F1 Series

Indoor Air Handing Units

Installation, Operation & Maintenance

⚠ WARNING

QUALIFIED INSTALLER

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a trained, qualified installer. A copy of this IOM should be kept with the unit.

⚠ NOTICE

These instructions are addressed primarily to the installer; however, useful maintenance information is included. This manual should be kept with the unit for future reference.

⚠ WARNING

FOR YOUR SAFETY
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

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(ACP 29902)

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Safety

Attention should be paid to the following statements:

NOTE - Notes are intended to clarify the unit installation, operation and maintenance.

⚠ **CAUTION** - Caution statements are given to prevent actions that may result in equipment damage, property damage, or personal injury.

⚠ **WARNING** - Warning statements are given to prevent actions that could result in equipment damage, property damage, personal injury or death.

⚠ **DANGER** - Danger statements are given to prevent actions that will result in equipment damage, property damage, severe personal injury or death.

⚠ WARNING

ELECTRIC SHOCK, FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- Before servicing, disconnect all electrical power to the unit. More than one disconnect may be provided.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing. Secure all doors with key-lock or nut and bolt.

⚠ WARNING

Electric shock hazard. Before servicing, disconnect all electrical power to the unit, including remote disconnects, to avoid shock hazard or injury from rotating parts. Follow proper Lockout-Tagout procedures.

⚠ WARNING

FIRE, EXPLOSION OR CARBON MONOXIDE POISONING HAZARD

Failure to replace proper controls could result in fire, explosion or carbon monoxide poisoning. Failure to follow safety warnings exactly could result in serious injury, death or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this appliance.

⚠ WARNING

During installation, testing, servicing and troubleshooting of the equipment it may be necessary to work with live electrical components. Only a qualified licensed electrician or individual properly trained in handling live electrical components shall perform these tasks.

Standard NFPA-70E, an OSHA regulation requiring an Arc Flash Boundary to be field established and marked for identification of where appropriate Personal Protective Equipment (PPE) be worn, should be followed.

⚠ WARNING

GROUNDING REQUIRED

All field installed wiring must be completed by qualified personnel. Field installed wiring must comply with NEC/CEC, local and state electrical code requirements. Failure to follow code requirements could result in serious injury or death. Provide proper unit ground in accordance with these code requirements.

⚠ WARNING

UNIT HANDLING

To prevent injury or death lifting equipment capacity shall exceed unit weight by an adequate safety factor. Always test-lift unit not more than 24 inches high to verify proper center of gravity lift point to avoid unit damage, injury or death.

⚠ WARNING

ROTATING COMPONENTS

Unit contains fans with moving parts that can cause serious injury. Do not open door containing fans until the power to the unit has been disconnected and fan wheel has stopped rotating.

⚠ CAUTION

Failure to properly drain and vent coils when not in use during freezing temperature may result in coil and equipment damage.

⚠ CAUTION

Rotation must be checked on all MOTORS AND COMPRESSORS of 3 phase units at startup by a qualified service technician. Scroll compressors are directional and can be damaged if rotated in the wrong direction. Compressor rotation must be checked using suction and discharge gauges. Fan motor rotation should be checked for proper operation. Alterations should only be made at the unit power connection

⚠ WARNING

Do not use oxygen, acetylene or air in place of refrigerant and dry nitrogen for leak testing. A violent explosion may result causing injury or death.

⚠ WARNING

Always use a pressure regulator, valves and gauges to control incoming pressures when pressure testing a system. Excessive pressure may cause line ruptures, equipment damage or an explosion which may result in injury or death.

⚠ WARNING

Do not work in a closed area where refrigerant or nitrogen gases may be leaking. A sufficient quantity of vapors may be present and cause injury or death.

⚠ CAUTION

Do not clean DX refrigerant coils with hot water or steam. The use of hot water or steam on refrigerant coils will cause high pressure inside the coil tubing and damage to the coil.

⚠ CAUTION

To prevent damage to the unit, do not use acidic chemical coil cleaners. Do not use alkaline chemical coil cleaners with a pH value greater than 8.5, after mixing, without first using an aluminum corrosion inhibitor in the cleaning solution.

⚠ WARNING

Some chemical coil cleaning compounds are caustic or toxic. Use these substances only in accordance with the manufacturer's usage instructions. Failure to follow instructions may result in equipment damage, injury or death.

⚠ WARNING

Risk of injury from hot parts – Disconnect all power, close all isolation valves and allow equipment to cool before servicing equipment with heating coils. Hot water will circulated even after the power is off.

⚠ CAUTION

PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain chemicals. Polyolester (POE) oils used with R-410A and other refrigerants, even in trace amounts, in a PVC or CPVC piping system will result in stress cracking of the piping and fittings and complete piping system failure.

1. Startup and service must be performed by a Factory Trained Service Technician.

2. The unit is for indoor use only. See General Information section for more unit information.

3. Every unit has a unique equipment nameplate with electrical, operational, and unit clearance specifications. Always refer to the unit nameplate for specific ratings unique to the model you have purchased.

4. READ THE ENTIRE INSTALLATION, OPERATION AND MAINTENANCE MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.

5. Keep this manual and all literature safeguarded near or on the unit.

F1 Series Feature String Nomenclature

Model/Feature Number

F1	-	B	-	060	-	1	-	M	-	C	:	C	0	0	0	C	000	0	0
Series and Generation		Rev.		Unit Size		Voltage		App.		Heat		Mtrs	Filters	Cntls	Blank	Refri.	Blank	Cabinet	Special

BASE MODEL

SERIES AND GENERATION
F1

REVISION
B = Design Sequence

UNIT SIZE
024 = 24 MBH (2 ton)
036 = 36 MBH (3 ton)
048 = 48 MBH (4 ton)
060 = 60 MBH (5 ton)

VOLTAGE
1 = 208-230V/1Φ/60Hz

APPLICATION
V = Vertical Position (Up-flow)
M = Multi-Position (Up-flow or Horizontal)

HEATING
0 = No Heat
A = 5 kW
B = 10 kW
C = 15 kW
D = 20 kW
E = 25 kW
G = Hot Water Heating

FEATURE 1: MOTORS

A = ECM - 1/2 hp
B = ECM - 3/4 hp
C = ECM - 1.0 hp

FEATURE 2: FILTERS

0 = Standard - 1”

FEATURE 3: CONTROLS

0 = Standard - Terminal Block

FEATURE 4: BLANK

0 = Standard

FEATURE 5: REFRIGERATION

0 = Standard - Split System Air Conditioner
C = Split System Heat Pump
D = Split System Air Conditioner + Modulating Hot Gas Reheat
F = Split System Heat Pump + Modulating Hot Gas Reheat

FEATURE 6: BLANK

0 = Standard

FEATURE 7: BLANK

0 = Standard

FEATURE 8: BLANK

0 = Standard

FEATURE 9: CABINET

0 = Standard - Galvanized Steel
A = Painted Cabinet Exterior

FEATURE 10: SPECIAL

0 = Standard
X = Special Price Authorization

General Information

F1 Series air handling units are designed for safe operation when installed, operated and maintained within design specifications and the instructions set forth in this manual. It is necessary to follow these instructions to avoid personal injury or damage to equipment or property during equipment installation, operation, start-up and maintenance.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer. A copy of this IOM should be kept with the unit.

⚠ WARNING

This equipment is protected by a standard limited warranty under the condition that initial startup and maintenance is performed according to the instructions set forth in this manual. This manual should be read in its entirety prior to installation and before performing any service or maintenance work.

⚠ CAUTION

These units must not be used as a "construction heater" at anytime during any phase of construction. Very low return air temperatures, harmful vapors, and misplacement of the filters will damage the unit and its efficiency.

Certification of Cooling Models

a. Certified for use with a R-410A condensing unit with a scroll compressor.
b. Certified for indoor installation only

Certification of Cooling and Reheat Models

a. Certified for use with a R-410A condensing unit with a scroll compressor and hot gas dehumidification capabilities.
b. Certified for indoor installation only

Certification of Electric Heat Models

a. Certified as an electric heating air handling unit with a cooling coil.
b. Certified for indoor installation only.

Codes and Ordinances

F1 Series units have been tested and certified, by ETL, in accordance with UL Safety Standard 1995/CSA C22.2 No. 236.

System should be sized in accordance with the American Society of Heating, Refrigeration and Air Conditioning Engineers Handbook.

Installation of F1 Series units must conform to the ICC standards of the International Mechanical Code, the International Building Code, Installation of Air Conditioning and Ventilating Systems Standard, NFPA 90A, and local building, plumbing and waste water codes. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70 or the current Canadian Electrical Code CSA C22.1.

Important: The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants in this unit. Failure to follow these regulations may harm the environment and can lead to

the imposition of substantial fines. Because regulations may vary due to passage of new laws, AAON suggests a certified technician perform any work done on this unit. Should you have any questions please contact the local office of the EPA.

⚠ WARNING

Do not, under any circumstances, connect ductwork to any other heat producing device such as fireplace insert, stove, etc. Unauthorized use of such devices may result in property damage, fire, carbon monoxide poisoning, explosion, personal injury or death.

⚠ WARNING

It is the responsibility of the installing contractor to comply with codes, ordinances, local and municipal building laws, and manufacturer's instruction. Personal injury and/or equipment damage may result if proper procedures are not followed.

⚠ CAUTION

The Clean Air Act of 1990 bans the intentional venting of refrigerant as of July 1, 1992. Approved methods of recovery, recycling, or reclaiming must be followed.

⚠ CAUTION

Always wear hand and eye protection when handling, installing, servicing, or maintaining equipment. Sharp edges, moving parts and fly debris may cause personal injury and care must be taken when working with equipment.

Any conflicting codes or regulations take precedence over the information in this manual. It is important that all installation and service work be performed by qualified professionals.

Receiving Units

All shipments are FOB from the factory. It is the responsibility of the receiving party to inspect the equipment upon arrival. Units should be inspected for damage that may have occurred in transit.

Check the unit model number, specifications, electrical characteristics and accessories to determine if they are correct. In the event an incorrect unit is shipped, it must be returned to the supplier and must NOT be installed. The manufacturer assumes no responsibility for installation of incorrectly shipped units.

Do the following upon receipt:

1. Assure that freight carrier is in compliance with Bill of Lading instructions.
2. Inspect delivery before signing Bill of Lading.

If damage is found or items are missing:

1. Note on Bill of Lading immediately.
2. Call carrier immediately to file a freight claim and to schedule an inspection.
3. Photograph damage if possible.
4. Do not move or discard damaged freight packaging materials

5. After losses have been acknowledged by the freight carrier, contact factory for a repair or replacement part quote.
6. With permission of freight carrier, order parts and/or make repairs.
7. Stay in contact with freight carrier to ensure payment of your claim.

Nameplate should be checked to ensure the correct model sizes and voltages have been received to match the job requirements.

If repairs must be made to damaged goods, then the factory should be notified before any repair action is taken in order to protect the warranty. Certain equipment alteration, repair, and manipulation of equipment without the manufacturer's consent may void the product warranty. Contact AAON Technical Support for assistance with handling damaged goods, repairs, and freight claims: (918) 382-6450.

Note: Upon receipt check shipment for items that ship loose such as filters, thermostats and remote sensors. Consult order and shipment documentation to identify potential loose-shipped items. Loose-shipped items may have been placed inside unit cabinet for security.

Dependent upon the optional accessories that were ordered, this equipment may contain fragile components and delicate electronics. Although the unit is constructed of sturdy materials, avoid impacts and handling methods that may damage internal apparatus and structure of the unit. Take care not to apply destructive force to coils, coil and drain stub-outs, or other parts protruding beyond the extents of the unit casing. Always handle the unit by its exterior casing and never by any of the protruding parts.

Before Installation

Carefully read all instructions for the installation prior to installing unit. Make sure each step or procedure is understood and any special considerations are taken into account before starting installation. Assemble all tools, hardware and supplies needed to complete the installation.

Some items may need to be purchased locally. After deciding where to install unit, closely look the location over - both the inside and outside of home. Note any potential obstacles or problems that might be encountered as noted in this manual. Choose a more suitable location if necessary.

Storage

This equipment is not suitable for outdoor use or storage. Never place this equipment where it may be subjected to outdoor conditions such as rain, snow, humidity, extreme temperatures or corrosive chemicals.

If installation will not occur immediately following delivery, store equipment in a dry protected area away from construction traffic, and in the proper orientation as marked on the packaging with all internal packaging in place. Secure all loose-shipped items.

Keep equipment free from debris, and construction waste during installation. Foreign materials may adversely affect unit operation resulting in premature failures that will not be covered by the manufacturer's warranty. Attach all service panels, and cover all exposed equipment when work is not being performed. Leave unit protected from other construction until start-up is to occur.

Direct Expansion (DX) Systems
All DX systems include evaporator coils and thermal expansion valves (TXV).

Never turn off the main power supply to the unit, except for servicing, emergency, or complete shutdown of the unit. When power is cut off from the unit crankcase heaters cannot prevent refrigerant migration into the condensing unit compressors. This means the compressor may cool down and liquid refrigerant may accumulate in the compressor. The compressor is designed to pump refrigerant gas and damage may occur when power is restored.

⚠ CAUTION

CRANKCASE HEATER OPERATION

Some units are equipped with compressor crankcase heaters, which should be energized at least 24 hours prior to cooling operation, to clear any liquid refrigerant from the compressors.

If power to the unit must be off for more than an hour, turn the thermostat system switch to "OFF", or turn the unit off at the control panel, and leave the unit off until the main power switch has been turned on again for at least 24 hours for units with compressor crankcase heaters. This will give the crankcase heater time to clear any liquid accumulation out of the compressor before it is started.

Always control the unit from the thermostat, or control panel, never at the main power supply, except for emergency or complete shutdown of the unit.

During the cooling season, if the air flow is reduced due to dirty air filters or any other reason, the cooling coils can get too cold which will cause excessive liquid to return to the compressor. As the liquid concentration builds up, oil is washed out of the compressor, leaving it starved for lubrication.

The compressor life will be seriously shortened by reduced lubrication and the pumping of excessive amounts of liquid oil and refrigerant.

Note: Low Ambient Operation
Air-cooled DX units without a low ambient option, such as condenser fan cycling or the flooded condenser 0°F low ambient option, will not operate in the cooling mode of operation properly when the outdoor temperature is below 55°F. Low ambient and/or economizer options are recommended if cooling operation below 55°F is expected.

Wiring Diagrams
Unit specific wiring diagrams are laminated and affixed inside the controls compartment door.

Condensate Drain Pans
Units require field installed drain p-traps and lines to be connected to the condensate drain pans of the unit. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

⚠ CAUTION

Unit should not be operated without a p-trap. Failure to install a p-trap may result in overflow of condensate water.

⚠ CAUTION

Emergency drain pan is recommended for all applications where a risk of water damage to surrounding structure or furnishings. Refer to local codes.

⚠ CAUTION

This unit must be stored indoors if installation is not to occur immediately following delivery. Unprotected units could develop corrosion if left exposed to the environment. Damage resulting from improper storage will not be covered by the limited warranty.

Installation

AAON equipment has been designed for quick and easy installation. Startup and service must be performed by Factory Trained Service Technician.

General
F1 Series air handling units are designed as heating, cooling or combination units for indoor installation only. They are designed for R-410A refrigerant only. Flexible connectors are required on all duct connections to minimize air leaks.

Locating the Unit
Placement of the unit relative to ductwork, electrical and plumbing must be carefully considered. Return air plenum or duct can be mounted directly to the return air flanges. Use flexible gasket material to seal the duct to the unit.

Verify floor, foundation or suspension support can support the total unit weight, including accessory weights. Unit must be level in both horizontal axes to support the unit and reduce noise and vibration from the unit.

Allow adequate space for piping access and panel removal. **To ensure proper access for field service, maintain minimum clearances for field piping and other obstructions.** Consult local building codes for additional service clearance requirements. Condensate drain connections are located on the access side of the unit.

Service and Installation Clearance
Before setting the air handling unit into place, caution must be taken to provide clearance for unit panels that must be accessible for periodic service. These areas contain the controls, safety devices, refrigerant piping, shut-off valves and filter access.

F1 series air handling units require a minimum of 36 inches of service clearance on the access panel side of the unit in order to ensure room for removal, replacement, or service of coils and other components if necessary.

Note: An auxiliary (emergency) drain pan is recommended for all applications where there is a risk of water damage to surrounding structure or furnishings. Refer to local codes.

Floor Mounted Units
Make sure that the unit is level, and mounted on a field-supplied platform with a minimum height of 12” to allow for proper fall on the condensate line. Other installation provisions may be necessary according to job specifications. F1 series air handling units are designed for up flow and horizontal applications only.

Suspended

The F1 series multi-position air handling unit can be easily suspended for suspended horizontal installations. The air handling unit should be lifted into position, supporting the entire unit from the bottom throughout the lift. Suspend the air handling unit as shown in the following Figure 1. An auxiliary drain pan that covers the entire unit would be required for above ceiling installations.

The air handling unit must be installed level and care should be taken to prevent damage to the cabinet. Other installation provisions may be necessary according to job specifications and local code.

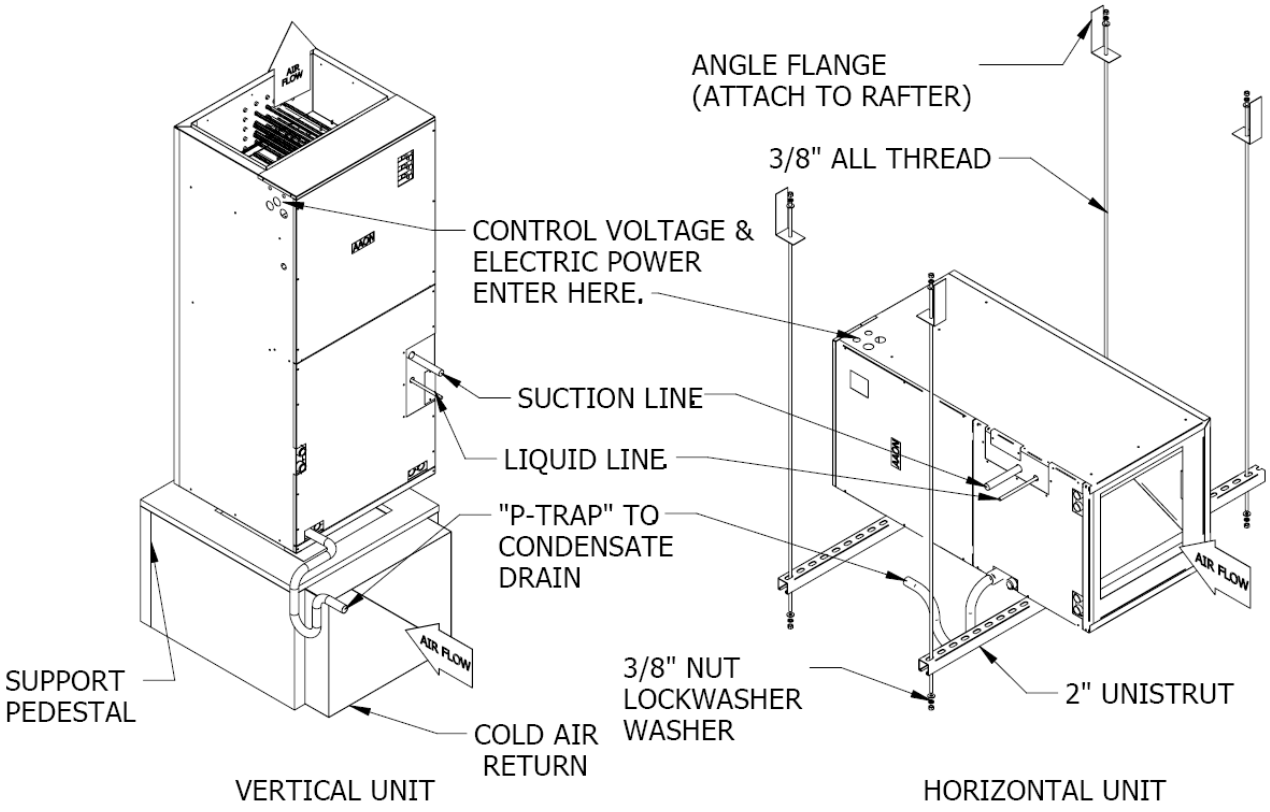


Figure 1 - Typical Vertical and Horizontal Unit Installation Methods

Lifting and Handling the Unit
Before lifting unit, be sure that all shipping material has been removed from unit.

⚠ WARNING

UNIT HANDLING

Incorrect lifting can cause damage to the unit, injury or death. Lifting equipment capacity should exceed unit weight by an adequate safety factor. Always test lift unit not more than 24 inches high to verify proper center of gravity lift point.

Care should be taken if using spreader bars, blocking or other lifting devices to prevent damage to the cabinet, coil or fans.

Sealing
It is very important to keep outside air from infiltrating the unit cabinet. Seal all piping penetrations with Armaflex, Permagum, or other suitable sealant. Also seal around drain connections, electrical connections, and other inlets where air may enter the cabinet. This is especially important when the unit is installed in an unconditioned area.

Cooling Equipment
Acceptable system design and installation will include consideration as follows:

Piping from the condensing unit to the indoor air handling unit is the responsibility of the installing contractor.

Only clean "ACR" tubing should be used.

Piping should conform to generally accepted practices and codes.

Care must be taken not to cross the circuits on reheat systems.

Once piped, the interconnecting piping and air handling unit **MUST BE** evacuated to 500 microns or less; leak checked and condenser shutoff valves opened to allow refrigerant flow to air handling unit. Charge unit with R-410A refrigerant to the recommended superheat/sub-cooling in the Charging Refrigerant section of this manual.

Make sure air handling unit thermal expansion valve bulb is mounted with good thermal contact on the suction line on a horizontal section, close to the evaporator but outside the cabinet in the 4 or 8 o'clock position and well insulated.
Lines should be fastened and supported according to local codes.

Heating Equipment

Hot Water Heating:
Water supply lines must be insulated, properly fastened, drained and supported according to local code requirements.

Electric Heating:
Installing Electric Heat Strip into the Unit:

1. Remove front control panel(s) of the unit
2. Remove screws and panel covering heat strip compartment
3. Open the heat strip kit and remove assembly from package
4. Install strip heat into opening and secure with 4 (four) screws
5. Install breaker assembly on bracket and secure with breaker with 4 (four) screws
6. Make sure that breaker is in the **OFF** position
7. Connect all control wires per wiring diagram included in the unit

8. Pull and install power wires per wiring diagram and MCA, MOP information herein and secure all wires firmly
9. Replace the front control panel(s) of the unit

FIELD INSTALLED WIRES SHOULD BE SINGLE STRAND WIRES. USE OF ROMEX WIRES IS NOT ACCEPTABLE.

Heating is accomplished by passing electrical current through a specified amount of resistance heaters, which will produce the required heat. The indoor blower motor will energize at the same time as the heaters. Wiring to the air handling unit must be done in accordance with local electrical codes and/or standards. Check specified electrical rating and install with proper wire sizes. Also refer to wiring diagrams included with the unit for wire sizes and circuit breaker recommendations.

Field Wiring - MCA and MOP

Minimum Circuit Ampacity (MCA) and Maximum Overcurrent Protection (MOP) are necessary to correctly connect field wired equipment.

The calculations for the MCA and MOP are based on requirements of NFPA 70, the National Electrical Code (NEC) and CSA C22.1, the Canadian Electrical Code (CEC). The MCA is the minimum wire size needed to prevent the wiring from overheating during operating conditions for the life of the product. The MOP is the maximum allowable circuit breaker size that will properly disconnect power to the equipment under anticipated fault conditions.

In the following tables, locate the kW of the heater to be field installed, and then choose the corresponding MCA and MOP values to correctly size the wire gauge(s) and circuit breaker(s), respectively.

Table 1 - Electric Heat Minimum Circuit Ampacity

230V	208V	Line 1	Line 2	Line 3
kW	kW	MCA	MCA	MCA
5	3.75	26.0		
10	7.50	52.1		
15	11.25	52.1	26.0	
20	15.00	52.1	52.1	
25	18.75	52.1	52.1	26.0

Overcurrent protection less than that recommended on the unit's "Specification Sheet" could result in unnecessary fuse failure and service call. The manufacturer bears no responsibility for damage caused to the equipment as a result of not using the recommended size for the protective devices as listed on the unit's rating plate.

Table 2 - Electric Heat Maximum Overcurrent Protection

230V	208V	Line 1	Line 2	Line 3
kW	kW	MOP	MOP	MOP
5	3.75	30		
10	7.50	60		
15	11.25	60	30	
20	15.00	60	60	
25	18.75	60	60	30

Heat Pump

For heat pump equipped split system configurations, the heat pump is the primary heat source during a call for heat. During operation at low ambient temperatures where the heat pump alone cannot satisfy the space temperature set point, electric resistance heat elements are activated. Below about 17°F, only the electric heat is operable; the heat pump is not active.

ECM Driven Fan

The Electrically Commutated Motor (ECM) has selectable fan speeds as determined by the configuration of four pins as shown in Figure 2.

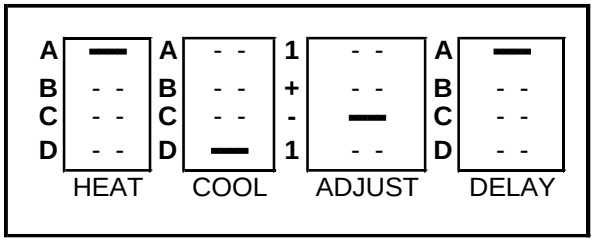


Figure 2 - Example Configuration of ECM Fan Taps

Adjust the taps as desired for cooling, dehumidification, and heating according to the following instructions.

Cooling:

Units are preprogrammed from the factory for a rated airflow rate of 400 cfm per ton as shown in Table 3.

Table 3 - Factory Preset Air Flow

Model	Preset cfm
F1-060	2000
F1-048	1600
F1-036	1200
F1-024	800

* Maximum total static is 2.25" w.g.

The **high** speed for cooling may be selected by setting the COOL and ADJUST fan speed taps (shown in Figure 2). The setting combinations are shown in Table 4.

Note: On the ADJUST tap, both of the '1' selections have the same effect on motor speed.

Table 4 - Cooling Fan Speed Tap Settings

F1-060/ F1-048 (cfm)	F1-036/ F1-024 (cfm)	COOL Tap	ADJUST Tap
2000	1200	A	1
2000	1200	D	1
1840	1150	B	+
1700	1020	A	-
1700	1020	D	-
1600	1000	B	1
1380	920	C	+
1360	850	B	-
1200	800	C	1
1020	680	C	-

A signal from the thermostat, showing a need for dehumidification, will cause the unit to slow the fan speed in order to allow the air moving across the coil to get colder thereby better dehumidifying the air. First stage dehumidification has a low fan speed of 67% of the selected max speed. Second stage dehumidification has a fan speed of 45% of the selected max speed. NOTE: The Modulating Hot Gas Reheat option must be selected to have a second stage of dehumidification.

In this comfort cooling application of the ECM fan motor, heat and cool taps, A & D have the same effect on motor speed.

Humidity Control:

Adjust the DELAY tap for humidity control that is suitable for the climate according to Table 5.

Table 5 - Climate Settings

CLIMATE	DELAY Tap
Humid	A
Sub-humid/Dry	B
Semi-Arid	C
Arid/Hyper-Arid	D

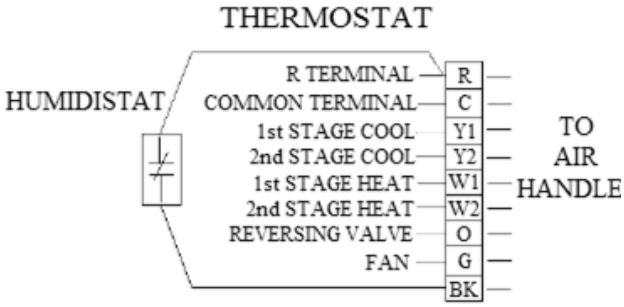
Heating:
The fan speed for the heating cycle is selected by adjusting the HEAT tap (see Figure 2) according to Table 6.

Table 6 - Heating Fan Speed Tap Settings

F1-060/ F1-048 (cfm)	F1-036/ F1-024 (cfm)	HEAT Tap
1800	1000	A
1400	800	B
1200	600	C
1800	1000	D

ECM Fan Notes

1. Fan only = 50% of max speed
2. Dehumidifying speeds
    i) First stage dehumidification = 67% of max speed
    ii) Second stage dehumidification = 45% of max speed
3. Green Light will blink once per every 100 CFM
4. Dehumidification terminal is BK. There must be a constant voltage to this terminal, and when the voltage is dropped then dehumidification mode will begin.



Fan wiring notes:

1. If only one stage of cooling is used then jumper Y1 and Y2.
2. If unit is not heat pump capable then jumper O and Y1.
3. If no humidistat is used then jumper BK and R.
4. When only one stage of heat is used jumper W1 and W2.

Reheat Coil Refrigerant Piping

The reheat coil is shipped already installed on the leaving air section of the air handling unit. The matching condensing unit must include a receiver for reheat systems. (See matching condensing unit installation, operation, & maintenance manual to determine acceptable refrigerant line size.)

The AAON modulating hot gas reheat system diverts hot discharge gas from the condenser to the air handling unit through the hot gas line. **Field piping between the condensing unit and the air handler is required.**

The line delivers the hot discharge gas to the reheat coil, so it is sized as a discharge line.

Discharge lines should be sized to ensure adequate velocity of refrigerant to ensure oil return, avoid excessive noise associated with velocities that are too high, and to minimize efficiency losses associated with friction.

Pitch the hot gas line in the direction of flow for oil return.

When installing vertical hot gas reheat lines, an oil drip line must be provided at the lowest point in the system. The oil drip line must be vertical, its diameter should be the same as the diameter of the riser, and it should be 1 foot long. Run an oil return line, using 1/8 inch capillary tube, 10 feet in length, from the hot gas reheat line oil drip line to the suction line. Connect the oil return line below the sight glass and 1 inch above the bottom of the oil drip line. (See Figure 3)

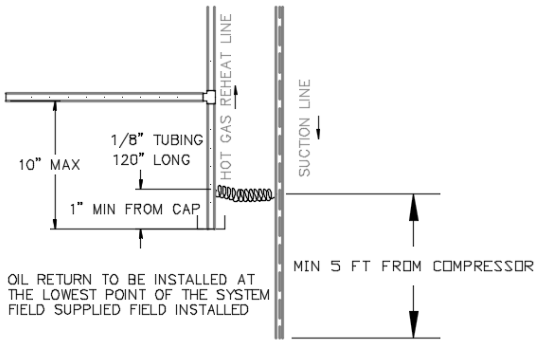


Figure 3 – Oil Return Line

Insulate the entire length of the hot gas line with a minimum 1 inch thick Armaflex insulation.

1. Run a hot gas line from the outdoor unit and connect it to the inlet of the stub-out on the reheat coil.
   a. **For vertical (up-flow) units.** The inlet connection is the left stub-out when facing the front of the unit. Connect the hot gas line from the outdoor unit to the left stub-out. Connect the check valve (shipped loose) to the right stub-out in a direction so that the refrigerant flow is leaving the right side of the coil. Be sure to not block access for service of the air handling unit with the placement of the check valve.
   b. **For horizontal discharge units.** Connect the hot gas line from the outdoor unit to the upper stub-out connection of the reheat coil. Connect the check valve (shipped loose) to the lower stub-out in a direction so that the refrigerant is leaving the bottom side of the reheat coil. Be sure to not block access for service of the air handling unit with the placement of the check valve.
2. After installing the check valve, run a liquid line from the discharge of the check valve to the condenser. *Note check valve in condenser liquid line is not used on heat pump models.* (See matching condensing unit installation, operation, & maintenance manual to determine acceptable refrigerant line size.)
3. After completing the reheat and liquid lines, run a Suction line from the evaporator outlet to the outdoor unit shutoff valve (See matching condensing unit installation, operation, & maintenance manual to determine acceptable refrigerant line size.)
4. After completing the refrigerant piping installation, install the supply air temperature sensor (shipped loose) 18" from the leaving air outlet from the air handling unit.
5. After installing the supply air temperature sensor, check that the reheat supply air temperature setpoint is correctly set on the control board. This temperature should be set to the desired space temperature when the unit is in cooling mode. If that temperature is unknown at the time of installation, set the setpoint to 72°F.

The reheat system provides for "neutral" (neither hot nor cold) air to the space so that the unit can dehumidify the air without over cooling or over heating the space. The desired leaving air temperature is set on the control board in the unit. The factory suggests a setpoint of 72°F for most applications; however, the setpoint is adjustable for more specific applications or differing comfort levels. The setpoint should be set for the desired temperature in the space during cooling mode. During dehumidification mode the cooling coil operates and the modulating valve in the reheat system meters the amount of hot refrigerant being directed to the reheat coil so that the cooled and dehumidified air is reheated, to the setpoint provided on the control board, to a room neutral temperature. This temperature setpoint and method of dehumidification

allows for the home to be dehumidified even when there is not a need for cooling in the space.

Note: Systems with the modulating hot gas reheat option will require refrigerant to be field added because of the additional refrigerant components and piping associated with the system.

Condensate Drain Piping
A drain trap must be connected to the drain pan at the unit. Condensate connections are provided on each side of the unit. Condensate piping should be installed according to local codes. The line should be the same pipe size as the drain nipple and should pitch downward toward the building drain.

All cooling coils must have drain pans equipped with "P" traps to avoid pulling air from outside the unit back through the drain line. All drain connection ports are sealed. Knock out only the connection port to be used. The trap should be located in warm ambient spaces. An additional drain pan may be installed under the air handling unit, and should include a separate drain line for overflow from the primary drain. An air break should be used with long runs of condensate lines.

Unit may be equipped with more than one condensate drain pan connection. A p-trap and drain line must be installed on at least one section's drain connection, with the p-trap not to exceed 6" from the drain connection. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

⚠ CAUTION

Unit should not be operated without p-traps. Failure to install a p-traps may result in overflow of condensate water.

Draw-through cooling coils will have a negative static pressure in the drain pan area. This will cause an un-trapped drain to back up due to air being pulled up through the condensate drain piping.

Condensate drain trapping and piping should conform to all applicable governing codes.

Note: The drain pan connection(s) is a 3/4" MPT fitting.

Drain pans in any air conditioning equipment, even when they have a built-in slope to the drain, will have moisture present and will require periodic cleaning to prevent any build-up of algae or bacteria. Cleaning of the drain pans will also prevent any possible plugging of the drain lines, and overflow of the pan itself. Some means to clean out the "P" trap should be provided. Only qualified personnel should clean drain pans, drain lines, or the insides of equipment.

Electrical
Check the unit data plate to make sure it agrees with the power supply. Connect power to the unit according to the wiring diagram provided with the unit.

Table 7 - Nameplate Voltage Markings

Voltage Feature		Nameplate Voltage Marking	Min/Max VAC
1	230V/1Φ/60Hz	230	197/252
1	208V/1Φ/60Hz	208	197/228

The power and control wiring may be brought in through the holes provided on the unit. Protect the branch circuit in accordance with code requirements. If the control wires, are to run inside the same conduit, use 600-volt wire or as required by applicable codes.

The units must be electrically grounded in accordance with the National Electric Code, ANSI / UL 1995 when installed if an external source is utilized; in Canada use current C.S.A. Standard C22.2, No. 236, Canadian Electric Code Part 1.

Power wiring is to the unit terminal control board. The manufacturer has done all wiring beyond this point. Power can be applied to the unit after the control wiring is connected, and startup checks are complete.

Thermostat
Units without the neutral air dehumidification feature will operate with most common thermostats. Units with the neutral air dehumidification feature must use thermostats with a normally closed (NC) dehumidification option. The following stats have been approved for usage with the dehumidification feature.

Robertshaw	**Honeywell**
9825i2	VisionPRO®IAQ

Filters
Open filter access bracket and slide correct filter in with arrow pointing towards the blower in the direction of airflow. Replacement filters are 20” x 20” x 1”.

Charging Refrigerant
The unit comes with full charge based on a 25-foot line set. Charging a system in the field must be based on determination of liquid sub-cooling and evaporator superheat. On a system with a thermostatic expansion valve, liquid sub-cooling is more representative of the charge than evaporator superheat but both measurements must be taken.

⚠ CAUTION

The Clean Air Act of 1990 bans the intentional venting of refrigerant as of July 1, 1992. Approved methods of recovery, recycling, or reclaiming must be followed.

Before Charging
The unit being charged must be at or near full load conditions before adjusting the charge.

Units equipped with hot gas reheat must be charged with the hot gas reheat valves closed while the unit is in cooling mode to get the proper charge. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation.

After adding or removing charge the system must be allowed to stabilize, typically 10-15 minutes, before making any other adjustments.

The type of unit and options determine the ranges for liquid sub-cooling and evaporator superheat. Table 8 when determining the proper sub-cooling.

The vertical rise of the liquid line must be known in order to adjust the sub-cooling range for proper charge.

Checking Liquid Sub-cooling

1. Measure the temperature of the **liquid line** as it leaves the condenser coil.

2. Read the gauge pressure reading of the **liquid line** close to the point where the temperature was taken. You must use liquid line pressure, as it will vary from discharge pressure due to condenser coil pressure drop.

3. Convert the pressure obtained in Step 2 to a saturated temperature using the appropriate refrigerant temperature-pressure chart (Table 9).

4. Subtract the measured liquid line temperature in Step 1 from the saturated temperature in Step 3 to determine the liquid sub-cooling.

5. Compare calculated sub-cooling to Table 8 for the appropriate unit type and options.

Checking Evaporator Superheat

1. Measure the temperature of the **suction line** close to the compressor.

2. Read gauge pressure at the **suction line** close to the compressor.

3. Convert the pressure obtained in Step 2 to a saturated temperature using the appropriate refrigerant temperature-pressure chart (Table 9).

4. Subtract the saturated temperature in Step 3 from the measured suction line temperature in Step 1 to determine the evaporator superheat.

5. Compare calculated superheat to the acceptable cooling mode superheat values of 8-15°F for all system types. Superheat will increase with long suction line runs.

Adjusting Sub-cooling and Superheat Temperatures

The system is **overcharged** if:

1. the sub-cooling temperature is too high **and**

2. the evaporator is fully loaded (low loads on the evaporator result in increased sub-cooling) **and**

3. the evaporator superheat is within the temperature range of 8-15°F (high superheat results in increased sub-cooling)

Table 8 - Acceptable Refrigeration Circuit Values

	Cooling Mode Liquid Sub-Cooling Values
Cooling Only Unit[4]	8-15°F
Cooling Only Unit with Hot Gas Reheat[1,4]	5-15°F
Heat PumpUnit[2,4]	2-4°F
Heat Pump Unit with Hot Gas Reheat[3,4]	2-6°F

Notes:

1. Must be charged with the hot gas valve closed. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation.
2. The sub-cooling value in this table is for the unit running in cooling mode of operation. After charging, unit should be operated in heating mode to check for correct operation.
3. The sub-cooling value in this table is for the unit running in cooling mode of operation and the hot gas valve closed. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation and then in heating mode to check for correct operation.
4. Sub-cooling must be increased by 1°F per 10 feet of vertical liquid line rise for R-410A (AHU above CU). For example, a cooling only unit with hot gas reheat and a vertical liquid drop can charge to a sub-cooling value of 5-15°F, but a cooling only unit with hot gas reheat and a vertical liquid rise of 30 ft must charge to a sub-cooling value of at least 8-15°F.

⚠ CAUTION

Thermal expansion valve must be adjust to approximately 8-15°F of suction superheat. Failure to have sufficient superheat will damage the compressor and void the warranty.

Correct an overcharged system by reducing the amount of refrigerant in the system to lower the sub-cooling.

⚠ CAUTION

DO NOT OVERCHARGE!

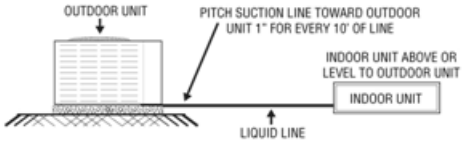
Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure.

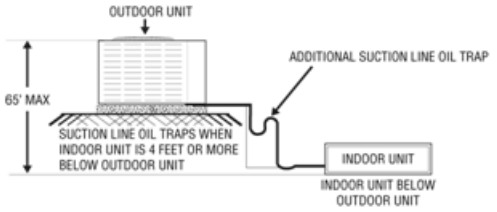
The system is **undercharged** if:
1. The superheat is too high **and**
2. The sub-cooling is too low.

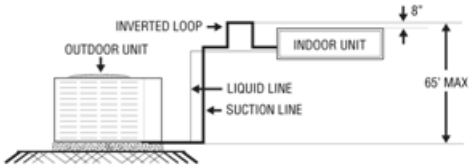
Correct an undercharged system by adding refrigerant to the system to reduce superheat and raise sub-cooling.

If the sub-cooling is correct and the superheat is too high, the TXV may need adjustment to correct the superheat.

Elevation Limitations
See CB Series Installation, Operation, and Maintenance manual for rise and run limitations. All lengths listed are in equivalent feet. An equivalent foot of the line includes the pressure drop of all valves, components, fittings and other pipes in the sections.







Evaporator Coil

⚠ CAUTION

Evaporator coils are shipped under high pressure. Use extreme care and follow the installation instructions provided with the evaporator coil to avoid personal injury.

The indoor coil is pressurized. The copper caps must be punctured to permit a gradual escape of the pressure prior to unsweating those caps. Immediately couple the tubing to the indoor unit to avoid exposing the coils to moisture. A properly sized filter drier is furnished in the condenser. When making solder connections, make sure dry nitrogen flows through the lines, when heating the copper, to prevent oxidization inside of the copper.

Table 9 – R-410A Refrigerant Temperature-Pressure Chart

°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG
20	78.3	**47**	134.7	**74**	213.7	**101**	321.0	**128**	463.2
21	80.0	**48**	137.2	**75**	217.1	**102**	325.6	**129**	469.3
22	81.8	**49**	139.7	**76**	220.6	**103**	330.2	**130**	475.4
23	83.6	**50**	142.2	**77**	224.1	**104**	334.9	**131**	481.6
24	85.4	**51**	144.8	**78**	227.7	**105**	339.6	**132**	487.8
25	87.2	**52**	147.4	**79**	231.3	**106**	344.4	**133**	494.1
26	89.1	**53**	150.1	**80**	234.9	**107**	349.3	**134**	500.5
27	91.0	**54**	152.8	**81**	238.6	**108**	354.2	**135**	506.9
28	92.9	**55**	155.5	**82**	242.3	**109**	359.1	**136**	513.4
29	94.9	**56**	158.2	**83**	246.0	**110**	364.1	**137**	520.0
30	96.8	**57**	161.0	**84**	249.8	**111**	369.1	**138**	526.6
31	98.8	**58**	163.8	**85**	253.7	**112**	374.2	**139**	533.3
32	100.9	**59**	166.7	**86**	257.5	**113**	379.4	**140**	540.1
33	102.9	**60**	169.6	**87**	261.4	**114**	384.6	**141**	547.0
34	105.0	**61**	172.5	**88**	265.4	**115**	389.9	**142**	553.9
35	107.1	**62**	175.4	**89**	269.4	**116**	395.2	**143**	560.9
36	109.2	**63**	178.4	**90**	273.5	**117**	400.5	**144**	567.9
37	111.4	**64**	181.5	**91**	277.6	**118**	405.9	**145**	575.1
38	113.6	**65**	184.5	**92**	281.7	**119**	411.4	**146**	582.3
39	115.8	**66**	187.6	**93**	285.9	**120**	416.9	**147**	589.6
40	118.1	**67**	190.7	**94**	290.1	**121**	422.5	**148**	596.9
41	120.3	**68**	193.9	**95**	294.4	**122**	428.2	**149**	604.4
42	122.7	**69**	197.1	**96**	298.7	**123**	433.9	**150**	611.9
43	125.0	**70**	200.4	**97**	303.0	**124**	439.6		
44	127.4	**71**	203.6	**98**	307.5	**125**	445.4		
45	129.8	**72**	207.0	**99**	311.9	**126**	451.3		
46	132.2	**73**	210.3	**100**	316.4	**127**	457.3		

Startup

General

ONLY QUALIFIED, AUTHORIZED PERSONNEL SHOULD POWER ON, OR STARTUP THIS EQUIPMENT.

Before starting up the equipment, building construction should be complete, and start-up personnel should:

Have a working knowledge of general HVAC and mechanical commissioning procedures and practices.

Be familiar with unit functions, features, optional unit accessories, and all control sequences.

Have appropriate literature on hand for consultation.

⚠ CAUTION

Equipment operation during construction is not recommended. Construction site pollution can affect unit operation, and seriously degrade performance. Operation during construction will void all manufacturers' warranties.

Before the structure is occupied, the installation, and/or startup personnel must take three essential steps:

1. Check-Out
2. Start-Up
3. Commissioning

Check-Out

Equipment should be thoroughly checked for loose wiring, a free spinning blower wheel and well fitting access panels. Air handling units should not be operated without proper ductwork and access panels installed, except as required during start-up and air balancing.

1. Check all electrical connections to be sure they are tight.
2. Open all access panels, and remove all shipping screws, or restraints.
3. Clean out any debris that may be present.
4. Check wheel alignment, and tightness of fan drives.
5. Check bearing locking collars if provided and fan wheel set screws for tightness.
6. Turn fan wheels to assure free rotation.
7. Ensure electrical supply matches the unit nameplate.
8. Ensure condensate lines are correctly connected.
9. Check local codes for any special provisions.
10. Replace and/or close all access panels.

Procedures

Note: Failure to adhere to the following start-up procedures will void all manufacturer warranties.

Install gauges, voltmeter and ammeter before start-up. Observe refrigerant pressures during initial operation. Note, and determine the cause of any excessive sound or vibration. Follow start-up procedures outlined below to start each piece of equipment.

Note: Completed factory test sheets are in the equipment literature packet shipped inside the unit. Factory run-test readings recorded on the test sheets may be helpful to reference during start-up.

⚠ WARNING

Do not alter factory wiring. Deviation from the supplied wiring diagram will void all warranties, and may result in equipment damage or personal injury. Contact the factory with wiring discrepancies.

Electric Heat Section Procedures

1. Perform final visual inspection. Check all equipment ductwork and piping to verify that all work is complete. Improperly installed equipment or ductwork can affect readings.
2. Ensure that there is no construction debris in the unit.
3. Check the unit for external damage.
4. Note all accessories installed.
5. Install a filter of the proper size and type.
6. Check all terminal blocks, fuses, fuse blocks, and contactors for correctness.
7. Check all high and low voltage wiring connections for correctness, and tightness.
8. Check unit for correct incoming voltage per the data plate.
9. Turn the power on.
10. Turn on the first stage of heating

Check amp draw of each element of each stage.

Ensure blower started with electric heat.

Check for temperature rise across heating section while all stages are on.

If temperature rise is within range, turn all heating calls off.

Check to see that fan stops.

Refrigerant Cooling Section Procedures

1. Perform final visual inspection. Check all equipment, ductwork and piping to verify that all work is complete, and equipment is properly installed and mounted. Improperly installed equipment or ductwork can affect readings.
2. Perform condensing unit start-up checks in addition to these air handling unit checks according to the unit manufacturer's instructions.
3. Ensure that there is no construction debris in the unit.
4. Check the unit for external damage.
5. Install filter of the proper size and type.
6. Ensure that drain P-trap is installed.
7. Check all terminal blocks, fuses, fuse blocks, disconnect box, and contactors for correctness.
8. Check all high and low voltage wiring connections for tightness. Check unit for correct incoming voltage per the data plate.
9. Check the security of the locking system on all blower bearings.
10. Turn the power on.
11. Check and record ambient temperature.
12. Check for guaranteed off timers (GOT), and/or time delay relays (TDR).
13. Start the first step cooling circuit, and blower circuit.

Optional Equipment Procedures
If Modulating Hot Gas Reheat is equipped, additional installation steps are required.

1. Field installed piping is required.
2. The field supplied thermostat and humidistat must be wired to the reheat control as shown in the unit wiring diagram.
3. Verify that the condenser hot gas valve and reheat hot gas valve are wired as shown in the wiring diagram.
4. Verify that the Modulating Hot Gas Reheat system is working properly. Run for five minutes in the reheat mode and verify that the temperature of the supply air stream matches the reheat temperature set point.

Commissioning

Air Balancing
High performance systems commonly have complex air distribution and fan systems. Unqualified personnel should not attempt to adjust fan operation, or air circulation, as all systems have unique operating characteristics. Professional air balance specialists should be employed to establish actual operating conditions, and to configure the air delivery system for optimal performance.

Water Balancing
A hydronic specialist with a complete working knowledge of water systems, controls and operation must be employed to properly balance the entire system. Unqualified personnel should not attempt to manipulate temperatures, pressures, or flow rates, as all systems have unique operating characteristics, and improper balancing can result in undesirable noises and operation.

Controls
A variety of controls and electrical accessories may be provided with the equipment.

Identify the controls on each unit by consulting appropriate submittal or order documents, and operate according to the control manufacturer's instructions. If you cannot locate installation, operation or maintenance information for the specific controls, then contact your sales representative, or the control manufacturer for assistance.

Operation and Maintenance

General
Immediately following unit startup, the air conditioning system requires a maintenance schedule to assure continued successful operation. A maintenance program similar to the example given below should be scheduled for routine maintenance of this equipment in order to provide efficient and reliable operation for the owner.

Maintenance Schedule

<u>One week after start-up:</u>
Check refrigerant charge. Evacuate and repair if leaking.

Check filters for cleanliness. Measure pressure loss if applicable. Replace if necessary.

Check cycling of compressors, fans and valves. Correct unusual cycling.

<u>Monthly:</u>
Check cleanliness of filters, and replace if necessary.

Check cooling coil drain pan to assure proper drainage or correct.

Inspect evaporator and condenser coils. Clean if dirty or obstructed in any way.

Quarterly:
Check operation of heating and cooling sections.

Check inlet and outlet air temperatures. Determine cause for abnormal changes.

Annually:
Clean the condenser and evaporator coils with steam or a non-corrosive cleaner.

Clean the drain line, "P" trap and condensate pan.

Check refrigerant pressures and temperatures every spring and correct unusual readings.

Check heating section every fall. Check all electrical connections for tightness and check heater elements for indications of overheating. Determine cause and replace elements if necessary.

Inspect and clean unit interior at the beginning of each heating and cooling season and as operating conditions require.

Lubrication
All original motors and bearings are furnished with factory lubrication. They require no lubrication.

Blower Assembly
F1 air handling units are equipped with highly efficient forward curved fans. The blower wheel should be inspected periodically and cleaned of dust and debris. Clean blower wheels reduce electrical use, maintain capacity and reduce stress on the unit.

To inspect and clean the blower, set thermostat to the "OFF" position. Turn the electrical power to the unit to the "OFF" position at the disconnect switch. Check set screw for tightness.

Coils
Coils should be inspected and cleaned annually to ensure there is no obstruction to airflow. Dirty evaporator coils will eventually freeze up, and often result in a time consuming and expensive service call. Clean filters will help to prevent dirt from accumulating on the evaporator. The evaporator should be cleaned annually with a non-corrosive coil cleaning solution.

Heating

Electric:
Set thermostat in the heat mode; call for heat to engage all electric heat strips. Verify that electric heat operates correctly.

Heat Pump:
Set thermostat in the heat mode; call for heat to engage the three-way valve and turn the heat pump mode on. Verify that the heat pump operates correctly.

Hot Water:
Set thermostat in the heat mode; call for hot water valve to open. Verify that hot water valve opens with call for heat.

Filters
Open filter access door. Slide filters away from unit and inspect. Replace dirty filters with 20" x 20" x 1" filters.

Ensure that the arrow points toward the blower in the direction of airflow. Filters should be checked every 30 days and replaced or cleaned as necessary.

⚠ CAUTION

Equipment should never be operation without filters.

Permanent type filters may be vacuumed and/or washed but should not be reinstalled until thoroughly dry. Most air filters are marked to indicate the direction of airflow, and this should be carefully noted when they are being installed.

⚠ CAUTION

Never flip a dirty filter to allow airflow in the opposite direction.

The blower and motor bearings are permanently lubricated and do not require additional lubrication. It is recommended that the owner have available at least one set of replacement fuses of the size supplied with the original equipment.

Important: Keep coils, fans and filters clean.

Service
In the event the unit is not functioning correctly and a service company is required, only a company with service technicians qualified and experienced in both heating and air conditioning should be permitted to service the systems in order to keep warranties in effect. The service tech may call the sales representative if assistance is required.

Replacement Parts
Parts for AAON equipment may be obtained from your local representative. When ordering parts, reference the unit serial number and part number.

AAON Technical Support
203 Gum Springs Rd.
Longview, TX 75602
Ph: (918) 382-6450
techsupport@AAON.com
www.AAON.com

Note: Before calling, technician should have model and serial number of the unit available for the service department to help answer questions regarding the unit.

General
Piping from the condensing unit to the air handling unit is the responsibility of the installing contractor.

Use only clean type "ACR" copper tubing that has been joined with high temperature brazing alloy.

The pipe sizes must be selected to meet the actual installation conditions and not simply based on the connection sizes at the evaporator and/or condensing unit. (See matching condensing unit installation, operation, & maintenance manual to determine acceptable refrigerant line size.)

Piping should conform to generally accepted practices and codes.

Upon completion of piping connection, the interconnecting piping and air handler MUST BE evacuated to 500 microns or less; leak checked and charged with refrigerant.

Thermal expansion valve bulbs should be mounted with good thermal contact on a horizontal section of the suction line close to the evaporator, but outside the cabinet, and well insulated.

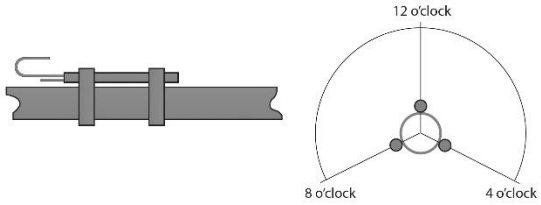


Figure 4 - TXV Bulb Position

Hot Gas Reheat

The AAON modulating hot gas reheat system diverts hot discharge gas from the condenser to the air handling unit through the hot gas line. **Field piping between the condensing unit and the air handling unit is required.** The line delivers the hot discharge gas to the reheat coil and/or the hot gas bypass valve, so it is sized as a discharge line.

Refrigerant Piping Diagrams

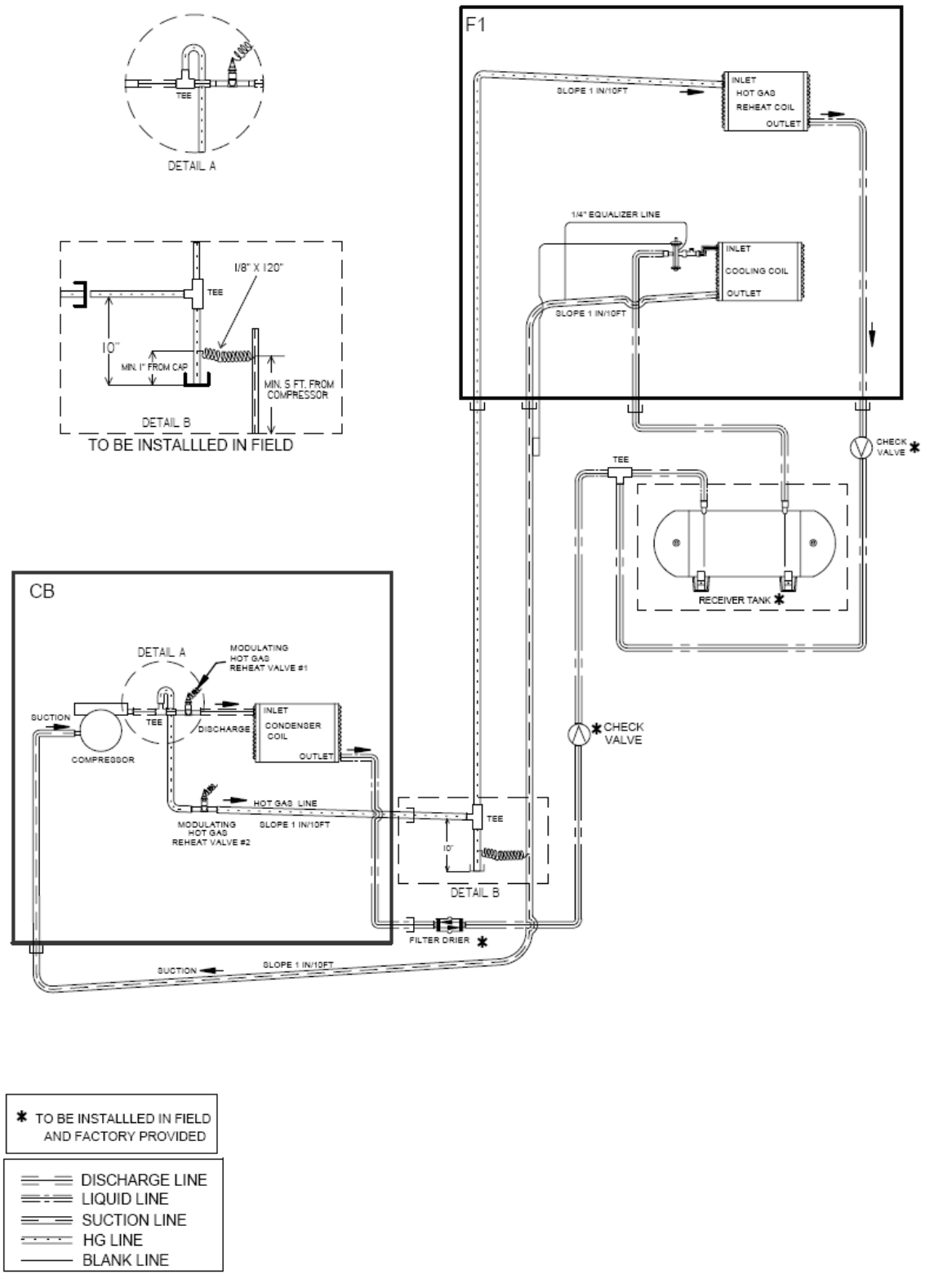


Figure 5 - Modulating Hot Gas Reheat Piping Diagram with Air Handling Unit above Condensing Unit.

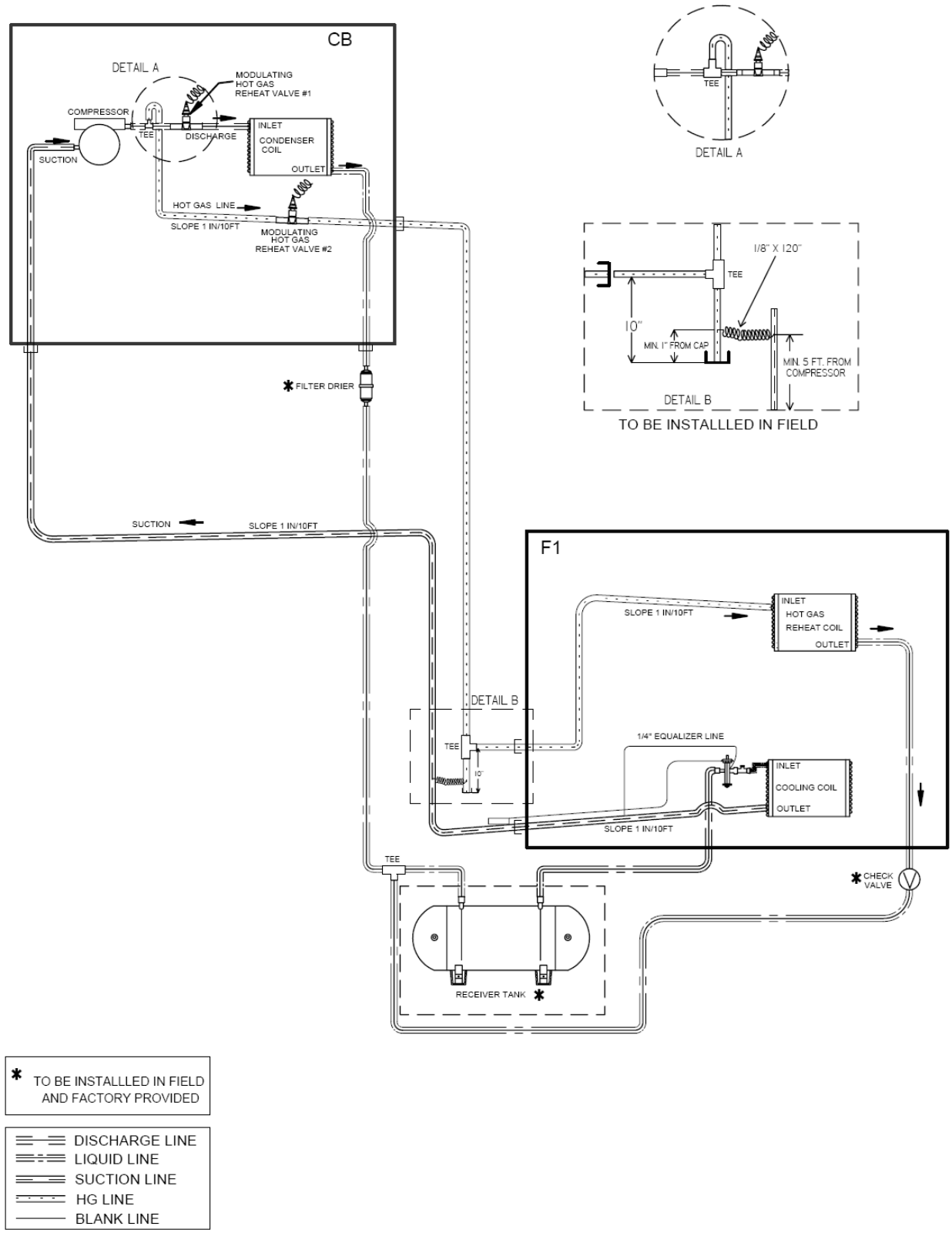


Figure 6 - Modulating Hot Gas Reheat Piping Diagram with Air Handling Unit below Condensing Unit

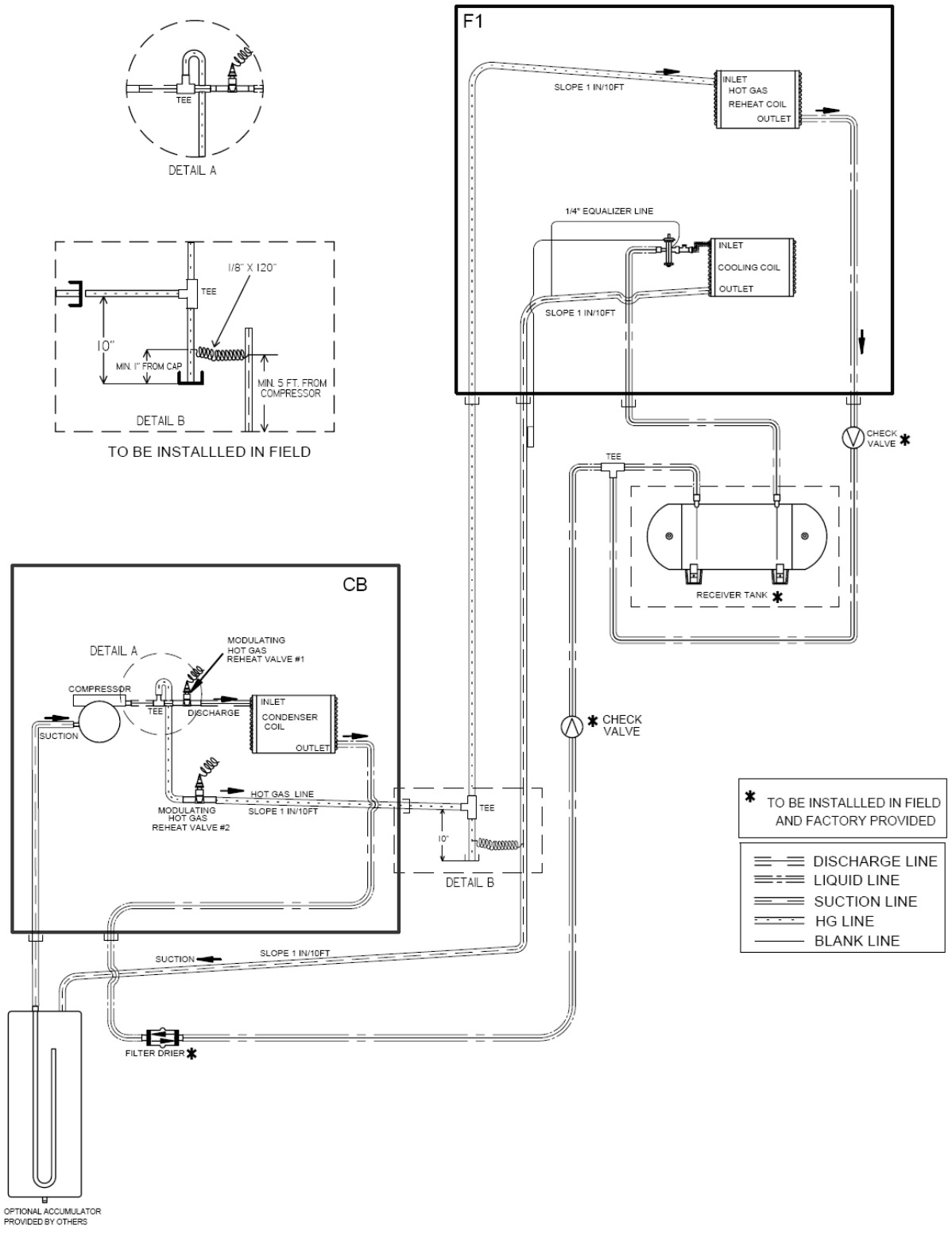


Figure 7 - Modulating Hot Gas Reheat Piping Diagram with Air Handling Unit above Condensing Unit with Optional Accumulator

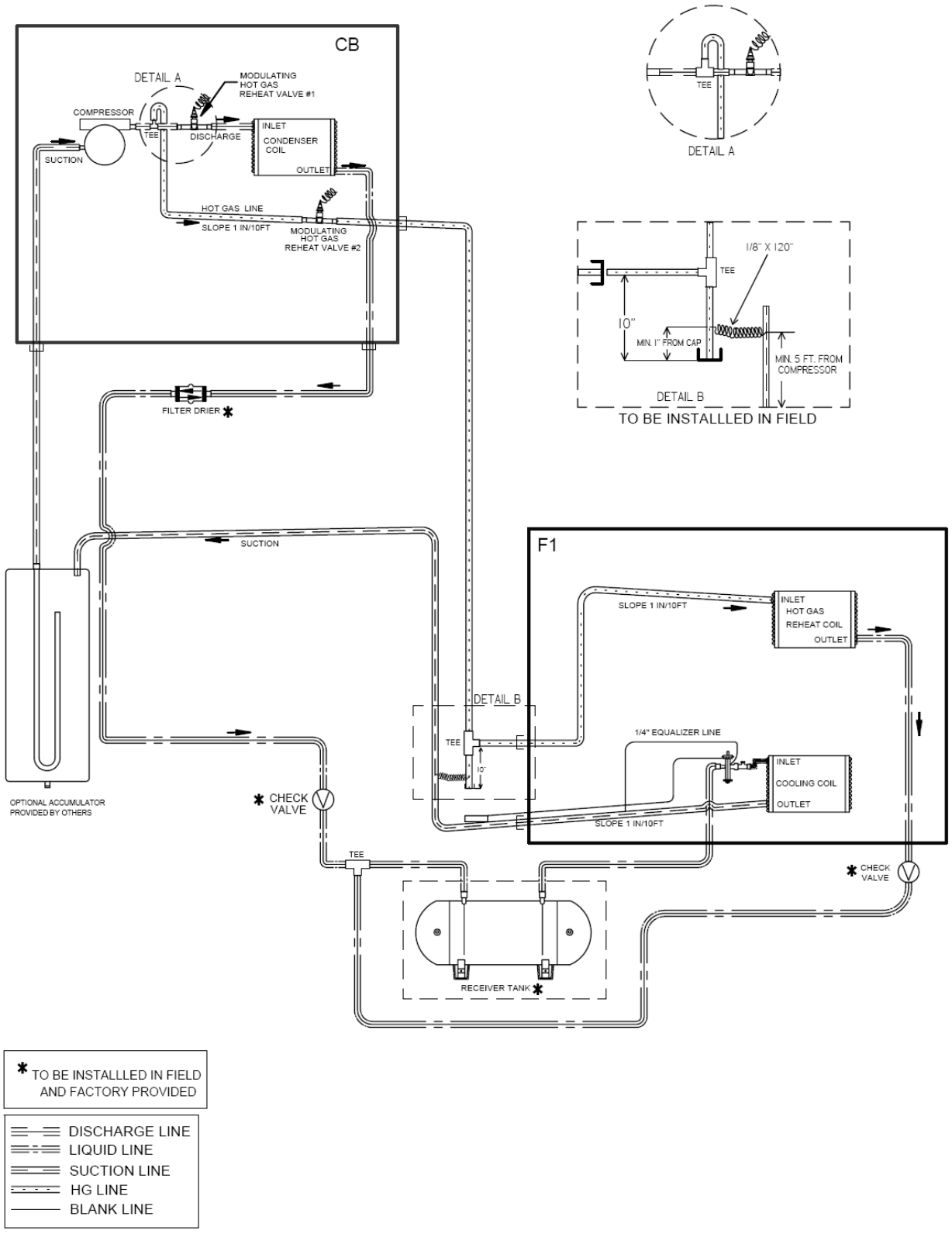


Figure 8 - Modulating Hot Gas Reheat Piping Diagram with Air Handling Unit below Condensing Unit with Optional Accumulator

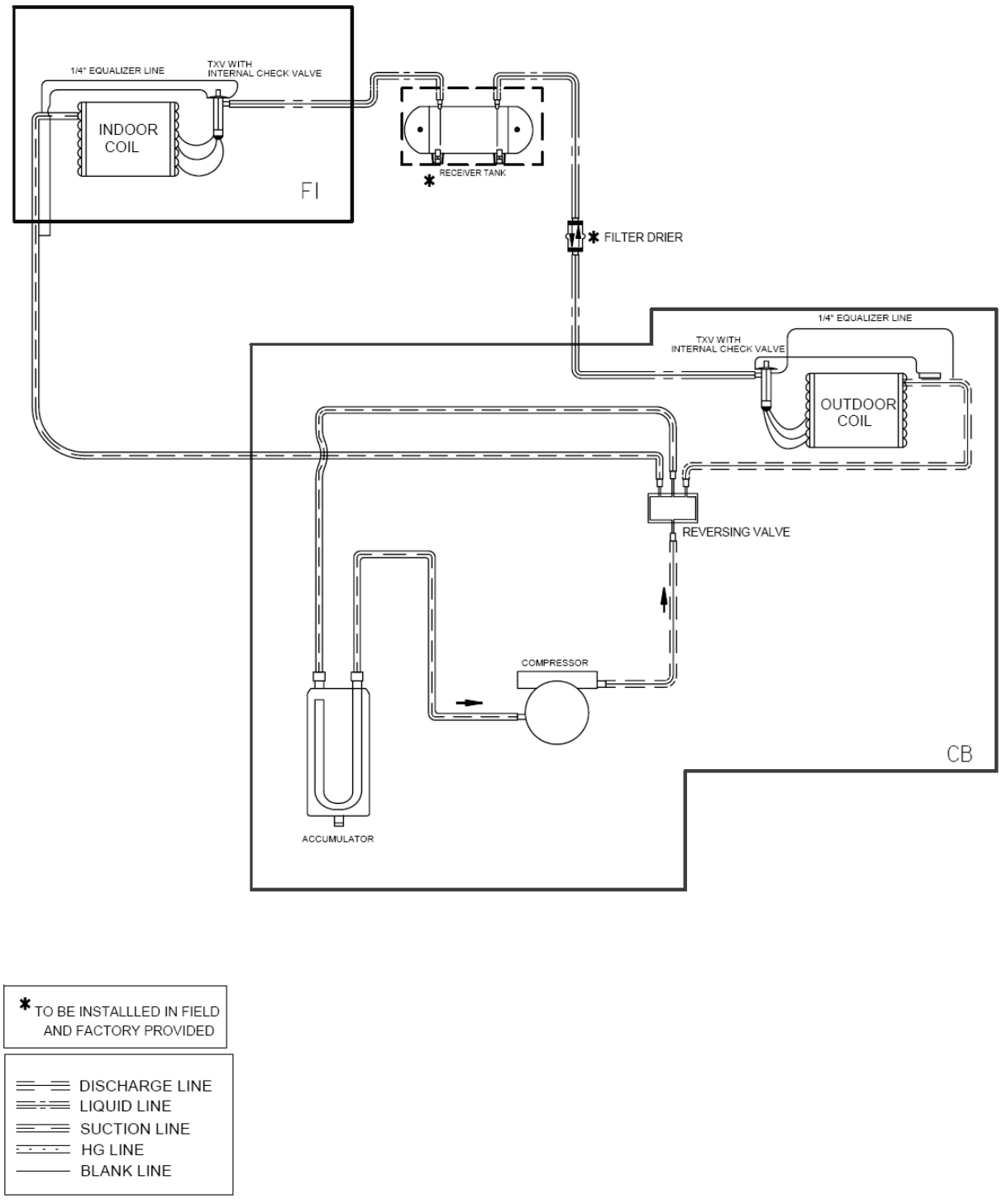


Figure 9 - Heat Pump Piping Diagram with Indoor Unit above Outdoor Unit

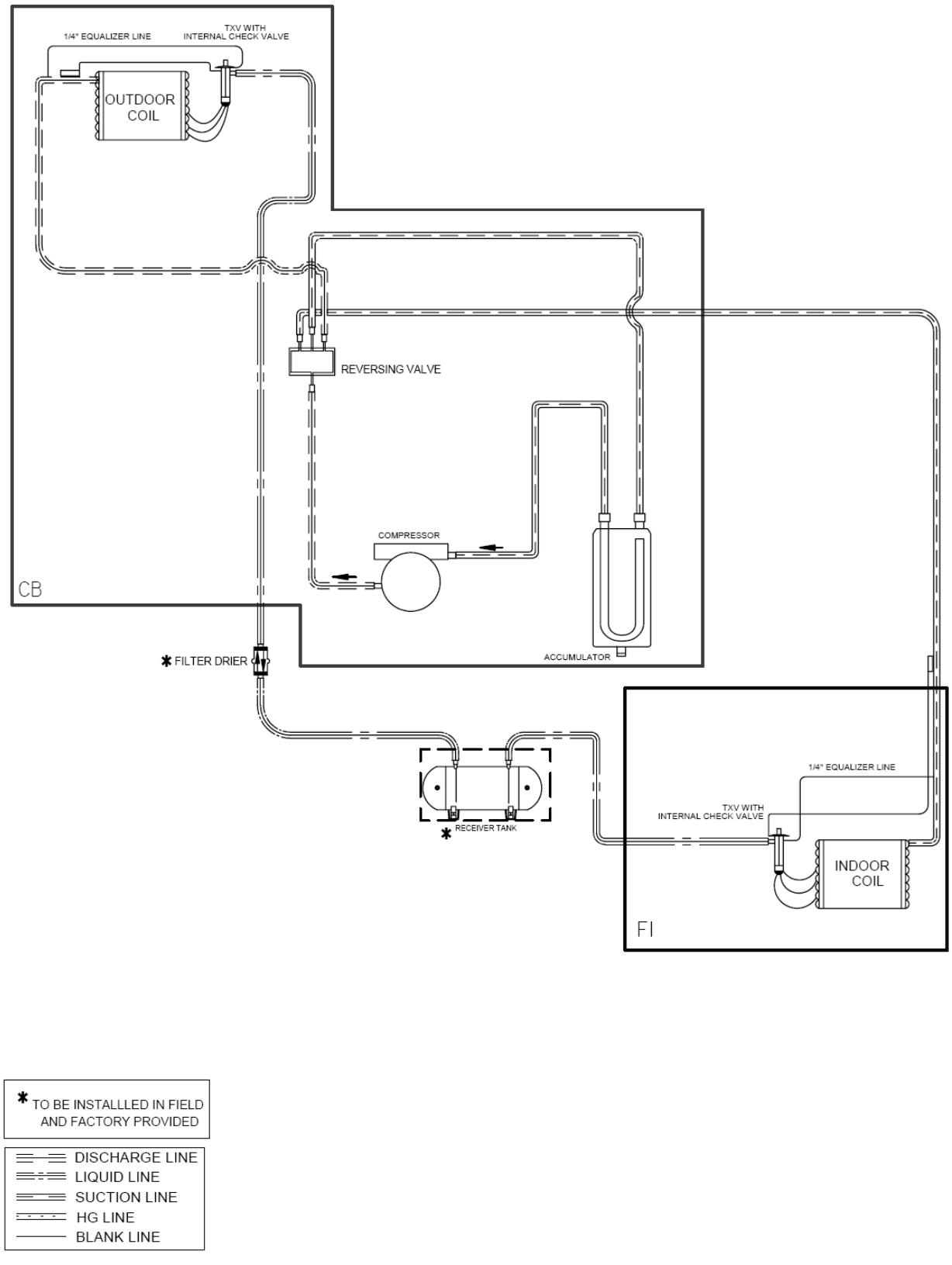


Figure 10 - Heat Pump Piping Diagram with Outdoor Unit above Indoor Unit

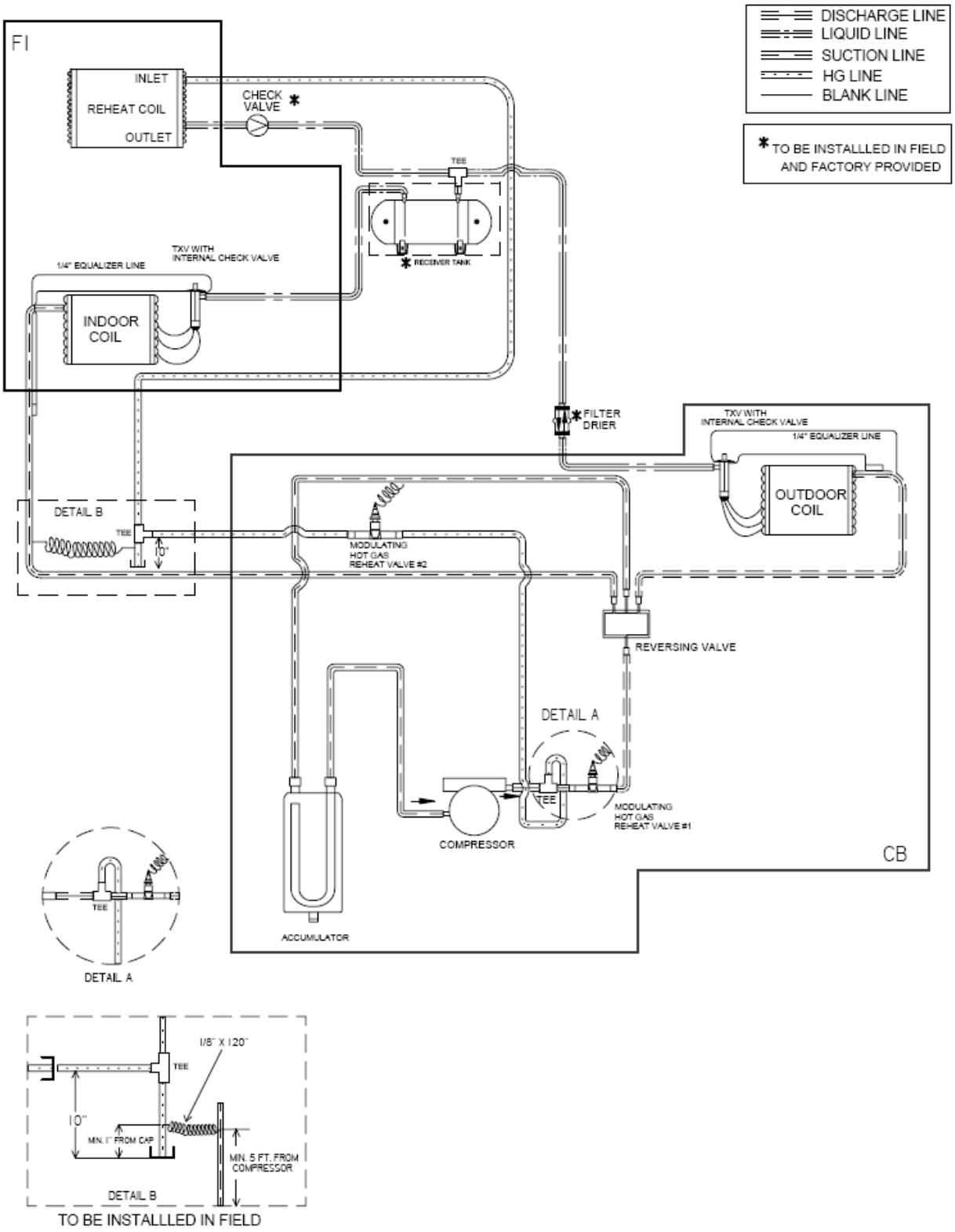


Figure 11 - Heat Pump Piping Diagram with Modulating Hot Gas Reheat and Indoor Unit above Outdoor Unit

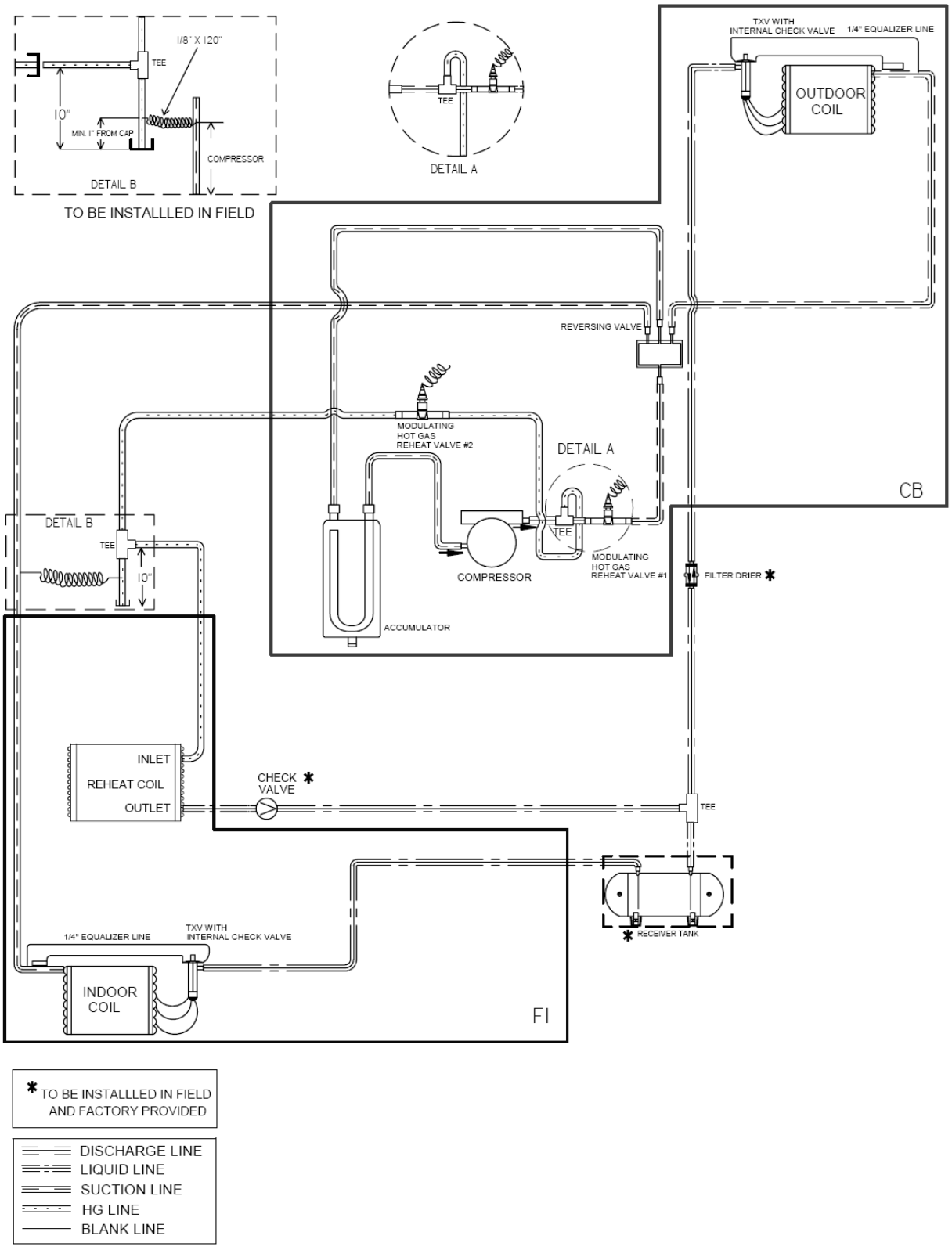


Figure 12 - Heat Pump Piping with Modulating Hot Gas Reheat and Outdoor Unit above Indoor Unit

Thermostat Installation and Wiring

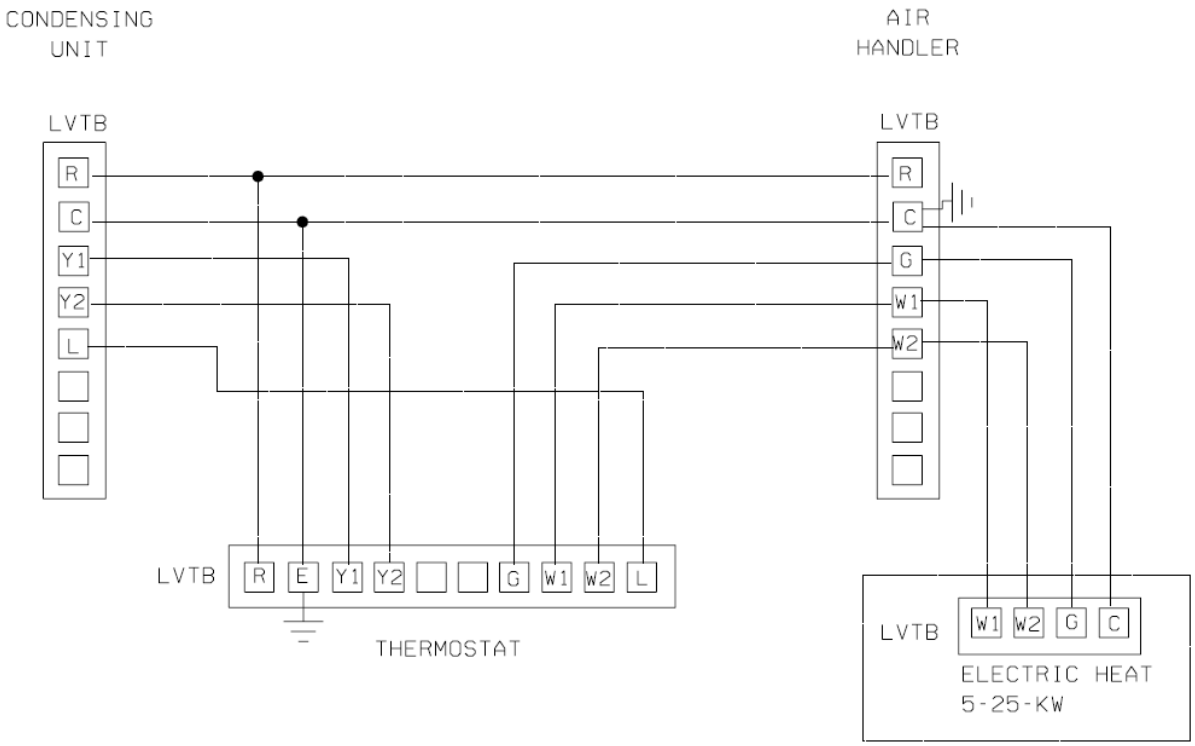


Figure 13 - 2 Stage Cooling with Electric Heat

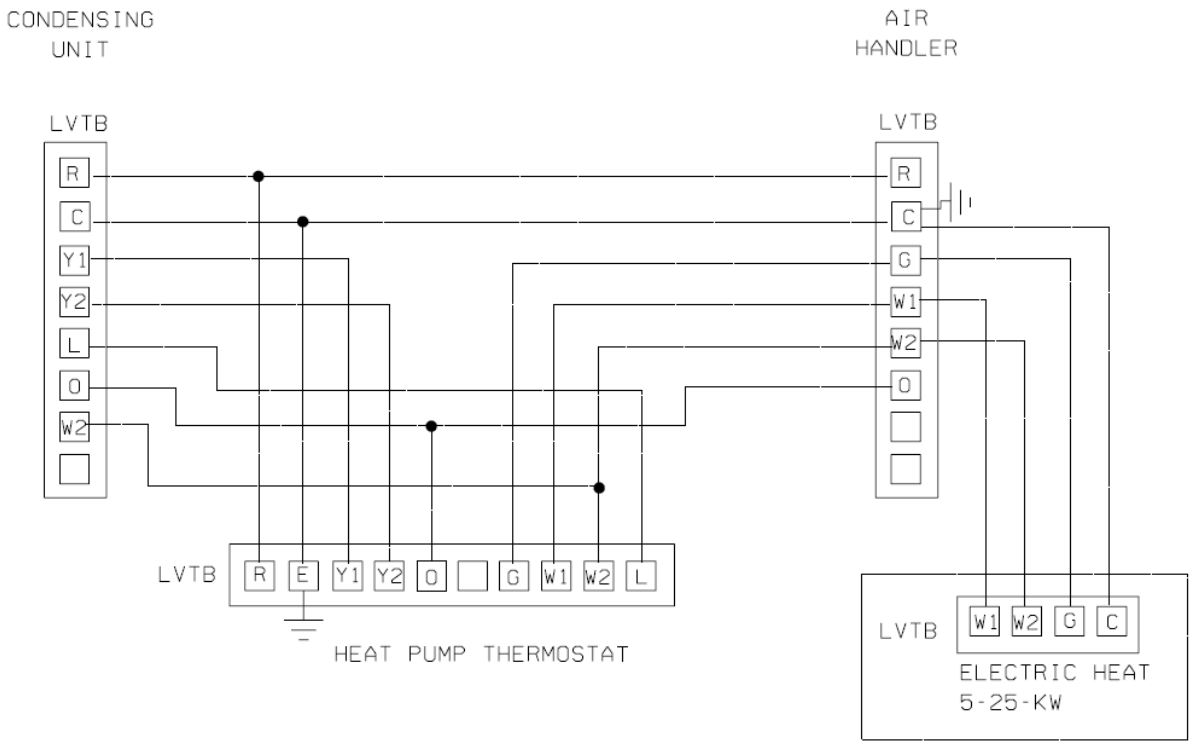


Figure 14 - 2 Stage Cooling with Heat Pump and Electric Heat

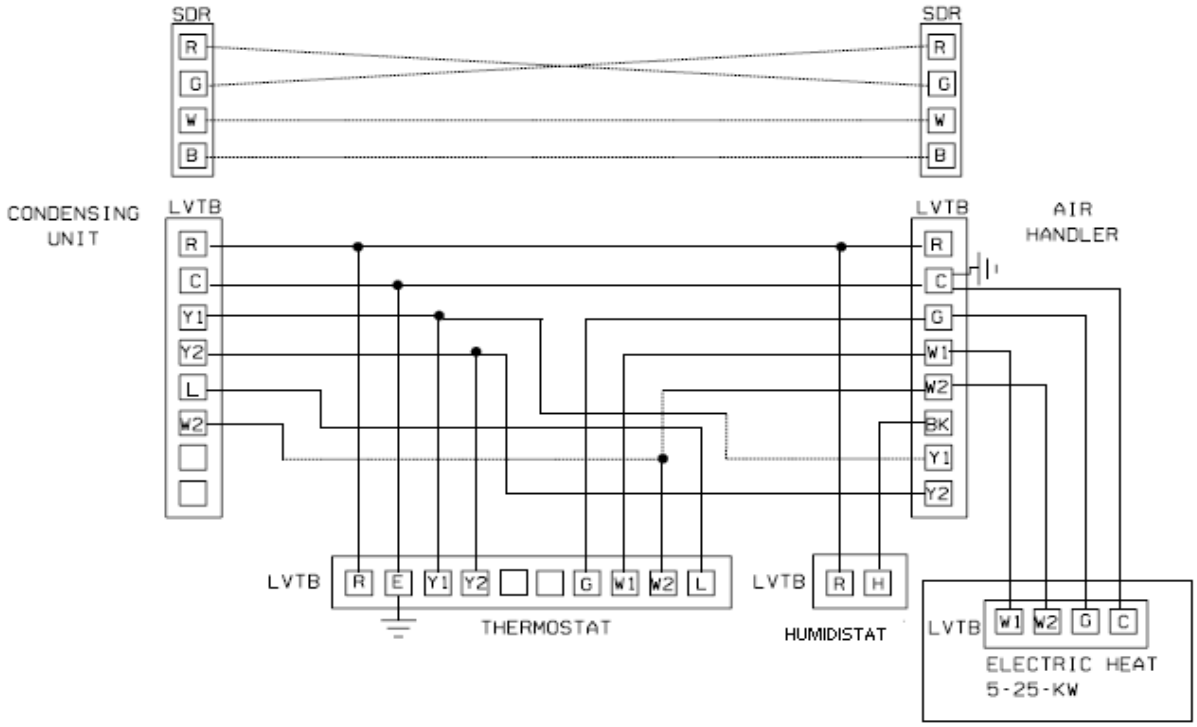


Figure 15 - 2 Stage Cooling and Electric Heat with Hot Gas Reheat and Humidistat

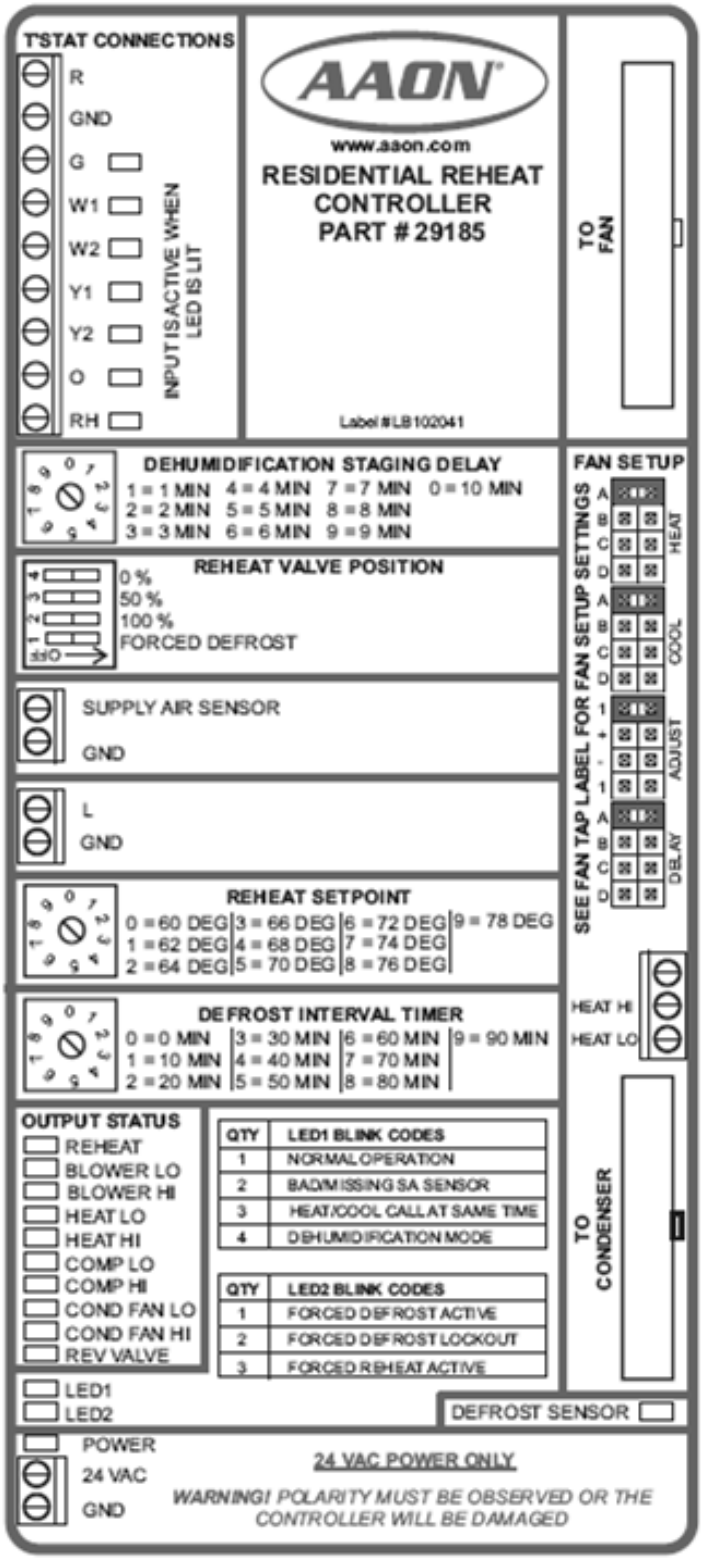


Figure 16 - Main Control Board for Units Equipped with Modulating Hot Gas Reheat

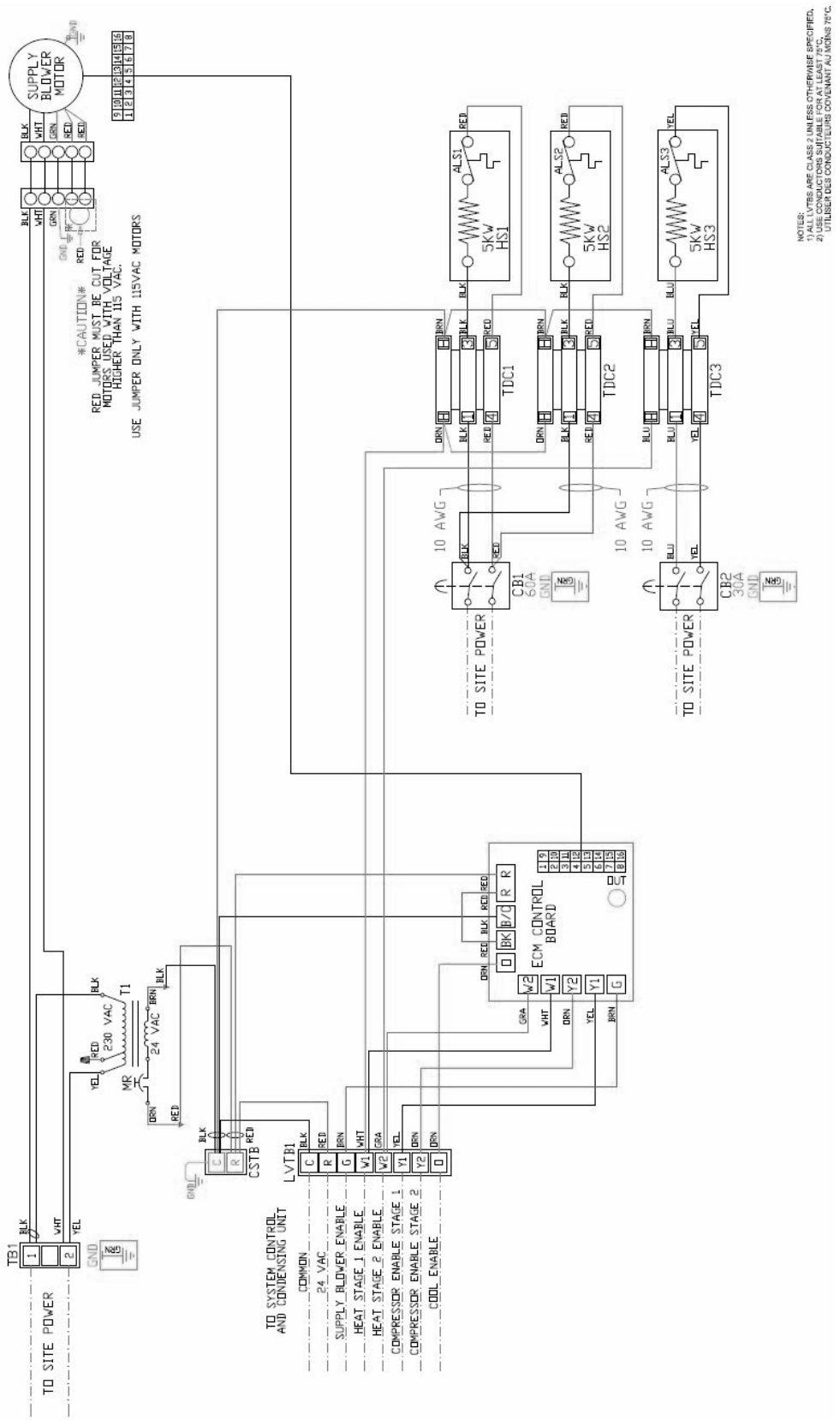


Figure 17 - Field Wiring Connections for an F1 Series Air Handling Unit.

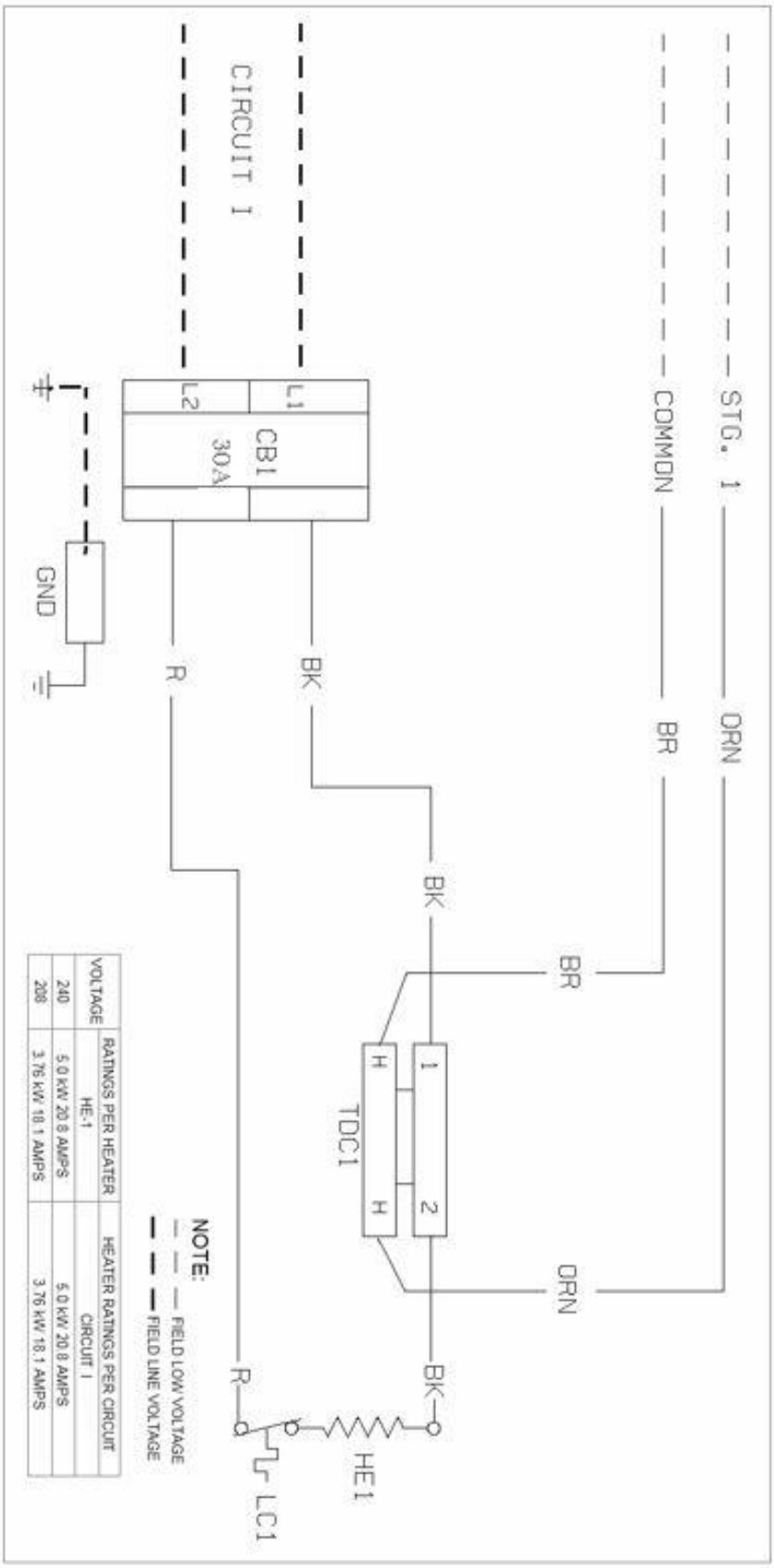
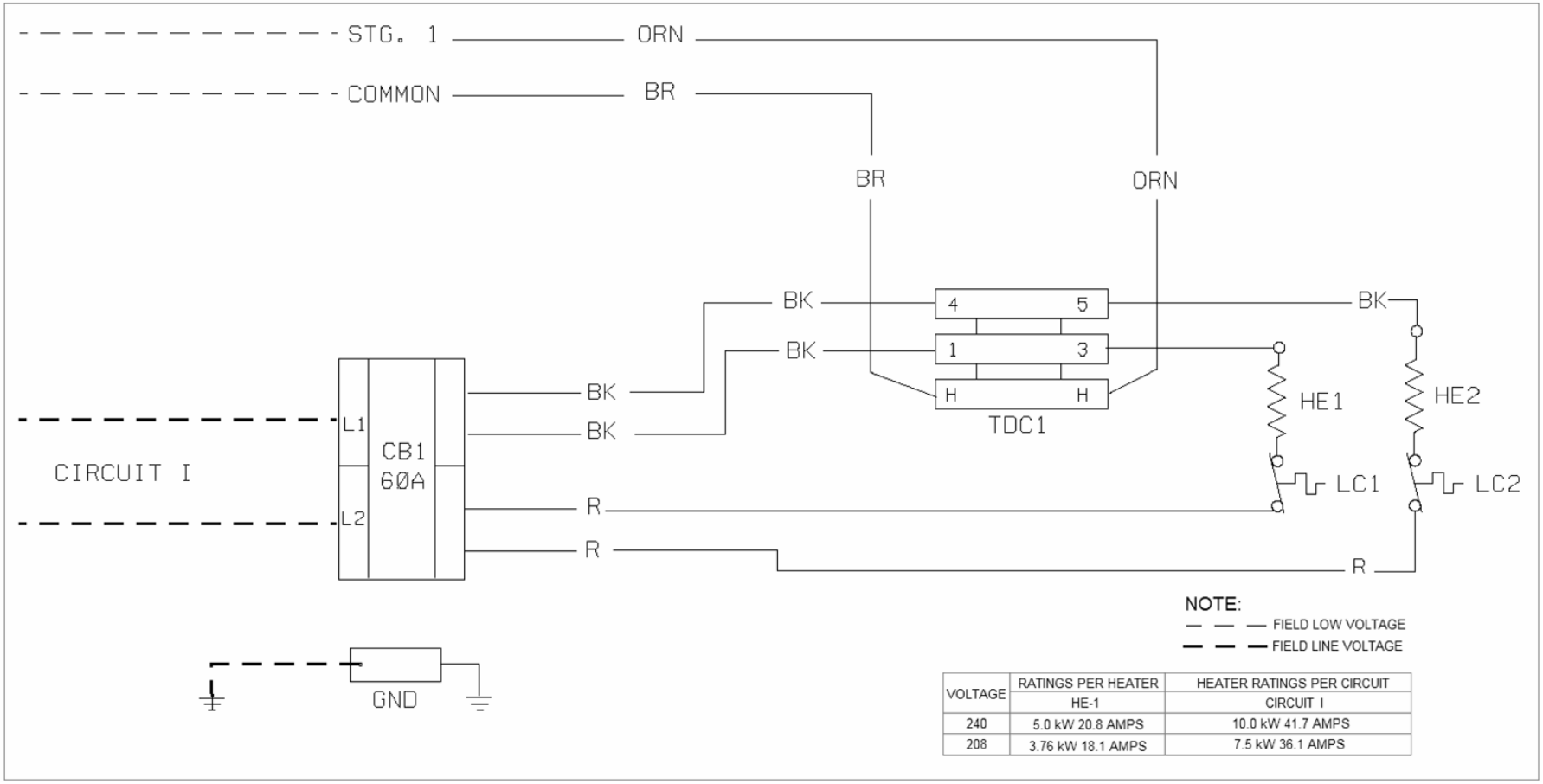
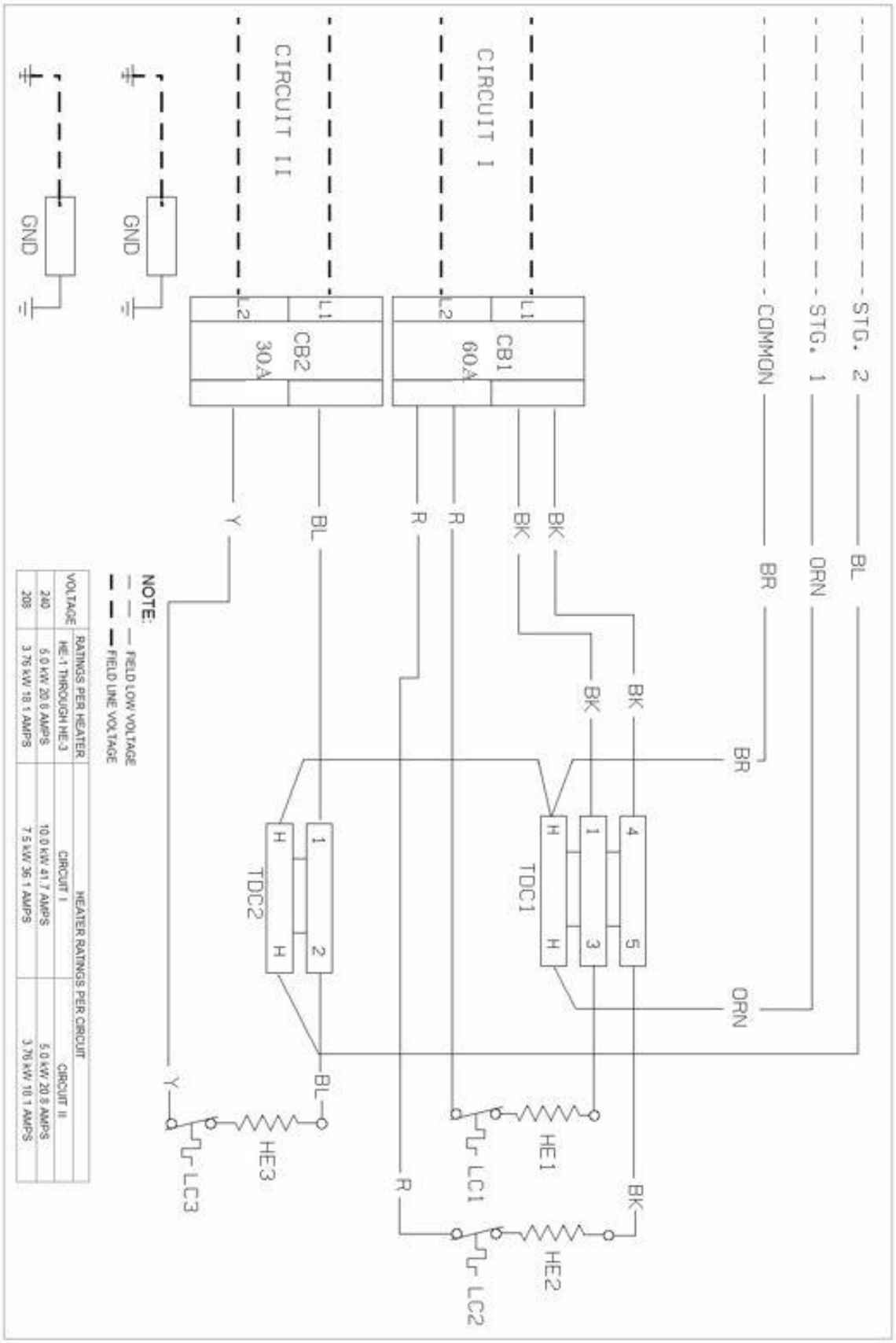


Figure 18 - 5kW Electric Heat



VOLTAGE	RATINGS PER HEATER	HEATER RATINGS PER CIRCUIT
	HE-1	CIRCUIT I
240	5.0 kW 20.8 AMPS	10.0 kW 41.7 AMPS
208	3.76 kW 18.1 AMPS	7.5 kW 36.1 AMPS

Figure 19 - 10 kW Electric Heat



VOLTAGE	RATINGS PER HEATER	HEATER RATINGS PER CIRCUIT	
	HE-1 THROUGH HE-3	CIRCUIT I	CIRCUIT II
240	5.0 kW 20.8 AMPS	10.0 kW 41.7 AMPS	5.0 kW 20.8 AMPS
208	3.76 kW 18.1 AMPS	7.5 kW 36.1 AMPS	3.76 kW 18.1 AMPS

Figure 20 - 15 kW Electric Heat

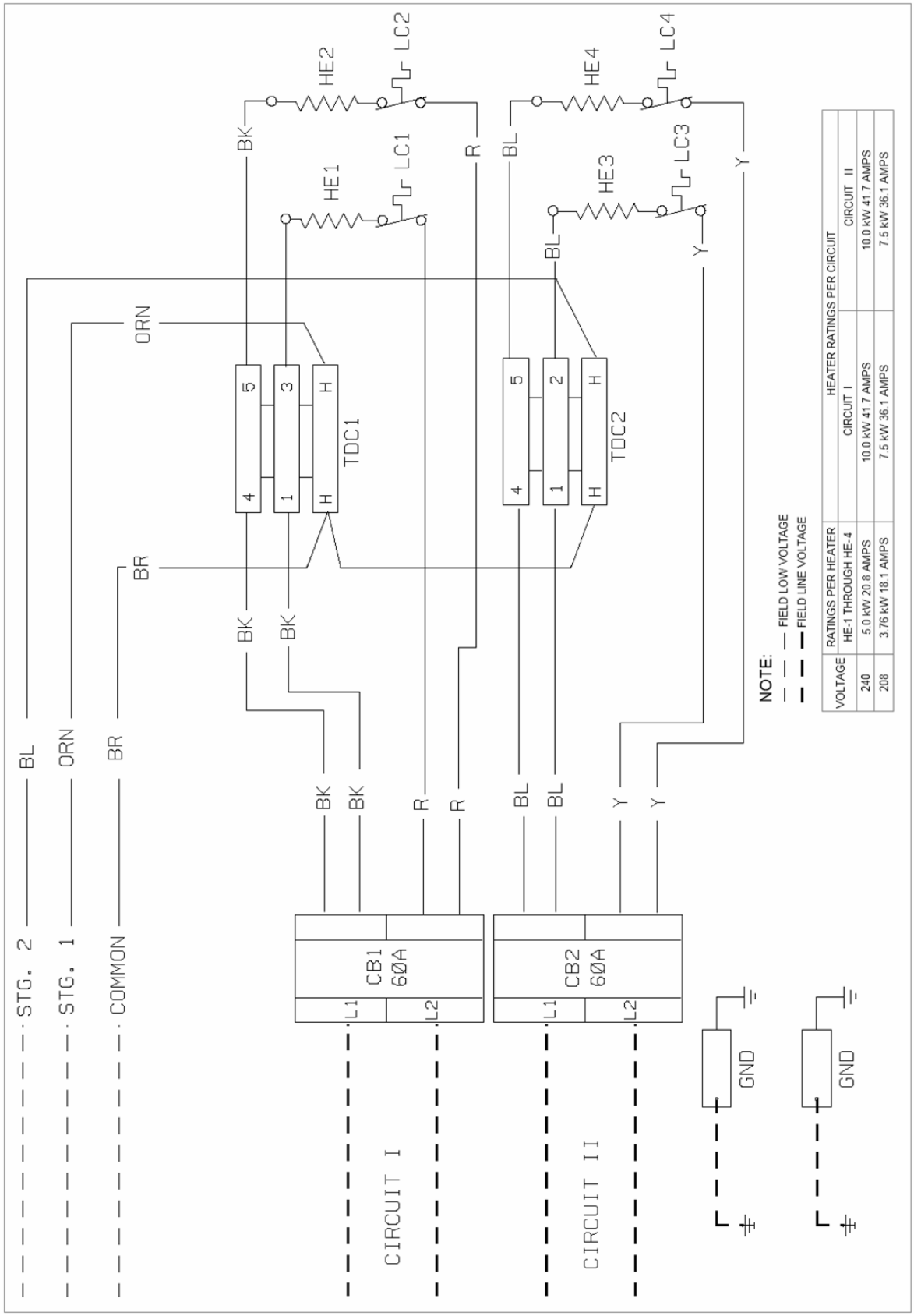


Figure 21 - 20 kW Electric Heat

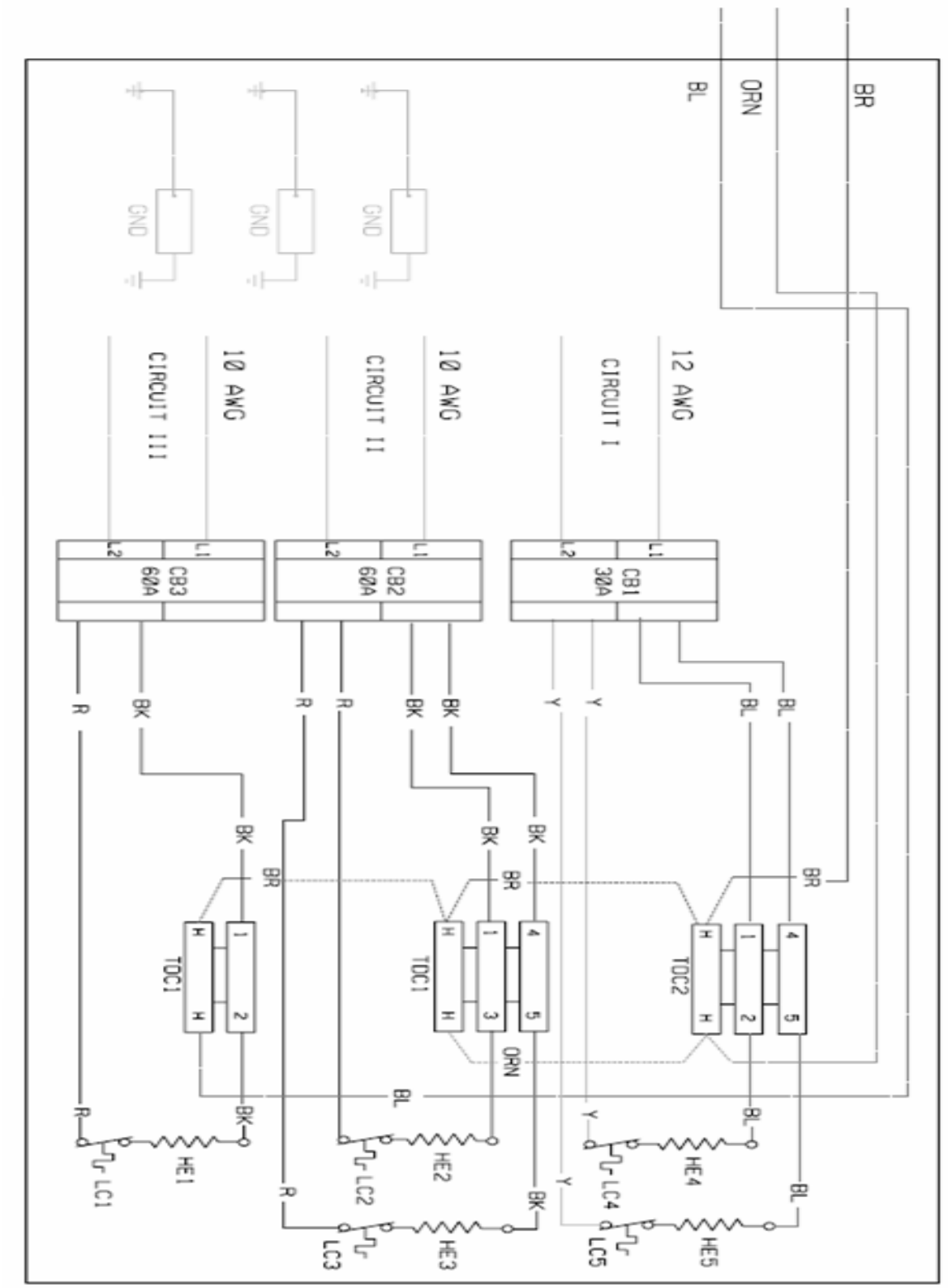


Figure 22 - 25 kW Electric Heat

F1 Series Startup Form

Job Name:_____ Date:_____

Address:_____

_____

Model Number:_____

Serial Number:_____ Tag:_____

Startup Contractor:_____

Address:_____

_____ Phone:_____

Pre Startup Checklist

Installing contractor should verify the following items.	
1. Is there any visible shipping damage?	☐Yes ☐No
2. Is the unit level?	☐Yes ☐No
3. Are the unit clearances adequate for service and operation?	☐Yes ☐No
4. Do all access doors open freely and are the handles operational?	☐Yes ☐No
5. Have all shipping braces been removed?	☐Yes ☐No
6. Have all electrical connections been tested for tightness?	☐Yes ☐No
7. Does the electrical service correspond to the unit nameplate?	☐Yes ☐No
8. On 208/230V units, has transformer tap been checked?	☐Yes ☐No
9. Has overcurrent protection been installed to match the unit nameplate requirement?	☐Yes ☐No
10. Have all set screws on the fans been tightened?	☐Yes ☐No
11. Do all fans rotate freely?	☐Yes ☐No
12. Does the field water piping to the unit appear to be correct per design parameters?	☐Yes ☐No
13. Is all copper tubing isolated so that it does not rub?	☐Yes ☐No
14. Are air filters installed with proper orientation?	☐Yes ☐No
15. Have condensate drain and p-trap been connected?	☐Yes ☐No

Ambient Temperature

Ambient Dry Bulb Temperature _____°F Ambient Wet Bulb Temperature _____°F

Supply Fan Assembly

Alignment ☐		Check Rotation ☐		Nameplate Amps_____
Number	hp	L1	L2	L3
1				

Compressors/DX Cooling

Check Rotation ☐						
Number	L1	L2	L3	Head Pressure PSIG	Suction Pressure PSIG	Crankcase Heater Amps
1 - Full Capacity						
2 - Reduced Capacity						

Refrigeration System 1 Full Capacity - Cooling Mode

	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 1 Reduced Capacity - Cooling Mode

	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 1 Full Capacity - Heating Mode (Heat Pump Only)

	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 1 Reduced Capacity - Heating Mode (Heat Pump Only)

	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Unit Configuration

Water-Cooled Condenser ☐	Air-Cooled Condenser ☐
No Water Leaks ☐	Condenser Safety Check ☐
Water Flow _____ gpm	
Water Inlet Temperature _____°F	Water Outlet Temperature _____°F

Water/Glycol System

1. Has the entire system been flushed and pressure checked?	☐ Yes ☐ No
2. Has the entire system been filled with fluid?	☐ Yes ☐ No
3. Has air been bled from the heat exchangers and piping?	☐ Yes ☐ No
4. Is the glycol the proper type and concentration (N/A if water)?	☐ Yes ☐ No
5. Is there a minimum load of 50% of the design load?	☐ Yes ☐ No
6. Has the water piping been insulated?	☐ Yes ☐ No
7. What is the freeze point of the glycol (N/A if water)? _____	

Air-Cooled Condenser

Alignment ☐		Check Rotation ☐		Nameplate Amps_____
Number	hp	L1	L2	L3
1				

Electric Heating

Stages_____		Limit Lockout ☐		Aux. Limit Lockout ☐
Stage	Amps		Stage	Amps
1			4	
2			5	
3			6	

Maintenance Log

This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair or adjustments. AAON Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper startup, maintenance and servicing of the equipment falls to the owner and qualified licensed technician.

Entry Date	Action Taken	Name/Tel.

Literature Change History

November 2009
Update of the IOM formatting to match with other IOMs and adding some variable capacity scroll compressor information.

April 2009
Update of the IOM adding the F1 Series model number description.

June 2010
Revision of the IOM adding PVC and CPVC piping Caution.

April 2012
Update of the IOM adding the electronic startup form, adding the index of tables and figures, and updating the table of contents.

November 2015
Added *Figure 3 TXV Bulb Position*

August 2016
Removed the section on refrigerant line sizing. See condensing unit products for this information.

October 2017
Updated subcooling values.

May 2018
Updated technical support contact information. Updated acceptable subcooling values table.

May 2019
Added the minimum/maximum voltage range table in the Electrical section.

February 2020
Corrected breaker amps on 5kW electric heat figure and 15kW electric heat figure. Updated Figure for Field Wiring Connections for an F1 Series Air Handling Unit.

AAON
203 Gum Springs Rd.
Longview, TX 75602-1721
www.AAON.com

F1 Series
Installation, Operation & Maintenance

R58420 · Rev. B · 200225
(ACP 29902)

Factory Technical Support: 918-382-6450

Note: Before calling Technical Support, please have the model and serial number of the unit available.

Parts: For replacement parts, please contact your local AAON Representative.