

MASTERMATIC 4100

MANUAL



1625 KDC Lane - P.O. Box 514 - Jackson WY 83001
(800) 447-8326 www.steamway.com

4100

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*Before Operating Your MasterMatic® VX Galaxy 4100, **THOROUGHLY**
READ AND STUDY This Manual.*

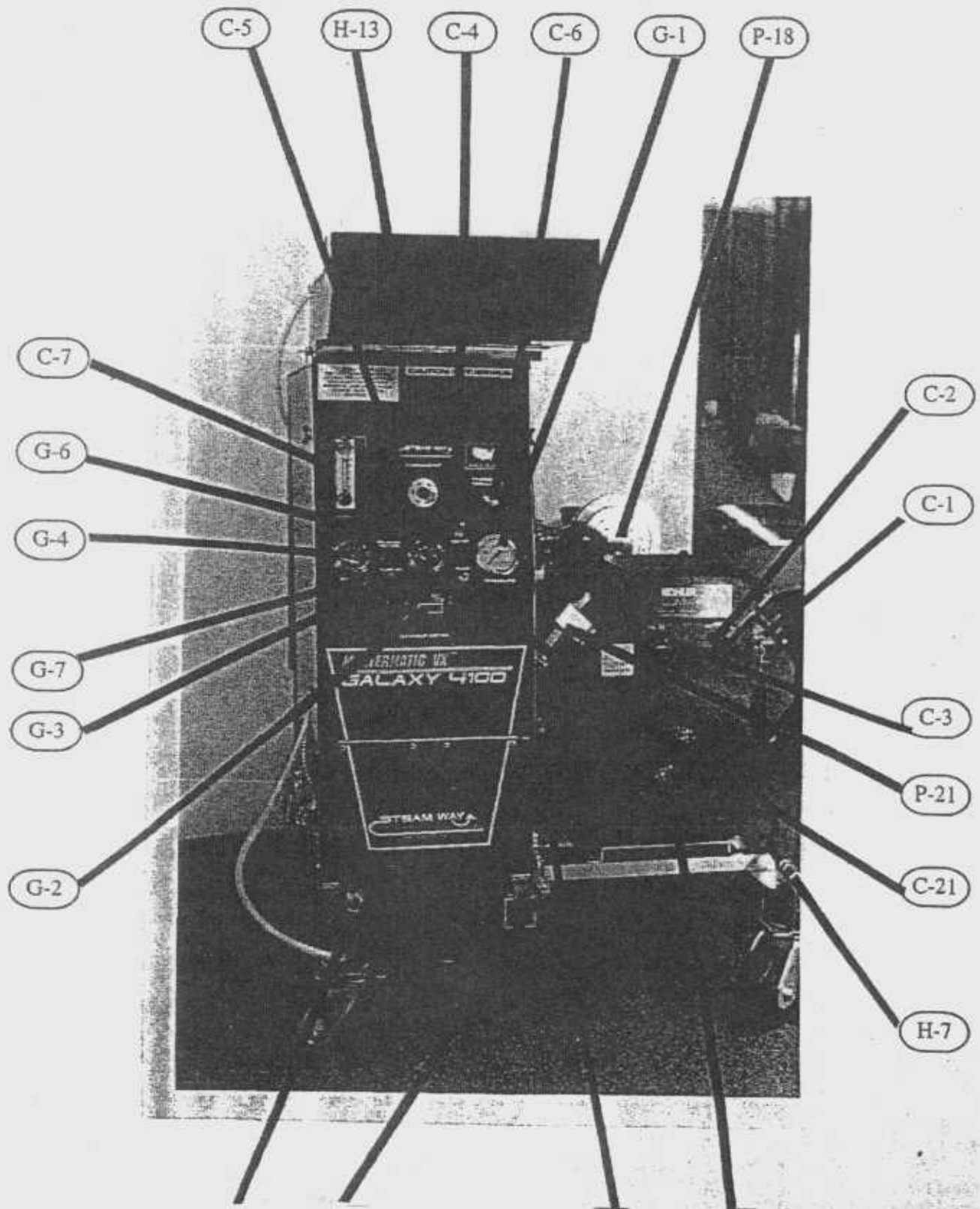
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MODEL 4100 MASTERMATIC



SECTION 2

INTRODUCTION

The Steam Way MASTERMATIC® VX GALAXY 4100 Truck Mounted Carpet and Upholstery Cleaning Unit by Steam Way International, Inc., is built for simplicity and ease of operation, plus low maintenance. Even though simple to operate and easy to maintain, it delivers a superb job on carpet and upholstery cleaning along with the ability to perform as a high pressure steam cleaner.

This unit comes with the newest innovations of Kohler Engine technology. The power plant is a 18 horsepower Command V twin cylinder engine with hydraulic operated over head valves. Overhead valves yield a higher compression ratio which will cause more complete fuel combustion, even burning for greater fuel efficiency and almost no carbon buildup. The interval between oil and oil filter changes are 100 and 200 hours respectively, which makes routine maintenance a breeze! The engine is equipped with an oil Sentry® switch to stop the engine in the event of low oil pressure.

The new GALAXY 4100 unit comes equipped with a 42 amp automotive alternator and clutch operated pump, that can be turned off when water pressure is not required.

The model GALAXY 4100 uses a fuel oil burner that produces 220,000 BTU for heating the water. The recommended fuel is kerosene with a consumption of approximately one-half gallon per hour. The temperature is thermostatically controlled and has a safety device, the water flow switch, which allows the heater to fire only when water is moving.

The standard waste recovery tank holds 70 gallons of water, with an optional 100 gallon waste tank available. It is made of aluminum and has baffles for reinforcement and reduced splashing. A screen mounted inside the tank insures that no debris can ever enter the vacuum blower. A cutoff switch is installed near the top of the tank to stop the engine when the tank is full to prevent a blowover. A 2 inch dump valve allows rapid dumping of waste water from the tank.

Remember that water does freeze at 32° F; so whether or not the unit is in use, in transit, or parked, it MUST be protected from freezing.

SAFETY

1. This portion may be the most important in your manual. It is our desire at Steam Way International that you have many years of satisfactory use, with no injuries to the operator, maintenance personnel, customers or onlookers. If the operator uses good safety practices, the likelihood of injuries will be minimal.
2. Carbon Monoxide is emitted by the gasoline engine and could become lethal if the unit is operated in a confined area. Carbon Monoxide is odorless, colorless and can cause death if inhaled. Never run the engine in a closed garage or similar area. Look for and consider the following:
 - A. Location of the vehicle
 - B. Wind direction
 - C. Dizziness
 - D. Unexplained headaches
 - E. Symptoms of others who are exposed to this situation
3. Hot exhaust tubes will cause burns to the hands and arms if touched while they are hot. These are all confined to the machine interior, but when performing service or maintenance, use much caution.
4. Moving parts can cause injuries if safety precautions are ignored. Always keep loose clothing away from pulleys, belts and shafts when maintenance procedures must be performed with the engine operating. Loose clothing can become tangled and caught in the machine's moving parts and can pull the hand or arm into pulleys or belts, causing personal injury.
5. The battery contains sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries produce an explosive hydrogen gas while being charged. To prevent a fire or explosion, charge battery only in a well ventilated area. Keep sparks, open flames and other sources of ignition away from the battery at all times.
6. Gasoline is an explosive fuel. Gasoline is extremely flammable and its vapors can explode if ignited. Do not fill the fuel tank while the engine is running, since spilled fuel could ignite if it comes in contact with sparks. When removing the fuel cap to fill the tank or venting the tank. Use extreme caution to assure that no cigarette smokers and other live flames or sparks are near. If gasoline comes in contact with the skin, wash it off immediately.
7. Kerosene is also a fuel that should be treated with respect, but is not nearly so volatile as gasoline. Use the same precaution with kerosene as discussed in the paragraph above. The kerosene tank should be vented during operation.
8. This unit uses a 12V DC power for the engine that has high voltage spark plug leads, like that of an automobile. Use the same electrical safety precautions observed on an automobile. A high voltage ignitor is used to produce an ? to ignite the fuel in the burner. Much care should be used to prevent electrical shock.

SECTION 3

INSTALLATION OF UNIT

The unit can be either side-mounted or rear-mounted. In either location, it is imperative that the exhaust scoop outlet be located visibly outside the van's interior. There are two very important reasons for this, first to protect occupants that might be in the van's interior, and secondly to keep the hot exhaust air from entering the engine's intake. Also, make sure that when the exhaust scoop is folded (in the down position) that the van doors will close. It is also very important not to operate the unit in an unvented area! Direct exhaust away from people and buildings. Stand away from the exhaust.

Close inspection that all is clear beneath the vehicle must be made prior to bolting the unit to the vehicle. Look for such things as gasoline tanks, brake and gas lines, and cross members; and be certain that no damage will result when drilling holes at that spot.

Install your unit in a safe manner, securing the unit so that in the event of an accident, the machine will not advance into the driver or passenger seat. A minimum of three 3/8" bolts should be used with large washers used beneath the floor of the vehicle, so that the bolts will not be pulled through the floor in the event of an accident.

Since the waste tank is not attached to the basic unit, its location can be where desired or applicable. It must be secured as described in the previous paragraph for the machine, using the four bolts to secure the tank. Other equipment in the vehicle should be secure while the vehicle is in motion.

To maintain cooler operating temperatures in the van, a roof vent may be installed. Roof vents are available through your Steam Way distributor or Steam Way International.

SECTION 4

PREOPERATIONAL INSTRUCTIONS

Before starting the GALAXY 4100, several operations must be complied with:

- 4-1 Fill the gasoline tank (red) with regular unleaded fuel, 87 octane or higher (Kohler's recommendation). The connection hose has a female connector that connects to Point H-1 (Figure 4-2) on the left side of the machine. Fill the kerosene tank (green) with recommended kerosene or #1 diesel fuel. With its connecting hose which goes to Point H-2 (Figure 4-2), bleed it by pushing the male connector against something solid; and by pumping the squeeze ball. All air can be dispensed before making connection to female connector H-2 (Figure 4-2).

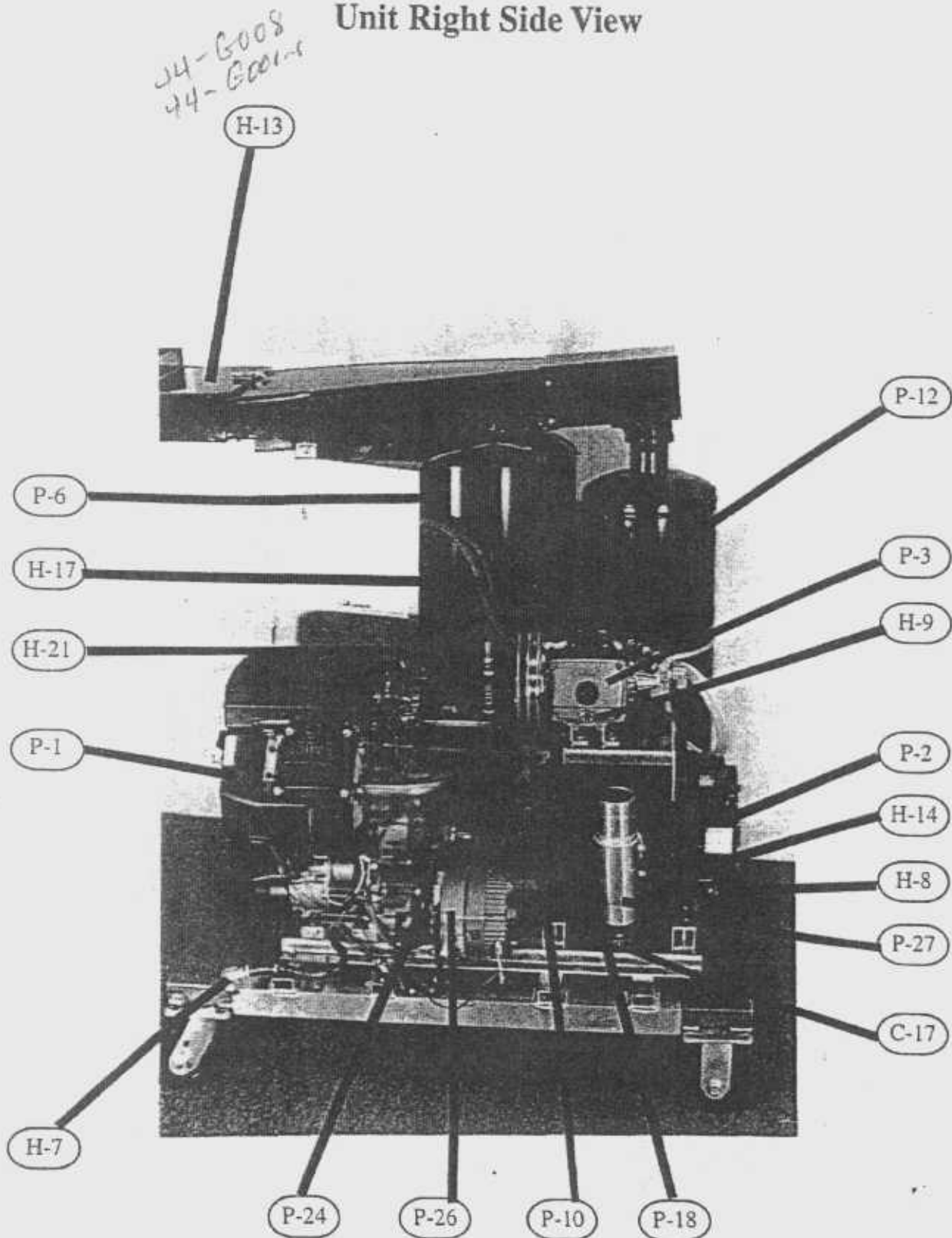
CAUTION:

For safety, always leave the supply hoses on the fuel tanks. When it is necessary to remove a tank for filling, remove the hose at the quick disconnect (H-1 or H-2) on the side of the machine. In this way, no incorrect connection can be made. Gasoline must never be applied to the heater, nor kerosene to the Kohler engine.

Condensation of water in the burner fuel tank causes a rapid deterioration of the fuel pump. As condensation of water in the fuel tank cannot be prevented, the addition of a fuel additive is suggested. A standard gas-line antifreeze may be used at a ratio of 2 to 4 ounces per 6 gallons of fuel. The additive is available under many brand names, one of which is Heet®. Another very effective method of removing water from the tank is by dumping the fuel occasionally, especially when the tank is very low on fuel; and by rinsing with a pint of clean fuel, this will remove water and debris from the tank.

Throughout this manual you will find reference numbers on figures, diagrams and drawings. These reference numbers are listed in Section 14 of controls, table 14-2 for gauges, table 14-3 for hookups, drains and hoses and table 14-4 for a list of major components.

FIGURE 4-1
Unit Right Side View

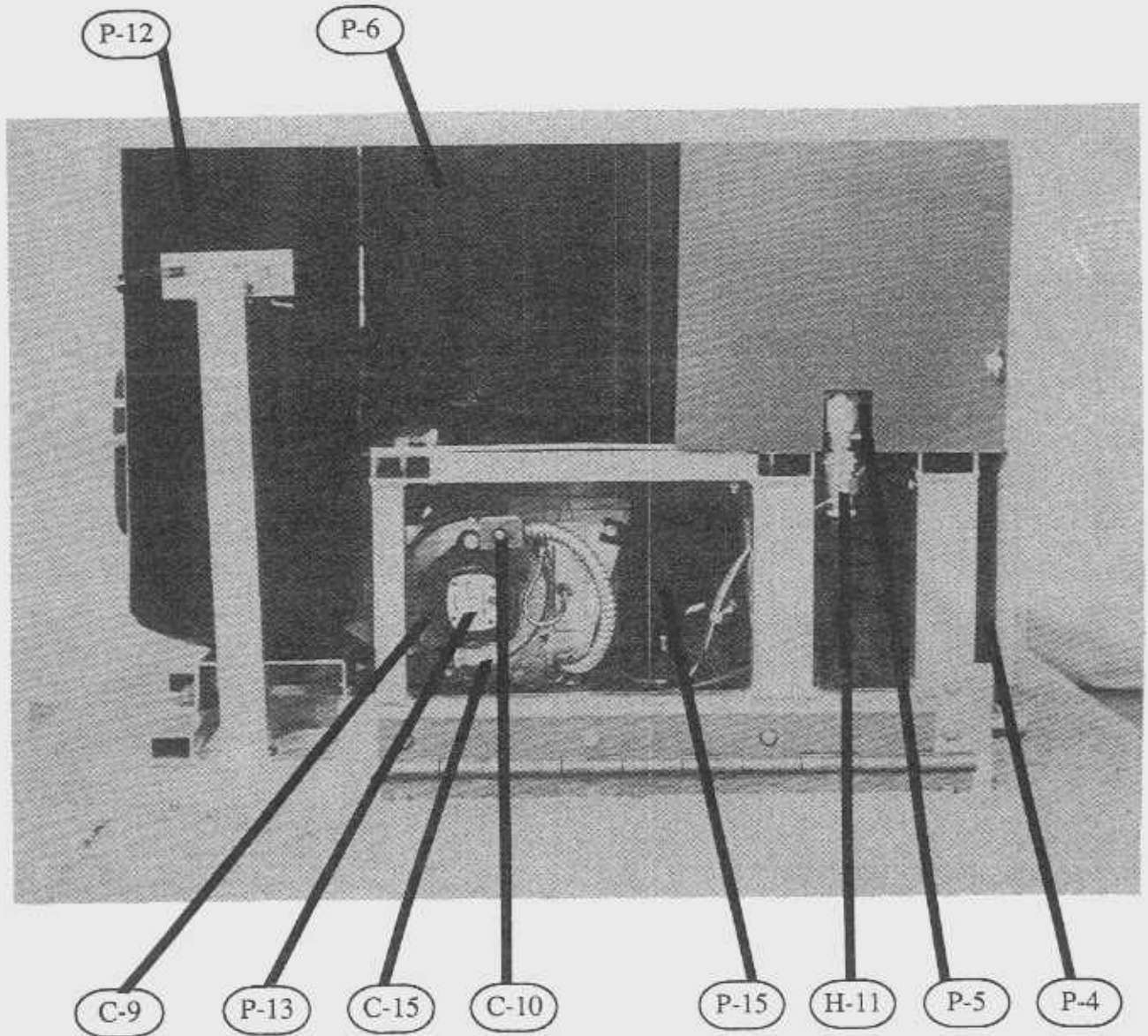


4-2 FLUSHING PROCEDURE (Before first start-up)

Before filling the water holding tank (P-5, Figure 4-2), disconnect the Q.D. (H-11, Figure 4-2), then connect the water hose assembly that was supplied with the starter package, to the female Q.D. of H-11. Disconnect the Q.D. (H-12, Figure 6-1) and leave the male side of the Q.D. pointing away from the machine. Now, turn the water on with the input valve assembly that is plugged into H-11, and the water will flush out antifreeze or stale water that was in the machine during shipping. Within a few seconds, clean fresh water will be observed at the male Q.D. (H-12, figure 6-1). When the hoses have been reconnected to the original positions, the flushing procedure is complete.

If the optional warm-up valve (Part #17-9015 which is highly recommended) is installed, it can be opened fully to warm-up instead of opening Q.D. (H-12).

FIGURE 4-2
Unit Left Side View



- 4-3 With the input valve assembly and garden hose attached to the water faucet, you now must fill the water holding tank (P-5) by inserting it into H-3 (Figure 4-3). When the tank is filled to a predetermined level, the float control valve (C-13) will shut the water off.
- 4-4 Fill the chemical container (P-19) with the desired cleaning agent premixed as instructed by the chemical manual supplied with your standard basic starter kit.
- 4-5 Snap the exhaust scoop to the UP position. **NEVER OPERATE IT IN THE DOWN POSITION!**

FIGURE 4-3
Unit Front Side View

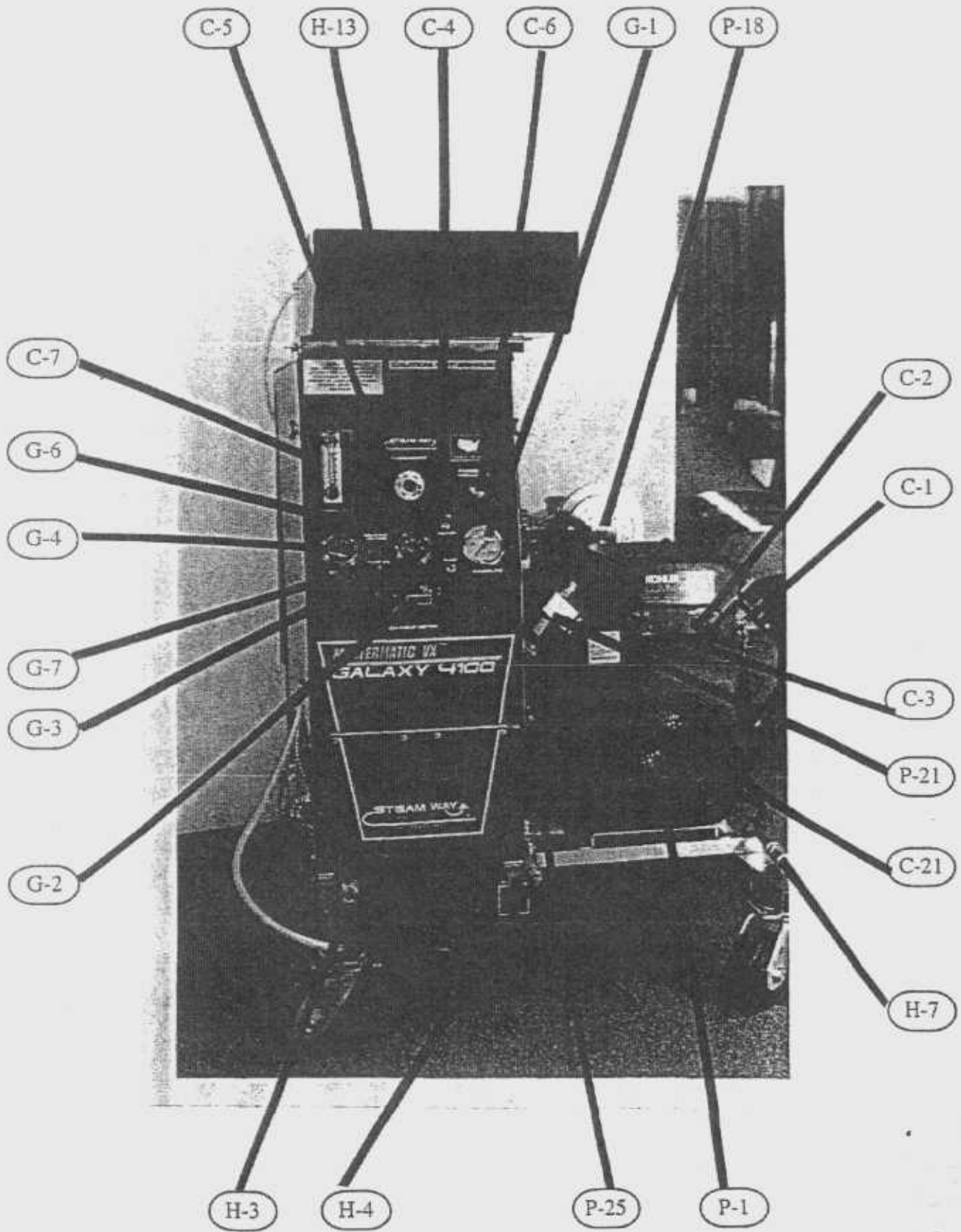
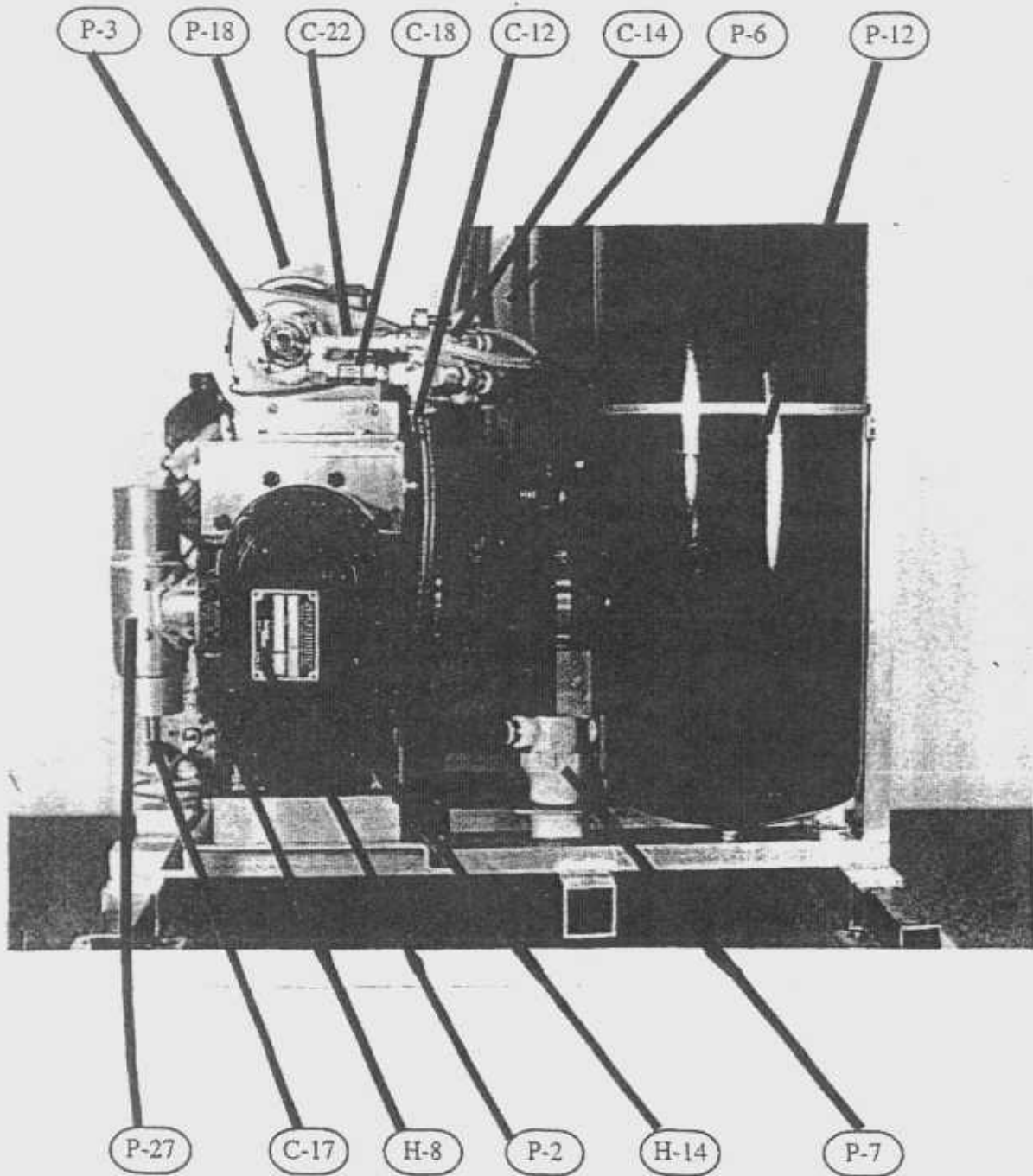


FIGURE 4-4
Unit Rear View



SECTION 5

OPERATING PROCEDURES

5-1 PREOPERATIONAL CONTROL SETTINGS

<u>Control</u>	<u>Number</u>	<u>Figure</u>	<u>Set To</u>
Engine Ignition Switch	C-1	4-3	Off
Engine Throttle	C-2	4-3	Closed
Engine Choke	C-3	4-3	In
Heater Switch	C-4	4-3	Off
Temperature Control	C-5	4-3	Low
Dump Valve	H-10	8-1	Closed
Soap Flow Meter	C-7	4-3	As Desired
Pressure Regulator	C-6	4-3	As Desired
Exhaust Scoop	H-13	6-1	Up
Pump Switch	C-21	4-3	Off

5-1.1 Check engine oil, blower oil and Cat pump oil levels

5-2 STARTING

5-2.1 Connect input water to H-3 (Figure 4-3) and turn on.

5-2.2 Attach vacuum hose from H-5 (Figure 8-1) to cleaning tool.

5-2.3 Connect the high pressure hose, that delivers solution to the cleaning tool, to H-4. If it is the first job of the day, turn the warm-up valve (optional item) to warm-up (open) for 2 or 3 minutes to discharge possible rusty water from the heater coils. The flushing procedure in paragraph 4-2 will accomplish the same. The warm-up valve when on will allow the heater to operate. The part number for the optional warm-up valve is 17-9015.

5-2.4 The engine is now ready to start. Open the throttle slightly. Pull the choke closed (if engine is cold). Turn the ignition switch to the start position. When the engine starts, push the choke back in.

5-2.5 Bring the engine up to operating speed (throttle against mechanical stop, preset at 2900 RPM).

5-2.5A Turn the pump switch on.

5-2.6 If using a special fabricated warm-up valve kit connected to H-4 (Figure 4-3), the movement of water can be observed, and the pump can flush the heater coils. This would constitute water flow, and the heater operation could be tested at the same time. The warm-up kit is highly recommended.

5-2.7 Turn the heater switch (C-4) on and select the desired safe cleaning temperature (C-5). The burner should NOT come on until water is made to flow.

5-2.8 The soap solution control (C-7) may have to be reset after the cleaning operation has begun to get to the desired results.

RUNNING

<u>Control</u>	<u>Number</u>	<u>Figure</u>	<u>Position</u>
Engine Ignition Switch	C-1	4-3	ON
Engine Throttle	C-2	4-3	OPEN to mechanical stop (2900 RPM)
Engine Choke	C-3	4-3	IN
Pump Switch	C-21	4-3	ON-Green light
Heater Switch	C-4	4-3	ON for heat
Temperature Control	C-5	4-3	As desired
Pressure Regulator	C-6	4-3	Set to desired pressure
DC Volt meter	G-4	4-3	IN-Green

PRESSURE EXAMPLES

A. Pressure Washing	1000 p.s.i. (1250 MAX)
B. Carpet Cleaning	425 p.s.i.
C. Upholstery Cleaning	175 p.s.i.

<u>Control</u>	<u>Number</u>	<u>Figure</u>	<u>Position</u>
Soap Flow Meter	C-7	4-3	As needed
Dump Valve	H-10	8-1	CLOSED
Vacuum Relief Breaker	C-17	8-1	Factory Adjusted to 13 Hg

- 5-3.1 During the cleaning operation or water recovery operation, if the engine stops suddenly, it is likely that the waste recovery tank has filled, and the float switch (C-16) has stopped the engine.
- 5-3.2 Observe closely the fuel quantities during operation, especially during big jobs.
- 5-3.3 Pay close attention to the amount of soap solution in the solution container (P-19). Running out of solution will result in a loss of pressure and could do serious damage to the water pressure pump (P-3)
- 5-3.4 When this unit is used for water extraction ONLY, the pump switch (C-21) MUST be turned off and the heater switch (C-4) must be off.

5-4 SHUT DOWN

5-4A Turn pump switch off (C-21).

5-4.1 Turn heater switch (C-4) off.

5-4.2 Move engine throttle control (C-2) to idle.

5-4.3 Turn ignition switch (C-1) to off.

5-4.4 A. Retrieve tools from job site and store.

B. Disconnect vacuum hose and place in vehicle.

C. Disconnect pressure hose and roll it up or store it.

5-4.5 In cold weather, use the most expedient method to get hoses and tools into the vehicle to keep from freezing.

5-4.6 Inspect the waste recovery tank.

A. Drain when and where appropriate. NOTE: Dumping waste water in the street is prohibited by law in some areas. Check with local authorities.

B. THOROUGHLY CLEAN THE LINT SCREEN. This system must be free of lint to perform optimum cleaning and drying.

C. Rinse out the waste tank FREQUENTLY while the dump valve is open.

Disconnect the water input valve assembly from H-3 to rinse the waste recovery tank while the water input hose is still connected to the water faucet.

D. Turn water faucet off, relieve the pressure in the hose roll up and place in vehicle.

SECTION 6

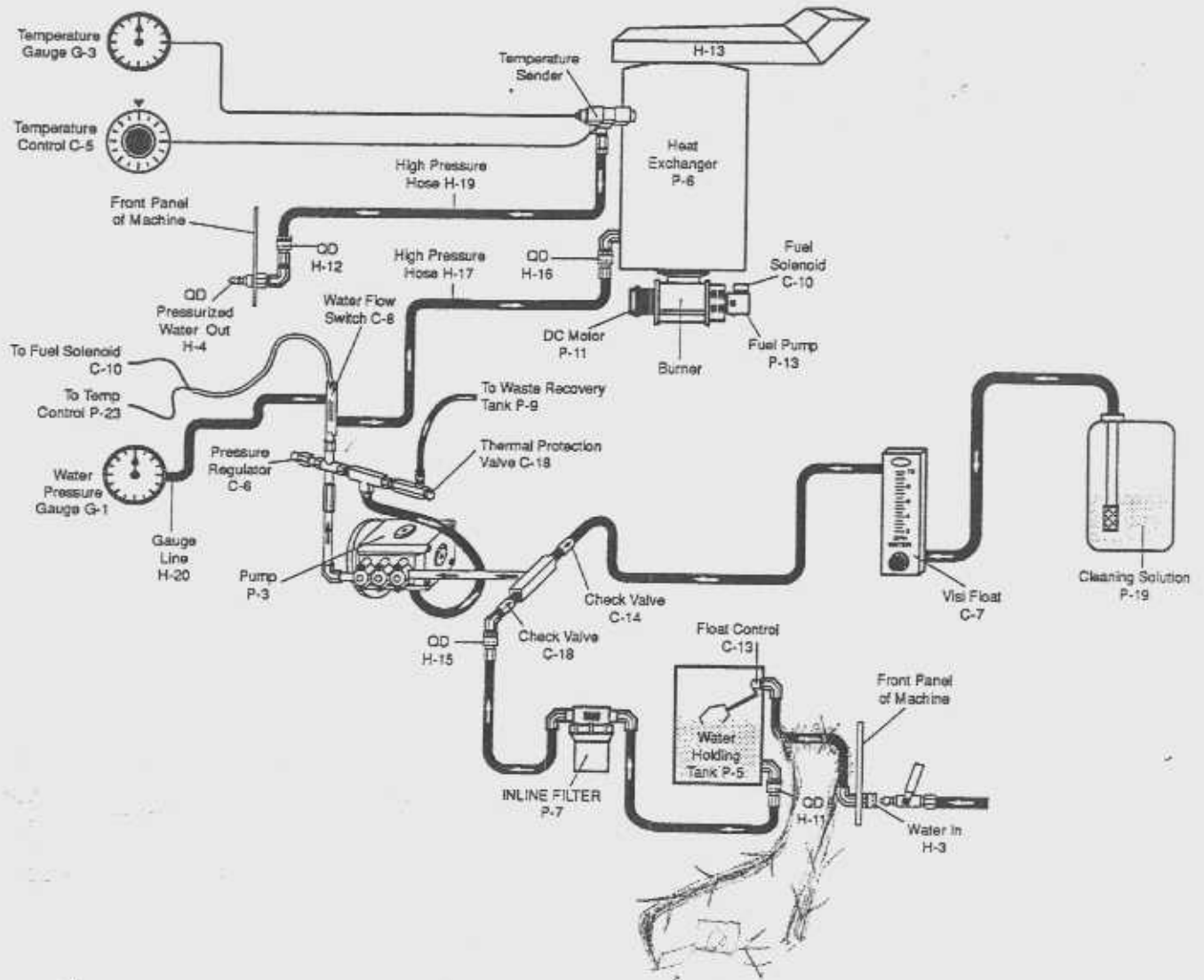
WATER FLOW SYSTEM

- 6-1 The water pump (P-3) has two reservoirs of liquids to draw from.
- A. The water holding tank (P-5), which is continuously refilled by the water input hose assembly. The hose assembly is attached to H-3, a female Q.D. in front of the machine.
 - B. The cleaning solution container (P-19), which contains the premixed solution required. (see your chemical manual)
 - C. When the pump switch (C-21) is turned on, the clutch is engaged and starts the action of the pump.
- 6-2 When a demand for water by the pump (P-3) is made (cleaning tool turned on), water and solution will be drawn from the two tanks mentioned above. The amount of detergent solution is controlled by the visi-float control (C-7).
- 6-3 Chemicals and water are mixed in the 4 way cross connector just prior to entering the water pump (P-3). Note that a one way check valve (C-14) is installed in the chemical line just before the mixing tee. This will prevent water from backing into the solution container when water is forced into the mixing tee.
- 6-4 As the Cat pump (P-3) is being driven by the engine, three plungers are drawing water and solution on the back stroke and is pushing or pressurizing water on the forward stroke. This causes a movement of approximately 3.5 gallons of water per minute. The water goes from the output of the pump, located on the discharge manifold, and flows to the pressure regulator (unloader C-6).
- 6-5 It is very important to note that the oil level sight gauge which has a red dot in the center is for checking the oil when the unit is NOT in operation. The oil level should be adjacent to the red dot. The Cat Pump (P-3) uses a special Cat Pump Oil (Part #4810106).

- 6-6 As the water reaches the pressure regulator (C-6), back pressure is produced, causing the excess water to bypass back to the pump; however, the pressurized usable water is directed into and through the water flow switch (C-8). The flow switch senses the water movement, causing an electrical contact with the heater circuit, which will be explained later. Note that a gauge line is connected to the water flow switch (C-8) so that the water pressure can be monitored on the water pressure gauge (G-1).
- 6-7 From the flow switch, water is directed into and through the heater coil (P-6) where the water is heated to the desired temperature. With the adjustment lug on the regulator (C-6), you may adjust the pressure to any desired pressure.
- 6-8 As the water leaves the heater coils (P-6), it passes temperature sensors for the temperature gauge (G-3) and temperature control (C-5). The water exits the machine at the male connector (H-4), and is sent to the cleaning tool via braided high pressure hoses.
- 6-9 CAUTION: When the cleaning tool is not in use (i.e., drying, moving furniture), the pressure regulator is bypassing all of the water causing a rapid increase in water temperature in the pump, which will cause damage to the pump. The Cat Pump manufacturer suggests that a limit of SIX MINUTES is maximum for this situation.
- 6-10 A Thermal Protection Valve (C-18) will protect the system for situations where the operator may not observe the six minute limit mentioned above. When the recycled water reaches a temperature of 145°F (still safe for the pump) the thermal valve will open, dispensing the hot water into the waste tank (P-9). The pump will draw cold water from the water holding tank (P-5) to cool itself to a safe temperature.

FIGURE 6-1

Water Flow Diagram



H

SECTION 7

HEATER SYSTEM

- 7-1 When the Command 18 H.P. engine is running at operating speed, the alternator produces 12 Volt DC from the 42 AMP charging system (automotive alternator). This supplies power for the ignition system, recharging the battery and providing power to run the components of the burner system.
- 7-2 The components of the burner system that require 12 Volt DC are: the fuel solenoid (C-10); the igniter module (P-15); and the DC motor (P-11). They are also protected by a circuit breaker (C-19, Figure 7-2) with a reset button.
- 7-3 When the heater switch is turned on 12 Volts is applied to the three components mentioned in paragraph 7-2 above. Twelve Volt DC travels to the igniter (P-15) which produces 20,000 Volts to the igniter tips. This results in a continuous arc (Figure 7-2). Twelve Volt DC also goes to the DC motor (P-11, Figure 7-2) which turns at 4500 rpm. This drives the squirrel cage fan (P-20), and the fuel pump (P-13) via a drive shaft. The pump also pressurizes the fuel to 130 p.s.i. When the fuel reaches the fuel solenoid (C-10), it is in the closed position unless specific conditions are satisfied.
- 7-4 To get the fuel solenoid (C-10, Figure 7-2) open so that the fuel can pass through enroute to the burner gun, refer to Figure 7-2. The fuel solenoid (C-10) is operated by 12 Volts DC that is picked up at the starter solenoid. Follow the circuit from the starter solenoid to the heater switch (C-4), through the temperature control (C-5), and finally through the water-flow switch (C-8). You will observe that all switches must be electrically closed to get voltage to the fuel solenoid. In order to get voltage to the fuel solenoid, all switches must be electrically closed in this manner:
- A. Pump switch ON.
 - B. Heater Switch (C-4) ON
 - C. Temperature Control Switch (C-5) ON (Temperature demand)
 - D. Water Flow Switch (C-8) CLOSED (Water Moving)
- 7-5 When the desired water temperature is met, the temperature control (C-5) will turn the fuel solenoid off. When the tool is turned off (no water flowing), the water flow switch (C-8) will turn the fuel solenoid (C-10) off, resulting in no more heating of the water in either situation.
- 7-6 To gain access to the burner gun and high voltage ignitor, the high voltage ignitor (P-15) of Figure 7-4 must be opened by:
- A. Loosening the screw in the slotted clamp on left side of ignitor.
 - B. Remove the screw on the top right side of the high voltage ignitor.

- 7-7 C. Open the ignitor (hinged at the bottom) by pulling it open from the top.
The efficiency of the oil burner can be changed by adjustments on the burner assembly as described below.

The fuel pressure can be changed by turning the adjusting nut C-15 (Figure 7-2). Each 1/4 turn will increase or decrease fuel pressure by approximately 3 to 4 psi. The air (oxygen) being drawn into the burner may be adjusted by opening or closing the air bands at C-11 (Figure 7-4) by small increments of change to increase efficiency of burner when needed. A bleed valve is located on the burner fuel pump (C-9) (P-13). When the D.C. motor is running, turning the bleed valve counterclockwise with a 3/8" wrench will allow the air to be disbursed.

CAUTION: MOVING PARTS.

7-8 THE POSSIBILITY OF ELECTRICAL SHOCK CAUSED BY THE HIGH VOLTAGE CIRCUIT CAN BE DECREASED BY GOOD MAINTENANCE PROCEDURES.

- A. When electrode spacing becomes too wide (Figure 7-3) this will increase the possibility of electrical shock.
- B. Poor condition of the high voltage ignition module will increase the likelihood of electrical shock.
- C. Excessive moisture in or near the high voltage circuit will increase the possibility of electrical shock.

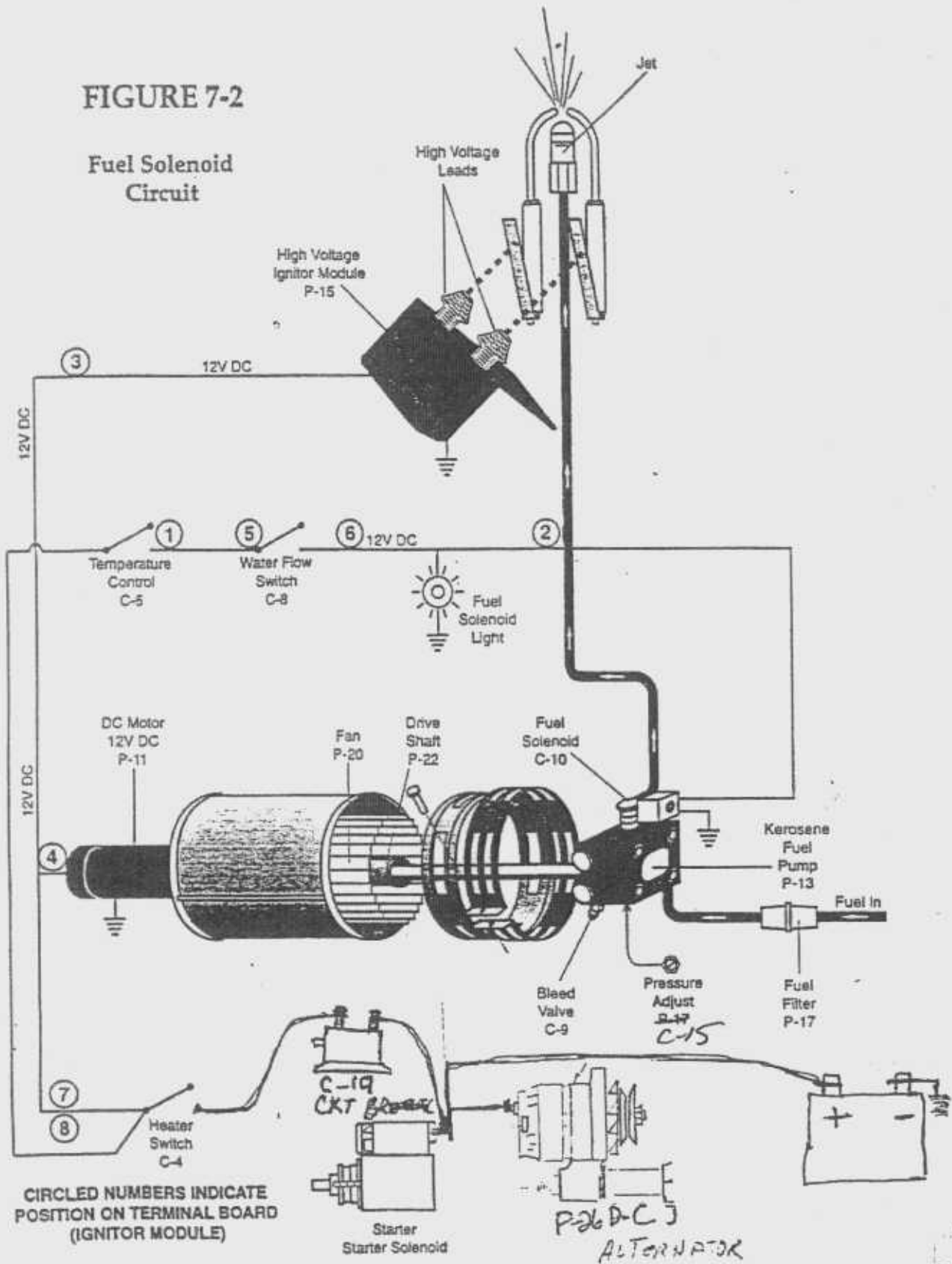
NOTE: When the operator becomes a better conductor of electrical current than the intended circuit, SHOCK WILL OCCUR.

FIGURE 7-1

(For Future Use)

FIGURE 7-2

Fuel Solenoid Circuit



CIRCLED NUMBERS INDICATE POSITION ON TERMINAL BOARD (IGNITOR MODULE)

BURNER ADJUSTMENTS

REMOVING THE GUN ASSEMBLY: Disconnect the kerosene line at the fan housing and remove the lock nut on the copper tube fitting. Remove the slot cover. Loosen the nut that secures the high voltage ignition module so that it can be hinged away from fan housing. Now burner gun can be removed through this opening.

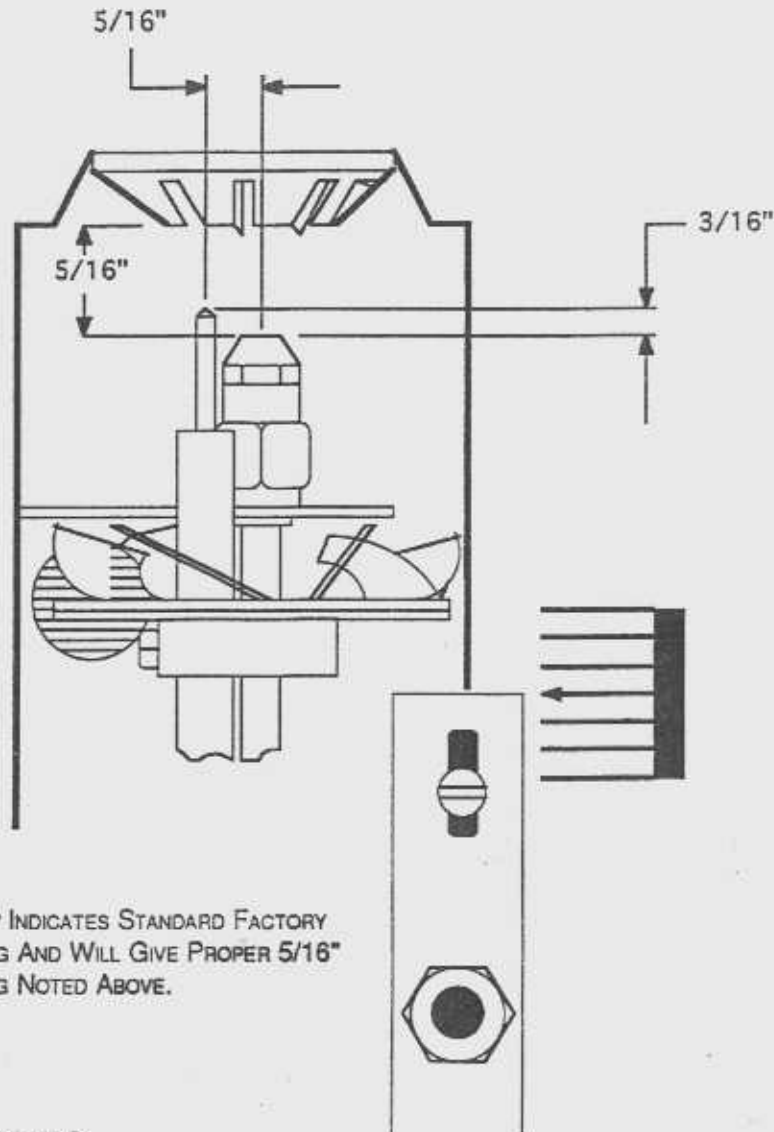


FIGURE 7-3
Burner Adjustments

ARROW INDICATES STANDARD FACTORY
SETTING AND WILL GIVE PROPER 5/16"
SETTING NOTED ABOVE.

SPACING OF ELECTRODES:

- Electrodes 1/8" apart
- Electrodes 3/16" ahead of nozzle
- Nozzle 5/16" back from opening
- Electrodes 5/16" above center line of nozzle

AIR ADJUSTMENT: The air intake is located on the side of the blower housing and consists of two interlocking bands. To adjust, loosen screw in outer band and position band by rotating to desired opening. Retighten screw after adjustment.

Sufficient air should be introduced into the fire until a trace of smoke is obtained. (Check with smoke tester).

FIGURE 7-4
Burner Assembly (Enlarged View)

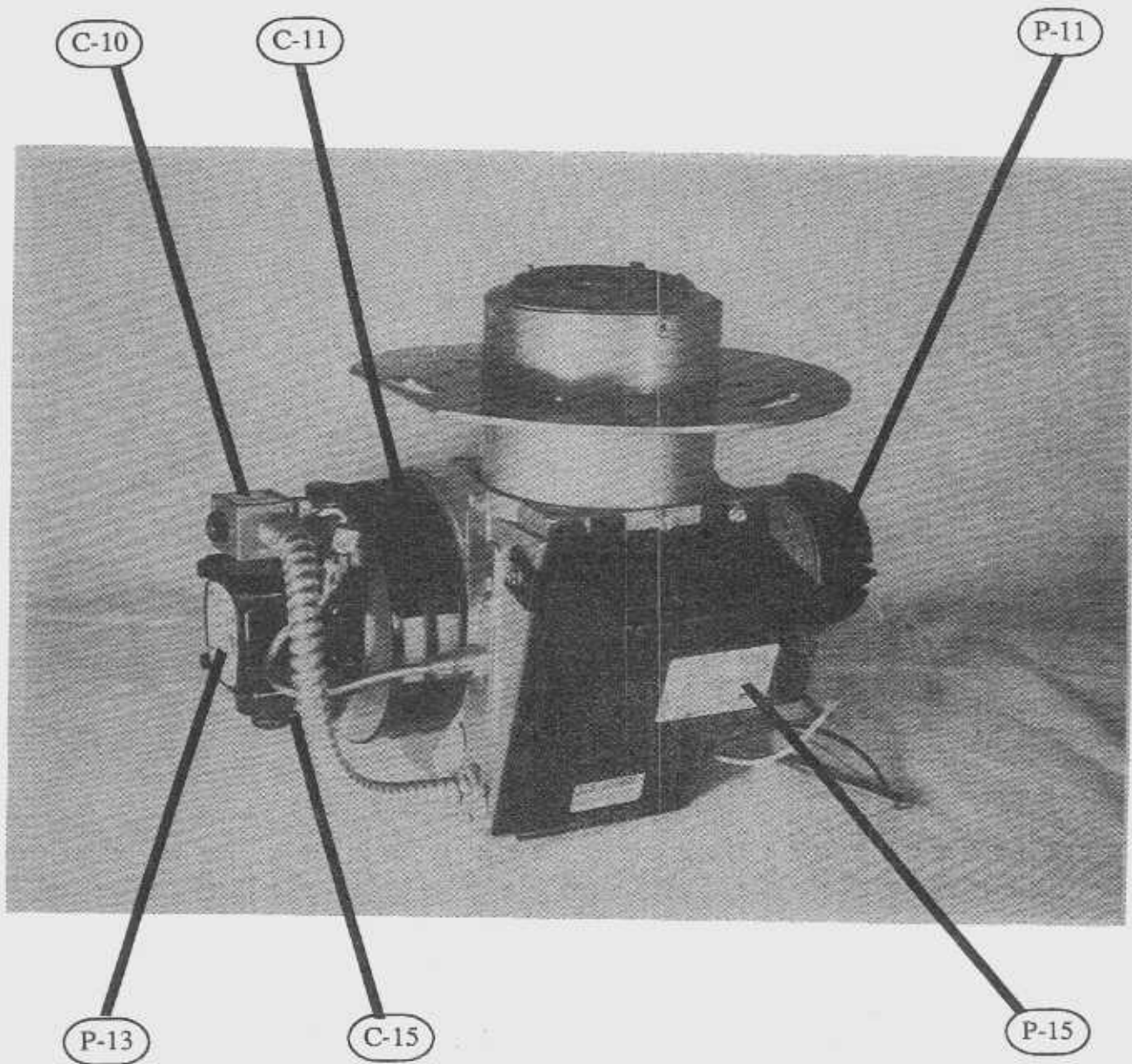
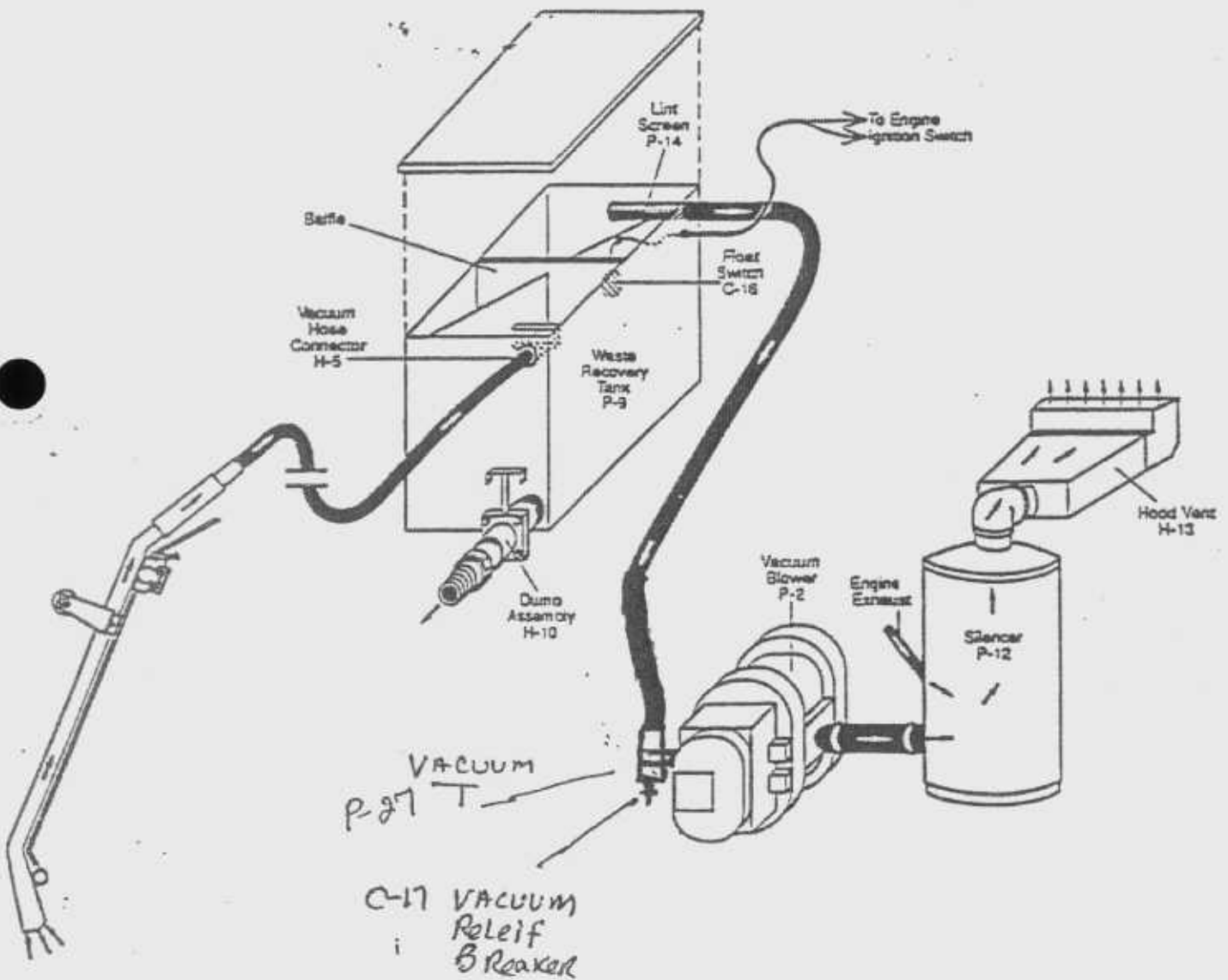


FIGURE 8-1
Recovery System



8-5 To check the recovery (vacuum) system to ensure peak performance, inspect the following:

- A. Clean lint screen (P-14).
- B. Dump valve closed (H-10).
- C. Seal around the lid of waste tank (P-9).
- D. Condition of vacuum hoses and cuffs.
- E. Inspect the cleaning tool for clogged air passage.

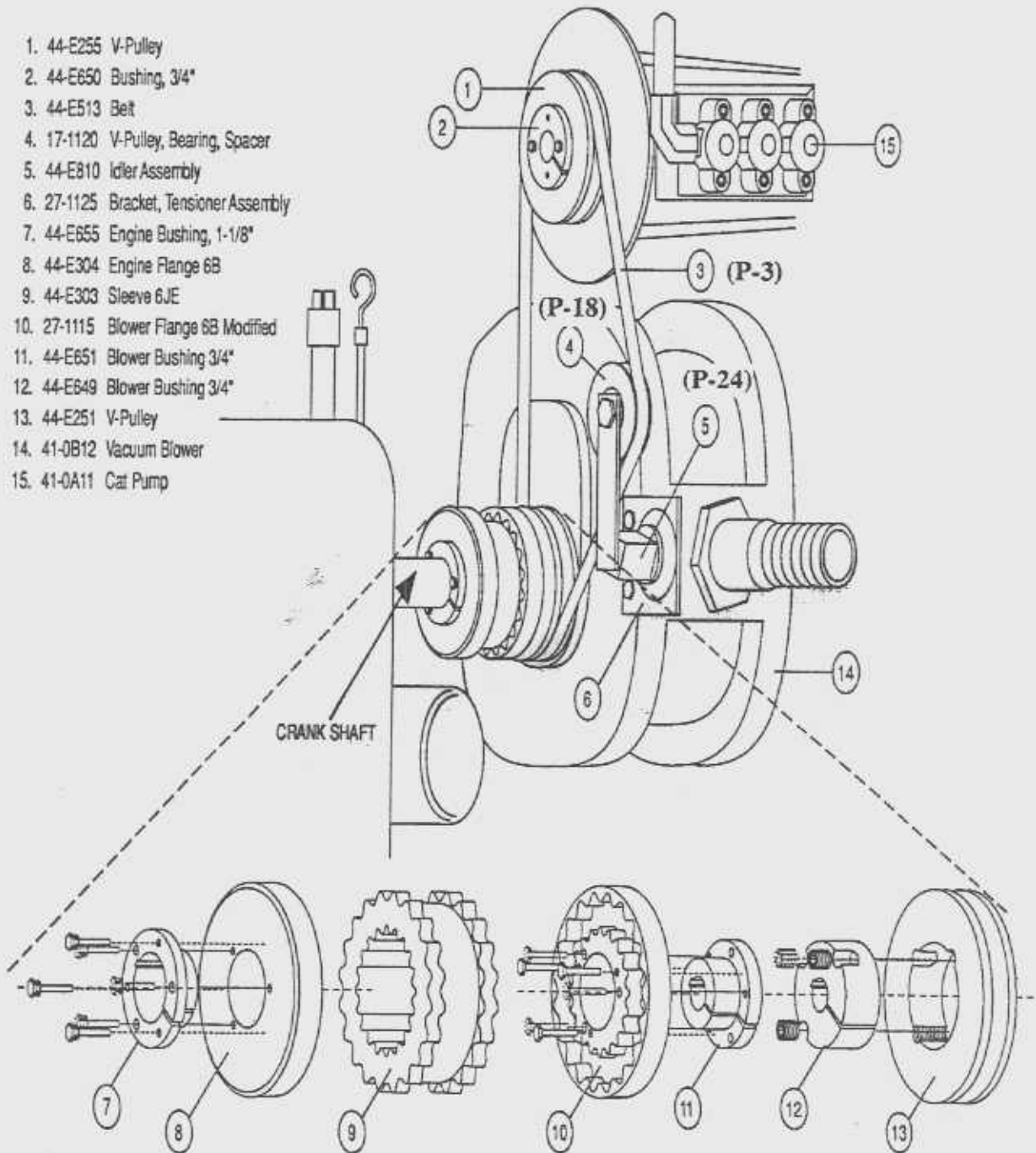
8-6 After a known blow-over (dirty water being pulled into and through the blower), the impellers should be cleaned and oiled. Press the vacuum breaker (C-17) in and allow water from the water input hose to be drawn into the blower at a slow rate. After approximately one or two pints of water has been inserted into the vacuum blower, allow the blower to air dry for about three minutes. After the blower has dried, insert a small amount of oil or spray WD-4 into the blower to lubricate the impellers.

**CAUTION: DO NOT LET THE BLOWER PULL ANYTHING INTO THE TUBE,
(i.e., LOOSE OBJECTS, ETC.); SERIOUS DAMAGE WILL RESULT.**

FIGURE 9-1

Belt And Drive System

- 1. 44-E255 V-Pulley
- 2. 44-E650 Bushing, 3/4"
- 3. 44-E513 Belt
- 4. 17-1120 V-Pulley, Bearing, Spacer
- 5. 44-E810 Idler Assembly
- 6. 27-1125 Bracket, Tensioner Assembly
- 7. 44-E655 Engine Bushing, 1-1/8"
- 8. 44-E304 Engine Flange 6B
- 9. 44-E303 Sleeve 6JE
- 10. 27-1115 Blower Flange 6B Modified
- 11. 44-E651 Blower Bushing 3/4"
- 12. 44-E649 Blower Bushing 3/4"
- 13. 44-E251 V-Pulley
- 14. 41-0B12 Vacuum Blower
- 15. 41-0A11 Cat Pump



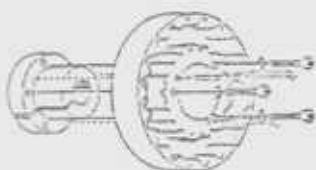
SECTION 9

BELT AND DRIVE SYSTEM

The belt and drive system consists of an engine to blower coupling device, two "V" belts, and two "V" pulleys.

9-1

The main drive system from the Kohler engine shaft to the vacuum blower shaft is coupled with a ^{MODIFIED} flange and tapered bushing (^{INTERNALLY} externally locked) on the engine shaft. The blower shaft uses a modified flange and tapered bushing (internally locked.). The coupling between the two flanges is made with a rubber sleeve. It is imperative that when the engine or blower is installed or repositioned, a perfect alignment between the two components be made. The use of a straight edge at the 3:00 or 9:00 o'clock positions of the flange will show either correct or incorrect alignment. (See ILLUSTRATION BELOW)

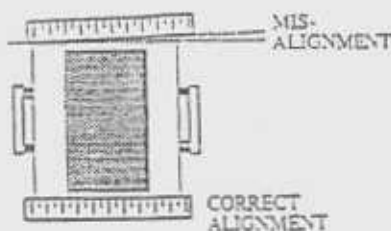


9-2

A "V" pulley is installed on the blower shaft that drives the belt. The belt operates the Cat pump (water pressure). A "V" pulley on the engine shaft operates the automotive type alternator that supplies DC power to run the burner, and power that keeps the battery recharged to run the engine and an electrical components.

1. Remove negative battery cable.
2. Loosen and remove engine mounting bolts.
3. Loosen the clamps on the flex exhaust and slide the flex tube toward the silencer. Remove the alternator adjustment bolt and rotate the adjustment bracket away from the alternator.
4. Slide the engine away from the blower to separate the rubber sleeve.
5. Install the new belt over engine shaft, then push the engine back into place. Start engine mounting bolts, lock washers, and nuts, but do not tighten. Using a straight edge (4" ruler etc.) on the sides of the two flange at the 3 o'clock or 9 o'clock positions, then align the engine to blower so that the straight edge is flush on both flange edges. (See diagram below) When a perfect alignment is observed, tighten the engine mounting bolts paying close attention that the alignment stays correct. Reinstall flex exhaust and tighten clamps.

OVERHEAD VIEW OF COUPLER
LOOKING FROM DIRECTLY ABOVE
ADDITIONALLY CHECK AT THE 12
O'CLOCK POSITION FOR VERTICAL
ALIGNMENT



6. Put the belt over both pulleys and push alternator down to increase tension. Install and tighten adjustment bolt while tension is held. See diagram on this page to see how to check tension. DO NOT OVER TIGHTEN.
7. Test run engine for a few minutes then recheck belt tension. After one or two jobs recheck belt tension and tighten if needed.

SECTION 9

BELT AND DRIVE SYSTEM

The belt and drive system consists of an engine to blower coupling device, two "V" belts, and two "V" pulleys.

9-1 The main drive system from the Kohler engine shaft to the vacuum blower shaft is coupled with a flange and tapered bushing (externally locked) on the engine shaft. The blower shaft uses a modified flange and tapered bushing (internally locked.). The coupling between the two flanges is made with a rubber sleeve. It is imperative that when the engine or blower is installed or repositioned, a perfect alignment between the two components be made. The use of a straight edge at the 3:00 or 9:00 o'clock positions of the flange will show either correct or incorrect alignment.

9-2 A "V" pulley is installed on the blower shaft that drives the belt. The belt operates the Cat pump (water pressure). A "V" pulley on the engine shaft operates the automotive type alternator that supplies DC power to run the burner, and power that keeps the battery recharged to run the engine and an electrical components.

9-3 When new "V" belt installation is required, the main drive coupler between the engine and blower must be decoupled. This is accomplished by removing the three bolts on the bushing of the engine flange. Insert the three bolts in the other three holes of the bushing; and as they are tightened, this will release the flange so that it can be slid on the shaft toward the engine. This will allow the rubber coupler to open so that a new belt can be inserted over the shaft. Reverse procedure is used for tightening. In some cases it may be easier to loosen the mounting bolts of the engine or blower to separate the drive coupler to install new belts. BELTS
Realignment of the blower to engine must be re-accomplished as per paragraph 9-1 above.
(Refer to Figure 9-1 on page 31)

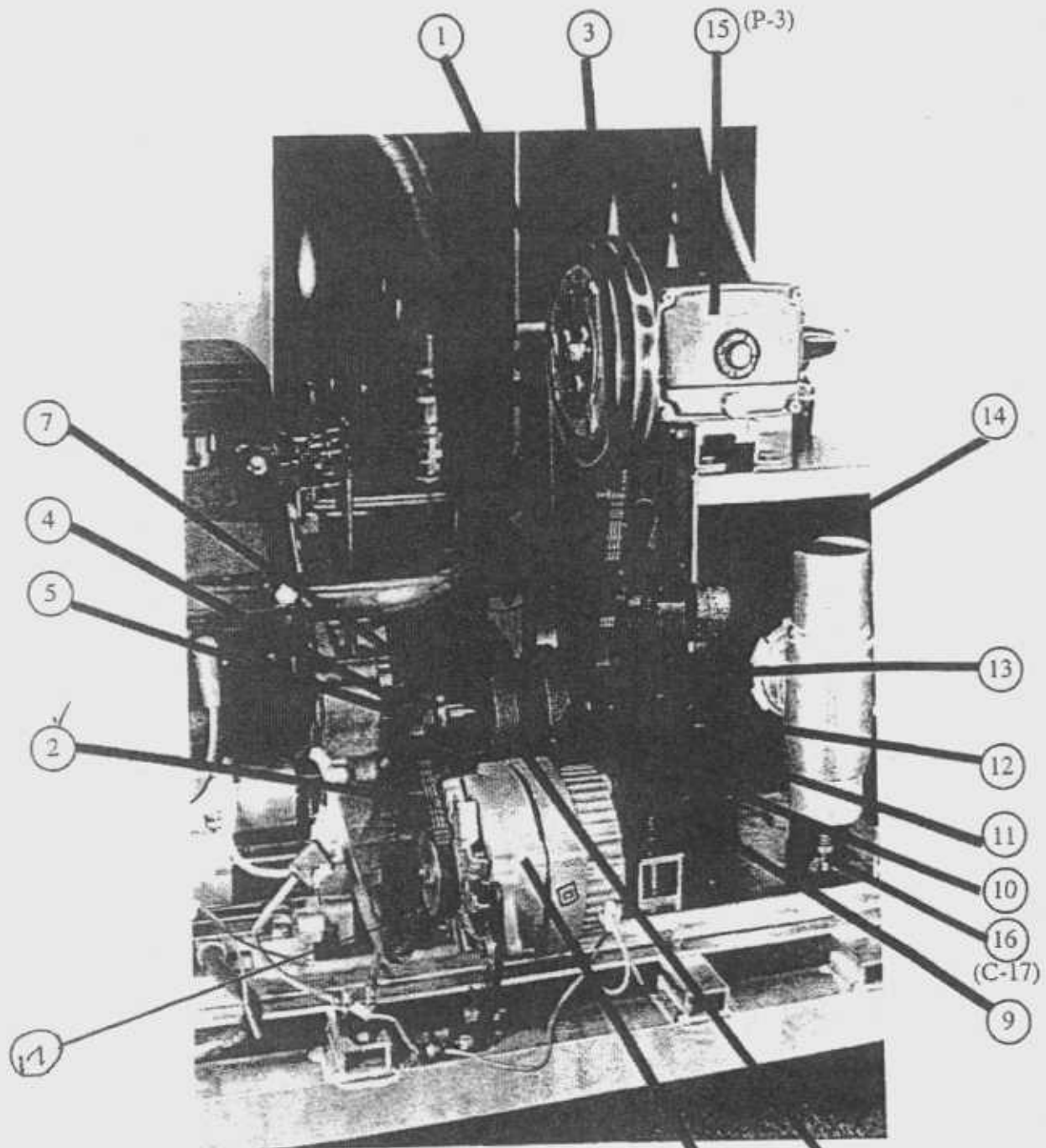
CAUTION: DO NOT OVER TIGHTEN

NOTE: SUGGESTED TORQUE VALUE IS 60 INCH LBS.

See Correct & Done

FIGURE 9-1

Belt And Drive System



- | | |
|--------------------------------------|---|
| 1. 41-0B12 CLUTCH | 9. 44-E303 SLEEVE 8JE |
| 2. 44-E514 ALT. BELT | 10. 27-1115 FLANGE (BLOWER) MODIFIED |
| 3. 44-E513 PUMP BELT | 11. 44-E651 BLOWER BUSHING FOR FLANGE |
| 4. 44-E210 V-PULLEY ENG. SHAFT | 12. 44-E849 BLOWER BUSHING FOR V-PULLEY |
| 5. 44-E908 BUSHING ENG. SHAFT | 13. 44-E251 V-PULLEY (PUMP DRIVE) |
| 6. 42-0B08 ALTERNATOR | 14. 41-0B12 BLOWER |
| 7. 44-E655 ENGINE BUSHING 1 1/8" | 15. 41-0A08 CAT PUMP |
| 8. 44-E804 FLANGE (ENGINE) | 16. 18-2400 VAC BREAKER |
| 17. 27-1115 FLANGE (ENGINE) modified | 18. 44-E224 V-Pulley ALT. |

44-E211
44-E660

6 (P-26)
8

Parts included with alternator belt and pulley kit. (17-9072)

44-E224	ALTERNATOR "V" PULLEY - 4100	1
44-E211	"V" PULLEY ENG. SHAFT - 4100	1
44-E514	"V" BELT	1
27-1115	FLANGE	1
40-4D60	FLANGE BOLT - 10-24X 1 1/4"	3
40-72D1	#10 FLAT WASHER	3
27-4219	SPACER - ALERNATOR MOUNT	1

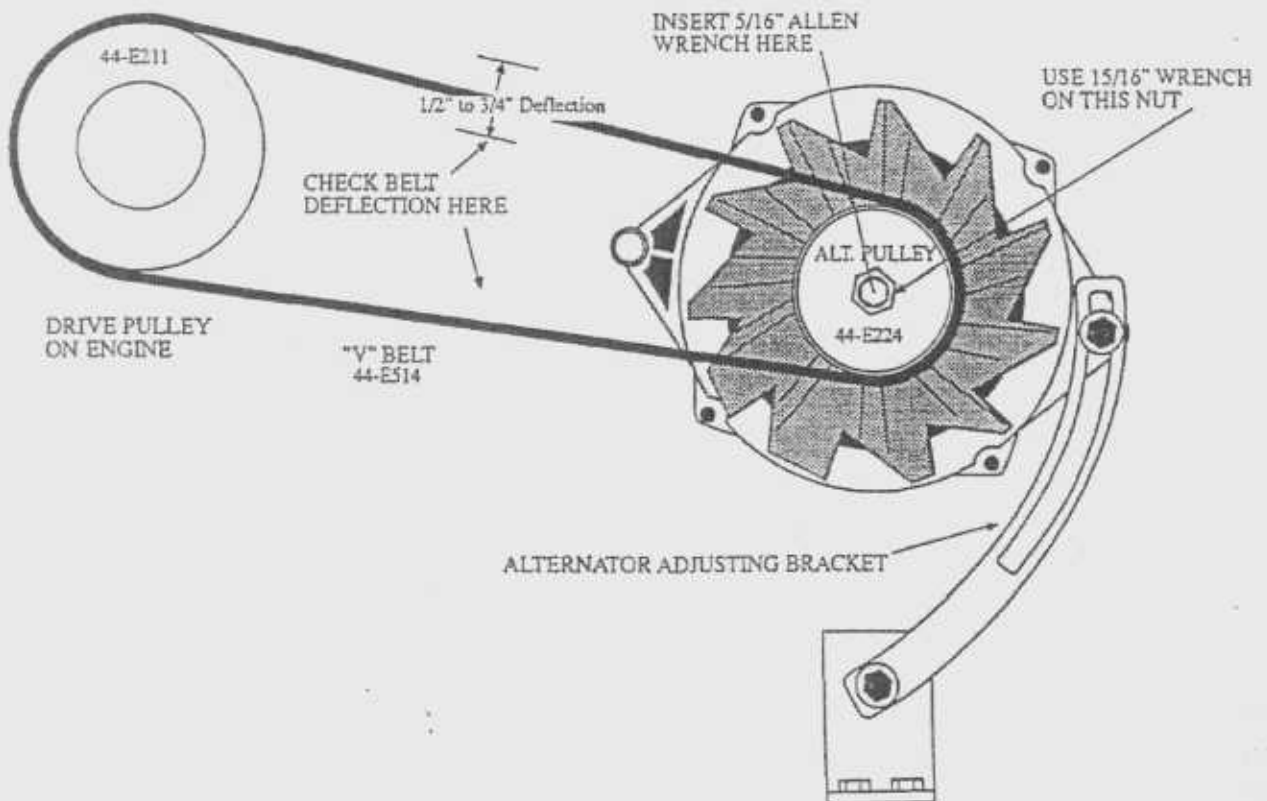
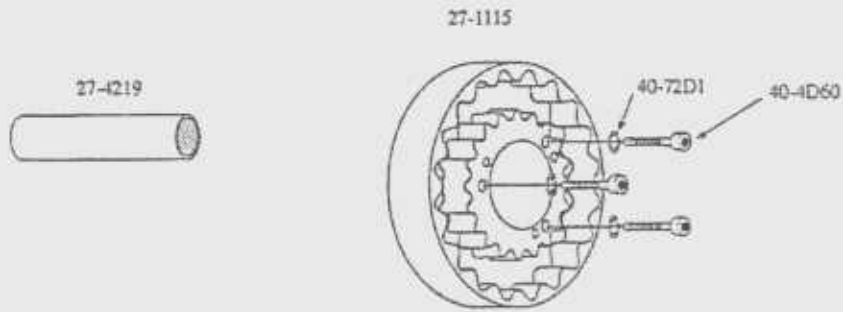
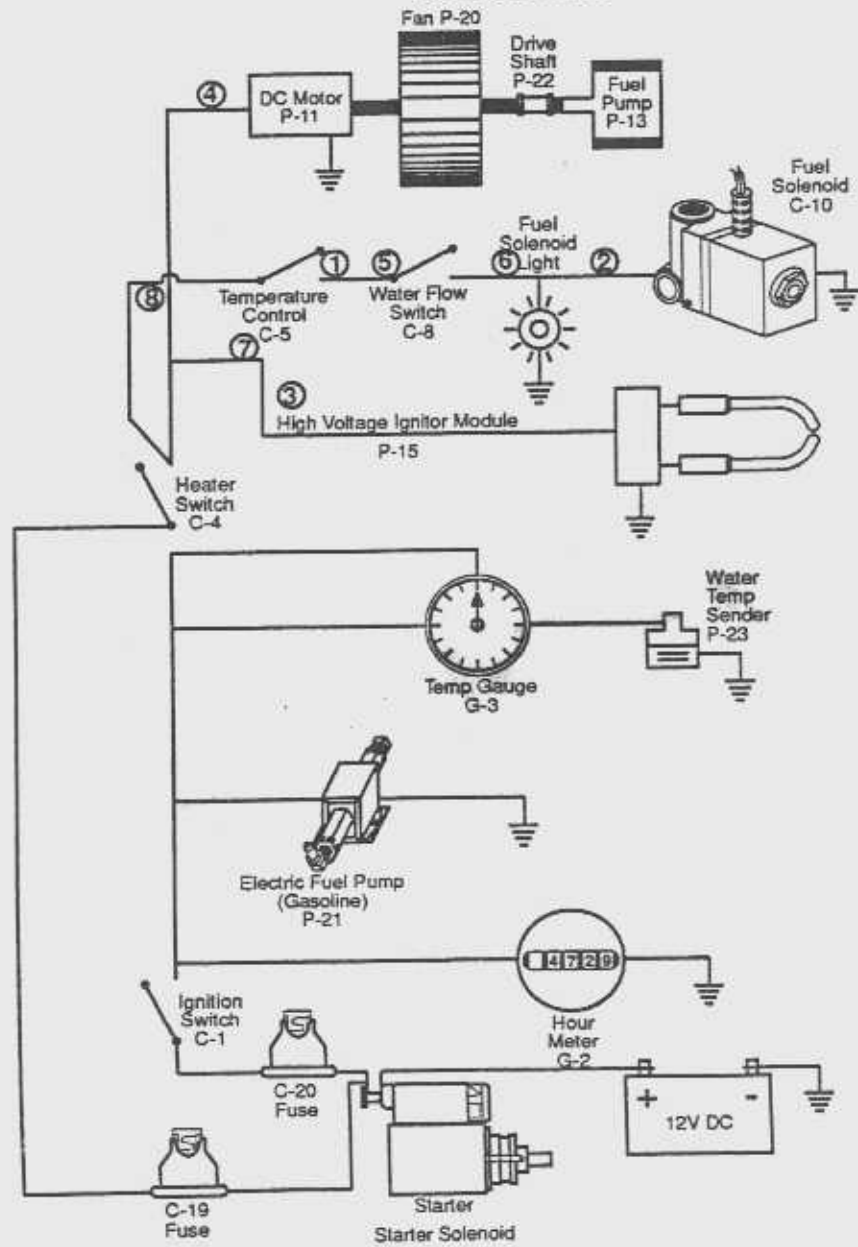
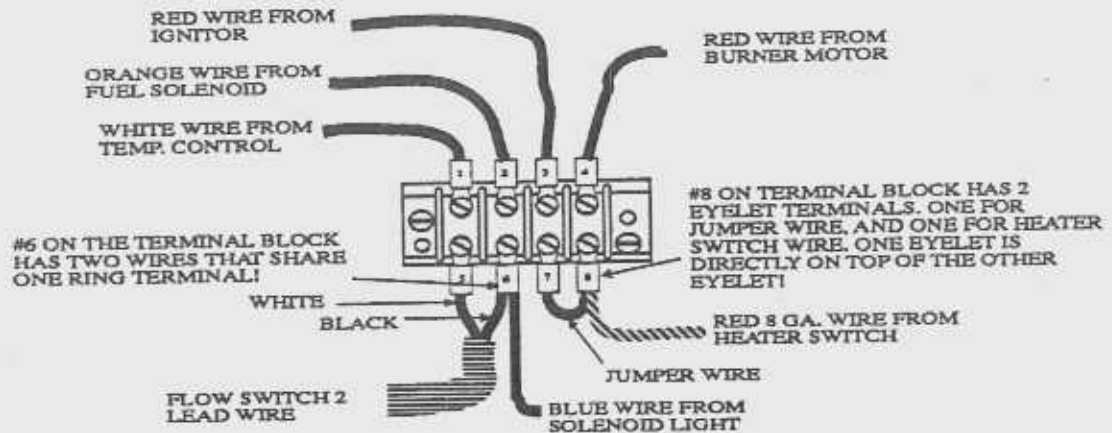


FIGURE 10-1
Wiring Diagram

MAGNIFIED VIEW OF TERMINAL BLOCK



Circled Numbers Indicate Position on Terminal Board

SECTION 10

WIRING SYSTEM

- 10-1 The various components requiring 12 volts DC receive their voltage from the ignition switch of the Kohler engine. Refer to the wiring diagram, Figure 10-1. The wiring of the Kohler engine is not included in this manual. Information on Kohler engine wiring can be obtained through your local Kohler distributor.
- 10-2 The Kohler engine circuits and MasterMatic DC circuits are protected by a 30 ampere fuse (C-20) located adjacent to the starter solenoid on the right hand side of the engine.
- 10-3 The heater circuits are protected by the circuit breaker (C-19) which is located on the frame directly below the starter solenoid.
- 10-4 The tach/hour meter will display the RPM of the engine when the engine is running, and will display the hours operated when the key is off. The electrical hook up is illustrated in the drawing below:

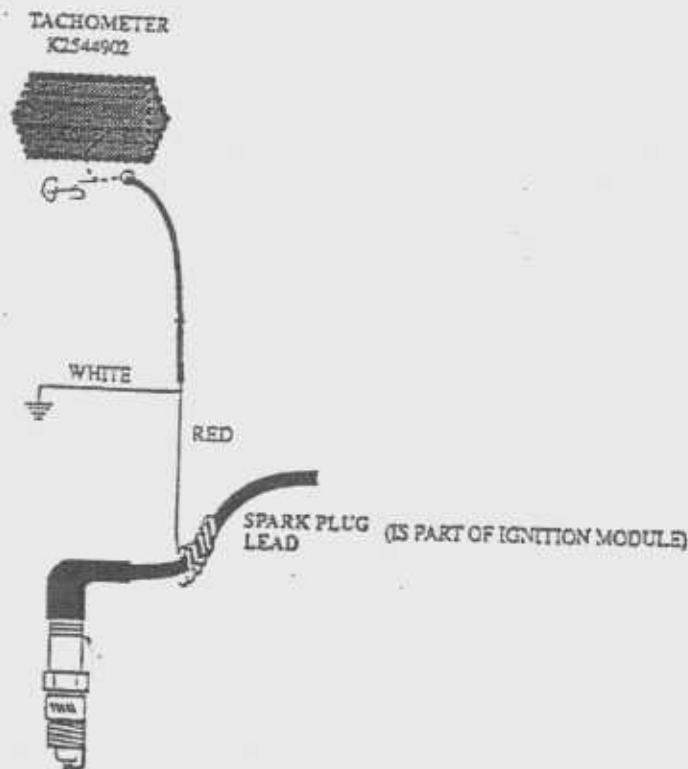
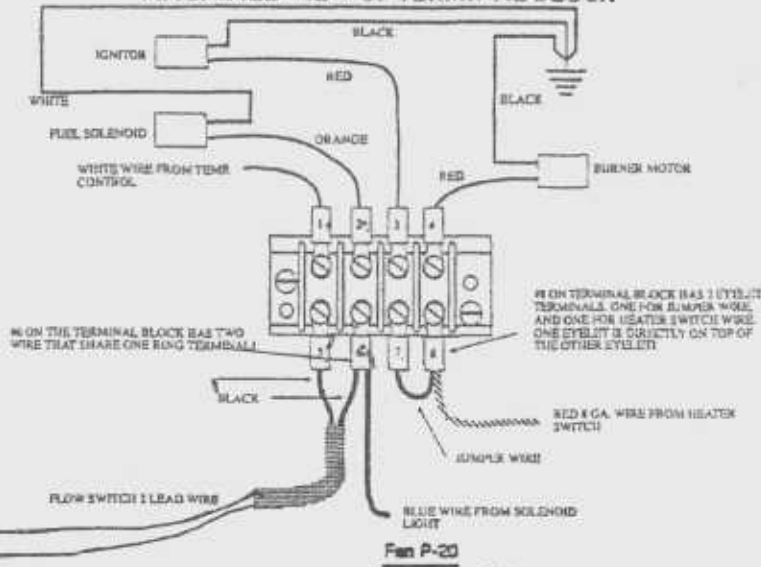


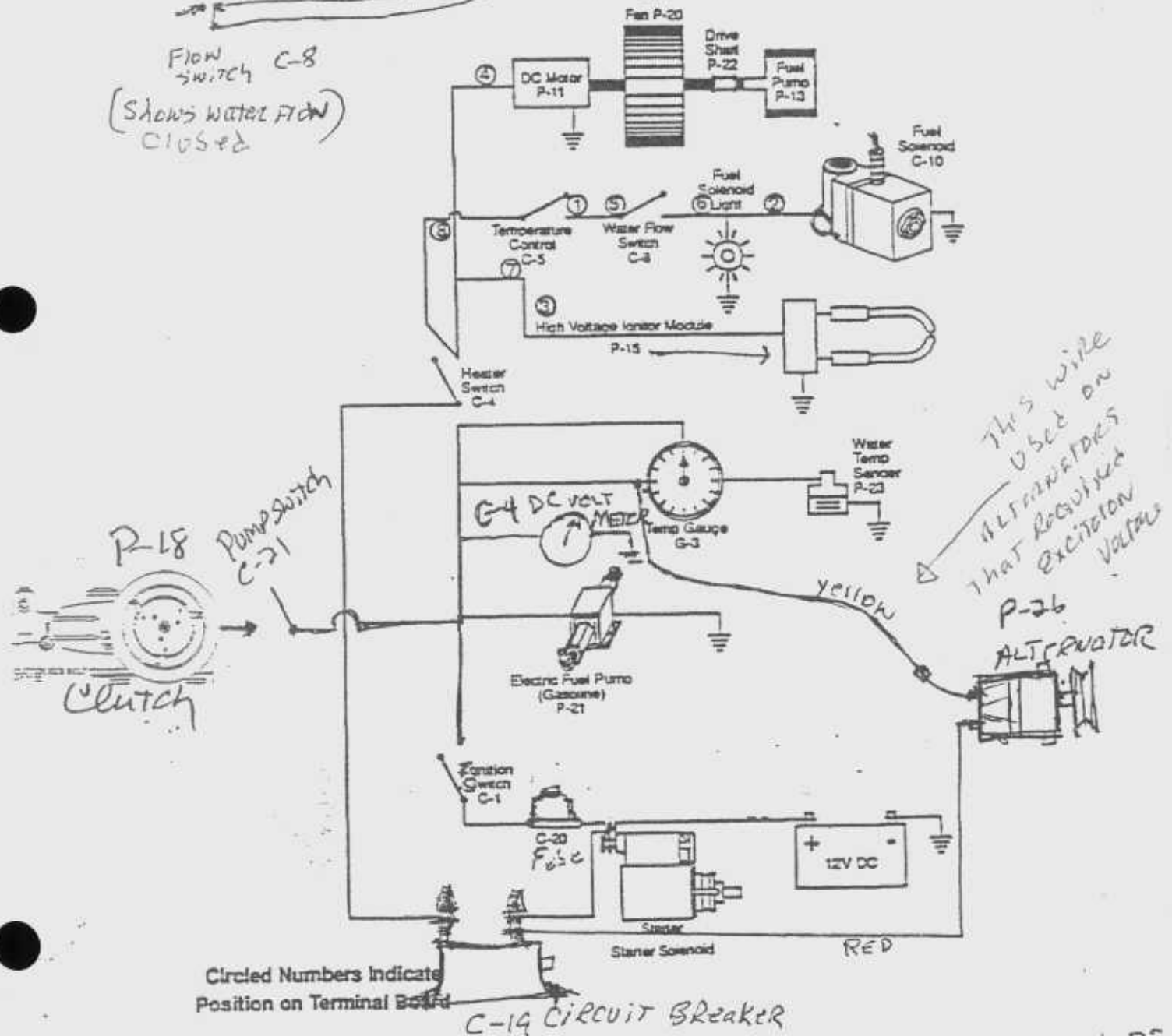
FIGURE 10-1
Wiring Diagram

4100

MAGNIFIED VIEW OF TERMINAL BLOCK



Flow switch C-8
(Shows water flow closed)



Circled Numbers Indicate Position on Terminal Block

C-19 Circuit Breaker

SECTION 11

SCHEDULED MAINTENANCE

11-1 Your MasterMatic unit is a machine that has many moving parts; but with proper maintenance they are designed for long life and relatively trouble-free service. The key to this unit, as with any other piece of equipment, depends upon the type of service that it receives.

When you purchase an automobile, tractor or any other piece of highly technical equipment, you also receive a maintenance schedule; and all interested new owners are eager to perform these procedures to insure good operation and long life for their new investment. It is imperative that you follow the maintenance schedule shown on Figure 11-1 and become thoroughly familiar with the individual owner manuals of the specific components of this unit, located in the appendix of this manual. A maintenance log should be started at the very beginning, so that accurate records of service are readily available.

(See Figure 11-1 on page 35)

SECTION 12

DESCALING PROCEDURE

- 12-1 The MASTERMATIC, like any other unit, has the inherent ability to collect calcium and other mineral deposits within the tubes, hoses and coils which will restrict the water flow within the machine. When this condition is noted or suspected, a very simple and inexpensive method of descaling has been established.
- 12-2 Items needed:
1. A five gallon plastic bucket (45# Formula A container).
 2. At least 1/2 gallon of Descaler Chemical Part Number 9950100 (Quarts).
 3. A Descaler hose, Part Number 15-8002.
 4. A high pressure hose or hoses, with the male connector removed from the end of the last hose.
- 12-3 Procedure: **(See Precautions Before Using)**
1. Mix 1/2 gallon of Descaler solution with five gallons of water in the plastic bucket.
 2. Connect the high pressure hose or hoses to pressure out connection H-4 on the machine. (You may desire to descale all hoses during the procedure.)
 3. Connect the descaler hose (15-8002) to the female connector H-11 on left side of the machine with the other end in the bucket of descaling solution.
 4. Start the engine turn the pump switch (C-21) on and note that the solution is being drawn from the bucket. When approximately 1/2 of the solution has been drawn into the machine, put the high pressure hose into the bucket so that the bucket will not become empty.
 5. After approximately 25 minutes, you should observe that the return flow rate back into the bucket has increased. This indicates that the procedure has been effective and the descaling procedure is almost complete. Stop the engine.

6. Now the descaling solution **MUST** be removed from the system. To accomplish this
 - a. Remove the descaler hose.
 - b. Reconnect H-11 to original configuration.
 - c. Reinsert the input water supply hose to H-3 "water in".
 - d. Start the engine and monitor the discharge coming out of the open high pressure hose (male end removed). When clean water is being discharged through the hose, the descaling procedure is complete.

PRECAUTIONS WHEN USING DESCALER:

CAUTION: CORROSIVE. USE THE FOLLOWING PRECAUTIONS WHEN USING DESCALER.

Harmful or fatal if swallowed. Contains Hydrochloric Acid. Do not mix with other chemicals. Do not use on aluminum parts. Use only with adequate ventilation. Wear respirator, goggles and gloves when applying. Dispose of wastes properly. Apply only in well ventilated areas. Avoid breathing spray mist or vapors. Avoid contact with skin. Keep out of the reach of children at all times. Avoid eye contact. As with all chemicals, use only with adequate ventilation. Professional chemicals should always be under the complete control of the technician at all times.

PLEASE READ MATERIAL SAFETY DATA SHEET BEFORE USING THIS PRODUCT.

SECTION 13

TROUBLE SHOOTING

- 13-1 Kohler engine problems - See the Kohler Engine Manual, located in the appendix of this technical manual. A list of Kohler Engine Sales and Service Centers is listed in the back of the Kohler Manual.
- 13-2 Water pump problems - See the Cat Pump Manual (Green Insert), last paragraph, for diagnosis and maintenance for the Cat Pump. The manual is located in the Appendix of this technical manual.
- 13-3 For the information concerning troubleshooting the Sutorbilt blower, refer to the Blower Manual, page 9, located in the Appendix Section of this manual.
- 13-4 When trouble shooting the water pressure system of the MASTERMATIC unit, refer to Figure 6-1 of this manual.
- 13-5 Remember that the system cannot draw water if an air leak exists in the suction side of the pump. To check for air leaks, insert tap water into the female QD of H-11, Figure 6-1, while looking for leaks.
- 13-6 Restriction in the system will result in low or no water pressure.
- 13-7 To trouble shoot the heater system, refer to Section 7-2 of this manual. Insure that adequate fuel is available, the Ignitor Module is developing a spark, and that 12 volt DC is applied to the fuel solenoid.
- 13-8 Recovery system problems are covered in Section 8 of this manual.

4100 *Est*

SECTION 14

PART NUMBER REFERENCE LISTS

TABLE 14-1

Controls

CONTROL#	PART NO.	NAME	FIGURE
C-1	K2509904	IGNITION SWITCH	4-3
C-2	KOHLER PART	ENGINE THROTTLE	4-3
C-3	KOHLER PART	ENGINE CHOKE	4-3
C-4	42-2A11	HEATER SWITCH	4-3
C-5	44-C027	TEMPERATURE CONTROL	4-3
C-6	4144205	PRESSURE REGULATOR	4-1
C-7	4146130 30	CHEMICAL CONTROL	4-3
C-8	42-1C08	WATER FLOW SWITCH	5-1
C-9	KEROSENE PUMP PART	BLEED VALVE KERO. PUMP	7-4
C-10	W100610	FUEL SOLENOID	7-4
C-11	PART OF BURNER ASSEMBLY	LOCK BOLT, AIR CONTROL	7-2
C-12	4146506	CHECK VALVE, WATER IN	4-4, 6-1
C-13	4143110	FLOAT CONTROL, WATER HOLDING TANK	6-1
C-14	4146505	CHECK VALVE, SOAP FLOW	6-1
C-15	KEROSENE PUMP PART	FUEL PRESSURE, KEROSENE	7-4
C-16	42-1C11	MERCURY FLOAT SWITCH, ENGINE KILL	8-1
C-17	16-2400	VACUUM BREAKER	4-4, 8-1, 9-1
C-18	C7140	THERMO VALVE	6-1
C-19	42-2C12	CIRCUIT BREAKER	7-2, 10-1
C-20	42-1C15	FUSE HOLDER	10-1
C-21	42-2A09	PUMP SWITCH	4-3
C-22	4146505	CHECK VALVE	4-4, 6-1

(X)

4100 BWA

TABLE 14-2

Gauges

GAUGE	PART NO.	NAME	FIGURE NO
G-1	44-C010	WATER PRESSURE	4-3
G-2	44-C016	TACH/ HOUR METER	4-3
G-3	44-C018	WATER TEMPERATURE	4-3
G-4	44-C035	DC VOLT METER	4-3
44-C045 → G-5	42-9A02 44-C045	TACH/HOUR METER	4-3
G-6	*42-9A08	FUEL SOLENOID LIGHT	4-3
G-7	*42-9A07	GREEN PUMP ON LIGHT	4-3
	*42-9A21	BULB FOR G-6, G-7	4-3

TABLE 14-3
Hookups, Drains, And Hoses

HOOKUP POINT	PART NUMBER		NAME	FIGURE NO.
	(Male)	(Female)		
H-1	4131210	4132210	GASOLINE CONNECTION	4-2
H-2	4131210	4132210	KEROSENE CONNECTION	4-2
H-3	4131660	4132665	WATER IN CONNECTION	4-3
H-4	4131420		PRESSURE OUT CONNECTION	4-3
H-5	PART OF WATER TANK		VACUUM HOSE CONNECTION	8-1
H-7	41-1N03		ENGINE OIL DRAIN	4-1
H-8	41-1N12		BLOWER OIL DRAIN	5-1
H-9	C25625		CAT PUMP OIL DRAIN	5-1
H-10	4142021		WASTE TANK DUMP VALVE	8-1
H-11	4131660	4132660	QUICK DISCONNECT, WATER HOLDING TANK	4-2
H-12	4131460	4132420	QUICK DISCONNECT, PRESSURE OUT	6-1
H-13			EXHAUST SCOOP	6-1
H-14	41-1N12		BLOWER OIL LEVEL PLUG	5-1
H-15	4131660	4132660	WATER INPUT QD TO PUMP	6-1
H-16	4131660	4132660	QUICK DISCONNECT TO HEATER COIL	6-1
H-17	3936623		HOSE, PUMP TO REGULATOR	6-1
H-19	3934430		HOSE, HEATER OUTPUT	6-1
H-20	3934418		HOSE, GAUGE LINE	6-1
H-21	3936623		HOSE, FLOW SWITCH TO HEATER COIL	6-1

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TABLE 14-4

Major Components

MAJOR	PART NO.	NAME	FIGURE NO.
P-1	43-0A06	KOHLER ENGINE	4-3
P-2	41-0B12	VACUUM BLOWER (SUTORBILT)	4-1
P-3	41-0A06	WATER PUMP (CAT)	4-1
P-4	42-9M22	12 VOLT BATTERY	4-2
P-5	17-1705	WATER HOLDING TANK	4-2
P-6	43-9M05	HEAT EXCHANGER	6-1
P-7	41-5C01	IN-LINE WATER FILTER	4-4, 6-1
P-8	K1205001	ENGINE OIL FILTER	4-1
P-9	17-3001	WASTE RECOVERY TANK (70 GALLON)	8-1
P-10	44-E513	PUMP DRIVE BELT	4-1, 9-1
P-11	W21993-001	DC MOTOR	7-2
P-12	43-1B06	SILENCER - VX	5-1
P-13	W100608-001	HEATER FUEL PUMP	7-4
P-14	17-3015	LINT FILTER, WASTE TANK	8-1
P-15	W100764-001	HIGH VOLTAGE IGNITOR MODULE	7-2
P-16	17-1015	ENGINE EXHAUST MANIFOLD COMMAND	4-1
P-17	41-5C42	KEROSENE FILTER	7-2
P-18	43-0B12	CLUTCH	4-1, 4-3, 6-1
P-19	9980010	SOLUTION CONTAINER	6-1
P-20	W21427	BURNER FAN	7-2
P-21	41-0A84	GASOLINE FUEL PUMP	4-1
P-22	W13424	BURNER DRIVE SHAFT	7-2
P-23	44-C018A	WATER TEMP SENDER	10-1
P-24	44-E514	ALTERNATOR BELT	4-1, 9-1
P-25	41-5C42	GASOLINE FILTER	4-3
P-26	42-0B08	ALTERNATOR	7-2
P-27		VACUUM INPUT T	4-4, 8-1, 9-1