CNT04829

18-CH42D1-2

Three Stage Integrated Furnace Control
for Furnaces with Variable Speed Fan

INSTALLATION INSTRUCTIONS

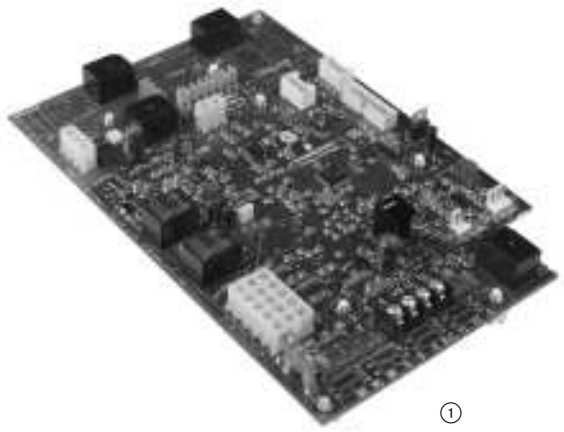
Operator: Save these instructions for future use!

FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING OR OPERATING THIS CONTROL COULD CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE.

DESCRIPTION

This control is a multi-stage ignition system, based on a solid-state, digital microcomputer. This control is designed for direct burner ignition, starting and timing all system components, operating multi-stage heat and supervision of all gases used in a gas fired furnace equipped with a variable speed draft inducer, variable speed indoor blower motor, and discrete pressure switches with a capacity of 150,000 BTU/hr or less. The control has circuitry and software to control a 3-stage gas valve.

Input to the control is received by way of serial communication. The control monitors safety inputs from high temperature limit, auxiliary switch(es), temperature sensors, discrete pressure switches, and the flame sensor. The control in turn initiates the starting and precise microcomputer controlled timing of the indoor blower motor, inducer fan motor, ignition means, gas valve, air cleaner, and humidifier. The control provides ignition, proof of ignition via remote sense, internal and external system diagnostics indicators, and dual relays in series with the primary gas valve coil.



①

WARNINGS AND CAUTIONS

⚠ CAUTION

Application of this type of control may cause flame rollout on initial startup and could cause personal injury and/or property damage.

Replace only with exact model number, including dash number. Failure to use exact replacement control could cause personal injury and/or property damage.

Do not exceed the specification ratings.

All wiring must conform to local and national electrical codes and ordinances.

This control is a precision instrument, and should be handled carefully. Rough handling or distorting components could cause the control to malfunction.

⚠ CAUTION

To prevent electrical shock and/or equipment damage, disconnect electric power to system at main fuse or circuit breaker box until installation is complete.

This control is not intended for use in locations where it may come in direct contact with water. Suitable protection must be provided to shield the control from exposure to water (dripping, spraying, rain, etc.).

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

<u>Following</u> installation or replacement, follow appliance manufacturers' recommended installation/service instructions to insure proper operation.

Do not exceed specified voltage of circuits. Higher voltage will damage control and could cause shock or fire hazard.

⚠ WARNING

Do not short out terminals on gas valve or primary control to test. Short or incorrect wiring will damage the comfort control and could cause personal injury and/or property damage.

CONTENTS

Trane
6200 Troup Highway
Tyler, TX 75707

<u>NOTICE</u>: Since the manufacturer has a policy of continuous product and product data improvement, it reserves the right to change design and specifications without notice.

18-CH42D1-2
08/09
WR Part No. 37-6828B

SPECIFICATIONS

ELECTRICAL RATINGS [@ 77°F (25°C)]:

Input Voltage: 25 VAC, 60 Hz

Max. Input Current @ 25 VAC: 600mA + MV

Relay Load Ratings:

Gas Valve Relay: 1.5 amp @ 25 VAC, 60 Hz, 0.6 pf

Ignitor: 2.0 amp @ 120 VAC, 60 Hz - resistive

Humidifier Relay: 1.0 Amp @120 VAC, 60 Hz.

Electronic Air Cleaner Relay: 1.0 Amp, @ 120 VAC, 60 Hz

Flame Current Requirements:

Minimum current to insure flame detection: 1 µA DC*

Maximum current for non-detection: 0.1 µA DC*

Maximum allowable leakage resistance: 100 M ohms

*Measured with a DC microammeter in the flame probe lead

OPERATING TEMPERATURE RANGE:

-40° to 176°F (-40° to 80°C)

HUMIDITY RANGE:

5% to 95% relative humidity (non-condensing)

Timing Specs: (@ 60 Hz**)

	maximum
Flame Establishing Time:	0.8 sec
Flame Failure Response Time:	2.0 sec

Gases Approved: Natural and Liquid Petroleum are approved for use.

Table 1 - TIMING SPECIFICATIONS

(All times are in seconds, unless noted otherwise)

CNT04829

PRE-PURGE	0
TRIAL FOR IGNITION PERIOD	5
IGNITION ACTIVATION PERIOD	2
RETRIES	2 times
VALVE SEQUENCE PERIOD	15
INTERPURGE	60
POST-PURGE	5
LOCKOUT TIME	300
HEAT DELAY-TO-FAN ON	45
HEAT DELAY-TO-FAN OFF*	60/100/ 140/180
COOL DELAY-TO-FAN OFF*	**
ELECTRONIC AIR CLEANER	YES
HUMIDIFIER	YES

*These times will vary depending on option switch position. See OPERATION section for further information.

**Selectable at Comfort Control

OPERATION

USER INTERFACE

The User Interface is used to adjust system operating parameters. Refer to furnace Service Facts for User Interface options.

PERSONALITY MODULE

The Personality Module is a removable device required for proper furnace operation. The Personality Module is tethered to the unit and must remain with the furnace at all times. The Personality Module must remain plugged into the furnace IFC. The Personality Module should be removed from the existing IFC and installed and tethered on the replacement IFC.

COMMUNICATION PROTOCOL (System)

The operational commands and queries will be sent by the comfort control system to the furnace control via a serial communication bus.

The control includes an amber LED to indicate communications on the communicating control bus and a green LED to indicate Bit Master operation. The amber LED on the communicating control indicates communications are present on the bus. The green LED indicates Bit Master operation. See Table 2.

COOLING MODE

Air Conditioning or Cooling Mode airflow shall be calculated based on the Outdoor (OD) Unit Capacity (Tons), CFM per Ton input from the Personality Module, User Interface, and Aux Circ Request. When used in an all communicating system, the comfort control will determine all delays in this mode. See Comfort Control Installer's Guide for more information.

When a communicating OD unit is not detected, the OD unit size will be selectable from the User Interface.

CONTINGENCY MODE

The Contingency Mode allows the user to set the equipment to operate in an on/off, duty cycle mode. This mode will be activated using the User interface. The user will select the desired level of capacity required, Stage 1, 2 or 3. The user will select the desired on/off duty cycle, 10% minimum to 50% maximum, (10% increments, 10% = 2 minutes On, 18 minutes Off; 50% = 10 minutes on, 10 minutes off).

Contingency Mode is only available if the comfort control is not detected. If setting the unit operation in the Contingency Mode, disconnect the "D" data wire at the low voltage unit terminal block.

See the furnace Service Facts for instructions on how to enter the Contingency Mode.

MANUAL FAN ON MODE

If the comfort control fan button is placed to the ON position, the indoor blower and air cleaner are energized. When the fan button is returned to the AUTO position, the indoor blower and air cleaner are de-energized.

COOL MODE

A call for cool is sent by the comfort control. This energizes the compressor, indoor blower and air cleaner. After the comfort control is satisfied, the compressor is de-energized and the optional cool mode delay-to-fan-off period begins. After the optional delay-to-fan-off period ends, the indoor blower and air cleaner are de-energized.

PRECAUTIONARY, SYSTEM LOCKOUT, AND DIAGNOSTIC FEATURES

PRECAUTIONARY FEATURES

The following precautionary features are built into the control.

1. During a call for heat cycle, if flame is sensed at any time when the gas valve is de-energized, the indoor blower and inducer fan are energized at low speed in conjunction with system lockout.
2. If the high limit (and/or auxiliary limit) switch(es) open at any time during a call for heat, the gas valve is de-energized and the indoor blower and inducer fan are energized at low speed.

SYSTEM LOCKOUT FEATURES

When system lockout occurs, the gas valve is de-energized, the indoor blower output and the inducer blower are energized at low speed. The diagnostic indicator light will flash to indicate system status. **(System lockout will never override the precautionary features described above.)**

To reset the control after system lockout, do one of the following:

1. Open the door switch for at least fifteen seconds. You may also need to reset the flame rollout sensor switch.
2. After one hour in lockout, the control will automatically reset itself.

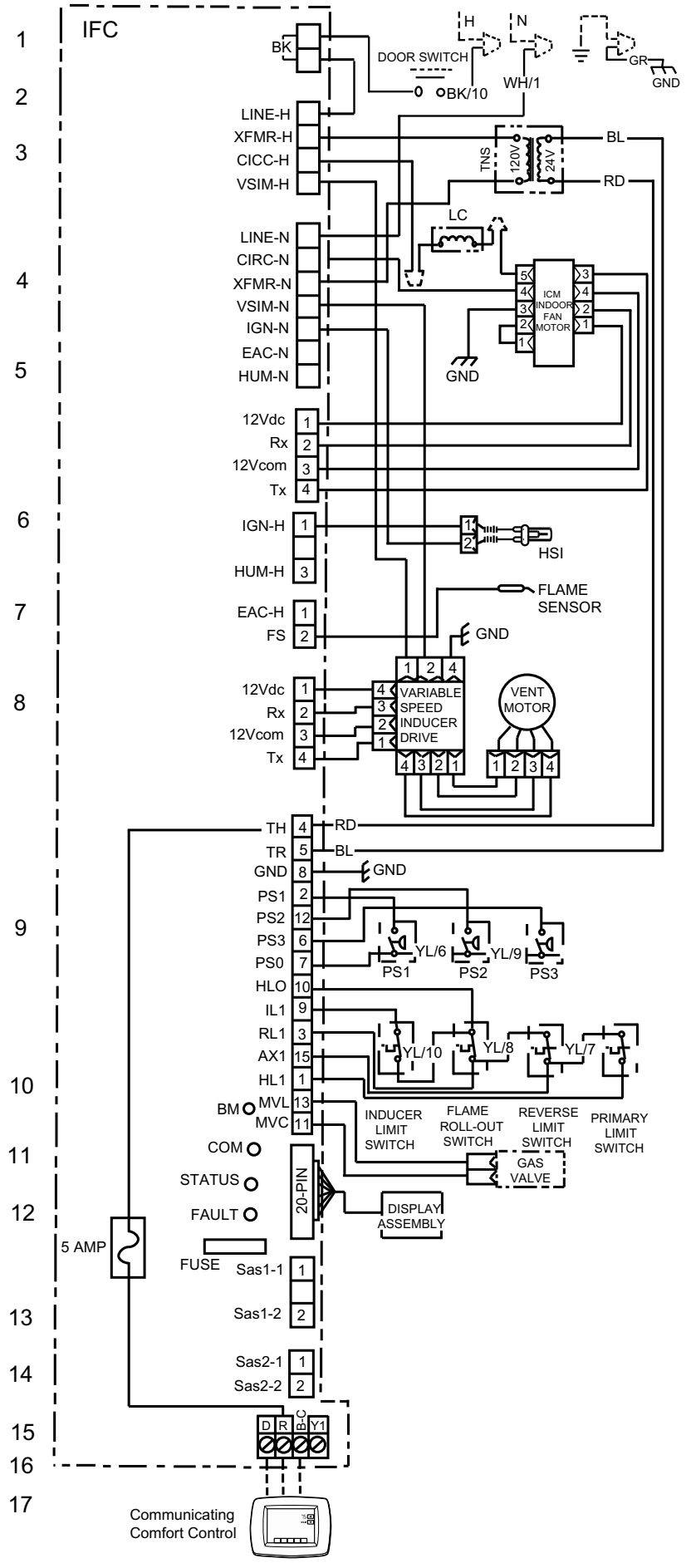
SEQUENCE OF OPERATION

NOTE:
The numbers in parentheses refer to the numbers along the left side of Figure 2 on page 5.

- The communicating comfort control (17) signals the furnace IFC for first stage heat. (16)
- The IFC then checks all safeties, thermostats (10) & pressure switches PS-1, 2 & 3. (9)
- The IFC signals the variable speed inducer drive (8) to start the vent motor (8) and go to its second stage speed.

Note:
The furnace lights in Second Stage mode.

- First & second stage pressure switches PS-1 & 2 close. (9)
- The IFC receives a 24 Volt AC signal from pressure switches PS-1 & PS-2 when they close. (9) This verifies the 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 time for ignition is five seconds.
- The IFC verifies ignition by the flame current sensing method. (7) If a flame is not detected, the IFC will cycle the furnace three times to try and verify a flame. If no flame is detected, the IFC will lock out for one hour. The IFC will send an alert code to the communicating comfort control and user interface. The IFC will also flash its Red alert LED two times repeatedly.
- If a flame is detected, the IFC will start the heat exchanger warm-up time delay for the indoor blower.
- After 45 seconds, the IFC signals the indoor blower (4) to engage and run at its second stage heat speed.
- The IFC then signals the variable speed inducer motor drive board (8) to ramp down the vent motor in steps to the first stage vent motor speed. The reduction of the vent motor speed in steps allows the gas flow through the gas valve to also be reduced in steps, decreasing the chances of burner flame out.
- When the IFC no longer detects the 24 Volt AC signal from pressure switch # 2, PS-2, (9) it will signal the indoor blower (4) to go to its first stage heating speed.
- The communicating comfort control (16) will continue to call for first stage heat operation until the indoor temperature is back at the communicating comfort control set point OR,
- If the communicating comfort control (17) does not detect that the indoor temperature is moving back towards its set point or the indoor temperature is still moving away from the communicating comfort control set point, it will signal the IFC (16) to go to second stage heat.
- The IFC signals the variable speed inducer drive (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 detects a 24 Volt AC signal that pressure switch #2, PS-2, (9) is closed, the IFC will then signal the indoor blower (4) to go to its second stage heat speed.
- The communicating comfort control (17) will continue to call for second stage heat operation until the indoor temperature approaches its set point. Before the indoor temperature reaches the communicating comfort control (17) set point the communicating comfort control will signal the furnace IFC to go back to first stage operation OR,
- If the communicating comfort control (17) senses the indoor temperature is not moving back towards its set point or the indoor temperature is still moving away from the communicating comfort control set point, it will signal the furnace IFC to go to third stage heat.
- The IFC signals the variable speed inducer drive board (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 detects a 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 communicating comfort control will continue to monitor the indoor temperature and send signals to the IFC to operate at different stages or turn off so that it can maintain the indoor temperature at the homeowner's set point.


115 VOLT 60 HZ 1 PH
POWER SUPPLY PER LOCAL CODE
IFC
BK
DOOR SWITCH
BK/10
H
N
WH/1
GR
GND
LINE-H
XFMR-H
CICC-H
VSIM-H
TNS
120V
24V
BL
RD
LC
LINE-N
CIRC-N
XFMR-N
VSIM-N
IGN-N
EAC-N
HUM-N
ICM INDOOR FAN MOTOR
GND
12Vdc
Rx
12Vcom
Tx
IGN-H
HUM-H
HSI
FLAME SENSOR
EAC-H
FS
GND
VARIABLE SPEED INDUCER DRIVE
VENT MOTOR
TH
TR
GND
PS1
PS2
PS3
PS0
HLO
IL1
RL1
AX1
HL1
BM
MVL
MVC
YL/6
YL/9
YL/10
YL/8
YL/7
INDUCER LIMIT SWITCH
FLAME ROLL-OUT SWITCH
REVERSE LIMIT SWITCH
PRIMARY LIMIT SWITCH
GAS VALVE
COM
STATUS
FAULT
20-PIN
DISPLAY ASSEMBLY
5 AMP
FUSE
Sas1-1
Sas1-2
Sas2-1
Sas2-2
D
R
C
B
Y1
Communicating Comfort Control
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

②

DIAGNOSTIC FEATURES

Diagnostic Operation, LED Flash Codes

The green, 'STATUS', and red LEDs will be turned on solid at power-up during the initialization sequence. At any other time the control is powered, the green LED indicator light shall be lit using the following signal:

Slow Flash Rate: Normal, no call for heat. ¼ second on, ¾ second off.
Fast Flash Rate: Normal, call for heat. ¼ second on, ¼ second off.

During an alert condition when in lockout, the red LED will flash groups of pulses. The red LED will flash on for approximately ¼ second then off for ¼ second. The pause between groups of flashes is approximately 2 seconds.

Alert Code Recovery: On power up, last 4 Alerts, if any, will be flashed on the Red Alert LED. The newest Alert detected will flash first and the oldest last. There will be a 2 second delay between Alert Code flashes. Solid Red LED error codes will not be displayed.

The Green BM LED will be on solid when the control is powered. The Green status LED indicator light will operate as shown in the table and the Red LED will flash (one flash) every 20 seconds.

The last four alerts will be available to display at any time via the User Interface, menu item Last Four Faults. See the User Interface Software Specification for more information.

Fault Code Reset: The control shall acknowledge the reset by turning on the Red LED and Green 'STATUS' LED for 2 seconds. The alert code may be reset using the User interface.

NOTE:
Use the flash code menu for detail of the alerts. Alert codes also are displayed on the User Interface menu using a descriptive text message and on the comfort control display using an alert code number. A complete list of the alert codes is included with the comfort control.

Table 2 - LED Flash Codes

LED	DESCRIPTION	FUNCTION
GREEN	STATUS LED	FAST FLASH - CALL FOR HEAT SLOW FLASH - NO CALL FOR HEAT
RED	ALERT LED	NO. OF FLASHES - SEE DIAGNOSTIC CODES
GREEN (BM)	BITMASTER	ON SOLID WHEN UNIT POWERED
AMBER	COM	FLASHES DEVICE COUNT

Table 3 - Diagnostic Codes
The diagnostics will indicate the specific alert through the following code:

Red LED Flash	Diagnostic Code
2	External lockout (retries or recycles exceeded)
3	Pressure switch/Inducer error
4	Open limit switch & Aux & Rollout
5	Flame sensed when no flame should be present
6	Reversed polarity, or Igniter (Triac) Fault
7	External gas valve circuit error
8	Low Flame Sense
9	Open Inducer Limit Switch
10	Communication Error
Solid Red	Internal GV Error
Solid Red w/Solid 'Status' LED	Continuous Reset caused by an internal error
Red Off and 'Status' Off	24Vac Fuse Open

Table 4 - FURNACE ALERT CODES

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 1hr 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 response [1]
		IND COMM ERR				Inducer motor no Comm response
		SYS COMM ERR				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 HI				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					

WIRING

⚠ WARNING

Do not use on circuits exceeding specified voltage. Higher voltage will damage control and could cause shock or fire hazard.

⚠ CAUTION

To prevent electrical shock and/or equipment damage, disconnect electric power to system at main fuse or circuit breaker box until installation is complete. Failure to earth ground the appliance or reversing the neutral and hot wire connection to the line can cause shock hazard.

Shut off main gas to heating system until installation is complete.

Route and secure all wiring as far from flame as practical to prevent fire and/or equipment damage.

Replace CNT04829 control as a unit - no user serviceable parts.

NOTE:

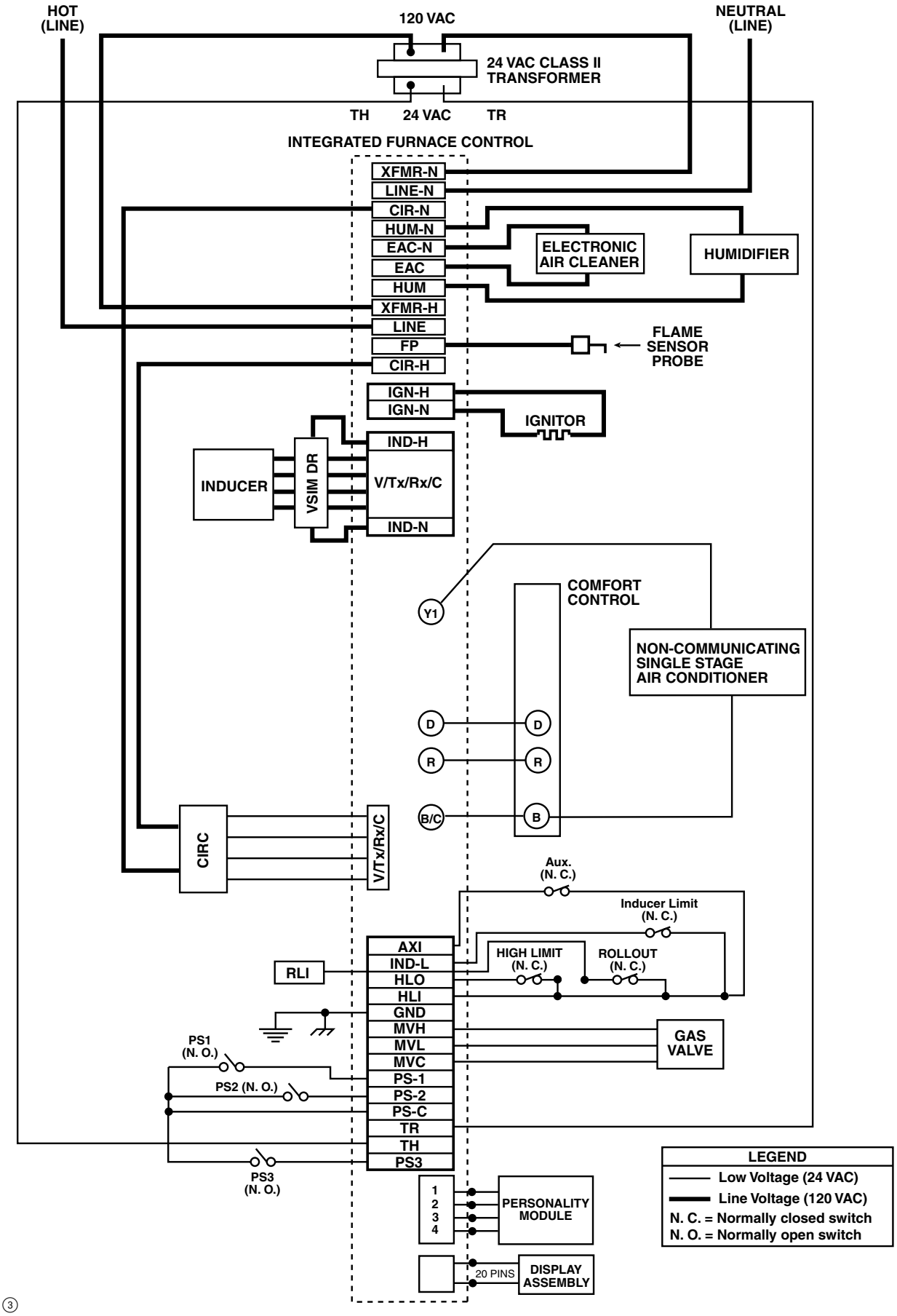
All wiring should be installed according to local and national electrical codes and ordinances.

Following installation or replacement, follow appliance manufacturer's recommended installation or service instructions to insure proper operation.

Removing the old IFC and installing the new IFC:

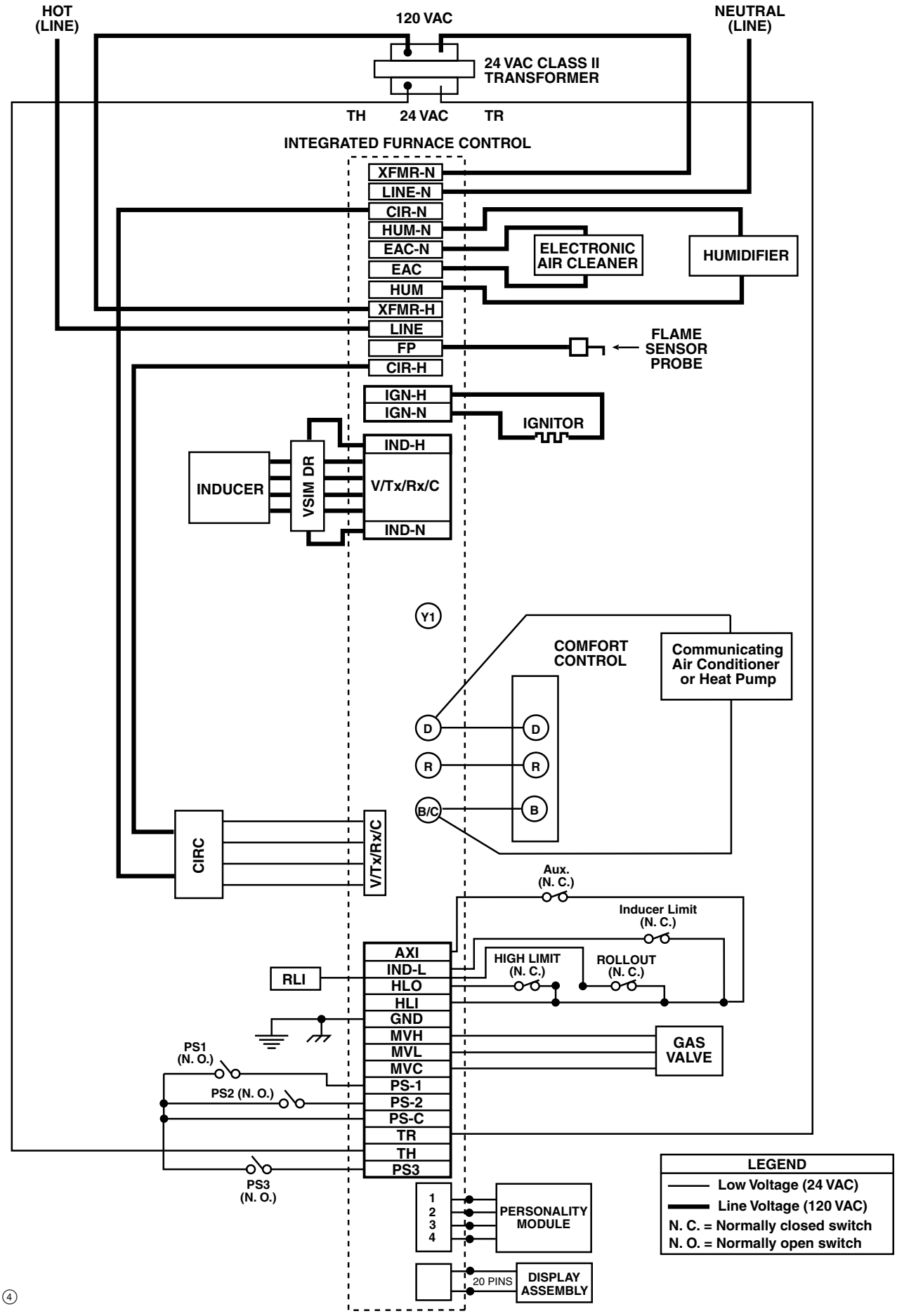
1) Remove all power from the system.
2) Remove the User Interface and bracket from the front of the IFC. To remove these items, remove the pins in the center of the fasteners on the side of the bracket that attach to the IFC platform. Rotate the bracket and User Interface assembly downward. Squeeze the back pieces of the fasteners together to remove the fasteners.
3) Remove all wiring connected to the IFC with modular plugs.
4) Label and remove wires at low voltage terminal block.
5) Remove Personality Module from IFC.
6) Remove the IFC from the platform by cutting plastic standoffs.
7) Place new IFC on platform using standoffs on new IFC.
8) Reconnect the low voltage wires at terminal block.
9) Plug Personality Module onto IFC. The Personality Module must be plugged into the IFC at all times during unit operation.
10) Reconnect all wiring with modular plugs.
11) Remount User Interface using the fasteners removed in step 2.
12) Restore power to the unit.
13) Use the User Interface to establish any custom set-up parameters.
14) Run system through operational check.

NON-COMMUNICATING SINGLE STAGE COOLING ONLY



③

COMMUNICATING OUTDOOR UNIT

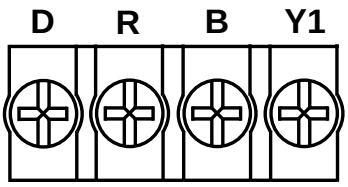


④

TYPICAL SYSTEM WIRING CONNECTIONS

Low voltage screw terminal block

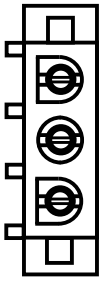
⑤



D serial communication bus (comfort control)
R 24VAC (fused)
B 24V common
Y1 24VAC relay output for single stage, non-communicating air conditioners

Igniter Interface

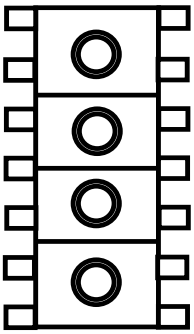
⑥



1	IGN-H	Igniter Hot
2		Not Used
3	HUM-H	Humidifier Hot

Line Voltage Terminals (0.25" x 0.032")

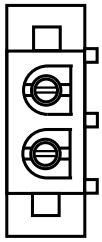
⑦



CIR-H	Indoor blower
LINE-H	L1
XFMR-H	Transformer
VSIM-H	Inducer

Accessory Line Voltage Terminals

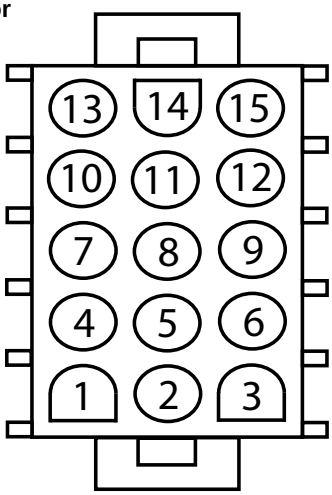
⑧



2	FS	Flame Sense
1	EAC-H	Electronic Air Cleaner

15 pin connector

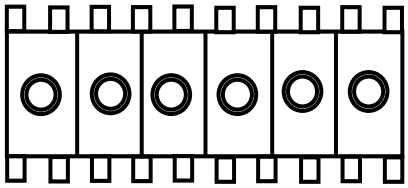
⑨



Pin 1	HLI	Limit Switch Input
Pin 2	PS1	First Stage Pressure Switch Input
Pin 3	RLI	Rollout Input
Pin 4	TH	High Side of secondary of Transformer, 24VAC un-fused
Pin 5	GND	24VAC common, connected to GND
Pin 6	PS3	Third Stage Pressure Switch Input
Pin 7	PSO	R out to the Pressure Switches
Pin 8	GND	connected to chassis and earth ground
Pin 9	ILI	Inducer Limit Switch Input
Pin 10	HLO	R out to the Limit Switches
Pin 11	GND	Gas Valve Common
Pin 12	PS2	Second Stage Pressure Switch Input
Pin 13	MVL	Gas Valve Main
Pin 14	MVH	Not Used
Pin 15	AXI	Reverse Flow Input

Neutrals (0.25" x 0.032")

⑩



IND-N	Inducer
LINE-N	L2
XFMR-N	Transformer
EAC-N	Electronic Air Cleaner
HUM-N	Humidifier
CIRC-N	Indoor blower
IGN-N	Ignitor

Trane
6200 Troup Highway
Tyler, TX 75707

For more information contact your local dealer (distributor)

P.I. 10/07