ACDS-B

Air-Cooled Chillers

with Tandem Scroll Compressors

14 to 100 Tons

Features

- Quiet operation
- Compact footprint
- Rated with HCFC-22
- ETL, MEA unit approval
- New high efficiency design
- Extra Quiet Option Available
- Windows® based PC interface
- Compatible with HFC refrigerants
- ***DB Director*** microcomputer controller

DUNHAM-BUSH *USA*

March 2004
Form No. 6009A

INTRODUCTION

Direct Drive Fans

PC Windows® Based Microcomputer Standard All Models

Optional Unit Disconnect

Modular Design with common components throughout the line

Optional Electronic Expansion Valves

Replaceable Filter Drier

Tandem Scroll Compressors

Figure 1

The Dunham-Bush Commitment...

The introduction of this new **ACDS-B** Scroll Air Cooled Packaged Chiller line is further evidence of our commitment to continuous product improvement and quality enhancement of our offering of quality products for the HVAC and Industrial Markets.

Scroll Compressors are designed for Commercial/Industrial Applications and provide the same high quality and efficiency as Reciprocating or Screw Compressors. They have been developed specifically for use in Packaged Chillers and Condensing Unit products.

New enhanced condenser fins, plus modular construction provide for increased commonality of parts, high unit electrical efficiency, and compact footprint throughout the line. This enables shorter lead times, while still offering all the optional features mounted, piped and wired to meet your exact needs. In fact, Dunham-Bush is famous for its design flexibility. Our customers find that we can handle special applications that others might turn away.

ACDS-B units feature state-of-the-art full function, PC Windows® based, microcomputer controller standard on all model sizes with an optional tie-in to a building management system. Remote monitoring via optional modem allows instant diagnosis by the user or a Dunham-Bush technician.

Upon shipment, the new **ACDS-B** unit is installation-ready with its compact size, reduced weight, and complete factory piping and wiring. Refrigerant charge is included and a thorough factory test under load is conducted on each unit to insure trouble-free start-up operation.

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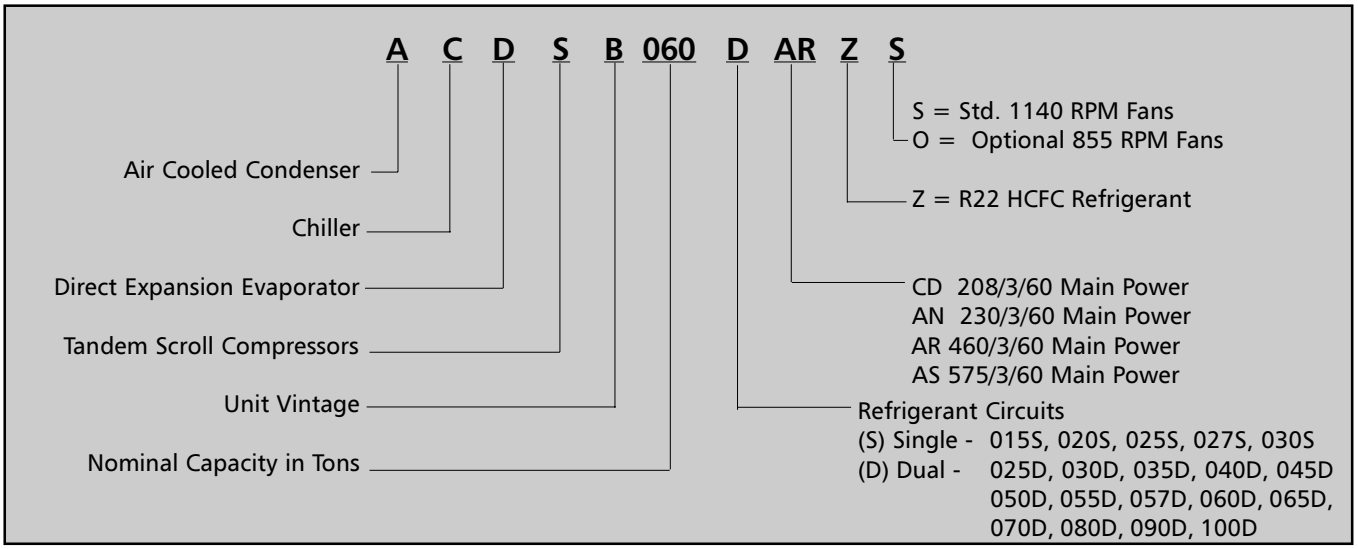
NOMENCLATURE



Standard Features and Owner Benefits

Size Range

- 19 Models from 14 to 100 Tons
- High Unit EER at ARI Standard Conditions
- Rated with HCFC-22

Quiet Operation

- Standard quiet Scroll operation with 1140 RPM fans
- Optional Extra Quiet Operation with Scroll Compressors and Extra Quiet 855 RPM Fans

Compressor

- Reliable Hermetic Tandem Scroll Type at 3500 RPM
- (2) Refrigerant Circuits over 25 Tons for Redundancy
- Compressor Cycling of 2 compressors on single circuit units up to 30 tons
- Compressor Cycling of 4 compressors for dual circuit units from 25 to 100 tons
- Manual or automatic compressor lead-lag all models
  If automatic lead-lag function is selected and hot gas bypass is required, use dual hot gas bypass on dual circuit models.

Evaporator

- ASME Stamped on all Sizes 015S - 100D
- DB High Efficiency Inner-Fin® Design for Compactness and Weight Reduction
- 300 PSIG or 200 PSIG Refrigerant Side Design Pressure
- 200 PSIG Water Side Design Pressure

Condenser

- Long Life Copper Tubes with Aluminum Fins
- Sub-Cooling Circuit for Efficiency
- 450 PSIG Test Pressure
- Low Noise 30" Diameter Fans - Direct Drive at 1140 RPM
- Extra Quiet Option 30” Diameter Fans - direct drive at 855 RPM
- All Fan Motors Open Drip Proof with Rain Shield for Safety and Low Maintenance
- Minimum Clearance Required on Sizes 015S to 030S

Electrical/Control

- 115 Volt Control Transformer (supplied standard on all models)
- Widest range of optional equipment available
- Proactive Full Function PC Windows® Based Microcomputer Controller on all Sizes 015S to 100D for Precise Control
- Separate Power and Control Panels for all dual refrigerant circuit models
- Separate Power and Control Compartments Sizes 015S to 030S
- ETL/CSA Unit Approval (IEC Control Panel Available)
- MEA Unit Approval
- High Pressure Limiting
- Low Pressure Limiting
- Load Limiting through Compressor Current Limiting

Unit Base Sub-Assembly with Tandem-Scroll Compressor Set Piped and Wired

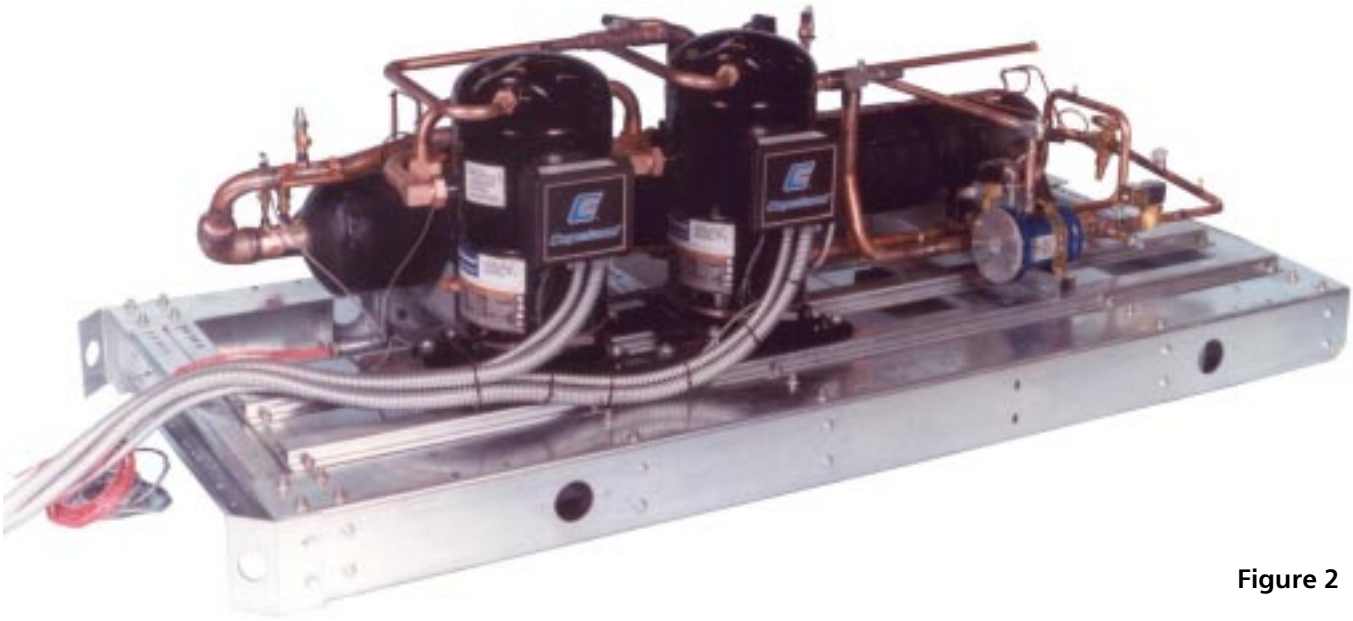


Figure 2

ACDS-B Packaged Chillers use Tandem Scroll Compressors. These rugged Commercial / Industrial Grade Scroll Compressors are designed and manufactured to meet the duty that our equipment demands. The construction includes cast iron frame and scroll sets, Teflon impregnated bearings and oil filtration devices internal to each compressor. Solid State motor protection is provided. Roto-Lock fittings are supplied for the suction and discharge connections for ease of change-out if a replacement is required.

Offering Scroll Compressor Products allows us to supply the same quality products that we have always supplied, but at a lower installed cost, over units with other types of compressors. Some of the attributes are durability, reliability, improved liquid handling capability, compact size, quiet operation, high operating efficiency, and reduced cost.

Scroll Compressor Technology has developed over many years in both Residential and Commercial/ Industrial markets and has proven the durability and reliability of these compressors. All units included in this catalog are supplied with Tandem Scroll Compressor sets.

Tandem Scroll Compressors consist of two individual compressors, mounted on a common base, manifolded into a single refrigerant circuit. Rubber inserts in the mounting rails provide sound dampening from the unit base, for extra quiet operation. A tandem compressor set(s) has suction, discharge, oil and gas equalization between the two compressors. A common discharge service valve is furnished to isolate the refrigerant charge in the condenser. An oil sight glass is provided in each compressor for oil monitoring and management purposes.

Scroll Compressor Design is based around two identical spirals or scrolls that, when inserted together, form crescent-shaped compression pockets. During a compression cycle, one scroll remains stationary while the other orbits around the first. As this motion occurs, gas is drawn into the scrolls and moved in increasingly smaller pockets toward the center. At this point, the gas, now compressed to a high pressure, is discharged from a port in the center of the fixed scroll to the condenser.

During each orbit, several pockets of gas are compressed simultaneously, creating smooth, nearly continuous compression. Figures 3a, 3b and 3c show the compression cycle and comparisons to reciprocating compressors.

Suction and Compression Cycles occur simultaneously but only four portions of the continuous Compression Cycle are shown for clarity purposes. (See Figure 3a).

- 1. The suction cycle occurs when the suction pocket opens and enlarges, causing a low pressure area in the suction pocket, drawing suction gas into the chamber. The suction pocket then closes and the compression cycle begins.
- 2. The Intermediate Compression Cycle is continuous as the orbiting scroll moves and compresses the refrigerant gas.
- 3. The high pressure pocket forces the high pressure gas to the discharge port at the top of the fixed scroll.
- 4. The high pressure gas is forced through the discharge port and the discharge check valve at the top of the fixed scroll.

Scroll Compressors have few moving parts, as compared to Reciprocating Compressors. Fewer moving parts, and the smooth continuous rotary scroll compression cycle, ensures a long, quiet operating, compressor life. (See Figure 3b).

Complete and Continuous Compression Cycle of the Scroll Compressor, with no Valve or Re-Expansion Volume losses, provide a smooth running, quiet, efficient, compressor. (See Figure 3c).

Figure 3a Scroll Compression Cycle—How A Scroll Works

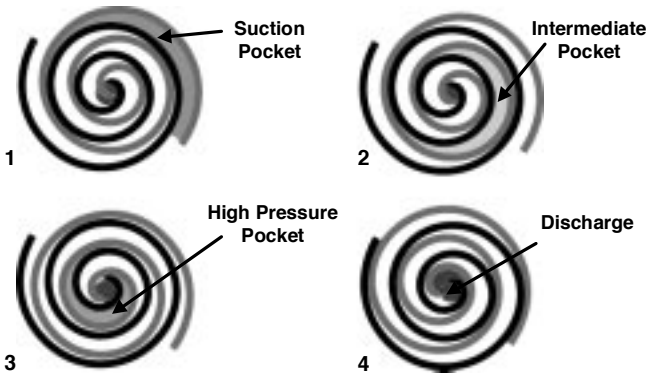


Figure 3b Scroll vs. Reciprocating Few Moving Parts

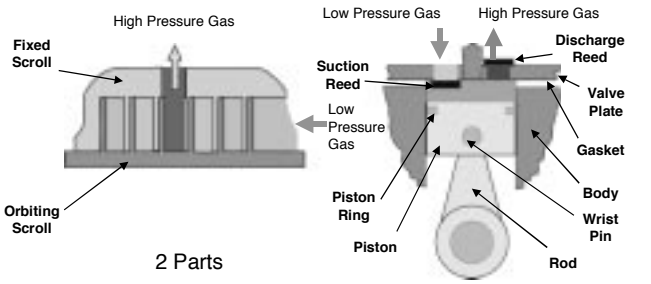
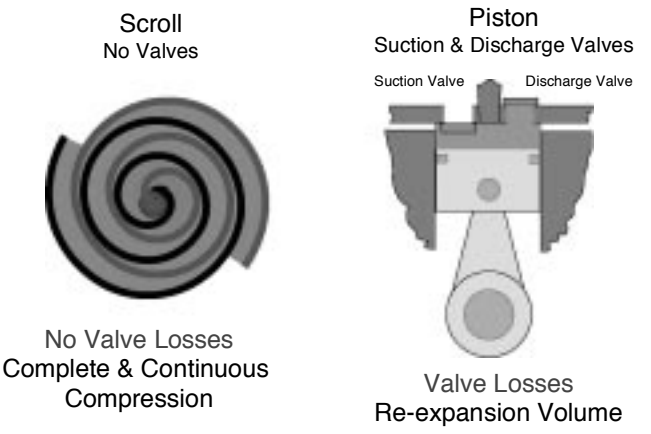


Figure 3c Complete and Continuous Compression Cycle



Unit Features: Scroll Compressors (cont.)

Scroll Compressors have much better liquid refrigerant handling capability than other types of compressors due to the nature of scroll design.

Scroll Compressor Durability and Reliability as well as Quiet Operation is inherent with the design of the scroll compressor. Scroll compressors have few moving parts, oversized Teflon impregnated bearings and a smooth gas flow compression cycle, to ensure durability and reliability.

A Large Capacity Built-In Suction Filter is located between the suction inlet and the motor to prevent abrasive material such as flux, dirt, scale or metal chips from entering the motor cavity. The abrasive action of this foreign material would crack, chip and wear the motor insulation which could cause premature motor failure. These same abrasives could also cause bearing seizures and excessive wear of all surfaces.

Compressor Motor Dependability has been developed with heavy duty motor windings cooled by suction refrigerant gas. Motor winding insulation systems exceed Class B requirements and overload protection is accomplished by solid state motor module with winding temperature thermistor sensor input.

Compressor Lubrication is provided by an integral centrifugal pumping system through the center of the motor/scroll shaft.

Quiet Operation of Scroll Compressors ensures considerably quieter unit operation, than other types of compressors. Heavy construction, few moving parts, small motor horsepower, and smooth gas flow through the orbital compression cycle, ensures quiet operation of our **ACDS-B Packaged Chillers**.

Vibration Free Operation is ensured by smooth quiet compressor operation plus having the compressors mounted with rubber grommets to the frame.

Capacity Control Modulation is managed by the units ***DB Director*** Microcomputer Controller in response to system load requirements. The system load requirements are measured by sensing the chiller's leaving fluid temperature and staging the compressors accordingly. The **ACDS-B** chiller part load efficiency is excellent due to the staging sequence of the compressors to meet the required load. If the minimum load requirement is less than the chiller's minimum mechanical step capability, hot gas by-pass option should be ordered with the unit. See Table 1 for unit capacity control capabilities.

Capacity Control Modulation with Optional Hot Gas By-Pass, operates by imposing an artificial load on the evaporator. Discharge gas from the compressor is introduced to the liquid-vapor mixture of refrigerant downstream of the expansion valve. The discharge gas is cooled by the liquid refrigerant present in the turbulence of the evaporator so that the final temperature of refrigerant gas leaving the evaporator does not rise. Hot gas by-pass does not offer any energy savings, but does allow the cooling capacity to the equipment to vary precisely with the load requirements.

Unit Features: Scroll Compressors (cont.)

Table 1 **Package Mechanical Capacity Control Steps**

Model	% Full Load Capacity Control	
	Standard	Standard with (Optional HGBP)[3] [4] [5]
ACDS-B	Single Circuit Units with Tandem Compressors[1]	Single Circuit Units with Tandem Compressors[1]
015S	100 - 50 - 0	100 - 50 - (25) - 0
020S	100 - 50 - 0	100 - 50 - (25) - 0
025S	100 - 50 - 0	100 - 50 - (25) - 0
027S	100 - 46 - 0	100 - 46 - (23) - 0
030S	100 - 50 - 0	100 - 50 - (25) - 0
ACDS-B	Dual Circuit Units with (2) Tandem Compressors[2]	Dual Circuit Units with (2) Tandem Compressors[2]
025D	100 - 75 - 50 - 25 - 0	100 - 75 - 50 - 25 - (13) - 0
030D	100 - 75 - 50 - 25 - 0	100 - 75 - 50 - 25 - (13) - 0
035D	100 - 74 - 50 - 24 - 0	100 - 74 - 50 - 24 - (12) - 0
040D	100 - 69 - 46 - 23 - 0	100 - 70 - 46 - 23 - (12) - 0
045D	100 - 75 - 50- -25 - 0	100 - 75 - 50- -25 - (13) - 0
050D	100 - 72 - 48 - 24 - 0	100 - 72 - 48 - 24 - (12) - 0
055D	100 - 74 - 48 - 22 - 0	100 - 74 - 48 - 22 - (11) - 0
057D	100 - 75 - 50 - 25 - 0	100 - 75 - 50 - 25 - (13) - 0
060D	100 - 75 - 50 - 25 - 0	100 - 75 - 50 - 25 - (13) - 0
065D	100 - 78 - 59 - 26 - 0	100 - 78 - 59 - 26 - (13) - 0
070D	100 - 80 - 59 - 29 - 0	100 - 80 - 59 - 29 - (15) - 0
080D	100 - 79 - 60 - 27 - 0	100 - 79 - 60 - 27 - (14) - 0
090D	100 - 80 - 60 - 28 - 0	100 - 80 - 60 - 28 - (14) - 0
100D	100 - 80 - 60 - 31 - 0	100 - 80 - 60 - 31 - (16) - 0

Notes:

1. Models ACDSB 015S - 030S have 2 Manifolded compressors on a single refrigerant circuit.
2. Models ACDSB 025D - 100D have (2) Sets of 2 Manifolded Compressors on two refrigerant circuits.
3. HGBP = Hot Gas Bypass option available on lead circuit or both circuits for lead-lag operation on dual circuit units.
4. HGBP is only active on the First On/Last Off stage of unit operation.
5. HGBP modulates to approximately one half of the minimum mechanical step of unit loading shown above. EXAMPLE: ACDSB 060D w/HGBP (25% x .5 = 13% minimum unit capacity)
6. **If the minimum load requirement** is less than a single unit minimum capacity step can provide, consider using two units of smaller size piped parallel, with the ***DB Director*** microcomputer linked together for proper System Control, see the Application Section of this catalog "Multiple Chiller Per Chilled Water System" on page 19.

Unit Features: Quiet and *Extra Quiet* Fan Operation

Dunham-Bush units are quieter than most in the industry, due to the design and construction of our units.

Scroll Compressors are considerably quieter than other types of compressors, due to the smooth gas flow through the scroll compressor orbital compression cycle, small horsepower, and few moving parts.

Dunham-Bush standard condenser design uses 1140 RPM open dripproof condenser fan motors, mounted in resilient motor supports.

Optional "***Extra Quiet*** **855 RPM Fan and Fan Motors**" provide an "***Extra Quiet*** **Condenser**". Couple this with the "***Extra Quiet*** **Scroll Compressors"** and the **ACDS-B Packaged Chillers are very quiet, smooth operating units,** with 'A' weighted sound levels starting at 59 dbA, based on sound power readings in accordance with ARI 370 Standard Sound Rating of Large Refrigeration & Air Conditioning Equipment @ 30' distance from the unit.

Unit Features: Air Cooled Condensers

All units have direct drive propeller fans and motors. Close blade tip clearance with the fan venturi assure smooth, quiet operation.

All air cooled condensers are formed of 3/8 inch diameter copper tubes mechanically expanded into aluminum fins for maximum efficiency of heat transfer between the circulating refrigerant and air. The fins have full self-spacing collars which completely cover each tube. The staggered tube design improves the thermal efficiency of the coil and eliminates bypassing of air around the tubes. The return bends, headers and nipples are all copper, sized for minimum pressure drop, brazed with inert gas in the tubes and tested after fabrication to 450 psig.

See the electrical data for information on motor specifications on pages 38 & 39.

A separate subcooling circuit is standard on all units to maximize energy efficiency.

Condenser Fan Section
Partitions separate each fan section to eliminate possible fan back spin and provide excellent head pressure controls. Two different fans cover the entire line and fan cycling control is supplied as standard. This lowers the minimum ambient temperature at which the packaged equipment will effectively start and operate. For lower ambient requirements than standard, variable speed options are available.

All cabinetry is heavy gauge galvanized steel construction with aluminum tube sheets. Control panels, fan decks, and header covers are coated with special high grade outdoor quality coating system tested to maintain integrity under the ASTM-B-117 specification.

Unit Features: DX Coolers

Water Coolers
The water coolers employ the most advanced vessel technology available today, including the patented Inner-Fin construction of the CH coolers (Figure 4). Larger vessels with microfin tubes are also designed and constructed to meet the requirements of the ASME Code, Section VIII, Division 1 for unfired pressure vessels and are stamped accordingly.

Cooler heaters are provided to protect to –20°F (–28.9°C) ambient which requires a separate 115 volt service.
The CH model coolers have copper tubes brazed into tubesheets. The shells are constructed of steel and the entire assembly is welded and brazed for the best cost effectiveness possible. Vent and drain connections are included on all vessels.

See Table 2 below for appropriate pressure ratings, Table 11 for connection sizes, pressure drop curves and minimum/maximum flow rates.

Figure 4

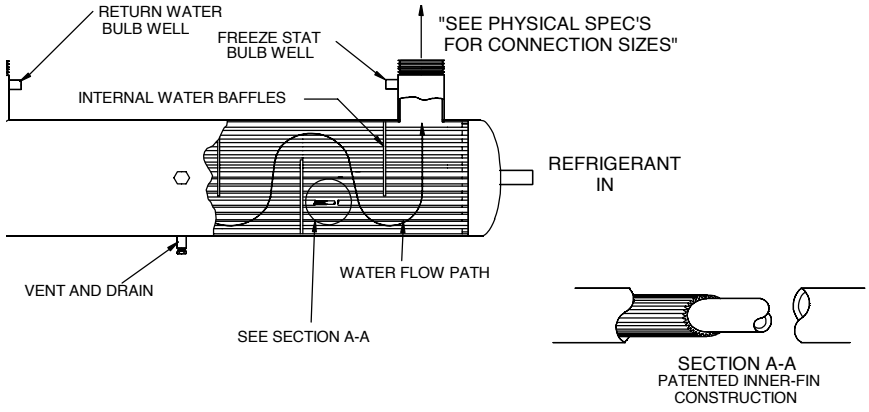
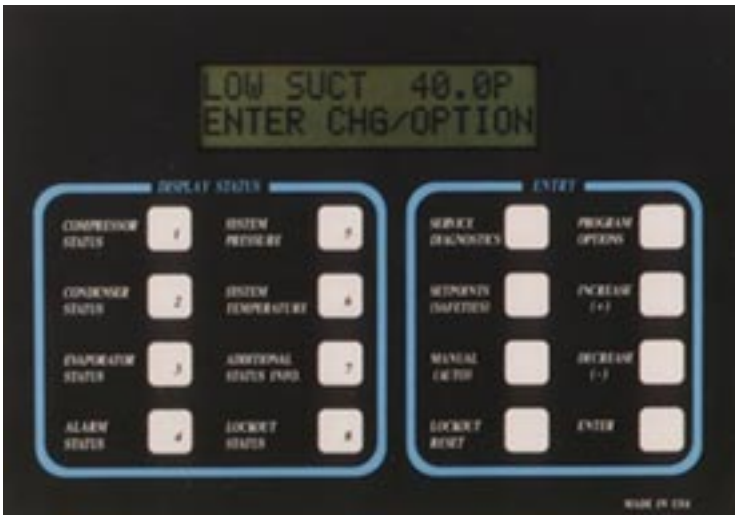


TABLE 2

Shell & Tube Heat Exchanger	Water Side		Refrigerant Side	
	Design Pressure (PSIG) (kPa)	Test Pressure (PSIG) (kPa)	Design Pressure (PSIG) (kPa)	Test Pressure (PSIG) (kPa)
Water Cooler CH	200 (1379)	300 (2068)	300 (2068)	375 (2586)

Windows® Based Microcomputer Controller



DB Director

Full Function Microcomputer Controller with Windows® Based PC Interface

Figure 5

Complementing our high-energy efficient product is a Full Function Microcomputer Controller designed to keep your system running at its most Energy Efficient Level, based on current load.

This system is designed as a Control 'State' (control status) microcomputer providing the user with the current Control State for the exact information on what the microcomputer is doing. Some of the main features of the controller are as follows:

- A large character LCD display that can be seen in bright or dim lighting.
- A 16 function keypad that is so user friendly it rarely requires a reference manual (Figure 5).
- A four-layer printed circuit board provides extremely high quality and unit control stability.
- A battery backed up Real Time Clock that should never need attention.
- An automatic power monitoring system that is designed to protect your system.
- Multiple authorization levels to provide complete security of the control system.
- Automatic history storage that provides data to a flexible static and dynamic graphing system.
- Extended temperature range to allow operation in either hot or cold climates, from -40°F (-40°C) to 140°F (60°C).
- A PC control programming download/pullback in only 45 seconds.
- Alarm information is provided in simple English for the previous 32 alarms, with data shown down to the second.
- The system provides 'last time' enabled & disabled, number cycles, and total run hours.
- A slope algorithm control function with all analogs read 10 times per second which provides unparalleled stability.
- A 'special control zone' based on leaving fluid temperature that reduces compressor cycling, and improves unit part load efficiency.
- A proactive compressor protection logic for protecting against low or high discharge pressure to minimize compressor cycling and nuisance trips.
- A Windows® based display providing all pertinent information on your 'PC'.
- A high speed RS232 port operating at 19,200 baud for connection to a local PC up to 100 feet (30 meters) away or a modem at 14,400 baud rate communications for remote communication.
- A high speed RS485 port for connection to a building management system, or PC at 38,400 baud rate communications up to 6000 feet (1829 meters) away from the chiller(s).

Display Information

All information is displayed using common terms that are easy to understand. It is a simple procedure to determine the actual status of the system and the individual circuits, as they are displayed in common terms that are meaningful. The 2 line by 16 extra large character alphanumeric liquid crystal display (LCD) utilizes easy to understand menu-driven software. The LCD displays eight character alphanumeric sensor names and twelve character alphanumeric set point names enabling the use of meaningful status names. This enables an inexperienced operator to quickly work through these menus to obtain the information they require or to modify control parameters. The well designed keypad is separated into a *DISPLAY STATUS* section and an *ENTRY* section each consisting of eight keys that are clearly labeled to identify the information that will be displayed. When data is being modified, the second display line contains help information to ensure that the desired modification is properly made. Easily accessible measurements include:

- Current capacity status
- Current circuit/compressor status
- Leaving chilled water temperature
- Evaporator pressure of each refrigerant circuit
- Condenser pressure of each refrigerant circuit
- Compressor elapsed run time, each compressor
- Number of compressor starts
- Compressor contactor status
- Fan on/off status
- Remote chilled water reset input (optional)
- Water flow switch status
- External start/stop command status
- Optional low ambient temperature sensor for easier cold ambient starting
- Optional low ambient lockout
- Optional entering fluid temperature monitoring
- Optional compressor amperage monitoring

Two proactive control features included in the microcomputer are low suction and high discharge pressure limiting. The second compressor in each circuit will shutdown if the discharge pressure exceeds the high pressure unload setpoint or if suction pressure from either refrigerant circuit approaches the low-pressure trip setpoint.

Capacity Control

Control is based upon leaving chilled water temperature. How fast the temperature is changing is calculated and capacity decisions are based upon the rate, the current temperature, and the control temperature zone. Capacity is never added if the system is moving toward the temperature target at an acceptable rate. The unit will monitor all control functions and stage the compressors to maintain the required operating capacity. Remote adjustment of the leaving chilled water setpoint is accomplished through either direct connection or a remote keypad to the microcomputer through the RS485 long distance differential communications port, via PC or a modem connected to the RS232 communication port, or from an external Building Automation System supplying a simple 0 to 5 VDC signal.

System Control

The unit may be enabled or disabled manually, or through the use of an external signal from a Building Automation System. In addition, the microcomputer may be programmed with a seven-day optional cycle or other DB control packages may start and stop the system through interconnecting wiring.

System Protection

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

- Low suction pressure limiting
- High discharge pressure limiting
- High motor temperature/over current
- Freeze protection
- Compressor run error
- Power loss
- Chilled water flow loss
- Sensor error
- Pump down and pumpout
- Anti-recycle
- Time delay between stages
- Load limiting via compressor current limiting

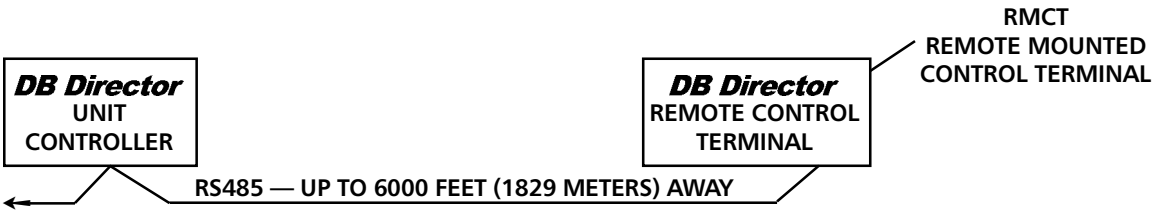
Remote Monitoring

The Microcomputer is equipped with a high speed RS232 communications port and two high speed RS485 communications ports, to allow for a variety of different remote monitoring operations. The RS232 communications port allows for remote communications at distances of up to 100 feet over a 4-wire shielded cable. The RS485 communication system allows for remote communications at up to 6000 feet (1829 meters) with a 2-wire shielded cable connection.

1) RMCT - Remote Mounted Control Terminal (Figure 6a)

This Remote Mounted Control Terminal (RMCT) is a stand alone Control Terminal to communicate and control the unit from a remote location up to 6000 feet (1829 meters) away, via the 485 communications port, when wired with a 2-wire shielded cable. The RMCT will then operate just like the controller in the unit. This enhanced version of the Remote Mounted Control Terminal with 8 relay outputs and 8 sensor inputs provides remote alarm capabilities and additional sensor inputs as may be required.

Figure 6a

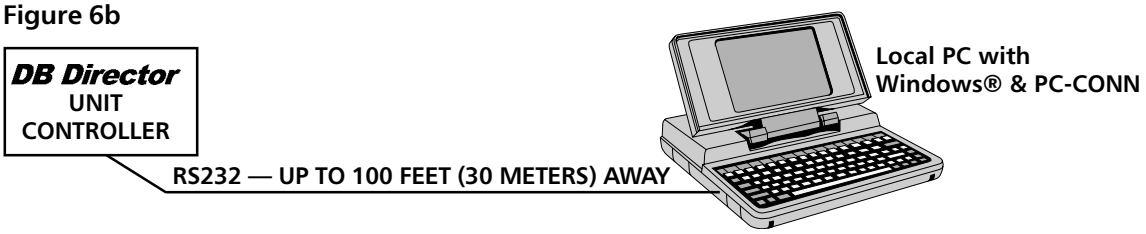


2) PCON - PC Connection:

The PC Connection program provides communications for complete operation of the packaged chiller including graphing information. This option is available through two communications techniques as follows:

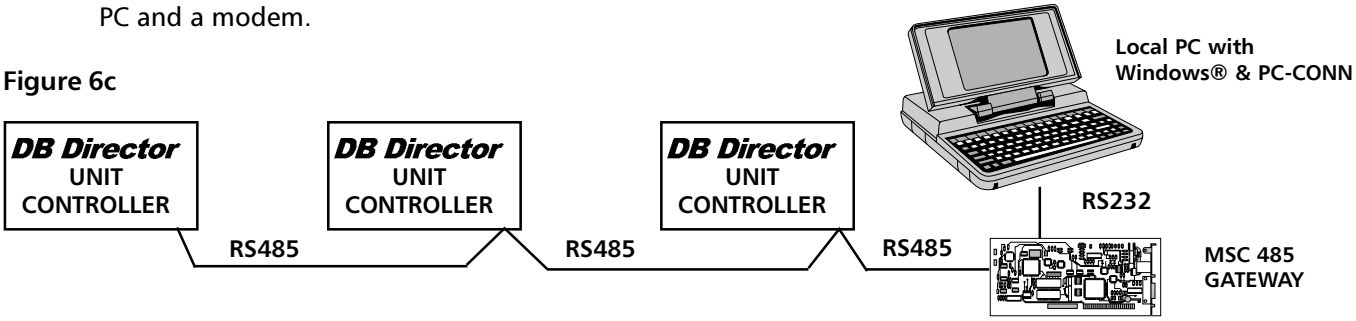
a) PCCB (Basic) (Figure 6b)
The standard communications for PCCB is via the RS232 connection which may be as far as 100 feet (30 meters) away from the packaged chiller. Only one chiller can be accessed

Figure 6b



b) PCCE (Enhanced) (Figure 6c)
The enhanced PCCE system allows for communications via the RS485 port and can be located as far as 6000 feet from the packaged chiller(s). This option requires the addition of a gateway to convert the RS485 port back to a RS232 port and then may be connected to a modem or directly to a PC. One additional feature is that you may field install a manual AB switch, which allows switching between a local PC and a modem.

Figure 6c



As can be seen, the microcomputer system allows for a variety of remote connection capabilities for almost infinite flexibility. Utilizing the PC connection program, up to twenty packaged chillers connected via the RS485/RS232 ports can be monitored. The user may then select whichever packaged chiller to review.

Unit Features: Optional Enclosures and Features

Optional plastic coated wire finguard. Available for upper half of unit (FGT) as shown on page 2, lower half of unit (FGB), or both.

Figure 7a

Optional full length painted aluminum grilles (GRL) to protect condenser fins and mechanical components. This option also includes sheet metal enclosure panels for the unit ends.

Figure 7b

Optional full length painted steel louvers (LUV) for the maximum protection for condenser fins and mechanical components. This option also includes sheet metal enclosure panels for the unit ends.

Figure 7c

Figure 8

Standard heavy duty base rails with cross members. Optional electronic expansion valves (EEV) shown.

Figure 9

Optional weatherproof alarm bell (BEL2) to indicate a general alarm fault.

OPTIONS

Options *are installed at the factory.*
Accessories *are shipped unmounted.*

Extra Quiet Fan Operation (EQF)—using 855 RPM Fans and Scroll Compressors, provide the quietest operating refrigeration equipment possible. There is a slight capacity reduction caused by operating the unit with 855 RPM fans, but the unit efficiency improvement more than makes up for the loss in capacity.

Copper Fin Condenser (CUF)—Copper fin and tube condenser.

Poly Fin Condenser (PFC)—The material is a polyester paint baked onto the aluminum finstock prior to final manufacture, rather than material applied to the assembly after formation of the coils. The pre-painted fin material has been tested for salt spray corrosion resistance using ASTM B117 specification.

Oversized Cooler (CH2)—For 42°F (5.5°C) leaving water temperature applications, 20% and higher glycol applications will not require oversized coolers.

Oversized Cooler (CH3)—For 40°F (4.5°C) leaving water temperature applications, 20% and higher glycol applications will not require oversized coolers.

Convenience Outlet (CON)—dual 3-prong ground fault receptacle powered from a dedicated transformer and fused for 15 amps.

Hot Gas Bypass (HGB1)—for single or dual circuit units to retain the unit on-line when the load is below the minimum unit mechanical capability. This minimizes compressor cycling and extends compressor life, on extra low minimum load conditions (see Table 1 for minimum load capability). **HGB1** is supplied for the First-On / Last-Off Stage Only, and for units **without compressor Lead-Lag control**.

Hot Gas Bypass (HGB2)—for dual circuit units to retain the unit on-line when the minimum load is below the unit mechanical capability. This minimizes compressor cycling and extends compressor life, on extra low minimum load conditions (see Table 1 for minimum load capability). **HGB2** is supplied for the First-On / Last-Off Stage Only, and for units with Auto Compressor Lead-Lag Control.

Low Ambient Control (LAC) TO 0°F (-17.8°C) Minimum Ambient—units use variable speed fans in conjunction with standard fan cycling.

Extra Low Ambient Control (ELAC) TO -20°F (-29°C) Minimum Ambient—includes LAC and EEV (Electronic Expansion Valve(s)) options and requires the use of 50% glycol and roughly 50% load to ensure extra low ambient starting, with a maximum of 5 MPH (8 KPH) wind. Some limitations apply.

Low Ambient Lock-out (LALO)—uses an ambient sensor and requires a lock-out set point entered into the microcomputer controller.

Unit Mounted Disconnect Switch (Non-fused) (UMD1)
—for 208 and 230 volt single power source units ACDSB 015S thru ACDSB 100D - mounted in the control box with mechanical interlock through the door.

Unit Mounted Disconnect Switch (Non-Fused) (UMD3)
—for 460 and 575 volt single point power source units —mounted in the control box with mechanical interlock through the door, all models ACDSB 015S-100D.

Operating and Safety Lights (OSL)—lights indicating control power to the unit and faults for high discharge pressure, high motor temperature and alarm status.

Gauges (GAG2)—includes suction and discharge pressure for all unit models. The microcomputer displays discharge and suction pressure so these readings are redundant.

Louvers (Painted Galvanized Steel) (LUV)—for complete unit enclosure for general mechanical security and unit aesthetics.

Grill (Aluminum Painted) (GRL)—similar to the louver option except manufactured of aluminum with 3/8" X 3 1/2" slots instead of louvers for security and hail protection and unit aesthetics.

Fin Guard Top (FGT) (1" x 4" Coated Wire)—protects the vertical condenser side coil only.

OPTIONS (CONT.)

Fin Guard Bottom (FGB) (1" x 4" Coated Wire)—encloses the bottom compressor, condenser and cooler section of the unit only. Use FGT and FGB for full unit protection.

Over and Under Voltage and Phase Protection Relay (UVR2)—Combined relay offering protects against high and low incoming voltage conditions as well as single phasing, phase reversal and phase imbalance by opening the control circuit. It is an automatic reset device, but the microcomputer can be set up for manual reset to prevent unwanted restarts.

Circuit Breakers (CB)—provide additional short circuit protection for each compressor.

Electrical Panel Door Latch Solenoids (DLS)—to provide the security required by local codes. Main power must be disconnected to gain entry to power or control electrical panel for models ACDSB 015S-030S. On all other models the control panel can be accessed with a keylock override actuated switch. The power must be disconnected to gain entry to the high voltage power panel.

Weather Proof Alarm Bell (BEL2)—mounted and wired to indicate a common alarm fault.

Unit Ground Fault Detector (GFD)—that takes the unit off line if a ground fault is detected.

500 Hour Salt Spray Coating (PNT)—special high-grade outdoor quality coating system tested to maintain integrity under the ASTM-B-117 specification.

Suction Line Insulation (INS)—suggested for medium temperature applications or where excessive sweating may occur.

Electronic Expansion Valves (EEV)—for more precise control over a wide range of operating conditions such as dual mode air conditioning and thermal storage applications. The EEV option is supplied as part of the (ELAC) extra low ambient operation down to -20°F (-23.9°C) minimum ambient operation.

Remote Monitoring Modem (MOD1)—for single chiller long distance communication, allows the system to be monitored, retrieve logs, and assist with investigating potential problems quickly and in a cost effective manner from a remote source.

Remote Monitoring Modem (MOD2)—for multiple chiller network long distance communication with the same features as MOD1, with the addition of a gateway to convert the RS485 ports for network operation.

Chiller*LINK* (CHLK)—for communication with (BMS) building management systems through N2 Bus, BacNet, Modbus or Lonworks. See Chiller*LINK* Data Acquisition Form SD202-22203.

Chilled Water Pump Control (CWPC)—provides a contact closure for pump starting prior to starting the chiller.

Mounted and Wired Water Flow Switch (MWFS)—is mounted, wired and tested at the factory. The water flow switch is a safety control and if not supplied mounted and wired must be field mounted and wired.

Auxiliary Control Module (ACM)—consisting of RWTM, UDL, LLC and CAM option package of special control functions.

- **RWTM** - Return Water (Fluid) Temperature Monitoring—is used for information only. Unit control is based on leaving water temperature with a specific temperature differential (range), so the return water temperature is for information only.

- **UDL**-Utility Demand Limiting—requires a remote analog input signal that is used to cycle compressors to limit electrical demand. The demand limiting can be one or two steps, based on the particular unit model. The required signal is 0 to 5VDC.

- **LLC** - Load Limiting Control—is based on compressor current limiting rather than return water temperature control load limiting method. This current limiting method is superior to return water temperature control method because it protects the compressor from over current while allowing the unit to run fully loaded when possible.

- **CAM** - Compressor Amp Monitoring—displays compressor amps for load monitoring and trend logging.

ACCESSORIES (SHIPPED LOOSE FOR FIELD MOUNTING)

Water Flow Switch (WFS) - paddle type field adjustable flow switch. Must be tied into the unit safety circuit so that the package will remain off until water flow is proved. Helps prevent cooler freeze up. NEMA 3R enclosure, for use on water, ethylene or propylene glycol circuits.

Spring Isolators (SPG) - designed for 1" deflection, these housed spring assemblies have a neoprene friction pad on the bottom to help prevent the passage of noise and a spring locking leveling bolt at the top. Neoprene inserts prevent contact between the steel upper and lower housings. Suitable for more critical applications than RIS isolators.

Rubber-in-shear Isolators (RIS) - designed for ease of installation, these rubber, one piece, molded isolators have skid resistant baseplates. Applicable for most installations.

Weather Proof Bell (BEL1) - is a shipped-loose bell to be mounted remote of the unit and wired to the ALC common alarm contacts in the unit by others.

PC Connection Basic (PCCB) - Provides communications via the RS232 connection port, for complete operation of the packaged chiller, including graphing information, up to 100 feet (30 meters) from the packaged chiller. The PCONN software will be provided for use with a remote PC by others. See connection diagram page 12.

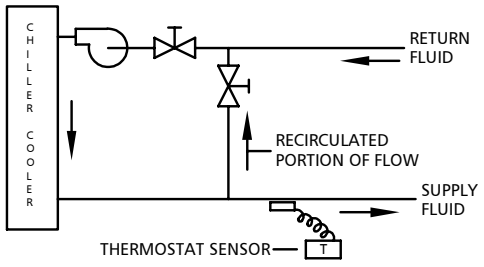
PC Connection Enhanced (PCCE) - Provides communications via the RS485 connection port, for complete operation of the packaged chiller including graphing, up to 6000 feet (1829 meters) away. This option includes the addition of a gateway to convert the RS485 port of the ***DB Director*** to RS232, which then may be connected to a modem or directly to a PC. One additional feature is that a field supplied and installed AB switch can be added to allow switching between a local PC and a modem. The gateway and PCONN software will be supplied for use with a remote PC by others. See connection diagram page 12.

Remote Monitor-Control Terminal (RMCT) - is a stand alone microcomputer that interfaces with the microcomputer in the unit which provides all unit control functions, at a remote location.

Cooler Design Data

1. ***Maximum*** - Leaving chilled fluid temperature (LCFT) is 60°F (18°C). The unit can start and pull down with up to 80°F (27°C) entering-water temperature. For sustained operation, it is recommended that the entering water temperature not exceed 70°F (21°C).
2. ***Minimum*** - LCFT is 42°F (5.5°C) for all models except ACDSB 025D, 030D, 035D and 040D for *water applications with standard coolers*. Oversized coolers CH2 for 42°F (5.5°C) water on models ACDSB 025D, 030D, 035D and 040D and CH3 for 40°F (4.4°C) water for most models are available from the factory for chilled *water* applications. Medium temperature glycol application selections from 20°F (6.6°C) to 39°F (3.9°C) are available from the factory.
3. Minimum/Maximum Flow Rates and Vessel Fluid Volume - refer to Physical Specifications, pages 28-31.
4. Pressure Drop Data - refer to Figure 13 and glycol correction factors, Tables 4a and 4b.
5. Wide Range ΔT - Low Flow Applications
   a. Multiple smaller chillers may be applied in series, each providing a portion of the design temperature range of roughly 10°F (5.5°C) each.
   b. Special cooler baffling may be provided from the factory for applications from 12.5°F to 20°F (7°C to 11°C) chiller fluid ranges.
   c. Chilled fluid may be recirculated through the cooler as shown below to allow the chiller to operate with acceptable flow rates and temperature ranges (Figure 10a).

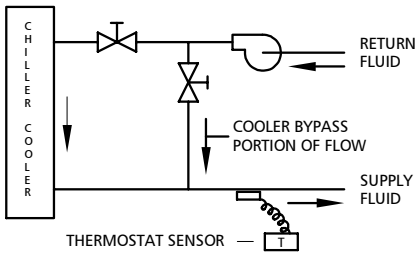
Figure 10a



The mixed fluid temperature range through the cooler for units with standard coolers, should not be less than 7.5°F (4.2°C).

6. Narrow Range ΔT - High Flow Applications
   a. Special cooler baffling is available from the factory for 5°F to 7.5°F (2.7°C to 4.2°C) ΔT applications.
   b. For Extra-Narrow Range ΔT applications a partial cooler bypass piping and valve configuration can be used as shown below. This permits a higher ΔT and lower ΔP (pressure drop) through the cooler (Figure 10b).

Figure 10b



The fluid mixes after the cooler.

Chilled Fluid Loop Volume (CFLV)

Careful consideration needs to be given to the "Chilled Fluid Loop Volume" (CFLV) or System / Inertia to maintain an acceptable leaving fluid temperature.

In close-coupled systems as the compressor starts and stops, the leaving fluid temperature will shift up and down 2°F to 4°F (1.1°C to 2.2°C) per step of capacity control. The 5-minute anti-recycle timer will prevent the compressor from starting for up to 5 minutes and will further complicate the leaving fluid temperature shift.

Air Conditioning Applications
The chilled fluid loop volume must equal or exceed 3 gallons per nominal ton of cooling (3.25 L per kW).

Process & Special Air Conditioning Applications
Where leaving fluid temperature is often more critical, the chilled fluid loop volume should be increased to 6 to 10 gallons per ton minimum (6.5 to 10.8 L per kW).

APPLICATION DATA (CONT.)

Table 3 **Quick Reference - Minimum Chilled Fluid Loop Volume***

	Air Conditioning Applications		Process Applications				
ACDS-B Model	Gallons	Liters	Gallons	Liters		Gallons	Liters
015S	41	157	83	313	To	138	522
020S	56	213	113	427	To	188	712
025S	71	268	142	536	To	236	893
027S	77	293	155	586	To	258	977
030S	87	329	174	659	To	290	1098
025D	78	296	157	593	To	261	988
030D	94	354	187	709	To	312	1181
035D	104	393	208	786	To	346	1310
040D	116	439	232	879	To	387	1465
045D	137	518	274	1036	To	456	1726
050D	148	561	296	1122	To	494	1870
055D	162	613	324	1226	To	540	2044
057D	170	644	340	1288	To	567	2146
060D	175	663	350	1326	To	584	2210
065D	195	746	391	1492	To	661	2487
070D	216	826	433	1653	To	721	2754
080D	236	900	471	1799	To	785	2999
090D	262	1000	523	1999	To	872	3331
100D	282	1077	564	2154	To	940	3591

*Values calculated for ARI Conditions of Service (C.O.S.)

Type of Application	Gal/Ton	L/kW
Normal Air Conditioning	3	3.25
Process Cooling	6 - 10	6.5 - 10.8

Gallons = Gal/Ton x ARI Capacity in Tons
Liters = L/kW x ARI capacity in kW

For applications with other than ARI C.O.S., calculate the system loop volume based on the adjusted or corrected unit capacity.

Tanks for System Volume Enhancement

It may be necessary to install a tank in the system to provide sufficient system fluid volume, as shown below. The tank should be baffled and piped for proper fluid mixing to prevent stratification.

Figure 11a

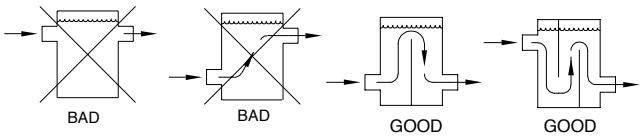


Figure 11b **Single Loop System with Storage Tank to Increase Loop Volume**

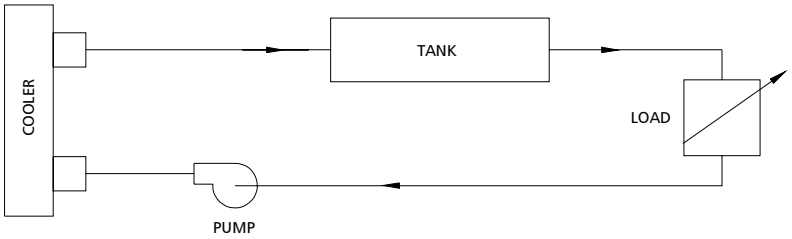
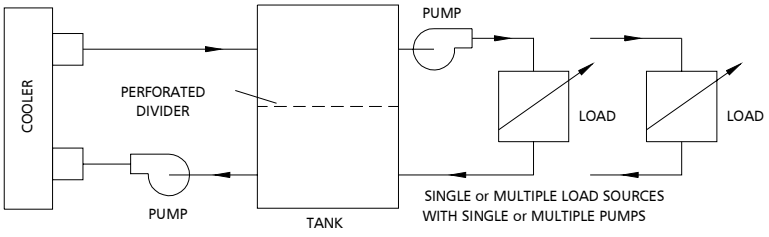


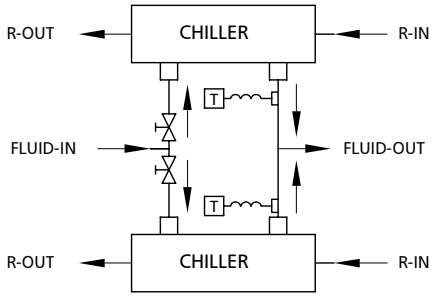
Figure 11c **Primary and Secondary Loop Systems are normally used where the secondary system has variable flow and/or multiple loads. See example below.**



Multiple Chillers Per Chilled Water System

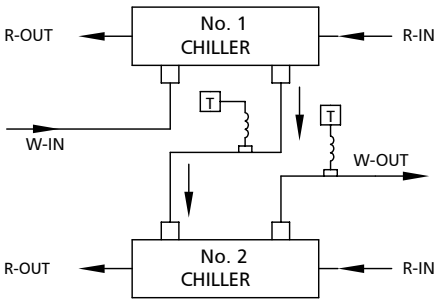
1. Where the load is greater than one **ACDS-B** can supply or where standby capacity is required or the load profile dictates, multiple chillers may be piped in parallel. Units of equal size help to ensure fluid flow balance, but balancing valves ensure balanced flows even with dissimilar sized chillers. Temperature controller sensors may or may not need to be moved to the common fluid piping depending on the specific application.
2. Parallel Chiller Applications (Figure 12a). Both units operate simultaneously modulating with load variations. Each unit operates independently sensing its own leaving water temperature. The set point of each thermostat is set to maintain the desired loading scheme.

Figure 12a



3. Series Chiller Applications (Figure 12b)
   Where a large temperature range is required (over 25°F [13.9°C]), the chiller may be piped in series. In this case the units are controlled independently. The load is progressive by temperature so the chiller selections are critical.

Figure 12b



Oversizing Chillers

Oversizing of chillers more than 5-10% is not recommended. Oversizing causes energy inefficiency and shortened compressor life due to excessive compressor cycling. Larger future load requirements may cause temporary oversizing of equipment which will require careful unit selection. It may be better to properly size for the present load and add another unit later for future expansion. It is also recommended using multiple units where operation at minimum load is critical. Fully loaded equipment operates better and more efficiently than large equipment running at or near minimum capacity.

Hot gas bypass should not be a means to allow oversizing of chillers. Hot gas bypass should only be used where the equipment is sized properly for full load but the load turn down is less than the minimum unloading step available. See Table 1 on Page 8 for estimated hot gas bypass turndown.

Sound and Vibration

ACDS-B compressors are mounted with rubber grommets to the frame to absorb sound and vibration. The compressors are not mounted on springs because extra movement may cause line breakage and refrigerant leaks. Unit isolation helps prevent any remaining sound or vibration from entering the building structure, piping or electrical service.

Water (Fluid) Strainers

It is recommended that 40-mesh strainers be installed in the fluid piping as close to unit cooler as possible.

Glycol Freeze Protection

If the chiller or fluid piping may be exposed to temperatures below freezing, glycol protection is recommended. The recommended protection is 15°F (8.3°C) below the minimum ambient temperature. Use only glycol solutions approved for heat exchanger duty. The use of automotive anti-freeze is not recommended because they have short-lived inhibitors and fouling of the vessels will occur. If the equipment is exposed to freezing temperature and not being used, the vessels and piping should be drained.

Cooler heaters are provided for protection down to -20°F (-29°C) minimum ambient but piping must be protected. A separate 115V service is required for this protection.

If the equipment is being used for operating conditions below the water rated vessel capability, glycol should be used to prevent freeze damage. The freeze protection level should be 20°F (11°C) lower than the leaving brine temperature. The use of glycol causes a performance derate as shown below in Table 4a for Ethylene Glycol and Table 4b for Propylene Glycol and needs to be included in the unit selection procedure.

Table 4a

Ethylene Glycol

% E.G.	FREEZE POINT		C1 CAPACITY FACTOR	K1 kW FACTOR	G1 FLOW RATE	P1 P.D. FACTOR
	°F	°C				
10	26.2	-3.2	0.995	0.998	1.019	1.050
15	22.4	-5.3	0.991	0.997	1.030	1.083
20	17.8	-7.9	0.988	0.996	1.044	1.121
25	12.6	-10.8	0.984	0.995	1.060	1.170
30	6.7	-14.1	0.981	0.994	1.077	1.219
35	0.0	-17.8	0.977	0.992	1.097	12.75
40	-8.0	-25.8	0.973	0.991	1.116	1.331
45	-17.5	-27.5	0.968	0.990	1.138	1.398
50	-28.9	-33.8	0.964	0.989	1.161	1.466

Table 4b

Propylene Glycol

% P.G.	FREEZE POINT		C2 CAPACITY FACTOR	K2 kW FACTOR	G2 FLOW RATE	P2 P.D. FACTOR
	°F	°C				
10	26.1	-3.3	0.988	0.994	1.005	1.019
15	22.8	-5.1	0.984	0.992	1.008	1.031
20	19.1	-7.2	0.978	0.990	1.010	1.051
25	14.5	-9.7	0.970	0.988	1.015	1.081
30	8.9	-12.8	0.962	0.986	1.021	1.120
35	2.1	-16.6	0.952	0.981	1.033	1.163
40	-6.4	-21.3	0.943	0.978	1.043	1.213
45	-16.6	-27.0	0.933	0.975	1.057	1.269
50	-28.9	-33.8	0.924	0.972	1.073	1.326

EXAMPLE

Select an air cooled packaged chiller for the following conditions of service:

50 Tons at 54°F entering, 44°F leaving chilled water. Design ambient is 95°F using R22 refrigerant. Minimum operating ambient is 50°F. Altitude is 6000 feet. Evaporator fouling is .00025. Electrical characteristics are 460/3/60. Unit to use 40% ethylene glycol by weight. (NOT ARI CERTIFIED)

Step 1 - Unit Selection

For 6000 feet elevation, divide the required tonnage by the altitude correction factor from Table 5.

$$\frac{50}{.97} = 51.5 \text{ Tons}$$

To correct for evaporator fouling, consult Table 6. In this example, the fouling factor is .00025 which has a capacity factor of 0.992 and a kW factor of 0.997, so the capacity correction is as follows:

$$\frac{51.5 \text{ Tons}}{.992} = 51.9 \text{ Tons}$$

To correct for 40% E.G., consult Table 4a for a correction factor and make the following adjustment.

$$\frac{51.9}{.973} = 53.3 \text{ Tons}$$

Entering the tables on page 24, we see that an ACDSB 055D for water at sea level will do 54.3 tons drawing 62.4 compressor kW.

The unit will do the following, when corrected for altitude fouling and ethylene glycol

Capacity 54.3 x .992 x .973 x .97 = 50.8 Tons

which exceeds the original requirement.

Compressor kW needs to be adjusted from Table 4a by factor K1 and Table 6 for 0.00025 fouling as follows:

62.4 kW x .991 x .997 = 61.7 kW

Step 2 - Cooler GPM and Pressure Drop

$$\text{Water GPM} = \text{Tons (water)} \times \frac{24}{\text{Cooling Range}} = 50 \times \frac{24}{10} = 120 \text{ GPM}$$

Correcting flow rate for glycol from Table 4a:

GPM = 120 x 1.116 = 133.92 (E.G.) GPM

Referring to pressure drop curve #9 (Figure 13) on page 23 for the evaporator pressure drop, we see a 8.8 feet of water pressure drop for 120 GPM of water.

Correcting pressure drop for glycol from Table 4a:

P.D. (EG) = 8.8 ft. of water x 1.331 = 11.7 ft. of water

PSI = Feet of water x .433 = 5.07

TABLE 5

Elevation above Sea Level (ft.)	Capacity Factor
0	1.00
2000	.99
4000	.98
6000	.97
8000	.96
10000	.95

TABLE 6

Evaporator Fouling Factor (hr-ft-°F/BTU)	Capacity Factor	kW Factor
.0001	1.000	1.000
.00025	0.992	0.997
.0005	0.978	0.990
.001	0.951	0.978

TABLE 7

Unit Model Size	Cooler Curve No. for Table 11		
	Std	Optional	Optional
	CH1	CH2	CH3
	44°F(CLR)	42°F (CLR)	40°F (CLR)
015S	1	1	1
020S	1	1	2
025S	3	3	2
027S	3	3	4
030S	4	4	4
025D	3	4	4
030D	3	4	6
035D	5	7	8
040D	5	7	9
045D	7	7	8
050D	9	9	12
055D	9	9	12
057D	9	9	12
060D	12	12	12
065D	11	11	11
070D	11	11	11
080D	11	11	11
090D	12	12	12
100D	13	13	13

SELECTION PROCEDURE: S.I. UNITS 60 HZ

EXAMPLE
Select an air cooled packaged chiller for the following conditions of service:

175 kWo at 12.5°C entering, 6.5°C leaving chilled water. Design ambient is 35°C. Minimum operating ambient is 10°C. Altitude is 1800 meters. Evaporator fouling is .044. Electrical characteristics are 460/3/60. Unit to use 40% ethylene glycol by weight. (NOT ARI CERTIFIED)

Step 1 - Unit Selection
For 1800 meters elevation, divide the required capacity by the altitude correction factor from Table 8.

$$\frac{175}{.97} = 180.4 \text{ kWo}$$

To correct for evaporator fouling, consult Table 9. In this example, the fouling factor is .044 which has a capacity factor of 0.992 and a kW factor of 0.997, so the capacity correction is as follows:

$$\frac{180.4 \text{ kWo}}{.992} = 181.8 \text{ kWo}$$

To correct for 40% E.G., consult Table 4a for a correction factor and make the following adjustment.

$$\frac{181.8}{.973} = 186.8 \text{ kWo}$$

Entering the tables on page 26, we see that an ACDSB 055D for water at sea level will do 189.1 kWo drawing 62.2 compressor kW.

The unit will do the following, when corrected for altitude and ethylene glycol

Capacity 189.1 x .992 x .973 x .99 =180.7 kWo

which exceeds the original requirement.

Compressor kW needs to be adjusted from Table 4a by factor K1 and Table 9 for 0.044 fouling as follows:

62.2 kW x .991 x .997 = 61.5 kW

Step 2 - Cooler Flow Rate and Pressure Drop

$$\text{Water Flow Rate} = \frac{\text{kWo(water)}}{4.187 \times \text{Range}} = \frac{175 \text{ kWo}}{4.187 \times 6} = 6.97 \text{ Lit./sec.}$$

Correcting flow rate for glycol from Table 4a:

Flow Rate = 6.97 x 1.116 = 7.78 (E.G.) Liters/sec.

Referring to pressure drop curve #9 (Figure 13) on page 23 for the evaporator pressure drop, we see a 22.5 kPa pressure drop for 6.97 Liters/sec. of water.

Correcting pressure drop for glycol from Table 4a:

P.D. (EG) = 22.5 kPa x 1.331 = 29.95 kPa

TABLE 8

Elevation above Sea Level (M)	Capacity Factor
0	1.00
600	.99
1200	.98
1800	.97
2400	.96
3000	.95

TABLE 9

Evaporator Fouling Factor ($hr\text{-}m^2\text{-}°C/kW^{-1}$)	Capacity Factor	kW Factor
0.018	1.000	1.000
0.044	0.992	0.997
0.088	0.978	0.990
0.176	0.951	0.978

TABLE 10

Unit Model Size	Cooler Curve No. for Table 12		
	Std	Optional	Optional
	CH1	CH2	CH3
	6.7°C (CLR)	5.5°C (CLR)	4.5°C (CLR)
015S	1	1	1
020S	1	1	2
025S	3	3	2
027S	3	3	4
030S	4	4	4
025D	3	4	4
030D	3	4	6
035D	5	7	8
040D	5	7	9
045D	7	7	8
050D	9	9	12
055D	9	9	12
057D	9	9	12
060D	12	12	12
065D	11	11	11
070D	11	11	11
080D	11	11	11
090D	12	12	12
100D	13	13	13

DX Cooler: Water Side Pressure Drop

English I.P. and S.I. Units

Figure 13

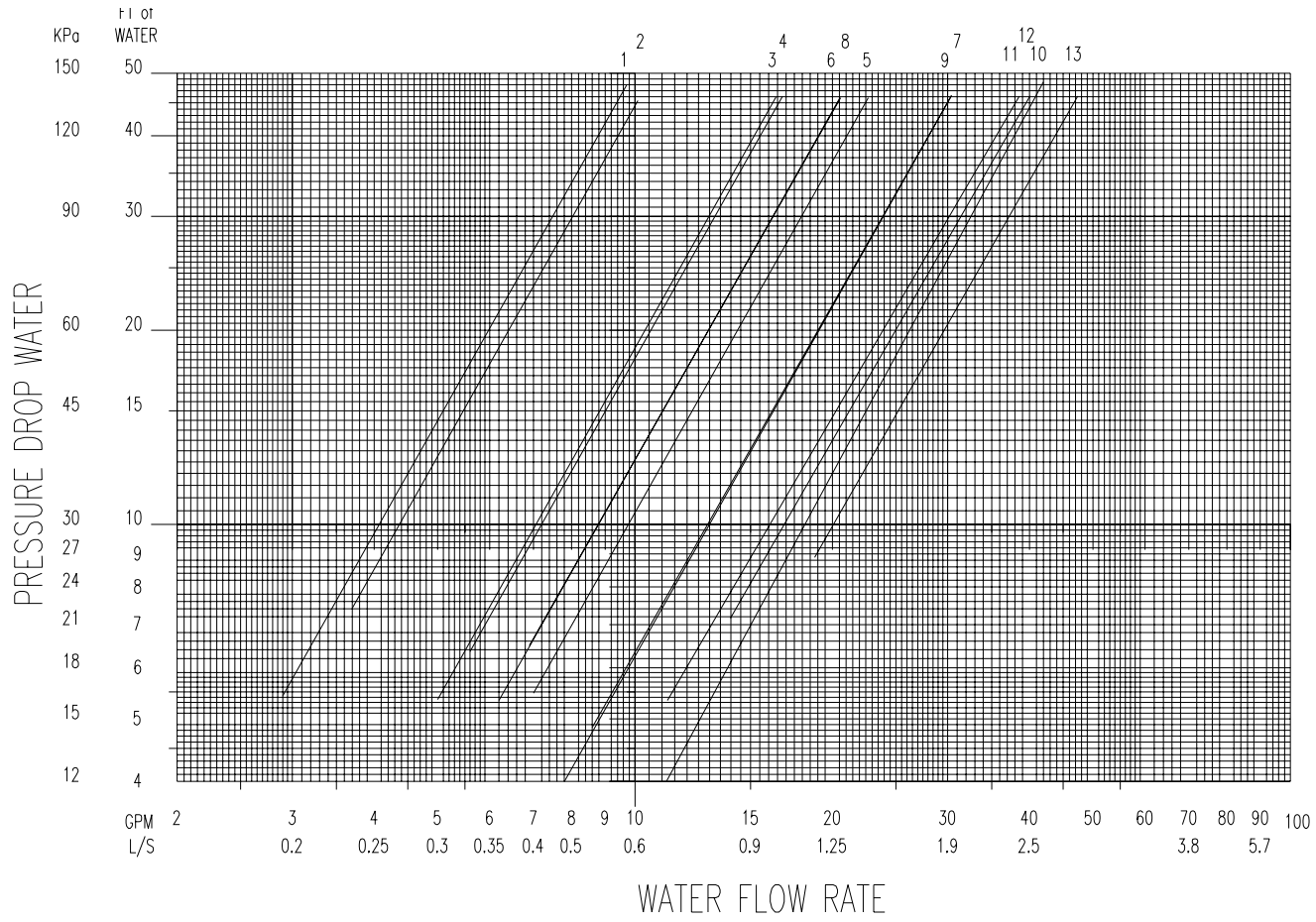


TABLE 11

Curve No.	Cooler		I.P. Units		S.I. Units	
	Model	*Conn. Size	Minimum GPM	Maximum GPM	Min. Lit./Sec.	Max. Lit./Sec.
	Single Circuit Coolers					
1	CHS006601B	3" NPTE	29	97	1.83	6.13
2	CHS007601A	3" NPTE	37	101	2.34	6.39
3	CHS007601B	3" NPTE	50	164	3.16	10.38
4	CHS008601A	3" NPTE	56	168	3.54	10.63
	Dual Circuit Coolers					
3	CHD007601B	3" NPTE	50	164	3.16	10.38
4	CHD008601A	3" NPTE	56	168	3.54	10.63
5	CHD008601B	3" NPTE	70	227	4.42	14.32
6	CHD010601A	4" NPTE	62	205	3.92	12.97
7	CHD010601B	4" NPTE	78	315	4.93	19.23
8	CHD011601A	4" NPTE	69	206	4.37	13.03
9	CHD011601B	4" NPTE	86	304	5.44	19.23
10	CHD013601B	4" NPTE	101	407	6.39	25.75
11	CXD12090F09	4" NPTE	112	365	6.94	22.63
12	CXD12090B07	4" NPTE	140	380	8.68	23.56
13	CXD12120B07	4" NPTE	188	459	11.65	28.45

*Non-metric compliance

PERFORMANCE DATA: ENGLISH I. P. UNITS .....

R22 - 60 HZ - Standard Unit - 1140 RPM Fans

Table 12a

LWT	ACDS-B	ENTERING CONDENSER AIR TEMPERATURE															
		85°F				95°F				105°F				115°F			
°F	MODEL	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV
40	015S	12.6	12.4	10.37	13.58	12.0	13.8	8.96	12.89	11.3	15.5	7.69	12.25	10.6	17.3	6.53	11.62
	**020S	17.4	16.9	10.54	13.86	16.5	19.0	9.05	13.16	15.5	21.3	7.72	12.48	14.5	23.8	6.54	11.65
	**025S	22.4	22.6	10.55	13.59	21.1	25.1	9.06	12.93	19.8	28.0	7.69	12.28	18.3	31.2	6.45	11.62
	**027S	26.9	26.8	10.84	15.46	25.3	29.9	9.26	14.73	23.6	33.2	7.85	14.03	21.9	36.8	6.61	13.32
	030S	29.6	30.6	10.61	14.97	27.8	34.0	9.04	14.20	26.0	37.7	7.68	13.66	24.2	41.7	6.51	13.00
	**025D	25.2	24.3	10.51	13.79	23.9	27.2	9.08	13.13	22.7	30.5	7.80	12.54	21.3	34.1	6.63	11.93
	**030D	31.0	30.7	10.62	14.14	29.3	34.4	9.08	13.43	27.6	38.4	7.73	12.78	25.8	42.9	6.54	11.97
	**035D	32.9	32.6	10.68	14.16	31.2	36.5	9.13	13.43	29.3	40.9	7.76	12.76	27.4	45.7	6.56	12.05
	**040D	38.0	37.0	10.66	15.48	36.0	41.3	9.15	14.75	33.8	46.2	7.80	14.09	31.5	51.6	6.59	13.08
	045D	46.6	45.1	10.99	15.23	44.0	50.2	9.43	14.54	41.1	55.9	8.00	13.76	38.0	62.3	6.71	13.20
	**050D	49.7	49.5	10.78	15.18	46.8	55.1	9.22	14.47	43.7	61.3	7.82	13.82	40.4	68.1	6.56	13.15
	**055D	55.3	55.5	10.82	15.39	52.0	61.8	9.23	14.65	48.6	68.6	7.83	14.13	45.1	76.0	6.61	13.47
	**057D	57.3	55.1	10.77	14.45	54.0	61.6	9.23	14.14	50.6	68.6	7.86	13.52	47.2	76.1	6.67	12.57
	060D	57.3	55.7	10.67	14.30	54.0	62.3	9.13	14.00	50.6	69.4	7.78	13.39	47.1	77.0	6.60	12.46
	065D	63.7	64.1	10.50	13.96	60.6	71.4	9.08	13.45	57.1	79.3	7.79	12.85	53.4	87.9	6.63	12.09
	070D	70.6	72.5	10.43	13.58	67.2	80.4	9.05	12.93	63.3	89.0	7.77	12.12	58.9	98.4	6.60	11.63
	080D	76.7	78.9	10.50	13.41	73.1	87.5	9.12	13.17	69.4	97.2	7.86	12.51	65.2	107.8	6.72	11.91
	090D	85.0	88.7	10.48	13.53	81.0	98.3	9.09	12.88	77.0	109.2	7.84	12.18	72.8	121.3	6.72	11.66
	100D	91.6	90.5	10.77	14.09	87.4	100.1	9.39	13.48	83.0	111.0	8.13	12.96	78.6	123.3	6.99	12.29
42	015S	13.1	12.4	10.72	14.02	12.4	13.9	9.26	13.31	11.8	15.6	7.95	12.65	11.0	17.4	6.75	11.78
	020S	17.8	16.9	10.81	13.95	16.8	18.9	9.27	13.24	15.8	21.1	7.90	12.55	14.8	23.6	6.69	11.73
	025S	23.1	22.7	10.83	13.91	21.9	25.3	9.30	13.23	20.5	28.2	7.90	12.56	19.0	31.5	6.63	11.90
	027S	27.0	26.9	10.89	15.70	25.5	29.9	9.30	14.97	23.8	33.3	7.89	14.26	22.1	36.9	6.65	13.55
	030S	30.7	30.8	10.92	15.34	28.9	34.3	9.31	14.55	27.0	38.1	7.90	14.04	25.1	42.0	6.70	13.36
	*025D	25.9	24.3	10.80	14.23	24.6	27.2	9.34	13.55	23.3	30.4	8.02	12.94	21.9	34.1	6.82	11.89
	*030D	31.6	30.5	10.88	14.41	29.9	34.1	9.31	13.68	28.1	38.2	7.92	13.02	26.3	42.7	6.70	12.21
	*035D	33.8	32.6	10.96	14.34	32.0	36.6	9.37	13.59	30.1	40.9	7.97	12.91	28.1	45.7	6.74	12.20
	*040D	39.0	37.0	10.91	15.68	36.9	41.4	9.37	14.93	34.6	46.3	7.98	14.26	32.3	51.7	6.75	13.26
	045D	46.5	45.0	10.98	15.36	43.9	50.1	9.43	14.67	41.1	55.9	8.00	13.90	38.0	62.2	6.71	13.33
	050D	50.2	49.6	10.87	15.41	47.3	55.2	9.30	14.70	44.2	61.5	7.89	13.97	41.0	68.3	6.63	13.38
	055D	55.7	55.6	10.88	15.60	52.4	61.9	9.29	14.85	49.0	68.8	7.89	14.36	45.6	76.2	6.67	13.70
	057D	57.7	55.2	10.83	14.62	54.5	61.6	9.29	14.34	51.1	68.7	7.92	13.71	47.6	76.3	6.73	12.76
	060D	59.4	56.1	11.01	14.66	56.0	62.6	9.43	14.42	52.5	69.8	8.03	13.79	48.9	77.5	6.81	12.83
	065D	66.0	64.6	10.81	14.35	62.8	71.9	9.35	13.85	59.3	79.9	8.03	13.13	55.4	88.6	6.84	12.46
	070D	73.1	73.1	10.72	13.95	69.6	81.1	9.31	13.29	65.7	89.8	8.00	12.46	61.1	99.3	6.79	11.96
	080D	79.4	79.7	10.77	14.17	75.8	88.4	9.37	13.52	71.9	98.1	8.08	12.85	67.7	108.8	6.91	12.23
	090D	88.2	89.8	10.74	13.84	84.1	99.4	9.33	13.17	79.9	110.4	8.05	12.47	75.5	122.6	6.90	11.94
	100D	95.1	91.6	11.06	14.44	90.6	101.2	9.65	13.83	86.2	112.2	8.36	13.08	81.6	124.5	7.20	12.63
44	015S	13.6	12.5	11.08	14.46	12.9	14.0	9.57	13.74	12.2	15.6	8.22	13.06	11.5	17.5	6.98	12.17
	020S	18.5	17.0	11.15	14.39	17.5	19.0	9.57	13.65	16.4	21.3	8.15	12.94	15.3	23.7	6.90	12.11
	025S	24.0	22.9	11.15	14.31	22.7	25.5	9.58	13.62	21.3	28.4	8.14	12.94	19.7	31.7	6.83	12.27
	027S	28.0	27.1	11.20	16.16	26.4	30.2	9.57	15.40	24.7	33.6	8.12	14.67	22.9	37.2	6.84	13.96
	030S	31.7	31.1	11.20	15.70	29.9	34.6	9.57	14.90	28.0	38.4	8.13	14.42	26.0	42.4	6.89	13.72
	025D	26.3	24.1	11.06	14.31	24.9	26.9	9.56	13.62	23.6	30.1	8.21	13.00	22.2	33.7	6.98	11.94
	030D	32.0	29.9	11.18	14.64	30.2	33.5	9.58	13.89	28.5	37.5	8.16	13.22	26.6	41.8	6.90	12.40
	035D	34.9	33.1	11.18	14.65	33.0	37.0	9.56	13.89	31.0	41.4	8.13	13.20	29.0	46.2	6.87	12.52
	040D	39.5	36.6	11.19	15.86	37.4	40.9	9.61	15.10	35.2	45.7	8.19	14.41	32.8	51.0	6.93	13.41
	045D	48.2	45.4	11.30	15.80	45.5	50.5	9.70	15.09	42.6	56.3	8.24	14.33	39.5	62.7	6.91	13.74
	050D	52.0	50.0	11.19	15.86	49.0	55.6	9.57	15.13	45.9	62.0	8.12	14.33	42.5	68.9	6.83	13.79
	055D	57.7	56.0	11.20	16.02	54.3	62.4	9.56	15.26	50.8	69.3	8.12	14.79	47.3	76.8	6.87	14.13
	057D	59.8	55.5	11.18	14.97	56.4	62.0	9.58	14.76	53.0	69.1	8.17	14.12	49.4	76.8	6.94	13.14
	060D	61.6	56.4	11.35	15.01	58.1	63.0	9.72	14.84	54.4	70.2	8.28	14.19	50.7	78.0	7.02	13.21
	065D	68.4	65.1	11.13	14.73	65.1	72.4	9.63	14.26	61.5	80.5	8.27	13.51	57.5	89.3	7.05	12.83
	070D	75.7	73.8	11.02	14.33	72.1	81.8	9.56	13.64	68.1	90.6	8.22	12.80	63.4	100.2	6.99	12.29
	080D	82.2	80.6	11.06	14.52	78.5	89.3	9.61	13.86	74.5	99.1	8.30	13.09	70.2	109.9	7.10	12.54
	090D	91.4	90.9	11.01	14.15	87.2	100.6	9.57	13.47	82.8	111.6	8.26	12.77	78.4	123.9	7.09	12.22
	100D	98.6	92.6	11.34	14.79	94.0	102.3	9.90	14.18	89.4	113.3	8.59	13.43	84.7	125.8	7.40	12.97

NOTES:
(1) Double asterisk (**) indicates ratings with CH3 oversized evaporator for 40°F LWT
(2) Asterisk (*) indicates ratings with CH2 oversized evaporator for 42°F LWT
(3) Ratings based on ARI Standard 550/590-98, 10°F water range in evaporator & .0001 fouling factor
(4) ARI Standard 550/590-98 **"NPLV"** (**"N**on-**S**tandard **P**art **L**oad **V**alue) has replaced ARI Standard 590-92 **"APLV"** (**A**pplied **P**art **L**oad **V**alue) ratings.
(5) Interpolation between ratings is permissible but extrapolation is **not**
(6) KW is for compressor only. EER is for entire unit. See Physical Specs for fan kW
(7) **ARI Standard rating point and IPLV**

PERFORMANCE DATA: ENGLISH I. P. UNITS

R22 - 60 HZ - Standard Unit - 1140 RPM Fans

Table 12b

LWT	ACDS-B	ENTERING CONDENSER AIR TEMPERATURE															
		85°F				95°F				105°F				115°F			
°F	MODEL	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV	TONS	KW	EER	NPLV
45	015S	13.8	12.5	11.26	14.69	13.1	14.0	9.73	13.96	12.4	15.7	8.35	13.26	11.7	17.5	7.10	12.37
	020S	18.8	17.0	11.33	14.61	17.8	19.1	9.72	13.86	16.7	21.3	8.28	13.14	15.6	23.8	7.01	12.30
	025S	24.4	23.0	11.32	14.52	23.1	25.6	9.72	13.81	21.6	28.5	8.26	13.08	20.1	31.8	6.94	12.45
	027S	28.5	27.3	11.36	16.38	26.9	30.3	9.71	15.62	25.1	33.7	8.23	14.88	23.3	37.4	6.94	14.16
	030S	32.2	31.2	11.33	15.88	30.4	34.7	9.68	15.07	28.5	38.6	8.24	14.61	26.5	42.6	6.98	13.90
	025D	26.7	24.2	11.24	14.53	25.4	27.0	9.72	13.83	24.1	30.2	8.35	13.21	22.6	33.8	7.10	12.14
	030D	32.5	30.0	11.36	14.86	30.8	33.6	9.73	14.10	29.0	37.6	8.28	13.42	27.1	41.9	7.01	12.60
	035D	35.5	33.2	11.35	14.87	33.6	37.1	9.71	14.10	31.6	41.5	8.25	13.40	29.5	46.3	6.98	12.73
	040D	40.2	36.7	11.36	16.10	38.1	41.0	9.76	15.33	35.8	45.8	8.32	14.63	33.4	51.2	7.03	13.62
	045D	49.1	45.6	11.47	16.03	46.4	50.7	9.84	15.31	43.4	56.5	8.36	14.55	40.2	63.0	7.01	13.95
	050D	52.9	50.2	11.34	16.08	49.9	55.9	9.71	15.34	46.7	62.2	8.24	14.55	43.3	69.2	6.93	14.00
	055D	58.7	56.2	11.36	16.22	55.3	62.6	9.70	15.46	51.8	69.6	8.24	15.01	48.1	77.1	6.96	14.34
	057D	60.8	55.6	11.35	15.15	57.5	62.2	9.73	14.97	53.9	69.3	8.30	14.32	50.3	77.0	7.04	13.33
	060D	62.7	56.5	11.53	15.19	59.1	63.1	9.87	15.05	55.4	70.4	8.41	14.40	51.6	78.2	7.13	13.40
	065D	69.7	65.3	11.29	14.92	66.3	72.7	9.77	14.46	62.6	80.8	8.39	13.71	58.6	89.6	7.15	13.01
	070D	77.1	74.1	11.17	14.52	73.4	82.2	9.69	13.82	69.3	91.0	8.34	12.97	64.6	100.7	7.09	12.45
	080D	83.7	81.0	11.20	14.70	79.9	89.7	9.74	14.03	75.8	99.6	8.41	13.26	71.4	110.4	7.20	12.70
	090D	93.1	91.5	11.14	14.31	88.7	101.2	9.69	13.62	84.3	112.2	8.37	12.91	79.8	124.6	7.18	12.36
	100D	100.3	93.2	11.49	14.93	95.7	102.9	10.04	14.36	91.1	113.9	8.71	13.60	86.3	126.4	7.50	13.14
46	015S	14.1	12.6	11.44	14.92	13.4	14.0	9.89	14.18	12.7	15.7	8.49	13.47	11.9	17.6	7.21	12.57
	020S	19.1	17.1	11.50	14.83	18.1	19.1	9.87	14.07	17.0	21.4	8.41	13.34	15.9	23.9	7.12	12.49
	025S	24.9	23.1	11.48	14.73	23.5	25.7	9.86	14.01	22.0	28.6	8.38	13.27	20.5	32.0	7.04	12.64
	027S	29.1	27.4	11.52	16.61	27.4	30.5	9.84	15.83	25.6	33.9	8.35	15.09	23.7	37.6	7.04	14.37
	030S	32.7	31.3	11.47	16.06	30.9	34.9	9.80	15.24	28.9	38.7	8.34	14.79	27.0	42.9	7.08	14.08
	025D	27.2	24.2	11.42	14.76	25.9	27.0	9.88	14.05	24.5	30.2	8.48	13.41	23.0	33.9	7.21	12.33
	030D	33.1	30.1	11.53	15.08	31.3	33.7	9.88	14.32	29.5	37.7	8.41	13.62	27.5	42.1	7.11	12.80
	035D	36.2	33.3	11.52	15.10	34.2	37.3	9.86	14.31	32.2	41.7	8.38	13.60	30.0	46.5	7.08	12.93
	040D	41.0	36.8	11.53	16.34	38.8	41.2	9.90	15.56	36.4	46.0	8.44	14.85	34.0	51.3	7.14	13.84
	045D	50.0	45.7	11.63	16.25	47.2	50.9	9.98	15.52	44.2	56.7	8.48	14.77	40.9	63.2	7.12	14.16
	050D	53.9	50.4	11.50	16.31	50.8	56.1	9.85	15.56	47.5	62.5	8.36	14.77	44.1	69.5	7.03	14.21
	055D	59.8	56.5	11.52	16.43	56.3	62.9	9.83	15.66	52.7	69.9	8.35	15.23	49.0	77.5	7.06	14.56
	057D	61.9	55.8	11.52	15.33	58.5	62.3	9.88	15.19	54.9	69.5	8.42	14.52	51.2	77.3	7.15	13.52
	060D	63.8	56.7	11.70	15.36	60.2	63.3	10.02	15.26	56.4	70.6	8.53	14.60	52.6	78.5	7.23	13.59
	065D	70.9	65.6	11.45	15.12	67.4	73.0	9.91	14.66	63.7	81.1	8.51	13.91	59.7	90.0	7.26	13.20
	070D	78.4	74.5	11.32	14.70	74.7	82.5	9.82	13.99	70.5	91.4	8.45	13.16	65.8	101.1	7.19	12.62
	080D	85.1	81.4	11.34	14.88	81.3	90.2	9.86	14.20	77.2	100.0	8.52	13.43	72.7	110.9	7.29	12.86
	090D	94.6	92.1	11.26	14.46	90.3	101.8	9.80	13.77	85.9	112.9	8.48	13.06	81.3	125.3	7.28	12.50
	100D	102.1	93.7	11.64	15.12	97.5	103.4	10.17	14.54	92.7	114.5	8.83	13.78	87.9	127.0	7.61	13.31
48	015S	14.6	12.7	11.81	15.38	13.9	14.1	10.21	14.62	13.1	15.8	8.76	13.90	12.3	17.7	7.45	12.98
	020S	19.8	17.2	11.86	15.28	18.7	19.2	10.17	14.50	17.6	21.5	8.67	13.75	16.5	24.0	7.34	12.89
	025S	25.8	23.3	11.81	15.14	24.4	25.9	10.15	14.41	22.8	28.9	8.63	13.66	21.2	32.2	7.25	13.01
	027S	30.1	27.6	11.84	17.06	28.3	30.7	10.11	16.27	26.5	34.2	8.58	15.46	24.6	37.9	7.23	14.78
	030S	33.8	31.6	11.73	16.41	31.8	35.2	10.03	15.92	29.9	39.1	8.54	15.16	27.9	43.3	7.24	14.44
	025D	28.2	24.3	11.79	15.21	26.8	27.2	10.20	14.48	25.4	30.4	8.76	13.83	23.8	34.0	7.44	12.73
	030D	34.3	30.3	11.88	15.53	32.5	33.9	10.18	14.75	30.5	37.9	8.66	14.03	28.5	42.3	7.33	13.21
	035D	37.5	33.5	11.87	15.54	35.4	37.5	10.15	14.74	33.3	41.9	8.63	14.00	31.1	46.8	7.29	13.34
	040D	42.4	37.1	11.88	16.83	40.1	41.4	10.20	16.03	37.7	46.3	8.70	15.30	35.2	51.7	7.36	14.28
	045D	51.7	46.1	11.96	16.70	48.9	51.3	10.27	15.96	45.8	57.2	8.72	15.21	42.4	63.7	7.33	14.59
	050D	55.8	50.8	11.83	16.76	52.6	56.6	10.13	15.99	49.3	63.0	8.59	15.22	45.7	70.0	7.23	14.63
	055D	61.8	56.9	11.82	16.85	58.3	63.4	10.10	16.06	54.6	70.5	8.59	15.57	50.8	78.1	7.25	14.99
	057D	64.1	56.1	11.87	15.67	60.6	62.7	10.18	15.61	56.9	69.9	8.68	14.71	53.1	77.8	7.36	13.89
	060D	66.1	57.1	12.06	15.71	62.3	63.7	10.33	15.68	58.4	71.1	8.79	14.98	54.4	79.0	7.45	13.97
	065D	73.4	66.1	11.78	15.50	69.8	73.5	10.19	15.07	66.0	81.8	8.76	14.30	61.9	90.7	7.47	13.58
	070D	81.2	75.1	11.62	15.08	77.3	83.3	10.09	14.35	73.0	92.2	8.68	13.51	68.2	102.0	7.39	12.93
	080D	88.0	82.2	11.62	15.24	84.1	91.1	10.12	14.55	79.9	101.0	8.74	13.76	75.3	112.0	7.49	13.18
	090D	97.6	93.2	11.49	14.75	93.2	103.0	10.01	14.05	88.7	114.2	8.66	13.35	84.0	126.7	7.45	12.75
	100D	105.8	94.9	11.93	15.49	101.0	104.6	10.43	14.90	96.1	115.8	9.06	14.13	91.2	128.3	7.82	13.63

NOTES:
(1) Double asterisk (**) indicates ratings with CH3 oversized evaporator for 40°F LWT
(2) Asterisk (*) indicates ratings with CH2 oversized evaporator for 42°F LWT
(3) Ratings based on ARI Standard 550/590-98, 10°F water range in evaporator & .0001 fouling factor
(4) ARI Standard 550/590-98 **"NPLV"** (**"Non-Standard Part Load Value**) has replaced ARI Standard 590-92 **"APLV"** (**Applied Part Load Value**) ratings.
(5) Interpolation between ratings is permissible but extrapolation is **not**
(6) KW is for compressor only. EER is for entire unit. See Physical Specs for fan kW
(7) **ARI Standard rating point and IPLV**

PERFORMANCE DATA: S. I. UNITS

R22 - 60 HZ - Standard Unit - 1140 RPM Fans

Table 13a

LWT °C	ACDS-B MODEL	ENTERING CONDENSER AIR TEMPERATURE								
		30°C			35°C			40°C		
		kWo	kWi	COP	kWo	kWi	COP	kWo	kWi	COP
6.5	015S	47.1	12.6	3.17	44.9	14.0	2.78	42.7	15.4	2.42
	020S	63.9	17.1	3.19	60.7	19.0	2.78	57.5	21.0	2.41
	025S	83.1	23.1	3.20	79.0	25.4	2.79	74.5	28.1	2.41
	027S	97.1	27.4	3.21	92.0	30.1	2.78	86.5	33.1	2.40
	030S	109.9	31.3	3.21	104.1	34.5	2.78	98.1	37.9	2.40
6.5	025D	93.1	24.7	3.20	88.8	27.3	2.80	84.6	30.2	2.45
	030D	113.5	31.0	3.21	108.0	34.3	2.79	102.2	37.9	2.41
	035D	121.7	33.2	3.24	115.6	36.7	2.81	109.4	40.6	2.43
	040D	140.0	37.6	3.22	133.1	41.6	2.81	125.9	46.0	2.43
	045D	167.0	45.8	3.24	158.5	50.4	2.82	149.4	55.6	2.43
	050D	180.0	50.4	3.20	170.6	55.5	2.78	160.7	61.1	2.40
	055D	199.7	56.5	3.21	189.1	62.2	2.78	178.1	68.4	2.40
	057D	206.9	56.0	3.20	196.4	61.9	2.78	185.5	68.2	2.41
	060D	212.8	56.9	3.24	201.8	62.8	2.82	190.4	69.3	2.44
	065D	236.3	65.6	3.18	225.8	72.2	2.79	214.6	79.4	2.43
	070D	261.5	74.3	3.15	250.2	81.5	2.77	237.6	89.4	2.42
	080D	283.8	81.0	3.16	272.1	88.9	2.79	259.8	97.6	2.44
	090D	315.6	91.4	3.15	302.3	100.1	2.78	288.8	110.0	2.43
	100D	340.8	93.2	3.25	326.6	101.9	2.88	312.3	111.8	2.53

NOTES: (1) Other performance requirements can be selected from the Dunham-Bush Electronic Catalog
(2) Ratings based on ARI Standard 550/590-98, 5°C water range in evaporator & .018 fouling factor
(3) Interpolation between ratings is permissable but extrapolation is **not**
(4) KWi is for compressor only. COP is for entire unit. See Physical Specs for fan kW

R22 - 60 HZ - Standard Unit - 1140 RPM Fans

Table 13b

LWT	ACDS-B	ENTERING CONDENSER AIR TEMPERATURE					
		45°C			49°C (See Note 4)		
6.5	015S	40.4	17.1	2.10	38.4	18.5	1.90
	020S	54.1	23.2	2.07	51.3	25.1	1.80
	025S	69.7	31.0	2.06	65.6	33.5	1.80
	027S	80.9	36.4	2.06	76.2	39.1	1.80
6.5	030D	91.9	41.5	2.07	87.0	44.5	1.80
	025D	80.0	33.4	2.12	76.0	36.2	1.90
	030D	96.2	41.9	2.08	91.2	45.3	1.80
	035D	103.0	44.9	2.09	97.7	48.6	1.80
	040D	118.3	50.8	2.09	112.0	54.9	1.90
	045D	139.5	61.3	2.08	131.1	66.2	1.80
	050D	150.2	67.3	2.06	141.4	72.5	1.80
	055D	166.8	75.1	2.06	157.6	80.7	1.80
	057D	174.3	75.0	2.08	165.1	80.8	1.90
	060D	178.7	76.2	2.10	169.2	82.0	1.90
	065D	202.4	87.2	2.11	191.9	93.8	1.87
	070D	223.4	97.9	2.10	210.7	105.0	1.85
	080D	246.5	107.2	2.13	234.9	115.5	1.89
	090D	275.0	120.9	2.12	263.5	130.3	1.90
	100D	297.7	122.8	2.22	285.7	132.4	1.98

NOTES: (1) Other performance requirements can be selected from the Dunham-Bush Electronic Catalog
(2) Ratings based on ARI Standard 550/590-98, 5°C water range in evaporator & .018 fouling factor
(3) Interpolation between ratings is permissable but extrapolation is **not**
(4) KWi is for compressor only. COP is for entire unit. See Physical Specs for fan kW
(5) **High Ambient Applications over 48°C may be affected by the unit's automatic "High Pressure Limiting" function that unloads the circuit if head pressure reaches limits by allowing only one compressor per circuit to run.**

PHYSICAL SPECIFICATIONS: ENGLISH I.P. & S.I. UNITS

Table 14a

ACDS-B 015S, 020S, 025S, 027S, 030S

ACDS-B MODEL	015S	020S	025S	027S	030S
Nominal Capacity in Tons (kW)	15 (52)	20 (70)	25 (88)	27 (95)	30 (105)
Quantity of Compressors	2	2	2	2	2
STANDARD EVAPORATOR	CHS006601B	CHS006601B	CHS007601B	CHS007601B	CHS008601A
Water Volume, Gallons (Liters)	3.4 (12.9)	3.4 (12.9)	5.5 (20.8)	5.5 (20.8)	7.0 (26.5)
Minimum Flow Rate, GPM (L/S)	29 (1.83)	29 (1.83)	50 (3.15)	50 (3.15)	56 (3.53)
Maximum Flow Rate, GPM (L/S)	97 (6.12)	97 (6.12)	168 (10.60)	168 (10.60)	172 (10.85)
Water Conn. Size In/Out (Type)	3"NPTE	3"NPTE	3"NPTE	3"NPTE	3"NPTE
(CH2) OPT. CLR for 42°F (5.5°C) LWT(1)	NR	NR	NR	NR	NR
Water Volume, Gallons (Liters)	NR	NR	NR	NR	NR
Minimum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Maximum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Water Conn. Size In/Out (Type)	NR	NR	NR	NR	NR
(CH3) OPT. CLR for 40°F (4.5°C) LWT(2)	NR	CHS007601A	CHS007601A	CHS008601A	NR
Water Volume, Gallons (Liters)	NR	27 (102.2)	27 (102.2)	35 (132.5)	NR
Minimum Flow Rate, GPM (L/S)	NR	37 (2.33)	37 (2.33)	56 (3.53)	NR
Maximum Flow Rate, GPM (L/S)	NR	101 (6.37)	101 (6.37)	168 (10.60)	NR
Water Conn. Size In/Out (Type)	NR	3"NPTE	3"NPTE	3"NPTE	NR
CONDENSER	L216	L216	L216	L216	L312
Fan Quantity - All 30" (766mm) Diameter	2	2	2	2	2
Motor Quantity(3)	(1) 2	(1) 2	(1) 2	(1) 2	(1) 2
Standard Fans - Nominal RPM	1140	1140	1140	1140	1140
Standard Fans - HP (3)	(1.0) 1.5	(1.0) 1.5	(1.0) 1.5	(1.0) 1.5	(1.0) 1.5
Standard Fans - (kW) (3)	(.76) 1.15	(.76) 1.15	(.76) 1.15	(.76) 1.15	(.76) 1.15
Opt. Extra Quiet Fans - Nominal RPM	855	855	855	855	855
Opt. Extra Quiet Fan Motor - HP (kW) (3)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)
GENERAL DATA					
Min.Starting/Operating Ambient°F (°C) (4)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)
with HGBP, °F (°C) (4)	40 (4.4)	40 (4.4)	40 (4.4)	40 (4.4)	40 (4.4)
Low Ambient Option, °F (°C) (5)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)
Extra Low Ambient Option, °F (°C) (6)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)
Number of Circuits	1	1	1	1	1
Refrigerant Charge, lbs. (kgs) R22	33 (15.0)	45 (20.4)	57 (25.9)	62 (28.1)	70 (31.8)
Shipping Wt., lbs. (kgs) Alum. Fin Cond.	1636 (743)	1674 (760)	1722 (782)	1807 (820)	1957 (888)
Shipping Wt., lbs. (kgs) Copper Fin Cond.	1865 (847)	1903 (864)	1952 (886)	2037 (925)	2304 (1046)
Operating Wt., lbs.(kgs) Alum. Fin Cond.	1668 (757)	1720 (781)	1768 (803)	1866 (847)	2016 (915)
Operating Wt., lbs.(kgs) Copper Fin Cond.	1897 (861)	1949 (885)	1998 (907)	2096 (952)	2363 (1072)

NOTES:
(1) CH2 - Oversized cooler required where indicated for 42°F (5.5°C) LWT.
(2) CH3 - Oversized cooler required where indicated for 40°F (4.5°C) LWT.
(3) Units with Low Ambient Option use (1) 1 HP (0.76 kW) in lieu of (1) 1.5 HP (1.15kW) fan motor per circuit
(4) Minimum Starting/Operation Ambient with a maximum of 5 MPH wind across coil & minimum load per Table 1.
(5) Low Ambient Option requires (1) 1 HP (0.76 kW) variable speed fan, motor per circuit.
(6) Extra Low Ambient Option requires electronic expansion valve(s), variable speed fan, 50% glycol, 50% minimum load and maximum 5 MPH wind across coil and may require additional system modifications. Contact factory.

NR - Not Required
NPTE - National Pipe Thread External

ACDS-B 025D, 030D, 035D, 040D, 045D

Table 14b

ACDS-B MODEL	025D	030D	035D	040D	045D
Nominal Capacity in Tons (kW)	25 (88)	30 (105)	35 (120)	40 (140)	45 (150)
Quantity of Compressors	4	4	4	4	4
STANDARD EVAPORATOR	CHD007601B	CHD007601B	CHD008601B	CHD008601B	CHD010601B
Water Volume, Gallons (Liters)	5.5 (20.8)	5.5 (20.8)	7 (26.5)	7 (26.5)	10.7 (40.5)
Minimum Flow Rate, GPM (L/S)	50 (3.15)	50 (3.15)	70 (4.42)	70 (4.42)	78 (4.93)
Maximum Flow Rate, GPM (L/S)	164 (10.35)	164 (10.35)	227 (14.32)	227 (14.32)	315 (19.23)
Water Conn. Size In/Out (Type)	3" NPTE	3" NPTE	3" NPTE	3" NPTE	4" NPTE
(CH2) OPT. CLR for 42°F (5.5°C) LWT(1)	CHD008601A	CHD008601A	CHD010601B	CHD010601B	NR
Water Volume, Gallons (Liters)	7.7 (29.1)	7.7 (29.1)	10.7 (40.5)	10.7 (40.5)	NR
Minimum Flow Rate, GPM (L/S)	56 (3.53)	56 (3.53)	78 (4.92)	78 (4.92)	NR
Maximum Flow Rate, GPM (L/S)	168 (10.60)	168 (10.60)	315 (19.87)	315 (19.87)	NR
Water Conn. Size In/Out (Type)	3" NPTE	3" NPTE	4" NPTE	4" NPTE	NR
(CH3) OPT. CLR for 40°F (4.5°C) LWT(2)	CHD008601A	CHD010601A	CHD011601A	CHD011601B	CHD011601A
Water Volume, Gallons (Liters)	7.7 (29.1)	10.7 (40.5)	12.9 (48.8)	12.9 (48.8)	12.9 (48.8)
Minimum Flow Rate, GPM (L/S)	56 (3.53)	62 (3.91)	69 (4.35)	86 (5.42)	69 (4.35)
Maximum Flow Rate, GPM (L/S)	168 (10.60)	205 (12.93)	206 (12.99)	304 (19.18)	206 (12.99)
Water Conn. Size In/Out (Type)	3" NPTE	4" NPTE	4" NPTE	4" NPTE	4" NPTE
CONDENSER	L216	L216	L216	L216	L216
Fan Quantity - All 30" (766mm) Diameter	4	4	4	4	4
Motor Quantity(3)	(2) 4	(2) 4	(2) 4	(2) 4	(2) 4
Standard Fans - Nominal RPM	1140	1140	1140	1140	1140
Standard Fans - HP (3)	1.0	1.0	1.0	(1.0) 1.5	(1.0) 1.5
Standard Fans - (kW) (3)	(.76) 1.15	(.76) 1.15	(.76) 1.15	(.76) 1.15	(.76) 1.15
Opt. Extra Quiet Fans - Nominal RPM	855	855	855	855	855
Opt. Extra Quiet Fan Motor - HP (kW) (3)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)
GENERAL DATA					
Min.Starting/Operating Ambient°F (°C) (4)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)
with HGBP, °F (°C) (4)	40 (4.4)	40 (4.4)	40 (4.4)	40 (4.4)	40 (4.4)
Low Ambient Option, °F (°C) (5)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)
Extra Low Ambient Option, °F (°C) (6)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)
Number of Circuits	2	2	2	2	2
Refrigerant Charge, lbs. (kgs) R22	62 (28.1)	75 (34.0)	83 (37.6)	93 (42.2)	109 (49.4)
Shipping Wt., lbs. (kgs) Alum. Fin Cond.	3424 (1554)	3517 (1597)	3604 (1636)	3629 (1648)	3702 (1681)
Shipping Wt., lbs. (kgs) Copper Fin Cond.	3877 (1760)	3968 (1802)	4057 (1842)	4081 (1853)	4154 (1886)
Operating Wt., lbs.(kgs) Alum. Fin Cond.	3844 (1584)	3606 (1637)	3712 (1685)	3737 (1697)	3810 (1730)
Operating Wt., lbs.(kgs) Copper Fin Cond.	3941 (1789)	4058 (1842)	4165 (1891)	4189 (1902)	4262 (1935)

NOTES:
(1) CH2 - Oversized cooler required where indicated for 42°F (5.5°C) LWT.
(2) CH3 - Oversized cooler required where indicated for 40°F (4.5°C) LWT.
(3) Units with Low Ambient Option use (1) 1 HP (0.76 kW) in lieu of (1) 1.5 HP (1.15kW) fan motor per circuit
(4) Minimum Starting/Operation Ambient with a maximum of 5 MPH wind across coil & minimum load per Table 1.
(5) Low Ambient Option requires (1) 1 HP (0.76 kW) variable speed fan, motor per circuit.
(6) Extra Low Ambient Option requires electronic expansion valve(s), variable speed fan, 50% glycol, 50% minimum load and maximum 5 MPH wind across coil, and may require additional system modifications. Contact factory.

NR - Not Required
NPTE - National Pipe Thread External

PHYSICAL SPECIFICATIONS: ENGLISH I.P. & S.I. UNITS

ACDS-B 050D, 055D, 057D, 060D

Table 14c

ACDS-B MODEL	050D	055D	057D	060D
Nominal Capacity in Tons (kW)	50 (175)	55 (190)	57 (200)	60 (210)
Quantity of Compressors	4	4	4	4
STANDARD EVAPORATOR	CHD011601B	CHD011601B	CHD011601B	CHD013601B
Water Volume, Gallons (Liters)	12.9 (49.0)	12.9 (49.0)	12.9 (49.0)	18.1 (68.5)
Minimum Flow Rate, GPM (L/S)	86 (5.44)	86 (5.44)	86 (5.44)	101 (6.39)
Maximum Flow Rate, GPM (L/S)	315 (19.23)	315 (19.23)	315 (19.23)	420 (25.76)
Water Conn. Size In/Out (Type)	4" NPTE	4" NPTE	4" NPTE	4" NPTE
(CH2) OPT. CLR for 42°F (5.5°C) LWT(1)	NR	NR	NR	NR
Water Volume, Gallons (Liters)	NR	NR	NR	NR
Minimum Flow Rate, GPM (L/S)	NR	NR	NR	NR
Maximum Flow Rate, GPM (L/S)	NR	NR	NR	NR
Water Conn. Size In/Out (Type)	NR	NR	NR	NR
(CH3) OPT. CLR for 40°F (4.5°C) LWT(2)	CHD013601B	CHD013601B	CHD013601B	NR
Water Volume, Gallons (Liters)	18.1 (68.5)	18.1 (68.5)	18.1 (68.5)	NR
Minimum Flow Rate, GPM (L/S)	101 (6.39)	101 (6.39)	101 (6.39)	NR
Maximum Flow Rate, GPM (L/S)	420 (25.76)	420 (25.76)	420 (25.76)	NR
Water Conn. Size In/Out (Type)	4" NPTE	4" NPTE	4" NPTE	NR
CONDENSER	L216	L312	L216	L216
Fan Quantity - All 30" (766mm) Diameter	4	4	6	6
Motor Quantity(3)	(2) 4	(2) 4	(2) 6	(2) 6
Standard Fans - Nominal RPM	1140	1140	1140	1140
Standard Fans - HP (3)	(1.0) 1.5	(1.0) 1.5	(1.0) 1.5	(1.0) 1.5
Standard Fans - (kW) (3)	(.76) 1.15	(.76) 1.15	(.76) 1.15	(.76) 1.15
Opt. Extra Quiet Fans - Nominal RPM	855	855	855	855
Opt. Extra Quiet Fan Motor - HP (kW) (3)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)
GENERAL DATA				
Min.Starting/Operating Ambient°F (°C) (4)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)
with HGBP, °F (°C) (4)	40 (4.4)	40 (4.4)	40 (4.4)	40 (4.4)
Low Ambient Option, °F (°C) (5)	0 (-18)	0 (-18)	0 (-18)	0 (-18)
Extra Low Ambient Option, °F (°C) (6)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)
Number of Circuits	2	2	2	2
Refrigerant Charge, lbs. (kgs) R22	119 (54.0)	130 (59.0)	136 (61.7)	140 (63.5)
Shipping Wt., lbs. (kgs) Alum. Fin Cond.	3910 (1775)	4228 (1920)	4649 (2111)	4649 (2111)
Shipping Wt., lbs. (kgs) Copper Fin Cond.	4362 (1980)	4926 (2236)	5325 (2418)	5325 (2418)
Operating Wt., lbs.(kgs) Alum. Fin Cond.	4061 (1844)	4379 (1988)	4800 (2179)	4800 (2179)
Operating Wt., lbs.(kgs) Copper Fin Cond.	4513 (2049)	5077 (2305)	5476 (2486)	5476 (2486)

NOTES:
(1) CH2 - Oversized cooler required where indicated for 42°F (5.5°C) LWT.
(2) CH3 - Oversized cooler required where indicated for 40°F (4.5°C) LWT.
(3) Units with Low Ambient Option use (1) 1 HP (0.76 kW) in lieu of (1) 1.5 HP (1.15kW) fan motor per circuit
(4) Minimum Starting/Operation Ambient with a maximum of 5 MPH wind across coil & minimum load per Table 1.
(5) Low Ambient Option requires (1) 1 HP (0.76 kW) variable speed fan, motor per circuit.
(6) Extra Low Ambient Option requires electronic expansion valve(s), variable speed fan, 50% glycol, 50% minimum load and maximum 5 MPH wind across coil and may require additional system modifications. Contact factory.

NR - Not Required
NPTE - National Pipe Thread External

PHYSICAL SPECIFICATIONS: ENGLISH I.P. & S.I. UNITS

Table 14d

ACDS-B 065D, 070D, 080D, 090D, 100D

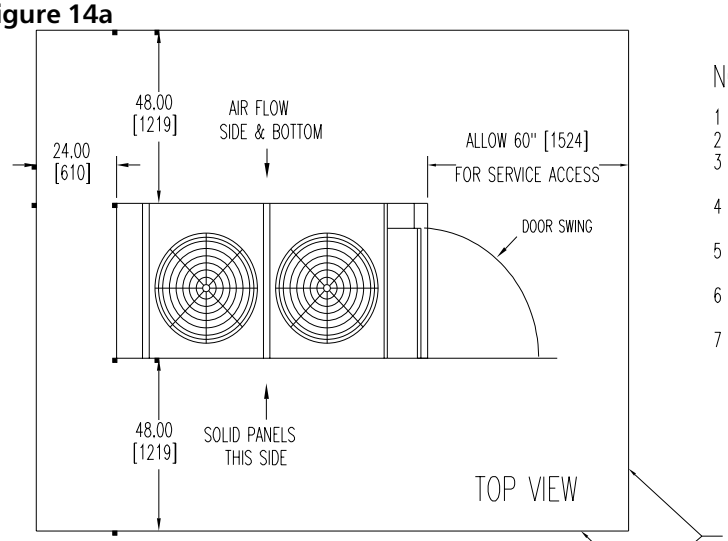
ACDS-B MODEL	065D	070D	080D	090D	100D
Nominal Capacity in Tons (kW)	65 (235)	70 (240)	80 (280)	90 (300)	100 (350)
Quantity of Compressors	4	4	4	4	4
STANDARD EVAPORATOR	CXD1209F09	CXD1209F09	CXD1209F09	CXD1209B07	CXD12120B07
Water Volume, Gallons (Liters)	28 (106)	28 (106)	28	23 (87.1)	30 (1136)
Minimum Flow Rate, GPM (L/S)	112/6.94	112/6.94	112/6.94	140/8.68	188/11.65
Maximum Flow Rate, GPM (L/S)	365/22.63	365/22.63	365/22.63	380/23.56	459/28.45
Water Conn. Size In/Out (Type)	4" VIC	4" VIC	4" VIC	4" VIC	4" VIC
(CH2) OPT. CLR for 42°F (5.5°C) LWT(1)	NR	NR	NR	NR	NR
Water Volume, Gallons (Liters)	NR	NR	NR	NR	NR
Minimum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Maximum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Water Conn. Size In/Out (Type)	NR	NR	NR	NR	NR
(CH3) OPT. CLR for 40°F (4.5°C) LWT(2)	NR	NR	NR	NR	NR
Water Volume, Gallons (Liters)	NR	NR	NR	NR	NR
Minimum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Maximum Flow Rate, GPM (L/S)	NR	NR	NR	NR	NR
Water Conn. Size In/Out (Type)	NR	NR	NR	NR	NR
CONDENSER	L216	L216	L312	L312	L216
Fan Quantity - All 30" (766mm) Diameter	6	6	6	6	8
Motor Quantity(3)	(2) 6	(2) 6	(2) 6	(2) 6	(2) 8
Standard Fans - Nominal RPM	1140	1140	1140	1140	1140
Standard Fans - HP (3)	(1) 1.5	(1) 1.5	(1) 1.5	(1) 1.5	(1) 1.5
Standard Fans - (kW) (3)	(0.76) 1.15	(0.76) 1.15	(0.76) 1.15	(0.76) 1.15	(0.76) 1.15
Opt. Extra Queit Fans - Nominal RPM	855	855	855	855	855
Opt. Extra Quiet Fan Motor - HP (kW) (3)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)	1.0 (0.76)
GENERAL DATA					
Min.Starting/Operating Ambient°F (°C) (4)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)	30 (-1.1)
with HGBP, °F (°C) (4)	49 (4.4)	49 (4.4)	49 (4.4)	49 (4.4)	49 (4.4)
Low Ambient Option, °F (°C) (5)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)
Extra Low Ambient Option, °F (°C) (6)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)	-20 (-29)
Number of Circuits	2	2	2	2	2
Refrigerant Charge, lbs. (kgs) R22	125	103	150	160	165
Shipping Wt., lbs. (kgs) Alum. Fin Cond.	6444	6615	7080	7302	7998
Shipping Wt., lbs. (kgs) Copper Fin Cond.	7099	7270	7712	7934	8872
Operating Wt., lbs.(kgs) Alum. Fin Cond.	6678	6849	7314	7494	8248
Operating Wt., lbs.(kgs) Copper Fin Cond.	7333	7504	7946	8126	9122

NOTES:
(1) CH2 - Oversized cooler required where indicated for 42°F (5.5°C) LWT.
(2) CH3 - Oversized cooler required where indicated for 40°F (4.5°C) LWT.
(3) Units with Low Ambient Option use (1) 1 HP (0.76 kW) in lieu of (1) 1.5 HP (1.15kW) fan motor per circuit
(4) Minimum Starting/Operation Ambient with a maximum of 5 MPH wind across coil & minimum load per Table 1.
(5) Low Ambient Option requires (1) 1 HP (0.76 kW) variable speed fan, motor per circuit.
(6) Extra Low Ambient Option requires electronic expansion valve(s), variable speed fan, 50% glycol, 50% minimum load and maximum 5 MPH wind across coil and may require additional system modifications. Contact factory..

NR - Not Required
VIC - Victaulic Connections

DIMENSIONAL DATA: ACDS-B 015S TO 030S

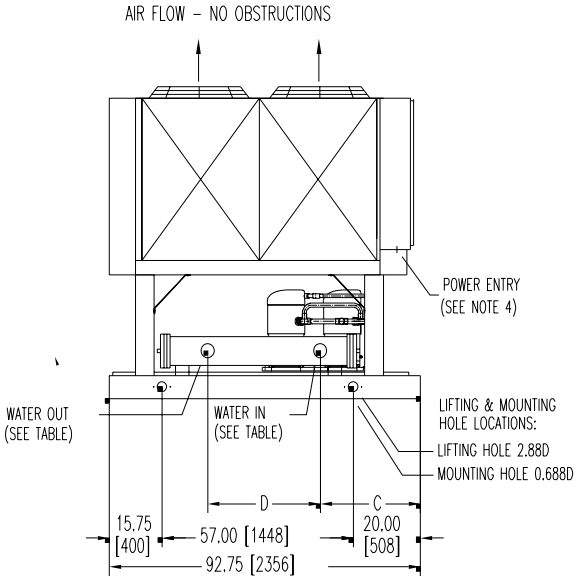
Figure 14a



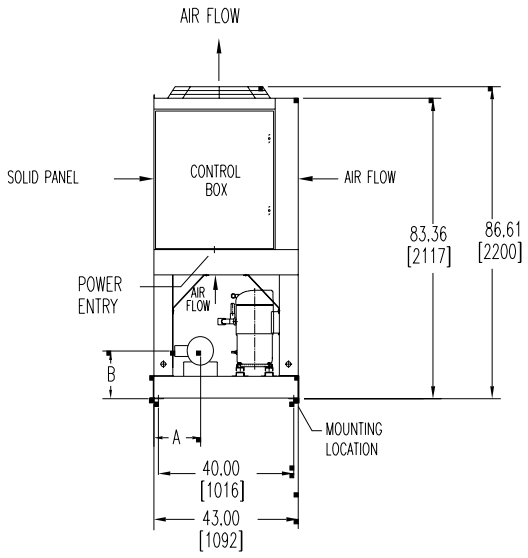
NOTE:

1 – ALL DIMENSIONS ARE IN INCHES AND MILLIMETERS.
2 – VENT & DRAIN CONNECTIONS PROVIDED ON COOLER.
3 – ALLOW 60 [1524] CLEARANCE AT CONTROL PANEL END OF UNIT FOR SERVICE.
4 – USE MINIMUM 36 [914] FLEXIBLE CONDUIT TO CONTROL BOX TO ISOLATE UNIT.
5 – WATER PIPING TO BE SUPPORTED TO MINIMIZE LOAD ON UNIT.
6 – ALL DIMENSIONS AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
7 – REFERENCE DIMENSIONAL DRAWING 022508A0.

CLEARANCE, SERVICE AND ACCESS REQUIREMENTS (NOT WALL OR WELL DIMENSIONS).



LEFT SIDE VIEW



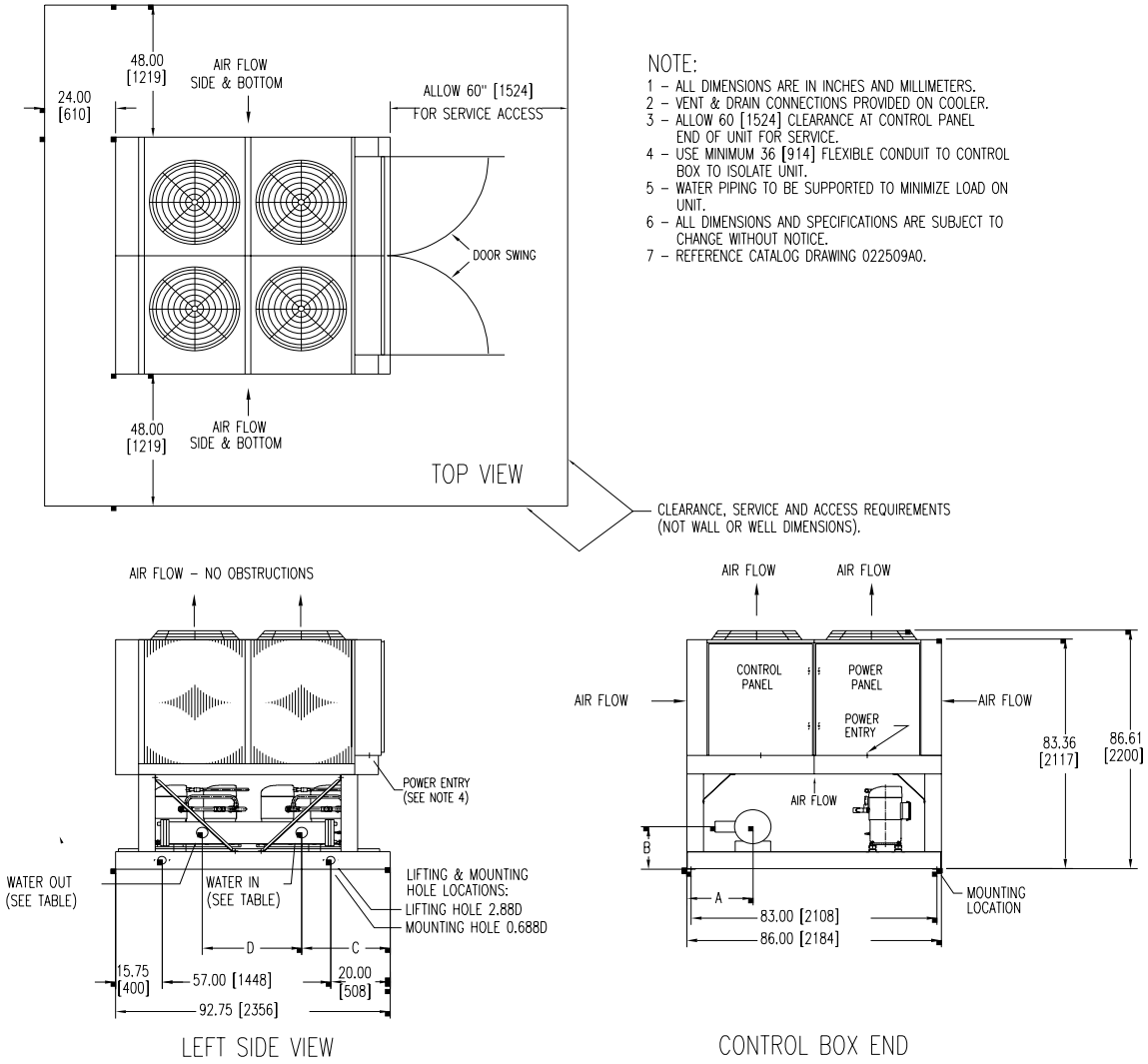
CONTROL BOX END

STANDARD CHILLER (CHR44) & OPTIONAL CHILLER (CHR42)						
2-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 015S	CHS00660	3" MPT	12.65 [321]	12.50 [318]	20.00 [508]	56.00 [1422]
ACDSB 020S						
ACDSB 025S	CHS00760	3" MPT	10.90 [277]	13.10 [333]	20.18 [513]	56.12 [1425]
ACDSB 027S						
ACDSB 030S	CHS00860	3" MPT	11.46 [291]	13.70 [348]	21.50 [546]	53.50 [1359]

OPTIONAL CHILLER (CHR40)						
2-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 015S	CHS00660	3" MPT	12.65 [321]	12.50 [318]	20.00 [508]	56.00 [1422]
ACDSB 020S	CHS00760	3" MPT	10.90 [277]	13.10 [333]	20.18 [513]	56.12 [1425]
ACDSB 025S						
ACDSB 027S	CHS00860	3" MPT	11.46 [291]	13.70 [348]	21.50 [546]	53.50 [1359]
ACDSB 030S						

DIMENSIONAL DATA: ACDS-B 025D TO 055D

Figure 14b



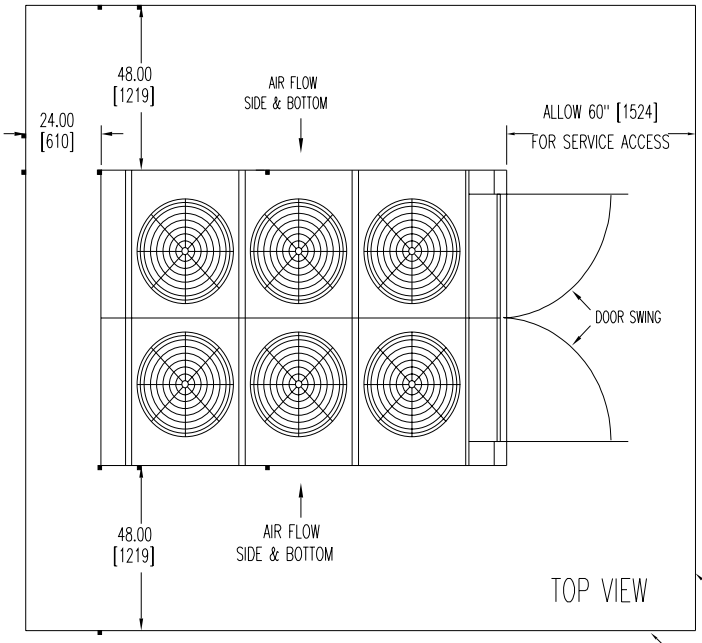
STANDARD CHILLER (CHR44)						
4-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 025D	CHD00760	3" MPT	20.52 [521]	13.14 [334]	20.18 [513]	56.12 [1425]
ACDSB 030D						
ACDSB 035D	CHD00860	3" MPT	17.74 [451]	13.70 [348]	21.24 [539]	53.50 [1359]
ACDSB 040D						
ACDSB 045D	CHD01060	4" MPT	18.36 [466]	14.26 [362]	21.24 [539]	53.50 [1359]
ACDSB 050D	CHD01160	4" MPT	18.92 [481]	14.83 [377]	21.24 [539]	53.50 [1359]
ACDSB 055D						

OPTIONAL CHILLER (CHR42)						
4-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 025D	CHD00860	3" MPT	17.74 [451]	13.70 [348]	21.24 [539]	53.50 [1359]
ACDSB 030D						
ACDSB 035D	CHD01060	4" MPT	18.36 [466]	14.26 [362]	21.24 [539]	53.50 [1359]
ACDSB 040D						
ACDSB 045D						
ACDSB 050D	CHD01160	4" MPT	18.92 [481]	14.83 [377]	21.24 [539]	53.50 [1359]
ACDSB 055D						

OPTIONAL CHILLER (CHR40)						
4-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 025D	CHD00860	4" MPT	17.74 [451]	13.70 [348]	21.24 [539]	53.50 [1359]
ACDSB 030D	CHD01060	4" MPT	18.36 [466]	14.26 [362]	21.24 [539]	53.50 [1359]
ACDSB 035D	CHD01160	4" MPT	18.92 [481]	14.83 [377]	21.24 [539]	53.50 [1359]
ACDSB 040D						
ACDSB 045D						
ACDSB 050D	CHD01360	4" MPT	20.05 [509]	15.95 [405]	21.18 [538]	53.50 [1359]
ACDSB 055D						

DIMENSIONAL DATA: ACDS-B 057D TO 060D

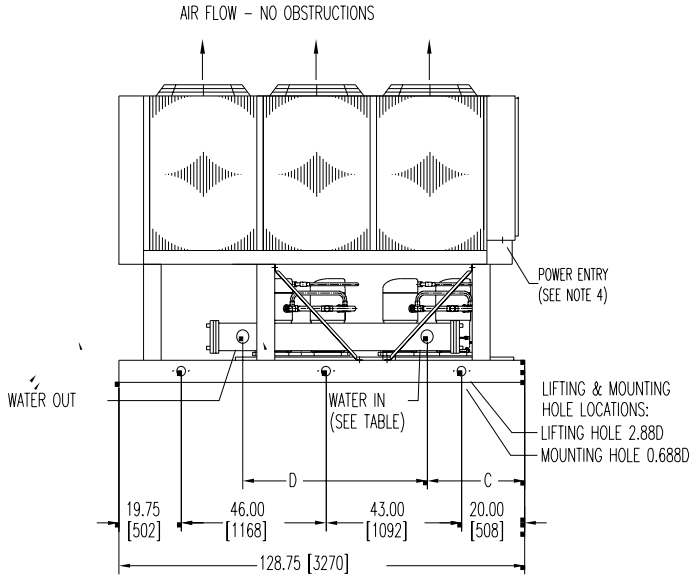
Figure 15a



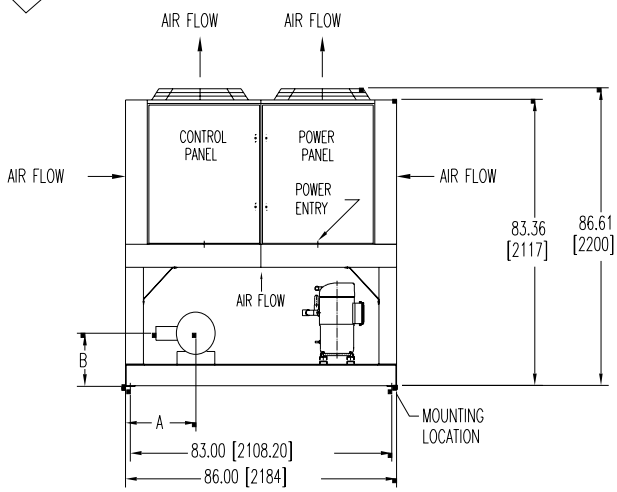
NOTE:

1 – ALL DIMENSIONS ARE IN INCHES AND MILLIMETERS.
2 – VENT & DRAIN CONNECTIONS PROVIDED ON COOLER.
3 – ALLOW 60 [1524] CLEARANCE AT CONTROL PANEL END OF UNIT FOR SERVICE.
4 – USE MINIMUM 36 [914] FLEXIBLE CONDUIT TO CONTROL BOX TO ISOLATE UNIT.
5 – WATER PIPING TO BE SUPPORTED TO MINIMIZE LOAD ON UNIT.
6 – ALL DIMENSIONS AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
7 – REFERENCE DIMENSIONAL DRAWING 022510A0.

CLEARANCE, SERVICE AND ACCESS REQUIREMENTS (NOT WALL OR WELL DIMENSIONS).



LEFT SIDE VIEW



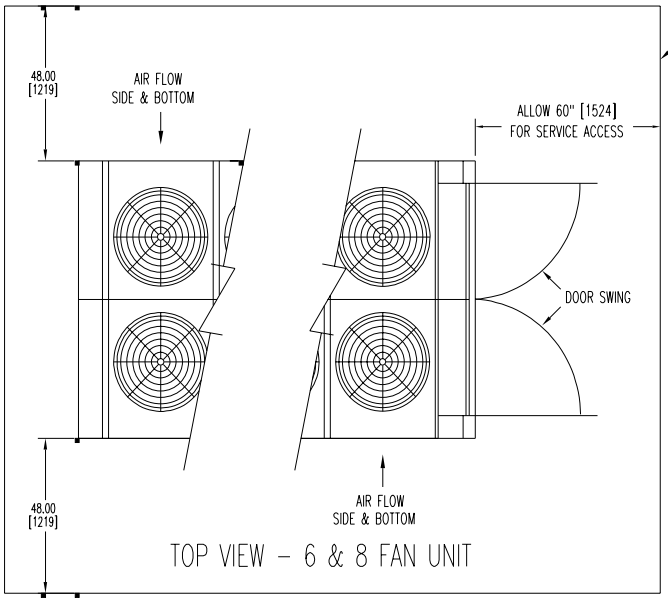
CONTROL BOX END

STANDARD CHILLER (CHR44) & OPTIONAL CHILLER (CHR42)						
6-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 057D	CHD01160	4" MPT	18.93 [481]	14.83 [377]	37.00 [940]	53.50 [1359]
ACDSB 060D	CHD01360	4" MPT	20.05 [509]	15.95 [405]	37.00 [940]	53.50 [1359]

OPTIONAL CHILLER (CHR40)						
6-FAN UNIT	CHILLER	CONN	A	B	C	D
ACDSB 057D	CHD01360	4" MPT	20.05 [509]	15.95 [405]	37.00 [940]	53.50 [1359]
ACDSB 060D						

Dimensional Data: ACDS-B 065D to 100D

Figure 15b

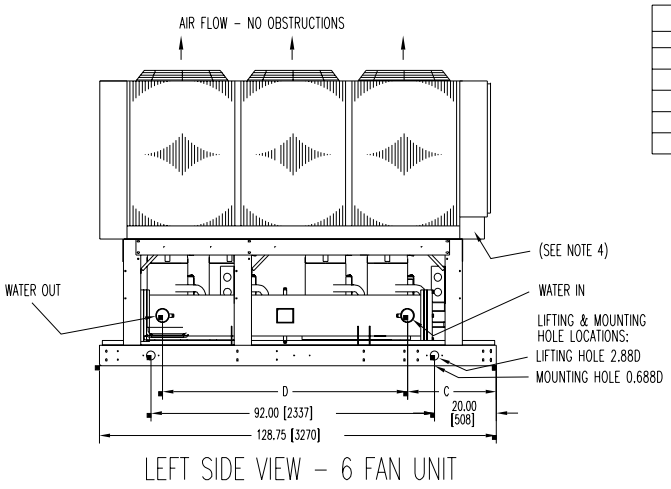


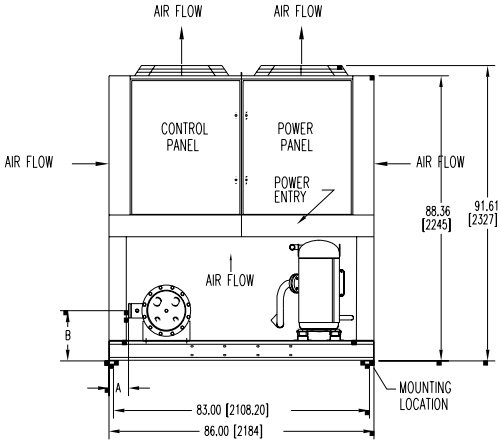
NOTE:

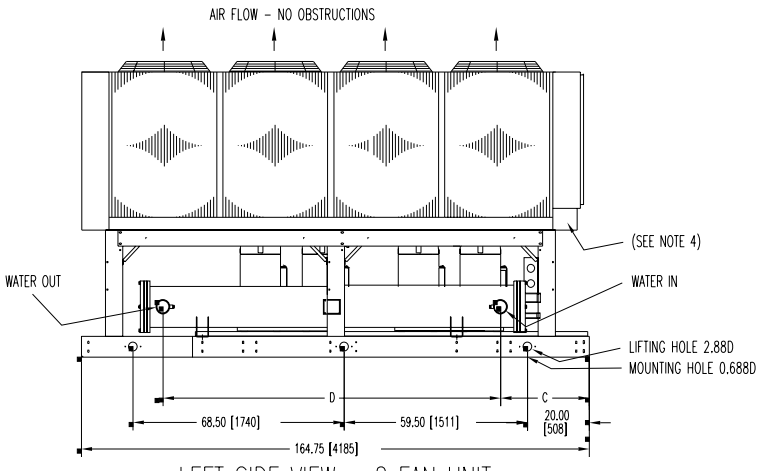
1 – ALL DIMENSIONS ARE IN INCHES AND MILLIMETERS.
2 – VENT & DRAIN CONNECTIONS PROVIDED ON COOLER.
3 – ALLOW 60 [1524] CLEARANCE AT CONTROL PANEL END OF UNIT FOR SERVICE.
4 – USE MINIMUM 36 [914] FLEXIBLE CONDUIT TO CONTROL BOX TO ISOLATE UNIT.
5 – WATER PIPING TO BE SUPPORTED TO MINIMIZE LOAD ON UNIT.
6 – ALL DIMENSIONS AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

CHILLER OPTIONS, FANS				
UNIT	FANS	CHR44 & 42	CHR40	CONN
ACDSB 065D	6	CXD12090F09		4" VIC
ACDSB 070D	6	CXD12090F09		4" VIC
ACDSB 080D	6	CXD12090F09		4" VIC
ACDSB 090D	6	CXD12090B07		4" VIC
ACDSB 100D	8	CXD12120B07		4" VIC

DIMENSIONS				
UNIT	A	B	C	D
ACDSB 065D	6.30 [160]	15.54 [395]	28.75 [730]	79.50 [2019]
ACDSB 070D	6.30 [160]	15.54 [395]	28.75 [730]	79.50 [2019]
ACDSB 080D	6.30 [160]	15.54 [395]	28.75 [730]	79.50 [2019]
ACDSB 090D	6.30 [160]	15.54 [395]	28.75 [730]	79.50 [2019]
ACDSB 100D	6.30 [160]	15.54 [395]	28.75 [730]	109.50 {2781]







024613AACAT

ELECTRICAL DATA: (60Hz/3PH)

Table 15a

ACDS-B Model		60 Hz Nom. Volts	Standard Unit Electrical Data			Each Compressor			Standard 1140 RPM Condenser Fan Motors			
			RLA	MCA	MFS/ HACR	Qty./ Circuit	RLA	LRA-XL	Qty.	HP	Total KW	FLA Each
015S	AK	208	62	68	90	2	23.8	189	2*	1.5	2.2	5.9
	AN	230	62	68	90	2	23.8	189	2*	1.5		5.9
	AR	460	33	36	45	2	12.6	94	2*	1.5		3
	AS	575	24	26	30	2	9.2	74	2*	1.5		2.1
020S	AK	208	82	90	110	2	33.6	278	2*	1.5	2.9	5.9
	AN	230	82	90	110	2	33.6	278	2*	1.5		5.9
	AR	460	41	45	60	2	16.5	127	2*	1.5		3
	AS	575	33	36	45	2	13.7	100	2*	1.5		2.1
025S	AK	208	97	107	125	2	41.1	350	2*	1.5	2.9	5.9
	AN	230	97	107	125	2	41.1	350	2*	1.5		5.9
	AR	460	51	57	70	2	21.8	158	2*	1.5		3
	AS	575	40	45	60	2	17.4	125	2*	1.5		2.1
027S	AK	208	104	116	150	1/1	41.1/48.1	350/425	2*	1.5	2.9	5.9
	AN	230	104	116	150	1/1	41.1/48.1	350/425	2*	1.5		5.9
	AR	460	53	59	80	1/1	21.8/23.8	158/187	2*	1.5		3
	AS	575	44	49	70	1/1	17.4/21.2	125/148	2*	1.5		2.1
030S	AK	208	111	123	150	2	48.1	425	2*	1.5	2.9	5.9
	AN	230	111	123	150	2	48.1	425	2*	1.5		5.9
	AR	460	55	61	80	2	23.8	187	2*	1.5		3
	AS	575	48	53	70	2	21.2	148	2*	1.5		2.1
025D	AK	208	127	133	150	4	25.1	189	4*	1.5	4.4	5.9
	AN	230	127	133	150	4	25.1	189	4*	1.5		5.9
	AR	460	68	71	80	4	13.6	94	4*	1.5		3
	AS	575	50	53	60	4	10.1	74	4*	1.5		2.1
030D	AK	208	146	154	175	4	29.9	232	4*	1.5	4.4	5.9
	AN	230	146	153	175	4	29.9	232	4*	1.5		5.9
	AR	460	75	79	90	4	15.3	125	4*	1.5		3
	AS	575	57	60	70	4	11.9	100	4*	1.5		2.1
035D	AK	208	158	167	200	2/2	31.1/34.8	232/278	4*	1.5	4.4	5.9
	AN	230	158	167	200	2/2	31.2/34.9	232/278	4*	1.5		5.9
	AR	460	80	84	100	2/2	16/17.2	125/127	4*	1.5		3
	AS	575	63	67	80	2/2	12.3/14.5	100/100	4*	1.5		2.1
040D	AK	208	168	179	200	3/1	33.6/41.1	278/350	4*	1.5	5.8	5.9
	AN	230	168	178	200	3/1	33.6/41.1	278/350	4*	1.5		5.9
	AR	460	85	90	110	3/1	16.5/21.8	127/158	4*	1.5		3
	AS	575	69	73	90	3/1	13.8/17.5	100/125	4*	1.5		2.1

NOTES: RLA - Rated Load Amps at ARI Conditions of Service
MCA - Minimum Circuit Ampacity
MFS / HACR - Maximum fuse or HACR breaker size, protective device
LRA-XL - Locked Rotor Amps Standard Across the Line Starting
*Replace (1) 1.5 HP motor with (1) 1 HP single phase motor per circuit on units with Low Ambient Option

IMPORTANT: See additional notes on page 40.

ELECTRICAL DATA: (60HZ/3PH)

Table 15b

ACDS-B Model		60 Hz Nom. Volts	Standard Unit Electrical Data			Each Compressor			Standard 1140 RPM Condenser Fan Motors			
			RLA	MCA	MFS/ HACR	Qty./ Circuit	RLA	LRA-XL	Qty.	HP	Total KW	FLA Each
045D	AK	208	191	201	225	4	41.1	350	4*	1.5	5.8	5.9
	AN	230	191	201	225	4	41.1	350	4*	1.5		5.9
	AR	460	103	107	125	4	22	158	4*	1.5		3
	AS	575	80	85	100	4	17.6	125	4*	1.5		2.1
050D	AK	208	198	210	250	3/1	41.1/48.1	350/425	4*	1.5	5.8	5.9
	AN	230	198	210	250	3/1	41.1/48.1	350/425	4*	1.5		5.9
	AR	460	103	109	125	3/1	21.8/23.8	158/187	4*	1.5		3
	AS	575	83	88	100	3/1	17.4/21.2	125/148	4*	1.5		2.1
055D	AK	208	212	224	250	1/3	41.1/48.1	350/425	4*	1.5	5.8	5.9
	AN	230	212	224	250	1/3	41.1/48.1	350/425	4*	1.5		5.9
	AR	460	121	128	150	1/3	25.4/27.3	158/187	4*	1.5		3
	AS	575	91	96	110	1/3	17.4/21.2	125/148	4*	1.5		2.1
057D	AK	208	249	263	300	4	52.8	425	6*	1.5	8.7	5.9
	AN	230	249	262	300	4	52.8	425	6*	1.5		5.9
	AR	460	127	132	150	4	26.5	187	6*	1.5		3
	AS	575	101	106	125	4	21.7	148	6*	1.5		2.1
060D	AK	208	249	263	300	4	52.8	425	6*	1.5	8.7	5.9
	AN	230	249	262	300	4	52.8	425	6*	1.5		5.9
	AR	460	127	132	150	4	26.5	187	6*	1.5		3
	AS	575	101	106	125	4	21.7	148	6*	1.5		2.1
065D	AK	208	287	305	350	2/2	52.8/71.1	425/480	6*	1.5	8.7	5.9
	AN	230	286	304	350	2/2	52.8/71.1	425/480	6*	1.5		5.9
	AR	460	139	147	175	2/2	26.5/33.0	187/225	6*	1.5		3.0
	AS	575	118	125	150	2/2	24.8/27.2	148/180	6*	1.5		2.1
070D	AK	208	323	341	400	4	71.1	480	6*	1.5	8.7	5.9
	AN	230	323	341	400	4	71.1	480	6*	1.5		5.9
	AR	460	142	150	175	4	30.7	225	6*	1.5		3.0
	AS	575	121	128	150	4	26.8	180	6*	1.5		2.1
080D	AK	208	352	374	450	2/2	71.1/85.6	480/500	6*	1.5	8.7	5.9
	AN	230	352	373	450	2/2	71.1/85.6	480/500	6*	1.5		5.9
	AR	460	162	172	200	2/2	30.7/40.6	225/2500	6*	1.5		3.0
	AS	575	130	137	150	2/2	26.8/31.1	180/200	6*	1.5		2.1
085D	AK	208	361	382	450	4	80.6	500	6*	1.5	8.7	5.9
	AN	230	361	381	450	4	80.6	500	6*	1.5		5.9
	AR	460	182	192	225	4	40.6	250	6*	1.5		3.0
	AS	575	138	146	175	4	31.1	200	6*	1.5		2.1
090D	AK	208	361	382	450	4	80.6	500	6*	1.5	8.7	5.9
	AN	230	361	381	450	4	80.6	500	6*	1.5		5.9
	AR	460	182	192	225	4	40.6	250	6*	1.5		3.0
	AS	575	138	146	175	4	31.1	200	6*	1.5		2.1
100D	AK	208	373	393	450	4	80.6	500	8*	1.5	11.6	5.9
	AN	230	373	393	450	4	80.6	500	8*	1.5		5.9
	AR	460	188	198	225	4	40.6	250	8*	1.5		3.0
	AS	575	143	150	175	4	31.1	200	8*	1.5		2.1

NOTES: RLA - Rated Load Amps at ARI Conditions of Service
MCA - Minimum Circuit Ampacity
MFS / HACR - Maximum fuse or HACR breaker size, protective device
LRA-XL - Locked Rotor Amps Standard Across the Line Starting

*Replace (1) 1.5 HP motor with (1) 1 HP single phase motor per circuit on units with Low Ambient Option

IMPORTANT: See additional notes on page 40.

Electrical Data: Field Wiring (60Hz/3PH)

Table 16a

ACDS-B Model	Supply Voltage 60 Hz. Code	Nom. Volts	Single Source Power - Wire Size Range and Quantity: Standard Terminal Block Qty. Wires Per Pole	Wire Size Range	Optional - Unit Mtd. Disconnect Switch Qty. Wires Per Pole	Wire Size Range
015S	AK	208	1	#12 TO 2/0	1	#14 TO 1/0
	AN	230	1	#12 TO 2/0	1	#14 TO 1/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
020S	AK	208	1	#12 TO 2/0	1	#14 TO 1/0
	AN	230	1	#12 TO 2/0	1	#14 TO 1/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
025S	AK	208	1	#12 TO 2/0	1	#4 TO 4/0
	AN	230	1	#12 TO 2/0	1	#4 TO 4/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
027S	AK	208	1	#12 TO 2/0	1	#4 TO 4/0
	AN	230	1	#12 TO 2/0	1	#4 TO 4/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
030S	AK	208	1	#12 TO 2/0	1	#4 TO 4/0
	AN	230	1	#12 TO 2/0	1	#4 TO 4/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
025D	AK	208	1	#12 TO 2/0	1	#4 TO 4/0
	AN	230	1	#12 TO 2/0	1	#4 TO 4/0
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
030D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
035D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
040D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#14 TO 1/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0

NOTE: Single point power is standard for all models ACDSB 015S to ACDSB 100D.

ELECTRICAL DATA: FIELD WIRING (60HZ/3PH)

Table 16b

ACDS-B Model	Supply Voltage		Single Source Power - Wire Size Range and Quantity			
	60 Hz.		Standard Terminal Block		Optional - Unit Mtd. Disconnect Switch	
	Code	Nom. Volts	Qty. Wires Per Pole	Wire Size Range	Qty. Wires Per Pole	Wire Size Range
045D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#4 TO 4/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
050D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#4 TO 4/0
	AS	575	1	#12 TO 2/0	1	#14 TO 1/0
055D	AK	208	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AN	230	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AR	460	1	#12 TO 2/0	1	#4 TO 4/0
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
057D	AK	208	1	#6 TO 400 MCM	2	3/0 TO 250MCM
	AN	230	1	#6 TO 400 MCM	2	3/0 TO 250MCM
	AR	460	1	#12 TO 2/0	1	#4 TO 4/0
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
060D	AK	208	1	#6 TO 400 MCM	2	3/0 TO 250MCM
	AN	230	1	#6 TO 400 MCM	2	3/0 TO 250MCM
	AR	460	1	#12 TO 2/0	1	#4 TO 4/0
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
065D	CD	208	1	#6 TO 400 MCM	1	2/0 to 600MCM
	AN	230	1	#6 TO 400 MCM	1	2/0 to 600MCM
	AR	460	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
070D	CD	208	1	#4 TO 500 MCM	1	2/0 to 600MCM
	AN	230	1	#4 TO 500 MCM	1	2/0 to 600MCM
	AR	460	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
080D	CD	208	1	#4 TO 500 MCM	1	2/0 to 600MCM
	AN	230	1	#4 TO 500 MCM	1	2/0 to 600MCM
	AR	460	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AS	575	1	#12 TO 2/0	1	#4 TO 4/0
090D	CD	208	2	#4 TO 500 MCM	2	2/0 to 600MCM
	AN	230	2	#4 TO 500 MCM	2	2/0 to 600MCM
	AR	460	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AS	575	1	#6 TO 400 MCM	1	#4 TO 350MCM
100D	CD	208	2	#4 TO 500 MCM	2	2/0 to 600MCM
	AN	230	2	#4 TO 500 MCM	2	2/0 to 600MCM
	AR	460	1	#6 TO 400 MCM	1	#4 TO 350MCM
	AS	575	1	#6 TO 400 MCM	1	#4 TO 350MCM

NOTE: Single point power is standard for all models ACDSB 015S to ACDSB 100D.

ELECTRICAL DATA: (60HZ/3PH)

General Electrical Notes

1. Main power must be supplied from a single power source field-supplied fused disconnect(s) using dual element time delay fuses or a HACR rated circuit breaker. Power supply is three phase unless otherwise shown.
2. The maximum terminal block incoming wire size is shown in the electrical field wiring data table.
3. Compressor starting is XL only.
4. Control circuit transformer (115VAC) is supplied as standard feature.
5. Cooler heater power (115VAC) must be field-supplied from a separate field-mounted fused disconnect (15 amp max. fuse size).
6. Crankcase heaters are wired in the control circuit. **The main unit power field disconnect and local safety switch must be closed (on) at all times for heater operation.**
7. The compressor crankcase heaters must be energized for 24 hours before the unit is initially started or after a prolonged open disconnect.
8. All field wiring must be in accordance with all applicable local and national codes.
9. Minimum and maximum unit supply voltages are shown in the following tabulated data.

Supply Voltage:

Nominal	Voltage Code	Minimum	Maximum
208V	AK	187V	220V
230V	AN	207V	253V
460V	AR	414V	506V
575V	AS	518V	632V

TABLE 17

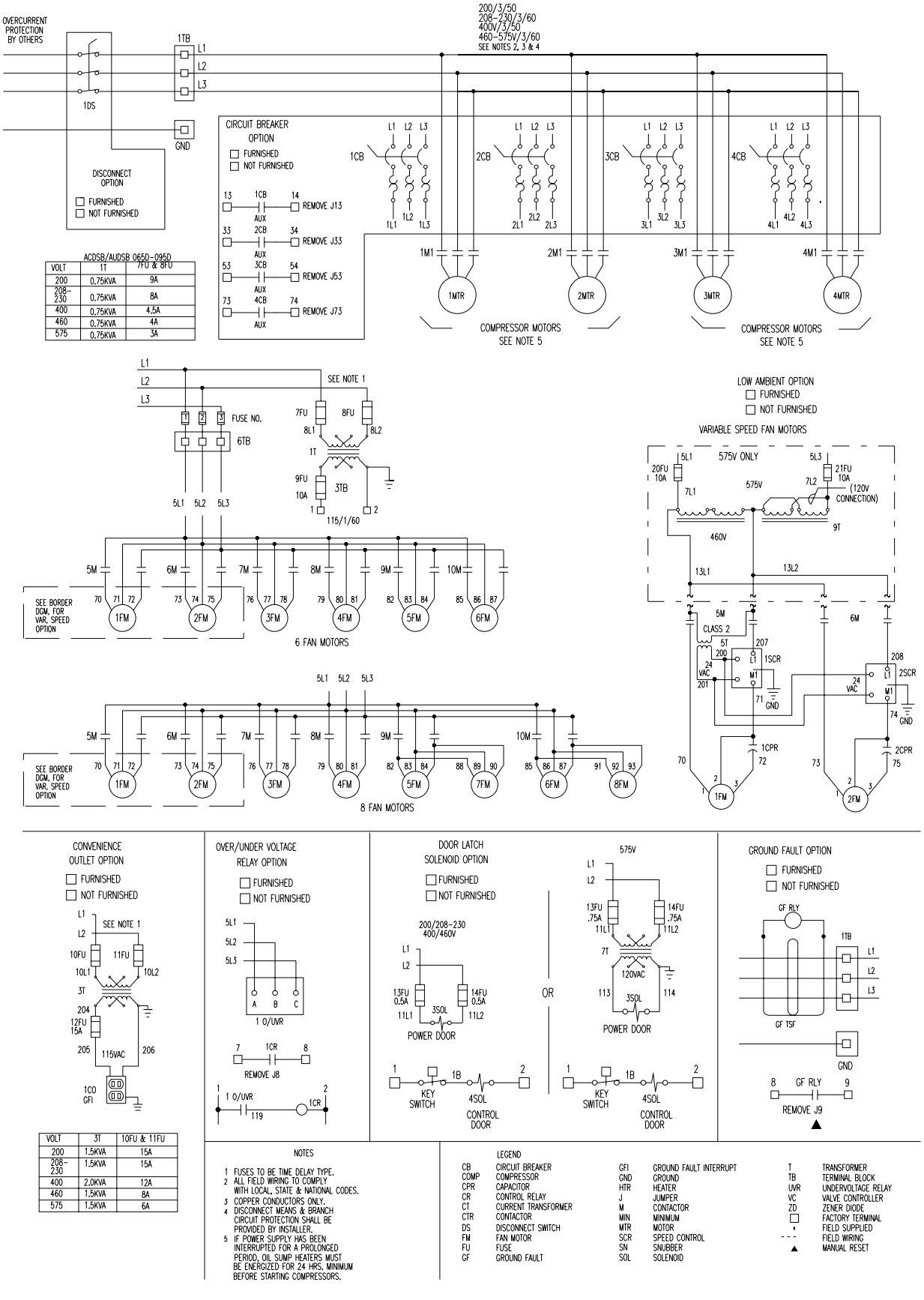
Cooler Heater Wattage							
Unit Model ACDS-B	Standard Cooler		CH2 Optional Cooler		CH3 Optional Cooler		Cooler Heater
	for 44°F (6.7°C)	FLA ea.	for 42°F (5.5°C)	FLA ea.	for 40°F (4.5°C)	FLA ea.	Qty.
015S	280	2.4	280	2.4	280	2.4	1
020S	280	2.4	280	2.4	280	2.4	1
025S	280	2.4	280	2.4	280	2.4	1
027S	280	2.4	280	2.4	280	2.4	1
030S	280	2.4	280	2.4	280	2.4	1
025D	280	2.4	280	2.4	280	2.4	1
030D	280	2.4	280	2.4	420	3.7	1
035D	280	2.4	420	3.7	420	3.7	1
040D	280	2.4	420	3.7	420	3.7	1
045D	420	3.7	420	3.7	420	3.7	1
050D	420	3.7	420	3.7	560	4.9	1
055D	420	3.7	420	3.7	560	4.9	1
057D	420	3.7	420	3.7	560	4.9	1
060D	560	4.9	560	4.9	560	4.9	1
065D	560	4.9	560	4.9	560	4.9	1
070D	560	4.9	560	4.9	560	4.9	1
080D	560	4.9	560	4.9	560	4.9	1
090D	560	4.9	560	4.9	560	4.9	1
100D	420	3.7	420	3.7	420	3.7	2

TABLE 18

Unit Model ACDS-B	Belt or Strap Type - Crankcase Heater Data		
	Qty.	Total Watts	Total FLA
015S	2	140	1.22
020S	2	140	1.22
025S	2	140	1.22
027S	2	140	1.22
030S	2	140	1.22
025D	4	280	2.44
030D	4	280	2.44
035D	4	280	2.44
040D	4	280	2.44
045D	4	280	2.44
050D	4	280	2.44
055D	4	280	2.44
057D	4	280	2.44
060D	4	280	2.44
065D	4	380	3.30
070D	4	480	4.17
080D	4	480	4.17
090D	4	480	4.17
100D	4	480	4.17

Typical Power Wiring Diagram (Four Compressor Model)

Figure 16a



VOLT	3T	10FU & 11FU
200	1.5KVA	15A
208-230	1.5KVA	15A
400	2.0KVA	12A
460	1.5KVA	8A
575	1.5KVA	6A

NOTES

1. FUSES TO BE TIME DELAY TYPE.
2. ALL FIELD WIRING TO COMPLY WITH LOCAL, STATE & NATIONAL CODES.
3. COPPER CONDUCTORS ONLY.
4. DISCONNECT MEANS & BRANCH CIRCUIT PROTECTION SHALL BE PROVIDED BY INSTALLER.
5. IF POWER SUPPLY HAS BEEN INTERRUPTED FOR A PROLONGED PERIOD, OIL SUMP HEATERS MUST BE ENERGIZED FOR 24 HRS. MINIMUM BEFORE STARTING COMPRESSORS.

LEGEND

CB	CIRCUIT BREAKER	GFI	GROUND FAULT INTERRUPT	T	TRANSFORMER
COMP	COMPRESSOR	GND	GROUND	TB	TERMINAL BLOCK
CPR	CAPACITOR	HTR	HEATER	UVR	UNDERVOLTAGE RELAY
CR	CONTROL RELAY	J	JUMPER	VC	VALVE CONTROLLER
CT	CURRENT TRANSFORMER	M	CONTACTOR	ZD	ZENER DIODE
CTR	CONTACTOR	MIN	MINIMUM	□	FACTORY TERMINAL
DS	DISCONNECT SWITCH	MTR	MOTOR	•	FIELD SUPPLIED
FM	FAN MOTOR	SCR	SPEED CONTROL	- - -	FIELD WIRING
FU	FUSE	SN	SNUBBER	▲	MANUAL RESET
GF	GROUND FAULT	SOL	SOLENOID		

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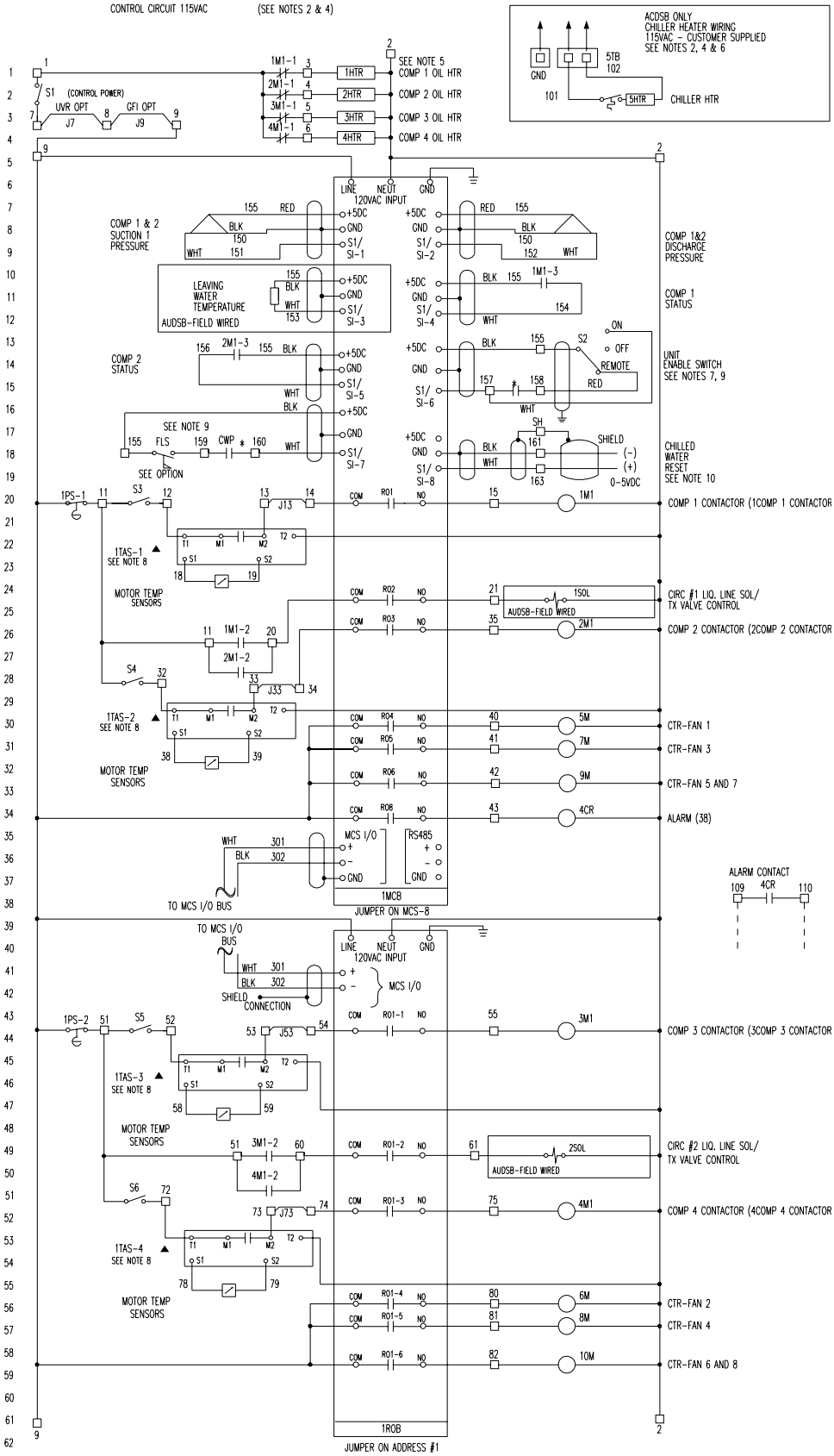
Typical Control Wiring Diagram (Four Compressor Model)••••

Figure 16b



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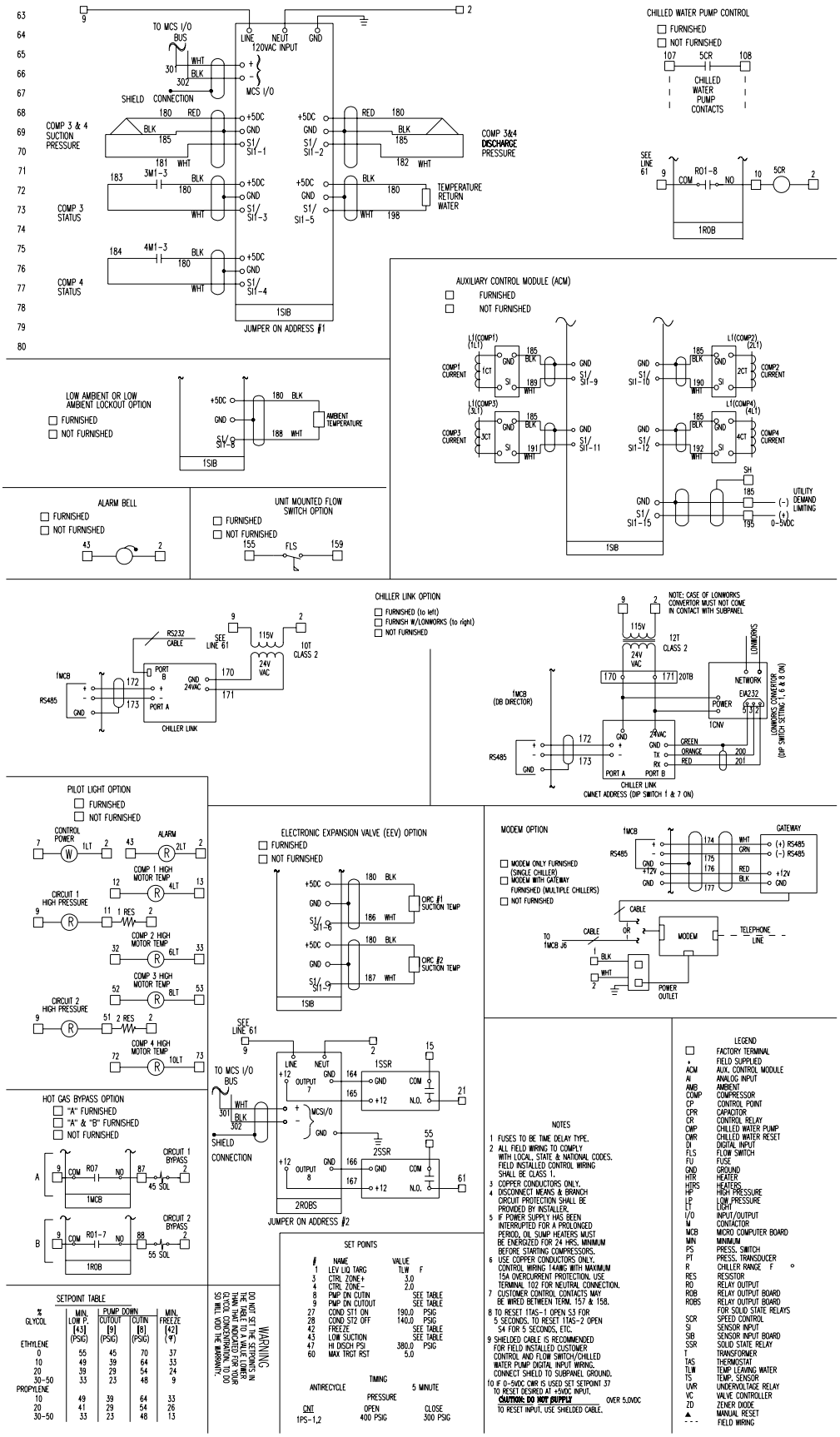
Typical Control Wiring Diagram (Four Compressor Model)••••

Figure 16c



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Typical Sequence of Operation

Microcomputer Controller

The following sequence of operation describes a four-compressor scroll packaged chiller. Operation is very similar for a two-compressor unit.

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

- All power to the package be supplied for 24 hours prior to starting a compressor.
- Control power switch on for at least 5 minutes.
- Compressor switches on.
- All safety conditions satisfied.
- Reset pressed on the microcomputer keypad.
- Chilled water pump running and chilled water flow switch made.
- Customer control contact closed or unit enable switch in the "ON" position.
- Leaving chilled water temperature higher than water temperature setpoint plus a deadband setpoint called "Control Zone +".

After all above conditions are met, the microcomputer will call for compressor #1 to start. When feedback to the compressor #1 status sensor input confirms that the compressor has started and pumpout is complete, liquid line solenoid #1 is energized. The first stage of capacity is now on-line.

As discharge pressure of compressor #1 rises, fan #1 turns ON at the "Fan Stage 1 ON" setpoint. If discharge pressure continues to rise, the subsequent odd-numbered fans will stage ON in increments of the "Condenser Differential_ON" setpoint. For example, if the "Fan Stage 1 ON" is 190 psig and the "Condenser Differential_ON" setpoint is 20, the stage on points will be 190, 210, 230, etc. The microcomputer may automatically increase these settings if short cycling of fans is detected.

If discharge pressure falls, the odd-numbered fans will stage OFF at the "Fan Stage 2 OFF" setpoint plus corresponding number of "Condenser Differential_OFF" setpoints. For example, if the "Fan Stage 2 OFF" is 140 psig and the "Condenser Differential_OFF" setpoint is 10, the stage off points will be 140, 150, 160, etc.

After a minimum interstage delay of approximately one minute, and if water temperature is not falling at a faster rate than the value stored in the "MAX_SLOPE-" setpoint, and the leaving water temperature is greater than the temperature setpoint plus "Control Zone +" setpoint, the microcomputer will call for compressor #3 to start. However, if leaving water temperature is falling at a faster rate than the value stored in the "MAX_SLOPE-" setpoint, no more stages of capacity will be added at this time.

When feedback to the compressor #3 status sensor input confirms that the compressor has started and pumpout is complete, liquid line solenoid #2 is energized. The second stage of capacity is now on-line.

As discharge pressure of compressor #3 rises, the even numbered fans are activated according to the fan stage setpoints as described above for circuit #1 fans.

The third and fourth stages of unit capacity will occur when the following conditions are met:

1. Minimum interstage time delay on increasing load of approximately 1 minute has expired.
2. Leaving water temperature is not falling at a faster rate than the value stored in the "MAX_SLOPE-" setpoint.
3. Leaving water temperature is greater than the water temperature setpoint plus "Control Zone +".

After all above conditions are met, the microcomputer will call for compressor #2 to start. The microcomputer than confirms that compressor #2 has started by its feedback to the compressor #2 status sensor input. The third stage of capacity is now on-line.

As the load continues to increase and the conditions described above are met, the microcomputer will call for compressor #4 to start. After compressor #4 is commanded to start, the microcomputer confirms that compressor #4 has started by its feedback to the compressor #4 status sensor input.

As the applied load decreases and the supply water temperature falls below the water temperature setpoint minus a deadband setpoint called "Control Zone-" stage 4 is turned off. Compressor #4 turns off.

If supply water temperature continues to fall below water temperature setpoint minus "Control Zone-" setpoint, stage 2 is turned off. Liquid line solenoid #2 is turned off. When compressor #3 and 4 suction pressure falls below the pumpdown-cutout setpoint, compressor #3 is turned off, and the even-numbered fans are turned off. The unit is now at 25% capacity. Note that if there is more than one compressor on a refrigerant circuit, only the last compressor to shut down will perform the pumpdown.

Stage 1 will shut down in a similar manner to stage 2 mentioned above.

When a refrigerant circuit is cycled off, a one-time pumpdown of that circuit is performed. When suction pressure falls below pumpdown-cutout setpoint, the compressor will shut down.

Two proactive control features included in the microcomputer are low suction and high discharge pressures unload. If there is more than one compressor operating on a refrigerant circuit, a compressor will be cycled off if that circuit's discharge pressure exceeds the high pressure unload setpoint or if the suction pressure approaches the low pressure trip setpoint. The cycled off compressor will remain off for a duration of time as specified in the "SAFETY DELAY" setpoint.

PART LOAD INFORMATION

TABLE 19

		Capacity Control Steps (Expressed in %)					
		English					Metric SI
ACDS-B Model		% Step	% Step	% Step	% Step	IPLV	COP (IPLV)
015S	%CAP	100	59	--	--	13.74	4.03
	%Kw	100	40	--	--		
020S	%CAP	100	59	--	--	13.65	4.0
	%Kw	100	41	--	--		
025S	%CAP	100	59	--	--	13.62	3.99
	%Kw	100	41	--	--		
027S	%CAP	100	57	--	--	15.4	4.51
	%Kw	100	33	--	--		
030S	%CAP	100	60	--	--	14.9	4.37
	%Kw	100	38	--	--		
025D	%CAP	100	78	59	31	13.62	3.99
	%Kw	100	71	41	18		
030D	%CAP	100	79	59	31	13.89	4.07
	%Kw	100	69	41	17		
035D	%CAP	100	78	59	29	13.89	4.07
	%Kw	100	66	41	16		
040D	%CAP	100	78	59	31	15.1	4.43
	%Kw	100	63	37	16		
045D	%CAP	100	82	62	32	15.09	4.42
	%Kw	100	67	40	17		
050D	%CAP	100	78	59	30	15.13	4.43
	%Kw	100	61	36	16		
055D	%CAP	100	81	59	28	15.26	4.47
	%Kw	100	63	36	14		
057D	%CAP	100	81	61	32	14.76	4.33
	%Kw	100	67	39	17		
060D	%CAP	100	81	60	31	14.84	4.35
	%Kw	100	67	39	17		
065D	%CAP	100	78	59	26	14.26	4.18
	%Kw	100	63	39	15		
070D	%CAP	100	80	59	29	13.64	4.0
	%Kw	100	67	39	19		
080D	%CAP	100	79	60	27	13.86	4.06
	%Kw	100	64	40	17		
090D	%CAP	100	80	60	28	13.47	3.95
	%Kw	100	66	40	19		
100D	%CAP	100	80	60	31	14.18	4.16

(1) Performance shown includes compressor(s) and fans per ARI 550/590-98.
(2) EER @ part load step = (% CAP ÷ % kW) x full load EER from rating tables.
(3) IPLV/NPLV shown on the rating tables per per ARI 550/590-98 at 100, 75, 50 & 25% load.
(4) Consult rating tables for 100% CAP & kW data.
(5) High IPLV (NPLV) / COP ratings provided by special staging of tandem-scroll compressors.

PRODUCT SPECIFICATION

Part 1: General

1.01 Work Included

A. Provide complete ***DB Director*** Microcomputer controlled air-cooled chiller utilizing Tandem Scroll Compressor sets suitable for outdoor installation. Contractor shall furnish and install chillers as shown and scheduled on the drawings. Units shall be installed in accordance with this specification.

B. Chillers shall be selected for use with water / (___% ethylene or propylene glycol).

1.02 Quality Assurance

A. Unit shall be rated in accordance with ARI Standard 550/590 latest version.

B. Unit construction shall be designed to conform to ANSI / ASHRAE 15 latest version safety standards, NEC (USA), and ASME Section VIII (USA) applicable codes.

C. Unit efficiency shall meet or exceed ASHRAE Standard 90.1 (1989).

D. Unit shall have ETL_c (USA) and (Canadian) approval (60Hz)

E. The unit shall be fully tested at the factory with all options mounted and wired.

1.03 Design Base

A. The construction drawings indicate a system based on a selected manufacturer of equipment and the design data available to the Engineer during construction document preparation. Electrical services, size, configuration and space allocations are consistent with that manufacturer's recommendations and requirements.

B. Other listed or approved manufacturers are encouraged to provide equipment on this project; however, it shall be the Contractor and/or Supplier's responsibility to assure the equipment is consistent with the design base. No compensation will be approved for revisions required by the design base or other manufacturers for any different services, space, clearances, etc.

1.04 Related Work Specified Elsewhere

A. General Provisions: Section 15XXX

B. General Completion and Startup: Section 15XXX

C. Equipment & Pipe Identification: Section 15XXX

D. Tests: Section 15XXX

E. Vibration Isolation: Section 15XXX

F. Chilled Water System: Section 15XXX

1.05 Submittals

A. Submit shop drawings on each piece of equipment specified in accordance with Specifications Section 51010, General Provisions.

B. Furnish three (3) sets of Operations and Maintenance Data.

C. Furnish one (1) copy of submittal for each chiller unit to the Temperature Control Contractor.

1.06 Delivery And Handling

A. The unit shall be delivered to the job site completely assembled and charged with R22 refrigerant and oil by the manufacturer.

B. Comply with the manufacturer's instruction for rigging and handling.

C. The unit controls shall be capable of withstanding 150°F (66°C) - storage temperature in the control panel for an indefinite period of time.

1.07 Startup

A. The contractor shall provide labor to accomplish the check, test and startup procedure as recommended by the unit manufacturer.

B. The startup serviceman shall provide and complete the manufacturer's check, test and start forms. One copy shall be sent to the engineer and one copy to the manufacturer's factory.

C. (The unit manufacturer shall provide a factory-trained serviceman to supervise the original startup of the units for final operation.)

1.08 Warranty

A. The equipment supplier shall provide a guarantee on the entire refrigeration system exclusive of refrigerant for a period of one (1) year from date of start-up or 18 months from date of shipment, whichever occurs first.

B. The start-up date shall be certified by the Mechanical Contractor, and provided to the Manufacturer, Engineer and Owner.
C. (Provide an optional extended four (4)-year warranty on the compressors only, 5 years total).
D. (During the warranty period, the equipment supplier shall furnish the services of an authorized service agency for all labor associated with parts replacement or repair, and start-up of the refrigeration equipment at the beginning of each cooling season. The equipment supplier shall also furnish the services of an authorized service agent for one maintenance visit during winter months of operation, such times shall be designated by the Owner.)

1.09 Maintenance
Maintenance of the chillers shall be the responsibility of the owner and performed in accordance with the manufacturer's instructions.

Part 2: Products

2.01 Tandem Scroll Compressor Air Cooled Water Chillers

2.02 Acceptable Manufacturers
A. Dunham-Bush, Inc.
B. (Approved equal)

2.03 General
A. Furnish and install as shown on the plans, air-cooled Tandem Scroll Compressor water chillers. Units shall be Dunham-Bush Model ACDS-B or equal.
B. The units are to be completely factory assembled and wired in a single package complete with Tandem Scroll Compressors, evaporator, condenser, starting control with safety and operating controls. The unit is to be given a complete factory operating and control sequence test under load conditions and is to be shipped with full operating charge of R-22 and full oil charge.
C. The units shall be built in accordance with all applicable national and local codes including the ANSI safety code; the National Electrical Code and applicable ASME Code for Unfired Pressure Vessels.

2.04 Performance
The units shall be furnished as shown on capacity schedules and drawings. Unit performance shall be in accordance with ARI Standard 550/590.

2.05 Construction
The unit will be designed for maximum corrosion protection being of heavy gauge, UL90 approved galvanized steel construction. The base and legs shall be manufactured of 10 gauge galvanized steel channel. Frame members are constructed of 12 gauge, galvanized steel.

2.06 Evaporator
Evaporator shall be direct expansion, shell and tube type. The shell shall be fabricated from carbon steel, with enhanced inner fin construction inside seamless copper tubes. The tube sheets shall be heavy gauge copper in welded head vessels. The tubes shall be brazed into the tubesheets. Water control baffles shall be copper. The heads shall be constructed of carbon steel. Evaporators shall be designed, constructed and inspected to comply with current ASME code for unfired pressure vessels. Shell side (water) design working pressure shall be minimum 200 PSIG and tube side (refrigerant) design working pressure shall be minimum 300 PSIG. A thermostatically controlled electric resistance heater cable shall be wrapped around the shell to prevent freezing down to -20°F (-28.9°C) outdoor temperature.

2.07 Condenser
The condenser coil is to be constructed of copper tubes and die formed aluminum fins having self-spacing collars. Fins shall be mechanically bonded to the tubes. An integral sub-cooling loop shall be incorporated into the coil. Condenser divider baffles shall fully separate each condenser fan section to control the airflow to maintain proper head pressure control.

2.08 Fans
The fans shall be heavy duty, aluminum blade, direct drive propeller type. Motors shall be three phase (except for low ambient option lead fan per circuit) with internal overloads and are to be permanently lubricated.

2.09 Compressor
A. The compressors shall be Tandem Scroll with suction and discharge manifolded and oil and gas equalization provided. All compressors shall be 3500 RPM direct drive with an integral two-pole hermetic squirrel cage motor. A dust-proof terminal box, located in an accessible location on the compressor, shall contain all connection terminals.

B. The compressors shall be fitted with a crankcase heater, large suction filter, oil sight glass, oil strainer and magnetic crankcase plug. The lubrication system shall be centrifugal forced feed type with external oil equalization.
C. To maximize reliability, the compressors shall utilize across-the-line start and, to limit start-up current draw, be limited to a maximum of 15 HP with a time delay between compressor starts.

2.10 Capacity Control

Compressor cycling shall be utilized to match the demand requirement of the system. A Proactive Full Function ***DB Director*** Microcomputer Controller shall cycle compressors in response to leaving water temperature and maintain water temperature within 3.0°F (1.67°C) of setpoint. This system is to provide precise and stable control of supply water temperature over the complete range of operating conditions. It shall be capable of a system capacity range from 100% to ____% at specified conditions without hot gas bypass.

2.11 Refrigerant Circuit

A. (Two compressors) (Four compressors) shall be used with a direct expansion evaporator.
B. The packaged chiller shall have no more than two compressors per refrigerant circuit.
C. The packaged chiller shall use HCFC-22 refrigerant, a positive pressure refrigerant that will not require a purge system and is recommended by the Montreal Protocol as an environmentally safe refrigerant.
D. Insulate evaporator and other cold surfaces as required to prevent condensation at ambient conditions of 75% humidity of 90°F (32°C) wet bulb with no air movement.
E. Each refrigerant circuit shall include expansion valve, sight glass, moisture indicator, solenoid valve, replaceable core filter-drier, liquid line shut off valves, charging and gauge connections.

2.12 Control Center

A. **Control Center** shall be fully enclosed in a steel, baked powder coated, control panel with hinged access doors. Dual compartments, separating safety and operating controls from the power controls, are to be provided. Controls shall include:
   1. Compressor protection, solid state, thermal sensing overloads, with manual reset
   2. High refrigerant discharge pressure, manual reset
   3. Separate power terminal blocks for main power and 115vAC chiller heater power
   4. Compressor starter including current sensing overload protection
   5. Proactive Full Function PC Windows® Based Microcomputer Controller with factory installed sensors including integral anti-recycle protection
   6. Complete labeling of all control components
   7. Numbered terminal strips and labeled components for easier wire tracing
   8. Condenser pressure sensing fan cycling control for start-up and operation down to 30°F (-1.1°C).
   9. (Undervoltage and phase failure protection against low voltage, phase imbalance or phase reversal).
   10. (Operating and safety lights visible from unit exterior including:)
      a. Control Power on
      b. High pressure, high motor temperature and general alarm
   11. (Control panel solenoid door latch to prevent door opening before turning off power to the unit).
   12. (Electronic expansion valves which shall be controlled by the microcomputer.)

B. **Control Center's** individual Full Function ***DB Director*** Microcomputer shall provide compressor staging based on leaving water temperature. It shall have two lines of 16 large characters each Alpha-Numeric Liquid Crystal display, and the inputs shall be through a 16 single function keypad through the menu driven prompts. The displayed data shall be updated once per second and the microcomputer shall have a Non-Volatile memory used for all control information. The microcomputer shall have an extended operating range of -20°F to +158°F (-29°C to +70°C). (It shall be proactive in control and accommodate system anomalies such as high condenser pressure and high entering water temperature by controlling loading and refrigerant flow to keep the machine on line but at reduced capacity until the condition is corrected.)

C. **Microcomputer** individual chiller controller shall provide as a minimum the following features and options.
   1. **Microcomputer - Unit Control** shall provide the following capabilities:
      a. Staging of compressors and hot gas bypass to achieve precise control of leaving liquid
      b. Activating fans of the air-cooled package to control head pressure
      c. 7 day time clock with schedules for machine control
      d. Automatic pump down before compressor shuts down and automatic pump out before liquid line opens on start-up.
      e. Proactive control of compressor cycling and /or hot gas bypass to help prevent high pressure or low pressure trips

f. Proactive control providing safeties for high pressure, low pressure and freeze protection, to eliminate nuisance trips
g. Proactive compressor staging to eliminate overloading during start-up to reduce compressor cycling
h. Continuous evaluation of sensors
i. (Control of Hot Gas bypass)

2. **Microcomputer - Unit Protection** shall provide the following:
   a. Low pressure cutout with Proactive safety
   b. High pressure cutout with Proactive safety
   c. Automatic re-start from power outage with event posting
   d. Battery backed-up real time clock and memory with over 10 years life and automatic recharge of lithium ion battery that requires no service.
   e. Safeties for temporary shutdown as well as lockout protection that requires manual reset
   f. Freeze protection on leaving chilled water temperature
   g. Anti-recycle timing
   h. Sensor error
   i. Pump down - pump out failure
   j. (Chilled water pump control system)
3. **Microcomputer - Readouts** shall provide the following:
   a. Sensor inputs
   b. Leaving liquid temperature
   c. Entering liquid temperature
   d. Compressor ampere draw
   e. Suction pressure each circuit
   f. Discharge pressure each refrigerant circuit
   g. Unit control contacts
   h. Water flow switch
   i. Chilled liquid reset
   j. Digital Outputs
   k. Compressor control status
   l. Liquid line solenoid control status
   m. Condenser fan control status
   n. Alarm control status
   o. (Hot gas bypass status)
   p. (Ambient temperature)
   q. (Utility demand limit)
   r. (Chilled water pump control)
   s. (Electronic expansion valve)
4. **Microcomputer - Setpoints** shall provide the following with proper authorization):
   a. High discharge pressure
   b. Low suction pressure
   c. Freeze protect temperature
   d. Leaving liquid temperature
   e. Control zone settings
   f. Fan condenser control
   g. Pump down - pump out settings
   h. (High & low compressor amperes)
   i. Low suction circuit limiting
   j. High discharge circuit limiting
   k. Anti-recycle delay setting
5. **Microcomputer - Alarm History** shall provide the following:
   a. The 32 most recent alarms can be identified
   b. Low suction pressure of all circuits
   c. High discharge pressure of all circuits
   d. Freeze protection cutout
   e. Pump down - pump out failure of all circuits
   f. External shutdown of each compressor
   g. Communication failure
   h. Battery failure
   i. Time/date invalid
   j. Memory failure
   k. Power failure

6. **Microcomputer Remote Monitoring Capabilities** - shall include a complete Full Function ***DB Director*** communication system through the following means:
   a. **PC Connection** - shall provide communications to a 3.1 or higher level ***DB Director*** Personal Computer, or BMS (Building Automation System) to provide, as a minimum, the following:
      1. Dynamic system data update of all outputs, inputs, control states, and alarms
      2. Complete History Storage of all data needed for both Static and Dynamic graphing
      3. Multiple Authorization Code Levels based on operator or full service authorization for modification of setpoints and manual status
      4. Capability of up to 20 Chiller Packages networked together via RS485 (up to 6000 feet)
   b. **(Remote Mounted-Stand Alone Control Terminal** - shall communicate and control a single unit, or network of up to twenty (20) units in a network, from a remote location up to 6000 feet away. The RS485 communications port shall be wired with a 2 wire shielded cable for up to the 6000 feet away from the chiller, or 100 feet (30 meters) away through the RS232 communication system via a (3) wire shielded cable).
      1. This option utilizes a duplicate display and keypad Control Terminal, similar to the one that shall be installed in the packaged chiller, or chiller network, and shall provide a full function operating terminal.
      2. This remote Control Terminal must be in addition to the unit mounted controller, so the unit can be fully serviced locally, without using the Remote Control Terminal that may be as much as 6000 feet away.
      3. The remote communications shall be accomplished through the RS485 high speed communications system up to 6000 feet (1829 meters) away, or the RS232 communication system up to 100 feet away.
   c. **(Telephone Modem** - for extended distance communications to a remote BMS System or a remote PC Computer through the telephone system.)
      1. A 14400 baud modem shall be connected directly to the RS232 port on the microcomputer.
      2. The Modem Option shall be capable of operating a network of up to 20 units in the network, connected via the RS485 port high speed communication system and a GATEWAY card, then connected through the modem for extended network communications via the telephone system.
   d. (Communications to a Building Management System (BMS) - shall be connected to the packaged chiller (or chiller network system) as follows for remote communication:
      1. (A modem shall be connected to the RS232 communication port for long distance communication through the telephone system, and a translator must be provided for communication with the Building Management System.)
      2. (The RS232 communication system shall be used for connection up to 100 feet (30 meters) away from the chiller (or chiller network) when connected by a 4 wire shielded cable, and a translator must be supplied for communication with the Building Management System.)
      3. (The RS485 high speed communication system shall be connected up to 6000 feet (1829 meters) away from the packaged chiller (or chiller network) when connected with a 3 wire shielded cable, and a translator must be supplied for communication with the Building Management System.)
   e. **(Chiller Link Translator** - shall be supplied for communication from the Chiller (or Chiller Network)(to the BMS (Building Management System) through BACnet, MODBUS or Johnson Controls® N2 Bus communicating systems).

2.13 Starting Equipment

A. Unit mounted contactors with compressor motor module protection for each compressor.
B. Five (5) minute anti-recycle timer
C. (Non-fused disconnect switch with through-the-door interlocking handle.)
D. (Unit mounted power transformer to provide 115 VAC control power.)
E. (Multiple small horsepower compressors for reduced inrush starting.)
F. (Ground fault interrupter.)

2.14 Additional Equipment

A. (Copper Fin/Copper Tube condenser coil.)
B. (Silicone polyester Poly-Coat condenser fin coating per ASME B117 specification for maximum salt spray and corrosion resistance.)
C. (Convenience Outlet 115 volt AC powered dual 3 prong ground fault receptacle powered by dedicated transformer and fused for 15 amps.)
D. (Hot gas bypass valve to permit operation down to 50% of unit mechanical unloading capability.)
E. (Low ambient control to 0°F (-17.8°C) minimum starting ambient.)
F. (Extra low ambient control to -20°F (-28°C) minimum starting ambient.)

G. (Low ambient lock-out control requiring a field setpoint.)
H. (Gauges include suction and discharge pressure for each refrigerant circuit in addition to the readings through the microcomputer.)
I. (Steel Painted Louvers for complete unit enclosure for general mechanical security and unit aesthetics.)
J. (Aluminum Painted Grills similar to louvers except manufactured or aluminum with 3/8" x 3 1/2" slots instead of louvers for hail damage protection and unit aesthetics.)
K. (Fin Guards Top only (1" x 4" wire mesh) for vertical side condenser coil protection.)
L. (Fin Guards Bottom only (1" x 4" wire mesh) for general unit mechanical security for the lower portion of the unit.)
M. (Over and under voltage protection relay protects against high and low incoming voltage conditions as well as single phasing, phase reversal and phase imbalance.)
N. (Circuit Breakers to provide compressor branch circuit protection.)
O. (Weatherproof Alarm Bell mounted and wired to indicate a common alarm fault.)
P. (Fully Painted Unit meets the requirements for outdoor unit application of 500 Hour Salt Spray Paint tested in accordance with ASTM-B-117.)
Q. (Suction Line Insulation for medium and low temperature applications, or where the relative humidity is above 75% with ambient temperature of 90°F (32°C) wet bulb.)
R. (Chilled Water Pump Control providing a contact closure for pump starting prior to starting the chiller.)
S. (*Mounted and Wired Water Flow Switch*)
T. (Auxiliary Control Module providing return water (fluid) temperature monitoring, utility demand limiting (requires an external 0 to 5 volt DC signal), load limiting by compressor over current protection, and compressor amperage monitoring/limiting.)

Part 3: Execution

3.01 Installation Work By Mechanical Contractor
A. Install on a flat surface level within 1/16 inch and of sufficient strength to support concentrated loading. Place vibration isolators under the unit.
B. Assemble and install all components furnished loose by manufacturer as recommended by the manufacturer's literature.
C. Complete all water and electrical connections so unit, water circuits and electrical circuits are serviceable.
D. Provide and install valves in water piping upstream and downstream of the evaporator to provide means of isolating shells for maintenance and to balance and trim system.
E. Provide soft sound and vibration eliminator connections to the cooler water inlet and outlet as well as electrical connections to the unit.
F. Interlock chillers through a flow switch in the chilled water line to the chilled water pump to ensure the unit can operate only when water flow is established.
G. Furnish and install taps for thermometers and pressure gauges in water piping adjacent to inlet and outlet connections of the evaporator.
H. Provide and install drain valves with capped hose ends to each water box.
I. Install vent cocks to each water box.
J. Provide a separate 115 volt electrical service to power the cooler heater for winter freeze protection.

3.02 Work By Temperature Control Contractor
A. Furnish interlock wiring per manufacturer's recommendations and install loose control components furnished by chiller manufacturer.

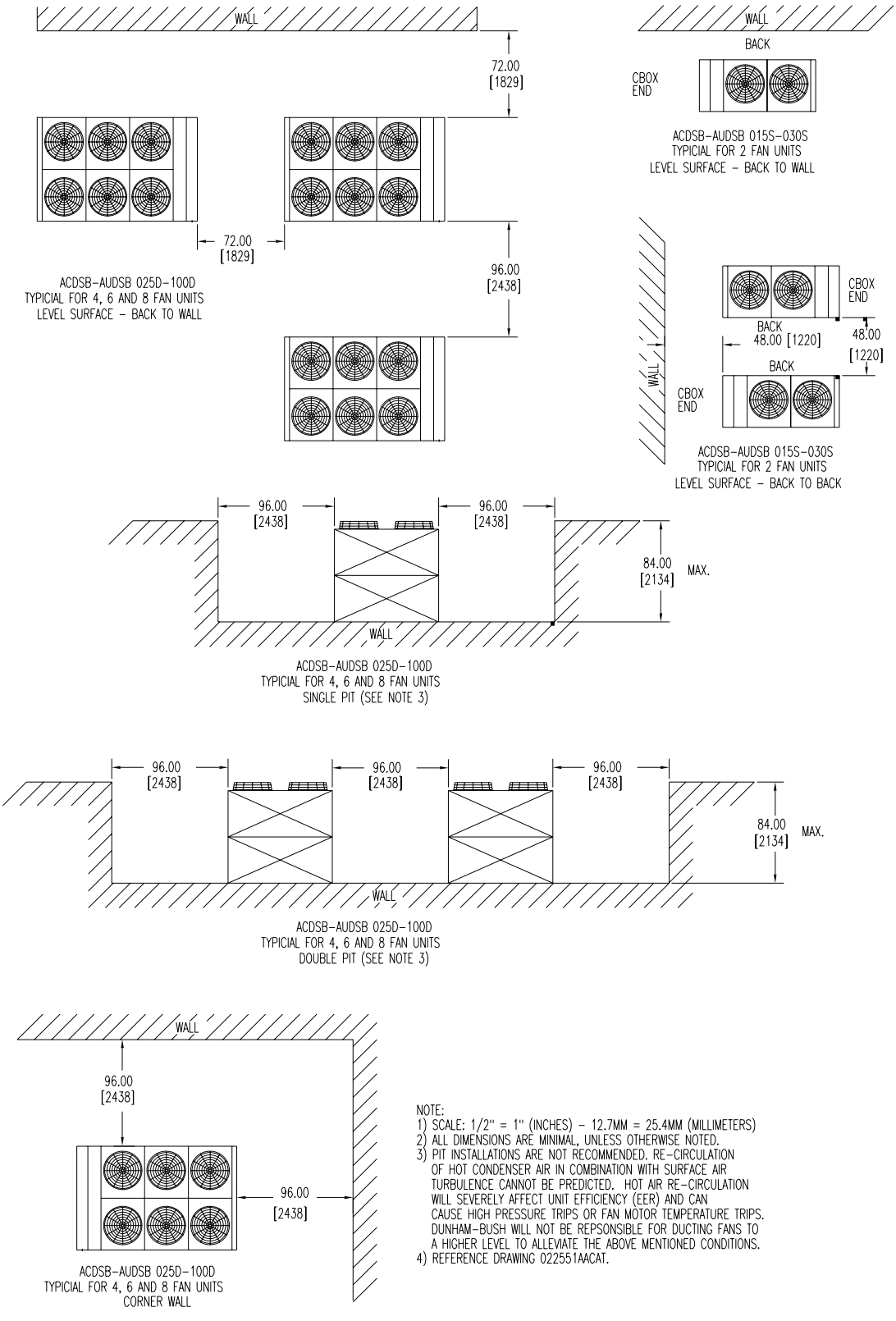
3.03 Work By Electrical Contractor
A. Furnish power wiring to chiller control panel and obtain required code approval.
B. Furnish and install approved disconnect switch and short circuit protection and short circuit protection.

END OF SECTION

Specifications subject to change without notice

INSTALLATION CLEARANCE

Figure 17



NOTE:
1) SCALE: 1/2" = 1" (INCHES) - 12.7MM = 25.4MM (MILLIMETERS)
2) ALL DIMENSIONS ARE MINIMAL, UNLESS OTHERWISE NOTED.
3) PIT INSTALLATIONS ARE NOT RECOMMENDED. 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 TRIPS OR FAN MOTOR TEMPERATURE TRIPS. DUNHAM-BUSH WILL NOT BE REPSONSIBLE FOR DUCTING FANS TO A HIGHER LEVEL TO ALLEVIATE THE ABOVE MENTIONED CONDITIONS.
4) REFERENCE DRAWING 022551AACAT.

DUNHAM-BUSH USA
P. O. Box 20000, Harrisonburg, VA 22801
Phone: 540-434-0711 FAX: 540-434-2448
www.dunham-bush.com