# INSTALLATION AND MAINTENANCE MANUAL
# FOR HERMETIC SCROLL COMPRESSOR UNITS (SCU) AND
# HERMETIC SCROLL WATER-COOLED CONDENSING UNITS (SWU)


SCU-30

SWU-30

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# INSTALLATION

## Unit Identification

When the unit arrives, compare all nameplate data with ordering and shipping information

## Unit Inspection

When the unit is delivered, verify that it is the correct unit and that it is properly equipped. Compare the information, which appears on the unit nameplate with the ordering and submittal information

## Inspection Checklist

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- Inspect the individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 15 days.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier's terminal of the damage immediately, by phone and by mail. Request an immediate, joint inspection of the damage with the carrier and the consignee.
- Notify the NAPPS sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative.

## Loose Parts Inventory

Check all items against the shipping list. Items, which are shipped loose, could be placed inside the unit control panel for shipment. If the optional neoprene or spring isolators are ordered, they are secured in place on the shipping skid or inside the unit control panel.

## Unit Description

NAPPS hermetic scroll compressor and condensing units are designed for installation on a prepared surface, in a suitable weatherproof enclosure. The SCU compressor units and the SWU condensing units consist of one to four scroll compressors and an integral control panel mounted on a common base. The SWU condensing unit is also equipped with a single circuit, shell-and-tube type, water cooled condenser.

Units with manifolded compressor sets (20 ton and larger units) are piped in parallel and utilize a passive oil management system to maintain the proper compressor oil level.

All units are shipped with a full charge of refrigerant oil and a holding charge of dry nitrogen. They are dehydrated, leak tested, and all controls are run through a dry functional test before shipment. The liquid line valve (SWU) and the discharge line valve (SCU) are closed for shipment, to isolate the holding charge in the unit.

When installing either the SCU or the SWU, be sure to install a liquid line solenoid valve, a filter drier, a sight glass, a thermostatic expansion valve and any other valves necessary to perform normal service functions.

The unit wiring diagram and installation and maintenance manual have been shipped with the unit and can be found in the unit control panel. Be sure to read all of this literature before installing and operating the unit.

## Warnings and Cautions

**WARNINGS** and **CAUTIONS** appear in **boldface** type at appropriate points in this manual. Your personal safety and reliable operation of this equipment depend upon strict observance of these precautions. NAPPS assumes no liability for installation or service procedures performed by unqualified personnel.

## Unit Nameplate

The unit nameplate is mounted on the inside of the control panel door. The nameplate provides the following information:

- Unit model number
- Unit serial number
- Refrigerant type (to be filled in by the installer)
- Refrigerant charge in pounds (to be filled in by the installer)
- Maximum operating pressures (SWU only)
- Unit electrical requirements

## Compressor Nameplate

The nameplate for the hermetic scroll compressor is mounted on the compressor housing, near the motor terminal junction box.

## Storage

SCU and SWU units are designed for indoor installation only. Store the unit in a suitable weatherproof enclosure.

**CAUTION: Store these units in a protected area only. Do not store outdoors with a protective covering such as a plastic shroud. This can result in excessive water condensation that could damage controls and other components**.

## Noise Considerations

Locate the unit away from sound-sensitive areas. If necessary, install the optional isolators under the unit. Install vibration isolators in all piping and use flexible electrical conduit. Consult an acoustical engineer for critical applications

## Foundation

A base or foundation is recommended for most installations. Provide a level surface strong enough to support the unit. Refer to "Dimensional Data" for dimensions and weights. A flexible (isolated) concrete foundation or footings at each loading point will reduce transmission of vibration. Install anchor bolts in the concrete to secure the unit. If the floor is warped, uneven or in poor condition, make necessary repairs before positioning the unit. Once the unit is in place, it should be level, within ¼" over its entire length and width.

## Clearances

Provide enough space around the unit to allow the installation and maintenance personnel unrestricted access to all service points. Unit dimensions are given in ""Dimensional Data". There should be adequate clearance for condenser and compressor servicing. A minimum of three feet is recommended for compressor service. A minimum clearance of 3'-6" is required to open the control panel doors. In all cases, local codes will take precedence over these recommendations.

## Ventilation

Provisions must be made to remove heat generated by unit operation from the equipment room. Ventilation must be adequate to maintain an ambient temperature lower than 125°F.

The condenser relief valve on SWU units must be vented in accordance with all local and national codes.

## Drainage

Locate the unit near a large capacity drain for condenser drain-down during shutdown or repair.

## Handling

SCU and SWU units are shipped stretch wrapped and bolted to a shipping skid.

**WARNING! Do not remove the unit from the shipping skid until it is at the installation location. Moving these units when not properly secured to the skid can result in personal injury, or death, and can seriously damage the unit.**

The skidded unit can be moved by using a fork truck of suitable capacity. Refer to "Dimensional Data" for unit weights.

**WARNING! Any on-site lifting equipment must be capable of handling the weight of the**

**unit with an adequate safety factor. Use of under-capacity lifting equipment can result in personal injury, or death, and can seriously damage the unit**.

When moving the unit, the lifting forks must be positioned at either end of the unit, under the shipping skid. Lift the unit and move it to the desired location.

Once the unit is at the installation location, remove the stretch wrap. Inspect the unit for damage and report if damage is found.

The optional unit isolators (if ordered) are secured to the shipping skid or in the unit control panel. Other optional items such as the water regulating valve may be attached to the skid or shipped separately.

## Rigging

Two steel lifting rails, which are to be used for lifting the unit, are secured to the skid. Hardware is provided for mounting the lifting rails to the unit.

**WARNING! To prevent injury or death, and damage to the unit, the capacity of the lifting equipment must exceed the unit lifting weight by an adequate safety factor**.

### Lifting Procedure

1. Remove the stretch wrap from the unit as described above, leaving the unit mounted to the skid.
2. Remove the two steel lifting rails from the skid.
3. Bolt the lifting rails to the unit, one lifting rail on each end of the unit, using the nuts and bolts provided.
4. Tighten each bolt to 69 foot-pounds torque.

**WARNING! To prevent injury or death, and damage to the unit, be certain the lifting angle mounting bolts are tightened to the recommended torque.**

5. Install clevis connectors in the 1 ¼" lifting holes provided on each of the lifting angles.
6. Attach lifting chains (cables) to the clevis connectors. Each chain (cable) alone must be strong enough to lift the unit.
7. Attach chains (cables) to a lifting beam. Position the lifting beam and chains (cables) so that they do not contact the unit piping or the unit control panel.

**CAUTION: To prevent damage to the unit, position the lifting beam and chains (cables) so that they do not contact the unit piping or the unit control panel**.

8. Remove the bolts that secure the unit to the shipping skid.
9. Raise the unit just off the skid to make sure that the unit is level when lifted. Adjust chain (cable) lengths as required.
10. Lift the unit off of the skid and place in the installation location.

### Alternate Moving Method

If it is not possible to lift the unit from above, as discussed previously, the unit can be raised off of the skid with jacks placed under the lifting rails. Then position equipment dollies under each end of the unit frame, lower the unit onto the dollies, and roll the unit into position.

## Direct Mounting

The unit can be installed directly on a rigid mounting surface as long as the surface is level and will support the weight of the unit. A ¾" hole is provided in the unit mounting brackets at each of the four unit mounting locations. A schematic of the mounting locations is shown in "Dimensional Data". Provide a means of securely anchoring the unit to the mounting surface. Level the unit carefully.

## Compressor Isolation

All compressors are rigidly bolted to the same compressor mounting frame. To prevent compressor movement during shipping, each compressor mounting frame is screwed to the top of its unit frame at the factory. These screws must be removed before the unit is operated. Remove the four tie-down screws that secure the compressor mounting frame to the unit frame.

## Unit Piping

### General Water Piping Recommendations

Make water piping connections to the evaporator and condenser. Isolate and support piping to prevent stress on the unit. Use flanged ells or spool-pieces to facilitate service procedures. Construct piping according to local and national codes. Insulate and flush the piping before connecting the unit.

**Caution: To prevent equipment damage, bypass the unit if using an acidic flushing agent.**

Use a pipe sealant of Teflon tape on all water connections. Minimize heat gain and prevent condensation by insulating all chilled water piping.

**Caution: To prevent damage to water piping, do not over-tighten connections**.

## Condenser Water Piping (SWU only)

Condenser water inlet and outlet types, sizes and locations are given in "Unit Data". Condenser piping components and layout vary, depending on the water source and connection locations, but this system should include a water regulating valve. The optional water regulating valve maintains condensing pressure and temperature by throttling water flow leaving the condenser in response to compressor discharge pressure. Adjust the regulating valve for proper operation during unit start-up. Under full load conditions the water temperature rise should be 10° F, producing a flow rate in the range of 3 gpm per ton. Condenser piping must be in accordance with all local and national codes.

## Water Treatment

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Consult a qualified water treatment specialist to determine if treatment is needed.

**Caution: The use of untreated or improperly treated water in these units may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine if treatment is needed. NAPPS warranty specifically excludes liability for corrosion, erosion or deterioration of NAPPS equipment. NAPPS assumes no responsibilities for the results of the use of untreated or improperly treated water or saline/brackish water**

## Water Pressure Relief Valves

Install a water pressure relief valve in the condenser leaving water line. Water vessels with close-coupled shutoff valves have a high potential for hydrostatic pressure buildup on a water temperature increase. Refer to applicable codes for relief valve installation guidelines.

## Refrigerant Piping

### General

The refrigerant pipe sizes selected must be within the velocity and pressure drop limitations required for proper system operation. It is essential that refrigerant piping be properly sized and applied, since these factors have a significant effect on system performance and reliability.

**Note:** Piping should be sized and laid out according to the job plans and specifications. This should be accomplished when the system components are selected.

**Caution: Use Type K or L refrigerant grade copper tubing only. The use of lower grade tubing can cause operating problems.**

**Liquid Line Components**

Thermostatic expansion valves, refrigerant sight glasses, solenoid valves, Schraeder valves and filter dryers must be installed for proper operation.

Install a liquid line service valve and charging port (SCU only) in the liquid line near the condenser. Install shutoff valves in the liquid line to isolate the filter drier for service.

**Liquid Line Sizing**

The liquid line diameter should be as small as possible, while maintaining acceptable pressure drop. This will minimize the required refrigerant charge and increase compressor life.

Liquid risers in a system require an additional 0.5 psig pressure drop per each foot of vertical rise. If riser length exceeds 15 feet, a larger diameter and/or shorter liquid line may be required to provide required subcooling at the expansion valve. The line does not have to be pitched. Basic liquid line sizing parameters for these units are:

Liquid velocity …….100-250 fpm.

Maximum allowable
pressure drop ……3-6 psig (1°F).

Liquid lines are not usually insulated. If, however, the line runs through an area of high ambient temperature (e.g. Boiler room), subcooling may drop below required levels. Liquid lines passing through these warm spaces should be insulated.

**Discharge (Hot Gas) Lines (SCU only)**

Pitch the discharge lines in the direction of hot gas flow, at the rate of ½" per 10 feet of horizontal run. Discharge line size is based on the velocity required to provide good oil movement. Basic discharge line parameters are:

Maximum allowable
pressure drop ……..6 psig.

Maximum velocity …….3500 fpm.

Minimum velocities
(at minimum load):

Horizontal lines ……..500 fpm.

Vertical lines
(upward flow) …….1000 fpm

**Suction Line Sizing**

Gas velocity is another consideration when sizing suction lines. It has been found that the minimum velocity requirement to move oil in horizontal suction lines is 500 fpm. For vertical up-flow suction lines, it must be increased to 1000 fpm. Keeping all suction line velocities below 4000 fpm will avoid excessive and undesirable noise levels.

**Leak Testing**

Use refrigerant as a tracer for leak detection and use dry nitrogen to develop required test pressure. Test the high and low side of the system at pressures dictated by local codes.

When leak testing a refrigerant system, observe these safety precautions:

**WARNING! Do not use oxygen, acetylene, or compressed air, in place of refrigerant and dry nitrogen, for leak testing. A violent explosion can result, which could cause serious injury or death.**

**WARNING! Always install a pressure regulator, shutoff valves, and gauges to control pressures during leak testing procedures. Unregulated pressures may cause line ruptures, equipment damage, or an explosion, which could result in personal injury or death.**

## Electrical Wiring

**General Recommendations**

The wiring procedures, as described in this portion of the manual, must be accomplished to obtain proper operation of the basic SCU or SWU unit.

**WARNING! To prevent injury or death, disconnect electrical power source before completing connections to the unit.**

All wiring must comply with National Electrical Code (NEC) and state and local requirements. Outside the United States, the national and/or local electrical requirements of other countries shall apply. The installer must provide properly sized system interconnecting and power supply wiring with appropriate fused disconnect switches. Type and locations of disconnects must comply with all applicable codes.

**Caution: To prevent corrosion and overheating at terminal connections, use copper conductors, sized per NEC and based on nameplate RLA.**

**Caution: All wiring must comply with applicable local and national codes.**

**Caution: Type and location of fused disconnect switches must comply with applicable local and national codes.**

Minimum circuit ampacities, recommended fuse sizes and other unit electrical data are provided on the unit nameplate.

## Power and Control Wiring

### Unit Power Wiring

The installing contractor must connect appropriate power wiring (with fused disconnects) to the terminal block or non-fused, unit-mounted disconnect in the power section of the unit control panel. Electrical schematics and component location drawings are also mounted on the inside of the control panel door.

The unit power fused disconnect switch should be located in the general area of the unit, to comply with NEC or local codes. Some codes require line-of-sight disconnect locations. The unit disconnect can be used as an emergency shutdown device.

### Unit Control Wiring

The installing contractor must connect the unit to a **temperature control device** with an appropriate number of control stages.

A **liquid line solenoid valve**(s) must be installed as shown in the electrical schematic. It is recommended that the evaporator be divided into the same number of circuits as the unit has capacity steps, with a solenoid valve on each circuit. When the evaporator must have only one circuit, the solenoid valve should be installed in the position indicated for Solenoid #1.

"**Accessory Start Contacts**" are provided (see electrical schematic) for controlling auxiliary devices which must run when the compressors run. These contacts are normally open, and close when the unit is running. The contacts are rated for 3amps (.8 amps inductive) at 240 vac.

"**Summary Fault Contacts**" are provided (see electrical schematic) for the remote signaling of a fault condition. These contacts are normally open, and close during a fault condition. The contacts are rated for 3amps (.8 amps inductive) at 240 vac.

Terminals are provided for the **installation of devices intended to prevent the unit from operating** under certain conditions. These devices may include flow switches, sail switches, building controllers, pump auxiliary contacts, etc. To install these devices, remove the jumper which is flagged on the schematic as "Remove Jumper To Install Remote Disable Contacts" and connect the contacts in its place. To install more than one device, put the contacts of all the devices in series.

Terminals are provided for the **installation of additional safety devices**. These devices may include freeze-stats, high-temperature switches, low temperature switches, etc. To install these devices, remove the jumper which is flagged on the schematic as "Remove Jumper To Install Additional Safety Devices" and connect the safety contacts in its place. Contacts installed here should be normally closed, and open during a fault condition. When a contact in this position opens, the unit will lock out and require a reset to continue operating. Turning the thermostat off and back on will reset the unit. To install more than one additional safety device, put the contacts in series.

## Scroll Compressor Electrical Phasing

### General

It is important that proper rotation of the scroll compressor be established before the machine is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the inlet power supply phased "ABC" or "L1, L2, L3".

The order in which the three voltages of a three-phase system succeed one another is called phase sequence or phase rotation.. When rotation is clockwise, phase sequence is usually called "ABC" and when counterclockwise, "CBA".

This direction may be reversed by interchanging any two of the line wires. It is this possible interchange of wiring that makes a phase sequence indicator necessary, if the operator is to quickly determine the phase rotation of the motor.

### Setting The Proper Electrical Phase Sequence

Proper compressor motor electrical phasing can be quickly determined and, if necessary, corrected before starting the unit. Use a quality instrument, such as an Associated Research Model 45 Phase Sequence indicator or equivalent and follow this procedure.

1. Verify that all operating controls for the unit are in the "Off" position.
2. Open the electrical disconnect or circuit protection switch that provides line power to the power distribution block in the unit control panel
3. Connect the phase sequence indicator leads to the power distribution block as follows:

| Phase Seq. Lead | Terminal ID |
|---|---|
| Black (Phase A) | L1 |
| Red (Phase B) | L2 |
| Yellow (Phase C) | L3 |

4. Turn power on by closing the unit supply power fused disconnect switch.
5. Read the phase sequence displayed on the indicator. The "ABC" LED on the face of the phase indicator will glow if phase sequence is ABC

**WARNING! To prevent injury or death due to electrocution, take extreme care when performing service procedures with electrical power energized**.

6. If the "CBA" indicator glows instead, open the unit main power disconnect and switch two line leads on the power distribution block in the unit control panel. Close the main power disconnect and recheck phasing.
7. Open the unit disconnect and remove the phase indicator.

## Unit Voltage

Electrical power to the unit must meet stringent requirements for the unit to operate properly. Total voltage supply and voltage imbalance between phases should be within the tolerances discussed below.

### Voltage Supply

Measure each leg of supply voltage at the line voltage disconnect switches. Readings must fall within the range of 187-254 volts for units with a nameplate voltage of 208/230 volt and 414-508 volts for units with a nameplate voltage of 460 volts. If voltage on any leg does not fall within tolerance, notify the power company and request correction of this situation before operating the unit. Inadequate voltage to the unit will shorten the life of relay contacts and compressor motors.

### Voltage Imbalance

Excessive voltage imbalance between phases in a three-phase system will cause motors to overheat and eventually fail. Maximum allowable imbalance is 2 percent. Voltage imbalance is defined as 100 times the maximum deviation of the three voltages (three phases) subtracted from the average (without regard to sign), divided by the average voltage.

## Equipment Grounds

Provide proper grounding at the connection point provided in the unit control panel.

## Installation Checklist

As the unit is installed, complete this checklist to verify that all recommended procedures are accomplished before the unit is started. This checklist does not replace the detailed

instructions given in previous sections of this manual. Read the entire installation section carefully to become familiar with the procedures before installing the unit.

**Unit Location**

- —— Inspect installation location for adequate ventilation.
- —— Provide drain facilities for condenser (SWU).
- —— Remove and discard all shipping material (skid, etc.).
- —— Inspect to insure that all service access clearances are adequate.
- —— Install optional neoprene or spring isolators (if required).
- —— Secure the unit to the mounting surface.
- —— Level the unit.
- —— Isolate the compressor by removing the shipping bolts that hold the isolators down.

**Condenser Connections (SWU)**

- —— Make condenser water connections.
- —— Install a water regulating valve in the water outlet line, if required.
- —— Install shutoff valves, thermometers, plugged clean-out tees, and pressure gauges in the water inlet and outlet lines.
- —— Install a water strainer and pressure reducing valve on the water inlet piping.
- —— Install drain piping with shutoff valves.
- —— Install a manual or automatic bypass valve in the cooling tower water supply (if used).
- —— Install refrigerant discharge piping for the condenser relief valve.
- —— Flush and clean all condensing water piping.

**Refrigerant Piping**

- —— Perform the initial leak test.
- —— Connect a properly sized and constructed liquid line (with charging valve, solenoid valve, filter drier, sight glass, and expansion valve) to the liquid line connection on the condenser (SWU).
- —— Connect a properly sized and constructed discharge line to the compressor discharge line connection (SCU).
- —— Connect a properly sized and constructed suction line from the evaporator to the suction line connection at the compressor (SWU, SCU).
- —— Insulate the suction line. Also insulate the hot gas bypass line (if used).
- —— Insulate the lengths of discharge or liquid line that are exposed to extremes in temperature.
- —— Leak test the unit and all piping connections.

**Power Supply Wiring**

- —— Connect proper power supply wiring, with fused disconnect, to the power distribution block (or unit mounted disconnect) in the unit control panel.
- —— Connect proper power supply wiring, with fused disconnects, to the condenser water pump starter, to the cooling tower fan starter (if used), and to the air-cooled condenser control panel.
- —— Connect proper power supply wiring to the evaporator fan coil.
- —— Connect proper power supply wiring to the customer-provided remote thermostat (if required).

**System Interconnection Wiring**

- —— Connect proper wiring to interlock the condenser water pump and the cooling tower (or air-cooled condenser) operation with unit start-up.
- —— Provide proper wiring to interlock the unit start-up with airflow switch operation.
- —— Connect proper wiring to interlock the liquid line solenoid valve operation with unit call for cooling.
- —— Connect proper wiring to interlock the low ambient lockout thermostat with unit operation (if used).
- —— Connect proper wiring from the customer-provided room thermostat to provide ON/OFF function for all stages of unit.

## Maintenance

Because Trane scroll compressors are a uniquely different design from traditional reciprocating compressors, their operating characteristics and requirements are a departure from the reciprocating compressor technology.

## Compressor Oil

The Trane scroll compressor uses Trane OIL-00078 (407c systems) without substitution. For 10-ton scroll compressors, the appropriate oil charge is 7 pints. For 15-ton scroll compressors, the appropriate oil charge is 11.5 pints.

Oil Level. While the compressor is running, the oil level may be below the sight glass but still visible through the sight glass. The oil level should never be above the sight glass!

Oil Appearance. If the oil is dark and smells burnt, it was overheated because of compressor operation at extremely high condensing temperatures, a compressor mechanical failure, or occurrence of a motor burnout. If the oil is black and contains metal flakes, a mechanical failure has occurred. This symptom is often accompanied by a high amperage draw at the compressor motor.

**Note:** If a motor burnout is suspected, use an acid test kit to check the condition of the oil. If a burnout has occurred, test results will indicate an acid level exceeding 0.05 mg KOH/g.

**Note:** The use of commercially available oil additives is not recommended. Liability for any detrimental effects that the use of non-approved products may have on equipment performance or longevity must be assumed by the equipment owner, equipment servicer, or the oil additive manufacturer.

## Compressor Motor Winding Thermostat

Each motor winding thermostat is a pilot-duty control, designed to stop compressor operation if the motor windings become hot due to rapid cycling, loss of charge, abnormally low suction temperatures, or the compressor running backwards.

## Compressor Electrical Phasing

Proper phasing of the electrical power is critical for proper operation and reliability of the scroll compressor. If the compressor electrical phasing is incorrect, the motor will draw low current, the suction and discharge pressures will change very little, and a rumble or rattle may be heard.

**Note:** The scroll compressor does not have suction or discharge valves. However, the symptoms for a phase reversal are similar to those for a valve failure.

**Note:** If the lockout relay has tripped, power removal from the control circuit is required for a restart.

**Note:** Whenever the lockout relay trips, compressor phasing should be checked as described under the section "**Scroll Compressor Electrical Phasing**".

## Scroll Compressor Functional Test

Since the scroll compressor does not use discharge or suction valves, it is not necessary to perform a pump-down capability test, i.e. a test where the liquid line valve is closed and the compressor is pumped in a vacuum to see if it will pump-down and hold. If fact, this kind of test may actually damage the scroll compressor!

**Caution: Do not pump the scroll compressor into a vacuum. Scroll compressors can pull internal low vacuums when the suction side is closed or restricted. This, in turn, may cause the internal Fusite terminal to arc, resulting in compressor damage or failure. It may also trip the circuit breakers, blow fuses, or trip the discharge thermostat.**

**The proper procedure for checking scroll compressor operation is outlined below:**

1. Verify that the compressor is receiving supply power of the proper voltage.
2. With the compressor running, measure the suction and discharge pressures to determine whether or not they fall within the normal operating ranges for the unit.

Normal operating pressures for the unit with a scroll compressor are the same as for a unit with a reciprocating compressor.

If the operating pressures do not seem correct, see “Scroll Compressor Electrical Phasing”.

## Compressor Operational Noises

Because the scroll compressor is designed to accommodate liquids (both oil and refrigerant) and solid particles without causing compressor damage, there are some characteristic sounds that differentiate it from those typically associated with a reciprocating compressor. These sounds, which are described below, are normal and do not indicate that the compressor is defective.

At Low Ambient Start-up: When the compressor starts up under low ambient conditions, the initial flow rate of the compressor is low, due to the low condensing pressure. This causes a low differential across the thermal expansion valve that limits its capacity. Under these conditions, it is not unusual to hear the compressor rattle until the suction pressure climbs and the flow rate increases. These sounds are normal and do not affect the operation or reliability of the compressor.

## Excess Amp Draw

Normally this condition occurs either because the compressor is operating at an abnormally high condensing temperature or because of low voltage at the compressor motor.

Motor amp draw may also be excessive if the compressor has internal mechanical damage. In this situation, vibration and discolored oil can also be observed.

## Low Suctions

Low suctions can be caused by a plugged screen on the compressor suction inlet. If the screen is plugged, the pressure in the oil sump, as measured at the oil charging valve, will be lower than the suction pressure measured at the evaporator.

Also, low suction pressures may be caused by low evaporator load. Other symptoms that may accompany low suctions include a rattling sound emitted from the compressor or an open motor winding thermostat or discharge thermostat.

## Excessive Vibration

If the compressor vibrates and does not pump, check the compressor phasing as described in “Scroll Compressor Electrical Phasing” and check the oil level and the oil’s appearance.

## Periodic Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

### Monthly

- —— Check compressor oil level.
- —— Check unit refrigerant charge by measuring sub-cooling or visually checking the sight glass for the presence of bubbles.
- —— Check refrigerant superheat at the compressor suction line. Superheat should be in the range of 10°-20°F.
- —— Check compressor phasing (See “Scroll Compressor Electrical Phasing”).

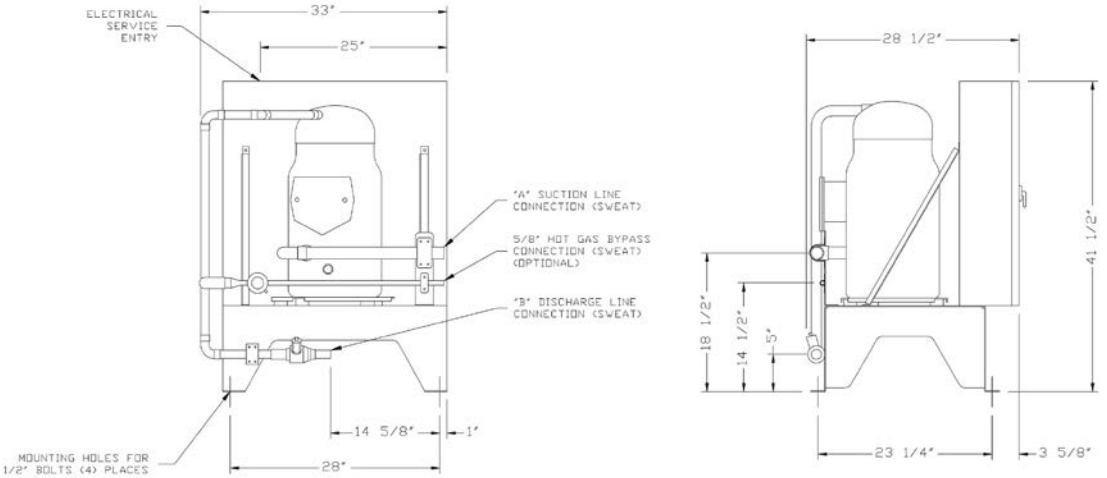
### Annually

- —— With the unit disconnect switch open, inspect the panel wiring. All electrical connections should be secure. Inspect the compressor contactors. If the contacts appear severely burned or pitted, replace the contactor. Do not clean the contacts.
- —— Remove any accumulation of dust and dirt from the unit.
- —— Check condenser water flow rate (SWU only).
- —— With unit operating, check refrigerant discharge and suction pressures.

## Dimensional & Electrical Data

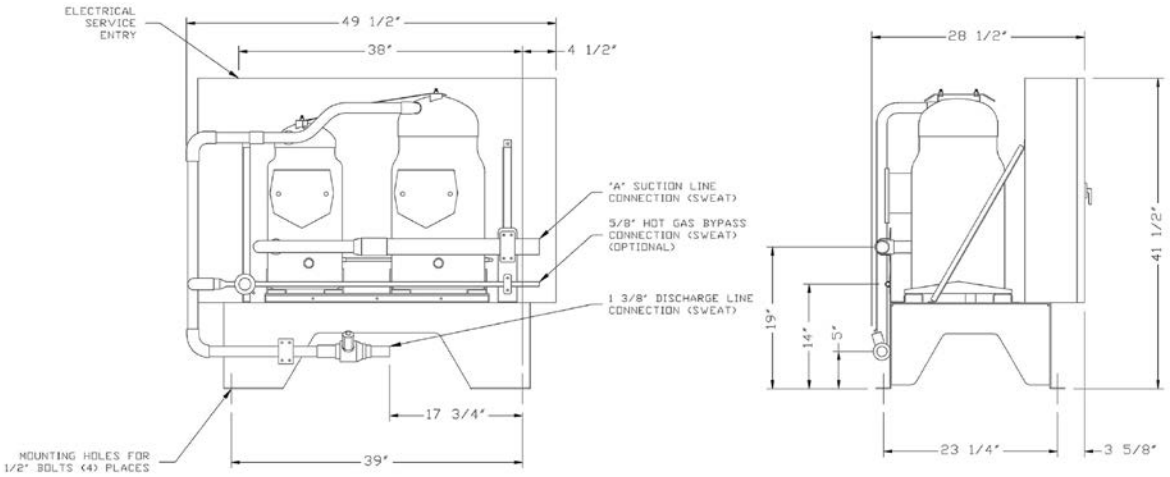
### SCU-10 & SCU-15

| | PHYSICAL DATA | | | ELECTRICAL DATA – 208/230 VOLT, 3ϕ, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ϕ, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | "B" | OPERATING WEIGHT | COMPRESSOR RLA | COMPRESSOR LRA | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SCU-10 | 1 3/8" | 7/8" | 360 LBS. | 43 | 251 | 53 | 90 | 60 | 19 | 117 | 23 | 40 | 30 |
| SCU-15 | 1 5/8" | 1 1/8" | 427 LBS. | 63 | 376 | 78 | 125 | 90 | 28 | 178 | 35 | 60 | 40 |



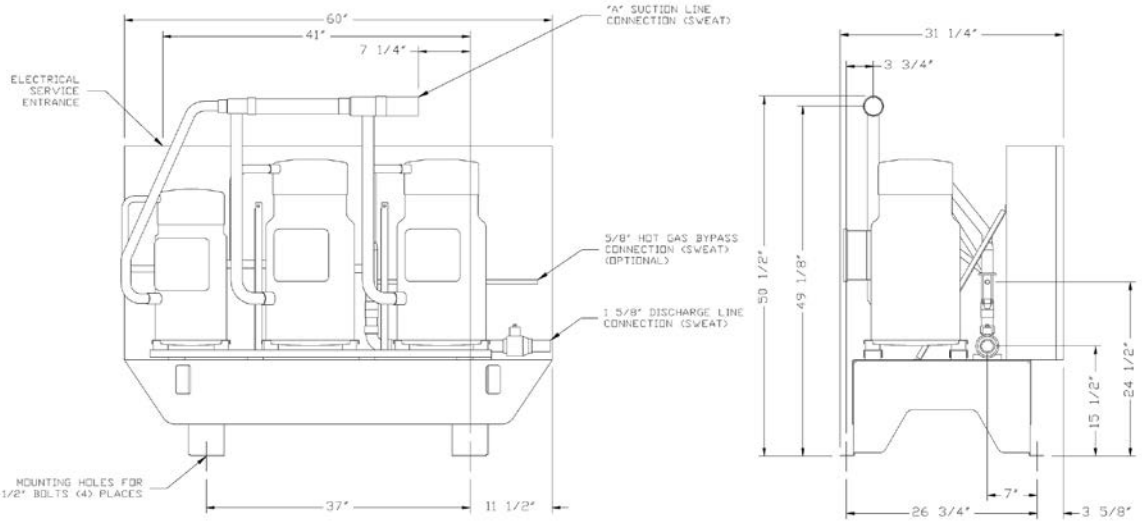

### SCU-20, SCU-25 & SCU-30

| | PHYSICAL DATA | | ELECTRICAL DATA – 208/230 VOLT, 3ϕ, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ϕ, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SCU-20 | 1 5/8" | 570 LBS. | 43/43 | 251/251 | 95 | 125 | 110 | 19/19 | 117/117 | 42 | 60 | 50 |
| SCU-25 | 2 1/8" | 637 LBS. | 43/63 | 251/376 | 120 | 175 | 150 | 19/28 | 117/178 | 53 | 80 | 60 |
| SCU-30 | 2 1/8" | 704 LBS. | 63/63 | 376/376 | 140 | 200 | 175 | 28/28 | 178/178 | 63 | 90 | 70 |



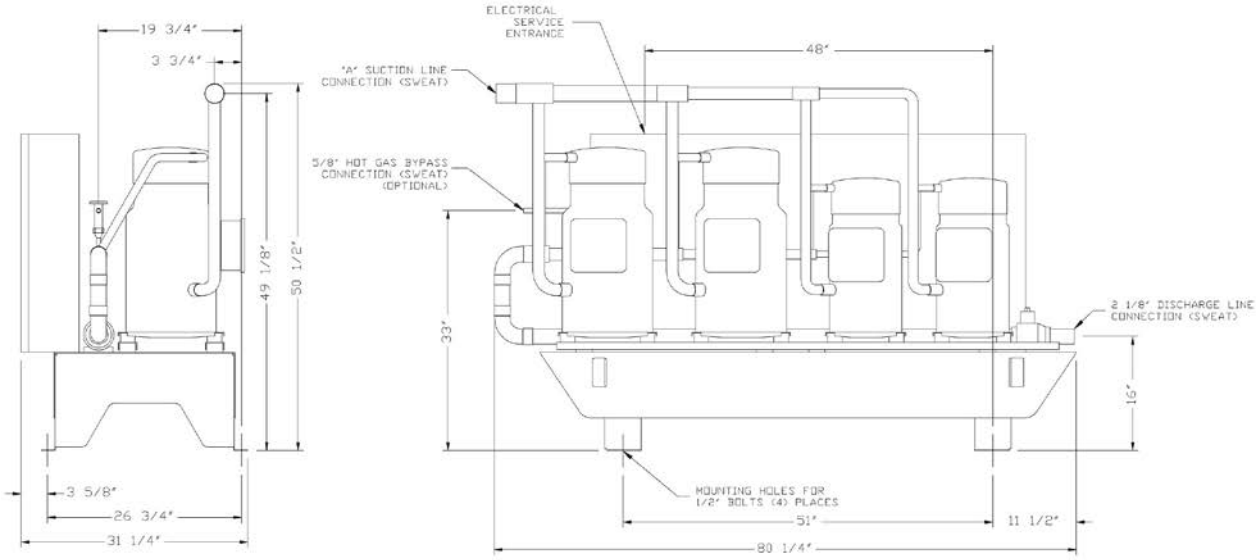
## SCU-35, SCU-40 & SCU-45

| | PHYSICAL DATA | | ELECTRICAL DATA – 208/230 VOLT, 3ø, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ø, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SCU-35 | 2 1/8" | 897 LBS. | 43/43/63 | 251/251/376 | 163 | 225 | 175 | 19/19/28 | 117/117/178 | 72 | 100 | 80 |
| SCU-40 | 2 5/8" | 964 LBS. | 43/63/63 | 251/376/376 | 183 | 225 | 200 | 19/28/28 | 117/178/178 | 81 | 110 | 90 |
| SCU-45 | 2 5/8" | 1031 LBS. | 63/63/63 | 376/376/376 | 203 | 250 | 225 | 28/28/28 | 178/178/178 | 90 | 110 | 100 |



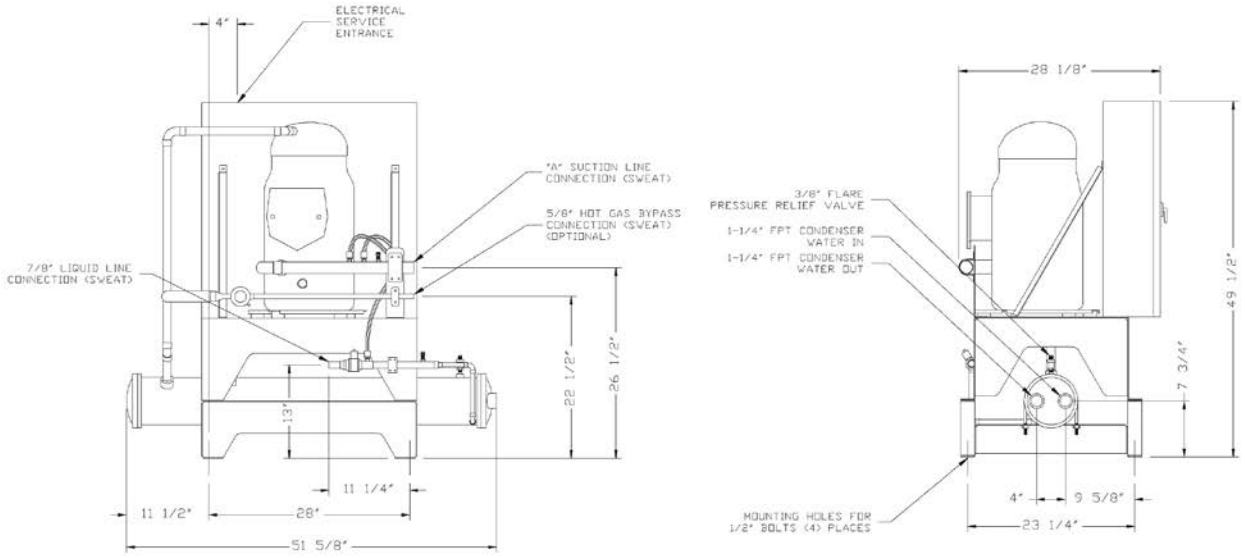

## SCU-50 & SCU-60

| | PHYSICAL DATA | | ELECTRICAL DATA – 208/230 VOLT, 3ø, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ø, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SCU-50 | 2 5/8" | 1224 LBS. | 63/63/43/43 | 376/376/251/251 | 225 | 250 | 250 | 28/28/19/19 | 178/178/117/117 | 99 | 125 | 110 |
| SCU-60 | 3 1/8" | 1358 LBS. | 63/63/63/63 | 376/376/376/376 | 265 | 300 | 300 | 28/28/28/28 | 178/178/178/178 | 118 | 125 | 125 |



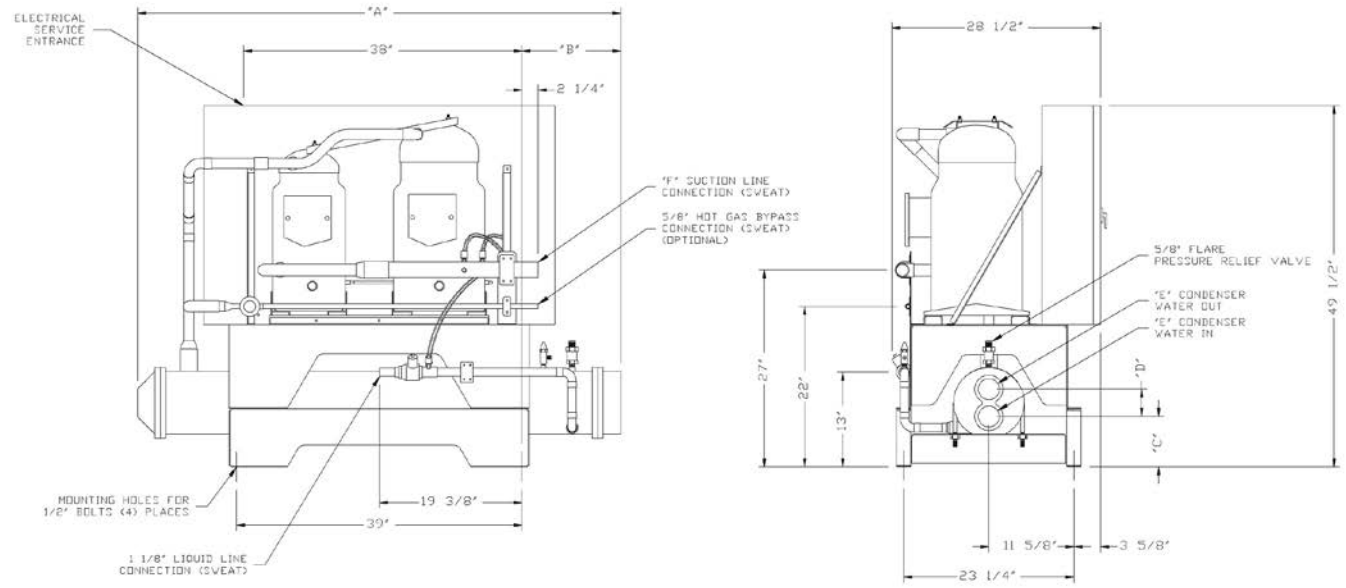
## SWU-10 & SWU-15

| | PHYSICAL DATA | | ELECTRICAL DATA – 208/230 VOLT, 3φ, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3φ, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | OPERATING WEIGHT | COMPRESSOR RLA | COMPRESSOR LRA | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA | COMPRESSOR LRA | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SWU-10 | 1 3/8" | 620 LBS. | 43 | 251 | 53 | 90 | 60 | 19 | 117 | 23 | 40 | 30 |
| SWU-15 | 1 5/8" | 697 LBS. | 63 | 376 | 78 | 125 | 90 | 28 | 178 | 35 | 60 | 45 |



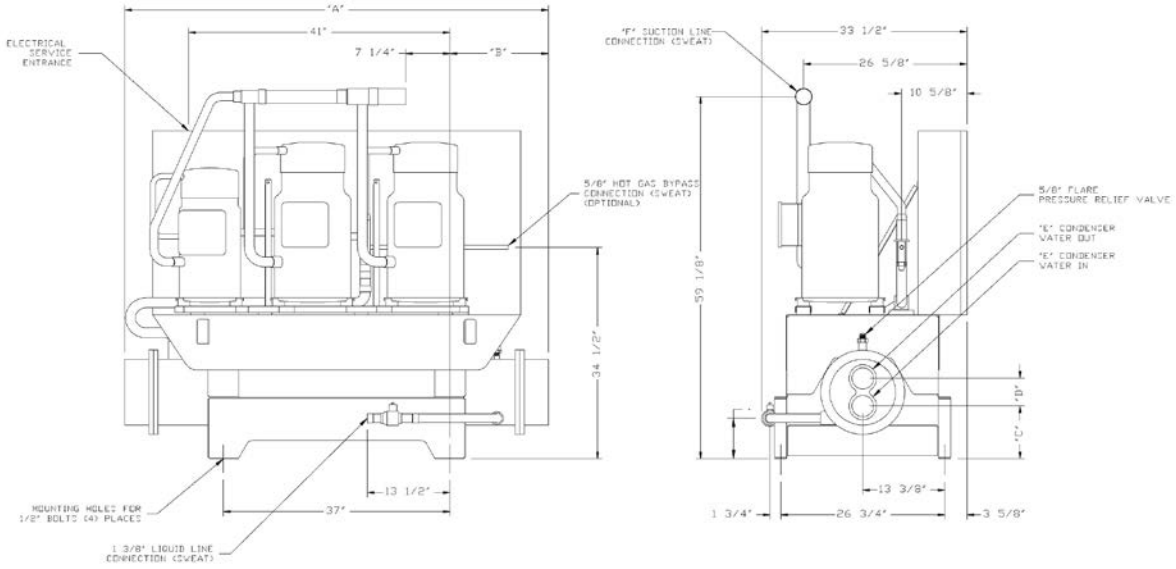

## SWU-20, SWU-25 & SWU-30

| | PHYSICAL DATA | | | | | | | ELECTRICAL DATA – 208/230 VOLT, 3φ, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3φ, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | "B" | "C" | "D" | "E" | "F" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SWU-20 | 64" | 12 1/2" | 6 3/8" | 2 7/8" | 2" FPT | 1 5/8" | 875 LBS. | 43/43 | 251/251 | 95 | 125 | 110 | 19/19 | 117/117 | 42 | 60 | 50 |
| SWU-25 | 64" | 12 1/2" | 6 3/8" | 2 7/8" | 2" FPT | 2 1/8" | 952 LBS. | 43/63 | 251/376 | 120 | 175 | 150 | 19/28 | 117/178 | 53 | 80 | 60 |
| SWU-30 | 66" | 13 1/2" | 7" | 3 3/4" | 2½" FPT | 2 1/8" | 1124 LBS. | 63/63 | 376/376 | 140 | 200 | 175 | 28/28 | 178/178 | 63 | 90 | 70 |



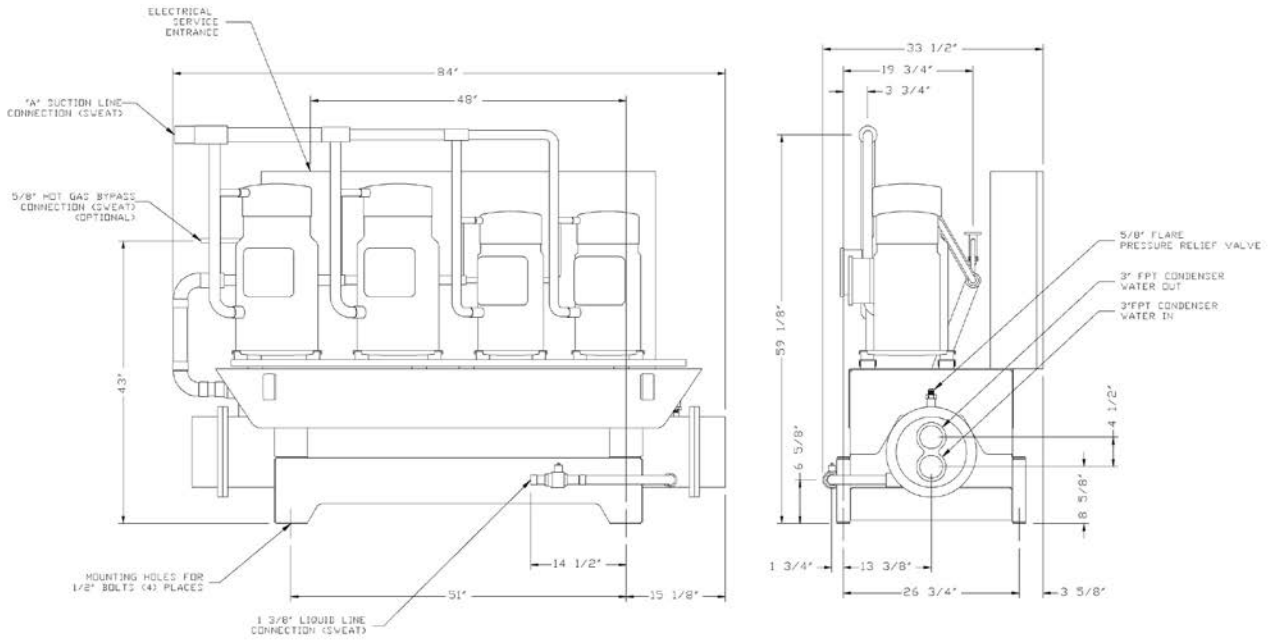
## SWU-35, SWU-40 & SWU-45

| | PHYSICAL DATA | | | | | | | ELECTRICAL DATA – 208/230 VOLT, 3ø, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ø, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | "B" | "C" | "D" | "E" | "F" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SWU-35 | 66" | 14 1/2" | 8" | 3 3/4" | 2½" FPT | 2 1/8" | 1327 LBS. | 43/43/63 | 251/251/376 | 163 | 225 | 175 | 19/19/28 | 117/117/178 | 72 | 100 | 80 |
| SWU-40 | 78" | 20 1/2" | 8" | 3 3/4" | 2½" FPT | 2 5/8" | 1434 LBS. | 43/63/63 | 251/376/376 | 183 | 225 | 200 | 19/28/28 | 117/178/178 | 81 | 110 | 90 |
| SWU-45 | 69 1/8" | 16 1/16" | 8 5/8" | 4 1/2" | 3" FPT | 2 5/8" | 1621 LBS. | 63/63/63 | 376/376/376 | 203 | 250 | 225 | 28/28/28 | 178/178/178 | 90 | 110 | 100 |



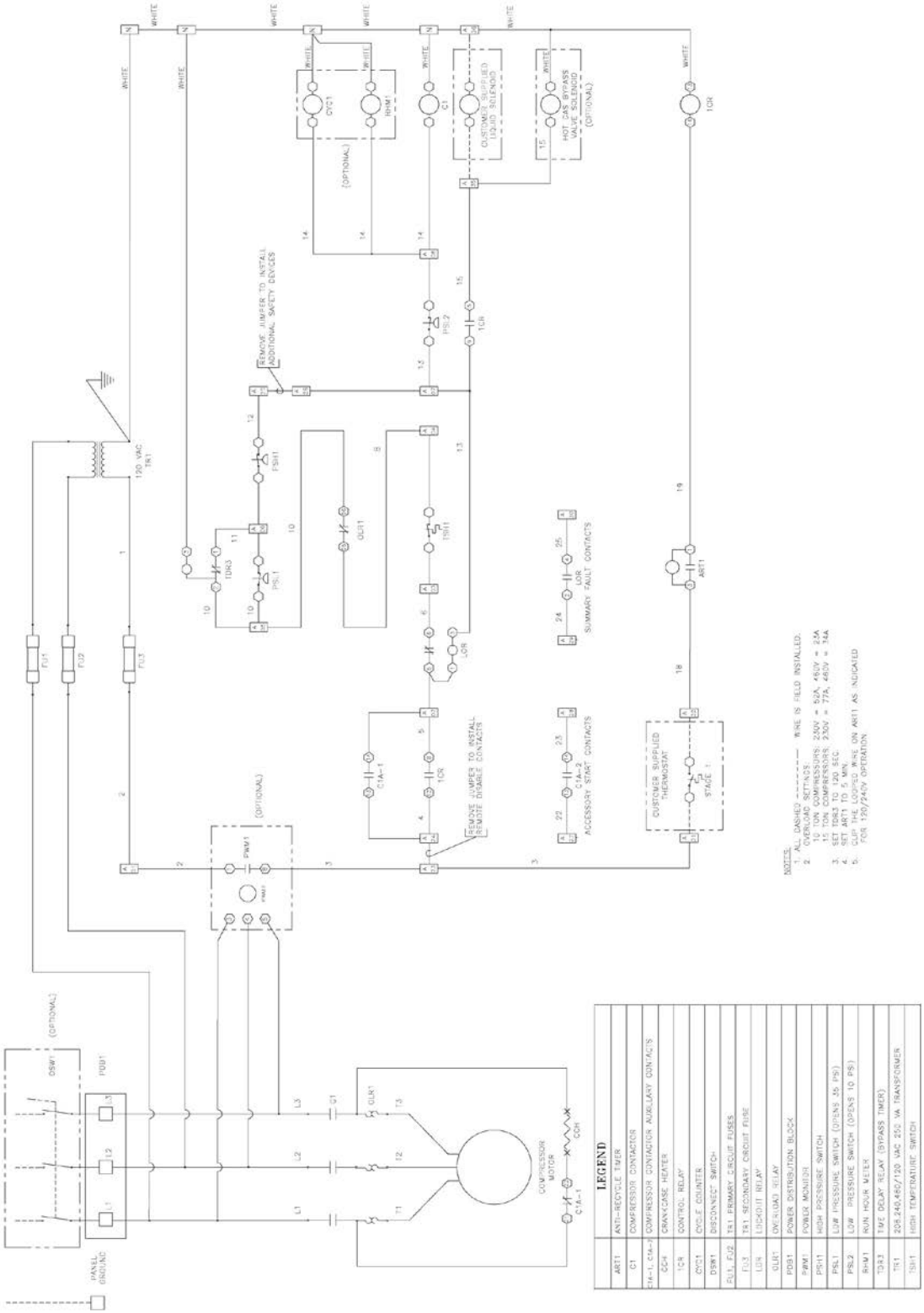

## SWU-50 & SWU-60

| | PHYSICAL DATA | | ELECTRICAL DATA – 208/230 VOLT, 3ø, 60 HZ | | | | | ELECTRICAL DATA – 460 VOLT, 3ø, 60HZ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | "A" | OPERATING WEIGHT | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE | COMPRESSOR RLA (EACH) | COMPRESSOR LRA (EACH) | MINIMUM CIRCUIT AMPACITY | MAXIMUM FUSE SIZE | RECOMMENDED TIME DELAY FUSE |
| SWU-50 | 2 5/8" | 1849 LBS. | 63/63/43/43 | 376/376/251/251 | 225 | 250 | 250 | 28/28/19/19 | 178/178/117/117 | 99 | 125 | 110 |
| SWU-60 | 3 1/8" | 1983 LBS. | 63/63/63/63 | 376/376/376/376 | 265 | 300 | 300 | 28/28/28/28 | 178/178/178/178 | 118 | 125 | 125 |

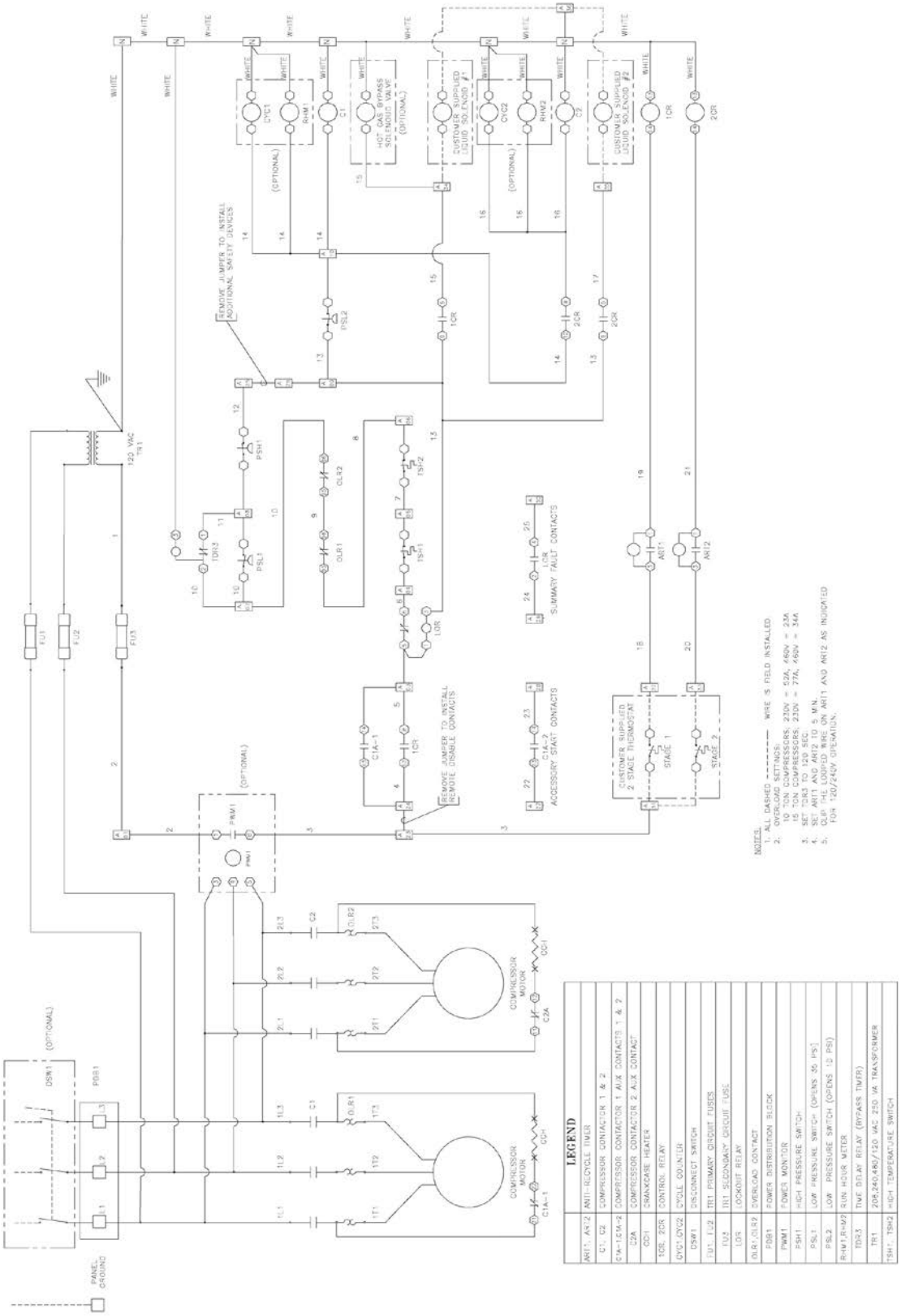


## Electrical Schematic

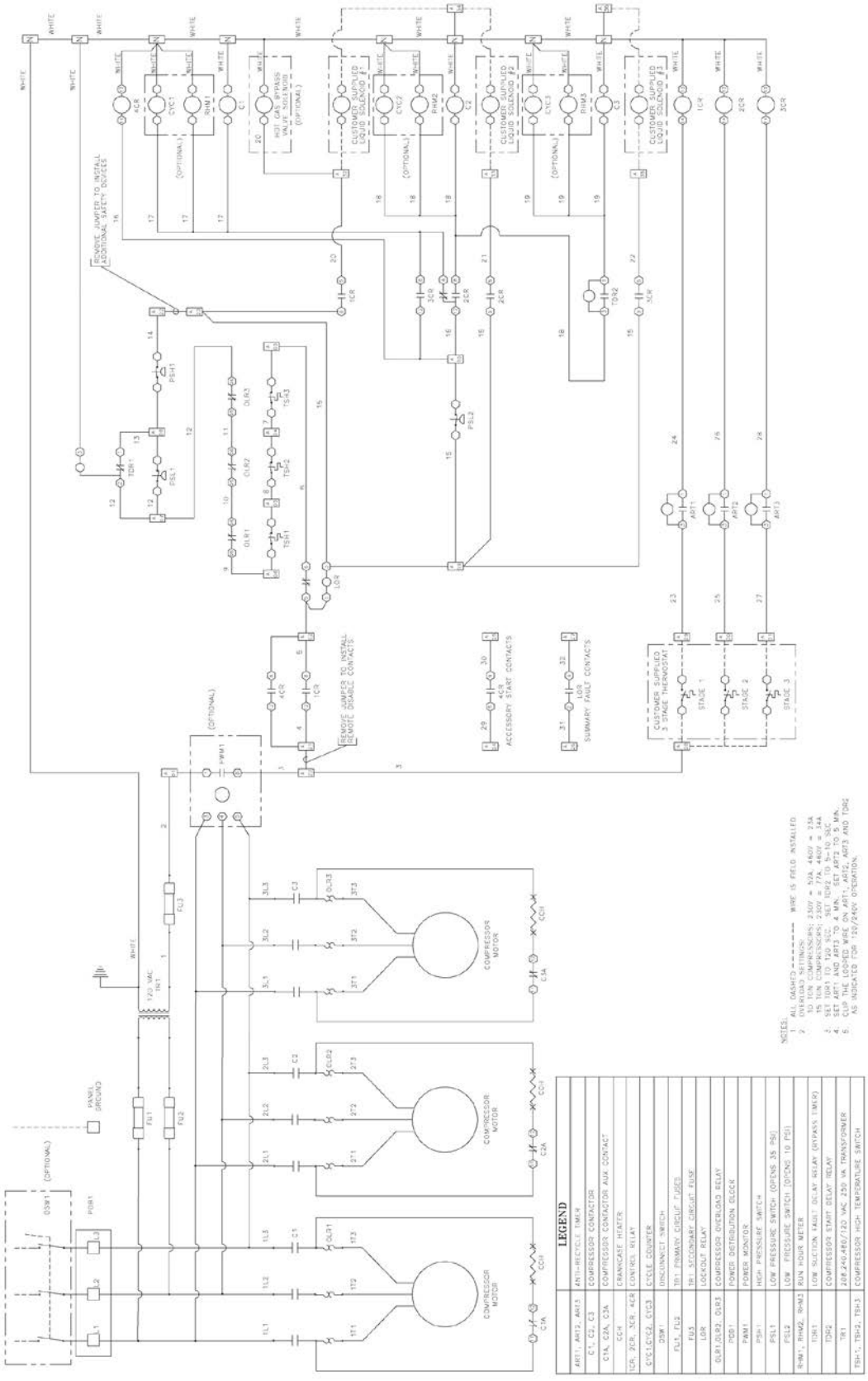
### Units with One Compressor



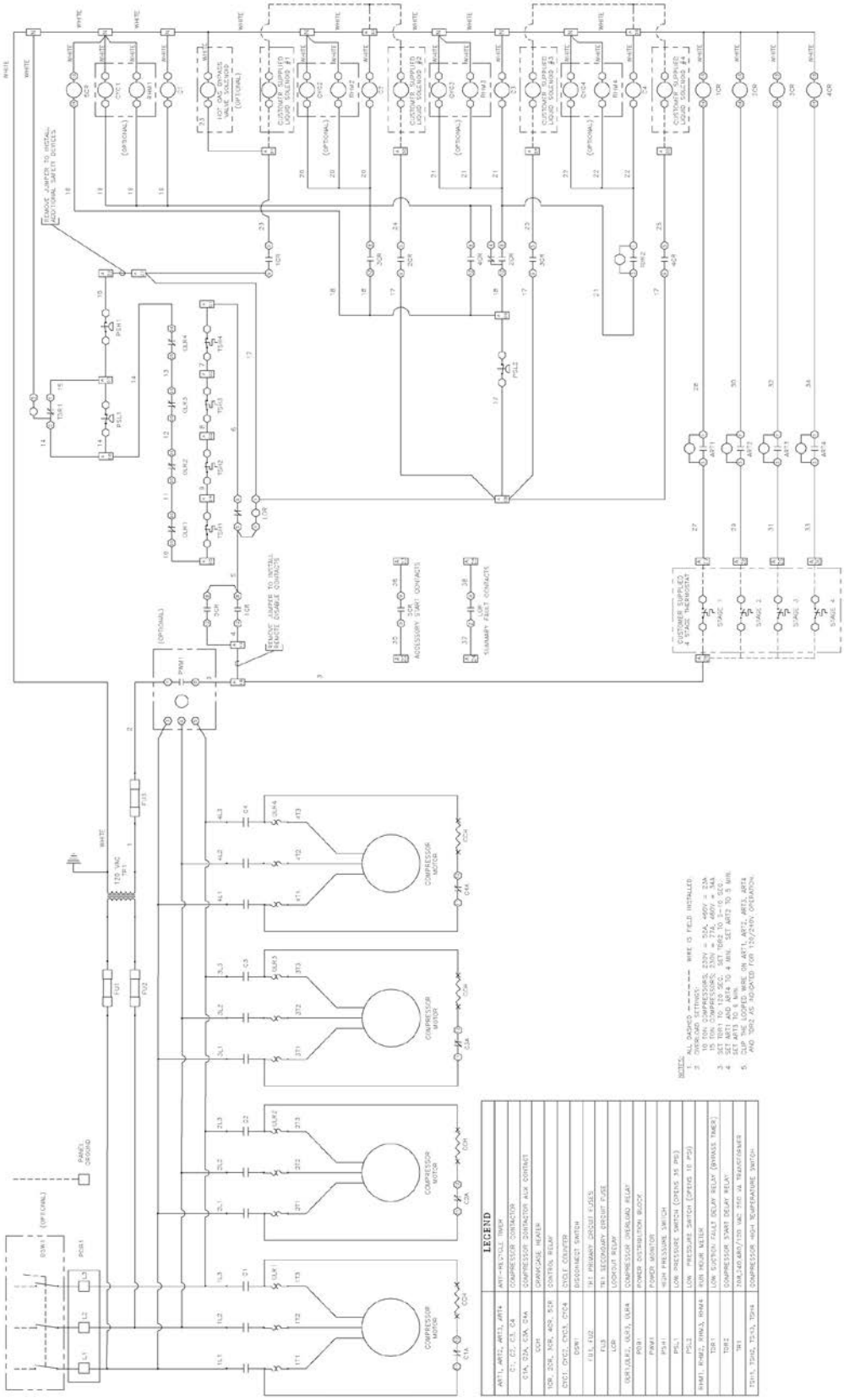
## Units with Two Compressor



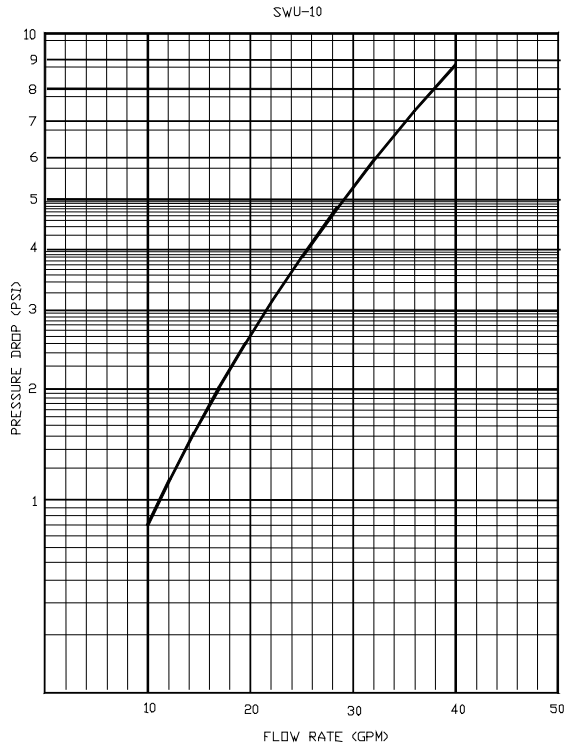
## Units with Three Compressors

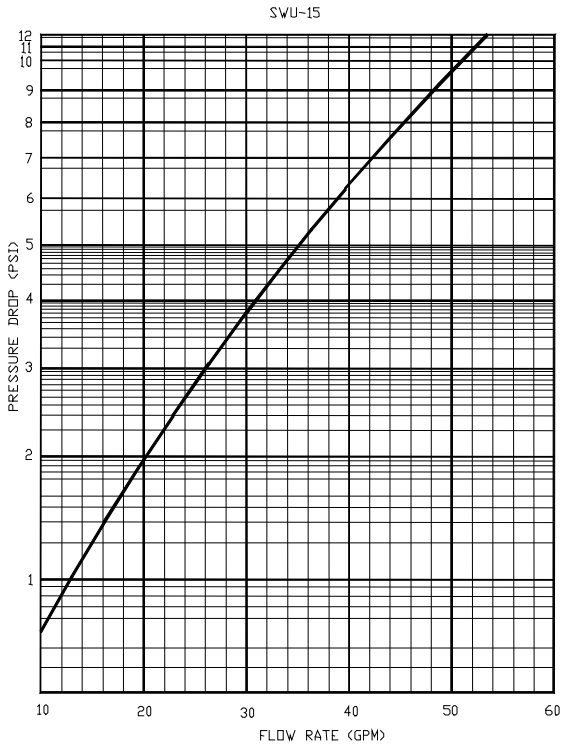


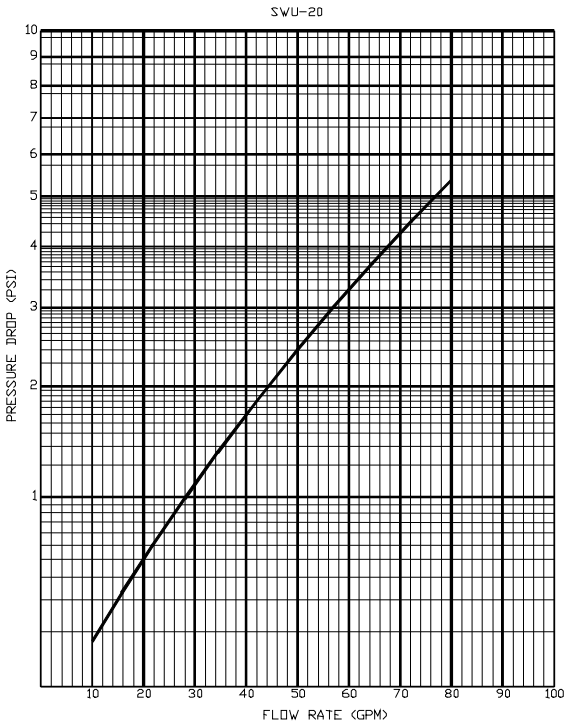
## Units with Four Compressors

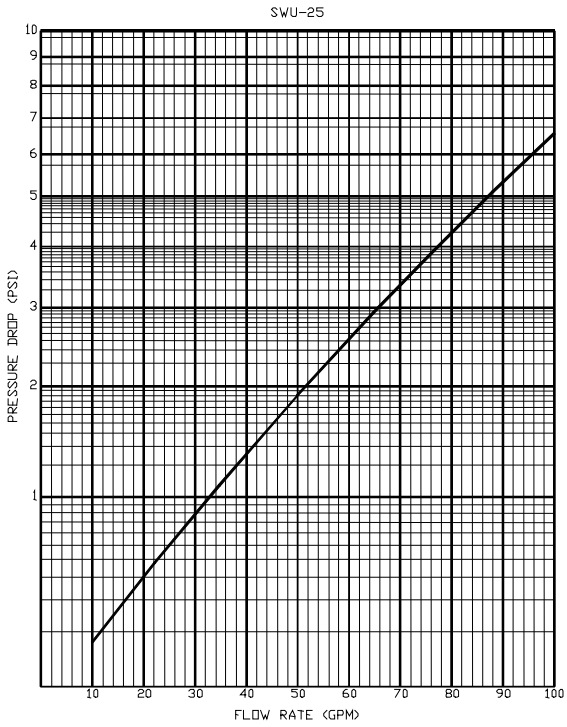


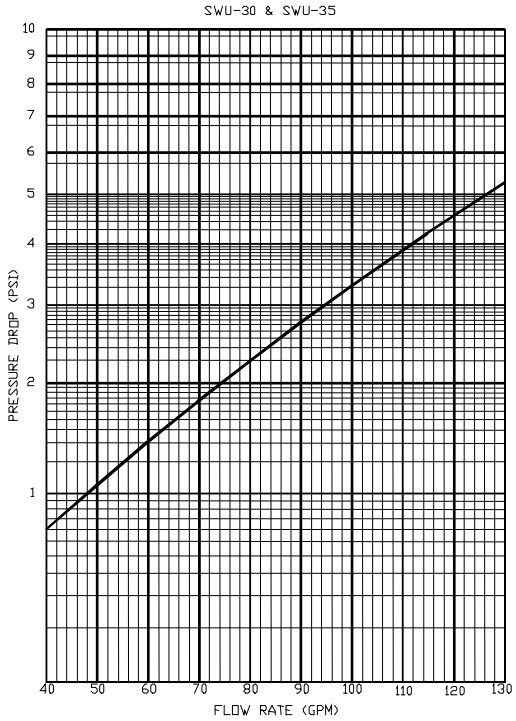
## Water Flow vs. Pressure Drop

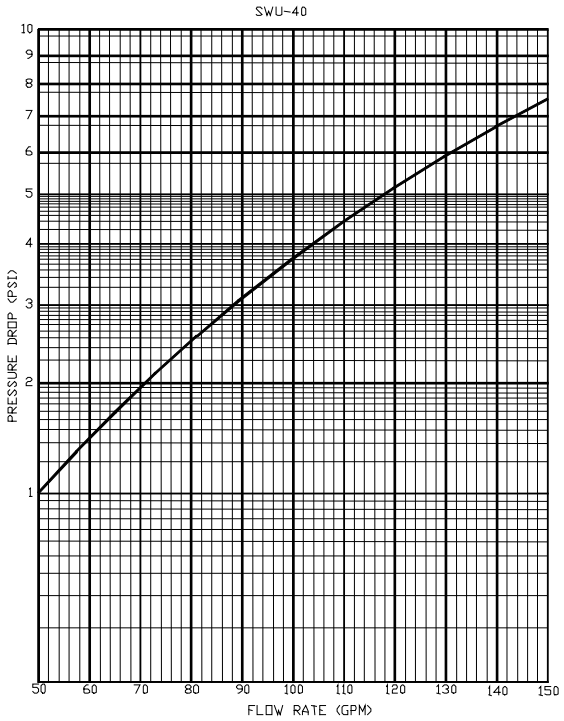


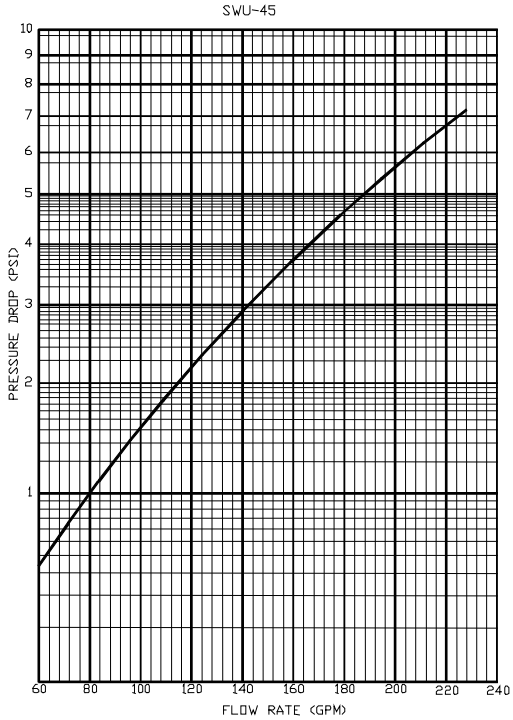



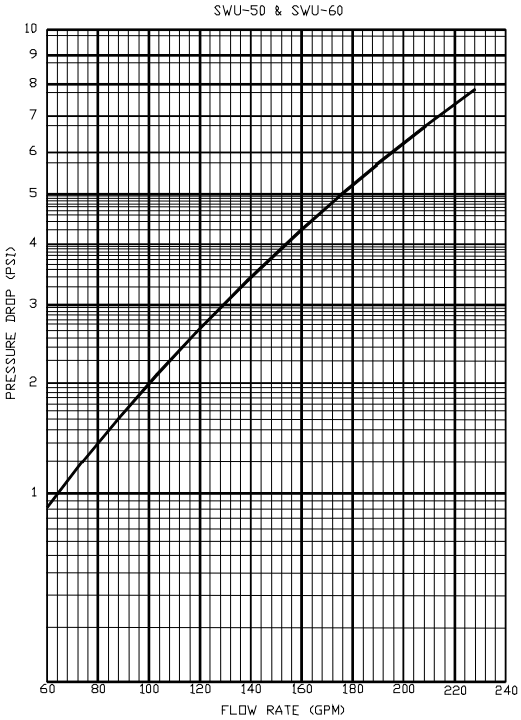




SWU-30 & SWU-35
PRESSURE DROP (PSI)
10
9
8
7
6
5
4
3
2
1
40
50
60
70
80
90
100
110
120
130
FLOW RATE (GPM)


SWU-40
PRESSURE DROP (PSI)
10
9
8
7
6
5
4
3
2
1
50
60
70
80
90
100
110
120
130
140
150
FLOW RATE (GPM)


SWU-45
PRESSURE DROP (PSI)
10
9
8
7
6
5
4
3
2
1
60
80
100
120
140
160
180
200
220
240
FLOW RATE (GPM)


SWU-50 & SWU-60
PRESSURE DROP (PSI)
10
9
8
7
6
5
4
3
2
1
60
80
100
120
140
160
180
200
220
240
FLOW RATE (GPM)

## Warranty

### I. LIMITED PRODUCT WARRANTY & SERVICE POLICY

Napps Industries, Inc. (NAPPS) warrants for a period of twelve (12) months from date of original shipment that all products, manufactured by NAPPS, with the exception of packaged refrigeration products, are free from defects of material and workmanship when used within the service, range, and purpose for which they were manufactured. Packaged refrigeration products shall be so warranted for a period of twelve (12) months from date of start-up or eighteen (18) months from date of original shipment, whichever may first occur. Service Parts shall be so warranted for a period of ninety (90) days from date of installation, or twelve (12) months from date of original shipment, whichever may first occur.

In case material is rejected on inspection by the buyer as defective, NAPPS shall be notified in writing within ten (10) days from receipt of said material. NAPPS will then have the option of re-inspection at the buyer's plant or its own plant before allowing or rejecting the buyer's claim. Expenses incurred in connection with claims for which NAPPS is not liable may be charged back to the buyer. No claim for correction will be allowed for work done in the field except with the written consent of NAPPS. Defects that do not impair service shall not be cause for rejection. NAPPS assumes no liability in any event for consequential damages. No claim will be allowed for material damaged by the buyer or in transit. Defective equipment or parts shall be returned to NAPPS freight prepaid.

NAPPS will, at its option, repair, replace or refund the purchase price of products found by NAPPS to be defective in material or workmanship provided that written notice of such defect requesting instruction for repair, replacement or refund is received by NAPPS within ten (10) days of determination of said defect, but not more than one (1) year after the date of shipment, and provided that any instructions given thereafter by NAPPS are complied with.

Any products covered by this order found to NAPPS' satisfaction to be defective upon examination at NAPPS' factory will, at NAPPS' option, be repaired or replaced and returned to Buyer via lowest cost common carrier, or NAPPS may, at its option, grant Buyer a credit for the purchase price of the defective article.

Without limitation of the foregoing, this warranty shall not apply to (i) deterioration by corrosion or erosion of material or any cause or failure other than defect of material or workmanship; (ii) the performance of any system of which NAPPS' products are a component part; or (iii) any of NAPPS' products or parts thereof which have been subjected to alteration or repair by anyone other than NAPPS or someone authorized by NAPPS, or subjected to misuse, neglect, free chemicals in system, corrosive atmosphere, abuse or improper use or misapplication such as breakage by negligence, accident, vandalism, the elements, shock, vibration or exposure to any other service, range or environment of greater severity than that for which the products were designed, or if operation is contrary to NAPPS' or manufacturer's recommendation, or if the serial number has been altered, defaced or removed.

Hermetic motor/compressors furnished by NAPPS are subject to the standard warranty terms set forth above, except that the hermetic motor/compressor replacements or exchanges shall be made through the nearest authorized wholesaler of the hermetic motor/compressor manufacturer (not NAPPS' factory) and no freight shall be allowed for transportation of the hermetic motor/compressor to and from the wholesaler. For TRANE hermetic motor/compressors, the nearest wholesaler referred to herein shall be the nearest TRANE PARTS CENTER. The replacement hermetic motor/compressor shall be identical to the model of the hermetic motor/compressor being replaced. Additional charges, which may be incurred through the substitution of other than identical replacements, are not covered by this warranty.

THE WARRANTY PROVIDED ABOVE IS THE ONLY WARRANTY MADE BY NAPPS WITH RESPECT TO ITS PRODUCTS OR ANY PARTS THEREFORE AND IS MADE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, BY COURSE OF DEALING, USAGES OF TRADE OR OTHERWISE, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE OR OF MERCHANTABILITY UNDER THE UNIFORM COMMERCIAL CODE. IT IS AGREED THAT THIS WARRANTY IS IN LIEU OF AND BUYER HEREBY WAIVES ALL OTHER WARRANTIES, GUARANTEES OR LIABILITIES ARISING BY LAW OR OTHERWISE. NAPPS SHALL NOT INCUR ANY OTHER, OBLIGATIONS OR LIABILITIES OR BE LIABLE TO BUYER OR ANY CUSTOMER OF BUYER FOR ANY ANTICIPATED OR LOST PROFITS, INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR ANY OTHER LOSSES OR EXPENSES INCURRED BY REASON OF THE PURCHASE, INSTALLATION, REPAIR, USE OR MISUSE BY BUYER OR THIRD PARTIES OF ITS PRODUCTS (INCLUDING ANY PARTS REPAIRED OR REPLACED); AND NAPPS DOES NOT AUTHORIZE ANY PERSON TO ASSUME FOR NAPPS ANY OTHER LIABILITY IN CONNECTION WITH THE PRODUCTS OR PARTS THEREFORE. NAPPS SHALL NOT BE RESPONSIBLE FOR THE LOSS OR REPLACEMENT OF OR THE ADDITION OF COMPRESSOR OIL, OR REFRIGERANT. THIS WARRANTY CANNOT BE EXTENDED, ALTERED OR VARIED EXCEPT BY A WRITTEN INSTRUMENT SIGNED BY NAPPS AND BUYER.

## II. LIMITATION OF LIABILITY

NAPPS shall not be liable, in contract or in tort, for any special, indirect, incidental or consequential damages, such as, but not limited to, loss of profits, or injury or damage caused to property, products, or persons by reason of the installation, modification, use, repair, maintenance or mechanical failure of any NAPPS product.