

ACCESSORY KIT INSTALLATION MANUAL

AC COMMUNICATING CONTROLS FIELD KIT RETRO FIT APPLICATIONS (S1-33102952111)

FOR MODELS: CZE, AC5B, AL5B, CZH, AC8B, AL8B

GENERAL INFORMATION

This kit can be used to replace current comfort alert modules and will provide lockout protection for the system. This kit can be used with a conventional thermostat control or with the new communicating thermostats offered through Source 1 (S1-YACNC01, S1-CZCNC01, S1-LACN01). Note, to utilize the communication function of the control, the indoor unit and thermostat must be upgraded to the proper communicating equipment.

The instructions below describe how to install the Outdoor AC Communicating Control into the applicable AC models. Please read through the instructions before working on the equipment and also make sure all the components listed in the Parts List are included in the kit.

Parts List

Part#	Description	Qty
501264	Control Board-AC Communicating	1
439930	Wiring Harness	1
439931	Wiring Harness	1
5935	Screw, PNH #6-20	6
501649	Wiring Diagram -15 SEER	1
501650	Wiring Diagram -18 SEER	1
501661	Label-Fault Code (AC)	1
503380	Ambient Sensor	1
7304	Strain Relief	1
14914	1/4" Insulated Quick Connect Terminal	2
7315	Zip Tie	2

INSTALLATION

COMPONENT REMOVAL

1. Turn Thermostat to OFF.
2. Turn OFF Power to Indoor and Outdoor unit's.
3. Remove access panel to outdoor unit.
4. Remove two lower screws on control box and loosen the two upper screws to lower control box down to gain better access.

IMPORTANT

Check with volt meter that power is off before proceeding.

5. Cut any of the large zip ties that are holding the bundle of wires together inside the control box.
6. Disconnect the following wires:
 - a. Thermostat wire and low voltage wires in low voltage box: Y1, R, C, and Y2 (keep wire nuts).
 - b. The following wires should be in a harness (part# 67849) with a small zip tie:
 - Discard red wire from contactor "T2" to Run Capacitor "C".
 - Discard yellow wire going from "Y" on comfort alert to contactor coil.
 - Discard black wire going from "C" on Comfort Alert Module to the low voltage box and disconnect/discard the black wire going to "C" on Comfort Alert Module to low pressure switch.

- Discard red wire going from "R" on Comfort Alert Module to the low voltage box.
 - c. Disconnect blue/pink wire from low pressure switch to contactor coil. Disconnect yellow/pink wire from high pressure switch to contactor coil.
 - d. Pull yellow/pink wire from high pressure switch out of low voltage box.
 - e. Disconnect & discard the blue/yellow wire from the 2-stage compressor solenoid coil to low voltage box.
 - f. Disconnect the compressor run, start, and common wires from the contactor and run capacitor. Remove these from the Comfort Alert Module, then reconnect them back to the contactor and run capacitor.
7. Remove Comfort Alert Module from the control box. The two screws that attach the Comfort Alert Module can be reused if needed to attach the new control board.

NEW COMPONENT INSTALLATION

1. Cut the insulated male quick connect off of the end of the low pressure switch blue/pink wire. Strip 3/16" to 1/4" of insulation off the end of the wire and crimp a 1/4" insulated female quick connect.
2. Take stripped end (3/16" to 1/4" long) of yellow/pink high pressure switch lead and crimp a 1/4" insulated female quick connect.
3. Take the six 5935 #6-20 screws and attach the 501264 control board to the upper right corner of the control box. See Figure 1.
4. Take wiring harness 439931 and install it to the control board 501264 & contactor. Refer to Figures 4 & 5.
 - Take black wire with insulated quick connect and attach to terminal "C" on the control board.
 - Take grey wire with insulated quick connect and attach it to terminal "M" on the control board.
 - Take black wire with non-insulated quick connect and attach it to the bottom terminal of the 24V contactor coil.
 - Take grey wire with non-insulated quick connect and attach it to the top terminal of the 24V contactor coil.
 - Take long side of red wire and attach it to "C" terminal on run capacitor.
 - Take short side of red wire and attach it to T2 on the contactor.
5. Connect the free end of the 2-Stage compressor solenoid coil to the M2 terminal on the control board per Figures 4 & 5.
6. Connect high & low pressure switches to their designated locations on the control board labeled HPS & LPS.
7. Take 503380 ambient sensor and connect it to the control board, labeled AMB.
 - a. Remove electrical cover on service valve corner-post. See Figure 1.
 - b. Route ambient sensor through plastic bushing in the bottom of the control box. Route wires/sensor toward the top of the service valve corner-post and push ambient sensor through hole in the top of the corner-post. Run the ambient sensor through the bottom of the electrical cover and let hang in air 1-2" below the bottom of the cover. See Figure 1.
 - c. Take 7304 strain relief and secure the ambient sensor wire in the hole on the top of the service valve corner-post. See Figure 1.
 - d. Reinstall electrical cover.

8. For CONVENTIONAL WIRING applications install wire harness 439930 per Figures 4 & 5, depending on application. Route the 439930 low voltage wire harness into the low voltage box and connect to the thermostat wire per unit installation instructions or how it was hooked up prior to installation of this kit.

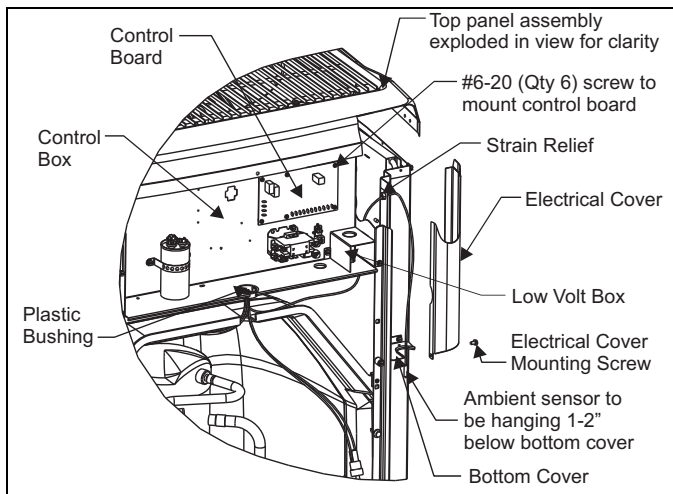


FIGURE 1: Control Panel

9. For full COMMUNICATING WIRING applications install communicating wire harness 500645 / S1-02542694000 or available through the communicating thermostat kits (S1-YACNC01, S1-CZCNC01, S1-LACN01). These are all available through Source 1. Connect plastic connector to the communication connection on the outdoor control board. Refer to Figures 2, 4 & 5. Route wires into low voltage box and connect thermostat wire per the thermostat installation diagram or unit installation instructions.
- Communication connection A, R, C, B on the outdoor unit should connect to A, R, C, B on the indoor unit via field installed thermostat wire.

NOTICE

Communicating systems require four wire thermostat conductors for operation. If these are not available new thermostat wire will need to be installed.

IMPORTANT

If unit is going to be setup as a communicating system, the conventional wiring must be removed from the outdoor control board, if not, damage to control board or indoor control could occur.

- Bundle wires together at the front of the control box and secure with a zip tie. Clip off the excess zip tie.
- Slide control box back into the up position and secure it with the factory screws.
- Re-apply indoor unit power and check for Green LED2 flash on control board at outdoor unit (refer to Label Fault Code-AC for additional information).
- Install wiring diagrams to access panel depending on specific application.
 - 501649 applies to CZE, AC5B, AL5B models
 - 501650 applies to CZH, AC8B, AL8B models

- Install 501661 Label Fault Code-AC in place of the 67407 label comfort alert diagnostics currently installed on access panel. The comfort alert Label can be removed from the access panel.
- Reinstall access panel.
- Turn on power to outdoor unit.
- Turn thermostat on and check for proper operation.

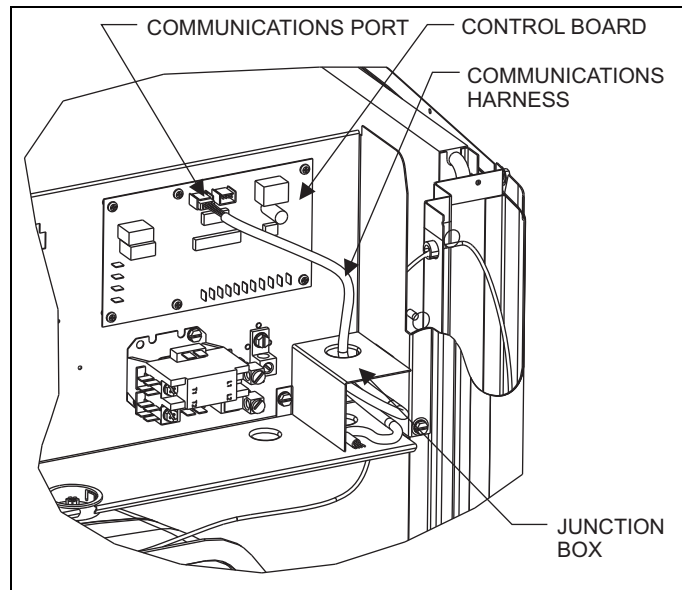


FIGURE 2: Communications Harness Connection

COMPETITOR INSTALLATIONS

This control in conjunction with the Indoor interface control can be applied to competitor systems to allow the use of the Johnson Controls branded York, Coleman, or Luxaire communicating thermostats to create a communicating system. The communicating indoor interface control and communicating thermostats can be purchased through Source 1. (ID Aux Control S1-03102953000, Thermostats S1-YACNC01, S1-CZCNC01, S1-LACN01).

Installation wiring will be based on the compressor inputs required to run the compressor/fan system. Further information is contained in this document that explains the function of the communicating AC control's inputs, outputs, and fault codes.

IMPORTANT

Additional components may be required to adapt the control into a competitor system. These components are not included in this kit and will be the responsibility of the installer to provide them.

Installation

- Turn thermostat to OFF.
- Turn OFF power to indoor and outdoor unit's.
- Remove access panel to outdoor unit.

IMPORTANT

Check with volt meter that power is off before proceeding.

- Remove any current control systems and /or wires from the control that are used to operate the condensing unit.

5. Find a suitable location free from moisture or potential water infiltration in the control box and mount the control with the six #6-20 Screws supplied in the kit. If there are no holes present, mark and drill six holes using a #36 drill bit (0.1065" Diameter).
6. Take 503380 ambient sensor and connect it to the control board, labeled AMB.
 - a. Find a suitable path free from sharp edges to run the ambient sensor to the outside of the unit.
 - b. The ambient sensor should hang in the air 1-2" away from sheetmetal.
7. Using wire harness 439931 wire up the board to the contactor. Refer to board layout and function to determine which M, M1, or M2 terminal needs to be connected to the contactor. Also connect C to the opposite side of the contactor from the M connection. Figures 4 & 5.
8. For full COMMUNICATING WIRING applications install communicating wire harness 500645 / S1-02542694000 or it is available through the communicating thermostat kits (S1-YACNC01, S1-CZCNC01, S1-LACN01). These are all available through Source 1. Connect plastic connector to the communication connection on the outdoor control board. Refer to Figures 2, 4 & 5. Route wires into low voltage box and connect thermostat wire per the thermostat installation instructions.
 - a. Communication connection A, R, C, B on the outdoor unit should connect to A, R, C, B on the indoor unit via field installed thermostat wire.
10. Re-apply indoor unit power and check for Green LED2 flash on control board at outdoor unit (refer to Label Fault Code-AC for additional information).
11. Install 501661 Label Fault Code-AC on the inside cover of the access panel.
12. Reinstall the access panel to the control box.
13. Turn on power to outdoor unit.
14. Turn thermostat on and check for proper operation.

OUTDOOR COMMUNICATING CONTROL BOARD FUNCTIONALITY

ANTI-SHORT CYCLE DELAY

The control includes a five-minute anti-short cycle delay (ASCD) timer to prevent the compressor from short cycling after a power interruption or thermostat signal interruption. The ASCD timer is applied when the control is first powered from the indoor unit thermostat and immediately following the completion of a compressor run cycle. The compressor and the outdoor fan will not operate during the five minutes that the timer is active.

The ASCD timer can be bypassed by connecting the TEST terminals for three seconds while the thermostat is calling for compressor operation (Y1 input signal energized).

LOW VOLTAGE DETECTION

The control monitors the transformer secondary (24 VAC) voltage and provides low voltage protection for the AC unit and its components. In particular, the control prevents contactor chatter during low voltage conditions. If the voltage drops below approximately 19 VAC, the control will continue to energize any relays that are already energized but will not energize any additional relays until the voltage level increases. If the voltage drops below approximately 16 VAC, the control will immediately de-energize the relay outputs and will not energize any relays until the voltage level increases. The control will store and display the appropriate fault codes when low voltage conditions occur.

TEST INPUT

The control includes a TEST input connector that can be used for various testing functions during installation and service. Table 1 summarizes the behavior of the control when the two TEST pins are connected.

NOTICE

Communicating systems require four wire thermostat conductors for operation. If these are not available new thermostat wire will need to be installed.

IMPORTANT

If unit is going to be setup as a communicating system, the conventional wiring must be removed from the Outdoor Control Board!

9. Bundle wires together in the control box and secure with a zip tie. Clip off the excess zip tie.

TABLE 1: TEST Input Functionality

Duration of connection (seconds)	Control behavior with no system master signals present	Control behavior with system master signals present
< 2	No response	No response
2 <	Display compressor type TS, Ultratech, or single stage compressor, Ignore LPS	Bypass ASCD (Reduce timer to zero immediately). If Y1 (thermostat or communication) is present and the high-pressure switch is closed, contactor's will be energized.
	Clear soft lockout	Clear soft lockout
	Clear hard lockout	Clear hard lockout
	Reset TS anticipation mode counter to zero for TS systems.	Reset TS anticipation mode counter to zero for TS systems.
		Reduce TS staging delays for TS systems as described below.
Connection removed	Resume normal LED display	
Connection not removed	Nothing more than previously explained	

LED DIAGNOSTIC INDICATORS

The control includes two LED's that display diagnostic information. LED1 is red and LED2 is green. These LED's are used to display operational mode, fault information. A third LED, LED3 is used to display status information. LED3 is yellow. These LED's are used to display operational mode, status, and fault information.

OPERATIONAL MODE DETECTION

The control can be used in a variety of applications including AC units with multistage compressors. The control uses various inputs to determine the proper mode of operation.

The control senses the connections that are made to M, M1, and M2 terminals and determines the correct operational mode for the control. This is done each time power to the control is cycled. Therefore, it is important that no loads be attached to the M1 or M2 terminals of the control for single-stage compressors, and no loads be attached to the M1 terminal of the control for a scroll two-stage compressor.

IMPORTANT

Do not connect any loads to the M1 or M2 terminals of the control for single-stage compressors, and no loads should be attached to the M1 terminal of the control for scroll two-stage compressor. Incorrect system behavior could result.

OPERATIONAL MODE DISPLAY

The control will display its active operational mode using the onboard LED's when the TEST pins are connected while no thermostat signals are energized. Table 2 describes the operational modes. The control will display the operational mode as long as the TEST pins are shorted and no thermostat signals are energized. When the TEST pin short is removed, the control will return to normal LED displays.

TABLE 2: Operational Mode Display

Compressor Type	LED1 (Red)	LED2 (Green)
Single Stage Compressor	1 flash	–
TS Compressor	2 flashes	–
UltraTech Compressor	3 flashes	–

STATUS CODE DISPLAY

The control also provides status codes using the LED's. Status codes indicate the state of the operation of the unit but do not represent a fault. Tables 3 & 4 describes the LED displays during status codes. Status codes will not be displayed when a fault code is present.

TABLE 3: Status Code Display

Description	Required Condition	LED1 (Red)	LED2 (Green)
No power to control	No power to control	OFF	OFF
First-stage compressor operation – TS or UltraTech	TS – M & M1 energized, UltraTech – M energized, Single Stage - NA	OFF	ON
Second-stage compressor operation - TS, UltraTech, or Single Stage	TS and UltraTech – M & M2 energized, Single Stage – M energized	ON	ON
Control normal operation – no communication or call for compressor present	No faults active, Y1 or Y2 not present	OFF	2s ON / 2s OFF
Control normal operation – in ASCD period	No faults active, Y1 or Y2 present, ASCD timer not expired	OFF	0.1 sec ON / 0.1 sec OFF

TABLE 4: Status Code Display

Description	Required Condition	LED3 (Yellow)
Control normal operation – with active communication present	System is active and presently communicating successfully.	0.1 sec ON / 0.1 sec OFF
Control powered – without active communication present	System has 24 VAC present and the microprocessor is active.	2s ON / 2s OFF

FAULT CODE DISPLAY

The control will display any fault code that is currently active using the LED's. The control will display the fault code, pause two seconds, and display the fault again. The control will continue the fault code display until the condition that caused the fault code no longer exists. If multiple fault codes are present at the same time, the control will display only the most recent fault.

Table 5 describes the operational faults that the control can detect. The control displays these types of errors by flashing the LED1 (Red) and/or LED2 (Green).

TABLE 5: Operational Fault Codes

Description	LED1 flash code (Red)	LED2 flash code (Green)
Control Failure	ON	OFF
Operational Faults		
High-pressure switch fault (not in lockout yet)	1	OFF
System in high-pressure switch lockout	2	OFF
System in low-pressure switch lockout	4	OFF
Low Voltage (<19.2VAC) preventing further relay outputs	5	OFF
Low Voltage (<16 VAC) stopped current relay outputs	6	OFF
High-pressure switch fault (with no communication for compressor operation and where Y1 and Y2 are not energized)	9	ON

SENSOR OR SWITCH FAULT CODES

Table 6 describes the faults that the control can detect when a problem is present with a sensor or switch. The control displays this type of error by energizing LED1 (Red) constantly and flashing LED2 (Green). These faults typically occur when an AC unit has been operating and a problem occurs with a sensor or its wiring. These faults could also occur during installation as the AC unit is configured.

TABLE 6: Sensor or Switch Fault Codes

Description	LED1 Flash Code (Red)	LED2 Flash Code (Green)
Outdoor ambient sensor failure (short)	ON	1
Outdoor ambient sensor failure (open)	ON	2

WIRING RELATED FAULT CODES

Table 7 describes the faults that the control can detect when a problem is present with the system wiring or jumper configurations. The control displays this type of error by flashing LED1 (Red) and energizing LED2 (Green) constantly. These faults typically occur when the AC unit is first installed or when a system component such as the room thermostat or indoor unit is replaced or rewired.

TABLE 7: Wiring Related Fault Codes

Description	LED1 Flash Code (Red)	LED2 Flash Code (Green)
Compressor Contactor Miswire	1	ON
Y2 present without Y1	2	ON

LOCKOUT MODES

Soft Lockout

The control will cause a soft lockout during the following conditions. Detailed descriptions of the conditions required for the control to enter the soft lockout mode are contained in other sections of this document.

- High-pressure switch.
 - Two openings within six hours.
- Low-pressure switch.
 - One opening of the switch for more than five seconds except under certain conditions.

During the soft lockout mode, the control will do the following:

- De-energize the compressor contactor outputs (M, M1, & M2).

- Energize the LED's with the appropriate flash codes as described elsewhere in this document.
- In **communication applications** the fault code will be stored in the thermostat. (This feature is not available for non communicating applications).

The control will reset the soft lockout condition when any of the following occur following removal of the fault condition.

- Power is cycled to the R or Y1 inputs of the control. This will cause the soft lockout condition to be reset when the thermostat is satisfied or when the thermostat is set to SYSTEM OFF and back to HEAT or COOL mode.
- The TEST terminals are shorted for more than two seconds.

When the soft lockout condition is reset, the control will stop displaying the fault code and will respond to thermostat inputs normally.

Hard Lockout

If four soft lockouts occur within a twelve-hour period, the control will cause a hard lockout condition. These soft lockouts can be caused by the same or different conditions. The control will function in the same way during soft and hard lockout conditions. The difference is in the requirements for resetting the lockout condition. The control will reset the hard lockout condition when any of the following occur following removal of the fault condition.

- Power is removed from the R input of the control.
- The TEST terminals are shorted for more than two seconds.

A hard lockout condition will not be reset when the thermostat is satisfied or when the thermostat is set to SYSTEM OFF and back to HEAT or COOL mode. Power (24 VAC) to the control must be removed and reapplied.

When the hard lockout condition is reset, the control will de-energize the LED's and respond to inputs/communication normally.

Wiring or Setting Related Lockouts

The control will not operate the compressor when the following faults occur. These faults can be reset using the same methods used to reset a soft lockout. However, two occurrences of these faults will not cause a hard lockout condition.

- Presence of Y2 thermostat signal without Y1.

If a compressor wiring error is detected, the control will not operate the compressor. Once the compressor wiring error has been detected, power (24 VAC) must be cycled to the control for the control to sense the wiring change and clear the lockout condition.

COOLING OPERATION

First-Stage Cooling Operation

During first-stage cooling operation, the control will receive a thermostat signal at the Y1 terminal. The control will energize the M compressor output terminal. This signal energizes the coil on the compressor contactor causing the compressor to run.

Second Stage Cooling Operation

During second-stage cooling operation, the control will receive a thermostat signal from Y1 and Y2 inputs. The control will energize both the M and M2 compressor output terminals. The M signal energizes the compressor contactor causing the compressor to run. The M2 signal applies 24VAC to the rectifier plug for the compressor solenoid allowing the compressor to operate in second stage.

Two-Stage Cooling Anticipation Mode

The purpose of this mode is to allow the unit to bypass first stage operation under very hot conditions when the unit will most likely require second stage operation anyway.

The factory setting for second-stage cooling anticipation mode is OFF.

If the control receives two consecutive calls for second-stage cooling (Y1 + Y2), it will force second stage compressor operation with the next call for first stage cooling (Y1). The control will continue to force second stage cooling operation with thermostat calls for first stage cooling until one of the following conditions occur.

- A thermostat call for first stage cooling (Y1) that has duration of less than 10 minutes.
- Recycling 24VAC to the control.
- Shorting the TEST input pins.

If the Y2 LOCK jumper is in the off position, the control will not implement two-stage anticipation mode, this results in second-stage operation only when the room thermostat calls for second-stage cooling (Y1 + Y2). If the jumper is removed the control will behave as if the jumper is in the OFF position.

HIGH-PRESSURE SWITCH FAULT

The AC Unit is equipped with a high-pressure switch that is connected to the control at the HPS terminals. If the high-pressure switch opens for more than 40 milliseconds, the control will de-energize the compressor and store and display the appropriate

fault code. If the pressure switch closes and a thermostat call for compressor operation is present, the control will apply the five-minute anti-short cycle delay timer and start the compressor when the timer expires. The control will ignore the high pressure switch for 10 seconds following a call for compressor operation to avoid nuisance errors. If a call for compressor operation is initiated while the high-pressure switch is open, the control will use the logic associated with a high-pressure switch opening during a call for compressor operation.

When the compressor is started following a high-pressure switch fault, the control will start a six-hour timer based on accumulated compressor run time. If the control senses another opening of the high-pressure switch before the timer expires, it will cause a soft lockout condition. The second opening of the high-pressure switch must be greater than 160 milliseconds for the lockout to occur. If the second opening is between 40 and 160 milliseconds, the control will de-energize the compressor but not cause a soft lockout condition. If the control does not sense a second high-pressure switch opening before the six-hour timer expires, the timer and counter will be reset.

LOW-PRESSURE SWITCH FAULT

The AC unit is equipped with a low-pressure switch which is connected to the control at the LPS terminals. If the low-pressure switch opens for more than five seconds, the control will cause a soft lockout condition and display the appropriate fault codes. If the control experiences multiple soft lockouts the control will enter a hard lockout as described in another section of this document. However, the control will ignore the low pressure switch input and not cause a soft lockout condition if it opens during the following conditions.

- First two minutes of compressor operation.
- While TEST input pins are shorted while any thermostat input Y1 or Y2 signal is being received.

OUTDOOR AMBIENT TEMPERATURE SENSOR

Ambient temperature sensor is used in communication applications only. It is used to display outdoor temperature to the home owner via the communicating thermostat.

- Has no effect on operation.
- Not required for operation, but a fault code will be displayed when sensor is not connected or if sensor is shorted.

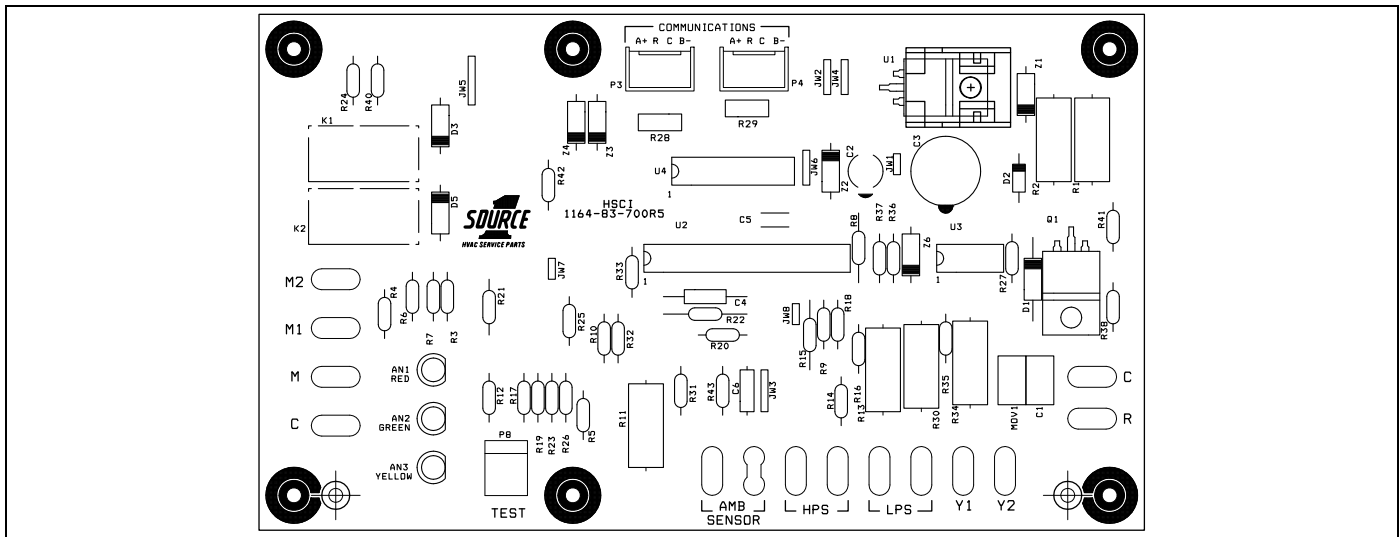


FIGURE 3: Control Board

WIRING DIAGRAMS

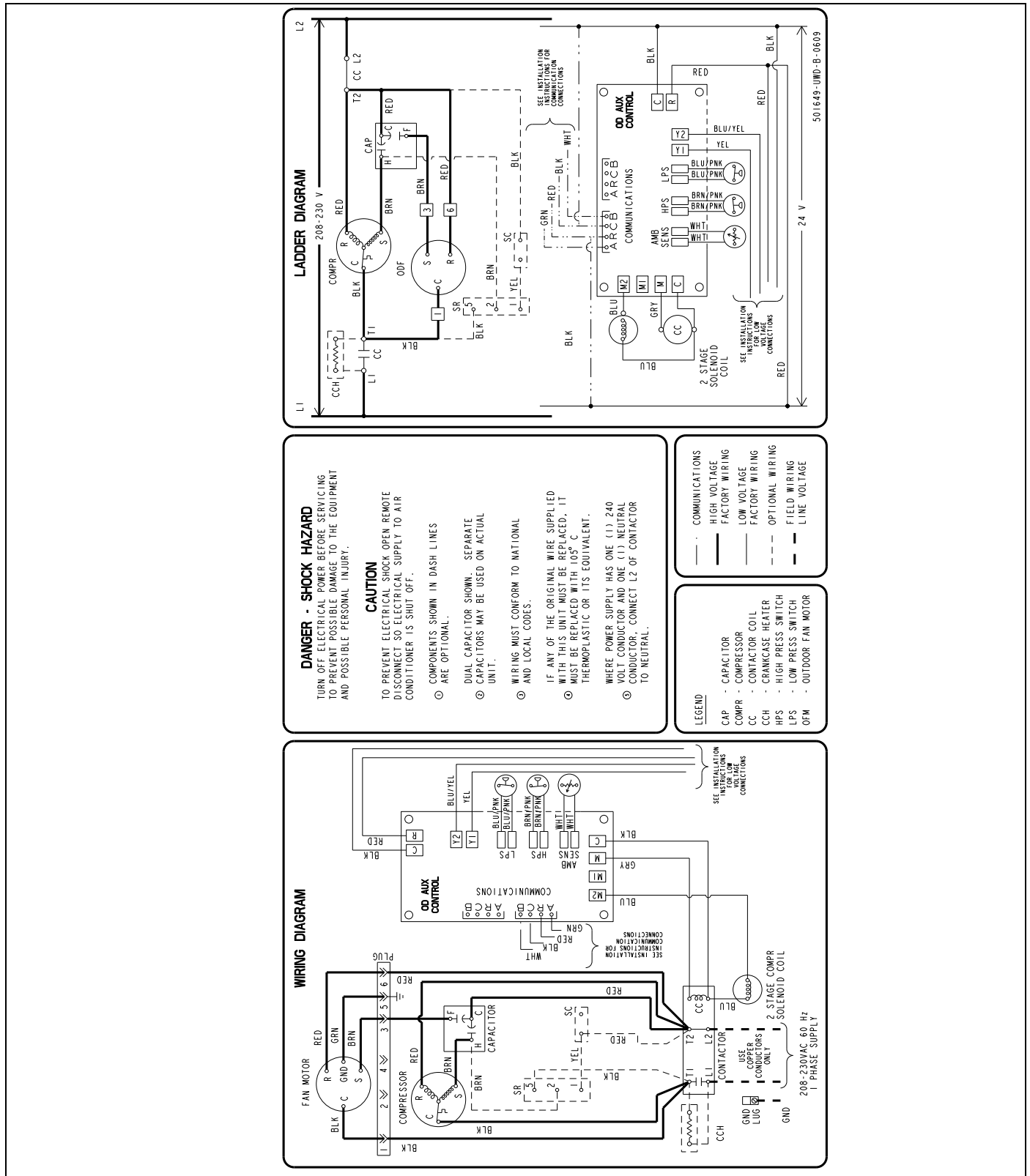


FIGURE 4: Wiring Diagram - CZE, AC5B & AL5B

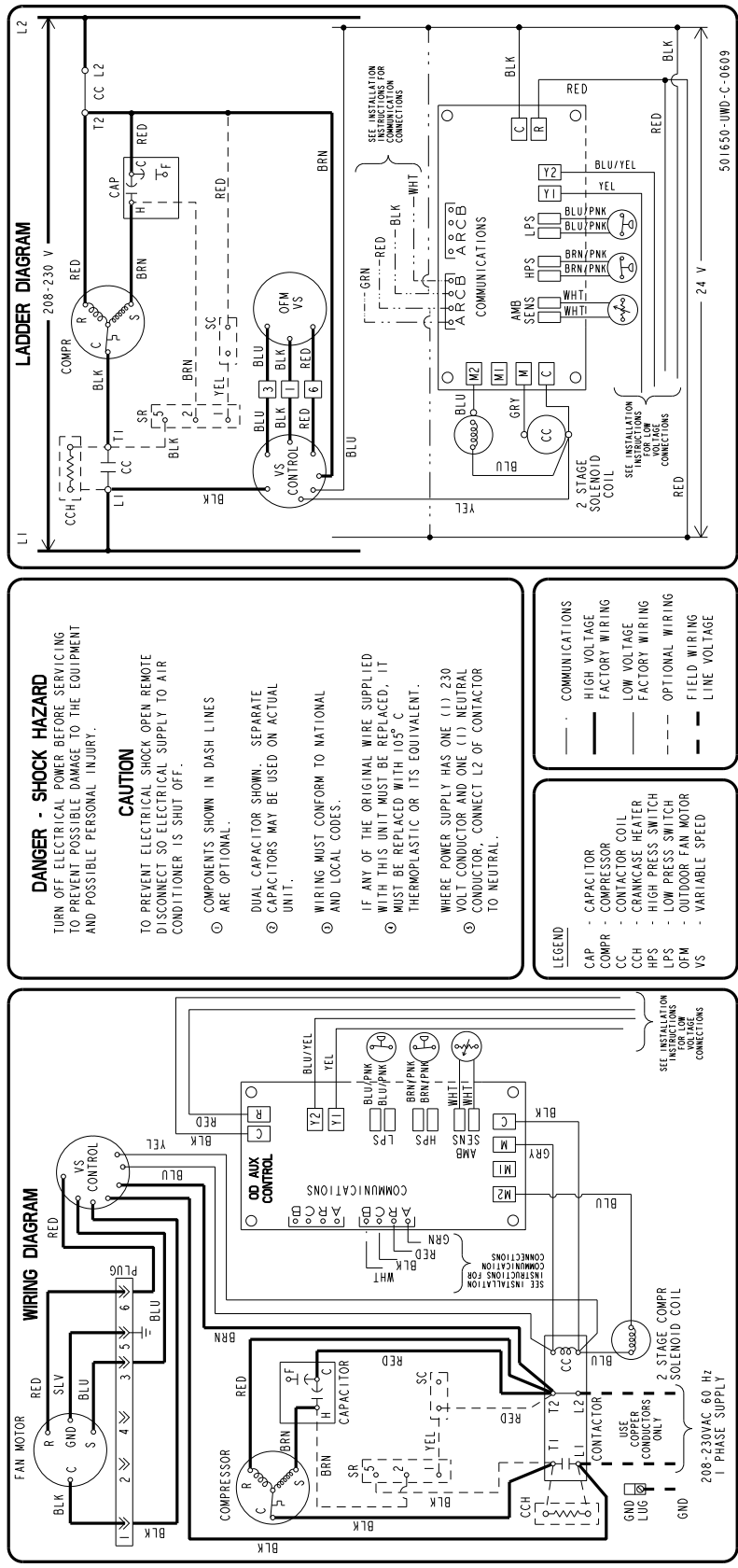


FIGURE 5: Wiring Diagram - CZH, AC8B & AL8B