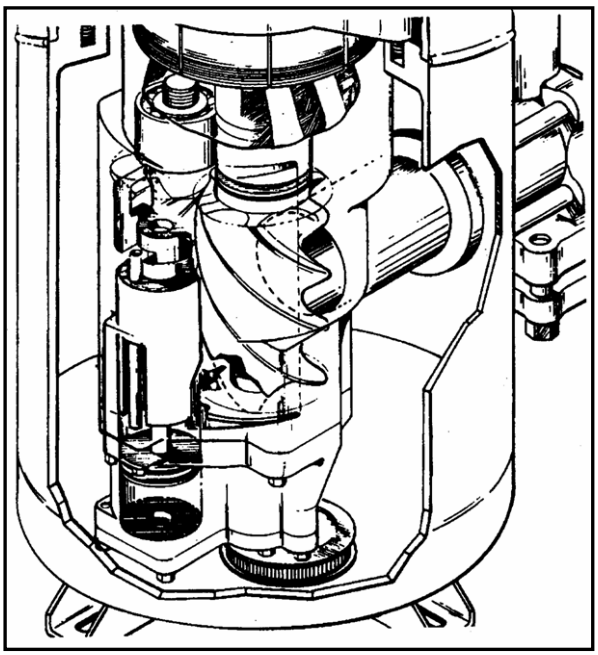
At a point determined by the designed "built-in" compression ratio, the discharge port is covered and the compressed gas is discharged by further meshing of the lobe and interlobe space--Fig D. While the meshing point of a pair of lobes is moving axially, the next charge is being drawn into the unmeshed portion and the working phases of the compressor cycle are repeated.

UNIT FEATURES

Compressor Fully Unloaded



Compressor Fully Loaded



Slide Valve Control

Movement of the slide valve is programmed by an exclusive Dunham-Bush electrically initiated (by variations in leaving chilled water temperature) hydraulically actuated control arrangement. When the compressor is fully loaded, the slide valve is in the closed position. Unloading starts when the slide valve is moved back away from the valve stop. Movement of the valve creates an opening in the side of the rotor housing.

Suction gas can then pass back from the rotor housing to the inlet port area before it has been compressed. Since no significant work has been done on this return gas, no appreciable power losses are incurred. Reduced compressor capacity is obtained from the gas remaining in the rotors which is compressed in the ordinary manner. Enlarging the opening in the rotor housing effectively reduces compressor displacement.

REFRIGERATING CYCLE

Dunham-Bush rotary screw air cooled chillers are designed for efficiency and reliability. The rotary screw compressor is a positive displacement, variable capacity compressor that will allow operation over a wide variety of conditions.

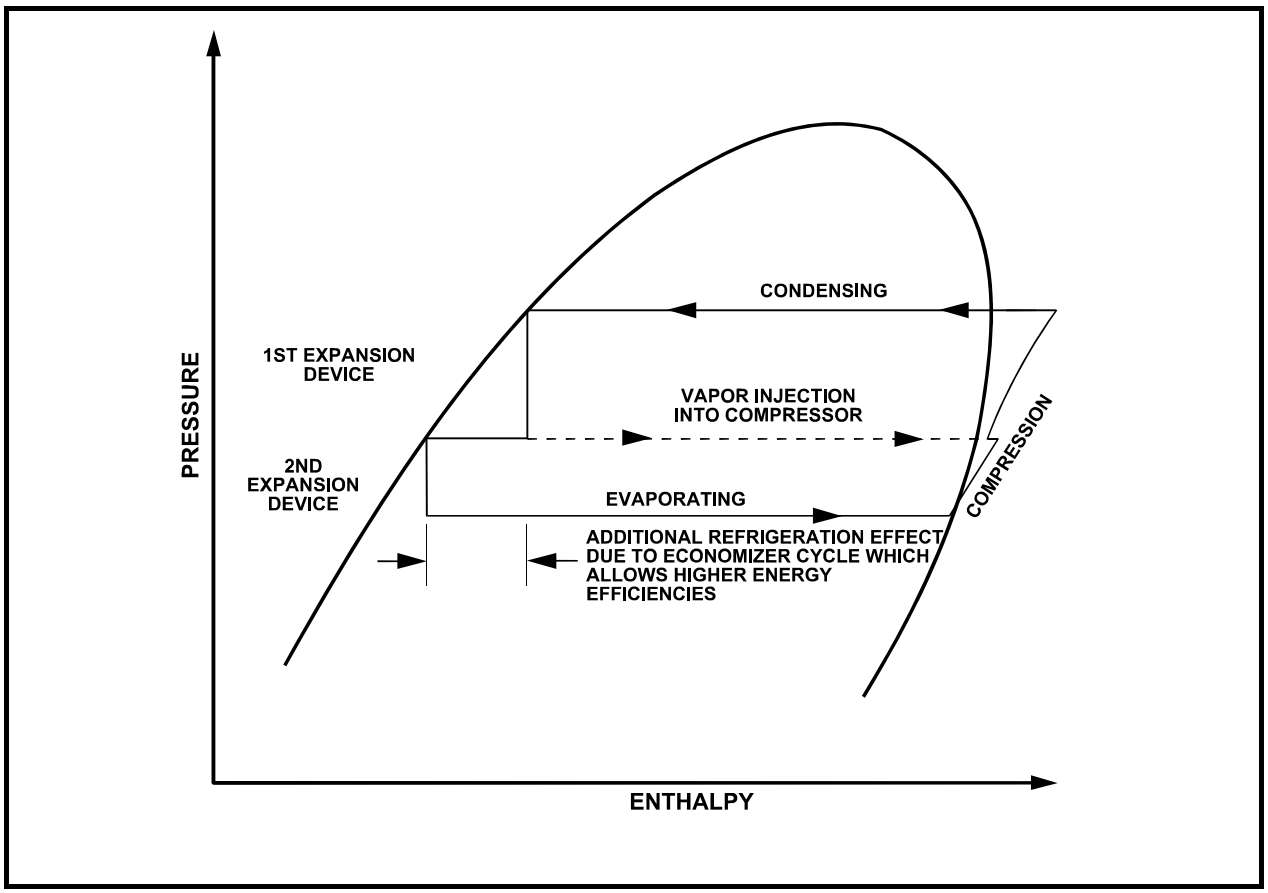
Even at high head and low capacity, a difficult condition for centrifugal compressors, the rotary screw performs easily. **It is impossible for this positive displacement compressor to surge.**

The refrigerant management system, however, is very similar to centrifugal water chillers and is shown in the refrigerant cycle diagram below.

Liquid refrigerant enters the flooded evaporator uniformly where it absorbs heat from water flowing through the evaporator tubes. The vaporized refrigerant is then drawn into the suction port of the compressor where the positive displacement compression begins.

This partially compressed gas is then joined by additional gas from the flash economizer as the rotors rotate past the vapor injection port at an intermediate pressure. Compressed gaseous refrigerant is then discharged into the integral oil separator where oil, which is contained in the refrigerant vapor, is removed and returned to the oil sump.

Fully compressed and superheated refrigerant is then discharged into the condenser, where air is being drawn through the condenser tube by the propeller fan cools and condenses the refrigerant. Liquid refrigerant then passes through the first expansion device and into the flash economizer where flash gas and liquid refrigerant are separated.



The gaseous refrigerant is then drawn out of the flash economizer and into the vapor injection port of the compressor. The remaining liquid refrigerant then passes through a second expansion device which reduces refrigerant pressure to evaporator levels where it is then distributed evenly into the evaporator.

By removing the flash gas from the flash economizer at an intermediate pressure, the enthalpy of the refrigerant flowing into the evaporator is reduced which increases the refrigeration effect and improves the efficiency of the refrigeration cycle.

Refrigerant flow into and out of the flash economizer is controlled by modulating valves which eliminate the energy wasting hot gas bypass effect inherent with fixed orifices.

PART-LOAD PERFORMANCE

Through the use of flash economizer modulating flow control and multiple compressors, Dunham-Bush rotary screw air cooled chillers have best part-load performance characteristics in the industry.

In most cases, actual building system loads are significantly less than full load design conditions, therefore chillers operate at part load most of the time.

Dunham-Bush rotary screw air cooled chillers combine the efficient operation of multiple rotary screw compressors with an economizer cycle and microprocessor control to yield the best total energy efficiency and significant operating saving under any load.

When specifying air conditioning equipment, it is important to consider the system load characteristics for the building application. In a typical city, the air conditioning load will vary according to changes in the ambient temperature. Weather data compiled over many years will predict the number of hours that equipment will operate at various load percentages.

OPERATING BENEFITS

EFFICIENCY AND RELIABILITY

COMPRESSOR EXPERIENCE

- 40 years of rotary screw experience and dedicated technological advancements.
- Simply designed for high reliability with only two rotating parts. No gears to fail.
- Insured continuous oil flow to each compressor through integral high efficiency oil separation for each compressor.
- Chillers use multiple rotary screw compressors for fail-safe reliability and redundancy.

ENERGY EFFICIENCY

- Designed to provide the greatest amount of cooling for the least kilowatt input over the entire operating range of your building.
- Delivers outstanding efficiency and total energy savings through the utilization of economizer cycle and microcomputer-controlled staging producing greater capacity with fewer compressors.
- Maximized performance through computer-matched components and multiple compressors on a single refrigerant circuit.
- High efficiency oil recovery system guarantees removal of oil carried over in the refrigerant and maintains the heat exchangers at their maximum efficiency at both full and part load.

INSTALLATION EASE

- Dramatic payback in reduced maintenance and overhaul costs both in down time and in labor expenditures.
- Ease of troubleshooting through microprocessor retention of monitored functions.
- Factory run tested.

SAFETY CODE

- ASME Boiler and Pressure Vessel Code Section VIII Division 1 "Unfired Pressure Vessels".
- JKKP Code.
- ASME Standard B31.5 Refrigeration Piping.
- ASHRAE Standard 15 Safety Code for Mechanical Refrigeration.
- IEEE.
- Safety quality license for import boiler and pressure vessel, China.

REFRIGERANT COMPATIBILITY

- Designed to operate with environmentally safe and economically smart HFC-134a with proven efficiency and reliability.
- Consult Factory for use of other HFC refrigerants.

CONTROL FLEXIBILITY

- Microcomputer-based with DDC (direct digital control) features precise push button control over every aspect of operation with built-in standard features that allow extra energy savings on start-up and throughout the life of your equipment.
- Insured uniform compressor loading and optimal energy efficiency through microcomputer controls which utilize pressure transducers to measure evaporator and condenser pressure.
- Lower energy costs resulting from automatic load monitoring and increased accuracy and efficiency in compressor staging.
- Monitor your chiller's key functions form a remote location with a simple, low costs, phone modem option.
- Proactive control by microcomputer that anticipates problems and takes corrective action before they occur. Controls will unload compressor(s) if head or suction pressure approach limits. This will enable unit to stay on the line while warning operator of potential problems.

TYPICAL SEQUENCE OF OPERATION

The Dunham-Bush rotary screw air cooled water chiller depends mainly on its on-board microcomputer for control. Operation described is for a two-compressor units and is very similar for single, three or four-compressor units.

For initial start-up, the following conditions must be met:

- Power supply to unit energized.
- Unit circuit breakers in the "on" position.
- Control power switch on for at least 15 minutes. Compressor switches on.
- Reset pressed on microcomputer keypad.
- Chilled water pump running and chilled water flow switch made.
- Leaving chilled water temperature at least 2°F above setpoint.
- All safety conditions satisfied.

After all above conditions are met, the microcomputer will call for the lead compressor to start. After a one-minute delay, the first contactor (e.g. 1M-1) is energized followed by the second contactor (e.g. 1M-2) after one-second-time delay. This provides reduced inrush stepped start. The compressor 15-minute anti-recycle timer is initiated at compressor start.

The microcomputer monitors compressor amps, volts, leaving water temperature and suction and discharge pressures. The compressor and cooling capacity is controlled by pulsed signals to load and unload solenoid valves on the compressor. When the compressor starts, it is fully unloaded, yielding about 25% of its full load capacity. As the computer gives it load signals, capacity gradually increases. The rate of compressor loading is governed by ramp control which is adjustable in the computer.

The computer responds to leaving chilled water temperature and its rate of change which is proportional and derivative control. If leaving chilled water temperature is within the deadband (+/-0.8°F from setpoint), no load or unload commands are given. If chilled water temperature is above deadband, the computer will continue loading the compressor until a satisfactory rate of declined is observed. If leaving chilled water temperature is below the deadband, the compressor is commanded to unload. Thus the compressor capacity is continuously modulated to match applied load and hold leaving chilled water temperature at setpoint.

If the applied load is greater than one compressor can handle, it will load fully and then the microcomputer will call for a second compressor. After one minute, the second compressors will start in the same manner as the first. Then both compressors will be commanded to adjust load to 50%. They are gradually loaded up together until the applied load is satisfied. In this way the two compressors share the load equally.

If the applied load decreases to the point that both compressors are running at about 40% capacity, the computer shuts down the lag compressor and loads the remaining compressor to about 80%. If applied load decreases further, the remaining compressor unloads proportionately. If applied load decreases to less than the minimum capacity of one compressor, the leaving chilled water temperature will decline to 2°F below setpoint, at which time the lead compressor will shut down. It will restart automatically if leaving chilled water temperature rises to 2°F above setpoint and both 15 minute anti-recycle and one minute start delay timers are satisfied.

During start-up operation, the computer monitors the difference between discharge and suction pressures to insure that minimum of 30 psi differential is available for compressor lubrication. If the difference falls below a minimum of 30 psi, the computer closes refrigerant flow control valves, starving the evaporator, causing evaporator pressure to drop, increasing differential pressure. This is especially helpful at startup, when warm chilled water and low ambient temperature would cause a low head situation. This feature is called EPCAS: Evaporator Pressure Control at Startup. It is one of several proactive control features of the microcomputer which overcome potential problems while continuing operation.

Two additional proactive features are low suction and high discharge pressure override. If operating pressures approach trip level, compressors are unloaded as necessary to continue operation.

PERFORMANCE DATA

LWT °F	MODEL AFVX	AMBIENT TEMPERATURE, °F											
		85.0			95.0			105.0			115.0		
		TR	kW	EER	TR	kW	EER	TR	kW	EER	TR	kW	EER
40.0	85-5SR	81.2	81.6	11.94	77.2	93.8	9.87	72.7	108.3	8.06	67.8	125.1	6.50
	105-5SR	97.2	99.4	11.73	92.4	114.4	9.70	87.1	131.9	7.92	81.3	152.0	6.42
	125-5SR	120.0	130.6	11.03	114.4	150.3	9.13	108.1	173.5	7.48	101.6	197.8	6.16
	155-5SR	146.1	152.6	11.49	139.3	175.5	9.52	131.6	202.7	7.79	123.6	231.2	6.41
	175-5SR	168.1	163.8	12.31	160.3	188.4	10.21	151.5	217.5	8.36	142.4	248.2	6.88
	115T-5SR	110.0	111.8	11.81	104.8	128.7	9.77	98.8	148.7	7.98	92.3	171.7	6.45
	130T-5SR	123.1	125.8	11.74	117.2	144.8	9.71	110.6	167.3	7.93	103.2	193.1	6.41
	145T-5SR	137.5	139.7	11.81	130.9	160.9	9.77	123.5	185.9	7.98	115.3	214.6	6.45
	160T-5SR	153.2	151.3	12.16	145.9	174.2	10.05	137.6	201.2	8.21	128.5	232.5	6.63
	180T-5SR	170.5	162.8	12.57	162.3	187.5	10.39	153.2	216.6	8.49	143.0	250.0	6.87
	190-5SR	186.6	180.6	12.40	177.6	208.0	10.24	167.5	240.3	8.37	156.5	276.8	6.78
	210-5SR	204.2	198.4	12.35	194.4	228.5	10.21	183.4	263.9	8.34	171.4	304.3	6.76
	235-5SR	227.1	229.6	11.87	216.3	264.5	9.82	204.4	305.5	8.03	191.7	350.1	6.57
	260-5SR	252.0	260.6	11.60	240.5	300.1	9.62	227.5	347.0	7.87	214.2	396.4	6.48
	290-5SR	278.1	282.5	11.81	265.4	325.4	9.79	251.0	376.2	8.01	236.1	429.7	6.59
	320-5SR	306.8	304.4	12.09	292.8	350.5	10.02	276.9	405.4	8.20	260.3	463.1	6.75
	340-5SR	328.8	315.6	12.50	313.8	363.4	10.36	296.8	420.2	8.48	279.1	480.1	6.98
	365-5SR	353.0	326.8	12.96	337.0	376.2	10.75	318.8	435.1	8.79	300.0	497.1	7.24
	390-5SR	385.1	361.5	12.79	367.2	416.3	10.58	347.0	481.3	8.65	325.6	552.9	7.07
	420-5SR	407.9	392.7	12.47	389.2	452.3	10.33	368.0	522.8	8.45	345.9	598.7	6.93
	445-5SR	430.8	423.9	12.20	411.1	488.2	10.11	389.0	564.4	8.27	366.2	644.6	6.82
	470-5SR	456.2	459.0	11.93	434.9	528.7	9.87	410.9	611.0	8.07	385.6	700.6	6.60
	520-5SR	504.0	521.2	11.60	481.0	600.3	9.62	455.1	694.1	7.87	428.4	792.7	6.48
42.0	85-5SR	84.4	81.5	12.43	80.3	93.8	10.28	75.8	108.3	8.39	70.7	124.7	6.80
	105-5SR	101.1	99.3	12.21	96.2	114.4	10.09	90.7	132.0	8.25	84.8	152.2	6.68
	125-5SR	124.7	130.5	11.46	119.1	150.1	9.52	112.6	173.5	7.79	106.0	198.3	6.42
	155-5SR	151.8	152.4	11.95	145.0	175.3	9.92	137.0	202.7	8.11	128.6	231.4	6.67
	175-5SR	174.7	163.6	12.82	166.8	188.2	10.64	157.7	217.6	8.70	148.4	248.4	7.17
	115T-5SR	114.3	111.5	12.30	108.9	128.5	10.17	102.8	148.7	8.30	96.1	172.0	6.71
	130T-5SR	127.9	125.5	12.23	121.9	144.7	10.11	115.0	167.3	8.25	107.5	193.4	6.67
	145T-5SR	142.8	139.4	12.30	136.1	160.7	10.16	128.5	185.9	8.30	120.1	214.7	6.71
	160T-5SR	159.2	150.9	12.66	151.7	174.0	10.46	143.2	201.3	8.54	133.8	232.1	6.92
	180T-5SR	177.1	162.4	13.09	168.8	187.3	10.81	159.4	216.6	8.83	149.0	249.6	7.16
	190-5SR	193.8	180.3	12.90	184.6	207.9	10.66	174.3	240.3	8.71	163.0	277.0	7.06
	210-5SR	212.2	198.0	12.86	202.1	228.3	10.62	190.8	264.0	8.67	178.5	304.5	7.04
	235-5SR	235.8	229.2	12.35	224.9	264.1	10.22	212.7	305.6	8.36	199.8	350.6	6.84
	260-5SR	261.6	260.1	12.07	250.0	299.7	10.01	236.8	347.0	8.19	223.2	396.8	6.75
	290-5SR	288.7	282.0	12.28	275.9	324.9	10.19	261.1	376.1	8.33	245.8	430.0	6.86
	320-5SR	318.5	303.8	12.58	304.3	350.0	10.43	288.0	405.2	8.53	270.8	463.3	7.01
	340-5SR	341.4	315.0	13.01	326.2	362.9	10.79	308.7	420.1	8.82	290.6	480.3	7.26
	365-5SR	366.5	326.1	13.48	350.2	375.7	11.19	331.6	434.9	9.15	312.3	497.3	7.54
	390-5SR	399.9	360.7	13.31	381.6	415.9	11.01	360.9	481.2	9.00	338.8	553.2	7.35
	420-5SR	423.5	391.8	12.97	404.4	451.6	10.75	382.8	522.7	8.79	360.1	599.2	7.21
	445-5SR	447.1	423.0	12.68	427.3	487.4	10.52	404.7	564.3	8.61	381.4	645.3	7.09
	470-5SR	473.7	458.1	12.41	452.0	528.0	10.27	427.6	611.0	8.40	401.7	701.3	6.87
	520-5SR	523.1	520.2	12.07	500.0	599.3	10.01	473.5	693.9	8.19	446.4	793.6	6.75
44.0	85-5SR	87.8	81.3	12.96	85.2	91.1	11.22	80.9	108.3	8.96	76.9	125.3	7.36
	105-5SR	108.5	99.0	13.14	105.3	109.9	11.50	100.0	132.0	9.09	95.0	152.3	7.49
	125-5SR	128.8	130.1	11.87	125.0	143.5	10.45	118.8	173.6	8.21	112.8	198.5	6.82
	155-5SR	159.9	152.0	12.62	155.2	167.5	11.12	147.4	202.7	8.73	140.1	231.8	7.25
	175-5SR	180.4	163.1	13.27	175.1	179.8	11.69	166.3	217.6	9.17	158.0	248.8	7.62
	115T-5SR	118.5	111.2	12.78	115.0	127.8	10.80	109.3	148.7	8.82	103.8	172.0	7.24
	130T-5SR	134.4	125.2	12.89	130.5	141.4	11.07	124.0	167.2	8.90	117.8	193.4	7.31
	145T-5SR	149.6	139.0	12.91	145.2	156.6	11.13	137.9	185.8	8.91	131.0	214.8	7.32
	160T-5SR	164.8	150.5	13.14	160.0	167.6	11.46	152.0	201.2	9.06	144.4	232.7	7.45
	180T-5SR	185.6	162.0	13.75	180.2	183.6	11.78	171.2	216.6	9.48	162.6	250.6	7.79
	190-5SR	197.3	179.7	13.18	191.6	205.1	11.21	182.0	240.3	9.09	172.9	277.6	7.47
	210-5SR	217.5	197.4	13.22	211.2	221.9	11.42	200.6	263.9	9.12	190.6	305.1	7.50
	235-5SR	244.3	228.5	12.83	237.2	250.8	11.35	225.3	305.5	8.85	214.1	351.3	7.31
	260-5SR	270.6	259.3	12.52	262.7	286.1	11.02	249.6	346.7	8.64	237.1	396.8	7.17
	290-5SR	298.7	281.1	12.75	290.0	310.1	11.22	275.5	375.9	8.79	261.7	430.1	7.30
	320-5SR	329.8	302.8	13.07	320.2	334.1	11.50	304.2	405.1	9.01	289.0	463.5	7.48
	340-5SR	350.5	314.0	13.40	340.3	346.3	11.79	323.3	419.9	9.24	307.1	480.5	7.67
	365-5SR	376.9	325.0	13.92	365.9	358.6	12.24	347.6	434.7	9.59	330.2	497.6	7.96
	390-5SR	404.7	359.4	13.51	392.9	403.6	11.68	373.3	480.9	9.31	354.6	553.4	7.69
	420-5SR	432.6	390.5	13.29	420.0	435.9	11.56	399.0	522.5	9.16	379.1	599.6	7.59
	445-5SR	458.6	421.6	13.05	445.2	465.7	11.47	422.9	564.0	9.00	401.8	645.7	7.47
	470-5SR	484.4	456.7	12.73	470.3	505.8	11.16	446.8	610.7	8.78	424.4	701.9	7.26
	520-5SR	536.9	518.6	12.42	521.3	572.6	10.92	495.2	693.5	8.57	470.5	793.6	7.11

Notes:
1.) Ratings based on 10°F water range in evaporator and .0001 fouling factor.
2.) Interpolation between ratings is permissible but extrapolation is NOT.
3.) KWI is for compressor input.
4.) Consult factory for 60 Hz operation.
5.) Units are running on part load above Ambient Temperature 115°F due to the current limiter.

PERFORMANCE DATA

LWT °F	MODEL AFVX	AMBIENT TEMPERATURE, °F											
		85.0			95.0			105.0			115.0		
		TR	kW	EER	TR	kW	EER	TR	kW	EER	TR	kW	EER
46.0	85-5SR	90.4	81.1	13.38	87.8	93.6	11.25	83.4	108.3	9.23	79.2	124.8	7.61
	105-5SR	111.7	98.8	13.56	108.5	114.1	11.41	103.0	132.0	9.37	97.9	152.3	7.71
	125-5SR	132.6	129.8	12.26	128.8	149.7	10.32	122.3	173.5	8.46	116.2	198.5	7.02
	155-5SR	164.7	151.6	13.03	159.9	174.9	10.97	151.9	202.7	8.99	144.3	231.9	7.46
	175-5SR	185.8	162.8	13.69	180.4	187.7	11.53	171.3	217.5	9.45	162.8	248.9	7.85
	115T-5SR	122.0	110.9	13.21	118.5	128.1	11.10	112.5	148.6	9.09	106.9	172.1	7.46
	130T-5SR	138.4	124.8	13.32	134.4	144.2	11.19	127.7	167.2	9.17	121.3	193.4	7.53
	145T-5SR	154.0	138.6	13.34	149.6	160.2	11.21	142.1	185.7	9.18	135.0	214.7	7.55
	160T-5SR	169.7	150.1	13.57	164.8	173.4	11.40	156.6	201.1	9.34	148.7	232.1	7.69
	180T-5SR	191.2	161.4	14.21	185.6	186.6	11.93	176.3	216.4	9.78	167.5	250.1	8.04
	190-5SR	203.3	179.2	13.61	197.3	207.1	11.43	187.5	240.1	9.37	178.1	277.5	7.70
	210-5SR	224.1	196.8	13.66	217.5	227.5	11.48	206.7	263.7	9.40	196.3	304.5	7.74
	235-5SR	251.6	227.8	13.26	244.3	263.1	11.14	232.1	305.2	9.12	220.5	350.7	7.54
	260-5SR	278.7	258.5	12.94	270.6	298.5	10.88	257.1	346.5	8.90	244.2	397.0	7.38
	290-5SR	307.7	280.3	13.17	298.7	323.6	11.08	283.8	375.6	9.07	269.6	430.4	7.52
	320-5SR	339.7	301.9	13.50	329.8	348.7	11.35	313.3	404.7	9.29	297.6	463.7	7.70
	340-5SR	361.0	313.0	13.84	350.5	361.5	11.63	333.0	419.6	9.52	316.3	480.7	7.90
	365-5SR	388.2	324.0	14.38	376.9	374.3	12.08	358.0	434.4	9.89	340.1	497.7	8.20
	390-5SR	416.8	358.3	13.96	404.7	414.3	11.72	384.5	480.6	9.60	365.2	552.9	7.93
	420-5SR	445.6	389.3	13.73	432.6	450.0	11.54	411.0	522.1	9.45	390.4	599.2	7.82
	445-5SR	472.3	420.3	13.49	458.6	485.7	11.33	435.6	563.6	9.28	413.8	645.4	7.69
	470-5SR	498.9	455.3	13.15	484.4	526.0	11.05	460.2	610.2	9.05	437.2	701.4	7.48
	520-5SR	553.0	516.9	12.84	536.9	597.0	10.79	510.1	692.9	8.83	484.6	793.9	7.32
48.0	85-5SR	93.1	80.8	13.82	90.4	93.4	11.61	85.9	108.3	9.52	81.6	125.3	7.81
	105-5SR	115.1	98.6	14.01	111.7	113.9	11.77	106.1	131.9	9.65	100.8	152.3	7.94
	125-5SR	136.6	129.4	12.67	132.6	149.4	10.65	126.0	173.3	8.72	119.7	198.6	7.23
	155-5SR	169.6	151.1	13.46	164.7	174.5	11.32	156.4	202.4	9.27	148.6	231.8	7.69
	175-5SR	191.3	162.3	14.15	185.8	187.3	11.90	176.5	217.3	9.75	167.7	248.8	8.09
	115T-5SR	125.7	110.4	13.65	122.0	127.8	11.46	115.9	148.4	9.37	110.1	172.1	7.68
	130T-5SR	142.6	124.3	13.77	138.4	143.8	11.55	131.5	167.0	9.45	124.9	193.4	7.75
	145T-5SR	158.7	138.1	13.79	154.0	159.8	11.57	146.3	185.5	9.47	139.0	214.6	7.78
	160T-5SR	174.8	149.5	14.03	169.7	173.0	11.77	161.3	200.9	9.63	153.2	232.5	7.91
	180T-5SR	196.9	160.8	14.69	191.2	186.2	12.32	181.6	216.1	10.08	172.5	250.5	8.27
	190-5SR	209.4	178.6	14.07	203.3	206.7	11.80	193.1	239.8	9.66	183.4	277.4	7.94
	210-5SR	230.8	196.1	14.12	224.1	227.0	11.85	212.9	263.5	9.70	202.2	304.9	7.96
	235-5SR	259.2	227.0	13.70	251.6	262.5	11.50	239.1	304.9	9.41	227.1	351.1	7.76
	260-5SR	287.1	257.5	13.38	278.7	297.9	11.23	264.8	346.1	9.18	251.5	396.8	7.61
	290-5SR	316.9	279.3	13.62	307.7	322.9	11.43	292.3	375.1	9.35	277.7	430.1	7.75
	320-5SR	349.9	300.8	13.96	339.7	347.8	11.72	322.7	404.2	9.58	306.6	463.3	7.94
	340-5SR	371.9	311.9	14.31	361.0	360.7	12.01	343.0	419.0	9.82	325.8	480.3	8.14
	365-5SR	399.8	322.8	14.86	388.2	373.4	12.47	368.8	433.8	10.20	350.3	497.1	8.46
	390-5SR	429.3	357.1	14.43	416.8	413.5	12.10	396.0	480.0	9.90	376.2	552.5	8.17
	420-5SR	458.9	387.9	14.20	445.6	449.0	11.91	423.3	521.5	9.74	402.1	598.7	8.06
	445-5SR	486.5	418.8	13.94	472.3	484.5	11.70	448.7	562.9	9.57	426.3	645.0	7.93
	470-5SR	513.9	453.7	13.59	498.9	524.8	11.41	474.0	609.5	9.33	450.3	701.7	7.70
	520-5SR	569.6	515.1	13.27	553.0	595.7	11.14	525.4	692.1	9.11	499.1	793.7	7.55
50.0	85-5SR	95.9	80.5	14.29	93.1	93.2	11.99	88.4	108.2	9.81	84.0	125.3	8.05
	105-5SR	118.5	98.2	14.49	115.1	113.6	12.16	109.3	131.8	9.95	103.8	152.8	8.16
	125-5SR	140.7	128.9	13.10	136.6	148.9	11.01	129.8	173.1	9.00	123.3	198.5	7.45
	155-5SR	174.7	150.5	13.92	169.6	174.0	11.69	161.1	202.2	9.56	153.1	231.9	7.92
	175-5SR	197.1	161.6	14.63	191.3	186.8	12.29	181.8	217.0	10.05	172.7	248.9	8.32
	115T-5SR	129.4	110.0	14.12	125.7	127.4	11.84	119.4	148.2	9.67	113.4	172.0	7.91
	130T-5SR	146.9	123.8	14.24	142.6	143.4	11.93	135.5	166.7	9.75	128.7	193.8	7.97
	145T-5SR	163.4	137.5	14.26	158.7	159.3	11.95	150.7	185.2	9.76	143.2	215.4	7.98
	160T-5SR	180.1	148.9	14.51	174.8	172.5	12.16	166.1	200.6	9.94	157.8	232.9	8.13
	180T-5SR	202.8	160.2	15.20	196.9	185.6	12.73	187.1	215.8	10.40	177.7	250.8	8.50
	190-5SR	215.6	177.8	14.56	209.4	206.0	12.19	198.9	239.5	9.97	189.0	278.3	8.15
	210-5SR	237.7	195.3	14.61	230.8	226.3	12.24	219.2	263.1	10.00	208.3	305.2	8.19
	235-5SR	267.0	226.0	14.17	259.2	261.6	11.89	246.2	304.3	9.71	233.9	350.9	8.00
	260-5SR	295.7	256.5	13.83	287.1	297.1	11.60	272.7	345.6	9.47	259.1	396.6	7.84
	290-5SR	326.4	278.1	14.08	316.9	322.2	11.80	301.0	374.7	9.64	286.0	430.0	7.98
	320-5SR	360.4	299.6	14.44	349.9	346.9	12.10	332.4	403.7	9.88	315.8	463.0	8.18
	340-5SR	383.0	310.6	14.80	371.9	359.7	12.41	353.3	418.5	10.13	335.6	480.1	8.39
	365-5SR	411.8	321.5	15.37	399.8	372.4	12.88	379.8	433.2	10.52	360.8	496.8	8.72
	390-5SR	442.2	355.6	14.92	429.3	412.4	12.49	407.9	479.5	10.21	387.5	553.0	8.41
	420-5SR	472.7	386.3	14.68	458.9	447.7	12.30	436.0	520.7	10.05	414.2	598.7	8.30
	445-5SR	501.1	417.1	14.42	486.5	483.1	12.09	462.2	562.0	9.87	439.1	644.4	8.18
	470-5SR	529.3	451.8	14.06	513.9	523.4	11.78	488.2	608.6	9.63	463.8	701.8	7.93
	520-5SR	586.7	513.0	13.72	569.6	594.1	11.51	541.2	691.1	9.40	514.1	793.2	7.78

Notes:
1.) Ratings based on 10°F water range in evaporator and .0001 fouling factor.
2.) Interpolation between ratings is permissible but extrapolation is NOT.
3.) KWI is for compressor input.
4.) Consult factory for 60Hz operation.
5.) Units are running on part load above Ambient Temperature 115°F due to the current limiter.

PHYSICAL DATA

MODEL	AFVX	85-5SR	105-5SR	125-5SR	155-5SR	175-5SR	115T-5SR
Compressor							
Model (Qty)		MSC1215 (1)	MSC1218 (1)	MSC1222 (1)	MSC1227 (1)	MSC1230 (1)	MSC1210 (1) MSC1210 (1)
Rpm		2950	2950	2950	2950	2950	2950
Nominal Capacity	**Tons**	85.2	105.3	125.0	155.2	175.1	115.0
Min. % Unit Capacity Reduction		25.0%	25.0%	25.0%	25.0%	25.0%	12.5%
Evaporator							
Model (Qty)		C1R (1)	D1R (1)	D2R (1)	J1R (1)	K1R (1)	B1R (2)
Water Connector	**Inch [mm]**	5 [127]	6 [152]	6 [152]	6 [152]	6 [152]	6 [152]
Nom. Water Flow / P.D.	**Gpm / Ft wg**	204.7/ 7.8	253/ 7.1	300.3/ 8.0	372.9/ 14.0	420.7/ 15.0	276.3/ 6.0
Min/Max Water Flow	**Gpm**	78.5/ 396.1	103.9/ 523.2	117.8/ 587	117.3/ 586.9	129.9/ 641.3	124.5/ 625.5
Min/Max Water P.D.	**Ft Wg**	1.6/ 28.7	1.6/ 28.5	1.6/ 28.8	1.9/ 33.7	1.9/ 34.0	1.6/ 30.3
Condenser							
Coil Rows Deep / Total FA	**Ft²**	3 / 121.9	3 / 162.6	4 / 162.6	4 / 171.1	4 / 171.1	3 / 162.6
No Of Fans		6	8	8	8	8	8
Fan Dia (Qty)	**mm**	800 (6)	800 (8)	800 (8)	900 (8)	900 (8)	800 (8)
Fan Motor (Qty)	**Hp**	1.5 (6)	1.5 (8)	1.5 (8)	3.0 (8)	3.0 (8)	1.5 (8)
Fan Motor FLA (Qty)	**Amp**	3.2 (6)	3.2 (8)	3.2 (8)	4.9 (8)	4.9 (8)	3.2 (8)
Min. Operating Ambient	**°F**	55	55	55	55	55	55
Electrical							
Nom. Voltage		400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz
Unit RLA	**Amp**	180	222	234	313	291	244
Unit Max. Inrush	**Amp**	462	520	358	471	503	466
General							
Unit Length	**Inch [mm]**	174 [4420]	216 [5486]	220 [5588]	220 [5588]	220 [5588]	231 [5867]
Unit Width	**Inch [mm]**	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]
Unit Height	**Inch [mm]**	87 ½ [2223]	88 ½ [2248]	88 ½ [2248]	97 ½ [2477]	97 ½ [2477]	88 ½ [2248]
Shipping Weight	**Lbs [kg]**	9376 [4253]	10712 [4859]	11920 [5407]	13466 [6108]	14664 [6652]	13094 [5939]
Operating Weight	**Lbs [kg]**	9532 [4324]	10915 [4951]	12139 [5506]	13720 [6223]	14952 [6782]	13338 [6050]
Operating Charge R134a	**Lbs [kg]**	208 [94]	247 [112]	299 [136]	364 [165]	416 [189]	273 [124]

MODEL	AFVX	130T-5SR	145T-5SR	160T-5SR	180T-5SR	190-5SR	210-5SR
Compressor							
Model (Qty)		MSC1210 (1) MSC1212 (1)	MSC1212 (2)	MSC1212 (1) MSC1215 (1)	MSC1215 (2)	MSC1215 (1) MSC1218 (1)	MSC1218 (2)
Rpm		2950	2950	2950	2950	2950	2950
Nominal Capacity	**Tons**	130.5	145.2	160.0	180.2	191.6	211.2
Min. % Unit Capacity Reduction		12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Evaporator							
Model (Qty)		C1R (2)	C1R (2)	D1R (2)	D1R (2)	D2R (2)	J1R (2)
Water Connector	**Inch [mm]**	6 [152]	6 [152]	8 [203]	8 [203]	8 [203]	8 [203]
Nom. Water Flow / P.D.	**Gpm / Ft wg**	313.6/ 5.4	348.9/ 6.6	384.4/ 4.6	433.0/ 5.4	460.4/ 5.2	507.5/ 7.4
Min/Max Water Flow	**Gpm**	158.1/ 791.4	158.1/ 791.4	208.5/ 1046.4	208.5/ 1046.4	234.8/ 1173.0	236.3/ 1351.0
Min/Max Water P.D.	**Ft Wg**	1.7/ 31.8	1.7/ 31.8	1.6/ 30	1.6/ 30	1.7/ 30.6	2.0/ 40.9
Condenser							
Coil Rows Deep / Total FA	**Ft²**	3 / 81.3, 4 / 81.3	4 / 171.1	3 / 85.6, 4 / 85.6	4 / 171.1	3 / 128.3, 4 / 85.6	3 / 256.7
No Of Fans		8	8	8	8	10	12
Fan Dia (Qty)	**mm**	800 (8)	800 (8)	900 (8)	900 (8)	900 (10)	900 (12)
Fan Motor (Qty)	**Hp**	1.5 (8)	1.5 (8)	3.0 (8)	3.0 (8)	3.0 (10)	3.0 (12)
Fan Motor FLA (Qty)	**Amp**	3.2 (8)	3.2 (8)	4.9 (8)	4.9 (8)	4.9 (10)	4.9 (12)
Min. Operating Ambient	**°F**	55	55	55	55	55	55
Electrical							
Nom. Voltage		400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz
Unit RLA	**Amp**	268	296	332	365	407	454
Unit Max. Inrush	**Amp**	575	510	548	645	707	753
General							
Unit Length	**Inch [mm]**	231 [5867]	234 [5944]	234 [5944]	234 [5944]	276 [7010]	318 [8077]
Unit Width	**Inch [mm]**	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]
Unit Height	**Inch [mm]**	88 ½ [2248]	96 ½ [2451]	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]
Shipping Weight	**Lbs [kg]**	13867 [6290]	14245 [6461]	16309 [7398]	16872 [7653]	18528 [8404]	20526 [9311]
Operating Weight	**Lbs [kg]**	14178 [6431]	14556 [6603]	16715 [7582]	17279 [7837]	18967 [8603]	21033 [9541]
Operating Charge R134a	**Lbs [kg]**	312 [142]	338 [153]	390 [177]	416 [189]	468 [212]	520 [236]

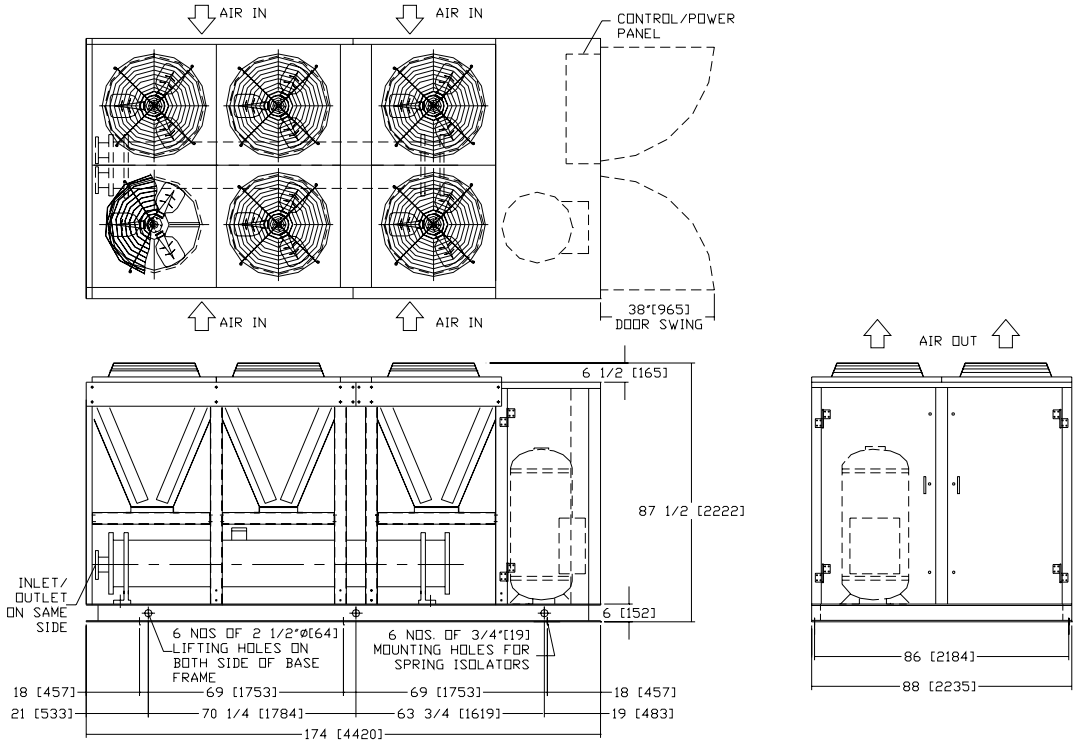
PHYSICAL DATA

MODEL	AFVX	235-5SR	260-5SR	290-5SR	320-5SR	340-5SR	365-5SR
Compressor							
Model (Qty)		MSC1218 (1) MSC1222 (1)	MSC1222 (2)	MSC1222 (1) MSC1227 (1)	MSC1227 (2)	MSC1227 (1) MSC1230 (1)	MSC1230 (2)
Rpm		2950	2950	2950	2950	2950	2950
Nominal Capacity	**Tons**	237.2	262.7	290.0	320.2	340.3	365.9
Min. % Unit Capacity Reduction		12.50%	12.50%	12.50%	12.50%	12.50%	12.50%
Evaporator							
Model (Qty)		J1R (2)	K1R (2)	K2R (2)	L1R (2)	L2R (2)	L2R (2)
Water Connector	**Inch [mm]**	8 [203]	8 [203]	8 [203]	10 [254]	10 [254]	10 [254]
Nom. Water Flow / P.D.	**Gpm / Ft wg**	569.9/ 9.0	631.2/ 9.4	696.8/ 9.0	769.4/ 8.8	817.6/ 7.8	879.2/ 9.0
Min/Max Water Flow	**Gpm**	236.3/ 1351.0	257/ 1282.2	284.1/ 1410.0	315.8/ 1574.2	364.5/ 1810.4	364.5/ 1810.4
Min/Max Water P.D.	**Ft Wg**	2.0/ 40.9	2.0/ 36.2	2.0 / 37.0	1.9/ 34.7	2.0/ 35.3	2.0/ 35.3
Condenser							
Coil Rows Deep / Total FA	**Ft²**	3 / 299.4	3 / 171.1, 4 / 128.3	3 / 171.1, 4 / 171.1	4 / 342.2	4 / 342.2	3 / 213.9, 4 / 171.1
No Of Fans		14	14	16	16	16	18
Fan Dia (Qty)	**mm**	900 (14)	900 (14)	900 (16)	900 (16)	900 (16)	900 (18)
Fan Motor (Qty)	**Hp**	3.0 (14)	3.0 (14)	3.0 (16)	3.0 (16)	3.0 (16)	3.0 (18)
Fan Motor FLA (Qty)	**Amp**	4.9 (14)	4.9 (14)	4.9 (16)	4.9 (16)	4.9 (16)	4.9 (18)
Min. Operating Ambient	**°F**	55	55	55	55	55	55
Electrical							
Nom. Voltage		400V/3/ 50Hz	400V/3/ 50Hz	400V/3/ 50Hz	400V/3/ 50Hz	400V/3/ 50Hz	400V/3/ 50Hz
Unit RLA	**Amp**	460	485	560	626	604	592
Unit Max. Inrush	**Amp**	761	609	718	784	816	835
General							
Unit Length	**Inch [mm]**	364 [9246]	364 [9246]	406 [10312]	406 [10312]	406 [10312]	448 [11379]
Unit Width	**Inch [mm]**	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]
Unit Height	**Inch [mm]**	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]	97 ½ [2477]
Shipping Weight	**Lbs [kg]**	22657 [10277]	25018 [11348]	26892 [12198]	28468 [12913]	29284 [13283]	30732 [13940]
Operating Weight	**Lbs [kg]**	23302 [10570]	25808 [11706]	27722 [12574]	29488 [13375]	30377 [13779]	31825 [14436]
Operating Charge R134a	**Lbs [kg]**	572 [259]	624 [283]	702 [318]	780 [354]	832 [377]	884 [401]

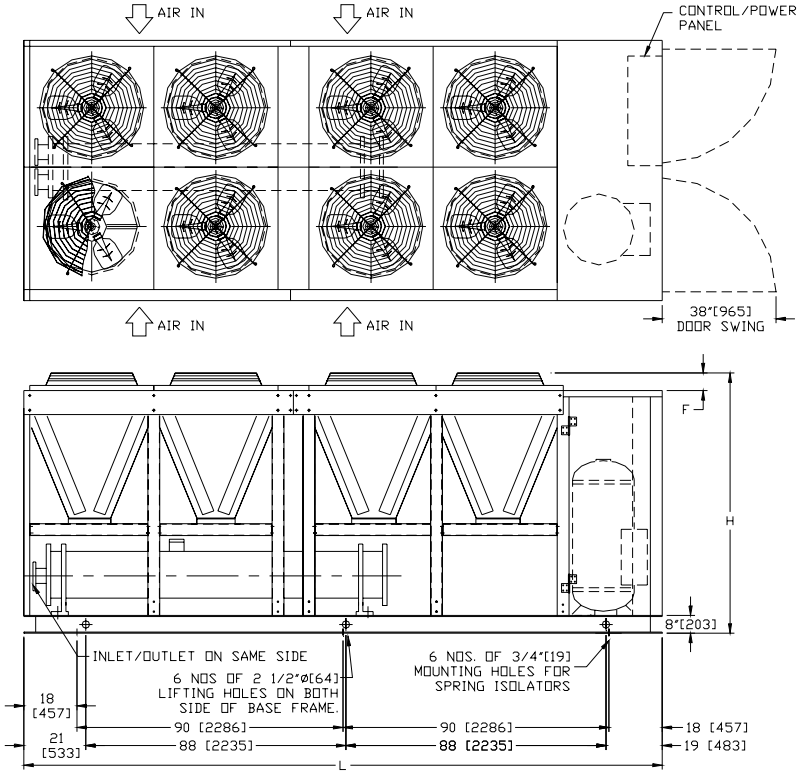
MODEL	AFVX	390-5SR	420-5SR	445-5SR	470-5SR	520-5SR
Compressor						
Model (Qty)		MSC1218 (2) MSC1230 (1)	MSC1218 (1) MSC1222 (1) MSC1230 (1)	MSC1222 (2) MSC1230 (1)	MSC1218 (2) MSC1222 (2)	MSC1222 (4)
Rpm		2950	2950	2950	2950	2950
Nominal Capacity	**Tons**	392.9	420.0	445.2	470.3	521.3
Min. % Unit Capacity Reduction		8.33%	8.33%	8.33%	6.25%	6.25%
Evaporator						
Model (Qty)		L2R (1), M1R (1)	L3R (1), M1R (1)	L3R (1), M1R (1)	L3R (1), M1R (1)	M1R (2)
Water Connector	**Inch [mm]**	10 [254]	10 [254]	10 [254]	10 [254]	12 [305]
Nom. Water Flow / P.D.	**Gpm / Ft wg**	944.0/ 8.8	1009.1/ 9.2	1069.7/ 10.2	1130.0/ 11.2	1252.5/ 12.0
Min/Max Water Flow	**Gpm**	437.3/ 1810.5	437.9/ 1945.3	437.9/ 1945.3	437.9/ 1945.3	437.9/ 2174.8
Min/Max Water P.D.	**Ft Wg**	1.9/ 34.8	2.0/ 35.0	2.0/ 35.0	2.0/ 35.0	1.9/ 40.5
Condenser						
Coil Rows Deep / Total FA	**Ft²**	3 / 320.8, 4 / 256.7	3 / 577.5	3 / 256.7, 4 / 320.8	3 / 320.8, 4 / 256.7	4 / 577.5
No Of Fans		18	18	18	18	18
Fan Dia (Qty)	**mm**	900 (18)	860 (18)	860 (18)	860 (18)	860 (18)
Fan Motor (Qty)	**Hp**	3.0 (18)	4.0 (18)	4.0 (18)	4.0 (18)	4.0 (18)
Fan Motor FLA (Qty)	**Amp**	4.9 (18)	7.1 (18)	7.1 (18)	7.1 (18)	7.1 (18)
Min. Operating Ambient	**°F**	55	55	55	55	55
Electrical						
Nom. Voltage		400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz	400V/3/50Hz
Unit RLA	**Amp**	740	788	796	935	960
Unit Max. Inrush	**Amp**	1035	1082	1007	1234	1085
General						
Unit Length	**Inch [mm]**	471 [11963]	471 [11963]	471 [11963]	471 [11963]	471 [11963]
Unit Width	**Inch [mm]**	88 [2235]	88 [2235]	88 [2235]	88 [2235]	88 [2235]
Unit Height	**Inch [mm]**	121 ½ [3087]	120 ½ [3061]	120 ½ [3061]	120 ½ [3061]	120 ½ [3061]
Shipping Weight	**Lbs [kg]**	33089 [15009]	33013 [14974]	34268 [15544]	36929 [16751]	39681 [17999]
Operating Weight	**Lbs [kg]**	33874 [15365]	33819 [15340]	35074 [15910]	37735 [17116]	40992 [18594]
Operating Charge R134a	**Lbs [kg]**	962 [436]	1001 [454]	1066 [484]	1144 [519]	1248 [566]

DIMENSIONAL DATA

AFVX 85-5SR



AFVX 105-5SR, 125-5SR, 155-5SR, 175-5SR

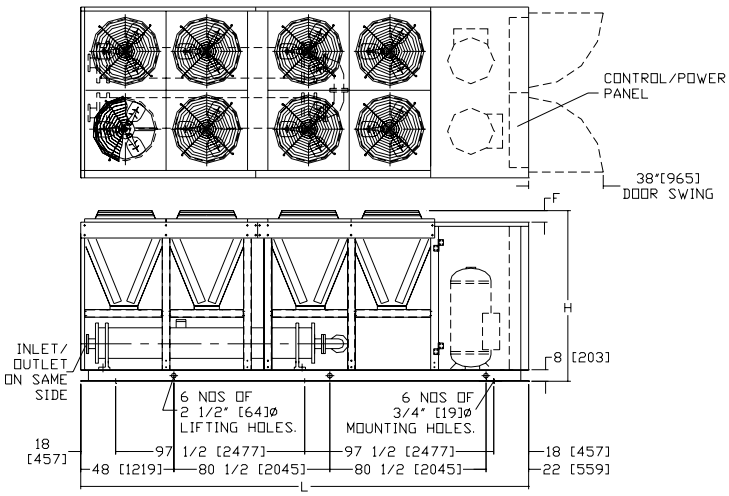


MODEL	F	H	L
AFVX 105-5SR	6 1/2" [165]	88 1/2" [2248]	216" [5486]
AFVX 125-5SR	6 1/2" [165]	88 1/2" [2248]	220" [5588]
AFVX 155-5SR	7 1/2" [191]	97 1/2" [2477]	220" [5588]
AFVX 175-5SR			

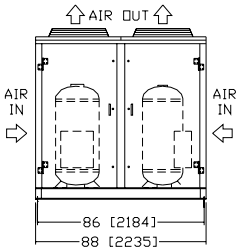
NOTE: ALL DIMENSIONS ARE IN INCHES[MM].

DIMENSIONAL DATA

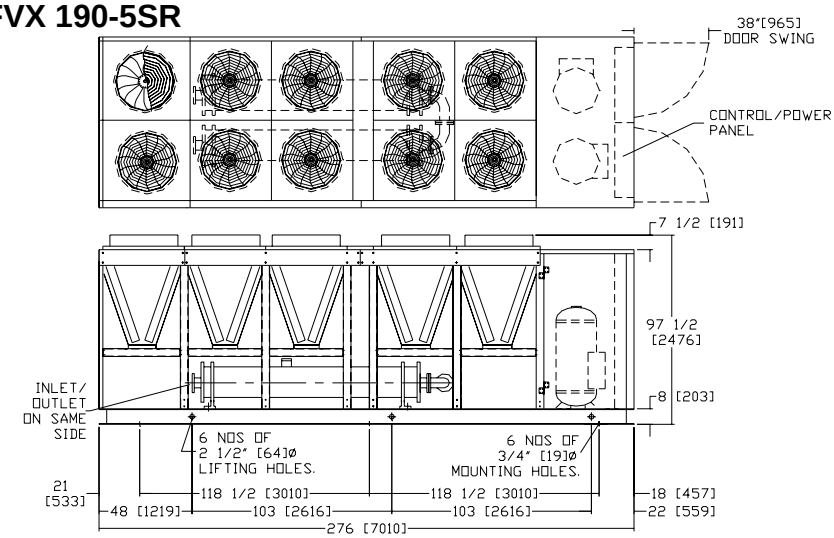
AFVX 115T-5SR, 130T-5SR, 145T-5SR, 160T-5SR, 180T-5SR

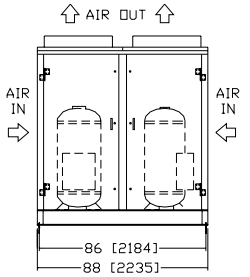


MODEL	F	H	L
AFVX 115T-5SR, 130T-5SR	6 1/2" [165]	88 1/2" [2248]	231" [5867]
AFVX 145T-5SR	6 1/2" [165]	96 1/2" [2451]	234" [5944]
AFVX 160T-5SR, 180T-5SR	7 1/2" [191]	97 1/2" [2477]	234" [5944]

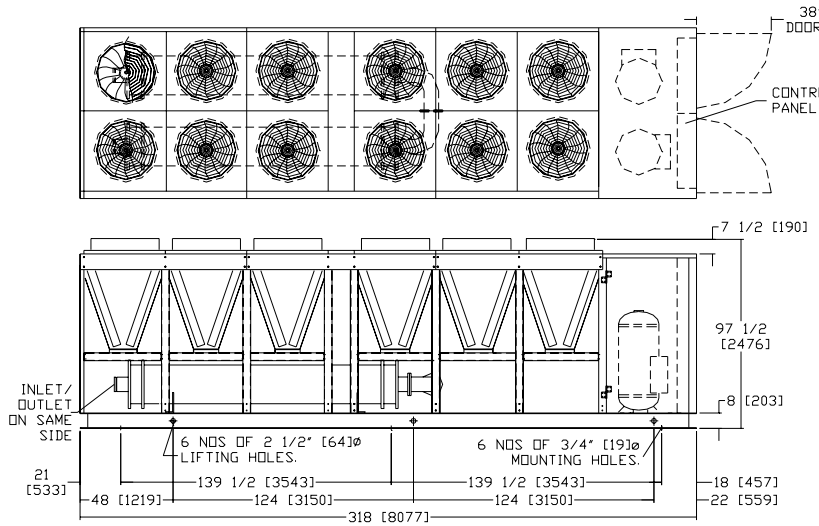


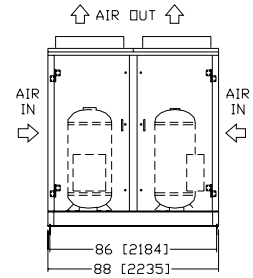
AFVX 190-5SR





AFVX 210-5SR

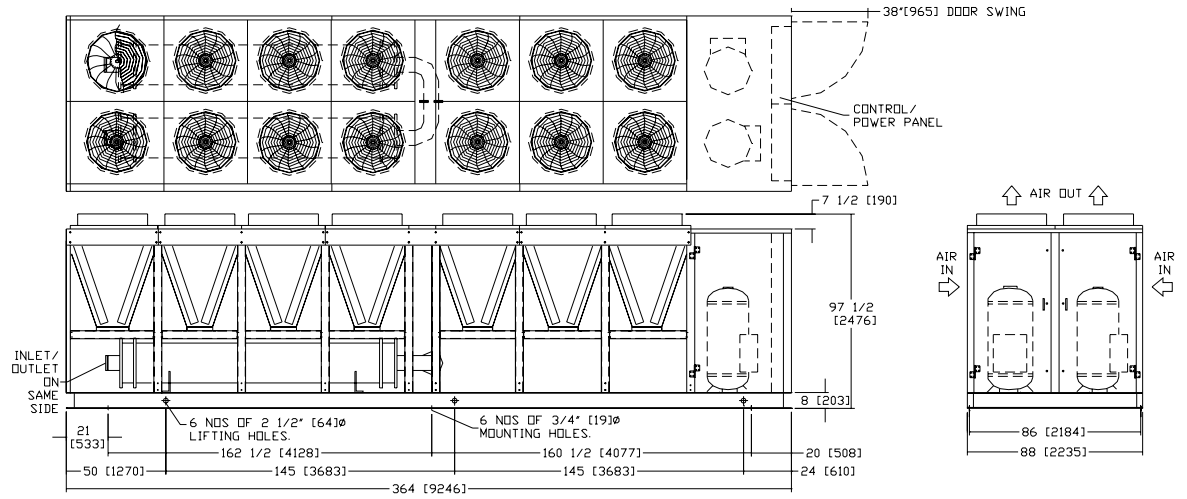




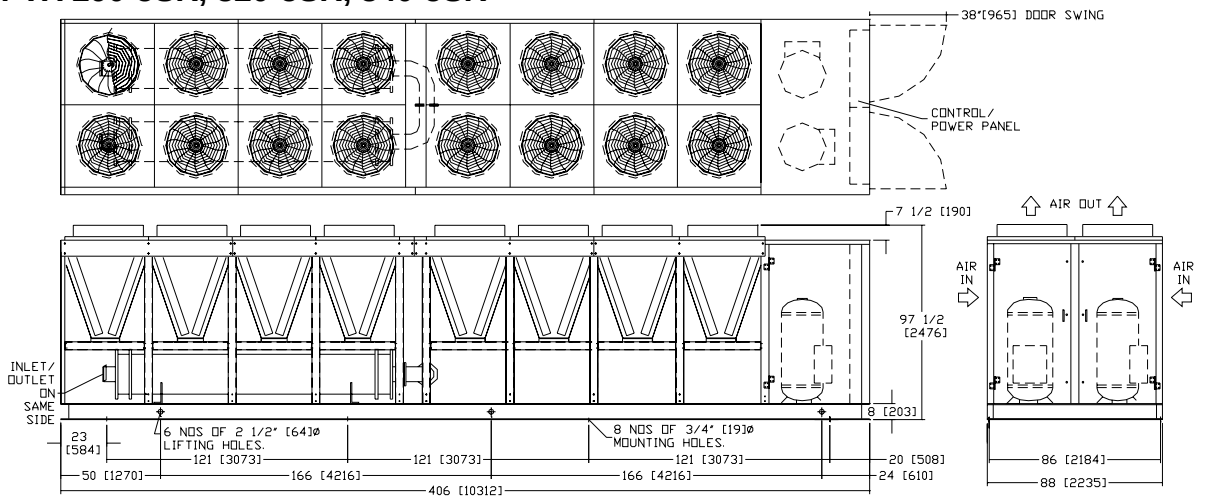
NOTE: ALL DIMENSIONS ARE IN INCHES[MM].

DIMENSIONAL DATA

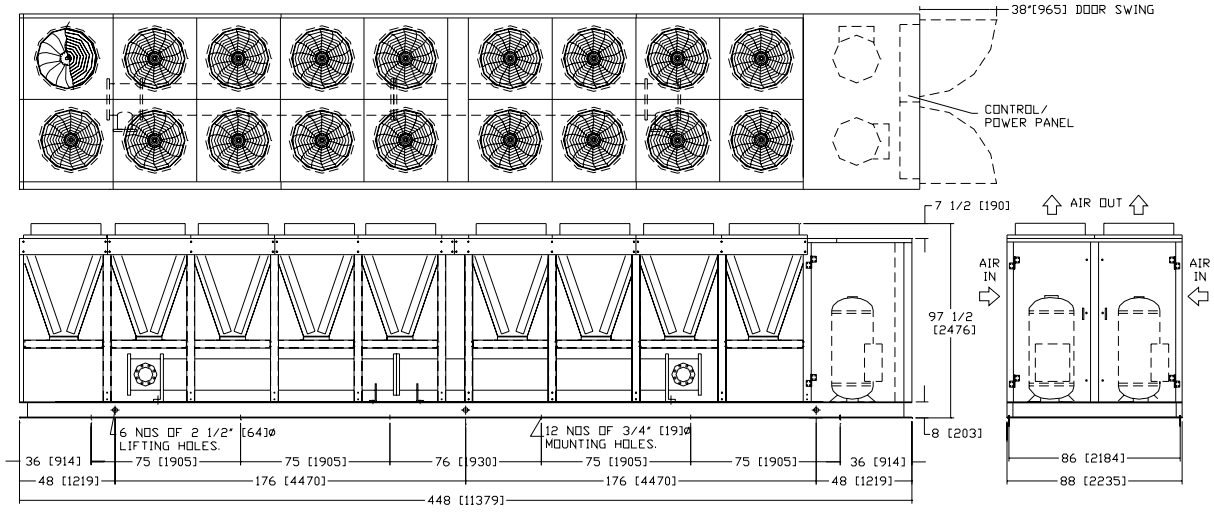
AFVX 235-5SR, 260-5SR



AFVX 290-5SR, 320-5SR, 340-5SR



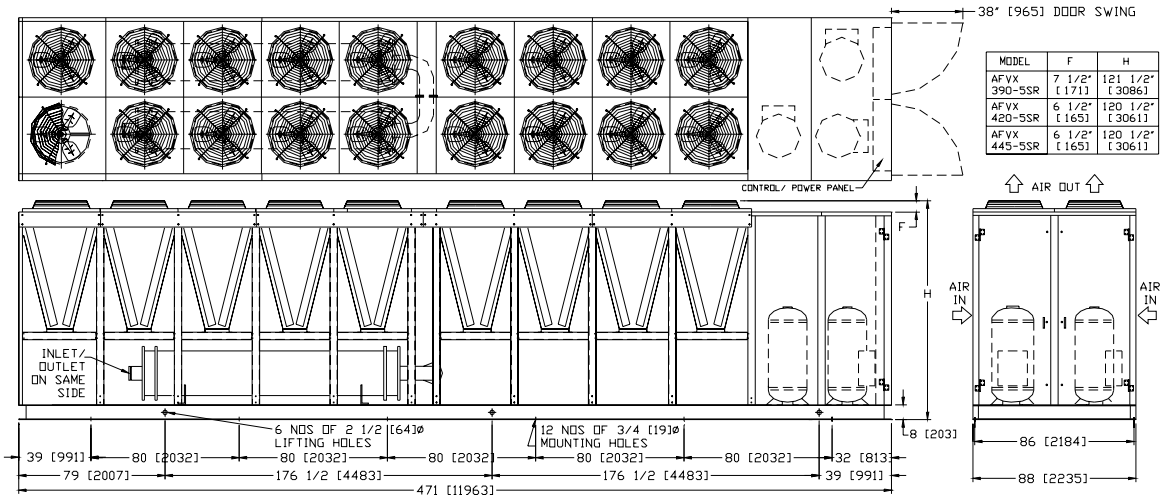
AFVX 365-5SR



NOTE: ALL DIMENSIONS ARE IN INCHES[MM].

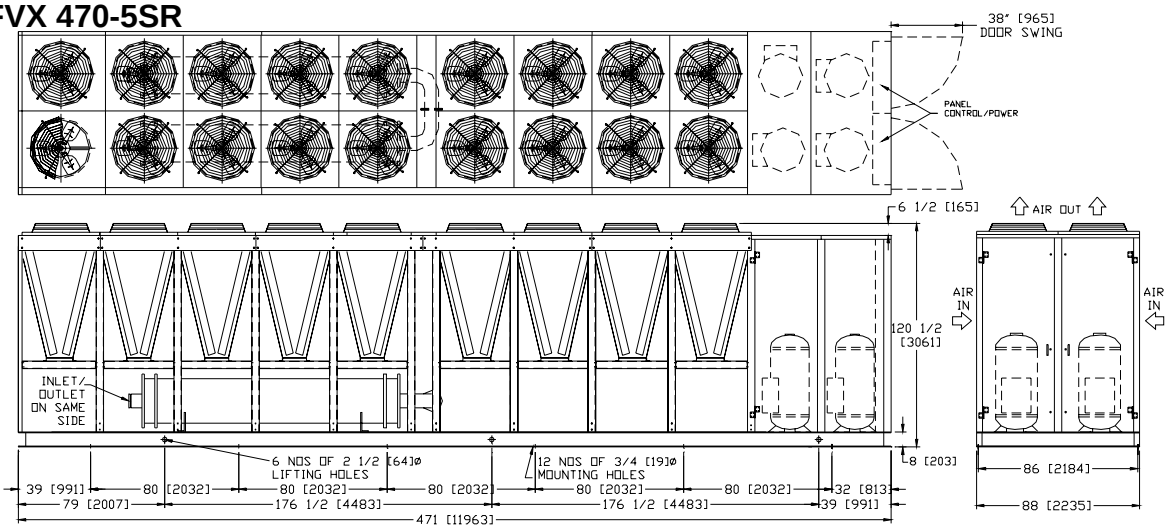
DIMENSIONAL DATA

AFVX 390-5SR, 420-5SR, 445-5SR

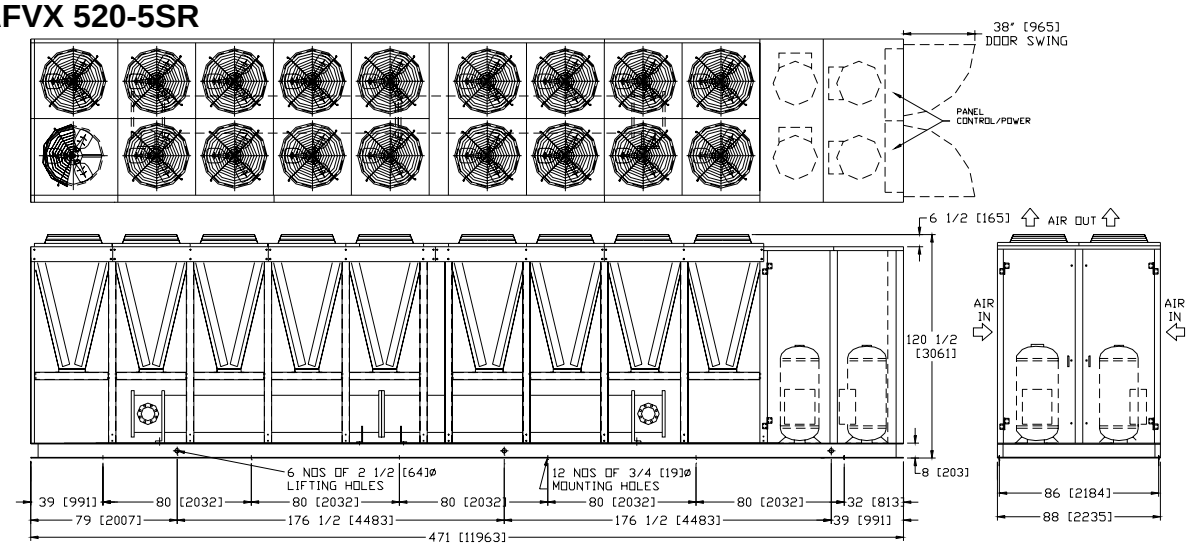


MODEL	F	H
AFVX 390-5SR	7 1/2" [171]	121 1/2" [3086]
AFVX 420-5SR	6 1/2" [165]	120 1/2" [3061]
AFVX 445-5SR	6 1/2" [165]	120 1/2" [3061]

AFVX 470-5SR



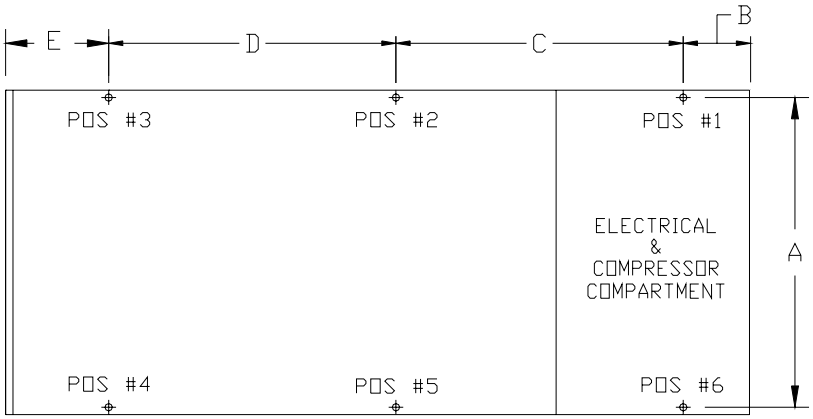
AFVX 520-5SR



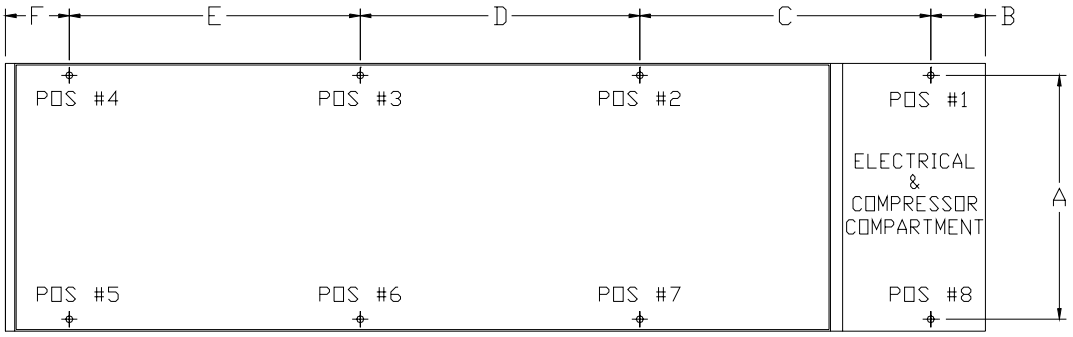
NOTE: ALL DIMENSIONS ARE IN INCHES[MM].

FLOOR LOADING DIAGRAM

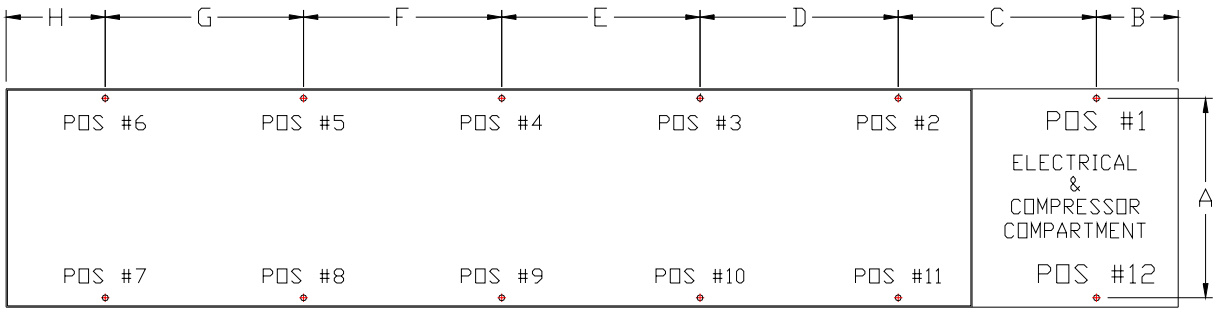
AFVX 85-5SR, 105-5SR, 155-5SR, 175-5SR, 115T-5SR, 130T-5SR, 145T-5SR, 160T-5SR, 180T-5SR, 190-5SR, 210-5SR, 235-5SR, 260-5SR



AFVX 290-5SR, 320-5SR, 340-5SR



AFVX 365-5SR, 390-5SR, 420-5SR, 445-5SR, 470-5SR, 520-5SR



FLOOR LOADING DIAGRAM

POINT LOAD LOCATION

Unit Model AFVX	Dimensions - Inches [mm]							
	A Dim.	B Dim.	C Dim.	D Dim.	E Dim.	F Dim.	G Dim.	H Dim.
85-5	86 [2184]	18 [457]	69 [1753]	69 [1753]	18 [457]	-	-	-
105-5	86 [2184]	18 [457]	69 [1753]	69 [1753]	18 [457]	-	-	-
130-5	86 [2184]	18 [457]	69 [1753]	69 [1753]	18 [457]	-	-	-
155-5	86 [2184]	18 [457]	90 [2286]	90 [2286]	18 [457]	-	-	-
180-5	86 [2184]	18 [457]	97 1/2 [2477]	97 1/2 [2477]	18 [457]	-	-	-
200-5	86 [2184]	18 [457]	118 1/2 [3010]	118 1/2 [3010]	21 [533]	-	-	-
220-5	86 [2184]	18 [457]	139 1/2 [3543]	139 1/2 [3543]	21 [533]	-	-	-
245-5	86 [2184]	18 [457]	139 1/2 [3543]	139 1/2 [3543]	21 [533]	-	-	-
270-5	86 [2184]	18 [457]	139 1/2 [3543]	139 1/2 [3543]	21 [533]	-	-	-
300-5	86 [2184]	18 [457]	160 1/2 [4077]	160 1/2 [4077]	21 [533]	-	-	-
320-5	86 [2184]	18 [457]	121 [3073]	121 [3073]	121 [3073]	21 [533]	-	-
355-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
380-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
405-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
430-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
455-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
480-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
515-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
545-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
570-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
590-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
615-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]
640-5	86 [2184]	32 [813]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	80 [2032]	39 [991]

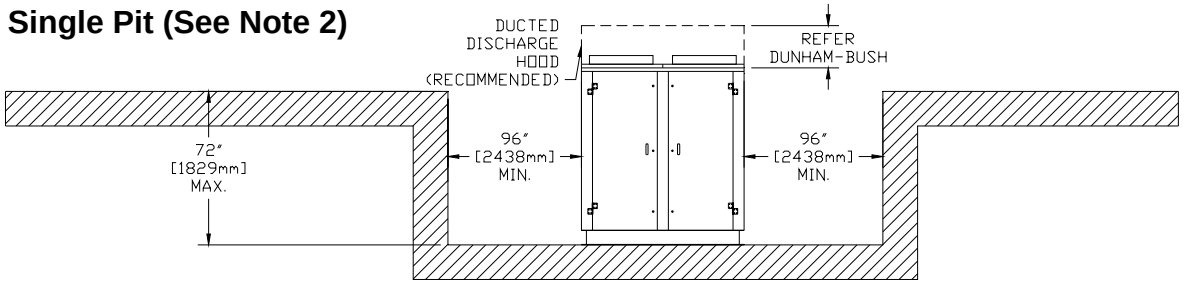
POINT LOAD DATA

Unit Model AFVX	Point Load - LBS [Kg]												Total Operating Weight LBS [Kg]
	Pos. #1	Pos. #2	Pos. #3	Pos. #4	Pos. #5	Pos. #6	Pos. #7	Pos. #8	Pos. #9	Pos. #10	Pos. #11	Pos. #12	
85-5	1360 [617]	1342 [609]	1324 [600]	1324 [601]	1502 [681]	1680 [762]	-	-	-	-	-	-	8532 [3870]
105-5	1420 [644]	1412 [640]	1404 [637]	1404 [637]	1579 [716]	1755 [796]	-	-	-	-	-	-	8973 [4070]
130-5	1578 [716]	1572 [713]	1566 [710]	1566 [711]	1771 [803]	1975 [896]	-	-	-	-	-	-	10026 [4548]
155-5	1762 [799]	1735 [787]	1708 [775]	1708 [775]	1940 [880]	2171 [985]	-	-	-	-	-	-	11024 [5001]
180-5	2498 [1133]	2267 [1028]	2036 [924]	2036 [924]	2267 [1028]	2498 [1133]	-	-	-	-	-	-	13603 [6170]
200-5	2722 [1235]	2564 [1163]	2405 [1091]	2406 [1091]	2571 [1166]	2737 [1242]	-	-	-	-	-	-	15405 [6988]
220-5	2956 [1341]	2778 [1260]	2600 [1179]	2600 [1179]	2778 [1260]	2956 [1341]	-	-	-	-	-	-	16669 [7561]
245-5	3199 [1451]	3019 [1369]	2839 [1288]	2841 [1289]	3054 [1385]	3267 [1482]	-	-	-	-	-	-	18217 [8263]
270-5	3353 [1521]	3156 [1432]	2959 [1342]	2959 [1342]	3156 [1432]	3353 [1521]	-	-	-	-	-	-	18937 [8590]
300-5	3653 [1657]	3353 [1521]	3054 [1385]	3053 [1385]	3358 [1523]	3663 [1662]	-	-	-	-	-	-	20135 [9133]
320-5	2873 [1303]	2741 [1243]	2609 [1183]	2476 [1123]	2476 [1123]	2609 [1183]	2741 [1243]	2873 [1303]	-	-	-	-	21397 [9706]
355-5	2012 [913]	2007 [911]	2003 [909]	1999 [907]	1995 [905]	1990 [903]	2040 [925]	2062 [936]	2085 [946]	2107 [956]	2129 [966]	2152 [976]	24582 [11150]
380-5	2066 [937]	2067 [938]	2068 [938]	2068 [938]	2069 [938]	2069 [939]	2200 [998]	2213 [1004]	2226 [1010]	2240 [1016]	2253 [1022]	2266 [1028]	25804 [11705]
405-5	2126 [964]	2136 [969]	2145 [973]	2154 [977]	2164 [982]	2173 [986]	2316 [1051]	2325 [1055]	2334 [1059]	2343 [1063]	2352 [1067]	2361 [1071]	26931 [12216]
430-5	2261 [1026]	2279 [1034]	2297 [1042]	2315 [1050]	2333 [1058]	2351 [1066]	2405 [1091]	2419 [1097]	2433 [1104]	2447 [1110]	2462 [1117]	2476 [1123]	28477 [12917]
455-5	2285 [1036]	2307 [1046]	2329 [1056]	2350 [1066]	2372 [1076]	2394 [1086]	2512 [1139]	2512 [1139]	2512 [1140]	2512 [1140]	2513 [1140]	2513 [1140]	29110 [13204]
480-5	2345 [1064]	2393 [1086]	2442 [1108]	2490 [1129]	2538 [1151]	2586 [1173]	2704 [1227]	2679 [1215]	2654 [1204]	2629 [1192]	2603 [1181]	2578 [1169]	30641 [13899]
515-5	2887 [1310]	2829 [1283]	2770 [1256]	2711 [1230]	2652 [1203]	2593 [1176]	2596 [1177]	2661 [1207]	2725 [1236]	2790 [1266]	2855 [1295]	2920 [1325]	32990 [14964]
545-5	2971 [1348]	2993 [1357]	3015 [1367]	3036 [1377]	3058 [1387]	3080 [1397]	3080 [1397]	3058 [1387]	3036 [1377]	3015 [1367]	2993 [1357]	2971 [1348]	36306 [16468]
570-5	3239 [1469]	3183 [1444]	3127 [1419]	3071 [1393]	3015 [1368]	2959 [1342]	2959 [1342]	3016 [1368]	3073 [1394]	3131 [1420]	3188 [1446]	3245 [1472]	37208 [16877]
590-5	3252 [1475]	3194 [1449]	3136 [1423]	3079 [1396]	3021 [1370]	2963 [1344]	2963 [1344]	3021 [1370]	3079 [1396]	3136 [1423]	3194 [1449]	3252 [1475]	37289 [16914]
615-5	3278 [1487]	3222 [1461]	3166 [1436]	3109 [1410]	3053 [1385]	2997 [1360]	2998 [1360]	3055 [1386]	3112 [1411]	3169 [1437]	3226 [1463]	3283 [1489]	37666 [17085]
640-5	3068 [1392]	3084 [1399]	3101 [1407]	3117 [1414]	3134 [1421]	3150 [1429]	3150 [1429]	3134 [1421]	3117 [1414]	3101 [1407]	3084 [1399]	3068 [1392]	37308 [16923]

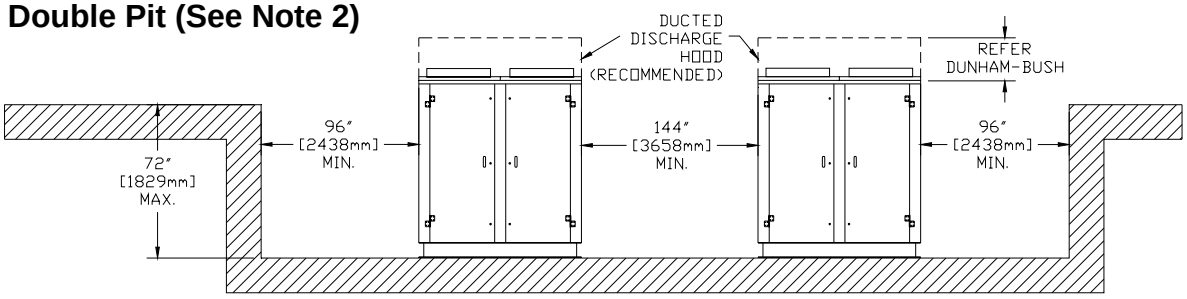
DIMENSIONAL CLEARANCE

AIR COOLED SCREW FLOODED CHILLER

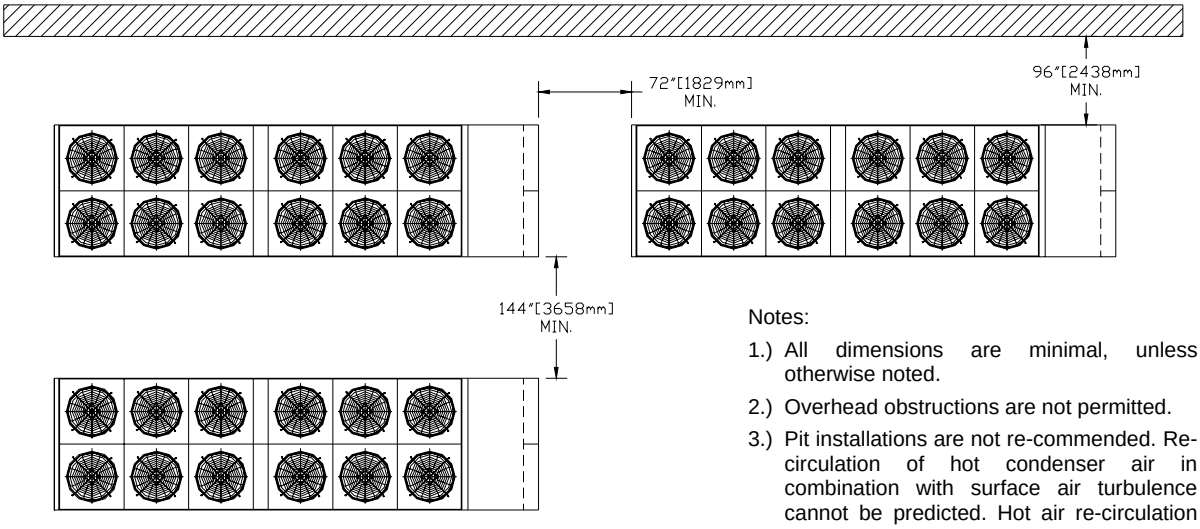
Single Pit (See Note 2)



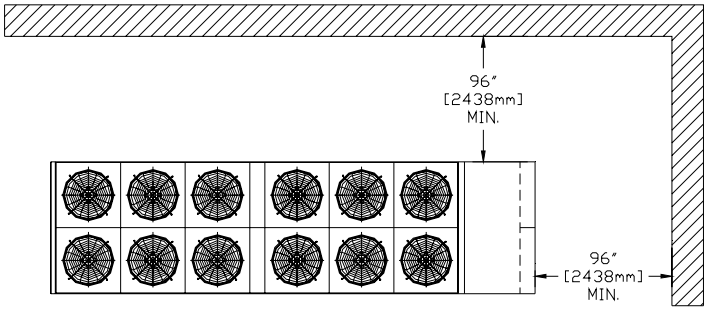
Double Pit (See Note 2)



Multi Pit



Corner Wall



Notes:

1.) All dimensions are minimal, unless otherwise noted.

2.) Overhead obstructions are not permitted.

3.) Pit installations are not re-commended. Re-circulation of hot condenser air in combination with surface air turbulence cannot be predicted. Hot air re-circulation will severely affect unit efficiency (EER) and can cause high pressure or fan motor temperature trips. Dunham-Bush will not be responsible for ducting fans to a higher level to alleviate the above mentioned conditions.

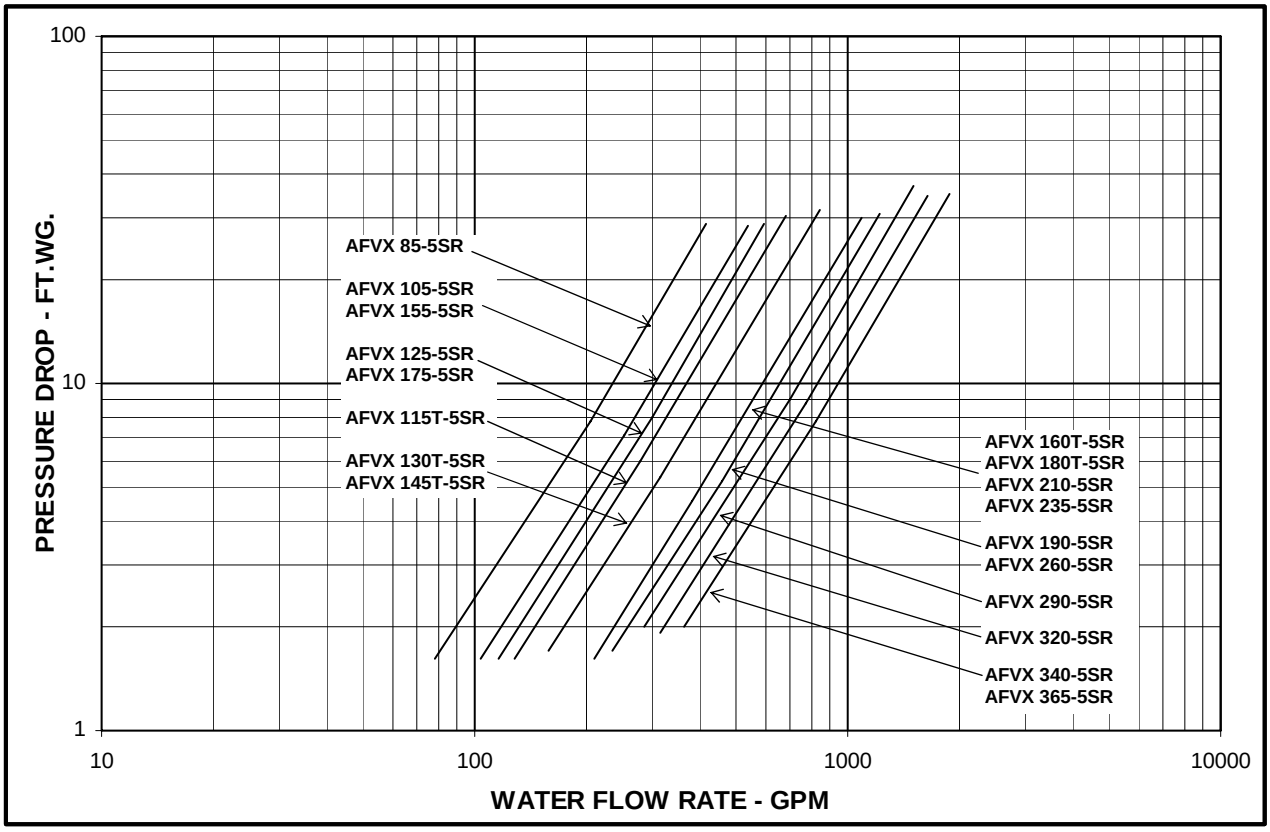
4.) If pit installation are unavoidable, ducted discharge hood as shown is recommended to reduce the hot air re-circulation. However, Dunham-Bush will not be responsible for the poor unit performance which might be caused by above recommendations, because there may be other unidentified and unpredictable causes at the installation sites.

5.) AFVX 210-5SR is shown in this drawing.

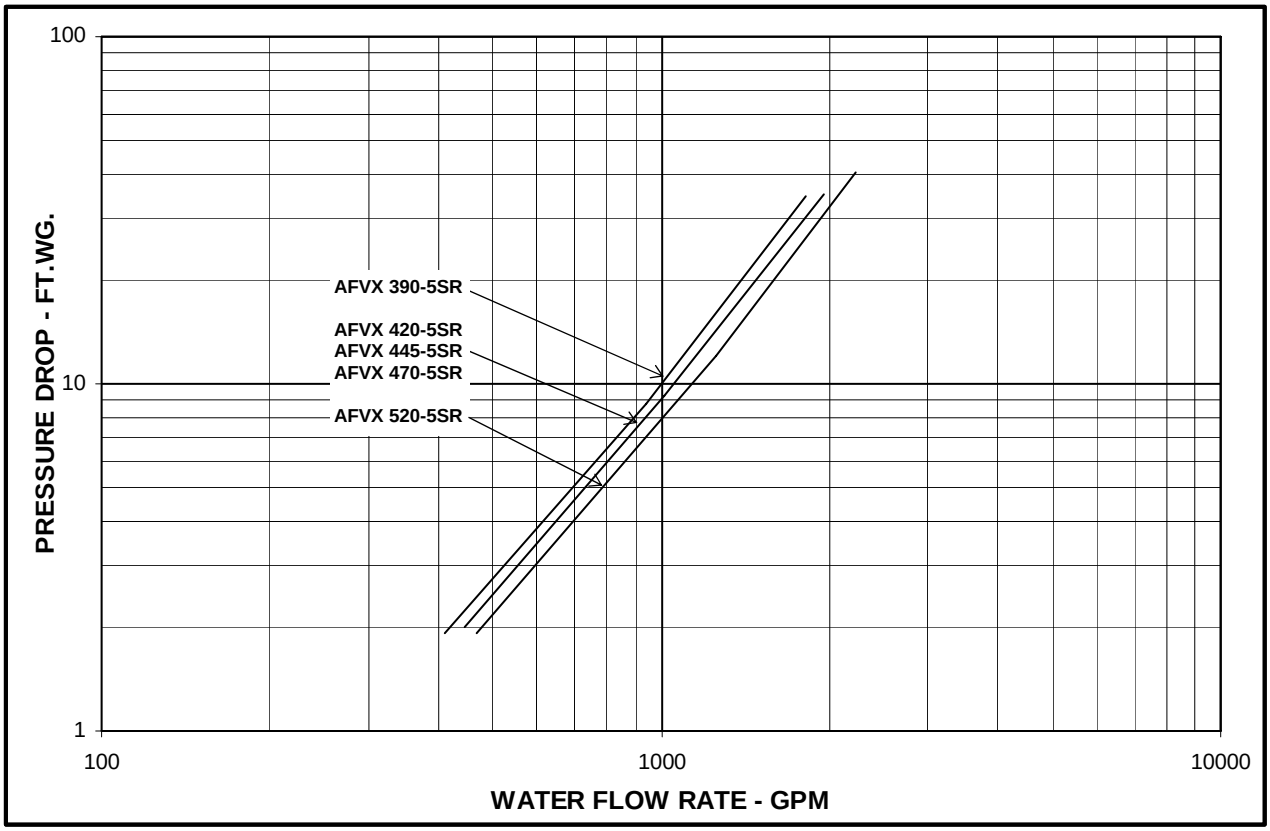
PRESSURE DROP

EVAPORATOR WATER PRESSURE

1.) 1 & 2 Compressor Units



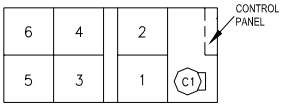
2.) 3 & 4 Compressor Units



CONDENSER FAN

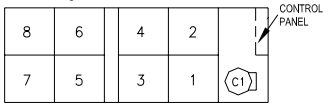
FAN POSITION NUMBER & CYCLING SEQUENCE

AFVX 85-5SR



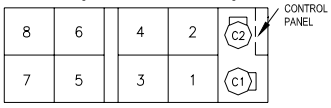
	SYSTEM
BASE FANS	2, 4 & 6
STAGE 2	1 & 5
STAGE 3	3

AFVX 105-5SR, 125-5SR, 155-5SR, 175-5SR



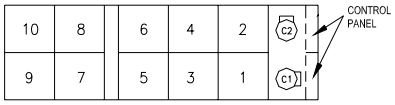
	SYSTEM
BASE FANS	2, 4, 6 & 8
STAGE 2	1 & 5
STAGE 3	3 & 7

AFVX 115T-5SR, 130T-5SR, 145T-5SR, 160T-5SR, 180T-5SR



	SYSTEM 1	SYSTEM 2
BASE FANS	6 & 8	2 & 4
STAGE 2	5	1
STAGE 3	7	3

AFVX 190-5SR

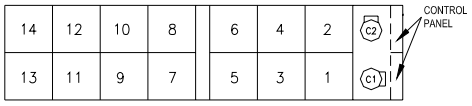


	SYSTEM 1	SYSTEM 2
BASE FANS	6, 8 & 10	2 & 4
STAGE 2	5 & 9	1
STAGE 3	7	3

AFVX 210-5SR

	SYSTEM 1	SYSTEM 2
BASE FANS	8, 10 & 12	2, 4 & 6
STAGE 2	7 & 11	1 & 5
STAGE 3	9	3

AFVX 235-5SR



	SYSTEM 1	SYSTEM 2
BASE FANS	8, 10, 12 & 14	2, 4 & 6
STAGE 2	7 & 11	1 & 5
STAGE 3	9 & 13	3

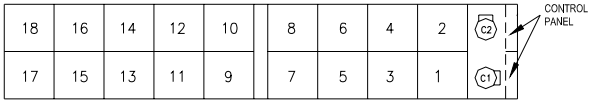
AFVX 260-5SR

	SYSTEM 1	SYSTEM 2
BASE FANS	10, 12 & 14	2, 4, 6 & 8
STAGE 2	9 & 13	1 & 5
STAGE 3	11	3 & 7

AFVX 290-5SR, 320-5SR, 340-5SR

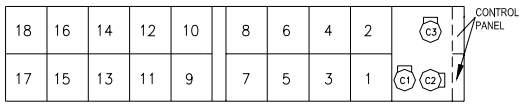
	SYSTEM 1	SYSTEM 2
BASE FANS	10, 12, 14 & 16	2, 4, 6 & 8
STAGE 2	9 & 13	1 & 5
STAGE 3	11 & 15	3 & 7

AFVX 365-5SR



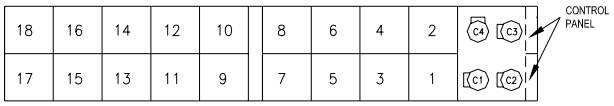
	SYSTEM 1	SYSTEM 2
BASE FANS	12, 14, 16 & 18	2, 4, 6, 8 & 10
STAGE 2	11 & 15	1 & 5
STAGE 3	13 & 17	3 & 7
STAGE 4	-	9

AFVX 390-5SR, 420-5SR, 445-5SR



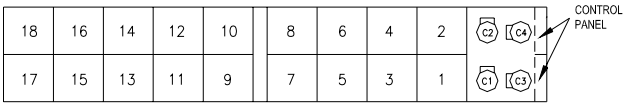
	SYSTEM 1	SYSTEM 2
BASE FANS	10, 12, 14, 16 & 18	2, 4, 6 & 8
STAGE 2	9 & 13	1 & 5
STAGE 3	11 & 15	3, 7
STAGE 4	17	-

AFVX 470-5



	SYSTEM 1	SYSTEM 2
BASE FANS	12, 14, 16 & 18	2, 4, 6, 8 & 10
STAGE 2	11 & 15	1 & 5
STAGE 3	13 & 17	3 & 7
STAGE 4	-	9

AFVX 520-5



	SYSTEM 1	SYSTEM 2
BASE FANS	10, 12, 14, 16 & 18	2, 4, 6, 8 & 10
STAGE 2	11 & 15	1 & 3
STAGE 3	13 & 17	5 & 7
STAGE 4	9 (Based on highest discharge pressure between 2 systems.)	

SOUND DATA

Sound Pressure Level dB(A) @ 10M- Free Field

BAND (HZ)	63	125	250	500	1K	2K	4K	8K	TOTAL	NC
AFVX 85-5SR	54	43	49	55	62	59	51	44	65	60
AFVX 105-5SR	55	43	49	56	63	60	51	44	66	65
AFVX 125-5SR	55	44	50	56	63	60	52	45	66	65
AFVX 155-5SR	54	44	50	56	63	60	52	45	66	65
AFVX 175-5SR	54	44	50	56	63	60	52	45	66	65
AFVX 115T-5SR	56	42	49	55	61	58	51	44	65	60
AFVX 130T-5SR	56	43	49	56	62	59	51	44	65	60
AFVX 145T-5SR	56	43	49	56	62	59	51	44	65	60
AFVX 160T-5SR	56	44	50	57	64	61	52	45	67	65
AFVX 180T-5SR	56	45	51	58	65	62	53	45	68	65
AFVX 190-5SR	57	46	51	58	65	62	53	46	68	65
AFVX 210-5SR	57	46	52	59	65	63	54	47	69	65
AFVX 235-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 260-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 290-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 320-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 340-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 365-5SR	57	46	52	59	65	63	54	47	68	65
AFVX 390-5SR	58	47	53	60	67	64	55	48	70	65
AFVX 420-5SR	58	49	56	62	67	65	57	51	71	65
AFVX 445-5SR	58	49	56	62	67	65	57	51	71	65
AFVX 470-5SR	60	50	56	62	68	66	58	51	72	70
AFVX 520-5SR	60	50	56	62	68	66	58	51	72	70

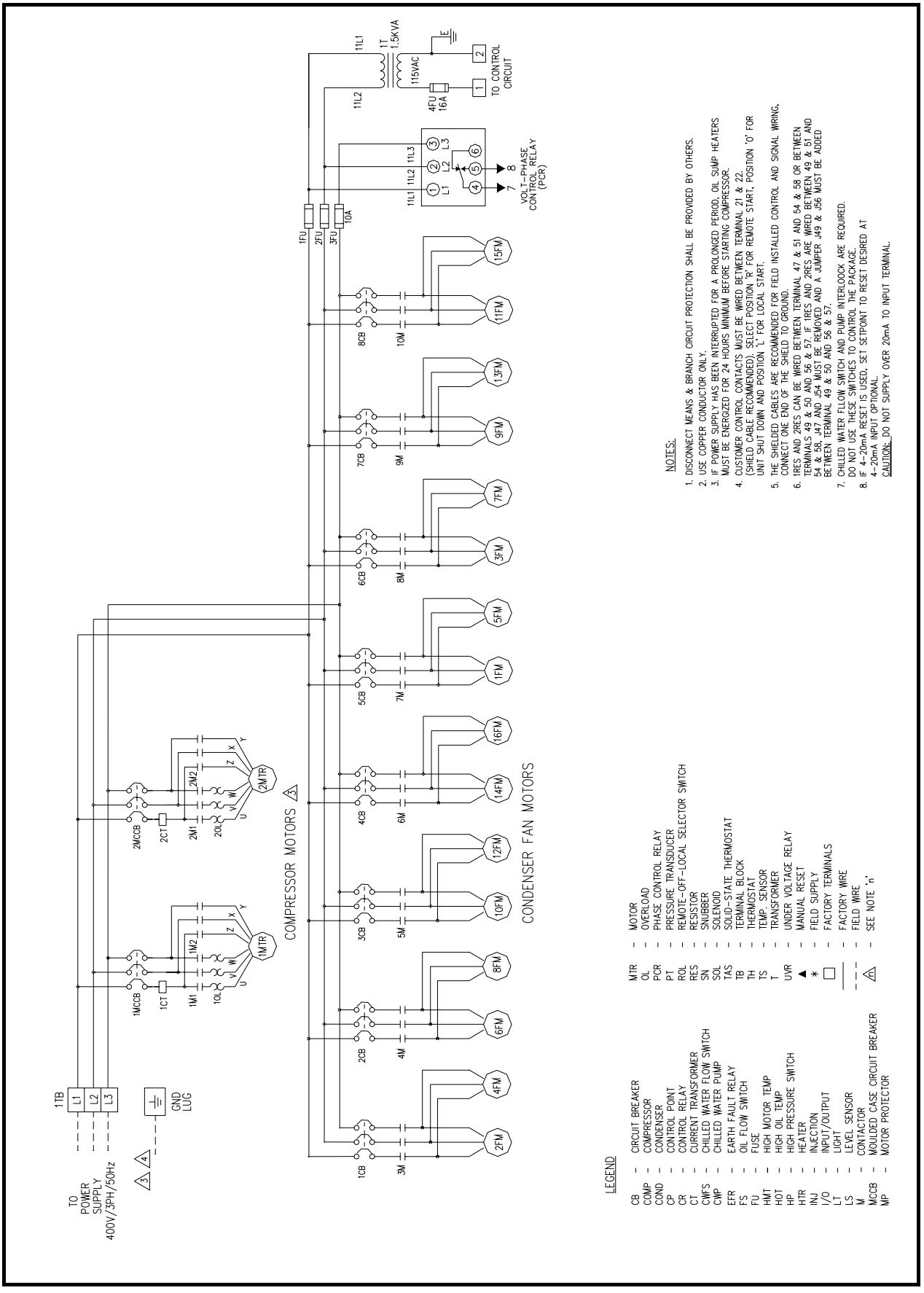
Note: Published sound values as above are with ±2 dB tolerance.

ELECTRICAL DATA

MODEL AFVX	COMPRESSOR DATA				COND. FAN MOTOR DATA			UNIT ELECTRICAL DATA		
	MODEL	RLA	1ST. STEP	XL	QTY	HP	FLA	FLA	MCA	MFS
85-5SR	MSC1215	161	325	885	6	1.5	3.2	180	220	350
105-5SR	MSC1218	196	375	1030	8	1.5	3.2	222	271	450
125-5SR	MSC1222	236	679	999	8	1.5	3.2	262	321	500
155-5SR	MSC1227	275	881	1295	8	3	4.9	314	383	600
175-5SR	MSC1230	321	946	1391	8	3	4.9	360	440	700
115T-5SR	MSC1210 MSC1210	109 109	200 200	498 498	4 4	1.5 1.5	3.2 3.2	244	271	350
130T-5SR	MSC1210 MSC1212	109 135	200 252	498 652	4 4	1.5 1.5	3.2 3.2	270	303	400
145T-5SR	MSC1212 MSC1212	135 135	252 252	652 652	4 4	1.5 1.5	3.2 3.2	296	329	450
160T-5SR	MSC1212 MSC1215	134 159	252 325	652 885	4 4	3 3	4.9 4.9	332	372	500
180T-5SR	MSC1215 MSC1215	163 163	325 325	885 885	4 4	3 3	4.9 4.9	365	406	500
190-5SR	MSC1215 MSC1218	163 195	325 375	885 1030	4 6	3 3	4.9 4.9	407	456	600
210-5SR	MSC1218 MSC1218	200 200	375 375	1030 1030	6 6	3 3	4.9 4.9	459	509	700
235-5SR	MSC1218 MSC1222	193 236	375 679	1030 999	6 8	3 3	4.9 4.9	498	557	700
260-5SR	MSC1222 MSC1222	236 236	679 679	999 999	8 6	3 3	4.9 4.9	541	600	800
290-5SR	MSC1222 MSC1227	236 275	679 881	999 1295	8 8	3 3	4.9 4.9	589	658	800
320-5SR	MSC1227 MSC1227	275 275	881 881	1295 1295	8 8	3 3	4.9 4.9	628	697	800
340-5SR	MSC1227 MSC1230	275 321	881 946	1295 1391	8 8	3 3	4.9 4.9	674	743	1000
365-5SR	MSC1230 MSC1230	321 321	946 946	1391 1391	10 8	3 3	4.9 4.9	730	810	1000
390-5SR	MSC1230 MSC1218*2	321 200	946 375	1391 1030	8 10	3 3	4.9 4.9	809	889	1200
420-5SR	MSC1230 MSC1218 MSC1222	321 194 236	946 375 679	1391 1030 999	8 10	4 4	7.1 7.1	879	959	1200
455-5SR	MSC1230 MSC1222*2	321 236	946 679	1391 999	8 10	4 4	7.1 7.1	921	1001	1200
470-5SR	MSC1218 MSC1222 MSC1218 MSC1222	196 236 196 236	375 679 375 679	1030 999 1030 999	10 8	4 4	7.1 7.1	992	1051	1200
520-5SR	MSC1222*2 MSC1222*2	236 236	679 679	999 999	9 9	4 4	7.1 7.1	1072	1131	1200

TYPICAL WIRING SCHEMATIC

AFVX – 2 COMPRESSORS



LEGEND

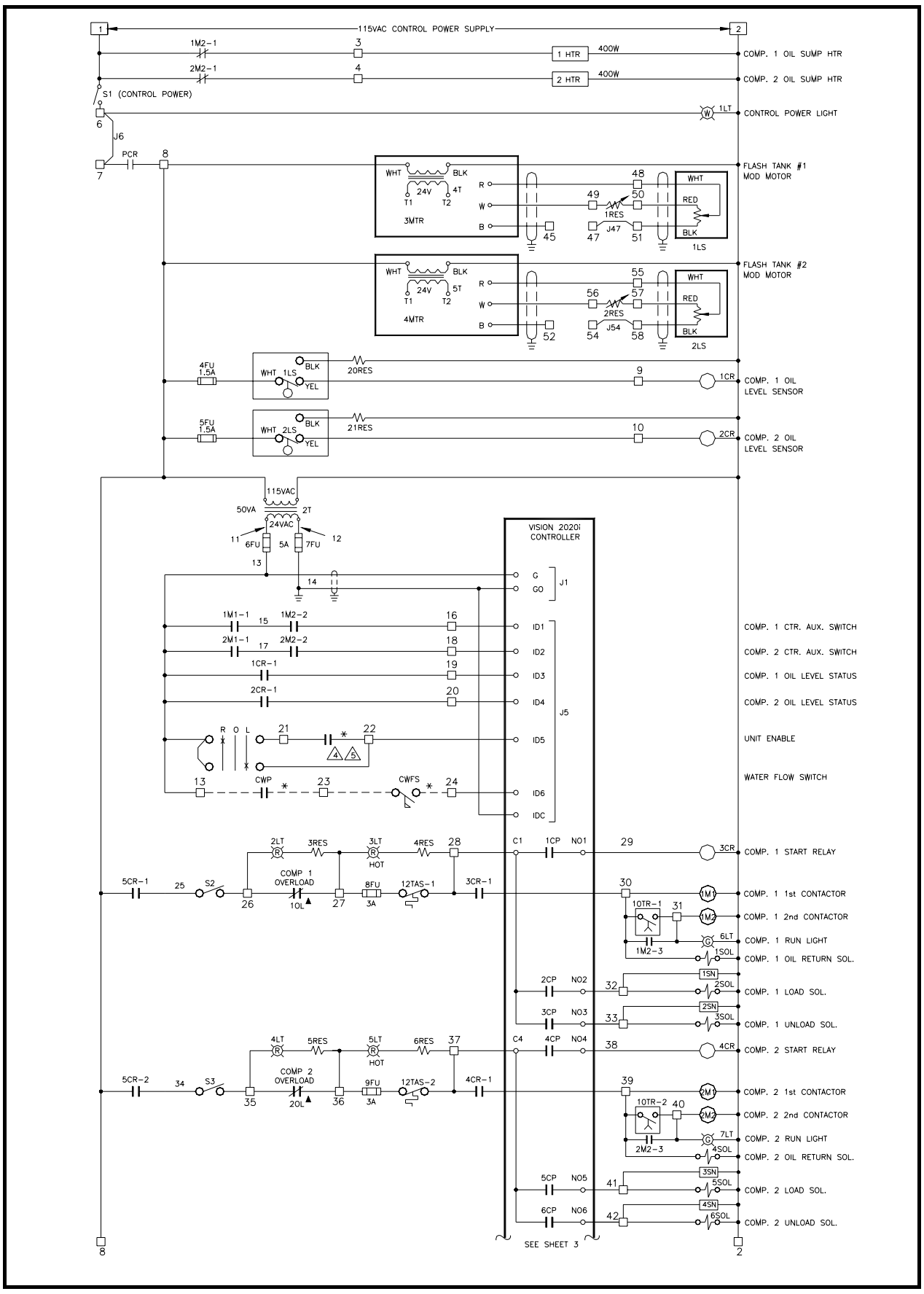
CB	–	CIRCUIT BREAKER	
COMP	–	COMPRESSOR	
COND	–	CONDENSER	
CP	–	CONTROL POINT	
CR	–	CONTROL RELAY	
CT	–	CURRENT TRANSFORMER	
CWFS	–	CHILLED WATER FLOW SWITCH	
CWP	–	CHILLED WATER PUMP	
EFR	–	EARTH FAULT RELAY	
FS	–	OIL FLOW SWITCH	
FU	–	FUSE	
HMT	–	HIGH MOTOR TEMP	
HOT	–	HIGH OIL TEMP	
HP	–	HIGH PRESSURE SWITCH	
HTR	–	HEATER	
INJ	–	INJECTION	
I/O	–	INPUT/OUTPUT	
LT	–	LIGHT	
LS	–	LEVEL SENSOR	
M	–	CONTACTOR	
MCCB	–	MOULDED CASE CIRCUIT BREAKER	
MP	–	MOTOR PROTECTOR	
MTR	–	MOTOR	
OL	–	OVERLOAD	
PCR	–	PHASE CONTROL RELAY	
PT	–	PRESSURE TRANSDUCER	
ROL	–	REMOTE-OFF-LOCAL SELECTOR SWITCH	
RES	–	RESISTOR	
SN	–	SNUBBER	
SOL	–	SOLENOID	
TAS	–	SOLID-STATE THERMOSTAT	
TB	–	TERMINAL BLOCK	
TH	–	THERMOSTAT	
TS	–	TEMP. SENSOR	
T	–	TRANSFORMER	
UVR	–	UNDER VOLTAGE RELAY	
▲	–	MANUAL RESET	
✱	–	FIELD SUPPLY	
□	–	FACTORY TERMINALS	
———	–	FACTORY WIRE	
- - - -	–	FIELD WIRE	
△	–	SEE NOTE 'n'	

NOTES:

1. DISCONNECT MEANS & BRANCH CIRCUIT PROTECTION SHALL BE PROVIDED BY OTHERS.
2. USE COPPER CONDUCTOR ONLY.
3. IF POWER SUPPLY HAS BEEN INTERRUPTED FOR A PROLONGED PERIOD, OIL SUMP HEATERS MUST BE ENERGIZED FOR 24 HOURS MINIMUM BEFORE STARTING COMPRESSOR.
4. CUSTOMER CONTROL CONTACTS MUST BE WIRED BETWEEN TERMINAL 21 & 22. (SHIELD CABLE RECOMMENDED). SELECT POSITION 'R' FOR REMOTE START, POSITION 'O' FOR UNIT SHUT DOWN AND POSITION 'L' FOR LOCAL START.
5. THE SHIELDED CABLES ARE RECOMMENDED FOR FIELD INSTALLED CONTROL AND SIGNAL WIRING. CONNECT ONE END OF THE SHIELD TO GROUND.
6. 1RES AND 2RES CAN BE WIRED BETWEEN TERMINAL 47 & 51 AND 54 & 58 OR BETWEEN TERMINALS 49 & 50 AND 56 & 57. IF 1RES AND 2RES ARE WIRED BETWEEN 49 & 51 AND 54 & 58, J47 AND J54 MUST BE REMOVED AND A JUMPER J49 & J56 MUST BE ADDED BETWEEN TERMINAL 49 & 50 AND 56 & 57.
7. CHILLED WATER FLOW SWITCH AND PUMP INTERLOCCK ARE REQUIRED. DO NOT USE THESE SWITCHES TO CONTROL THE PACKAGE.
8. IF 4-20mA RESET IS USED, SET SETPOINT TO RESET DESIRED AT 4-20mA INPUT OPTIONAL.
   CAUTION: DO NOT SUPPLY OVER 20mA TO INPUT TERMINAL.

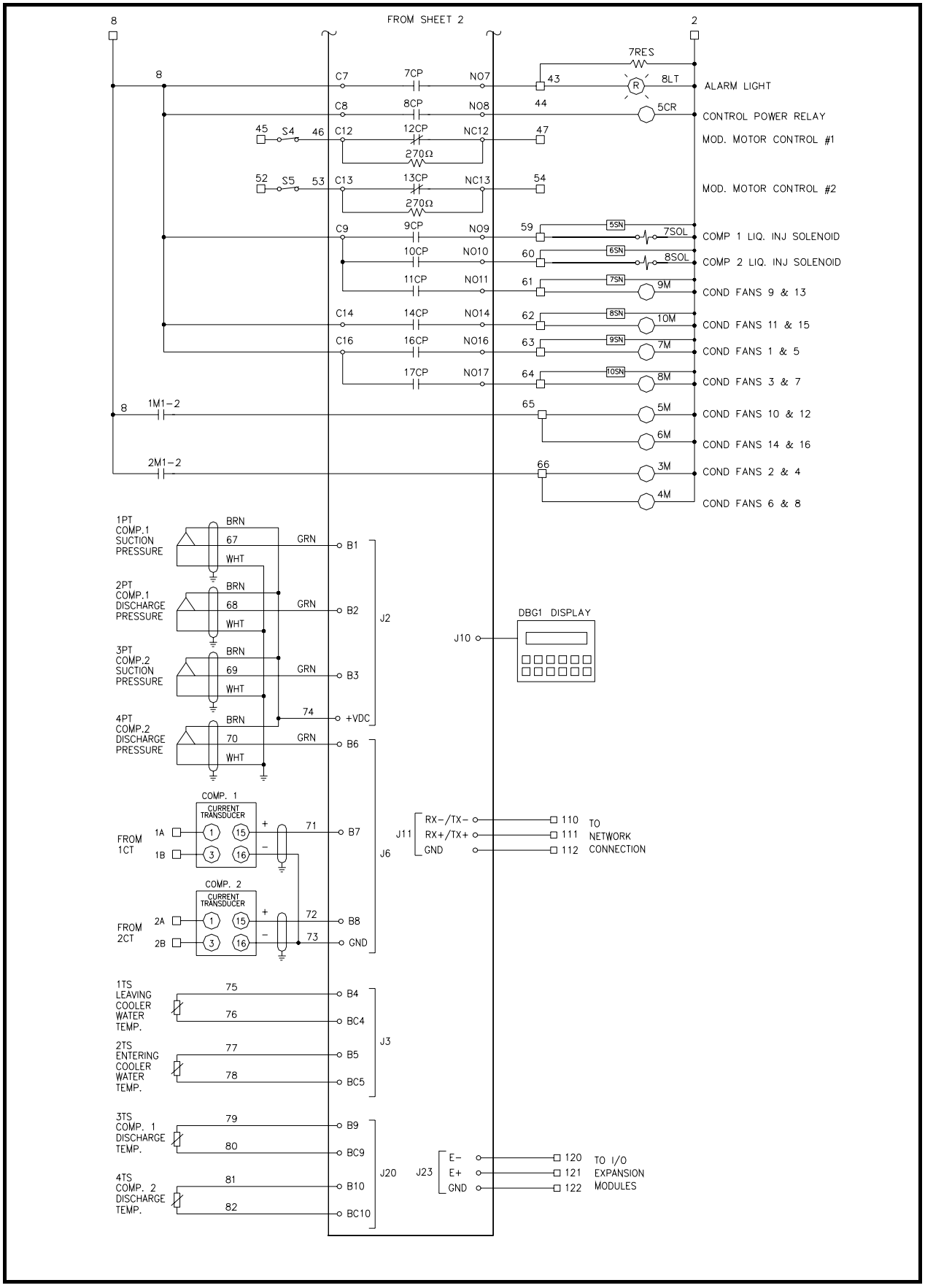
TYPICAL WIRING SCHEMATIC

AFVX – 2 COMPRESSORS



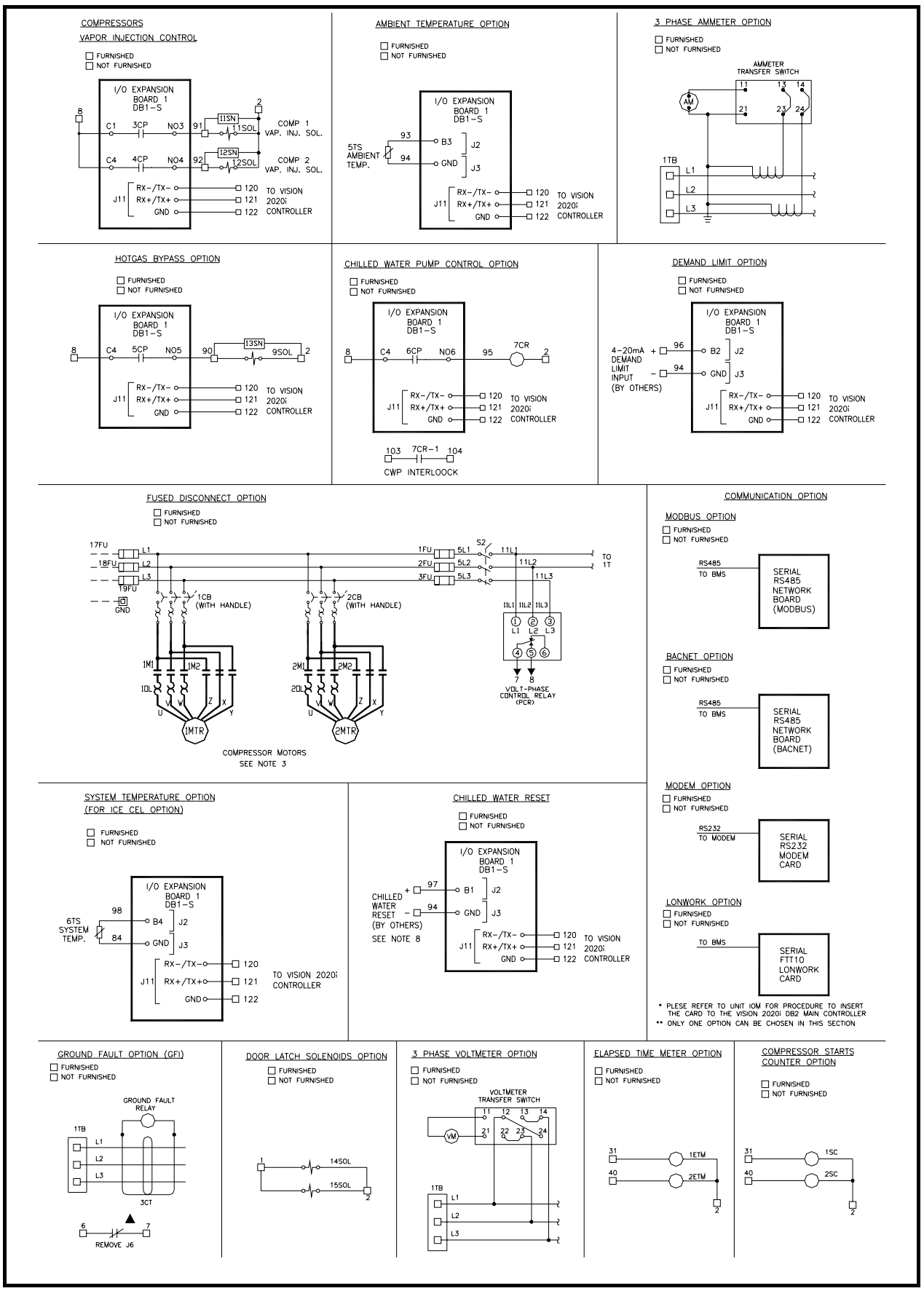
TYPICAL WIRING SCHEMATIC

AFVX – 2 COMPRESSORS



TYPICAL WIRING SCHEMATIC

AFVX – 2 COMPRESSORS



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