Midwest Electric, Inc.
A Touchstone Energy® Cooperative
06029 County Road 33A
St. Marys, OH 45885
419-394-4110; 1-800-962-3830
www.midwestrec.com

The (Cool Returns) program requires a load management device on any HVAC unit that receives a rebate or a home that is eligible for a reduced electric rate.

Midwest Electric Inc. will pay the installing contractor for the installation of the load control device. The (Cool Returns) switch is a duty cycling control that will have very limited use in the summer months and effect the condensing unit only. This program is intended for use with all HVAC equipment: Geothermal systems, Air Source Heat Pumps, and Central Air Conditioning units.

NEW EQUIPMENT - AFTER THE SALE OF EQUIPMENT IS COMPLETE

- *Pick-up Cool Returns Switch*

The control devices are available for pick-up at the Midwest Electric office at 06029 County Road 33A east of St. Marys, or they are available at 2J Supply in Lima, The Habegger Corporation in Lima, Johnston Supply in Wapakoneta, and Western Ohio True Value in St. Henry.

- *After the installation is complete:*

Complete the rebate paperwork available on the Midwest Electric web site.
www.midwestrec.com > Rebates

1. Complete the form with all required information including:
   (Cool Returns) RCS Serial #
2. Include a copy of the customers invoice.
3. Include invoice for installing the (Cool Returns Switch) ($100 Flat Rate)
4. Scan/email or send to Midwest Electric Inc. for processing.

EXISTING EQUIPMENT

1. Member will contact Midwest Electric for enrollment in (Cool Returns) program.
2. Midwest Electric will refer to preferred contractor or local contractor.
3. Contractor will schedule with customer for inspection and installation.
4. Contractor to pick-up (Cool Returns) device or have delivered.
5. Contractor to install (Cool Returns) device and complete inspection of HVAC equipment. ($125 Flat Rate) repairs are not covered.
   The service technician (must) advise and receive authorization for any additional work. Any additional repairs, cleaning, or other will be billed to the homeowner.
6. After completion of work, contractor to complete required forms including:
   (Cool Returns) RCS Serial # and submit with invoice to Midwest Electric for reimbursement.

RCS INSTALLATION MANUAL FOR A/C CONTROL

February 2010

APPENDIX "A"

RCS WIRING DIAGRAMS FOR CONTROLLING A/C UNITS WITH CONVENTIONAL 24 VOLTS AC CONTROL SYSTEMS

APPENDIX "B"

RCS WIRING DIAGRAMS FOR CONTROLLING A/C UNITS WITH ADVANCED COMMUNICATIONS CONTROL SYSTEMS:
(BRYANT - EVOLUTION)
(CARRIER - INFINITY)
(TRANE - XL COMFORTLINK)

Features and Operation of Buckeye's A/C Radio Controlled Switch (RCS)

Comverge Adaptive Algorithm RCS

Buckeye Power, Inc. - May 2008, **Updated February 2010**

1. By definition, a control cycle occurs during a 30 minute period (i.e. two periods per hour) for an A/C unit equipped with a specially designed Comverge Adaptive Algorithm RCS.

2. The RCS senses and archives a rolling one hour average previous run-time (PRT) for the controlled A/C unit. If archived information is incomplete or times are less than 15 minutes, then PRT is assumed to be 60 minutes.

3. The amount of load control is designated by the percentage of control (POC) applied to the PRT during each 30 minute control cycle, rather than specifying the amount of **"OFF"** time and **"ON"** time. The allowable run time **ON** and controlled time **OFF** during each 30 minute control cycle can be computed as explained by the following examples:
   a. (1-POC) x PRT/2 = allowable run-time **ON** for each 30 minutes. (e.g. 40% POC and PRT of 60 minutes computes: (1-.4) x (60 minutes/2) = 18 minutes **ON**.
   b. For computing the amount of controlled time **OFF**, simply subtract the amount computed in the example above in 3.a from 30 minutes. 30 minutes - 18 minutes = 12 minutes **OFF**.
   c. The application of the Comverge Adaptive Algorithm Feature affects the amount of **ON** and **OFF** times which will vary relative to the amount of the A/C unit's rolling one hour average previous run-time (PRT)
   d. The above calculation using the POC and PRT is applied only once for the start of control and those results are used throughout the control session.
   e. Refer to the table on the next page for a run-time matrix detailing the affect of the adaptive algorithm feature of the Comverge RCS. The figures shown are run-times **ON**; subtract these figures from 30 minutes to derive controlled time **OFF**.

4. Depending upon the amount of peak load reduction needed, Buckeye will use either a 25% or 40% POC cycle.

5. The start time for load control (when the **OFF** time begins) is randomized with all RCS. Thus applying the information in item (4) above, this can occur anytime from the beginning of the hour to 18 minutes past the hour in order to achieve the POC example as illustrated in item 4.b. above.

6. If load control starts at the beginning of an hour, there will be one **OFF** cycle followed by one **ON** cycle during the first and any subsequent 30 minute control period. If load control starts after beginning of a 30 minute period, there will be two **ON** cycles and one **OFF** cycle. In this case, the **ON** cycle will occur before and after the designated **OFF** cycle.

7. The cycled **OFF** times are never contiguous between consecutive 30 minute control periods.

8. The Comverge adaptive algorithm RCS provides cyclic equality among A/C control participants by applying the same POC to each controlled A/C PRT. It provides the desired amount of peak load shedding relief while minimizing the degree of discomfort experienced by the consumer member. In addition, the disturbance of load diversity among all controlled A/C units is minimized which is very important for overall peak load reduction.

Comverge Radio Control Switch (RCS)
Adaptive Algorithm Allowable Run-Time Matrix
(RCS controlling A/C Systems)

Percentage of Control (POC)	Previous Run Time (PRT) rolling average for last hour (minutes)												
	0	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**
0%	0.0	0.0	0.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	30.0	30.0
5%	0.0	0.0	0.0	7.1	9.5	11.9	14.2	16.6	19.0	21.4	23.7	30.0	30.0
10%	0.0	0.0	0.0	6.7	9.0	11.2	13.5	15.7	18.0	20.2	22.5	24.7	30.0
15%	0.0	0.0	0.0	6.4	8.5	10.6	12.7	14.9	17.0	19.1	21.2	23.4	30.0
20%	24.0	24.0	24.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0
25%	22.5	22.5	22.5	5.6	7.5	9.4	11.2	13.1	15.0	16.9	18.7	20.6	22.5
30%	21.0	21.0	21.0	5.2	7.0	8.7	10.5	12.2	14.0	15.7	17.5	19.2	21.0
35%	19.5	19.5	19.5	4.9	6.5	8.1	9.7	11.4	13.0	14.6	16.2	17.9	19.5
40%	18.0	18.0	18.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0
45%	16.5	16.5	16.5	4.1	5.5	6.9	8.2	9.6	11.0	12.4	13.7	15.1	16.5
50%	15.0	15.0	15.0	3.7	5.0	6.2	7.5	8.7	10.0	11.2	12.5	13.7	15.0
55%	13.5	13.5	13.5	3.4	4.5	5.6	6.7	7.9	9.0	10.1	11.2	12.4	13.5
60%	12.0	12.0	12.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
65%	10.5	10.5	10.5	2.6	3.5	4.4	5.2	6.1	7.0	7.9	8.7	9.6	10.5
70%	9.0	9.0	9.0	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	8.2	9.0
75%	7.5	7.5	7.5	1.9	2.5	3.1	3.7	4.4	5.0	5.6	6.2	6.9	7.5
80%	6.0	6.0	6.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
85%	4.5	4.5	4.5	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7	4.1	4.5
90%	3.0	3.0	3.0	0.7	1.0	1.2	1.5	1.7	2.0	2.2	2.5	2.7	3.0
95%	1.5	1.5	1.5	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.4	1.5
100%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: **Buckeye Power uses 25% and 40% POC for its load control strategies. These cells are highlighted in yellow for quick reference.**

The figures shown in the matrix where the POC intersects with the previous run time (PRT) is the run time (in minutes) that the controlled A/C unit will be allowed to operate during a 30 minute control period. As an example, for 40% POC and a PRT of 60 minutes, the actual allowed run time for the controlled A/C unit will be 18 minutes per 30-minute control period. In this example the remaining time of the 30 minutes will result in 12 minutes of controlled off time.

A/C Radio Controlled Switch (RCS)
Installation Guide

Buckeye Power, Inc. - May 2008, **Updated February 2010**

1. Assess the overall condition of the A/C unit scheduled for the RCS installation.
   a. If possible test run the A/C unit prior to RCS installation to evaluate its operating condition. Install a Buckeye RCS only on known working A/C units.
   b. Do not install a Buckeye radio switch on sub-standard A/C systems.
   c. When there is any doubt about the A/C unit condition, **AVOID FUTURE PROBLEMS AND DON'T INSTALL A RCS DEVICE IF THE CONDITION OF THE A/C IS QUESTIONABLE.**

2. Once the A/C unit is determined to qualify for a Buckeye radio switch installation, select a location to securely mount the radio switch and that will allow for the shortest possible routing of conduit and cabling. ***Keep all aspects of the installation free of interference with the A/C unit***.

3. Suggested RCS mounting locations:
   a. Mount on side of house near the A/C condensing unit; or
   b. Mount on interior wall near geothermal unit; or
   c. Mount on geothermal unit as long as RCS is unaffected by vibration.

EXAMPLE INSTALLATIONS MOUNTED ON SIDE OF HOUSE

4. Turn **OFF** the electrical power to the A/C unit prior to beginning any installation work! **Remember...Safety First!**

5. Follow all applicable local building codes and National Electric Code Rules and Regulations when making the radio switch installation.

6. The Comverge A/C RCS requires a 240 volt AC supply to power the switch's electronic logic board. The RCS comes in a one-relay model or a two-relay model depending upon the need for controlling single-stage or two-stage cooling systems. The relays are form "C", normally closed contacts with a 5 ampere rating. The RCS enclosure has an integrated junction box for making wiring connections. In accordance with the national electric code, there is a divider in the junction box for maintaining separation of the low and high voltages that will be present in the box.

Single-Stage A/C RCS Control Device
(Notice one set of blue control leads)

Two-Stage A/C RCS Control Device
(Notice two sets of control leads yellow and blue)

Both models have the integral junction box with voltage divider panel and red & black power leads.

Refer to the Block Diagram Schematics in Appendix A for connecting the RCS to conventional 24 volt AC control circuits. Refer to Appendix B for wiring connections to advanced communications control systems associated with Bryant, Carrier and Trane.

7. All 240 volt AC wiring must be within approved conduit material. Since the RCS is typically mounted near the safety disconnect switch (where applicable) and/or the A/C condensing unit, the 240 volts AC power supply needed for the RCS can be obtained from either device. It is recommend that liquid-tight flex conduit be used for this application between the RCS enclosure and connecting device (e.g. safety disconnect switch or A/C unit).

8. Low voltage thermostat wiring does not have to be within conduit. Standard PVC jacketed thermostat wiring can be used between the RCS and the A/C condensing unit control circuit.

9. The RCS **will only control** the A/C outdoor condensing unit (compressor/fan) by switching the low voltage thermostat wiring. The indoor air handler will operate normally to circulate air for maintaining maximum comfort.

10. All aspects of the installation must be completed in a craftsmanship like manner. Make sure to leave the site clean and free of any excess materials left-over as a result of the installation.

APPENDIX "A"

RCS WIRING DIAGRAMS FOR CONTROLLING A/C UNITS WITH CONVENTIONAL 24 VOLTS AC CONTROL SYSTEMS

(SINGLE AND TWO STAGE UNITS)

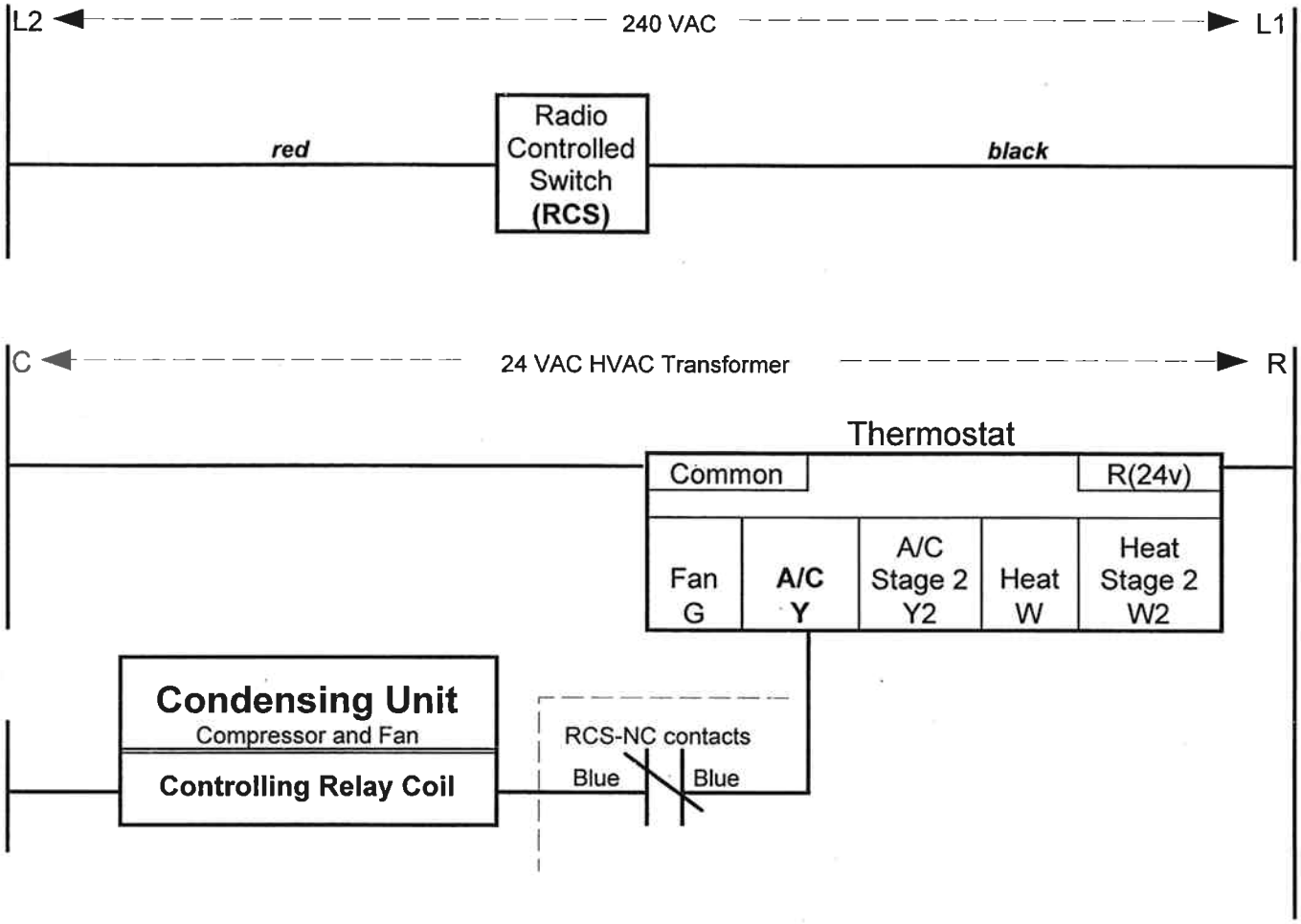
BLOCK WIRING SCHEMATIC

Radio Control Switch **(RCS)** for ***SINGLE-STAGE*** Air Conditioning Systems

May 2008, **UPDATED February 2010**

For conventional 24 vac control systems

(Excludes advanced communications control systems used by the following models: Bryant - Evolution, Carrier - Infinity and Trane - XL ComfortLink)



NOTES:

1) The Radio Controlled Switch (RCS) is powered by 240 VAC as shown above using the red and black leads in the RCS wiring harness.
2) RCS-NC (normally closed) relay contacts are shown in the de-energized state. Note that the RCS relay contacts will remain in their normal closed state when power is first applied to the RCS.
3) A single stage A/C RCS is equipped with one set of normally closed (NC) contacts for controlling a single stage air conditioning unit. These contacts are connected to the blue wires in the RCS wiring harness and are to be wired in series with the Y thermostat lead (as shown above) to the controlling circuit of the condensing unit. These contacts are operated from the RCS F1 function.
4) Once the RCS is activated by the proper radio signal using a hand-held tester, the contacts will open for one period (7.5 minutes plus or minus 1.5), then will revert to a closed state unless additional radio signals are received.
5) The RCS may be activated by a radio signal via Cooperatives' radio base stations. The contacts will then open for the duration of a scheduled cyclic control session. CHECK WITH BUCKEYE POWER FOR THE EXPECTED LENGTH OF CONTROL IF REQUIRED (800-282-6962 x203 or 614-430-7845).

The above is for informational purposes only and Buckeye can not be held responsible for errors, omissions or any problems arising from its use. When in doubt of making proper connections, consult with the manufacturer or an authorized OEM representative of the A/C unit before installing RCS.

REFER TO BUCKEYE POWER FOR ANY QUESTIONS OR COMMENTS (800-282-6962 x203 or 614-430-7845)

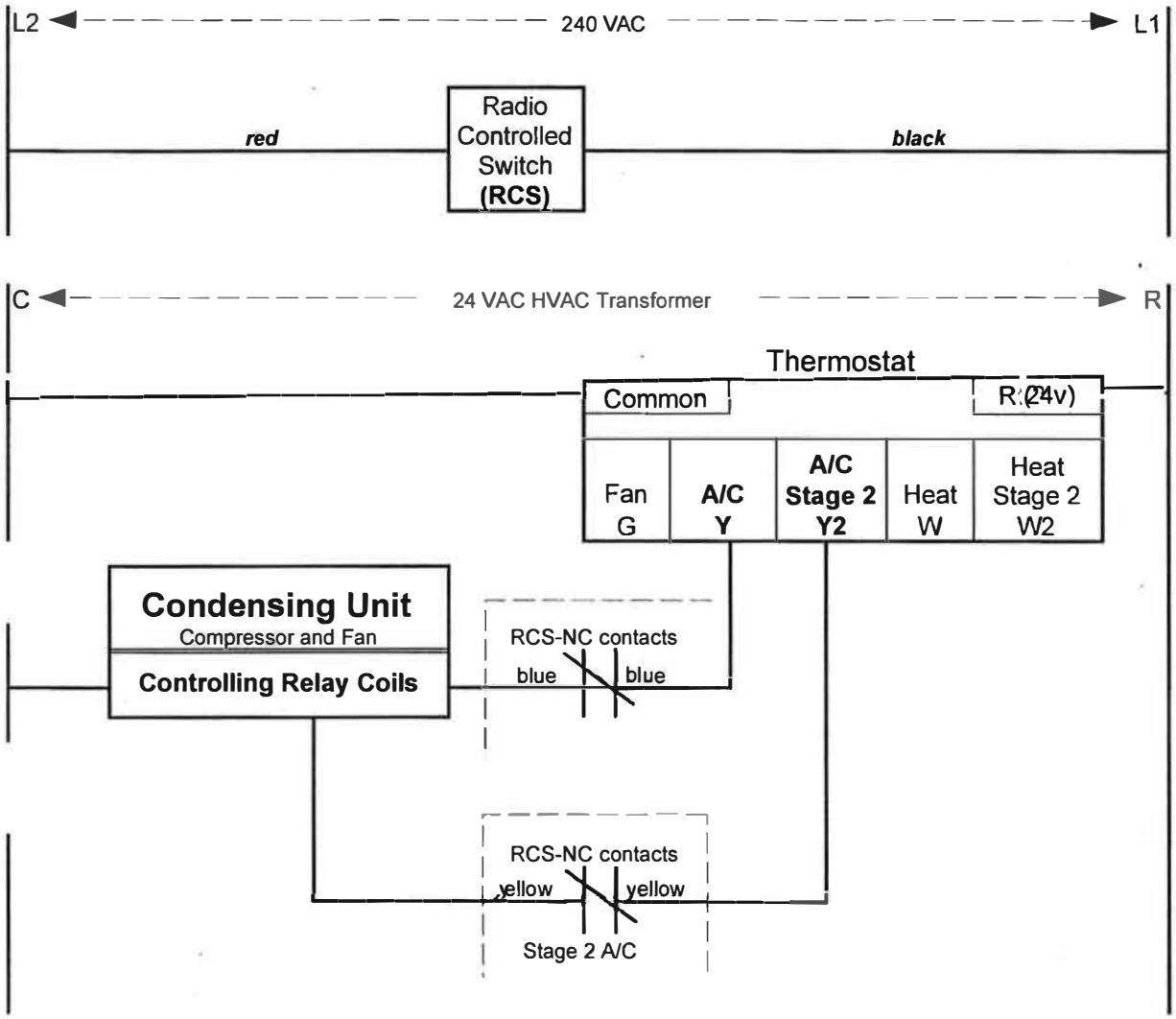
BLOCK WIRING SCHEMATIC

Radio Control Switch **(RCS)** for ***TWO-STAGE*** Air Conditioning Systems

May 2008, **UPDATED February 2010**

For conventional 24 vac control systems

(Excludes advanced communications control systems used by the following models: Bryant - Evolution, Carrier - Infinity and Trane - XL ComfortLink)



NOTES:

1) The Radio Controlled Switch (RCS) is powered by 240 VAC as shown above using the red and black leads in the RCS wiring harness.
2) RCS-NC (normally closed) relay contacts are shown in the de-energized state. Note that the RCS relay contacts will remain in their normal closed state when power is applied to the RCS.
3) A two stage A/C RCS is equipped with two sets of NC isolated contacts for controlling two stages of air conditioning. In the RCS wiring harness, one set has blue wires and the other set has yellow wires. These are to be wired in series with the Y and Y2 thermostat leads (as shown above) to the controlling circuit for the condensing unit. Both relay contacts are operated simultaneously from RCS F1 function.
4) Once the RCS is activated by the proper radio signal using a hand-held tester, the contacts will open for one period (7.5 minutes plus or minus 1.5), then will revert to a closed state unless additional radio signals are received.
5) The RCS may be activated by a radio signal via Cooperatives' radio base stations. The contacts will then open for the duration of a scheduled cyclic control session. CHECK WITH BUCKEYE POWER FOR THE EXPECTED LENGTH OF CONTROL IF REQUIRED (800-282-6962 x203 or 614-430-7845).

The above is for informational purposes only and Buckeye can not be held responsible for errors, omissions or any problems arising from its use. When in doubt of making proper connections, consult with the manufacturer or an authorized OEM representative of the A/C unit before installing RCS.

REFER TO BUCKEYE POWER FOR ANY QUESTIONS OR COMMENTS (800-282-6962 x203 or 614-430-7845)

APPENDIX "B-1,2 & 3"

RCS WIRING DIAGRAMS FOR CONTROLLING A/C UNITS WITH ADVANCED COMMUNICATIONS CONTROL SYSTEMS

(BRYANT - EVOLUTION)
(CARRIER - INFINITY)
(TRANE - XL COMFORTLINK)

APPENDIX "B-1"

RCS WIRING DIAGRAMS FOR CONTROLLING BRYANT - EVOLUTION A/C UNITS WITH ADVANCED COMMUNICATIONS CONTROL SYSTEMS

180A, 187A
Evolution® Line Air Conditioners with Puron Refrigerant
2 to 5 Nominal Tons (Sizes 024 to 060)

bryant®

Installation Instructions

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

Unless otherwise noted, information in these installation instructions pertain to both 180A and 187A series units. Information that is unique to the 180A series will be identified as such; likewise information that is unique to the 187A series will also be identified.

SAFETY CONSIDERATIONS

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

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and current editions of the National Electrical Code (NEC) NFPA 70. In Canada, refer to current editions of the Canadian electrical code CSA 22.1.

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

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

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

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

Indoor Thermostat Control Options

Model	Evolution Control	Standard 2-stage Thermostat
187A	Yes	Yes
180A	Yes	Yes*

* Units containing circuit board HK38EA015 or newer.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

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

Puron refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron equipment.

System Functions And Sequence Of Operation

The outdoor unit control system has special functions. The following is an overview of the 2-stage control functions:

Cooling Operation

187A and 180A (containing circuit board HK38EA015 or newer) models utilize either a 2-stage cooling indoor thermostat or an Evolution communicating User Interface. With a call for first stage cooling, the outdoor fan and low-stage compressor are energized. If low-stage cannot satisfy cooling demand, high-stage is energized by the second stage of indoor thermostat or User Interface. After second stage is satisfied, the unit returns to low-stage operation until first stage is satisfied or until second stage is required again. When both first stage and second stage cooling are satisfied, the compressor will shut off.

NOTE: On 187A models, if unit has not operated within the past 12 hrs, or following a unit power-up, upon the next thermostat high- or low-stage demand, unit operates for a minimum of 5 minutes in high-stage.

NOTE: With non-communicating (non-Evolution) systems, with first stage of cooling, (Y1) is powered on; and with second stage of cooling, (Y1 and Y2) are on.

NOTE: When 2-stage unit is operating at low-stage, system vapor (suction) pressure will be higher than a standard single-stage system or high-stage operation.

NOTE: Outdoor fan motor will continue to operate for one minute after compressor shuts off, when outdoor ambient is greater than or equal to 100°F (37.78°C). This reduces pressure differential for easier starting on the next cycle.

Communication and Status Function Lights

For Evolution Control Only, Green communications (COMM) Light

A green LED (**COMM light**) on the outdoor board (see Fig. 6) indicates successful communication with the other system products. The green LED will remain OFF until communications is established. Once a valid command is received, the green LED will turn ON continuously. If no communication is received within 2 minutes, the LED will be turned OFF until the next valid communication.

Amber Status Light

An amber colored **STATUS light** is used to display the operation mode and fault codes as specified in the troubleshooting section. See Table 6 for codes and definitions.

NOTE: Only one code will be displayed on the outdoor unit control board (the most recent, with the highest priority).

Utility Interface

With Evolution Control

The utility curtailment relay should be wired between R and Y2 connections on the control board for Evolution Communicating Systems only (see Fig. 6.) This input allows a power utility device to interrupt compressor operation during peak load periods. When the utility sends a signal to shut the system down, the User Interface will display, "Curtailment Active".

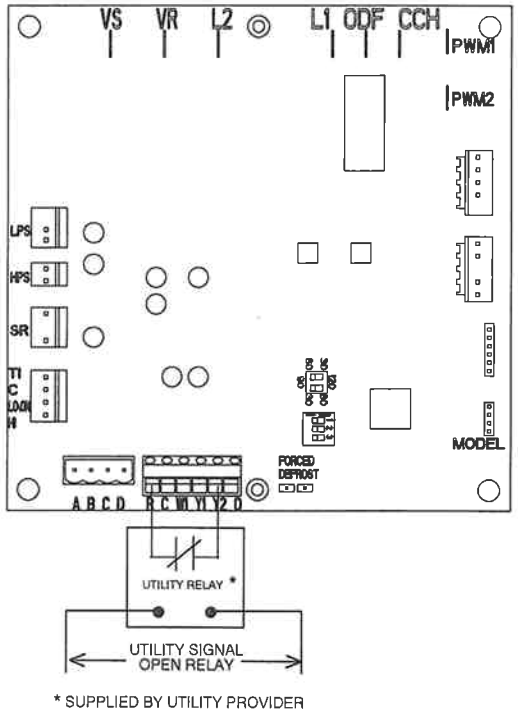
One Minute Stage Change Time Delay on 187A Models

When compressor changes stages from high to low or low to high, there is a 1-minute time delay before compressor restarts. The outdoor fan motor remains running.

Compressor Operation on 187A Models

When the compressor operates in high-stage operation, the motor rotates clockwise. Both the lower and upper pistons are eccentric with the rotating crankshaft and both compress refrigerant.

When the compressor operates in low-stage operation the motor reverses direction (rotates counterclockwise). The lower piston becomes idle and the upper piston compresses refrigerant. **The start and run windings are reversed.**



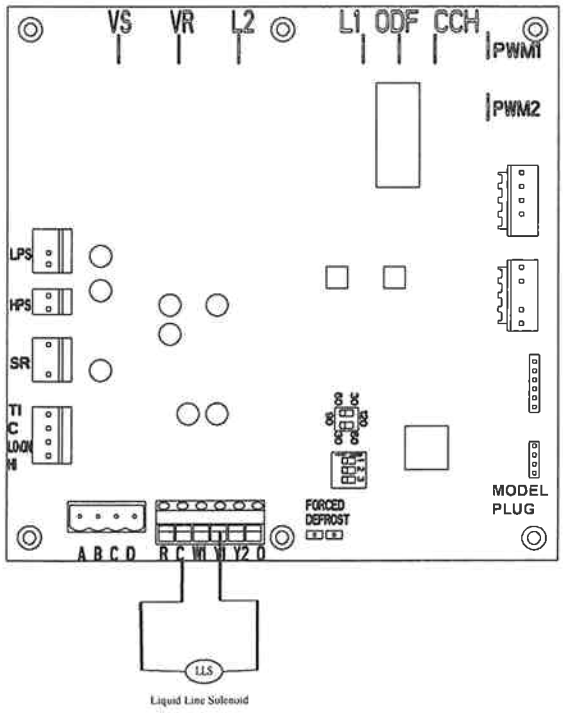


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Fig. 6 - 2-Stage Control Board

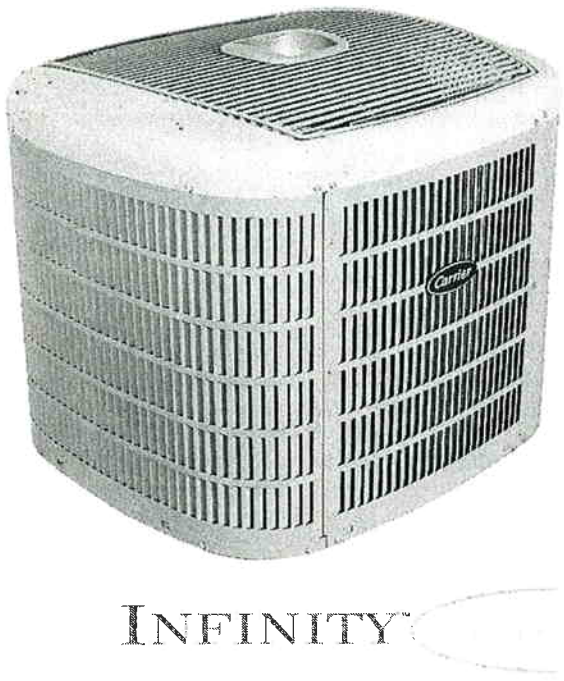
APPENDIX "B-2"

RCS WIRING DIAGRAMS FOR CONTROLLING
CARRIER - INFINITY A/C UNITS
WITH ADVANCED
COMMUNICATIONS CONTROL SYSTEMS

25HNA
Infinity™ Series Heat Pumps with Puron®
Sizes 24 to 60
2 To 5 Nominal Tons

Carrier®
Turn to the Experts.

Installation Instructions



A05240

Fig. 1 – 25HNA6 / 25HNA9

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

Unless otherwise noted, information in these installation instructions pertain to both 25HNA6 and 25HNA9 series units. Information that is unique to the 25HNA6 series will be identified as such; likewise information that is unique to the 25HNA9 series will also be identified.

TABLE OF CONTENTS

STEP 13 —Start-Up

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this caution may result in minor personal injury, equipment damage or improper operation.

Observe the following:

- Do not overcharge system with refrigerant.
- Do not operate unit in a vacuum or at negative pressure.
- Do not disable low pressure switch
- Dome temperatures may be hot.

PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

Wear safety glasses, protective clothing, and gloves when handling refrigerant.

ENVIRONMENTAL HAZARD

Failure to follow this caution may result in environmental damage.

Federal regulations require that you do not vent refrigerant to the atmosphere. Recover during system repair or final unit disposal.

Follow these steps to properly start up the system:

1. After system is evacuated, fully back seat (open) liquid and vapor service valves.
2. Unit is shipped with valve stem(s) front seated (closed) and caps installed. Replace stem caps after system is opened to refrigerant flow (back seated). Replace caps finger-tight and tighten with wrench an additional 1/12 turn.
3. Close electrical disconnects to energize system.
4. Set room thermostat or User Interface at desired temperature. Be sure set point is below indoor ambient temperature and is set low enough to energize desired stage.
5. Set room thermostat or User Interface to COOL and fan control to ON or AUTO mode, as desired. Operate unit for 15 minutes. Check system refrigerant charge.

NOTE: For 25HNA6 Series only using non-communicating (non-Infinity) thermostat. Carrier electronic thermostats are equipped with a 15-minute staging timer. This timer prevents the two-stage system from operating at high stage until unit has been operating in low stage for 15 minutes, unless there is at least a 5°F difference between room temperature and thermostat set point. To force high stage (after a minimum of 2 minutes in low stage), adjust the set point at least 5°F below room ambient.

6. Set room thermostat or User Interface to HEAT or COOL and fan control to AUTO or ON, as desired. Wait for appropriate time delay(s). Operate unit for 15 minutes. Check refrigerant charge.

STEP 14 —SYSTEM FUNCTIONS AND SEQUENCE OF OPERATION

The outdoor unit control system has special functions. The following is an overview of the two-stage control functions:

Cooling and Heating Operation

The 25HNA6 model utilizes either a standard indoor thermostat or Infinity Communication User Interface. The 25HNA9 models utilize an Infinity communicating User Interface only. With a call for first stage cooling, the outdoor fan, reversing valve, and low stage compressor are energized. If low-stage cannot satisfy cooling demand, high-stage cooling is energized by the second stage of indoor thermostat or User Interface. After second stage is satisfied, the unit returns to low-stage operation until first stage is satisfied or until second stage is required again. When both first stage and second stage cooling are satisfied, the compressor will shut off. The reversing valve will remain energized until the control board power is removed or a call for heating in initiated. With a call for heating, the outdoor fan and compressor are energized. The compressor will operate in high or low stage operation, as needed to meet the heating demand. When the heating demand is satisfied, the compressor and fan will shut off. The reversing valve is de-energized in the heating mode.

NOTE: When two-stage unit is operating at low-stage, system vapor (suction) pressure will be higher than a standard single-stage system or high-stage operation.

NOTE: Outdoor fan motor will continue to operate for one minute after compressor shuts off, when outdoor ambient is greater than or equal to 100°F.

NOTE: On 25HNA6 models, if unit has not operated within the past 12 hours, or following a unit power-up, upon the next thermostat high- or low-stage demand, unit operates for a minimum of 5 minutes in high-stage.

On 25HNA6 models with non-communicating (non-Infinity) systems, with first stage of cooling, Y1 and O are powered on; and with second stage of cooling, Y1, Y2, and O are on. For these systems, with first stage of heating Y1 is on and for second stage of heating, Y1 and Y2 are on. When the reversing valve is energized, O is powered on.

Communication and Status Function Lights

For Infinity Control only, Green communications (COMM) Light

A green LED **(COMM light)** on the outdoor board (see Fig. 9) indicates successful communication with the other system products. The green LED will remain OFF until communications is established. Once a valid command is received, the green LED will turn ON continuously. If not communication is received within 2 minutes, the LED will be turned OFF until the next valid communication.

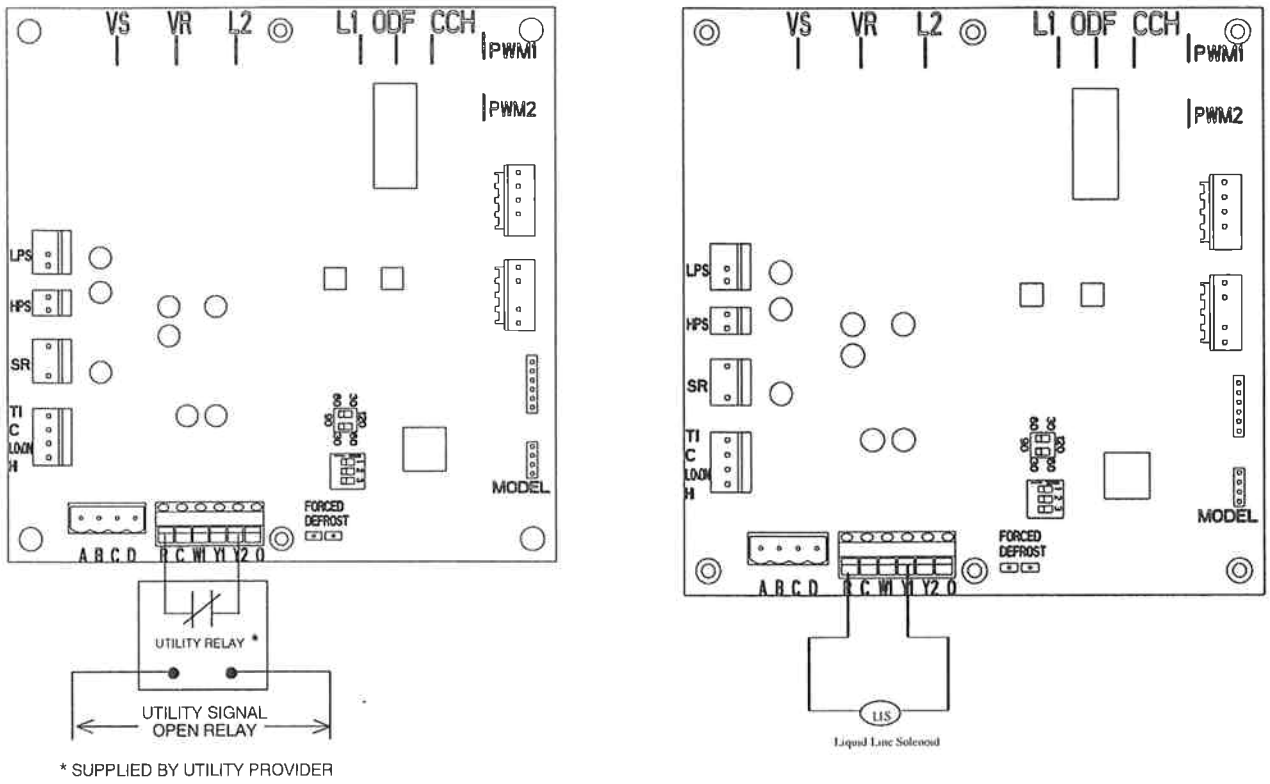
Amber Status Light

An amber colored **STATUS light** is used to display the operation mode and fault codes as specified in the troubleshooting section. See Table 5 for codes and definitions.

NOTE: Only one code will be displayed on the outdoor unit control board (the most recent, with the highest priority).

Utility Interface With Infinity Control

The utility curtailment relay should be wired between R and Y2 connections on the control board for Infinity Communicating Systems only (see Fig. 9.) This input allows a power utility device to interrupt compressor operation during peak load periods. When the utility sends a signal to shut the system down, the User Interface will display, "Curtailment Active".



A05247

Fig. 9 – 2-Stage Control Board

25HNA

GENERAL INFORMATION

Low Ambient Cooling

When this unit is operating below 55°F outdoor temperature, provisions must be made for low ambient operation.

Infinity Controlled low ambient cooling:

This unit is capable of low ambient cooling without a kit ONLY when using Infinity control. A low ambient kit is not required, and the outdoor fan motor does not need to be replaced for Infinity controlled low ambient operation. The Infinity Control provides an automatic evaporator coil freeze protection algorithm that eliminates the the need for an evaporator freeze thermostat. Low ambient cooling must be enabled in the User Interface set up. Fan may not begin to cycle until about 40°F OAT. Fan will cycle based on coil and outdoor air temperature.

Infinity controlled low ambient mode operates as follows:

- Fan is OFF when outdoor coil temp is < (outdoor air temperature + 3 °F) or outdoor fan has been ON for 30 minutes. (Fan is turned off to allow refrigerant system to stabilize.)
- Fan is ON when outdoor coil temp > (outdoor air temperature + 25°F) or outdoor coil temp > 80°F or if outdoor fan has been OFF for 30 minutes. (Fan is turned on to allow refrigerant system to stabilize.)
- Low pressure switch is ignored for first 3 minutes during low ambient start up. After 3 minutes, if LPS trips, then outdoor fan motor is turned off for 10 minutes, with the compressor running. If LPS closes within 10 minutes then cooling continues with the outdoor fan cycling per the coil temperature routine listed above for the remainder of the cooling cycle. If the LPS does not close within 10 minutes, then the normal LPS trip response (shut down cooling operation and generate LPS trip error) will occur.

Defrost

This control offers 5 possible defrost interval times: 30, 60, 90, 120 minutes, or AUTO.

On 25HNA6 models, these are selected by dip switches on the unit control board or by the Infinity Control User Interface. The Infinity Control selection overrides the control board dip switch settings.

On 25HNA9 , the defrost interval times: 30, 60, 90, and 120 - minutes or AUTO are selected by the Infinity Control User Interface (the dip switches are not used.)

AUTO defrost adjusts the defrost interval time based on the last defrost time as follows:

- When defrost time <3 minutes, the next defrost interval=120 minutes.
- When defrost time 3-5 minutes, the next defrost interval=90 minutes.
- When defrost time 5-7 minutes, the next defrost interval=60 minutes.
- When defrost time >7 minutes, the next defrost interval=30 minutes.

The control board accumulates compressor run time. As the accumulated run time approaches the selected defrost interval time, the control board monitors the coil temperature sensor for a defrost demand. If a defrost demand exists, a defrost cycle will be initiated at the end of the selected time interval. A defrost demand exists when the coil temperature is at or below 32°F for 4 minutes during the interval.

The defrost cycle is terminated when the coil temperature reaches 65°F or 10 minutes has passed.

If the coil temperature does not reach 32°F within the interval, the interval timer will be reset and start over.

- Upon initial power up the first defrost interval is defaulted to 30 minutes. Remaining intervals are at selected times.
- Defrost is only allowed to occur below 50°F outdoor ambient temperature.

APPENDIX "B-3"

RCS WIRING DIAGRAMS FOR CONTROLLING TRANE - XL COMFORTLINK A/C UNITS WITH ADVANCED COMMUNICATIONS CONTROL SYSTEMS

TRANE

It's Hard To Stop A Trane.®

Application Guide

Trane Residential Communicating Systems

SSC-APG005-EN

Shutdown Device Wiring Diagrams
Unit Mounting
Minimum Clearances
Refrigerant Piping Limitations

Photo of Trane XL20*i* outdoor unit with Comfortlink™ II and Charge Assist™

XL16i Typical wiring if load shedding is required as specified in Table 1.

Stage One and Stage Two Load Shedding

Diagram shows only the affected common low voltage circuitry

Figure #8

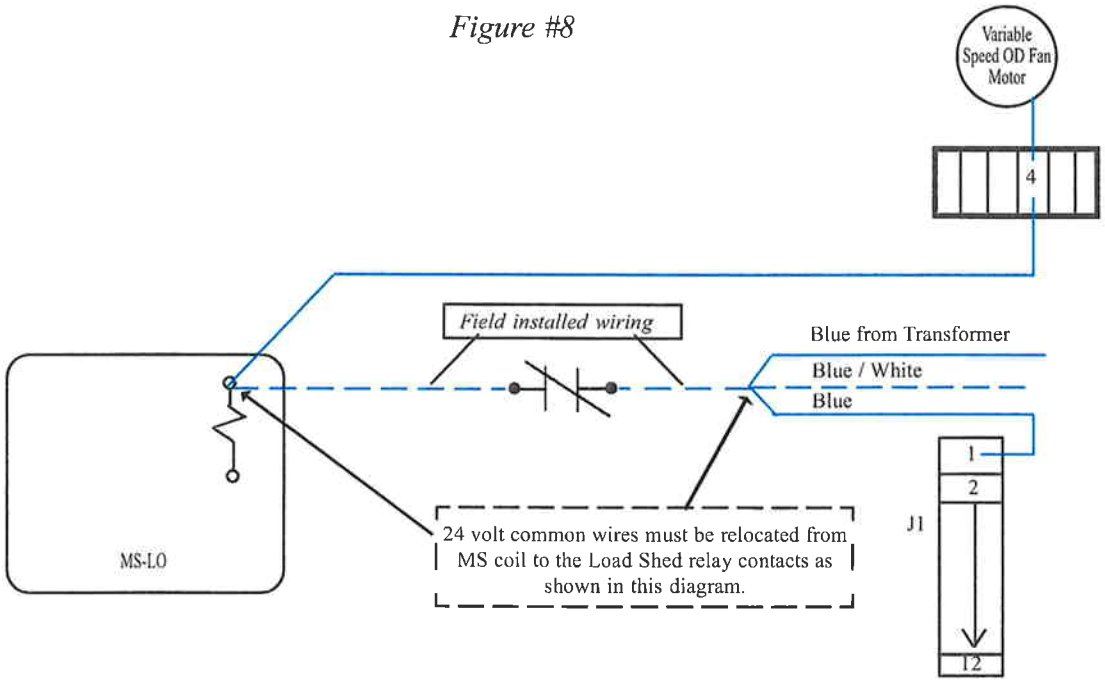


Figure #9

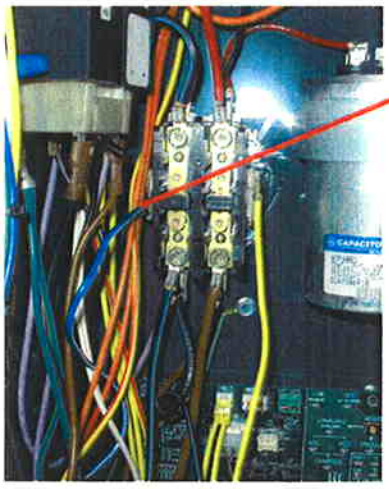


Photo of XL16i Com Sys cooling model contactor relay

Remove the three low voltage blue wires from the MS contactor and connect them to one side of the EDC contacts. Connect the other side of the EDC contacts to the MS contactor as shown in Figure 8

HOW IT WORKS

The purpose of any load shedding device is to off load the local utility grid when demand exceeds power capability or a predetermined load by the local untility has been exceeded. This control will cycle both compressors and the outdoor fan off whenever the load shedding device energizes. Communication failures should not result from breaking the common circuitry in the above manner.

⚠ WARNING

Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

XL20i Typical wiring if load shedding is required as specified in Table 1.

Stage One and Stage Two Load Shedding

Diagram shows only the affected common low voltage circuitry

Figure #10

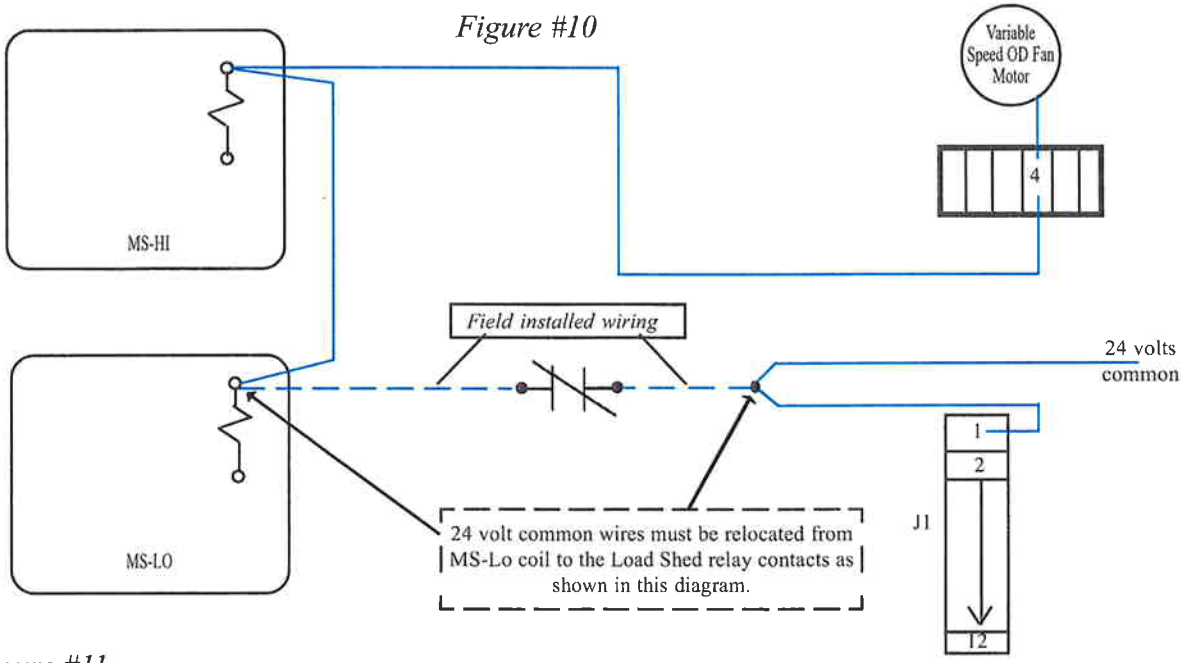


Figure #11

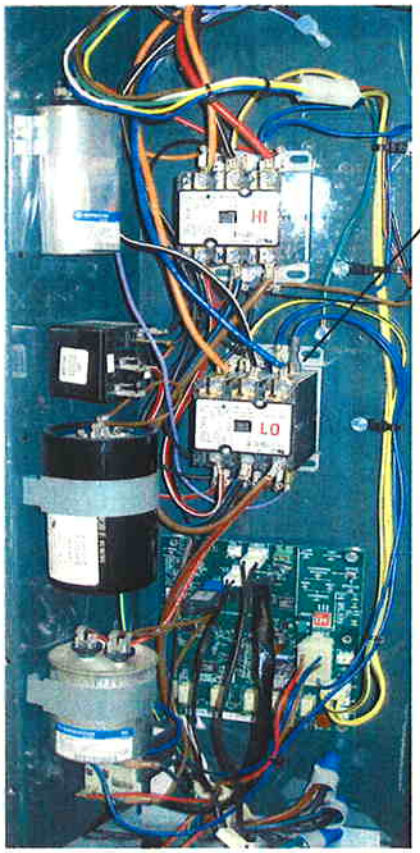


Photo of XL20i Com Sys cooling model.

Remove the two wire spade connection and connect it to one side of the load shed relay contacts and connect the other side of the contacts to the MS-LO contactor coil as shown in the above illustration.

HOW IT WORKS

The purpose of any load shedding device is to off load the local utility grid when demand exceeds power capability or a predetermined load by the local untility has been exceeded. This control will cycle both compressors and the outdoor fan off whenever the load shedding device energizes. Communication failures should not result from breaking the common circuitry in the above manner.

⚠ WARNING

Hazardous Voltage!
Disconnect all electric power, including remote disconnectsbefore servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

XL20i Typical wiring if partial load shedding is required as specified in Table 1.

Stage Two Load Shedding

Diagram shows only the affected common low voltage circuitry

Figure #12

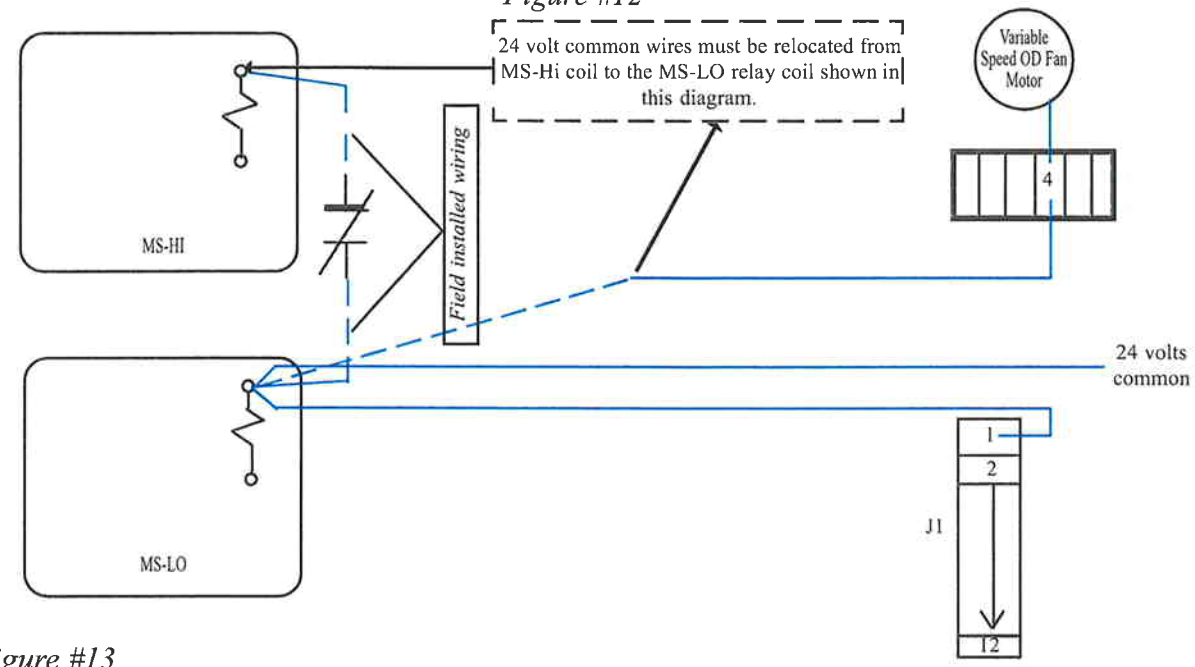


Figure #13

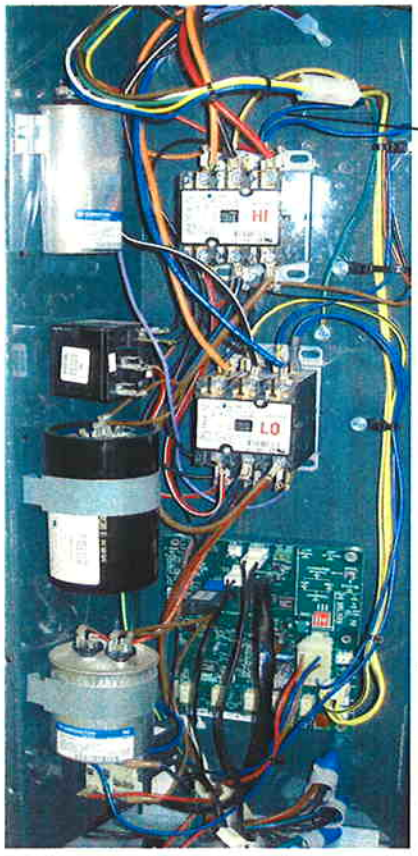


Photo of XL20i Com Sys cooling model.

Remove the two wire spade connection and connect it to one side of the load shed relay contacts and connect the other side of the contacts to the MS-HI contactor coil as shown in figure 12.

HOW IT WORKS

The purpose of any load shedding device is to off load the local utility grid when demand exceeds power capability or a predetermined load by the local untility has been exceeded. This control will cycle the high speed compressor off whenever the load sheddng device energizes. The indoor blower will run independently and may ramp to high speed. **The home-owner must be made aware that higher than normal humidity could result during load shedding periods if this scheme is used.** Communica-tion failures should not result from breaking the common circuitry in the above manner.

⚠ WARNING

Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.