



*SMART FAMILY OF
COOLING PRODUCTS*

*INSTALLATION, OPERATION, &
MAINTENANCE MANUAL*

SCOD060AR4

**Air Cooled Chiller
F/O 19172**

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IMPORTANT NOTICE

- SMARTech pursues a policy of continuing improvement in design and performance of products. The right therefore is reserved to vary specifications without notice.
- SMARTech cannot anticipate every possible circumstance that might involve a potential hazard.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify severity of hazard.

DANGER

Immediate hazards which WILL result in severe personal injury or death.

WARNING

Hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

NOTE

Useful information for operation and /or maintenance.

- If you have any questions, please contact your contractor or dealer of SMARTech.
- This manual gives a common description and information for this air-cooled chiller which you operate as well as for other models.
- This air-cooled chiller has been designed for the following temperatures. Please operate the air-cooled chiller within this range.

Item	Standard
Chilled Water Outlet Temperature	(40~60)°F
Condenser Air Inlet Temperature	(40~110)°F

- This manual should be considered as a permanent part of the air-cooled chiller equipment and should remain with the air-cooled chiller equipment.
- It is assumed that the reader of this manual and those who install, operate and maintain the equipment have a basic understanding of the principles of air conditioning, refrigeration and electrical controls.
- This equipment must be installed by qualified personnel in accordance with all local and national codes.
- An earth ground lug is provided on the cabinet interior for proper grounding according to national electrical codes. An earth ground is necessary to ensure personnel safety to prevent electrical hazards around this equipment.
- This equipment is **not** for use as an industrial water source for drinking or food ingredient water for humans or animals.
- Read and follow installation instructions for proper operation.
- The main electrical supply to this equipment must remain on to keep compressor crankcase heaters functional. Failure to do so can result in non-warranty compressor damage.

PREPARATION

Upon delivery of your new SMARTech equipment:

1. Verify that the equipment is the correct model, voltage and phase against the order confirmation supplied by SMARTech.
2. Verify the serial number matches that on the bill of lading.
3. Inspect all exterior components for visible damage. Report any apparent damages or material shortages to the carrier and make a notation on the delivering carrier's bill of lading copy. Specify the extent and type of damage and then notify SMARTech immediately. **Do not proceed with the installation of a damaged unit without the approval of SFCP ; to do so will be at the risk of assuming all responsibility for the damage.**

****PROTECT YOURSELF: IF THE EQUIPMENTS EXTERIOR CRATING SHOWS ANY SIGNS OF DAMAGE, NOTATE ON THE BILL OF LADING "POSSIBLE FREIGHT DAMAGE" BEFORE THE DRIVER LEAVES. ALWAYS TAKE PICTURES OF ANY SUSPECT DAMAGE.**

Inspection Checklist

To protect against loss due to damage incurred in transit complete the following checklist:

- Inspect each piece before accepting delivery. Check for torn cartons, broken skids, bent sheet metal, torn shrink wrap.
- Check the unit(s) for concealed damage before storage and as soon as possible after delivery. In event of suspected concealed damage, ask the driver to wait. Concealed damage must be reported within 1 day of receipt.
- If concealed damage is found, stop unpacking the shipment. Do not move damaged material from the receiving location. Take photos of the damage. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier of the damage as soon as possible. Request an immediate joint inspection by the carrier and consignee. A determination of responsibility will be made and the carrier will authorize repairs in the event of admission of fault.
- Notify SMARTech immediately. We will coordinate repairs with the owner and carrier; do not attempt to make repairs locally without SMARTech's permission.

Accepting Delivery

It is the consignee's responsibility to accept delivery of damaged goods unless permission to refuse delivery has been given by SMARTech. **DO NOT REFUSE DELIVERY** of damaged goods without prior authorization. The ownership of the shipment has passed from SMARTech to the customer at the time of shipment. Refusal of the delivery may impede the recovery of damages.

****SMARTECH IS NOT, AND WILL NOT BE, RESPONSIBLE FOR DAMAGES, OR FOR FILING FREIGHT CARRIER CLAIMS.**

PREPARATION

Initial Check

Required Materials - Measure and check architectural information regarding installation location.

Installation Location - Confirm the final installation location is provided with convenient piping and wiring work. Strong water runoff should be avoided.

Installation Space - Check for obstacles which hamper maintenance work and unit operation in the space specified in "space requirements and clearance". When the unit is installed at the location where the unit is encircled with walls and obstruction of free air circulation is suspected, consultation with SMARTech regarding the operation space is recommended.

Foundation - Check to ensure the foundation is flat, level, and sufficiently strong, taking into account the maximum foundation gradient and the unit weight balance. Confirm elevation provision for unit on a solid base with an iron frame or concrete curbs for either rooftop or on-the-ground installation, provide a gravel or concrete space around the condenser air intake, in order to avoid air flow obstruction due to grass or other vegetation.

Unit - Check to ensure that the unit has been transported without damage. File a damage claim with the transportation companies if mishandling due to transportation company negligence is suspected.

Transportation - Secure the route to the final installation location by confirming the packing dimensions. (Refer "Unit Dimensional Data")

Placing the Unit

DANGER

- If leakage is detected, stop the unit and contact the installer or a service shop. Don't use a naked fire near the refrigerant gas. If a naked fire is utilized near the refrigerant gas, refrigerant gas is turned into harmful phosgene compound.

WARNING

- The unit is operated with refrigerant R-407c, which is non flammable and non poisonous. However, refrigerant itself is heavier than the atmosphere so that a floor is covered with refrigerant gas if refrigerant is leaked. Therefore, maintain good ventilation to avoid choke during servicing.

CAUTION

- Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormally high pressure.

Tools and Instruments - pincers, Wrenches, Facilities to Transport and Place the Unit.

Transportation - Transport the unit as close to the final installation location as possible before unpacking is accomplished. Provide adequate facilities to place the unit on the foundation, with sufficient consideration given to those individuals performing the installation.

Unpacking - Follow the instructions marked on the packing.

PREPARATION

Machine Labeling

Nameplates

The chiller nameplate is located on the electrical compartment end of the unit. It contains all the most current and pertinent information about the chiller. In the event of a component change, the nameplate will be the corrected values; the manual may not have been updated yet.

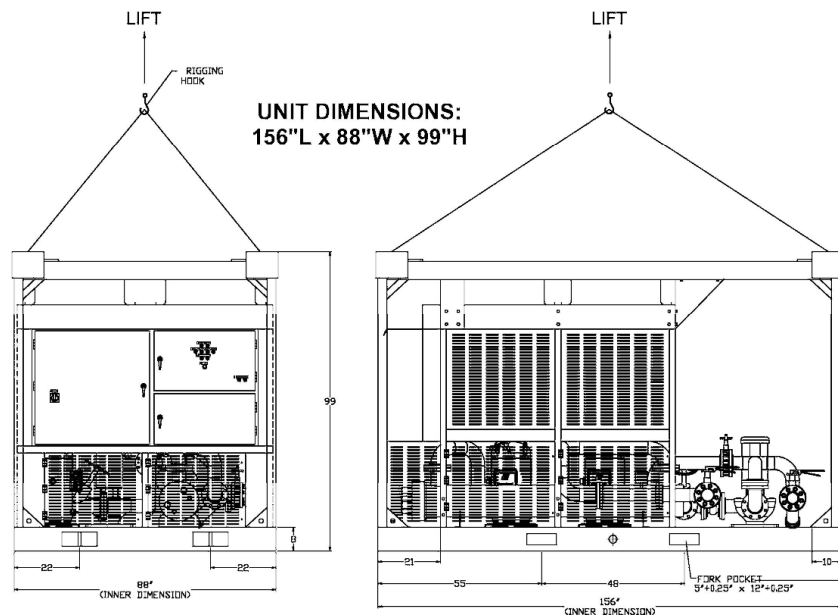
Please refer to this nameplate and provide SMARTech with the pertinent data when calling for information or parts.

****Compressor nameplates are on the compressor housings.**

Transportation

1) Rigging

Hook wire cables with spreader bars on the top of the unit (refer to figure below) to prevent the unit panels from damage due to cable scratches. The unit should remain in an upright position even during rigging. The wire cable to rig the unit shall be 3(three) times stronger than unit weight. Check to ensure that the rigging bolts are tightly fixed to the unit. The rigging angle shall be greater than 60°. The weight of the unit is indicated on unit "physical specification".



SHIPPING WEIGHT: 9600 LBS

RIGGING DIAGRAM



- Do not attach a chain hoist sling to the piping or pipe fittings!

PREPARATION

2) Transportation by Forklift

Unit mounted on skid may be moved with a forklift, but care must be taken not to cause damage by the forks. The skid should not be removed until the unit is at its final location.

Space Requirements and Clearance

The dimensional data and clearances that follow are useful for determining space requirements. The unit should be placed with the necessary clearance for proper servicing. Failure to allow such clearance may cause damage and improper operation.

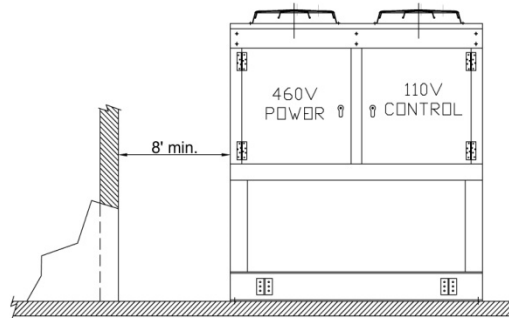
The provision for supply of ambient air to the condenser, and sufficient hot air rejection from the condenser area is imperative to ensure unit performance and reliable operation. Failure to comply with the minimum space clearances will result in higher condensing temperatures, poor operation, high power consumption and possible equipment failure. Unit must not be located in the vicinity of steam, hot air or fume exhausts.

Mount the unit away from noise sensitive spaces and provide adequate support to avoid vibration and noise transmission into occupied spaced. If possible mount unit over corridors, utility areas, rest rooms or other auxiliary areas where sound levels are not an important factor. Consult sound and structural experts on critical installations.

PREPARATION

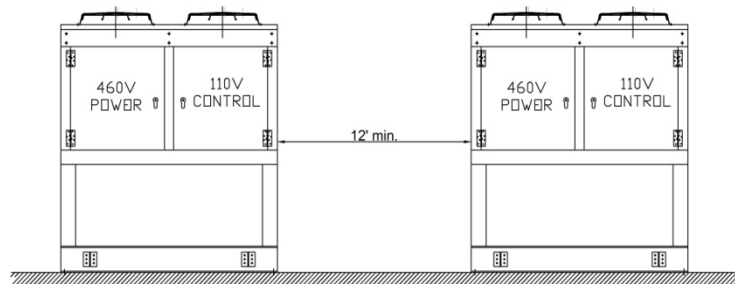
1) Walls or Obstructions

For proper air flow and access, all sides of the unit must be a minimum of 8 feet away from any wall or obstruction. Allow extra space if possible. Ensure there is ample room for maintenance work through access doors and panels. Overhead obstructions are not permitted.



2) Installing Multiple Units

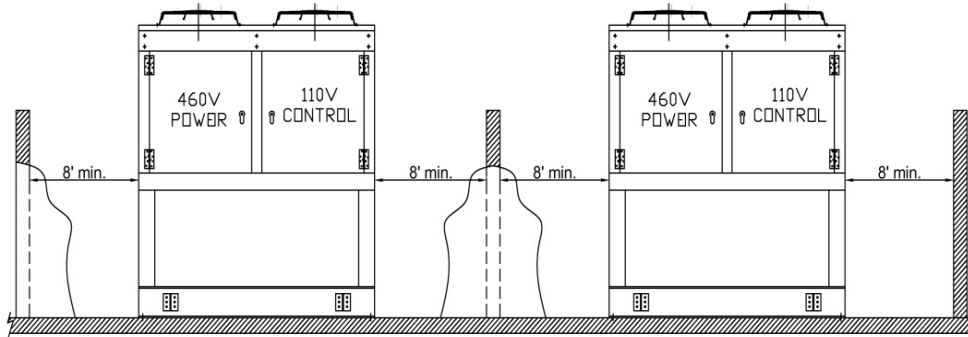
Minimum space required between 2 units is 12 feet. Increase unit spacing to 8 feet if coils are facing each other.



PREPARATION

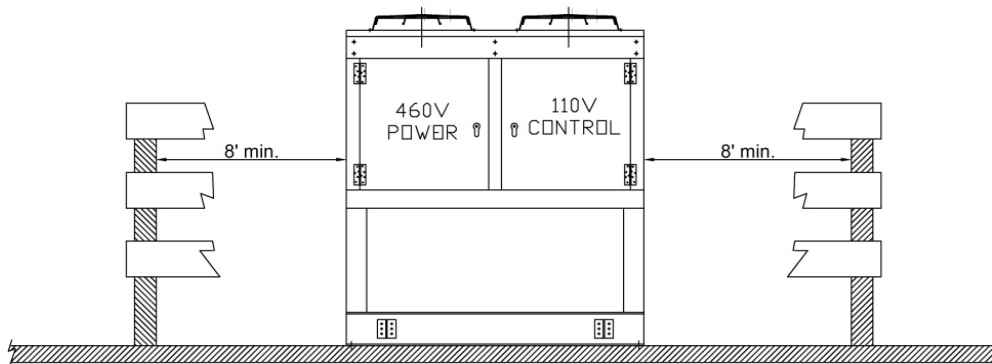
3) Pit Installation

The height of wall shall be lower than top of the unit. Hot air rejection will be restricted with unit installed sunken in pit. Please contact SMARTech when obstruction of free air circulation is suspected.



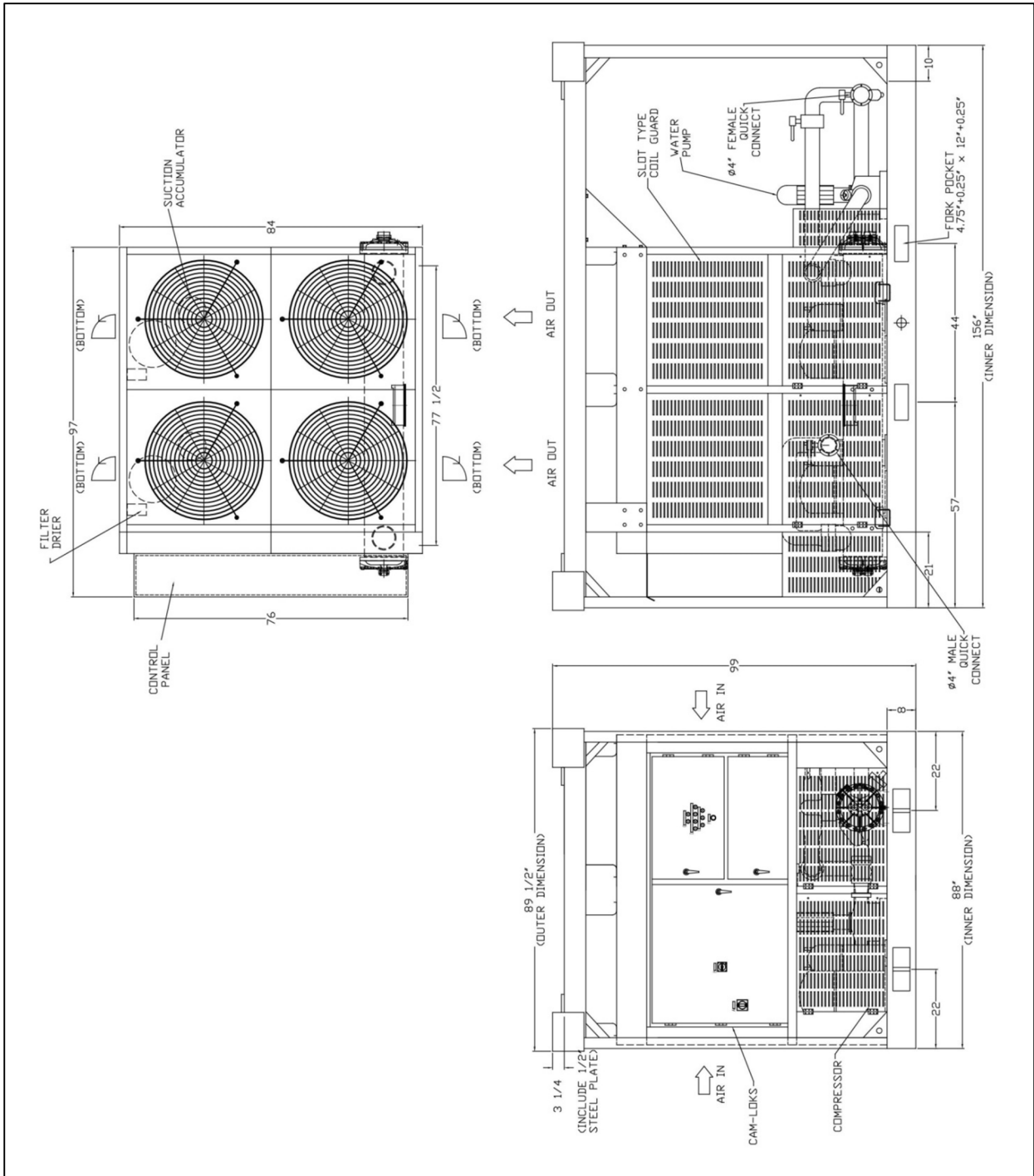
4) Decorative Fences/Louvre

Fences must have at least 50% opening area, with a minimum of 1 foot undercut, 8 feet minimum clearance, and must not exceed the top of unit. Otherwise refer to "Pit Installation".



PREPARATION

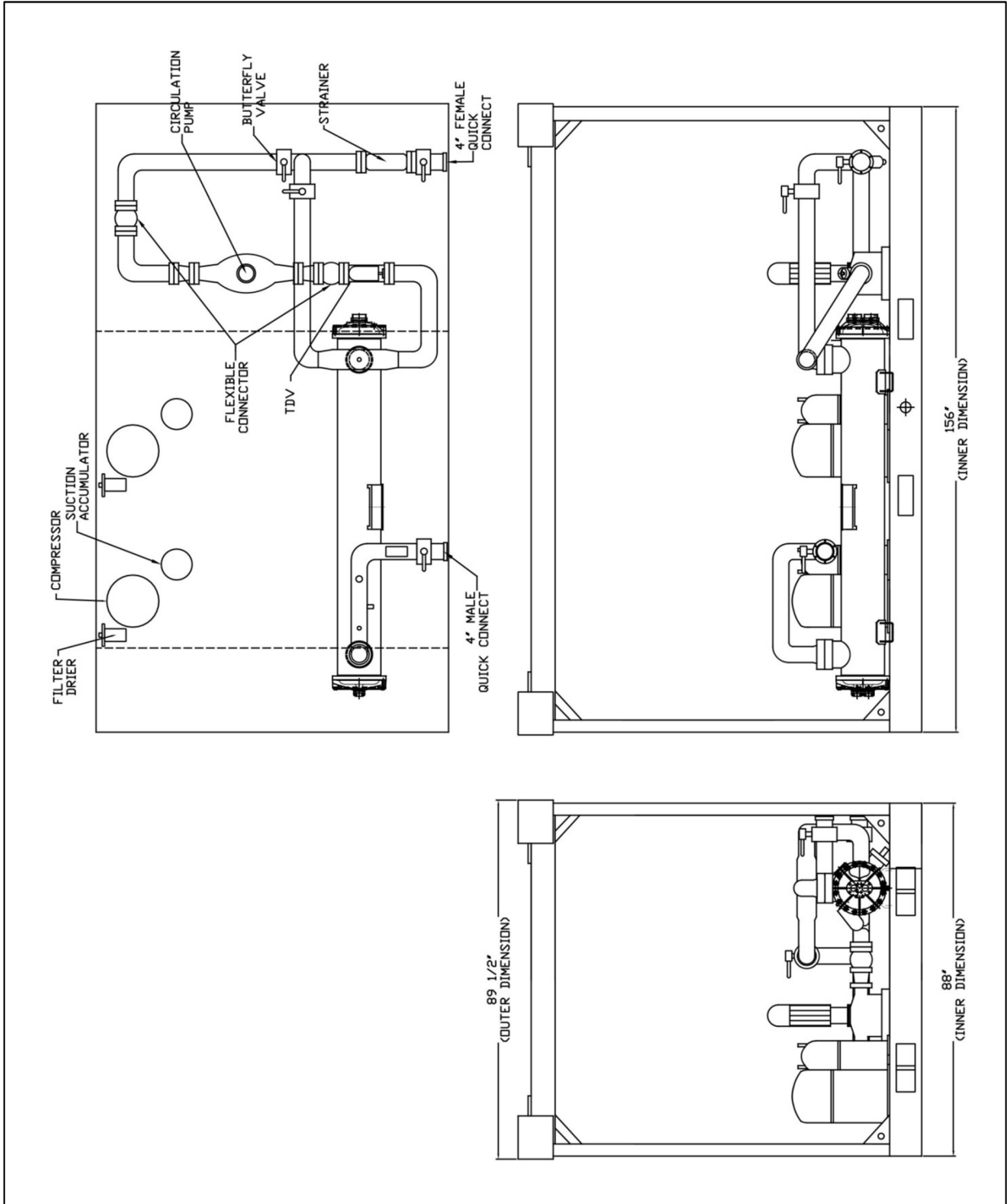
Unit Dimensional Data [SCOD060AR4]



All dimensions are in inches

PREPARATION

Component Layout [SCOD060AR4]



PREPARATION

Physical Specifications

Model Size		SCOD060AR4
Compressor		
(Qty) Model		(2) CPR27067
Displacement @60Hz	(Qty) CMH	(2) 45.6
Oil Charge	(Qty) liters	(2) 6.9
Refrigerant		R410A
Air Cooled Condenser		
Coil Rows Deep / Total Face Area	Sq. ft	4/21.39
Fan Diameter	Inches	31
Fan Type		Axial Fan
Fan (Qty) Hp each		(4) 2.5
Fan Motor RPM - 60Hz		990
DX Cooler		
Shell Diameter	Inches	10 ¾
Tube Length	Inches	80 ¾
Water Connector	Inches	4
General		
No of Refrigerant Circuits		2
Chiller Shipping	lbs	9,600
Refrigerant Charge	(Qty) lbs	(2) 59.5

INSTALLATION

Electrical Wiring

Tools and Instruments - One set of wiring tools and electrical tester (Clamp Meter)

⚠ CAUTION

- **Confirm that the field-selected electrical components (main power switch, fuses, wires, conduit connections, wire terminals and others) are properly selected according to the Electrical Data in wiring diagram and ensure they comply with national and local codes.**
- **It is recommended that the main power switch be locked at the “OFF” position, to prevent against accidental supply of power during equipment servicing.**
- **Check to ensure that an earthing wire is correctly connected to the unit. This wire protects unit from an electrical shock. Utilization of an earth leakage breaker is recommended.**

Main Power and Control Wiring – Connect the main power wiring and control interlocking wiring according to the wiring diagram label. The power supply should match the unit nameplate in volts, phase and Hertz. All wirings are to be checked for damage and all terminal connections are to be tested for tightness. Unit terminal blocks are to be connected with copper conductors only and sized per ampacity listed on unit data plate.

Water Piping

When piping connections are performed:

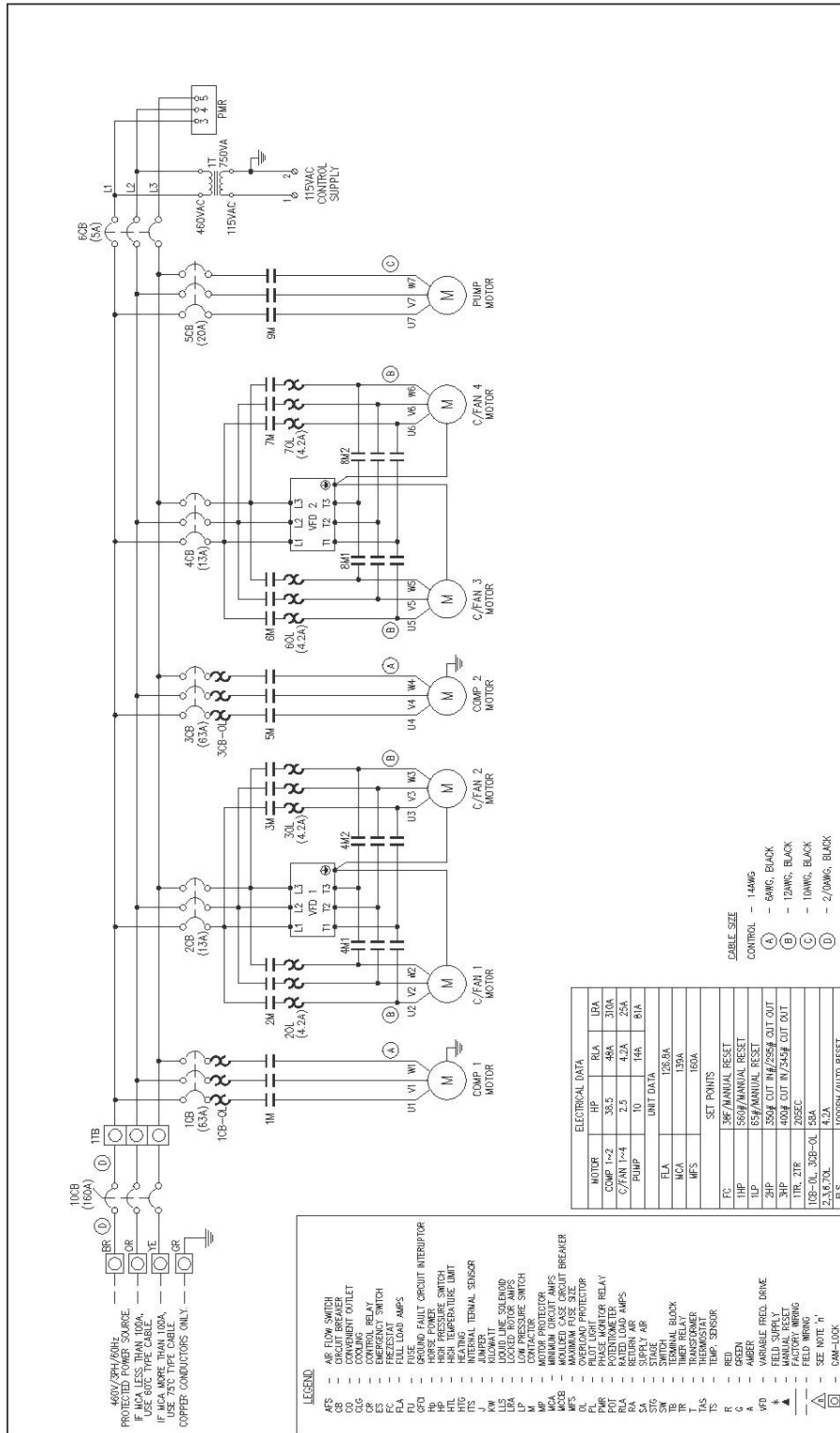
1. Connect all pipes as close possible to the unit, so that disconnection can be easily performed when required.
2. It is recommended to utilize flexible joints for chilled water inlet and outlet connection so that vibration will not be transmitted.
3. Whenever permissible, sluice valves should be utilized for water piping, in order to minimize flow resistance and to maintain sufficient water flow.
4. Proper inspection should be performed to check for leaking parts inside and outside the system, by completely opening the chilled water inlet and outlet valve. Additionally, equip valves to the inlet and outlet piping. Equip an air purge cock on the inlet piping and a drain cock on the outlet piping. The cock handle should be removed so that the cock cannot be opened under normal circumstances. If this cock is opened during operation, trouble will occur due to water blow-off.
5. Sufficiently perform insulation to keep the chilled water piping cool and to prevent sweating of the piping.
6. Under the condition where the ambient temperature is low in winter. There is a case where equipment and piping will become damaged during shutdown periods at night, because the water in the pump or piping will be frozen. To prevent freezing of the water. It is effective to operate the pumps even during the shutdown periods. In the case where there is still a danger of freezing, completely drain the water from the piping. Additionally, in a case where measures such as water draining are difficult, utilize antifreeze mixture of ethylene glycol type or propylene glycol type.
7. Multiple unit package chillers have been successfully applied to parallel and series piping systems for years. Special attention, however, must be given to the particulars involved for each application or serious operational problems can result. The following guidelines should be followed for multiple unit application. It is assumed that the chilled water flow rate is constant.

⚠ CAUTION

- **Never use an antifreeze mixture of the salt type. Because it possesses strong corrosion characteristics, and water equipment will be damaged.**

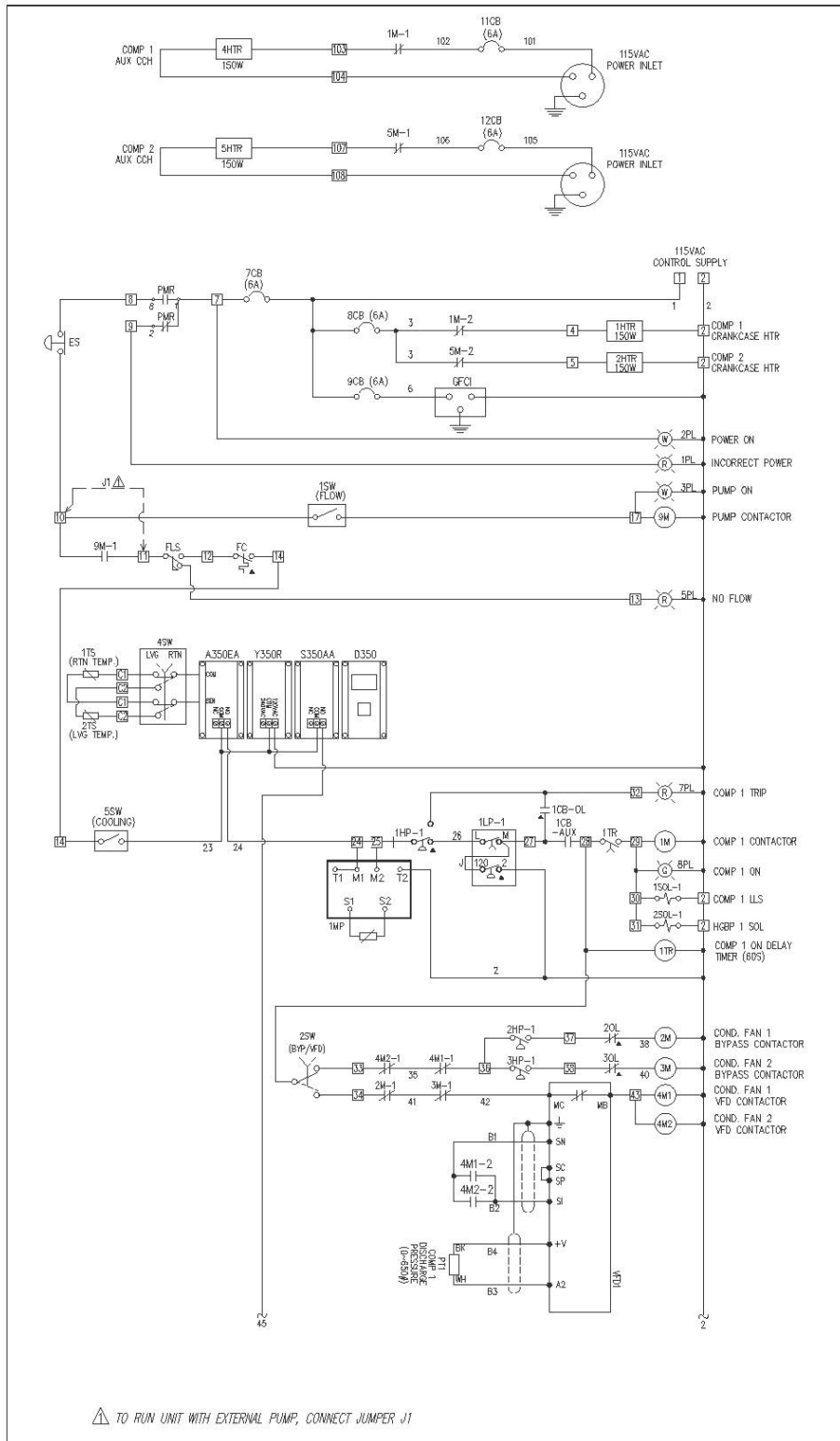
INSTALLATION

Wiring Diagram – SCOD060AR4



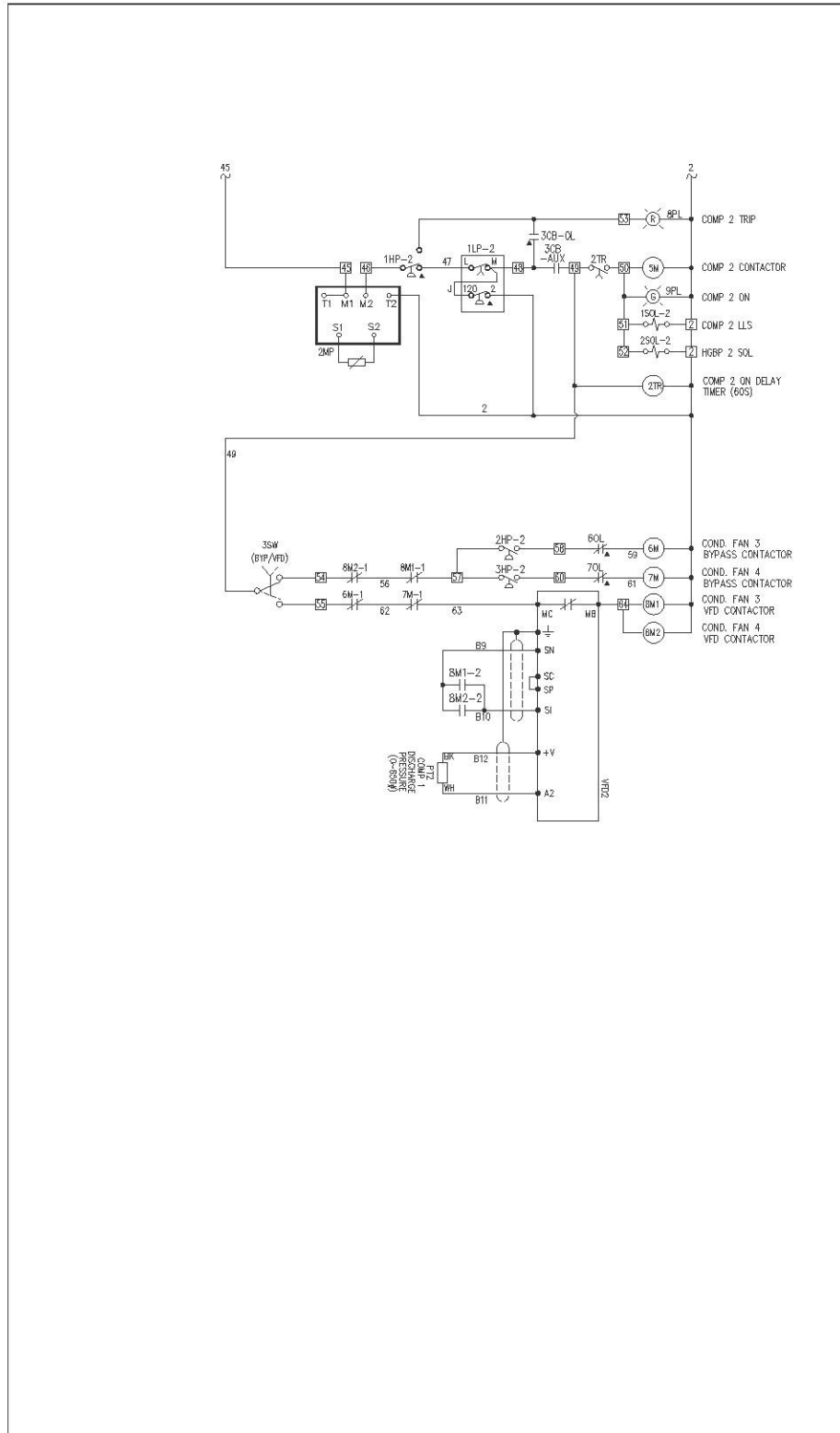
INSTALLATION

Wiring Diagram – SCOD060AR4



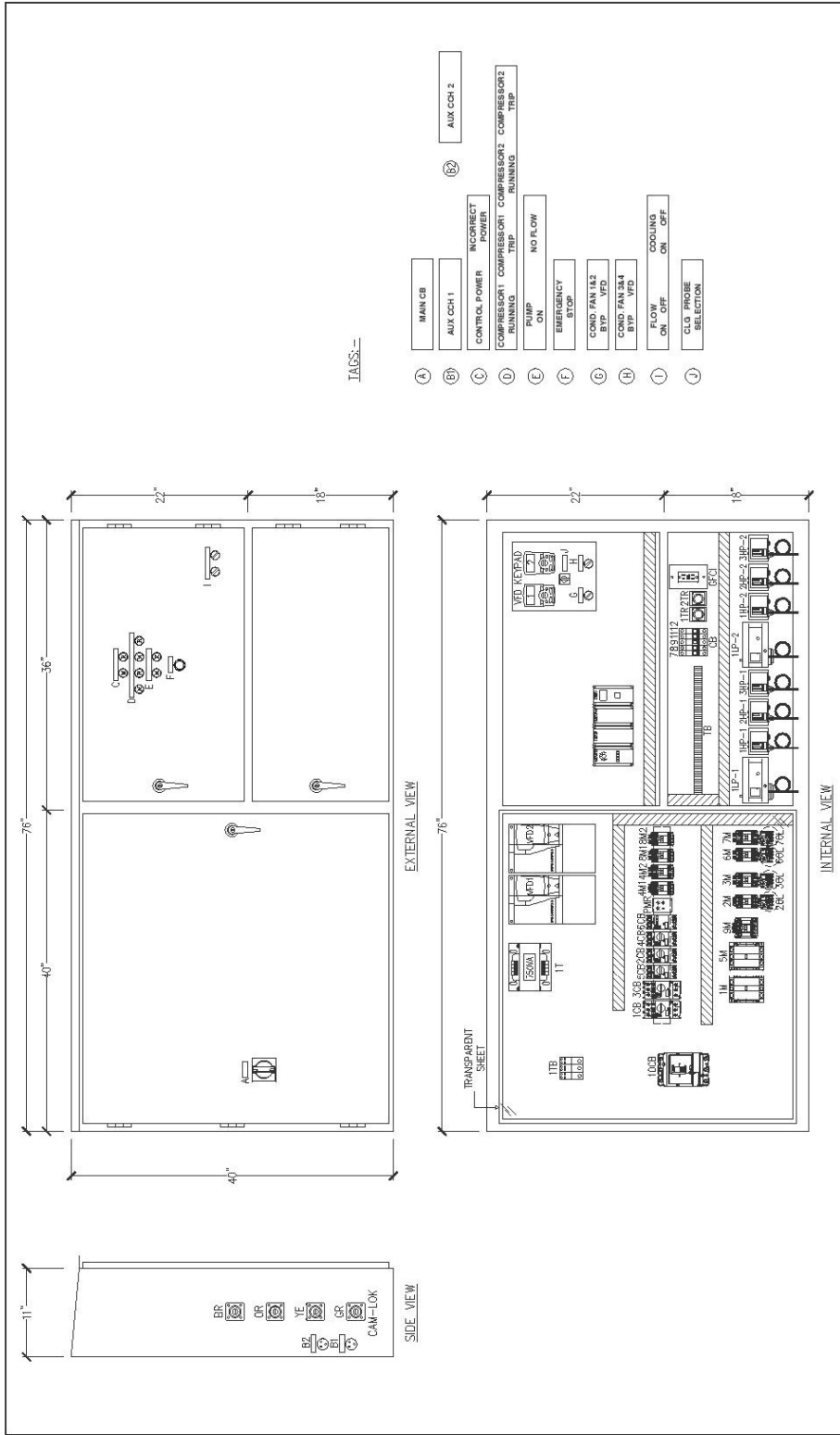
INSTALLATION

Wiring Diagram – SCOD060AR4



INSTALLATION

Component Layout – SCOD060AR4



INSTALLATION

Installation Final Check

Inspect the installation work according to all documents and drawings, Table below shows the minimum check points.

<p>1. Is the unit solidly mounted and levelled?</p> <p>2. Is the installation location adequate?</p> <ul style="list-style-type: none">○ Space for Condenser Air Flow○ Space for Maintenance Work○ Noise and Vibration○ Sunshine and Raining○ Appearance <p>3. Is the water piping system adequate?</p> <ul style="list-style-type: none">○ Tube Size○ Water Drain○ Length○ Water Control○ Flexible Joint○ Air Purge○ Insulation○ Pressure Control	<p>4. Is electrical wiring system adequate?</p> <ul style="list-style-type: none">○ Wire Size○ Tightened Connections○ Switch Size○ Operation Control Devices○ Fuse Size○ Safety Devices○ Voltage and Hz○ Interlock <p>5. Have the L1, L2 and L3 phases of the water chiller correctly been connected to the L1, L2 and L3 phases of the main power source, respectively?</p> <p>6. Are the stops valves for the condenser liquid line open?</p> <p>7. Have the packing glands and the cap nuts for the stop valves been tightened?</p>
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Tools and Instruments – High Pressure Compound Gauge, Low Pressure Compound Gauge, Electrical Tester and general Tools.

⚠ CAUTION

- **Switch ON the main power switch, and energize the oil heater (if equipped) for 12 hours before start-up, to sufficiently warm the oil.**
- **Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormally high pressure.**
- **Remove the foreign particles and substances from the water piping perfectly by operating the water pump to circulate the chilled water through the chilled water piping without going through the water coolers, and clean the strainer. Check to ensure that no foreign particle and substance exists in the chilled water piping.**

Test Running

Test running should be accomplished as follows, when the unit is wired according to SMARTech wiring label.

- Switch ON the field-supplied pump and the pump will be started immediately. Check the condition and operation state of these components.
- Fully open the liquid line stop valve.
- Set the operation switch to "ON", and the compressor will be started in a few minutes after this operation.

⚠ CAUTION

- **Screw compressor works in a fixed rotation. Before compressor start-up, the rotation direction should be checked with a phase sequence indicator. Rotation direction could be changed by interchange two of the three phases connected to the main power wiring terminals of the unit.**
- **Operate the pump for chilled water and other auxiliary equipment such as fan coil units, check to ensure that the chilled water flow is sufficient and other auxiliary equipment operates properly.**
- **Set the controller at the desired temperature.**
- **Check the rotation direction of the condenser fans.**
- **After the system operation becomes stable, check the discharge and suction pressure.**
- **Check to ensure that the control & protective devices are in normal state.**

OPERATION

SYSTEM CONTROL / CAPACITY CONTROL

Johnson Controls A350E series electronic temperature controller is used on this Air-Cooled Scroll Chiller. This controller provides a SPDT relay output and LED relay status indicator, designed to operate for cooling application. Wide adjustable differential range of 1 to 30°F (0.6 to 16.7°C) and set point range of 10 to 65°F (-12 to 18°C). Capacity or compressor staging control is based on entering water temperature sensing.

ELECTRICAL CONTROLS

CB – Circuit Breaker

Circuit breakers for motor (MMS) provide optimal protection by integrating the function of a molded case circuit breaker and thermal overload relay into a highly compact unit.

M – Magnetic Contactor

The contactor, operated by control circuit, provides power individually to the power driven motor. Contactors are used either singly or in parallel pairs for cross-the line start (simultaneous operation). These devices are amp rated to handle both rated load amp and locked rotor amps.

CR – Control Relays (Miscellaneous Control)

These relays provide the necessary circuit logic for lock-in, lock-out and transfer functions.

HTR – Crankcase Heater (Optional)

The heater maintains crankcase temperature above the system temperature during the compressor off cycle, preventing refrigerant migration into the crankcase and consequent compressor damage.

SOL – Solenoid Valve

Usually normally close types designed for liquid, suction and discharge gas application.

Liquid Line Solenoid (LLS) valve is used to prevent any liquid from accumulating in the chiller during off cycle. It serves also as pump-up and pump-down device.

Hot Gas Bypass (HGBP) valve is used to bypass controlled amount of discharge gas into evaporator, creating artificial load, during low load condition.

FLS – Flow Switch (optional-field supply)

Prove of flow device to prevent cooler from freezing due to no flow operation.

ESTOP – Emergency Stop Switch

2 position, pull/push switch, to turn on/off control power.

1SW – Flow Switch

2 position switch, to turn on/off pump.

2SW, 3SW – Condenser Fan Operating Mode Switch

2 position switch, to turn VFD/BYP to require condenser fan operating mode.

4SW – Cooling Probe Selection Switch

2 position 2 pole selector switches, to turn RTN/LVG cooling probe.

5SW – Cooling Switch

2 position switch, to turn on/off unit.

OPERATION

VARIABLE FREQUENCY DRIVE (VFD)

The condensing fans driven by VFD. Listed below is a quick reference for factory adjusted VFD settings. VFD packaged Instruction Manual is enclosed and to be read in conjunction with this manual as necessary.

Condenser Fan VFD [VFD27035] Parameters:

PAR	DESCRIPTION	SET	DEFINE
A1-00	Language Selection	0	ENGLISH – default
A1-01	Access Level Selection	2	Advanced Access - default
A1-04	Password	0	default
A1-05	Password Setting	0	default
A1-06	Application Preset	0	General purpose – default
b1-01	Frequency Reference Selection 1	1	AI terminal – default
b1-02	Run Command Selection 1	1	Control Circuit terminal – default
b1-03	Stopping Method Selection	1	Coast to stop
b1-04	Reverse Operation Selection	1	Reverse Operation Disabled
b1-11	Drive Delay Time Setting	10s	
b1-14	Phase Order Selection	0	Standard Phase Order - default
d2-01	Frequency Reference Upper Limit	100%	
d2-02	Frequency Reference Lower Limit	33%	
d2-03	Master Speed Reference Lower Limit	0%	
E1-01	Input Voltage Setting	460V	
E1-03	V/f Pattern Selection	F	default
E1-04	Maximum Output Frequency	60Hz	
E1-05	Maximum Voltage	460V	
E1-06	Base Frequency	60Hz	
E1-13	Base Voltage	460V	
E2-01	Motor Rated Current	8.4A	
E2-04	Number of Motor Poles	4	
E2-11	Motor Rated Power	3kW	
H1-01	Terminal S1 Function Selection	40	Forward Run Command (2-wire Sequence)
H1-02	Terminal S2 Function Selection	F	Not used
H1-03	Terminal S3 Function Selection	1	Local/Remote Selection
H1-04	Terminal S4 Function Selection	F	Not used
H1-05	Terminal S5 Function Selection	F	Not used
H1-06	Terminal S6 Function Selection	F	Not used
H1-07	Terminal S7 Function Selection	F	Not used
H1-08	Terminal S8 Function Selection	F	Not used
H3-09	Terminal A2 Signal Level Selection	3	0 to 20mA
H3-10	Terminal A2 Function Selection	0	Frequency Bias - default
H3-11	Terminal A2 Gain Setting	150%	
H3-12	Terminal A2 Bias Setting	-100%	
H3-13	Analog Input Filter Time Constant	1.0s	
H3-14	Analog Input Terminal Enable Selection	2	A2 only enable
L1-01	Motor Overload Protection Selection	1	Standard Fan Cooled
L1-02	Motor Overload Protection Time	1.0min	default
L8-35	Installation Method Selection	2	IP00 NEMA Type 1 enclosure
o2-01	LO/RE Key Function Selection	0	disabled
o2-02	STOP Key Function Selection	0	STOP key is disabled in REMOTE operation

OPERATION

END USER OPERATION PROCEDURE

STEP 1: Confirm that circuit breaker (7CB) is switched ON and CONTROL POWER pilot light (2PL) is lit.

- If INCORRECT POWER pilot light (1PL) is lit, check PMR for phase rotation and voltage setting.

STEP 2: Turn ON PUMP (Flow) switch (1SW).

STEP 3: Cooling probe selection switch (4SW)

- Turn 4SW to LVG - Cooling is based on leaving water control.
- Turn 4SW to RTN - Cooling is based on entering water control.

STEP 4: Turn ON COOLING switch (5SW)

STEP 5: Turn BYP/VFD switch (2SW, 3SW) to require condenser fan operating mode.

- BYP - Condenser fan is started using bypass starter.
- VFD - Condenser fan is started using VFD.

It is the customer's responsibility to always follow the written operating instructions of the unit and maintain safe work practices.

MAINTENANCE

The unit should be periodically inspected according to the same items as those described in the paragraph titled "Test Running". In order to ensure dependable performance and long life operation, the following additional items should be given particular attention.

▲WARNING

- If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and an electric fire.
- Do not operate the unit near flammable gases such lacquer, paint, oil, etc. to avoid a fire or an explosion.
- Turn OFF the main switch when electrical box covers are removed. Do not operate the unit without fixing panels.
- Do not touch the parts at the discharge gas side by hand, since the pips at the discharge side are heated by refrigerant and the temperature may become higher than 100°C.
- Do not utilize this unit for cooling or heating of drinking water or food, comply with local codes and regulation to use it.
- Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. In addition, if the unit cannot be stopped by the control switch, it can turn OFF the main switches for power supply to stop it.

Components

Air-Cooled Condenser – Inspect the condenser and remove any accumulated dirt from the coil, at regular intervals. Other obstacles such as growing grass and pieces of paper, which might restrict air flow, should also be removed.

Electrical Equipment - Always pay careful attention to working voltage, amperage, and phase balance. Check for faulty contact caused by loosened terminal connections; oxidize contacts, foreign matter and others.

Control and Protective Devices - Do not readjust the settings in the field or bypass safety device connection.

Lubrication

Compressor - The compressors are charged at the factory with the correct type and amount of oil. It is not necessary to add oil, if the refrigerant cycle remains sealed. Check oil level frequently to see that a sufficient amount of oil remains in the crankcase. Compressor oil level can be checked by the sight glass. To make sure that proper oil level is observe, operate the compressor for 15 minutes, then stop the compressor. Oil should appear from 1/2 to 3/4 in the sight glass with the compressor stopped. If the oil becomes discolored indicating contamination, the contamination can be removed by installing a new filter-drier in the liquid line and replacing the oil.

▲WARNING

- **Use only SMARTech approved refrigeration oil. Failure to comply may void warranty!**

Fan Motor –Bearing of all fan motors are pre-lubricated. Lubrication is not required.

Deposits

Lime and other minerals in chilled water tend to deposit at surface of the plate over a period of operation. Increase of these minerals deposits will cause excessive power consumption, if excessively high discharge pressure or lower operation pressure are detected, it may indicate evidence of deposits in the water cooler.

Cleaning Method

(1) Installation of cleaning circuit

- 1.1 Stop the water chiller.
- 1.2 Stop the circulation water pump.
- 1.3 Disconnect the inlet/outlet of the chilled water and set up a circulating water circuit by using an acid-resistant type pump.

(2)Check of Circulating Circuit

Pour water into the cleaning tank and operate the acid-resistant type water pump to ensure:

- 2.1 No water leakage exists.
- 2.2 The water hose is firmly fixed.
- 2.3 The cleaning agent will not damage the facility near the water chiller even if bubbles occur or touch them.
- 2.4 Good ventilation is available
- 2.5 No abnormality noise exists

MAINTENANCE

(3) Cleaning Work

- 3.1 Discharge water in the water circuit of the air conditioning system.
- 3.2 Supplies diluted cleaning fluid from the cleaning water tank by operating the acid-resistant pump.
- 3.3 Circulate the cleaning fluid for an appropriate period of time (the operating time should be determined according to the type of cleaning agents, concentration and fouling thickness)

(4) Waste Fluid

- 4.1 Stop the acid-resistant pump.
- 4.2 Flow the waste fluid into the waste fluid tank.
- 4.3 Supply water into the cleaning tank and operate the pump for water cleaning.
- 4.4 Put the cleaning water into the waste fluid tank as same as the waste fluid.
- 4.5 Measure the PH degree using a PH test sheet, and neutralize the waste fluid by gradually adding neutralizing agent.
- 4.6 After neutralization, ask a waste fluid company to handle it.

(5) Neutralization Treatment in the Water Piping

- 5.1 Supply water into the cleaning tank.
- 5.2 Start the acid-resistant pump.
- 5.3 Measure the PH degree by using a PH test sheet, gradually add neutralizing agent until the pH reaches PH= 7.
- 5.4 Operate the acid-resistant pump for a specified period of time for neutralization.
- 5.5 Discharge the used water.
- 5.6 Operate circulating pump and clean circuit with water until no fouling fluid is observed.

(6) Re-starting

- 6.1 Connect the unit piping as they were so that the water chiller can operate normally.
- 6.2 After cleaning, perform water treatment (preventive treatment) in order to prevent the unit from corrosion.

Periodic Maintenance

Note: for the most up-to-date maintenance information, we recommend that you visit the SMARTech web site: www.smartechamerica.com

MONTHLY

1. Check for foreign debris in the condenser coil inlets of an air cooled chiller.
2. Visually inspect for water leaks and proper tank level
3. Inspect solder joints for evidence of oil or water leaks.
4. Check electrical connections and components.
5. Listen for excessive vibrations or motor noise.
6. Check system fluid for proper glycol percentage.
7. Check the liquid line sight for bubbles.
8. Check the compressor oil level in sight glass if equipped.
9. Check fan and pump rotation for free rotation and correct direction.

YEARLY

In addition to above:

1. Tighten all electrical connection screws.

MAINTENANCE

2. Check the glycol solution for cleanliness. Drain and refill with clean solution if excessive sludge or dirt is present. Flush the system prior to refilling.
3. Check motor amp draws and voltage supplies. Make sure they are within name plate rating.
4. Check operating pressures of the refrigeration system.
5. Check super heat and sub cooling.
6. Inspect for leaks with a sensitive electronic leak detector.
7. Check for excess wear or burned contacts on motor starters replace if in doubt.
8. Wash out the condenser coils of an air cooled system.
9. Check the operation of the safety devices and thermostat.
10. Ensure that the pipe insulation is dry and not broken down.
11. Check mechanical mounts and vibration isolators for wear.

Refrigerant Cycle

Filter Drier: Check whether the filter drier is clogged before each operation of the unit.

Refrigerant Charge: Inspect the refrigerant charge of the system by checking the discharge and suction pressure. Perform a leakage test, if any leakage is suspected, and always perform such a test after a refrigerant cycle component is replaced. When the refrigerant charge is required, please follow the following instructions:

(1) When the refrigerant gas completely leaked....

Before charging, the entire cycle must be completely evacuated and dehydrated. A gauge manifold or equivalent piping preparation is recommended as a convenient procedure regarding both charging and evacuation.

1. Fully open all the stop valves.
2. Connect the evacuating line to the check joints of the high and the low pressure sides.
3. Completely evacuate the entire cycle with a vacuum pump.
4. Charge refrigerant to the refrigeration cycle by weighing the charger cylinder. The proper refrigerant charge is listed on the nameplate.
5. When charging by weight is stopped due to high ambient temperature, close the valve and operate the unit after circulating the chilled water through the water cooler.

(2) When only additional refrigerant is required....

Connect a gauge manifold to check joint of low pressure side, and connect a charge cylinder to gauge manifold.

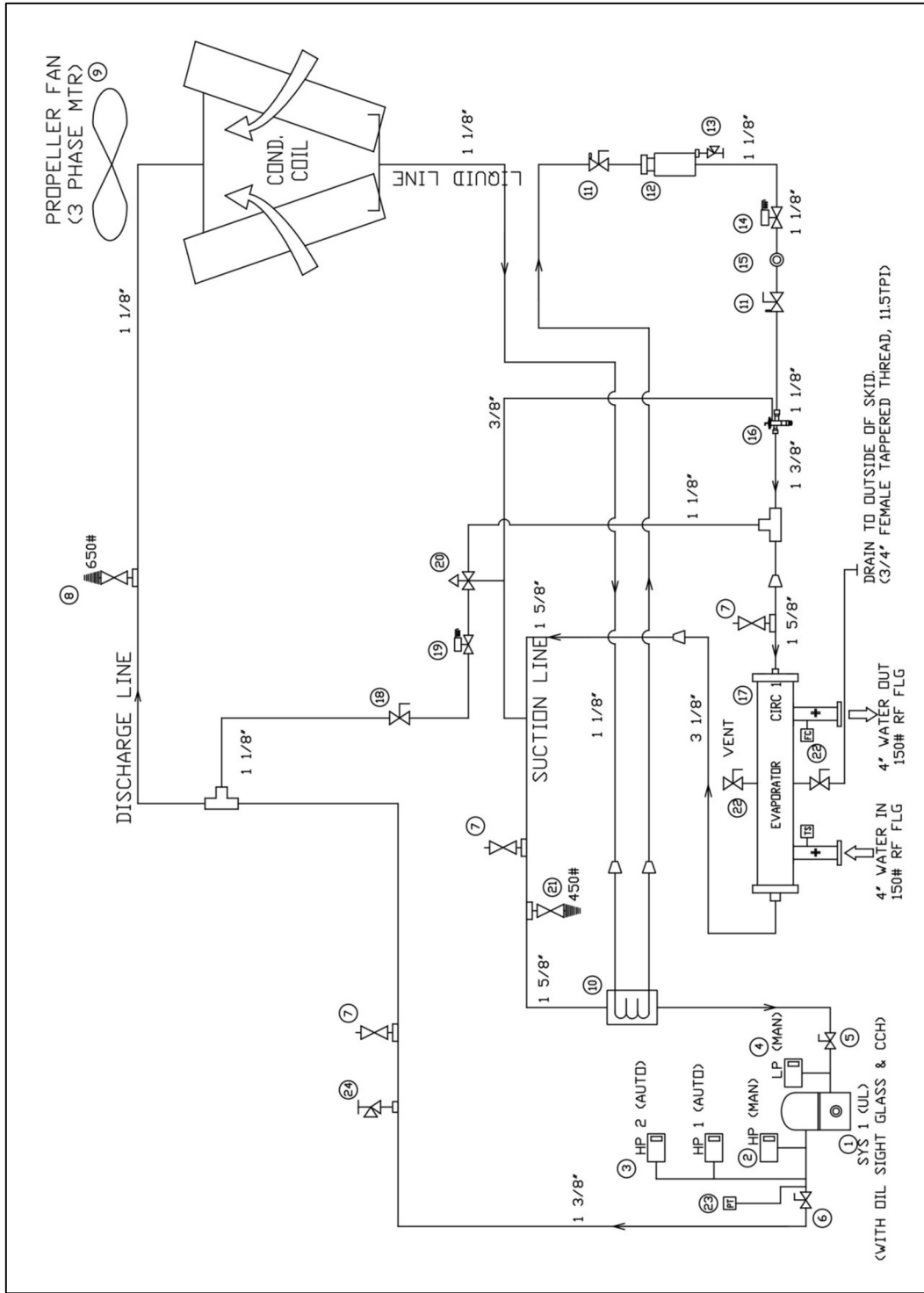
Operate the unit after circulating the chilled water.

Repeat the following procedure until pressure becomes proper.

1. Charge the gas refrigerant a little slowly into refrigeration cycle from check joint for low pressure.
2. Check the pressure after refrigeration cycle becomes stable.

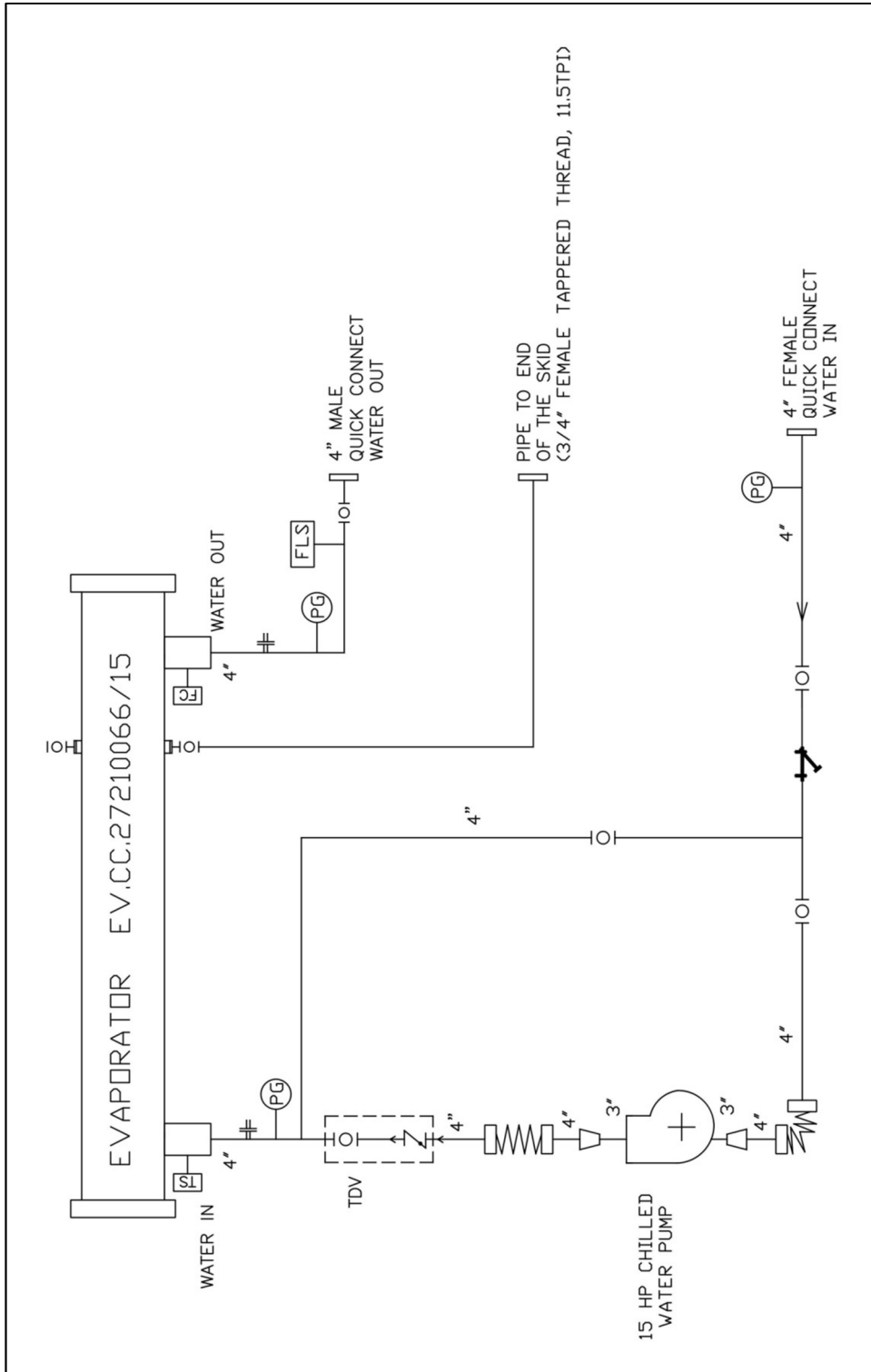
MAINTENANCE

Refrigerant Piping – SCOD060AR4



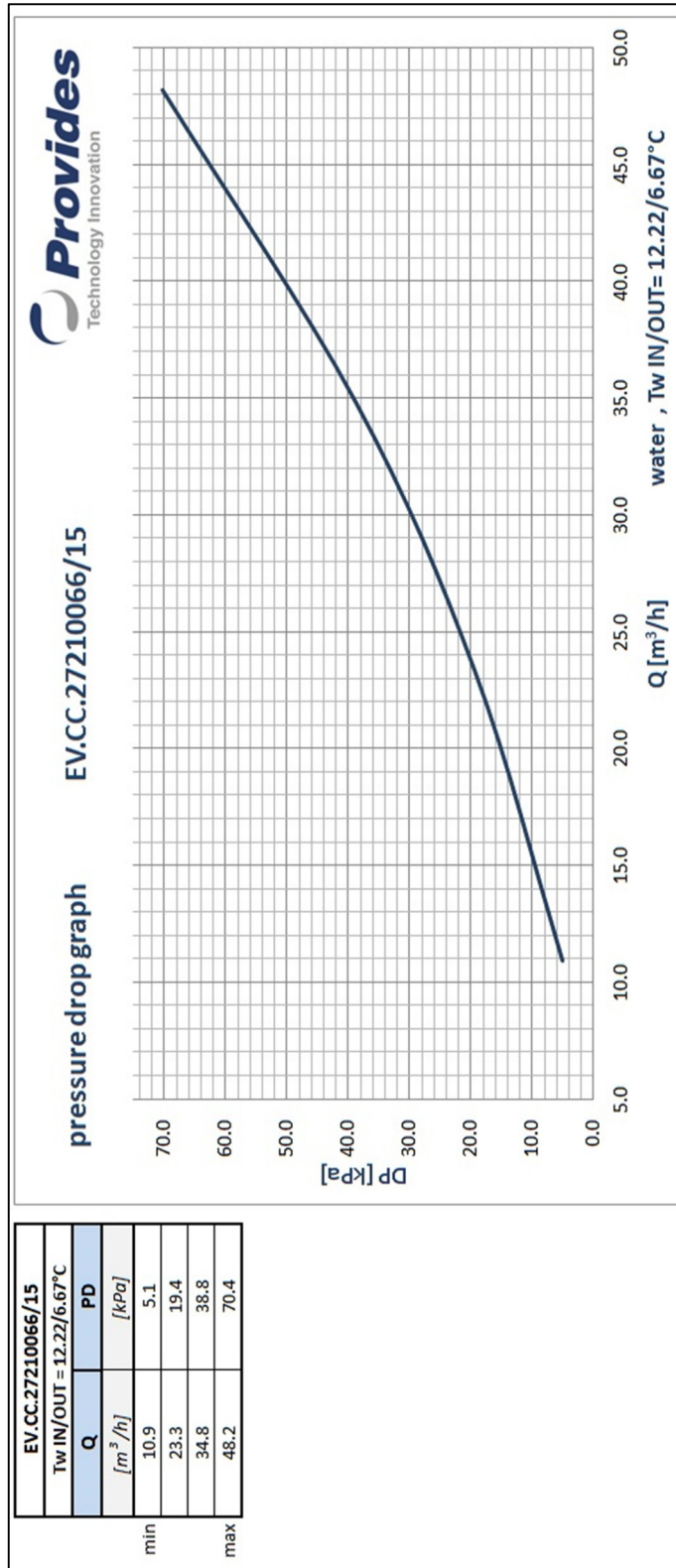
MAINTENANCE

Chilled Water Piping – SCOD060AR4



MAINTENANCE

Pressure Drop Performance Curve - SCOD060AR4



MAINTENANCE

Start-up Check Sheet

AIR COOLED DX SCREW CHILLER

TECH		DATE	
MODEL#		SERIAL#	
FACTORY ORDER#		CUSTOMER PO:	
C1 MODEL#		C1 SERIAL#	
C2 MODEL#		C2 SERIAL#	
EVAP MODEL#		EVAP SERIAL#	
COND MODEL#		COND SERIAL#	

SETTING OF UNIT:			
VIBRATION ISOLATOR USED?	YES	NO	
SPRING ISOLATOR ADJUSTED FOR EQUAL HEIGHT?	YES	NO	
IF RUBBER-IN-SHEAR ISOLATORS USED, UNIT LEVELED BY SHIMMING?	YES	NO	

POWER WIRING			
POWER WIRING COMPLETE?	YES	NO	
CONTROL WIRING COMPLETE?	YES	NO	
SEPARATE CHILLER/COND UNIT HEATER WIRING COMPLETE?	YES	NO	
ELECTRIC SERVICE ADEQUATE FOR LOAD?	YES	NO	
POWER SOURCE VOLATGE CORRECT FOR MOTOR(S) USED?	YES	NO	
MOTOR CIRCUIT HAS PROPER SIZE FUSETRONS?	YES	NO	
SYSTEM WIRED PER ELECTRICAL DIAGRAM?	YES	NO	
ALL LEAD CONNECTIONS TIGHTENED?	YES	NO	
WIRING COMPLIES WITH ALL LOCAL/NATIONAL CODES?	YES	NO	
FLOW SWITCHES OPERATING (IF APPLICABLE)?	YES	NO	

PIPING			
ALL EXTERNAL PIPING PROPERLY SUPPORTED?	YES	NO	
EXTERNAL REFRIGERANT PIPING SIZED PROPERLY? (IF APPLICABLE)	YES	NO	
PEA TRAPS USED WHERE NEEDED IN REFRIG. PIPING? (IF APPLICABLE)	YES	NO	
CHILLED WATER LINES INSULATED? (IF APPLICABLE)	YES	NO	

PRIOR TO START-UP			
OPEN LIQUID VALVES	YES	NO	
OPEN SUCTION & DISCHARGE VALVES TO PRESSURE GAUGES	YES	NO	
CHECK ROTATION OF ALL FAN MOTORS	YES	NO	
START AUXILIARY EQUIPMENT (PUMPS/FAN), IF APPLICABLE	YES	NO	
IS CRANKCASE OPERATING? OPERATE 24HRS PRIOR TO START-UP	YES	NO	
CHECK COMPRESSOR OIL LEVEL THROUGH C'CASE SIGHT GLASS. OIL LEVEL SHOULD BE 1/2 OF THE GLASS. IF LEVEL LOW, ADD OIL IN ACCORDANCE WITH DIRECTIONS IN THE IOM MANUAL	YES	NO	
CHECK ALL CONTROL SETTINGS AS SPECIFIED ON WIRING DIAGRAM	YES	NO	
AIR PURGED FROM CHILLED WATER SYSTEM (IF APPLICABLE)?	YES	NO	

MAINTENANCE

AFTER START-UP		
CHECK OIL TEMPERATURE SAFETY SWITCH	YES	NO
CHECK & ADJUST LOW TEMP FREEZE CONTROL AS NEEDED	YES	NO
CHECK & ADJUST UNIT CONTROLLER AS NEEDED	YES	NO
CHECK & ADJUST LOW PRESSURE CONTROL AS NEEDED	YES	NO
CHECK & ADJUST EXPANSION VALVE SUPERHEAT AS NEEDED	YES	NO

MAINTENANCE

Sample Log Sheet

AIR COOLED DX SCREW CHILLER

TECH		DATE			
MODEL#		SERIAL#			
FACTORY ORDER#		CUSTOMER PO:			
C1 MODEL#		C1 SERIAL#			
C2 MODEL#		C2 SERIAL#			
EVAP MODEL#		EVAP SERIAL#			
COND MODEL#		COND SERIAL#			
LEAK TEST					
TECH		MIC START		RISE	
DATE		MIC FINISH		TIME	
VERIFIED BY (WHOM - DATE):					
TEST STAND RUN					
AMB. AIR TEMP		FLOW RATE:			
COND OUT TEMP:		EVAP PSI ENT:			
REFRIGERANT:		EVAP PSI LVG:			
C1 AMPS		C2 AMPS			
C1 SUCT P		C2 SUCT P			
C1 SUCT T		C2 SUCT T			
C1 SAT S		C2 SAT S			
C1 SUC SH		C2 SUC SH			
C1 EV APR		C2 EV APR			
C1 DISH P		C2 DISH P			
C1 DISH T		C2 DISH T			
C1 SAT D		C2 SAT D			
C1 DSH		C2 DSH			
C1HG START		C2HG START			
C1 TOT FANS		C2 TOT FANS			
C1 FANS ON		C2 FANS ON			
C1 AC APR		C2 AC APR			
C1 LIQ P		C2 LIQ P			
C1 LIQ T		C2 LIQ T			
C1 SAT L		C2 SAT L			
C1 LIQ SC		C2 LIQ SC			
C1 OIL LVL		C2 OIL LVL			
C1 OIL COLOR		C2 OIL COLOR			
C1 LIQ SG		C2 LIQ SG			

MAINTENANCE

TEST STAND RUN HOURS:		DRIER CORES CHANGED:	
CALCULATED CAPACITY:		UNIT MEETS CAPACITY:	
SAFETIES CHECKED:			
SAFETY:	SETTING	VERIFIED	
HIGH PRESSURE - MICRO			
HIGH PRESSURE - MECHANICAL			
LOW AMPS			
HIGH AMPS			
LOW FLOW			
UNSAFE SUCTION			
LOW SUCTION			
FREEZE			

NOTE: THIS LOG SHEET IS PROVIDED AS A RECOMMENDATION OF THE READINGS THAT SHOULD BE TAKEN ON A PERIODIC BASIS. THE ACTUAL READINGS TAKEN AND THE FREQUENCY WILL DEPEND UPON THE UNITS APPLICATION, HOURS OF USE, ETC. THIS TYPE OF INFORMATION CAN PROVE VERY USEFUL IN PREVENTING AND/ OR SOLVING PROBLEMS THAT MIGHT OCCUR DURING THE LIFE OF THE UNIT.

MAINTENANCE

Troubleshooting Table

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. Unit will not start	<ol style="list-style-type: none"> 1. Power off 2. Main line open 3. Incorrect wiring 4. Loose terminals 5. Control circuit open 	<ol style="list-style-type: none"> 1. Check main disconnect switch. 2. Check main fuses. 3. Check with wiring diagrams. 4. Tighten terminals. 5. Check pump fuses, starter heater elements, pressure and temperature controls.
2. Compressor hums but does not start	<ol style="list-style-type: none"> 1. Low voltage 2. No power on one phase of 3 phase unit 3. Faulty starter or contactor 	<ol style="list-style-type: none"> 1. Check at main entrance and at unit. Consult power company if voltage is low and increase wire size to the unit if voltage is normal at main and low at unit. Voltage must be within 10% of motor nameplate rating. 2. Check fuses and wiring. 3. Check the contacts.
3. Compressor cycles on low pressure control	<ol style="list-style-type: none"> 1. Refrigerant shortage 2. No load on chiller 3. Restriction in liquid line 	<ol style="list-style-type: none"> 1. Check for leaks and add refrigerant. 2. Check pump operation and water flow. 3. a.) Plugged drier. If temperature drop exists across the drier remove and replace cores. b.) Liquid line or suction valve partially closed. Open valves fully and close in one full turn. c.) Expansion valve clogged or inoperative. Check superheat setting. Check charge and thermo bulb.
4. Compressor cycles on high pressure control	<ol style="list-style-type: none"> 1. Compressor discharge valve partially closed. 2. Overcharge of refrigerant 3. High pressure control improperly set 4. Condenser fan inoperative 5. Dirty condenser 6. Fan cycle switches inoperative, or set too high 7. Fan motors not running 8. Fan motor reverse rotation 	<ol style="list-style-type: none"> 1. Open valve fully and close with one turn 2. Purge system while in operation until bubbles show in sight glass. Close valve and add small amount of refrigerant until sight glass just clears. 3. Adjust the control. 4. Check, replace or repair set screw (pulley), fan motor, or inoperative fan control. 5. Clean condenser surfaces with brush and/or vacuum. 6. Check and readjust. 7. Check contactor, thermal overload relay, check motor, check capacitor. (If single phase) 8. Reverse two fan motor leads. (3 phase only)