ALLIED™ Air Enterprises

SERVICE MANUAL

A80US2V Gas Furnace

This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

Table of Contents

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer (or equivalent), service agency or the gas supplier.

CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

WARNING

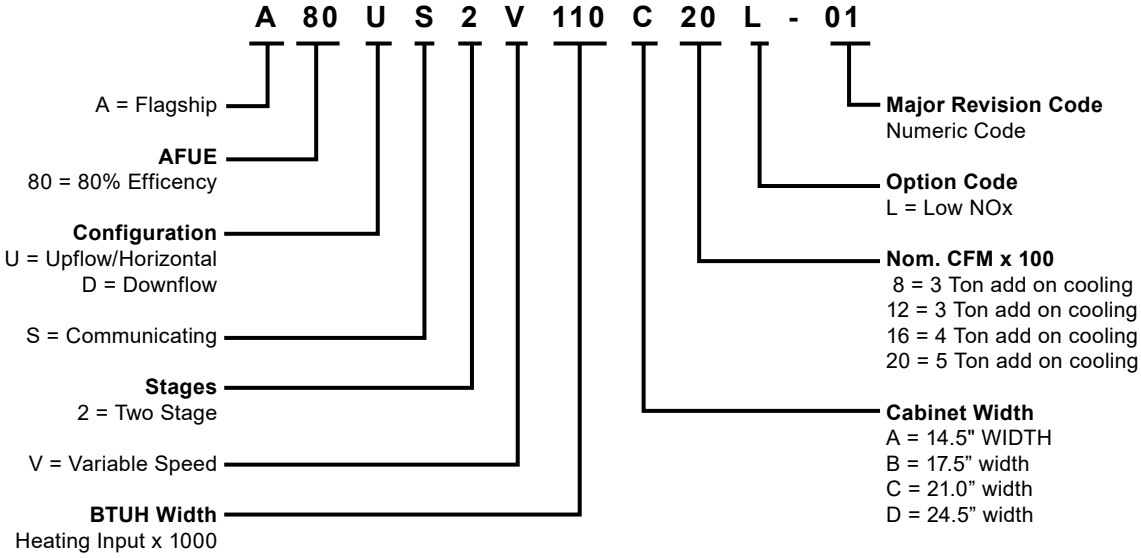
Electric shock hazard.

Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

(P) 508155-01

Technical Specifications - A80US2V

MODEL NUMBER GUIDE



PHYSICAL AND ELECTRICAL DATA

	Model	Input (Btuh)	Output* (Btuh)	AFUE (ICS)	Nominal Cooling Capacity	Gas Inlet (in.)	Volts/ Hz/ Phase	Max. Time Delay Breaker or Fuse	Nominal F.L.A.	Trans. (V.A.)	Approx. Shipping Weight (lbs.)
UPFLOW/HORIZONTAL	A80US2V070A12	66,000	52,000	80.0%	3 tons	1/2	120-60-1	15	7.7	40	128
	A80US2V090B12	88,000	70,000	80.0%	3 tons	1/2	120-60-1	15	7.7	40	143
	A80US2V090B16	88,000	70,000	80.0%	4 tons	1/2	120-60-1	20	12.8	40	154
	A80US2V090C20	88,000	70,000	80.0%	5 tons	1/2	120-60-1	20	12.8	40	173
	A80US2V110C20	110,000	87,000	80.0%	5 tons	1/2	120-60-1	20	12.8	40	181
	A80US2V135D20	132,000	105,000	80.0%	5 tons	1/2	120-60-1	20	12.8	40	199
	A80US2V070A12L	66,000	52,000	80.0%	3 tons	1/2	120-60-1	15	7.7	40	128
	A80US2V090B16L	88,000	70,000	80.0%	4 tons	1/2	120-60-1	20	12.8	40	154
	A80US2V110C20L	110,000	87,000	80.0%	5 tons	1/2	120-60-1	20	12.8	40	181

Note: For vent length and clearances to combustibles, please reference installation instructions.
** Outputs shown are High Fire, 100% rate, Low Fire is 67% of shown output.*

BLOWER PERFORMANCE DATA

	Model	Motor Size (hp)	Blower Size	Heating						Cooling					
				Low Fire			High Fire			Cooling Stage	Speed Adjustment	CFM @ 0" - 0.8" w.c.			
				Rise Range Fº	Speed Adjustment	CFM @ 0" - 0.5" w.c.	Rise Range Fº	Speed Adjustment	CFM @ 0" - 0.5" w.c.			Low	Med Low	Med High	High (Default)
Upflow/Horizonatl	A80US2V070A12(L)	1/2 HP	10 x 8	25-55	+24%	1073	40 -70	+24%	1178	1st Stage	+10%	748	801	864	970
					+18%	1021		+18%	1121		Default	680	728	785	882
					+12%	969		+12%	1064						
					+6%	917		+6%	1007		-10%	612	655	707	974
					Default	865		Default	950	2nd Stage	+10%	1007	1095	1210	1348
					-6%	813		-6%	893		Default	915	995	1100	1225
					-12%	761		-12%	836						
					-18%	709		-18%	779		-10%	824	896	990	1103
	A80US2V090B12	1/2 HP	10 x 9	25-55	+24%	1302	40 -70	+24%	1426	1st Stage	+10%	556	699	787	919
					+18%	1239		+18%	1357		Default	505	635	715	835
					+12%	1176		+12%	1288						
					+6%	1113		+6%	1219		-10%	455	572	644	752
					Default	1050		Default	1150	2nd Stage	+10%	930	1100	1210	1320
					-6%	987		-6%	1081		Default	845	1000	1100	1200
					-12%	924		-12%	1012						
					-18%	861		-18%	943		-10%	761	900	990	1080
	A80US2V090B16(L)	1 HP	11-1/2 x 9	25-55	+24%	1353	40-70	+24%	1488	1st Stage	+10%	743	935	1073	1238
					+18%	1287		+18%	1416		Default	675	850	975	1125
					+12%	1222		+12%	1344						
					+6%	1156		+6%	1272		-10%	608	765	878	1013
					Default	1091		Default	1200	2nd Stage	+10%	1045	1320	1540	1760
					-6%	1026		-6%	1128		Default	950	1200	1400	1600
					-12%	960		-12%	1056						
					-18%	895		-18%	984		-10%	855	1080	1260	1440
	A80US2V090C20	1 HP	11-1/2 x 10	25-55	+24%	1353	35-65	+24%	1488	1st Stage	+10%	897	1045	1177	1353
					+18%	1287		+18%	1416		Default	815	950	1070	1230
					+12%	1222		+12%	1344						
					+6%	1156		+6%	1272		-10%	734	855	963	1107
					Default	1091		Default	1200	2nd Stage	+10%	1276	1491	1683	1931
					-6%	1026		-6%	1128		Default	1160	1355	1530	1755
					-12%	960		-12%	1056						
					-18%	895		-18%	984		-10%	1044	1220	1377	1580
	A80US2V110C20(L)	1 HP	11-1/2 x 10	25-55	+24%	1693	35-65	+24%	1860	1st Stage	+10%	1155	1210	1342	1419
					+18%	1611		+18%	1770		Default	1050	1100	1220	1290
					+12%	1529		+12%	1680						
					+6%	1447		+6%	1590		-10%	945	990	1098	1161
					Default	1365		Default	1500	2nd Stage	+10%	1650	1735	1914	2024
					-6%	1283		-6%	1410		Default	1500	1575	1840	1840
					-12%	1201		-12%	1320						
					-18%	1119		-18%	1230		-10%	1350	1418	1566	1656
	A80US2V135D20	1 HP	11-1/2 x 11	25-55	+24%	1872	40-70	+24%	2058	1st Stage	+10%	1062	1139	1309	1419
					+18%	1782		+18%	1959		Default	965	1035	1190	1290
					+12%	1691		+12%	1859						
					+6%	1601		+6%	1760		-10%	869	932	1071	1161
					Default	1510		Default	1660	2nd Stage	+10%	1513	1623	1870	2024
					-6%	1419		-6%	1560		Default	1375	1475	1700	1840
					-12%	1329		-12%	1461						
					-18%	1238		-18%	1361		-10%	1238	1328	1530	1656

ACCESSORY LIST

Catalog Number	Description
External Filter Rack Kits	
1.841018	1 pack (16 x 25)
1.841039	10 pack (16 x 25)
Natural to LP Kits	
11K48	Two-Stage (0 - 7500 ft.)
11K47	Two-Stage (>7500 ft.)
Return Air Base	
68W61	Return Air Base 14.5 Inch, A Width
68W62	Return Air Base 17.5 Inch, B Width
68W63	Return Air Base 21.0 Inch, C Width
Night Service Kit	
89W54	Two-Stage
Horizontal Suspension Kit	
51W10	80% & 90% Kit
Combustible Floor Base	
11M59	14.5 Inch, A Width
11M60	17.5 Inch, B Width
11M61	21.0 Inch, C Width
Comfort Sync® Controls	
1.841226	Comfort Sync® A3 Thermostat
1.851399	Comfort Sync® Zoning Controller
1.851422	Comfort Sync® Zone Sensor

Note: For vent length and clearances to combustibles, please reference installation instructions.

Parts Arrangement

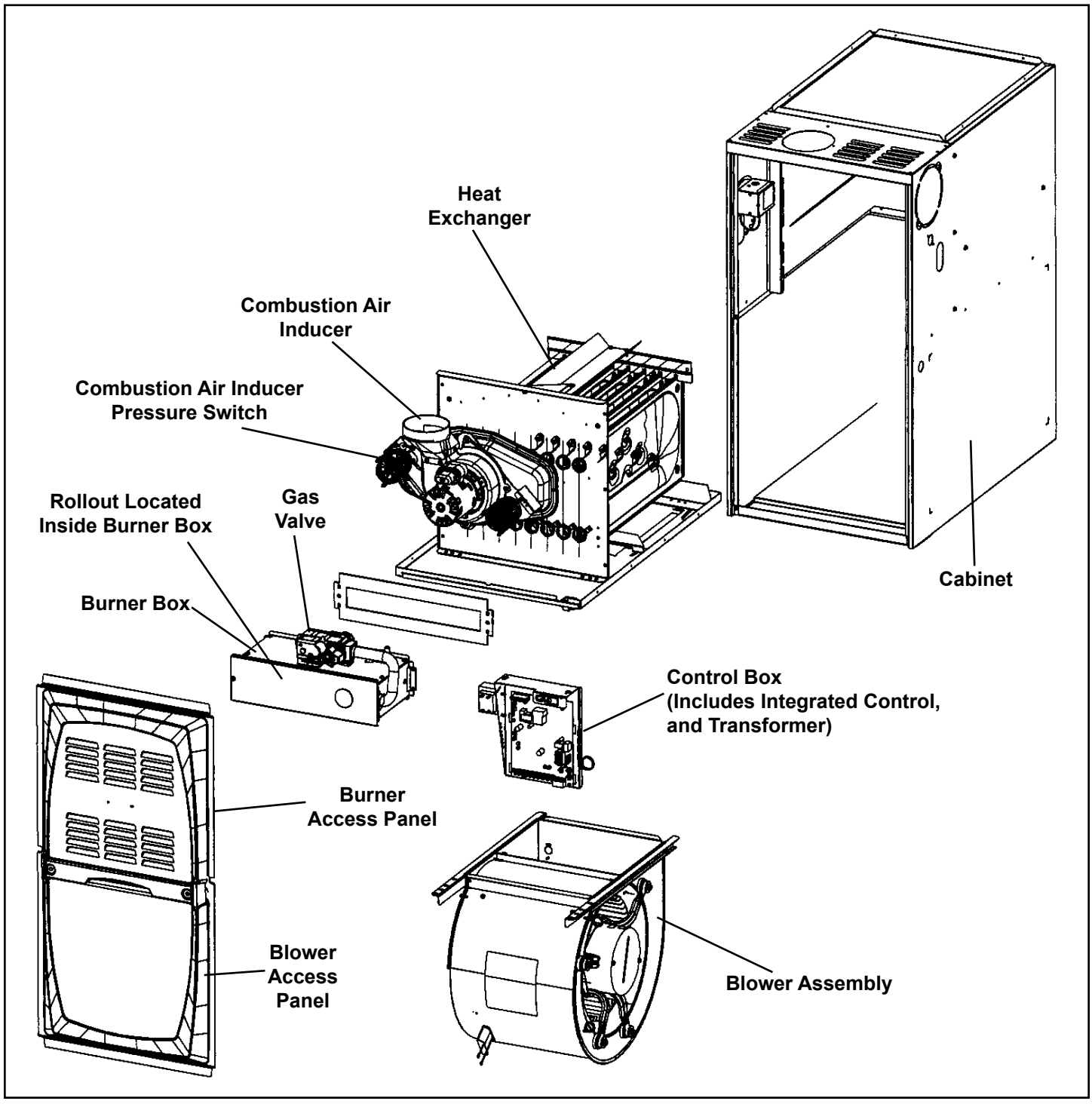


Figure 1. Expanded View

Unit Components

A80US2V unit components are shown in Figure 1. The gas valve, combustion air inducer and burners can be accessed by removing the access panel. Electrical components are in the control box (Figure 2) found in the blower compartment.

A80US2V units are factory-equipped with a bottom return air panel in place. The panel is designed to be field removed as required for bottom air return. Markings are provided for side return air and may be cut out in the field.

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

Control Box

Control Transformer (T1)

A transformer located in the control box provides power to the low voltage section of the unit. Transformers on all models are rated 40VA with a 120V primary and a 24V secondary.

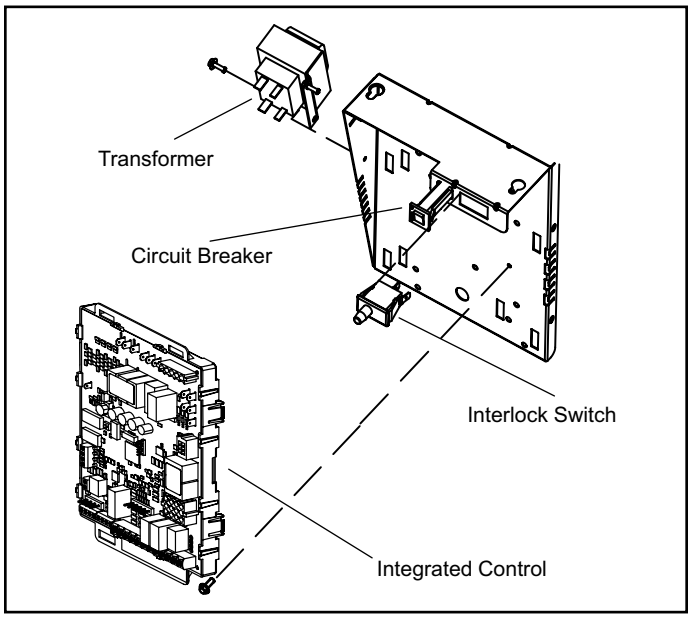


Figure 2. Control Box

Door Interlock Switch (S51)

A door interlock switch rated 14A at 125VAC is wired in series with line voltage. When the inner blower access panel is removed the unit will shut down.

Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated 3A at 32V. If the current exceeds this limit the breaker will trip and all unit operation will shutdown. The breaker can be manually reset by pressing the button on the face. See Figure 3.

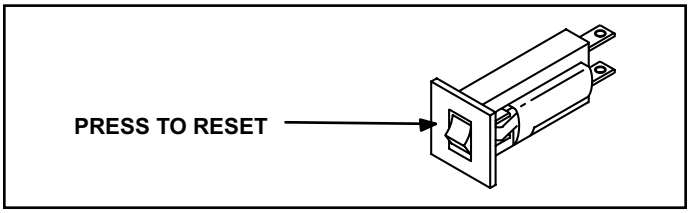


Figure 3. Circuit Breaker CB8

⚠ WARNING

Shock hazard.

Disconnect power before servicing. Integrated control is not field repairable. If control is inoperable, simply replace entire control.

Can cause injury or death. Unsafe operation will result if repair is attempted.

Integrated Control (A92)

Units are equipped with a variable capacity integrated control. This control is used with the Comfort Sync® thermostat as part of a communicating comfort system. The control can also operate with a non-communicating conventional single or two-stage thermostat. The system consists of an ignition / blower control (Figure 4 and Figure 5) with control pin designations (Table 1 through Table 3) and an ignitor. The control and ignitor work in combination to ensure furnace ignition and ignitor durability. The control provides gas ignition, safety checks and indoor blower control with two-stage gas heating. The furnace combustion air inducer, gas valve and indoor blower are controlled in response to various system inputs such as thermostat signal, pressure and limit switch signal and flame signal. The control features a seven-segment LED display, indicating furnace status (including indoor blower) and error codes. The LED flashes in single digits. For example, using Table 5 under CODE, an “E” followed by “2” followed by “5” followed by “0”, the limit switch circuit is open. The control also has two unpowered (dry) 1/4” contacts for a humidifier and a 120 volt accessory terminal. Both rated at (1) one amp each.

Pin #	Function
1	Ignitor
2	Combustion Air Inducer High Speed
3	Combustion Air Inducer Low Speed
4	Combustion Air Inducer Neutral
5	Ignitor Neutral

Table 1. Control 5-Pin Terminal Designation

Pin #	Function
1	Gas Valve Second Stage
2	Second Stage Prove Switch
3	Rollout Switch In
4	Ground
5	24V Hot
6	Primary Limit In
7	Gas Valve First Stage
8	Gas Valve Common
9	24V Neutral
10	Ground
11	Rollout Switch Out
12	First Stage Prove Switch

Table 2. Control 12-Pin Terminal Designation

Pin #	Function
1	Data Input From Motor
2	Common
3	Not Used
4	Data Output To Motor
5	5 Volt Bias Supply
6	Not Used

Table 3. Control 6-Pin Terminal Designation

Electronic Ignition

At the beginning of the heat cycle the integrated control monitors the first stage and second stage combustion air inducer prove switch. The control will not begin the heating cycle if the first stage prove switch is closed (by-passed). Likewise the integrated control will not begin the second stage heating cycle if the second stage prove switch is closed, and will remain in first stage heat. However, if the second stage prove switch closes during the first stage heat pre-purge, the control will allow second stage heat. Once the first stage prove switch is determined to be open, the combustion air inducer is energized on low (first stage) heat speed. When the differential in the prove switch is great enough, the prove switch closes and a 15-second pre-purge begins.

NOTE: *During abnormal conditions such as low supply voltage or low outdoor temperatures and the low fire pressure switch does not close, the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire*

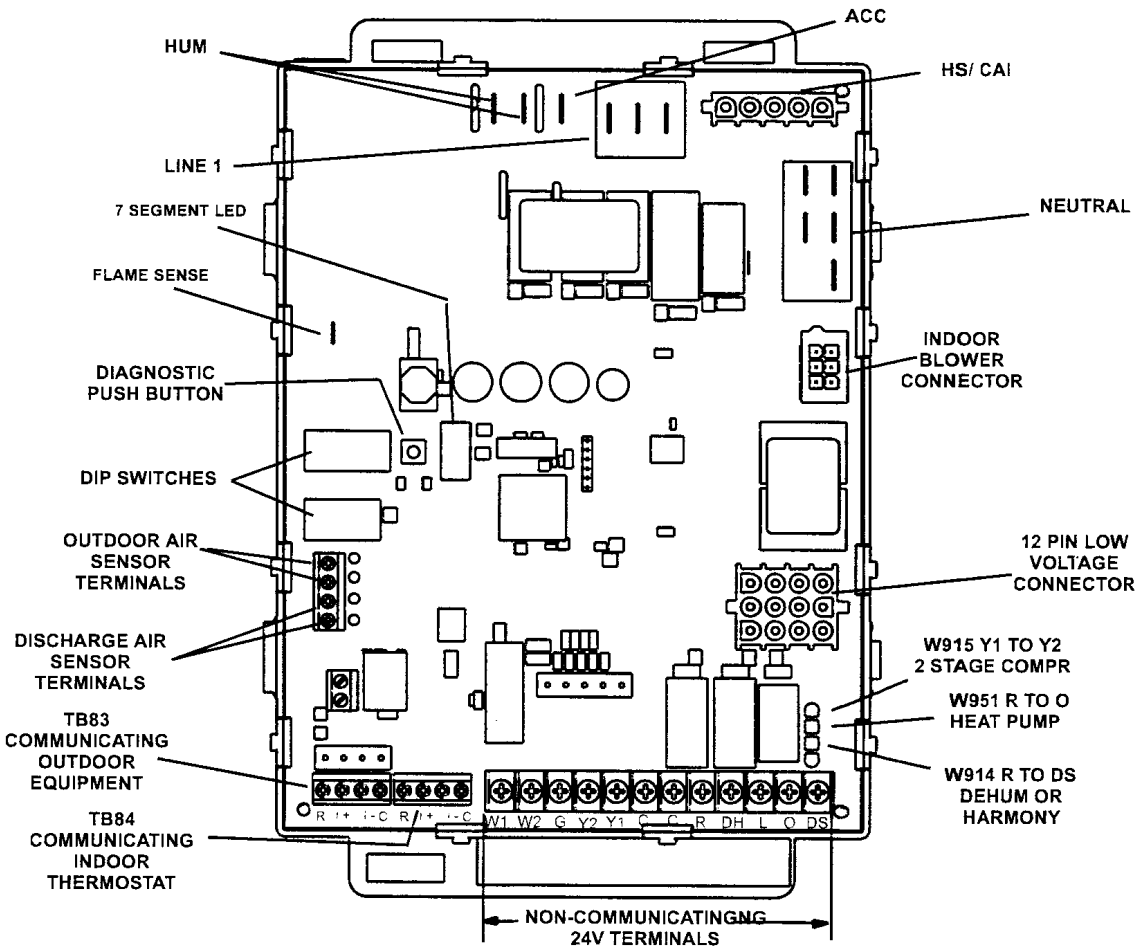
After the 15-second pre-purge period, the ignitor warms up for 20 seconds after which the gas valve opens for a 4-second trial for ignition. The ignitor remains energized during the trial until flame is sensed. If ignition is not proved during the 4-second period, the control will try four more times with an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the control will begin the ignition sequence again.

Two Stage Operation / Thermostat Selection DIP Switch

The control can be utilized in two modes: SINGLE-STAGE thermostat or TWO-STAGE thermostat. The thermostat selection is made using a DIP switch and must be positioned for the particular application. DIP switch 1, labeled T"STAT HEAT STAGE is factory-set in the OFF position for use with a two-stage thermostat. Move the DIP switch to ON for use with a single stage thermostat.

While in the single-stage thermostat mode, the burners will always fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second stage heat after a "recognition period". DIP switch 2, labeled SECOND STAGE DELAY, is factory set in the OFF position for a 7 minute recognition period. The switch can be moved to the ON position for a 12 minute recognition period, after which time the unit will switch to secondstage heat.

While in the two-stage thermostat mode, the burners will fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second-stage heat on call from the indoor thermostat. If there is a simultaneous call for first and second stage heat, the unit will fire an first stage heat and switch to second stage heat after 30 seconds of operation. See Sequence of Operation flow charts in the back of this manual for more detail.



RS-BUS LINK (TB82, future use)

I+ = DATA HIGH CONNECTION
I - = DATA LOW CONNECTION

RS-BUS OUTDOOR (TB83)

R = 24VAC
I + = DATA HIGH CONNECTION
I - = DATA LOW CONNECTION
C = 24VAXC COMMON

RS-BUS INDOOR (TB84)

R = 24VAC
I + = DATA HIGH CONNECTION
I - = DATA LOW CONNECTION
C = 24VAXC COMMON

1/4" QUICK CONNECT TERMINALS

HUM = UNPOWERED NORMALLY OPEN (DRY) CONTACTS

XMFR = 120 VAC OUTPUT TO TRANSFORMER

LI = 120 VAC INPUT TO CONTROL

ACC = 120 VAC OUTPUT TO OPTIONAL ACCESSORY

NEUTRALS = 120 VAC NEUTRAL

THERMOSTAT CONNECTIONS (TB1)

DS = DEHUMIDIFICATION SIGNAL

W2 = HEAT DEMAND FROM 2ND STAGE T/STAT

W1 = HEAT DEMAND FROM 1ST STAGE T/STAT

R = CLASS 2 VOLTAGE TO THERMOSTAT

G = MANUAL FAN FROM T'STAT

C = THERMOSTAT SIGNAL GROUND CONNECTED TO TRANSFORMER GRD (TR) & CHASIS GROUND (GRD)

Y1 = THERMOSTAT 1ST STAGE COOL SIGNAL

Y2 = THERMOSTAT 2ND STAGE COOL SIGNAL

O = THERMOSTAT SIGNAL TO HEAT PUMP REVERSING VALVE

DH = DEHUMIDIFICATION OUTPUT COMMUNICATING THERMOSTAT ONLY

L = USE ONLY WITH A COMMUNICATING THERMOSTAT AND A NON-COMMUNICATING OUTDOOR UNIT

Figure 4. Integrated Control

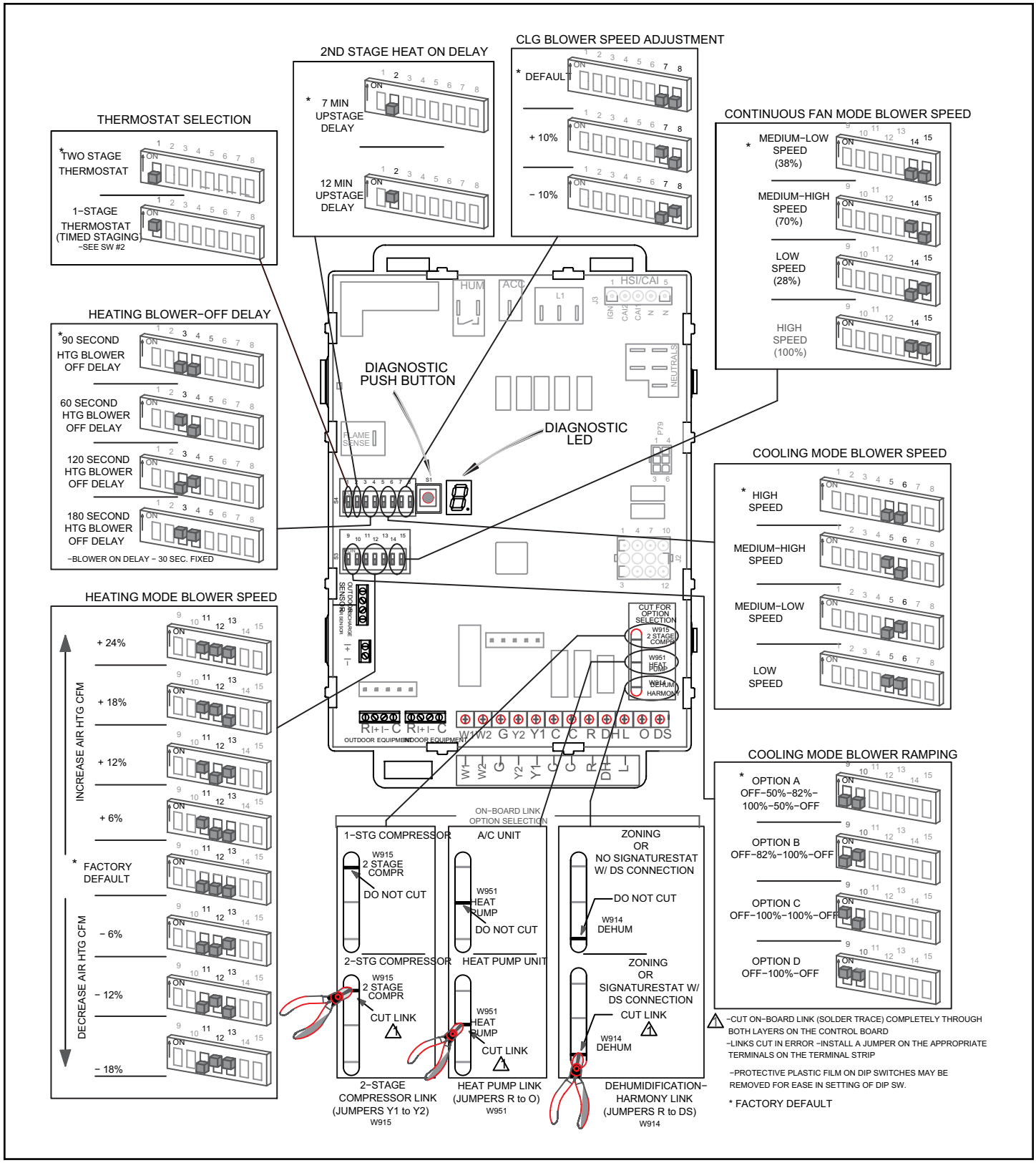


Figure 5. Integrated Control Configuration Guide

Display	Action (when button released)
No change (idle)*	Remain in idle mode
Solid “E”	Enter diagnostic recall mode
Solid “D”	Discharge air installed
Solid “F”	Enter flame signal mode
Solid “P” (variable speed only)	Program unit capacity/size unit (Unit Code)
* No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.)	

Table 4. Integrated Control Diagnostic Modes

Diagnostic LED (Figure 4)

The seven-segment diagnostic LED displays operating status, target airflow, error codes and other information. Table 5 lists diagnostic LED codes.

Diagnostic Push Button (Figure 4)

The diagnostic push button is located adjacent to the seven-segment diagnostic LED. This button is used to enable the Error Code Recall “E” mode, the Flame Signal “F” mode and “P” the Program Unit Capacity/Size mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.

Error Code Recall Mode

Select ”E” from the menu to access the most recent 10 error codes. Select “c” from the Error Code Recall menu to clear all error codes. Button must be pressed a second time while “c” is flashing to confirm command to delete codes. Press the button until a solid “≡” is displayed to exit the Error Code Recall mode.

Flame Signal Mode

Select ”F” from the menu to access the flame signal mode. The integrated control will display the flame current on seven-segment LED in in micro amps (uA).

Flame signal mode is exited after any of the following:

- Power is reset
- Pressing and holding push button until 3 horizontal lines “≡” are displayed
- 10 minutes after entering the flame sense mode.

Program Unit Capacity/Size Mode

After the “P” is selected (by releasing the push button) the integrated control will start flashing the “P” on display for 90 seconds. If push button is pressed again and held during that time, the control will start to display characters corresponding to different variable speed furnace models for 3 seconds each. While the wanted character-model is displayed push button has to be released. Selected option will flash display for 10 seconds and during that time push button has to be pressed and held for 5 seconds. Once control accepts new setting it will store data in non-volatile memory and reset itself. If 10 seconds expires or push button is held less than 5 seconds, control will exit field test mode and go into idle without changing programming the unit size.

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
•	Idle mode (Decimal blinks at 1 Hertz - 0.5 seconds ON, 0.5 seconds OFF).	
A	Cubic feet per minute (cfm) setting for indoor blower (1 second ON, 0.5 seconds OFF) / cfm setting for current mode displayed.	
C	Cooling stage (1 second ON, 0.5 seconds OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes.	
d	Dehumidification mode (1 second ON, 1 second OFF) / cfm setting displayed / Pause / Repeat codes.	
h	Heat pump stage (1 second ON, 0.5 seconds OFF) / % of input rate displayed / Pause / cfm setting / Pause / Repeat codes.	
H	Gas Heat stage (1 second ON, 0.5 seconds OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes. Blinking during ignition.	
dF	Defrost mode.	
U	Discharge Air Temperature	
E105	Device communication problem - No other devices on RS BUS (Communication system).	Equipment is unable to communicate. Indicates numerous message errors. In most cases, errors are related to electrical noise. Make sure high voltage power is separated from RSBus. Check for mis-wired and/or loose connections between the stat, indoor unit, and outdoor unit. Check for a high voltage source of noise close to the system. Fault clears after communication is restored.
E110	Low line voltage.	Line Voltage low (Voltage tower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E113	High line voltage.	Line Voltage high (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.
E114	Line voltage frequency out-of-range.	No 60 Hertz power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.
E115	Low 24V - Control will restart if the error recovers.	24 Volt Power high (Range is 18 to 30 Volts). Check and correct voltage. Check for additional power robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace/air handler. Clears after fault recovered.
E120	Unresponsive device (Communicating systems only).	Usually caused by delay in outdoor unit responding to indoor unit poling. Recycle power. Check all wiring connections. Cleared after unresponsive device responds to any inquiry.
E124	Active communicating thermostat signal missing for more than 3 minutes (Communicating systems only).	Equipment lost communication with the thermostat. Check four wiring connections, ohm wires, and cycle power at the thermostat. Alert stops all services and waits for heartbeat message from thermostat (subnet controller). Cleared after valid thermostat (subnet) message is received.
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers, Integrated control not communicating Covers hardware errors (flame sense circuit faults, pin shorts, etc).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Cleared 300 seconds after fault recovered.
E126	Control internal communication problem.	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Cleared 300 seconds after fault recovered.
E131	Corrupted control parameters (Verify configuration of system) (Communicating systems only).	Reconfigure the system. Replace control if heating or cooling is not available. Only applicable in the communicating mode not in startup. Exit from Commissioning and Execute Se+ factory Default mode. Control will still operate on default parameter settings.

Table 5. Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E180	Outdoor air temperature sensor failure. Only shown if shorted or out of range (Communicating systems only)	Compare outdoor sensor resistance to temperature resistance charts in unit installation instructions. Replace sensor pack if necessary. At beginning of (any) configuration, furnace or air handler control will sense outdoor air and discharge air temperature sensor(s) If detected (reading in range), appropriate feature will be set as installed and that could be seen in 'About ' screen. In normal operation after control recognizes sensors, alarm will be sent if valid temperature reading is lost. To get rid of setting and alarm, redo configuration and make sure that temperature sensor is marked as not installed in indoor Unit 'About' screen. When indoor unit control is replaced thermostat will 'tell' new control if temperature sensor is in system or not. Clears 30 seconds after fault recovered.
E200	Hard Lock out - Rollout circuit open or previously open	Correct cause of rollout trip or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.
E201	Indoor blower/communication failure - Unable to communicate with blower motor	Indoor blower communication failure including power outage. Lost communication with indoor blower motor. Possible causes: motor not powered, loose wiring. Problem may be on control or motor side. Cleared after fault recovered.
E202	Indoor blower motor mis-match - indoor motor horsepower does not match unit capacity	Incorrect appliance capacity code selected. Check for proper configuring under Unit Size Code for Furnace/Air Handler on configuration guide or in installation instructions. Cleared after the correct match is detected following a reset. (Remove thermostat from system while applying power and reprogramming)
E203	Appliance capacity size is NOT programmed. Invalid unit codes. Refer to configuration flow chart.	No appliance capacity code selected. Check for proper configuring under Unit Size Codes for Furnace on configuration guide or in installation instruction. Critical Alert Cleared after valid unit code is read following a reset (remove thermostat from system while applying power and reprogramming)
E204	Gas valve mis-wired	Check gas valve operation and wiring. Clears when repaired.
E205	Gas valve control relay contact shorted	Check wiring on control and gas valve. If wiring is correct replace control.
E207	Hot surface igniter sensed open - Refer to troubleshooting	Measure resistance of hot surface igniter. Replace if open or not within specified range found in 10M. Resumes normal operation after fault is cleared.
E223	Low pressure switch failed open	Check pressure(inches W.C) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E224	Low pressure switch failed closed -Refer to troubleshooting	Check pressure(inches W.C) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E225	High pressure switch failed open -Refer to troubleshooting	Check pressure(inches W.C) of high pressure switch closing on heat call. Measure operating pressure (inches w.c. Inspect vent and combustion air inducer for correct operation and restriction Resumes normal operation after fault is cleared.
E226	High pressure switch failed closed -Refer to troubleshooting	Check operation of high pressure closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E227	Low pressure switch open during trial for ignition or run mode. Refer to troubleshooting	Check operation of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E228	Combustion air inducer calibration failure	Unable to perform pressure switch calibration. Check vent system and pressure switch wiring connections. Resumes normal operation after fault is cleared.

Table 5. Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E240	Low flame current - Run mode- Refer to troubleshooting	Check micro-amperes of flame sensor using control diagnostics or field installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat all has been completed.
E241	Flame sensed out of sequence-Flame still present.	Shut off gas. Check for gas valve leak. Replace if necessary. Alert clears when fault is recovered.
E250	Limit switch circuit open - Refer to troubleshooting.	Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes unit will go into 1 hour soft lockout. Resumes normal operation after fault is cleared.
E252	Discharge air temperature too high (gas heat only).	Check temperature rise airflow and input rate. Clear when heat call is finished.
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for proper gas flow. Ensure that igniter is lighting burners. Check flame sensor current. Clears when heat call finishes successfully.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening	Check operation of low pressure to see if it is stuck closed on heat call. Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure. Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure	Check micro-amperes of flame sensor using control diagnostics or field installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed.
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	Shut down system 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.
E275	Soft lockout - Flame sensed out of sequence. Flame signal is gone.	Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.
E276	Watchguard calibration failure.	Unable to perform pressure switch calibration. Check vent system and pressure switch wiring connections. 1-hour soft lockout. Clears when calibration has finished successfully.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	Measure resistance of hot surface igniter. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable.
E291	Heat airflow restricted below the minimum.	Check for dirty filter and airflow restriction. Check blower performance. 1-hour soft lockout. Cleared when heat call finishes successfully.
E292	Indoor blower motor unable to start due to obstructed wheel seized bearings.	Indoor blower motor unable to start (seized bearing, stuck wheel, etc.) Replace motor or wheel if assembly does not operate or meet performance standards. 1-hour soft lockout. Clears after circulator successfully starts.
E294	Combustion air inducer over current.	Check combustion blower bearings wiring and amps. Replace if does not operate or does not meet performance standards. Clears after inducer current is sensed to be in-range after the ignition following the soft lockout or reset.
E295	Indoor blower motor temperature is too high.	Indoor blower motor over temperature (motor tripped on internal protector). Check motor bearings and amps. Replace if necessary. Cleared after blower demand is satisfied.
E310	Discharge error temperature sensor failure. Only shown if shorted or out of range.	Compare discharge sensor resistance to temperature resistance charts in installation instructions.. Replace sensor if necessary. Cleared in Communicating mode 30 seconds after fault recovered. In Non-Communicating mode cleared after the current heat call is completed.

Table 5. Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E311	Heat rate reduced to match indoor blower airflow.	Warning Only. Furnace blower in cutback mode due to restricted airflow. Reduce firing rate every 60 seconds to match available CFM. Check filter and duct system. To clear replace filter if needed or repair/add duct. 2-stage controls will reduce firing rate to 1-stage. Clears when heat call finished successfully.
E312	Restricted airflow in cooling or continuous fan mode is lower than CFM setting.	Warning Only. Restricted airflow - Indoor blower is running at a reduced CFM (Cutback Mode - The variable speed motor has preset speed and torque limiters to protect the motor from damage caused by operating outside of design parameters (0 to 0.8" W.C. total external static pressure). Check filter and duct system. To clear, replace filter if needed or repair/add duct. Cleared after the current service demand is satisfied.
E313	Indoor or outdoor unit capacity mismatch. Communication only.	Incorrect indoor/outdoor capacity code selected. Check for proper configuring in installation instructions. Alarm is just a warning. The system will operate, but might not meet efficiency and capacity parameters. Alarm will clear when commissioning is complete.
E331	Global network connection - Communications link problem.	For Future Use.
E347	No 24 Volt output on Y1 of "integrated control" with non-communicating outdoor unit.	Operation stopped. Y1 relay/Stage 1 failed. (Pilot relay contacts did not close or the relay coil did not energize; no input back to IFC chip.) Critical Alert. Cleared after reset and Y1 input sensed.
E348	No 24 Volt output on Y2 of "integrated control" with non-communicating outdoor unit.	Y2 relay/Stage 2 failed. (Pilot relay contacts did not close or the relay coil did not energize; no input back to IFC chip.) Critical Alert. Cleared after reset and Y1 input sensed.
E349	No 24 Volts between R & O on "integrated control" with non-communicating outdoor unit (dual fuel model required for heat pump application).	Configuration link R to O needs to be restored. Replace link or hardware. Applicable in non-communicating mode. Critical Alert.
E401	LSOM - Compressor long run cycle or low system pressure.	Compressor ran more that 18 hours to satisfy a single thermostat demand. Critical Alert. Clears the error after 30 consecutive normal run cycles or power reset. Also monitors low pressure switch trips.
E402	LSOM - Outdoor unit system pressure trip.	Discharge or suction pressure out-of-limits, or compressor overloaded. Clears the error after 4 consecutive normal compressor run cycles.
E403	LSOM - Compressor short-cycling (Running less than 4 minutes). Outdoor unit pressure trip.	Compressor runs less than 3 minutes to satisfy a thermostat demand. Clears the error after 4 consecutive normal run cycles or power reset.
E404	LSOM - Compressor rotor locked. Compressor short-cycling. (Running less than 4 minutes.)	Compressor rotor locked up due to run capacitor shore, bearings are seized, excessive liquid refrigeration, etc. Clears the error after 4 consecutive normal run cycles or power reset.
E405	LSOM - Compressor open circuit.	Compressor circuit open (due to power disconnection, open fuse, etc.) Clears the error after 1 normal compressor run cycle.
E406	LSOM - Compressor open start circuit.	Required amount of current is not passing through Start current transformer. Clears the error after current is sensed in START sensor, or after power reset.
E407	LSOM - Compressor open run circuit.	Required amount of current is not passing through Run current transformer. Clears the error after current is sensed in RUN sensor, or 1 normal compressor run cycle, or after power reset.
E408	LSOM - Compressor contactor is welded.	Compressor runs continuously. Clears the error after 1 normal compressor run cycle or after power reset.
E409	LSOM - Compressor low voltage.	Secondary voltage s below 18VAC. After 10 minutes, operation is discontinued. Clears the code after voltage is higher than 20VAC for 2 seconds or after power reset.

Table 5. Integrated Diagnostic Codes/Status of Equipment

NOTE: *All Comfort Sync settings are set at the Comfort Sync Wi-Fi thermostat. See Comfort Sync installation instruction. In Comfort Sync communication system all DIP switch and clippable link settings are ignored. For conventional thermostats proceed with DIP switch and clippable link settings as outlined in the following.*

Heating Operation DIP Switch Settings

Switch 1 -- Thermostat Selection -- This unit may be used with either a single-stage or two-stage thermostat. The thermostat selection is made using a DIP switch which must be properly positioned for the particular application. The DIP switch is factory-positioned for use with a two-stage thermostat. If a single-stage thermostat is to be used, the DIP switch must be repositioned.

a. Select "OFF" for two-stage heating operation controlled by a two-stage heating thermostat (factory setting);

b. Select "ON" for two-stage heating operation controlled by a single-stage heating thermostat. This setting provides a timed delay before second-stage heat is initiated.

Switch 2 -- Second Stage Delay (Used with Single-Stage Thermostat Only) -- This switch is used to determine the second stage on delay when a single-stage thermostat is being used. The switch is factory-set in the OFF position, which provides a 7-minute delay before second-stage heat is initiated. If the switch is toggled to the ON position, it will provide a 12-minute delay before second-stage heat is initiated. This switch is only activated when the thermostat selector jumper is positioned for single-stage thermostat use.

Switches 3 and 4 -- Blower-Off Delay -- The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds. The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures. Table 6 provides the blower off timings that will result from different switch settings.

Blower Off Delay (Seconds)	Switch 3	Switch 4
60	On	Off
90 (Factory)	Off	Off
120	Off	On
180	On	On

Table 6. Blower Off Delay Switch Settings

Indoor Blower Operation DIP Switch Settings

Switches 5 and 6 -- Cooling Mode Blower Speed -- The unit is shipped from the factory with the dip switches positioned for high speed (4) indoor blower motor operation during the cooling mode. Table 7 provides the cooling mode blower speeds that will result from different switch settings. Switches 5 and 6 set the blower cfm for second-stage cool. The integrated control automatically ramps down to 70% of the second-stage cfm for first-stage cfm. Refer to blower tables for corresponding cfm values.

Speed	Switch 5	Switch 6
Low	On	On
Medium Low	Off	On
Medium High	On	Off
High (Factory)	Off	Off

Table 7. Cooling Mode Blower Speeds

Switches 7 and 8 -- Cooling Blower Speed Adjustment -- The unit is shipped from the factory with the dip switches positioned for NORMAL (no) adjustment. The dip switches may be positioned to adjust the blower speed by +10% or -10% to better suit the application. Table 8 provides blower speed adjustments that will result from different switch settings. Refer to blower tables for corresponding cfm values.

Adjustment	Switch 7	Switch 8
+10% (approx.)	On	Off
Factory Default	Off	Off
-10% (approx.)	Off	On

Table 8. Cooling Blower Speed Adjustment

Switches 9 and 10 -- Cooling Mode Blower Speed Ramping -- Blower speed ramping may be used to enhance dehumidification performance. The switches are factory set at option A which has the greatest effect on dehumidification performance. Table 9 provides the cooling mode blower speed ramping options that will result from different switch settings. The cooling mode blower speed ramping options are detailed below.

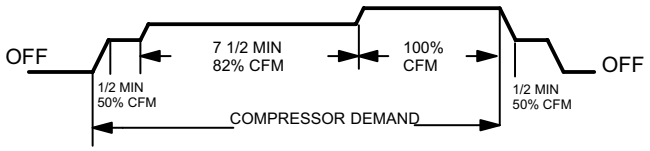
NOTE: *In heat pump mode blower operation defaults to option C.*

Ramping Option	Switch 12	Switch 13
A (Factory)	Off	Off
B	Off	On
C	On	Off
D	On	On

Table 9. Cooling Mode Blower Speed Ramping

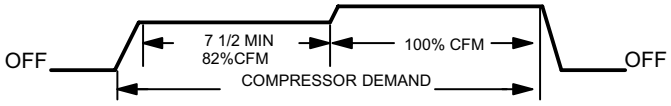
Ramping Option A (Factory Selection)

- Motor runs at 50% for 30 seconds.
- Motor then runs at 82% for approximately 7-1/2 minutes.
- If demand has not been satisfied after 7-1/2 minutes, motor runs at 100% until demand is satisfied.
- Once demand is met, motor runs at 50% for 30 seconds then ramps down to stop.



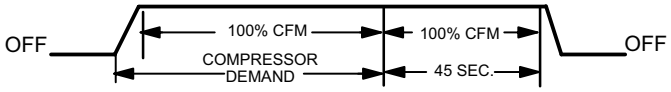
Ramping Option B

- Motor runs at 82% for approximately 7-1/2 minutes. If demand has not been satisfied after 7-1/2 minutes, motor runs at 100% until demand is satisfied.
- Once demand is met, motor ramps down to stop.



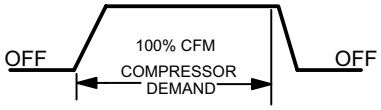
Ramping Option C

- Motor runs at 100% until demand is satisfied.
- Once demand is met, motor runs at 100% for 45 seconds then ramps down to stop.



Ramping Option D

- Motor runs at 100% until demand is satisfied.
- Once demand is met, motor ramps down to stop.



Switches 11, 12 and 13 -- Heating Mode Blower Speed -- The switches are factory set to the OFF position which provides factory default heat speed. Refer to Table 10 for switches 11, 12 and 13 that provided the corresponding increases or decrease to both high and low heat demand.

Heat Speed	Switch 11	Switch 12	Switch 13
+24%	On	On	On
+18%	On	On	Off
+12%	On	Off	On
+6%	On	Off	Off
Factory Default	Off	Off	Off
-6%	Off	Off	On
-12%	Off	On	Off
-18%	Off	On	On

Table 10. Heating Mode Blower Speeds

Operating Sequence		System Demand							System Response		
System Condition	Step	Thermostat Demand					Relative Humidity		Compressor	Blower CFM (COOL)	Comments
		Y1	O	G	W1	W2	Status	D			
NO CALL FOR DEHUMIDIFICATION											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	Compressor and indoor blower follow thermostat demand
BASIC MODE (only active on a Y1 thermostat demand)											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	Thermostat energizes Y1 and de-energizes O on a call for de-humidification
Dehumidification Call	2	On	On	On			Demand	0 VAC	High	70%*	
PRECISION MODE (operates independent of a Y1 thermostat demand)											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	Dehumidification mode begins when humidity is greater than set point
Dehumidification Call	2	On	On	On			Demand	0 VAC	High	70%*	
Dehumidification Call ONLY	1	On	On	On			Demand	0 VAC	High	70%*	Thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint**
	• Jumpers at indoor unit with a single stage outdoor unit • With Condensing unit - Cut W914 (R to OS) on control • With Heat Pump - Cut W914 (R to DS) and W951 (R to O) on control										
* Dehumidification blower speed is 70% of COOL speed for all units. ** In Precision mode, thermostat will maintain room temperature up to 2°F (1.2°C) cooler than room setting.											

Table 11. A80US2V, Non-Communicating Thermostat with Humidity Control Feature and Single-Speed Outdoor Unit

Operating Sequence		System Demand								System Response		
System Condition	Step	Thermostat Demand						Relative Humidity		Compressor	Blower CFM (COOL)	Comments
		Y1	Y2	A	G	W1	W2	Status	D			
NO CALL FOR DEHUMIDIFICATION												
Normal Operation - Y1	1	On		On	On			Acceptable	24 VAC	Low	70%*	Compressor and indoor blower follow thermostat demand
Normal Operation - Y2	2	On	On	On	On			Acceptable	24 VAC	High	100%	
ROOM THERMOSTAT CALLS FOR FIRST STAGE COOLING												
BASIC MODE (only active on a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	Thermostat energizes Y2 and de-energizes D on a call for de-humidification
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
PRECISION MODE (operates independent of a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	Dehumidification mode begins when humidity is greater than set point
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
Dehumidification Call ONLY	1	On	On	On	On			Demand	0 VAC	High	70%**	Thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint***
ROOM THERMOSTAT CALLS FOR FIRST AND SECOND STAGE COOLING												
BASIC MODE (only active on a Y1 thermostat demand)												
Normal Operation	1	On	On	On	On			Acceptable	24 VAC	High	100%	Thermostat energizes Y2 and de-energizes D on a call for de-humidification
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
PRECISION MODE (operates independent of a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	Dehumidification mode begins when humidity is greater than set point
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
Dehumidification Call ONLY	1	On	On	On	On			Demand	0 VAC	High	70%**	Thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint***
	• Jumpers at indoor unit with a single stage outdoor unit • Cut factory jumper from Y1 to Y2 or cut W915 (Y1 to Y2) • With Condensing unit - Cut W914 (R to OS) on control • With Heat Pump - Cut W914 (R to DS) and W951 (R to O) on control											
*Normal operation first stage cooling blower speed is 70% COOL speed. **Dehumidification blower speed is reduced to 70% of COOL.												

Table 12. A80US2V, Non-Communicating Thermostat with Humidity Control Feature and Two-Speed Outdoor Unit

On-Board Links

NOTE: *In Comfort Sync systems with a conventional outdoor unit (non-communicating), the on-board clippable links must be set to properly configure the system.*

⚠ WARNING

Carefully review all configuration information provided. Failure to properly set DIP switches, jumpers and on-board links can result in improper operation!

On-Board Link W914 Dehum (R to DS)

On-board link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with either the zone control or a thermostat which features humidity control. If the link is left intact the PMW signal from the control will be blocked and also lead to control damage. Refer to Table 11 for operation sequence in applications including A80US2V, a thermostat which features humidity control and a single-speed outdoor unit. Table 12 gives the operation sequence in applications with a two-speed outdoor unit.

On-Board Link W951 Heat Pump (R to O)

On-board link W951 is a clippable connection between terminals R and O on the integrated control. W951 must be cut when the furnace is installed in applications which include a heat pump unit and a thermostat which features dual fuel use. If the link is left intact, terminal “O” will remain energized eliminating the HEAT MODE in the heat pump.

On-Board Link W915 2-Stage Compressor (Y1 to Y2)

On-board link W915 is a clippable connection between terminals Y1 and Y2 on the integrated control. W915 must be cut if two-stage cooling will be used. If the link is not cut the outdoor unit will operate in second-stage cooling only.

Indoor Blower Motor

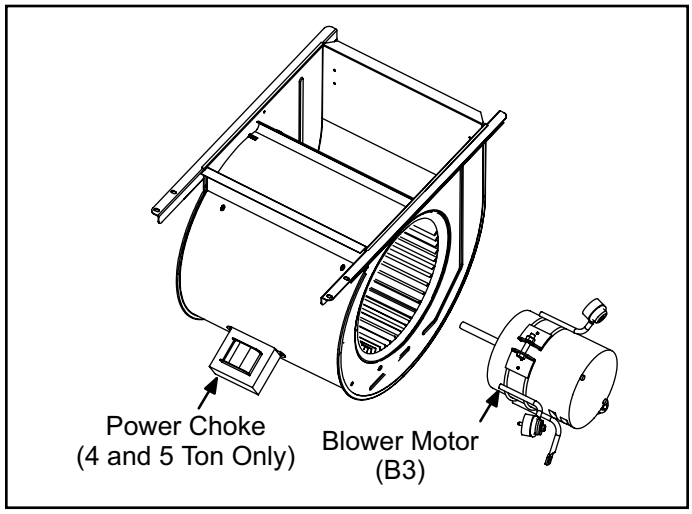


Figure 6.

⚠ WARNING

During blower operation, the ECM motor emits energy that may interfere with pacemaker operation. Interference is reduced by both the sheet metal cabinet and distance.

The motor communicates with the integrated control via a 2-way serial connection. The motor receives all necessary functional parameters from the integrated control and does not rely on a factory program like traditional variable speed motors. A80US2V units use a three-phase, electronically controlled D.C. brushless motor (controller converts single phase a.c. to three phase D.C.), with a permanent-magnet type rotor (Figure 7). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.

The stator windings are split into three poles which are electrically connected to the controller. This arrangement allows motor windings to turn on and off in sequence by the controller.

⚠ IMPORTANT

Earlier ECM motors used on other Allied Air furnace models are not interchangeable with motors used on the A80US2V furnace line.

A solid-state controller is permanently attached to the motor. The controller is primarily an A.C. to D.C. converter. Converted D.C. power is used to drive the motor. The controller contains a microprocessor which monitors varying conditions inside the motor (such as motor workload).

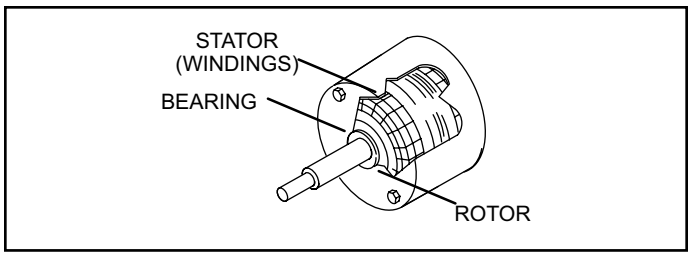


Figure 7. Blower Motor Components

The controller uses sensing devices to sense what position the rotor is in at any given time. By sensing the position of the rotor and then switching the motor windings on and off in sequence, the rotor shaft turns the blower.

All A80US2V blower motors use single phase power. An external run capacitor is not used. The motor uses permanently lubricated ball-type bearings.

Internal Operation

The motor is controlled via serial communication between the integrated control on the furnace and the controller attached to the motor shell. The messages sent back and forth between the two controls serve to communicate rotational direction, demand, motor size, current draw, torque, and rpm, among other variables.

Motor rpm is continually adjusted internally to maintain constant static pressure against the blower wheel. The controller monitors the static work load on the motor and motor amp-draw to determine the amount of rpm adjustment. Blower rpm may be adjusted any amount in order to maintain a constant cfm as shown in blower tables. The cfm remains relatively stable over a broad range of static pressure. Since the blower constantly adjusts rpm to maintain a specified cfm, motor rpm is not rated. Hence, the terms “cool speed”, “heat speed” or “speed tap” in this manual, on the unit wiring diagram and on blower B3, refer to blower cfm regardless of motor rpm.

Initial Power Up

When line voltage is applied to B3, there will be a large inrush of power lasting less than 1/4 second. This inrush charges a bank of DC filter capacitors inside the controller. If the disconnect switch is bounced when the disconnect is closed, the disconnect contacts may become welded. Try not to bounce the disconnect switch when applying power to the unit.

Motor Start-Up

When B3 begins start-up, the motor gently vibrates back and forth for a moment. This is normal. During this time the electronic controller is determining the exact position of the rotor. Once the motor begins turning, the controller slowly eases the motor up to speed (this is called “soft-start”). The motor may take as long as 10-15 seconds to reach full speed. If the motor does not reach 200 rpm within 13 seconds, the motor shuts down. Then the motor will immediately attempt a restart. The shutdown feature provides protection in case of a frozen bearing or blocked blower wheel. The motor may attempt to start eight times. If the motor does not start after the eighth try, the controller locks out. Reset controller by momentarily turning off power to unit.

The DC filter capacitors inside the controller are connected electrically to the motor supply wires. The capacitors take approximately 5 minutes to discharge when the disconnect is opened. For this reason it is necessary to wait at least 5 minutes after turning off power to the unit before attempting to service motor.

⚠ DANGER

Disconnect power from unit and wait at least five minutes to allow capacitors to discharge before attempting to service motor. Failure to wait may cause personal injury or death.

Power Choke (L13)

A choke coil is used on A80US2V 4 and 5 ton units equipped with 1 hp motors. The choke is located on the blower housing and is used to suppress transient current spikes.

Remove Blower from Unit

1. Remove unit access panels, control box, bolts and wiring jackplugs.
2. Slide blower out front of unit.

Troubleshooting Motor Operation

To verify motor operation see steps below and Figure 8 and Figure 9.

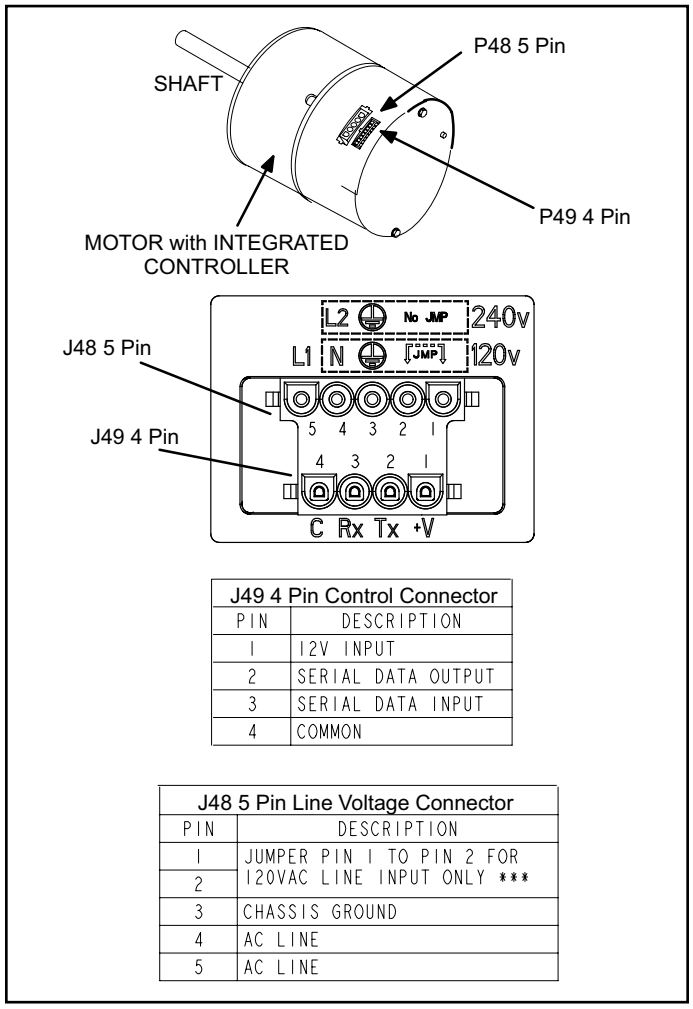
1. Remove J48 (5 pin power plug) from P48 on the motor.
2. With the power on at the furnace and door switch depressed, use a test meter to verify 120V between pins 4 and 5 on J48.
3. Reconnect J48 to P48 on the motor.
4. Remove J49 (4 pin low voltage connector) from P49 on the motor.

5. Using test jumpers, apply 24V to pins 3 and 4 on P49 on the motor.

   NOTE: *Do not apply 24V to pins 2 and 4 on P49. Doing so will cause permanent damage to the motor.*

6. Motor should run at 75%.
7. Test is complete. Remove jumpers and reconnect plugs.

Another option is to use the TECMate PRO motor tester with the 16 to 4 pin adaptor. The use of the TECMate PRO isolates the motor from the integrated control. Follow the instructions provided with the kit. If the motor runs, do not replace.



J49 4 Pin Control Connector	
PIN	DESCRIPTION
1	12V INPUT
2	SERIAL DATA OUTPUT
3	SERIAL DATA INPUT
4	COMMON

J48 5 Pin Line Voltage Connector	
PIN	DESCRIPTION
1	JUMPER PIN 1 TO PIN 2 FOR 120VAC LINE INPUT ONLY ***
2	
3	CHASSIS GROUND
4	AC LINE
5	AC LINE

Figure 8. Blower B3 Harness Connectors

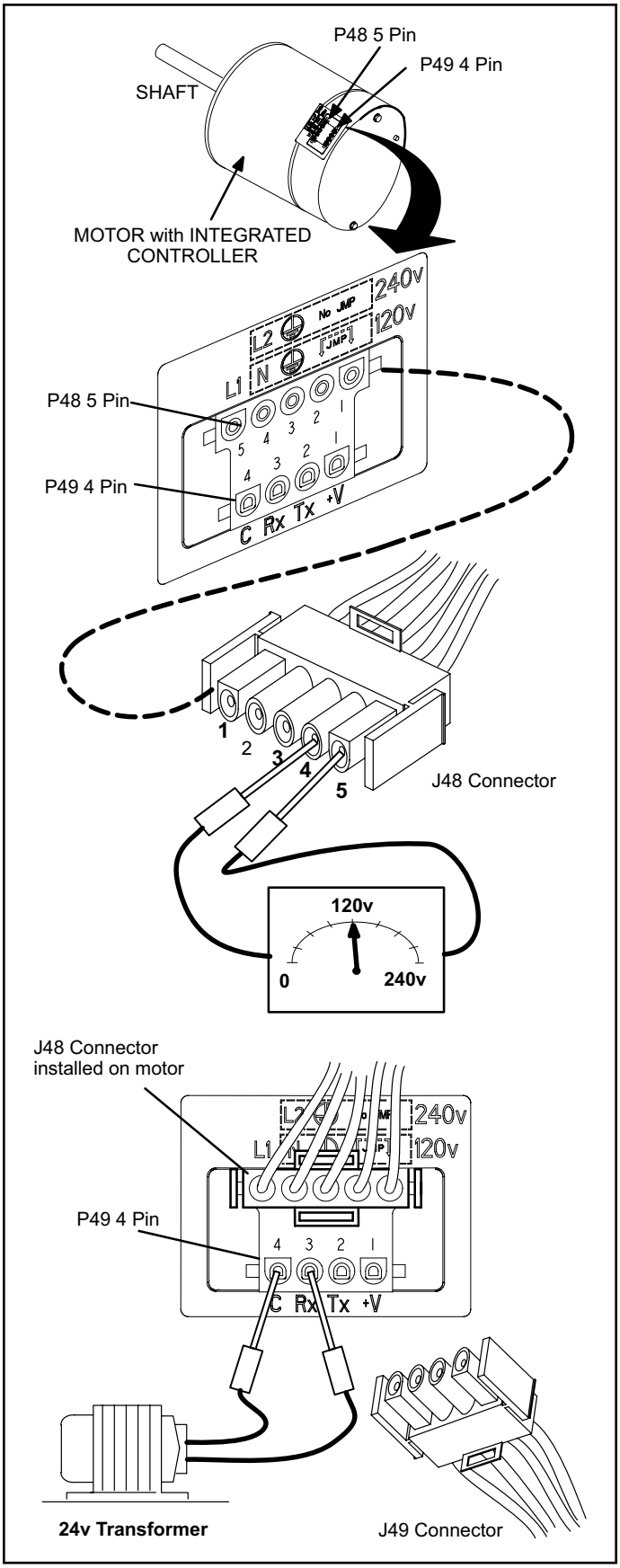


Figure 9. Blower B3 Harness Connectors

Troubleshooting Motor Windings

Ensure that motor windings are not damaged by performing the following tests:

NOTE: *If your ohm meter is not an auto-ranging type, set it to the highest ohm scale (100k ohms or greater) before performing tests.*

Scale	Measurement Range	
	in Words	in ohms
2 M	two megohm-two million ohms	0 - 2,000,000
200 K	two hundred kilo-ohm-two hundred thousand ohms	0 - 200,000
20 K	twenty kilo-ohm-twenty thousand ohms	0 - 20,000
2 K	two kilo-ohm two-thousand ohms	0 - 2,000
200	two hundred ohms	0 - 200

Table 13. Ohm Meter Range

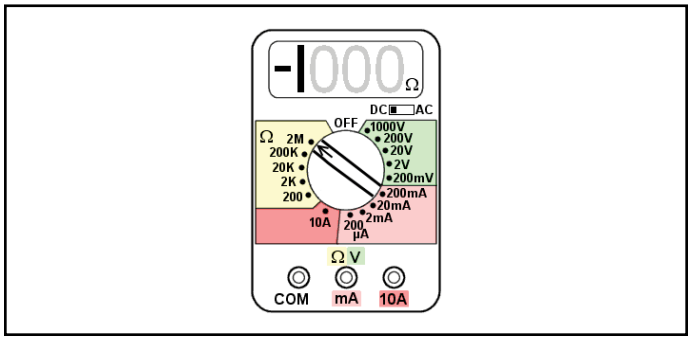


Figure 10.

TEST A

Measure the resistance between each of the three motor leads (3-pin plug) and the unpainted part of the end shield.

If the winding resistance to ground is <100k ohms, replace the motor and control module. If the resistance to ground is >100k, the motor windings are fine. Proceed to Test B.

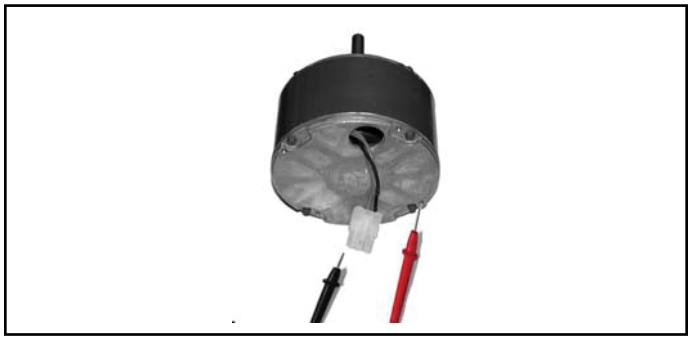


Figure 11. Test A

TEST B

Use an ohmmeter to measure the motor phase-to-phase resistance by checking these combinations of the the 3-pin motor plug. For the purpose of this test, start at either end of the connector as lead 1.

1. The lead-to-lead resistance across any two leads should be less than 20 ohms.
2. Each lead-to-lead resistance should be the same.

If the measured resistance is greater than 20 ohms, replace the motor and control module.

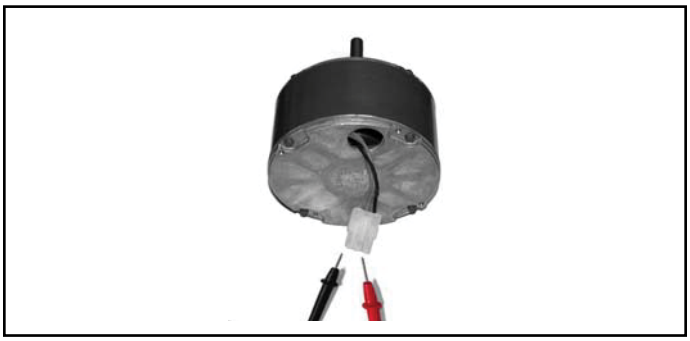


Figure 12. Test B

Heating Components

Ignitor

The ignitor is made of durable silicon nitride. Ignitor longevity is enhanced by controlling voltage to the ignitor. The integrated control provides a regulated 120 volts to the ignitor for a consistent ignition and long ignitor life. Ohm value should be 39 to 70. See Figure 14 for ignitor location and Figure 13 for ignitor check out.

NOTE: *The A80US2V furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

Flame Sensor

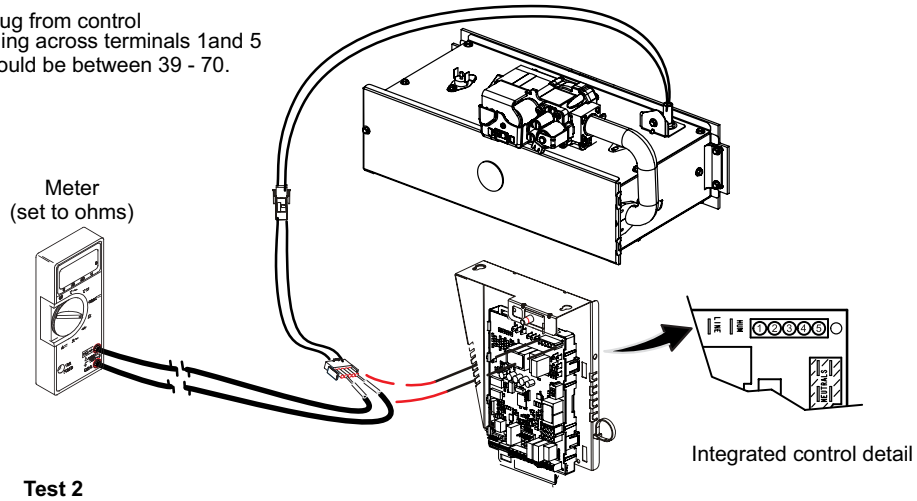
A flame sensor (Figure 14) is located on the left side of the burner support. The sensor is mounted on the flame rollout plate and the tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The control allows the gas valve to remain open as long as flame signal is sensed. To check flame sense signal use the push-button found on the integrated control and go to Field Test Mode. The menu will display the flame signal. See Table 14 for flame signal.

Flame Signal in Microamps		
Normal	Low	Drop Out
2.6 or greater	2.5 or less	1.1

Table 14.

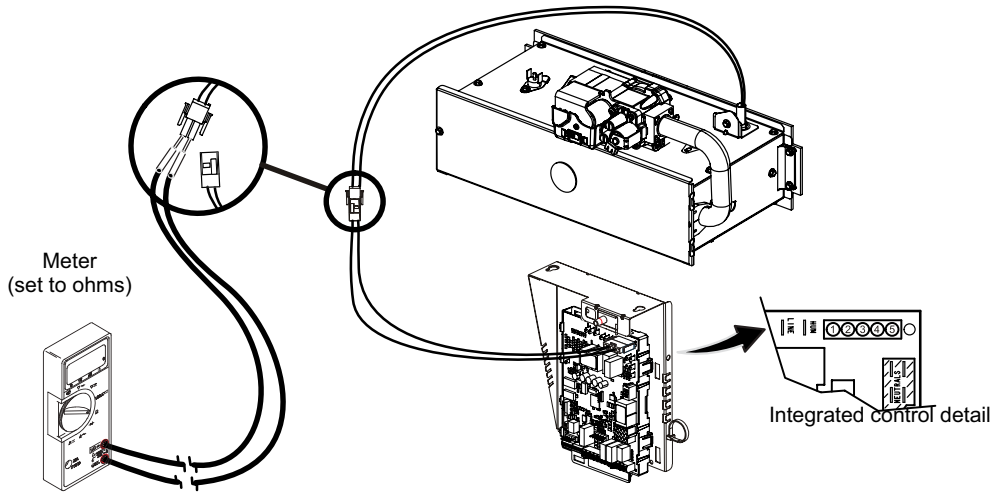
Test 1

Remove 5-pin plug from control
Check ohms reading across terminals 1and 5
Ohm value should be between 39 - 70.



Test 2

Seperate the 2-pin jack plug near the manifold and check resistance of the ignitor. If the reading is correct, then then there is a problem with the wiring between the jack plug and control. If the reading is not correct the issue is the ignitor.



Test 3

Insert meter probes into the terminals 1 and 5. (Use small diameter probes in order to not damage plug). Check voltage during 20 second warm up period. Voltage should read 120 volts ± 10%. If voltage is above these values, check for correct supply voltage to furnace.

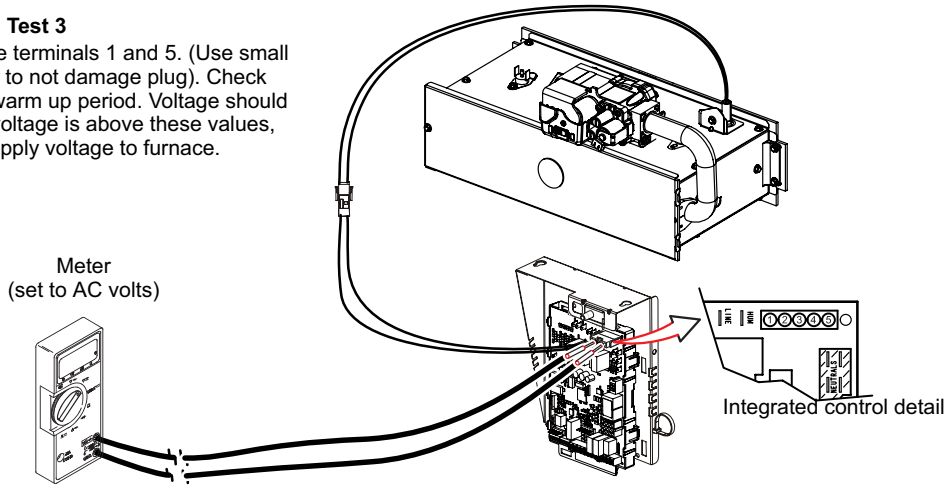


Figure 13. Ignitor Check

Flame Rollout Switches

Flame rollout switch is a high temperature limit located on top of the burner box, one on each side.- See Figure 14. The limit is a N.C. SPST manual-reset limit. When S47 senses rollout, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. Rollout can be caused by a blocked heat exchanger, flue or lack of combustion air. The switch is factory set to trip (open) at 210°F and cannot be adjusted. The switch can be manually reset. To manually reset a tripped switch, push the reset button located on the control.

Burners

All units use inshot burners. Burners are factory set and require no adjustment. Always operate the unit with the burner box front panel in place. Each burner uses an orifice that is precisely matched to the burner input. Burners can be removed as a one piece assembly for service. If burner assembly has been removed, it is critical to align center of each burner to the center of the clamshell when re-installing. See more detail in Maintenance.

Gas Valve

The valve (Figure 17) is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and gas control knob are located on the valve. A wire harness connects the terminals from the gas valve to the electronic ignition control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve.

LPG change over kits are available from Allied. Kits include burner orifices and a gas valve.

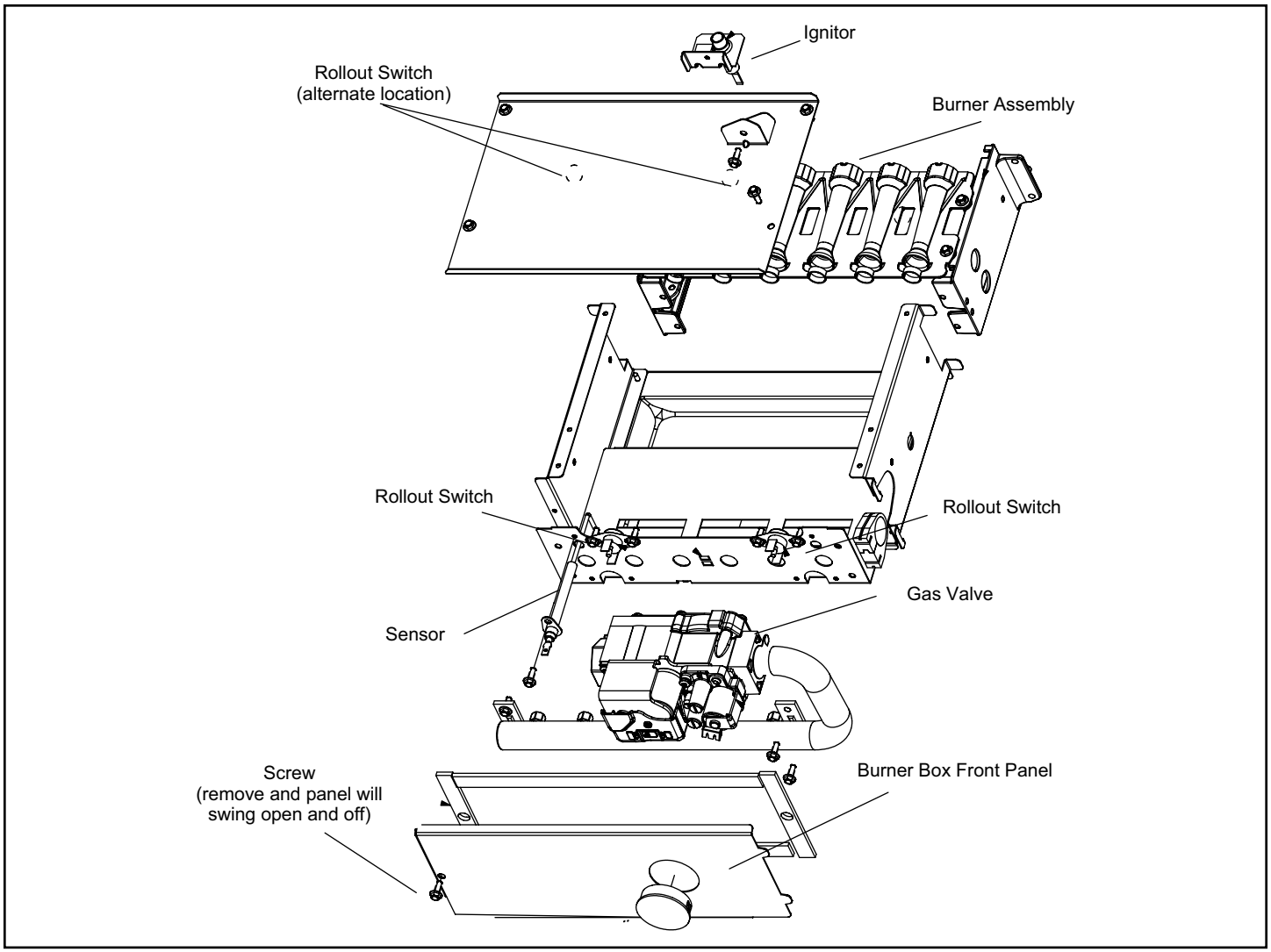


Figure 14. Heating Components

Primary Limit Control

The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the control will go into Watch guard for one hour. The switch is factory set and cannot be adjusted. The switch may have a different set point for each unit model number.

Secondary Limit Controls

The secondary limit (S21) is located in the blower compartment on the back side of the blower housing. A80US2V units require two secondary limits. When excess heat is sensed in the blower compartment, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the control will go into Watch guard for one hour. The switch is factory set and cannot be adjusted.

Combustion Air Inducer

All A80US2V units use a two-stage combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge). The inducer operates on low speed during firststage heat, then switches to high speed for second stage heat.

A proving switch connected to the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. See Table 15 for orifice sizes. The switch monitors air pressure in the inducer housing. During normal operation, the pressure in the housing is negative. If pressure becomes less negative (signifying an obstruction) the proving switch opens. When the proving switch opens, the furnace control (A92) immediately closes the gas valve to prevent burner operation.

Combustion Air Inducer Prove Switch

A80US2V series units are equipped with a dual combustion air proving switch (first and second stage) located on the combustion air inducer orifice bracket. See Figure 15. The switch is connected to the combustion air inducer housing by means of a flexible silicone hose. It monitors negative air pressure in the combustion air inducer housing.

The switches are a single-pole single-throw proving switch electrically connected to the integrated control. The purpose of the switch is to prevent burner operation if the combustion air inducer is not operating or if the flue becomes obstructed.

On heat demand (first or second stage) the switch senses that the combustion air inducer is operating. It closes a circuit to the integrated control when pressure inside the combustion air inducer decreases to a certain set point. Set points vary depending on unit size. See Table 15. The pressure sensed by the switch is negative relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (pressure becomes more equal with atmospheric pressure) and opens the circuit to the furnace control and gas valve. A bleed port on the switch allows relatively dry air in the vestibule to purge switch tubing, to prevent condensate build up.

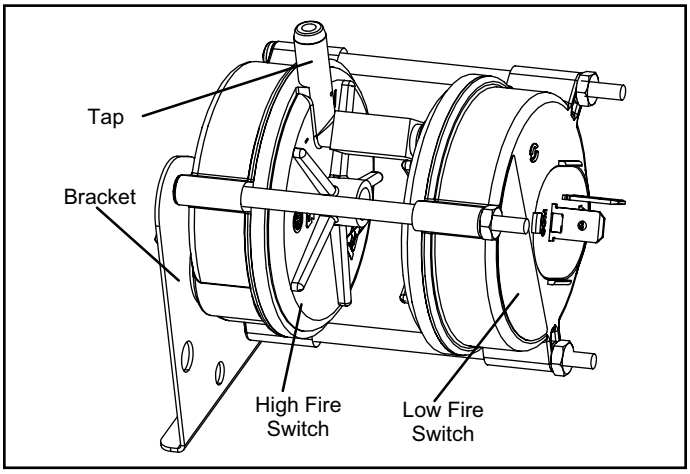


Figure 15.

NOTE: *The switch is factory set and is not field adjustable. It is a safety shut-down control in the furnace and must not be by-passed for any reason. If switch is closed or bypassed, the control will not initiate ignition at start up.*

Unit	Set Point Low Heat	Set Point High Heat
-070	0.25	0.60
-090	0.30	0.68
-110	0.30	0.68
-135	0.30	0.75

Table 15. 0 - 4500'

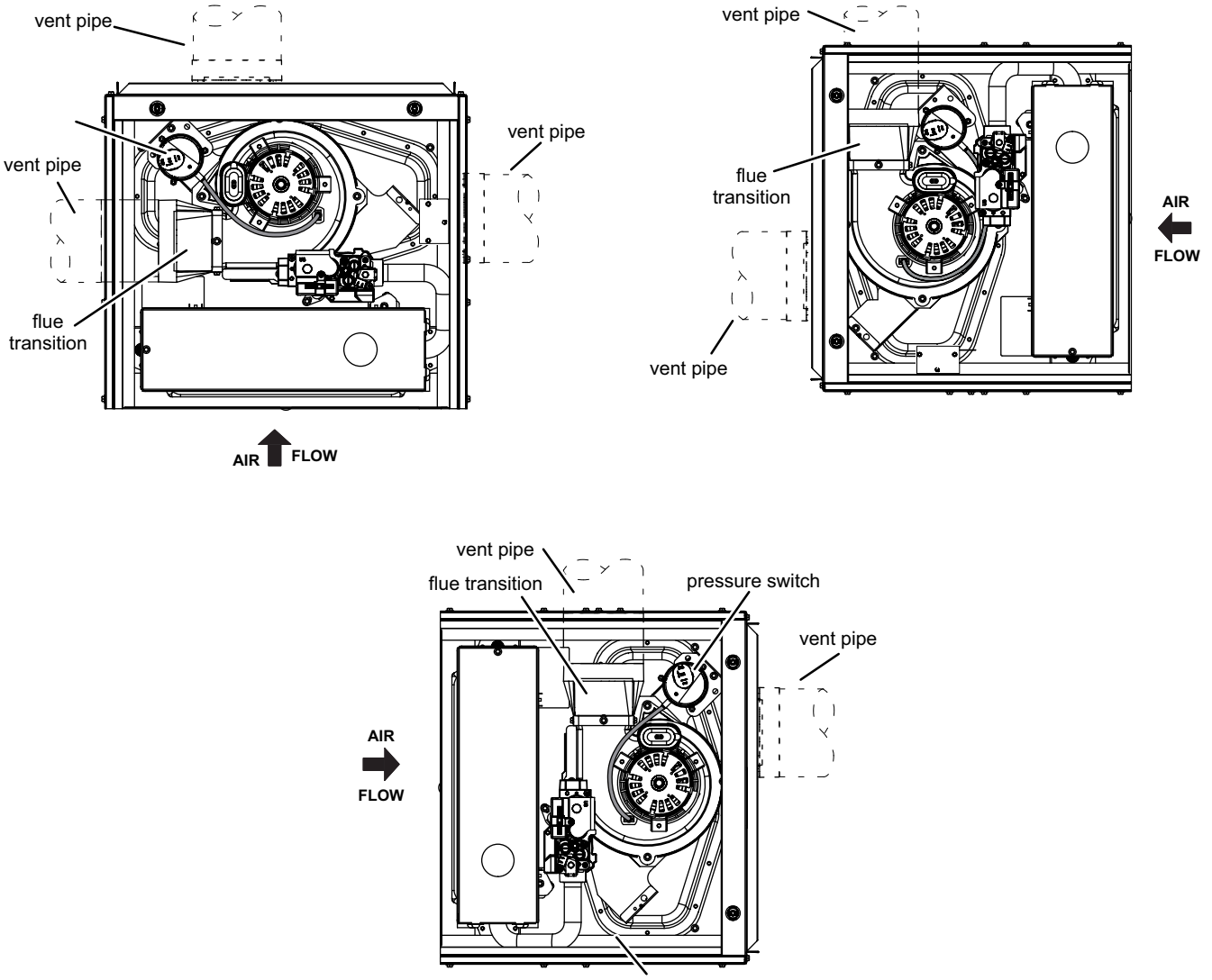
Multiple Venting

The A80US2V furnace can vent in multiple positions. See Figure 16.

The make up box may be removed and the combustion air inducer may be rotated clockwise or counterclockwise 90° to allow for vertical or horizontal vent discharge in a vertical or horizontal cabinet position. Remove the four mounting screws, rotate the assembly (assembly consists of orifice plate, proving switch, gasket and combustion air inducer), then reinstall the mounting screws. See unit Installation Instructions for more detail.

⚠ IMPORTANT

The combustion air pressure switch must be moved for horizontal discharge air left position.



In all positions route the wires away from moving parts and the heat of the inducer motor to prevent damage to the wires. The pressure switch must be installed above the CAI to prevent moisture from collecting in the hoses or switch.

Figure 16.

Placement and Installation

Make sure unit is installed in accordance with installation instructions and applicable codes.

Start-Up

Preliminary and Seasonal Checks

1. Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.
2. Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.

Heating Start-Up

⚠ WARNING

Shock and burn hazard.

A80US2V units are equipped with a hot surface ignition system. Do not attempt to light manually.

Gas Valve Operation

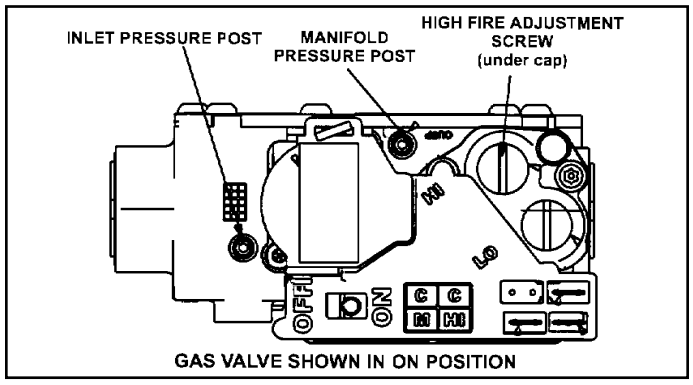


Figure 17.

1. **STOP**! Read the safety information at the beginning of this section.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the unit.
4. This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Remove the upper access panel.
6. Move gas valve switch to OFF. See Figure 17.
7. Wait five minutes to clear out any gas. If you then smell gas, **STOP**! Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
8. Move gas valve switch to ON. See Figure 17.
9. Replace the upper access panel.
10. Turn on all electrical power to to the unit.
11. Set the thermostat to desired setting.

    NOTE: *When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.*
12. If the appliance will not operate, follow the instructions "Turning Off Gas to Unit" and call your service technician or gas supplier.

Turning Off Gas to Unit

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the unit if service is to be performed.
3. Remove the upper access panel.
4. Move gas valve switch to OFF.
5. Replace the upper access panel.

Failure to Operate

If the unit fails to operate, check the following:

1. Is the thermostat calling for heat?
2. Are access panels securely in place?
3. Is the main disconnect switch closed?
4. Is there a blown fuse or tripped circuit breaker?
5. Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.
6. Is gas turned on at the meter?
7. Is the manual main shut-off valve open?
8. Is the internal manual shut-off valve open?
9. Is the unit ignition system in lock out? If the unit locks out again, call the service technician to inspect the unit for blockages.
10. Is pressure switch closed? Obstructed flue will cause unit to shut off at pressure switch. Check flue and outlet for blockages.
11. Are flame rollout switches tripped? If flame rollout switches are tripped, call the service technician for inspection.

Safety or Emergency Shutdown

Turn off unit power. Close manual and main gas valves.

Extended Period Shutdown

Turn off thermostat or set to "UNOCCUPIED" mode. Close all gas valves (both internal and external to unit) to guarantee no gas leak into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

Heating System Service Checks

CSA Certification

All units are CSA design certified without modifications. Refer to the A80US2V Installation Instruction.

Gas Piping

⚠ CAUTION

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet.

⚠ WARNING

Do not over torque (800 in-lbs) or under torque (350 in-lbs) when attaching the gas piping to the gas valve.

Gas supply piping should not allow more than 0.5”W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

Testing Gas Piping

⚠ IMPORTANT

In case emergency shutdown is required, turn off the main shut-off valve and disconnect the main power to unit. These controls should be properly labeled by the installer.

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5psig (14” W.C.). See Figure 18. If the pressure is greater than 0.5psig (14” W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.

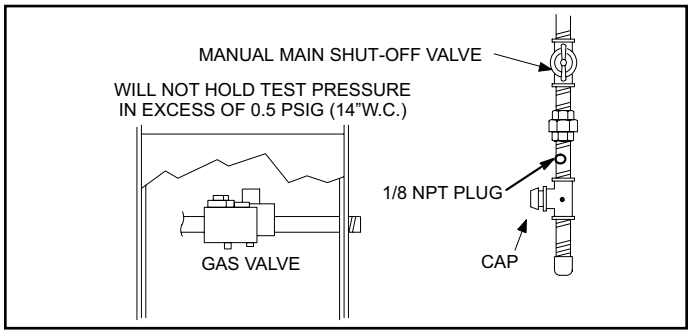


Figure 18.

When checking piping connections for gas leaks, use preferred means. Kitchen detergents can cause harmful corrosion on various metals used in gas piping. Use of a specialty Gas Leak Detector is strongly recommended.

Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

Testing Gas Supply Pressure

An inlet post located on the gas valve provides access to the supply pressure. See Figure 17. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure supply pressure. See Table 20 for supply line pressure.

Check Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move pressure gauge to outlet pressure tap located on unit gas valve (GV1). Checks of manifold pressure are made as verification of proper regulator adjustment. Manifold pressure for the A80US2V can be measured at any time the gas valve is open and is supplying gas to the unit. See Table 20 for operating manifold pressure.

⚠ IMPORTANT

For safety, shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

The gas valve is factory set and should not require adjustment. All gas valves are factory regulated.

Manifold Adjustment Procedure

NOTE: *Pressure test adapter kit (10L34) is available from Allied Air to facilitate manifold pressure measurement.*

1. Connect test gauge to manifold pressure post (Figure 17) on gas valve.
2. Ignite unit on low fire and let run for 5 minutes to allow for steady state conditions.
3. After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in Table 20.
4. If necessary, make adjustments. Figure 17 shows location of high fire and low fire adjustment screw.
5. Repeat steps 2, 3 and 4 on high fire.
6. Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.
7. Start unit and perform leak check. Seal leaks if found.

Proper Gas Flow (Approximate)

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in Table 16. If manifold pressure matches Table 20 and rate is incorrect, check gas orifices for proper size and restriction.

NOTE: *To obtain accurate reading, shut off all other gas appliances connected to meter.*

Model	Seconds for One Revolution			
	Natural		LP	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-070	55	110	136	272
-090	41	82	102	204
-110	33	66	82	164
-135	27	54	68	136
	Natural - 1000 btu/cu ft		LP - 2500 btu/cu ft	

Table 16. Gas Meter Clocking Chart

IMPORTANT

For safety, shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue outlet and compare to Table 17. **The maximum carbon monoxide reading should not exceed 100 ppm.**

Model	CO_2 % for Nat	CO_2 % for LP
High Fire	6.8 - 7.4	7.5 - 9.0
-070	4.2 - 5.7	5.0 - 6.0
The maximum carbon monoxide reading should not exceed 100ppm.		

Table 17.

High Altitude

The manifold pressure, gas orifice and pressure switch may require adjustment or replacement to ensure proper operation at higher altitudes. See Table 20 for manifold pressures. See Table 19 for gas conversion and Table 18 for pressure switch kits.

Unit Input	High Altitude Pressure Switch Kit		
	0 - 4500 ft.	4501 - 7500 ft.	7501 - 10,000 ft.
070	No Change	No Change	73W35
090	No Change	69W56	73W35
110	No Change	69W56	73W35
135	No Change	73W33	73W34

Table 18. High Altitude Pressure Switch Kits

Unit Input	High Altitude Natural Gas Orifice Kit	Natural Gas to LP/ Propane Kit	
	7501 - 10,000 ft.	0 - 7500 ft.	7501 - 10,000 ft.
070	51W01	11K48	11K47
090	51W01	11K48	11K47
110	51W01	11K48	11K47
135	51W01	11K48	11K47

Table 19. White Rodgers Gas Valve Conversion Kits

Unit Input	Gas	Orifice Size 0 - 7500 ft.[1]	Orifice Size 7501 ft. - 10,000 ft.	Manifold Pressure in w.g. 0 - 4500 ft.		Manifold Pressure in w.g. 4501 - 7500 ft.		Manifold Pressure in w.g. 7501 - 10,000 ft.[2]		Supply Line Pressure in w.g.	
				Low Fire	High Fire	Low Fire	High Fire	Low Fire	High Fire	Low Fire	High Fire
070	Natural	.063	.055	1.7	3.5	1.6	3.4	1.7	3.5	4.5	13.0
	LP/propane[3]	.034	.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
090	Natural	.063	.055	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP/propane[3]	.034	.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
110	Natural	.063	.055	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP/propane[3]	.034	.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
135	Natural	.063	.055	1.7	3.5	1.6	2.8	1.7	3.5	4.5	13.0
	LP/propane[3]	.034	.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0

[1] This is the only permissible derate for these units.

[2] Natural gas high altitude orifice kit required.

[3] A natural to L.P./propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

NOTE: *Units may be installed at altitudes up to 4500 ft. above sea level without modifications.*

Table 20. Manifold and Supply Line Pressure 0 - 10,000 ft.

Typical Operating Characteristics

Blower Operation and Adjustment

1. Blower operation is dependent on thermostat control system.
2. Generally, blower operation is set at thermostat subbase fan switch. With fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.
3. Depending on the type of indoor thermostat, blower and entire unit will be off when the system switch is in OFF position.

Temperature Rise

Temperature rise for A80US2V units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of “TEMP. RISE °F” listed on the unit rating plate.

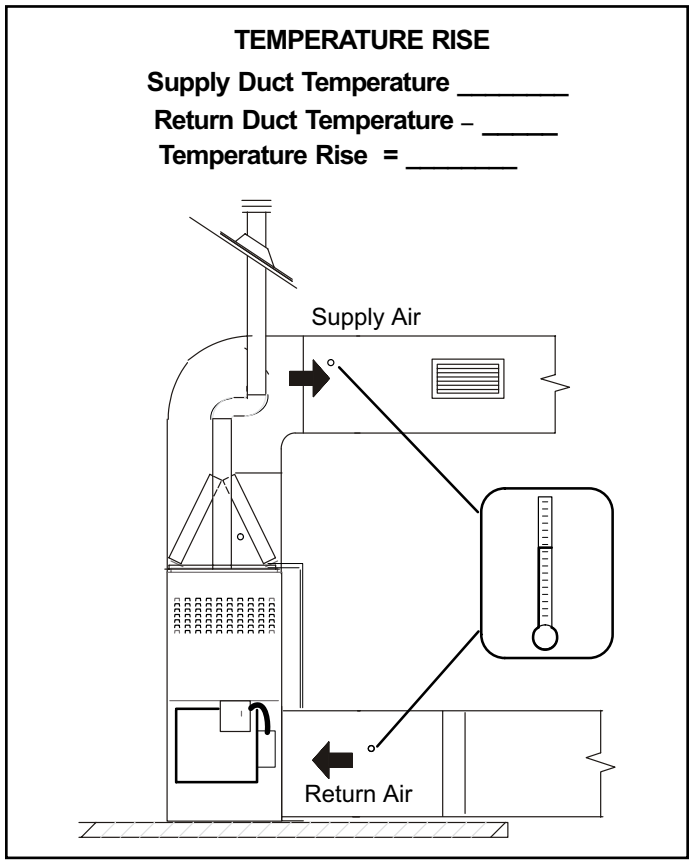


Figure 19. Temperature Rise

External Static Pressure

1. Tap locations shown in Figure 20.
2. Punch a 1/4” diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
3. With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed (second-stage heat speed) external static pressure drop must not be more than 0.8” W.C. For cooling speed (second-stage cool speed) external static pressure drop must not be more than 1.0” W.C.
4. Seal the hole when the check is complete.

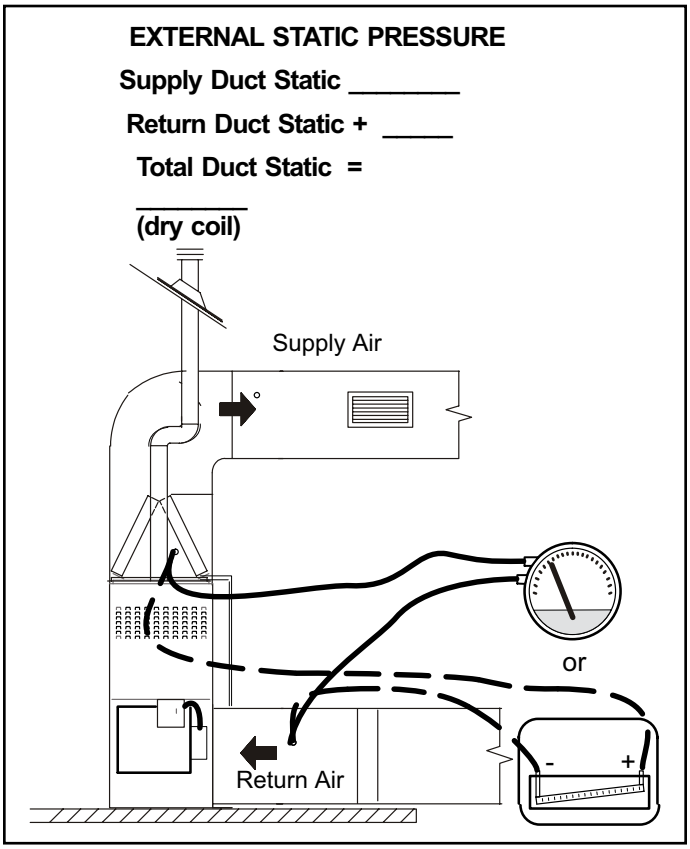


Figure 20. Static Pressure Test

Maintenance

Annual Furnace Maintenance

At the beginning of each heating season, and to comply with the Allied Air Limited Warranty, your system should be checked by a licensed professional technician (or equivalent) as follows:

⚠ WARNING

Disconnect power before servicing unit.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

1. Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
2. Check the condition of the belt and shaft bearings if applicable.
3. Inspect all gas pipe and connections for leaks.
4. Check the cleanliness of filters and change if necessary (monthly).

⚠ IMPORTANT

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer against the data given in the appropriate Product Specifications.

⚠ WARNING

The blower access panel must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

5. Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
6. Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary . The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
7. Inspect the combustion air inducer and clean if necessary.
8. Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at www.ahrinet.org
9. Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
10. Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code
11. Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
12. Check the condition of the furnace cabinet insulation and repair if necessary.
13. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
14. Verify operation of CO detectors and replace batteries as required.

General System Test

Turn on the furnace to check operating functions such as the start-up and shut-off operation.

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.

3. Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.

Cleaning the Heat Exchanger and Burner

NOTE: *Use papers or protective covering in front of the furnace during cleaning.*

1. Turn off both electrical and gas power supplies to furnace.
2. Remove flue pipe and top cap (some applications top cap can remain) from the unit.
3. Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
4. Remove the screws that secure the combustion air inducer/pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
5. Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
6. Disconnect gas supply piping. Remove the screw securing the burner box cover and remove cover. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
7. Remove screws securing burner box and remove burner box.
8. NOX units only - Remove screw securing NOX insert. Remove NOX insert. See Figure 21.
9. Remove screws from both sides, top and bottom of vestibule panel.
10. Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See Figure 22.
11. Back wash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
12. To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect inside the burners and crossovers for any blockage caused by foreign matter. Remove any blockage. Figure 23 shows burner detail.
13. To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.
14. Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
15. NOX units only - replace NOX inserst.
16. Reinstall collector box and combustion air assembly. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any damage and replace if necessary.
17. Reinstall burner box, manifold assembly and burner box cover.
18. Reconnect all wires.
19. Reconnect top cap and vent pipe to combustion air inducer outlet.
20. Reconnect gas supply piping.
21. Turn on power and gas supply to unit.
22. Set thermostat and check for proper operation.
23. Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

⚠ CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

24. If a leak is detected, shut gas and electricity off and repair leak.
25. Repeat steps 24 and 26 until no leaks are detected.
26. Replace access panel.

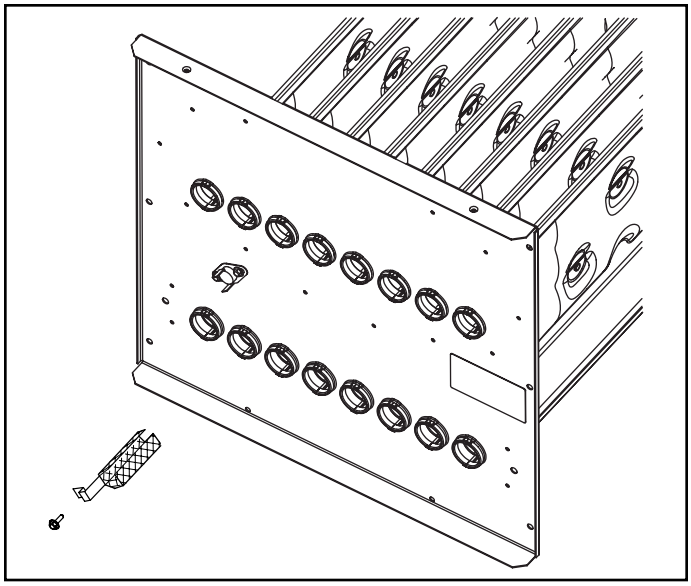


Figure 21. A80US2V NO_x Inserts

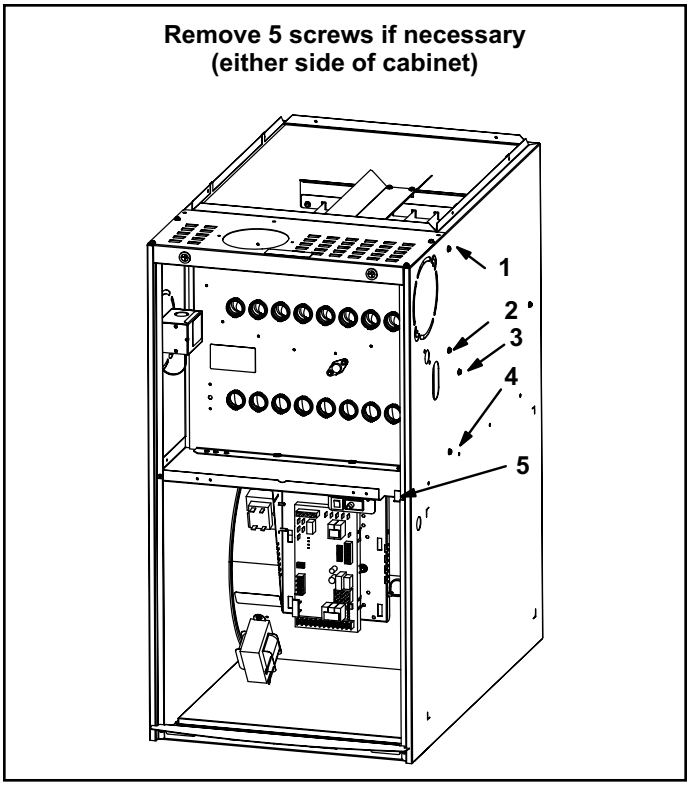


Figure 22.

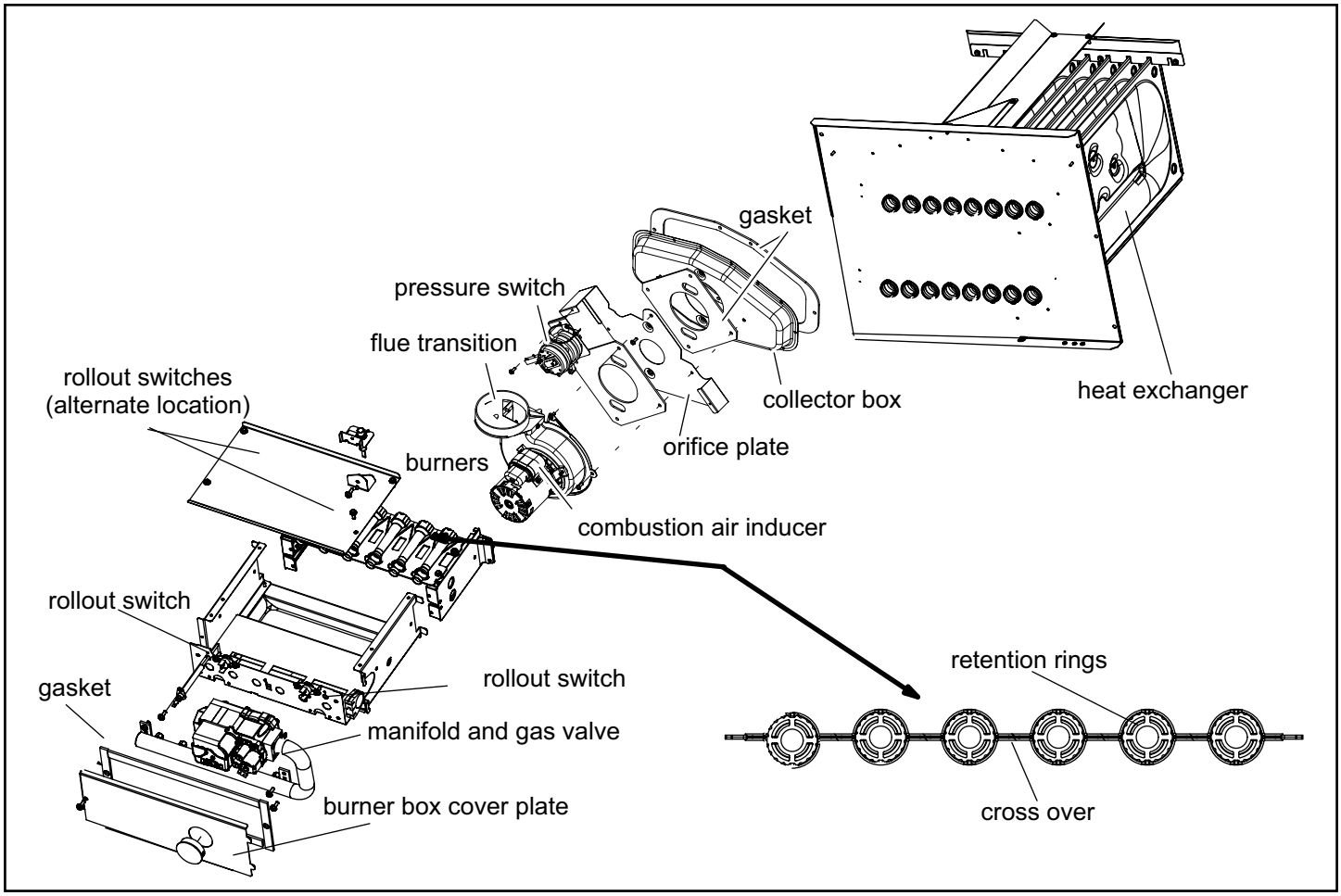


Figure 23. A80US2V Burner, C.A.I. Assembly, and Heat Exchanger Removal

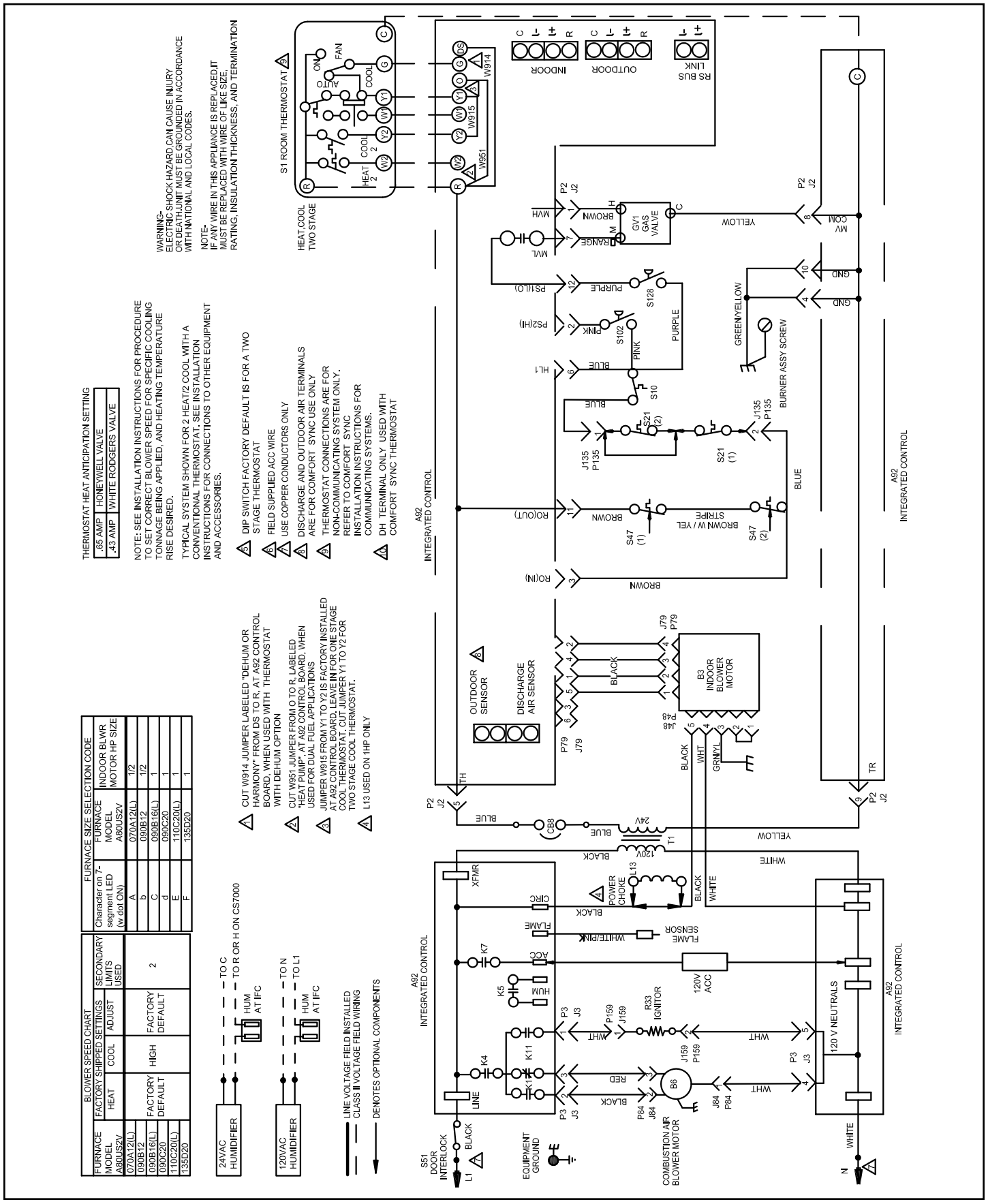


Figure 24. A80US2V Schematic Wiring Schematic

⚠ WARNING

Electric Shock Hazard.

Can cause injury or death. Unit must be properly grounded in accordance with national and local codes.

⚠ WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

⚠ WARNING

Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Technical Specifications and unit rating plate.

Integrated Control Self Check

When there is a call for heat, the Comfort Sync-enabled integrated control runs a self check. The control checks for S10 primary limit, S21 secondary limit (s) and S47 rollout switch normally closed contacts. The control also checks for S102 high heat and S128 low heat prove switch normally open contacts. Once self check is complete and all safety switches are operational, heat call can continue.

NOTE: *The ignition control thermostat selection DIP switch is factory-set in the "TWO-STAGE" position.*

Sequence of Operation

NOTE: *The ignition control thermostat selection DIP switch is factory-set in the "TWO-STAGE" position.*

Applications Using a Two-Stage Thermostat

A - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 OFF in "Two-Stage" Position (Factory Setting)

See Figure 25 for ignition control sequence.

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

   NOTE: *If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.*
3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.

   NOTE: *If the indoor thermostat is set on CONTINUOUS FAN ON mode, the furnace will light on high fire (second-stage) for 60 seconds to improve heat exchanger warm up. After 60 second warm-up period, furnace will switch to low fire (first-stage).*
5. If second-stage heat is required, the thermostat second-stage heat contacts close and send a signal to the integrated control. The integrated control initiates a 30-second second-stage recognition delay.
6. At the end of the recognition delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
7. When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second stage) gas valve is de-energized. The low-fire (first stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.
8. When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second post-purge period.
9. When the combustion air post-purge period is complete, the inducer, the HUM contacts as well as the 120V ACC terminals are de-energized. The indoor blower is de-energized at the end of the off delay.

Applications Using a Single-Stage Thermostat

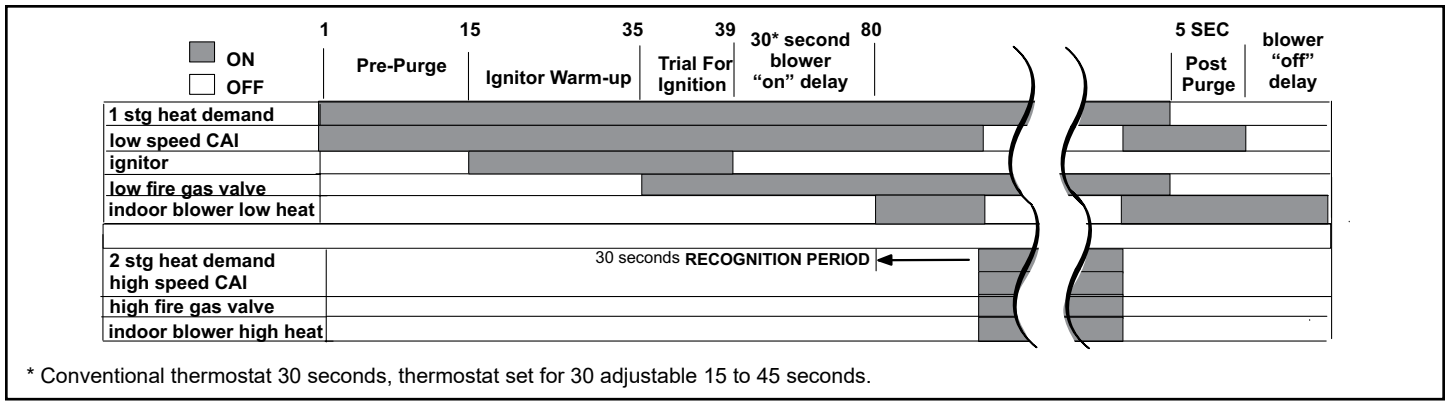
B - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 ON in "Single-Stage" Position

See Figure 26 for ignition control sequence.

NOTE: *In these applications, two-stage heat will be initiated by the integrated control if heating demand has not been satisfied after the field adjustable period (7 or 12 minutes).*

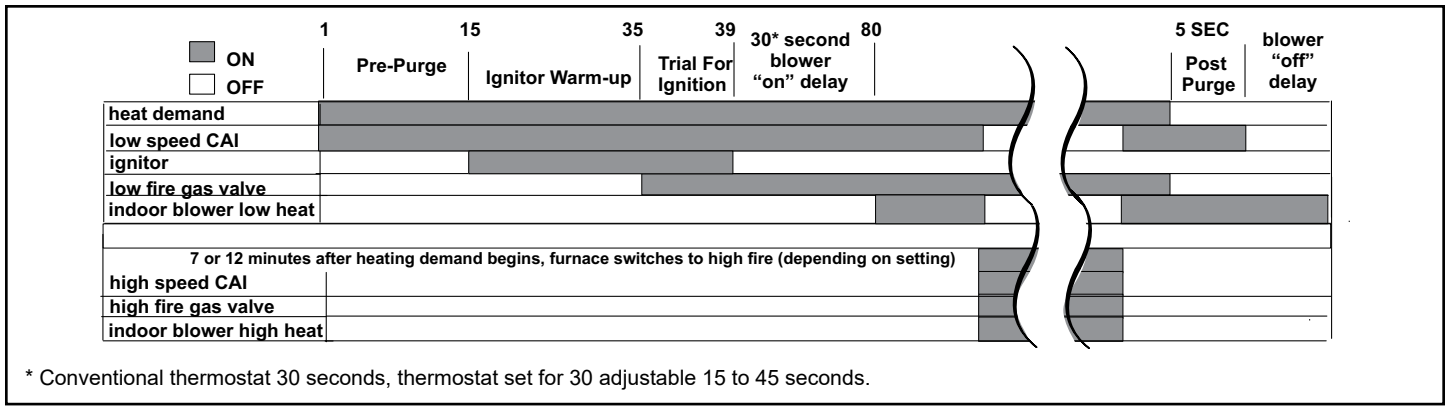
1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

   NOTE: *If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.*
3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed and the HUM contacts are energized. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).
5. If the heating demand continues beyond the second-stage on delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
6. When the thermostat heating demand is satisfied, the combustion air inducer begins a 5-second low speed post-purge. The field-selected indoor blower off delay begins. The indoor blower operates at the low-fire heating speed.
7. When the combustion air post-purge period is complete, the inducer, the HUM contacts as well as the 120V ACC terminals are de-energized. The indoor blower is de-energized at the end of the off delay.



* Conventional thermostat 30 seconds, thermostat set for 30 adjustable 15 to 45 seconds.

Figure 25. Heating Operation with Two-Stage Thermostat

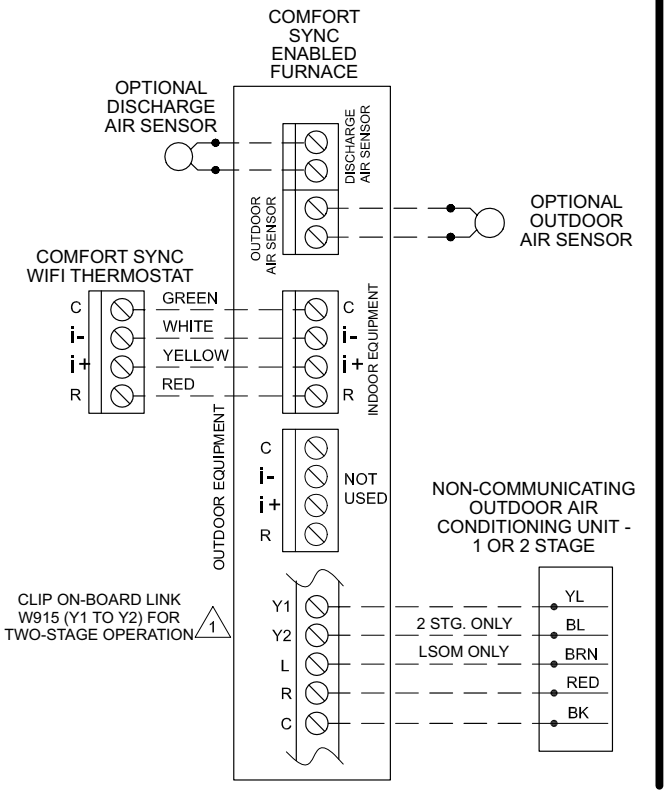


* Conventional thermostat 30 seconds, thermostat set for 30 adjustable 15 to 45 seconds.

Figure 26. Heating Operation with Single Stage Thermostat

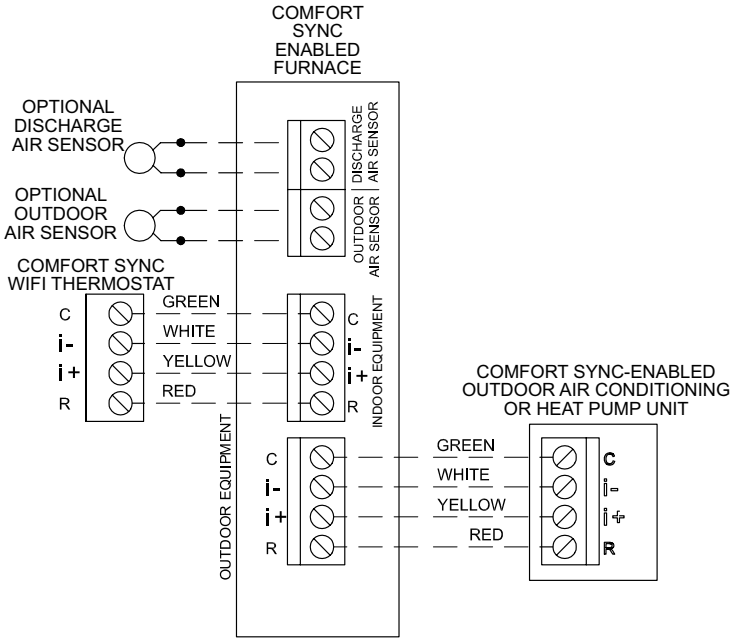
Comfort Sync Wifi Thermostat with A96US2V and Non-Communicating Outdoor Unit

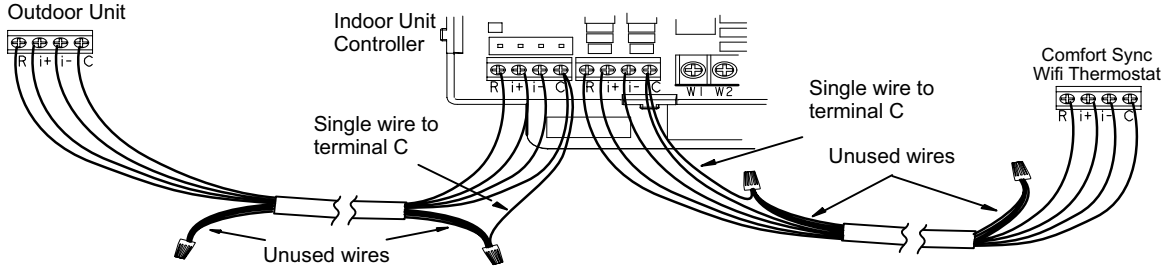
Comfort Sync Wifi Thermostat
Comfort Sync-enabled A96US2V Indoor Furnace
Non-Communicating Outdoor Air Conditioner



Comfort Sync Wifi Thermostat with A96US2V and Comfort Sync-enabled Outdoor Unit

Comfort Sync Wifi Thermostat
Comfort Sync-enabled A96US2V Indoor Furnace
Comfort Sync-enabled Outdoor Air Conditioner or Heat Pump





Communicating systems using the Comfort Sync Wifi thermostat require four thermostat wires between the thermostat and the furnace/air handler control and four wires between the outdoor unit and the furnace/air handler control. When a thermostat cable with more than four wires is used, the extra wires must be properly connected to avoid electrical noise. The wires must not be left disconnected.

Use wire nuts to bundle the four unused wires at each end of the cable. A single wire should then be connected to the indoor unit end of the wire bundle and attached to the “C” terminals as shown above.

Figure 27.

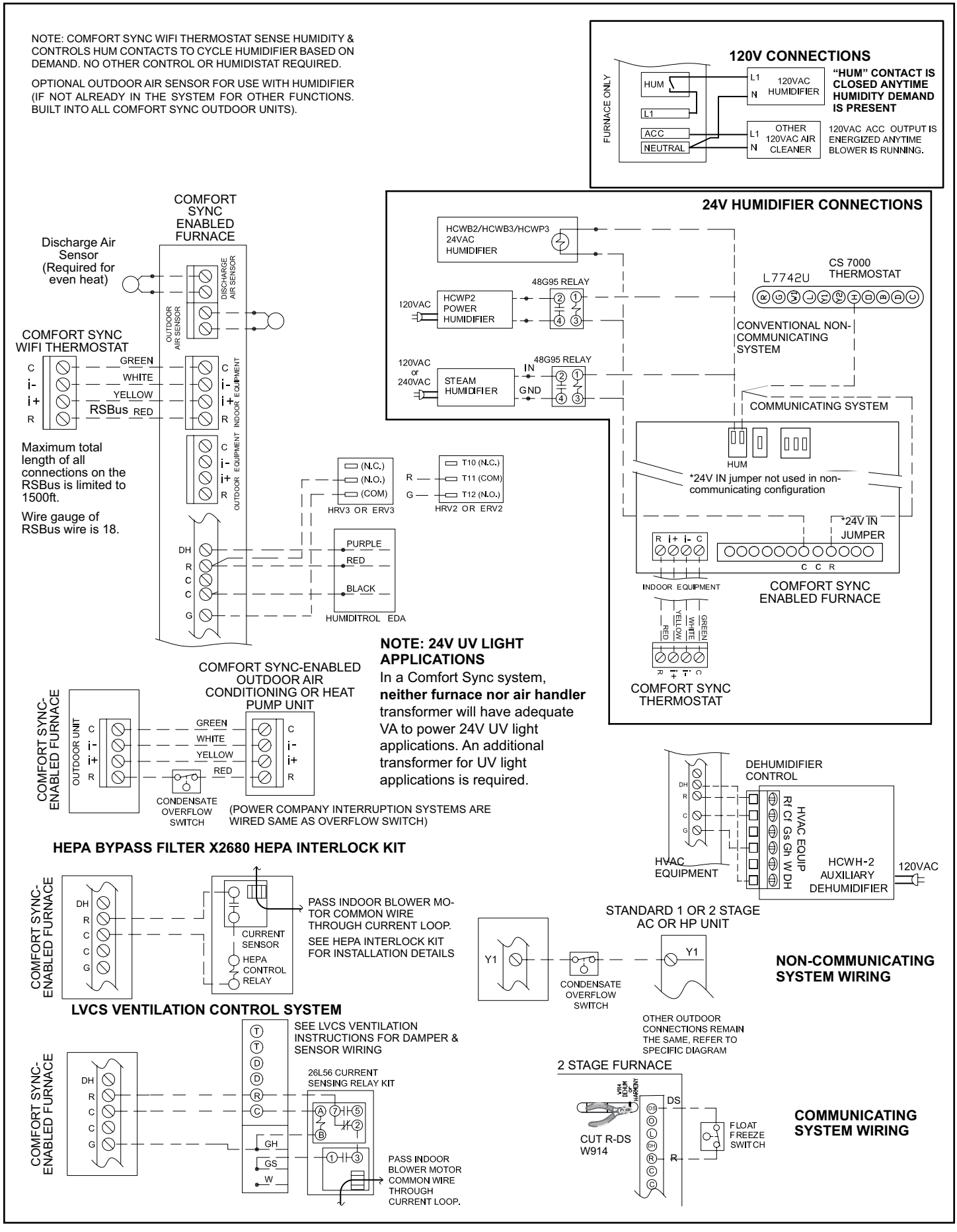


Figure 28. Optional Accessories for Use with Any Comfort Sync System

Field Wiring Applications with Conventional Thermostat

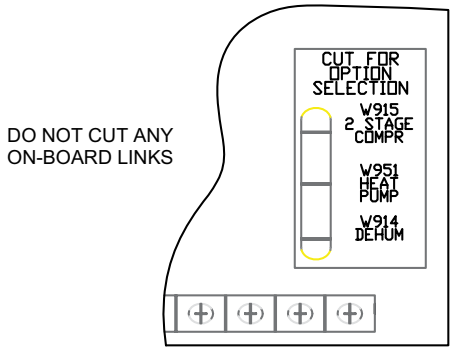
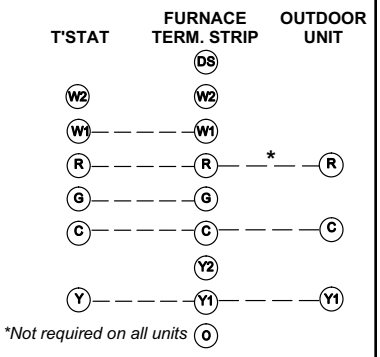
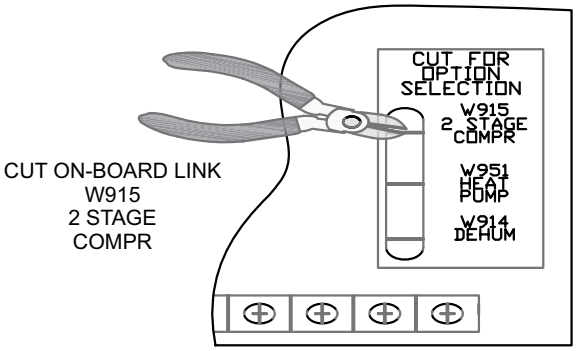
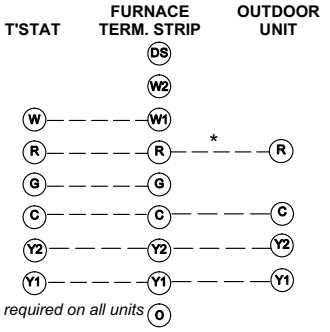
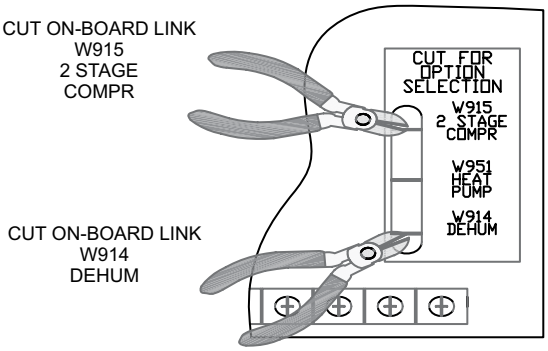
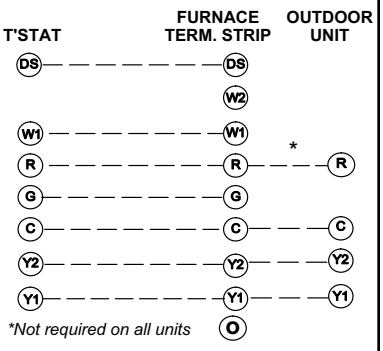
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1	On Board Links Must Be Cut To Select System Options	
1 Heat / 1 Cool **NOTE:** *Use DIP switch 2 to set sceond-stage heat ON delay.* *OFF - 7 minutes* *ON - 12 minutes*	ON		
1 Heat / 2 Cool **NOTE:** *Use DIP switch 2 to set sceond-stage heat ON delay.* *OFF - 7 minutes* *ON - 12 minutes*	ON		
1 Heat / 2 Cool with t'stat with dehumidification mode **NOTE:** *Use DIP switch 2 to set sceond-stage heat ON delay.* *OFF - 7 minutes* *ON - 12 minutes*	ON		
NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the A80US2V integrated control.			

Table 21. Field Wiring for Non-Communicating Thermostat Applications

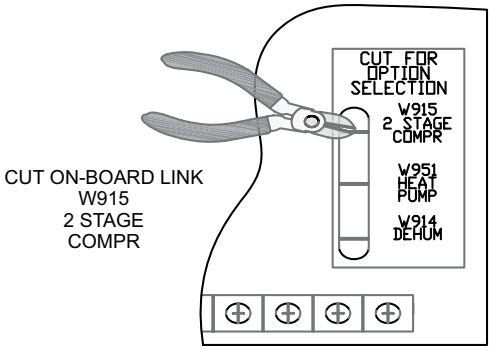
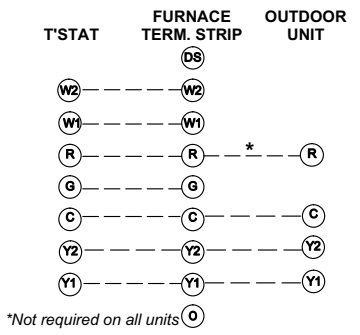
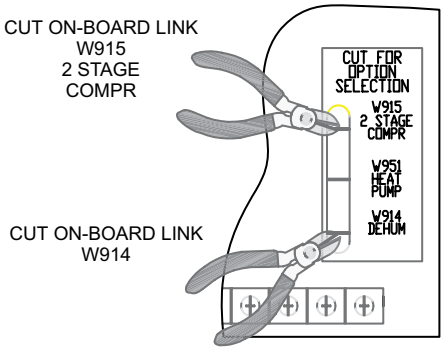
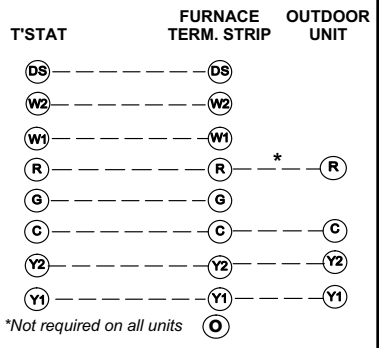
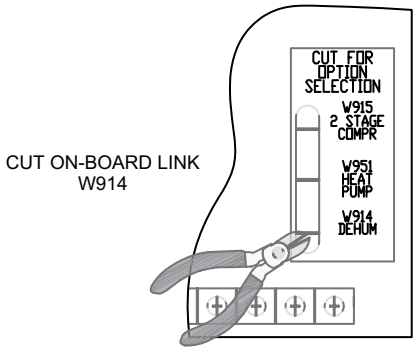
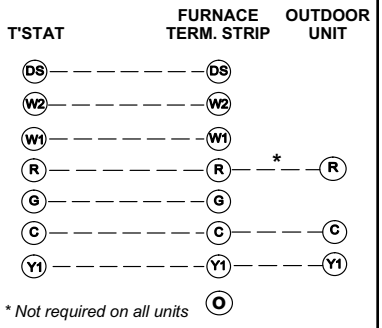
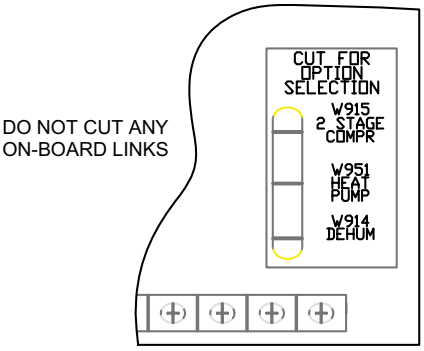
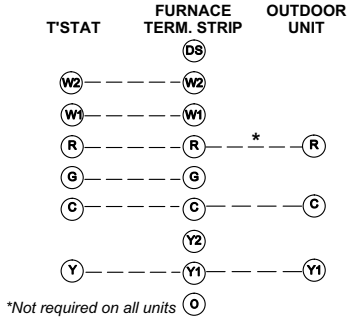
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1	On Board Links Must Be Cut To Select System Options	
2 Heat / 2 Cool	OFF		
2 Heat / 2 Cool with t'stat with dehumidification mode	OFF		
2 Heat / 1 Cool with t'stat with dehumidification mode	OFF		
2 Heat / 1 Cool	OFF		
NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the A80US2V integrated control.			

Table 21. Field Wiring for Non-Communicating Thermostat Applications

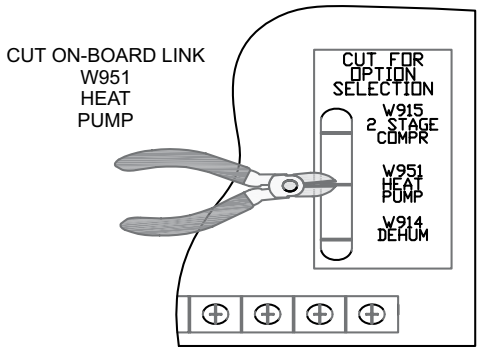
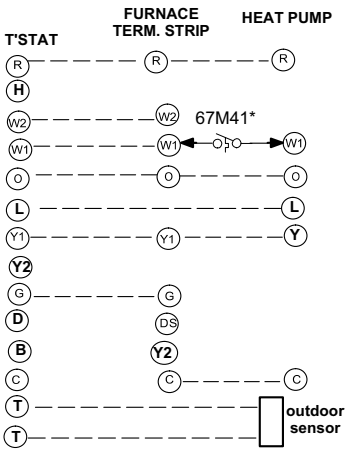
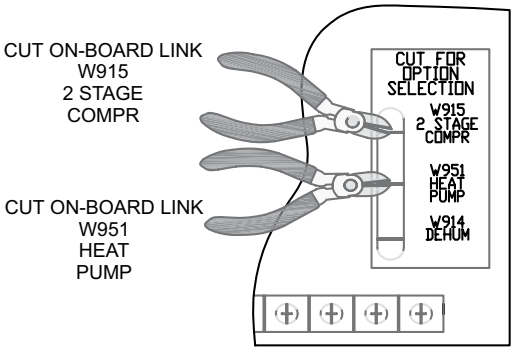
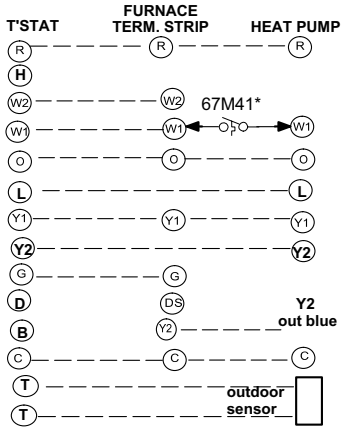
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single-Stage Heat Pump **Comfort Sync thermostat w/dual fuel capabilities** **Capable of 2-stage gas heat control**	OFF		
Dual Fuel Two-Stage Heat Pump **Comfort Sync thermostat w/dual fuel capabilities** **Capable of 2-stage gas heat control**	OFF		
NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the A80US2V integrated control.			

Table 21. Field Wiring for Non-Communicating Thermostat Applications

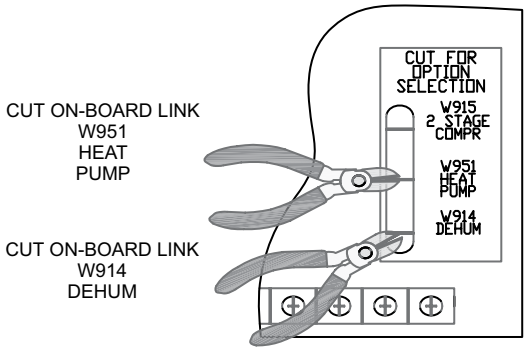
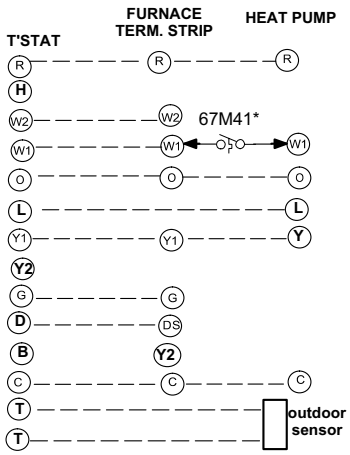
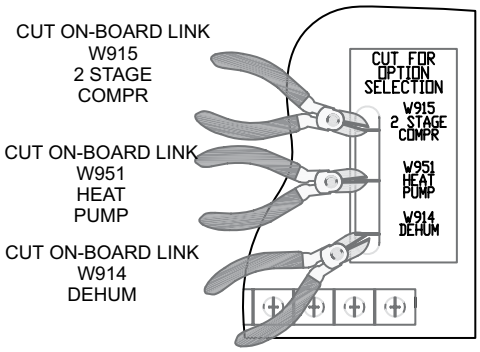
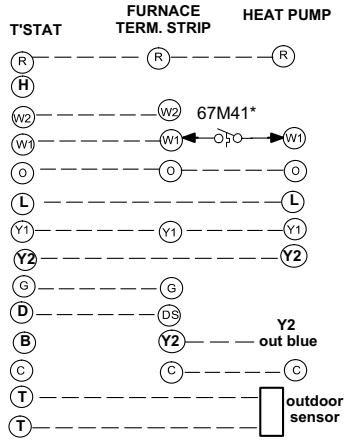
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single-Stage Heat Pump **Comfort Sync thermostat w/dual fuel capabilities** **Capable of 2-stage gas heat control with dehumidification mode**	OFF		
Dual Fuel Two-Stage Heat Pump **Comfort Sync thermostat w/dual fuel capabilities** **Capable of 2-stage gas heat control with dehumidification mode**	OFF		
NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the A80US2V integrated control.			

Table 21. Field Wiring for Non-Communicating Thermostat Applications

Program Unit Capacity Size Modes

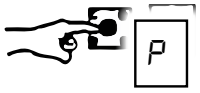
Power-Up - Number displayed by integrated control represents unit size code (furnace model and capacity). If three horizontal bars are displayed followed by continuous E203, furnace control does not recognize unit size code. Configure per the following:

Furnace control in IDLE mode (No heating, cooling, or indoor fan operation)

No → Turn room thermostat to OFF.

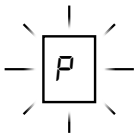
Yes →

To enter **Program Unit Capacity/ Size** mode: Push and hold button next to 7-segment LED display until solid "P" symbol appears. Release button.



IMPORTANT: Field replacement controls may need to be manually configured to validate furnace unit size code.

Solid P starts blinking on 7-segment LED.



Push and hold button. Integrated control will display unit size code number for each furnace model for three seconds.

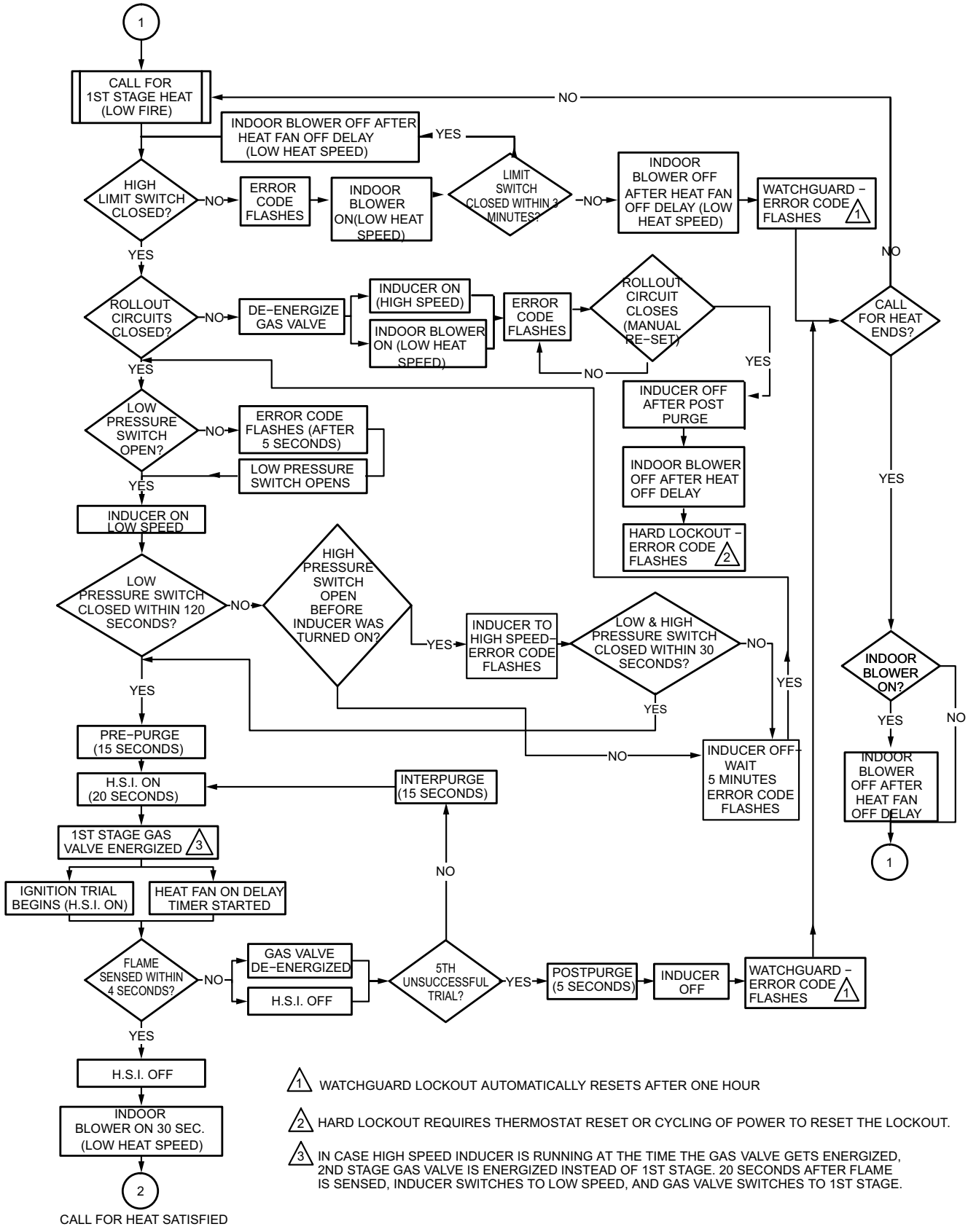
UNIT SIZE CODE	FURNACE MODEL	UNIT SIZE CODE	FURNACE MODEL
A	A80US2V070A12(L)	H	A80DS2V070A12(L)
b	A80US2V090A12(L)	J	A80DS2V090B16(L)
C	A80US2V090B16(L)	L	N/A
d	A80US2V090C20(L)	n	A80DS2V110C20(L)
E	A80US2V110C20(L)		
F	A80US2V135D20(L)		

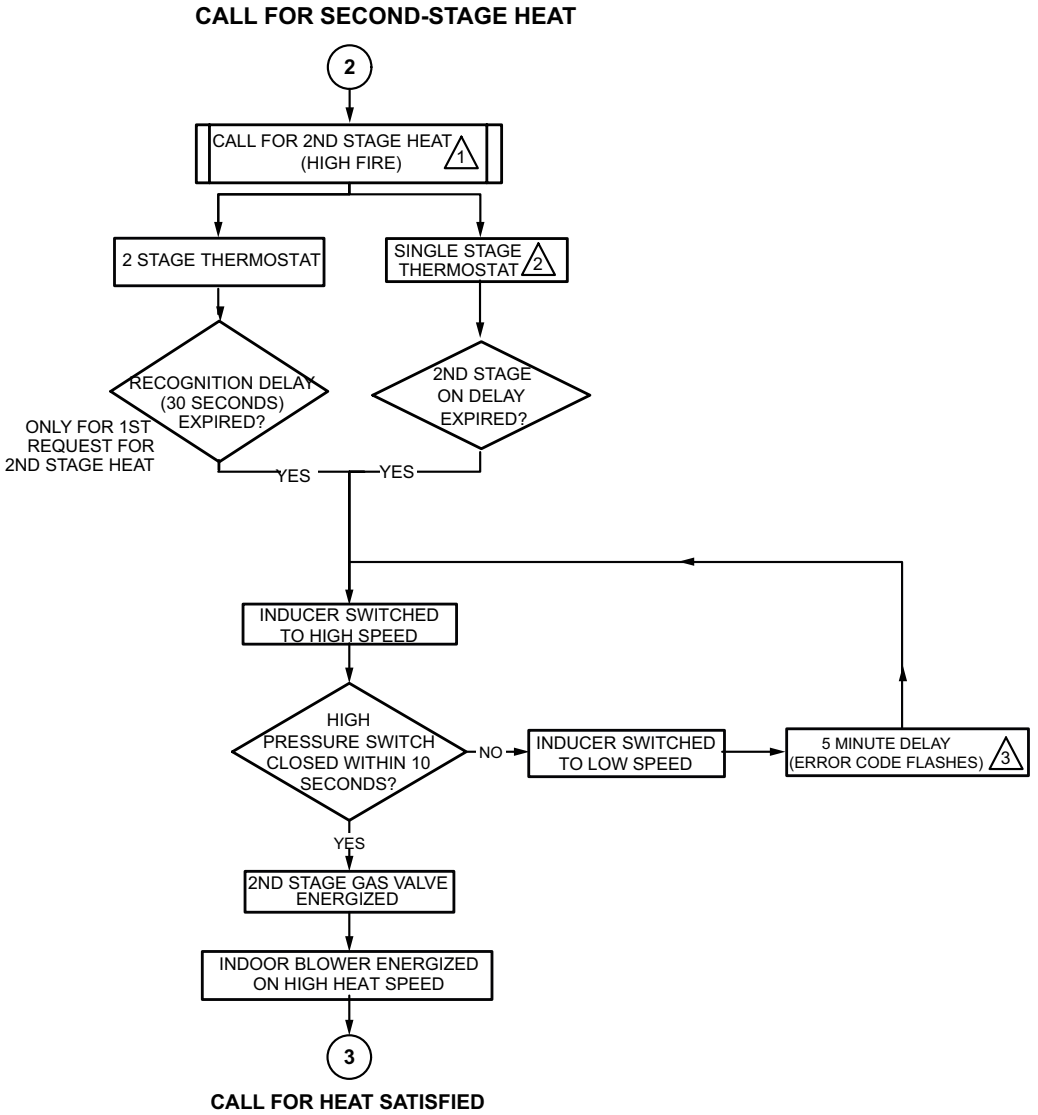
When the correct unit size code is displayed, release button. Selected code will flash for 10-second period. During that period, press and hold button for 5 seconds. Integrated control will store code in memory and will automatically exit **Program Unit Capacity/Size** mode and reset. (If second period expires or button is held less than 5 seconds, control will automatically exit **Program Unit Capacity/Size** mode and go into **Idle** mode without storing unit size code. If this happens, programming function must be repeated.)

Verify that the selected unit size code is correct and stored in non-volatile memory by cycling the 24 volt power to the furnace control. (At 24 volt power-up of the furnace control, the 7-segment LED will display a unit size code. If three horizontal bars display, the board does not recognize the unit size code. The programming function must be repeated.)

FINISHED

CALL FOR FIRST-STAGE HEAT

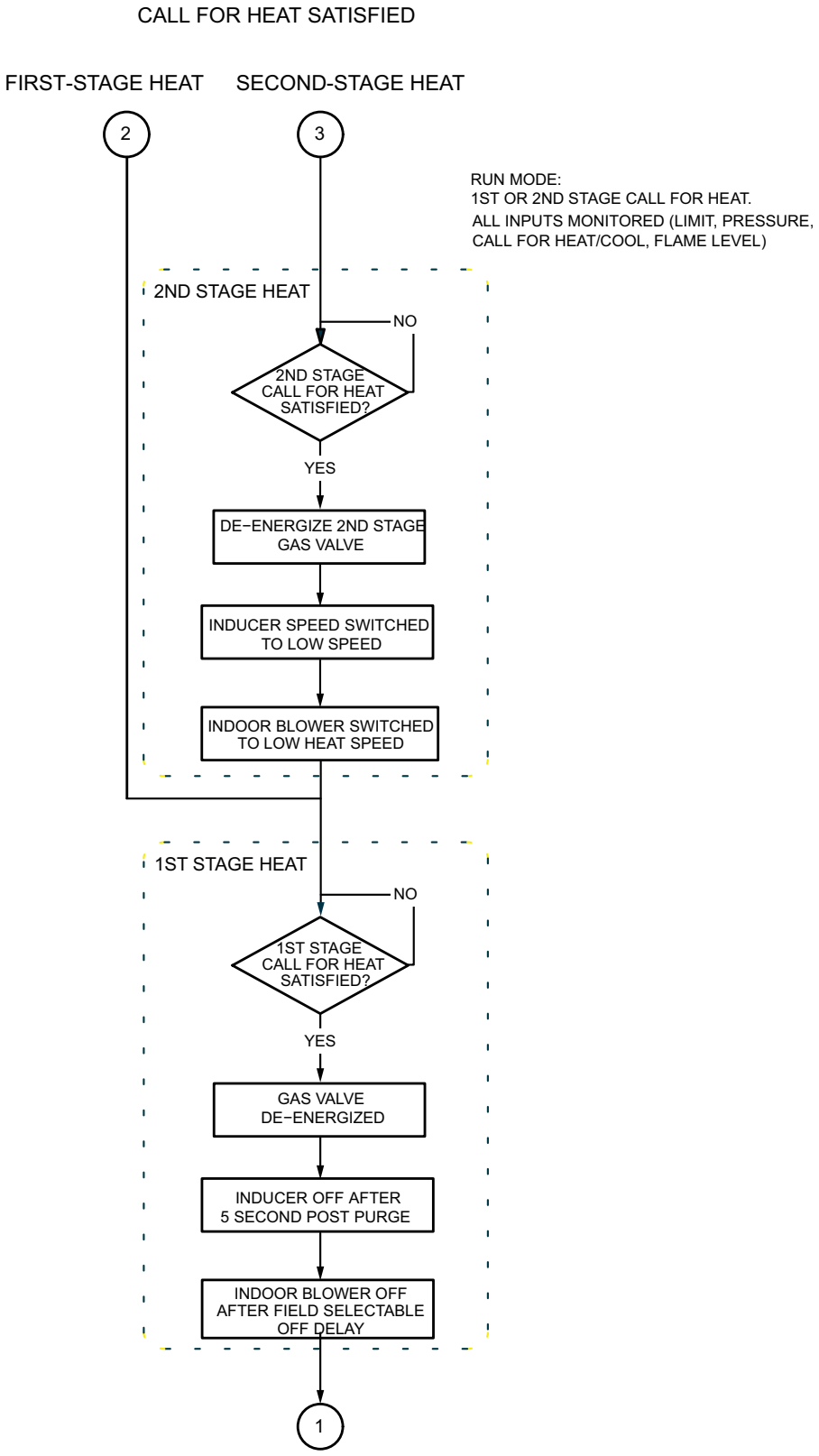




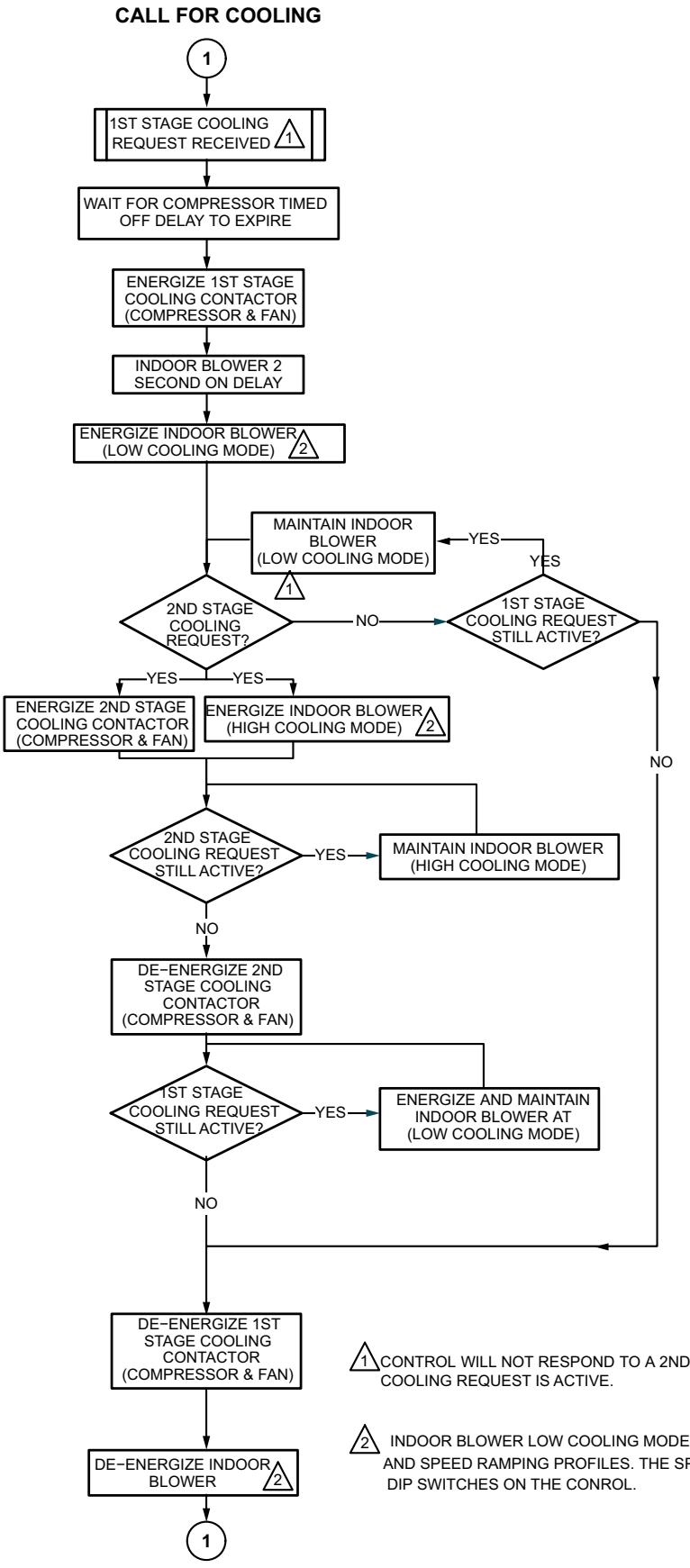
1 SYSTEM WILL ALWAYS LIGHT ON LOW FIIRE, EVEN IF 2ND STAGE HEAT IS IN PLACE.

2 WHEN USED WITH A SINGLE STAGE THERMOSTAT, SET SW1 TO THE ON POSITION IN DIP SWITCH S4.

3 IF THE HIGH FIRE PRESSURE SWITCH DOES NOT CLOSE WITHIN 5 ATTEMPTS, THE SYSTEM WILL OPERATE AT LOW FIRE FOR THE REMAINDER OF THE CALL FOR HEAT REQUEST.


CALL FOR HEAT SATISFIED
FIRST-STAGE HEAT
SECOND-STAGE HEAT
2
3
RUN MODE:
1ST OR 2ND STAGE CALL FOR HEAT.
ALL INPUTS MONITORED (LIMIT, PRESSURE, CALL FOR HEAT/COOL, FLAME LEVEL)
2ND STAGE HEAT
NO
2ND STAGE CALL FOR HEAT SATISFIED?
YES
DE−ENERGIZE 2ND STAGE GAS VALVE
INDUCER SPEED SWITCHED TO LOW SPEED
INDOOR BLOWER SWITCHED TO LOW HEAT SPEED
1ST STAGE HEAT
NO
1ST STAGE CALL FOR HEAT SATISFIED?
YES
GAS VALVE DE−ENERGIZED
INDUCER OFF AFTER 5 SECOND POST PURGE
INDOOR BLOWER OFF AFTER FIELD SELECTABLE OFF DELAY
1

Troubleshooting: Cooling Sequence of Operation



Troubleshooting: Continuous Fan Sequence of Operation