LIQUID COOLED
ELECTRIC PLANT

INSTRUCTION MANUAL

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INTRODUCTION

SCOPE

This manual covers the installation, operating and maintenance instructions for the Winpower line of liquid-cooled electric plants. A parts list and wiring diagram covering the particular model you have purchased is included with the manual. The engine manufacturer's manual is included and gives the necessary operating and maintenance instructions for the engine. The voltage regulator manufacturer's manual is also included.

GENERAL

The electric plants covered by this manual are powered by either a gasoline or diesel engine. The generators are of the single bearing, brushless type, with the generator rotor being connected to the engine flywheel by means of a flexible disc coupling.

All sets have been thoroughly tested at the factory. The necessary fuel intake system adjustments have been made. The set has been tested with the type of fuel specified by the customer.

The set should be carefully inspected on delivery for evidence of possible shipping damage. If damage has occurred, a notation should be made on the freight bill and a claim should be made if necessary. If the damage appears to be of a major nature, the set should not be operated until the fault has been corrected.

The model number and the serial number of the plant must be given when contacting the dealer or the factory.

ELECTRICAL DESCRIPTION

The generator used in the Winpower line of liquid-cooled electric plants is a brushless, single bearing, revolving field type. The exciter is a revolving armature type, three phase AC generator. The output of the exciter armature is fed into a three phase, full wave bridge rectifier whose diodes are mounted on two heat sinks which are fixed to a molded insulated hub. The output of the rectifier supplies the DC excitation for the generator field. The generator voltage is regulated by an automatic voltage regulator mounted in the control cabinet. A change board is located in the generator cabinet. Figure 1 gives the various connections and voltage available (this does not apply to machines ordered for special voltages, as for example, 600 volts)

NOTE

Check Federal, State and Local regulations for installation of electric plants. Check especially for regulations pertaining to fuel storage and handling.

GENERAL

There are two prime requirements in the installation of electric plants. They are:

1. Adequate combustion and cooling air for the engine.
2. Proper discharge of the exhaust gas.

Other factors of importance are:

1. Location
2. Mounting
3. Fuel connection
4. Load connection
5. Service accessibility

LOCATION

The plant should be located in an atmosphere that is free from excessive dust, wind blown particles, excessive high and/or low temperature, and corrosive fumes. Allowance must be made for a minimum of a three foot clearance around the set for service accessibility.

MOUNTING

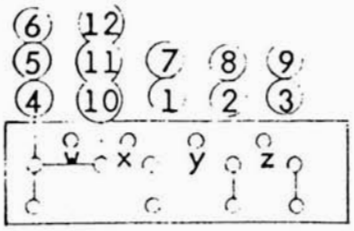
A permanently installed electric plant should be mounted on a concrete base as shown in Figure 2 and Table 1. The mounting bolts should be imbedded in concrete as per Figure 2 & 3. It is advisable to place vibration dampening pads between the skid and the floor as shown in Figure 4. Vibration mounts are available from Winpower for all units.

VENTILATION

It is imperative that the engine have an adequate supply of air for combustion and cooling. If the unit is installed inside a building, or enclosure, it means that there must be an adequate air inlet and a ducted air outlet. The radiator cooling fans are of the pusher type. The radiator should be positioned so that the air can pass horizontally and directly into the air outlet. Ductwork should be used from the radiator to the outlet to prevent air recirculation. See Figure 5 for a typical installation. The radiator duct should be 50% greater in size than the radiator outlet. There should be a flexible section between the radiator and the duct work. The air inlet should be preferably larger in size than the air outlet.

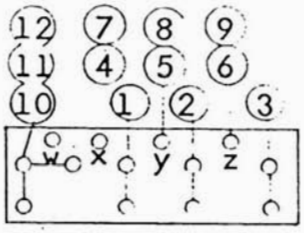
CONNECTIONS

3 PHASE WYE CONNECTIONS



N L_1 L_2 L_3

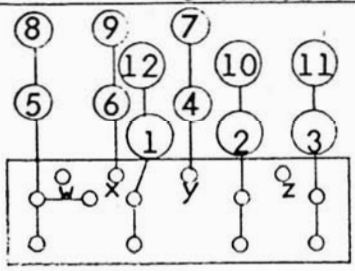
120/208V CODE "D"



N L_1 L_2 L_3

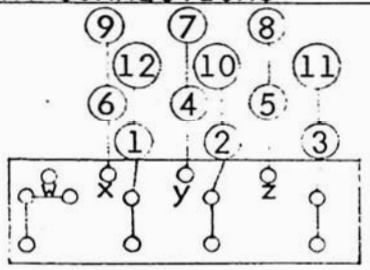
240/416V CODE "N"

3 PHASE DELTA CONNECTIONS



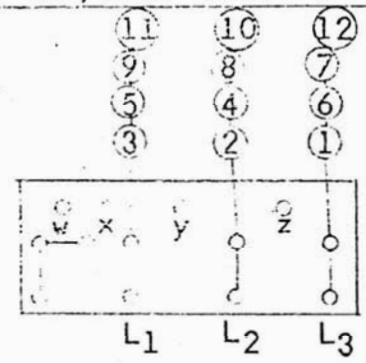
N L_1 L_2 L_3

120/240V CODE "J"



L_1 L_2 L_3

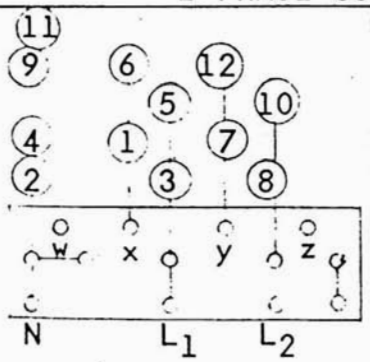
240V CODE "T"



L_1 L_2 L_3

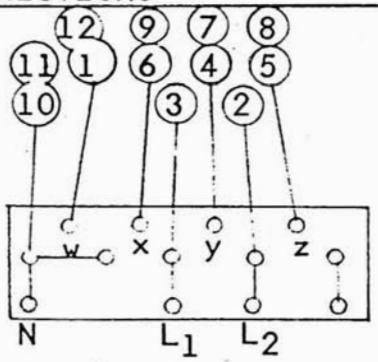
120V CODE "S"

1 PHASE CONNECTIONS



N L_1 L_2

120/240 CODE "C"



N L_1 L_2

240/480V CODE "P"

VOLTAGE REG. RECONNECTION

CONNECT.	CODE
41 to T_9	D,N,P,B
41 to T_{12}	C,J,T
51 to T_9	C,J,T
51 to T_{12}	D,N,P,B
53 to T_8	D,N,P,J,T
53 to T_{11}	C,B
56 to T_8	C,B
56 to T_{11}	D,N,P,J,T

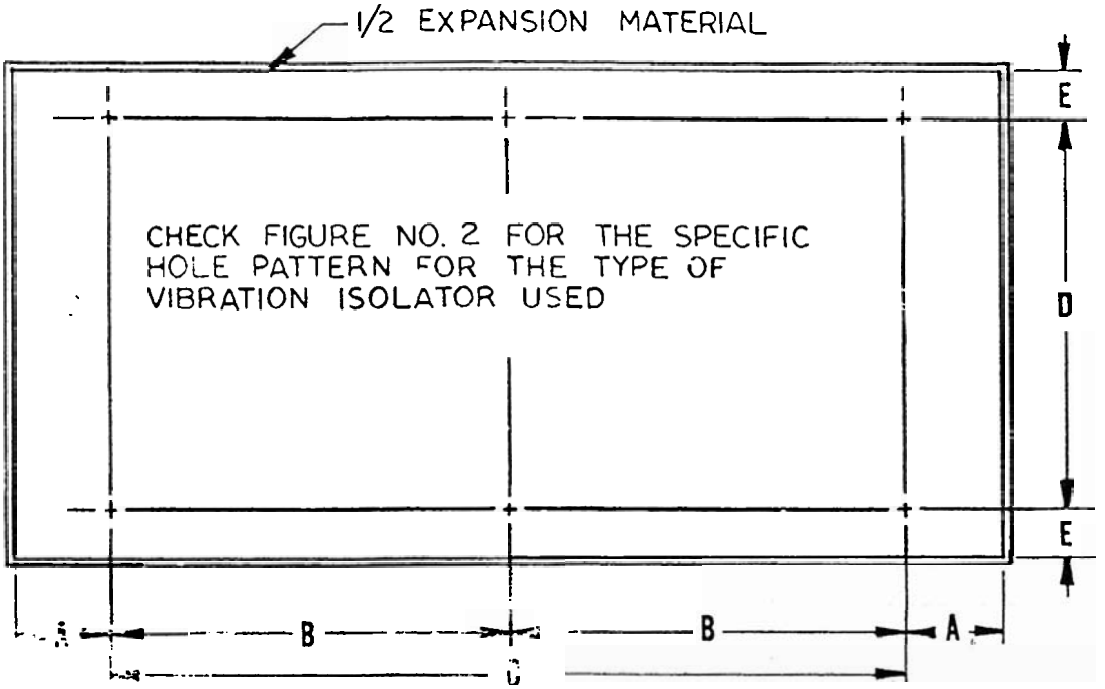
NOTE:

1. Always verify the four (#41,51,53 and 56) voltage regulator lead connections per the above table so that they are in agreement with the desired voltage code. All connections are in the lower cabinet.

2. Code "L" 277/480 Volt is connected identical to Code "N".

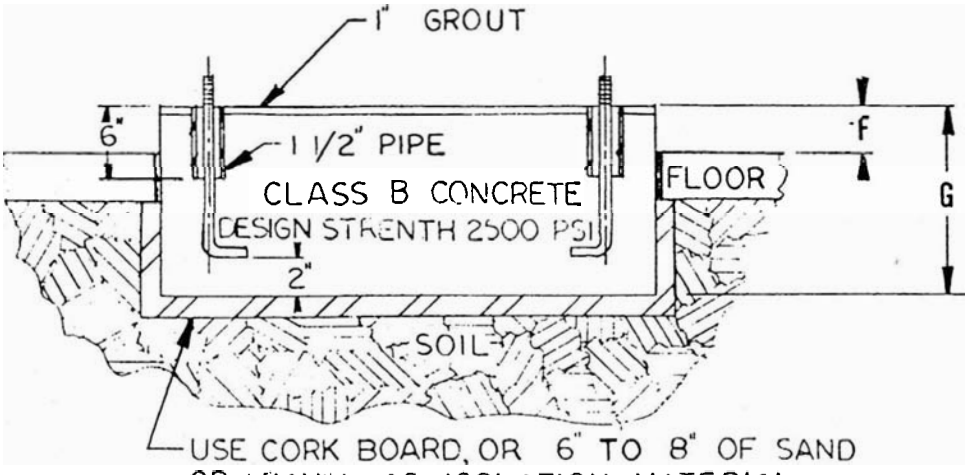
CAUTION:
When connecting single phase loads to Code "J", beware that L_1 to N is the wild phase.

FIGURE 1 GENERATOR CONNECTION DIAGRAMS



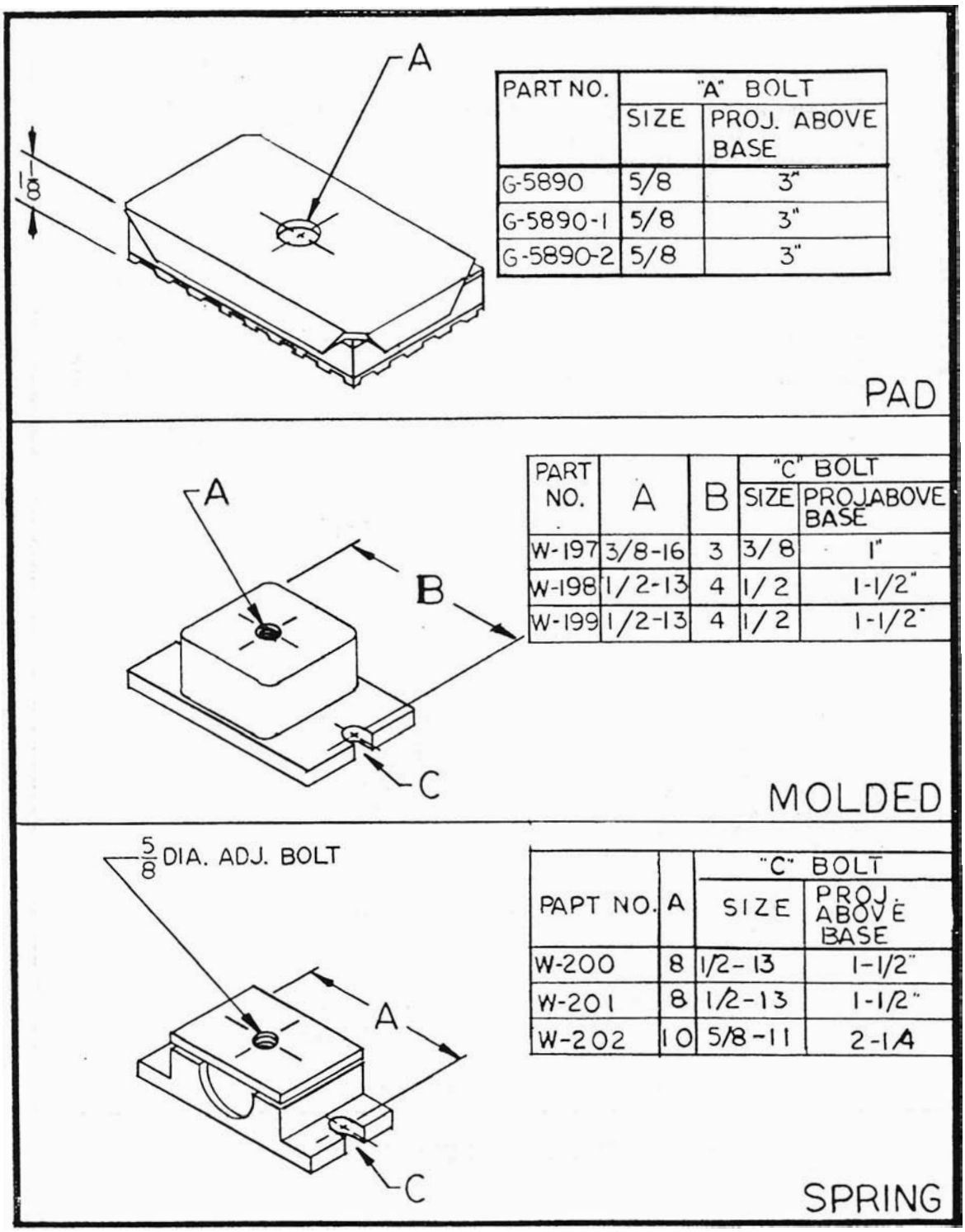
TYPICAL PLAN VIEW

NOTE
FOR DIMENSIONS SEE TABLE NO. 1



TYPICAL CROSS SECTION

FIGURE 2 POURED CONCRETE BASE



PART NO.	"A" BOLT	
	SIZE	PROJ. ABOVE BASE
G-5890	5/8	3"
G-5890-1	5/8	3"
G-5890-2	5/8	3"

PART NO.	A	B	"C" BOLT	
			SIZE	PROJ ABOVE BASE
W-197	3/8-16	3	3/8	1"
W-198	1/2-13	4	1/2	1-1/2"
W-199	1/2-13	4	1/2	1-1/2"

PAPT NO.	A	"C" BOLT	
		SIZE	PROJ ABOVE BASE
W-200	8	1/2-13	1-1/2"
W-201	8	1/2-13	1-1/2"
W-202	10	5/8-11	2-1/4

FIGURE 3 VIBRATION ISOLATOR MOUNTS

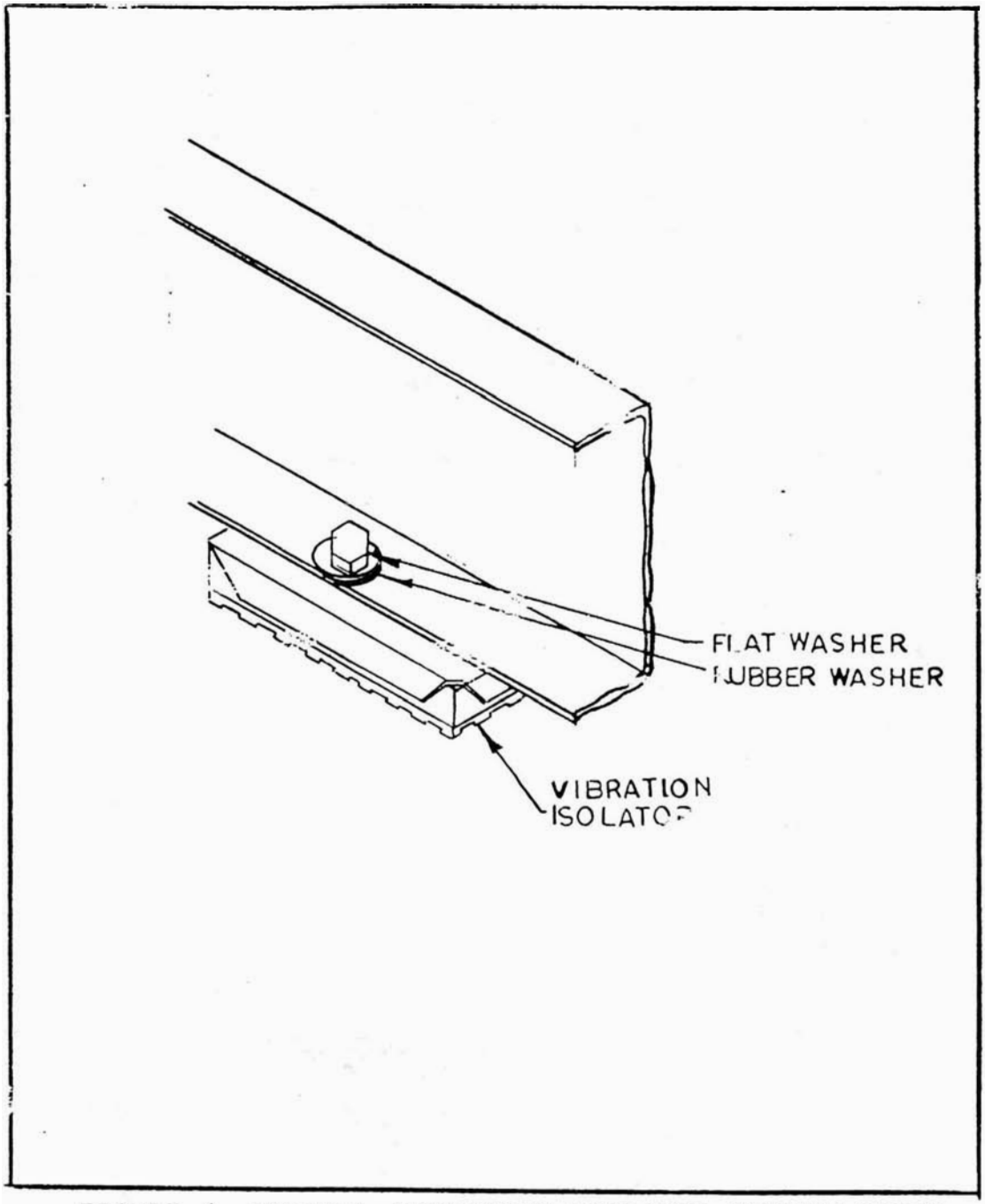


FIGURE 4 TYPICAL VIBRATION ISOLATOR INSTALLATION

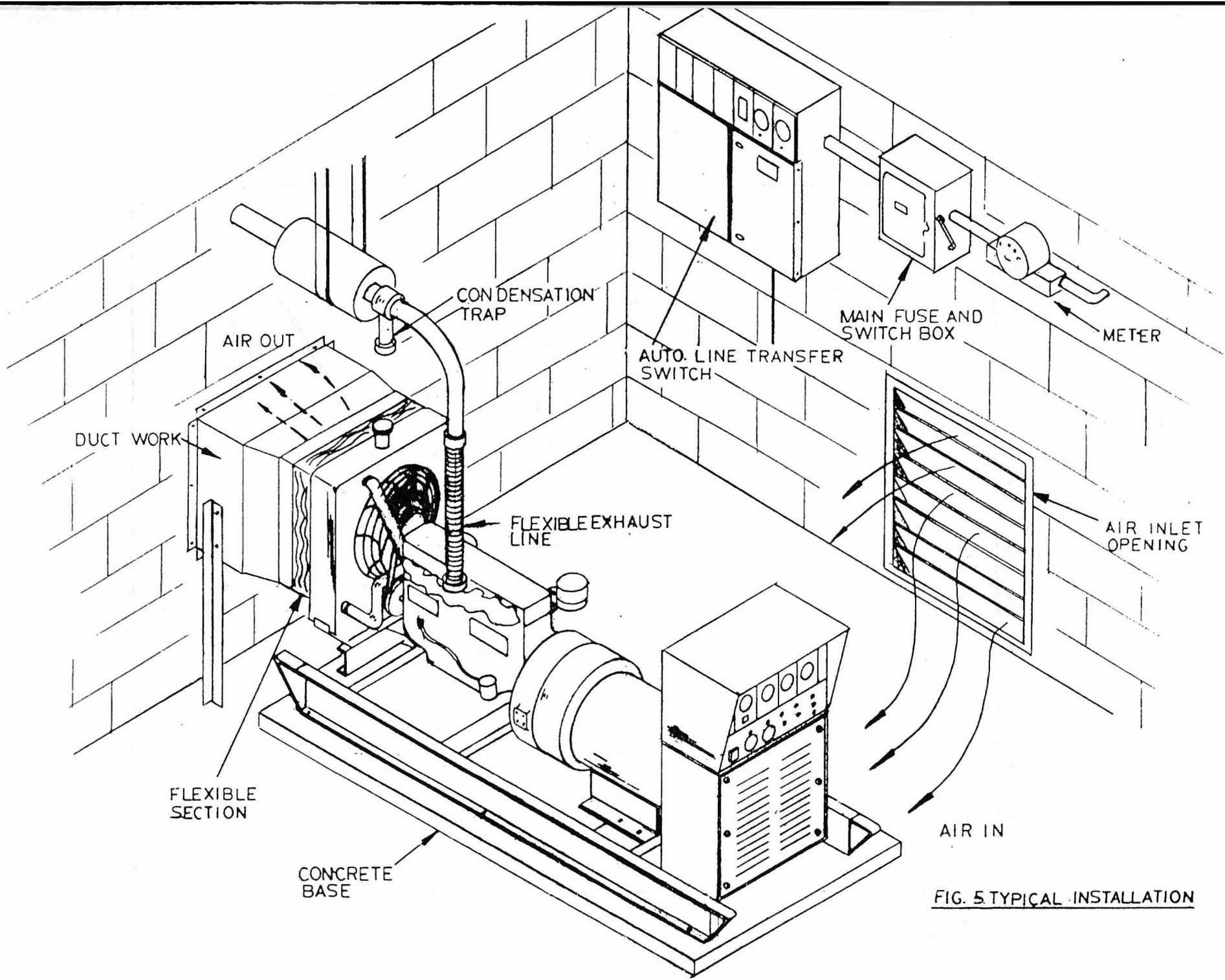


FIG. 5 TYPICAL INSTALLATION

EXHAUST

When the unit is installed inside a building, means must be provided for exhausting the poisonous gases from the engine exhaust system. If a muffler is used, the preferable location is inside the building. If the exhaust pipe passes thru a wall with combustible material it must be shielded by a metal thimble as per Figure 6 . The end of the exhaust pipe should be located a distance away from the air inlet to the engine. Use flexible steel tubing to connect the engine exhaust fitting to the rigid pipe or muffler.

FUEL CONNECTION - Diesel Fuel

Clean fuel is essential for the successful operation of a diesel engine due to the vulnerability of the pump and injection system to dirt. The piping should be black iron pipe or copper tubing. Galvanized pipe or fittings must not be used. Care must be taken that all fittings are tight, as it is possible to have an air leak without an oil leak. Air entering the fuel system will affect engine performance adversely.

See Table 2 giving the fuel consumption to determine the size of tank required. The location of the tank will determine whether or not an auxiliary fuel pump should be used. If the lift is more than 5 feet, or if the horizontal run is long, an auxiliary pump should be used.

If the set is used for standby service, and is unattended, a priming tank (sometimes called a day tank) should be used. This prevents a delay in starting due to the fuel in the pump and line having drained back to the tank. See Figure 7 for the day tank installation.

FUEL CONNECTION - Gasoline

Gasoline is a volatile and easily ignited fuel and careful consideration must be given to the fuel system. Local and State regulations usually require the tank to be placed underground. Connect the fuel pump on the engine to the fuel source by means of a flexible line. The tank should be below the level of the fuel pump. If the fuel lift exceeds 5 feet, an auxiliary pump should be used at the tank. If it is necessary to place the tank at a higher level than the carburetor, a shut off valve must be used. See Table 3 for fuel consumption.

A priming tank should be installed if the unit is to be used for standby service. The gasoline in the carburetor and line may evaporate, thus causing a delay in starting. See Figure 8 & 12 for priming tank installation.

FUEL SYSTEM - Gasoline and Diesel Accessory Items

As there are numerous variables in making an electric plant installation, recognition must be made of the alternate methods for meeting the conditions. This includes the basic recommended fuel tank fittings as shown in Figure 9. For installations with the fuel tank located above the engine see Figure 10 (gasoline engine) or Figure 11 (diesel engine)

To install a hand transfer pump in parallel with the electric transfer pump see Figure 12. The hand pump allows hand priming the day or priming tank.

Two types of fuel level measuring systems are shown. Figure 8 shows a levelometer which indicates the actual fuel level. A low fuel alarm system is shown in Figure 11. See Figure 8 for a suggested installation of a levelometer.

FUEL CONNECTION - Gaseous Fuel

Gaseous fuels are of two kinds:

1. Natural or manufactured gas, or a combination of both, which usually comes thru the gas company mains. For natural gas fuel consumption rate see Table 4.
2. Liquified petroleum gas (LPG) which comes bottled in steel tanks. It may be withdrawn from the tank in two forms: a. Vapor withdrawal
   b. Liquid withdrawal

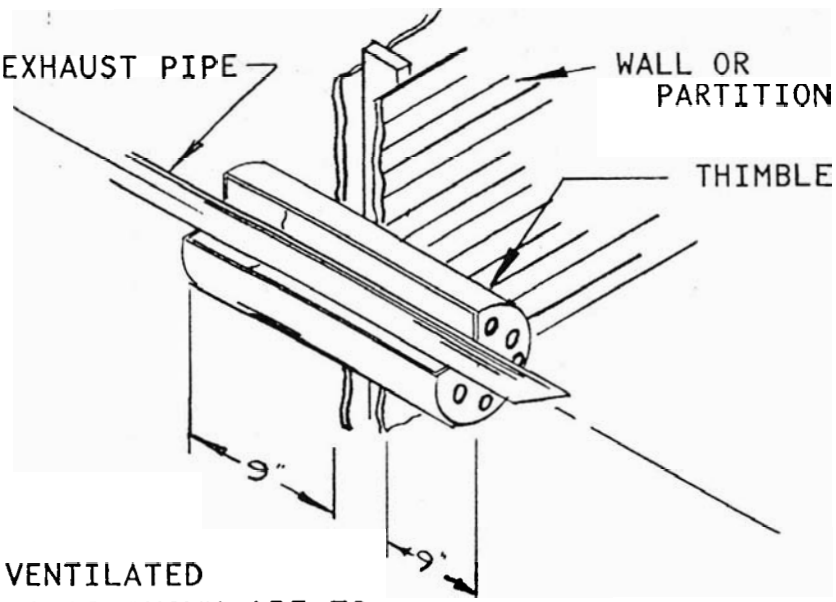
   For the liquified petroleum gas fuel consumption rate see Table 5.

With gaseous fuels we are dealing with gas under pressure. The gas pressure must be reduced close to atmospheric pressure at the entrance to the carburetor. The final step in pressure reduction is done by the secondary regulator which is mounted on the engine. A primary regulator is used for the coarse regulating on LP gas and also on natural gas, if the pressure from the main exceeds 4 oz.

In an LP gas installation it may be necessary to use two primary regulators if the gas has to travel an appreciable distance. This enables one to carry the gas at a higher pressure over the long distance.

If liquid withdrawal of LP gas is used, it is necessary to use a vaporizer. See Figure 13 for a typical installation.

An electric solenoid fuel valve is furnished with the engine. This valve becomes energized when the starting circuit is energized and becomes deenergized when the engine is shut down.



METAL VENTILATED
THIMBLES AS SHOWN ARE TO
BE 12 INCHES LARGER IN DIAMETER
THAN THE EXHAUST PIPE

FIGURE 6 TYPICAL THIMBLE INSTALLATION

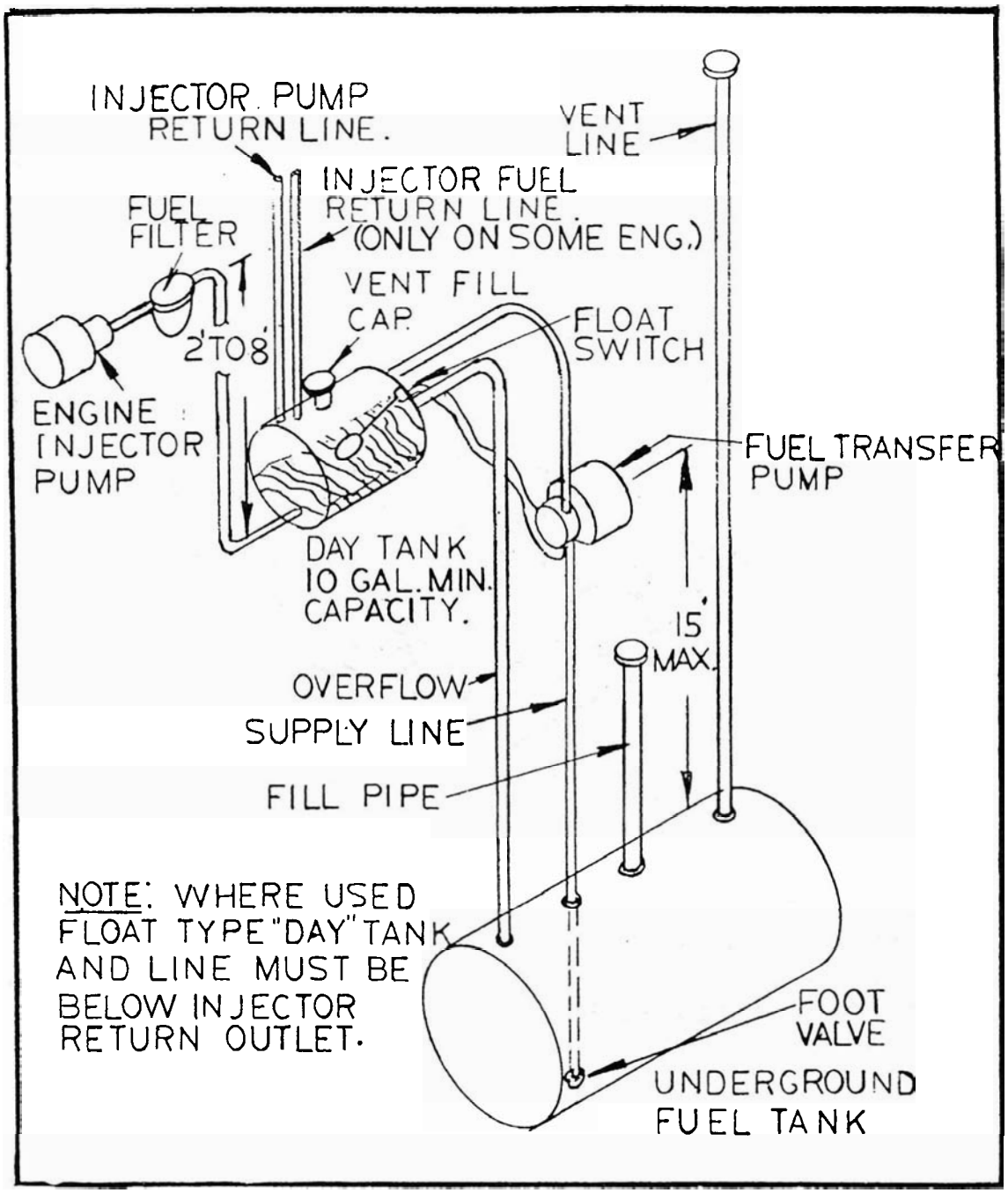


FIGURE 7 DIESEL FUEL SYSTEM

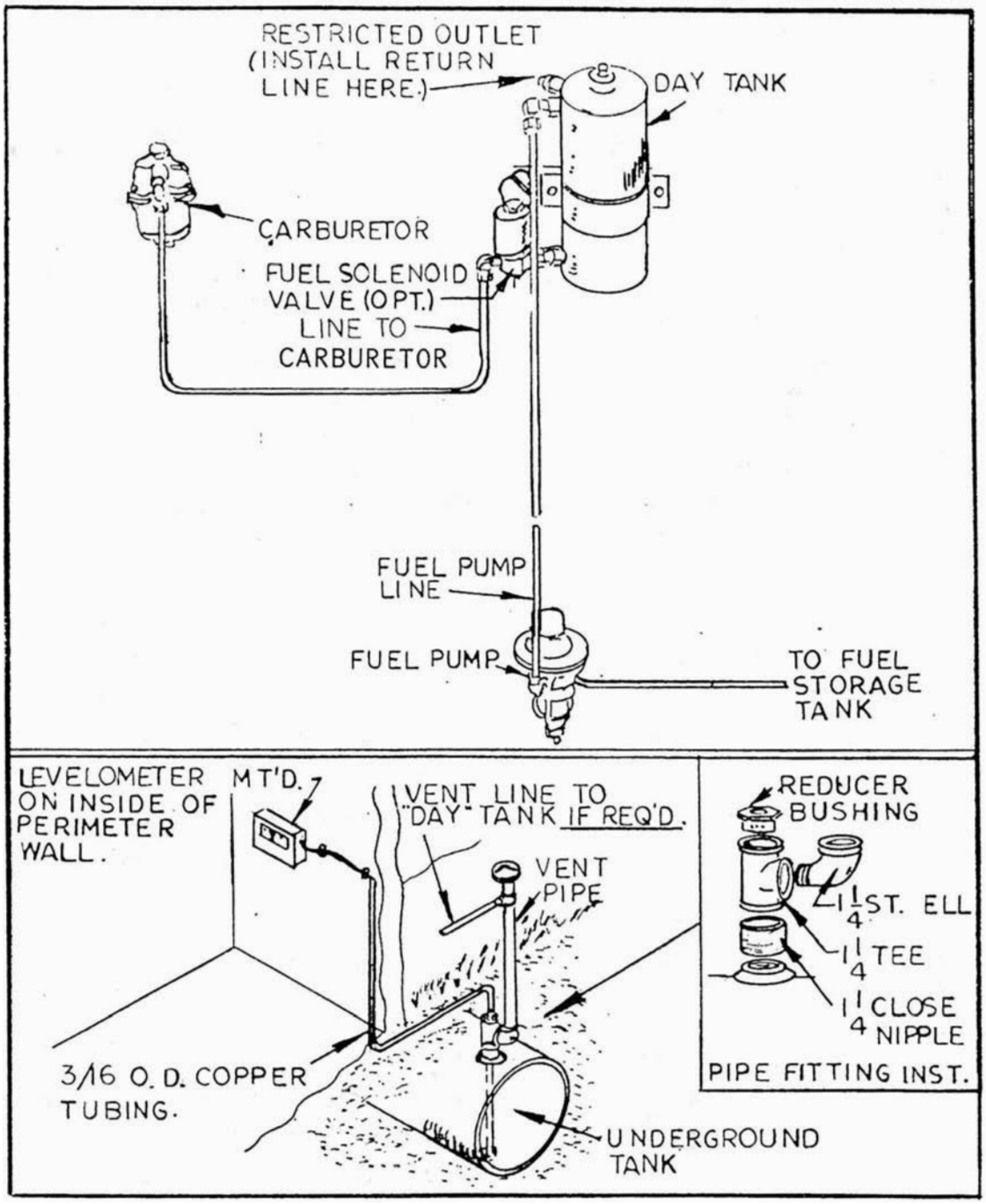


FIGURE 8 TOP - PRIMING TANK INSTALLATION
BOTTOM - LEVELOMETER INSTALLATION

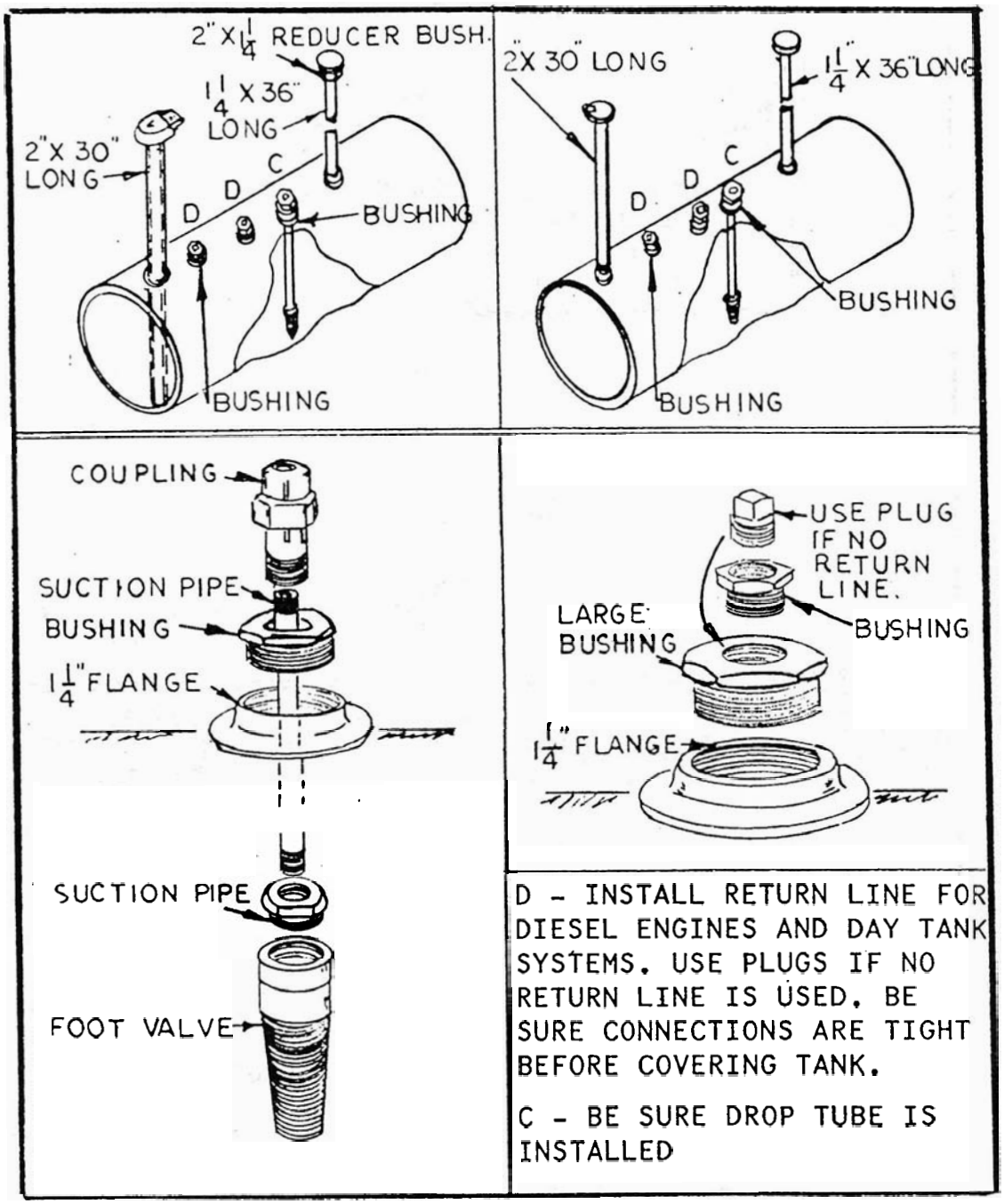
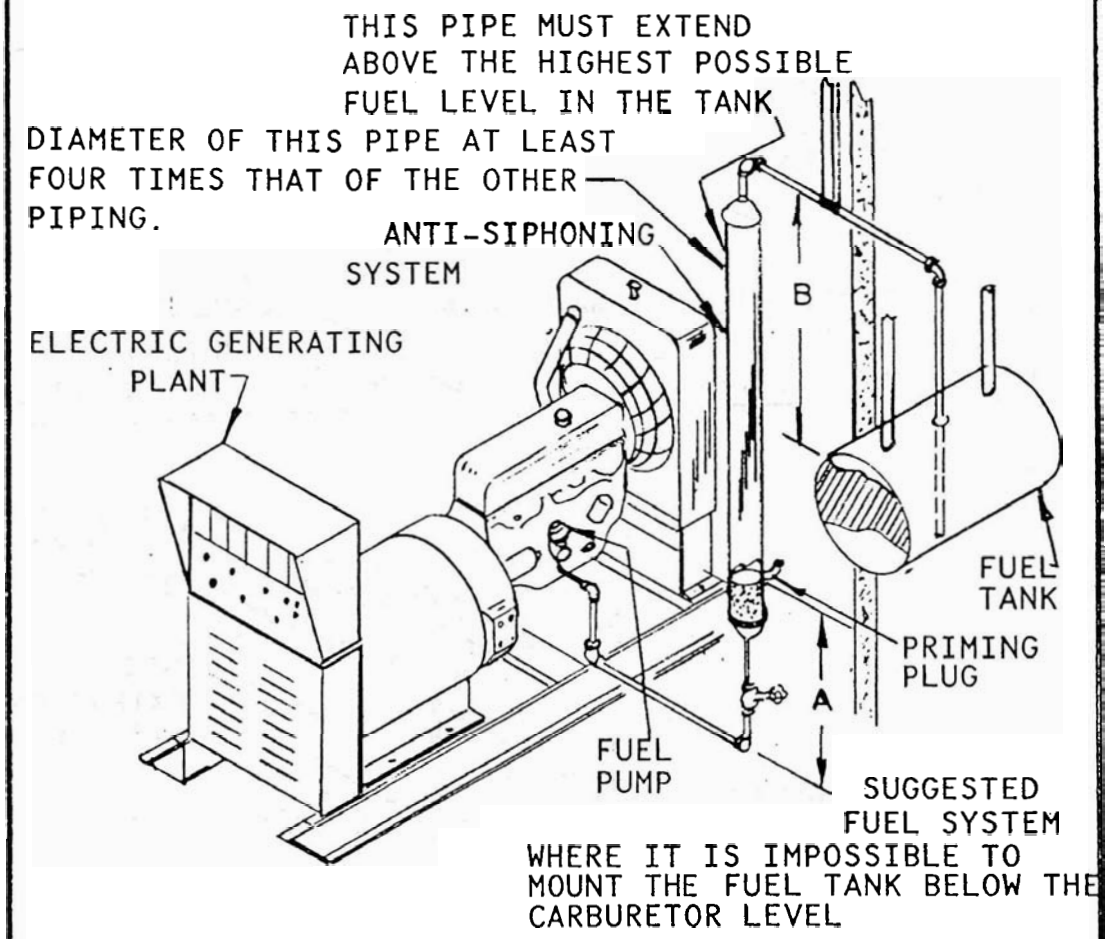


FIGURE 9 SUGGESTED FUEL TANK FITTINGS



NOTE: THE LEVEL OF PRIMING FUEL "A" MUST NOT EXCEED THE HEAD OF FUEL "B". DIMENSION "B" TO BE MEASURED TO THE TOP OF THE FUEL STORAGE TANK.

FIGURE 10 INSTALLATION WITH FUEL TANK ABOVE ENGINE (GASOLINE)

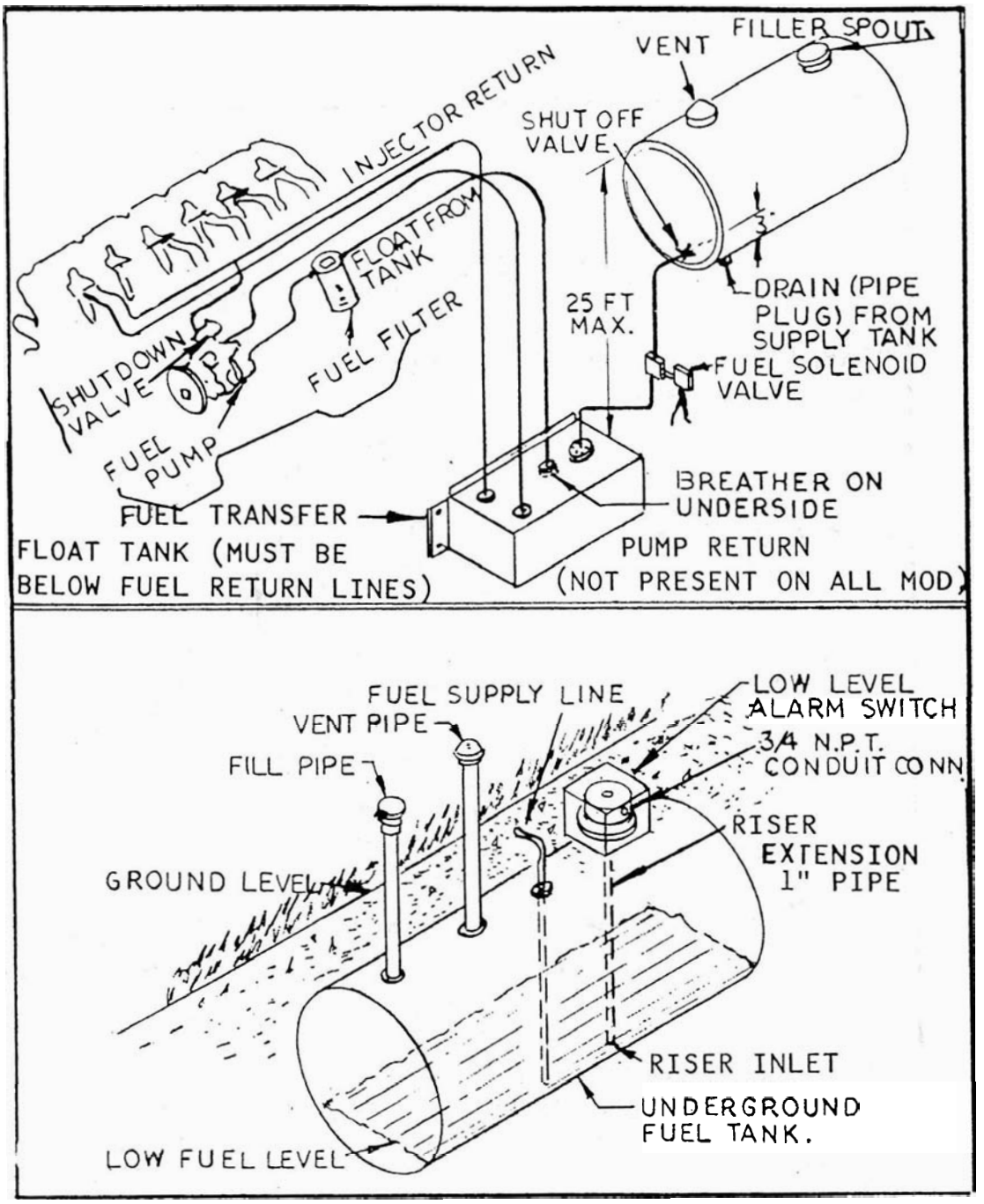


FIGURE 11 TOP - INSTALLATION WITH FUEL TANK ABOVE ENGINE (DIESEL)
BOTTOM - LOW FUEL LEVEL ALARM SWITCH

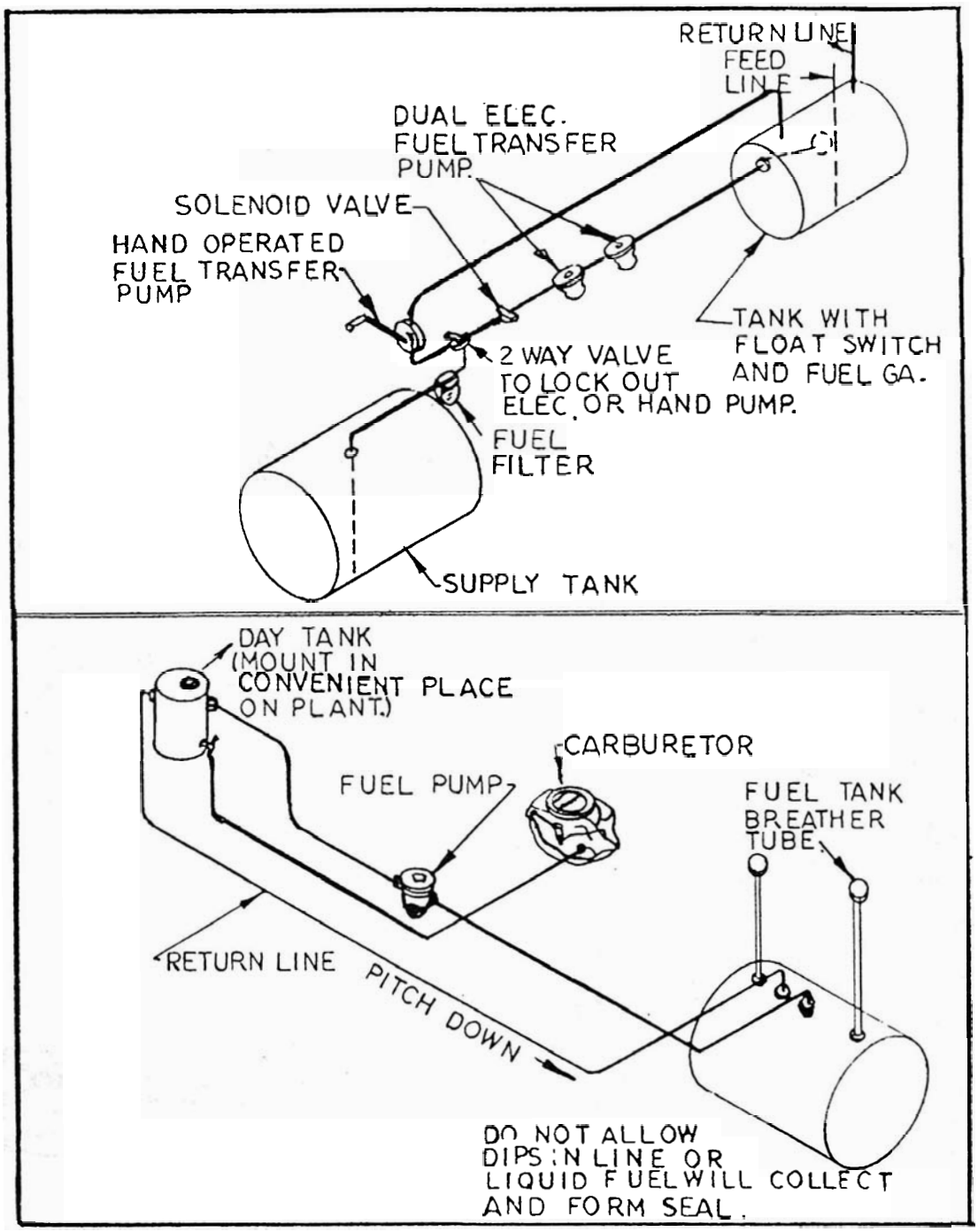
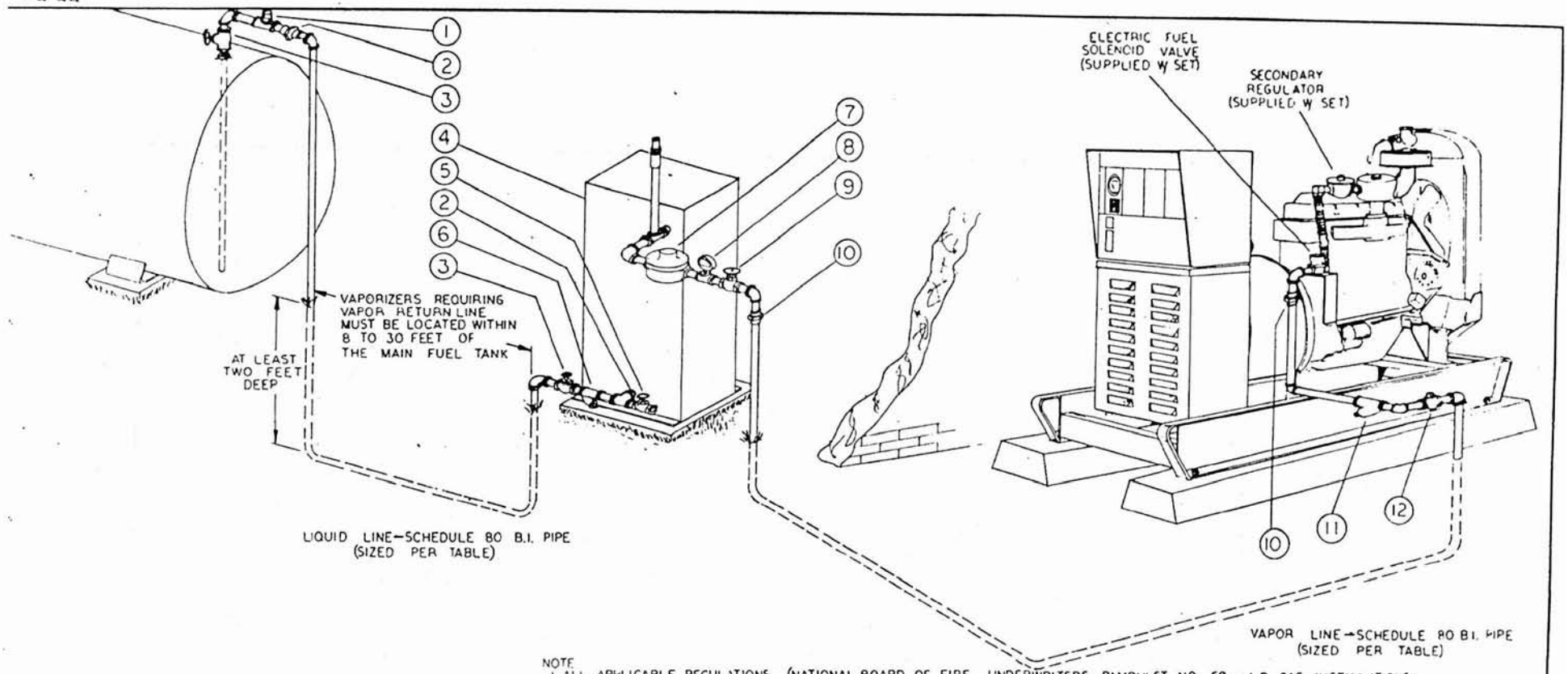


FIGURE 12 TOP - HAND OPERATED TRANSFER PUMP
BOTTOM - PRIMING TANK INSTALLATION FOR GASOLINE ENGINE



NOTE

1. ALL APPLICABLE REGULATIONS (NATIONAL BOARD OF FIRE UNDERWRITERS, PAMPHLET NO. 58 — L.P. GAS INSTALLATIONS; CSA B149 — INSTALLATION CODE FOR GAS BURNING APPLIANCES AND EQUIPMENT; AND, ALL STATE AND LOCAL CODES) SHOULD BE ADHERED TO.
2. THIS IS ONLY A TYPICAL INSTALLATION; AND, THE INSTALLATION REQUIREMENTS OF THE VAPORIZER MANUFACTURE MUST BE FULLY MET.
3. RECOMMENDED VAPORIZERS (OR EQUAL)
   A. RANSOME TORCH AND BURNER COMPANY
      1125-67 TH STREET, OAKLAND, CALIFORNIA 94608
      MODEL GVB-30 (COMPLETE WITH, 5 TO 25 PSIG VAPOR OUTLET, REGULATOR)
   B. JOHN E. MITCHELL COMPANY
      3800 COMMERCE, DALLAS, TEXAS 75226
      MODEL 30 HP (COMPLETE WITH, 5 TO 25 PSIG VAPOR OUTLET, REGULATOR AND SUPPORT STAND)
   C. ALGAS INDUSTRIES, INC
      DALLAS, TEXAS 75220
      MODEL 40/40H (COMPLETE WITH, 5 TO 25 PSIG VAPOR OUTLET, REGULATOR)
4. VAPOR LINE MUST BE SUPPORTED NEAR THE ELECTRIC FUEL SOLENOID WITH A FLOOR OR WALL SUPPORTED BRACKET (THE SHIPPING BRACKET MUST BE REMOVED).

	1/2	1/2	1/2	1 1/2	1 1/2	2
	50 FT	100 FT	300 FT	50 FT	100 FT	300 FT
LIQUID LINE LENGTH				VAPOR LINE LENGTH		
SUGGESTED PIPE LINE SIZES						

REF	PART DESCRIPTION
	CRANE PLASTIC SEAL NO. 2, OR EQUAL.
12	CRANE B.I. GAS LINE COCK NO. 1228, OR EQUAL.
11	CRANE B.I. STRAINER NO. 988 1/2 WITH 80 MESH MONEL SCREEN, OR EQUAL.
10	B.I. UNION - EXTRA HEAVY.
9	CRANE BRONZE GLOBE VALVE NO. 1240 WITH COMPOSITION DISC (150 PSIG W.P.) OR EQUAL.
8	PRESSURE GAUGE.
7	PRIMARY REGULATOR 5 TO 25 PSIG OUTLET (SUPPLIED WITH VAPORIZER).
6	CRANE B.I. STRAINER NO. 990 1/2 WITH 80 MESH MONEL SCREEN OR EQUAL.
5	BLOWDOWN VALVE (SUPPLIED WITH VAPORIZER)
4	VAPORIZER (SEE NOTE 3).
3	JOHN CRANE BRONZE GLOBE VALVE NO. 130 WITH COMPOSTION DISC (400 PSIG W.P.), U.L. APPR'D OR EQUAL
2	B.I. UNION - EXTRA HEAVY (300 PSIG WORKING PRESSURE)
1	HYDROSTATIC RELIEF VALVE

NO. REQ'D. | MICROFILM DATA

MATERIAL

WINPOWER MFG. CO.
NEWTON, IOWA

FUEL CONNECTION

Federal, State and local codes should be checked and complied with in regards to the use of gaseous fuels. National Fire Protection Association Standards No. 54 should be complied with for a natural gas installation. National Fire Protection Association Standards No. 58 should be complied with for an LP gas installation.

GROUNDING

The generator frame must be grounded to a **grounding** stake driven into moist earth, or to a water pipe at the street side of the water meter.

LOAD CONNECTIONS

Make certain that the load connection board shown in Figure 1 is connected to correspond to the system it is to be connected to.

BATTERY

The recommended battery sizes are as follows:

Engine		Battery	Connection Figure
Allis Chalmers	2900	One 12V-150 Ampere Hour	A
Allis Chalmers	3500	Two 12V-150 Ampere Hour Operated in Parallel	B
Allis Chalmers	11000	Two 12V-150 Ampere Hours Operated in Series	C
Hercules	G-1600	One 12V-72 Ampere Hour	A
Hercules	G-2300	One 12V-72 Ampere Hour	A
Hercules	G-3400	One 12V-72 Ampere Hour	A
Hercules	D-1700	One 12V-90 Ampere Hour	A
Hercules	D-2300	One 12V-90 Ampere Hour	A
International	UV-401	One 12V-90 Ampere Hour	A
International	UV-549	One 12V-90 Ampere Hour	A
Waukesha	FG17G4	One 12V-200 Ampere Hour	A
Minneapolis-Moline	HD-800	One 12V-200 Ampere Hour	A

The battery should be placed in the battery rack and fastened with the hold down bolts. The battery connection should be as per Figure 14 .

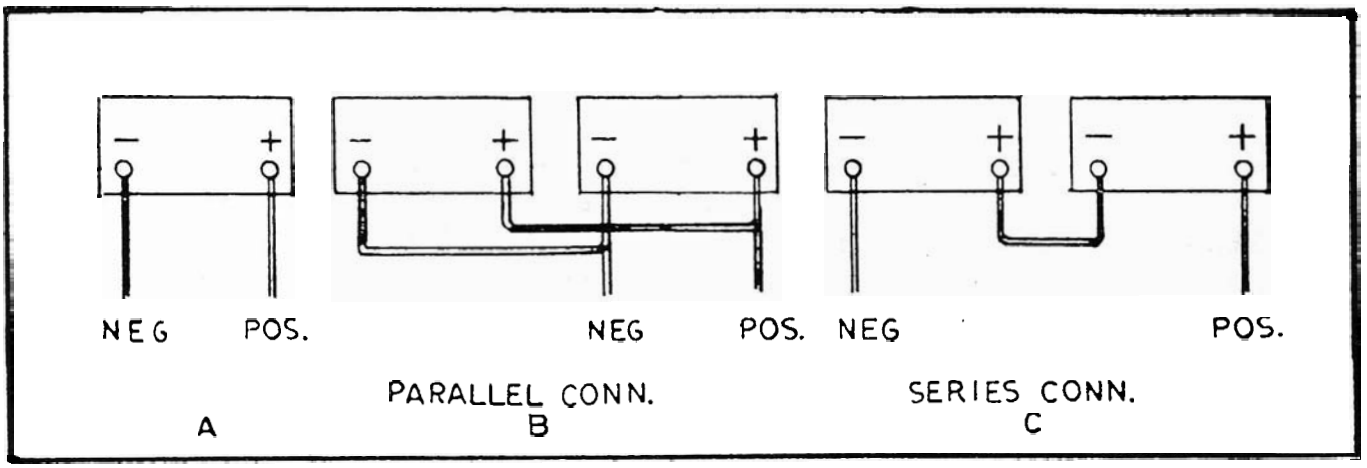


FIGURE 14

REMOTE START & STOP

For remote start and stop operation, connect the two remote cables to terminal positions 21 and 22 as shown below:

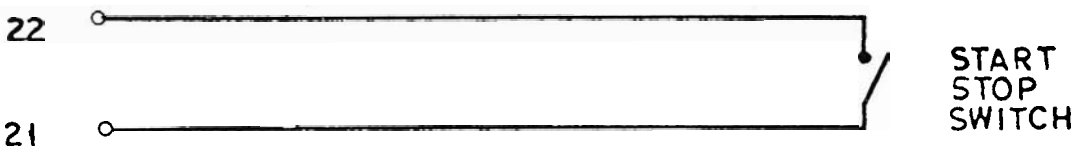


FIGURE 15

LINE TRANSFER CONTROL

Any make of line transfer switch may be used with any model Winpower liquid cooled set. The engine starting controls of the automatic transfer switch are to connect across terminal positions 21 and 22 in generator control panel.

We recommend using a Winpower Automatic Line Transfer Control which incorporates over-cranking protection and a selector switch for selecting the following modes: automatic, test, and stop.

OPERATION

INITIAL START UP

The engine manual should be thoroughly read in regards to operation. The engine crankcase must be filled with an oil recommended by the engine manufacturer, except for units powered by Allis Chalmers or International Harvester Engines which are shipped with oil in the crankcase.

INITIAL START UP (Cont'd)

The level of the oil in these engines should, however, be checked. The sets are shipped without liquid in the cooling system. Fill with water, or anti freeze, if freezing temperatures are encountered. Refer to engine manuals for capacities of cooling system.

To start the unit, place all protective circuit breakers in the "on" position, place regulator switch in the "on" position, place load circuit breaker if used in the "off" position, then place "run stop" switch in the run position. After unit has come up to speed, adjust voltage to the proper value. When starting the unit for the first time observe the set for any possible abnormal condition. Apply load and observe the voltage regulation which should be within plus or minus one per cent of the no-load voltage.

STOPPING

Before stopping unit, all loads should be disconnected. Run unit at no-load for a minimum of three minutes before stopping engine. If the unit had been operating at a heavy load for a appreciable period of time, the length of run at no-load should be extended to ten minutes.

MAINTENANCE

ENGINE

Refer to engine manual

GENERATOR

The generator is a brushless generator and requires little maintenance. It should be cleaned every 200 hours.

1. Clean outside of generator frame using a solvent if necessary.
2. Blow dust and dirt from interior of generator by means of low pressure compressed air.

The generator bearing is a wide type sealed bearing and requires no relubrication.

BATTERY

The level of the battery electrolyte should be checked weekly under constant use and monthly with intermittent use. Refill to proper level with distilled water. Never allow the battery to stand for a long period of time in a discharged condition.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
No voltage build up	Open circuit	Check wiring
	Shorted coil in generator stator or exciter armature	This would require generator to be sent to electric motor repair shop
	Regulator switch in "off position"	Place in "on position"
	Defective diode in rotating rectifier assembly	Replace diode
	Defective voltage regulator	Replace regulator
	Fuse blown on voltage regulator	Replace fuse
	Voltage regulator sensing leads in wrong place	Check with Figure 1
Voltage too low	Defective diode in rotating rectifier assembly	Replace diode
	Voltage adjusting rheostat improperly adjusted	Readjust
	Shorted generator stator or exciter armature	This would require generator to be sent to electric motor repair shop
	Voltage regulator sensing leads in wrong place	Check with Figure 1
Voltage too high	Voltage adjusting rheostat improperly adjusted	Readjust
	Defective voltage regulator	Replace regulator
	Voltage regulator sensing leads in wrong place	Check with Figure 1

TABLE 1

TYPE OF VIBRATION ISOLATOR

ENERATOR MODEL	DIMENSIONS A	B	C	D	E	F	G	PAD PART NO	MOLDED PART NO	SPRING PART NO
R13H4 X5 R13H4 X5 R15H4 R15H4	12	-	49-1/2	24-7/8	6	4	12	(4) G-5890-1	(4) W-197	(4) W-200
R20H4 X5 R20H4 X5 R25H4 R25H4	12	-	49-1/2	24-7/8	6	4	12	(4) G-5890	(4) W-198	(4) W-201
R30H4 X5 R30H4 X5 R40H4 R40H4 X5 R40H4 R40A4 X5 R50H4 R50I4 X5 R50A4 R60I4 R60I4 X5 R75I4	6	33-1/2	67	30	8	4	12	(6) G-5890	(6) W-198	(6) W-201
R50A4 X5 R60A4 R60A4 X5 R75A4	6	33-1/2	67	30	8	4	12	(6) G-5890	(6) W-198	(6) W-201
R90K4 X5 R90M4 X5 R100K4 R100M4	8	45	90	35	12	6	16	(6) G-5890-2	(6) W-199	(6) W-202
R90A4 X5	6	40	80	35	12	6	16	(6) G-5890-2	(6) W-199	(6) W-202

[illegible] vibration isolators part numbers

DIESEL ELECTRIC PLANTS - LIQUID COOLED
RATED U. S. GALLONS PER HOUR (6.88 Lbs/Gal)

MODEL	ENGINE MAKE & MODEL	HZ	RPM	LOAD	STANDBY SERVICE		CONTINUOUS SERVICE	
R13H4( )*X5	Hercules D-1700	50	1500	1/4	15 KW	0.81 GPH	12.5 KW	.77 GPH
				1/2	+	1.21	+	1.11
				3/4	+	1.64	+	1.48
				Full	+	2.15	+	1.90
R15H4( )*	Hercules D-1700	60	1800	1/4	17.5 KW	0.65 GPH	15 KW	0.63 GPH
				1/2	+	0.99	+	0.92
				3/4	+	1.37	+	1.24
				Full	+	1.82	+	1.60
R20H4( )*X5	Hercules D-2300	50	1500	1/4	22.5 KW	0.87 GPH	20 KW	0.84 GPH
				1/2	+	1.38	+	1.24
				3/4	+	1.93	+	1.74
				Full	+	2.63	+	2.30
R25H( )*	Hercules D-2300	60	1800	1/4	30 KW	1.08 GPH	25 KW	1.03 GPH
				1/2	+	1.66	+	1.51
				3/4	+	2.28	+	2.06
				Full	+	3.08	+	2.69
R30H4( )*X5	Hercules D-3400	50	1500	1/4	32.5 KW	1.28 GPH	30 KW	1.22 GPH
				1/2	+	2.03	+	1.86
				3/4	+	2.86	+	2.57
				Full	+	3.92	+	3.40
R40H4( )*	Hercules D-3400	60	1800	1/4	45 KW	1.56 GPH	40 KW	1.48 GPH
				1/2	+	2.43	+	2.22
				3/4	+	3.40	+	3.07
				Full	+	4.62	+	4.03
R40A4( )*X5	Allis Chalmers 2900	50	1500	1/4	50 KW	1.47 GPH	40 KW	1.30 GPH
				1/2	+	2.45	+	2.05
				3/4	+	3.42	+	2.85
				Full	+	4.38	+	3.60
R50A4( )*	Allis Chalmers 2900	60	1800	1/4	60 KW	1.68 GPH	50 KW	1.50 GPH
				1/2	+	2.85	+	2.45
				3/4	+	4.00	+	3.43
				Full	+	5.00	+	4.40
R50A4( )*X5	Allis Chalmers 3500	50	1500	1/4	60 KW	1.75 GPH	50 KW	1.57 GPH
				1/2	+	2.85	+	2.50
				3/4	+	3.95	+	3.42
				Full	+	5.08	+	4.30
R60A4( )*	Allis Chalmers 3500	60	1800	1/4	70 KW	2.35 GPH	60 KW	2.15 GPH
				1/2	+	3.45	+	3.10
				3/4	+	4.55	+	4.07
				Full	+	5.70	+	5.05
R60A4( )*X5	Allis Chalmers 3500	50	1500	1/4	75 KW	2.07 GPH	60 KW	1.75 GPH
				1/2	+	3.60	+	2.85
				3/4	+	4.76	+	3.95
				Full	+	6.15	+	5.08
R75A4( )*	Allis Chalmers 3500	60	1800	1/4	90 KW	2.65 GPH	75 KW	2.43 GPH
				1/2	+	4.08	+	3.43
				3/4	+	5.55	+	4.80
				Full	+	7.00	+	6.01
R90A4( )*X5	Allis Chalmers 11000	50	1500	1/4	105 KW	3.19 GPH	90 KW	2.94 GPH
				1/2	+	4.88	+	4.40
				3/4	+	6.60	+	5.85
				Full	+	8.30	+	7.35
R100A4( )*	Allis Chalmers 11000	60	1800	1/4	125 KW	3.70 GPH	100 KW	3.30 GPH
				1/2	+	5.72	+	4.90
				3/4	+	7.78	+	6.56
				Full	+	9.80	+	8.20

NOTE: Voltage Keying Alpha Omitted.

TABLE 3

FUEL CONSUMPTION CHART (± 5%)
GASOLINE° ELECTRIC PLANTS - LIQUID COOLED
RATED U. S. GALLONS PER HOUR (6.00 Lbs/Gal)

MODEL	ENGINE MAKE & MODEL	HZ	RPM	LOAD	STANDBY SERVICE		CONTINUOUS SERVICE	
GR13H4( )*X5	Hercules G-1600	50	1500	1/4	15 KW	1.56 GPH	12.5 KW	3.19 GPH
				1/2	+	2.25	+	2.69
				3/4	+	2.89	+	2.09
				Full	+	3.40	+	1.47
GR15H4( )*	Hercules G-1600	60	1800	1/4	17.5 KW	1.74 GPH	15 KW	1.76 GPH
				1/2	+	2.60	+	2.44
				3/4	+	3.25	+	3.05
				Full	+	3.72	+	3.52
GR20H4( )*X5	Hercules G-2300	50	1500	1/4	22.5 KW	1.74 GPH	20 KW	1.67 GPH
				1/2	+	2.48	+	2.29
				3/4	+	3.12	+	2.91
				Full	+	3.80	+	3.52
GR25H4( )*	Hercules G-2300	60	1800	1/4	30 KW	2.42 GPH	25 KW	1.94 GPH
				1/2	+	2.82	+	2.67
				3/4	+	3.59	+	3.36
				Full	+	4.41	+	4.07
GR30H4( )*X5	Hercules G-3400	50	1500	1/4	32.5 KW	2.21 GPH	30 KW	2.15 GPH
				1/2	+	3.06	+	2.92
				3/4	+	3.88	+	3.70
				Full	+	4.70	+	4.45
GR40H4( )*	Hercules G-3400	60	1800	1/4	45 KW	2.82 GPH	40 KW	2.68 GPH
				1/2	+	3.84	+	3.60
				3/4	+	5.18	+	4.48
				Full	+	5.86	+	5.40
GR40H4( )*X5	Hercules G-3400	50	1500	1/4	45 KW	2.59 GPH	40 KW	2.42 GPH
				1/2	+	3.69	+	3.39
				3/4	+	4.65	+	4.31
				Full	+	5.98	+	5.37
GR50H4( )*	Hercules G-3400	60	1800	1/4	55 KW	3.17 GPH	50 KW	2.97 GPH
				1/2	+	4.32	+	4.08
				3/4	+	5.52	+	5.11
				Full	+	7.21	+	6.31
GR50I4( )*X5	International UV-401	50	1500	1/4	55 KW	3.24 GPH	50 KW	2.16 GPH
				1/2	+	3.98	+	4.15
				3/4	+	5.47	+	5.22
				Full	+	8.25	+	6.96
GR60I4( )*	International UV-401	60	1800	1/4	65 KW	4.00 GPH	60 KW	2.76 GPH
				1/2	+	5.08	+	5.28
				3/4	+	6.87	+	6.21
				Full	+	9.00	+	8.42
GR60I4( )*X5	International UV-549	50	1500	1/4	65 KW	4.62 GPH	60 KW	4.27 GPH
				1/2	+	5.95	+	5.85
				3/4	+	7.54	+	7.15
				Full	+	11.09	+	8.98
GR75I4( )*	International UV-549	60	1800	1/4	82 KW	5.40 GPH	75 KW	5.07 GPH
				1/2	+	7.20	+	6.93
				3/4	+	9.00	+	7.84
				Full	+	11.52	+	10.03
GR90K4( )*X5	Waukesha F817GU	50	1500	1/4	100 KW	6.35 GPH	90 KW	5.55 GPH
				1/2	+	9.45	+	8.65
				3/4	+	11.82	+	10.88
				Full	+	14.62	+	12.55
GR100K4( )*	Waukesha F817GU	60	1800	1/4	115 KW	7.95 GPH	100 KW	6.95 GPH
				1/2	+	11.75	+	10.65
				3/4	+	13.50	+	12.80
				Full	+	16.20	+	14.90

FUEL CONSUMPTION CHART (± 5%)
NATURAL GAS ELECTRIC PLANTS - LIQUID COOLED
RATED CUBIC FEET PER HOUR (1000 BTU/CU. FT)

MODEL	ENGINE MAKE & MODEL	HZ	RPM	LOAD	STANDBY SERVICE		CONTINUOUS SERVICE	
GR13H4( )*X5	Hercules G-1600	50	1500	1/4	15 KW	133 CFH	12.5 KW	124 CFH
				1/2	+	193	+	180
				3/4	+	256	+	232
				Full	+	294	+	275
GR15H4( )*	Hercules G-1600	60	1800	1/4	17.5 KW	157 CFH	15 KW	147 CFH
				1/2	+	235	+	219
				3/4	+	293	+	275
				Full	+	350	+	323
GR20H4( )*X5	Hercules G-2300	50	1500	1/4	22.5 KW	180 CFH	20 KW	171 CFH
				1/2	+	262	+	245
				3/4	+	334	+	311
				Full	+	407	+	371
GR25H4( )*	Hercules G-2300	60	1800	1/4	30 KW	220 CFH	25 KW	207 CFH
				1/2	+	319	+	299
				3/4	+	394	+	369
				Full	+	473	+	437
GR30H4( )*X5	Hercules G-3400	50	1500	1/4	32.5 KW	221 CFH	30 KW	213 CFH
				1/2	+	313	+	300
				3/4	+	393	+	375
				Full	+	470	+	450
GR40H4( )*	Hercules G-3400	60	1800	1/4	45 KW	323 CFH	40 KW	320 CFH
				1/2	+	413	+	400
				3/4	+	513	+	478
				Full	+	603	+	557
GR40H4( )*X5	Hercules G-3400	50	1500	1/4	45 KW	257 CFH	40 KW	246 CFH
				1/2	+	375	+	351
				3/4	+	483	+	449
				Full	+	575	+	536
GR50H4( )*	Hercules G-3400	60	1800	1/4	55 KW	310 CFH	50 KW	292 CFH
				1/2	+	456	+	438
				3/4	+	572	+	534
				Full	+	686	+	633
GR50I4( )*X5	International UV-549	50	1500	1/4	55 KW	407 CFH	50 KW	335 CFH
				1/2	+	700	+	525
				3/4	+	917	+	680
				Full	+	1050	+	800
GR60I4( )*	International UV-549	60	1800	1/4	65 KW	415 CFH	60 KW	400 CFH
				1/2	+	610	+	580
				3/4	+	800	+	757
				Full	+	970	+	946
GR60I4( )*X5	International UV-549	50	1500	1/4	65 KW	476 CFH	60 KW	374 CFH
				1/2	+	784	+	594
				3/4	+	991	+	759
				Full	+	1075	+	863
GR75I4( )*	International UV-549	60	1800	1/4	82 KW	465 CFH	75 KW	450 CFH
				1/2	+	732	+	694
				3/4	+	882	+	875
				Full	+	1082	+	1053
GR90M( )*X5	Minneapolis-Moline HD800A-6A	50	1500	1/4	100 KW	615 CFH	90 KW	537 CFH
				1/2	+	853	+	744
				3/4	+	1107	+	965
				Full	+	1364	+	1190
GR100M4( )*	Minneapolis-Moline HD800A-6A	60	1800	1/4	115 KW	697 CFH	100 KW	623 CFH
				1/2	+	970	+	865
				3/4	+	1208	+	1076
				Full	+	1548	+	1382

*NOTE: Voltage keying alpha omitted.

TABLE 5

FUEL CONSUMPTION CHART (± 5%)
LPG° ELECTRIC PLANTS - LIQUID COOLED
RATED CUBIC FEET PER HOUR (2522 BTU/CU. FT)

MODEL	ENGINE MAKE & MODEL	HZ	RPM	LOAD	STANDBY SERVICE		CONTINUOUS SERVICE	
GR13H4( )*X5	Hercules G-1600	50	1500	1/4	15 KW	80 CFH	12.5 KW	75 CFH
				1/2	+	112	+	105
				3/4	+	144	+	134
				Full	+	170	+	159
GR15H4( )*	Hercules G-1600	60	1800	1/4	17.5 KW	91 CFH	15 KW	88 CFH
				1/2	+	130	+	123
				3/4	+	162	+	153
				Full	+	187	+	177
GR20H4( )*X5	Hercules G-2300	50	1500	1/4	22.5 KW	69 CFH	20 KW	66 CFH
				1/2	+	104	+	96
				3/4	+	135	+	125
				Full	+	167	+	153
GR25H4( )*	Hercules G-2300	60	1800	1/4	30 KW	88 CFH	25 KW	83 CFH
				1/2	+	125	+	117
				3/4	+	162	+	150
				Full	+	206	+	183
GR30H4( )*X5	Hercules G-3400	50	1500	1/4	32.5 KW	89 CFH	30 KW	87 CFH
				1/2	+	123	+	114
				3/4	+	159	+	150
				Full	+	191	+	182
GR40H4( )*	Hercules G-3400	60	1800	1/4	45 KW	119 CFH	40 KW	113 CFH
				1/2	+	165	+	160
				3/4	+	210	+	190
				Full	+	260	+	245
GR40H4( )*X5	Hercules G-3400	50	1500	1/4	45 KW	100 CFH	40 KW	96 CFH
				1/2	+	150	+	139
				3/4	+	198	+	182
				Full	+	244	+	224
GR50H4( )*	Hercules G-3400	60	1800	1/4	55 KW	128 CFH	50 KW	123 CFH
				1/2	+	182	+	170
				3/4	+	239	+	221
				Full	+	297	+	271
GR50I4( )*X5	International UV-401	50	1500	1/4	55 KW	123 CFH	50 KW	114 CFH
				1/2	+	190	+	174
				3/4	+	243	+	228
				Full	+	297	+	273
GR60I4( )*	International UV-401	60	1800	1/4	65 KW	158 CFH	60 KW	139 CFH
				1/2	+	239	+	209
				3/4	+	311	+	307
				Full	+	302	+	332
GR60I4( )*X5	International UV-549	50	1500	1/4	65 KW	168 CFH	60 KW	138 CFH
				1/2	+	235	+	214
				3/4	+	310	+	278
				Full	+	394	+	346
GR75I4( )*	International UV-549	60	1800	1/4	82 KW	184 CFH	75 KW	155 CFH
				1/2	+	278	+	263
				3/4	+	368	+	343
				Full	+	479	+	437
GR90M4( )*X5	Minneapolis-Moline HD-800A-6A	50	1500	1/4	100 KW	306 CFH	90 KW	279 CFH
				1/2	+	425	+	388
				3/4	+	551	+	502
				Full	+	681	+	621
GR100M4( )*	Minneapolis-Moline HD-800A-6A	60	1800	1/4	115 KW	270 CFH	100 KW	242 CFH
				1/2	+	432	+	388
				3/4	+	562	+	505
				Full	+	692	+	622

*NOTE: Voltage keying alpha omitted

°LPG per HD5 Specification: 2522 BTU/Cu. Ft.; 4.24 Lbs./Gallon; 21,600 BTU/Lb.

OWNER'S SERVICE RECORD

CONSULT ENGINE MANUAL FOR SUGGESTED
MAINTENANCE AND SERVICE INTERVALS

CONSULT GENERATOR SET OPERATOR'S MANUAL
FOR GENERATOR SERVICE AND MAINTENANCE

	DATE											
ENGINE	Lube Oil											
	Lube Oil Filter											
	Air Cleaner											
	Exhaust System											
	Fuel Filter											
	Lubricate Gov. Link											
	Ignition Tune-Up											
	Battery											
	Cooling Air Intake											
	Cooling Air Discharge											
GENERATOR	Brushes											
	Air Intake											
	Air Discharge											

GENERATOR SET:

Model No. _____

Serial No. _____

Purchased From _____

Placed In Service _____

ENGINE:

Model _____

Serial No. _____