Carrier

40RLA/Q/S*14-30
Packaged Air-Handling Units with Puron Advance™ (R-454B) Refrigerant
60 Hz

Installation, Start-up and Service Instructions

CONTENTS

Catalog No. 04-53400095-01 Printed in U.S.A. Form No. 40RL-14-30-02SI Pg 1 3-25 Replaces: 40RL-14-30-01SI

SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in U.S.A., ANSI/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ DANGER

ELECTRICAL SHOCK HAZARD

Failure to follow this warning will result in personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-454B is an A2L refrigerant. All service equipment or components must be A2L refrigerant rated. Do not use non-A2L rated equipment or components on R-454B refrigerant equipment.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

These air handling units are dedicated voltages. Unlike older air handler units the voltage of these units cannot be changed in the field.

⚠ WARNING

PERSONAL INJURY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses, and gloves when handling parts and servicing units.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution could cause equipment damage.

Ensure voltage listed on unit data plate agrees with electrical supply provided for the unit.

⚠ WARNING

RISK OF FIRE — FLAMMABLE REFRIGERANT

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

Unit Label Safety Symbols

	WARNING	This symbol shows that the appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an ignition source, there is a risk of fire.
	CAUTION	This symbol shows that the operation manual should be read carefully.
	CAUTION	This symbol shows that the service personnel should be handling the equipment with reference to the installation manual.
	CAUTION	This symbol shows that the information is available such as the operating manual or installation manual.

Detection of Flammable Refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector utilizing a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks, but in the case of flammable refrigerants the sensitivity may not be adequate, or may need recalibration. Detection equipment shall be calibrated in a refrigerant-free area. Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% max.) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids:

- Bubble method.
- Fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the following section.

Ignition Source Mitigation

No person carrying out work on an appliance containing A2L refrigerants which involves exposing any pipe work shall use any sources of ignition in such a way that can lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, must be kept sufficiently far away from the site of work. This includes, but is not limited to, installation, repair, removal, and disposal of equipment.

Work shall be performed under a controlled procedure so as to minimize the risk of flammable gas or vapors being present while work is performed.

Ventilation Requirements

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work.

A degree ventilation shall continue during the period that work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it external atmosphere. Should an auxiliary ventilation system be present, check that it is operating correctly and no outlets are obstructed.

Evacuation, Removal, and Recovery

When breaking into the refrigerant circuit to make repairs - or for any other purpose - conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas (optional for A2L refrigerants).
4. Evacuate (optional for A2L refrigerants).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

For appliances containing flammable refrigerants, purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process may need to be repeated several times until the system is free from refrigerant. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect coupling and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer not arranged. Do not mix refrigerants in recovery units, and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

At no point during this process should the outlet for the vacuum pump be close to any potential ignition sources, and ventilation shall be available.

Charging

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

PRE-INSTALLATION

1. The power supply (v, ph, and Hz) must correspond to that specified on unit rating plate.
2. The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.
3. Refer to Installation, General section (page 4) and Fig. 1 and 2 for locations of electrical inlets, condensate drain, duct connections, and required clearances before setting unit in place.
4. This installation must conform with local building codes and with the NEC (National Electrical Code) or ANSI (American National Standards Institute)/NFPA (National Fire Protection Association) latest revision. Refer to provincial and local plumbing or wastewater codes and other applicable local codes.

Moving and Storage

To transfer unit from truck to storage site, use a fork truck. Do not stack units more than 2 high during storage. If unit is to be stored for more than 2 weeks before installation, choose a level, dry storage site free from vibration. Do not remove plastic wrap or skid from unit until final installation.

If the unit is to be stored for longer periods of time, inspect the unit periodically; every two weeks if stored in a dry location, or once per week (or after heavy rain, high humidity, or high heat) if stored in a humid location (at a minimum). Perform the following checks:

- Check overall unit condition.
- Check for any indication of refrigerant leaks.
- Check for dirt, debris, and rust.
- Check for signs of excess heat.
- Check for condensation on panels and electrical components.
- Rotate the fan(s). Mark the fan positions first to make sure they stop in a different position.

Carrier reserves the right to not assume responsibility for equipment damage resulting from improper storage or handling, accumulation of condensate on unit electrical components, abuse of the product when used for temporary heating or cooling, improper equipment operation (including application, airflows, or temperatures), operation when the proper pre-start-up and start-up have not been completed, or damaged caused by improper or lack of maintenance.

NOTE: Do not use the unit heating, cooling, or dehumidification features as temporary means to dry out the inside of the unit before performing pre-start-up and start-up checks. Operating the equipment with condensation on electrical components or before minimum start-up times (for VFD reforming and for crank case heater operation) can cause damage.

Rigging

All 40RL Series units can be rigged by using the shipping skid. Units are shipped fully assembled. Do not remove shipping skids or protective covering until unit is ready for final placement; damage to bottom panels can result. Use slings and spreader bars as applicable to lift unit.

Checks to Refrigerating Equipment

The following checks shall be made to installations using A2L refrigerants:

- The actual charge is in accordance with the room size within which the refrigerant containing parts are installed.
- Supplementary ventilation machinery and outlets are operating adequately and are not obstructed.
- For appliances utilizing indirect refrigeration, the secondary circuit shall be checked for the presence of refrigerant.
- Warning markings on the equipment is visible and legible, with those that are not being either replaced or corrected.
- Refrigerant piping or components are installed in a position where they are unlikely to be exposed to any substance which may corrode them, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against said corrosion.

INSTALLATION

General

Allow the following clearances for service access and airflow:

- Rear: 2-1/2 ft (762 mm)
  NOTE: Units equipped with accessory electric heat may require additional rear clearance to allow service access.
- Front: 2-1/2 ft (762 mm)
- Right Side: 2-1/2 ft (1067 mm)
- Left Side: 2-1/2 ft (762 mm)

For units equipped with an economizer, refer to the accessory installation instructions for additional clearance requirements. Be sure floor, wall, or ceiling can support unit weight (Tables 1-5). See Fig. 1 and 2 for dimensions.

If using a remote VFD keypad, install the accessory remote VFD keypad before positioning the 40RL unit in its final operating location.

Uncrating

Move unit as near as possible to final location before removing shipping skid.

Remove metal banding, top skid, and plastic wrap. Examine unit for shipping damage. If shipping damage is evident, file claim with transportation agency. Remove base skid just prior to actual installation.

Check nameplate information against available power supply and model number description in Fig. 3.

NOTE: Be sure to remove the foam shipping pad from the thermostatic expansion valve (TXV). Verify that it has been removed. See Fig. 4 for determining foam pad location.

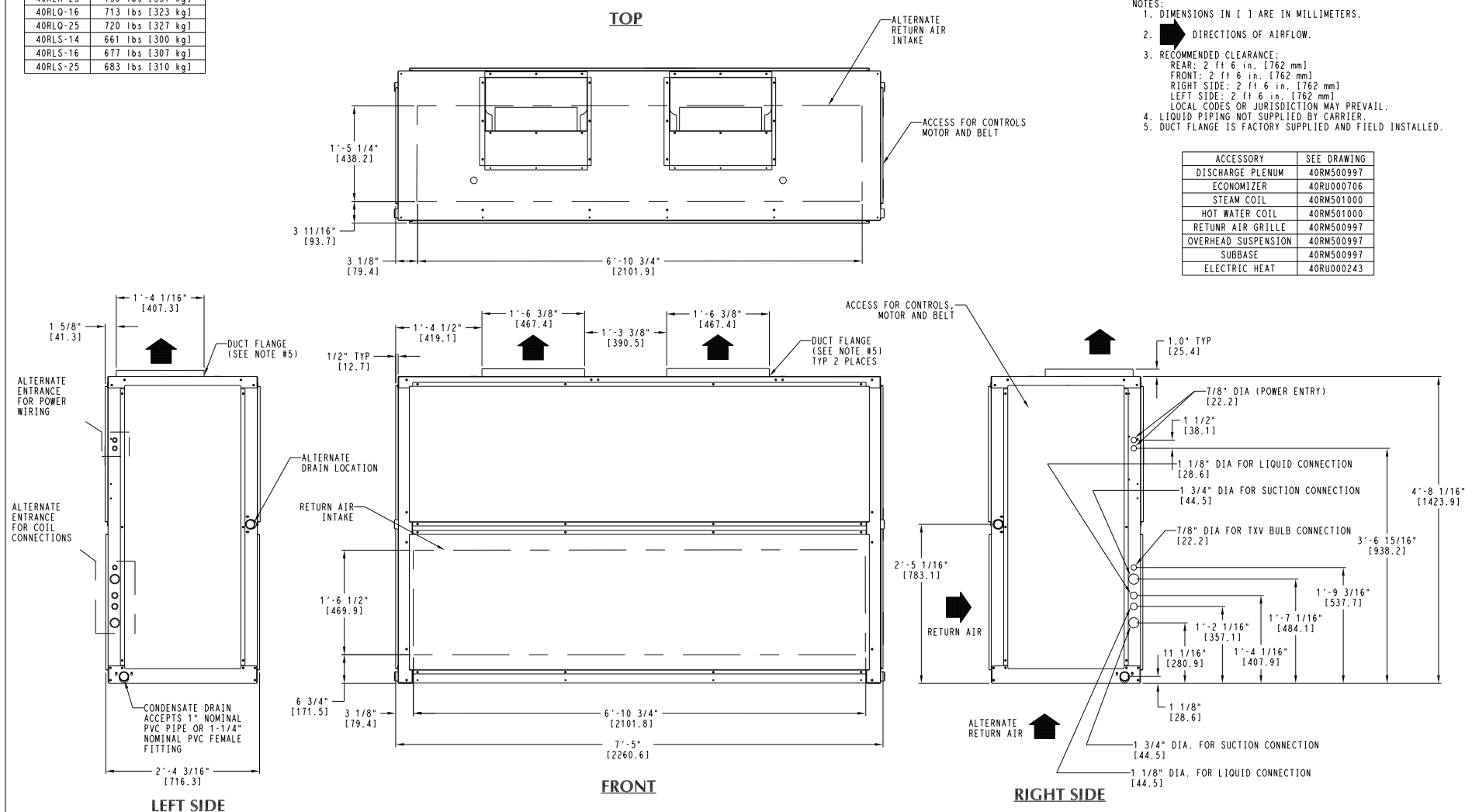
Accessories

Refer to instructions shipped with each accessory for specific information.

UNIT	UNIT WEIGHT (W/TXV)
40RLA-14	695 lbs [315 kg]
40RLA-16	713 lbs [323 kg]
40RLA-25	730 lbs [331 kg]
40RLQ-16	713 lbs [323 kg]
40RLQ-25	720 lbs [327 kg]
40RLS-14	661 lbs [300 kg]
40RLS-16	677 lbs [307 kg]
40RLS-25	683 lbs [310 kg]

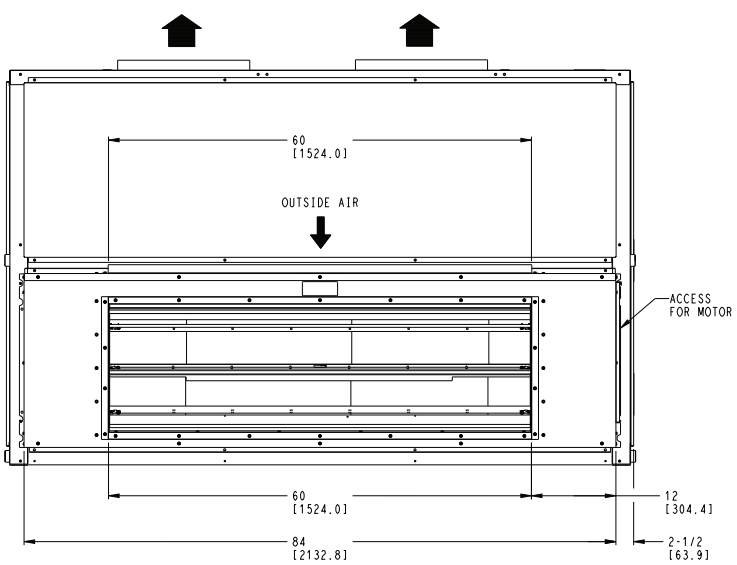
NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ➡ DIRECTIONS OF AIRFLOW.
3. RECOMMENDED CLEARANCE:
   REAR: 2 ft 6 in. [762 mm]
   FRONT: 2 ft 6 in. [762 mm]
   RIGHT SIDE: 2 ft 6 in. [762 mm]
   LEFT SIDE: 2 ft 6 in. [762 mm]
   LOCAL CODES OR JURISDICTION MAY PREVAIL.
4. LIQUID PIPING NOT SUPPLIED BY CARRIER.
5. DUCT FLANGE IS FACTORY SUPPLIED AND FIELD INSTALLED.

ACCESSORY	SEE DRAWING
DISCHARGE PLENUM	40RM500997
ECONOMIZER	40RU000706
STEAM COIL	40RM501000
HOT WATER COIL	40RM501000
RETUNR AIR GRILLE	40RM500997
OVERHEAD SUSPENSION	40RM500997
SUBBASE	40RM500997
ELECTRIC HEAT	40RU000243

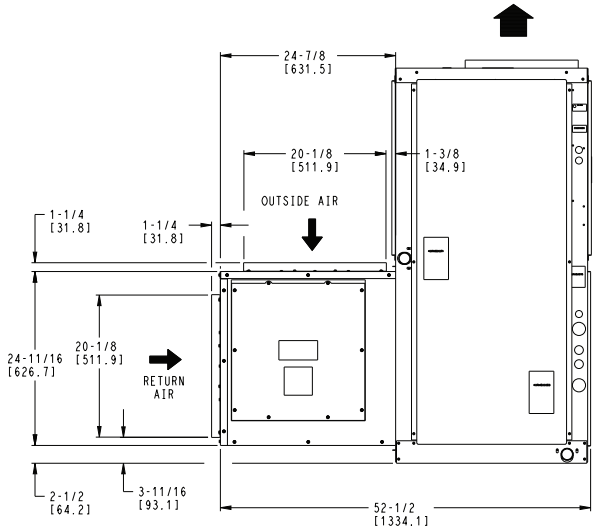


ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES		
U.S. ECCN:NSR	1 OF 2	10/16/24	-	FAN COIL UNITS 40RL A / Q / S - 14 / 16 / 25	40RU001208	REV -

Fig. 1 — Dimensions – Sizes 14, 16, and 25



FRONT



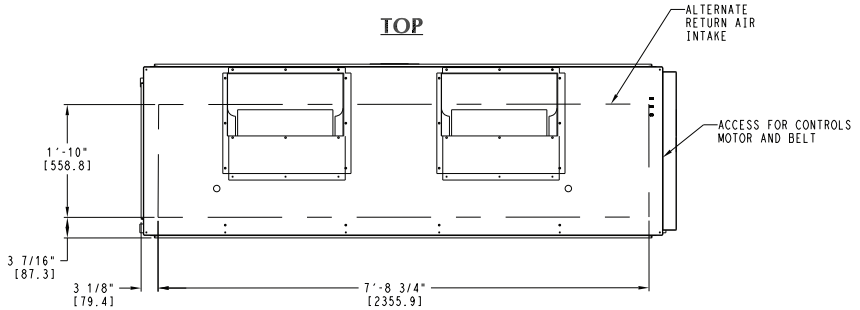
RIGHT SIDE

UNIT WITH ECONOMIZER

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	2 OF 2	10/16/24	-	FAN COIL UNITS 40RL A / Q / S - 14 / 16 / 25	40RU001208	-

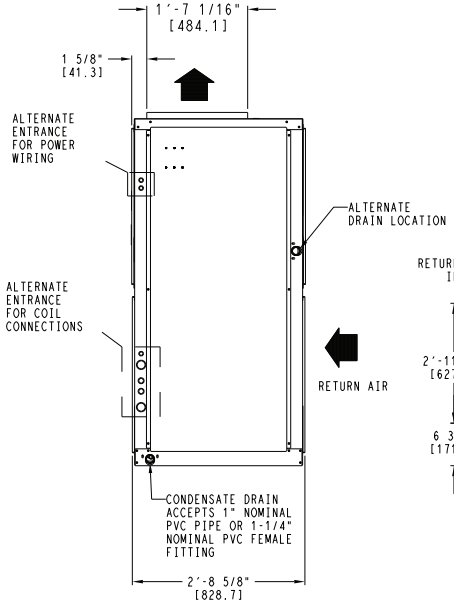
Fig. 1 — Dimensions – Sizes 14, 16, and 25 (cont)

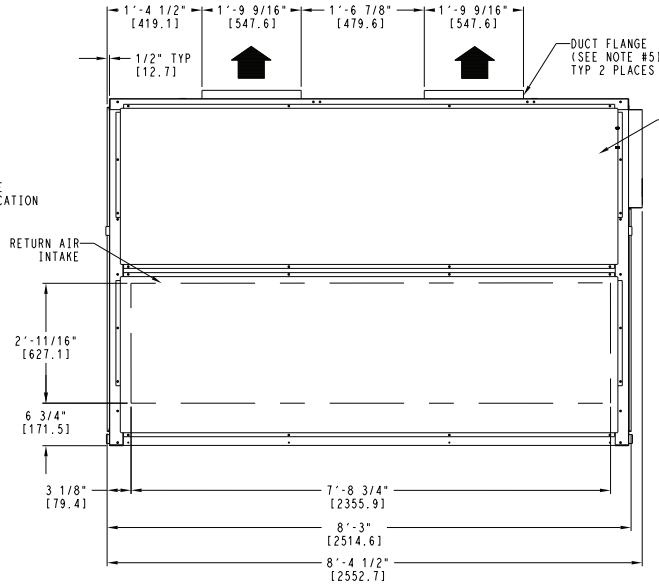
UNIT	UNIT WEIGHT (W/TXV)
40RLA-28	1050 lbs [477 kg]
40RLA-30	1062 lbs [482 kg]
40RLS-28	1035 lbs [469 kg]
40RLS-30	1042 lbs [473 kg]

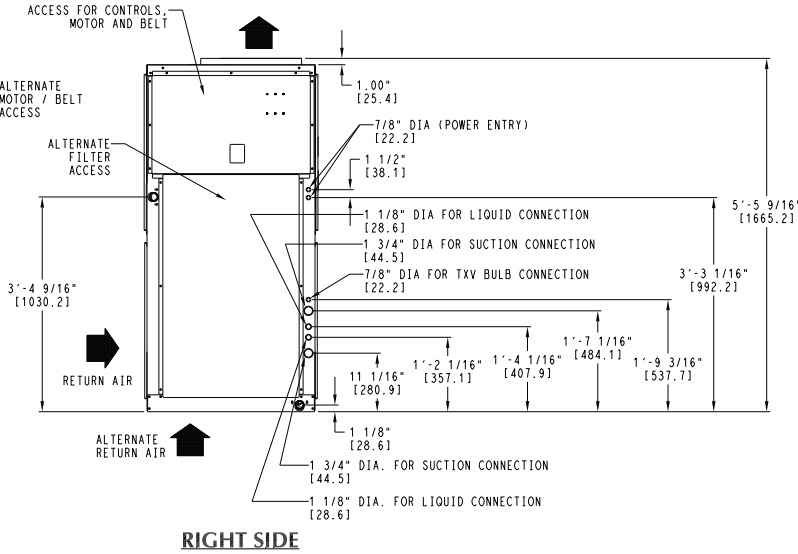


NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ➡ DIRECTIONS OF AIRFLOW.
3. RECOMMENDED CLEARANCE:
   REAR: 2 ft 6 in. [762 mm]
   FRONT: 2 ft 6 in. [762 mm]
   RIGHT SIDE: 2 ft 6 in [762 mm]
   LEFT SIDE: 2 ft 6 in [762 mm]
   LOCAL CODES OR JURISDICTION MAY PREVAIL.
4. LIQUID PIPING NOT SUPPLIED BY CARRIER.
5. DUCT FLANGE IS FACTORY SUPPLIED AND FIELD INSTALLED.

ACCESSORY	SEE DRAWING
DISCHARGE PLENUM	40RM500998
ECONOMIZER	40RU000707
STEAM COIL	40RM501001
HOT WATER COIL	40RM501001
RETUNR AIR GRILLE	40RM500998
OVERHEAD SUSPENSION	40RM500998
SUBBASE	40RM500998
ELECTRIC HEAT	40RU000244

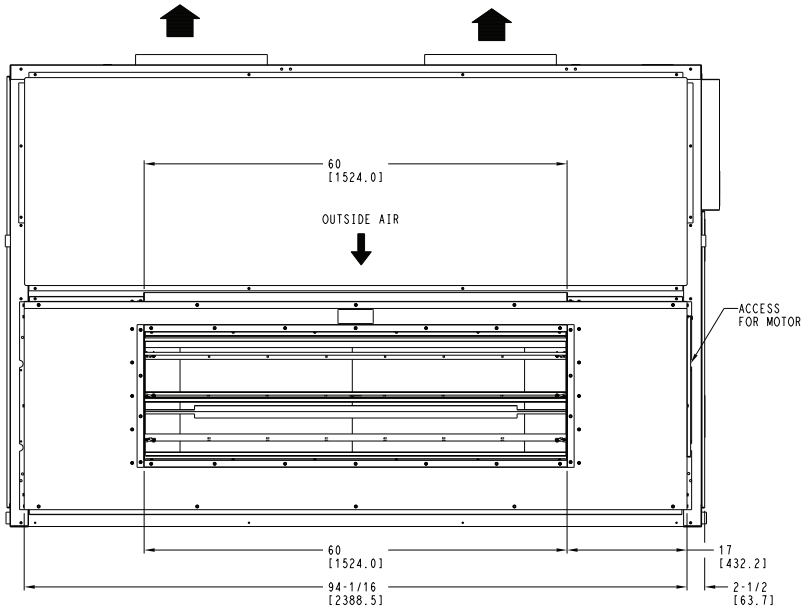




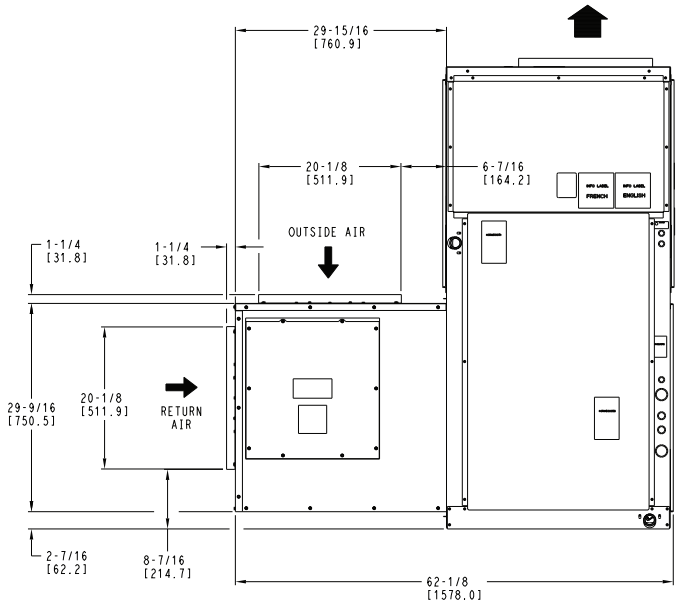


ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES		
U.S. ECCN:NSR	1 OF 2	10/16/24	-	FAN COIL UNITS 40RL A / S - 28 / 30	40RU001209	REV -

Fig. 2 — Dimensions – Sizes 28 and 30



FRONT

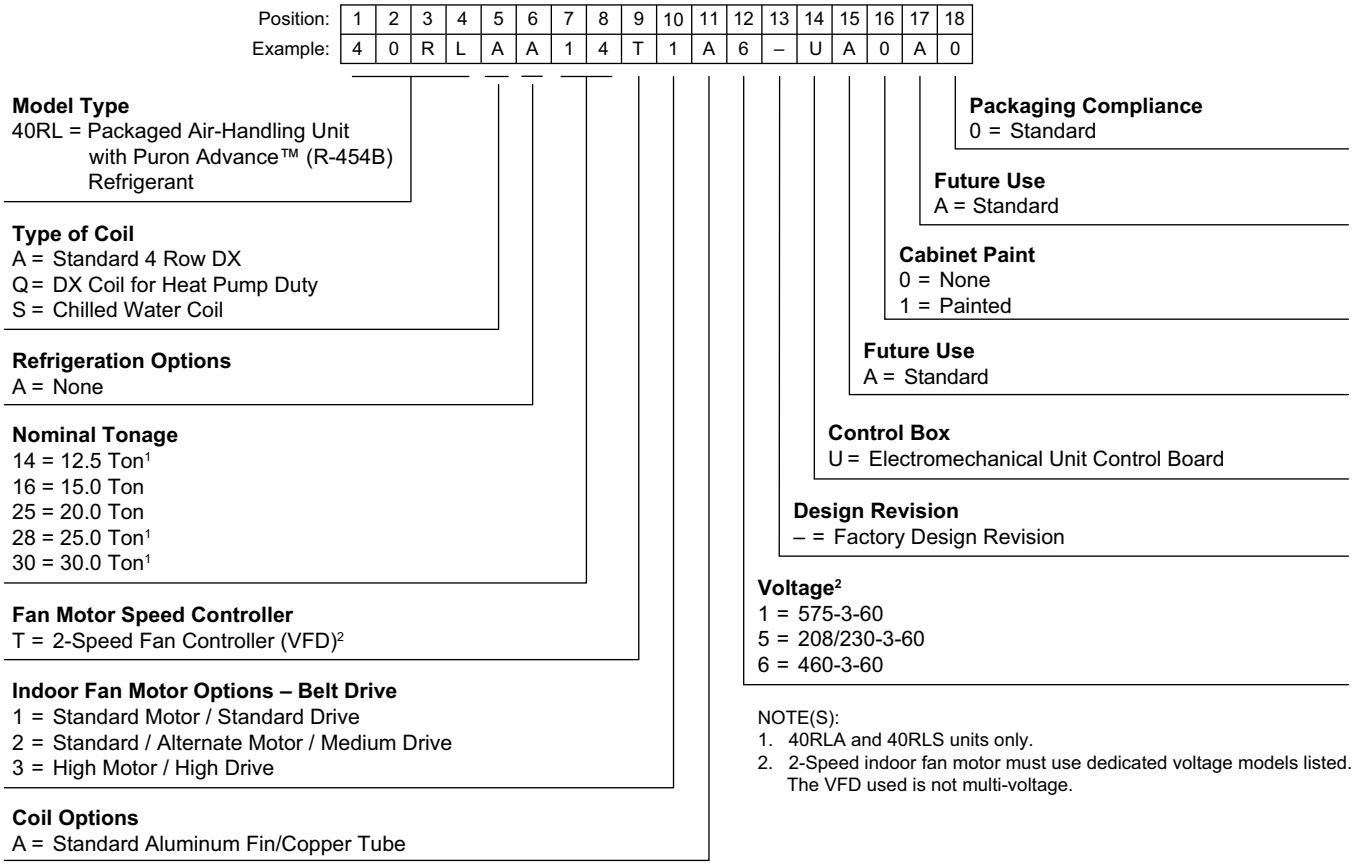


RIGHT SIDE

UNIT WITH ECONOIZER

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	2 OF 2	10/16/23	-	FAN COIL UNITS 40RL A / S - 28 / 30	40RU001209	-

Fig. 2 — Dimensions – Sizes 28 and 30 (cont)



NOTE(S):
1. 40RLA and 40RLS units only.
2. 2-Speed indoor fan motor must use dedicated voltage models listed. The VFD used is not multi-voltage.

Fig. 3 — Model Number Nomenclature

Table 1 — 40RLA Physical Data — Cooling Units (Sizes 14-25)

UNIT 40RLA	14	16	25
NOMINAL CAPACITY (tons)	12.5	15.0	20.0
OPERATING WEIGHT (lb)			
Base Unit with TXV	695	713	730
Plenum	225	225	225
FANS			
Qty / Diameter (in.)	2 / 15	2 / 15	2 / 15
Nominal Airflow (cfm)	5,000	6,000	8,000
Airflow Range (cfm)	3,750-6,250	4,500-7500	6,000-10,000
Nominal Motor Hp (standard motor)			
208/230-3-60 and 460-3-60	2.9	3.7	5.0
575-3-60	3.7	3.7	5.0
Motor Speed (rpm)			
208/230-3-60 and 460-3-60	1,735	1,750	1,755
575-3-60	1,710	1,710	1,755
REFRIGERANT	R-454B	R-454B	R-454B
Operating Charge (lb) (approx per circuit)[a]	2.0 / 2.0	2.5 / 2.5	3.5 / 3.5
DIRECT EXPANSION COIL	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins
Max Working Pressure (psig)	650	650	650
Face Area (sq ft)	13.25	17.67	19.88
No. of Splits	2	2	2
No. of Circuits per Split	12	16	18
Split Type / Percentage	Face / 50 / 50	Face / 50 / 50	Face / 50 / 50
Rows / Fins per Inch	4 / 15	4 / 15	4 / 15
PIPING CONNECTIONS			
Qty / Size (in.)			
DX Coil — Suction (ODF)	2 / 1-1/8	2 / 1-1/8	2 / 1-1/8
DX Coil — Liquid Refrigerant (ODF)	2 / 5/8	2 / 5/8	2 / 5/8
Steam Coil, In (MPT)	1 / 2-1/2	1 / 2-1/2	1 / 2-1/2
Steam Coil, Out (MPT)	1 / 1-1/2	1 / 1-1/2	1 / 1-1/2
Hot Water Coil, In (MPT)	1 / 2	1 / 2	1 / 2
Hot Water Coil, Out (MPT)	1 / 2	1 / 2	1 / 2
Condensate (PVC)	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 1-5/8 ODM / 1-1/4 IDF
FILTERS	Throwaway — Factory-Supplied	Throwaway — Factory Supplied	Throwaway — Factory-Supplied
Qty / Size (in.)	4 / 16 x 20 x 2 4 / 16 x 24 x 2	4 / 16 x 20 x 2 4 / 16 x 24 x 2	4 / 16 x 20 x 2 4 / 16 x 24 x 2
Access Location	Either Side	Either Side	Either Side
STEAM COIL[b]			
Max Working Pressure (psig at 260°F)	20	20	20
Total Face Area (sq ft)	13.33	13.33	13.33
Rows / Fins per Inch	1 / 10	1 / 10	1 / 10
HOT WATER COIL[b]			
Max Working Pressure (psig)	150	150	150
Total Face Area (sq ft)	13.33	13.33	13.33
Rows / Fins per Inch	2 / 8.5	2 / 8.5	2 / 8.5
Water Volume			
(gal)	13.9	13.9	13.9
(ft^3)	1.85	1.85	1.85

NOTE(S):

a. Units are shipped without refrigerant charge.
b. Field-installed accessory only.

LEGEND

DX — Direct Expansion
IDF — Inside Diameter, Female
ODF — Outside Diameter, Female
ODM — Outside Diameter, Male
TXV — Thermostatic Expansion Valve

Table 2 — 40RLA Physical Data — Cooling Units (Sizes 28 and 30)

UNIT 40RLA	28	30
NOMINAL CAPACITY (tons)	25.0	30.0
OPERATING WEIGHT (lb)		
Base Unit with TXV	1,050	1,062
Plenum	325	325
FANS		
Qty / Diameter (in.)	2 / 18	2 / 18
Nominal Airflow (cfm)	10,000	12,000
Airflow Range (cfm)	7,500-12,500	9,000-15,000
Nominal Motor Hp (standard motor)		
208/230-3-60 and 460-3-60	7.5	10.0
575-3-60	7.5	10.0
Motor Speed (rpm)		
208/230-3-60 and 460-3-60	1,760	1,755
575-3-60	1,750	1,755
REFRIGERANT	R-454B	R-454B
Operating Charge (lb) (approx per circuit)[a]	4.5 / 4.5	5.0 / 5.0
DIRECT EXPANSION COIL	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins
Max Working Pressure (psig)	650	650
Face Area (sq ft)	24.86	29.83
No. of Splits	2	2
No. of Circuits per Split	20	24
Split Type / Percentage	Face / 50 / 50	Face / 50 / 50
Rows / Fins per Inch	4 / 15	4 / 15
PIPING CONNECTIONS		
Qty / Size (in.)		
DX Coil — Suction (ODF)	2 / 1-3/8	2 / 1-3/8
DX Coil — Liquid Refrigerant (ODF)	2 / 5/8	2 / 5/8
Steam Coil, In (MPT)	1 / 2-1/2	1 / 2-1/2
Steam Coil, Out (MPT)	1 / 1-1/2	1 / 1-1/2
Hot Water Coil, In (MPT)	1 / 2	1 / 2
Hot Water Coil, Out (MPT)	1 / 2	1 / 2
Condensate (PVC)	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 1-5/8 ODM / 1-1/4 IDF
FILTERS	Throwaway — Factory Supplied	Throwaway — Factory-Supplied
Qty / Size (in.)	4 / 20 x 24 x 2 4 / 20 x 25 x 2	4 / 20 x 24 x 2 4 / 20 x 25 x 2
Access Location	Either Side	Either Side
STEAM COIL[b]		
Max Working Pressure (psig at 260°F)	20	20
Total Face Area (sq ft)	15.0	15.0
Rows / Fins per Inch	1 / 10	1 / 10
HOT WATER COIL[b]		
Max Working Pressure (psig)	150	150
Total Face Area (sq ft)	15.0	15.0
Rows / Fins per Inch	2 / 12.5	2 / 12.5
Water Volume		
(gal)	14.3	14.3
(ft^3)	1.90	1.90

NOTE(S):

a. Units are shipped without refrigerant charge.
b. Field-installed accessory only.

Table 3 — 40RLQ Physical Data — Heat Pump Units (Sizes 16 and 25 Only)

UNIT 40RLQ	16	25
NOMINAL CAPACITY (tons)	15.0	20.0
OPERATING WEIGHT (lb)		
Base Unit with TXV	713	720
Plenum	225	225
FANS		
Qty / Diameter (in.)	2 / 15	2 / 15
Nominal Airflow (cfm)	5,625	8,000
Airflow Range (cfm)	4,500-7,500	6,000-10,000
Nominal Motor Hp (standard motor)		
208/230-3-60 and 460-3-60	3.7	5.0
575-3-60	3.7	5.0
Motor Speed (rpm)		
208/230-3-60 and 460-3-60	1,725	1,760
575-3-60	1,725	1,745
REFRIGERANT	R-454B	R-454B
Operating Charge (lb) (approx per circuit)[a]	3.0/3.0	3.5/3.5
DIRECT EXPANSION COIL	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins
Max Working Pressure (psig)	650	650
Face Area (sq ft)	16.56	19.9
No. of Splits	2	2
No. of Circuits per Split	10	10
Split Type / Percentage	Face / 50 / 50	Face / 50 / 50
Rows / Fins per Inch	4 / 15	4 / 15
PIPING CONNECTIONS		
Qty / Size (in.)		
DX Coil — Suction (ODF)	2 / 1-1/8	2 / 1-1/8
DX Coil — Liquid Refrigerant (ODF)	2 / 5/8	2 / 5/8
Steam Coil, In (MPT)	1 / 2-1/2	1 / 2-1/2
Steam Coil, Out (MPT)	1 / 1-1/2	1 / 1-1/2
Hot Water Coil, In (MPT)	1 / 2	1 / 2
Hot Water Coil, Out (MPT)	1 / 2	1 / 2
Condensate (PVC)	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 1-5/8 ODM / 1-1/4 IDF
FILTERS	Throwaway — Factory Supplied	Throwaway — Factory Supplied
Qty / Size (in.)	4 / 16 x 20 x 2 4 / 16 x 24 x 2	4 / 16 x 20 x 2 4 / 16 x 24 x 2
Access Location	Either Side	Either Side
STEAM COIL[b]		
Max Working Pressure (psig at 260°F)	20	20
Total Face Area (sq ft)	13.33	13.33
Rows / Fins per Inch	1 / 10	1 / 10
HOT WATER COIL[b]		
Max Working Pressure (psig)	150	150
Total Face Area (sq ft)	13.33	13.33
Rows / Fins per Inch	2 / 8.5	2 / 8.5
Water Volume		
(gal)	13.9	13.9
(ft^3)	1.85	1.85

NOTE(S):

a. Units are shipped without refrigerant charge.
b. Field-installed accessory only.

LEGEND

DX — Direct Expansion
IDF — Inside Diameter, Female
ODF — Outside Diameter, Female
ODM — Outside Diameter, Male
TXV — Thermostatic Expansion Valve

Table 4 — 40RLS Physical Data — Chilled Water Units (Sizes 14-25)

UNIT 40RLS	14	16	25
NOMINAL CAPACITY (tons)	12.5	15.0	20.0
OPERATING WEIGHT (lb)			
Base Unit with TXV	661	677	683
Plenum	225	225	225
FANS			
Qty / Diameter (in.)	2 / 15	2 / 15	2 / 15
Nominal Airflow (cfm)	5,000	6,000	8,000
Airflow Range (cfm)	3,750-6,250	4,500-7,500	6,000-10,000
Nominal Motor Hp (standard motor)			
208/230-3-60 and 460-3-60	2.9	3.7	5.0
575-3-60	3.7	3.7	5.0
Motor Speed (rpm)			
208/230-3-60 and 460-3-60	1,725	1,725	1,745
575-3-60	1,725	1,725	1,745
CHILLED WATER COIL	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins
Max Working Pressure (psig)	435	435	435
Face Area (sq ft) — Upper	8.3	8.3	11.0
Face Area (sq ft) — Lower	5.5	8.3	8.3
Rows / Fins per Inch	3 / 15	3 / 15	3 / 15
Water Volume			
(gal)	4.7	5.6	6.4
(ft^3)	0.63	0.75	0.85
PIPING CONNECTIONS			
Qty / Size (in.)			
Chilled Water, In (ODM)	2 / 1-3/8	2 / 1-3/8	2 / 1-3/8
Chilled Water, Out (ODM)	2 / 1-3/8	2 / 1-3/8	2 / 1-3/8
Steam Coil, In (MPT)	1 / 2-1/2	1 / 2-1/2	1 / 2-1/2
Steam Coil, Out (MPT)	1 / 1-1/2	1 / 1-1/2	1 / 1-1/2
Hot Water Coil, In (MPT)	1 / 2	1 / 2	1 / 2
Hot Water Coil, Out (MPT)	1 / 2	1 / 2	1 / 2
Condensate (PVC)	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 1-5/8 ODM / 1-1/4 IDF	1 / 5/8 ODM/1-1/4 IDF
FILTERS	Throwaway — Factory Supplied	Throwaway — Factory Supplied	Throwaway — Factory Supplied
Qty / Size (in.)	4 / 16 x 20 x 2 4 / 16 x 24 x 2	4 / 16 x 20 x 2 4 / 16 x 24 x 2	4 / 16 x 20 x 2 4 / 16 x 24 x 2
Access Location	Either Side	Either Side	Either Side
STEAM COIL[a]			
Max Working Pressure (psig at 260°F)	20	20	20
Total Face Area (sq ft)	13.33	13.33	13.33
Rows / Fins per Inch	1 / 10	1 / 10	1 / 10
HOT WATER COIL[b]			
Max Working Pressure (psig)	150	150	150
Total Face Area (sq ft)	13.33	13.33	13.33
Rows / Fins per Inch	2 / 8.5	2 / 8.5	2 / 8.5
Water Volume			
(gal)	13.9	13.9	13.90
(ft^3)	1.85	1.85	1.85

NOTE(S):

a. Field-installed accessory only.

LEGEND

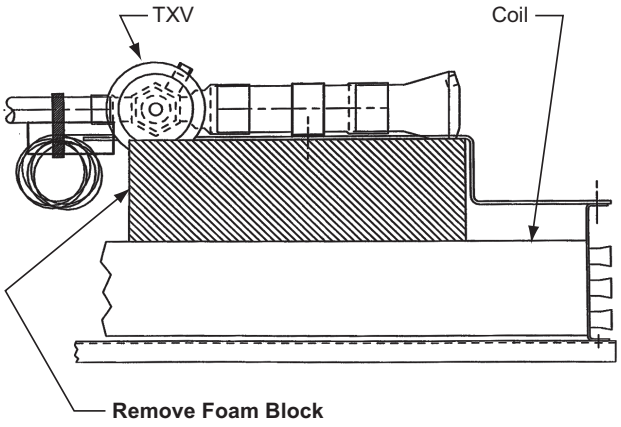
IDF — Inside Diameter, Female
ODF — Outside Diameter, Female
ODM — Outside Diameter, Male

Table 5 — 40RLS Physical Data — Chilled Water Units (Sizes 28 and 30)

UNIT 40RLS	28	30
NOMINAL CAPACITY (tons)	25.0	30.0
OPERATING WEIGHT (lb)		
Base Unit with TXV	1,035	1,042
Plenum	325	325
FANS		
Qty / Diameter (in.)	2 / 18	2 / 18
Nominal Airflow (cfm)	10,000	12,000
Airflow Range (cfm)	7,500-12,500	9,000-15,000
Nominal Motor Hp (standard motor)		
208/230-3-60 and 460-3-60	7.5	10.0
575-3-60	7.5	10.0
Motor Speed (rpm)		
208/230-3-60 and 460-3-60	1,760	1,755
575-3-60	1,750	1,755
CHILLED WATER COIL	Enhanced Copper Tubes, Aluminum Sine-Wave Fins	Enhanced Copper Tubes, Aluminum Sine-Wave Fins
Max Working Pressure (psig)	435	435
Face Area (sq ft) — Upper	12.4	15.5
Face Area (sq ft) — Lower	12.4	12.4
Rows / Fins per Inch	3 / 15	3 / 15
Water Volume		
(gal)	8.9	9.9
(ft^3)	1.19	1.32
PIPING CONNECTIONS		
Qty / Size (in.)		
Chilled Water, In (ODM)	2 / 2-1/8	2 / 2-1/8
Chilled Water, Out (ODM)	2 / 2-1/8	2 / 2-1/8
Steam Coil, In (MPT)	1 / 2-1/2	1 / 2-1/2
Steam Coil, Out (MPT)	1 / 1-1/2	1 / 1-1/2
Hot Water Coil, In (MPT)	1 / 2	1 / 2
Hot Water Coil, Out (MPT)	1 / 2	1 / 2
Condensate (PVC)	1 / 5/8 ODM/1-1/4 IDF	1 / 5/8 ODM/1-1/4 IDF
FILTERS	Throwaway — Factory Supplied	Throwaway — Factory Supplied
Qty / Size (in.)	4 / 20 x 24 x 2 4 / 20 x 25 x 2	4 / 20 x 24 x 2 4 / 20 x 25 x 2
Access Location	Either Side	Either Side
STEAM COIL[a]		
Max Working Pressure (psig at 260°F)	20	20
Total Face Area (sq ft)	15.0	15.0
Rows / Fins per Inch	1 / 10	1 / 10
HOT WATER COIL[b]		
Max Working Pressure (psig)	150	150
Total Face Area (sq ft)	15.00	15.00
Rows / Fins per Inch	2 / 12.5	2 / 12.5
Water Volume		
(gal)	14.30	14.30
(ft^3)	1.90	1.90

NOTE(S):

a. Field-installed accessory only.



LEGEND
TXV — Thermostatic Expansion Valve

Fig. 4 — Foam Block Location

Rated Indoor Airflow (cfm)

Tables 6-8 list the rated indoor airflow used for the AHRI (Air-Conditioning, Heating, and Refrigeration Institute) efficiency rating for the units covered in this document.

Table 6 — 38AXZ with 40RLA

MODEL NUMBER	FULL LOAD AIRFLOW (cfm)
38AXZ*14 — 40RLA*14	4,400
38AXZ*16 — 40RLA*16	5,625
38AXZ*25 — 40RLA*25	8,000

Table 7 — 38AXD with 40RLA

MODEL NUMBER	FULL LOAD AIRFLOW (cfm)
38AXD*14 — 40RLA*14	4,400
38AXD*16 — 40RLA*16	5,625
38AXD*25 — 40RLA*25	8,000
38AXD*28 — 40RLA*28	9,450

Table 8 — 38AXQ with 40RLQ

MODEL NUMBER	FULL LOAD COOLING / HEATING AIRFLOW (CFM)
38AXD*16 — 40RLQ*16	5,625
38AXD*25 — 40RLQ*25	7,500

Unit Positioning

The unit can be mounted on the floor for vertical application with return air entering the face of the unit and supply air discharging vertically through the top of the unit. The unit can also be applied in a horizontal arrangement with return air entering horizontally and the supply air discharging horizontally. When applying the unit in a horizontal arrangement, ensure the condensate drain pan is located at the bottom center of the unit for adequate condensate disposal. See Fig. 5 for condensate connections for each unit position.

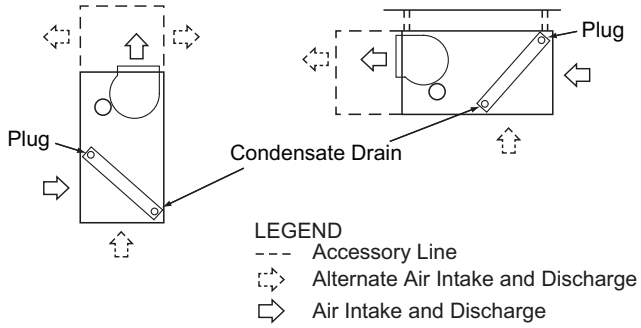


Fig. 5 — Typical Unit Positioning

IMPORTANT: Do NOT attempt to install unit with return air entering top panel of unit. Condensate will not drain from unit.

Typical positioning and alternate return air locations are shown in Fig. 5. Alternate return air locations can be used by moving the unit panel from the alternate return air location to the standard return air location. Refer to overhead suspension accessory drawings (see Fig. 6 and 7) for preferred suspension technique. The unit needs support underneath to prevent sagging.

Unit Isolation

Where extremely quiet operation is essential, install isolators between floor and base of unit, or between ceiling and top section of unit.

Be sure that unit is level and adequately supported. Use channels at front and sides of unit for reference points when leveling.

IMPORTANT: Do not bury refrigerant piping underground.

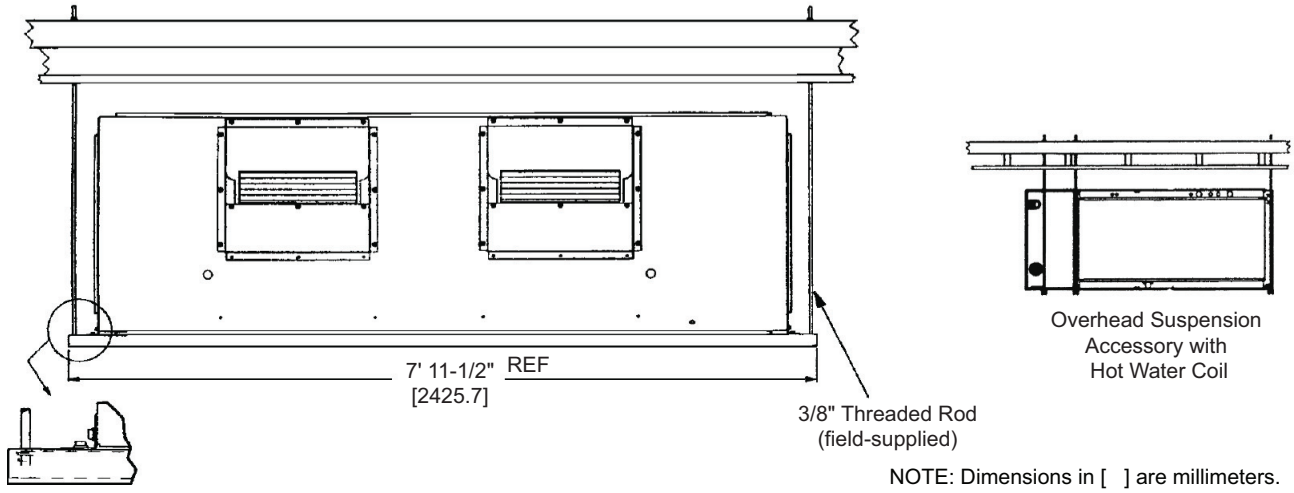


Fig. 6 — Preferred Suspension Technique (Sizes 14 and 16)

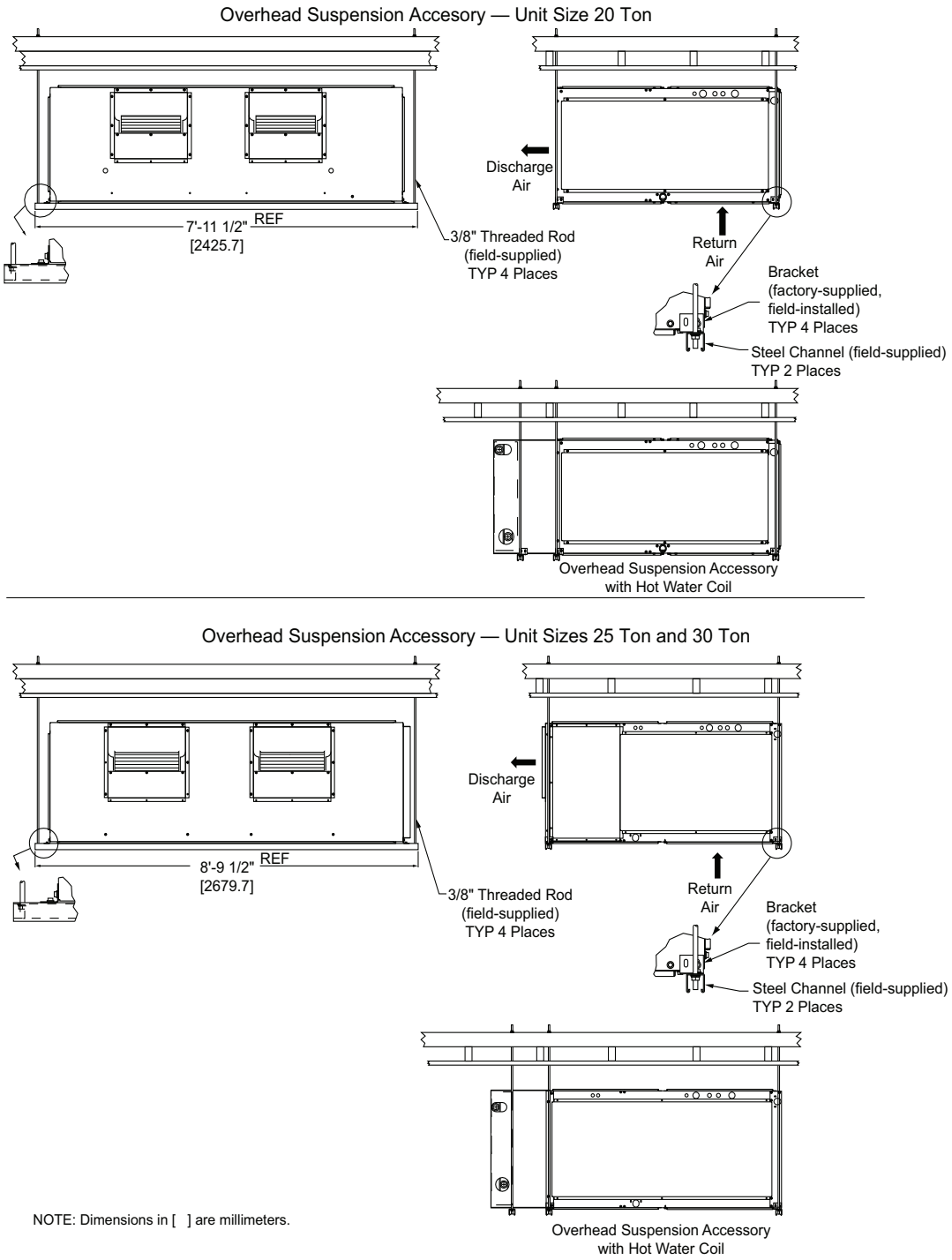


Fig. 7 — Preferred Suspension Technique (Sizes 25, 28 and 30)

Refrigerant Piping

See Tables 1-5 for refrigerant pipe connection sizes. For ease in brazing, it is recommended that all internal solder joints be made before unit is placed in final position.

The 40RL direct-expansion units have internal factory-installed thermostatic expansion valves (TXVs), distributors, and nozzles for use with R-454B. See Table 9 for part numbers. Knockouts are provided in the unit corner posts for 40RL refrigerant piping. See Fig. 8, which also lists recommended knockouts and access holes to use for each 40RL unit size. Refrigerant and chilled water piping access hole data is listed in Table 10. Recommended fittings are listed in Table 11.

The sensor bulb capillary tubes must be routed from the TXVs inside the unit through one of the piping access holes. Clamp the TXV sensor bulb on a vertical portion of the suction line, outside the unit. See Fig. 9.

Requirements of A2L Refrigerant Piping

The following must be adhered to for refrigerant piping:

- Installation of pipe-work must be kept to a minimum, with minimum piping lengths whenever possible.
- Connecting joints shall only be made in easily accessible locations for service purposes.
- There shall be no bends in pipe-work lines with a centerline bend radius less than 2.5 times the external diameter.
- Pipework must be protected from potential damage during normal operation, service or maintenance.

Refrigerant and Chilled Water Piping Access

The 40RL Series units come with standard knockouts for refrigerant and chilled water piping. These knockouts are located on both sides of the unit for installation flexibility. The standard knockouts provide sufficient access to the unit's coils for all 40RLA*14, 16, 25, 28, and 30 units. 40RLQ*16 and 25 units, as well as 40RLS*14, 16, 25, 28, and 30 units require additional holes that must be field-fabricated to accommodate the piping. See Fig. 8 for the positions and dimensions of the additional access holes required for 40RLQ and 40RLS units. Recommended access hole use is also listed for all units. Note that Fig. 8 shows the access holes on the control-box side of the unit; this is the side of the unit with the coil headers, so it is used most often for piping access.

NOTE: Be sure to remove the foam shipping pad from the TXV. Verify that it has been removed. See Fig. 4.

IMPORTANT: Never attach the sensor to the suction manifold. Do NOT mount the sensor on a trapped portion of the suction line.

The 40RL Series evaporator coils have a face-split design. Ensure that lower circuit of coil is first on/last off when connected to the condensing unit and/or system controls. (See Fig. 10.)

External TXV equalizer connections are provided and factory-brazed into the coil suction manifolds.

If suction line must be horizontal, clamp bulb to suction line at least 45 degrees above bottom, at approximately the 4 o'clock or 8 o'clock position. See Fig. 11.

Table 9 — Factory-Installed Nozzle and Distributor Data[a]

UNIT	COIL TYPE STD	TXV QTY / PART NO.	DISTRIBUTOR QTY / PART NO.	FEEDER TUBES PER DISTRIBUTOR[b] QTY / SIZE (in.)	NOZZLE QTY / PART NO.
40RLA*14	4 Row	2 / HXAE-6-KX	2 / 1113	12 / 3/16	2 / G3
40RLA*16	4 Row	2 / BBIZE—6—GA	2 / 1136	16 / 3/16	2 / G4
40RLQ*16	4 Row	2 / BBIZE—8—GA	2 / 1113	10 / 3/16	2 / G5
40RLA*25	4 Row	2 / BBIZE-8-GA	2 / D196-18-3/16	18 / 3/16	2 / G6
40RLQ*25	4 Row	2 / BBIZE-12.5-GA	2 / 113-12-3/16	2-12 / 3/16	2 / G8
40RLA*28	4 Row	2 / BBIZE-12.5-GA	2 / 1126	20 / 3/16	2 / C15
40RLA*30	4 Row	2 / BBIZE-15-GA	2 / 1126	24 / 3/16	2 / C17

NOTE(S):

a. Hot gas bypass applications require field-supplied auxiliary side connector.
b. Feeder tube size is 1/4 in. (6.35 mm).

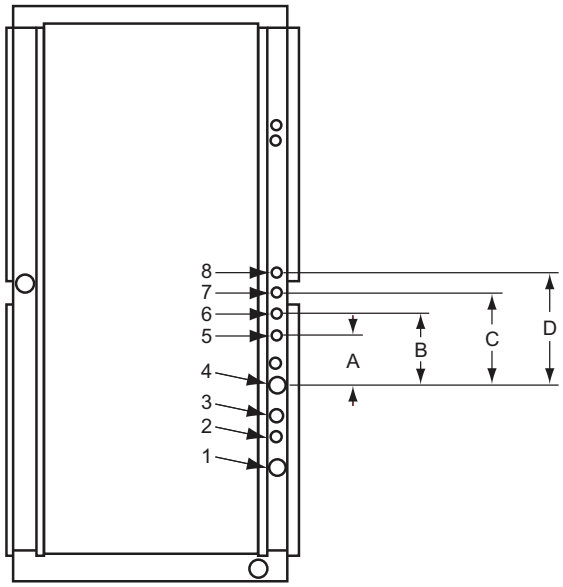


Fig. 8 — Refrigerant and Chilled Water Piping Access Holes

Table 10 — Refrigerant and Chilled Water Piping Access Hole Data

UNIT	USE HOLE NUMBERS[a]	FIELD-FABRICATED HOLE DIAMETERS in. (mm)				FIELD-FABRICATED HOLE POSITION DIMENSIONS, in. (mm)			
		NO. 5	NO. 6	NO.7	NO. 8	A	B	C	D
40RLA*14, 16	1, 2, 3, 4	—	—	—	—	—	—	—	—
40RLS*14, 16	4, 5, 6, 7	1-3/4 (44.5)	1-3/4 (44.5)	1-3/4 (44.5)	—	3.00 (76.2)	6.000 (152.5)	10.50 (266.7)	—
40RLQ*16	3[b], 5, 6, 7	1-1/8 (28.6)	1-1/8 (28.6)	1-3/4 (44.5)	—	3.25 (82.6)	6.125 (155.6)	10.38 (263.7)	—
40RLA*25,28,30	1,2,3,4	—	—	—	—	—	—	—	—
40RLS*25	4,5,6,7	1-3/4 (44.5)	1-3/4 (44.5)	1-3/4 (44.5)	—	3.0 (76.2)	6.0 (152.5)	10.5 (266.7)	—
40RLQ*25	3[c],5,6,7	1-1/8 (28.6)	1-1/8 (28.6)	1-3/4 (44.5)	—	3.25 (82.6)	6.125 (155.6)	10.38 (263.7)	—
40RLS*28,30	5,6,7,8	2-1/2 (63.5)	2-1/2 (63.5)	2-1/2 (63.5)	2-1/2 (63.5)	6.0 (152.5)	9.625 (244.5)	13.38 (339.9)	17.0 (431.8)

NOTE(S):

a. Access hole knockouts 1-4 are factory-supplied.
b. Must be enlarged from 1-1/8 in. (28.6 mm) to 1-3/4 in. (44.5 mm)
c. Must be enlarged from 1-1/8 in. (28.6mm) to 1-3/4 in. (44.5mm).

Table 11 — Fitting Requirements

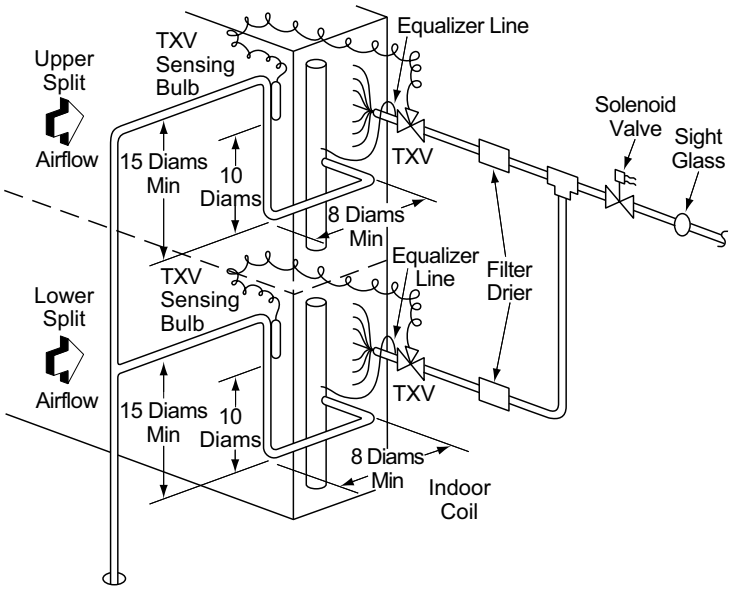
UNIT	ACCESS HOLE NO.[a]	CONNECTION TYPE	CIRCUIT	FITTING REQUIRED[b] (in.)
40RLA*14	1	Suction	Lower	1-1/8 Street Elbow 1-1/8 Nipple, 7-5/8 L 1-1/8 Long Radius Elbow
	2	Liquid	Lower	5/8 Street Elbow 5/8 Nipple, 1-7/16 L 5/8 Long Radius Elbow
	3	Liquid	Upper	5/8 Street Elbow 5/8 Nipple, 11-1/2 L 5/8 Long Radius Elbow
	4	Suction	Upper	1-1/8 Nipple, 5-5/8 L 1-1/8 Long Radius Elbow 1-1/8 Nipple, 13 L 1-1/8 Long Radius Elbow
40RLA*16	1	Suction	Lower	1-1/8 Street Elbow 1-1/8 Nipple, 72-3/4 L 1-1/8 Long Radius Elbow
	2	Liquid	Lower	5/8 Street Elbow 5/8 Nipple, 1-3/8 L 5/8 Long Radius Elbow
	3	Liquid	Upper	5/8 Street Elbow 5/8 Nipple, 11-1/2 L 5/8 Long Radius Elbow
	4	Suction	Upper	1-1/8 Nipple, 5-5/8 L 1-1/8 Long Radius Elbow 1-1/8 Nipple, 13 L 1-1/8 Long Radius Elbow
40RLQ*16	3	Suction	Lower	1-1/8 Nipple, 3 L 1-1/8 Long Radius Elbow
	5	Suction	Lower	5/8 Nipple, 2-7/8 L 5/8 45° Elbow 5/8 Nipple, 1-5/8 L 5/8 Long Radius Elbow
	6	Liquid	Upper	5/8 Nipple, 2-7/8 L 5/8 45° Elbow 5/8 Nipple, 4-1/4 L 5/8 Long Radius Elbow
	7	Suction	Upper	1-1/8 Nipple, 5 L 1-1/8 45° Elbow 1-1/8 Nipple, 8-3/4 L 1-1/8 Long Radius Elbow
40RLS*14 40RLS*16	4	Supply	Lower	1-3/8 Long Radius Elbow 1-3/8 Nipple, 3-3/4 L 1-3/8 Long Radius Elbow
	5	Return	Lower	1-3/8 Long Radius Elbow 1-3/8 Nipple, 3-3/8 L 1-3/8 Long Radius Elbow
	6	Return	Upper	1-3/8 Long Radius Elbow 1-3/8 Nipple, 7 L 1-3/8 Long Radius Elbow
	7	Supply	Upper	1-3/8 Long Radius Elbow 1-3/8 Nipple, 11-3/4 L 1-3/8 Long Radius Elbow

Table 11 — Fitting Requirements (cont)

UNIT	ACCESS HOLE NO.[a]	CONNECTION TYPE	CIRCUIT	FITTING REQUIRED[b] (in.)
40RLA*25	1	Suction	Lower	1-1/8 Street Elbow 1-1/8 Nipple, 7-5/8 L 1-1/8 Long Radius Elbow
	2	Liquid	Lower	5/8 Street Elbow 5/8 Nipple, 6-1/2 L 5/8 Long Radius Elbow
	3	Liquid	Upper	5/8 Street Elbow 5/8 Nipple, 9-1/2 L 5/8 Long Radius Elbow
	4	Suction	Upper	1-1/8 Nipple, 5-5/8 L 1-1/8 Long Radius Elbow 1-1/8 Nipple, 11 L 1-1/8 Long Radius Elbow
40RLQ*25	3	Suction	Lower	1-1/8 Nipple, 3 L 1-1/8 Long Radius Elbow
	5	Suction	Lower	5/8 Nipple, 2-7/8 L 5/8 45° Elbow 5/8 Nipple, 1-5/8 L 5/8 Long Radius Elbow
	6	Liquid	Upper	5/8 Nipple, 2-7/8 L 5/8 45° Elbow 5/8 Nipple, 4-1/4 L 5/8 Long Radius Elbow
	7	Suction	Upper	1-1/8 Nipple, 5 L 1-1/8 45° Elbow 1-1/8 Nipple, 8-3/4 L 1-1/8 Long Radius Elbow
40RLS*25	4	Supply	Lower	1-3/8 Long Radius Elbow 1-3/8 Nipple, 3-3/4 L 1-3/8 Long Radius Elbow
	5	Return	Lower	1-3/8 Long Radius Elbow 1-3/8 Nipple, 3-3/8 L 1-3/8 Long Radius Elbow
	6	Return	Upper	1-3/8 Long Radius Elbow 1-3/8 Nipple, 7 L 1-3/8 Long Radius Elbow
	7	Supply	Upper	1-3/8 Long Radius Elbow 1-3/8 Nipple, 11-3/4 L 1-1/8 Long Radius Elbow
40RLA*28	1	Suction	Lower	1-3/8 Street Elbow 1-3/8 Nipple, 11 L 1-3/8 Long Radius Elbow
	2	Liquid	Lower	5/8 Street Elbow 5/8 Nipple, 1-1/2 L 5/8 Long Radius Elbow
	3	Liquid	Upper	5/8 Street Elbow 5/8 Nipple, 19-1/2 L 5/8 Long Radius Elbow
	4	Suction	Upper	1-3/8 Nipple, 4-3/16 L 1-3/8 Long Radius Elbow 1-3/8 Nipple, 23-1/4 L 1-3/8 Long Radius Elbow
40RLS*28 40RLS*30	5	Supply	Lower	2-1/8 Long Radius Elbow 2-1/8 Nipple, 3-1/2 L 2-1/8 Long Radius Elbow
	6	Return	Lower	2-1/8 Long Radius Elbow 2-1/8 Nipple, 3 L 2-1/8 Long Radius Elbow
	7	Return	Upper	2-1/8 Long Radius Elbow 2-1/8 Nipple, 6-7/8 L 2-1/8 Long Radius Elbow
	8	Supply	Upper	2-1/8 Long Radius Elbow 2-1/8 Nipple, 11-7/8 L 2-1/8 Long Radius Elbow
40RLA*30	1	Suction	Lower	1-3/8 Street Elbow 1-3/8 Nipple, 3 L 1-3/8 Long Radius Elbow
	2	Liquid	Lower	5/8 Street Elbow 5/8 Nipple, 7-3/4 L 5/8 Long Radius Elbow
	3	Liquid	Upper	5/8 Street Elbow 5/8 Nipple, 18-1/2 L 5/8 Long Radius Elbow
	4	Suction	Upper	1-3/8 Nipple, 4-3/16 L 1-3/8 Long Radius Elbow 1-3/8 Nipple, 19-1/4 L 1-3/8 Long Radius Elbow

NOTE(S):

a. See Fig. 8 for access hole location by number.
b. Fittings are listed in order from header or tee stub connection out to access hole in corner support post.



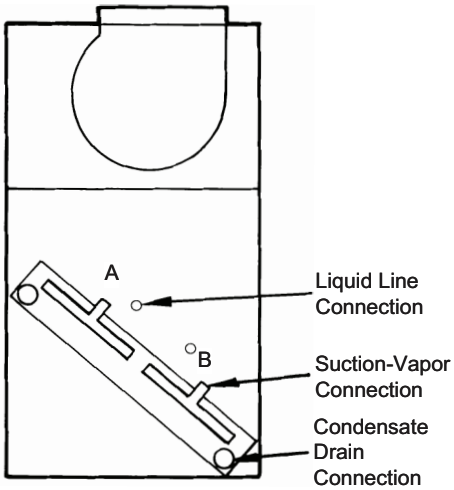
LEGEND

TXV — Thermostatic Expansion Valve

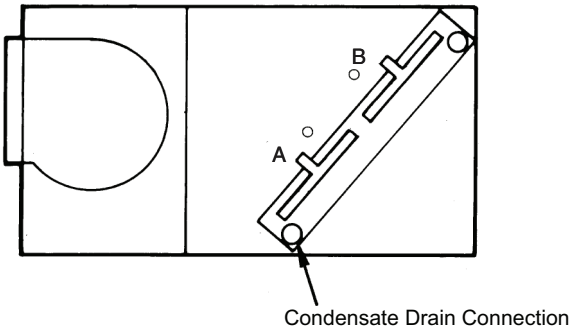
NOTE(S):

Component location arrangement shown for field installation of sight glasses, solenoid valves, filter driers, and TXV sensing bulbs. The TXVs and equalizer lines are factory-installed.

Fig. 9 — Face-Split Coil and Liquid Line Piping (Typical for Single Circuit Condensing Units)

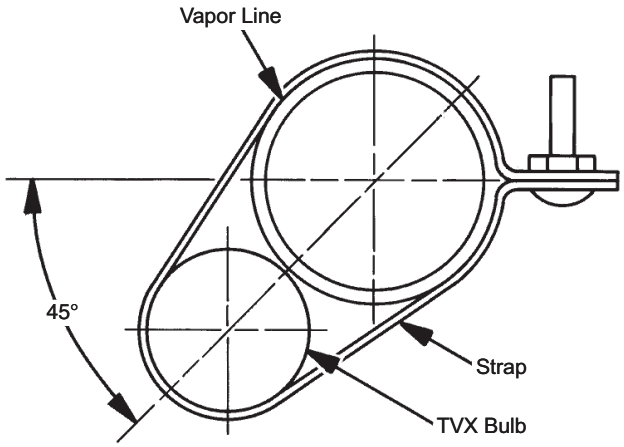


First On/Last Off = B
Vertical Installation



First On/Last Off = A
Horizontal Installation

Fig. 10 — Typical Evaporator Coil Connections (40RL)



LEGEND

TXV — Thermostatic Expansion Valve

NOTE: The 8 o'clock position is shown above.

Fig. 11 — TXV Sensing Bulb Location

Chilled Water Piping

See Tables 4 and 5 for chilled water connection sizes. For ease in brazing, it is recommended that all internal solder joints be made before unit is placed in final position.

Knockouts are provided in the unit corner posts for 40RLS refrigerant piping. Additional field-fabricated access holes are required for 40RLS chilled water piping. See Fig. 8, which lists recommended knockouts and access holes to use for each 40RLS unit size.

To size, design, and install chilled water piping, consult the Carrier System Design manual. See Fig. 12 for an example of a typical installation. Recommended fittings are listed in Table 11.

To access 40RLS coil vents and drains, remove the unit side panel over the coil header. Vent and drain plugs are on the top and bottom of header, respectively. See the Service section for information on preventing coil freeze-up during winter.

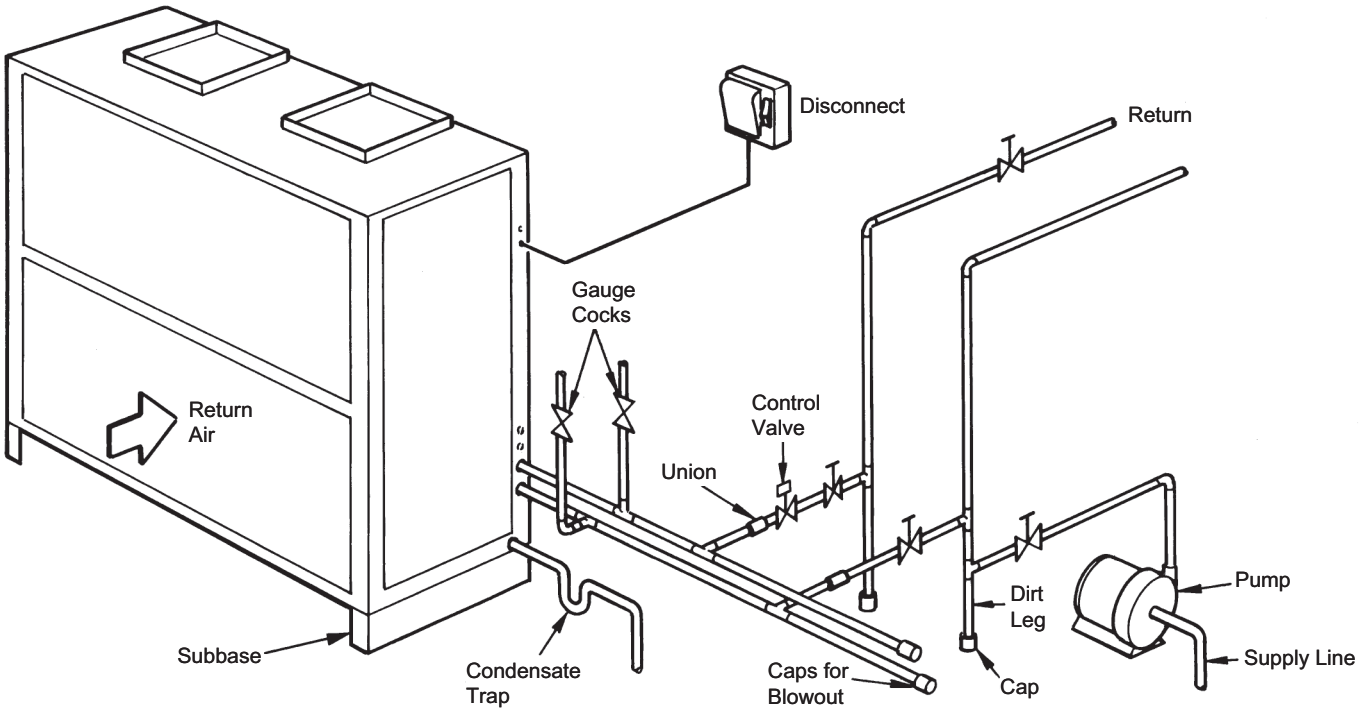


Fig. 12 — Typical 40RLS Chilled Water Piping

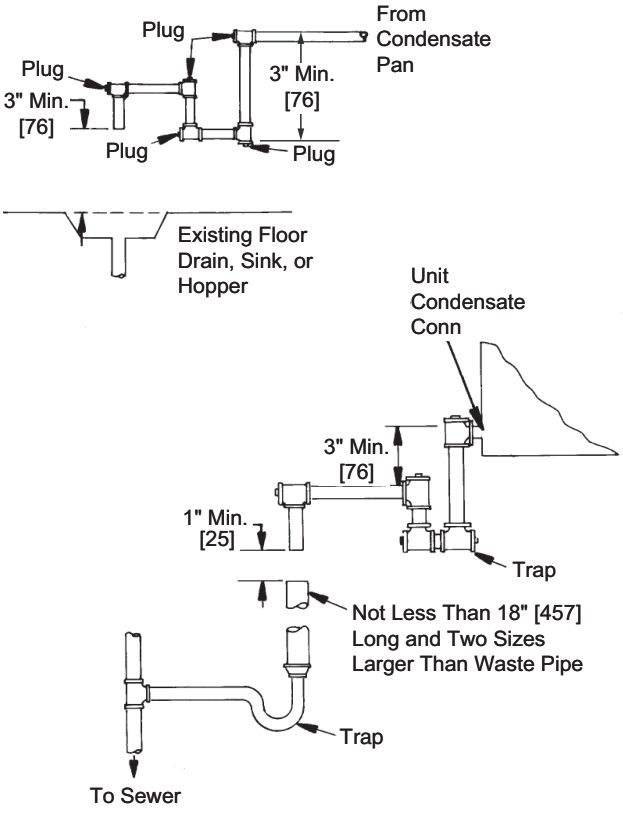
Condensate Drain

Install a trapped condensate drain line to unit connection as shown in Fig. 13. The unit drain connection is a PVC stub. (See Fig. 14.) Some areas may require an adapter to connect to either galvanized steel or copper pipe. For these applications, install a field-supplied threaded PVC adapter.

NOTE: A trap must be installed in the condensate drain line to ensure that the static pressure of fans is balanced with the water column in the drain line and that condensate can drain completely from pan. Without a trap, air can be drawn up drain line until water level in condensate pan becomes equal to static pressure created by fans, preventing complete drainage. Conditions will worsen as filters become dirty.

Install clean-out plugs in trap. Pitch drain line downward to an open floor drain or sump. Provide service clearance around drain line to permit removal of unit panels. Observe all local sanitary codes.

As shipped, the unit's condensate drain pan is NOT sloped towards the drain connection. The pan slope must be changed to pitch towards the side of the unit with the drain connection. (See Fig. 14.) Loosen the 2 screws next to the drain outlet at both ends of the unit, push drain pan down in the slots near the drain connection, and up in the slots on the opposite end. Re-tighten screws. The pan should have a pitch of at least 1/4 in. over its length toward the drain connection.



NOTE: Dimensions in [ ] are in millimeters

Fig. 13 — Condensate Drain

Fan Motors and Drives

Motor and drive packages are factory installed in all units. The motor and drive packages consist of the following items:

1 — fan motor

1 — adjustable motor pulley

1 — fan pulley

2 — matched fan belts

For instructions on changing drive speeds and adjusting drives, see "Pulley and Drive Adjustment" on page 40.

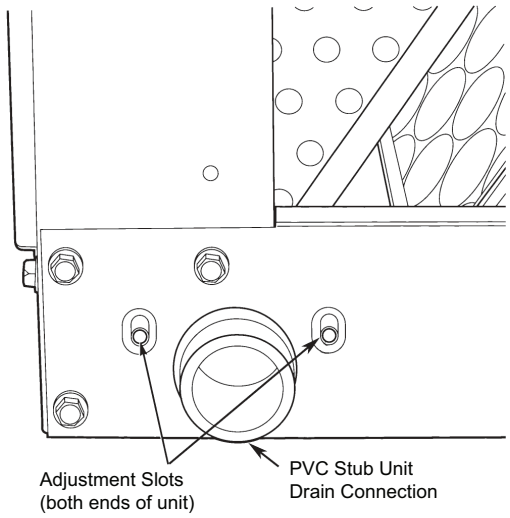


Fig. 14 — Drain Pan Slope Adjustment

Power Supply and Wiring

Check the unit data plate to ensure that available power supply matches electrical characteristics of the unit. Provide a disconnect switch with an integrated lock-out feature of size required to provide adequate fan motor starting current. See Table 12 for unit electrical data.

See Table 13 for recommended torque of the ground lug screw when using approved electrical wire for the electrical ground. Route the field power wiring in through the opening designated in Fig. 16.

⚠WARNING

Failure to follow this warning could result in personal injury or death.

Do not use gas piping as an electrical ground.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

⚠WARNING

FIRE HAZARD

Failure to follow this warning could result in personal injury, death, or property damage.

Do not connect aluminum wire between disconnect switch and fan coil unit. Use only copper wire. (See Fig. 15.)

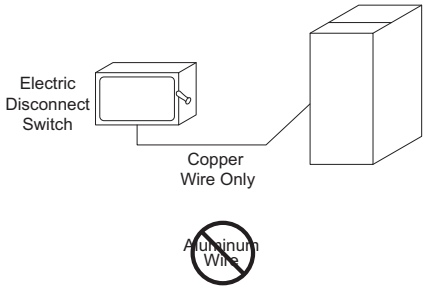


Fig. 15 — Disconnect Switch and Unit

Table 12 — Electrical Data — Two Speed Motors[a]

UNIT	VOLTAGE[b]	IFM TYPE	VOLTAGE LIMITS[c]		FAN MOTOR/*VFD*			POWER SUPPLY[d]	
			Min	Max	Hp	kW	FLA/*MOC*[e]	MCA	MOCP
40RLA/S*14	208/230	STD	187	253	2.9	2.16	*15.0*	19.0	30.0
		MED	187	253	2.9	2.16	*15.0*	19.0	30.0
		HIGH	187	253	3.7	2.76	*17.0*	22.0	35.0
	460	STD	414	506	2.9	2.16	*3.8*	5.0	15.0
		MED	414	506	2.9	2.16	*3.8*	5.0	15.0
		HIGH	414	506	3.7	2.76	*4.9*	7.0	15.0
	575	STD	518	632	3.7	2.76	*4.5*	6.0	15.0
		MED	518	632	3.7	2.76	*4.5*	6.0	15.0
		HIGH	518	632	5.0	3.73	*5.1*	7.0	15.0
40RLA/S/Q*16	208/230	STD	187	253	3.7	2.76	*17.0*	22.0	35.0
		MED	187	253	3.7	2.76	*17.0*	22.0	35.0
		HIGH	187	253	5.0	3.73	*25.0*	32.0	50.0
	460	STD	414	506	3.7	2.76	*4.9*	7.0	15.0
		MED	414	506	3.7	2.76	*4.9*	7.0	15.0
		HIGH	414	506	5.0	3.73	*9.1*	12.0	20.0
	575	STD	518	632	3.7	2.76	*4.5*	6.0	15.0
		MED	518	632	3.7	2.76	*4.5*	6.0	15.0
		HIGH	518	632	5.0	3.73	*5.1*	7.0	15.0
40RLA/S/Q*25	208/230	STD	187	253	5.0	3.73	*25.0*	32.0	50.0
		MED	187	253	5.0	3.73	*25.0*	32.0	50.0
		HIGH	187	253	7.5	5.60	*25.0*	32.0	50.0
	460	STD	414	506	5.0	3.73	*9.1*	12.0	20.0
		MED	414	506	5.0	3.73	*9.1*	12.0	20.0
		HIGH	414	506	7.5	5.60	*15.0*	19.0	30.0
	575	STD	518	632	5.0	3.73	*8.0*	10.0	15.0
		MED	518	632	5.0	3.73	*8.0*	10.0	15.0
		HIGH	518	632	7.5	5.60	*9.0*	12.0	20.0
40RLA/S*28	208/230	STD	187	253	7.5	5.60	*25.0*	32.0	50.0
		MED	187	253	10.0	7.46	*25.0*	32.0	50.0
		HIGH	187	253	10.0	7.46	*33.0*	42.0	70.0
	460	STD	414	506	7.5	5.60	*15.0*	19.0	30.0
		MED	414	506	10.0	7.46	*16.0*	20.0	35.0
		HIGH	414	506	10.0	7.46	*16.0*	20.0	35.0
	575	STD	518	632	7.5	5.60	*9.0*	12.0	20.0
		MED	518	632	10.0	7.46	*13.0*	17.0	25.0
		HIGH	518	632	10.0	7.46	*13.0*	17.0	25.0
40RLA/S*30	208/230	STD	187	253	10.0	7.46	*33.0*	42.0	70.0
		MED	187	253	10.0	7.46	*33.0*	42.0	70.0
		HIGH	187	253	10.0	7.46	*33.0*	42.0	70.0
	460	STD	414	506	10.0	7.46	*16.0*	20.0	35.0
		MED	414	506	10.0	7.46	*16.0*	20.0	35.0
		HIGH	414	506	10.0	7.46	*16.0*	20.0	35.0
	575	STD	518	632	10.0	7.46	*13.0*	17.0	25.0
		MED	518	632	10.0	7.46	*13.0*	17.0	25.0
		HIGH	518	632	10.0	7.46	*13.0*	17.0	25.0

NOTE(S):

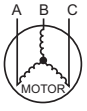
a. Installation with Accessory Electric Heaters: Size the Field Power Wiring between the heater TB1 and the 40RL indoor fan motor per NEC Article 430-28 (1) or (2) (depends on length of conduit between heater enclosure and 40RL power entry location). Install wires in field-installed conduit.
b. Unbalanced 3-Phase Supply Voltage: Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the formula in the example (see example below) to determine the percentage of voltage imbalance.
c. Motors are designed for satisfactory operation within 10% of normal voltage shown. Voltages should not exceed the limits shown in the Voltage Limits column.
d. Minimum circuit amps (MCA) and maximum overcurrent protection (MOCP) values are calculated in accordance with NEC Article 440.
e. Motor FLA and VFD MOC values are established in accordance with Underwriters Laboratories (UL). Standard 60335-2-40.

LEGEND

FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOC — Maximum Operating Current (For Variable Frequency Drives)
MOCP — Maximum Overcurrent Protection

$$\text{\% Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 230-3-60



AB = 224-v
BC = 231-v
AC = 226-v

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

Determine maximum deviation from average voltage.

(AB) 227-224 = 3-v

(BC) 231-227 = 4-v

(AC) 227-226 = 1-v

Maximum deviation is 4-v.

Determine percent of voltage imbalance.

$$\text{\% Voltage Imbalance} = 100x \frac{4}{227} = 1.76\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

Table 13 — Recommended Torque of Ground Lug Field Connection

AWG	TORQUE (in.-lb)
16	35±4
14	35±4
12	35±4
10	35±4
8	40±5
6	45±5.5
4	45±5.5
2	50±6
0	50±6
00	50±6

Install disconnect switch and power wiring in accordance with all applicable local codes. See Fig. 16-17 and the unit label diagram. For units with motor sizes less than 5 Hp (3.7 kW), connect power wiring to unit with no. 10 ring terminal. For units with motor sizes of 5 Hp (3.7 kW) or more, connect power wiring with 1/4 in. ring terminal.

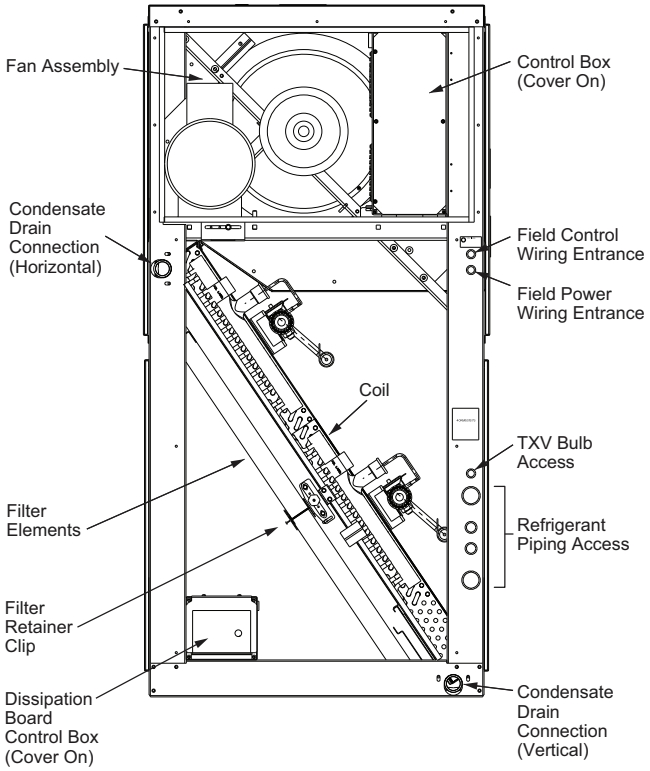


Fig. 16 — Wiring and Service Access (Side Panel Removed)

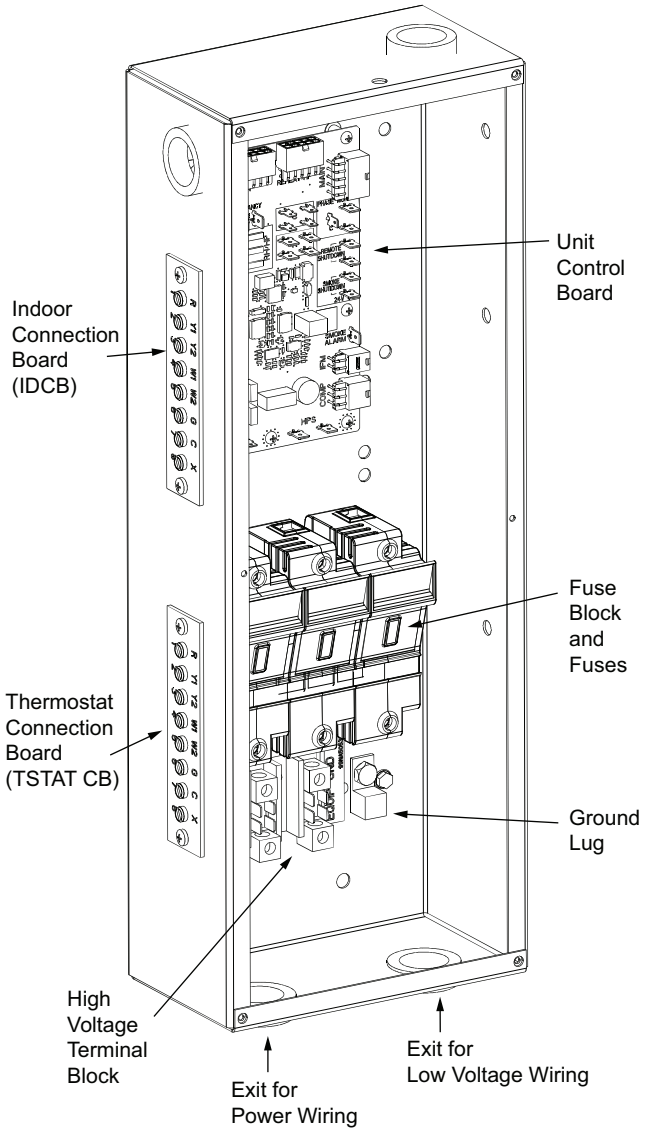
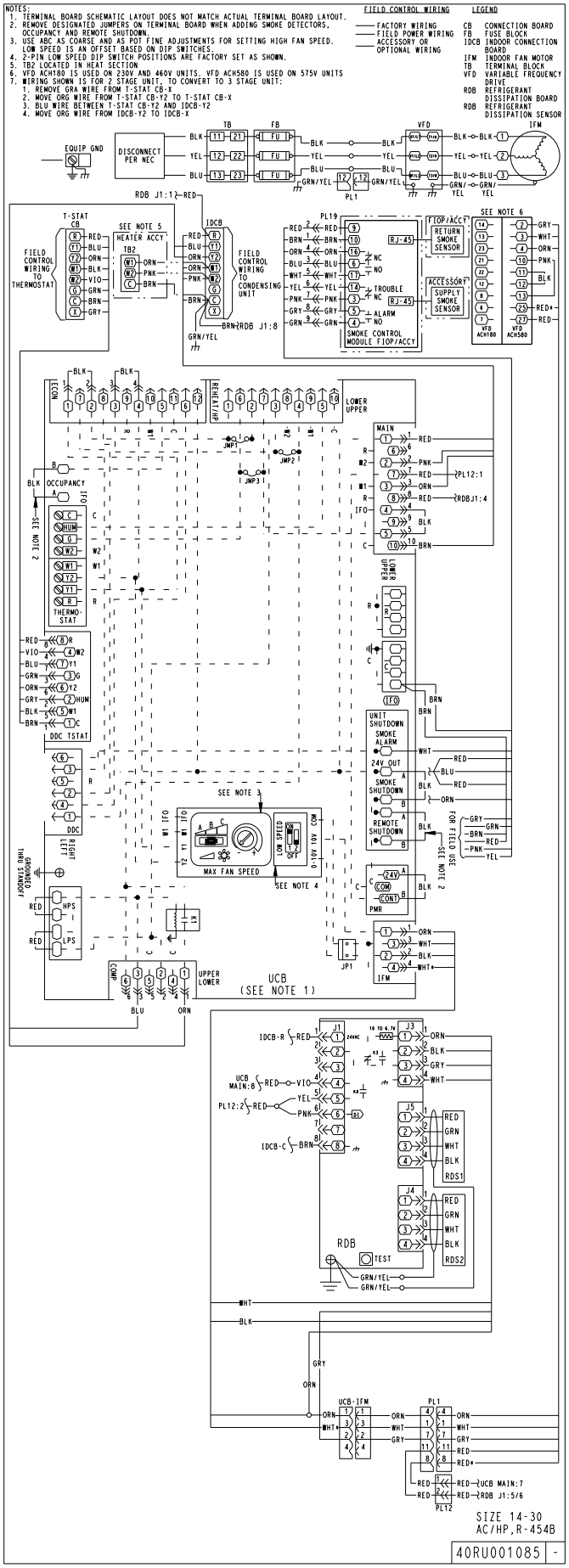


Fig. 17 — Control Box (Cover Removed) (Typical)

The 40RL size 14-30 units that have motors wired for 460 v, 3 ph, 60 Hz operation can be field-converted to 208/230-v, 3 ph, 60 Hz operation. Rewire the motor according to the diagram plate on the motor. After reconfiguring the motor, mark the motor specifying 208 v or 230 v operation replacing the 460 v sticker information on the units' corner post.

Fan motors are factory-installed on all units. The control box (see Fig. 17) contains a Unit Control Board (UCB) that receives thermostat commands from the thermostat (through the Thermostat Connection Board [TSTAT CB]) and outputs these commands to the condensing unit (through the Indoor Connection Board [IDCB]). The control box also contains a high voltage terminal block and fuses that provide overcurrent protection to the Variable Frequency Drive.

Complete 24-v control circuit wiring. Wire the thermostat to TSTAT CB terminal block (see Fig. 17), according to Fig. 18 and the unit label diagram. If the air handler is part of a split system, complete the wiring from the condensing unit to IDCB terminal block (see Fig. 17). Refer to Fig. 18 and the unit label diagram.



NOTE: On select units, the black and blue IFM wires are reversed.

Fig. 18 — Unit Wiring Diagram

THREE STAGE OPERATION

All units are factory shipped for 2-stage cooling operation. To convert a unit to 3-stage operation, see Fig. 19 adjust the following wires between the control board and two terminal strips on the side of the control box:

1. Remove gray wire from Thermostat CB terminal X.
2. Move orange wire from Thermostat CB terminal Y2 to terminal X.
3. Make connections of blue wire included in factory harness. Connect one end to Thermostat CB terminal Y2 and the other to Indoor Connection Board terminal Y2.
4. Move orange wire from Indoor Connection Board terminal Y2 to terminal X.

The 3-stage system will run the fan at low speed with a G, Y1, and Y1+Y2 call, and at high speed with a call for Y1, Y2, and Y3. A thermostat with 3 cooling stage capability is required for this system configuration.

FREEZE PROTECTION

On select models, there is a factory-installed and wired temperature switch (HH18HB016) to protect the compressor(s) in the condensing unit when frost buildup is present on the indoor coil. The temperature switch is used to prevent the compressor(s) from turning on while the indoor coil is frosted. Refer to the unit wiring label diagram for wiring of this switch.

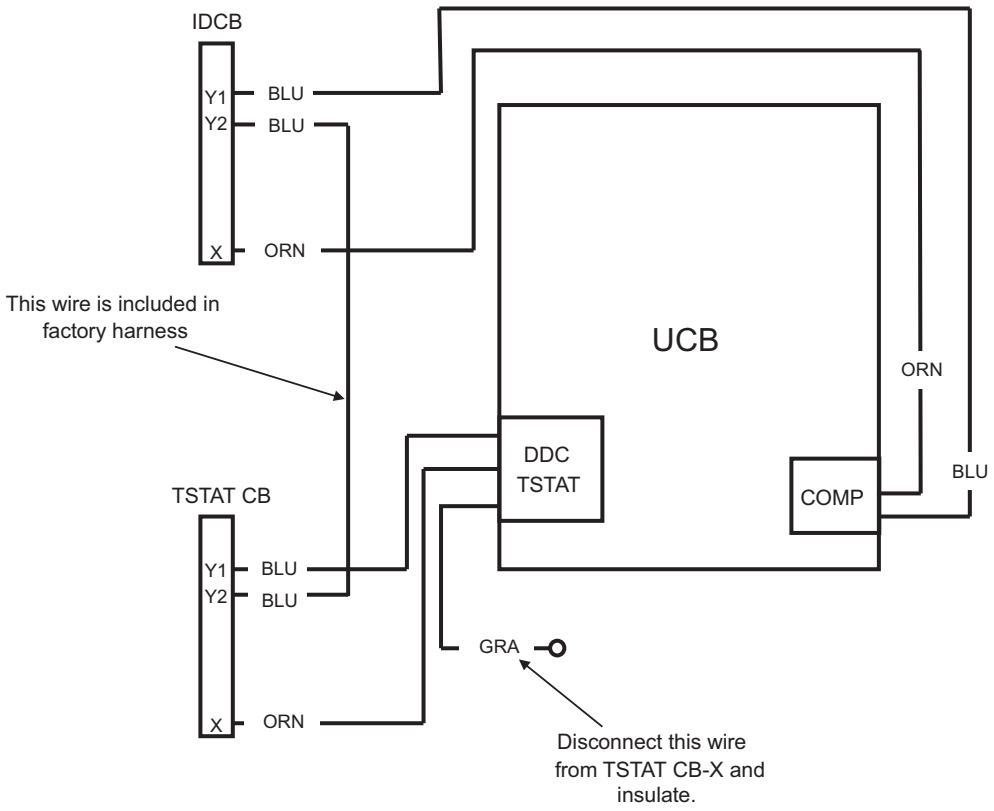


Fig. 19 — 3-Stage Cooling Diagram

Leak Dissipation System

40RL units use R-454B refrigerant. These units are equipped with a factory installed R-454B leak dissipation system to ensure safe operation in the event of a refrigerant leak. This system consists of two A2L sensors and the dissipation control board (see Fig. 20-21), which are located in the return (indoor entering) section of the unit. See Fig. 23 for a more detailed view of the dissipation control box.

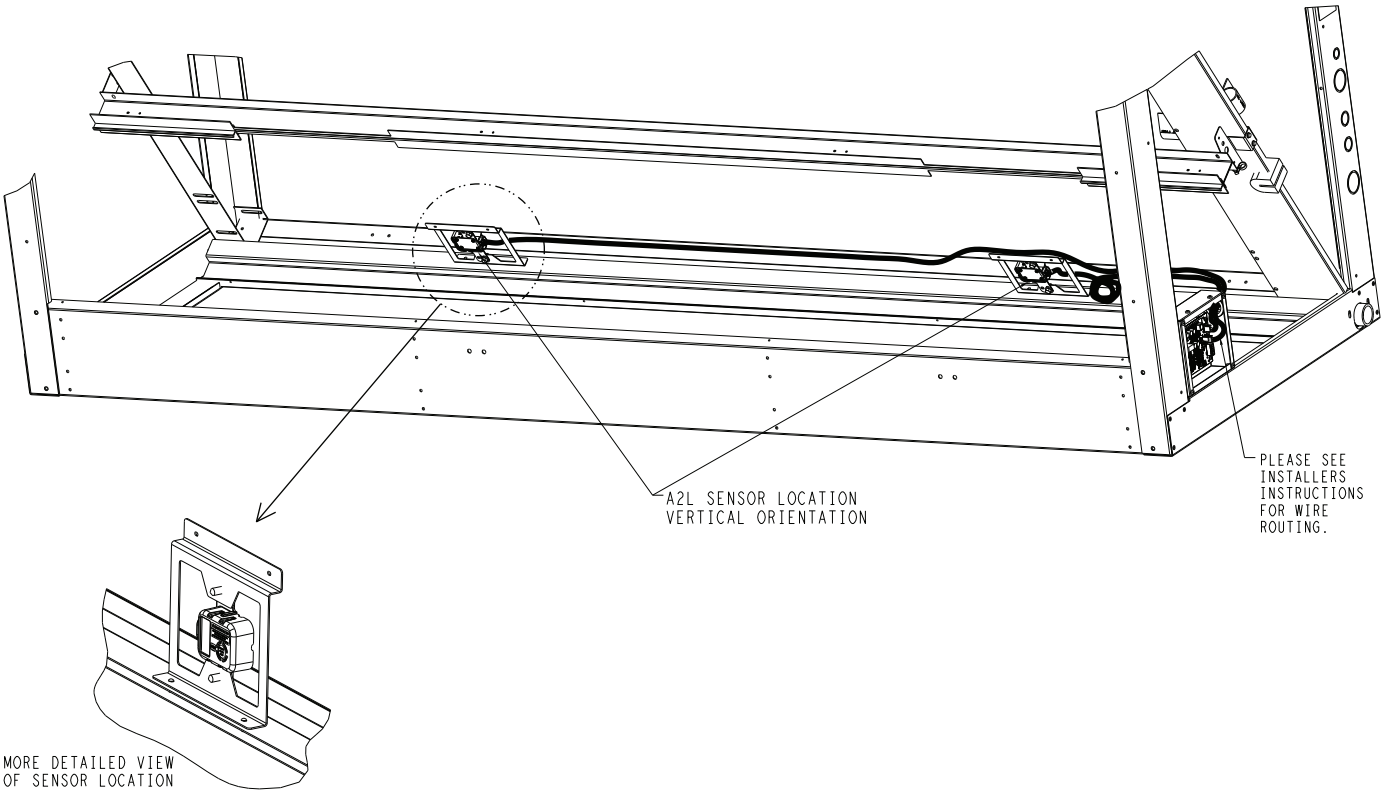


Fig. 20 — Location of A2L Sensors and Dissipation Control Board (Shown with Cover Removed) — Unit in Vertical Orientation

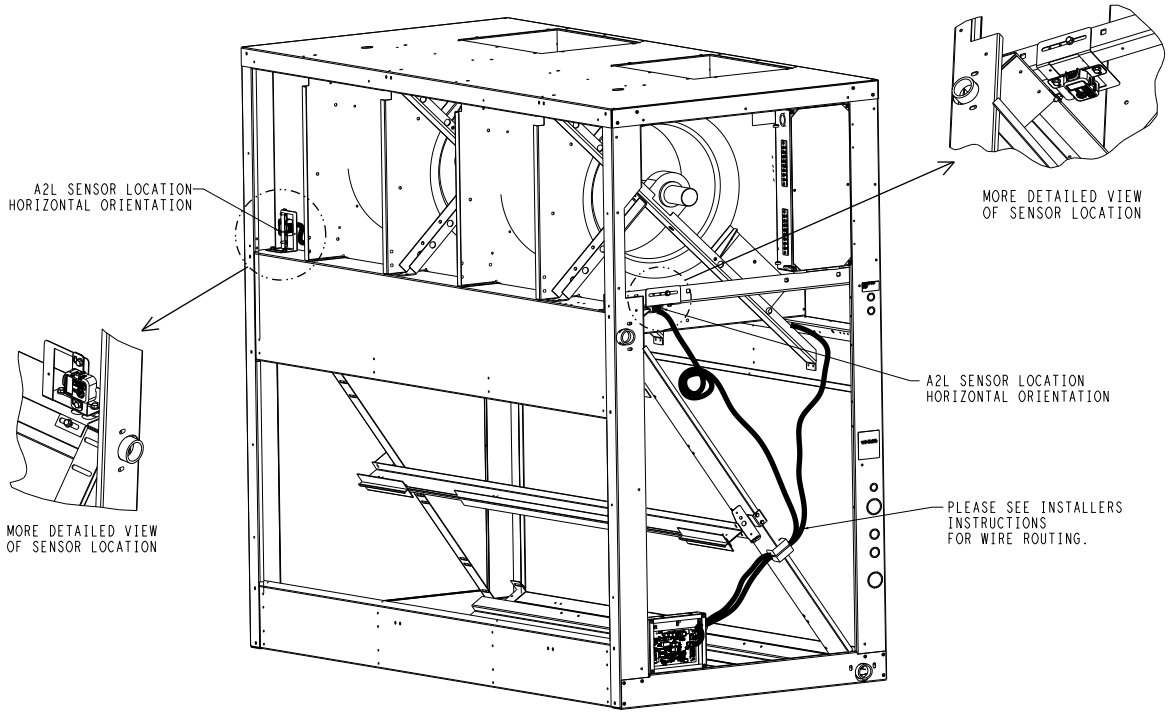


Fig. 21 — Location of A2L Sensors and Dissipation Control Board (Shown with Cover Removed) — Unit in Horizontal Orientation

The A2L detection sensors communicate via wiring harnesses to the dissipation board. Each sensor harness is factory-connected to the dissipation board and will additionally need to be field-connected to the sensors when they are installed in the correct locations. The harnesses should be routed from the dissipation control board through the wire access hole in the sheet metal box. Use wire ties to route the harnesses according to Fig. 20 and 21. Extra length of harness should be neatly bundled and wire tied.

IMPORTANT: The sensors are shipped in a box secured to the rail that supports the motor and must be field-relocated depending on the orientation of the unit. See Fig. 20 for the locations the sensors need to be installed at when the unit is installed in a vertical orientation, and Fig. 21 for the locations the sensors need to be installed at when the unit is installed in a horizontal orientation. The correct location of the sensors is critical for the unit to sense leaked refrigerant properly.

The drain wire must be properly connected to the ground lug on the dissipation board via the quick connect and ground harness. Failure of proper sensor harness grounding can lead to false dissipation events.

NOTE: Chilled water units do not come with the leak dissipation system.

SEQUENCE OF OPERATION

The control functions as an R-454B refrigerant dissipation system. If either of the refrigerant detection sensors sends a signal indicating a refrigerant leak, the control board will prevent heating and cooling operation and begin dissipating the sensed refrigerant with a blower request. The refrigerant dissipation board will display a flash code from the yellow status LED (see Fig. 22) indicating the sensor that detected the refrigerant. See Fig. 25 on page 30 for the full text on the Dissipation Control dust cover label.

When the sensor signal indicates the refrigerant has dissipated, the dissipation board yellow status LED will display a flash code 3 and return to its normal state and allow unit operations after a 5 minute delay.

LEAK DISSIPATION SYSTEM SELF-TEST

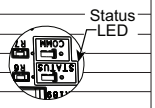
Power on the unit and verify proper functioning of equipment. The yellow Status LED on the dissipation board should be steady (see Fig. 22). If flash codes are present, see Troubleshooting (Table 17 on page 31).

NOTE: Operation of the Test Mode is only possible if no faults exist on the dissipation board.

Remove the cover from the Dissipation control box to access the Test button (see Fig. 24). The Test button is located above the COMM LED.

STATUS CODE DESCRIPTION FOR CONTROL BOARD

STATUS LED (YELLOW)	ERROR MODE
ON	NORMAL OPERATION
OFF	HARDWARE FAILURE
1 Flash	SENSOR 1 R454B leak
2 Flash	SENSOR 1 OPEN
3 Flash	5 MINUTE MITIGATION OFF DELAY
4 Flash	BLOWER OUTPUT NOT OPERATING
5 Flash	SENSOR 1 FAULT
6 Flash	TEST BUTTON STUCK
7 Flash	K1 OR K4 RELAY WIRING INVERTED
8 Flash	K1 OR K4 RELAY WIRING SHORTED
9 Flash	SENSOR 2 R454B LEAK
10 Flash	SENSOR 2 OPEN (Sensor config jumper)
11 Flash	SENSOR 2 FAULT
12 Flash	INCORRECT TEMP SENSOR
13 Flash	FIRE/SMOKE OVERRIDE



Test Button Operation Notes:
1. Test mode (60 second mitigation test) = Press test button for 1 second
2. Alarm code history (last 7 codes from 1 week history) = Press test button for 10 seconds
3. Clear alarm history = Press test button 3 times consecutively

48TC006475 REV A

Fig. 22 — Yellow STATUS LED

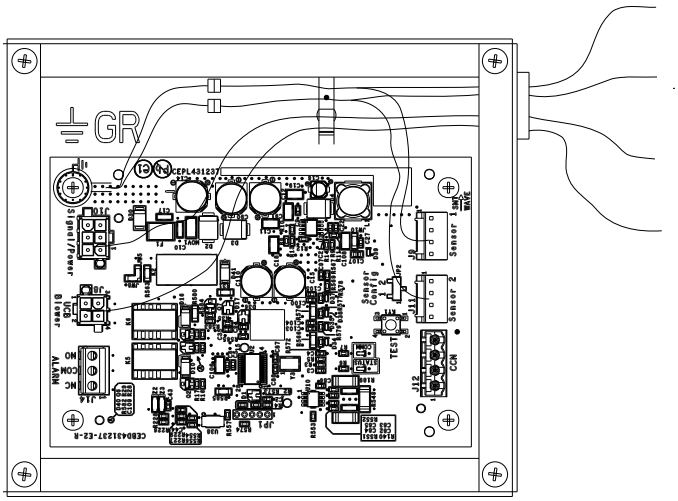
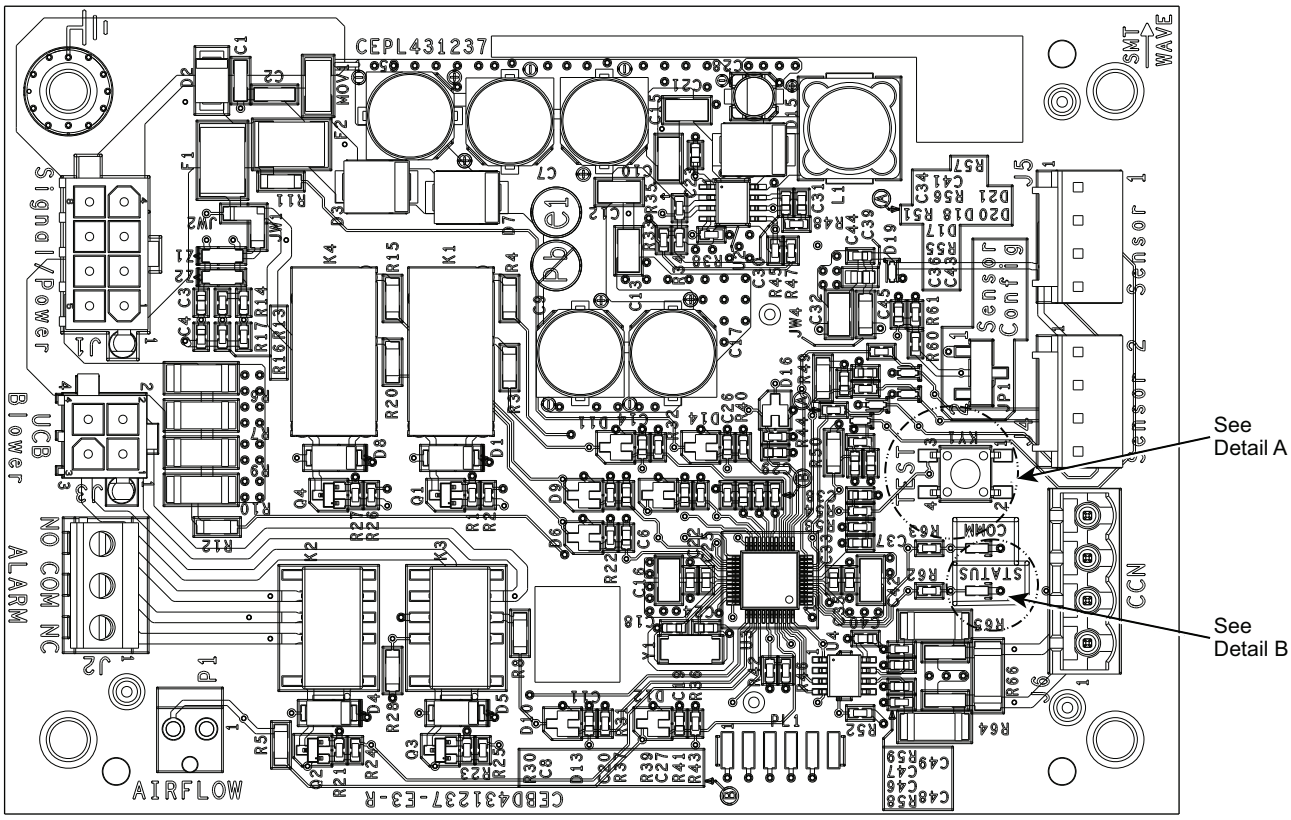
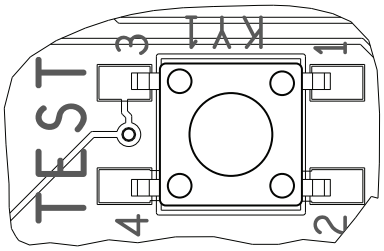
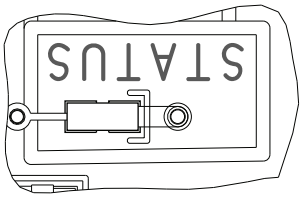


Fig. 23 — Dissipation Control Box





Detail A — Test Button



Detail B — Status LED

Fig. 24 — Dissipation Control Board — Shown without Dust Cover

Press the Test button on the dissipation system control board to ensure proper dissipation system operation under each test condition listed below. After pressing the Test button, system will enter Dissipation Mode for 60 seconds to help verify correct operation.

IMPORTANT: Press the Test button for roughly ONE SECOND to enter Test Mode. Pressing the Test button for a longer periods enables different functions (see Table 14).

Table 14 — Dissipation Board Test Button Functions

HOLD BUTTON TIME (SEC)	FUNCTION
1-4	Dissipation Mode for 60 seconds
5-29	Display flash code history
30+	Flash code 6
3 Rapid Presses	Clear flash code history

Ensure that the unit is able to meet the minimum required dissipation mode airflows. These required minimum airflow rates during Dissipation Mode are listed in Table 15. They are based on the total system refrigerant charge quantity. Table 15 also shows the minimum required total conditioned room area. Both minimum required airflow and room area are based on the max possible charge in the system.

Table 15 — Minimum Dissipation Airflow and Minimum Required Area of Total Conditioned Space Based on Max System Charge

UNIT	MAX ALLOWABLE CHARGE (lb)	AIRFLOW (cfm)	ROOM AREA (ft^2)
38AXZM/N14-40RLA*14	52.9	1,430	795
38AXDT/U14-40RLA*14	66.1	1,790	990
38AXZM/N16-40RLA*16	94.6	2,560	1,420
38AXDT/U16-40RLA*16	82.3	2,230	1,235
38AXQT/U16-40RLQ*16	59.3	1,610	890
38AXZM/N25-40RLA*25	97.1	2,630	1,460
38AXDT/U25-40RLA*25	156.2	4,230	2,345
38AXQT/U25-40RLQ*25	65.2	1,770	980
38AXDT/U28-40RLA*28	163.6	4,430	2,455

Table 16 details the required operational checks to ensure proper dissipation system function.

Table 16 — Dissipation System Required Operational Checks

NORMAL OPERATION				
TEST NO.	UNIT DEMAND	COMPRESSOR	INDOOR FAN	ELECTRIC HEAT
1	None	Off	Off	Off
2	Cool	On	On	Off
3	Heat	On for 40RLQ	On	On
DISSIPATION ACTIVATED				
4	None	Off	On	Off
5	Cool	Off	On	Off
6	Heat	Off	On	Off

Fig. 25 shows the flash codes displayed on the Dissipation control board.

TROUBLESHOOTING

For all flash codes, first try power cycling the system to remove the code.

No Power

Verify the wiring to/from pins 1 and 8 on the power harness plug. Check the 24V system wiring the IDCB terminal in the main control box.

See Table 17 for details on the operating status and troubleshooting of the Dissipation system for the various flash codes.

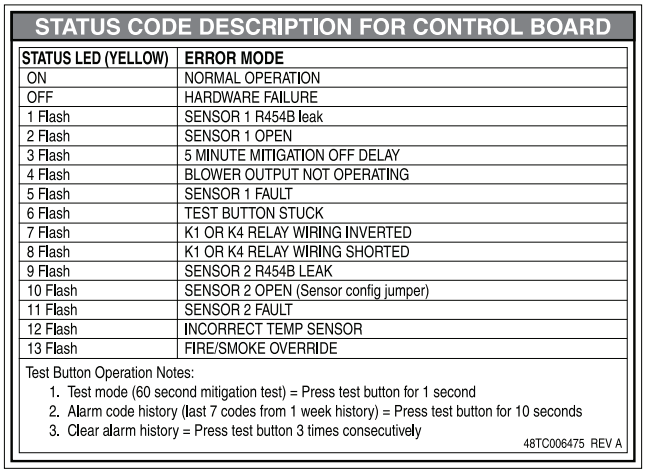


Fig. 25 — Dissipation Control Cover Label

Table 17 — Status LED Troubleshooting Table

STATUS LED	REASON	CONTROL VERBIAGE	MODE
1 Flash	Sensor 1 ≥ 20% LFL	REFRIG DISSIPATION ACTIVE	Dissipation in Process
2 Flash	Sensor 1 Open	REFRIG SENSOR OPEN	Dissipation in Process
3 Flash	5 Minute Blower Operating, Sensor < 20% LFL and sensors are not opened (done after fault 1, 2, 9 and 10)	DISSIPATION OFF DELAY ACTIVE	Dissipation in Process
4 Flash	0 VAC sensed on G output.	BLOWER OUTPUT NOT OPERATING	Dissipation in Process
5 Flash	Fault with the A2L digital sensor	REFRIG SENSOR FAULT	Dissipation in Process
6 Flash	If KY1 is stuck pressed for more than 30 seconds.	TEST BUTTON STUCK	To prevent a shorted KY1 to keep the dissipation running continuously.
7 Flash	Y out switched with Y in or W out switched with W in	Y (K4) OR W (K1) WIRING INVERTED	Normal mode
8 Flash	Y or W shorted (relay detects both sides are high)	Y (K4) OR W (K1) OUTPUT SHORTED TO Y (K4) OR W (K1) INPUT	Normal mode
9 Flash	Sensor 2 ≥ 20% LFL	SENSOR 2 DISSIPATION ACTIVE	Dissipation in Process
10 Flash	Sensor 2 Open	SENSOR 2 OPEN	Dissipation in Process
11 Flash	Fault with the second A2L digital sensor	SENSOR 2 FAULT	Dissipation in Process
12 Flash	High temperature sensor attached on commercial	OVERCURRENT INCORRECT SENSOR	Normal mode
13 Flash	G input signal is lost. Indicates another unit safety will override dissipation.	EXT SAFETY OVERRIDE	Normal mode

LEGEND

LFL — Lower Flammable Limit

Variable Frequency Drive

The unit is equipped with a Variable Frequency Drive (VFD) to control the indoor fan in sequence with the unit's ventilation, cooling, and heating operation. The VFD is controlled through a 0-10 vdc signal that is provided by the Unit Control Board (UCB) in the control box. Per ASHRAE 90.1-2016 and IECC-2015 standards, during the first stage of cooling operation, the VFD will adjust the fan motor to provide 66% of the design airflow rate for the unit. When the call for the second stage of cooling is required, the VFD will allow the design airflow rate for the unit established (100%). During heating mode, the VFD will allow total design airflow rate (100%) operation. During ventilation mode, the VFD will operate the fan motor at 66% of full speed.

The ABB ACH180 model (see Fig. 26) are used on 208/230-v and 460-v units, while the ABB ACH580 (see Fig. 27) model is used on 575-v units. See Fig. 28-32 for location of the VFD.

Fig. 26 — ACH180 Variable Frequency Drive (VFD)

Fig. 27 — ACH580 Variable Frequency Drive (VFD)

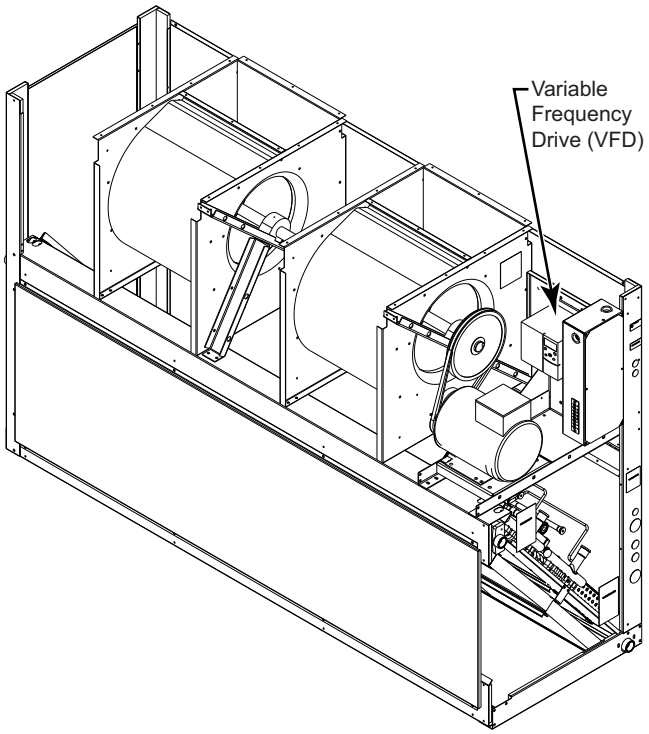


Fig. 28 — ACH180 VFD Location — 40RLA/S 14-16, 40RLQ 16 (208/230-v and 460-v only)

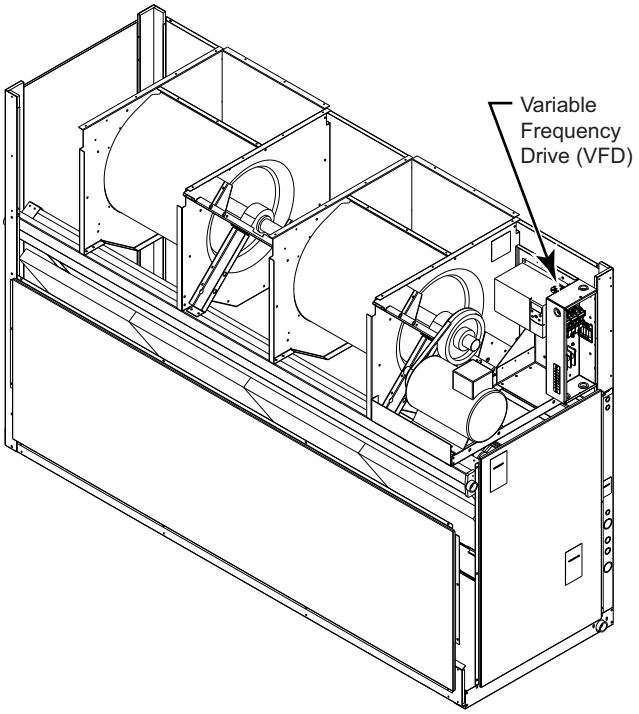


Fig. 30 — ACH180 VFD Location — 40RLA/S 28-30 (208/230-v and 460-v only)

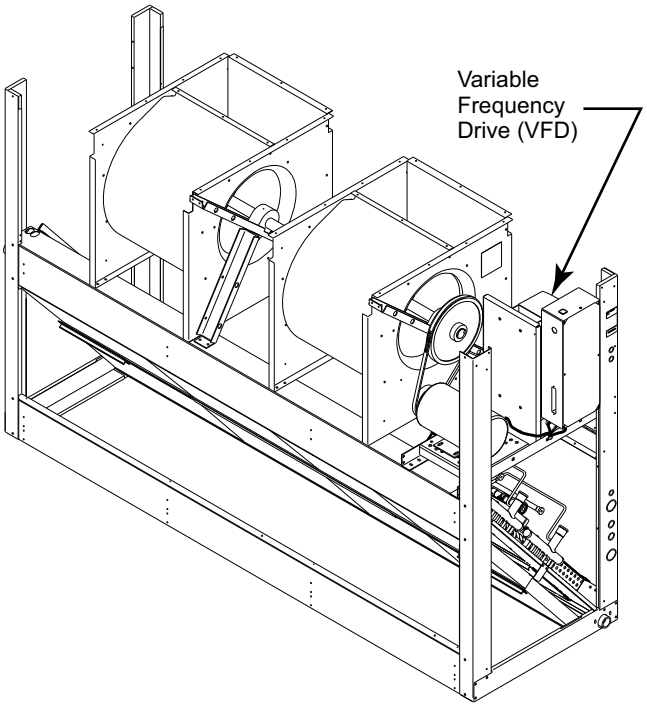


Fig. 29 — ACH580 VFD Location — 40RLA/S 14-16, 40RLQ 16 (575-v only)

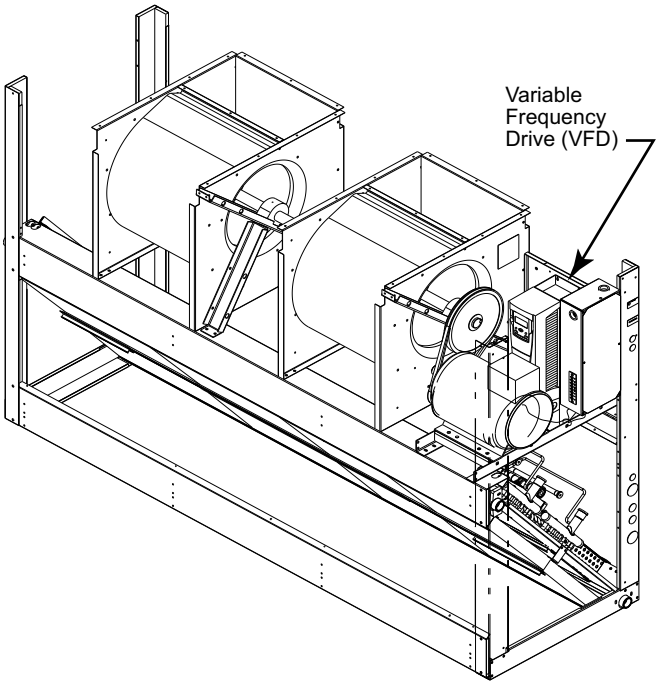


Fig. 31 — ACH580 VFD Location — 40RLA/S 25, 40RLQ 25 (575-v only)

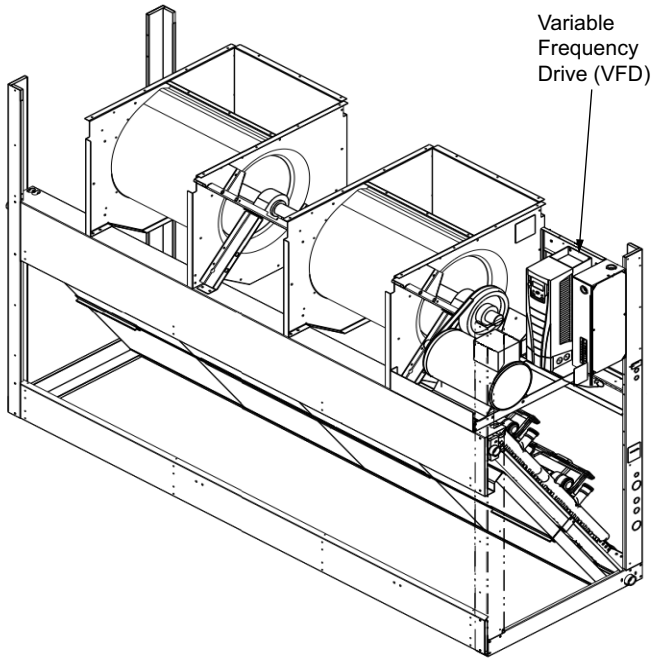


Fig. 32 — ACH580 VFD Location — 40RLA/S 28-30 (575-v only)

Connecting Ductwork

Refer to the Carrier System Design Manual for the recommended design and layout of ductwork. Fig. 33 shows recommended duct connection to units with 2 fans.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution could cause equipment damage.

Do not operate unit without ductwork or discharge plenum unless fan speed has been adjusted for external static pressure of 0 in. wg. Failure to do so may result in motor overload.

DISCHARGE CONNECTIONS

Duct flanges are factory-supplied; they are shipped inside the unit attached to the hairpin end of the coil tube sheet for field installation. Using the existing screws, install the duct flanges on the unit's fan deck. Each fan discharge requires 2 flanges; each flange must be bent in the middle to conform to the discharge opening. See Fig. 34. After flanges are installed, connect them to the supply duct using a canvas connection to prevent vibration. It is important that this connection be properly fabricated to prevent high air friction losses and air noise.

RETURN CONNECTIONS

When using return-air ductwork, route return-air duct to the unit's return air inlet near the filter rack, using a canvas connection to prevent transmission of unit vibration. If the duct blocks off the unit's access panel, provide a slip joint in the ductwork to permit removal for servicing.

OUTDOOR-AIR INLET CONNECTIONS

Connect outdoor-air inlet to field-installed accessory economizer. Refer to Economizer Installation Instructions.

Return-Air Filters

Type and size of filters are shown in Tables 1-5 and are factory-supplied and factory-installed. In all units with 2 fans, a filter replacement tool (hook) is shipped inside the unit for field use when replacing filters. See the Service section for instructions on filter element replacement.

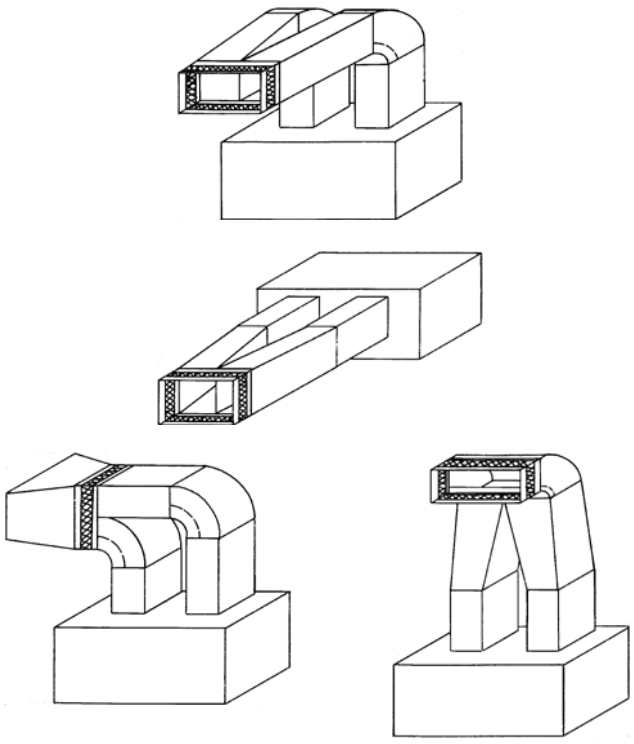


Fig. 33 — Typical Fan Discharge Connections for Multiple Fan Units

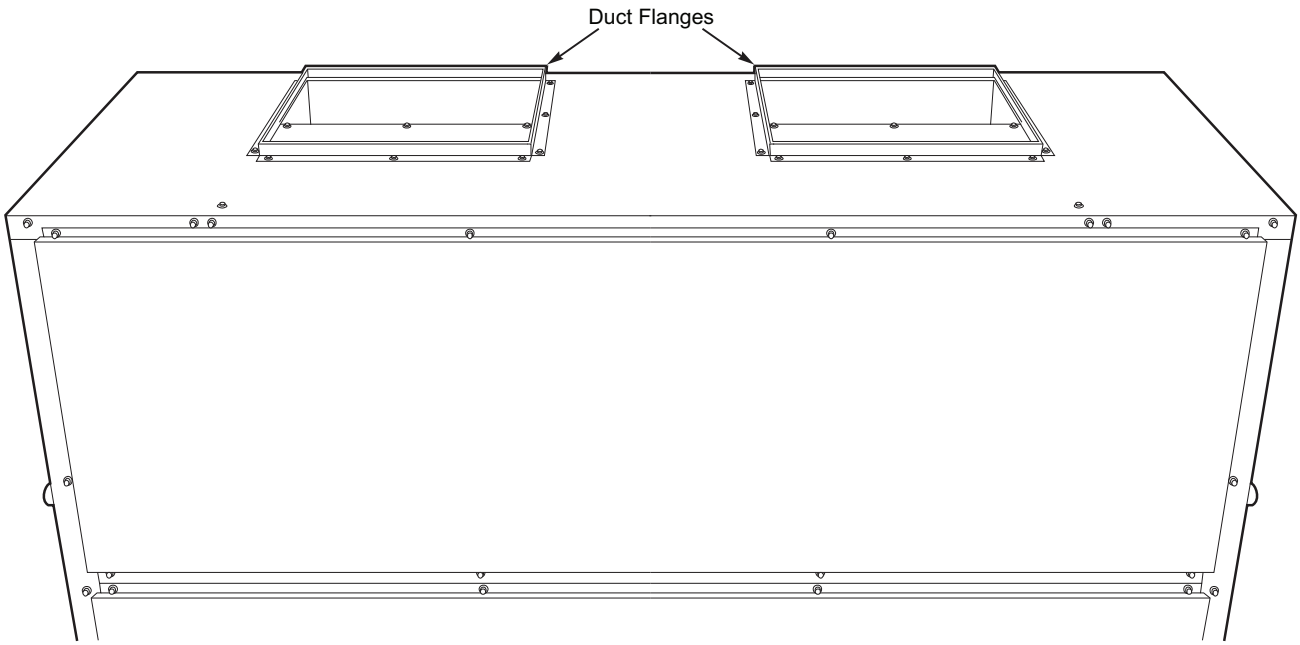


Fig. 34 — Duct Flange Installation

START-UP

Before starting unit, check the following and correct as necessary:

- Is unit solidly supported?
- Is fan adjusted for speed and pulley alignment?
- Are pulleys, motor, and bearings securely mounted?
- Are there any loose parts that will rattle or vibrate?
- Is condensate drain pan pitched for correct drainage?
- Are coil baffle plates tight against coil to prevent air bypass?
- Are all panels securely fastened?
- Are all electrical connections correct and tight?
- Are there any loose or disconnected wires at the VFD or in the control box, or wires in contact with sharp edges or moving parts (pulley, belt)?
- Have all safety, caution, and warning labels been read?

Pre-Start Check for VFD:

1. Remove the side access panel to reach the VFD. This is the same access panel to open the control box.

   NOTE: see Fig. 28-32 for VFD location in the units covered by this document.
2. Read all safety, caution, and warning labels.
3. Inspect wiring at the VFD for loose or disconnected wires at the terminal strip and for wires in contact with sharp edges and moving parts (pulley, belt).

40RLA and 40RLQ ONLY

- Is TXV bulb located on suction tube per Fig. 35?
- Is the capillary tube to the bulb free of kinks and not subject to pinching?
- Is the bulb well secured to the suction tube with strap?

Also refer to condensing unit or outdoor heat pump section instructions before starting a split system. A split system start-up checklist is provided at the end of these instructions.

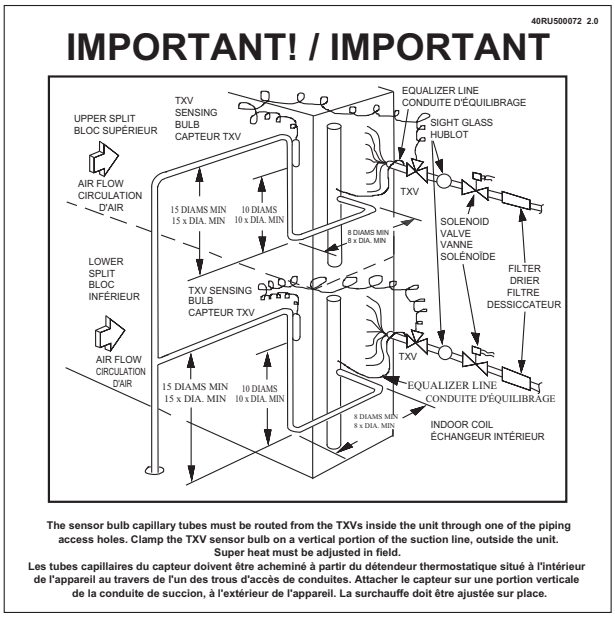


Fig. 35 — TXV Bulb Location Label

Adjusting TXV for Superheat (40RLA and 40RLQ only)

The unit-mounted thermostatic expansion valve(s) is/are factory set to provided superheat at the bulb location in 10°F to 15°F (5.5 to 8.3°C) range. Actual system load conditions may require adjustment of the factory setting. See Fig. 36.

To adjust the TXV superheat setting:

1. Remove the seal cap from the bottom of the TXV body.
2. To increase superheat, turn the stem clockwise. To decrease the superheat, turn the stem counterclockwise. Do not turn the stem more than one full turn.
3. Wait until suction pressure and superheat stabilize. This may take more than 30 minutes.
4. Continue adjustment until superheat reaches 10 to 15°F (5.5 to 8.3°C).
5. Replace the seal cap; tighten.

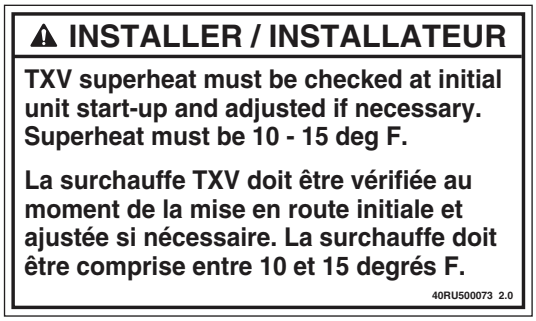


Fig. 36 — TXV Adjustment Label

Compressor Rotation

Follow instructions in Condensing Unit installation instructions. For units equipped with a VFD on the indoor fan motor cannot use rotation direction of the indoor fan motor and fan to visually confirm a correct phase connection to the unit and compressors. Correct phases to equipment for proper compressor rotation. The VFD will maintain the same rotation as input phases are changed. Pressure gages MUST BE USED during cooling system start-up to confirm correct compressor rotation and operation.

Indoor Fan Motor

Raise the cooling set point at the space thermostat to higher than the space temperature. Switch the thermostat's FAN switch to the CONT (Continuous) position. The fan motor will start and run at reduced speed.

Check fan motor speed. Motor shaft should be rotating at 1,150 to 1,180 rpm (19.2 to 19.7 rps).

Switch the thermostat's FAN switch to AUTO position. Fan motor will stop.

Cooling with Staged Air Volume (SAV™)

FIRST STAGE (Y1)

Set the thermostat FAN switch to AUTO and the SYSTEM switch to COOL. Slowly lower the cooling set point until first stage compressor starts. Indoor fan motor also starts and runs at reduced speed.

SECOND STAGE (Y2)

Lower the cooling set point until the second stage compressor starts. The indoor fan speed is dependent on the number of cooling stages:

- 2-Stage Systems: The indoor fan motor will switch to high speed.
- 3-Stage Systems: The indoor fan motor will remain at low speed.

THIRD STAGE (Y3) — 3-STAGE SYSTEMS ONLY

Lower the cooling set point until the third stage compressor starts. The indoor fan motor will switch to high speed.

Check the fan motor speed. Motor shaft should be rotating at 1,725 to 1,760 rpm (28.8 to 29.3 rps).

Confirm compressors are running at correct rotation by checking suction and discharge pressures. To reverse the compressor rotation, disconnect unit power and switch two of the unit's main power leads. Restore unit power and recheck compressor operation.

Reset thermostat cooling set point to a position above the space temperature.

Both compressors will shut off. Indoor fan motor will stop immediately.

Operating Fan for Test and Balance (Alternate)

During the Test and Balance procedure, it is necessary to operate the supply fan in High Speed without concurrent operation of the Cooling or Heating systems. Use the following procedure to force the fan speed to High.

1. Set the space thermostat to SYSTEM OFF and FAN in AUTO.
2. Disconnect unit power. Lock-out/tag out.
3. Open the fan access panel and remove the cover of control box.
4. Adjust the Low Speed 2-Pin DIP switches on the Unit Control Board. Set both switches to "OFF." This will allow the motor to run at full speed in ventilation only.
5. Locate pressure ports or pitot tubes in the return duct and supply duct to measure external static pressure.
6. Replace control box cover.
7. Restore unit power.
8. Set the space thermostat to FAN CONT.
9. Check the motor speed with stroboscope or similar tool. Motor shaft speed must be in 1,725 to 1,760 rpm (28.8 to 29.3 rps) range for High Speed.
10. Replace the fan access panel.
11. Perform test and balance procedure.
12. Adjust the supply fan speed according to the Pulley and Drive Adjustment section to deliver the project selection cfm value. Ensure the selection cfm value is not lower that the "Min cfm Per Fan Motor Type" for this unit-size as found in Table 18. See Fan Speed Set Up for alternate method of adjusting supply fan speed through the Unit Control Board.

To restore the unit to ready-to-start condition, disconnect the unit power and lock-out/tag-out, set the space thermostat to FAN AUTO, remove the test pressure ports from the external duct locations, and re-set Low Speed 2-Pin DIP switches to factory setting (refer to wiring diagram on control box cover). Replace the supply fan access panel. Restore unit power.

Table 18 — 40RL Min cfm Per Fan Motor Type

UNIT	2-SPEED FAN MOTOR (AT HIGH SPEED)	2-SPEED FAN MOTOR (AT LOW SPEED)
40RLA/S*14	4,056	2,704
40RLA/S/Q*16	4,500	3,000
40RLA/S/Q*25	7,500	5,000
40RLA/S*28	8,450	5,633
40RLA/S*30	10,140	6,760

Fan Speed Set Up

These units contain a variable frequency drive (VFD) fan assembly. The fan operates from a 0-10 vdc signal.

NOTE: The indoor fan motors are equipped with protection relays designed to disable unit operation when a problem is detected. See Typical Wiring Diagram (see Fig. 18) for the red wires in the Indoor fan control.

Fan motor is wired to connect the motor protection relays in series.

UNITS WITH ELECTROMECHANICAL CONTROLS

The fan speed set up controls are located on the lower section of the Unit Control Board (UCB). (See Fig. 37.)

The Unit Control Board (UCB) voltage is set for 10 vdc from the factory to allow for full speed with belt/pulley adjustments.

The following procedure will allow for fan speed reduction if desired.

1. Check the job specifications for the cfm (cubic feet per minute) and ESP (external static pressure) required.
2. Connect a multimeter to the vdc terminals on the UCB.
3. Set the Range Switch to either A, B, or C per the Switch Range table. A is the lowest speed range, B is the middle speed range and C is the highest speed range.
4. Using a straight blade screwdriver, turn the vdc control dial to fine tune the vdc reading until the unit matches the required airflow setting.
5. Record the reading in the Field Setting field.

NOTE: Fan Set Up vdc is not affected by the operating stage of the unit.

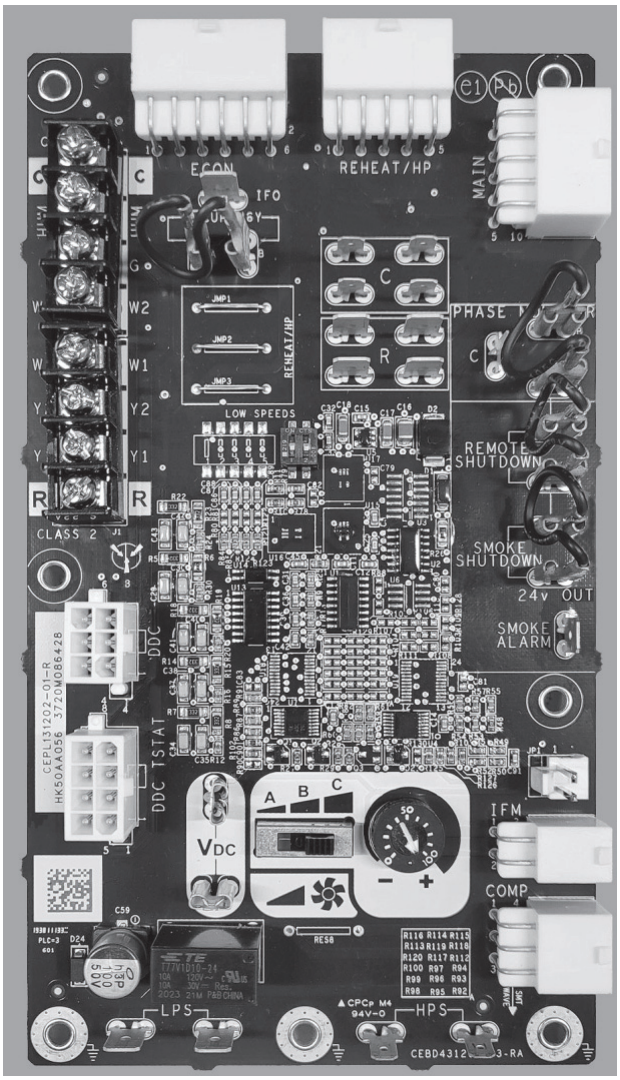


Fig. 37 — Unit Control Board

MAINTENANCE

These items should be part of a routine maintenance program, to be checked every month or two, until a specific schedule for each can be identified for this installation:

Quarterly Inspection (and 30 days after initial start)

INDOOR SECTION

- condenser coil cleanliness checked
- return air filter replacement
- outdoor hood inlet filters cleaned
- fan shaft bearing locking collar tightness checked
- condensate drain checked

Heating

- power wire connections
- fuses ready
- manual-reset limit switch is closed

See Tables 19 and 20 for unit specific maintenance checklists.

Seasonal Maintenance

These items should be checked at the beginning of each season (or more often if local conditions and usage patterns dictate):

AIR-CONDITIONING

- condenser fan motor mounting bolts tightness
- compressor mounting bolts
- condenser fan blade positioning
- control box cleanliness and wiring condition
- wire terminal tightness
- refrigerant charge level
- evaporator coil cleaning
- evaporator blower motor amperage

Table 19 — Outdoor Unit Maintenance Checklist

MAINTENANCE CHECKLIST[a]	RECOMMENDED INTERVAL[b]	
Outdoor unit specific:	**Monthly**	**Annual**
Clear away debris and vegetation near unit.	X	
Inspect cabinet for damage. Replace components that are damaged or severely rusted.		X
Inspect electrical disconnect for proper function. Repair or replace as necessary.		X
Inspect electrical wiring and connections. Tighten loose connections. Inspect and perform functional test of equipment as needed to ensure proper function. Repair or replace damaged or overheated components and wiring.		X
Check refrigerant system subcooling and superheat.		X
Inspect inside of unit. Clean if debris is present.		X
Inspect condenser coil. Clean if dust, dirt, or debris is present. Rinse unit with fresh water.[c]		X[d]
Inspect motor and fan for damage. Make sure fans spin freely.		X

NOTE(S):

a. The above list may not include all maintenance items. Inspection intervals may vary depending on climate and opening hours. Consult your Carrier dealer about a service contact for seasonal inspections.
b. Monthly maintenance items and outdoor unit rinsing may be performed by the customer. All other maintenance items and all service work must be performed by a qualified service technician. Read all warning labels.
c. Do not use harsh chemicals or high pressure water on coils. More frequent rinsing is required near a sea coast.
d. Monthly rinsing of the condenser coil is recommended if the unit is located in a corrosive climate.

Table 20 — Indoor Unit Maintenance Checklist

MAINTENANCE CHECKLIST[a]	RECOMMENDED INTERVAL[b]	
Indoor Unit Specific: (for accessories refer to unit specific literature)	**Monthly**	**Annual**
Inspect, clean, or replace air filter if dirty.	X	
Inspect and clean blower assembly (includes blower housing, wheel, and motor). Inspect belts and motor pulley. Lubricate shaft bearings.		X
Inspect internal and external cabinet. Clean as needed.		X
Inspect electrical disconnect for proper function. Repair or replace as necessary.		X
Inspect electrical components, wiring, and connections. Tighten loose connections. Repair or replace damaged components and wiring.		X
Inspect evaporator coil. Clean if dust, dirt, or debris is present.[c]		X
Clean condensate pan, trap, and drain lines (more frequent maintenance may be required in humid climates — consult your local HVAC dealer).		X
Inspect motor and fan for damage. Make Inspect airflow system (ductwork). Check for leaks and repair as needed.		X

NOTE(S):

a. The above list may not include all maintenance items. Inspection intervals may vary depending on climate and opening hours. Consult your Carrier dealer about a service contact for seasonal inspections.
b. Monthly maintenance items and outdoor unit rinsing may be performed by the customer. All other maintenance items and all service work must be performed by a qualified service technician. Read all warning labels.
c. Do not use harsh chemicals or high pressure water on coils. More frequent rinsing is required near a sea coast.

SERVICE

Inspection and maintenance should be performed at regular intervals and should include the following:

- complete cleaning of cabinet, fan wheel, cooling coil, condensate pan and drain, heating coils, and return-air grille (if present)
- inspection of panels and sealing of unit against air leakage.
- adjustment of fan motor, belt, bearings, and wheels
- cleaning or replacement of filters
- testing for cooling/heating system leaks
- checking of all electrical connections

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lockout tag. Unit may have more than one power switch.

Most unit service can be performed by removing one or both of the unit's side panels. Coil cleaning, removal or insulation cleaning may require removal of a rear, top, or bottom panel, depending on the unit's orientation. When service is completed, replace unit panels.

Panels

Panels are fastened to unit frame with sheet metal screws. Fan and coil compartment must be sealed tightly after service to prevent air from bypassing the cooling coil.

Fan Motor Lubrication

Fan motor supplied with unit is permanently lubricated and requires no further lubrication.

Fan Shaft Bearings

Sizes 14-16 units have pillow-block bearings (see Fig. 38) that must be lubricated with suitable bearing grease approximately every 3 months. See Table 21 for suitable lubricants.

Table 21 — Lubricant Data

MANUFACTURER	LUBRICANT
Mobil	Mobilplex EP No. 2
Sunoco	Prestige 42
Texaco	Multifak 2
Texaco	Regal AFB – 2[a]

NOTE(S):

a. Preferred lubricant, contains rust and oxidation inhibitors.

Centering Fan Wheel

If fan and fan shaft assembly are not properly centered, blades may scrape against the blower side scroll plate or may create an objectionable whistling noise. It may be necessary to adjust individual fan wheels or move entire fan shaft. See the following 2 sections.

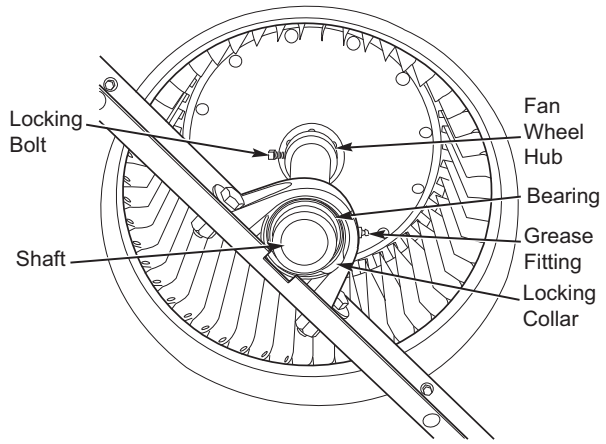


Fig. 38 — Fan Shaft, Bearings, and Fan Wheel (Typical)

Fan Shaft Position Adjustment

Loosen setscrew or locking collar of each fan shaft bearing. Slide shaft into correct position and replace locking collar. (See Fig. 39.) To replace locking collar, push collar up against inner face of bearing. Turn collar in direction of fan rotation until tight, and tighten setscrew. Tightening locking collar in direction of fan rotation results in further tightening of collar should setscrew work itself loose.

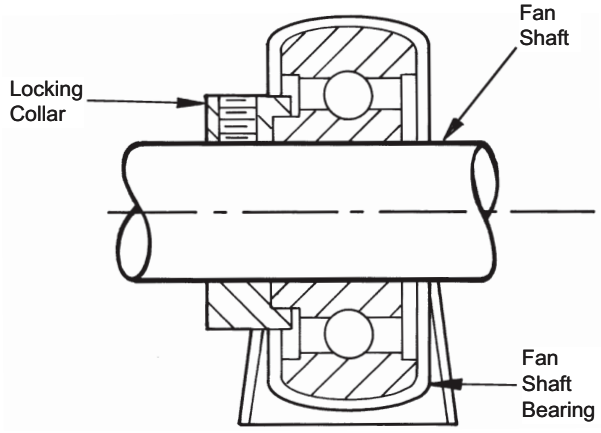


Fig. 39 — Fan Shaft Bearing

Individual Fan Wheel Adjustment

Loosen the 2 locking bolts holding the fan wheel hub to shaft. (See Fig. 38.) Position fan wheel in center of the fan housing and tighten locking bolts. Clearance between wheel and housing should be the same on both sides.

Fan Belts

Motor mounting plate and motor support angles are slotted to permit both vertical and horizontal adjustment. Adjust belt(s) for correct deflection by loosening motor plate mounting bolts, moving motor/plate assembly forward or back, and re-tightening bolts. Press down on belt with one finger midway between fan and motor pulleys to check deflection. For units with motor sizes up to and including 3.7 Hp (2.76 kW), correct deflection is 3/16 in. (4.8 mm). For larger motor sizes, correct deflection is 1/8 in. (3.2 mm). See Fig. 40.

If complete belt replacement is required during servicing, loosen the motor plate mounting bolts (Fig. 40), move motor/plate assembly towards fan pulley, and pull belt(s) off pulleys. Reverse the procedure with new bolts and readjust deflection.

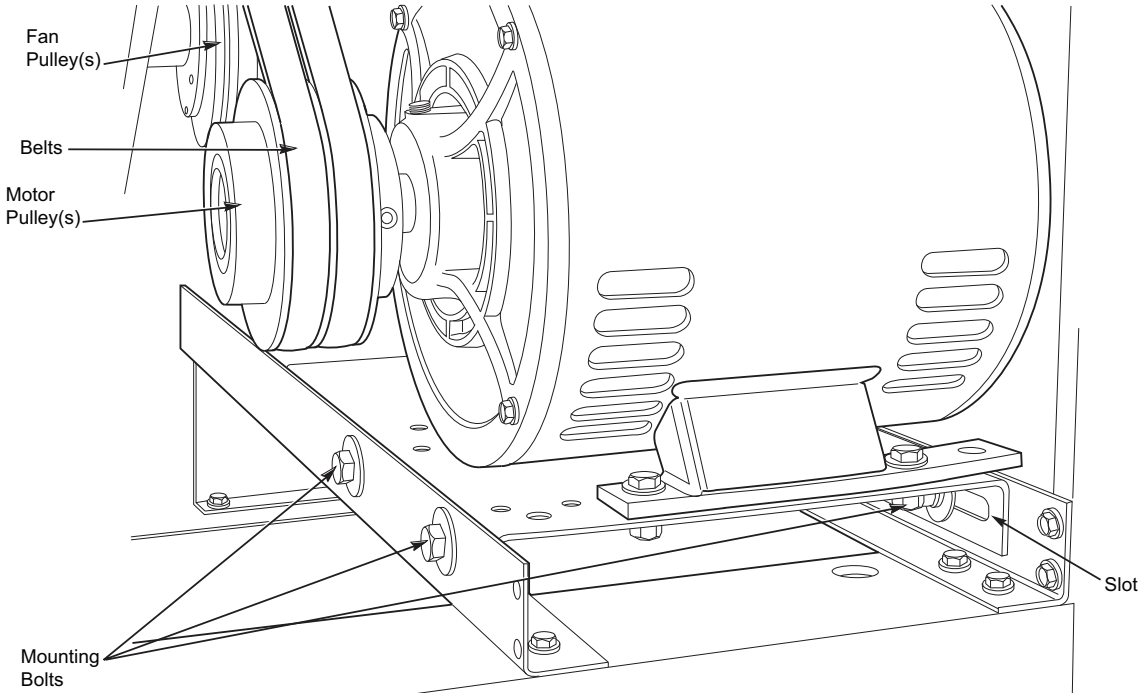


Fig. 40 — Fan Motor Mounting

Fan Rotation

Correct fan rotation with respect to fan outlet is shown in Fig. 41.

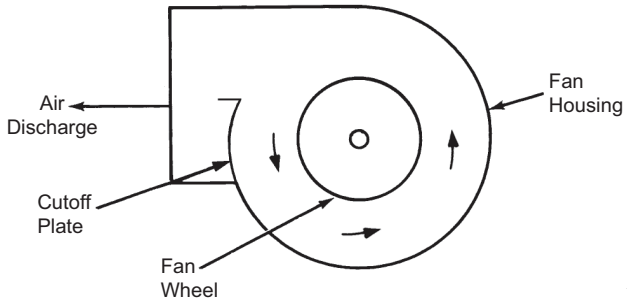


Fig. 41 — Fan Rotation

Fan Pulley Alignment

Align as follows:

1. Loosen setscrews on pulleys.
2. Align pulleys visually and tighten setscrews on fan pulley to lock it in place.
3. Use the methods shown in Fig. 42 to check proper pulley alignment.
4. If pulleys are not in correct alignment, loosen the motor holddown bolts and slide the motor axially until the pulleys are aligned.
5. Tighten motor holddown bolts.

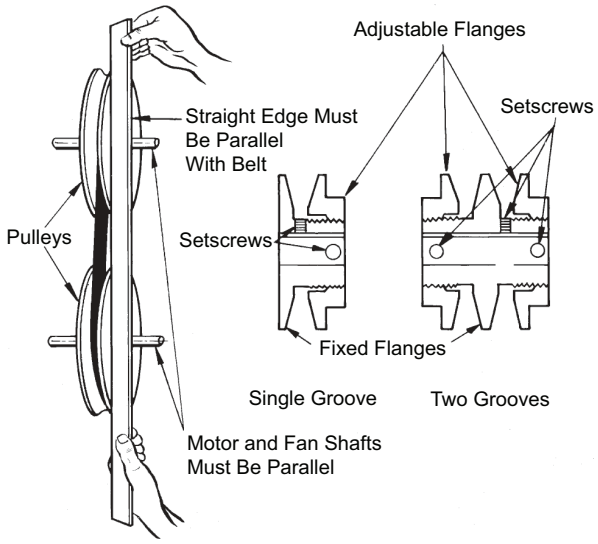


Fig. 42 — Fan Pulley Adjustments

Pulley and Drive Adjustment

To obtain desired fan speed, refer to the fan motor, drive data and performance data in Tables 22-32 and adjust fan motor pulley as follows:

1. Remove belt from fan motor pulley after loosening motor from motor base.
2. Loosen setscrew in movable flange of pulley. Screw movable flange toward fixed flange to increase the fan speed and away from fixed flange to reduce speed. Before tightening setscrew, make certain that setscrew is over nearest flat surface of pulley hub. See Fig. 42.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution could cause equipment damage.

Increasing fan speed produces a greater load on motor. Do not exceed rated capacity of motor.

Table 22 — Fan Motor Data, 40RLA/S Standard Motor, Two Speed

UNIT	40RLA/S 14	40RLA/S 16	40RLA/S 25	40RLA/S 28	40RLA/S 30
208/230-3-60 and 460-3-60					
Speed (rpm)	1,735	1,750	1,755	1,760	1,755
Hp	2.9	3.7	5.0	7.5	10.0
Frame (NEMA)	56HY	56HY	184T	S213T	S215T
Shaft Dia (in.)	7/8	7/8	1-1/8	1-3/8	1-3/8
575-3-60					
Speed (rpm)	1,710	1,710	1,755	1,750	1,755
Hp	3.7	3.7	5.0	7.5	10.0
Frame (NEMA)	56HY	56HY	184T	S213T	S215T
Shaft Dia (in.)	7/8	7/8	1-1/8	1-3/8	1-3/8

Table 23 — Fan Motor Data, 40RLA/S Alternate Motor, Two Speed

UNIT	40RLA/S 14	40RLA/S 16	40RLA/S 25	40RLA/S 28	40RLA/S 30
208/230-3-60 and 460-3-60					
Speed (rpm)	1,750	1,755	1,760	1,755	1,755
Hp	3.7	5.0	7.5	10.0	10.0
Frame (NEMA)	56HY	184T	S213T	S215T	S215T
Shaft Diameter (in.)	7/8	1-1/8	1-3/8	1-3/8	1-3/8
575-3-60					
Speed (rpm)	1,755	1,755	1,750	1,755	1,755
Hp	5.0	5.0	7.5	10.0	10.0
Frame (NEMA)	184T	184T	S213T	S215T	S215T
Shaft Diameter (in.)	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8

Table 24 — Motor Efficiency 40RLA/S — Two-Speed Motor

MOTOR HP	EPACT MINIMUM (%)	MOTOR EFFICIENCY (%)
2.4	—	80.0
2.9	—	86.5
3.7	—	83.6
5.0	89.5	89.5
7.5	—	91.0
10.0	—	91.7

LEGEND

EPACT — Energy Policy and Conservation Act of 1992

Table 25 — Fan Motor Data, 40RLQ Standard Motor, Two Speed

UNIT	40RLQ 16	40RLQ 25
208/230-3-60 and 460-3-60		
Speed (rpm)	1,750	1,755
Hp	3.7	5.0
Frame (NEMA)	56HY	184T
Shaft Diameter (in.)	7/8	1-1/8
575-3-60		
Speed (rpm)	1,710	1,755
Hp	3.7	5.0
Frame (NEMA)	56HY	184T
Shaft Diameter (in.)	7/8	1-1/8

Table 26 — Fan Motor Data, 40RLQ Alternate Motor, Two Speed

UNIT	40RLQ 16	40RLQ 25
208/230-3-60 and 460-3-60		
Speed (rpm)	1,755	1,760
Hp	5.0	7.5
Frame (NEMA)	184T	S213T
Shaft Diameter (in.)	1-1/8	1-3/8
575-3-60		
Speed (rpm)	1,755	1,750
Hp	5.0	7.5
Frame (NEMA)	184T	S213T
Shaft Diameter (in.)	1-1/8	1-3/8

Table 27 — Motor Efficiency 40RLQ Two-Speed Motor

MOTOR HP	EPACT MINIMUM (%)	MOTOR EFFICIENCY (%)
1.7	—	82.0
2.4	—	80.0
2.9	—	86.5
3.7	—	83.6
3.7[a]	—	87.9
5.0	89.5	87.9
7.5	—	91.0
10.0	—	91.7

NOTE(S):

a. High Efficiency Motor.

Table 28 — Standard Drive Data

UNIT	40RLA/S 14	40RLA/Q/S 16	40RLA/Q/S 25	40RLA/S 28	40RLA/S 30
MOTOR DRIVE					
Motor Pulley Pitch Diameter (in.)	2.8-3.8	2.8-3.8	3.7-4.7	4.3-5.3	4.3-5.3
Pulley Factory Setting Full Turns Open	2.5	2.5	3.0	3.0	3.0
FAN DRIVE					
Pulley Pitch Diameter (in.)	9.0	9.0	9.4	11.0	11.0
Pulley Bore (in.)	1-1/16	1-1/16	1-1/16	1-15/16	1-15/16
Belt No. — Section	1—A	1—A	1 — B	2 — B[a]	2 — B[a]
Belt Pitch (in.)	42.3	42.3	41.8	(2) 42.8 (2) 43.8	(2) 42.8 (2) 43.8
FAN SPEEDS (rpm)					
Factory Setting	632	632	771	752	752
Range	537-728	537-728	679-863	682-841	674-831
Max Allowable Speed (rpm)	1,200	1,200	1,200	1,100	1,100
Change per 1/2 Turn of Movable Motor Pulley Flange	19.1	19.1	15.3	13.1	13.1
MAX FULL TURN FROM CLOSED POSITION	5	5	6	6	6
SHAFTS CENTER DISTANCE (in.)	10.44-12.32	10.44-12.32	9.12-10.99	6.67-9.43	6.67-9.43

NOTE(S):

a. Four belts shipped with unit. Use correct set of 2 belts sized according to the pulley setting.

Table 29 — Medium-Static Drive Data

UNIT	40RLA/S 14	40RLA/Q/S 16	40RLA/Q/S 25	40RLA/S 28	40RLA/S 30
MOTOR DRIVE					
Motor Pulley Pitch Diameter (in.)	3.4-4.4	3.7-4.7	4.3-5.3	4.3-5.3	4.3-5.3
Pulley Factory Setting Full Turns Open	2.5	3.0	3.0	3.0	3.0
FAN DRIVE					
Pulley Pitch Diameter (in.)	8.2	8.6	9.4	9.4	9.4
Pulley Bore (in.)	1-1/16	1-1/16	1-1/16	1-15/16	1-15/16
Belt No. — Section	1—A	1—B	1 — B	2 — B[a]	2 — B[a]
Belt Pitch (in.)	41.3	41.8	41.8	(2) 38.8 (2) 39.8	(2) 38.8 (2) 39.8
FAN SPEEDS (rpm)					
Factory Setting	820	842	881	881	881
Range	715-926	742-943	798-984	798-984	798-984
Max Allowable Speed (rpm)	1,200	1,200	1,200	1,100	1,100
Change per 1/2 Turn of Movable Motor Pulley Flange	21.1	16.7	15.3	15.3	15.3
MAX FULL TURN FROM CLOSED POSITION	5	6	6	6	6
SHAFTS CENTER DISTANCE (in.)	10.44-12.32	10.44-1.2.32	9.16-10.99	6.67-9.43	6.67-9.43

NOTE(S):

a. Four belts shipped with unit. Use correct set of 2 belts sized according to the pulley setting.

Table 30 — High-Static Drive Data

UNIT	40RLA/S 14	40RLA/Q/S 16	40RLA/Q/S 25	40RLA/S 28	40RLA/S 30
MOTOR DRIVE					
Motor Pulley Pitch Diameter (in.)	3.7-4.7	4.3-5.3	4.3-5.3	4.3-5.3	4.3-5.3
Pulley Factory Setting Full Turns Open	3.0	3.0	3.0	3.0	3.0
FAN DRIVE					
Pulley Pitch Diameter (in.)	7.4	7.9	7.4	8.6	8.6
Pulley Bore (in.)	1-1/16	1-1/16	1-1/16	1-15/16	1-15/16
Belt No. — Section	1—B	1—B	2 — B	2 — B	2 — B
Belt Pitch (in.)	39.8	39.8	36.8	37.8	37.8
FAN SPEEDS (rpm)					
Factory Setting	979	1,060	1,118	1,024	1,024
Range	873-1,096	950-1,171	1,014-1,200[a]	873-1,075	873-1,075
Max Allowable Speed (rpm)	1,200	1,200	1,200	1,100	1,100
Change per 1/2 Turn of Movable Motor Pulley Flange	19.4	18.4	19.4	16.7	16.7
MAX FULL TURN FROM CLOSED POSITION	6	6	6	6	6
SHAFTS CENTER DISTANCE (in.)	10.44-12.32[b]	9.16-10.99	8.16-10.02	6.67-9.43	6.67- 9.43

NOTE(S):

a. It is possible to adjust drive so that fan speed exceeds maximum allowable. DO NOT exceed 1,200 rpm.
b. 575v unit has a center distance of 9.16-10.99 in.

Table 31 — Fan Performance Data — 40RL[a,b,c]

UNIT	AIRFLOW (cfm)	EXTERNAL STATIC PRESSURE (in. wg)[d]													
		0.0		0.2		0.4		0.6		0.8		1.0		1.2	
		rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
40RLA*14 40RLS*14	3,750	**410**	**0.43**	**467**	**0.55**	567	0.83	649	1.12	721	1.41	788	1.72	851	2.05
	4,300	**455**	**0.62**	**504**	**0.74**	599	1.05	679	1.38	748	1.70	811	2.04	871	2.39
	5,000	**514**	**0.92**	556	1.06	641	1.39	718	1.76	786	2.14	847	2.52	903	2.91
	5,700	575	1.32	612	1.47	686	1.82	759	2.23	825	2.66	884	3.09	939	3.52
	6,250	624	1.71	657	1.87	725	2.24	793	2.66	856	3.12	915	3.59	969	4.06
40RLA*16 40RLQ*16 40RLS*16	4,500	**437**	**0.61**	**483**	**0.72**	576	1.01	660	1.35	732	1.69	797	2.03	856	2.38
	5,300	**499**	**0.95**	538	1.07	617	1.37	696	1.74	767	2.13	830	2.53	888	2.94
	6,000	**555**	**1.34**	590	1.48	659	1.79	730	2.17	798	2.59	860	3.04	918	3.49
	6,800	620	1.91	651	2.06	712	2.39	774	2.78	836	3.22	896	3.71	952	4.21
	7,500	677	2.52	706	2.69	761	3.04	817	3.44	873	3.89	929	4.39	984	4.93
40RLA*25 40RLQ*25[c] 40RLS*25	6,000	532	1.25	569	1.39	639	1.69	711	2.06	781	2.48	846	2.93	905	3.60
	7,000	608	1.93	641	2.09	702	2.42	763	2.08	824	3.23	885	3.71	943	4.23
	8,000	686	2.83	716	3.01	770	3.38	823	3.77	876	4.21	930	4.70	983	5.24
	9,000	764	3.97	791	4.18	841	4.59	888	5.02	935	5.47	982	5.96	1,030	6.51
	10,000	843	5.38	868	5.62	914	6.09	957	6.55	1,000	7.02	1,042	7.53	1,084	8.08
40RLA*28 40RLS*28	7,500	456	1.29	490	1.47	556	1.85	621	2.25	678	2.64	729	3.06	778	3.60
	8,750	521	1.98	551	2.18	608	2.61	664	3.07	720	3.53	770	3.99	816	4.45
	10,000	587	2.88	614	3.11	664	3.59	714	4.09	763	4.62	812	5.15	857	5.68
	11,250	653	4.03	678	4.29	724	4.82	768	5.37	812	5.95	856	6.54	899	7.14
	12,500	720	5.46	743	5.75	785	6.33	825	6.93	865	7.55	904	8.20	944	8.86
	15,000	829	8.84	850	9.19	888	9.88	924	10.57	958	11.27	991	11.99	1,024	12.73
40RLA*30 40RLS*30	9,000	521	1.99	550	2.25	616	2.77	676	3.23	731	3.72	782	4.20	829	4.70
	10,500	596	3.16	623	3.40	672	3.89	720	4.40	767	4.94	814	5.50	859	6.05
	12,000	673	4.63	698	4.90	743	5.45	785	6.02	826	6.62	867	7.23	908	7.87
	13,500	751	6.51	773	6.82	815	7.44	853	8.06	890	8.71	927	9.38	963	10.07
	15,000	829	8.84	850	9.19	888	9.88	924	10.57	958	11.27	991	11.99	1,024	12.73

UNIT	AIRFLOW (cfm)	EXTERNAL STATIC PRESSURE (in. wg)[d]											
		1.4		1.6		1.8		2.0		2.2		2.4	
		rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
40RLA*14 40RLS*14	3,750	912	2.39	971	2.76	1,028	3.14	1,083	3.54	**1,135**	**3.95**	**1,185**	**4.36**
	4,300	928	2.75	982	3.13	1,036	3.53	1,087	3.94	**1,138**	**4.37**	**1,187**	**4.81**
	5,000	956	3.30	1,007	3.71	1,056	4.13	**1,104**	**4.56**	**1,151**	**5.00**	**1,196**	**5.46**
	5,700	990	3.96	1,039	4.40	1,086	4.85	**1,130**	**5.31**	**1,174**	**5.78**	—	—
	6,250	1,019	4.54	1,067	5.02	**1,112**	**5.50**	**1,156**	**5.99**	**1,198**	**6.49**	—	—
40RLA*16 40RLQ*16 40RLS*16	4,500	912	2.75	967	3.12	1,019	3.52	1,070	3.92	1,120	4.35	1,168	4.79
	5,300	942	3.34	992	3.76	1,041	4.18	1,088	4.61	1,134	5.06	**1,179**	**5.52**
	6,000	971	3.95	1,020	4.40	1,067	4.86	1,112	5.33	1,156	5.81	**1,198**	**6.29**
	6,800	1,005	4.72	1,054	5.23	1,101	5.75	1,145	6.27	**1,187**	**6.79**	—	—
	7,500	1,036	5.48	1,084	6.04	1,131	6.61	**1,174**	**7.17**	—	—	—	—
40RLA*25 40RLQ*25[c] 40RLS*25	6,000	954	3.83	1,005	4.27	1,052	4.72	1,098	5.22	1,142	5.67	—	—
	7,000	990	4.74	1,040	5.24	1,090	5.80	1,135	6.30	1,176	6.84	—	—
	8,000	1,028	5.79	1,078	6.38	1,130	7.00	1,173	7.60	—	—	—	—
	9,000	1,073	7.11	1,120	7.72	1,169	8.37	—	—	—	—	—	—
	10,000	1,126	8.75	1,166	9.37	—	—	—	—	—	—	—	—
40RLA*28 40RLS*28	7,500	831	4.41	870	5.10	913	5.90	950	6.88	985	7.70	—	—
	8,750	859	4.97	901	5.59	944	6.42	980	7.20	1,020	8.10	—	—
	10,000	900	6.20	939	6.74	976	7.33	1,013	8.00	1,050	8.82	—	—
	11,250	941	7.73	980	8.32	1,017	8.90	1,052	9.51	1,088	10.16	—	—
	12,500	984	9.53	1,022	10.19	1,058	10.84	1,093	11.49	—	—	—	—
	15,000	1,057	13.49	1,090	14.28	—	—	—	—	—	—	—	—
40RLA*30 40RLS*30	9,000	866	5.20	899	5.85	950	6.65	989	7.38	1,029	8.32	1,077	9.74
	10,500	902	6.60	942	7.14	980	7.70	1,016	8.31	1,051	8.99	1,085	9.77
	12,000	949	8.50	988	9.14	1,026	9.76	1,062	10.38	1,095	11.01	—	—
	13,500	1,000	10.78	1,036	11.49	1,073	12.21	—	—	—	—	—	—
	15,000	1,057	13.49	1,090	14.28	—	—	—	—	—	—	—	—

NOTE(S):

a. Maximum allowable fan speed is 1,200 rpm for all sizes.
b. Fan performance is based on deductions for wet coil, clean 2 in. filters, and unit casing. See table below for factory-supplied filter pressure drop.
c. Refer to fan motor and drive tables for additional data.
d. Bold indicates field-supplied drive is required. Plain type indicates standard motor and standard drive. Underlining indicates a different motor and drive combination other than the standard motor and standard drive combination is required. Refer to fan motor and drive tables to complete selection.

LEGEND

bhp — Brake Horsepower Input to Fan
ESP — External Static Pressure

Table 32 — Factory-Supplied Pressure Drop

UNIT	AIRFLOW (cfm)	PRESSURE DROP (in. wg)
40RLA*14 40RLS*14	3,750	0.06
	5,000	0.10
	6,250	0.13
40RLA*16 40RLQ*16 40RLS*16	4,500	0.08
	6,000	0.12
	7,500	0.17
40RLA*25 40RLQ*25 40RLS*25	6,000	0.12
	8,000	0.19
	10,000	0.26
40RLA*28 40RLS*28	7,500	0.15
	10,000	0.22
	12,500	0.30
40RLA*30 40RLS*30	9,000	0.19
	12,000	0.29
	15,000	0.40

Variable Frequency Drive

The VFD switches the indoor fan motor speed between full/high speed (60 Hz motor operation) and reduced/low speed (40 Hz motor operation), as required by ASHRAE 90.1-2016 and IECC-2015 requirements for two-stage HVAC units. The VFD is factory-configured to match the current and power requirements for each motor selection and all wiring connections are completed by the factory; no field adjustments or connections are necessary.

While the basic VFD retains all of its standard capabilities, the SAV 2-speed application uses only a limited portion of these features to provide a 0-10 vdc input based on thermostat demand to the VFD to control the motor speed. With a ventilation or low cooling demand, the Unit Control Board will provide a vdc input corresponding to 66% of design airflow. With a high cooling or heating demand, the Unit Control Board will provide a vdc input corresponding to 100% of design airflow. The fan control signal is based on control board settings (potentiometer and DIP switches) that are factory-set and thermostat demand to the UCB. While the pulley and drive should be adjusted to obtain desired airflow, the potentiometer on the UCB can be used to fine-tune the airflow setting when the fan is running in high speed.

The ACH580 VFD is not equipped with a keypad. A keypad is available as an accessory (Part Number: CRDISKIT003A00) for field-installation or expanded service access to VFD parameter and troubleshooting tables. VFD ACH180 comes with an integrated/non-removable keypad.

See Tables 33-34 for terminal designations and Fig. 43-44 for wiring. See Appendix A for VFD parameters.

The VFD used in the SAV™ system has soft start capabilities to slowly ramp up speeds, eliminating any high in-rush of air volume during speed changes. It also has internal overcurrent protection for the fan motor.

Table 33 — ACH180 VFD Terminal Designations

TERMINAL	FUNCTION
L1 L2 L3	Three-Phase Main Circuit Input Power Supply
T1/U T2/V T3/W	Three-Phase AC Output to Motor, 0-v to Maximum Input Voltage Level
14 (AI1) 13 (GND)	Analog Input (0 to 10-v)
23	10 vdc Reference Voltage
22 (GND) 12 (COMMON)	Factory-Supplied Jumper
21 (24 VDC) 8 (DI-1)	Activate to Start Drive (Start/Stop)
6 (Relay COM) 7 (Relay NO)	Relay Output for Unit Control Board Safety Chain

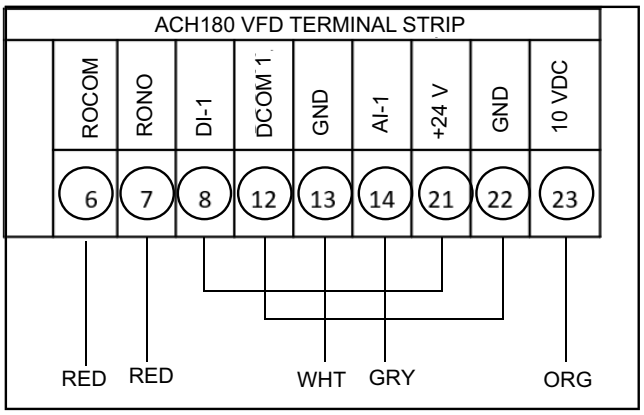


Fig. 43 — ACH180 VFD Wiring

Table 34 — ACH580 VFD Terminal Designations

TERMINAL	FUNCTION
L1 L2 L3	Three-Phase Main Circuit Input Power Supply
T1/U T2/V T3/W	Three-Phase AC Output to Motor, 0-v to Maximum Input Voltage Level
2 (AI1) 3 (GND)	Analog Input (0-10-v)
4	10 vdc Reference Voltage
11 (GND) 12 (COMMON)	Factory-Supplied Jumper
10 (24 VDC) 13 (DI-1)	Activate to Start Drive (Start/Stop)
25 (Relay 3 COM) 27 (Relay 3 NO)	Relay Output for Unit Control Board Safety Chain

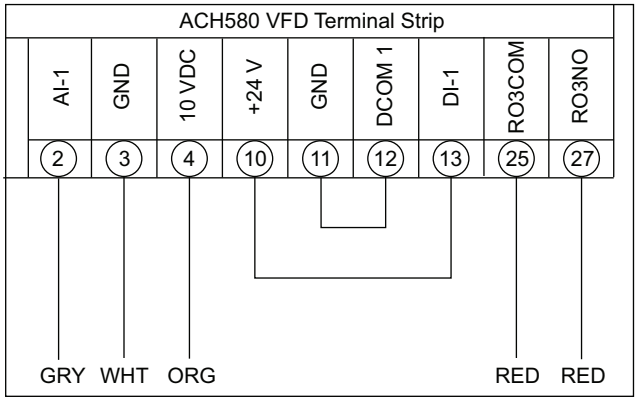


Fig. 44 — ACH580 VFD Wiring

INDOOR FAN MOTOR

The indoor fan motors used with the VFD are specially manufactured for use with VFD power circuits. The motor winding insulation is specially formulated to resist breakdown due to voltage stress issues. The motor shaft includes grounding rings to prevent damage to bearings caused by grounding currents. Replace these motors with Factory Authorized Parts available from Replacement Components Division (RCD).

VFD FUSES

Table 35 details the fuse requirement for the VFD installed in 40RL units. Check the control wiring diagram label on the specific unit in use for the fuse location.

Table 35 — VFD Fuse Requirements, 40RL Units

UNIT	HP	VOLTAGE	ACH180	ACH580	MOTOR	STANDARDIZED FUSE	FUSE P/N	HARNESS[a]
40RL	2.9	208/230	HK30WB504	N/A	HD58FE654	30A - CLASS CC KTK	HY10KB300	10
		460	HK30WB510	N/A	HD58FE654	15A - CLASS CC KTK	HY10KB151	10
	3.7	208/230	HK30WB505	N/A	HD60FE656	30A - CLASS CC KTK	HY10KB300	10
		460	HK30WB511	N/A	HD60FE656	20A - CLASS CC KTK	HY10KB200	10
		575	N/A	HK30WB370	HD58FE577	10A - CLASS CC KTK	HY10KB101	10
	5.0	208/230	HK30WB506	N/A	HD60FQ659	60A - CLASS J	HY10JK060	10
		460	HK30WB512	N/A	HD60FQ659	30A - CLASS CC KTK	HY10KB300	10
		575	N/A	HK30WB371	HD60FX579	15A - CLASS CC KTK	HHY10KB151	10
	7.5	208/230	HK30WB506	N/A	HD62FQ654	60A - CLASS J	HY10JK060	10
		460	HK30WB512	N/A	HD62FQ654	30A - CLASS CC KTK	HY10KB300	10
		575	N/A	HK30WB371	HD64FX575	15A - CLASS CC KTK	HY10KB151	10
	10.0	208/230	HK30WB507	N/A	HD64FQ654	60A - CLASS J	HY10JK060	10
		460	HK30WB513	N/A	HD64FQ654	30A - CLASS CC KTK	HY10KB300	10
		575	N/A	HK30WB372	HD64FX579	15A - CLASS CC KTK	HY10KB151	10

NOTE(S):

a. Harness wire gauge between control box and VFD.

LEGEND

Hp — Horsepower
N/A — Not Applicable
P/N — Part Number
VFD — Variable Frequency Drive

FAN FAULT DETECTION

The Variable Frequency Drive is equipped with a relay internal to the drive that is used to prevent the motor from running if there are faults detected by the VFD. If the 40RL unit is connected to the condensing unit correctly (refer to Power Supply and Wiring section), then the Unit Control Board will also prevent the thermostat signals from being sent to the condensing unit, preventing compressor(s) from energizing if there is a VFD fault or if the VFD is de-energized.

VFD ALARMS AND FAULTS TROUBLESHOOTING

The VFD has two LEDs (light-emitting diodes) on its front panel that indicate VFD operating status. These LEDs are GREEN and RED.

- GREEN LED ON STEADY: Power ON to VFD
- GREEN LED FLASHING: Alarm condition detected
- RED LED ON (Steady or Flashing): Fault condition detected

ALARMS

Alarms are advisory in nature. These indicate a problem has been detected by the VFD's diagnostics but this problem will not require that the VFD and its motor be shut down. Typical fault condition on the SAV™ application might be loose connections at the VFD terminal board or damaged conductors between the unit control board and the VFD terminal strip. See Table 36 for ACH580/ACH180 fault and alarm codes.

CLEAR THE ALARM LED

Shut off power to the VFD for five minutes. Restore power and recheck the GREEN LED. If this LED is still flashing, then connect the accessory remote display keypad kit. Use Table 36 to determine if the alarm requires any corrective action (action is not always required) and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact Carrier.

FAULTS

A fault is a significant internal situation for the VFD or its motor. If the motor was running when the fault was detected, it was shutdown. See Table 36 for a full list of faults, display codes, and recommended actions.

Clear the Fault LED

The recommended corrective action for faults is shown in Table 36. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

Connect the accessory remote display keypad kit if needed. To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter 31.11 Fault Reset Selection. digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

VFD REMOTE KEYPAD

NOTE: The following only applies when a unit with the factory-installed SAV™ option is equipped with the field-installed Remote VFD Keypad (Part Number: CRDISKKIT003A00) ACH580.

On 40RL fan coils equipped with the SAV option, the supply fan speed is controlled by a 3-phase VFD. See Fig. 28 and 29 for the location of the VFD.

The VFD is powered during normal operation to prevent condensation from forming on the boards during the off mode and is stopped by driving the speed to 0. The units use ABB VFDs. The interface wiring for the VFDs is shown in Fig. 43 and 44 (on page 45). Terminal designations are shown in the Terminal Designation table (see Tables 33 and 34 on page 45). Configurations are shown in the VFD Keypad Parameters tables (see Appendix A, Tables A-D on pages 63-64).

ACH580 Operation with Remote Keypad

The VFD keypad is shown in Fig. 45 and Fig 46. The functions of the Left and Right Softkeys (and) change depending on what is displayed on the screen. The function of Left Softkey matches the word in the lower left-hand box on the display screen. The function of Right Softkey matches the word in the lower right-hand box on the display screen. If the box is empty, then the Softkey does not have a function on that specific screen. The Arrow Keys are used to navigate through the menus. The Off key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The Hand key is used to change control of the drive to local (handheld) control. The Help key is used to access the help screens.

For the VFD to operate on the units covered by this document, the drive must be set in AUTO mode. The word "AUTO" will appear in the upper left hand corner of the VFD display. Press the AUTO button to set the drive in AUTO mode.

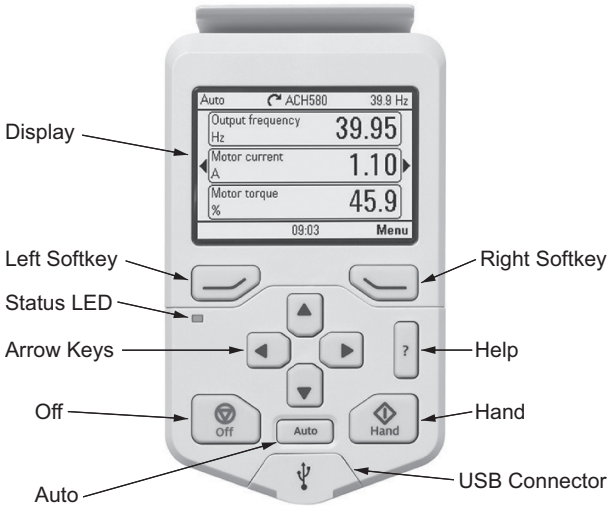


Fig. 45 — ACH580 VFD Keypad — Front

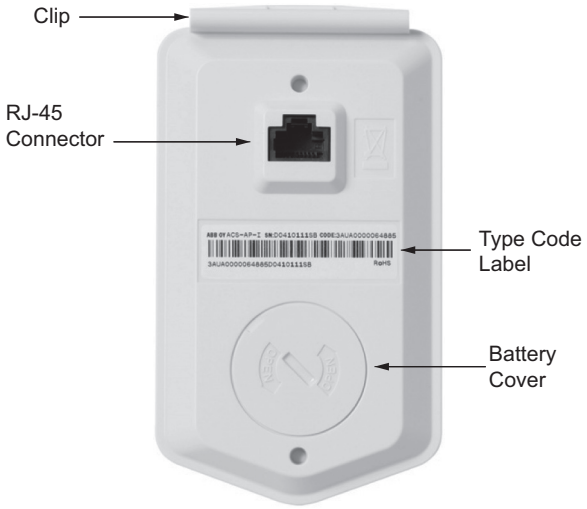


Fig. 46 — ACH580 VFD Keypad — Back

FIRST START ASSISTANT

Initial start-up has been performed at the factory. Use of the start up assistant will override factory VFD configurations.

⚠CAUTION

CONFIGURATION OVERRIDE HAZARD

Do not use ABB or Carrier start-up assistant on this VFD application. Use of start-up assistant will override the factory VFD configurations.

Use the following procedure to reset the factory configurations for ACH580 VFDs:

1. Disconnect unit power. Lock-out/tag-out.
2. Remove the VFD's front cover.
3. Disconnect the DI1 input at Terminal 13 (see Fig. 47 for location of DI1).

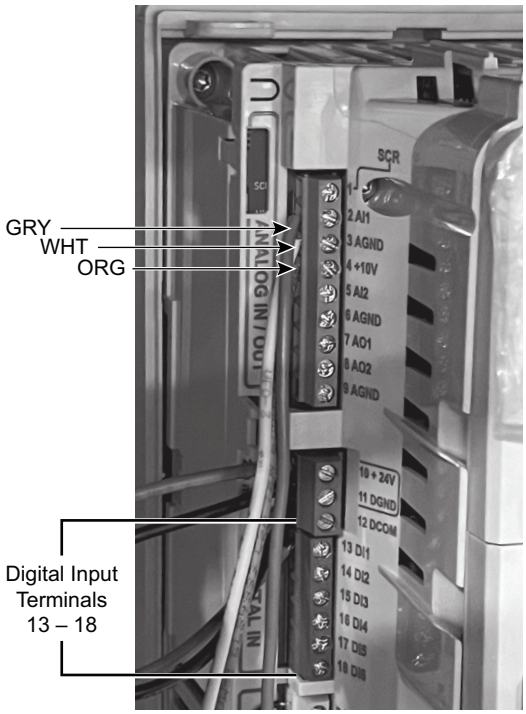


Fig. 47 — Digital Input Terminal Block Location on ACH580 VFD

4. Connect the VFD Keypad accessory to the VFD (if not already connected).

   NOTE: The VFD Keypad is a field-installed accessory; it is not included with the factory-installed VFD option.
5. At this point, providing you have a clean backup of the drive, you can select "RESTORE" from "BACKUP" Menu from the Main Menu.

   Please Note: To restore a backup, the drive has to be in Local control.
6. If you do not have a clean backup the drive will have to be manually programmed following the instructions in this document.
7. When the correct parameters have been uploaded, disconnect power to the unit, reconnect DI1 to Terminal 13, and replace the VFD cover.
8. Reconnect power to the unit. The VFD is now commissioned from the backup file.

START UP BY CHANGING PARAMETERS INDIVIDUALLY

Initial start-up is performed at the factory. To start up the VFD by changing individual parameters, perform the following procedure:

1. Select MENU (Press ⊂). The Main menu is displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (Press ⊂).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (Press ⊂).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (Press ⊂).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (Press ⊂) to store the modified value. Press CANCEL (Press ⊃) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT/BACK (Press ⊃) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT/BACK (Press ⊃) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously.

ACH580 VFD Modes

The VFD has several different modes for configuring, operating, and diagnosing the VFD. The modes are:

1. Standard Display mode — shows drive status information and operates the drive.
2. Parameters mode — edits parameter values individually
3. Start-up Assistant mode — guides the start up and configuration.
4. Changed Parameters mode — shows all changed parameters.
5. Drive Parameter Backup mode — stores or uploads the parameters.
6. Clock Set mode — sets the time and date for the drive.
7. I/O Settings mode — checks and edits the I/O settings.

ACH580 STANDARD DISPLAY MODE

Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press BACK until the LCD display shows status information as described below. See Fig. 48.

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control

is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain. From Home view press “Options” then “Edit Home View” to change the Home layout, the middle of the LCD display can be configured to display 3 parameter values, graphs or digital indicators. The default display shows (OUTPUT FREQ) in percent speed, (CURRENT) in amperes, and (AI1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

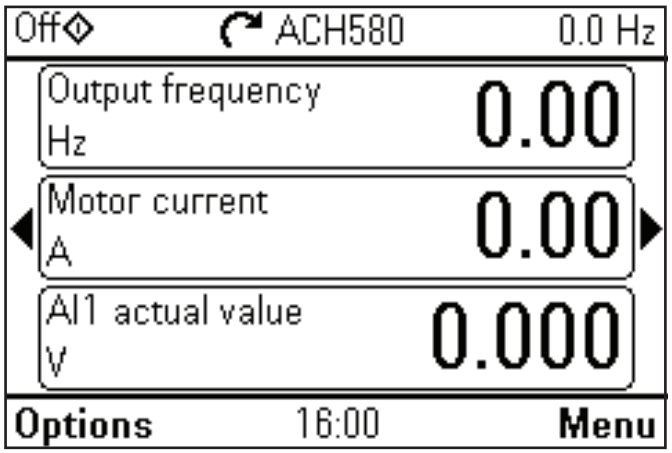


Fig. 48 — ACH580 Standard Display Example

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain.

From Home view press “Options” then “Edit Home View” to change the Home layout, the middle of the LCD display can be configured to display 3 parameter values, graphs or digital indicators. The default display shows (OUTPUT FREQ) in percent speed, (CURRENT) in amperes, and (AI1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

To adjust the speed in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 28 reference select) to also allow modification in the remote control mode.

PARAMETERS MODE

The Parameters mode is used to change the parameters on the drive. To change parameters, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press Select (Press).
3. Use the UP or DOWN keys to highlight the desired parameter group and press Select (Press).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (Press).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (Press) to store the modified value. Press CANCEL (Press) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press BACK (Press) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (Press) to return to the main menu.

CHANGED PARAMETERS MODE

The Changed Parameters mode is used to view and edit recently changed parameters on the drive. To view the changed parameters, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press Select (Press).
3. Use the UP or DOWN keys to highlight MODIFIED on the display screen and press Select (Press). A list of the recently changed parameters will be displayed.
4. Use the UP or DOWN keys to highlight the desired parameter group and press EDIT (Press) to change the parameter if desired.
5. Press BACK (Press) to exit the Changed Parameters mode.

DRIVE PARAMETER BACKUP MODE

The drive parameter back up mode is used to export the parameters from one drive to another. The parameters can be uploaded from a VFD to the removable control panel. The control panel can then be transferred to another drive and the parameters downloaded into memory.

Depending on the motor and application, there are two options available. The first option is to download all parameters. This copies both application and motor parameters to the drive from the control panel. This is recommended when using the same application for drives of the same size. This can also be used to create a backup of the parameters group for the drive.

The second option downloads only the application parameters to the drive. This is recommended when using the same application for drives of different sizes. Parameters 99.07, 99.06, 99.08, 99.09, 99.10, and group 51 parameters and internal motor parameters are not copied.

Upload All Parameters

To upload and store parameters in the control panel from the VFD insert the Keypad into the VFD slot (see Fig. 49) and animation will appear loading the VFD configuration.

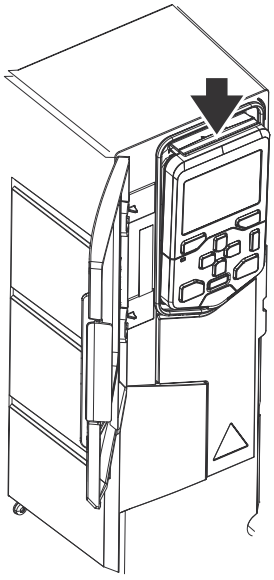


Fig. 49 — Insert Keypad in Slot

Download All Parameters From Backup

To download all parameters from the control panel to the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (Press). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight BACKUPS on the display screen and press SEL (Press).
4. Use the UP or DOWN keys to highlight the backup file and press SEL (Press).
5. The text "Restoring Parameters" will be displayed with a progress indicator. To stop the process, select CANCEL (Press).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select BACK (Press) to return to the main menu.
8. The control panel can now be disconnected from the drive.

CLOCK SET MODE

Use the clock set mode to set the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs.

To set the clock, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PRIMARY SETT. on the display screen and press ENTER (Press). The Sub list will be displayed.
3. Use the UP or DOWN keys to highlight Clock, region, display and press SEL (Press). This parameter is used to display or hide the clock on the screen. Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Sub list menu.
4. Use the UP or DOWN keys to highlight SET TIME and press SEL (Press). Use the UP or DOWN keys to change the hours and minutes. Press OK (Press) to save the configuration and return to the Clock Set menu.
5. Use the UP or DOWN keys to highlight TIME FORMAT and press SEL (Press). Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Clock Set menu.
6. Use the UP or DOWN keys to highlight SET DATE and press SEL (Press). Use the UP or DOWN keys to change the day, month, and year. Press OK (Press) to save the configuration and return to the Clock Set menu.
7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (Press). Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Clock Set menu.
8. Press BACK (Press) twice to return to the main menu.

I/O SETTINGS MODE

Use the I/O Settings mode to view and edit the I/O settings.

To configure the I/O settings, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PRIMARY SETT. on the display screen and press SEL (Press). The Sub list will be displayed.
3. Use the UP or DOWN keys to highlight ADVANCED OPTIONS/FUNCTIONS on the display screen and press SEL (Press). The Sub list will be displayed.
4. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press SEL (Press). The I/O Settings parameter list will be displayed.
5. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (Press).
6. Use the UP or DOWN keys to select the parameter to view. Press OK (Press).
7. Use the UP or DOWN keys to change the parameter setting. Press SAVE (Press) to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
8. Press BACK (Press) twice to return to the main menu.

ACH180 VFD Standard Keypad Detail

By default, the ACH180 has an integrated control panel. See Fig. 50.

1. Display — Shows the Home view as default.
2. Status LED — Green and red colors indicate the state and potential problems.
3. Back key — Opens the Options view.
4. Arrow keys — For menu navigation and setting values.
5. OK key — Opens the Menu in the Home view.
6. Off key— Stops the drive and switches to the Off mode.
7. Auto/Hand key — Opens a selection screen view that allows the user to select between Auto and Hand modes.

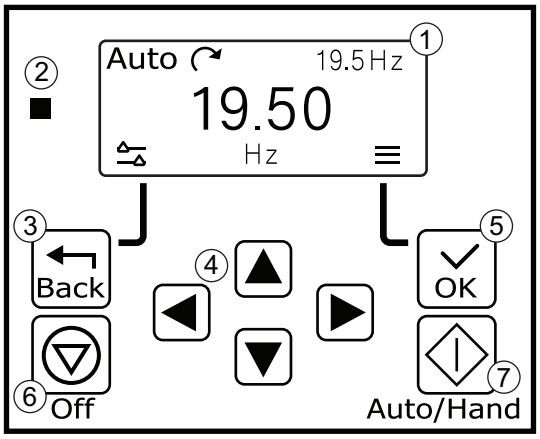
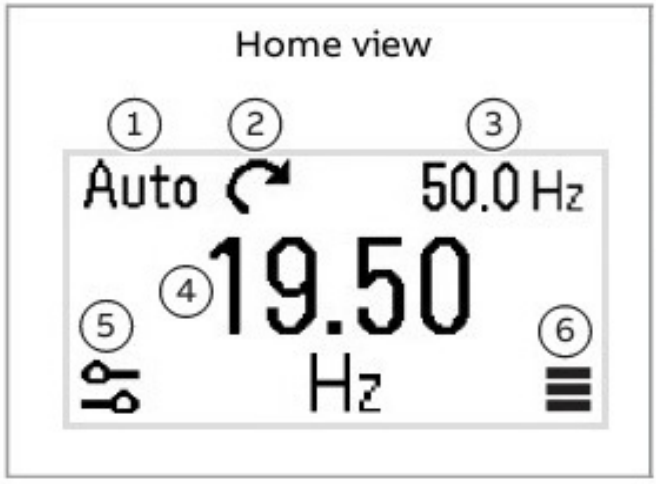


Fig. 50 — ACH180 Integrated Keypad

ACH180 Submenus

The Main menu items have submenus. Some submenus also have menus and/or option lists. The content of the submenus depends on the drive type.

The Home view is the main view. You can open the main Menu and Options menu from the Home view. See Fig. 51.



1	Control Location - Hand, Off or Auto
2	Rotation Direction - Forward Or Reverse
3	Location Reference Setting - Enabled
4	Frequency - Target
5	Options Menu - Quick Access Menu
6	Main Menu - Menu List

Fig. 51 — ACH180 Home View

Options Menu and Main Menu

The ACH180 drives have 5 menu options available (see Fig. 52):

- motor data/motor parameters
- motor control
- diagnostics
- energy efficiency
- parameters

Fig. 52-57 show the available options and information within each of the submenus.

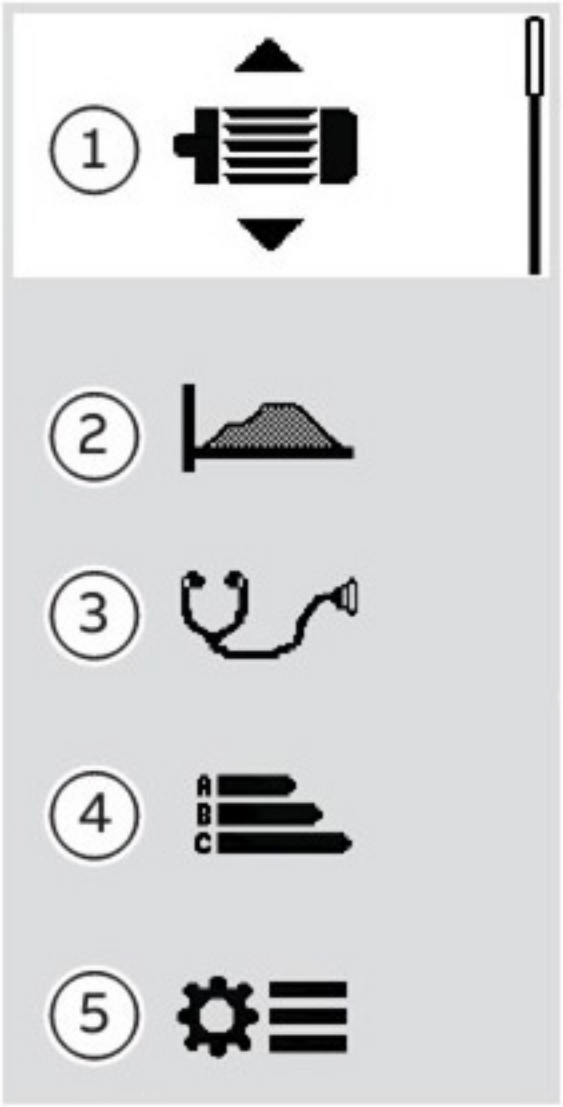
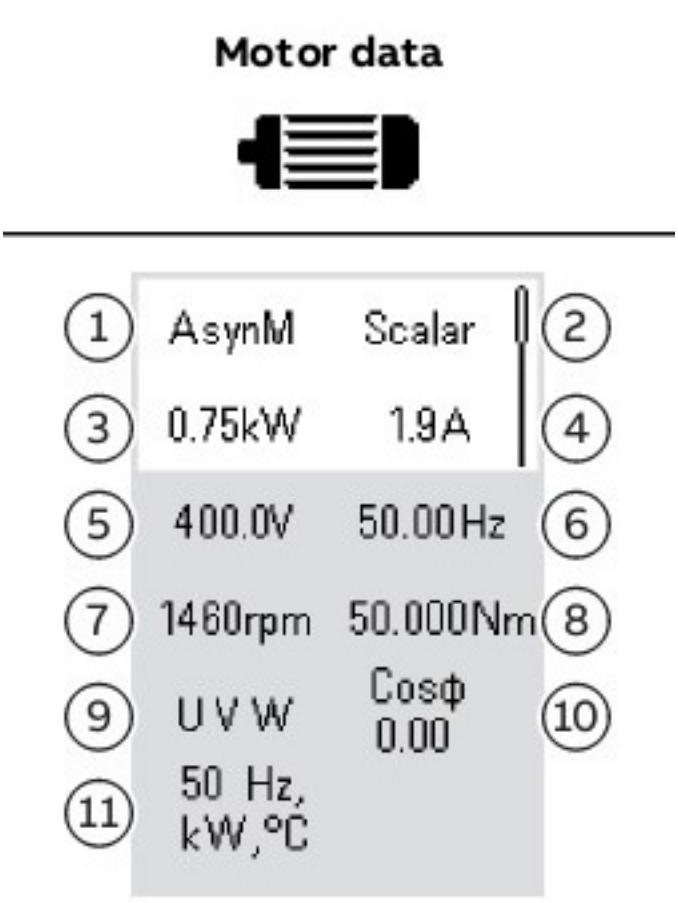
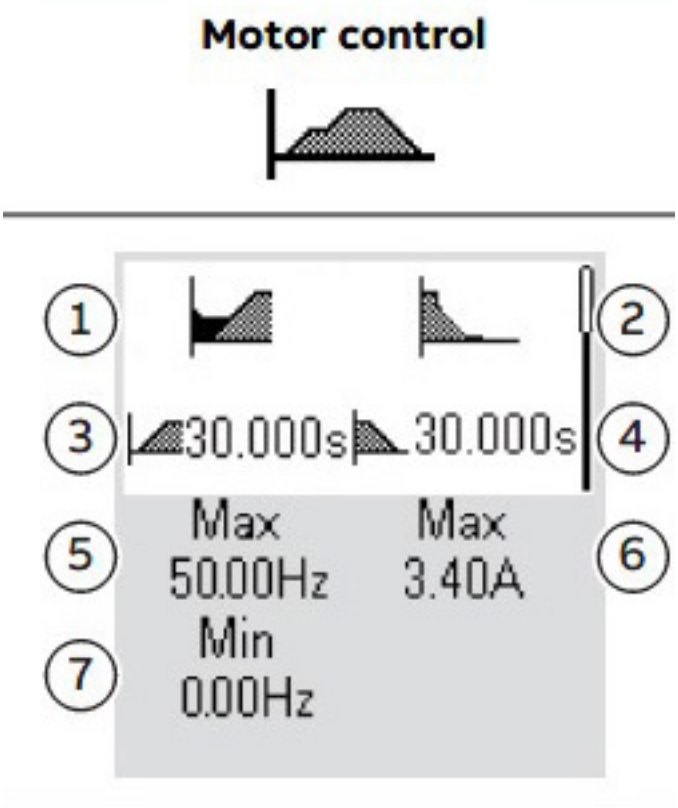


Fig. 52 — ACH180 Options Menu Items



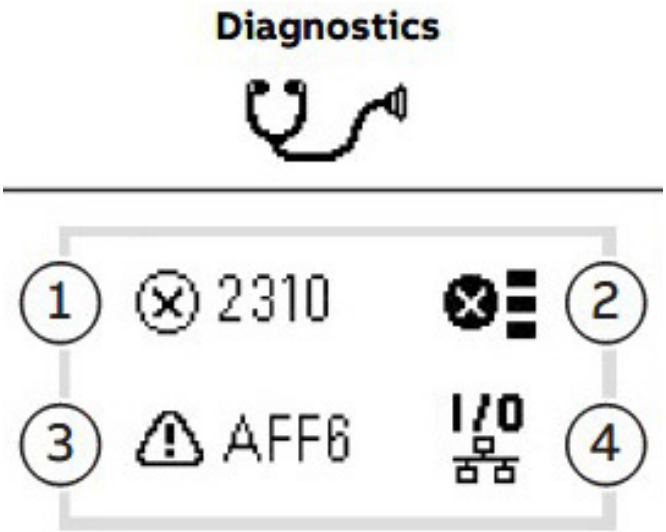
1	Motor Type - AsynM, PMSM, EC, Ti
2	Control Mode - Scalar, Vector
3	Nominal Power
4	Nominal Current
5	Nominal Voltage
6	Nominal Frequency
7	Nominal Speed
8	Nominal Torque
9	Phase Order, U V W, U W V
10	Nominal Cosphi
11	Unit Selection, SI or US Units

Fig. 53 — Motor Data Submenu



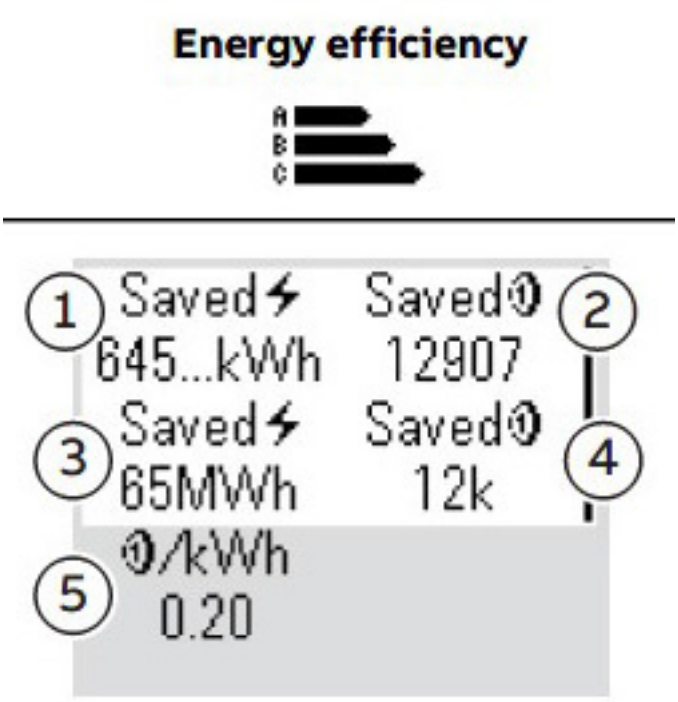
1	Start Mode - Const Time, Automatic
2	Stop Mode - Coast, Ramp, DC hold
3	Acceleration Time
4	Deceleration Time
5	Maximum Allowed Speed
6	Maximum Allowed Current
7	Minimum Allowed Speed

Fig. 54 — Motor Control Submenu



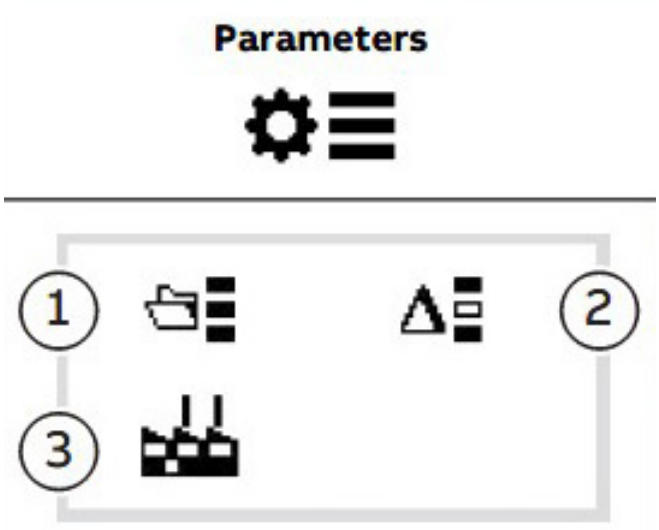
1	Active Fault - Shows the Fault Code
2	Fault History - List of Latest Fault Codes (newest first)
3	Active Warnings - Shows the Warning Code
4	Connection Status - Fieldbus and I/O Signals

Fig. 55 — Diagnostics Submenu



1	Saved Energy in kWh
2	Saved Money
3	Saved Energy in MW
4	Saved Money x 1000
5	Cost per kWh h

Fig. 56 — Energy Efficiency Submenu



1	Complete Parameter List - Groups Menu with Complete Parameters and Parameter Levels
2	Modified parameter list
3	Parameter Restore - Resets the Drive to the Factory Default Parameters

Fig. 57 — Parameters Submenu

FIRST START ASSISTANT

Initial start-up has been performed at the factory. Use of the start up assistant will override factory VFD configurations.

⚠ CAUTION

CONFIGURATION OVERRIDE HAZARD

Do not use start-up assistant on this VFD application! Use of start-up assistant will override the factory VFD configurations!

Use the following procedure to reset the factory configurations for ACH180 VFDs:

1. Disconnect unit power. Lock-out/tag-out.
2. Remove the VFD's front cover.
3. Disconnect the DI1 input at Terminal 8 (see Fig. 58 for location of DI1).

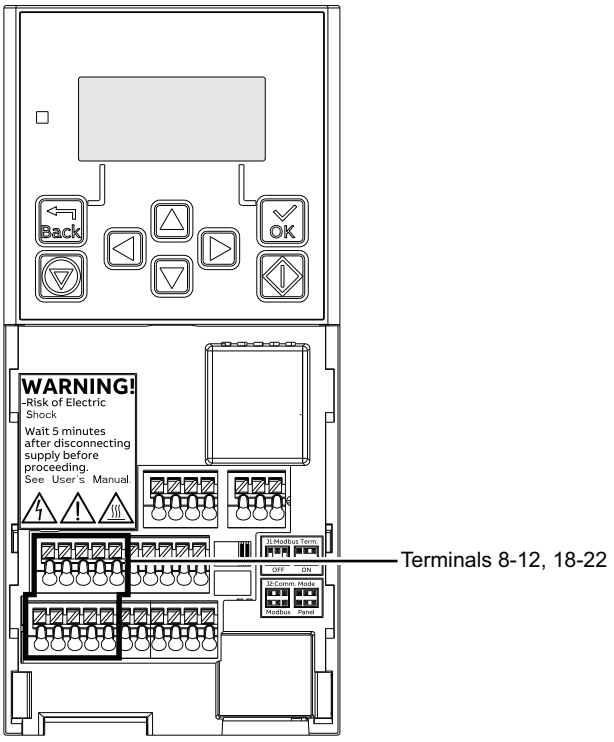


Fig. 58 — Digital Input Terminal Block Location on ACH180 VFD

4. If you have a clean backup of the drive, you can select "PARAMETER RESTORE" from "PARAMETERS" Menu from the Main Menu. (See Fig. 57 for view of Parameters Submenu.)
5. If you do not have a clean backup the drive will have to be manually programmed following the instructions in this document.
6. When the correct parameters have been uploaded, disconnect power to the unit, reconnect DI1 to Terminal 8, and replace the VFD cover.
7. Reconnect power to the unit. The VFD is now commissioned from the backup file.

ACH580 VFD Diagnostics

The drive detects error situations and reports them using:

- Status LED on the control panel
- Control panel display
- The Fault Word and Alarm Word parameter bits

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

FAULTS (RED LED LIT)

The VFD signals that it has detected a severe error, or fault, by:

- Enabling the red LED on the drive (LED is either steady or flashing)
- Setting an appropriate bit in a Fault Word parameter
- Overriding the control panel display with the display of a fault code
- Stopping the motor (if it was on)

The fault code on the control panel display is temporary. Pressing the MENU, (Press ⌯). buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched, and the fault is still active. See Table 36 for a list of fault codes.

ALARMS (GREEN LED FLASHING)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

- Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
- Sets an appropriate bit in an Alarm Word parameter
- Overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists. See Table 36 for a list of alarm codes.

CORRECTING FAULTS

The recommended corrective action for faults is shown in Table 36. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter, digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

CORRECTING ALARMS

To correct alarms, first determine if the alarm requires any corrective action (action is not always required). Use Table 36 to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact Carrier.

HISTORY

For reference, the last three fault codes are stored into parameters 04.11, 04.12, and 04.13 for ACH580 and ACH180.

In the ACH580 and ACH180, the drive stores three each of non-active faults and warnings (04.11 through 04.18).

ACH180 VFD Diagnostics

The drive detects error situations and reports them using the Status LED on the control panel (see Fig. 50). See Table 36 for more information about the Fault and Alarm Codes.

FAULTS (RED LED LIT)

The VFD signals that it has detected a severe error, or fault, by:

1. Enabling the red LED on the drive (LED is either steady or flashing)
2. Setting an appropriate bit in a Fault Word parameter
3. Overriding the control panel display with the display of a fault code
4. Stopping the motor (if it was on)

ALARMS (GREEN LED FLASHING)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

1. Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
2. Sets an appropriate bit in an Alarm Word parameter
3. Overrides the control panel display with the display of an alarm code and/or name

Table 36 — Fault and Alarm Codes for ACH580/ACH180 VFD

CODE (HEX)	WARNING / AUX. CODE	CAUSE	WHAT TO DO
A2B1	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this warning may also be caused by an earth fault or supply phase loss.	Check motor load. Check acceleration times in parameter group 23 Speed reference ramp (speed control) or 28 Frequency reference chain (frequency control). Also check parameters 46.01 Speed scaling, 46.02 Frequency scaling and 46.03 Torque scaling. Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter Electrical installation, section Checking the insulation of the assembly in the Hardware manual of the drive. Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 Motor data corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable.
A2B3	Earth Leakage	Drive has detected load unbalance typically due to earth fault in motor or motor cable.	Check there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter Electrical installation, section Checking the insulation of the assembly in the Hardware manual of the drive. If an earth fault is found, fix or change the motor cable and/or motor. If no earth fault can be detected, contact your local Carrier representative.
A2B4	Short Circuit	Short-circuit in motor cable(s) or motor.	Check motor and motor cable for cabling errors. Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter Electrical installation, section Checking the insulation of the assembly in the Hardware manual of the drive. Check there are no power factor correction capacitors or surge absorbers in motor cable.
A6A4	Motor Nominal Value	The motor parameters are set incorrectly. The drive is not dimensioned correctly.	Check the auxiliary code. See actions for each code below.
A6A4	Motor Nominal Value 0001	Slip frequency is too small.	Check the settings of the motor configuration parameters in groups 98 and 99. Check that the drive is sized correctly for the motor.
A6A4	Motor Nominal Value / 0002	Synchronous and nominal speeds differ too much.	Check the settings of the motor configuration parameters in groups 98 and 99.
	Motor Nominal Value / 0003	Nominal speed is higher than synchronous speed with 1 pole pair.	
	Motor Nominal Value / 0004	Nominal current is outside limits.	
	Motor Nominal Value / 0005	Nominal voltage is outside limits.	
	Motor Nominal Value / 0006	Mechanical nominal power is higher than electrical active power.	
	Motor Nominal Value / 0007	Nominal power not consistent with nominal speed and torque.	
A780	Motor Stall Programmable Warning: 31.24 Stall Function	Motor is operating in stall region because of, for example, excessive load or insufficient motor power.	Check motor load and drive ratings. Check fault function parameters.
A783	Motor Overload	Motor current is too high.	Check for overloaded motor. Adjust the parameters used for the motor overload function (35.51...35.53) and 35.55...35.56.
A784	Motor Disconnect	All three output phases are disconnected from motor.	Check that switches between drive and motor are closed. Check that all cables between drive and motor are connected and secured. If no issue was detected and drive output was actually connected to motor, contact Carrier.
A7AB	Extension I/o Configuration Failure	Installed extension module is not the same as configured.	Check that the installed extension module (shown by parameter 15.02 Detected extension module) is the same as selected by parameter 15.01 Extension module type.
A7C1	FBAA Communication Programmable Warning: 50.02 FBAA Comm Loss Function	Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out. Check cable connections. Check if communication master is able to communicate.
A7CE	EFB Comm Loss Programmable Warning: 58.14 Communication Loss Action	Communication break in embedded fieldbus (EFB) communication.	Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit for ACH580 or EIA-485 terminals 25, 26, 27, and 28 for ACH180.
A7EE	Panel Loss Programmable Warning: 49.05 Communication Loss Action	Control panel or PC tool selected as active control location for drive has ceased communicating.	Check PC tool or control panelcconnection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel.
A88F	Cooling Fan	Maintenance timer limit exceeded.	Consider changing the cooling fan. Parameter 05.04 Fan on-time counter shows the running time of the cooling fan.

Table 36 — Fault and Alarm Codes for ACH580/ACH180 VFD (cont)

CODE (HEX)	WARNING / AUX. CODE	CAUSE	WHAT TO DO
AFAA	Auto Reset	A fault is about to be auto reset.	Informative warning. See the settings in parameter group 31 Fault functions.
AFE1	Emergency Stop (Off2)	Drive has received an emergency stop (mode selection off2) command.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. If the emergency stop was unintentional, check the source selected by parameter 21.05 Emergency stop source.
AFE2	Emergency Stop (Off 1 Or Off3)	Drive has received an emergency stop (mode selection off1 or off3) command.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. If the emergency stop was unintentional, check the source selected by parameter 21.05 Emergency stop source.
AFE9	Start Delay	The start delay is active and the drive will start the motor after a predefined delay.	Informative warning. See parameter 21.22 Start delay.
AFED	Run Permissive	Run permissive is keeping the drive from running the motor.	Check the setting of (and source selected by) parameter 20.40 Run permissive.
AFEE	Start Interlock 1	Start interlock 1 is keeping the drive from starting.	Check the signal source selected for parameter 20.41 Start interlock 1.
AFEF	Start Interlock 2	Start interlock 2 is keeping the drive from starting.	Check the signal source selected for parameter 20.42 Start interlock 2.
AFF0	Start Interlock 3	Start interlock 3 is keeping the drive from starting.	Check the signal source selected for parameter 20.43 Start interlock 3.
AFF1	Start Interlock 4	Start interlock 4 is keeping the drive from starting.	Check the signal source selected for parameter 20.44 Start interlock 4.
AFF2	Run Permissive Forced Warning	A forced DI is used as a source for parameter 20.40 Run permissive.	If 20.40 Run permissive uses DIx as the source, check if the bit corresponding to DIx in parameter 10.03 DI force selection is 1.
AFF3	Start Interlock Forced Warning	One or more forced DIs is used as a source for one or more of parameters 20.41 Start interlock 1 ... 20.44 Start interlock 4.	Check all parameters 20.41 Start interlock 1 ... 20.44 Start interlock 4. If any of these parameters uses DIx as the source, check if the bit corresponding to DIx in parameter 10.03 DI force selection is 1.
AFF5	Override New Start Required	The Safe torque off function was active and has been reset while in Override.	A new start signal is required to start the drive again.
AFF6	Identification Run	Motor ID run will occur at next start.	Informative warning.
AFF8	Motor Heating Active	Pre-heating is being performed.	Informative warning. Motor pre-heating is active. Current specified by parameter 21.16 Preheating current is being passed through the motor.
AFFE	Override Active	Drive is in Override mode.	Informative warning.
B5A2	Power Applied	The drive was powered up or the control board was rebooted successfully.	Informative event.
B681	Hand Mode Selected	The drive was placed in Hand mode.	Informative event. Check the control panel to ensure that the current control location is correct.
B682	Off Mode Selected	The drive was placed in Off mode.	Informative event. Check the control panel to ensure that the current control location is correct.
B683	Auto Mode Selected	The drive was placed in Auto mode.	Informative event. Check the control panel to ensure that the current control location is correct.
2310	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this fault may also be caused by an earth fault or supply phase loss.	Check motor load. Check acceleration times in parameter group 23 Speed reference ramp (speed control) or 28 Frequency reference chain (frequency control). Also check parameters 46.01 Speed scaling, 46.02 Frequency scaling and 46.03 Torque scaling. Check motor and motor cable (including phasing and delta/star connection). Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter Electrical installation, section Checking the insulation of the assembly in the Hardware manual of the drive.
FF61	ID Run	Motor ID run was not completed successfully.	Check the nominal motor values in parameter group 99 Motor data. Check that no external control system is connected to the drive. Cycle the power to the drive (and its control unit, if powered separately). Check that no operation limits prevent the completion of the ID run. Restore parameters to default settings and try again. Check that the motor shaft is not locked. Check the auxiliary code. See actions for each code below.

VFD MAINTENANCE

If installed in an appropriate environment, the VFD requires very little maintenance, but it is recommended that the VFD receives regular maintenance by the user. These items include:

- control panel cleaning
- recommended annual actions (see Table 38)
- cleaning the heatsink

Control Panel Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery Replacement

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Routine Maintenance

Table 37 lists the routine maintenance intervals recommended by Carrier. Table 38 lists the recommended annual actions.

Table 37 — Maintenance Intervals

MAINTENANCE	INTERVAL
Heat sink temperature check and cleaning	Every 6 to 12 months (depending on the dustiness of the environment)
Remote keypad battery change	Every ten years

Table 38 — Recommended Annual Actions by the User

CONNECTIONS AND ENVIRONMENT							
Quality of the Supply Voltage	P						
SPARE PARTS							
Spare Parts	I						
Reforming DC Circuit Capacitors of Spare Drives	P						
INSPECTIONS							
Tightness of Terminals	I						
Dustiness, Corrosion and Temperature	I						
Cleaning the Heatsink	P						

MAINTENANCE TASK/OBJECT[a,b]	**YEARS FROM START-UP**						
	3	**6**	**9**	**12**	**15**	**18**	**21**
COOLING FANS							
Main Cooling Fan (Frames R1-R4)		R		R		R	
FUNCTIONAL SAFETY							
Safety Function Test	I (See the maintenance information of the safety function.)						
Safety Component Expiry (mission time T_M)	20 years						

NOTE(S):

a. Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. Carrier recommends annual drive inspections to ensure the highest reliability and optimum performance.
b. Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components.

LEGEND

ACTION		DESCRIPTION
I	—	Inspection (visual inspection and maintenance action if needed)
P	—	Performance of on/off-site work (commissioning, tests, measurements or other work)
R	—	Replacement

Heat Sink Cleaning

The heat sink fins accumulate dust from the cooling air. The drive runs into overtemperature warnings and faults if the heat sink is not cleaned. In a normal environment check the heat sink annually, in a dusty environment check more often.

Use the following procedure to clean the heat sink on ACH180 VFDs:

1. Turn off and lock out unit power.
2. Remove the module cooling fan(s). See Fig. 59.

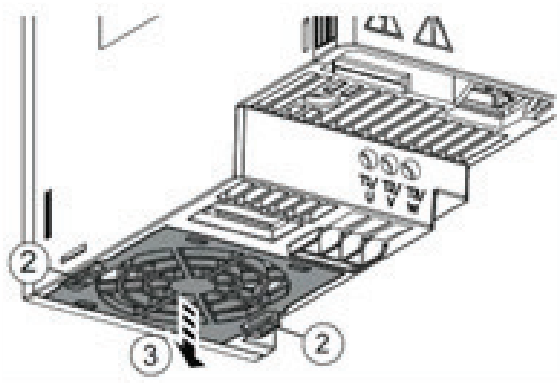


Fig. 59 — Remove ACH180 Cooling Fan

3. Blow dry, clean and oil-free compressed air from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. If there is a risk of dust entering adjoining equipment, do the cleaning in another room.
4. Reinstall the cooling fan. See Fig. 60.

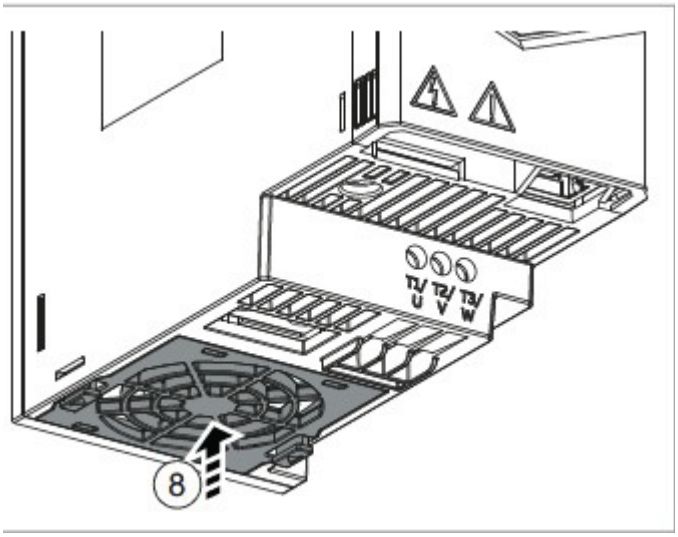


Fig. 60 — Reinstall ACH180 Cooling Fan

Use the following procedure to clean the heat sink on AHC580 VFDs:

1. Turn off and lock out unit power.
2. Remove the drive cover (see Fig. 61).
3. Remove the top fan cover (see Fig. 62).
4. Blow clean compressed air (not humid) from bottom to top while simultaneously using a vacuum cleaner at the air outlet to trap the dust.
5. Replace the top fan cover.
6. Replace the drive cover.
7. Restore power.

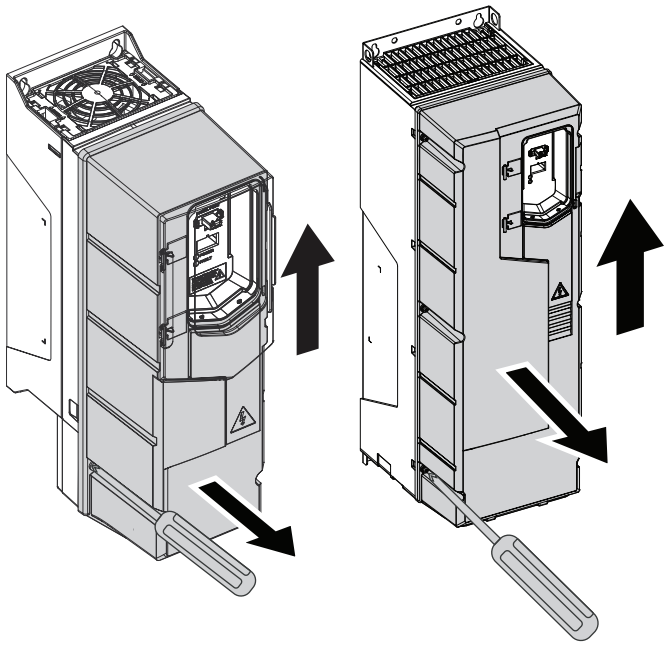


Fig. 61 — Remove Drive Cover (R1 and R2 Frame Sizes)

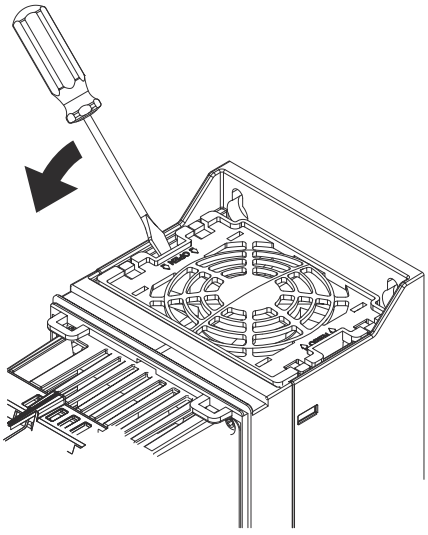


Fig. 62 — Remove Top Cover/Fan Assembly on ACH580 VFD

Fan Replacement

The life span of the drive's cooling fan(s) depends on the drive usage and ambient temperature. Parameter 05.04 "Fan On-Time Counter" shows the running time of the cooling fan. After you replace the fan, reset the fan counter.

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heat sink temperature in spite of heat sink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from Carrier.

ACH580 MAIN FAN REPLACEMENT

To replace the main fan for frame sizes R1 and R2, perform the following (see Fig. 63 and 64):

1. Remove power from drive. Wait for 5 minutes and then make sure by measuring that there is no voltage
2. Remove drive cover.
3. Press together the retaining clips on the fan cover and lift. Disconnect the fan cable.
4. Install the new fan by reversing Steps 2 to 4.
5. Restore power.

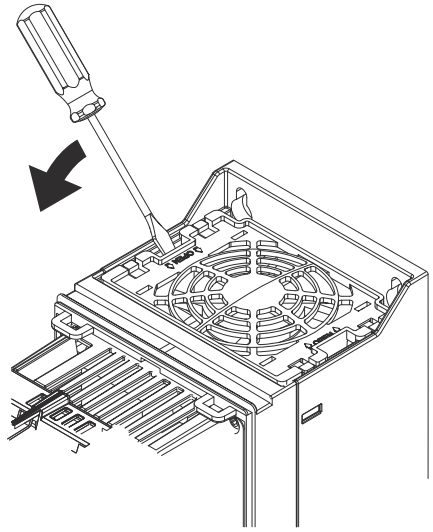


Fig. 63 — Remove Main Fan Fingerguard

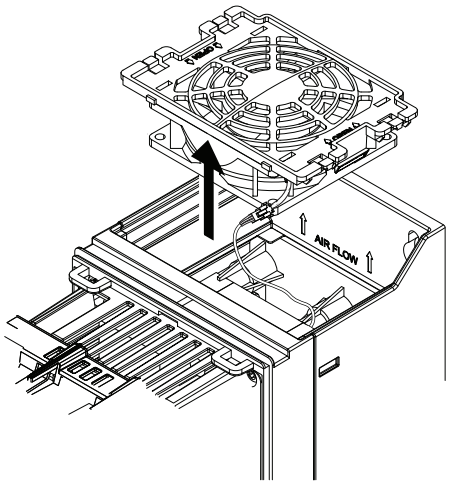


Fig. 64 — Remove Main Fan

ACH580 AUXILIARY COOLING FAN REPLACEMENT

To replace the internal enclosure fan for frame sizes R1 and R2 perform the following (see Fig. 65, 66, and 67):

1. Remove power from drive. Wait for 5 minutes and then make sure by measuring that there is no voltage.
2. Remove the remote keypad, if installed. See Fig. 65.
3. Remove the front cover by loosening the retaining screw. See Fig. 66.
4. Unplug fan power supply wires from the drive (see Fig. 67).
5. Remove the fingerguard: Insert a screwdriver into the hole of the fingerguard (see Fig. 67).
6. Unplug the fan power supply wires from the drive (see Fig. 67).
7. Pull off the fan.
8. Install the new fan in reverse order.

NOTE: Make sure that the arrow on the fan points to the same direction as the arrow on the drive frame.

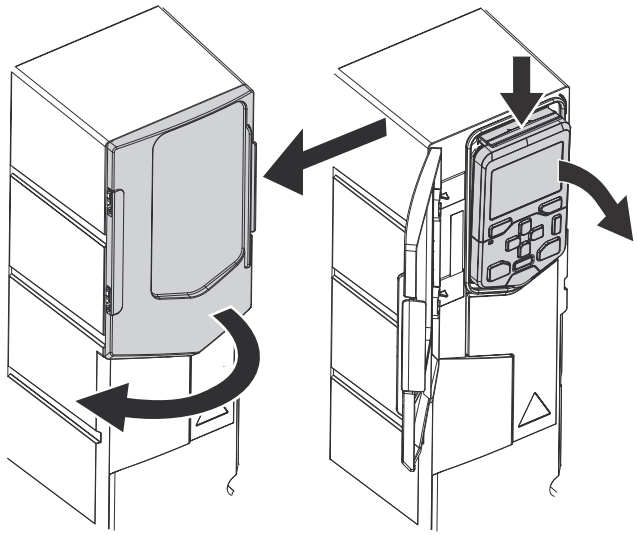


Fig. 65 — Open Keypad Cover and Remove Keypad

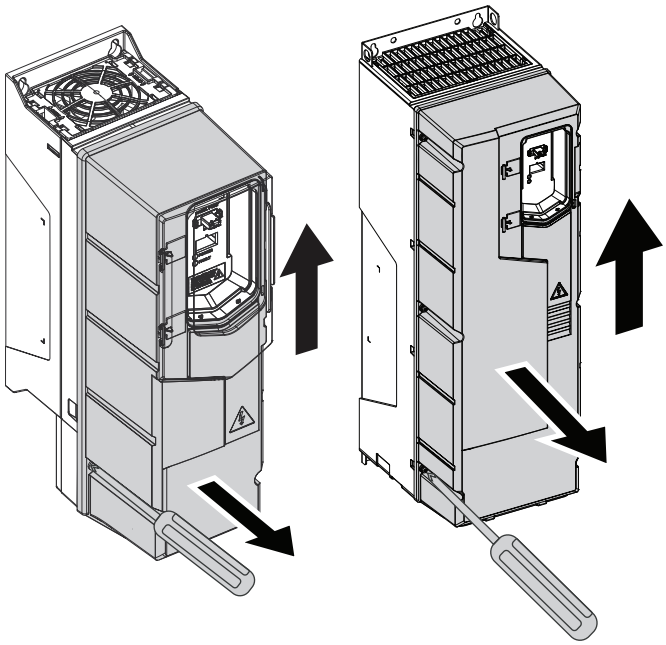


Fig. 66 — Remove Drive Cover (R1 and R2 Frame Sizes)

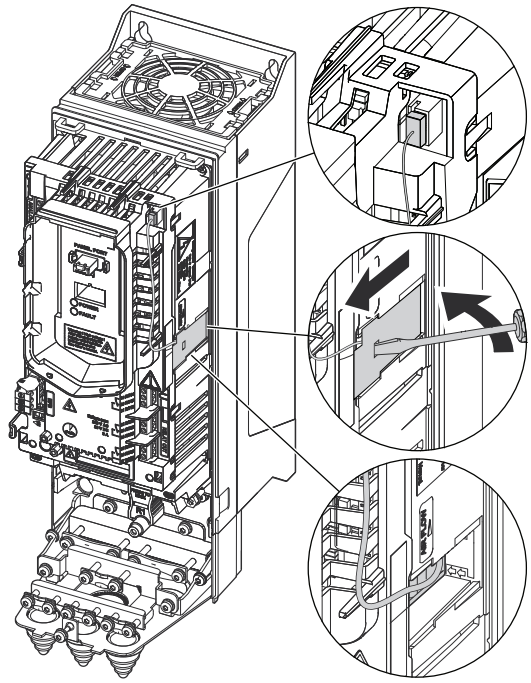


Fig. 67 — Remove Auxiliary Fan

ACH180 COOLING FANS REPLACEMENT

1. Stop the drive and lockout unit energy.
2. Press the two clips by fingers to open the fan cover.
3. Carefully lift the fan cover out of the drive. Note that the fan cover holds the cooling fan. See Fig. 68.

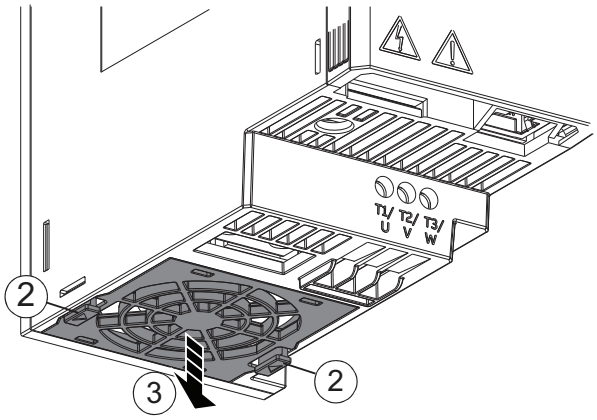


Fig. 68 — Lifting the Fan Cover out of Drive

4. Disconnect the fan power cable. See Fig. 69.

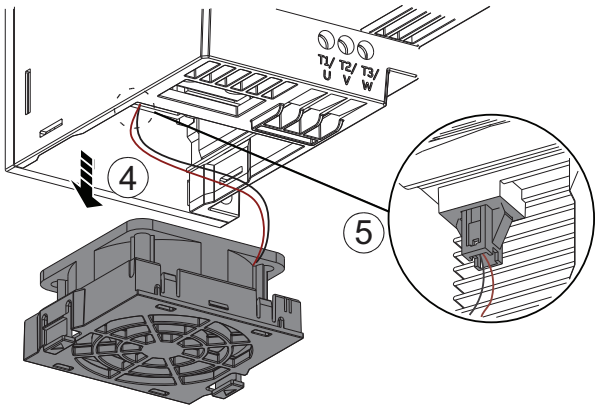


Fig. 69 — Disconnecting the Fan

5. Free the fan clips and remove the fan from the fan cover.
6. Install the new fan into the fan cover. Make sure that the air flow is in the correct direction. The air flows in from the bottom of the drive and out from the top of the drive. As shown in the following figure, the side with the fan power cable is aligned to the double bars sign on the fan cover. See Fig. 70.

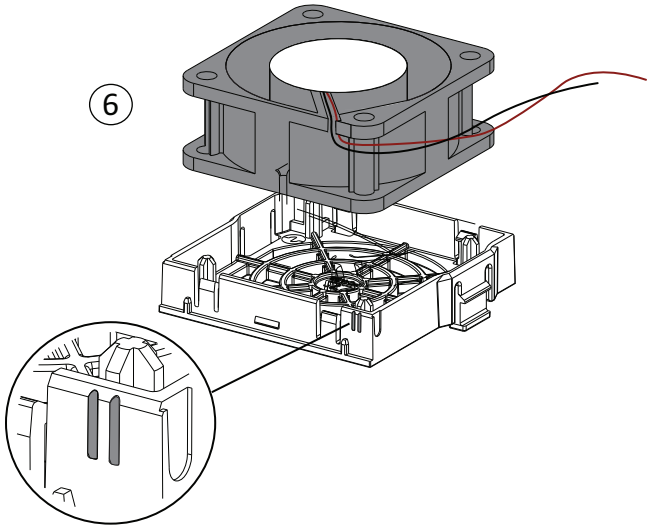


Fig. 70 — Install New Fan into Fan Cover

7. Connect the fan power cable. (See Fig. 71.)

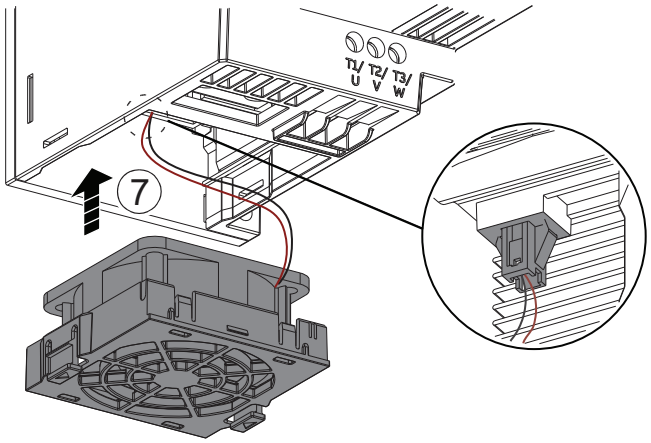


Fig. 71 — Connect Fan To Power

8. Carefully put the fan cover into position in the drive. Make sure that the fan power cable is routed correctly. Push the cover to lock into position. (See Fig. 72.)

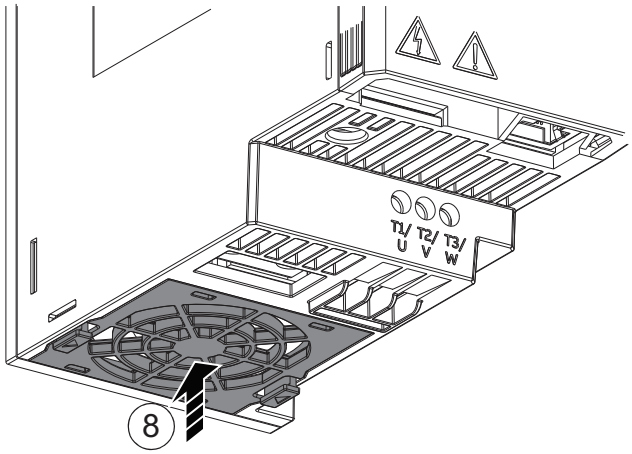


Fig. 72 — Place Fan Cover Back into Drive

Bypass the VFD

⚠ WARNING

Bypassing the VFD is not recommended. This is a temporary procedure to provide cooling or heating operation when a new VFD is required. When in this bypass mode the fire shut down will not turn off the blower and it will continue to run. The bypass should only be used for a short duration until a new VFD has been received.

The factory-installed VFD is wired and agency approved as outlined in this manual. This VFD is utilized to help provide added efficiencies and comfort during the cooling operation.

If there is an occasion where the VFD has mis-functioned and temporary cooling/operation is required, bypass the VFD as shown in Fig. 73.

To bypass ACH180 VFD on fused units (208/230-v, 460-v):

1. Turn off and lock out unit power.
2. Disconnect the connector linking the fuse to the VFD.
3. Disconnect the connector between the VFD and the indoor fan motor.
4. Disconnect the ground wires at the base of the VFD.
5. Remove the VFD, if required.
6. Replace standard fuses with Slow Blow fuses.
7. Connect the lead from the fuse to the lead from the indoor fan motor.
8. Connect the ground wire from the indoor fan motor to the fan deck.
9. Restore power.

IMPORTANT: It is recommended NOT to bypass the ACH580 VFD on 40RL 575-3-60 units.

Condensate Drains

Keep condensate drains free of dirt and foreign matter.

Return-Air Filters

Refer to Replacing Filters section on page 62 for filter accessibility and removal. Replace with clean filters of the sizes listed in Tables 1-5.

Chilled Water Coil Freeze Protection

Shut off water supply to unit. Remove side panel of unit and remove vent and drain plugs in top and bottom of coil header. Drain coil and blow out remaining water. Reinstall plugs and side panel. Alternative freeze protection methods follow:

- Circulate hot water within the water coil's supply main or supplementary space heating.
- Close off supply lines to unit and open a union or field-supplied drain valve in the return line.

IMPORTANT: Draining from return line will not completely drain water from coils.

- After draining as much water as possible from coils, add sufficient antifreeze to prevent residual water in the coil from freezing.
- Add a sufficient quantity of non-corrosive antifreeze to the entire system to prevent all water within the system from freezing.

Coil Removal

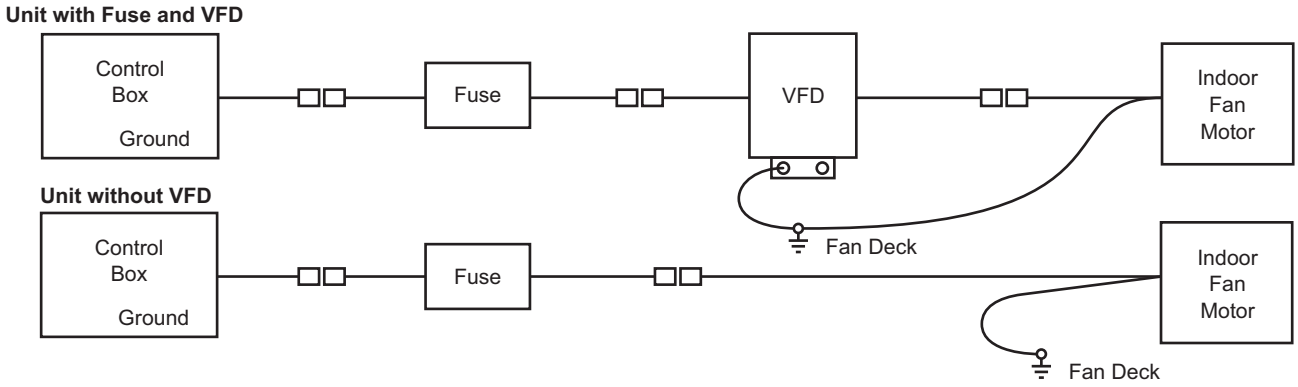
Remove unit panels and corner posts as required. Disconnect coil connections and remove fastening screws. Remove coil through end or side sections of unit.

Cleaning Cooling Coil

Remove return-air filters. Remove any heavy dirt that may have accumulated on underside of coil. Coil can be cleaned more easily with a stiff brush, vacuum cleaner, or compressed air when coil is dry. If coil is wet or if water is to be used for cleaning, guard against splashing water on electrical components or damaging surrounding area. Clean coil baffles as applicable and check for tight fit to be sure air does not bypass coil.

Cleaning Insulation

The insulation contains an immobilized antimicrobial agent that helps inhibit the growth of bacteria and fungi. Clean the inner surface of the insulation according to the separate maintenance instructions shipped with the unit.



NOTE: Standard fuses need to be replaced with Slow Blow fuses for bypass.

Fig. 73 — To Bypass ACH180 VFD on Fused Units — 40RL 208/230-3-60, 460-3-60 Units

Replacing Filters

Filters can be removed and installed from either side of the unit. Install new filters in units that have one fan as follows:

1. Remove the side access panel (retain screws).
2. Remove the filter retainer clip (see Fig. 74).
3. Remove old filters by lifting and tilting them out of the filter track. See Fig. 16 and 75.
4. Reverse the procedure to install new filters.

To install new filters in larger units that have 2 fans, follow the preceding steps, but use the factory-supplied filter hook to slide filters within reach for removal. The filter hook is shipped inside the unit in the filter track.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this CAUTION can result in premature wear and damage to equipment.

DO NOT OPERATE THE UNIT WITHOUT THE RETURN AIR FILTERS IN PLACE.

Dirt and debris can collect on heat exchangers and coils possibly resulting in a small fire. Dirt buildup on components can cause excessive current used resulting in motor failure.

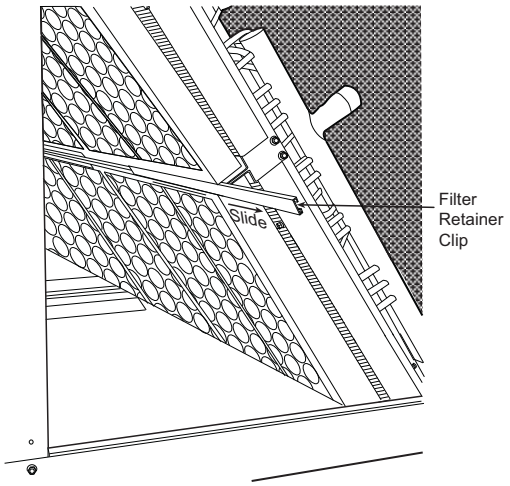


Fig. 74 — Remove Filter Retainer Clip

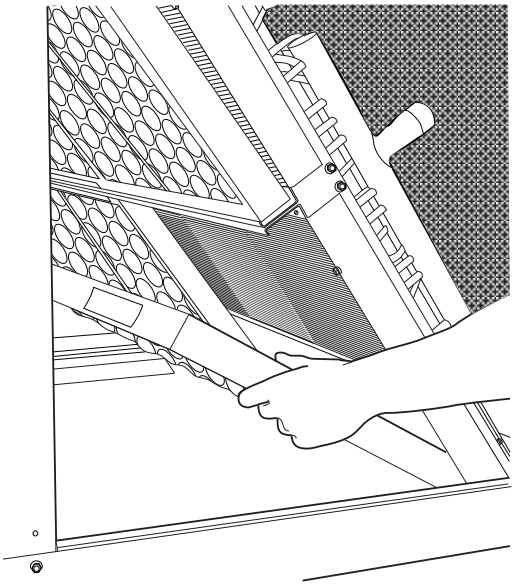


Fig. 75 — Filter Removal/Replacement

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate the system electrically.
3. Before attempting the procedure, ensure that:
   a. Mechanical handling equipment is available, if required for handling refrigerant cylinders
   b. All personal protective equipment is available and being used correctly
   c. The recovery process is supervised at all times by a competent person
   d. Recovery equipment and cylinders conform to the appropriate standards
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that the cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% of volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from the site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labelled that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

APPENDIX A — VFD PARAMETERS

Table A — ACH180 Common Parameters

Parameters	Description	Setting
10.24	RO1 Source	FAULT (-1) [15]
12.17	AI1 Min	2.00% [0.200 V]
13.12	AO1 Source	—
19.11	EXT1/EXT2 Selection	EXT1 [0]
20.01	EXT1 Commands	In1 Start [1]
20.40	Run Permissive	—
20.41	Start Interlock 1	Not Used [0]
21.03	Stop Mode	Coast [0]
21.19	Scalar Start Mode	Automatic [2]
28.11	EXT1 Frequency Ref1	AI1 Scaled [1]
28.22	Constant Frequency Sel1	DI3 [4]
28.26	Constant Frequency 1	40 Hz
28.27	Constant Frequency 2	60 Hz
28.28	Constant Frequency 3	60 Hz
28.29	Constant Frequency 4	—
28.71	Freq Ramp Set Selection	Not Selected [0]
28.72	Freq Acceleration Time 1	30 sec.
28.73	Freq Deceleration Time 1	30 sec.
30.13	Minimum Frequency	0.0Hz
30.14	Maximum Frequency	60Hz
31.12	Autoreset Selection	—
31.15	Total Trials Time	300.0 sec.
31.16	Delay Time	6.0 sec.
58.01	Protocol Enable	—
58.03	Node Address	—
58.04	Baud Rate	—
58.05	Parity	—
97.01	Switching Frequency Reference	4 kHz [4]
97.13	IR Compensation	0%

Table B — ACH580 Common Parameters

Parameters	Description	Setting
10.24	RO1 Source	—
10.30	RO3 Source	Fault (-1)
12.17	AI1 Min	2%
13.12	AO1 Source	—
19.11	EXT1/EXT2 Selection	EXT1
20.01	EXT1 Commands	In1 Start
20.40	Run Permissive	—
20.41	Start Interlock 1	Not Used
21.03	Stop Mode	Ramp
21.19	Scalar Start Mode	Automatic
28.11	EXT1 Frequency Ref1	AI1 Scaled
28.22	Constant Frequency Sel1	DI2, 3
28.26	Constant Frequency 1	40 Hz
28.27	Constant Frequency 2	60 Hz
28.28	Constant Frequency 3	60 Hz
28.29	Constant Frequency 4	—
28.72	Freq Acceleration Time 1	30 sec.
28.73	Freq Deceleration Time 1	30 sec.
30.13	Minimum Frequency	0 Hz
30.14	Maximum Frequency	60 Hz
51.01	FBA A Type	—
58.01	Protocol Enable	—
58.03	Node Address	—
58.04	Baud Rate	—
58.05	Parity	—
58.25	Control Profile	—
97.01	Switching Frequency	4 kHz

APPENDIX A — VFD PARAMETERS (cont)

Table C — ACH180 VFD Parameters for 40RL Units with Electromechanical Controls

VFD PARAMETERS	PKG ABB ACH180	MOTOR PART NUMBER	VFD PART NUMBER	REPLACEMENT COMPONENT NUMBER	DRIVE HP	DESCRIPTION	VOLTAGE	NOM. AMPS	MOTOR NOM. FREQ	NOM. RPM	NOM. HP	MAX AMPS
							99.07	99.06	99.08	99.09	99.10	30.17
40RU000898-DATA	40RU000898	HD58FE654	HK30WB504	HK30WB504	3.0	40RL VFD 2.9 HP 230V	230	8.6	60 Hz	1,725	2.9	9.9
40RU000899-DATA	40RU000899	HD60FE656	HK30WB505	HK30WB505	5.0	40RL VFD 3.7 HP 230V	230	10.8	60 Hz	1,725	3.7	12.4
40RU000900-DATA	40RU000900	HD60FQ659	HK30WB506	HK30WB506	7.0	40RL VFD 5.0 HP 230V	230	17.0	60 Hz	1,760	5.0	19.6
40RU000901-DATA	40RU000901	HD62FQ654	HK30WB506	HK30WB506	7.0	40RL VFD 7.5 HP 230V	230	21.5	60 Hz	1,760	7.5	24.7
40RU000902-DATA	40RU000902	HD64FQ654	HK30WB507	HK30WB507	10.0	40RL VFD 10.0 HP 230V	230	28.6	60 Hz	1,755	10.0	32.2
40RU000903-DATA	40RU000903	HD58FE654	HK30WB510	HK30WB510	3.0	40RL VFD 2.9 HP 460V	460	3.8	60 Hz	1,725	2.9	4.4
40RU000904-DATA	40RU000904	HD60FE656	HK30WB511	HK30WB511	5.0	40RL VFD 3.7 HP 460V	460	4.9	60 Hz	1,725	3.7	5.6
40RU000905-DATA	40RU000905	HD60FQ659	HK30WB512	HK30WB512	7.0	40RL VFD 5.0 HP 460V	460	7.6	60 Hz	1,760	5.0	8.7
40RU000906-DATA	40RU000906	HD62FQ654	HK30WB512	HK30WB512	7.0	40RL VFD 7.5 HP 460V	460	14.3	60 Hz	1,760	7.5	16.4
40RU000907-DATA	40RU000907	HD64FQ654	HK30WB513	HK30WB513	10.0	40RL VFD 10.0 HP 460V	460	15.2	60 Hz	1,755	10	17.5

Table D — ACH580 VFD Parameters for 40RL Units with Electromechanical Controls

VFD PARAMETERS	PKG ABB ACH580	MOTOR PART NUMBER	VFD PART NUMBER	REPLACEMENT COMPONENT NUMBER	DRIVE HP	DESCRIPTION	VOLTAGE	NOM. AMPS	MOTOR NOM. FREQ	NOM. RPM	NOM. HP	MAX AMPS
							99.07	99.06	99.08	99.09	99.10	30.17
40RU000894-DATA	40RU000894	HD58FE577	HK30WB370	HK30WB341	5.0	40RL VFD 3.7 HP 575V	575	4.9	60 Hz	1,725	3.7	5.6
40RU000895-DATA	40RU000895	HD60FX579	HK30WB371	HK30WB342	7.5	40RL VFD 5.0 HP 575V	575	8.0	60 Hz	1,745	5.0	9.2
40RU000896-DATA	40RU000896	HD62FX575	HK30WB371	HK30WB342	7.5	40RL VFD 7.5 HP 575V	575	9.0	60 Hz	1,750	7.5	10.4
40RU000897-DATA	40RU000897	HD64FX579	HK30WB372	HK30WB343	10.0	40RL VFD 10.0 HP 575V	575	11.0	60 Hz	1,755	10.0	12.7

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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START-UP CHECKLIST

Split Systems with 40RL Units

(Remove and use for job file)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation, Start-Up, and Service document.

I. PRELIMINARY INFORMATION

OUTDOOR:
MODEL NO. _____
SERIAL NO. _____
INDOOR:
MODEL NO. _____
SERIAL NO. _____
ADDITIONAL ACCESSORIES _____

II. PRE-START-UP

OUTDOOR UNIT

Is there any shipping damage?
If so, where:_____
Will this damage prevent unit start-up? (Y/N) _____
Check power supply. Does it agree with unit? (Y/N) _____
Has the ground wire been connected? (Y/N) _____
Has ground integrity been verified with a continuity test? (Y/N) _____
Has the circuit protection been sized and installed properly? (Y/N) _____
Are the power wires to the unit sized and installed properly? (Y/N) _____
Have compressor holddown bolts been loosened? (Y/N) _____

CONTROLS

Are thermostat(s) & indoor fan control wiring connections made & checked? (Y/N) _____
Are all wiring terminals (including main power supply) tight? (Y/N) _____
Have outdoor unit crankcase heaters been energized for 24 hours? (Y/N) _____

INDOOR UNIT

Has water been placed in drain pan to confirm proper drainage? (Y/N) _____
Are proper air filters in place? (Y/N) _____
Have fan and motor pulleys been checked for proper alignment? (Y/N)_____
Do the fan belts have proper tension? (Y/N)_____

PIPING

40RLA, 40RLQ

Has foam shipping block been removed from the TXV (Thermostatic Expansion Valve)? (Y/N) _____
Are Liquid Line Solenoid Valves located at the indoor unit or outdoor unit coils as required? (Y/N) _____
Have leak checks been made at compressors, condensers, indoor coils,
TXVs (Thermostatic Expansion Valves) solenoid valves, filter driers, and fusible plugs with a leak detector? (Y/N) _____
Locate, repair, and report any leaks. _____
Have all compressor service valves been fully opened (backseated) (Y/N) _____
Are the compressor oil sight glasses showing correct levels? (Y/N) _____

40RLS

Has air been bled from system? (Y/N) _____
Have leak checks been made at compressors, chillers, valves, & indoor coils? (Y/N) _____
Locate, repair, and report any leaks. _____

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB_____ V AC_____ V BC_____ V

(AB + AC + BC) / 3 = Average Voltage = _____V

Maximum deviation from average voltage = _____V

Voltage imbalance = 100 x (Max Deviation) / (Average Voltage) = _____

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!

CALL LOCAL POWER COMPANY FOR ASSISTANCE.

III. START-UP

Check indoor fan motor speed and record.

After at least 10 minutes running time, record the following measurements:

	COMP A1	COMP B1
Oil pressure	_____	_____
Suction pressure	_____	_____
Suction line temp	_____	_____
Discharge pressure	_____	_____
Discharge line temp	_____	_____
Entering outdoor unit air temp	_____	_____
Leaving outdoor unit air temp	_____	_____
Indoor unit entering air DB temp	_____	_____
Indoor unit entering air WB temp	_____	_____
Indoor unit leaving air DB temp	_____	_____
Indoor unit leaving air WB temp	_____	_____
Outdoor unit entering water temp (40RLS only)	_____	_____
Outdoor unit leaving water temp (40RLS only)	_____	_____
Indoor unit entering water temp (40RLS only)	_____	_____
Indoor unit leaving water temp (40RLS only)	_____	_____
Compressor amps (L1/L2/L3)	____/____/____	____/____/____

Check the compressor oil level sight glasses: are the sight glasses showing oil level at 1/8 to 1/3 full? (Y/N) _____

NOTES:

_____

_____

_____

_____

_____

_____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE