

## INTRODUCTION

This manual has been prepared to assist in the installation, operation, and maintenance of your burner. Before installation, start-up, or operation of the burner, please read this manual carefully.

Due to the variation in engineering specifications, state and local codes, utility and insurance underwriters' requirements, the contents of this manual are of a general nature. If additional information is required or questions arise concerning specific requirements, please contact your local representative or the factory.

This combination gas-oil burner is listed by Underwriters' Laboratories Inc. and is approved by American National Standards Institute, the states of Massachusetts, Connecticut and the city of New York.

12/3/73

## SECTION I

### GENERAL INFORMATION - GAS-OIL

#### NATURAL GAS...

is a gas consisting principally of combustible gases, methane ( $\text{CH}_4$ ) and ethane ( $\text{C}_2\text{H}_6$ ) and some non-combustible gases, nitrogen ( $\text{N}_2$ ) and carbon dioxide ( $\text{CO}_2$ ). It has a thermal or heating value ranging from 950 to 1,125 BTU/cubic foot with specific gravity of about .65. Ten cubic feet of air is required to completely burn 1 cubic foot of gas. When burned ideally, the maximum amount of carbon dioxide in the waste gases is about 12%. There should be no carbon monoxide. The maximum theoretical flame temperature is about 3550 degrees Fahrenheit and it is a relatively slow burning gas.

#### NUMBER TWO FUEL OIL...

is composed of about 15% hydrogen and 85% carbon, thus it is called a hydro-carbon compound. It has a thermal or heating value of about 140,000 BTU/gallon with a Saybolt viscosity (gravity) of 38 maximum and a minimum of 32. Approximately 2219 cubic feet of air is required to burn one gallon of fuel oil. When burned in ideal conditions, the maximum carbon dioxide in the waste gases is about 15% and there should be no smoke. The fuel oil used should conform to U.S. Commercial specification #CS12-48.

## SECTION II

### GENERAL INFORMATION - BURNER

#### BURNER DATA CHART (Appendix, page II)

The table on Appendix, page II lists the standard burner and gives pertinent information, such as fuel input, motor size, gas train data, and oil nozzles, etc.

The burner you receive may vary slightly in equipment from that shown in the table, due to your specific job requirements.

#### FUEL INFORMATION

Fuel Oil - #1 or #2 distillate fuel oil.  
Gas - Natural.

#### PARTS INFORMATION

Any major replacement part can be easily located in the illustrated parts list section of this manual. This section contains an exploded parts drawing with itemized parts list. (Appendix, page IX)

12/13/73

#### AIR FLOW - CENTRIFUGAL SWITCH

The electric motor for the blower which supplies combustion air to the burner is equipped with a centrifugal switch which is wired in series with the gas and oil switch. The switch is normally open until the speed of the blower motor closes it and thus transfers power to the change-over switch. The gas valve or oil valve will not open until the blower motor is operating at full speed.

#### OIL PUMP

An integral oil pump - 3450 RPM, single or two-stage fuel unit is direct driven from the motor shaft with a flexible coupling. Note - It is recommended that the oil pump coupling may be removed when firing gas for extended periods of time.

#### GAS PRESSURE

Gas service pressure between 4 and 14 inches Water Column (W/C) must be provided. Under no circumstances should the equipment be operated on service pressure over 14" W/C.

#### THE MAIN GAS VALVE.....

is a single function gas valve which opens when the 24 volt output from the DSI system is applied. The valve operator is a solenoid oil filled operator providing quiet operation. Maximum capacity is 400,000 BTU at a 1" pressure drop with natural gas.

#### THE OIL SOLENOID VALVE.....

is the main oil valve, instantaneous type. A second oil valve is available upon request.

#### THE CONTROL CABINET.....

is burner mounted, has factory color coded wiring, and contains a cad cell control for oil and a DSI system for the gas firing. It also contains the 24 volt transformer, terminal strip and purge timer. A burner ON/OFF switch is available upon request. The cad cell control is mounted on the exterior of the control cabinet on the left hand side.

#### THE GAS PRESSURE GAUGE.....

is a diaphragm or inclined gauge used for initial adjustment and proper maintenance on all installations (not furnished as standard).

#### OIL NOZZLES

The standard nozzles furnished with the burners are of the standard simplex type and the nozzle marking is the input rating at 100 PSI.

### THE COMBUSTION HEAD...

is a unique firing head that incorporates an independent gas head, as well as an independent oil head. If the gas portion is not to function the burner can be operated on oil without a control component change. This is also true with the oil portion of the burner. NO GAS PILOT IS REQUIRED FOR OIL IGNITION OR GAS IGNITION. The oil firing is identical to a standard type oil burner in the current market.

### GAS-OIL SWITCHING

The burner fuel system is designed to be switched from gas to oil or from oil to gas. A manual change-over switch (the fuel selector switch) is provided on top of the control cabinet.

## BURNER INSTALLATION

### GENERAL INFORMATION

The burner is shipped as a factory assembled unit. The burner control cabinet is factory wired and color coded. The standard mounting is at the rear of the burner.

NOTE: Before installing burner, carefully check the following:

1. Combustion air supply - The boiler room in which burner is located must be provided with an adequate fresh air supply to assure proper combustion. The ventilation opening should not be less than 1.0 square inch of free opening per 1,000 BTU of burner input.

2. A stack and breeching should be used on all installations.

3. Electrical connection - The power supply must agree with burner requirements. All wiring must be done in accordance with the National Electrical Code and local utility and code requirements. The burner electric power should be provided from a separate fused disconnect switch located in the boiler room. (Fuse protection should be the "slow blow" type).

### BURNER GASKET

Cement asbestos rope gasket or install the sheet gasket furnished with burner on the burner mounting flange. This will prevent leakage of combustion gases from the boiler fire box. Pack insulating material around flame rod and electrode before installing cover box.

### BURNER MOUNTING

Attach burner to the boiler front plate by firmly tightening nuts on the mounting studs so that a rigid installation is accomplished.

NOTE: Make sure burner is level before tightening.

### GAS TRAIN

Install the gas train components, which are not factory mounted, on burner and connect to gas supply. Refer to Appendix, page VI for correct gas train sequences and detailed information.

### REFRACTORY CHAMBER

Chart #3, (Appendix, page IV) shows the minimum dimensions to be used for the construction of combustion chambers for the burner. If it seems necessary to reduce either the length or width below the minimum shown, the company must be consulted before any reduction is made. The total boiler volume (including space above combustion chamber) should be approximately 1.25 cubic feet per boiler horsepower.

Consult any and all special drawings furnished by Wayne Home Equipment Company, Incorporated.

### GAS PIPING - GENERAL

Gas piping should be installed in accordance with the National Board of Fire Underwriters, Pamphlet #54, and American Standards Association Bulletin Z21.30 and all other local codes which may apply.

Building gas piping should be sized to provide the required minimum pressure at the manual gas cock when operating at the maximum input. See Chart #1 (Appendix, page III) for gas pipe flow capacities for various pipe sizes and pressure drops. Consult your local utility concerning questions on gas pressures, allowable gas piping pressure drops, and local codes and utility piping requirements. Natural gas pressure regulators and manual gas cocks for the main burner will be supplied with the burner.

The gas train control size furnished with the burner and the minimum gas pressure required at the manifold are shown on the burner data sheet. (Appendix, page II). These gas train control sizes are for the standard burner and are based on natural gas. Consult the factory for gas train sizes other than standard.

### CIL PIPING INFORMATION

(Refer to pump literature for proper installation)

### FUEL CIL SYSTEM

The burner is designed for use with #1 or #2 fuel oils, which can be burned without any preheating equipment.

### OIL TANK LOCATION

The rules of the National Board of Fire Underwriters (Pamphlet #31) and local codes and regulations should be followed in locating and installing oil storage tanks and burner.

### OIL SHUT-OFF VALVE

A hand shut-off valve should be provided in the suction line near the burner and also at the tank or near the wall where the suction line comes through from an outside tank.

### CHECK VALVE AND FILTER

If the top of the tank is below burner level, use a check valve in the suction line on the burner side of the hand valve nearest the tank, inside the building. An oil filter is required for all installations.

NOTE: Select a check valve of the spring-loaded soft-seated type suitable for #2 oil, which will seal tightly with a low head.

### BURNER START-UP

#### GENERAL INFORMATION - ALL FUELS

A representative of the owner or the operator of the equipment should be present to receive instruction in care and adjustment of the unit. When the initial start-up has been completed, the representative or operator should sign the start-up form used, acknowledging that instruction has been received and a date recorded for the start of free service period, if it is to be provided.

Proper combustion adjustments involve setting the fuel input rates and the combustion air to achieve maximum practical efficiencies on either fuel. It is recommended that the adjustments for oil burning be made first on the burner. The matched inputs of oil and gas can then be easily accomplished by matching the gas to the oil by adjusting the gas pressure regulator.

The operator should become familiar with the location and purpose of all controls covering the burner operation. The schematic wiring diagram, (Appendix, page V) and identification material in this manual show the valves, instruments, and electrical controls which regulate the burner operation.

#### BEFORE START-UP, CAREFULLY CHECK THE FOLLOWING:

- a. The oil tank is filled and oil piping completed and tested.
- b. The gas utility company has been notified in case they require a representative on the job during start-up of gas-fuel equipment.
- c. Gas piping into building meter and service regulator have been installed, tested, and ready for service.
- d. All electrical wiring and power connections have been completed.
- e. City gas or heating inspector has been notified when applicable.
- f. Make certain the boiler is properly filled with water.
- g. Check to see if boiler breeching and stack passages are open and unobstructed.
- h. Open boiler damper, if provided.

### VOLTAGE CHECK - 115 VOLT MOTOR & CONTROLS

Set the burner control switch "off". Turn on the burner power at the disconnect switch or breaker. Check the voltage with a meter between terminals 1 and 2 on terminal strip in the burner control cabinet. If the voltage is not within 110-120 volts, contact the local electric utility.

### LIGHTING - STARTUP

SEE: INSTRUCTIONS FOR LIGHTING- (App., pg. I) or metal instruction plate on top of control cabinet.

### MOTOR RUNNING CURRENT AND VOLTAGE CHECK

Measure the motor running current after final air adjustments have been made. The current should not exceed "motor service factor amps" plus 15% shown on the motor nameplate. Check the control voltage on terminals 1 and 2 as motor starts. The voltage should not drop even momentarily below 100 volts or difficulty may occur in control operation. Extreme voltage drop indicates inadequate service wire size to the motor.

### LIMIT & OPERATING CONTROL CHECK

Permit burner to operate until the desired operating pressure is reached, which will be indicated on the steam or temperature gauge. Burner should shut off near this point if proper setting has been made on operating control.

The Hi-Limit control is normally set 2 or 3 psi or 15 to 20 degrees higher than operating control, depending on whether the heating system is steam or hot water. The operating control may be set higher than the limit control to check operation of the Hi-Limit control. After checking Hi-Limit, reset operating control at desired setting and observe burner cut-in point as pressure or temperature drops and cut-out point as pressure or temperature rises. Some readjusting of operating control may be necessary to match desired operating pressure or temperature.

When the burner is operating, open the blow down valve on the low water cut off. The flame should immediately cut off as the water leaves the low water cut off. The burner should restart automatically when the proper level of water in the low water cut off is re-established.

### EMERGENCY SHUT OFF SWITCH

If used, should be checked to make sure that it shuts off the burner.

### BURNER START UP FORM

The following readings should be taken and recorded on burner start-up form after final adjustments have been made:

- A. Microamperes from sensor
- B. Carbon Dioxide (CO<sub>2</sub>) percentage in stack gases
- C. Smoke indications from Shell Bacharach scale. (oil)
- D. CO indications in stack gases (Gas)
- E. Stack temperature

BURNER START UP FORM (continued)

- F. Burner input (CFH-Gas) (GPH-Oil)
- G. Gas pressure on burner orifices
- H. Oil pressure on oil pump
- I. Burner motor volts, amps
- J. Control circuit volts

GAS START-UP - GENERAL

Leak check - Use soap suds to check all gas lines for leaks. All leaks must be corrected before starting burner.

BOILER PRE-PURGE

SEE: INSTRUCTIONS FOR LIGHTING - (Appendix, page I) Trial Sequence

FLAME ROD AND ELECTRODE CHECK

Move the fuel selector switch to Gas. The burner will sequence in accordance with the data in INSTRUCTIONS FOR LIGHTING - (Appendix, page 1). Observe the mixing chamber cover plate with a flame mirror. If no ignition is observed, stop the burner and adjust the electrode (1/8" to 3/16" gap). Refer to the "Electrode Setting Detail", Appendix, page VIII. Recycle the burner and after ignition is observed, check the test meter signal to see if the flame rod reading is in accordance with the control instruction sheet (4 to 10 Microampere). Allow control to sequence to running position and turn the burner off.

ADJUSTMENT OIL FIRING - GENERAL

Shut off all manual gas cocks, if applicable.

PURGE OIL SYSTEM

Move the fuel selector switch to "off" position. Remove the pipe plug from the gauge port of the pump and install an oil pressure gauge capable of reading at least 100 p.s.i. Turn the fuel selector switch on and allow the pump to operate until purging is complete and oil pressure is indicated on the gauge.

CAUTION: If the gauge does not indicate pressure within two minutes, turn off the fuel selector switch. Prime the pump according to the fuel unit instruction sheet. This will prevent damage to the pump through lack of lubrication.

OIL PUMP PRESSURE

The oil pump should produce at least 100 p.s.i. pressure. Adjustment is made with a 1/8" hex wrench or a screw driver.

SMOKE ANALYSIS

Allow ample time for stable combustion conditions to develop. Set the air adjustment band to result in a #2 (maximum allowable) or less smoke spot (Bacharach scale).



CAUTION: Do not set the fire visually. Instruments are the only reliable method to determine the proper air adjustments.

#### CO<sub>2</sub> ANALYSIS

When the final oil pressure and air adjustments have been made, the final air setting should produce a CO<sub>2</sub> gas analysis in the vicinity of 7 to 10% on natural gas and 10 to 12% on oil.

#### GUN ASSEMBLY

The burner has been shipped with the gun assembly adjusted to a standard setting, determined thru extensive testing in various boilers. To determine if the drawer assembly is in the proper location, consult the heating equipment literature. A label with an arrow is located under the adjusting plate.

It is possible that a slight in or out adjustment might be necessary for a particular boiler condition, this, however, should be a rare case.

#### DRAFT

A minimum draft over the fire of .02 inches water column (Maximum of .05" W.C.) must be maintained unless otherwise specified by the manufacturer.

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APPENDIX

<u>DESCRIPTION</u>	<u>PAGE</u>
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INSTRUCTIONS FOR LIGHTING  
COMBINATION GAS-OIL BURNER

GAS

A. SAFETY CHECK

1. Move the FUEL SELECTOR switch to the OFF position.
2. Allow a five minute complete shut off period before relighting.
3. Set the operating control to call for heat, turn the manual gas cock off and move the FUEL SELECTOR switch to GAS.
4. An automatic 30 second prepurge cycle will then commence.
5. The spark ignition will start after the prepurge cycle. The ignition will last for six seconds.
6. The gas control will go into a safety lock out which shuts off the main gas valve, thereby checking the control for flame failure.
7. The GAS MANUAL RESET will trip in 15 seconds.

B. START UP SEQUENCE

1. Move the FUEL SELECTOR switch to the OFF position.
2. Allow five minutes to lapse.
3. Open the main gas cock.
4. Push the GAS MANUAL RESET button.
5. Move the FUEL SELECTOR switch to GAS. The gas will ignite after the 30 second prepurge cycle.

OIL

OPERATING SEQUENCE

1. Set the operating control to call for heat, and move the FUEL SELECTOR switch to OIL.
2. An automatic 30 second prepurge cycle will then commence.
3. After the 30 second prepurge the spark will be established, the oil valve will open and oil spray will ignite.

BURNER DATA SHEET

MODELS EHA/GC - EH/GC - EHG - EHO

GAS INPUT CFH	245,000 BTU to 400,000
OIL INPUT GPH	1.75 to 2.85
(EHA/GC) MOTOR	1/8 HP - 3450 RPM - 115 V. 60 HZ. -1 Ph.
(EH/GC) MOTOR	1/4 HP - 3450 RPM - 115 V. 60 HZ. -1 Ph.
(EHA/GC) PUMP	3450 RPM - A & M Series
(EH/GC) PUMP	3450 RPM - J & IR Series
FAN	5-1/16" Diameter x 3-5/8"
C.D. TUBE	5-1/2" SEE Appendix, page VII
GAS PIPE SIZE	3/4"
TRANSFORMER - OIL ONLY	115 V. 60 Cy. 1 Ph. - 10,000 V. Secondary interrupted spark
USABLE TUBE LENGTHS	See Fig. VII
IGNITION - GAS	120 V. 60 Cy. 1 Ph - 19,000 V. Secondary interrupted spark
OIL BURNER NOZZLE	See Chart #3

NATURAL GAS

<u>Manifold Pressure</u>	<u>Orifice Size Total of 6 Orifices</u>	<u>BTU Output of Burner</u>
3.2	#22	400,000
2.8	#22	380,000
2.4	#22	350,000
1.8	#22	280,000
1.3	#22	245,000
2.6	#16	400,000
2.4	#16	380,000
2.0	#16	350,000

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CHART #1

EQUIVALENT LENGTH OF PIPE - FEET

Pipe Size Inches	Pressure Drop Inches of Water	Pressure Drop											
		10 CFH	20 CFH	30 CFH	40 CFH	50 CFH	60 CFH	70 CFH	80 CFH	90 CFH	100 CFH	150 CFH	200 CFH
3/4	0.2	180	128	104	90	81	73	68	63	60	57	47	40
	0.5	285	202	164	142	128	116	108	101	95	91	73	63
	1.0	403	286	232	201	181	164	153	143	134	129	103	89
1	0.2	362	256	209	180	162	148	137	128	120	115	93	81
	0.5	573	405	330	286	256	234	216	202	191	181	148	128
	1.0	810	573	466	379	362	331	306	286	270	256	209	181
1-1/4	0.2	795	565	459	398	356	325	301	282	266	252	206	178
	0.5	1262	894	727	630	565	514	477	446	420	399	326	178
	1.0	1787	1263	1029	891	799	726	675	631	594	565	461	399

CHART #2

Specific Gravity	Factor	Specific Gravity	Factor	Specific Gravity	Factor	Specific Gravity	Factor	Specific Gravity	Factor	Specific Gravity	Factor
.34	1.28	.44	1.13	.54	1.02	.64	.93	.80	.83	1.52p	.603
.36	1.25	.46	1.10	.56	1.00	.66	.92	.90	.79	1.60	.59
.38	1.21	.48	1.08	.59	.98	.68	.90	1.00	.74	1.80	.56
.40	1.18	.50	1.06	.60	.96	.70	.89	1.20	.68	2.0	.53
.42	1.15	.52	1.04	.62	.95	.75	.86	1.40	.63	2.07b	.52

CHART #3

GAS CFH	OIL GPH	COMBUSTION CHAMBER			HEIGHT OF Air Tube *	BTU PER HOUR HEATER OUTPUT AT		NET STANDING LOAD SQ. FT. Radiation		BOILER OUTPUT SQ. FT. E.D.R.		BOILER OUTPUT H.P.
		Width	Length	Dia.		Input	70% Eff.	Steam	Water	Steam	Water	
245	1.75	12"	15"	15"	3.0"	245,000	171,500	437	700	683	1092	5.25
280	2.00	12"	15"	15"	4.0"	280,000	196,000	500	800	780	1248	5.58
350	2.50	13"	18"	18"	4.0"	350,000	245,000	680	1060	931	1490	7.35
400	2.85	15"	18"	18"	4.0"	400,000	280,000	784	1720	1083	1738	8.31

NOZZLE AND COMBUSTION CHAMBER DATA FOR CONVERSION BURNER INSTALLATIONS

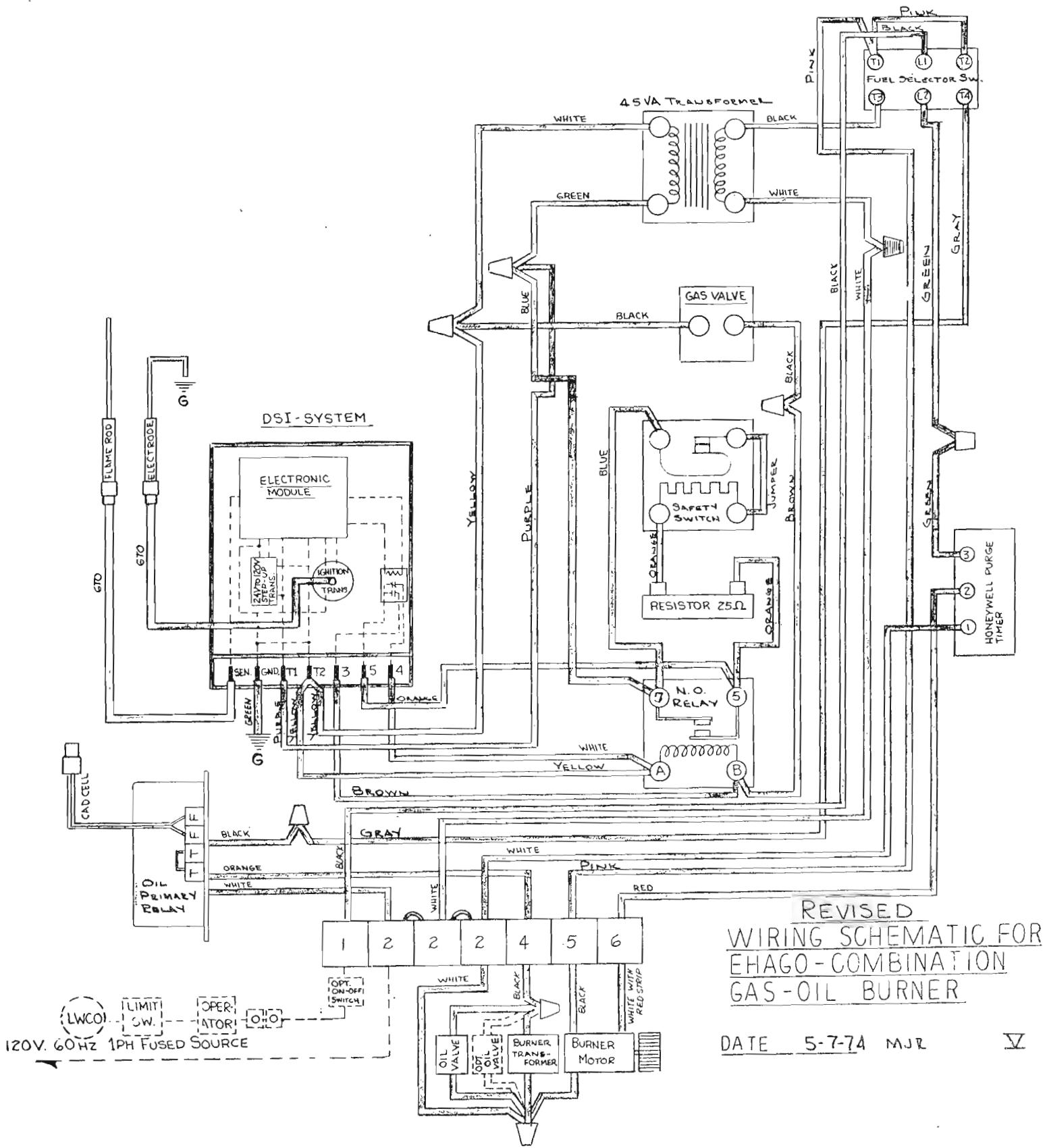
The above firing rates are for conversion burners, and are based on use of 60 HZ. current and sea level air pressure. IBR firing rates can be established only by laboratory testing. Maximum capacity is applicable up to 1,000 feet of altitude. For each additional 1,000 feet of altitude the maximum capacity is reduced by 5%. Catalytic oil was used in testing burners to establish firing rates.

\*The height of the air tube specified is the distance between the bottom of the air tube and the floor of the combustion chamber.

Net standing load square feet of radiation is calculated with an allowance of approximately 50% for piping and pick-up.

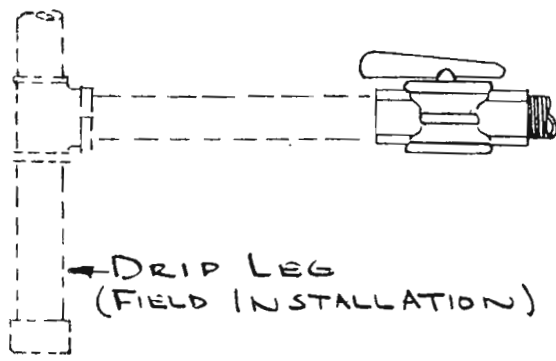
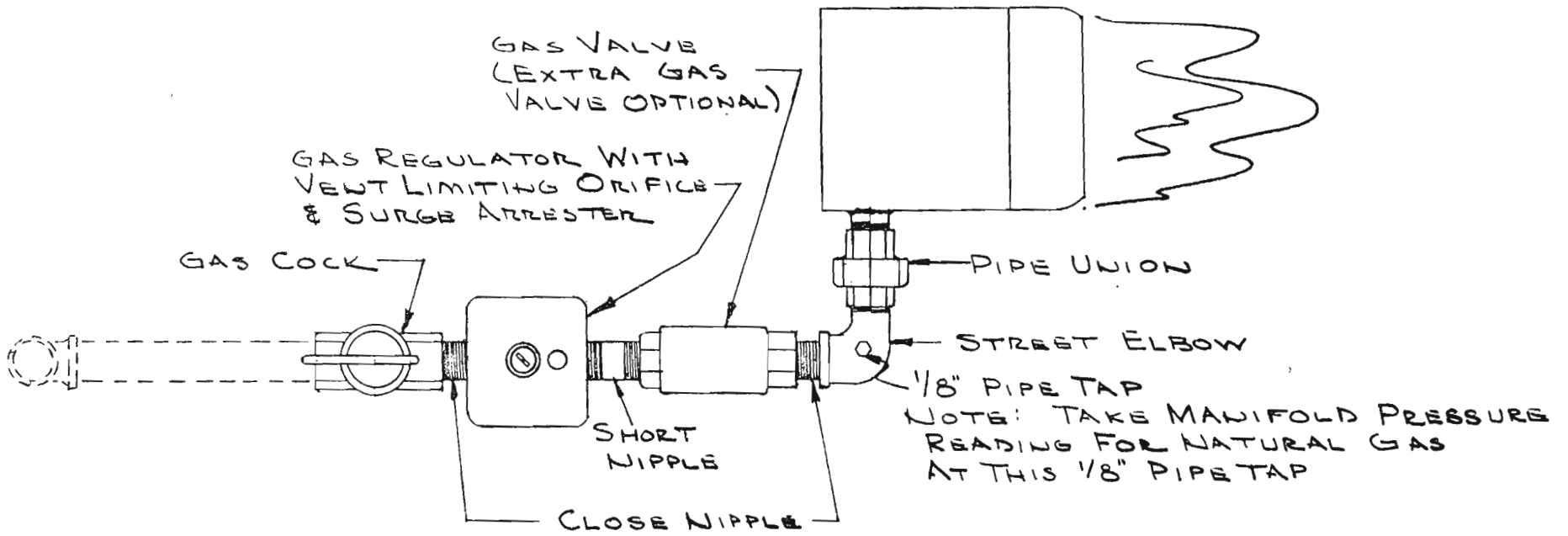
The oil nozzles are to have 60° to 80° spray angles. Specifications may vary according to the application.

12/17/73



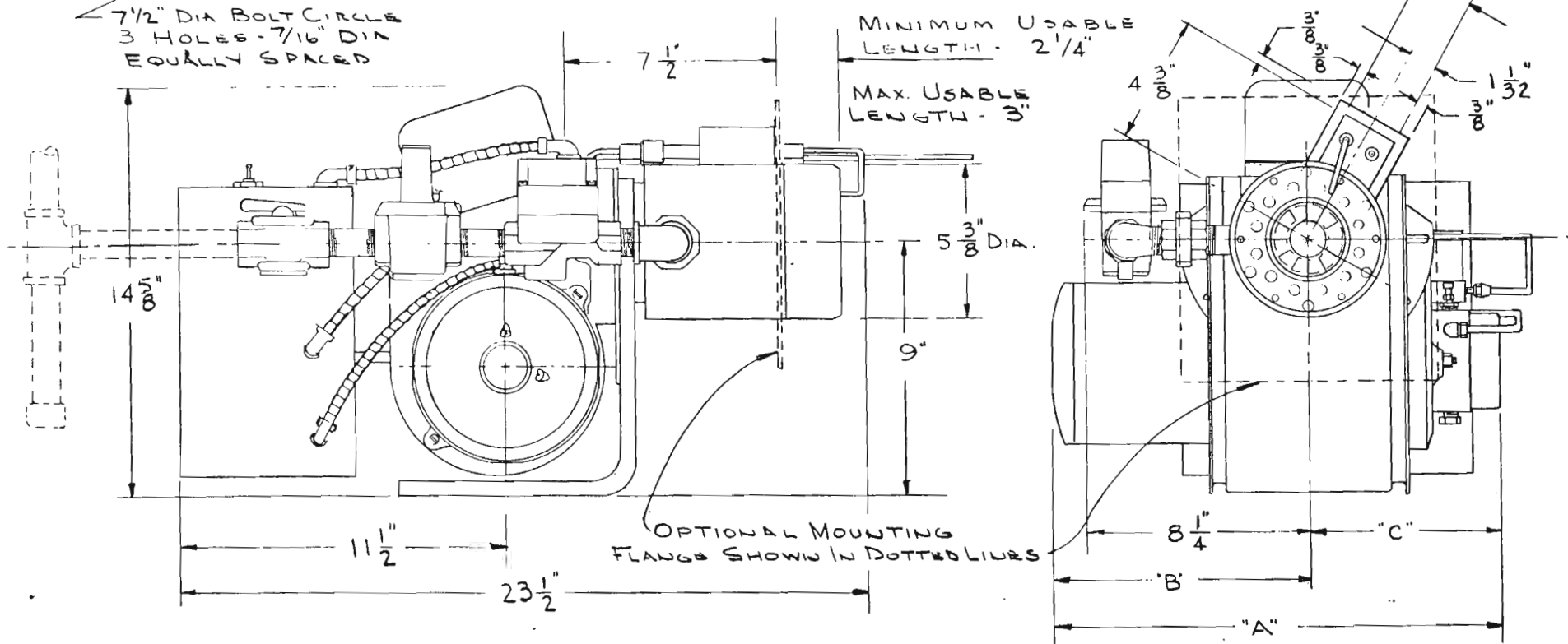
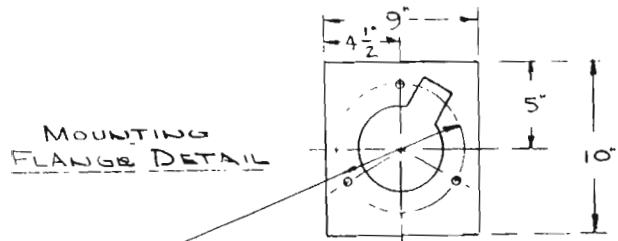
REVISED  
 WIRING SCHEMATIC FOR  
 EHAGO-COMBINATION  
 GAS-OIL BURNER

DATE 5-7-74 MJR V



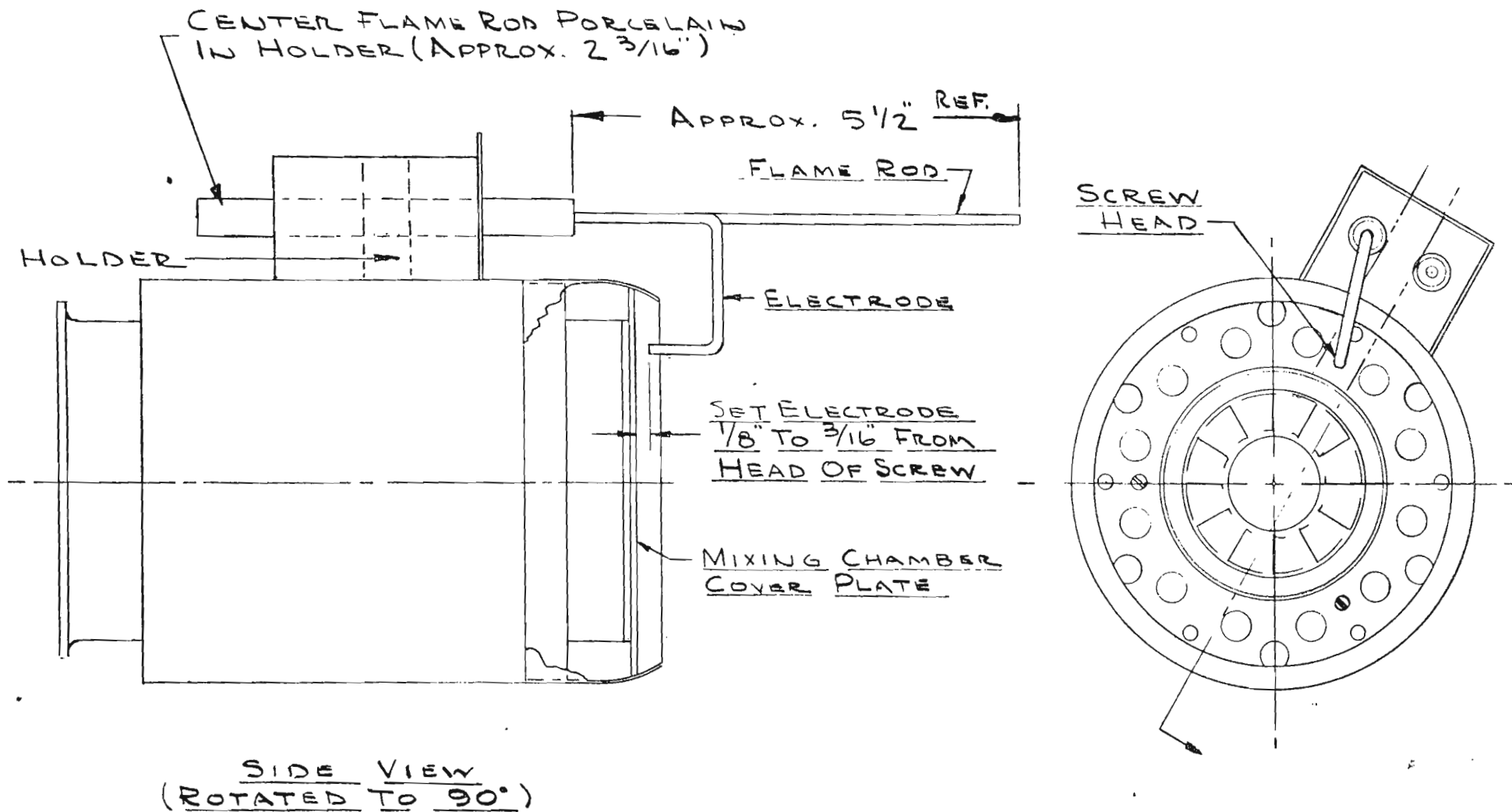
TYPICAL GAS TRAIN DIAGRAM



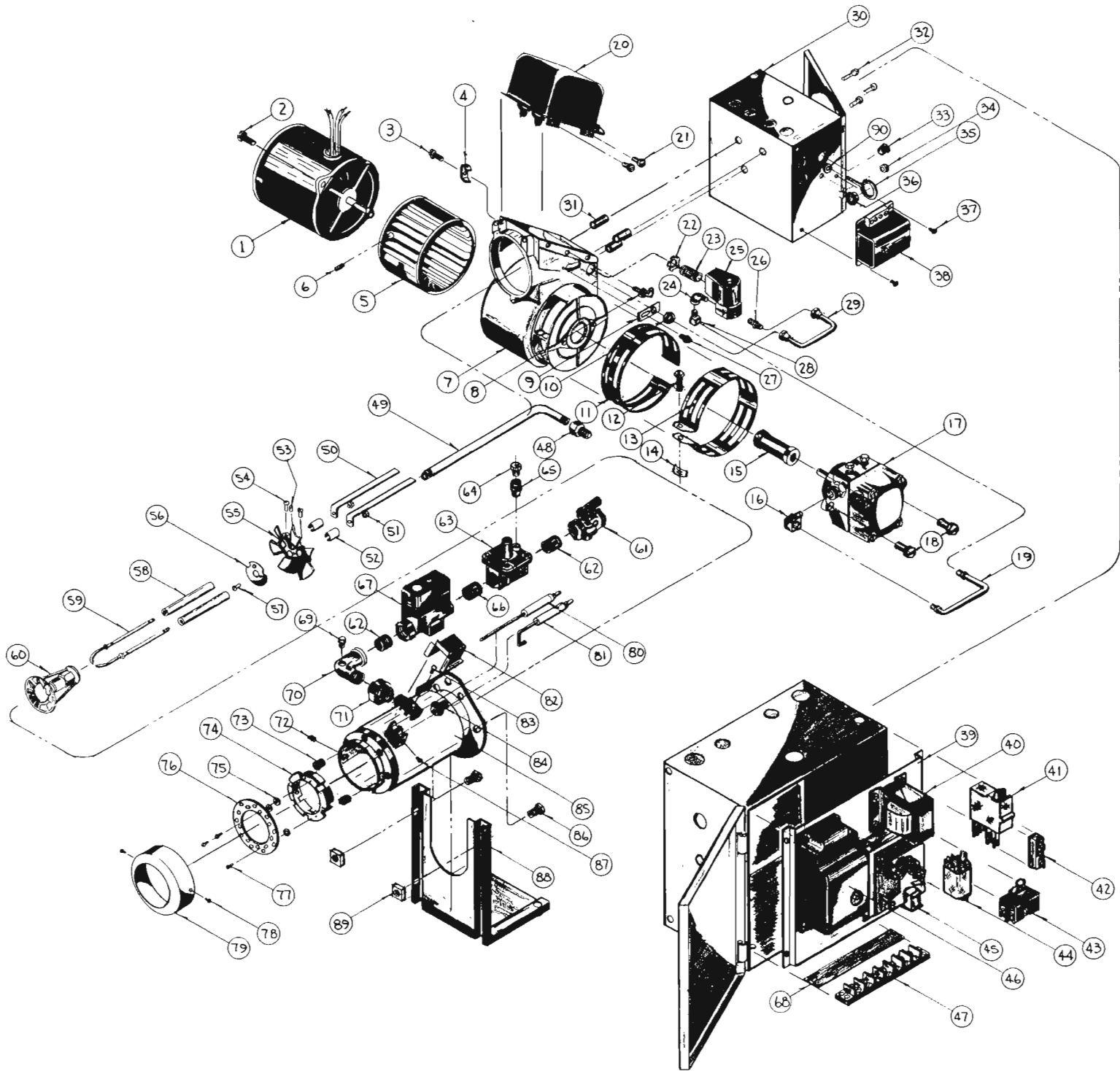


MODEL	"A"	"B"	"C"	MOTOR HP.	PUMP
EHGO	14 1/8	8 1/2	5 5/8	1/8	"A" CR "M"
EHGO	16 7/8	9 3/4	7 1/8	1/4	"J" OR "R"

EXTERNAL DIMENSIONS



ELECTRODE SETTING



**MODEL EHAGO**

PART LIST WAYNE GAS-OIL BURNER MODEL EHAGO

ITEM	DESCRIPTION	NUMBER REQUIRED	PART NO.	ITEM	DESCRIPTION	NUMBER REQUIRED	PART NO.
1	Motor 1/8 HP 1/115/60-Special	1	20864	45	Purge Timer	1	13857
2	Motor Mounting Screw	2	12701	46	DSI System	1	13870
3	Transformer Hold Down Clip Screw	1	13360	47	Terminal Block	1	13755
4	Transformer Hold Down Clip	1	13038	48	Oil Pipe Fitting	1	12335
5	Fan	1	20288	49	Oil Pipe	1	13245
6	Fan Set Screw (Included w/fan)	1	-	50	Buss Bar	2	12349
7	Fan Housing	1	20850	51	Palnut	2	13110
8	Transformer Support	1	12641	52	Insulator Bushing	2	12408
-	Hex Nut (For Transformer Support)	2	15872	53	Set Screw (Included w/Support)	1	-
9	Oil Line Slot Cover	1	12338	54	Rd. Hd Machine Screw	2	12694
10	Oil Line Locknut	1	12342	55	Electrode Support - Stabilizer	1	12320
11	Air Band - Inner	1	2669	56	Baffle Plate	1	12332
12	Air Band Screw	1	12701	57	Baffle Plate Screw	1	12695
13	Air Band - Outer	1	2668	58	Insulator	2	12354
14	Tinnerman Nut	1	12343	59	Electrode Stem	2	13163
15	Coupling	1	13279	60	Flamelock Assembly	1	12988
16	Oil Line Elbow	1	13270	61	Gas Cock 3/4"	1	13791
17	Fuel Pump - Sundstrand	1	13495	62	Close Pipe Nipple 3/4"	2	15912
18	Fuel Pump Mounting Screw	2	12701	63	Gas Regulator	1	13790
19	Oil Line - Pump to Valve	1	13620	64	Vent Limiting Orifice	1	13918
20	Transformer 120 V to 10,000 V	1	20358	65	Surge Arrestor	1	13919
21	Transformer Hinge Screw	2	13045	66	Short Pipe Nipple 3/4"	1	15919
22	Locknut - 1/2" Conduit - (One Shown)	2	12910	67	Gas Valve	1	13789
23	Short Nipple - 1/2"	1	13384	68	Marker Strip - Insulator	1	13866
24	Street Elbow - 1/8"	1	13385	69	Pipe Plug 1/8"	1	15766
25	Oil Valve - No Delay	1	13521	70	Street Elbow 90° - Special	1	13909
26	Connector	1	13064	71	Union - Ground Joint 3/4"	1	13786
27	Slot Cover Screw	1	12697	72	RD HD Machine Screw	1	12694
28	Inverted Flare Elbow	1	13270	73	Gas Orifice	6	13793
29	Oil Line - Valve to Gun	1	13381	74	Inner Air Cone	1	13729
30	Control Box 10" X 10" X 6"	1	30148	75	Washer Spacer	3	13367
31	Spacer	3	13750	76	Gas Mixing Ring	1	13731
32	Control Box Mounting Screw	3	13749	77	RD. HD. Machine Screw	3	12695
33	Heyco Bushing #SB-875-6	1	13752	78	RD. HD. Machine Screw	2	12695
-	Heyco Bushing #SB-375-4 (Inside #33)	1	13754	79	Outer Air Cone	1	13798
34	Heyco Bushing #SB-375-4	1	13754	80	Flame Rod Assembly	1	13883
35	Standoff Bolt	1	13751	81	Electrode Assembly (Gas)	1	13882
36	Heyco Bushing #SB-750-6	1	13753	82	Electrode Housing Box	1	13779
-	Heyco Bushing #SB-375-4 (Inside #36)	1	13754	-	Electrode Housing Box Gasket	1	13794
37	Relay Mounting Screw	2	12694	83	RD. HD. Machine Screw	1	15906
-	Lockwasher - Relay (Not Shown)	2	13855	84	Flange Mounting Screw	3	12903
-	Nut - Relay (Not Shown)	2	13213	85	Gas Manifold & Flange Assembly	1	20853
38	Relay - Honeywell #R8184K-1006	1	13084	86	Hex. HD. Cap Screw	2	15753
39	Component Panel	1	20915	87	RD. HD. Machine Screw	1	12694
40	Transformer 120 V to 27 V	1	13756	88	Base	1	2796
41	Gas Manual Reset Switch	1	13858	89	Square Nut - 3/8"-16	2	13231
42	Resistor	1	13901	90	Hex Nut #10-24 (One Shown)	2	13213
43	Fuel Selector Switch - DPDT	1	13761	-	Instruction Plate (Not Shown)	1	13874
44	Low Voltage Relay	1	13859				

TROUBLE	PROBABLE CAUSE	REMEDY
Blower motor does not run	Operating controls not calling for heat	Jumper operator, if burner does not start check controls and wiring
	Fuel pump shaft frozen	Replace pump
	Power disconnected or improper voltage supply	Check with voltmeter on terminals 1 & 2 for correct voltage
	Overload tripped out motor	Reset
	Fuel selector switch in off position	Move selector switch to fuel desired
	Fuel selector switch defective	Must have continuity between terminals 1 & 5 with selector switch on oil or gas, if not change switch
	Defective motor	Replace motor if voltage correct at 2 & 5
Purge timer does not run	Blower motor end switch	Check with voltmeter between terminals 2 & 6 after motor is running, if no voltage replace motor
	Purge timer defective	Replace purge timer
No ignition on oil	Purge timer switch not working	Check voltage with voltmeter on terminals T4 of selector switch and #2. Replace timer if voltage not correct
	Oil primary control	Check with voltmeter on terminals 2 & 4, if no voltage replace primary
	Oil valve	If spark on, check with voltmeter on terminals 2&4 if voltage correct replace valve
	Ignition transformer	Check voltage with voltmeter on terminals 2 & 4
	Buss bars on gun assembly	Check contact between transformer and buss bar
	Cracked electrode insulators	Replace insulators
	Electrodes not properly set	Readjust electrode to manual specifications
	No oil	Check to see if oil valves are open and fuel pump is running
Bad primary control	Replace primary control, check voltage on terminals 2&4	
Oil primary control	Cad cell	Remove cad cell leadwires, start burner, shortly after burner starts and the minute the burner is firing on oil place a temporary jumper between F & F. Connect ohmmeter across cad cell leadwires-resistance should read under 1200 ohms. Stop burner and remove temporary jumper. With burner off cell resistance across the leadwires- should be greater than 1 megohm (1,000,000 ohms)
	Dirty cad cell	Clean cad cell
	Defective cad cell	Replace cad cell
	No ignition	See- "No ignition on oil" Page 1
	Nozzle	Replace nozzle, this could be giving a bad flame pattern effecting cad cell reading

TROUBLE	PROBABLE CAUSE	REMEDY
No ignition on gas	Purge timer switch not working	See-"Purge timer does not run" - Page 1
	No spark	Turn off manual gas cock to prevent flow of gas, disconnect ignition cable at stud terminal to isolate circuit on D.S.I. Prepare short jumper lead using heavily insulated wire such as ignition cable. Touch one end of jumper firmly to ground, move free end slowly towards stud terminal to establish spark, then slowly away from stud-noting the length of gap at which arcing discontinues. Arc length 3/16 inch or more indicates satisfactory voltage output
	Electrode setting	Reset electrode per drawing
	Cracked electrode insulator	Replace insulator
	Manual reset switch defective	Replace
	D.S.I. not working	Check voltage between T1 & T2 (24V), if voltage correct replace D.S.I.
	Gas valve not opening	Check voltage between T1 & T3 on D.S.I. (24V) Check manual reset switch for cloudy color at resistor, if so replace manual reset.
	GTO wire connections loose	Check connections
Gas valve shutting off D.S.I. going off on safety	No gas	Check to see if gas cock is turned on and gas pressure is correct.
	D.S.I. going off on safety	Check voltage between T2 & 3 on D.S.I. (24V) Install adequate ground between burner & ground.
Manual reset going off on safety	Flame sensor	Check position of sensor Flame sensor must be at least 4 microamperes and steady but not more than 10 microamperes. Disconnect GTO wire from terminal S on D.S.I. Connect RED positive (+) lead of micrometer to quick connect terminal S and BLACK negative (-) meter lead to free end of GTO wire, restart system and read meter.
	No gas flame	See- "No ignition on gas"
Manual reset going off on safety	D.S.I. locking out	Replace D.S.I.
	Defective safety switch	Replace safety switch

