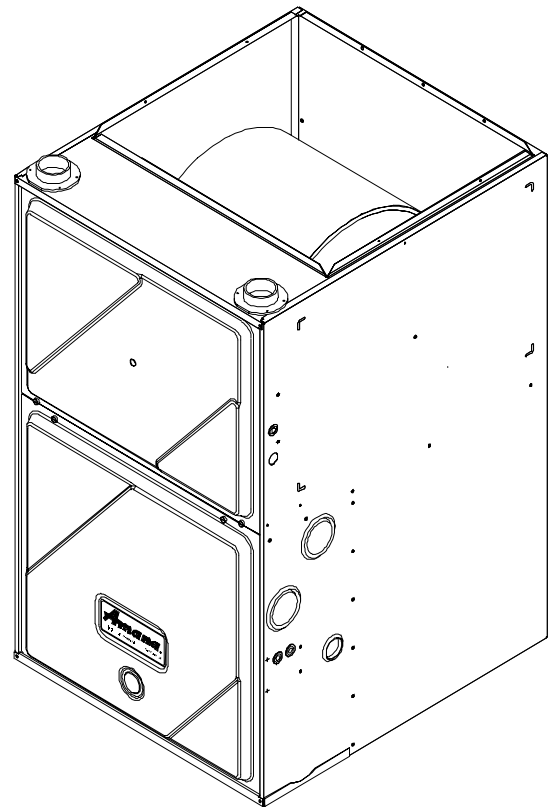
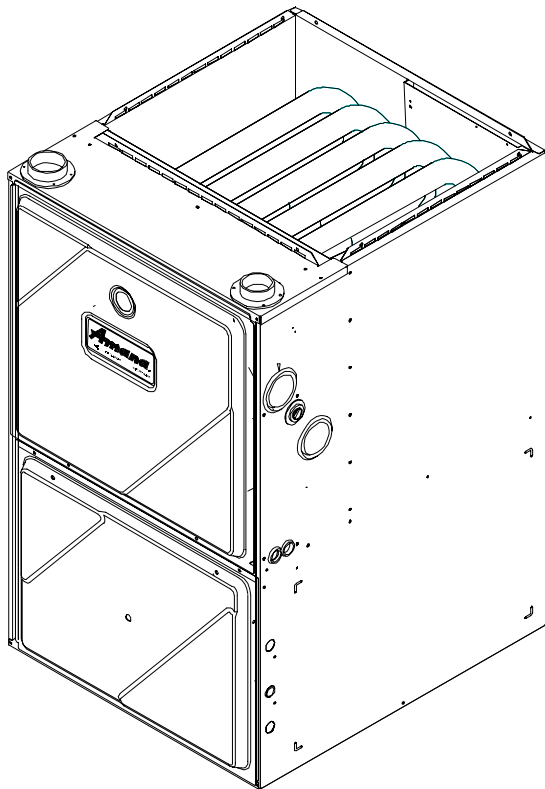


Service Instructions

40" 90% Condensing Gas Furnaces GUCA, GCCA & Accessories



This manual is to be used by qualified HVAC technicians only. Amana does not assume any responsibility for property damage or personal injury for improper service procedures done by an unqualified person.

Amana[®]
Heating ■ Air Conditioning
A higher standard of comfort

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IMPORTANT INFORMATION

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.

IMPORTANT NOTICES



IF REPAIRS ARE ATTEMPTED BY UNQUALIFIED PERSONS, DANGEROUS CONDITIONS (SUCH AS EXPOSURE TO ELECTRICAL SHOCK) MAY RESULT. THIS MAY CAUSE SERIOUS INJURY OR DEATH.



AMANA WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU PERFORM SERVICE ON YOUR OWN PRODUCT, YOU ASSUME RESPONSIBILITY FOR ANY PERSONAL INJURY OR PROPERTY DAMAGE WHICH MAY RESULT.

To locate an authorized servicer, please consult your telephone book or the dealer from whom you purchased this product. For further assistance, please contact:

CONSUMER AFFAIRS DEPT.
AMANA HEATING & AIR CONDITIONING
AMANA, IOWA 52204

**OR
CALL**

1-319-622-5511
and ask for
Consumer Affairs

If outside the United States contact:

AMANA HEATING & AIR CONDITIONING
ATTN: INTERNATIONAL DIVISION
AMANA, IOWA 52204, USA
Telephone: (319) 622-5511
Facsimile: (319) 622-2180

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS



DANGER - Immediate hazards which WILL result in severe personal injury or death.



WARNING - Hazards or unsafe practices which COULD result in severe personal injury or death.



CAUTION - Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

PRODUCT IDENTIFICATION

The model and manufacturing number are used for positive identification of component parts used in manufacturing. At which time engineering and manufacturing changes take place where interchangeability of components are affected, the manufacturing number will change.

It is very important to use the model and manufacturing numbers at all times when requesting service or parts information.

MODEL	M/N	MODEL	M/N
GUCA045AX30	P1219301F	GUCA045AX30	P1227501F
GUCA070AX30	P1219302F	GUCA070AX30	P1227502F
GUCA070AX40	P1219303F	GUCA070AX40	P1227503F
GUCA090AX40	P1219304F	GUCA090AX40	P1227504F
GUCA090AX50	P1219305F	GUCA090AX50	P1227505F
GUCA115AX50	P1219306F	GUCA115AX50	P1227506F
GCCA045AX30	P1219501F	GCCA045AX30	P1227601F
GCCA070AX30	P1219502F	GCCA070AX30	P1227602F
GCCA070AX40	P1219503F	GCCA070AX40	P1227603F
GCCA090AX40	P1219504F	GCCA090AX40	P1227604F
GCCA090AX50	P1219505F	GCCA090AX50	P1227605F
GCCA115AX50	P1219506F	GCCA115AX50	P1227606F

FURNACE ACCESSORY KITS

FTK_ Furnace Twinning Kit
HANG_ High Altitude Natural Gas Kit
HALP_ High Altitude LP Kit
HAPS_ High Altitude Pressure Switch Kit
LPTK_ LP Conversion Kit

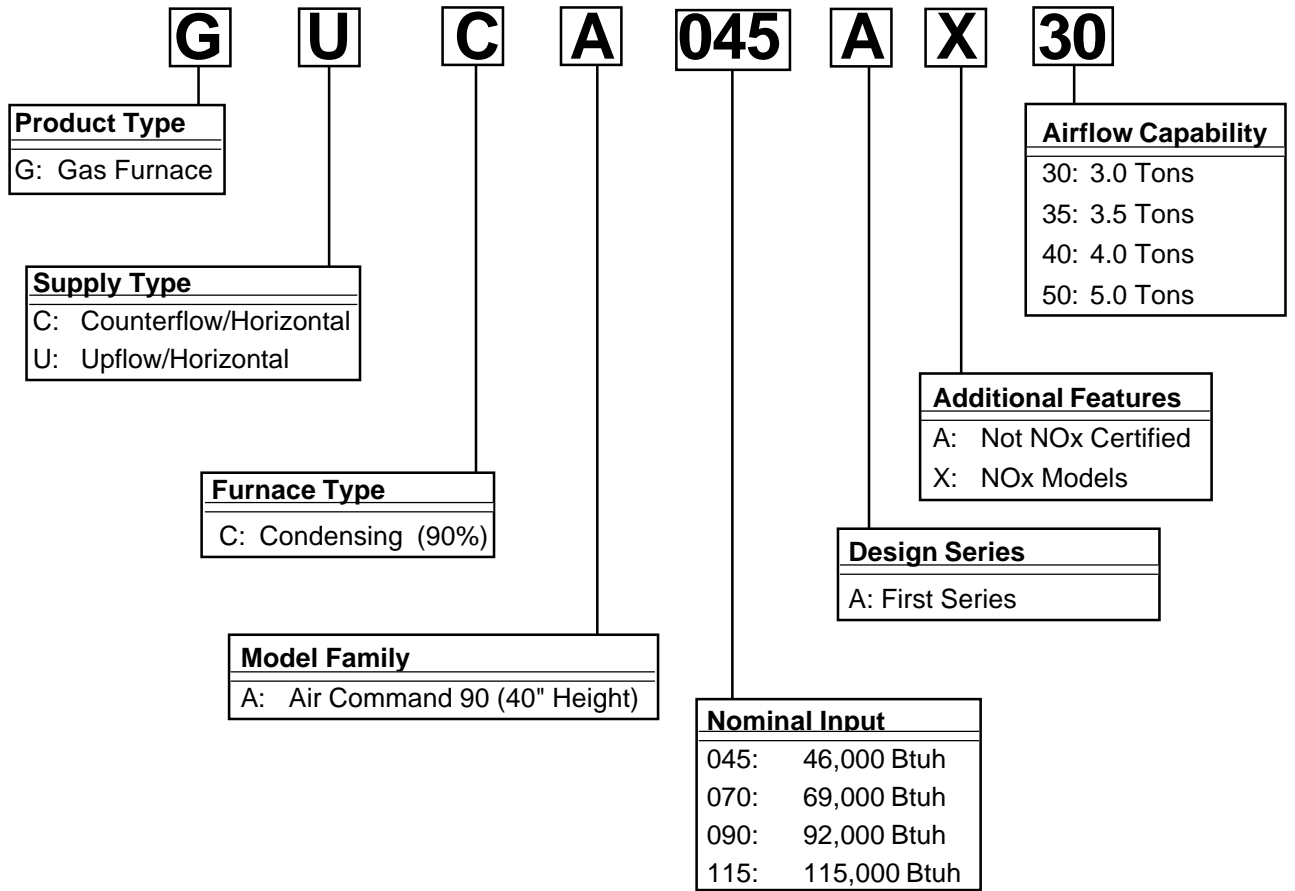
Note: See servicing section for available kits and usage.

ADDITIONAL FURNACE ACCESSORIES

CFB_ Counterflow Floor Base
EAC_ Electronic Air Cleaner
EFR_ External Filter Rack Kit
HCVK_ Horizontal Style Concentric Vent Kit
MAC_ Media Air Cleaner
MAF_ Media Air Filter (Replacement Filter For MAC_)
VCVK_ Vertical Style Concentric Vent Kit

Note: For additional accessory kits listed above, see product identification section pages 11, 12 and 13 for available accessories and usage.

PRODUCT IDENTIFICATION



PRODUCT IDENTIFICATION

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions explosion may result causing property damage, personal injury or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- C. Use only your hand to push in or turn the gas control lever. Never use tools. If the lever will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been underwater. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been underwater.

LIRE AVANT DE METTRE EN MARCHELIRE

AVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans le présent manuel risque de déclencher un incendie ou une explosion entraînant des dommages matériels, des lésions corporelles ou la perte de vies humaines.

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne pas tenter d'allumer le brûleur manuellement.

- B. **AVANT DE LE FAIRE FONCTIONNER**, renifler tout autour de l'appareil pour déceler une odeur de gaz. Renifler près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE S'IL Y A UNE ODEUR DE GAZ

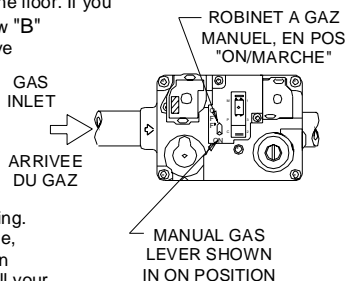
- Ne pas tenter d'allumer l'appareil
- Ne toucher aucun interrupteur électrique; n'utiliser aucun téléphone dans le bâtiment.
- Appeler immédiatement le fournisseur de gaz en employant le téléphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.
- Si personne ne répond, appeler le service des incendies.

- C. Ne pousser ou tourner le levier d'admission du gaz qu'à la main; ne jamais employer d'outil à cet effet. Si la manette reste coincée, ne pas tenter de la réparer; appeler un technicien qualifié. Quiconque tente de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.

- D. Ne pas se servir de cet appareil s'il a été plongé dans l'eau, complètement ou en partie. Appeler un technicien qualifié pour inspecter l'appareil et remplacer toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Push the gas control lever to "OFF" Position. Do not force.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you then smell gas, **STOP!** Follow "B" in the safety information above on this label if you don't smell gas, go to next step.
7. Push gas control lever to "ON".
8. Replace access panel.
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas company.



MISE EN MARCHÉ

1. **ARRETÉR!** Lisez les instructions de sécurité sur la portion supérieure de cette étiquette.
2. Régler le thermostat à la température la plus basse
3. Couper l'alimentation électrique de l'appareil.
4. Cet appareil ménager étant doté d'un système d'allumage automatique, ne pas essayer à allumer le brûleur manuellement.
5. Pousse le levier du contrôle du gaz à "OFF/ ARRET" position.
6. Attendre cinq (5) minutes pour laisser échapper tout le gaz. Renifler tout autour de l'appareil, y compris près du plancher, pour déceler une odeur de gaz. Si c'est le cas, **ARRETER!** Passer à l'étape B des instructions de sécurité sur la portion supérieure de cette étiquette. S'il n'y a pas d'odeur de gaz, passer à l'étape suivante.
7. Pousse le levier du contrôle du gaz à "ON/MARCHE" position.
8. Remettre en place le panneau d'accès.
9. Mettre l'appareil sous tension.
10. Régler le thermostat à la température désirée.
11. Si l'appareil ne se met pas en marche, suivre les instructions intitulées. Comment couper l'admission de gaz de l'appareil et appeler un technicien qualifié ou le fournisseur de gaz.

TO TURN OFF GAS TO APPLIANCE

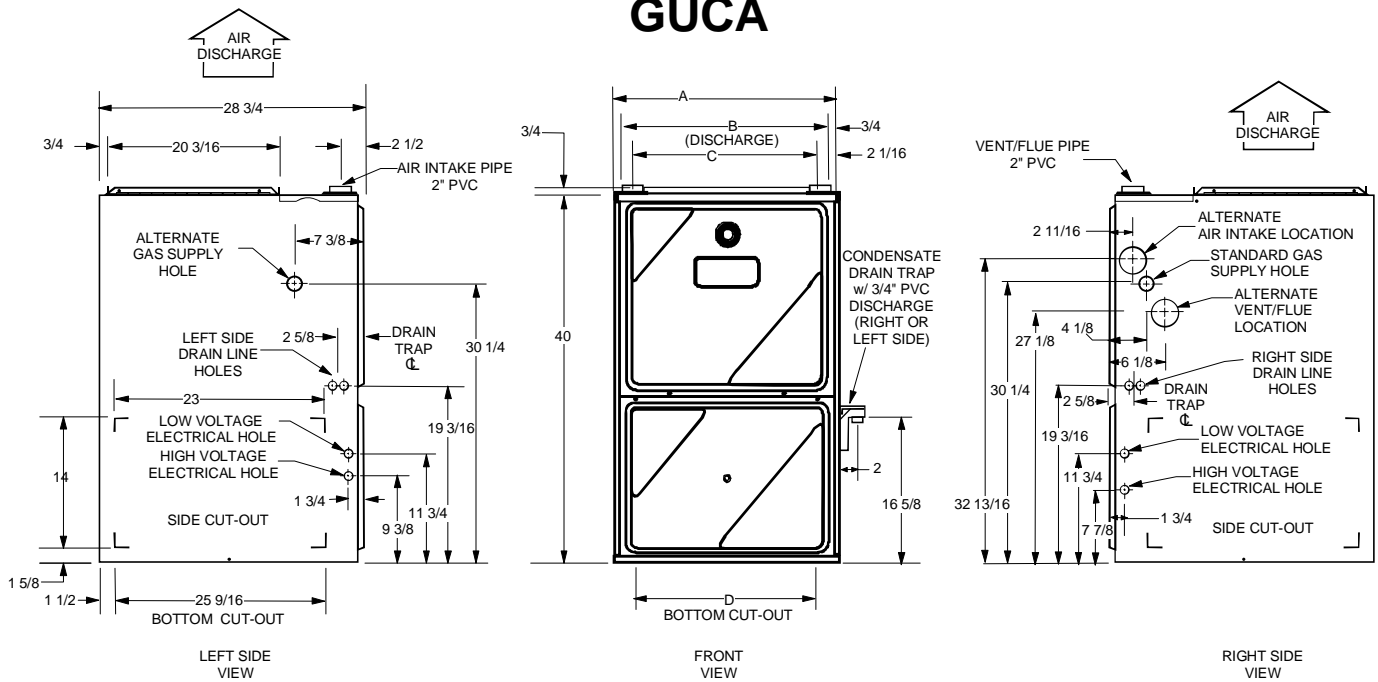
1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Push the gas control lever to "OFF" Position. Do not force.
4. Replace control access panel.

POUR COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Régler le thermostat à la température la plus basse.
2. Couper l'alimentation électrique de l'appareil s'il faut procéder à des opérations d'entretien.
3. Pousse le levier du contrôle du gaz à "OFF / ARRET" position. Ne pas forcer.
4. Remettre en place le panneau d'accès.

PRODUCT IDENTIFICATION

GUCA



Cabinet Size	Units	A	B	C	D
Small	045__30 070__30	16-1/2	15	12-3/8	12-5/8
Medium	070__40 090__40	20-1/2	19	16-3/8	14-5/8
Large	090__50 115__50	24-1/2	23	20-3/8	18-5/8

All dimensions are in inches.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (INCHES)						
POSITION*	SIDES	FRONT	REAR	TOP	BOTTOM	FLUE
Upflow	0	3	0	1	C	0
Horizontal	6	3	0	6	C	0

* = All positioning is determined as installed unit is viewed from the front.

C = If placed on combustible floor, floor MUST be wood ONLY.

NOTES:

1. Installer must supply one or two PVC pipes: one for combustion air (optional) and one for the flue outlet (required). Vent pipe must be either 2" or 3" in diameter, depending upon furnace input, number of elbows, length of run and installation (1 or 2 pipes). The optional Combustion Air Pipe is dependent on installation/code requirements and must be 2" or 3" diameter PVC.
2. Line voltage wiring can enter through the right or left side of the furnace. Low voltage wiring can enter through the right or left side of furnace.
3. Conversion kits for high altitude natural gas operation are available. Contact your Amana distributor or dealer for details.

4. Installer must supply following gas line fittings, according to which entrance is used:

Left -- Two 90° Elbows, one close nipple, straight pipe

Right -- Straight pipe to reach gas valve

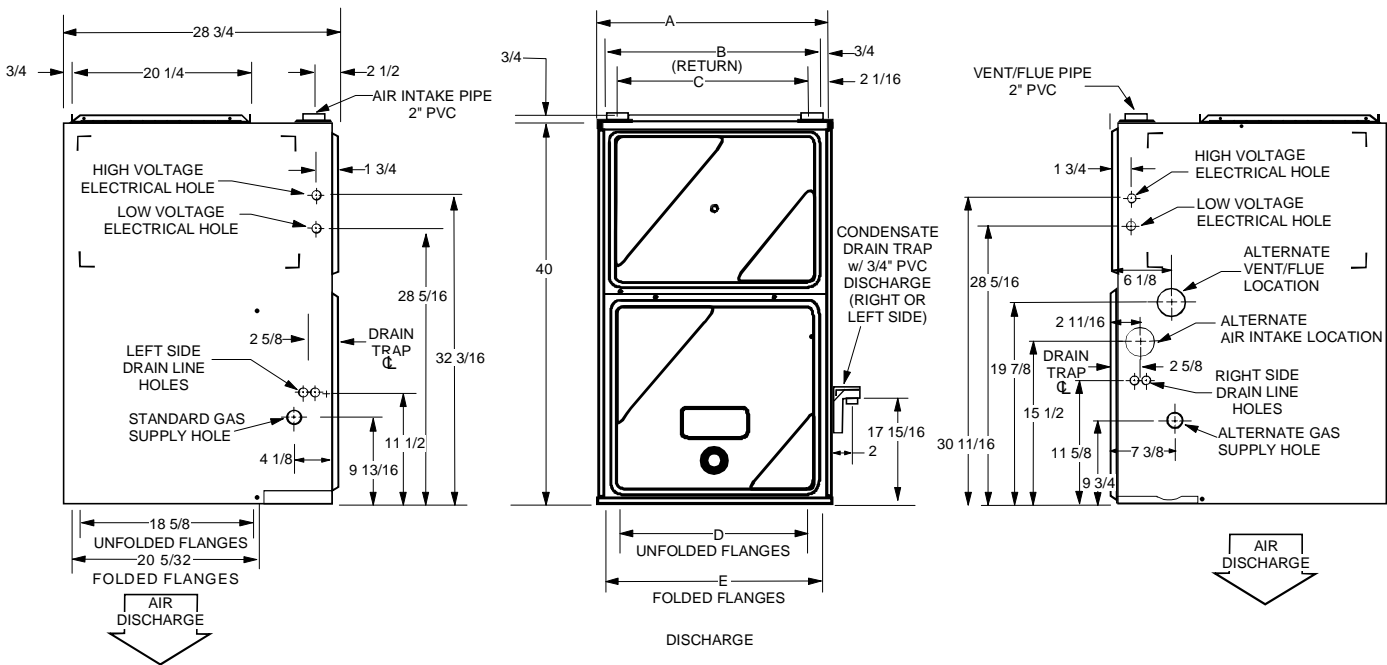
ACCESSIBILITY CLEARANCES (MINIMUM):

36" at front is required for servicing or cleaning.

NOTE: In all cases, accessibility clearance shall take precedence over clearances from the enclosure where accessibility clearances are greater.

PRODUCT IDENTIFICATION

GCCA



Cabinet Size	Units	A	B	C	D Unfolded	E Folded
Small	045__30 070__30	16-1/2	15	12-3/8	13-1/2	15
Medium	070__40 090__40	20-1/2	19	16-3/8	17-1/2	19
Large	090__50 115__50	24-1/2	23	20-3/8	21-1/2	23

All dimensions are in inches.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (INCHES)						
POSITION*	SIDES	FRONT	REAR	TOP	BOTTOM	FLUE
Counterflow	0	3	0	1	NC	0
Horizontal	6	3	0	6	C	0

* = All positioning is determined as installed unit is viewed from the front.

C = If placed on combustible floor, floor MUST be wood ONLY.

NC = For installation on non-combustible floors only. A combustible floor subbase must be used for installations on combustible flooring.

NOTES:

1. Installer must supply one or two PVC pipes: one for combustion air (optional) and one for the flue outlet (required). Vent pipe must be either 2" or 3" in diameter, depending upon furnace input, number of elbows, length of run and installation (1 or 2 pipes). The optional Combustion Air Pipe is dependent on installation/code requirements and must be 2" or 3" diameter PVC.
2. Line voltage wiring can enter through the right or left side of the furnace. Low voltage wiring can enter through the right or left side of furnace.
3. Conversion kits for high altitude natural gas operation are available. Contact your Amana distributor or dealer for details.

4. Installer must supply following gas line fittings, according to which entrance is used:

Right -- Two 90° Elbows, one close nipple, straight pipe

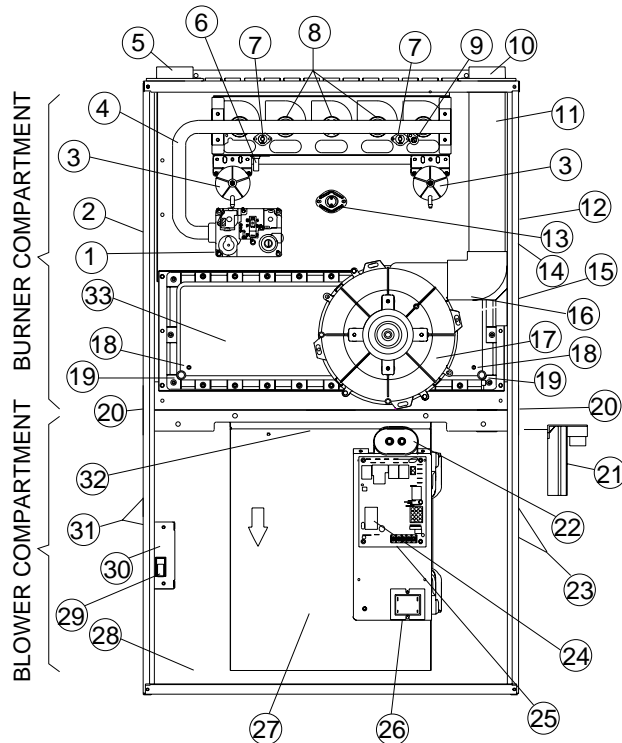
Left -- Straight pipe to reach gas valve

ACCESSIBILITY CLEARANCES (MINIMUM):

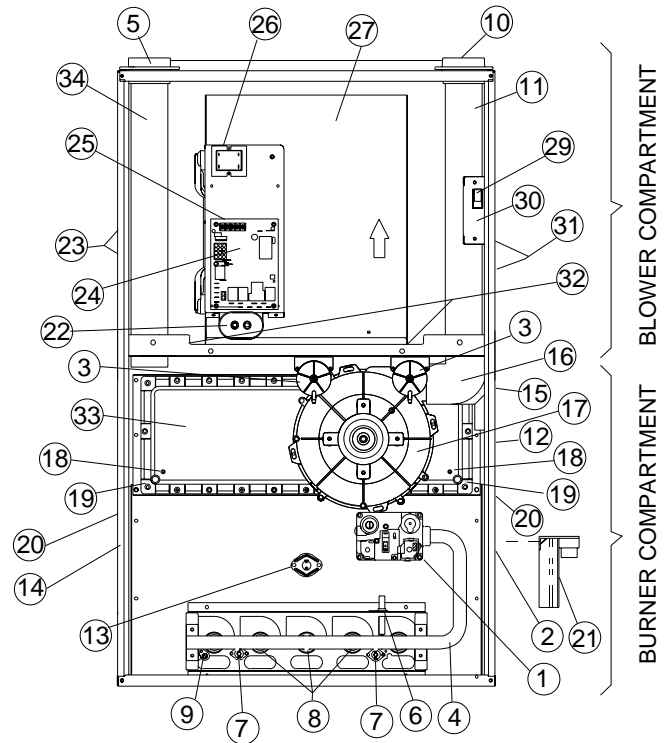
36" at front is required for servicing or cleaning.

NOTE: In all cases, accessibility clearance shall take precedence over clearances from the enclosure where accessibility clearances are greater.

PRODUCT IDENTIFICATION



Upflow/Horizontal (GUCA Models)



Counterflow/Horizontal (GCCA Models)

- 1 Gas Valve
- 2 Gas Line Entrance (Alternate)
- 3 Pressure Switch
- 4 Gas Manifold
- 5 Combustion Air Intake Connection / "Coupling"
- 6 Hot Surface Igniter
- 7 Rollout Limit
- 8 Burners
- 9 Flame Sensor
- 10 Flue Pipe Connection / "Coupling"
- 11 Flue Pipe (Internal)
- 12 Combustion Air Intake (Alternate)
- 13 Primary Limit
- 14 Gas Line Entrance
- 15 Flue Pipe Connection (Alternate)
- 16 Rubber Elbow

- 17 Induced Draft Blower
- 18 Coil Front Cover Pressure Tap
- 19 Coil Front Cover Drain Port
- 20 Drain Line Penetrations
- 21 Drain Trap
- 22 Capacitor
- 23 Electrical Connection Inlets (Alternate)
- 24 Integrated Control Module
(with fuse and diagnostic LED)
- 25 24-Volt Thermostat Connections
- 26 Transformer (40 VA)
- 27 Circulator Blower
- 28 Bottom Return Filter Retainer
- 29 Blower Door Interlock Switch
- 30 Junction Box
- 31 Electrical Connection Inlets
- 32 Auxiliary Limit
- 33 Coil Front Cover
- 34 Combustion Air Inlet Pipe

COMPONENT IDENTIFICATION

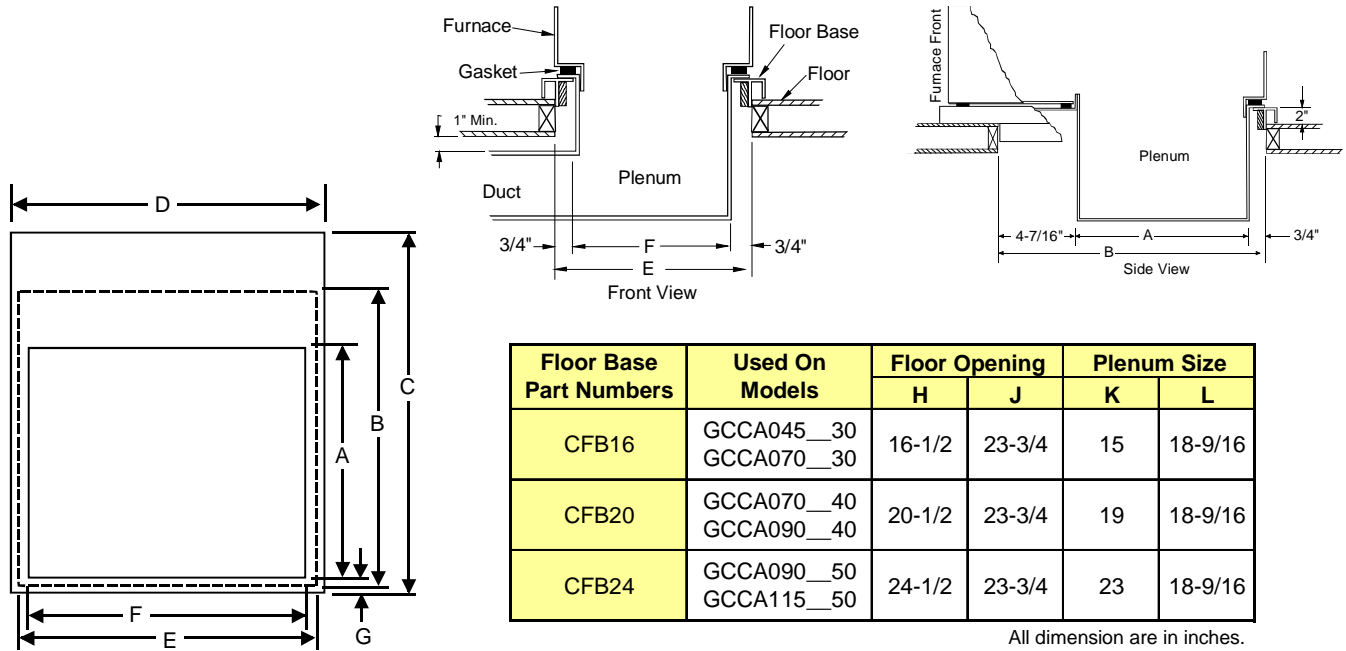
PRODUCT IDENTIFICATION

A large array of Amana coils are available for use with the new GUCA and GCCA furnaces, in either upflow, counterflow, or horizontal applications. These coils are available in both cased and uncased models, with or without a TXV expansion device. These new 90%+ furnaces match up with the existing Amana coils as shown in the chart below.

Btuh Input	Cabinet Width	Air Flow (tons)	CHA_F°C Cased A-Coils	CCA_FSC Uncased A-Coils	CHA_TCC Cased TXV A-Coils	CHA_TSC Uncased TXV A-Coils	CCF_F°C Horiz. A-Coils	CHF_TCC Horiz. A-Coils
45,000	16 1/2"	1 1/2 - 3	CCA18FCC CCA24FCC CCA30FCC CCA36FCC CCA42FCC	CCA18FSC CCA24FSC CCA30FSC CCA36FSC CCA42FSC	CHA18TCC CHA24TCC CHA30TCC CHA36TCC	CHA18TSC CHA24TSC CHA30TSC CHA36TSC	CCF24FCC CCF30FCC CCF36FCC	CHF18TCC CHF24TCC CHF30TCC
70,000	16 1/2"	2 - 3 1/2						
70,000	20 1/2"	2 1/2 - 4	CCA30FDC CCA36FDC CCA42FDC CCA48FCC	CCA48FSC	CHA42TCC	CHA42TSC	CCF24FDC CCF36FDC CCF42FCC CCF48FCC	CHF36TCC CHF42TCC
90,000	20 1/2"	2 1/2 - 4						
90,000	24 1/2"	3 - 5	CCA36FKC CCA48FDC CCA54FCC CCA57FCC CCA60FCC	CCA54FSC CCA57FSC CCA60FSC	CHA48TCC CHA54TCC CHA57TCC CHA60TCC	CHA48TSC CHA54TSC CHA57TSC CHA60TSC	CCF48FDC CCF60FCC	CHF48TCC
115,000	24 1/2"	3 - 5						

COIL MATCHES

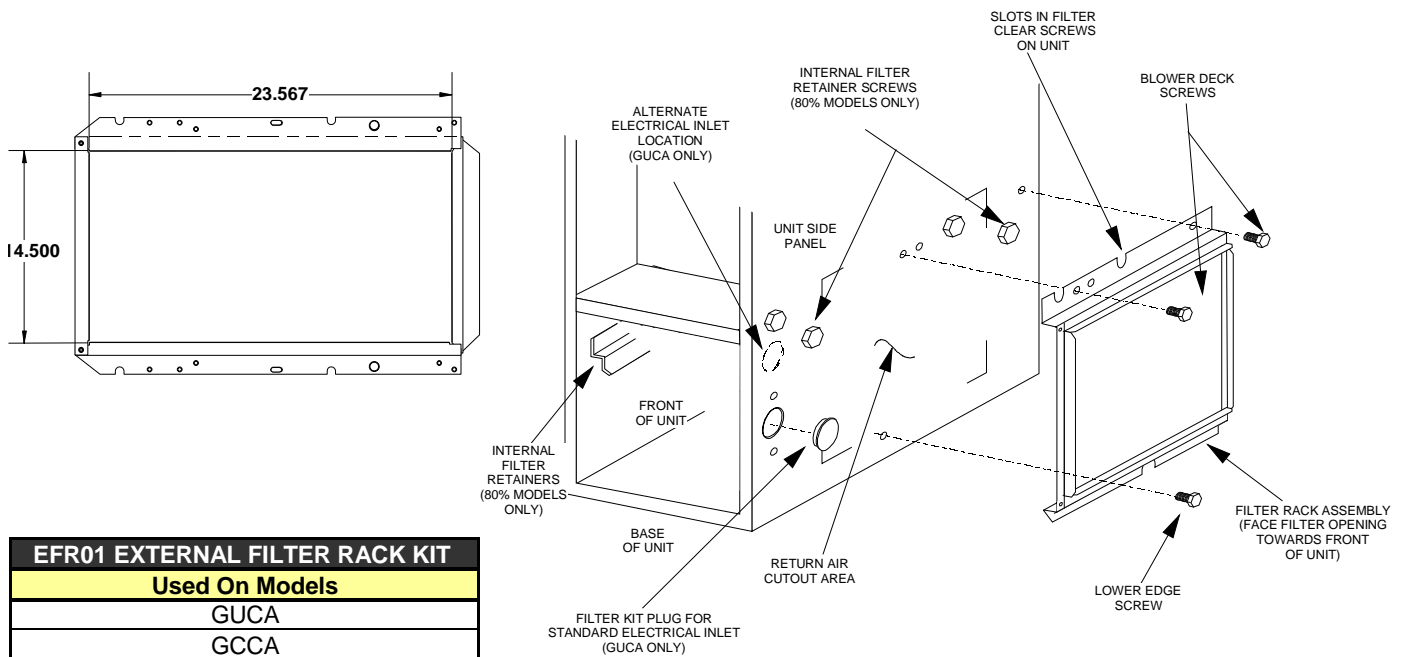
PRODUCT IDENTIFICATION ACCESSORIES



Floor Base Part Numbers	Used On Models	A	B	C	D	E	F	G
CFB16	GCCA045__30 GCCA070__30	18-9/16	23-3/4	29	17-1/2	16-1/2	15	1-11/32
CFB20	GCCA070__40 GCCA090__40	18-9/16	23-3/4	29	21-1/2	20-1/2	19	1-11/32
CFB24	GCCA090__50 GCCA115__50	18-9/16	23-3/4	29	25-1/2	24-1/2	23	1-11/32

All dimension are in inches.

COUNTERFLOW FLOOR BASE



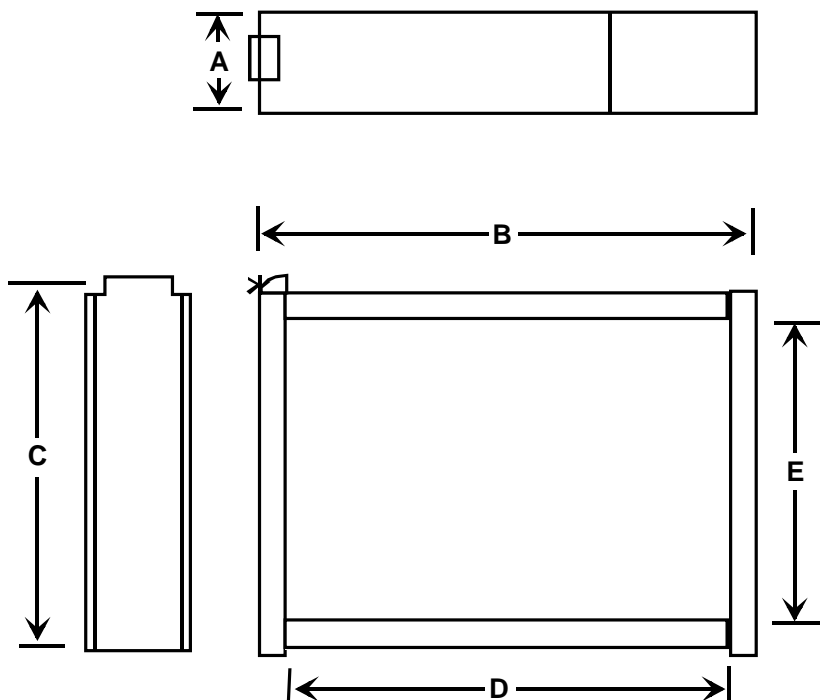
EXTERNAL FILTER RACK KIT

PRODUCT IDENTIFICATION ACCESSORIES

MAC1 SPECIFICATIONS	
CAPACITY	600-2000CFM
MEDIA SERVICE LIFE	12 MO.NOMINAL
MEDIA LISTING	UL CLASS 2
DIMENSIONS	
A	7-1/4
B	25
C	22-1/8
D	22-5/8
E	17-11/16
RESISTANCE	
CFM	INCHES W.C.
600	.04
800	.05
1000	.09
1200	.12
1400	.15
1600	.18
1800	.22
2000	.27

All dimensions are in inches.

MEDIA AIR CLEANER	
Used On Models	
	GUCA
	GUCA

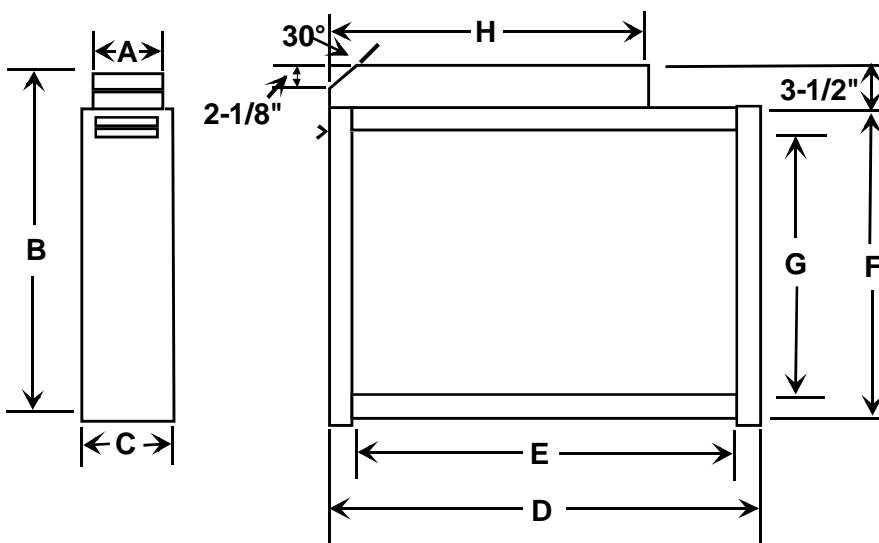


MEDIA AIR CLEANER

EAC5 SPECIFICATIONS	
RATED CAPACITY	2000 CFM (3400
MAX. PRESSURE DROP	.13 in. w.g. @
CELL WEIGHT	(2) 12 lbs. each
UNIT WEIGHT	46 lbs.
POWER CONSUMPTION	48 watts maximum
ELECTRICAL INPUT	120 V , 60 HZ, 1
ELECTRICAL OUTPUT	3.2 MA @ 6200
DIMENSIONS	
A	4-1/2
B	24-7/16
C	7-3/16
D	25
E	20-5/16
F	20-3/4
G	22-1/2
H	17-3/4

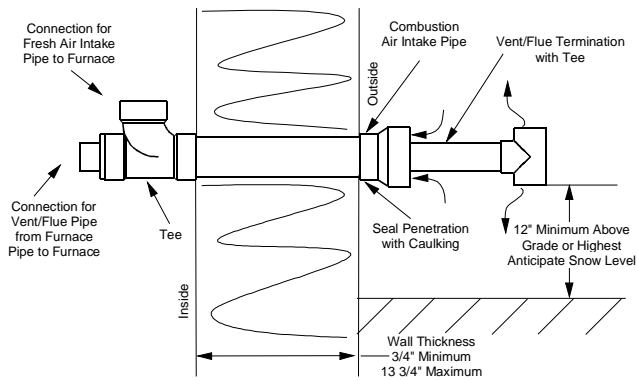
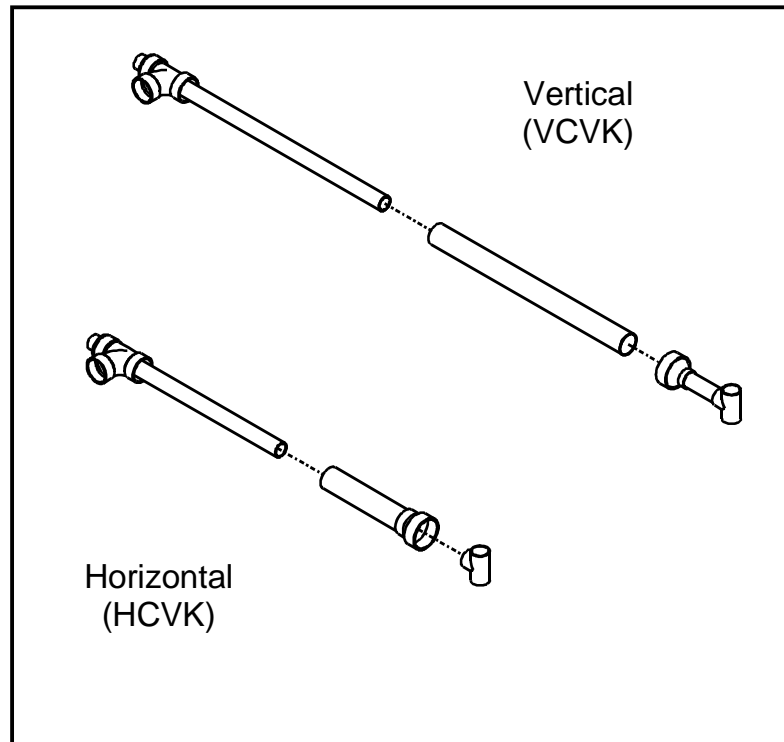
All dimensions are in inches.

EAC5 ELECTRONIC AIR CLEANER	
Used On Models	
	GUCA
	GCCA

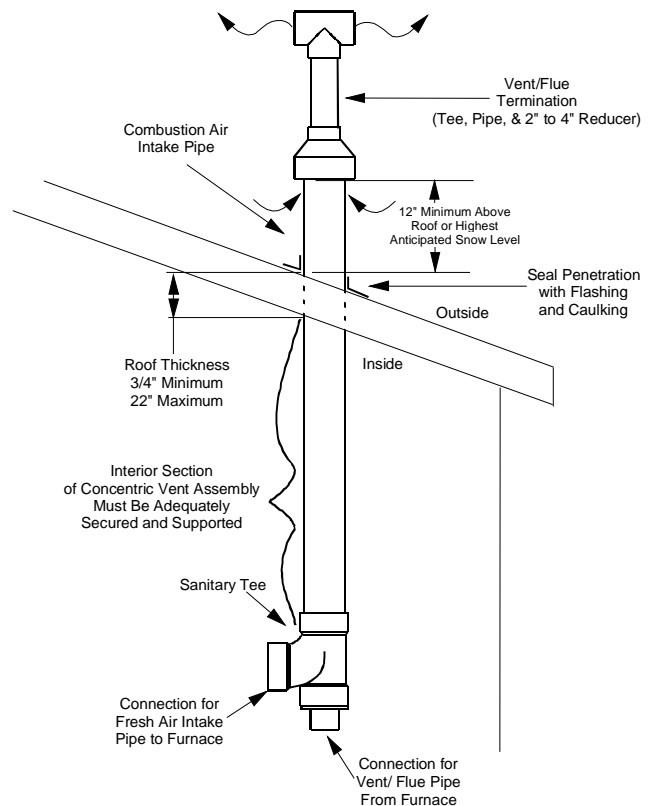


ELECTRONIC AIR CLEANER

PRODUCT IDENTIFICATION ACCESSORIES



HVCK Installation



VCKV Installation

Concentric Vents Kits HVCK and VCKV are suitable for use with the following Amana 90% efficient furnace products:

CONCENTRIC VENT KIT
Used On Models
GUCA
GCCA

This kit is not certified for, and must not be applied to any furnace not listed in the above table.

CONCENTRIC VENT CONVERSION KIT

FURNACE SPECIFICATIONS

MODEL	GUCA045AX30	GUCA070AX30	GUCA070AX40	GUCA090AX40	GUCA090AX50	GUCA115AX50
Btuh						
Input (US)	46,000	69,000	69,000	92,000	92,000	115,000
Output (US)	42,800	64,400	64,400	86,000	85,300	106,500
Input (CAN)	46,000	69,000	69,000	92,000	90,000	115,000
Output (CAN)	42,800	64,400	64,400	86,000	85,300	106,500
A.F.U.E.	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Rated External Static (WC)	.20 - .50	.20 - .50	.20 - .50	.20 - .50	.20 - .50	.20 - .50
Temperature Rise °F	35 - 65	35 - 65	35 - 65	35 - 65	35 - 65	35 - 65
ID Blower Pressure Switch Trip Point	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
Front Cover Pressure Switch Trip Point	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
Blower Wheel (D x W)"	11 x 6	11 x 7	11 x 9	11 x 9	11 x 9	11 x 10
Blower Horsepower	1/3	1/2	1/2	1/2	3/4	3/4
Blower Speeds	4	4	4	4	4	4
Max CFM @ 0.5 E.S.P.	1196	1406	1643	1544	2128	2029
Power Supply	115-60-1	115-60-1	115-60-1	115-60-1	115-60-1	115-60-1
Min. Circuit Ampacity (MCA)	9.0	8.9	8.9	8.9	13.8	14.9
Max. Overcurrent Device	15.0	15.0	15.0	15.0	15.0	15.0
Transformer (VA)	40	40	40	40	40	40
Heat Anticipator	0.7	0.7	0.7	0.7	0.7	0.7
Limit Setting °F	150	150	160	150	150	150
Aux. Limit °F.	150	150	150	150	150	160
Fan Delay Timings						
On Heating	30 secs.	30 secs.	30 secs.	30 secs.	30 secs.	30 secs.
Off Heating *	90 secs.	90 secs.	90 secs.	90 secs.	90 secs.	90 secs.
On Cooling	5 sec.	5 sec.	5 sec.	5 sec.	5 sec.	5 sec.
Off Cooling	45 secs.	45 secs.	45 secs.	45 secs.	45 secs.	45 secs.
Gas Supply Pressure (Nat/LP)	7" / 11"	7" / 11"	7" / 11"	7" / 11"	7" / 11"	7" / 11"
Manifold Pressure (Nat/LP)	3.5 " / 10"	3.5 " / 10"	3.5 " / 10"	3.5 " / 10"	3.5 " / 10"	3.5 " / 10"
Orifice Size (Nat/LP)	#43 / #55	#43 / #55	#43 / #55	#43 / #55	#43 / #55	#43 / #55
Number of Burners	2	3	3	4	4	5
Vent Connector Diameter	2"	2"	2"	2"	2"	2"
Combustion Air Connector Diameter	2"	2"	2"	2"	2"	2"
Shipping Weight (lbs.)	131	144	152	166	175	187

* Off Heating - This fan delay timing is adjustable (60, 90, 120 or 180 seconds). 90 seconds as shipped.

1. These furnaces are manufactured for natural gas operation. Optional LP Conversion Kits are available to convert to propane gas.
2. When these furnaces are installed at high altitude, the appropriate High Altitude orifice kit must be applied. This is required due to the natural reduction in the density of both the gas fuel and combustion air as altitude increases. The kit will provide the proper design certified input rate within the specified altitude range.
3. The total heat loss from the structure as expressed in TOTAL BTU/HR must be calculated by the manufactures method of in accordance with the "A.S.H.R.A.E. GUIDE" or "MANUAL J-LOAD CALCULATIONS" published by the AIR CONDITIONING CONTRACTORS OF AMERICA. The total heat loss calculated should be equal to or less than the heating capacity. Output based on D.O.E. test procedures, steady state efficiency times output.
4. Minimum Circuit Ampacity calculated as: (1.25 x Circulation Blower Amps) + I.D. Blower Amps.

FURNACE SPECIFICATIONS

MODEL	GCCA045AX30	GCCA070AX30	GCCA070AX40	GCCA090AX40	GCCA090AX50	GCCA115AX50
Btuh						
Input (US)	46,000	69,000	69,000	92,000	92,000	115,000
Output (US)	43,000	65,400	63,300	87,500	86,200	109,100
Input (CAN)	46,000	69,000	69,000	92,000	92,000	115,000
Output (CAN)	43,000	65,400	63,300	87,500	86,200	109,100
A.F.U.E.	92.0%	92.0%	92.0%	92.0%	92.0%	92.0%
Rated External Static (WC)	.20 - .50	.20 - .50	.20 - .50	.20 - .50	.20 - .50	.20 - .50
Temperature Rise °F	35 - 65	35 - 65	35 - 65	40 - 70	35 - 65	40 - 70
ID Blower Pressure Switch Trip Point	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
Front Cover Pressure Switch Trip Point	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
Blower Wheel (D x W)"	11 x 6	11 x 7	11 x 9	11 x 9	11 x 9	11 x 10
Blower Horsepower	1/3	1/2	1/2	1/2	3/4	3/4
Blower Speeds	4	4	4	4	4	4
Max CFM @ 0.5 E.S.P.	1195	1366	1590	1581	1987	1903
Power Supply	115-60-1	115-60-1	115-60-1	115-60-1	115-60-1	115-60-1
Min. Circuit Ampacity (MCA)	9.0	8.9	8.9	8.9	13.8	14.9
Max. Overcurrent Device	15.0	15.0	15.0	15.0	15.0	15.0
Transformer (VA)	40	40	40	40	40	40
Heat Anticipator	0.7	0.7	0.7	0.7	0.7	0.7
Limit Setting °F	170	170	170	150	170	155
Aux. Limit °F.	160	160	160	160	170	160
Fan Delay Timings						
On Heating	30 secs.	30 secs.	30 secs.	30 secs.	30 secs.	30 secs.
Off Heating *	90 secs.	90 secs.	90 secs.	90 secs.	90 secs.	90 secs.
On Cooling	5 sec.	5 sec.	5 sec.	5 sec.	5 sec.	5 sec.
Off Cooling	45 secs.	45 secs.	45 secs.	45 secs.	45 secs.	45 secs.
Gas Supply Pressure (Nat/LP)	7" / 11"	7" / 11"	7" / 11"	7" / 11"	7" / 11"	7" / 11"
Manifold Pressure (Nat/LP)	3.5" / 10"	3.5" / 10"	3.5" / 10"	3.5" / 10"	3.5" / 10"	3.5" / 10"
Orifice Size (Nat/LP)	#43 / #55	#43 / #55	#43 / #55	#43 / #55	#43 / #55	#43 / #55
Number of Burners	2	3	3	4	4	5
Vent Connector Diameter	2"	2"	2"	2"	2"	2"
Combustion Air Connector Diameter	2"	2"	2"	2"	2"	2"
Shipping Weight (lbs.)	132	145	153	167	176	188

* Off Heating - This fan delay timing is adjustable (60, 90, 120 or 180 seconds). 90 seconds as shipped.

1. These furnaces are manufactured for natural gas operation. Optional LP Conversion Kits are available to convert to propane gas.
2. When these furnaces are installed at high altitude, the appropriate High Altitude orifice kit must be applied. This is required due to the natural reduction in the density of both the gas fuel and combustion air as altitude increases. The kit will provide the proper design certified input rate within the specified altitude range.
3. The total heat loss from the structure as expressed in TOTAL BTU/HR must be calculated by the manufactures method of in accordance with the "A.S.H.R.A.E. GUIDE" or "MANUAL J-LOAD CALCULATIONS" published by the AIR CONDITIONING CONTRACTORS OF AMERICA. The total heat loss calculated should be equal to or less than the heating capacity. Output based on D.O.E. test procedures, steady state efficiency times output.
4. Minimum Circuit Ampacity calculated as: $(1.25 \times \text{Circulation Blower Amps}) + \text{I.D. Blower Amps}$.

BLOWER PERFORMANCE SPECIFICATIONS

GUCA Blower Performance															
Model (Heating Speed As Shipped)	Motor Speed	Tons AC at 0.5" ESP	External Static Pressure (Inches Water Column)												
			0.1		0.2		0.3		0.4		0.5		0.6	0.7	0.8
			CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	CFM	CFM
GUCA045AX30 (MED-LO)	HIGH	3.0	1322	---	1298	---	1278	---	1243	---	1196	---	1137	1074	1000
	MED	2.5	1131	35	1114	35	1097	36	1068	37	1019	39	968	907	827
	MED-LO	2.0	903	44	896	44	876	45	844	47	807	49	764	706	652
	LOW	1.5	702	56	680	58	657	60	624	63	584	---	542	485	423
GUCA070AX30 (MED-LO)	HIGH	3.5	1590	37	1550	38	1505	39	1454	41	1406	42	1343	1266	1194
	MED	3.0	1489	40	1450	41	1415	42	1370	43	1324	45	1261	1205	1130
	MED-LO	2.5	1251	47	1226	48	1205	49	1173	50	1135	52	1096	1037	975
	LOW	2.0	1001	59	988	60	969	61	956	62	929	64	902	859	807
GUCA70AX40 (MED-LO)	HIGH	4.0	1861	---	1823	---	1778	---	1721	---	1643	36	1581	1500	1387
	MED	3.5	1620	37	1597	37	1565	38	1516	39	1462	41	1410	1318	1235
	MED-LO	3.0	1387	43	1369	43	1313	45	1284	46	1224	48	1167	1095	1024
	LOW	2.5	1193	50	1162	51	1118	53	1072	55	1012	59	961	894	836
GUCA090AX40 (HIGH)	HIGH	4.0	1821	43	1768	45	1699	46	1624	49	1544	51	1439	1354	1227
	MED	3.5	1624	49	1561	51	1520	52	1461	54	1381	57	1297	1217	1109
	MED-LO	3.0	1395	57	1363	58	1311	60	1258	63	1201	66	1120	1045	957
	LOW	2.5	1212	65	1164	---	1126	---	1080	---	1014	---	957	882	815
GUCA090AX50 (MED-HI)	HIGH	5.0	2375	---	2323	---	2282	35	2217	36	2128	37	2056	1956	1857
	MED	4.0	1752	45	1741	45	1729	46	1682	47	1640	48	1591	1534	1454
	MED-LO	3.5	1504	53	1487	53	1469	54	1443	55	1412	56	1380	1318	1228
	LOW	3.0	1274	62	1258	63	1253	63	1222	65	1201	---	1147	1072	972
GUCA115AX50 (HIGH)	HIGH	5.0	2359	42	2298	43	2208	45	2117	47	2029	49	1914	1783	1678
	MED	4.0	1849	53	1808	55	1757	56	1722	57	1651	60	1595	1507	1403
	MED-LO	3.5	1575	63	1556	63	1527	65	1497	---	1456	---	1370	1290	1205
	LOW	3.0	1370	---	1348	---	1313	---	1278	---	1254	---	1180	1114	1029

1. CFM in charts is with filters(s). Filters do not ship with this furnace, but must be provided by the installer. If the furnace requires two return filters, this chart assumes both filters are installed.
2. All furnaces ship as high speed cooling. Installer must adjust blower speed as needed.
3. For most jobs, about 400 CFM per ton when cooling is desirable.
4. INSTALLATION IS TO BE ADJUSTED TO OBTAIN TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING PLATE.
5. The chart is for information only. For satisfactory operation, external static pressure must not exceed value shown on rating plate. The shaded area indicates ranges in excess of maximum external static pressure allowed when heating.
6. The dashed (---) areas indicate a temperature rise not recommended for this model.
7. The above chart is for U.S. furnaces installed at 0-4000 feet. At higher altitudes, a properly derated unit will have approximately the same temperature rise at a particular CFM, while the ESP at that CFM will be lower.

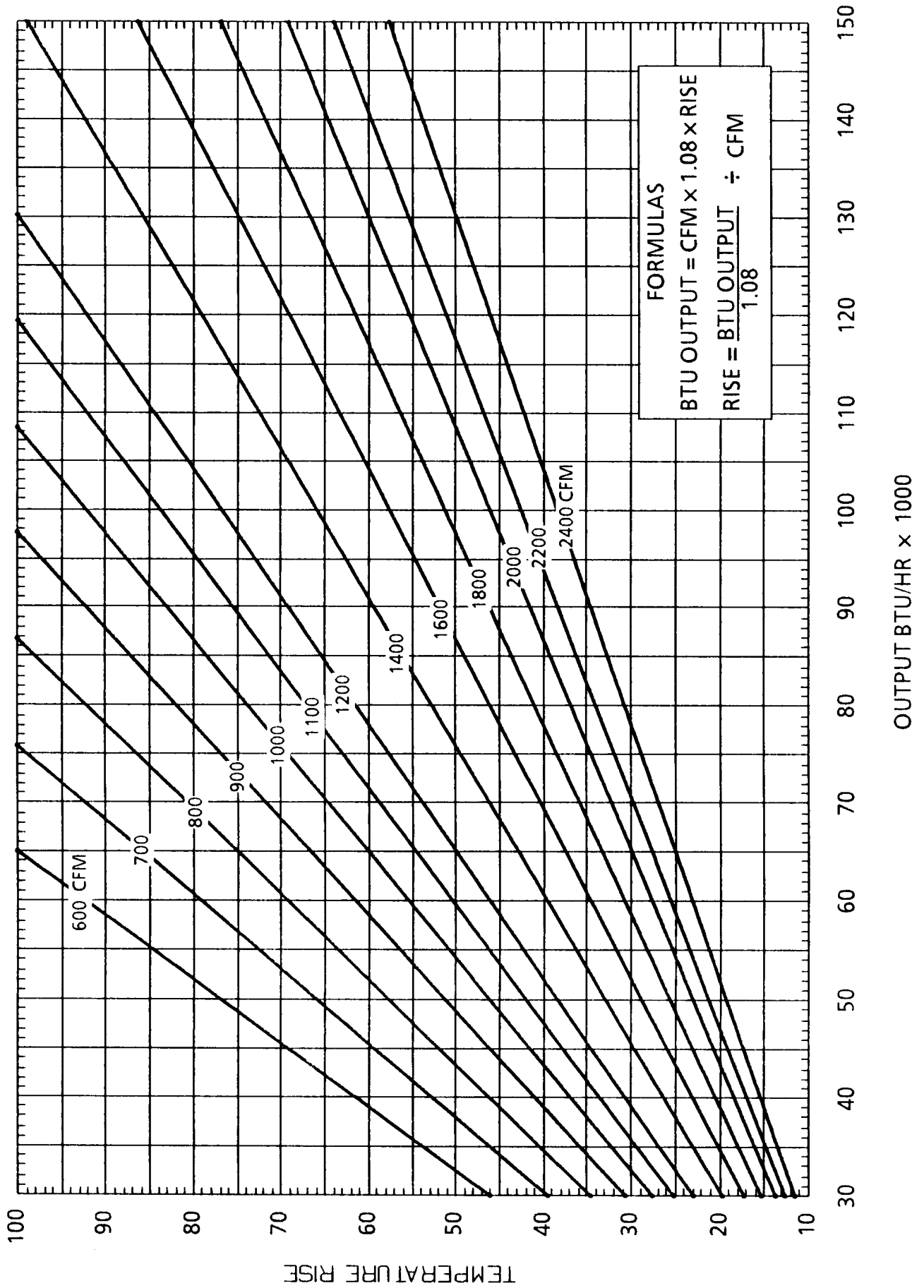
BLOWER PERFORMANCE SPECIFICATIONS

GUCA Blower Performance															
Model (Heating Speed As Shipped)	Motor Speed	Tons AC at 0.5" ESP	External Static Pressure (Inches Water Column)												
			0.1		0.2		0.3		0.4		0.5		0.6	0.7	0.8
			CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	CFM	CFM
GCCA045AX30 (MED-LO)	HIGH	3.0	1327	----	1342	----	1305	----	1251	----	1195	----	1128	1056	969
	MED	2.5	1195	----	1179	----	1136	35	1092	36	1037	38	988	918	839
	MED-LO	2.0	979	40	949	42	906	43	862	46	816	48	791	736	668
	LOW	1.5	764	52	736	54	703	56	668	59	621	63	589	537	477
GCCA070AX30 (MED-HIGH)	HIGH	3.5	1594	37	1541	38	1495	40	1426	41	1366	43	1300	1229	1155
	MED	3.0	1385	43	1338	44	1300	45	1245	47	1198	49	1138	1075	1008
	MED-LO	2.5	1164	51	1135	52	1105	53	1068	55	1027	58	982	931	873
	LOW	2.0	982	60	957	62	924	64	891	----	859	----	819	777	724
GCCA70AX40 (MED-LO)	HIGH	4.0	1911	----	1838	----	1762	----	1674	35	1590	37	1501	1407	1294
	MED	3.5	1674	35	1609	37	1551	38	1481	40	1407	42	1329	1234	1157
	MED-LO	3.0	1481	40	1407	42	1352	44	1329	44	1234	48	1157	1076	972
	LOW	2.5	1282	46	1234	48	1183	50	1117	53	1047	56	987	906	818
GCCA090AX40 (HIGH)	HIGH	4.0	1867	42	1797	44	1730	46	1660	47	1581	50	1498	1403	1316
	MED	3.5	1654	48	1594	49	1531	51	1485	53	1403	56	1263	1239	1157
	MED-LO	3.0	1452	54	1407	56	1353	58	1295	61	1225	64	1156	1083	1005
	LOW	2.5	1255	63	1206	65	1165	68	1115	----	1056	----	997	931	849
GCCA090AX50 (MED-LO)	HIGH	5.0	2313	----	2243	35	2171	36	2066	38	1987	40	1889	1785	1655
	MED	4.5	1900	41	1862	42	1810	44	1744	45	1674	47	1601	1510	1412
	MED-LO	3.5	1661	47	1615	49	1583	50	1530	52	1480	53	1406	1332	1245
	LOW	3.0	1450	54	1415	56	1379	57	1332	59	1284	61	1219	1144	1053
GCCA115AX50 (MED-HI)	HIGH	5.0	2283	43	2192	45	2108	47	2012	49	1903	52	1829	1727	1636
	MED	4.5	1910	52	1860	53	1782	55	1714	57	1658	59	1555	1460	1377
	MED-LO	3.5	1686	58	1644	60	1585	62	1524	65	1460	67	1411	1324	2132
	LOW	3.0	1460	67	1410	70	1377	----	1324	----	1288	----	1212	1152	1067

1. CFM in charts is with filters(s). Filters do not ship with this furnace, but must be provided by the installer. If the furnace requires two return filters, this chart assumes both filters are installed.
2. All furnaces ship as high speed cooling. Installer must adjust blower speed as needed.
- 3 For most jobs, about 400 CFM per ton when cooling is desirable.
4. INSTALLATION IS TO BE ADJUSTED TO OBTAIN TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING PLATE.
5. The chart is for information only. For satisfactory operation, external static pressure must not exceed value shown on rating plate. The shaded area indicates ranges in excess of maximum external static pressure allowed when heating.
- 6 The dashed (----) areas indicate a temperature rise not recommended for this model.
7. The above chart is for U.S. furnaces installed at 0-4000 feet. At higher altitudes, a properly derated unit will have approximately the same temperature rise at a particular CFM, while the ESP at that CFM will be lower.

BLOWER PERFORMANCE SPECIFICATIONS

BTU OUTPUT vs TEMPERATURE RISE CHART



COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)



Property damage, bodily injury, or death may occur if the furnace and any other fuel-burning appliances are not provided with enough fresh air for proper combustion and ventilation of flue gases. Most homes require outside air to be supplied into the furnace area.

Improved construction and additional insulation in homes has reduced the heat loss and made these homes much tighter around doors and windows so that air infiltration is minimal. This creates a problem to supply combustion and ventilation air for gas fired or other fuel burning appliances.. Any use of appliances that pull air out of the house (clothes dryers, exhaust fans, fireplaces, etc.) increases this problem and appliances could be starving for air.

In addition, these energy saving measures mean that your home will retain more water vapor and have a higher relative humidity. High humidity, especially during cold weather, may be damaging to buildings because condensation forms on windows and inside walls.

AIR REQUIREMENTS

Most homes will require that outside air be supplied to the furnace area by means of ventilation grilles or ducts connecting directly to the outdoors or spaces open to the outdoors such as attics or crawl spaces. The following information on air for combustion and ventilation is reproduced from the National Fuel Gas Code NFPA54/ANSIZ223.1 Section 5.3.

5.3.1 General

(a) The provisions of 5.3 apply to gas utilization equipment installed in buildings and which require air for combustion, ventilation and dilution of flue gases from within the building. They do not apply to (1) direct vent equipment which is constructed and installed so that air for combustion is obtained from the outside atmosphere and all flue gases are discharged to the outside atmosphere, or (2) enclosed furnaces which incorporate an integral total enclosure and use only outside air for combustion and dilution of flue gases.

(b) Equipment shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and the maintenance of ambient temperature at safe limits under normal conditions of use. Equipment shall be located so as not to interfere with proper circulation of air. When normal infiltration does not provide the necessary air, outside air shall be introduced.

(c) In addition to air needed for combustion, process air shall be provided as required for: cooling of equipment or material, controlling dew point, heating, drying, oxidation or dilution, safety exhaust, odor control, and air for compressors.

(d) In addition to air needed for combustion, air shall be applied for ventilation, including all air required for comfort and proper working conditions for personnel.

(e) While all forms of building construction cannot be covered in detail, air for combustion, ventilation, and dilution of flue gases for gas utilization equipment vented by natural draft normally may be obtained by appliance of one of the methods covered in 5.3.3 and 5.3.4.

(f) Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers, and fireplaces shall be considered in determining the adequacy of a space to provide combustion air requirements.

5.3.2 Equipment Located in Unconfined Spaces:

In unconfined spaces (see definition below) in buildings, infiltration may be adequate to provide air for combustion, ventilation and dilution of flue gases. However, in buildings of tight construction (for example, weather stripping, heavily insulated, caulked, vapor barrier, etc.), additional air may need to be provided using the methods described in 5.3.3-b or 5.3.4.

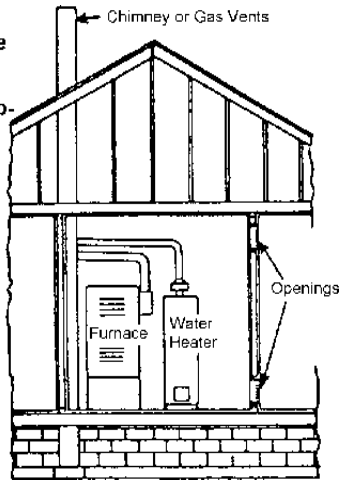
Unconfined Space. For purposes of this Code, a space whose volume is not less than 50 cubic feet per 1,000 Btu per hour of the aggregate input rating of all appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

5.3.3 Equipment Located in Confined Spaces:

(a) *All Air from Inside the Building:* The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 square inch per 1,000 Btu per hour of the total input rating of all gas utilization equipment in the confined space, but not less than 100 square inches. One opening shall be within 12 inches of the top and one within 12 inches of the bottom of the enclosure. The following drawing illustrates the air opening specifications for equipment located in confined spaces; all air from inside building.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

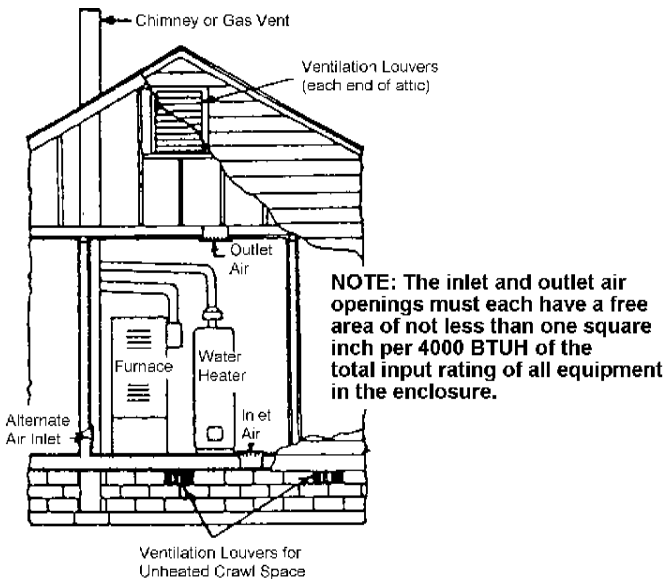
NOTE: Each opening must have a free area of not less than one square inch per 1000 BTU of the total input rating of all equipment in the enclosure, but not less than 100 square inches.



Equipment Located in Confined Spaces; All Air from Inside Building. See 5.3.3-a

(b) *All Air from Outdoors:* The confined space shall be provided with two permanent openings, one commencing within 12 inches of the top and one commencing within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

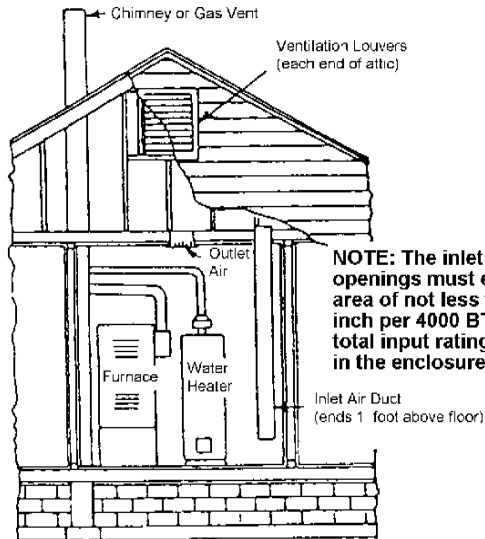
1. When directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 BTU per hour of total input rating of all equipment in the enclosure. The following drawing illustrates the air opening specifications for equipment located in confined spaces; all air from outdoors-inlet air from ventilated crawl space and outlet air to ventilated attic.



NOTE: The inlet and outlet air openings must each have a free area of not less than one square inch per 4000 BTUH of the total input rating of all equipment in the enclosure.

Equipment Located in Confined Spaces; All Air from Outdoors—Inlet Air from Ventilating Crawl Space and Outlet Air to Ventilating Attic. See 5.3.3-b

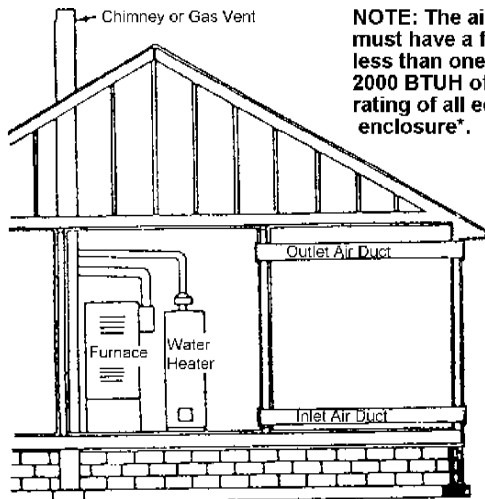
2. When communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 BTU per hour of total input rating of all equipment in the enclosure. The following drawing illustrates the air opening specifications for equipment located in confined spaces; all air from outdoors through ventilated attic.



NOTE: The inlet and outlet air openings must each have a free area of not less than one square inch per 4000 BTUH of the total input rating of all equipment in the enclosure.

Equipment Located in Confined Spaces; All Air from Outdoors Through Ventilating Attic. See 5.3.3-b.

3. When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 BTU per hour of total input rating of all equipment in the enclosure. The following drawing illustrates the air opening specifications for equipment located in confined spaces; all air from outdoors.



NOTE: The air duct openings must have a free area of not less than one square inch per 2000 BTUH of the total input rating of all equipment in the enclosure*.

*If the appliance room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 BTU per hour of the total input rating of all appliances in the enclosure.

Equipment Located in Confined Spaces; All Air from Outdoors. See 5.3.3-b.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

- When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall not be less than 3 inches.

5.3.4 Specially Engineered Installations:

The requirements of 5.3.3 shall not necessarily govern when special engineering, approved by the authority having jurisdiction, provides an adequate supply of air for combustion, ventilation, and dilution of flue gases.

5.3.5 Louvers and Grilles:

In calculating free area in 5.3.3, consideration shall be given to the blocking effect of louvers, grilles or screens protecting openings. Screens used shall not be smaller than 1/4 inch mesh. If the area through a design of louver or grille is known, it should be used in calculating the size of opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 20-25 percent free area and metal louvers and grilles will have 60-75 percent free area. Louvers and grilles shall be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

5.3.6 Special Conditions Created by Mechanical Exhausting or Fireplaces:

Operation of exhaust fans, ventilation systems, clothes dryers, or fireplaces may create conditions requiring special attention to avoid unsatisfactory operation of installed gas utilization equipment.

Vent/Flue Pipe and Combustion Air Pipe

General



Failure to follow these instructions can result in bodily injury or death. Carefully read and follow all instructions given in this section.



Upon completion of the furnace installation, carefully inspect the entire flue system both inside and outside the furnace to assure it is properly sealed. Leaks in the flue system can result in serious personal injury or death due to exposure to flue products, including carbon monoxide.

A condensing gas furnace achieves its high level of efficiency by extracting almost all of the heat from the products of combustion and cooling them to the point where condensation takes place. Because of the relatively low flue gas temperature and water condensation requirements, PVC pipe is used as venting material.

This furnace must not be connected to Type B, BW, or L vent or vent connector, and must not be vented into any portion of a factory built or masonry chimney except when used as a pathway for PVC as described later in this section. Never common vent this appliance with another appliance or use a vent which is used by a solid fuel appliance. Do not use commercially available "no hub connectors" other than those shipped with this product.

It is the responsibility of the installer to follow the manufacturers' recommendations and to verify that all vent/flue piping and connectors are compatible with furnace flue products. Additionally, it is the responsibility of the installer to ensure that all piping and connections possess adequate structural integrity and support to prevent flue pipe separation, shifting, or sagging during furnace operation.

Dual Certification: Non-Direct/Direct Vent

This furnace is dual certified and may be installed as a non-direct vent (single pipe) or direct vent (dual pipe) appliance. A *non-direct vent* installation requires only a vent/flue pipe, while a *direct vent* installation requires both a vent/flue pipe and a combustion air intake pipe. Refer to the appropriate section for details concerning piping size, length, number of elbows, furnace connections, and terminations.

Materials and Joining Methods



To avoid fire, explosion, or bodily injury, solvent cements must be kept away from all ignition sources (i.e., sparks, open flames, and excessive heat) as they are combustible liquids. Avoid breathing cement vapors or contact with skin and/or eyes.

Two- or three-inch nominal diameter PVC Schedule 40 pipe meeting ASTM D1785, PVC primer meeting ASTM F656, and PVC solvent cement meeting ASTM D2564 specifications must be used. Fittings must be DWV type fittings meeting ASTM D2665 and ASTM D3311. Carefully follow the manufacturer's instructions for cutting, cleaning, and solvent cementing of PVC.

As an alternative to PVC pipe, primer, solvent cement, and fittings, ABS materials which are in compliance with the following specifications may be used. Two-or-three-inch ABS Schedule 40 pipe must meet ASTM D1527 and, if used in Canada, must be CSA listed. Solvent cement for ABS to ABS joints must meet ASTM D2235 and, if used in Canada, must be CSA listed. The solvent cement for the PVC to ABS transition joint must meet ASTM D3138. Fittings must be DWV type fittings meeting ASTM D2661 and ASTM D3311 and, if used in Canada, must be CSA listed. Carefully follow the manufacturers' instructions for cutting, cleaning, and solvent cementing PVC and/or ABS.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

All 90° elbows must be medium radius (1/4 bend DWV) or long radius (Long sweep 1/4 bend DWV) types conforming to ASTM D3311. A medium radius (1/4 bend DWV) elbow measures 3 1/16" minimum from the plane of one opening to the centerline of the other opening for 2" diameter pipe, and 4 9/16" minimum for 3" pipe.

Proper Vent/Flue and Combustion Air Piping Practices

Adhere to these instructions to ensure safe and proper furnace performance. The length, diameter, and number of elbows of the vent/flue pipe and combustion air pipe (when applicable) affects the performance of the furnace and must be carefully sized. All piping must be installed in accordance with local codes and these instructions.

Piping must be adequately secured and supported to prohibit sagging, joint separation, and/or detachment from the furnace. Horizontal runs of vent/flue piping must be supported every three feet and must maintain a 1/4 inch per foot downward slope, back towards the furnace, to properly return condensate to the furnace's drain system. Allowances should be made for minor expansion and contraction due to temperature variations. For this reason, particular care must be taken to secure piping when a long run is followed by a short offset of less than 40 inches.

Precautions should be taken to prevent condensate from freezing inside the vent/flue pipe and/or at the vent/flue pipe termination. All vent/flue piping exposed outdoors or in unheated areas must be insulated with 1/2" thick closed cell foam such as "Armaflex" or "Insultube." Inspect piping for leaks prior to installing insulation.

Termination Locations

Note: Refer to *Location Requirements and Considerations* section for combustion air contaminant restrictions.

The following bullets and diagram describe the restrictions concerning the appropriate location of vent/flue pipe and combustion air intake pipe (when applicable) terminations. Refer to *Non-Direct Vent (Single Pipe) Piping* and *Direct Vent (Dual Pipe) Piping* sections for specific details on termination construction.

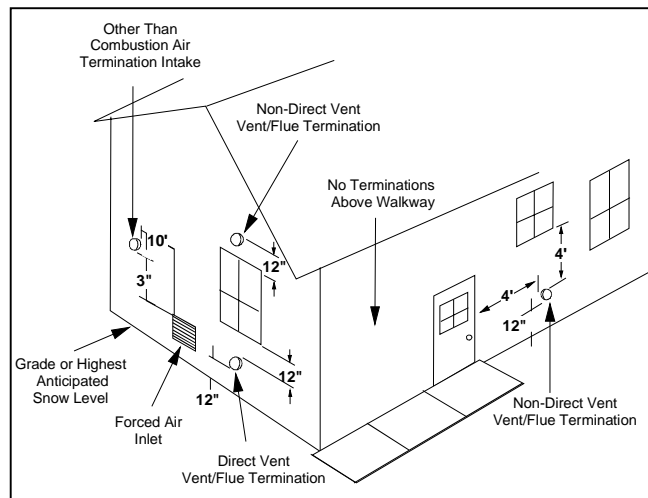
- All terminations must be located at least 12 inches above ground level or the anticipated snow level.
- Vent terminations must terminate at least 3 feet above any forced air inlet located within 10 feet.

Note: This provision does not apply to the combustion air intake termination of a direct vent application.

- The vent termination of a *non-direct vent* application must terminate at least 4 feet below, 4 feet horizontally from, or 1 foot above any door, window, or gravity air inlet into any building.

- The vent termination of a *direct vent* application must terminate at least 12 inches from any opening through which flue gases may enter a building (door, window, or gravity air inlet).
- The vent termination of vent pipe run vertically through a roof must terminate at least 12 inches above the roof line (or the anticipated snow level) and be at least 12 inches from any vertical wall (including any anticipated snow build up).
- A vent termination shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.
- The combustion air intake termination of a direct vent application should not terminate in an area which is frequently dusty or dirty.

Note: In Canada, the Canadian Fuel Gas Code takes precedence over the preceding termination restrictions.



Vent Termination Clearances

Canadian Venting Requirements

In Canada, venting must conform to the requirements of the current CAN/CGA-B149 Installation Code. Use only CSA listed two or three inch diameter PVC or ABS pipe, solvent cement, and fittings throughout. Carefully follow the manufacturers' instructions for cutting, cleaning, and solvent cementing PVC and/or ABS.

The vent can be run through an existing unused chimney provided the space between the vent pipe and the chimney is insulated and closed with a weather-tight, corrosion-resistant flashing.

The vent shall *not* be located:

- Less than 12 inches above the finished grade line.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

- Less than 36 inches from any building opening or any gas service regulator. For gas service regulators in the Province of Ontario, 72 inches.
- Less than 72 inches from the combustion air intake of another appliance.
- Directly above a gas utility meter or service regulator.
- Over a walkway unless located 84 inches above grade.

Standard Furnace Connections

It is the responsibility of the installer to ensure that the piping connections to the furnace are secure, airtight, and adequately supported.

As shipped, attachment “couplings” for vent/flue and combustion air intake pipe connections are provided on the furnace’s top cover (upflow) or basepan (counterflow). To use the standard connections, field supplied vent/flue pipe and combustion air intake pipe (when applicable) should be secured directly to the furnace at these locations.

Vent/Flue Pipe

Vent/flue pipe can be secured to the vent/flue coupling using the rubber coupling and worm gear hose clamps provided with this furnace (See “Standard Connections” figure). The rubber coupling allows separation of the vent/flue pipe from the furnace during servicing.

Note: Do not use other commercially available “no hub connectors” due to possible material conflicts. The vent/flue pipe can also be secured using a PVC or ABS elbow or coupling using the appropriate glue (See *Materials and Joining Methods* section).

Note: For *non-direct vent* installations, a minimum of one 90° elbow must be installed on the combustion air intake coupling to guard against inadvertent blockage.

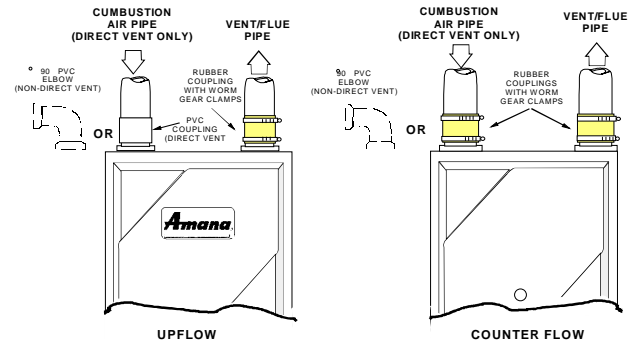
Combustion Air Pipe

Direct Vent Installations

On *upflow* units secure the combustion air intake pipe directly to the air intake coupling. On *counterflow* units secure the combustion air intake pipe to the air intake coupling using the rubber coupling and worm gear hose clamps provided with the unit. The counterflow rubber coupling allows service removal of air intake piping internal to the furnace blower compartment. **Note:** Because of probable material conflicts, do not use other commercially available “no hub connectors”. The combustion air intake pipe can also be secured directly to the counterflow unit air intake pipe coupling.

Non-Direct Vent Installations

A minimum of one 90° elbow must be installed on the combustion air intake “coupling” to guard against inadvertent blockage.



Standard Connections

Alternate Furnace Connections

If the standard locations are undesirable for a specific installation, alternate side panel locations are available for both combustion air inlet and vent/flue pipe connections. These locations may be of particular benefit to upright upflow installations requiring additional access to an “A” coil, or to upright counterflow installations requiring additional access to a filter or electronic air cleaner, or to horizontal installations desiring vent/flue (and combustion air intake) piping run vertically from the side of the cabinet.

Note: Standard and alternate locations can be combined (i.e., an installation may use the standard combustion air intake location but use the alternate vent/flue location or vice versa), if needed.



Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

Alternate Vent/Flue Location

The alternate vent/flue location is the large hole directly in line with the induced draft blower outlet. To use the alternate vent/flue location refer to the following steps, the “Vent/Flue Pipe Cuts” figure, and the “Alternate Vent/Flue Location” figure.

Note: Counterflow instructions follow the upflow instructions.

1. Remove and save the four screws securing the vent/flue coupling to the furnace top panel.

Counterflow units.

Remove and save the four screws securing the vent/flue coupling to the furnace basepan. Also remove the three screws securing the furnace’s internal vent/flue piping to the blower deck.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

2. *Upflow and Counterflow units.*

Loosen the worm gear hose clamps on the rubber elbow and detach it from both the induced draft blower and the vent/flue pipe.

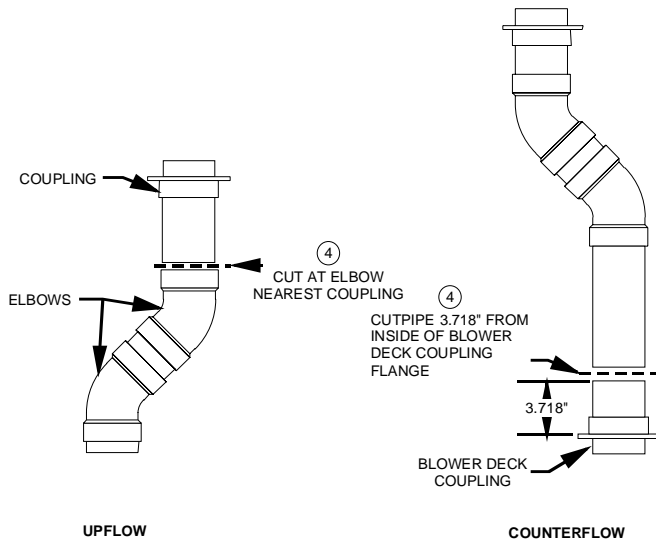
3. *Upflow and Counterflow units.*

Remove the vent/flue pipe from the furnace.

4. Cut the vent/flue pipe at the elbow nearest the coupling end of the pipe (See "Vent/Flue Pipe Cuts" figure). The section of pipe attached to the coupling will reach through the side panel to the induced draft blower. Discard unused side pipe and elbows.

Counterflow units.

Cut the vent/flue pipe 3.718 inches from the blower deck coupling (See "Vent/Flue Pipe Cuts" figure). Save vent/flue pipe attached to blower deck coupling for use in the alternate location. Discard remaining pipe and elbows.



Vent/Flue Pipe Cuts

5. Remove plastic plug from alternate vent/flue location. Relocate and install plug in standard vent/flue location (top cover).

Counterflow units.

Remove plastic plug from alternate vent/flue location. Relocate and install plug in standard vent/flue location (basepan). Plug remaining hole in blower deck with plastic plug included in the drain kit bag.

6. *Upflow and Counterflow units.*

Insert cut section of vent/flue pipe and coupling into alternate vent/flue location. Using a rubber coupling and worm gear hose clamps from the drain kit bag, attach the vent/flue pipe and coupling to the induced draft blower. Secure the coupling to the cabinet using the screws removed in step 1 or with field-supplied 3/8" #8 self drilling screws.

WARNING

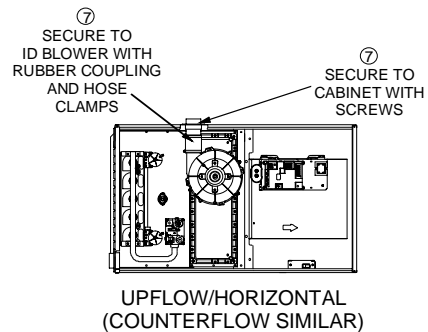
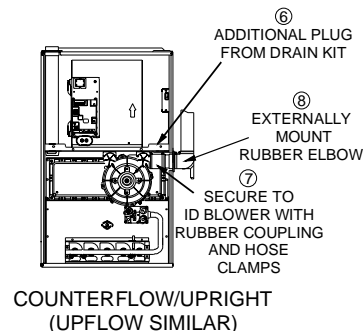
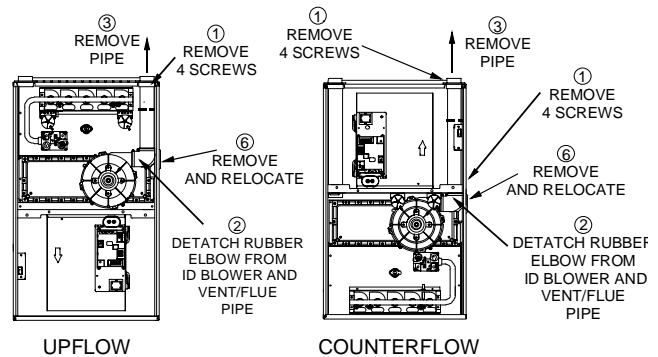
The rubber elbow is not designed to support a load. When the rubber elbow is mounted externally to the furnace cabinet, extreme care must be taken to adequately support field-supplied vent/flue piping. As damage can result in leaks causing bodily injury or death due to exposure to flue gases, including carbon monoxide.

7. *Upflow and Counterflow units.*

For **upright installations**, externally mount the rubber elbow to the vent/flue coupling using a worm gear hose clamp. Secure field supplied vent/flue piping to the rubber elbow using a worm gear hose clamp. **Note:** Use of the alternate vent/flue location for upright installations, requires the drain trap be installed on the same side of the unit as the flue pipe.

8. *Upflow and Counterflow units.*

For **horizontal installations**, externally secure the field-supplied vent/flue pipe directly to the vent/flue coupling using a PVC or ABS coupling or elbow.



Alternate Vent/Flue Location

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

Alternate Combustion Air Intake Location

The alternate combustion air intake location is the large hole *not* in line with the induced draft blower outlet. To use the alternate combustion air intake location, refer to the following steps, and the “Alternate Combustion Air Intake Location” figure.

Note: Counterflow unit instructions follow the upflow instructions.

1. Remove and save the four screws securing the combustion air intake coupling to the furnace’s top panel (upflow).

Counterflow units.

Remove and save the four screws securing the combustion air intake coupling to the basepan. Remove an additional three screws securing the furnace’s internal combustion air intake pipe to the blower deck.

2. Remove the combustion air intake coupling and gasket from the top panel.

Counterflow units.

Remove the combustion air intake pipe from the furnace and cut the pipe at the basepan coupling. Save basepan coupling and gasket, from blower desk coupling, for use in the alternate location. Discard the remaining pipe.

3. Remove plastic plug from alternate combustion air intake location. Relocate and install plug in standard air intake location (top cover).

Counterflow units.

Remove plastic plug from alternate combustion air intake location. Relocate and install plug in standard air intake location (basepan). Plug the remaining hole in the blower deck with the plastic plug included in the drain kit bag.

4. *Upflow and Counterflow units.*

With the gasket facing the cabinet side panel, and the flange’s flat spot facing forward, secure the combustion air intake coupling to the cabinet using the screws removed in step 1 or with field-supplied 3/8” #8 self-drilling screws.



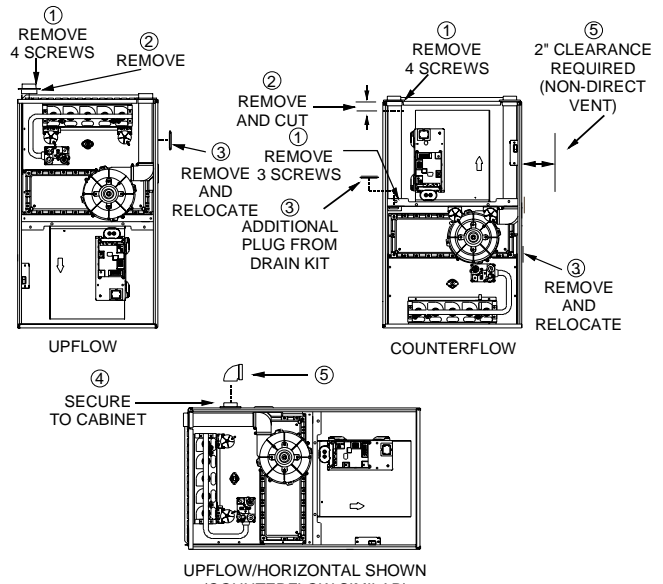
Be sure not damage internal wiring or other components, when reinstalling coupling and screws.

5. *Upflow and Counterflow units.*

For **non-direct vent installations** installed *horizontally*, a minimum of one 90° elbow must be installed on the combustion air intake coupling to guard against inadvertent blockage. No elbow is required on the alternate combustion air intake of *upright* installations, however, a minimum clearance of 2 inches is required to assure proper air supply.

6. *Upflow and Counterflow units.*

For **direct vent installations**, secure field-supplied combustion air intake pipe directly to the air intake coupling. (PVC coupling or elbow required on counterflow units).



Alternate Combustion Air Intake Location

Non-Direct Vent (Single Pipe) Piping

Non-direct vent installations require only a vent/flue pipe. The vent pipe can be run horizontally with an exit through the side of the building or run vertically with an exit through the roof of the building. The vent can also be run through an existing *unused* chimney; however, it must extend a minimum of 12 inches above the top of the chimney. The space between the vent pipe and the chimney must be closed with a weather-tight, corrosion-resistant flashing. For details concerning connection of the vent/flue pipe to the furnace, refer to *Vent/Flue Pipe and Combustion Air Pipe - Standard Furnace Connections or Alternate Furnace Connections* section for specific details. Refer to the following *Non-Direct Vent (Single Pipe) Piping - Vent/Flue Pipe Terminations* section for specific details on termination construction.

Although *non-direct vent* installations do not require a combustion air intake *pipe*, a minimum of one 90° elbow must be attached to the furnace’s combustion air intake *if* an upright installation uses the standard intake location, or a horizontal installation uses the alternate air intake location. This elbow will guard against inadvertent blockage of the air intake.

Vent/Flue Pipe Lengths and Diameters

Refer to the following table for applicable length, elbows, and pipe diameter for construction of the vent/flue pipe system of a non-direct vent installation. In addition to the vent/flue pipe, a single 90° elbow must be secured to the com-

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

bustion air intake to prevent inadvertent blockage. The tee used in the vent/flue termination must be included when determining the number of elbows in the piping system.

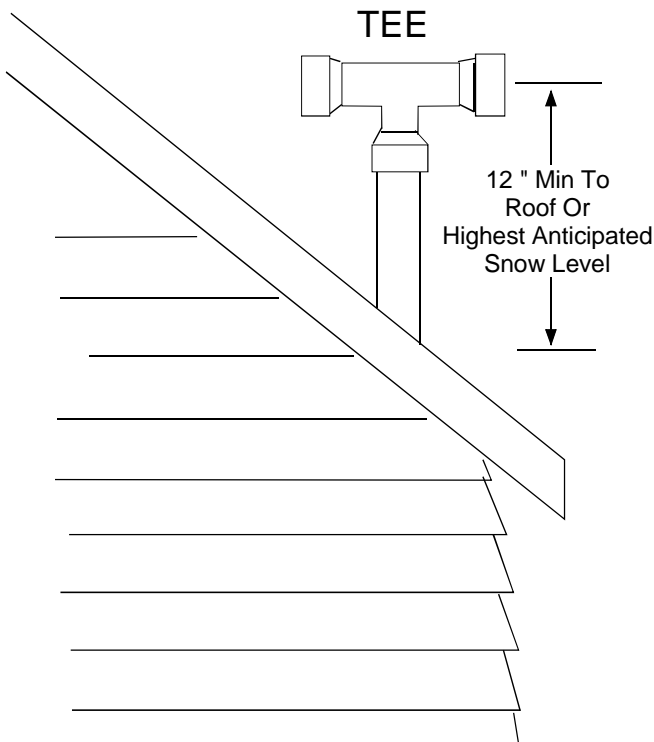
Non-Direct Vent (Single Pipe)									
Maximum Allowable Length of Vent/Flue Pipe (ft) ^{(1) (2)}									
Unit Input (BTU)	Pipe Size (inc.)	Number of Elbows ⁽³⁾							
		1	2	3	4	5	6	7	8
45,000	2	71	68	65	62	59	56	53	50
70,000	2	71	68	65	62	59	56	53	50
90,000	2	62	60	57	55	52	50	47	45
115,000	2	47	45	42	40	37	35	32	30
[0 - 4,500 ft]	3	114	111	107	104	100	97	93	90
115,000	2	27	25	22	20	17	15	12	10
[4,500 - 11,000 ft]	3	61	58	55	52	49	46	43	40

- (1) One 90° elbow must be secured to the combustion air intake connection.
- (2) Minimum vent length is five feet and one elbow/tee.
- (3) Tee used in the vent/flue termination must be included when determining the number of elbows in the piping system.

Vent/Flue Pipe Terminations

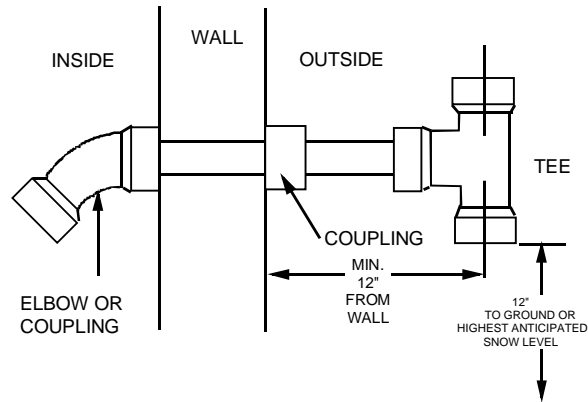
The vent/flue pipe may terminate vertically, as through a roof, or horizontally, as through an outside wall.

Vertical vent/flue pipe terminations should be as shown in the following figure. Refer to *Vent/Flue Pipe and Combustion Air Pipe - Termination Locations* section for details concerning location restrictions. The penetration of the vent through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.

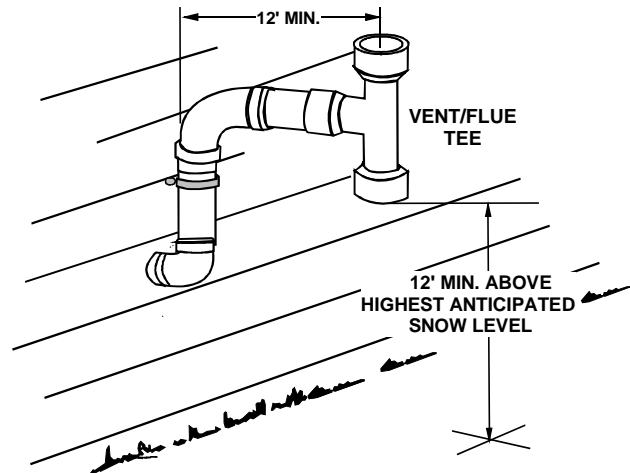


Vertical Termination (Single Pipe)

Horizontal vent/flue pipe terminations should be as shown in the following figure. Refer to *Vent/Flue Pipe and Combustion Air Pipe - Termination Locations* section for details concerning location restrictions. A 2 3/8" diameter wall penetration is required for 2" diameter pipe while a 3 1/2" diameter hole is required for 3" diameter pipe. To secure the pipe passing through the wall and prohibit damage to piping connections, a coupling should be installed on either side of the wall and solvent cemented to a length of pipe connecting the two couplings. The length of pipe should be the wall thickness plus the depth of the socket fittings to be installed on the inside and outside of the wall. The wall penetration should be sealed with silicone caulking material.



Horizontal Termination (Single Pipe)



Horizontal Termination (Single Pipe) Above Highest Anticipated Snow Level

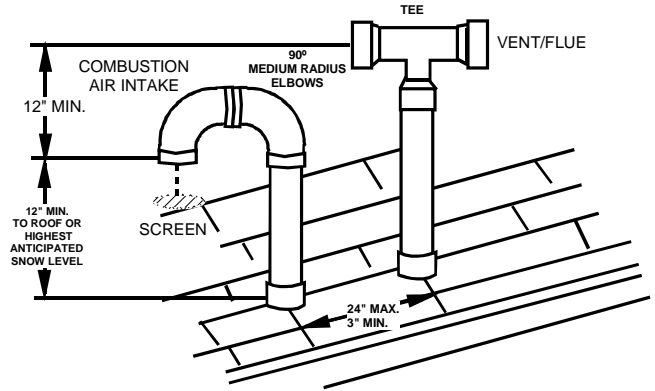
In a basement installation, the vent/flue pipe can be run between joist spaces. If the vent pipe must go below a joist and then up into the last joist space to penetrate the header, two 45° elbows should be used to reach the header rather than two 90° elbows.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)

Direct Vent (Dual Pipe) Piping

Direct vent installations require both a combustion air intake and a vent/flue pipe. The pipes may be run horizontally and exit through the side of the building or run vertically and exit through the roof of the building. The pipes may be run through an existing *unused* chimney; however, they must extend a minimum of 12 inches above the top of the chimney. The space between the pipes and the chimney must be closed with a weather tight, corrosion resistant flashing. Both the combustion air intake and a vent/flue pipe terminations must be in the same atmospheric pressure zone. Refer to *Vent/Flue and Combustion Air Pipe - Termination Locations* or *Concentric Vent Termination* section for specific details on termination construction. For details concerning connection of pipes to the furnace, refer to the *Vent/Flue Pipe and Combustion Pipe - Standard Furnace Connections* or *Alternate Furnace Connections* section.

Vertical pipe terminations should be as shown in the following figure. Refer to *Vent/Flue Pipe and Combustion Pipe - Termination Locations* section for details concerning location restrictions. The penetrations through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.



Vertical Terminations (Dual Pipe)

Direct Vent (Dual Pipe)									
Maximum Allowable Length of Vent/Flue & Combustion Air Intake Pipe (ft)									
Unit Input (Btu)	Pipe Size (in.)	Number of Elbows ⁽¹⁾ ⁽²⁾ ⁽³⁾							
		1	2	3	4	5	6	7	8
45,000	2	71	68	65	62	59	56	53	50
70,000	2	71	68	65	62	59	56	53	50
90,000	2	58	55	52	49	46	43	40	37
115,000	2	29	26	23	20	Not Recommended			
	3	92	88	84	80	76	72	68	64

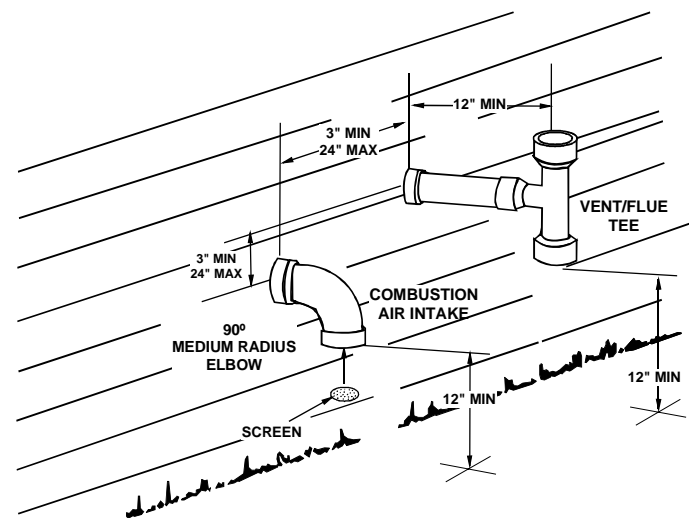
- (1) Elbows and/or Tees used in the terminations must be included when determining the number of elbows in the piping system.
- (2) Number of elbows tabulated are for each (Vent/Flue & Combustion air intake) pipe.
- (3) Minimum length of each Vent/Flue & Combustion Air Intake pipe is five feet and one elbow/tee.

Horizontal terminations should be as shown in the following figure. Refer to *Vent/Flue Pipe and Combustion Pipe - Termination Location* section for location restrictions. A 2 3/8 inch diameter wall penetration is required for 2 inch diameter pipe while a 3 1/2 inch diameter hole is required for 3 inch diameter pipe. To secure the pipe passing through the wall and prohibit damage to piping connections, a coupling should be installed on either side of the wall and solvent cemented to a pipe connecting the two couplings. The pipe length should be the wall thickness plus the depth of the socket fittings to be installed on the inside and outside of the wall. The wall penetration should be sealed with silicone caulking material.

Vent/Flue and Combustion Air Pipe Lengths and Diameters

Refer to the following table for applicable length, elbows, and pipe diameter for construction of the vent/flue and combustion air intake pipe systems of a direct vent (dual pipe) installation. The number of elbows tabulated represents the number of elbows and/or tees in each (Vent/Flue & Combustion Air Intake) pipe. Elbows and/or tees used in the terminations must be included when determining the number of elbows in the piping systems.

If the combustion air intake pipe is to be installed above a finished ceiling or other area where dripping of condensate will be objectionable, insulation of the combustion air pipe may be required. Use 1/2 inch thick closed cell foam insulation such as Armaflex or Insultube where required.

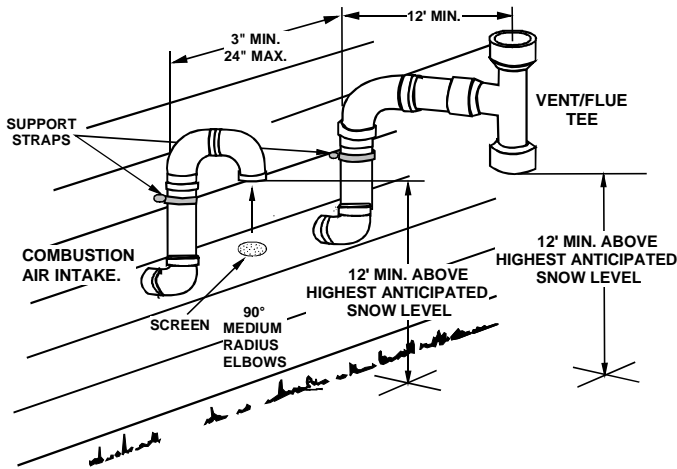


Horizontal Terminations (Dual Pipe)

Vent/Flue and Combustion Air Pipe Terminations

The vent/flue and combustion air pipes may terminate vertically, as through a roof, or horizontally, as through an outside wall.

COMBUSTION AND VENTILATION AIR (DIRECT/NON-DIRECT VENT MODELS)



**Horizontal Terminations
Above Anticipated Snow Level (Dual Pipe)**

In a basement installation, the pipes may be run between the joist spaces. If the pipes must go below the joist and then up into the last joist space to penetrate the header, two 45° elbows should be used to reach the header rather than two 90° elbows.

Concentric Vent Termination

The Concentric Vent Kits HCVK and VCVK are designed to allow the terminations of a direct vent furnace to be "concentrically" vented through a wall (HCVK) or roof (VCVK). These kits allow a single penetration to support terminations for both the vent/flue pipe and the combustion air intake pipe. HCVK is designed for horizontal, through the wall terminations, while the VCVK is designed for vertical, through the roof terminations. The appropriate kit must be used for a given termination placement (horizontal or vertical).

Concentric Vent Kits HVCK and VCVK are suitable for use with the following Amana 90% efficient furnace product:

CONCENTRIC VENT KIT	
Used On Models	Description
GUCA	40" Tall 90% Upflow/Horizontal Furnace
GCCA	40" Tall 90% Counterflow/Horizontal Furnace

Note: This kit is not certified for, and must not be applied to any furnace not listed in the above table.

Refer to the directions provided with the concentric vent kit for installation specifications.

CONDENSATE DRAIN LINES AND DRAIN TRAP

Condensate Drain Lines and Drain Trap

General

A condensing gas furnace achieves its high level of efficiency by extracting almost all of the heat from the products of combustion and cooling them to the point where condensation takes place. The condensate which is generated must be piped to an appropriate drain location.

In *upright* installations, the furnace's drain hoses may exit either the right or left side of the furnace. **Note:** If the alternate vent/flue outlet is utilized in an upright installation, the drain trap and drain connections must be located on the same side as the alternate vent/flue outlet.

In *horizontal* installations, the drain hoses will exit through the bottom (down side) of the unit with the drain trap suspended beneath the furnace. The field-supplied drain system must be in accordance with all local codes and the instructions in the following sections.



WARNING

In upright upflow installations, the drain trap must be mounted on the opposite side of the unit from the junction box. This will reduce the risk of water reaching the junction box in the event of a blocked drain condition. Failure to follow these instructions can result in possible death, personal injury, or property damage due to electrical shock.

Follow the bullets listed below when installing the drain system. Refer to the following sections for specific details concerning furnace drain trap installation and drain hose hook ups.

- The drain trap supplied with the furnace must be used.
- The drain line between furnace and drain location must be constructed of 3/4" PVC or CPVC.
- The drain line between furnace and drain location must maintain a 1/4 inch per foot downward slope toward the drain.
- Do not trap the drain line in any other location than at the drain trap supplied with the furnace.
- Do not route the drain line outside where it may freeze.
- If the drain line is routed through an area which may see temperatures near or below freezing, precautions must be taken to prevent condensate from freezing within the drain line.
- If an air conditioning coil is installed with the furnace, a common drain may be used. An open tee must be installed in the drain line, near the cooling coil, to relieve positive air pressure from the coil's plenum. This is necessary to prohibit any interference with the function of the furnace's drain trap.

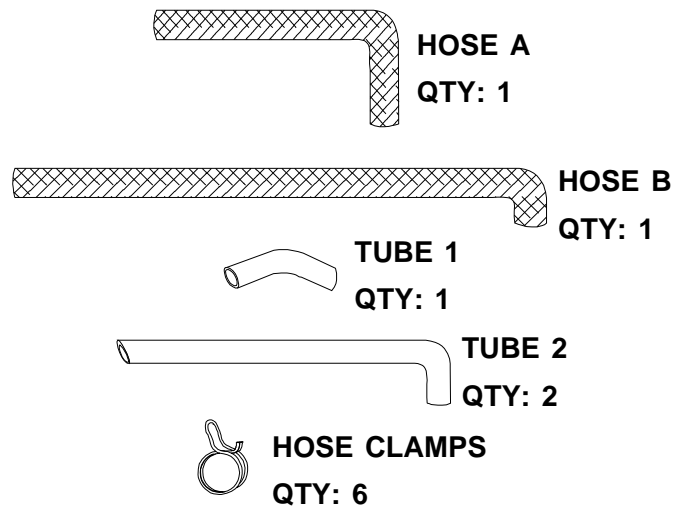
Upright Installations

In an upright installation drain hoses are connected to drain ports on the rubber elbow and the recuperator coil front cover. The drain lines are then routed through the right or left side panel and into the drain trap secured to the outside of the cabinet.

Note: Refer to *Condensate Drain Lines and Drain Trap - Alternate Vent/Flue Hose Connections* section for upright installations using an alternate vent/flue outlet .

Standard Right or Left Side Drain Hose Connections

Upright installations using the *standard* vent/flue outlet require drain hoses to be connected as follows. The following quantity of hoses, tubes, and hose clamps are provided with the unit.

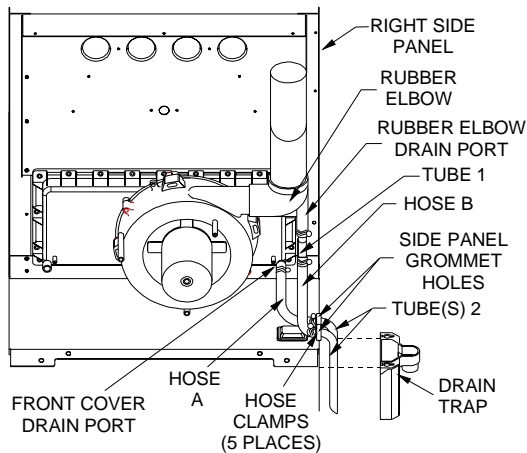


Hose and Tube Identification

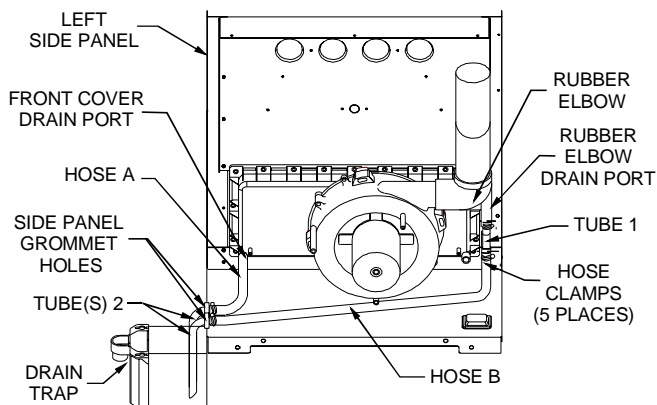
1. Remove the rubber plug from the front cover drain port (right or left side, depending on the intended drain trap mounting).
2. Secure Hose A to front cover drain port with a hose clamp. Route hose to rear side panel grommet hole.

Note: For left side drainage, grommets will have to be relocated to left side panel.

CONDENSATE DRAIN LINES AND DRAIN TRAP



**Upright "Standard" Connections
Right Side
(Upflow Shown, Counterflow Similar)**



**Upright "Standard" Connections
Left Side
(Upflow Shown, Counterflow Similar)**

3. Cut and remove 1/4 inch from the end of the drain port on the rubber elbow.
4. Insert Tube 1 into rubber elbow drain port and secure with hose clamp. Angle tube outward toward front of furnace.
5. *Right side drains*

Cut 17 3/4 inches from the long end of Hose B and discard. Secure the remaining hose to Tube 1 with a hose clamp. Route the other end of Hose B to front right side panel grommet hole.

Left side drains

Cut "X" inches from the long end of Hose B and discard. Refer to table for appropriate length to cut. Secure remaining hose to Tube 1 with a hose clamp. Route other end of Hose B to front left side panel grommet hole.

Cabinet Width (inches)	Model GUCA & GCCA (kBTU Tons)	"X" Length to Cut From Long End of Hose B (inches)
16.5	045_30	8 inches
	070_30	
20.5	070_40	4 inches
	090_40	
24.5	090_50	None
	115_50	

6. Insert short end of each Tube 2 through side panel grommet holes. Secure tubes to Hose A and Hose B with hose clamps.

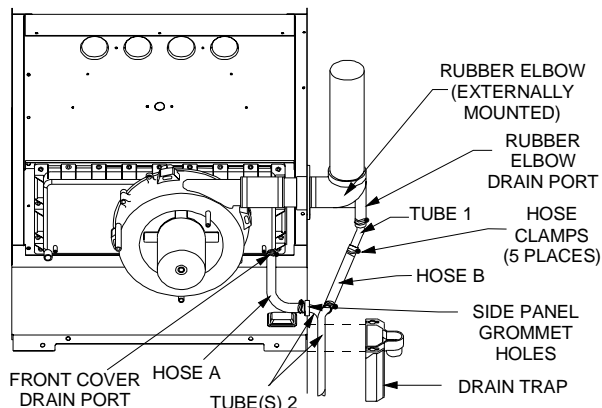
Note: Ensure hoses and tubes maintain a downward slope for proper drainage and that they are not kinked or binding.

For details concerning mounting of the drain trap, refer to, *Condensate Drain Lines and Drain Trap - Upright Drain Trap Mounting* section.

Alternate Vent/Flue Drain Hose Connections

Upright installations using the *alternate* vent/flue outlet will require "right-side only" drain hoses to be connected as follows. Refer to *Vent/Flue Pipe and Combustion Air Pipe* section for details on alternate vent/flue pipe connection.

1. Remove the rubber plug from the front cover right-side drain port. Save for use in step 3.
2. Secure Hose A to front cover drain port with a hose clamp. Route hose to rear right side panel grommet hole.



**Upright "Alternate" Connections
Right Side Only
(Upflow Shown, Counterflow Similar)**

3. Remove grommet from front right-side panel drain hole. Seal hole in grommet with large end of plug. Reinstall grommet and plug into side panel drain hole.
4. Cut 1/4 inch from the end of the drain port on the externally mounted rubber elbow. Discard cut portion.
5. Insert Tube 1 into rubber elbow drain port and secure with hose clamp. Angle tube outward toward front of furnace.

CONDENSATE DRAIN LINES AND DRAIN TRAP

- Cut 17 7/8 inches from the long end of Hose B and discard.
- Secure remaining end of Hose B to exposed end of Tube 1 with a hose clamp. Route hose toward right side panel grommet holes.
- Insert short end of one Tube 2 through rear right side panel grommet drain hole. Secure tube to Hose A with hose clamp.
- Insert short end of remaining Tube 2 into Hose B from rubber elbow and secure with hose clamp.

Note: Ensure hoses and tubes maintain a downward slope for proper drainage and are not kinked or binding.

For details concerning mounting of the drain trap, refer to the following section.

Upright Drain Trap Mounting (Left or Right Side Panel)

- Insert drain tubes into drain trap and position the drain trap against the side panel. **Note:** Drain tubes must reach the bottom of the drain trap.
- Secure drain trap to side panel at the mounting holes (dimples or crosshairs on Counterflow models) located below the grommet drain holes.
- Attach PVC drain line to drain trap outlet with either a 90° elbow or coupling.

Note: Ensure hoses and tubes maintain a downward slope for proper drainage and that they are not kinked or binding.

Horizontal Installations

Right Side Down

Horizontal installations with the right side down require that the drain hoses be connected to the right side front cover drain port and the rubber elbow drain port.

Note: On counterflow models, relocation of the front cover pressure switch hose is required.

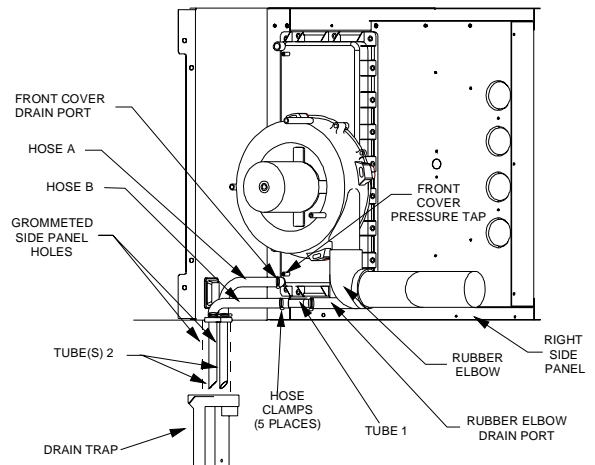
Make connections as follows:

- Remove the rubber plug from the coil front cover drain port.

Counterflow furnaces

Relocate the front cover pressure switch hose connection from the left side pressure tap to the right (down) side tap. The pressure switch hose must be connected to the down side to guard against blocked drain conditions. Cut hose to appropriate length to minimize sagging. Plug left (unused) pressure tap with plug removed from right side.

- Secure Hose A to front cover drain tap with a hose clamp. Route hose to rear right (down) side panel grommet holes.



**Horizontal Connections
Right Side Down
(Upflow Shown, Counterflow Similar)**

- Cut 1/4 inch from the end of the drain port on the rubber elbow and discard.
- Insert Tube 1 into rubber elbow drain port and secure with hose clamp. Angle tube outward toward front of furnace.
- Cut 17 3/4 inches from the long end of Hose B and discard.
- Secure remaining end of Hose B to exposed end of Tube 1 with a hose clamp. Route hose to front right down side panel grommet holes.
- Cut 5 1/2 inches straight length from the long end of each Tube 2.
- Insert approximately one inch of each Tube 2 through the right down side panel grommet holes. Secure tubes to Hose A and Hose B using hose clamps.

Note: Ensure hoses and tubes maintain a downward slope for proper drainage and are not kinked or bound.

For details concerning mounting of the drain trap, refer to *Condensate Drain Lines and Drain Trap - Upright Drain Trap Mounting Left Side Down* section.

Left Side Down

Horizontal installations with the left side panel down will require drain hoses to be connected to the left side front cover drain port and the induced draft blower drain port.

Note: On upflow models, relocation of the front cover pressure switch hose is required.

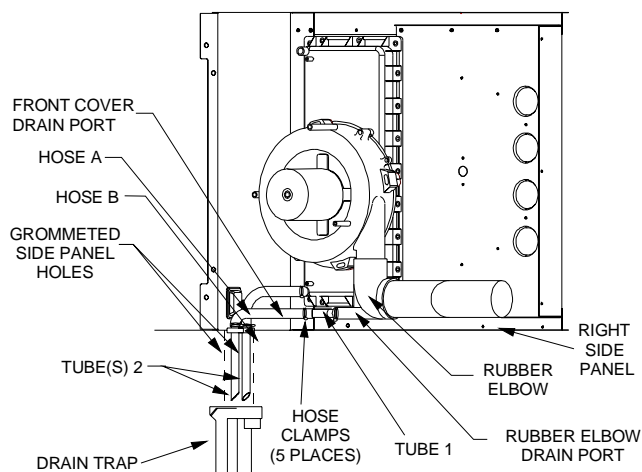
- Remove the rubber plug from the coil front cover left (down) side drain port.

CONDENSATE DRAIN LINES AND DRAIN TRAP

2. Upflow furnaces

Relocate the front cover pressure switch hose connection from the right side (as shipped) pressure tap to the left (down) side tap. The pressure switch hose must be connected to the down side to guard against blocked drain conditions. Cut hose to appropriate length to minimize sagging. Plug right (unused) pressure tap with plug removed from left side.

- Secure Hose A to front cover drain port with a hose clamp. Route hose to rear left down side panel grommet holes. **Note:** For left side drainage, grommets must be relocated to left side panel.



**Horizontal Connections
Left Side Down
(Upflow Shown, Counterflow Similar)**

- Cut "X" inches from the long end of Hose B and discard. Refer to table below for appropriate length to cut.

Cabinet Width (inches)	Model GUCA & GCCA (kBTU Tons)	"X" Length to Cut From Long End of Hose B
16 1/2	045_30 070_30	19 1/8 inches
20 1/2	070_40 090_40	14 3/4 inches
24 1/2	090_50 115_50	11 1/4 inches

- Secure short end of Hose B to induced draft blower drain port using a hose clamp. Route hose to front left (down) side panel grommet holes.

- For units with a 16 1/2" cabinet width, cut 5 1/2 inches straight length from the long end of one Tube 2.

For units with a 20 1/2" and 24 1/2" cabinet width, cut 5 1/2 inches straight length from the long end of each Tube 2.

- Units with a 16 1/2" cabinet width.*

Insert approximately one inch of cut Tube 2 through left side panel grommet hole and secure to Hose A with a hose clamp. Insert uncut Tube 2 through remaining grommet hole and secure to Hose B. **Note:** Tube must reach bottom of trap.

Units with a 20 1/2" and 24 1/2" cabinet width.

Insert approximately one inch of each Tube 2 through left side panel grommet hole. Secure tubes to Hose A and Hose B with hose clamps. **Note:** Tube must reach bottom of trap.

Note: Ensure hoses and tubes maintain a downward slope for proper drainage and that they are not kinked or binding.

For details concerning mounting of the drain trap, refer to, *Condensate Drain Lines and Drain Trap - Upright Drain Trap Mounting* section.

Horizontal Drain Trap Mounting (Left or Right Side Panel)

- Position the drain trap against side panel with drain tubes inserted into trap. Note that the trap may be orientated with the outlet facing either the furnace's top cover or base pan.
- Secure drain trap to side panel at the dimples or crosshairs located on either side of the grommet drain holes.
- Confirm that tubes reach bottom of drain trap and that all hoses maintain a downward slope and are not kinked or binding.
- Attach PVC drain line to drain trap outlet with either a 90° elbow or coupling.

PRODUCT DESIGN

Safety

Please adhere to the following warnings and cautions when installing, adjusting, altering, servicing, or operating the furnace.



To prevent personal injury or death due to improper installation, adjustment, alteration, service or maintenance, refer to this manual. For additional assistance or information, consult a qualified installer, service agency or the gas supplier.



This product contains or produces a chemical or chemicals which may cause serious illness or death and which are known to the State of California to cause cancer, birth defects or other reproductive harm.



To prevent possible death, personal injury or property damage due to electrical shock, the furnace must be located to protect the electrical components from water.



This unit must not be used as a “construction heater” during the finishing phases of construction on a new structure. This type of use may result in premature failure of the unit due to extremely low return air temperatures and exposure to corrosive or very dirty atmospheres.

Electrostatic Discharge (ESD) Precautions

Note: Discharge body’s static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body’s electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnaces near the control. Any tools held in a person’s hand during grounding will be discharged.

3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

Product Application

This product is designed for use as a residential home gas furnace. It is not designed or certified for use in mobile home, trailer, recreational vehicle, or commercial applications. This furnace is an AGA/CGA dual certified appliance and is appropriate for use with natural or propane gas (**Note:** If using propane, a propane conversion kit is required).

Dual certification means that the combustion air inlet pipe is optional and the furnace can be vented as a:

Non-direct vent (single pipe) central forced air furnace in which combustion air is taken from the installation area or from air ducted from the outside or,

Direct vent (dual pipe) central forced air furnace in which all combustion air supplied directly to the furnace burners through a special air intake system outlined in these instructions.

To ensure proper installation, operation and servicing, thoroughly read the installation and service manuals for specifics pertaining to the installation, servicing and application of this product.



Possible death, personal injury or property damage due to fire, explosion, smoke, soot, condensation, electrical shock or carbon monoxide may result from improper installation, repair, operation, or maintenance of this product.



To prevent death, personal injury or property damage due to fire, do not install this furnace in a mobile home, trailer, or recreational vehicle.

To ensure proper furnace operation, install, operate, maintain and service the furnace in accordance with the installation, operation and service instructions, all local building codes and ordinances. In their absence, follow the latest edition of the National Fuel Gas Code (NFPA 54/ANSI Z223.1), and/or CAN/CGA B149 Installation Codes, local plumbing or waste water codes, and other applicable codes.

PRODUCT DESIGN

A copy of the National Fuel Gas Code (NFPA 54/ANSI Z223.1) can be obtained from any of the following:

American National Standards Institute
1430 Broadway
New York, NY 10018

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269

American Gas Association
1515 Wilson Boulevard
Arlington, VA 22209

A copy of the CAN/CGA B149 Installation Codes can be obtained from:

Canadian Gas Association
55 Scarsdale Road
Don Mills, Ontario, Canada M3B, 2R3

The rated heating capacity of the furnace should be greater than or equal to the total heat loss of the area to be heated. The total heat loss should be calculated by an approved method or in accordance with "ASHRAE Guide" or "Manual J-Load Calculations" published by the Air Conditioning Contractors of America.

Location Requirements and Considerations

General



To prevent possible death, personal injury, equipment damage, or property damage the following bullet points must be observed when installing the unit.

Follow the instructions listed below when selecting a furnace location. Refer also to the guidelines provided in the *Combustion and Ventilation Air Requirements* section.

- Centrally locate the furnace with respect to the proposed or existing air distribution system.
- Ensure the temperature of the return air entering the furnace is between 55°F and 100°F when the furnace is heating.
- Provide provisions for venting combustion products outdoors through a proper venting system. Special consideration should be given to vent/flue pipe routing and combustion air intake pipe when applicable. Refer to the *Vent/Flue Pipe and Combustion Air Pipe -Termination Locations* section for appropriate termination locations. Also, refer to the *Vent/Flue Pipe and Combustion Air Pipe -Termination Locations* section to determine if the piping system from furnace to termination can be accomplished within the guidelines given. **Note:** The length of flue and/or combustion air piping can be a limiting factor in the location of the furnace.
- Locate the furnace so that the condensate can be piped at a downward slope between furnace and drain. Do not locate the furnace or its condensate drainage system in any area subject to below freezing temperatures without proper freeze protection. Refer to the *Condensate Drain Lines and Trap* section for further details.
- Set the furnace on a level floor to enable proper condensate drainage. If the floor becomes wet or damp at times, place the furnace above the floor on a concrete base sized approximately 1-1/2" larger than the base of the furnace. Refer to the *Horizontal Applications and Considerations* section for leveling of horizontal furnaces.
- Ensure upflow or horizontal furnaces are not installed directly on carpeting, or any other combustible material. The only combustible material allowed is wood.
- A special accessory subbase must be used for upright counterflow unit installations over any combustible material (including wood). Refer to subbase instructions for installation details. (**Note:** A subbase will not be required if an air conditioning coil is located beneath the furnace between the supply air opening and the combustible floor.
- Exposure to contaminated combustion air will result in safety and performance-related problems. Do not install the furnace where the combustion air is exposed to the following substances:
 - chlorinated waxes or cleaners
 - chlorine-based swimming pool chemicals
 - water softening chemicals
 - deicing salts or chemicals
 - carbon tetrachloride
 - halogen type refrigerants
 - cleaning solutions (such as perchloroethylene)
 - printing inks
 - paint removers
 - varnishes
 - hydrochloric acid
 - cements and glues
 - antistatic fabric softeners for clothes dryers
 - and masonry acid washing materials
- Seal off a *non-direct vent* furnace if it is installed near an area frequently contaminated by any of the above substances. This protects the *non-direct vent* furnace from airborne contaminants. To ensure that the en-

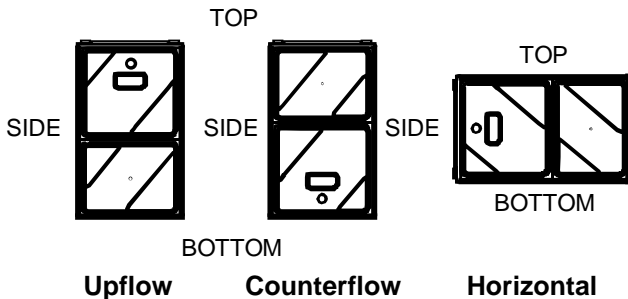
PRODUCT DESIGN

closed *non-direct vent* furnace has an adequate supply of combustion air, vent from a nearby uncontaminated room or from outdoors. Refer to the *Combustion and Ventilation Air Requirements* section for details.

- If the furnace is used in connection with a cooling unit, install the furnace upstream or in parallel with the cooling unit. Premature heat exchanger failure will result if the cooling unit is placed ahead of the furnace.
- If the furnace is installed in a residential garage, position the furnace so that the burners and ignition source are located not less than 18 inches (457 mm) above the floor. Protect the furnace from physical damage by vehicles.
- If the furnace is installed horizontally, the furnace access doors must be vertical so that the burners fire horizontally into the heat exchanger. Do not install the unit with the access doors on the “up/top” or “down/bottom” side of the furnace.

Clearances and Accessibility

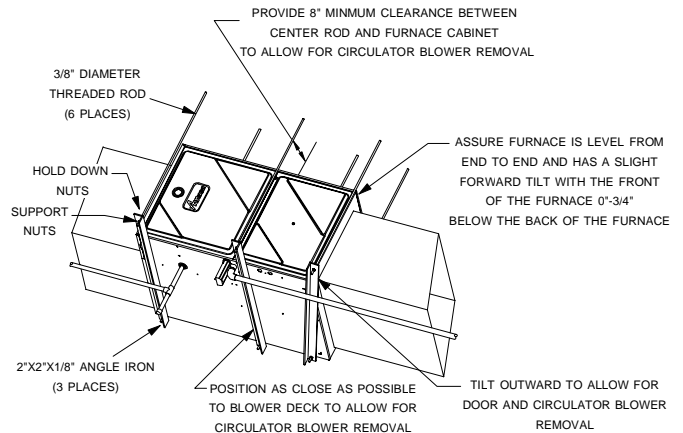
Installations must adhere to the clearances to combustibles which this furnace has been design certified to. The minimum clearance information for this furnace is provided on the unit’s clearance label. These clearances must be permanently maintained. Clearances must also accommodate an installation’s gas, electrical, and drain trap and drain line connections. If the alternate combustion air intake or vent/flue connections are used additional clearances must be provided to accommodate these connections. Refer to *Vent Flue Pipe and Combustion Air Pipe* section for details. **Note:** In addition to the required clearances to combustibles materials, a minimum of 36 inches service clearance must be available in front of the unit.



A furnace installed in a confined space (i.e., a closet or utility room) must have two ventilation openings with a total minimum free area of 0.25 square inches per 1,000 BTU/hr of furnace input rating. Refer to the *PRODUCT IDENTIFICATION* section, pages 7 and 8, for minimum clearances to combustibles materials dimensions. One of the ventilation openings must be within 12 inches of the top; the other opening must be within 12 inches of the bottom of the confined space. In a typical construction, the clearance between the door and door frame is usually adequate to satisfy this ventilation requirement.

Furnace Suspension

If suspending the furnace from rafters or joist, use 3/8" threaded rod and 2"x2"x1/8" angle iron as shown below. The length of rod will depend on the application and the clearances necessary.

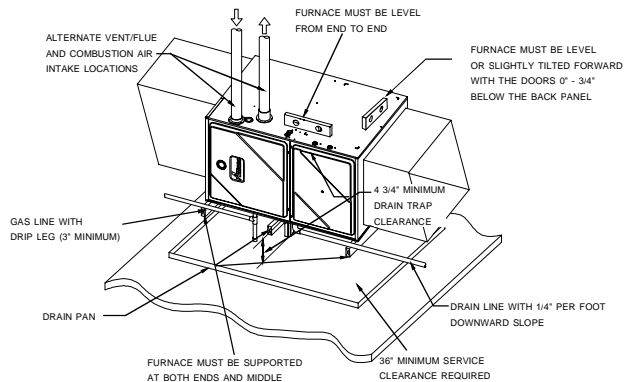


Suspended Furnace

Horizontal Applications and Considerations

General

Horizontal applications, in particular, may dictate many of the installation’s specifics such as airflow direction, ductwork connections, flue and combustion air pipe connections, etc. The basic application of this furnace as a horizontal furnace differs only slightly from an upright installation. When installing a furnace horizontally, additional consideration must be given to the following:



Horizontal Furnace

PRODUCT DESIGN

Existing Furnace Removal

Note: When an existing furnace is removed from a venting system serving other appliances, the venting system may be too large to properly vent the remaining attached appliances.

The following vent testing procedure is reproduced from the **American National Standard/National Standard of Canada for Gas-Fired Central Furnaces ANSI Z21.47-1993, CAN/CGA-2.3-M93 Section 1.23.1.**

The following steps shall be followed with each appliance connected to the venting system placed in operation, while any other appliances connected to the venting system are not in operation:

- a. Seal any unused openings in the venting system;
- b. Inspect the venting system for proper size and horizontal pitch, as required by the National Fuel Gas Code, ANSI Z223.1 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition;
- c. In so far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they shall operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers;
- d. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance shall operate continuously;
- e. Test for draft hood equipped spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle;
- f. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use;
- g. If improper venting is observed during any of the above tests, the common venting system must be corrected.

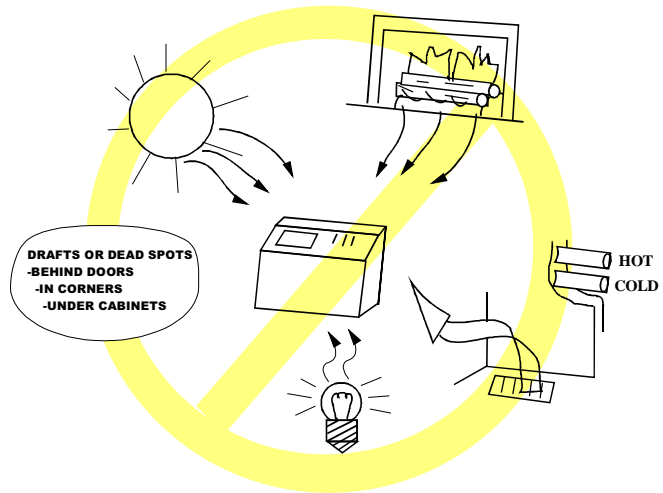
Corrections must be in accordance with the latest edition of the National Fuel Gas Code NFPA 54/ANSI Z223.1 and/or CAN/CGA B149 Installation Codes.

If resizing is required on any portion of the venting system, use the appropriate table in Appendix G in the latest edition of the National Fuel Gas Code ANSI Z223.1 and/or CAN/CGA B149 Installation Codes.

Thermostat Location

In an area having good air circulation, locate the thermostat about five feet high on a vibration-free inside wall. Do not install the thermostat where it may be influenced by any of the following:

- Drafts, or dead spots behind doors, in corners, or under cabinets.
- Hot or cold air from registers.
- Radiant heat from the sun.
- Light fixtures or other appliances.
- Radiant heat from a fireplace.
- Concealed hot or cold water pipes, or chimneys.
- Unconditioned areas behind the thermostat, such as an outside wall.



Thermostat Influences

Consult the instructions packaged with the thermostat for mounting instructions and further precautions.

Drain Trap and Lines

In horizontal applications the condensate drain trap is secured to the furnace side panel, suspending it below the furnace. A minimum clearance of 4 3/4 inches below the furnace must be provided for the drain trap. Additionally, the appropriate downward piping slope must be maintained from the drain trap to the drain location. Refer to *Condensate Drain Trap and Lines* section for further details. If the drain trap and drain line will be exposed to temperatures near or below freezing, adequate measures must be taken to prevent condensate from freezing.

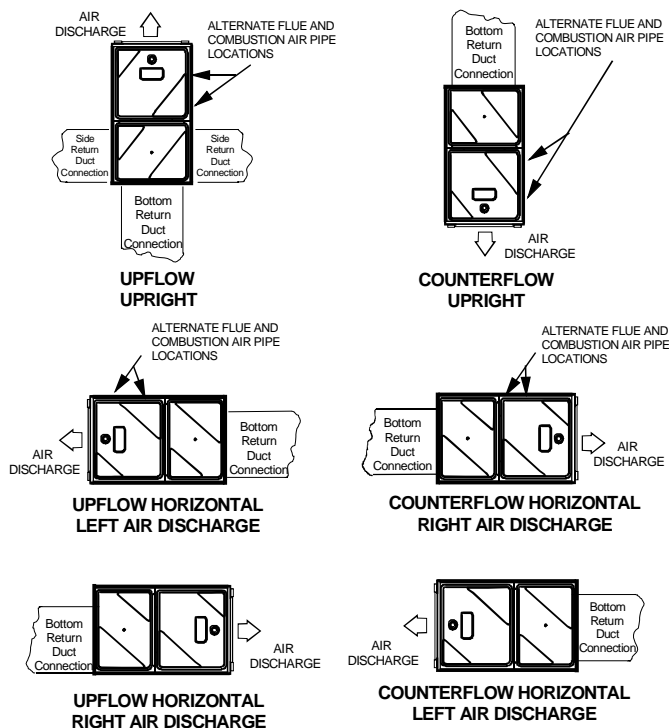
Leveling

Leveling ensures proper condensate drainage from the heat exchanger and induced draft blower. For proper flue pipe drainage, the furnace must be level lengthwise from end to end. The furnace should also be level from back to front or have a slight tilt with the access doors downhill (approximately 3/4 inches) from the back panel. The slight tilt allows the heat exchanger condensate, generated in the recuperator coil, to flow forward to the recuperator coil front cover.

PRODUCT DESIGN

Alternate Vent/Flue and Combustion Air Connections

In horizontal installations provisions for alternate flue and combustion air piping are available for upflow furnaces with left discharge and counterflow furnaces with right air discharge. In these positions the flue and combustion air piping can be run vertically through the side of the furnace. Refer to the "Recommended Installation Positions" figure for further detail. The standard piping connections may also be used in these positions. Refer to *Vent/Flue Pipe and Combustion Air Pipe* section for details concerning the conversion to the alternate vent/flue and combustion air connections.



Recommended Installation Positions

Note: Alternate "vertical" piping connections can not be used when an upflow furnace is installed with supply air discharging to the right, or when a counterflow furnace is installed with supply air discharging to the left. In either case, use the standard flue and combustion air piping connections.

Alternate Electrical and Gas Line Connections

This furnace has provisions allowing for electrical and gas line connections through either side panel. In horizontal applications the connections can be made either through the "top" or "bottom" of the furnace.

Drain Pan

A drain pan must be provided if the furnace is installed above a conditioned area. The drain pan must cover the entire area under the furnace (and air conditioning coil if applicable).

Freeze Protection

Refer to *Horizontal Applications and Conditions - Drain Trap and Lines* section for details.

Furnace Suspension

If the furnace is installed in a crawl space it must be suspended from the floor joist or supported by a concrete pad. Never install the furnace on the ground or allow it to be exposed to water. Refer to *Location Requirements and Considerations - Furnace Suspension* section for further details.

Electrical Connections



To avoid the risk of electrical shock, wiring to the unit must be properly polarized and grounded.



To avoid electrical shock, injury or death, disconnect electrical power before servicing or changing any electrical wiring.



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

Wiring Harness

The wiring harness is an integral part of this furnace. Field alteration to comply with electrical codes should not be required. Wires are color and number coded for identification purposes. Refer to the wiring diagram for wire routings. If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C. Any replacement wiring must be copper conductor.

115 Volt Line Connections

Before proceeding with electrical connections, ensure that the supply voltage, frequency, and phase correspond to that specified on the unit rating plate. Power supply to the furnace must be N.E.C. Class 1, and must comply with all applicable codes. The furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of The National Electric Code, ANSI NFPA 70 and/or The Canadian Electric Code CSA C22.1.

PRODUCT DESIGN

Use a separate fused branch electrical circuit containing properly sized wire, and fuse or circuit breaker. The fuse or circuit breaker must be sized in accordance with the maximum overcurrent protection specified on the unit rating plate. An electrical disconnect must be provided at the furnace location.

Note: Line polarity must be observed when making field connections.

WARNING

In upright upflow installations, the drain trap must be mounted on the opposite side of the unit from the junction box. This will reduce the risk of water reaching the junction box in the event of a blocked drain condition.

Connect hot, neutral, and ground wires as shown in the wiring diagram located on the unit's blower door. Line polarity must be observed when making field connections. Line voltage connections can be made through either the right or left side panel. The furnace is shipped configured for a left side (right side for counterflows) electrical connection with the junction box located inside the blower compartment. To make electrical connections through the opposite side of the furnace, the junction box must be relocated to the other side of the blower compartment prior to making electrical connections. To relocate the junction box, follow the steps shown below.

Note: Wire routing must not to interfere with circulator blower operation, filter removal, or routine maintenance.

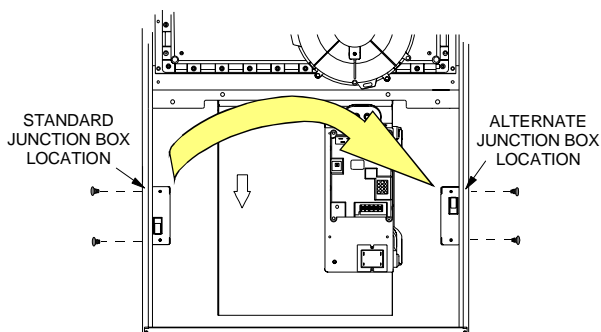
CAUTION

Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

WARNING

Disconnect Electrical Power Supply:

1. Remove the blower compartment door.
2. Remove and save the two screws securing the junction box to the side panel.
3. Relocate junction box and associated plugs and grommets to opposite side panel. Secure with screws removed in step 2. Refer to figure below.



Junction Box Relocation

4. Verify that wires will not interfere with circulator blower operation, filter removal, or routine maintenance.
5. Reinstall blower compartment door.
6. Turn on electrical power and verify proper unit operation.

WARNING

To avoid the risk of electrical shock, injury, or death, the furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of The National Electric Code.

To ensure proper unit grounding, the ground wire should run from the furnace ground screw located inside the furnace junction box all the way back to the electrical panel.

Note: Do not use gas piping as an electrical ground. To confirm proper unit grounding, turn off the electrical power and perform the following check.

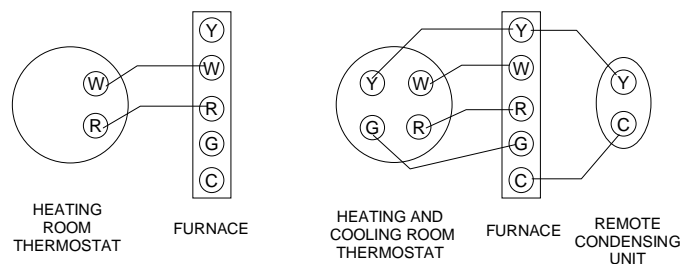
1. Measure resistance between the neutral (white) connection and one of the burners.
2. Resistance should measure 10 ohms or less.

This furnace is equipped with a blower door interlock switch which interrupts unit voltage when the blower door is opened for servicing. Do not defeat this switch.

24 Volt Thermostat Wiring

Note: Wire routing must not interfere with circulator blower operation, filter removal, or routine maintenance.

Low voltage connections can be made through either the right or left side panel. Thermostat wiring entrance holes are located adjacent to the junction box locations in the blower compartment. Wire routing must not to interfere with circulator blower operation, filter removal, or routine maintenance. Refer to the following figure for thermostat connections to the integrated control module terminal strip.



Thermostat Diagram

This furnace is equipped with a 40 VA transformer to facilitate use with most cooling equipment. Consult the wiring diagram, located on the blower compartment door or the *WIRING DIAGRAM* section of this manual, for further details of 115 Volt and 24 Volt wiring.

PRODUCT DESIGN

115 Volt Line Connection of Accessories (Humidifier and Electronic Air Cleaner)

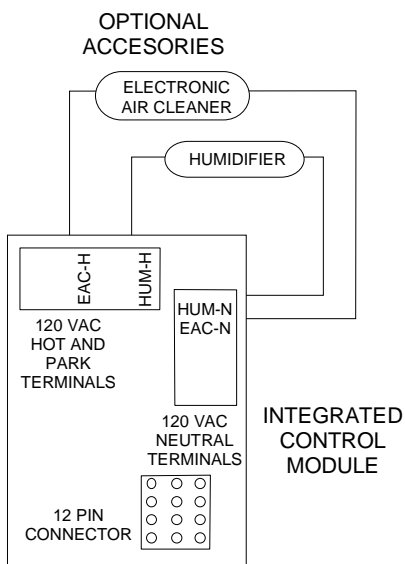


To avoid electrical shock, injury or death, disconnect electrical power before servicing, or changing any electrical wiring.

The furnace's integrated control module is equipped with line voltage accessory terminals for controlling power to an optional field-supplied humidifier and/or electronic air cleaner.

Accessory Load Specifications	
Humidifier	1.0 Amp maximum at 120 VAC
Electronic Air Cleaner	1.0 Amp maximum at 120 VAC

Turn OFF power to the furnace before installing any accessories. Follow the humidifier or air cleaner manufacturers' instructions for locating, mounting, grounding, and controlling these accessories. Accessory wiring connections are to be made through the 1/4" quick connect terminals provided on the furnace integrated control module. The humidifier and electronic air cleaner hot and neutral terminals are identified as HUM and EAC. All field wiring must conform to applicable codes. Connections should be made as shown below.



Accessories Wiring

If it is necessary for the installer to supply additional line voltage wiring to the inside of the furnace, the wiring must conform to all local codes, and have a minimum temperature rating of 105°C. All line voltage wire splices must be made inside the furnace junction box.

The integrated control module humidifier terminals (HUM) are energized with 115 volts whenever the induced draft blower is energized. The integrated control module electronic air cleaner terminals (EAC) are energized with 115 volts whenever the circulator blower is energized.

Gas Supply and Piping

General

The furnace rating plate includes the approved furnace gas input rating and gas types. The furnace must be equipped to operate on the type of gas applied. This includes any conversion kits required for alternate fuels and/or high altitude.



To prevent unreliable operation or equipment damage, the inlet gas supply pressure must be as specified on the unit rating plate with all other household gas fired appliances operating.

Inlet gas supply pressures must be maintained within the ranges specified below. The supply pressure must be constant and available with all other household gas fired appliances operating. The minimum gas supply pressure must be maintained to prevent unreliable ignition. The maximum must not be exceeded to prevent unit overfiring.

Inlet Gas Supply Pressure	
Natural Gas	Minimum:5.0" W.C. Maximum :10.0" W.C.
Propane Gas	Minimum:11.0" W.C. Maximum :13.0" W.C.

High Altitude Derate

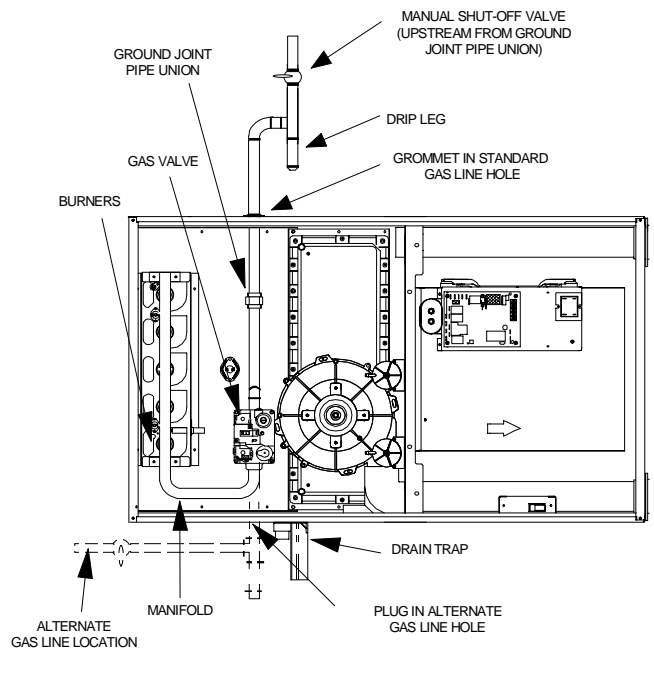
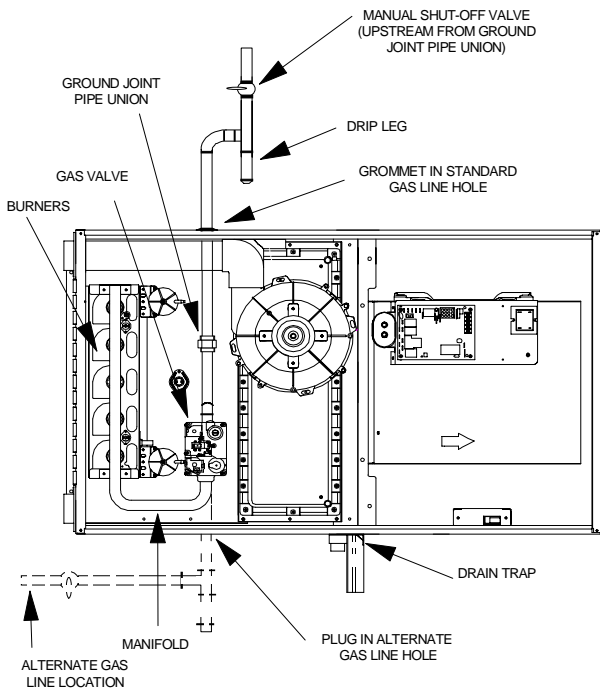
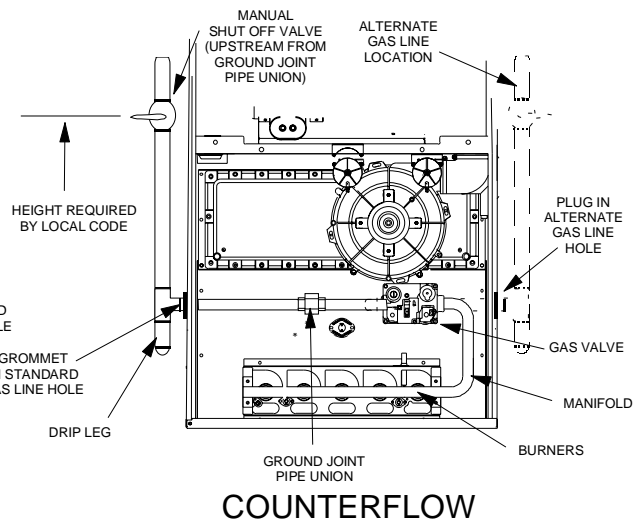
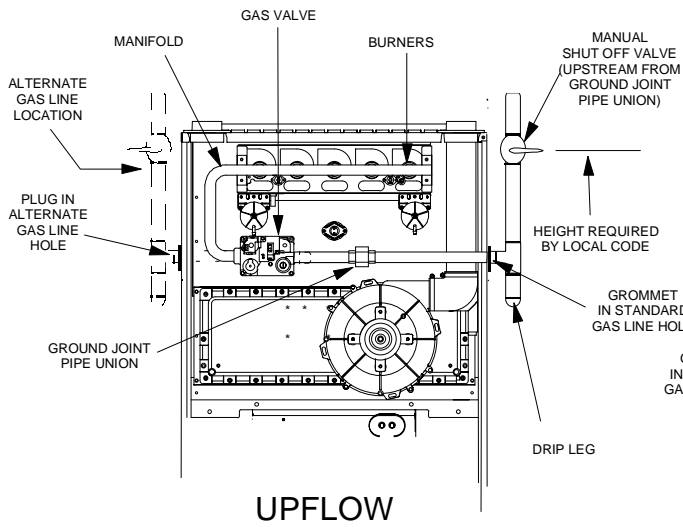
When this furnace is installed at high altitude, the appropriate High Altitude orifice kit must be applied. This is required due to the natural reduction in the density of both the gas fuel and combustion air as altitude increases. The kit will provide the proper design certified input rate within the specified altitude range.

High altitude kits are purchased according to the installation altitude and usage of either natural or propane gas. Refer to the *S-19 HIGH ALTITUDE APPLICATION (USA)* section located in the *SERVICING* section of this manual or an Amana distributor for a tabular listing of appropriate altitude ranges and corresponding manufacturer's high altitude (Natural, propane gas, and/or Pressure Switch) kits.

Do **not** derate the furnace by adjusting the manifold pressure to a lower pressure than specified on the furnace rating plate. The combination of the lower air density and a lower manifold pressure will prohibit the burner orifice from drawing the proper amount of air into the burner. This may cause incomplete combustion, flashback, and possible yellow tipping.

In some areas the gas supplier may artificially derate the gas in an effort to compensate for the effects of altitude. If the gas is artificially derated, the appropriate orifice size must be determined based upon the BTU/ft³ content of the derated gas and the altitude. Refer to the National Fuel Gas Code, NFPA 54/ANSI Z223.1, and information provided by the gas supplier to determine the proper orifice size.

PRODUCT DESIGN



NOTES: 1. WHEN GAS LINE IS IN THE ALTERNATE LOCATION, SWAP THE POSITION OF THE PLUG AND GROMMET.

2. DRIP LEG MAY TERMINATE WITH A 1/2" X 1/8" PIPE PLUG TO ACCOMMODATE LINE GAS PRESSURE MEASUREMENT.

Gas Piping Connections

PRODUCT DESIGN

A different pressure switch may be required at high altitude regardless of the BTU/ft³ content of the fuel used. Refer to *S-19 HIGH ALTITUDE APPLICATION (USA)* section located in the *SERVICING* section of this manual or an Amana distributor for a tabular listing of appropriate altitude ranges and corresponding manufacturer's pressure switch kits.

Propane Gas Conversion



Possible death, personal injury or property damage may occur if the correct conversion kits are not installed. The appropriate kits must be applied to insure safe and proper furnace operation. All conversions must be performed by a qualified installer or service agency.

This unit is configured for natural gas. The appropriate manufacturer's propane gas conversion kit, must be applied for propane gas installations. Refer to the "Propane Gas and/or High Altitude Installations" section for details.

Gas Valve

This unit is equipped with a 24 volt gas valve controlled during furnace operation by the integrated control module. As shipped, the valve is configured for natural gas. The valve is field convertible for use with propane gas by replacing the regulator spring with a propane gas spring from an appropriate manufacturer's propane gas conversion kit. Taps for measuring the gas supply pressure and manifold pressure are provided on the valve.

The gas valve has a manual ON/OFF control located on the valve itself. This control may be set only to the "ON" or "OFF" position. Refer to the lighting instructions label located on the furnace or on page 6, and the "Furnace Startup" and "Furnace Shutdown" sections for use of this control during start up and shut down periods.

Gas Piping Connections

General



To avoid possible unsatisfactory operation or equipment damage due to underfiring of equipment, use the proper size of natural/propane gas piping needed when running pipe from the meter/tank to the furnace.

When sizing a trunk line, be sure to include all appliances which will operate simultaneously when sizing a trunk line.

The gas piping supplying the furnace must be properly sized based on the gas flow required, specific gravity of the gas, and length of the run. The gas line installation must comply with local codes, or in their absence, with the latest edition of the National Fuel Gas Code, NFPA 54/ANSI Z223.1.

**Natural Gas Capacity of Pipe
In Cubic Feet of Gas Per Hour (CFH)**

Length of Pipe in Feet	Nominal Black Pipe Size				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	980
40	63	130	245	500	760
50	56	115	215	440	670
60	50	105	195	400	610
70	46	96	180	370	560
80	43	90	170	350	530
90	40	84	160	320	490
100	38	79	150	305	460

(Pressure 0.5 psig or less and pressure drop of 0.3" W.C.; Based on 0.60 Specific Gravity Gas)

$$CFH = \frac{BTUH \text{ Furnace Input}}{\text{Heating Value of Gas (BTU/Cubic Foot)}}$$

To connect the furnace to the building's gas piping, the installer must supply a ground joint union, drip leg, manual shutoff valve, and line and fittings to connect to gas valve. In some cases, the installer may also need to supply a transition piece from 1/2" pipe to a larger pipe size.

The following stipulations apply when connecting gas piping. Refer to the figures on page 40 for typical gas line connections to the furnace.

- Use black iron or steel pipe and fittings for the building piping.
- Use pipe joint compound on male threads only. Pipe joint compound must be resistant to the action of the fuel used.
- Use ground joint unions.
- Install a drip leg to trap dirt and moisture before it can enter the gas valve. The drip leg must be a minimum of three inches long.
- Install a 1/8" NPT pipe plug fitting, accessible for test gage connection, immediately upstream of the gas supply connection to the furnace.
- Use two pipe wrenches when making connection to the gas valve to keep it from turning. The orientation of the gas valve on the manifold must be maintained as shipped from the factory.
- Install a manual shutoff valve between the gas meter and unit within six feet of the unit. If a union is installed, the union must be downstream of the manual shutoff valve, between the shutoff valve and the furnace.
- Tighten all joints securely.
- Connect the furnace to the building piping by one of the following methods:
 - Rigid metallic pipe and fittings.
 - Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing must not be used in exterior locations. In order to seal the grommet cabinet penetration, rigid pipe must be used to reach the outside of the cabinet. A semirigid connector to the gas piping may be used from there.

PRODUCT DESIGN

- Use listed gas appliance connectors in accordance with their instructions. Connectors must be fully in the same room as the furnace
- Protect connectors and semirigid tubing against physical and thermal damage when installed. Ensure aluminum-alloy tubing and connectors are coated to protect against external corrosion when in contact with masonry, plaster, or insulation, or subjected to repeated wetting by liquids such as water (except rain water), detergents, or sewage.



Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

Direct/Standard Inlet Piping

When gas piping enters *directly* to the gas valve through the *standard* inlet hole (upflow through the right side panel; counterflow, through the left side panel), the installer must supply straight pipe with a ground joint union to reach the exterior of the furnace. The rigid pipe must be long enough to reach the outside of the cabinet to seal the grommet cabinet penetration. A semirigid connector to the gas piping can be used outside the cabinet per local codes.

Indirect/Alternate Inlet Piping

When gas piping enters *indirectly* to the gas valve through the *alternate* gas inlet hole (upflow through the left side panel; counterflow, through the right side panel), the installer must swap the alternate inlet hole plug with the standard inlet grommet and supply the following fittings (starting from the gas valve) to reach the outside of the cabinet:

- Coupling.
- 90 degree elbow.
- 2 inch close nipple.
- 90 degree elbow.
- Straight pipe, with a ground joint union, to reach the exterior of the furnace. The rigid pipe must be long enough to reach the outside of the cabinet so as to seal the grommet cabinet penetration. A semirigid connector to the gas piping can be used outside the cabinet per local codes.

Gas Piping Checks

Before placing unit in operation, leak test the unit and gas connections.



To avoid the possibility of explosion or fire, never use a match or open flame to test for leaks.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved testing methods.

Note: Never exceed specified pressures for testing. Higher pressure may damage the gas valve and cause subsequent overfiring, resulting in heat exchanger failure.

Disconnect this unit and shutoff valve from the gas supply piping system before pressure testing the supply piping system with pressures in excess of 1/2 psig (3.48 kPa).

Isolate this unit from the gas supply piping system by closing its external manual gas shutoff valve before pressure testing supply piping system with test pressures equal to or less than 1/2 psig (3.48 kPa).

Propane Gas Tanks and Piping



Propane gas is heavier than air and any leaking gas can settle in any low areas or confined spaces. To prevent death, personal injury, or property damage due to fire or explosion caused by a propane gas leak, install a gas detection warning device.

A gas detecting warning system is the only reliable way to detect a propane gas leak. Rust can reduce the level of odorant in propane gas. Do not rely on your sense of smell. Contact a local propane gas supplier about installing a gas detecting warning system. If the presence of gas is suspected, follow the instructions on Page 6 of this manual.

All propane gas equipment must conform to the safety standards of the National Board of Fire Underwriters, NBFU Manual 58.

For satisfactory operation, propane gas pressure must be 11 inch WC at the furnace manifold with all gas appliances in operation. Maintaining proper gas pressure depends on three main factors:

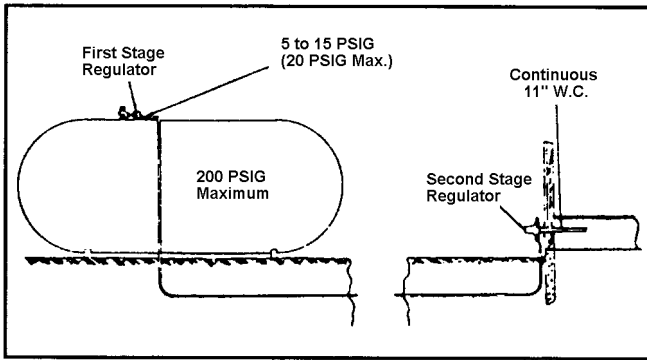
1. Vaporization rate, depending on temperature of the liquid, and “wetted surface” area of the container or containers.
2. Proper pressure regulation. (Two-stage regulation is recommended for both cost and efficiency).
3. Pressure drop in lines between regulators, and between second stage regulator and the appliance. Pipe size will depend on length of pipe run and total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and propane gas suppliers.

Since propane gas will quickly dissolve white lead and most standard commercial compounds, special pipe dope must be used. Shellac-based compounds resistant to the actions of liquefied petroleum gases such as Gasolac[®], Stalactic[®], Clyde's[®] or John Crane[®] are satisfactory.

PRODUCT DESIGN

Refer to the following illustration for typical propane gas installations.



Propane Gas Installation (Typ.)

Propane Gas Piping Charts

Sizing Between First and Second Stage Regulator*

Maximum Propane Capacities listed are based on 2 psig pressure drop at 10 psig setting. Capacities in 1,000 BTU/hour.

Pipe or Tubing Length, Feet	Tubing Size, O.D. Type L					Nominal Pipe Size Schedule 40	
	3/8"	1/2"	5/8"	3/4"	7/8"	1/2"	3/4"
10	730	1,700	3,200	5,300	8,300	3,200	7,500
20	500	1,100	2,200	3,700	5,800	2,200	4,200
30	400	920	2,000	2,900	4,700	1,800	4,000
40	370	850	1,700	2,700	4,100	1,600	3,700
50	330	770	1,500	2,400	3,700	1,500	3,400
60	300	700	1,300	2,200	3,300	1,300	3,100
80	260	610	1,200	1,900	2,900	1,200	2,600
100	220	540	1,000	1,700	2,600	1,000	2,300
125	200	490	900	1,400	2,300	900	2,100
150	190	430	830	1,300	2,100	830	1,900
175	170	400	780	1,200	1,900	770	1,700
200	160	380	730	1,100	1,800	720	1,500

To convert to capacities at 15 psig settings - multiply by 1.130

To convert to capacities at 5 psig settings - multiply by 0.879

Sizing Between Single or Second Stage Regulator and Appliance*

Maximum Propane Capacities Listed are Based on 1/2" W.C. pressure drop at 11" W.C. setting. Capacities in 1,000 BTU/hour.

Pipe or Tubing Length, Feet	Tubing Size, O.D. Type L						Nominal Pipe Size Schedule 40				
	3/8"	1/2"	5/8"	3/4"	7/8"	1-1/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"
10	39	92	199	329	501	935	275	567	1,071	2,205	3,307
20	26	62	131	216	346	630	189	393	732	1,496	2,299
30	21	50	107	181	277	500	152	315	590	1,212	1,858
40	19	41	90	145	233	427	129	267	504	1,039	1,559
50	18	37	79	131	198	376	114	237	448	913	1,417
60	16	35	72	121	187	340	103	217	409	834	1,275
80	13	29	62	104	155	289	89	185	346	724	1,066
100	11	26	55	90	138	255	78	162	307	630	976
125	10	24	48	81	122	224	69	146	275	567	866
150	9	21	43	72	109	202	63	132	252	511	787
200	8	19	39	66	100	187	54	112	209	439	665
250	8	17	36	60	93	172	48	100	185	390	590

*Data in accordance with NFPA pamphlet NO. 54

Circulating Air and Filters

Ductwork - Air Flow

Duct systems and register sizes must be properly designed for the CFM and external static pressure rating of the furnace. Ductwork should be designed in accordance with the recommended methods of "Air Conditioning Contractors of America" Manual D.

A duct system must be installed in accordance with Standards of the National Board of Fire Underwriters for the Installation of Air Conditioning, Warm Air Heating and Ventilating Systems. Pamphlets No. 90A and 90B.

A closed return duct system must be used, with the return duct connected to the furnace. Supply and return connections to the furnace may be made with flexible joints to reduce noise transmission. To prevent the blower from interfering with combustion air or draft when a central return is used, a connecting duct must be installed between the unit and the utility room wall. A room, closet, or alcove must not be used as a return air chamber.

When the furnace is used in connection with a cooling unit, the furnace should be installed in parallel with or on the upstream side of the cooling unit to avoid condensation in the heating element. With a parallel flow arrangement, the dampers or other means used to control the flow of air must be adequate to prevent chilled air from entering the furnace and, if manually operated, must be equipped with means to prevent operation of either unit unless the damper is in the full heat or cool position.

When the furnace is installed without a cooling coil, it is recommended that a removable access panel be provided in the outlet air duct. This opening shall be accessible when the furnace is installed and shall be of such a size that the heat exchanger can be viewed for visual light inspection or such that a sampling probe can be inserted into the airstream. The access panel must be made to prevent air leaks when the furnace is in operation.

When the furnace is heating, the temperature of the return air entering the furnace must be between 55°F and 100°F.

Filters - Read This Section Before Installing The Return Air Ductwork

Filters must be used with this furnace. Discuss filter maintenance with the building owner. Filters do not ship with this furnace, but must be provided by the installer. Filters must comply with UL900 or CAN/ULCS111 standards. If the furnace is installed without filters, the warranty will be voided.

Guide dimples locate the side and bottom return cutout locations. Use a straight edge to scribe lines connecting the dimples. Cut out the opening on these lines.

Note: An undersized opening will cause reduced airflow.

For air delivery of less than 1800 CFM, use a one side or bottom return.

For air delivery of 1800 CFM or higher, use either a two side return or a one side return with a bottom return.

PRODUCT DESIGN

To ensure proper unit performance follow the filter sizes given in the following filter sizing charts.

Side Return Filters							
Minimum Recommended Size For Maximum CFM							
Model Input Air Flow	Max CFM	Disposable*			Permanent*		
		Qty	Nom. Size	Area (in ²)	Qty	Nom. Size	Area (in ²)
045_30	1200	1	24x24x1	576	1	16x25x1	400
070_30	1400	1	25x30x1	750	1	16x25x1	400
070_40	1600	1	25x30x1	800	1	16x25x1	400
090_40	1600	1	25x30x1	800	1	16x25x1	400
090_50	2000	2	20x25x1	1000	2	16x25x1	800
115_50	2000	2	20x25x1	1000	2	16x25x1	800

Bottom Return Filter				
Minimum Recommended Size For Maximum CFM				
Model Input Air Flow	Max CFM	Permanent		
		Qty	Nominal Size	Area (in ²)
045_30	1200	1	14x25x1	350
070_30	1400	1	14x25x1	350
070_40	1600	1	16x25x1	400
090_40	1600	1	16x25x1	400
090_50	2000	1	20x25x1	500
115_50	2000	1	20x25x1	500

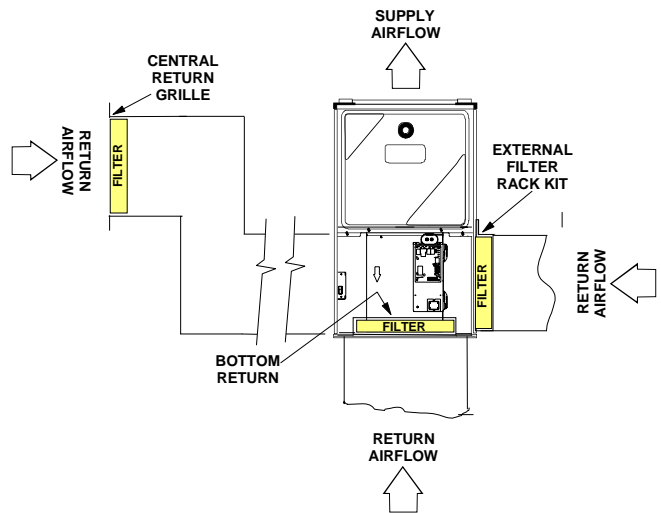
Counterflow Filters						
Minimum Recommended Size For Maximum CFM						
Model Input Air Flow	Max CFM	Qty	Nom. Size	Area (in ²)	Filter Type*	Dimension "A"
070_30	1400	2	15X20X1	750		
070_40	1600	2	15X20X1	800		
090_40	1600	2	15X20X1	800	Permanent	13
090_50	2000	2	15X20X1	1000		
115_50	2000	2	15X20X1	1000	Permanent	11 1/4

Horizontal Installations							
Minimum Recommended Size For Maximum CFM							
Model Input Air Flow	Max CFM	Disposable*			Permanent*		
		Qty	Nominal Size	Area (in ²)	Qty	Nominal Size	Area (in ²)
045_30	1200	1	15x20x1	600	1	15x25x1	300
070_30	1400	1	16x20x1	800	1	16x25x1	4000
070_40	1600	1	16x25x1	800	1	16x25x1	400
090_40	1600	1	16x25x1	800	1	16x25x1	400
090_50	2000	1	20x25x1	1000	1	20x25x1	500
115_50	2000	1	20x25x1	1000	1	20x25x1	500

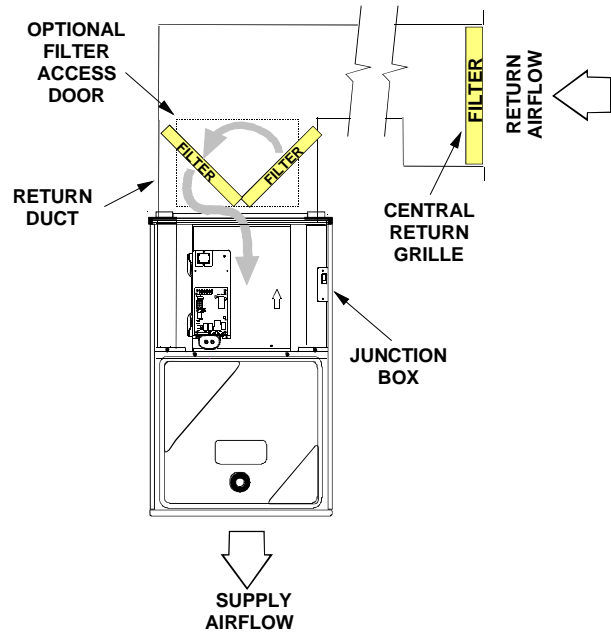
Upright Installations

Depending on the installation and/or customer preference, differing filter arrangements can be applied. Filters can be installed in the central return register, the bottom of the blower compartment (upflows), a side panel external filter rack kit (upflows), or the ductwork above a counterflow furnace. As an alternative a media air filter or electronic air cleaner can be used as the requested filter. Review and follow the filter sizes given in the previous filter sizing charts to ensure proper unit performance. The following figures show possible filter locations.

Note: A ductwork access door must be used in counterflow applications to allow filter removal.



Possible Upright Upflow Filter Locations



Possible Upright Counterflow Filter Locations

Horizontal Installations

Filters must be installed in the central return register. Refer to the previous filter charts for recommended minimum filter sizes.

Startup Procedure and Adjustment

Furnace must have a 115 VAC power supply properly connected and grounded. Proper polarity must be maintained for correct operation. Refer to POLARIZATION AND PHASING section on page 52 of this service manual for the correct procedures on checking for proper polarization of the incoming power supply.

PRODUCT DESIGN

Heat Anticipator Setting

The heat anticipator in the room thermostat must be correctly adjusted to obtain the proper number of cycles per hour and to prevent “overshooting” of the setting. Set the heat anticipator setting to 0.7 amps. Follow the thermostat manufacturer’s instructions on how to adjust the heat anticipator setting and refer to *S-3B Heating Anticipator* section in the *SERVICING* section of this manual.

Drain Trap Priming

The drain trap must be primed prior to furnace startup. To prime, fill the drain trap with water. This ensures proper furnace drainage upon startup and prohibits the possibility of flue gases escaping through the drain system.

Furnace Operation

Purge gas lines of air prior to startup. Be sure not purge lines into an enclosed burner compartment.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved method. Verify that all required kits (propane gas, high altitude, etc.) have been appropriately installed.

Furnace Startup

1. Close the manual gas shut-off valve external to the furnace.
2. Turn off the electrical power to the furnace.
3. Set the room thermostat to the lowest possible setting.
4. Remove the burner compartment door.

Note: This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

5. Move the furnace gas valve manual control to the OFF position.
6. Wait five minutes then smell for gas. Be sure check near the floor as some types of gas are heavier than air.
7. If you smell gas after five minutes, immediately follow the instructions on page 6 of this manual. If you do not smell gas after five minutes, move the furnace gas valve manual control to the ON position.
8. Replace the burner compartment door.
9. Open the manual gas shut-off valve external to the furnace.
10. Turn on the electrical power to the furnace.
11. Adjust the thermostat to a setting above room temperature.
12. After the burners are lit, set the thermostat to desired temperature.

Furnace Shutdown

1. Set the thermostat to the lowest setting.

The integrated ignition control will close the gas valve and extinguish flame. Following a 15 second delay, the induced draft blower will be de-energized. After a 60, 90, 120, or 180 second delay period (field selectable), the circulator blower will be de-energized.
2. Remove the burner compartment door and move the furnace gas valve manual control to the OFF position.
3. Close the manual gas shut-off valve external to the furnace.
4. Replace the burner compartment door.

Circulator Blower Speeds

This furnace is equipped with a multispeed circulator blower. This blower provides ease in adjusting blower speeds. The *BLOWER PERFORMANCE SPECIFICATIONS* section of this manual or *Specifications Sheet* provides an airflow table, showing the relationship between airflow (CFM) and external static pressure (E.S.P.), for the proper selection of heating and cooling speeds. The cooling blower speed is shipped set on HIGH, and the heating blower speed is set as indicated in the *BLOWER PERFORMANCE SPECIFICATIONS* section of this manual or *Specifications Sheet*. These blower speeds should be adjusted by the installer to match the installation requirements so as to provide the correct heating temperature rise and the correct cooling CFM.

To adjust the circulator blower speed, proceed as follows:

1. Turn OFF power to the furnace.
2. Remove the blower compartment door to gain access to the circulator blower wires connected to the integrated control module.
3. Select the heating and cooling blower speeds that match the installation requirements from the airflow table shown in the *BLOWER PERFORMANCE SPECIFICATION* section of this manual or the *Specifications Sheet*.
4. Relocate desired motor leads to the circulator blower heat and cool speed terminals on the integrated control module. (Terminals are identified as HEAT and COOL (hot)). If heating and cooling blower speeds are the same, a jumper wire must be used between the heat and cool terminals.
5. Connect all unused blower motor leads to the “PARK” terminals on the integrated ignition control. Any leads not connected to the “PARK” terminals must be taped.
6. Replace the blower compartment door.
7. Turn on the electrical power to the furnace.
8. Verify proper temperature rise as outlined in *S-17 CHECKING TEMPERATURE RISE* section in the *SERVICING* section of this manual.

PRODUCT DESIGN

Circulator Blower Speeds	
Speed	Wire Color
Low	Red
Medium Low	Orange
Medium	Blue
High	Black
Common/Neutral	White

Blower Heat Off Delay Timings

The integrated control module provides a selectable heat off delay function. The heat off delay period may be set to 60, 90, 120, 180 seconds using the DIP switches or jumper provided on the control module. The delay is factory shipped at 90 seconds but may be changed to suit the installation requirements and/or homeowner preference. Refer to the following figure for switch positions and corresponding delay times.

	DIP Switches	Jumper
60 Second Delay	1 ON 2 ON	
90 Second Delay	1 OFF 2 ON	
120 Second Delay	1 ON 2 OFF	
180 Second Delay	1 OFF 2 OFF	

Heat Off Delay Switches

SYSTEM OPERATION

Normal Sequence of Operation

Power Up

The normal power up sequence is as follows:

- 115 VAC power applied to furnace.
- Integrated control module performs internal checks.
- Integrated control module flashes LED one time.
- Integrated control module monitors safety circuits continuously.
- Furnace awaits call from thermostat.

Heating Mode

The normal operational sequence in heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized causing pressure switch contacts to close. Humidifier terminals are energized with induced draft blower.
- Igniter warm up begins upon close of pressure switch contacts.
- Gas valve opens at end of igniter warm up period, delivering gas to burners and establishing flame.
- Integrated control module monitors flame presence. Gas valve will remain open only if flame is sensed.
- Circulator blower is energized on heat speed following a fixed thirty second blower on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace runs, integrated control module monitors safety circuits continuously.
- R and W thermostat contacts open, completing the call for heat.
- Gas valve closes, extinguishing flame.
- Induced draft blower is de-energized following a fifteen second post purge. Humidifier terminals are de-energized.
- Circulator blower is de-energized following a selectable heat off delay period (60, 90, 120, or 180 seconds). Electronic air cleaner terminals are de-energized.
- Furnace awaits next call from thermostat.

Cooling Mode

The normal operational sequence in cooling mode is as follows:

- R and Y thermostat contacts close, initiating a call for cool.
- Integrated control module performs safety circuit checks.
- Outdoor fan and compressor are energized.
- Circulator blower is energized on cool speed following a fixed five second on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace circulator blower and outdoor cooling unit run, integrated control module monitors safety circuits continuously.
- R and Y thermostat contacts open, completing the call for cool.
- Outdoor fan and compressor are de-energized.
- Circulator blower is de-energized following a fixed forty five second cool off delay period. Electronic air cleaner terminals are de-energized.
- Furnace awaits next call from thermostat.

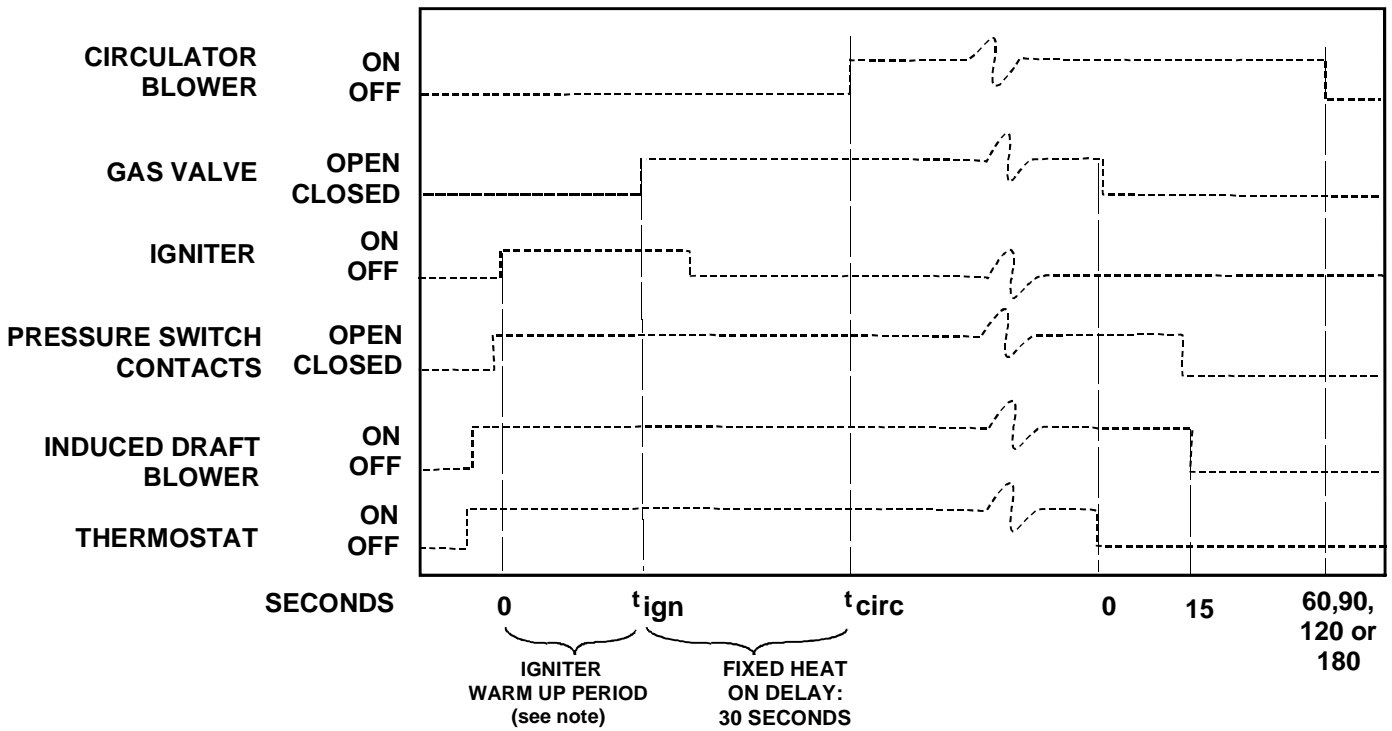
Fan Only Mode

The normal operational sequence in fan only mode is as follows:

- R and G thermostat contacts close, initiating a call for fan.
- Integrated control module performs safety circuit checks.
- Circulator blower is energized on cool speed. Electronic air cleaner terminals are energized.
- Circulator blower runs, integrated control module monitors safety circuits continuously.
- R and G thermostat contacts open, completing the call for fan.
- Circulator blower is de-energized. Electronic air cleaner terminals are de-energized.
- Furnace awaits next call from thermostat.

SYSTEM OPERATION

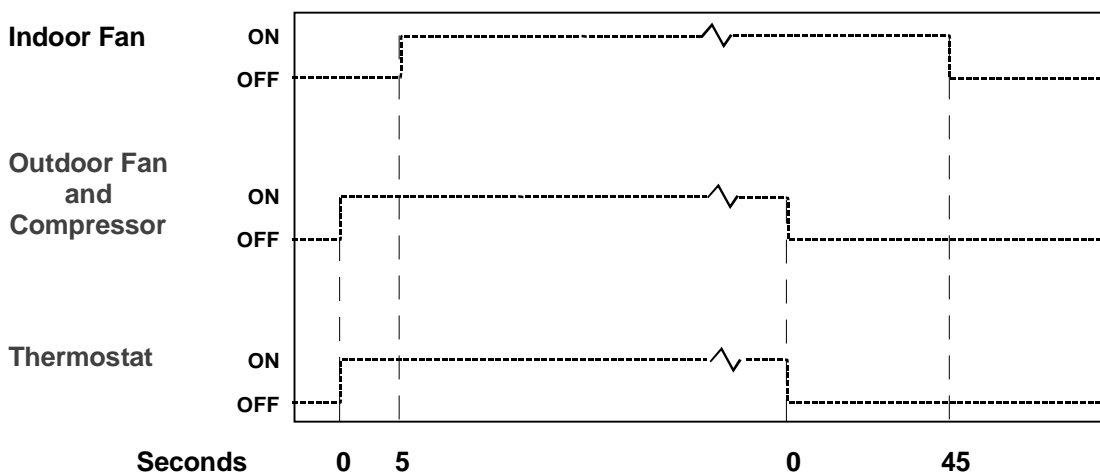
TIMING CHART FOR NORMAL HEATING OPERATION



NOTE: **HEATCRAFT** INTEGRATED CONTROL MODULE HAS A FIXED STANDARD SEVEN-SECOND IGNITER WARM UP PERIOD (MINI IGNITER).

WHITE-RODGERS INTEGRATED CONTROL MODULE HAS A VARIABLE STANDARD IGNITER WARM UP PERIOD BETWEEN A 17-SECOND MAXIMUM AND A FIVE-SECOND MINIMUM.

TIMING CHART FOR NORMAL COOLING OPERATION



SYSTEM OPERATION

Troubleshooting

Electrostatic Discharge (ESD) Precautions

Note: Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnaces near the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

Diagnostic Chart



To avoid electrical shock, injury or death, disconnect electrical power before performing any service or maintenance.

Refer to the troubleshooting chart for assistance in determining the source of unit operational problems.








Resetting From Lockout

Furnace lockout results when a furnace is unable to achieve ignition after three attempts, or when it has lost flame five times during a single call for heat. It is characterized by a non-functioning furnace and a one flash diagnostic LED code. If the furnace is in "lockout", it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.
2. Manual power interruption. Interrupt 115 volt power to the furnace for 0 - 20 seconds.
3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat then reset to previous setting. Interrupt thermostat signal to the furnace for 0 - 20 seconds.





Note: If the condition which originally caused the lockout still exists, the control will return to lockout. Refer to *Troubleshooting - Diagnostic Chart* on pages 50 and 51 for aid in determining the cause.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation	Associated LED Code (See Note 2)	Fault Description(s)	Possible Causes	Corrective Action	Cautions and Notes
- Furnace fails to operate, and - Integrated control module diagnostic LED provides no signal.	None	- No 115 V power to furnace, or no 24 V power to integrated control module. - Blown fuse, or circuit breaker. - No signal from thermostat.	- Manual disconnect switch OFF, door switch open, or 24 V wires miswired, loose or misconnected wires. - Blown fuse, or circuit breaker. - Improper thermostat connection or setting.	- Assure 115 V and 24 V power to furnace and integrated control module. - Check integrated control module fuse (3 A). Replace if necessary. - Check for possible shorts in 115 V and 24 V circuits. Repair as necessary.	- Turn power OFF prior to repair. - Replace integrated control module fuse with 3 A automotive style fuse.
- Furnace fails to operate, and - Integrated control module diagnostic LED is lit continuously.	 Continuous On	- Integrated control module has an internal fault.	- Integrated control module has an internal fault.	- Replace bad integrated control module with known good control module.	- Turn power OFF prior to repair. - Read precautions in "Electrostatic Discharge" section of manual.
- Furnace is not operating and - Integrated control module diagnostic LED is flashing one flash.	 1 Flash	- Furnace lockout due to an excessive number of ignition "retries" (3 total attempts), or "recycles" (5 total recycles). See note 1.	- Failure to establish flame. Cause may be no gas to burners, front cover pressure switch stuck open, bad igniter or igniter alignment, improper orifices, or coated/oxidized or misconnected flame sensor. - Loss of flame after establishment. Cause may be interrupted gas supply, lazy burner flames (improper gas pressure or restriction in flue and/or combustion air piping), front cover pressure switch opening, or improper induced draft blower performance.	- Locate and correct gas interruption. - Check front cover pressure switch operation (hose, wiring, contact operation). Correct if necessary. - Replace or realign igniter. - Check flame sense signal. Sand sensor if coated/oxidized. - Check flue piping for blockage, proper length, elbows, and termination. - Verify proper induced draft blower performance.	- Turn power OFF prior to repair. - Igniter is fragile, handle with care. - Sand flame sensor with emery cloth - See "Flue and Combustion Air Pipe" section for piping details.
- Furnace fails to operate, and - Integrated control module diagnostic LED is flashing two flashes.	 2 Flashes	- Pressure switch circuit is closed even though induced draft blower is not operating.	- Induced draft blower pressure switch contacts sticking. - Shorts in pressure switch circuit.	- Replace induced draft blower pressure switch if bad. - Check for and correct shorted wiring.	- Turn power OFF prior to repair. - Replace pressure switch with proper replacement part.
- Induced draft blower runs continuously with no further furnace operation, and - Integrated control module diagnostic LED is flashing three flashes.	 3 Flashes	- Pressure switch circuit does not close in response to induced draft blower operation.	- Pressure switch hose blocked, pinched, or misconnected. - Blocked flue and/or inlet air pipe, blocked drain system, or weak induced draft blower. - Incorrect pressure switch set point or malfunctioning switch contacts. - Loose or misconnected wiring.	- Check and correct pressure switch hose. - Check flue and/or inlet air piping for blockage, proper length, elbows and termination. Check drain system. - Verify proper pressure switch set point and contact motion. - Check and correct wiring.	- Turn power OFF prior to repair. - See "Flue and Combustion Air Pipe" section for piping details. - Replace pressure switch with proper replacement part.
- Circulator blower runs continuously with no further furnace operation, and - Integrated control module diagnostic LED is flashing four flashes.	 4 Flashes	- Primary limit circuit is open. (Primary or auxiliary limit).	- Insufficient conditioned air over the heat exchanger. Cause may be blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower. - Loose or misconnected wiring.	- Check filters and ductwork for blockage. Clean filters or remove obstruction. - Check for proper circulator blower speed and performance. Correct speed or replace blower if necessary. - Check and correct wiring.	- Turn power OFF prior to repair. - See Specification Sheet for allowable rise range and proper circulator blower speed.
- Circulator blower runs continuously with no further furnace operation, and - Integrated control module diagnostic LED is flashing five flashes.	 5 Flashes	- Rollout limit circuit is open.	- Rollout limit(s) is(are) open due to flame rollout. Cause may be misaligned burners, blocked flue and/or air inlet pipe, or failed induced draft blower. - Loose or misconnected wiring.	- Check burners for proper alignment. - Check flue and/or air inlet piping for blockage, proper length, elbows, and termination. - Check induced draft blower for proper performance. Replace if necessary. - Check and correct wiring.	- Turn power OFF prior to repair. - See "Flue and Combustion Air Pipe" section for piping details. - Replace induced draft blower with proper replacement part.
- Furnace fails to operate, and - Integrated control module diagnostic LED is flashing six flashes.	 6 Flashes	- Polarity of 115 V or 24 V AC power is reversed.	- Polarity of 115 V AC power to furnace or integrated control module is reversed. - Orange and gray wires to transformer are reversed. - Poor unit ground.	- Review wiring diagram. - Verify proper grounding. - Check and correct wiring.	- Turn power OFF prior to repair.

- Notes:
 1) Integrated control module will automatically attempt to reset from lock out after one hour.
 2) LED flash code will cease if power to the control module is interrupted through the disconnect or door switch.
 3) Integrated control module will automatically attempt to reset from lock out after 20 minutes.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation	Associated LED Code (See Note 2)	Fault Description(s)	Possible Causes	Corrective Action	Cautions and Notes
<ul style="list-style-type: none"> - Normal furnace operation, but - Integrated control module diagnostic LED is flashing seven flashes. 	 7 Flashes <i>White Rodgers Control Only</i>	<ul style="list-style-type: none"> - Flame sense micro-amp signal is low. 	<ul style="list-style-type: none"> - Flame sensor is coated/oxidized. - Flame sensor incorrectly positioned in burner flame. - Lazy burner flame due to improper gas pressure, or combustion air. 	<ul style="list-style-type: none"> - Sand flame sensor if coated/oxidized. Inspect for proper sensor alignment. - Check inlet air piping for blockage, proper length, elbows, and termination. - Check for proper gas pressures. 	<ul style="list-style-type: none"> - Turn power OFF prior to repair. - Sand flame sensor with emery cloth. - See "Flue and Combustion Air Pipe" section for piping details. - See rating plate for proper gas pressures.
<ul style="list-style-type: none"> - Furnace is not operating and - Integrated control module diagnostic LED is flashing eight flashes. 	 8 Flashes <i>Heatcraft Control Only</i>	<ul style="list-style-type: none"> - Pressure switch circuit has opened five times during a single call for heat. See note 3. 	<ul style="list-style-type: none"> - Pressure switch hose blocked, pinched, or misconnected. - Blocked flue and/or inlet air pipe, blocked drain system, or weak induced draft blower. - Incorrect pressure switch set point or malfunctioning switch contacts. - Loose or misconnected wiring. 	<ul style="list-style-type: none"> - Check and correct pressure switch hose. - Check flue and/or inlet air piping for blockage, proper length, elbows and termination. Check drain system. - Verify proper pressure switch set point and contact motion. - Check and correct wiring. 	<ul style="list-style-type: none"> - Turn power OFF prior to repair. - See "Flue and Combustion Air Pipe" section for piping details. - Replace pressure switch with proper replacement part.
<ul style="list-style-type: none"> - Circulator blower running continuously with no further furnace operation and - Integrated control module diagnostic LED is flashing nine flashes. 	 9 Flashes <i>Heatcraft Control Only</i>	<ul style="list-style-type: none"> - Limit circuit (primary or auxiliary) has opened five times during a single call for heat. See note 1. 	<ul style="list-style-type: none"> - Insufficient conditioned air over the heat exchanger. Cause may be blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower. - Loose or misconnected wiring. 	<ul style="list-style-type: none"> - Check filters and ductwork. For blockage. Clean filters or remove obstruction. - Check for proper circulation blower speed and performance. Correct speed or replace blower if necessary. - Check and correct wiring. 	<ul style="list-style-type: none"> - Turn power OFF prior to repair. - See Specification Sheet for allowable rise range and proper circulator blower speed.
<ul style="list-style-type: none"> - Induced draft and circulator blower run continuously with no further furnace operation, and - Integrated control module diagnostic LED is flashing continuously. 	 Continuous Flashing	<ul style="list-style-type: none"> - Flame has been sensed with no call for heat. 	<ul style="list-style-type: none"> - Short to ground in flame sense circuit. 	<ul style="list-style-type: none"> - Correct short at flame sensor or in flame sensor wiring. 	<ul style="list-style-type: none"> - Turn power OFF prior to repair.

Notes:

- 1) Integrated control module will automatically attempt to reset from lock out after one hour.
- 2) LED flash code will cease if power to the control module is interrupted through the disconnect or door switch.
- 3) Integrated control module will automatically attempt to reset from lock out after 20 minutes.

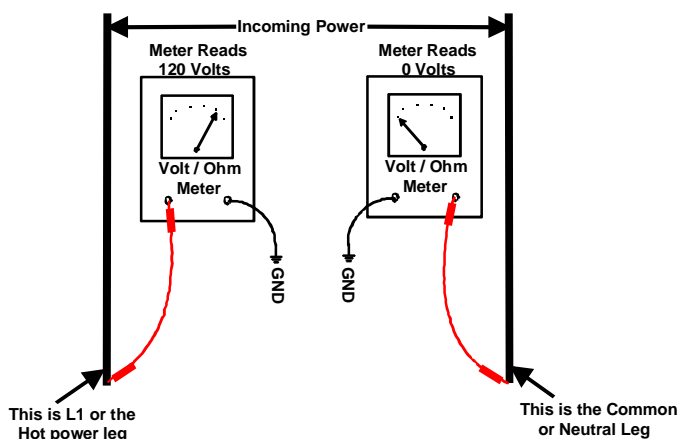
POLARIZATION AND PHASING

As more and more electronic's are introduced to the Heating Trade, Polarization of incoming power and phasing of primary to secondary voltage on transformers becomes more important.

Polarization has been apparent in the Appliance industry since the introduction of the three prong plug, however, the Heating Industry does not use a plug for incoming power, but is hard wired.

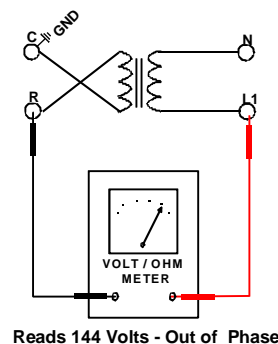
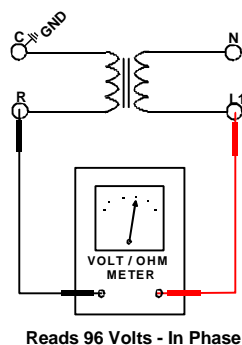
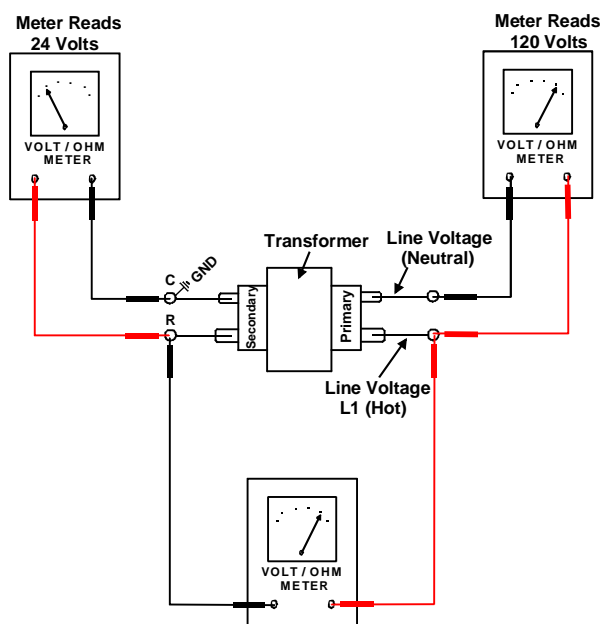
Some of the electronic boards being used today, with flame rectification, will not function properly and/or at all without polarization of incoming power. Some also require phasing between the primary and secondary sides of step-down transformers.

To instill new working habits for our trade, we recommend that these two items be checked during normal installation and/or service calls. See as follows:



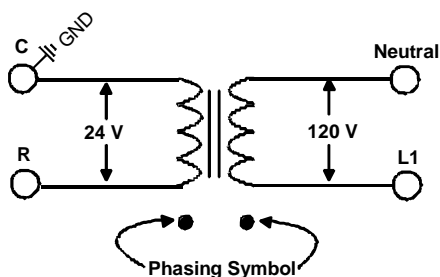
These then should be wired to the furnace accordingly.

CHECKING FOR PHASING - PRIMARY TO SECONDARY OF UNMARKED TRANSFORMERS*



If meter reads approximately 96 volts - the primary to secondary are in phase - if reads approximately 144 volts out of phase - reverse low voltage wires.

***Note:** For flame rectification the common side of the secondary voltage (24 V) is cabinet grounded. If you were to bench test a transformer the primary neutral and secondary common must be connected together for testing purposes.



Some transformers will display phasing symbols as shown in the illustration to the left to assist in determining proper transformer phasing.

Checking for polarization and phasing should become a habit in servicing. Let's start now.

Note: The new White-Rodgers 50A55-288 and the Heatcraft HSI-2 integrated ignition controls used on the GUCA and GCCA model furnaces, have a diagnostic flash code for reversed polarity. This is a six flash diagnostic flash code (Refer to *Troubleshooting-Diagnostic Chart* on pages 50 and 51).

MAINTENANCE



TO AVOID ELECTRICAL SHOCK, INJURY OR DEATH, DISCONNECT ELECTRICAL POWER BEFORE PERFORMING ANY MAINTENANCE.



IF YOU MUST HANDLE THE IGNITOR, HANDLE WITH CARE. TOUCHING THE IGNITOR BODY WITH BARE FINGERS, ROUGH HANDLING, OR VIBRATION COULD RESULT IN EARLY IGNITOR FAILURE. ONLY A QUALIFIED SERVICER SHOULD EVER HANDLE THE IGNITOR.

ANNUAL INSPECTION

The furnace should be inspected by a qualified installer, or service agency at least once per year. This check should be performed at the beginning of the heating season. This will ensure that all furnace components are in proper working order and that the heating system functions appropriately. Pay particular attention to the following items. Repair or service as necessary.

- Flue pipe system. Check for blockage and/or leakage. Check the outside termination and the connections at and internal to the furnace.
- Combustion air intake pipe system (where applicable). Check for blockage and/or leakage. Check the outside termination and the connection at the furnace.
- Heat exchanger. Check for corrosion and/or buildup within the heat exchanger passageways.
- Burners. Check for proper ignition, burner flame, and flame sense.
- Drainage system. Check for blockage and/or leakage. Check hose connections at and internal to furnace.
- Wiring. Check electrical connections for tightness and/or corrosion. Check wires for damage.
- Filters.

AIR FILTER



NEVER OPERATE FURNACE WITHOUT A FILTER INSTALLED AS DUST AND LINT WILL BUILD UP ON INTERNAL PARTS RESULTING IN LOSS OF EFFICIENCY, EQUIPMENT DAMAGE, AND POSSIBLE FIRE.

Filters must be used with this furnace. Filters do not ship with these furnaces but must be provided by the installer for proper furnace for proper operation.

Remember that dirty filters are the most common cause of inadequate heating or cooling performance.



DISCONNECT THE ELECTRICAL POWER TO THE FURNACE BEFORE REMOVING THE FILTER OR PERFORMING ANY OTHER MAINTENANCE.

Maintenance

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every two months or as required. It is the owner's responsibility to keep air filters clean. When replacing a filter, it must be replaced with a filter of the same type and size.

Filter Removal

Depending on the installation, differing filter arrangements can be applied. Filters can be installed in the central return register, the bottom of the blower compartment (upflow only), a side panel external filter rack kit (upflow only), or the ductwork above a counterflow furnace. A media air filter or electronic air cleaner can be used as an alternate filter. The filter sizes given in the *Product Design* section of this manual and the *Specifications Sheet* must be followed to ensure proper unit performance. Refer to the following for removal and installation of filters.

Upright Upflow Filter Removal

To remove a filter from the bottom of the blower compartment:

1. Turn off electrical power to furnace.
2. Remove blower compartment door.
3. Push back and up on the wire filter retainer to release it from under the front lip of the furnace basepan. Do not remove. To access the filter, tilt the wire filter retainer upwards.
4. Slide filter forward and out. Vacuum blower compartment.
5. Replace filter and secure retainer opposite of removal.

To remove filters from an external filter rack in an upright upflow installation, follow the directions provided with external filter rack kit.

Media Air Filter or Electronic Air Cleaner Removal

Follow the manufacturer's directions for service.

Upright Counterflow Filter Removal

To remove filters from the ductwork above an upright counterflow installation:

1. Turn off electrical power to furnace.
2. Remove access door in ductwork above furnace.

MAINTENANCE

3. Remove filters
4. Remove blower compartment door. Vacuum compartment. Replace blower compartment door.
5. Replace filters opposite of removal.
6. Replace access door in ductwork.

Horizontal Unit Filter Removal

Filters in horizontal installations are located in the central return register.

INDUCED DRAFT AND CIRCULATION BLOWERS

The bearings in the induced draft blower and circulator blower motors are permanently lubricated by the manufacturer. No further lubrication is required. Check motor windings for accumulation of dust which may cause overheating. Clean as necessary.

CONDENSATE DRAINAGE SYSTEM (QUALIFIED SERVICER ONLY)

The drain tubes, standpipe, and field supplied drain line must be checked annually and cleaned as often as necessary to ensure proper condensate drainage.

FLUE PASSAGES (QUALIFIED SERVICER ONLY)

At the start of each heating season, inspect and, if necessary, clean the furnace flue passages.

CLEANING FLUE PASSAGES (QUALIFIED SERVICER ONLY)

1. Turn OFF the electrical power and gas supply to the furnace.
2. Disconnect the gas line and remove the burner/ manifold assembly by removing the screws securing the assembly to the partition panel.
3. Disconnect the flue pipe system from the induced draft blower.
4. Remove the induced draft blower and, drain and pressure tap hoses from the recuperator coil front cover.
5. Remove the recuperator coil front cover to expose the coil tubes and turbulators.
6. Remove the recuperator coil turbulators individually by slowly pulling each turbulator forward firmly.
7. Clean the recuperator coil tubes using a long handle wire brush, such as a gun cleaning brush.
8. Clean the primary heat exchanger tubes using a wire brush attached to a length of high grade stainless steel cable, such as drain cleanout cable. Attach a variable speed reversible drill to the other end of the cable. Slowly rotate the cable with the drill and insert it into one of the heat exchanger tubes. While reversing the drill, work the cable in and out several times to obtain sufficient cleaning. Repeat for each tube.

9. Clean residue from furnace using a vacuum cleaner.
10. Replace the parts removed in the previous steps in reverse order.
11. Turn on electrical power and gas to furnace. Check for leaks and proper unit operation.
12. Severe heat exchanger fouling is an indication of an operational problem. Perform the checks listed in *Start-up Procedure and Adjustments* section to reduce the chances of repeated fouling.

FLAME SENSOR (QUALIFIED SERVICER ONLY)

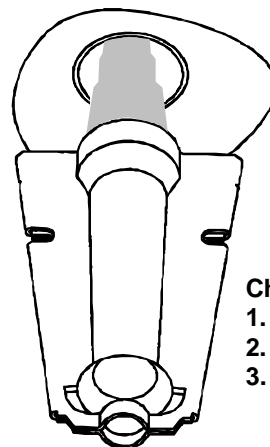
Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator, causing a drop in the flame sensing signal. If this occurs, a qualified servicer must carefully clean the flame sensor with emery cloth or steel wool. After cleaning, the flame sensor output should be as listed on the specification sheet.

BURNERS



ELECTRICAL COMPONENTS ARE CONTAINED IN BOTH COMPARTMENTS. TO AVOID ELECTRICAL SHOCK, INJURY OR DEATH, DO NOT REMOVE ANY INTERNAL COMPARTMENT COVERS OR ATTEMPT ANY ADJUSTMENT. CONTACT A QUALIFIED SERVICE AGENT AT ONCE IF AN ABNORMAL FLAME APPEARANCE SHOULD DEVELOP.

Periodically during the heating season make a visual check of the burner flames. Turn the furnace on at the thermostat. Wait a few minutes, since any dislodged dust will alter the normal flames appearance. Flames should be stable, quiet, soft and blue with slightly orange tips. They should not be yellow. They should extend directly outward from the burner ports without curling downward, floating or lifting off the ports.



Check the burner flames for:

1. Good adjustment
2. Stable, soft and blue
3. Not curling, floating, or lifting off.

Burner Flame

SERVICING

TEST EQUIPMENT

Proper test equipment for accurate diagnosis is as essential as regulator hand tools.

The following is a must for every service technician and service shop.

1. Dial type thermometers or thermocouple meter (optional) - to measure dry bulb temperature.
2. Amprobe - to measure amperage and voltage.
3. Volt-Ohm Meter - testing continuity, capacitors, and motor windings.
4. Inclined Manometer - to measure static pressure, pressure drop across coils, filters, and draft.
5. Water Manometer (12") - to test gas inlet and manifold pressure.

Other recording type instruments can be essential in solving abnormal problems, however, in many instances they may be rented from local sources.

Proper equipment promotes faster, more efficient service and accurate repairs resulting in fewer call backs.

HEATING PERFORMANCE TEST

Before attempting to diagnose an operating fault, run a heating performance test and apply the results to the Service Problem Analysis Guide.

To conduct a heating performance test, the BTU input to the furnace must be calculated.

After the heating cycle has been in operation for at least fifteen minutes and with all other gas appliances turned off, the gas meter should be clocked.

To find the BTU input, multiply the number of cubic feet of gas consumed per hour by the heating value of the gas being used. (The calorific value of the gas being used is found by contacting your local utility.)

Example: It is found by the gas meter, that it takes forty (40) seconds for the hand on the cubic foot dial to make one complete revolution, with all appliances off, except the furnace. Take this information and locate it on the gas rate chart. Observe the forty (40) seconds, locate and read across to the one (1) cubic foot dial column. There we find the number 90, which shows that ninety (90) cubic feet of gas will be consumed in one (1) hour.

Let's assume the local gas utility has stated that the calorific value of the gas is 1025 BTU.

Multiplying the ninety (90) cubic feet by 1025 BTU gives us an input of 92,250 BTUH.

Checking the BTU input on the rating plate of the furnace being tested.

EXAMPLE: GUCA090AX40

INPUT: 92,000 BTU/HR

OUTPUT CAP: 84,000

Should the figure you calculated not fall within five (5) percent of the nameplate rating of the unit, adjust the gas valve pressure regulator or resize orifices.



ALWAYS CONNECT A MANOMETER TO THE 1/8" PIPE TAP AT THE GAS VALVE BEFORE ADJUSTING THE PRESSURE REGULATOR. IN NO CASE SHOULD THE FINAL MANIFOLD PRESSURE VARY MORE THAN PLUS OR MINUS .3 INCHES WATER COLUMN FROM 3.5 INCHES WATER COLUMN FOR NATURAL GAS OR 10 INCHES WATER COLUMN FOR PROPANE GAS.

To adjust the pressure regulator on the gas valve, turn down (clockwise) to increase pressure and input, and out (counterclockwise) to decrease pressure and input.

Since normally propane gas is not installed with a gas meter, clocking will be virtually impossible. The gas orifices used with propane are calculated for 2500 BTU gas and with proper inlet pressures and correct piping size, full capacity will be obtained.

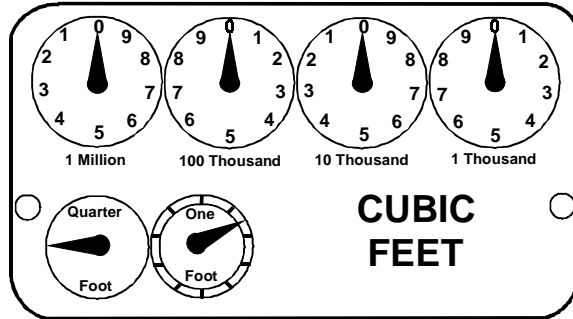
With propane gas, no unit gas valve regulator is used; however, the second stage supply line pressure regulator should be adjusted to give 11" water column with all other gas consuming appliances running.

The dissipation of the heat transferred to the heat exchanger is now controlled by the amount of air circulated over its surface.

The amount (CFM) of air circulated is governed by the external static pressure in inches of water column of duct work, cooling coil, registers and etc., applied externally to the unit versus the motor speed tap (direct drive) or pulley adjustments of the motor and blower (belt drive).

A properly operating unit must have the BTU input and CFM of air, within the limits shown to prevent short cycling of the equipment. As the external static pressure goes up, the temperature rise will also increase. Consult the proper tables for temperature rise limitation.

SERVICING



GAS RATE - CUBIC FEET PER HOUR

GAS RATE -- CUBIC FEET PER HOUR

Seconds for One Revolution	Size of Test Dial					Seconds for One Revolution	Size of Test Dial				
	1/4 cu/ft	1/2 cu/ft	1 cu/ft	2 cu/ft	5 cu/ft		1/4 cu/ft	1/2 cu/ft	1 cu/ft	2 cu/ft	5 cu/ft
10	90	180	360	720	1800	36	25	50	100	200	500
11	82	164	327	655	1636	37	--	--	97	195	486
12	75	150	300	600	1500	38	23	47	95	189	474
13	69	138	277	555	1385	39	--	--	92	185	462
14	64	129	257	514	1286	40	22	45	90	180	450
15	60	120	240	480	1200	41	--	--	--	176	439
16	56	113	225	450	1125	42	21	43	86	172	429
17	53	106	212	424	1059	43	--	--	--	167	419
18	50	100	200	400	1000	44	--	41	82	164	409
19	47	95	189	379	947	45	20	40	80	160	400
20	45	90	180	360	900	46	--	--	78	157	391
21	43	86	171	343	857	47	19	38	76	153	383
22	41	82	164	327	818	48	--	--	75	150	375
23	39	78	157	313	783	49	--	--	--	147	367
24	37	75	150	300	750	50	18	36	72	144	360
25	36	72	144	288	720	51	--	--	--	141	355
26	34	69	138	277	692	52	--	--	69	138	346
27	33	67	133	265	667	53	17	34	--	136	340
28	32	64	129	257	643	54	--	--	67	133	333
29	31	62	124	248	621	55	--	--	--	131	327
30	30	60	120	240	600	56	16	32	64	129	321
31	--	--	116	232	581	57	--	--	--	126	316
32	28	56	113	225	563	58	--	31	62	124	310
33	--	--	109	218	545	59	--	--	--	122	305
34	26	53	106	212	529	60	15	30	60	120	300
35	--	--	103	206	514						

SERVICING

Complaint	No Heat		Unsatisfactory Heat					Test Method Remedy	See Service Procedure Reference		
	SYMPTOM										
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE"											
	System Will Not Start	Burner Won't Ignite	Burner Ignites-Locks Out	Burner Shuts Off prior to T Stat being Satisfied	Short Cycles	Long Cycles	Soot and /or Fumes	To Much Heat	Not Enough Heat		
Power Failure	•									Test Voltage	S-1
Blown Fuse	•									Test Voltage	S-4
Loose Connection	•									Check Wiring	S-2
Shorted or Broken Wires	•									Check Wiring	S-3
No Low Voltage	•									Check Transformer	S-4
Faulty Thermostat	•				•	•		•		Check Thermostat	S-3
Faulty Transformer	•									Check Transformer	S-4
Poor or High Resistance Ground			•							Measure Ground Resistance	S-21
Improper Heat Anticipator Setting					•	•		•	•	Adjust Heat Anticipator Setting	S-3
Improper Thermostat Location					•	•		•	•	Relocate Thermostat	
Faulty Limit or Roll Out Switch		•		•						Test Control	S-5 & 22
Faulty Flame Sensor			•							Test Flame Sensor	S-21
Faulty Ignition Control		•	•							Test Control	S-20
Gas Valve or Gas Supply Shut Off		•								Turn Valves to On Position	S-9
Faulty Induced Draft Blower		•					•			Test Blower	S-7 & 17
Broken or Shorted Igniter		•								Test Igniter	S-19
Dirty Flame Sensor, Low uA			•							Clean Flame Sensor	S-21
Flame Sensor not in Flame, Low uA			•							Test/Adjust Position of Flame Sensor	S-21
Faulty Gas Valve		•					•		•	Replace Gas Valve	S-9
Open Auxiliary Limit		•		•						Reset Control	S-6
Improper Air Flow or Distribution				•					•	Check Duct Static	S-15
Cycling on Limit				•	•				•	Check Controls & Temperature Rise	S-5 & 16
Delayed Ignition							•			Test for Delayed Ignition	S-13
Flashback							•			Test for Flashback	S-14
Orifice Size							•	•	•	Check Orifices	S-11
Gas Pressure		•					•	•	•	Check Gas Pressure	S-12
Cracked Heat Exchanger							•			Check Burner Flames	S-10
Sooted Heat Exchanger			•		•		•		•	Check Flue Negative Pressure / Replace Heat Exchanger	S-10 & 23
Stuck Gas Valve		•					•	•		Replace Gas Valve	S-9
Furnace Undersized									•	Replace with Proper Size Furnace	
Faulty Pressure Switch		•	•	•						Test Pressure Switch	S-17
Blocked or Restricted Flue							•			Check Flue Negative Pressure	S-17
Blocked or Restricted Drain							•			Check Coil Cover Negative Pressure	S-17
Blocked or Restricted Recuperator Coil							•			Check Coil Cover Negative Pressure	S-17
Open Roll Out Switch		•	•							Test Control	S-22
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SERVICING

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SERVICING

S-1 CHECKING VOLTAGE

Disconnect Electrical Power Supply:

1. Remove blower compartment door from furnace to gain entry to Junction Box.
2. Remove cover from Junction Box to gain access to incoming power lines.

With Power ON:



LINE VOLTAGE NOW PRESENT.

3. Using a voltmeter, measure the voltage across the hot and neutral connections.
4. No reading - indicates open wiring, open fuse, no power, or etc. from unit to fused disconnect service. Repair as needed.
5. With ample voltage at line voltage connectors, energize the furnace circulator blower motor.

Note: To energize the furnace, the Door Interlock Switch must be engaged at this point.

6. With the blower motor in operation, the voltage should be 115 volts \pm 10 percent.
7. If the reading falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company of the condition.
8. After completing check and/or repair, replace Junction Box cover and reinstall blower compartment door.
9. Turn on electrical power and verify proper unit operation.

S-2 CHECKING WIRING



Disconnect Electrical Power Supply:

1. Check wiring visually for signs of overheating, damaged insulations and loose or corroded connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with AWM, 105°C. 4/64 thick insulation of the same gauge or its equivalent.

S-3 CHECKING THERMOSTAT, WIRING, AND ANTICIPATOR

S-3A Thermostat and Wiring



Disconnect Electrical Power Supply:

1. Remove blower compartment door to gain access to the thermostat low voltage wires located at the furnace integrated control module terminals.
2. Remove the thermostat low voltage wires at the furnace integrated control module terminals.
3. Jumper terminals R to W on the integrated control module.

With Power ON (and Door Interlock Switch closed):



LINE VOLTAGE NOW PRESENT.

3. Induced Draft Motor must run and pull in pressure switch.
4. If the hot surface ignitor heats and approximately 17 seconds (White-Rodgers Integrated Control) or 7 seconds (Heatcraft Integrated Control) later the gas valve opens and the burners ignite, the trouble is in the thermostat or wiring.
5. With power off, check the continuity of the thermostat and wiring. Repair or replace as necessary.

If the furnace is an air conditioning model and wired for same, proceed as follows.

6. With power off, Jumper terminals R to Y.
7. Turn on the power
8. If the furnace blower motor starts and the condensing unit runs, then the trouble is in the thermostat or wiring. Repair or replace as necessary.
9. After completing check and/or repair of wiring and check and/or replacement of thermostat, reinstall blower compartment door.
10. Turn on electrical power and verify proper unit operation.

S-3B Heating Anticipator

The heating anticipator is a wire wound adjustable heater which is energized during the "ON" cycle to help prevent overheating of the conditioned space.

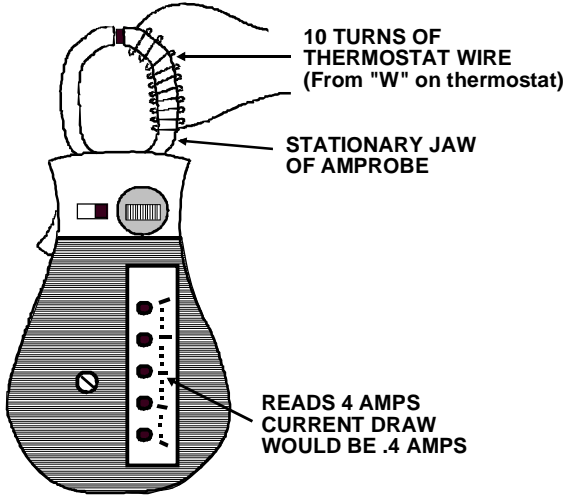
The anticipator is a part of the thermostat and if it should fail for any reason, the thermostat must be replaced.

The heating anticipator setting for the furnaces covered in this manual are listed in the following chart.

SERVICING

GUCA / GCCA	
Ignition Control	Heat Anticipator Setting
White-Rodgers 50A55-288	.70 amps
Heatcraft HSI-2	.70 amps

If the anticipator current draw is unknown, then an amp draw should be taken to determine the anticipator setting. Use an amprobe as shown below. Wrap 10 turns of thermostat wire around the stationary jaw of the amprobe and divide the reading by 10.



Checking Heating Anticipator Amp Draw

S-3C Cooling Anticipator

The cooling anticipator is a small heater (resistor) in the thermostat. During the "OFF" cycle it heats the bimetal element helping the thermostat call for the next cooling cycle. This prevents the room temperature from rising too high before the system is restarted. A properly sized anticipator should maintain room temperature within 1 1/2 to 2 degrees range.

The anticipator is fixed in the subbase and is not to be replaced. If the anticipator should fail for any reason, the subbase must be changed.

S-4 CHECKING TRANSFORMER AND CONTROL CIRCUIT

A step-down transformer 120 volt primary to 24 volt secondary, 40 VA (Heating and Cooling Models) supplies ample capacity of power for either operation.



WARNING

Disconnect Electrical Power Supply:

1. Remove blower compartment door to gain access to the thermostat low voltage wires located at the furnace integrated control module terminals.
2. Remove the thermostat low voltage wires at the furnace integrated control module terminals.

With Power On (and Door Interlock Switch Closed):



WARNING

LINE VOLTAGE NOW PRESENT.

3. Use a voltmeter, check voltage across terminals R and C. Must read 24 VAC.
4. No voltage indicates faulty transformer, open fuse, bad wiring, bad splice, or open door interlock switch.
5. Check transformer primary voltage at incoming line voltage connections, fuse, splices, and blower door interlock switch.
6. If line voltage is available to the primary side of transformer and not at secondary side, the transformer is inoperative. Replace.
7. After completing check and/or replacement of transformer and check and/or repair of control circuit, reinstall blower compartment door.
8. Turn on electrical power and verify proper unit operation.

S-5 CHECKING PRIMARY LIMIT CONTROL

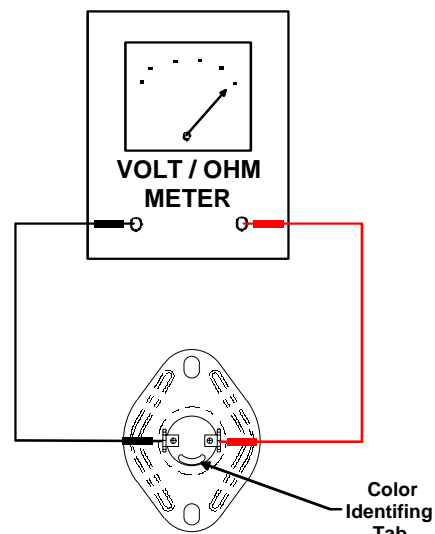
Furnaces using the WR50A55 or HSI-2 integrated ignition control use a, preset nonadjustable, automatic reset Klixon type limit control part number 201629__.



WARNING

Disconnect Electrical Power Supply:

1. Remove burner compartment door to gain access to the primary limit control.
2. Remove low voltage wires at limit control terminals.
3. With an ohmmeter, test between these two terminals (see limit figure below). Should read continuous unless heat exchanger temperature is above limit control setting. If not as above, replace the control.



Testing Primary Limit Control

SERVICING

- After completing check and/or replacement of primary limit control, reinstall burner compartment door.
- Turn on electrical power and verify proper unit operation

To aid in identifying these controls, these controls have a color coded marking on them. Refer to the following chart for temperature settings and color codes.

T.O.D. PRIMARY LIMIT (201629 _)							
Part Number	01	02	03	04	05	06	07
Open Setting	210	220	160	150	145	170	155
Color Code(s)	Red	Green	Blue	Brown	Yellow	White	Orange
GUCA045AX30				1			
GUCA070AX30				1			
GUCA070AX40			1				
GUCA090AX40				1			
GUCA090AX50				1			
GUCA115AX50				1			
GCCA045AX30						1	
GCCA070AX30						1	
GCCA070AX40						1	
GCCA090AX40				1			
GCCA090AX50						1	
GCCA115AX50							1

S-6 CHECKING AUXILIARY LIMIT CONTROL

Both the GUCA and GCCA furnaces use an additional limit switch required for safety control of high temperature within the furnace or duct work.

This control is preset, nonadjustable manual reset, control mounted in the blower compartment area. The auxiliary limit control is mounted on the blower deck of the GUCA, and on the blower housing of the GCCA.

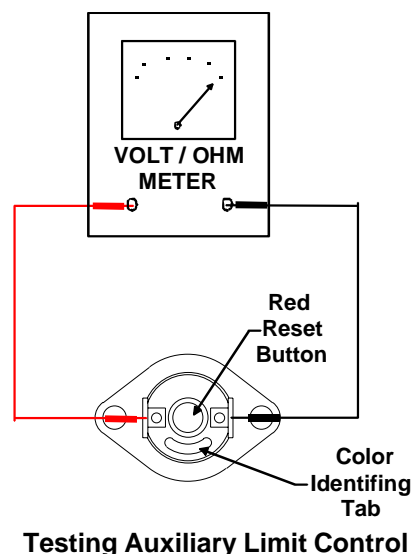
It is connected in series with the primary limit control wiring to the integrated ignition control. If its temperature should be exceeded, it will open, interrupting the voltage to the gas valve causing it to close.



WARNING

Disconnect Electrical Power Supply:

- Remove blower compartment door to gain access to the auxiliary limit control located in the furnace blower compartment area.
- Remove the wires from the auxiliary limit control terminals.
- Use an ohmmeter, test for continuity across the two terminals (see auxiliary limit control figure below). No reading indicates the control is open. Push the red reset button, test again - if still open, replace the control.



To aid in identifying these controls, color coded labels are attached to the back of the controls. Refer to the chart below for temperature settings, color codes and the number of controls used on each unit.

AUXILLARY LIMIT SWITCHES (101235 _)				
Part Number	06	16	18	19
Open Setting (°F)	160	150	170	160
Color Code(s)	Orange	Red	Blue	Pink
GUCA045AX30		1		
GUCA070AX30		1		
GUCA070AX40		1		
GUCA090AX40		1		
GUCA090AX50		1		
GUCA115AX50	1			
GCCA045AX30				2
GCCA070AX30				2
GCCA070AX40			2	
GCCA090AX40				2
GCCA090AX50			2	
GCCA115AX50				2

- After completing check and/or repair of auxiliary limit control, reinstall blower access door.
- Reapply power and verify proper operation of the furnace.

S-7 CHECKING BLOWER MOTOR



WARNING

Disconnect Electrical Power Supply:

- Remove blower compartment door to gain access to the circulator blower motor.
- Disconnect the motor wire leads from its connection point at integrated control module and capacitor if applicable.
- Using an ohmmeter, test for continuity between each of the motor leads.
- Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

SERVICING

If the windings do not test continuous or a reading is obtained from lead to ground, replace the motor.

5. After completing check and/or replacement of blower motor, reinstall blower compartment door.
6. Turn on electrical power and verify proper unit operation.

S-8 CHECKING CAPACITOR

The direct drive motors are of the permanent split capacitor design. A run capacitor is wired across the auxiliary and a portion of the main windings. The capacitor's primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor to the load.

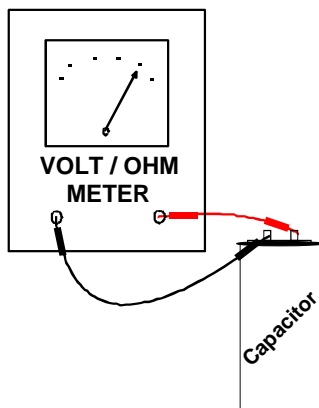


WARNING

DISCHARGE CAPACITOR THROUGH A 20 TO 30 OHM RESISTOR BEFORE HANDLING

Two quick ways to test a capacitor are a resistance and a capacitance check. Refer to the next two figures for proper meter connections for the resistance and capacitance testing of the capacitor.

S-8A Resistance Check



Testing Capacitor Resistance



WARNING

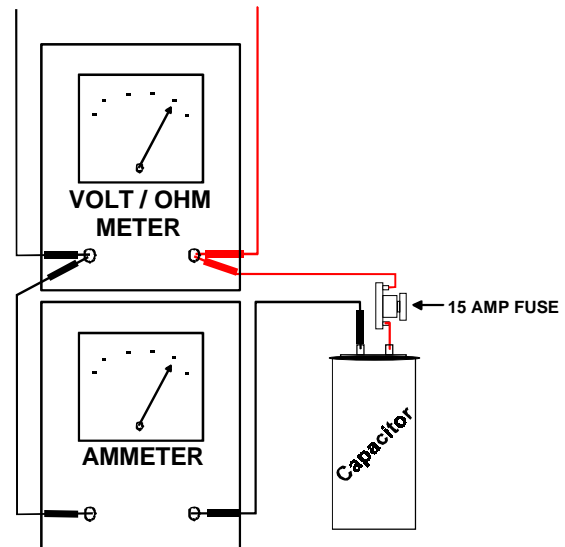
Disconnect Electrical Power Supply:

1. Remove blower compartment door to gain access to capacitor.
2. Discharge capacitor and remove wire leads.
3. Set an ohmmeter on its highest ohm scale and connect the leads to the capacitor.

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- a. Good Condition - indicator swings to zero and slowly returns toward infinity.
- b. Shorted - indicator swings to zero and stops there - replace.
- c. Open - no reading - replace. Reverse leads. Check again no reading - replace.
- d. Reverse leads and recheck.

S-8B Capacitance Test



Testing Capacitance

With power On (and Door Interlock Switch closed):



WARNING

LINE VOLTAGE NOW PRESENT.

Using a hook-up as shown above, take the amperage and voltage readings and use them in the formula:

Capacitance (MFD) = $2650 \times \text{Amperage} / \text{Voltage}$

4. After completing check and/or replacement of capacitor, reinstall blower compartment door.
5. Turn on electrical power and verify proper unit operation.

S-9 CHECKING GAS VALVE (Redundant)

A combination redundant operator type gas valve which provides all manual and automatic control functions required for gas fired heating equipment is used.

The valve provides control of main burner gas flow, pressure regulation, and 100 percent safety shut-off.



WARNING

Disconnect Electrical Power and Shut Off Gas Supply:

1. Remove burner compartment door to gain access to gas valve.

SERVICING

- Next, remove wire connections from gas valve terminals.
- Using an ohmmeter, test across the gas valve coil terminals M1 and C2.

Note: Make sure gas valve switch is in the "ON" position when taking reading.

- Should read approximately 100 Ohms for the White-Rodgers 36E22 gas valve.

If not as above, replace the entire gas valve.

- After check and/or replacement of gas valve, turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
- Turn on electrical power and verify proper unit operation.

S-10 CHECKING MAIN BURNERS

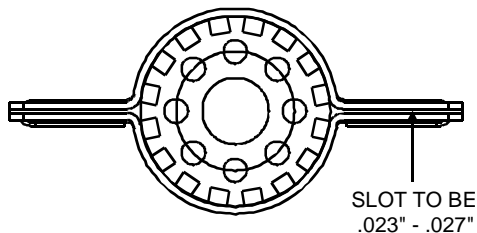
The main burners are used to provide complete combustion of various fuels in a limited space, and transfer this heat of the burning process to the heat exchanger.

Proper ignition, combustion, and extinction are primarily due to burner design, orifice sizing, gas pressure, primary and secondary air, vent and proper seating of burners.



Disconnect Electrical Power and Shut Off Gas Supply:

- Remove burner compartment door to gain access to manifold assembly.
- Remove the entire manifold assembly from the front of the heat exchanger assembly.
- Check main burners for signs of rust, oversized and undersized carryover ports or restrictions of foreign material, etc. Refer to the following figure for the proper dimension of the carryover ports.



GUCA / GCCA Beckett Burner

- After completing check, repair and/or replacement of main burners, reinstall manifold assembly to front of heat exchanger.
- Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
- Turn on electrical power and verify proper unit operation.

S-11 CHECKING ORIFICES

A predetermined fixed gas orifice is used in all of these furnaces. That is an orifice which has a fixed bore and position.

No resizing should be attempted until all factors are taken into consideration such as inlet manifold gas pressure, alignment, positioning, specific gravity and BTU content of the gas being consumed.

The only time resizing is required is when a reduction in firing rate is required for an increase in altitude.

Orifices should be treated with care in order to prevent damage. They should be removed and installed with a box-end wrench in order to prevent distortion. In no instance should an orifice be peened over and redrilled. This will change the angle or deflection of the vacuum effect or entraining of primary air, which will make it difficult to adjust the flame properly. This same problem can occur if an orifice spud of a different length is substituted.

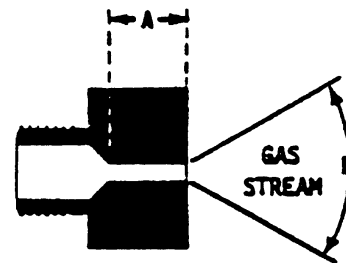


Disconnect Electrical Power and Shut Off Gas Supply:

- Remove top access door to gain access to the manifold assembly.
- Remove manifold from burner bracket.
- Check orifice visually for distortion and/or burrs.
- Check orifice size with orifice sizing drills.

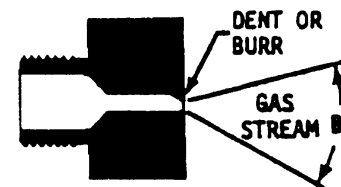
Note: It may be necessary to remove orifices from manifold to view more clearly.

- If resizing is required, a new orifice of the same physical size and angle with proper drill size opening should be installed.



The length of Dimension "A" determines included angle of Spray "B".

A dent or burr will cause severe deflection of gas stream.



SERVICING

- After check and/or replacement of orifice(s) reinstall manifold to burner bracket.
- Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
- Turn on electrical power and verify proper unit operation.

S-12 CHECKING GAS PRESSURE

Gas Supply Pressure Measurement



To prevent unreliable operation or equipment damage, the inlet gas supply pressure must be as specified on the unit rating plate with all other household gas fired appliances operating.

Gas inlet and manifold pressures should be checked and adjusted in accordance to the type of fuel being consumed.

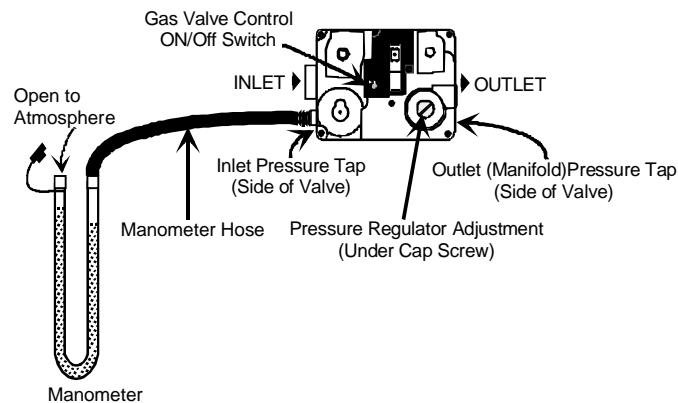
The line pressure supplied to the gas valve must be within the range specified below. The supply pressure can be measured at the gas valve inlet pressure tap or at a hose fitting installed in the gas piping drip leg. The supply pressure must be measured with the burners operating. To measure the gas supply pressure, use the following procedure.



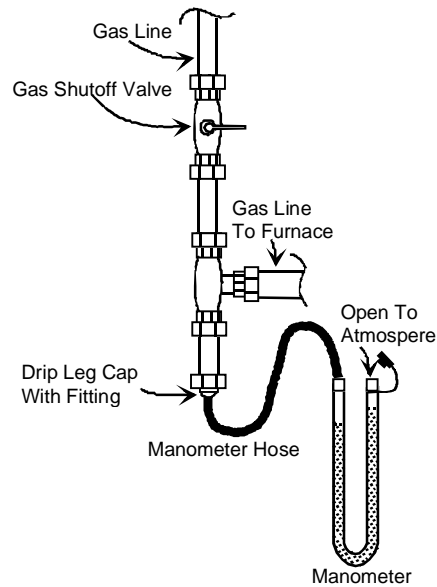
Disconnect Electrical Power and Shut Off Gas Supply:

- After turning off gas to furnace at the manual gas shutoff valve external to the furnace, remove burner compartment door to gain access to the gas valve.
- Connect a calibrated water manometer (or appropriate gas pressure gauge) at either the gas valve inlet pressure tap or the gas piping drip leg as shown in the following two figures.

Note: At either location, a hose fitting must be installed prior to making the hose connection.



Measuring Inlet Gas Pressure (Gas Valve Tap)



Measuring Inlet Gas Pressure (Alternate Method)

- Turn ON the gas and electrical power supply and operate the furnace and all other gas consuming appliances on the same gas supply line.
- Measure furnace gas supply pressure with burners firing. Supply pressure must be within the range specified in the table below.

Inlet Gas Supply Pressure	
Natural Gas	Minimum:5.0" W.C. Maximum :10.0" W.C.
Propane Gas	Minimum:11.0" W.C. Maximum :13.0" W.C.

If supply pressure differs from above, make necessary adjustments to pressure regulator, gas piping size, etc., and/or consult with local gas utility.



Disconnect Electrical Power and Shut Off Gas Supply:

- Disconnect manometer after turning off gas at manual shutoff valve. Reinstall plug before turning on gas to furnace.
- Turn OFF any unnecessary gas appliances started in step 3.
- Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
- Turn on electrical power and verify proper unit operation.

SERVICING

Gas Manifold Pressure Measurement and Adjustment



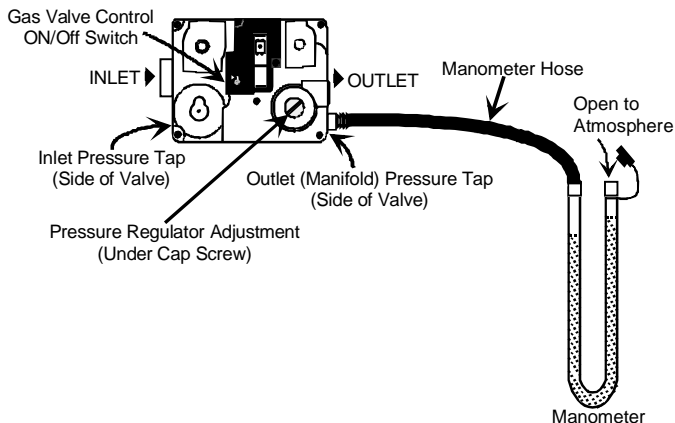
To prevent unreliable operation or equipment damage, the gas manifold pressure must be as specified on the unit rating plate. Only minor adjustments should be made by adjusting the gas valve pressure regulator.

Only small variations in gas pressure should be made by adjusting the gas valve pressure regulator. The manifold pressure must be measured with the burners operating. To measure and adjust the manifold pressure, use the following procedure.



Disconnect Electrical Power and Shut Off Gas Supply:

1. After turning off gas to furnace at the manual gas shutoff valve external to the furnace, remove burner compartment door to gain access to the gas valve.
2. Connect a calibrated water manometer (or appropriate gas pressure gauge) at the gas valve outlet pressure tap as shown in the following figure.



**Measuring Manifold Gas Pressure
(Gas Valve Tap)**

3. Turn ON the gas and electrical power supply and operate the furnace.
4. Measure gas manifold pressure with burners firing. Adjust manifold pressure using the table below.

Manifold Gas Pressure	
Natural Gas	3.5" w.c.
Propane Gas	10.0" w.c.

The final manifold pressure must not vary more than ± 0.3 " w.c. from the above specified pressures. Any necessary major changes in gas flow rate should be made by changing the size of the burner orifice.

5. To adjust the gas valve pressure regulator, remove the regulator cap.

6. Turn the adjustment screw clockwise to increase the pressure, or counterclockwise to decrease the pressure.
7. Securely replace the regulator cap.



Disconnect Electrical Power and Shut Off Gas Supply:

8. Disconnect manometer after turning off gas at manual shutoff valve. Reinstall gas valve outlet pressure tap plug before turning on gas to furnace.
9. Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
10. Turn on electrical power and verify proper unit operation.

S-13 CHECKING FOR DELAYED IGNITION

Delayed ignition is a delay in lighting a combustible mixture of gas and air which has accumulated in the combustion chamber.

When the mixture does ignite, it may explode and/or rollout causing burning in the burner venturi.

If delayed ignition should occur, the following should be checked:

1. Improper gas pressure - adjust to proper pressure. (See *SERVICING* section S-12)
2. Improper burner positioning - burners should be in locating slots, level front to rear and left to right.
3. Carry over (lighter tube or cross lighter) obstructed - clean.
4. Main burner orifice(s) deformed, or out of alignment to burner - replace.

S-14 CHECKING FOR FLASH-BACK

Flash-back will also cause burning in the burner venturi, but is caused by the burning speed being greater than the gas-air flow velocity coming from a burner port.

Flash-back may occur at the moment of ignition, after a burner heats up or when the burner turns off. The latter is known as extinction pop.

Since the end results of flash-back and delayed ignition can be the same (burning in the burner venturi) a definite attempt should be made to determine which has occurred.

If flash-back should occur, check for the following:

1. Improper gas pressure - adjust to proper pressure. (See *SERVICING* section S-12).
2. Check burner for proper alignment and/or replace burner (See *SERVICING* section S-10).
3. Improper orifice size - check orifice for obstruction. (See *SERVICING* section S-11).

SERVICING

S-15 CHECKING DUCT STATIC

The maximum and minimum allowable external static pressures are found in the specification section. These tables also show the amount of air being delivered at a given static by a given motor speed or pulley adjustment.

The furnace motor cannot deliver proper air quantities (CFM) against statics other than those listed.

Too great of an external static pressure will result in insufficient air that can cause excessive temperature rise, resulting in limit tripping, etc. Whereas not enough static may result in motor overloading.

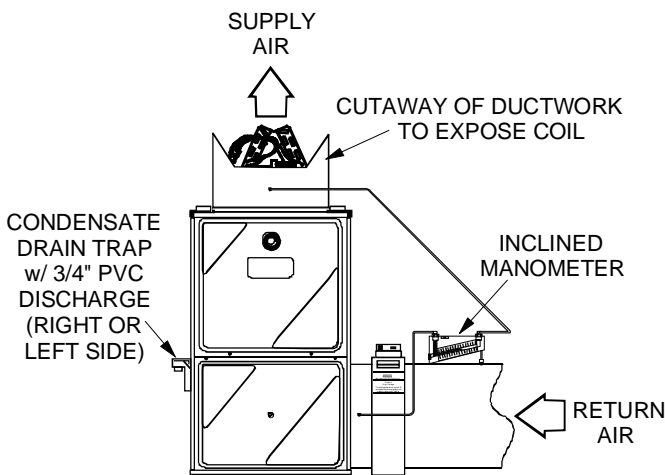
To determine proper air movement, proceed as follows:

1. With clean filters in the furnace, use a draft gauge (inclined manometer) to measure the static pressure of the return duct at the inlet of the furnace. (Negative Pressure)
2. Measure the static pressure of the supply duct. (Positive Pressure)
3. Add the two (2) readings together for total external static pressure.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired. If an air conditioning coil or Electronic Air Cleaner is used in conjunction with the furnace, the readings must also include these components. Refer to the following figure.

4. Consult proper airflow tables in *BLOWER PERFORMANCE SPECIFICATIONS* section of this manual or Specifications Sheet for the quantity of air.

If the total external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, registers, undersized and/or oversized poorly laid out duct work.

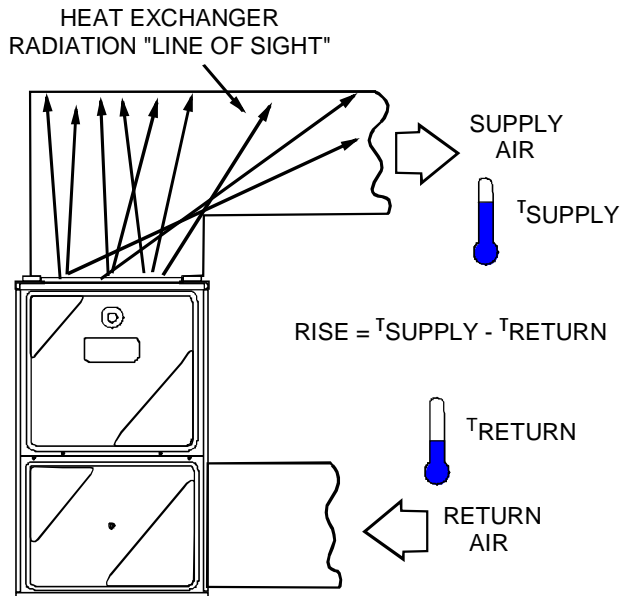


Checking Static Pressure

S-16 CHECKING TEMPERATURE RISE

The more air (CFM) being delivered through a given furnace, the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given furnace specifications and its external static pressure. An incorrect temperature rise may result in condensing in or overheating of the heat exchanger. An airflow and temperature rise table is provided in the blower performance specification section. Determine and adjust temperature rise as follows:

1. Operate furnace with burners firing for approximately ten minutes. Check BTU input to furnace - do not exceed input rating stamped on rating plate. Ensure all registers are open and all duct dampers are in their final (fully or partially open) position.
2. Place thermometers in the return and supply ducts as close to the furnace as possible. Thermometers must not be influenced by radiant heat by being able to "see" the heat exchanger.



Checking Temperature Rise

3. Subtract the return air temperature from the supply air temperature to determine the air temperature rise. Allow adequate time for thermometer readings to stabilize.
4. Adjust temperature rise by adjusting the circulator blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise. Refer to *Circulator Blower Speed* section in the *PRODUCT DESIGN* section of this manual for speed changing details. Temperature rise is related to the BTUH output of the furnace and the amount of air (CFM) circulated over the heat exchanger. Take motor amperage draw to determine that the motor is not overloaded during adjustments.

SERVICING

PRESSURE SWITCH TRIP POINTS AND USAGE CHART

MODEL	NEGATIVE PRESSURE WITH FLUE NOT FIRING TYPICAL SEA LEVEL DATA	NEGATIVE PRESSURE WITH FLUE FIRING TYPICAL SEA LEVEL DATA	NEGATIVE PRESSURE COIL COVER NOT FIRING TYPICAL SEA LEVEL DATA	NEGATIVE PRESSURE COIL COVER FIRING TYPICAL SEA LEVEL DATA	PRESSURE SWITCH TRIP POINTS AND USAGE					
					0 to 7,000 ft.			7,001 to 11,000 ft.		
					TRIP POINT COIL COVER PRESSURE SWITCH	TRIP POINT ID MOTOR PRESSURE SWITCH	PRESSURE SWITCH	TRIP POINT COIL COVER PRESSURE SWITCH	TRIP POINT ID MOTOR PRESSURE SWITCH	HIGH ALTITUDE KIT
GUCA045AX30 GCCA045AX30	-1.00	-1.05	-0.65	-1.10	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307
GUCA070AX30 GCCA070AX30	-0.80	-0.95	-0.60	-1.10	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307
GUCA070AX40 GCCA070AX40	-0.70	-0.85	-0.80	-1.30	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307
GUCA090AX40 GCCA090AX40	-0.60	-0.75	-0.80	-1.30	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307
GUCA090AX50 GCCA090AX50	-0.60	-0.85	-0.80	-1.30	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307
GUCA115AX50 GCCA115AX50	-0.60	-0.85	-1.40	-1.90	-0.37	-0.37	PROD.	-0.37	-0.16	HAPS27 20197307

Note: All installations above 7,000 ft. require a pressure switch change. For installations in Canada the Amana 90% furnace is certified only to 4500.ft.

Note: Replacement pressure switch number is listed below high altitude kit number.

Note: Minimum negative pressure required to activate the pressure switch is -0.52" w.c.

SERVICING

S-17 CHECKING PRESSURE CONTROL

A pressure control device is used to measure negative pressure at the induced draft blower motor inlet to detect a partial or blocked flue and also a pressure control device is used to measure negative pressure at the recuperator coil cover to detect a partial or blocked recuperator coil or drain.

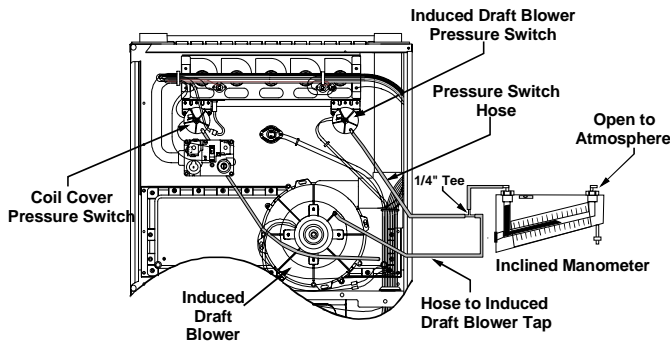


Disconnect Electrical Power Supply:

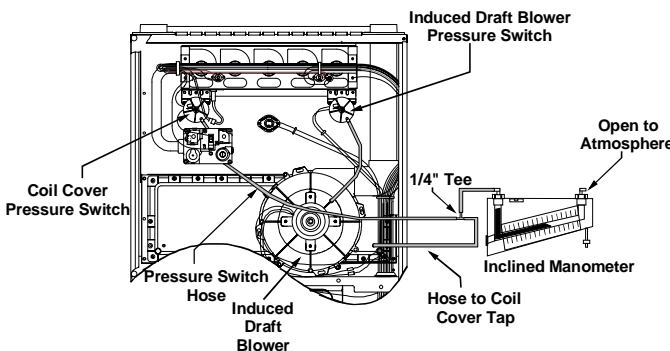
1. Remove burner compartment door to gain access to pressure switches.
2. Remove wires from the two electrical terminals on each switch.
3. Using a VOM check from common terminal to NO (Normally Open) - should read open.

If switches read as above proceed to Step 4, otherwise replace control.

4. Remove the pressure control hose from the control and interconnect with an inclined manometer as shown in the following illustration:



**ID Blower Pressure Switch
Negative Pressure Measurement
(Upflow Shown - Counterflow Similar)**



**Coil Cover Pressure Switch
Negative Pressure Measurement
(Upflow Shown - Counterflow Similar)**

5. Reconnect wires YL-20 to C (Common) and OR-22 to NO (Normally Open) terminals on ID Blower Pressure Switch and GY-34 to C (Common) and GY-12 to NO (Normally Open) terminals on Coil Cover Pressure Switch. Refer to wiring diagram for proper wire connections.

With Power ON:



LINE VOLTAGE NOW PRESENT.

6. Energize furnace for heating cycle. The induced draft blower motor will begin to run. The inclined manometer for the induced draft blower pressure switch should read approximately negative **0.60" to 1.00" w.c.** and the inclined manometer for the coil cover pressure switch should read approximately negative **0.65" to 1.40" w.c.** with no combustion. Refer to the chart on page 67 for pressure switch usage and trip points.
7. Remove and check the electrical wires using the VOM, check from Common to NO (Normally Open) - should read closed.

If not as above, replace control.

8. Reconnect all wires to each control and place in a heating cycle.
9. Begin to restrict the flue outlet until the pressure control trips - cycling OFF the burner. Also a blocked drain test will need to be performed until the coil cover pressure control trips - cycling OFF the burner. The trip points should be as shown on the page 67.
10. If not as listed, replace control.
11. After check and/or replacement of pressure switch(es), reinstall burner compartment door and verify proper unit operation.

The "ID Blower" pressure control is a safety device to prevent the combustion cycle from occurring with inadequate venting caused by a restricted or blocked vent pipe, or too many effective feet of vent pipe.

The "Coil Cover" pressure control is a safety device to prevent the combustion cycle from occurring due to a restricted or blocked recuperator coil or drain.

The pressure readings listed in the Pressure Switch Usage and Trip Point table on page 67 must be adhered to for proper operation.

S-18 HIGH ALTITUDE APPLICATION (USA)

For those altitudes starting at 7000 feet and above, it may be necessary to replace the induced draft blower pressure switch and orifices. The coil cover pressure switch does not need to be changed.

These changes are required to compensate for the reduction in atmospheric pressure (less available air for combustion) as the altitude increases.

SERVICING

The following chart give the orifice drill size and high altitude kit required for different elevations.

High altitude pressure switches and kits are listed on the page 67 in the Pressure Switch Usage and Trip Point Chart.

Note: In Canada, gas furnaces are certified only to 4500 feet.

ORIFICE SIZE AND HIGH ALTITUDE KIT CHART			
GUCA GCCA	0 to 7,000 ft.	Nat. #43	Original Equipment Factory Installed (uses 10716003 orifices)
GUCA GCCA	7,001 to 9,000 ft.	Nat. #44	HANG11 High Altitude Orifice Kit (uses 10716004 orifices)
GUCA GCCA	7,001 to 11,000 ft.	Nat. #45	HANG12 High Altitude Orifice Kit (uses 10716005 orifices)
GUCA GCCA	0 to 7,000 ft.	Propane #55	LPTK09 Propane Conversion Kit (uses 10716009 orifices)
GUCA GCCA	7,001 to 11,000 ft.	Propane #56	HALP10 High Altitude Orifice Kit (uses 10716010 orifices)

S-19 CHECKING MINI IGNITER

A 120V ceramic/metallic composite mini-igniter is used for ignition. Time to temperature for this igniter is within 5 seconds. The normal operating temperature is approximately 1200° - 1450° C (2192° - 2642°F).



WARNING

Disconnect Electrical Power Supply:

1. Remove burner compartment door to gain access to mini igniter.
2. Igniter cool - approximately 75°F.
3. Disconnect the mini igniter at the two pin connector that connects it to the RD-2 and WH-33 wires from ignition control.
4. Using an ohmmeter measure the resistance of the igniter - should read between 50 to 300 ohms for igniter, Amana part number 20165701, used in initial production GUCA and GCCA models, and 30 to 175 ohms for igniter, Amana part number 20165702, used in later production GUCA and GCCA models.
5. Reconnect igniter.



WARNING

LINE VOLTAGE NOW PRESENT.

6. Place unit in heating cycle, measure current draw of igniter during preheat cycle. Should read approximately 1 amp maximum. The steady state current at 120V is a nominal of .7 plus or minus .3 amps.
7. After check and/or replacement of mini igniter, reinstall burner compartment door and verify proper unit operation.

S-20 CHECKING WHITE-RODGERS 50A55-288 OR HEATCRAFT HSI-2 INTEGRATED IGNITION CONTROL MODULES

Note: Failure to earth ground the furnace, reversing the neutral and hot wire connection to the line (polarity), or a high resistance connection in the neutral line may cause the control to lockout due to failure to sense flame.



WARNING

To avoid the risk of electrical shock, wiring to the unit must be properly polarized and grounded. Disconnect power before performing service listed below.

The ground wire must run from the furnace all the way back to the electrical panel. Proper grounding can be confirmed by disconnecting the electrical power and measuring resistance between the neutral (white) connection and the burner closest to the flame sensor. Resistance should be less than 10 ohms.

The ignition control module is a combination electronic and electromechanical device and is not field repairable. Complete unit must be replaced.

The White-Rodgers 50A55 and Heatcraft HSI-2 ignition controls, control all furnace operations including blower operation in air conditioning. Blower on time delays are controlled by the ignition control and are nonadjustable, see *Circulator Blower Speeds and Blower Heat Delay Timings* sections located in the *Product Design* section of this manual for blower delay information.



WARNING

LINE VOLTAGE NOW PRESENT.

These tests must be completed within a given time frame due to the operation of the ignition control. See *Sequence of Operation* section in the *SYSTEM OPERATION* section of this manual for timing chart.

The ignition control is capable of diagnosing many furnace failures to speed troubleshooting. A flashing red diagnostic indicator light (White-Rodgers 50A55) or a flashing green diagnostic indicator light (Heatcraft HSI-2) flashes a code for any discovered failures. When the control is powered up normally the light will flash once for about one second. This can be used to test for 120 volts and 24 volts to the control since both must be present for the light to flash. If this step fails, check for 120 volts to the control and check the transformer and its associated wiring. If this step is successful give the control a call for heat and wait five (5) seconds or until the furnace goes into lockout. If the control detects a failure it will now be shown on the diagnostic indicator light. Refer to the *Troubleshooting-Diagnostic Charts* in the *SYSTEM OPERATION* section of this manual for more detail on failure codes for each control.

SERVICING

The indicator light may then be viewed by looking through the peep hole in the blower access door. Failure to hold the door switch closed while removing the blower compartment door will result in the loss of the stored failure code. In most cases recycling the ignition control will result in the same failure code originally displayed.

1. Remove the blower compartment door to gain access to the control area.
2. Check for 120 volts from Line 1 (BK-4 wire) to line 2 neutral (WH-5 wire) at the ignition control. No voltage - check the door switch connections and wire harness for continuity.
3. Check for 24 volts from W to C at the thermostat connections on the ignition control. No voltage - check transformer, room thermostat, and wiring.
4. Check for 120 volts to the induced draft blower by measuring voltage between IND (BK-3) and neutral. No voltage - replace ignition control.
5. If voltage is present in Steps 2 through 4 and the induced draft blower is operating, check for 120 volts to the igniter during the preheat cycle. Measure voltage between terminals IGN (RD-2) and neutral. No voltage - check pressure switch.

Note: The *White-Rodgers 50A55* control has an adaptive algorithm that adjusts the duration of igniter warmup for the purpose of extending igniter life. Following application of power, the warmup time will be 17 seconds for the first 64 successful ignitions. Each subsequent warmup time will be decreased by 1 second until flame fails to be achieved (resulting in a retry) or until the minimum of 5 seconds is achieved.

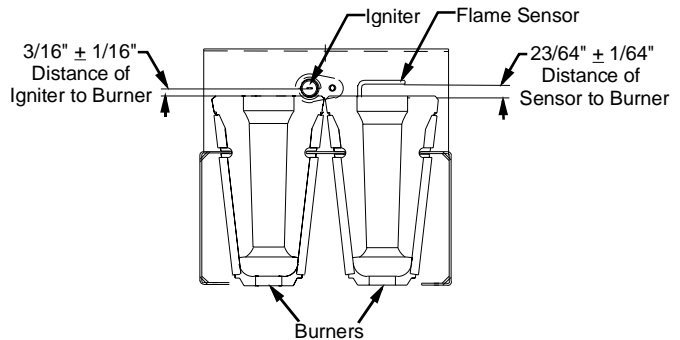
Note: The *Heatcraft HSI-2* ignition control has an initial igniter warmup time of 7 seconds. In the event of a retry, the warmup time will be increased by two seconds and that duration will remain effective until another retry. In which case, the warmup time is again increased by two seconds but never more than 11 seconds. At the end of the heat cycle, the warmup time is reset back to the minimum time setting.

6. After a call for heat begins, check for 24 volts to the gas valve. Voltage will be present only if proof of flame has been established. Measure voltage from Pin 9 MV terminal (BR-13 wire) to Pin 12 MV terminal (GY-12) on the ignition control 12 Pin connector. No voltage - replace ignition control.
7. If proof of flame was established 120 volts will be provided to the air circulation blower 30 seconds after a call for heat. Check for 120 volts from the CIRC-N terminal (WH) wire to the HEAT-H heat terminal on the ignition control. No voltage - replace ignition control.
8. After check and/or replacement of integrated ignition control, reinstall blower compartment door and verify proper unit operation.

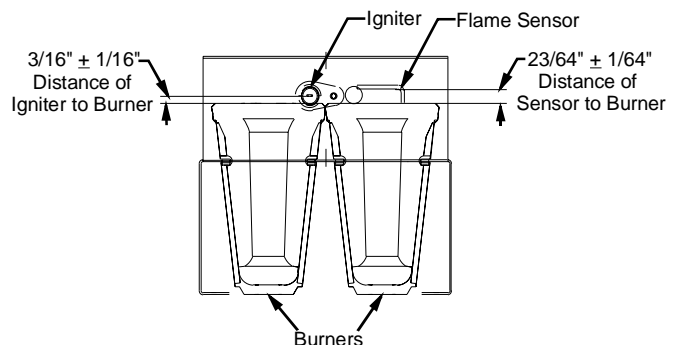
S-21 CHECKING FLAME SENSOR

A flame sensing device is used in conjunction with the ignition control module to prove combustion. If a micro-amp signal is not present the control will deenergize the gas valve and "retry" for ignition or lockout.

The following figures illustrate from a top view, the approximate distances for the igniter and flame sensor to the gas inshot burner. You will note the igniter is not in the main burner stream, but along the carry over port.



Igniter and Flame Sensor Positioning (Upflow Models)



Igniter and Flame Sensor Positioning (Counterflow Models)



Disconnect Electrical Power Supply:

1. Remove burner compartment door to gain access to the flame sensor.
2. Disconnect the flame sensor wire (BU-14) from the flame sensor terminal
3. Connect a micro-amp meter in series with this wire (BU-14) and the flame sensor terminal.
- Be sure the negative side of the meter is to the wire and the positive of the meter is to terminal FP.

With Power ON:



LINE VOLTAGE NOW PRESENT.

4. Place the unit into a heating cycle.
5. As soon as flame is established a micro-amp reading should be evident once proof of flame (micro-amp read-

SERVICING

ing) is established, the hot surface ignitor will be de-energized.

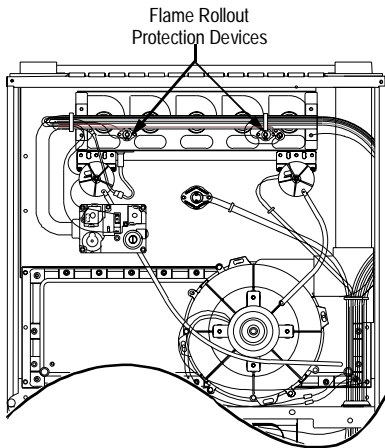
- The micro-amp reading should be 1 to 4 micro-amps. If the micro-amp reading is less than the minimum specified, check for high resistance wiring connections, coated flame sensor, the distance between the sensor and flame ground connections or poor grounding.

Note: Contaminated fuel or combustion air can create a nearly invisible coating on the flame sensor. This coating works as an insulator causing a loss in the flame sense signal. If this situation occurs the flame sensor must be cleaned with emery cloth or steel wool.

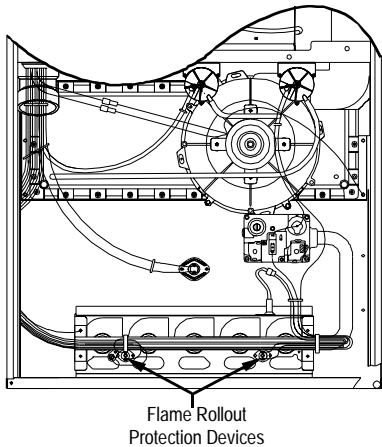
- If absolutely no reading, check for continuity on all components and if good - replace ignition control module.
- After check and/or replacement of flame sensor, reinstall burner compartment door and verify proper unit operation.

S-22 CHECKING FLAME ROLLOUT SWITCH

A temperature activated manual reset control is mounted to the burner bracket on all models as shown in the following two figures.



**Rollout Protection Devices
(Upflow/Horizontal Models)**



**Rollout Protection Devices
(Counterflow/Horizontal Models)**

This control is wired in series with the gas valve. The control is designed to open should a flame roll out occur. An over firing condition or flame impingement on the heat shield may also cause the control to open.

To aid in identifying these controls, color coded labels are attached to the back of these controls. Refer to the following chart for temperature settings, color codes and the number of controls used on each unit.

ROLLOUT LIMT SWITCHES (101235 _)					
Part Number	10	13	14	15	17
Open Setting (°F)	300	350	200	220	210
Color Code(s)	Green	Gray	Yellow	Orange	White
GUCA045AX30			1		
GUCA070AX30			2		
GUCA070AX40					2
GUCA090AX40			2		
GUCA090AX50				2	
GUCA115AX50				2	
<hr/>					
GCCA045AX30					1
GCCA070AX30					2
GCCA070AX40					2
GCCA090AX40				2	
GCCA090AX50				2	
GCCA115AX50					2

If the rollout control has opened the circuit between the ignition control and gas valve will be interrupted. The ignition will cycle and try to light 3 times but will not sense flame and go into lockout.

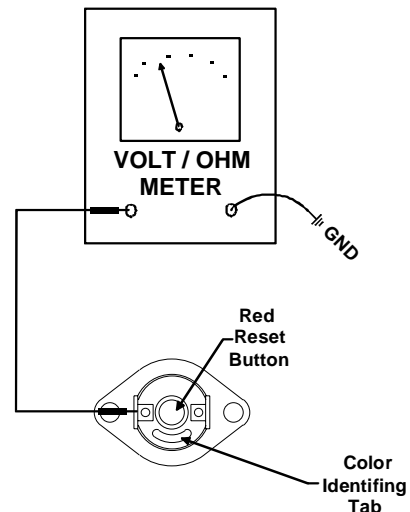


LINE VOLTAGE NOW PRESENT.

- Remove burner compartment door to gain access to the rollout switch(es) mounted to burner bracket.

The servicer should reset the ignition control by opening and closing the thermostat circuit. Then look for the igniter glowing which indicates there is power to the ignition control.

- Measure the voltage between each side of the rollout control and ground during the ignition attempt. Refer to the following figure.



Checking Flame Rollout Switch

SERVICING

- a. If no voltage is measured on either side of control it indicates that either the ignition control or wiring to control is the problem.
 - b. If voltage is measured on one side of the control and not the other it indicates the control is open.
 - c. If voltage is measured on both sides of the control the wiring to gas valve or valve is at fault.
3. After check and/or replacement of rollout switch, reinstall burner compartment door and verify proper unit operation.

S-23 HEAT EXCHANGER ASSEMBLY

With the improvements in the product design of these model furnaces, the Heat Exchanger Assembly, primary and secondary, can now be replaced as a single unit thus eliminating the need to replace the furnace due to defect in either material or workmanship.

The service replacement heat exchanger assemblies contain the complete heat exchanger assembly, primary and secondary, along with three pieces of gasket material that are used between the heat exchanger assembly and the inside rails. There are a total of twelve Heat Exchanger Replacement Kits available for these model furnaces, six for the GUCA models and six for the GCCA models.

The following chart lists the kit number and the model furnace that it is used on.

R Kit #	Used on Models
R9800656	GUCA045AX30
R9800657	GUCA070AX30
R9800658	GUCA070AX40
R9800659	GUCA090AX40
R9800660	GUCA090AX50
R9800661	GUCA115AX50
R9800662	GCCA045AX30
R9800663	GCCA070AX30
R9800664	GCCA070AX40
R9800665	GCCA090AX40
R9800666	GCCA090AX50
R9800667	GCCA115AX50

Note: The following is a brief explanation of the heat exchanger removal and replacement procedures. For complete detailed instructions on the heat exchanger removal and replacement procedures, refer to the installations instructions provided with the Heat Exchanger Replacement Kits listed in the above chart.

Removal of Existing Heat Exchanger:



Disconnect Electrical Power and Shut Off Gas Supply:

Note: Save all components (except existing heat exchanger) and screws removed in the following procedures for reassembly.

1. After electrical power and gas supply have been shut off, remove the burner and blower compartment doors.
2. Remove the gas supply piping from the unit. In order to have proper clearance to remove the heat exchanger assembly, all gas piping needs to be removed from the inner cabinet of the furnace.
3. Disconnect the attached supply ductwork along with the combustion air pipe (Direct Vent Only) and vent/flue pipe from the furnace.

Note: The GCCA model furnace installed in counterflow position will need to be removed from the installation in order to gain access to the screws that attach the top cover assembly to the furnace. To remove the GCCA model furnace, disconnect both the supply and return ductwork connections and the incoming electrical power lines along with the combustion air pipe (Direct Vent Only) and vent/flue pipe from the furnace.

4. Disconnect and remove the condensate drain lines and drain trap.
5. Disconnect and remove the flue couplings and inner vent/flue pipe (GUCA Only) along with rubber elbow (Standard Vent/Flue Connection) or rubber coupling (Alternate Vent/Flue Connection) that are attached to induced draft blower.
6. Remove the top cover assembly from furnace cabinet. This must be removed to gain enough clearance to remove the heat exchanger assembly.
7. Remove the primary limit, manifold assembly and orifice shield, pressure switches and induced draft blower. These components do not have to be unwired since there is enough wire for them to be laid in the blower compartment area out of the way.
8. The final step in removing the heat exchanger assembly is to remove the screws that hold heat exchanger assembly to the inside rails. After removing the screws remove the permagum located in the top and bottom corners of the cabinet that is used to help seal the burner compartment, lift up on heat exchanger assembly and slide out of the cabinet.

SERVICING

Reinstallation of New Heat Exchanger:

Note: Before installing new heat exchanger assembly, inspect gasket along inside rails. If the gasket needs replacing, install the new pieces of gasket supplied with kit.

1. Slide new heat exchanger into cabinet and secure with screws removed in Step 8 of removal procedures. Reinstall the permagum in the top and bottom corners between the heat exchanger and cabinet, that is used to help seal the burner compartment area.
2. Next, reinstall top cover assembly to furnace cabinet that was removed in Step 6 of removal procedures.
3. Reinstall the orifice shield and manifold assembly, pressure switches and induced draft blower removed in Step 7 of removal procedures. Make sure wiring is placed back in side clip and also reattach wires at manifold with wire ties.
4. Reinstall inner vent/flue pipe (GUCA Only) with flue coupling along with rubber elbow (Standard Vent/Flue Connection) or rubber coupling (Alternate Vent/Flue Connection) and attach to induced draft blower removed in Step 5 of removal procedures.
5. Reconnect condensate drain lines to induced draft blower and recuperator cover and then install condensate drain trap removed in Step 4 of removal procedures.

Note: The GCCA model furnace (Counterflow Installations) can now be reinstalled into the installation.

6. Reconnect the attached ductwork along with combustion air pipe (Direct Vent Only) and vent/flue pipe to furnace removed in Step 3 of removal procedures. Also reconnect the incoming electrical power lines (GCCA Counterflow Installations).

7. Reinstall the inner gas supply piping and reconnect to gas supply line removed in Step 2 of removal procedures.



To avoid the possibility of explosion or fire, never use a match or open flames to test for leaks.



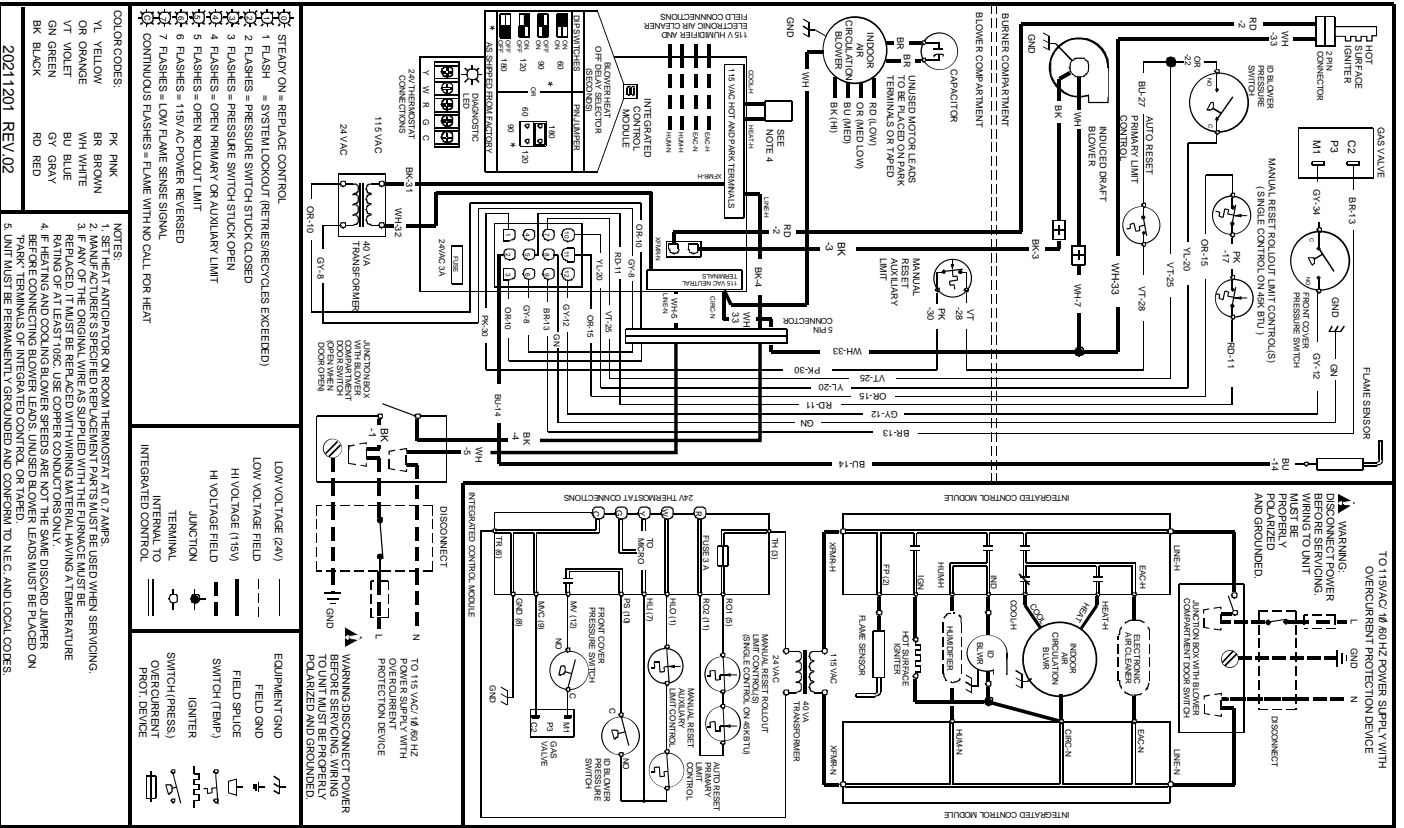
Upon completion of the heat exchanger replacement, carefully inspect the entire flue system both inside and outside the furnace to assure it is properly sealed. Leaks in the flue system can result in serious personal injury or death due to exposure to flue products, including carbon monoxide.

8. Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door and blower compartment door.
9. Turn on electrical power and verify proper unit operation.

Note: Listed below are the complete unit checks that need to be done after installation of a new heat exchanger assembly:

1. Verify proper gas pressures (See *SERVICING* section S-12).
2. Verify proper duct static (See *SERVICING* section S-15).
3. Verify proper temperature rise (See *SERVICING* section S-16).
4. Verify proper negative draw down from combustion blower (See *SERVICING* section S-17).

WIRING DIAGRAMS



- NOTES:**
1. SET HEAT ANTICIPATOR ON ROOM THERMOSTAT AT 0.7 AMPS.
 2. MANUFACTURER'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
 3. IF ANY OF THE ORIGINAL WIRES SUPPLIED WITH THE RANGE ARE DAMAGED, THE RATING OF AT LEAST THE SAME GAUGE COPPER CONDUCTORS ONLY.
 4. IF HEATING AND COOLING BLOWER SPEEDS ARE NOT THE SAME DISCARD JUMPER BEFORE CONNECTING BLOWER LEADS. UNUSED BLOWER LEADS MUST BE PLACED ON PINK TERMINALS OF INTEGRATED CONTROL OR TAPPED.
 5. LIMIT MUST BE TERMINALLY GROUNDED AND DOWN TO NEC AND LOCAL CODES.

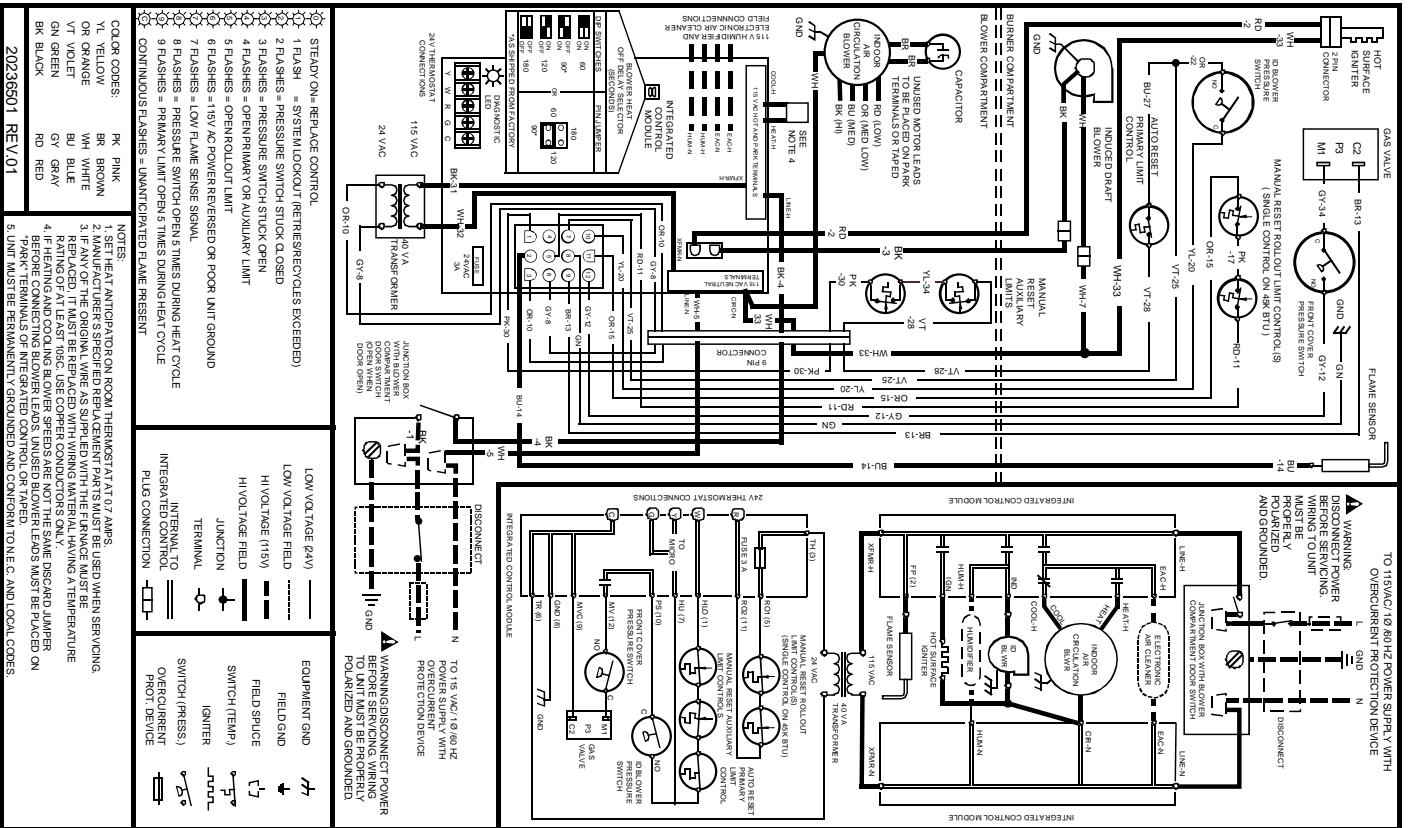
- DISCONNECT:**
- TO 115VAC/18/80/12Z
OVERCURRENT
PROTECTION DEVICE
- WARNING:** DISCONNECT POWER BEFORE SERVICING. WIRING MUST BE POLARIZED AND GROUNDED.

- LEGEND:**
- LOW VOLTAGE FIELD
 - HIGH VOLTAGE FIELD (115V)
 - HIGH VOLTAGE FIELD
 - JUNCTION
 - INTERNAL TO INTEGRATED CONTROL
 - EQUIPMENT GND
 - FIELD GND
 - FIELD SPALICE
 - SWITCH (TEMP)
 - SWITCH (PRESS)
 - IONIZER
 - OVERCURRENT PROT. DEVICE

WARNING

TO AVOID POSSIBLE ELECTRICAL SHOCK, PERSONAL INJURY, OR DEATH, DISCONNECT THE POWER BEFORE SERVICING.

WIRING DIAGRAMS



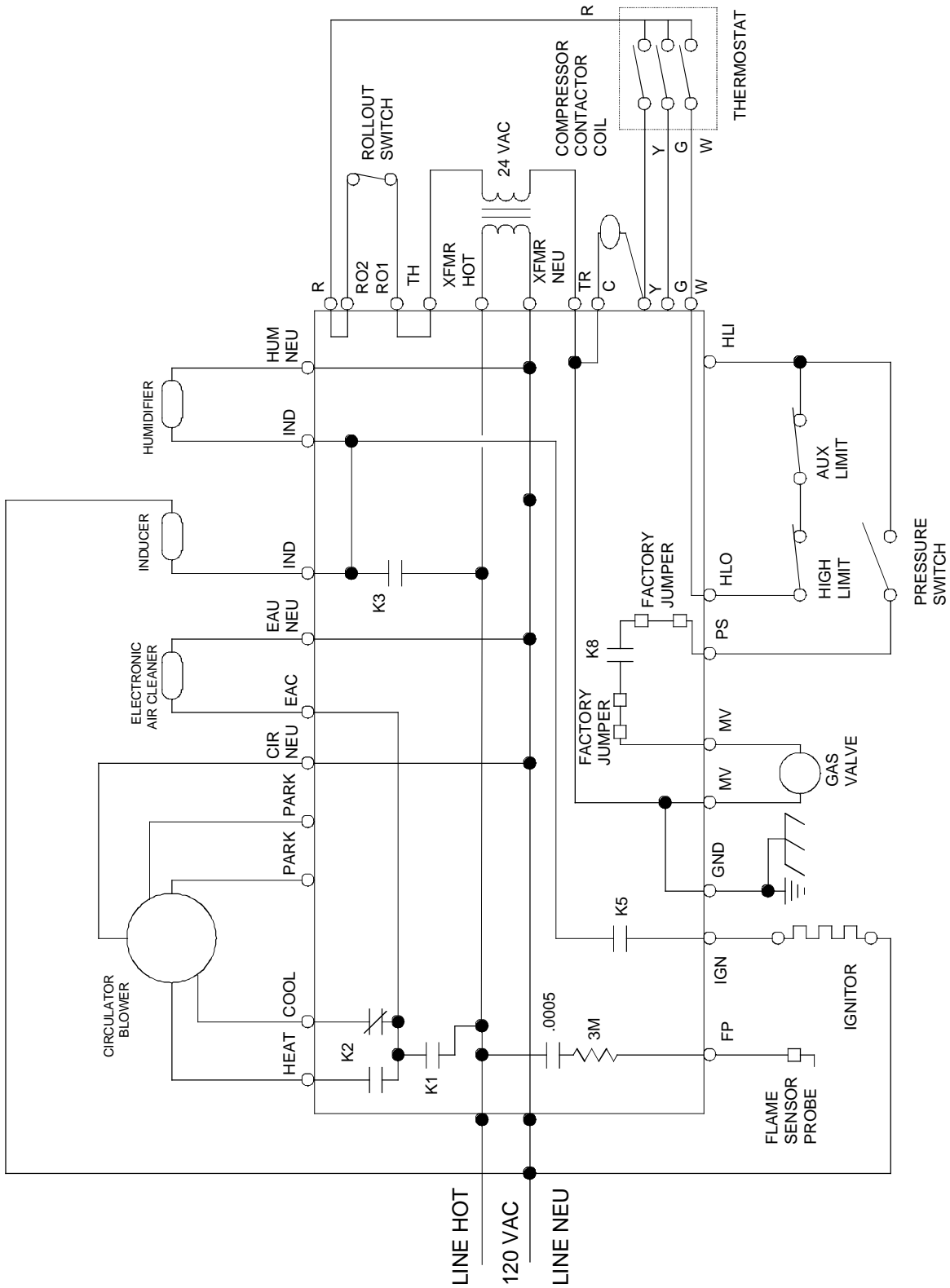
STEADY ON - REPLACE CONTROL	LOW VOLTAGE (24V)	EQUIPMENT GND
1 FLASH = SYSTEM LOCKOUT (REPEATS/RECYCLES EXCEEDED)	LOW VOLTAGE FIELD	FIELD GND
2 FLASHES = PRESSURE SWITCH STUCK CLOSED	HI VOLTAGE (115V)	FIELD SPACE
3 FLASHES = PRESSURE SWITCH STUCK OPEN	HI VOLTAGE FIELD	SWITCH (TEMP)
4 FLASHES = OPEN/ROLLOUT LIMIT	JUNCTION	IGNITER
5 FLASHES = OPEN/ROLLOUT LIMIT	INTERNAL TO	SWITCH (PRESS)
6 FLASHES = LOW FLAME SENSE SIGNAL	INTEGRATED CONTROL	OVERCURRENT
7 FLASHES = PRESSURE SWITCH OPEN 5 TIMES DURING HEAT CYCLE	PILOT CONNECTION	PROT. DEVICE
8 FLASHES = PRIMARY LIMIT OPEN 5 TIMES DURING HEAT CYCLE		
9 FLASHES = UNANTICIPATED FLAME PRESENT		

COLOR CODES	NOTES
PK PINK	1. SET HEAT ANTICIPATOR ON ROOM THERMOSTAT AT 0.7 AMPS.
BR BROWN	2. MANUFACTURER'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
WH WHITE	3. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE FURNACE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 90°C (200°F).
BU BLUE	4. IF HEATING AND COOLING BLOWER SPEEDS ARE NOT THE SAME, DISCARD JUMPER BEFORE CONNECTING OF INTEGRATED CONTROL OR TAPED.
GY GRAY	5. WNT MUST BE PERMANENTLY GROUNDING AND COMPARTMENT G.C. AND LOCAL CODES.
RD RED	
BK BLACK	

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WARNING TO AVOID POSSIBLE ELECTRICAL SHOCK, PERSONAL INJURY, OR DEATH, DISCONNECT THE POWER BEFORE SERVICING.

SCHEMATICS



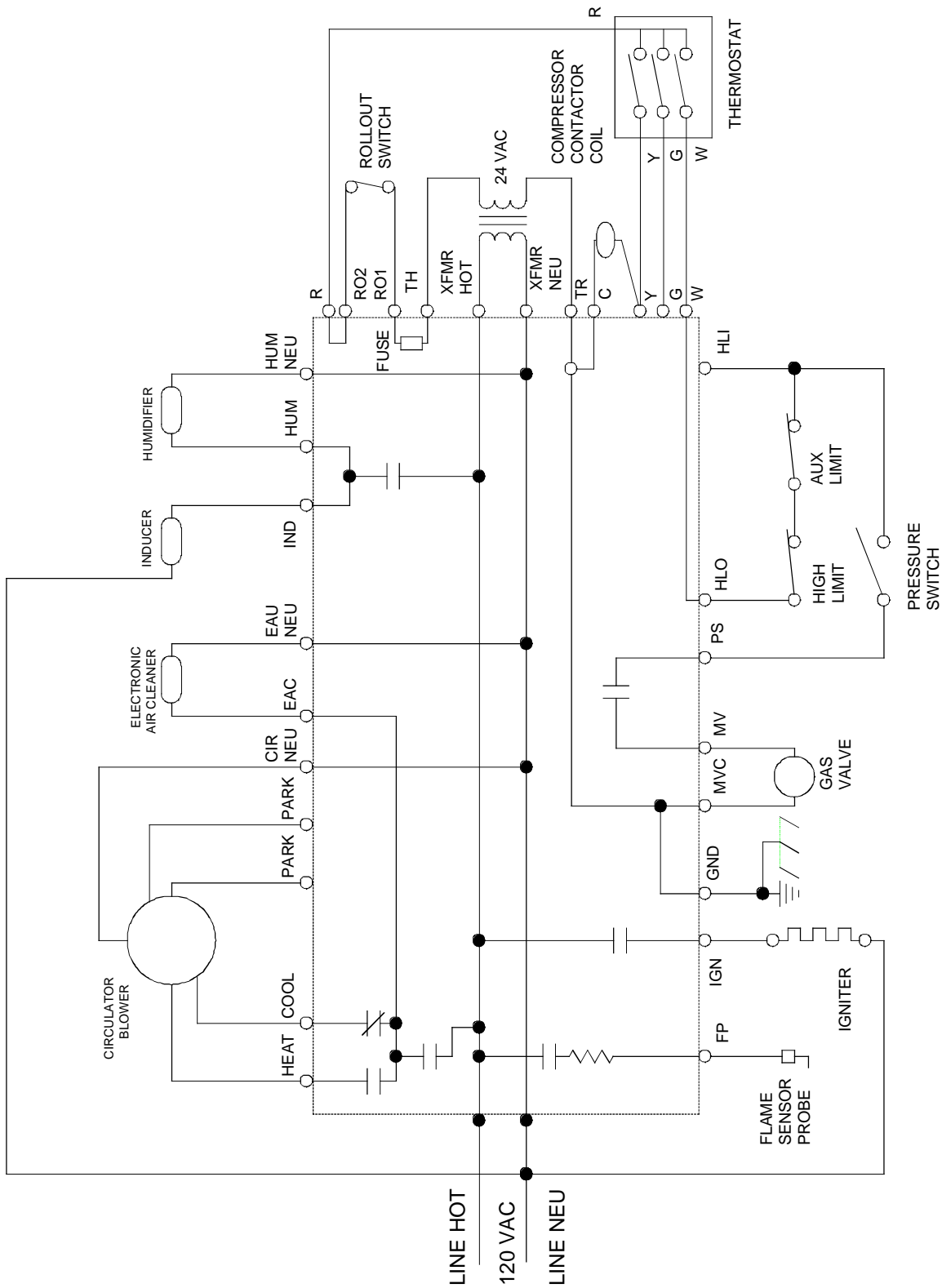
TYPICAL SCHEMATIC GUCA MODEL FURNACES

10207709 WR50A55 INTEGRATED IGNITION CONTROL

This schematic is for reference only. Not all wiring is as shown above,
refer to the appropriate wiring diagram for the unit being serviced.

WARNING
TO AVOID POSSIBLE ELECTRICAL SHOCK, PERSONAL INJURY,
OR DEATH, DISCONNECT THE POWER BEFORE SERVICING.

SCHEMATICS



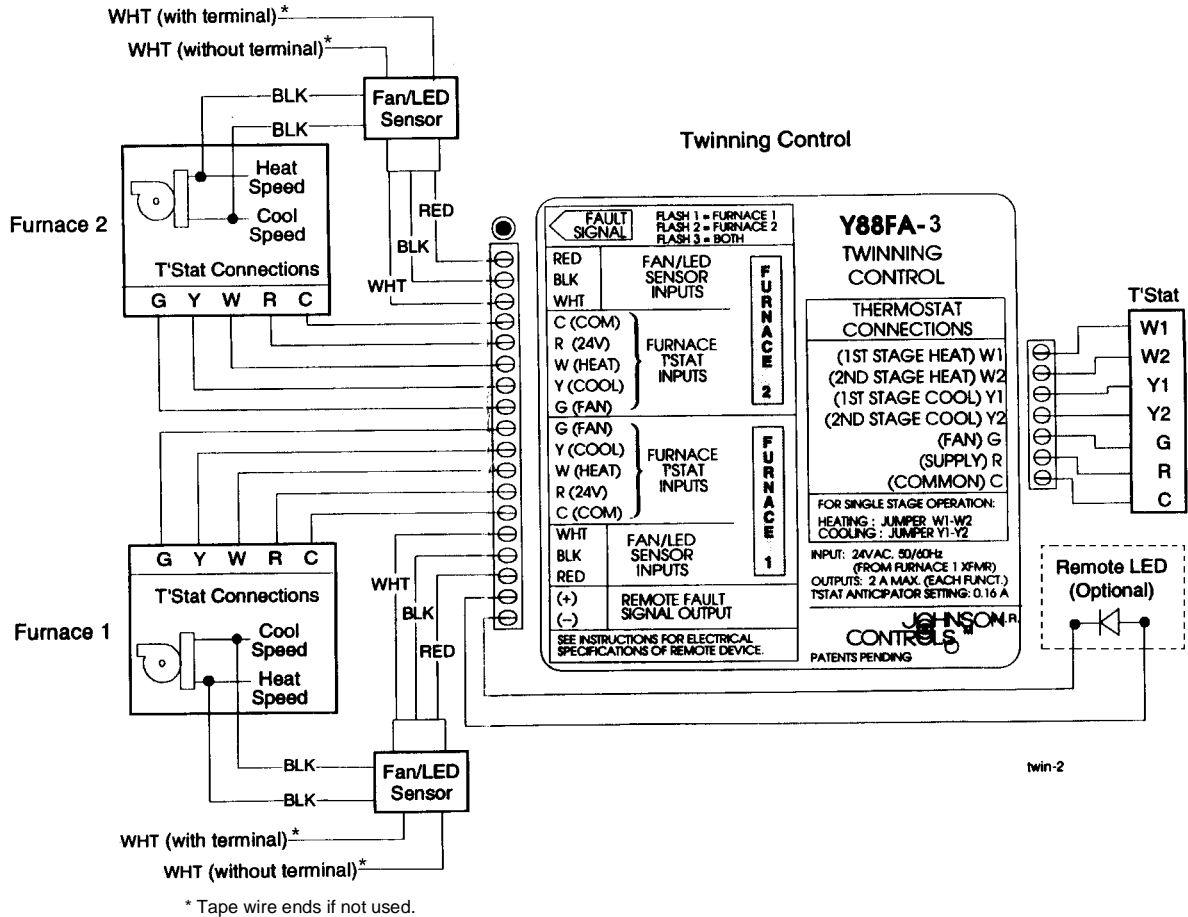
TYPICAL SCHEMATIC GCCA MODEL FURNACES

11184504 HSI-2 INTEGRATED IGNITION CONTROL

This schematic is for reference only. Not all wiring is as shown above,
refer to the appropriate wiring diagram for the unit being serviced.

WARNING
TO AVOID POSSIBLE ELECTRICAL SHOCK, PERSONAL INJURY,
OR DEATH, DISCONNECT THE POWER BEFORE SERVICING.

SCHEMATICS



TO AVOID POSSIBLE ELECTRICAL SHOCK, PERSONAL INJURY, OR DEATH, DISCONNECT THE POWER BEFORE SERVICING.



FURNACE TWINNING KIT - FTK03A

This schematic is for reference only. Not all wiring is as shown above, refer to the appropriate wiring diagram for the unit being serviced.