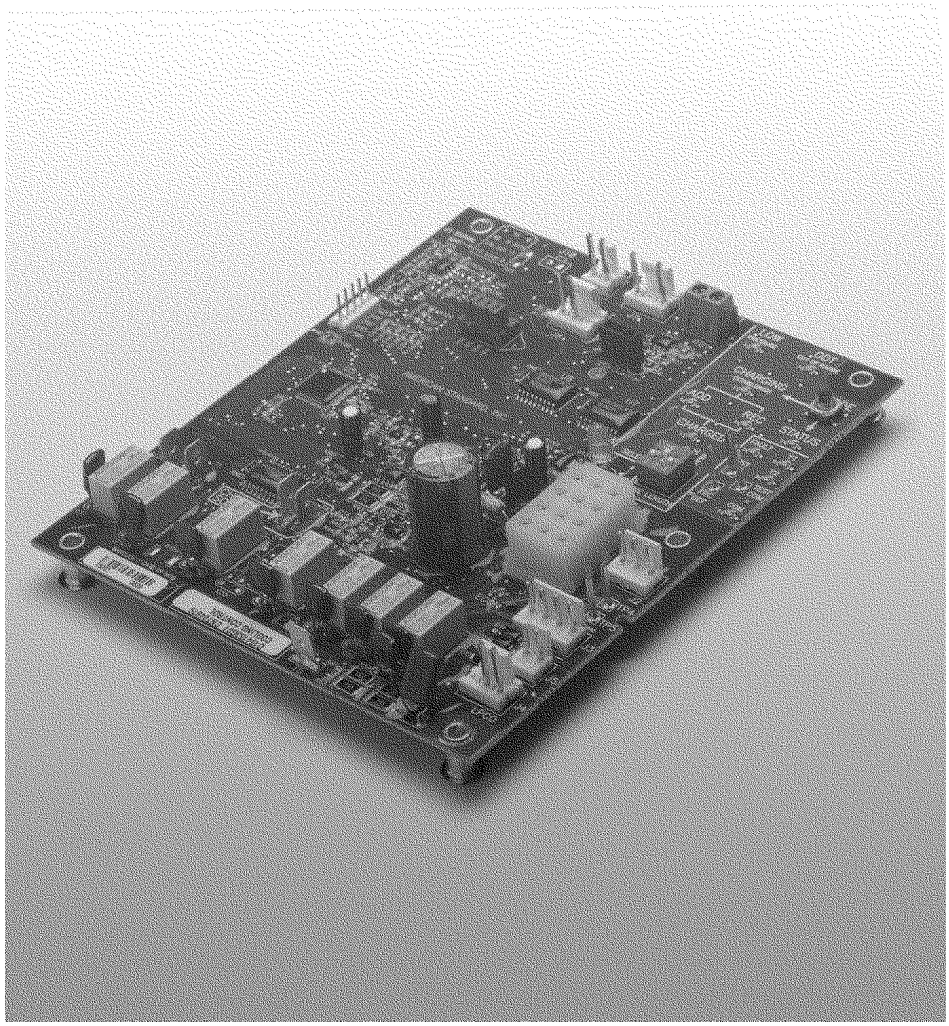
Communicating Controls Service Manual



Theory of Operation | Common Components
Telephone Access Module | Service/Troubleshooting

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Note: This publication is general in nature and is intended for INSTRUCTIONAL PURPOSES ONLY. It is not to be used for equipment selection, application, installation, or specific service procedures.

Warnings and Cautions

Throughout this manual there are procedures where voltage may be present and gas or refrigerant system checks may be required. Read all cautions and warnings on this page before proceeding.

⚠ WARNING

SAFETY HAZARD

THIS INFORMATION IS INTENDED FOR USE BY INDIVIDUALS POSSESSING ADEQUATE BACKGROUNDS OF ELECTRICAL AND MECHANICAL EXPERIENCE. ANY ATTEMPT TO REPAIR A CENTRAL AIR CONDITIONING PRODUCT MAY RESULT IN PERSONAL INJURY AND OR PROPERTY DAMAGE. THE MANUFACTURER OR SELLER CANNOT BE RESPONSIBLE FOR THE INTERPRETATION OF THIS INFORMATION, NOR CAN IT ASSUME ANY LIABILITY IN CONNECTION WITH ITS USE.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

FAILURE TO FOLLOW THE SAFETY WARNINGS EXACTLY COULD RESULT IN SERIOUS PERSONAL INJURY, PROPERTY DAMAGE, OR DEATH. IMPROPER SERVICING COULD RESULT IN DANGEROUS OPERATION, SERIOUS PERSONAL INJURY , PROPERTY DAMAGE, OR DEATH.

⚠ WARNING

SERVICE PROCEDURES HAZARD

BODILY INJURY CAN RESULT FROM HIGH VOLTAGE ELECTRICAL COMPONENTS, FAST MOVING FANS, AND COMBUSTIBLE GAS. FOR PROTECTION FROM THESE INHERENT HAZARDS DURING INSTALLATION AND SERVICING, THE ELECTRICAL SUPPLY MUST BE DISCONNECTED AND THE MAIN GAS VALVE MUST BE TURNED OFF. IF OPERATING CHECKS MUST BE PERFORMED WITH THE UNIT OPERATING, IT IS THE TECHNICIAN'S RESPONSIBILITY TO RECOGNIZE THESE HAZARDS AND PROCEED SAFELY.

⚠ WARNING

Voltage Hazard

Disconnect power to the unit before removing the blower door. Allow a minimum of 10 seconds for IFC power supply to discharge to 0 volts.

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

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

FAILURE TO FOLLOW THE SERVICE AND/ OR PERIODIC MAINTENANCE INSTRUCTIONS FOR THE FURNACE AND VENTING SYSTEM, COULD RESULT IN CARBON MONOXIDE POISONING OR DEATH.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

SHOULD OVERHEATING OCCUR, OR THE GAS SUPPLY FAIL TO SHUT OFF, SHUT OFF THE GAS VALVE TO THE UNIT BEFORE SHUTTING OFF THE ELECTRICAL SUPPLY.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.

⚠ CAUTION

Safety Hazard

Sharp Edge Hazard

Be careful of sharp edges on equipment or any cuts made on sheet metal while installing or servicing. Personal injury may result.

Where there is no complete return duct system, the return connection must be run full size from the furnace to a location outside the utility room, basement, attic, or crawl space.

Do NOT *install return air through the back of the furnace cabinet.*

Do NOT *install return air through the side of the furnace cabinet on horizontal applications.*

NOTE:

Minimum return air temperature is 55°F.

⚠ CAUTION

CONTAINS REFRIGERANT!

SYSTEM CONTAINS OIL AND REFRIGERANT UNDER HIGH PRESSURE. RECOVER REFRIGERANT TO RELIEVE PRESSURE BEFORE OPENING SYSTEM.

Failure to follow proper procedures can result in personal illness or injury or severe equipment damage.

CAUTION

LABELING WIRES!

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. VERIFY PROPER OPERATION AFTER SERVICING.

⚠ CAUTION

BURN HAZARD

DO NOT TOUCH IGNITER. IT IS EXTREMELY HOT.

Communication Controls Theory Of Operation

The indoor thermostat, indoor unit, outdoor unit and other accessories communicate using two of the three thermostat wires required in this type of installation. The three wires are the; Data line (D), Common Line (B) and 24VAC Power Line. The indoor unit's transformer provides 24 Volt AC Power to itself and the thermostat. The outdoor unit has its own 24VAC transformer and will only require the Data Line and the Common Line for operation.

- Three wires needed between the indoor unit and thermostat (D, R, & B)
- Two wires needed between the indoor and outdoor unit (D & B).
- The communicating system is a microprocessor based system which operates as an open communications system. This type of control system can be expanded easily. When an additional item is added to the control system and powered up, such as a communicating IFD air cleaner, a Telephone Access Module "TAM" or a communicating humidifier, it will establish communications automatically with the other components in the system.
- Each component in the system has a pre-assigned electronic address.
- V.S. Indoor Blower Speeds are automatically set when the Outdoor Unit is a communication type. The Cooling CFM per ton, and the Heating CFM can be changed at the Air Handler or Gas Furnace User Inter Face display.
- When the system is operating, all operational messages and alerts will be sent on the data line to all communicating components in the system. All compatible components can read and send messages on the data line.
- The Air Handler or the Gas Furnace control will be the Bit Master in a communicating Comfort Control system. The Bit Master can be considered to be the system clock. It places timing pulses on the data line to indicate to the other connected devices exactly when their data bits can be transmitted on the data line bus.

Communication Controls Theory Of Operation: 900 Series Comfort Control

The communicating system's comfort control is a true thermostat sensing indoor dry bulb temperature and relative humidity. When the thermostat senses the indoor air temperature or humidity has changed from the set point it will send an operational message on the data line. All units that are connected to the data line will read this operational message. The unit or units being called for will start and run on first stage; a gas furnace will start in the second stage of operation and then go back to the first stage of operation. The thermostat also sends blower speed information.

Operation is similar to a standard two-stage thermostat. When the indoor temperature does not move back towards the thermostat set point in a given time period or the temperature continues to move away from the set point the thermostat will change its operational message on the data line. The new message will be a call for the next stage of operation. When the indoor temperature moves back towards the set point the thermostat will again change its operational message on the data line and the units running will then go back to first stage of operation. When the indoor temperature is back to the set point temperature and the minimum run time for the equipment has been met, the thermostat will send another new operational message that the system is to shut down and any indoor blower off-delays will begin.

Indoor Dehumidification Control Cycle

When the indoor humidity in the cooling cycle is above the thermostat humidity set point, the thermostat message being sent can cause the system to continue to run to a maximum of three degrees below the thermostat set point. This will help control humidity under light loads conditions. This cycle is adjustable from 1 to 3 degrees in the Installer Setup Menu #0380 and #0383. Refer to Comfort Control Installer's Guide setup menu for complete menu.

- Minimum compressor run time is three minutes
- Minimum compressor off time is five minutes
- Frost Control cycle is used when a humidifier is installed and the control system has an outdoor temperature sensor installed. The frost control works by reducing the humidity level in the home when outdoor conditions can cause condensation or frost to form on windows. The factory setting is five. To reduce the condensation or frost on the windows, lower the number. If the humidity is too low in the home at the factory setting of five, increase the number. See advanced thermostat setup for programming setup instructions.

Reliable Communications

To insure that the message being sent by a component (ex. thermostat, indoor or outdoor unit) is not being over written by another components operational message, noise, or electrical interference, the sending component will monitor its own operational message on the data line. The message must match the original message. If the message does not match the sending components original message, it will stop sending its message and try again later. When a good operating message has been received by the indoor and the outdoor unit the system will begin to operate. The Indoor and Outdoor units use this operating message until a different operational message is received. This operating message is being sent repeatedly. If the system is running and the units do not receive a good operating message within four minutes the system will shut down. This four minute run time prevents the system from shutting down if a component receives a corrupted operating message. A corrupted message could be caused by two components sending a message at the same time, over written message, noise, or electrical interference noise on the data line. When commutations are reestablished the system will again operate.

Equipment Setup

When the system is powered up, the microprocessors in the thermostat, indoor unit, outdoor unit and other accessories will establish communications with each other. This is known as a plug and play system. A minimum amount of set up may be required at the indoor thermostat for approved equipment combinations and their accessories, reference page 6, Approved Combinations.

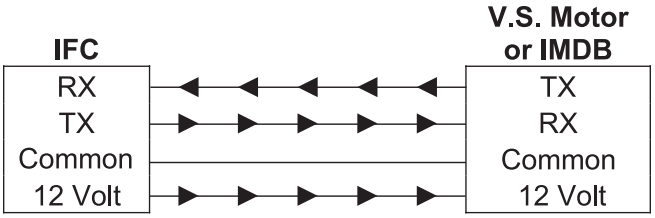
The information supplied by the outdoor unit is used by the indoor unit to set up the indoor blower airflow, CFM, and any delays needed. The thermostat uses the information from the indoor and outdoor units to configure the thermostat for the number stages of compressor operation, Air Conditioner or Heat Pump, type of heat - fossil fuel or electricity and number of stages of heat installed. No dip switches to set.

Fault Detection & Alert Signaling

The thermostat, indoor and outdoor units can provide notification of system faults. When a fault is detected by the indoor unit, outdoor unit, or thermostat a coded message is sent on the Data Line to the thermostat and will be displayed as an Alert. The thermostat will turn on the red Service LED and the display will switch back and forth between the main screen and an Alert screen.

The Alert screen will show the diagnostic Err code number. When multiple fault codes exist at the same time it will cycle through (up to 5 max) by showing the next code each time it comes to the diagnostic screen. The thermostat will not switch back and forth when on any other screen. The service LED will not be used for signaling emergency heat or anything else when the thermostat has received an Alert message.

Communication between Furnace IFC and V.S. Motor or Inducer Motor Drive Board



Clearing Alerts and Approved Combinations

Clearing Alerts

When a fault or faults are corrected and the faults are cleared at that unit's microprocessor, that microprocessor will quit sending the coded fault message. The thermostat will then turn off the red Service LED and quit switching the display back and forth between the normal display and the Alert screen display.

Approved Combinations

4H/3C HP, w/ 1 Aux, 1 EH, gas or electric
4H/2C HP, w/ 2 Aux, 2 EH, gas or electric
4H/1C HP, w/ 3 Aux, 3 EH, gas or electric
3H/3C HP, w/ 0 Aux, 0 EH
3H/2C HP, w/ 1 Aux, 1 EH, gas or electric
3H/1C HP, w/ 2 Aux, 2 EH, gas or electric
2H/2C HP, w/ 0 Aux, 0 EH
2H/1C HP, w/ 1 Aux, 1 EH, gas or electric
1H/1C HP, w/ 0 Aux, 0 EH
3H/3C conventional, gas or electric
2H/3C conventional, gas or electric
1H/3C conventional, gas or electric
0H/3C conventional
3H/2C conventional, gas or electric
2H/2C conventional, gas or electric
1H/2C conventional, gas or electric
0H/2C conventional

The following sequence of operation will occur when there are more stages of heat installed than the approved combinations list above shows. Example: When a two stage heat pump is installed with a three stages gas furnace the thermostat can only call for two stages of auxiliary heat, as shown above. When the thermostat calls for first stage auxiliary heat the furnace IFC will operate the furnace in the second stage of heat. When the thermostat calls for second stage auxiliary heat, the furnace IFC will operate the furnace in the third stage of heat.

*Alert Code Addendum*③

Alert Code	Alert Group	Communicating Equipment			Alert Notification				Alert Description
		Air Handler	Furnace	Outdoor Unit	Comfort Control	User Interface Display	Fault LED	COM LED	
1	Pressure Switch Failure		X		N/A	PS3 OPEN	3 Flash	Device count	Open Pressure Switch, third stage
						PS3 CLOSED			Shorted Pressure Switch, third stage
						PS2 OPEN			Open Pressure Switch, second stage
						PS2 CLOSED			Shorted Pressure Switch, second stage
						PS1 OPEN			Open Pressure Switch, first stage
						PS1 CLOSED			Shorted Pressure Switch, first stage
4	Low Flame Signal		X		N/A	LO FLAME SNS	8 Flash	Device count	Flame current is low, but still strong enough to allow operation.
10	Ignition Means Fault		X		ERR 10	IGNITER ERR	6 Flash	Device count	Igniter fault
						TRIAC ERR			Triac fault
18	Control Failure	X			ERR 18	CNTRL FAULT †	Solid ON ‡	N/A	Internal Control Error
18	Control Failure		X		ERR 18	CNTRL FAULT	Solid ON	Device count	Internal control failure
19	Twinning Fault	X			N/A	TWIN ERROR	8 Flash	N/A	Air Handler Twinning Error
19	Twinning Fault		X		N/A	TWIN ERROR	None	Device count	Twinning Not Allowed with Variable Speed
20	Flame lost or Ignition failure		X		N/A	RECYCLE	2 Flash	Device count	Flame is off when flame should be detected. Furnace tries to relight itself.
						RETRY			Furnace tries to light, but no flame is detected.
22	Soft lockout due to flame lost or ignition retries		X		ERR 22	RECYCLE LO	2 Flash	Device count	10 recycles within a single call for heat will cause 1hr lockout.
						RETRY LO			3 ignition attempts in a row within a single call for heat results in 1 hr lockout.
26	High Temp Limit Fault		X		ERR 26	AUX LIMIT	4 Flash	Device count	Open Reverse Flow - Heat exchanger temperature too high. Could be caused by low airflow or fan failure.
						HIGH LIMIT			
						IND LIMIT	9 Flash		Open High Limit - Heat exchanger temperature too high. Could be caused by low airflow or fan failure.
27	Replace Device				ERR 27	N/A	N/A	N/A	The device needs to be replaced
33	Line Polarity Fault		X		N/A	POLARITY ERR	6 Flash	Device count	Voltage reverse polarity
34	Flame Detect Fault		X		ERR 34	FLAME ERROR	5 Flash	Device count	Flame detected, should not be present
35	Zoning Fault *				ERR 35	N/A	N/A	N/A	Duplicate zone - Another zone is present with the same zone number
37	Duplicate Filter *				ERR 37	N/A	N/A	N/A	Another air filter timer is present.
38	Duplicate Humidifier Pad *				ERR 38	N/A	N/A	N/A	Another humidifier pad timer is present.
39	Duplicate Humidity Sensor *				ERR 39	N/A	N/A	N/A	Another humidity sensor is present.
50	Duplicate OD Temp			X	None	N/A	15 Flash	N/A	Duplicate OD temperature sensor
52	Discharge Air Sensor Fault	X			N/A	DAS SHORT *	5 Flash *	N/A	Discharge Air Sensor Short Error
						DAS OPEN *			Discharge Air Sensor Open Error
53	Faulty Outdoor Sensor				ERR 53	N/A	N/A	N/A	There is a faulty outdoor temp sensor
54	Faulty Humidity Sensor				ERR 54	N/A	N/A	N/A	There is a faulty humidity sensor
59	AC Line Fault		X		N/A	AC VOLTS LOW	None	Device count	Voltage too low
						AC VOLTS HI			Voltage too high
67	Temp Sensor Fault			X	ERR 67	N/A	5 Flash	N/A	Ambient Temperature Sensor Fault (Out of Range - Open or Shorted)
							6 Flash		Coil Temperature Sensor Fault (Out of Range - Open or Shorted)
					None		11 Flash		Liquid Temperature Fault (Out of Range - Open or Shorted)
							13 Flash		External ODT Sensor Fault (Out of Range - Open or Shorted)
68	Defrost Fault			X	None	N/A	2 Flash	N/A	Defrost Fault A
							3 Flash		Defrost Fault B and/or C
							4 Flash		Defrost Fault A and (B and/or C)
79	LPCO Fault			X	ERR 79	N/A	7 Flash	N/A	LPCO Fault (Open outside of defrost Cycle)
87	Roll Out Fault		X		ERR 87	ROLLOUT OPEN	4 Flash	Device count	Open flame rollout
88	Ground Fault		X		N/A	GND FAULT	6 Flash	Device count	Occurs when proper earth ground is not detected.
89	Equipment Missing				ERR 89	N/A	N/A	N/A	Expected equipment is not reporting
90	Communication Busy Fault		X		N/A	SYS COMM CRC	10 Flash	Fast Flash	Comm system unrecognized response
						IND COMM CRC			Inducer Motor unrecognized response
						BLW COMM CRC			Blower motor unrecognized response
90	Communication Busy Fault	X			N/A	SYS COMM CRC	3 Flash **	Fast Flash	COMM System Busy Error
					N/A	BLW COMM CRC	3 Flash	N/A	Serial Motor Communication Busy Error
90	Communication Busy Fault			X	ERR 90	N/A	1 Flash	N/A	Excessive Communication CRC Errors
90	Communication Busy Fault				ERR 90	N/A	None	N/A	Comm line busy and no idle has been detected.
91	Communication Inactive Fault	X			ERR 91	NO SYS CLK	3 Flash **	Fast Flash	COMM Bit Master Clock Error
						SYS COMM ERR	3 Flash **	Fast Flash	COMM Heat/Cool Demand Error
						BLW COMM ERR	3 Flash	N/A	Serial Motor Communication Inactive Error①
91	Communication Fault		X		ERR 91	BLW COMM ERR	10 Flash	Fast Flash	Blower motor no Comm response①
						IND COMM ERR			Inducer motor no Comm response
						SYS COMM ERR			Loss of heat/cool demand
						NO SYS CLK			Loss of clock signal
91	Communication Fault			X	ERR 91	N/A	1 Flash	Fast Flash	No Communication
					ERR 91	N/A	1 Flash	Fast Flash	Loss of Clock Signal
91	Communication Fault				ERR 91	N/A	None	N/A	Comm line is dead and no bits have been received.

*Alert Code Addendum*③

Alert Code	Alert Group	Communicating Equipment			Alert Notification				Alert Description
		Air Handler	Furnace	Outdoor Unit	Comfort Control	User Interface Display	Fault LED	COM LED	
92	Fuse		X		N/A +	CHECK FUSE	None	N/A	24V Fuse Open
92	Fuse Failure	X			N/A +	CHECK FUSE †	Solid ON ‡	N/A	24V Fuse Open Error
93	Gas Valve Fault		X		ERR 93	EXT GV ERR	7 Flash	Device count	Control senses 24V present at the gas valve when it should not be present.
							Solid ON		Control tried to turn on gas valve, but 24V not sensed.
						INT GV ERR			Control senses 24V present at the gas valve when it should not be present.
101	Y1 Relay Failure		X		ERR 101	Y1 OFF ERR	None	Device count	Y1 Output OFF when it should be ON
						Y1 ON ERR			Y1 Output ON when it should be OFF
101	Y1 Relay Fault	X			ERR 101	Y1 ON ERR	7 Flash	N/A	Y1 Relay Stuck Closed Error
						Y1 OFF ERR			Y1 Relay Stuck Open Error
102	Y2 without Y1 - Miswire (24V mode only)			X	None	N/A	10 Flash	N/A	Y2 without Y1 - Miswire (24 volt mode only)
104	Heater Relay Fault	X			ERR 104	HT ON ERR	4 Flash	N/A	Heater Relay Stuck Closed Error
	Heater Relay Fault	X			ERR 104	HT OFF ERR	4 Flash	N/A	Heater Relay Stuck Open Error
105	Heater Interlock Relay Fault	X			ERR 105	HT+LK ON ERR	4 Flash	N/A	Both Interlock Relay & Heater Relay Stuck Closed Error
					ERR 105	INTLK ON ERR	4 Flash	N/A	Interlock Relay Stuck Closed Error
					ERR 105	NTLK OFF ERR	4 Flash	N/A	Interlock Relay Stuck Open Error
106	External Shutdown Fault	X			ERR 106 *	EXT SW OPEN *	1 Flash *	N/A	External Shutdown Input Open Error
110	Return Air Sensor Fault	X			N/A	RAS SHORT *	6 Flash *	N/A	Return Air Sensor Short Error
						RAS OPEN *			Return Air Sensor Open Error
113	Liquid Pressure Sensor Fault			X	None	N/A	12 Flash	N/A	Liquid Pressure Sensor Fault (Out of Range - Open or Shorted)
114	PM Bad or Missing Fault	X			ERR 114	N/A	2 Flash	N/A	PM Data Corrupt Error
						N/A			PM Missing Error
						ID MTR ERR			Motor Mismatch Error
					N/A	PM UNIT ERR			PM Unit Data Error
						CAP MISMATCH			Compressor Capacity Mismatch Error
						PM DATA ERR			PM Data Section Error
114	Bad or Missing PM		X		N/A	PM DATA ERR	None	Device count	Data Section is Corrupt but PM is useable
						CAP MISMATCH			Compressor size does not match capacity in PM
					ERR 114	ID MTR ERR			Blower HP/OEM does not match PM Data
						PM MISSING			No PM
					N/A	PM UNIT ERR			Primary Copy of Unit Data File is Corrupt.
					ERR 114	PM MEM ERROR			Primary and Secondary copies of Unit Data File are Corrupt
114	Bad or Missing PM			X	ERR 114	N/A	14 Flash	N/A	PM Data Corrupt Error or PM Missing Error
					N/A				PM Unit Data Error or PM Data Section Error
117	Return Air Temperature Fault	X			N/A	RAS RNG ERR *	6 Flash *	N/A	Return Air Temperature Range Error
118	Discharge Air Temperature Fault	X			ERR 118 *	DAS RNG ERR *	5 Flash *	N/A	Discharge Air Temperature Range Error
						DAS UL ERR *			Discharge Air Temperature Upper Limit Error
						DAS LL ERR *			Discharge Air Temperature Lower Limit Error
119	Temperature Sensor Failure		X		N/A	TS 1 SHORT	None	Device count	Temperature sensor 1 shorted.
						TS 1 OPEN			Temperature sensor 1 open.
						TS 2 SHORT			Temperature sensor 2 shorted.
						TS 2 OPEN			Temperature sensor 2 open.
123	Demand Configuration Fault	X			N/A	DEMAND ERR *	9 Flash	N/A	Heat/Cool Demand Conflict Error
						HT CFG ERR		N/A	Electric Heat Configuration Error
126	Equipment Change Alert				ERR 126	N/A	N/A	N/A	Equipment does not match valve stored at startup②

Notes:

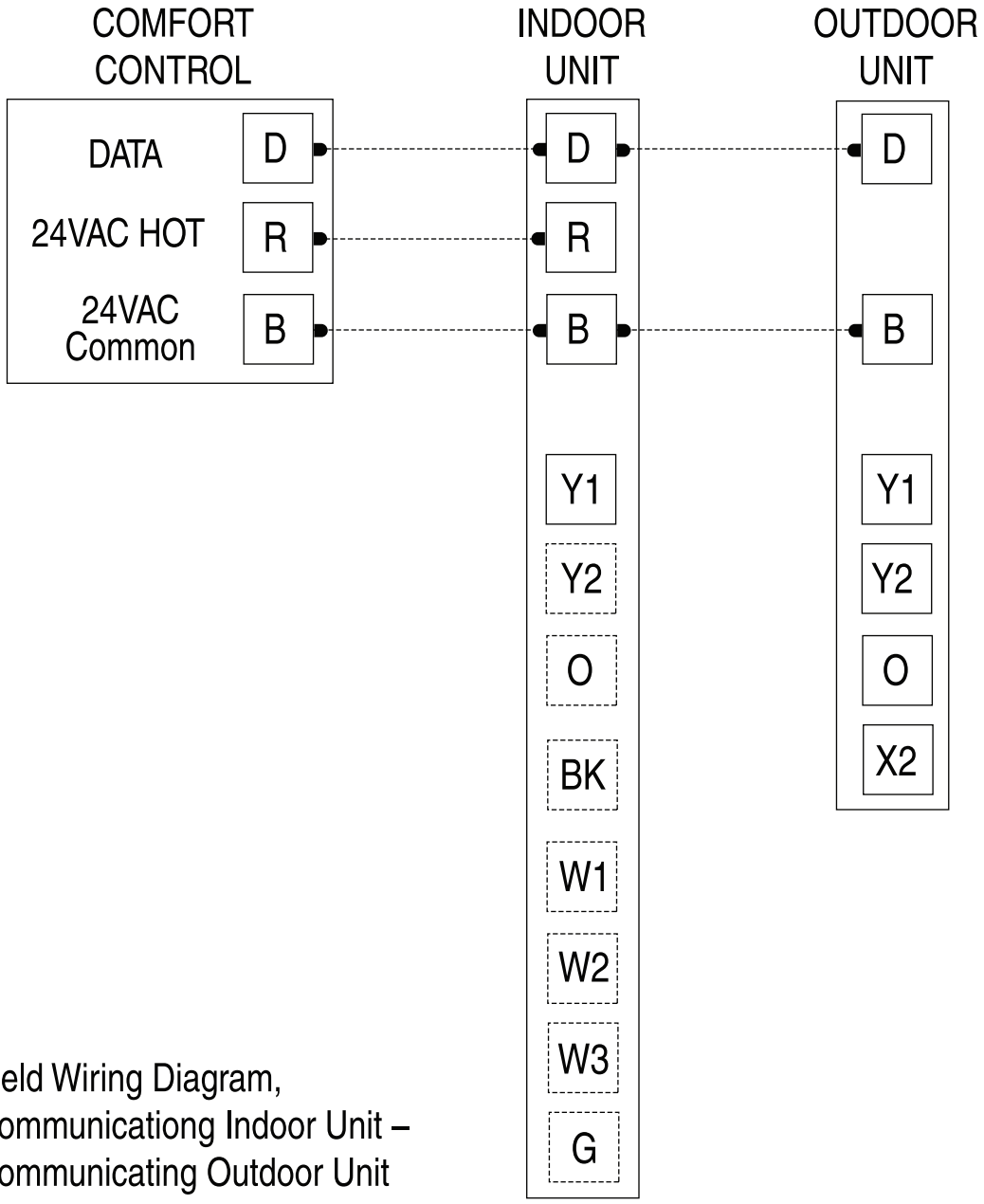
† If Air Handler processor is reset or fuse is open, COMM Alert cannot be reported; if the processor is reset the User Interface will not be updated
* Alert flash code will not be implemented for initial release
** COMM communication errors may also be flashed on Fault LED
‡ LitePort™ transmissions will be allowed during ON flash codes
\+ Fuse alert notification level would show on Comfort Control, but when fuse is open the COMM bus has no power

Notes: None

Notes: 4 highest priority Faults display flash codes sequentially. 2 second pause between faults and 4 second pause between sequences. Cycle power to ODU to clear Faults.

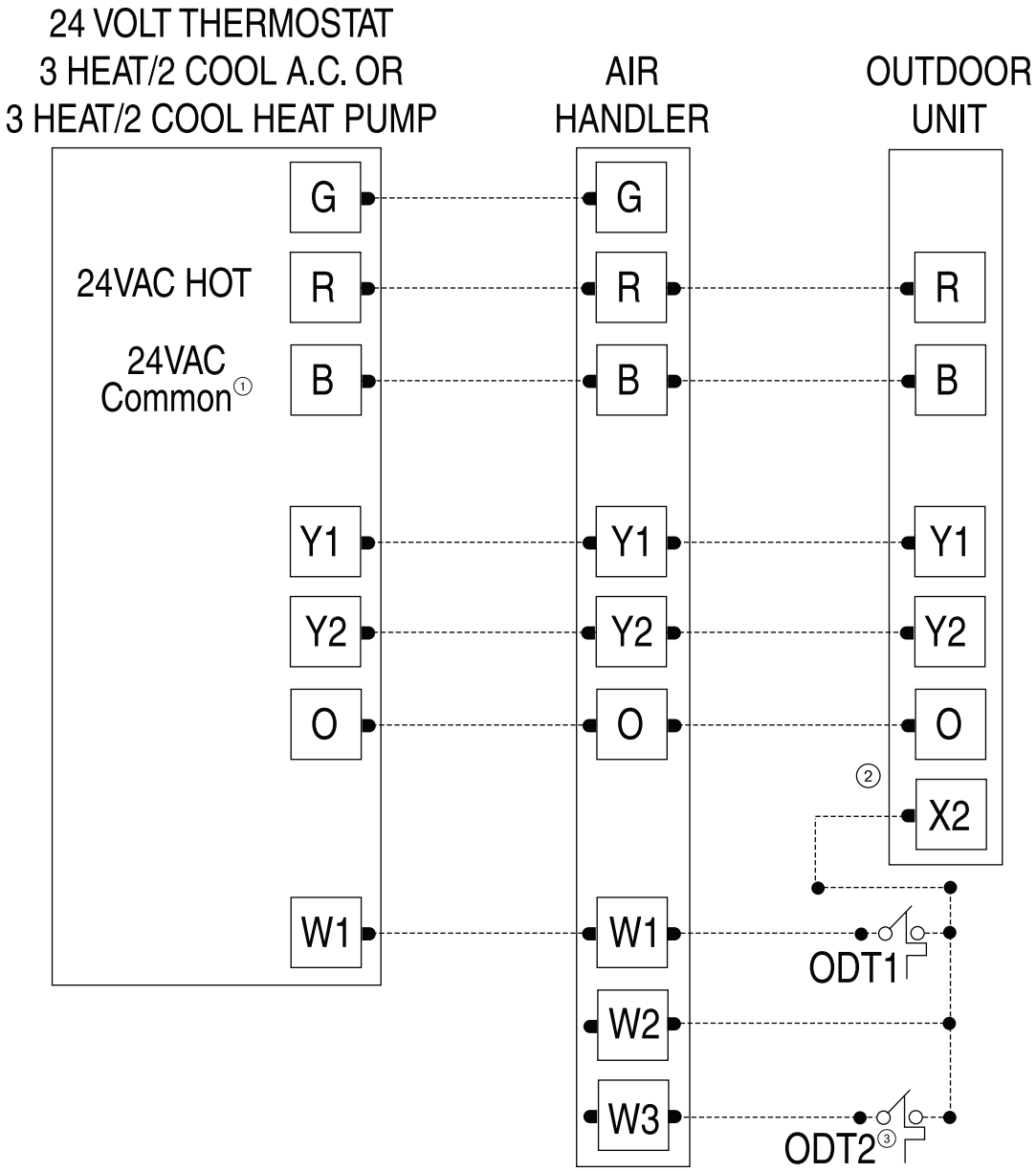
Notes:
① Comfort Control will switch to "OFF" until this fault condition clears.
② A device has changed since auto discovery (see Installer Guide ISU 0706 to reset)
③ Pub. No. 18-HD32D2-2, Revision 3, 08/07/2007

Communication Controls Theory Of Operation: With Communicating Outdoor Unit



Field Wiring Diagram,
Communicationg Indoor Unit –
Communicating Outdoor Unit

24 Volt Thermostat with a Communicating Outdoor Unit Using a 24V Harness Kit #BAYACHP024A



Notes:

① 24 Volt Common B may not be required at the thermostat.

② 0 and X2 Thermostat wires are used on heat pumps installations only.

③ ODT2 not required on a two stage auxiliary electric heater.

24 Volt Thermostat with a Communicating Outdoor Unit Using a 24V Harness Kit #BAYACHP024A

For instructions, components and diagrams used in this kit, order kit #BAYACHP024A. Shown here is an excerpt from the kit for reference:

1. Be certain power to unit is **DISCONNECTED**.

2. Remove cover panel on control box compartment.

3. Disconnect and remove the existing communicating control harness assembly. This harness consists of the 4 wire plug assembly (J1). Disconnect/remove: the red wire and fuse assembly from the transformer; the blue lead from the transformer; the green/yellow transformer ground wire; the brown wire going out to field connections; the blue wire going out to field connections and the double blue wire connection terminal at the lo contractor coil.

   Also disconnect and remove the two transformer primary wires; brown/red wire coming from the start capacitor and the black/blue wire coming from the hi contractor. The transformer is no longer used and should be removed.

4. Connect the 24 volt harness (supplied with the kit) to the control board, where the communicating harness was removed (connector J1). Take the double blue lead terminal and connect to the lo contractor coil, where the previous blue lead was removed. Route the remaining yellow, blue, orange, red, black, and yellow/red wires out for field connection, as shown.

   If the unit is a cooling only model (not a heat pump), the orange and black leads will not be used and should be capped off.

   The table below defines maximum total length of low voltage wiring from the outdoor unit to the indoor unit, and to the Comfort Control.

NEC Class II Wiring, 24 Volts

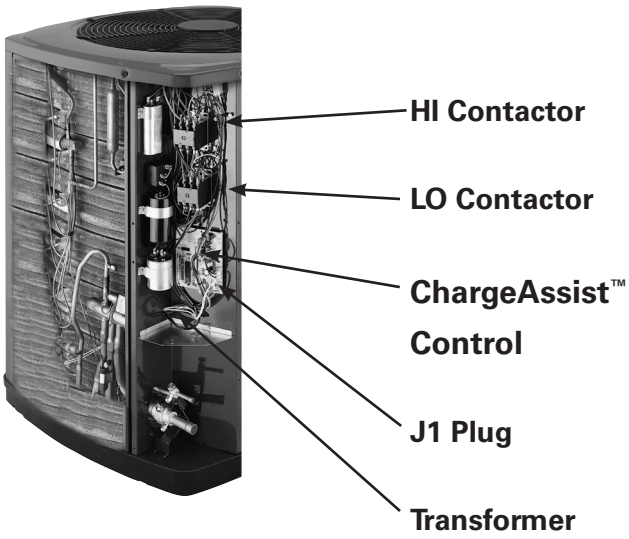
Wire Size	Max Wire Length
18 AWG	150 FT.
16 AWG	225 FT.
14 AWG	300 FT.

5. Place the proper wiring diagram over the existing unit wiring diagram.
   If the unit is a:
   - 30,000 BTU heat pump, use D154942
   - 36,480 or 60,000 BTU heat pump, use D154944
   - 30,000 BTU cooling only model, use D154652
   - 36,000, 48,000 or 60,000 BTU cooling only models, use D154657

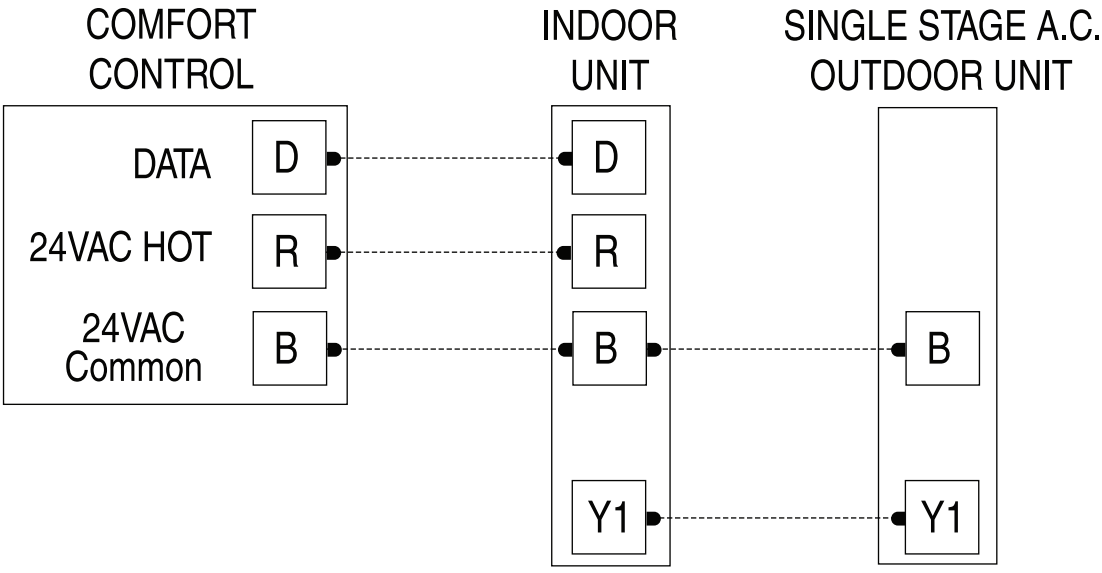
6. Replace the control compartment cover panel.

7. Reconnect power, which was disconnected in step #1.

8. Please retain communication harness and transformer for possible future use.



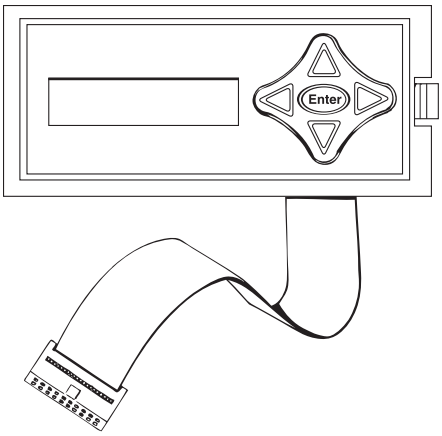
Comfort Control with a Single Stage 24 Volt Controlled A.C.



Field Wiring Diagram,
Communicationg Indoor Unit –
Non-Communicating A.C. Outdoor Unit

Gas Furnace and Air Handler Common Components

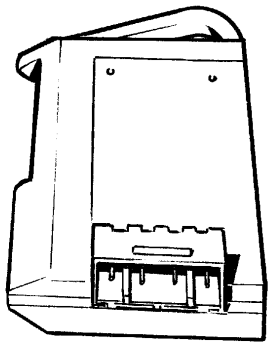
User Interface Assembly



The indoor User Interface Assembly will display the model and serial number during normal unit operation. In addition, the following information can also be accessed through the display.

- The Units Model & Serial Number (Normal Display)
- System Status (Mode of Operation; Heating Stage 1, 2 or 3, Cooling Stage 1, 2 or 3, or OFF, thermostat not calling)
- Requested Airflow (CFM) when the thermostat is calling.
- Indoor Unit's Alert Codes
- Unit Test Cycle (Heating Cycle Only)
- Blower Motor Speed (RPM when operating)
- Fossil Fuel Draft Inducer Speed (RPM when operating)
- Last Four Alerts
- Replacement Part List
- Personality Module Serial Number
- Stand alone operation, without a thermostat: Duty Cycling of gas equipment (Contingency Mode)
- Exit

Personality Module



The communicating microprocessor controls in the indoor and outdoor units have a Personality Module plugged onto their control. The Personality Module (PM) contains the following system specific information:

- Type of indoor unit, air handler or gas furnace,
- Variable speed or four speed indoor blower and horsepower of blower
- The number of stages of heat
- Type of the outdoor unit, AC or HP
- Number of compressor stages, 1, 2 or 3
- Size of the outdoor unit
- Indoor Air Flow and Delays
- Alerts

The stored information is downloaded into the unit's controller when the unit is powered up. This information is sent to other microprocessor controls connected to the Data Line.

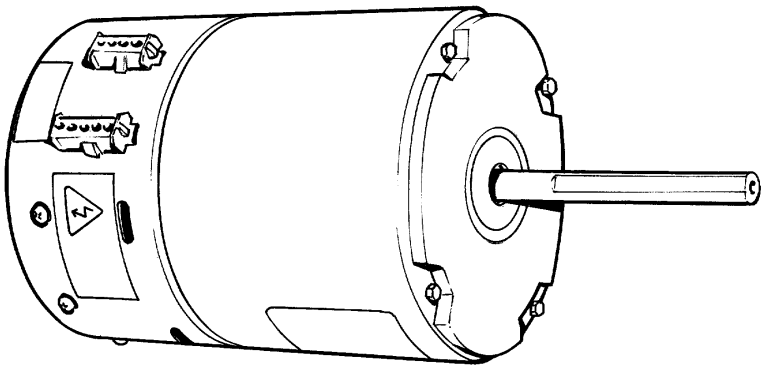
Note: Do not remove the Personality Module (PM) from its control board; it is model number and serial number specific to this unit.
If the PM is unplugged from its control board after the system is powered up, the system will continue to operate.

If the PM is not plugged back onto the control board, an ERROR message will be displayed at the thermostat.

24VAC Fuse

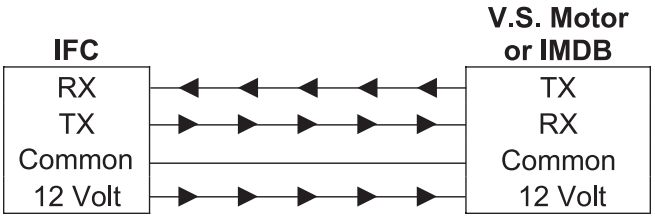
The on-board 24VAC automotive type fuse is in series with the 24VAC terminal (R). If the fuse opens, the control's microprocessor remains powered. If the system is running it will shut down all operation. A gas furnace's gas valve or an air handler's auxiliary heat will turn off at once and there will be a several second delay before the gas furnace's Inducer motor and indoor blower is shut down. The User Interface Assembly will display CHECK FUSE when the last four faults are displayed.

Variable Speed Indoor Blower Motor Operation



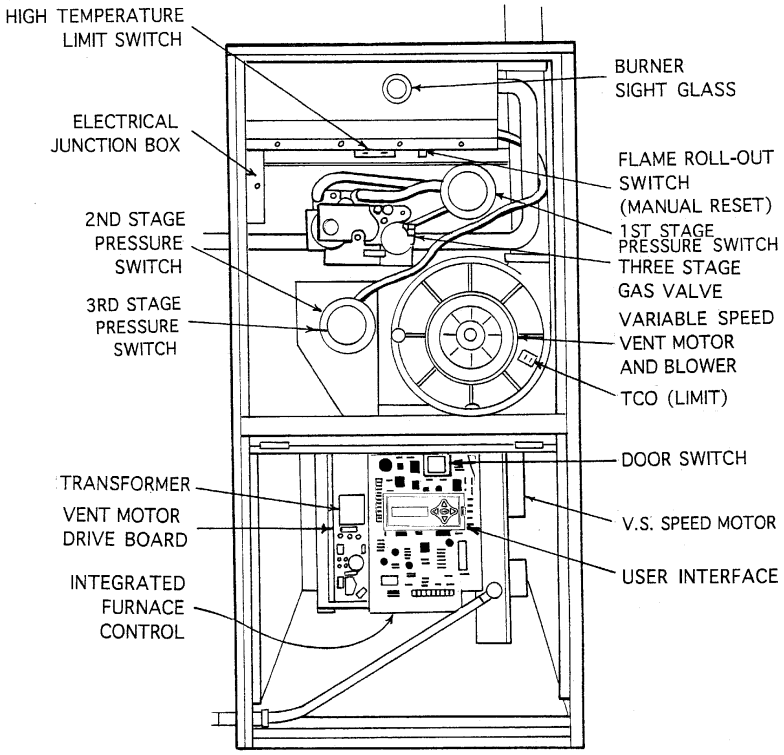
Serial Port Communication

The Serial Port Communication type of variable speed motor operates the same as the 24 volt controlled V.S. type except the on/off control and speed signals are now a digital command signal. The Motor module receives the command signal and replies back to the indoor product control board. This type of motor module is not preprogrammed at the factory. The horsepower, operating speeds, maximum RPM and direction of rotation information are stored in the Personality Module, which is located on the Gas Furnace Control (IFC) or an Air Handler Control (AHC). When the system is powered up, the V.S. Motor programming information stored in the Personality Module is sent to the V. S. Motor module. The Serial Port Communication V.S. Motor has four low voltage wires plugged into it. The four wires are; (1) The TX wire which is used to send all digital information, (2) The RX wire which is used to receive all digital information, (3) 24 Volt AC and DC common wire, and (4) 12 Volt DC wire. The 12 volts are supplied by the IFC or AHC control and used to power the input and output circuits, optic-couplers, in the V.S. Motor.



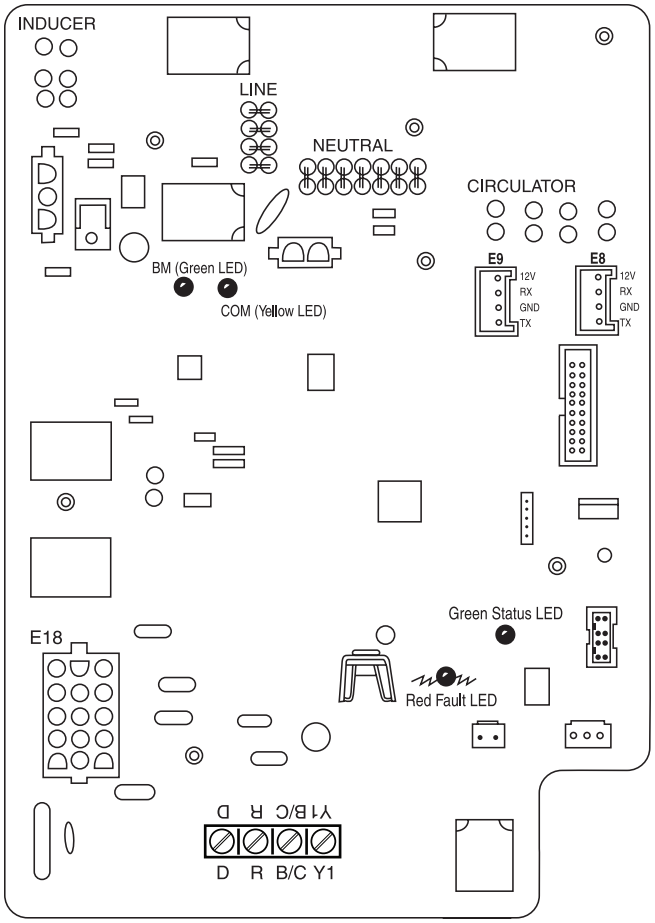
Single phase 120 or 240 volts AC power is applied to the motor module and IS NOT turned on or off by the IFC or AHC. The V.S. Motor module converts the AC power to DC power. Some of the DC voltage is reduced to power the microprocessor inside the V.S. Motor module. A communication fault will appear if line voltage is removed from the V.S. Motor module and the IFC or AHC system is then repowered. When blower operation is called for, the V.S. Motor module turns the DC power on and off to each leg of its three phase motor in a rotating manner. The V.S. Motor Module will increase the voltage and number of Hertz it applies to its three phase motor to increase its speed, or decrease the voltage and Hertz to slow it down. The V.S. Motor module monitors the motor's RPM and power and compares this information to its programmed information. If the RPM and power do not align with the programmed information, the V.S. Motor module will change its output voltage and Hertz to bring the airflow back in line with its program.

Three-Stage Gas Furnace



Features

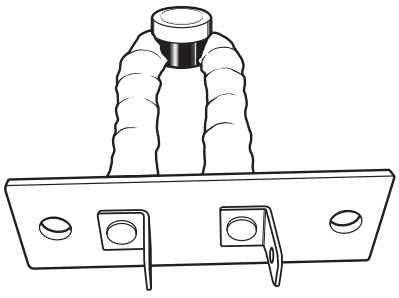
- Three Stages of heat provide better comfort control
  - o 1st Stage – 40% – Typical Input
  - o 2nd Stage – 65% – Typical Input
  - o 3rd Stage – 100% – Typical Input
- Communicating Control System equals; simple installation, limited diagnoses at the thermostat, greater diagnoses capabilities at the Furnace's User Interface Module.
- System operation and set point changes can be done via telephone with a Telephone Access Module, when installed.
- Variable speed operation of the 3 Phase Inducer Motor will allow furnace operation with up to 200 equivalent feet of vent pipe and pipe fittings.
- Variable Speed Indoor Blower will provide more efficient operation while maintaining rated airflow over a greater range of conditions.
- Has a Heating Test Cycle which will cycle the furnace through it three stages of heat rapidly.
- Capable of stand alone operation (Contingency Mode) duty cycling of heat.
- Convertible to Propane Gas (change orifices only). Operates on Propane at 3.5" manifold pressure.
- To ensure the furnace's heating efficiency, the furnace IFC will go through a RESET to the Inducer's Motor's learning routine after :
  - o 150 Cycles in First Stage Heat
  - o 100 Cycles in Second Stage Heat
  - o 50 Cycles in Third Stage Heat
  - o Or whenever power is interrupted to the furnace and is then restored
- The furnace IFC communicates the following information with the Indoor V.S. Blower Motor:
  - o Rotation Direction
  - o Speed & Max CFM
  - o Start & Stop Commands
- Also Checks the V.S. Motor horsepower (HP) and will send an error message if HP is not correct.
- The furnace IFC controls the Heating Cycles CFM, all other airflows are controlled by the comfort control thermostat.
- Silicon Nitride Hot Surface Igniter.
  - o IFC uses the proven Adaptive Learning Routine providing reliable ignition and prolonging the life of the Hot Surface Igniter
- ComfortR™ indoor blower Ramp cycle and cooling airflows are set at the comfort control thermostat. No Dip Switches to set.
- Heating V.S. Indoor Blower Motor time delay to off selectable at the User Interface Module.
- These furnaces can only be controlled by a communicating comfort control.
- The thermostat and furnace communicate digitally with each other. The Data and Common thermostat wires are used for communications.
- The furnace provides 24 Volts A.C. power to operate the thermostat.



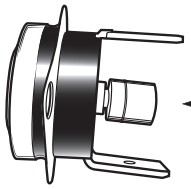
IFC Control / Part # Cnt 04836

Heating Cycle

The Furnace Integrated Furnace Control, IFC, receives a message from the comfort control thermostat to operate in the first, second or third stage of heat.

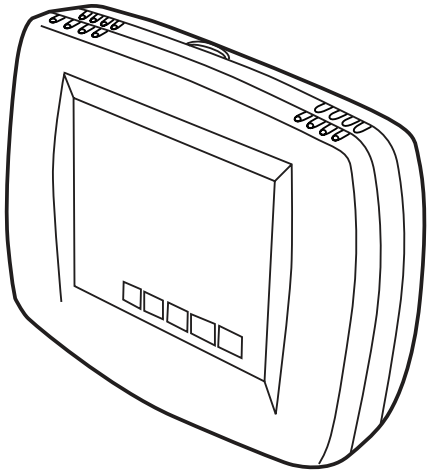


Primary Limit



Manual Reset Button

Manual Reset Flame Roll-Out Limit



Comfort Control Thermostat

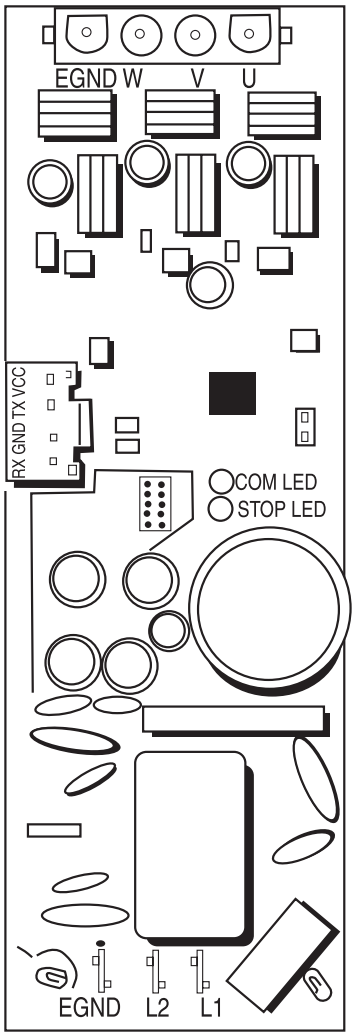
Checks Performed Before Starting a Heating Cycle

The furnace's IFC will check to see if all of the limits are closed and the pressure switches for stage one (PS-1) and stage two (PS-2) are open. These operating components are always checked before a heating cycle can begin. Stage three (PS-3) pressure switch is not checked until a call for third stage heat is received by the furnace's IFC. The furnace's IFC will always start the heating cycle in the Second Stage of heat and then goes to First Stage heat, or whatever stage the comfort control thermostat is calling for.

The furnace's IFC then communicates digitally with the Inducer Motor Drive Board (IMDB) and the Variable Speed Indoor Blower (VSIB). The furnace IFC signals the IMDB and the VSIB on its Transmit Line and receives replies from these components on its Receive Line.

The three phase Inducer Motor speed is controlled by the output Voltage Level and the number of AC Cycles, hertz, supplied by the IMDB. When the inducer's motor speed changes are needed the furnace's IFC will signal the IMDB which will change its output voltage and number of hertz. An increase in voltage and an increase in the number of hertz from the IMDB will cause the inducer motor to run faster.

3Ø Power Output To Inducer Motor



Power Plug
120 V.A.C. Input

VCC = 12 VDC Input
TX = Data Output
GND = Ground/Common
RX = Data Input

Inducer Motor Drive Board LED'S

Communication, COM, LED Green

COM LED ON = No Call For Inducer Motor

COM LED FLASHING = Call For Inducer Motor Operation

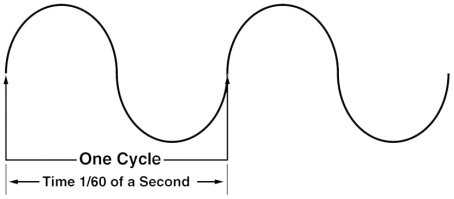
STOP LED OFF/ON = Only Flashes When IFC Signals Inducer Motor Drive Board To Turn Off.

Note #1
When IMDB & IFC are not communicating the User Interface will display no data when inducer RPM is selected.

Silicon Nitride Ignitor Learning Routine

The ignitor is constructed of a tungsten heater element and silicon nitride ceramic insulators. The voltage rating of the ignitor is 80 volts R.M.S., which is less than the line voltage applied to the furnace; therefore, the control will reduce the number of cycles it supplies to the SiNi ignitor per second. The control checks the line voltage constantly and when a call for heat is received the control sets the number of cycles it is going to supply to the ignitor based on the line voltage it is reading. This reduced number of AC sine wave cycles per second reduces the effective voltage, R.M.S, applied to the SiNi ignitor per second. If the line voltage is low, the number of cycles will go up, or if the line voltage is high, the number of cycles is reduced.

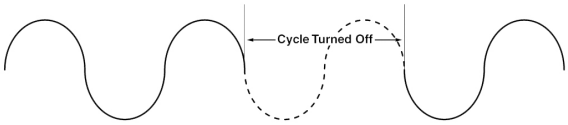
60 Hertz AC Sine Wave



Number of cycles per second affects the effective voltage or voltage R.M.S.

R.M.S. = Root—Mean—Square = The value assigned to an alternating current or voltage that results in the same power dissipation in a fixed resistance as DC current or voltage of the same numerical value.

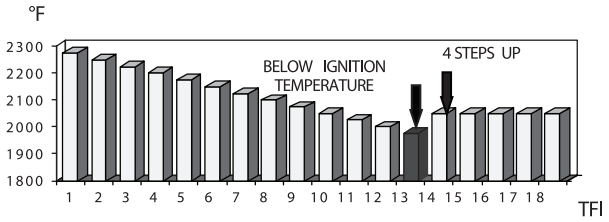
One or more cycles are turned off by the I.F.C. control to control the R.M.S. voltage supplied to the silicon nitride ignitor.



Learning Process

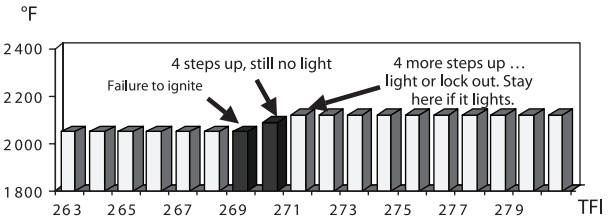
After each successful ignition, the number of AC sine wave cycles are reduced. The lower number of AC sine waves reduces the effective voltage applied to the ignitor, and this lowers it's maximum temperature.

After each successful ignition attempt, the burner lights, then the number of cycles are reduced. During this learning program the number of cycles will become too low and the gas fails to ignite.



A retry is initiated by the IFC and the number of AC sine wave cycles is raised four steps up to increase the ignitor temperature.

If for some reason, flame is still not proven on this retry for ignition, the IFC then raise the AC Sine wave cycles four steps up.



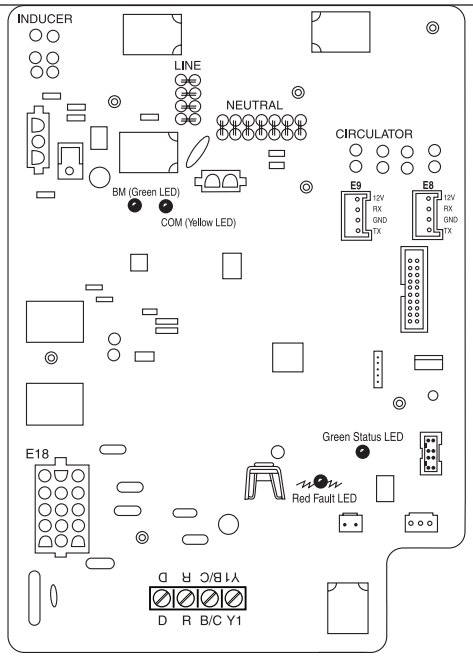
If the flame is proven the IFC will keep this step setting. If flame is not proven the IFC locks out for one hour.

On a power interruption, the furnace control starts the igniter power at the high side of it's range and repeats the learning routine.

The furnace IFC will call for heat and a trial for ignition is initiated. If flame is not detected, the IFC will recycle the furnace two more times before lockout.

This learning process is employed to provide the most reliable ignition process and to extend the service life of the ignitor. This control requires the correct polarity of the 120 V.A.C. wiring and a ground connection. If the line voltage is low, or the line polarity is reversed, the IFC control will lock out the heating cycle and cause the Red Fault LED to flash six times.

This Ignitor can only be checked by using a OHM Meter and reading it's Resistance. A good ignitor reads 11-18 ohms. A bad ignitor will have a much higher resistance.



IFC LEDs

BM / Clock Signal LED Green

LED on when IFC Clock is working.

Communication (COM) LED Amber

LED ON when first powered up

LED Flashes the number of communicating components in the system

(ex. communicating stat and furnace will equal two flashes)

Status LED

Slow flash = no call for heat

Fast flash = call for heat

Fault LED

Will flash to signal a fault (see fault code chart)

Will flash the last four faults detected when the furnace is re-powered

Will only flash a fault code when the furnace is receiving a call for heat

"FAULT LED" Flash Codes	
2 Flash	External Lockout (Retries or Recycles exceeded)
3 Flash	Pressure Switch/Inducer Error
4 Flash	Open Limit Switch
5 Flash	Flame Sensed when no flame should be present
6 Flash	Reversed Polarity, or Ignitor (Triac) Fault
7 Flash	External Gas Valve Circuit Error
8 Flash	Low Flame Sense
9 Flash	Open Inducer Limit Switch
10 Flash	Communication Error
Solid ON	Internal GV IFC Error
Solid ON with Solid "STATUS" - ON	Internal IFC Error

IFC Inducer Learning Routine Sequence

- The furnace IFC will go through an Inducer Learning Routine for each stage of heat.
- The Learning Routine is done to determine the correct amount of ventilation air for complete combustion.
- Too much ventilation air will reduce the furnace's AFUE efficiency rating.
- The inducer motor's speed for each stage may be different for each installation due to the different length and size of the ventilation pipe, vent pipe, number of pipe fittings used, and the type of vent cap installed.
- The Inducer Learning Routine is repeated each time the furnace IFC does a **RESET** or is powered up and the furnace's IFC receives a call for heat.
- The furnace IFC checks the pressure switches PS-1 and PS-2. They both must be open before a heating cycle can begin.
- The furnace's IFC sends a digital signal to the Inducer Motor Drive Board, IMDB to run the inducer motor at the preset factory second stage heat RPM.
- The furnace's IFC looks for the PS-1 and PS-2 pressure switches to close. A 24 Volt A.C. Signal goes to the furnace IFC when a pressure switch closes.
- The furnace IFC will continue to signal the IMDB to increase the inducer speed in steps if PS-1 and PS-2 are not closed when the preset factory second stage heat RPM is reached. The maximum RPM for stage two is set at 4400 RPM, maximum RPM for stage one is set at 3600 RPM.

Fault Detection During Second Stage Heat Learning Routine

- If PS-1 and PS-2 are not closed when the inducer reaches 4400 RPM the furnace IFC will signal the IMDB to shut down the inducer motor. The IFC flashes its Red Fault LED three times repeatedly for thirty seconds.
- This thirty second inducer off period is done so any accumulated water that may be in the vent system can drain out. The IFC will repeat this cycle three times if needed before it locks out for one hour. (See Trouble Shooting Pressure Switch procedure.)
- After the thirty second off period the IFC will stop flashing the Fault LED and then will signal the IMDB to again start the inducer motor and go to the preset factory second stage heat RPM.

- When PS-1 and PS-2 switches do close the furnace IFC will then start the ignition cycle.
- The IFC now starts the Igniter warm up cycle. (See Silicon Nitride Ignitor Learning Routine.)
- Near the end of the warm up cycle the furnace IFC will turn on the Gas Valve.
- When the burner flame is detected by the furnace IFC, a forty-five second time delay for indoor blower operation begins. The forty-five second time delay allows the heat exchanger and the recuperative cell to warm up. By the end of this delay time, the inducer's discharge air temperature will be at its operating temperature and the density of the products of combustion will stabilize.
- The furnace IFC now signals the V.S. indoor blower to run at the programmed second stage heating airflow.
- The furnace IFC will now start its inducer second stage heat airflow learning routine.
- The furnace IFC will signal the Inducer Motor Control Board, IMCB, to begin to reduce the Inducer Motor speed in steps. Inducer motor speed is reduced until the furnace IFC sees PS-2 open.
- When PS-2 opens, the furnace IFC will **NOTE** the Inducers Motor RPM.
- The furnace IFC then adds an additional number of RPM to the inducer's motor second stage **NOTED** RPM.
- The additional number of RPM plus this **NOTED** RPM is the **learned** second stage inducer operating RPM.
- The furnace IFC now stores this learned operating inducer RPM for second stage heat in its memory.
- The furnace IFC will use this stored **learned** operating inducer RPM for second stage heat calls it receives in the future.
- If the furnace IFC is still receiving only a call for first stage operation, it will now start the learning routine for first stage.
- The furnace IFC will then continue to reduce the inducer motor's RPM in steps until the furnace IFC sees PS-1 open.
- When PS-1 opens the furnace IFC will **NOTE** this Inducer Motor RPM.
- The furnace IFC then adds an additional number of RPM to the first stage **NOTED** RPM.
- The furnace IFC now stores this **learned** operating inducer RPM in its memory and uses it for first stage heat calls it receives in the future.
- The IFC will now signal the Inducer Motor Drive Board (IMDB) to increase the Inducer Motors, IMDB, and speed to its **learned** RPM for first stage operation.
- The IFC signals the indoor V.S. blower to operate at the programmed first stage heating airflow.
- Whenever the furnace is powered up or after a **RESET**, the furnace IFC will not go through a learning routine for the third stage of heat until it receives a call for the third stage of heat.

Third Stage Inducer Learning Routine

- When the furnace IFC receives a digital signal for the third stage of heat from the comfort control thermostat, it will begin the inducer motor learning routine for third stage heat.
- The furnace will start the heating cycle in second stage, if not already on, and then begin the third stage learning routine.
- The furnace checks Pressure Switch Three, PS-3, it must be open.
- When the furnace IFC sees PS-3 open, it will send a digital signal to the Inducer Motor Drive Board, IMDB to run the inducer motor at the preset factory third stage RPM.
- The furnace IFC looks for the PS-3 pressure switch to close
- The furnace IFC will continue to signal the IMDB to increase the inducer motors speed in steps if PS-3 does not close when the preset factory third stage RPM is reached. The maximum RPM for the third stage heat is set at 5200 RPM.
- If PS-3 is not closed when the Inducer reaches 5200 RPM, the furnace IFC will signal the IMDB to reduce the inducer motor speed in steps to its second stage **LEARNED SPEED**. The furnace IFC flashes its Red Fault LED three times repeatedly. No Alert message is sent to the comfort control thermostat.The furnace IFC will keep operating at second stage of heat until the thermostat sends a different signal.
- When the furnace IFC sees PS-3 close, it signals the V.S. indoor blower to operate at its third stage heating airflow.
- The furnace IFC enters a time delay so the heat exchanger and the recuperative cell warms up to its third stage operating temperature. At the end of this time delay, the inducer's discharge air temperature will be at its third stage operating temperature and the density of the products of combustion will be stabilized.
- The furnace will now signal the IMDB to reduce the inducer speed in steps until PS-3 opens.
- When PS-3 opens the furnace IFC will **NOTE** this Inducer Motor RPM.
- The furnace IFC then adds an additional number of RPM to the third stage **NOTED** RPM.
- The furnace IFC will now store this **learned** operating inducer RPM in its memory and use it for third stage heat calls it receives in the future.
- The IFC will now signal the Inducer Motor Drive Board to increase the Inducer Motors speed to its **learned** RPM for third stage operation.

Faults Detected During Third Stage Learning Routine

- If PS-3 is closed, the furnace IFC will send a signal to the IMDB to slow down the Inducer Motor in steps trying to get PS-3 to open. The furnace IFC will reduce the Inducer Motor's speed in steps until Pressure Switch, PS-2 opens. If PS-3 does not open when this speed is reached, the furnace IFC will again signal the IMDB to increase the Inducer Motor back to the second stage **LEARNED Speed**. The furnace IFC then starts flashing its Fault LED three times repeatedly. No Alert message is sent to the comfort control thermostat. The furnace IFC will keep operating the furnace at its second stage of heat. After operating this way for one hour, the furnace IFC will again check to see if PS-3 is open or can be opened. If PS-3 is now open or can be opened, the furnace IFC will go through its learning routine for third stage heat. The furnace IFC will stop flashing its Fault LED.

When the Comfort Control Thermostat is Satisfied

- When the furnace IFC receives a signal to go down to a lower stage of operation, it will signal the Inducer Motor Drive Board (IMDB) to lower the speed of the Inducer Motor in steps to the learned speed for that stage of operation.
- When the comfort control thermostat is satisfied, it will send a new digital signal to the furnace IFC to shut down the heating cycle.
- The furnace IFC now turns off the gas valve.
- When the furnace IFC sees the burners have shut down (no flame current), it will begin the time delay period to off for the inducer motor purge cycle and the V.S. Indoor Blower heat exchanger cool down cycle.

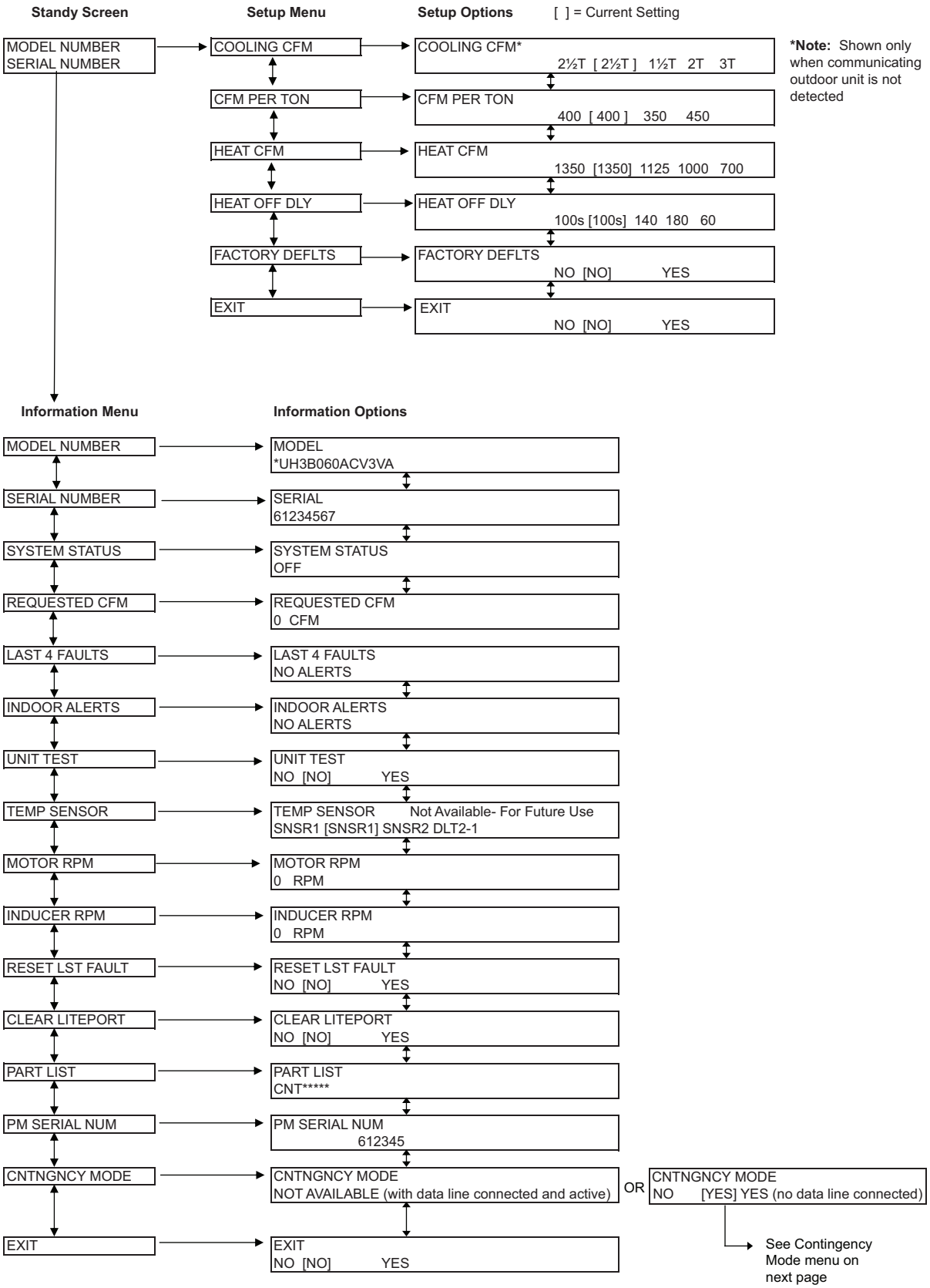
(Contingency Mode) Stand Alone Operation

- Stand Alone Operation can only be entered at the User Interface Assembly.
  1. Stand Alone Operation can be set up to operate the furnace in **Heating Only**.
  2. When the thermostat is **not** communicating with the furnace IFC. Disconnect the Data wire D from the furnace IFC terminal block.
  3. When the furnace IFC is **not** flashing a fault code at its Fault LED.
- Turn 120 VAC power off. When the Green LED on the Inducer Drive Motor Board goes out, turn 120 VAC power back on.
- Scroll down using the down arrow ▼ at the User Interface Display until you see **CNTNGNCY Mode** then press the **Enter** button.
- **CNTNGNCY Mode** and ◄ **STAGE** ► will be displayed. Press the **Enter** button.
- **STAGE** and ◄ **OFF (OFF)** will be displayed. A First, Second or Third stage of heat must be selected. Use the ◄ or ► arrows to select the stage of heat wanted and then push the **Enter** button and then the ▼ button.
- **DUTY CYCLE** and **10%** will be displayed. A duty cycle **must** now be selected from 10 to 50%. A 10% duty cycle will run the furnace for 2 minutes and then off for 18 minutes. A 50% duty cycle will run the furnace for 10 minutes and then be off for 10 minutes. These duty cycles will be repeated 3 times per hour. Use the ◄ or ► arrows to select a duty cycle and then push the **Enter** button and then the ▼ button.
- **Start** and **NO (NO)** will now be displayed. With a **NO/NO** question being asked. Use the ◄ or ► arrows to select the **YES** and then press **ENTER**.
- **Are you Sure and NO (NO)** will now be displayed. With a **NO/NO** question being asked. Use the ◄ or ► arrows to select the **YES** and then press **ENTER**.
- Turn 120 VAC power off. When the Green LED on the Inducer Drive Motor Board goes out, turn 120 VAC power back on.
- When the furnace is operating in the Contingency Mode (Stand Alone Operating Cycle), the User Interface will display the following information: The top line will say **CNTNGNCY Mode**. The bottom line will show the operating stage number **STG (1, 2, or 3)** selected, and the percent number **10-50 %** selected.
- All furnace operating limits, pressure switches and communications between the IFC and the IMDB, and the V.S. Indoor Blower will be monitored for proper safe operation of the furnace.
- The ◄ ► ▲ ▼ and **ENTER** buttons do not function in the contingency mode of operation. To exit the Contingency Mode of operation, turn off the 120VAC power to the furnace.
- The Contingency Mode (Stand Alone Operation) will stop for any of the following reasons:
  1. A signal is received from the thermostat, Data wire D from the thermostat reconnected to the furnace IFC D terminal block.
  2. Power removed from the furnace and then turned back on.
  3. The furnace IFC enters a RESET mode of operation.
  4. A fault is detected by the furnace IFC. Fault LED will be flashing a fault code.

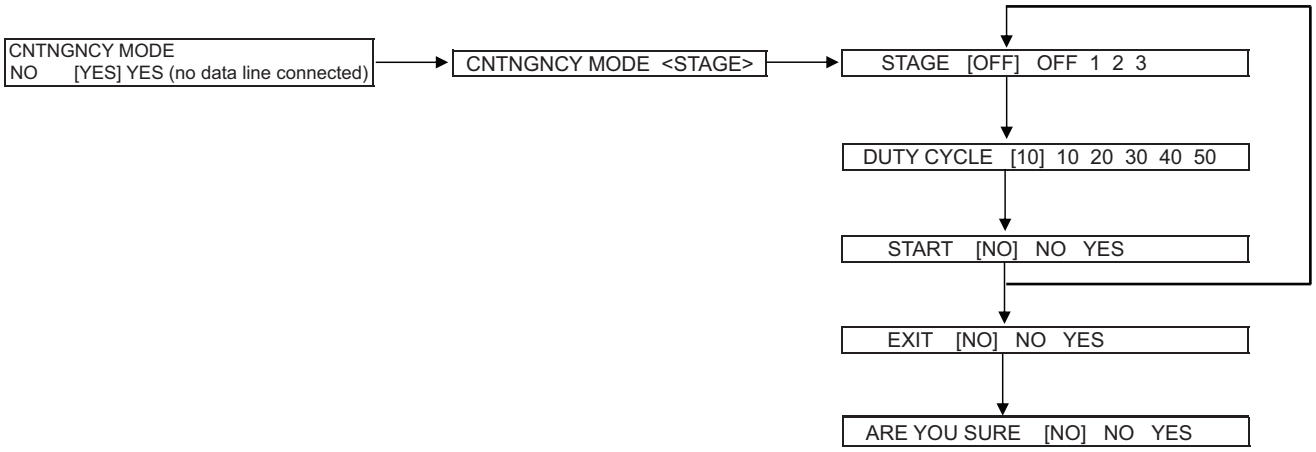
*Inducer RPM		
	Minimum RPM	Maximum RPM
Stage 1	1200	3600
Stage 2	1500	4400
Stage 3	2300	5200

***Inducer RPM are the same for all models.**

Interface Display Troubleshooting



Interface Display Troubleshooting (continued)

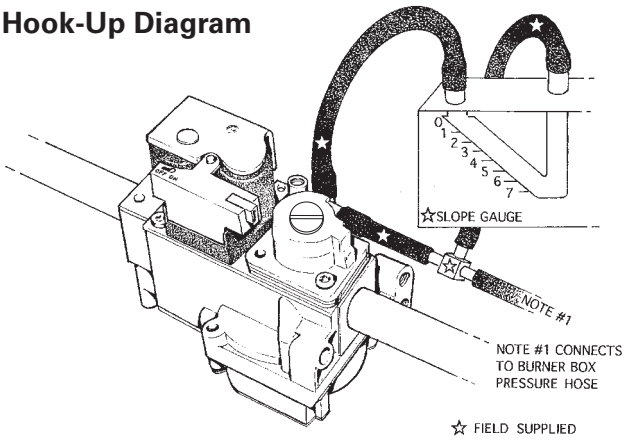


Note:
Contingency Mode Setup and Operation is explained on page 21.

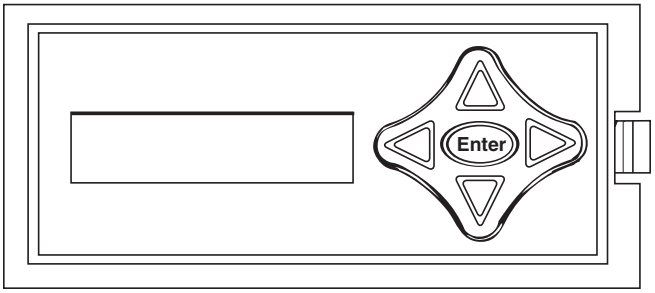
Three Stage Gas Valve Manifold Pressure Adjustment Procedures

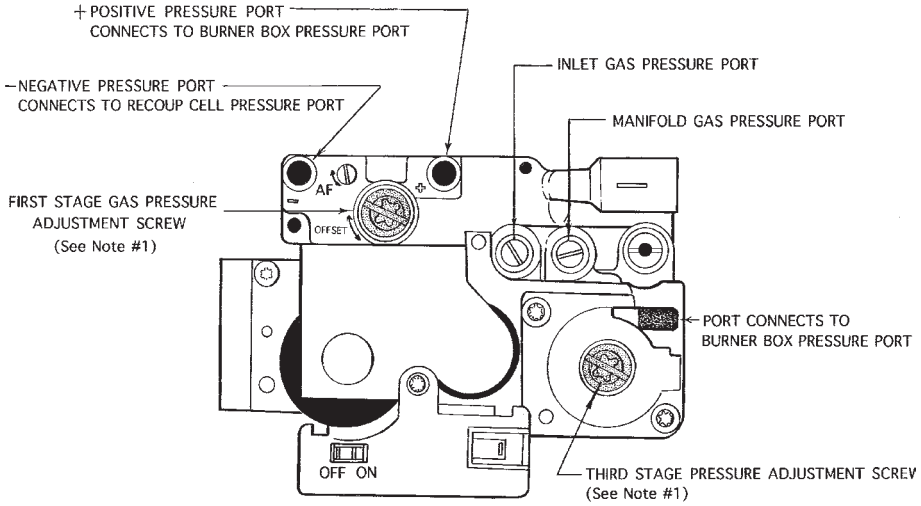
- Turn off the 120VAC power to the furnace.
- Turn the screw inside the Manifold Gas Pressure Port once counter-clockwise to open the port.
- Connect a field supplied U Tube Manometer, with field supplied rubber tubes and tees, to the three stage furnace as shown in the hook-up diagram.
- Remove the thermostat wire from the furnace's IFC D terminal.
- Apply 120 VAC power to the furnace. The furnace User Interface will display **WAIT**, then, **model and serial number**.
- Set up the furnace in the **contingency mode** of operation at the User Interface Assembly for the first stage of **heat** with a **50% duty cycle**. (See contingency mode of operation for additional details)
- **Remove 120 VAC power from the furnace. DO NOT re-power the furnace until the Green LED on the Inducer Motor Drive Board goes out**.
- Apply 120 VAC power to the furnace. The furnace User Interface will display WAIT, and then the display will change to the **"Contingency Mode STG 1 50%**.
- Let the furnace go through First Stage learning routine and its temperature rise stabilize. The temperature rise and learning routine will take four minutes.
- Read the first stage manifold gas pressure after the furnace's temperature rise has stabilized.
- If needed, adjust the gas valve's first stage of heat pressure adjustment screw to obtain the correct first stage pressure. Use Final Manifold Pressure Settings table for the correct first stage pressure reading in inches of Water Column pressure.

Hook-Up Diagram



User Interface Assembly





Note #1 Dust Cap Cover Removed for gas pressure adjustment.
Replace Dust Caps when adjustments are complete and the manifold pressure is being read.

Three-Stage Gas Furnace

Furnace Input Rate (KBTU/hr)	FINAL MANIFOLD PRESSURE SETTING (inches W.C.)		
	1st Stage	2nd Stage	3rd Stage
60	0.7 ± 0.2	Not Adjustable	3.5±0.2
80	0.7 ± 0.2	Not Adjustable	3.5±0.2
100	0.7 ± 0.2	Not Adjustable	3.5±0.2
120	0.7 ± 0.2	Not Adjustable	3.5±0.2
Manifold pressures apply for Natural Gas & Propane applications			

Note: Gas valve adjustment and manifold pressure settings on these model furnaces will be the same for both Natural Gas and LP. The only change to the furnace for operation to LP will be burner orifices (#51 for LP). Refer to LP Conversion instructions for more detailed information.

First Stage Adjustment: Clockwise To Decrease Or Counter-Clockwise To Increase Pressure.

- Once the first stage gas pressure is adjusted, turn the gas valve switch to the OFF position. Operate the furnace for two more minutes to cool down the heat exchanger.
- The furnace IFC will stop the first stage 50% duty heating cycle after ten minutes. To manually exit the first stage contingency cycle, remove 120 VAC power from the furnace.
- **DO not re-power the furnace until the Green LED on the Inducer Motor Drive Board goes out.**
- Turn the gas valve switch to the ON position.
- Again, turn on the 120 VAC power to the furnace.
- Set up the furnace in the **CONTINGENCY MODE** of operation at the **User Interface Assembly** for the third stage of heat with a **50% duty cycle**, then depower and then repower the furnace.
- Let the furnace go through the stage 3 learning routine and its temperature rise to stabilize. This temperature rise and learning routine will take three to four minutes.
- The dust cap screw covering the third stage pressure adjustment screw must be in place during manifold gas pressure readings. Remove the dust cap and adjust the gas valve third stage of heat pressure adjustment screw, one turn.

Third Stage Adjustment: Counter-Clockwise To Decrease Or Clockwise To Increase Pressure.

Replace and tighten the dust cap for the third stage adjustment screw and then read the manifold pressure again. This procedure may need to be repeated until the manifold gas pressure is 3.5" of Water Column pressure.

- Once the third stage gas pressure is adjusted, turn the gas valve switch to the OFF position. Operate the furnace for two more minutes to cool down the heat exchanger.
- **Remove 120 VAC power from the furnace. DO not re-power the furnace until the Green LED on the Inducer Motor Drive Board goes out.**
- Turn the gas valve switch to the ON position.
- Again, operate the furnace in the contingency mod of operation in first stage of heat with a 50 % duty cycle. Re-adjust the first stage pressure adjustment screw if the adjustment of the third stage adjustment affected the first stage setting. If the first stage pressure adjustment screw setting is now changed, you will have to again go to the third stage heat and check its operating pressure. If the third stage operating gas pressure has again changed, you will have to adjust it again and then recheck the first stage operating gas pressure. Adjust the first stage and third stage pressure adjustment screws until minimum interaction between the two are seen.
- When the correct operating gas valve pressures are obtained, turn the furnace off. Remove the field supplied manometer tubing and the tee installed at the beginning steps and TIGHTEN DOWN THE MANIFOLD DUST CAPS and the GAS PRESSURE PORT SCREW. Reconnect the thermostat data line to the D terminal of the furnace. Turn on the 120V power to the furnace. With the thermostat data line connected to the furnace and communications between the thermostat and the furnace re-established, the furnace operation will now be controlled by the comfort control thermostat.

INPUT RATING BTUH	NUMBER OF BURNERS	MAIN BURNER ORIFICE DRILL SIZE	
		NAT. GAS	LP GAS
60,000	3	45	51
80,000	4	45	51
100,000	5	45	51
120,000	6	45	51

Valve	Supplier	Opening Characteristics	Propane Convertible	Gas Valve	LP Kit
1	Honeywell	Three Stage	Yes (burner orfices only)	VAL08715	BAYLPKT220A

Unit Test Cycle

A qualified technician can cycle the variable speed indoor blower and the three stage gas furnace through its three stages of heat at the User Interface Assembly.

- The Unit Test Cycle will be entered at the User Interface assembly.
- The test cycle can only be entered when the thermostat is not calling and the furnace IFC is not reporting a fault. Disconnect the Data wire D from the furnace IFC terminal block to ensure the Unit Test Cycle will not be interrupted.

- Scroll down using the ▼ button at the User Interface Display until you see **UNIT TEST**, then press **ENTER**.
- **UNIT TEST** and ◀ **NO (NO)** ▶ will be displayed. Use the ◀ or ▶ arrow button to change the **NO** to a **YES** and then press **ENTER**.
- **ARE YOU SURE** and **NO (NO)** will now be displayed. Use the ◀ or ▶ arrow button to change the **NO** to a **YES** and then press **ENTER**.
- **UNIT TEST** and **STAGE OFF** will now be displayed. The variable speed indoor blower will then be turned on by the IFC for 10 seconds and then off.
- **UNIT TEST** and **STAGE OFF** will now be displayed. The Furnace IFC will now start the variable speed inducer motor and then go through the igniter warm up cycle. The Furnace IFC will turn on the gas valve and when the burner flame is detected the user interface display will change.
- **UNIT TEST** and **STAGE 2** will now be displayed. The furnace IFC will now be in second stage heat, and 45 seconds after flame is detected, the furnace will call for the variable speed indoor blower.
- **UNIT TEST** and **STAGE 3** will now be displayed. The furnace IFC will ramp up the variable speed inducer motor and the indoor variable speed blower to third stage operation for a few seconds.
- **UNIT TEST** and **STAGE 1** will now be displayed. The furnace IFC will ramp down the variable speed inducer motor and the indoor variable speed blower to first stage operation for a few seconds.
- The **Model** and **Serial Number** will now be displayed. The variable speed indoor blower will now be operated for the heat exchanger cool down cycle and then be turned off.
- Reconnect the Data wire to the D terminal of the furnace IFC.

Vent Length Table for Variable Speed Vent Motor Models Only

Maximum Vent Length Table (Installation instructions must be followed for installation of the venting system)				
	Maximum Vent Length (Equivalent Feet)			
Direct Vent (2 Pipe System)				
Models *UC1/*DC1 & *UX1/*DX1	**2" Pipe**	**2.5" Pipe**	**3" Pipe**	**4" Pipe**
*UC1/*UX1-040/060	60	80	100	130
*UC1/*UX1-080	50	80	100	130
*UX1C080A9601	See Note 1	60	100	130
*UC1/*UX1-100	See Note 1	40	100	130
*UC1/*UX1-120	See Note 1	15	60	130
*DC1/*DX1-040	60	80	100	130
*DC1/*DX1-060	50	80	100	130
*DC1/*DX1-080	45	80	100	130
*DC1/*DX1-100	See Note 1	80	100	130
*DC1/*DX1-120	See Note 1	15	60	130
Non-Direct Vent (1 Pipe System)				
*UC1/*UX1 & *DC1/*DX1-040/060	50	80	80	130
*UC1/*UX1 & *DC1/*DX1-080	40	80	80	130
*UX1C080A9601	See Note 1	60	80	130
*UC1/*UX1-100	See Note 1	40	80	130
*UC1/*UX1 & *DC1/*DX1-120	See Note 1	25	70	130
*DC1/*DX1-100	See Note 1	80	80	130
For *UH3 and *DH3 Propane Applications- See Notes 6-9				
Models *UY/*DY & *UX/*DX-R *UX2/*DX2 & *UH2/*DH2 *UX3/*DX3 & *UH3/*DH3	**2" Pipe**	**2.5" Pipe**	**3" Pipe**	**4" Pipe**
Altitude/Altitude 0-7,000 FT./PI (0-2134 M)				
060	200 (Note 6)	200 (Note 6)	200 (Note 7)	200 (Note 7)
080	50 (Note 6)	120 (Note 6)	200 (Note 7)	200 (Note 7)
100	See Note 1	60 (Note 6)	200 (Note 7)	200 (Note 7)
120	See Note 1	See Note 1	200 (Note 7)	200 (Note 7)
*DH3/*DX3-120 (Propane)	See Note 1	See Note 1	100	100
Altitude/Altitude 7,000 FT./PI - 9500 FT./PI (2134 M-2896 M)				
060	100 (Note 6)	100 (Note 6)	100 (Note 8)	100 (Note 8)
080	25 (Note 6)	60 (Note 6)	100 (Note 8)	100 (Note 8)
100	See Note 1	30 (Note 6)	100 (Note 8)	100 (Note 8)
120	See Note 1	See Note 1	100 (Note 8)	100 (Note 8)
*DH3/*DX3-120 (Propane)	See Note 1	See Note 1	50	50
Altitude/Altitude 9,500 FT./PI - 12,000 FT./PI (2896 M-3658 M)				
060	50 (Note 6)	50 (Note 6)	50 (Note 9)	50 (Note 9)
080	See Note 1	30 (Note 6)	50 (Note 9)	50 (Note 9)
100 & 120	See Note 1	See Note 1	50 (Note 9)	50 (Note 9)
*DH3/*DX3-120 (Propane)	See Note 1	See Note 1	25	25

Notes

1. Not allowed.
2. Minimum vent length for all models: 3′ horizontal and vertical.
3. The INLET Air of one pipe systems require the installation of a 90″ elbow (to prevent dust and debris from falling straight into the furnace) and a 2′ horizontal or vertical straight pipe section connected below the elbow.
4. This appliance requires a special venting system. Refer to installation instructions for parts list and method of installation.
5. * letter may be "A", "C", or "T"
6. Use of vent pipe smaller than 3″ in diameter is not permitted for *UH3 & *DH3 models in propane applications.
7. Maximum vent length is 150′ for *UH3 & *DH3 models in propane applications at an altitude of 0-7,000 feet.
8. Maximum vent length is 100′ for *UH3 & *DH3 models in propane applications at an altitude of 7,000-9,500 feet.
9. Maximum vent length is 38′ for *UH3 & *DH3 models in propane applications at an altitude of 9,500-12,000 feet.

Additional Notes:

1. One SHORT radius 90 elbow is equivalent to 10′ of 3″ pipe and one LONG radius elbow is equivalent to 6′ of 3″ pipe. One 90 elbow is equivalent to 7.5′ of 2 1/2″ pipe and 5′ of 2″ pipe. Two 45 elbows equal one 90 elbow.
2. The termination tee or bend must be included in the total numbers of elbows. If BAYVENT100A termination kit is used, the equivalent length of pipe is 5 feet.
3. Pipe adapters are field supplied (except 120).
4. Low temperature icing on vent inlet or termination may cause pressure switch problems.

Furnace Sequence of Operation

The comfort control thermostat signals **(17)** the Furnace IFC for First Stage Heat. **(16)**

IFC checks all limits **(10)** & Pressure Switches PS-1, 2, 3. **(9)**

IFC signals the Variable Speed Inducer Drive, IMDB **(8)** to start the Vent Motor **(8)** and go to its second stage speed.

Furnace always lights off in second stage. **(9)**

IFC sees 24 Volt AC signal from Pressure Switches PS-1 & PS-2 when they close. **(9)**

This proves Vent Motor is moving the correct amount of combustion air through the furnace and vent system.

IFC starts the Hot Surface Igniter learning routine warm-up time cycle. **(6)**

IFC turns on the Gas Valve **(11)**. Trial for Ignition is five seconds.

The IFC proves Ignition by the flame current sensing method **(7)**. If flame is not detected, the IFC will cycle the furnace three times to try and prove flame and then the IFC locks out for one hour. The IFC will send an Alarm Code. It will also flash its Red Fault LED two times repeatedly.

If flame is detected, the IFC will start the heat exchanger warm-up time delay for the indoor blower.

45 Seconds later the IFC signals the Indoor Blower **(4)** to come on and run at its second stage heat speed.

The IFC then signals the Inducer Motor Drive Board, IMDB, **(8)** to ramp down the vent motor in steps to the first stage vent motor speed. This reduction in steps of the Vent Motor Speed will cause the Gas Flow through the Gas Valve to go down in steps which will reduce the chances of a burner flame out. When the IFC sees the 24 Volt AC signal from Pressure Switch # 2 (PS-2) **(9)** go away, it will then signal the Indoor Blower **(4)** to go to the First Stage Heat speed.

The comfort control thermostat **(17)** will continue to call for first stage heat operation until the indoor temperature is back at the comfort control thermostat set point or, if the comfort control thermostat **(17)** sees the indoor temperature is not moving back towards its set point in time or the indoor temperature is still moving away from comfort control thermostat set point, it will Signal the IFC **(17)** to go to second stage heat. The comfort control thermostat **(17)** then signals the Furnace IFC for second Stage Heat.

The IFC **(8)** signals the Inducer Motor Drive Board, IMDB, **(8)** to ramp the Vent Motor up in steps to its Learned Second Stage RPM speed.

AS the Vent Motor **(8)** speed increases, the amount of gas coming through the gas valve will increase.

When the IFC sees the 24 Volt AC Signal from Pressure Switch #2, PS-2, **(9)** closing, the IFC will then signal the Indoor Blower **(4)** to go to its Second Stage Heat Speed.

The comfort control thermostat **(17)** will continue to call for second stage heat operation until the indoor temperature moves back toward its set point. Before the indoor temperature reaches the comfort control thermostat **(17)** set point, the thermostat will signal the Furnace IFC to go back to first stage operation.

Or, if the comfort control thermostat **(17)** sees the indoor temperature is not moving back towards its set point in time, or the indoor temperature is still moving away from thermostat's set point, it will signal the furnace IFC to go to Third Stage Heat.

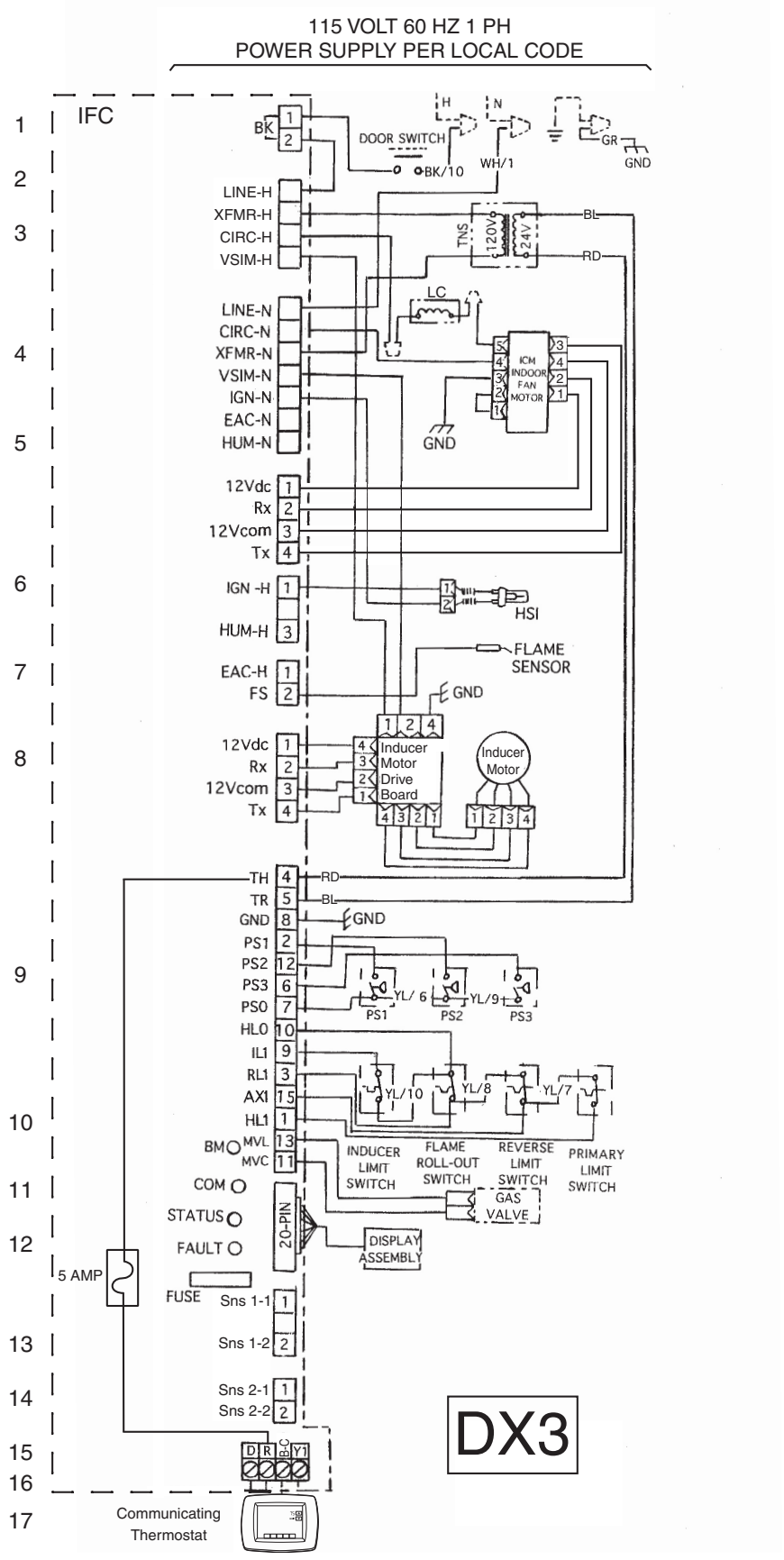
The IFC signals the Inducer Motor Drive Board, IMDB **(8)** to ramp the vent motor in steps to its learned third stage RPM speed.

As the Vent Motor Speed increases, the amount of gas coming through the gas valve will increase.

When the IFC sees the 24 Volt AC Signal from Pressure Switch 3, PS-3 **(9)** closing, the IFC will then signal the indoor blower **(4)** to go to its Third Stage Heat speed.

The comfort control thermostat will continue to monitor the indoor temperature and send signals to the IFC to operate at different stages or go to off so it can maintain the indoor temperature at the homeowner's set point.

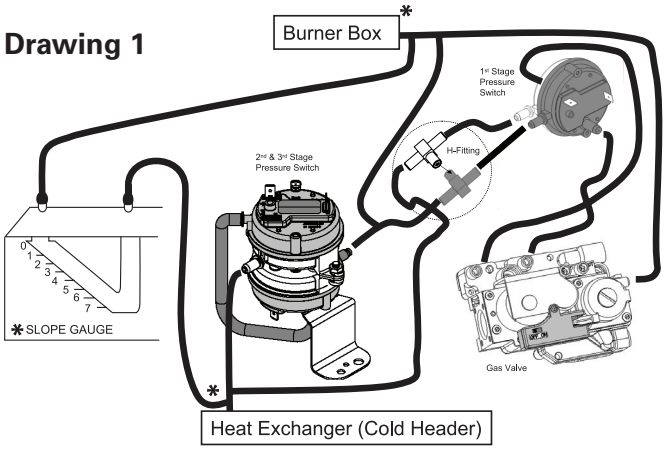
Three-Stage Gas Furnace



Pressure Switch Testing

1. Connect a slope gauge or magnehelical gauge to the recoup cell cold header and the burner box fittings using field supplied tees and hoses, see drawing # 1.

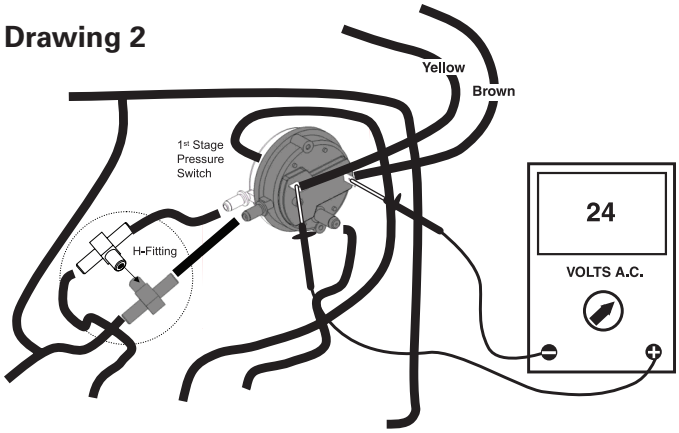
Drawing 1



***Field Supplied**

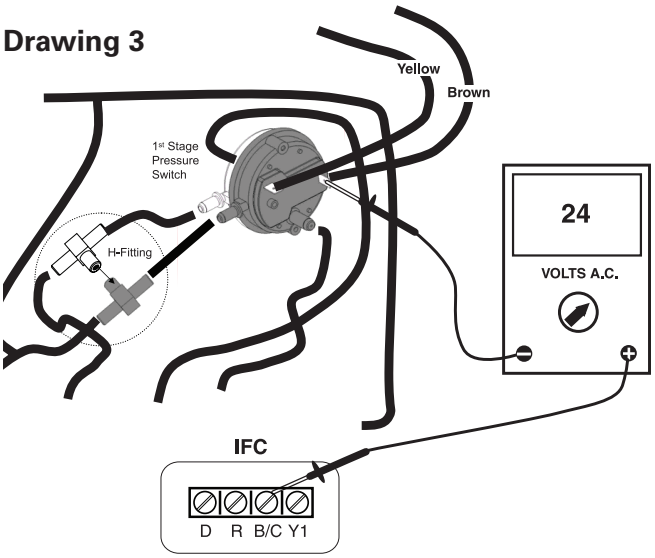
2. Connect an AC Volt Meter to the pressure switch being tested. Connect the meter leads to the pressure switch terminals, see drawing # 2. The AC Volt Meter should read 24 Volts AC, if the 24 Volts AC is present at the switch go to step #4, if the 24 Volts AC is not read go to step # 3.

Drawing 2



3. Check for 24 Volts AC coming to the pressure switch, see drawing # 3. Connect one lead of the AC Volt Meter to the B/C terminal of the gas furnace low voltage terminal board and the other AC Volt Meter lead will be connected to one pressure switch terminal (one at a time) to see if 24 Volts AC is being supplied to the pressure switch. If 24 Volts AC is present at both pressure switch terminals, the pressure switch is closed and it must be replaced. Check the following furnace's components if 24 Volts AC is not being supplied to the pressure switch; 5 amp fuse, transformer, wiring and the furnace IFC.

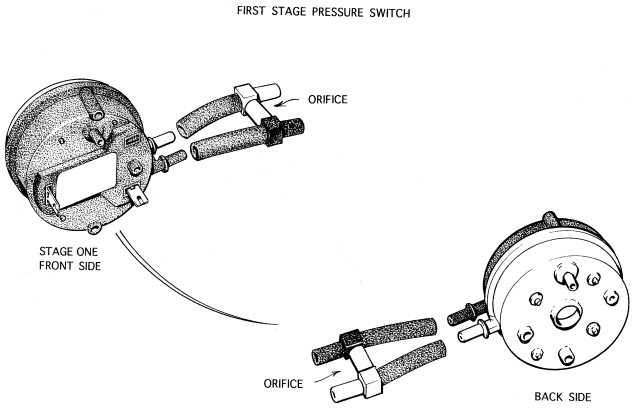
Drawing 3

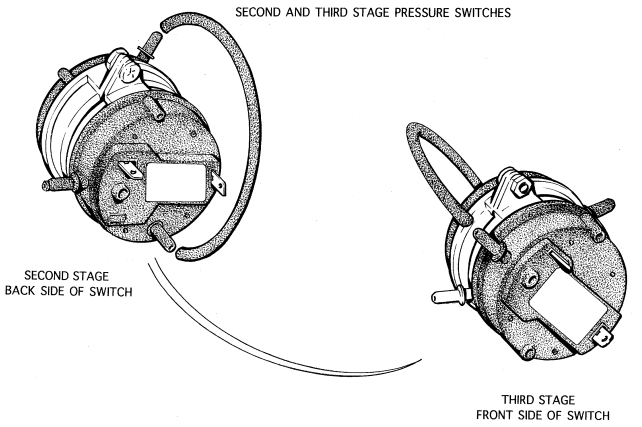


4. Set the comfort control thermostat to call for heat. Connect the AC Volt Meter to the pressure switch being tested, then go to step #5.

5. The AC Volt Meter should read 24 Volts AC until the inducer motor comes up to speed to create the operating pressure needed to close the switch. See the pressure switch(s) label being tested or the Gas Furnace Pressure Switch Matrix Chart for the switch's operating pressure. If the pressure switch being tested does not close when the operating pressure is reached, the switch must be replaced.

Pressure Switches And Interconnecting Hose Diagram



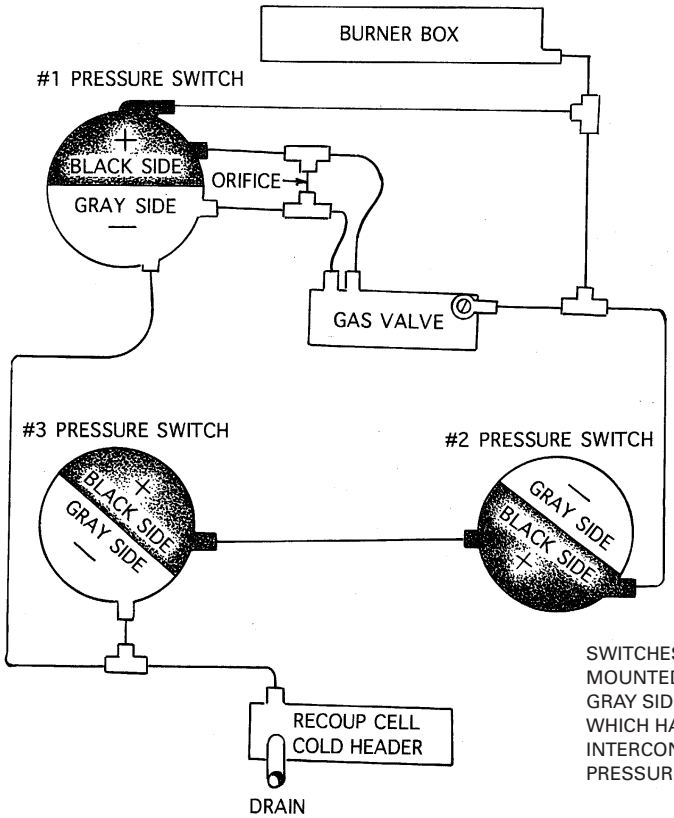


There is an orifice installed in the black tee. This tee & orifice assembly is connected to the black side of pressure switch #1. The orifice & tee assembly is not universal. **The orifice is sized for the furnace's BTU input capacity.**

Pressure switch #1 has two black and two gray pressure ports. The black side of pressure switch #1 is connected to the furnace's burner box. The gray side of the switch is connected to the recoupitive cells cold header tee.

The closing negative pressure, in inches of water column, is printed on the switch label.

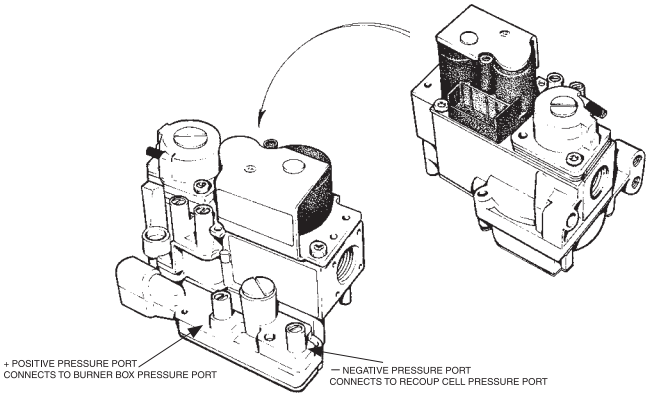
These two switches are an assembly. Separate switches are not available.

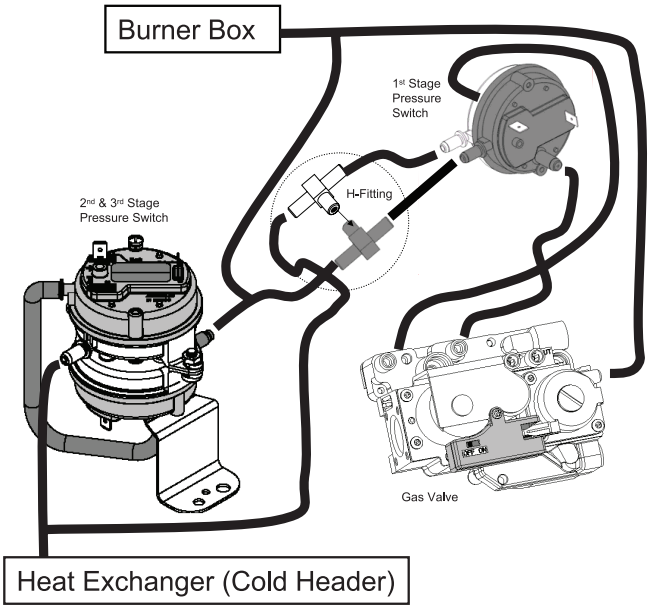


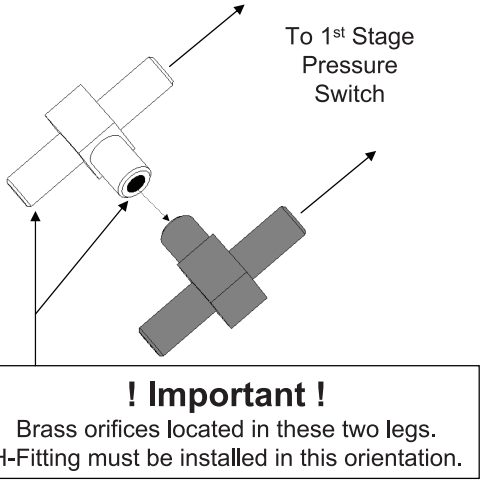
SWITCHES 2 & 3 ARE MOUNTED BACK TO BACK, GRAY SIDE TO GRAY SIDE, WHICH HAVE AN INTERCONNECTING PRESSURE PORT

Honeywell Multi Stage Automatic Gas Valve

The gas furnace manifold gas pressure is modulated in steps by the pressure difference of the positive inlet burner air pressure and the negative outlet air pressure of the recuperative cell. These two pressures are connected to the gas valve. These two pressures are used to set the gas valve's pressure regulator for the correct operating pressure for the stage of operation being called for by the furnace IFC.







! Important !
Brass orifices located in these two legs.
H-Fitting must be installed in this orientation.

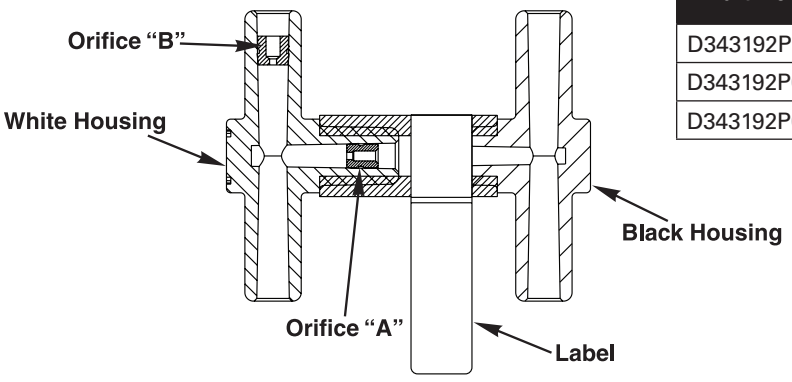
Furnace Input Rate (KBTU/hr)	FINAL MANIFOLD PRESSURE SETTING (inches W.C.)		
	1st Stage	2nd Stage	3rd Stage
60	0.7 ± 0.2	Not Adjustable	3.5 ± 0.2
80	0.7 ± 0.2	Not Adjustable	3.5 ± 0.2
100	0.7 ± 0.2	Not Adjustable	3.5 ± 0.2
120	0.7 ± 0.2	Not Adjustable	3.5 ± 0.2
Manifold pressures apply for both Natural Gas & Propane applications			

Note: Gas valve adjustment and manifold pressure settings on these model furnaces will be the same for both Natural Gas and LP. The only change to the furnace for operation to LP will be burner orifices (#51 for LP). Refer to LP Conversion instructions for more detailed information.

Gas Furnace Pressure Switch Matrix Chart

Model	Part ID	Replacement Part Number	Operating Pressure	Close/Open Range	MIN-MAX Inducer RPM	Factory Part Number	Color of H-Fitting Label
UH3B060AC	PS1	SWT03072	0.55" W.C.	± 0.05"W.C.	1200-3600	D342606P04	Blue
	PS2	SWT02978	0.88"W.C.	0.81/0.61"W.C.	1500-4400	C342634P61	
	PS3	SWT02978	1.60" W.C.	1.57/1.31"W.C.	2300-5200	C342634P61	
DH3B060AC	PS1	SWT03069	0.55" W.C.	± 0.05"W.C.	1200-3600	D342606P01	Blue
	PS2	SWT02978	0.88"W.C.	0.81/0.61"W.C.	1500-4400	C342634P61	
	PS3	SWT02978	1.60" W.C.	1.57/1.31"W.C.	2300-5200	C342634P61	
UH3B080AC	PS1	SWT03073	0.76" W.C.	± 0.05"W.C.	1200-3600	D342606P05	White
	PS2	SWT02979	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P62	
	PS3	SWT02979	2.25" W.C.	2.28/1.93"W.C.	2300-5200	C342634P62	
DH3B080AC	PS1	SWT03070	0.76" W.C.	± 0.05"W.C.	1200-3600	D342606P02	Yellow
	PS2	SWT02979	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P62	
	PS3	SWT02979	2.25" W.C.	2.28/1.93"W.C.	2300-5200	C342634P62	
UH3B100AC	PS1	SWT03073	0.76" W.C.	± 0.05"W.C.	1200-3600	D342606P05	White
	PS2	SWT02979	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P62	
	PS3	SWT02979	2.25" W.C.	2.28/1.93"W.C.	2300-5200	C342634P62	
DH3B100AC	PS1	SWT03070	0.76" W.C.	± 0.05"W.C.	1200-3600	D342606P02	White
	PS2	SWT02979	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P62	
	PS3	SWT02979	2.25" W.C.	2.28/1.93"W.C.	2300-5200	C342634P62	
UH3B120AC	PS1	SWT03074	0.65" W.C.	± 0.05"W.C.	1200-3600	D342606P06	Yellow
	PS2	SWT02980	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P63	
	PS3	SWT02980	2.10" W.C.	2.12/1.79"W.C.	2300-5200	C342634P63	
DH3B120AC	PS1	SWT03071	0.65" W.C.	± 0.05"W.C.	1200-3600	D342606P03	Yellow
	PS2	SWT02980	1.25" W.C.	1.19/0.97"W.C.	1500-4400	C342634P63	
	PS3	SWT02980	2.10" W.C.	2.12/1.79"W.C.	2300-5200	C342634P63	

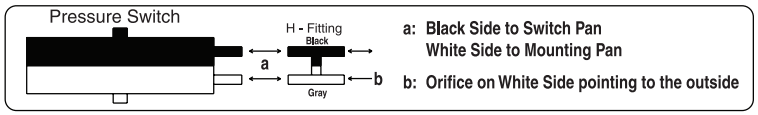
Note: The first stage pressure switch comes as an assembly with the H-Fitting connected to it.



*From drawing #D343192

Part No.	Honeywell Part No.	Orifice "A" +/-.005	Orifice "B" +/-.005	Label Color
D343192P01	50014119-001	.033	.032	White
D343192P02	50014119-002	.033	.035	Yellow
D343192P03	50014119-003	.033	.039	Blue

H-Fitting Label



Gas Furnace — Communicating Systems Trouble Shooting Checklist

Note: Alert, ERR, Codes will **only** be displayed at the thermostat when a call for heat is being sent by the thermostat. The Red LED will be ON at the thermostat. The Furnace IFC Status LED will be flashing fast; the Fault LED will be flashing a fault code.

Note: The * Alert number will not be displayed at the thermostat.

Comfort Control Alert	Fault LED	User Interface Display	Possible Causes
ERR 1	3 Flash	System Status- OFF Last 4 Faults- PS-1, 2, 3 Open or Closed	Pressure Switch, PS, # 1, 2 or 3 possible failure.
		PS-1 & 2 Open	Furnace Drain System stopped up.
		PS-1 & 2 Open	Inducer Motor Drive Board, or Inducer Motor.
		PS-1, 2 or 3 Open	Vent or Ventilation system problems.
ERR 4	8 Flash	System Status-OFF Last 4 Faults-Lo FLAME SNS	Flame Sensing Rod Coated, or failure. Burner not grounded good. Flame Sensing Rod position. Low Gas Pressure or IFC
ERR 10	6 Flash	System Status- OFF Last 4 Faults- IGNITOR Trica ERR	Ignitor Open or Wiring IFC failure
ERR 18	ON	System Status-OFF Last 4 Faults- CHECK CNTRL or CNTRL FAULT	IFC failure
ERR 22 Flame Detected Then lost	2 Flash	System Status-OFF Last Four Faults- RECYCLE LO RETRY LO	Low flame current, Flame Sensing Rod, Low gas pressure, Burner. The difference from ERR20 & ERR22 is Flame was detected and then lost with an ERR22.
ERR26	4 Flash	System Status-OFF AUX LIMIT or HIGH LIMIT	Dirty Filter, Blower motor Inoperative, wrong blower speed Duct Work Restrictions,
	9 Flash	System Status-OFF IND LIMIT	Furnace being over fired
	4 Flash	System Status-OFF AUX LIMIT LO HIGH LIMIT LO IND LIMIT LO	
ERR34	5 Flash	System Status-OFF FLAME ERROR	GAS Valve, IFC or Wiring
ERR87	4 Flash	System Status- OFF ROLLOUT OPEN ROLLOUT LO	Inducer Motor running slow, Vent or ventilation problem, Furnace being Over Fired.
ERR90	10 Flash	System Status-OFF SYS COMM CRC, or IND COMMM CRC, or BLW COMM CRC	Communications Errors EMI getting into control System, or wiring, or a control Component.
ERR93	ON	System Status-OFF EXT GV ERR INT GV ERR	Furnace wiring or jumper added Replace Furnace Control
ERR101	N.A.	System Status-?? Y1 OFF ERR Y1 ON ERR	Furnace IFC Furnace IFC

Gas Furnace — Communicating Systems Trouble Shooting Checklist

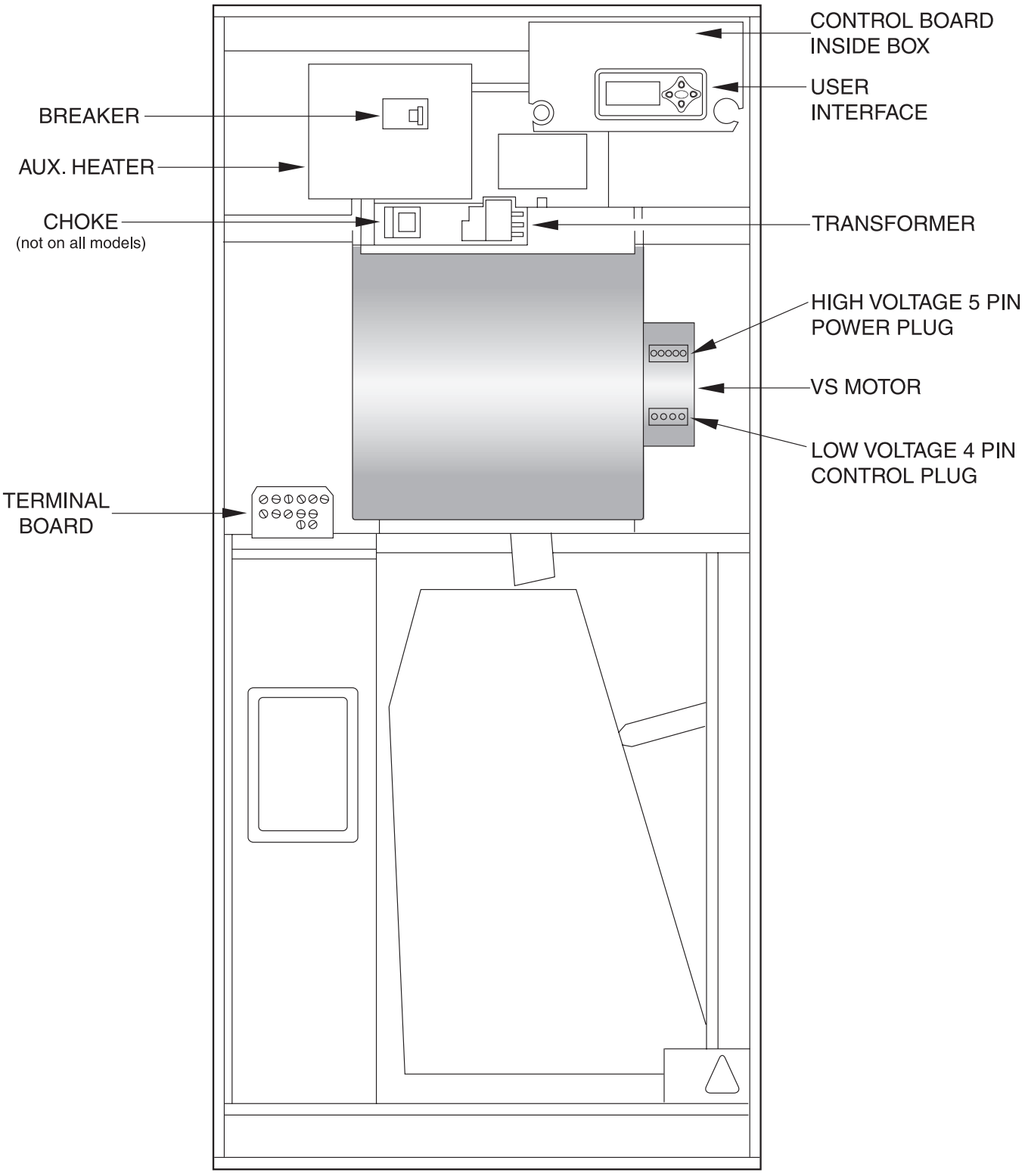
Alert Codes (continued)

Comfort Control Alert	Fault LED	User Interface Display	Possible Causes
	N.A.	TWIN ERROR Not approved for V.S. models	Twinning Fault
	2 Flash	System Status-OFF Last 4 Faults- RECYCLE RETRY	Ignitor position, Wiring, Furnace IFC, Gas Valve, No Gas, Flame Sensing Rod, Burner
	6 Flash	System Status-OFF POLARITY ERR	I20 VAC power wires reversed (White and Black wires reversed)
	N.A.	System Status-On Or OFF AC VOLTS LO AC VOLTS HI	High or Low Voltage being Supplied to the Furnace
	6 Flash	System Status-OFF GND FAULT	Furnace not Grounded
	10 Flash	System Status-OFF SYS COMM ERR NO SYS CLK BLW COMM ERR IND COMM ERR	Thermostat, Field wire Furnace IFC V.S. BLOWER Motor, Inducer Motor Drive Board
	N.A.	System Status-OFF CHECK FUSE	
	N.A.	System Status-?? DATA BAD OD CAP ERR	Repower IFC / replace PM Check thermostat set up for O D Unit size.

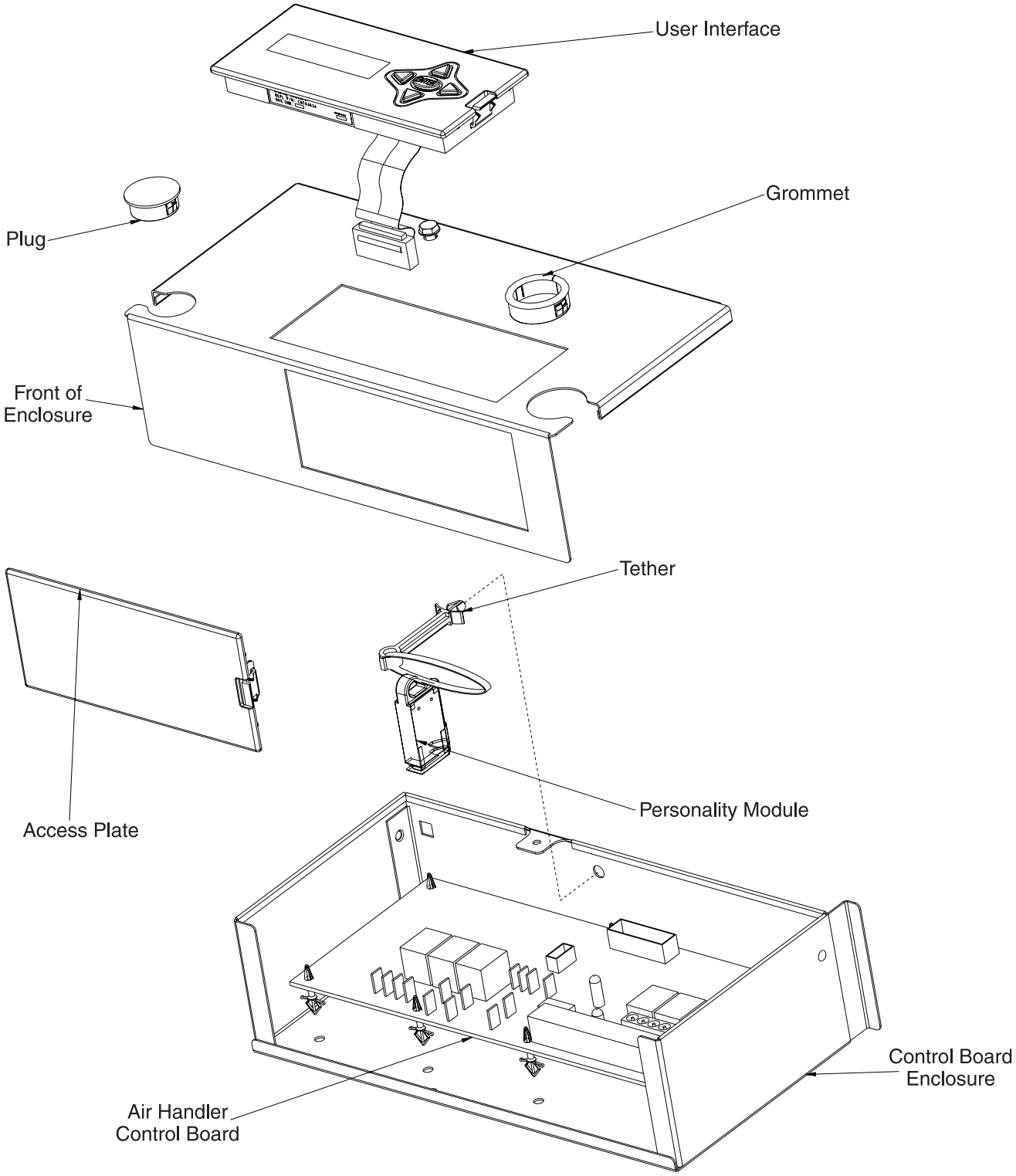
Gas Furnace — Alert Code Addendum

Alert Notification				Alert Code	Alert Group	Alert Description
Fault LED	COM LED	User Interface Display	Control Display			
2 Flash	Device count	RECYCLE	N/A	20	Flame lost or Ignition failure	Flame is off when flame should be detected. Furnace tries to relight itself.
		RETRY				Furnace tries to light, but no flame is detected.
		RECYCLE LO	ERR 22	22	Soft lockout due to flame lost or ignition retries	10 recycles within a single call for heat will cause 1 hr lockout.
		RETRY LO				3 ignition attempts in a row within a single call for heat results in 1 hr lockout.
3 Flash	Device count	PS3 OPEN	N/A	1	Pressure Switch Failure	Open Pressure Switch, third stage
		PS3 CLOSED				Shorted Pressure Switch, third stage
		PS2 OPEN				Open Pressure Switch, second stage
		PS2 CLOSED				Shorted Pressure Switch, second stage
		PS1 OPEN				Open Pressure Switch, first stage
		PS1 CLOSED				Shorted Pressure Switch, first stage
4 Flash	Device count	AUX LIMIT	ERR 26	26	High Temp Limit Fault	Open Reverse Flow - Heat exchanger temperature too high. Could be caused by low airflow or fan failure.
		HIGH LIMIT				Open High Limit- Heat exchanger temperature too high. Could be caused by low airflow or fan failure.
		ROLLOUT OPEN	ERR 87	87	Roll Out Fault	Open flame rollout
5 Flash	Device count	FLAME ERROR	ERR 34	34	Flame Detect Fault	Flame detected, should not be present.
6 Flash	Device count	POLARITY ERR	N/A	33	Line Polarity Fault	Voltage reverse polarity
		GND FAULT	N/A	88	Ground Fault	Occurs when proper earth ground is not detected.
		IGNITER ERR	ERR 10	10	Ignition Means Fault	Igniter fault
		TRIAC ERR				Triac Fault
7 Flash	Device count	EXT GV ERR	ERR 93	93	Gas Valve Fault	Control senses 24V present at the gas valve when it should not be present.
Solid ON		INT GV ERR				Control tried to turn on gas valve, but 24V not sensed.
						Control senses 24V present at the gas valve when it should not be present.
8 Flash	Device count	LO FLAME SNS	N/A	4	Low Flame Signal	Flame current is low, but still strong enough to allow operation.
9 Flash	Device count	IND LIMIT	ERR 26	26	High Temp Limit Fault	Flue gas temperature too high. Could be caused by low airflow or fan failure.
10 Flash	Fast Flash	SYS COMM CRC	N/A	90	Communication Busy Fault	Comm system unrecognized response
		IND COMM CRC				Inducer Motor unrecognized response
		BLW COMM CRC				Blower motor unrecognized response
		BLW COMM ERR	ERR 91	91	Communication Fault	Blower motor no Comm response①
		IND COMM ERR				Inducer motor no Comm response
		SYS COMM EER				Loss of heat/cool demand
		NO SYS CLK				Loss of clock signal
Solid ON	Device count	CNTRL FAULT	ERR 18	18	Control Failure	Internal control failure
None	Device count	TWIN ERROR	N/A	19	Twinning Fault	Twinning Not Allowed with Variable Speed
None	Device count	PM DATA ERR	N/A	114	Bad or Missing PM	Data Section is Corrupt but PM is useable
		CAP MISMATCH				Compressor size does not match capacity in PM
		ID MTR ERR	ERR 114			Blower HP/OEM does not match PM Data
		PM MISSING				No PM
		PM UNIT ERR	N/A			Primary Copy of Unit Data File is Corrupt.
		PM MEM ERROR	ERR 114			Primary and Secondary copies of Unit Data File are Corrupt
None	Device count	AC VOLTS LOW	N/A	59	AC Line Fault	Voltage too low
		AC VOLTS HIGH				Voltage too high
None	Device count	CHECK FUSE	N/A	92	Fuse	24V Fuse Open
None	Device count	Y1 OFF ERR	ERR 101	101	Y1 Relay Failure	Y1 Output OFF when it should be ON
		Y1 ON ERR				Y1 Output ON when it should be OFF
None	Device count	TS 1 SHORT	N/A	119	Temperature Sensor Failure	Temperature sensor 1 shorted.
		TS 1 OPEN				Temperature sensor 1 open.
		TS 2 SHORT				Temperature sensor 2 shorted.
		TS 2 OPEN				Temperature sensor 2 open
Notes:	① Comfort Control will switch system to "OFF" until this fault condition clears.					

Communicating Air Handler

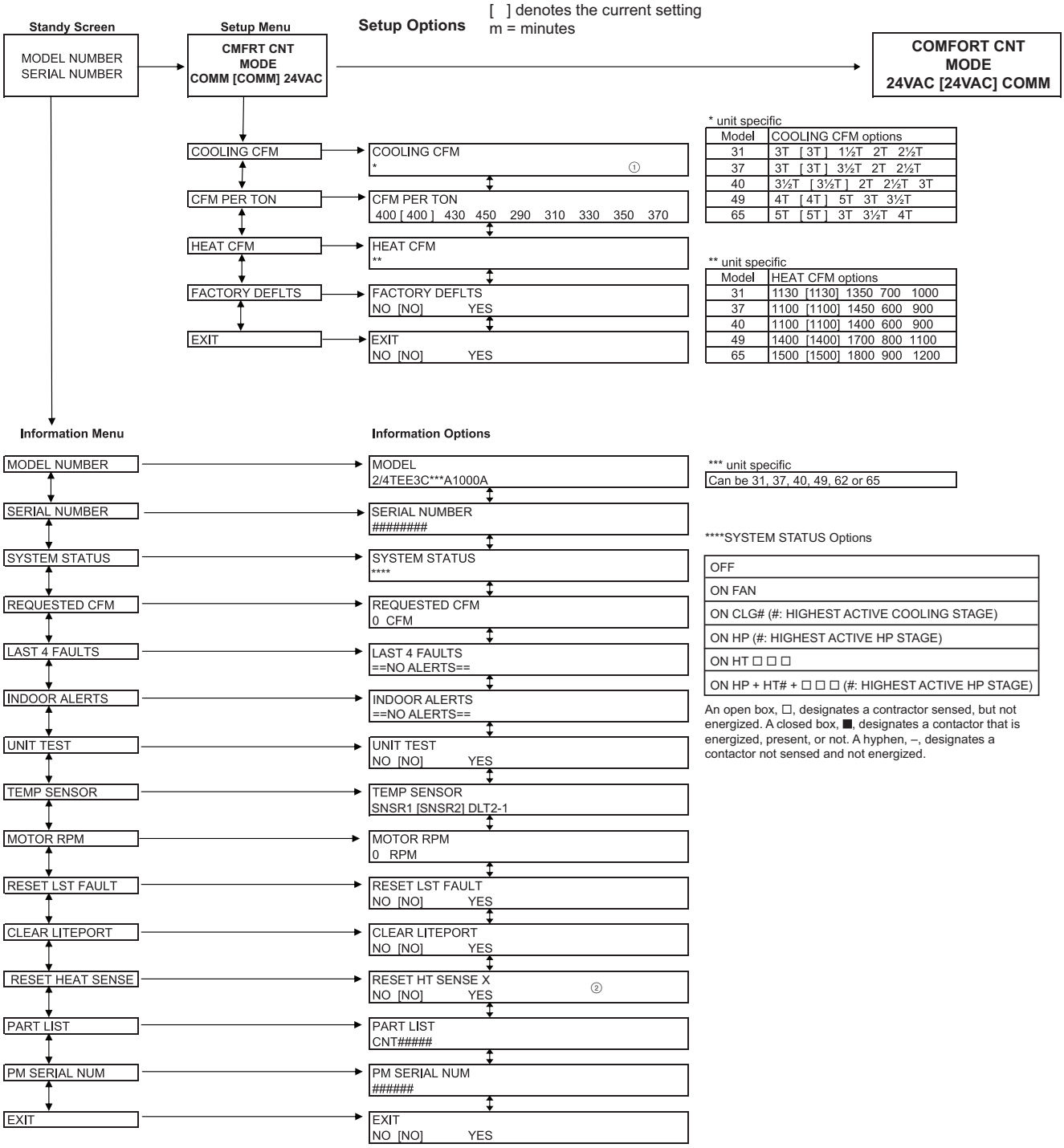


Communicating Air Handler



Communicating Mode Drawing

Communicating Mode



* unit specific

Model	COOLING CFM options
31	3T [3T] 1½T 2T 2½T
37	3T [3T] 3½T 2T 2½T
40	3½T [3½T] 2T 2½T 3T
49	4T [4T] 5T 3T 3½T
65	5T [5T] 3T 3½T 4T

** unit specific

Model	HEAT CFM options
31	1130 [1130] 1350 700 1000
37	1100 [1100] 1450 600 900
40	1100 [1100] 1400 600 900
49	1400 [1400] 1700 800 1100
65	1500 [1500] 1800 900 1200

*** unit specific

Can be 31, 37, 40, 49, 62 or 65

****SYSTEM STATUS Options

OFF
ON FAN
ON CLG# (#: HIGHEST ACTIVE COOLING STAGE)
ON HP (#: HIGHEST ACTIVE HP STAGE)
ON HT □ □ □
ON HP + HT# + □ □ □ (#: HIGHEST ACTIVE HP STAGE)

An open box, □, designates a contractor sensed, but not energized. A closed box, ■, designates a contactor that is energized, present, or not. A hyphen, –, designates a contactor not sensed and not energized.

Notes:
① Shown only when Outdoor Communicating Unit is not detected.
② X indicates actual number of heat banks detected under reset menu.

Communicating Mode Drawing

24 Volt Mode

(continued)

CMFRT CNT
MODE
24VAC [24VAC] COMM

[ ] denotes the current setting
m = minutes

24V Mode Setup Menu	Setup Options
COOLING CFM	COOLING CFM *
CFM PER TON	CFM PER TON 400 [400] 430 450 290 310 330 350 370
CLG STAGES	CLG STAGES STG 1 [STG 1] STG 2
CLG 1ST STG CFM③	CLG 1ST STG CFM **
CONT FAN CFM	CONT FAN CFM 50% [50%] 75% 100% 25%
FAN PRERUN DLY	FAN PRERUN DLY NONE [NONE] 1m50%
FAN SHRTRUN DLY	FAN SHRTRUN DLY NONE [NONE] 4m80% 7½m80%
FAN OFF DELAY	FAN OFF DLY 1½m100% [1½m100%] NONE 1m50% 2m50% 3m50%
HEAT CFM	HEAT CFM ***
FACTORY DEFLTS	FACTORY DEFLTS NO [NO] YES
EXIT	EXIT NO [NO] YES

③ CLG 1ST STG CFM menu will not appear if STG1 is selected in CLG stages menu.

* unit specific

Model	COOLING CFM options
31	3T [3T] 1½T 2T 2½T
37	3T [3T] 3½T 2T 2½T
40	3½T [3½T] 2T 2½T 3T
49	4T [4T] 5T 3T 3½T
65	5T [5T] 3T 3½T 4T

** unit specific

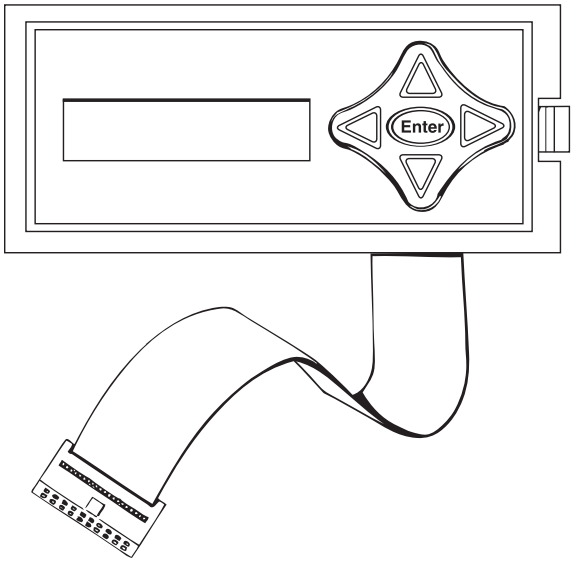
Model	CLG 1ST STG CFM options
31	50% [50%] 55% 65% 80%
37	50% [50%] 55% 65% 80%
40	55% [55%] 65% 80% 50%
49	55% [55%] 65% 80% 50%
65	60% [60%] 65% 80% 50%

*** unit specific

Model	HEAT CFM options
31	1130 [1130] 1350 700 1000
37	1100 [1100] 1450 600 900
40	1100 [1100] 1400 600 900
49	1400 [1400] 1700 800 1100
65	1500 [1500] 1800 900 1200

Communicating Air Handler

Air Handler Interface Display Assembly



The indoor USER Interface Display Assembly will display the model and serial number, and the following information can also be displayed:

- The Unit Model & Serial Number (Normal Display)
- System Status - Mode of Operation; Heating, Cooling, Fan or OFF.
- Requested Airflow (CFM) when the thermostat is calling
- Indoor Unit's Alert Codes
- Unit Test Cycle
- Blower Motor Speed (RPM) when operating
- Last Four Alerts
- Replacement Part List
- Personality Module Serial Number
- Stand alone operation, with a 24 Volt thermostat
- Exit

24VAC Fuse

The on-board 24VAC automotive type fuse is in series with the 24 Volt A.C. terminal R. The fuse will protect against short circuit conditions external to the control. If the fuse opens, the control remains powered and will turn on its Fault LED. If the system is running, it will shut down all operation.

An air handler's auxiliary heat will turn off at once. There will be a several second delay before the indoor blower is shut down. The User Interface Assembly will display **CHECK FUSE**.

The air handler can operate using the Communicating System or with 24VAC thermostat inputs. The air handler control will default to the communicating system operation on initial power-up, and will ignore any 24VAC input signals while in that state. The control mode can be changed to 24VAC at the User Interface. The control will operate the indoor blower motor and electric heat contactors.

LVTB	Function	P1 and AH Control
R	24VAC Power	(Pin 9)
B	24VAC Common	(Pin 10)
D	Data Line (Comfort Controls System Only)	(Pin 8)
W/W1 Input	1st Stage Heating (AUX)	(Pin 6)
W2 Input	2nd Stage Heating (AUX)	(Pin 5)
W3 Input	3rd Stage Heating (AUX)	(Pin 4)
Y1 Input	1st Stage Compressor	(Pin 11)
Y2 Input	2nd Stage Compressor	(Pin 12)
G Input	Continuous Fan/Blower	(Pin 7)
O Input	Heat Pump Cooling	(Pin 13)
BK Input	Humidistat Option/PWM Input	(Pin 3)
DA-1	Discharge Air Sensor Input (–)	(Pin 1) Future
DA-2	Discharge Air Sensor Input (+)	(Pin 2) Future

Air Temperature Inputs (Future)

Return Air Sensor input: Thermistor input which measures the temperature of the air as it enters the Air Handler.

Discharge Air Sensor input: Thermistor input which measures the temperature of the air as it exits the Air Handler.

Serial Port Variable Speed Motor

A 4-wire harness enables communication between the serial port variable speed blower and the air handler control board.

VS – Com Plug

Pin 1	12VDC	Power
Pin 2	RX	Motor to Control Data Line
Pin 3		Common
Pin 4	TX	Control to Motor Data Line

See page 42 for location of VS-COM plug.

Air Handler: Sequence of Operation

Electric Heater Terminals

A 4-wire harness provides 24V output to the electric heater contactors.

Pin 1 1st stage electric heat
Pin 2 2nd stage electric heat
Pin 3 3rd stage electric heat
Pin 4 Common

Humidifier Terminals - (HUM)

A set of N.O. contacts (¼" QC male terminals) will close for operation of a humidifier when the control is in heating mode and the blower is operating.

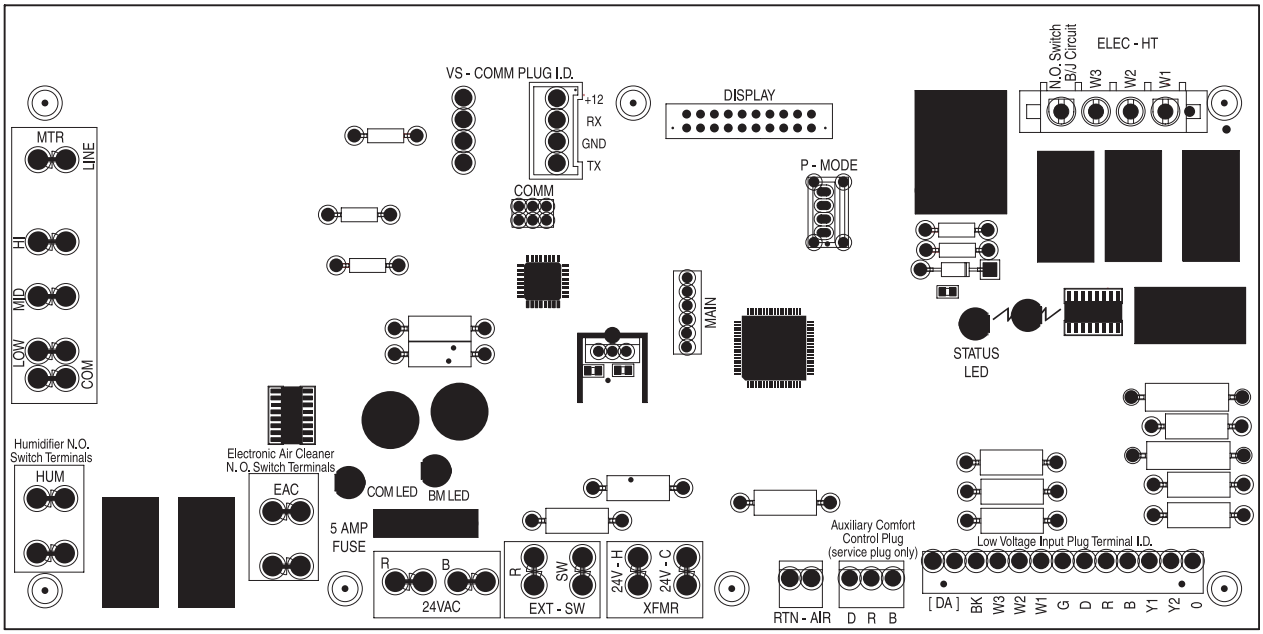
24V to 240VAC operation, 1 amp max.

Electronic Air Cleaner Terminals (EAC)

A set of N.O. contacts (¼" QC male terminals) will close for operation of the air cleaner anytime the blower is operating.

24V to 240VAC operation, 1 amp max.

Air Handler Control Board



= Indicates a male spade terminal RTN = Return air sensor plug DA = Discharge air sensor plug terminals BK= PWM blower speed terminal

Status LED

The Status LED will turn on solid at power-up during the initialization sequence.

Slow Flash = No call.

Fast Flash = Call for heat, cool or fan only.

On: Open Fuse or control faults

Bit Master (BM) LED

BM / Clock Signal LED Green
LED on when AHC Clock is working.

COM LED

Communication (COM) LED Amber
LED ON when first powered up
LED Flashes the number of communicating components in the system
(ex. communicating stat and furnace will equal two flashes)

Fault LED

Refer to page 46.

Air Handler: Sequence of Operation – Communicating Mode

Continuous Fan

Note: CONTINUOUS fan mode during COOLING operation may not be appropriate in humid climates. If the indoor air exceeds 60% relative humidity or simply feels uncomfortably humid, it is recommended that the fan only be used in the AUTO mode.

When a request is received without a Heat/Cool Demand, the air handler control (AHC) will energize the blower at the speed for Continuous Fan operation. When the request is removed, the AHC will turn off the blower immediately.

Proprietary Humidity Control - When enabled, this feature will disable any blower off delays and disable continuous fan mode when the indoor humidity is above the dehumidification setpoint. This will help prevent coil condensation from being evaporated back into the air stream.

Note: This feature, ISU 0388, is not shown unless some form of dehumidification control is selected.

Call for Cooling

(Non-communicating outdoor unit – A/C Only)
When a request for cooling is received, the AHC will energize the blower and the Y1 relay to activate the outdoor unit contactor. When the request to terminate Cooling is received, the Y1 relay will be turned off and the blower will be de-energized once any user selected fan-off delays have expired.

Note: In Communicating Mode, the Air Handler will not operate a non-communicating Heat Pump.

(Communicating outdoor unit A/C or Heat Pump)
When the request for cooling is received the AHC will energize the blower. When the request to terminate cooling is received, the blower will be de-energized once any user selected fan-off delays have expired. The Charge Assist™ Control in the outdoor unit will control the sequence of the compressor(s) and the outdoor fan speed.

Call for 2nd Stage Cooling

(Communicating A/C or Heat Pump)
When request for 2nd Stage Cooling is received the AHC will change the blower speed to 2nd stage airflow. When the request to terminate 2nd Stage Cooling is received, the blower will return to 1st stage airflow.

Heating

(Electric Heat Only)
When the request for heat is received, the AHC will energize the blower and heating contactors. The number of heating stages needed is determined by the Comfort Control. If a blower request for a higher airflow is received, the AHC will energize the blower at the higher airflow. When the request to terminate heat is received, the AHC will turn off the heat contactors and the blower will be de-energized.

Heat Pump Only Applications

(Communicating Heat Pump)
When the request for mechanical heat is received, the AHC shall energize the blower. When the request for mechanical heat is terminated, the AHC will de-energize the blower once any user selected fan-off delays have expired.

Note: In Communicating Mode, the Air Handler will not operate a non-communicating Heat Pump.

Heat Pump & Electric Heat Applications

(Communicating Heat Pump)
When the request for electric and mechanical heat is received, the AHC will energize the blower at auxiliary heat airflow and turn on the electric heat contactors. The number of heating contactors (stages of electric heat installed and available) is determined by the Comfort Control. If a blower request for a higher airflow is received, the AHC will energize the blower at the higher airflow. When the request to terminate electric heat is received, the AHC will turn off the corresponding heater outputs. If the mechanical heat demand remains, the AHC will keep blower energized at mechanical heat airflow. When the request to terminate mechanical heat is received, the AHC will de-energize the blower once any user selected fan-off delays have expired.

Heat Pump & Electric Heat Applications

(Non-communicating Heat Pump)
Operation of the AHC in ComfortLink™ II with a non-communicating Heat Pump is not allowed.

Air Handler: Sequence of Operation – 24V Mode

Continuous Fan

When only the G is energized, the control will energize the blower for fan only operation. When the G input turns off, the control turns off the blower immediately.

Cooling Operation

- When the air handler receives Y1 or Y1 & Y2 demands, the 1st or 2nd stage blower will be selected depending on the Y1 & Y2 input combinations. The number of cooling stages can be selected via the User Interface. The air handler is shipped for single stage operation.
- When only one stage of Cooling is selected, the indoor blower speed will default to Cooling HI fan speed.
- When two stages of Cooling are selected, the 1st stage CFM can be selected via the User Interface Assembly. In addition, the control will ignore Y2 when Y1 is not present.
- If one stage of Cooling is selected, Y2 input will be ignored by the air handler control.
- The Cool-On-Delay (selectable) will begin when both Y1 & G are present. When the Y1 & G inputs are removed, the blower will turn off after the Cool-Off-Delay (selectable) has timed out.

Note: The O input must be present for cooling mode to allow blower speed changes for dehumidification, i.e. Fan Pre-Run and Short-Run.

Blower Operation vs. Y1 & Y2 Inputs - A/C & Heat Pumps (table 2)

Y2	Y1	Single-Stage	2-Stage
0V	0V	OFF	OFF
0V	24V	HI	LO
24V	0V	OFF	OFF
24V	24V	HI	HI

Heating Operation

- The Air Handler control will operate blower for Heat Pump stages (Mechanical Heating) the same as in cooling mode. (Reference table 2 above).
- If W1, W2 or W3 (without Y1, Y2 or G) signals are present, the control will turn on the blower even if the G signal is not present. The control will energize the blower in the heating speed.
- There is no blower On or Off Delays in Electric Heat mode; the Cooling Off Delay only applies after the Heat Pump (Mechanical Heat) turns off.
- If more than one stage of Electric Heat demand is called, the Heat calls, W1, W2 and W3 will be energized at least 0.5 seconds apart.

Electric Heat Only Sequence – 24VAC Input

- When the W1 and G are present, the control will energize the 1st heater contactor and blower at the heating speed selected via the User Interface. (G is not required)
- When W2 is present, the control will energize the 2nd stage heater contactor.
- When W3 is present, the control will energize the 3rd stage heater contactors.
- When W1, W2 or W3 is removed, the corresponding contactor will de-energize.
- When the G input is removed, the control will turn off the blower immediately (no Heat-Off-Delay). (G is not required)

Heat Pump Only Sequence – 24VAC Input

- When Y1 and G are present, the compressor will be energized along with the blower on high speed in single-stage operation or low speed in two-stage operation.
- When Y1 and Y2 are present, the 2nd stage compressor (in two-stage equipment) will energize and the blower will go to high speed (Air handler must be set for 2 stage operation).
- When Y2 and Y1 inputs are removed, the 2nd stage compressor will turn off. When G is removed, the blower will turn off after the Heat-Off-Delay (selectable) has timed out.

Air Handler: Sequence of Operation – 24V Mode

Heat Pump with Electric Heat Sequence – 24VAC Inputs

- When Y1 and G are present, the compressor will energize along with the blower on high speed in single-stage operation or low speed in two-stage operation.
- When Y1 and Y2 are present, the 2nd stage compressor (in two-stage equipment) will energize and the blower will go to high speed.
- When any combination W1, W2, and W3 are present the air handler control will energize appropriate heater contactor.
- If the cooling CFM is lower than the selected heating CFM, the motor will run in the heating speed (Air handler will select highest CFM).
- When any W input is removed, the corresponding Heat output will be de-energized.
- When Y1 and Y2 inputs are removed, the 2nd stage compressor will turn off. When G is removed, the blower will turn off after the Heat-Off-Delay (selectable) has timed out.

Air Handler: Unit Test Mode

The Comfort Control should be switched to "OFF" before entering the Unit Test Mode via the User Interface. The Test mode operates the same in Communicating Mode and 24 Volt Mode.

Note: Unit will exit Test Mode if any one of the following conditions exists:

- **If Air Handler receives a request for operation from the Comfort Control.**
  - **This includes Heating, Cooling or Blower requests.**
- **If a fault is detected during any phase of Test Mode (except 123).**
- **If any button on the User Interface is pressed.**

To access the Unit Test Mode scroll down through the User Interface Information Menu until you see the Unit Test option. Press ENTER. When prompted select YES and press ENTER. When the User Interface displays ARE YOU SURE? Select YES and press ENTER to begin the Unit Test.

The Unit Test will perform the following steps without delays:

(User Interface displays UNIT TEST – BLWR)
- Start Blower at 50% airflow for 10 seconds
- Go to 100% airflow for 10 seconds

(User Interface displays UNIT TEST – COOL)
- Energize Y1 relay for 15 seconds with 100% airflow
- De-energize Y1 relay and go to Electric Heat airflow

(User Interface displays UNIT TEST – HEAT)
- Energize blower interlock and stage 1 heat relay
- After 1 second energize stage 2 heat relay
- After 1 more second energize stage 3 heat relay
- After 5 seconds de-energize blower interlock, stage 1, 2 & 3 heat relays

(User Interface displays UNIT TEST – EXIT)
- Displayed for three seconds

Note: Airflow is default or programmed selections

Air Handler: LED Fault Code

Fault LED

The Fault LED will be turned on at power-up and will remain on for a short time period and then turned off.

When no faults are present, the Fault LED will blink once every 20 seconds. This blink is a data output, not field usable.

When a fault has been detected, the control will flash the Fault LED for a specified number of times to indicate the nature of the fault.

The last four faults will be available for display at any time via the User Interface.

The stored Fault Codes can be cleared using the User Interface.

Alert Notification				Alert Code	Alert Group	Alert Description
Fault LED	COMM LED	User Interface Display	Comfort Control Display			
Solid ON ‡	N/A	CNTRL FAULT †	ERR 18	18	Control Failure	Internal Control Error
Solid ON ‡	N/A	CHECK FUSE †	N/A +	92	Fuse Failure	24V Fuse Open Error
1 Flash *	N/A	EXT SW OPEN *	ERR 106 *	106	External Shutdown Fault	External Shutdown Input Open Error
2 Flash	N/A	PM MEM ERR	ERR 114	114	PM Bad or Missing Fault	PM Data Corrupt Error
		PM MISSING				PM Missing Error
		ID MTR ERR				Motor Mismatch Error
		PM UNIT ERR	N/A			PM Unit Data Error
		CAP MISMATCH				Compressor Capacity Mismatch Error
		PM DATA ERR				PM Data Section Error
3 Flash **	Fast Flash	NO SYS CLK	ERR 91	91	Communication Inactive Fault	COMM Bit Master Clock Error
		SYS COMM ERR				COMM Heat/Cool Demand Error
3 Flash	N/A	BLW COMM ERR				Serial Motor Communication Inactive Error①
3 Flash **	Fast Flash	SYS COMM CRC	N/A	90	Communication Busy Fault	COMM System Busy Error
3 Flash	N/A	BLW COMM CRC				Serial Motor Communication Busy Error
4 Flash	N/A	HT+LK ON ERR	ERR 105	105	Heater Interlock Relay Fault	Both Interlock Relay & Heater Relay Stuck Closed Error
		INTLK ON ERR				Interlock Relay Stuck Closed Error
		NTLK OFF ERR				Interlock Relay Stuck Open Error
4 Flash	N/A	HT ON ERR	ERR 104	104	Heater Relay Fault	Heater Relay Stuck Closed Error
		HT OFF ERR				Heater Relay Stuck Open Error
5 Flash *	N/A	DAS RNG ERR *	ERR 118 *	118	Discharge Air Temperature Fault	Discharge Air Temperature Range Error
		DAS UL ERR *				Discharge Air Temperature Upper Limit Error
		DAS LL ERR *				Discharge Air Temperature Lower Limit Error
5 Flash *	N/A	DAS SHORT *	N/A	52	Discharge Air Sensor Fault	Discharge Air Sensor Short Error
		DAS OPEN *				Discharge Air Sensor Open Error
6 Flash *	N/A	RAS RNG ERR *	N/A	117	Return Air Temperature Fault	Return Air Temperature Range Error
6 Flash *	N/A	RAS SHORT *	N/A	110	Return Air Sensor Fault	Return Air Sensor Short Error
		RAS OPEN *				Return Air Sensor Open Error
7 Flash	N/A	Y1 ON ERR	ERR 101	101	Y1 Relay Fault	Y1 Relay Stuck Closed Error
		Y1 OFF ERR				Y1 Relay Stuck Open Error
8 Flash	N/A	TWIN ERROR	N/A	19	Twinning Fault	Air Handler Twinning Error
9 Flash	N/A	DEMAND ERR *	N/A	123	Demand Configuration	Heat/Cool Demand Conflict Error
		HT CFG ERR				Electric Heat Configuration Error

Notes

† If Air Handler processor is reset or fuse is open, COMM Alert cannot be reported; if the processor is reset the User Interface will not be updated

* Alert flash code will not be implemented for initial release

** COMM communication errors may also be flashed on Fault LED

‡ LitePort™ transmissions will be allowed during ON flash codes

\+ Fuse alert notification level would show on Comfort Control, but when fuse is open the COMM bus has no power

① Comfort Control will switch to "OFF" until this fault condition clears

Air Handler: Communicating Systems Trouble Shooting Checklist

Comfort Control Alert	Fault LED	COMM LED	User Interface Display	Possible Causes
ERR 18	Solid ON‡	N/A	CONTROL FAULT†	Cycle power- A/H control
NO DISPLAY	Solid ON‡	N/A	CHECK FUSE†	24 Volt fuse on A/H control. A SYS COMM ERR will also be displayed as one of the last four faults.
ERR 91	3 Flash** 3 Flash	Fast Flash N/A	NO SYS CLK SYS COMM ERR BLW COMM ERR	A/H control- see Trouble Shooting Procedure # 91 (TS # 91)
ERR # Not Displayed	3 Flash**	Fast Flash	SYS COMM CRC	Field Thermostat Wiring- see TS # 91
ERR # Not Displayed	3 Flash	N/A	BLW COMM CRC	Check Indoor Blower Low Voltage Cable- check Indoor Blower Motor
ERR 101	7 Flash	N/A	Y1 ON ERR Y1 OFF ERR	A/H control Y1 relay failure Replace A/H control
ERR 104	4 Flash	N/A	HT ON ERR HT OFF ERR	Check W1, W2, W3 for 24VAC call. No 24VAC call, replace A/H control Check Electric Heat Plug on A/H control. No 24VAC, replace A/H control
ERR 105	4 Flash	N/A	HT + LK ON ERR INTLK ON ERR INTLK OFF ERR	Replace A/H control
ERR 106*	1 Flash*	N/A	EXT SW OPEN*	Check Field Wiring, Safety Interlock Float Switch
ERR 114	2 Flash*	N/A	PM MEM ERR PM MISSING ID MTR ERR	Cycle power- if fault does not clear, replace PM Put PM in A/H Control Cycle power- check for correct ID Blower Motor H.P.
ERR # Not Displayed	2 Flash*	N/A	PM UNIT ERR CAP MISMATCH PM DATA ERR	Cycle power- replace PM Cycle power- outdoor unit must match the size of ID unit. Replace outdoor unit's PM Cycle power- replace A/H PM
ERR 118*	5 Flash*	N/A	DAS RNG ERR* DAS UL ERR* DAS LL ERR*	Check Discharge Air Sensor Discharge air temperature too high- check indoor air flow Discharge air temperature too low- check indoor air flow
ERR # Not Displayed	5 Flash*	N/A	DAS SHORT* DAS OPEN*	Discharge Air Sensor
ERR # Not Displayed	6 Flash*	N/A	RAS RNG ERR*	Check Return Air Sensor
ERR # Not Displayed	6 Flash*	N/A	RAS SHORT* RAS OPEN*	Check Return Air Sensor
ERR # Not Displayed	8 Flash	N/A	TWIN ERROR	2 A/H detected on the same buss., NO operation permitted
ERR # Not Displayed	9 Flash	N/A	DEMAND ERR* HT CFG ERR	More stages of Auxiliary Heat wired up than control system can control

Notes:

† If Air Handler processor is reset or fuse is open, COMM Alert cannot be reported; if the processor is reset the User Interface will not be updated.

* Alert flash code will not be implemented for initial release.

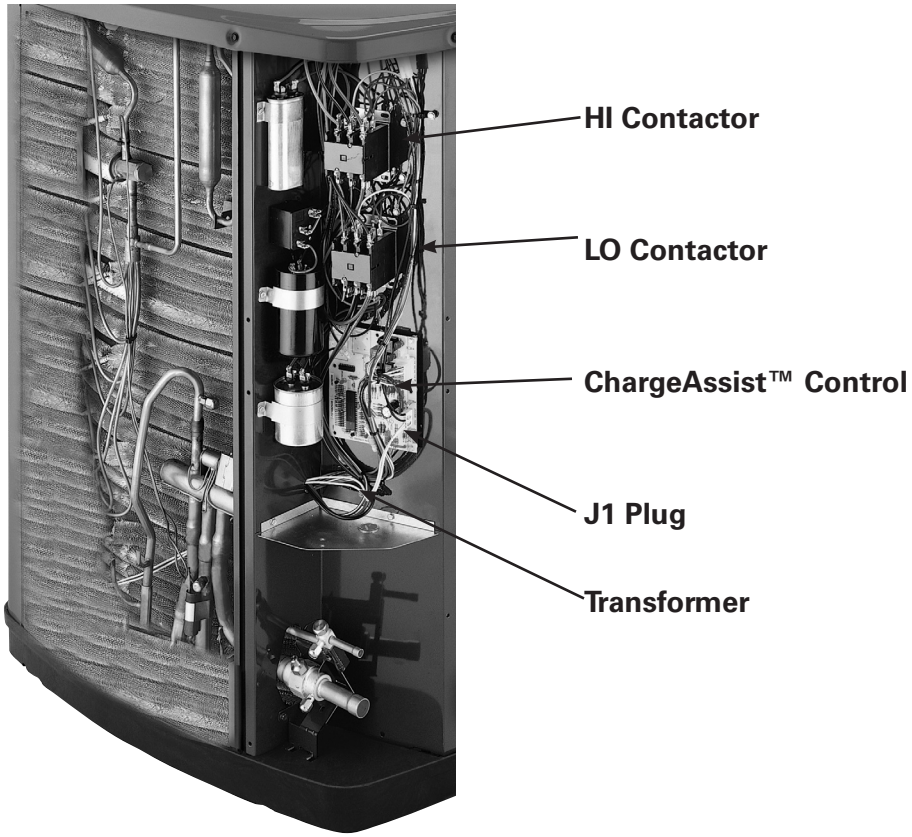
** COMM communication errors may also be flashed on Fault LED.

‡ LitePort™ transmissions will be allowed during ON flash codes.

\+ Fuse alert notification level would show on Comfort Control, but when Fuse is open the COMM bus has no power.

A/H	Air Handler
TS	Trouble Shooting Procedure Number
PM	Personality Module
ID	Indoor
SYS	System
BLW	Indoor Blower Motor
COMM	Communication
CRC	Circuit
HT	Heater
LK	Interlock
INTLK	Interlock
EXT	External
SW	Switch
MTR	Motor
CAP	Compressor Capacity
DAS	Discharge Air Sensor
RAS	Return Air Sensor

Two Compressor Outdoor Units



Features and Benefits

- Efficiency
- 2 Wire Control System with Alert Signaling with Communication System
- Refrigerant System Efficiency Monitored
- Charge Assist
- Single Side Service
- Ten Year Warranty on All Parts
- Variable Speed Outdoor Fan Motor
- Compressor Sound Shields
- Unit can be controlled with a Standard 24VAC Volt Thermostat

Charge Assist™ Control

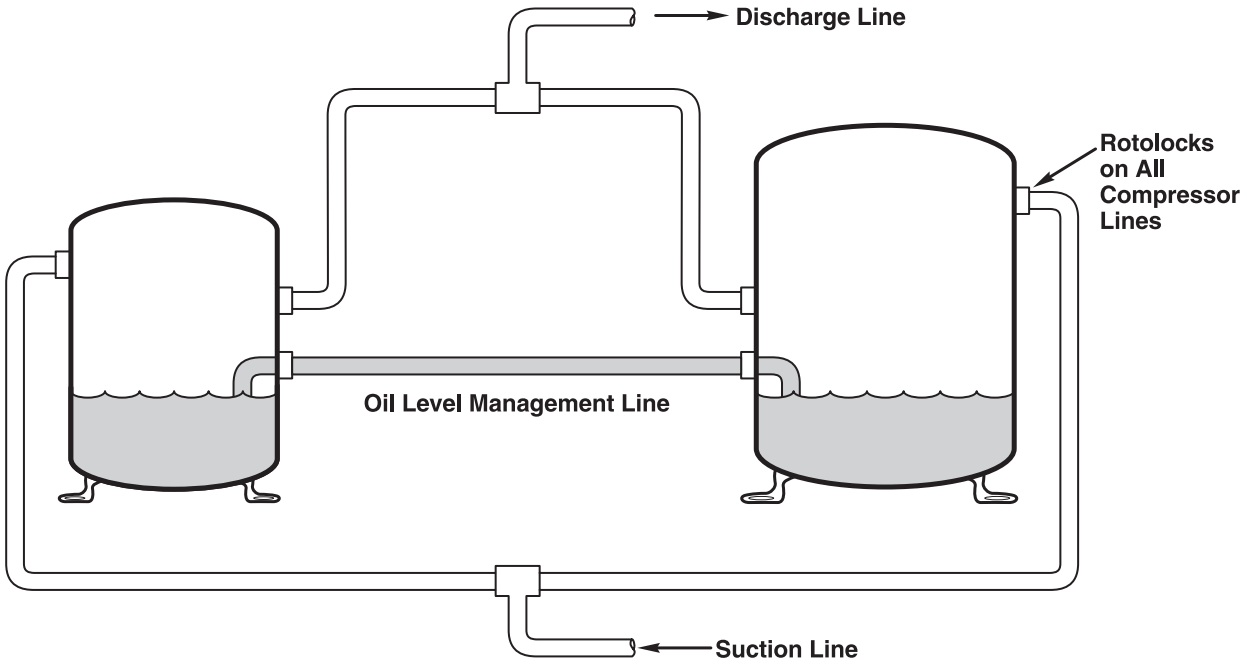
The Outdoor unit's Charge Assist™ Control Board is located in the outdoor unit. The Charge Assist™ Control sequences the two compressors one at a time, provides compressor time delays, does fault diagnostics, and when the Charge Assist™ cycle is entered by the service technician the Charge Assist™ Control can determines if the refrigerant system is correctly charged, under charged or over charged. If the outdoor unit is a heat pump the Charge Assist™ Control is also the defrost control.

Internal Refrigerant Piping

These series of two compressor units have several additions items added to the air conditioning condenser refrigerant circuit. These additions make possible the use of two compressors in a single refrigerant system. For the technician, an understanding of these additional items is needed when normal service is performed.

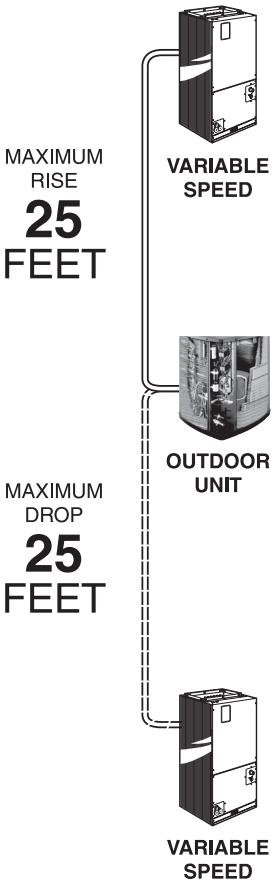
The two compressors are joined by an oil level management tube which ensures a correct oil level in both compressors. As the oil circulates with the refrigerant, it must be returned to the compressor in operation in order to both cool and lubricate it. Since the smaller or first stage compressor operates more frequently, the oil will be used more often in its system. The larger compressor works less often and therefore the oil level must be monitored to see that an adequate supply is always available for its use.

The oil level management tube is connected on both ends by Rotolock fittings to the two compressors, in the same way the suction and discharge lines are connected. The same care must be used in tightening these Rotolocks as the original ones. When changing a compressor, raise the oil line up to prevent oil loss from the good compressor.



Outdoor Units: Refrigerant Pipe Sizing

- Pipe sizing is also straight forward.
- 2.5 ton, 3 ton units use 3/8 inch liquid lines and 7/8 inch vapor or gas lines.
- Four and five ton units use 3/8 inch liquid lines and 1-1/8 inch vapor or gas lines.
- Above sizes are used for both cooling and heat pump models.



Ductwork

Size ductwork carefully!

1st and 2nd stage airflow: Pay special attention to register selection that supplies the best airflow and quiet operation.

Indoor section is a variable speed furnace or air handler.

Low Ambient Cooling

Systems are manufactured to 50°F outdoor temperature and with an Evaporator Defrost Control (EDC) to 30°F outdoor temperature.

Two Compressor Manual Charging Instructions

It is recommended installing only ARI rated indoor and outdoor systems.

All dual compressor split systems models are ARI rated with only TXV indoor systems. The benefit of installing approved indoor and outdoor split systems are maximum efficiency, optimum performance and the best overall system reliability.

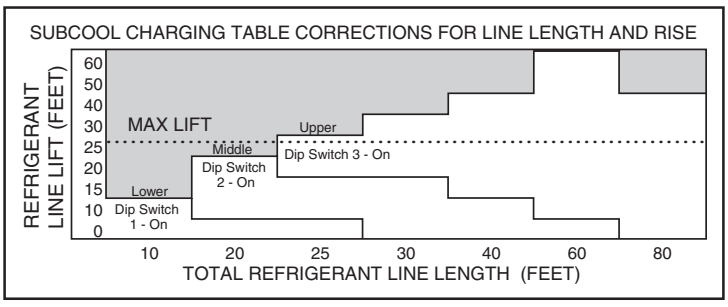
The following charging method is therefore prescribed for systems with an indoor TXV:

1. Subcooling (in the cooling mode) is the only recommended manual method of charging above 55°F ambient temperatures, and below 100°F. When the ambient temperature is above 100°F, charge the system to 10°F of subcooling at the liquid line just passed the service valve. It is important to return and check the system charge when the outdoor temperature is between 55°F and 100°F to verify the system charge.
2. For best results the indoor temperature should be kept between 70°F to 80°F. Add system heat if needed.
3. At startup, or whenever charge is removed or added, the system must be operated for a minimum of twenty (20) minutes to stabilize before accurate measurements can be made.
4. Determine the total refrigerant line length, and height (lift) if the indoor section is above the condenser. Turn on one (1) Dip switch on the Charge Assist™ board to the ON position as indicated in the Correction Table to the Lower, Middle or Upper ON position. (Turn on only one switch on the Charge Assist™ board. A Dip Switch does not have to be turned on for the manual charging method.)
5. Turn the indoor thermostat down to a low setting to insure the system will operate at second stage operation during this charging procedure. Indoor blower should automatically go to second stage cooling air flow.
6. Measure the Liquid Line Temperature and Refrigerant Pressure at the Liquid LINE Service Valve
7. The R-22 Refrigerant charging charts are for the listed models ONLY. These charts are on pages 52, 53, 54, and 55. Locate your liquid line temperature in the left column of the R-22 Refrigerant Charging Chart, and the intersecting liquid line pressure under the lower, middle or upper column. The correct column was determined in step #4. Add refrigerant to raise the pressure to match the table, or remove refrigerant to lower the pressure. Again, wait twenty (20) minutes for the system conditions to stabilize before adjusting the charge again.
8. When the system is correctly charged, you can refer to the System Pressure Curves in the unit's Service Facts to verify typical performance.
9. Return the indoor thermostat to the customer original set point.

Example:

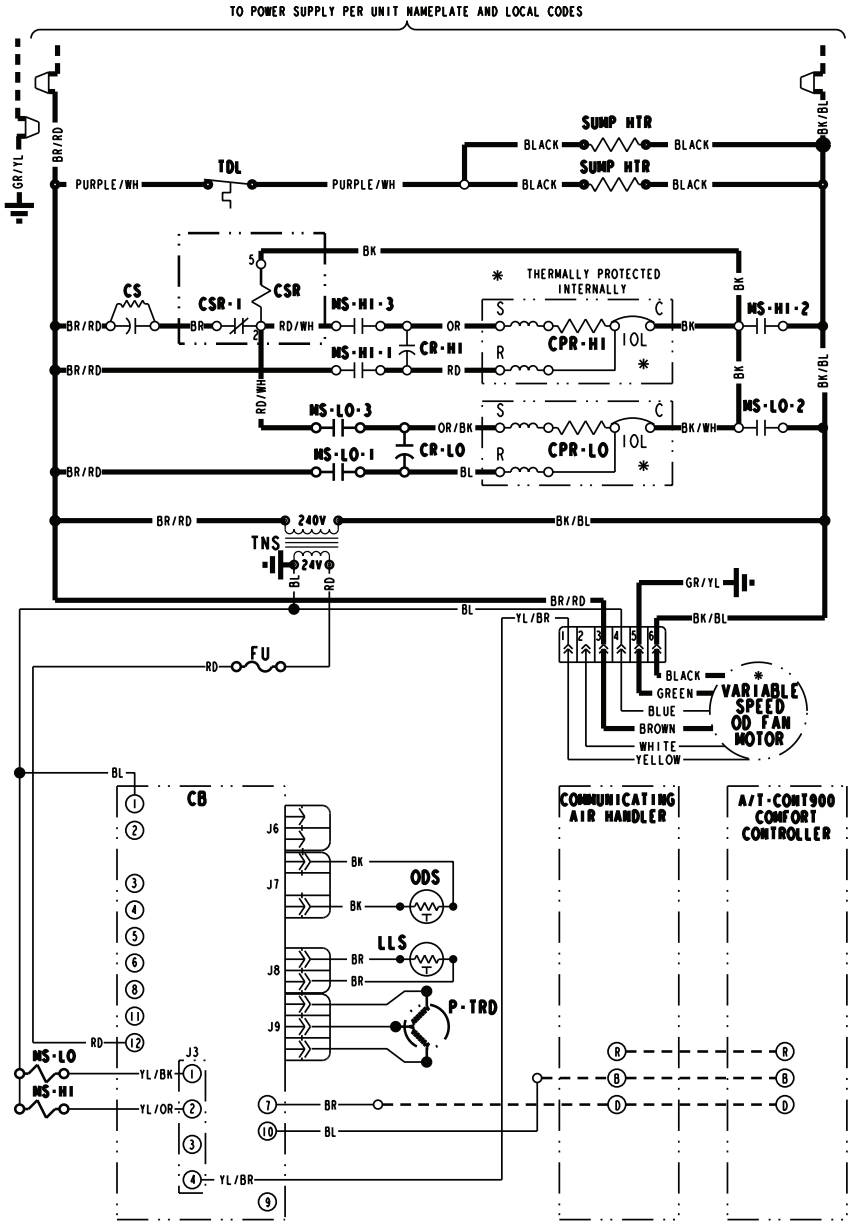
- (1) Refrigerant Line Lift = 15 feet.
- (2) Total Refrigerant Line Length = 30 feet
- With these Lift and Total Line Length dimension the Subcooling Charging Table corrections indicates that the Dip Switch #2 should be turned on and to use the Middle column on the R-22 Refrigerant Charging Chart when Manually Charging the system.
- Your temperature tester shows that the Liquid Line temperature is 95°F.
- On the R-22 Refrigerant Charging Chart in the column labeled LIQUID TEMP (°F) go to your Liquid Line Temperature of 95°F.
- At the 95°F Liquid Line Temperature on the chart go across the chart to the DIP SWITCH 2 MIDDLE column. The pressure displayed at this point is 226#. Add refrigerant to increase the pressure or recover refrigerant to decrease the pressure. Wait twenty (20) minutes for the system to stabilize and again take the Liquid Line Temperature.

Note: 55° F to 100° F is the operational limit of charge of Charge Assist™. Charge Assist™ will work above 100° F but the results may not be as accurate as desired. The service technician will need to recheck the system charge when temperatures are between 55° F to 100° F.



Field Wiring Hook Up Diagrams and Charging Chart
2.5 Ton Cooling Models Only

SCHEMATIC DIAGRAM



CA	COOLING ANTICIPATOR	LPCO	LOW PRESSURE CUTOUT SW.
CB	CONTROL BOARD	MS	COMPRESSOR MOTOR CONTACTOR
CBS	COIL BOTTOM SENSOR	ODA	OUTDOOR ANTICIPATOR
CF	FAN CAPACITOR	OFT	OUTDOOR FAN THERMOSTAT
CN	WIRE CONNECTOR	ODS	OUTDOOR TEMPERATURE SENSOR
CPR	COMPRESSOR	ODT	OUTDOOR THERMOSTAT
CR	RUN CAPACITOR	P-TRD	PRESSURE TRANSDUCER
CS	STARTING CAPACITOR	RHS	RESISTANCE HEAT SWITCH
CSR	CAPACITOR SWITCHING RELAY	SC	SWITCHOVER VALVE SOLENOID
DFC	DEFROST CONTROL	SM	SYSTEM "ON-OFF" SWITCH
F	INDOOR FAN RELAY	TDL	DISCHARGE LINE THERMOSTAT
FU	FUSE	TNS	TRANSFORMER
HA	HEATING ANTICIPATOR	TS	HEATING-COOLING THERMOSTAT
HPCO	HIGH PRESSURE CUTOUT SW.	TSH	HEATING THERMOSTAT
IOL	INTERNAL OVERLOAD PROTECTOR		
LLS	LIQUID LINE SENSOR		

⚠ WARNING	⚠ CAUTION
HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH!	USE COPPER CONDUCTORS ONLY! UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT!

COLOR OF WIRE
BK/BL BLACK WIRE WITH BLUE MARKER
COLOR OF MARKER

BK	BLACK	OR	ORANGE	YL	YELLOW
BL	BLUE	RD	RED	GR	GREEN
BR	BROWN	WH	WHITE	PR	PURPLE

NOTES:

1. LOW VOLTAGE FIELD WIRING MUST BE 18 AWG MIN.

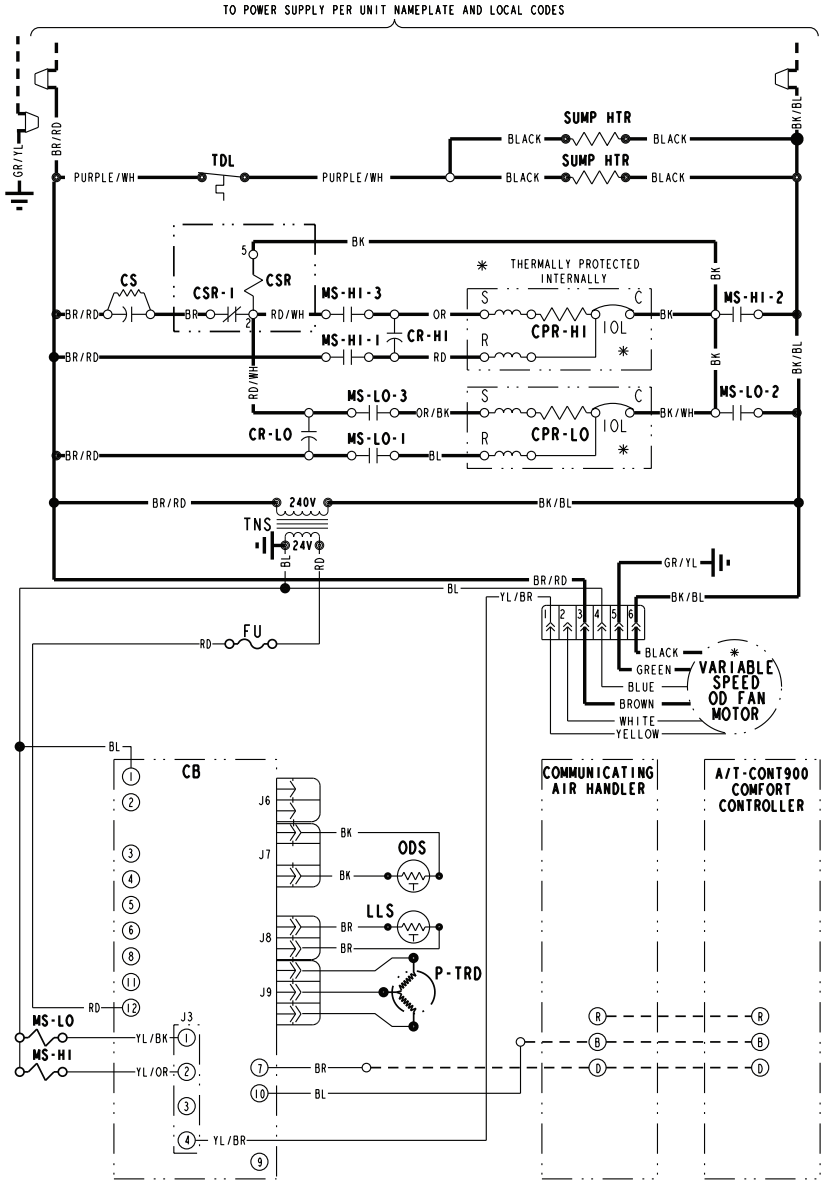
NOTE
THREE PHASE MOTOR (S) FACTORY SUPPLIED IN THIS EQUIPMENT PROTECTED UNDER PRIMARY SINGLE-PHASE CONDITIONS.

R-22 Refrigerant Charging Chart
(2.5 Ton Cooling Models ONLY)

LIQUID TEMP (F)	Liquid Gage Pressure (PSIG) DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	94	98	102
60	105	109	113
65	117	121	126
70	130	134	139
75	143	147	152
80	156	161	167
85	171	176	182
90	186	191	197
95	201	207	213
100	218	224	230
105	235	241	248
110	252	259	266
115	271	278	285
120	289	297	305
125	309	317	325

Field Wiring Hook Up Diagrams and Charging Chart 3, 4, and 5 Ton Cooling Models Only

SCHEMATIC DIAGRAM

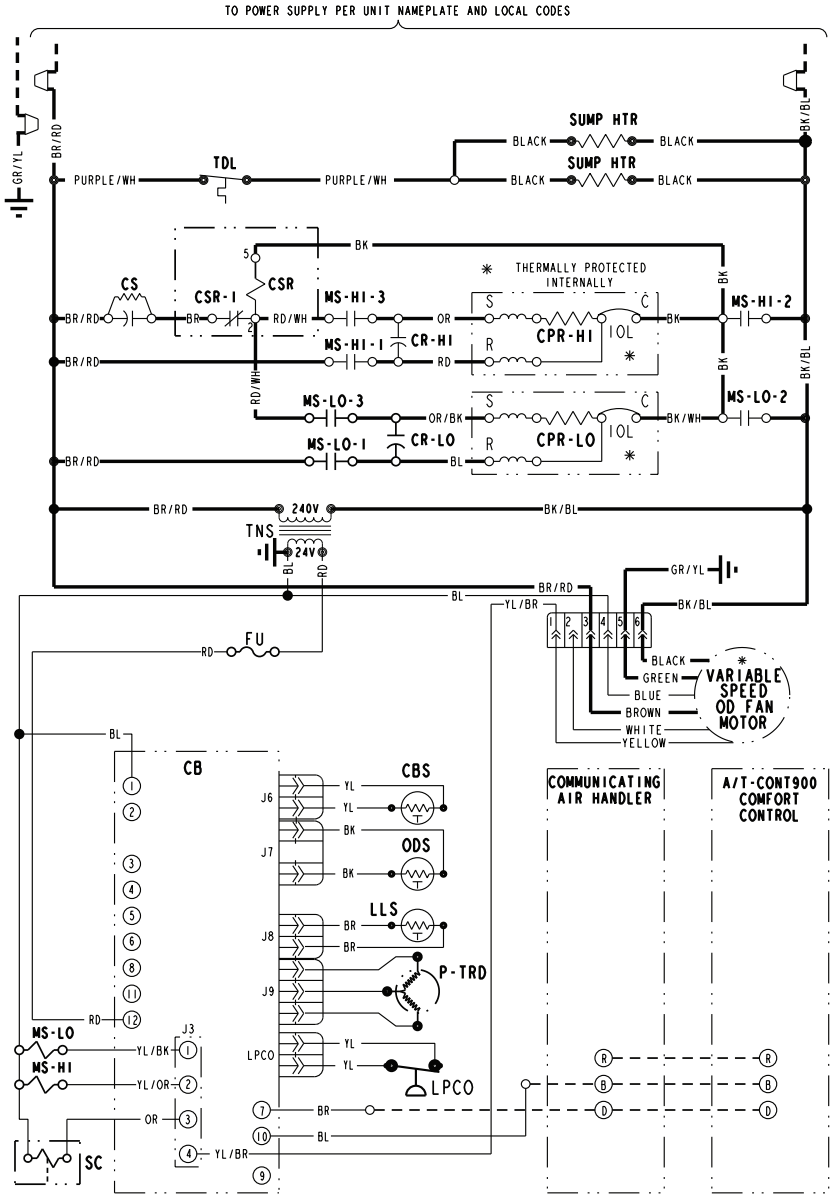


R-22 Refrigerant Charging Chart (3 & 4 Ton Cooling Models ONLY)			
	Liquid Gage Pressure (PSIG)		
LIQUID TEMP (F)	DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	98	102	105
60	109	113	117
65	121	126	130
70	134	139	143
75	147	152	157
80	161	167	172
85	176	182	187
90	191	197	203
95	207	213	220
100	224	230	237
105	241	248	255
110	259	266	274
115	278	285	293
120	297	305	313
125	317	325	334

R-22 Refrigerant Charging Chart (5 Ton Cooling Models ONLY)			
	Liquid Gage Pressure (PSIG)		
LIQUID TEMP (F)	DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	102	105	109
60	113	117	122
65	126	130	135
70	139	143	148
75	152	157	162
80	167	172	177
85	182	187	193
90	197	203	209
95	213	220	226
100	230	237	244
105	248	255	262
110	266	274	281
115	285	293	301
120	305	313	321
125	325	334	342

Field Wiring Hook Up Diagrams and Charging Chart
2.5 Ton Heat Pump Models Only

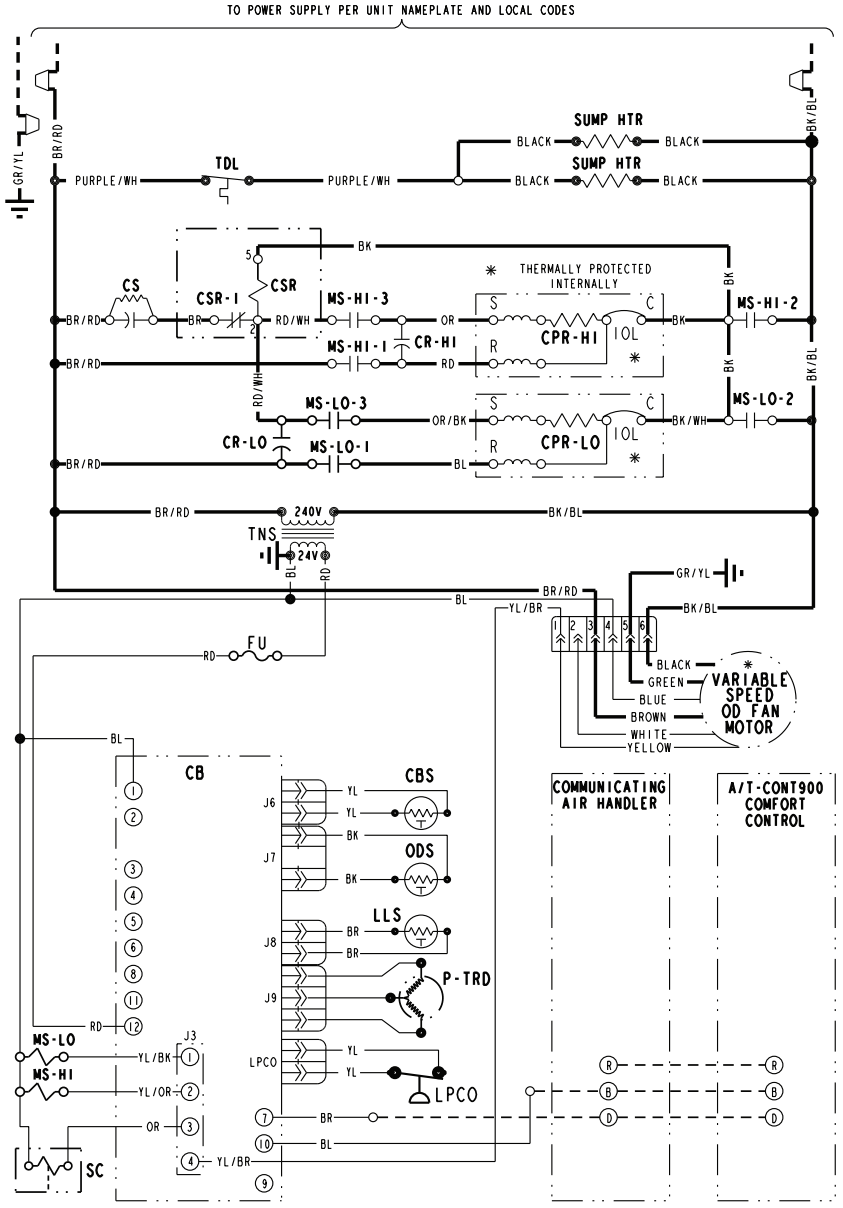
SCHEMATIC DIAGRAM



R-22 Refrigerant Charging Chart (2.5, 3 & 4 Ton Heat Pump Models ONLY)			
LIQUID TEMP (F)	Liquid Gage Pressure (PSIG)		
	DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	105	109	114
60	117	122	126
65	130	135	139
70	143	148	153
75	157	162	168
80	172	177	183
85	187	193	199
90	203	209	216
95	220	226	233
100	237	244	251
105	255	262	269
110	274	281	289
115	293	301	309
120	313	321	329
125	334	342	351

Field Wiring Hook Up Diagrams and Charging Chart 3, 4 and 5 Ton Heat Pump Models Only

SCHEMATIC DIAGRAM



R-22 Refrigerant Charging Chart (2.5, 3 & 4 Ton Heat Pump Models ONLY)			
	Liquid Gage Pressure (PSIG)		
LIQUID TEMP (F)	DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	105	109	114
60	117	122	126
65	130	135	139
70	143	148	153
75	157	162	168
80	172	177	183
85	187	193	199
90	203	209	216
95	220	226	233
100	237	244	251
105	255	262	269
110	274	281	289
115	293	301	309
120	313	321	329
125	334	342	351

R-22 Refrigerant Charging Chart (5 Ton Heat Pump Models ONLY)			
	Liquid Gage Pressure (PSIG)		
LIQUID TEMP (F)	DIP SWITCH 1 LOWER	DIP SWITCH 2 MIDDLE	DIP SWITCH 2 UPPER
55	109	114	118
60	122	126	131
65	135	139	144
70	148	153	159
75	162	168	174
80	177	183	189
85	193	199	205
90	209	216	222
95	226	233	240
100	244	251	258
105	262	269	277
110	281	289	297
115	301	309	317
120	321	329	338
125	342	351	360

Charge Assist™

Charge Assist™ Sequence of Operation

The OUTDOOR UNIT'S Charge Assist ™(CA) Control Board, is a microprocessor based control which can communicate digitally with a communicating system's thermostat or can be connected to a standard 24VAC thermostat. The CA control has two modes of operation. In the normal operating mode, the CA control will respond to the indoor thermostat call for operation. The other mode of operation is the Charge Assist™ mode.

To put the outdoor unit into the Charge Assist™ mode, press the MODE button for 1 second. The control exits the normal operating mode and enters the Charge Assist™ mode.

See pages 57 and 58 for Charge Assist™ Procedures for a communicating system thermostat. See page 60 for the Charge Assist™ Procedures for a standard 24VAC Thermostat system. The CA control completes the following operations:

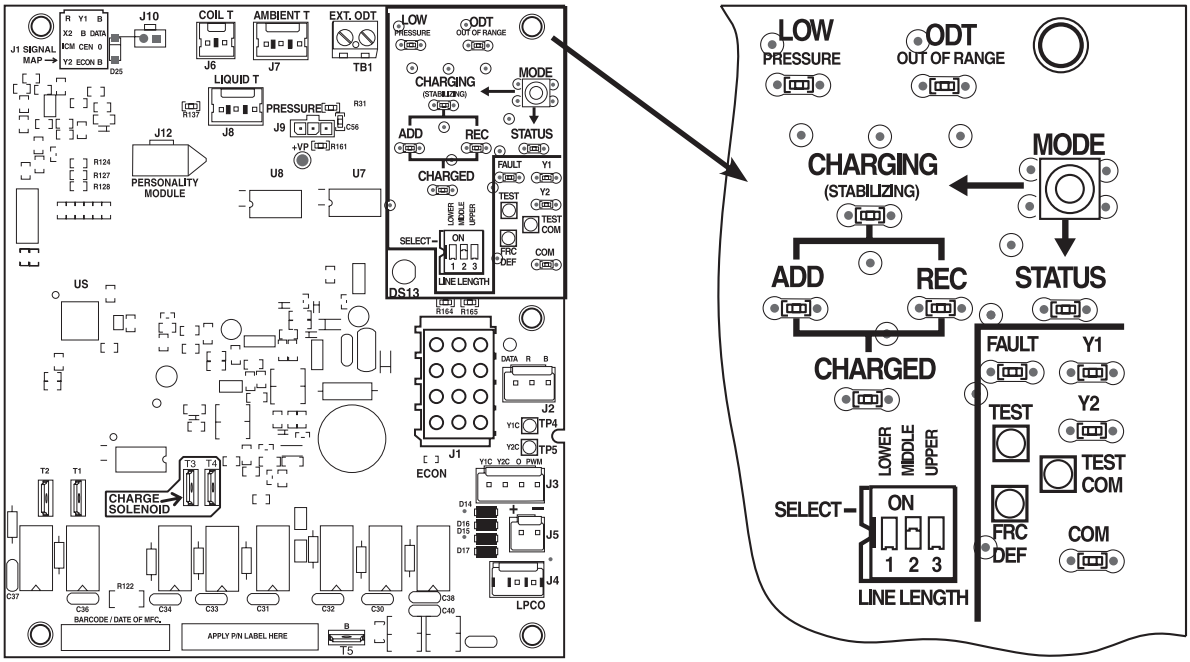
- Turns on the first or second stage compressor
- Controls the two compressors' minimum on and off time and the one minute time delay between stages
- Sends speed signals to the outdoor fan
- Reads the outdoor temperature and sends a digital outdoor temperature message to the communicating system thermostat
- Reads the Liquid Line Pressure and temperature
- Is also the Demand Defrost Control when applied to a Heat Pump
- Can diagnose System Operating Faults. See, LED & Alert Codes

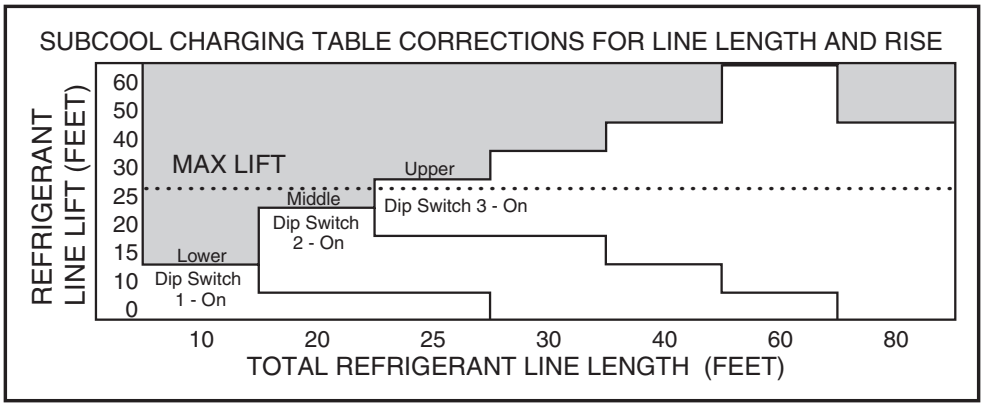
Charge Assist™ Control LED Indications

- **Y-1 LED ON** = First Stage Compressor operation
- **Y-1 and Y-2 LEDs Flashing** = CA™ control system is in the one minute compressor off time delay period before going to Second Stage compressor operation
- **Y-1 LED andY-2 LED ON** = Second Stage Compressor operation
- **Y-1 LED Flashing** = CA™ control system is in the one minute compressor off time delay period before going back to FIRST stage compressor operation
- **Status LED Slow Flash** = CA™ control in the normal operating mode
- **Status LED Fast Flash** = At power up, this LED will flash fast for 20 seconds.
- **Status LED OFF** = CA™ control is in the Charge Assist™ Mode.
- **Com LED ON** = At power up, this LED will be on for 20 seconds.
- **Com LED Flashing** = The number of Flashes equals the number of communicating controls talking on the Data Line. Example: A communicating system thermostat + a communicating indoor unit + a communicating outdoor unit = Three Flashes.
- **Fault LED Flashing** = When the CA™ control detects a fault it will flash this LED a different number of times for each fault detected. (See chart on page 75)
- The following LEDs are used during the CA™ mode cycle only; LOW PRESSURE, ODT, CHARGING (STABILIZING), ADD, REC, and the CHARGED LED.

Charge Assist™ Procedure Details

Figure 1





Note 1: On the Charge Assist™ control, set the LINE LENGTH DIP SWITCHES before running system or entering CA™ Mode. If all dip switches are in the ON position, control will default to Upper Range. If all dip switches are in the OFF position, control will default to Lower Range.

Refer to Service Facts for additional information.

Note 2: In Two-Compressor A/C or heat pumps units, the CA™ control works in the second stage cooling cycle only. LEDs Y1 and Y2 will be on during the CA™ control charging cycle.

Entering CA™ Mode when a heat pump is operating in the heating cycle will turn the system OFF for the minimum equipment OFF time of 5 minutes. After the 5 minute delay the CA™ control will run the 1st stage compressor for one minute, Green LEDY1 on. The CA™ control will then stop the first stage compressor, enter a 1 minute delay and start flashing the Green LEDs Y1 and Y2. Then the CA™ control will start the second stage compressor, Green LEDs Y1 and Y2 will then be ON. The CA™ control now starts its Charge Assist™ cycle.

Note 3: Personality Module (PM) contains model specific information needed for system operation – Do Not Remove

Note 4: The word **WAIT** will be displayed on the Communicating Comfort Control when the system is in the CA™ mode. The Communicating Comfort Control does not control the system operation when the system is running in the CA™ Mode. Any changes in the Communicating Comfort Control programming made during the CA™ mode of operation will become effective after the CA™ mode ends.

Charge Assist™ Procedure Details

Charge Assist™ (CA™) Procedure with a Communicating Comfort Control

The Communicating Comfort Control will auto configure the system size and airflow requirement at power-up. The CA™ Mode will set the indoor blower to 100%, override any blower delays and will turn on 2nd stage compressor. **Green LEDs Y1** and **Y2** will be **ON.** The **Green Status LED** will be turned **OFF**.

STEP 1:

Press **MODE** button (see fig. 1) for 2 seconds to enter the CA™ Mode cycle. The CA™ control takes control of the system and overrides the Communicating Comfort Control. The **Green STATUS LED** is turned **OFF**.

The CA™ control will now check the operating Conditions before continuing the CA™ Mode.

Note: Pressing the **MODE** button at any time will stop the CA™ Mode cycle. The CA™ control will then begin slowly flashing its **Green STATUS LED** indicating that the CA™ control is now in its normal operating cycle.

Next:

Outdoor Temperature (ODT) must be above 65° F.

If **ODT** is below **65° F**, the **ODT** OUT OF RANGE **Red LED** will flash **ON and OFF** for 30 seconds. This error condition causes the **CHARGING** (STABILIZING) **Amber LED** to flash 2 times. The CA™ control will then exit the CA™ mode and the **Green Status** LED begins to flash slowly.

Next:

Liquid Line Temperature must be within range.

If this sensor is shorted or open, this error condition causes an 11 flash **Fault LED**.

Next:

Liquid Line Pressure must be above 50 psig R-22 systems.

If the liquid pressure is below 50 psig – The **LOW** PRESSURE **Red LED** will **flash for 30 seconds**. This error condition causes the CA™ control to flash its **CHARGING** (STABILIZING) **Amber LED** 2 times. The CA™ control will then exit the CA™ mode and it then begins flashing its **Green Status LED** slowly.

Note: 65° F to 100° F is the operational limit of Charge Assist™. Charge Assist™ will work above 100° F but the results may not be as accurate as desired. The service technician will need to recheck the system charge when temperatures are between 65° F to 100° F.

STEP 2:

Enter Stabilization Routine

The **CHARGING** (STABILIZING) **Amber LED** will begin to flash.

The CA™ control will then indicate the time it will take for the refrigerant system to stabilize by flashing its **CHARGING** (STABILIZING) **Amber LED**.

CHARGING (STABILIZING) LED Blink Rate Schedule

1 sec ON/OFF means the system is 6-20 minutes away from being stable.

3/4 sec ON/OFF means the system is 4-6 minutes away from being stable.

1/2 sec ON/OFF means the system is 2-4 minutes away from stable.

1/4 sec ON/OFF means the system is 1/2 - 2 minutes away from stable.

The CA™ control may run the system for up to twenty minutes to insure the refrigerant system is at a steady operating state. Once the system is at a steady operating state, the CA™ control will enter the **Charging Routine**.

STEP 3:

CHARGING Routine, (The CA™ control will now determine if the system is)

Correctly Charged go to STEP 4	
CHARGING (stab) LED	**OFF**
CHARGED LED	**ON**
STATUS LED	**FLASHING**

Under Charged go to STEP 5	
ADD LED	**ON**
CHARGED LED	**FLASHING**
STATUS LED	**OFF**

Overcharged go to STEP 6	
RECOVER LED	**ON**
SYSTEM LOCKED OFF FOR 1 HOUR	
STATUS LED	**OFF**

Charge Assist™ Procedure Details

STEP 4:

If the CA™ control determines the system is correctly charged the **CHARGING** (STABILIZING) **Amber LED** will be turned **OFF** and the **CHARGED Green LED** will be turned **ON**.

The CA™ control will then exit the charge assist cycle and return the control of the system to the Communicating Comfort Control. The **Green Status LED** will be slowly flashing. The **CHARGED Green LED** will stay **ON** for 1 hour.

STEP 5:

ADD Routine
If the CA™ control determines refrigerant is required, the **ADD Amber LED** will turn **ON** and the **Green CHARGED LED** will begin **FLASHING** according to the ***CHARGED Green LED*** flash Rate Schedule.

Green Charged LED Blink Rate*

1 sec **ON/OFF** means the system is less than 20 PSI off target

3/4 sec **ON/OFF** means the system is greater than 15 PSI off target

1/2 sec **ON/OFF** means the system is greater than 10 PSI of target

1/4 sec **ON/OFF** means the system is greater than 5 PSI off target

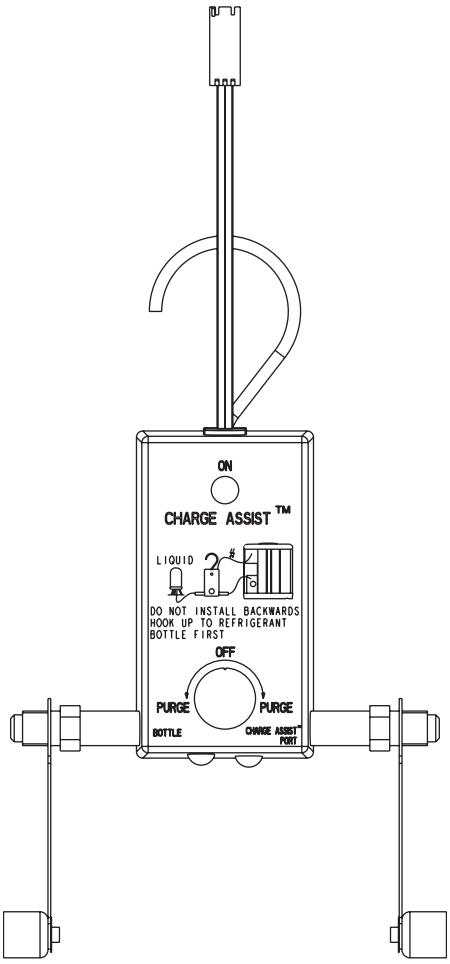
*The **Green CHARGED LED** will not start to blink until the system pressure is within 20 PSI of the target pressure.

Note: For Automated charging, use BAYCAKT001AA. When utilizing a Charging accessory Solenoid Kit (BAYCAKT001) refer to the instructions in the kit for proper hook up. When the **Amber ADD LED** is **ON** the CA™ control board provides a 24VAC power for the accessory solenoid. The CA™ control will turn off the 24VAC power when the **Amber ADD LED** goes off.

When refrigerant is being added, the CA™ control will **exit** the charge assist cycle if the liquid line pressure **does not increase by 4 psig in 50 minutes or if the liquid line pressure does not get within the 20 psig of the required charged pressure within 1 hour.**

Note: For Manual Charging
Once sufficient charge has been added, the **Amber ADD LED** will turn **OFF** and the **Green CHARGED LED** will be turned **ON**. When the **Amber ADD LED turns OFF stop adding refrigerant**. The **Green CHARGED LED** will stay on for 5 minutes while the unit runs. The CA™ control will now exit the Charge Assist™ cycle and return control to Communicating Comfort Control.

Charge Assist™ Tool
(Part No. BAYCAKT001AA)



STEP 6:

Recover Routine

If the CA™ control determines there is excessive refrigerant in the system, the **REC Red LED** will be turned **ON**. The CA™ control will lock the system off for one hour and it will them exit the CA™ cycle. The **REC Red LED** will stay **ON** for 1 hour. The CA™ control lock out period can be stopped by pressing the MODE button for 1 second. Status **LED** will be off during lockout.

Charge Assist™ Procedure for a NON-Communicating 24 VAC Control System

24 VAC Step 1:

Installations using indoor units with 24 volts require the technician to set up the Variable Speed (VS) Air Handler or VS Furnace with the DIP switches for the size of the equipment installed. (Unit tonnage, CFM per ton 350, 400, 450 required, the blower delays and Heating airflow) CA™ cycle is compatible with **ENHANCED Mode**.

24 VAC Step 2:

A technician must set the indoor system thermostat to call for the **SECOND STAGE of COOLING**. The indoor **CONTROL** must be **set low enough** to ensure the system continues to run in **SECOND STAGE of COOLING** throughout the CA™ mode cycle. The CA™ control will exit the CA™ **mode CYCLE** if the system control does not stay in the **SECOND STAGE** cooling cycle. (The CA™ Control must see 24 volts call on both Y1 and Y2.)

24 VAC Step 3:

Press the mode button on the CA™ board and follow the CA™ procedures starting with **STEP 1** in the **Communicating Comfort Control Section** above.

24 VAC Step 4:

After the CA™ control exits the CA™ **mode CYCLE,** the technician must then return the **NON-COMMUNICATING** 24 volt indoor **CONTROL** to the desired customer setting.

Note: 65° F to 100° F is the operational limit of Charge Assist™. Charge Assist™ will work above 100° F but the results may not be as accurate as desired. The service technician will need to recheck the system charge when temperatures are between 65° F to 100° F.

Charge Assist™ Summary Of The Module and Its LEDs

LOW PRESSURE **LED (RED)**
Liquid Pressure must be above 50 psig to enter **CA™**. Below 50 psig- turn on LOW Pressure LED for 30 sec. and flash CHARGING RED LED 5 times per sec for 2 sec. Exit **CA™**.

ODT OUT OF RANGE **LED (RED)**
Ambient Temperature must be above 65°F to enter **CA™**. Below 65°F- flash ODT Out of Range LED 1 sec ON/OFF for 30 sec and flash CHARGING LED 5 times per sec for 2 sec. Exit **CA™**.

COM LED (AMBER)
OFF - no power, ON solid at power-up, Flash device count when in communication (number of communicating products connected in system), Rapid flashes followed by a pause indicates disrupted communications (CRC errors)

Y1 LED (GREEN)	
ON	1st stage compressor requests
Y2 LED (GREEN)	
ON	2nd stage compressor request
STATUS LED (GREEN)	
Fast Flash	At Power Up ~ 20 seconds
Slow Flash	Standard operation
OFF	Charge Assist™ mode
LitePort LED (GREEN)	
Occasional flash	For transmitting LitePort data

CA™ procedure allows 1 hour to get within 20 psi of "Charged" and 50 minutes to move 4 psi, Otherswise Time Out

"CHARGED" LED (GREEN)	
ON	Charge is Correct
BLINKING	1 sec ON/OFF = 15-20 PSI off target 3/4 sec ON/OFF = 10-15 PSI off target 1/2 sec ON/OFF = 5-10 PSI off target 1/4 sec ON/OFF = PSI off target
"CHARGING" (STABILIZING) (AMBER LED)	
BLINKING	1 sec ON/OFF = 6-20 minutes away from a steady operating state. 3/4 sec ON/OFF = 4-6 minutes away from a steady operating state. 1/2 sec ON/OFF = 2-4 minutes away from a steady operating state. 1/4 sec ON/OFF = 1/2-2 minutes away from a steady operating state.
"RECOVER" (RED LED)	
ON	Exit Charge Assist™ - need to recover refrigerant
"ADD" (AMBER LED)	
ON	System requires refrigerant charge (Control has turned on the 24 volt AC output) Use Charge Assist™ Tool # BAYCAKT001AA

Outdoor Units: Communicating Systems Trouble Shooting Checklist

Note: The * Alert number or text will not be displayed at the Comfort Control or the User Interface Display.

Comfort Control	Fault LED	User Interface Display	Possible Causes
*	OFF	*	Standby or No 24 Volts AC to Control
ERR 90	1 Flash	*	Excessive Communication CRC Errors
ERR 91		*	No Communication
*	2 Flash	*	Defrost Fault A (See Defrost Control Service Procedure Section)
*	3 Flash	*	Defrost Fault B and/or C (See Defrost Control Service Procedure Section)
*	4 Flash	*	Defrost Fault A and (B and/or C) (See Defrost Control Service Procedure Section)
ERR 67	5 Flash	*	Ambient Temperature Sensor Fault (Out of Range- Open or Shorted) Note # 1
ERR 67	6 Flash	*	Coil Temperature Sensor Fault (Out of Range- Open or Shorted) Note # 1
ERR 79	7 Flash	*	Low Pressure Cut Out (LPCO) Fault (Open outside of Defrost Cycle)
*	10 Flash	*	Y2 without Y1 Miswire (24 Volt mode only)
*	11 Flash	*	Liquid Temperature Fault (Out of Range- Open or Shorted) Note # 2
*	12 Flash	*	Liquid Pressure Sensor Fault Voltage Out of Range (Open or Shorted) Note # 3
*	13 Flash	*	External ODT Sensor Fault (Out of Range- Open or Shorted) Note # 4
ERR 114	14 Flash	*	Bad or Missing PM
*	15 Flash	*	Duplicate OD Temperature Sensor (2 different units are reporting the Outdoor Temperature)
ERR 126	OFF	*	Breaker or Outdoor Unit Disconnect OFF Outdoor Transformer. Field Thermostat Wiring.

The last four fault codes will be display sequentially - 2 second pauses between faults and 4 second pauses between sequences. Cycle power or 24 volt to outdoor unit to clear faults.

Note # 1: Check the Ambient Coil Temperature Sensor plug and its wire harness. Check the sensor resistance and its temperature and then compare to Chart # 1 in the Charge Assist Control Trouble Shooting Section

Note # 2: Check the Liquid Line Temperature Sensor plug and its wire harness. Check the sensor resistance and its temperature and then compare to Chart # 2 in the Charge Assist Control Trouble Shooting Section

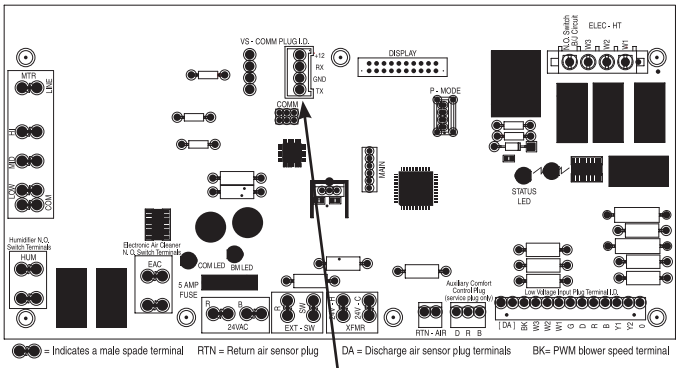
Note # 3: Check the Liquid Line Pressure Sensor plug and then check its DC voltage at its test point VP and the 24 Volt AC common. Read the Liquid Line Pressure at the Liquid Line Service Valve and compare the DC Voltage and the Liquid Line Pressure to Chart # 3 in the Charge Assist Control Trouble Shooting Section.

Note # 4: Check the Accessory External Ambient Temperature Sensor connected to terminal board TB1 and its wire harness. Check the sensor resistance and its temperature and then compare them to Chart # 4 in the Charge Assist Control Trouble Shooting Section.

Go/No - Go Test for Serial Port V.S. Blower Motor

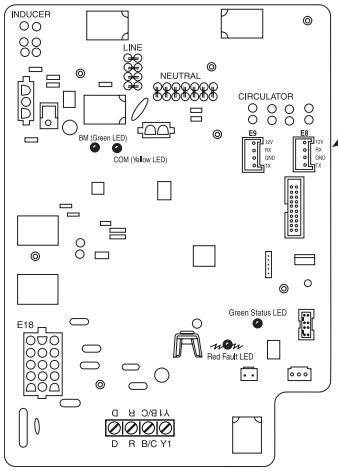
Step 1: Remove power from the gas furnace or the air handler. Unplug the serial port variable speed motor low voltage plug from the motor. Connect 24 Volt AC test harness to the serial port variable speed motor low voltage plug as shown and connect red and blue wires to the 24 Volt AC.

Air Handler Control Board



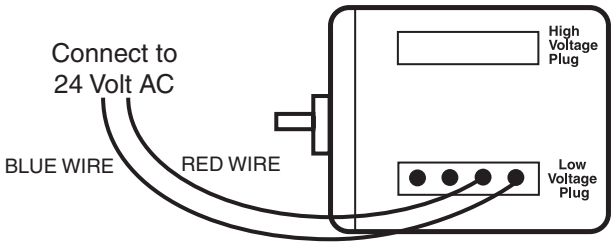
VS-COMM Plug

Furnace IFC



E8 Plug

24 Volt AC Test Harness 34-3454-01



Serial Port V.S. Blower Motor

Step 2: Restore power to the gas furnace or the air handler, and go to step #3.

Go/No - Go Test for Serial Port V.S. Blower Motor

Step 3: Does the serial port variable speed motor start and run after a short delay to turn on?

YES: Serial port variable speed motor is good. Check the furnace IFC or the air handler control board.

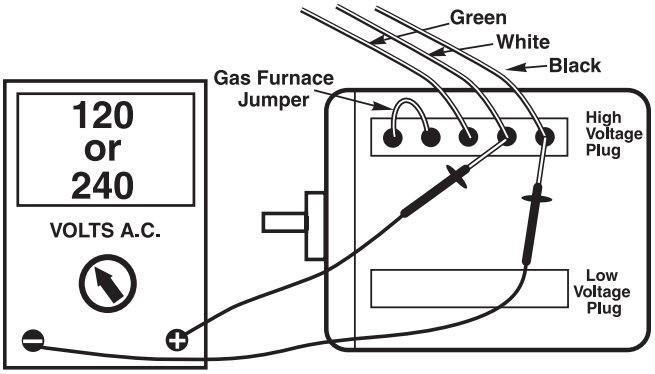
NO: Go to step #4.

Step 4: Is there 120 Volts at the gas furnace or 240 Volts AC at the air handler serial port variable speed motor, SPVS motor, high voltage plug?

YES: If the motor turns freely, replace the SPVS motor.

NO: Repair as needed and retest.

Serial Port V.S. Blower Motor



Indoor Serial Port Variable Speed Blower Motor Test

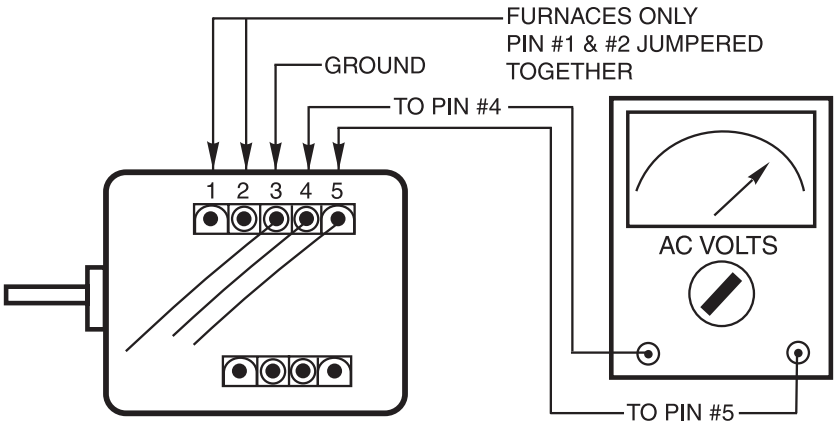
Step 1: Is the line voltage to the blower motor high voltage plug pin #4 and pin #5 correct?

Furnace blower motor correct voltage is 120 Volts A.C. and a factory jumper wire must be present connecting pin #1 and pin #2 together.

Air Handlers blower motor correct voltage is 240 Volts A.C. and there is no jumper wire connecting pin #1 and pin #2 together.

YES: Go to step #2.

NO: Correct line voltage fault.



Step 2: Disconnect the blower motor's low voltage harness from the furnace's IFC or the air handler's control board.

Furnace IFC plug is E8.

Air Handler's plug is VS-COMM.

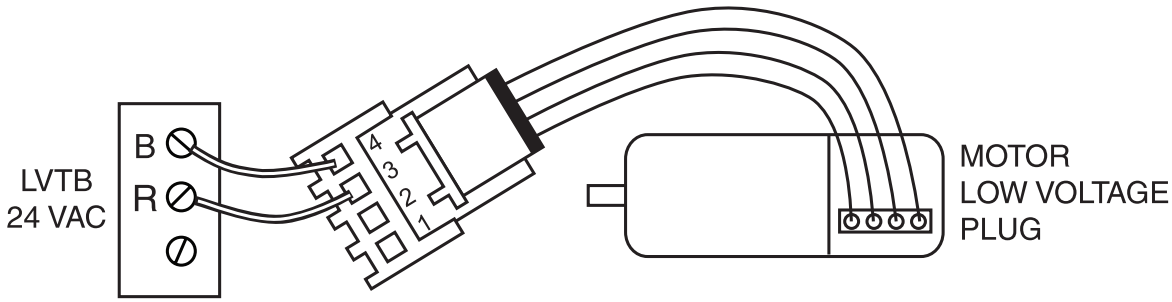
Jumper 24 Volts A.C. into pin #3 and #4 in the blower motor low voltage plug removed from the furnace IFC or the air handler control board. The blower motor should start to run after a short delay. The blower motor should run at 75 % of it's programmed torque. **Does the blower motor run?**

YES:

Furnace. Replace the Furnace IFC.

Air Handler. Check the Air Handler's control setup. If the Air Handler is connected to a communicating thermostat the Air Handler control must be set up for a communicating system not a 24 Volt A.C. control system. If the Air Handler control setup is correct replace the Air Handler control board.

NO: Go to step #3.

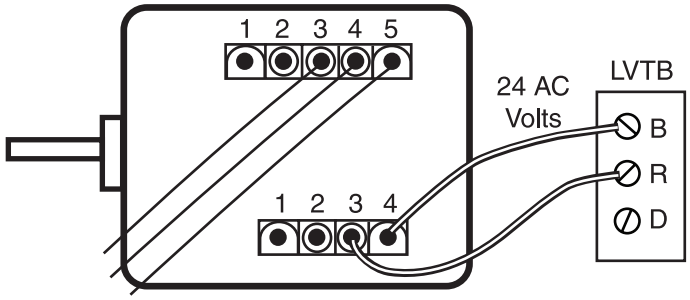


Indoor Serial Port Variable Speed Blower Motor Test

Step 3: Jumper 24 Volts A.C. in to the blower motor low voltage plug pin # 3 and pin # 4. The blower motor should start to run after a short delay. The blower motor should run at 75 % of it's programmed torque. **Does the blower motor run?**

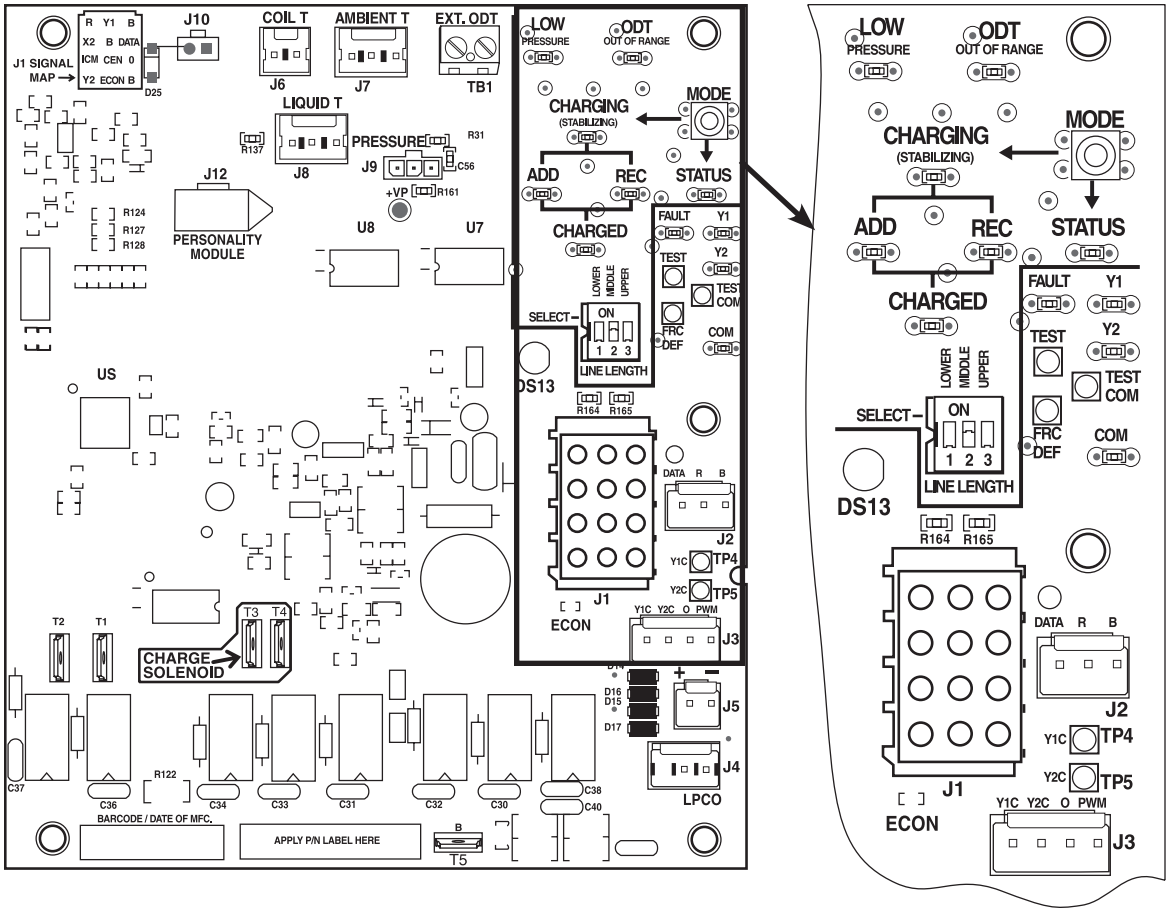
YES: Repair or replace the blower low voltage harness.

NO: Replace the blower motor.



LOW VOLTAGE CONTROL PLUG

Trouble Shooting the Outdoor Unit's Charge Assist™ Control



Step 1. Is there 24 Volts AC at the Charge Assist™ Control at plug J2 pins R and B?

YES: Go to step #2 for a communicating system. For a 24 Volt AC control system go to step #4.

NO: Restore the 24 Volt AC power to the outdoor unit.

Note 1: A communicating system the 24 Volt AC is supplied by the Outdoor Units transformer.

Note 2: A 24 Volt AC control system the 24 Volt AC power is supplied by the Indoor Unit's transformer.

Step 2. Is the Charge Assist™ Control's COM LED flashing the correct number of times? Example. A system that has a communicating thermostat, a communicating furnace or air handler and a communicating outdoor unit the COM LED should be flashing in groups of three flashes.

YES: The Charge Assist™ control is communicating with the control system. Go to step #3.

NO: The COM LED is flashing fast go to the trouble shooting ERR code 89 or 91 trouble shooting section.

Step 3. Is the Status LED flashing slowly?

YES: Go to step #4.

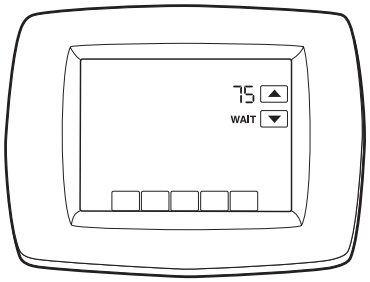
NO: If the Status LED is out go to step #5, if the Status will not stop flashing fast replace the Charge Assist™ Control.

Trouble Shooting the Outdoor Unit's Charge Assist™ Control

Step 4. Does Y1 or Y2 LEDs come on when a call for compressor operation is placed at the Comfort Sensor thermostat or the 24 Volt AC control thermostat?

Note 1: When the Comfort Sensor thermostat is set up for compressor operation and WAIT is displayed on the sensor display there will be a five minute delay before Y1 or Y2 will come on.

Note 2: A 24 Volt AC digital thermostat may have a time delay when the cooling set point is changed to prevent compressor short cycling.



YES: Go to step #6.

NO: On an A/C unit replace the Charge Assist™ Control. Heat Pumps units only check for 24 Volts AC across Charge Assist™ Control LPCO plug J4. The fault LED should be flashing in groups of seven flashes if the LPCO switch is open. If 24 Volts AC is present the Heat Pump is locked out by the Low Pressure Cut Out Switch. Repair system as needed. If there is no 24 Volts AC at plug J4 replace the Charge Assist™ Control.

Step 5. Push in and hold the Mode switch on the Charge Assist™ Control for 1 second. Does the Status LED now flash slowly?

YES: Go to step #4.

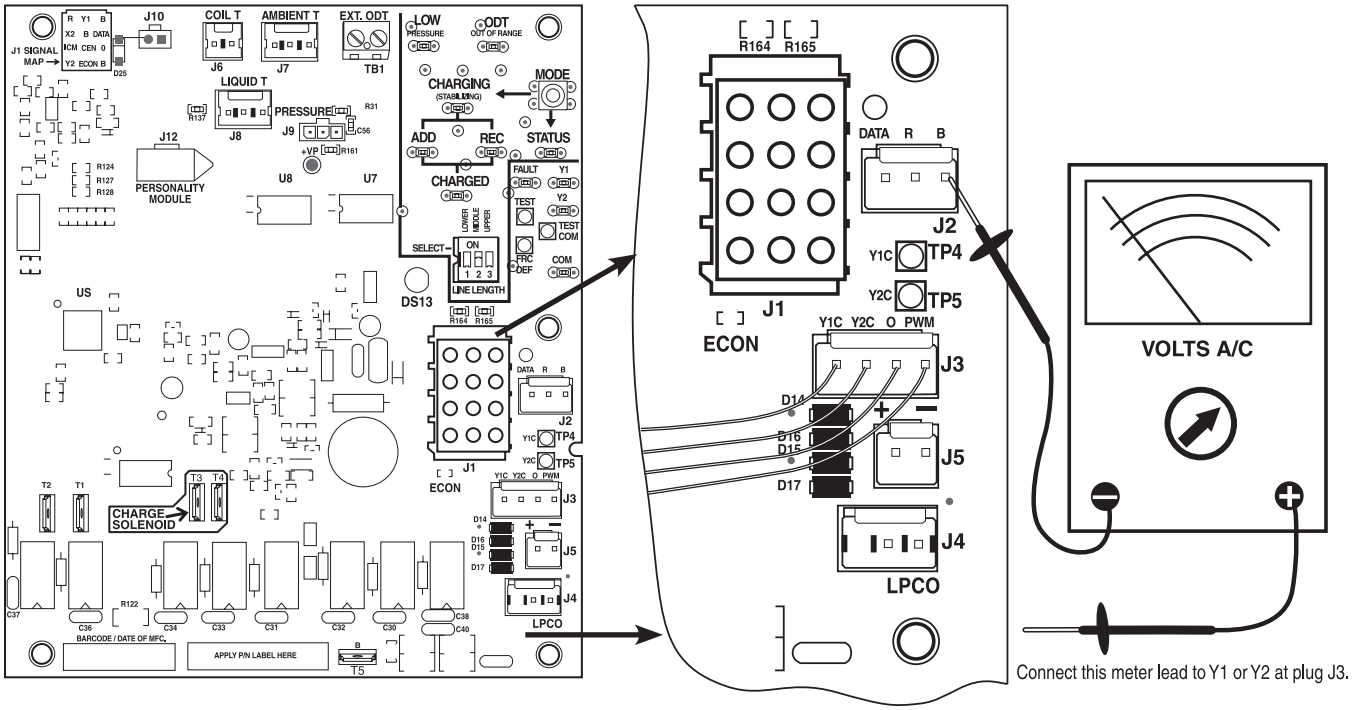
NO: Replace the Charge Assist™ Control.

Step 6. Is there 24 Volts AC at plug J3 between its pins Y1 and B or Y2 and B?

Note: There should be 24 Volts present only between pins Y1 and B when the Amber LED Y1 is on or 24 Volts AC between pins Y2 and B when the Amber LED Y2 is on.

YES: Charge Assist™ Control is working correctly; fault is with the unit's wiring, it's contactors or it's compressor.

NO: Replace the Charge Assist™ Control.

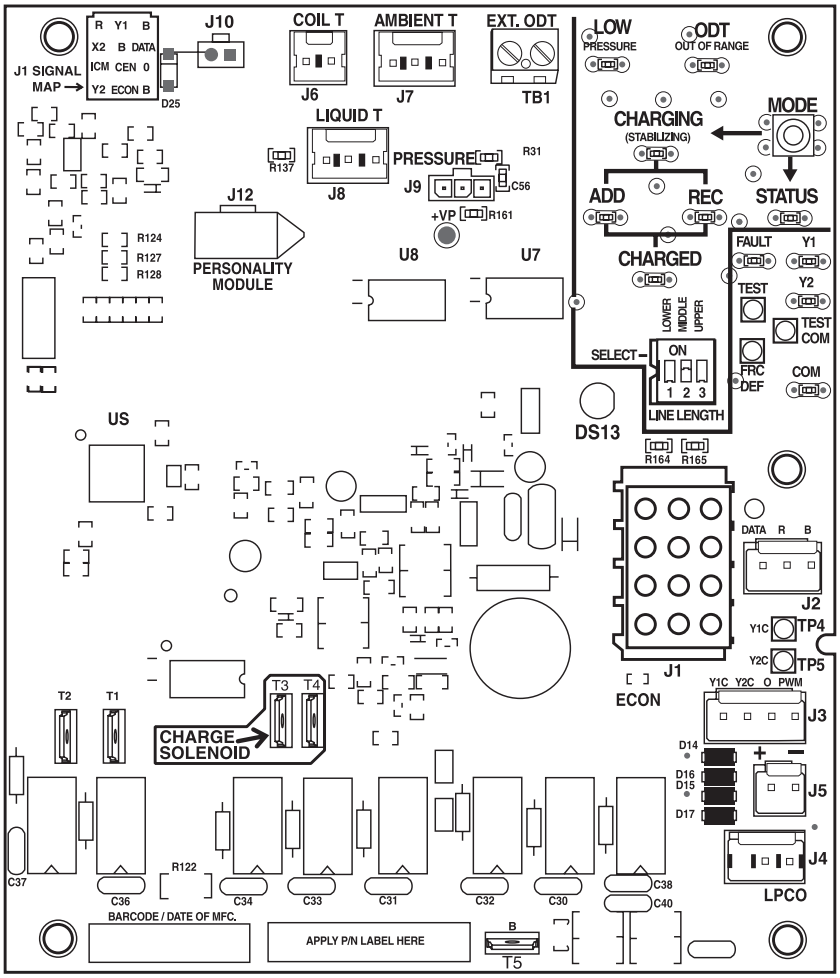


Trouble Shooting: Charge Assist™ Control Fault LED Flash Code

Charge Assist™ Control LED Flash Code Trouble Shooting Procedures

If the Comfort Control is displaying an Err code of 89 or 91 or if the Charge Assist™ Control Fault LED is flashing a 1 flash code go to trouble shooting procedures for Err code 89 or 91.

Fault LED	LED Color	Alert Code	Description	Comfort Control Display
1 Flash	Red	90	Excessive Communication CRC Errors	ERR 90
		91	No Communication	ERR 91
			Loss of Clock Signal	
2 Flash		68	Defrost Fault A	None
3 Flash			Defrost Fault B and/or C	
4 Flash			Defrost Fault A and (B and/or C)	
5 Flash		67	Ambient Temperature Sensor Fault (Out of Range - Open or Shorted)	ERR 67
6 Flash			Coil Temperature Sensor Fault (Out of Range - Open or Shorted)	
7 Flash		79	LPCO Fault (Open outside of defrost Cycle)	ERR 79
10 Flash		102	Y2 without Y1 - Miswire (24 volt mode only)	None
11 Flash		67	Liquid Temperature Fault (Out of Range - Open or Shorted)	
12 Flash		113	Liquid Pressure Sensor Fault (Out of Range - Open or Shorted)	
13 Flash		67	External ODT Sensor Fault (Out of Range - Open or Shorted)	
14 Flash		114	Bad or Missing PM	ERR 114
15 Flash		50	Duplicate OD temperature sensor	None



Trouble Shooting: Charge Assist™ Control Fault LED Flash Code

Fault LED Flash Codes of 2*, 3*, or 4* flashes go to defrost control trouble shooting Procedures. These Faults are not reported to the Comfort Control as Err codes

Fault LED Flash Code of 5. ERR code #67 will be displayed at the Comfort Control. The fault LED will be flashing in groups of five flashes. This indicates that the outdoor Ambient Temperature Sensor is reading out of range. At the Charge Assist™ control read the DC voltage at the Ambient Temperature Sensor plug J7 with the sensor plugged in or unplug the sensor and read the resistance of the sensor. **Does the ambient temperature and the DC voltage or its resistance in ohms read at the Ambient Temperature Sensor plug J7 agree with the temperature, resistance and voltage chart #1.**

YES: Unplug and re-plug the Ambient Temperature Sensor plug several times to insure it is making good contact with the control pins. Turn off the 24 Volts AC to the Charge Assist Control and then re-power the control. If the 5 flash codes continue to be displayed replace the Charge Assist™ Control.

NO: Unplug and re-plug the Ambient Temperature Sensor plug J7 several times to insure that it is making good contact with the Charge Assist™ Control plug, then recheck the DC voltage at plug J7 or unplug the sensor and read the resistance of the sensor. IF the DC voltage or resistance at plug J7 and the ambient temperature still does not agree with the temperature,
resistance and voltage Chart1 replace the Ambient Temperature Sensor.

Fault LED Flash Code of 6. ERR code #67 will be displayed on heat pump Comfort Controls only. This sensor is used only on heat pump models. The fault LED will be flashing in groups of six flashes. This indicates that the Coil Temperature Sensor is reading out of range. Read the DC voltage at the Charge Assist™ Control Coil Temperature Sensor plug J6 with the sensor plugged in or unplug the sensor and read the resistance of the sensor. **Does the coil temperature and the DC voltage or its resistance in ohms read at the Coil Temperature Sensor plug J6 agree with the temperature, resistance and voltage chart #1**.

YES: Unplug and re-plug the Coil Temperature Sensor plug J6 several times to insure it is making good contact with the control pins. Turn off the 24 Volts AC to the Charge Assist™ Control and then re-power the control. If the 6 flash codes continue to be displayed replace the Charge Assist™ Control.

NO: Unplug and re-plug the Coil Temperature Sensor plug several times to insure that it is making good contact with the Charge Assist™ Control plug J6, then recheck the DC voltage at plug J6 or unplug the sensor and read the resistance of the sensor. IF the DC voltage and temperature or resistance and temperature does not agree with the temperature, resistance and voltage Chart #1 replace the Coil Temperature Sensor.

Fault LED Flash Code of 7. ERR code #79. This fault code only applies to Heat Pump models in the heating or cooling cycle. During the defrost cycle the LPCO switch is not checked by the Charge Assist™ Control. The fault LED will be flashing in groups of seven flashes. This is an indication that the Low Pressure Cut Out switch (LPCO) is open. Check the suction pressure, it must be above 9 pounds. **Is the system suction pressure above 9 pounds?**

YES: Check the voltage at the LPCO plug J4. IF 24 volts AC is present at plug J4 unplug the LPCO and jumper the two pins of J4 together. Turn off the 24 Volts AC to the Charge Assist™ Control and then re-power the control. The Fault LED should go out and the outdoor unit should come on when a call for heat or cooling is placed at the Comfort Control. IF the Fault LED continues to flash in groups of seven and the out door unit will not come on replace the Charge Assist™ Control.

NO: Repair Refrigerant System as needed.

Fault LED Flash Code of #10*. This fault will only appear when the Charge Assist™ Control in being operated with a standard 24 volt AC thermostat, non communicating type, and thermostat leads Y1 and Y2 are reversed.

Trouble Shooting: Charge Assist™ Control Fault LED Flash Code

Fault LED Flash Code of 11*. The fault LED will be flashing in groups of eleven flashes. This indicates that the Liquid Line Temperature Sensor is reading out of range. At the Charge Assist™ Control read the DC voltage at the Liquid Temperature Sensor plug J8 with the sensor plugged in or unplug the sensor and read the resistance of the sensor. **Does the liquid line temperature and the DC voltage or resistance read at the Liquid Temperature Sensor plug J8 agree with the temperature, resistance and voltage chart #2**.

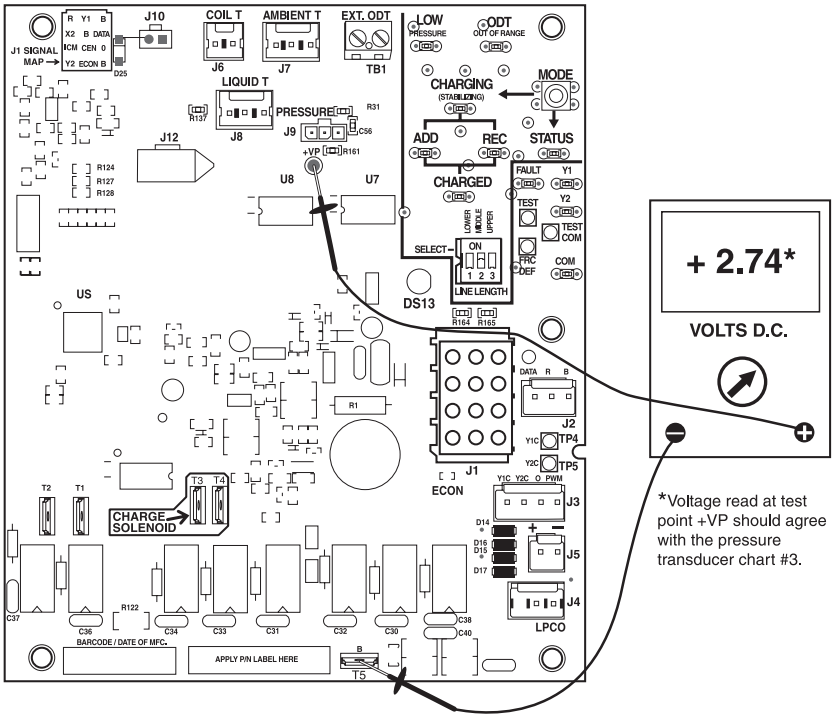
YES: Unplug and re-plug the Liquid Line Temperature Sensor several times to insure it is making good contact with the control pins. Turn off the 24 Volts AC to the Charge Assist™ Control and then re-power the control. If the 11 flash codes continue to be displayed replace the Charge Assist™ Control.

NO: Unplug and re-plug the Liquid Line Temperature Sensor plug several times to insure that it is making good contact with the Charge Assist™ Control plug; then recheck the DC voltage or resistance. IF the DC voltage and temperature or resistance still does not agree with the Liquid Line temperature, resistance and voltage Chart # 2 replace the Liquid Line Temperature Sensor.

Fault LED Flash Code of 12*. The fault LED will be flashing in groups of twelve flashes. This indicates that the Liquid Pressure Sensor is reading out of range. (1)Read the DC voltage at the Liquid Line Pressure Sensor plug J9 test point + VP and the 24 AC volt common terminal T5 with the sensor plugged in. (2) Read the liquid line pressure with a calibrated high pressure gage. **Does the liquid line pressure and the DC voltage read at the Liquid Pressure Sensor plug J9 test point + VP and the 24 volt AC terminal T5 agree with the pressure shown on the liquid line pressure and voltage chart #3** Note: The pressure transducer is only used by the Charge Assist™ Control during the charge assist cycle.

YES: Replace the Charge Assist™ Control.

NO: If there is 4.9 volts DC between the black common wire and the red power wire at pressure plug J9 and the pressure and voltage measured do not match the liquid line pressure and voltage chart replace the pressure transducer. If there is no voltage between the black common wire and the red power wire or the 4.9 volts DC is lower than 4.9 volts DC unplug the transducer and recheck the voltage at plug J9. If the voltage at the pressure plug J9, with the pressure transducer unplugged, now reads 4.9 volts replace the transducer. If the voltage at the pressure plugs remains low when the transducer is unplugged replace the Charge Assist Control.



Trouble Shooting: Charge Assist™ Control Fault LED Flash Code

Fault LED Flash Code of 13*. The fault LED will be flashing in groups of thirteen flashes. This indicates that the outdoor External Ambient Temperature Sensor is reading out of range. Read the DC voltage at the External Ambient Temperature Sensor EXT. ODT terminal boards (TB) with the sensor connected or remove the sensor leads and read the resistance of the sensor. **Does the External Ambient Temperature and the DC voltage read at the External Ambient Temperature Sensor (TB) or resistance of the sensor agree with the external temperature, resistance and voltage chart #4** Note: The temperature displayed at the Comfort Sensor requires five minutes to stabilize. If the External Ambient Temperature Sensor circuit is not connected to a sensor the Charge Assist™ Control automatically use the unit Internal Ambient Temperature Sensor connected to the Ambient Sensor plug #J7.

YES: Turn off the 24 Volts AC to the Charge Assist™ Control and then re-power the control. If the thirteen flash codes continue to be displayed replace the Charge Assist™ Control. Note: Disconnect the External Ambient Temperature Sensor and re-power the control system. The Charge Assist™ Control will now use the internal Ambient Sensor.

NO: When the DC voltage and temperature do not agree with the external temperature, resistance temperature, resistance and voltage Chart #4 replace the External Ambient Temperature Sensor.

Fault LED Flash Code of 14. Error code of ERR 114 will be reported to the Comfort Control. This indicates that the Personality Module plugged into the Charge Assist™ Control is unplugged or its stored information is not usable. **Is the Personality Module plugged into the Charge Assist™ Control?**

YES: Turn off the 24 volt AC supply to the Charge Assist™ Control and then re-power. Fault code should clear itself; if the fault code does not clear itself replace the Personality Module. Note: To order a Personality Module you must have the complete model and serial number from the unit it goes into.

NO: Turn off the 24 volt AC supply and the plug the Personality Module back into its socket #J12. Re-power the Charge Assist™ Control, the fault code should clear itself.

Fault LED Flash Code of #15*. This indicates that there are multiple External Ambient Temperature sensors installed. Only one or four sensors can be connected to the EXT. terminal board on the Charge Assist™ Control.

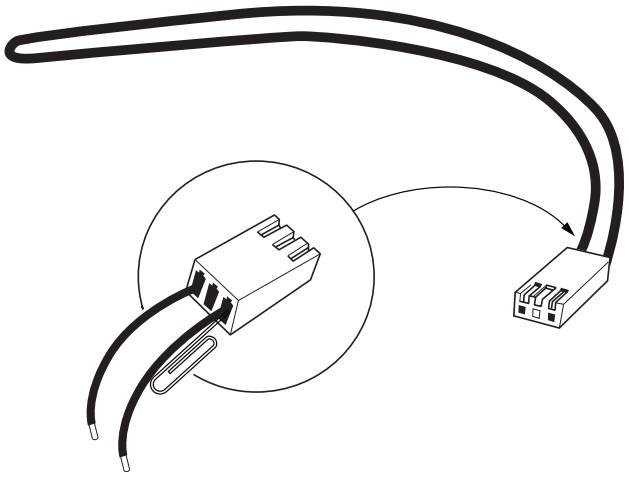
Alert Code Addendum

Charge Assist™ (CA) LEDs		LED Color	Description	Comfort Control Display
LOW	On	Red	Liquid pressure below 50 psig - Liquid pressure must be above 50 psig to enter CA. ***Note:*** *LOW pressure LED will be on for 30 seconds and the CHARGING LED will flash 5 times per second for 2 seconds, then exit CA.*	None
ODT	Flashing		Ambient Temperature below 65°F - Ambient Temperature must be above 65°F to enter CA. ***Note:*** *ODT LED will flash 1 sec ON/OFF for 30 seconds and the CHARGING LED will flash 5 times per second for 2 seconds, then exit CA.*	
COM	On	Amber	Solid at power-up	
	Off		No power	
	Flashing		Flash device count when in communication (number of communicating products connected in system) Rapid flashes followed by a pause indicates disrupted communications (CRC errors)	
CHARGED	On	Green	Charge is Correct	
	Off		Charged or not in CA Mode	
	Flashing		See Charging Blink Rate	
CHARGING	Off	Amber	Not in CA Mode	
	Flashing		See Stabilization Blink Rate	
RECOVER	On	Red	Need to recover refrigerant - unit locked out for 1 hour or press mode button to exit Charge Assist™	
ADD	On	Amber	System requires refrigerant charge (Control has 24 volt AC output to Charge Solenoid)	
Y1	On	Green	1st stage compressor requests	
Y2	On		2nd stage compressor request	
STATUS	Fast Flash		At Power Up ~ 20 seconds	
	Slow Flash		Standard operation	
	Off		Charge Assist™ mode or no power to control	
LitePort	Occasional Flash		For transmitting LitePort™ data	

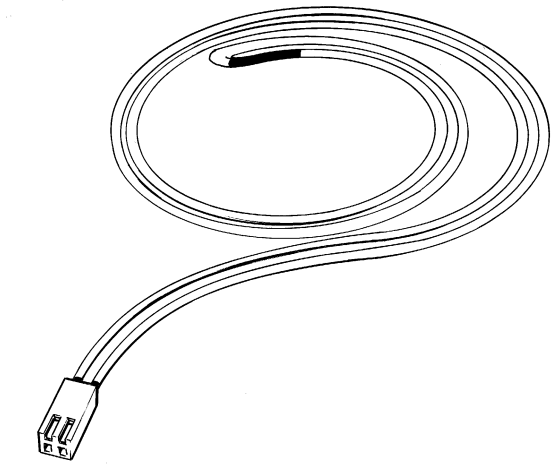
Notes:	4 highest priority Faults display flash codes sequentially. 2 second pause between faults and 4 second pause between sequences. Cycle power to ODU to clear Faults.

Chart #1: Coil and Ambient Temperature Sensors

Ambient Sensor



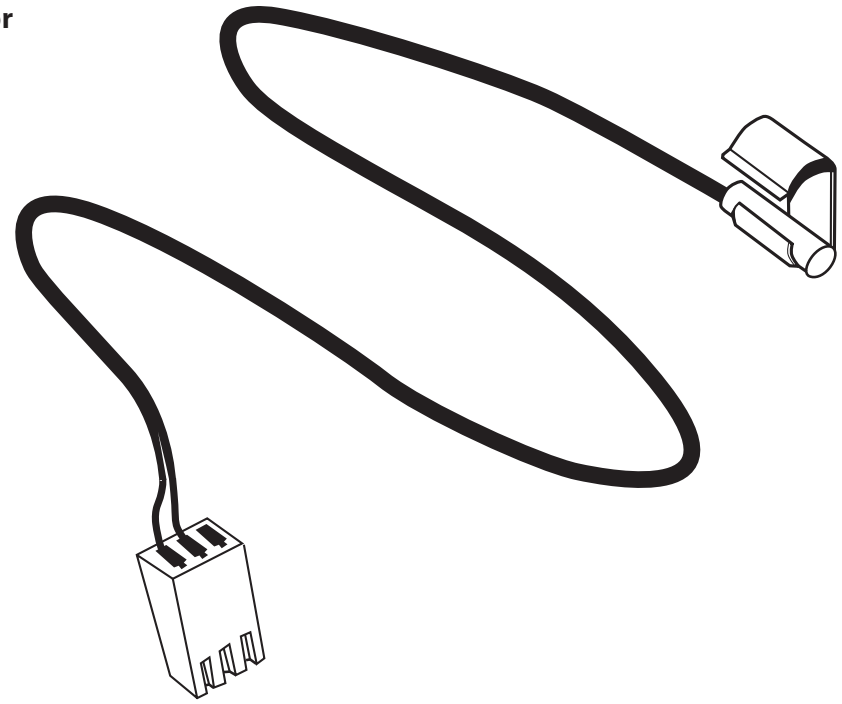
Coil Sensor



T deg F	T deg C	Thermistor Resistance (OHMS	Volts D.C. at Plug J-6 & J-7 ONLY
0	-17.78	83246.63	3.292
5	-15.00	71108.25	3.110
10	-12.22	60916.37	2.925
15	-9.44	52332.78	2.739
20	-6.67	45075.79	2.553
25	-3.89	38926.99	2.370
30	-1.11	33703.02	2.191
35	1.67	29253.02	2.019
40	4.44	25452.49	1.854
45	7.22	22198.45	1.697
50	10.00	19405.43	1.550
55	12.78	17002.31	1.412
60	15.56	14929.80	1.284
65	18.33	13138.29	1.166
70	21.11	11585.68	1.057
75	23.89	10237.51	0.958
80	26.67	9064.99	0.867
85	29.44	8042.90	0.785
90	32.22	7149.96	0.710
95	35.00	6368.17	0.642
100	37.78	5682.28	0.581
105	40.56	5079.31	0.526
110	43.33	4548.19	0.476
115	46.11	4079.48	0.431
120	48.89	3665.07	0.391
125	51.67	3298.03	0.355
130	54.44	2972.36	0.322
135	57.22	2682.92	0.292
140	60.00	2425.25	0.266
145	62.78	2195.49	0.242
150	65.56	1990.31	0.220

Chart #2: Liquid Line Temperature Sensor

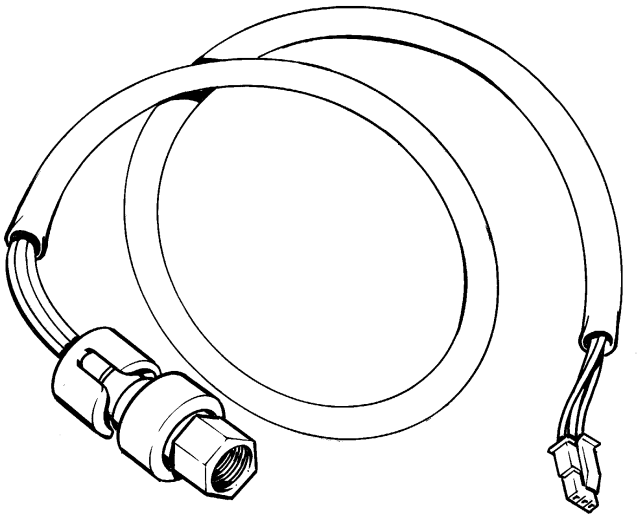
Liquid Line Sensor



T deg F	T deg C	Thermistor Resistance (OHMS	Volts D.C. at Liquid T Plug J-8 ONLY
50	10.00	19405.43	2.189
55	12.78	17002.31	2.029
60	15.56	14929.80	1.876
65	18.33	13138.29	1.730
70	21.11	11585.68	1.592
75	23.89	10237.51	1.461
80	26.67	9064.99	1.339
85	29.44	8042.90	1.226
90	32.22	7149.96	1.121
95	35.00	6368.17	1.024
100	37.78	5682.28	0.934
105	40.56	5079.31	0.852
110	43.33	4548.19	0.777
115	46.11	4079.48	0.709
120	48.89	3665.07	0.646
125	51.67	3298.03	0.589
130	54.44	2972.36	0.537
135	57.22	2682.92	0.490
140	60.00	2425.25	0.447
145	62.78	2195.49	0.409
150	65.56	1990.31	0.373

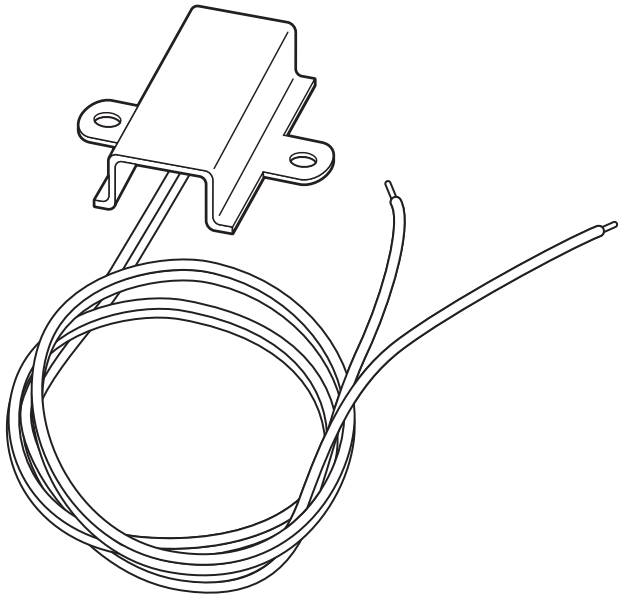
Chart #3: Liquid Line Pressure Transducer

Voltage to Pressure Reference Chart



DC volts	Pressure (PSIG)
0.81	31
0.91	41
1.00	51
1.10	60
1.20	70
1.32	82
1.42	92
1.52	101
1.62	111
1.72	120
1.81	130
1.91	140
2.03	152
2.13	161
2.23	171
2.33	181
2.43	190
2.52	200
2.65	212
2.74	222
2.84	231
2.94	241
3.04	250
3.14	260
3.26	272

Chart #4: External Accessory Temperature Sensor — BAYSEN01ATEMPA



T deg F	T deg C	External Thermistor Resistance (OHMS)	Volts D.C. at EXT ODT Terminal Board TB1 Only
0	-17.78	85137.6	3.8
5	-15.00	72741.6	3.7
10	-12.22	62326.4	3.5
15	-9.44	53550.0	3.4
20	-6.67	46133.2	3.2
25	-3.89	39848.1	3.1
30	-1.11	34507.3	2.9
35	1.67	29957.0	2.7
40	4.44	26070.1	2.6
45	7.22	22741.5	2.4
50	10.00	19883.9	2.2
55	12.78	17424.8	2.1
60	15.56	15303.6	1.9
65	18.33	13469.6	1.8
70	21.11	11880.5	1.6
75	23.89	10500.4	1.5
80	26.67	9299.3	1.4
85	29.44	8251.8	1.2
90	32.22	7336.4	1.1
95	35.00	6534.7	1.0
100	37.78	5831.4	1.0
105	40.56	5213.1	0.9
110	43.33	4668.5	0.8
115	46.11	4188.0	0.7
120	48.89	3763.3	0.7
125	51.67	3387.1	0.6
130	54.44	3053.5	0.6
135	57.22	2757.1	0.5
140	60.00	2493.2	0.5

Trouble Shooting: ERR 91 Displayed at the Comfort Control

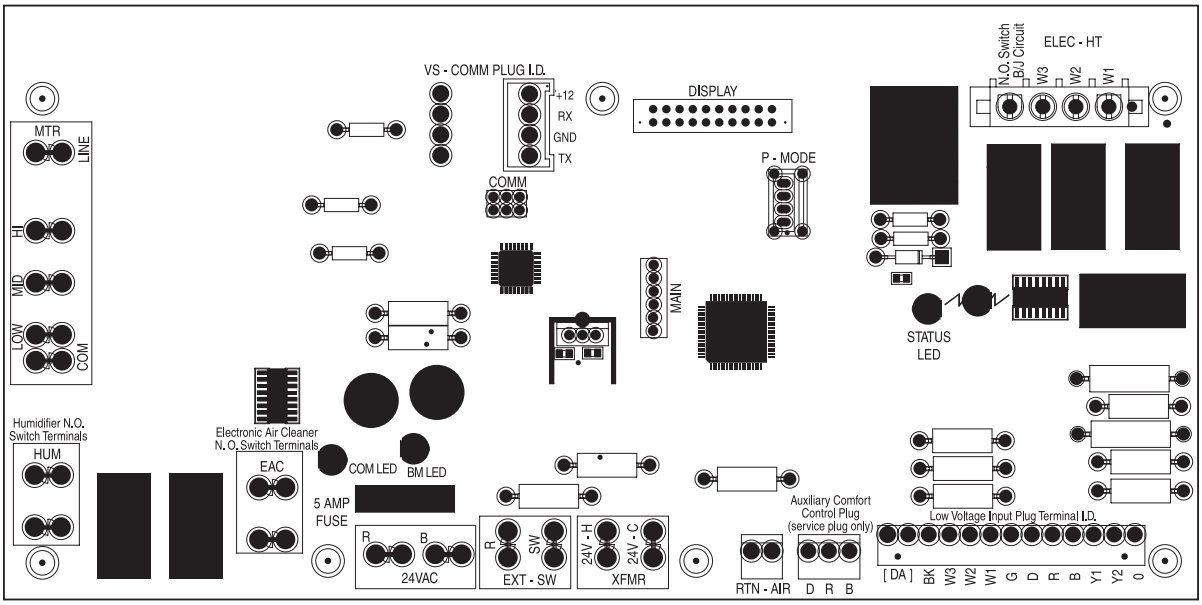
When ERR 91 is displayed at the comfort control, thermostat will go to OFF.

At the Gas Furnace or Air Handler, is the **COM LED** flashing slowly in groups of 2, 3, 4 or 5 flashes indicating number of devices, OR is it flashing fast?

If the COM LED is flashing slowly in groups of 2, 3, 4 or 5, go to Chart F-1.

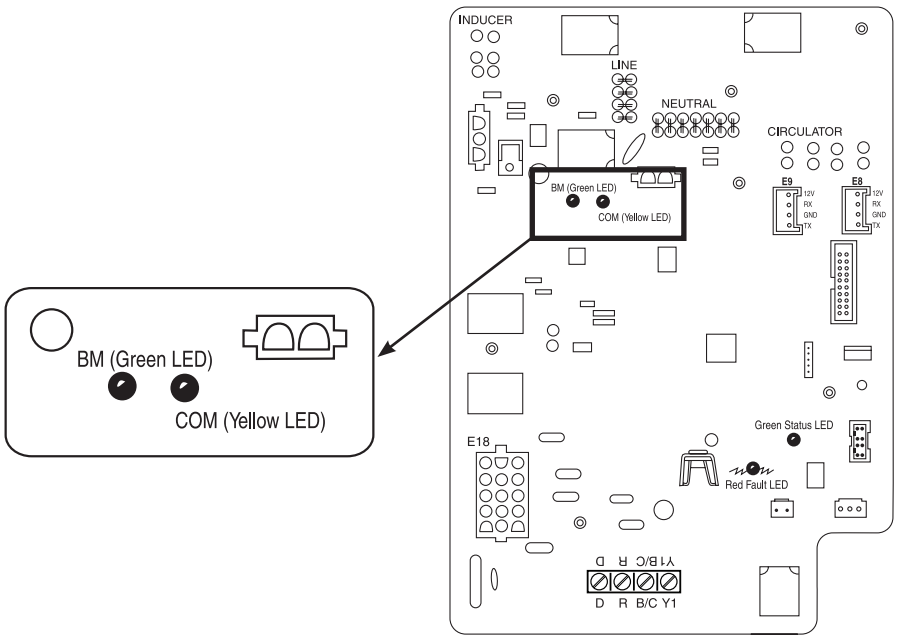
If the COM LED is flashing fast go to System Communication Troubleshooting section on page 94.

Air Handler Control Board



= Indicates a male spade terminal RTN = Return air sensor plug DA = Discharge air sensor plug terminals BK= PWM blower speed terminal

Gas Furnace IFC



Trouble Shooting Chart F-1: ERR 91 Displayed at the Comfort Control

Step 1: At the User Interface Assembly, scroll down ▼ to the LAST 4 FAULTS and press the Enter button.

Step 2: What is now displayed on the User Interface Display?

If **IND COMM ERR** is displayed go to Trouble Shooting Chart **F-2 IND COMM ERR** on page 80.
If **BLW COMM ERR** is displayed, **is the Green LED on the Inducer Motor Drive Board on**?

YES: Perform 24 Volt AC GO/ NO - GO Test for Serial Port V.S. Blower Motor; see page 63.

NO: (1) Unplug the wires going into plug E9 on the furnace IFC; these wires go from the furnace IFC to the Inducer Motor Drive Board (IMDB).

(2) At the Comfort Control set the fan to the ON position.

(3) Turn the power off to the furnace for 30 seconds and then back on.

(4) The User Interface will display, wait until the furnace IFC goes through the power up routine. **Does the Indoor Blower now come on**?

YES: Err 91 is being caused by the Inducer Motor Drive Board. Check for 120 volts AC at the Inducer Motor Drive Board power plug, if 120 volts AC is present at the IMDB power plug replace the IMDB.

NO: Check for the following DC voltage at the furnace IFC plug E8. This is the plug going to the indoor blower. Read the voltage with the blower motor plug connected to the furnace IFC.

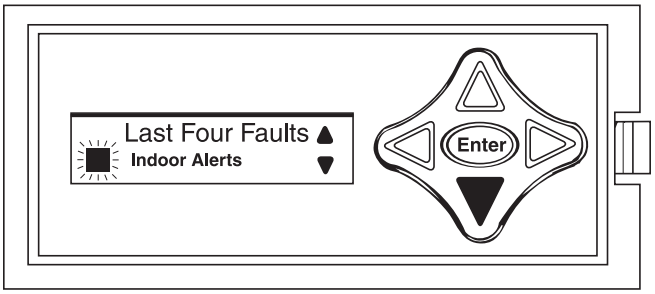
Plug E8 pin (labeled 12V) and the next pin (labeled RX) should read 12 volts DC. Connect the volt meter to the B/C terminal on the low voltage terminal strip and the pin in plug E8. **Is the voltage correct**?

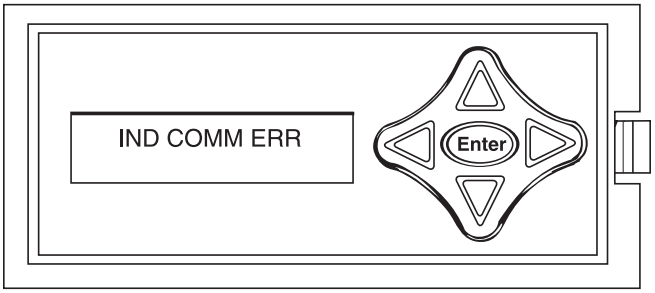
YES: If the 12 volts DC is present at both pins in plug E8, the fault is with the harness or the indoor blower motor. Perform the 24 Volt AC GO/ NO - GO Test for Serial Port V.S. Blower Motor on page 63.

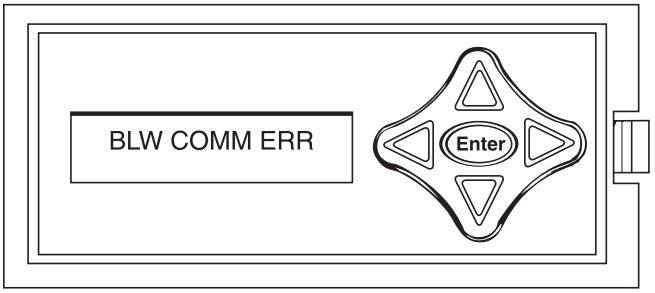
NO: If the DC voltage is low or not present at the furnace plug E8 pins 12V and RX, unplug the wire from plug E8 and again check for the DC voltage at these two pins. The voltage should read 12 volts DC at these two pins. **Is the 12 volts DC voltage present at both pins**?

YES: Fault is in the harness or the indoor blower motor. See Trouble Shooting Chart **F-3 BLW COMM ERR** on page 84 for additional information.

NO: Fault is the furnace IFC, replace the furnace IFC.







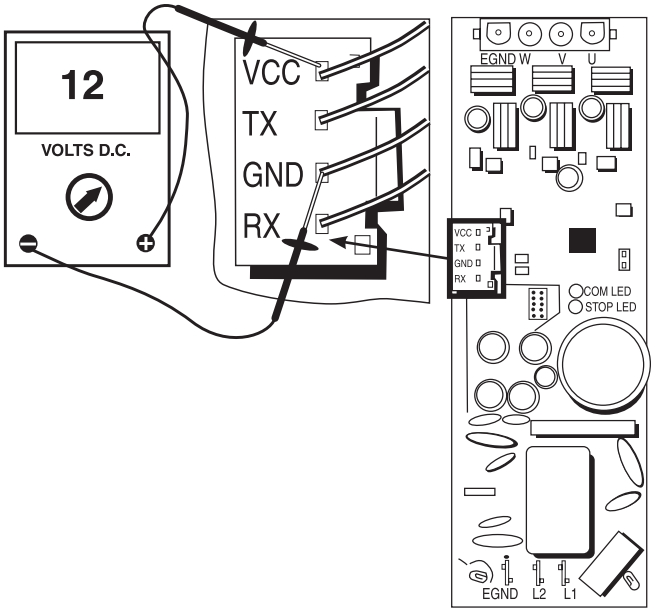
Trouble Shooting Chart F-2: IND COMM ERR

Note: Inducer Motor Drive Board LED Functions:

If the Green COM LED on the inducer motor drive board is flashing, this is an indication that the inducer motor drive board and the Gas Furnace IFC are communicating with each other. The inducer motor drive COM LED will continue to flash as long as there is a call for heat.

The inducer motor drive board RED STOP LED will flash on and off a few times when the Gas Furnace IFC sends a command to turn off the inducer motor. The RED STOP LED is normally off.

Inducer Motor Drive Board



Step 1: Turn power ON.

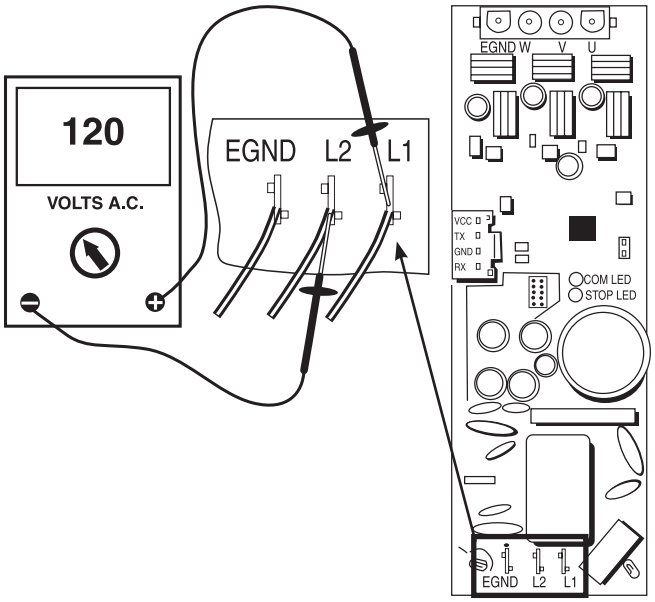
Is there 12 VDC at the inducer motor drive board terminals VCC and GND?

YES: Go to step #2

NO: Go to step #7

Step 2: Turn power ON.

Inducer Motor Drive Board



Is there 120 VAC at the inducer motor drive board terminal L1 and L2?

YES: Go to step #3

NO: Repair as needed and retest

Trouble Shooting Chart F-2: IND COMM ERR

Step 3: Cycle power to the comfort control thermostat and set it to call for heat.

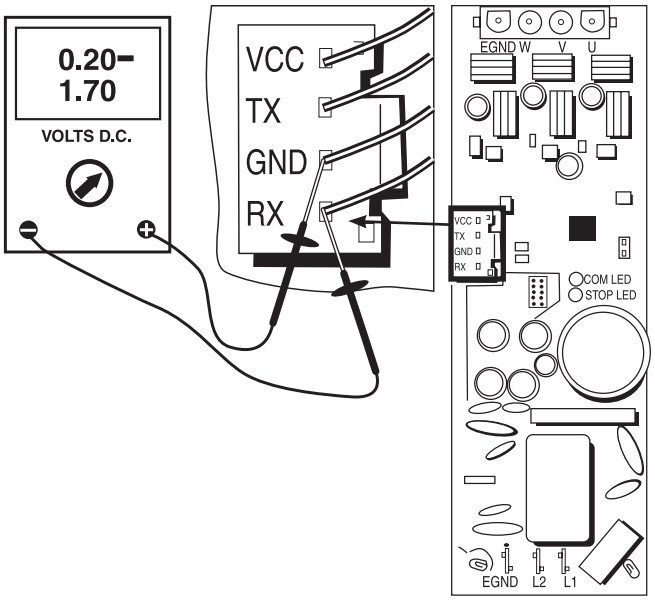
Is there DC voltage between the inducer motor drive board terminals RX and GND? This DC voltage should be going up and down between 0.2 Volts DC and 1.7 Volts DC*.

***Note:** Voltage levels may vary depending on Volt OHM Meter Type.

YES: Go to step #5

NO: Go to step #4

Inducer Motor Drive Board



Step 4: Set the thermostat to call for heat.

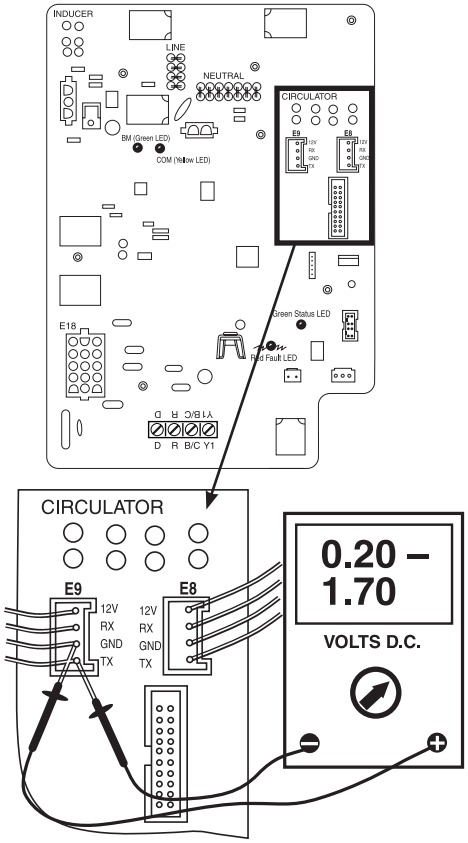
Is there DC voltage between the Gas Furnace IFC plug E9 terminal TX and GND? This DC voltage should be going up and down between 0.2 Volts DC and 1.7 Volts DC*.

***Note:** Voltage levels may vary depending on Volt OHM Meter Type.

YES: Repair or replace the low voltage harness going from the Gas Furnace IFC plug E9 to the inducer motor drive board.

NO: Replace the IFC.

Gas Furnace IFC



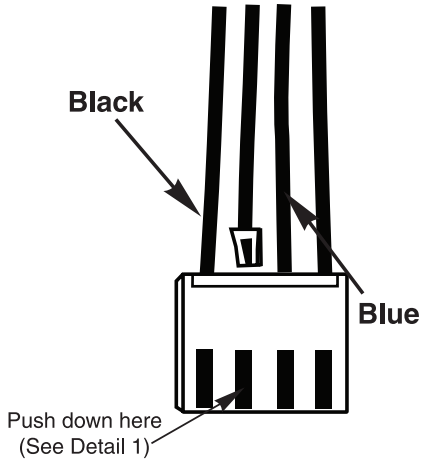
Trouble Shooting Chart F-2: IND COMM ERR

Step 5: **De-power** the Gas Furnace. At the Gas Furnace IFC, remove the wire from the terminal RX at the E9 plug going to the inducer motor drive.

Detail 1:
Push down on the wire connector latch clip on the side of the plug and pull the RX wire from the E9 plug. Plug the E9 back into the IFC.

Detail 2:
Connect a digital DC Voltmeter to the RX wire removed from E9 plug and the B/C low voltage terminal board.

Detail 3:
Re-power the Gas Furnace.

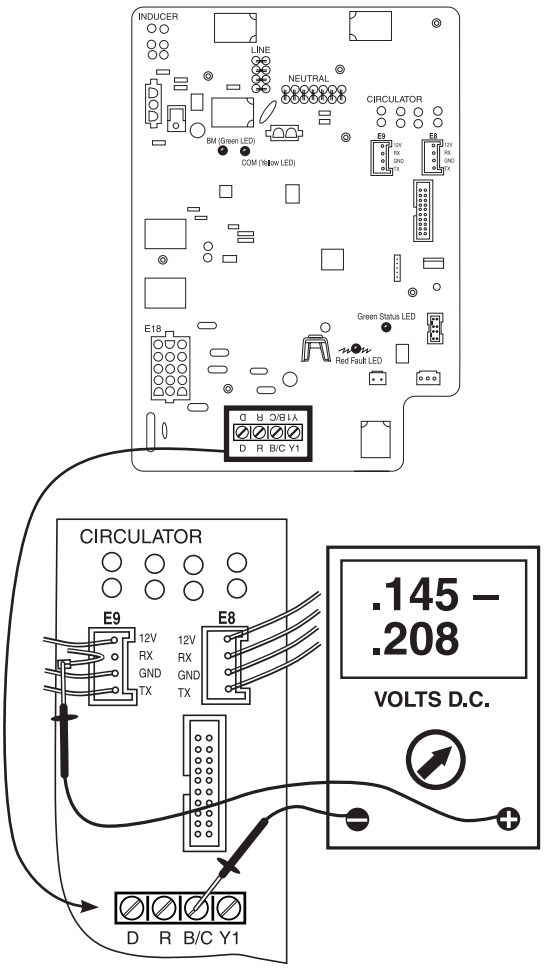


Is the DC voltage between the wire removed from the Gas Furnace IFC plug E9 Terminal RX and the low voltage terminal B/C going up and down between 0.145 Volts DC and 0.208 Volts DC?

YES: Replace the Gas Furnace IFC.

NO: Go to step #6. Do NOT reconnect the RX wire.

Gas Furnace IFC



Trouble Shooting Chart F-2: IND COMM ERR Chart

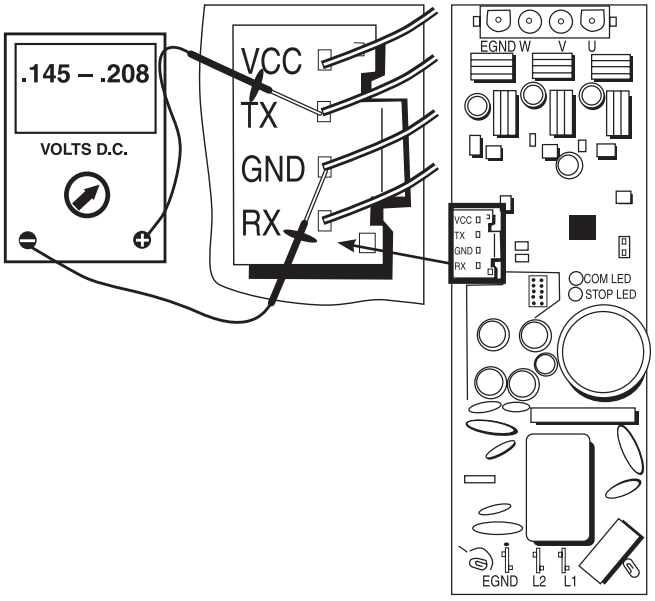
Step 6: **De-power** the Gas Furnace. Connect the DC volt as shown and then re-power the Gas Furnace.

Is there DC voltage between the inducer motor drive board terminal TX and GND? This DC voltage should be going up and down between 0.145 Volts DC and 0.208 Volts DC.

YES: Repair or replace the low voltage harness.

NO: Replace the inducer motor drive board and reconnect the wire that was removed from the Gas Furnace IFC plug E9.

Inducer Motor Drive Board

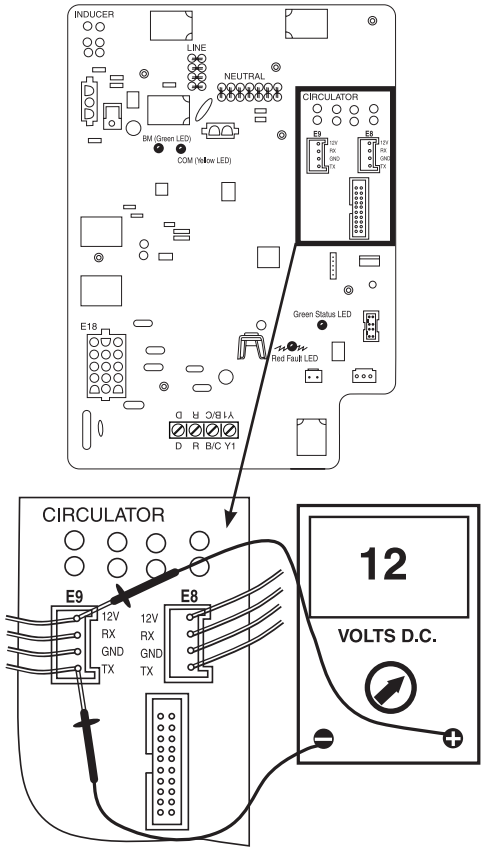


Step 7: **Is the 12 VDC at the Gas Furnace IFC plug E9 measured between terminals 12V and GND?**

YES: Repair or replace the low voltage harness going from the Gas Furnace IFC plug E9 to the inducer motor drive board.

NO: Replace the Gas Furnace IFC.

Gas Furnace IFC



Trouble Shooting Chart F-3: BLW COMM ERR

A Gas Furnace Fault LED will be flashing a ten (10) flash code.

An Air Handler Fault LED will be flashing a three (3) flash code.

Step 1: Power is on during this step.
Is there 12VDC at the indoor blower low voltage plug terminals 12V and GND?

YES: Go to step #2

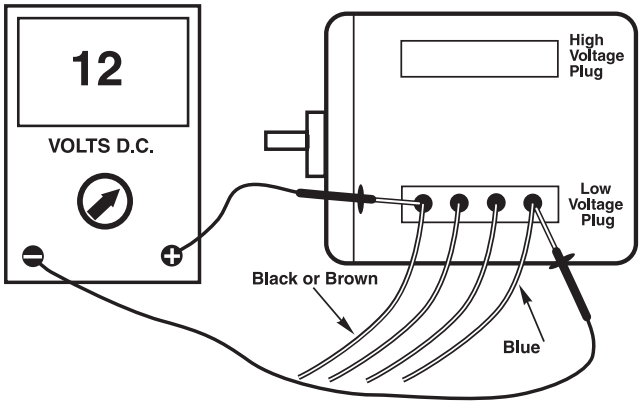
NO: Go to step #7

Note: The colors of the low voltage V.S. Blower Motor wires are:

Gas Furnace uses a blue wire and a black wire.

Air Handler uses a blue wire and a brown wire.

V.S. Blower Motor



Step 2: Is there 120 VAC at the indoor blower high voltage plug terminals?

YES: Go to step #3

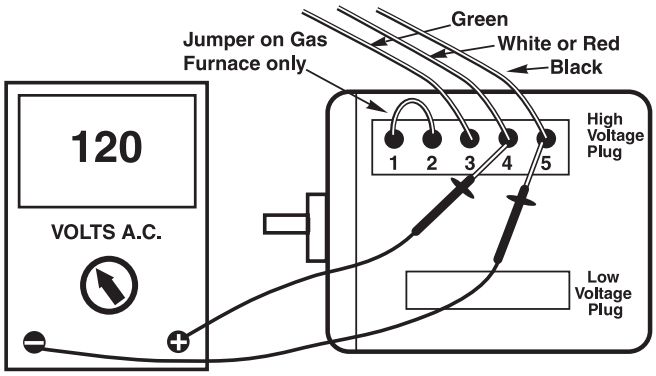
NO: Repair as needed and retest

Note:

1. The correct line voltage is:
   Gas Furnace – 120 Volts AC
   Air Handler – 220 Volts AC

2. The colors of the line voltage wires are:
   Gas Furnace has a black wire and a white wire.
   Air Handler has a black wire and a red wire.

V.S. Blower Motor



Trouble Shooting Chart F-3: BLW COMM ERR

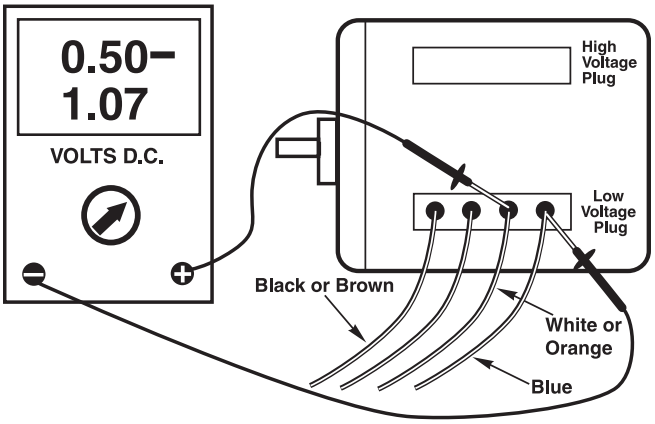
Step 3: Set the comfort control thermostat to call for blower operation.

Is there DC voltage between the indoor blower motor low voltage plug terminal RX and GND? This DC voltage should be going up and down between 0.50 Volts DC and 1.07 Volts DC. The Volt Meter will stop reading at times and then start reading again.

YES: Go to step #5

NO: Go to step #4

V.S. Blower Motor



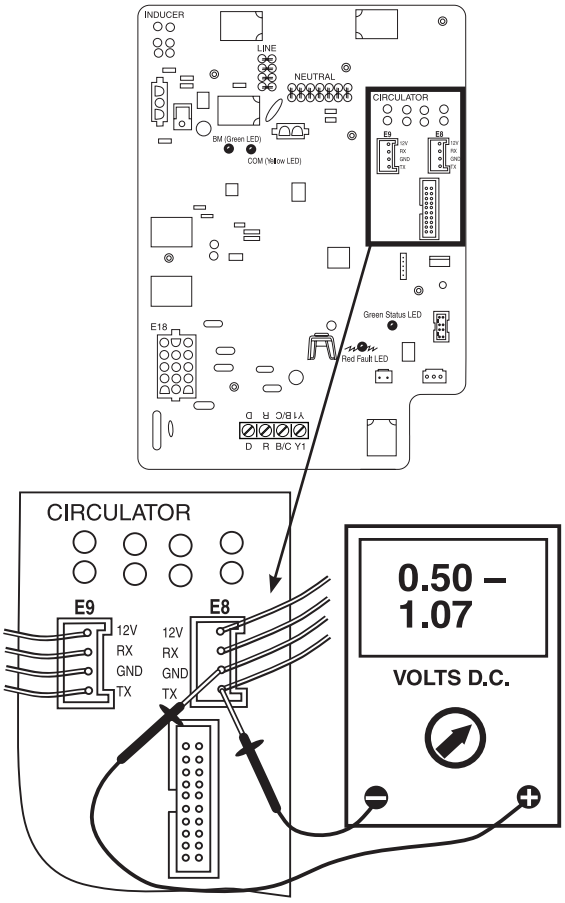
Step 4: Set the comfort control thermostat to call for blower operation.

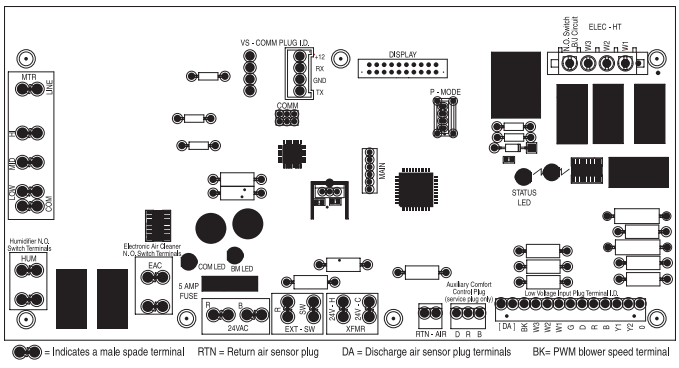
Is there DC voltage between the Gas Furnace IFC plug E8 Terminal TX and GND? This DC voltage should be going up and down between 0.5 volts DC and 1.07 volts DC. This voltage reading will stop reading at times and start again.

YES: Repair or replace the low voltage harness going from the Gas Furnace IFC plug E8 or the Air Handler plug to VS COMM going to the indoor blower low voltage plug.

NO: Replace the Gas Furnace IFC or the Air Handler control board.

Gas Furnace IFC





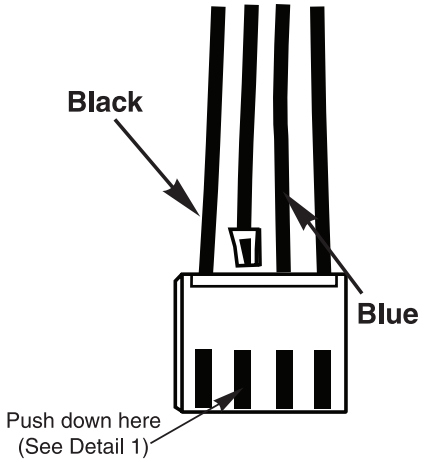
Trouble Shooting Chart F-3: BLW COMM ERR

Step 5: **De-power** the Gas Furnace or the Air Handler. At the Gas Furnace IFC or the Air Handler control board, remove the wire from the terminal RX in the low voltage plug going to the indoor blower low voltage plug. When the RX wire is removed from the low voltage plug, put the low voltage plug back into the Gas Furnace IFC or the Air Handler control board.

Detail 1:
Push down on the wire connector latch clip on the side of the plug and pull the RX wire from the low voltage plug. Plug the low voltage plug back into the IFC.

Detail 2:
Connect a digital DC voltmeter to the RX wire removed from the low voltage plug and the B/C terminal at the low voltage terminal board.

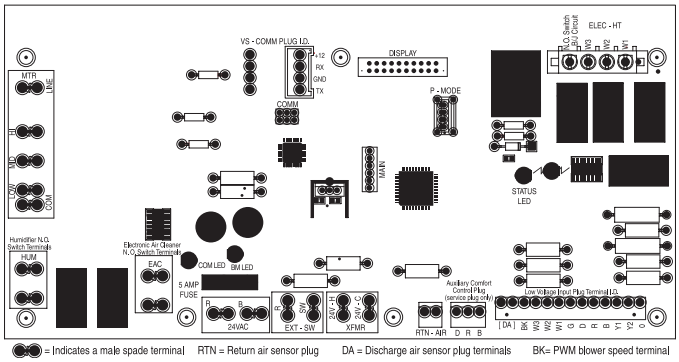
Detail 3:
Re-power the Gas Furnace.



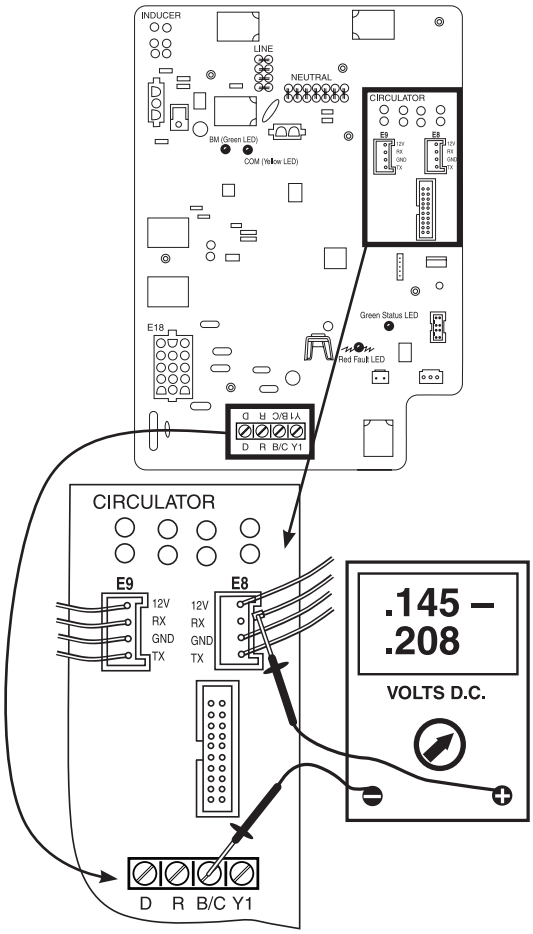
Is there DC voltage between the wire removed from the Gas Furnace IFC or the Air Handler control board plug low voltage terminal RX and the low voltage terminal B/C going up and down between 0.152 Volts DC and 0.174 Volts DC? The Votage Meter will stop reading at times and then start reading again.

YES: Replace the Gas Furnace IFC or the Air Handler control board.

NO: Go to step #6. Do not reconnect the RX wire.



Gas Furnace IFC



Trouble Shooting Chart F-3: BLW COMM ERR

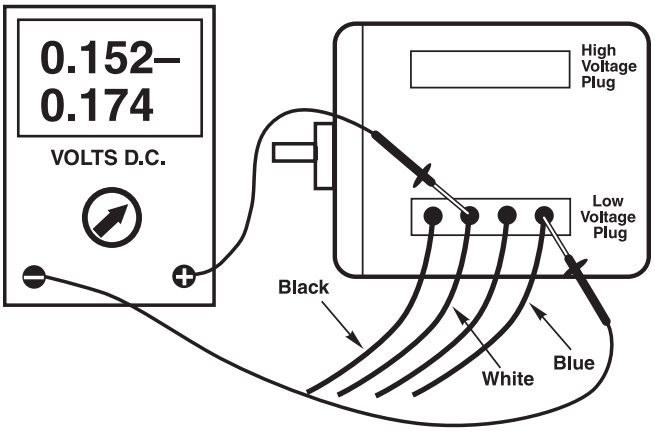
Step 6: **De-power** the Gas Furnace or the Air Handler. Connect the DC voltmeter as shown and then re-power the Gas Furnace or the Air Handler.

Is there DC voltage between the indoor door blower terminals TX and GND? This DC voltage should be going up and down between 0.152 Volts DC and 0.174 Volts DC. The Voltage Meter will stop reading at times and then start reading again.

YES: Repair or replace the low voltage harness going from the indoor blower to the Gas Furnace IFC.

NO: Replace the indoor blower motor and reconnect the wire removed from the Gas Furnace IFC or the Air Handler.

V.S. Blower Motor

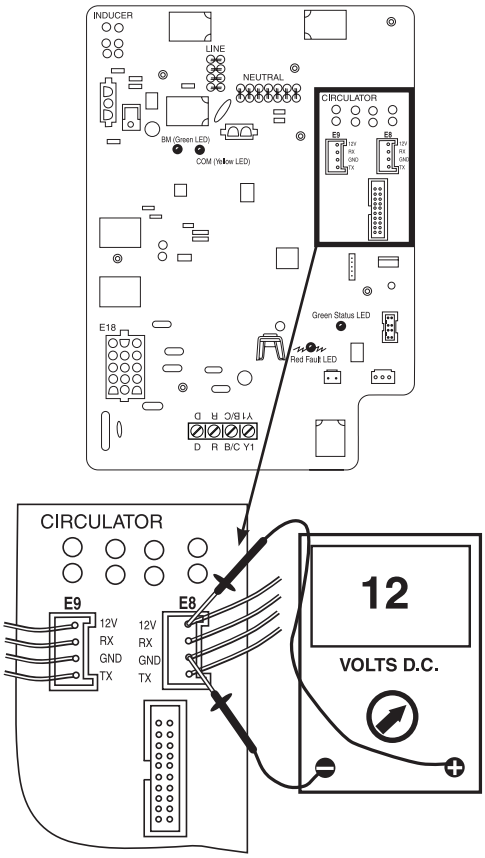


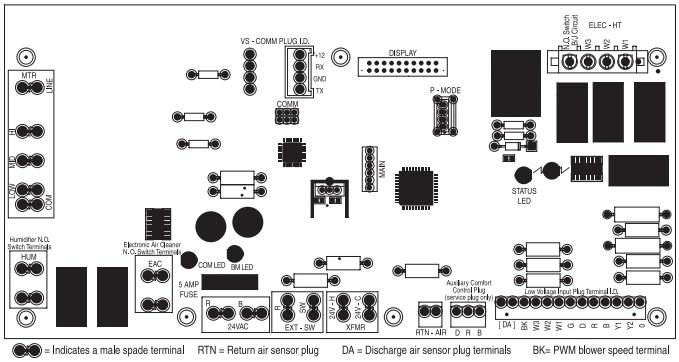
Step 7: **Is there 12 VDC at the Gas Furnace IFC or Air Handler low voltage plug measured between terminals 12V and GND?**

YES: Repair or replace the low voltage harness going from the Gas Furnace IFC plug to the indoor blower low voltage harness.

NO: Replace the IFC.

Gas Furnace IFC





System Communication Trouble Shooting

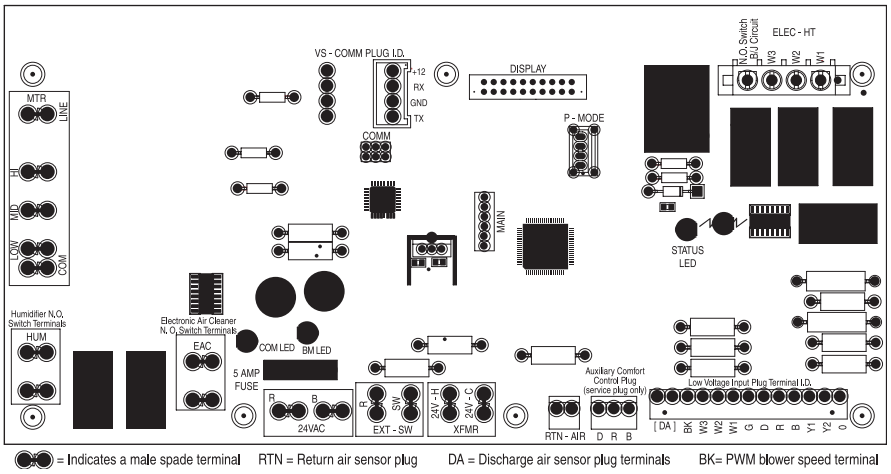
Step 1: Turn off the power to the furnace or air handler. Remove the blower door to be able to see the furnace IFC or air handler control board LEDs and their User Interface display. On an air handler installation the User Interface display must be temporarily set aside to be able to view the LEDs. Restore the power to the furnace or the air handler and watch the green BM LED and the amber COM LED.

Does the green BM LED come on solid and bright? (**Note:** BM LED must glow brightly, with no flashing.)

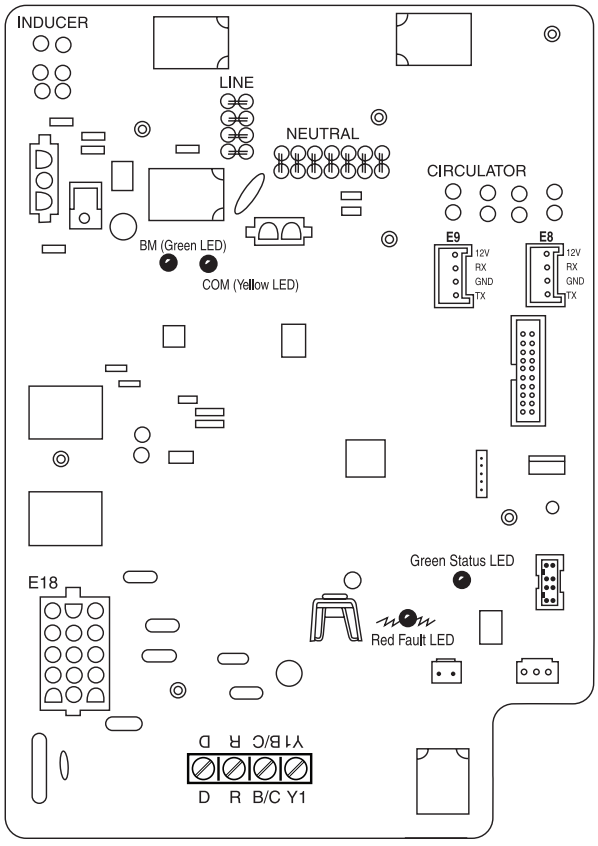
YES: Go to step #3

NO: Go to step #2

Air Handler Control Board



Furnace IFC



Step 2: Is there 24 volts AC power at (1) the outdoor unit Charge Assist™ control, (2) at the furnace IFC or the air handler control board and (3) the Telephone Access Module?

Note: If there is no 24 volt AC power at some of the communicating components the BM LED may be very dim or out, or may be flashing very fast. And an error code of ERR 89 my have been seen at the Comfort Sensor.

YES: Remove all wires from D terminal at the furnace IFC or air handler terminal board. Does the BM LED now come on? If the BM does not come on replace the furnace IFC or the air handler control board. If the BM LED comes on go to step #11.

NO: Restore 24 volt AC power and then test control system for proper operation.

Step 3: The amber COM LED will normally flash rapidly for a few seconds when the system is powered up and then go to a slow flash rate of 1, 2 or 3 or more flashes.

What is the amber COM LED doing?

Slowly flashing 1 flash and after three minutes it then goes to a fast flash. This means the furnace IFC or the air handler control board is not communicating with anything. Go to step #7.

Flashing in groups of 2, 3 or more flashes. This means the furnace IFC or the air handler control board is communicating with the Comfort sensor and some of the other components in the system. The number of flashes in the group is the number of things that are communicating with each other. Go to step #4.

Flashing in groups of 2, 3 or more flashes for three minutes and then goes to a fast flash rate. This means that the Comfort Sensor and the furnace IFC or air handler control board are not communicating. Go to step #6.

Step 4: How many communicating components are connected in this system? The furnace IFC or air handler count as one, the thermostat counts as two, the outdoor unit counts as three (if the outdoor unit is a communicating type) and a telephone access module would count as four.

Does the number of communicating components agree with the flash code count of the furnace IFC or air handler COM LED?

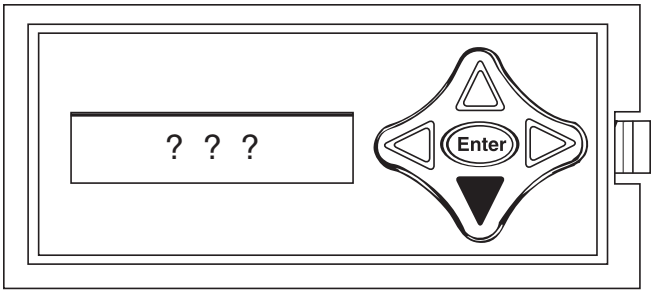
YES: Go to step #5.

NO: Go to step #8.

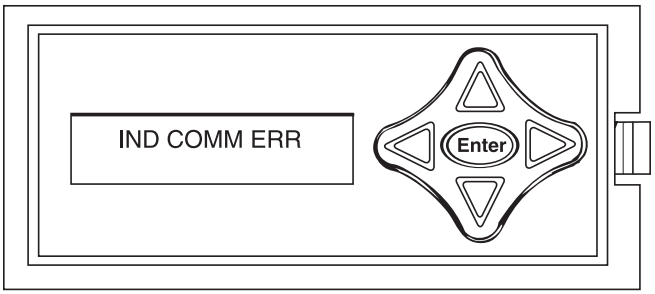
System Communication Trouble Shooting

Step 5: At the user interface scroll down ▼ to the INDOOR ALERT screen. Press the Enter button to see the alert message.

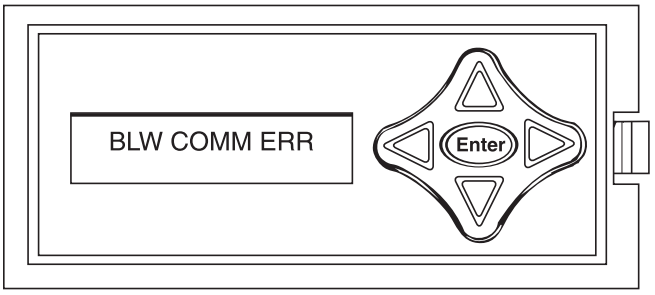
What is now displayed?



If **IND COMM ERR** is displayed go to chart **F-2**



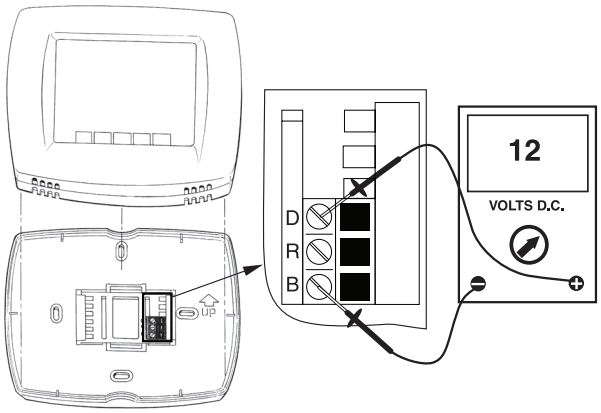
If **BLW COMM ERR** is displayed go to chart **F-3**



If **NO ALERTS** is displayed go to **step #9**.

System Communication Trouble Shooting

Step 6: Check the thermostat wire going to the Comfort Sensor. The B thermostat wires going from B terminal at the furnace IFC or air handler terminal board must go to the B terminal on the Comfort Sensor. If the B and R wires are crossed the Comfort Sensor will have a display but it will not communicate and Err 91 will be displayed. Check for 10 to 12 Volts DC at the thermostat sub base terminals D and B. This voltage comes from the furnace IFC or Air handler control board.



Is the Comfort Sensor wired correctly and is the10 to 12 Volts DC present?

YES: Go to step #7.

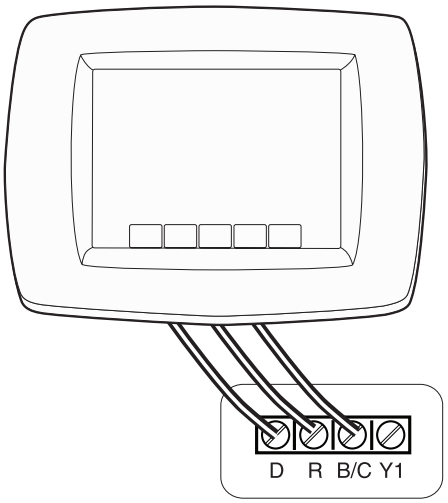
NO: Repair or replace the thermostat wire.

Step 7: Turn power off to the furnace or air handler. Disconnect the Comfort Sensor and sub base and reconnect it to the furnace IFC or air handler terminal board with a short piece of thermostat wire. Disconnect all other wires connected to the D terminal at the furnace IFC or air handler terminal board. Turn power back on to the furnace or air handler.

Does the Comfort Sensor and furnace IFC or air handler now communicate?

YES: Err 91 is being caused by the thermostat wire or its routing. Repair, or reroute or replace the thermostat wire.

NO: Replace the Comfort Sensor



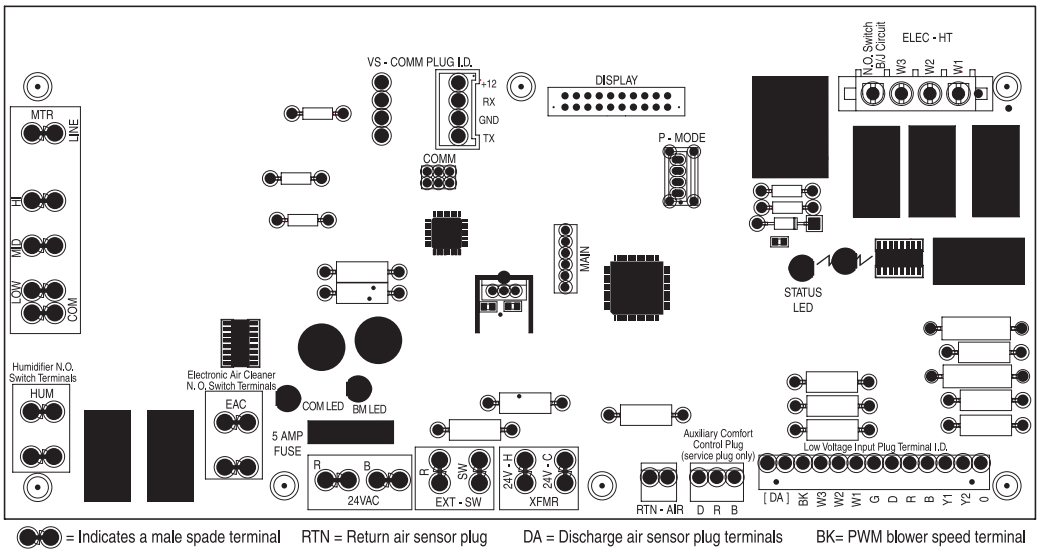
Furnace IFC or Air Handler Board

Step 8: Does the furnace IFC or air handler fault LED show a fault flash code?

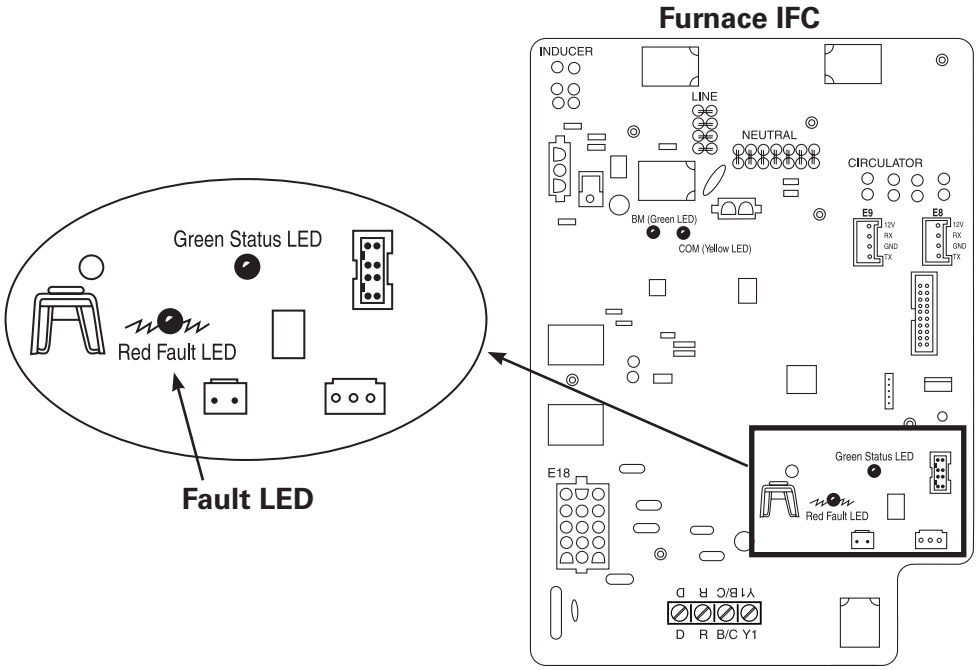
YES: Go to step #5.

NO: Go to step #9.

Air Handler Control Board



Furnace IFC



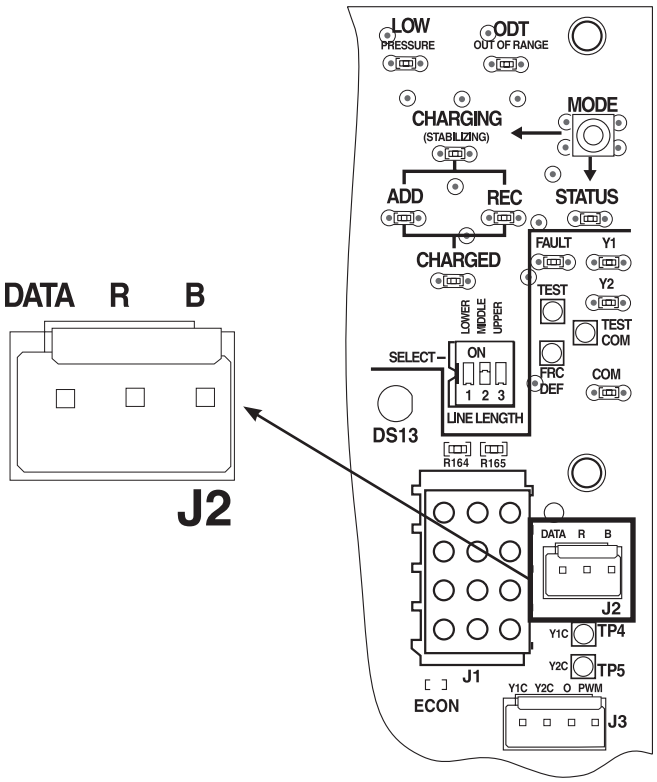
Step 9: Does the outdoor unit Charge Assist™ control have 24 volts AC at plug J2 terminals R and B?

Note: When any of the Charge Assist™ LEDs are on or flashing, this only indicates that some low voltage AC is present. Check the 24 volt AC supply with a volt ohm meter.

YES: Go to step #10.

NO: 24 volts AC is supplied by the outdoor unit's transformer. Repair or replace as needed.

Charge Assist™ Board

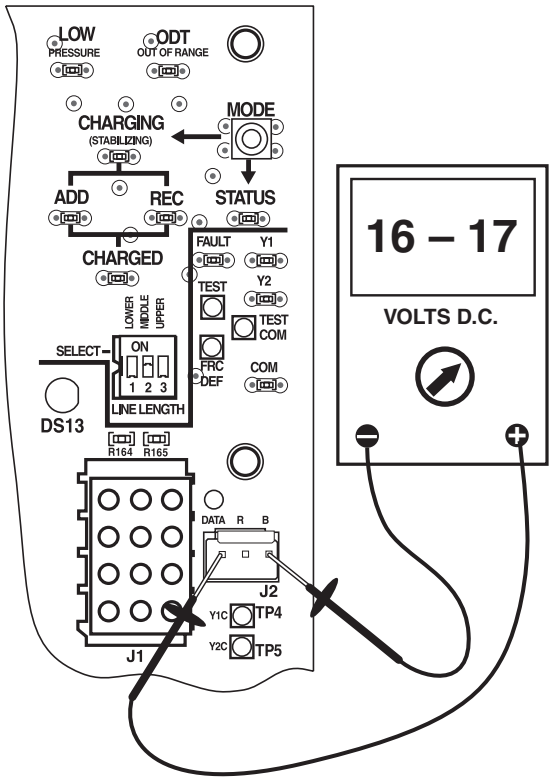


Step 10: Does the outdoor unit Charge Assist™ control fault LED show a fault flash code of 1 flash?

YES: Check the DC voltage at test plug J2 terminals D and B. If this voltage is 16 to 17 volts DC this indicates that the D or B or both thermostat wires coming from the furnace or air handler are open. Repair or replace the thermostat wire.

NO: Normal voltage at this point is 12.5 volts DC. Go to step #11.

Charge Assist™ Board



Step 11: Connect **one wire at a time back** onto the D terminal of the furnace IFC or air handler terminal board. These are the wires removed in step #2.

Does the BM LED stay on solid and bright when each wire is reconnected one at a time to the D terminal?

YES: Check the control system for proper operation.

NO: When a thermostat wire is reconnected to the D terminal and the BM LED goes out, goes dim, or starts flashing this indicates that this is the circuit which is causing the ERR or fault. Remove this thermostat wire and determine where this thermostat wire goes, then go to step #12.

Step 12: Go to the component that is being fed by the thermostat wire that was determined to be creating the Err or fault in step #11, and disconnect the thermostat wire going to that component. Now go back to the furnace or air handler and reconnect the thermostat wire that was determined in step #11 to be the circuit causing the problem.

Does the BM now stay on solid and bright?

YES: This proves the thermostat wire going to this component is good.

NO: This ERR or fault is being caused by the thermostat wire. Repair as needed or replace the thermostat wire.

Communicating System Voltage Readings

Note: These measurements to be made at component's LVTB, Thermostat subbase or field wiring connections at outdoor unit. Line Voltage applied to unit.

Normal Operating Voltage

R = Power = 24 Volts A.C.
D = Data = 12 Volts D.C.
B = Common (B terminal is common for A.C. and D.C. voltage readings)

Furnace, Air Handler, Comfort Control, TAM or Outdoor Unit

R to B = 24 Volts A.C.
D to B = 12 Volts D.C.
If you read **R to D** you will read 12 Volts D.C. or 24 Volts A.C., depending on how you set up your volt meter.

Voltage readings made at the Furnace or Air Handler LVTB

R to B = 0 Volts A.C. – With 24 Volts A.C. to control board and fuse is ok, change control board
D to B = 0 Volts D.C. – 24 Volts A.C. ok, change control board

Voltage readings made at the Comfort Control Subbase. 24 Volts A.C. and 12 Volts D.C. ok at the Furnace or Air Handler LVTB.

R to B = 0 Volts A.C. – Open thermostat wire **(R or B)**
D to B = 0 Volts D.C. – Open thermostat wire **(D)**

Voltage readings made at the Outdoor Unit

D to B = 16.5 Volts D.C. - Open thermostat wire **(D)**
D to B = 13.6 Volts D.C. – Open thermostat wire **(B)**

When outdoor unit is off (no 24VAC) data line voltage stays at 12VDC. This 12VDC is supplied by the communicating indoor unit.

When outdoor unit is on (24VAC present) and D field thermostat wire is open the data line voltage will read 16.5 VDC.

Voltage readings made at TAM

R to B = 0 Volts A.C. – Open thermostat wire **(R or B)**
D to B = 0 Volts D.C. – Open thermostat wire **(D)**

Communicating Voltage to Blower Motor and Furnace Inducer Drive Board

FURNACE IFC
The following voltage readings are to be made at plugs E8 or E9 with motor harness connected.
12V to GND = 12 Volts D.C.
RX to GND = 12 Volts D.C.
TX to GND = 0 Volts D.C.

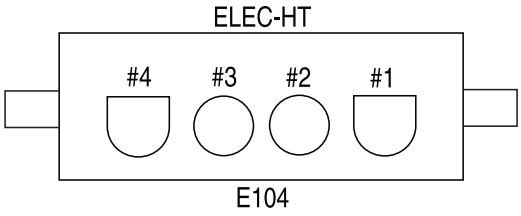
NOTE: The **TX** may have a voltage of 0.5 to 1.5 Volts D.C. when Air Handler control board is first powered up. This may also occur if the blower motor and Air Handler control board are not communicating with each other.

Air Handler

The following voltage readings are to be made at plug VS-COMM with motor harness connected.

12 VCC (brown wire) to B/C = 12 Volts D.C.
RX (purple wire) to B/C = 12 Volts D.C.
TX (orange wire) to B/C = 0 Volts D.C.
B/C (blue wire)

Air Handler Electric Heat Plug



	ELEC-HT Plug Voltage Reading			
	One Stage of Electric Heat Installed			
	B/J COMMON PIN #4 Interlock Voltage	PIN # 1 Voltage	PIN # 2 Voltage	PIN # 3 Voltage
No Call For Electric Heat	0VAC 24VDC	0VAC 24VDC	0VAC 0VDC	0VAC 0VDC
Call For Electric Heat	0VAC 0VDC	24VAC	0VAC 0VDC	0VAC 0VDC
	Two Stages of Electric Heat Installed			
	B/J COMMON PIN#4 Interlock Voltage	PIN # 1 Voltage	PIN # 2 Voltage	PIN # 3 Voltage
No Call For Electric Heat	0VAC 24VDC	0VAC 24VDC	0VAC 24VDC	0VAC 0VDC
Call For Electric Heat	0VAC	24VAC	24VAC	0VAC 0VDC
	Three Stages of Electric Heat Installed			
	B/J COMMON PIN#4 Interlock Voltage	PIN # 1 Voltage	PIN # 2 Voltage	PIN # 3 Voltage
No Call For Electric Heat	0VAC 24VDC	0VAC 24VDC	0VAC 24VDC	0VAC 24VDC
Call For Electric Heat	0VAC 0VDC	24VAC	24VAC	24VAC

Note: When measuring voltage at pins 1, 2, 3, or 4, the other meter lead should be connected to the transformer 24V common.

Literature Order Number		
File No.	Pub. No. 34-4093-01	1/08
Supersedes		—
Stocking location		PI