

**400 SERIES  
and  
500 SERIES  
BOILERS**

**FV-20 BURNER  
SECTION**

*Installation Instructions*

*Service and Parts Manual*

ID-78-578R5 1186

# TABLE OF CONTENTS

	Page
Preliminary Information . . . . .	3
Protection Of Equipment Before And During Installation . . . . .	3
Check All Components Immediately Upon Arrival . . . . .	3
Removal & Installation of Burner Assembly . . . . .	4
Breeching, Stack and Draft Controls . . . . .	5
Fuel Connections and Sizes . . . . .	5
Gas Train Controls . . . . .	5
Gas Fuel Systems	
Sizing Gas Header from Meter to Burner . . . . .	8
Sizing Gas Header from Meter to Boiler . . . . .	9
Gas Pressure Regulator Requirements . . . . .	9
Gas Line Feeder Sizes . . . . .	10
Oil Fuel Systems	
Suggested Fuel Oil Piping Arrangement . . . . .	11
Light Oil . . . . .	11
Fuel Oil Tank . . . . .	12
Suggested Procedure for Installing Fuel Oil Tanks . . . . .	12
Boiler Room Ventilation . . . . .	12
Service, Maintenance and Starting Instructions for Burner . . . . .	13
Oil Nozzle . . . . .	13
Lubrication Procedure and Requirements for Motors . . . . .	14
Starting Instructions . . . . .	17
Parts List and Reference Drawings	
FV-20 A & B Light Oil Full Modulation . . . . .	23
FV-20 A & B Light Oil-Gas Combination . . . . .	24
FV-20 A & B Light Oil Spark Ignition . . . . .	25
FV-20 A Gas Fired Gas Ignition (141809) . . . . .	26
FV-20 B Gas Fired Gas Ignition (141794) . . . . .	27
Nozzle Pipe Assembly (131550) . . . . .	28
Nozzle Pipe Assembly (127515) . . . . .	29
Nozzle Pipe Assembly (131210) . . . . .	30
Nozzle Pipe Assembly (131553) . . . . .	31
Ignitor Assembly (138643) . . . . .	32
Ignitor Assembly (131554) . . . . .	33

## PRELIMINARY INFORMATION

The most important single point in the successful operation of a DONLEE Technologies Burner is proper installation. Please read these instructions carefully before starting the installation. For special components and arrangements, refer to factory. Failure to follow these instructions and precautions could result in voiding the DONLEE Technologies warranty on this product.

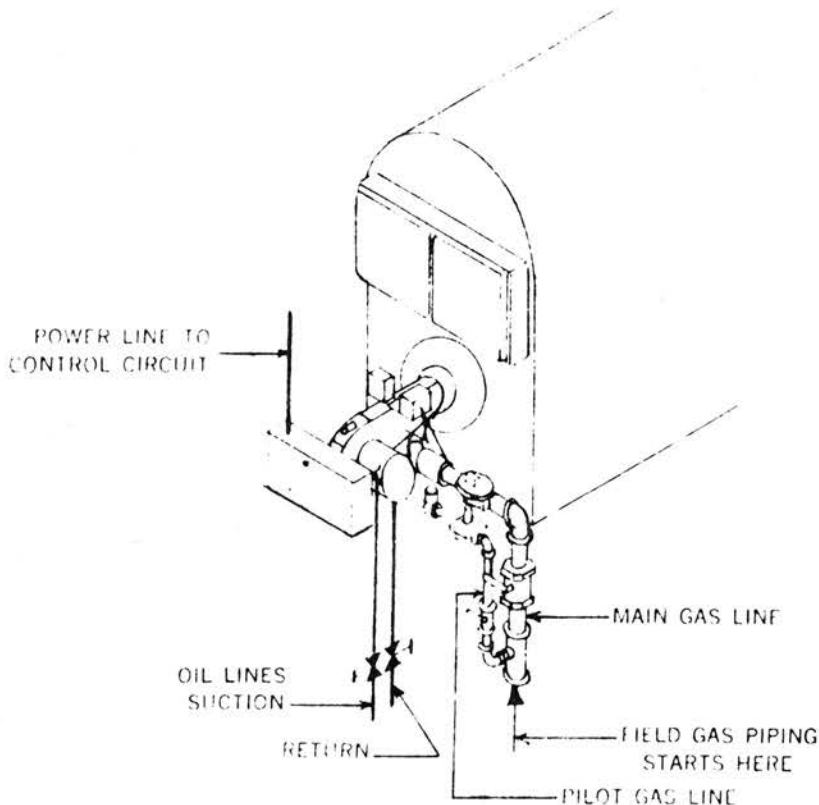
## PROTECTION OF EQUIPMENT BEFORE AND DURING INSTALLATION

If the unit is exposed to the elements, dust, cement, mortar and so forth, it should be covered with a tarpaulin or protected in any manner that will prevent damage to the burner, controls and other components. If there is a possibility of flooding the boiler room, it is suggested that the necessary steps be taken to install cellar drainage or sump pumps.

## CHECK ALL COMPONENTS IMMEDIATELY UPON ARRIVAL

1. If unit is damaged, make claim to the carrier.
2. Check specifications of electrical service to make sure that they correspond with the electrical characteristics stamped on the unit.
3. Check total ampere rating of the motors, control system, to make sure that the electrical service is adequate.
4. Check the unit controls for type and pressure to make sure that they correspond to the system.
5. Investigate the gas pressure required for maximum capacity of unit on gas or gas/oil burners.

The burner will arrive complete ready to connect to fuel and electrical service.



## REMOVAL & INSTALLATION OF BURNER ASSEMBLY

The entire burner can be removed as a unit as follows:

1. Turn off all power & fuel supply lines.
2. Remove and tag any wiring which would restrict the removal of the burner.
3. Disconnect all fuel lines (unions and/or flare fittings).
4. Remove the nuts holding the burner mounting plate to boiler.
5. Place a rope sling around the neck of the blower to support and balance the unit during removal. The sling should be attached to a suitable hoist or lift truck.
6. Be careful to remove the burner unit from the boiler in a straight line to prevent damage to the refractory.
7. Replace all gaskets before replacing the burner unit. Insert in a straight line to prevent refractory damage.
8. Coat all studs with grease or anti-seize lubricant.
9. Tighten the nuts evenly to assure proper alignment and a tight seal.
10. Replace power and fuel lines.

## BREECHING, STACK AND DRAFT CONTROLS

FV Series burners are designed for forced draft operation, with the burner blower providing all the air necessary for proper combustion. A simple vent to the atmosphere, run as directly as possible (in compliance with local requirements) is satisfactory. DONLEE strongly recommends use of round breechings (to avoid excessive noise and vibration) with gaskets and flanged joints.

Multiple boiler installations may be connected to a common breeching and/or stack, but other appliances should be connected to separate breeching and stacks. All directional changes should use wide sweeps, and connections from each boiler should enter the main breeching with a wide sweep elbow or 45° connection in the direction of gas flow.

The following chart suggests minimum breeching and stack sizes for various boiler sizes. Variations may be necessary to suit specific conditions.

Boiler Horsepower	Vent/Breeching and Stack Sizes for Number of Boilers (diameter in inches)			
	1	2	3	4
40 and 50	10	14	16	20
60 thru 80	12	16	20	24

When high stacks or other conditions on such installations, result in a draft condition of the boiler in excess of 0.3" w.c. Negative, dampers and sequence draft controls are usually recommended.

## FUEL CONNECTIONS AND SIZES REQUIRED FOR STANDARD BURNERS

### OIL:

Pipe size of fuel pump (#2, oil) -

Supply - 1/4" Pipe

Return - 1/4" Pipe

## GAS TRAIN CONTROLS

All standard U/L gas trains for main flame include an upstream shut-off cock, and electric gas valve, a down-stream shut-off cock with test connection, and a gas volume control (butterfly) valve. A gas pressure regulator is not included.

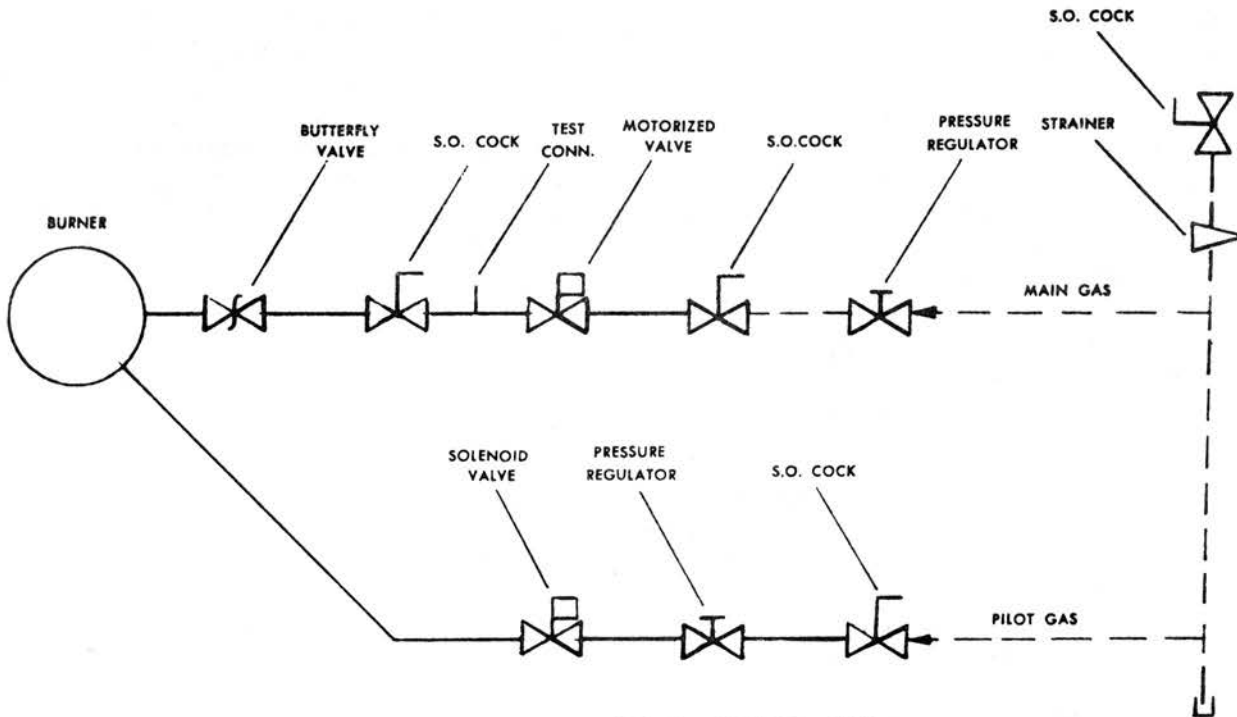
For firing rates above 2,500 MBh, the gas train also includes high and low gas pressure switches and the electric valve is a proof of closure motorized valve.

Components vary, as necessary for FM or IRI insurance requirements, and pipe sizes vary with burner size and with available gas pressures.

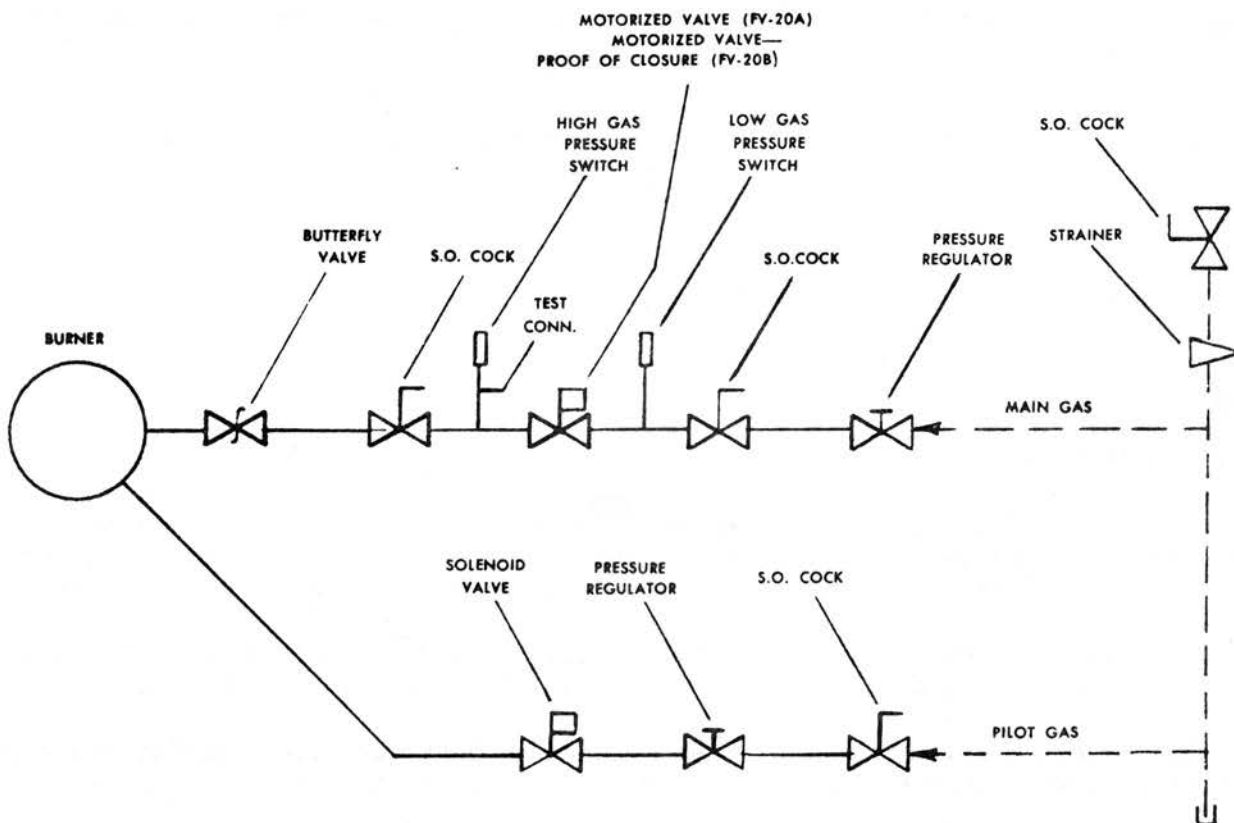
The following schematic drawings show component arrangements for U/L, FM & IRI. Pressure requirements, main pressure regulator selection, and variations in pipe size are detailed in price sheets and on page 9 in this manual.

All gas burners are assumed to fire natural gas, 1000 btu/cu. ft., 0.6 specific gravity. For other fuels, consult the factory.

# SUGGESTED GAS PIPING



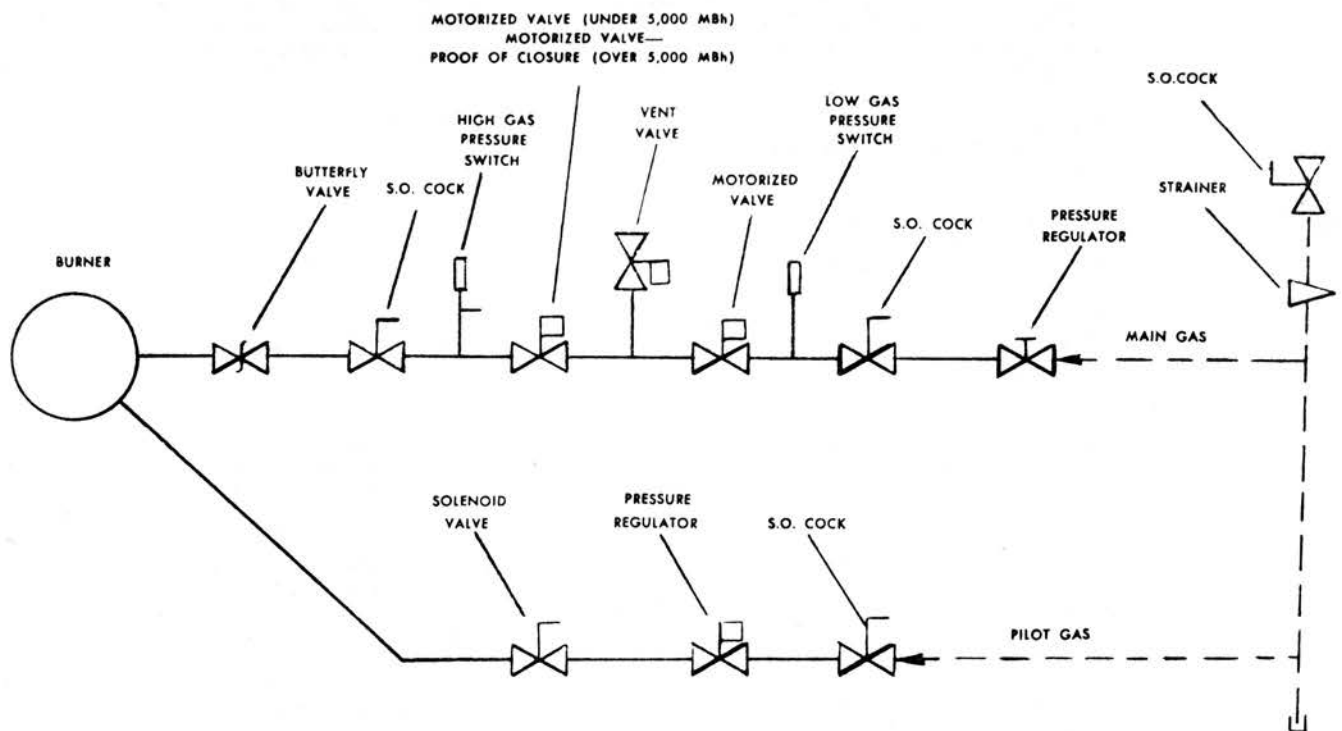
FV20A BURNERS—U/L



FV20A BURNERS—FM

FV20B BURNERS—U/L & FM

## SUGGESTED GAS PIPING



FV20A & B—IRI

## GAS FUEL SYSTEMS

### SIZING GAS HEADER FROM METER TO BURNER

Sizing the gas line from the utility service at the meter to the gas pressure regulator at the burner can be important in cases where the gas pressure available limits the pressure drop to a low value. The following sizing method will prove helpful in sizing this line for single or multiple burner installations.

**Step #1.** Determine the gas flow rate (CFH) by adding the CFH inputs of all units being supplied by the header line. (Note factor for gas with BTU/cu.ft. other than 1000.)

**Step #2.** Determine the highest pressure required at any one unit being supplied by the header line. (Note pressure requirements will change if IRI or FM controls are desired and also BTU/cu. ft. less than 1000, note factor).

**Step #3.** Determine the gas pressure required at the entrance of the unit gas regulator. This would be the inlet pressure shown on the gas pressure regulator chart.

**Step #4.** Determine available pressure drop through the header to supply the quantity of gas by subtracting pressure found in Step #3 from the gas pressure available at the utility meter. (This information will be supplied by the utility).

**Step #5.** Determine the estimated equivalent length of header piping to the most distant unit by adding 25% to the actual length of straight pipe involved to allow for all fittings and valves in the line.

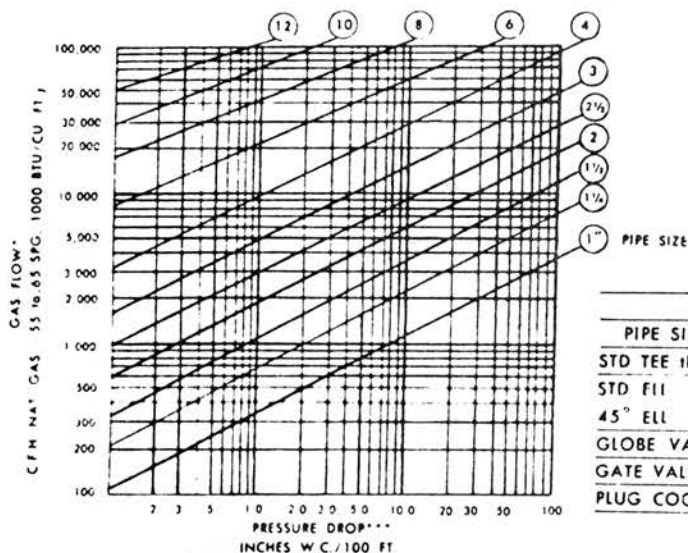
**Step #6.** Divide (Step #5) answer by 100.

**Step #7.** Calculate the pressure drop available in the header per 100 ft. of pipe by dividing (Step #4) by (Step #6).

**Step #8.** Refer to (Fig. I). Locate the gas flow rate (Step #1) on the left side of the chart and draw a horizontal line to the right. Locate the available pressure drop per 100 ft. (Step #7) along the bottom of the chart and draw a line vertically upward. The location of the intersection of the lines will determine the pipe size of the header line (where the intersection falls between pipe sizes use the larger size).

**Step #9.** Step #5 may now be repeated using from (Fig. II) the actual straight pipe equivalent for the pipe size fittings as determined in (Step #8) in place of the 25% estimate. Steps #6, 7, 8, 9 can then be repeated to check the original estimated condition.

PIPE SIZE REQUIRED FOR GAS FLOW & PRESSURE DROP/100 EQ. FT.



EQUIVALENT LENGTH FOR FITTINGS IN FEET											
PIPE SIZE (IPS)	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12
STD TEE thru. SIDE	5.5	7.5	9.0	12.0	14.0	17.0	22.0	33.0	43.0	55.0	65.0
STD EL	2.7	3.7	4.3	5.5	6.5	8.0	12.0	16.0	20.0	24.0	31.0
45° EL	1.2	1.6	2.0	2.5	3.0	3.7	5.0	7.5	10.0	12.0	15.0
GLOBE VALVE	27.0	40.0	43.0	45.0	65.0	82.0	120.0	170.0	240.0	290.0	340.0
GATE VALVE	0.6	0.8	0.9	1.2	1.4	1.6	2.2	3.5	4.5	5.5	7.0
PLUG COCK	3.0	4.0	5.5	7.5	9.0	12.0	16.0	27.0	39.0	51.0	65.0

Figure I

Figures II



# GAS

## SIZING GAS HEADER FROM METER TO BOILER

FIG. III

SIZE SERIES & HP	MAX. FIRING RATE CFH	REQ'D PRESS. AT UNIT (See Notes)		
		STD.	FM	IRI
542-40	1675	5.0	5.0	5.5
-50	2095	7.0	7.0	8.0
-60	2520	6.5	6.5	7.5
548-60	2520	4.5	4.5	5.5
-70	2935	6.0	6.0	7.0
-80	3350	8.0	8.0	9.0

40 & 50 H.P. FV20A Burner  
60 To 80 H.P. FV20B Burner

UNIT FIRING RATES (CFH 1000 BTU/CU FT  
.55 to .65 SPG GAS)

APPROXIMATE CONVERSION  
13.9" W.C. = 8 OZ/SQ IN = .5 PSI

### NOTES:

1. FOR GAS WITH BTU/CU. FT. OTHER THAN 1000, DETERMINE CFH BY MULTIPLYING CFH SHOWN IN (FIG. III) BY THE RATIO OF (1000/ACTUAL BTU/CU. FT.)
2. WHEN BTU/CU. FT. IS LESS THAN 1000, MULTIPLY THE REQUIRED PRESSURE AT THE UNIT SHOWN IN (FIG. III) BY THE RATIO OF (1000/ACTUAL BTU/CU. FT.)<sup>2</sup>. IF TOTAL PRESSURE REQUIRED IS NOT AVAILABLE CONSULT THE FACTORY FOR INCREASED GAS TRAIN SIZES AVAILABLE.
3. FOR GAS OR SP.G. OTHER THAN .55 TO .65, DIVIDE THE ALLOWABLE LINE PRESSURE DROP/100 EQ. FT. BY THE RATIO OF (ACTUAL SP.G./.6).

## GAS PRESSURE REGULATOR REQUIREMENTS

Boiler Size Series & HP	CFH Firing Rate	U/L STANDARD & FM APPROVAL				IRI APPROVAL			
			Press. Req'd		Reg. Size & Model		Press. Req'd		Reg. Size & Model
			Inlet	Outlet			Inlet	Outlet	
542-40	1675	Std	6.5	5.0	1-1/2" RV-81	Std	7.0	5.5	1-1/2" RV-81
		Low	3.5	3.0	2-1/2" RV-91	Low	3.5	3.0	2-1/2" RV-91
		High	11.0	6.5	1" RV-60	High	12.0	7.0	1" RV-60
-50	2095	Std	9.0	7.0	1-1/2" RV-81	Std	10.0	8.0	1-1/2" RV-81
		Low	5.0	4.0	2-1/2" RV-91	Low	5.5	4.5	2-1/2" RV-91
		High	16.0	9.5	1" RV-60	High	17.0	10.5	1" RV-60
-60	2520	Std	7.5	6.5	2" RV-91	Std	8.5	7.5	2" RV-91
		Low	6.5	5.5	2-1/2" RV-91	Low	7.0	6.0	2-1/2" RV-91
		High	13.0	10.1	1-1/2" RV-81	High	15.0	11.5	1-1/2" RV-81
548-60	2520	Std	5.5	4.5	2" RV-91	Std	6.5	5.5	2" RV-91
		Low	4.5	3.5	2-1/2" RV-91	Low	5.0	4.0	2-1/2" RV-91
		High	11.0	8.0	1-1/2" RV-81	High	13.0	9.5	1-1/2" RV-81
-70	2935	Std	7.5	6.0	2" RV-91	Std	9.0	7.0	2" RV-91
		Low	5.0	4.5	3" RV-110	Low	5.5	5.5	3" RV-110
		High	14.5	11.0	1-1/2" RV-81	High	17.5	13.0	1-1/2" RV-81
-80	3350	Std	10.0	8.0	2" RV-91	Std	11.0	9.0	2" RV-91
		Low	6.0	5.5	3" RV-110	Low	7.0	6.5	3" RV-110
		High	18.0	13.5	1-1/2" RV-81	High	22.0	16.5	1-1/2" RV-81

## GAS LINE FEEDER SIZES

The size of the piping from the gas header piping to each unit gas regulator in a multiple unit installation should be sized using the max. gas flow for the individual unit and the pressure drop per 100 ft. found in (Step #6 - in no case should the pipe size be smaller than the unit gas pressure regulator pipe size - see gas pressure regulator requirements.

### SAMPLE PROBLEM

What size gas header should be run to handle two 50 HP hot water boilers and a single 80 HP high pressure steam boiler? The boilers are to be furnished to meet UL requirements. The gas is natural, .6 SPG and 1000 BTU/cu.ft.

**Step #1.** Determine the maximum gas flow rate of all units using  $2 \times 2095 + 3350 = 7540$  CFH.

**Step #2.** Determine that the highest pressure required at any one unit for UL requirements is 10.0" W.C.

**Step #3.** The gas company indicates that gas pressure of up to 1 psi will be available after their meter. The available pressure drop to push the quantity of gas through the header is then  $1 \text{ psi} = 27.8" - 10.0" \text{ W.C. (Step \#2)} = 17.8" \text{ W.C.}$

**Step #4.** From the plans it is determined that the length of straight pipe in the header to the most distant boiler is 200 ft. The allowance for fittings etc. would then be  $200 \text{ ft.} \times .25\% = 50 \text{ ft.}$  or a total length straight pipe distance of  $200 \text{ ft.} + 50 \text{ ft.} = 250 \text{ ft.}$

**Step #5.** Divide 250 ft. (Step #4) by 100 = 2.5.

**Step #6.** The pressure drop available in the header per 100 ft. of pipe is then  $17.8" \text{ W.C. (Step \#3)} \text{ divided by } 2.5 \text{ (Step \#5)} = 7.12" \text{ W.C./100 ft.}$

**Step #7.** Referring to (Fig. I) and locating the intersection of 7540 CFH (Step #1) and  $7.12" \text{ W.C./100 ft. (Step \#6)}$  we find that a 2-1/2" IPS pipe might be satisfactory.

**Step #8.** Now that a good estimate of the pipe size required has been made, go back to Step #4. It has been established that the header will contain - 2 tees, 3 standard elbows and a gate valve. For 2-1/2" pipe (Step #7) the equivalent length of these is  $(2 \times 14) + (3 \times 6.5) + 1.4 = 48.9 \text{ ft.}$

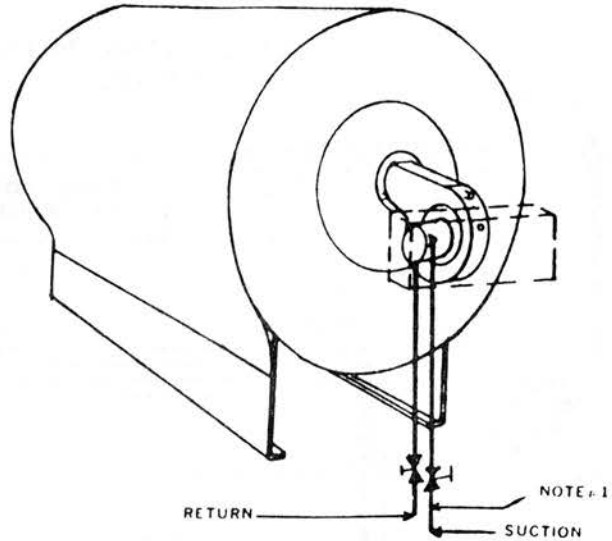
**Step 4A.** The new equivalent length of pipe is  $200 + 48.9 = 248.9 \text{ ft.}$

**Step 5A.** Divide 248.9 ft. (Step #4A) by 100 = 2.489 ft.

**Step 6A.** The new pressure drop available in the header per 100 ft. of pipe is now  $17.8" \text{ W.C. (Step \#3)} \text{ divided by } 2.489 \text{ (Step \#5A)} = 7.15" \text{ W.C./100 ft.}$

**Step 7A.** Referring to (Fig. I) and locating the intersection of 7540 CFH (Step #1) and  $7.15" \text{ W.C./100 ft. (Step \#6A)}$  we find that a 2-1/2" IPS pipe is the actual requirement.

## SUGGESTED FUEL OIL PIPING ARRANGEMENT



**NOTE #1**—FOR SUCTION AND RETURN LINE SIZE AND ALLOWABLE LENGTH OF RUN SEE "LIGHT OIL" LINE SIZING INFORMATION.

### LIGHT OIL

**40 SSU MAX. @ 100° F—.85 SPG**

Maximum allowable run and suction return line sizing for #2 Oil Burning Units.

#### LINE SIZING

For all light oil burners, use individual lines of 1/2" O.D. tubing or 1/2" pipe for both suction and return lines.

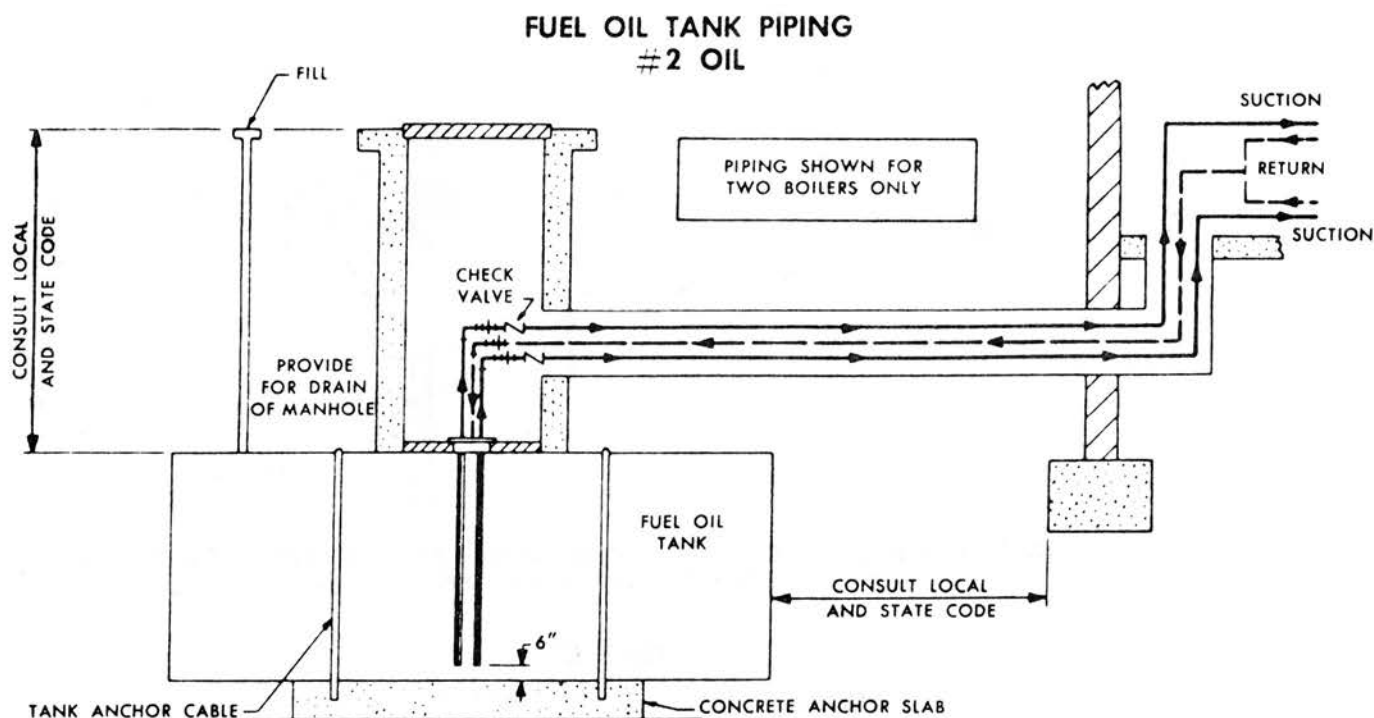
#### MAXIMUM ALLOWABLE PIPE RUN

To determine the maximum allowable pipe or tubing run from the pump suction connection to the bottom of the fuel oil tank for various lifts and for all size units use the chart below.

TOTAL LIFT (FT.)*	ALLOWABLE RUN (FT.)**
0	91
1	87
2	84
3	81
4	77
5	74
6	70
7	67
8	63
9	60
10	58
11	53
12	50
13	46
14	43
15	39

\* To determine "Total Lift" for all units add 4 ft. to the vertical distance from the boiler room floor to the bottom of the fuel oil tank.

\*\* If the actual run exceeds the maximum allowable run, an auxiliary pump set must be used.



### FUEL OIL TANK

The fuel oil tank should be located as per local and State Regulations. Proper size depends on the number of gallons consumed per hour, and the availability of delivery. When possible, the tank should be buried beneath the ground. If it is not possible, it should be well protected by masonry construction. Sufficient tapings should be furnished to accommodate a large fill line, remote oil gauge, vent line, suction line and return line.

#### SUGGESTED PROCEDURE FOR INSTALLING FUEL OIL TANKS

1. Test suction and return lines by sealing off tank and boiler piping and subjecting closed system to 125 lbs. inert gas pressure. Remove source of gas. Allow system to remain full for a period of no less than 8 hrs. Pressure gauge should be installed in closed system before subjecting to pressure. If pressure remains at 125 PSI for test period it is assumed system is tight.
2. **POSITIVELY DO NOT** use cast iron fittings in fuel oil piping. Check all pipe threads for over cutting.
3. Run outside lines well below frost line.
4. Protect outside lines below driveways with reinforced concrete slab. Be careful with heavy machinery used during construction and in vicinity of pipe runs.
5. Install tank vent high enough to eliminate source of objectionable odors. Terminate tank vent within sight of tank fill. Use full sized tank fill pipe.
6. Use as few elbows and other fittings as possible—straight run preferable.
7. Pitch lines up from tank to burner or remote pump set.
8. Run suction and return lines full sized, to within 2-feet of burner pump connection.
9. To size lines and locate pump set see "Fuel Pump Location and Suction and Return Line Sizing" information.

### BOILER ROOM VENTILATION

Each boiler requires sufficient fresh air to assist the combustion process. Insufficient air will result in smoky fires and large deposits of soot and carbon inside the boiler which will lower the boiler operating efficiency. There are times when incoming air is not desirable. These will be periods of normal shutdown of the equipment. When the boilers are shut off the air supply damper automatically positions the fresh air louver to a closed position preventing the chilling of any piping into the boiler room.

Switch on the motor should prevent burner from starting if louvers fail to open.

Proper screening should be provided.

If automatic louver is not required, stationary louvers are satisfactory.

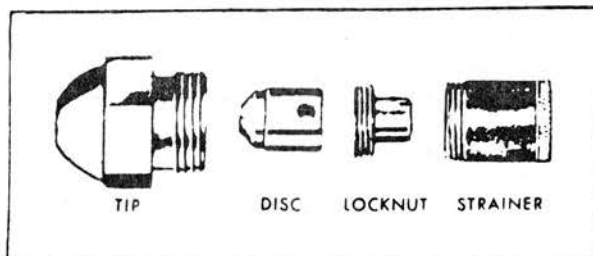
Sufficient amount of ventilation should be furnished into the upper section of boiler room to keep the ambient temperature below 90° F.

BOILER HORSEPOWER	Equivalent Free Area Opening
40 and 50	18" x 25"
60 thru 80	25" x 29"

The area around the unit and its components must be maintained and serviced. Check dimensions of the burner and components so that ample space is available to perform these functions and meet local codes.

## SERVICE, MAINTENANCE AND STARTING INSTRUCTIONS FOR BURNER.

The starting and operation of the burner is just as important as the installation. If a good installation is made and the unit is not properly started and the operator not properly instructed, maximum operating efficiency cannot be obtained. For the proper procedures of starting and maintaining the equipment, these instructions are provided by DONLEE Technologies



The Oil Burning Nozzle prepares the oil for burning by properly atomizing the fuel. Therefore, this assembly should be properly adjusted and cleaned. When assembly is removed, careful note should be made of the dimensions and returned as per drawing provided. A detail of the nozzle is provided above.

### NEW NOZZLES

If a new nozzle does not spray properly, polish the orifice with a round sharpened toothpick. This will remove any test oil which may not have been flushed out completely and, later, congealed in the orifice.

### HANDLING

Always handle a nozzle as carefully as you would a fine watch. It is a precision piece of equipment, easily damaged by careless or rough treatment. NEVER clean orifices with needles, pins, wires or ANY sharp metal as the least scratch will ruin the spray and damage the nozzle permanently. Keep your stock nozzles in individual containers as supplied from the factory—DON'T place them loosely in your toolbox or a bag and expect them to be usable.

### CLEANING

Remove strainer, locknut and disc from tip. Brush parts thoroughly, particularly the slots of the disc and the inside of the tip. Use a Monarch brass wire nozzle brush. Soak in carbon tetrachloride or any good carbon solvent, and then rinse thoroughly with hot water. Polish orifice lightly, front and rear, with a round sharpened toothpick.

**CAUTION:** Be sure hands and tools are clean before re-assembling. Re-assemble disc and locknut in tip and tighten firmly with screw driver, holding tip in socket or box wrench or a vise. Re-assemble strainer, first making sure that parts are free of any loose wires, lint, sludge, etc., then screw it into the tip, finger tight.

### STRAINERS

Strainers should always be used with nozzles up to about 5.00 GPH and may be used for as large as 12.50 GPH if desired. They will not fit sizes over 12.50 GPH.

To clean nozzle make sure the main disconnect switch is open. Drain fuel oil from nozzle lines. Disconnect electrode cables and fuel lines; loosen allen set screw between mounting plate and holder, withdraw nozzle and electrode assembly. When returning assembly, make sure holder is flush to mounting plate.

**NOTE:** Extreme care should be taken to adjust electrode as per dimensions.

## LUBRICATION PROCEDURE & REQUIREMENTS FOR STEAM-PAK MOTORS

### A. Ball Bearing (Identified by plugged grease ports)

#### 1. To add grease periodically:

- a. Check grease level in bearings each month adding grease only if necessary. Too much grease may be just as damaging as too little. Housing should be at least 1/3 full but never more than 2/3 full.
- b. When greasing use only a hand operated pressure gun.
- c. Wipe clean the plugged hole and the regions around hole and relief plug. (G.E. motors use pressure fitting.)
- d. Remove both filler plug and relief plug to prevent a pressure build up.
- e. Free relief hole of hardened grease.
- f. Add grease with motor running until it is expelled through the relief hole.
- g. Run motor for several minutes with relief plug removed to expel excess grease and relieve pressure which may have been built up.
- h. Clean and replace relief plug.

#### 2. To Clean and Re-Grease:

- a. Bearings should be cleaned and regreased once a year.
- b. Follow through on Section 1, items c, d and e.
- c. Replace relief plug and fill housing with solvent, with motor running. After 10 minutes drain off solvent. Repeat this process until solvent comes out clear. If carbon tetrachloride is used for flushing, rinse housing with small amounts of light mineral oil.
- d. Follow through on Section 1, items f, g and h.

#### 3. Motors with special characteristics:

- a. High speed motors (3450 RPM) should be greased every six months.
- b. Motors 7-1/2 HP or greater should use at least one ounce of grease every six months.
- c. Westinghouse pre-lubricated ball bearings provide adequate lubrication for at least five years. At the end of five years the shield on the outer end of the bearing should be removed and the grease examined. If grease is discolored and has a bad odor, bearings should be cleaned and re-packed with grease. If not, shield may be replaced and the bearings put back into service for several years.

### B. Sleeve Bearings (Usually identified by spring capped oil fill)

#### 1. Periodic Oiling:

- a. Check oil on sleeve bearing once a month.
- b. To add oil, motor should be stationary. A false oil level is shown when motor is running. It may be high or low, depending on direction of rotation. Always fill to near the top of housing.
- c. Always wipe up surplus oil. Exterior oil is sign of a leak. If found, determine cause and correct.

#### 2. To clean and re-oil sleeve bearings:



- a. Bearings should be cleaned and re-oiled every six months. However, if oil is dirty and emulsified before this time, clean more often.
- b. To clean bearings, flush through filler cap with drain plug removed.
- c. After draining, seal threads of drain plug with an oil sealing compound and refill the oil reservoir.

3. Motors with special characteristics.

- a. High speed motors (3450 RPM) should be re-oiled every 3 months.
- b. Motors 7-1/2 HP or greater should be re-oiled every 3 months.

C. Lubricants for Ball Bearings

1. Gould Motors

- a. Fractional Horsepower Motor Bearings: Pre-lubricated, no further lubrication necessary.
- b. Integral Horsepower Motor Bearings: Relubricate with Non-Fluid Oil Corp G-60 or Chevron SRI #2 grease unless otherwise stamped on the nameplate.

2. G. E. Motors:

- a. G. E. Grease Specification D6A2C5 - General Electric Co., Schenectady, N.Y.
- b. A grease with following characteristics:
  - 1. ASTM worked consistency 270-290 with minimum change over range of operating temperatures.
  - 2. Melting point preferably above 150°C.
  - 3. Freedom from separation of oil and soap.
  - 4. Freedom from abrasive matter and acidity.

3. Westinghouse Motors:

- a. Use Westinghouse 53701RY grease unless a special grease is specified on the nameplate. Some equivalent greases are:  
Chevron SRI-2 - Standard Oil of California  
Premium RB - Texaco, Inc.  
Unirex N2 - Exxon  
Dolium R - Shell Oil Company  
Rykon Premium - American Oil
- b. Lubricate approximately every two years - 1800 RPM & every year - 3600 RPM.

4. Marathon Motors:

- a. Frame 56 Motor Bearings: Sealed lubricated bearings require no attention.
- b. All Other Frame Sizes: Alvania #2, Shell Oil Company or equivalent. Relubricate approximately every two and one-half years.

5. Reuland Motors:

- a. Reuland Motors feature lifetime lubricated, Sealed Ball Bearings, grease packed and sealed by the Bearing Manufacturer.

6. Baldor Motors:

- a. For motors 1/8 to 7-1/2 HP, relube every five years. For motors 10 to 40 HP, relube every three years.
- b. Frame 215T and smaller motor bearings: Alvania #2, Shell Oil Company or equivalent.
- c. Frame 254 and larger motor bearings: Dolium R, Shell Oil Company or equivalent.

D. LUBRICANT FOR SLEEVE BEARINGS

1. G. E. Motors:

- a. SAE 10 viscosity turbine oil for motors up to 1/2 HP.
- b. SAE 20 viscosity turbine oil for motors 1/2 HP and larger.

2. Westinghouse Motors:

- a. PD-2268 Westinghouse specification number.
- b. SAE 10 viscosity for motors up to 1/2 HP.
- c. SAE 20 viscosity for motors 1/2 HP and larger.

3. Marathon Motors:

- a. Reoil with SAE No. 10 oil for every 2000 hours of motor operation.

NOTE: NEVER LUBRICATE COMMUTATORS.  
NEVER OVERLUBRICATE.



## STARTING THE OIL BURNER MODEL FV-20-2

After all pipe lines have been tested and all electrical connections have been made, the fuses should be fastened in their proper places, the automatic controls adjusted to operate the burner, and the burner motor oiled with SAE No. 20 Motor Oil.

There should be sufficient oil in the tank. The oil lines and pump should be freed of air by running the burner and bleeding the air through the gauge port of the fuel unit until oil runs free of bubbles. An oil pressure gauge should be used when adjusting the pump pressure. Set pump pressure at 100 PSI.

When the burner is fired for the first time, loosen the air damper locking screw and set air damper to allow about one-half of the total opening of the shutter. A finer adjustment may be made after the flame has been maintained in a hot combustion chamber.

Metering of the air for combustion is accomplished by the air damper. An upward position of the lever allows more air to enter the combustion chamber while downward position of the lever allows less air to enter the combustion chamber. After setting the air damper to the desired position it should be locked in place by tightening the linkage.

To obtain the best burner operation three adjustments are usually necessary.

1. The air damper that regulates the volume of air should be set to produce the proper flame color. Increasing the volume of air will produce a flame changing from yellow toward white. Too much air usually produces a fire having sparklers and can be detected by a strong odor. Decreasing the volume of air will produce a flame changing from white through yellow into an orange color with dark smokey tips at the end of the flames. The best setting should yeild a flame between yellow and orange color with no smokey tips.
2. The oil pressure at the pump should be adjusted between 90 and 120 PSI. To get the best setting vary the pressure between these two settings until needle on pressure gauge remains stationary or has the least movement. If gauge is not available do not alter this setting more than 1-1/2 turns from the original setting. Changing this setting may reduce flicker in flame due to variable pressure.
3. Lengthwise movement of the nozzle pipe assembly forward or back to give the best mixture of oil and air at the air nose. To make this adjustment, loosen the nut holding the assembly in position. Lock securely when finished and check bus bars to be sure they are in position.

## GENERAL SERVICE

### A. If Oil Fails To Ignite

1. Make certain there is oil in the tank.
2. Check oil pressure - standard setting 100 PSI. If no pressure is developed, bleed air from pump through gauge port opening.
3. Remove nozzle pipe assembly. Check electrode setting both as to spark gap and position of tips in relation to nozzle check tightness of nozzle.
4. If electrode setting is correct, clean nozzle as follows:
  - a. Remove nozzle from nozzle adapter.
  - b. Screw out nozzle strainer and insert.

## GENERAL SERVICE CONT'D

- c. Wash all nozzle parts in very hot water or in carbon tetrachloride, making certain there are no dirt particles in the slots or nozzle orifice. UNDER NO CIRCUMSTANCES, USE A PIN OR A NEEDLE TO CLEAN SLOTS AND ORIFICE. Use the edge of a piece of hard paper to clean slots. Use clean rags and keep hands free from grit and dirt while working with nozzle parts. IT MAY SAVE YOU A REPEAT SERVICE CALL.
    - d. Assemble nozzle and install in nozzle adapter.
  5. Check transformer for proper spark as follows:
    - a. Remove motor lead from transformer terminal.
    - b. Remove nozzle pipe assembly from burner and connect buss bars to transformer clips. WARNING: BUSS BARS CARRY HIGH VOLTAGE - KEEP CLEAR OF THEM WHEN BURNER IS ON.
    - c. Turn burner on - spark should be strong enough that you cannot blow spark from electrode tips.
- B. If Fire Is One Sided
  1. Follow steps A-3 and A-4 and if fire is still one sided, install a new nozzle.
- C. If Fire Is Well Centered But Rough
  1. Check oil pressure - standard setting 100 PSI.
  2. Clean nozzle as described under A-4
  3. Adjust nozzle pipe assembly to the rear position (toward burner cover plate).
  4. Adjust pump pressure between 90 and 125 PSI. and set at point which gives best operation.
  5. Check for fluctuating pump pressure - this may be corrected by step C-4.
  6. Check for oil leaks in suction line or on suction side of fuel unit - check particularly at oil line filter and fuel unit end plate. An air leak will generally be indicated by an intermittent hissing sound at the fuel unit or by unsteady pump pressure. Air leaks **MUST** be eliminated.
  7. Increase air by rotating air damper slightly.
- D. If After Fire or "Bump" Occurs on Shut-Down
  1. Adjust nozzle pipe assembly to rear position (toward burner cover plate).
  2. Make certain air is purged from fuel unit and nozzle pipe assembly.
  3. Increase pump pressure 5 to 10 PSI.
  4. Check for air leaks in suction line and suction side of fuel unit (See C-6).
  5. Check for excessive vacuum on pump by inserting vacuum gauge in unused suction opening in fuel unit. Vacuum should not be over 7". High vacuum may be caused by kinked suction line, dirty oil line filter or dirty strainer in pump.
  6. Remove cut-off valve piston (under hex nut on fuel unit) and remove any dirt particles on neoprene seat in the end piston.
- E. If Fire Puffs on Start
  1. Follow step A-3
  2. Check for air leaks in suction line on suction side of fuel unit (See C-6).
  3. On a two-pipe system, check for leaking check valve in suction line by putting pressure on suction line between fuel unit and check valve with a

## GENERAL SERVICE CONT'D

pressure gauge so placed as to show if pressure is holding or not.  
**DISCONNECT SUCTION LINE FROM PIPE.**

### F. If Fire Is Smokey

1. Increase air by rotating air damper to point where fire is clean.
2. Check for dirt and lint in fan wheel or at air intake.
3. Check for obstruction in chimney.
4. Clean nozzle as described under A-4.
5. Install new nozzles.
6. Check for low pump pressure - less than 80 PSI.

## YEARLY SERVICE

1. Clean boiler or furnace thoroughly and have service man check burner firing rate.
2. Clean burner thoroughly, remove and clean nozzle with care so that surface inside tip is not scratched; if badly caked, replace.
3. Clean and properly reset electrodes. Refer to Parts Identification Drawing.
4. Clean burner fan, housing and blast tube.
5. Remove (8) cap screws from end cap of pump. Remove pump strainer, clean thoroughly. Replace gasket on pump with a new one.
6. Replace filter cartridge (if filter is used).
7. Use a few drops of S.A.E. No. 20 motor oil for the two oil cups on burner motor (every six months).

## STARTING THE GAS BURNER MODEL FV-20-N

Refer to the Flame Control Bulletin in your instruction package or manual.

## GENERAL SERVICE

A. When adjusting the main flame, a forward or rearward adjustment of the ignitor assembly can affect the flame pattern. Generally, the proper setting is with the ignitor funnel flush with the forward edge of the gas head. When adjustments are correct, a quiet, blue flame with orange tips should result.

B. As part of routine service, the position of ignition electrode should be checked.

C. If Main Gas Valve will not open after pilot is established, check to see that Burner Air Switch contacts are made.

## STARTING THE DUAL FUEL BURNER MODEL FV-20-N2

Refer to the Flame Control Bulletin in your instruction package or manual.

## GENERAL SERVICE

A. When adjusting the main flame, a forward or rearward adjustment of the nozzle-electrode-ignitor assembly can effect the flame pattern. When adjustments are correct, a fast blue gas flame and clean, bright oil flame should result.

B. As part of routine service, the position of the ignition electrode should be checked.

C. If the fuel valves will not open after pilot is established, check to see that Burner Air Switch contacts are made.

# **FULLY MODULATED LIGHT OIL (#2) BURNERS USING PRESSURE ATOMIZATION (OPTION)**

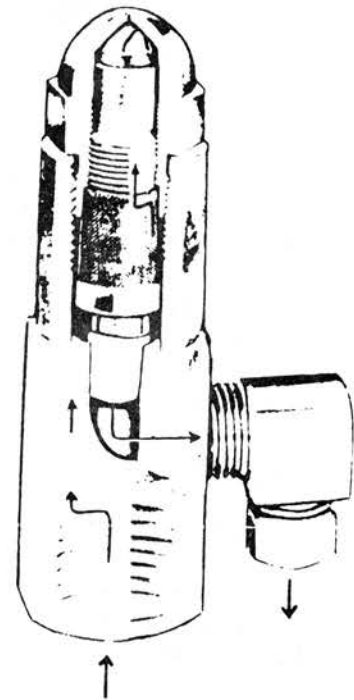
As an optional arrangement, pressure atomized light oil burners are available for full range modulation.

This is accomplished by using a by-passing nozzle which produces a variable firing rate by by-passing fuel from the nozzle swirl chamber.

The nozzles are rated and stamped with the capacity when operating at 100 PSI with the by-pass closed. With the by-pass opened, the firing rate will decrease. These nozzles may be operated at supply pressures in excess of 100 PSI. At this increased nozzle pressure, the nozzle will deliver a greater quantity of fuel.

The variable pressure needed to change the firing rate is accomplished with a modulating metering oil valve on the return line, connected to a linkage, and operated by modulating motor which also controls the blower air damper.

The oil flow to the nozzles is controlled by a solenoid valve in the supply line, and a safety solenoid in the return line prevents back flow from the return line.



**F-80-BPS NOZZLE**

## **\* TYPICAL PRESSURE SETTINGS**

BOILER HORSEPOWER	PUMP PRESSURE	RETURN PRESSURE	
		HIGH	LOW
40 and 50	140 P.S.I.	85	15
60 thru 80	145 P.S.I.	85	10

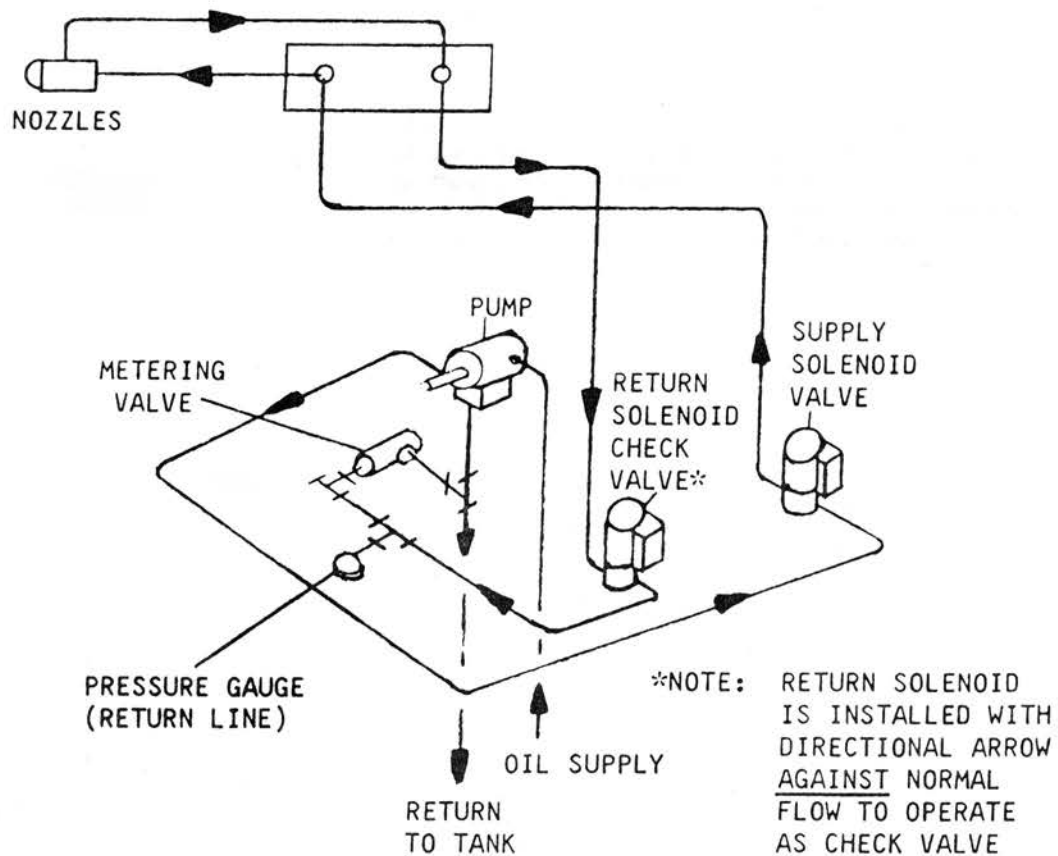
\* THESE ARE AVERAGE AND WILL VARY SLIGHTLY FROM INSTALLATION TO INSTALLATION

TYPICAL SETTINGS FOR FV-20A & B BURNERS

BOILER HORSEPOWER	FUEL	FUEL RATE	CO %	NOZZLE OIL PRESS.	GAS MAN. PRESS.
40 and 50	Gas	2095 C.F.H.	9.0	—	2.5" W.C.
	Oil	15.0 G.P.H.	11.0	115 P.S.I.	—
60 thru 80	Gas	3350 C.F.H.	9.5	—	5.5" W.C.
	Oil	24.0 G.P.H.	11.5	105 P.S.I.	—

NOTE: The above "typical readings" are for general use only. Specific installation readings may vary due to various types of burner applications. Burner start-up and service personnel should adjust all settings for maximum efficiency operation.

**SCHEMATIC PIPING ARRANGEMENT  
FOR LIGHT OIL FULL MODULATION WITH MECHANICAL ATOMIZATION**



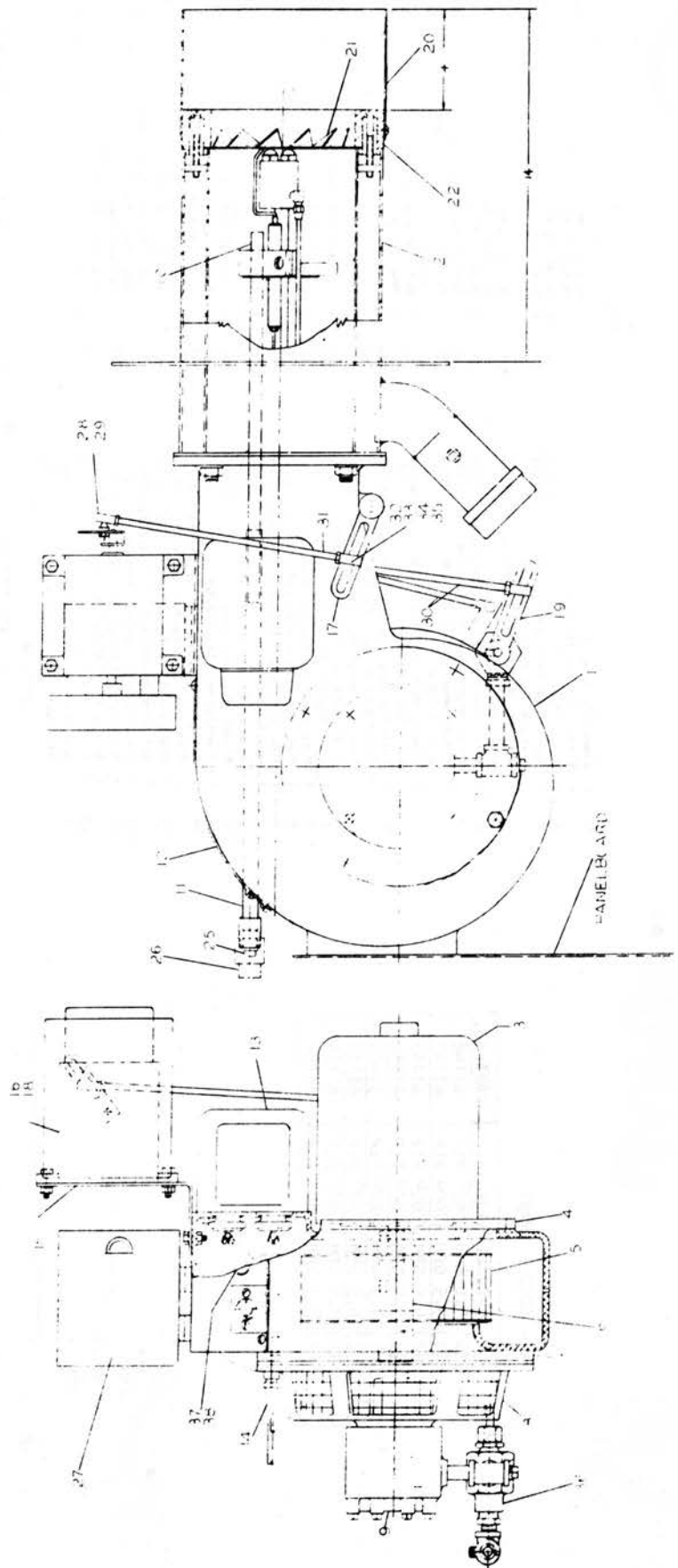
# **PARTS REFERENCE DRAWING** **FOR FV-20 A & B LIGHT OIL FULL MODULATING BURNERS**

**FV - NOZZLE CHART (FULL MODULATION)**

BURNER	UNIT	NOZZLE SIZE	PART NO.
FV-20A	40 H.P.	(1) 5.0 Gal. F80° BPS*	106260
		(1) 3.5 Gal. F80° BPS	106257
	50 H.P.	(1) 3.0 Gal. F80° BPS	106256
		(2) 4.5 Gal. F80° BPS	106259
FV-20B	60 H.P.	(1) 5.0 Gal. F80° BPS*	106260
		(3) 5.5 Gal. F80° BPS	106261
	70 H.P.	(3) 6.5 Gal. F80° BPS	106262
		(2) 7.5 Gal. F80° BPS	106263
	80 H.P.	(1) 8.3 Gal. F80° BPS*	106280

\* 1 - Nozzle Used For Pilot

Ref. No. No. Rqd.	Part Name	Part No.	Ref. No. No. Rqd.	Part Name	Part No.
1	Blower Housing (FV-20A)	127513	16	Modulrol Motor Honeywell M30UA	106722
1	Blower Housing (FV-20B)	136082	17	Metering Arm	15932
2	Blow Pipe	127514	18	Metering Arm	22665
3	Motor 1 HP 3450 RPM Fr. 5/8" (FV-20A)	61213	19	Burner Tube Extension	127517
1	Motor 2 HP 3450 RPM Fr. 5/8" (FV-20B)	57058	20	Air Whirl Sub Assembly	127522
4	Motor Mounting Plate (FV-20A)	13916	21	Orifice Plate	127519
1	Motor Mounting Plate (FV-20B)	71085	22	Burner Mounting Flange Gasket	127668
5	Blower Wheel 760-553 x 5/8"	18859	23	Oil Line Assy Pump To Valve	138623
1	Bore (FV-20A)	110387	24	Orifice Scavenger Tube	112617
1	Blower Wheel 987-105 x 5/8"	110387	25	Heat Block	63631
6	Bore (FV-20B)	127589	26	Conduit Box - Full Lid	138351
1	Flexible Coupling 5/8" x 7/16"	69805	27	Linkage Rod (Specify Length)	105149
1	Bore x 1" Lg. (FV-20A)	69805	28	Linkage Rod (Specify Length)	105157
1	Flexible Coupling 5/8" x 7/16"	69805	29	Linkage Rod (Specify Length)	105157
7	Bore x 1-1/2" Lg. (FV-20B)	74571	30	1/4" - 28 N.P. Ball & Socket Joint	66728
1	Iris Shutter Assembly	127597	31	1/4" Flat Washers	105149
8	Pump Mounting Bracket Assembly	51398	32	1/4" 28 N.P. Hex Nut	15514
9	Pump Standrad H6KA-100	131550	33	Metering Valve Assembly	47910
10	Nozzle & Electrode Assembly	127525	34	Peep Sight Glass	64516
11	Scavenger Extension Assembly	127525	35	1/2" Conduit Bushing (Plastic)	69801
12	Blower Housing Cover Assembly	127369	36	Crack Arm 1002 (Honeywell)	69802
13	Transformer L52W 115/60	54671	37	Washer (Honeywell)	
14	Oil Line Assembly (FV-20A)	127731	38		
1	Oil Line Assembly (FV-20B)	138661	39		
15	Modulrol Motor Mounting Bracket	131760	40		

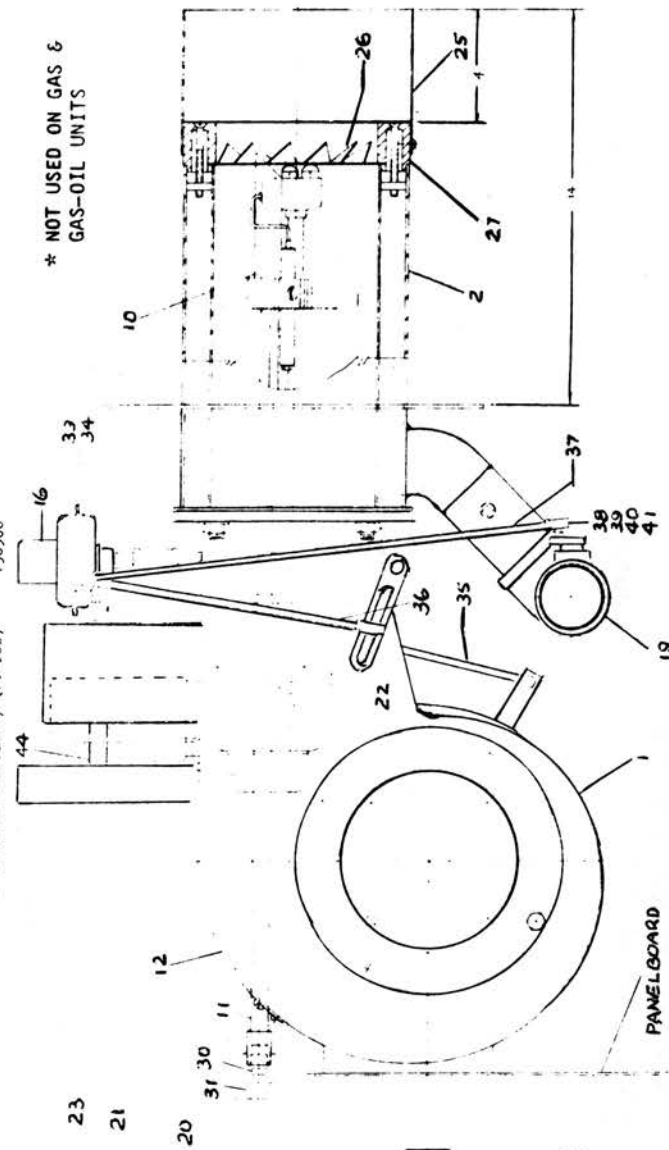
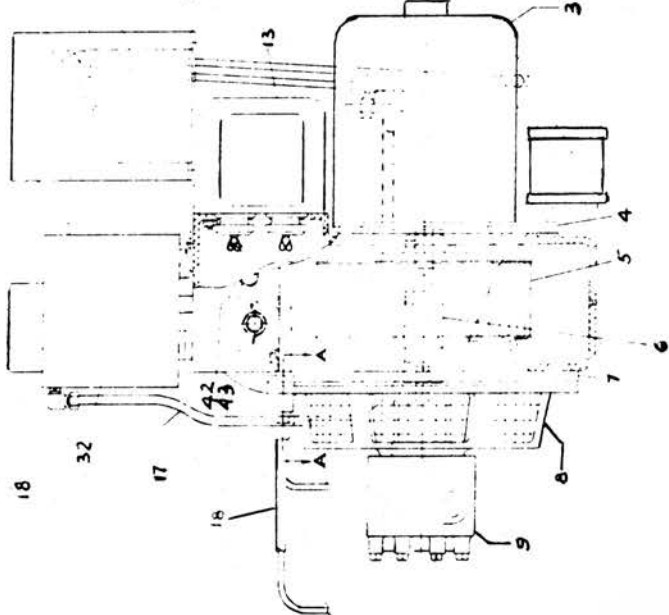




# PARTS REFERENCE DRAWING FOR FV-20 A & B LIGHT OIL-GAS COMBINATION BURNERS

FV - NOZZLE CHART

BURNER	UNIT	NOZZLE SIZE	PART NO.
FV-20A	40 H.P.	(2) 4.0 GPH x 60° PLP	61148
		(1) 3.5 GPH x 60° PLP	61147
	50 H.P.	(2) 4.5 GPH x 60° PLP	61149
		(1) 5.0 GPH x 60° PLP	61150
FV-20B	60 H.P.	(3) 5.5 GPH x 60° PLP	61152
		(2) 7.5 GPH x 60° PLP	61154
	70 H.P.	(3) 6.5 GPH x 60° PLP	61152
	80 H.P.	(1) 8.3 GPH x 60° PLP	61167



Ref. No.	Part Name	Part No.	Ref. No.	Part Name	Part No.
1	Blower Housing (FV-20A)	127513	20	Modutrol Motor Mtg. Bracket	138953
2	Blower Housing (FV-20B)	134082	21	Modutrol Motor Mtg. Bracket	106235
3	Blower Housing (FV-20C)	127514	22	Modutrol Motor Mtg. Bracket	45932
4	Motor 1 HP 3450 RPM Fr. 56C.	61213	23	Modutrol Motor Mtg. Bracket	51768
5	Motor 2 HP 3450 RPM Fr. 56C.	57058	24	Modutrol Motor Mtg. Bracket	127537
6	Motor Mounting Plate (FV-20A)	43916	25	Modutrol Motor Mtg. Bracket	127522
7	Motor Mounting Plate (FV-20B)	71085	26	Modutrol Motor Mtg. Bracket	127519
8	Motor Mounting Plate (FV-20C)	48859	27	Modutrol Motor Mtg. Bracket	127668
9	Blower Wheel 762-25 x 5/8"	140387	28	Modutrol Motor Mtg. Bracket	138623
10	Blower Wheel 987-305 x 5/8"	140387	29	Modutrol Motor Mtg. Bracket	131637
11	Flexible Coupling 5/8" Bore x 7/16" Bore 4" Lg. (FV-20A)	127589	30	Modutrol Motor Mtg. Bracket	63631
12	Flexible Coupling 5/8" Bore x 7/16" Bore 3-1/2" Lg. (FV-20B)	69805	31	Modutrol Motor Mtg. Bracket	138451
13	Flexible Coupling 5/8" Bore x 7/16" Bore 3-1/2" Lg. (FV-20C)	69805	32	Modutrol Motor Mtg. Bracket	
14	Isis Shutter Assembly	7451	33	Modutrol Motor Mtg. Bracket	
15	Pump Mounting Bracket Assembly	127597	34	Modutrol Motor Mtg. Bracket	
16	Pump Sundstrand H3PA-100 (FV-20A)	100463	35	Modutrol Motor Mtg. Bracket	
17	Pump Sundstrand H3PA-100 (FV-20B)	131398	36	Modutrol Motor Mtg. Bracket	
18	Nozzle & Electrode Assembly	127515	37	Modutrol Motor Mtg. Bracket	
19	Scanner Extension Assembly	127525	38	Modutrol Motor Mtg. Bracket	
20	Blower Housing Cover	132369	39	Modutrol Motor Mtg. Bracket	
21	Transformer LEEW 115/60	54671	40	Modutrol Motor Mtg. Bracket	
22	Oil Line Assembly-Main (FV-20A)	127731	41	Modutrol Motor Mtg. Bracket	
23	Oil Line Assembly-Main (FV-20B)	138661	42	Modutrol Motor Mtg. Bracket	
24	Oil Line Assembly-Pilot (FV-20A)	127730	43	Modutrol Motor Mtg. Bracket	
25	Oil Line Assembly-Pilot (FV-20B)	138662	44	Modutrol Motor Mtg. Bracket	
26	Oil Switch Cleveland OFSH-CO	68587	45	Modutrol Motor Mtg. Bracket	
27	Air Switch Tubing (FV-20A)	127707	46	Modutrol Motor Mtg. Bracket	
28	Air Switch Tubing (FV-20B)	138556	47	Modutrol Motor Mtg. Bracket	
29	Pilot Tube Assembly	127709			
30	Gas Train Assembly (FV-20A)	157902			
31	Gas Train Assembly (FV-20B)	136500			

\* NOT USED ON GAS & GAS-OIL UNITS



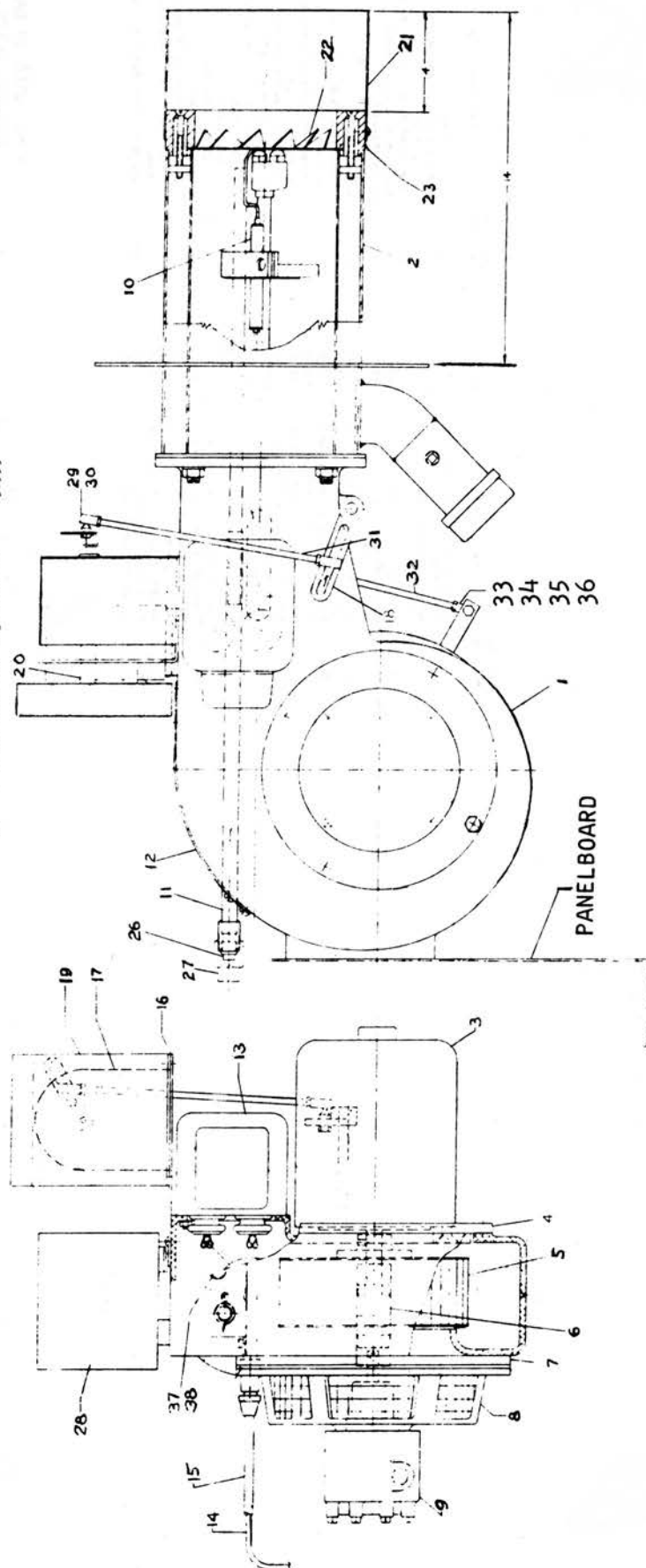
# **PARTS REFERENCE DRAWING** **FOR FV-20 A & B LIGHT OIL SPARK IGNITION BURNERS**

**FV - NOZZLE CHART**

BURNER	UNIT	NOZZLE SIZE	PART NO.
FV-20A	40 H.P.	(2) 4.0 GPH x 60° PLP	61148
		(1) 3.5 GPH x 60° PLP	61147
		(2) 4.5 GPH x 60° PLP	61149
FV-20B	50 H.P.	(1) 5.0 GPH x 60° PLP	61150
		(3) 5.5 GPH x 60° PLP	51434
	70 H.P.	(3) 6.5 GPH x 60° PLP	61152
		(2) 7.5 GPH x 60° PLP	61154
	80 H.P.	(1) 8.3 GPH x 60° PLP	61167

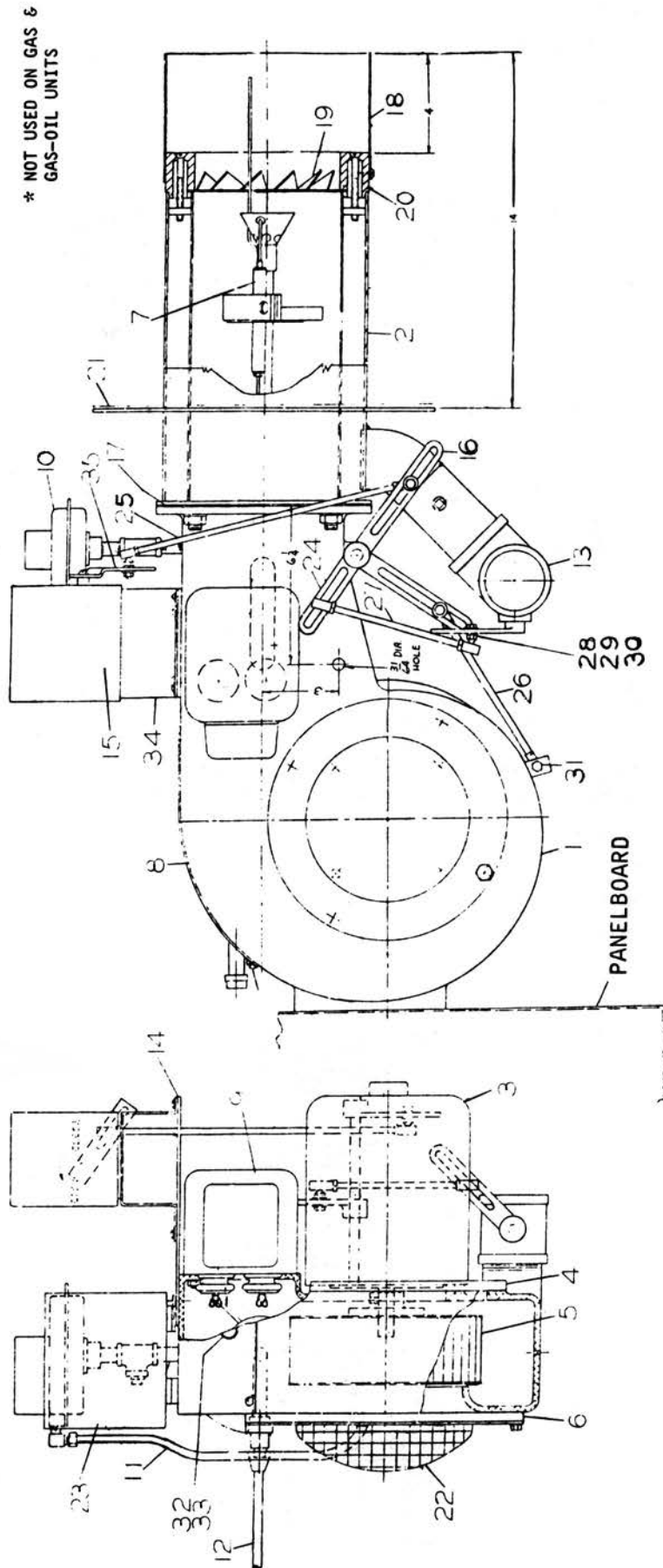
Ref. No.	No. Rqd.	Part Name	Part No.
17	1	Modutrol Motor M436	106235
18	2	Metering Arm	45932
19	1	End Switch 3607A	51768
20	1	Burner Tube Extension	127537
21	1	Air Whirl Sub Assembly	127522
22	1	Orifice Plate	127519
23	1	Burner Mtg. Flange Gasket	127668
24	1	Oil Line Assembly -	138623
25	1	Pump To Valve	
26	1	Conduit Box - Pull Lid	138451
27	1	Linkage Rod (Specify Length)	
28	1	Linkage Rod (Specify Length)	
29	1	Socket Joint	66728
30	1	1/4" x 28" N.F. Ball &	
31	1	Socket Joint	
32	1	1/4" Flatwasher	105149
33	1	1/4" Lockwasher	105157
34	1	1/4" 28 N.F. Hex Nut	53679
35	1	Peep Sight Glass	47910
36	1	1/2" Conduit Bushing (Plastic)	64516
37	1	Shaft Ext. & Mtg. Screws	106237
38	1	Bag Assy 40748RU	
39	1	Mtg. Bracket (Mod. Motor)	106238
40	1	Bag Assy 7640JM	
41	1	Bracket (Mod. Motor)	106239
42	1	Bag Assy 16254AC	
43	1	Crank Arm & Ext. Bag Assy 7640JL	106236

Ref. No.	No. Rqd.	Part Name	Part No.
1	1	Blower Housing (FV-20A)	127513
2	1	Blower Housing (FV-20B)	136082
3	1	Blast Pipe	127514
4	1	Motor 1 HP 3450 RPM Fr. 56C, (FV-20B)	61213
5	1	Motor 2 HP 3450 RPM Fr. 56C, (FV-20B)	57058
6	1	Motor Mounting Plate (FV-20A)	43916
7	1	Motor Mounting Plate (FV-20B)	71085
8	1	Blower Wheel 162-255 x 5/8"	48859
9	1	Bore (FV-20A)	
10	1	Blower Wheel 987-305 x 5/8"	140387
11	1	Bore (FV-20B)	
12	1	Flexible Coupling 5/8" x 7/16"	127589
13	1	Bore 4" Lg. (FV-20A)	
14	1	Flexible Coupling 5/8" x 7/16"	69805
15	1	Bore 3-1/2" Lg. (FV-20B)	
16	1	Iris Shutter Assembly	7451
17	1	Pump Mounting Bracket Assembly	127597
18	1	Pump Sundstrand H3PA-100 (FV-20A)100463	
19	1	Pump Sundstrand H6KA-100 (FV-20B) 51398	
20	1	Nozzle & Electrode Assy (FV-20A) 131210	
21	1	Nozzle & Electrode Assy (FV-20B) 131553	
22	1	Blower Housing Cover Assy	132031
23	1	Transformer LEM 115/60	54671
24	1	Oil Line Assy - Main (FV-20A)	127731
25	1	Oil Line Assy - Main (FV-20B)	138661
26	1	Pilot Tube Assy (FV-20A)	127709
27	1	Oil Line Assy (FV-20B)	138662
28	1	Modutrol Motor Mtg. Bracket	138953



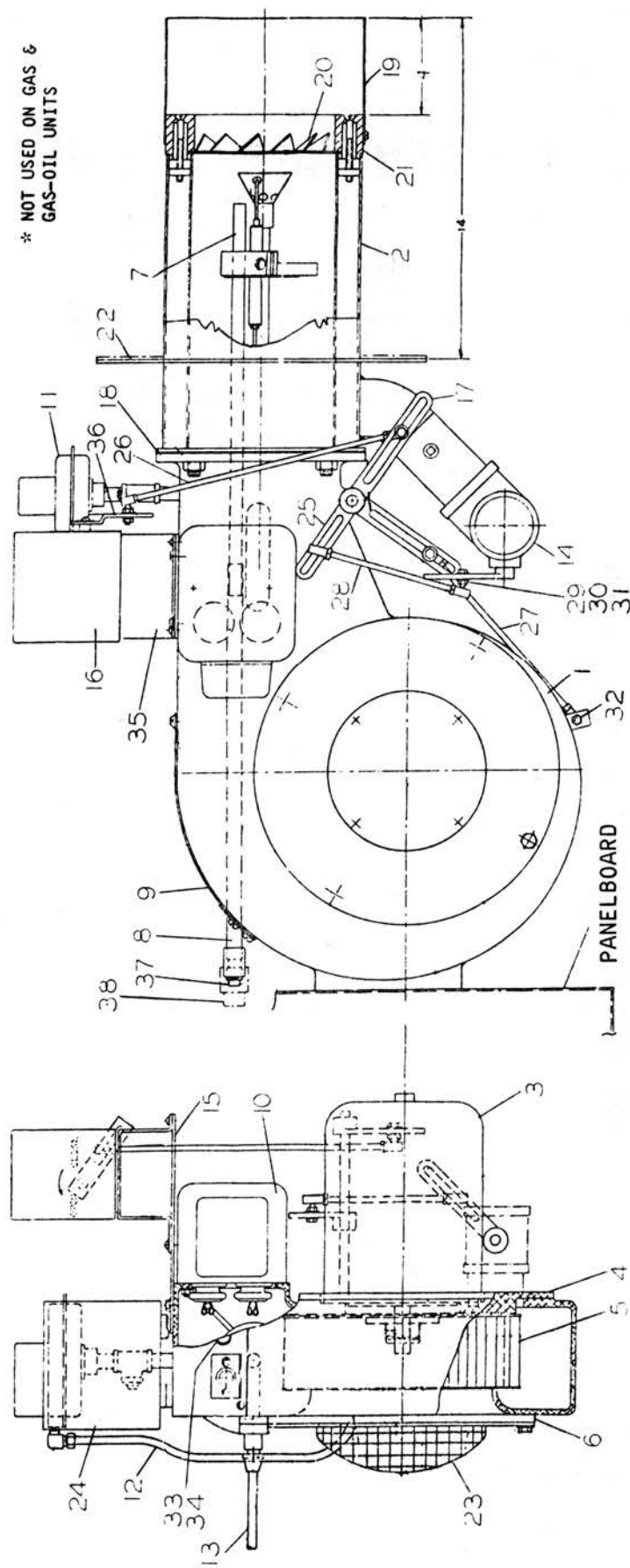
# PARTS REFERENCE DRAWING FOR FV-20 A GAS FIRED GAS IGNITION BURNER (141809)

Ref. No.	Part Name	Part No.	Ref. No.	Part Name	Part No.
1	Blower Housing (FV-20A)	127513	20	Drift Plate	127519
2	Blow Plate	127514	21	(When Used On Steam-Pak)	
3	Motor 1 HP 115/60 RPM Fr. 56C	61213	22	Drift Plate	141468
4	Motor Mounting Plate (FV-20A)	43916	23	Burner Mtg. Flange Gasket	127568
5	Blower Wheel (FV-20A)	48859	24	Screen Assembly	131713
6	Bore (FV-20A)	7451	25	Conduit Box Pull Lid	138451
7	Iris Shutter Assembly	138453	26	Metering Arm	141784
8	Blower Housing Cover Assembly	132031	27	Linkage Rod, Mod. Motor to	23592
9	Transformer LEU 115/60	54651	28	Jackshaft 10" Lg.	3267
10	Air Switch Cleveland DFLH-CO	4868	29	Linkage Rod, Jackshaft to Iris	
11	Air Switch Tubing (FV-20A)	127707	30	Shutter 7-1/2" Lg.	
12	Pilot Tube Assembly	157902	31	Butterfly Valve 4" Lg.	66728
13	Gas Train Assembly	160068	32	1/4" 28 N.F. Ball & Socket Joint	105149
14	(When Used As Conversion Burner)		33	1/4" Flat Washer	125157
15	Modutrol Motor Mfg. Bracket	138953	34	1/4" 28 N.F. Hex Nut	53673
16	Modutrol Motor Mfg. 16	106235	35	Peep Sight Glass	47910
17	Metering Arms	45972		1/2" Conduit Bushing (Pastic)	64516
*18	Gasket, Blower To Blast Pipe	138379		Bracket (Mod. Motor) Bag Assy	106239
19	Burner Tube Extension	127537		162544C	
	Air Whirl Sub-Assembly	127522		Crank Arm & Ext. Bag Assy	7640JL 106236



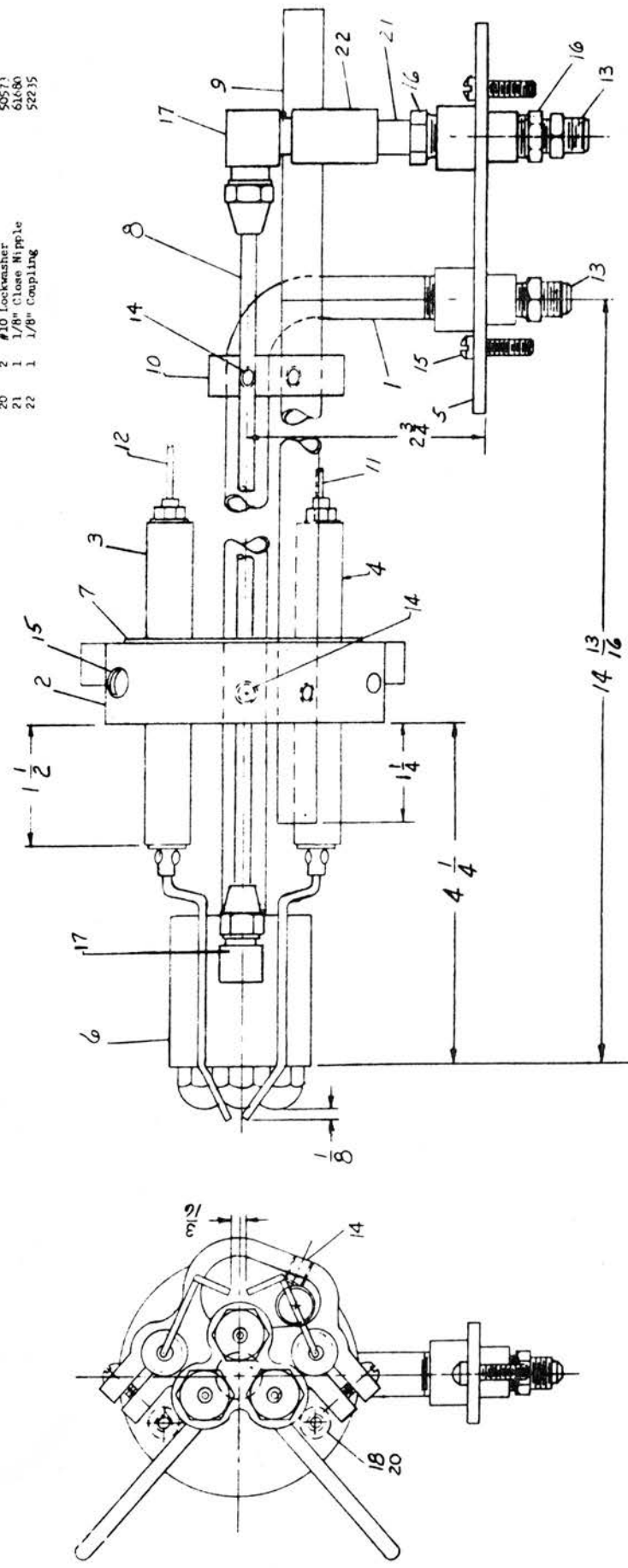
# **PARTS REFERENCE DRAWING** **FOR FV-20 B GAS FIRED GAS IGNITION BURNER (141794)**

Ref. No. No. Rqd	Part Name	Part No.	Ref. No. No. Rqd	Part Name	Part No.
1	Blower Housing (FV-20B)	136082	20	Air Whirl Sub-Assembly	127422
2	Blast Pipe	127514	21	Orifice Plate (When Used On Steam-Pak)	152288
3	Motor 2 HP 3450 RPM Fr. 56C (FV-20B)	57058		Orifice Plate	1-1-Mod
4	Motor Mounting Plate (FV-20B)	71085	22	When Used As Conversion Burner	127668
5	Blower Wheel 90-1305 x 5/8"	140387	23	Burner Mtg. Flange Gasket	131213
6	Bore (FV-20B)	7451	24	Screen Assembly	138451
7	Ignitor Assembly	131554	25	Conduit Box Pull Lid	142784
8	Ignitor Extension Assembly	127525	26	Metering Arm	3272
9	Blower Housing Cover Assembly	132369	27	Linkage Rod Mod. Motor To	3272
10	Transformer LEEM 115/60	54671	28	Linkage Rod Jackshaft To Iris	3272
11	Air Switch Cleveland DPM-CC	68587	29	Linkage Mod Jackshaft To	3267
12	Air Switch Tubing (FV-20B)	138556	30	Butterfly Valve w/ Lg.	66728
13	Pilot Tube Assembly	127709	31	1/4" 28 M.F. Ball & Socket Joint	105149
14	Gas Train Assembly	160048	32	1/4" Flat Washer	105157
	(When Used On Steam Pak)	160059	33	1/4" 28 M.F. Hex Nut	53679
15	Gas Train Assembly	160059	34	Peep Sight Glass	47310
16	Modulot Motor Mtg. Bracket	138953	35	1/2" Conduit Bushing (Plastic)	64516
17	Modulot Motor M36	106235	36	Bracket (Mod. Motor)	106239
18	Metering Arm	45932		Bag Assembly 162544C	
*19	Gasket Blower To Blast Pipe	138129		Crank Arm & Ext. Bag Assembly	106236
	Burner Tube Extension	127537		7640JL	
			37	Scanner Tube Orifice	131637
			38	Heat Block	63631



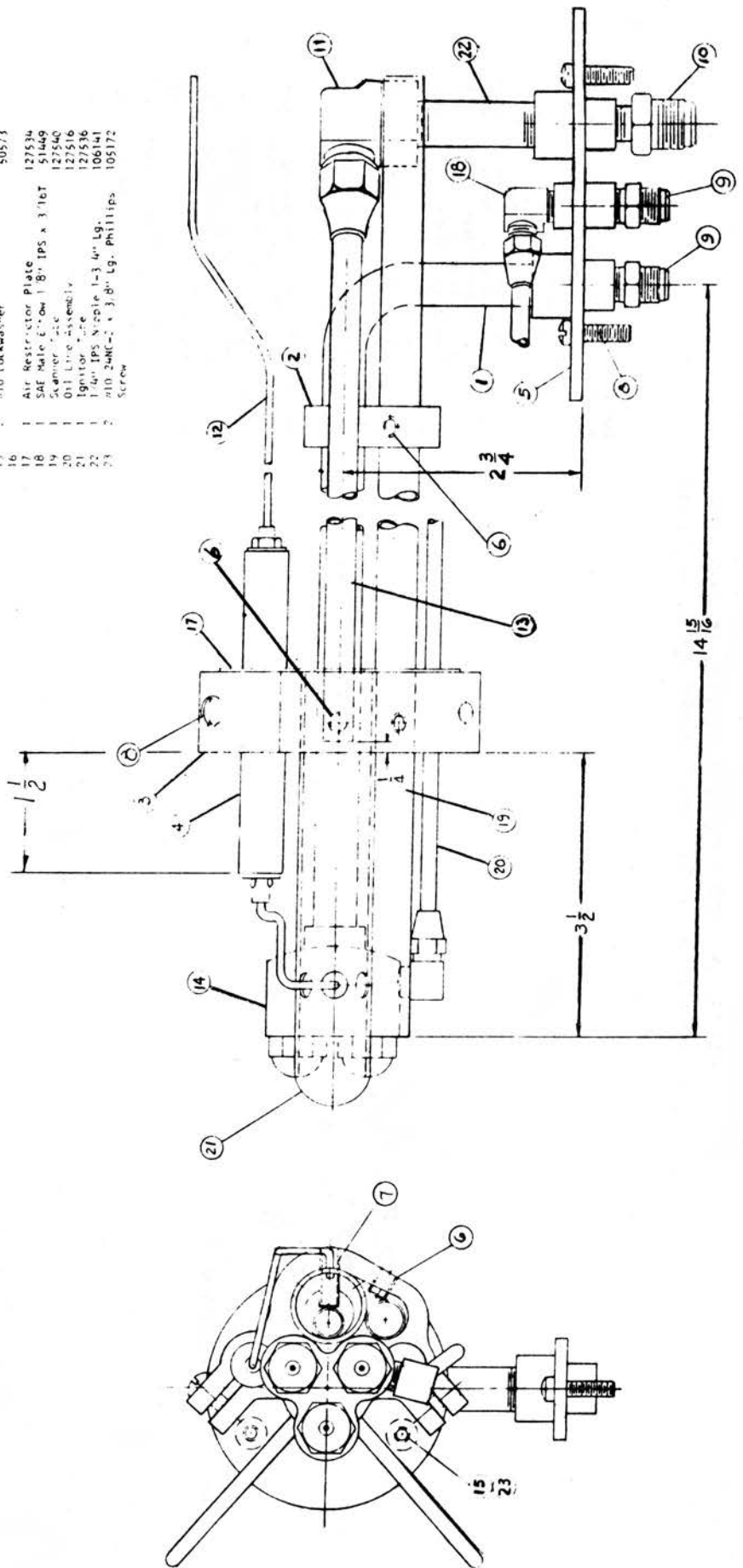
# PARTS LIST FOR NOZZLE & ELECTRODE ASSEMBLY FOR FV-20 A & B OIL FIRED & SPARK IGNITION FULL MODULATION (131550)

Part No. No. Rqd.	Part Name	Part No.
1	Nozzle Pipe	131504
1	Electrode Holder	127518
1	R.H. Electrode Assembly	131505
1	L.H. Electrode Assembly	131506
1	Nozzle Pipe Holder Assembly	140338
6	Nozzle Adapter	131642
7	Air Restrictor Plate	130787
8	Oil Line Assembly	131202
9	Scanner Tube	127500
10	Scanner Holder	127535
11	R.H. Bus Bar	131216
12	L.H. Bus Bar	131217
13	3/16" Tube 1/8" IFS Male Conn.	50081
14	WH 48x3	
14	1/4" 20NC-2 x 1/2 Set Screw Hex	52213
15	Soc. Cup Pt.	
15	#10 24 NC-2 x 3/4" Mech. Scr.	105175
16	Pan Hd Ph Cadmium Plated	
16	1/4" x 1/8" IFS Hex Bushing	50280
17	3/16" Tube 1/8" IFS Male Elbow	51149
17	49x3	
18	#10 24NC-2 x 3/8" Lg. Phillips	105172
18	Machine Screw	
19	#10 Lockwasher	50573
20	1/8" Close Nipple	61680
21	1/8" Coupling	52235
22	1/8" Coupling	

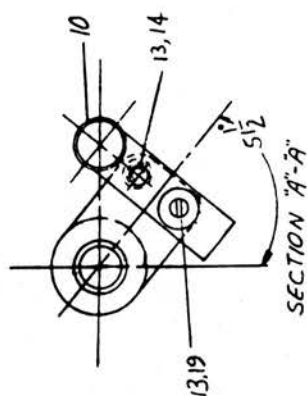


# PARTS LIST FOR NOZZLE & ELECTRODE ASSEMBLY FOR FV-20 A & B LIGHT OIL FIRED GAS IGNITION (127515)

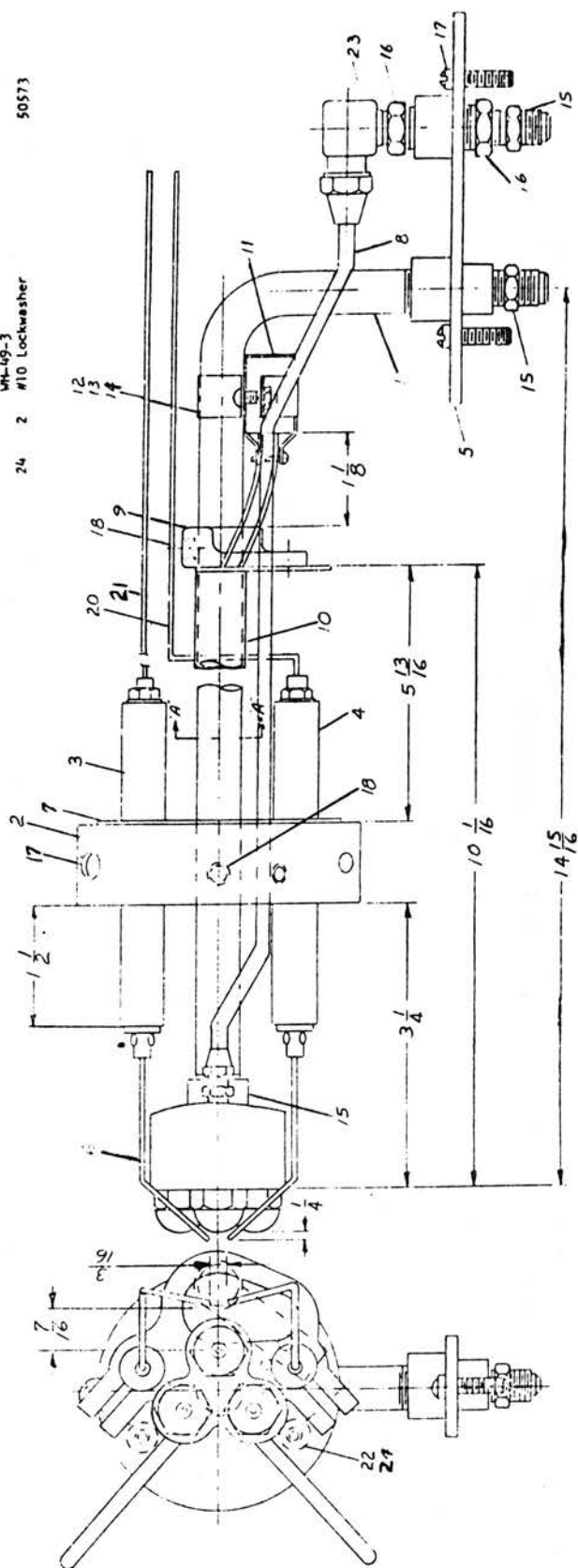
Ref. No.	No. Qtd	Part Name	Part No.
1	1	Nozzle Pipe	127517
2	1	Scanner Holder	127535
3	1	Electrode Holder	127518
4	1	Electrode Assembly	131662
5	1	Nozzle Pipe Holder Assembly	140334
6	4	1/4" 20NC-2 x 1 1/2" Lg. Set	52213
7	1	Screw Hex. Socket Cup Pt.	53615
8	3	Set Screw	50111
9	3	Machine Screw	50081
10	1	3/16" Tube 1/8" IPS Male Conn.	50841
11	1	3/8" Tube 1/4" IPS Male Conn.	55738
12	1	3/8" Tube 1/4" IPS Female Elbow	131217
13	1	Buss Bar	127524
14	1	Gas Line Assembly	108623
15	2	Nozzle Adapter M3/5-FB 1/4"	50573
16	1	Washer	127534
17	1	Air Restrictor Plate	51449
18	1	Saf Male Elbow 1/8" IPS x 3/16"	127540
19	1	Scanner Set	127516
20	1	Oil Line Assembly	127536
21	1	Ignitor Set	106141
22	2	1/4" IPS Nipple 1-3/4" Lg.	105172
23	2	M10 24NC-2 x 3/8" Lg. Phillips Screw	



### PARTS LIST FOR NOZZLE & ELECTRODE ASSEMBLY FOR FV-20 A & B OIL FIRED SPARK IGNITION (131210)

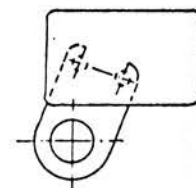
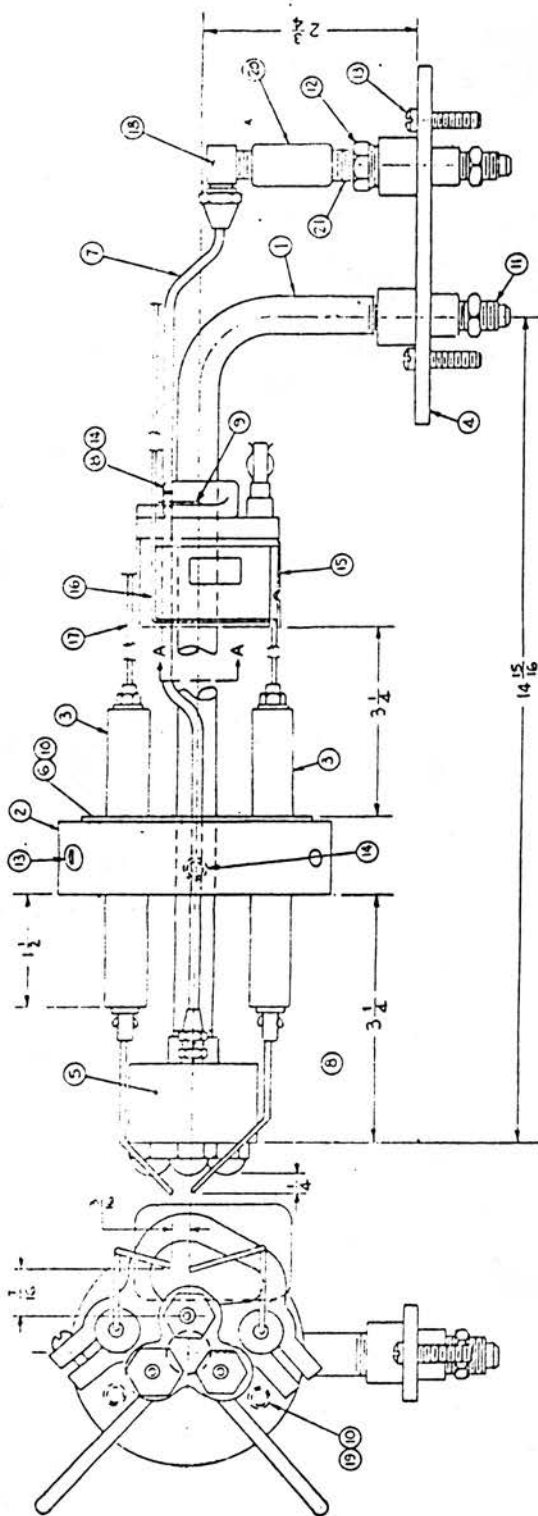


Part No.	Part Name	Part No.
1	Nozzle Pipe	127537
2	Nozzle Holder	127538
3	R.H. Electrode Assembly	131546
4	L.H. Electrode Assembly	131545
5	Nozzle Pipe Holder Assembly	130238
6	Nozzle Adapter M375-F8 1/4	108623
7	Air Restrictor Plate	130787
8	Oil Line Assembly	131202
9	Flame Detector Holder	88302
10	Flame Detector Honeywell C551A	69559
11	1018	
12	Socket S-102-CCT H.B. Jones	52620A
13	1/4" Pipe Strap	51256
14	#6 3/16"-2 x 1/2" Lg. Mach. Scr.	104170
15	Pan Hd. Phillips Cad. Plated	
16	#6 3/16"-2 Hex Nut Cad. Plated	
17	3/16" Tube 1/8" IPS Male Conn.	51677
18	WH 1483	50081
19	1/4" x 1/8" IPS Hex Bushing	50280
20	#10 2L NC-2 x 3/4" Mach. Screw	50111
21	Pan Hd. Ph. Cad. Plated	
22	1/4" 20NC-2 x 1/2" Set Screw	52213
23	Hex. Socket "up Pt.	
24	#6 Flat Type "B" Reg. St. Med.	105155
25	Cad. Plated	
26	R.H. Bus Bar	131217
27	L.H. Bus Bar	131216
28	#10 20NC-2 x 3/8" Lg. Phillips	105172
29	Machine Screw	
30	3/16" Tube 1/8" IPS x 90° Ell	51449
31	WH-49-3	
32	#10 Lockwasher	50573



# **PARTS LIST FOR NOZZLE & ELECTRODE ASSEMBLY FOR FV-20 A & B OIL FIRED SPARK IGNITION WITH PHOTOCELL (131553)**

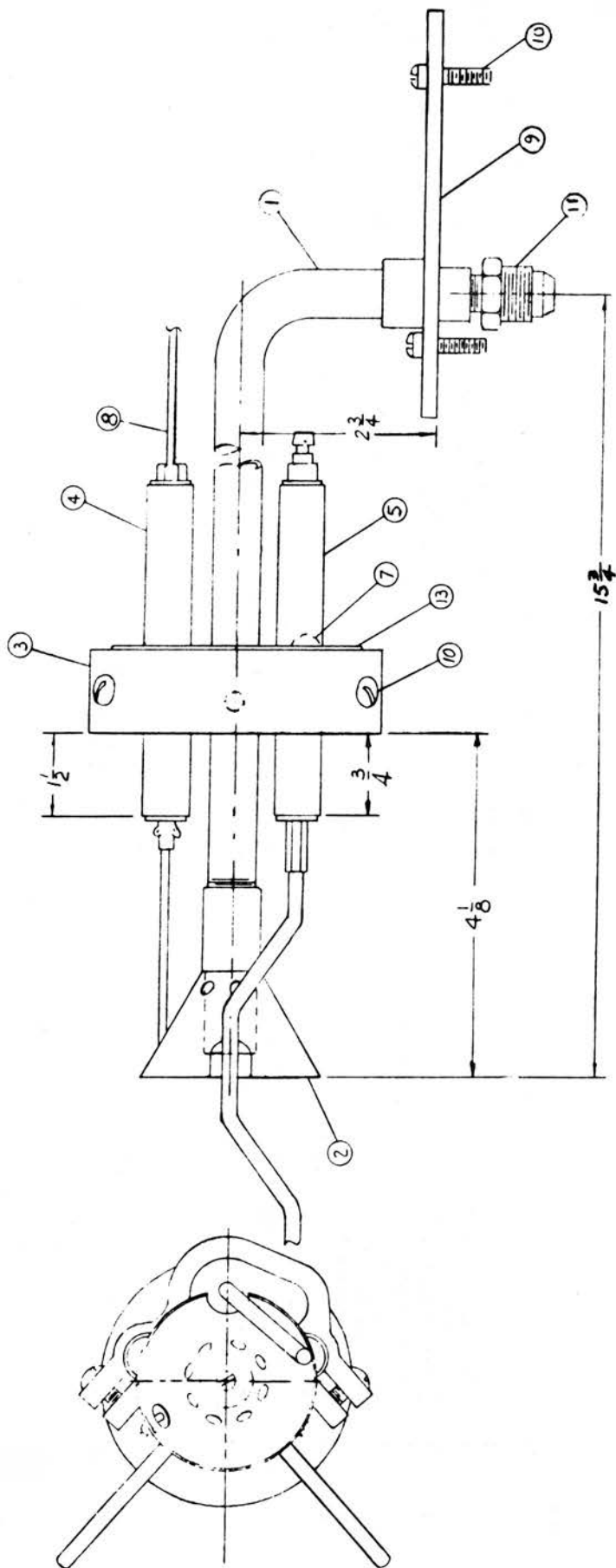
Ref. No.	No. Rqd.	Part Name	Part No.	Ref. No.	No. Rqd.	Part Name	Part No.
1	1	Nozzle Pipe	127517	12	1	Bushing, Hex., 1/4" x 1/8" IPS	50280
2	1	Electrode Holder	127518	13	4	Screw, Machine, Phillips Rd. Hd., #10-24NC2 x 3/4" Lg.	105175
3	2	Electrode Assembly	157313	14	2	Screw, Set, Socket Cup Pt. Hex. Hd., 1/4" 20NC2 x 1/2" Lg.	52213
4	1	Nozzle Pipe Holder Assembly	92556	15	1	Photocell & Mount, Honeywell C7014A-1002	51359
5	1	Nozzle Adapter - Monarch #H375-FB-1/4	108623	16	1	Buss Bar, R.H.	131216
6	1	Air Restrictor Plate	181457	17	1	Buss Bar, L.H.	131217
7	1	Oil Line Assembly	131202	18	1	Elbow, 90°, 3/16" Tube x 1/8" IPS, WH #49x3	51449
8	1	Flame Detector Holder	88302	19	2	Washer, Lock, #10	105156
9	2	Screw, Machine, Phillips Pan Hd. #6-32NC2 x 1/2" Lg.	105170	20	1	Coupling, Full, 1/8" IPS	66718
10	2	Screw, Machine, Phillips Hd., #10-24NC2 x 3/8" Lg.	105172	21	1	Nipple, Close, 1/8" IPS	61680
11	2	Connector, Male, 3/16" Tube x 1/8" IPS, WH #48x3	50081				



VIEW A-A

# **PARTS LIST FOR IGNITOR ASSEMBLY FOR FV-20 A WITH FLAME ROD GAS IGNITION (138643)**

Part No. No. Req.	Part Name	Part No.
1	Nozzle Pipe	130499
2	Ignitor Funnel Sub-Assy	130498
3	Electrode Holder	127518
4	Electrode Assembly	89484
5	Flame Rod	138642
6	1/4" 20NC-2 x 1/2" Lg. Set Screw Max. Socket Out-Point	52213
7	#10-24 x 1/8" Lg. Phillips Machine Screw Cad. Plated	105172
8	Bus Bar	131217
9	Nozzle Pipe Holder Assembly	140339
10	#10-24 3/4" Lg. Fill Hd. Mach. Screw	105175
11	1/4" 1F5 x 1/8" GAE Str. Male Connector WH 48x6	50841
12		
13	Air Restrictor Plate	130787





# **PARTS LIST FOR IGNITOR ASSEMBLY** **FOR FV-20 B WITH SCANNER GAS IGNITION (131554)**

Ref. No.	No. Rqd.	Part Name	Part No.
1	1	Nozzle Pipe	130499
2	1	Ignitor Funnel Sub-Assembly	130498
3	1	Electrode Holder	127518
4	1	Electrode Assembly	15660
5	1	Scanner Tube	127540
6	3	Screw, Set, Socket Hd., 1/4" 20NC2 x 1/2" Lg.	52213
7	4	Screw, Machine, Phillips Hd. #10 24NC2 x 3/8" Lg.	105172
8	1	Buss Bar	131216
9	1	Nozzle Pipe Holder Assembly	140339
10	4	Screw, Machine, Filler Hd., #10 24NC-2 x 3/4" Lg.	105175
11	1	Connector, Straight, Male, 1/4" IPS x 3/8" SAE, MH #48x6	50841
12	1	Screw, Machine, Pan Hd., #6 32NC2 x 3/8" Lg.	54175
13	1	Air Restrictor Plate	127534
14	1	Scanner Holder	127535

