

# Installation Operation and Service Manual

## \_SON Series





# TABEL OF CONTENTS

S No.	TOPIC	Page
1.	<b>1.0: SAFETY INSTRUCTIONS</b>	4-5
	1.1: Warnings	
	1.2: Requirements For Electric Connection	
2.	<b>2.0: MODEL NOMENCLATURE</b>	6
3.	<b>3.0: GENERAL INFORMATION</b>	7-8
	3.1 General	
	3.2: Checking Product Received	
	3.3: Application	
	3.4: Information On R410a & Tools	
	3.5.1: Specification Of R-410a	
	3.6.2: Quick Reference Guide For R-410a	
4.	<b>4.0: ELECTRICAL &amp; PHYSICAL DATA ROTARY</b>	9-12
	4.1: Technical Specification _SIN - _SON Rotary Units	
	4.2: Technical Specification _SIN - _SON Scroll Units	
	4.3: Unit Dimension _SON Rotary Units	
5.	<b>5.0: UNIT DIMENSION _SON SCROLL</b>	13
6.	<b>6.0: INSTALLATION INSTRUCTIONS</b>	14-22
	6.1: Corrosive Environment	
	6.2: Location Unit	
	6.3: Unit Mounting	
	6.4: System Operation Information	
	6.5: Things you may do	
	6.6: Oil Trap	
	6.7: Minimize The Equivalent Length	
	6.8: Pipe Insulation	
	6.9: Horizontal Runs	
	6.9: Vertical Runs	
	6.10 CRANKCASE HEATER (OPTIONAL)	
	6.11: Pipe Bends	
	6.12: Pipe bender	
	6.13 : Copper Elbow	
7.	<b>7.0: REFRIGERANT PIPE CONNECTIONS</b>	23-26
	7.1: Recommendations	
	7.2: Line Sizing Chart Rotary	
	7.3: Suction Line	
	7.4: Liquid Line	
	7.5: Minimize Bends	
8.	<b>8.0 LEAK TEST &amp; VACUUM TEST</b>	27
	8.1 LEAK TESTING	
	8.2 VACUUM TEST	
9.	<b>9.0: REFRIGERANT CHARGE</b>	28-29
	9.1: Charging by Weight	
	9.2: Contamination	
10.	<b>10.0: ELECTRICAL WIRING</b>	30
	10.01 Power Wiring	
	10.2: Grounding	
	10.3: Control Wiring	
11.	<b>11.0: OPERATION &amp; PERFORMANCE</b>	31
	11.1: Safety Features	
12.	<b>12.0: ELECTRICAL WIRING DIA GRAM</b>	32-34
13.	<b>13.0: TROUBLE SHOOTING</b>	35
14.	<b>12.0: OPERATIONS</b>	36-41

# 1.0 SAFETY INSTRUCTIONS

## 1.1 WARNINGS

### WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

### WARNING

THE MANUFACTURER'S WARRANTY DOES NOT COVER ANY DAMAGE OR DEFECT TO THE UNIT CAUSED BY THE ATTACHMENT OR USE OF ANY COMPONENTS, ACCESSORIES OR DEVICES (OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER) INTO, ONTO OR IN CONJUNCTION WITH THE UNIT. YOU SHOULD BE AWARE THAT THE USE OF UN AUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES MAY ADVERSELY AFFECT THE OPERATION OF THE UNIT AND MAY ALSO ENDANGER LIFE AND PROPERTY. THE MANUFACTURER DISCLAIMS ANY RESPONSIBILITY FOR SUCH LOSS OR INJURY RESULTING FROM THE USE OF SUCH UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES.

### WARNING

DISCONNECT ALL POWER TO UNIT BEFORE STARTING MAINTENANCE. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

DO NOT USE OXYGEN TO PURGE LINES OR PRESSURIZE SYSTEM FOR LEAK TEST. OXYGEN REACTS VIOLENTLY WITH OIL, WHICH CAN CAUSE AN EXPLOSION RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

THE UNIT MUST BE PERMANENTLY GROUNDED. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

TURN OFF ELECTRIC POWER AT THE FUSE BOX OR SERVICE PANEL BEFORE MAKING ANY ELECTRICAL CONNECTIONS. ALSO, THE GROUND CONNECTION MUST BE COMPLETED BEFORE MAKING LINE VOLTAGE CONNECTIONS. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK, SEVERE PERSONAL INJURY OR DEATH.

### CAUTION

THE FILTER DRIER IS LOCATED INSIDE THE CONTROL BOX. THE FILTER DRIER MUST BE INSTALLED EXTERNALLY IN THE LIQUID LINE OR THE WARRANTY WILL BE VOID!

### CAUTION

THIS APPLIANCE IS NOT INTENDED FOR USE BY PERSONS ( INCLUDING CHILDREN) WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES, OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY HAVE BEEN GIVEN SUPERVISION OR INSTRUCTION CONCERNING USE OF THE APPLIANCE BY A PERSON RESPONSIBLE FOR THEIR SAFETY.

CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY VERY DO NOT PLAY WITH THE APPLIANCE.

### CAUTION

APPLIANCE DOES NOT HAVE CLASS III CONSTRUCTED PART.



---

## 1.2 Requirements For Electric Connection

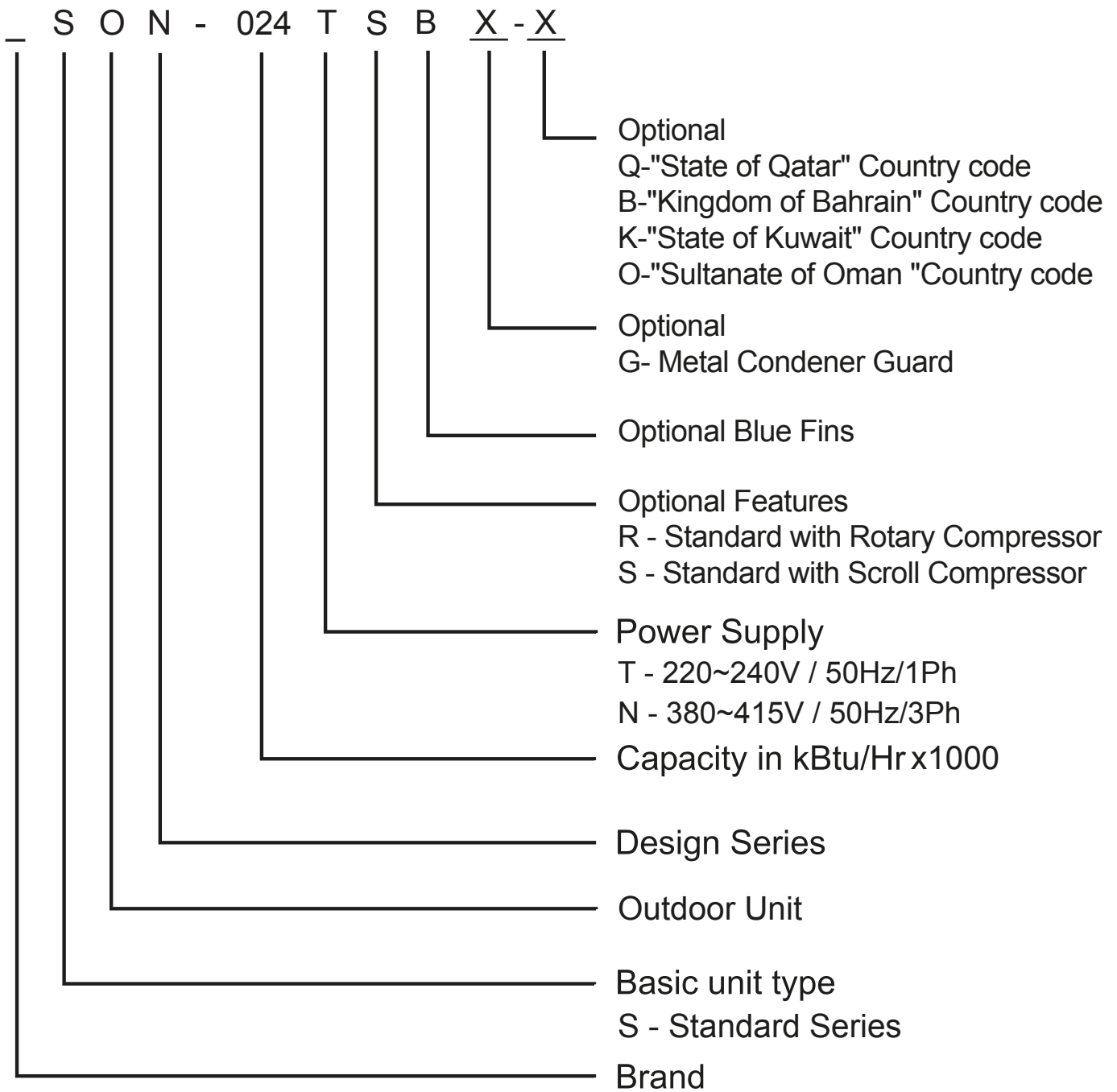
### Safety precaution

1. Must follow the electric safety regulations when installing the unit.
2. According to the local safety regulations, use qualified power supply circuit and air switch.
3. Make sure the power supply matches with the requirement of air conditioner. Unstable power supply or incorrect wiring or malfunction. Please install proper power supply cables before using the air conditioner.
4. Properly connect the live wire, neutral wire and grounding wire of power socket.
5. Be sure to cut off the power supply before proceeding any work related to electricity and safety.
6. Do not put through the power before finishing installation.
7. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
8. The temperature of refrigerant circuit will be high, please keep the interconnection cable away from the copper tube.
9. The appliance shall be installed in accordance with national wiring regulations.

### Grounding requirement

1. The air conditioner is the first class electric appliance. It must be properly grounded with specialized grounding device by a professional. Please make sure it is always grounded effectively, otherwise it may cause electric shock.
2. The yellow-green wire in air conditioner is grounding wire, which can't be used for other purposes.
3. The grounding resistance should comply with national electric safety regulations.
4. The appliance must be positioned so that the plug is accessible.
5. An all-pole disconnection switch having a contact separation of at least 3mm in all poles should be connected in fixed wiring.

## 2.0: MODEL NOMENCLATURE



# 3.0: GENERAL

---

The information contained in this manual has been prepared to assist in the proper installation, operation and maintenance of the air conditioning system. Improper installation, or installation not made in accordance with these instructions, can result in unsatisfactory operation and/or dangerous conditions, and can cause the related warranty not to apply.

Read this manual and any instructions packaged with separate equipment required to make up the system prior to installation. Retain this manual for future reference.

To achieve optimum efficiency and capacity, the indoor cooling coils listed in the condensing unit specification sheet should be used.

**IMPORTANT:** We recommend replacement of any HVAC equipment that has been subjected to flooding in order to avoid any risk of injury or harm.

**IMPORTANT:** Use all available safety precautions during the installation and servicing of any HVAC equipment.

Reference the model nameplate and brand label on the unit for the following product information:

- Model Number
- Serial Number
- Country of Origin
- Rated Voltage and Frequency
- Rated T1 and T3 conditions for:
  - Rated Current
  - Rated Power (kW)
  - Rated Capacity
  - Rated EER

The Estimated Annual Energy Consumption of this product is calculated using the following formula:

Estimated Annual Energy Consumption = Rated Power (kW) at T1 conditions multiplied by 2700 working hours.

## 3.1 Checking Product Received

Upon receiving unit, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company. Check condensing unit model number, electrical characteristics and accessories to determine if they are correct and match the original order from the local distributor. Check system components (evaporator coil, condensing unit, evaporator blower, etc.) to make sure they are properly matched.

## 3.2 Application

Before installing any air conditioning equipment, a duct analysis of the structure and a heat gain calculation must be made. A heat gain calculation begins by measuring all external surfaces and openings that gain heat from the surrounding air and quantifying that heat gain. A heat gain calculation also calculates the extra heat load caused by sunlight and by humidity removal.

There are several factors that the installers must consider:

- Outdoor unit location
- System refrigerant charge
- Indoor unit blower speed
- System air balancing
- Proper equipment evacuation
- Indoor unit airflow
- Supply and return air duct design and sizing
- Diffuser and return air grille location and sizing

### 3.3. Information on R410a & Tools

Manifold Sets:  
-Up to 800 PSIG High Side  
-Up to 250 PSIG Low Side

Manifold Hoses:  
-Service Pressure Rating of 800 PSIG

Recovery Cylinders:  
-400 PSIG Pressure Rating

#### **⚠ CAUTION**

*R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.*

#### 3.3.1 SPECIFICATION OF R-410A:

**Application:** R-410A is not a drop-in replacement for R-22; equipment designs must accommodate its higher pressures. It cannot be retrofitted into R-22 condensing units.

**Physical Properties:** R-410A has an atmospheric boiling point of -62.9°F and its saturation pressure at 77°F is 224.5 psig.

**Composition:** R-410A is an azeotropic mixture of 50% by weight difluoromethane (HFC-32) and 50% by weight pentafluoroethane (HFC-125).

**Pressure:** The pressure of R-410A is approximately 60% (1.6 times) greater than R-22. Recovery and recycle equipment, pumps, hoses and the like need to have design pressure ratings appropriate for R-410A. *Manifold sets need to range up to 800 psig high-side and 250 psig low-side with a 550 psig low-side retard. Hoses need to have a service pressure rating of 800 psig. Recovery cylinders need to have a 400 psig service pressure rating.* DOT 4BA400 or DOT BW400.

**Combustibility:** At pressures above 1 atmosphere, mixture of R-410A and air can become combustible. R-410A and air should never be mixed in tanks or supply lines, or be allowed to accumulate in storage tanks. Leak checking should never be done with a mixture of R-410A and air. Leak checking can be performed safely with nitrogen or a mixture of R-410A and nitrogen.

#### 3.3.2 QUICK REFERENCE GUIDE FOR R-410A

- R-410A refrigerant operates at approximately 60% higher pressure (1.6 times) than R-22. Ensure that servicing equipment is designed to operate with R-410A.
- R-410A refrigerant cylinders are pink in color.
- R-410A, as with other HFC's is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- R-410A systems are to be charged with liquid refrigerants. Prior to March 1999, R-410A refrigerant cylinders had a dip tube. These cylinders should be kept upright for equipment charging. Post March 1999 cylinders do not have a dip tube and should be inverted to ensure liquid charging of the equipment.
- Do not install a suction line filter drier in the liquid line.
- A liquid line filter drier is standard on every unit. Only manufacturer approved liquid line filter driers can be used. These are Sporlan (CW083S) and Alco (80K083S) driers. These filter driers are rated for minimum working pressure of 600 psig.
- Desiccant (drying agent) must be compatible for POE oils and R-410A.

# 4.0: ELECTRICAL & PHYSICAL DATA \_SON ROTARY

## 2.06 ELECTRICAL & PHYSICAL DATA

Table 2: Electrical Data for Units

Model	Volts,Hz,Phase	Compressor RLA	Compressor LRA	Fan Motor FLA	Fuse Rating (A)	No.of Rows	Face Area (sq.ft.)	R410A Charge (Kg)
_SON-012TR	220-240,50,1~	4.8	27.5	0.7	20	2	3.9	1.6
_SON-018TR	220-240,50,1~	7.3	46.2	0.7	20	2	6.0	1.8
_SON-021TR	220-240,50,1~	8.4	57.2	0.7	20	2	6.0	2.1
_SON-024TR	220-240,50,1~	9.8	60.5	1.5	20	2	6.7	2.6
_SON-030TR	220-240,50,1~	11.5	63.8	1.5	20	2	6.7	3.2
_SON-021TS	220-240,50,1~	9.0	53.0	0.7	20	2	6.0	2.1
_SON-025TS	220-240,50,1~	11.0	60.0	1.5	20	2	6.7	2.3
_SON-030TS	220-240,50,1~	15.0	67.0	2	20	2	9.2	2.7
_SON-036TS	220-240,50,1~	17.7	98.0	2	32	2	9.2	2.85
_SON-036NS	380-415,50,3N~	6.7	43.0	2	20	2	9.2	2.85
_SON-042NS	380-415,50,3N~	6.8	43.0	2	20	3	9.2	3.5
_SON-048NS	380-415,50,3N~	7.6	51.5	2	20	3	9.2	3.6
_SON-054NS	380-415,50,3N~	10.9	64.0	3	20	4	11.9	5.7

Table 3: Electrical Data for Switchgears

MODEL	POWER SUPPLY (Volts,Hz,Phase)	MAX CURRENT (A)	Cable size (core X sq.mm)	MINIMUM MCB RATING (A)
_SON-012TR	220-240,50,1~	7	3 X 2.5	12
_SON-018TR	220-240,50,1~	11	3 X 2.5	16
_SON-021TR	220-240,50,1~	13	3 X 2.5	25
_SON-024TR	220-240,50,1~	15	3 X 2.5	25
_SON-030TR	220-240,50,1~	18	3 X 2.5	25
_SON-021TS	220-240,50,1~	15	3 X 2.5	25
_SON-025TS	220-240,50,1~	17	3 X 2.5	25
_SON-030TS	220-240,50,1~	23	3 X 4.0	32
_SON-036TS	220-240,50,1~	27	3 X 6.0	32
_SON-036NS	380-415,50,3N~	12	4 X 2.5	20
_SON-042NS	380-415,50,3N~	12	4 X 2.5	20
_SON-048NS	380-415,50,3N~	14	4 X 2.5	25
_SON-054NS	380-415,50,3N~	18	4 X 2.5	25

# 4.1: TECHNICAL SPECIFICATION \_SIN - \_SON ROTARY UNITS

TABLE FOR TECHNICAL DATA										
AIR HANDLING UNIT MODEL		_SIN-012T	_SIN-018T	_SIN-021T	_SIN-024T	_SIN-030T				
CONDENSING UNIT MODEL		_SON-012TR	_SON-018TR	_SON-021TR	_SON-024TR	_SON-030TR				
AMBIENT TEMP 95°F	EVAP ENTERING AIR TEMP.	12.0	18.2	20.8	25.1	29.2	TMBH	80 DB / 67 WB °F		
		10.2	14.9	17.9	20.5	25.9	SMBH			
AMBIENT TEMP 115°F	EVAP ENTERING AIR TEMP.	10.6	16.2	18.3	22.1	25.6	TMBH	80 DB / 67 WB °F		
		9.6	13.5	16.8	19.5	24.5	SMBH			
AIR FLOW PERFORMANCE (DRY COIL)		360	485	745	795	1145		LOW		
		435	570	770	840	1200	CFM	MED		
		500	650	790	890	1250		HIGH		
Sound Level		38.6	38.4	40.8	46.3	44.8		LOW		
		39.3	39.1	41.3	46.5	45.4	dBA	MED		
		39.7	40.5	41.7	47.5	45.9		HIGH		
EXTERNAL STATIC PRESSURE (ESP)		0.1 (25)	0.1 (25)	0.1 (25)	0.1 (25)	0.15 (37)		IN (Pa)		
NUMBER OF COMPRESSORS		1	1	1	1	1				
NUMBER OF REFRIGERANT CIRCUIT FOR AHU		1	1	1	1	1				
EXPANSION DEVICE/REFRIGERANT - R410A		Orifice								
ELECTRICAL DATA	POWER SUPPLY	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240	PH-HZ-VOLT			
	POWER INPUT at T1 Condition	0.058	0.079	0.097	0.150	0.156	KW			
	CIRCUIT BREAKER SIZE	0.959	1.466	1.660	1.972	2.309				
	FULL LOAD CURRENT	15	15	15	15	15	AMPS			
		25	25	25	25	32				
		0.3	0.4	0.4	0.7	0.8	AMPS			
COIL FACE AREA		4.2	6.3	7.4	8.8	10.4				
		2.7	2.7	3.6	3.6	4.5	SQ. FT			
NO OF FANS		3.9	6.0	6.0	6.7	6.7				
		2	2	2	2	2	NOS.			
NET WEIGHT		1	1	1	1	1				
		37	38	44	44	58	KG			
Total equivalent pipe length		36	50	50	55	58	KG			
		20	30	30	30	30	M			
Maximum Vertical Height (ODU above IDU)		10	21	21	21	21	M			
		6	9	9	9	9	M			

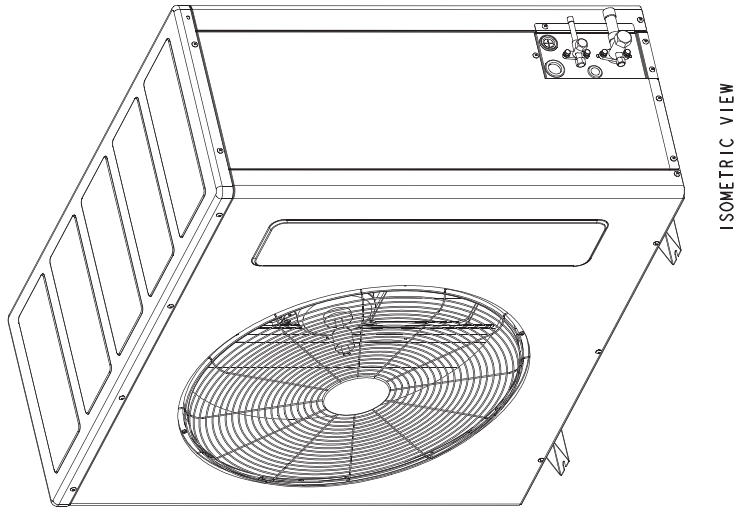
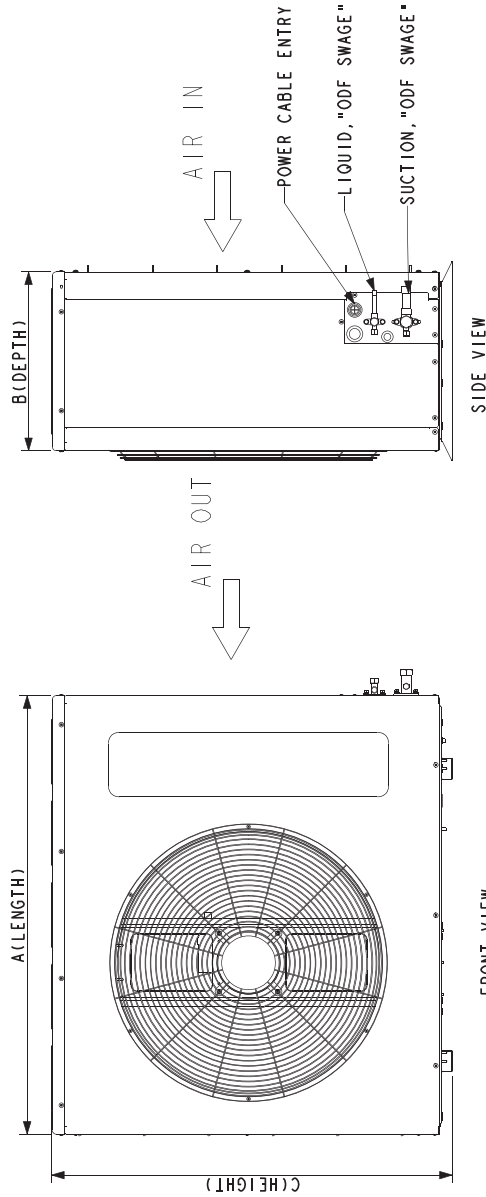
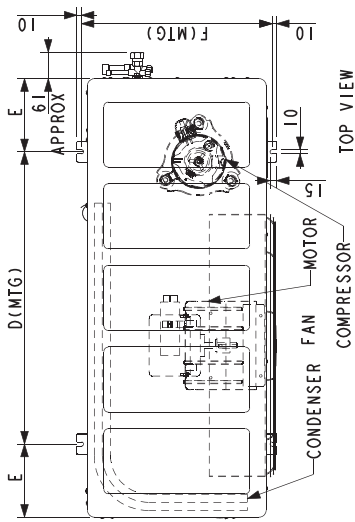
\* Air flow and sound data is mentioned at compressor off condition.

\* Unit performance is rated as per ESMA standard for evaluation.

# 4.2: TECHNICAL SPECIFICATION \_SIN - \_SON SCROLL UNITS

TABLE FOR TECHNICAL DATA											
AIR HANDLING UNIT MODEL		_SIN-021T	_SIN-025T	_SIN-029T	_SIN-036T	_SIN-036T	_SIN-036T	_SIN-042T	_SIN-048T	_SIN-054T	
CONDENSING UNIT MODEL		_SON-021TS	_SON-025TS	_SON-030TS	_SON-036TS	_SON-036TS	_SON-036NS	_SON-042NS	_SON-048NS	_SON-054NS	
AMBIENT TEMP 95 °F	EVAP ENTERING AIR TEMP.	80 DB / 67 WB °F	27.0	29.2	37.4	37.4	37.2	40.1	46.3	59.3	
		SMBH	22.1	24.7	29.5	29.5	29.2	34.1	38.1	47.7	
		TMBH	19.5	24.0	33.0	33.0	32.9	35.4	40.7	53.3	
AMBIENT TEMP 115 °F	EVAP ENTERING AIR TEMP.	80 DB / 67 WB °F	23.3	25.1	32.0	32.0	31.5	34.4	40.2	51.9	
		LOW	745	1170	1200	1200	1200	1260	1250	1460	
		MED	770	1225	1250	1250	1250	1390	1400	1600	
AIR FLOW PERFORMANCE (DRY COIL)		HIGH	790	1275	1290	1290	1290	1560	1560	2040	
		LOW	40.8	46.3	45.8	45.4	45.4	48.1	49.1	52	
		MED	41.3	46.5	46.3	45.9	45.9	49.1	50.7	52.6	
NOISE LEVEL		HIGH	41.7	47.5	47.1	46.7	46.7	50.7	52.5	53.4	
		IN (Pa)	0.1 (25)	0.1 (25)	0.15 (37)	0.15 (37)	0.15 (37)	0.15 (37)	0.2 (50)	0.2 (50)	
		NUMBER OF COMPRESSORS	1	1	1	1	1	1	1	1	
NUMBER OF REFRIGERANT CIRCUIT FOR AHU			1	1	1	1	1	1	1	1	
EXPANSION DEVICE/REFRIGERANT - R410A			1	1	1	1	1	1	1	1	
ELECTRICAL DATA	POWER SUPPLY	AIR HANDLING UNIT	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1
		CONDENSING UNIT	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1
	POWER INPUT	AIR HANDLING UNIT	0.102	0.146	0.158	0.177	0.177	0.175	0.257	0.297	0.439
		CONDENSING UNIT	1.771	2.143	2.290	2.994	2.994	2.976	3.069	3.621	4.584
	CIRCUIT BREAKER SIZE	AIR HANDLING UNIT	15	15	15	15	15	15	15	15	15
		CONDENSING UNIT	25	25	32	32	32	25	25	25	25
	FULL LOAD CURRENT	AIR HANDLING UNIT	0.4	0.6	0.8	0.9	0.9	0.9	1.2	1.6	1.91
		CONDENSING UNIT	7.7	9.5	9.9	12.6	12.6	6.3	6.3	6.4	8.9
	COIL FACE AREA	AIR HANDLING UNIT	3.6	3.6	4.5	4.5	4.5	4.5	5.1	5.1	6.1
		CONDENSING UNIT	6.0	6.7	9.2	9.2	9.2	9.2	9.2	9.2	11.9
NO OF FANS	AIR HANDLING UNIT	2	2	2	2	2	2	2	2	2	
	CONDENSING UNIT	1	1	1	1	1	1	1	1	1	
NET WEIGHT	INDOOR UNIT	44	44	55	58	58	58	64	64	72	
	OUTDOOR UNIT	53	57	78	86	86	86	90	92	110	

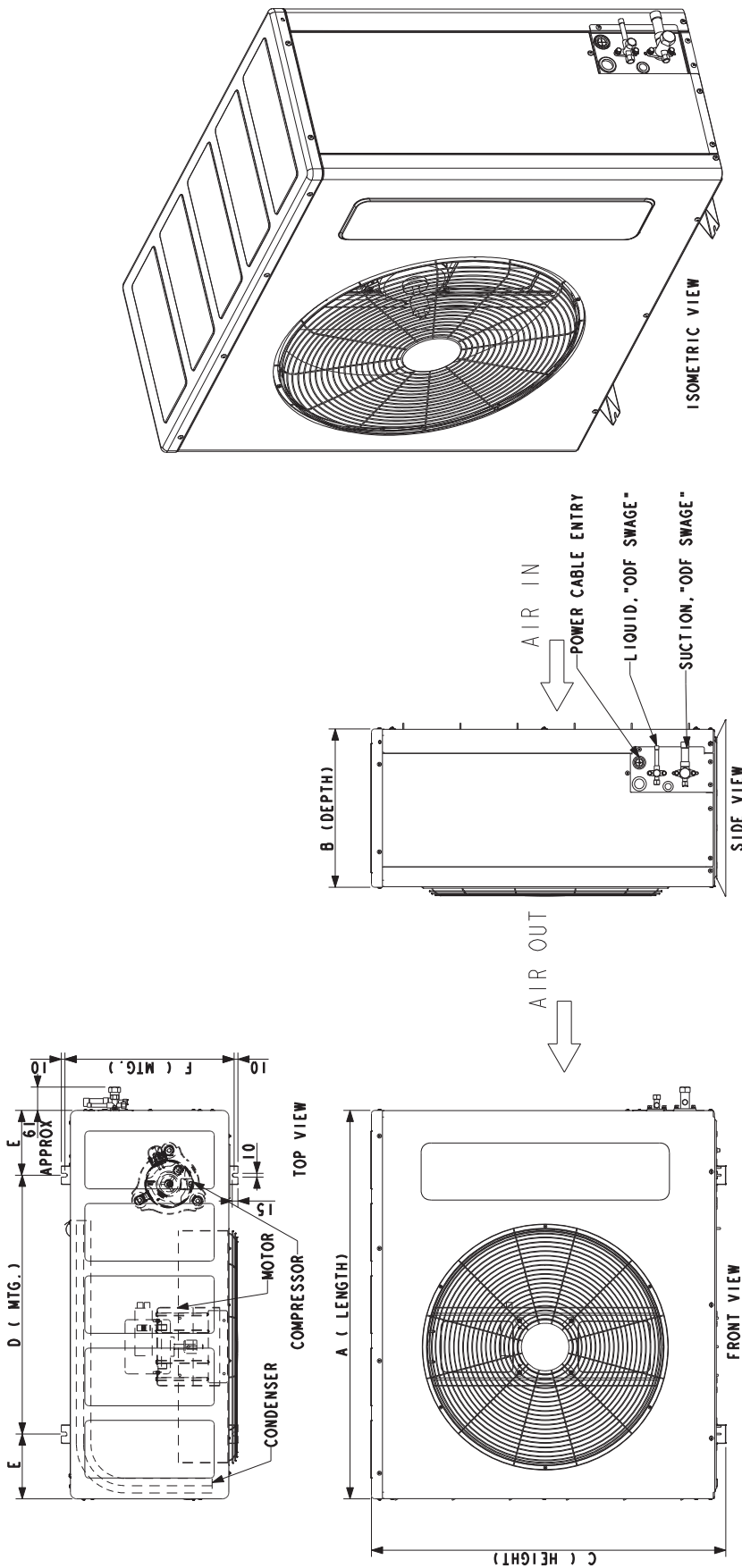
# 4.3: UNIT DIMENSION SON ROTARY UNITS



MODEL - 50Hz .	A	B	C	D	E	F	SUCTION CONNECTION	LIQUID CONNECTION	FAN DIA
-SON-024TR/30TR	850	310	800	595	125	350	5/8"	3/8"	20"
-SON-021TR	850	310	690	595	125	350	5/8"	3/8"	18"
-SON-018TR	850	310	690	595	125	350	1/2"	3/8"	18"
-SON-012TR	850	310	550	535	157	350	1/2"	3/8"	16"



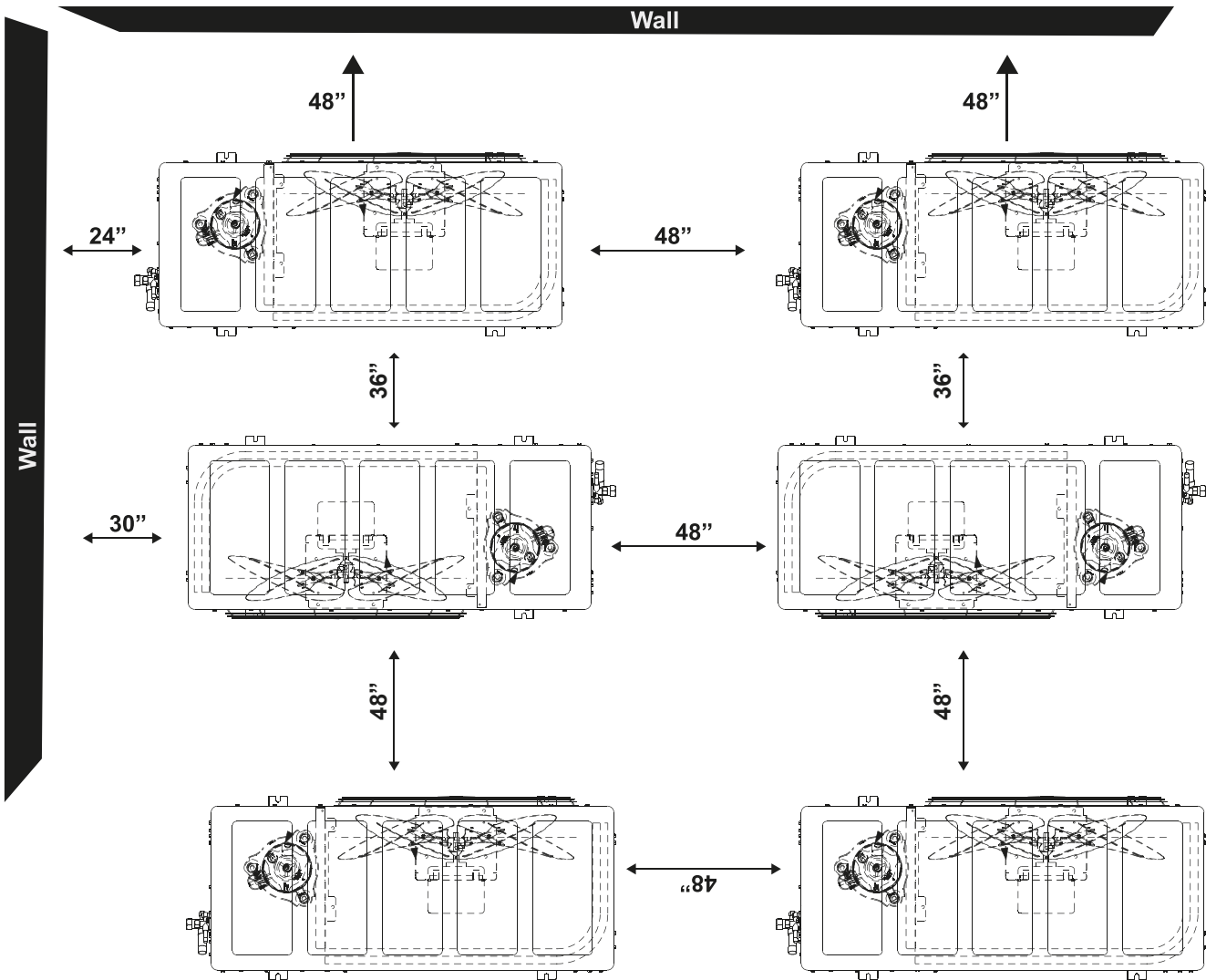
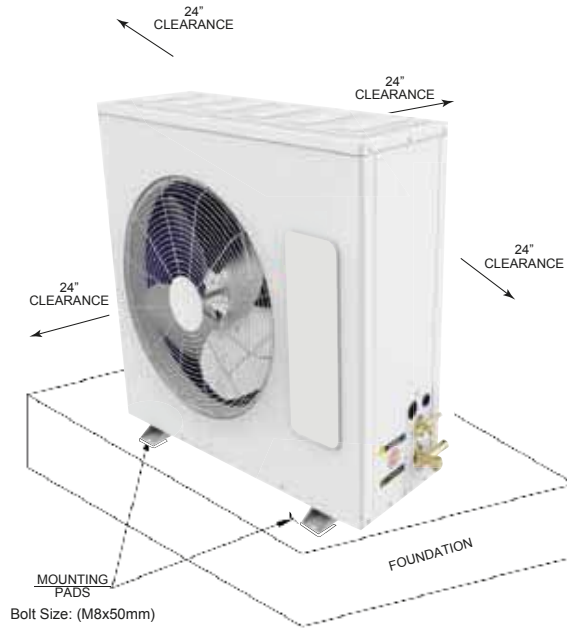
# 5.0 UNIT DIMENSION SON SCROLL UNITS



MODEL - 50Hz	A	B	C	D	E	F	SUCTION CONNECTION	LIQUID CONNECTION	FAN DIA
-SON-021TS	850	310	690	595	125	350	5/8"	3/8"	18"
-SON-025TS	850	310	800	595	125	350	5/8"	3/8"	20"
-SON-030TS / -SON-036TS / -SON-036NS	1020	416	930	680	170	445	5/8"	3/8"	24"
-SON-042NS / -SON-048NS	1020	416	930	680	170	445	3/4"	3/8"	24"
-SON-054NS	1020	416	1045	680	170	445	3/4"	3/8"	26"

# 6.0: INSTALLATION INSTRUCTIONS

## 6.1: Multiple Unit Installation



## 6.2: LOCATION UNIT

---

### 6.1: Corrosive Environment

The metal parts of this unit may be subject to rust or deterioration if exposed to a corrosive environment. This oxidation could shorten the equipment's useful life. Corrosive elements include salt spray or fog in seacoast areas, sulphur or chlorine from sprinkler systems, and various industrial contaminants. If the unit is to be installed in an area where contaminants are likely to be a problem, special attention be given to equipment location and exposure.

- Prevent sprinkler heads from spraying directly on the cabinet.
- In coastal area, locate the unit on the side of the building away from the waterfront.
- Shielding provided by fences or shrubs may give some protection.
- Elevating the unit off its slab or base enough to allow air circulation will prevent water from being held against the base pan.

### 6.2: Location Unit

Consult local building codes or ordinances for special installation requirements. When selecting a site to locate the outdoor unit, consider the following:

- The unit requires a minimum clearance of 24" (610 mm) on the valve side for service access, 24"(610 mm) on the coil sides for air intake, and 40" ( 1000 mm) in the front for air discharge.
- **IMPORTANT:** Condensing unit must be installed a minimum of 4 feet (1219 mm) horizontally from any gas vent termination.
- The unit must be located outdoors and cannot be connected to ductwork.
- Locate unit where operating sound will not disturb owner or neighbours.
- Locate unit so runoff water from the roof does not pour directly on the unit. Provide gutter or other shielding at roof level.
- To reduce noise transmission, do not connect concrete slabs to the building foundation or structure.
- Do not obstruct openings in bottom of the unit.
- The length of refrigerant piping and wiring should be as short as possible to avoid capacity losses and increased operating costs.
- Locate the pad sufficiently above grade to prevent ground water from entering the unit.

### 6.3: Unit Mounting

Picture showing rubber concrete base structure, its dimensions, unit bolted to base with rubber pads.

- The base rails provided elevate the condenser coil 1 1/2" (38 mm) above the base pad.
- When elevating the unit on a flat roof, 4" (102 mm) x 4" (102 mm) stringers may be used to distribute unit weight evenly and reduce vibration or use antivibration rubberised pads.
- Use bolt of size M8x50 mm.

### 6.4: System Operation Information

It is most important to select the comfort temperature you desire for either heating or cooling by use of the controller.

Do Not Play With The Controller & use it with care.

If the temperature selection procedure is new to you, ask your installing contractor to familiarize you with the operation of the controller.

1. Keep the filter clean. Your system will operate more efficiently and provide better conditioned air, more economically.
2. Arrange your furniture and drapes so that the supply and return air registers and grilles are unobstructed.
3. Close door and windows. This will reduce the cooling load on your system for a more economical operation.
4. Avoid excessive use of kitchen exhaust fans.
5. Window shades and awnings will reduce the cooling load.
6. Unless you plan to clean the coil in the outdoor unit, do not disconnect the main power to your unit. This is a safety precaution for the protection of the compressor. Otherwise, use the thermostat switches to shut the system off.
7. For extended operation periods, set the thermostat system switch in the off position and the fan switch in the auto position.
8. If the unit is shut off at thermostat, wait 5 minutes before restarting.
9. We suggest that you do not allow the outdoor unit to become a play stand for children. This could be dangerous to the child.
10. A regular period of waxing the finish on an outdoor unit will increase the life of the finish.
11. Remember to keep the air filters clean for efficiency and energy saving operation.

## 6.5: Things you may do

### WARNING

Turn off main electrical power to the outdoor unit or indoor unit before attempting any maintenance operation.

Keep air filters clean. There are several types of materials used in air filters and there are many possible locations for air filters, Consult with your contractor as to the location of the filters and type of material in use.

How To Clean : Glass Fiber- (Throwaway) This is a disposable type of filter. Inspect monthly and replace when necessary. A new home will normally require more frequent attention to the filters.

Aluminum Mesh Wash with detergent and water, air dry thoroughly and renew the coating in compliance with the manufacturer's instructions. Plastic impregnated Fiber-Wash with detergent and water or vacuum clean, then reinstall.

### CAUTION

DO NOT OPERATE YOUR SYSTEM FOR EXTENDED PERIODS WITHOUT FILTERS, AS THE DUST ENTRAINED IN THE AIR MAY PACK INTO THE FIN AREA OF THE INDOOR COIL. CREATING A CONDITION WHICH COULD REQUIRE EXTENSIVE REPAIRS.

- 4 Oiling of Electrical Motors : The blower motor sleeve bearings are prelubricated by the motor manufacturer and may not require attention for an indefinite period of time. However, our recommendations are as follows:
  - A Motors without oiling ports-Prelubricated and sealed. No further lubrication should be required, but in case of bearing problems, the blower and the motor end bells of some motors can be disassembled and the bearings relubricated by a qualified service person.
  - B Motors with oiling ports Add from 10 to 20 drops of Electric Motor Oil or an SE grade of non-detergent SAED10 or 20 motor oil to each bearing every two years for somewhat continuous duty, or at least every five years for light duty. Take care not to over oil, because excessive lubrication can damage the motor.

The compressor motor is in a sealed system so it does not require lubrication.

If your outdoor unit is equipped with an external manual high pressure switch reset button, have your servicing contractor familiarize you with its location. Many models have compressors equipped with internal pressure relief valves using an automatic reset feature eliminating the need for an external control. This high pressure switch or the relief valve will open under excessive high pressure to protect the compressor. Some models with internal relief valves will require power interruption prior to resetting itself. The high refrigerant pressure may be due to a temporary condition, so if your unit is required a reset button you may reset it as required. However, if the problem persists, refer to item 8, and or refer the problem to your servicing contractor. Please refer safety cutout page.

If the condenser coil is allowed to become restricted by dirt tint, paper, grass clipping, leaves, etc., the system efficiency will suffer and abnormally high refrigerant operating pressures will result. To correct this condition, be sure to first cut off power to the unit, and then clean such material from the condenser coil and cabinet. Using a garden hose with a nozzle can be effective in cleaning the condenser coil, but the water should be sprayed from the inside to outside of the coil in the opposite direction from the normal airflow, when the condensing unit is operating.

If you know or suspect that the compressor in the outdoor section is not working, you should place the thermostat system switch on the thermostat subbase to the off position. This will stop the operation of the outdoor unit.

If you suspect that a problem has developed with your system and before you advise your servicing contractor, we suggest you check the following service hints :vttt

## 6.6: Oil Trap

Oil traps are required to be installed at fixed intervals along the Vertical suction pipe. This is especially so when the outdoor unit is located on a higher elevation than the indoor unit. These oil traps help to get any accumulated oil to move upwards, as shown in Figure 2.1. The design of the traps will forcibly cause the gaseous refrigerant to pass through the oil thus, carrying it upwards back to the compressor.

As a guideline, an oil trap is required at every 10 to 15ft (3 – 4.6m) intervals

Figure 2.02 illustrates how oil traps are installed. However, the high pressure drop across such traps may cause high capacity reduction.

## 6.7: Minimize The Equivalent Length

The system does not perform correctly when both the condenser and evaporator units are too far away from each other (either vertically or horizontally). The required refrigerant quantity increases and the products' guaranteed range is exceeded. Also, the circulation of refrigerant and lubrication oil malfunctions, the capacity drops, and compressor trouble may occur.

The piping length should be as short as possible because the capacity and the reliability decreases as piping length increases. Select the shortest length possible. Refer Section Table #

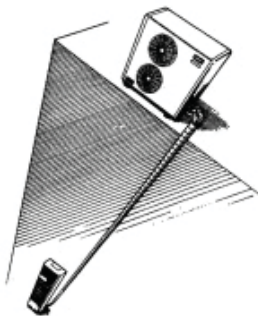


Figure 5.08: Excessive height different.

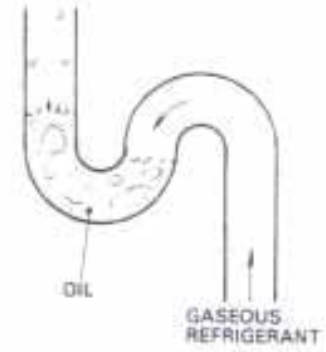


Figure 5.06: Internal refrigerant flow inside an oil trap

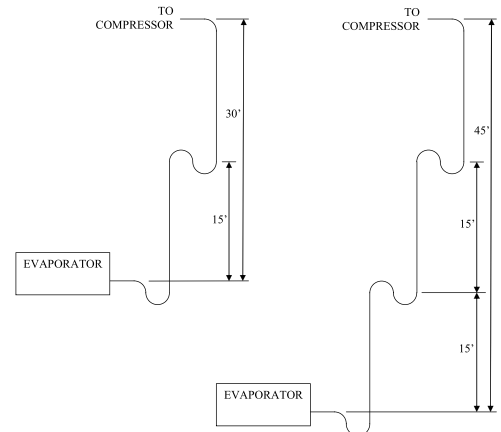


Figure 5.06: Oil traps installations

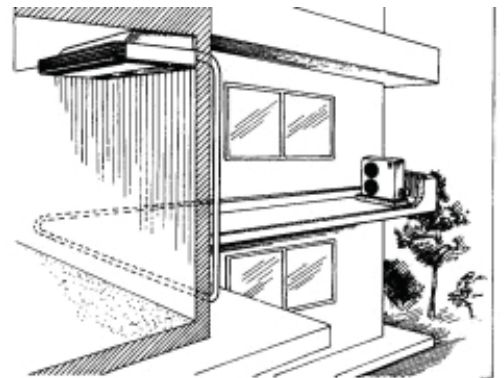


Figure 5.07: Too long horizontal length.



## 6.8: Pipe Insulation

It is only necessary to insulate the cold suction pipe. Do not insulate the hot liquid pipe. If the expansion device is located in the outdoor unit, the liquid pipe must also be insulated.

However, for heat pump units, it is important for both pipes to be insulated. This is because of the cold ambient temperatures when the unit is running in heat mode. The insulation will prevent heat loss to the ambient along the hot pipe line.

Insulation can be done easily by inserting the copper pipes into elastomeric insulation pipes. Examples are Armaflex and Superlon. Use the correct insulation sizes to the corresponding copper pipe size. Do not use a larger insulation as this will create an air space which will then create condensation (sweating). Cut sections of the insulation must be glued or taped together over the pipes, e.g. at bends and joints.

Recommended insulation: k-value of 0.034 – 0.037 W/m.K  
Minimum insulation thickness: ½" (12.7 mm)

Do not insert two copper pipes into a single large pipe insulation. Such practice will cause the system to lose performance due to heat gain or heat loss because the pipe surfaces are not in good contact with the insulation. Cross heat transfer between a cold and hot pipe can occur due to the close proximity of the two pipes. Potential sweating problems may also occur due to the created air space within.

## Piping Installation

The following section will provide some guidelines for refrigerant copper pipe installation, especially in relation to long piping jobs. Since the copper pipe is a flexible material, care must be taken to ensure proper installation.

## 6.9: Horizontal Runs

Normally, refrigerant pipes are run above the ceiling space. In order to do such horizontal runs, it is necessary to have supports at certain intervals so that the pipes do not sag. Supports in the form of saddles or angle brackets may be used. Multiple pipes can share the same support.

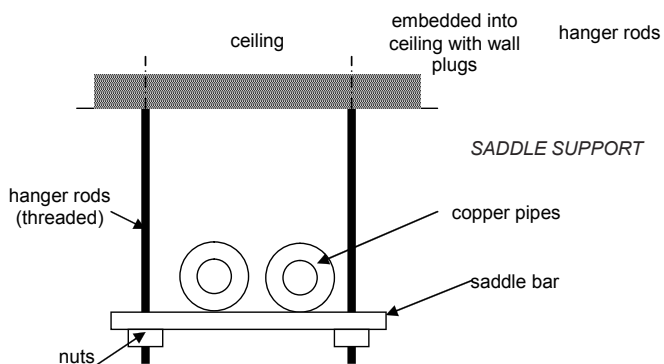


Figure 5.09: Pipe support using saddle

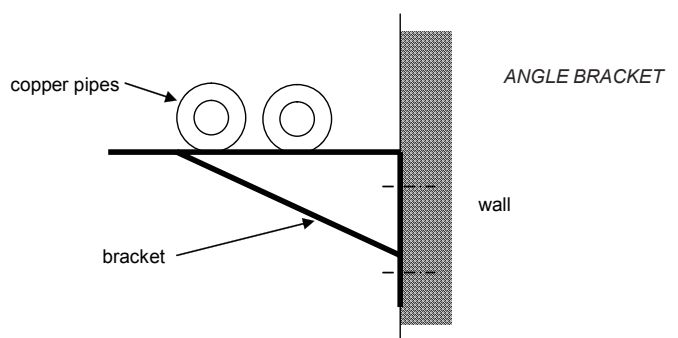


Figure 5.09: Pipe support using angle bracket

## a. Pipe Material

However, working with R-410A refrigerant will require a stronger pipe material to withstand the higher working pressure. Burst strength of at least 2400 psig will be required. In view of this, do not use the softer refrigeration tubing and Type M pipes. It is recommended that Type L be used for R-410A.

Joining of two pipes can be done easily by brazing with a copper filler rod. For better quality joint, a filler rod with 10% silver may be used. It may also be necessary to braze the copper pipe to a brass or steel fitting. In such instances, brazing with 34% silver filler rods must be used (together with brazing flux).

It is recommended to run the pipes on the floor, for the simple reason that people may just step on the pipes and damage them. However, should there be a need to do so; some kind of must be given. An example is to place the pipes into a box which is mounted (screwed) onto the floor.

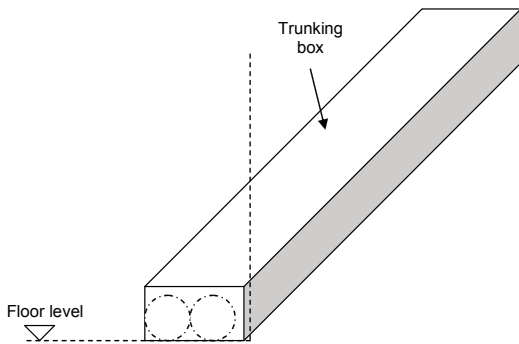


Figure 5.11: Pipe support using trunking box

The following table gives recommendation for the support spacing of the copper pipes:

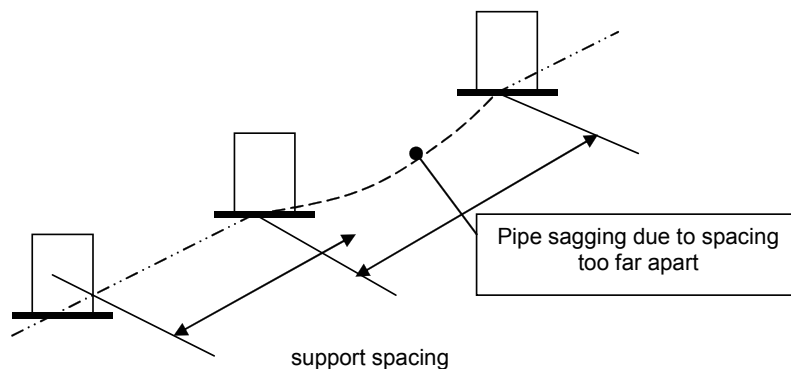


Figure 5.12: Effect of improper support spacing

## 6.9: Vertical Runs

Vertical pipe runs (of small sizes up to 5/8") are usually mounted on walls by nailing them with wall clips. This is an easy and quick method of installation.

An alternative method is by using pipe brackets. Simple saddle brackets made with angle iron are mounted with wall plugs onto the wall. The pipes are then clamped onto these brackets. This method is especially good for heavier and larger pipe sizes.

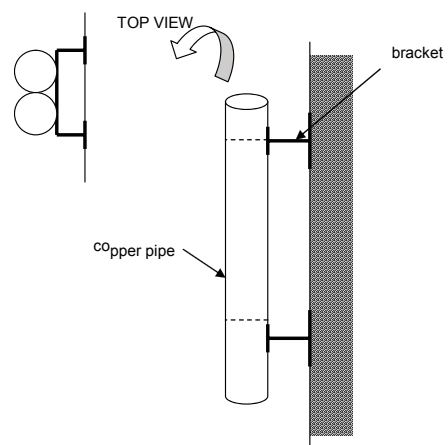


Figure 5.13: Vertical pipe installation on saddle brackets



Another method of running these pipes is by using electrical cable trays. These pre-fabricated trays are mounted onto the wall by using saddle brackets. The copper pipes are then clamped onto the trays. The main advantage of using these trays is a very neat, organized, and clean installation.



Figure 5.14: Vertical pipe installation on cable tray

Another similar method is by using trunking boxes. The trunking can be mounted straight onto the wall with wall plugs or on brackets. Copper pipes are then inserted into the trunking. The main advantage is that the pipes will be covered and protected from damage.



Figure 5.15: Trunking box

## 6.10 CRANKCASE HEATER STANDARD WITH “OS” MODEL

Crankcase heater is a sealed heater installed with close contact to the outer circumference at the bottom of the compressor. Examples of crankcase heater and how crankcase heater is installed onto a compressor is shown in Figure 2.8, Figure 2.9, and Figure 2.10.

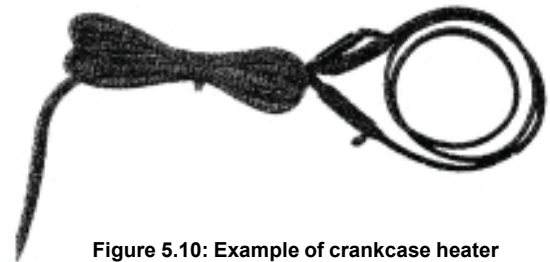


Figure 5.10: Example of crankcase heater

The purpose of installing crankcase heater is to protect the compressor from the negative effects of the liquid refrigerant in the compressor and in the lubricating oil. In simple words, crankcase heaters are frequently used to retard migration. It removes the refrigerant by heating from the outside. Refrigerant entering the compressor will be vaporized and driven back into the suction line. Crankcase heater should be installed during long piping installations where the risk of liquid refrigerant migration is much higher.

The crankcase heater size differs according to the capacity and the application of the compressor. A heater of about 40W to 80W should be used.

When the compressor is inactive for a long period, the crankcase heater should be energized for at least 6 to 12 hours before operation of the compressor is started. Please note that burning might occur if oil gets on to the crankcase heater.

Deterioration due to water condensation and acoustic insulation materials (such as “pneuol products”) can lead to defective insulation.

In some instances, the pipes are required to go through a floor slab. A suitably sized hole must be made in the floor (e.g. by coring method) to accommodate all the pipes going through. Suitable brackets may then be fabricated to hold the pipes together.

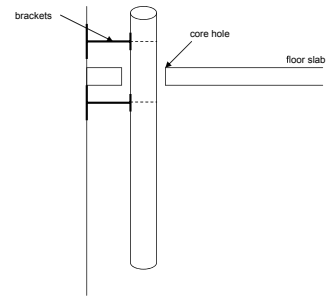


Figure 5.16: Pipe run through floor slab

### 6.11 Pipe Bends

Copper pipes **MUST NOT** be bent with bare hands. This will cause the pipe to dent or collapse at the bent area. Use the proper pipe bending tool and the correct tool size corresponding to the required pipe diameter

#### Figure 6.12: Pipe bender

Pipes up to 3/4" can be bent by using the pipe bending tool. Generally, larger pipes are not bent but rather copper elbows are used instead. The elbows are brazed onto straight lengths of pipe.

#### Figure 6.13 : Copper Elbow

An application example will be making an oil trap. The pipe bending tool is used to bend the two U-shape of the trap. For the larger pipe size, braze together 4 elbows to form the trap.

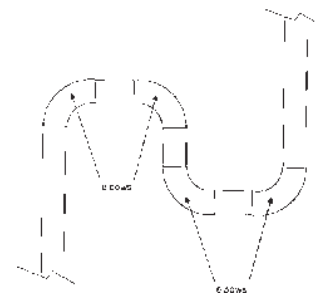


Figure 5.18 : Example of how elbows can be used to create U-traps.

### Tubing Connections

Be certain both refrigerant service valve at the condensing unit are closed (turned fully clockwise).

All lines should be assembled with type "L" refrigerant tubing and not with copper water pipe. They should be brazed with the following alloy:

Copper to Copper- 15% Silver Alloy (no flux)

#### FOR SWEAT-TYPE TUBING CONNECTIONS:

Clean the inside fitting and outside of the tubing with steel wool or sand cloth before soldering. Always keep chips, steel wool, dirt etc. Out of the inside of tubing when cleaning. Assemble tubing part way into fitting.

Remove cap and schrader core from service port to protect seals form heat damage.

Wrap service valve with a wet rag before applying heat. Braze the tubing between outdoor unit and indoor coil. Flow dry nitrogen into service port and through the tubing while brazing.

# 7.0: REFRIGERANT PIPE CONNECTIONS

All units are factory charged with Refrigerant R410A. All models are supplied with service valves. To prevent system contamination, keep tube ends sealed until connection is made.

## 7.1: Recommendations

Seamless copper tubes, bright annealed as per ASTM B-68 & B-75. Copper C12200 (Phosphorous deoxidized, High residual phosphorous) with Cu : 99.9%, P:0.015~0.040% “.

To prevent failure of new condensing unit, the existing evaporator cubing system must be cleaned or replaced. Care must be exercised that the expansion devices are not plugged. Liquid line filter driers are recommended on all units if compressor motor has failed. Test the oil for acid. If positive, suction line filter drier is mandatory.

For cooling position the system switch to "cool" and the fan switch to "auto". If constant fan operation is desired, place the fan switch in the "on" position. When heating is desired, position the system switch to call for heating and place the fan switch in the "auto" position.

## Refrigerant Pipe Sizing

It is desirable to have line sizes as small as possible from the standpoint of low initial cost. However, the overall system performance must be evaluated and the following recognised:

- a) Suction and discharge line pressure drop due to friction losses reduces compressor capacity and increases power consumption.
- b) Liquid line pressure drop due to friction loss and liquid static head may cause flash gas (Flash gas is the refrigerant gas which results from the vaporisation of liquid refrigerant to cool the remaining liquid refrigerant to a lower pressure level).
- c) Suction and discharge lines must be sized for proper gas velocity to assure oil return to the compressor.

The design considerations with long refrigerant piping installations are:

- a) Assure positive and continuous return of oil to the compressor crankcase.
- b) Refrigerant pressure losses are inevitable with long piping . This should not be remedied at the expense of retarding oil return to the compressor.
- c) Prevent liquid refrigerant from entering the compressor during running, off cycles and start up.
- d) Avoid trapping of oil in the evaporator or suction line which may subsequently return to the compressor as large slug with possible damage to the compressor.

In view of the above mentioned considerations, it is recommended that the refrigerant pipe size be maintained as specified on the indoor and outdoor units. It is not necessary to resize the pipe as long as the refrigerant pipe length limits are not exceeded.

Cooling Only units (No Heat Pumps)																	
Single Stage	Liquid Line Size [mm]	Suction Line Size [mm]	Condition - A					Condition - B					Condition - C				
			15.5-22.5	23-45	38-45	45-75	75-90	45.5-52.5	53-60	61.5-67.5	68-75	75.5-82.5	83-90				
			Equivalent Length in Meters														
			Maximum Vertical Separation / Capacity Multiplier														
			<15	15-52.5	23-45	38-45	45-75	75-90	45.5-52.5	53-60	61.5-67.5	68-75	75.5-82.5	83-90			
			15/1.00	22.5/0.99	33.5/0.99	40/0.98	40/0.98	52.5/0.97	52.5/0.97	52.5/0.97	52.5/0.97	52.5/0.97	52.5/0.97	52.5/0.97			
1.5 Ton	1/4" [6.35]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.98	45/0.96	52.5/0.97	58/0.97	55/0.96	56/0.96	55/0.96	52.5/0.96	52.5/0.95			
	5/16" [7.94]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.98	45/0.96	52.5/0.97	60/0.97	60/0.96	60/0.96	60/0.96	60/0.96	60/0.95			
	3/8" [9.52.5]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.98	45/0.96	52.5/0.97	60/0.97	60/0.96	60/0.96	60/0.96	60/0.96	60/0.95			
2 Ton	1/4" [6.35]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.97	45/0.95	52/0.97	55/0.96	50/0.95	47/0.95	47/0.95	60/0.95	60/0.94			
	5/16" [7.94]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.97	45/0.95	52.5/0.97	60/0.96	60/0.95	60/0.95	60/0.95	60/0.94				
	3/8" [9.52.5]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.98	40/0.97	45/0.95	52.5/0.97	60/0.96	60/0.95	60/0.95	60/0.95	60/0.94				
2.5 Ton	5/16" [7.94]	5/8" [15.88]	15/0.98	22.5/0.97	33.5/0.97	40/0.95	45/0.92	45/0.91	52.5/0.94	60/0.93	60/0.93	60/0.92	60*/0.92	60*/0.91			
	3/8" [9.52.5]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.99	40/0.98	45/0.97	45/0.96	52.5/0.98	60/0.98	60/0.97	60/0.97	60*/0.97	60*/0.96			
	5/16" [7.94]	3/4" [19.06]	15/1.00	22.5/0.99	33.5/0.96	40/0.93	45/0.90	45/0.88	52.5/0.93	60/0.91	60/0.90	60/0.90	60*/0.89	60*/0.88			
3 Ton	5/16" [7.94]	3/4" [19.06]	15/1.00	22.5/0.99	33.5/0.99	40/0.98	45/0.97	45/0.96	52.5/0.96	60/0.98	60/0.97	60/0.97	60*/0.96	60*/0.96			
	3/8" [9.52.5]	5/8" [15.88]	15/1.00	22.5/0.99	33.5/0.99	40/0.98	45/0.96	45/0.95	52.5/0.98	60/0.97	60/0.97	60*/0.96	60*/0.96				
	5/16" [7.94]	3/4" [19.06]	15/1.00	22.5/0.99	33.5/1.00	40/0.98	45/0.96	45/0.95	52.5/0.98	60/0.97	60/0.97	60*/0.96	60*/0.95				
3.5 Ton	5/16" [7.94]	7/8" [22.22.5]	15/1.00	22.5/1.00	33.5/1.00	40/0.98	45/0.96	45/0.95	52.5/0.99	60/0.99	60/0.99	60*/0.96	60*/0.96				
	3/8" [9.52.5]	7/8" [22.22.5]	15/1.00	22.5/0.97	33.5/0.96	40/0.95	45/0.92	45/0.91	52.5/0.94	60/0.93	60*/0.92	58*/0.92	52*/0.92				
	5/16" [7.94]	7/8" [22.22.5]	15/1.00	22.5/0.97	33.5/0.96	40/0.95	45/0.92	45/0.91	52.5/0.94	60/0.93	60*/0.92	58*/0.92	47*/0.91				
4 Ton	1/2" [12.71]	3/4" [19.06]	15/0.98	22.5/0.97	33.5/0.96	40/0.95	45/0.92	45/0.91	52.5/0.94	60/0.93	60/0.92	60/0.92	60*/0.92	60*/0.91			
	3/8" [9.52.5]	7/8" [22.22.5]	15/1.00	22.5/0.98	33.5/0.98	40/0.97	45/0.96	45/0.96	52.5/0.97	60*/0.97	60*/0.96	58*/0.96	52*/0.96				
	1/2" [12.71]	7/8" [22.22.5]	15/1.00	22.5/0.98	33.5/0.98	40/0.97	45/0.96	45/0.96	52.5/0.97	60/0.97	60/0.96	60/0.96	60*/0.96				
5 Ton	3/8" [9.52.5]	3/4" [19.06]	15/0.98	22.5/0.96	33.5/0.95	40/0.93	45/0.90	45/0.91	52.5/0.92	60*/0.92	55*/0.91	49*/0.90	60*/0.96				
	1/2" [12.71]	3/4" [19.06]	15/0.98	22.5/0.96	33.5/0.95	40/0.93	45/0.90	45/0.89	52.5/0.92	60/0.92	60/0.91	60/0.90	60*/0.89				
	3/8" [9.52.5]	7/8" [22.22.5]	15/1.00	22.5/0.99	33.5/0.98	40/0.97	45/0.95	45/0.95	52.5/0.97	60*/0.96	55*/0.96	49*/0.95	60*/0.89				
	1/2" [12.71]	7/8" [22.22.5]	15/1.00	22.5/0.99	33.5/0.98	40/0.97	45/0.95	45/0.94	52.5/0.97	60/0.96	60/0.96	60/0.95	60*/0.95	60*/0.94			

**Condition:**

Light Gray - (<45m vertical separation)

Dark Gray

Black

Standard unit

Use Oil Separator recommended and Crank (Less than 45m vertical separation)

Use Oil Separator, Crank case heater, Hard Start Kit and Non-bleed TXV.

Not Recommended

\* Applications with asterisks (\*) require a minimum of 15m vertical separation.

Condition	Total Equivalent Length	Max. Vertical Separation
A	3 ~ 45	<33.5
B	38 ~ 90	34 ~ 45
C	45.5 ~ 90	45.1 ~ 60

## 7.2: Line Sizing Chart Rotary

### Line Size Chart for R410a Condensing Units with Rotary Compressors

#### a. Limitations on pipe lengths

Condition / Capacity	09 ~ 18kBTU/Hr.	21 ~ 30kBTU/Hr.
Total Equivalent Length	20	30
Maximum Elevation (ODU above IDU)	10	21
Maximum Elevation (ODU below IDU)	6	9

#### b. Pipe Sizes

Unit Capacity	Liquid Line mm	Gas Line mm
09 ~ 18 kBTU/Hr.	9.52	12.7
21 ~ 30 kBTU/Hr.	9.52	15.88

Note: Applicable for both T1 and T3 climatic condition.

In order to have long life expectancy of these compressors, following precautions are must during commissioning and operation.

1. Gas charge quantity must not increase above rated on compressor specification.
2. Additional oil must be charged per guidelines (depending upon the pipe size and running length).
3. Ref. Pipe to be used must size properly as specified in the catalogues.
4. Rotary compressors are sensitive to discharge side pressures / temperatures.

Hence routine maintenance is must for longer life expectancy.

## 7.3: Suction Line

The Suction Line should maintain in saturation temperature (which is sufficient velocity (> 1500 fpm for vertical riser, >750fpm for horizontal runs) for oil return to the compressor (greater refrigerant velocities are obtained by decreasing the size of the suction line. However this will create a higher pressure drop).

When installing the evaporator below the compressor, using a "trap" at the bottom of the pipe riser is necessary. The purpose of the trap is to drain oil and liquid refrigerant out of the line to which the expansion valve bulb is strapped. See following diagram:

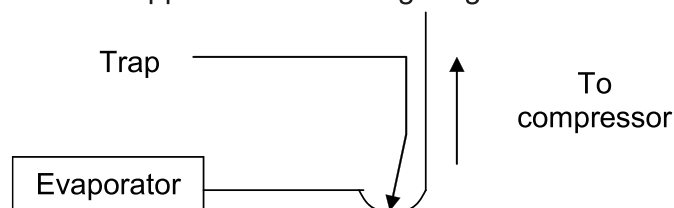
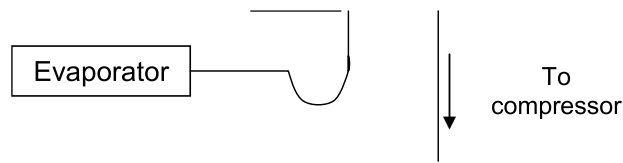


Figure: 5.02: Evaporator Located below the compressor

When installing the evaporator above the compressor, using an inverted “Loop” can prevent refrigerant from draining into the compressor during “OFF” cycle. However, the loop will not prevent refrigerant migration due to temperature of the evaporator being higher than the compressor.



**Figure 5.02: Evaporator located above the compressor.**

The trap should be as small as possible to prevent large slugs of oil being returned to the compressor when the trap clears. When a suction riser is 30 feet or more in length, an oil trap should be installed every 15 feet of vertical rise. This trap aids in oil return and provides a drainage point for oil, which is en route up the riser when the compressor stops. When the unit starts again, the oil is returned to the compressor quickly and in a relatively small slugs. See Section 2.3.

### 7.4: Liquid Line

When the refrigerant is in liquid state, the oil in the liquid line is readily carried along by the refrigerant to the evaporator. There is no problem with oil return in liquid lines. Thus, the design of the liquid piping is less critical than that of the suction lines and the discharge lines.

The problem encountered in the liquid line is mainly one of preventing the liquid from flashing before it reaches the refrigerant control (capillary tube or thermal expansion valve).

The problem of flash gas in the liquid line is that:

- a) It reduces the capacity of the refrigerant control.
- b) It causes erosion of the valve pin and seat.
- c) It often results in erratic control of the liquid refrigerant to the evaporator.

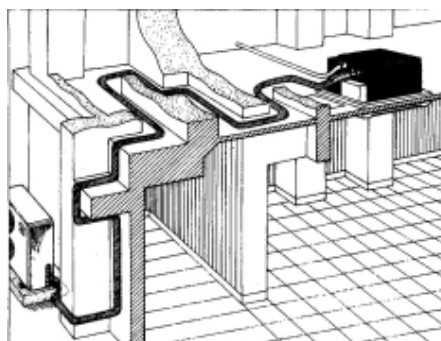
To avoid flashing of the liquid in the liquid line, sufficient liquid subcooling is required along the pipe line.

The liquid line should be designed with a maximum gas velocity of 360 fpm.

### 7.5: Minimize Bends

Piping between the condenser and evaporator units shall not have too many bends. Bends should be avoided as much as possible.

When the number of bends (bending angle) is large, the internal pipe resistance increases, and the refrigerant flow is impaired. These bends tend to retard oil return. The compressor capacity is also reduced and there are higher risks of compressor failures. Refer Section 1.6 for the recommended maximum number of bends.



**Figure 5.3: Too many bends**

# 8.0 LEAK TEST & VACUUM TEST

## 8.1 LEAK TESTING

Indoor coils have only a holding charge of dry nitrogen. Keep all tube ends sealed until connections are to be made.

### **WARNING**

DO NOT USE OXYGEN TO PURGE LINES OR PRESSURIZE SYSTEM FOR LEAK TEST. OXYGEN REACTS VIOLENTLY WITH OIL, WHICH CAN CAUSE AN EXPLOSION RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

- Pressurize line set and coil through service fittings with dry nitrogen to 150 PSIG maximum. Close nitrogen tank valve, let system sit for at least 15 minutes, and check to see if the pressure has dropped. If the pressure has dropped, check for leaks at the line set braze joints with soap bubbles and repair leak as necessary. Repeat pressure test. If line set and coil hold pressure, proceed with line set and coil evacuation (see page 21)
- The vapor line must be insulated for its entire length to prevent dripping (sweating) and prevent performance losses. Closed-cell foam insulation such as Armaflex and Rubatex® are satisfactory insulations for this purpose. Use 1/2" [12.7 mm] minimum insulation thickness. Additional insulation may be required for long runs.

## 8.2 VACUUM TEST

Evacuation is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air and moisture from the system.

Air or nitrogen in the system causes high condensing temperatures and pressure, resulting in increased power input and non-verifiable performance.

Moisture chemically reacts with the refrigerant and oil to form corrosive hydrofluoric acid. This attacks motor windings and parts, causing breakdown.

- After the system has been leak-checked and proven sealed, connect the vacuum pump and evacuate system to 500 microns and hold 500 microns or less for at least 15 minutes. The vacuum pump must be connected to both the high and low sides of the system by connecting to the two pressure ports. Use the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.
- After adequate evacuation, open both service valves by removing both brass service valve caps with an adjustable wrench. Insert a 3/16" [5mm] or 5/16" [8 mm] hex wrench into the stem and turn counterclockwise until the wrench stops.



# 9.0: REFRIGERANT CHARGE

The indoor conditions must be within 2°F (2°F wet bulb) of desired comfort conditions and system must be run until operating conditions stabilize (15 min. to 30 min.)

**IMPORTANT :** Do not operate the compressor without charge in system.

Addition of R-410A will raise pressures (vapor, liquid and discharge) and lower vapor temperature.

**IMPORTANT:** If addition of R-410A raises both vapor pressure and temperature, unit is overcharged.

## 9.1: Charging by Weight

For a new installation, evacuation of interconnecting tubing and evaporator coil is adequate; otherwise, evacuate the entire system. Use the factory charge shown in Table of these instructions or unit data plate.

Note: charge value includes charge required for 25 ft. of standard size interconnecting liquid line. Calculate actual charge required for liquid line size and length using: (1/4" O.D.=0.3 oz./ft.), (5/16" O.D.=0.4 oz./ft.), (3/8" O.D.= 0.6 oz./ft.), (1/2" O.D.=1.2 oz./ft.). With an accurate scale (t 1 oz.) or volumetric charging device, adjust charge difference between that shown on the unit data plate and that calculated for the new system installation. If the entire system has been evacuated, add the total calculated charge.

### WARNING

EXERCISE CAUTION WHEN SERVICING. ONLY ONE LEG OF THE POWER SUPPLY IS BROKEN WITH THE CONTACTOR. FAILURE TO ADHERE TO THIS WARNING CAN CAUSE ELECTRICAL SHOCK

RESULTING IN SEVERE PERSONAL INJURY OR DEATH:

## 9.2: Contamination

Contamination is the presence of foreign substances in the refrigerant system. Some foreign matter can cause chemical reaction or change the chemical composition of material within the system.

There are several types of contamination:

- a) Acid in system from previous compressor change.
- b) Flux from solder joints.
- c) Copper shavings.
- d) Water.
- e) Dirt.
- f) Air.

The effects of contamination are:

- a) Blocked oil passages – leads to bearing failure.
- b) Motor failures due to solid shorting windings.
- c) High head pressure due non condensable gases.
- d) Moisture in the system - forms acid in the system which attacks the metal and windings. Moisture will also cause the expansion device to freeze-up internally.

The longer the piping, the higher the chances that contamination will get into the system.

There are several ways to eliminate such undesirable situations:

- a) Air – Evacuate the system thoroughly before charging.
- b) Moisture – Evacuate the system thoroughly before charging.
- c) Foreign matter – Apply care to workmanship. Use filter-driers.



## Presence of Moisture

Of all the contaminants, moisture in a HVAC system is the most harmful. Moisture will reduce the life span of the HVAC system. The possible causes for moisture to be present are:

- a) Open system – exposed to air and moisture.
- b) Compressor tubes left open.
- c) Leak in system (particularly on the low side).
- d) Wet rags or water to cool poor solder joints.
- e) Wet refrigerant.
- f) Lack of knowledge with the use of hygroscopic oils.
- g) Incorrect evacuation process.

Again, with long piping installations, the chances are higher that moisture may enter into the refrigeration system. This is due to the extra brazing/welding of the long pipe sections.

shows the progression of compressor failure due to the contamination of foreign substances, while Figure A.2 shows the same when the contamination is due to air and moisture.

# 10.0: ELECTRICAL WIRING

Field wiring must comply with any applicable local Ordinance.

## 10.01 Power Wiring

It is important that proper electrical power be available at the condensing unit contactor. Voltage should not vary more than 10 % of that stamped on the rating plate when the unit is trying to start. Interphase variation on three-phase units must not be more than 3%.

Install a branch circuit disconnect within sight of the unit and of adequate size to handle the starting current. See specifications.

For branch circuit wiring (main power supply to unit disconnect) the minimum wire size for the feet length of run in line with the circuit ampacity found on the unit rating plate.

Power wiring must be run in grounded, raintight conduit. Conduits must be run through the connector panel below the access cover and attached to the bottom of the control box. (See Figure 1.) Connect power wiring to contactor located in outdoor condensing unit electrical box. (See wiring diagram attached to unit access panel and at the end of this book.)

Check all electrical connections, including factory wiring within the unit and make sure all connections are tight.

**Outdoor is having IP-X4 protection.**

DO NOT connect aluminum field wire to the contactor terminals.

**SPECIAL INSTRUCTION FOR POWER WIRING WITH ALUMINUM CONTACTORS**

## 10.2: Grounding

### **WARNING**

The Unit Must Be Permanently Grounded. Failure To Do So Can Cause Electrical Shock Resulting In Severe Personal Injury Or Death. A grounding lug is provided near control panel for outdoor unit wire. Grounding may be accomplished by grounding the power wire conduit to the condensing unit. Make sure the conduit nut locking teeth have pierced the insulating paint film..

## 10.3: Control Wiring

If the low voltage control wiring is run in conduit with the power supply, Class I insulation is required. Class II insulation is required if run separate. Low voltage wiring may be run through the insulated bushing provided in the 7/8 hole in the connection panel and attached to the terminal block from the bottom of the control box. Conduit can be run to the base panel if desired by removing the insulated bushing. A thermostat is required for the control circuit of the condensing unit. The air handler transformer may be used if sufficient. See the wiring diagram for Reference.

### **Note:**

The supply cord instruction “ If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard”

# **11:0: OPERATION & PERFORMANCE**

## **11.1: Safety Features**

**High Pressure Switch:**The unit is provided with a auto reset high pressure cut out. This protects the compressor from overloading.

**Low Pressure Switch:** The unit is provided with a auto reset low pressure cut out. This protects the compressor against loss of charge in the system.

**Low Ambient Kit:** The unit is provided with a fan cycling switch for operation at low ambient conditions. This maintains the condensing temperature within safe operating envelope.

**Compressor internal overload protector :** The scroll compressor used in the unit is provided with internal thermal overload protector. This protects the compressor motor against excessive winding temperature during abnormal operating conditions. This safety is auto reset type.

Fault must be cleared and then resetting should be done manually from controller.

## **11.2: Operation**

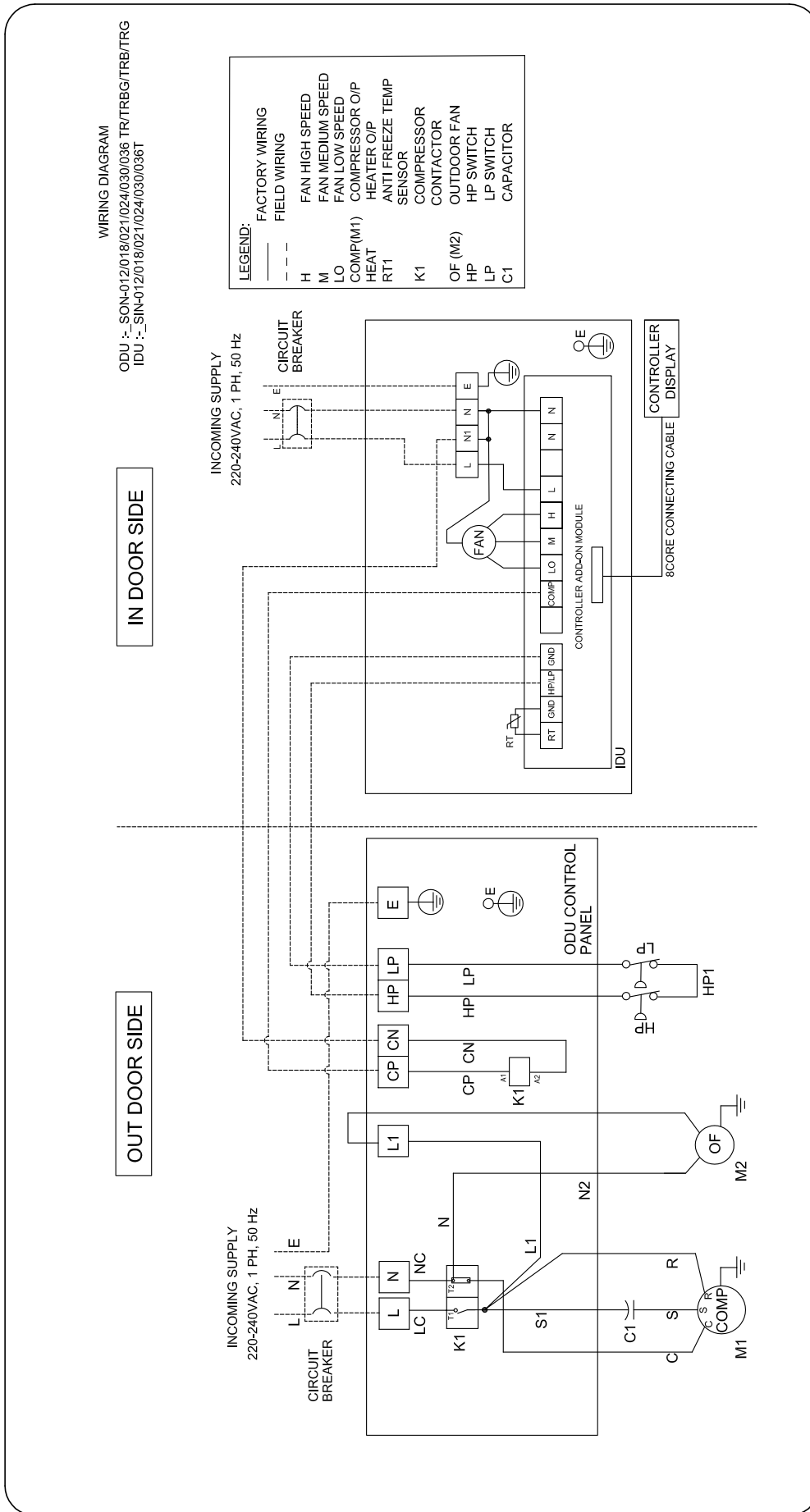
Single phase units are operated PSC (no starting components). It is important that such systems be off for a minimum of 5 minutes before restarting to allow equalization of pressure. The thermostat should not be moved to cycle unit without waiting 5 minutes. To do so may cause the compressor to go off on an automatic overload device or blow a fuse. Poor electrical service can also cause nuisance tripping on overloads, trip a breaker, or cause light dimming. This generally can be corrected by adding start components. Check with factory for recommended start components, if required. For PSC type operation, refrigerant metering must be done with fixed orifice, cap tubes or bleed type expansion valves because of low starting torque. If non-bleed expansion valve coils (supplied by factory) are used, start components are required.

## **12.0: Maintenance**

1. Filter Cleaning
2. Tightness of electrical connections
3. Top up gas if required
4. Measure the Operating Parameter: Suction pressure, liquid pressure, air flow, room temperature, ambient temperature, compressor amps etc.

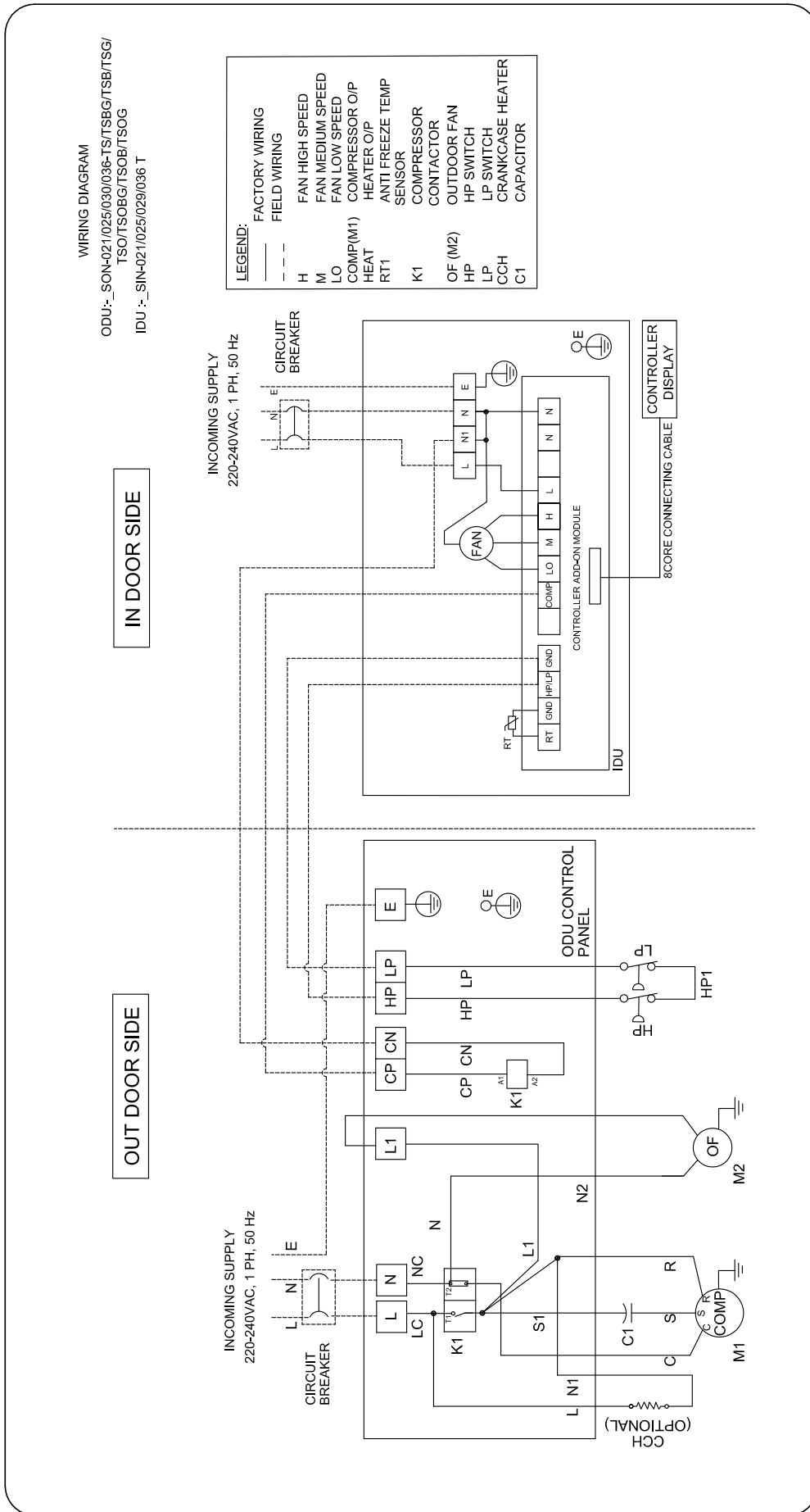
# 12.0: ELECTRICAL WIRING DIAGRAM ( Rotary)

## RSON (Rotary)



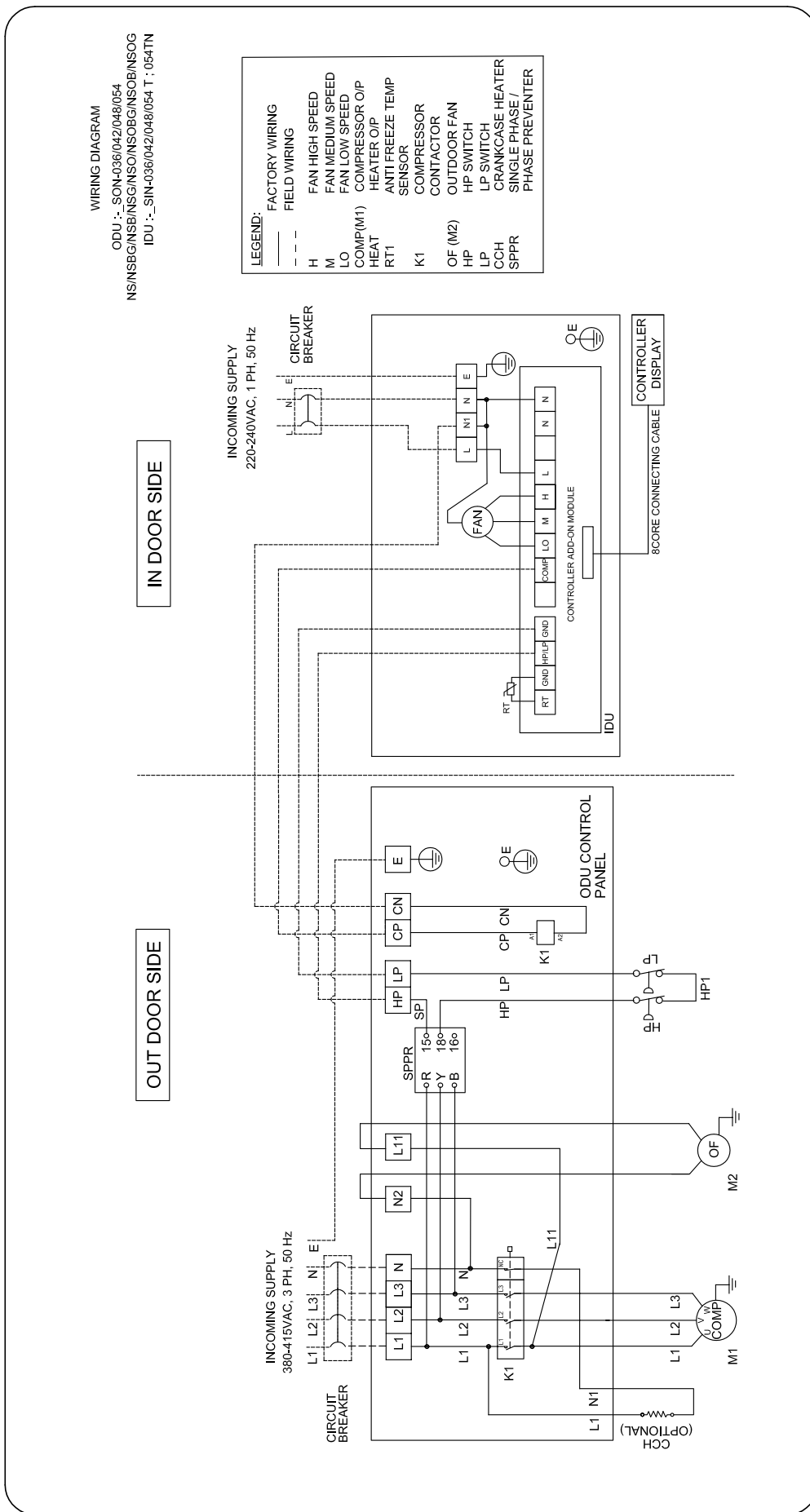
# 12.2: ELECTRICAL WIRING DIAGRAM (Scroll)

## RSON Scroll (Single-Phase)



# 12.1: ELECTRICAL WIRING DIAGRAM ( Scroll)

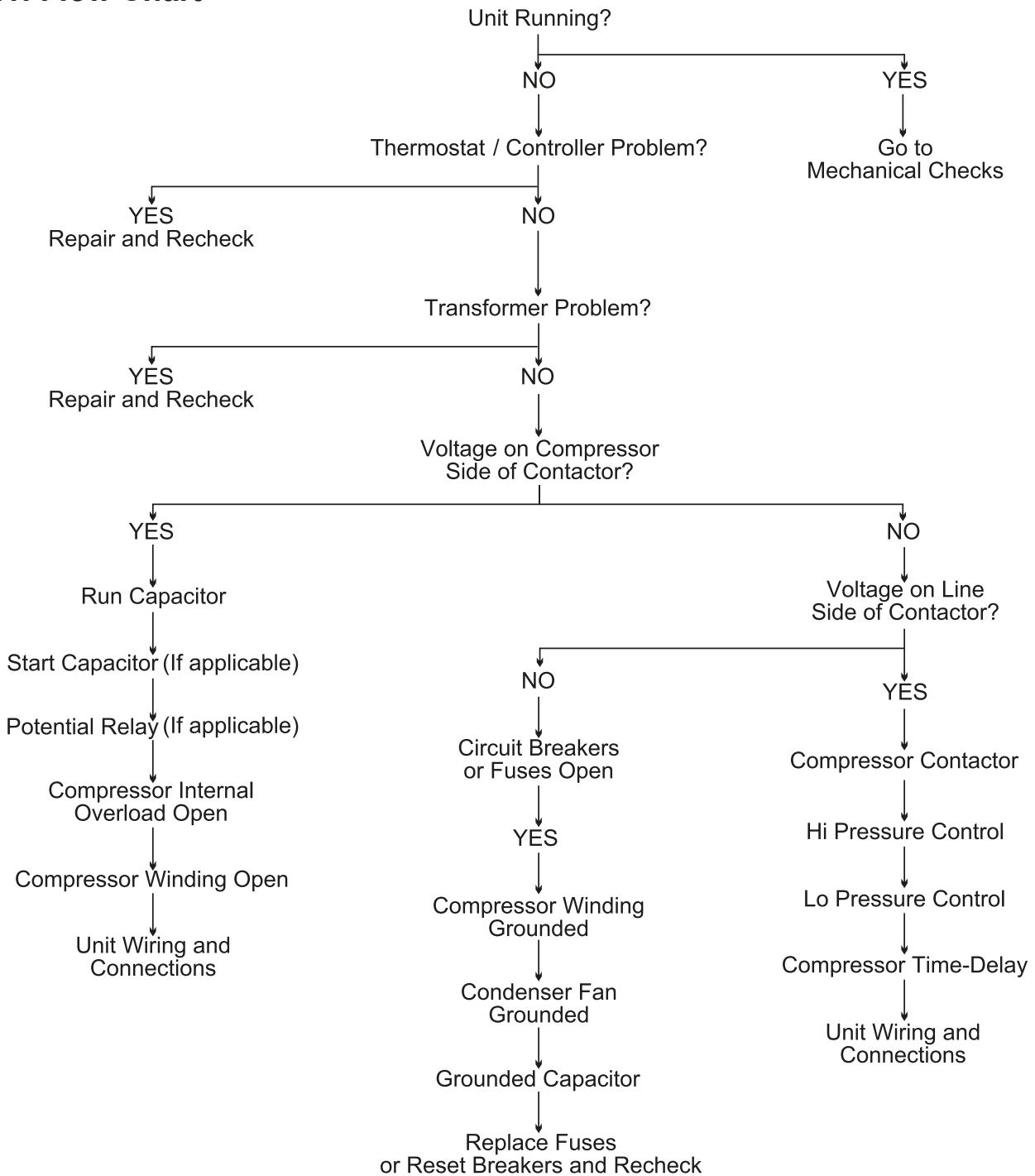
## RSON Scroll (Three-Phase)



# 13.0: TROUBLE SHOOTING

In diagnosing common faults in the air conditioning system, it is useful to present the logical pattern of thought that is used by experienced technicians. The charts which follow are not intended to be an answer to all problems, but only to guide your thinking as you attempt to decide on your course of action. Through a series of yes and no answers, you will follow the logical path to a likely conclusion. Use these charts as you would a road map, if you are a beginning technician. As you gain experience, you will learn where to establish the shortcuts. Remember that the chart will help clarify the logical path to the problem.

## 13.1: Flow Chart



# 14.0: OPERATION

---

## Ductable Split unit controller

### A) Specifications:

- |                                   |   |
|-----------------------------------|---|
| 1. Powers supply to controller    | 230VAC +/-10% , 50/60Hz, +/-1Hz, 1Ph  |
| 2. Operating temperature limit    | 18~45°C   |
| 3. Storage temperature limit      | 0 - 60°C  |
| 4. Display                        | LCD graphics display with Backlight   |
| 5. Temperature control accuracy   | ± 1°C   |
| 6. Temperature display resolution | 1°C   |
| 7. Temperature display range      | 0°C to 50°C   |
| 8. Set temperature range          | 20°C- 30°C  |
| 9. Temperature sensors            | a. Inbuilt room temperature sensor  |
| 10. Inputs                        | a. Inbuilt room temperature sensor<br>b. Digital input for HP/ LP   |
| 11. Outputs                       | Three fan speeds & one compressor   |
| 12. Add on Module                 | Add on module acts as interface between controller display and input/outputs and consists of<br>a. One relay (10 Amps) for compressor<br>b. Three relays (10 Amps each) for fan Speeds<br>c. Potential free input for HP/LP interlocking. |
| 13. Connecting Cable              | 8 core cable connect with 12 volt supply ,connecting cable between display and module .<br>Direct plug and Pull type connection required .<br>Length : 10 meter as standard.  |

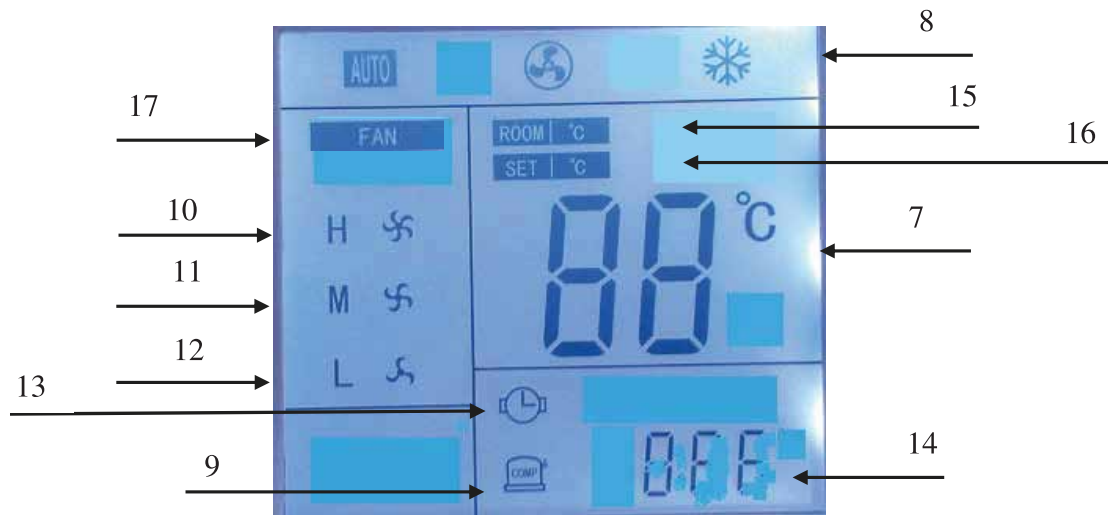


## B) Description of LCD icons and Keys on handset



### Key operation

Sr. No.	Key	Description
1	FAN SPEED	Press to change the fan speed (High → Med → Low )
2	DOWN	Press to decrease temperature by 1 °C
3	MODE	Press to change the mode of the unit (Fan → Cool → Auto )
4	UP	Press to increase temperature by 1 °C
5	POWER	Press to switch unit ON and OFF
5a	RESET(UP+DOWN)	Press any key to make backlight ON , & then press UP & DOWN key together for 5 secs to reset the alarms
5b	LOCK OUT REST (MODE+FAN SPEED)	Press any key to make backlight ON , & then press MODE & FAN SPEED key together for 10 secs to reset the lock out alarms



### 1. LCD Segment description

Sr No.	Segment	Description
7	Seven segment digits (temp segment)	<p>a. Indicates room temperature / Set temperature value , fault or alarm condition.</p> <p>b. Room temperature will be displayed by default.Set temperature should appear on temp segments on pressing of Up/down key . Along with display of “SET TEMP” .This should remain for 10 seconds and revert back to room temperature. “SET TEMP” text will not be displayed when room temp is displayed.</p> <p>c. Error code will be displayed in case of fault or alarms</p>
8	Cool, Fan, Auto mode	<p>a. Indicates the operation mode.</p> <p>b. Cool Mode : Cool symbol will be displayed</p> <p>c. Auto Mode : Cool &amp; Auto Fan symbol will be displayed</p> <p>d. Fan Mode : Selected fan speed symbol will be displayed</p>
9	Compressor ON status	a. Indicates ON status.
10	Fan high speed	a. Indicate fan high speed condition
11	Fan medium speed	a. Indicate fan medium speed condition
12	Fan low speed	a. Indicate fan low speed condition
13	Timer	a. Indicate timer mode.
14	Unit OFF status	a. Indicate OFF mode.
15	Room temp display	a. Indicate Room temp
16	Set temp display	a. Indicate set temp
17	Fan indication	a.. Indicate fan

### **C) Modes of operation:**

Press MODE key to switch between Fan, Cool and Auto modes.

#### **1. Cool mode:**

- a. In cool mode logic, IDU will control the temperature as per the set temperature.
- b. Compressor ON OFF will as per the logic for achieving desired temperature.
- c. Temperature setting range in cool mode is from 20°C to 30°C
- d. Fan speed will be as per user selection

#### **2. Auto mode :**

Auto mode is similar to cool mode with fan ON/OFF logic as given below :

- a. IDU fan and compressor will switch OFF in this mode on achieving the set temperature. Compressor will switch off immediately and indoor fan will switch OFF after 1 minute of compressor.
- b. IDU fan will switch ON after thermostat signal.
- c. Compressor will switch on 10 sec after thermostat signal provided the anti-cycle time of 3 minutes is completed.
- d. IDU fan continue to run and compressor will trip in case of HP/LP and temperature sensor fault.

#### **3. Fan mode :**

- a. In fan mode, only IDU fan operates at High, Med or Low speed as per setting. Compressor will remain OFF in this mode.
- b. Temperature will not be settable in this mode of operation

### **D) Operation after power failure :**

Functioning of Cool, Fan and Auto modes during the following conditions

- a. Unintentional power cycle - Controller should remember previous settings and should continue in same mode, fan speed & previous temperature setting of operation after power is restored.
- b. IDU Off/On by user - Mode of operation, fan speed and previous temperature setting should be restored.

### **E) Fan speed display & logic :**

Fan motor will operate on selected speed from the Fan key and symbol for high, medium or low speed will be displayed on the display.

## F) OFF Timer function:

It will OFF the system after specified time which will be settable.

**Setting Procedure :** In the working state, press the mode button for 5sec, displays the clock mark, enter the timing off set, blinking display clock marker ☹, then, by reducing the key change delay shutdown time, set after the end, 5 sec automatically returns to the state, display of set temperature and the LCD screen display clock marker ☺.will automatically lapse time temperature controller,automatic shutdown time is zero. Timing shutdown setting range: 0.0—23.50 hours (shown in the set column). Time is set to 0.0, cancel the shutdown function.

**Note :** This function will get canceled in case of power loss or timer function is completed.

## G) Temperature control logic

### 1. Fan logic :

- a. Fan will switch ON immediately on switching the unit ON.
- b. Fan will be ON when unit is switched ON from controller except Auto mode.

### 2. Compressor Control :

Temperature condition	Compressor status
Actual temp $\geq$ Set value + 1	Compressor ON
Actual temp $\leq$ Set value - 1	Compressor OFF

### 3. Compressor Logic

- a. Anti-cycle time of 180 sec is delay between compressor OFF to ON.
- b. Minimum compressor ON time - 120sec once the compressor starts. Minimum run time is to be ignored when there is any one of the following faults: Low /High pressure ,Temp sensor fault .
- c. HP/LP fault should be ignored for initial 45 sec.
- d. Once the compressor starts, it should run minimum 2 minutes irrespective of the demand from room temperature sensor. After 2 min controller will decide the compressor relay status based on demand.
- e. In case HP/LP fault arises after 45 secs , compressor will trip immediately.
- f. In case coil temperature fall below antifreeze alarm, compressor will trip immediately with error display.

## 14.1: Error Code

LCD indicators displays the various faults occurring in the unit are as following.

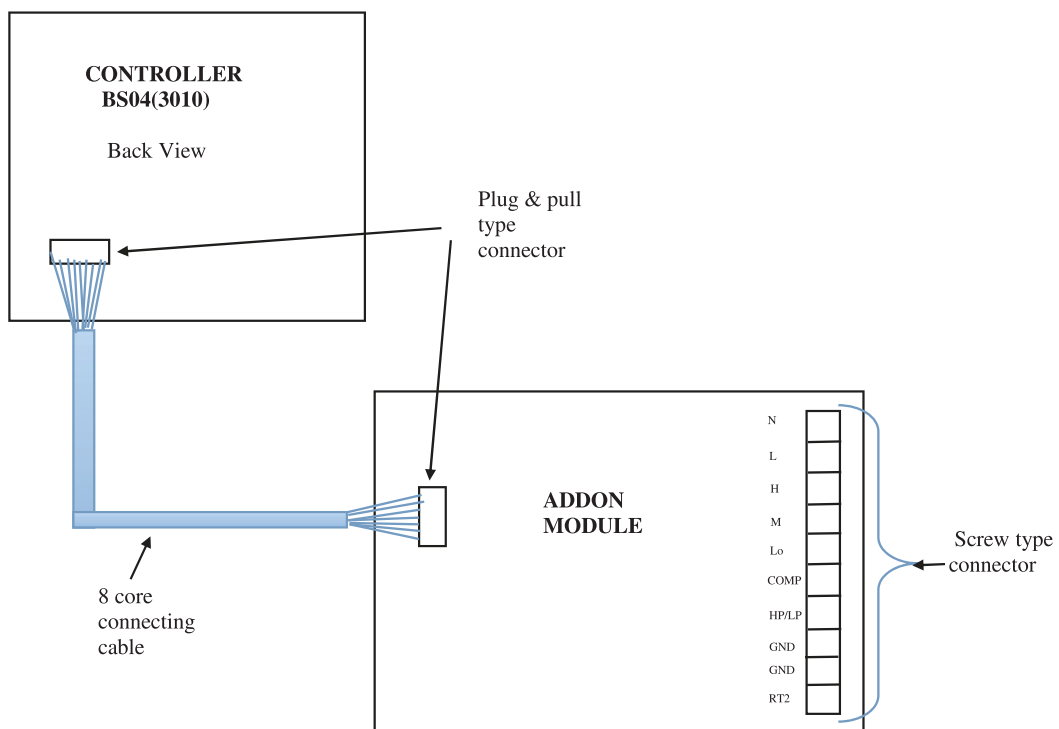
Alarm symbol:

Nature of Fault	LCD Display	Correction of Fault.
Room Temp sensor is open	E1	If Temp sensor is open or damaged, E1 will be displayed and only blower fan will operate. This fault is Auto reset.
Room Temp sensor is short	E2	If Temp sensor is short, E2 will be displayed and only blower fan will operate. This fault is Auto reset.
High Pressure /Low Pressure /SPPR Lock out fault	E7	E7 will be displayed on the unit when HP / LP/SPPR trips three times in last one hour. Total system will enter in to lock out condition.

Note : High Pressure /Low Pressure /SPPR fault

When HP/LP/SPPR error happens first and second time : Unit gets Autoreset. No Error Code display. When HP/LP/SPPR error happens third time with in 1hour : Unit required manual reset.

### I) Controller & add-on module connection .







---

Before proceeding with installation, refer to installation instructions packaged with each model, as well as complying with all Federal, Stat, Provincial, and Local codes, regulations, and practies.

In keeping with its policy of continuous progress and product improvement,  
Manufacturer reserves the right to make changes without notice

---



\_SON-/17/REV. 06



# Installation Operation & Maintenance Manual

\_SIN Series





# TABEL OF CONTENTS

S No.	TOPIC	Page
1.	<b>1.0: SAFETY INSTRUCTIONS</b> 1.2: Warnings	4-5
2.	<b>2.0: NOMENCLATURE</b>	5
3.	<b>3.0: TECHNICAL SPECIFICATION _SIN - _SON ROTARY UNITS</b> 3.1 Technical Specification _SIN - _SON Scroll Units 3.2 Air Flow Data	6-8
4.	<b>4.0: GENERAL INFORMATION</b> 4.1 General 4.2: Checking Product Received 4.3: Application 4.4: Information On R410a & Tools 4.5.1: Specification Of R-410a 4.6.2: Quick Reference Guide For R-410a	10-12
5.	<b>5.0: UNIT DIMENSIONS</b>	13
6.	<b>6.0: INSTRUCTIONS FOR INSTALATION</b>	14-15
7.	<b>7.0: WIRING DIAGRAM</b>	16
8.	<b>8.0: OPERATION</b> 8.1: Features & Functions of Remote Controller 8.2: Operation Guide	17-21
9.	<b>9.0: TROUBLESHOOTING</b> 9.1: Discription of Error Code	22
10.	<b>10.0: SERVICE INSTRUCTIONS</b> 10.1 Maintenance 10.2 Instrction for air filter removal 10.3 Indoor coil - Drain Line 10.4: Blower Assembly Removal & Replacement	23-25

# 1.0 SAFETY INSTRUCTIONS

## 1.1 WARNINGS

### WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

### WARNING

THE MANUFACTURER'S WARRANTY DOES NOT COVER ANY DAMAGE OR DEFECT TO THE UNIT CAUSED BY THE ATTACHMENT OR USE OF ANY COMPONENTS, ACCESSORIES OR DEVICES (OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER) INTO, ONTO OR IN CONJUNCTION WITH THE UNIT. YOU SHOULD BE AWARE THAT THE USE OF UN AUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES MAY ADVERSELY AFFECT THE OPERATION OF THE UNIT AND MAY ALSO ENDANGER LIFE AND PROPERTY. THE MANUFACTURER DISCLAIMS ANY RESPONSIBILITY FOR SUCH LOSS OR INJURY RESULTING FROM THE USE OF SUCH UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES.

### WARNING

DISCONNECT ALL POWER TO UNIT BEFORE STARTING MAINTENANCE. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

DO NOT USE OXYGEN TO PURGE LINES OR PRESSURIZE SYSTEM FOR LEAK TEST. OXYGEN REACTS VIOLENTLY WITH OIL, WHICH CAN CAUSE AN EXPLOSION RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

THE UNIT MUST BE PERMANENTLY GROUNDED. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

### WARNING

TURN OFF ELECTRIC POWER AT THE FUSE BOX OR SERVICE PANEL BEFORE MAKING ANY ELECTRICAL CONNECTIONS. ALSO, THE GROUND CONNECTION MUST BE COMPLETED BEFORE MAKING LINE VOLTAGE CONNECTIONS. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK, SEVERE PERSONAL INJURY OR DEATH.

### CAUTION

THE FILTER DRIER IS LOCATED INSIDE THE CONTROL BOX. THE FILTER DRIER MUST BE INSTALLED EXTERNALLY IN THE LIQUID LINE OR THE WARRANTY WILL BE VOID!

### CAUTION

THIS APPLIANCE IS NOT INTENDED FOR USE BY PERSONS ( INCLUDING CHILDREN) WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES, OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY HAVE BEEN GIVEN SUPERVISION OR INSTRUCTION CONCERNING USE OF THE APPLIANCE BY A PERSON RESPONSIBLE FOR THEIR SAFETY.

CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY VERY DO NOT PLAY WITH THE APPLIANCE.

### CAUTION

APPLIANCE DOES NOT HAVE CLASS III CONSTRUCTED PART.

## 1.2 WARNINGS

# 1.2 REQUIREMENTS FOR ELECTRIC CONNECTION

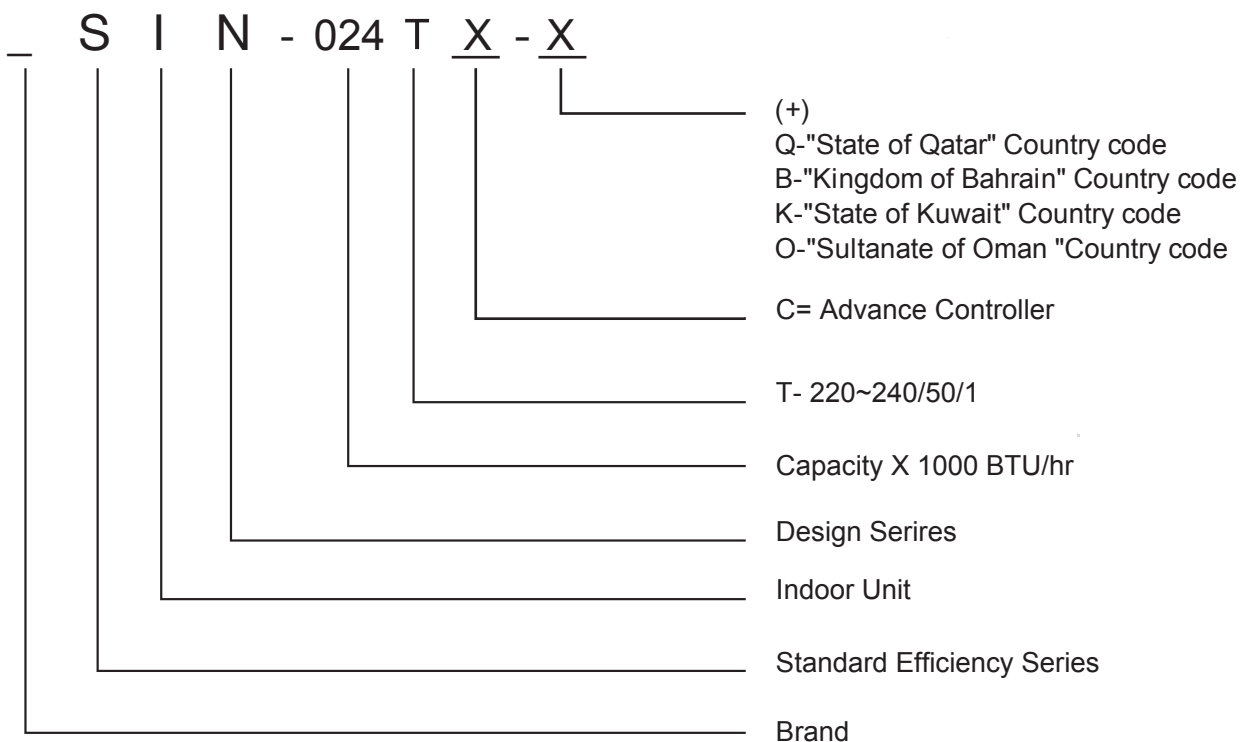
### Safety precaution

1. Must follow the electric safety regulations when installing the unit.
2. According to the local safety regulations, use qualified power supply circuit and air switch.
3. Make sure the power supply matches with the requirement of air conditioner. Unstable power supply or incorrect wiring or malfunction. Please install proper power supply cables before using the air conditioner.
4. Properly connect the live wire, neutral wire and grounding wire of power socket.
5. Be sure to cut off the power supply before proceeding any work related to electricity and safety.
6. Do not put through the power before finishing installation.
7. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
8. The temperature of refrigerant circuit will be high, please keep the interconnection cable away from the copper tube.
9. The appliance shall be installed in accordance with national wiring regulations.

### Grounding requirement

1. The air conditioner is the first class electric appliance. It must be properly grounding with specialized grounding device by a professional. Please make sure it is always grounded effectively, otherwise it may cause electric shock.
2. The yellow-green wire in air conditioner is grounding wire, which can't be used for other purposes.
3. The grounding resistance should comply with national electric safety regulations.
4. The appliance must be positioned so that the plug is accessible.
5. An all-pole disconnection switch having a contact separation of at least 3mm in all poles should be connected in fixed wiring.

## 2.0: MODEL NOMENCLATURE



### 3: TECHNICAL SPECIFICATION \_SIN - \_SON ROTARY UNITS

TABLE FOR TECHNICAL DATA

AIR HANDLING UNIT MODEL		_SIN-012T	_SIN-018T	_SIN-021T	_SIN-024T	_SIN-030T
CONDENSING UNIT MODEL		_SON-012TR	_SON-018TR	_SON-021TR	_SON-024TR	_SON-030TR
AMBIENT TEMP 95°F	EVAP ENTERING AIR TEMP.	12.0	18.2	20.8	25.1	29.2
		TMBH				
	80 DB / 67 WB °F	10.2	14.9	17.9	20.5	25.9
		SMBH				
AMBIENT TEMP 115°F	EVAP ENTERING AIR TEMP.	10.6	16.2	18.3	22.1	25.6
		TMBH				
	80 DB / 67 WB °F	9.6	13.5	16.8	19.5	24.5
		SMBH				
AIR FLOW PERFORMANCE (DRY COIL)		360	485	745	795	1145
	LOW					
	MED	435	570	770	840	1200
	HIGH	500	650	790	890	1250
Sound Level		38.6	38.4	40.8	46.3	44.8
	LOW					
	MED	39.3	39.1	41.3	46.5	45.4
	HIGH	39.7	40.5	41.7	47.5	45.9
EXTERNAL STATIC PRESSURE (ESP)		0.1 (25)	0.1 (25)	0.1 (25)	0.1 (25)	0.15 (37)
NUMBER OF COMPRESSORS		1	1	1	1	1
NUMBER OF REFRIGERANT CIRCUIT FOR AHU		1	1	1	1	1
EXPANSION DEVICE/REFRIGERANT - R410A		Orifice				
ELECTRICAL DATA	POWER SUPPLY	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240
	POWER INPUT at T1 Condition	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240	1/50/220-240
	CIRCUIT BREAKER SIZE	0.058	0.079	0.097	0.150	0.156
	FULL LOAD CURRENT	0.959	1.466	1.660	1.972	2.309
		15	15	15	15	15
		25	25	25	25	32
COIL FACE AREA	AIR HANDLING UNIT	0.3	0.4	0.4	0.7	0.8
	CONDENSING UNIT	4.2	6.3	7.4	8.8	10.4
		2.7	2.7	3.6	3.6	4.5
NO OF FANS	AIR HANDLING UNIT	3.9	6.0	6.0	6.7	6.7
	CONDENSING UNIT	2	2	2	2	2
		1	1	1	1	1
NET WEIGHT	AIR HANDLING UNIT	37	38	44	44	58
	CONDENSING UNIT	36	50	50	55	58
		20	30	30	30	30
Total equivalent pipe length						
Maximum Vertical Height (ODU above IDU)		10	21	21	21	21
Maximum Vertical Height (ODU below IDU)		6	9	9	9	9

\* Air flow and sound data is mentioned at compressor off condition.

\* Unit performance is rated as per ESMA standard for evaluation.

# 3.1 TECHNICAL SPECIFICATION \_SIN - \_SON SCROLL UNITS

TABLE FOR TECHNICAL DATA

AIR HANDLING UNIT MODEL		TABLE FOR TECHNICAL DATA									
CONDENSING UNIT MODEL		SIN-021T	SIN-025T	SIN-029T	SIN-036T	SIN-036T	SIN-042T	SIN-048T	SIN-054TN		
CONDENSING UNIT MODEL		SON-021TS	SON-025TS	SON-030TS	SON-036TS	SON-036NS	SON-042NS	SON-048NS	SON-054NS		
AMBIENT TEMP 95 °F	EVAP ENTERING AIR TEMP.	22.1	27.0	29.2	37.4	37.2	40.4	46.3	60.0		
AMBIENT TEMP 115 °F	EVAP ENTERING AIR TEMP.	17.6	20.9	24.7	30.1	29.4	32.5	35.5	45.8		
	80 DB / 67 WB °F										
	84.2 DB / 66.2 WB °F										
	LOW										
	MED										
	HIGH										
	CFM	745	795	1170	1200	1200	1260	1250	1640		
	LOW	790	840	1225	1250	1250	1390	1400	1720		
	MED	40.8	46.3	45.8	45.4	45.4	48.1	49.1	51.8		
	HIGH	41.3	46.5	46.3	45.9	45.9	49.1	50.7	52.6		
	NOISE LEVEL	41.7	47.5	47.1	46.7	46.7	50.7	52.5	53.4		
	IN (Pa)	0.1(25)	0.1(25)	0.15(37)	0.15(37)	0.15(37)	0.15(37)	0.2(50)	0.2(50)		
	NUMBER OF COMPRESSORS	1	1	1	1	1	1	1	1		
	NUMBER OF REFRIGERANT CIRCUIT FOR AHU	1	1	1	1	1	1	1	1		
	EXPANSION DEVICE/REFRIGERANT - R410A	Orifice									
ELECTRICAL DATA	POWER SUPPLY	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1	220-240/50/1		
	POWER INPUT	0.102	0.146	0.158	0.177	0.175	0.257	0.297	0.383		
	CIRCUIT BREAKER SIZE	1.771	2.143	2.290	2.994	2.976	3.069	3.621	4.699		
	FULL LOAD CURRENT	15	15	15	15	15	15	15	15		
		25	25	32	32	25	25	25	25		
		0.4	0.6	0.8	0.9	0.9	1.2	1.6	1.67		
COIL FACE AREA	AIR HANDLING UNIT	7.7	9.5	9.9	12.6	6.3	6.3	6.4	9.10		
	CONDENSING UNIT	3.6	3.6	4.5	4.5	4.5	5.1	5.1	6.2		
	CONDENSING UNIT	6.0	6.7	9.2	9.2	9.2	9.2	9.2	11.9		
NO OF FANS	AIR HANDLING UNIT	2	2	2	2	2	2	2	2		
	CONDENSING UNIT	1	1	1	1	1	1	1	1		
	INDOOR UNIT	44	44	55	58	58	64	64	74		
NET WEIGHT	OUTDOOR UNIT	53	57	78	86	86	90	92	110		
	ODU ABOVE	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5		
	ODU BELOW	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5		
Total Equivalent Pipe Length		50	50	50	50	50	50	50	50		



### 3.2 AIR FLOW DATA \_SIN UNITS (Rotary)

MODEL	BLOWER MOTOR SPEED	AIR FLOW AND POWER	CFM @ EXTERNAL STATIC PRESSURE (Inches of Water)						
			0	0.1	0.15	0.2	0.3	0.4	
_SIN-012T	5	CFM	455	360	290	-	-	-	
		POWER	50	45	40	-	-	-	
	4	CFM	510	435	340	-	-	-	
		POWER	55	50	45	-	-	-	
	3	CFM	575	500	400	-	-	-	
		POWER	65	60	50	-	-	-	
	2	CFM	675	590	520	-	-	-	
		POWER	80	70	60	-	-	-	
	1	CFM	795	680	600	-	-	-	
		POWER	95	85	80	-	-	-	
	_SIN-018T	5	CFM	460	340	-	-	-	-
			POWER	50	40	-	-	-	-
4		CFM	515	390	310	-	-	-	
		POWER	50	45	40	-	-	-	
3		CFM	580	485	360	-	-	-	
		POWER	60	50	50	-	-	-	
2		CFM	675	570	435	280	-	-	
		POWER	70	65	60	50	-	-	
1		CFM	785	650	560	290	-	-	
		POWER	90	80	70	60	-	-	
_SIN-021T		3	CFM	890	745	645	425	-	-
			POWER	90	80	70	60	-	-
	2	CFM	925	770	665	450	-	-	
		POWER	95	85	75	65	-	-	
	1	CFM	955	790	685	470	-	-	
		POWER	100	90	80	70	-	-	
_SIN-024T	5	CFM	850	750	700	630	460	-	
		POWER	120	115	110	105	100	-	
	4	CFM	890	795	745	695	520	-	
		POWER	130	125	120	115	110	-	
	3	CFM	930	840	795	740	585	-	
		POWER	140	135	130	125	120	-	
	2	CFM	980	890	845	790	640	-	
		POWER	150	145	140	135	130	-	
	1	CFM	1030	945	900	845	690	-	
		POWER	170	160	155	150	140	-	
	_SIN-030T	5	CFM	1355	1225	1145	1045	615	-
			POWER	190	160	150	140	95	-
4		CFM	1420	1280	1200	1100	635	-	
		POWER	200	180	165	150	100	-	
3		CFM	1485	1330	1250	1145	705	-	
		POWER	210	185	170	160	120	-	
2		CFM	1560	1385	1290	1185	720	-	
		POWER	220	190	180	170	130	-	
1		CFM	1635	1455	1355	1235	785	-	
		POWER	270	250	240	230	190	-	

\* Air flow at dry coil condition and at standard T1 ambient temperature condition

Highlighted speeds are connected from factory.



### 3.3 AIR FLOW DATA \_SIN UNITS (Scroll)

MODEL	BLOWER MOTOR SPEED	PERFORMANCE	CFM @ EXTERNAL STATIC PRESSURE (Inches of Water)					
			0	0.1	0.15	0.2	0.3	0.4
RSIN-021T	LOW	CFM	890	745	645	425	-	-
		POWER	90	80	70	60	-	-
	MED	CFM	925	770	665	450	-	-
		POWER	95	85	75	65	-	-
	HIGH	CFM	955	790	685	470	-	-
		POWER	100	90	80	70	-	-
RSIN-025T	LOW	CFM	890	795	745	695	520	-
		POWER	130	125	120	115	110	-
	MED	CFM	930	840	795	740	585	-
		POWER	140	135	130	125	120	-
	HIGH	CFM	980	890	845	790	640	-
		POWER	150	145	140	135	130	-
RSIN-029T	LOW	CFM	1360	1240	1170	1075	655	-
		POWER	200	170	160	140	100	-
	MED	CFM	1440	1300	1225	1125	720	-
		POWER	210	180	170	150	110	-
	HIGH	CFM	1540	1360	1275	1170	750	-
		POWER	220	190	180	160	120	-
RSIN-036T	LOW	CFM	1420	1280	1200	1100	635	-
		POWER	200	180	165	150	100	-
	MED	CFM	1485	1330	1250	1145	705	-
		POWER	210	185	170	160	120	-
	HIGH	CFM	1560	1385	1290	1185	720	-
		POWER	220	190	180	170	130	-
RHLH-042T	LOW	CFM	1310	1290	1260	1180	880	470
		POWER	250	240	230	200	150	120
	MED	CFM	1520	1460	1390	1250	890	480
		POWER	290	250	230	200	150	120
	HIGH	CFM	1810	1660	1560	1400	980	480
		POWER	310	270	250	230	180	140
RSIN-048T	LOW	CFM	1520	1460	1390	1250	890	480
		POWER	290	250	230	200	150	120
	MED	CFM	1810	1660	1560	1400	980	480
		POWER	310	270	250	230	180	140
	HIGH	CFM	2025	1810	1700	1560	1200	540
		POWER	360	330	310	290	260	210
RSIN-054TN	LOW	CFM	1965	1830	1740	1640	1200	475
		POWER	365	325	305	295	245	180
	MED	CFM	2130	1950	1835	1720	1265	490
		POWER	395	355	335	320	275	205
	HIGH	CFM	2285	2065	1935	1825	1370	530
		POWER	435	400	385	365	325	270

## 4.0: GENERAL INFORMATION

The Indoor unit to which these instructions apply is versatile, and your installing contractor may have applied it with an outdoor cooling unit.

Please become familiar with the provisions of the limited warranty applicable to this unit. We suggest you record on your limited warranty the complete model and serial number and date of installation of this new indoor unit. The model number and serial number are listed on the rating plate, located either on the inner control box panel or on the outer coil door panel. This information may be helpful if a replacement part is required at a later date.

Expect for the need to clean or change the air filter your unit will require little service. Therefore these instructions include only a few suggestions relating to the use and care of this unit, but you should become familiar with these pointers.

**WARNING : DO NOT REMOVE SERVICE ACCESS PANELS AND ATTEMPT UNIT SERVICE WITHOUT DISCONNECTING ALL POWER CABLES**

### BLOWER MOTOR

The blower motor bearings are pre-lubricated by the motor manufacturer and may not require attention for an indefinite period of time. However, our recommendations are as follows:

Motors without oiling ports

Re-lubricated and sealed. No further lubrication should be required, but in case of bearing problems, the blower and the motor end bells can be disassembled and the bearings re-lubricated by a qualified service person.

In any event, clean the motor periodically to prevent the possibility of overheating due to an accumulation of dust and dirt on windings or on the motor exterior. And as suggested elsewhere in these instructions, the air filter should be kept clean and the motor depends upon sufficient air flowing across and through it to keep from overheating.

### FUSE LINKS

These are provided as backup protection for the primary automatic reset high temperature limits. If a fuse link should open without an obvious reason, such as insufficient air flow, the primary limit should be checked for proper calibration or replaced.

**Indoor units are IP-X0 protected**

**WARNING: THE FUSE LINK MUST BE REPLACED, NOT JUMPED, JUMPING FUSE LINK MAY HELP TO CREATE AN UNSAFE CONDITION**

**NOTE:** Fuse links are not applicable to units without electrical heating elements.

### FILTER MAINTENANCE:

Check filter every sixty (60) days of operation under normal use and, if required, clean or replace. Replacement filters should be the same size, or larger, and the same type as originally supplied. If these filters are a permanent type they may be cleaned in warm soapy water and replaced. The unit must not run without filter, not with a dirty filter for a long period of time. If the system is equipped with electric air cleaner instead of conventional type air filters, consult the air cleaner maintenance instruction.

### INDOOR COIL

Check periodically and clean if necessary with warm water and mild detergent.

## 4.1 GENERAL

---

The information contained in this manual has been prepared to assist in the proper installation, operation and maintenance of the air conditioning system. Improper installation, or installation not made in accordance with these instructions, can result in unsatisfactory operation and/or dangerous conditions, and can cause the related warranty not to apply.

Read this manual and any instructions packaged with separate equipment required to make up the system prior to installation. Retain this manual for future reference.

To achieve optimum efficiency and capacity, the indoor cooling coils listed in the condensing unit specification sheet should be used.

**IMPORTANT:** We recommend replacement of any HVAC equipment that has been subjected to flooding in order to avoid any risk of injury or harm.

**IMPORTANT:** Use all available safety precautions during the installation and servicing of any HVAC equipment.

Reference the model nameplate and brand label on the unit for the following product information:

- Model Number
- Serial Number
- Country of Origin
- Rated Voltage and Frequency
- Rated T1 and T3 conditions for:
  - Rated Current
  - Rated Power (kW)
  - Rated Capacity
  - Rated EER

The Estimated Annual Energy Consumption of this product is calculated using the following formula:

Estimated Annual Energy Consumption = Rated Power (kW) at T1 conditions multiplied by 2700 working hours.

## 4.2 Checking Product Received

Upon receiving unit, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company. Check condensing unit model number, electrical characteristics and accessories to determine if they are correct and match the original order from the local distributor. Check system components (evaporator coil, condensing unit, evaporator blower, etc.) to make sure they are properly matched.

## 4.3 Application

Before installing any air conditioning equipment, a duct analysis of the structure and a heat gain calculation must be made. A heat gain calculation begins by measuring all external surfaces and openings that gain heat from the surrounding air and quantifying that heat gain. A heat gain calculation also calculates the extra heat load caused by sunlight and by humidity removal.

There are several factors that the installers must consider:

- Outdoor unit location
- System refrigerant charge
- Indoor unit blower speed
- System air balancing
- Proper equipment evacuation
- Indoor unit airflow
- Supply and return air duct design and sizing
- Diffuser and return air grille location and sizing

## 4.4. Information on R410a & Tools

Manifold Sets:  
-Up to 800 PSIG High Side  
-Up to 250 PSIG Low Side

Manifold Hoses:  
-Service Pressure Rating of 800 PSIG

Recovery Cylinders:  
-400 PSIG Pressure Rating

### CAUTION

*R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.*

### 4.5.1 SPECIFICATION OF R-410A:

**Application:** R-410A is not a drop-in replacement for R-22; equipment designs must accommodate its higher pressures. It cannot be retrofitted into R-22 condensing units.

**Physical Properties:** R-410A has an atmospheric boiling point of -62.9°F and its saturation pressure at 77°F is 224.5 psig.

**Composition:** R-410A is an azeotropic mixture of 50% by weight difluoromethane (HFC-32) and 50% by weight pentafluoroethane (HFC-125).

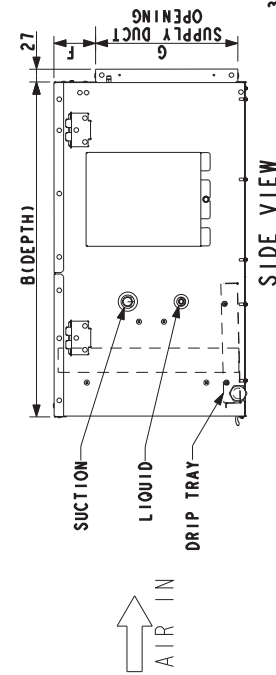
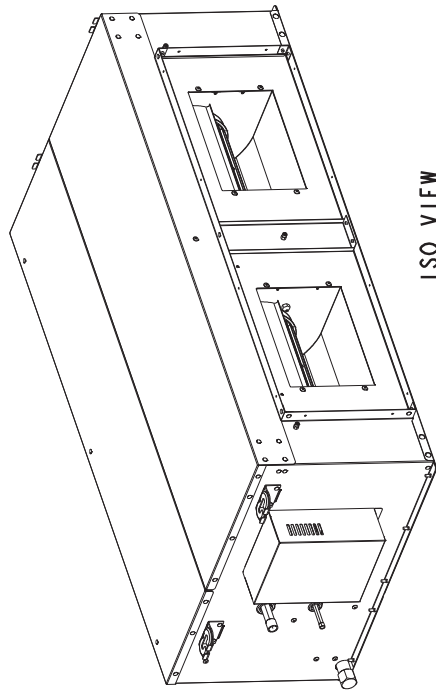
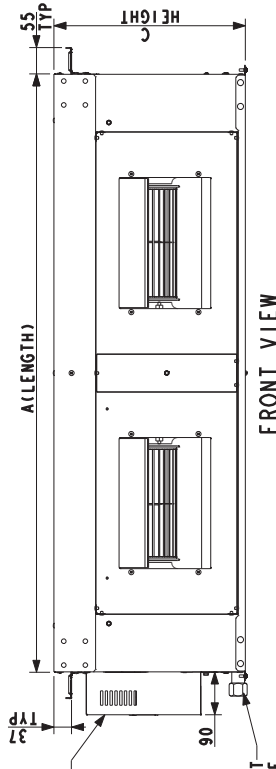
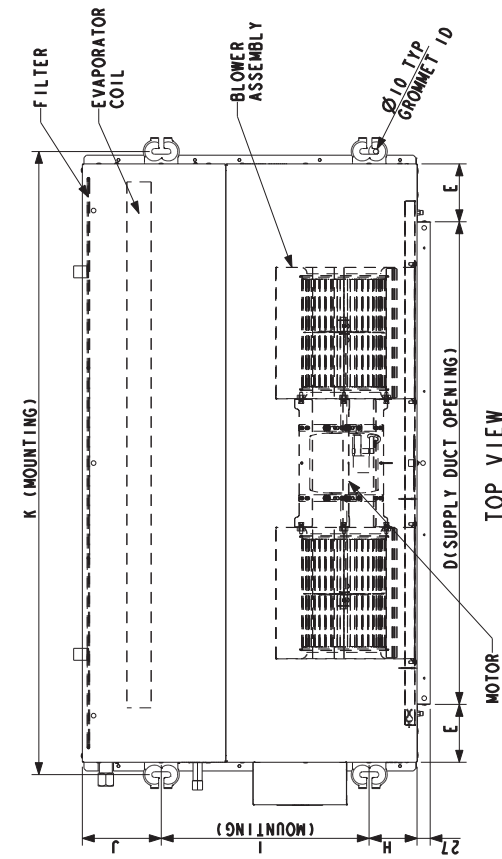
**Pressure:** The pressure of R-410A is approximately 60% (1.6 times) greater than R-22. Recovery and recycle equipment, pumps, hoses and the like need to have design pressure ratings appropriate for R-410A. *Manifold sets need to range up to 800 psig high-side and 250 psig low-side with a 550 psig low-side retard. Hoses need to have a service pressure rating of 800 psig. Recovery cylinders need to have a 400 psig service pressure rating.* DOT 4BA400 or DOT BW400.

**Combustibility:** At pressures above 1 atmosphere, mixture of R-410A and air can become combustible. R-410A and air should never be mixed in tanks or supply lines, or be allowed to accumulate in storage tanks. Leak checking should never be done with a mixture of R-410A and air. Leak checking can be performed safely with nitrogen or a mixture of R-410A and nitrogen.

### 4.6.2 QUICK REFERENCE GUIDE FOR R-410A

- R-410A refrigerant operates at approximately 60% higher pressure (1.6 times) than R-22. Ensure that servicing equipment is designed to operate with R-410A.
- R-410A refrigerant cylinders are pink in color.
- R-410A, as with other HFC's is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- R-410A systems are to be charged with liquid refrigerants. Prior to March 1999, R-410A refrigerant cylinders had a dip tube. These cylinders should be kept upright for equipment charging. Post March 1999 cylinders do not have a dip tube and should be inverted to ensure liquid charging of the equipment.
- Do not install a suction line filter drier in the liquid line.
- A liquid line filter drier is standard on every unit. Only manufacturer approved liquid line filter driers can be used. These are Sporlan (CW083S) and Alco (80K083S) driers. These filter driers are rated for minimum working pressure of 600 psig.
- Desiccant (drying agent) must be compatible for POE oils and R-410A.

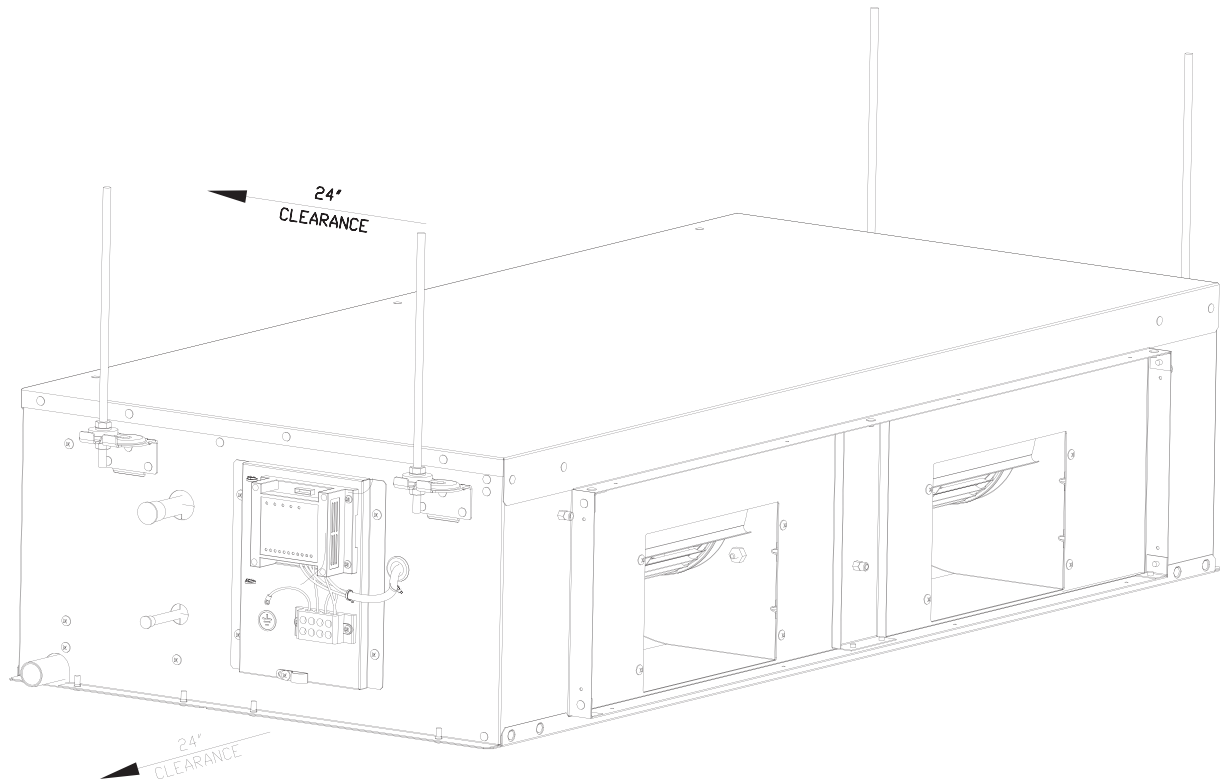
# 5.0 UNIT DIMENSION



MODEL	A	B	C	D	E	F	G	H	I	J	K	SUC. SIZE	LIO. SIZE
-SIN-012/18T	977	600	310	815	81	52	242	75	390	135	1304	1/2"	3/8"
-SIN-021/24/25T	1252	600	310	1010	121	52	242	75	390	135	1304	5/8"	3/8"
-SIN-029/30/36T	1232	700	400	1010	121	87	297	100	435	165	1304	5/8"	3/8"
-SIN-042/48T	1402	700	400	1010	196	87	297	100	435	165	1454	3/4"	3/8"
-SIN-054T	1402	700	479	1010	196	120	342	100	435	165	1454	3/4"	3/8"

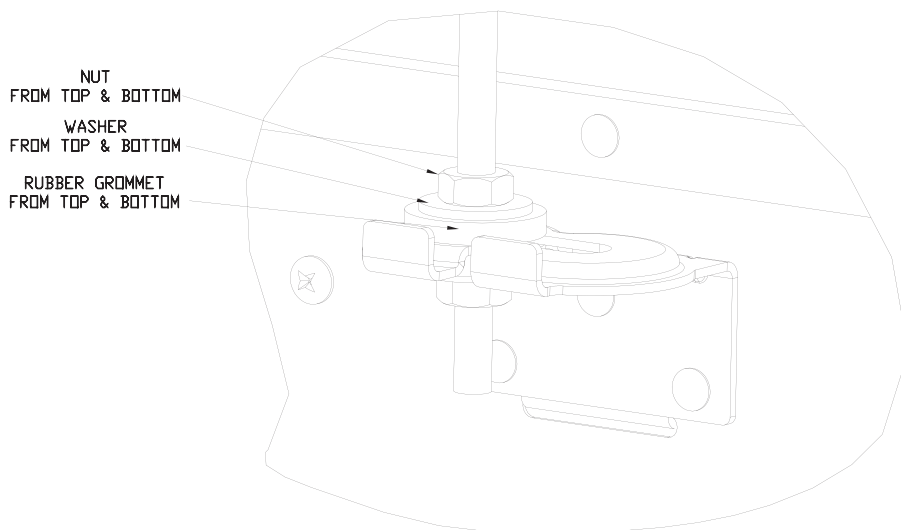
# 6.0: INSTRUCTIONS FOR INSTALLATION

## 6.1: Positioning



## 6.2: Installation Instructions

- Locate the unit as shown in the below figure
- Hang it on the threaded bolts of size 8mm dia
- Lock the unit on the hangers as shown in the below figure



**Note:** Please follow the local safety guidelines building codes and instructions.

## 6.3 POWER WIRING

It is important that proper electrical power is available for connection to the unit model being installed. See the unit nameplate, wiring diagram and electrical data in the installation instructions.

If required, install a branch circuit disconnect of Adequate size located within sight of and readily Accessible to the unit.

Supply circuit power wiring must be 75°C minimum Copper conductors only. See electrical data for ampacity, wire size and circuit protector requirement. Supply circuit protective devices may be either Fuses or HACR type circuit breakers.

Power wiring is connected to the power terminal block.

## 6.4 CONTROL WIRING

**IMPORTANT:** class 2 low voltage control wire should not be run in conduit with power wiring and must be separated from power wiring, unless class 1 wire of proper voltage rating is used.

Low voltage control wiring should be 18Awg Color-coded (105°C minimum) for lengths Longer than 100ft 16Awg wire should be used.

## 6.6 Electrical Ratings

### Indoor Unit ( \_SIN Series - 50Hz)

#### Indoor Unit ( \_SIN Series -50Hz)

MODEL	POWER SUPPLY	MAX CURRENT (A)	Cable size (core x sq.mm) copper	MCB RATING (A)
_SIN-012T	220-240,50,1~	2	3 X 1.5	4
_SIN-018T	220-240,50,1~	2	3 X 1.5	4
_SIN-021T	220-240,50,1~	2	3 X 1.5	4
_SIN-024T	220-240,50,1~	2	3 X 1.5	4
_SIN-025T	220-240,50,1~	2	3 X 1.5	4
_SIN-029T	220-240,50,1~	3	3 X 1.5	6
_SIN-030T	220-240,50,1~	3	3 X 1.5	6
_SIN-036T	220-240,50,1~	3	3 X 1.5	6
_SIN-042T	220-240,50,1~	3	3 X 1.5	6
_SIN-048T	220-240,50,1~	4	3 X 1.5	6
_SIN-054TN	220-240,50,1~	4	3 X 1.5	6

see wiring diagrams attached to indoor and outdoor sections to be connected and control wiring diagram booklet supplied with Outdoor heat pump section.

Do not leave excess field control wiring label inside unit, pull excess control wire to outside of unit and provide strain relief for field control wiring on inside of cabinet at point wiring penetrates cabinet.

Make sure, after installation, separation of control wiring and power wiring has been maintained.

## 6.5. GROUNDING

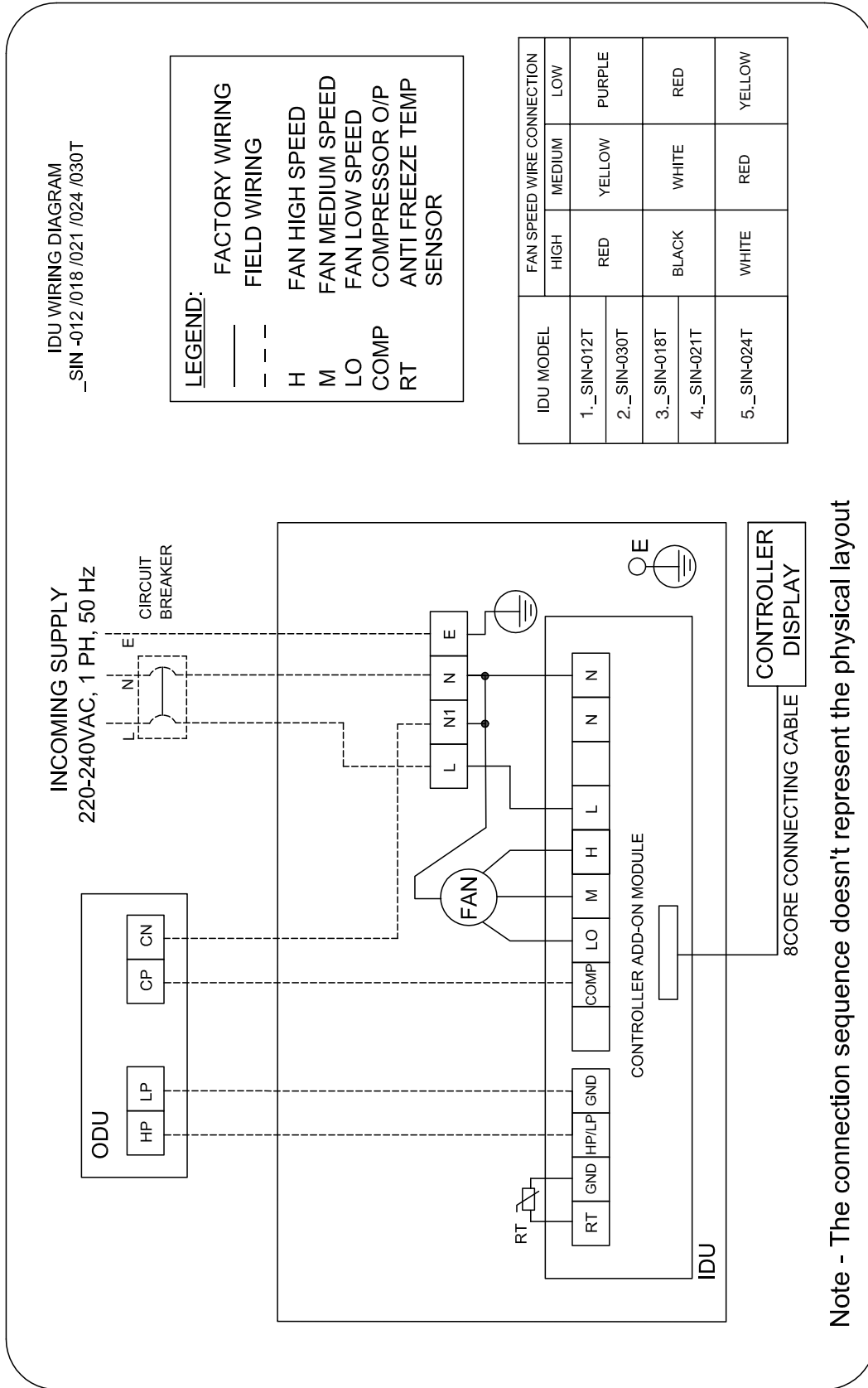
### WARNING

**THE UNIT MUST BE PERMANENTLY GROUNDED. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK CAUSING PERSONAL INJURY OR DEATH.**

Grounding may be accomplished Metal conduit when installed in accordance with electrical codes to the unit cabinet.

# 7.0 WIRING DIAGRAM

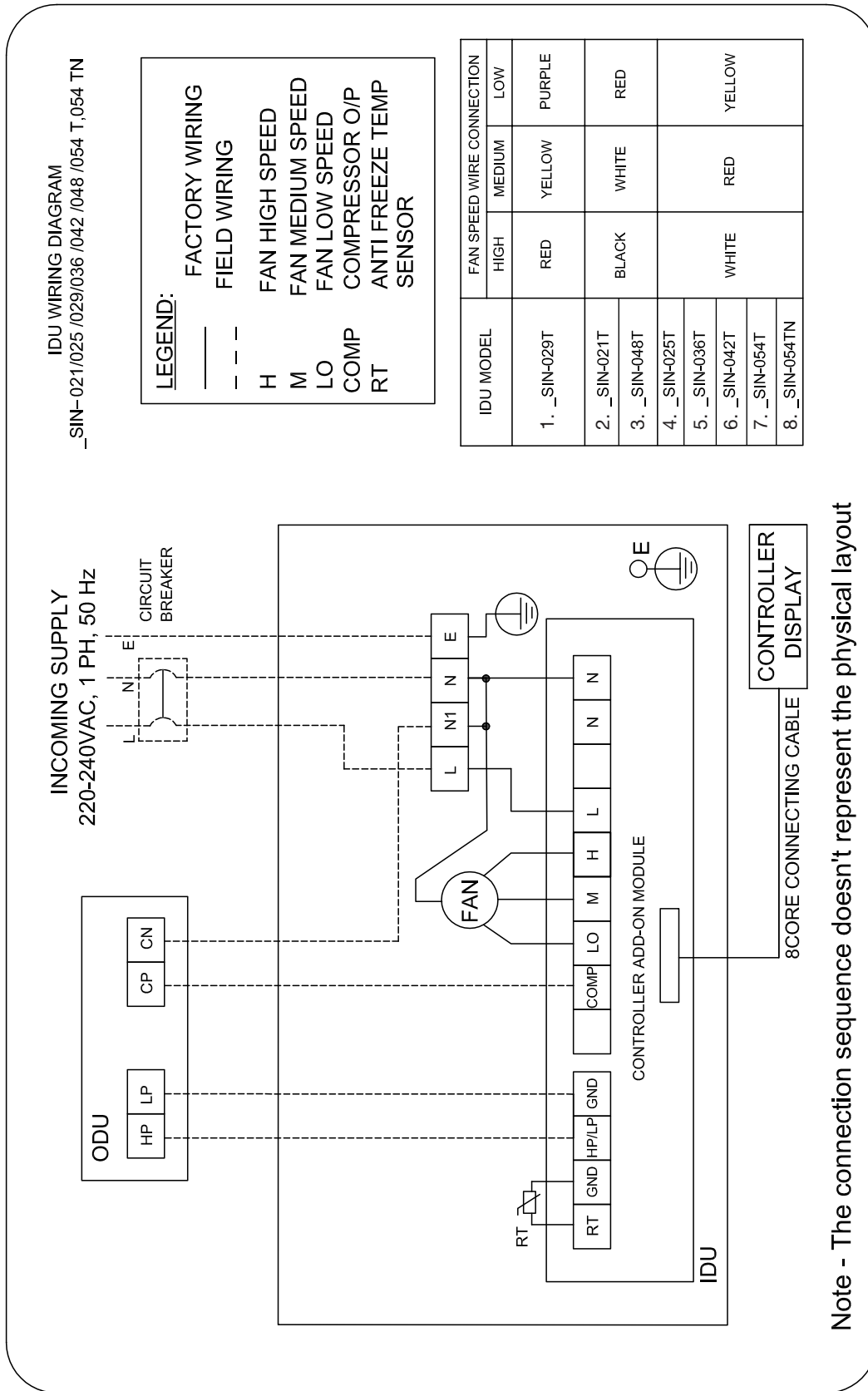
## RSIN (with RSON Rotary)





# 7.0 WIRING DIAGRAM

## RSIN (with RSON Scroll)



Note - The connection sequence doesn't represent the physical layout

# 8.0: OPERATION

---

## Ductable Split unit controller

### A) Specifications:

- |                                   |   |
|-----------------------------------|---|
| 1. Powers supply to controller    | 230VAC +/-10% , 50/60Hz, +/-1Hz, 1Ph  |
| 2. Operating temperature limit    | 18~45°C   |
| 3. Storage temperature limit      | 0 - 60°C  |
| 4. Display                        | LCD graphics display with Backlight   |
| 5. Temperature control accuracy   | ± 1°C   |
| 6. Temperature display resolution | 1°C   |
| 7. Temperature display range      | 0°C to 50°C   |
| 8. Set temperature range          | 20°C- 30°C  |
| 9. Temperature sensors            | a. Inbuilt room temperature sensor  |
| 10. Inputs                        | a. Inbuilt room temperature sensor<br>b. Digital input for HP/ LP   |
| 11. Outputs                       | Three fan speeds & one compressor   |
| 12. Add on Module                 | Add on module acts as interface between controller display and input/outputs and consists of<br>a. One relay (10 Amps) for compressor<br>b. Three relays (10 Amps each) for fan Speeds<br>c. Potential free input for HP/LP interlocking. |
| 13. Connecting Cable              | 8 core cable connect with 12 volt supply ,connecting cable between display and module .<br>Direct plug and Pull type connection required .<br>Length : 10 meter as standard.  |

## **C) Modes of operation:**

Press MODE key to switch between Fan, Cool and Auto modes.

### **1. Cool mode:**

- a. In cool mode logic, IDU will control the temperature as per the set temperature.
- b. Compressor ON OFF will as per the logic for achieving desired temperature.
- c. Temperature setting range in cool mode is from 20°C to 30°C
- d. Fan speed will be as per user selection

### **2. Auto mode :**

Auto mode is similar to cool mode with fan ON/OFF logic as given below :

- a. IDU fan and compressor will switch OFF in this mode on achieving the set temperature. Compressor will switch off immediately and indoor fan will switch OFF after 1 minute of compressor.
- b. IDU fan will switch ON after thermostat signal.
- c. Compressor will switch on 10 sec after thermostat signal provided the anti-cycle time of 3 minutes is completed.
- d. IDU fan continue to run and compressor will trip in case of HP/LP and temperature sensor fault.

### **3. Fan mode :**

- a. In fan mode, only IDU fan operates at High, Med or Low speed as per setting. Compressor will remain OFF in this mode.
- b. Temperature will not be settable in this mode of operation

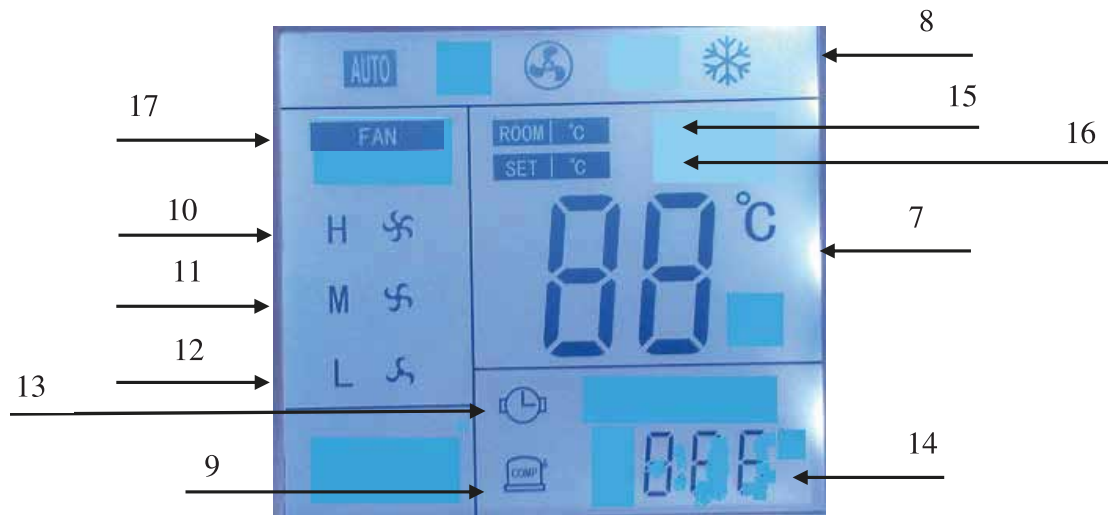
## **D) Operation after power failure :**

Functioning of Cool, Fan and Auto modes during the following conditions

- a. Unintentional power cycle - Controller should remember previous settings and should continue in same mode, fan speed & previous temperature setting of operation after power is restored.
- b. IDU Off/On by user - Mode of operation, fan speed and previous temperature setting should be restored.

## **E) Fan speed display & logic :**

Fan motor will operate on selected speed from the Fan key and symbol for high, medium or low speed will be displayed on the display.



### 1. LCD Segment description

Sr No.	Segment	Description
7	Seven segment digits (temp segment)	<p>a. Indicates room temperature / Set temperature value , fault or alarm condition.</p> <p>b. Room temperature will be displayed by default.Set temperature should appear on temp segments on pressing of Up/down key . Along with display of “SET TEMP” .This should remain for 10 seconds and revert back to room temperature. “SET TEMP” text will not be displayed when room temp is displayed.</p> <p>c. Error code will be displayed in case of fault or alarms</p>
8	Cool, Fan, Auto mode	<p>a. Indicates the operation mode.</p> <p>b. Cool Mode : Cool symbol will be displayed</p> <p>c. Auto Mode : Cool &amp; Auto Fan symbol will be displayed</p> <p>d. Fan Mode : Selected fan speed symbol will be displayed</p>
9	Compressor ON status	a. Indicates ON status.
10	Fan high speed	a. Indicate fan high speed condition
11	Fan medium speed	a. Indicate fan medium speed condition
12	Fan low speed	a. Indicate fan low speed condition
13	Timer	a. Indicate timer mode.
14	Unit OFF status	a. Indicate OFF mode.
15	Room temp display	a. Indicate Room temp
16	Set temp display	a. Indicate set temp
17	Fan indication	a.. Indicate fan

## F) OFF Timer function:

It will OFF the system after specified time which will be settable.

**Setting Procedure :** In the working state, press the mode button for 5sec, displays the clock mark, enter the timing off set, blinking display clock marker ☹, then, by reducing the key change delay shutdown time, set after the end, 5 sec automatically returns to the state, display of set temperature and the LCD screen display clock marker ☺.will automatically lapse time temperature controller,automatic shutdown time is zero. Timing shutdown setting range: 0.0—23.50 hours (shown in the set column). Time is set to 0.0, cancel the shutdown function.

**Note :** This function will get canceled in case of power loss or timer function is completed.

## G) Temperature control logic

### 1. Fan logic :

- a. Fan will switch ON immediately on switching the unit ON.
- b. Fan will be ON when unit is switched ON from controller except Auto mode.

### 2. Compressor Control :

Temperature condition	Compressor status
Actual temp $\geq$ Set value + 1	Compressor ON
Actual temp $\leq$ Set value - 1	Compressor OFF

### 3. Compressor Logic

- a. Anti-cycle time of 180 sec is delay between compressor OFF to ON.
- b. Minimum compressor ON time - 120sec once the compressor starts. Minimum run time is to be ignored when there is any one of the following faults: Low /High pressure ,Temp sensor fault .
- c. HP/LP fault should be ignored for initial 45 sec.
- d. Once the compressor starts, it should run minimum 2 minutes irrespective of the demand from room temperature sensor. After 2 min controller will decide the compressor relay status based on demand.
- e. In case HP/LP fault arises after 45 secs , compressor will trip immediately.
- f. In case coil temperature fall below antifreeze alarm, compressor will trip immediately with error display.

## B) Description of LCD icons and Keys on handset



### Key operation

Sr. No.	Key	Description
1	FAN SPEED	Press to change the fan speed (High → Med → Low )
2	DOWN	Press to decrease temperature by 1 °C
3	MODE	Press to change the mode of the unit (Fan → Cool → Auto )
4	UP	Press to increase temperature by 1 °C
5	POWER	Press to switch unit ON and OFF
5a	RESET(UP+DOWN)	Press any key to make backlight ON , & then press UP & DOWN key together for 5 secs to reset the alarms
5b	LOCK OUT REST (MODE+FAN SPEED)	Press any key to make backlight ON , & then press MODE & FAN SPEED key together for 10 secs to reset the lock out alarms

# 9.0: TROUBLESHOOTING

## 9.1: Error Code

LCD indicators displays the various faults occurring in the unit are as following.

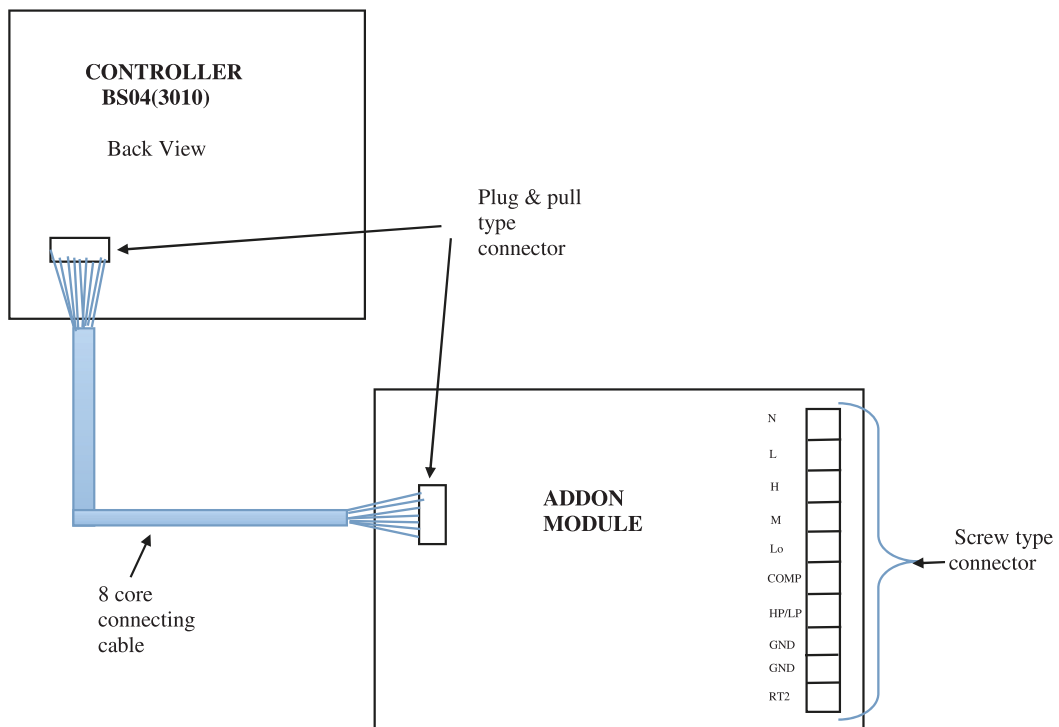
Alarm symbol:

Nature of Fault	LCD Display	Correction of Fault.
Room Temp sensor is open	E1	If Temp sensor is open or damaged, E1 will be displayed and only blower fan will operate. This fault is Auto reset.
Room Temp sensor is short	E2	If Temp sensor is short, E2 will be displayed and only blower fan will operate. This fault is Auto reset.
High Pressure /Low Pressure /SPPR Lock out fault	E7	E7 will be displayed on the unit when HP / LP/SPPR trips three times in last one hour. Total system will enter in to lock out condition.

Note : High Pressure /Low Pressure /SPPR fault

When HP/LP/SPPR error happens first and second time : Unit gets Autoreset. No Error Code display. When HP/LP/SPPR error happens third time with in 1hour : Unit required manual reset.

### I) Controller & add-on module connection .



# 10.0: SERVICE INSTRUCTIONS

## ⚠ WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED, LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

### 11.1: MAINTENANCE

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your local dealer as to the proper frequency of maintenance and the availability of a maintenance contract.

## ⚠ WARNING

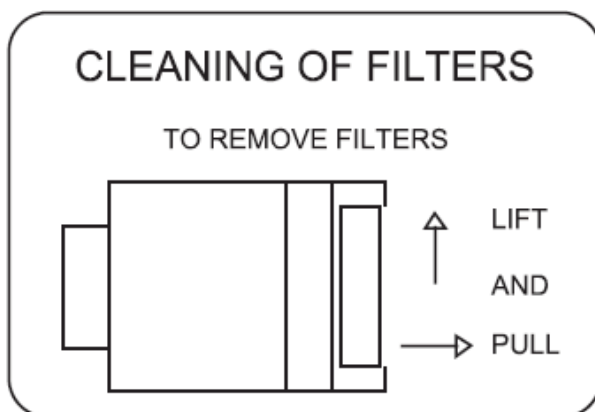
UNITS WITH CIRCUIT BREAKER(S) MEET REQUIREMENTS AS A SERVICE ISOLATION SWITCH, HOWEVER, IF ACCESS IS REQUIRED TO THE LINE SIDE (COVERED) OF THE CIRCUIT BREAKER WITH THE BREAKER(S) DEENERGIZED CONTACT WITH THE LINE SIDE CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

### BLOWER MOTOR AND WHEEL

Inspect the blower motor and wheel for cleanliness. With the system air filter in place, it should be several years before it would become necessary to clean the blower motor and wheel. If it becomes necessary to remove the blower assembly from the unit, see instruction on removal and disassembly of motor, blower and heater parts. The blower motor and wheel may be cleaned by using a vacuum with a soft brush attachment. Remove grease with a mild solvent such as hot water and detergent. Be careful not to disturb the balance weight (clips) on the blower wheel blades. Do not drop or bend wheel as balance will be affected.

### 11.2: Instruction for air Filter removal

**CAUTION :** Do not operate the system without a filter in place.



**Note:** The supply cord instruction "If cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard".

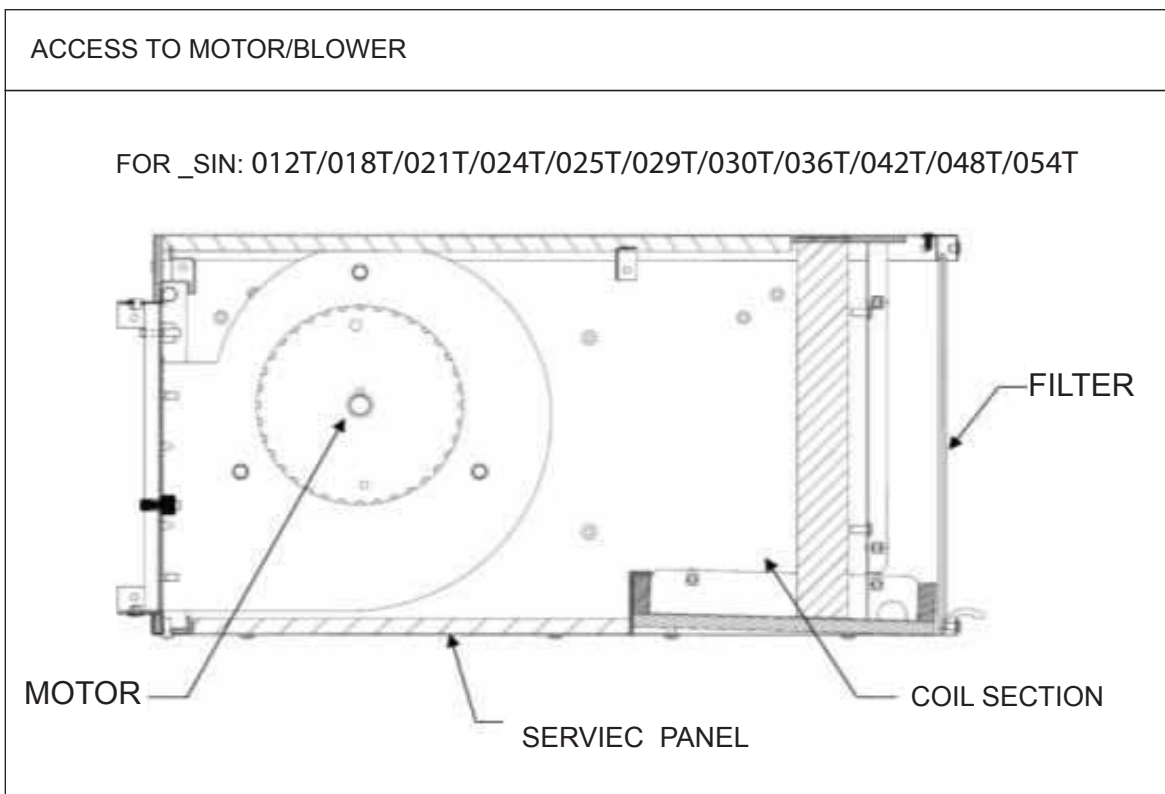


### 10.3: Indoor Coil - Drain Pan-drain Line

Inspect the indoor coil once each year for cleanliness and clean as necessary. In some cases, it may be necessary to remove the filter and check the return side of the coil with a mirror and flashlight.

- Generally, the coil can be easily cleaned when it is dry. If the coil is coated with dirt or limit, blow compressed air nitrogen through the supply air side of the coil fins Blowing dirt or lint from the return air side of the coil into filter or cardboard placed between filter and coil. Be sure lint and dirt is removed from the filter and return air system.
- If the coil is coated with oil or grease, clean it with a mild detergent and water solution. Rinse the coil thoroughly with clear water. Be careful not to splash water excessively into unit and system.
- Inspect the drain pan and condensate drain at the same time the cooling coil is checked. Clean the drain pan and condensate drain by removing any foreign matter from the pan. Fush the pan and drain tube with clear water.
- If the drain tube is restricted, it can generally be cleaned with high pressure water. Remove the drain line from the unit Away from the pan and coil to clear the drain.

**IMPORTANT:** Do not use caustic household drain Cleaners in the condensate pan or near the indoor coil. Drain cleaners will quickly damage the indoor coil.



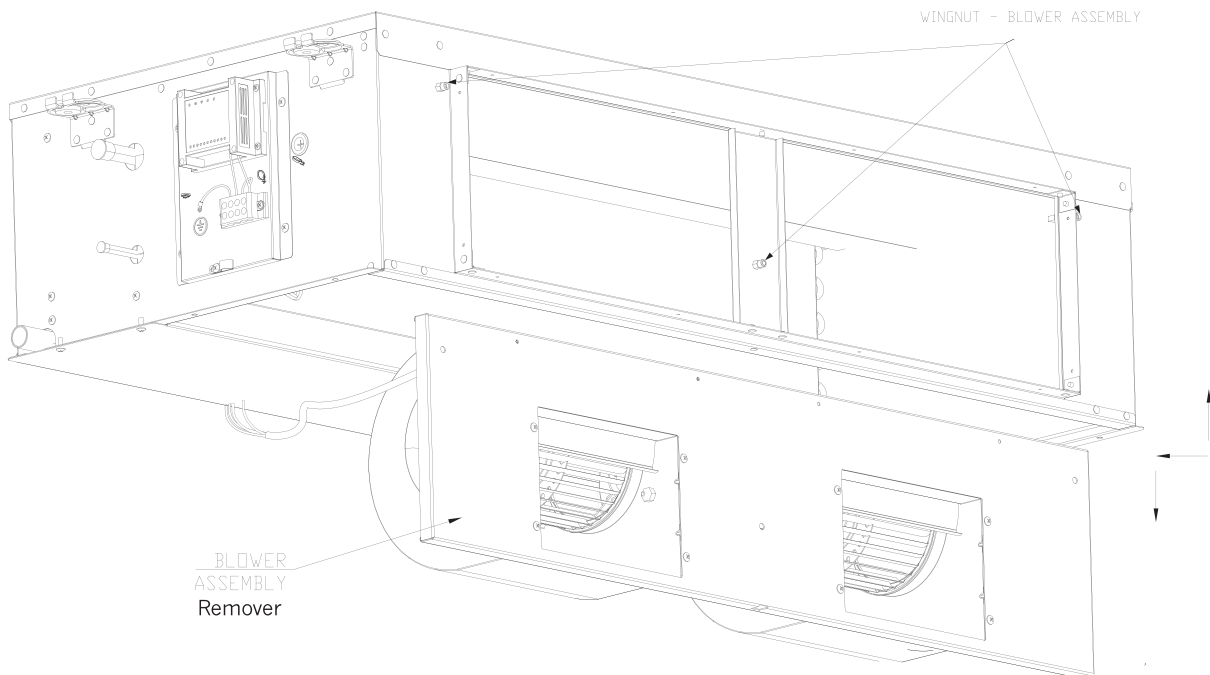
## 10.4: Blower Assembly Removal & Replacement (Bottom Access Panel)

Removing the blower assembly is not required for normal service and Maintenance. Removal is necessary for replacement of defective parts such as motor, blower wheel and electric heaters(s) after extended use. Removal of the blower assembly may become necessary for thorough cleaning of the blower motor and wheel.

### **⚠ WARNING**

**IF REMOVAL OF THE BLOWER ASSEMBLY IS REQUIRED, ALL DISCONNECT SWITCHES SUPPLYING POWER TO THE EQUIPMENT MUST BE DE-ENERGIZED AND LOCKED ( IF NOT IN SIGHT OF UNIT ) SO THE FIELD POWER WIRES CAN BE SAFETY REMOVED FROM THE BLOWER ASSEMBLY. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.**

SR. NO	MODEL NO	PART NAME	WEIGHT (Kg)
1	_SIN-012/018T	FRONT PANEL ASSY	14
2	_SIN-021/024/025T	FRONT PANEL ASSY	16
3	_SIN-029/030/036T	FRONT PANEL ASSY	19
4	_SIN-042/048T	FRONT PANEL ASSY	20
5	_SIN-054TN	FRONT PANEL ASSY	23





---

Before proceeding with installation, refer to installation instructions packaged with each model, as well as complying with all Federal, Stat, Provincial, and Local codes, regulations, and practies.

In keeping with its policy of continuous progress and product improvement,  
Manufacturer reserves the right to make changes without notice

---



\_SIN-/17/REV. 09