ARROW - MASTER

MOBILE HYDRAULIC HAMMER

Operator's & Service Manual

Mechanical Stroke Control
and Electronic Stroke Control

MODELS: HG1250, HG1250RHJ1250, HJ1250R and HD1250

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Publication No. 5000052
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MODEL NUMBER: _____

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SOLD AND SERVICED BY: _____

_____

ARROW-MASTER, INCORPORATED

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SAFETY

Safety is important. Make it a habit to use safe practices in all operating, maintenance, and service procedures. Pay particular attention to these suggestions.

Do not allow anyone except the operator to ride on the ARROW HAMMER.

Do not leave the ARROW HAMMER unattended while the engine is running.

Be careful when working near open drives or moving parts.

Do not wear loose fitting clothes when working near moving parts.

Be sure to check cables daily for wear and make sure clampings are securely fastened.

Be sure everyone is clear of moving parts before operating them.

Keep shields in place during operation.

Do not operate the engine in a closed or poorly ventilated building.

Do not fill the gasoline tank while the engine is running.

Do not adjust or service any unit while it is in operation.

Disconnect power sources before working on electrical or hydraulic units.

Please observe all safety features marked by proper decals.

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OPERATION SECTION

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ADDENDUM

HAMMER OPERATION

HAMMER OPERATION

PREPARATION FOR TRANSPORTATION TO JOB

1. Allow engine and hydraulic system to warm up before applying full load.

2. Hammer weight is raised by pulling backward on handle of Hammer Control Valve. Raise hammer weight until the indicating arrow on hammer weight aligns with lock on side of leads. (Refer to Figure A.) Rotate lock handle to forward position until lock will slip into place in the hammer weight. Secure by turning handle down.

CAUTION: When transporting the machine the hammer weight must be locked in position. An unlocked hammer weight is dangerous and if the weight slides back in the leads it will be impossible to raise the leads hydraulically.

3. With weight in proper carrying position and locked, push forward on side shift control valve handle and move leads to extreme right (as viewed from the operator's position). Pull back on layback control valve handle until leads fully lay back. Use the tilt control valve to move leads into lead support. The leads must be centered for better balance and safety in roading and transporting.

The safety latch on the side shift ways weldment must be manually raised to allow leads to fully lay back.

4. **If the hammer is equipped with 4-post roll bars, pull the pins on the sleeve and drop the sleeve. Position leads for best balance and visibility, re-position sleeve and replace the pins.**
sleeve is pinned in position.

5. If the hammer is equipped with a twist lock parking brake in addition to the mechanical parking brake, release by turning lever to vertical position. Release mechanical parking brake by pushing down on brake release lever. The machine is now ready for travel.

CAUTION: It is unsafe to use hand throttle in transporting machine.

PREPARATION FOR WORK

1. Use the tilt control valve to move leads out of lead support, then use layback control to raise leads to working position.

2. Raise hammer lift cylinder by pulling back on hammer control valve handle until slack is removed from cable. Unlock hammer weight by rotating hammer lock handle forward to horizontal position, pull out and rotate hammer lock handle down to secure in out position.

TOOL CLAMP

Lower hammer weight and install desired tool by clamping into position. Tighten tool clamp bolts to a torque of 250 foot pounds. After approximately one hour of operation the hammer clamp bolts should be re-tightened to 250 foot pounds torque. Periodic tightening thereafter will ensure longer tool and clamp life. Do not overtighten. The four cap screws holding the tool head to the hammer weight should be checked periodically. These bolts should be torqued to 250 foot pounds.

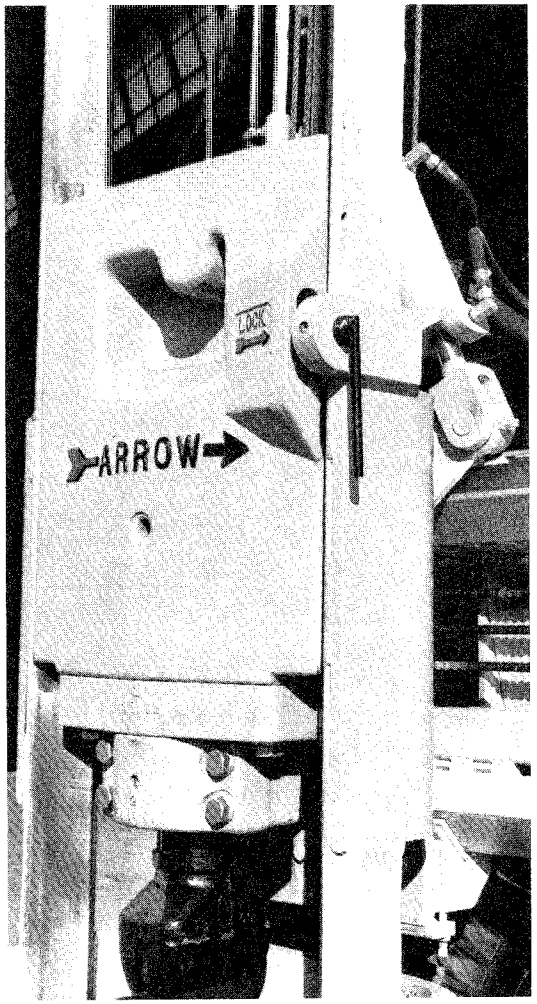
HYDRAULIC CREEPER DRIVE

1. To engage creeper drive, put transmission shift lever in neutral. Swing creep gear lever up. It is not necessary to depress clutch pedal when using this lever. Creeper drive is now ready for operation. If gear does not mesh, jog with control.

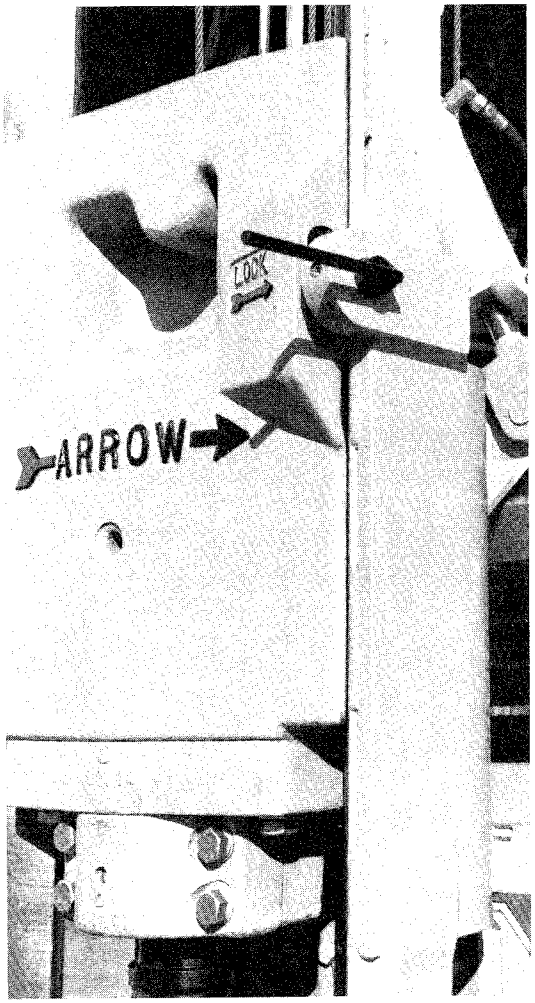
CAUTION: Do not move transmission lever out of neutral position while creep gear is engaged.

2. To creep forward, push creeper control handle forward (Refer to Figure B). To creep backward, pull handle back. Control handle provides for an infinite variation of creeper speeds, depending on the position of the control handle.

3. To stop the creeper drive, merely depress the brake pedal or center the control handle. Applying the brakes operates the hydraulically actuated creeper bypass valve. Therefore, frequent or continuous use of the brake will not cause any damage or overheating of the hydraulic system, nor excessive brake wear. Thus,



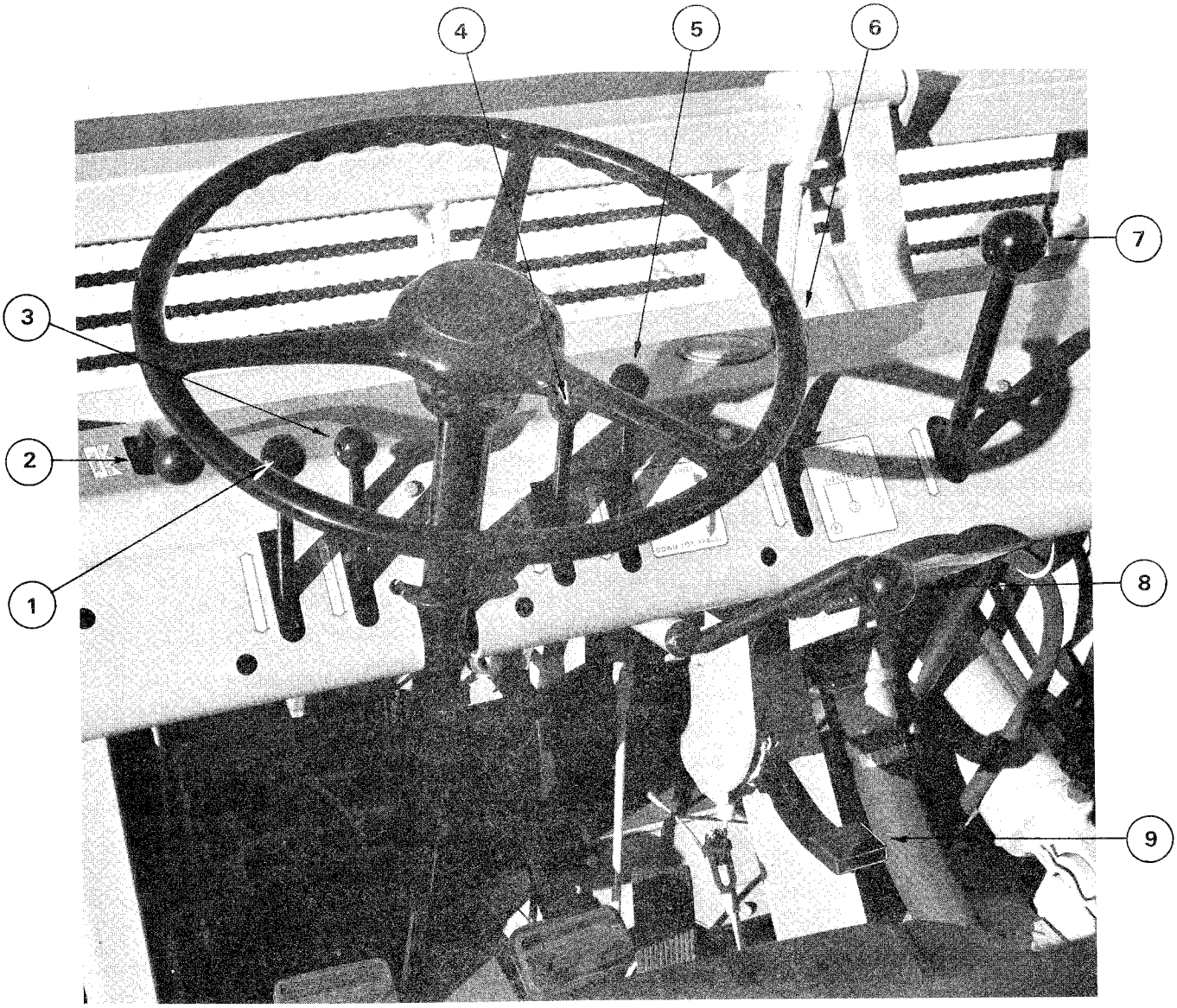
Hammer Weight in locked position. The hammer leads now may be lowered and the machine driven to job site.



To unlock the hammer weight, rotate the locking pin handle forward and pull the pin out as far as possible.

Secure pin by turning handle down. To lock the hammer weight, align the indicating arrow with the pin. Rotate handle to lock and secure weight.

Hammer Lock, Fig. A



1. SIDE SHIFT
2. CREEPER
3. REMOTE STROKE ADJUST
4. LAYBACK
5. VERTICAL ANGLE
6. AUTO MANUAL
7. HAMMER
8. CREEPER DRIVE
9. PARKING BRAKE (mechanical)

CONTROLS FIG. B

the operator can make repeated blows to the same spot. When the brake pedal is released the creeper will again move the machine. Coordination of the use of this bypass with the hammer stroke will provide the desired spacing of blows.

CABLE ADJUSTMENT

1. Move auto-manual control valve handle forward to manual position (refer to Figure B). Lower tool to working surface by pushing forward on hammer control valve handle.

2. Loosen either cable wedge on hammer or on cylinder base, and raise hammer lift cylinder by pulling backward on hammer valve control handle until cylinder is extended upward 6 inches from bottom of stroke.

3. Pull slack out of cable and secure wedge. SLOWLY raise the weight to the top of the leads. **With the cylinder fully extended, the weight should stop no closer than 6-8" from the top. If it is closer than this, the cable must be re-adjusted.**

When the Arrow Hammer is shipped from the factory, the cable has been set for use with a short tool such as a chisel. If a longer tool is to be used, it will be necessary to shorten the cable as described above. Otherwise, automatic trip fingers will not be in proper position in relation to hammer stroke. Cable length must be set long enough to enable hammer to strike a full blow before starting up stroke.

If the cable is too long, there will be a time lag between strokes. At certain times, it may be preferable to reset the DOWN stroke (refer to Figure E). This will accomplish the same purpose as resetting the cable.

AUTOMATIC OPERATION

Controls for the Automatic Hammer Operation are the Auto-Manual control valve, and the Auto-Adjust Control Valve. (Refer to Figures B and E). The Auto-Adjust Control allows the operator to change the length of hammer drop by remote control by hydraulically adjusting the UP-STROKE trip.

1. With the Auto-Manual valve in forward manual position, and the Hammer Control valve in normal center position, set throttle at full governed speed by flipping the hand throttle lever towards the operator (refer to Figure C).

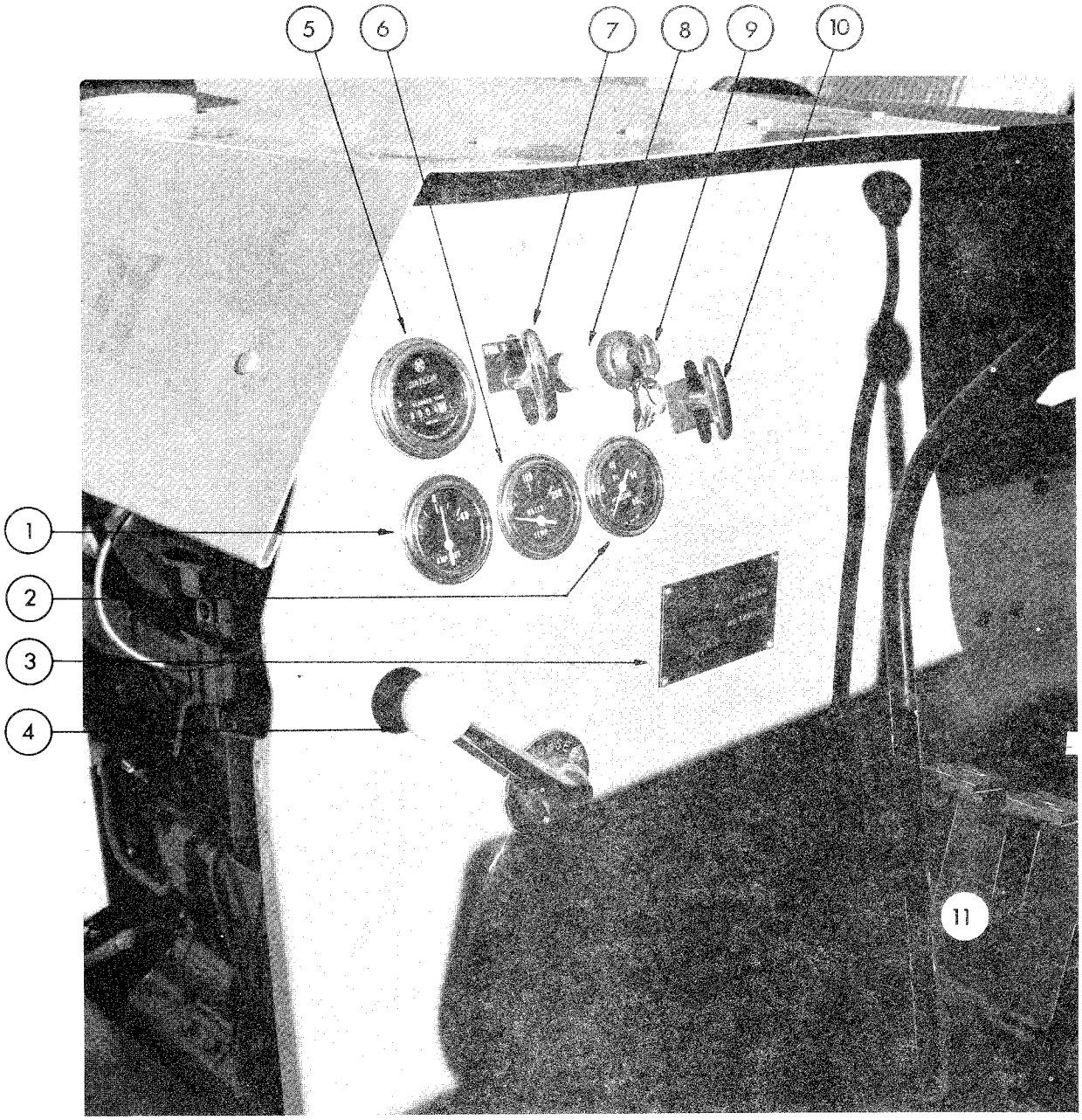
2. Check to see if the UP-STROKE trip is in proper position. If not, use the Auto-Adjust control to run the trip to the base where it will be cammed into proper position. Re-adjust UP-STROKE trip to desired position. Be sure that Pilot Valve lever is in down position. If the Pilot Valve lever should stop in center position, hammer valve will be locked. Pilot Valve lever will have to be moved manually to DOWN position.

3. Move Auto-Manual control valve handle backward to Automatic and hammer will operate automatically.

4. The automatic operation of the Hammer Control valve may be changed to manual at any time by moving the Auto-Manual control valve handle forward to manual position. To stop the automatic, move the Auto-Manual control valve handle forward to manual when hammer is on the DOWN stroke.

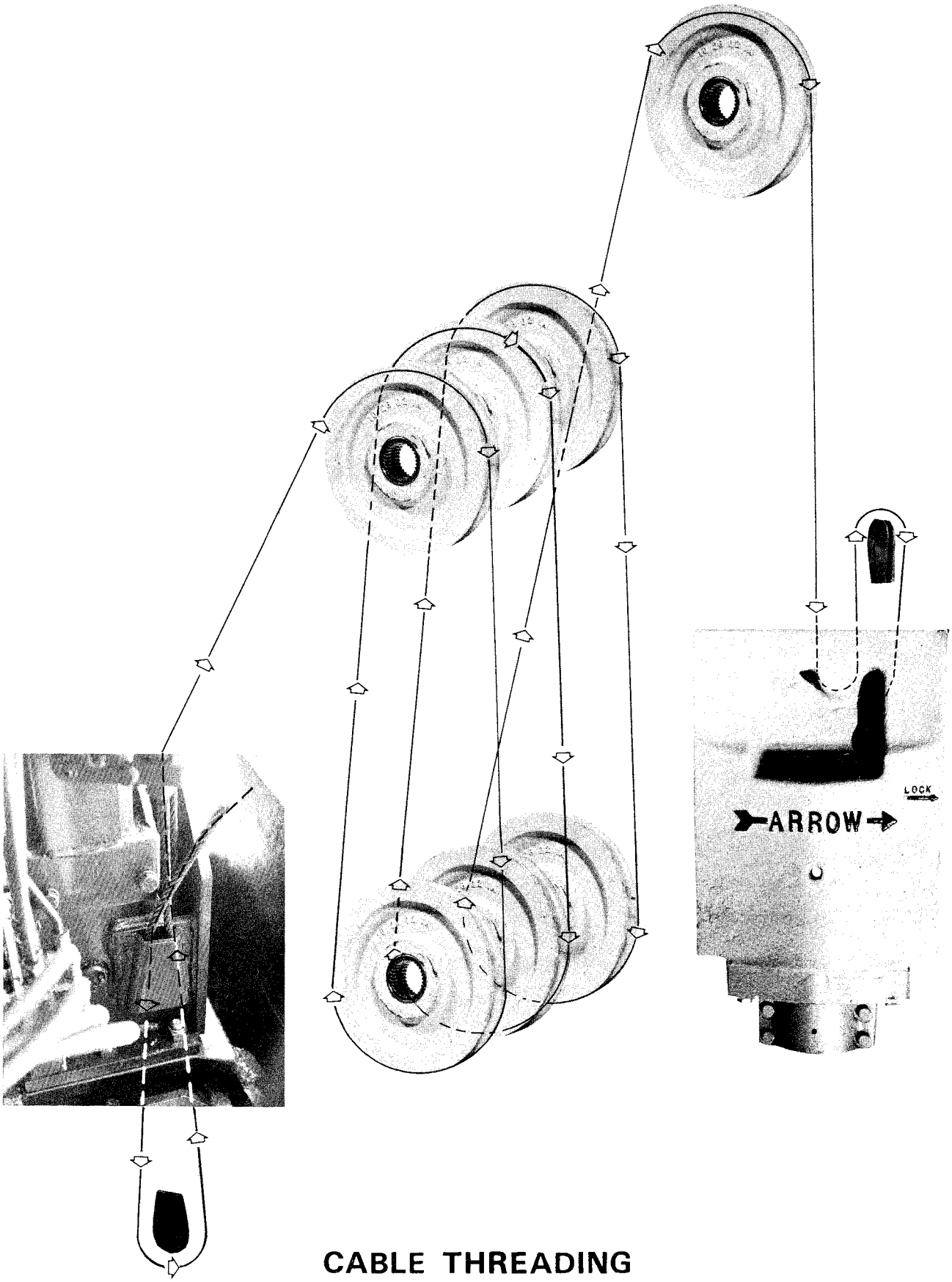
If the Auto-Manual control valve is moved to manual with the hammer on the UP stroke, no damage will be done, but the hammer will overrun the trip and continue to the end of the UP stroke until taken over manually. When this occurs, it will be necessary to reset the trip finger which snaps into the detent in the trip position.

5. When the machine is first started, or the oil is cold, it may be necessary to assist the automatic by actuating the hammer control valve handle until the oil has warmed up, or operate the machine manually until the oil has warmed up sufficiently so that the Pilot Valve is tripped by the UP-STROKE trip without overrunning the trip finger on the UP-STROKE trip. On a very short stroke operation, it is possible for the Pilot Valve Lever to stop in center position. When this happens, the hammer valve will be locked in HOLD position. It will then be necessary to lower the UP-STROKE trip to allow the Pilot Valve Lever to be actuated downward manually.



1. AMMETER
2. OIL PRESSURE GAUGE
3. SERIAL NO./SPECIFICATION PLATE
4. HIGH THROTTLE LEVER
5. HOUR METER
6. WATER TEMPERATURE GAUGE
7. DIESEL STOP LEVER - NORMAL STOP (illustrated) OR
   CHOKE CONTROL FOR GASOLINE MODEL (not illustrated)
8. LIGHT SWITCH
9. IGNITION SWITCH
10. DIESEL STOP LEVER - EMERGENCY STOP
11. CREEPER TRANSMISSION INTERLOCK

INSTRUMENT PANEL FIG. C



CABLE THREADING
FIG. D

HAMMER OPERATION

GENERAL OPERATING INSTRUCTIONS

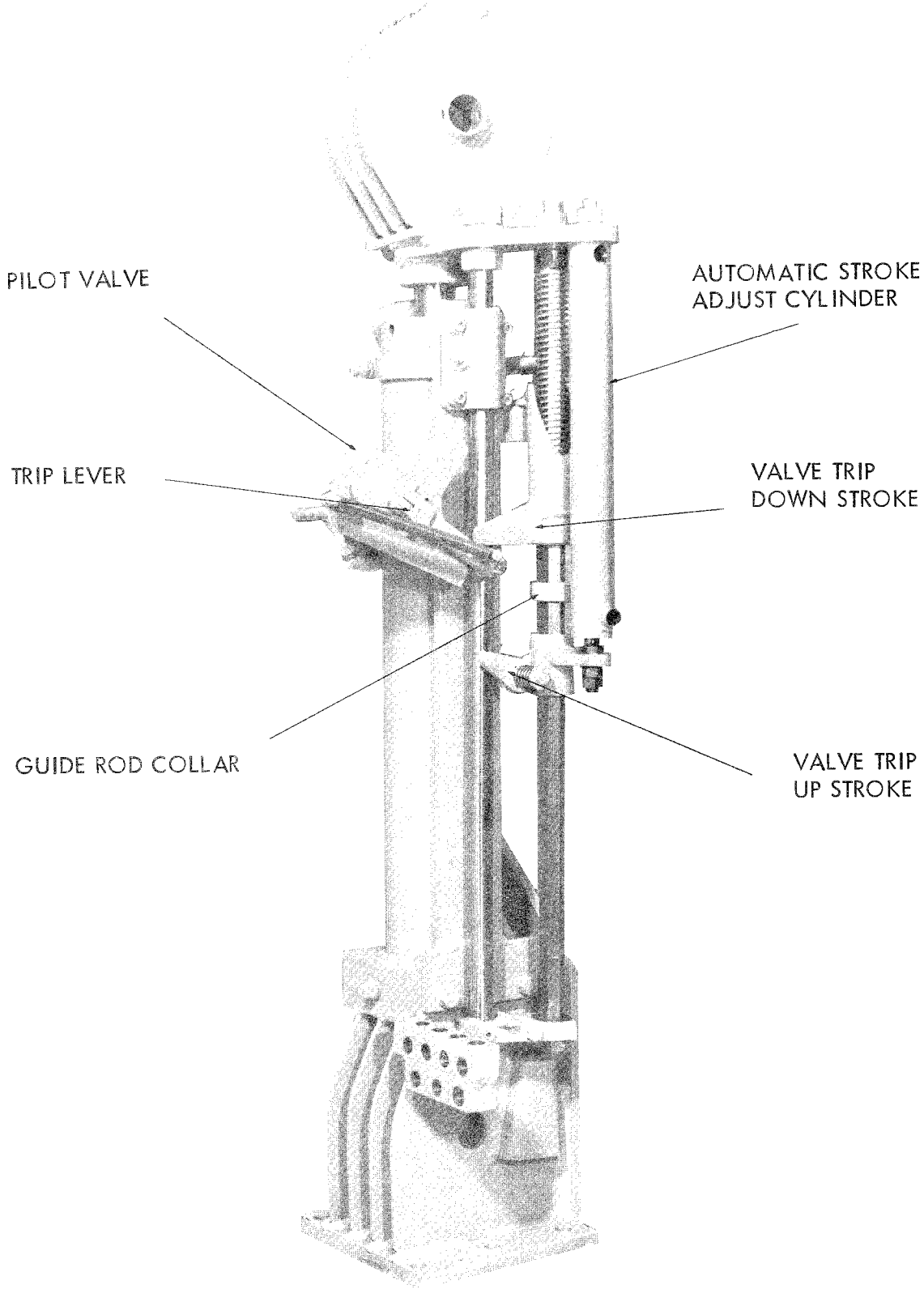
1. SIDE SHIFT . . . The leads may be moved back and forth, laterally, by using the SIDE SHIFT control valve.

2. VERTICAL ANGLE . . . The leads may be angled laterally, to the left or to the right to a maximum of 9° by using the TILT valve control.

3. LAYBACK . . . The leads may be angled forward or backward while working by using the LAYBACK control valve to maintain the leads in vertical position forward and back. This control is also used to lay back leads for traveling. The safety latch must be raised to allow the leads to be layed back and secured in travel position.

4. PARKING BRAKE . . . The Arrow Hammer is equipped with mechanical parking brakes. To apply parking brakes, press firmly on the parking brake pedal. If the machine is also equipped with the Mico hydraulic parking brakes, turn lever to the left or to the right and press on service brake pedal. Release by turning lever to vertical position. Release mechanical parking brakes by pushing down on release lever. The Hydraulic Creeper Drive will not operate with the Mico hydraulic brakes set as the brake pressure operates the creeper stop valve, making the creeper inoperative.

CAUTION: When parking the machine for an extended period of time, it is recommended that the hydraulic creeper engaging lever be put in UP position and set the parking brake. This will positively lock the machine from rolling on an incline.



AUTOMATIC CYLINDER
FIG. E

SERVICE AND MAINTENANCE

MECHANICAL MAINTENANCE

1. Daily check and tighten all bolts and nuts.
2. Check for chafing of hydraulic hose lines.
3. Carry spare cable on cable roll holder provided. Do not cut cable. The proper cable to use is ⅜" diameter, 6 x 19 hemp center, improved plow, minimum length of 51'.
4. Carry one spare set of hammer tool clamp bolts.
5. Carry spare cable wedge and extra flex pins. They are easily lost.
6. Wheel stud nuts should be tightened periodically. After changing tires nuts should be re-tightened after a short period of use.
7. Cross slide bearing adjustment. A minimum of .020 should be maintained at the back of the bearing block. Refer to Figure J. Adjustments are made with leads in vertical position.
8. With leads in horizontal position the clearance between the thrust washer and center tube on cross slide carriage should be .005 minimum and .010 maximum. Adjustment is made by loosening the lock bolt in the threaded nut and turning clockwise to tighten. Use standard feeler gauges for checking clearances.
9. The three belt drive on the small pump should be checked for proper belt tension. The proper tension is determined by putting a force of approximately 6 pounds at the center of the belt span, with a deflection of 5/32 of an inch per belt.
10. TIRE SPECIFICATIONS . . . Front drive tires . . . 7.50 x 16 load range D. Inflate to 55 PSI. Rear steering tires . . . 6.00 x 16 load range C. Inflate to 35 PSI.
11. WHEEL ALIGNMENT . . . Steering axle toe in should be maintained at ⅛ inch in direction of forward travel.
12. STEERING AXLE MAXIMUM TURN STOPS should be maintained so that wheels contact stops before steering gear comes to end of travel, otherwise sector shaft may damage case.

SERVICE AND REPAIR HYDRAULIC SYSTEM

Do not set hydraulic pressures by guess. Always use a pressure gauge and refer to detailed section, setting of hydraulic pressures. Failure to follow instructions can result in damage to pumps, drives, valves, hydraulic lines and structural members.

The Arrow Hydraulic Hammer utilizes two separate pumps delivering 49.5 GPM and 14.6 GPM @ 2200 RPM engine speed. (Models HD1250 and HG1250 thru S/N HG1250199) The larger pump actuates the hammer lift cylinder only. The smaller pump performs the following functions: (See Hydraulic Circuit Diagram)

1. Hydraulic Creeper Drive.
2. Side Shift.
3. Layback of tower or leads.
4. Tilt of tower leads.
5. Automatic control of hammer lift cycle.
6. Remote stroke adjustment

(Models HJ1250 and HG1250 S/N HG1250200 & up, use a double pump.)

(See Page 15)

NOTE: Oil flow through the Auto-Manual Valve.

In manual and in center position oil flows from the small pump directly through the valve to the reservoir. When the automatic selector valve is in rearward or automatic position a small amount of the flow is used to actuate the Servo-Cylinder on the hammer valve. The balance of the flow passes over a relief valve set at approximately 300 PSI and returns to the oil reservoir.

HYDRAULIC SYSTEM ALTERATIONS

The factory should be consulted prior to making any changes in the hydraulic system. Additions of controls or changing to other makes or models of controls may cause serious damage to the hydraulic system, and, also, may be dangerous to operating personnel. It is possible to add control valves for operating accessory equipment, however, the factory should be consulted first.

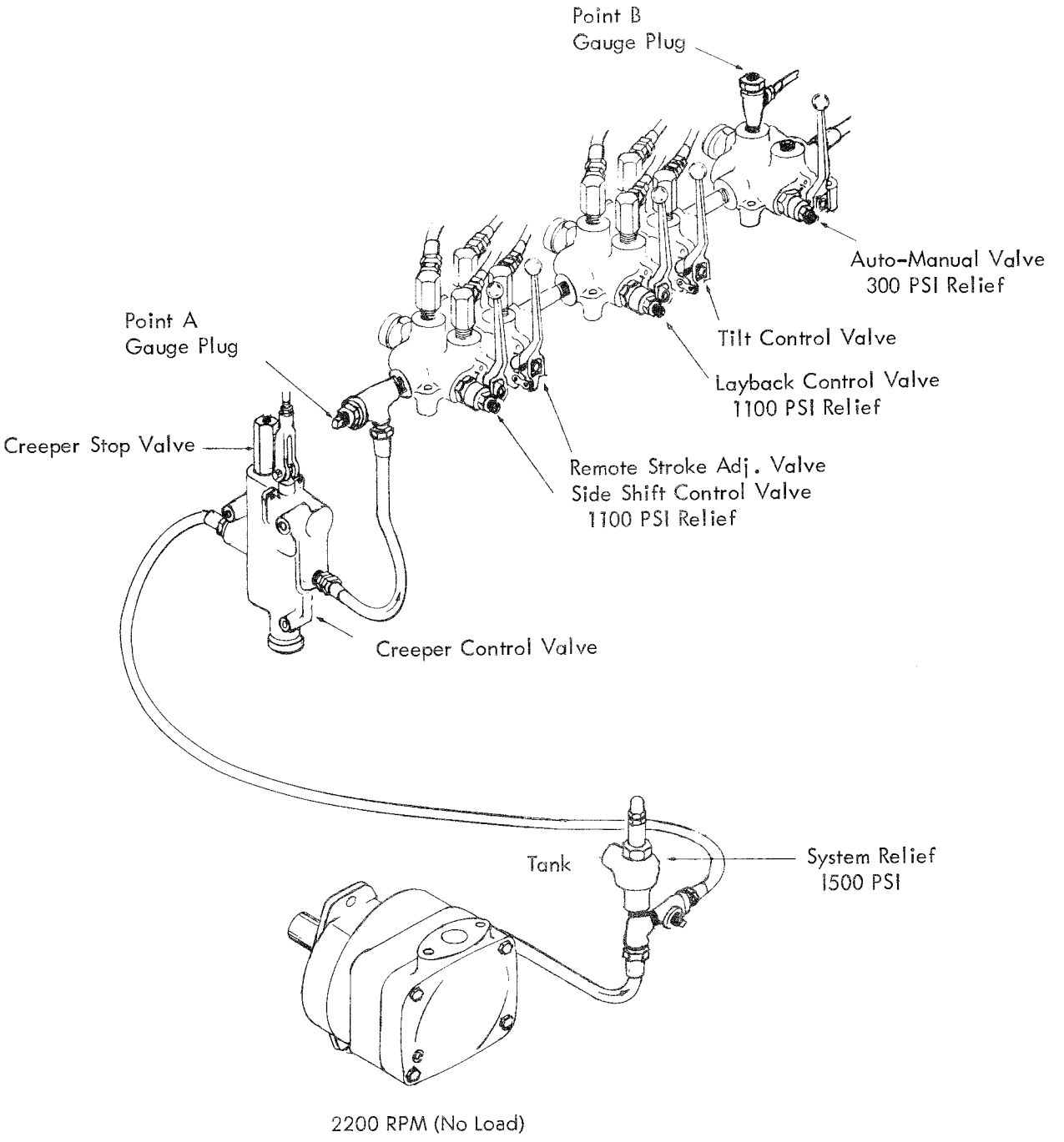


Fig. F

SMALL PUMP..Control Circuit

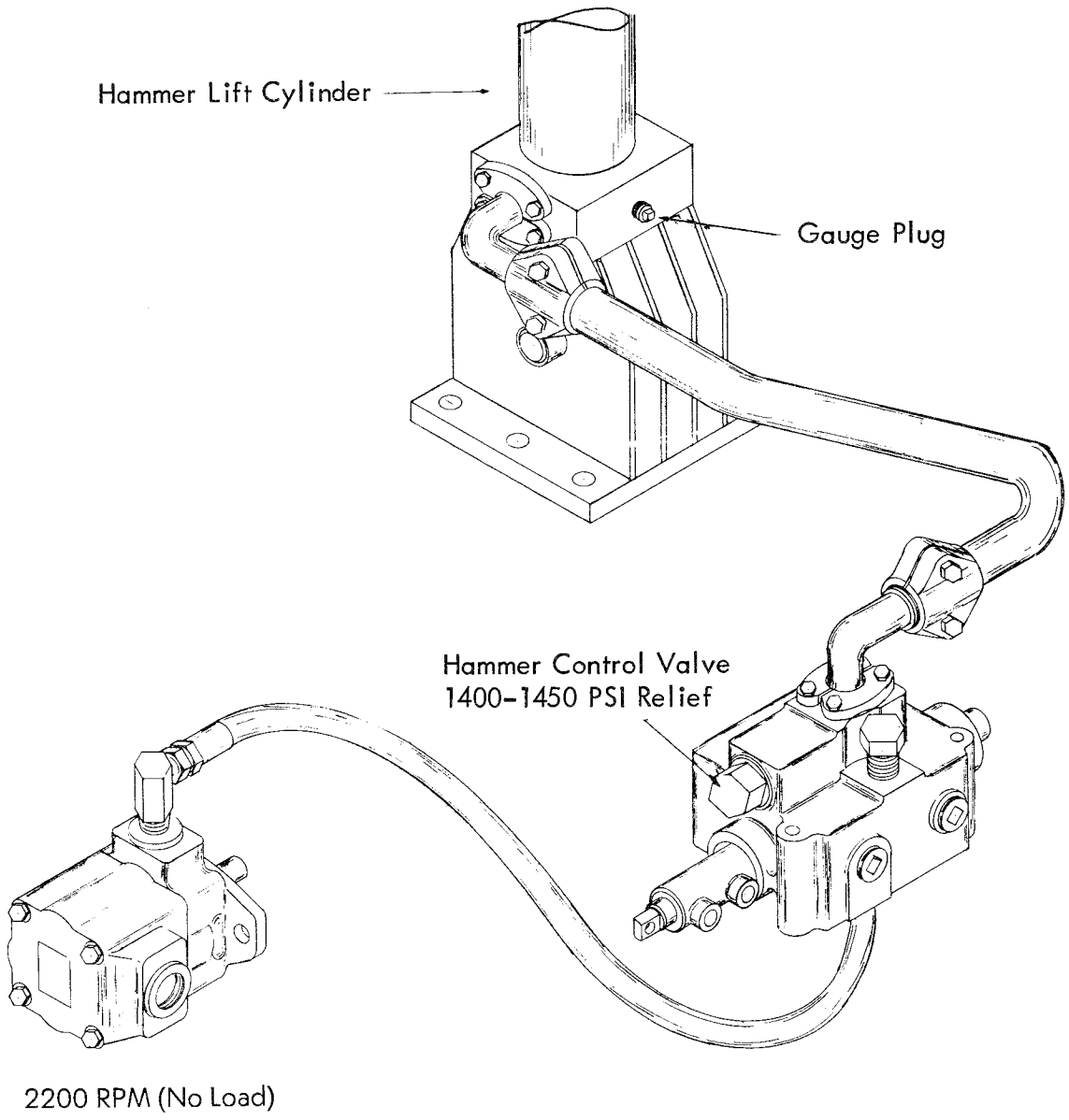


Fig. G

LARGE PUMP.. Hammer Circuit

SERVICE AND MAINTENANCE

HYDRAULIC OIL FILTER

The hydraulic oil filter should be cleaned regularly and the filter cartridge replaced with a new one. Continued operation with a plugged filter will cause system contamination and eventually failure of system components.

PROPER SETTINGS OF HYDRAULIC PRESSURES

CAUTION: The following procedure and sequence should be followed accurately when setting pressures. Failure to do this will result in poor and short service life of hydraulic components. Improper settings can cause excessive pressures which can break pump shafts or engine crankshafts. Always use an accurate pressure gauge for setting hydraulic pressures, never guess. Increasing pressures above those recommended will not increase the operating speed of the machine but will cause unnecessary strain on machine components.

EQUIPMENT REQUIRED

1 3000 PSI gauge, graduations 50 PSI or less, accurate to ± 20 PSI.

1 600 PSI gauge, graduations 20 PSI or less, accurate to ± 10 PSI.

INSTALLING GAUGE IN HAMMER LIFT CIRCUIT AND SETTING PRESSURE (LARGE PUMP)

System should be full of hydraulic oil to mark on dipstick, with Hammer Lift Cylinder down.

1. Remove ½" square head pipe plug at base of Hammer Lift Cylinder on the side facing the operator. **Refer to Figure G. — Gauge Plug.**
2. **Install 3000 PSI Gauge.**
3. Start engine and set engine at governed speed of **2200 RPM** no load (2000 to 2100 full load). Pull back slowly on Hammer Lift Valve. Weight should be locked in position, or it can be raised to the top of the leads. Pressure should read **1400 to1450 PSI.** Be sure oil is warm. 80° F.)
4. To correct pressure either add or remove shims, Part No. 3001344. These shims are placed between Spring, Part No. 4001217 and Cap Nut, Part No. 3000951. Each shim will change the pressure approximately **40** PSI. **CAUTION:** If adding shims does not increase the pressure, there may be one or more of the following things wrong:

(a) Pump may be worn.

(b) Improper oil.

(c) Oil temperature too high.

(d) Valve spool not being actuated to full stroke.

(f) Defective or worn relief valve or seat, or both.

(g) Defective or worn Hammer Lift Valve.

(h) Leaking Hammer Lift Cylinder

(i) Engine not maintaining governed speed.

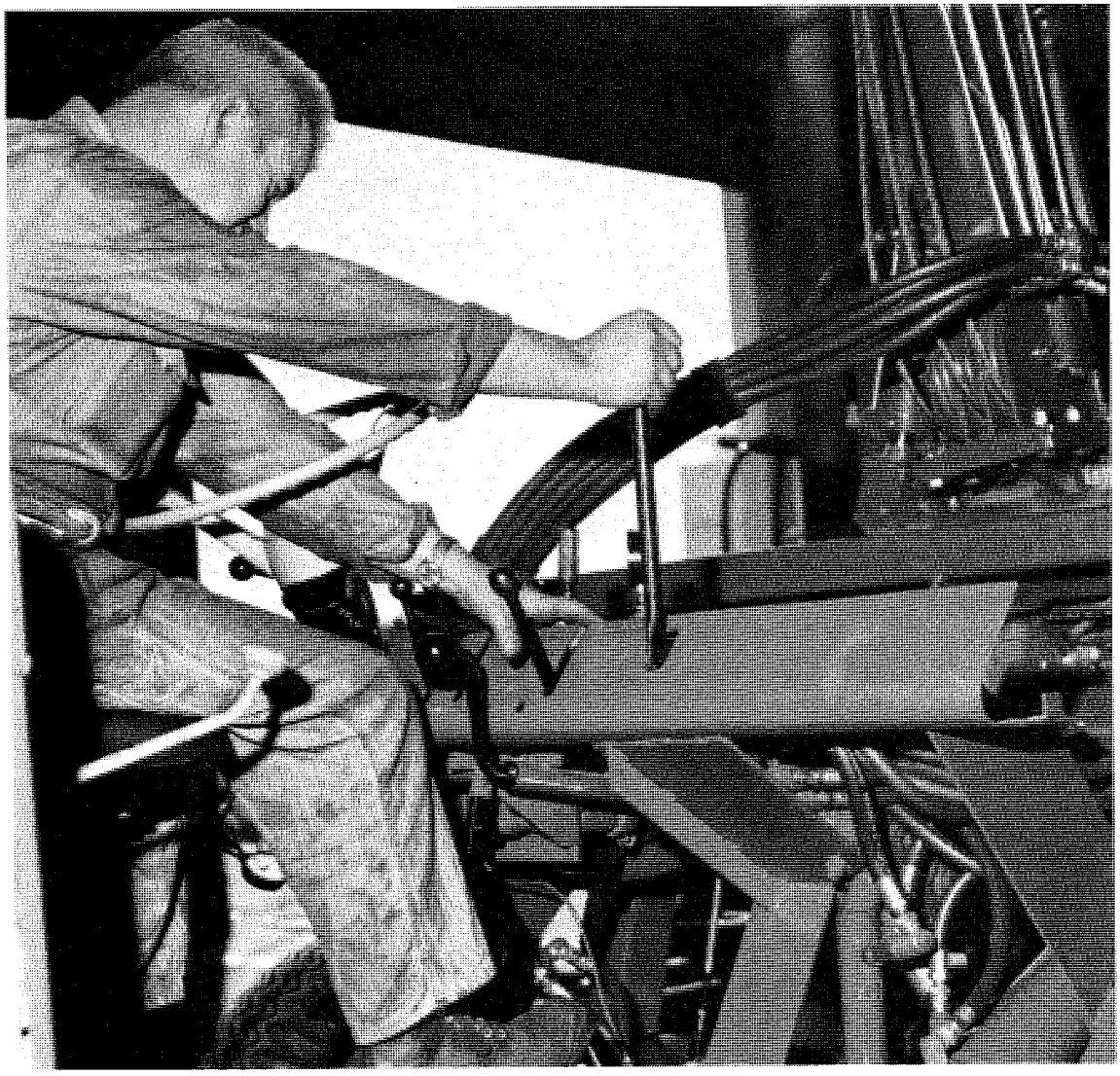
The engine in proper operating condition will easily turn the Pump at the required pressure setting and RPM. (Service engine to correct any difficulty).

INSTALLING GAUGES AND SETTING PRESSURE IN CONTROL CIRCUIT (SMALL PUMP)

Refer to Figure F

1. Remove cowling over valves. This is not necessary if you are checking pressure for side shift and layback as a 3" access hole is provided in the side cowling for this purpose.
2. **Install 3000 PSI gauges at Point A.** Gauges should be installed with engine off. Gauge outlets are above oil level.
3. **Install 600 PSI gauge at Point B.**
4. Check reservoir oil level. Start engine and set at full governed speed, 2200 RPM (no load). Allow to operate until oil has reached approximately 100°F. Oil may be warmed by actuating Hammer Lift Valve with weight against top of leads or in locked position so oil is passing over the relief. This will warm the oil up quite readily.

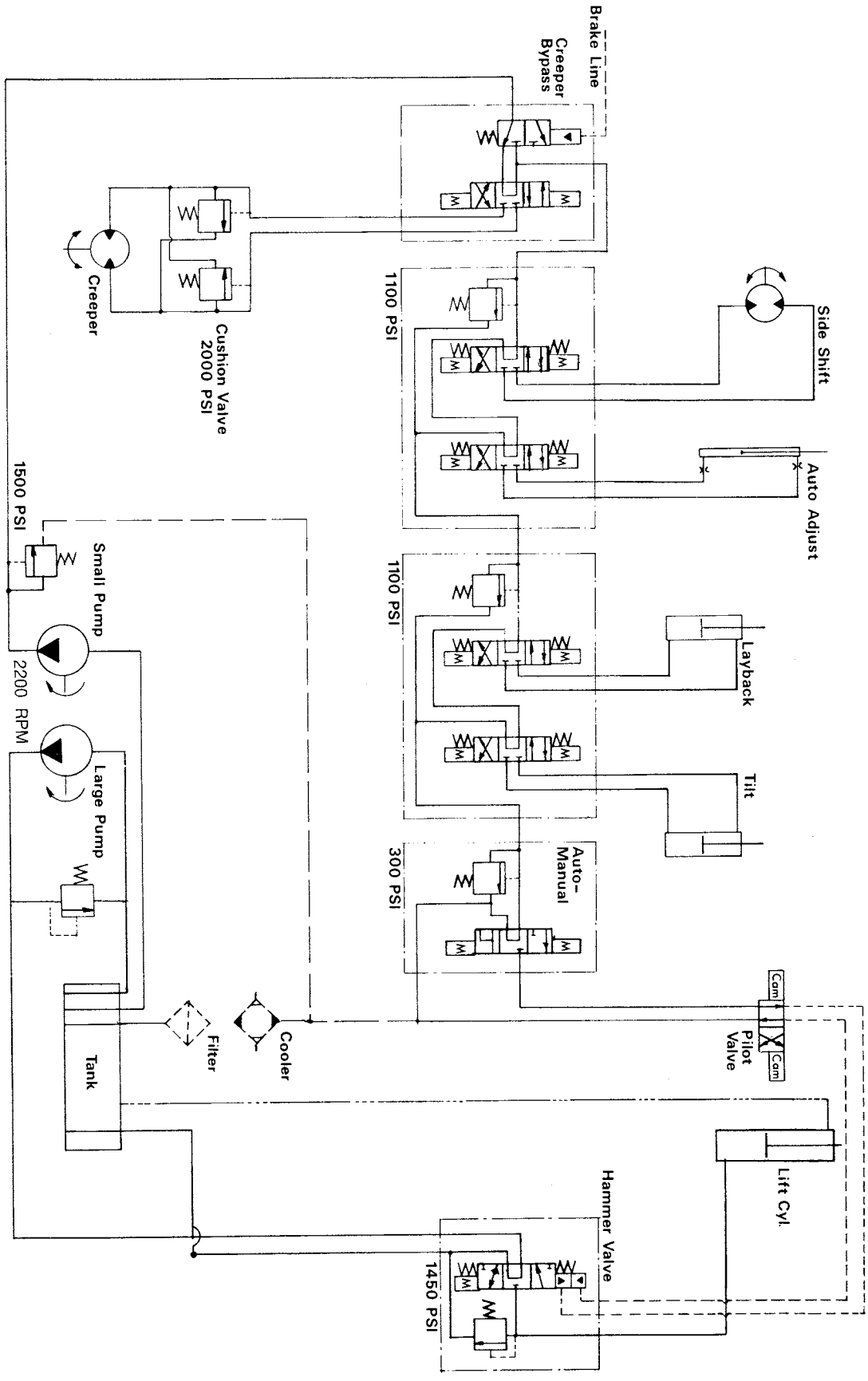
MAINTENANCE & SERVICE



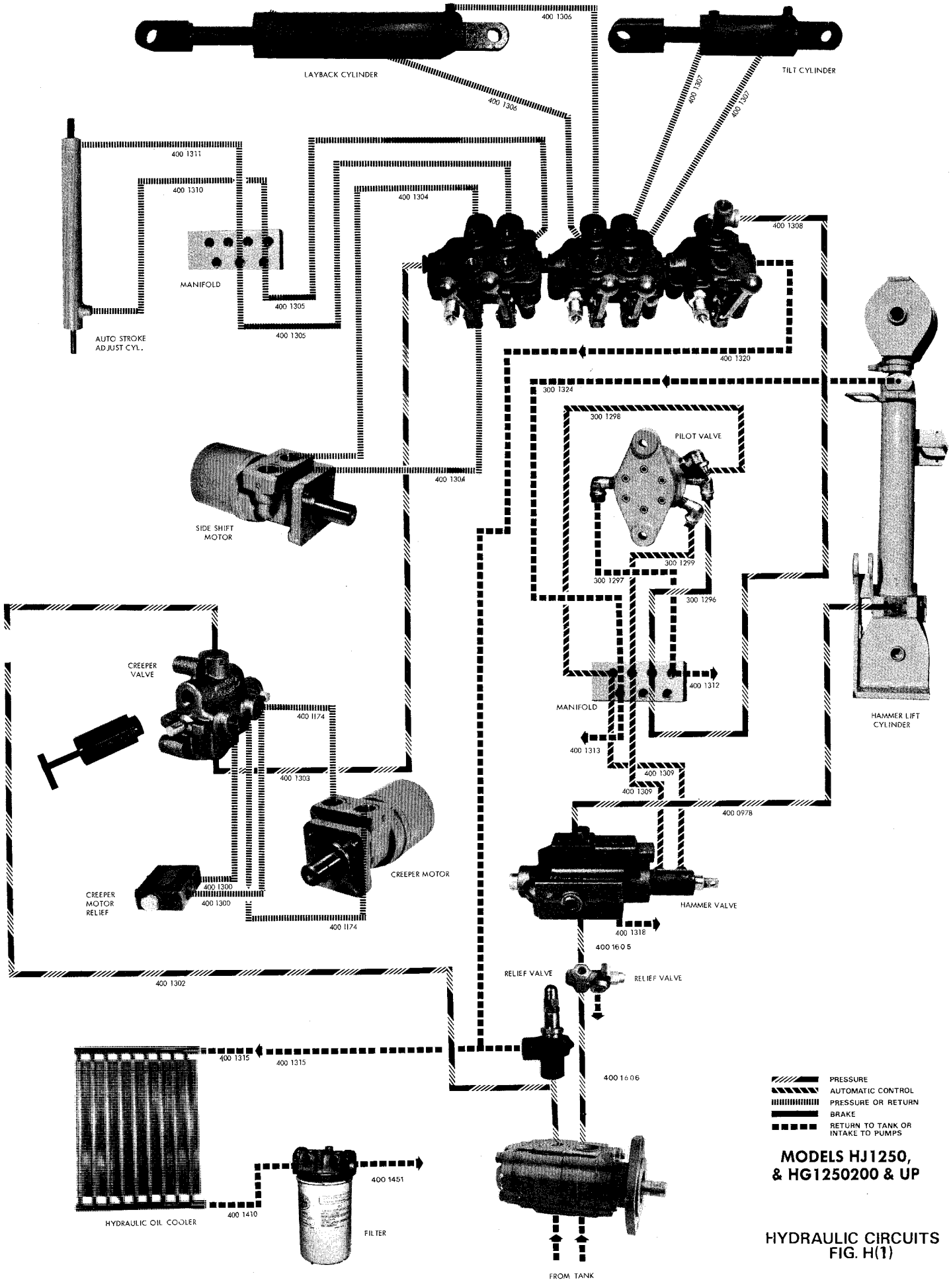
5. To set system relief at **1500 PSI** use the following procedure:
   (a) Actuate side shift control lever forward until side shift reaches end of travel.
   (b) Actuate tilt control valve lever forward until leads are tilted to extreme travel of cylinder.
   (c) Actuate both valves forward, side shift control and tilt control at the same time.
   (d) With both control valve levers forward, gauge attached at outlet A should read **1500 PSI.**

6. If gauge does not read **1500 PSI** use the following procedure:
   (a) Check for correct oil level and make certain that pump inlet is not restricted. Check for proper belt tension as outlined in Preventive Maintenance.
   (b) To set system relief, remove acorn nut and loosen lock nut with end wrench. Turn slotted screw clockwise to increase pressure. Approximately ¼ turn will increase pressure approximately **50** PSI. Correct pressure is **1500 PSI.**
   (c) **CAUTION:** Failure to push forward on side shift and tilt handles at the same time, when setting the system relief will cause incorrect setting (most likely a very high setting), providing no protection for the pump, pump drive and creeper control circuit.
   (d) If pressure does not increase on screwing relief valve down, check for the following:
      (1) Improper hydraulic fluid.
      (2) Broken relief valve spring or damaged seat or ball.
      (3) Worn pump.
      (4) Oil too hot, above 150° F.
      (5) Belts slipping, pulley key missing and belt sheave slipping on shaft.

7. If Valve spool travel is uneven in either direction, or spools do not return normally to center position on valves, check to see that screw #5000218 at the rear end of the spool is tight. These parts are illustrated in the Parts Catalog. This screw is reached by removing the stop disc and snap ring #5000220.
8. The relief valves on the Side Shift Control Valve and the Tilt and Layback Control Valve can be set after the system relief valve is set.
   (a) Side Shift and Remote Stroke Adjustment Valve. Push Side Shift Control Valve Handle forward until carriage stops. At this point the Side Shift Relief Valve will operate and gauge should read **1100 PSI.** If pressure is incorrect, loosen jam nut on Side Shift Relief Valve with end wrench through slot in bottom of cowl. Reset Relief Valve using screw driver through hole in front of cowl to correct pressure. If this fails to correct pressure, check for broken Relief Valve spring, damaged ball or seat, or valve not at full stroke position.
   (b) Tilt and Layback Valve.
   Push Tilt Valve forward until tilt cylinder bottoms. At this point the Relief Valve on this valve will operate and the gauge should read **1100 PSI.** If pressure is incorrect, reset as described above.
9. (a) To set the Auto-Manual Control Valve Relief, the Hammer Valve Control Lever must be held forward when checking or setting the pressure. Hold the lever securely forward as it will require some effort to overcome the Servo Cylinder pressure that will be applied when the Auto-Manual Control Valve Lever is put in automatic position.
   (b) Push Auto-Manual Valve Lever to forward position.
   (c) Set the Relief Valve on the Auto-Manual Control Valve by using the same procedure as on other relief valves. The correct pressure is 300 PSI.

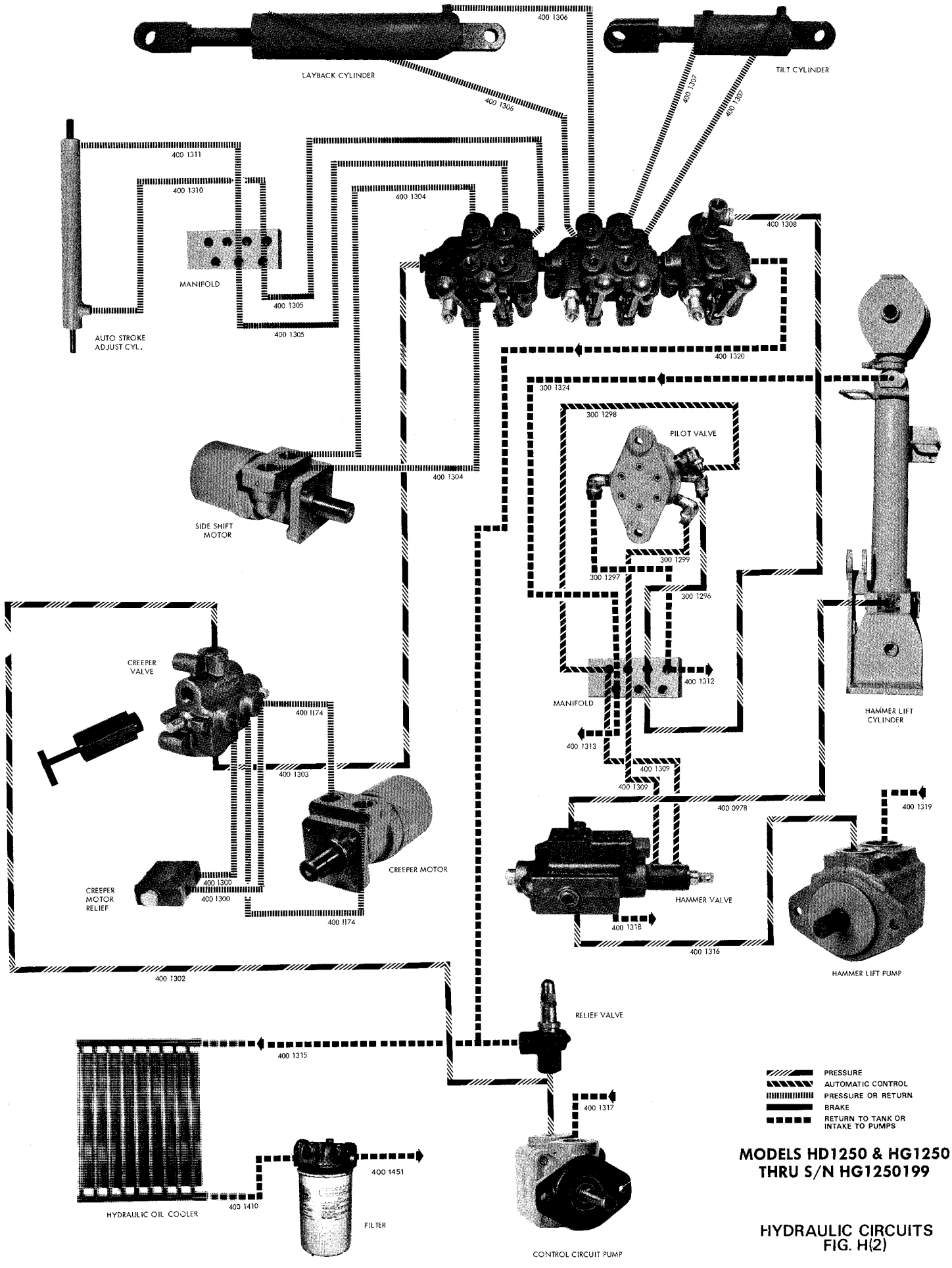


Hydraulic Schematic Fig. H



MODELS HJ1250, & HG1250200 & UP

HYDRAULIC CIRCUITS FIG. H(1)



MODELS HD1250 & HG1250 THRU S/N HG1250199

HYDRAULIC CIRCUITS FIG. H(2)

10. The operating functions of the Arrow Hammer will not be correct unless the engine speed is maintained at the proper RPM. Under no load conditions the engine speed should be 2200 RPM. Under full load the engine should maintain at least 2000 RPM. This is the full open governed speed. The velocity governor on the engine should be set at **2200 RPM.** Altitude affects the setting of the governor. When starting out a new hammer, the engine speed should be checked with a tachometer and the governor should be set to the proper RPM. If a hammer is moved to a different elevation which would change the engine speed over 50 RPM the governor should be reset. The engines supplied in Arrow Hammers can be operated at a higher speed than those specified, however, the speed of the engine is limited by the maximum operating speed of the hydraulic pumps. Increasing the speed of the engine above the recommended setting will prematurely wear out the hydraulic pumps.

SERVICE

ENGINE WILL NOT START

1. The engine may not start if both the hydraulic creeper drive and the standard transmission are in gear. **Remedy:** Put either transmission in neutral and start engine.
2. Refer to Engine Manufacturer's Service Manual for engine starting problems and general service requirements.

NOISY HYDRAULIC SYSTEM

1. Low oil level. **Remedy:** Add oil to correct level.
2. Cold oil. **Remedy:** Allow machine to idle until oil has warmed up sufficiently.
3. Improper oil. **Remedy:** Refer to oil recommendations.
4. Valve left in operating position and oil is passing over relief valve. **Remedy:** Center control valve to neutral position.
5. Air entering hydraulic system: Air can enter intake hoses at clamps or defective hose between oil reservoir and pumps. Air entering the intake side of the pumps will make them very noisy. Air in the system can be detected by the milky appearance of the oil. Sometimes the oil will foam. Air can enter a pump intake without a visible oil leak. **Remedy:** Tighten connections.
6. Defective or worn hydraulic pumps. **Remedy:** Replace pumps.
7. Contaminated oil. **Remedy:** Replace with new oil and new filter cartridge. **Never use gasoline for cleaning or flushing the hydraulic system.**

HYDRAULIC CREEPER WILL NOT WORK

1. Creeper engaging lever not in correct position. **Remedy:** Engage creeper lever. Operate creeper control to facilitate engaging gears. Check for missing pins, keys and springs.
2. Creeper valve not operating properly. **Remedy:** Check creeper valve cam and linkage. Release parking brake. Replace worn or broken belts on small pump.
3. Low or no hydraulic pressure. **Remedy:** Refer to section on hydraulic maintenance. Replace defective hoses.
4. Creeper stop valve sticking. **Remedy:** Remove and disassemble. Check for broken or sticking parts.
5. Defective Mico Parking brake. **Remedy:** Repair or replace.
6. Defective Creeper Motor. **Remedy:** Replace with new motor.
7. Defective internal mechanism. **Remedy:** Remove creeper housing and examine. **Refer to Figure K.**

NOTE: if creeper, side shift, auto. adjust, leads tilt, layback, etc., fail to operate properly, check for proper oil level, inspect pump belts for breaks, wear or looseness. Check hydraulic pumps and control valves. Inspect hoses for breaks and kinks. Follow recommended procedures for setting pressures.

SERVICE AND MAINTENANCE

SIDE SHIFT WILL NOT WORK

1. Defective or worn side shift motor. **Remedy:** Replace defective motor. To check for a worn or scored creeper motor, the following procedure should be followed.

   (a) Make certain control valve pressure is correct and oil temperature is normal.

   (b) Set engine at full governed RPM and push forward on side shift control lever and allow side shift to reach extreme right end of travel (if side shift will move.)

   (c) Remove bottom hose from side shift motor. This is a non-pressure hose when the control lever is pushed forward. Screw pipe cap on end of hose removed, and install length of clean, low-pressure drain hose in bottom port of motor. Place other end of hose in a clean 5 gallon container.

   (d) With engine at full governed speed, hold side shift control lever forward. If the container will fill in less than one minute, the motor is defective and should be replaced.

2. Seized motor. **Remedy:** It is possible for a motor to be seized and it will not show up as defective in step 1 above. If the side shift motor does not appear to rotate against the chain, remove the chain and attempt to rotate the motor by actuating the control lever. If it will not rotate, it is apparently seized in its bearings and must be replaced.

3. Carriage way bearings too tight. **Remedy:** Adjust way bearings according to instructions, **Figure J.**

4. Cross tubes bent or misaligned. **Remedy:** Repair or replace.

5. Dry or defective bearings in sprocket idlers. **Remedy:** Replace defective bearings or lubricate.

6. Improper Way lubrication. **Remedy:** Clean ways with suitable solvent.

NOTE: It is advisable to exchange hydraulic motors instead of attempting to make field repairs.

LEADS CANNOT BE RAISED TO WORKING POSITION

1. Hammer not in proper position for raising leads. **Remedy:** Weight should be carried in locked position. At this point the hydraulic system can easily raise the leads. If the leads are accidently laid down with the hammer weight in the top end of the leads, the weight can be slid forward by allowing a small amount of slack in the cable and stopping the machine in its forward motion abruptly. **Caution:** Do not leave an excessive amount of slack in the cable. It is dangerous.

2. Rapid and erratic layback action of leads. **Remedy:** If the oil has been drained for any reason, and none is present in both sides of the cylinder, the operator should be careful to actuate the layback cylinder a small amount in each direction until air has been expelled. Orifice fitting part 4000224 must be installed on the cylinder to maintain a safe control speed. The layback safety latch must be raised manually in order to lay the leads down. This safety latch is for the operator's protection, and should never be made inoperative.

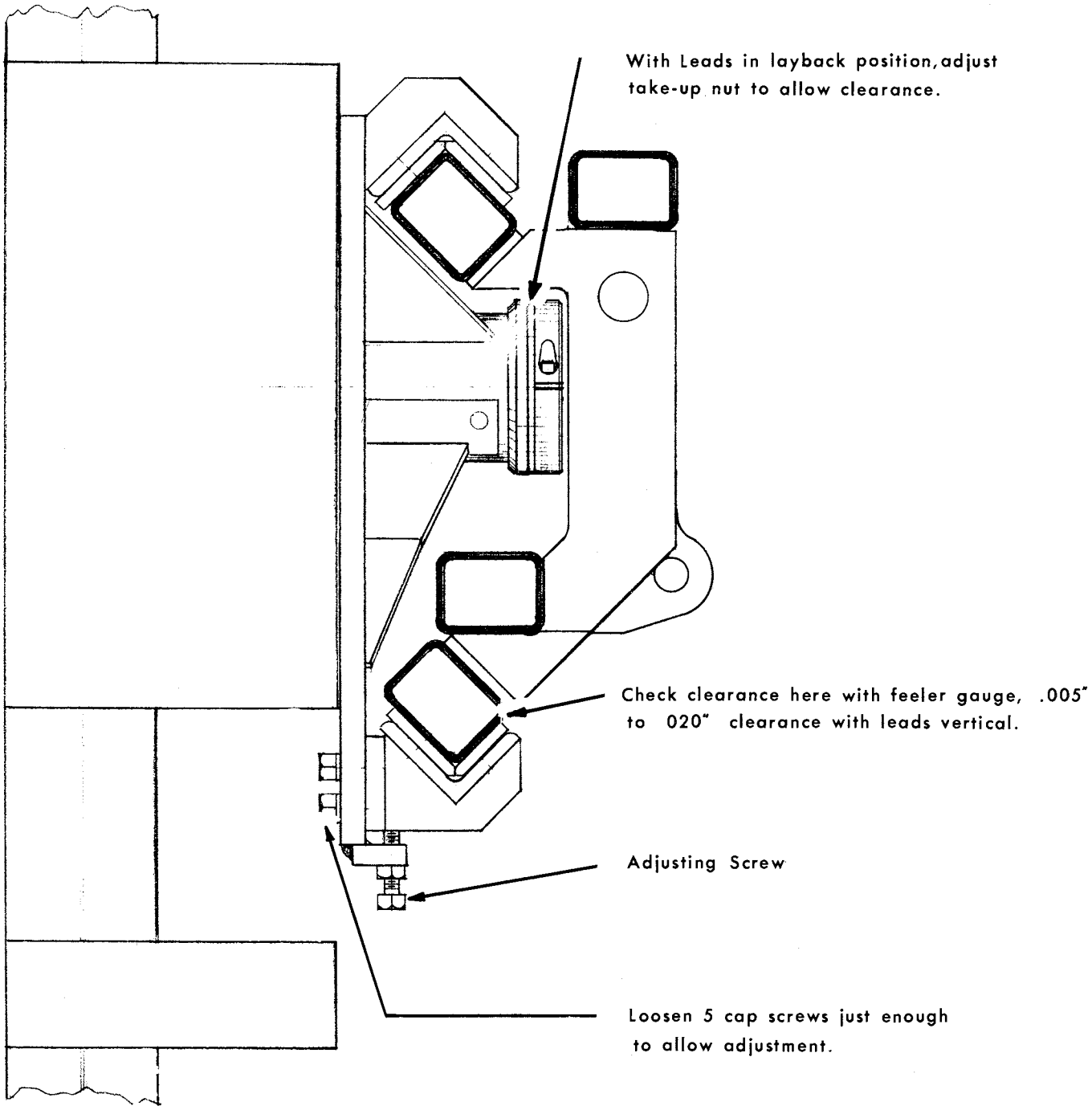
LEADS WILL NOT TILT

1. Lead Center Pin stuck. **Remedy:** This is either a lubrication or mechanical failure, and it will be necessary to disassemble the leads from the cross slide carriage and repair. Dress off pin, if necessary. Replace center pin bushings, if worn. Lubricate. Also, refer to **Figure J.**

LAYBACK OR TILT CYLINDER WILL NOT HOLD POSITION.

1. Control Valve not centering to hold position. **Remedy:** Check to see if Screw #5000218 (see parts book) is loose. Screw should be tight.

2. Leaky cylinder. **Remedy:** Repair or replace. To check for leaky cylinders, use the following procedure:



CARRIAGE, CENTER PIN ADJUSTMENTS, FIG. J

TILT CYLINDER

(a) Tilt the top of the leads to the right and disconnect the lower hose from the tilt cylinder.

(b) Cap the hose and apply pressure very slowly to tilt the leads to the right by metering the valve as slowly as possible. If oil does not discharge from cylinder rod end port, the cylinder is O.K. Both hoses must be connected when repositioning leads.

(c) Tilt leads to left, reversing procedure, to test cylinder in opposite direction. The reason for testing in the opposite direction is that the piston rod nut could be loose and it would be possible to seal in one direction while leaking in the opposite direction. Also, a cylinder barrel can be defective at one end of the stroke and perfect at the other. By testing in this manner, both ends of the cylinder barrel are tested.

LAYBACK CYLINDER

(a) Push forward on layback control lever until leads are forward as far as possible.

(b) Disconnect hose from anchor end of cylinder and cap.

(c) Apply pressure slowly by moving layback control lever slowly forward. If cylinder is defective and leaking, oil will discharge out anchor end cylinder port. Both hoses must be connected when repositioning leads.

(d) To test the other end of the cylinder, connect hose to anchor end of cylinder. Lay leads down on lead support by pulling backward on layback control handle.

(e) Remove hose at cylinder rod end and cap.

(f) Apply pressure slowly by pulling backward on layback control lever. If oil discharges from cylinder rod end port, the cylinder is defective. **Remedy:** Remove defective cylinders to repair. Inspect bore finishes, replace rings and seals. If cylinder barrels are rough replace with a new part.

MALFUNCTION OF HAMMER AUTOMATIC CYCLE

SAFETY LEVER (VALVE TRIP UP STROKE) MOVES OUT OF POSITION AND WILL NOT ACTUATE THE PILOT VALVE.

1. Cold oil. **Remedy:** Manually assist hammer lift control lever by pushing forward on the lever for several strokes as automatic operates, or until oil warms sufficiently to operate without tripping the safety lever.

2. Oil too heavy for operating temperature. **Remedy:** Refer to **Fig. L.**

3. Auto-Manual control valve pressure set too low. **Remedy:** Refer to section on setting pressures and **Figure F.**

4. Valve Trip Stops too close together. **Remedy:** Reset stops to wider position.

5. Pilot valve jammed. **Remedy:** Check for foreign material in valve. Free up valve. If valve is scored, replace with a new valve.

6. Check also for missing woodruff key, weak or missing trip lever spring, worn guide rod bushing, pinched hoses or dented tubes and hoses.

7. Hammer Control Valve sticking or linkage jammed. **Remedy:** Examine control linkage, loosen mounting bolts slightly. Mounting bolts too tight can cause bind in valve spool. Operate valve manually with auto-manual control valve in manual position. If valve does not free up, check to see that pilot valve is in tripped position down, that is, not on center position. If valve still binds, disconnect servo-cylinder lines and attempt to actuate control valve manually. If binding still persists, most likely foreign material is in the valve, causing the valve spool to bind in the body. Either mechanically repair hammer valve or replace with a new one. If hammer valve operates freely with servo lines

disconnected, check for kinked or obstructed hydraulic lines. Also, recheck for items above, such as Woodruff key missing in lever, etc.

8. Hydraulic lines hooked up incorrectly. **Remedy:** Refer to Hydraulic Circuit Diagram, **Figure H.**

9. Pilot valve loose on mounting plate. Trip misses pilot valve lever. **Remedy:** Retighten and align pilot valve. Also, check for bent guide rods. Repair or replace.

ALIGN GUIDE RODS AND TRIP FINGERS.

1. To align guide rods and trip fingers, loosen the two nuts next to the sheave housing at the top of the cylinder. One is a round guide rod and one is a hex guide rod. Loosen the clamp bolt at the bottom of the hex guide rod. Let the cylinder all the way down. This should align the round guide rod with the guide rod bearing. Next, with the auto adjust cylinder rod extended, adjust length of round guide rod and lower trip finger position so that the trip finger will re-set and the auto adjust cylinder piston will bottom internally instead of on the bar at the bottom of he rods. Tighten the two nuts at the top of the guide rods and tighten the clamp bolt at the bottom of the guide rods. This will also align the trip fingers with the pilot valve bearing.

2. Adjust cable properly as described in the Operation Section of this manual.

3. Put a ¼" cable clamp next to the weight on the cable to keep it from slipping through.

4. The cable should be 51' long, or longer.

5. Weight should come within 6" or 8" from the top of the tower at maximum cylinder extension.

6. Check automatic valve, making sure it does not exceed **300 P.S.I.** Point B, Figure F is for the automatic valve. It can also be checked at Point A.

7. Check Hammer cylinder pressure. Pressure should read **1450 P.S.I.** The gauge plug is located at the base of the hammer lift cylinder.

8. Check all sheaves and make sure they are not binding, and that the bearings have not frozen.

9. Check upper sheave housing to make sure the set screw is tight. This is the housing mounted at the top of the automatic cylinder shaft.

10. Make sure the cable is threaded properly. Refer to Figure D in the Hammer Operation section.

11. Check the pilot valve and bearing. Valve and bearing must work freely. This valve is illustrated in the parts book. Item 14 is the trip lever, and Item 16 is the cam follower bearing.

ON DOWNSTROKE, CIRCUIT DOES NOT REVERSE AND RAISE HAMMER

1. Review items 1 through 9 above.

2. Incorrect cable adjustment. **Remedy:** Refer to cable lengths setting instructions, also refer to #4 above.

HAMMER REVERSES BEFORE DOWNSTROKE IS COMPLETED

1. Incorrect cable adjustment. Refer to cable lengths setting instructions.

2. Stop loose. Refer to **Figure E.**

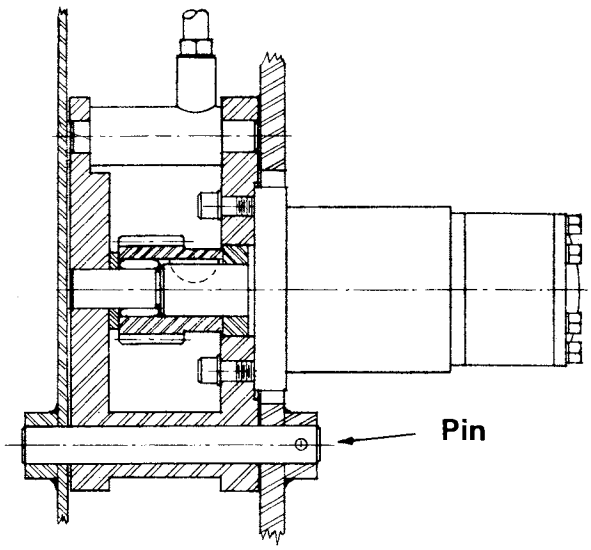
HAMMER WEIGHT DRIFTS DOWN

1. Hammer control valve not centering in hold position.

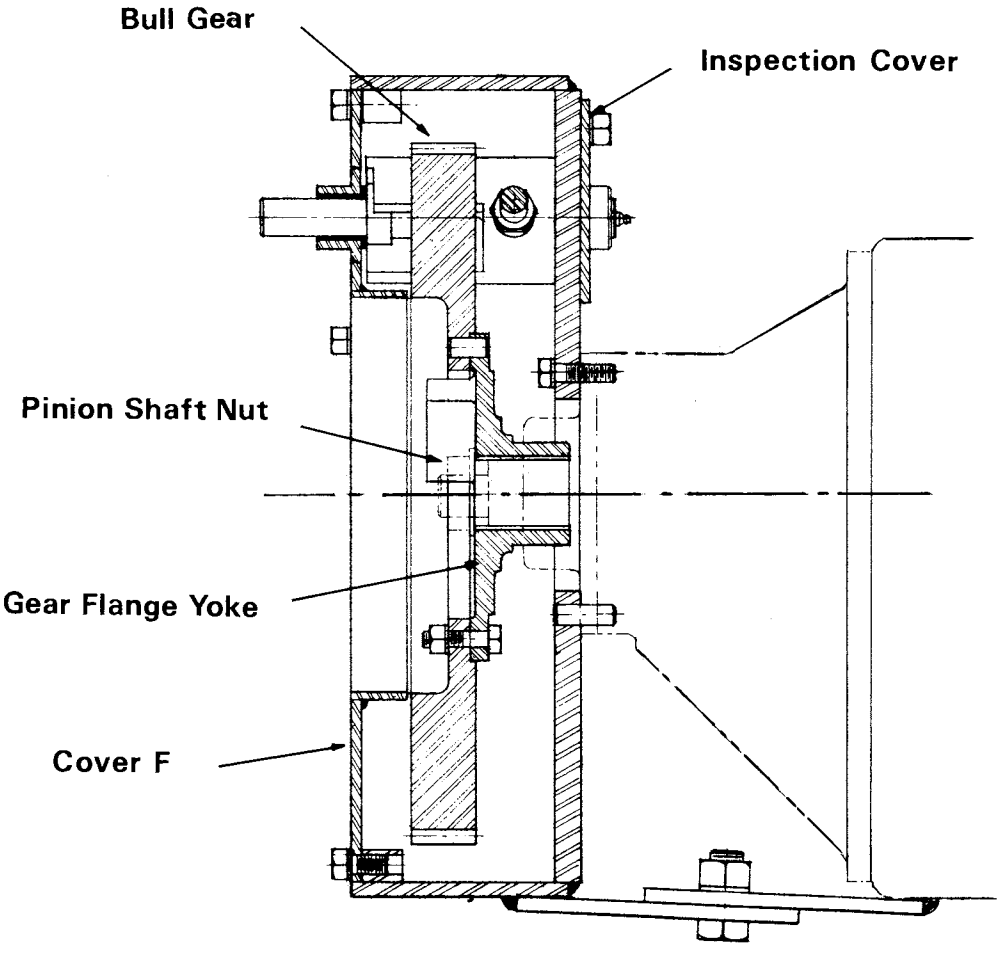
REMEDIES:

(a) Pilot valve lever on or near center position which traps oil in the servo-cylinder on hammer control valve, and does not allow spring to center the hammer control valve. Pushing lever to **DOWN** position will allow servo-cylinder to return to centered position on hammer control valve. Refer to **Figure E.**

(b) Check for damaged or defective valve control handle linkage. Repair or replace.

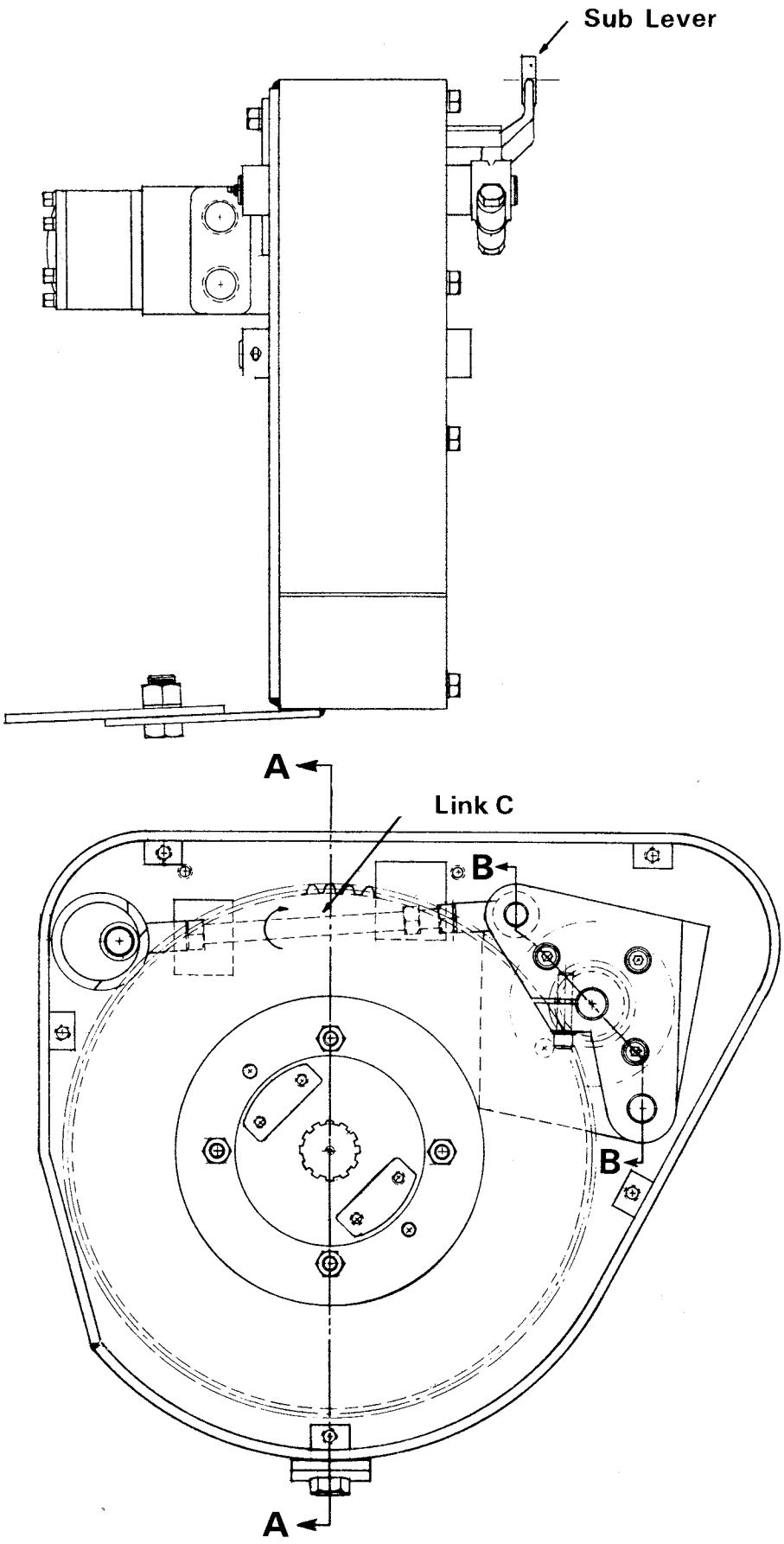


Section at **BB**



Section at **AA**

Creeper Gear Adjustments, Fig. K



Creeper Gear Adjustments, Fig. K

(c) Hammer control valve spool binding. This is caused either by foreign material in the valve, causing the spool to bind, or mounting bolts too tight (torque to 25 foot pounds).

(d) Relief valve leaking. Leakage can be caused by either a defective valve or seat, or broken or weak springs, Part No. 4001217 and Part No. 4001218. Replace weak or broken springs.

(e) Too low a pressure relief valve setting. Pressure should be set at 1350-1450 PSI. Refer to section on setting pressures.

(f) Broken or weak spool return spring, Part No. 4001219. Replace if weak or broken.

(g) Leaking seals in hammer lift cylinder. To test for leaking cylinder, raise cylinder to maximum stroke with hammer weight to top of leads. Allow hammer lift control valve to remain in center position until hammer weight strikes ground. Disconnect line from top of hammer lift cylinder (rod end). Slowly raise hammer. If oil spews from disconnected cylinder port the cylinder is defective and seals will need to be replaced. If cylinder barrel surface is rough or grooved, it should be replaced with a new cylinder and base.

(h) Worn hammer control valve spool. The valve must be replaced or sent to the factory for rebuilding. Some leakage is normal and necessary for every spool type hydraulic valve and should be no cause for alarm.

WHEN RAISING WEIGHT, THE WEIGHT SETTLES BEFORE IT STARTS UPWARD

1. Worn or defective Check Valve, Part No. 3001335, or defective Relief Valve Seal, Part No. 4001044. **Remedy:** Replace defective parts, or entire control valve.

PREMATURE CABLE BREAKAGE

1. Not using proper cable, cable too dry or improperly threaded. **Remedies:** Refer to section on proper cable; use standard cable lubricant sparingly. Refer to **Figure D**, for cable threading.

2. Cable or trip stops improperly adjusted. **Remedy:** Refer to Automatic and Cable adjustments. A cable set too short or stops set so that hydraulic system reverses too quickly on **DOWN** stroke will cause the cable and hydraulic system to absorb the hammer impact, thereby shortening cable life and diminishing the working force of the machine. Setting cable too long, or the stops so that cylinder does not reverse soon enough, leaving extra slack in the cable, will cause the cable to whip between the hammer weight and the lead sheave, thereby shortening the life of the cable.

3. Defective sheave bearings. **Remedy:** Replace bearings. Refer to **Figure O** for lubrication specifications.

4. Hammer relief pressure set too high. **Remedy:** Refer to **Figure G,** and section on setting pressures.

5. Stopping the hammer weight on the downward stroke with the hydraulic control. **Remedy:** Avoid stopping the weight wherever possible as it stresses the cable. Allow the tool to strike the ground. Avoid allowing the hammer weight to fall through to the end of the cylinder travel.

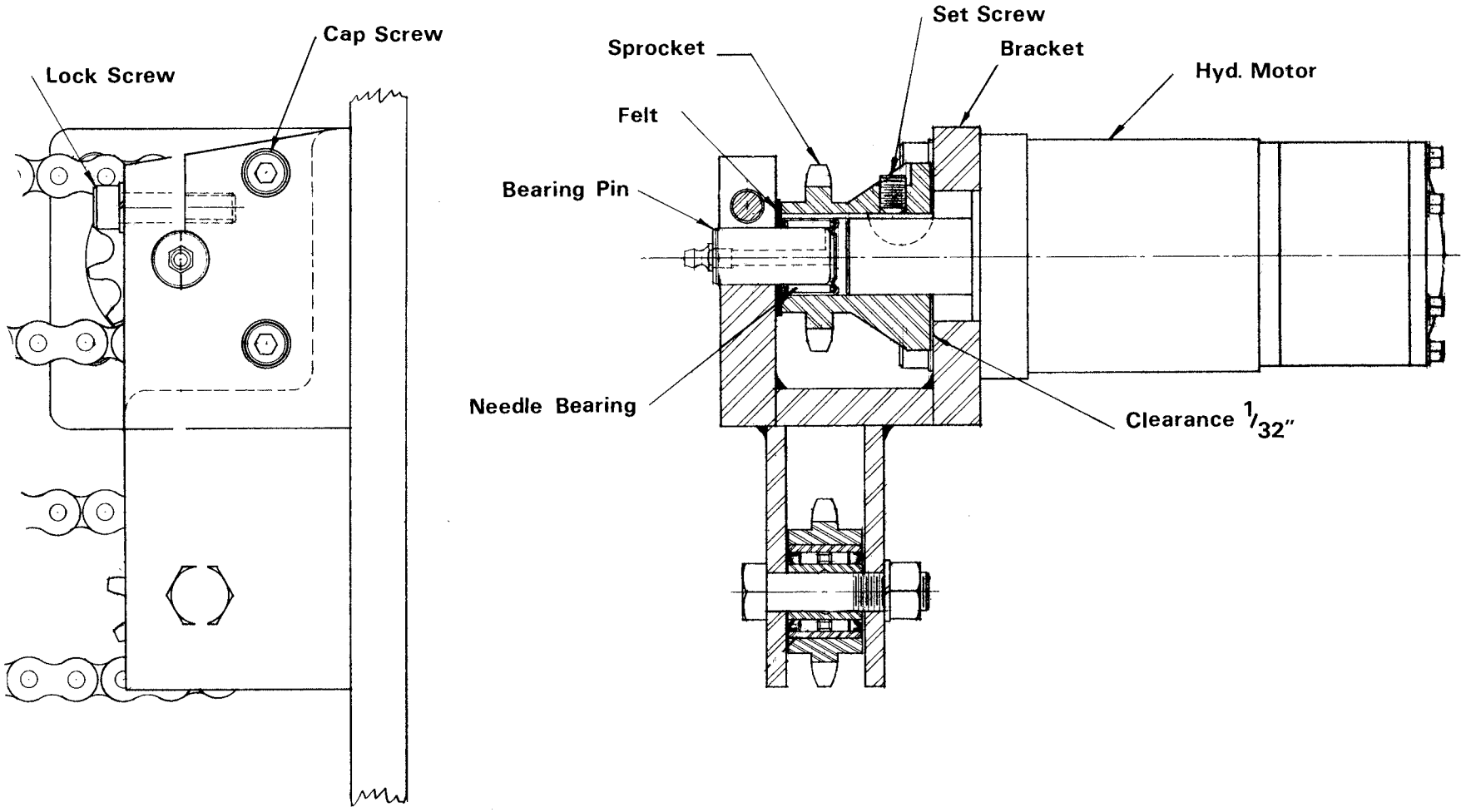
7. Worn cable sheaves. **Remedy:** Replace with new sheaves, Part No. 3001329 (6 required) and Lead Sheave, Part No. 3001042 (1 required at top of leads).

DAMAGE TO STEERING GEAR

Steering gear, or other steering parts. **Remedy:** Adjust steering axle wheel stops so that wheels strike stop screws before steering gear bottoms. Repair or replace defective parts.

REPLACEMENT OF HYDRAULIC HOSE ASSEMBLIES

Refer to Hydraulics Circuits Diagram, **Figure H.** It calls out the part number and routing of each hose in the system. Some of the hoses are low pressure hoses. Do not use them on the pressure system.



Side Shift Motor & Sprocket, Fig. L

SERVICE AND MAINTENANCE

SERVICING OF CREEPER DRIVE TRANSMISSION

1. Length of connecting rod between sub-levers should be so adjusted that sub-levers are parallel to each other.

2. To adjust creeper gear backlash

(a) Remove inspection cover from housing. To increase backlash in gears, turn Link C in the direction of the arrow indicated in **Figure K.** Proper backlash is .005 to .008. To decrease, turn Link C in the opposite direction of the arrow. Loosen lock nuts at either end of link before making adjustments. Refer to **Figure M.** Lubrication chart.

REMOVAL OF CREEPER DRIVE MOTOR

1. Remove sub-lever, Part No. 3001208 and Woodruff key in shaft. Remove Cover F, **Figure K;** and slide cover assembly over drive line towards transmission. Disconnect U-joint assembly at large gear flange yoke. Remove two hydraulic hoses from fluid motor.

NOTE: It is not necessary to drain the hydraulic system when removing the hoses from the creeper motor. Place the creeper control valve in neutral position and the only oil that will be lost is the oil contained in the motor and the short hydraulic hoses. If creeper valve is not in neutral position, the oil will siphon out until the system is drained.

2. Remove pin, Part No. 3001201 from creeper motor mounting bracket. Remove differential pinion gear shaft nut and pull large gear, Part No. 3001198, and yoke, Part No.

Creeper motor and bracket can now be removed from the case.

REMOVAL AND INSTALLATION OF SIDE SHIFT HYDRAULIC MOTOR.

1. **Refer to Figure L,** Side Shift Motor and sprocket assembly.

2. To remove motor, loosen set screw in sprocket. Remove the four socket head cap screws. Hydraulic motor can then be removed from bracket. To remove bearing pin, loosen clamping bracket. To remove bearing pin, loosen clamping lock screw.

3. To install hydraulic motor on mounting bracket, make sure that the mounting face on the flange of the motor is free from paint, dirt, nicks, etc. Also, that the motor mounting base on the bracket is clean, etc. Pack the needle bearing with a good grade of lubricant. Hold sprocket gear and felt in place in bracket housing. Install motor in place and make sure that Woodruff key is in motor shaft and stays in.

4. Insert pin in housing and tap lightly until it is fully in place. Pin will project approximately 3/16" as shown.

5. Tighten socket cap screws with lock screw loose. Pry sprocket away from housing so that there is a clearance space of about 1/32" as indicated. Tighten set screw. Loosen the four socket head set screws one turn and tighten bearing pin clamp bolt. Now retighten socket head cap screws. It is very important that bearing alignment is maintained between the motor mounting bracket and the motor. The above procedure should be followed in order to insure proper alignment.

GUIDE TO LUBRICATION SPECIFICATIONS

Figure M

Engine Oil

Application	Specification	Viscosity
Ford 240 CID	API Class MS Ford Spec. M2C101-B	SAE 30*
Detroit Diesel 353	API CC/SE MIL -L-2104B	SAE 30*
John Deere 4219D	API CD/SD MIL-L-2104C	SAE 30*

*Except for low temperature, SAE 20

HYDRAULIC FLUID

Premium Turbine Grade.
Inhibitors: Anti-wear, oxidation, rust and foam.
195 to 210 SSU @ 100° F.
45 to 50 SSU @ 210° F.
Pour Point — 25° Min.

GEAR LUBRICANT

Multigear EP 90 wt.
MIL -L-2105B

BRAKE FLUID

SAE J1703C

ANTI-FREEZE

Ethylene Glycol base with corrosion inhibitor and anti-foam agent

GREASE

NLGI Grade #2 Lithium Soap Base

HYDRAULIC OIL RECOMMENDATIONS FOR THE ARROW MOBILE HYDRAULIC HAMMER

THE OIL IN A HYDRAULIC SYSTEM SERVES AS THE POWER TRANSMISSION MEDIUM. IT IS ALSO THE SYSTEM'S LUBRICANT AND COOLANT. SELECTION OF THE PROPER OIL IS A REQUIREMENT FOR SATISFACTORY SYSTEM PERFORMANCE AND LIFE.

TWO IMPORTANT FACTORS IN SELECTING AN OIL FOR USE IN MOBILE HYDRAULIC SYSTEMS ARE:

1. ANTIWEAR ADDITIVES — The oil must contain the necessary additives to insure high antiwear characteristics.
2. VISCOSITY — The oil selected must have proper viscosity to maintain an adequate lubricating film at system operating temperature.

SUITABLE TYPES OF OIL FOR USE IN MOBILE HYDRAULIC SYSTEMS ARE:

1. ANTIWEAR TYPE HYDRAULIC OIL — There is no common designation for oils of this type. However, they are produced by all major oil suppliers and provide the antiwear qualities of the above designated crankcase oils.
2. CERTAIN OTHER TYPES OF PETROLEUM OILS are suitable for Mobile hydraulic service if they meet the following provisions:
   (A) Contain the type and content of antiwear additives found in the above designated oils or have passed pump tests similar to those used in developing the antiwear type hydraulic oils.
   (B) Meet the viscosity recommendations shown in the following table.
   (C) Have sufficient chemical stability for Mobile Hydraulic system service.

THE FOLLOWING TABLE SHOWS OIL-VISCOSITY RECOMMENDATIONS FOR USE IN MOBILE HYDRAULIC SYSTEMS:

HYDRAULIC SYSTEM OPERATING TEMPERATURE RANGE (MIN.* TO MAX.)		DESIGNATION VISCOSITY SAE
***		5W
-10° F. to 130° F.	(-23° C. to 54° C.)	5W-20
		5W-30
0° F. to 180° F.	(-18° C. to 83° C.)	10W
0° F. to 210° F.	(18° C. to 99° C.)	10W-30**
50° F. to 210° F.	(10° C. to 99° C.)	20-20W

*Ambient Start-Up Temperature
**See Paragraph on Viscosity Index
***See Paragraph on Artic Conditions

OPERATING TEMPERATURES—The temperatures shown in table are cold start-up to maximum operating. Suitable start-up procedures must be followed to insure adequate lubrication during system warm-up.

ARTIC CONDITIONS—Artic conditions represent a specialized field when extensive use is made of heating equipment before starting. If necessary this and judicious use of the following recommendations may be used.

1. SAE 5W or SAE 5W-20 oil, in line with the viscosity guidelines shown in the table.
2. Oils especially developed for use in artic conditions such as synthetic hydrocarbons, esters, or mixtures of the two.
3. Dilution of SAE 10W oil with kerosene or low temperature diesel fuel is not permissible. Kerosene and diesel fuel are not sufficiently refined for use in hydraulic systems. Their use will cause premature wear to the pump and will damage the seals.

During cold start-up, avoid high speed operation of hydraulic system components until the system is warmed up to provide adequate lubrication.

HYDRAULIC OIL RECOMMENDATIONS FOR THE ARROW MOBILE HYDRAULIC HAMMER

Operating temperature should be closely monitored to avoid exceeding a temperature of 130° F. (54°C.) with any of these light weight or diluted oils.

OTHER FACTORS IN SELECTING AN OIL ARE:

1. VISCOSITY — Viscosity is the measure of fluidity. In addition to dynamic lubricating properties, oil must have sufficient body to provide adequate sealing effect between working parts of pumps, valves, cylinders and motors, but not enough to cause pump cavitation or sluggish valve action. Optimum operating viscosity of the oil should be between 195 to 210 @ 100°F. and 45 to 50 SSU @ 210°F. Four Point -25°F. Min.
2. VISCOSITY INDEX — Viscosity index reflects the way viscosity changes with temperature. The smaller the viscosity change, the higher the viscosity index. The viscosity index of hydraulic system oil should not be less than 90. Multiple viscosity oils, such as SAE-10W-30, incorporate additives to improve viscosity index (polymer thickened). Oils of this type generally exhibit both temporary and permanent decrease in viscosity due to the oil shear encountered in the operating hydraulic system. The actual viscosity can, therefore, be far less in the operating hydraulic system than what is shown in normal oil data. Accordingly, when such oils are selected, it is desirable to use those with high shear stability to insure that viscosity remains within recommended limits.
3. ADDITIVES — Research has developed a number of additive agents which materially improve various characteristics of oil for hydraulic systems. These additives are selected to reduce wear, increase chemical stability, inhibit corrosion and depress the pour point. The most desirable oils for hydraulic service contain higher amounts of antiwear compounding.
4. CHEMICAL STABILITY—Oxidative and thermal stability are essential characteristics of oils for Mobile Hydraulic systems. The combination of base stocks and additives should be stable during the expected lifetime of the oil when exposed to the environment of these systems.

SPECIAL REQUIREMENTS

Where special considerations indicate a need to depart from the recommended oils or operating conditions, see your Arrow representative.

CLEANLINESS

Thorough precautions should always be observed to insure that the hydraulic system is clean, during assembly and start-up after overhaul or servicing.

A. Clean (flush) entire system to remove paint, metal chips, welding spatter, etc.
B. Filter each change of oil to prevent introduction of contaminant into the system.
C. Maintain continuous oil filtration to remove sludge and products of wear and corrosion
D. During usage, proper oil filling and servicing of filters, breathers, reservoirs, etc. generated during the life of the system. cannot be over emphasized.

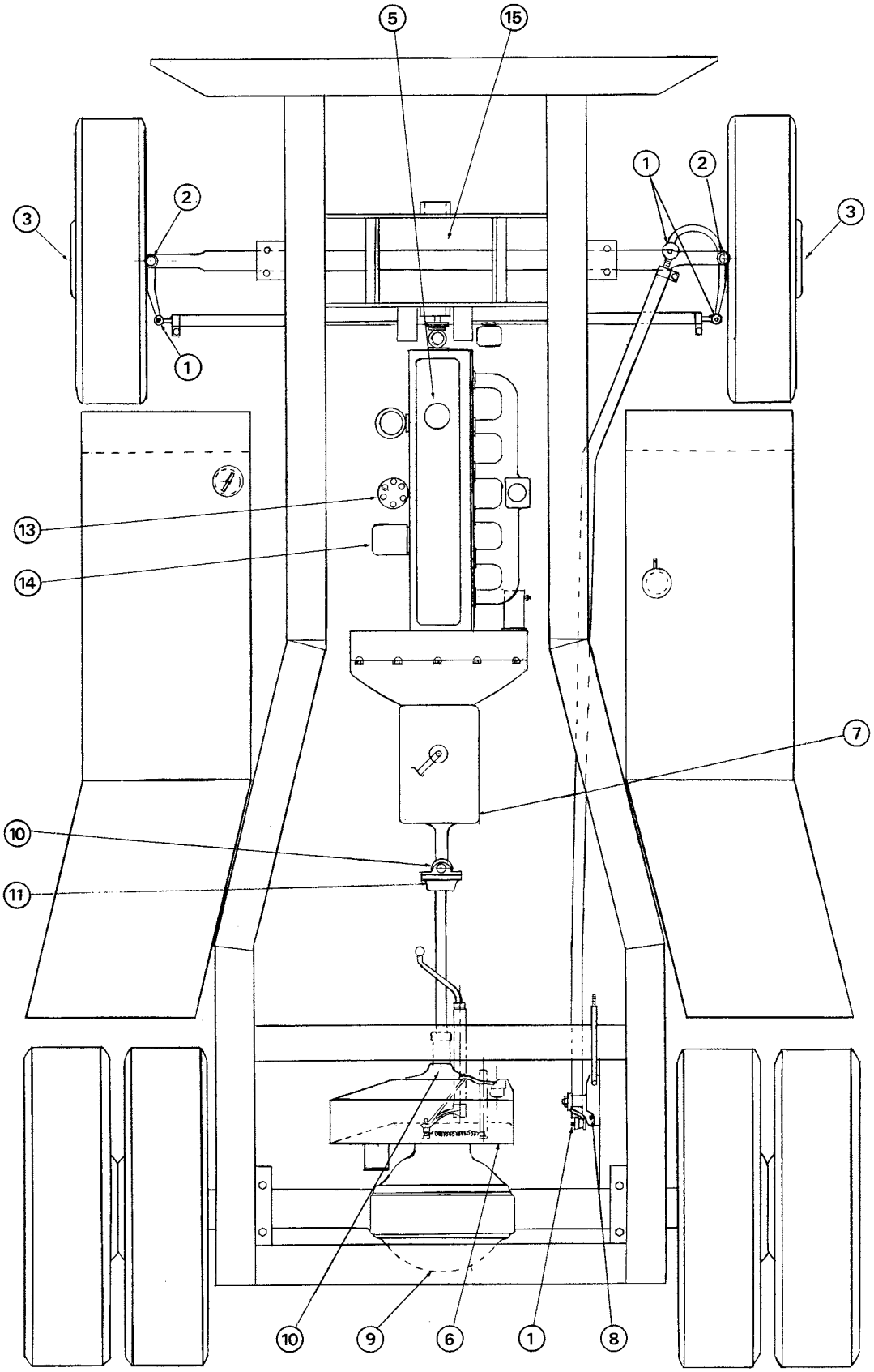
HAMMER LUBE CHART

	Item	Lubricant	Quantity	Period	Type of Fitting
1	Hydraulic Oil Filter	Replace filter cartridge after 1st 50 hours of operation, then every 250 hours.			
2	Engine Coolant	Refer to Manufacturers Service Book.			
3	Engine Fuel Tank	Keep full to prevent water condensation in tank. Clean out vent hole.			
4	Cable Sheave Pins	Multi-purpose Grease (CL)	one shot	8 hrs.	Alemite hydraulic
5	Automatic Pilot Valve Cam Follower Bearing	Multi-purpose grease (CL)	one shot	8 hrs.	Alemite hydraulic
6	Lead Tilt Bearing	Multi-purpose grease (CL)	three shots	125 hrs.	Alemite hydraulic
7	Lead Tilt Pin	Multi-purpose grease (CL)	three shots	125 hrs.	Alemite hydraulic
8	Idler Sprocket Bearings	Lubriplate 630-A or equal	hand packed	125 hrs.	

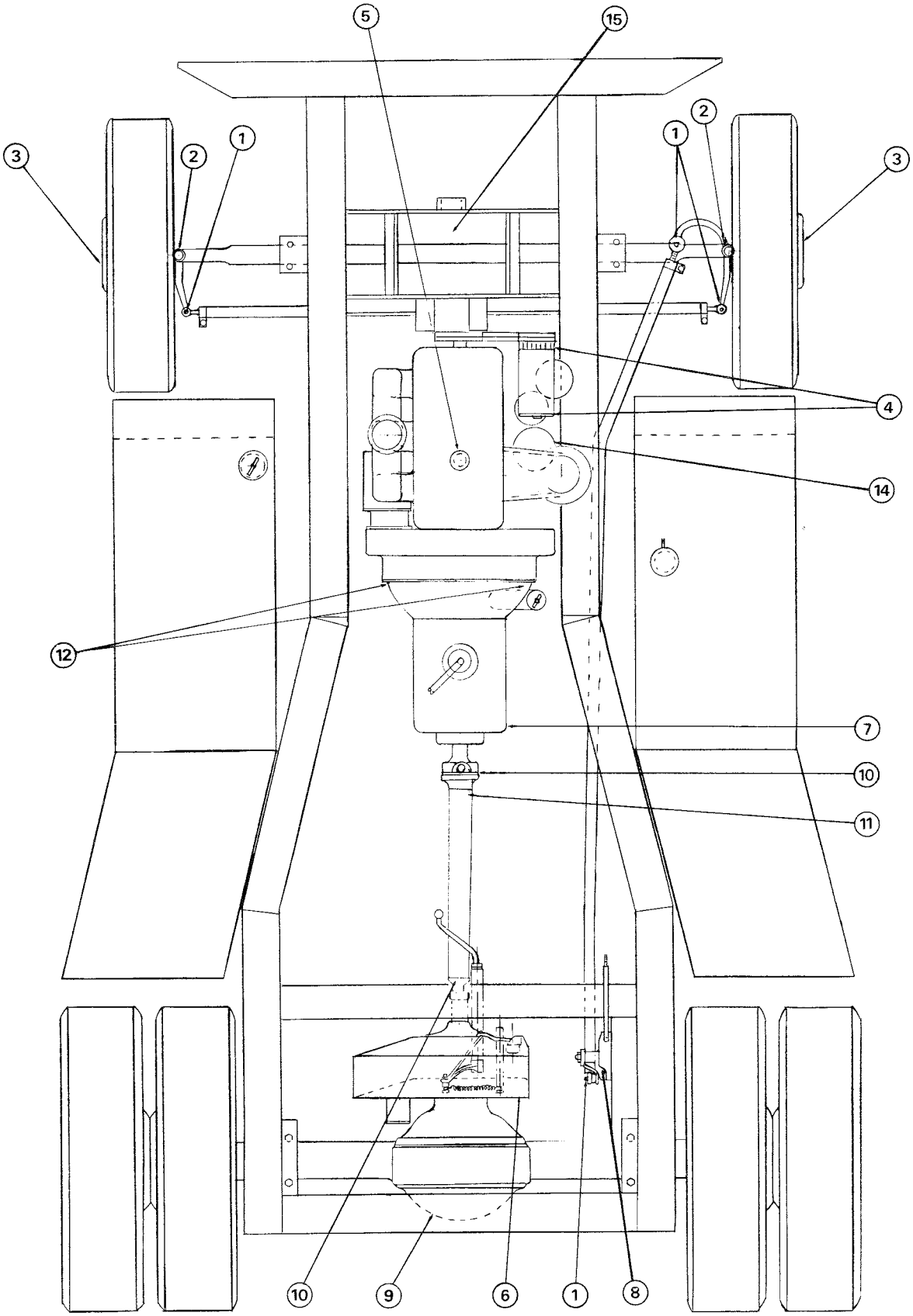
CHASSIS & ENGINE LUBE CHART **See FIG. P**

1	Ball & Socket Joint, Steering	Multi-purpose grease (CL)	one shot	125 hrs.	Alemite hydraulic
2	King, pin, Steering	Multi-purpose grease (CL)	one shot	125 hrs.	Alemite hydraulic
3	Bearing, Front Wheel	Multi-purpose grease (CL)	Clean & repack	500 hrs.	
4	Bearing, Generator	SAE 20 Wt. Engine Oil	eight to ten drops	125 hrs.	Oil cup
5	Ventilator & Refill Cap, Engine Crankcase	Wash in solvent		200 hrs.	
6	Shift Pin, Creeper gear	Multi-purpose grease (CL)	one shot	125 hrs.	Alemite hydraulic
7	Transmission	Universal 90 Gear Lube	Check level Drain & refill	125 hrs. 1000 hrs.	Pipe plug
8	Housing, Steering Gear	Universal 90 Gear Lube	Check level	125 hrs.	Pipe plug
9	Housing, Differential	Universal 90 Gear Lube	Check level Drain & refill	125 hrs. 1000 hrs.	Pipe plug
10	Universal Joint	Multi-purpose grease (CL)	one shot	125 hrs.	Alemite hydraulic
11	Spline, Slip Joint	Multi-purpose grease (CL)	one shot	125 hrs.	Alemite hydraulic
12	Shaft, Clutch Throw-Out	High Temperature Grease	one shot	125 hrs.	Alemite hydraulic
13	Cam, Distributor	Refer to Manufacturers Service Book.			
14	Oil Filter, Engine	Drain & replace element		200 hrs.	
15	Pivot Pin, Front Axle	Multi-purpose grease (CL)	two shots	125 hrs.	Alemite hydraulic

CL — Chassis Lube

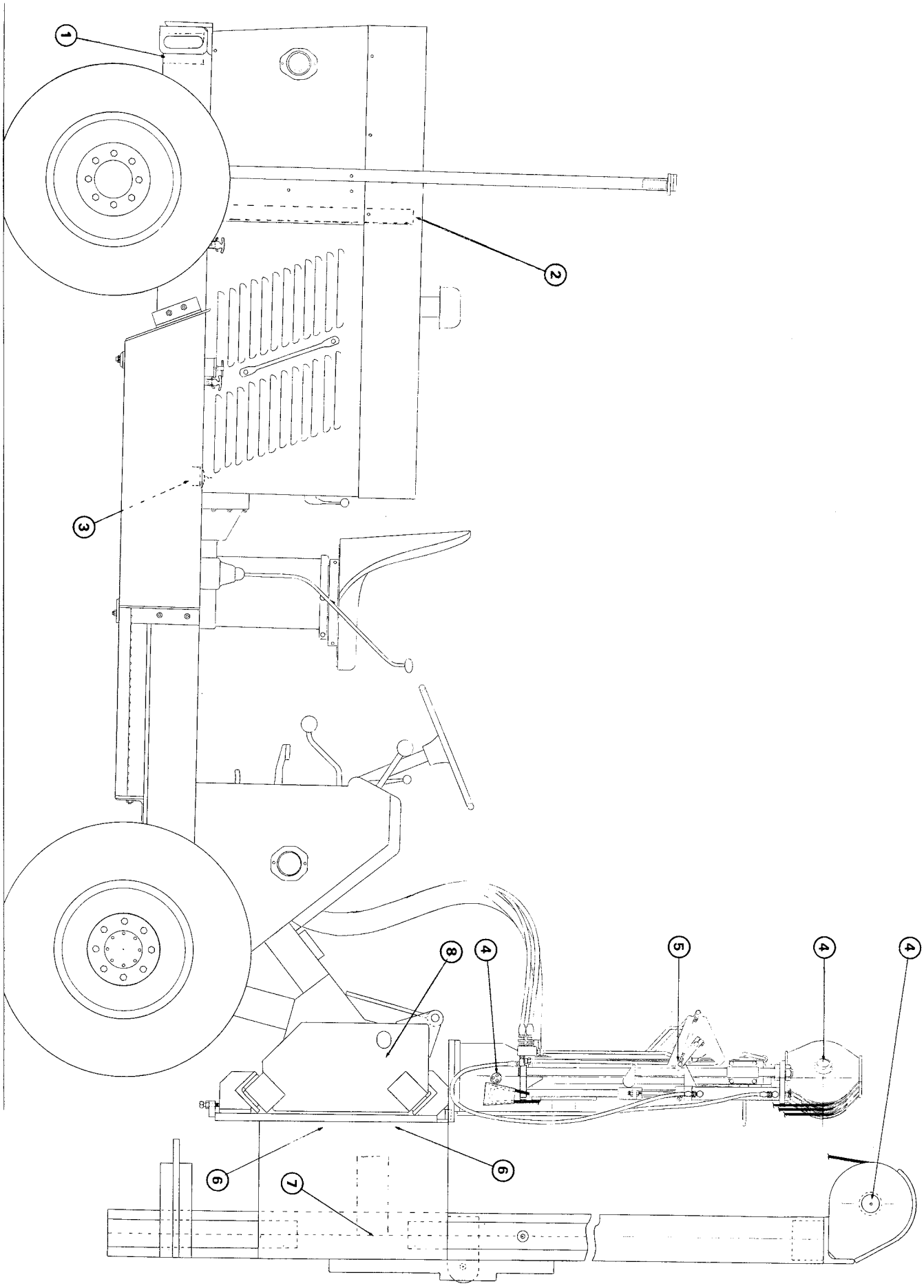


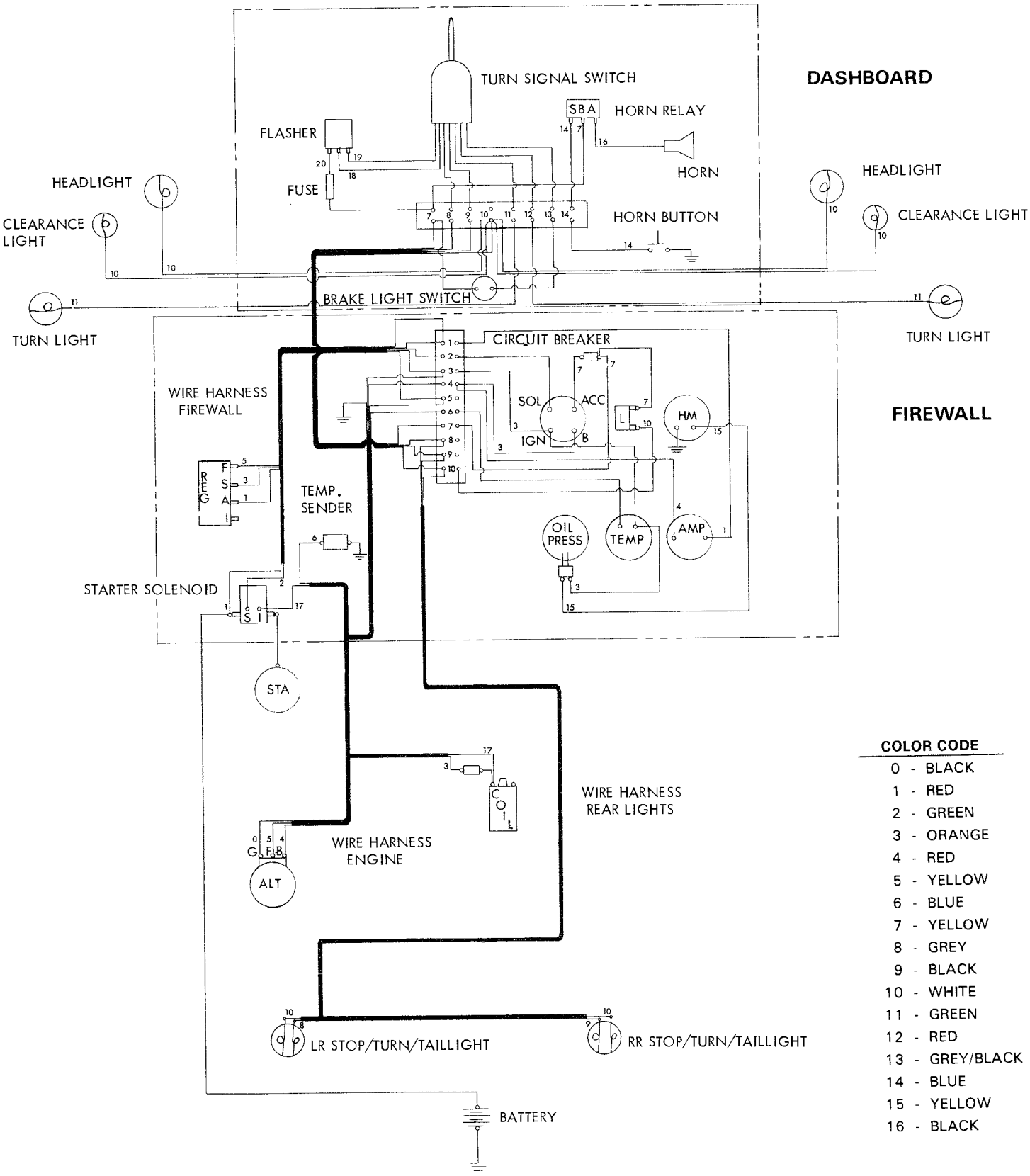
CHASSIS, ENGINE LUBE GUIDE
HG 1250 FIG. N



CHASSIS, ENGINE LUBE CHART
HJ 1250, HD 1250 FIG. O

HAMMER LUBE CHART FIG. P





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13 - GREY/BLACK
14 - BLUE
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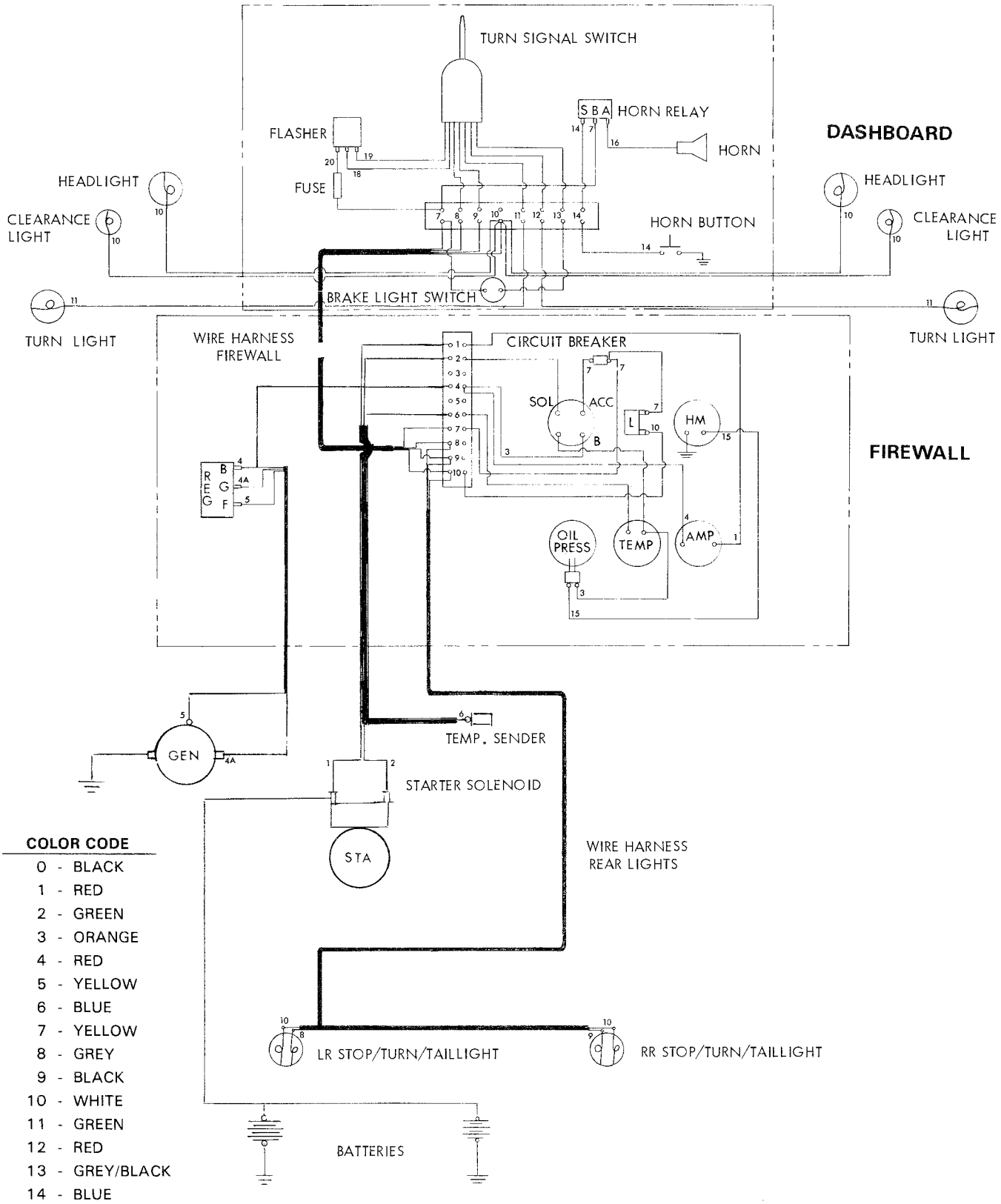
16 - BLACK

ELECTRICAL CIRCUITS HG 1250
FIG. R



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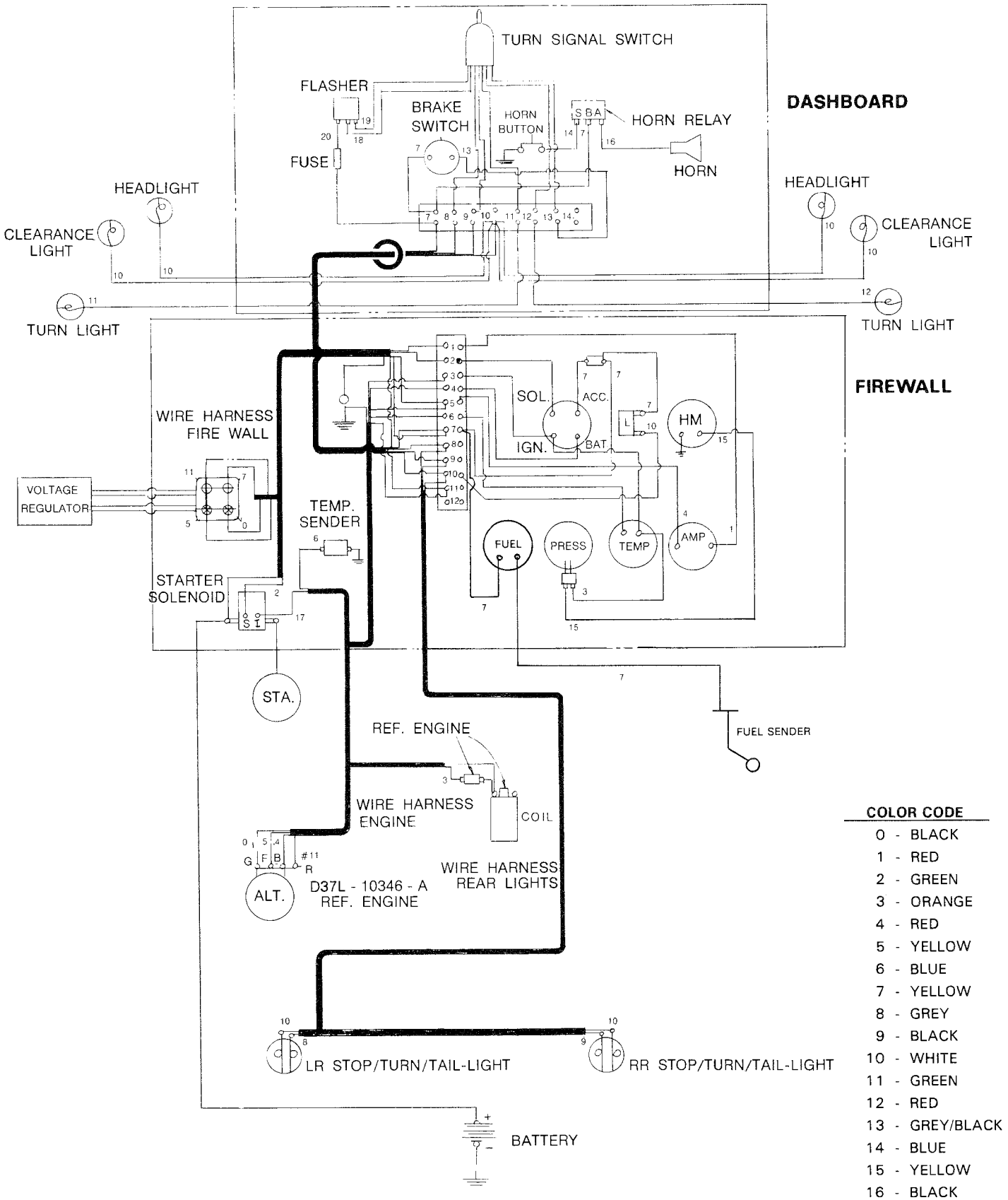
ELECTRICAL CIRCUITS HD1250
FIG. S



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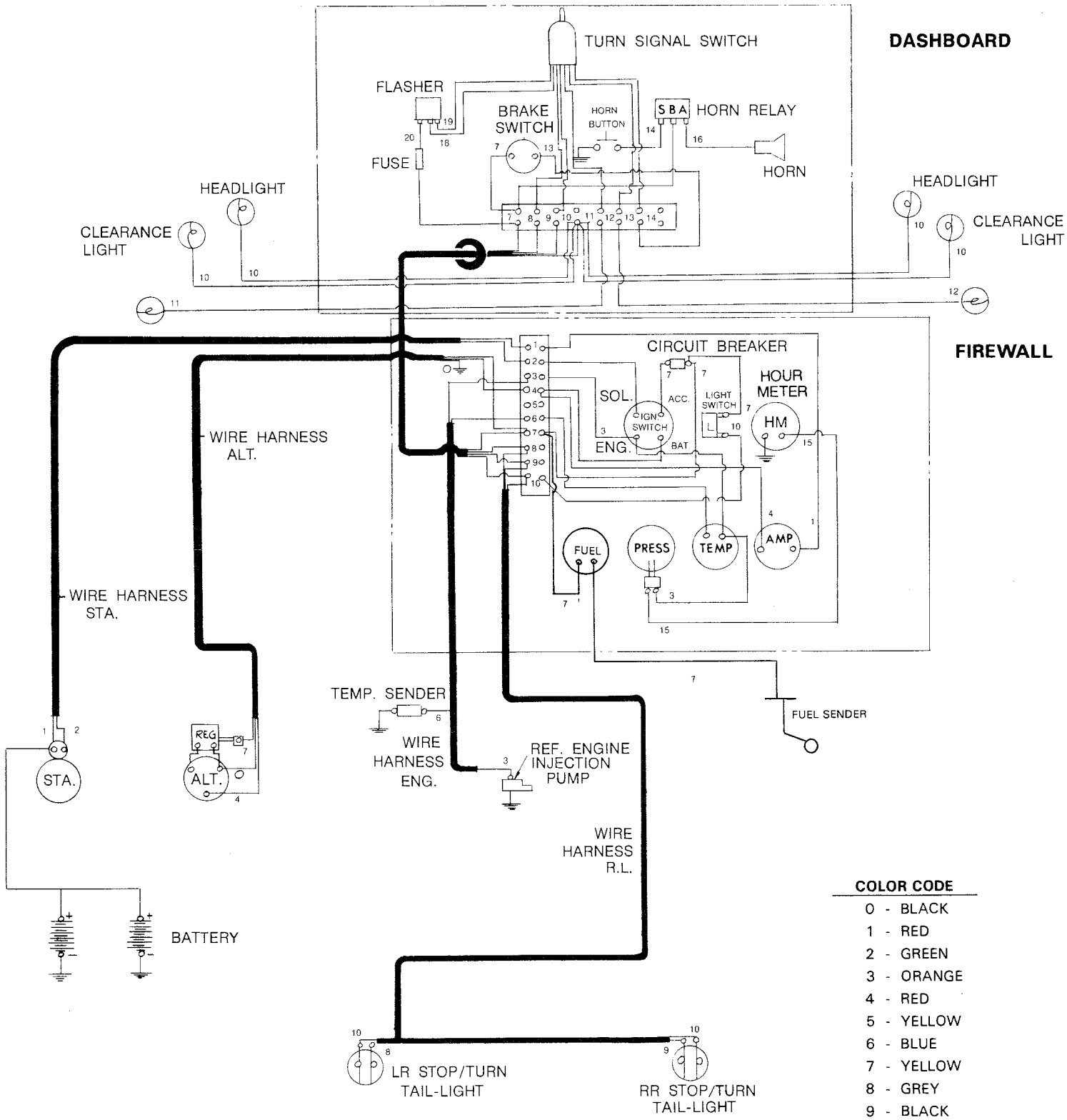
15 - YELLOW
16 - BLACK

ELECTRICAL CIRCUIT FOR HG1250
WITH TRANSISTORIZED VOLTAGE REGULATOR
FIG. T.



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7 - YELLOW
8 - GREY
9 - BLACK
10 - WHITE
11 - GREEN
12 - RED
13 - GREY/BLACK
14 - BLUE
15 - YELLOW
16 - BLACK

ELECTRICAL CIRCUIT FOR HJ1250

FIG. U

ADDENDUM

ELECTRONIC STROKE CONTROL

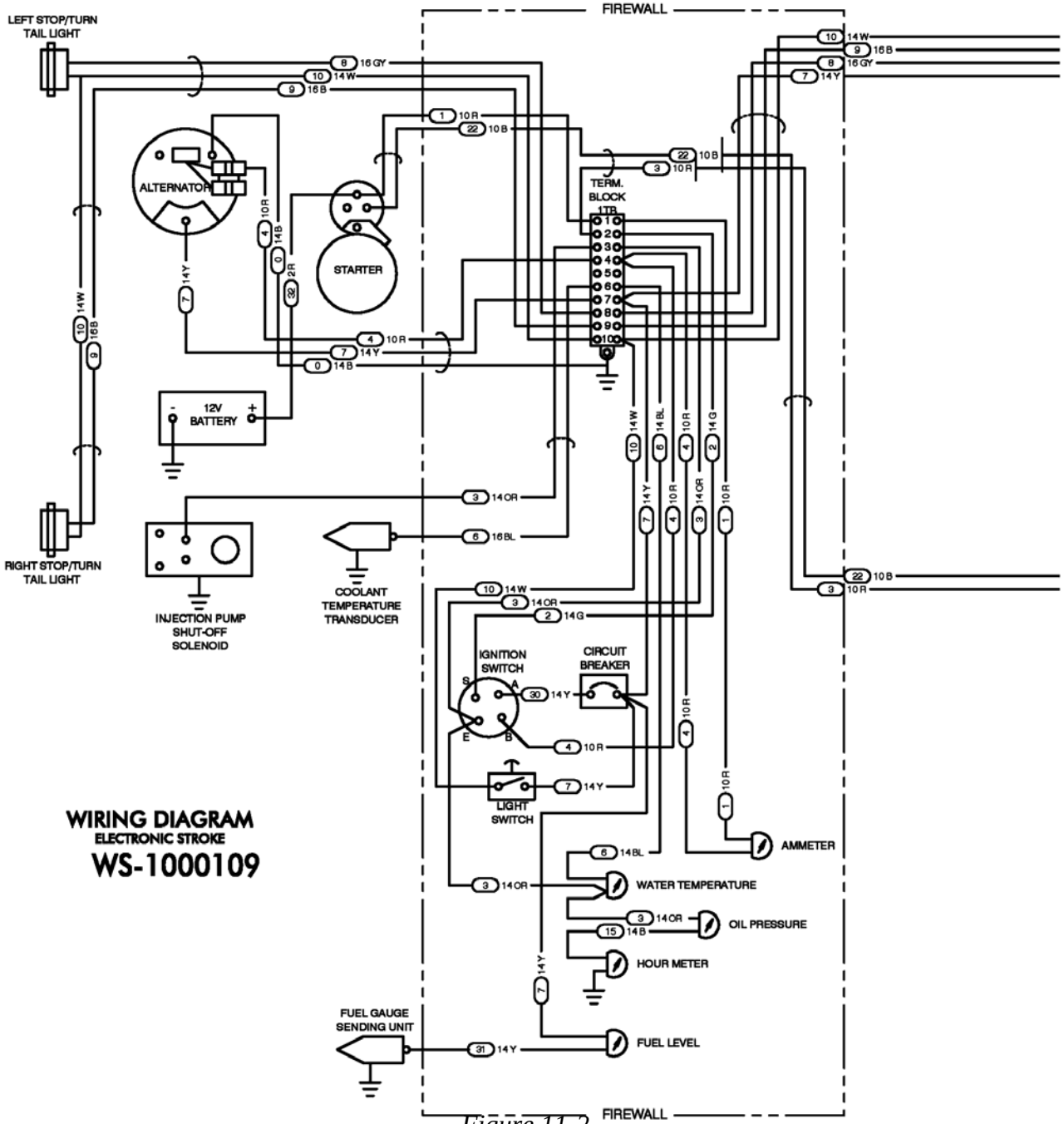
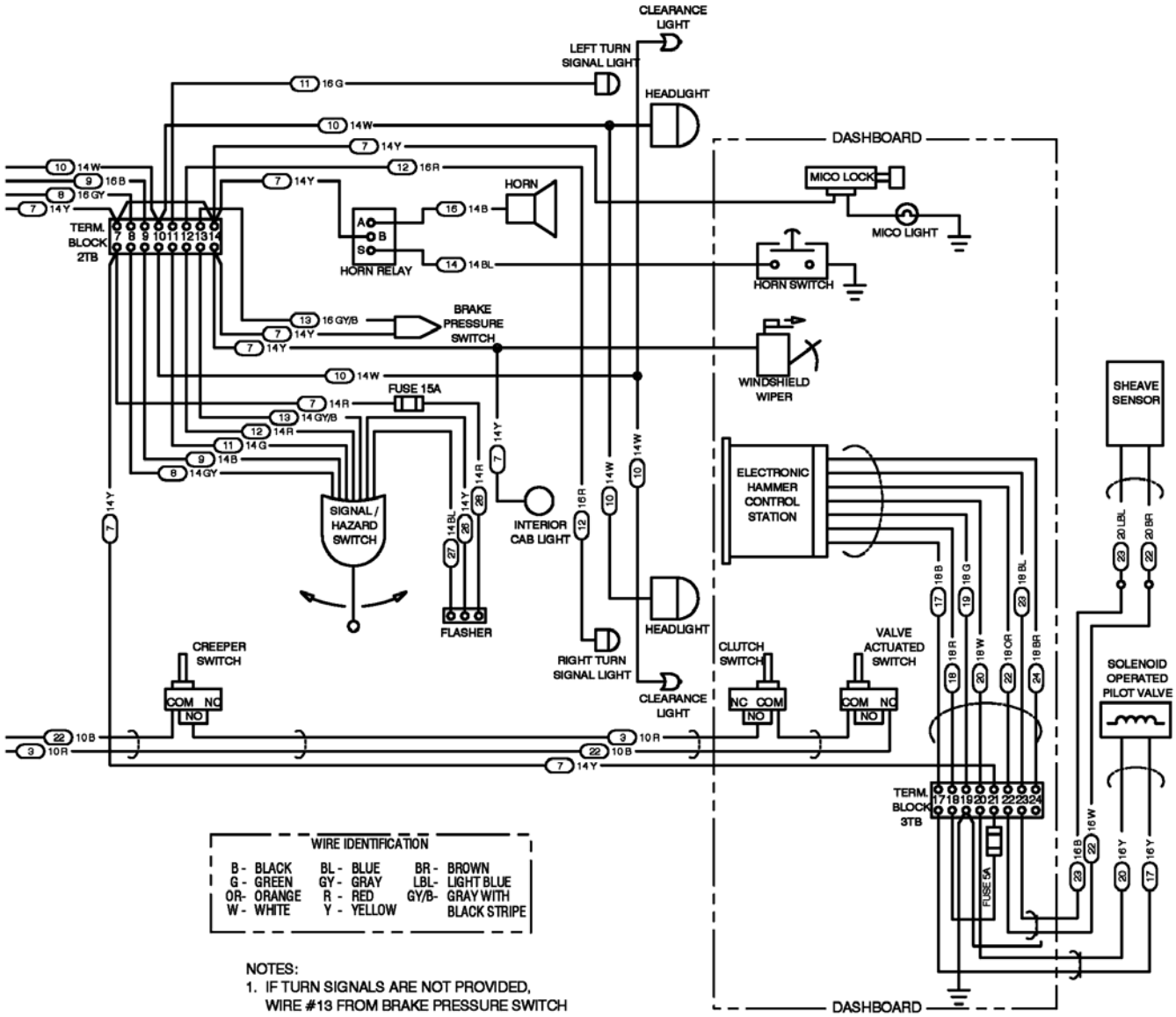


Figure 11-2
Electrical Diagram
Firewall Mounted Gauges



NOTES:

1. IF TURN SIGNALS ARE NOT PROVIDED, WIRE #13 FROM BRAKE PRESSURE SWITCH IS CONNECTED TO TERMINAL 9 ON THE TERMINAL BLOCK. TERMINALS 8 & 9 ARE ALSO JUMPERED TOGETHER.
2. FOR SHUTDOWN GAUGE SET WIRING SEE 7000169.
3. FIRST USED ON S/N 6300 - 6909

WIRING DIAGRAM
ELECTRONIC STROKE
WS-1000109

Table 12-1
General Trouble Shooting - (cont'd.)

PROBLEM	**POSSIBLE CAUSE**	**REMEDY**
When raising the weight, the weight settles before starting upward.	Worn or defective check valve. Defective relief valve seat.	Repair or replace entire check valve. Seal or replace.
Hammer weight sticks in the UP position.	Broken spring on pilot valve. Defective pilot valve. Upstroke trip finger is not actuating the lever on the pilot valve (mechanical stroke and cable adjust models).	Replace spring. Replace pilot valve. Reset trip finger position or adjust cable length.
Erratic Strokes. Premature reversals both up and down.	Loose electrical connection. Defective valve switch.	Check and tighten loose connections. Replace valve switch.
Excessive stroke (hammer weight hits the cross member on the lead).	Improper cable length. Stroke length set too high (mechanical stroke and cable adjust models). Engine speed set to high.	Adjust cable length. Reset trip finger position or adjust cable length. Reset engine speed.
Weight fails to raise after the tool strikes the ground.	Trip fingers improperly set (mechanical stroke and cable adjust models). Stroke length set too short (mechanical stroke and cable adjust models).	Reset trip fingers. Adjust stroke length.

ELECTRONIC STROKE CONTROL TROUBLE SHOOTING

Refer to Table 12-2

General

A correctly operating stroke-control system is evidenced by a repetitive stroke length, independent of terrain. Having set the stroke length, there should be no further requirement to change it. The hammer should be able to operate as long as necessary, without making further adjustments. It should be clearly understood that the stroke-length adjustment knob sets the total stroke length, not the height to which the hammer rises on the lead. The controller references stroke length from the striking point of the tool. Obviously, if the tool is striking 3 feet below the road level, the high point on the lead will be 3 feet lower than if the tool is striking at road level.

Sensor Problems

If the hammer is operating within the stroke capability, there should be no cable "snatching". Cable "snatching" usually indicates a problem with the proximity sensor or its associated cable. If the cable is "snatched" infrequently, the proximity sensor is probably set too far from the sheave. Setting the sensor 1/32" closer to the sheave will probably cure the problem. If the cable is "snatched" frequently, or if the hammer weight has a tendency to crawl up the lead on short strokes, the sensor or its associated cable is faulty. The system has no ground reference without a sensor, so the timer free-runs. In other words, the controller doesn't know where the hammer weight is. The sensor and its cable can be checked most conveniently at the sensor itself. Following are a List of Checks:

- Mark the adjustment on the threads of sensor for convenient replacement, and remove the sensor.
- Check the end of the sensor for damage. If the sheave hits or rubs the end of the sensor, it's probably ruined and must be replaced.
- Check the sheave for excessive side play - (1/32" maximum side play.)

Replacing the Sensor

Pay attention to wire colors - the sensor won't work if the lead are reversed. Set the sensor at the proper spacing. The end of the sensor should clear the sheave by 1/8 inch. Refer to the "Adjustments" section of this manual.

Voltage Check

If the sensor appears to be physically sound, make the following electrical checks before replacing the sensor. *Note: Do not disconnect the sensor lead.*

1. Check the blue sensor with respect to ground. Move the sensor to and from metal. There should be a definite meter movement from approximately 0.8 volts when away from the metal, to less than 0.1 volts when the sensor is very near, or touching metal.
2. If the sensor doesn't react as described above, open the blue sensor lead from the black cable lead and make a continuity check of the black lead with respect to ground. The black lead should measure 100 ohms with respect to ground. If it reads 0 ohms, the black lead is shorted somewhere. If it reads open, the black lead is open somewhere in the cable. If the cable lead are ok according to the above checks, the sensor is bad.
3. If a cable problem is indicated, remove the cowling over the controls for access to the terminal strip. Locate wire numbers 23 and 24 (refer to the Electrical Diagram, Figure 11-2). Remove the white and black cable lead going up to the sensor.4.Check for a short to ground on either lead going to the sensor. Both lead should read open with respect to ground. Check wire 23, or the terminal block. It should read 8 volts ± 0.2 volts. Check the continuity of wire 24 going back to the timer. It should read 100 ohms. An open in the sensor cable can be checked out by connecting the white and black wires together at the sensor end and reading continuity at the terminal strip end.

Table 12-2
Electronic Stroke Control Trouble Shooting

PROBLEM	POSSIBLE CAUSE	REMEDY
Electronic Control Station power lamp does not turn ON (power lamp does not light).	Power switch turned "OFF".	Turn power switch to "ON".
	Power lamp is defective.	Check and replace bulb.
	Loose electrical connection, broken wire, or blown fuse.	Check all connections. Check and replace fuse.
	Defective valve switch.	Eliminate switch. Consult factory for rewiring procedure.
	Defective Electronic Control Station.	Replace Electronic Control Station.
Erratic stroke at all settings of the Electronic Control Station.	Defective or improperly adjusted sheave sensor.	Check the sensor lead and connections. Replace defective sheave sensor. Check adjustment and make sure sensor is positioned 1/8" from the sheave spokes.
	Disconnected or defective sensor cable	Check all cable connections. Test sensor cable for broken wires and replace if necessary.
	Excessive side play of the lead sheave.	Shim the lead sheave as necessary to reduce sideplay. Badly worn lead sheaves must be replaced.
	Lead sheave not properly installed.	Check and make sure the casting letters on the lead sheave are positioned on the side opposite to the sheave sensor. Remove the lead sheave and reinstall properly.
	Defective or improperly adjusted safety switch on the automatic valve.	Eliminate switch. Consult factory for rewiring procedure.
	Loose electrical connection.	Check and tighten loose connections.
	Defective or improper wiring connection.	Consult factory for rewiring procedure.
	Defective Electronic Control Station.	Replace Electronic Control Station.
Pressure settings correct. Servo on the hammer valve is not shifting properly.	Defective solenoid valve	Replace solenoid valve
	Solenoid valve filter is plugged.	Replace solenoid valve filter.
Hammer weight sticks in the UP position. Solenoid valve has power.	Defective solenoid valve.	Replace defective solenoid valve.
	Solenoid-valve spool sticking.	Disassemble and clean solenoid valve.
Weight does not immediately raise after the tool strikes the ground (excessive dwell time).	Defective Electronic Control Station.	Replace Electronic Control Station.

Table 12-2
Electronic Stroke Control Trouble Shooting - (cont'd.)

PROBLEM	POSSIBLE CAUSE	REMEDY
Excessive stroke (hammer weight hits the cross member on the lead).	Improper cable length. Stroke length set too high. Engine speed set to high. Defective Electronic Control Station.	Adjust cable length. Stroke is approximately 8' at maximum setting on the stroke control dial. If a very long tool is used, there may not be enough stroke available. Set the stroke control dial to a lower value. Reset engine speed. Replace Electronic Control Station.
Weight fails to raise after the tool strikes the ground.	Improper connection or defective Electronic Control Station. Sheave sensor out of adjustment. Defective sensor or sensor cable. Stroke length set too short.	Check cable for proper connection. Replace defective Electronic Control Station. Adjust sensor. See "Adjustments" section. Check and replace sensor and/or cable. Adjust stroke length.
Hammer reverses before the downstroke is completed.	Sheave sensor out of adjustment. Defective sensor or sensor cable. Improper connection or defective Electronic Control Station.	Adjust sensor. See "Adjustments" section. Check and replace sensor and/or cable. Check cable for proper connection. Replace defective Electronic Control Station.
Short Strokes.	Defective Electronic Control Station.	Replace Electronic Control Station.
Hammer not getting full stroke. Pressure settings correct.	Engine rpm too low.	Increase engine rpm with the engine speed control hand throttle.

Additional notes:

1. Low pilot pressure is usually indicated by premature reversals during side shift operation. If the pilot pressure is low, the side shift operation lowers it below critical levels, causing the hammer valve to shift prematurely.

2. The pilot valve spool can stick, or the seals on the spool can fail. If the Electronic Control Station is supplying the voltage to the solenoid valve (as measured across the solenoid coil), but the hammer weight is not reversing, a bad pilot valve is indicated. If, with the engine turned "OFF" and the Electronic Control Station cycling, a clicking sound is heard from the pilot valve, the solenoid is operating but the spool is defective.

Solenoid Valve

The most common failure of a pilot valve is a sticky spool, usually caused by dirt in the system. If the spool sticks, the hammer valve receives no pilot signal. As a result, the hammer goes either to the top of the lead and stays, or goes to the bottom of the lead and won't lift. If this condition occurs, turn on the Electronic Control Station and allow it to free run (engine off). Observe the up/down lamps to assure the Electronic Control Station is cycling. Audible checks should be heard each time the timer switches from up to down and visa versa. If the checks are not heard, the valve spool is sticking and should be either repaired or replaced.

Note that in-line filters should be found with every solenoid pilot valve.

Valve Switch

On older Arrow hammers, the automatic valve has a power-shutoff switch mounted on the valve body. The switch can get out of adjustment, causing intermittent power loss to the Electronic Control Station. The result is an abrupt stop of the hammer weight. That action will be accompanied by blinking of the power on lamp on the Electronic Control Station. The switch can get so far out of adjustment that it cuts the power completely, in which case, the entire electronic stroke control system will be dead. Check the switch out, if it is suspect. Adjust the switch so that it properly follows the manual control-valve handle.

Electronic Control Station

The Electronic Control Station can fail in a way that can cause all of the above malfunctions. The easiest way to check the Electronic Control Station is to replace the suspected unit with a known good one. If the problem is corrected, the suspected unit is bad. Return it to the factory for repair. If replacement of the Electronic Control Station is not possible, check out the following features:

- **Power lamp (red)** - The red lamp should be on when the unit is turned on. If the lift lamp (yellow) is blinking properly with the free-running timer, and the power lamp is not lit, the power lamp is probably burned out and should be replaced.

  Note that a burned out bulb does not affect the operation of the unit.

- **Lift lamp (yellow)** - Switching of this lamp (blinking on and off) should be accompanied by the clicking sound of the solenoid pilot valve as it is actuated. If the lift lamp does not blink while the solenoid pilot valve is cycling, the bulb is probably burned out.
  Note that a burned out bulb does not affect the operation of the unit.

- **Valve Driver Transistor Switch** - If the solenoid pilot valve doesn't click, but the lights blink in synch with the free-running timer, the valve driver transistor may be bad. Check the voltage at the solenoid pilot valve and at terminal 20 on the terminal board. The voltage should swing between 12 volts and approximately 0 volts in synch with the lift lamp. If the voltage cycles as described, the solenoid valve coil may be burned out - check the coil for continuity. If the voltage doesn't cycle as described, the transistor switch in the Electronic Control Station is probably bad. Before replacing either the Electronic Control Station or the solenoid valve, visually inspected the wiring between the solenoid valve and Electronic Control Station. Be sure that all connectors and terminals on the terminal block are tight.

Stroke Length Control

The stroke length is adjustable by means of the control knob on the front face of the Electronic Control Station. The stroke length should be at the maximum when the knob is set to the no. 8 on the dial. The stroke shortens proportionately as the knob is rotated counter-clockwise. The stroke is adjustable to any desired length between maximum and minimum stroke. Minimum stroke should be approximately one foot. If stroke control can't be achieved, the Electronic Control Station is bad and should be replaced.

Governor Setting

If the governor speed is too far off from 2200 rpm, the stroke length will vary from the 8 ft. maximum stroke normally expected. The Electronic Control Station times the up stroke. Therefore, if the engine runs faster than 2200 rpm - causing more oil to be pumped - the stroke length will be increased for any given setting of the stroke-length control knob. Conversely, the stroke length will be decreased if the engine runs slower than 2200 rpm.

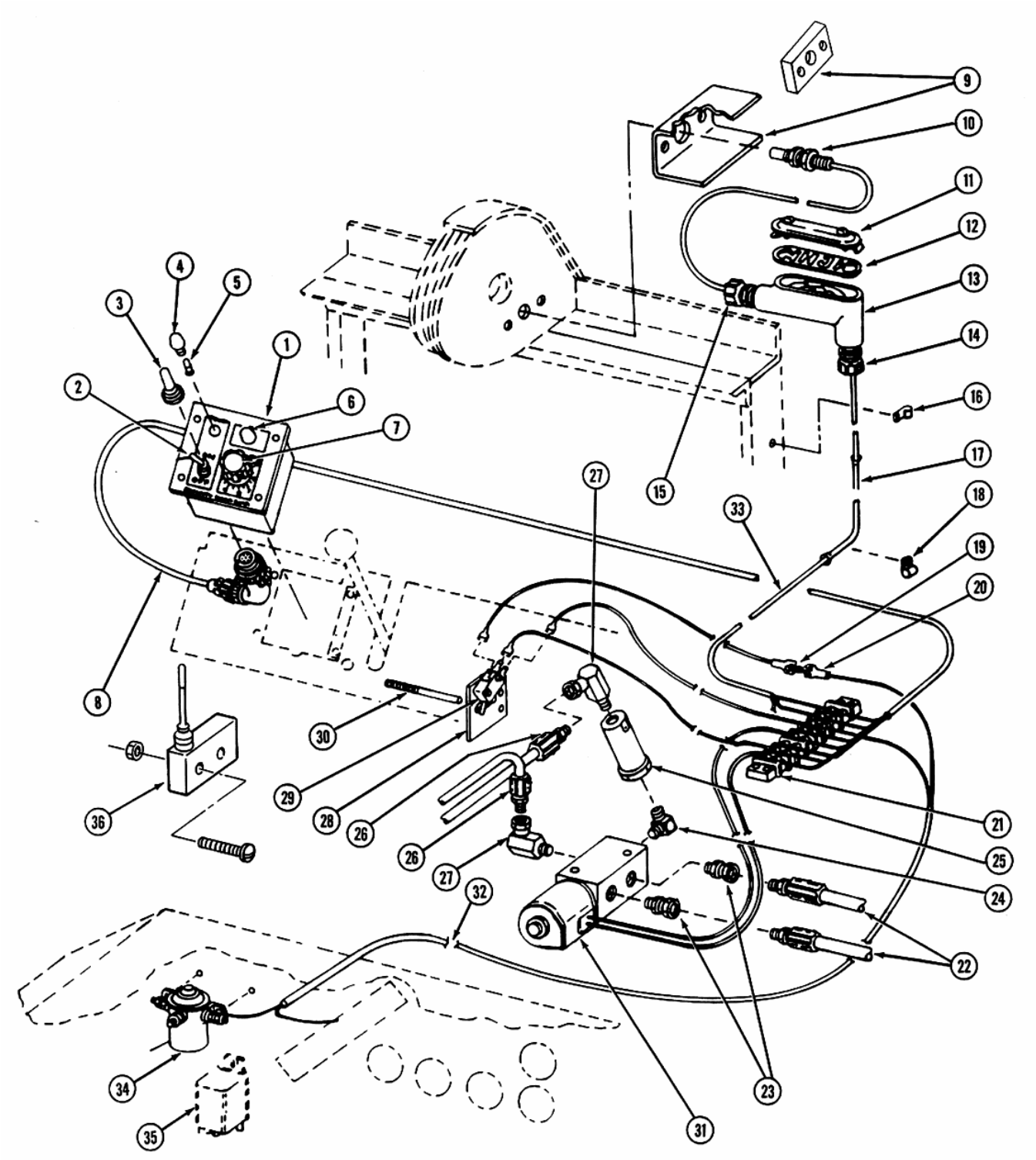


Figure 12-1
Electronic Stroke Control

Electronic Stroke Control

Item	Part Number	Description
1	2000608	Controller
2	4001852	Toggle Switch
3	4001853	Boot
4	4001724	Red Lens
5	4001723	Lamp (2)
6	4001725	Amber Lens
7	4001721	Knob
8	2000609	Control Cable
9	3001827	14mm Sensor Bracket (1982-87)
	3002003	18mm Sensor Bracket (1987- . . .)
10	. . . . .	
	4001890	18mm Sensor w/Nuts (1987- . . .)
11	4001791	Cover
12	4001790	Gasket
13	4001789	Conduit Body
14	4001788	Cord Grip
15	4001782	Cord Grip
16	4000584	J-Clip (4)
17	3001895	Conduit
18	4000686	Clamp (2)
19	4001779	5-Amp Fuse
20	4001778	Fuse Holder
21	4001234	Terminal Block
22	4001421	3/8" x 30" Hose (2)
23	4001296	1/4" x 3/8" Swivel (2)
24	4001891	Male Elbow
25	4001812	Oil Filter
26	4001306	3/8" x 40" Hose (2)
27	4001806	1/4" x 3/8" 90°- Swivel
28	3001887	Switch Bracket (Thru S/N: 6021)
	3002161	Switch Bracket (S/N: 6022 - 6299)
29	4001786	Valve Switch (Thru S/N: 6021)
	4002081	Valve Switch (S/N: 6022 - 6299)
30	3001858	Actuating Rod (Thru S/N: 6021)
31	4001805	Solenoid Valve
32	2000626	Relay Wiring Harness
33	2000625	Shielded Cable
34	4001849	Solenoid (Discontinued 1995)
35	4001722	Solenoid (Discontinued 1985)
36	4002143	Safety Switch
	5503071	#6-32 x 1-1/8" Screw
	5550402	#6-32 Locknut