

INSTALLATION INSTRUCTIONS & HOMEOWNER'S INFORMATION FEU Upflow Electric Furnace

Approved for use in manufactured homes.

NOTE: Read the entire instruction manual before starting the installation.

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause death, 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, protective clothing and work gloves. Use quenching cloths for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and the applicable editions of the National Electrical Codes (NEC) NFPA 70.

In Canada, refer to the current editions of the Canadian Electrical Code CSA C22.1.

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** and **CAUTION**. 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.

WARNING

ELECTRICAL SHOCK HAZARD

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

Before installing, modifying or servicing system, always turn off main power to system. There may be more than one disconnect switch. Lock out and tag switch with a suitable warning label.

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 and gloves when handling parts.

INTRODUCTION

Model FEU has been designed for upflow applications. Models are available for system sizes 2 – 5 tons (24,000 – 60,000 BTUH) nominal cooling capacity. All models use an ECM motor.

FEU models contain a factory supplied replaceable air filter. Factory approved electric heater packages are available in sizes 10kW through 20kW.

LOCATION

Select the best position which suits the installation site conditions. The location should provide adequate structural support, space in the front of the unit for service access, clearance for return air and supply duct connections, space for refrigerant piping connections and condensate drain line connections.

NOTE: Internal filter can be accessed from a separate filter door.

WARNING

FIRE HAZARD

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

When heaters are installed, maintain clearances from combustible materials as specified on the unit rating plate.

Table 1 – Required Clearances

ALL MODELS – Space, inches	
Back and Sides	0"
Front	In Closet – 6" to closet door In Alcove – 24" for access
Ducts	0–15kW heater – 0" 20kW heater – 1" for first 36" of duct

POSITION UNIT

Allow space for wiring, piping, and servicing unit.

1. Remove electrical knockouts from desired wire entry locations for high voltage and thermostat wire.
2. Place the Upflow Stand in the desired location and attach to the floor with wood screws. See Figure 1.

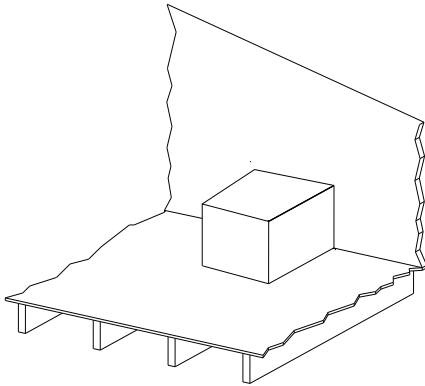


Fig. 1 – Upflow Stand

3. Set the unit onto the Upflow Stand. See Figure 2.
4. Secure the unit to the stand using self-tapping screws, or drill pilot holes in the casing and use sheet metal screws.
5. Make overhead duct connections per other approved designs, and maintain proper clearances where required.

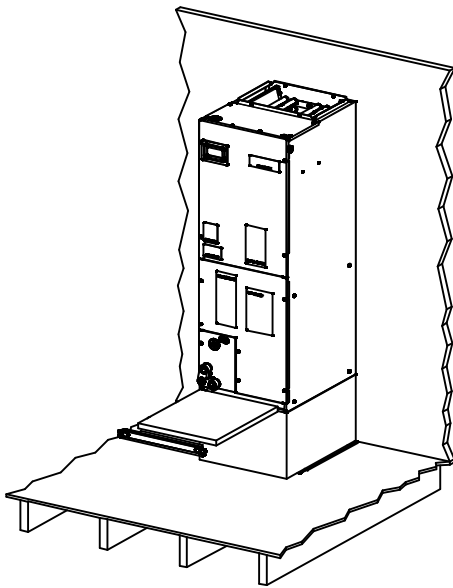


Fig. 2 – Unit with Filter

Filtered Grille Applications

When the unit is located within a closet, a filtered return air grille may be used as a door or through an adjacent wall into the furnace compartment. **IMPORTANT:** When this application is used, the air filter within the unit **must** be removed.

ELECTRICAL CONNECTIONS

These units do not have a printed circuit board (PCB), they have a low voltage circuit protective fuse (3 amp) inline on the wire harness. Speed selections are made at the fan motor with the Blue wire. The motor is pre-programmed with the time-delay circuit on some of the speed taps. See Page 5.

Before proceeding with electrical connections, make certain that supply voltage, frequency, phase, and circuit ampacity are as specified on the unit rating plate. See unit wiring label for proper field high and low voltage wiring.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Turn off the main (remote) disconnect device before working on incoming (field) wiring..

Incoming (field) wires on the line side of the circuit breaker found in the furnace unit remain live, even when the switch is in the OFF position. Service and maintenance to incoming (field) wiring cannot be performed until the main disconnect switch (remote to the unit) is turned off.

Line Voltage Connections

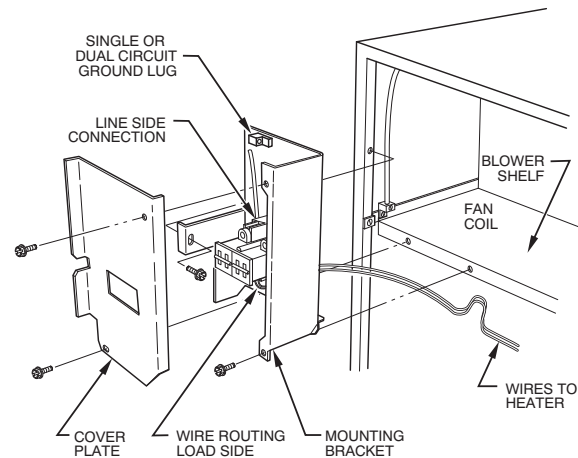


Fig. 3 – Circuit Breaker Detail View

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High Voltage Wiring

- Units with 10kW heaters are wired for single-supply circuit only. See Figure 4.
- Units with 12kW, 15kW and 20kW heaters are wired for dual-supply circuits only. See Figure 5.
- Torque all connections to the specification listed on the breaker body.

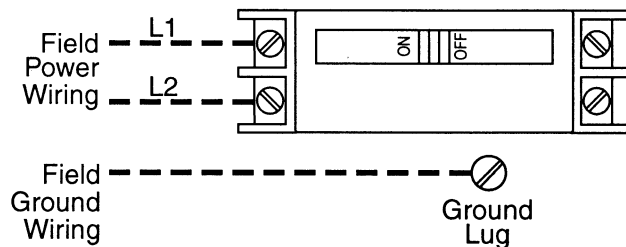


Fig. 4 – 10 kW Circuit Breaker and Disconnect Heaters

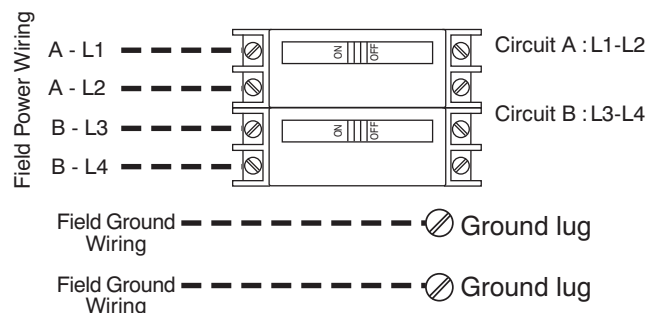


Fig. 5 – 12, 15 & 20 kW Circuit Breakers

Thermostat Wiring

Connection to Unit

Wire thermostat in accordance with wiring label on the blower (also refer to Figs 6 through 8). Use minimum 22 AWG color-coded, insulated (35 °C minimum) wire to make the low-voltage connections between the thermostat, the unit, and the outdoor equipment. If the thermostat is located more than 100 feet from the unit (as measured along the low voltage wire), use 18 AWG color-coded, insulated (35 °C minimum) wire. All wiring must be NEC Class 1 and must be separated from incoming power leads. Refer to outdoor unit wiring instructions for additional wiring recommendations.

Wiring Connections

For the following three figures 6, 7, and 8:

- R = 24V
- G = Fan
- W2, W3, E = Electric Heat / Heat Pump Defrost
- Y = Cooling / Heat Pump Heating
- O = Reversing Valve (heat pump applications)

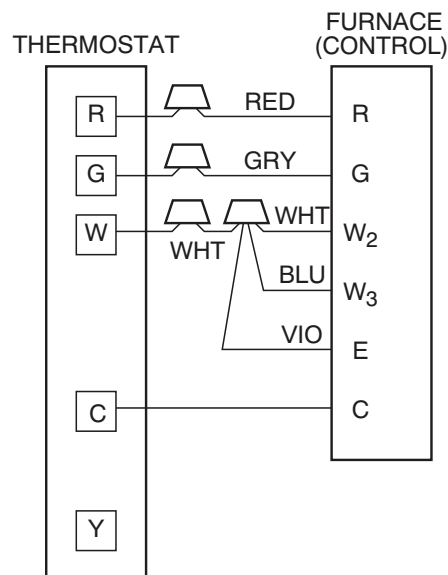


Fig. 6 – Wiring Layout – Furnace

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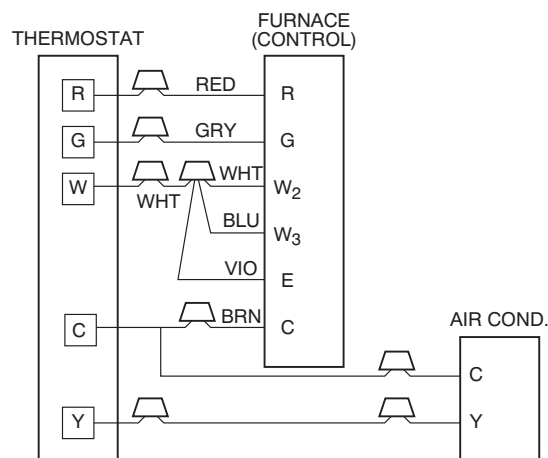


Fig. 7 – Wiring Layout – Air Conditioning Unit (Cooling and 1-Stage Heat)

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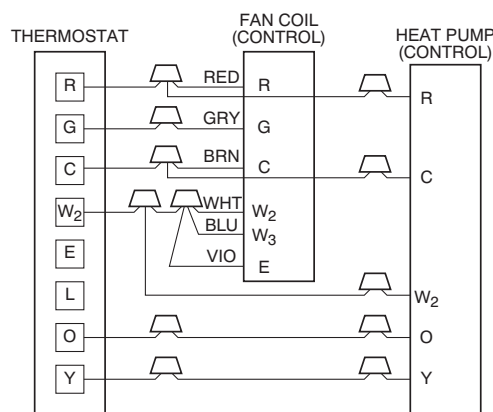


Fig. 8 – Wiring Layout – Heat Pump Unit (Cooling and 2-Stage Heat with No Outdoor Thermostat)

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Transformer Information (applicable to on-site HVAC contractor)

The transformer is factory wired for 230V operation. For 208V applications, the installing contractor should disconnect the black wire from the 230V terminal on transformer and connect it to the 208V terminal. See Figure 9.

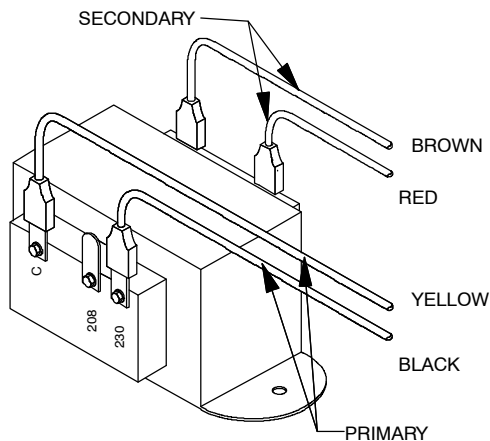


Fig. 9 – Transformer Connections

Ground Connections



WARNING

ELECTRICAL SHOCK HAZARD

Failure to establish uninterrupted or unbroken ground could result in personal injury or death.

According to NEC, ANSI/NFPA 70, and local codes, the cabinet must have an uninterrupted or unbroken ground in order to minimize potential for personal injury or death if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes. If conduit connection uses reducing washers, a separate ground wire must be used.

NOTE: Grounding may be accomplished by using grounding lugs provided in control box.

Minimum CFM and Motor Speed Selection (applicable to on-site HVAC contractor)

Units with electric heaters require a minimum CFM. Refer to the unit wiring label to ensure that the fan speed selected is not lower than the minimum fan speed indicated.

Fan speed selection is done at the fan motor. To change motor speeds, reposition wire at fan motor speed terminals labeled 1–2–3. See Figure 10. Units with or without electric heaters require a minimum CFM. Refer to the unit wiring label to ensure that the fan speed selected is not lower than the minimum fan speed indicated.

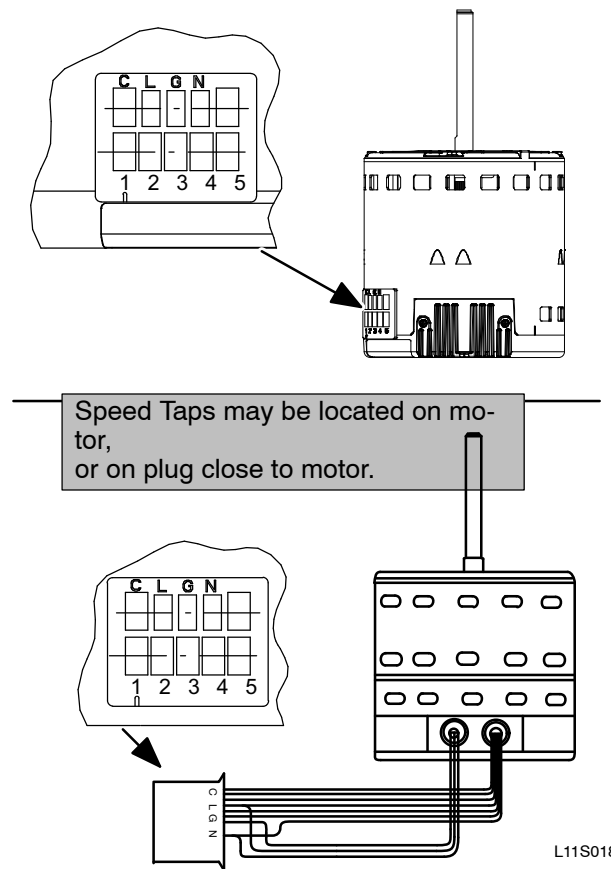


Fig. 10 – Motor Speed Selection

Table 2 – Speed Tap Selection at Motor Connector

Tap 1	Low	90 sec off delay
Tap 2	Medium	90 sec off delay
Tap 3	High	90 sec off delay
Tap 4	Electric Heat †	0 sec off delay
Tap 5	Max ‡	0 sec off delay

† Electric heat airflow is same CFM as Tap 3, but with 0 sec off delay.

‡ For high static applications, see Airflow Performance Tables for max airflow.

To change motor speeds disconnect the BLUE fan lead from motor connector terminal #2 (factory default position) and move to desired speed tap; 1, 2, 3, or 5. See Figure 10.

Speed taps 1, 2, and 3 have a 90 second blower off time delay pre-programmed into the motor. Speed tap 4 is used for electric heat only (with 0-second blower time delay) and the WHITE wire should remain on tap 4. Speed tap 5 is used for high static applications, but has a 0 second blower time delay pre-programmed into the motor (see Airflow Performance Tables for actual CFM for each tap). Also, see Figure 10 for motor speed selection location.

NOTE: In low static applications, lower motor speed tap should be used to reduce possibility of water being blown off coil.

SEQUENCE OF OPERATIONS

Continuous Fan (Whole House Ventilation)

Thermostat closes R to G. G sends signal direct to motor which completes circuit to indoor blower motor. When G is de-energized, there is a 90 second off delay before indoor blower motor stops.

Electric Heat or Emergency Heat Mode

Thermostat closes R to W. W energizes electric heat relay(s) which completes circuit to heater element(s). W also energizes the indoor blower motor. When W is de-energized, electric heat relay(s) opens and the indoor blower motor is de-energized and stops.

Cooling Mode

Thermostat energizes R to G, R to Y, and R to O (heat pump only). G sends signal direct to motor, which completes circuit to indoor blower motor. When G is de-energized, there is a 90 second off delay before indoor blower motor stops.

Heat Pump Heating Mode

Thermostat energizes R to G and R to Y. G sends signal direct to motor, which completes circuit to indoor blower motor. When G is de-energized, there is a 90 second off delay before indoor blower motor stops.

Heat Pump Heating with Auxiliary Electric Heat

Thermostat energizes R to G, R to Y, and R to W. G energizes indoor blower motor. W energizes electric heat relay(s) which completes circuit to heater element(s). When W is de-energized, electric heat relay(s) open, turning off heater elements. When G is de-energized, the indoor blower motor is de-energized and stops.

⚠ CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in poor unit performance and/or product damage.

Never operate the unit without a filter. For those applications where access to an internal filter is impractical, a field-supplied filter must be installed in the return air stream.

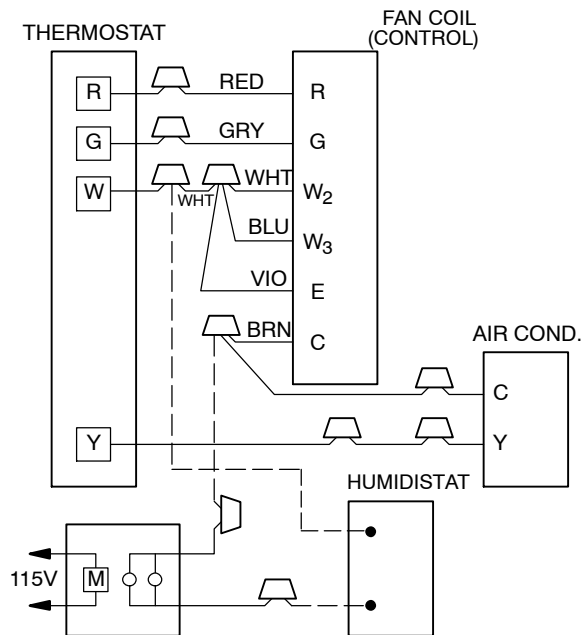


Fig. 11 – Wiring Layout of Humidifier to Furnace with Electric Heat

Table 3 – Airflow Performance – without Cooling Coil (CFM)

SIZE	BLOWER SPEED	TOTAL STATIC (inches water column)					
		0.10	0.20	0.30	0.40	0.50	0.60
FEU002410	Tap 5	1123	1081	1032	993	967	914
	Tap 4	1015	934	892	857	800	737
	Tap 3	1015	942	892	856	804	738
	Tap 2	1012	833	761	705	643	585
	Tap 1	1014	829	627	560	496	441
FEU003612	Tap 5	1492	1453	1425	1398	1364	1335
	Tap 4	1382	1348	1314	1286	1255	1219
	Tap 3	1383	1347	1313	1285	1254	1218
	Tap 2	1223	1182	1151	1122	1079	1039
	Tap 1	1165	1123	1092	1060	1012	973
FEU004815	Tap 5	1991	1954	1919	1888	1850	1811
	Tap 4	1885	1849	1811	1776	1737	1692
	Tap 3	1889	1846	1812	1778	1739	1690
	Tap 2	1630	1584	1547	1499	1449	1403
	Tap 1	1480	1431	1385	1332	1280	1237
FEU006020	Tap 5	2069	2031	2005	1977	1945	1912
	Tap 4	1857	1824	1795	1760	1727	1689
	Tap 3	1859	1822	1794	1760	1725	1688
	Tap 2	1699	1664	1635	1595	1553	1509
	Tap 1	1569	1482	1403	1355	1308	1263

■ – Airflow outside 450 cfm/ton.

NOTES:

1. Airflow based upon dry coil at 230v with factory-approved filter and electric heater; airflow at 208 volts is approximately the same as 230 volts because the ECM motor is a constant torque motor. The torque doesn't drop off at the speeds the motor operates.
2. To avoid potential for condensate blowing out of drain pan prior to making drain trap:
Return static pressure must be less than 0.40 in. wc.
3. Airflow above 400 cfm/ton on 4800 – 6000 size could result in condensate blowing off coil or splashing out of drain pan.

Table 4 – Airflow Performance – with Accessory Cooling Coil (CFM)

SIZE	BLOWER SPEED	TOTAL STATIC (inches water column)					
		0.10	0.20	0.30	0.40	0.50	0.60
FEU002410	TAP 5	969	936	892	835	763	676
	TAP 4	826	795	766	743	706	660
	TAP 3	826	795	766	743	706	660
	TAP 2	701	660	616	581	537	499
	TAP 1	617	592	552	507	472	420
FEU003612	TAP 5	1295	1270	1239	1212	1170	1115
	TAP 4	1221	1185	1163	1137	1099	1068
	TAP 3	1221	1185	1163	1137	1099	1068
	TAP 2	1081	1056	1024	995	960	924
	TAP 1	1020	994	963	932	893	859
FEU004815	TAP 5	1733	1702	1669	1632	1600	1564
	TAP 4	1659	1624	1589	1554	1521	1489
	TAP 3	1659	1624	1589	1554	1521	1489
	TAP 2	1442	1403	1367	1329	1298	1261
	TAP 1	1290	1246	1211	1172	1132	1091
FEU006020	TAP 5	2020	1985	1951	1917	1878	1832
	TAP 4	1801	1765	1730	1693	1654	1603
	TAP 3	1801	1765	1730	1693	1654	1603
	TAP 2	1655	1622	1583	1546	1497	1443
	TAP 1	1452	1408	1361	1317	1268	1218

Table 5 – Electrical Data

Model	Heater kW	Circuit	Motor Amps	Heater Amps	Min Circuit Amps	Breaker Size
FEU002410	10 KW	SINGLE	2.8	40	53.6	60
FEU003612	12 KW	A (L1,L2)	4.1	31.7	44.8	50
		B (L3,L4)		15.8	19.8	20
FEU004815	15 KW	A (L1,L2)	6	40	57.5	60
		B (L3,L4)		20	25	25
FEU006020	20 KW	A (L1,L2)	6	40	57.5	60
		B (L3,L4)		40	50	50

1. All values are calculated at 230 volts.
2. Wire size must be in accordance with the applicable revision of the NEC and all other applicable codes.
3. Amperage ratings may vary. Verify correct Amperage listing to ensure adequate breaker size for over—current protection.
4. Use copper wire only.

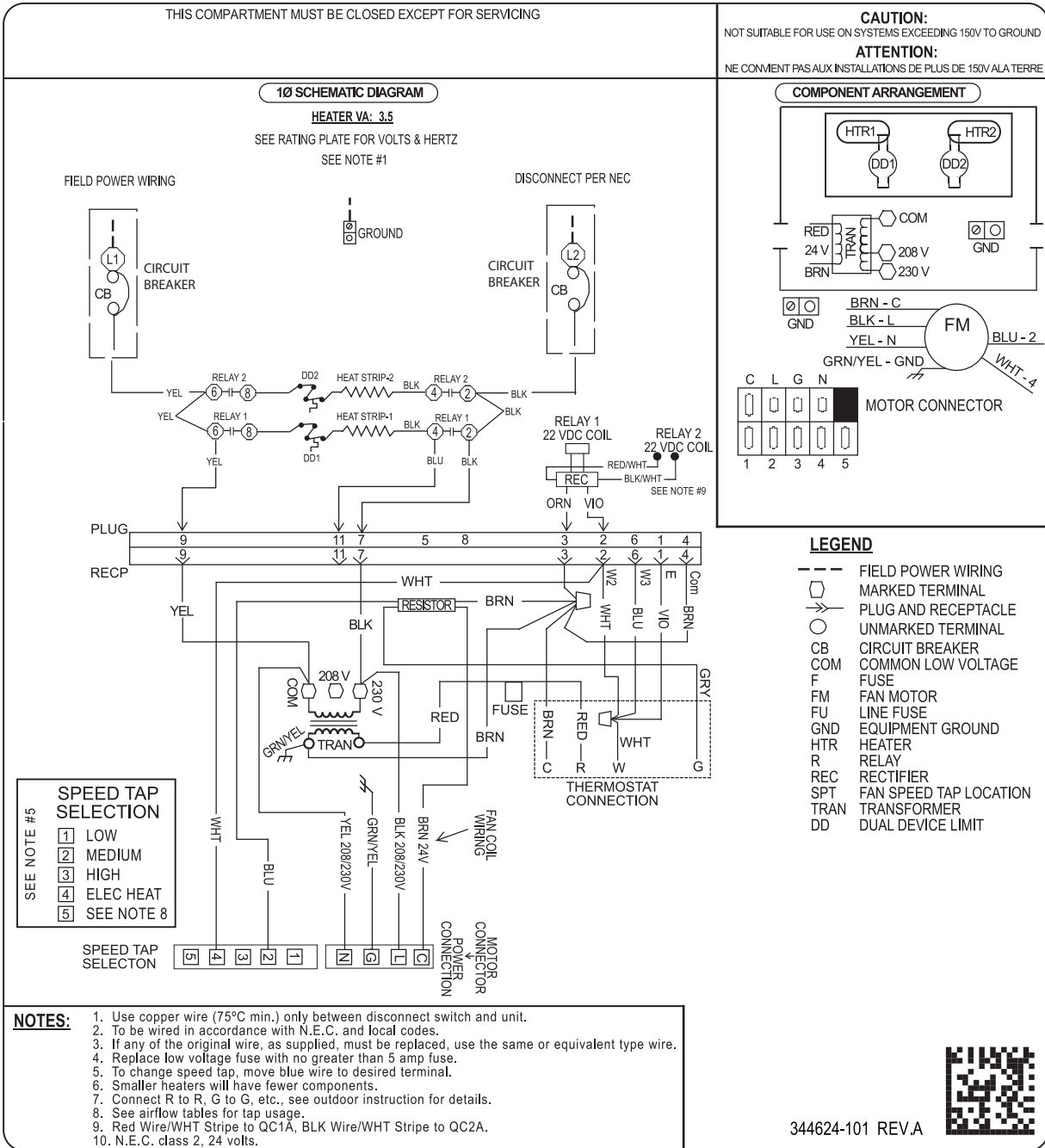
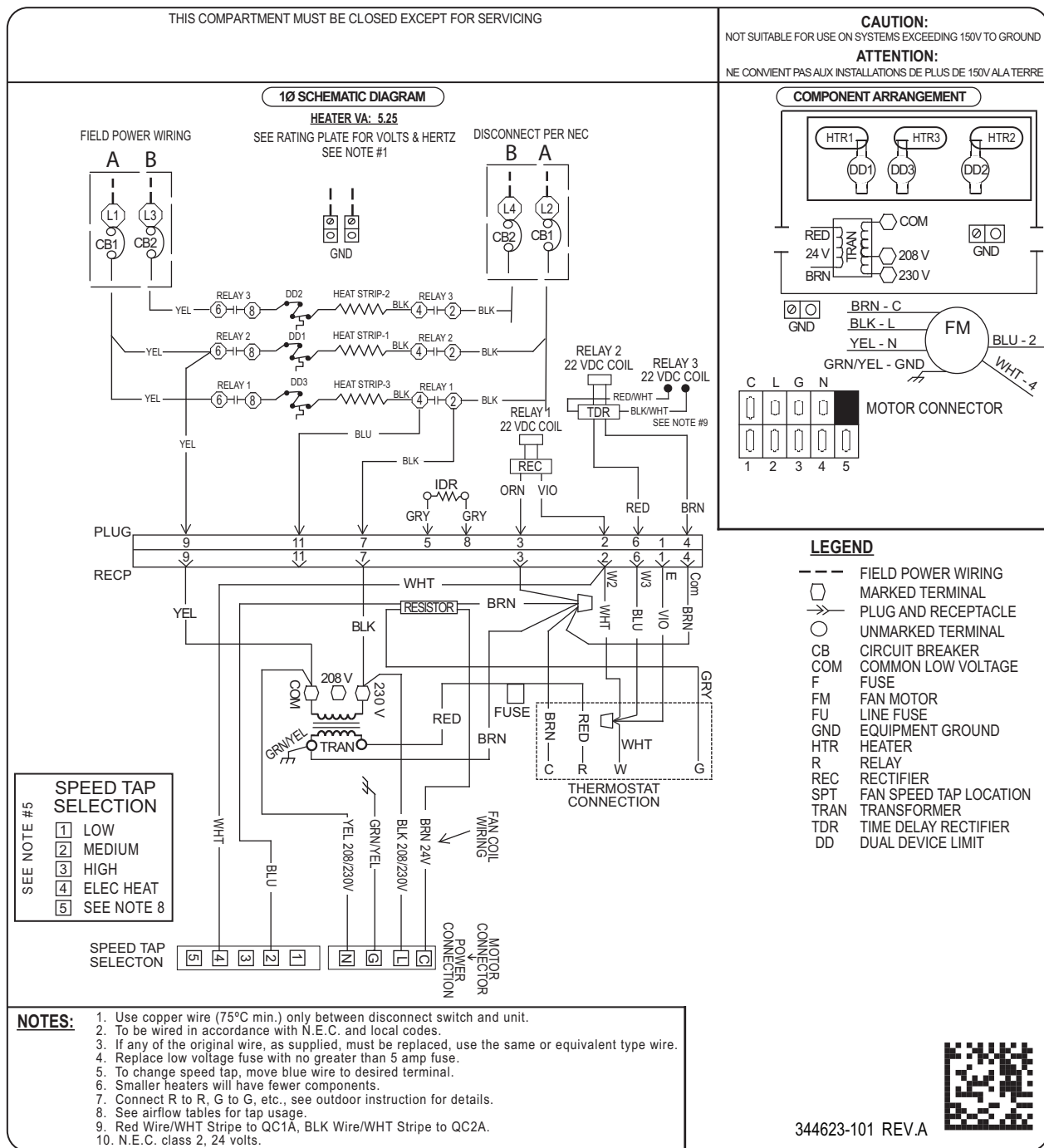


Fig. 12 – 10 kW Wiring Diagram



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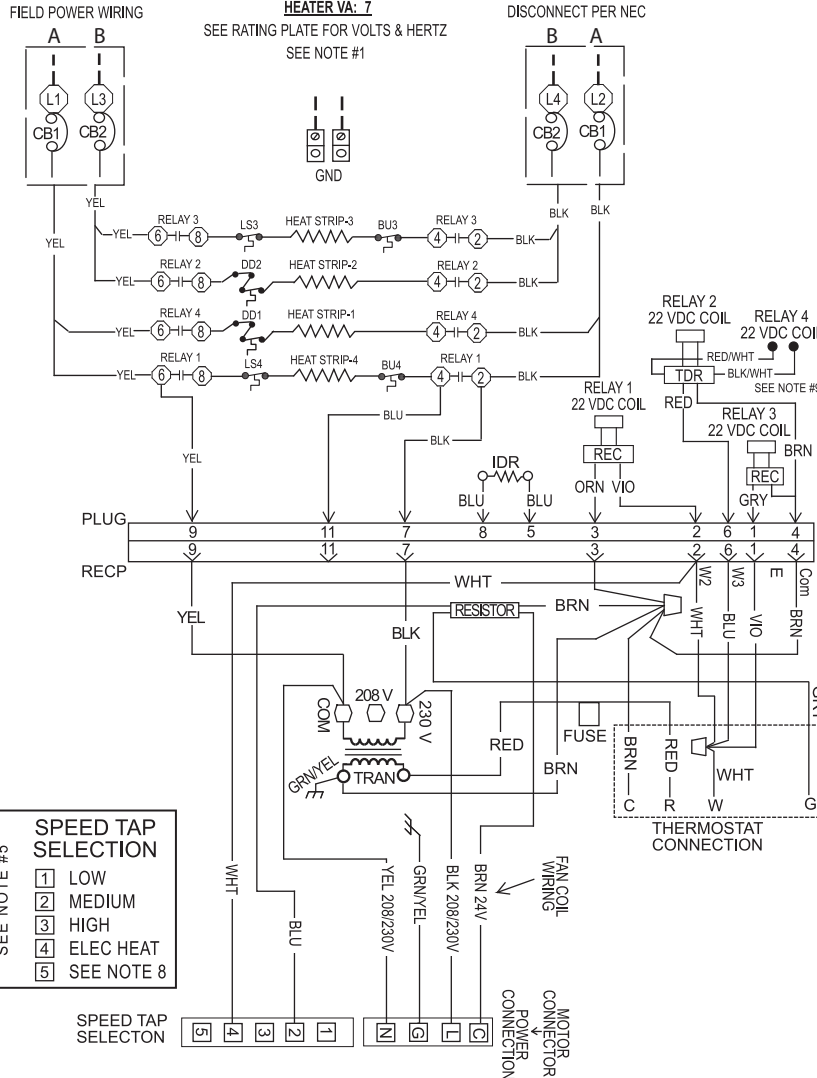
Fig. 13 – 12 kW / 15 kW Unit Wiring Diagram

THIS COMPARTMENT MUST BE CLOSED EXCEPT FOR SERVICING

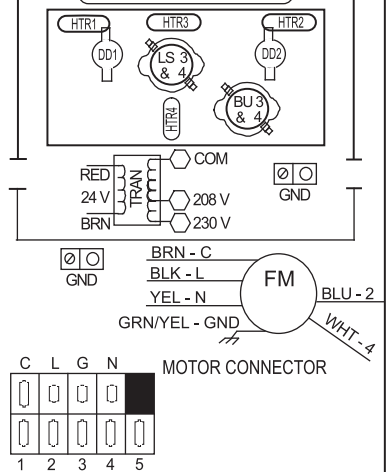
CAUTION:
NOT SUITABLE FOR USE ON SYSTEMS EXCEEDING 150V TO GROUND

ATTENTION:
NE CONVIENT PAS AUX INSTALLATIONS DE PLUS DE 150V ALA TERRE

1Ø SCHEMATIC DIAGRAM



COMPONENT ARRANGEMENT



LEGEND

- FIELD POWER WIRING
- MARKED TERMINAL
- PLUG AND RECEPTACLE
- UNMARKED TERMINAL
- CB CIRCUIT BREAKER
- COM COMMON LOW VOLTAGE
- F FUSE
- FM FAN MOTOR
- FU LINE FUSE
- GND EQUIPMENT GROUND
- HTR HEATER
- LS LIMIT SWITCH
- R RELAY
- REC RECTIFIER
- SPT FAN SPEED TAP LOCATION
- TRAN TRANSFORMER
- TDR TIME DELAY RECTIFIER
- DD DUAL DEVICE LIMIT
- BU BACK UP LIMIT

NOTES:

1. Use copper wire (75°C min.) only between disconnect switch and unit.
2. To be wired in accordance with N.E.C. and local codes.
3. If any of the original wire, as supplied, must be replaced, use the same or equivalent type wire.
4. Replace low voltage fuse with no greater than 5 amp fuse.
5. To change speed tap, move blue wire to desired terminal.
6. Smaller heaters will have fewer components.
7. Connect R to R, G to G, etc., see outdoor instruction for details.
8. See airflow tables for tap usage.
9. Red Wire/WHT Stripe to QC1A, BLK Wire/WHT Stripe to QC2A.
10. N.E.C. class 2, 24 volts.

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Fig. 14 – 20 kW Wiring Diagram

HOMEOWNER'S INFORMATION

THERMOSTAT

Your unit is controlled by the thermostat mounted on your wall. The thermostat is a highly sensitive low voltage device and is available in several different configurations from different manufacturers. The details listed below are typical for most installations. Ask your dealer for more specific information regarding the model of thermostat installed.

Heating Mode

Set the system selector switch to HEAT. The unit will run until the actual room temperature is raised to the point you have selected.

NOTE: If you have a heat pump outdoor unit installed, you may see **steam** (may look like “**smoke**”) occasionally coming from the outdoor unit during cold weather. This is normal as frost is removed from the coil during the defrost cycle.

Cooling Mode

If a cooling system is installed, set the system selector switch on the thermostat to COOL. The unit will run (as an air conditioner) until the actual room temperature is lowered to the point you have selected.

Temperature Control

Set the temperature selector to your desired room temperature. For heating, the unit will run any time the actual room temperature falls below the point you have selected. For cooling, it will run any time the actual room temperature rises above the point you have selected.

Fan Control (Whole House Ventilation)

The fan selector switch allows you to run the fan continuously or cycle it automatically with the heating or cooling system. Set the selector switch to ON for continuous operation or to AUTO for automatic cycling. For maximum comfort satisfaction, continuous fan operation throughout the year is recommended (selector switch set to ON).

WHAT TO DO IF YOUR SYSTEM DOES NOT WORK

Before Requesting a Service Call:

1. Check thermostat settings. If you desire heat, make sure to select a temperature above the actual room temperature, and set the system selector switch to HEAT. If you desire cooling, make sure to select a temperature below the actual room temperature, and set the system selector switch to COOL.
2. Inspect your return air filter. Replace a dirty filter or clean a reusable type filter.
3. Check circuit breakers and/or fuses. Reset breakers or replace fuses as necessary.
4. Inspect the coils and fins on the outdoor unit. Clean away any obstructions (grass clippings, leaves, dirt, dust, or lint). Check that branches, twigs, or other debris are not obstructing the fan blade.

If your system still does not operate, contact your servicing dealer.

Have the Model and Serial Numbers of the indoor and outdoor units available and be sure to describe the problem.

REGULAR MAINTENANCE REQUIREMENTS

Your system should be regularly inspected by a qualified service technician. Between visits, there are some routine maintenance procedures you can do to help keep your system operating at peak performance.



WARNING

ELECTRICAL SHOCK HAZARD

Failure to turn off electrical power could result in personal injury or death.

Turn OFF all electrical power to both the indoor and outdoor units before performing any maintenance or removing any panels or doors. There may be more than one electrical disconnect switch.

Indoor Unit Air Filter

Inspect air filters at least monthly and replace or clean as required. Disposable type filters should be replaced. Reusable type filters may be cleaned by soaking in mild detergent and rinsing with cold water. Install filters with the arrows on the side pointing in the direction of air flow. **Dirty air filters are the most common cause of inadequate heating or cooling performance, and of compressor failures.**

Condensate Drain

If a cooling system is installed, the indoor coil condenses water from the air, and this water must be disposed through an appropriate drain system. During the cooling season check at least monthly for free flow of drainage. Clean if necessary.

Outdoor Unit Coils

Grass clippings, leaves, dirt, dust, lint from clothes dryers, and fall-off from trees can be drawn into coils by movement of the air. Clogged outdoor coils will lower the efficiency of your unit and could cause damage to the compressor. Clean debris away from the outdoor coils. Use a soft bristle brush with light pressure only. Do not damage or bend coil fins. Damaged or bent fins may affect unit operation.

Painted Surfaces

In geographical areas where the water has a high concentration of minerals (calcium, iron, sulfur, etc.) it is recommended that lawn sprinklers not be allowed to spray on the unit. Spraying this type of water on the unit may result in premature deterioration of the paint finish and metal components.