Model DSH
Ceiling Mounted Ducted R-410A
Air Conditioning Units

New Release

Form 145.32-IOM1 (908)

CEILING MOUNTED DUCTED R-410A
AIR CONDITIONING UNITS
INSTALLATION INSTRUCTIONS

IMPORTANT!
READ BEFORE PROCEEDING!
GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTE is used to highlight additional information which may be helpful to you.

All wiring must be in accordance with published specifications and must be performed ONLY by qualified service personnel. Johnson Controls will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this will void the manufacturer's warranty and cause serious damage to property or injury to persons.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls policy for continuous product improvement, the information contained in this document is subject to change without notice. While Johnson Controls makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest Johnson Controls service office.

It is the responsibility of operating/service personnel as to the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then, prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

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GENERAL INFORMATION

Our units are designed to meet the ever-changing (unique) installation requirements of today's market. The horizontal configuration is unitized for single package or split installation. Low profile design allows the unit to be installed on the floor or suspended from the ceiling. All unit components are securely mounted inside the heavy gauge "Galvalume" sheet metal cabinet. All units are lined with a 1/2 in. thick – 21lb density acoustical insulation to ensure the quietest operation. All models are shipped with medium-efficiency 2-in. thick throw-away filters. Multi-position filter rack is external to the cabinet.

Unit can be turned on its side for short periods of time, which allows passage through standard door sizes. Removal of the cross supports on the top and sides will convert packaged unit into a split system, allowing the condensing section to be installed remotely from the evaporator section.

Horizontal units 2, 3, 4 & 5 ton models have a single refrigerant circuit configuration. All models are equipped with an adjustable thermal expansion valve (with external equalizer), one valve per circuit. Each refrigerant circuit is also equipped with a liquid line filter drier, sight glass/moisture indicator and easy access service gauge ports. All 2-5 ton models are shipped as factory-charged unitized packages. The 2-5 ton units include refrigerant line shut-off valves to allow the units to be field split.

Installation time is minimized with all models. When planning an installation consider power supply, thermostat, condensate drain line, duct run, servicing allowances, and load points. A remote thermostat control device is field supplied and installed to control the units operation. Each refrigerant circuit is equipped with auto-reset high pressure and low pressure switches. Each circuit is constantly monitored by ComfortAlert module. By monitoring and analyzing data from the Copeland Scroll compressor and the thermostat demand, the module can accurately detect the cause of electrical and system related failures and protect the compressor. A flashing LED indicator communicates the ALERT code and guides the service technician more quickly and accurately to the root cause of a problem. Control circuit is 24-volt operation with oversized transformer. Optional anti-short circuit timers can be field/factory installed.

Service access doors are equipped with handles and are located on all sides of the unit to allow easy servicing of all components. Service access doors are factory shipped with knock-outs allowing gauge lines to be installed and pressure readings to be taken while the machine is operating. In addition there is a removable panel on the access door so visual observation of the sight glass is possible without removing the access door. All units are equipped with centrifugal blowers combined with variable pitch adjustable pulleys. Forward curved double width and inlet centrifugal blowers are used for condenser & evaporator air movement. All models employ a draw-through air flow system. All blower wheels are galvanized steel, with solid steel shafts and are equipped with permanently lubricated ball bearings. V-belt driven blowers are used in all models; RPM can be adjusted through the variable pitch motor sheave.

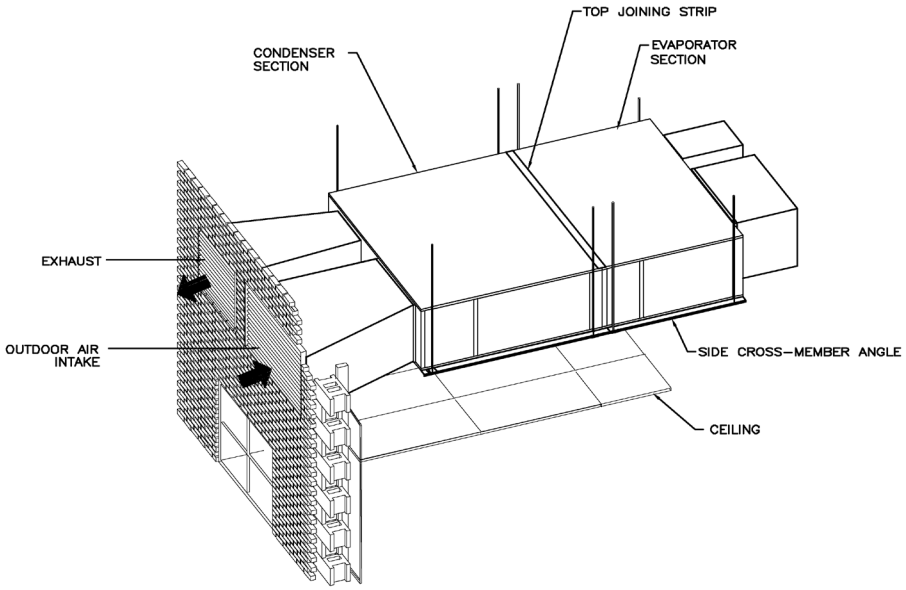
ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION AND SERVICE OF THIS EQUIPMENT.

High efficiency scroll compressors are used in all models, mounted on durable rubber isolator pads reducing vibration and noise while operating. Large evaporator and condenser coil face areas reduce noise levels, air pressure drops and minimize potential for condensate blow off. All models are equipped with copper tube and rippled aluminum plate fin coils.

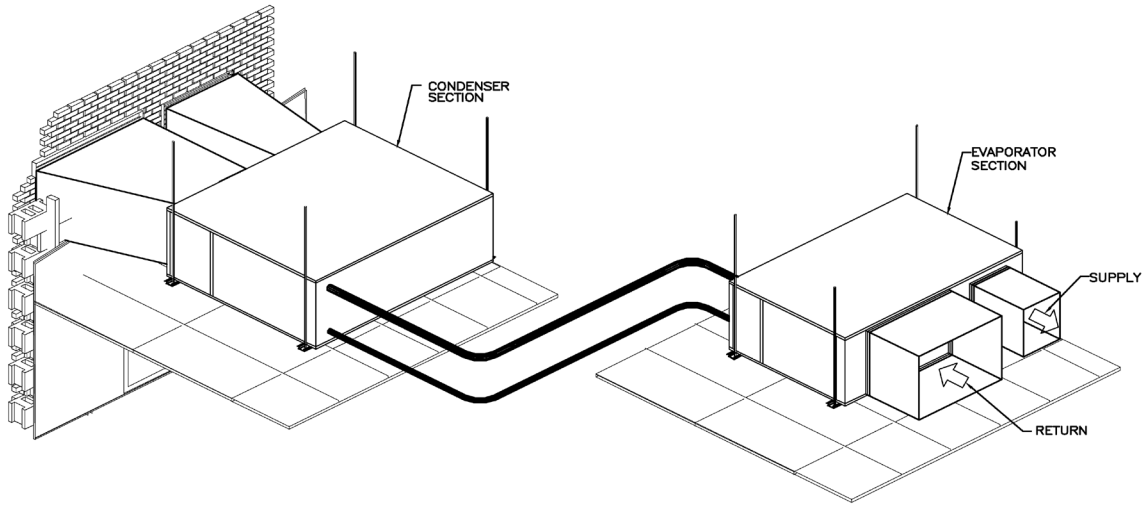
Units will operate reliably at an outdoor ambient down to 60 deg F.

TYPICAL INSTALLATION DRAWING

HORIZONTAL Ductable Ceiling Air Conditioner
Packaged Installation



HORIZONTAL Ductable Ceiling Air Conditioner
Split Installation



PRE-INSTALLATION INSPECTION OF EQUIPMENT

All units are factory tested to ensure safe operation and quality assembly. Units are packaged and sealed on shipping skids and shipped in first class condition. Torn and broken packaging, scratched or dented panels should be reported to carrier immediately. An internal inspection of each unit should be performed prior to installation. Remove all access doors and check for visual defects that can occur during transport. Any problems found internally should be reported to carrier and manufacturer immediately. Refrigerant circuit should be checked to ensure no leaks have occurred during shipment. Install gauge set on high and low pressure ports to confirm pressure has been maintained and no leaks have occurred during shipment. Repair any damage prior to installation to ensure safe operation.

Record any unit damage on the Bill of Lading and report to carrier and factory immediately. Shipping and handling damages are not warranty items.

RIGGING

Prior to mounting unit, check individual unit weights (pages 7-8) and verify lifting capacity of lifting equipment exceeds weight of units by safe margins. Failure to do so may result in unit damage, personal injury or even death.

To ensure safe installation of the unit when ceiling mount application is specified, estimate the approximate center of gravity of the unit. The configuration of internal components for each unit is different and weight is unevenly distributed.

Determine the actual center of gravity of the unit by performing a test lift. Lifting an unbalanced unit can cause personal injury or even death.

INSTALLATION

Lock all electrical power supply switches in the off position before installing the unit. Failure to disconnect power supply may result in electrical shock or even death.

Location - To ensure unit operates at maximum efficiencies, choose a dry indoor area where the temperature is controlled between 50 deg F and 115 deg F. Consideration of surrounding areas should be taken when choosing a location to install the unit. Common vibration and sound levels associated with commercial equipment may be objectionable to people or equipment.

Failure to allow adequate space between units may result in poor unit performance and possible unit failure.

Refer to typical installation diagram (Page #5).

Install thermostats, air supplies and returns so that each unit will operate only on individual unit control. To assure fast drainage of condensate run-off, unit can be slightly pitched in the same direction as drain pan outlet.

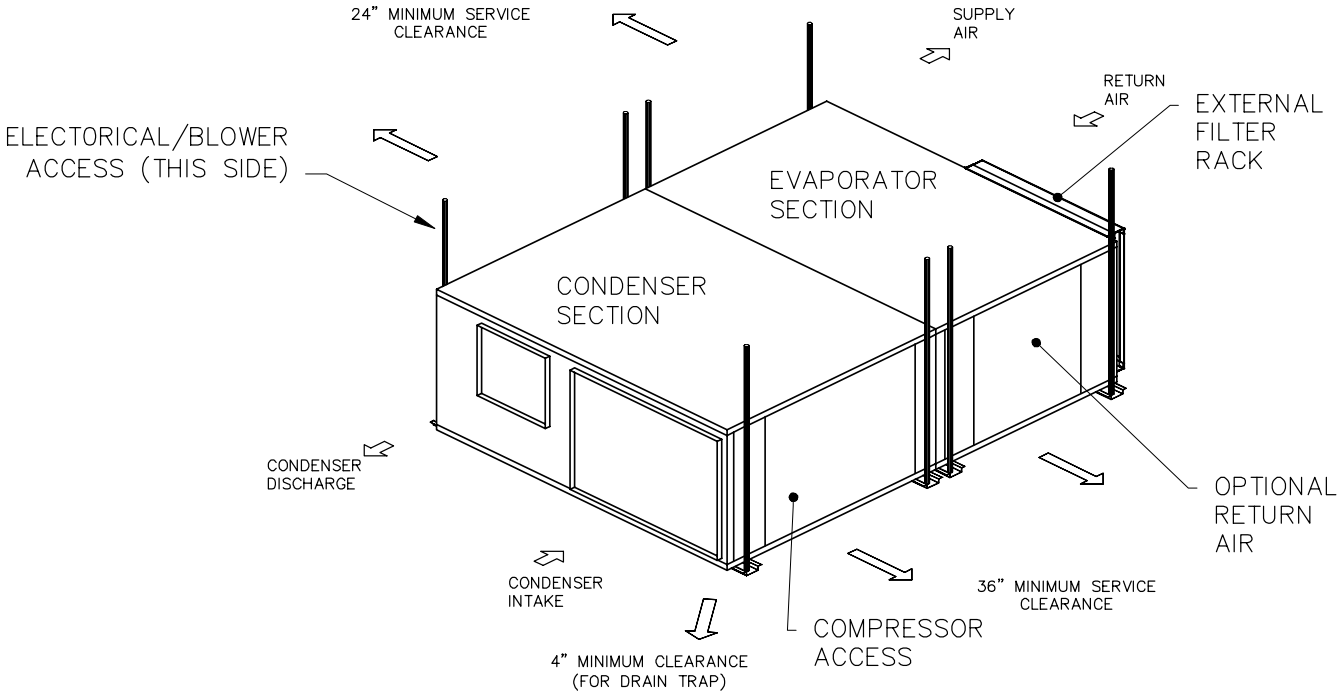
UNIT MOUNTING

The 2 through 5 ton unit consist of an evaporator and condenser module. These two modules are rigidly attached by a joining strip across the top of the two cabinet, and two long side cross-member angles which bridge the mounting channels on the bottom of the unit. These units may be field split to allow for passage through doors, elevators, hallways, etc. Alternatively, the units may be installed as a split system after separation.

Units may be either hung, or floor mounted. If unit is to be hung, use all mounting points indicated - regardless if unit is installed as a package or split system (See unit dimension drawings). Use of 1/2in. dia hanger rods is recommended. Ensure the attachment point of the rods to the building structure is sufficient to support the unit weight. In order to ensure efficient condensate drainage, the unit may be pitched towards the evaporator end of the unit.

A minimum of 4-in. clearance is required under the unit to allow for trapping of the evaporator condensate drain.

Floor mounted units should be secured on a solid, level pad. The use of isolating vibro-pads at several points under the bottom mounting channels is recommended. Ensure that provision is made for clearance to install a trap on the condensate drain outlet.



SEPARATION OF UNITS

The 2 through 5 ton units are provided with refrigerant shut-off valves to allow the evaporator and condenser sections to be field split - without the necessity of reclaiming the entire unit refrigerant charge.

The evaporator and condenser sections may be separated by performing the following procedure:

1. Close all refrigerant shut-off valves, on both suction and liquid lines. There are four valves in a single compressor model, and a total of eight valves in the dual compressor models. Valves are not a back-seating design. Caps are wrench tight. Remove caps and turn stem clockwise to seat in the closed position.

2. Use the valve access ports to reclaim the refrigerant trapped in the lines between the pairs of shut-off valves.

3. Cut the refrigerant line sections between the pairs of shut-off valves. It is recommended to make this out where accessibility is greatest - in the condensing section of the unit. This will allow best access for reconnection, or attachment of an extended line set in the case of a split system.

4. Remove the interconnecting wiring between the evaporator and condenser electrical panel. Disconnect the wire terminations in the condenser electrical panel, and pull the excess wire into the evaporator panel.

5. Remove the threaded wire bushing connecting the two electrical panels.

6. Remove the unit top-joining strip; take care to remove only those screws which attaches the joining strip to the evaporator and condenser cabinets.

7. Remove the two side cross-member angles.

8. Carefully pull the evaporator section away from the condenser section. Take care not to damage the short lengths of refrigerant tubing extending into the condenser section.

The separated evaporator and condenser modules may now be individually moved to the proposed installation site for re-assembly, or separately located for split applications.

INTERCONNECTING REFRIGERANT TUBING - SPLIT INSTALLATION

After the evaporator and condenser sections have been mounted, the interconnecting refrigerant tubing can be fabricated. Line sizing recommendations shown in the accompanying table are suitable for most applications. Consult sales office for applications outside the specified guidelines.

Route refrigerant tubing for minimum linear length, and minimum number of bends and fittings. Use long radius elbows for all 90-degree bends, except oil traps. Traps should be constructed from short radius street elbows, in order to keep the trap as small as possible. All brazing should be done using a 2 to 8 psig dry nitrogen purge flowing through the pipe being brazed.

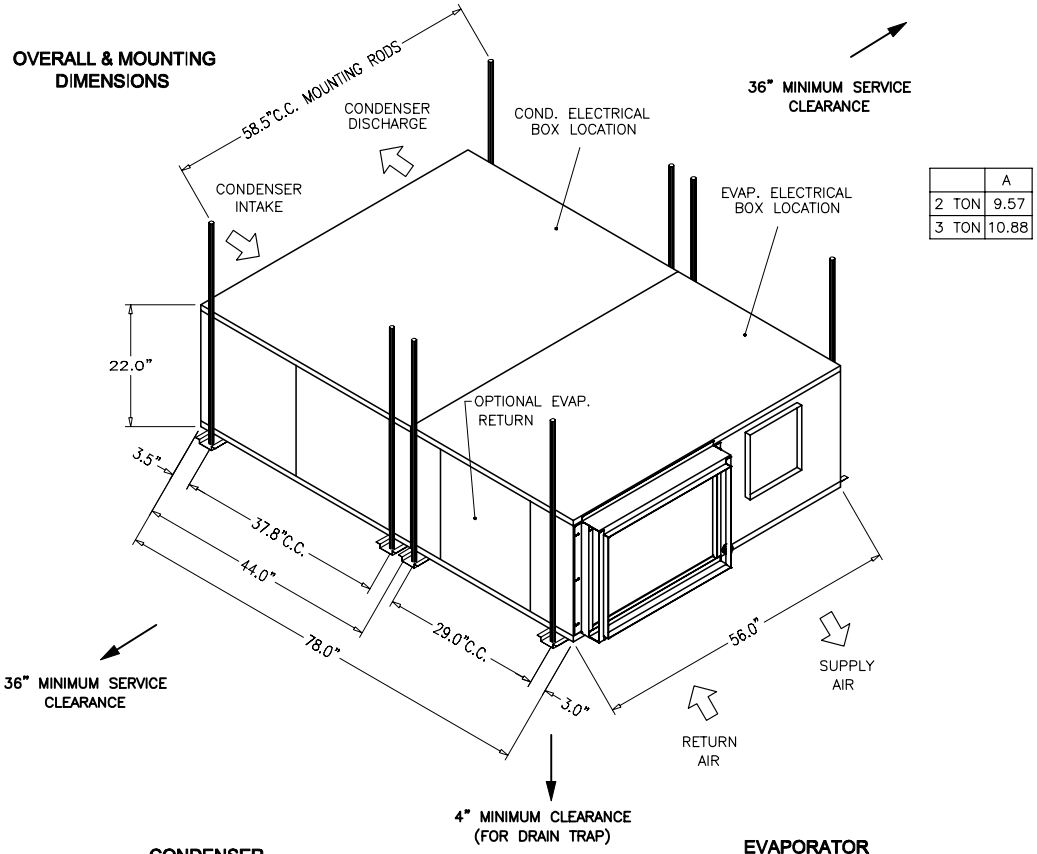
Once the brazing operation of refrigeration lines is completed, the field-brazed connections must be checked for leaks. Pressurize the system through the shut-off valve ports with dry nitrogen to a minimum of 400 psig. Use soap bubbles or alternate methods of leak-checking all field brazed joints. After completion of the leak check, evacuate the interconnecting lines to hold a 350-micron vacuum. If gauge pressure rises above 500 microns in one minute, then evacuation is incomplete or the system has a leak.

Additional refrigerant (R-410A) must be added to the system due to the extended refrigerant lines. Calculate the amount of additional refrigerant required as follows:

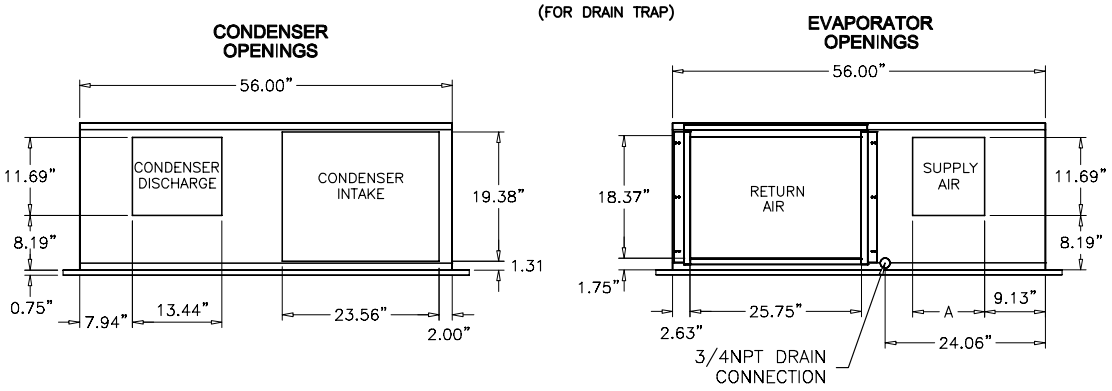
1. 5/16 in OD liquid line - add 0.40 oz per linear foot
2. 3/8 in OD liquid line - add 0.60 oz per linear foot
3. 1/2 in OD liquid line - add 1.20 oz per linear foot
4. 5/8 in OD liquid line - add 1.80 oz per linear foot

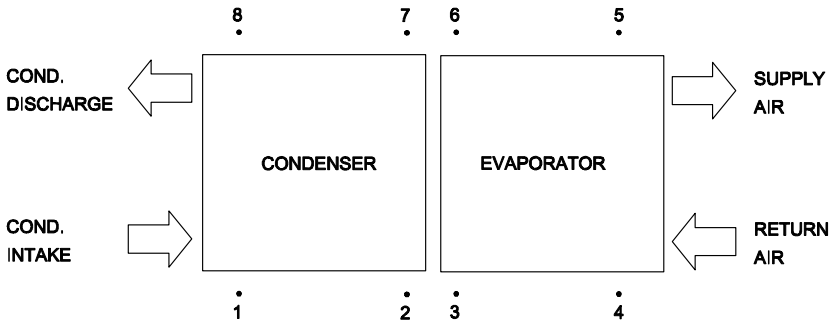
DIMENSIONAL DATA

2 & 3 TON UNITS



	A
2 TON	9.57
3 TON	10.88



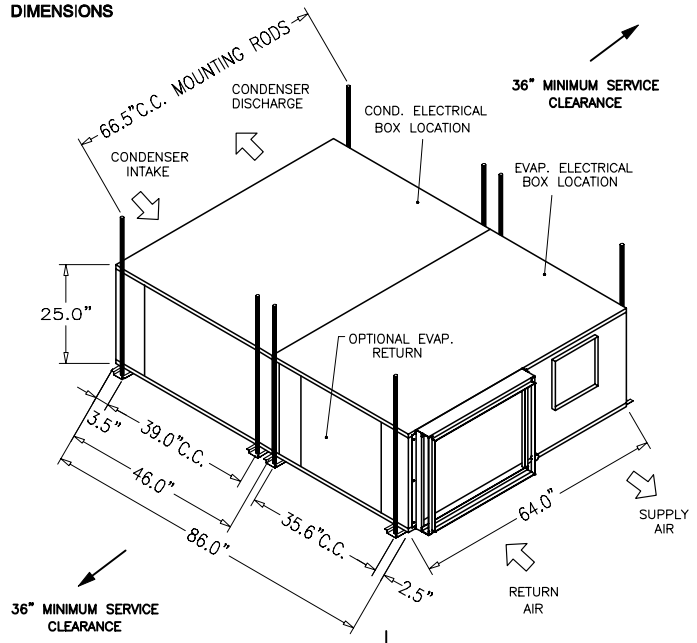


UNIT	POINT WEIGHTS [Lbs.]								TOTAL	
	1	2	3	4	5	6	7	8	OPERATING	SHIPPING
2 TON	136	75	75	67	69	67	68	108	665	695
3 TON	142	76	76	71	71	73	73	117	700	730

DIMENSIONAL DATA (Cont.)

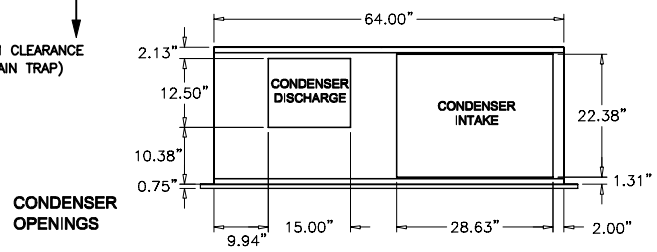
4 & 5 TON UNITS

OVERALL & MOUNTING DIMENSIONS

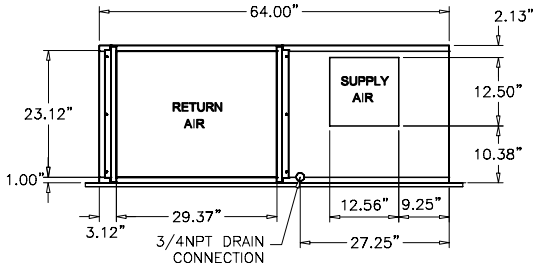


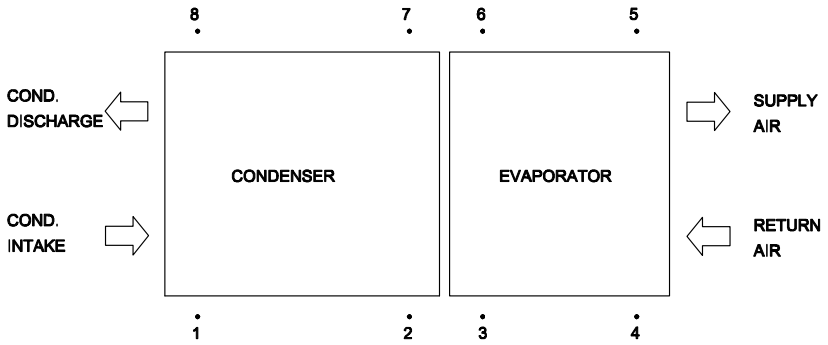
4" MINIMUM CLEARANCE (FOR DRAIN TRAP)

CONDENSER OPENINGS



EVAPORATOR OPENINGS





UNIT	POINT WEIGHTS [Lbs.]								TOTAL	
	1	2	3	4	5	6	7	8	OPERATING	SHIPPING
4 TON	136	132	82	78	85	91	112	114	830	885
5 TON	136	133	83	79	85	92	112	115	835	890

DUCTWORK

When installing ductwork, adhere to local Codes and sensible practice. Minimize duct runs and avoid abrupt changes in direction where possible. Allow ample access space for servicing of the coils and changing of filters. Perform regular maintenance on ducts to increase unit life, maintain efficient operation, and reduce accumulation of explosive dust. Refer to blower performance charts, and engineer duct runs and accessory pressure drop so as not to exceed maximum external static values.

LOUVER SIZING GUIDELINES

One of the key issues in obtaining optimum performance from indoor air-conditioners is the proper selection of the condenser intake and discharge louvers. Unlike outdoor air cooled units, which intake and discharge their cooling virtually unrestricted, indoor units must overcome the resistance of grilles or louvers at the outside wall - plus the restriction of any interconnecting ductwork.

Our indoor air cooled air-conditioners are designed to accommodate the external static pressure loss associated with properly sized louvers of the “storm proof” type. This type of louver typically has a free area approximately 40-45% of the actual louver size. To determine the free area required for any given unit, adhere to the following guidelines:

- Size condenser air intakes for 500-750 feet/minute nominal velocity

  (Maximum recommended 800 feet/minute)
- Size condenser air discharge for 1,200-1,500 feet/minute nominal velocity

  (Maximum recommended 1,700 feet/minute)

The use of louvers with higher velocities than above may be employed, at the discretion of the engineer/installer, provided that the total air pressure drop does not exceed the capability of the condenser fan and motor. The use of low restriction louvers with shallow blade angles can allow higher face velocities without excessive static pressure loss.

Exceeding the static pressure capability of the condenser fan will result in insufficient condenser air volume. This will cause a loss in system capacity, and may cause compressor shutdown during high ambient periods. (Installation of an oversize condenser motor/drive, where applicable, may be considered in such cases.)

(As a general rule, these velocities will require an intake louver sized approximately 1.25 to 1.5 times the dimensions of the duct connection on the unit, and a discharge louver sized approximately 1.5 to 2 times the duct connection dimensions.)

Use only louver sections that provide different deflection angles for air discharge and air intake, to ensure the unit does not short circuit. Protect the unit from weather conditions (rain, snow) entering through the condenser air intake. All outdoor air ducts should pitch away from the unit, toward the outside wall. Connect all ducts to unit with canvas section duct connectors or choose another suitable noise and vibration absorbing device.

The Manufacturer will not accept any liability resulting from incorrect installation of this equipment. Follow installation instructions carefully.

ELECTRICAL WIRING

Follow local electrical codes when making electrical connections. Units are completely factory wired for normal supply voltages (ie.208-230, 460, 575/3phase/60Hz) Confirm unit specifications by checking unit data plate. The factory wiring terminates in two boxes, one in each section of the unit. The electrical control boxes are located behind outer access panels. Each electrical compartment has its own control cover.

Provide individual power disconnects for each unit, or each section in the case of split applications. Install a secure ground to both evaporator and condenser. If canvas joiners are used on ductwork, install a ground wire to the ductwork as well. Unit requires installer to provide a 24volt thermostat with appropriate heating and cooling stages as needed. The condenser section electrical cover is installed with wiring diagrams on the inner access door, which must be opened to read the diagrams.

WARNING

Disconnect and lock out power when servicing unit. Unit may start automatically if power is not disconnected. Failure to do so may result in personal injury or death due to electrical shock.

PACKAGED UNIT

If unit is to be installed as a complete integral unit, the thermostat (low voltage) wiring is to be brought through connection “A”, while power wiring will be brought through connection “C”). Make sure you check the unit data plate for full specifications as previously mentioned (i.e. minimum circuit ampacity and fuse size).

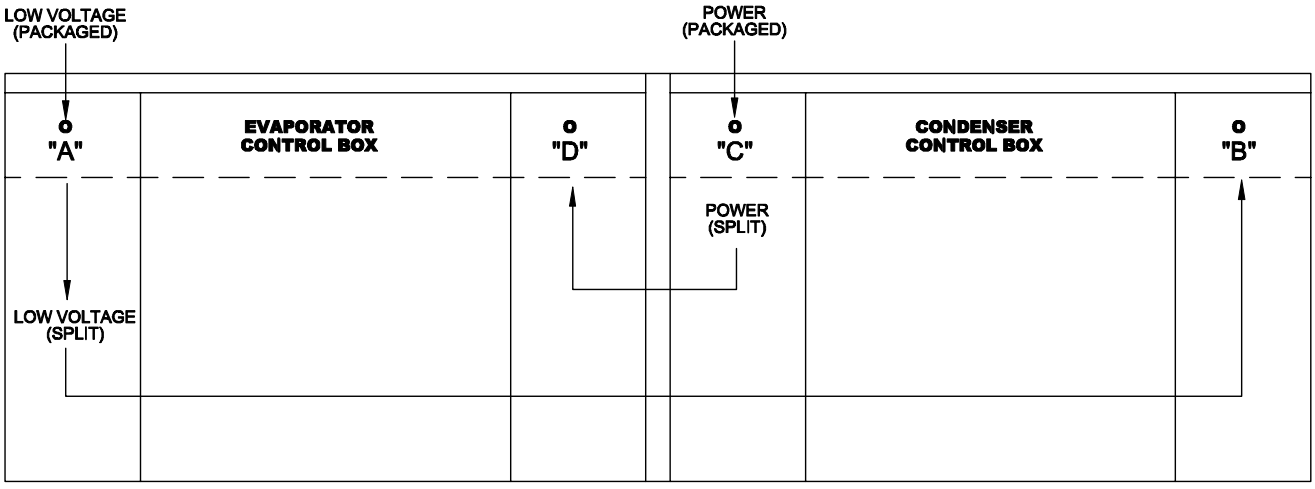
SPLIT SYSTEM

If the unit is a split system application (condenser section remote from evaporator section), the following wiring instructions are applicable. The thermostat wiring is brought through connection “A” on the evaporator section, and is then interconnected via connection “B” on the condenser section. The power wiring is brought through “C” on the condenser section. The power feed to the evaporator is run through “D” on the evaporator section.

NOTE

IMPORTANT: All wiring must comply with applicable local and national codes (NEC). Type and location of disconnect switches must comply with all applicable codes.

For low voltage wiring, 18 gauge wire may be used for up to 50 feet lengths. Low voltage runs up to 125 feet require 16-gauge wire.



STANDARD MOTORS

MODEL #	VOLTAGE	COMPRESSOR QTY	RLA	LRA	EVAPORATOR FAN HP	FLA	CONDENSER FAN HP	FLA	MIN. CCT. AMPACITY	"MOP" Max Overcurrent Prot.
DSH 24H12	208-230/1/60	1 @	13.5	58.3	0.25	2.6	0.50	4.5	23.98	35
DSH 24H32	208-230/3/60	1 @	8.6	55.0	0.25	1.4	0.50	2.2	14.35	20
DSH36H12	208-230/1/60	1 @	14.1	77.0	0.33	3.3	0.75	5.5	26.43	40
DSH36H32	208-230/3/60	1 @	9.0	71.0	0.33	1.6	0.75	2.6	15.45	20
DSH36H34	460/3/60	1 @	5.6	38.0	0.33	0.8	0.75	1.3	9.10	15
DSH36H35	575/3/60	1 @	3.8	36.5	0.50	0.9	0.75	1.0	6.63	15
DSH48H12	208-230/1/60	1 @	19.9	109.0	0.75	5.5	1.00	6.3	36.68	50
DSH48H32	208-230/3/60	1 @	13.1	83.1	0.75	2.6	1.00	3.3	22.28	35
DSH48H34	460/3/60	1 @	6.1	41.0	0.75	1.3	1.00	1.5	10.43	15
DSH48H35	575/3/60	1 @	5.0	34.0	0.75	1.0	1.00	1.1	8.35	15
DSH60H32	208-230/3/60	1 @	16.0	110.0	1.00	3.3	1.50	4.6	27.90	40
DSH60H34	460/3/60	1 @	7.8	52.0	1.00	1.5	1.50	2.1	13.35	20
DSH60H35	575/3/60	1 @	5.7	38.9	1.00	1.1	1.50	1.7	9.93	15

Notes: Data shown for packaged unit installation, with single point power supply.
For split installation with separate evaporator motor power supply, calculate MCA and MFS as follows -
Min. Circuit Ampacity (MCA) = 1.25 X Largest motor amps (FLA or RLA) + sum of the remaining motor amps

Max Fuse / Cct. Bkr Size (MFS) = 2.25 X Largest motor amps + sum of the remaining motor amps
Select next smallest NEC listed fuse size from calculated value

FAN PERFORMANCE DATA

SUPPLY AIR BLOWER PERFORMANCE

MODEL	SUPPLY CFM	EXTERNAL STATIC PRESSURE - Inches W.C. 0.2 RPM	0.2 BHP	0.4 RPM	0.4 BHP	0.6 RPM	0.6 BHP	0.8 RPM	0.8 BHP	1.0 RPM	1.0 BHP	1.2 RPM	1.2 BHP	1.4 RPM	1.4 BHP	1.6 RPM	1.6 BHP	1.8 RPM	1.8 BHP
2 TON	700	593	0.06	755	0.10	915	0.13	1048	0.17	1175	0.23	-	-	-	-	-	-	-	-
	800	629	0.08	777	0.12	914	0.16	1169	0.20	1178	0.25	-	-	-	-	-	-	-	-
	900	668	0.11	804	0.15	930	0.19	1170	0.24	-	-	-	-	-	-	-	-	-	-
3 TON	1000	598	0.11	722	0.16	835	0.19	930	0.25	1141	0.32	-	-	-	-	-	-	-	-
	1200	727	0.20	831	0.25	929	0.31	972	0.33	-	-	-	-	-	-	-	-	-	-
	1400	747	0.26	844	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 TON	1450	595	0.22	661	0.27	745	0.31	836	0.38	909	0.45	982	0.52	1046	0.61	-	-	-	-
	1600	601	0.26	691	0.33	773	0.39	847	0.44	921	0.51	987	0.61	1056	0.67	-	-	-	-
	1800	652	0.35	735	0.42	812	0.5	883	0.57	948	0.64	1018	0.72	-	-	-	-	-	-
5 TON	1800	583	0.30	674	0.37	755	0.44	830	0.52	900	0.59	966	0.69	1037	0.75	-	-	-	-
	2000	688	0.45	767	0.53	839	0.61	907	0.69	971	0.77	1029	0.85	1086	0.92	-	-	-	-
	2200	677	0.5	754	0.59	826	0.68	894	0.77	957	0.86	1018	0.95	-	-	-	-	-	-

NOTE:
1. At higher evaporator airflows and wet bulb conditions, condensate carry-over may occur. Adjust airflow downward as necessary.
2. Values include pressure drop from wet coil and clean filters.
3. Shaded areas indicate oversize motors
4. Adjustment limits of standard factory-installed drives are indicated by bold borders. (See pulley data on Pg. 14)

CONDENSER AIR BLOWER PERFORMANCE

MODEL	OUTDOOR CFM	EXTERNAL STATIC PRESSURE - Inches W.C. 0.2 RPM	0.2 BHP	0.4 RPM	0.4 BHP	0.6 RPM	0.6 BHP	0.8 RPM	0.8 BHP	1.0 RPM	1.0 BHP	1.2 RPM	1.2 BHP	1.4 RPM	1.4 BHP	1.6 RPM	1.6 BHP
2 TON	1600	750	0.29	852	0.35	948	0.42	996	0.46	-	-	-	-	-	-	-	-
3 TON	1950	864	0.47	949	0.55	1032	0.63	1112	0.72	-	-	-	-	-	-	-	-
4 TON	2500	645	0.53	749	0.63	812	0.74	872	0.86	945	0.98	-	-	-	-	-	-
5 TON	2900	723	0.79	800	0.84	871	1.07	935	1.20	996	1.55	1057	1.42	-	-	-	-

MOTOR AND PULLEY DATA

EVAPORATOR - STANDARD BLOWER MOTOR AND DRIVE DATA

Model	Drive Range (RPM)	Motor			Adjustable Motor Pulley		Fixed Blower Pulley		Belts	
		HP	Frame	Eff.(%)	Pitch Dia.(in)	Browning #	Pitch Dia.(in)	Browning#	Rating / Size	Qty
2 TON	845-1170	1/4	56	66.0	2.6-3.6	1VP40 X 5/8	5.4	AK56H	4L370	1
3 TON	675-1010	1/3	56	75.0	2.0-3.0	1VP34 X 5/8	5.2	AK54H	4L370	1
4 TON	675-1010	3/4	56	75.0	2.0-3.0	1VP34 X 5/8	5.2	AK54H	4L400	1
5 TON	745-1120	1	143	75.0	2.0-3.0	1VP34 X 7/8	4.7	AK49H	4L390	1

CONDENSER - STANDARD BLOWER MOTOR AND DRIVE DATA

Model	Drive Range (RPM)	Motor			Adjustable Motor Pulley		Fixed Blower Pulley		Belts	
		HP	Frame	Eff.(%)	Pitch Dia.(in)	Browning #	Pitch Dia.(in)	Browning#	Rating / Size	Qty
2 TON	770-1070	1/2	56	75.0	2.6-3.6	1VP40 X 5/8	5.9	AK61H	4L500	1
3 TON	745-1071	3/4	56	82.5	2.0-3.0	1VP34 X 5/8	4.7	AK49H	4L390	1
4 TON	615-920	1	143	82.5	2.0-3.0	1VP34 X 7/8	5.7	AK59H	4L490	1
5 TON	770-1070	1.5	145	84.0	2.6-3.6	1VP40 X 7/8	5.9	AK61H	4L500	1

BLOWER SPEED ADJUSTMENT

The RPM of the supply air and condenser air blowers will depend on the required CFM, and the static resistance of both the supply/discharge and the return/intake duct systems. With this information, the RPM for the blowers can be determined from the blower performance tables. Adjustment of blower speed is accomplished as follows:

1. Loosen belt tension by moving motor towards the blower shaft via the adjustable mounting base.

2. Loosen the setscrew in the adjustable motor pulley flange. Remove external key on pulleys 4-in. dia and larger.

3. Blower speed will increase when moveable flange is adjusted towards the fixed flange (closed). Blower speed will decrease when the moveable flange is adjusted away from the fixed flange (opened). Pulleys are adjustable only in half-turn increments. Do not open pulley more than five full turns for “4L” and “A” belts, or six full turns for “B” belts.

4. Once the pulley has been opened/closed the appropriate number of turns, replace the external key and tighten the adjustment set screw. Proper torque is 110 - 130 in-lbs.

5. Install drive belt and adjust motor mount to tension belt.

START-UP AND OPERATION

Prior to starting unit for the first time, turn the thermostat system switch to OFF - or raise the cooling setpoint to the highest temperature, to prevent the unit from starting. Close the electrical disconnect switch. This will energize the compressor crankcase heater(s). WAIT A MINIMUM OF FOUR HOURS BEFORE STARTING THE SYSTEM. This period will allow the crankcase heater to vaporize any liquid refrigerant in the compressor crankcase.

Start unit and check rotation of fans and compressors.

Scroll compressors will only compress in one rotational direction. Three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, it is important to ensure proper rotation direction is achieved when the system is installed and operated.

Verification of proper direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level as well as substantially reduced current draw.

There is no negative impacts on durability caused by operating three phase Scroll compressors in the reversed direction for a short period of time (less than one hour). However, after several minutes of operation the compressors internal protector will trip.

If opposite rotation is needed, disconnect and reverse any two leads of the three phase supply. Reconnect power and observe for correct rotation.

Observe unit operation and check for unusual noise or vibration.

REFRIGERANT CHARGES

Ref. Charge	2 TON	3 TON	4 TON	5 TON
No. of Circuits	1	1	1	1
Per Circuit (lb)	7.625	8.125	11.188	10.938

The Air Conditioning section of this equipment is charged with R-410A; a hi-pressure refrigerant. Only qualified technicians, using appropriately pressure-rated test instruments, should perform trouble-shooting or service on this equipment.

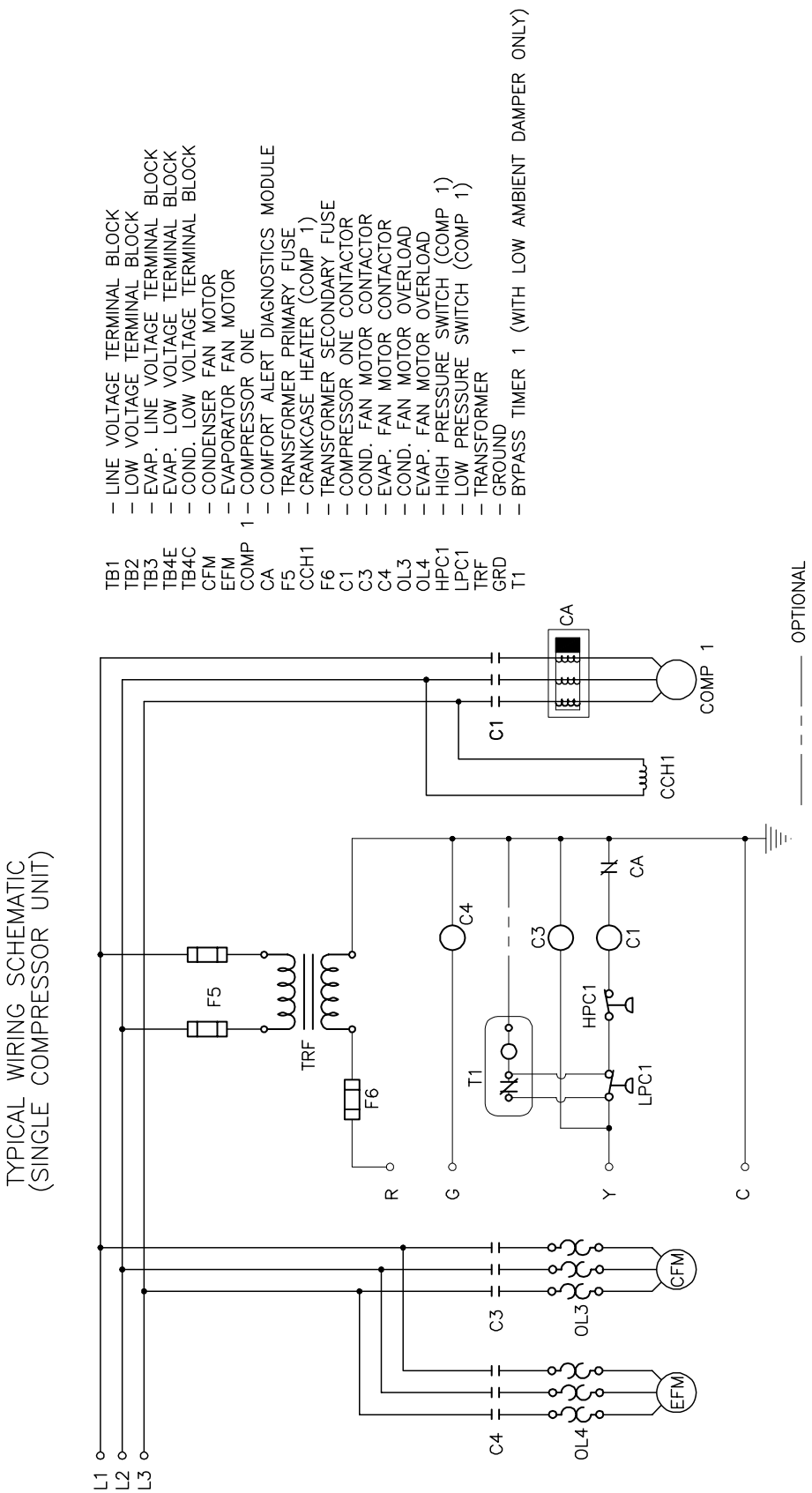
PRESSURE SWITCH SETTINGS

ALL MODELS		
	High	**Low**
Cut Out (PSIG)	600	55
Cut In (PSIG)	450	75

RECCOMENEDED REFRIGERANT LINE SIZES				
UNIT SIZE	LESS THAN 60 LINEAR FEET		60 - 150 LINEAR FEET	
	LIQUID LINE	**SUCTION LINE**	**LIQUID LINE**	**SUCTION LINE**
2 TON	5/16	5/8	3/8	3/4
3 TON	3/8	3/4	3/8	7/8
4 TON	3/8	7/8	1/2	1-1/8
5 TON	3/8	1-1/8	1/2	1-1/8
8 TON	2 X 3/8	2 X 7/8	2 X 3/8	2 X 1-1/8
10 TON	2 X 3/8	2 X 1-1/8	2 X 1/2	2 X 1-1/8
12 TON	2 X 1/2	2 X 1-1/8	2 X 1/2	2 X 1-3/8
15 TON	2 X 1/2	2 X 1-1/8	2 X 5/8	2 X 1-3/8

NOTES: - Maximum Suction Lift 60 FT
- Maximum Liquid Line Rise 40 FT (measured from condensing unit level).
- Liquid Line Solenoid Valve required on systems over 100 linear feet.
- Suction Accumulator(s) required on systems over 125 linear feet.

TYPICAL SCHEMATIC



MAINTENANCE / SERVICE

Disconnect And Lock Out Power When Servicing Unit. Failure To Do So May Result In Personal Injury Or Death Due To Electrical Shock.

Exercise care when working around the sharp metal edges of door panels or door frames, etc. These edges can cause injury.

FILTERS

Inspect filters monthly and replace as necessary. Use UL Class 2 rated filters. Factory supplied filters are medium efficiency, extended surface pleated type. Replacements should be of the same type, to maintain optimum airflow performance. Filter sizes are as follows:

FILTERS	2 TON	3 TON
QTY / SIZE	2 / 20 x 14 x 2	2 / 20 x 14 x 2
FILTERS	4 TON	5 TON
QTY / SIZE	2 / 25 x 16 x 2	2 / 25 x 16 x 2

EVAPORATOR AND CONDENSER COILS

Inspect the evaporator coil at filter change intervals. Inspect the condenser coil at least semi-annually. A dirty condenser coil will result in elevated condensing pressures and poor unit performance. Dirty or clogged evaporator coils cause low suction pressure and lost capacity. If the coils appear dirty, clean them using mild detergent or a commercial coil cleaning agent.

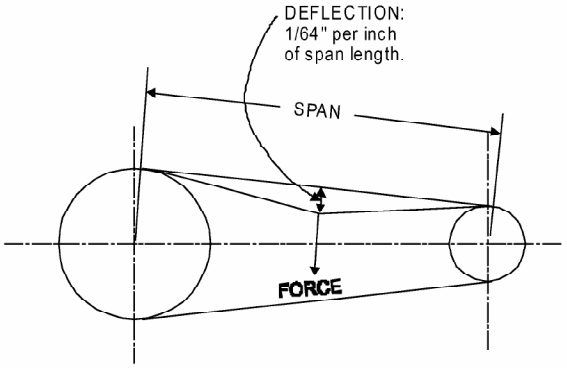
BLOWERS

Inspect both the evaporator and condenser blowers at each regular service interval. Clean blower wheels as needed. Bearings are permanently sealed ball type, and do not require lubrication. Check bearings for any signs of wear (movement between inner and outer races). Ensure bearing locking collars are secure to the shaft, and that collar locking screw is properly set. Check that the blower wheel is tight on the shaft, and that the setscrews in the blower hub are properly torqued.

DRIVE BELTS

Examine belts periodically for wear. Glazed areas on the drive surfaces indicate overheating due to belt slippage. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over-tensioning shortens belt and bearing life.

The tension on the belt should be adjusted for a deflection of 1164 of an inch per inch of belt span, with the appropriate force applied at the midpoint of the span. Tension “New” belts at the maximum value indicated. Used belts should be maintained at the minimum value.



	POUNDS FORCE	
Belt Cross Section	Min.	Max.
4L	1-1/2	2-1/2
A	3-1/2	6-1/2
B	5-1/2	8
BX	8	11

REFRIGERANT CIRCUIT(S)

With the unit operating, check and record the compressor discharge and suction pressures. The compressor running current should also be recorded. A maintenance log of these readings can indicate if the unit is operating within its normal limits. Abnormal readings should be investigated, and the cause corrected.

COMFORT ALERT™ DIAGNOSTICS

The Comfort Alert diagnostics module is a breakthrough innovation for troubleshooting and protecting three phase Copeland Scroll® compressors. The module installs easily in the electrical box of the condensing unit near the compressor contactor. By monitoring and analyzing data from the Copeland Scroll compressor and the thermostat demand, the module can accurately detect the cause of electrical and system related failures and protect the compressor. A flashing LED indicator communicates the ALERT code and guides the service technician more quickly and accurately to the root cause of a problem.

NOTE

This module provides compressor protection and will shut down the compressor when compressor damaging conditions are detected.

LED DESCRIPTION

POWER LED (Green): indicates voltage is present at the power connection of the module.

ALERT LED (Yellow): communicates an abnormal system condition through a unique flash code. The ALERT LED will flash a number of times consecutively, pause and then repeat the process. The number of consecutive flashes, defined as the Flash Code, correlates to a particular abnormal condition. Detailed descriptions of specific ALERT Flash Codes are shown in two tables attached to this manual.

TRIP LED (Red): indicates there is a demand signal from the thermostat but no current to the compressor is detected by the module. The TRIP LED typically indicates the compressor protector is open or may indicate missing supply power to the compressor. A flashing TRIP LED indicates the anti-short cycle timer is active, preventing compressor from starting.

INTERPRETING THE DIAGNOSTIC LEDS

When an abnormal system condition occurs, the Comfort Alert module displays the appropriate ALERT and/or TRIP LED. The yellow ALERT LED will flash a number of times consecutively, pause and then repeat the process. To identify a Flash Code number, count the number of consecutive flashes. Every time the module powers up, the last ALERT Flash Code that occurred prior to shut down is displayed for one minute. If the yellow ALERT LED is on solid more than 2 amps are conducted through the PROT terminal. The contactor coil may be shorted or the PROT terminal miswired.

Some ALERT codes indicate a compressor damaging condition and the Comfort Alert module will shut down and lock out the compressor. Refer to the tables below to identify ALERT codes that result in a lock out.

Status LED	Status LED Description	Status LED Troubleshooting Information
Green “POWER”	Module has power	Supply voltage is present at module terminals
Red “TRIP” LED On Solid	Thermostat demand signal Y is present, but the compressor is not running	1. Compressor protector is open
		2. Condensing unit power disconnect is open
		3. Compressor circuit breaker or fuse(s) is open
		4. Broken supply wires or connector is not making contact
		5. Compressor power wires not routed through Comfort Alert
		6. Compressor contactor has failed open
Red “TRIP” LED Flashing	The anti-short cycle timer (3 minutes), in module is preventing compressor restart.	
Module locks out compressor when compressor damaging ALERT codes appear. Lockout ALERT codes are noted in the Status LED Description. During a compressor lock out, 24VAC power must be removed from module to manually reset		
Yellow "ALERT" LED On Solid	A short circuit or over current condition exists on PROT terminal.	1. Compressor contactor coil shorted.
		2. Electrical load too high for PROT circuit (maximum 1 Amp)
		3. 24 VAC wired directly to PROT terminal
Yellow “ALERT” Flash Code 2	System Pressure Trip Discharge pressure out of limits or compressor over-loaded (if no high pressure switch in system) LOCKOUT	1. High head pressure
		2. Condenser coil poor air circulation (dirty, blocked, damaged)
		3. Condenser fan is not running
		4. If low pressure switch is open: Refer to Code 3 for troubleshooting
Yellow “ALERT” Flash Code 3	Short Cycling Compressor is running only briefly LOCKOUT	1. If low pressure switch is open: a. Low refrigerant charge b. Evaporator blower is not running c. Evaporator coil is frozen d. Faulty metering device e. Condenser coil is dirty f. Liquid line restriction (filter drier blocked if present)
		2. If high pressure switch is open, go to Flash Code 2 information
		3. Intermittent thermostat demand signal
		4. System or control board defective

Status LED	Status LED Description	Status LED Troubleshooting Information
Yellow “ALERT” Flash Code 4	Locked Rotor LOCKOUT	1. Low line voltage to compressor
		2. Excessive liquid refrigerant in compressor
		3. Compressor bearings are seized
Yellow “ALERT” Flash Code 5	Open Circuit	1. Condensing unit power disconnect is open
		2. Compressor circuit breaker or fuses are open
		3. Compressor contactor has failed open
		4. High pressure switch is open and requires manual reset
		5. Broken supply wires or connector is not making contact
		6. Unusually long compressor protector reset time due to extreme ambient temperature
		7. Compressor windings are damaged
Yellow “ALERT” Flash Code 6	Missing Phase LOCKOUT	1. Compressor fuse is open on one phase
		2. Broken wire or connector on one phase
		3. Compressor motor winding is damaged
		4. Utility supply has dropped one phase
Yellow “ALERT” Flash Code 7	Reverse Phase LOCKOUT	1. Compressor running backward due to supply phase reversal
Yellow “ALERT” Flash Code 8	Welded Contactor Compressor always runs	1. Compressor contactor has failed closed
		2. Thermostat demand signal not connected to module
Yellow “ALERT” Flash Code 9	Low Voltage Control circuit < 18VAC	1. Control circuit transformer is overloaded
		2. Low line voltage to compressor

Flash code number corresponds to a number of LED flashes, followed by a pause and then repeated.

TRIP and ALERT LED’s flashing at the same time means control circuit voltage is too low for operation.

Resetting Alert Codes

Alert codes can be reset manually and automatically. The manual method to reset an Alert code is to cycle the power to Comfort Alert off and on. For automatic reset, Comfort Alert continues to monitor the compressor and system after an Alert is detected. If conditions return to normal, the Alert code is turned off automatically. ALERT codes that result in a compressor lock out can only be reset manually. ALERT codes that result in a lockout can only be reset manually.

NOTE

Miswiring the Comfort Alert module will cause false LED codes. Table 1 describes LED operation when the module is miswired and what troubleshooting action is required to correct the problem.

Miswired Module Indication	Recommended Troubleshooting Action
Green LED is not on, module does not power up	Determine if both R and C module terminals are connected. Verify voltage is present at module's R and C terminals. Review **24VAC Power Wiring** (page 4) for R and C wiring.
Green LED intermittent, module powers up only when compressor runs	Determine if R and Y terminals are wired in reverse. Verify module's R and C terminals have a constant source. Review **24VAC Power Wiring** (page 4) for R and C wiring.
TRIP LED is on but system and compressor check OK	Verify Y terminal is wired properly per OEM wiring diagram. Verify voltage at contactor coil falls below 0.5VAC when off. Verify 24VAC is present across Y and C when thermostat demand signal is present. If not, R and C are reverse wired.
TRIP LED and ALERT LED flashing together	Verify R and C terminals are supplied with 19-28VAC.
ALERT Flash Code 3 (Compressor Short Cycling) displayed incorrectly	Verify Y terminal is connected to 24VAC at contactor coil. Verify voltage at contactor coil falls below 0.5VAC when off.
ALERT Flash Code 5 or 6 (Open Circuit, Missing Phase) displayed Incorrectly	Check that compressor T1 and T3 wires are through module's current sensing holes. Verify Y terminal is connected to 24VAC at contactor coil. Verify voltage at contactor coil falls below 0.5VAC when off.
ALERT Flash Code 8 (Welded Contactor) displayed incorrectly	Determine if module's Y terminal is connected. Verify Y terminal is connected to 24VAC at contactor coil. Verify 24VAC is present across Y and C when thermostat demand signal is present. If not, R and C are reverse wired. Verify voltage at contactor coil falls below 0.5VAC when off. Review **Thermostat Demand Wiring** (page 4) for Y and C wiring.

TABLE 1 - COMFORT ALERT MODULE TROUBLESHOOTING

Installation Verification

To verify the installation of Comfort Alert is correct, a functional test can be performed. Force a call for cooling and when the compressor starts to run, monitor the yellow ALERT LED. The LED should remain off during test. Disconnect power to the compressor while the call for cooling is still active. The red TRIP LED will flash indicating the anti-short cycle timer is active. If the red LED does not function as described, refer to Table 1 to verify the wiring.

LIMITED WARRANTY

ONE YEAR LIMITED WARRANTY

Johnson Controls warrants this product to be free from defects in workmanship or material for a period of one year from date of original installation or 18 months from date of shipment, whichever comes first.

Johnson Controls obligation under this Warranty is LIMITED to repairing or replacing at our sole option, at our factory, any part thereof which shall be returned to our factory, transportation charges prepaid and which on examination proves to have been thus defective under normal domestic use not exceeding the fuel rating. The defective part should be returned through a qualified servicing dealer. Upon warranty determination, the replacement part will be shipped freight collect and assumes the unexpired portion of this Limited Warranty.

When a defective part can be repaired or replaced, Johnson Controls shall not be obligated to repair the entire unit or any part thereof other than the defective part.

This warranty applies only to the original homeowner, and is subject to the terms and conditions hereof.

COMPRESSOR – FIVE YEAR LIMITED WARRANTY

In addition to the One Year Limited Warranty, Johnson Controls warrants the compressor to be free from defects in workmanship or material for a period of five (5) years from the date of original installation. If a compressor fails during this five year period, a new compressor will be supplied. The customer will be responsible for freight costs from our factory for delivery of the replacement compressor and also for the return of the defective compressor which may be required under the terms of the Warranty. Labor and any other expense involved in replacing the compressor is not covered by this Warranty.

LABOR AND COST NOT COVERED

This Warranty provides only replacement parts or credits, and does not provide for or cover any labor, shipping, handling or other costs for service travel, servicing, removing, or installing any parts.

EXCLUSIONS

This Warranty shall be void if:

1. The unit is not installed by a licensed or otherwise qualified or contractor and in compliance with the Installation Manual, applicable installation and good trade practices.
2. The defect or damage is caused by accident, abuse, negligence of any person or company, misuse, riot, flood, fire or Acts of God.
3. The unit is not operated and regularly serviced and maintained as called for in the Users' Manual.
4. Damages are caused by operating the unit in a commercial or corrosive atmosphere containing any damaging or dangerous chemicals.
5. The unit is modified or services in a manner not in accordance with the Installation Manual and Users' Manual.
6. Components, replacement parts, or other accessories not compatible with the unit or not approved by Johnson Controls have been used with or attached to the unit.
7. The defect or damage is not caused by Johnson Controls, or it arises from circumstances beyond the control of Johnson Controls.
8. The unit is installed outside the United States or Canada, or has been removed from the place where it was originally installed.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES, EXPRESSED OR IMPLIED BY EMPLOYEES OR REPRESENTATIVES OF JOHNSON CONTROLS. ALL STATUTORY, EXPRESSED OR IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY NEGATED AND EXCLUDED. ANY CLAIMS FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES, OR ANY OTHER DAMAGES OR EXPENSES BEYOND THE TERMS OF THIS LIMITED WARRANTY ARE HEREBY EXPRESSLY NEGATED AND EXCLUDED.

R-410A QUICK REFERENCE GUIDE

Refer to Installation Instructions for specific installation requirements.

- R-410A Refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A Refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig. DOT 4BA400 or DOT BW400.
- Recovery equipment must be rated for R-410A.
- Do not use R-410A service equipment on R-22 systems. All hoses, gages, recovery cylinders, charging cylinders and recovery equipment must be dedicated for use on R-410A systems only.
- Manifold sets must be at least 700 psig high side, and 180 psig low side, with 550 psig retard.
- All hoses must have a service pressure rating of 800 psig.
- Leak detectors, must be designed to detect HFC refrigerants.
- Systems must be charged with refrigerant. Use a commercial type metering device in the manifold hose.
- R-410A can only be used with POE type oils.
- POE type oils rapidly absorb moisture from the atmosphere.
- Vacuum pumps will not remove moisture from POE type oils.
- Do not use liquid line driers with a rated working pressure rating less than 600 psig.
- Do not install suction line drivers in the liquid line.
- A liquid line drier is required on every unit.
- Do not use an R-22 TXV. If a TXV is to be used, it must be an R-410A TXV.
- Never open system to atmosphere when under vacuum.
- If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace filter driers.

Form 145.32-IOM1 (908)
New Release

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