

## TEMPSTAR 90

MODEL NUMBER:	NUGM Series - Upflow
BTU SIZES:	50-75-100-125,000 BTU's

### ACCESSIBILITY CLEARANCE

A front clearance of 30" (762mm) is recommended for access to the burner, controls, and filter.

### CLEARANCE FROM COMBUSTIBLE MATERIAL

Top - 1", Bottom - 0", Righthand - 0", Lefthand - 0", Back - 0", Front - 3", Flue - 0"

### COLD AIR RETURN AIR DUCTS

**WARNING:** Return air duct **MUST** be sealed to furnace casing.

### GARAGE

Approved. Must meet requirements in the UMC and the Good Practice Book.

### GENERAL

This furnace is **NOT** to be used for temporary heat of buildings or structures under construction.

**WARNING:** This furnace can **NOT** be common vented or connected to any type B, BW, or L vent or vent connector, nor to any portion of a factory-built or masonry chimney.

Drip leg and union: union should be outside the cabinet. Manual shut-off valve **MUST** be upstream of dripleg, union, and furnace.

**NOTE:** Gas connector may **NOT** be used inside the furnace or be secured or supported by the furnace cabinet.

Heat Anticipator: Set thermostat heat anticipator in accordance with thermostat instructions and actual measured value.

Blower Motor: If oil ports are provided on the motor, periodic lubrication is recommended. If no oil ports are provided, the motor is considered permanently lubricated and no lubrication is required. Combustion air blower motor does **NOT** required oiling.

**CAUTION:** Do **NOT** over oil or use 3 in 1 oil, penetrating oil, WD40 or similar oils, Use of these may damage motors.

## HIGH ALTITUDE INSTALLATIONS

Deration	4% deration for each 1,000 feet above sea level.
Orifice	Change - No peening
Regulator Pressure	Set per high altitude chart provided with manufacturer's installation instructions. See Figures 18 and 19.
Pressure Switch	High altitude air pressure switch - Altitudes over 4,000 ft. require a different air pressure switch than the one installed at the factory.

**Gas Pressure Adjustment:** Make adjustment to manifold pressure with burners operating and combustion air box cover removed.

- 1) Remove combustion air box cover.
- 2) Connect U-tube manometer to the tapped opening on the outlet side of gas valve. Use manometer with a 0-12 inches water column.
- 3) Turn gas ON, fire the furnace and remove adjustment screw cover on gas valve.
- 4) Turn counterclockwise to decrease pressure and clockwise to increase.
- 5) Set pressure as listed on furnace rating plate.
- 6) When pressure is set, replace adjustment screw cover on gas valve.
- 7) Replace combustion air box cover.

**NOTE:** Adjustment screw cover **MUST** be replaced on gas valve **BEFORE** reading manifold pressure and operating furnace.

Figure 18		High Altitude Pressure Chart 2000-4999 ft. (Natural Gas)			
Heat Value Btu/Cu.Ft.	Elevation Above Sea Level				
	0-1999	2000-2999	3000-3999	4000-4999	
800	3.5	3.5	3.5	3.5	
850	3.5	3.5	3.5	3.2	
900	3.5	3.2	3.2	2.9	
950	3.5	3.1	2.8	2.6	
1000	3.5	2.8	2.5	2.3	
1050	3.2	2.5	2.3	3.5	
1100	2.9	2.3	3.5	3.3	

Shaded box requires orifice change to a #44.  
 No Shading indicates factory installed orifice and manifold pressure change only.

Figure 19		High Altitude Pressure Chart 5000-7999 ft. (Natural Gas)		
Heat Value Btu/Cu.FL	Elevation Above Sea Level			
	5000-5999	6000-6999	7000-7999	
800	3.2	2.9	2.7	
850	2.9	2.6	2.3	
900	2.6	2.3	3.5	
950	2.3	3.5	3.3	
1000	3.5	3.3	3.0	
1050	3.3	3.0	2.7	
1100	3.0	2.7	2.4	

Shaded box requires orifice change to a #44.  
 No Shading indicates factory installed orifice and manifold pressure change only.

## MOBILE HOME

Not approved.

### VENTING MATERIAL AND REQUIREMENTS

Vent Pipe	PVC, PVC, ABS, and Cellular Core pipe. Schedule 40 is the ONLY approved wall thickness.
Vent Fittings	Pipe and Fittings - ASTM D1785, D2466, D2661, D2665, F-891. PVC Primer and Solvent Cement - ASTM D2564.

### VENT CLEARANCE FROM COMBUSTIBLE MATERIAL

0"

### VENTING PROCEDURE

**Dual Certified Furnace:** This furnace is certified as a Category IV appliance and is dual certified as a direct vent furnace using outside air for combustion or it can use air from inside the structure for combustion. The INLET air pipe is optional. If combustion air is drawn from outside the structure, it MUST be taken from the same atmospheric pressure zone as the vent pipe.

**Contaminated Combustion Air:** Installations in certain areas or types of structures will increase the exposure to chemicals or Halogens which may harm the furnace. The following areas or types of structures may contain chemicals or Halogens. Inspect structure carefully to ensure listed chemicals or substances are NOT present.

- ▶ Commercial Building
- ▶ Buildings with indoor pools
- ▶ Furnaces installed in laundry rooms
- ▶ Furnaces installed in hobby or craft room
- ▶ Furnaces installed near chemical storage areas

Exposing the furnace to the following substances will damage the furnace. Do NOT situate air inlet near any of the following chemicals or their source.

**CAUTION:** Terminate the combustion air intake as far as possible from any air conditioner, heat pump, swimming pool, swimming pool pumping, chlorinator or filtration units, or dryer vent.

- ▶ Permanent wave solutions for hair
- ▶ Chlorinated waxes and cleaners
- ▶ Chlorine based swimming pool chemicals
- ▶ Water softening chemicals
- ▶ De-icing salts or chemicals
- ▶ Carbon tetrachloride
- ▶ Halogen type refrigerants
- ▶ Cleaning solvents (such as perchloroethylene)
- ▶ Printing inks, paint removers, varnishes, etc.
- ▶ Hydrochloric acid
- ▶ Sulfuric Acid
- ▶ Solvent cements and glues
- ▶ Anti-static fabric softeners for clothes dryers
- ▶ Masonry acid washing materials

## VENTING PROCEDURE

## Vent and Combustion Air Piping Guidelines:

- 1) Use of vertical piping is preferred.
- 2) The vent MUST exit the furnace at the top left side.
- 3) The vertical vent pipe MUST be supported so that no weight is allowed to rest on the combustion blower.
- 4) Exhaust vent piping diameter MUST NOT be reduced.
- 5) All piping from the furnace to termination MUST slope upwards, away from furnace, a minimum of 1/4" per foot of run.
- 6) Use DWV type long radius elbows whenever possible, as they provide for the minimum slope on horizontal runs and they provide less resistance in the vent system. If DWV elbows cannot be used, use two, 45 degree elbows when possible. On horizontal runs the elbow can be slightly misaligned to provide the correct slope.
- 7) All horizontal pipe runs MUST be supported at least every five feet with metal pipe strapping. NO sags or dips are permitted.
- 8) All vertical pipe runs MUST be supported every six feet where accessible.
- 9) The maximum pipe length is 40 total feet. Up to five, 90 degree elbows can be used.
- 10) The minimum pipe run length is 5 feet.

NOTE: In NO case can the piping be run in a chase where temperatures can exceed 140 degrees F. or where radiated heat from adjacent surfaces would exceed 140 degrees F.

- 11) If installing as a direct-vent appliance, the vent outlet MUST be installed to terminate in the same atmospheric pressure zone as the combustion air inlet.
- 12) The vent system can be installed in an existing unused chimney provided that:
  - ◆ Both the exhaust vent and air intake run the length of the chimney.
  - ◆ No other gas fire appliance or fireplace is vented into the chimney.
  - ◆ The top of the chimney MUST be sealed flush or crowned up to seal against rain or melting snow so ONLY the piping protrudes.
  - ◆ The termination clearances are maintained.

Piping Insulation Guidelines: NOTE: In general, chimneys on an outside wall and attics are exposed to cold conditions which can cause the vent pipe to sweat from condensation. This can lead to moisture damage to living spaces. It is highly recommended that piping in these cases be insulated to insure proper protection from condensation damage.

Use 1/2" (50mm) wall, closed cell, neoprene insulation or equivalent. If Fiberglass or equivalent insulation is used it must have a vapor barrier. Use R values of 7 up to 10 feet, R-11 if exposure exceeds 10 feet. If Fiberglass insulation is used, exterior to the structure, the pipe MUST be boxed in and sealed against moisture.

- 1) Insulate pipe when the exhaust vent passes through an unconditioned space or raceway.
- 2) If situations require pipe to be run on the exterior wall to reach a suitable termination point, it MUST be properly insulated.
- 3) If it is necessary to insulate piping when an inactive chimney is used as a chase, the top of the chimney MUST be sealed flush or crowned up to seal against rain or melting snow so ONLY the piping protrudes.
- 4) When the vent or combustion air pipe height above the roof exceeds 30 inches (760mm), or if an exterior vertical riser is used on a horizontal vent to get above snow levels, the exterior portion MUST be insulated.
- 5) When combustion air inlet piping is installed above a suspended ceiling, the pipe MUST be insulated with moisture resistant insulation such as Armaflex or other equivalent type of insulation.
- 6) Insulate combustion air inlet piping when run in warm, humid spaces such as basements.

### Sizing Combustion Air and Vent Pipe

- 1) Single Pipe Installation - if installing as a non-direct vent appliance (single outlet pipe and no inlet pipe) refer to Table 1. The table show the maximum number of elbows allowed with any given pipe diameter and length of run.
- 2) Double Pipe Installation - if installing as a direct-vent appliance, consult Table 2 to select the proper diameter exhaust and combustion air piping. Exhaust and combustion air piping is sized for each furnace Btuh size based on total lineal vent length (on inlet or outlet side), and number of 90 degree elbows required.
- 3) Use of Elbows - Two 45 degree elbows can be substituted for one 90 degree elbow. The elbow or elbows used for vent termination outside the structure ARE counted, including elbows needed to bring termination above expected snow levels. **When the vent system length used is borderline with the next size combination category, always use the next larger size.**

### Vent Termination Clearances

- 1) The vent termination must be located at least 12 inches (300 mm) above ground or normally expected snow accumulation levels.
- 2) Do NOT terminate over public walkways. Avoid areas where condensate may cause problems such as above planters, patios, or adjacent to windows where steam may cause fogging.
- 4) The vent termination shall be located at least 4 feet (1220 mm) horizontally from any electric meter, gas meter, regulator, and any relief equipment. These distances apply ONLY to U.S. installations.
5. The vent termination is to be located at least 3 feet (914 mm) above any forced air inlet located within 10 feet (3m); and at least 10 feet (3m) from a combustion air intake of another appliance, except another direct vent furnace intake.

Vent Pipe Connection - install the ABS supplied piece of vent pipe to the combustion blower using RTV sealant ONLY. This provides for future serviceability.

**CAUTION:** DO NOT cement pipe into combustion blower. When inserting vent pipe into combustion blower, use a bead of RTV sealant that is at least 3/8" (10mm) from the edge of the pipe. Too much sealant can cause the condensate to clog.

Install the flexible connector (provided) on the ABS pipe from the combustion blower. This will be used to connect to the rest of the vent system.

Connecting Vent Pipes and Termination: NOTE: Combustion air intake and vent MUST terminate in the same atmospheric pressure zone. If installation is in a cold climate (sustained temperature below 0°F), increase the minimum distance between vent pipe and air intake from 8" to 18".

**CAUTION:** Maintain a minimum of 36 inches (1mm) between combustion air inlet and clothes dryer vent. Terminate the combustion air intake as far as possible from any air conditioner, heat pump, swimming pool, swimming pool pumping, chorlinator or filtration unit.

### Vertical Termination:

- 1) Figure 16 shows the proper installation and clearances for vertical vent termination. The vertical roof termination should be sealed with a plumbing roof boot or equivalent flashing. The inlet of the intake pipe and end of the exhaust vent must be terminated no less than 12" (300 mm) above the roof or snow accumulation level, and 12" (300 mm) away from a vertical wall or other position.
- 2) If the vent system is installed in an existing chimney make sure clearances shown in Figure 16 are maintained. Horizontal section before the termination elbow can be extended on the inlet air to provide necessary clearance.

**Horizontal Termination:**

- 1) If installing as a direct-vent appliance, cut two holes, 2 1/2" (67mm) for 2" (50mm) pipe, 3" (75mm) for 2 1/2" (67mm) pipe, or 3 1/2" (90 mm) for 3" (75mm) pipe. Do NOT make the holes oversized, or it will be necessary to add a sheet metal or plywood plate on the outside with the correct size hole in it. If venting as a single pipe appliance, cut only one hole.
- 2) Check hole sizes by making sure it is smaller than the couplings or elbows that will be installed on the outside. The couplings or elbows MUST prevent the pipe from being pushed back through the wall.
- 3) Extend vent pipe and combustion air pipe through the wall 3/4 to 1" (19 to 25mm) and seal area between pipe and wall.
- 4) Install the couplings, nipple and termination elbows as shown and maintain spacing between vent and combustion air piping as indicated in Figure 14 through Figure 16.

**Using Exterior Risers:**

- 1) Install elbows and pipe for form riser as shown in Figure 15.
- 2) Secure vent pipe to wall with galvanized strap or other rust resistant material to restrain pipe from moving.
- 3) Insulate pipe with Armaflex or equivalent moisture resistant closed cell foam insulation or Fiberglass insulation if boxed in and sealed against moisture.

**Optional Vent Screens:** To prevent unwanted pests or foreign material from entering terminated pipes, plastic vent screens are available in 2" and 3" sizes. Use of these screens is recommended except in cold climate areas where ice is likely to form on them. Glue the screen inside the termination elbow using pipe cement. Screens should be inspected monthly for blockage and cleaned yearly prior to startup.

**Vent Termination Shielding:** Under certain wind conditions some building materials may be affected by flue products expelled in close proximity to unprotected surfaces. Sealing or shielding of the exposed surfaces with a corrosion resistant material (such as aluminum sheeting) may be required to prevent staining or deterioration. The protective material should be attached and sealed (if necessary) to the building before attaching the vent terminal.

A metal shield is recommended 18" x 18" (457mm x 457mm) min. or 18" (457mm) min. diameter around the vent termination at the exterior wall to protect the house interior materials from flue product or condensation (freezing) damage.

**MISCELLANEOUS INFORMATION/NOTES**

**Fan Control:** The fan control is preset at the factory with a fixed blower ON delay of 60 seconds in the heating mode. The blower OFF timing is preset at 120 seconds. If desired, the fan OFF delay can be reset to obtain the longest OFF time while still maintaining comfort levels. See Figure 26 and Figure 27.

Table 1		Pipe Diameter Table Single Piping ONLY						
50,000 & 75,000 Btuh Furnaces								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
UP TO 5	All combinations use "A" a 2" Exhaust							
100,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
1	A	A	A	A	A	A	B,C	
2	A	A	A	A	A	B,C	B,C	
3	A	A	A	A	B,C	B,C	B,C	
4	A	A	A	B,C	B,C	B,C	B,C	
5	A	A	B,C	B,C	B,C	B,C	B,C	
125,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
1	A	A	B,C	B,C	B,C	B,C	C	
2	A	B,C	B,C	B,C	B,C	C	C	
3	B,C	B,C	B,C	B,C	C	C	C	
4	B,C	B,C	B,C	C	C	C	C	
5	B,C	B,C	C	C	C	C	C	

- Possible combination legend:

- A = 2" Exhaust
- B = 2 1/2" Exhaust
- C = 3" Exhaust

Elbows are DWV Long Radius Type for 2" and 3" vents. Schedule 40 (sharp radius) for 2 1/2"

$\mathcal{S}$  - Signifies the maximum number of elbows, including the termination elbow(s), on any one part of the system. Example: 4 elbows on the exhaust and 5 elbows on the inlet would use the chart showing 5 elbows, because 5 is the maximum number on any one side.

\* Feet of pipe is whichever pipe run is the longest, either inlet or outlet side.

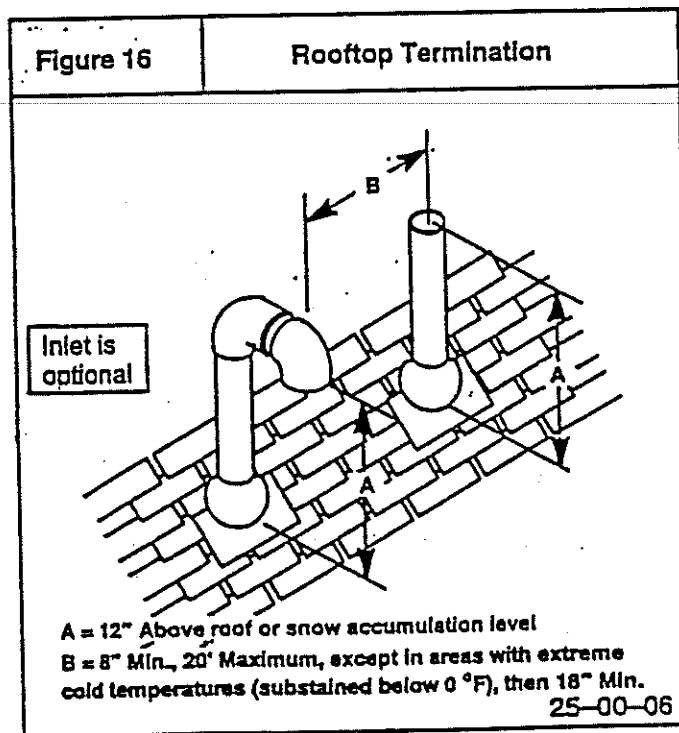
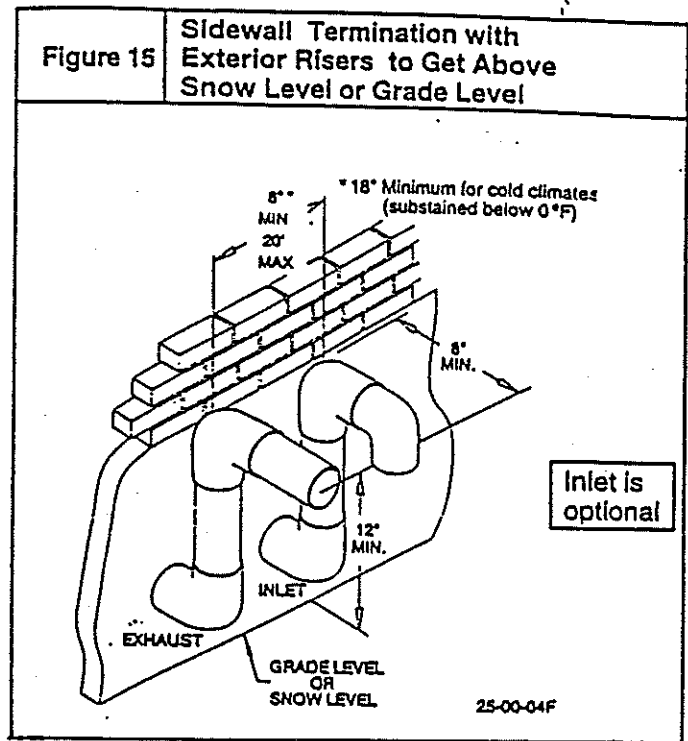
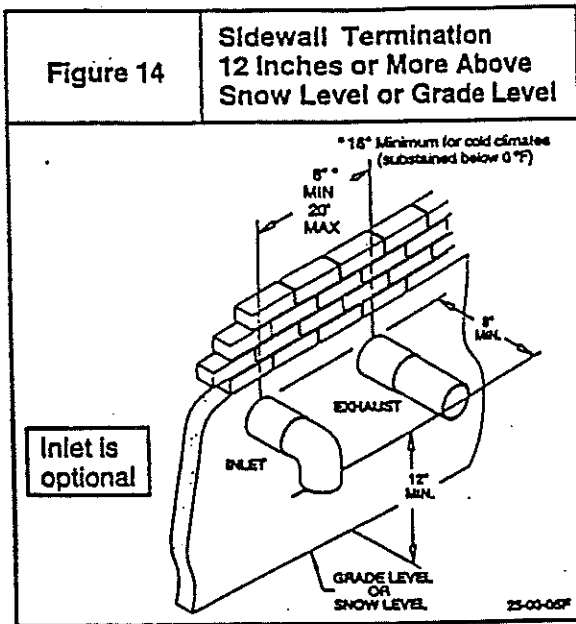
Table 2		Pipe Diameter Table Dual Piping ONLY						
50,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
UP TO 5	All combinations use "A" a 2" Exhaust and 2" Air Inlet Pipe							
75,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
1	A	A	A	A	D,B	E,B	E,B	
2	A	A	A	D,B	E,B	E,B	C,F	
3	A	A	D,B	E,B	E,B	C,F	C,F	
4	A	D,B	E,B	E,B	C,F	C,F	C,F	
5	D,B	E,B	E,B	C,F	C,F	C,F	C,F	
100,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
1	A	A	A	D,B	E,B	E,B	C,F	
2	A	A	D,B	E,B	E,F	C,F	C,F	
3	A	D,B	E,B	E,F	C,F	C,F	C,F	
4	D,B	E,B	E,F	C,F	C,F	C,F	C,F	
5	E,B	E,F	C,F	C,F	C,F	C,F	C,F	
125,000 Btuh Furnace								
Max No. Of Elbows in One Side $\mathcal{S}$	Feet of Pipe*							
	0-9	10-14	15-19	20-24	25-29	30-34	35-40	
UP TO 5	All combinations use "F" a 3" Exhaust and 3" Air Inlet Pipe							

Possible combination legend:

- A = 2" Inlet with a 2" Exhaust
- B = 3" Inlet with a 2" Exhaust
- C = 3" Inlet with a 2 1/2" Exhaust
- D = 2 1/2" Inlet with a 2" Exhaust
- E = 2 1/2" Inlet with a 2 1/2" Exhaust
- F = 3" Inlet with a 3" Exhaust

Elbows are DWV Long Radius Type for 2" and 3" vents. Schedule 40 (sharp radius) for 2 1/2"

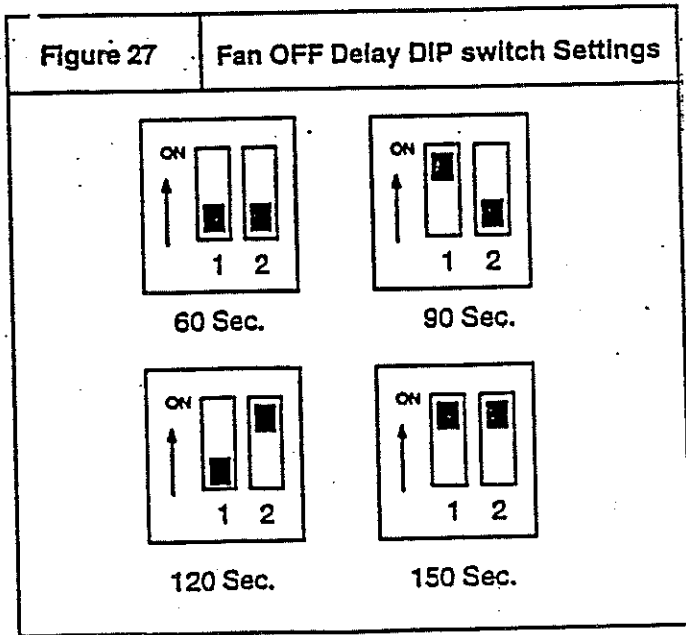
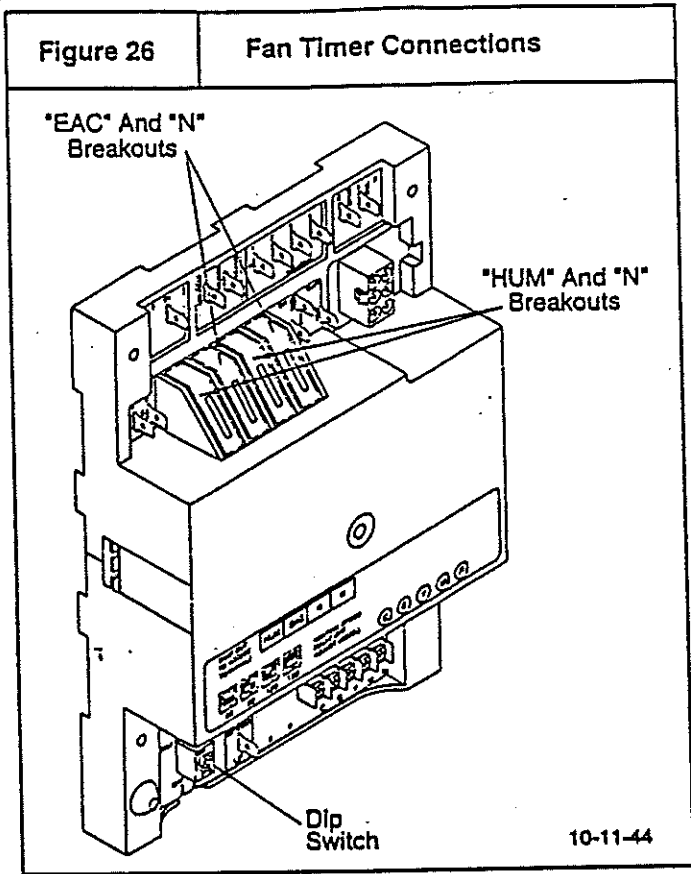






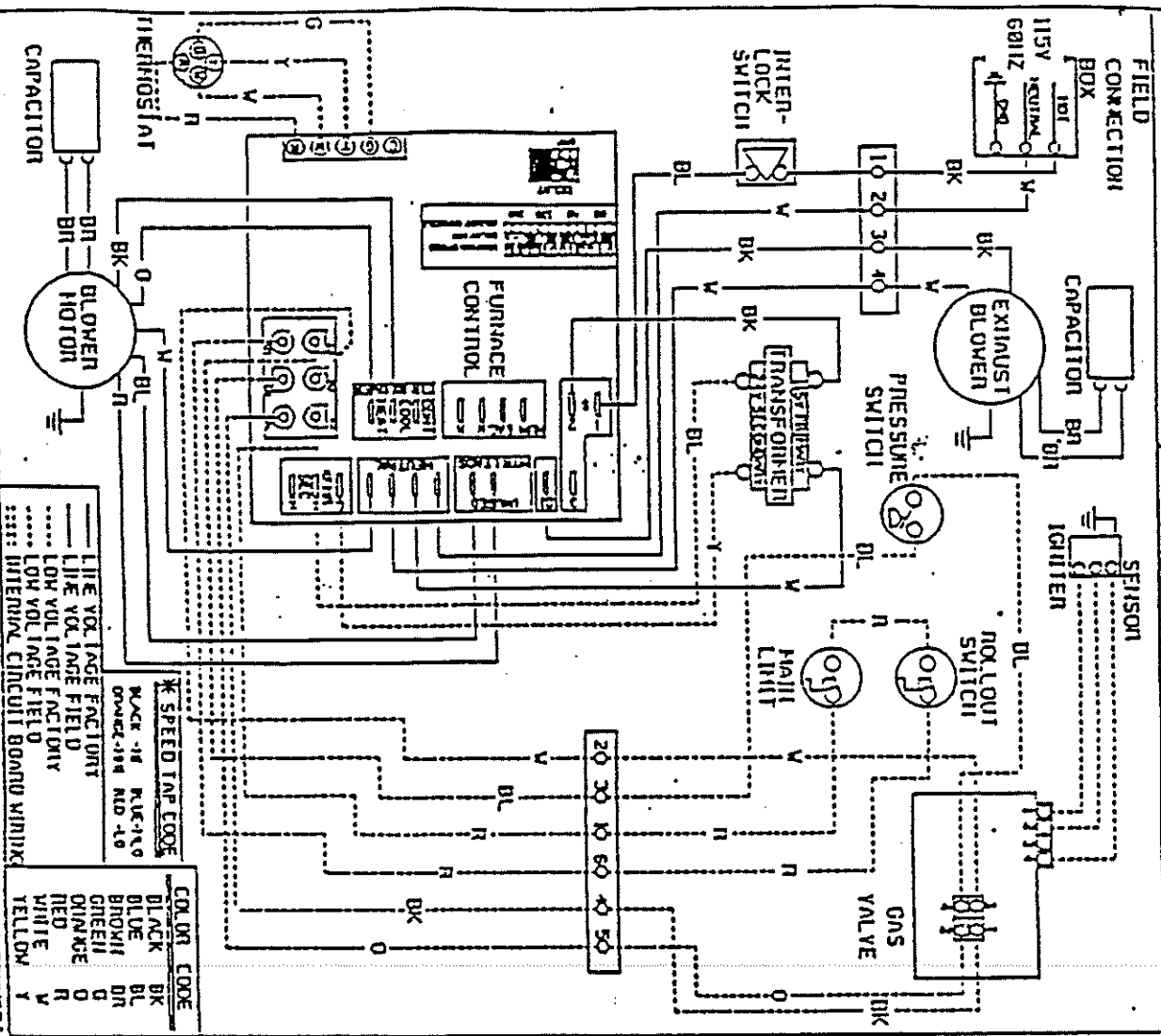
## HONEYWELL FAN TIMER/FURNACE CONTROL and "SMART PILOT" IGNITION DEVICE

1. 24 Volts from the secondary side of the transformer is applied across the "C" and "X" terminals of the fan timer then out terminal [pin] #4 [as a power source for the ignitor] to gas valve terminal #1. Common returns from gas valve terminal #3 to terminal [pin] #2 of the fan timer.
2. From the "X" terminal 24 volts is applied out through terminal [pin] #1 through the safety circuit [main limit, aux. limit if used, & rollout switch] then back to the fan timer at terminal [pin] #6. 24 volts is now available at the "R" terminal.
3. If the 24 volt signal is lost at the #6 terminal [due to an open safety] the unit's conditioned air blower and combustion blower will start immediately and continue to run until the safety closes. Then, the combustion blower will stop after the 5 second [fixed] post-purge has expired. The conditioned air blower will stop after the pre-selected "OFF" delay expires.
4. On a call for "Heat", a circuit between "R" & "W" is completed in the thermostat signaling the fan timer to start the combustion blower. [115 volts now available at terminal "D1" and also at "HUM" terminal].
5. When combustion blower reached full speed developing sufficient pressure to close the pressure switch, it will complete the 24 volt circuit from terminal #3 of the fan timer to terminal #4 of the gas valve, causing the ignition sequence to begin.
6. The ignition sequence simultaneously powers the pilot circuit of the gas valve [allowing gas to flow to the pilot burner] and sends 24 volts to the ignitor causing it to heat up.
7. Once pilot flame has been established it sends a rectification signal [D.C. Microamps] back through the sensor wire to the ignition module. This rectification signal causes the ignition module to simultaneously turn off 24 volts to the ignitor while powering the main valve [allowing the pilot to light the main burner] and powering terminal [pin] #5 of the fan timer.
8. With power now applied to terminal [pin] #5 of the fan timer, the "ON" delay timing [60 seconds - fixed] will begin, and once it has elapsed, the conditioned air blower will start. "EAC" terminal will also be powered at this time.
9. Furnace will continue to operate [Burners & Blowers] until the thermostat is satisfied, signaling the fan timer to break the circuit to terminal [pin] #3 causing the burners to drop out immediately, thereby removing power to terminal [pin] #5.
10. This begins post-purge timing on terminal "D1" [causing combustion blower to stop after 5 seconds] and the pre-selected "OFF" delay timing [adjustable 60-150 secs.] after which the conditioned air blower will stop.



# CONNECTION DIAGRAM

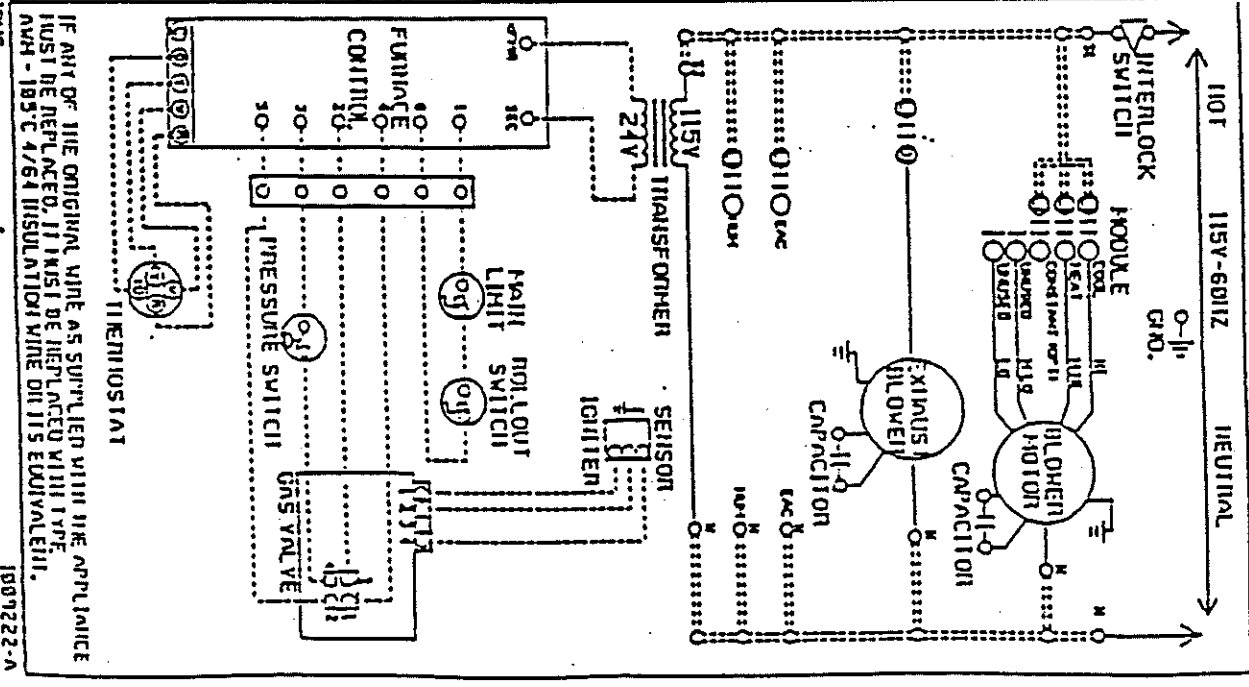
DANGER! ELECTRICAL SHOCK HAZARD!  
DISCONNECT BEFORE SERVICING



**\* SPEED TAP CODE**  
MAKE-UP RUG-100  
DANGER-HAZARD

LINE VOLTAGE FACTORY	LOW VOLTAGE FACTORY	INTERNAL CIRCUIT BOARD WIRING
BLACK	RED	Y
BLUE	ORANGE	N
BROWN	GREEN	BL
GREEN	WHITE	Y
ORANGE	YELLOW	N
RED		BL
WHITE		Y
YELLOW		N

# LADDEN DIAGRAM



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH THE SAME TYPE. AWG - 185°C INSULATION WIRE OR ITS EQUIVALENT.

\* SEE THE MANUAL FOR C.F.J. VS. E.S.P. TO DETERMINE PROPER HEATING AND COOLING SPEED CONNECTIONS.

# TROUBLESHOOTING GUIDE

## SMART PILOT Troubleshooting Sequence

NOTE: Before troubleshooting, familiarize yourself with the sequence of operation

