# Service and Troubleshooting

## ANX, SSX, ASX, GSX, DSX, VSX Condensing Units, ANZ, SSZ, ASZ, GSZ, DSZ, VSZ Split System Heat Pumps With R-410A Refrigerant Blowers, Coils, & Accessories

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. **REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.**

**WARNING**

**ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR(HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVISE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

For service information related to the Bluetooth® Shared Data Loader BTSDL01 referenced in this manual, please refer to the installation instructions for the BTSDL01 at www.coolcloudhvac.com/loaderuserguide.

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# IMPORTANT INFORMATION


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## IMPORTANT NOTICES FOR CONSUMERS AND SERVICERS

### RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

**WARNING**

**TO PREVENT THE RISK OF PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH, DO NOT STORE COMBUSTIBLE MATERIALS OR USE GASOLINE OR OTHER FLAMMABLE LIQUIDS OR VAPORS IN THE VICINITY OF THIS APPLIANCE.**

**WARNING**

**HIGH VOLTAGE**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

**WARNING**

**THIS UNIT SHOULD NOT BE CONNECTED TO, OR USID IN CONJUNCTION WITH, ANY DEVICES THAT ARE NOT DESIGN CERTIFIED FOR USE WITH THIS UNIT OR HAVE NOT BEEN TESTED AND APPROVED BY THE MANUFACTURER. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY, REDUCED UNIT PERFORMANCE AND/OR HAZARDOUS CONDITOINS MAY RESULT FROM THE USE OF DEVICES THAT HAVE NOT BEEN APPROVED OR CERTIFIED BY THE MANUFACTURER.**

# IMPORTANT INFORMATION

### SAFE REFRIGERANT HANDLING

While these items will not cover every concievable situation, they should serve as a usefull guide.

**WARNING**

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- Never purge refrigerant into an enclosed room or space. By law, all refrigerant must be reclaimed.
- If an indoor leak is suspected, thoroughly ventilate the area before beginning work.
- Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact with refrigerant and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.
- Always follow EPA regulations. Never burn refrigerant, as posionous gas will be produced.

**WARNING**

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

**WARNING**

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

**WARNING**

To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.

**WARNING**

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- Ensure the cylinder is free of damage which could lead to a leak or explosion.
- Ensure the hydrostatic test date does not exceed 5 years.
- Ensure the pressure rating meets or exceeds 400 lbs.

When in doubt, do not use cylinder.

# PRODUCT IDENTIFICATION NOMENCLATURE

The model and manufacturing number are used for positive identification of component parts used in manufacturing. Please use these numbers when requesting service or parts information.

| A | N | Z | 13 | 036 | 1 | AA |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4,5 | 6,7,8 | 9 | 10,11 |

**Brand**

A Amana® Brand

**Product Category**

S Split System

N Nominal Split System

**Unit Type**

X Condenser R-410A

Z Heat Pump R-410A

**Efficiency**

13 13 SEER

14 14 SEER

16 16 SEER

18 18 SEER

**Nominal Capacity**

| | | | |
|---|---|---|---|
| 018 | 1½ Tons | 042 | 3½ Tons |
| 024 | 2 Tons | 048 | 4 Tons |
| 030 | 2½ Tons | 060 | 5 Tons |
| 036 | 3 Tons | | |

**Electrical**

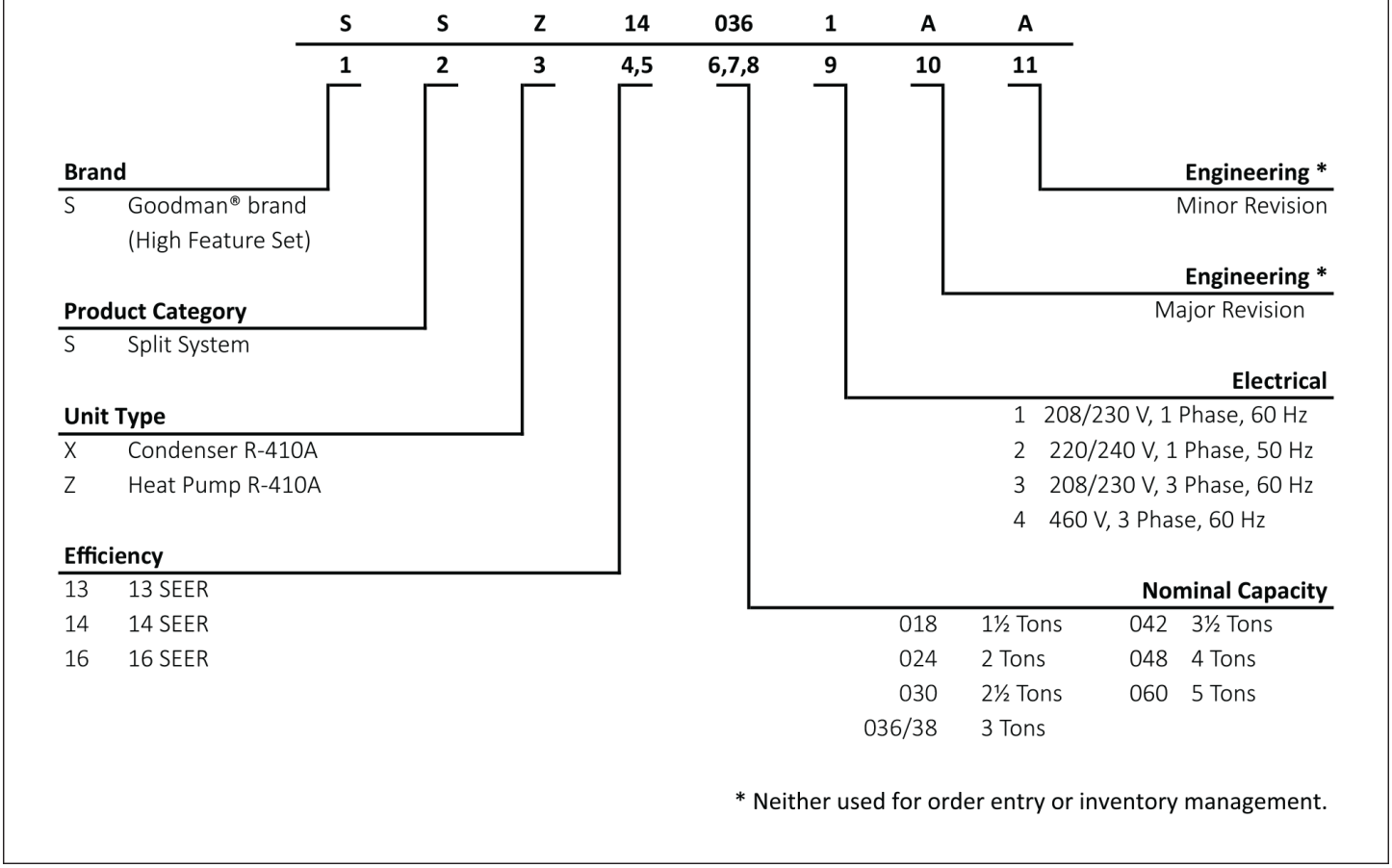
1 - 208/230 V, 1 Phase, 60 Hz

**Engineering ***

Major/ Minor Revisions

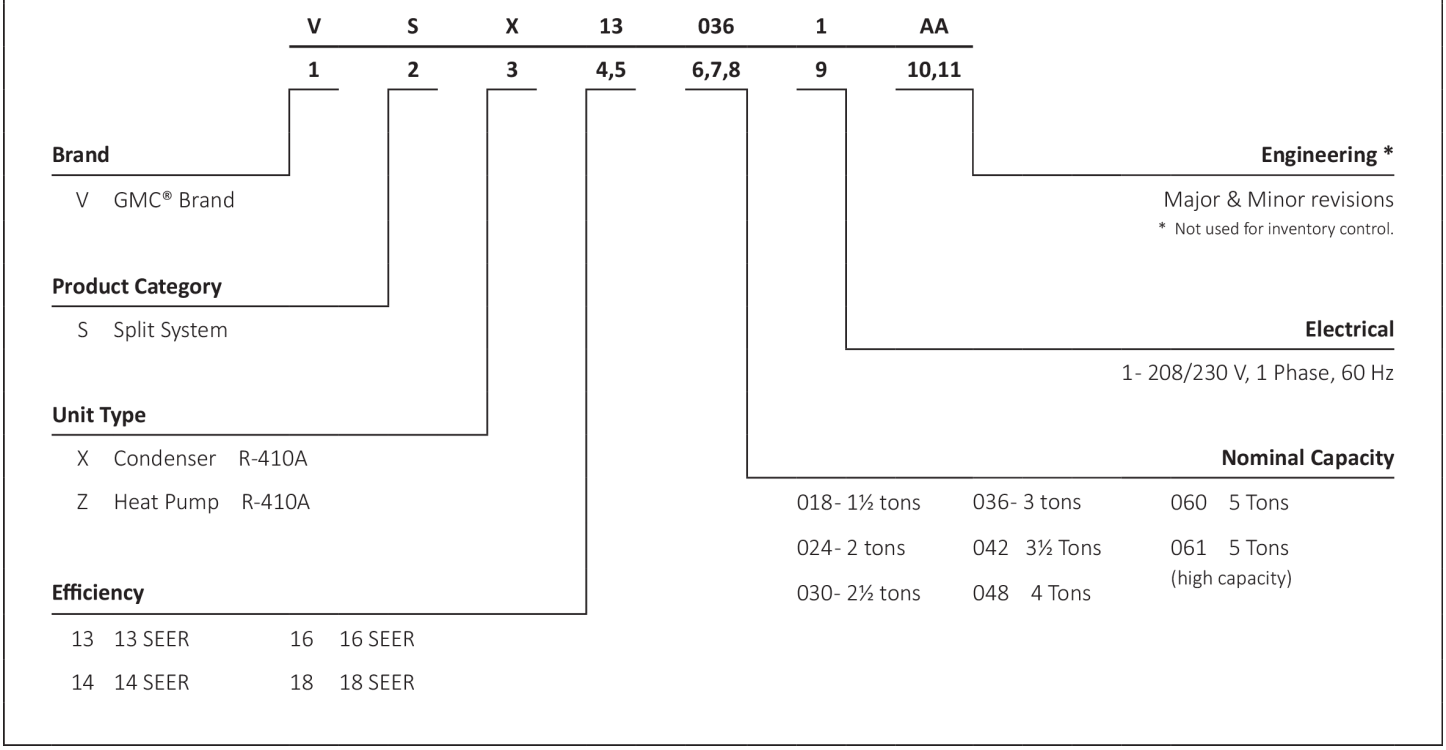
* Not used for order or inventory control

# PRODUCT IDENTIFICATION




* Neither used for order entry or inventory management.

# PRODUCT IDENTIFICATION



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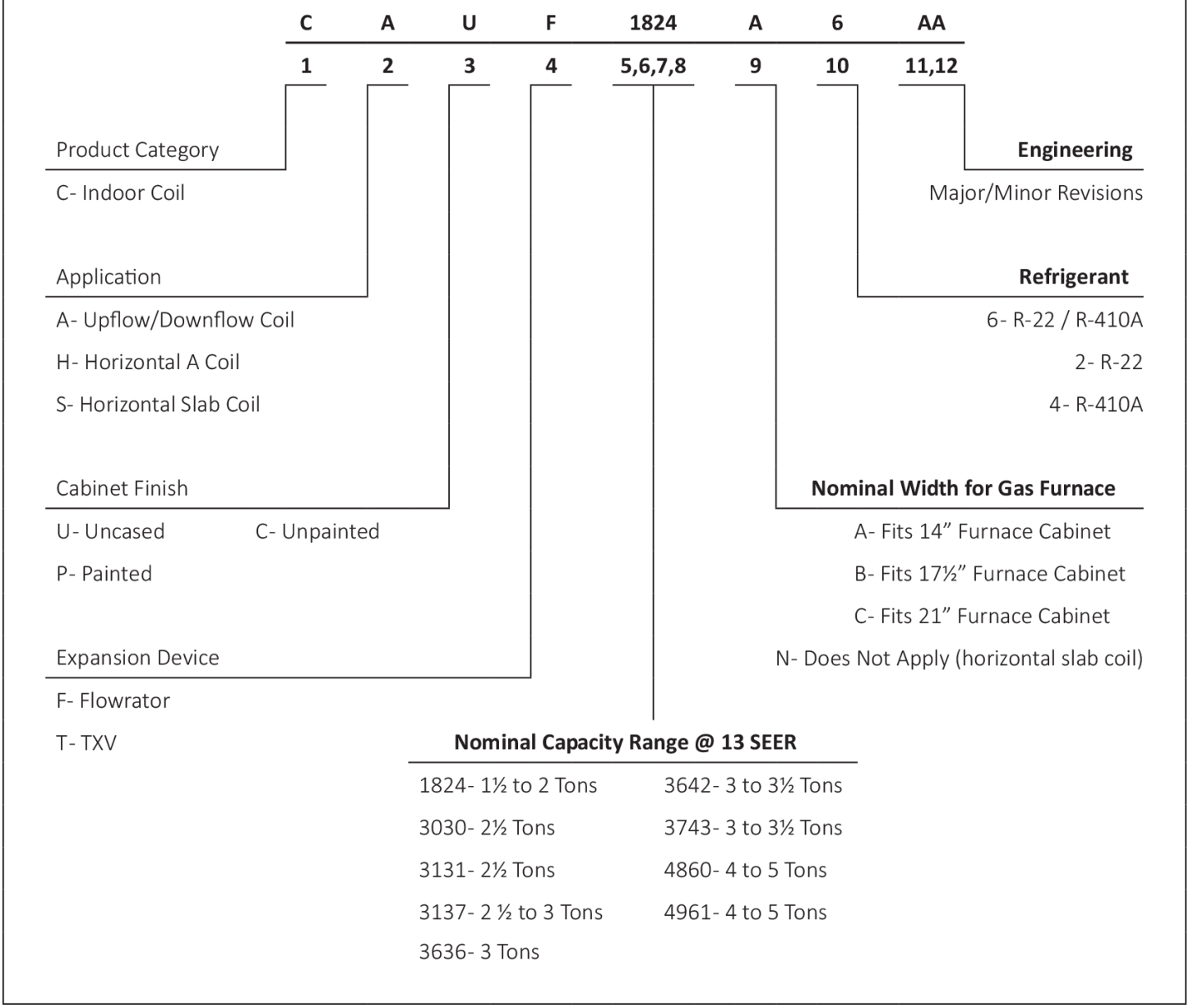


# PRODUCT IDENTIFICATION

| C | A | P | F | A | 1 | 8 | 1 | 4 | A | 6 | A | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |

AlumaFin7 Evaporator Coil

**Product Category**

C Indoor Coil

**Application**

A Upflow/Downflow

H Horizontal

**Cabinet Finsih**

U Uncased

P Cased- Painted

C Cased- Unpainted

**Expansion Device**

F Flowrater

T TXV

E Electronic Expansion Device

**Coil Configuration**

A A Coil

S Slab

**Nominal Capacity Range**

17, 18- 1.5 Tons
23, 24- 2 Tons
29, 30- 2.5 Tons
35, 36- 3 Tons
42- 3.5 Tons
48- 4 Tons
60- 5 Tons

**Nominal Width for Gas Furnace**

A- 14" Width
B- 17.5" Width
C- 21" Width
D- 24.5" Width
N- Not Applicable (Slab Coil)

**Cased Height**

14- 14" Coil
18- 18" Coil
22- 22" Coil
26- 26" Coil
30- 30" Coil

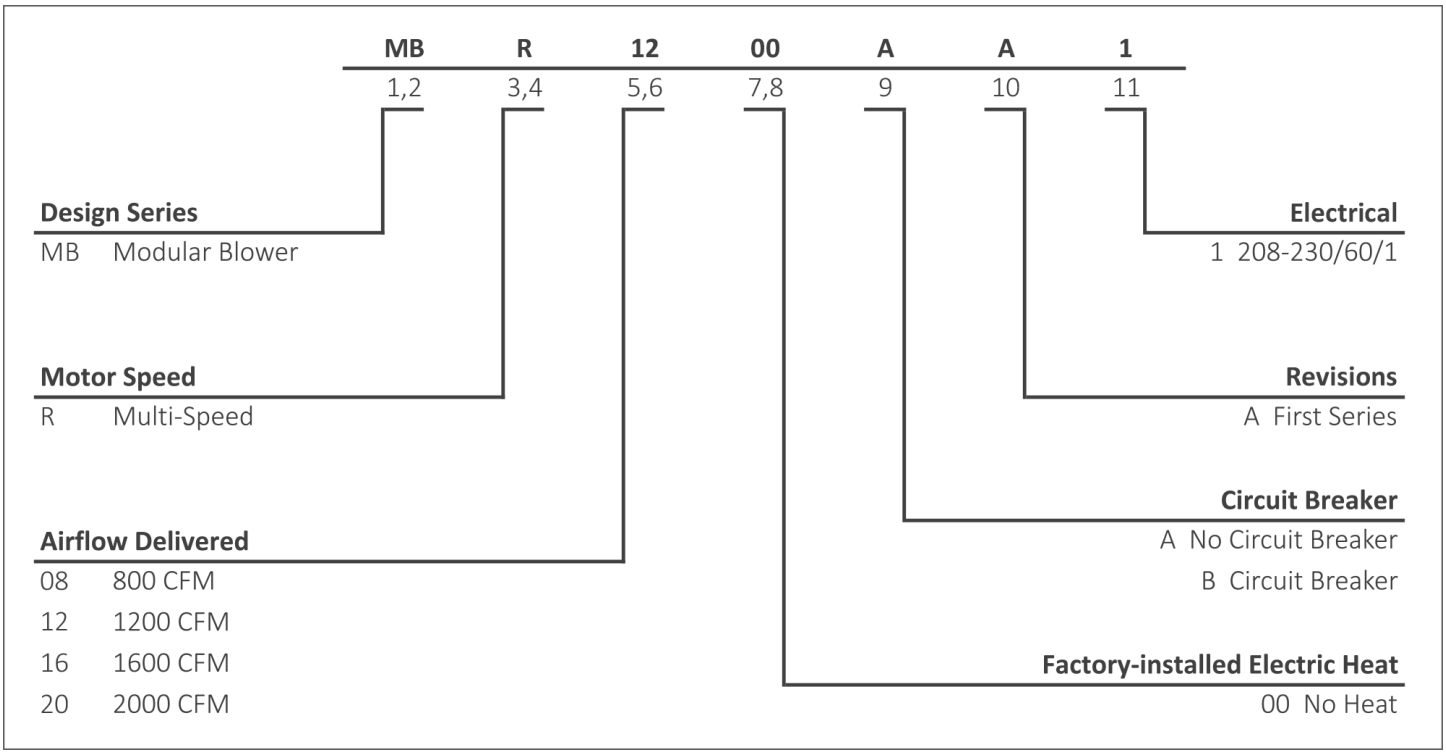
**Refrigerant**

2- R-22 only
4- R-410A only
6- R-22 or R-410A compatible

**Engineering**

Major/ Minor Revisions

# PRODUCT IDENTIFICATION



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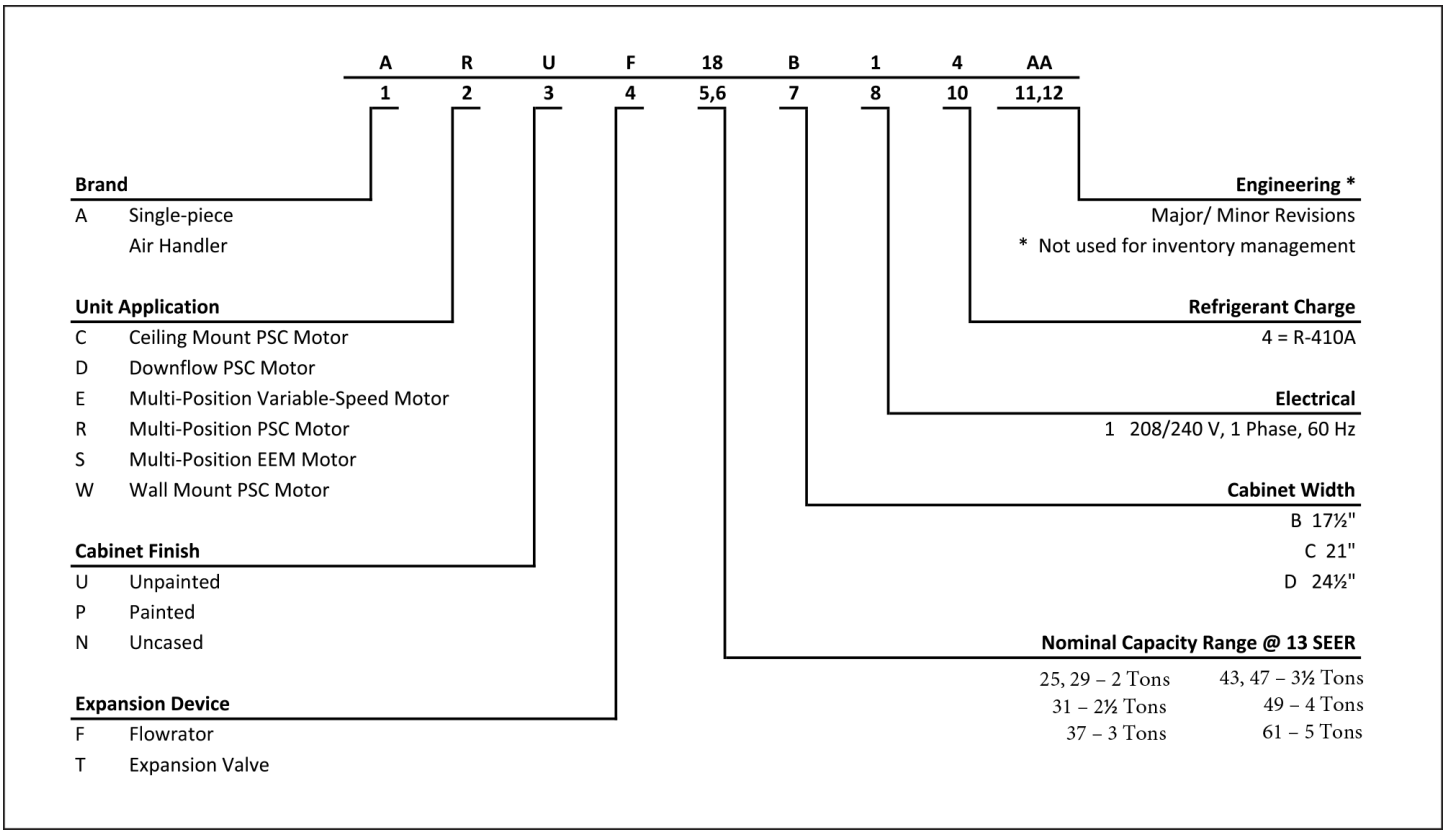



All Airhandlers use **DIRECT DRIVE MOTORS**. Power supply is AC 208-240v, 60 hz, 1 phase.

# PRODUCT IDENTIFICATION

**G S X 11 090 1 AA**

1 2 3 4,5 6,7,8 9 10,11

**Brand**
G - Goodman brand
A - Amana brand

**Type**
S Split System

**Type**
X: Condenser R-410A
Z: Heat Pump R-410A

**SEER**
11 - 11 SEER
13 - 13 SEER
14 - 14 SEER
16 - 16 SEER

**Nominal Capacity**
036 - 3 Tons
048 - 4 Tons
060 - 5 Tons
090 - 7-1/2 Tons
120 - 10 Tons

**Voltage**
1 - 208/230V Single-Phase 60 Hz
2 - 220/240V Single-Phase 50 Hz
3 - 208/230V Three-Phase 60 Hz
4 - 460V Three-Phase 60 Hz
5 - 380/415V Three-Phase 50 Hz

**Engineering**
Major/Minor Revisions

**A R 090 AA**

1 2 3,4,5 6,7

**Brand**
A Single Piece Air Handler

**Unit Application**
R Multi Position PSC Motor

**Nominal Capacity**
090 7-1/2 Tons
120 10 Tons

**Engineering**
Major/Minor Revisions

**For use with GSX/GSZ11 Light Commercial models only.**

# PRODUCT IDENTIFICATION

| GSX11 LIGHT COMMERCIAL<br>**G**OODMAN® BRAND **S**PLIT **X-**R410A CONDENSERS 11 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSX11090*AA<br>GSX11120*AA | Introduction of Goodman Light Commercial 11 SEER, R-410A Condensers. |
| GSX111203AB<br>GSX110903AB<br>GSX111204AB<br>GSX110904AB | 208-230V and 460V 3 Phase condensing units with new ball valve/brackets, suction tube/assembly and panel w/offset. |

| GSZ11 LIGHT COMMERCIAL<br>**G**OODMAN **S**PLIT **Z-**R410A HEAT PUMP 11 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSZ11090*AA<br>GSZ11120*AA | Introduction of Goodman Light Commercial 11 SEER, R-410A Heat Pumps. |
| GSZ110903AB<br>GSZ111203AB<br>GSZ110904AB<br>GSZ111204AB | 208-230V and 460V 3 Phase R410A heat pump units with new ball valve/brackets, suction tube/assembly and panel w/offset. |

| AR LIGHT COMMERCIAL<br>**A** SINGLE PIECE **R-**MULTI-POSITION PSC MOTOR | |
|---|---|
| **Model/Rev** | **Description** |
| AR0904A<br>AR1204A | Introducation of new 7.5 & 10 Ton Air Handler Models, for use with GSX11 and GSZ11 Light Commercial Models. |

# PRODUCT IDENTIFICATION

| ASZ13<br>**A**MANA® BRAND **S**PLIT **Z**-R410A HEAT PUMP 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASZ130**1AA | Initial release of Amana® Brand 13 SEER Heat Pump R410A. |
| ASZ130**1AB | Introduces new revisions with improved circuiting for effective defrost. |
| ASZ130[18, 36-60]1AB<br>ASZ130[24-30]1AC | Introduces models containing crankcase heater, CCH switch and upgraded defrost control. |
| ASZ130[18, 36-60]1AC<br>ASZ130[24-30]1AD | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| ASZ130[18, 36-60]1AD<br>ASZ130[24-30]1AE | Initial release of models using single speed PSC motors; removal of low ambient temperature switch. |
| ASZ130241BA | Release of 2 Ton models, converting from 3/8" to 5mm condenser coils |
| ASZ130181AF<br>ASZ130[24-30]1AG | Current reversing valve change from Dunan to new SanHua reversing valve |
| ASZ130481AF | Current Ranco reversing valve 0151M00020 replaced by SanHua 0151R00070 reversing valve |
| ASZ130361AG<br>ASZ130421AH | Change from copper wound motor to aluminum wound motor. |
| ASZ130481AG<br>ASZ130601AF | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ASZ130181AG<br>ASZ130[24,30]1AH | Replaced motor 0131M000266 with 0131M00811 |
| ASZ130421AJ | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |

# PRODUCT IDENTIFICATION

| ASZ14<br>AMANA® BRAND SPLIT Z-R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASZ140**1AA | Initial release of Amana® Brand 14 SEER Heat Pump R410A with sound blankets and Coresense control. |
| ASZ140**1AB | Screw locations moved in the top panel, base pans, louvers, and control box covers. |
| ASZ140**1AC | Horizontal style louvers. |
| ASZ140[18, 42-48]1AD<br>ASZ140[24-36, 60]1AE | New steel muffler, and suction tubes w/shock loop. |
| ASZ140361AF<br>ASZ140421AD<br>ASZ140[48-60]1AE | TXV & compensator replaced with flowrator & accumulator. |
| ASZ140[18, 30,36]1AF<br>ASZ140241AG<br>ASZ14[42, 48, 60]1AE | Sanhua (RANCO) reversing valves. |
| ASZ140241AF | Smaller B1227315 reversing valve. |
| ASZ140[18,30,36]1AG<br>ASZ140241AH<br>ASZC160[42,48,60]1AF | Introduction of heat pumps with accumulators, crankcase heaters, and upgraded defrost control. |
| ASZ140361BA | Chassis size reduction from large to medium. |
| ASZ140[18, 30]1AH<br>ASZ140241AJ<br>ASZ140[42-60]1AG | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| ASZ140[18, 30]1AJ<br>ASZ140241AK<br>ASZ140[42-60]1AH<br>ASZ140361BB | 2 speed PSC motors replaced with single speed PSC motors. |
| ASZ140181AL<br>ASZ140241AM<br>ASZ140301AL<br>ASZ140361BC<br>ASZ140381AB<br>ASZ140[42-60]1AK | Revision made for design improvement. |

***ASZ14 CONTINUED ON THE NEXT PAGE**

# PRODUCT IDENTIFICATION

| ASZ14<br>AMANA® BRAND SPLIT Z-R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASZ140381AA | 35" chassis with 6-channel flowrator and ZP29K5 compressor. |
| ASZ140[18-30]1BA | Updated ratings and agency information. |
| ASZ140[18-60]1KA | Introduction of ready 15, 14 SEER heat pumps to meet the 2015 energy efficiency requirement. |
| ASZ140[42,49]1KB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| ASZ140181KC | Change from copper wound motor to aluminum wound motor. |
| ASZ140[24,30,36,48,60]1KB<br>ASZ140[42,49]1 KC | Refrigerant Charge Reduction |
| ASZ140181KD | Refrigerant Charge Reduction |

| ASZ16<br>AMANA® BRAND SPLITS Z-R410A HEAT PUMP 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASZ160**1AA | Initial release of Amana® Brand 16 SEER Heat Pump R410A. |
| ASZ160**1AB | Introduces models with screw locations moved in the top panel, base pans, louvers, and control box covers. |
| ASZ160**1AC | Horizontal style louvers. |
| ASZ160**1AD | Muffler and standardized TXV, Compensator using the ASZ18 Seer weldment. |
| ASZ160241AD<br>ASZ160[36-60]AE | Adds new steel muffler, and suction tubes w/shock loop. |
| ASZ160[24,36]1AF<br>ASZ160[48,60]1AF | Sanhua (RANCO) reversing valves. |
| ASZ160[24,36,48,60]1KA | Initial release of Amana® Brand 16 SEER Heat Pump models |
| ASZ160[18-48]1LA | Initial release of Amana® Brand 16 SEER Heat Pump models with 9.6+ HSPF |
| ASZ160601LA | Initial release of Amana® Brand 5 Ton 16 SEER, 13 eer Heat Pump models. |
| ASZ160[24,30]1LB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| ASZ160181LB | 16SEER 1.5T Heat Pumps, Remove Hard Start Kit |
| ASZ160181LC | Change from copper wound motor to aluminum wound motor. |
| ASZ160[36,48]1LB | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ASZ160421LB | Replaced motor 0131M00018P with 0131M00813 |

| ASZ18<br>AMANA® BRAND SPLIT Z-R410A HEAT PUMP 18 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASZ180**1AB | Initial release of Amana® Brand 18 SEER Heat Pump R410A. |
| ASZ180[36,48,60]1AC | Sanhua (RANCO) reversing valves. |

# PRODUCT IDENTIFICATION

| ANZ13<br>**A**MANA® BRAND SPLIT SYSTEM **N-**BASE **Z-**R410A HEAT PUMP 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ANZ130[18-60]1AA | Initial release of Amana® Brand Split System Base Heat Pump, 13 Seer R-410A units. |
| ANZ130[18/24/30]1AB | Reversing valve change from Dunan to new SanHua reversing valve |
| ANZ130481AB | Ranco 0151M00020 reversing valve changed to new SanHua 0151R00070 reversing valve |
| ANZ130241AC | Create new Motor & Replace 0131M00294 with 0131M00800 |
| ANZ130601AB | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ANZ130[18,30]1AC | Replaced motor 0131M000266 with 0131M00811 |
| ANZ130[36,42,48]1AC | Replaced motor 0131M00018P with 0131M00813 |
| ANZ130421AD<br>ANZ130421AE | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |

| ANZ14<br>**A**MANA® BRAND SPLIT SYSTEM **N-**BASE **Z-**R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ANZ140(18-60)1AA | Introduction of ready 15, 14 SEER heat pumps to meet the 2015 energy efficiency requirement. |
| ANZ140(24-30)1AB | Energy guide update. |
| ANZ140181AB | Minor revisions on OD units ZP14K6 compressors without hard start kit.<br>14S 1.5T HPs ONLY. |
| ANZ140421AB<br>ANZ140491AB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| ANZ140[18,30]1AC<br>ANZ140361AB | Change from copper wound motor to aluminum wound motor. |
| ANZ140[42,49]1AC<br>ANZ140[48,60]1AB | Refrigerant Charge Reduction |
| ANZ140[18,30]1AD<br>ANZ140361AC | Refrigerant Charge Reduction |
| ANZ140241AD | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| ANZ140[48,60]1AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |

# PRODUCT IDENTIFICATION

| DSZ16<br>**D**ELUXE **S**PLIT **Z-**R410A HEAT PUMP 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| DSZ160**1AA | Initial release of Deluxe Goodman 2-stage 16 SEER heat pumps with R-410A. |
| DSZ160241AC<br>DSZ16036, 48, 60]1AB | Sanhua (RANCO) reversing valves. |

| DSZ18<br>**D**ELUXE **S**PLIT **Z-**R410A HEAT PUMP 18 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| DSZ180**1AA | Initial release of Deluxe Goodman 2-stage 18 SEER heat pumps with R-410A. |
| DSZ180[36, 48, 60]1AB | Sanhua (RANCO) reversing valves. |

# PRODUCT IDENTIFICATION

| VSZ13<br>**V**ALUE **S**PLIT **Z**-R410A HEAT PUMP 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| VSZ13**1AA | Initial release of Value Line 13 SEER heat pumps with R-410A. |
| VSZ130[24 & 30]1AB | Improved circuiting for effective defrost. |
| VSZ130[24 & 36]1BA | Initial release of models with 5mm Smart Coil™. |
| VSZ130[18, 42, 48]1AB<br>VSZ130241BB<br>VSZ130301AC | Models containing crankcase heater, CCH switch and upgraded defrost control. |
| VSZ130[24 & 36]1BC<br>VSZ130301AE<br>VSZ130[18, 42 & 48]1AD | Release of single phase models with new 6 pole motor. |
| VSZ130[18, 42-60]1AC<br>VSZ130301AD | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| VSZ130241CA | Release of 2 Ton models with a compressor change from ZP21K5EPFV130 to ZP20K5EPFV130. |
| VSZ130181AE<br>VSZ130421AF | Changed from four-piece louver assembly to a two piece louver assembly. Added a corner post on 26" and 29" chassis. |
| VSZ130361BD<br>VSZ130301AF<br>VSZ130481AE | Single phase models with new 6 pole motor.<br>Changed from four-piece louver assembly to a two piece louver assembly. Added a corner post on 26" and 29" chassis. |
| VSZ130421AF | Compressor change from ZP36K5EPFV130 to ZP34K5EPFV130. |
| VSZ130241CB | 2 Ton models changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| VSZ130181AF<br>VSZ130241BD<br>VSZ130301AG | Reversing valve change from Dunan to new SanHua. |
| VSZ130481AF | Ranco 0151M00020 reversing valve replaced by SanHua 0151R00070 reversing valve |
| VSZ130241BE | Create new Motor & Replace 0131M00294 with 0131M00800 |
| VSZ130601AD | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |

# PRODUCT IDENTIFICATION

| VSZ14<br>**V**ALUE **S**PLIT **Z**-R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| VSZ14[018-060]1AA | Introduction of ready 15, 14 SEER heat pumps to meet the 2015 efficiency requirement. |
| VSZ140(18-30)1AB | Energy guide update. PCBDM160 with new software. |
| VSZ140421AB<br>VSZ140491AB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| VSZ140[18,30]1AC<br>VSZ140[36,48,60]1AB | Refrigerant charge reduction. |
| VSZ140[18, 30]1AD<br>VSZ140361AC | Change from copper wound motor to aluminum wound motor. |
| VSZ140[24, 42, 49]1AC | Refrigerant Charge Reduction |
| VSZ140241AD | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| VSZ140[48,60]1AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| VSZ140[18,24,30]1AF<br>VSZ140[36,42,48,49,60]1AE | GMC product for outdoor splits is changing the paint color to match the new paint for GMC indoor furnaces being released. |
| VSZ140181BA | Convert VSZ 14 SEER 1.5 Ton HP from Copeland to Rechi Compressor |

# PRODUCT IDENTIFICATION

| GSZ13<br>**G**OODMAN **S**PLIT **Z-**R410A HEAT PUMP 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSZ13**1AA | Initial release with Regal Beloit motor. |
| GSZ13**1AB<br>GSZ13**3AA<br>GSZ13**4AA | Initial release with Broad Ocean motor. |
| GSZ130[24 & 30]1AC | Release of minor revision with improved circuiting for effective defrost. |
| GSZ130[24 & 36]1BA | Initial release of models with 5mm Smart Coil™. |
| GSZ130241CA | Release of 2 Ton models with a compressor change from ZP21K5EPFV130 to ZP20K5EPFV130. |
| GSZ130241CB | 2 Ton models changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSZ130[18, 42-60]1AC<br>GSZ130301AD<br>GSZ130361BB | Release of models containing crankcase heater, CCH switch and upgraded defrost control. |
| GSZ130[18,42,48,60]1AD<br>GSZ130301AE<br>GSZ130[36,48,60{3,4]AB<br>GSZ130[48,60{3,4]AB | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| GSZ130[18,42,48]1AF<br>GSZ130301AG<br>GSZ130[36,48]3AD<br>GSZ130484AC | Changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSZ130361BC<br>GSZ130[42,48]1AE | Release of models with new 6 pole motor/fan combination. |
| GSZ130361BD | Models with new 6 pole motor/fan combination. Changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSZ130421AF | Release of two piece louver plus corner post on 26" and 29" chassis with compressor changing from ZP36K5EPFV130 to ZP34K5EPFV130. |
| GSZ130[36, 48]3AC | Release of 3 phase models with new 6 pole motor. |
| GSZ14**1AA | Initial release of 14 SEER models. |
| GSZ130481AG<br>GSZ130483AE<br>GSZ130484AD | Replaced Ranco reversing valve 0151M00020 with SanHua 0151R00070 reversing valve . |

# PRODUCT IDENTIFICATION

| GSZ13<br>**G**OODMAN **S**PLIT **Z-**R410A HEAT PUMP 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSZ130[19,31]1AD<br>GSZ130241BE<br>GSZ130251AC | Create new Motor & Replace 0131M00294 with 0131M00800 |
| GSZ130601AE | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| GSZ130181AH<br>GSZ130301AJ | Replaced motor 0131M000266 with 0131M00811 |
| GSZ130361BF<br>GSZ130371AD<br>GSZ130421AJ<br>GSZ130481AH | Replaced motor 0131M00018P with 0131M00813 |
| GSZ130421AK<br>GSZ130421AL | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |

| GSZ14<br>**G**OODMAN **S**PLIT **Z-**R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSZ140(18-60)1KA<br>GSZ140491AA | Introduction of ready 15 14 SEER heat pumps to meet the 2015 energy efficiency requirement. |
| GSZ140(18-30)1KB | Energy guide update. PCBDM160 with new software. |
| GSZ140301KC<br>GSZ140361KB | Migrating from copper to aluminum motors. |
| GSZ140[42,49]1KB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| GSZ140181KC<br>GSZ140361KC | Refrigerant charge reduction |
| GSZ140[24,30]1KD<br>GSZ140[48,60]1KB | New model revisions, GSZ140241KD, GSZ140301KD, GSZ140481KB and GSZ140601KB will have the BOMs changed and have a lower refrigerant charge. |
| GSZ140[24,30]1KE<br>GSZ140[48,60]1KC | New model revisions to deplete current overstock of Ranco reversing valves |
| GSZ140181KD | Change from copper wound motor to aluminum wound motor. |
| GSZ140[42,49]1KC | Refrigerant charge reduction |
| GSZ140241KF | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| GSZ140371AB<br>GSZ140[48,60]1KD | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |

# PRODUCT IDENTIFICATION

| GSZ16<br>**G**OODMAN **S**PLIT **Z-**R410A HEAT PUMP 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSZ160[18-48]1BA | Initial release of Goodman 16 SEER, 13 EER Heat Pumps with 9.0+ HSPF |
| GSZ1160601BA | Initial release of Goodman 5 Ton 16 SEER, 13 EER Heat Pumps |
| GSZ160241BB<br>GSZ160301BB | Motor change on 3 & 3.5T 14 SEER & 2 & 2.5T 16 SEER. Increase blade gap. |
| GSZ160181BB | 16 SEER 1.5T Heat Pumps, Remove Hard Start Kit |
| GSZ160181BC | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| GSZ160181BD<br>GSZ160[24,30]1BC<br>GSZ160[36,42,48,60]1BB | Switching current Goodman 16SEER condensers and heat pumps with grille tops to louver tops to be consistent with other Goodman units having louver-style top panels. |
| GSZ160[36,48]1BC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| GSZ160421BC | Replaced motor 0131M00018P with 0131M00813 |

# PRODUCT IDENTIFICATION

| SSZ14<br>SPECIAL HIGH FEATURE SPLIT Z-R410A HEAT PUMP 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| SSZ140**1AA | Initial release of Goodman 14 SEER Heat Pump R410A. |
| SSZ140**1AB | Screw locations moved in the top panel, base pans, louvers, and control box covers. |
| SSZ140**1AC | Broad Ocean Motors. |
| SSZ140181AC<br>SSZ140241AF<br>SSZ140301AD | Discharge line mufflers added. |
| SSZ140361AF<br>SSZ140[42-60]1AD | Added discharge line mufflers. Replaced TXV and compensator with flowrator and accumulator. |
| SSZ140241AG | Smaller B1227315 reversing valve. |
| SSZ140[18, 30, 42-60]AE<br>SSZ140241AH<br>SSZ140361AG | Sanhua (RANCO) reversing valves. |
| SSZ140[18, 30, 42-60]AF<br>SSZ140241AJ<br>SSZ140361AH | Introduction of heat pumps with accumulators, crankcase heaters, and upgraded defrost control. |
| SSZ140[18,30]1AH<br>SSZ140241AL<br>SSZ140361BB | Changed from four-piece louver assembly to a two piece louver assembly. Added a corner post on Goodman 26" and 29" chassis. |
| SSZ140140[18, 30]1AJ<br>SSZ140[19, 25]1AC<br>SSZ140[31, 37]1AC<br>SSZ140241AM<br>SSZ140361BCC<br>SSZ140381AB<br>SSZ140140381AB<br>SSZ140[42-60]AH | Revision made for design improvement. |
| SSZ140[18-60]1AD | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| SSZ140361AF<br>SSZ140[42-60]1AD | Chassis size reduction from large to medium. |
| SSZ140381AA | Initial release of 35" chassis with 6-channel flowrator and ZP29K5 compressor. |
| SSZ140[18-30]1BA | Updated ratings and agency information. |
| SSZ140241BB<br>SSZ140251AE | Change from copper wound motor to aluminum wound motor. |
| SSZ140361BE<br>SSZ140371AE<br>SSZ140[42,48,60]1AK | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |

# PRODUCT IDENTIFICATION

| SSZ16<br>**S**PECIAL HIGH FEATURE **S**PLIT **Z-**R410A HEAT PUMP 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| SSZ160**1AA | Initial release of Goodman 16 SEER Heat Pump R410A. |
| SSZ160**1AB | Screw locations moved in the top panel, base pans, louvers, and control box covers. |
| SSZ160**1AC | Broad Ocean Motor. Updated muffler and standardized TXV. Compensator using ASZ18 SEER weldment to the SSZ160601AC. |
| SSZ16[024-48]1AC<br>SSZ160601AD | Discharge line mufflers added. |
| SSZ160361AF<br>SSZ160[42-60]1AD | Added discharge line mufflers. Replaced TXV and compensator with flowrator and accumulator. |
| SSZ160241AF<br>SSZ160[36, 48]1AD<br>SSZ160601AE | Sanhua (RANCO) reversing valves. |
| SSZ160241AF<br>SSZ160[36-48]1AE<br>SSZ160601BA | Introduction of heat pumps with accumulators, crankcase heaters, and upgraded defrost control. |
| SSZ160241AH | Changed from four-piece louver assembly to a two piece louver assembly. Added a corner post on Goodman 26" and 29" chassis. |
| SSZ160601BB | Ultratech® compressor |
| SSZ160241AK | Change from copper wound motor to aluminum wound motor. |

# PRODUCT IDENTIFICATION

| GSX13<br>GOODMAN BRAND SPLIT X-R410A CONDENSERS 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSX130**1AA | Initial release of Goodman 13 SEER R-410A Condensers with Regal Beloit motors |
| GSX13061[1/3/4]AA | Introduction of Goodman 13 SEER R-410A Condensers that supplement our current 5 ton models. |
| GSX130363AB<br>GSX130484AB<br>GSX130603AB<br>GSX130604AB | Changed from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSX130**1AB | Broad Ocean motors. |
| GSX130483AB | 3 Phase model with new 6 pole motor. |
| GSX130483AC | 3 phase model changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSX130181EA<br>GSX130181EB | Introduction of 1.5 ton condenser with Rechi Compressor. |
| GSX130**1BA<br>GSX130**3AA<br>GSX130**4AA | Introduction of Goodman 13 SEER R-410A Condensers using SmartCoil® coils. Units will have new louvers because units are smaller. Piston size change. Other components unchanged. |
| GSX130301BB | Replaced fan motor to -294 and fan blade to -18 on GSX130301BA models. |
| GSX130[42, 48]1BC<br>GSX130301BC<br>GSX130601BB | Changed from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSX130[42, 48]1BB | New 6 pole motor/fan combination. |
| GSX130181CA | Rotary compressor. |
| GSX130421CA<br>GSX130481CA | Introduction of Goodman 3.5 and 4 ton 13 SEER condensing units with reciprocating compressor. |
| GSX130361CA | Replaced current compressor with compressor ZP29K5EPFV130. |
| GSX130[18-36]1DA | Condenser conversion to 23" chassis for the 1.5 - 3 ton models. |
| GSX130181ED | Changed from a 4 leg Rechi Compressor 50N382XV-ZAKM to 3 Leg Rechi Compressor 50N382XV-5AKM. Changed Suction line Assy from 0210R01608 to 0210R01406. This minor |
| GSX13031DB | Improved coil circuit assembly for greater capacity/efficiency and a new discharge tubing assembly. |
| GSX130361EA | Introduction of Goodman 3 ton conversion from 29" chassis to 26". |
| GSX130361EB | Changed from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| GSX130371AA | Improved decibel ratings for Canadian market. |
| GSX130181EF | Change from motor 0131M00276 to 0131M00593 on units GSX130181 & VSX130181 |
| GSX130363AD | Change from copper wound motor to aluminum wound motor. |
| GSX130241EC<br>GSX130301BF | Create new Motor & Replace 0131M00294 with 0131M00800 |

***GSX13 Continued on the next page**

# PRODUCT IDENTIFICATION

| GSX13<br>**G**OODMAN BRAND **S**PLIT **X-**R410A **C**ONDENSERS 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSX130611AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| GSX130241ED<br>GSX130[30,60]1BG<br>GSX130361EE<br>GSX130[42,48]1BF | Factory Refrigerant Charge Optimization |
| GSX130181EH | Changing Flat BOM structure to Indented BOM structure |
| GSX130181EG | Switching 3-legged and 4-legged compressors in 13SEER and 14SEER condensers to those with improved overload protection (OLP). |
| GSX130181EJ | Switching compressor from 50N382XV-5AKM to 50N382YV-5AKM |
| GSX130301LA | 13 SEER 2_5T Condenser Rechi Conversion - Switch from Copeland compressor to Rechi compressor in 13 SEER 2.5 ton condensers (GSX, VSX, ANX) |
| GSX130361EF<br>GSX130[42,48]1BG<br>GSX130483AE<br>GSX130601BH | Replaced motor 0131M00018P with 0131M00813 |
| GSX130421BH<br>GSX130421BJ | Change from copper wound motor to aluminum wound motor. |
| GSX130301LB | Change from copper wound motor to aluminum wound motor. |
| GSX130241FA | Reduce chassis size to 23" base |

# PRODUCT IDENTIFICATION

| GSX14<br>**G**OODMAN BRAND **S**PLIT **X-**R410A **C**ONDENSERS 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSX14**1AA | Introduction of Goodman 14 SEER R-410A models. |
| GSX140[18-19]1KA<br>GSX140[24-25]1KA<br>GSX140[30-31]1KA<br>GSX140[36-37]1KA<br>GSX140[42, 48, 60]1KA | Goodman **S**plit **X** 14 Seer Condensing units. Introducing the Goodman 14 SEER standard condenser 5mm architecture with updated scroll compressors. |
| GSX140241KB | Replaced 1/12hp fan motor with 1/8hp fan motor. |
| GSX140311AA | Introduction of 12.2 EER air conditioning units. |
| GSX140[30-36,42]1KB | Migrating from copper to aluminum motors. |
| GSX140251LA | Changed compressor from K5 to K6, Changed coil slab from 25" tall to 30" tall, Changed louvers from 24" tall to 29" tall |
| GSX140241LB | Create minor revisions of the new Rechi 2.0T units to consume the excess inventory of 19P fan motor |
| GSX140191KB | Remove HS Kit from Control Panels of condenser units with updated ZP14K6E scroll compressors. |
| GSX140361KC<br>GSX140371KB<br>GSX140421KC<br>GSX140 [43,48,60]1KB | Refrigerant charge reduction. |
| GSX140311KB<br>GSX140371KC<br>GSX140431KC | Change from copper wound motor to aluminum wound motor. |
| GSX140[48,60]1KC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| GSX140301LA | Changing from Copeland to Rechi in 14 SEER 2.5T condenser units: Project involves moving to a larger coil, and added accessories for the Rechi application. |
| GSX140181LB | Switching 3-legged and 4-legged compressors in 13SEER and 14SEER condensers to those with improved overload protection (OLP). |
| GSX140241LD | Charge Optimization for 14 SEER 2T lineup |
| GSX140[36,42]1KE | Charge Optimization for 14 SEER 3T and 3.5T condenser units |
| GSX140181LC<br>GSX140191KC<br>GSX140251BB | Replaced motor 0131M000266 with 0131M00811 |
| GSX140241LC | Replaced motor 0131M000266 with 0131M00811<br>Refrigerant Charge Change |
| GSX140[37,43]1KD | Charge optimization for Southwest 14 SEER models |
| GSX140301KC | Reinstatement and new minor revision |
| GSX140181MA | Reduce chassis size to 23" base |

# PRODUCT IDENTIFICATION

| GSX16<br>GOODMAN BRAND SPLIT X-R410A CONDENSERS 15 AND 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| GSX160**1FA | Initial release of the Goodman 16 SEER R410A Condensers. |
| GSX160611FA | New high capacity 5 ton model that will supplement the current GSX160601 models. |
| GSX160[18-61]1FB | Minor revision for GSX16s to include ball valves 0151R00045 and 0151R00046. |
| GSX160601GA | 7mm coils. |
| GSX160(48/60/61)1FB | Ball valve change from 0151R00046 to 0151R00081 |
| GSX160(18/24/30/36)1FC | Migrating from copper to aluminum motors. |
| GSX160(18/24/30/36)1FC<br>GSX160(42/48/60/61)1FC | Ball Valve Re-work 0151R00045 & 0151R00046 |
| GSX160311AA<br>GSX160371AA | Initial release creates and launches 2 new SKUs in the 16 SEER single-stage AC product line. |
| GSX160[24, 30, 60]1FE | Refrigerant charge reduction. |
| GSX160[31,37]1AB | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| GSX160[18,36,42,48,61]1FE<br>GSX160[24,30]1FF<br>GSX160[31,37]1AC | Switching current Goodman 16SEER condensers and heat pumps with grille tops to louver tops to be consistent with other Goodman units having louver-style top panels. |
| GSX160[48,61]1FF | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| GSX160421FG<br>GSX160481FH | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |
| GSX16S[18-48]1AA<br>GSX16A[18-60]1AA | Releasing new top level nomenclature for the 16 SEER condenser family. The "0" that previously followed the GSX16 family name (preceding the nominal capacity digits) will now be used to designate the region the product can be sold in (A=All Regions, N=Nor |
| GSX16S301AB | QIP Factory Refrigerant Charge Optimization. |

# PRODUCT IDENTIFICATION

| SSX14<br>**S**PECIAL HIGH FEATURE **S**PLIT **X-**R410A CONDENSERS 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| SSX140**1AA | Initial release of Goodman 14 SEER AC 410A. |
| SSX140**1AB | Revisions have screw locations moved in the top panel, base pans, louvers, and control box covers. |
| SSX14018, 241AC | Revised condenser coils by removing [1] haripin. |
| SSX140301AC | Model contains the Broad Ocean motor 0131M00060 |
| SSX14036-601AC | Models contain the Broad Ocean motor 0131M00061 |
| SSX14030,361AD | Revised condenser coils by removing [1] haripin. |
| SSX140421AD | Introduces SSX140421A in 29" base pan |
| SSX140[18-24]1BA<br>SSX140[30-36]1BA<br>SSX140421CA | Converts 1.5 - 3.5 ton condenser coil tubes from 3/8" tube diameter to 5mm tube diameter. |
| SSX140[18-36]1BC<br>SSX140421CC | Changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| SSX140[18-36]1BD<br>SSX140421CD<br>SSX140481BB<br>SSX140601AG | Revision made for design improvement. |
| SSX140421BA | Revision for SSZ140421B* in 29 base pan and it will the reduce the unit charge from 180 oz. to 170 oz. and replace the 1/4 hp outdoor unit motor with 1/6 hp motor. |
| SSX14030-421AE | Revised condenser coils by removing [1] haripin. |
| SSX140[18-48]1BA<br>SSX14042-481CA | Introduction of Goodman 14 SEER R-410A Condensers with SmartCoil® Coils. |
| SSX140[18-36]1BB<br>SSX140421CB<br>SSX140601AF | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |

# PRODUCT IDENTIFICATION

| SSX16<br>**S**PECIAL HIGH FEATURE **S**PLIT **X-**R410A **C**ONDENSER 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| SSX160**1AA | Introduces Goodman 16 SEER AC 410A |
| SSX160**1AB | New revisions have screw locations moved in the top panel, base pans, louvers, and control box covers. |
| SSX160**1AB<br>SSX160591AA | New revisions have screw locations moved in the top panel, base pans, louvers, and control box covers. |
| SSX160[24, 36, 48]1BA<br>SSX160[30 & 42]1AA | SmartCoil® coils. |
| SSX160[24, 36]1BC<br>SSX160[30, 42]1AB | Changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| SSX160601BA | ZPS49K compressor. |
| SSX160[24,36,60]1BB | Relocation of low pressure switch from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |

| DSX16<br>**D**ELUXE **S**PLIT **X-**R410A HEAT PUMP 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| DSX160**1AA | Initial release of Goodman 2-stage, 16 SEER condensing units with R-410A. |
| DSX160[24, 36]1BA | Conversion of 2 & 3 ton models to SmartCoil® Coils. |
| DSX160241BC | Introduces Ultratech® 2.0 compressor changes. |

| DSX18<br>**D**ELUXE **S**PLIT **X-**R410A HEAT PUMP 18 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| DSXC18**1AA | Intial release of 2-stage condensing units with R-410A communicating models. |
| DSXC18036AB<br>DSXC18048AB<br>DSXC18060AB | Updated wiring diagram with notes for communicating condensing units. |
| DSXC18036AC | Replaced existing compressor ZPS20K4EPFV230 to ZPS20K5EPFV130 & existing compressor ZPS30K4EPFV230 to ZPS30K5EPFV130 for communicating condensing units. |
| DSXC180[48-60]AC | Intial release of Ultratech 2.0 to communicating condensing units |

# PRODUCT IDENTIFICATION

| VSX13<br>**V**ALUE **S**PLIT **X-**R410A CONDENSER 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| VSX130[18-48]1AA | Introduces Value Line 13 SEER condensing units with R-410A. |
| VSX130611AA | Supplements the 5 ton model GSX130611 to enhance performance. |
| VSX130301AB | Replaced fan motor to -294 and fan blade to -18 on the VSX130301AA. |
| VSX130301AC<br>VSX130[42-48]1AC | Changed from current four piece louver assembly to a two piece louver assembly plus a corner post on Goodman and value series 26" and 29" chassis. |
| VSX130[42-48]1AB | Replaced with 6-pole motor and Copeland compressor. |
| VSX130181BA | Rotary compressor. |
| VSX130181EA<br>VSX130181EB | Introduction of 1.5 ton condenser with Rechi Compressor. |
| VSX130181ED | Changed 4-leg Rechi Compressor 50N382XV-ZAKM to 3-Leg Rechi Compressor 50N382XV-5AKM. Changed Suction line Assy from 0210R01608 to 0210R01406. |
| VSX130241BA | 2.0 ton condensing units with aluminum coils, aluminum manifolds w/existing scroll compressor. |
| VSX130361BA | Replaced current compressor with compressor ZP29K5EPFV130. |
| VSX130361EB | Changed from current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| VSX130601BA | Condensing units with SmartCoil® coils. |
| VSX130601BB | Changing from the current four piece louver assembly, to a two piece louver plus a corner post on Goodman and value series 26" and 29" chassis. |
| VSX130421BA<br>VSX130481BA | 3.5 and 4 ton 13 SEER condensing units with reciprocating compressor. |
| VSX130[18-36]1DA | 3.5 and 4 ton 13 SEER Condensers conversion to 23" chassis for the 1.5 - 3 ton models. |
| VSX130301DB | 2.5 13 SEER Condensers with improved coil circuit assembly for greater capacity/efficiency and the creation of a new discharge tubing assembly. |
| VSX130301EA | 3 Ton 13 SEER Condensers release of 3 ton models converting from 29" chassis to 26" chassis. |
| VSX130241EA | 2.0 Ton 13 SEER Condensers with Rechi Compressor, converting 23" chassis to 26" chassis |
| VSX130371AA | 2.5 13 SEER Condensers with improved decibel ratings for Canadian market. |
| VSX130241EB | Compressor wires yellow, red and black changing from 40" to 45". |
| VSX130181EF | Change from motor 0131M00276 to 0131M00593 on units GSX130181 & VSX130181 |
| VSX130241ED<br>VSX130301AF | Create new Motor & Replace 0131M00294 with 0131M00800 |

***VSX13 Continued on the next page**

# PRODUCT IDENTIFICATION

| VSX13<br>**V**ALUE **S**PLIT **X-**R410A CONDENSER 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| VSX130611AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| VSX13[241,361]EE<br>VSX130301AG<br>VSX130[421,481]AF<br>VSX130601BE | Factory Refrigerant Charge Optimization |
| VSX130181EH | Changing Flat BOM structure to Indented BOM structure |
| VSX130181EG | Switching 3-legged and 4-legged compressors in 13SEER and 14SEER condensers to those with improved overload protection (OLP). |
| VSX130181EJ | Switching compressor from 50N382XV-5AKM to 50N382YV-5AKM |
| VSX130301LA | 13 SEER 2_5T Condenser Rechi Conversion - Switch from Copeland compressor to Rechi compressor in 13 SEER 2.5 ton condensers (GSX, VSX, ANX) |
| VSX130361EF<br>VSX130[42,48]1AG<br>VSX130601BF | Replaced motor 0131M00018P with 0131M00813 |
| VSX130181EL<br>VSX130241EG<br>VSX130301LB<br>VSX130361EH<br>VSX130421AM<br>VSX130421AL<br>VSX130481AJ<br>VSX130601BH<br>VSX130611AE | GMC product for outdoor splits is changing the paint color to match the new paint for GMC indoor furnaces being released. |
| VSX130421AJ<br>VSX130421AK | Change from copper wound motor to aluminum wound motor. |
| VSX130301LC | Change from copper wound motor to aluminum wound motor. |
| VSX130241FA | Reduce chassis size to 23" base |

# PRODUCT IDENTIFICATION

| VSX14<br>**V**ALUE **S**PLIT **X-**R410A CONDENSER 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| VSX140[18-19]1AA<br>VSX140[24-25]1AA<br>VSX140[30-31]1AA<br>VSX140[36-37]1AA<br>VSX140[42, 48, 60]1AA | Introducing the 14 SEER standard condenser 5mm architecture with updated scroll compressors. |
| VSX140241AB | Replaced 1/12hp fan motor with 1/8hp fan motor. |
| VSX140251BA | Changed compressor from K5 to K6, Changed coil slab from 25" tall to 30" tall, Changed louvers from 24" tall to 29" tall |
| VSX140241BB | Create minor revisions of the new Rechi 2.0T units to consume the excess inventory of 19P fan motor |
| VSX140191KB | Remove HS Kit from Control Panels of condenser units with updated ZP14K6E scroll compressors. |
| VSX140[30,31]1AB<br>VSX140[36-43]1AC | Change from copper wound motor to aluminum wound motor. |
| VSX140301BA | Copeland to Rechi 2.5 T update suct tube, fix liq line assy, fix wiring diagram, change charge qty. |
| VSX140[48,60]1AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| VSX140181BB | Switching 3-legged and 4-legged compressors in 13SEER and 14SEER condensers to those with improved overload protection (OLP). |
| VSX140241BD | Charge Optimization for 14 SEER 2T lineup |
| VSX140[36,42]1AE | Charge Optimization for 14 SEER 3T and 3.5T condenser units |
| VSX140181BC<br>VSX140191AC<br>VSX140251BB | Replaced motor 0131M000266 with 0131M00811 |
| VSX140241BC | Replaced motor 0131M000266 with 0131M00811<br>Refrigerant Charge Change |
| VSX140[37,43]1AD | Charge optimization for Southwest 14 SEER models |
| VSX140[18,24]1BF<br>VSX140[18,25]1BE<br>VSX140[19,36,42]1AF<br>VSX140[19,37,43,48,60]1AE<br>VSX140241BG<br>VSX140251BD<br>VSX140301BC<br>VSX140311AD | GMC product for outdoor splits is changing the paint color to match the new paint for GMC indoor furnaces being released. |
| VSX140181CA | Reduce chassis size to 23" base |

# PRODUCT IDENTIFICATION

| ANX13<br>**A**MANA® BRAND SPLIT SYSTEM **N-**BASE **X-**R410A CONDENSERS 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ANX130[18-24]1AA | Launch of the Tier 1.5T & 2.0T models. Launched with 26" chasis to accommodate horizontal style louvers. |
| ANX130[30-61]1AA | Initial release. |
| ANX130241BA | Convert ANX13/14 1.5 and 2 ton models to Rechi compressors. |
| ANX130[30-60]1AD | Refrigerant Charge Reduction |
| ANX130241BB<br>ANX130301AE | Create new Motor & Replace 0131M00294 with 0131M00800 |
| ANX130611AD | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ANX130241BC<br>ANX130301AF<br>ANX130[36,42,48,60]1AE | Factory Refrigerant Charge Optimization |
| ANX130181BA | New major revision of ANX130181 as a result of change to Rechi compressor. Rechi compressor and associated parts (grommets, bolts, wires, associated tubing, etc.) will replace the current compressor and associated parts. |
| ANX130301BA | 13 SEER 2_5T Condenser Rechi Conversion - Switch from Copeland compressor to Rechi compressor in 13 SEER 2.5 ton condensers (GSX, VSX, ANX) |
| ANX130181AC<br>ANX130181BB | Replaced motor 0131M000266 with 0131M00811 |
| ANX130181BC<br>ANX130181BD | Replaced 50N382XV-ZAKM Rechi compressor with rechi 50N382YV-ZAKM compressor in all models. |
| ANX130[36,42,48,60]1AF | Replaced motor 0131M00018P with 0131M00813 |
| ANX130421AG<br>ANX130421AH | Change from copper wound motor to aluminum wound motor. |
| ANX130301BB | Change from copper wound motor to aluminum wound motor. |

# PRODUCT IDENTIFICATION

| ANX14<br>**A**MANA® BRAND SPLIT SYSTEM **N-**BASE **X-**R410A CONDENSERS 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ANX140[18-60]1AA | Introducing the Amana® Brand 14 SEER standard condenser 5mm architecture with updated scroll compressors. |
| ANX140241AB | Replaces 1/12hp fan motor with 1/8hp fan motor. |
| ANX140431AA | Introduction of ready 15, 12.2 EER air conditioning units. |
| ANX140251BA | Changed compressor from K5 to K6, Changed coil slab from 25" tall to 30" tall, Changed louvers from 24" tall to 29" tall |
| ANX140191AB | Remove HS Kit from Control Panels of condenser units with updated ZP14K6E scroll compressors. |
| ANX140181BA<br>ANX140241BA | Convert ANX13/14 1.5 and 2 ton models to Rechi compressors. |
| ANX140[30-37]1AB<br>ANX140[42,43]1AB | Change from copper wound motor to aluminum wound motor. |
| ANX140481AB<br>ANX140601AB | Refrigerant Charge Reduction |
| ANX140[36,37]1AC<br>ANX140[42,43]1AC | Refrigerant Charge Reduction |
| ANX140[48,60]1AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ANX140301BA | Changing from Copeland to Rechi in 14 SEER 2.5T condenser units: Project involves moving to a larger coil, and added accessories for the Rechi application. |
| ANX140181BB | Switching 3-legged and 4-legged compressors in 13SEER and 14SEER condensers to those with improved overload protection (OLP). |
| ANX140241BC | Charge Optimization for 14 SEER 2T lineup |
| ANX140[36,42]1AD | Charge Optimization for 14 SEER 3T and 3.5T condenser units |
| ANX140181BC<br>ANX140191AC<br>ANX140251BB | Replaced motor 0131M000266 with 0131M00811 |
| ANX140241BB | Replaced motor 0131M000266 with 0131M00811<br>Refrigerant Charge Change |
| ANX140[37,43]1AD | Charge Optimization for Southwest 3T and 3.5T lineup |

# PRODUCT IDENTIFICATION

| ASX13<br>**A**MANA® BRAND **S**PLIT **X-**CONDENSERS 13 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASX130**1AA | Initial release new models of Amana® Brand Deluxe 13 SEER AC R410A conditioners. |
| ASX130611AA | Initial release of new models of Amana® Brand Deluxe 13 SEER AC R410A conditioners; replaced ASX130601* models. |
| ASX130611AA | Introduction of Amana® brand 13 SEER R-410A Condensers that supplement our current 5 ton models. |
| ASX130**1BA | Initial release of models using SmartCoil® coils. Smaller units with new louvers. Piston size changed; other components unchanged. |
| ASX130**1CB | Relocation of low pressure switch from liquid line to suction line. Compressor safeguard to prevent low pressure from entering. |
| ASX130181DA | Initial release of models with new 266 fan motor; Low pressure switch removed. |
| ASX130181DB<br>ASX130[24-48]1CD<br>ASX130601CC | Low pressure switch 013M00082 added; updated wiring diagram. |
| ASX130[24-48]1CC<br>ASX130601CB | Initial release of models with single speed PSC motors; Does not contain a low pressure switch, low ambient temperature switch and relay. |
| ASX130361DA | Release of 3 ton models with a 26" chassis. |
| ASX130361DE | Refrigerant Charge Reduction |
| ASX130[42,48]1CF<br>ASX130601CE<br>ASX130611AC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ASX130[24,30,60]1CF<br>ASX130361DF<br>ASX130[42,48]1CG | Factory Refrigerant Charge Optimization |
| ASX130181DD<br>ASX130[24,30]1CG | Replaced motor 0131M000266 with 0131M00811 |
| ASX130361DG | Replaced motor 0131M00018P with 0131M00813 |
| ASX130421CH | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |

# PRODUCT IDENTIFICATION

| ASX14<br>AMANA® BRAND SPLIT X-CONDENSERS 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASX140**1AA | Initial release of models of Amana® Brand Deluxe 14 SEER AC R410A conditioners. |
| ASX140**1AB | Screw locations moved in the top panel, base pans, louvers, and control box covers. |
| ASX140**1AC | Horizontal style louvers. |
| ASX14018-361AD | Revised condenser coils by removing (1) hairpin. R410A quantity reduced by 6 ounces. |
| ASX140421AD | Initial release of model ASX140421A in 29" base pan |
| ASX140421BA | 29" platform. Unit charge reduced from 180 oz. to 170 oz. 1/4 hp outdoor unit motor replaced with 1/6 hp motor. |
| ASX14018-361BA<br>ASX140[42-48]1CA | 1.5 - 3.5 ton condenser coil tubes converted from 3/8" tube diameter to 5mm tube diameter. |
| ASX140[18-30]1BA<br>ASX140[42-48]1CA | Initial release of models using SmartCoil® coils. |
| ASX140[18-36]1CB<br>ASX140421DB<br>ASX140601BB | Low pressure switch relocated from liquid line to suction line as a compressor safeguard to prevent low pressure from entering. |
| ASX140[24-36]1CC<br>ASX140421DC<br>ASX140481CB<br>ASX140601BC | Initial release of models with single speed PSC motors; Does not contain a low pressure switch, low ambient temperature switch and relay. |
| ASX140181DB<br>ASX140[24-36]1CD<br>ASX140421DD<br>ASX140481CC<br>ASX140601BD | Low pressure switch added. |
| ASX140181DD<br>ASX140[24-48]1CE<br>ASX140421DE<br>ASX140601BE | Design improvement. |
| ASX140181DA | Initial release of models with new 266 fan motor; Low pressure switch removed. |
| ASX140[18-19, 24-25]1KA<br>ASX140[30-31, 36-37]1KA<br>ASX140[42, 48, 60]1KA | Initial release of 5mm architecture with updated scroll compressors. |
| ASX140241KB | 1/8 hp fan motor replaced 1/12 hp fan motor. |
| ASX140241LA ASX140251LA | Changed compressor from K5 to K6, Changed coil slab from 25" tall to 30" tall, Changed louvers from 24" tall to 29" tall |

***ASX14 Continued on the next page**

# PRODUCT IDENTIFICATION

| ASX14<br>**A**MANA® BRAND **S**PLIT **X**-CONDENSERS 14 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASX140191KB | Remove HS Kit from Control Panels of condenser units with updated ZP14K6E scroll compressors. |
| ASX140241LA | Change compressor from K6 to K5 on ASX140241 and DX14SA0241 |
| ASX 140[30,43]1KB | Change from copper wound motor to aluminum wound motor. |
| ASX 140[48,60]1KB | Refrigerant Charge Reduction |
| ASX 140[36,37,42,43]1KC<br>ASX160[24,30]1FC | Refrigerant Charge Reduction |
| ASX140[48,60]1KC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ASX140[36,42]1KD | Charge Optimization for 14 SEER 3T and 3.5T condenser units |
| ASX140181KB<br>ASX140191KC<br>ASX140[24,25]1LB | Replaced motor 0131M000266 with 0131M00811 |
| ASX140[37,43]1KD | Charge Optimization for Southwest 3T and 3.5T lineup |

# PRODUCT IDENTIFICATION

| ASX16<br>AMANA® BRAND SPLIT X-CONDENSERS 16 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASX160**1AB | Screw locations moved in the top panel, base pans, louvers, and control box covers. |
| ASX160**1AC | Horizontal style louvers. |
| ASX160**1FA | Single speed outdoor fan. |
| ASX160611FA | High capacity 5 ton models that supplement the current ASX160601 models. |
| ASX160611GA | 7mm coils. |
| ASX160[24-60]1BA | Wiring diagram updated with notes. |
| ASX160[24/36]1CA | Initial release of Conversion of 2 & 3 ton models to SmartCoil® coils. |
| ASX160(48/60/61)1FB | Ball valve change from 0151R00046 to 0151R00081 |
| ASX160311AA<br>ASX160371AA | Initial release creates and launches 2 new SKUs in the 16 SEER single-stage AC product line. |
| ASX160[18-42]1FB | Change from copper wound motor to aluminum wound motor. |
| ASX160601FC | Refrigerant charge reduction |
| ASX160[31,37]1AB | Equivalent motor with Aluminum Windings replacing Copper Windings. |
| ASX160[48,61]1FC | Create new Motor 0131M00807 & Replace 0131M00061 with 0131M00807 |
| ASX160421FC<br>ASX160481FD | Change from copper wound compressor motor to aluminum wound compressor motor. ZP34K5EPFV130 and ZP36K5EPFV130. |

| ASX18<br>AMANA® BRAND SPLIT X-CONDENSERS 18 SEER | |
|---|---|
| **Model/Rev** | **Description** |
| ASX180**1AB | Initial release new models of Amana® Brand Deluxe 18 SEER AC R410A conditioners. |

# PRODUCT IDENTIFICATION

| **ACNF**<br>**A-**SINGLE PIECE AIR HANDLER **C**EILING MOUNT **N-**UNCASED **F**LOWATER | |
|---|---|
| **Model/Rev** | **Description** |
| ACNF****1AA | Release of all models of 13 SEER Dayton uncased air handlers. |
| ACNF****16AA | Release of all models of 13 SEER Dayton uncased air handlers suitable for use with R-22 & R-410A. |
| ACNF****1AB | Drain pan material change. |
| ACNF****1BA | Current wavey fin design with replaced new louvered fin design |
| ACNF****16DA | Converted copper coils, manifolds, hairpins, flowrators, 90° flowrator stub to aluminum. Conversion of copper 3/8" return bends to aluminum 5/16" return bends. |
| ACNF180[51-81]6DB<br>ACNF240[51-81]6DB<br>ACNF241016DB<br>ACNF300[51-81]6DB<br>ACNF301016DB | UL1995 heater change. |
| ACNF250[01/05/06/08/]16AA<br>ACNF251016AA<br>ACNF310[01/05/06/08/10]16AA | Change in the air handler design. The motor changed from an existing PSC to a constant torque motor. |
| ACNF180016DC<br>ACNF18[0516,0616,0816]DD<br>ACNF240016DC<br>ACNF24[0516,0616,0816,1016]DD<br>ACNF25[0016,0516,0616,0816,1016]AB<br>ACNF300016DC<br>ACNF30[0516,0616,0816,1016]DD<br>ACNF31[0016,0516,0616,0816,1016]AB | Creation of new ACNF Minor Rev models to produce coils with non acid etched fins. |

| **ADPF**<br>**A-**SINGLE PIECE **D**OWNFLOW AIR HANDLER PSC MOTOR **P**AINTED **F**LOWATER | |
|---|---|
| **Model/Rev** | **Description** |
| ADPF****16AA | Introduction of new 13 SEER Air Handler Models suitable for use with R-22 and R-410A. |
| ADPF364216AB | Replacement of the current spot welded blower housing with the same cinched or crimped design used on the 80% furnace line. |
| ADPF486016AB | Replacement of the current spot welded blower housing with the same cinched or crimped design used on the 80% furnace line. |
| ADPF304216AC | Replacement of the current spot welded blower housing with the same cinched or crimped design used on the 80% furnace line. |
| ADPF****1BA | Replacement of all ARPFcoils using wavy fin with louver enhanced fin. |
| ADPF182416CA<br>ADPF486016CA | Replacement of existing air handler copper coils and other associated parts with aluminum components. |

# PRODUCT IDENTIFICATION

| **AEPF**<br>**A-**SINGLE PIECE **E-**MULTI-POSITION VARIABLE SPEED **P**AINTED **F**LOWATER | |
|---|---|
| **Model/Rev** | **Description** |
| AEPF****16AA | Introducation of new 13 SEER Air Handler Models suitable for use with R-22 and R-410A. |
| AEPF****16BA | Introduction of new models adding lower kW hit kits on the S&R plate. |
| AEPF****16BB | Replacement of the current spot welded blower housing with the same cinched or crimped design used on the 80% furnace line. |
| AEPF****16CA | Replacement of all ARPFcoils using wavy fin with louver enhanced fin. |
| AEPF313716AA | Introduction of 3-Ton Air Handler units with 3-row coil. |

| **ARPF**<br>**A-**SINGLE PIECE AIR HANDLER **R-**MULTI-POSITION PSC MOTOR **P**AINTED **F**LOWRATER | |
|---|---|
| **Model/Rev** | **Description** |
| ARPF364216AB<br>ARPF486016AB | Replacement of the current spot welded blower housing with the same cinched or crimped design used on the 80% furnace line. |
| ARPF****16BA | Wavy fin replaced with louver enhanced fin. |
| ARPF****16CA | Replaced air handler copper coils and other associated parts with aluminum components. |

# PRODUCT IDENTIFICATION

| **ARUF**<br>**A-**SINGLE PIECE AIR HANDLER **R-**MULTI-POSITION PSC MOTOR **U**NPAINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| ARUF172916AA<br>A24-00-2RCA | Introduction of new Air Handler Models with all aluminum evaporator coils. Conversion includes coils, manifold, hairpin, flowrators, 3/8" return bend to 5/16" aluminum return bends. |
| ARUF****16AA | Introduction of new 13 SEER Air Handler Models suitable for use with R-22 and R-410A |
| ARUF364216AB<br>ARUF486016AB<br>ARUF364216AC | Replaced current spot welded blower housing with cinched/crimped design used on the 80% furnace line. |
| ARUF****16BA | Replaced wavy fin with louver enhanced fin. |
| ARUF****16CA | Replaced existing air handler copper coils and other associated parts with aluminum components. |
| ARUF***14AA<br>ARUF***14AA<br>ARUF***14AB | Initial release of the redesigned air handlers manufactured at the Houston furnace facility. |
| ARUF18B14AB<br>ARUF24B14BA<br>ARUF36C14BA<br>ARUF42C14AB | R-410A only. 2 & 3 ton coil replacement. 2 ton replaced w/3 row/16" tall; 3 ton replaced with 18" tall coil. 3.5 ton model blower motor changes from 10X8 to 10X10. |
| ARUF24B14BB | Changed 16 Tall, 3 Row, 6 Cir Coil Assembly to 14 Tall, 3 Row , 6 Cir Coil Assembly. |
| ARUF24B14CA | Initial release of model to meet AHRI requirements |
| ARUF30C14BA | ARUF30B, 17.5 inch wide models converted to an ARUF30C, 21 inch wide model. |
| ARUF36C14BB<br>ARUF42C14AC | The aluminum models changes the RBs, COs, and coil slabs to 9mm braze joints. |
| ARUF36C14BC<br>ARUF30B14AC<br>ARUF30C14BB<br>ARUF42C14AD<br>ARUF[48-60]D14AC | Serial plate changes |
| ARUF[37,43,49]C14AA | Release ARUF series airhandlers for 7mm 14SEER HP's to meet 2015 DOE energy efficiency level |
| ARUF[37,43,49]D14AA | Initial Release. D53 Cabinet fir 7mm 14 SEER Heat Pumps. |
| ARUF[47,61]D14AA | Ready 2015 - Release ARUF series airhandlers for 7mm 14SEER HP's to meet 2015 DOE energy efficiency level |
| ARUF[37,43,49]C14AB<br>ARUF[37,43,47,49,61]D14AB | Revisions because of New Heater kits released |
| ARUF[25,29,31,]B14AB<br>ARUF[37,43,49]C14AC<br>ARUF[37,43,47,49,61]D14AC | Air handler revisions due to using an upgraded (thicker with higher R value) Quietflex wrapper insulation. |

# PRODUCT IDENTIFICATION

| ARPT - R410A ONLY<br>**A-**SINGLE PIECE AIR HANDLER **R-**MULTI-POSITION PSC MOTOR **P**AINTED FLOWRATER **T**XV | |
|---|---|
| **Model/Rev** | **Description** |
| ARPT***14AA | Initial release of the new air handlers. |
| ARPT***14AB | Initial release of the air handlers manufactured at the Houston furnace facility. |
| ARPT[18-36]B14AC<br>ARPT[36-60]D14AC | Serial plate changes. |

| ASPF<br>**A-**SINGLE PIECE AIR HANDLER **S-**MULTI-POSITION EEM MOTOR **P**AINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| ASPF****16AA | Introduction of new ASPF Air Handlers. |
| ASPF****16BA | Initial release of modified ASPF control scheme, to ensure blower operation during and after call for heat on units with heat kits and replacing wavy fin with louver enhanced fin on coil. |
| ASPF****16CA | Replaced existing air handler copper coils and other associate departs with aluminum components. |
| ASPF****16DA | Initial release of models with Emerson SelecTech motor. Replaced Regal-Beloit X-13 motor. |
| ASPF****16EA | Replaced of existing air handler copper coils and other associated parts with aluminum components and replaced Regal-Beloit X-13 motor with Emerson SelecTech motor. |

| ASUF<br>**A-**SINGLE PIECE AIR HANDLER **S-**ENERGY EFFICIENT MOTOR **U**NPAINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| ASUF29B14AA<br>ASUF39C14AA | Initial release of models in the mid-range efficiency air handler. Incorporates smart frame chassis with EEM (X-13) style motors and piston type flowrators. |
| ASUF49C14AA<br>ASUF59D14AA | Initial release of mid-range efficiency air handler with X-13 motor & fixed orifice flowrator. |
| ASUF49C14AB<br>ASUF59D14AB | 9 mm return bend coil. |
| ASUF59D14ACF | our row, piston, 9 mm return bend coil. |
| ASUF59D14ADN | idec Pre-programmed Motor. Nidec motor can be programmed by the supplier. |
| ASUF29B14AB<br>ASUF39C14AB<br>ASUF49C14AC | Programmed Broad Ocean Motor. The supplier can program the motor. |
| ASUF29B14AC<br>ASUF39C14AC<br>ASUF49C14AD | Changed from X13 Motor IP to IGBT (Broad Ocean). |

# PRODUCT IDENTIFICATION

| ASPT<br>**A-**SINGLE PIECE AIR HANDLER **S-**MULTI-POSITION EEM MOTOR **P**AINTED **T**XV | |
|---|---|
| **Model/Rev** | **Description** |
| ASPT[24/36/48/60]*14 | Introduction of new generation ASPT air handlers. |
| ASPT36C 14AB<br>ASPT[48/60]D14AB<br>ASPT48D 14AC | 9mm return bend coil changes to new generation of ASPT air handlers. |
| ASPT24B 14AC<br>ASPT30C 14AB<br>ASPT36C 14AC | Programmed Broad Ocean Motor. The supplier can program the motor instead of furnace plant, thus eliminating any programming installing issues. The programmed label will provide by supplier. |
| ASPT[24, 36]B14AD<br>ASPT30C14AC<br>ASPT[42, 48] C14AB | X13 Motor IP changed to IGBT (Broad Ocean). |
| ASPT[42-48]C14AA | Initial release of models with 2+2 coil slab assy. These models are required to meet higher tonnage rating in Cabinet. |
| ASPT42D 14AB<br>ASPT48D 14AD<br>ASPT60D 14AC | Nidec Pre-programmed Motor. Nidec motor can be programmed by the supplier instead of programming at the furnace plant, thus eliminating any programming installing issues. |
| ASPT[25,29,37] B14AA<br>ASPT[37,47, 59] C14AA<br>ASPT[47, 49, 61] D14AA | Initial release of models with a 2 slab, low airflow resistant coil with a fixed speed ECM 53" cabinet size. ASPT42C and aspt48C 2+2 models discontinued. |
| ASPT33C14AA<br>ASPT39C14AA<br>ASPT49C14AA | Upgrade the current ASPT C-49 cabinets to include 1. quality improvements captured in Ready15 design. 2.include redesigned drain pan, Morrison blower housing and Emerson NXT Booster Charge AdjustableTXV. |
| ASPT35B14AA | Introducing 2.5 and 3 Ton Air Handler product lines. |
| ASPT[33,37,39,47,49,59]C14AB<br>ASPT[47,49,61]D14AB | Revisions because of New Heater kits released |
| ASPT[25,29,37,]B14AB<br>ASPT[33,37,39,47,49,59]C14AC<br>ASPT[47,49,61]D14AC | Air handler revisions due to using an upgraded (thicker with higher R value) Quietflex wrapper insulation. |
| ASPT[33,39,47]BA | Revision change on ASPT33C14/39C14/47C14 air handlers to change the amps in electrical data which ends reducing the MOP size from 35 to 30 and thus increasing wire gauge size in the field for the 5kW heater kit |
| ASPT35B14AB | The SR plate format is changing from SR075 to SR099 and in order to track this change a minor revision is necessary. |

# PRODUCT IDENTIFICATION

| **MBR**<br>**M**ODULAR **B**LOWER AIR HANDLER **R-**MULTI-POSITION PSC MOTOR | |
|---|---|
| **Model/Rev** | **Description** |
| MBR****AA-1AA | Initial release of a module blower with PSC blower motor. |
| MBR****AA-1AB | A quality improvement to use 0.75" Quiet Flex Insulation. |
| MBR****AA-1AC | Release of MBR/MBVC Models(Minor Revisions) for 11th St Plant. Dayton to Houston |
| MBR****AA-1AD | Add permanent sealing/condensation-control upgrades to all MB units and remove high-voltage knockouts |

| **MBE**<br>**M**ODULAR **B**LOWER AIR HANDLER **E-**MULTI-POSITION VARIABLE-SPEED | |
|---|---|
| **Model/Rev** | **Description** |
| MBE****AA-1AA | Introduction of a module blower with variable speed blower motor. |
| MBE****AA-1BA | Introduction of new models adding lower kW hit kits on the S&R plate. |

# PRODUCT IDENTIFICATION

| **AWUF**<br>**A** SINGLE PIECE AIR HANDLER **W**ALL **M**OUNT PSC **M**OTOR **U**NPAINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| AWUF****1AA | Initial release of 13 SEER Dayton wall mount air handlers. |
| AWUF****16AA | Initial release 13 SEER Dayton wall mount air handlers suitable for use with R-22 and R-410A refrigerant. |
| AWUF3005-101AA | Introduces 13 SEER Dayton wall mount air handlers using a Burr Oak Louvered Fin coil. |
| AWUF****1BA | Replaced wave fin design with new louvered fin design. |
| AWUF370**16AA | Initial release of AWUF37 Air Handlers for use with R-22 and R410A. |
| AWUF****16BA | Replaced wave fin design with new louvered fin design. Replaced copper tube hairpins with aluminum hairpins. |
| AWUF180316BA<br>AWUF240316BA<br>AWUF300316BA | Initial release of AWUF 3KW Heater air handlers. |
| AWUF310[5/8]16AA<br>AWUF321016AA | Initial release of higher 14 SEER AWUF series air-handlers |
| AWUF300[3-10]16BB<br>AWUF360[5-10]16BB | 18 x 20 x 1 filter replaced the 16 x 20 x 1 filter. |
| AWUF18F[3-8]16AA<br>AWUF24F[1/8]16AA<br>AWUF30F*16AA<br>AWUF31F[5/8]16AA<br>AWUF32F116AA<br>AWUF36F*16AA<br>AWUF37F[1/5/8]16AA | Initial release of R-401A air handlers with factory-installed float switch and a drain pan water sensor switch. |
| AWUF180[3-8]16BB<br>AWUF240[3-10]16BB<br>AWUF300[5-10]16BC<br>AWUF310[5-10]16AB<br>AWUF360[5-10]16BC<br>AWUF370[5-10]6BB | UL1995 heater change to remove sequencer and replace a contactor. |
| AWUF190*16AA<br>AWUF250*16AA<br>AWUF251*16AA | Matchup to meet the new 14 SEER min efficiency levels. Uses a 4 row coil and an EEM Motor (X13 style) to achieve higher efficiency. Initial release. |

***AWUF Continued on the next page**

# PRODUCT IDENTIFICATION

| AWUF<br>A SINGLE PIECE AIR HANDLER WALL MOUNT PSC MOTOR UNPAINTED FLOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| AWUF180[316,516,816]BC<br>AWUF190[316,516,816]AB<br>AWUF240[316,516,816]BC<br>AWUF241016BC<br>AWUF250[316,516,816]AB<br>AWUF251016AB<br>AWUF300[516,816]BD<br>AWUF301016BD<br>AWUF310[516,816]AC<br>AWUF321016AC<br>AWUF360[516,816]BD<br>AWUF361016BD<br>AWUF370[516,816]BC<br>AWUF371016BC | Release gasket and caps to seal leak. With this modification we will be able to meet 2% at 1 inch static leak and 1.4% leak rate at 0.5 inch static. Modified all current AWUF units to pass current air leak rate. |
| AWUT310[516,816]AA<br>AWUT321016AA<br>AWUT370[516,816]AA<br>AWUT371016AA | AWUT is a new lineup of the AWUF wall mounted Electric Heat Air Handlers with a factory installed TXV. The lineup will be matched with a 5, 8 and 10KW heater, 208V/230V and single phase. |
| AWUF310516AD | Design improvement - Update MOP |
| AWUF180[316,516,816]BD<br>AWUF190[316,516,816]AC<br>AWUF240[316,516,816]BD<br>AWUF241016BC<br>AWUF250[316,516,816]AC<br>AWUF251016AC<br>AWUF300[516,816]BC<br>AWUF301016DC<br>AWUF310516AE<br>AWUF310816AD<br>AWUF321016AD<br>AWUF360[516,816]BE<br>AWUF361016BE<br>AWUF[516,816]BD<br>AWUF371016BD | Redesigned the AWUF Control Box to make it larger to allow more room to access components for serviceability in the field. |
| AWUT24[05,08,10]14 | AWUT is a new lineup of the AWUF with a 7mm coil and a factory installed TXV. The lineup will be matched with a 5, 8 and 10KW heater, 208V/230V and single phase. |

# PRODUCT IDENTIFICATION

| **CAPF**<br>**C-**INDOOR COIL **A-**UPFLOW/DOWNFLOW **P**AINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CAPF*****6AA | Initial release of CAPF Dayton Upflow/Downflow coils. |
| CAPF*****6BA | Burr Oak Louvered Fin released in place of the Wavy Fin. |
| CAPF36***CA | Redesigned for performance improvement from 2 row to 3 row. |
| CAPF*****6DA | Replaced existing copper coils and other associated parts with aluminum components. |
| CAPF*****6DB | Drain pan material changed. |
| CAPF1824A6DC<br>CAPF1824B6DC<br>CAPF1824C6DC<br>CAPF3030A6DC<br>CAPF3030B6DC<br>CAPF3030C6DC<br>CAPF3030D6DC<br>CAPF3131B6DC<br>CAPF3131C6DC<br>CAPF3137B6AB<br>CAPF3636A6DC<br>CAPF3636B6DC<br>CAPF3636C6DC<br>CAPF3636D6DC<br>CAPF3642C6DC<br>CAPF3642D6DC<br>CAPF3743C6DC<br>CAPF3743D6DC<br>CAPF4860C6DC<br>CAPF4860 | Redesign the wrapper for the CAPF to provide increased ease of installation. |
| CAPFA1818A6AA<br>CAPFA1818B6AA | Replaced 3/8 aluminum tubing in residential splits indoor coils with more efficient 7mm aluminum tubing. |
| CAPFA1818A6BA<br>CAPFA1818B6BA | Redesigned drain pan, replace two piece access panels with single piece access panel. |
| CAPFA1818C6AA<br>CAPFA2418A6AA<br>CAPFA2418B6BA<br>CAPFA2418C6AA<br>CAPFA2422B6AA<br>CAPFA2422C6AA | Initial release of CAPFA Upflow/Downflow 7mm AL Coils. |
| CAPFA3022B6AA<br>CAPFA3022C6AA<br>CAPFA3022D6AA<br>CAPFA3626B6AA<br>CAPFA3626C6AA<br>CAPFA3626D6AA | Initial release of CAPFA Upflow/Downflow 7mm AL Coils. |

# PRODUCT IDENTIFICATION

| CAPF<br>C-INDOOR COIL A-UPFLOW/DOWNFLOW PAINTED FLOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CAPFA1714A6AA<br>CAPFA1714B6AA<br>CAPFA1818C6BA | Initial release of 7mm AL CAPFA Upflow/Downflow Coils. |
| CAPFA2318A6AA<br>CAPFA2318B6AA<br>CAPFA2318C6AA<br>CAPFA2422A6AA<br>CAPFA3022A6AA | Initial release of 7mm AL CAPFA Upflow/Downflow Coils. |
| CAPFA2922A6AA<br>CAPFA2922B6AA<br>CAPFA2922C6AA | Initial release of 7mm AL CAPFA Upflow/Downflow Coils. |
| CAPFA4226B6AA<br>CAPFA4226C6AA<br>CAPFA4226D6AA | Initial release of 7mm AL CAPFA Upflow/Downflow Coils. |
| CAPFA1714A6BA<br>CAPFA1714B6BA<br>CAPFA1818A6CA<br>CAPFA1818B6CA<br>CAPFA1818C6CA<br>CAPFA2318A6BA<br>CAPFA2318B6BA<br>CAPFA2318C6BA<br>CAPFA2418A6BA<br>CAPFA2418B6BA<br>CAPFA2418C6BA<br>CAPFA2422A6BA<br>CAPFA2422B6BA<br>CAPFA2422C6BA<br>CAPFA2922A6BA<br>CAPFA2922B6BA<br>CAPFA2922C6BA<br>CAPFA3022A6BA<br>CAPFA3022B6BA<br>CAPFA3022C6BA<br>CAPFA3022D6BA | Major revision update for A-chassis drain port relocation |

# PRODUCT IDENTIFICATION

| **CAPT**<br>**C**-INDOOR COIL **A**-UPFLOW/DOWNFLOW **P**AINTED CASED FLOWRATOR W/**T**XV | |
|---|---|
| **Model/Rev** | **Description** |
| CAPT3131B4BA<br>CAPT3131C4BA | Initial release of coils with factory-installed, non-adjustable TXV. Single stage AHRI ratings for CAPT3131 NTC combinations. |
| CAPT3743C4AA<br>CAPT3743D4AA | Initial release of single stage AHRI ratings for CAPT3743 NTC combinations. |
| CAPT4961C4AA<br>CAPT4961D4AA | Initial release of single stage AHRI ratings for CAPT4961C4 NTC combinations. |
| CAPT3131B4AB<br>CAPT3131C4AB<br>CAPT3743C4AB<br>CAPT3743D4AB<br>CAPT4961C4AB<br>CAPT4961D4AB | Redesign the wrapper for the CAPT to provide increased ease of installation. |

| **CHPF**<br>**C**-INDOOR COIL **H**ORIZONTAL A-COIL **P**AINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CHPF*****6AA | Intial release of 13 SEER CHPF horizontal A coil. |
| CHPF*****6BA | Released Burr Oak Louvered Fin in place of the Wavy Fin. The rows changed by one, (i.e. 4 row to 3 row; 3 row to 2 row) where applicable. |
| CHPF1824A6CA<br>CHPF2430B6CA<br>CHPF3636B6CA<br>CHPF3642C6CA<br>CHPF3642D6CA<br>CHPF3743C6BA<br>CHPF3743D6BA<br>CHPF4860D6DA | Louvered fins. Replaced copper tube hairpins with aluminum hairpins. |
| CHPF1824A6CB<br>CHPF2430B6CB<br>CHPF3636B6CB<br>CHPF3642C6CB<br>CHPF3642D6CB<br>CHPF3743C6BB<br>CHPF3743D6BB<br>CHPF4860D6DB | Drain pan material change to a Decabromodiphenyl Ether free resin. |
| CHPF1824A6CC<br>CHPF2430B6CC<br>CHPF3636B6CC<br>CHPF3642C6CC<br>CHPF3642D6CC<br>CHPF3743C6BC<br>CHPF3743D6BC<br>CHPF4860D6DC | Change to prepainted wrappers |

# PRODUCT IDENTIFICATION

| CAUF/A<br>C-INDOOR COIL A-UPFLOW/DOWNFLOW UNCASED FLOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CAUF*****6AA | Initial release of CAUF Dayton Upflow/Downflow coils. |
| CAUF*****6BA | Burr Oak Louvered Fin released in place of the Wavy Fin. |
| CAUF****6*DA | Replaced existing copper coils and other associated parts with aluminum components. |
| CAUF*****6DB | Drain pan material changed. |
| CAUF1824(A/B/C)6RDB<br>CAUF3636(A/B)6RDB<br>CAUF3636(C/D)6RDB<br>CAUF3642(C/D)6RDB<br>CAUF3743(C/D)6RDB<br>CAUF4860(C/D)6RDB<br>CAUF4961(C/D)6RDB | Manufacturing Location Change from Dayton to Houston. Designated by "R". |
| CAUF3137B6RAA | Manufacturing Location Change from Dayton to Houston. Designated by "R". |
| CAUF36***CA | Redesign from 2 row to 3 row for performance improvement. |
| CAUFA*****6AA<br>CAUFA*****6BA | Initial release of 7mm AL CAUFA Upflow/Downflow Coils. |
| CAUFA*****6BA<br>CAUFA*****6CA | Major revision update for A-chassis drain port relocation. |

# PRODUCT IDENTIFICATION

| **CSCF**<br>**C-**INDOOR COIL **S-**HORIZONTAL SLAB **C**OIL UNPAINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CSCF*****6AA | Release 13 SEER CSCF slab horizontal coil. |
| CSCF*****6BA | Burr Oak Louvered Fin released in place of the Wavy Fin. The rows change by one, (i.e. 4 row to 3 row; 3 row to 2 row) where applicable. |
| CSCF1824N6BB<br>CSCF3036N6BB<br>CSCF3642N6CB<br>CSCF4860N6CB | Drain pan material change. |
| CSCF3642N6CA<br>CSCF4860N6CA | Release 13 SEER CSCF slab horizontal coil. Louvered fin project. |
| CSCF1824N6DA<br>CSCF3036N6DA<br>CSCF3642N6DA<br>CSCF4860N6DA | Release 13 SEER CSCF slab horizontal coil. Converting copper coils, maifolds, haripins, flowrators to aluminum coils. |

| **CTPF**<br>**C-**INDOOR COIL **T-**COATED **P**AINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CTPF*****6AA | Initial release of coated coils. |
| CTPF1824*6AB<br>CTPF3030*6AB<br>CTPF3131*6AB<br>CTPF3636*6AC<br>CTPF3642*6AB<br>CTPF4860*6AB | Drain pan material change. |

| **CTUF**<br>**C-**INDOOR COIL **T-**COATED **U**NPAINTED **F**LOWRATOR | |
|---|---|
| **Model/Rev** | **Description** |
| CTUF1824*6AA<br>CTUF3030*6AA<br>CTUF3131*6AA<br>CTUF3636*6AA<br>CTUF3642*6AA<br>CTUF4860*6AA | Initial release. |
| CTUF1824*6AB<br>CTUF3030*6AB<br>CTUF3131*6AB<br>CTUF3636*6AC<br>CTUF3642*6AB<br>CTUF4860*6AB | Initial release. |

# PRODUCT DESIGN

This section gives a basic description of cooling unit operation, its various components and their basic operation. Ensure your system is properly sized for heat gain and loss according to methods of the Air Conditioning Contractors Association (ACCA) or equivalent.

**Condensing Unit**
The condenser air is pulled through the condenser coil by a direct drive propeller fan. This condenser air is then discharged out of the top of the cabinet. These units are designed for free air discharge, so no additional resistance, like duct work, shall be attached.

The suction and liquid line connections on present models are of the sweat type for field piping with refrigerant type copper. Front seating valves are factory installed to accept the field run copper. The total refrigerant charge for a normal installation is factory installed in the condensing unit.

GSX, GSZ, ANX, ANZ, ASX, ASZ, SSX, SSZ, DSX, DSZ, VSX, and VSZ models are available in 1 1/2 through 5 ton sizes and use R-410A refrigerant. They are designed for 208/230 volt single phase applications.

GSX/GSZ *****3 models are available in 3, 4, and 5 ton sizes and use R-410A refrigerant. They are designed for 208/230 volt 3-phase applications.

ASX, ASZ, DSX and DSZ R-410A model units use the Copeland Scroll “Ultratech” Series compressors which are specifically designed for R-410A refrigerant. These units also have Copeland® ComfortAlert diagnostics.

ANX, ANZ, GSX, GSZ, SSX, SSZ, VSX, and VSZ R-410A model units use a mix of Scroll and Energy Efficient compressors which are specifically designed for R-410A refrigerant. There are several design characteristics which are different from the traditional reciprocating and/or scroll compressors. “Ultractech” Series scroll compressors will not have a discharge thermostat. Some of the early model scroll compressors required discharge thermostat.

“Ultratech” Series scroll compressors use “POE” or polyolester oil which is NOT compatible with mineral oil based lubricants like 3GS. “POE” oil must be used if additional oil is required.

**Coils And Blower Coils**
MBR/MBE blower cabinets are designed to be used as a two-piece blower and coil combination. MBR/MBE/MBVC blower sections can be attached to cased evaporator coil. This two-piece arrangement allows for a variety of mix-matching possibilities providing greater flexibility. The MBE/MBVC blower cabinets use a variable speed motor that maintains a constant airflow with a higher duct static.

MBE blower cabinests are approved for applications with cooling coils of up to 0.8 inches W.C. external static pressure. The MBE models includes a feature that allows airflow to be changed by +10% or -15%. The MBVC models allow airflow trimming of +/-10%.

The MBR blower cabinet uses a PSC motor. It is approved for applications with cooling coils of up to 0.5 inches W.C. external static pressure.

The MBR/MBE blower cabinets with proper coil matches can be positioned for upflow, counterflow, horizontal right or horizontal left operation. All units are constructed with R-4.2 insulation. In areas of extreme humidity (greater than 80% consistently), insulate the exterior of the blower with insulation having a vapor barrier equivalent to ductwork insulation, providing local codes permit.

The CAUF, CAPF and CAPT coils are designed for upflow and counterflow applications. The CACF and CHPF coils are designed for horizontal applications.

**AR*F, ASPF, ASUF, ASPT**
**Multi-Position Air Handler**
These one-piece multi-position air handlers are used with R-410A and are available in 2 to 5 ton sizes with optional 3 kW to 25kW electric heat kits available for field installation. The AR*F unit’s blower design includes a PSC motor and is compatible with heat pumps and cooling applications. ASUF and ASPT units use an EEM blower motor and are compatible with heat pumps and cooling applications.

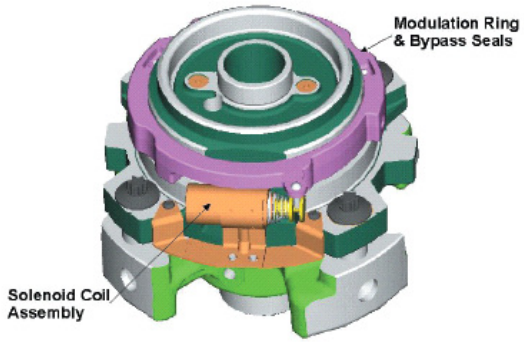
This appliance can be installed in the vertical or left horizontal position without modification. The horizontal right and downflow positions require product modification. This product is designed for zero inches (0 inches) clearance; however, adequate access for service or replacement must be considered without removing permanent structure. This unit can be installed on a platform when deemed necessary.

In an attic installation a secondary drain pan must be provided by the installer and placed under the entire unit with a separate drain line properly sloped and terminated in an area visible to the owner. This secondary drain pan is required in the event that there is a leak or main drain blockage. Closed cell insulation should be applied to the drain lines in unconditioned spaces where sweating may occur.

**NOTE: Single piece air handlers are factory-sealed to achieve a 2% or less leakage rate at 1.0” water gauge external duct static pressure.**

# PRODUCT DESIGN

The ASX [16 & 18], ASZ [16 & 18], DSX[16 & 18] and DSZ [16 & 18] series split system units use a two-stage scroll compressor. The two-step modulator has an internal unloading mechanism that opens a bypass port in the first compression pocket, effectively reducing the displacement of the scroll. The opening and closing of the bypass port is controlled by an internal electrically operated solenoid.




The ZPS/ZRS two-step modulated scroll uses a single step of unloading to go from full capacity to approximately 67% capacity. A single speed, high efficiency motor continues to run while the scroll modulates between the two capacity steps.

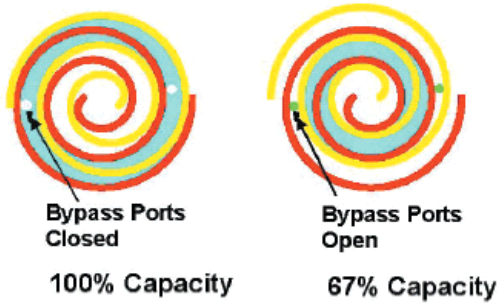



**FIGURE A**

A scroll is an involute spiral which, when matched with a mating scroll form as shown, generates a series of crescent shaped gas pockets between the two members.

During compression, one scroll remains stationary (fixed scroll) while the other form (orbiting scroll) is allowed to orbit (but not rotate) around the first form.

As this motion occurs, the pockets between the two forms are slowly pushed to the center of the two scrolls while simultaneously being reduced in volume. When the pocket reaches the center of the scroll form, the gas, which is now at a high pressure, is discharged out of a port located at the center.

During compression, several pockets are being compressed simultaneously, resulting in a very smooth process. Both the suction process (outer portion of the scroll members) and the discharge process (inner portion) are continuous.

Some design characteristics of the Compliant Scroll compressor are:

- Compliant Scroll compressors are more tolerant of liquid refrigerant.

**NOTE: Even though the compressor section of a Scroll compressor is more tolerant of liquid refrigerant, continued floodback or flooded start conditions may wash oil from the bearing surfaces causing premature bearing failure.**

- “Ultratech” Series scroll compressors use “POE” or polyolester oil which is NOT compatible with mineral oil based lubricants like 3GS. “POE” oil must be used if additional oil is required.
- Compliant scroll compressors perform “quiet” shutdowns that allow the compressor to restart immediately without the need for a time delay. This compressor will restart even if the system has not equalized.

**NOTE: Operating pressures and amp draws may differ from standard reciprocating compressors. This information can be found in the unit’s Technical Information Manual.**

**Capacity Control - Legacy Models**

During the compression process, there are several pockets within the scroll that are compressing gas. Modulation is achieved by venting a portion of the gas in the first suction pocket back to the low side of the compressor thereby reducing the effective displacement of the compressor. See Figure A. Full capacity is achieved by blocking these vents, increasing the displacement to 100%. A solenoid in the compressor, controlled by an external 24-volt ac signal, moves the slider ring that covers and uncovers these vents. The vent covers are arranged in such a manner that the compressor operates somewhere around 67% capacity when the solenoid is not energized and 100% capacity when the solenoid is energized. The loading and unloading of the two step scroll is done “on the fly” without shutting off the motor between steps. See Figure B below. The unloaded mode default was chosen for two reasons:

# PRODUCT DESIGN

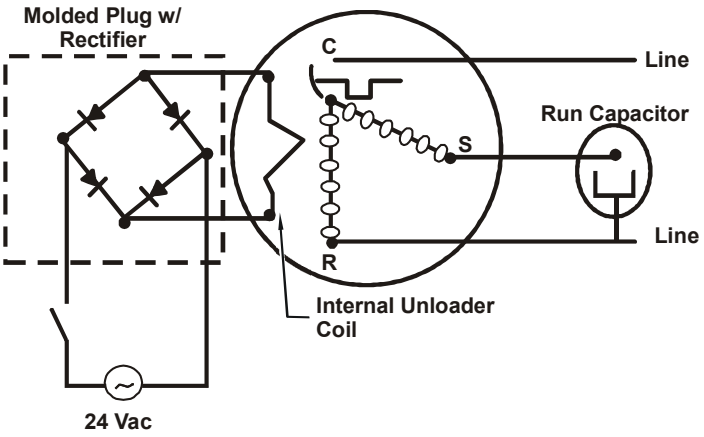



FIGURE B

1. It is expected that the majority of run hours will be in the low capacity, unloaded mode.
2. It allows a simple two-stage thermostat to control capacity through the second stage in both cooling and possibly heating if desired.

**Unloader Solenoid**

A nominal 24-volt direct current coil activates the internal unloader solenoid. The input control circuit voltage must be 18 to 28 volt ac. The coil power requirement is 20 VA. The external electrical connection is made with a molded plug assembly. This plug is connected to the Comfort Alert™ or CoreSense™ Module (dependent upon which module you are using) which contains a full wave rectifier to supply direct current to the unloader coil.

# SYSTEM OPERATION

**Cooling Cycle**

For legacy room thermostat: When the room thermostat calls for cool, the contacts of the room thermostat close making terminals R to Y1 & G (if thermostat calls for low stage cool), or R to Y1, Y2 & G (if thermostat calls for high stage cool), the low voltage circuit of the transformer is completed. Current now flows through the magnetic holding coils of the compressor contactor (CC) and fan relay (RFC). If thermostat calls for high stage cool, the microprocessor on the UC board will also energize the compressor high stage solenoid to run the compressor at full capacity.

This draws in the normally open contact CC, starting the compressor and condenser fan motors in either low or high stage depending on the thermostat's demand. At the same time, contacts RFC close, starting the indoor fan motor. When the thermostat is satisfied, it opens its contacts, breaking the low voltage circuit, causing the compressor contactor and indoor fan relay to open, shutting down the system.

If the room thermostat fan selector switch should be set on the "on" position, then the indoor blower would run continuously rather than cycling with the compressor. GSZ, ANZ, ASZ, SSZ, DSZ, and VSZ models energize the reversing valve thorough the "O" circuit in the room thermostat. Therefore, the reversing valve remains energized as long as the thermostat subbase is in the cooling position. The only exception to this is during defrost.

For heat pumps, during cooling cycle the reversing valve is energized as the room thermostat closes "O" terminal to R and the microprocessor on the UC board responds to such a condition by energizing the solenoid coil on the reversing valve.

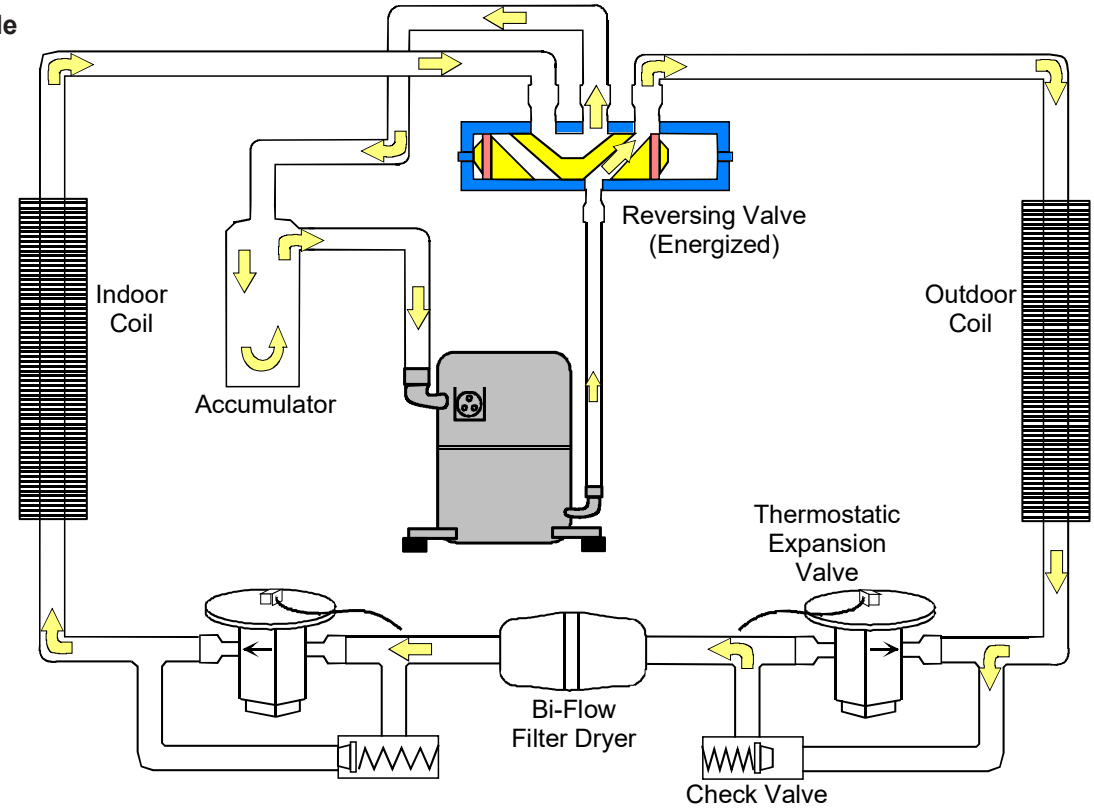
**Defrost Cycle**

The defrosting of the outdoor coil is jointly controlled by the defrost control board and the defrost thermostat.

**Solid State Defrost Control**

During operation the power to the circuit board is controlled by a temperature sensor, which is clamped to a return bend (3/8" coils) or a feeder tube (5 mm coils) entering the outdoor coil. Defrost timing periods of 30, 60, or 90 minutes may be selected by connecting the circuit board jumper to 30, 60, or 90 respectively. Accumulation of time for the timing period selected starts when the sensor closes (approximately 31° F), and when the room thermostat calls for heat. At the end of the timing period, the unit's defrost cycle will be initiated provided the sensor remains closed. When the sensor opens (approximately 75° F), the defrost cycle is terminated and the timing period is reset. If the defrost cycle is not terminated due to the sensor temperature, a ten minute override interrupts the unit's defrost period. The new upgraded defrost control has a 12 minute override interrupt.

**Cooling Cycle**



# SYSTEM OPERATION

**Heating Cycle**
The reversing valve on the GSZ, SSZ, ANZ, ASZ and DSZ models is energized in the cooling cycle through the “O” terminal on the room thermostat.

These models have a 24 volt reversing valve coil. When the thermostat selector switch is set in the cooling position, the “O” terminal on the thermostat is energized all the time.

Care must be taken when selecting a room thermostat. Refer to the installation instructions shipped with the product for approved thermostats.

When the room thermostat calls for heat, the contacts of the room thermostat close making terminals R to Y & G, the low voltage circuit of the transformer is completed. Current now flows through the magnetic holding coils of the compressor contactor (CC) and fan relay (RFC).

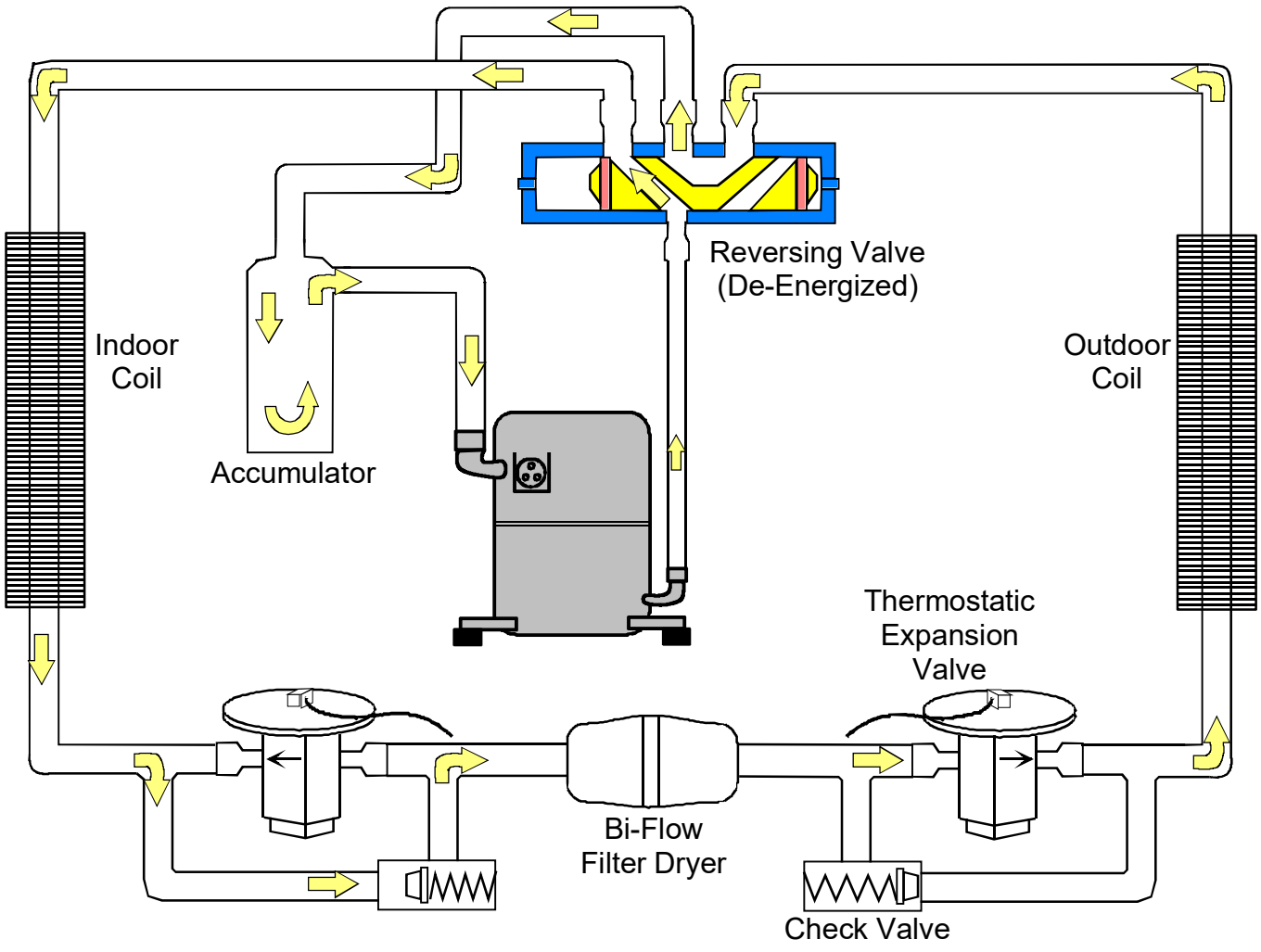
This draws in the normally open contact CC, starting the compressor condenser fan motors. At the same time, contacts RFC close, starting the indoor fan motor.

When the thermostat is satisfied, it opens its contacts, breaking the low voltage circuit, causing the compressor contactor and indoor fan relay to open, shutting down the system.

If the room thermostat fan selector switch should be set to the “on” position, then the indoor blower would run continuously rather than cycling with the compressor.

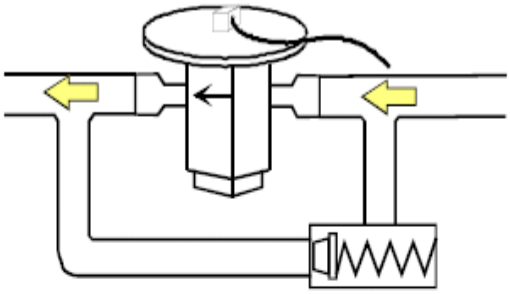
When the thermostat is satisfied, appropriate commands are sent to the UC control. The compressor relay and outdoor fan relay is de-energized. The compressor high stage solenoid is de-energized if it was energized. The UC control sends an appropriate command to the indoor unit to de-energize the indoor blower motor.

**Heating Cycle**

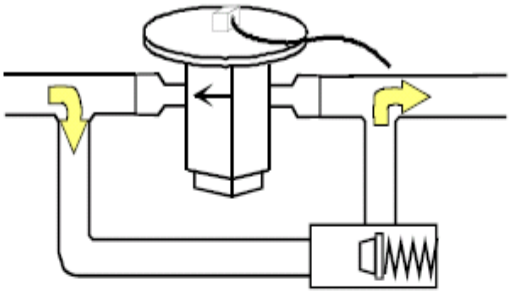


# SYSTEM OPERATION

**Expansion Valve/Check Valve Assembly In Cooling Operation**

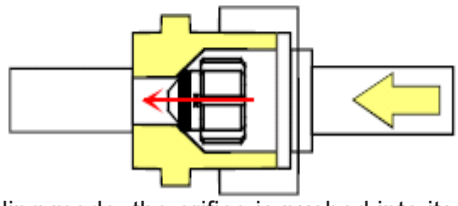


**Expansion Valve/Check Valve Assembly In Heating Operation**



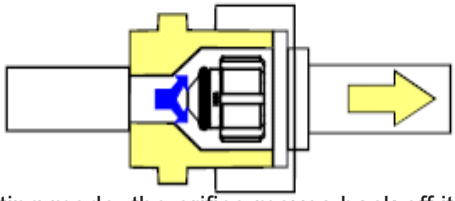
Most expansion valves used in current Amana Heat Pump products use an internally checked expansion valve. This type of expansion valve does not require an external check valve as shown above.

**Restrictor Orifice Assy in Cooling Operation**



In the cooling mode, the orifice is pushed into its seat, forcing refrigerant to flow through the metered hole in the center of the orifice.

**Restrictor Orifice Assy in Heating Operation**



In the heating mode, the orifice moves back off its seat allowing refrigerant to flow unmetered around the outside of the orifice.

## SEQUENCE OF OPERATION

**Refer to the installation instructions and wiring diagrams provided with the MBR/AR*F for specific wiring connections and system configuration.**

**MBR/AR*F With Single Stage Condensers**

**1.0 Cooling Operation**

**1.1** On a demand for cooling, the room thermostat energizes “G” and “Y” and 24Vac is supplied to “Y” at the condensing unit and the “G” terminal on the EBTDR board.

**1.2** The compressor and condenser fan are turned on and after a 7 second on delay, the relay on the EBTDR board is energized and the blower motor starts.

**1.3** When the cooling demand “Y” is satisfied, the room thermostat removes the 24Vac from “G” and “Y”.

**1.4** The compressor and condenser fan are turned off and after a 65 second delay off, the relay on the EBTDR board is de-energized and the blower is turned off.

**2.0 Heating Operation**

**2.1** On a demand for heat, the room thermostat energizes “W1” and 24Vac is supplied to heat sequencer, HR1, on the heater assembly.

**2.2** The contacts M1 and M2 will close within 10 to 20 seconds and turn on heater element #1. The normally closed contacts on the EBTDR are also connected to terminal M1. When M1 and M2 close, the blower motor will be energized thru the normally closed contacts on the EBTDR board. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3 and M4, which will close to turn on heater element #2.

# SYSTEM OPERATION

**NOTE: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2,which will control the 3rd and 4th heater elements if available. If the first stage heat demand, "W1" cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize "W2" and 24Vac will be supplied to HR2 on the heater assembly. When the "W2" demand is satisfied, the room thermostat will remove the 24Vac from HR2. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off. On most digital/electronic thermostats, "W2" will remain energized until the first stage demand "W1" is satisfied and then the "W1" and "W2" demands will be removed.**

**2.3** When the "W1" heat demand is satisfied, the room thermostat will remove the 24Vac from HR1. Both set of contacts on the relay opens within 30 to 70 seconds and turn off the heater element(s) and the blower motor.

**MBR/AR*F With Single Stage Heat Pumps**

**3.0 Cooling Operation**

On heat pump units, when the room thermostat set to the cooling mode, 24Vac is supplied to "O" which energizes the reversing valve. As long as the thermostat is set for cooling, the reversing valve will be in the energized position for cooling.

**3.1** On a demand for cooling, the room thermostat energizes "G" and "Y" and 24Vac is supplied to "Y" at the heat pump and the "G" terminal on the EBTDR board.

**3.2** The heat pump turned on in the cooling mode and after a 7 second on delay, the relay on the EBTDR board is energized and the blower motor starts.

**3.3** When the cooling demand is satisfied, the room thermostat removes the 24Vac from "G" and "Y".

**3.4** The heat pump is turned off and after a 65 second delay off, the relay on the EBTDR board is de-energized and the blower motor is turned off.

**4.0 Heating Operation**

On heat pump units, when the room thermostat set to the heating mode, the reversing valve is not energized. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle. Some installations may use one or more outdoor thermostats to restrict the amount of electric heat that is available above a preset ambient temperature. Use of optional controls such as these can change the operation of the electric heaters during the heating mode. This sequenceof operation does not cover those applications.

**4.1** On a demand for first stage heat with heat pump units, the room thermostat energizes "G" and "Y" and 24Vac is supplied to "Y" at the heat pump unit and the "G" terminal on the EBTDR board. The heat pump is turned on in the heating mode and the blower motor starts after a 7 second on delay.

**4.2** If the first stage heat demand cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize terminal "W2' for second stage heat and 24Vac will be supplied to heat sequencer HR1 on the heater assembly.

**4.3** HR1 contacts M1 and M2 will close will close within 10 to 20 seconds and turn on heater element #1. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3 and M4, which will close and turn on heater element #2. The blower motor is already on as a result of terminal "G" on the EBTDR board being energized for the first stage heat demand.

**NOTE: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2, which will control the 3rd and 4th heater elements if available. If the second stage heat demand, "W2" cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize "W3" and 24Vac will be supplied to HR2 on the heater assembly. When the "W3" demand is satisfied, the room thermostat will remove the 24Vac from HR2. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off. On most digital/electronic thermostats, "W3" will remain energized until the first stage heat demand "Y" is satisfied and then the "G", "Y", "W2" and "W3" demands will be removed.**

**4.4** As the temperature indoors increase, it will reach a point where the second stage heat demand, "W2", is satisfied. When this happens, the room thermostat will remove the 24Vac from the coil of HR1. The contacts on HR1 will open between 30 to 70 seconds and turn off both heater element(s). The heat pump remains on along with the blower motor because the "Y" demand for first stage heat will still be present.

**4.5** When the first stage heat demand "Y" is satisfied, the room thermostat will remove the 24Vac from "G" and "Y". The heat pump is turned off and the blower motor turns off after a 65 second off delay.

**5.0 Defrost Operation**

On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized.

# SYSTEM OPERATION

As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle.

**5.1** The heat pump will be on and operating in the heating mode as described the Heating Operation in section 4.

**5.2** The defrost control in the heat pump unit checks to seeif a defrost is needed every 30, 60 or 90 minutes of heat pump operation depending on the selectable setting by monitoring the state of the defrost thermostat attached to the outdoor coil.

**5.3** If the temperature of the outdoor coil is low enough to cause the defrost thermostat to be closed when the defrost board checks it, the board will initiate a defrost cycle.

**5.4** When a defrost cycle is initiated, the contacts of the HVDR relay on the defrost board open and turns off the outdoor fan. The contacts of the LVDR relay on the defrost board closes and supplies 24Vac to “O” and “W2”. The reversing valve is energized and the contactson HR1 close and turns on the electric heater(s). The unit will continue to run in this mode until the defrost cycle is completed.

**5.4a** For models with defrost control PCBDM133 or PCBDM160, a 30 second compressor delay at defrost initiation/termination is optional. As shipped from the factory, the control is set for the delay (“DLY”), which will turn the compressor off for 30 seconds while the reversing valve shifts to/from the cooling mode position. To bypass the delay, which typically reduces sound levels during defrost mode, change the pin settings from “DLY” to “NORM”.

**5.5** When the temperature of the outdoor coil rises high enough to causes the defrost thermostat to open, the defrost cycle will be terminated. If at the end of the programmed 10 minute override time the defrost thermostat is still closed, the defrost board will automatically terminate the defrost cycle.

**5.6** When the defrost cycle is terminated, the contacts of the HVDR relay will close to start the outdoor fan and the contacts of the LVDR relay will open and turn off the reversing valve and electric heater(s). The unit will now be back in a normal heating mode with a heat pump demand for heating as described in the Heating Operation.

**MBE/AEPF With GSX, SSX, ANX, ASX, DSX, VSX MBE Electronic Blower Time Delay Relay AEPF Air Handler**

## SEQUENCE OF OPERATION

This document covers the basic sequence of operation for a typical application with a mercury bulb thermostat. When a digital/electronic thermostat is used, the on/off staging of the auxiliary heat will vary. Refer to the installation instructions and wiring diagrams provided with the MBE/AEPF for specific wiring connections, dip switch settings and system configuration.

**MBE/AEPF With Single Stage GSX, ANX, ASX, SSX, And VSX Condensers**

When used with a single stage GSX, SSX, ASX, and VSX condensers, dip switch #4 must be set to the on position on the VSTB inside the MBE/AEPF. The “Y” output from the indoor thermostat must be connected to the yellow wire labeled “Y/Y2” inside the wire bundle marked “Thermostat” and the yellow wire labeled “Y/Y2” inside the wire bundle marked “Outdoor Unit” must be connected to “Y” at the condenser. The orange jumper wire from terminal “Y1” to terminal“O” on the VSTB inside the MBE/AEPF must remain connected.

**1.0 Cooling Operation**

**1.1** On a demand for cooling, the room thermostat energizes “G” and “Y” and 24Vac is supplied to “G” and “Y/Y2” of the MBE/AEPF unit. The VSTB inside the MBE/AEPF will turnon the blower motor and the motor will ramp up to the speed programmed in the motor based on the settings for dip switch 5 and 6. The VSTB will supply 24Vac to “Y” at the condenser and the compressor and condenser are turned on.

**1.2** When the cooling demand is satisfied, the room thermostat removes the 24Vac from “G” and “Y”. The MBE/AEPF removes the 24Vac from “Y’ at the condenser and the compressor and condenser fan are turned off. The blower motor will ramp down to a complete stop based on the time and rate programmed in the motor.

**2.0 Heating Operation**

**2.1** On a demand for heat, the room thermostat energizes “W1” and 24Vac is supplied to terminal “E/W1” of the VSTB inside the MBE/AEPF unit. The VSTB will turn on the blower motor and the motor will ramp up to the speed programmed in the motor based on the settings for dip switch 1 and 2. The VSTB will supply 24Vac to heat sequencer HR1 on the electric heater assembly.

**2.2** HR1 contacts M1 and M2 will close within 10 to 20 seconds and turn on heater element #1. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3 and M4, which will close and turn on heater element #2.

# SYSTEM OPERATION

**NOTE: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2, which will control the 3rd and 4th heater elements if available. For the 3rd and 4th heater elements to operate on a second stage heat demand, the PJ4 jumper on the VSTB inside the MBE/ AEPF must be cut. With the PJ4 jumper cut, the VSTB will run the blower motor on low speed on a "W1" only demand. If the first stage heat demand, "W1" cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize "W2" and 24Vac will be supplied to HR2 on the heater assembly and the blower motor will change to high speed. When the "W2" demand is satisfied, the room thermostat will remove the 24Vac from "W2" and the VSTB will remove the 24Vac from HR2. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off and the blower motor will change to low speed. On most digital/electronic thermostats, "W2" will remain energized until the first stage demand "W1" is satisfied and then the "W1" and "W2" demands will be removed.**

2.3 When the "W1" heat demand is satisfied, the room thermostat will remove the 24Vac from "E/W1" and the VSTB rebetween 30 to 70 seconds and turn off the heater element(s) and the blower motor ramps down to a complete stop.

**MBE/AEPF With Single Stage**
**GSZ, SSZ, ANZ, ASZ, and VSZ Heat Pumps**
When used with a single stage GSZ, SSZ, ASZ, or VSZ heat pumps, dip switch #4 must be set to the ON position on the VSTB inside the MBE. The "Y" output from the indoor thermostat must be connected to the yellow wire labeled "Y/Y2" inside the wire bundle marked "Thermostat" and the yellow wire labeled "Y/Y2" inside the wire bundle marked "Outdoor Unit" must be connected to "Y" at the heat pump. **The orange jumper wire from terminal "Y1" to terminal "O" on the VSTB inside the MBE/AEPF must be removed.**

**3.0 Cooling Operation**
On heat pump units, when the room thermostat is set to the cooling mode, 24Vac is supplied to terminal "O" of the VSTB inside the MBE/AEPF unit. The VSTB will supply 24Vac to "O" at the heat pump to energize the reversing valve. As long as the thermostat is set for cooling, the reversing valve will be in the energized position for cooling.

**3.1** On a demand for cooling, the room thermostat energizes "G" and "Y" and 24Vac is supplied to terminals "G" and "Y/Y2" of the MBE/AEPF unit. The VSTB will turn on the blower motor and the motor will ramp up to the speed programmed in the motor based on the settings of dip switch 5 and 6. The VSTB will supply 24Vac to "Y" at the heat pump.

**3.2** The heat pump is turned on in the cooling mode.

**3.3** When the cooling demand is satisfied, the room thermostat removes the 24Vac from "G" and "Y/Y2" of the MBE/AEPF and the VSTB removes the 24Vac from "Y" at the heat pump. The heat pump is turned off and the blower motor will ramp down to a complete stop based on the time and rate programmed in the motor.

**4.0 Heating Operation**
On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle. Some installations may use one or more outdoor thermostats to restrict the amount of electric heat that is available above a preset ambient temperature. Use of optional controls such as these can change the operation of the electric heaters during the heating mode. This sequence of operation does not cover those applications.

**4.1** On a demand for first stage heat with heat pump units, the room thermostat energizes "Y" and "G" and 24Vac is supplied to "G" and "Y/Y2" of the MBE/AEPF. The VSTB will turn on the blower motor and the motor will ramp up to the speed programmed in the motor based on the settings of dip switch 1 and 2. The VSTB will supply 24Vac to "Y" at the heat pump and the heat pump is turned on in the heating mode.

**4.2** If the first stage heat demand cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize terminal "W2" for second stage heat and 24Vac will be supplied to "E/W1" of the MBE/ AEPF. The VSTB will supply 24Vac to heat sequencer, HR1, on the electric heater assembly.

**4.3** HR1 contacts M1 and M2 will close within 10 to 20 seconds and turn on heater element #1. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3 and M4, which will close to turn on heater element #2.

# SYSTEM OPERATION

**NOTE: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2, which will control the 3rd and 4th heater elements if available. For the 3rd and 4th heater elements to operate on a third stage heat demand, the PJ4 jumper on the VSTB inside the MBE/AEPF must be cut. If the second stage heat demand, "W2", cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize "W3" and 24Vac will be supplied to "W/W2" of the MBE/AEPF. The VSTB will supply 24Vac to HR2 on the electric heater assembly. When the "W3" demand is satisfied, the room thermostat will remove the 24Vac from "W/W2" of the MBE/AEPF. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off. On most digital/electronic thermostats, "W3" will remain energized until the first stage demand "Y" is satisfied and then the "G", "Y", "W2" and "W3" demands will be removed.**

**4.4** As the temperature indoors increase, it will reach a point where the second stage heat demand, "W2", is satisfied. When this happens, the room thermostat will remove the 24Vac from "E/W1" of the MBE/AEPF. The contacts on HR1 will open between 30 to 70 seconds and turn off both heater element(s). The heat pump remains on along with the blower motor because the "Y" demand for first stage heat will still be present.

**4.5** When the first stage heat demand "Y" is satisfied, the room thermostat will remove the 24Vac from "G" and "Y/Y2" of the MBE/AEPF. The VSTB removes the 24Vac from "Y" at the heat pump and the heat pump is turned off. The blower motor will ramp down to a complete stop based on the time and rate programmed in the motor control.

**5.0 Defrost Operation**

On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle.

**5.1** The heat pump will be on and operating in the heating mode as described the Heating Operation in section 4.

**5.2** The defrost control in the heat pump unit checks to see if a defrost is needed every 30, 60 or 90 minutes of heat pump operation depending on the selectable setting by monitoring the state of the defrost thermostat attached to the outdoor coil.

**5.3** If the temperature of the outdoor coil is low enough to cause the defrost thermostat to be closed when the defrost board checks it, the board will initiate a defrost cycle.

**5.4** When a defrost cycle is initiated, the contacts of the HVDR relay on the defrost board open and turns off the outdoor fan.

The contacts of the LVDR relay on the defrost board closes and supplies 24Vac to "O" and "W2". The reversing valve is energized and the contacts on HR1 close and turns on the electric heater(s). The unit will continue to run in this mode until the defrost cycle is completed.

**5.4a** For models with defrost control PCBDM133 or PCBDM160, a 30 second compressor delay at defrost initiation/termination is optional. As shipped from the factory, the control is set for the delay ("DLY"), which will turn the compressor off for 30 seconds while the reversing valve shifts to/from the cooling mode position. To bypass the delay, which typically reduces sound levels during defrost mode, change the pin settings from "DLY" to "NORM".

**5.5** When the temperature of the outdoor coil rises high enough to causes the defrost thermostat to open, the defrost cycle will be terminated. If at the end of the programmed 10 minute override time the defrost thermostat is still closed, the defrost board will automatically terminate the defrost cycle.

**5.6** When the defrost cycle is terminated, the contacts of the HVDR relay on the defrost board will close to start the outdoor fan and the contacts of the LVDR relay will open and turn off the reversing valve and electric heater(s). The unit will now be back in a normal heating mode with a heat pump demand for heating as described in the Heating Operation in section 4. See section 5.4a.

**MBE/AEPF With Two Stage ASX & DSX Condensers**

**1.0 Cooling Operation**

**When used with the ASX & DSX two stage condensers, dip switch #4 must be set to the OFF position on the VSTB inside the MBE/AEPF. The "Y1" output from the indoor** thermostat must be connected to the purple wire labeled "Ylow/Y1" inside the wire bundle marked "Thermostat" and the purple wire labeled "Ylow/Y1" inside the wire bundle marked "Outdoor Unit" must be connected to "Ylow/Y1" at the condenser. The "Y2" output from the indoor thermostat must be connected to the yellow wire labeled "Y/Y2" inside the wire bundle marked "Thermostat" and the yellow wire labeled "Y/Y2" inside the wire bundle marked "Outdoor Unit" must be connected to "Y/Y2" at the condenser. **The orange jumper wire from terminal "Y1" to terminal "O" on the VSTB inside the MBE/AEPF must remain connected.**

# SYSTEM OPERATION

**1.1** On a demand for cooling, the room thermostat energizes “G” and “Y1” and 24Vac is supplied to “G” and “Ylow/Y1” of the MBE/AEPF unit. The VSTB inside the MBE/AEPF will turn on the blower motor and the motor will ramp up to 60% of the speed programmed in the motor based on the settings for dip switch 5 and 6. The VSTB will supply 24Vac to “Ylow/Y1” at the condenser and the compressor and condenser fan starts in low speed operation.

**1.2** If first stage cooling cannot satisfy the demand, the room thermostat will energize “Y2” and supply 24Vac to the MBE/AEPF unit. The blower motor will change to the cfm for high speed operation and the VSTB will supply 24Vac to “Y/Y2” at the condenser and the compressor and condenser fan will change to high speed operation. When the “Y2” demand is satisfied, the thermostat will remove the “Y2” demand and the VSTB will remove the 24Vac from “Y/Y2” at the condenser.
The blower will drop to 60% of the programmed cfm and the compressor and condenser fan will change to low speed. **On most digital/electronic thermostats, “Y2” will remain energized until the first stage cooling demand “Y1” is satisfied and then the “G”, “Y1” and “Y2” demands will be removed.**

**1.3** When the first stage cooling demand, “Y1”, is satisfied, the room thermostat removes the 24Vac from “G” and “Y1”. The MBE/AEPF removes the 24Vac from “Ylow/Y1’ at the condenser and the compressor and condenser fan are turned off. The blower motor will ramp down to a complete stop based on the time and rate programmed in the motor.

**2.0 Heating Operation**

**2.1** On a demand for heat, the room thermostat energizes “W1” and 24Vac is supplied to terminal “E/W1” of the VSTB inside the MBE/AEPF unit. The VSTB will turn on the blower motor and the motor will ramp up to the speed programmed in the motor based on the settings for dip switch 1 and 2. The VSTB will supply 24Vac to heat sequencer HR1 on the electric heater assembly.

**2.2** HR1 contacts M1 and M2 will close within 10 to 20 seconds and turn on heater element #1. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3 and M4, which will close and turn on heater element #2.

**NOTE: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2, which will control the 3rd and 4th heater elements if available. For the 3rd and 4th heater elements to operate on a second stage heat demand, the PJ4 jumper on the VSTB inside the MBE/AEPF must be cut. With the PJ4 jumper cut, the VSTB will run the blower motor on low speed on a “W1” only demand. If the first stage heat demand, “W1” cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize “W2” and 24Vac will be supplied to HR2 on the heater assembly and the blower motor will change to high speed. When the “W2” demand is satisfied, the room thermostat will remove the 24Vac from “W2” and the VSTB will remove the 24Vac from HR2. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off and the blower motor will change to low speed. On most digital/electronic thermostats, “W2” will remain energized until the first stage demand “W1” is satisfied and then the “W1” and “W2” demands will be removed.**

**2.3** When the “W1” heat demand is satisfied, the room thermostat will remove the 24Vac from “E/W1” and the VSTB removes the 24Vac from HR1. The contacts on HR1 will open between 30 to 70 seconds and turn off the heater element(s) and the blower motor ramps down to a complete stop.
***MBE/AEPF With Two Stage ASZ & DSZ Heat Pump Units***

**3.0 Cooling Operation**

**When used with the ASZ & DSZ two stage heat pumps, dip switch #4 must be set to the OFF position on the VSTB inside the MBE/AEPF.** The “Y1” output from the indoor thermostat must be connected to the purple wire labeled “Ylow/Y1” inside the wire bundle marked “Thermostat” and the purple wire labeled “Ylow/Y1” inside the wire bundle marked “Outdoor Unit” must be connected to “Y” at the heat pump. The “Y2” output from the indoor thermostat must be connected to the yellow wire labeled “Y/Y2” inside the wire bundle marked “Thermostat” and the yellow wire labeled “Y/Y2” inside the wire bundle marked “Outdoor Unit” must be connected to “Y/Y2” at the heat pump. **The orange jumper wire from terminal “Y1” to terminal “O” on the VSTB inside the MBE/AEPF must be removed.**

On heat pump units, when the room thermostat is set to the cooling mode, 24Vac is supplied to terminal “O” of the VSTB inside the MBE unit. The VSTB will supply 24Vac to “O” at the heat pump to energize the reversing valve. As long as the thermostat is set for cooling, the reversing valve will be in the energized position for cooling.

# SYSTEM OPERATION

**3.1** On a demand for cooling, the room thermostat energizes “G” and “Y1” and 24Vac is supplied to “G” and “Ylow/Y1” of the MBE unit. The VSTB inside the MBE will turn on the blower motor and the motor will ramp up to 60% of the speed programmed in the motor based on the settings for dip switch 5 and 6. The VSTB will supply 24Vac to “Y” at the heat pump and the compressor and outdoor fan starts in low speed operation.

**3.2** If first stage cooling cannot satisfy the demand, the room thermostat will energize “Y2” and supply 24Vac to “Y/Y2”of the MBE unit. The blower motor will change to the cfm for high speed operation and the VSTB will supply 24Vac to “Y2” at the heat pump. The compressor and outdoor fan will change to high speed operation. When the “Y2” demand is satisfied, the thermostat will remove the “Y2” demand and the VSTB will remove the 24Vac from “Y2” at the heat pump. The blower will drop to 60% of the programmed cfm and the compressor and outdoor fan will change to low speed operation. **On most digital/ electronic thermostats, “Y2” will remain energized until the first stage cooling demand “Y1” is satisfied and then the “G”, “Y1” and “Y2” demands will be removed.**

**3.3** When the first stage cooling demand, “Y1”, is satisfied, the room thermostat removes the 24Vac from “G” and “Y1”. The VSTB removes the 24Vac from “Y’ at the heat pump and the compressor and outdoor fan are turned off. The blower motor will ramp down to a complete stop based on the time and rate programmed in the motor.

**4.0 Heating Operation**

On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle. Some installations may use one or more outdoor thermostats to restrict the amount of electric heat that is available above a preset ambient temperature. Use of optional controls such as these can change the operation of the electric heaters during the heating mode. This sequence of operation does not cover those applications.

**4.1** On a demand for first stage heat with heat pump units, the room thermostat energizes “G” and “Y1” and 24Vac is supplied to “G” and “Ylo/Y1” of the MBE/AEPF. The VSTB will turn on the blower motor and the motor will ramp up to 60% of the speed programmed in the motor based on the settings of dip switch 1 and 2. The VSTB will supply 24Vac to “Y” at the heat pump. **The compressor will start on low stage and outdoor fan will start on low speed on a “Y1” heating demand but the blower motor will deliver only 60% of the programmed cfm for high speed heating operation.**

**4.2** If a thermostat that provides a “Y2” demand in heating is used and first stage heating cannot satisfy the demand, the room thermostat will energize “Y2” and supply 24Vac to “Y/Y2” of the MBE unit. The blower motor will change to the cfm for high speed heating operation and the VSTB will supply 24Vac to “Y/Y2” at the heat pump. The outdoor fan will change to high speed operation and compressor will shift to high stage. If the “Y2” demand is present and becomes satisfied, the thermostat will remove the “Y2” demand and the VSTB will remove the 24Vac from “Y/ Y2” at the heat pump. The blower will drop to 60% of the programmed cfm and the outdoor fan will change to low speed. On most digital/electronic thermostats, “Y2” will remain energized until the first stage heating demand “Y1” is satisfied and then the “G”, “Y1” and “Y2” demands will be removed.

**4.3** If the heat pump operation cannot satisfy the demand, the room thermostat energizes “W2/W3” and 24Vac is supplied to terminal “E/W1” of the VSTB inside the MBE/ AEPF unit. The VSTB will supply 24Vac to heat sequencer HR1 on the electric heater assembly.

**4.4** HR1 contacts M1 and M2 will close within 10 to 20 seconds and turn on heater element #1. At the same time, if the heater assembly contains a second heater element, HR1 will contain a second set of contacts, M3and M4, which will close and turn on heater element #2.

**Note: If more than two heater elements are on the heater assembly, it will contain a second heat sequencer, HR2, which will control the 3rd and 4th heater elements if available. For the 3rd and 4th heater elements to operate on a second stage auxiliary heat demand, the PJ4 jumper on the VSTB inside the MBE/AEPF must be cut. If the “W2/W3” demand cannot be satisfied by the heat pump, the temperature indoors will continue to drop. The room thermostat will then energize “W3/W4” and 24Vac will be supplied to “W/W2” of the MBE. The VSTB will supply 24Vac to HR2 on the electric heater assembly. When the “W3/ W4” demand is satisfied, the room thermostat will remove the 24Vac from “W/W2” of the MBE/AEPF. The contacts on HR2 will open between 30 to 70 seconds and heater elements #3 and #4 will be turned off. On most digital/electronic thermostats, “W3/W4” will remain energized until the first stage demand “Y1” is satisfied and then the “G”, “Y1”, “Y2” “W2/W3” and “W3/W4” demands will be removed.**

# SYSTEM OPERATION

**4.5** As the temperature indoors increase, it will reach a point where the “W2/W3” demand is satisfied. When this happens, the room thermostat will remove the 24Vac from “E/W1” of the MBE/AEPF. The contacts on HR1 will open between 30 to 70 seconds and turn off the 1st and 2nd heater elements. If the “Y2” demand is present and becomes satisfied the room thermostat will remove the 24Vac from “Y/Y2” of the MBE and the blower motor will change to 60% of the programmed cfm. The VSTB will remove the 24Vac from “Y/Y2” at the heat pump and the outdoor fan will change to low speed operation. The heat pump remains on along with the blower motor because the “Y1” demand for first stage heat will still be present.

**4.6** When the first stage heat demand “Y1” is satisfied, the room thermostat will remove the 24Vac from “G” and “Ylo/Y1” of the MBE/AEPF. The VSTB removes the 24Vac from “Ylo/Y1” at the heat pump and the compressor and outdoor fan are turned off. The blower motor will ramp down to a complete stop based on the time and rate programmed in the motor control.

**5.0 Defrost Operation**

On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle.

**5.1** The heat pump will be on and operating in the heating mode as described the Heating Operation in section 4.

**5.2** The defrost control in the heat pump unit checks to see if a defrost is needed every 30, 60 or 90 minutes of heat pump operation depending on the selectable setting by monitoring the state of the defrost thermostat attached to the outdoor coil.

**5.3** If the temperature of the outdoor coil is low enough to cause the defrost thermostat to be closed when the defrost board checks it, the board will initiate a defrost cycle.

**5.4** When a defrost cycle is initiated, the contacts of theHVDR relay on the defrost board open and turns off the outdoor fan. The contacts of the LVDR relay on the defrost board closes and supplies 24Vac to “O” and “W2”. The reversing valve is energized and the contacts on HR1 close and turns on the electric heater(s). The unit will continue to run in this mode until the defrost cycle is completed.

**5.4a** For models with defrost control PCBDM133 or PCBDM160, a 30 second compressor delay at defrost initiation/termination is optional. As shipped from the factory, the control is set for the delay (“DLY”), which will turn the compressor off for 30 seconds while the reversing valve shifts to/from the cooling mode position. To bypass the delay, which typically reduces sound levels during defrost mode, change the pin settings from “DLY” to “NORM”.

**5.5** When the temperature of the outdoor coil rises high enough to causes the defrost thermostat to open, the defrost cycle will be terminated. If at the end of the programmed 10 minute override time the defrost thermostat is still closed, the defrost board will automatically terminate the defrost cycle.

# SERVICING

**Checking Voltage**

1. Remove outer case, control panel cover, etc., from unit being tested.

With power ON:

**WARNING**

**LINE VOLTAGE NOW PRESENT**

2. Using a voltmeter, measure the voltage across terminals L1 and L2 of the contactor for the condensing unit or at the field connections for the air handler or heaters.
3. No reading - indicates open wiring, open fuse(s) no power or etc., from unit to fused disconnect service. Repair as needed.
4. With ample voltage at line voltage connectors, energize the unit.
5. Measure the voltage with the unit starting and operating, and determine the unit Locked Rotor Voltage.

**NOTE: If checking heaters, be sure all heating elements are energized.**

**Locked Rotor Voltage** is the actual voltage available at the compressor during starting, locked rotor, or a stalled condition. Measured voltage should be above minimum listed in chart below.

To measure Locked Rotor Voltage attach a voltmeter to the run "R" and common "C" terminals of the compressor, or to the T1 and T2 terminals of the contactor. Start the unit and allow the compressor to run for several seconds, then shut down the unit. Immediately attempt to restart the unit while measuring the Locked Rotor Voltage.

6. Locked rotor voltage should read within the voltage tabulation as shown. If the voltage falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company in regard to either low or high voltage.

| Unit Supply Voltage | | |
|---|---|---|
| Voltage | Min. | Max |
| 208/230 | 197 | 253 |
| 460 | 414 | 506 |

**NOTE: When operating electric heaters on voltages other than 240 volts, refer to the System Operation section on electric heaters to calculate temperature rise and air flow. Low voltage may cause insufficient heating.**

**Checking Wiring**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with comparable gauge and insulation thickness.

**Checking Thermostat And Wiring**

Thermostat Wiring: The maximum wire length for 18 AWG thermostat wire is 100 feet.

**Thermostat Wiring**

**WARNING**

**LINE VOLTAGE NOW PRESENT**

With power ON, thermostat calling for cooling

1. Use a voltmeter to check for 24 volts at thermostat wires C and Y in the condensing unit control panel.
2. No voltage indicates trouble in the thermostat, wiring or external transformer source.
3. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

**Indoor Blower Motor**

With power ON:

**WARNING**

**LINE VOLTAGE NOW PRESENT**

1. Set fan selector switch at thermostat to “ON” position.
2. With voltmeter, check for 24 volts at wires C and G.
3. No voltage indicates the trouble is in the thermostat or wiring.
4. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

# SERVICING

**Resistance Heaters**

1. Set room thermostat to a higher setting than room temperature so both stages call for heat.
2. With voltmeter, check for 24 volts at each heater relay.
3. No voltage indicates the trouble is in the thermostat or wiring.
4. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

**NOTE: Consideration must be given to how the heaters are wired (O.D.T. and etc.). Also safety devices must be checked for continuity.**

**Checking Transformer And Control Circuit**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

A step-down transformer (208/240 volt primary to 24 volt secondary) is provided with each indoor unit. This allows ample capacity for use with resistance heaters. The outdoor sections do not contain a transformer (see note below).

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Remove control panel cover, or etc., to gain access to transformer.

With power ON:

**WARNING**

**LINE VOLTAGE NOW PRESENT**

2. Using a voltmeter, check voltage across secondary voltage side of transformer (R to C).
3. No voltage indicates faulty transformer, bad wiring, or bad splices.
4. Check transformer primary voltage at incoming line voltage connections and/or splices.
5. If line voltage available at primary voltage side of transformer and wiring and splices good, transformer is inoperative. Replace.

**Checking Contactor And/Or Relays**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

The compressor contactor and other relay holding coils are wired into the low or line voltage circuits. When the control circuit is energized, the coil pulls in the normally open contacts or opens the normally closed contacts. When the coil is de-energized, springs return the contacts to their normal position.

**Checking Contactor Contacts**

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

**Single Phase:**

1. Disconnect the wire leads from the terminal (T) side of the contactor.
2. With power ON, energize the contactor.

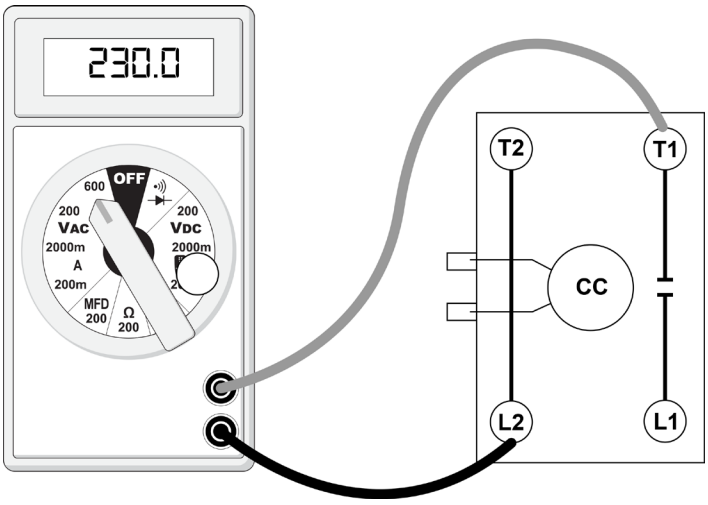
**WARNING**

**LINE VOLTAGE NOW PRESENT**

3. Using a voltmeter, test across terminals.
   a. L2 - T1 - No voltage indicates CC1 contacts open.

If a no voltage reading is obtained - replace the contactor.

# SERVICING

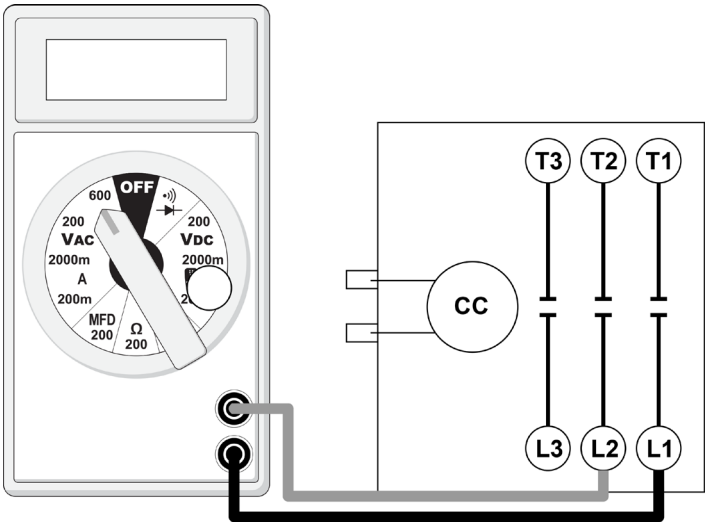



**Testing Compressor Contactor (Single Phase)**

**Three Phase**

Using a voltmeter, test across terminals:

1. L1-L2, L1-L3, and L2-L3 - If voltage is present, proceed to B. If voltage is not present, check breaker or fuses on main power supply..
2. T1-T2, T1-T3, and T2-T3 - If voltage readings are not the same as in “A”, replace contactor.




**Testing Compressor Contactor (Three-Phase)**

**Checking Fan Relay Contacts**

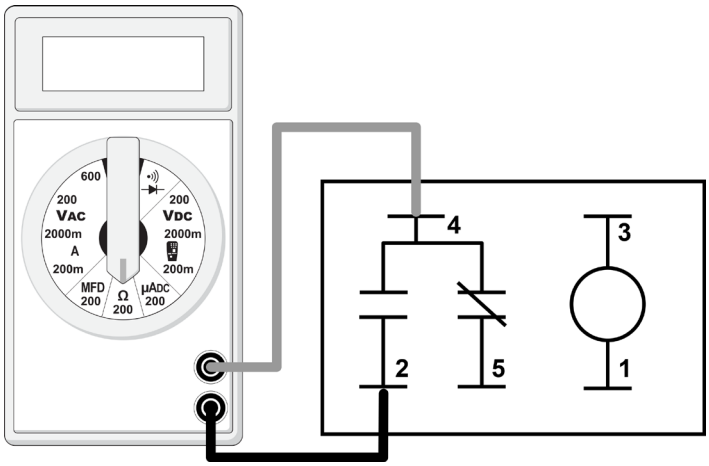
**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Disconnect wire leads from terminals 2 and 4 of Fan Relay Cooling and 2 and 4, 5 and 6 of Fan Relay Heating.
2. Using an ohmmeter, test between 2 and 4 - should read open. Test between 5 and 6 - should read continuous.
3. With power ON, energize the relays.

**WARNING**

**LINE VOLTAGE NOW PRESENT**




**Testing Fan Relay**

4. Using an ohmmeter, test between 2 and 4 - should read continuous . Test between 5 and 6 - should read open.
5. If not as above, replace the relay.

**Checking Relay Contacts - PSC Fan Motor**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Disconnect the motor leads from 6-circuit fan motor wire harness.
2. Connect a voltmeter between circuit 3 and circuits 2 (low speed) or 1 (high speed).

**NOTE: Circuit 3 is connected directly to L2.**

3. Energize the system at low or high stage.

# SERVICING

**WARNING**

**LINE VOLTAGE NOW PRESENT**

4. The measured voltage between circuit 3 and circuits 2 or 1 should be approximately 0VAC, which indicates the relay contacts are closed. A voltage measurement of approximately 115VAC indicates the relay is open. Replace the control if the relay checks open when it should be closed. See notes and cautions below.

**NOTE: Ensure any ON delays have expired before making voltage measurements**

**CAUTION: Prolonged operation with the condenser fan motoR disconnected will cause the high pressure switch to trip.**

**Checking Loss Of Charge Protector (Heat Pump Models)**

The loss of charge protectors senses the pressure in the liquid line and will open its contacts on a drop in pressure. the low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 21 PSIG. It will automatically cut-in (close) at approximately 50 PSIG.Test for continuity using a VOM and if not as above, replace the control.

**Checking High Pressure Control**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

The high pressure control capillary senses the pressure in the compressor discharge line. If abnormally high condensing pressures develop, the contacts of the control open, breaking the control circuit before the compressor motor overloads. This control is automatically reset.

**Test 1. Testing High Pressure Control in Cooling Mode**

1. Connect refrigerant gages to unit.
2. Disconnect power to outdoor unit.
3. Remove control panel cover.
4. Disconnect black wire from condenser fan motor (single stage units) or remove plug from control board on 2 stage units. Note: Tape or isolate black wire to prevent possible short.
5. Apply power to unit and set thermostat to cool and set for all for cool.
6. High pressure switch should open at 610 PSIG +/- 10 PSIG and close at 420 PSIG +/- 25 PSIG
7. If high pressure switch does not operate in these parameters replace switch.

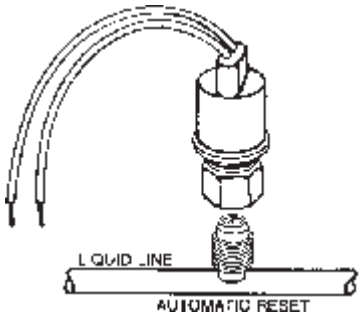
**Test 2. Testing High Pressure Control in Heating Mode**

1. Connect refrigerant gages to unit.
2. Disconnect power to indoor unit.
3. Remove control panel cover.
4. Disconnect black wire from evaporator fan motor (single stage units) or remove plug from control board on 2 stage units. Note: Tape or isolate black wire to prevent possible short.
5. Apply power to unit and set thermostat to heat and set for call for heat.
6. High pressure switch should open at 610 PSIG +/- 10 PSIG and close at 420 PSIG +/- 25 PSIG
7. If high pressure switch does not operate in these parameters replace switch.

With power ON:

**WARNING**

**LINE VOLTAGE NOW PRESENT**




**Checking Low Pressure Control**

The low pressure control senses the pressure in the suction line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

**Test 1. Testing Low Pressure Control in Cooling Mode**

1. Connect refrigerant gages to unit.
2. Disconnect power to indoor unit.
3. Remove control panel cover.
4. Disconnect black wire from evaporator fan motor (single stage units) or remove plug from control board on 2 stage units. Note: Tape or isolate black wire to prevent possible short.

# SERVICING

5. Apply power to unit and set thermostat to cool and set for a call for cool.
6. Low pressure switch should open at 21 PSIG, and auto reset (close) at approximately 50 PSIG.
7. If low pressure switch does not operate in these parameters replace switch.

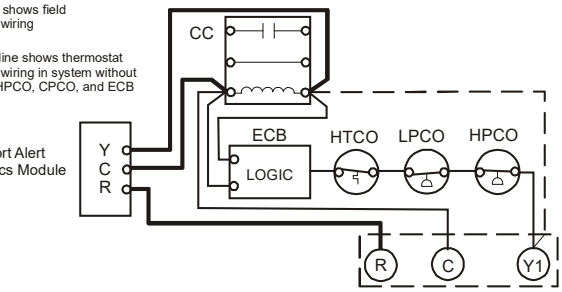
**Test 2. Testing Low Pressure Control in Heating Mode**

1. Connect refrigerant gages to unit.
2. Disconnect power to outdoor unit.
3. Remove control panel cover.
4. Disconnect black wire from condenser fan motor (single stage units) or remove plug from control board on 2 stage units. Note: Tape or isolate black wire to prevent possible short.
5. Apply power to unit and set thermostat to cool and set for all for cool.
6. Low pressure switch should open at 21 PSIG and auto reset (close) at approximately 50 PSIG
7. If low pressure switch does not operate in these parameters replace switch.

**Copeland Comfort Alert™ Diagnostics - 3-Wire module**
**Applies to ASX /ASZ and DSX/DSZ units**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**




Schematic Abbreviation Descriptions

| | | | |
|---|---|---|---|
| HTCO | High Temperature Cut Out Switch | CC | Compressor Contactor |
| HPCO | High Pressure Cut Out Switch | ECB | Electronic Control Board (Defrost or Time Delay) |
| LPCO | Low Pressure Cut Out Switch | | |

**Wiring Schematic - 3-Wire Comfort Alert Module**

Comfort Alert™ is self-contained with no required external sensors and is designed to install directly into the electrical box of any residential condensing unit that has a Copeland Scroll™ compressor inside.

Once attached, Comfort Alert provides around-the-clock monitoring for common electrical problems, compressor defects and broad system faults. If a glitch is detected, an LED indicator flashes the proper alert codes to help you quickly pinpoint the problem. *(See Diagnostic Table: 3-Wire Comfort Alert Module on previous page.)*

**Copeland Coresense™ Diagnostics - 3-Wire module**
**Applies to ASX /ASZ and DSX/DSZ units**

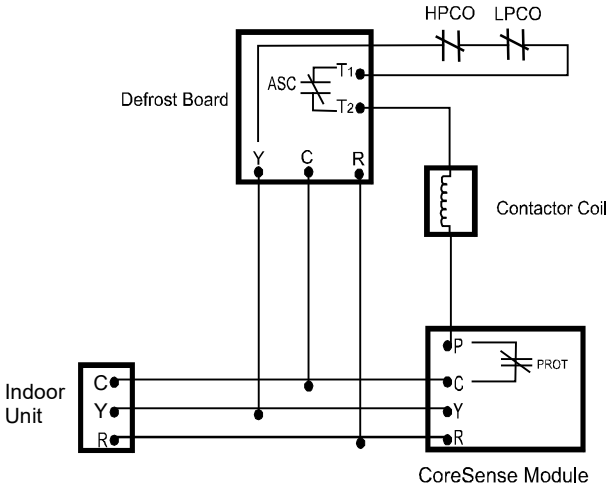
**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

The CoreSense™ module is self-contained with no required external sensors and works with any residential condensing unit that has a Copeland Scroll™ compressor inside.

# SERVICING

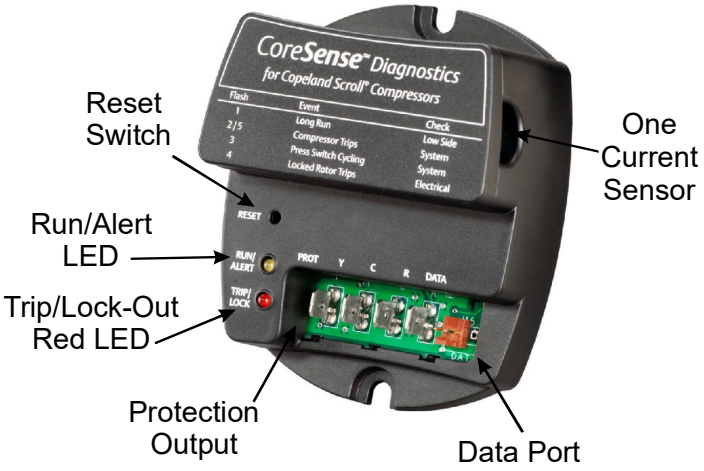
Once attached, CoreSense™ provides around-the-clock monitoring for common electrical problems, compressor defects and broad system faults. If a glitch is detected, an LED indicator flashes the proper alert codes to help you quickly pinpoint the problem. *See Diagnostic Table: 3-Wire CoreSense™ Module on following pages.*




Schematic Abbreviation Descriptions

| | | | |
|---|---|---|---|
| HTCO | High Temperature Cut Out Switch | CC | Compressor Contactor |
| HPCO | High Pressure Cut Out Switch | ECB | Electronic Control Board (Defrost or Time Delay) |
| LPCO | Low Pressure Cut Out Switch | | |

### Wiring Schematic - 3-Wire Coresense™ Alert Module



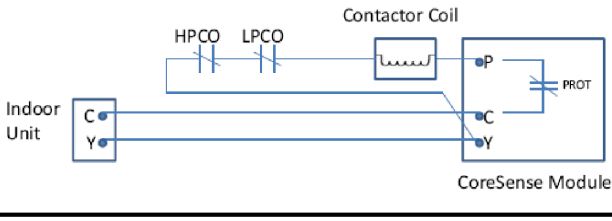

### Diagnostics - 2-Wire Module
### Applies to ASX130[18-60]CA, ASX140[18-36]1CA, ASX140421DA, And ASX140[48-60]1BA Units

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

The CoreSense™ module is self-contained with no required external sensors and works with any residential condensing unit that has a Copeland Scroll™ compressor inside.

Once attached, CoreSense™ provides around-the-clock monitoring for common electrical problems, compressor defects and broad system faults. If a glitch is detected, an LED indicator flashes the proper alert codes to help you quickly pinpoint the problem. *See Diagnostic Table: 2-Wire Comfort Alert™ Module on following pages.)*




Schematic Abbreviation Descriptions

| | | | |
|---|---|---|---|
| HTCO | High Temperature Cut Out Switch | CC | Compressor Contactor |
| HPCO | High Pressure Cut Out Switch | ECB | Electronic Control Board (Defrost or Time Delay) |
| LPCO | Low Pressure Cut Out Switch | | |

### Wiring Schematic - 2-Wire Coresense™ Module

# SERVICING

**Diagnostics Table: 2-Wire Comfort Alert™ Module**

| Status LED | Status LED Description | Status LED Troubleshooting Information |
|---|---|---|
| **Green "POWER"** | **Module has power** | Supply voltage is present at module terminals |
| **Red "TRIP"** | Thermostat demand signal Y1 is present, but the compressor is not running | 1. Compressor protector is open<br>2. Outdoor unit power disconnect is open<br>3. Compressor circuit breaker or fuse(s) is open<br>4. Broken wire or connector is not making contact<br>5. Low pressure switch open if present in system<br>6. Compressor contactor has failed open |
| **Yellow "ALERT"**<br>**Flash Code 1** | **Long Run Time**<br>Compressor is running extremely long run cycles | 1. Low refrigerant charge<br>2. Evaporator blower is not running<br>3. Evaporator coil is frozen<br>4. Faulty metering device<br>5. Condenser coil is dirty<br>6. Liquid line restriction (filter drier blocked if present in system)<br>7. Thermostat is malfunctioning |
| **Yellow "ALERT"**<br>**Flash Code 2** | **System Pressure Trip**<br>Discharge or suction pressure out of limits or compressor overloaded | 1. High head pressure<br>2. Condenser coil poor air circulation (dirty, blocked, damaged)<br>3. Condenser fan is not running<br>4. Return air duct has substantial leakage<br>5. If low pressure switch present in system, check Flash Code 1 information |
| **Yellow "ALERT"**<br>**Flash Code 3** | **Short Cycling**<br>Compressor is running only briefly | 1. Thermostat demand signal is intermittent<br>2. Time delay relay or control board defective<br>3. If high pressure switch present go to Flash Code 2 information<br>4. If low pressure switch present go to Flash Code 1 information |
| **Yellow "ALERT"**<br>**Flash Code 4** | **Locked Rotor** | 1. Run capacitor has failed<br>2. Low line voltage (contact utility if voltage at disconnect is low)<br>3. Excessive liquid refrigerant in compressor<br>4. Compressor bearings are seized |
| **Yellow "ALERT"**<br>**Flash Code 5** | **Open Circuit** | 1. Outdoor unit power disconnect is open<br>2. Compressor circuit breaker or fuse(s) is open<br>3. Compressor contactor has failed open<br>4. High pressure switch is open and requires manual reset<br>5. Open circuit in compressor supply wiring or connections<br>6. Unusually long compressor protector reset time due to extreme ambient temperature<br>7. Compressor windings are damaged |
| **Yellow "ALERT"**<br>**Flash Code 6** | **Open Start Circuit**<br>Current only in run circuit | 1. Run capacitor has failed<br>2. Open circuit in compressor start wiring or connections<br>3. Compressor start winding is damaged |
| **Yellow "ALERT"**<br>**Flash Code 7** | **Open Run Circuit**<br>Current only in start circuit | 1. Open circuit in compressor run wiring or connections<br>2. Compressor run winding is damaged |
| **Yellow "ALERT"**<br>**Flash Code 9** | **Low Voltage**<br>Control circuit < 17VAC | 1. Control circuit transformer is overloaded<br>2. Low line voltage (contact utility if voltage at disconnect is low) |

• FLASH CODE NUMBER CORRESPONDS TO A NUMBER OF LED FLASHES, FOLLOWED BY A PAUSE AND THEN REPEATED
• TRIP AND ALERT LEDS FLASHING AT SAME TIME MEANS CONTROL CIRCUIT VOLTAGE IS TOO LOW FOR OPERATION.
• LAST ALERT FLASH CODE IS DISPLAYED FOR 1 MINUTE AFTER MODULE IS POWERED ON.

# SERVICING

**Diagnostics Table: Coresense™ Module**

Flash code number corresponds to the number of LED flashes, followed by a pause and then repeated. TRIP and ALERT LEDs flashing at the same time mean control circuit voltage is too low for operation.

| Status | Description | Troubleshooting Information |
|---|---|---|
| Solid Yellow "RUN" | Module has power and operating normally | Supply voltage is present at module terminals |
| Solid Red "TRIP" | Thermostat demand signal Y is present, but the compressor is not running | 1. Compressor protector is open<br>• Check for high head pressure<br>• Check compressor supply voltage<br>2. Outdoor unit power disconnect is open<br>3. Compressor circuit breaker or fuse(s) is open<br>4. Broken wire or connector is not making contact<br>5. High pressure switch open if present in system<br>6. Compressor contactor has failed open |
| **"ALERT" Flash Codes** | | |
| Yellow "ALERT" Flash Code 1 | Long Run Time; Compressor is running extremely long run cycles indicative of low capacity due to a system low-side fault | 1. Low refrigerant charge<br>2. Evaporator blower is not running<br>• Check blower relay coil and contacts<br>• Check blower motor capacitor<br>• Check blower motor for failure or blockage<br>• Check evaporator blower wiring and connectors<br>• Check indoor blower control board<br>• Check thermostat wiring for open circuit<br>3. Evaporator coil is frozen<br>• Check for low suction pressure<br>• Check for excessively low thermostat setting<br>• Check evaporator airflow (coil blockages or return air filter)<br>• Check ductwork or registers for blockage<br>4. Faulty metering device<br>• Check TXV bulb installation (size, location and contact)<br>• Check if TXV/fixed orifice is stuck closed or defective<br>5. Liquid line restriction (filter drier blocked if present in system)<br>6. Thermostat is malfunctioning<br>• Check thermostat sub-base or wiring for short circuit<br>• Check thermostat installation (location, level) |
| Yellow "ALERT" Flash Code 2 | Compressor (Pressure) Trip; Discharge pressure out of limits or compressor overloaded | 1. Condenser fan is not running<br>• Check fan capacitor<br>• Check fan wiring and connectors<br>• Check fan motor for failure or blockage<br>2. High head pressure<br>• Check high pressure switch if present in system<br>• Check if system is overcharged with refrigerant<br>• Check for non-condensable in system<br>3. Condenser coil poor air circulation (dirty, blocked, damaged) |
| Yellow "ALERT" Flash Code 3 | Short Cycling; Compressor is running only briefly | 1. Thermostat demand signal is intermittent<br>2. Time delay relay or control board defective<br>3. Low or high pressure switch is cycling |

# SERVICING

**Diagnostics Table: Coresense™ Module**

Flash code number corresponds to the number of LED flashes, followed by a pause and then repeated. TRIP and ALERT LEDs flashing at the same time mean control circuit voltage is too low for operation.

| Status | Description | Troubleshooting Information |
|---|---|---|
| Yellow "ALERT" Flash Code 4 | Locked Rotor | 1. Run capacitor has failed<br>2. Low line voltage (contact utility if voltage at disconnect is low)<br>• Check wiring connections<br>3. Excessive liquid refrigerant in compressor<br>4. Compressor bearings are seized<br>• Measure compressor oil level |
| Yellow "ALERT" Flash Code 5 | Compressor (Moderate Run) Trip | 1. Evaporator blower is not running<br>• Check blower relay coil and contacts<br>• Check blower motor capacitor<br>• Check blower motor for failure or blockage<br>• Check evaporator blower wiring and connectors<br>• Check indoor blower control board<br>• Check thermostat wiring for open circuit<br>2. Faulty metering device<br>• Check TXV bulb installation (size, location and contact)<br>• Check if TXV/fixed orifice is stuck closed or defective<br>3. Condenser coil poor air circulation (dirty, blocked, damaged)<br>4. Low refrigerant charge |
| **"LOCK" Flash Codes** | | |
| Red "LOCK" Flash Code 2 Yellow Off | Compressor (Pressure) Trip; Compressor is locked out after 4 consecutive or 10 total compressor (pressure) trip events | 1. Condenser fan is not running<br>• Check fan capacitor<br>• Check fan wiring and connectors<br>• Check fan motor for failure or blockage<br>2. High head pressure<br>• Check high pressure switch if present in system<br>• Check if system is overcharged with refrigerant<br>• Check for non-condensable in system<br>3. Condenser coil poor air circulation (dirty, blocked, damaged) |
| Red "LOCK" Flash Code 3 Yellow Off | Short Cycling; Compressor is locked out after 10 consecutive short cycling events | 1. Thermostat demand signal is intermittent<br>2. Time delay relay or control board defective<br>3. If high pressure switch present go to Flash Code 2 information |
| Red "LOCK" Flash Code 4 Yellow Off | Locked Rotor; Compressor is locked out after 10 consecutive locked rotor events | 1. Run capacitor has failed<br>2. Low line voltage (contact utility if voltage at disconnect is low)<br>• Check wiring connections<br>3. Excessive liquid refrigerant in compressor<br>4. Compressor bearings are seized<br>• Measure compressor oil level |
| Red "LOCK" Flash Code 5 Yellow Off | Compressor (Moderate Run) Trip; Compressor is locked out after 4 consecutive or 10 total compressor (moderate run) trip events | 1. Evaporator blower is not running<br>• Check blower relay coil and contacts<br>• Check blower motor capacitor<br>• Check blower motor for failure or blockage<br>• Check evaporator blower wiring and connectors<br>• Check indoor blower control board<br>• Check thermostat wiring for open circuit<br>2. Faulty metering device<br>• Check TXV bulb installation (size, location and contact)<br>• Check if TXV/fixed orifice is stuck closed or defective<br>3. Condenser coil poor air circulation (dirty, blocked, damaged)<br>4. Low refrigerant charge |

# SERVICING

**Table 1 - Quick Reference Table**

| Alert Code | Alert Condition | Lock Level | Lock Indication |
|---|---|---|---|
| **Normal Run** Solid Yellow | Normal operation, no trip | N/A | N/A |
| **Code1** Yellow Flash 1 | Long run time. Compressor is on running for more than 18 hours. (Code1 is disabled in Heat Pump mode.) | N/A | N/A |
| **Code2** Yellow Flash 2 | Compressor (pressure) trip. Compressor runs for 12 sec to 15 min followed by a compressor trip condition lasting longer than 7 min. | 4x consecutive | Red: Flash 2 Yellow: Off |
| **Code3** Yellow Flash 3 | Pressure switch cycling. Compressor runs for 12 sec to 15 min followed by a compressor trip lasting between 35 sec to 7 min. | 4x consecutive or 10x total | Red: Flash 3 Yellow: Off |
| **Code4** Yellow Flash 4 | Locked rotor. Compressor triips within a compressor run time of 12 sec and does not start within 35 sec. | 10x consecutive | Red: Flash 4 Yellow: Off |
| **Code5** Yellow Flash 5 | Compressor (moderate run) trip. Compressor runs for 15 min to 18 hrs followed by a compressor trip lasting longer than 7 min. | 4x consecutive or 10x total | Red: Flash 5 Yellow: Off |
| **Code9** Red Flash 9 | The current to the PROT terminal is greater than 2A | Current > 2A for 40ms | Red: Flash 9 Yellow: Off |
| **Trip** Solid Red | Demand is present, but compressor is not running | N/A | N/A |

# SERVICING

### Checking Capacitor

**Capacitor, Run**

A run capacitor is wired across the auxiliary and main windings of a single phase permanent split capacitor motor. The capacitors primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings, so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor.

The line side of this capacitor is marked with “COM” and is wired to the line side of the circuit.

**Resistance Check Using A Digital Multi-Meter**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

**Check for Digital Test**

1. Set the meter on Ohm range (Set it at lease 1000 Ohm=1k).

**WARNING**

**DISCHARGE CAPACITOR THROUGH A 200 TO 300 OHM RESISTOR BEFORE HANDLING.**

2. Connect the Meter leads to the Capacitor terminals.
3. Digital meter will show a reading momentarily (Figure 1). Note the reading.

**Figure 1**

**Figure 2**

4. Reading will immediately return to the OL = (Open Line) (Figure 2). Every attempt of Step 2 will show the same result as was in step 4 and Step 5. This indicates that the capacitor is good.
5. If there is no Change, then capacitor is dead and must be replaced.

**Check for Analog Meter**

1. Good Condition - indicator swings to zero and slowly returns to infinity. (Start capacitor with bleed resistor will not return to infinity. It will still read the resistance of the resistor).
2. Shorted - indicator swings to zero and stops there - replace.
3. Open - no reading - replace. (Start capacitor would read resistor resistance.)

**Capacitance Check Using A Digital Multi-Meter (In Capacitance Mode)**

**WARNING**

**DISCHARGE CAPACITOR THROUGH A 200 TO 300 OHM RESISTOR BEFORE HANDLING.**

**NOTE: You can do this test with a multi-meter if you have a Capacitance meter on your multi-meter.**

1. Remove the capacitor from the circuit.
2. Now Select “Capacitance” on your multi-meter.
3. Now connect the capacitor terminals to the multi-meter leads.
4. If the reading is near to the actual value of the capacitor (i.e. the printed value on the capacitor). The capacitor is good. (Note that the reading may be less than the actual printed value of the capacitor).
5. If you read a significantly lower capacitance or none at all, then capacitor is dead and must be replaced.

**Capacitor, Start**
**Scroll Compressor Models**

In most cases hard start components are not required on Scroll compressor equipped units due to a non-replaceable check valve located in the discharge line of the compressor. However, in installations that encounter low lock rotor voltage, a hard start kit can improve starting characteristics and reduce light dimming within the home. Only hard start kits approved by Amana® brand or Copeland should be used. “Kick Start” and/or “Super Boost” kits are not approved start assist devices.

The discharge check valve closes off high side pressure to the compressor after shut down allowing equalization through the scroll flanks. Equalization requires only about 1/2 second.

# SERVICING

To prevent the compressor from short cycling, a Time Delay Relay (Cycle Protector) has been added to the low voltabe circuit.

**Testing a Run Capacitor Under Load**

1. Measure the amperage of the wire from Herm on the capacitor to start terminal on compressor.
2. Multiply the amperage reading by the constant of 2,652
3. Measure voltage across the capacitor between “HERM” and “C” terminals this is the measured voltage across the start and run terminals on the compressor.
4. Divide total from step 2 by the voltage measurement. This total is the capacitance. This give a more accurate measurement of the capacitor’s performance.
5. Read the rated MFD on the capacitor and compare to your actual readings. If outside of +/- tolerance stated on the capacitor, replacement of the capacitor may be recommended.

**Formula: Start Winding Amps x 2,652 ÷ capacitor voltage = microfarads.**

**Checking Outdoor Fan and Blower Motors (PSC Motors)**

The auto reset fan motor overload is designed to protect the motor against high temperature and high amperage conditions by breaking the common circuit within the motor, similar to the compressor internal overload. However, heat generated within the motor is faster to dissipate than the compressor, allow at least 45 minutes for the overload to reset, then retest.

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Remove the motor leads from its respective connection points and capacitor (if applicable).
2. Check the continuity between each of the motor leads.
3. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

If the windings do not test continuous or a reading is obtained from lead to ground, replace the motor.

**Checking Fan and Blower Motor (ECM Motors)**

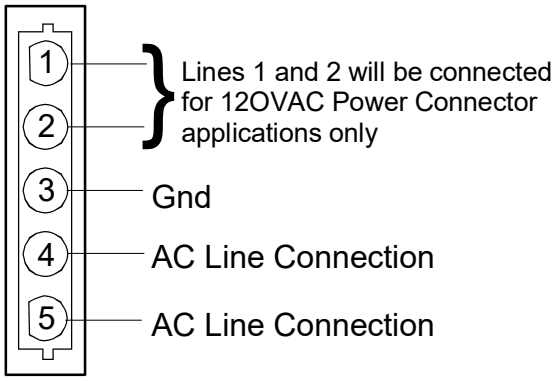
An ECM is an *Electronically Commutated Motor* which offers many significant advantages over PSC motors. The ECM has near zero rotor loss, synchronous machine operation, variable speed, low noise, and programmable air flow. Because of the sophisticated electronics within the ECM motor, some technicians are intimated by the ECM motor; however, these fears are unfounded. GE/ Regal Beloit offers two ECM motor testers, and with a VOM meter, one can easily perform basic troubleshooting on ECM motors. An ECM motor requires power (line voltage) and a signal (24 volts) to operate. The ECM motor stator contains permanent magnet. As a result, the shaft feels “rough” when turned by hand. This is a characteristic of the motor, not an indication of defective bearings.

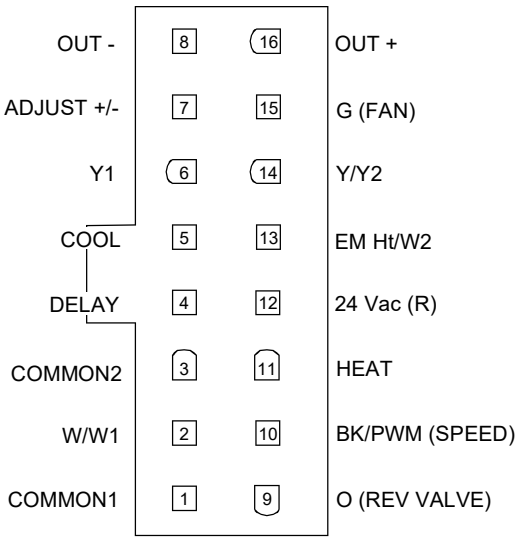
**WARNING**

**LINE VOLTAGE NOW PRESENT**

1. Disconnect the 5-pin connector from the motor.
2. Using a volt meter, check for line voltage at terminals #4 & #5 at the power connector. If no voltage is present:
3. Check the unit for incoming power.
4. Check the control board.
5. If line voltage is present, reinsert the 5-pin connector and remove the 16-pin connector.
6. Check for signal (24 volts) at the transformer.
7. Check for signal (24 volts) from the thermostat to the “G” terminal at the 16-pin connector.
8. Using an ohmmeter, check for continuity from the #1 & #3 (common pins) to the transformer neutral or “C” thermostat terminal. If you do not have continuity, the motor may function erratically. Trace the common circuits, locate and repair the open neutral.
9. Set the thermostat to “Fan-On”. Using a voltmeter, check for 24 volts between pin # 15 (G) and common.
10. Disconnect power to compressor. Set thermostat to call for cooling. Using a voltmeter, check for 24 volts at pin #6 and or #14.
11. Set the thermostat to a call for heating. Using a voltmeter, check for 24 volts at pin #2 and/or #11.

# SERVICING




16-PIN ECM HARNESS CONNECTOR

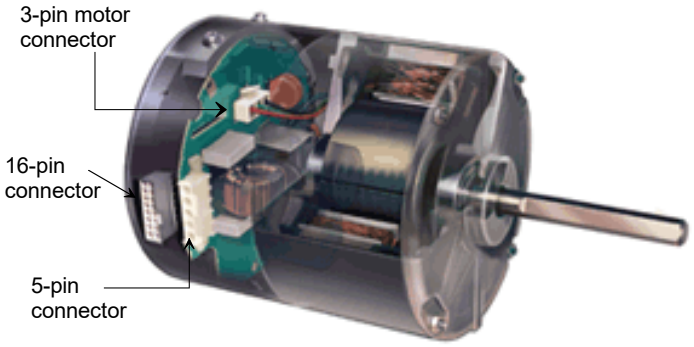
If you do not read voltage and continuity as described, the problem is in the control or interface board, but not the motor. If you register voltage as described , the ECM power head is defective and must be replaced.

**Checking ECM Motor Windings**

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Disconnect the 5-pin and the 16-pin connectors from the ECM power head.
2. Remove the 2 screws securing the ECM power head and separate it from the motor.
3. Disconnect the 3-pin motor connector from the power head and lay it aside.
4. Using an ohmmeter, check the motor windings for continuity to ground (pins to motor shell). If the ohmmeter indicates continuity to ground, the motor is defective and must be replaced.
5. Using an ohmmeter, check the windings for continuity (pin to pin). If no continuity is indicated, the thermal limit (over load) device may be open. Allow motor to cool and retest.




**ECM CFM Adjustments MBE/AEPF**

**MBE Motor**

This section references the operation characteristics of the MBE/AEPF models motor only. The ECM control board is factory set with the dipswitch #4 in the “ON” position and all other dipswitches are factory set in the “OFF” position. When MBE/AEPF are used with 2-stage cooling units, dipswitch #4 should be in the “OFF” position.

***For most applications, the settings are to be changed according to the electric heat size and the outdoor unit selection.***

The MBE/AEPF products use a GE/Regal Beloit ECMTM motor. This motor provides many features not available on the traditional PSC motor. These features include:

- Improved Efficiency
- Constant CFM
- Soft Start and Stop
- Improved Humidity Control

**MOTOR SPEED ADJUSTMENT**

Each ECM™ blower motor has been preprogrammed for operation at 4 distinct airflow levels when operating in Cooling/Heat Pump mode or Electric Heat mode. These 4 distinct levels may also be adjusted slightly lower or higher if desired. The adjustment between levels and the trim adjustments are made by changing the dipswitch(s) either to an “OFF” or “ON” position.

# SERVICING

### Dipswitch Functions

The MBE / AEPF air handler motors have an electronic control that contains an eight (8) position dip switch. The function of these dipswitches are shown in **Table 1**.

**Dipswitch Functions**

| Dipswitch Number | Function |
|---|---|
| 1 | Electric Heat |
| 2 | |
| 3 | N/A |
| 4 | Indoor Thermostat |
| 5 | Cooling & Heat Pump CFM |
| 6 | |
| 7 | CFM Trim Adjust |
| 8 | |

**Table 1**

### CFM Delivery

**Tables 2, 3, 5** and **6** show the CFM output for dipswitch combinations 1-2, and 5-6.

**Electric Heat Operation**

| Model | Switch 1 | Switch 2 | CFM |
|---|---|---|---|
| MBE1200 | OFF | OFF | 1,200 |
| | ON | OFF | 1,000 |
| | OFF | ON | 800 |
| | ON | ON | 600 |
| MBE1600 | OFF | OFF | 1,600 |
| | ON | OFF | 1,400 |
| | OFF | ON | 1,200 |
| | ON | ON | 1,000 |
| MBE2000 | OFF | OFF | 2,000 |
| | ON | OFF | 1,800 |
| | OFF | ON | 1,600 |
| | ON | ON | 1,200 |

**Table 2**

**Cooling/Heat Pump Operation**

| Model | Switch 5 | Switch 6 | CFM |
|---|---|---|---|
| MBE1200 | OFF | OFF | 1,200 |
| | ON | OFF | 1,000 |
| | OFF | ON | 800 |
| | ON | ON | 600 |
| MBE1600 | OFF | OFF | 1,600 |
| | ON | OFF | 1,400 |
| | OFF | ON | 1,200 |
| | ON | ON | 1,000 |
| MBE2000 | OFF | OFF | 2,000 |
| | ON | OFF | 1,800 |
| | OFF | ON | 1,600 |
| | ON | ON | 1,200 |

**Table 3**

### Thermostat "Fan Only" Mode

During Fan Only Operations, the CFM output is 30% of the cooling setting.

### Dipswitch Functions

The AEPF air handler motor has an electronic control that contains an eight (8) position dip switch. The function of these dipswitches are shown in **Table 9**.

| Dipswitch Number | Function |
|---|---|
| 1 | Electric Heat |
| 2 | |
| 3 | N/A |
| 4 | Indoor Thermostat |
| 5 | Cooling & Heat Pump CFM |
| 6 | |
| 7 | CFM Trim Adjust |
| 8 | |

**Table 9**

# SERVICING

**CFM Delivery**
**Tables 10-Electric Heat** and **11-Cooling/Heat Pump** show the CFM output for dipswitch combinations 1-2, and 5-6.

| Model | Switch | | Switch | | Emergecny (Electric) Heat | Heat Pump w/Backup Heat |
|---|---|---|---|---|---|---|
| | 1 | 2 | 7 | 8 | | |
| AEPF1830 | OFF | OFF | OFF | OFF | 1100 | 1210 |
| | ON | OFF | OFF | OFF | 890 | 935 |
| | OFF | ON | OFF | OFF | 700 | 770 |
| AEPF3036<br>AEPF3137<br>AEPF4260 | OFF | OFF | OFF | OFF | 2050 | 2150 |
| | ON | OFF | OFF | OFF | 1750 | 1835 |
| | OFF | ON | OFF | OFF | 1600 | 1680 |
| | ON | ON | OFF | OFF | 1200 | 1260 |
| | ON | ON | OFF | ON | 1020 | 1070 |

**Table 10**

| Model | Switch | | Switch | | Nominal Cooling Tonnage | CFM |
|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | | |
| AEPF1830 | OFF | OFF | OFF | OFF | 2 ½ | 1100 |
| | ON | OFF | OFF | OFF | 2 | 800 |
| | OFF | ON | OFF | OFF | 1 ½ | 600 |
| AEPF3036<br>AEPF3137<br>AEPF4260 | OFF | OFF | OFF | OFF | 5 | 1800 |
| | ON | OFF | OFF | OFF | 4 | 1580 |
| | OFF | ON | OFF | OFF | 3 ½ | 1480 |
| | ON | ON | OFF | OFF | 3 | 1200 |
| | ON | ON | OFF | ON | 2 ½ | 1020 |

**Table 11**

**Thermostat "Fan Only Mode"**
During "Fan Only Mode" operation, the CFM output is 30% of the cooling setting.

**CFM Trim Adjust**
Minor adjustments can be made through the dip switch combination of 7-8. The following **Table 12** shows the switch position for this feature.

| CFM | Switch 7 | Switch 8 |
|---|---|---|
| +10% | ON | OFF |
| -15% | OFF | ON |

**Humidity Control**
When using a Humidistat (normally closed), cut jumper PJ6 on the control board. The Humidistat will only affect cooling airflow by adjusting the Airflow to 85%.

## Troubleshooting Chart for GE/Regal-Beloit ECM Variable Speed Air Circulator Blower Motors

| Symptom | Fault Description(s) | Possible Causes | Corrective Action | Cautions and Notes |
|---|---|---|---|---|
| - Motor rocks slightly when starting. | - This is normal start-up for variable speed motor. | ---- | ---- | ---- |
| - Motor won't start. | - No movement. | - Manual disconnect switch off or door switch open.<br>- Blown fuse or circuit breaker.<br>- 24 Vac wires miswired.<br>- Unseated pins in wiring harness connectors.<br>- Bad motor/control module.<br>- Moisture present in motor or control module. | - Check 230 Vac power at motor.<br>- Check low voltage (24 Vac R to C) at motor.<br>- Check low voltage connections (G, Y, W, R, C) at motor.<br>- Check for unseated pins in connectors on motor harness.<br>- Test with a temporary jumper between R - G.<br>- | - Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.<br>- Handle electronic motor/control with care. |
| | - Motor rocks, but won't start. | - Loose motor mount.<br>- Blower wheel not tight on motor shaft.<br>- Bad motor/control module. | - Check for loose motor mount.<br>- Make sure blower wheel is tight on shaft.<br>- Perform motor/control replacement check, ECM motors only. | - Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.<br>- Handle electronic motor/control with care. |
| - Motor oscillates up & down while being tested off of blower. | - It is normal for motor to oscillate with no load on shaft. | ---- | ---- | ---- |
| - Motor starts, but runs erratically. | - Varies up and down or intermittent. | - Variation in 230 Vac to motor.<br>- Unseated pins in wiring harness connectors.<br>- Erratic CFM command from "BK" terminal.<br>- Improper thermostat connection or setting.<br>- Moisture present in motor/control module. | - Check line voltage for variation or "sag".<br>- Check low voltage connections (G, Y, W, R, C) at motor, unseated pins in motor harness connectors.<br>- Check-out system controls - Thermostat.<br>- Perform Moisture Check.* | - Turn power OFF prior to repair. |
| | - "Hunts" or "puffs" at high CFM (speed). | - Incorrect or dirty filter(s).<br>- Incorrect supply or return ductwork.<br>- Incorrect blower speed setting. | - Does removing panel or filter reduce "puffing"?<br>- Check/replace filter.<br>- Check/correct duct restrictions.<br>- Adjust to correct blower speed setting. | - Turn power OFF prior to repair. |

***Moisture Check**

- Connectors are oriented "down" (or as recommended by equipment manufacturer).
- Is condensate drain plugged?
- Check for undercharged condition.
- Arrange harnesses with "drip loop" under motor.
- Check for low airflow (too much latent capacity).
- Check and plug leaks in return ducts, cabinet.

**Note:** You must use the correct replacement control/motor module since they are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality. The ECM variable speed motors are c

**Important Note:** Using the wrong motor/control module voids all product warranties and may produce unexpected results.

**CHART CONTINUED ON NEXT PAGE**

CHART CONTINUED FROM PREVIOUS PAGE.

## Troubleshooting Chart for GE/Regal-Beloit ECM Variable Speed Air Circulator Blower Motors

| Symptom | Fault Description(s) | Possible Causes | Corrective Action | Cautions and Notes |
|---|---|---|---|---|
| - Motor starts, but runs erratically. | - Stays at low CFM despite system call for cool or heat CFM. | - 24 Vac wires miswired or loose.<br>- "R" missing/not connected at motor.<br>- Fan in delay mode. | - Check low voltage (Thermostat) wires and connections.<br>- Verify fan is not in delay mode - wait until delay complete.<br>- Perform motor/control replacement check, ECM motors only. | - Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.<br>- Handle electronic motor/control with care. |
| | - Stays at high CFM. | - "R" missing/not connected at motor.<br>- Fan in delay mode. | - Is fan in delay mode? - wait until delay time complete.<br>- Perform motor/control replacement check, ECM motors only. | - Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.<br>- Handle electronic motor/control with care. |
| | - Blower won't shut off. | - Current leakage from controls into G, Y, or W. | - Check for Triac switched t'stat or solid state relay. | - Turn power OFF prior to repair. |
| - Excessive noise. | - Air noise. | - High static creating high blower speed.<br>- Incorrect supply or return ductwork.<br>- Incorrect or dirty filter(s).<br>- Incorrect blower speed setting. | - Check/replace filter.<br>- Check/correct duct restrictions.<br>- Adjust to correct blower speed setting. | - Turn power OFF prior to repair. |
| | - Noisy blower or cabinet. | - Loose blower housing, panels, etc.<br>- High static creating high blower speed.<br>- Air leaks in ductwork, cabinets, or panels. | - Check for loose blower housing, panels, etc.<br>- Check for air whistling thru seams in ducts, cabinets or panels.<br>- Check for cabinet/duct deformation. | - Turn power OFF prior to repair. |
| | - "Hunts" or "puffs" at high CFM (speed). | - High static creating high blower speed.<br>- Incorrect or dirty filter(s).<br>- Incorrect supply or return ductwork.<br>- Incorrect blower speed setting. | - Does removing panel or filter reduce "puffing"?<br>- Check/replace filter.<br>- Check/correct duct restrictions.<br>- Adjust to correct blower speed setting. | - Turn power OFF prior to repair. |
| - Evidence of Moisture. | - Motor failure or malfunction has occurred and moisture is present. | - Moisture in motor/control module. | - Replace motor and perform Moisture Check.* | - Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.<br>- Handle electronic motor/control with care. |

***Moisture Check**

- Connectors are oriented "down" (or as recommended by equipment manufacturer).
- Is condensate drain plugged?
- Check for undercharged condition.
- Arrange harnesses with "drip loop" under motor.
- Check for low airflow (too much latent capacity).
- Check and plug leaks in return ducts, cabinet.

**Note:** You must use the correct replacement control/motor module since they are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality. The ECM variable speed motors are c

**Important Note:** Using the wrong motor/control module voids all product warranties and may produce unexpected results.

# SERVICING

**Blower Performance Data**

| SPEED | STATIC | MBR800**-* SCFM | MBR1200**-* SCFM | MBR1600**-* SCFM | MBR2000**-* SCFM |
|---|---|---|---|---|---|
| HIGH | 0.1 | 1,240 | 1,500 | 1,800 | 2,160 |
| | 0.2 | 1,170 | 1,460 | 1,740 | 2,080 |
| | 0.3 | 1,120 | 1,360 | 1,680 | 1,990 |
| | 0.4 | 1,060 | 1,280 | 1,610 | 1,890 |
| | 0.5 | 980 | 1,200 | 1,520 | 1,790 |
| | 0.6 | 900 | 1,110 | 1,430 | 1,690 |
| MEDIUM | 0.1 | 900 | 1,380 | 1,540 | 1,730 |
| | 0.2 | 850 | 1,320 | 1,490 | 1,670 |
| | 0.3 | 790 | 1,270 | 1,450 | 1,590 |
| | 0.4 | 740 | 1,200 | 1,400 | 1,520 |
| | 0.5 | 680 | 1,140 | 13,560 | 1,420 |
| | 0.6 | 605 | 1,040 | 1,280 | 1,320 |
| LOW | 0.1 | 650 | 1,170 | 1,130 | 1,520 |
| | 0.2 | 590 | 1,130 | 1,100 | 1,450 |
| | 0.3 | 540 | 1,080 | 1,070 | 1,360 |
| | 0.4 | 500 | 1,020 | 1,030 | 1,290 |
| | 0.5 | 430 | 950 | 990 | 1,200 |
| | 0.6 | 330 | 830 | 930 | 1,090 |

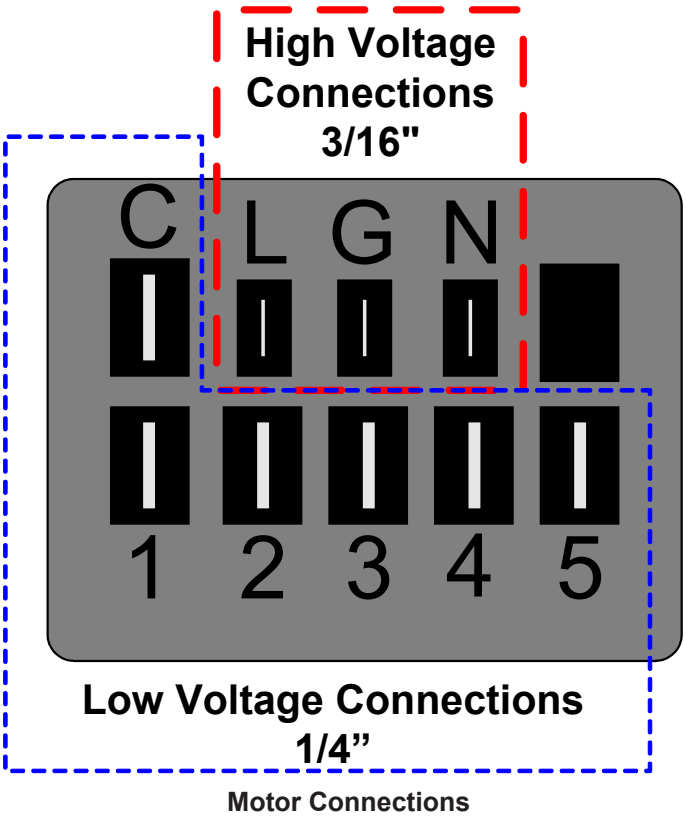
**NOTE: External static is for blower @ 230 Volts. It does not include Coil, Air Filter or Electric Heaters.**

**Checking High Efficiency Motors**

The motor is a one piece, fully encapsulated, 3 phase brushless DC (single phase AC input) motor with ball bearing construction.

1. Using a voltmeter, check for 230 volts to the motor connections L and N. If 230 volts is present, proceed to step 2. If 230 volts is not present, check the line voltage circuit to the motor.
2. Using a voltmeter, check for 24 volts from terminal C to either terminal 1, 2, 3, 4, or 5, depending on which tap is being used, at the motor. If voltage present, proceed tostep 3. If no voltage, check 24 volt circuit to motor.
3. If voltage was present in steps 1 and 2, the motor has failed and will need to be replaced.

**NOTE: When replacing motor, ensure the belly band is between the vents on the motor and the wiring has the proper drip loop to prevent condensate from entering the motor.**

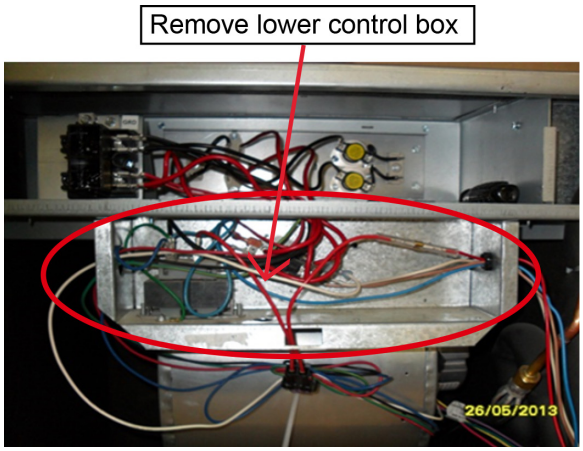


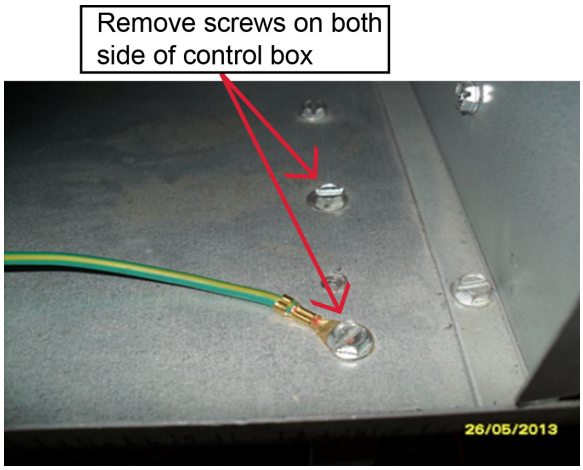

Motor Connections

# SERVICING

**EEM Blower Replacement**
*For AWUF19-25, AWUF31-32, and AWUF37 Air Handlers.*

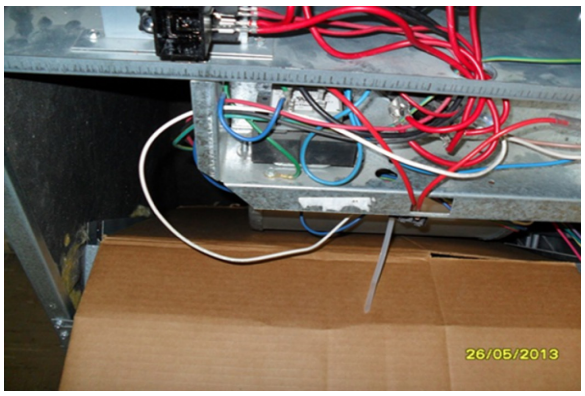
1. Disconnect power at main electrical panel.
2. Remove front access panel.
3. Remove the two screws on each side holding the lower control box and move out of the way to give access to the blower assembly



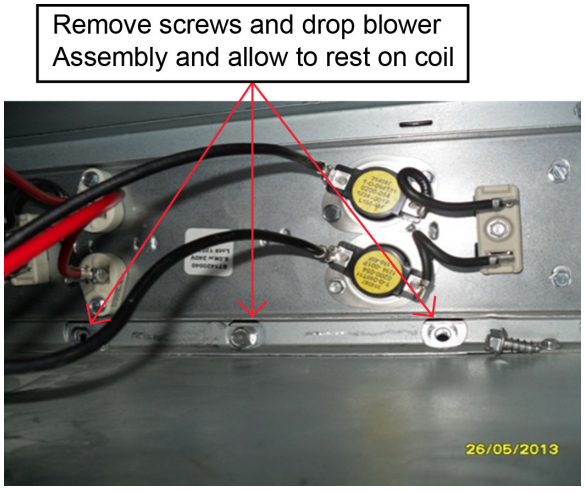




4. Loosen or remove set screw on blower wheel hub and ensure the wheel slides freely on the shaft of the motor.

5. Install cardboard or rug over coil to protect fins from damage.

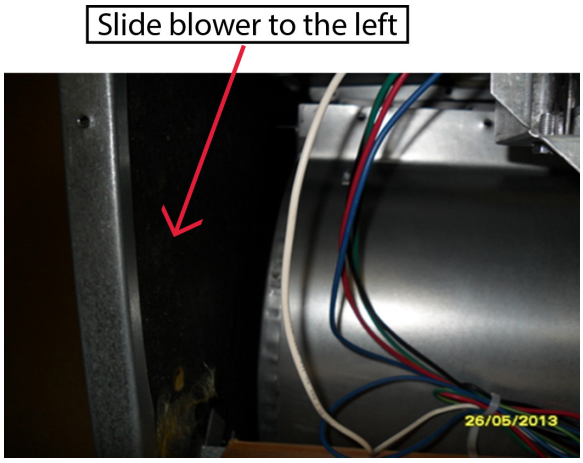



6. Remove the three 3/8” screws holding the blower in place.

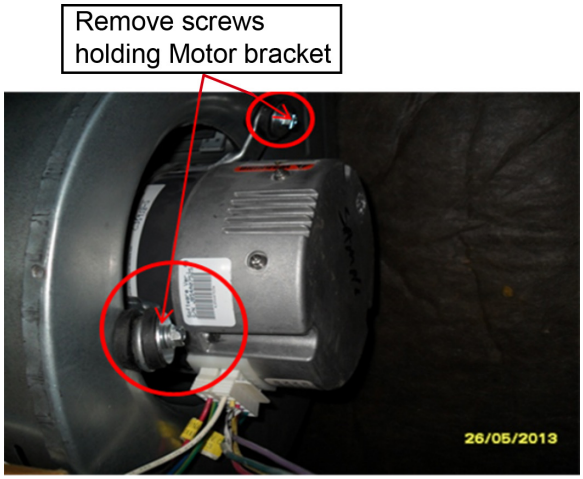



7. Lower blower onto coil.
8. Slide blower assembly all the way to the left side of cabinet.

# SERVICING




9. Remove the bolts holding the motor bracket to the blower and slide out of blower shell.




10. Replace the motor and reinstall blower and control box.
11. Reconnect power and test operation.

**MBR/AR*F Electronic Blower Time Delay Relay**
The MBR/AR*F contains an Electronic Blower Time Delay Relay board, B1370735. This board provides on/off time delays for the blower motor in cooling and heat pump heating demands when “G” is energized.

During a cooling or heat pump heating demand, 24Vac is supplied to terminal “G” of the EBTDR to turn on the blower motor. The EBTDR initiates a 7 second delay on and then energizes it’s onboard relay. The relay on the EBTDR board closes it’s normally open contacts and supplies power to the blower motor. When the “G” input is removed, the EBTDR initiates a 65 second delay off. When the 65 seconds delay expires the onboard relay is de-energized and it’s contacts open and remove power from the blower motor.

During an electric heat only demand, “W1” is energized but “G” is not. The blower motor is connected to the normally closed contacts of the relay on the EBTDR board. The other side of this set of contacts is connected to the heat sequencer on the heater assembly that provides power to the first heater element. When “W1” is energized, the sequencer will close it’s contacts within 10 to 20 seconds to supply power to the first heater element and to the blower motor through the normally closed contacts on the relay on the EBTDR. When the “W1” demand is removed, the sequencer opens it contacts within 30 to 70 seconds and removes power from the heater element and the blower motor.

The EBTDR also contains a speedup terminal to reduce the delays during troubleshooting of the unit. When this terminal is shorted to the common terminal, “C”, on the EBTDR board, the delay ON time is reduced to 3 seconds and the delay OFF time is reduced to 5 second.
Two additional terminals, M1 and M2, are on the EBTDR board. These terminals are used to connect the unused leads from the blower motor and have no affect on the board’s operation.

**Checking Compressor**

**WARNING**

**HERMETIC COMPRESSOR ELECTRICAL TERMINAL VENTING CAN BE DANGEROUS. WHEN INSULATING MATERIAL WHICH SUPPORTS A HERMETIC COMPRESSOR OR ELECTRICAL TERMINAL SUDDENLY DISINTEGRATES DUE TO PHYSICAL ABUSE OR AS A RESULT OF AN ELECTRICAL SHORT BETWEEN THE TERMINAL AND THE COMPRESSOR HOUSING, THE TERMINAL MAY BE EXPELLED, VENTING THE VAPOR AND LIQUID CONTENTS OF THE COMPRESSOR HOUSING AND SYSTEM.**

If the compressor terminal PROTECTIVE COVER and gasket (if required) are not properly in place and secured, there is a remote possibility if a terminal vents, that the vaporous and liquid discharge can be ignited, spouting flames several feet, causing potentially severe or fatal injury to anyone in its path.

This discharge can be ignited external to the compressor if the terminal cover is not properly in place and if the discharge impinges on a sufficient heat source.

Ignition of the discharge can also occur at the venting terminal or inside the compressor, if there is sufficient contaminant air present in the system and an electrical arc occurs as the terminal vents.

# SERVICING

Ignition cannot occur at the venting terminal without the presence of contaminant air, and cannot occur externally from the venting terminal without the presence of an external ignition source.

Therefore, proper evacuation of a hermetic system is essential at the time of manufacture and during servicing.

To reduce the possibility of external ignition, all open flame, electrical power, and other heat sources should be extinguished or turned off prior to servicing a system.

**Resistance Test**
Each compressor is equipped with an internal overload.

The line break internal overload senses both motor amperage and winding temperature. High motor temperature or amperage heats the disc causing it to open, breaking the common circuit within the compressor on single phase units.

Heat generated within the compressor shell, usually due to recycling of the motor, high amperage or insufficient gas to cool the motor, is slow to dissipate. Allow at least three to four hours for it to cool and reset, then retest.

Fuse, circuit breaker, ground fault protective device, etc. has not tripped -

**WARNING**

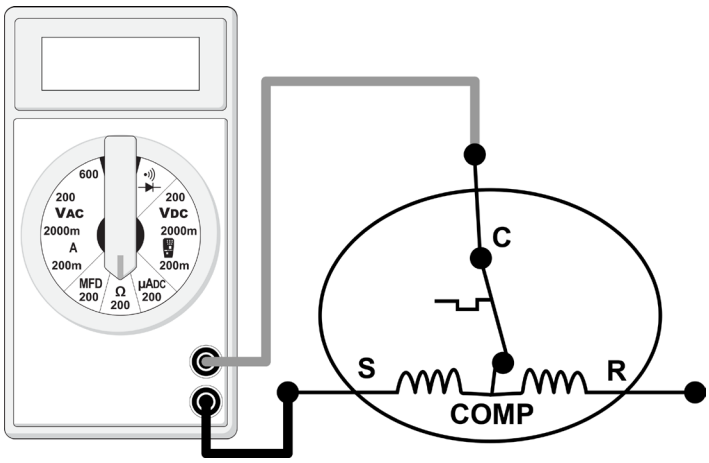
**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Remove the leads from the compressor terminals.

**WARNING**

**HERMETIC COMPRESSOR ELECTRICAL TERMINAL VENTING CAN BE DANGEROUS. WHEN INSULATING MATERIAL WHICH SUPPORTS A HERMETIC COMPRESSOR OR ELECTRICAL TERMINAL SUDDENLY DISINTEGRATES DUE TO PHYSICAL ABUSE OR AS A RESULT OF AN ELECTRICAL SHORT BETWEEN THE TERMINAL AND THE COMPRESSOR HOUSING, THE TERMINAL MAY BE EXPELLED, VENTING THE VAPOR AND LIQUID CONTENTS OF THE COMPRESSOR HOUSING AND SYSTEM.**

2. Using an ohmmeter, test continuity between terminals S-R, C-R, and C-S, on single phase units or terminals T2, T2 and T3, on 3 phase units.




**Testing Compressor Windings**

If either winding does not test continuous, replace the compressor.

**NOTE: If an open compressor is indicated, allow ample time for the internal overload to reset before replacing compressor.**

**Ground Test**
If fuse, circuit breaker, ground fault protective device, etc., has tripped, this is a strong indication that an electrical problem exists and must be found and corrected. The circuit protective device rating must be checked, and its maximum rating should coincide with that marked on the equipment nameplate.

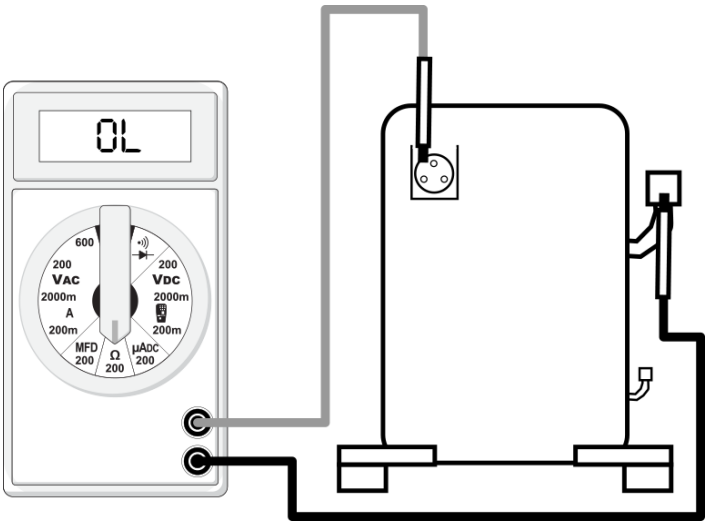
With the terminal protective cover in place, it is acceptable to replace the fuse or reset the circuit breaker ONE TIME ONLY to see if it was just a nuisance opening. If it opens again, DO NOT continue to reset.

**Disconnect all power to unit**, making sure that **all** power legs are open.

1. DO NOT remove protective terminal cover. Disconnect the three leads going to the compressor terminals at the nearest point to the compressor.
2. Identify the leads and using an ohmmeter on the R x 10,000 scale or the highest resistance scale on your ohmmeter check the resistance between each of the three leads separately to ground (such as an unpainted tube on the compressor).
3. If a ground is indicated, then carefully remove the compressor terminal protective cover and inspect for loose leads or insulation breaks in the lead wires.
4. If no visual problems indicated, carefully remove the leads at the compressor terminals.
5. Carefully retest for ground, directly between compressor terminals and ground.

# SERVICING

6. If ground is indicated, replace the compressor. The resistance reading should be infinity. If there is any reading on meter, there is some continuity to ground and compressor should be considered defective.




**Compressor Ground Test**

**WARNING**

**DAMAGE CAN OCCUR TO THE GLASS EMBEDDED TERMINALS IF THE LEADS ARE NOT PROPERLY REMOVED. THIS CAN RESULT IN TERMINAL AND HOT OIL DISCHARGING.**

**Unloader Test Procedure**
**(2 Stage Compressors Only)**

A nominal 24-volt direct current coil activates the compressor internal unloader solenoid. The input control circuit voltage must be 18 to 28 volt ac. (remove) The coil power requirement is 5 VA. The external electrical connection is made with a molded plug assembly. This plug contains a full wave rectifier to supply direct current to the unloader coil. The measured DC voltage at the connectors in the plug should be 15 to 27 volt dc.

**Unloader Test Procedure**

If it is suspected that the unloader is not working, the following methods may be used to verify operation.

1. Operate the system and measure compressor amperage. Cycle the unloader ON and OFF at 10 second intervals. The compressor amperage should increase when switching from part-load to full-load and decrease when switching from full-load to part-load. The percent change depends on the operating conditions and voltage, but should be at least 25 percent.
2. If step one does not give the expected results, shut unit off. Apply 18 to 28 volt ac to the unloader molded plug leads and listen for a click as the solenoid pulls in. Remove power and listen for another click as the unloader returns to its original position.
3. If clicks can't be heard, shut off power to the unit and remove the control circuit molded plug from the compressor and measure the unloader coil resistance (connections on the compressor). The solenoid coil should have continuity and not be grounded or have infinite resistance. If the coil resistance is infinite, zero, or grounded, the compressor must be replaced.
4. Next check the molded plug.
   a. Voltage check: Apply control voltage to the plug wires (18 to 28 volt ac). The measured dc voltage at the female connectors in the plug should be around 15 to 27 vdc.
   b. Resistance check: Measure the resistance from the end of one molded plug lead to either of the two female connectors in the plug. One of the connectors should read close to zero ohms while the other should read infinity. Repeat with other wire. The same female connector as before should read zero while the other connector again reads infinity. Reverse polarity on the ohmmeter leads and repeat. The female connector that read infinity previously should now read close to zero ohms.

Replace plug if either of these test methods doesn't show the desired results.

**Operation Test**

If the voltage, capacitor, overload and motor winding test fail to show the cause for failure:

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Remove unit wiring from disconnect switch and wire a test cord to the disconnect switch.

**NOTE: The wire size of the test cord must equal the line wire size and the fuse must be of the proper size and type.**

2. With the protective terminal cover in place, use the three leads to the compressor terminals that were disconnected at the nearest point to the compressor and connect the common, start and run clips to the respective leads.
3. Connect good capacitors of the right MFD and voltage rating into the circuit as shown.
4. With power ON, close the switch.

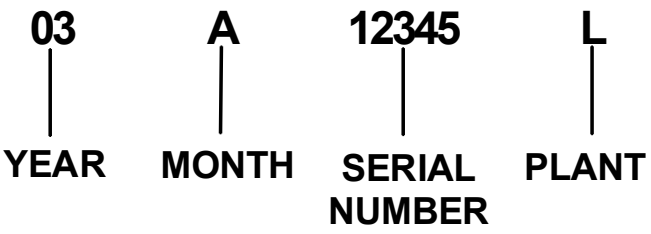
# SERVICING

**WARNING**

**LINE VOLTAGE NOW PRESENT**

- If the compressor starts and continues to run, the cause for failure is somewhere else in the system.
- If the compressor fails to start - replace.

## COPELAND COMPRESSOR




**Checking 3-Phase Scroll Compressor Rotation**
Verify the proper rotation of Copeland scroll compressors as follows:

**NOTE: The compressor may run backwards (noisy operation) for 1 or 2 seconds at shutdown. This is normal and does not harm the compressor.**

1. Install gauges and verify that the suction pressure drops while the discharge pressure increases.
2. Listen for normal compressor sound levels. Reverse rotation results in elevated or unusual sound levels.
3. Reverse rotation will result in substantially reduced amp draw from tabulated values.

To correct improper rotation, switch any two power supply leads at the outdoor unit contactor.

The 3-phase scroll compressors are direction of rotation sensitive. They will rotate in either direction depending on the phasing of the power. There is no negative impact on durability caused by operating 3-phase compressors in reversed rotation. The compressor's internal protector will trip, de-energizing the compressor. Continued operation of 3-phase scroll compressors with the rotation reversed will contribute to compressor failure. All 3-phase scroll compressors should be checked for correct phase rotation.

**Testing Crankcase Heater (Optional Item)**
*The crankcase heater must be energized a minimum of four (4) hours before the condensing unit is operated.*
Crankcase heaters are used to prevent migration or accumulation of refrigerant in the compressor crankcase during the off cycles and prevents liquid slugging or oil pumping on start up.

*A crankcase heater will not prevent compressor damage due to a floodback or over charge condition.*

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Disconnect the heater lead in wires.
2. Using an ohmmeter, check heater continuity - should test continuous. If not, replace.

**NOTE: The positive temperature coefficient crankcase heater is a 40 watt 265 voltage heater. The cool resistance of the heater will be approximately 1800 ohms. The resistance will become greater as the temperature of the compressor shell increases.**

**Checking Reversing Valve and Solenoid**
Reversing valve used in heat pumps could potentially leak internally. Discharge gases can leak into the suction inside the valve. Compound gages will give the same symptoms as bad compressor valves or broken scroll flanks. The temperature between true suction and the suction line after the valve should not be greater than 4 degrees. Note: The center tube is always the suction line and should be cold.

**Troubleshooting the Reversing Valve for Electrical Failure**
1. Place unit into the cooling mode. Test for 24 volts at the solenoid. If there is no voltage present at coil, check the control voltage.
2. If voltage is present, loosen the nut on the top of the coil. Remove the coil, there should be slight resistance.
3. If the slight resistance is felt, remove the coil. As you remove the coil listen carefully, an audible click should be detected. The clicking is due to the movement of the pilot valve plunger. The absence of a clicking sound indicates the plunger is stuck.

**Troubleshooting Mechanical Failures on a Reversing Valve by Pressure**
1. Troubleshooting the reversing valve can be done by pressure and touch.
2. Raise the head pressure. In the cooling mode block the fan exhaust. Once head pressure has been raised, cycle between cooling and heating and see if the piston can be freed.

# SERVICING

**Trouble Shooting Mechanical Failures on a Reversing Valve by Temperature**

1. When operating properly the valve contains refrigerant gases at certain temperatures.
2. The discharge line should be the same temperature after the valves discharge line.
3. The true suction should be the same as the suction line after the valve. If there is a 4-degree difference, valve is leaking

When stuck in the mid-position, part of the discharge gas from the compressor is directed back to the suction side, resulting in excessively high suction pressure. An increase in the suction line temperature through the reversing valve can also be measured. Check operation of the valve by starting the system and switching the operation from COOLING to HEATING cycle.

If the valve fails to change its position, test the voltage (24V) at the valve coil terminals, while the system is on the COOLING cycle.

***All heat pumps and communicating heat pumps wired in legacy*** - If no voltage is registered at the coil terminals, check the operation of the thermostat and the continuity of the connecting wiring from the “O” terminal of the thermostat to the unit.

***Communicating heat pumps only*** - Check voltage (24VAC) at the non-insulated terminal E22 on the UC control board (RVS on silkscreen) and “C” terminal on the 7-pin or 4-pin connector on the UC control

If voltage is registered at the coil, tap the valve body lightly while switching the system from HEATING to COOLING, etc. If this fails to cause the valve to switch positions, remove the coil connector cap and test the continuity of the reversing valve solenoid coil. If the coil does not test continuous - replace it.

If the coil test continuous and 24 volts is present at the coil terminals, the valve is inoperative - replace it.

**Testing Defrost Control**

To check the defrost control for proper sequencing, proceed as follows: With power ON; unit not running.

1. Jumper defrost thermostat by placing a jumper wire across the terminals “DFT” and “R”/”R-DFT” at defrost control board.
2. Remove jumper from timer pins and jump across test pins on defrost control board. Note: Do not use screwdriver or field supplied jumper to test the control.
3. Set thermostat to call for heating. System should go into defrost within 21 seconds
4. Immediately remove jumper from test pins.
5. Using VOM check for voltage across terminals “C & O”. Meter should read 24 volts.
6. Using VOM check for voltage across fan terminals DF1 and DF2 on the board. You should read line voltage (208-230 VAC) indicating the relay is open in the defrost mode.
7. Using VOM check for voltage across “W”/”W2” & “C” terminals on the board. You should read 24 volts.
8. If not as above, replace control board.
9. Set thermostat to off position and disconnect power. Remove jumper from defrost thermostat and replace timer jumper to the desired defrost time.

**NOTE: Remove jumper across defrost thermostat before returning system to service.**

**Testing Defrost Thermostat**

1. Install a thermocouple type temperature test lead on the tube adjacent to the defrost control. Insulate the lead point of contact.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. Part # 0130M00009P which is used on 2 and 2.5 ton units should close at 34°F ± 5°F. Part # 0130M00001P or B1370803 which is used on 3 thru 5 ton units should close at 31°F ± 3°F.
3. Check the temperature at which the control closes its contacts by lowering the temperature of the control. Part # 0130M00085, which is used onunits with 5 mm coils, should close at 30°F ± 5°F.
4. Check the temperature at which the control opens its contacts by raising the temperature of the control. Part #0130M00009P which is used on 2 and 2.5 ton units should open at 60°F ± 5°F. Part # 0130M00001P or B1370803 which is used on 3 thru 5 ton units should open at 75°F ± 6°F.
5. Check the temperature at which the control opens its contacts by raising the temperature of the control. Part # 0130M00085, which is used on units with 5 mm coils, should open at 60°F ± 5°F.
6. If not as above, replace control.

**Checking Heater Limit Control(s)**
**(Optional Electric Heaters)**

Each individual heater element is protected with an automatic rest limit control connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F. to 160°F and close at approximately 110°F.

# SERVICING

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Remove the wiring from the control terminals.
2. Using an ohmmeter test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary. Make sure the limits are cool before testing.

**If Found Open - Replace - Do Not Wire Around.**

**Checking Heater Elements**
Optional electric heaters may be added, in the quantities shown in the spec sheet for each model unit, to provide electric resistance heating. Under no condition shall more heaters than the quantity shown be installed.

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Disassemble and remove the heating element(s).
2. Visually inspect the heater assembly for any breaks in the wire or broken insulators.
3. Using an ohmmeter, test the element for continuity - no reading indicates the element is open. Replace as necessary.

**Electric Heater (Optional Item)**
Optional electric heaters may be added, in the quantities shown in the specifications section, to provide electric resistance heating. Under no condition shall more heaters than the quantity shown be installed.

The low voltage circuit in the air handler is factory wired and terminates at the location provided for the electric heater(s). A minimum of field wiring is required to complete the installation.

Other components such as a Heating/Cooling Thermostat and Outdoor Thermostats are available to complete the installation.

The system CFM can be determined by measuring the static pressure external to the unit. The installation manual supplied with the blower coil, or the blower performance table in the service manual, shows the CFM for the static measured.

Alternately, the system CFM can be determined by operating the electric heaters and indoor blower WITHOUT having the compressor in operation. Measure the temperature rise as close to the blower inlet and outlet as possible.

If other than a 240V power supply is used, refer to the **BTUH CAPACITY CORRECTION FACTOR** chart below.

| BTUH CAPACITY CORRECTION FACTOR | | | | |
|---|---|---|---|---|
| SUPPLY VOLTAGE | 250 | 230 | 220 | 208 |
| MULTIPLICATION FACTOR | 1.08 | .92 | .84 | .75 |

**EXAMPLE:** Five (5) heaters provide 24.0 KW at the rated 240V. Our actual measured voltage is 220V, and our measured temperature rise is 42°F. Find the actual CFM:

**Answer:** 24.0KW, 42°F Rise, 240 V = 1800 CFM from the **TEMPERATURE RISE** chart on the right.

Heating output at 220 V = 24.0KW x 3.413 x .84 = 68.8 MBH.
Actual CFM = 1800 x .84 Corr. Factor = 1400 CFM.

**NOTE: The temperature rise table is for sea level installations. The temperature rise at a particular KW and CFM will be greater at high altitudes, while the external static pressure at a particular CFM will be less.**

| TEMPERATURE RISE (°F) @ 240V | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CFM | 3.0 kW | 4.8 kW | 7.2 kW | 9.6 kW | 14.4 kW | 19.2 kW | 24.0 kW | 28.8 kW |
| 600 | 16 | 25 | 38 | 51 | - | - | - | - |
| 700 | 14 | 22 | 33 | 43 | - | - | - | - |
| 800 | 12 | 19 | 29 | 38 | 57 | - | - | - |
| 900 | 11 | 17 | 26 | 34 | 51 | - | - | - |
| 1000 | 10 | 15 | 23 | 30 | 46 | - | - | - |
| 1100 | 9 | 14 | 21 | 27 | 41 | 55 | - | - |
| 1200 | 8 | 13 | 19 | 25 | 38 | 50 | - | - |
| 1300 | 7 | 12 | 18 | 23 | 35 | 46 | - | - |
| 1400 | 7 | 11 | 16 | 22 | 32 | 43 | 54 | 65 |
| 1500 | 6 | 10 | 15 | 20 | 30 | 40 | 50 | 60 |
| 1600 | 6 | 9 | 14 | 19 | 28 | 38 | 47 | 57 |
| 1700 | 6 | 9 | 14 | 18 | 27 | 36 | 44 | 53 |
| 1800 | 5 | 8 | 13 | 17 | 25 | 34 | 42 | 50 |
| 1900 | 5 | 8 | 12 | 16 | 24 | 32 | 40 | 48 |
| 2000 | 5 | 8 | 12 | 15 | 23 | 30 | 38 | 45 |
| 2100 | 5 | 7 | 11 | 14 | 22 | 29 | 36 | 43 |
| 2200 | 4 | 7 | 11 | 14 | 21 | 27 | 34 | 41 |
| 2300 | 4 | 7 | 10 | 13 | 20 | 26 | 33 | 39 |

# SERVICING

| ELECTRIC HEATER CAPACITY BTUH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HTR KW | 3.0 KW | 4.7 KW | 6.0 KW | 7.0 KW | 9.5 KW | 14.2 KW | 19.5 KW | 21.0 KW |
| BTUH | 10200 | 16200 | 20400 | 23800 | 32400 | 48600 | 66500 | 71600 |

**FORMULAS:**
Heating Output = KW x 3413 x Corr. Factor

Actual CFM = CFM (from table) x Corr. Factor

BTUH = KW x 3413

BTUH = CFM x 1.08 x Temperature Rise (T)

$$CFM = \frac{KW \times 3413}{1.08 \times T}$$

$$T = \frac{BTUH}{CFM \times 1.08}$$

**Checking Heater Limit Control(s)**
Each individual heater element is protected with a limit control device connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F.

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Remove the wiring from the control terminals.
2. Using an ohmmeter, test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary.

**If Found Open - Replace - Do Not Wire Around.**

**Checking Heater Fuse Link**
**(Optional Electric Heaters)**
Each individual heater element is protected with a one time fuse link which is connected in series with the element. The fuse link will open at approximately 333°.

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Remove heater element assembly so as to expose fuse link.
2. Using an ohmmeter, test across the fuse link for continuity - no reading indicates the link is open. Replace as necessary.

**NOTE: The link is designed to open at approximately 333°F. DO NOT WIRE AROUND - determine reason for failure.**

**Checking Heater Elements**

**WARNING**

**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Disassemble and remove the heating element.
2. Visually inspect the heater assembly for any breaks in the wire or broken insulators.
3. Using an ohmmeter, test the element for continuity - no reading indicates the element is open. Replace as necessary.

**Refrigeration Repair Practice**

**DANGER**

**ALWAYS REMOVE THE REFRIGERANT CHARGE IN A PROPER MANNER BEFORE APPLYING HEAT TO THE SYSTEM.**

When repairing the refrigeration system:

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

1. Never open a system that is under vacuum. Air and moisture will be drawn in.
2. Plug or cap all openings.
3. Remove all burrs and clean the brazing surfaces of the tubing with sand cloth or paper. Brazing materials do not flow well on oxidized or oily surfaces.
4. Clean the inside of all new tubing to remove oils and pipe

chips.

5. When brazing, sweep the tubing with dry nitrogen to prevent the formation of oxides on the inside surfaces.
6. Complete any repair by replacing the liquid line drier in the system, evacuate and charge.

**Brazing Materials**

**IMPORTANT NOTE: Torch heat required to braze tubes of various sizes is proportional to the size of the tube. Tubes of smaller size require less heat to bring the tube to brazing temperature before adding brazing alloy. Applying too much heat to any tube can melt the tube. Service personnel must use the appropriate heat level for the size of the tube being brazed.**

**NOTE: The use of a heat shield when brazing is recommended to avoid burning the serial plate or the finish on the unit. Heat trap or wet rags should be used to protect heat sensitive components such as service valves and TXV valves.**

**Copper to Copper Joints** - Sil-Fos used without flux (alloy of 15% silver, 80% copper, and 5% phosphorous). Recommended heat 1400°F.

**Copper to Steel Joints** - Silver Solder used without a flux (alloy of 30% silver, 38% copper, 32% zinc). Recommended heat - 1200°F.

**Standing Pressure Test (Recommended before System Evacuation)**

**WARNING**

**TO AVOID THE RISK OF FIRE OR EXPLOSION, NEVER USE OXYGEN, HIGH PRESSURE AIR OR FLAMMABLE GASES FOR LEAK TESTING OF A REFRIGERATION SYSTEM.**

**WARNING**

**TO AVOID POSSIBLE EXPLOSION, THE LINE FROM THE NITROGEN CYLINDER MUST INCLUDE A PRESSURE REGULATOR AND A PRESSURE RELIEF VALVE. THE PRESSURE RELIEF VALVE MUST BE SET TO OPEN AT NO MORE THAN 450 PSIG.**

Using dry nitrogen, pressurize the system to 450 PSIG. Allow the pressure to stabilize and hold for 15 minutes (minimum). If the pressure does not drop below 450 PSIG the system is considered leak free. Proceed to system evacuation using the Deep Vacuum Method. If after 15 minutes the pressure drops below 450 PSIG follow the procedure outlined below to identify system leaks. Repeat the Standing Pressure Test.

**Leak Testing (Nitrogen or Nitrogen-Traced)**

**WARNING**

**TO AVOID THE RISK OF FIRE OR EXPLOSION, NEVER USE OXYGEN, HIGH PRESSURE AIR OR FLAMMABLE GASES FOR LEAK TESTING OF A REFRIGERATION SYSTEM.**

**WARNING**

**TO AVOID POSSIBLE EXPLOSION, THE LINE FROM THE NITROGEN CYLINDER MUST INCLUDE A PRESSURE REGULATOR AND A PRESSURE RELIEF VALVE. THE PRESSURE RELIEF VALVE MUST BE SET TO OPEN AT NO MORE THAN 450 PSIG.**

Leak test the system using dry nitrogen and soapy water to identify leaks. If you prefer to use an electronic leak detector, charge the system to **10 PSIG** with the appropriate system refrigerant (see Serial Data Plate for refrigerant identification). Do not use an alternative refrigerant. Using dry nitrogen finish charging the system to **450 PSIG**. Apply the leak detector to all suspect areas. When leaks are discovered, repair the leaks, and repeat the pressure test. If leaks have been eliminated proceed to system evacuation.

**System Evacuation**

Condensing unit liquid and suction valves are closed to contain the charge within the unit. The unit is shipped with the valve stems closed and caps installed. Do not open valves until the system is evacuated.

**WARNING**

**REFRIGERANT UNDER PRESSURE!**

**FAILURE TO FOLLOW PROPER PROCEDURES MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

**NOTE: Scroll compressors should never be used to evacuate or pump down a heat pump or air conditioning system.**

**CAUTION**

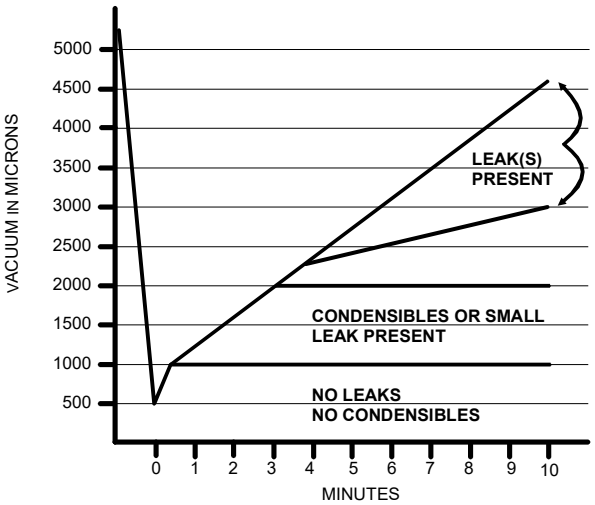
**PROLONGED OPERATION AT SUCTION PRESSURES LESS THAN 20 PSIG FOR MORE THAN 5 SECONDS WILL RESULT IN OVERHEATING OF THE SCROLLS AND PERMANENT DAMAGE TO THE SCROLL TIPS, DRIVE BEARINGS AND INTERNAL SEAL.**

# SERVICING

**Deep Vacuum Method (Recommended)**
The Deep Vacuum Method requires a vacuum pump rated for 500 microns or less. This method is an effective and efficient way of assuring the system is free of non-condensable air and moisture. As an alternative, the Triple Evacuation Method is detailed in the Service Manual for this product model.

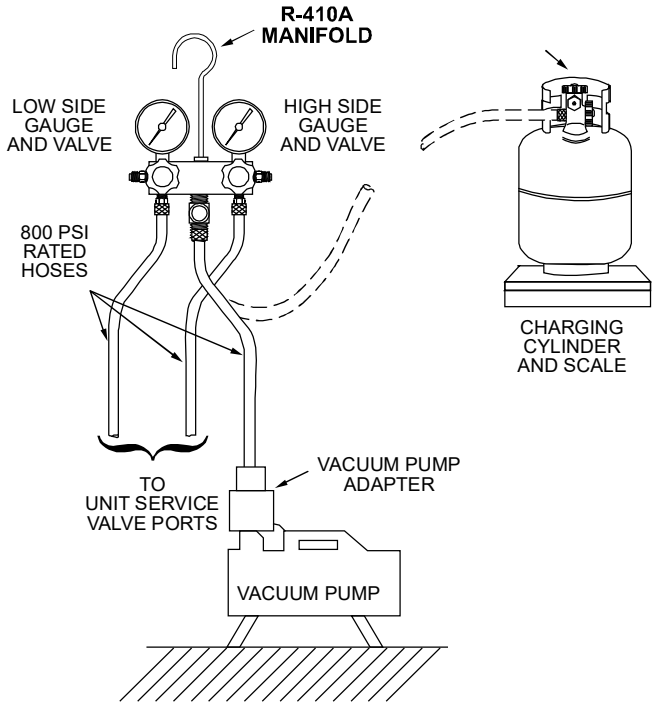
It is recommended to remove the Schrader Cores from the service valves using a core-removal tool to expedite the evacuation procedure.

1. Connect the vacuum pump, micron gauge, and vacuum rated hoses to both service valves. Evacuation must use both service valves to eliminate system mechanical seals.
2. Evacuate the system to 500 microns or less using suction and liquid service valves. Using both valves is necessary as some compressors create a mechanical seal separating the sides of the system.
3. Close pump valve and hold vacuum for 10 minutes. Typically, pressure will rise during this period. If the pressure rises to 1000 microns or less and remains steady the system is considered leak-free; proceed to startup.
4. If pressure rises above 1000 microns but holds steady below 2000 microns, moisture and/or non-condensable may be present or the system may have a small leak. Return to step 2: If the same result is encountered check for leaks as previously indicated and repair as necessary then repeat evacuation.
5. If pressure rises above 2000 microns, a leak is present. Check for leaks as previously indicated and repair as necessary then repeat evacuation.




**Triple Evacuation Method (Alternate)**

1. Evacuate the system to 4000 microns and hold for 15 minutes. Break the vacuum with dry nitrogen, bring the system pressure to 2-3 PSIG, and hold for 20 minutes. Release the nitrogen,
2. Evacuate to 1500 microns and hold for 20 minutes. Break the vacuum with dry nitrogen again, bring the system pressure back to 2-3 PSIG, and hold for 20 minutes
3. Evacuate the system to 500 microns and hold for 60 minutes.
4. If the pressure rises to 1000 microns or less and remains steady the system is considered leak free; proceed to start-up.




**Charging**

**WARNING**

**REFRIGERANT UNDER PRESSURE!**

- **DO NOT OVERCHARGE SYSTEM WITH REFRIGERANT.**
- **DO NOT OPERATE UNIT IN A VACUUM OR AT NEGATIVE PRESSURE.**

**FAILURE TO FOLLOW PROPER PROCEDURES MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

**CAUTION**

**USE REFRIGERANT CERTIFIED TO AHRI STANDARDS. USED REFRIGERANT MAY CAUSE COMPRESSOR DAMAGE AND IS NOT COVERED UNDER THE WARRANTY. MOST PORTABLE MACHINES CANNOT CLEAN USED REFRIGERANT TO MEET AHRI STANDARDS.**

**CAUTION**

**DAMAGE TO THE UNIT CAUSED BY OPERATING THE COMPRESSOR WITH THE SUCTION VALVE CLOSED IS NOT COVERED UNDER THE WARRANTY AND MAY CAUSE SERIOUS COMPRESSOR DAMAGE.**

Charge the system with the exact amount of refrigerant. Refer to the specification section or check the unit nameplates for the correct refrigerant charge. An inaccurately charged system will cause future problems.

# SERVICING

**NOTE: R410A should be drawn out of the storage container or drum in liquid form due to its fractionation properties, but should be "Flashed" to its gas state before entering the system. There is commercially available restriction devices that fit into the system charging hose set to accomplish this. DO NOT charge liquid R410A into the compressor.**

**NOTE: Power must be supplied to the 18 SEER outdoor units containing ECM motors before the power is applied to the indoor unit. Sending a low voltage signal without high voltage power present at the outdoor unit can cause malfunction of the control module on the ECM motor.**

Adequate refrigerant charge for the matching evaporator coil or air handler and 15 feet of line set is supplied with the condensing unit. If using evaporator coils or air handlers other than HSVTC coil it may be necessary to add or remove refrigerant to attain proper charge. If line set exceeds 15 feet in length, refrigerant should be added at .6 ounces per foot of liquid line.

**NOTE: The outdoor temperature should be 60°F or higher when charging the unit.Charge should always be checked using subcooling when using TXV equipped indoor coil to verify proper charge.**

When opening valves with retainers, open each valve only until the top of the stem is 1/8" from the retainer. To avoid loss of refrigerant, DO NOT apply pressure to the retainer. When opening valves without a retainer remove service valve cap and insert a hex wrench into the valve stem and back out the stem by turning the hex wrench counterclockwise. Open the valve until it contacts the rolled lip of the valve body.

**NOTE: These are not back-seating valves. It is not necessary to force the stem tightly against the rolled lip.**

Break vacuum by fully opening liquid service valve.

After the refrigerant charge has bled into the system, open the suction service valve. The service valve cap is the secondary seal for the valves and must be properly tightened to prevent leaks. Make sure cap is clean and apply refrigerant oil to threads and sealing surface on inside of cap. Tighten cap finger-tight and then tighten additional 1/6 of a turn (1 wrench flat), or to the following specification, to properly seat the sealing surfaces.

**NOTE: Adequate refrigerant charge for the matching HSVTC evaporator coil or air handler and 15 feet of line set is supplied with the outdoor unit.**

## EXPANSION VALVE SYSTEM

**NOTE: Units matched with indoor coils equipped with non-adjustable TXV should be charged by subcooling only.**

**NOTE: The TXV should NOT be adjusted at light load conditions 55º to 60ºF. Use the following guidelines and methods to check unit operation and ensure that the refrigerant charge is within limits. Charge the unit on low stage.**

**Final Charge Adjustment**
Airflow and Total Static Pressure for the indoor unit should be verified before attempting to charge system.

1. Total static pressure is .5" WC or less.
2. Airflow is correct for installed unit.
3. Airflow tables are in the installation manual and Spec Sheet for Indoor Unit.
4. Complete charging information are in Service Manual RS6200006

**NOTE: Superheat adjustments should not be made until indoor ambient conditions have stabilized. This could take up to 24 hours depending on indoor temperature and humidity. Before checking superheat run the unit in cooling for 10-15 minutes or until refrigerant pressures stabilize. Use the following guidelines and methods to check unit operation and ensure that the refrigerant charge is within limits.**

Units matched with indoor coils equipped with a non-adjustable TXV should be charged by Subcooling only. Superheat on indoor coils with adjustable TXV valves are factory set and no adjustment is normally required during startup. Only in unique applications due to refrigerant line length, differences in height between the indoor and outdoor unit and refrigerant tubing sizes or poor performance should Superheat setting require adjustment. These adjustments should only be performed by qualified service personnel. For detailed charge and TXV adjustments refer to the appropriate Service Manual.

**Units Equipped with Adjustable Expansion Valves should be charged by Subcooling and Superheat adjusted only if necessary.**

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run the system in low stage at least 10 minutes to allow pressure to stabilize.
2. Temporarily install a thermometer on the liquid line at the liquid line service valve and 4-6" from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use liquid line temperature to determine subcooling and vapor

temperature to determine superheat.

3. Check subcooling and superheat. Systems with TXV application should have a subcooling of 5 to 7°F and superheat of 7 to 9 °F.

**NOTE: To adjust superheat, turn the valve stem clockwise to increase and counter clockwise to decrease.**

4. If subcooling and superheat are low, adjust TXV to 7 to 9 ºF superheat, and then check subcooling.
5. If subcooling is low and superheat is high, add charge to raise subcooling to 5 to 7 °F then check superheat.
6. If subcooling and superheat are high, adjust TXV valve to 7 to 9 ºF superheat, then check subcooling.
7. If subcooling is high and superheat is low, adjust TXV valve to 7 to 9 ºF superheat and remove charge to lower the subcooling to 5 to 7 ºF.

**NOTE: Do NOT adjust the charge based on suction pressure unless there is a gross undercharge.**

8. Disconnect manifold set, installation is complete.

SUBCOOLING FORMULA = SATURATED LIQUID TEMP. - LIQUID LINE TEMP.

**NOTE: Check the Schrader ports for leaks and tighten valve cores if necessary. Install caps finger-tight.**

## HEAT PUMP - HEATING CYCLE

The proper method of charging a heat pump in the heat mode is by weight with the additional charge adjustments for line size, line length, and other system components. For best results on outdoor units with TXVs, superheat should be 2-5°F at 4-6" from the compressor. Make final charge adjustments in the cooling cycle.

**Checking Compressor Efficiency**

The reason for compressor inefficiency is broken or damaged scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

The condition of the scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a "Cooling Performance Test.

If the test shows:

a. Below normal high side pressure.
b. Above normal low side pressure.
c. Low temperature difference across coil.
d. Low amp draw at compressor.

And the charge is correct. The compressor is faulty - replace the compressor.

**Overfeeding**

Overfeeding by the expansion valve results in high suction pressure, cold suction line, and possible liquid slugging of the compressor.

If these symptoms are observed:

1. Check for an overcharged unit by referring to the cooling performance charts in the servicing section.
2. Check the operation of the power element in the valve as explained in Checking Expansion Valve Operation.
3. Check for restricted or plugged equalizer tube.

**Underfeeding**

Underfeeding by the expansion valve results in low system capacity and low suction pressures.

If these symptoms are observed:

1. Check for a restricted liquid line or drier. A restriction will be indicated by a temperature drop across the drier.
2. Check the operation of the power element of the valve as described in Checking Expansion Valve Operation.

**Checking Superheat**

**Superheat on Fixed Orifice or TXV**

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install a thermometer 4-6" from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use vapor temperature to determine superheat.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.
4. Disconnect manifold set, installation is complete.

**Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.**

# SERVICING

| Pistons Used in Outdoor Heat Pump Coils | | | | |
|---|---|---|---|---|
| Goodman 14 SEER Heat Pumps | | | | |
| **Model** | **Cur. Rev** | **Piston** | **Prev. Rev** | **Piston** |
| G/VSZ140181 | LA | .032 | KF | .039 |
| G/VSZ140241 | LA | .047 | KH | .047 |
| G/VSZ140301 | KG | .052 | KF | .052 |
| G/VSZ140361 | KE | .059 | LA | .059 |
| G/VSZ140421 | KE | .061 | KD | .061 |
| G/VSZ140481 | KF | .065 | KE | .065 |
| G/VSZ140491 | KE | .065 | KD | .065 |
| G/VSZ140601 | KE | .065 | KD | .065 |
| Amana 14 SEER Heat Pumps | | | | |
| **Model** | **Cur. Rev** | **Piston** | **Prev. Rev** | **Piston** |
| ASZ140181 | KE | .039 | KD | .039 |
| ASZ140241 | KD | .047 | KC | .047 |
| ASZ140301 | KD | .052 | KC | .052 |
| ASZ140361 | KD | .059 | KC | .059 |
| ASZ140381 | AC | .059 | n/a | .059 |
| ASZ140421 | KD | .061 | KC | .061 |
| ASZ140481 | KD | .065 | KC | .065 |
| ASZ140491 | KD | .065 | KC | .065 |
| ASZ140601 | KC | .065 | KB | .065 |
| Amana 14 SEER Heat Pumps | | | | |
| **Model** | **Cur. Rev** | **Piston** | **Prev. Rev** | **Piston** |
| ANZ140181 | AE | .039 | AD | .039 |
| ANZ140241 | AD | .047 | AA | .047 |
| ANZ140301 | AE | .052 | AD | .052 |
| ANZ140361 | AD | .059 | AC | .059 |
| ANZ140421 | AD | .061 | AC | .061 |
| ANZ140481 | AD | .065 | AC | .065 |
| ANZ140491 | AD | .065 | AC | .065 |
| ANZ140601 | AC | .065 | AB | .065 |

**CAUTION**

**TO PREVENT PERSONAL INJURY, CAREFULLY CONNECT AND DISCONNECT MANIFOLD GAUGE HOSES. ESCAPING LIQUID REFRIGERANT CAN CAUSE BURNS. DO NOT VENT REFRIGERANT TO ATMOSPHERE. RECOVER DURING SYSTEM REPAIR OR FINAL UNIT DISPOSAL.**

1. Run system at least 10 minutes to allow pressure to stabilize.
2. For best results, temporarily install a thermometer on the liquid line at the liquid line service valve and 4-6” from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use liquid line temperature to determine sub-cooling and vapor temperature to determine superheat.

**NOTE: An optional method is to locate the thermometer at the suction line service valve. Ensure the thermometer makes adequate contact and is insulated for best possible readings.**

3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.

**Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.**

**EXAMPLE**:

a. Suction Pressure = 143

b. Corresponding Temp. °F. = 50

c. Thermometer on Suction Line = 61°F.

To obtain the degrees temperature of superheat, subtract 50.0 from 61.0°F.

The difference is 11° Superheat. The 11° Superheat would fall in the ± range of allowable superheat.

**Subcooling on Expansion Valve System**

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run system at least 10 minutes to allow pressure to stabilize.
2. Clamp a pipe clamp thermometer on the liquid line near the liquid line service valve and 4-6” from the compressor on the suction line.
   a. nsure the thermometer makes adequate contact to obtain the best possible readings.
   b. The temperature read with the thermometer should be lower than the saturated condensing temperature.
3. The difference between the measured saturated condensing temperature and the liquid line temperature is the liquid Subcooling value.
4. TXV-based systems should have a Subcooling value of 8°F +/- 1°F.
5. Add refrigerant to increase Subcooling and remove refrigerant to decrease Subcooling.

**Checking Expansion Valve Operation**

1. Remove the remote bulb of the expansion valve from the suction line.
2. Start the system and cool the bulb in a container of ice water, closing the valve. As you cool the bulb, the suction pressure should fall and the suction temperature will rise.
3. Next warm the bulb in your hand. As you warm the bulb, the suction pressure should rise and the suction temperature will fall.
4. If a temperature or pressure change is noticed, the expansion valve is operating. If no change is noticed, the valve is restricted, the power element is faulty, or the equalizer tube is plugged.

5. Capture the charge, replace the valve and drier, evacuate and recharge.

**Checking Restricted Liquid Line**
When the system is operating, the liquid line is warm to the touch. If the liquid line is restricted, a definite temperature drop will be noticed at the point of restriction. In severe cases, frost will form at the restriction and extend down the line in the direction of the flow.

Discharge and suction pressures will be low, giving the appearance of an undercharged unit. However, the unit will have normal to high subcooling.

Locate the restriction, replace the restricted part, replace drier, evacuate and recharge.

**Overcharge Of Refrigerant**
An overcharge of refrigerant is normally indicated by an excessively high head pressure.

An evaporator coil, using an expansion valve metering device, will basically modulate and control a flooded evaporator and prevent liquid return to the compressor.

An evaporator coil, using a capillary tube metering device, could allow refrigerant to return to the compressor under extreme overcharge conditions. Also with a capillary tube metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and liquid return to the compressor, but the head pressure would be lower.

There are other causes for high head pressure which may be found in the "Service Problem Analysis Guide."
If other causes check out normal, an overcharge or a system containing non-condensables would be indicated.

If this system is observed:
1. Start the system.
2. Remove and capture small quantities of gas from the suction line dill valve until the head pressure is reduced to normal.
3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

**Non-Condensables**
If non-condensables are suspected, shut down the system and allow the pressures to equalize. Wait at least 15 minutes. Compare the pressure to the temperature of the coldest coil since this is where most of the refrigerant will be. If the pressure indicates a higher temperature than that of the coil temperature, non-condensables are present.

Non-condensables are removed from the system by first removing the refrigerant charge, replacing and/or installing liquid line drier, evacuating and recharging.

**Checking Compressor Efficiency**
The reason for compressor inefficiency is broken or damaged scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor. The condition of the scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a "Cooling Performance Test. If the test shows:
   a. Below normal high side pressure.
   b. Above normal low side pressure.
   c. Low temperature difference across coil.
   d. Low amp draw at compressor.

And the charge is correct. The compressor is faulty – replace the compressor.

**Compressor Burnout**
When a compressor burns out, high temperature develops causing the refrigerant, oil and motor insulation to decompose forming acids and sludge.

If a compressor is suspected of being burned-out, attach a refrigerant hose to the liquid line dill valve and properly remove and dispose of the refrigerant.

**NOTICE**

**VIOLATION OF EPA REGULATIONS MAY RESULT IN FINES OR OTHER PENALTIES.**

Now determine if a burn out has actually occurred. Confirm by analyzing an oil sample using a Sporlan Acid Test Kit, AK-3 or its equivalent.
Remove the compressor and obtain an oil sample from the suction stub. If the oil is not acidic, either a burnout has not occurred or the burnout is so mild that a complete clean-up is not necessary.

If acid level is unacceptable, the system must be cleaned by using the clean-up drier method.

**CAUTION**

**DO NOT ALLOW THE SLUDGE OR OIL TO CONTACT THE SKIN. SEVERE BURNS MAY RESULT.**

**NOTE: The Flushing Method using R-11 refrigerant is no longer approved by Amana® Brand Heating-Cooling.**

# SERVICING

## Pressure vs. Temperature Chart

### R-410A

| PSIG | °F | PSIG | °F | PSIG | °F | PSIG | °F | PSIG | °F | PSIG | °F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | -37.7 | 114.0 | 37.8 | 216.0 | 74.3 | 318.0 | 100.2 | 420.0 | 120.7 | 522.0 | 137.6 |
| 14 | -34.7 | 116.0 | 38.7 | 218.0 | 74.9 | 320.0 | 100.7 | 422.0 | 121.0 | 524.0 | 137.9 |
| 16 | -32.0 | 118.0 | 39.5 | 220.0 | 75.5 | 322.0 | 101.1 | 424.0 | 121.4 | 526.0 | 138.3 |
| 18 | -29.4 | 120.0 | 40.5 | 222.0 | 76.1 | 324.0 | 101.6 | 426.0 | 121.7 | 528.0 | 138.6 |
| 20 | -36.9 | 122.0 | 41.3 | 224.0 | 76.7 | 326.0 | 102.0 | 428.0 | 122.1 | 530.0 | 138.9 |
| 22 | -24.5 | 124.0 | 42.2 | 226.0 | 77.2 | 328.0 | 102.4 | 430.0 | 122.5 | 532.0 | 139.2 |
| 24 | -22.2 | 126.0 | 43.0 | 228.0 | 77.8 | 330.0 | 102.9 | 432.0 | 122.8 | 534.0 | 139.5 |
| 26 | -20.0 | 128.0 | 43.8 | 230.0 | 78.4 | 332.0 | 103.3 | 434.0 | 123.2 | 536.0 | 139.8 |
| 28 | -17.9 | 130.0 | 44.7 | 232.0 | 78.9 | 334.0 | 103.7 | 436.0 | 123.5 | 538.0 | 140.1 |
| 30 | -15.8 | 132.0 | 45.5 | 234.0 | 79.5 | 336.0 | 104.2 | 438.0 | 123.9 | 540.0 | 140.4 |
| 32 | -13.8 | 134.0 | 46.3 | 236.0 | 80.0 | 338.0 | 104.6 | 440.0 | 124.2 | 544.0 | 141.0 |
| 34 | -11.9 | 136.0 | 47.1 | 238.0 | 80.6 | 340.0 | 105.1 | 442.0 | 124.6 | 548.0 | 141.6 |
| 36 | -10.1 | 138.0 | 47.9 | 240.0 | 81.1 | 342.0 | 105.4 | 444.0 | 124.9 | 552.0 | 142.1 |
| 38 | -8.3 | 140.0 | 48.7 | 242.0 | 81.6 | 344.0 | 105.8 | 446.0 | 125.3 | 556.0 | 142.7 |
| 40 | -6.5 | 142.0 | 49.5 | 244.0 | 82.2 | 346.0 | 106.3 | 448.0 | 125.6 | 560.0 | 143.3 |
| 42 | -4.5 | 144.0 | 50.3 | 246.0 | 82.7 | 348.0 | 106.6 | 450.0 | 126.0 | 564.0 | 143.9 |
| 44 | -3.2 | 146.0 | 51.1 | 248.0 | 83.3 | 350.0 | 107.1 | 452.0 | 126.3 | 568.0 | 144.5 |
| 46 | -1.6 | 148.0 | 51.8 | 250.0 | 83.8 | 352.0 | 107.5 | 454.0 | 126.6 | 572.0 | 145.0 |
| 48 | 0.0 | 150.0 | 52.5 | 252.0 | 84.3 | 354.0 | 107.9 | 456.0 | 127.0 | 576.0 | 145.6 |
| 50 | 1.5 | 152.0 | 53.3 | 254.0 | 84.8 | 356.0 | 108.3 | 458.0 | 127.3 | 580.0 | 146.2 |
| 52 | 3.0 | 154.0 | 54.0 | 256.0 | 85.4 | 358.0 | 108.8 | 460.0 | 127.7 | 584.0 | 146.7 |
| 54 | 4.5 | 156.0 | 54.8 | 258.0 | 85.9 | 360.0 | 109.2 | 462.0 | 128.0 | 588.0 | 147.3 |
| 56 | 5.9 | 158.0 | 55.5 | 260.0 | 86.4 | 362.0 | 109.6 | 464.0 | 128.3 | 592.0 | 147.9 |
| 58 | 7.3 | 160.0 | 56.2 | 262.0 | 86.9 | 364.0 | 110.0 | 466.0 | 128.7 | 596.0 | 148.4 |
| 60 | 8.6 | 162.0 | 57.0 | 264.0 | 87.4 | 366.0 | 110.4 | 468.0 | 129.0 | 600.0 | 149.0 |
| 62 | 10.0 | 164.0 | 57.7 | 266.0 | 87.9 | 368.0 | 110.8 | 470.0 | 129.3 | 604.0 | 149.5 |
| 64 | 11.3 | 166.0 | 58.4 | 268.0 | 88.4 | 370.0 | 111.2 | 472.0 | 129.7 | 608.0 | 150.1 |
| 66 | 12.6 | 168.0 | 59.0 | 270.0 | 88.9 | 372.0 | 111.6 | 474.0 | 130.0 | 612.0 | 150.6 |
| 68 | 13.8 | 170.0 | 59.8 | 272.0 | 89.4 | 374.0 | 112.0 | 476.0 | 130.3 | 616.0 | 151.2 |
| 70 | 15.1 | 172.0 | 60.5 | 274.0 | 89.9 | 376.0 | 112.4 | 478.0 | 130.7 | 620.0 | 151.7 |
| 72 | 16.3 | 174.0 | 61.1 | 276.0 | 90.4 | 378.0 | 112.6 | 480.0 | 131.0 | 624.0 | 152.3 |
| 74 | 17.5 | 176.0 | 61.8 | 278.0 | 90.9 | 380.0 | 113.1 | 482.0 | 131.3 | 628.0 | 152.8 |
| 76 | 18.7 | 178.0 | 62.5 | 280.0 | 91.4 | 382.0 | 113.5 | 484.0 | 131.6 | 632.0 | 153.4 |
| 78 | 19.8 | 180.0 | 63.1 | 282.0 | 91.9 | 384.0 | 113.9 | 486.0 | 132.0 | 636.0 | 153.9 |
| 80 | 21.0 | 182.0 | 63.8 | 284.0 | 92.4 | 386.0 | 114.3 | 488.0 | 132.3 | 640.0 | 154.5 |
| 82 | 22.1 | 184.0 | 64.5 | 286.0 | 92.8 | 388.0 | 114.7 | 490.0 | 132.6 | 644.0 | 155.0 |
| 84 | 23.2 | 186.0 | 65.1 | 288.0 | 93.3 | 390.0 | 115.0 | 492.0 | 132.9 | 648.0 | 155.5 |
| 86 | 24.3 | 188.0 | 65.8 | 290.0 | 93.8 | 392.0 | 115.5 | 494.0 | 133.3 | 652.0 | 156.1 |
| 88 | 25.4 | 190.0 | 66.4 | 292.0 | 94.3 | 394.0 | 115.8 | 496.0 | 133.6 | 656.0 | 156.6 |
| 90 | 26.4 | 192.0 | 67.0 | 294.0 | 94.8 | 396.0 | 116.2 | 498.0 | 133.9 | 660.0 | 157.1 |
| 92 | 27.4 | 194.0 | 67.7 | 296.0 | 95.2 | 398.0 | 116.6 | 500.0 | 134.0 | 664.0 | 157.7 |
| 94 | 28.5 | 196.0 | 68.3 | 298.0 | 95.7 | 400.0 | 117.0 | 502.0 | 134.5 | 668.0 | 158.2 |
| 96 | 29.5 | 198.0 | 68.9 | 300.0 | 96.2 | 402.0 | 117.3 | 504.0 | 134.8 | 672.0 | 158.7 |
| 98 | 30.5 | 200.0 | 69.5 | 302.0 | 96.6 | 404.0 | 117.7 | 506.0 | 135.2 | 676.0 | 159.2 |
| 100 | 31.2 | 202.0 | 70.1 | 304.0 | 97.1 | 406.0 | 118.1 | 508.0 | 135.5 | 680.0 | 159.8 |
| 102 | 32.2 | 204.0 | 70.7 | 306.0 | 97.5 | 408.0 | 118.5 | 510.0 | 135.8 | 684.0 | 160.3 |
| 104 | 33.2 | 206.0 | 71.4 | 308.0 | 98.0 | 410.0 | 118.8 | 512.0 | 136.1 | 688.0 | 160.8 |
| 106 | 34.1 | 208.0 | 72.0 | 310.0 | 98.4 | 412.0 | 119.2 | 514.0 | 136.4 | 692.0 | 161.3 |
| 108 | 35.1 | 210.0 | 72.6 | 312.0 | 98.9 | 414.0 | 119.6 | 516.0 | 136.7 | 696.0 | 161.8 |
| 110 | 35.5 | 212.0 | 73.2 | 314.0 | 99.3 | 416.0 | 119.9 | 518.0 | 137.0 | | |
| 112 | 36.9 | 214.0 | 73.8 | 316.0 | 99.7 | 418.0 | 120.3 | 520.0 | 137.3 | | |

*Based on ALLIED SIGNAL Data

| REQUIRED LIQUID LINE TEMPERATURE | | | | | | |
|---|---|---|---|---|---|---|
| LIQUID PRESSURE AT SERVICE VALVE (PSIG) | REQUIRED SUBCOOLING TEMPERATURE (°F) | | | | | |
| | 8 | 10 | 12 | 14 | 16 | 18 |
| 189 | 58 | 56 | 54 | 52 | 50 | 48 |
| 195 | 60 | 58 | 56 | 54 | 52 | 50 |
| 202 | 62 | 60 | 58 | 56 | 54 | 52 |
| 208 | 64 | 62 | 60 | 58 | 56 | 54 |
| 215 | 66 | 64 | 62 | 60 | 58 | 56 |
| 222 | 68 | 66 | 64 | 62 | 60 | 58 |
| 229 | 70 | 68 | 66 | 64 | 62 | 60 |
| 236 | 72 | 70 | 68 | 66 | 64 | 62 |
| 243 | 74 | 72 | 70 | 68 | 66 | 64 |
| 251 | 76 | 74 | 72 | 70 | 68 | 66 |
| 259 | 78 | 76 | 74 | 72 | 70 | 68 |
| 266 | 80 | 78 | 76 | 74 | 72 | 70 |
| 274 | 82 | 80 | 78 | 76 | 74 | 72 |
| 283 | 84 | 82 | 80 | 78 | 76 | 74 |
| 291 | 86 | 84 | 82 | 80 | 78 | 76 |
| 299 | 88 | 86 | 84 | 82 | 80 | 78 |
| 308 | 90 | 88 | 86 | 84 | 82 | 80 |
| 317 | 92 | 90 | 88 | 86 | 84 | 82 |
| 326 | 94 | 92 | 90 | 88 | 86 | 84 |
| 335 | 96 | 94 | 92 | 90 | 88 | 86 |
| 345 | 98 | 96 | 94 | 92 | 90 | 88 |
| 354 | 100 | 98 | 96 | 94 | 92 | 90 |
| 364 | 102 | 100 | 98 | 96 | 94 | 92 |
| 374 | 104 | 102 | 100 | 98 | 96 | 94 |
| 384 | 106 | 104 | 102 | 100 | 98 | 96 |
| 395 | 108 | 106 | 104 | 102 | 100 | 98 |
| 406 | 110 | 108 | 106 | 104 | 102 | 100 |
| 416 | 112 | 110 | 108 | 106 | 104 | 102 |
| 427 | 114 | 112 | 110 | 108 | 106 | 104 |
| 439 | 116 | 114 | 112 | 110 | 108 | 106 |
| 450 | 118 | 116 | 114 | 112 | 110 | 108 |
| 462 | 120 | 118 | 116 | 114 | 112 | 110 |
| 474 | 122 | 120 | 118 | 116 | 114 | 112 |
| 486 | 124 | 122 | 120 | 118 | 116 | 114 |
| 499 | 126 | 124 | 122 | 120 | 118 | 116 |
| 511 | 128 | 126 | 124 | 122 | 120 | 118 |

# SERVICING

**Suction Line Drier Clean-Up Method**
The POE oils used with R410A refrigerant is an excellent solvent. In the case of a burnout, the POE oils will remove any burnout residue left in the system. If not captured by the refrigerant filter, they will collect in the compressor or other system components, causing a failure of the replacement compressor and/or spread contaminants throughout the system, damaging additional components.

Install a field supplied suction line drier. This drier should be installed as close to the compressor suction fitting as possible. The filter must be accessible and be rechecked for pressure drop after the system has operated for a time. It may be necessary to use new tubing and form as required.

**NOTE: At least twelve (12) inches of the suction line immediately out of the compressor stub must be discarded due to burned residue and contaminates.**

1. Remove compressor discharge line strainer.
2. Remove the liquid line drier and expansion valve.
3. Purge all remaining components with dry nitrogen or carbon dioxide until clean.
4. Install new components **including** liquid line drier.
5. Braze all joints, leak test, evacuate, and recharge system.
6. Start up the unit and record the pressure drop across the drier.
7. Continue to run the system for a minimum of twelve (12) hours and recheck the pressure drop across the drier. Pressure drop should not exceed 6 PSIG.
8. Continue to run the system for several days, repeatedly checking pressure drop across the suction line drier. If the pressure drop never exceeds the 6 PSIG, the drier has trapped the contaminants. Remove the suction line drier from the system.
9. If the pressure drop becomes greater, then it must be replaced and steps 5 through 9 repeated until it does not exceed 6 PSIG.

**NOTICE: Regardless, the cause for burnout must be determined and corrected before the new compressor is started.**

**Refrigerant Piping**
The piping of a refrigeration system is very important in relation to system capacity, proper oil return to compressor, pumping rate of compressor and cooling performance of the evaporator.

POE oils maintain a consistent viscosity over a large temperature range which aids in the oil return to the compressor; however, there will be some installations which require oil return traps. These installations should be avoided whenever possible, as adding oil traps to the refrigerant lines also increases the opportunity for debris and moisture to be introduced into the system. Avoid long running traps in horizontal suction line.

**Duct Static Pressures**
This minimum and maximum allowable duct static pressure for the indoor sections are found in the specifications section.

Tables are also provided for each coil, listing quantity of air (CFM) versus static pressure drop across the coil.

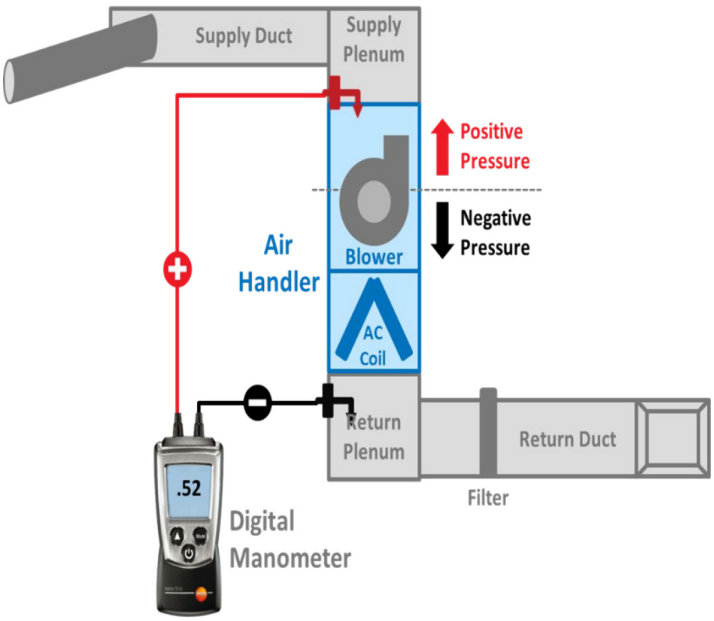
Too great an external static pressure will result in insufficient air that can cause icing of the coil. Too much air can cause poor humidity control and condensate to be pulled off the evaporator coil causing condensate leakage. Too much air can also cause motor overloading and in many cases this constitutes a poorly designed system.

**Single Piece Air Handler External Static**
To determine proper airflow, proceed as follows:

1. Using a Inclined Manometer or Magnehelic gauge , measure the static pressure of the return duct at the inlet of the air handler, this will be a negative pressure (for example-.30”wc)
2. Measure the static pressure of the supply duct at the outlet of the air handler, this should be a positive pressure (for example .20”wc).
3. Add the two readings together (for example -.30”wc + .20”wc = .50”wc total external static pressure.

**NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.**

4. Consult proper air handler airflow chart for quantity of air (CFM) at the measured external static pressure.



# SERVICING

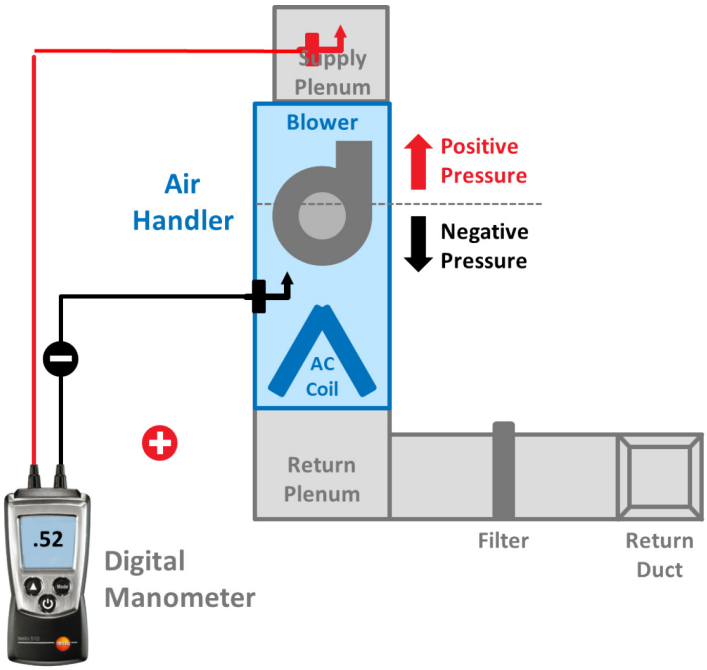
**Two Piece Air Handler External Static Pressure**

To determine proper airflow, proceed as follows:

1. Using a Inclined Manometer or Magnehelic gauge, measure the static pressure between the outlet of the evaporator coil and the inlet of the air handler, this will be a negative pressure ( for example -.30”wc)
2. Measure the static pressure of the supply duct at the outlet of the unit, this should be a positive pressure (for example .20”wc).
3. Add the two readings together (for example -.30”wc + .20”wc = .50”wc total static pressure.

**NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.**

4. Consult proper air handler airflow chart for quantity of air (CFM) at the measured external static pressure.




**Furnace External Static Pressure**

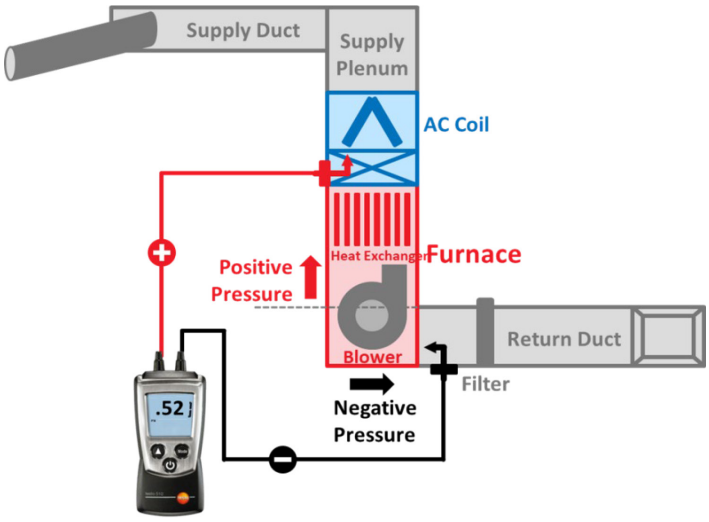
To determine proper airflow, proceed as follows:

1. With clean filters in the furnace, using a Inclined Manometer or Magnehelic gauge measure the static pressure of the return duct at the inlet of the furnace. (Negative Pressure)
2. Measure the static pressure between the furnace and the inlet of the evaporator coil. (Positive Pressure). The limit switch can be removed, and probe inserted to obtain this reading.
3. Add the two (2) readings together for total external static pressure.

**NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired. If high Efficiency Air Filter or Electronic Air Cleaner is used in conjunction with the furnace, the readings must also include these components, as shown in the following drawing.**

4. Consult proper airflow tables for the quantity of air (CFM).

If the total external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, registers, undersized and/or oversized poorly laid out ductwork.




**Static Pressure Drop**

**Periodic Maintenance**

**Motors**

Indoor and Outdoor motors are permanently lubricated and do not need additional oiling.

**Cleaning Outdoor Coil**

1. Check for oil deposits on coil this could be an indication of possible leak. If no leak detected spray coil with ordinary household detergent.
2. Using garden hose, spray coil vertically downward with constant stream of water at moderate pressure. Keep nozzle at a 15− to 20° angle, about 3 in. from coil face. Spray so debris is washed out of coil and base pan.
3. Reinstall top cover and position blade.
4. Reconnect electrical power and check for proper operation.

**Cleaning Outdoor Fan Blade**

1. Check balance weights on fan blade.
2. Check fan blade setscrew for tightness.

**Electrical Controls and Wiring**

1. Disconnect power to both outdoor and indoor units.
2. Check all electrical connections for tightness.
3. Tighten all screws on electrical connections.
4. Connections that appear to be burned or smoky should be disassembled and cleaned all parts
5. Wire connections that appear burned and corroded should be replaced and crimp tightly to assure they do not overheat.
6. Reconnect electrical power to indoor and outdoor units and check for proper operation.

# SERVICING

**Cleaning Aluminum Coils**
Evaporator coils and air handlers are equipped with an aluminum tube evaporator coil. The safest way to clean the evaporator coil is to simply flush the coil with water. This cleaning practice remains as the recommended cleaning method for both copper tube and aluminum tube residential cooling coils.

An alternate cleaning method is to use one of the products listed in the technical publication TP-109 (shipped in the literature bag with the unit) to clean the coils. The cleaners listed are the only agents deemed safe and approved for use to clean round tube aluminum coils. TP-109 is available on the web site in Partner Link > Service Toolkit.

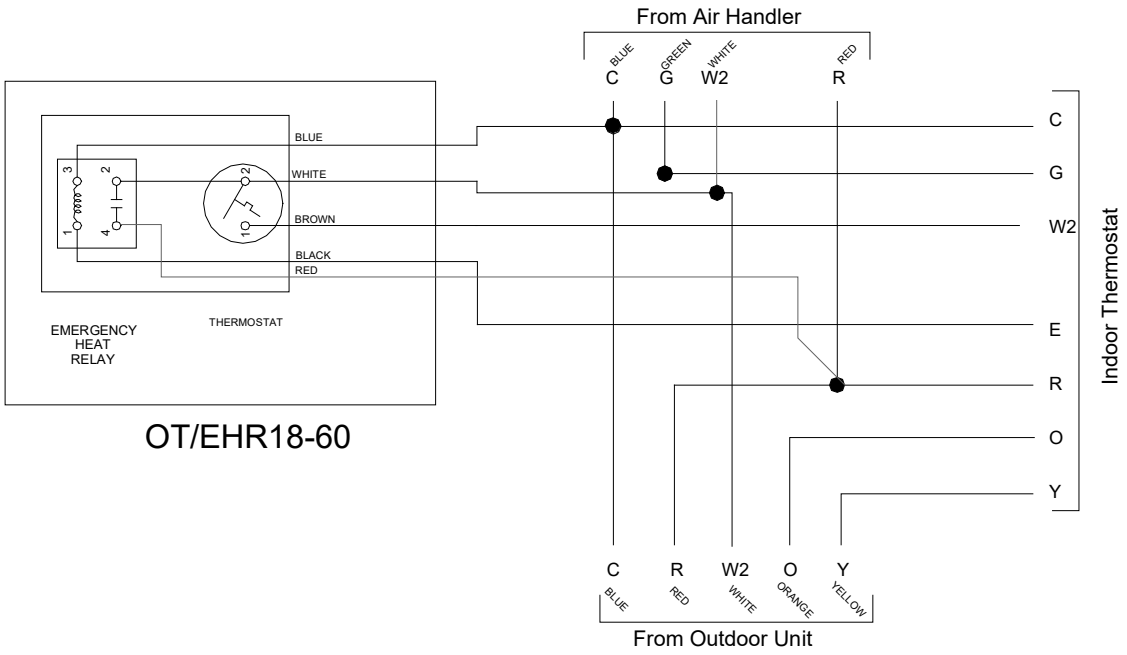
**NOTE: Ensure coils are rinsed well after use of any chemical cleaners**

# WIRING DIAGRAMS

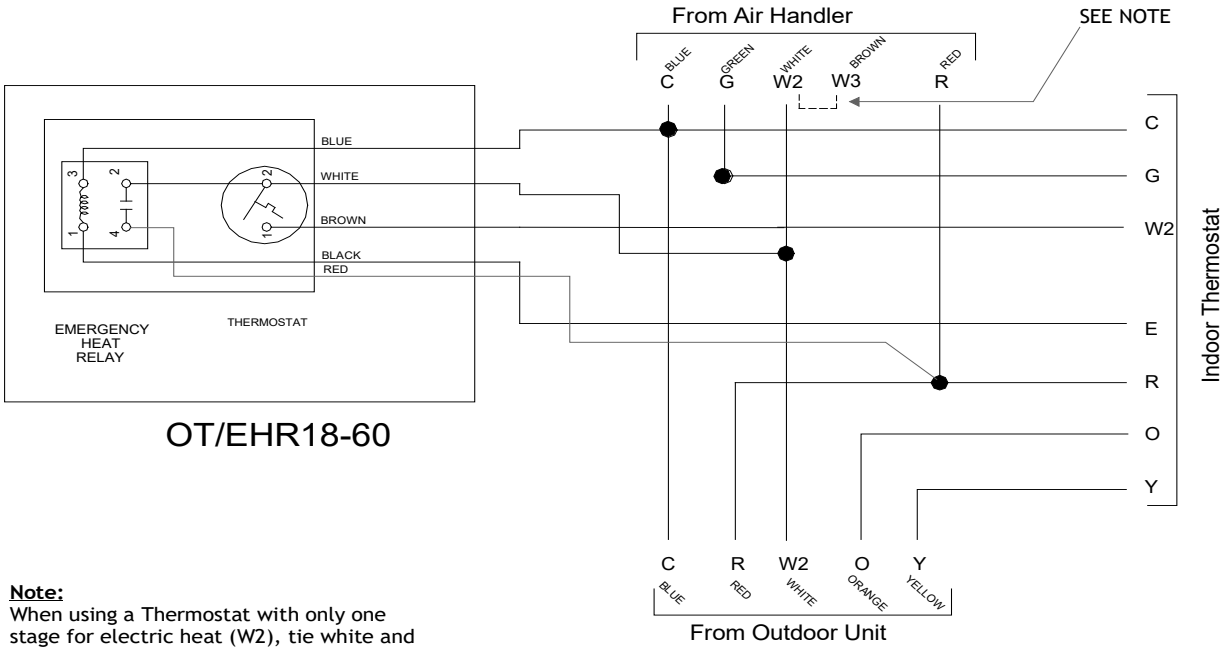
**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

## 10kw and Below, One Stage Electric Heat




## 15kw and Above, Two Stage Electric Heat



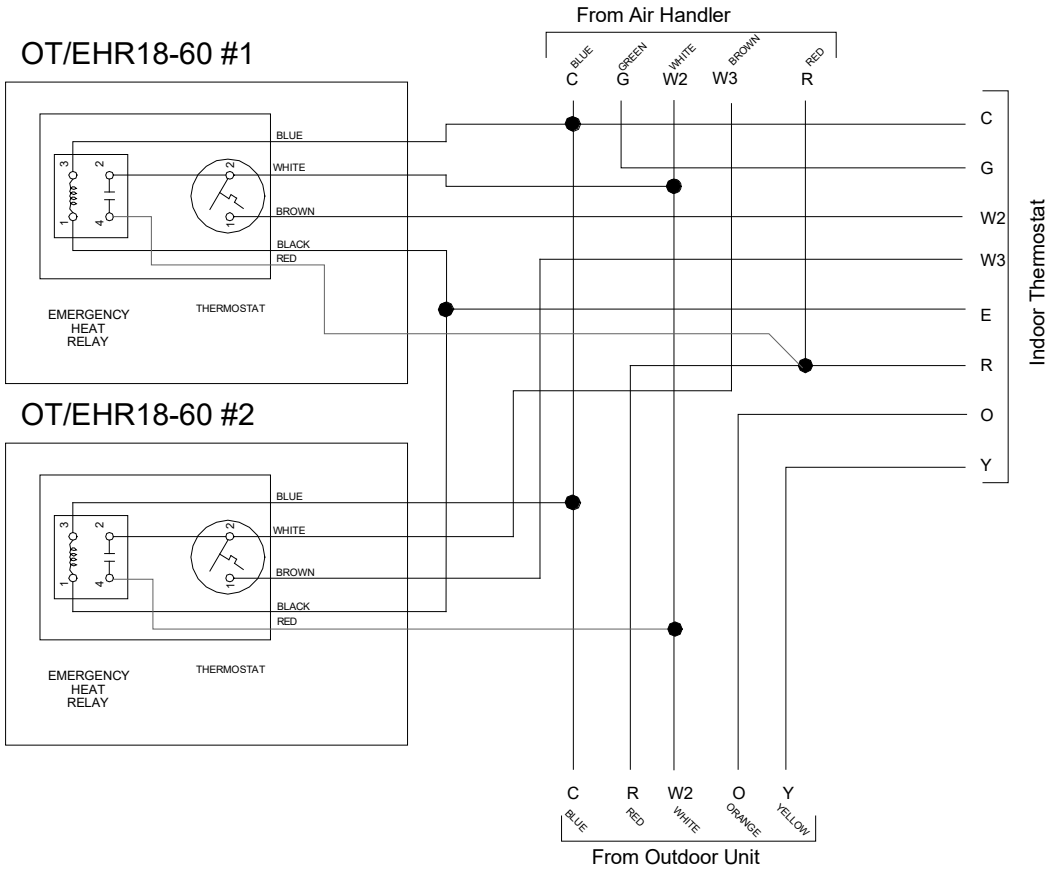

**Note:**
When using a Thermostat with only one stage for electric heat (W2), tie white and brown wires from air handler together.

Typical Wiring Schematics for OT/EHR18-60 (Outdoor Thermostat & Emergency Heat Relay).
This wiring diagram is for reference only. Not all wiring is as shown above.
Refer to the appropriate wiring diagram for the unit being serviced.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

15kw and Above with Two OT/EHR18-60's, Two Stage Electric Heat and Two Stage Thermostat




Typical Wiring Schematics for OT/EHR18-60 (Outdoor Thermostat & Emergency Heat Relay).
This wiring diagram is for reference only. Not all wiring is as shown above.
Refer to the appropriate wiring diagram for the unit being serviced.

**WARNING**

**HIGH VOLTAGE!**
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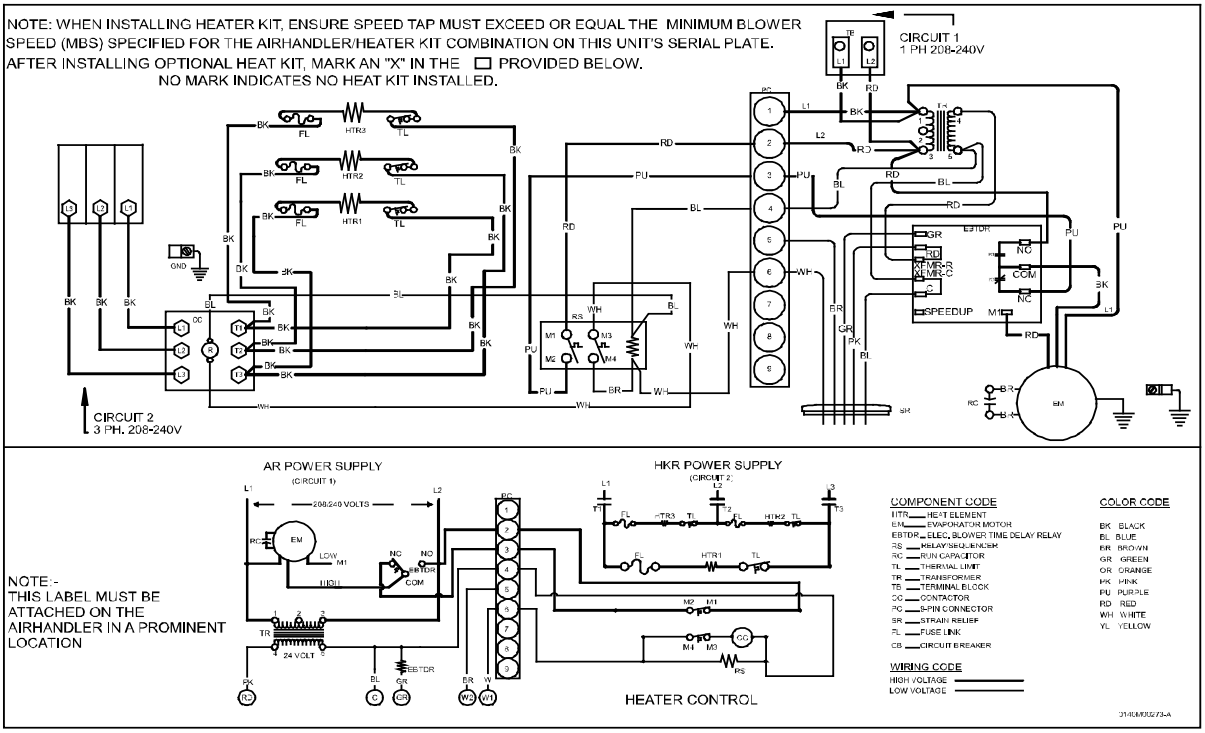
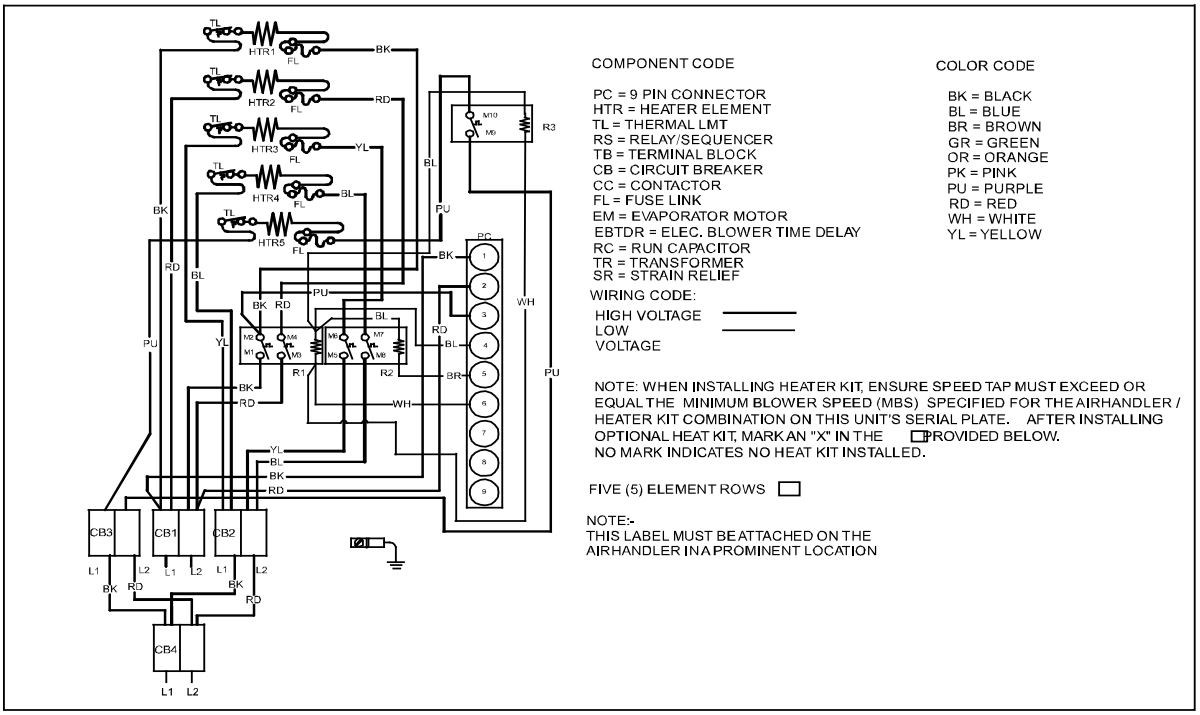
# WIRING DIAGRAMS

## 3-Phase Heat Kit




## 25kW Heat Kit




**WARNING**

**HIGH VOLTAGE!**
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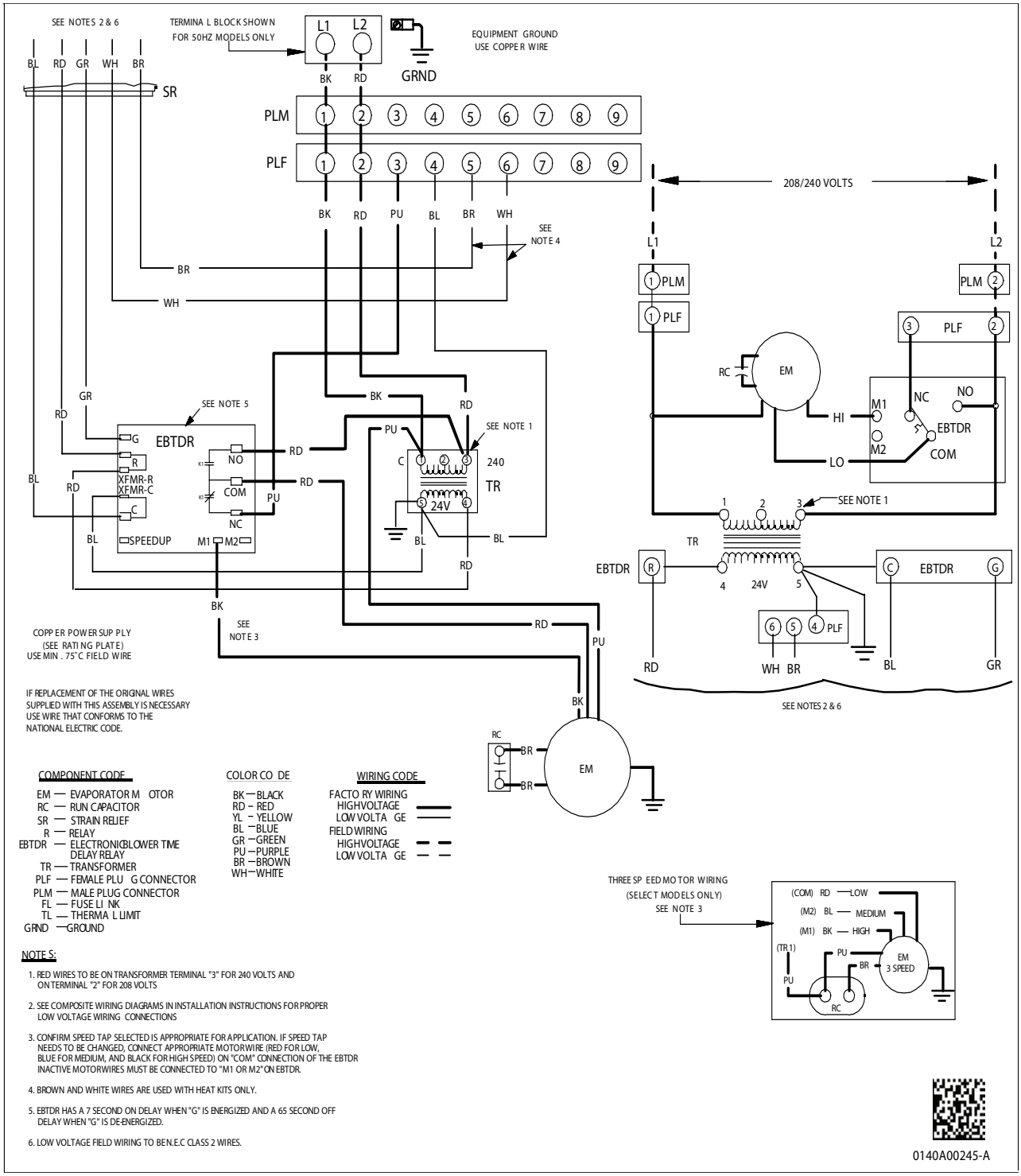
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS



HIGH VOLTAGE!
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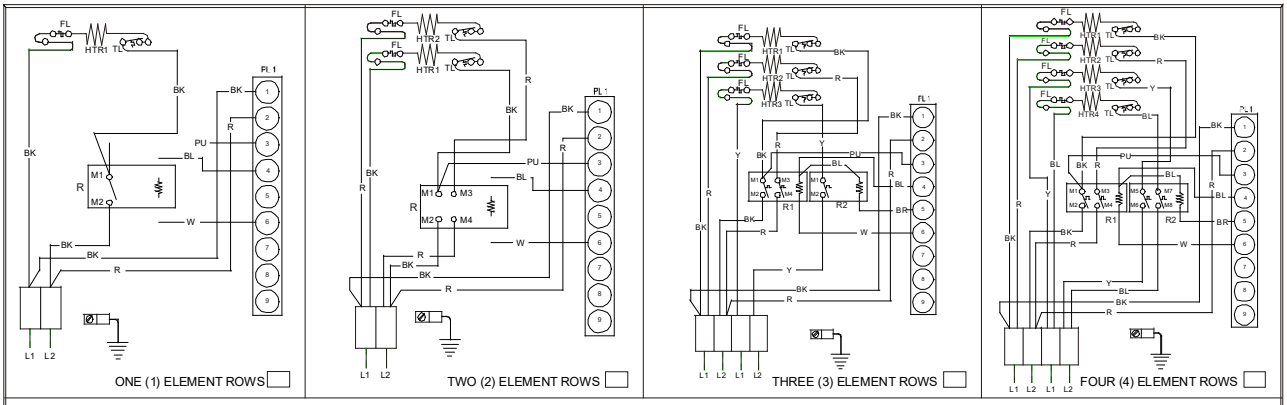
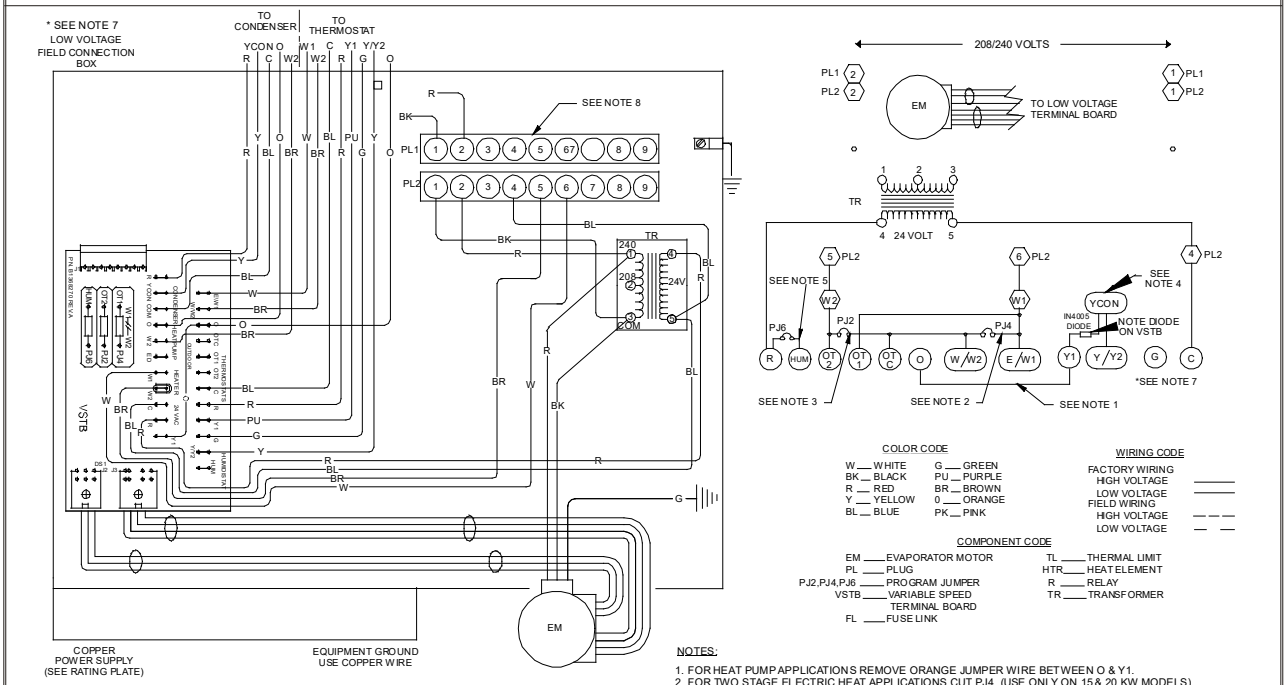
WARNING




AFTER INSTALLING OPTIONAL HEAT KIT, MARK AN "X" IN THE ☐ PROVIDED ABOVE.
MARK ACCORDING TO NUMBER OF HEATER ELEMENT ROWS INSTALLED
NO MARK INDICATES NO HEAT KIT INSTALLED




COLOR CODE

| | |
|---|---|
| W ___ WHITE | G ___ GREEN |
| BK ___ BLACK | PU ___ PURPLE |
| R ___ RED | BR ___ BROWN |
| Y ___ YELLOW | O ___ ORANGE |
| BL ___ BLUE | PK ___ PINK |

WIRING CODE

FACTORY WIRING
HIGH VOLTAGE _____
LOW VOLTAGE _____
FIELD WIRING
HIGH VOLTAGE — — —
LOW VOLTAGE — —

COMPONENT CODE

| | |
|---|---|
| EM ___ EVAPORATOR MOTOR | TL ___ THERMAL LIMIT |
| PL ___ PLUG | HTR ___ HEAT ELEMENT |
| PJ2,PJ4,PJ6 ___ PROGRAM JUMPER | R ___ RELAY |
| VSTB ___ VARIABLE SPEED TERMINAL BOARD | TR ___ TRANSFORMER |
| FL ___ FUSE LINK | |

NOTES:

1. FOR HEAT PUMP APPLICATIONS REMOVE ORANGE JUMPER WIRE BETWEEN O & Y1.
2. FOR TWO STAGE ELECTRIC HEAT APPLICATIONS CUT PJ4. (USE ONLY ON 15 & 20 KW MODELS).
3. FOR OUTDOOR THERMOSTAT OPERATION OF SECOND STAGE HEAT, CUT PJ2 & ADD OT18-60 TO OTC & OT2.
4. FOR SINGLE STAGE COOLING APPLICATIONS CONNECT THERMOSTAT TO Y/Y2 ONLY, TAPE OR REMOVE Y1 CONNECTION. CONNECT CONDENSING UNIT TO YCON & C.
5. WHEN HUMIDSTAT IS PROVIDED CUT PJ6. THERMOSTAT OPENS ON HUMIDITY RISE.
6. RED WIRES TO BE ON TRANSFORMER TERMINAL 3 FOR 240 VOLTS AND ON TERMINAL 2 FOR 208 VOLTS.
7. SEE COMPOSITE WIRING DIAGRAMS IN INSTALLATION INSTRUCTIONS FOR PROPER LOW VOLTAGE CONNECTIONS AND DETAILS ON COMPATIBLE THERMOSTATS AND THEIR CONNECTIONS.
8. DISCARD ORIGINAL "PL1" PLUG CONNECTOR WHEN INSTALLING OPTIONAL HEAT KIT.

CONTROLS SHOWN WITH UTILITIES IN "ON" POSITION AND THERMOSTAT IN "OFF" POSITION.
IF REPLACEMENT OF THE ORIGINAL WIRES SUPPLIED WITH THIS ASSEMBLY IS NECESSARY, USE 105°C. WIRE. SIZE TO CONFORM TO THE NATIONA L ELECTRIC CODE.

0140A00000P

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**AEPF******CA**

**HIGH VOLTAGE!**
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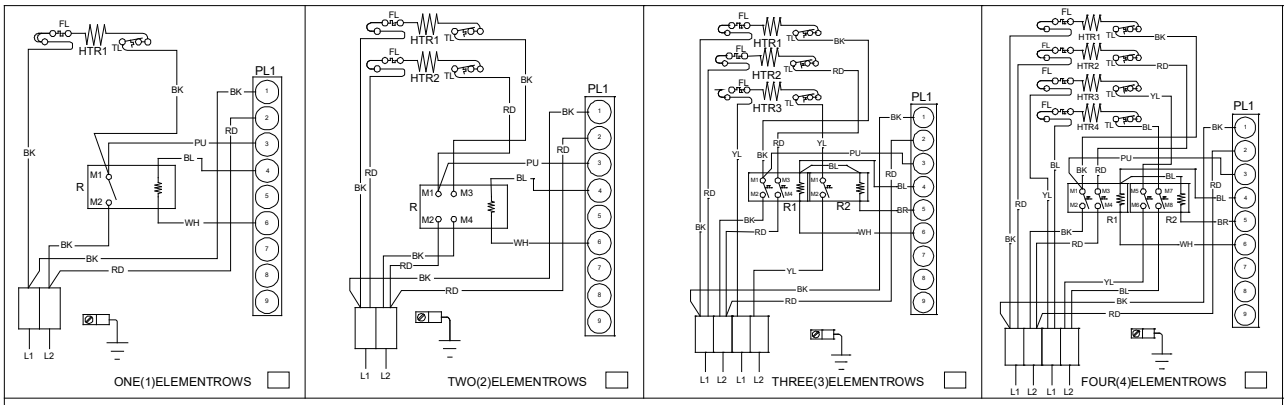
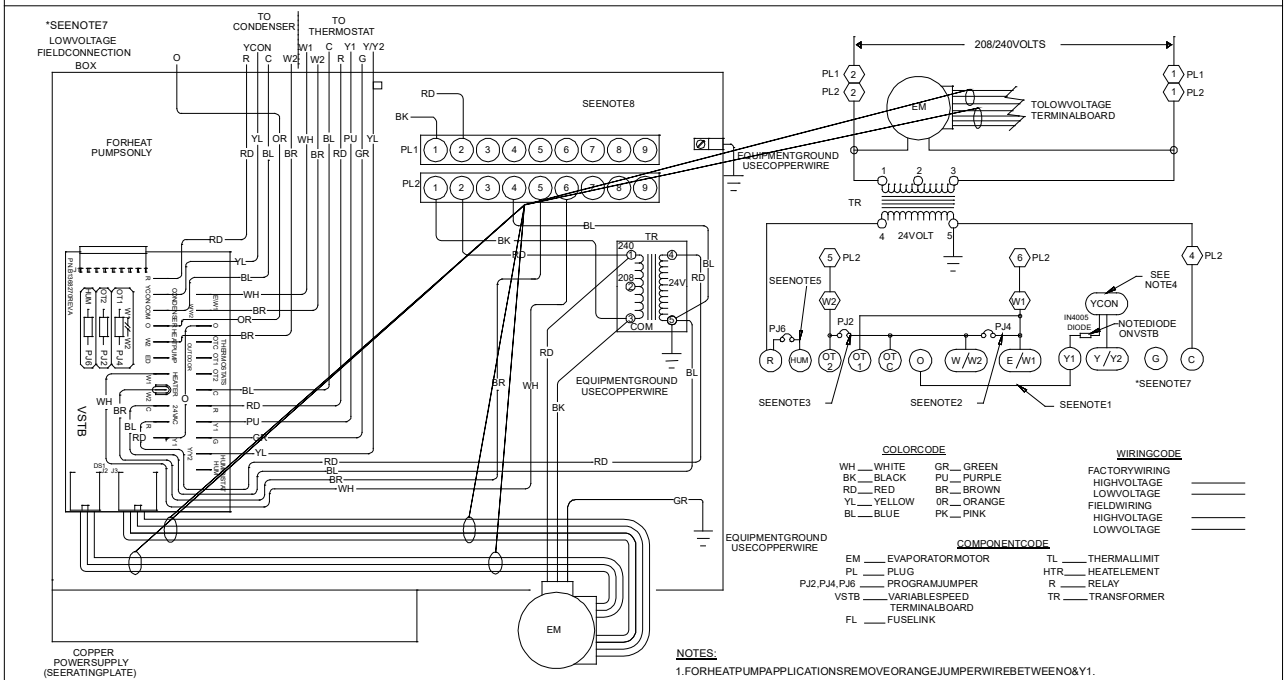
**WARNING**




AFTERINSTALLINGOPTIONALHEATKIT, MARKA"X"INTHE PROVIDEDABOVE.
MARKACCORDINGTONUMBEROFHEATERELEMENTROWSINSTALLED
NOMARKINDICATESNOHEATKITINSTALLED




**COLORCODE**

| | | | |
|---|---|---|---|
| WH | WHITE | GR | GREEN |
| BK | BLACK | PU | PURPLE |
| RD | RED | BR | BROWN |
| YL | YELLOW | 0R | ORANGE |
| BL | BLUE | PK | PINK |

**WIRINGCODE**

FACTORYWIRING
FIELDWIRING
HIGHVOLTAGE
LOWVOLTAGE
HIGHVOLTAGE
LOWVOLTAGE

**COMPONENTCODE**

| | | | |
|---|---|---|---|
| EM | EVAPORATORMOTOR | TL | THERMALLIMIT |
| PL | PLUG | HTR | HEATELEMENT |
| PJ2,PJ4,PJ6 | PROGRAMJUMPER | R | RELAY |
| VSTB | VARIABLESPEED TERMINALBOARD | TR | TRANSFORMER |
| FL | FUSELINK | | |

NOTES:

1. FORHEATPUMPAPPLICATIONSREMOVEORANGEJUMPERWIREBETWEENO&Y1.
2. FORTWOSTAGEELECTRICHEATAPPLICATIONSCUTPJ4.(USEONLYON15&20KWMODELS).
3. FOROUTDOORTHERMOSTATOPERATIONOFSECONDSTAGEHEAT,CUTPJ2&ADDOT18-60TOOTC&OT2.
4. FORSINGLESTAGECOOLINGAPPLICATIONSCONNECTTHERMOSTATTOY/Y2ONLY, TAPEORREMOVEY1CONNECTION. CONNECTCONDENSINGUNITTOYCON&C.
5. WHENHUMIDSTATISPROVIDEDCUTPJ6.THERMOSTATOPENSONHUMIDITYRISE.
6. REDWIRESTOBEONTRANSFORMERTERMINAL3FOR240VOLTSANDONTERMINAL2FOR208VOLTS.
7. SEECOMPOSITEWIRINGDIAGRAMSININSTALLATIONINSTRUCTIONSFORPROPERLOWVOLTAGE CONNECTIONSANDDETAILSONCOMPATIBLETHERMOSTATSANDTHEIRCONNECTIONS.
8. DISCARDORIGINAL"PL1"PLUGCONNECTORWHENINSTALLINGOPTIONALHEATKIT.

CONTROLSSHOWNWITHUTILITIESIN"ON"POSITIONANDTHERMOSTATIN"OFF"POSITION.

0140A00041-B

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**WARNING**

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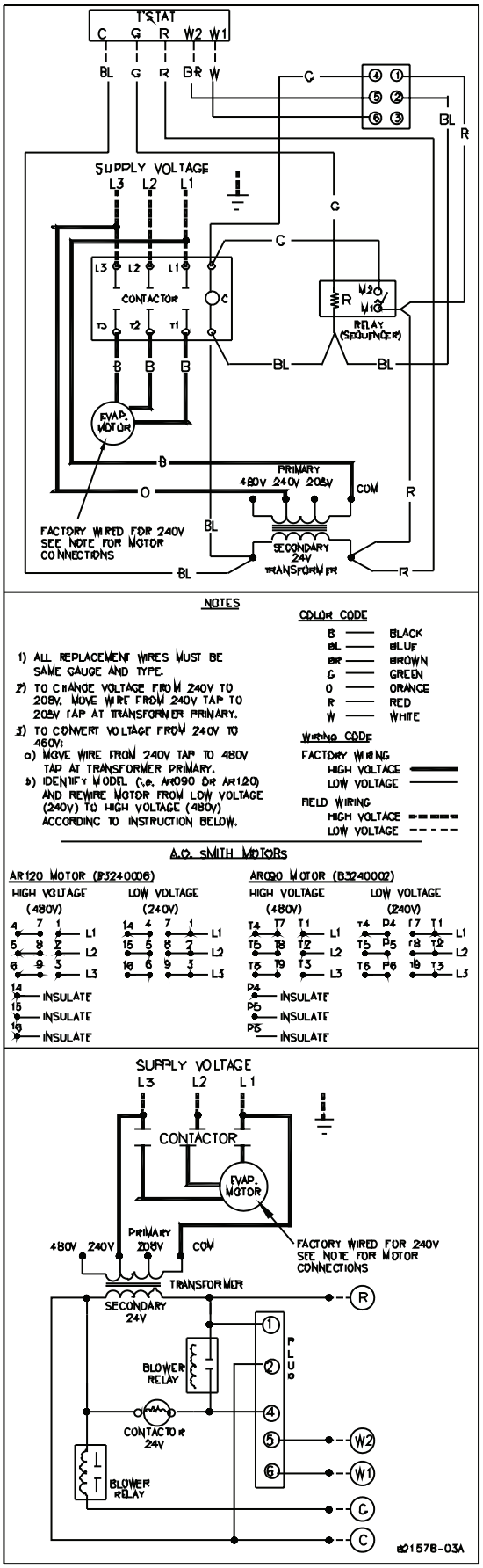
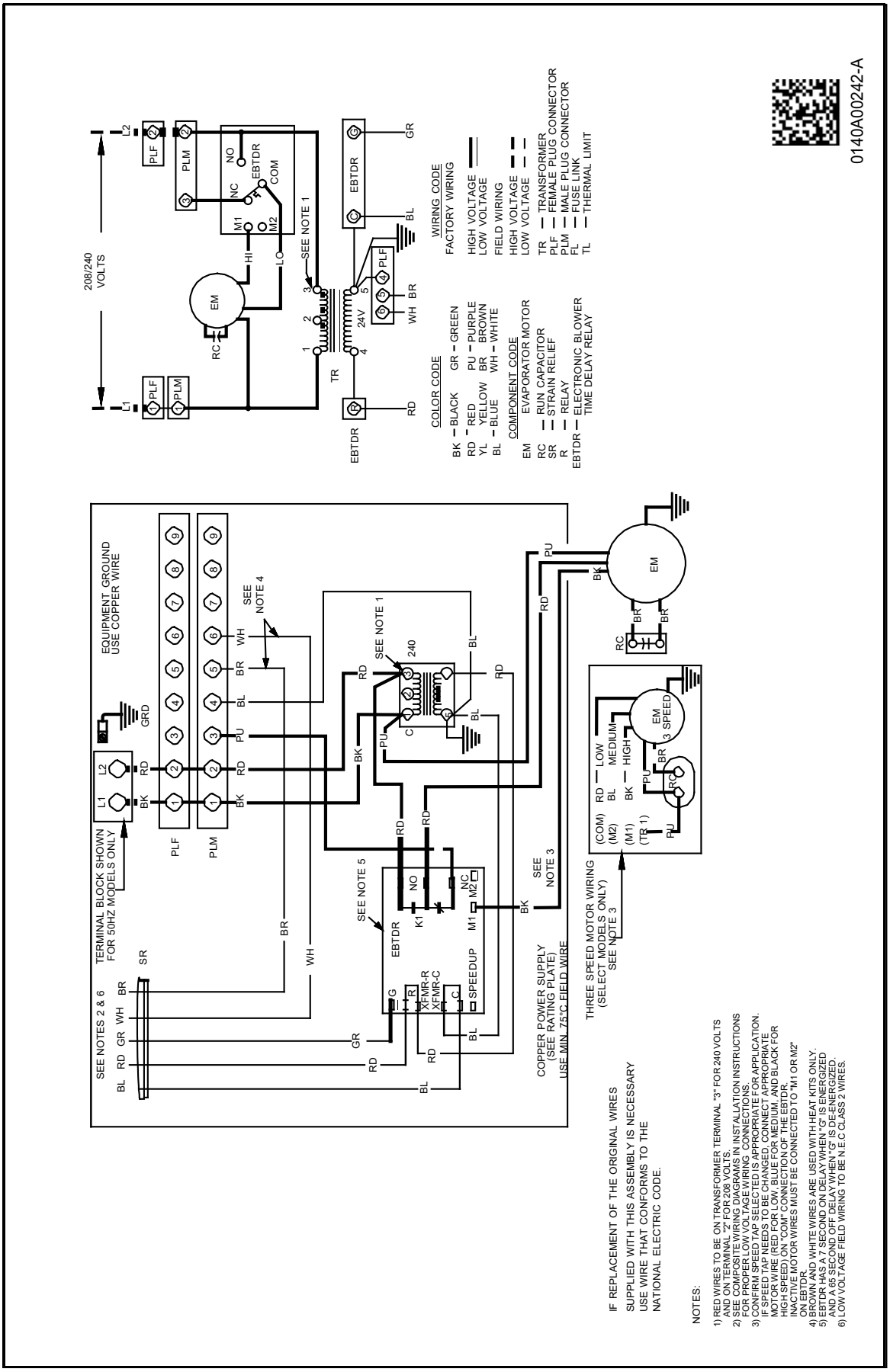



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**WARNING**

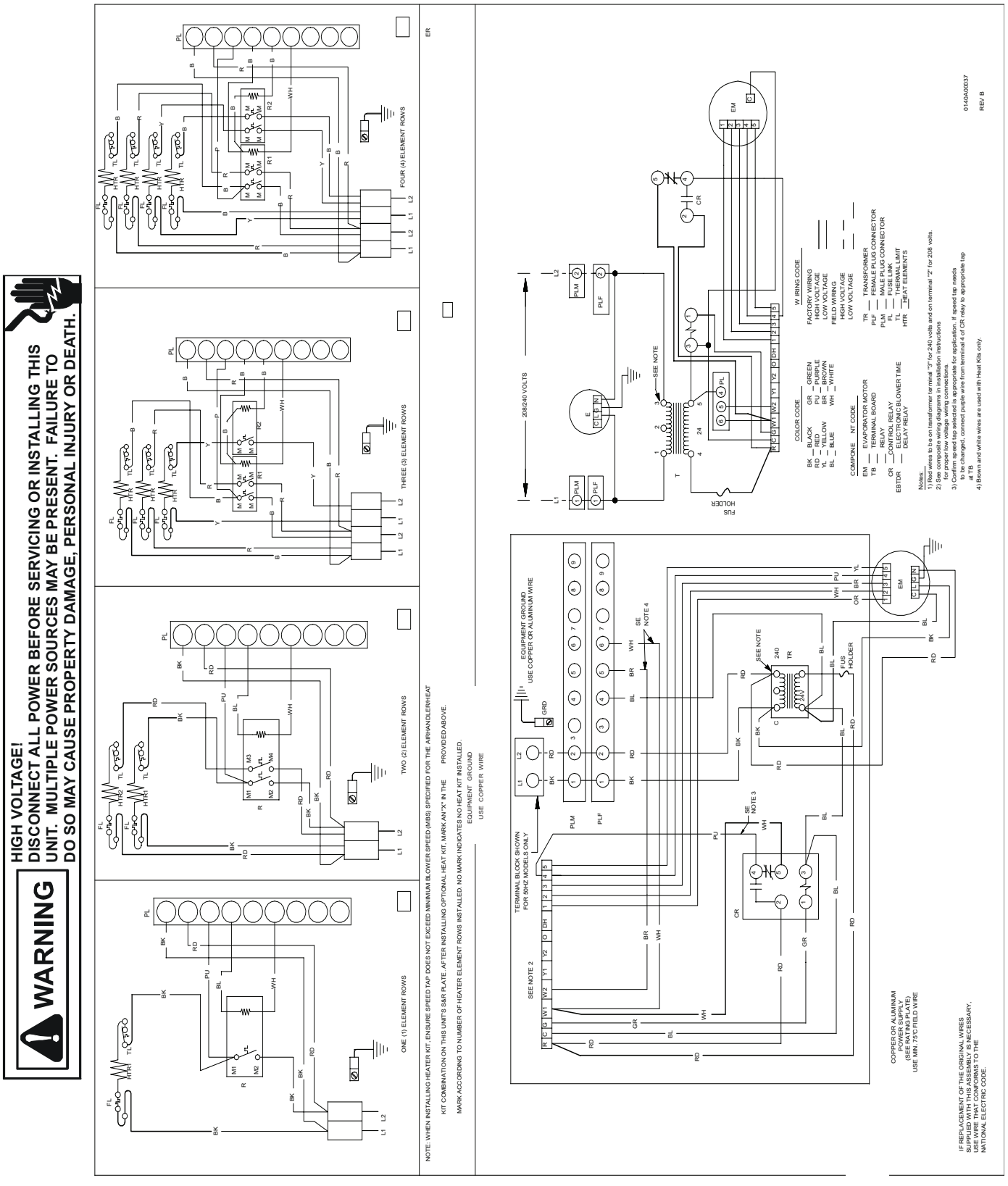
**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

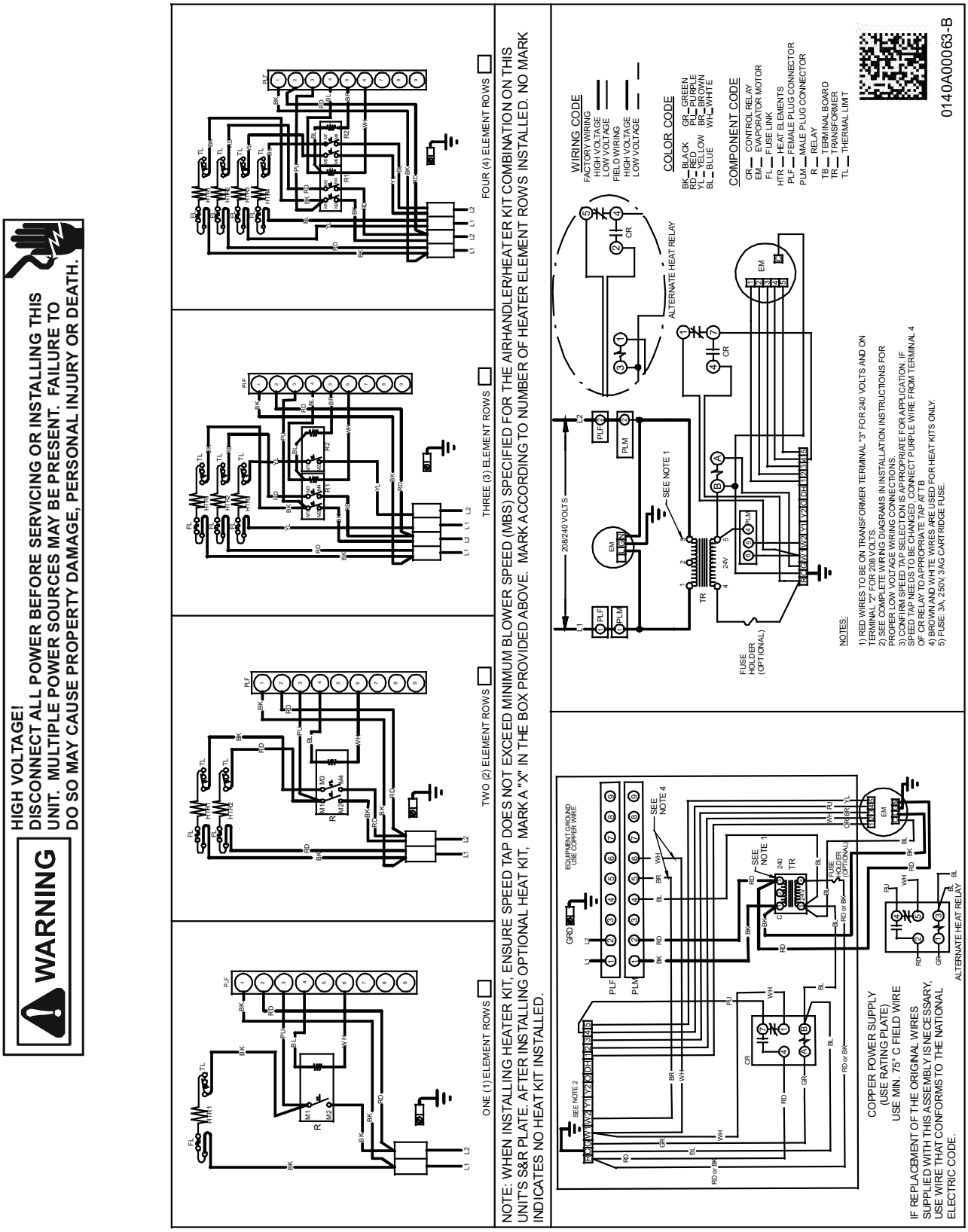
# WIRING DIAGRAMS

**ASPF******BA**



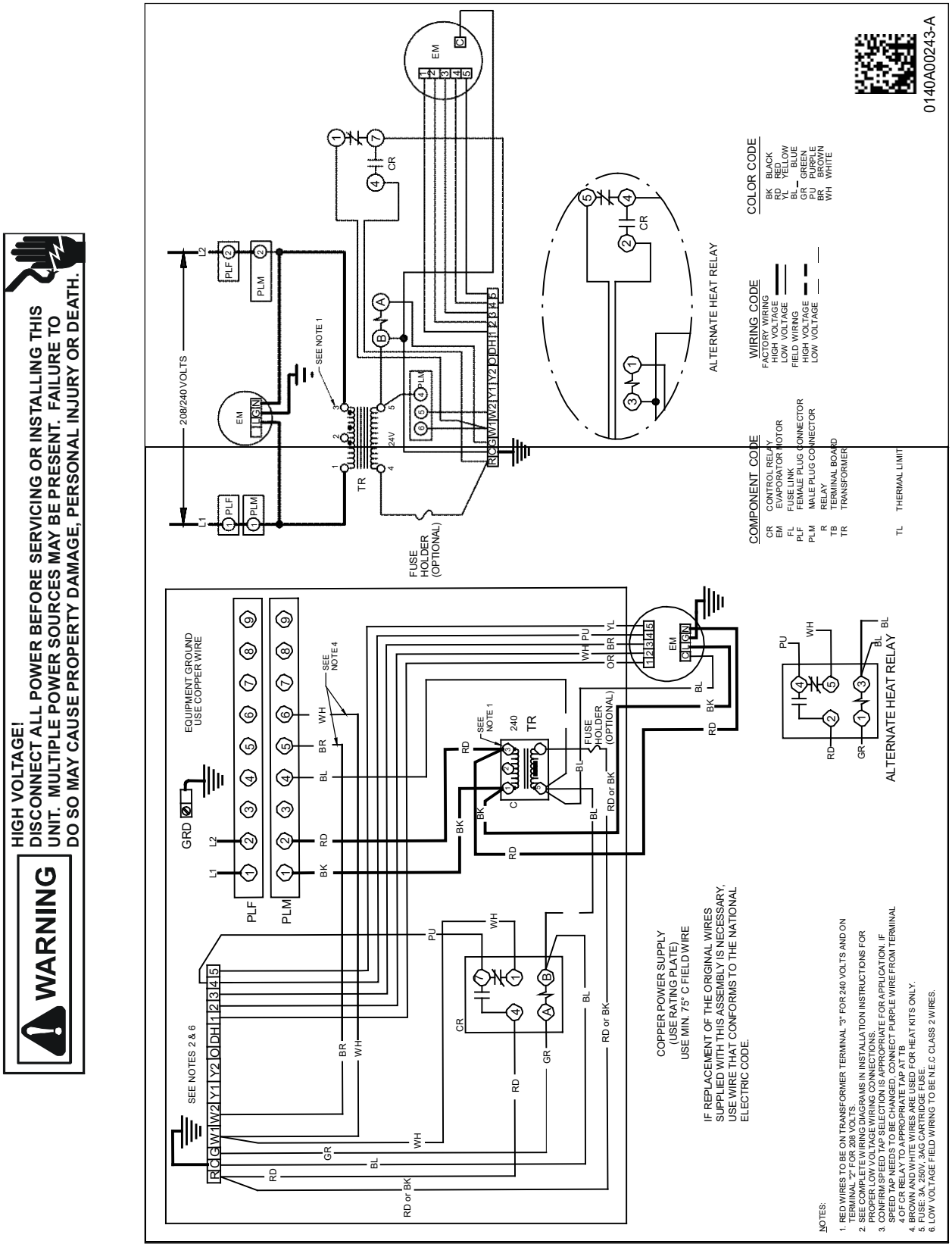

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS



**3-PHASE HEAT KIT**

**WARNING**

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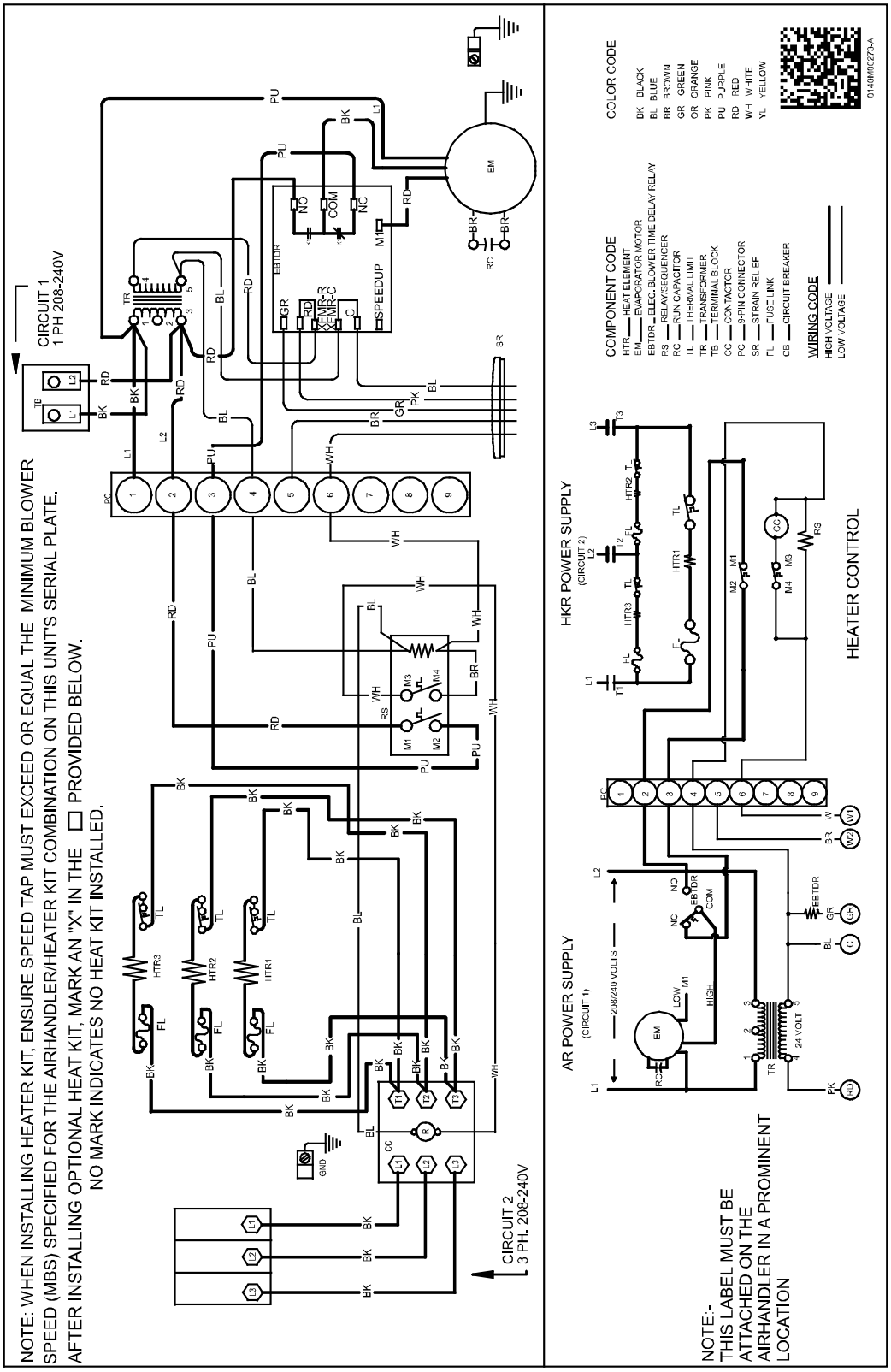
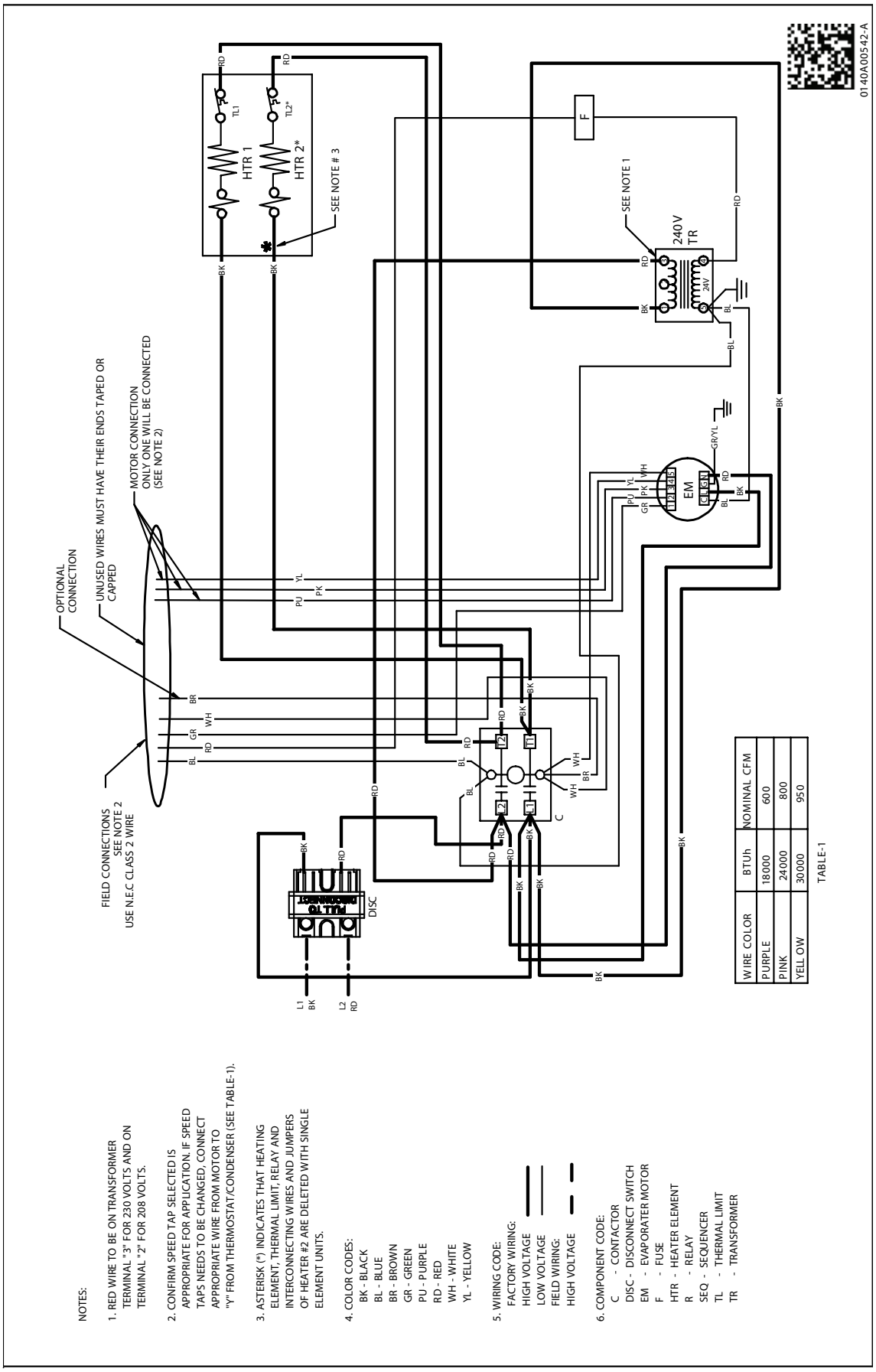



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.



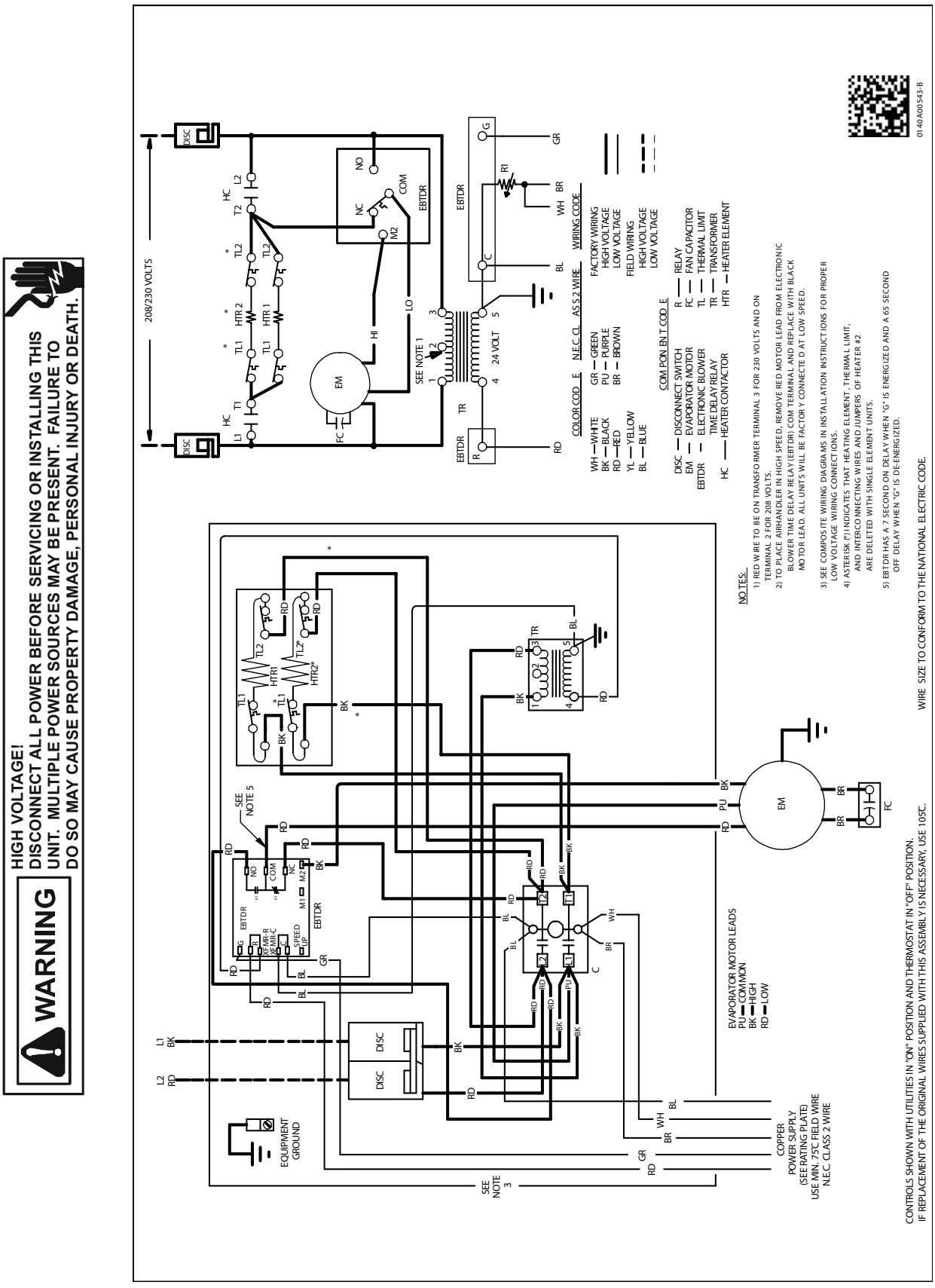

| WIRE COLOR | BTUh | NOMINAL CFM |
|---|---|---|
| PURPLE | 18000 | 600 |
| PINK | 24000 | 800 |
| YELL OW | 30000 | 950 |

TABLE-1

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**AWUF180[316,516,816]BD, AWUF240[316,516,816]BD, AWUF241016BD,AWUF300[516,816]BE, AWUF301016BE, AWUF360[516,816]BE, AWUF361016BE, AWUT24[05,08,10]14AA**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

**WARNING**

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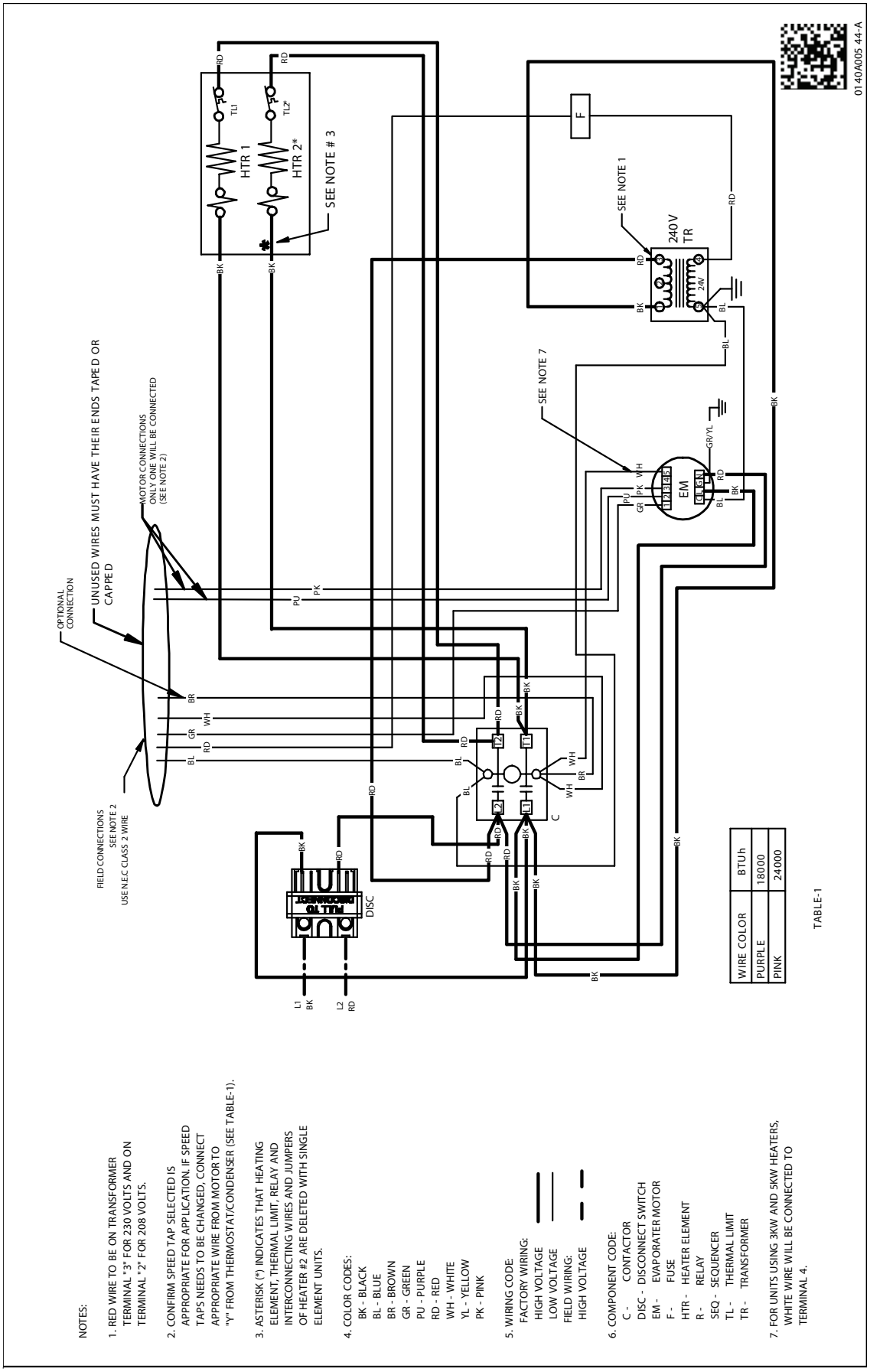
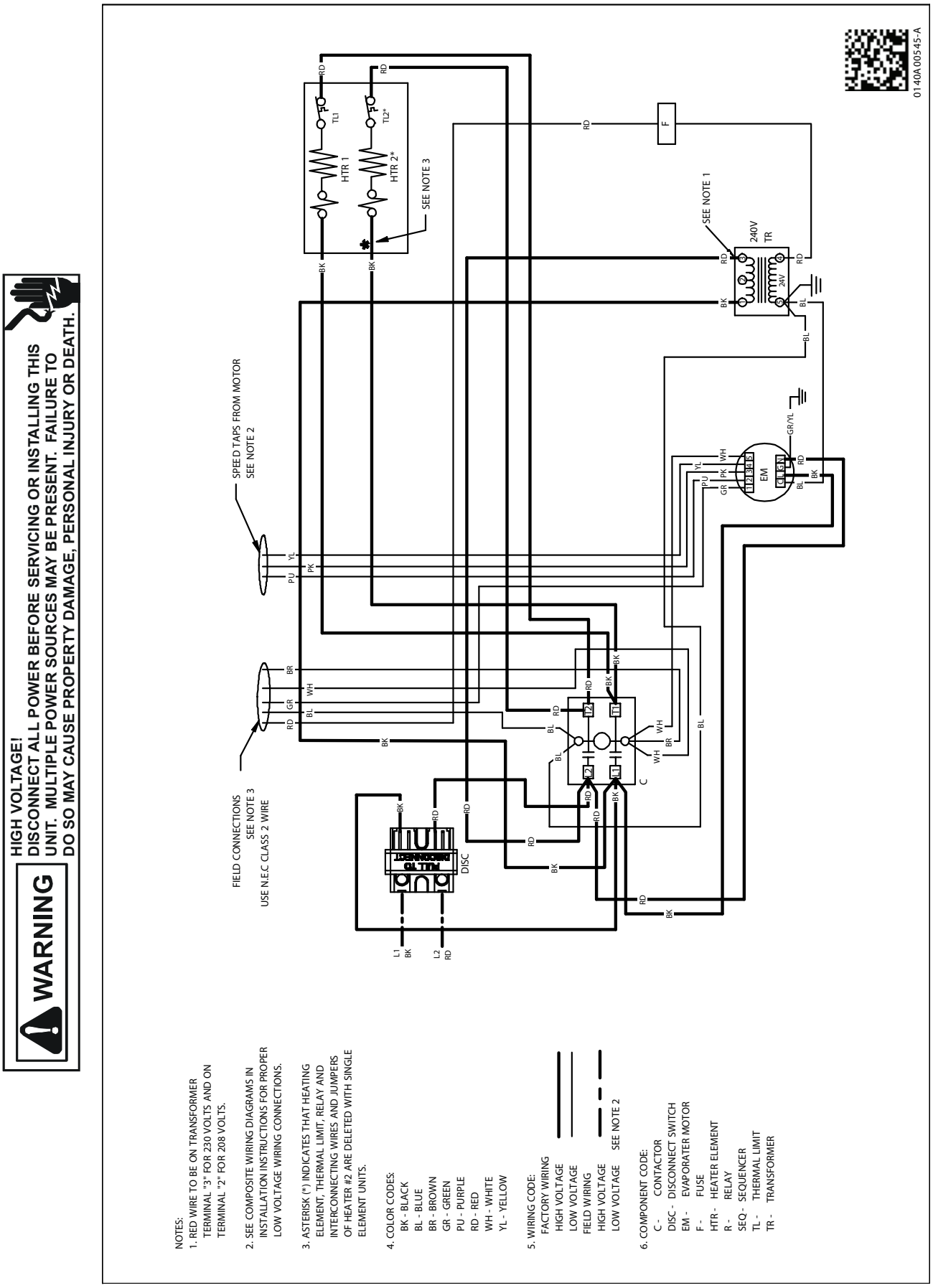



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

**WARNING**

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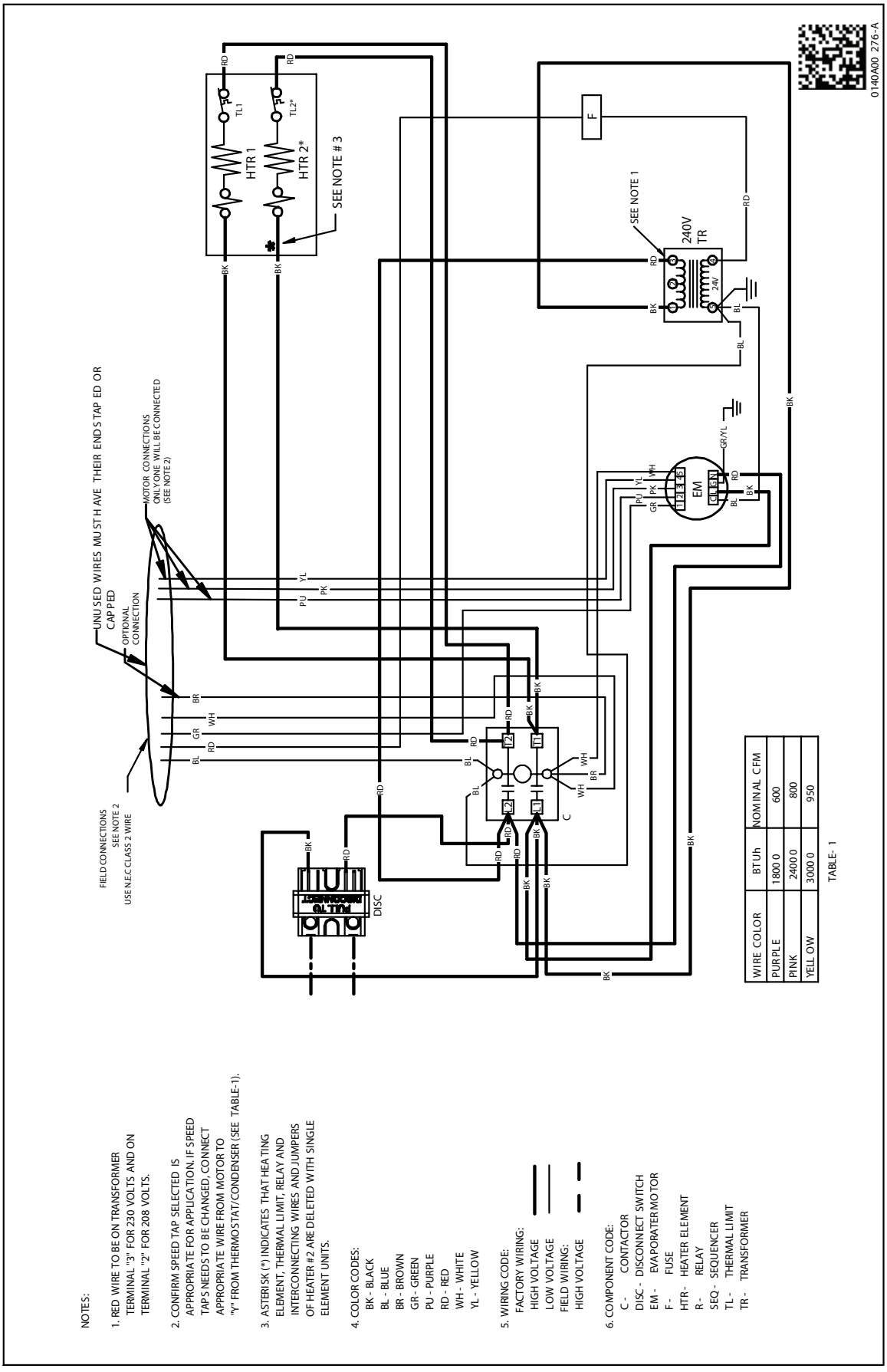



NOTES:

1. RED WIRE TO BE ON TRANSFORMER TERMINAL "3" FOR 230 VOLTS AND ON TERMINAL "2" FOR 208 VOLTS.
2. CONFIRM SPEED TAP SELECTED IS APPROPRIATE FOR APPLICATION. IF SPEED TAP S NEEDS TO BE CHANGED, CONNECT APPROPRIATE WIRE FROM MOTOR TO "Y" FROM THERMOSTAT/CONDENSER (SEE TABLE-1).
3. ASTERISK (*) INDICATES THAT HEATING ELEMENT, THERMAL LIMIT, RELAY AND INTERCONNECTING WIRES AND JUMPERS OF HEATER #2 ARE DELETED WITH SINGLE ELEMENT UNITS.
4. COLOR CODES:
   - BK - BLACK
   - BL - BLUE
   - BR - BROWN
   - GR - GREEN
   - PU - PURPLE
   - RD - RED
   - WH - WHITE
   - YL - YELLOW
5. WIRING CODE:
   - FACTORY WIRING:
     - HIGH VOLTAGE
     - LOW VOLTAGE
   - FIELD WIRING:
     - HIGH VOLTAGE
6. COMPONENT CODE:
   - C - CONTACTOR
   - DISC - DISCONNECT SWITCH
   - EM - EVAPORATER MOTOR
   - F - FUSE
   - HTR - HEATER ELEMENT
   - R - RELAY
   - SEQ - SEQUENCER
   - TL - THERMAL LIMIT
   - TR - TRANSFORMER

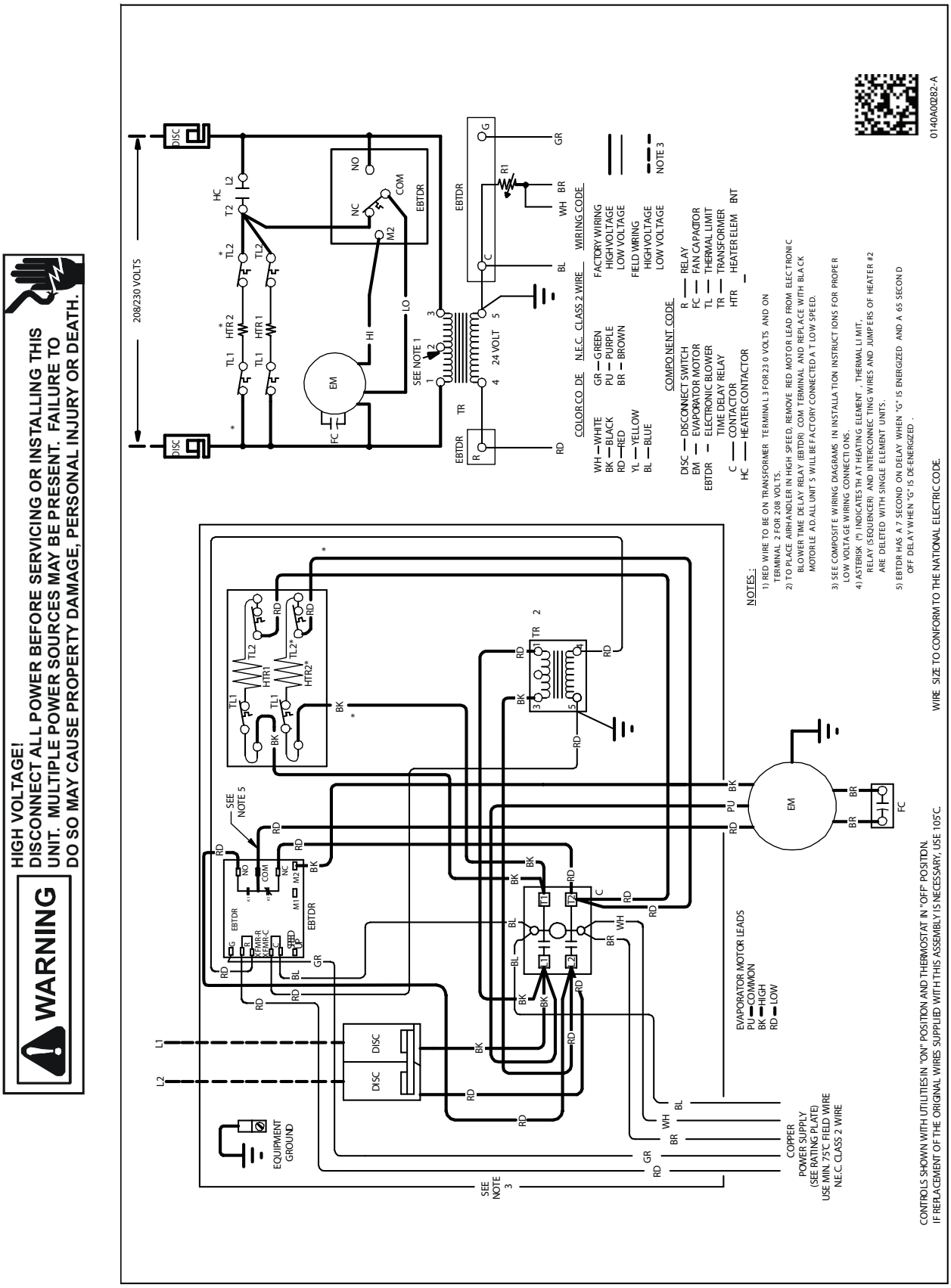
| WIRE COLOR | BTUh | NOMINAL CFM |
|---|---|---|
| PURPLE | 18000 | 600 |
| PINK | 24000 | 800 |
| YELLOW | 30000 | 950 |

TABLE- 1

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS



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# WIRING DIAGRAMS



**WARNING**

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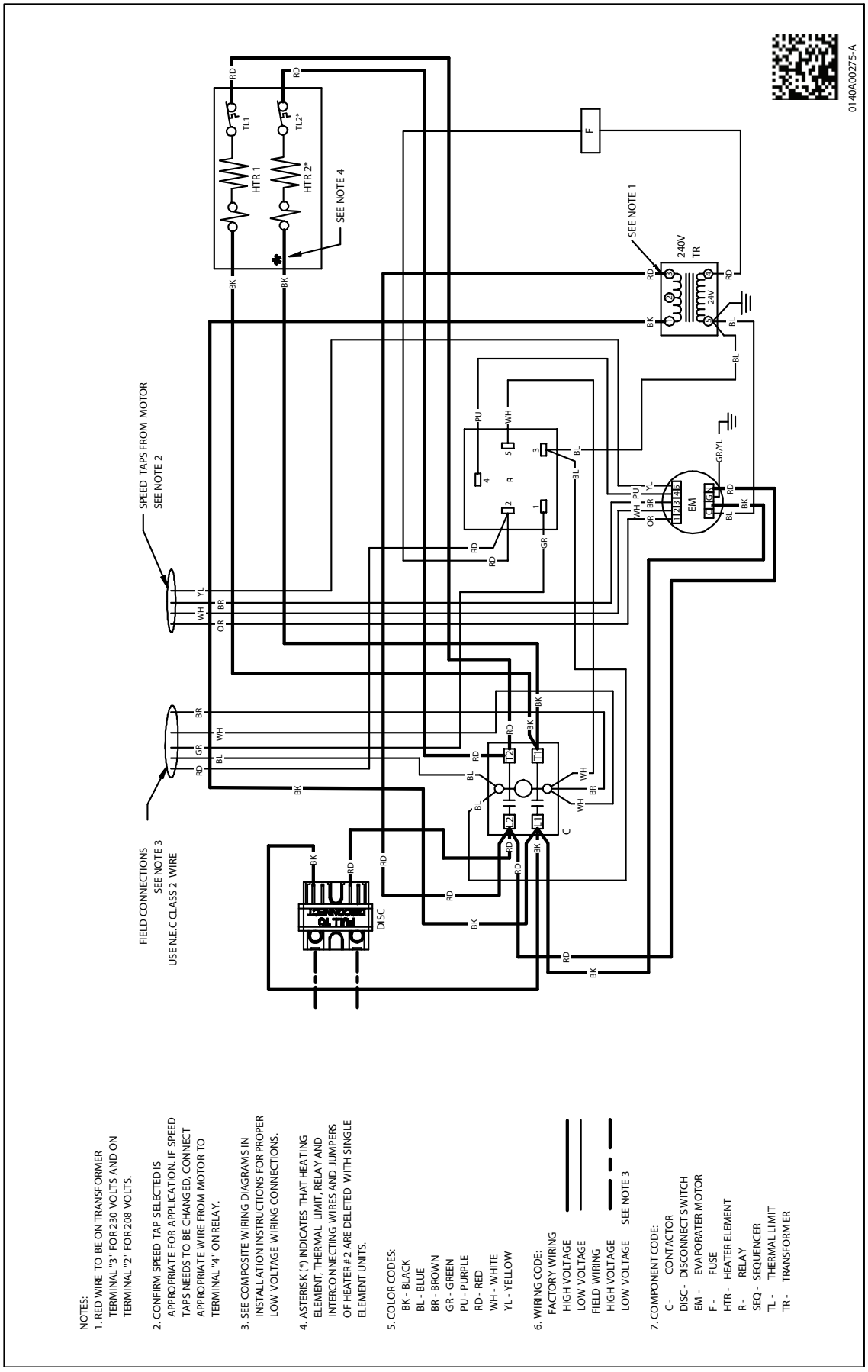
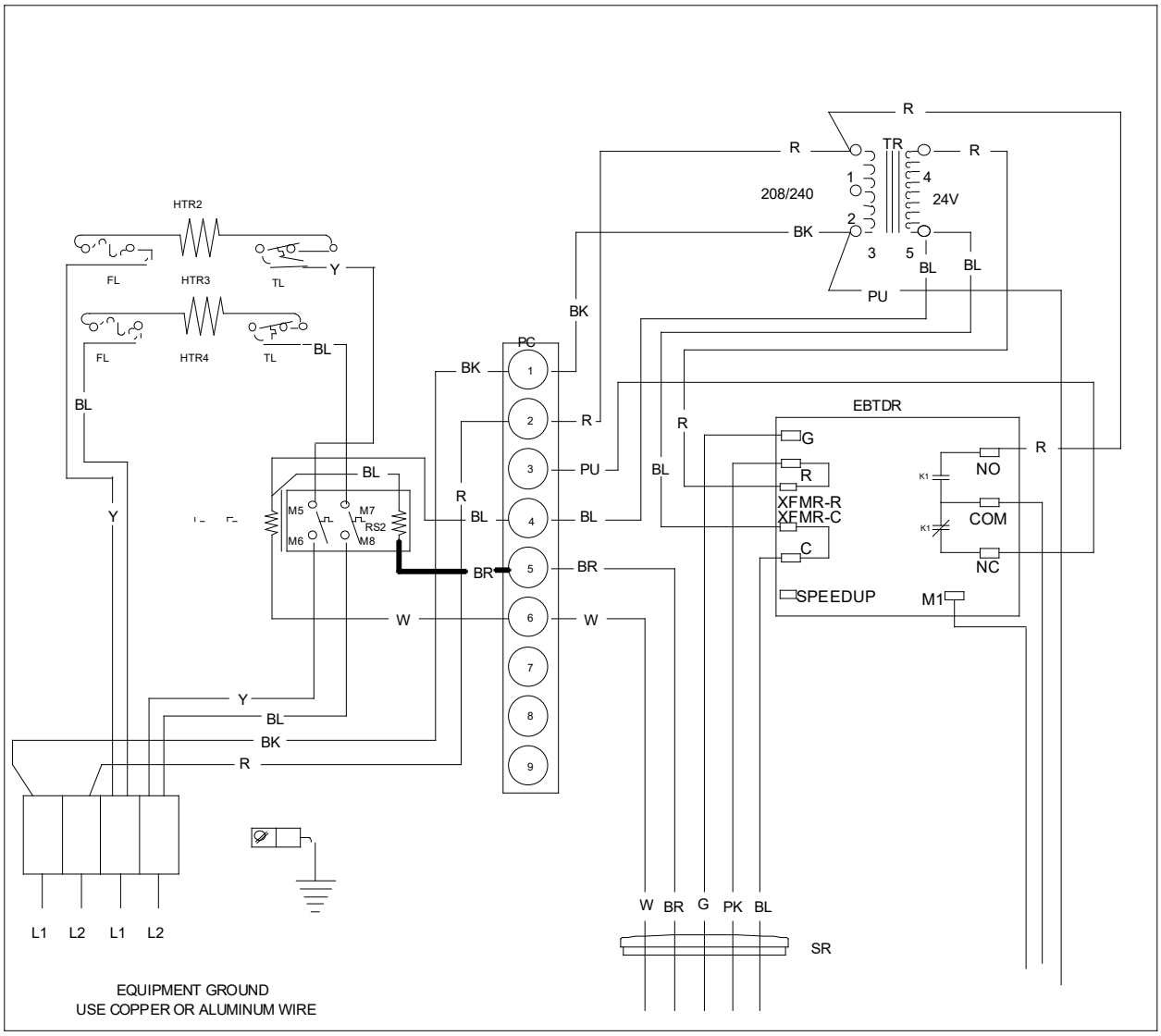



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS




USE COPPER WIRE

**WARNING**

**HIGH VOLTAGE!**
**DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

Typical Wiring Schematic MBR Blower with Electric Heat.
This wiring diagram is for reference only. Not all wiring is as shown above.
Refer to the appropriate wiring diagram for the unit being serviced.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**WARNING**

**HIGH VOLTAGE!**
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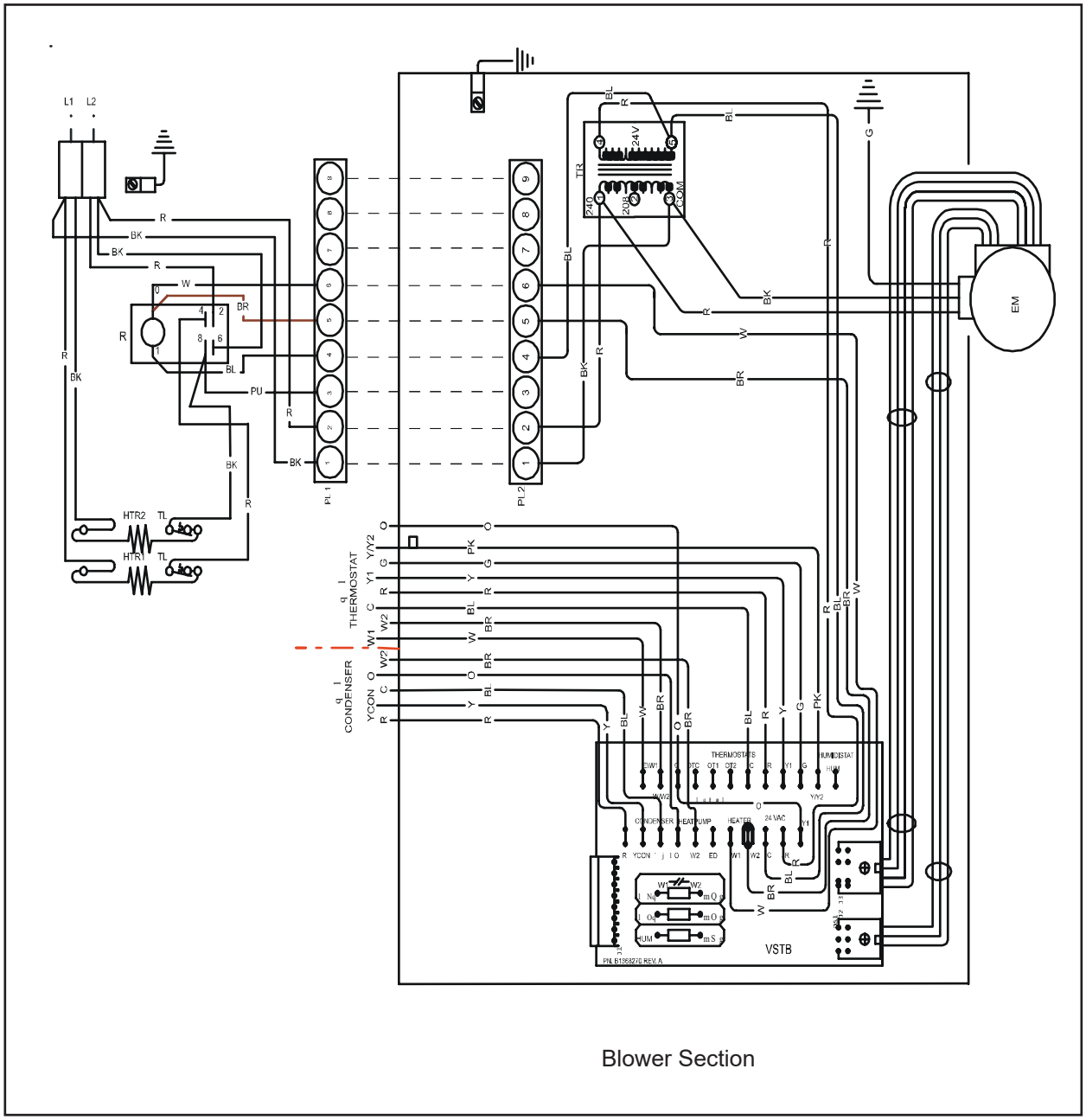


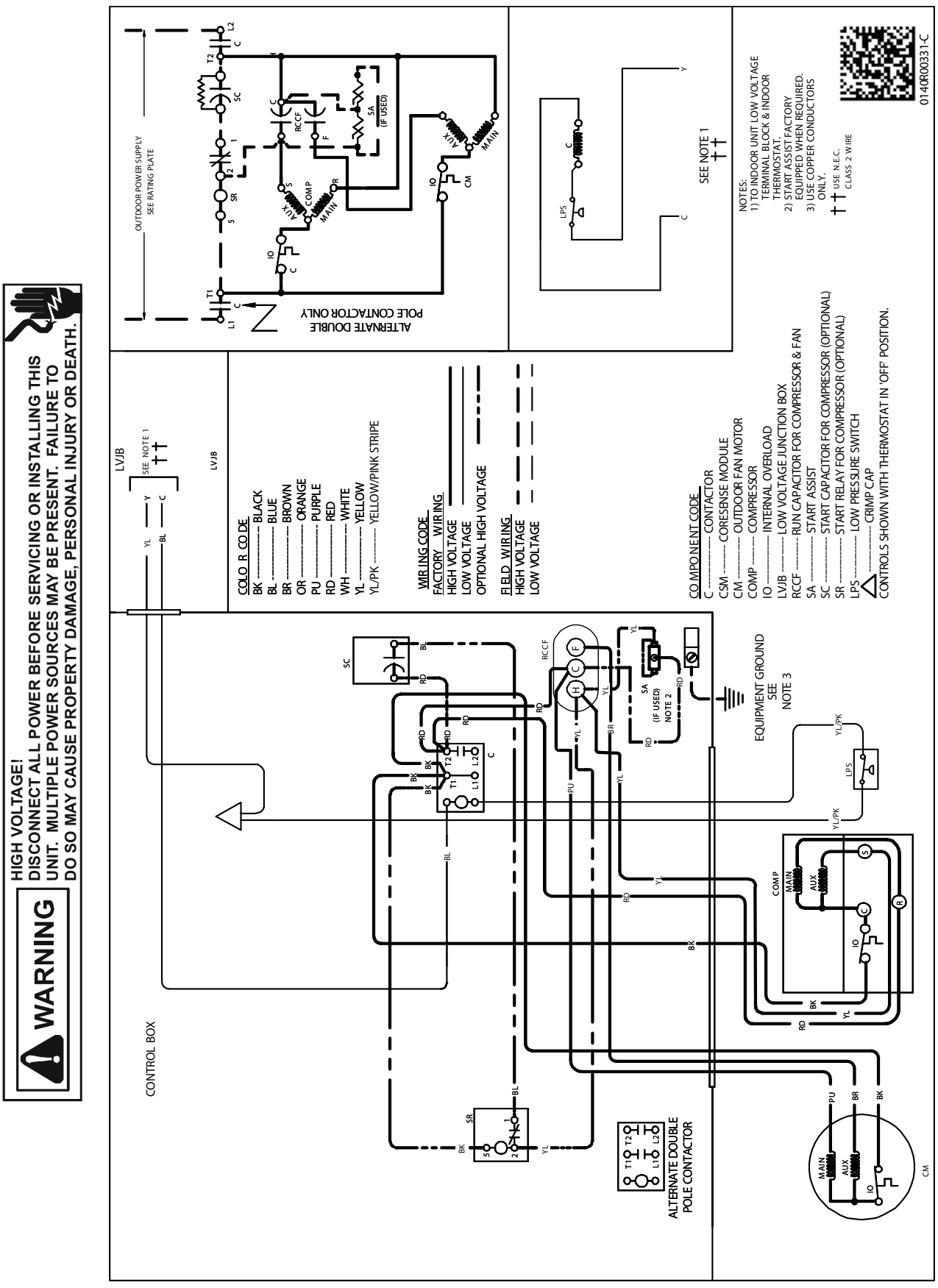

Blower Section

Typical Wiring Schematic MBE Blower with Electric Heat.
This wiring diagram is for reference only.
Not all wiring is as shown above.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

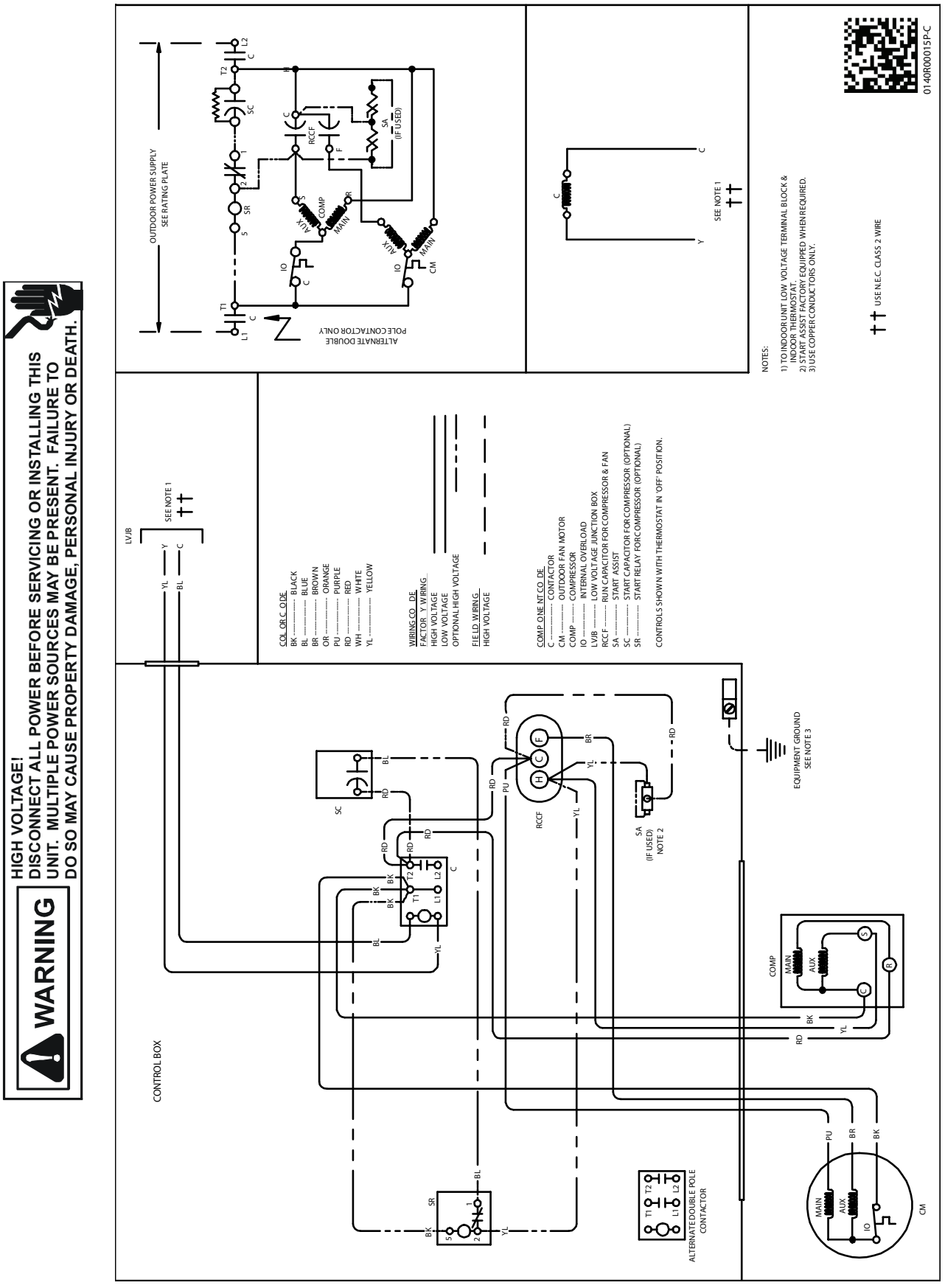
**ANX130[18-24]1A***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

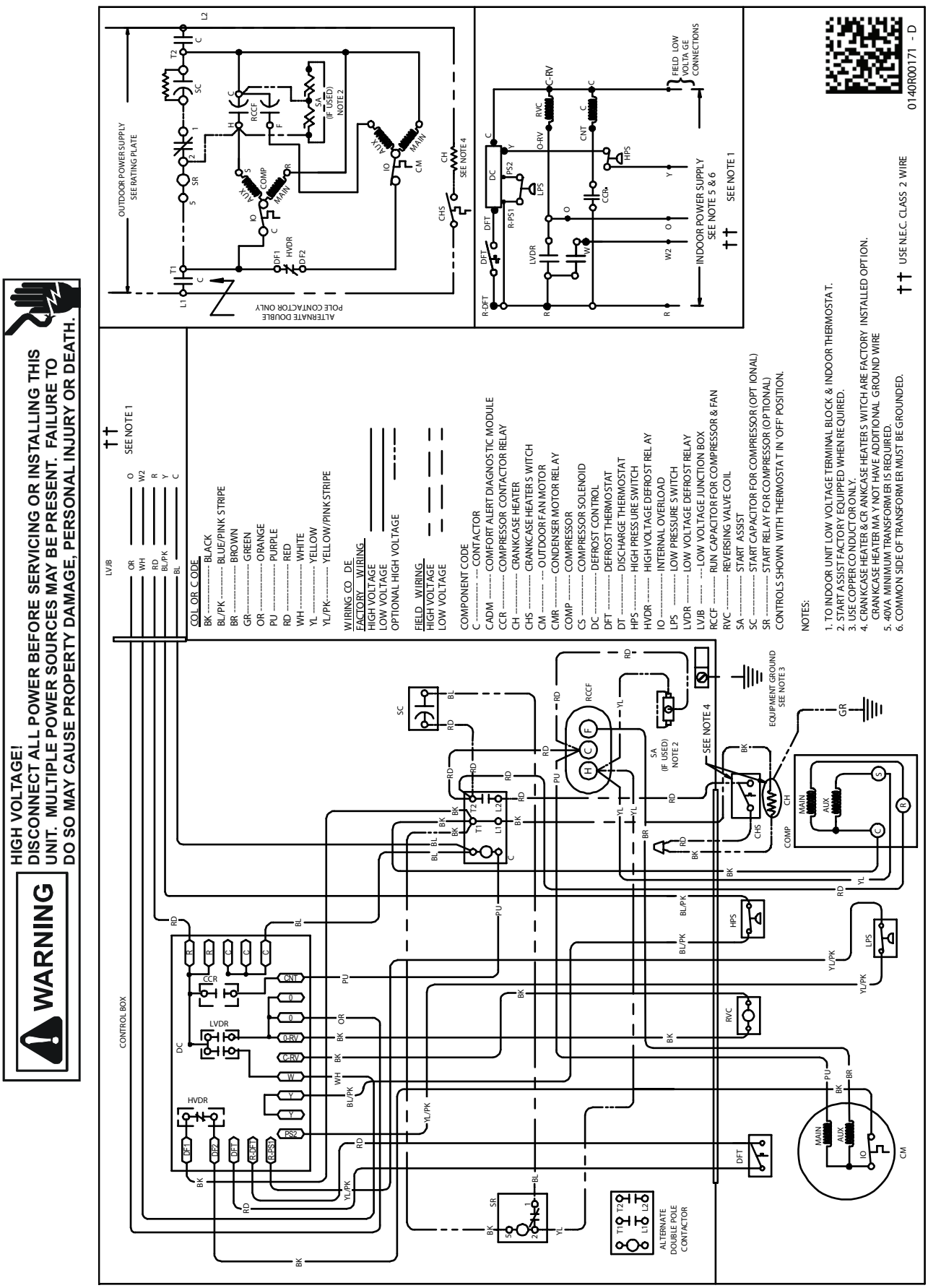
**ANX130[30-61]1A***
**ANX140[18-60]1A***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

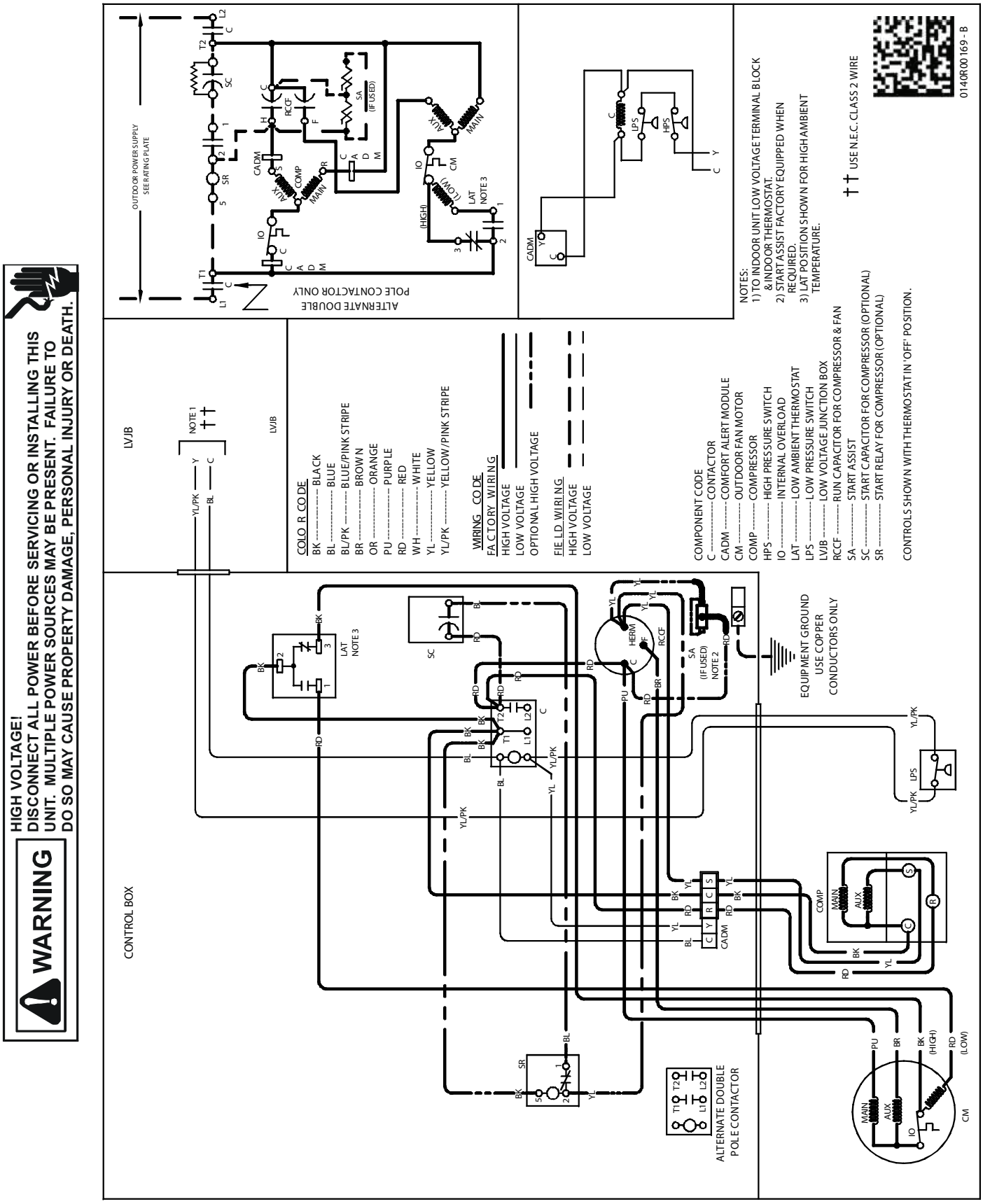
**ANZ130[18-60]1A***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

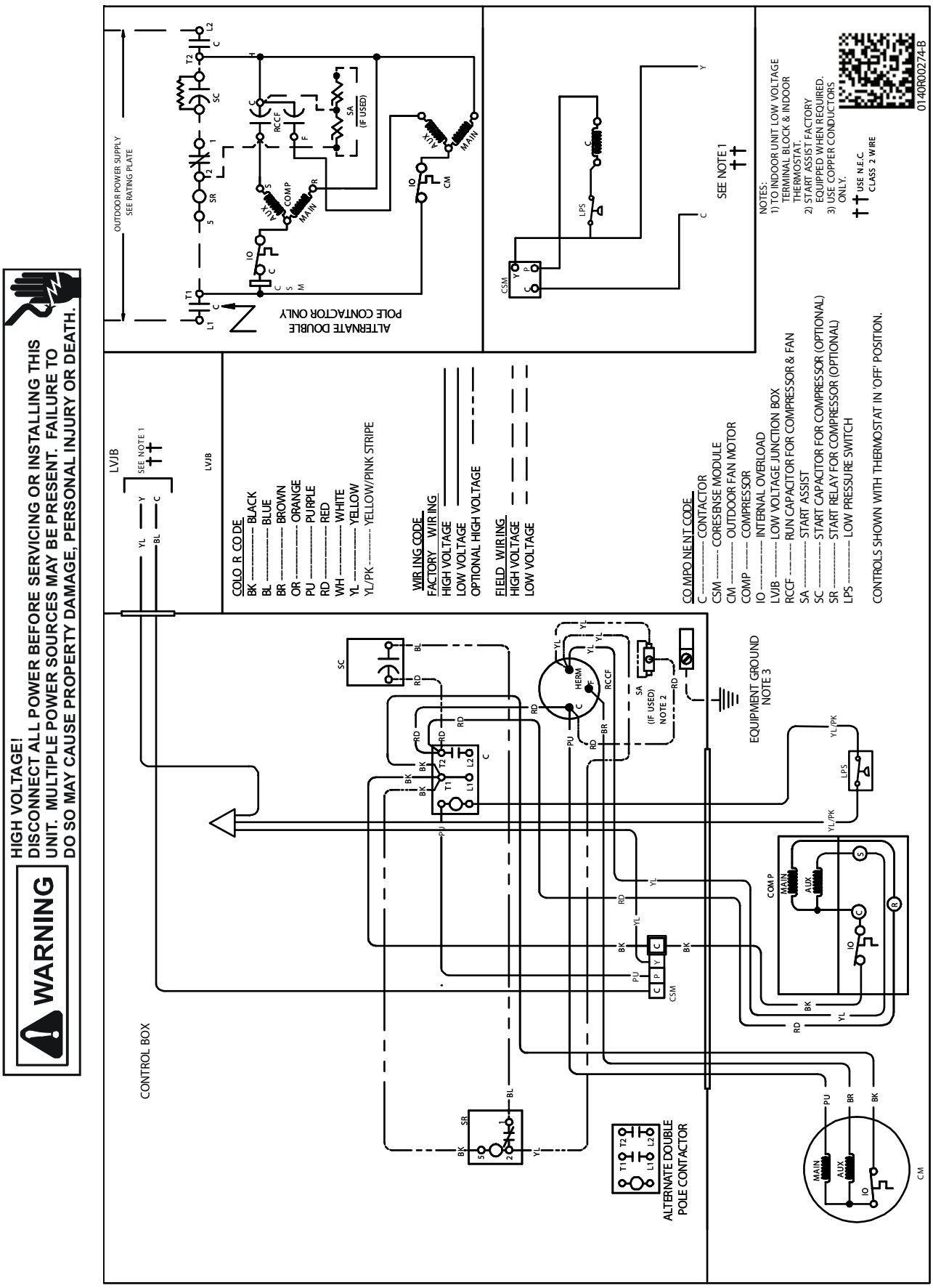
**ASX130[18-48]1C[A/B]/ASX130601CA**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

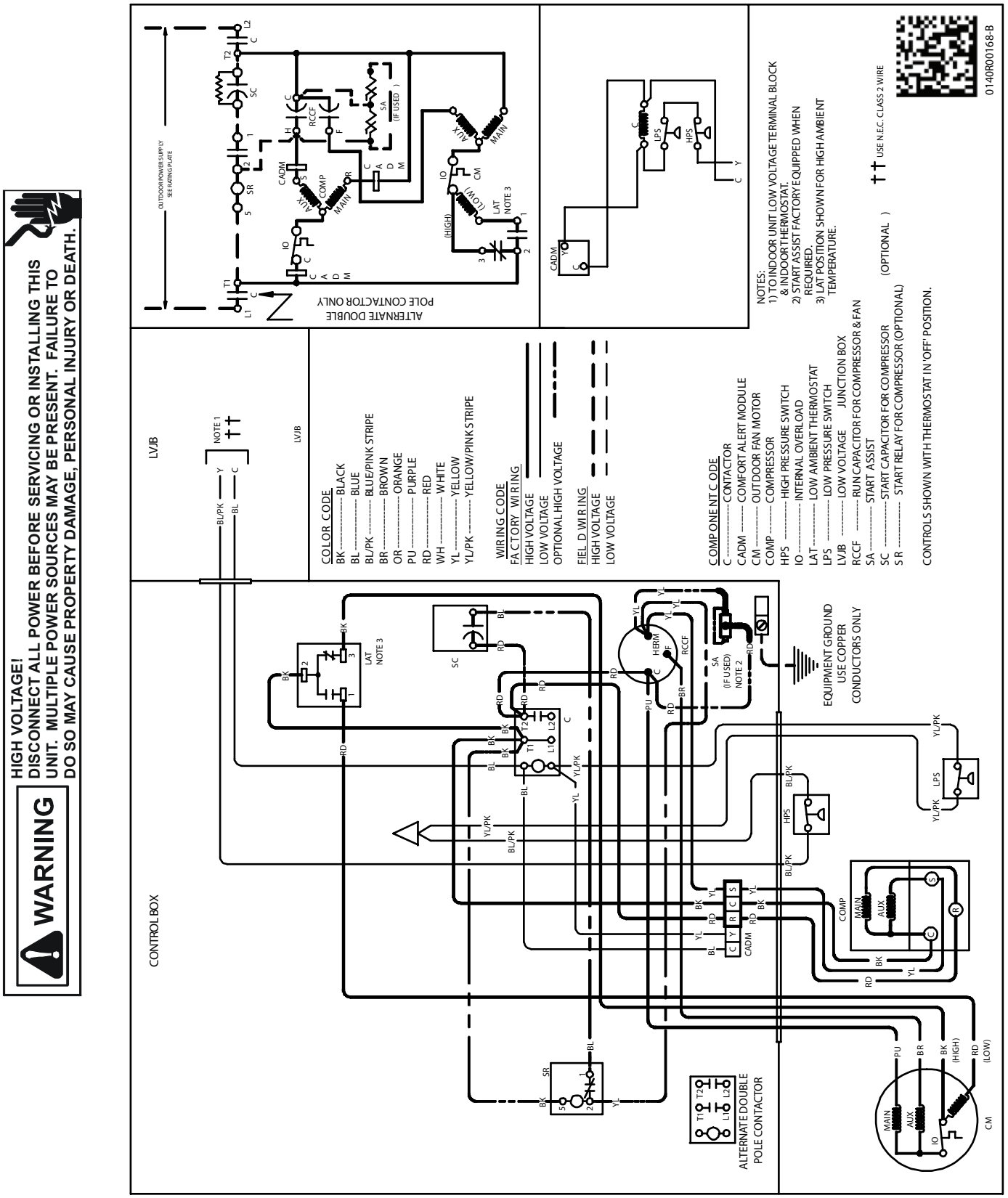





Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

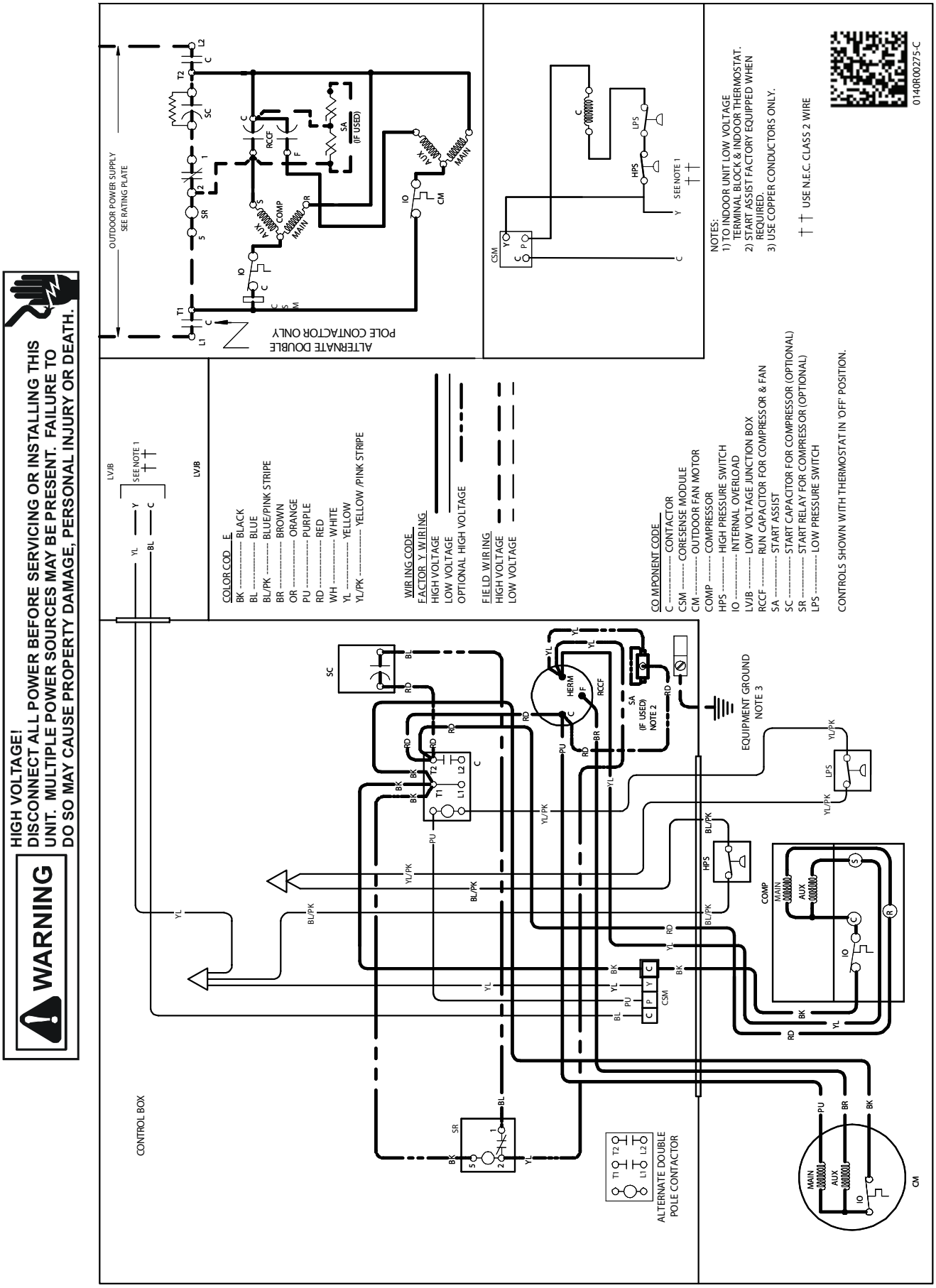
**ASX140[18-36/48]1C[A/B]**
**ASX140421D[A/B] / ASX140[48-60]1[BA/B]**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

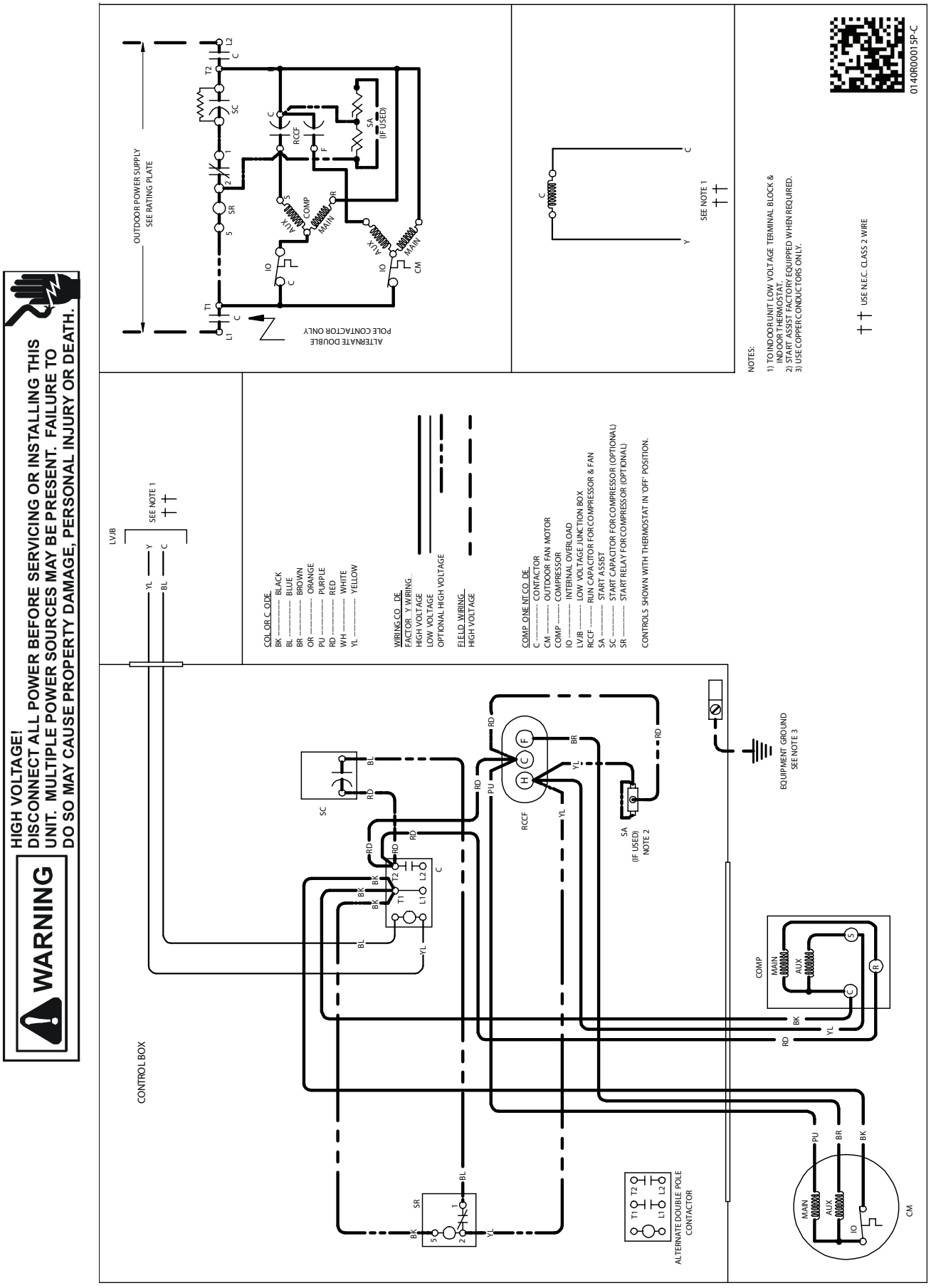
**ASX140[24-36]1CD/ASX140421DD/ASX140481CC/ ASX140601BD/ ASX1401801DB/ ASX140241KB**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

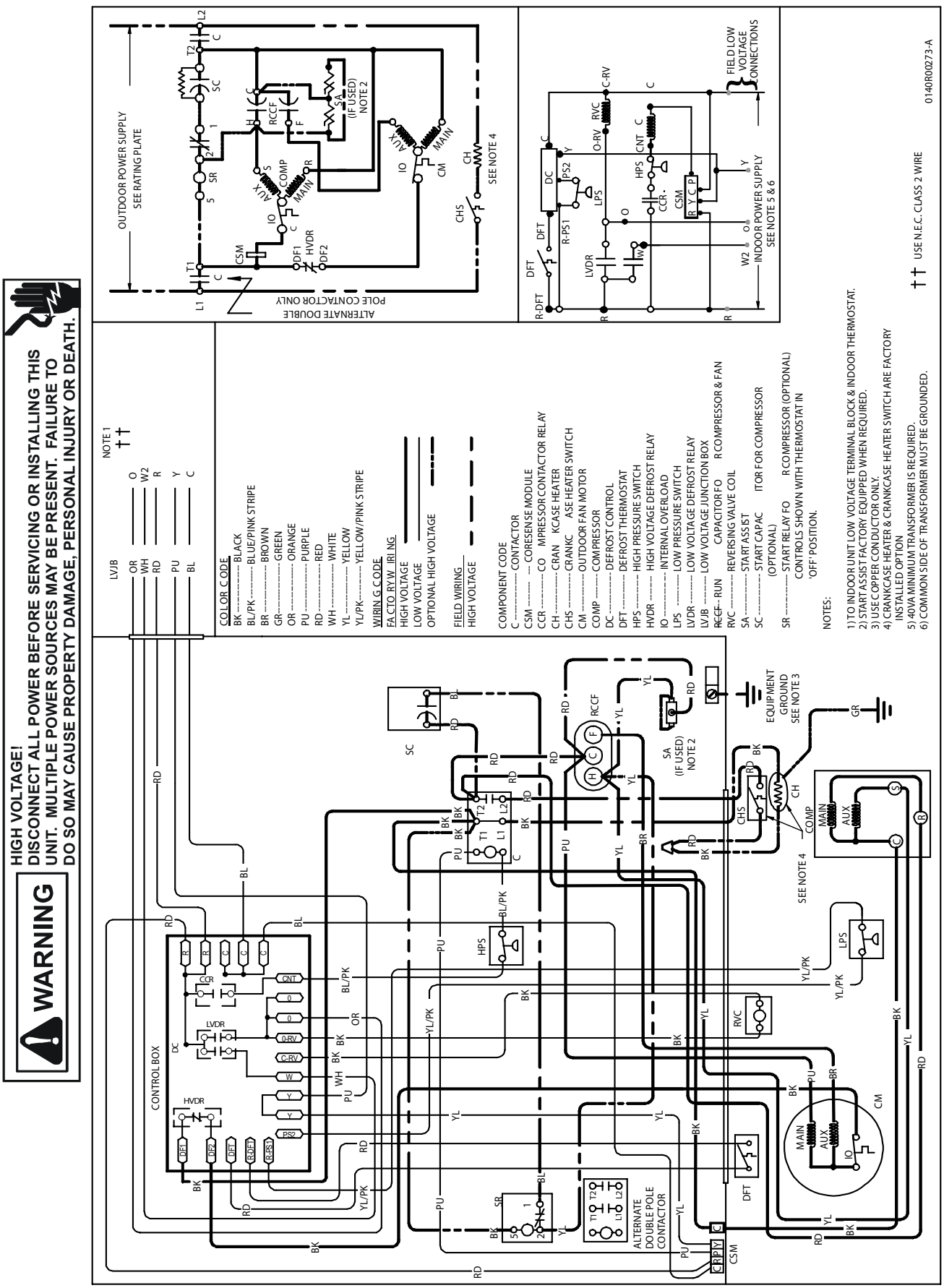
**ASX140[18-60]1KA**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

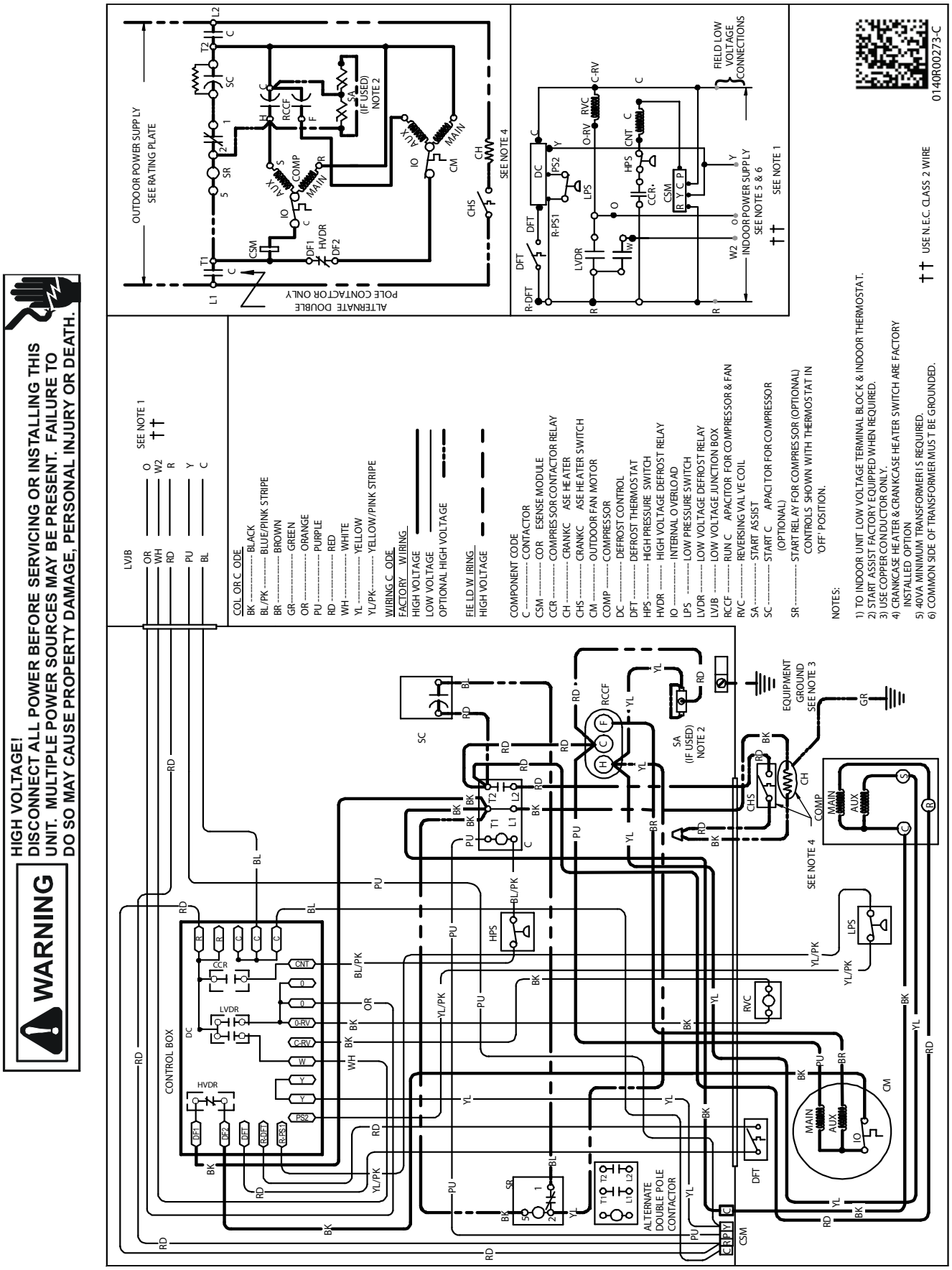





Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

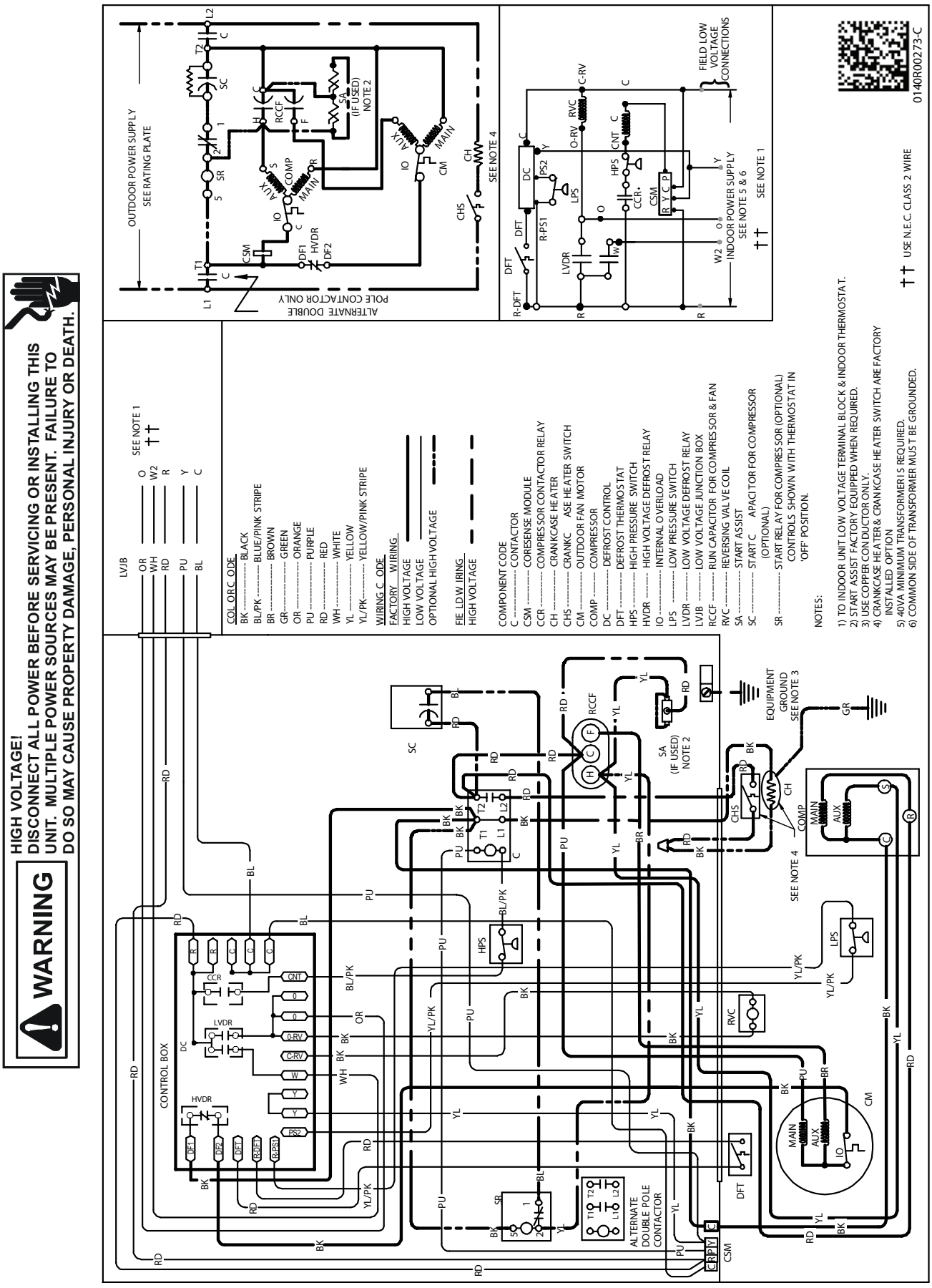
**ASZ140381A*; ASZ140[18,30]1*K; ASZ140241*L;**
**ASZ140301*K; ASZ140421*J; ASZ140[18-30]1B***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

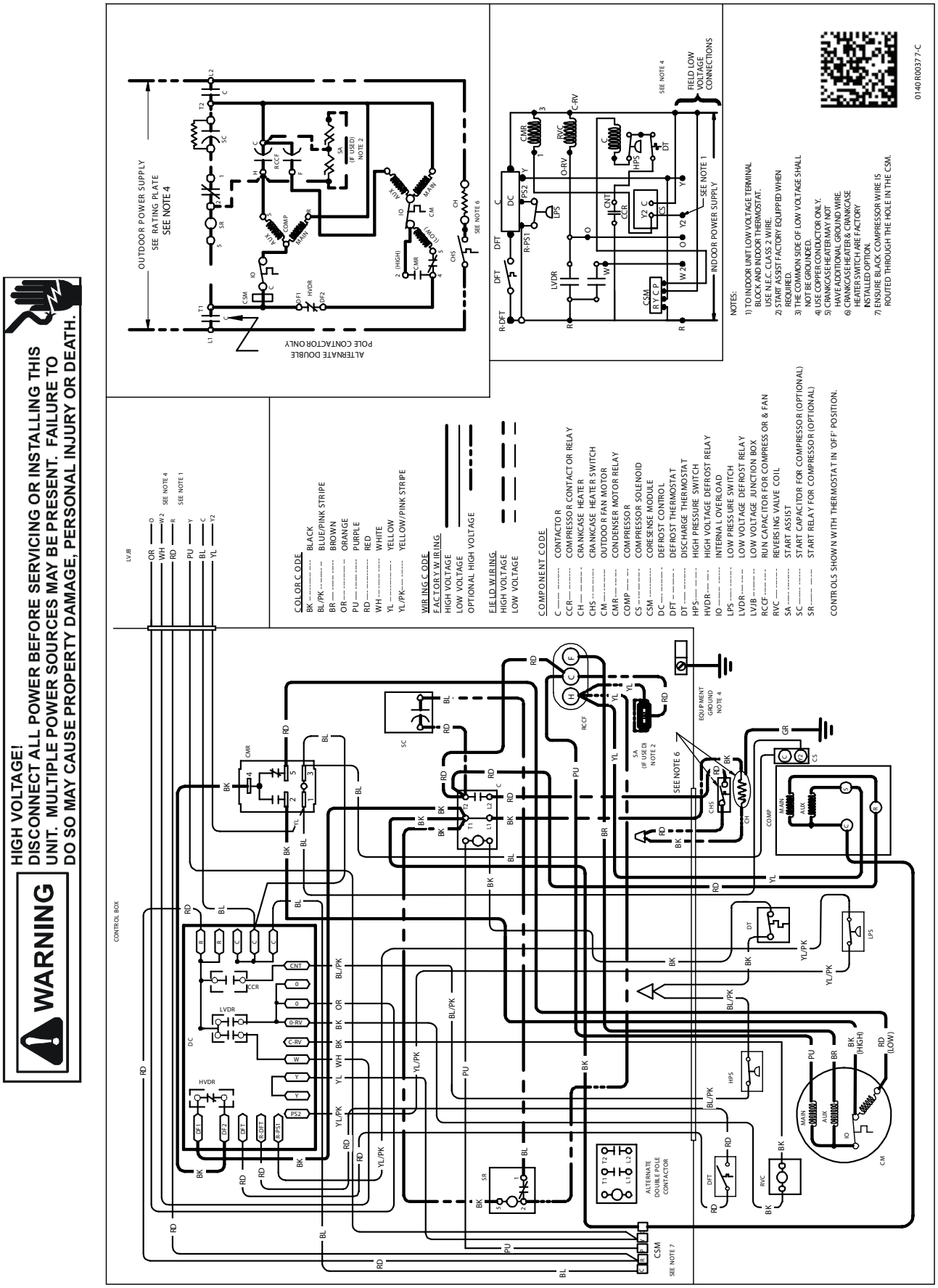
**ASZ160[18-48]1L***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**ASZ160601-L***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

***SX160[24-60]1****

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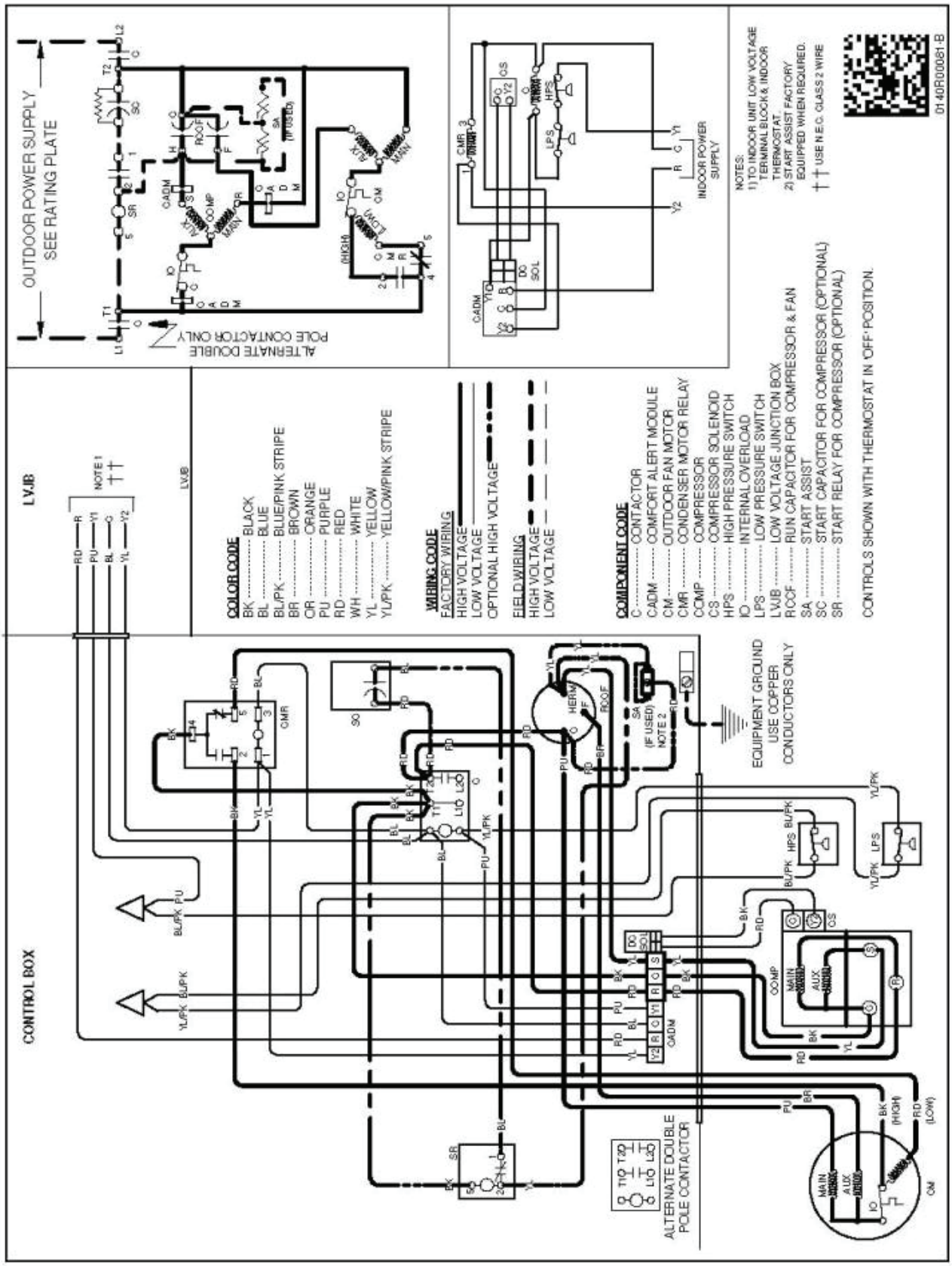


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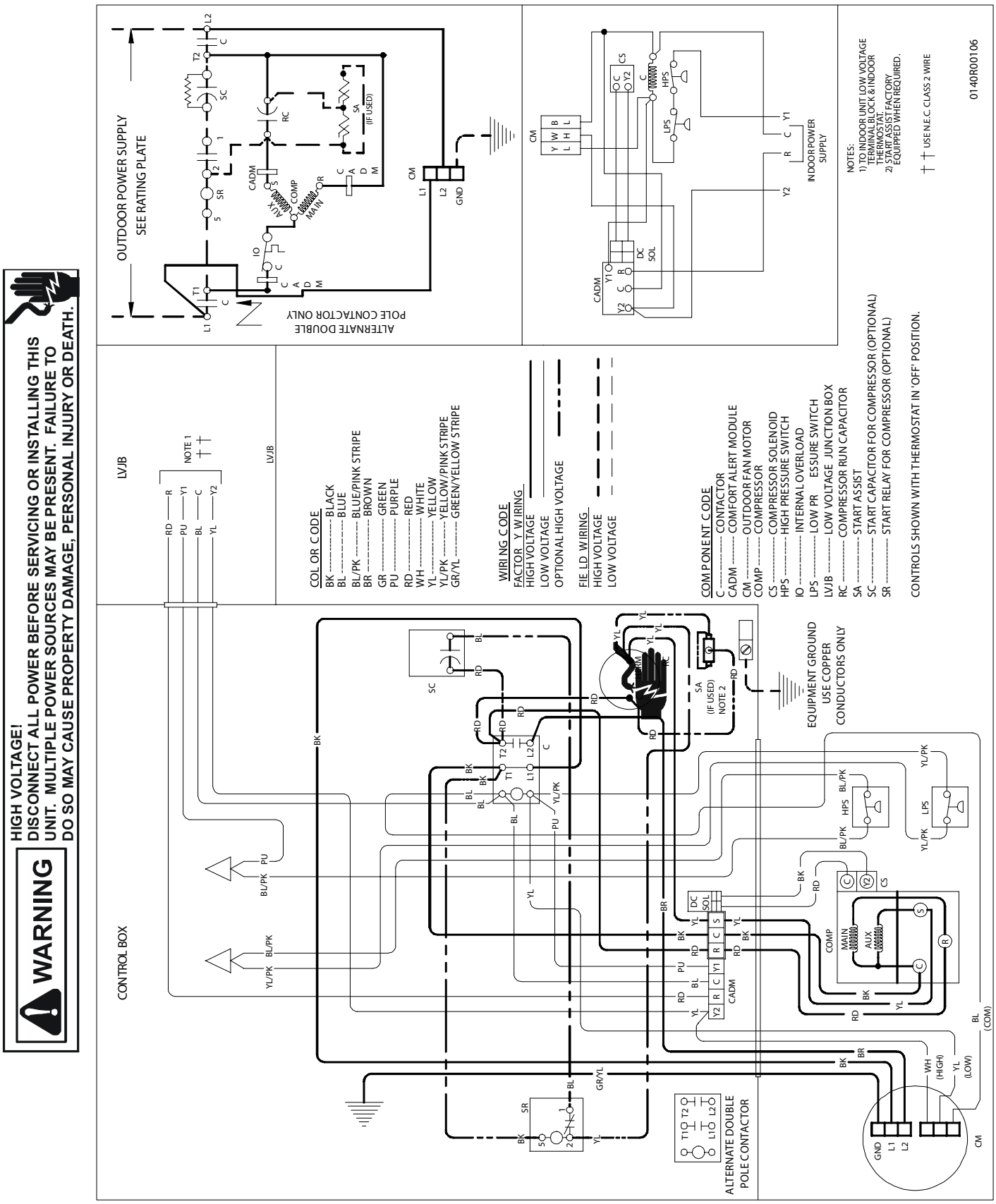
# WIRING DIAGRAMS

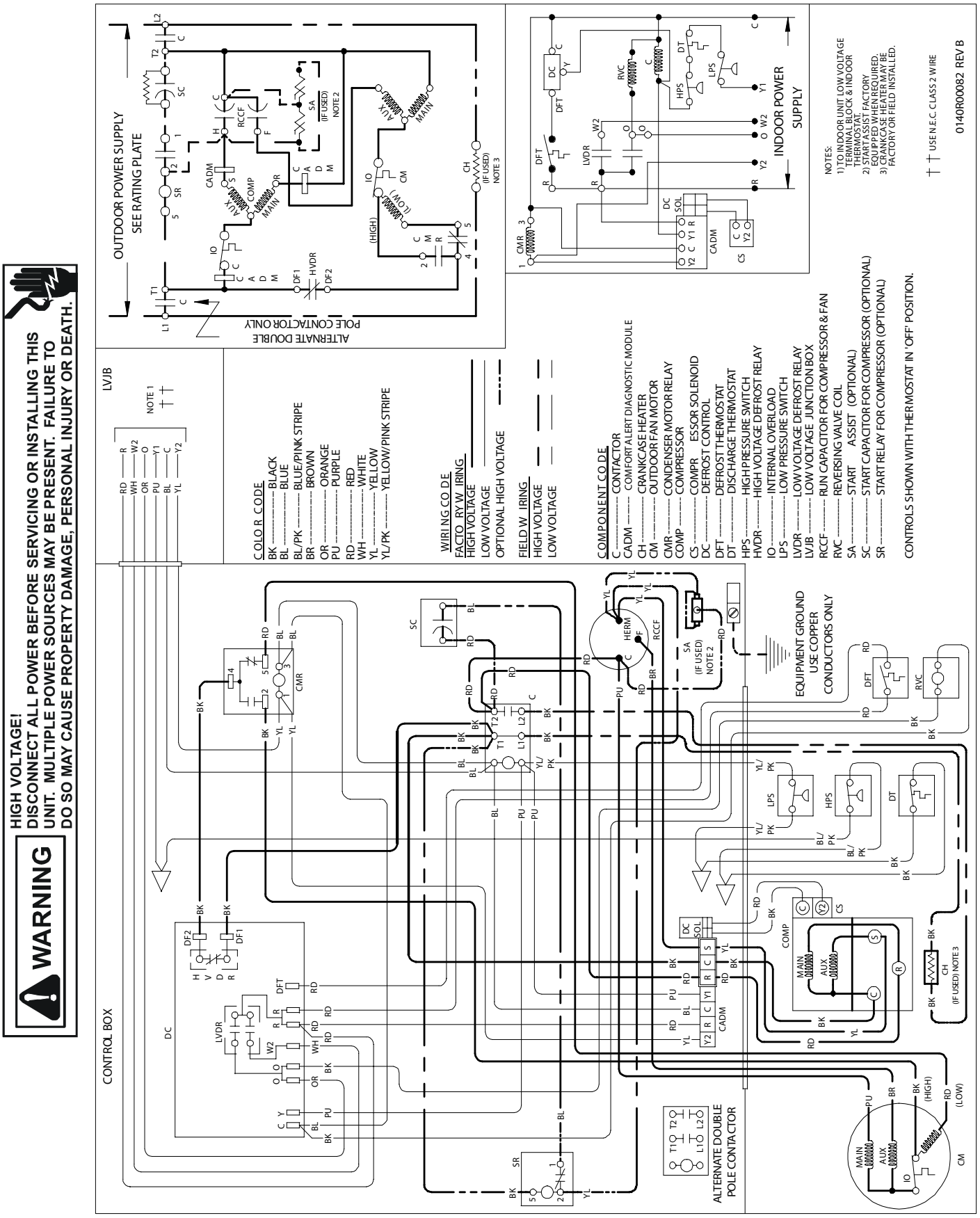
***SX180[36-60]1A***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

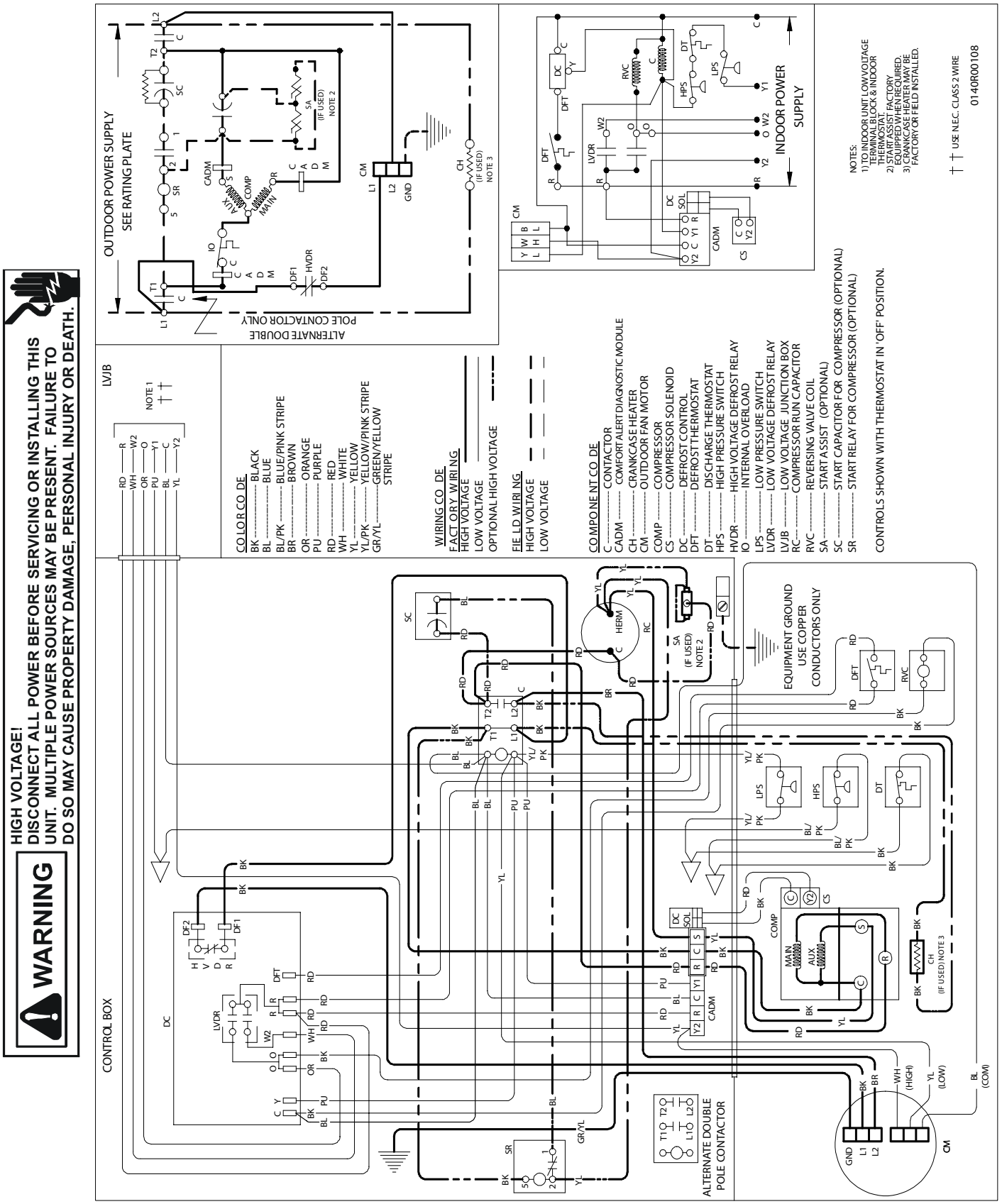
***SZ160[24-60]1A***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

***SZ180[36-60]1A***

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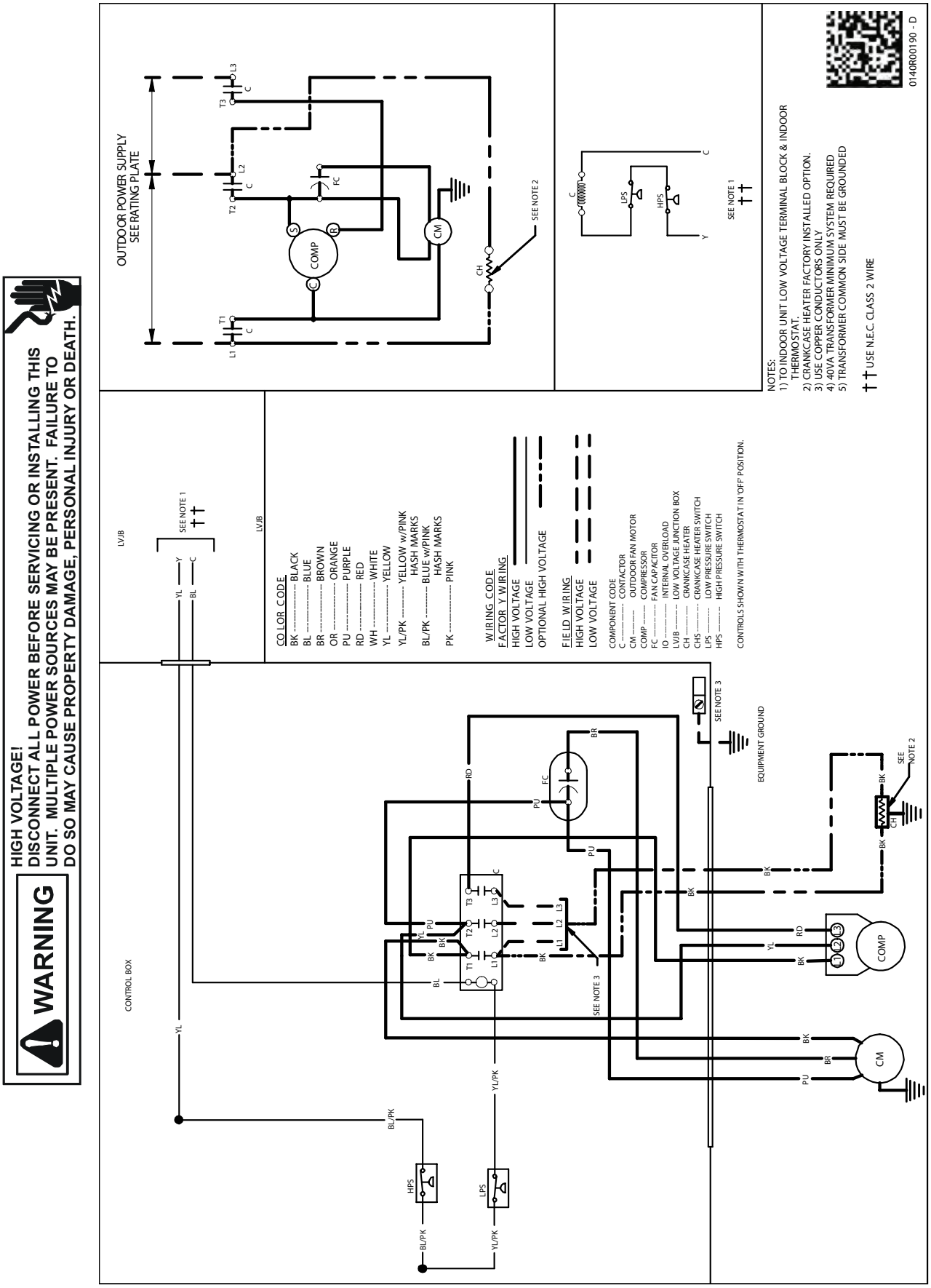
# WIRING DIAGRAMS



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# WIRING DIAGRAMS



**WARNING**

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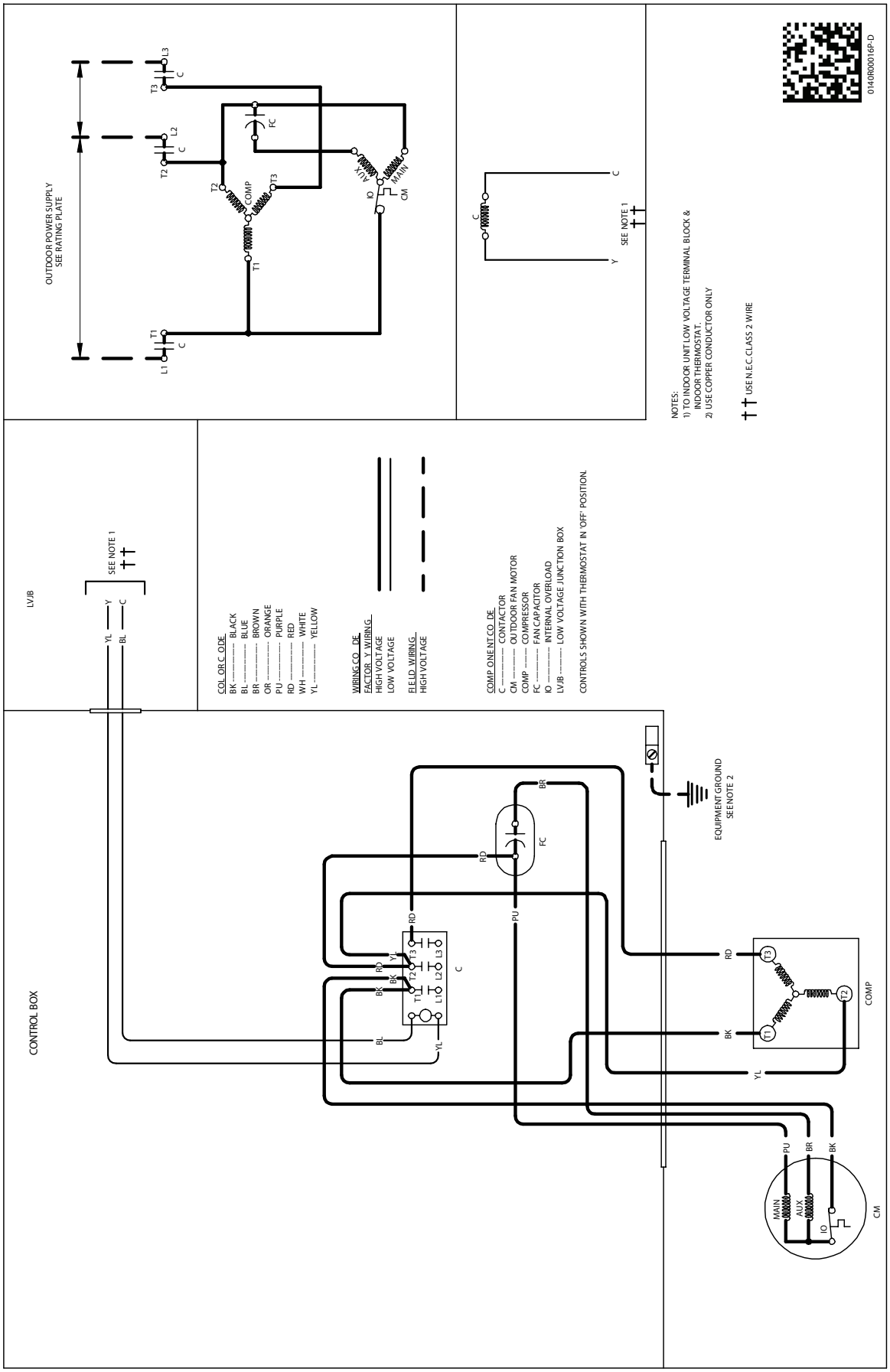


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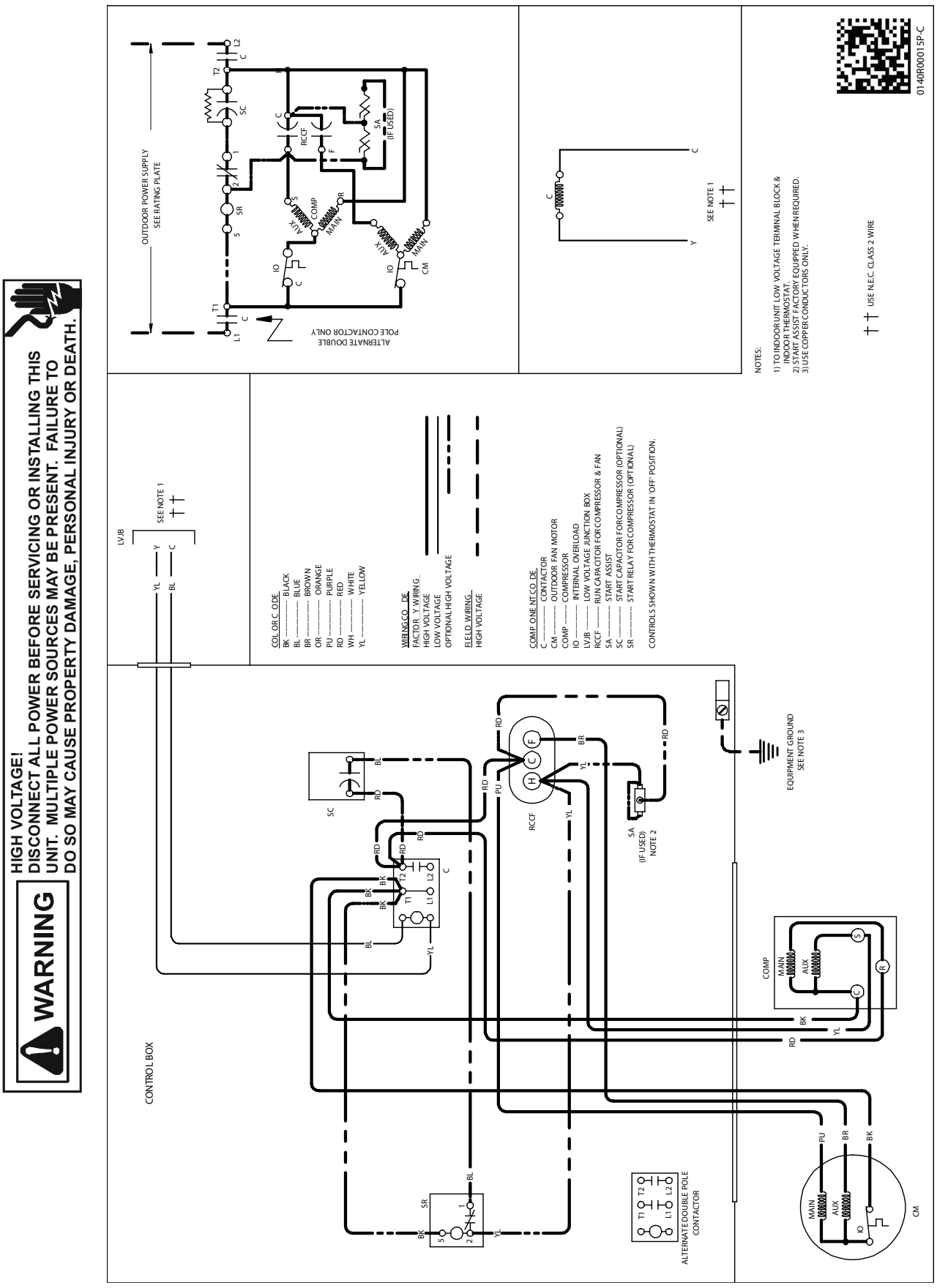
# WIRING DIAGRAMS

**GSX140[18-60]1K*,**
**GSX160[18-48,611]1F***

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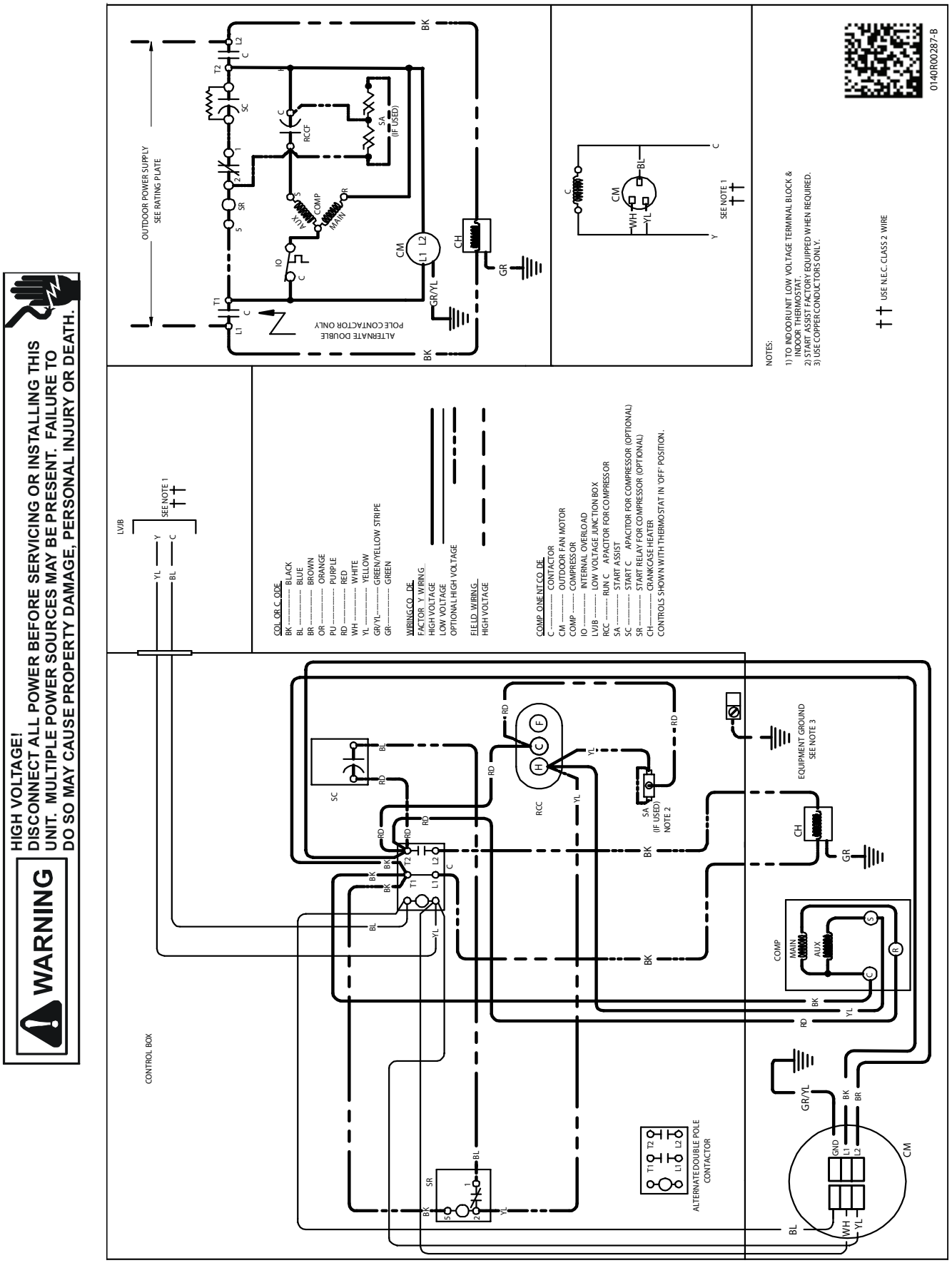
# WIRING DIAGRAMS

GSX160601F*




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

GSX160611F*

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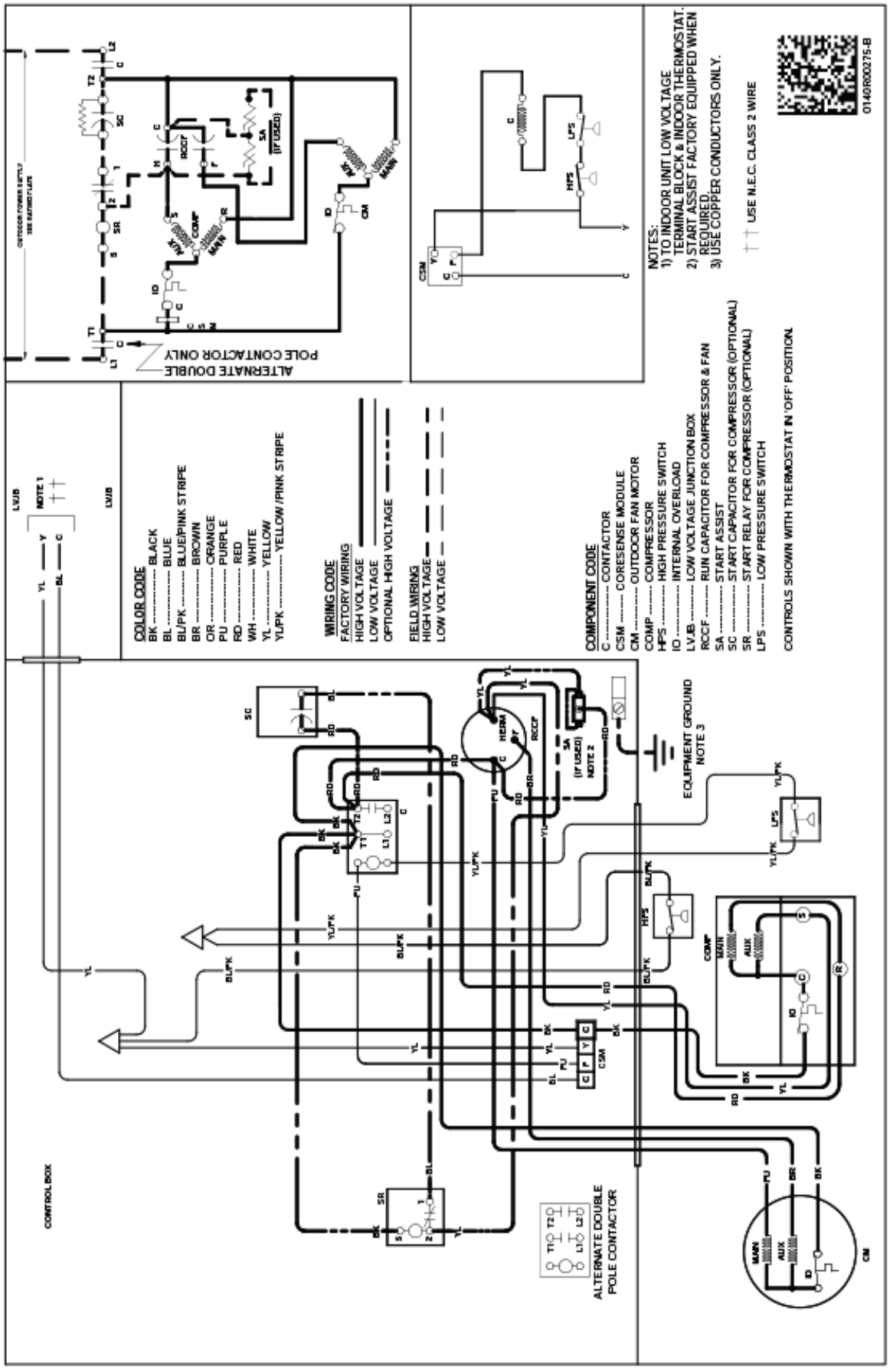
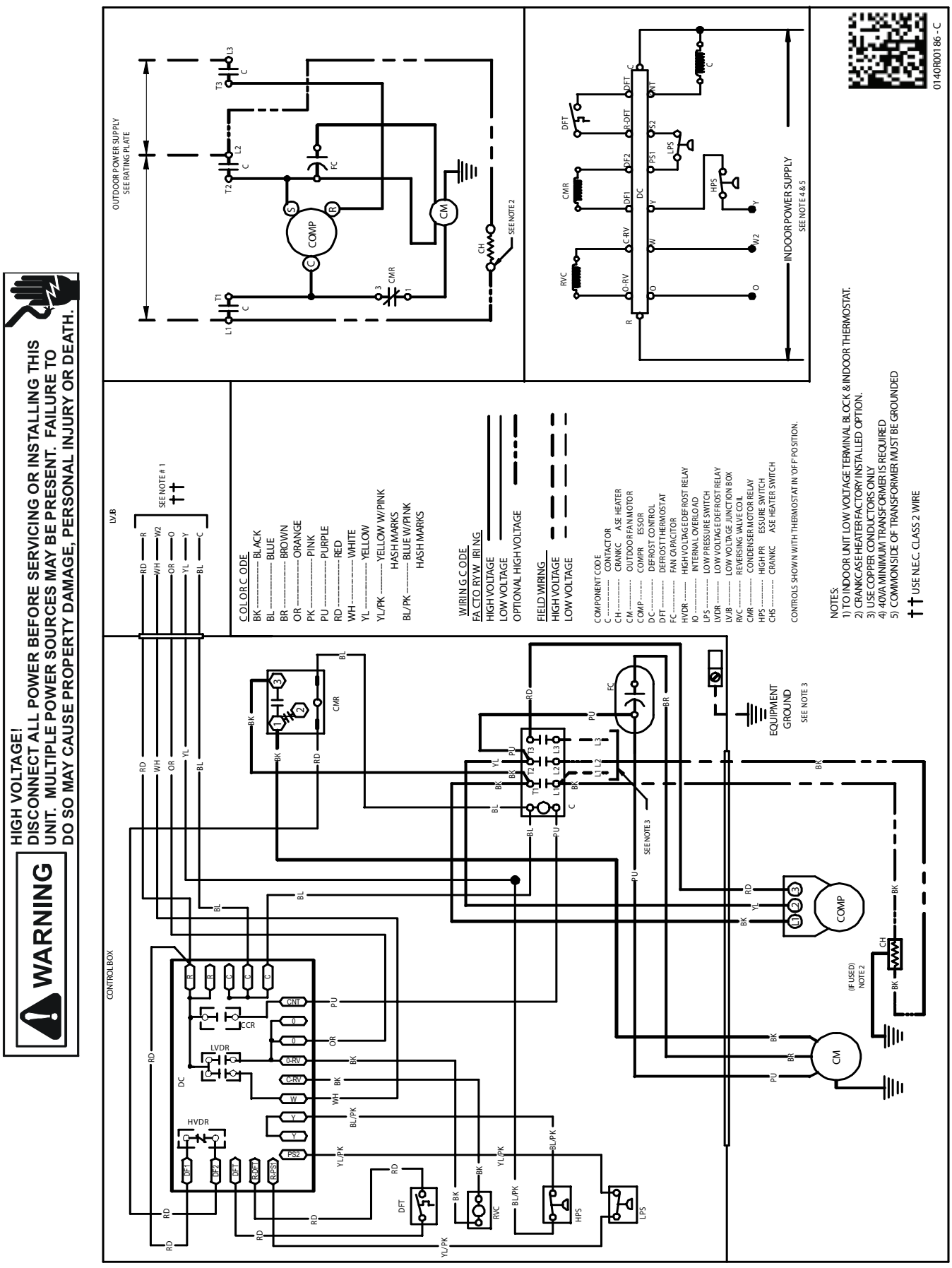



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

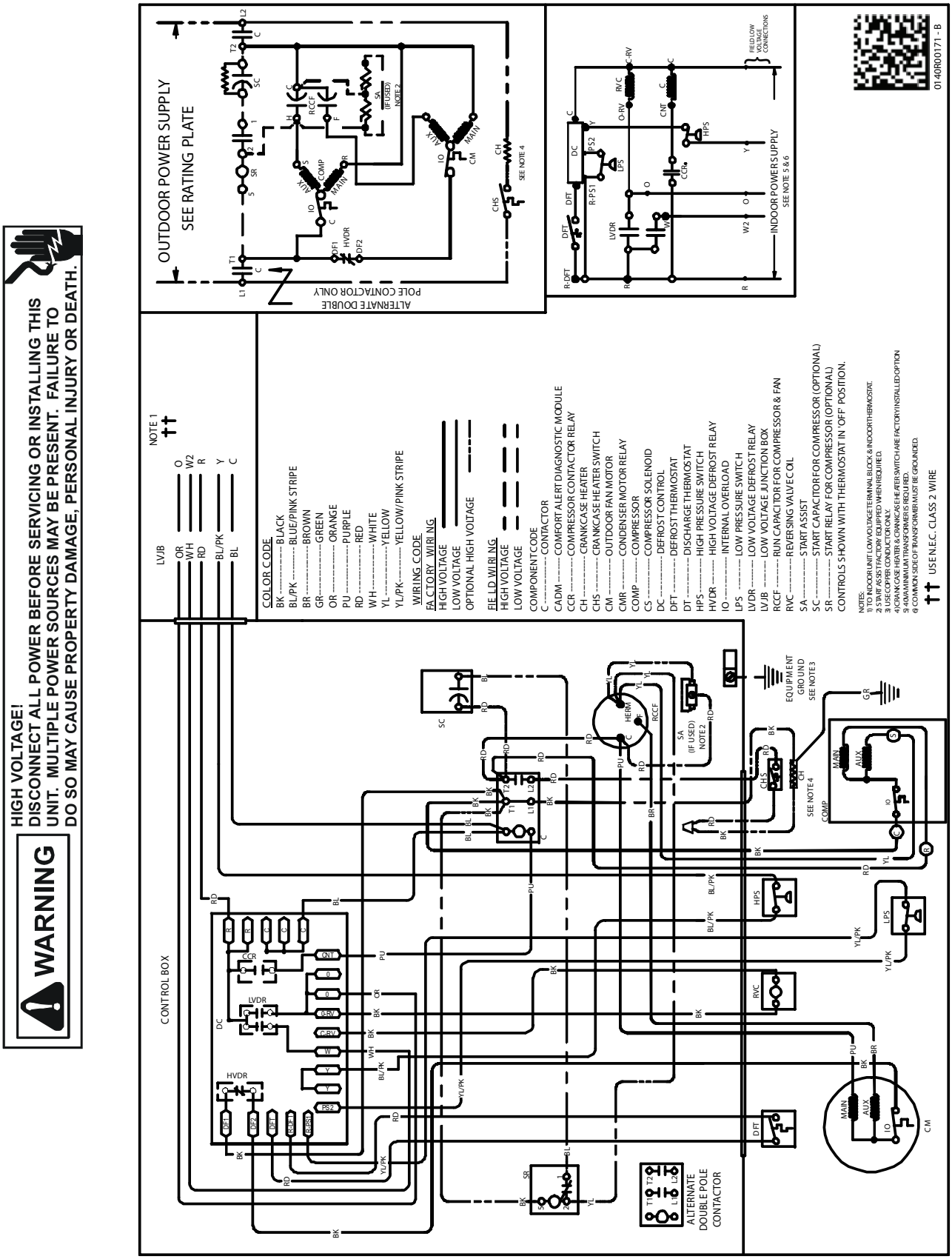
GSZ11[090-120]3A*




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

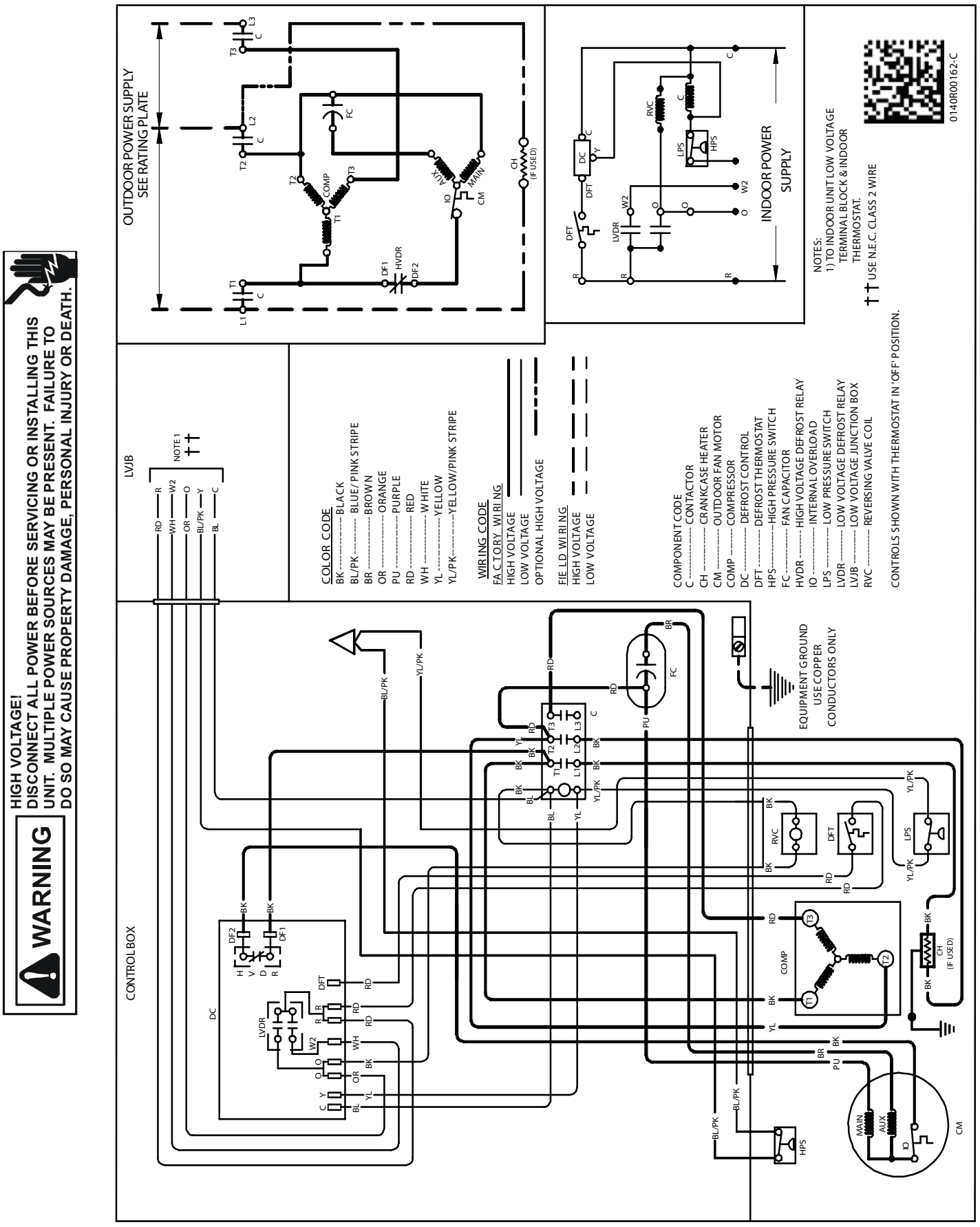
**GSZ130181A[D/F/G], GSZ130241[B*/C*], GSZ130421A[G/H], GSZ130301A[E/F/G/H], GSZ130361B*, GSZ140[18-30/48-60]1AA, GSZ140[36-42]1AB, GSZ130181AC, GSZ130241BB, GSZ130301AD GSZ130361B*, GSZ130421A*, GSZ130481AC, GSZ130601AC**



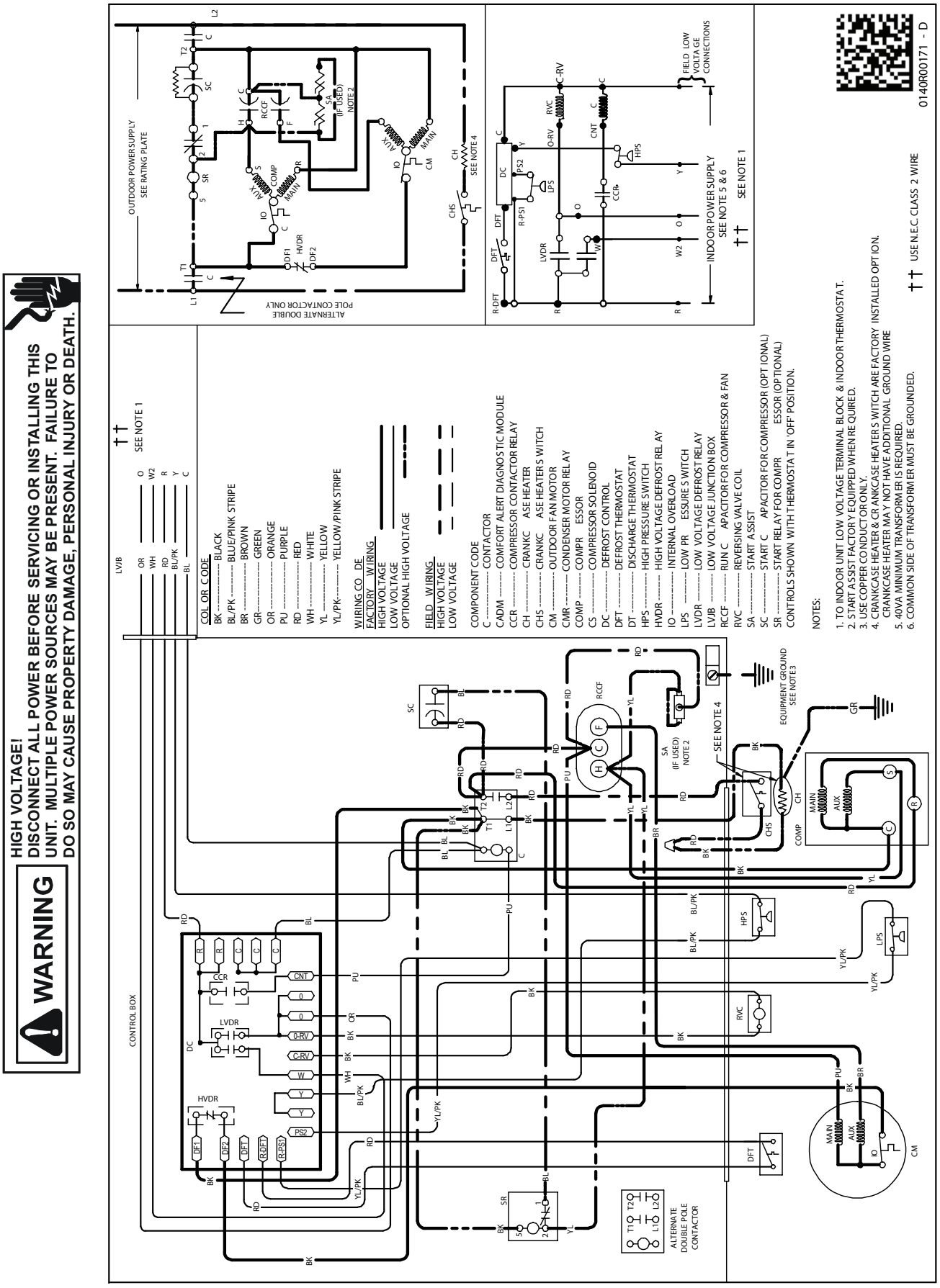

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

GSZ130[36-60][3,4]A*



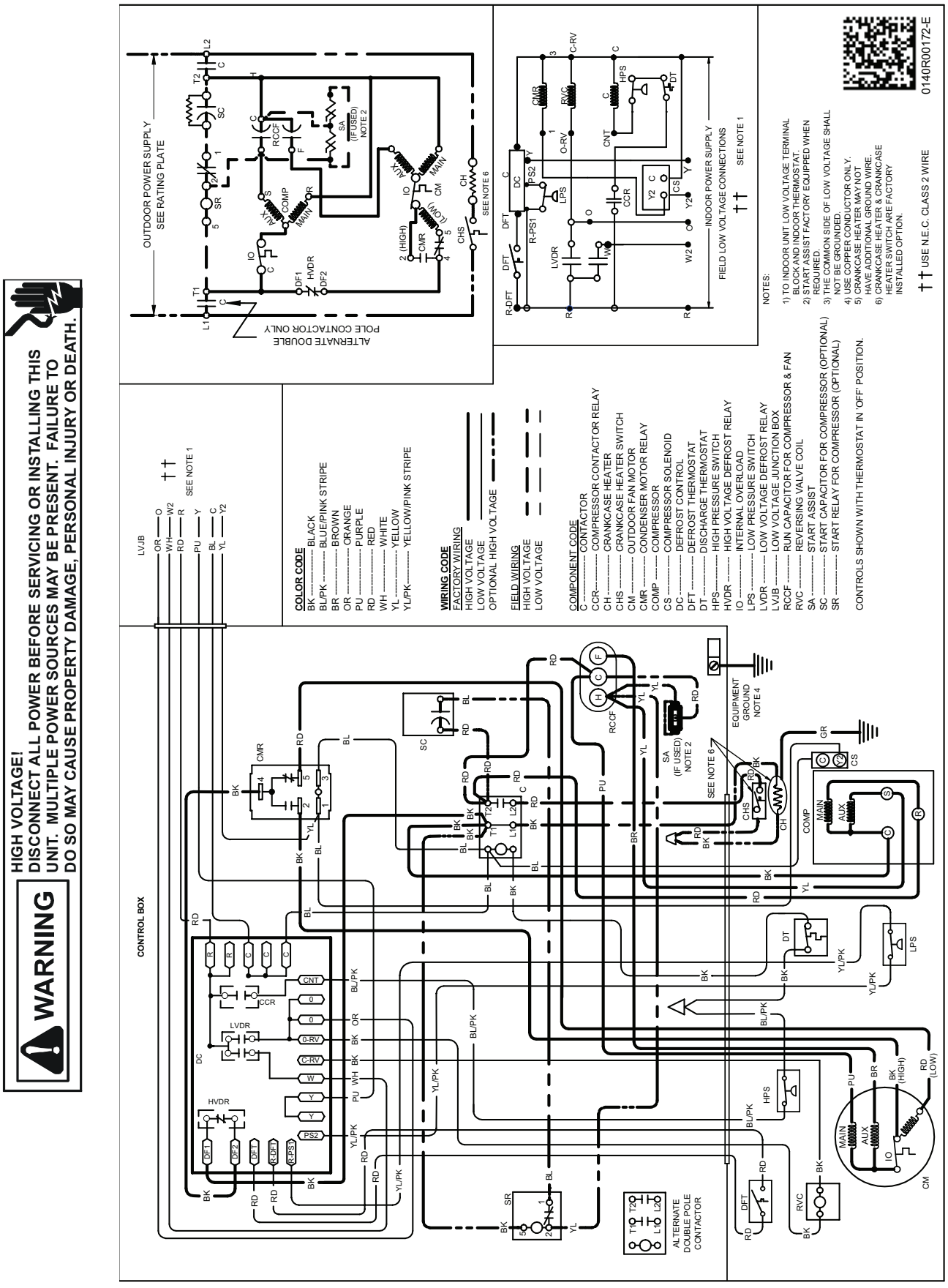

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

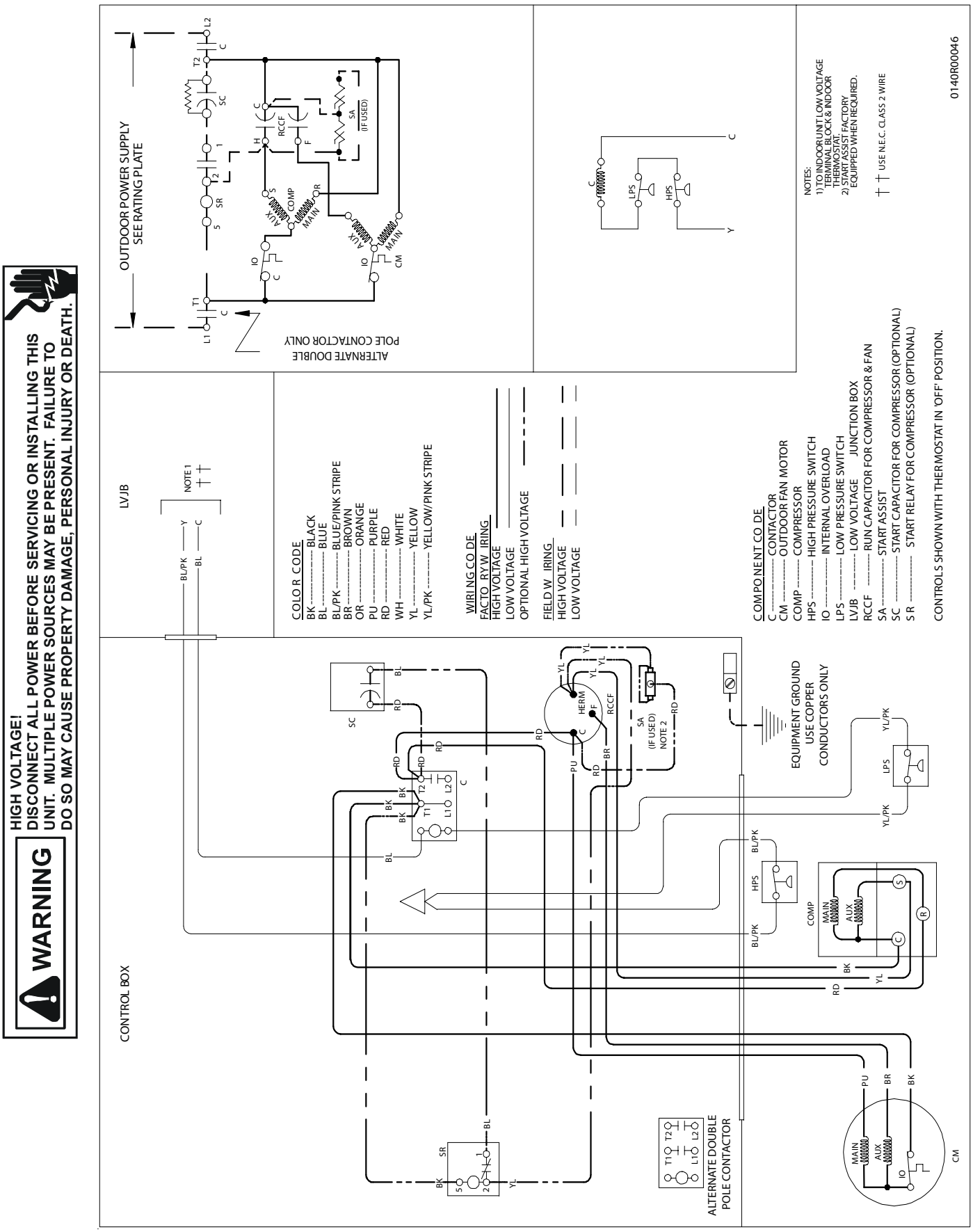




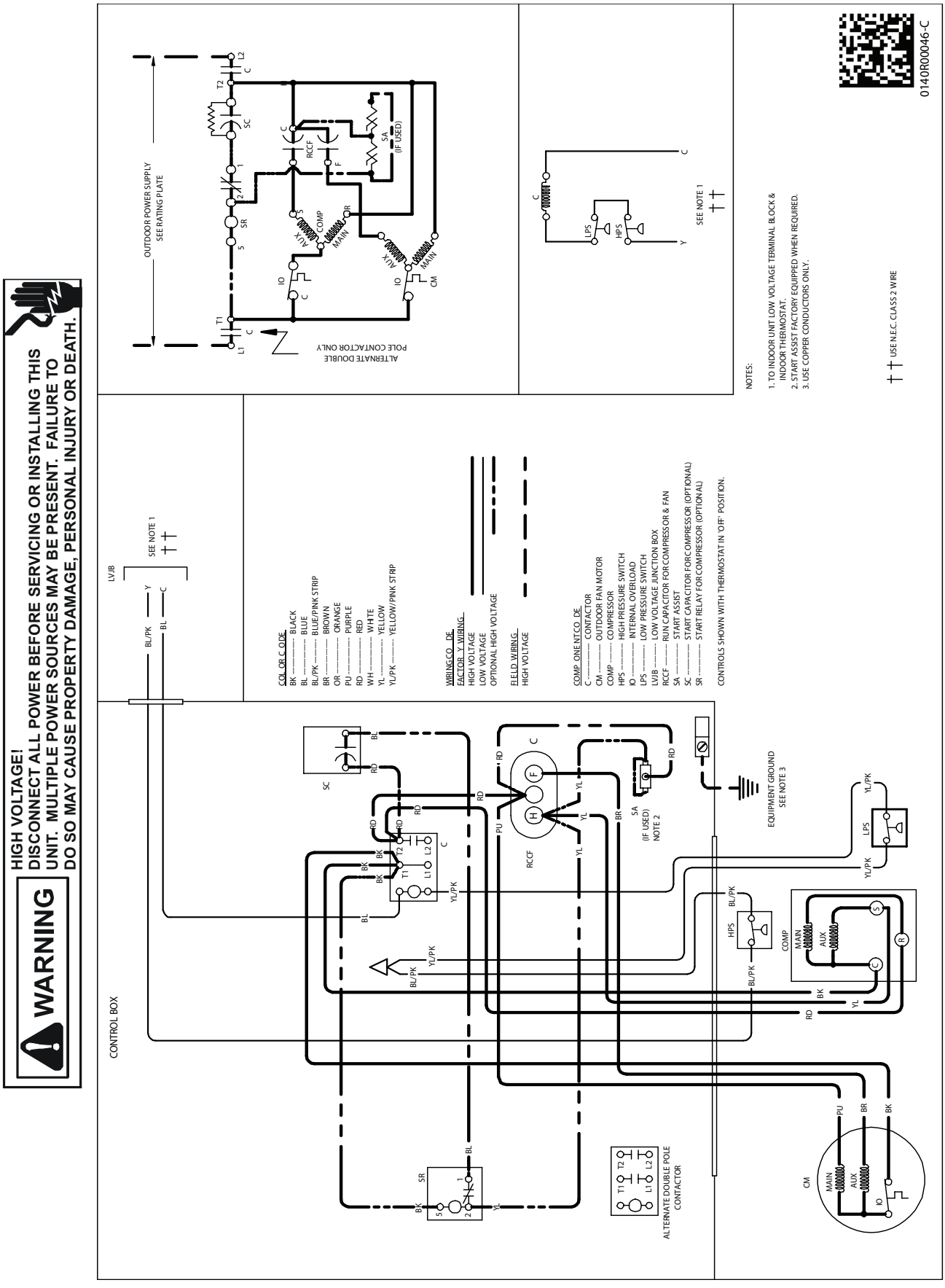

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS



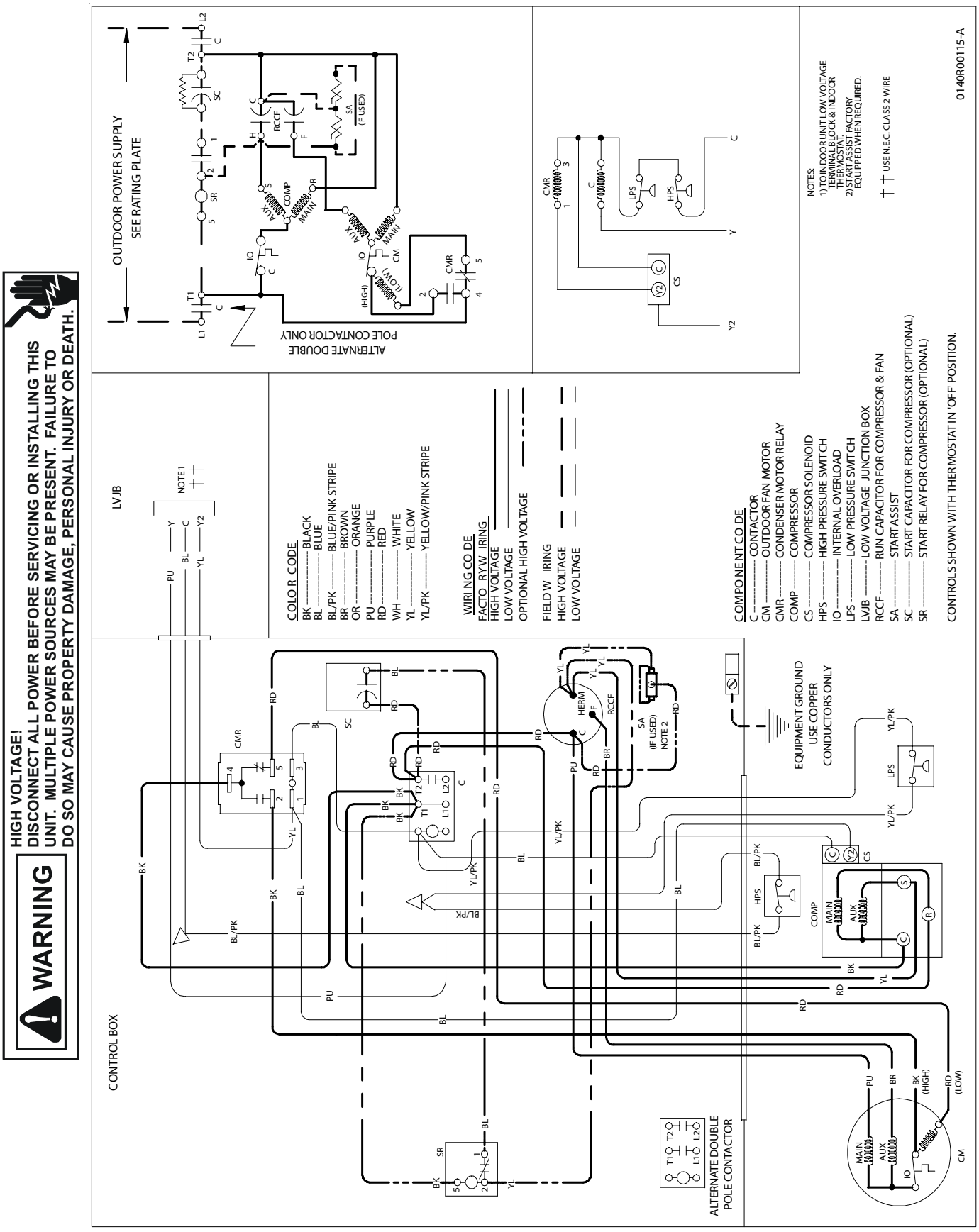



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

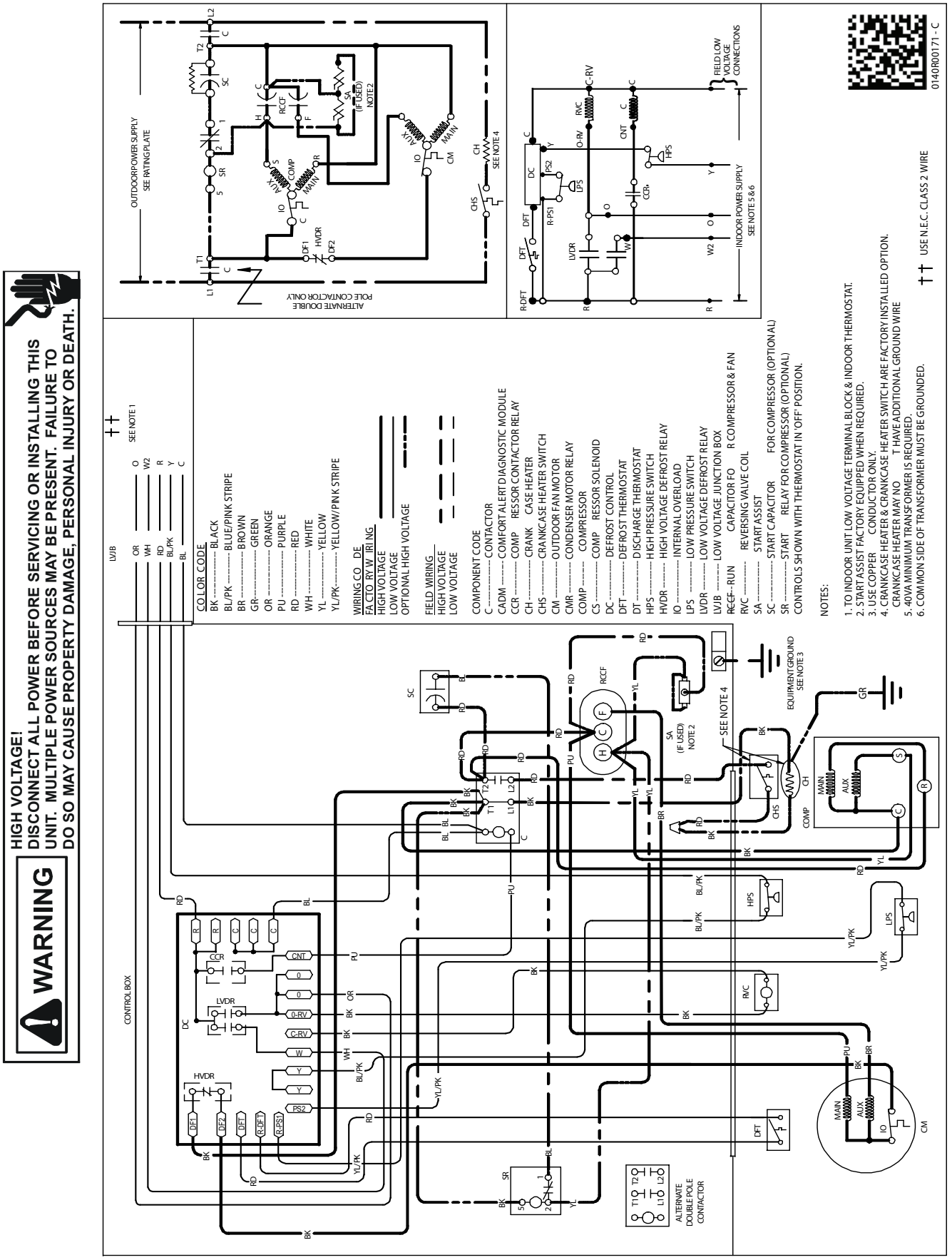
# WIRING DIAGRAMS




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

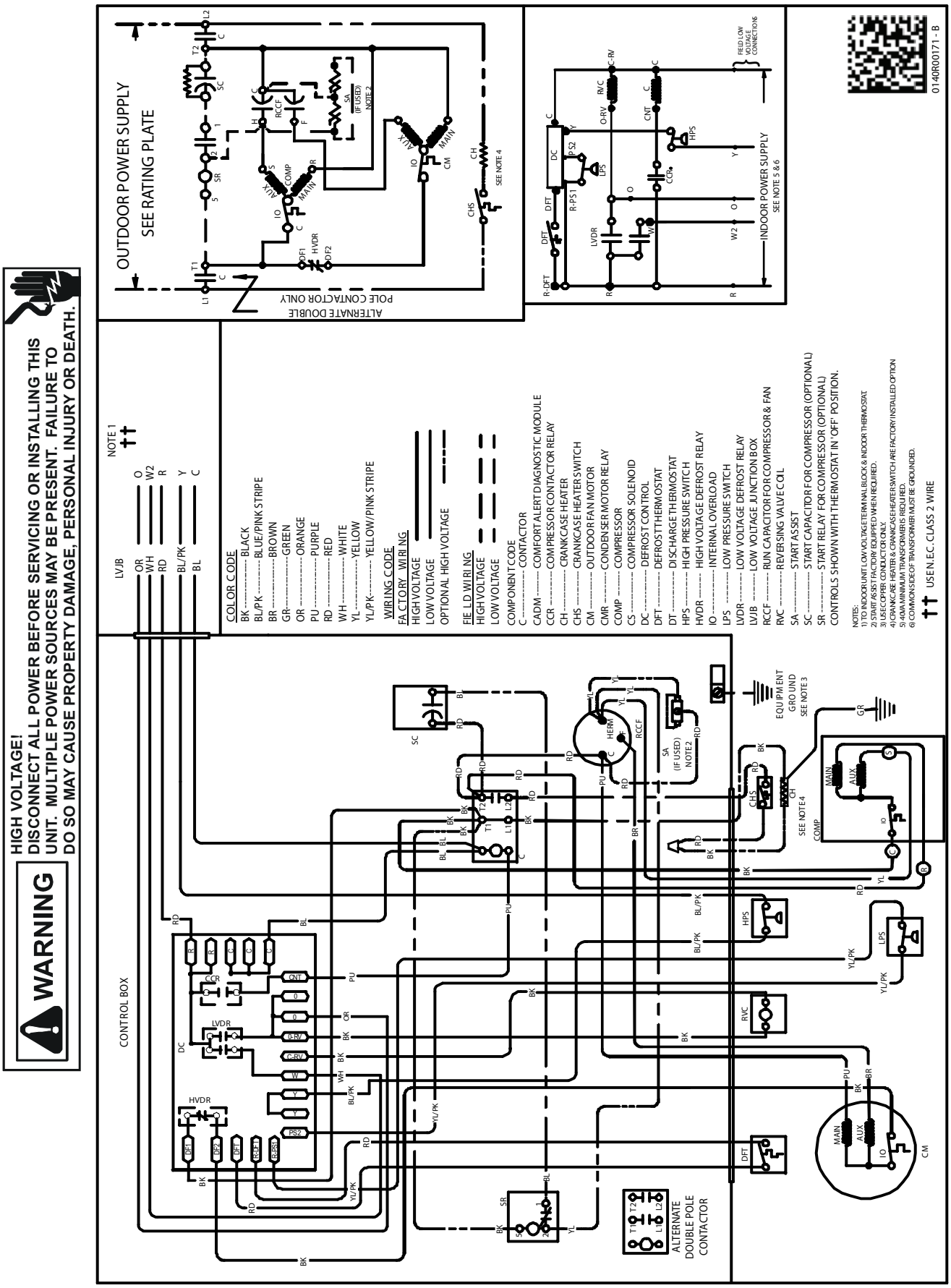
**SSZ140381AA, SSZ140[18,30,42-60]1A*, 241A*, 361A*, SSZ140[18-36]1B*, SSZ140[19-37]1A*, SSZ140[18,30,42-60]1A*, 241A*, 361A*, SSZ140361B***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

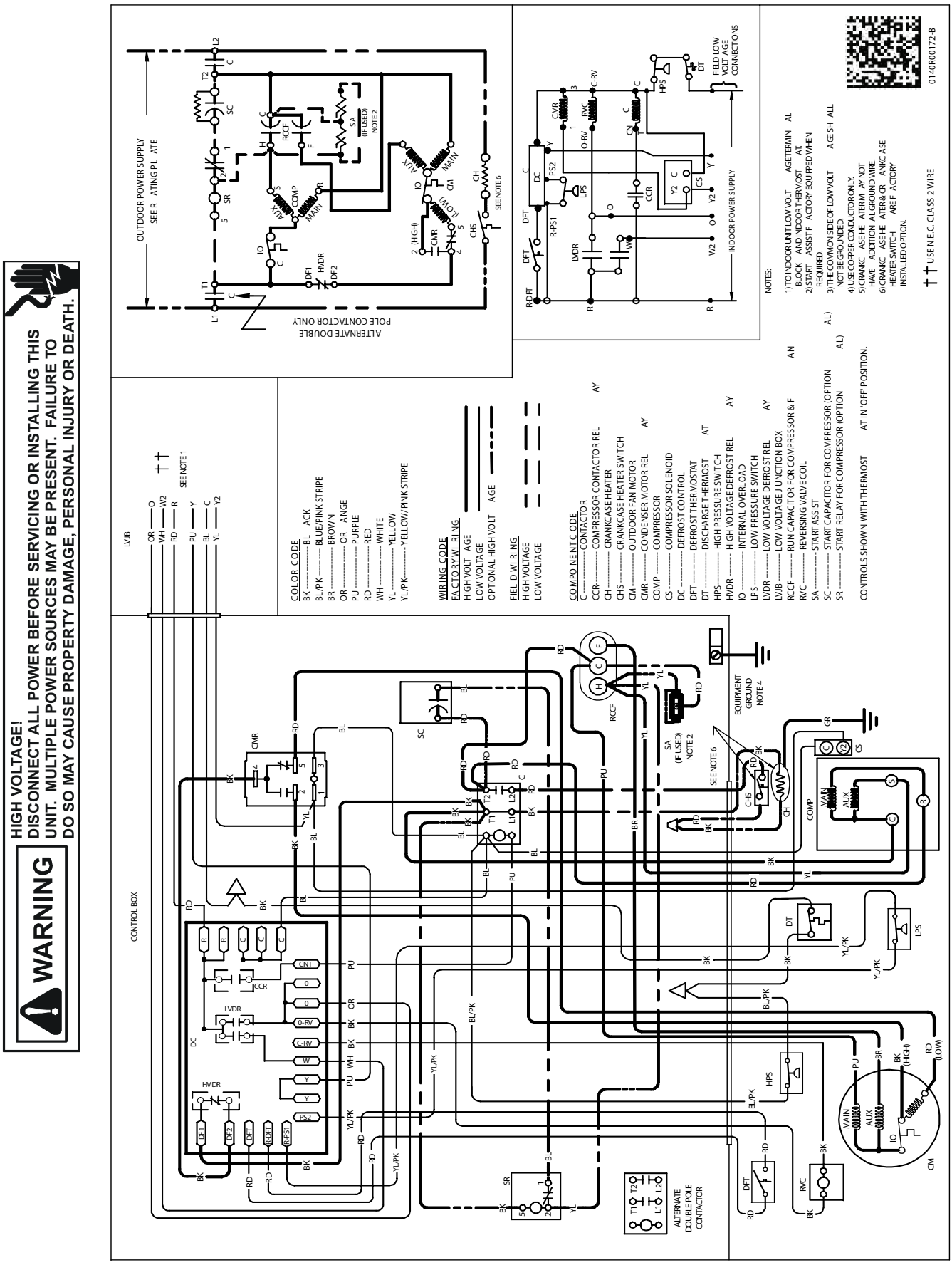
**SSZ160[24]1AG, SSZ160[36-48]1AE,**
**SSZ160[24]1AA-AF, SSZ160[36-48]1AA-AD**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

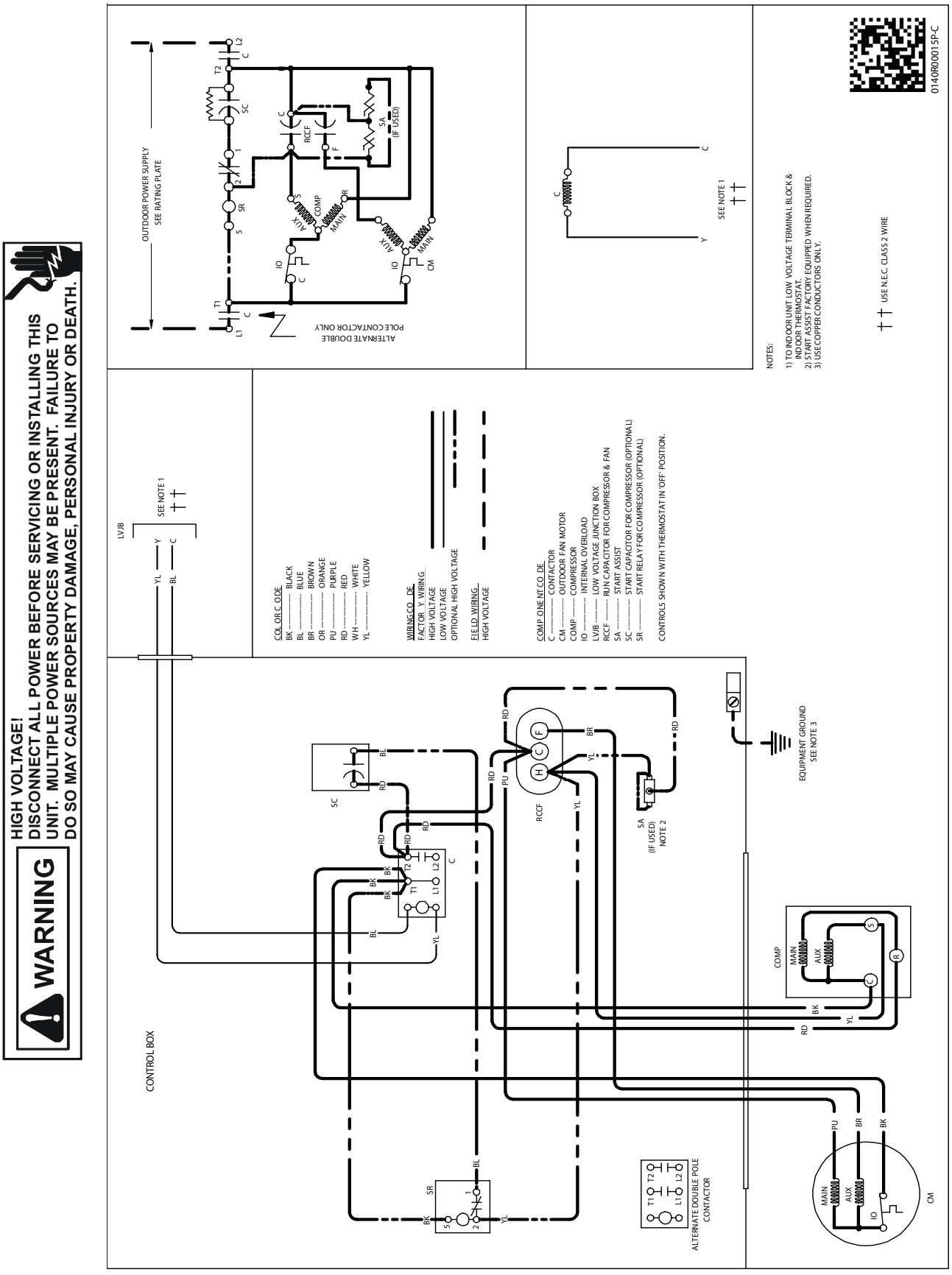
**SSZ160[60]1BA,**
**SSZ160[60]1AB/AC/AD/AE**




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**VSX130[18-48/61]1A* / VSX130{24/36/42-60]1B*/1D*,**
**VSX130[30]1D*/VSX130[36]1E*/ VSX140[18-60]1A*/VSX130[18-48/61]1A***
**VSX130[24/36/42-60]1B*/1D*/VSX130[30]1D*/ VSX130[36]1E***

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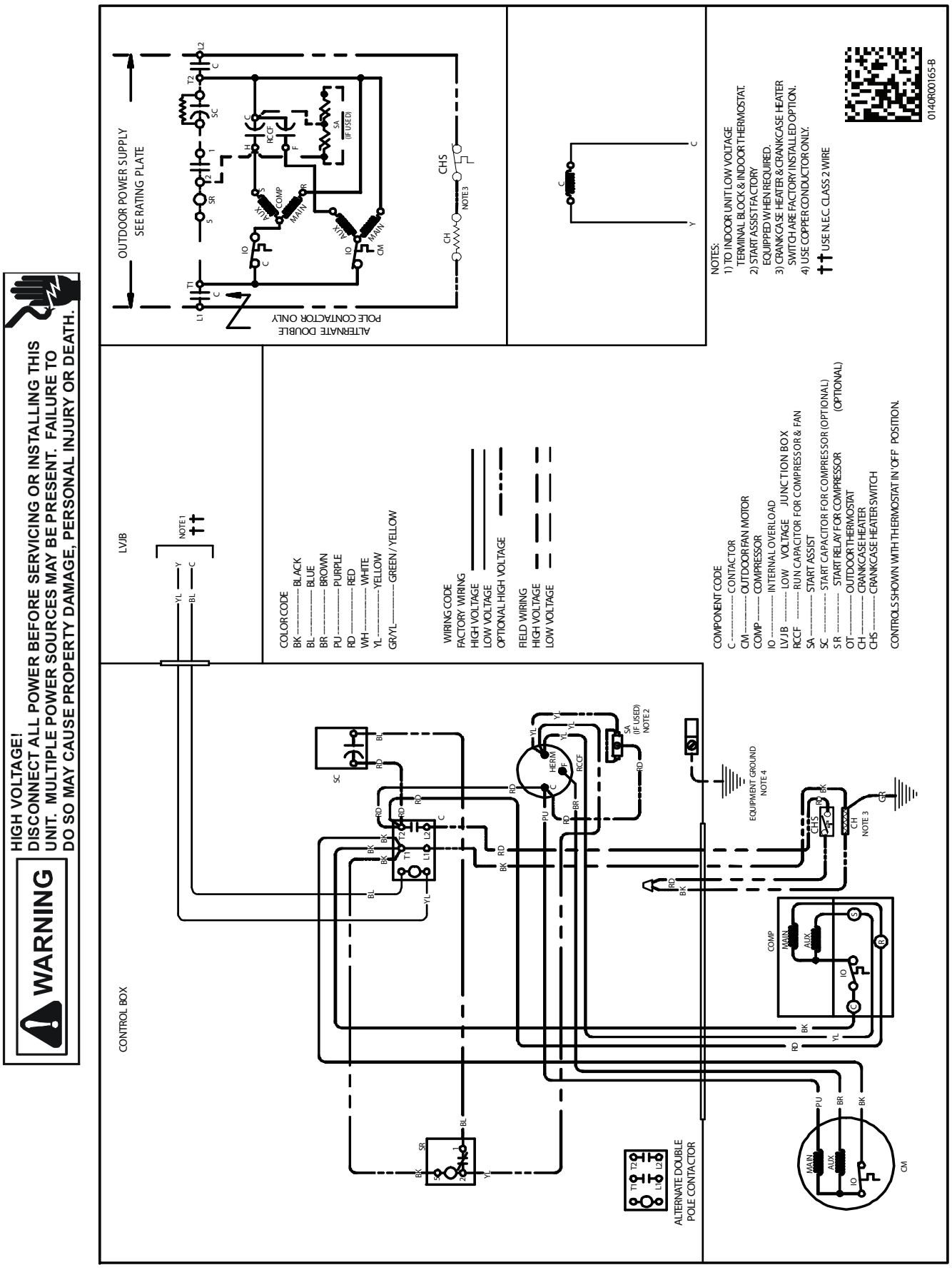
# WIRING DIAGRAMS

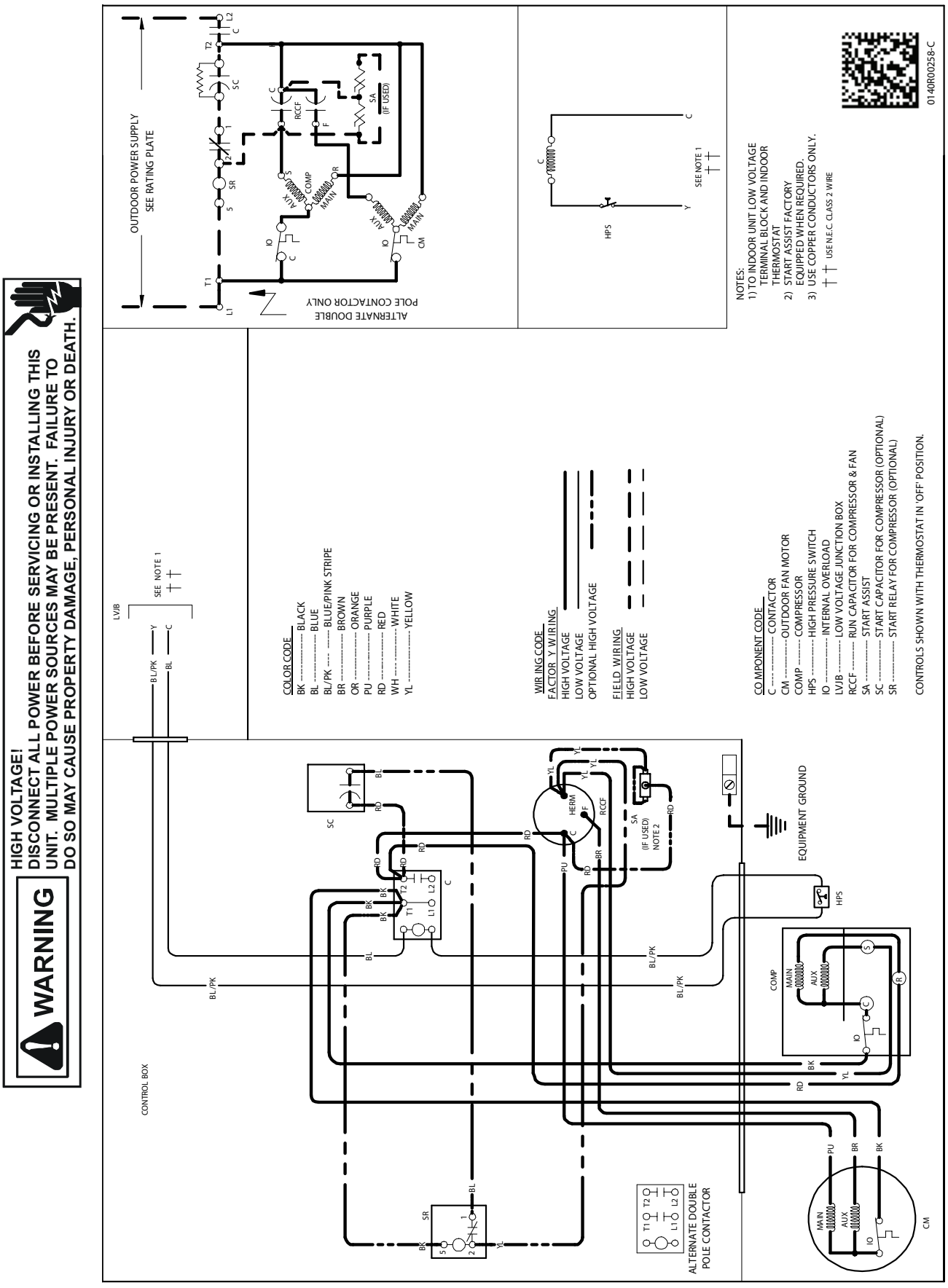
**VSX130181B*/D***




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

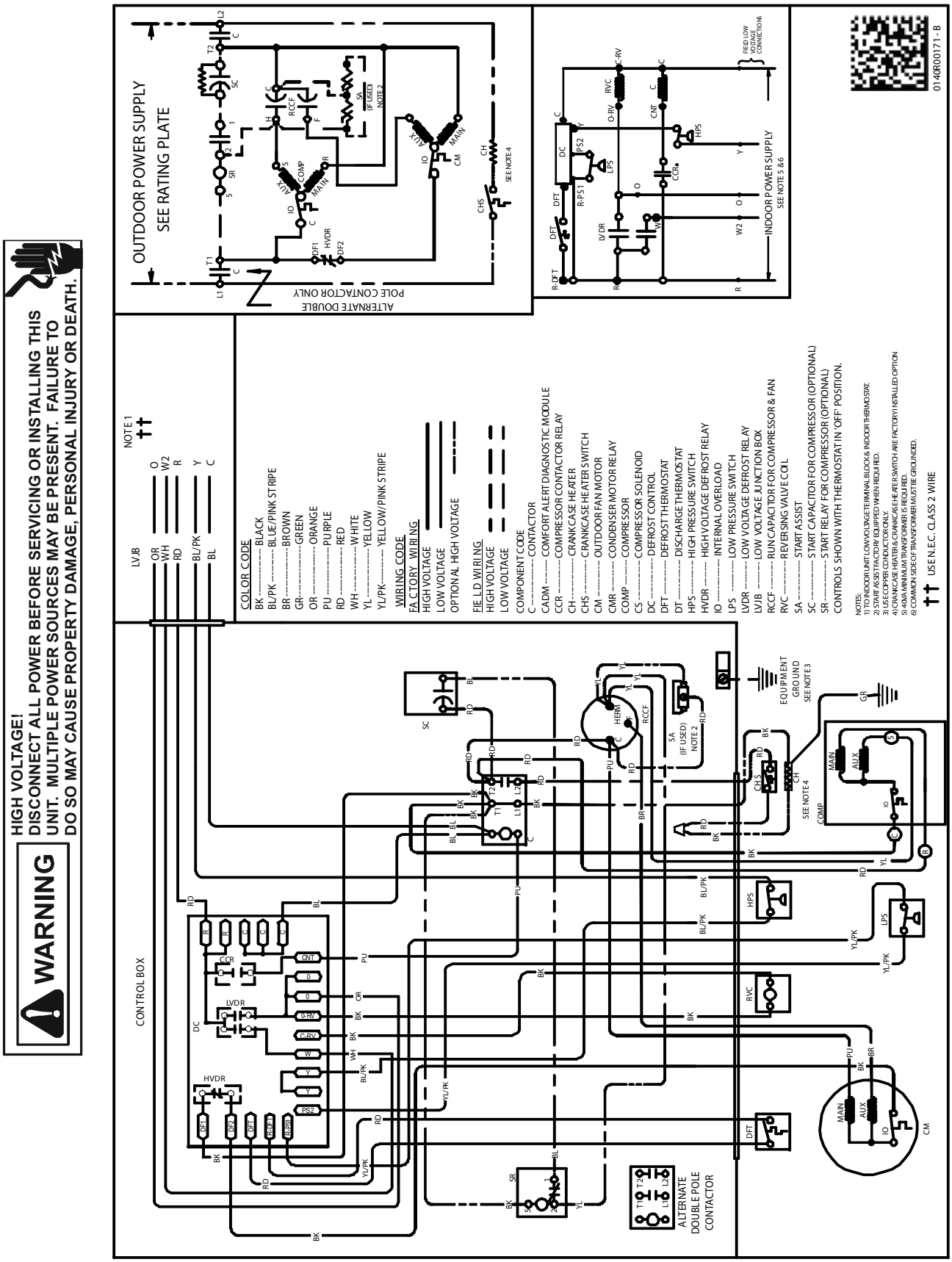
VSX130[18-24]1E*




Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

# WIRING DIAGRAMS

**VSZ130181A[C/D/E/F], VSZ130241B[B/C/D], VSZ130301A[D/E/F/G], VSZ130361B[B/C/D], VSZ130421A[C/D/E/F/G], VSZ130481A[C/D], VSZ130601AC**

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