ARROW - MASTER

MOBILE HYDRAULIC HAMMER

MODEL 1350 & 1350T

Operator's Manual

Publication No. 5000053
(Revised 03/12)

SERIAL NUMBER: _____

SOLD AND SERVICED BY: _____

_____

ARROW-MASTER, INCORPORATED

1201 Seventh Street ● East Moline, IL 61244
www.arrowmaster.com

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Description

The Arrow Hammer Model 1350 is a highly mobile, heavy duty, pneumatic-tired hydraulic drop-hammer. The Arrow Hammer can operate either on or off paved surfaces. The Arrow Hammer Model 1350 propels itself along its work by means of a hydraulically controlled creeper gear. The Arrow Hammer utilizes an automotive-style transmission for transport between work sites. The Arrow Hammer uses a hydraulic cylinder and cable actuator system to lift a weight to a specified height and then release the weight to gravity free fall. The controls on the Arrow Hammer allow the lift and drop cycle to be repeated automatically. The Arrow Hammer is a self-contained unit which is controlled and operated by a single person.

The Arrow Hammer is generally used in 3 different applications:

1. Breaking/demolition of concrete, rock, asphalt or other hard materials by repeated hammer blows to reduce the size of the materials as suitable to allow easy excavation and/or recovery.

2. Cutting/sectioning of asphalt or concrete pavements into smaller sections prior to excavation.

3. Compaction by impact in confined areas.

Control of the tool lift and drop cycle on the Arrow Hammer can be accomplished hydraulically or by means of an electronic control station. See the **Operation** Section of this manual for details of these optional features.

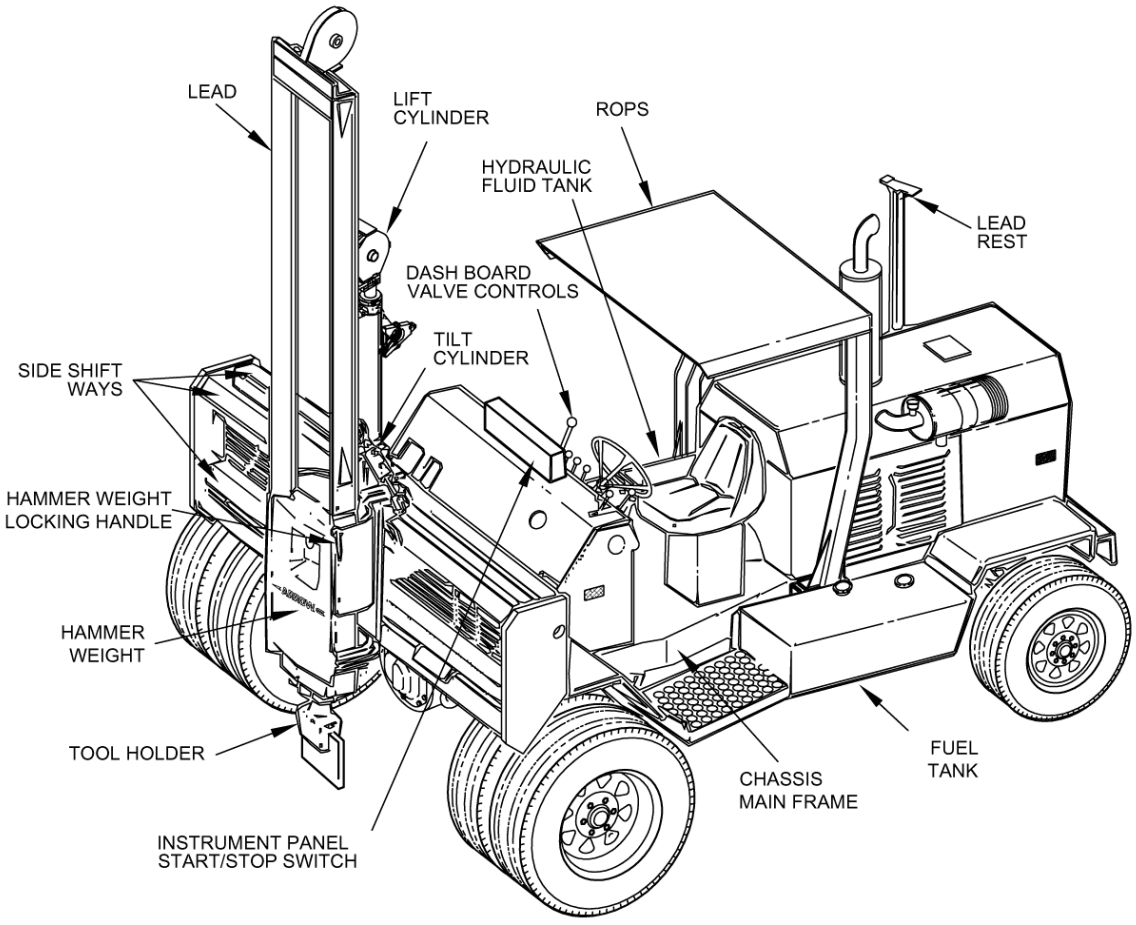


Figure 1-1
ARROW HAMMER COMPONENTS

Intended Application

The Arrow Hammer is designed for breaking/demolition, cutting/sectioning, compaction, and driving and impacting using specifically designed attachments. Any other applications are considered unintended application, and are not the responsibility of the manufacturer. Any damages resulting from such unintended application are at the sole risk of the operating contractor.

Intended application also involves strict adherence to the manufacturer's operating instructions, service instructions, and maintenance instructions. The Arrow Hammer should only be operated, serviced, and maintained by experienced personnel who have been instructed about any possible dangers. While working, the machine is to be operated by the driver only. The presently valid accident prevention regulations, as well as the generally accepted safety, working medicine and road traffic regulations are to be followed.

Any alterations to the machine which are not approved by the manufacturer, and any damages resulting therefrom, are at the sole risk of the operating contractor. The manufacturer's operating instructions, service instructions, and maintenance instructions are to be strictly adhered to.

Tools and Attachments
The list below contains the tools and attachments approved for use with the Arrow-Hammer. These tools and attachments are available from the manufacturer and shall only be used as outlined.

• Tamper (36" - 914 mm)	Compaction of soil, sand, and granular fill.
• Tamper (72" - 1829 mm)	Compaction of soil, sand, and granular fill in deeper trenches.
• Frost Chisel	Cutting frozen ground.
• Breaker Head (8" - 203mm Round)	General concrete breaking., Crack and Seat (Detensioning)
• Concrete Breaker (4-1/2" - 114 mm Round)	General concrete breaking.
• Heavy-Duty Breaker (2" x 8" - 51 x 203 mm)	Controlled and general concrete breaking.
• Concrete Wedge	Breaking concrete with asphalt overlay.
• Tapered Asphalt Cutter	Cutting asphalt.
• Blunt Asphalt Cutter	Scoring asphalt.
• Tapered Scoring Tool	Cutting concrete .
• Blunt Scoring Tool	Scoring concrete.
• Post Driver	Setting posts in soil.
• Rock Breaker	Breaking natural rock.
• Post Hole Punch	Punching round holes in soil, concrete, and asphalt.
• Trencher	Making small trenches in soil.
• Star Tool	Cutting round post holes in soft rock
• Post Extractor	Extracting posts from soil.

Unintended Application

The Arrow Hammer should not be used:

To carry passengers who are not operating personnel of the machine.

To tow or push other machines or vehicles.

To lift or carry any materials or loads.

With any attachments or tools not specifically designed for the machine by the manufacturer.

This machine could be dangerous if it is operated by non-trained personnel, incorrectly operated by trained personnel, or misused for unintended applications. The machine must not be operated with any guards or shields missing.

Safety

Safety is important. Make it a habit to use safe practices in all operating, maintenance and service procedures. Read and follow the safety precautions outlined below and others recommended in this manual.

SAFETY RULES

1. READ ARROW OPERATORS MANUAL.
2. VISUALLY CHECK STRUCTURES, BOLTS, CABLE, TIRES ETC., BEFORE STARTING THE ENGINE.
3. REFER TO "STARTING PROCEDURE" BEFORE STARTING THE ENGINE.
4. WEAR HARDHAT, GOGGLES, AND HEARING PROTECTION.
5. START AND OPERATE THE HAMMER FROM THE SEAT POSITION ONLY. WEAR SEAT BELT
6. KEEP PERSONS CLEAR OF THE WORK AREA.
7. NEVER MAKE ADJUSTMENTS TO THE MACHINE WHILE THE ENGINE IS RUNNING.
8. USE ONLY RECOMMENDED CABLE AND ADJUST TO AVOID HITTING THE TOP OF THE LEAD ON THE UPSTROKE, OR CATCHING THE WEIGHT WITH THE CABLE ON THE DOWNSTROKE.
9. IT IS UNSAFE TO USE THE ENGINE SPEED HAND CONTROL LEVER FOR TRANSPORTING THE MACHINE.
10. DO NOT SMOKE WHILE REFUELING.
11. LOWER OR LOCK THE HAMMERWEIGHT WHEN MACHINE IS NOT IN OPERATION.
12. USE CREEPER DRIVE FOR LOADING AND UNLOADING.
13. LOCK HAMMERWEIGHT BEFORE STOWING LEAD ONTO LEAD BRACE.
14. STOW AND CENTER LEAD BEFORE TRANSPORTING THE MACHINE.
15. REMOVE KEY TO PREVENT UNAUTHORIZED OPERATION.

3001555

- **Do not operate this machine unless you are qualified by training and/or experience in its safe operation. Know and follow your employer's work rules, governmental regulations and the Arrow Hammer Operator's Manual.**
- **Do not allow anyone except the operator to ride on the Arrow Hammer.**
- **Check cables daily for wear and make sure clamps are securely fastened.**
- **Visually check structures, bolts, cables, tires, etc. before starting.**
- **Refer to "OPERATION" (Section 5) before operating the machine.**
- **Start and operate the Arrow Hammer from the operator's seat position only.**
- **Wear seat belt unless unit is not equipped with ROPS.**
- **Do not leave the Arrow Hammer unattended while the engine is running.**
- **Wear hardhat, goggles, and hearing protection while in the work mode.**
- **Keep persons and objects clear of the machine and work area.**
- **Do not operate the engine in a closed or poorly ventilated building.**
- **Minimize dust with water spray or wear a respirator.**

- **Lower or lock the hammer weight when the machine is not in operation.**
- **Never service the machine or make adjustments while the engine is running, or the unit is operating.**
- **Lock the hammer weight before lowering the lead onto the lead support brace.**
- **Lower and center the lead on the side for transport.**
- **Do not use the engine speed hand control lever during transport.**
- **Use safe driving or trailering practices when transporting the machine.**
- **Never exceed 20 mph (32 km/h) when driving the machine.**
- **Use the creeper drive to load and unload the machine for transport.**
- **Do not smoke while refueling.**
- **Do not refuel the machine while the engine is running.**
- **Do not adjust or service the unit while it is in operation.**
- **Use only the recommended cable and adjust the length to avoid hitting the top of the lead on upstroke, or catching the weight on the downstroke.**
- **Disconnect power sources before working on electrical or hydraulic units.**
- **Remove the key to prevent unauthorized operation.**

⚠WARNING Escaping hydraulic fluid under pressure can have sufficient force to penetrate the skin. Hydraulic Fluid can also become very hot and cause burns. These conditions are capable of causing serious personal injury. Before disconnecting lines, be sure to relieve all pressure. Before applying pressure to the system, be sure all connections are tight and that lines, pipes, and hoses are not damaged. Use a piece of cardboard or wood, rather than hands, to search for leaks.

NOTE: If injured by escaping or hot hydraulic fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Observe all safety features marked by proper decals. Decals are reproduced throughout this manual to familiarize the operator with the controls and safety features of the machine.

Maximum On-Site Transporting & Operating Grade Limits

⚠ DANGER **The operator must be aware of, and not exceed the maximum limits to ensure the safe operation of the machine when transporting or operating on a solid grade.**

Maximum Grade Limits for On-Site Transporting

Uphill		Downhill		Sidehill	
1st Gear	Creep Mode	1st Gear	Creep Mode	1st Gear	Creep Mode
15° (26.8%) Maximum	20° (36.4%) Maximum	15° (26.8%) Maximum	20° (36.4%) Maximum	10° (17.6%) Maximum	10° (17.6%) Maximum

Maximum Grade Limits for On-Site Operation

Uphill	Downhill	Sidehill
5° (8.75%) Maximum	10° (17.6%) Maximum	9° (15.8%) Maximum

Maximum sideways tilt of the machine - 10° (17.6%)

Maximum longitudinal tilt of the machine - 20° (36.4%)

Specifications

BASE UNIT (Part No. 8000016)

SHIPPING WEIGHT (Approximate): 9,800 lbs. (4.5 t)

HEIGHT:
In working position (overall): 14'-3" (4.3 m)
Traveling position with ROPS (overall): 7'-11" (2.4 m)

LENGTH:
In working position (overall): 13'-8" (4.2 m)
In traveling position (overall): 14'-4" (4.4 m)

TREAD WIDTH:
Front Wheels: 84-1/2" (2146 mm)
Rear Wheels: 73-1/2" (1867 mm)

WHEELBASE: 97" (2464 mm)

WIDTH (overall): 88-1/2" (2248 mm)

MAXIMUM ROAD SPEED: 20 mph (32 km/h)

CHASSIS:
All-welded unitized frame.

ENGINE:
John Deere Model 4045T diesel engine. 4-cylinder, 4-cycle, 275 cubic-inch displacement (4.5 l), Bore - 4.20" (107 mm), Stroke - 5.00" (127 mm), 80 hp (60 kW) @ 2400 rpm intermittent, maximum torque of 211-ft (286 N·m) @ 1700 rpm. Equipped with a full-flow oil filter and dry-type air cleaner.

ENGINE SPEEDS (No Load):
Hand Throttle: 2200 RPM
Foot Throttle: 2200 RPM

TRANSMISSION:
Conventional standard, synchromesh totally enclosed transmission. Three forward speeds up to 20 mph (32 km/h) and one reverse speed.

AXLES:
Front wheel drive with single hypoid gear, axle rated at 11,500 lbs. (5.2 t) Rear wheel steering with 3,300 lbs. (1.5 t) rated axle.

CREEPER DRIVE:
Patented hydraulic creeper drive mounted directly on the transmission. Creep speed is infinitely variable up to 63 fpm (19.2 mpm) in forward or reverse.

TRANSMISSION CREEPER INTERLOCK:
Supplied with a mechanical device that prevents the creeper gear from being engaged if the travel transmission is in gear.

TIRES:
Driving tires (Dual): Traction tread load-range D - 8" x 19.5" (203 mm x 495 mm) Inflation 70 psi (482 kPa).
Steering tires: Traction tread load-range D - 8.75" x 16.5" (222 mm x 419 mm) Inflation 55 psi (379 kPa).

SERVICE BRAKES:
Four wheel hydraulic independent system.

PARKING BRAKE:
Mechanical parking brake, wheel mounted.

POWER STEERING:
Full power steering that allows unit to be steered when engine is not running. Steering wheel is mounted to a fixed steering column attached to the dashboard.

HORN:
Electric 12-volt horn to comply with OSHA requirements.

STOP LIGHTS AND REFLECTOR:
Recessed combination stop and tail lights and reflectors front and rear.

FUEL TANK CAPACITY: 30 Gallons (113 l)

OIL TANK CAPACITY: 24 Gallons (91 l)

HYDRAULIC SYSTEM:
Hydraulic system consists of a tandem hydraulic driven pump driven directly from the engine crankshaft. The tandem hydraulic pump delivers 44 gpm (167 lpm) @ 1,750 psi (121 b) for hammer activation and 16 gpm (61 lpm) @ 1,500 psi (103 b) for all other functions. The system includes suction strainers, a return in-line filter and oil cooler.

HAMMER WEIGHT: 1,356 lbs. (616 kg)

IMPACT ENERGY (ft-lb): 13,000 (17680 N·m) Maximum

HAMMER CYCLES:

24" (.6 m) Stroke:	42 Per Minute
Full Stroke	24 Per Minute

LENGTH OF STROKE: 1' to 9' (.3 m - 2.7 m) Maximum

CABLE:
Cable type: 3/8" (10 mm) Dia. 6 x 19 strand hemp center, improved plow.
Minimum length: 51' (15.5 m) Nominal Strength: 6.1 tons (5.5 t)

LEAD:
One-piece lead that lays back hydraulically for traveling/transport.

MAST TRAVERSE UNIT:
The mast traverse unit is a hydraulically controlled chain and sprocket system that allows adjustable placement of the mast on the lead assembly. The mast traverses on long-life machine-type ways.

MAST TRAVERSE DISTANCE (from center line of tool): 68-1/2" (174 cm)

MAST TILT:
The mast assembly pivots hydraulically, approximately 9 degrees to either side, to provide square controllable blows.

GAUGES:
Oil Pressure, Water Temperature, Hour Meter, Fuel, and Ammeter.

ELECTRICAL SYSTEM:
12-volt system with (1) one Group 31 - 750 CCA battery and a 65 amp alternator.

OPERATOR'S AREA:
Operator's area includes controls for hammer functions (actuation, stroke control, traverse, mast tilt and mast lay-back). Also includes controls for acceleration, braking and transmission. Grip-type access step is provided for access to the seat which is adjustable front to back.

Fuels, Lubricants, & Fluids

Fuel (30 gal tank)	
above 40°F	No. 2-D Diesel
below 40°F	No. 1-D Diesel

Refer to the engine manual for recommendations on other fuel requirements and content.

Cooling system (16 qt.)	Ethylene Glycol water mixture
Engine oil (9 qt w/filter) (8 qt w/o filter)	SAE 10W-30*

* The Engine manufacturer recommends their own brand name oil (see engine manual). Other oils may be used if they meet one or more of the following: API service classifications CI-4, CH-4, CG-4, CF-4. Factory supplied oil is to be changed after the first 100 hours. See engine manufacturer's manual for this engine.

Brakes	SAE J1703c or DOT 3 fluid
Hydraulic system (24 gal tank) (See detailed discussion of hydraulic fluids on the following pages)	AW-20 hydraulic fluid
Transmission (8-11 pts.)	SAE 80 or 80W90 (or MIL-L-2105-D)
Drive axle	SAE 80 or 80W90 (or MIL-L-2105-D)
Lube fittings	No. 2 lithium MP grease (Amolith #2 or equivalent)
Wheel bearings	No. 2 lithium MP grease
Sliding surfaces & chain	SAE 30 engine oil
Idler sprocket bearings	No. 2 lithium MP grease

HYDRAULIC FLUID

Recommendations

The fluid in the hydraulic system serves as a power transmission medium. It is also the system's lubricant and coolant. Selection of the proper fluid is a requirement for satisfactory system performance and life. The selection and care of the hydraulic fluid will have an important effect on how the system performs and on the life of its components. The following are some of the name brand hydraulic fluids which may be used in the Arrow hammer:

- Ashland AW-20
- Trojan 46 AW
- Valvoline AW-20b
- Amoco AW 46

Viscosity

The viscosity of the fluid is the measure of the fluid's resistance to flow; or an inverse measure of its fluidity. Arrow has determined that under normal operating conditions, a fluid having a viscosity range between 200 SUS at 100°F and 45 SUS at 210°F provides the best overall hydraulic system performance. These fluids may carry the designation "anti-wear 20" or the ISO classification "46AW". It may be necessary to change the viscosity of the fluid in the hydraulic system for operation in extreme environments such as are found in the arctic. Fluids designed for these conditions are available from the oil suppliers and should be readily available in the particular region. When selecting a fluid, make sure that the viscosity never goes below 45 SUS or above 4000 SUS regardless of the operating temperature. In addition, select a fluid which has a pour point at least 20°F below the lowest temperature expected to be encountered.

Use of Additives

Since most of the desirable properties of a fluid are at least partly traceable to additives, it might be assumed that additional commercial additives could be incorporated into the fluid to make it more suitable for the hydraulic system. Refiners, however, warn against this practice, as some additives may not be compatible with the base fluid or with the additives already existing in the fluid. Compatibility between additives cannot be determined in the field without laboratory or test results. Therefore, leave the selection of the additives to the manufacturer of the fluid.

Use of Synthetic Oils

Synthetic oils are laboratory synthesized chemicals which are themselves less flammable than petroleum based oils. Synthetic oils are not compatible with the Nitrile (Buna) and neoprene seals commonly used in hydraulic components. Therefore, if special considerations indicate a need to depart from the petroleum based fluids recommended for the Arrow hydraulic system, contact your Arrow representative or consult the factory.

FLUID MAINTENANCE

Hydraulic fluid is not an inexpensive item. Furthermore, the use of poorly cared for or contaminated hydraulic fluid in the Arrow hydraulic system could result in considerable damage to the system. Therefore, take proper care of hydraulic fluid while it is being stored.

Storage and Handling

Follow these simple rules to prevent contamination of hydraulic fluid during storage and handling:

1. Store drums on their sides.
2. Before opening a drum, clean the top and the bung thoroughly so that dirt will not enter the drum.
3. Use only clean containers, hoses, etc. to transfer the fluid from the drum to the hydraulic reservoir. An oil transfer pump equipped with 25 micron filters is recommended.
4. Provide a 200 mesh screen in the reservoir filler pipe.

Keeping the fluid clean and free from moisture will help it last much longer and avoid contamination damage to close-fitting parts in the hydraulic components.

In-Operation Care

Proper in-operation care of the hydraulic fluid includes:

1. Prevent contamination by keeping the system tight and by using proper air and fluid filtration.
2. Follow the hydraulic fluid and filter change intervals recommended in this manual as a minimum requirement. Dirty and dusty operating conditions will dictate a more frequent service interval.
3. Keep the reservoir filled properly to take advantage of its heat dissipating characteristics, and to prevent moisture from condensing on the inside walls of the tank.
4. Repair all leaks immediately.
5. If the system becomes contaminated, change the fluid and filter immediately.

Operation

CONTROLS

Control Panel Configurations

The Arrow Hammer may have one of three control panel configurations depending on the optional equipment specified on the machine (Electronic Stroke Control, Mechanical Stroke Control or Mechanical Stroke Control with hydraulic cable adjust). The three illustrations in Figure 5-1 show the different control configurations and are labeled to show the locations of individual control valves. Refer to Figure 5-1 to better acquaint yourself with the controls on your machine.

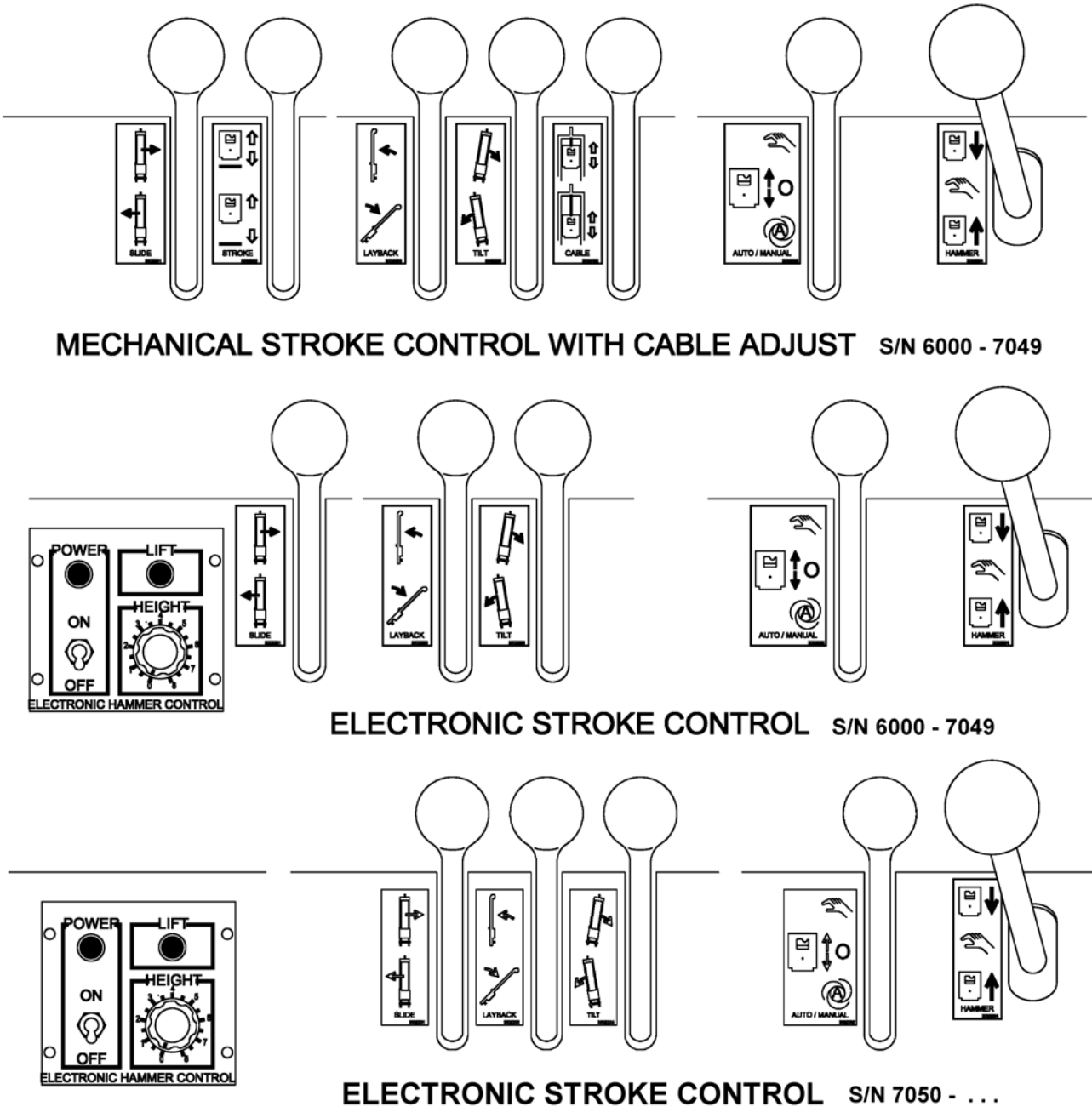
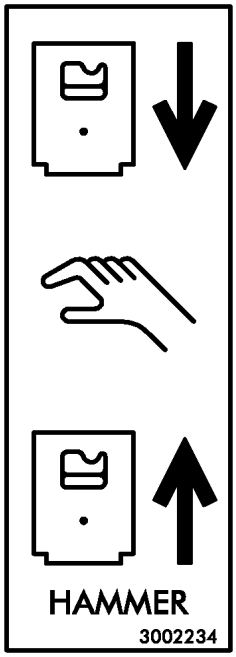
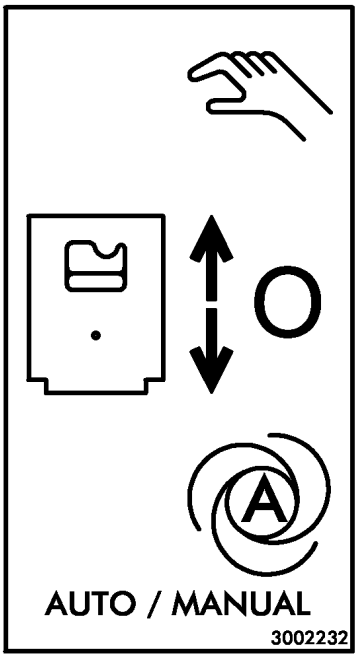


Figure 5-11
CONTROL PANEL CONFIGURATIONS



Hammer Control Decal
3002234

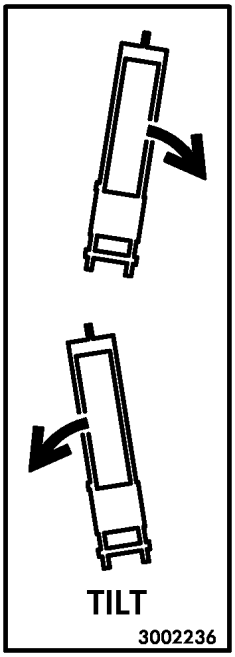
Hammer Valve - The hammer valve controls the primary function of the Arrow Hammer - lifting and dropping of the hammer weight. The hammer valve can be actuated manually, by means of a lever; or automatically, by means of a pilot-operated hydraulic servo valve. The hammer valve control lever is located at the right hand end of the valve control panel. The hammer valve is spring loaded to return the control handle to the neutral (center) position when the handle is released. Pull the handle back (toward the operator) to raise the hammer weight. Push the handle forward (away from the operator) to lower the weight.



Auto Stroke Decal
3002232

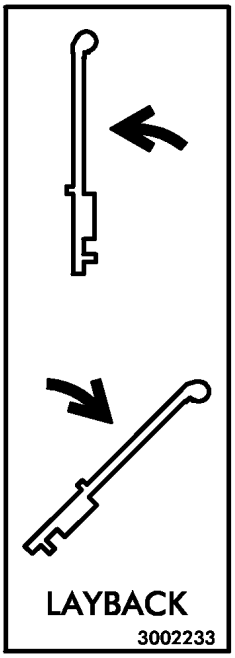
Auto-Manual Valve - The auto-manual valve controls the operating mode (manual control or automatic control) of the hammer valve. The auto-manual valve is located directly to the left of the hammer valve. **THIS VALVE IS NOT SPRING CENTERED - IT WILL REMAIN IN THE SELECTED POSITION.** The auto-manual valve has three control positions. The center position is not used. The forward position allows manual control of the hammer weight when the hammer valve handle is actuated. Place the control handle in the forward position before starting the engine (on units produced after 1994, the engine starting system is interlocked to prevent starting the machine with the hammer valve set to operate in automatic mode). The hammer valve can be actuated manually with the auto-manual valve in the manual/start position. Pull the control handle back to "auto" position to place the hammer valve under automatic control.

⚠CAUTION **Make sure that the stroke control trip fingers have been adjusted to produce the desired stroke length before placing the unit into the automatic operating mode. Machines equipped with electronic stroke control should be adjusted to the "zero" position to produce short strokes upon start-up.**



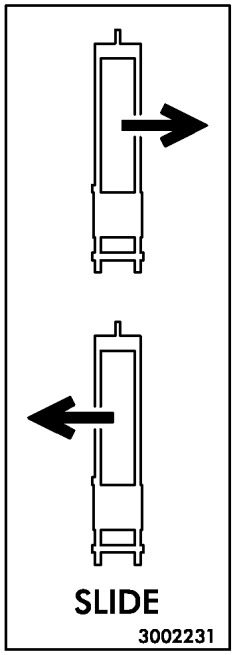
Lead Tilt Decal
3002236

Lead Tilt Valve - The lead tilt valve controls the vertical alignment (left to right) of the lead. Use the lead tilt control to keep the lead plumb when operating the unit on a slope. Keeping the lead plumb will maximize impact and minimize wear on the hammer weight. The lead tilt control is located directly to the left of the auto-manual valve. Push the control handle forward to tilt the top of the lead to the right. Pull the control lever back to tilt the top of the lead to the left.



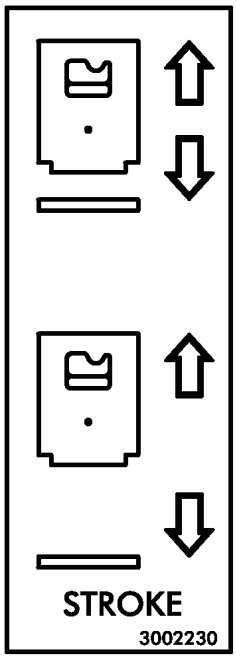
Layback Control Decal
3002233

Layback Valve - The layback control valve allows the operator to raise the lead into the operating position, or to lower the lead into the transport position. The layback control also provides the operator with the capability to keep the lead plumb in the fore and aft direction. Keeping the lead plumb will maximize impact and minimize wear on the hammer weight. The layback control valve is located directly to the left of the lead tilt control valve (just to the right of the steering column on all machines except those having the hydraulic cable adjust option).



Sideshift Decal
3002231

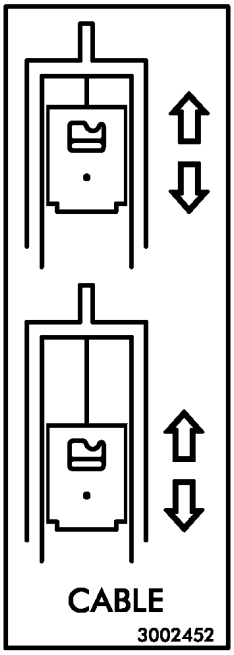
Sideshift Valve - The sideshift valve allows the operator to adjust the position of the lead to any desired location along the sideshift ways, in either direction, left or right of the machine centerline. Push the control lever forward to shift the lead to the right. The far right position releases the layback safety latch, Fig 5-4A. Pull the control lever back to shift the lead to the left. **DO NOT operate the sideshift control lever when the tool is on the ground**. The sideshift control valve is located on the left side of the steering column, just below and to the right of the creeper control valve.



Stroke Adjust Decal
3002230

Stroke Adjust Valve - The stroke adjust control valve is found only on machines equipped with mechanical stroke control (with or without the hydraulic cable adjust option). This valve is located directly to the right of the sideshift valve. The stroke adjust control allows the operator to move the lower of the two trip fingers located on the side of the hammer lift cylinder assembly. Push the control lever forward to shorten the stroke (raises the trip finger). Pull the control lever back to lengthen the stroke (lowers the trip finger).

⚠CAUTION **If the cable length is too short, or improperly set, it may be possible to adjust the lift height so that the weight strikes the upper travel limit stop blocks on the lead. Striking the travel limit stop blocks can cause severe structural damage to the machine. Make sure that the lift height and cable length are properly set to prevent damage to the machine.**

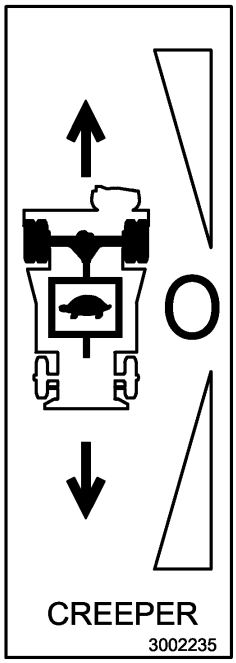


Cable Adjust Decal 3002452

Cable Adjust Valve - The cable adjust valve is found only on machines equipped with mechanical stroke control and the hydraulic cable adjust option. This valve is located on the right side of the steering column (to the right of the layback control valve). The cable adjust valve allows the operator to fine tune the position of the lower travel limit by adjusting the uppermost travel limit trip finger located on the side of the hammer lift cylinder assembly. The effect of this control on overall operation of the machine is to enhance productivity, by providing the operator with the means for keeping the time lag at the bottom of the stroke to a minimum, and to compensate for small changes in cable length without stopping the machine to make mechanical adjustments. Push the control lever forward to "shorten" or reduce slack in the cable (lowers the trip finger). Pull back on the control lever to "lengthen" or increase slack in the cable (raises the trip finger).

NOTICE **If cable slack is adjusted too short, the machine will "snatch" the weight before it has lost it's downward momentum. Snatching the weight will shorten the life of the cable and can lead to structural damage to the machine. The lower stroke limit must be adjusted long enough to prevent "snatching", and short enough to allow proper function of the travel limit trip finger.**

Creeper Valve - The creeper control valve handle is located at the far left end of the control panel. The creeper valve controls machine direction and speed when the machine is powered by the creeper drive system. **THE CREEPER CONTROL VALVE IS NOT SPRING LOADED TO NEUTRAL. IT WILL REMAIN AT WHATEVER SETTING IS SELECTED.** Creeper speed variation is accomplished by valve handle position, which allows flow through the valve to be metered. The control lever is equipped with a spring-tensioned friction mechanism, which allows lever resistance to be adjusted. The creeper control valve also has detents at the neutral position and at each maximum setting. The creeper control valve is connected to the machine's service braking system so that hydraulic fluid can be bypassed around the creeper motor when the brakes are actuated. This feature allows the motion of the machine to be brought to a temporary halt by applying the machine's brakes. The machine may be returned immediately to the previously selected speed by releasing the brakes. The creeper bypass feature does not create hydraulic pressure and therefore does not generate heat. It may be used as frequently as needed without harming the equipment. Push the creeper control lever forward to increase travel speed in the forward direction (or reduce travel speed in the reverse direction). Pull the control lever back to reduce travel speed in the forward direction (or increase travel speed in the reverse direction).



Creeper Drive Decal 3002235

⚠WARNING **Make sure the creeper valve control lever is in the neutral (center) position before starting the engine. Starting the engine with the creeper control valve lever out of the neutral position could result in sudden unexpected motion with possible serious injury or death to the operator or others.**

⚠WARNING **Do not park and leave the machine with the creeper drive engaged. Loss of hydraulic fluid pressure in the creeper drive motor over a period of time could result in sudden unexpected motion. Always set the parking brake before leaving the machine or place the tool on the ground.**

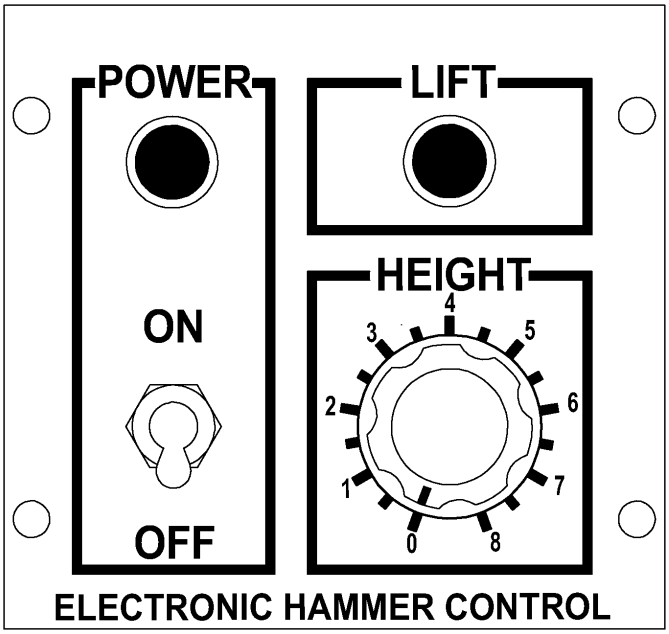


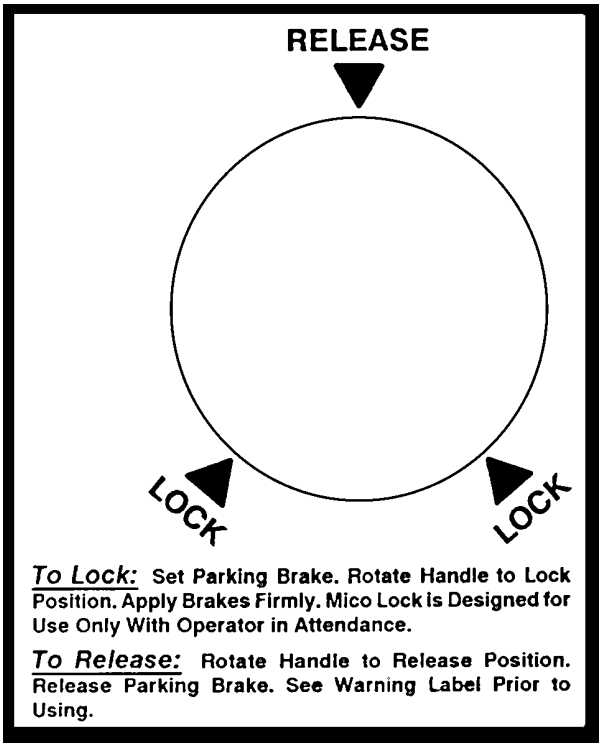
Figure 5-2
Electronic Control Station

Electronic Control Station - The Electronic Control Station is found only on machines equipped with the Electronic Stroke Control option. The control station is located to the left of the steering column, directly to the left of the sideshift control valve. The Electronic Control Station allows the operator to adjust the upper limit of hammer weight travel when the unit is operating. The electronic control senses the point of impact of the tool on the work surface and automatically compensates for changes in cable length and undulations in the work surface. Thus, there is no need to provide the operator with a means of adjusting the lower travel limit. The electronic control actuates a solenoid-operated directional control valve, which alternately reverses the direction of hydraulic fluid flow through the pilot system for the hammer cylinder lift control valve. The Electronic Control Station contains a power (on-off) toggle switch and control knob having graduations from 0 to 8. The position of the adjustment knob determines the height that the unit will lift the weight on each cycle, with higher numbers corresponding to greater lift height. The graduations on the control knob are relative, and do not correspond directly to any given amount of lift height. The correct setting must be determined by the operator. The Electronic Control Station contains two indicator lamps. The red lamp indicates that power to the unit has been switched on. The yellow lamp lights only during the timed lift portion of the operating cycle. The yellow lamp will flash while the unit is operating. The indicator lamps do not have an effect on machine function.

NOTICE **lf the cable length is too short, or improperly set, it may be possible to adjust the lift height so that the weight strikes the upper travel limit stop blocks on the lead. Striking the travel limit stop blocks can cause severe structural damage to the machine. Make sure that the lift height and cable length are properly set to prevent damage to the machine.**

Parking Brake - The machine is equipped with a foot-operated parking brake which mechanically actuates the service brakes on the front drive axle of the machine.* The parking brake is conveniently mounted under the dashboard, just forward and to the right of the operator. Press the parking brake pedal down firmly to apply the parking brake. To release the parking brake, pull the brake release lever out. The parking brake should be adjusted so that braking resistance is sufficient to kill the engine when attempting to drive the machine forward from a stopped condition in third gear with the engine speed foot control pedal fully depressed.

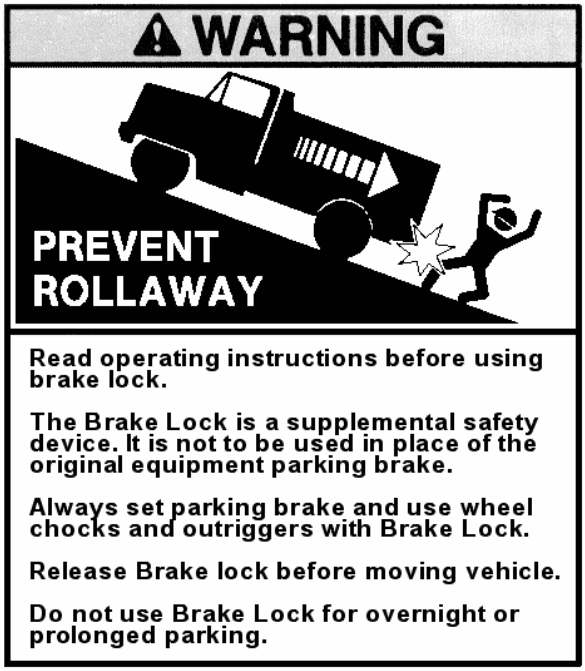
* A hand-operated parking brake was used in 1992-93.



Hydraulic Brake Lock - The optional hydraulic brake locking device is located to the extreme left end of the control panel, just below the creeper control valve handle. The hydraulic brake lock allows the operator to retain pressure in the machine's service brake system after the brake pedal has been released. The hydraulic brake lock is useful in situations where it is necessary to maintain a constant position without moving the machine, or when using the sideshift feature to work back and forth across the face of the work surface. Actuation of the hydraulic brake lock also actuates the creeper motor bypass. Therefore, the machine may be brought to a halt for a considerable period of time without maintaining brake pedal pressure and without changing the creep speed setting. The hydraulic brake lock is equipped with a warning lamp to indicate a low brake line pressure situation to the operator.* To actuate the hydraulic brake lock, rotate the lever on the hydraulic brake lock device either direction from vertical then apply the machine's service brake system by depressing the brake pedal. Release the brake pedal. To release the hydraulic brake lock, rotate the lever back to the vertical position.

* Early production units equipped with hydraulic brake lock do not have the warning lamp.

Hydraulic Brake Lock Instruction Decal
3002046



Creeper Drive Decal
3002241

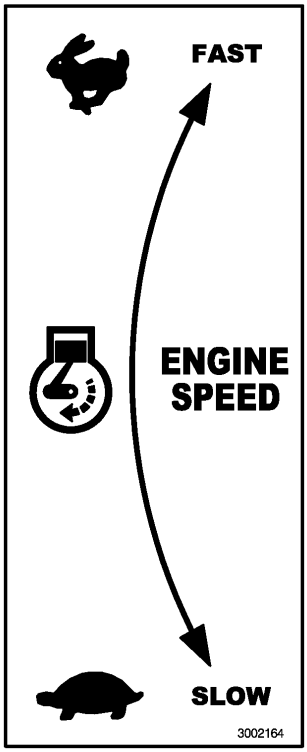
Creeper Engagement and Interlock Mechanism - The creeper drive system hydraulic motor can be physically engaged or disengaged with the creeper drive bull gear by means of the actuator lever and linkage located near the floor plate just to the right of the operator's seat support pedestal.* The creeper drive interlock device is a component of the actuator mechanism and automatically captures the gearshift lever on the transport transmission as the creeper drive is engaged. The interlock device will not fit over the gearshift lever unless the transmission has first been placed into neutral gear. The transport transmission cannot be shifted out of neutral gear when the creeper drive is engaged. To engage the creeper drive, rotate the creeper drive actuator lever down (clockwise), until the lever is securely held by the lever latch. If the gears do not mesh correctly, actuate the creeper valve control slightly to rotate the motor, then secure the lever in the engaged position.

* Prior to 1992, the creeper engagement lever was located below the hammer valve handle.

⚠WARNING **Do not start the engine with the transport transmission or creeper drive engaged. Starting the engine with the transmission or creeper drive engaged could result in sudden and unexpected motion.**
Refer to the instructions in the section titled - STARTING THE ENGINE.

⚠WARNING **Do not park the machine with the creeper drive engaged. Loss of hydraulic fluid in the creeper drive motor over a period of time could result in sudden and unexpected motion of the machine.**
Always set the parking brake before leaving the machine.

NOTICE **Do not attempt to operate the transport transmission with the creeper drive engaged. Operating both drive systems simultaneously could result in severe damage to the creeper drive system and/or other components.**



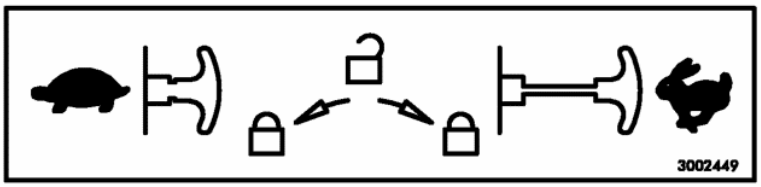
Engine Speed Control Decal 3002164

Engine Speed Hand Control - The engine speed hand control is located on the cowl, behind and to the right of the operator's seat. The hand control allows the operator to set the engine to operate at a continuous speed (usually maximum) for maximum power delivery while the machine is working. The hand control is equipped with a friction mechanism which allows the engine to be set to intermediate speeds if desired by the operator.*

* Early production units do not have the friction mechanism.

⚠CAUTION **Do not start the engine unless the engine speed hand control lever has been set to "slow" position.**

⚠WARNING **Do not use the engine speed hand control lever when transporting this machine.**



Push-Pull Speed Control Decal 3002449

Use of the engine hand speed control when transporting the machine can result in the operator's inability to make rapid corrections to speed and/or direction as dictated by travel conditions, and may also result in excessive travel speed. This machine is equipped with a foot-operated engine speed control for use during transport. The foot-operated control automatically returns the engine to a slower operating speed when released.

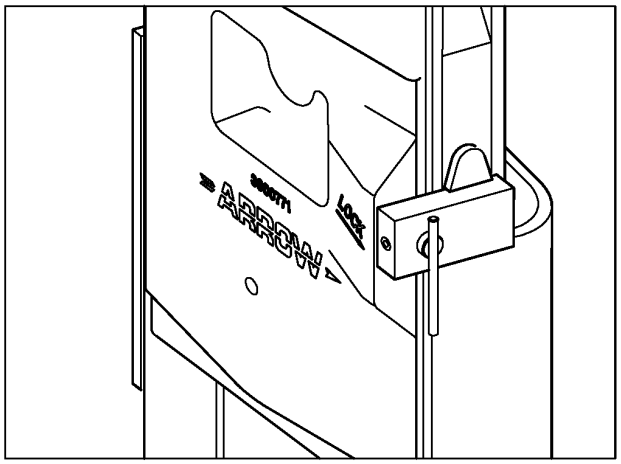


Figure 5-3
Hammer Weight Lock

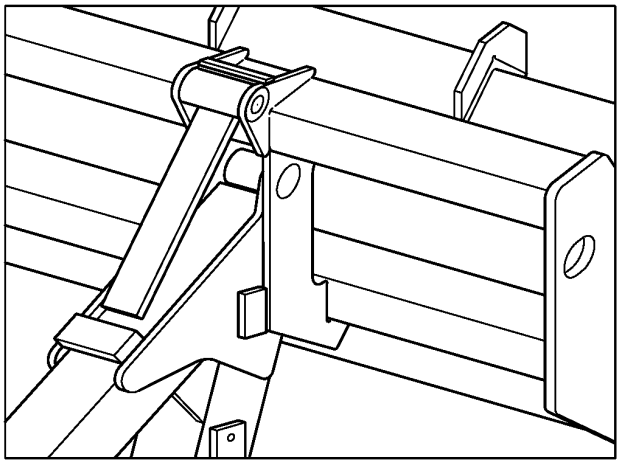


Figure 5-4
Layback Latch

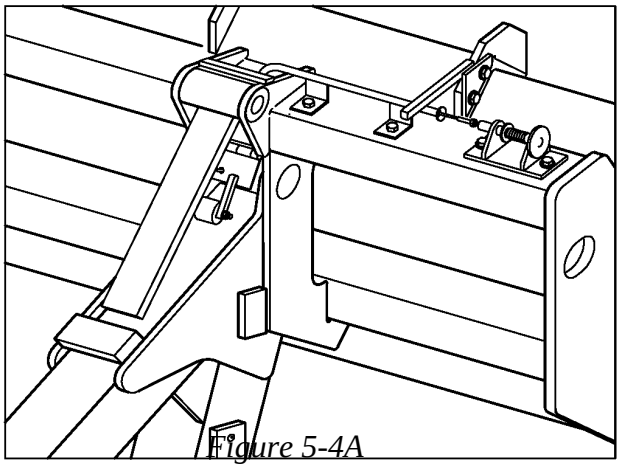


Figure 5-4A
Layback Latch Release Mechanism

Hammer Weight Lock - The weight and tool assembly can be locked into position between the leads for transport or maintenance of the machine. To lock the weight, raise the leads into the vertical position. Using the manual control lever on the hammer valve, carefully position the weight until the lock pin slot on the weight aligns with the lock pin located on the left side of the lead. Rotate the lock handle forward to a horizontal position. Push the lock pin inward to engage the pocket in the hammer weight. Secure the pin by rotating the handle down. slowly lower the weight onto the pin.

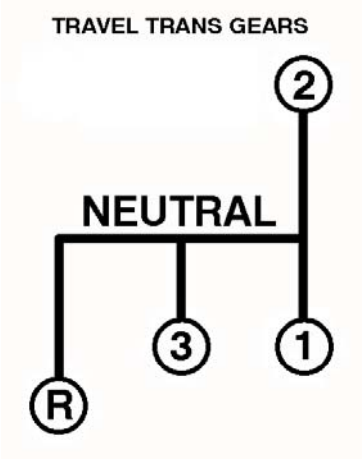
Layback Safety Latch - The layback safety latch is located just behind the right hand sideshift frame pivot on the machine's mainframe. The purpose of the layback safety latch is to prevent the lead from accidentally falling into the operator's compartment or onto the machine. The layback safety latch will automatically engage a stop block located on the mainframe. The safety latch must be physically raised above the stop block in order to lower the leads onto the lead rest for transport. Use the following procedure when disengaging the safety latch:

1. Disengage the creeper drive.
2. Place the engine speed hand control in "slow" position.
3. Place the transport transmission in neutral gear.
4. Set the parking brake.
5. Side-shift the lead to the far right of the slide.
6. Tilt the top of the lead to the far right.
7. Carefully lower the lead until the safety latch is just ready to engage the stop block.
8. Stand up. Manually lift, and hold, the safety latch above the stop block.
9. Make sure fingers are clear.
10. Carefully lower the lead until the safety latch has cleared the stop block.
11. Release the safety latch and return to the operator's seat, safely clear of the lead.
12. Finish lowering the leads in the normal manner.

Early production units having an operator's cab are equipped with a hand lever inside of the cab for disengaging the layback safety latch. The handle is located below the right hand side window.

Layback Latch Release Mechanism - In 1997, a mechanism to release the layback safety latch was provided for operator convenience. By side-shifting the lead to the far right of the side-shift frame, the latch will be raised enough to lay the lead back without lifting the layback safety latch by hand. On models equipped with this device, steps 7 to 11 noted above, will be omitted, Refer to figure 5-4A.

TRANSPORT CONTROLS



Gearshift Decal
3002434

Transport Transmission - The machine is equipped with a mechanical gear transmission having three forward speeds and one reverse speed. The upper two forward speeds are synchronized for ease in changing gears.

Clutch - The machine is equipped with an automotive-style, dry-disc clutch to enable the operator to temporarily disconnect engine power from the transmission. The clutch is actuated by a foot pedal located below and to the left of the steering column. On units built after 1994, the clutch must be depressed in order to start the machine.

Service Brakes - The machine is equipped with an automotive-style braking system which supplies fluid pressure to actuate the hydraulic brakes located on the front and rear axles at each wheel. The brakes are actuated by means of a foot pedal located below the steering column.

Parking Brake - The machine is equipped with a mechanical parking brake which applies the service brakes on the front axle. The parking brake pedal is located in front and to the right of the operator's seat. (see the **CONTROLS** section of this chapter for a more detailed description of the parking brake).

Engine Speed Foot Control - The machine is equipped with an automotive-style, foot-operated engine speed control pedal. The engine speed foot control pedal is spring loaded to return the engine to slow speed whenever the operator's foot is removed from the pedal. The pedal linkage has been designed to limit engine speed in order to limit transport speed to 20 mph (32 km/h).* Always use safe driving practices.

* Early production units may travel faster than 20 mph (32 km/h).

⚠WARNING **Do not use the engine speed hand control lever when transporting this machine.**

Starting Procedure Decal
3002167

STARTING THE ENGINE

Before starting the engine, check and make sure:

1. Transport transmission is in neutral.
2. Automatic Stroke Control (auto-manual) lever is in manual/start position (forward).* All other controls are in neutral (centered) position.
3. Engine speed hand control lever is in "slow" speed position.
4. Parking brake is engaged.
5. Creeper drive is disengaged.*
6. Clutch pedal has been depressed.*

* Units built after 1994 are interlocked to prevent starting.

After starting the engine, allow the engine and hydraulic system to warm up before working or transporting the machine.

PREPARATION FOR WORK

1. Clear people from the area around the machine. Check for amy overhead obstructions or power lines.
2. Use the tilt control to move the lead out of the lead support, then use the layback control to raise the lead into the vertical (working) position.
3. Raise the hammer lift cylinder by pulling back on the hammer valve control handle until slack has been removed from the cable and the weight has been raised off the weight lock pin.
4. Rotate the lock pin handle forward to the horizontal position. Pull out on the lock pin to release the lock pin from the weight. Rotate the lock pin handle down to secure it in the "out" position. See **"Hammer Weight Lock"** in the **CONTROLS** section of this chapter.
5. Slowly, pull the hammer valve handle back and raise the weight to the top of the lead. Push the hammer valve handle forward to lower the weight to the ground.

INSTALLING A TOOL

1. Raise the mast to the vertical position and lock the weight in place (see Figure 5-3).
2. Loosen the capscrews and remove the hammer tool clamp (Socket size is 1-5/16").
3. Use a suitable jack or blocking to support the weight of the tool and install the tool into the hammer head.

   NOTE: For long tools such as a tamper, lay the mast back at an angle and carefully tip the tool into position in the hammer head.
4. Reinstall the tool holder clamp, and torque the capscrews to 250 lb-ft (340 N•m).
5. When a tool holder is installed, secure the blade in place with 2 flex pins (see Figure 1-1).
6. Retorque the tool holder clamp capscrews after approximately one hour of operation.
7. Periodic tightening will insure longer tool and clamp life. Do not over tighten.
8. Periodically check and retorque the four capscrews holding the tool head to the hammer weight. The correct torque is 250 lb-ft (340 N•m).
9. If the length of the tool has changed, refer to **"CABLE LENGTH"** in the **Adjustments** Section.

HYDRAULIC CREEPER DRIVE

1. To operate the hydraulic creeper drive, stop the machine and place the transport transmission into neutral gear. Set the engine to idle.
2. Rotate the creeper shift actuator lever (located just below and to the right of the operator's seat) down (clockwise) into the engaged position. Be sure the creeper shift lever is securely engaged to keep the drive gears properly meshed.
3. Check to make sure that the slot in the creeper interlock device has properly hooked over the transmission shift lever and will prevent accidental operation of the transmission while the creeper shift is engaged.

NOTICE **Do not attempt to operate the machine's transport transmission with the creeper gear engaged. Doing so could result in severe damage to the creeper drive system or other components.**

4. To make the machine creep forward, push the creeper drive control valve lever forward. To creep backward, pull the control lever back. The control lever provides for an infinite variation of creeper speeds, depending on the position of the control lever.
5. To momentarily stop the creeper drive, depress the brake pedal. Pressure in the brake lines will actuate the creeper bypass valve. Frequent or continuous use of the brake to stop the machine will not cause any damage or overheating of the hydraulic system, nor will it cause excessive brake wear. The creeper bypass valve allows the operator to make repeated blows to the same spot. When the brake pedal is released, the creeper will again automatically move the machine at the speed previously selected with the creeper valve control.
6. Machines equipped with the optional hydraulic brake lock can be held in the creeper bypass mode without the continuous actuation of the brake pedal. Refer to the **CONTROLS** section of this chapter for more information on the operation of the hydraulic brake lock.
7. When it is desired to stop the creeper drive for longer periods, or when finished with the work, return the creeper valve control lever to the neutral (centered) position.
8. The preferred method for breaking pavement is to use the creeper in reverse. Begin breaking and sideshift to one side. Then use the creeper in reverse to move to a new breaking area. Then alternate the opposite direction with the sideshift. Operating in reverse reduces tire damage which can be caused by the rubble and it gives the operator a better view of the work done.

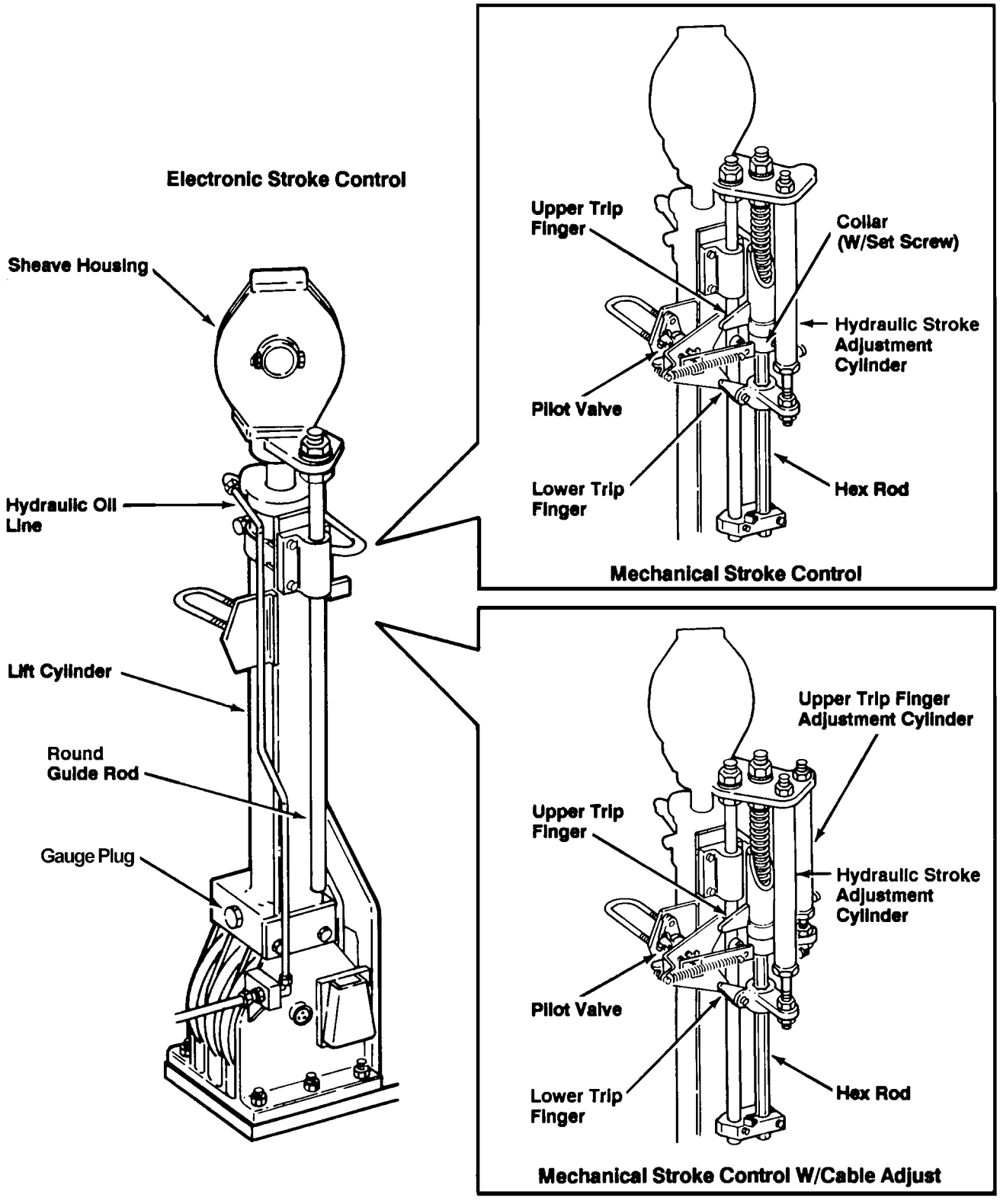


Figure 5-5
THE LIFT CYLINDER

AUTOMATIC OPERATION

Units Equipped with Electronic Stroke Control - Refer to Figure 5-5

The Electronic Stroke Control allows the operator to set and maintain constant lift height by timing the lift portion of the hammer cycle. The control unit will allow the hammer to follow uneven terrain by sensing the impact of each successive blow. Therefore, the control "knows" where it is with respect to the ground at all times. The Electronic Stroke Control minimizes dwell time, cable slacking, and "snatching" of the hammer weight. It is not necessary to adjust the cable length to accommodate small differences in tool height.

1. **To operate a machine equipped with Electronic Stroke Control, set the on-off switch on the timer control to the "off" position.**
2. **Rotate the height selector knob to "zero" position by turning the knob CCW until it stops.**
3. **Push the auto-manual valve control lever forward to the manual/start position. (If the engine is not running, the auto-manual valve control lever must be set to manual/start in order to start the engine.)**
4. **If necessary, start the engine according to the instructions given in the STARTING THE ENGINE section of this chapter.**
5. **Allow the engine and hydraulic system to warm up. It may be necessary to actuate the lift cylinder manually to warm the hydraulic fluid in cold weather.**
6. **Using the manual control lever on the hammer valve, lower the tool to contact the ground or work site. It is necessary to establish a ground reference for the electronic stroke control to operate correctly during start-up.**
7. **Adjust the engine speed control hand lever to the "fast" position. (The unit will work at various engine speeds. However, stroke length is dependent on engine speed and will change if the engine speed is changed.)**
8. **Set the on-off switch on the Electronic Control Station to the "on" position. The red lamp on the control unit should be lit, indicating that the unit is receiving power.**
9. **Pull the auto-manual control valve lever back (toward the operator) to place the control in "auto" (automatic stroke) position.**
10. **Adjust the lift control knob on the Electronic Control Station by turning the knob slowly clockwise until the desired stroke length is obtained. The yellow lamp on the control station should flash on and off indicating that the lift cycle is being timed. Stroke is adjustable up to 8-ft.**

NOTICE ***Do not turn the lift control knob further clockwise than is necessary to obtain the desired lift height. Turning the control knob too far can cause the lift cylinder to reach its stroke limit before the timed portion of the lift cycle has been completed. This condition will cause the unit to hesitate at the top of the stroke.***

NOTICE **If the cable length is too short, or improperly set, it may be possible to adjust the lift height so that the weight strikes the upper travel limit stop blocks on the lead. Striking the travel limit stop blocks can cause severe structural damage to the machine. Make sure that the lift height and cable length are properly set to prevent damage to the machine.**

11. The hammer weight can be stopped instantly during the timed lift portion of the cycle by shifting the auto-manual control lever from "auto" to manual/start position. Lower the weight to the ground using the manual control lever on the hammer valve.

NOTE: It is best to stop the weight at the bottom of the down stroke whenever possible. This procedure will prolong cable life.

12. When finished using the automatic stroke control, return the lift control knob to the "**zero**" position.
13. Set the on-off control switch to the "**off**" position.

NOTE: When operation of the Arrow Hammer is stopped for some time, turn off the engine. Excessive idling wastes fuel and can cause premature engine maintenance.

Units with Mechanical Stroke Control - Refer to Figure 5-5

To operate an Arrow Hammer equipped with Mechanical Stroke Control or Mechanical Stroke Control with hydraulic cable adjust, use the following procedure:

1. Set the engine speed hand control lever to "slow" position.
2. Check to make sure the up stroke trip finger (lower trip finger) is in the correct position. If not, use the stroke adjust control to run the trip finger down to the base of the lift cylinder where it will be cammed into the proper position.
3. Make sure the pilot valve actuating lever is in the DOWN position.

NOTE: If the pilot valve control lever is stopped in the center position, the hammer valve will be locked. It will be necessary to manually move the pilot valve lever into the DOWN position.

4. Using the hammer valve manual control lever, raise the weight to the desired lift height.
5. Using the stroke adjust valve control lever, raise the up stroke trip finger (lower trip finger) until the trip finger begins to raise the pilot valve actuating lever.
6. Lower the hammer weight to the ground.
7. Set the engine speed hand control lever to "fast" position.
8. Pull the auto-manual valve control lever back into "auto" (automatic) mode. The hammer should operate automatically.
9. If the machine is equipped with the hydraulic cable adjust option, adjust the cable to provide the proper amount of slack to prevent the cable from whipping or snatching the weight. The time delay at the bottom of the stroke should be a minimum.
10. The automatic operation of the hammer control valve can be returned to manual operation at any time by moving the auto-manual valve control lever forward from "auto" to manual/start position. If possible, change to manual operating mode during the DOWN stroke.

NOTE: If the control is changed from automatic to manual mode during the up stroke, no damage will be done. However, the hammer will overrun the up limit trip and continue to the end of the up stroke. When this occurs,it will be necessary to shut off the engine, lower the weight to the ground, manually set pilot valve lever down, restart the engine, and reset the lower trip finger which snaps into a detent in the tripped position.

11. When the machine is first started, or when the hydraulic fluid is cold, it may be necessary to actuate the hammer control valve manually until the hydraulic fluid has been sufficiently warmed to allow the unit to operate in the automatic mode. When the hydraulic fluid is too cold, the pilot valve actuating lever may overrun the trip finger during the up stroke.
12. During very short stroke operation, it is possible for the pilot valve lever to stop in the center position. When this happens, the hammer valve will become locked in the "hold" position. It will then be necessary to lower the up stroke trip (lower trip finger) to allow the pilot valve lever to be actuated downward manually.

⚠ DANGER Shut off the engine and place the auto-manual valve control lever into manual/start position before moving the pilot valve lever manually. Otherwise, moving the pilot valve lever may cause the unit to suddenly return to automatic operation with possible serious injury or death to the operator.

NOTE: When operation of the Arrow Hammer is stopped for some time, turn off the engine. Excessive idling wastes fuel and can cause premature engine maintenance.

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JUMP STARTING

Jump starting a machine which will not start under the normal starting procedure can be dangerous. Do not attempt to jump start the unit if you are not familiar with safe methods for connecting the auxiliary power cables, or if you are not familiar with the operating controls of the Arrow Hammer.

⚠WARNING

1. **Never bypass the safety interlocks in the starting circuit by shorting across the terminals on the starting motor.**
2. **Never attempt to start the machine while standing on the ground.**
3. **Always place the transport transmission in neutral.**
4. **Always disengage the creeper drive.**
5. **Always apply the parking brake.**
6. **Always wear safety goggles when connecting auxiliary power cables.**
7. **Connect auxiliary power cables positive to positive and negative to a good ground on the unit being started.**
8. **Connect positive cables first.**

TRANSPORTING THE ARROW HAMMER

Roading - When transporting the Arrow Hammer short distances, the machine may be driven at a maximum speed of 20 mph (32.2 km/h).

NOTICE ***Towing the Arrow Hammer behind another vehicle is not recommended.***

1. Start the engine according to the procedure outlined under **STARTING THE ENGINE.**
2. Allow the engine and hydraulic system to warm up before applying full load.
3. Long tools that extend beyond the bottom of the mast when the weight is locked (such as a tamper) must be removed before transporting.
4. Make sure the hammer weight is locked into its transport position. Lock the weight according to the procedure described under **"Hammer Weight Lock"** in the **CONTROLS** section of this chapter.

⚠CAUTION **When transporting the Arrow Hammer, the hammer weight must be locked into position. An unlocked weight is dangerous, and if the weight slides back in the leads, it will be impossible to raise the leads hydraulically.**

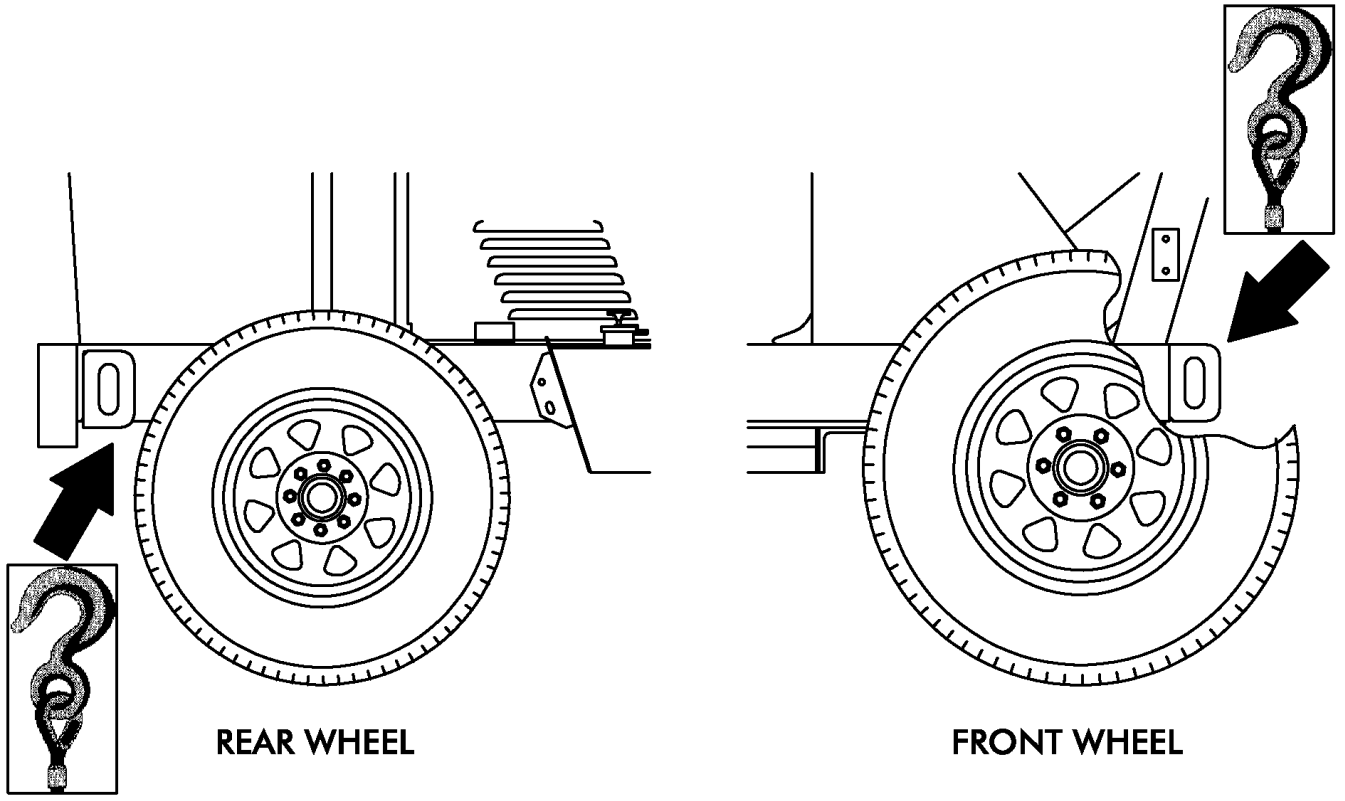
5. Lay the lead down and stow it on the lead rest in the transport position. Follow the procedure outlined under **"Layback Safety Latch"** in the **CONTROLS** section of this chapter.
6. Center the lead on the machine as reasonably as possible by using the sideshift and tilt functions.
7. Make sure the creeper drive has been disengaged and place the creeper control valve lever in neutral (center) position.
8. Set the engine speed hand control lever to "slow" speed.
9. Release the hydraulic brake lock and/or the parking brake.
10. The Arrow Hammer is equipped with controls which are configured similar to the controls on a car or light truck with a manual transmission.

⚠CAUTION **The Arrow Hammer is construction equipment which has been designed to perform a specific task. In order to improve the maneuverability of the tool into tight places, the Arrow is configured with a rear-mounted steering axle. The Arrow Hammer also carries a heavy tool, which produces a relatively high center of gravity. These two features can make sharp maneuvers with the Arrow Hammer dangerous at high speeds. The manufacturer has provided a foot-operated engine speed control pedal which limits engine speed (and thus travel speed) during transport. (Maximum transport speed is 20 mph).**

Trailering - When transporting the Arrow Hammer over long distances, the machine should be transported on a trailer. If the engine is equipped with a turbo charger, the rain cap on the muffler must be tied shut when transported at highway speeds.

NOTICE ***Towing the Arrow Hammer behind another vehicle is not recommended.***

When loading the machine on a low-loader, trailer, or railway wagon, the angle of the loading ramps must not exceed 20°. The machine must be well secured by chains and tensioners from the tie-down rings, to the transportation vehicle to prevent the machine from slipping or sliding off. The following illustration shows the location of the tie-down rings. The tie-down rings are not intended for lifting.



EMERGENCY TOWING

In the event of an emergency, the machine can be recovered and towed from a danger zone. Towing is recommended in emergency situations only and is not intended as a means of transporting the machine. Place the transmission in the neutral and disengage the creeper and brakes before towing.

NOTICE **The towing distance of the machine must not exceed 1/2 mile (800 m). The maximum towing speed is 2 mph (3.2 km/h). Towing the machine over longer distances or at faster speeds can cause severe damage to the drive train components.**

Safety Instructions

The presently valid safety regulations and accident prevention regulations must be strictly adhered to when towing. When towing the machine which is capable of braking, the wire ropes, chains or towing bars of sufficient dimension must be securely connected between the involved vehicles to their towing hitches, towing hooks or towing eyes. The machine must only be moved by a towing vehicle when it is rigidly connected to it. The use of flexible objects, such as towing ropes, or objects for pushing purposes, such as wooden beams, is not permitted.

Requirements

1. **A suitable towing vehicle is available.**
2. **Wire ropes, chains, or towing bars of sufficient dimensions are available.**
3. **The hammer weight is raised and pinned into the locked position.**
4. **If the hydraulic system is operable, lay the lead back for transport (Refer to "TRANSPORTING THE ARROW HAMMER").**
5. **The combustion engine is stopped.**
6. **The machine operator is on the operator's seat.**
7. **The driver of the towing vehicle, the machine operator, and any other assisting persons must continuously maintain visual contact with each other.**
8. **The rear (steering axle) end of the machine is securely connected to the towing vehicle.**

⚠ DANGER **The parking brake must only be released after the machine has been sufficiently secured to the towing vehicle, to prevent rolling away.**

9. The transmission must be in neutral, the creeper drive must be disengaged, and the parking brake must be released. The machine can now be towed - backwards - away from the danger area.

In the event of an emergency, depress the brake pedal. Be sure to engage the parking brake after completing the towing operation.

Maintenance

Follow the maintenance schedule shown on the following pages. Additional maintenance items not shown on the schedule are:

1. Daily check and tighten all bolts and nuts.
2. Check for chafing of hydraulic hoses.
3. Carry spare cable on the cable roll holder provided. Do not cut cable. The proper cable to use is 3/8" (10 mm) diameter, 6 X 19 hemp center, improved plow, minimum length of 51' (15.5 m).
4. Carry a spare cable wedge and extra flex pins.
5. Carry a spare set of hammer tool clamp bolts.
6. Tighten wheel lug nuts periodically. After changing a tire, retighten the lug nuts after a short period of use.

MAINTENANCE SCHEDULE

The following maintenance schedules are listed according to service interval. Refer to Figures 6-1 & 6-2, and perform these prescribed checks and service procedures.

Daily or Every 10 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
2	Engine Coolant	Check Coolant Level	See Engine Manual
4	Engine Oil	Check Oil Level	See Engine Manual
6	Fuel Filter	Drain Water	
16	Parking Brake	Check & Adjust Parking Brake	Hold Machine Starting off in 3rd
26	Engine Air Pre-Cleaner	Check Pre-Cleaner Bowl	Empty as needed
27	Hydraulic Fluid	Check Level & Add as	AW-20 Hydraulic Fluid
29,30	Cable Sheave Bearings	Lubricate Bearings	Multi-Purpose Lithium Grease
36	Guide Rod Bearings	Lubricate Bearings	Multi-Purpose Lithium Grease
37	Lead Surfaces	Clean & Lubricate Lead	SAE 30W Oil
38	Cable	Check Condition of Cable,	Adjust or Replace Cable, Lubricate
39	Tool Clamp Capscrews	Tighten Capscrews	250 lb-ft (340 N•m)
42	Sideshift Ways	Clean & Lubricate	SAE 30W Oil
--	Tires	Check Pressure & Condition	
--	Hydraulic hoses and lines	Check Condition	Replace if worn
--	Guards	Secured Properly	
--	Loose Hardware	Check Hardware	Tighten or Replace
--	Air Compressor Filter	Push Bottom Drain	

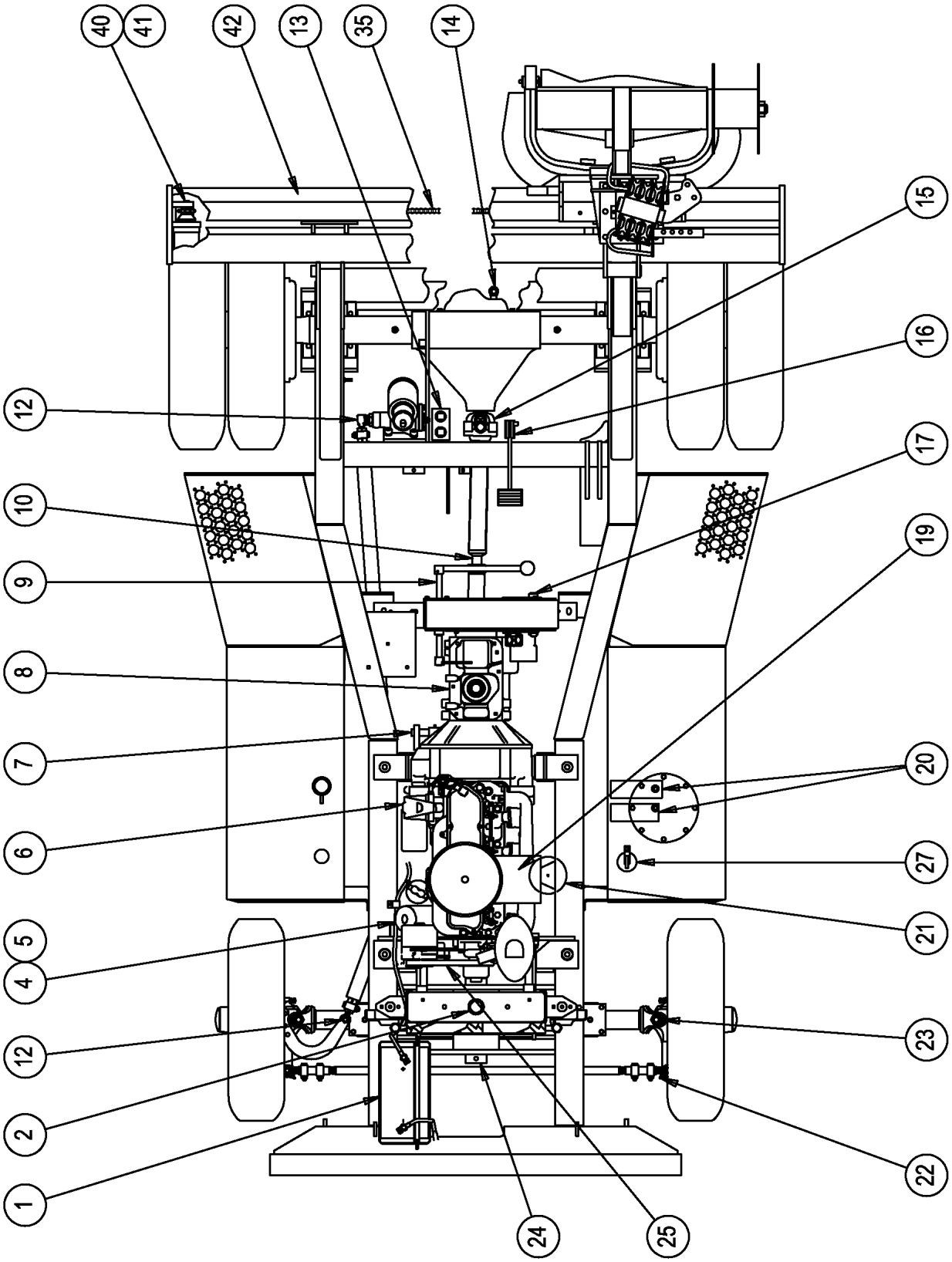


Figure 6-1
HAMMER CHECK POINT & LUBRICATION CHART

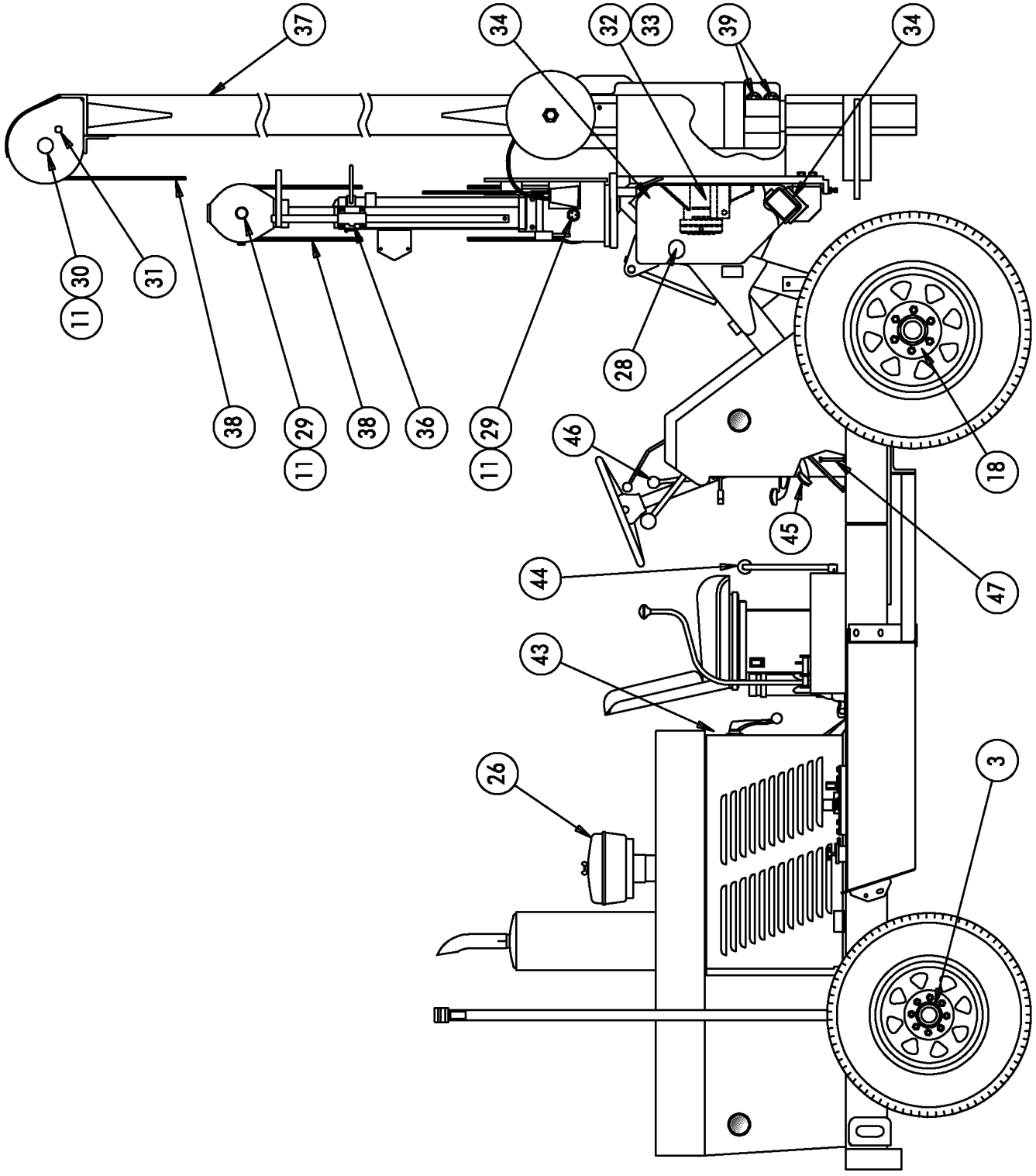


Figure 6-2
HAMMER CHECK POINT & LUBRICATION CHART

Maintenance Schedule cont'd.

Monthly or Every 100 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
13	Brake Fluid	Check Level	DOT 3 or SAE J1703C
19	Engine Air Cleaner	Check Dust Valve	Remove Obstructions
32	Lead Tilt Pin	Lubricate	Multi-Purpose Lithium Grease
32	Lead Tilt Pin	Adjust End Play	See "**Adjustments**" Section
33	Lead Tilt Bearing	Lubricate	Multi-Purpose Lithium Grease
34	Sideshift Bearing	Adjust	See "**Adjustments**" Section
35	Sideshift Chain	Adjust	See "**Adjustments**" Section
35	Sideshift Chain	Lubricate	SAE 30W Oil
40	Shift Motor Shaft	Lubricate	Multi-Purpose Lithium Grease
11	Sheaves	Check for Wear	
43,44	Safety Interlock Switch - Creeper	Check Proper Operation of Safety Interlock Switches	Engine must not start with the creeper engaged, with the clutch pedal out, or with the auto-stroke valve in the idle or automatic position.
43,45	Safety Interlock Switch - Clutch		
43,46	Safety Interlock Switch - Auto-Stroke Valve		
47	Accelerator Pedal Adjustment	Check Pedal Stop Bolt	Maximum Road Speed 20 mph (32 km/h)

Quarterly or Every 250 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
1	Battery	Clean Terminals	
4,5	Engine Oil & Filter	Replace Oil & Filter	See Engine Manual
8	Transmission Lubricant	Check Level	SAE 80W or 80W90 Oil
14	Axle Housing Lubricant	Check Level	SAE 80W or 80W90 Oil
25	Engine Belts	Check for Wear & Proper Tension	See Engine Manual
41	Idler Sprocket Bearings	Clean & Repack	Multi-Purpose Lithium Grease
--	Hydraulic System	Check System Pressures	See "**Hydraulic System**" Section

Maintenance Schedule cont'd.

Semi-Annually or Every 400 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
--	Engine Valves*	Adjust	See Engine Manual
18	Brake Pads	Inspect	Replace pads as necessary
21	Hydraulic Return Line Filter	Replace Filter	Arrow p/n: 5000206

* S/N 6000-6499 : Adjust valves after the first 400 hours, then follow 1200 hour schedule.
* S/N 6500- . . . : Adjust valves after 2000 hours.

Annually or Every 600 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
2	Cooling System	Check	See Engine Manual
3	Wheel Bearings	Repack	Multi-Purpose Lithium Grease
6	Fuel Filter	Replace	See Engine Manual
7	Clutch Shaft	Lubricate Shaft	Multi-Purpose Lithium Grease
9	Creeper Actuator	Lubricate	Lubriplate #930-2
10	Drive shaft Slip Joint	Lubricate	Multi-Purpose Lithium Grease
12,22	Steering Joints	Lubricate	Multi-Purpose Lithium Grease
15	Universal Joints	Lubricate	Multi-Purpose Lithium Grease
17	Creeper Pinion Shaft	Lubricate	Multi-Purpose Lithium Grease
19	Air Cleaner	Replace Element	Arrow-Master p/n: 5000369
24	Axle Center Pivot	Lubricate	Multi-Purpose Lithium Grease
28	Layback Tilt Pins	Lubricate	Multi-Purpose Lithium Grease
--	Air Intake System	Hoses & Clamps	See Engine Manual
--	Engine Vent Tube	Clean	See Engine Manual
--	Air Compressor Tank	Check Replacement Date	5 Year Expected Life
--	Air Compressor Safety Valve	Pull to Check Operation	

Maintenance Schedule cont'd.

Bi-Annual or Every 1200 Hours

KEY	DESCRIPTION	SERVICE	SPECIFICATION
2	Engine Coolant	Flush & Replace	See Engine Manual
8	Transmission Lubricant	Replace	SAE 80W or 80W90 Oil
14	Axle Housing Lubricant	Replace	SAE 80W or 80W90 Oil
20	Suction Strainers	Clean	
27	Hydraulic Fluid	Replace	AW-20 Hydraulic Oil
--	Engine Thermostats	Replace	See Engine Manual
--	Engine*	Conduct Tune-up	See Engine Manual

* Set high throttle speed to 2200 rpm, no load

Adjustments

CABLE LENGTH

In order to account for differences in the length of certain tools it may be necessary to make adjustments to the length of the cable.* Refer to Figure 7-1 and use the following procedure when adjusting the cable:

1. Move the auto-manual control valve handle forward to the manual/start position and set the parking brake.
2. Start the engine and raise the lead to the vertical position with the layback control. Move the lead all the way to the right-hand side of the slide using the sideshift control.
3. Lower the tool to the ground or flat surface by pushing forward on the hammer control valve handle. Shut the engine off.
4. Loosen the cable wedge at the hammer weight or at the base of the lift cylinder. (Refer to Figure 7-1)
5. Start the engine and use the hammer control valve handle to carefully extend the lift cylinder upward 10 inches (25 cm) above the bottom of the stroke. Shut the engine off.
6. Pull the slack out of the cable and resecure the wedge(s).
7. Restart the engine and use the hammer control valve handle to carefully extend the lift cylinder to its maximum length. The weight should stop no closer than 6-10 inches (15 - 25 cm) from the stop blocks located near the top of the lead. Readjust the cable, if necessary, to obtain the correct gap.

NOTICE **If the cable length is too short, or improperly set, it may be possible to adjust the lift height so that the weight strikes the upper travel limit stop blocks on the lead. Striking the travel limit stop blocks can cause severe structural damage to the machine. Make sure that the lift height and cable length are properly set to prevent damage to the machine.**

* When the Arrow hammer is shipped from the factory, the cable length has been set for use with a short tool such as a breaker or a scoring tool. If a longer tool is to be used, it may be necessary to shorten the cable setting as described above. On mechanically adjusted units, the automatic trip fingers will not be in the proper position in relationship to hammer stroke unless cable length is properly adjusted. The cable length must be set long enough to enable the hammer to strike a full blow before starting the up stroke. Too long a cable will result in a time lag between strokes. Minor changes in cable length can be accounted for without making physical changes to the cable setting by adjusting the mechanical up and down limit trips on mechanically actuated units. Machine equipped with electronic stroke control are self-compensating for minor changes in cable length.

REPLACING THE CABLE

Inspect the cable daily. If the cable is badly worn, bent, kinked, or has broken wires or strands, it must be replaced. The Arrow Hammer is equipped with either a one-piece cable or a cable spool. A one-piece cable will require replacement whenever the cable is broken, damaged, or frayed. The cable spool, which holds 250 ft. (76 m) of spare cable, permits replacement of the broken or damaged section only.

Cable Spool - Refer to the following instructions and Figure 7-1.

NOTE: When carrying spare cable, Do not cut the cable between the cable spool and the lift cylinder. Cable fraying usually starts near the end of the cable closest to the weight. Leaving the cable intact makes it possible to feed only as much cable as needed to replace the damaged section. Using this procedure, insures the most efficient use of the cable on the cable spool.

1. Lock the hammer weight (See Figure 5-3) and lay the lead back into the stowed transport position. Shut the engine off and set the parking brake.

NOTE: If the cable has broken during operation, it will not be possible to raise and lock the hammer weight. DO NOT attempt to lay the lead back with the hammer weight on the ground. Retract the lift cylinder completely and temporarily re-attach the broken cable end to the hammer weight. Lift and lock the hammer weight in place before proceeding.

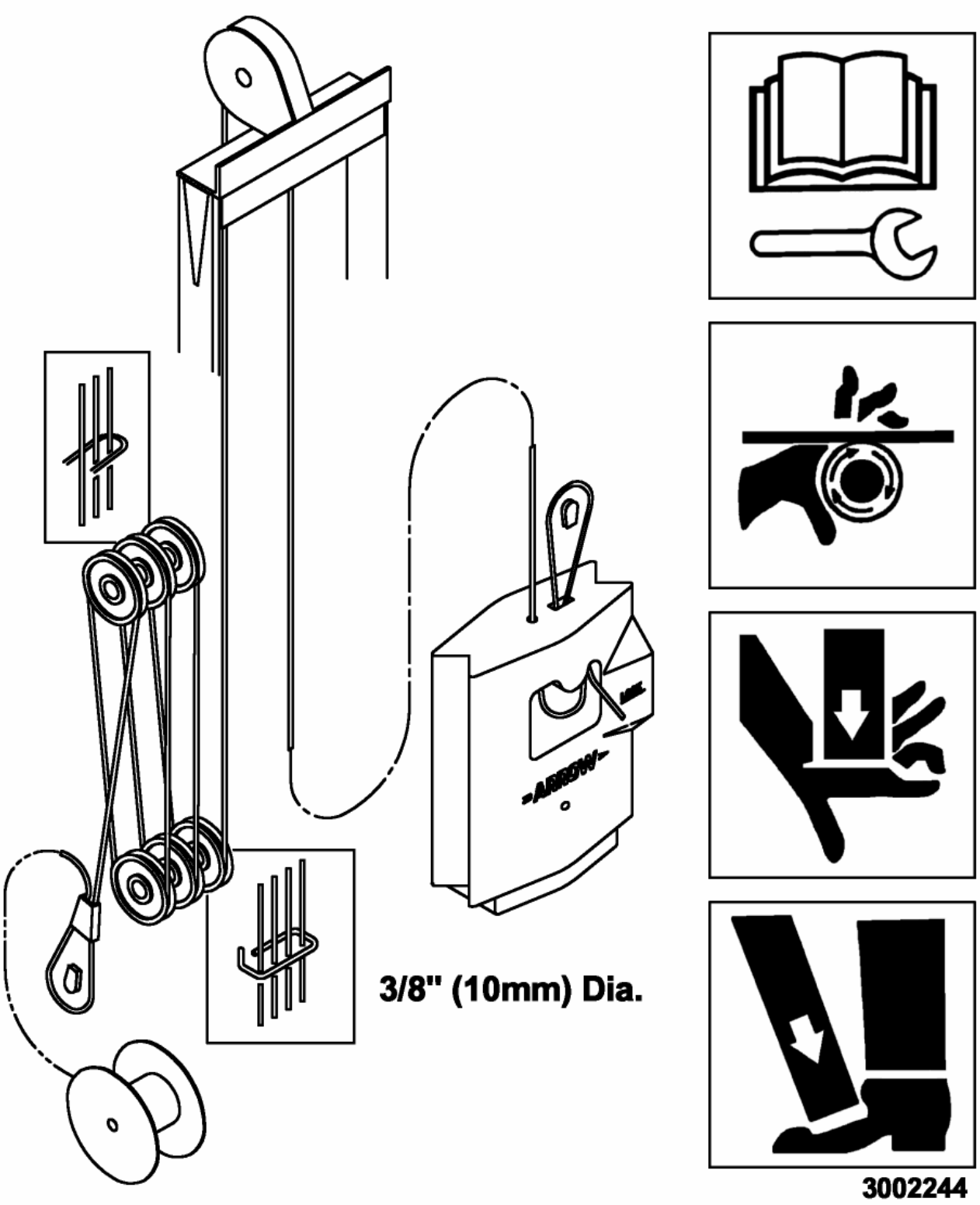


Figure 7-1
CABLE THREADING

REPLACING THE CABLE - Cable Spool cont'd.

2. Remove both cable wedges and the cable clamp. Remove the broken or damaged section of cable.
3. Loosen the cable spool nut and rethread the cable as needed (refer to Figure 7-1). Make sure the cable is threaded inside the two retaining loops on the attachment bracket.
4. Thread the cable back through the hammer weight. Reinstall the cable wedge and cable clamp.

NOTE: When replacing a section of damaged cable, pull the cable through the hammer weight until the damaged section is clear of the cable wedge when reinstalled. Cut and discard the damaged section.

5. Follow the procedure for adjusting the CABLE LENGTH to complete the installation. Be sure to retighten the spool nut before resuming operation.

Short Cable - 51' (15.5 m) Minimum - Refer to the following instructions and Figure 7-1.

1. Lock the hammer weight (See Figure 5-3) and lay the lead back into the stowed transport position. Shut the engine off and set the parking brake.

NOTE: If the cable has broken during operation, it will not be possible to raise and lock the hammer weight. DO NOT attempt to lay the lead back with the hammer weight on the ground. Retract the lift cylinder completely and temporarily re-attach the broken cable end to the hammer weight. Lift and lock the hammer weight in place before proceeding.

2. Remove both cable wedges (Refer to Figure 7-1).
3. Remove the broken or damaged cable. Be sure to remove and retain the cable clamp.
4. Insert the end of the new cable at the base of the lift cylinder and reinstall the cable wedge (Refer to Figure 7-1).
5. Thread the cable through the sheaves in the lift cylinder as shown in Figure 7-1. Make sure that the cable is threaded inside the two retaining loops on the attachment bracket (Refer to Figure 7-1).
6. Run the cable through the sheave at the top of the leads and back down to the weight.
7. Reinstall the cable wedge and the cable clamp at the hammer weight.
8. Follow the procedure for adjusting the CABLE LENGTH to complete the installation.

Refer to the "**Specifications**" section for proper cable specifications. Minimum length for the cable is 51 ft. (15.5 m). Replacement part numbers: 4001024 - 51 ft. (15.5 m), 2000616 - 250 ft. (76 m)

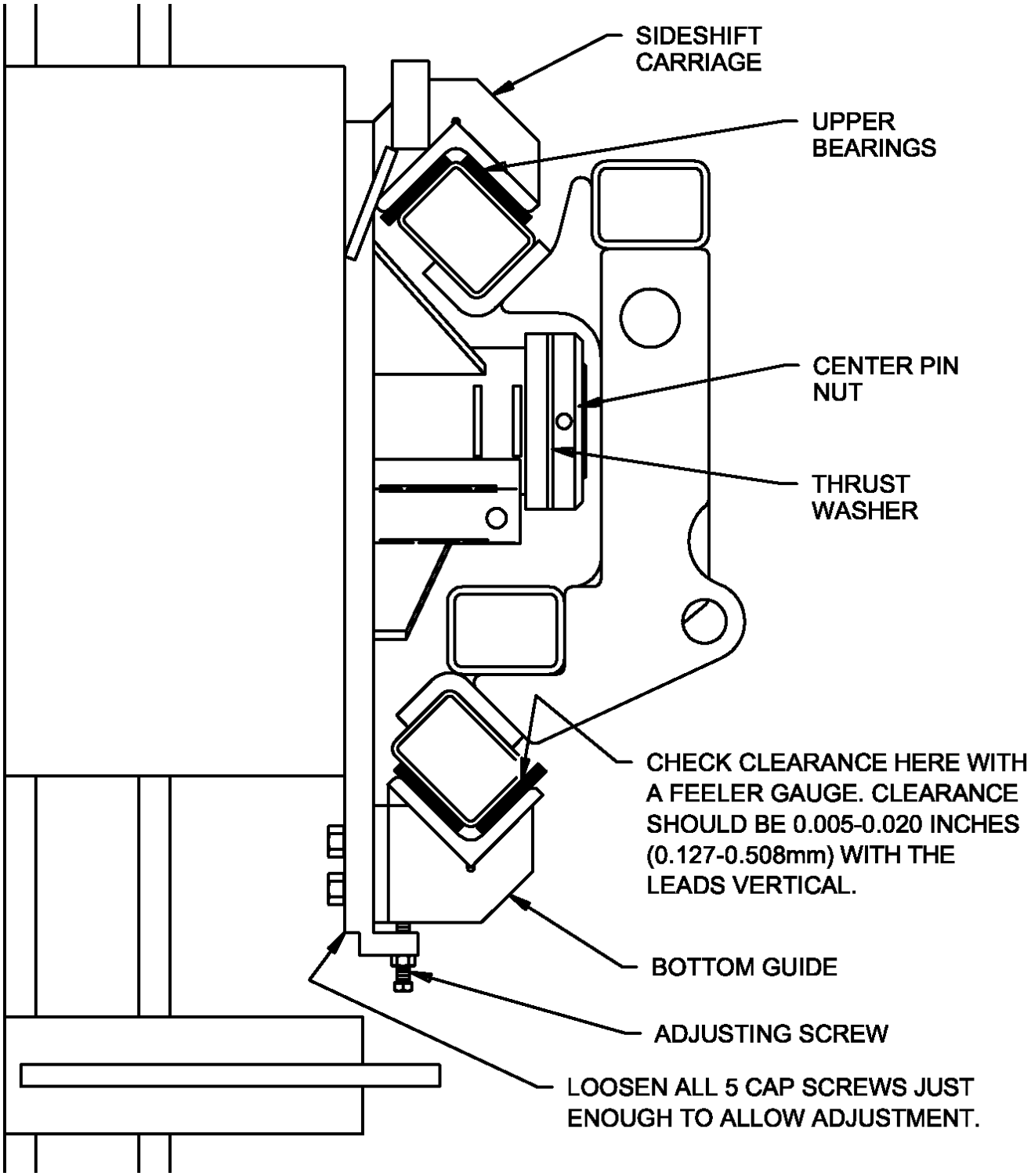


Figure 7-2

CARRIAGE & CENTER PIN ADJUSTMENTS

CROSS-SLIDE BEARING ADJUSTMENT

The carriage assembly is equipped with plastic slider bearings which operate in contact with the surfaces of the sideshift ways. It will occasionally be necessary to adjust these bearings for wear. (Refer to Figure 7-2)

1. Using the layback control valve, raise the leads into a vertical position.
2. Using the sideshift control valve, move the carriage assembly to a position approximately 3 inches (8 cm) from the extreme right hand end of its travel.
3. Loosen, but **DO NOT REMOVE**, the bolts that attach the lower bearing retainer to the carriage assembly. (Refer to Figure 7-2)

⚠WARNING Removal of the lower cross slide bearing holder will allow the lead and carriage assembly to tip off the sideshift frame in any direction. Do not remove the lower cross slide bearing holder unless the top of the lead has been properly secured such as to an overhead hoist or crane.

4. Loosen the jam nuts from the adjustment screws located at the bottom of the carriage assembly.
5. Turn the adjustment screws to obtain a running clearance of 0.005" to 0.020" (0.127 - 0.508 mm) at the lower bearing. (Refer to Figure 7-2)
6. Retighten the jam nuts and the mounting bolts.
7. Clean the sideshift ways and apply fresh lubricant to the slide contact surfaces of the ways.
8. Check the sideshift mechanism for freedom of movement by shifting the mechanism from side to side.
9. Readjust to provide greater bearing clearance as required for freedom of movement.

CARRIAGE BEARING END PLAY

The center pivot bearing on the carriage assembly should be checked periodically for end play. To adjust the end play, refer to Figure 7-2 and use the following procedure:

1. Lay the leads down onto the lead rest and shut the engine off.
2. Move the layback control valve lever both directions to relieve any cylinder pressure.
3. Using standard feeler gauges, check the end play between the thrust washer and the retaining ring at the back of the carriage center pivot. (Refer to Figure 7-2)
4. The correct end play is 0.005" to 0.010" (0.127 - 0.254 mm).
5. Loosen the lock bolt on the retaining ring.
6. Turn the retaining ring clockwise to reduce the end play.
7. Retighten the lock bolt.

SIDESHIFT CHAIN

To adjust the tension on the sideshift drive chain, refer to Figure 7-3 and the following procedures:

1. Using the layback control valve, raise the leads into an upright position.
2. Using the sideshift control valve, move the carriage until it is approximately 3 inches (8 cm) away from the right hand travel limit.
3. Loosen the jam nuts on each of the two chain adjustment screws located at the rear of the carriage, near the center pivot. (Refer to Figure 7-3)
4. Adjust both screws equally until the slack has been removed from the chain.

NOTICE **Do not over tighten the sideshift chain. Over tightening will lead to excess wear and possible failure of the chain and chain drive components.**

5. To check for proper chain tension, locate the approximate center of the chain span. Grasp two adjacent strands of the chain between thumb and forefinger. It should be easy to deflect each chain approximately 1 inch (2.5 cm), but difficult to make the chains touch.
6. Retighten the nuts and the jam nuts on the chain tensioning screws.

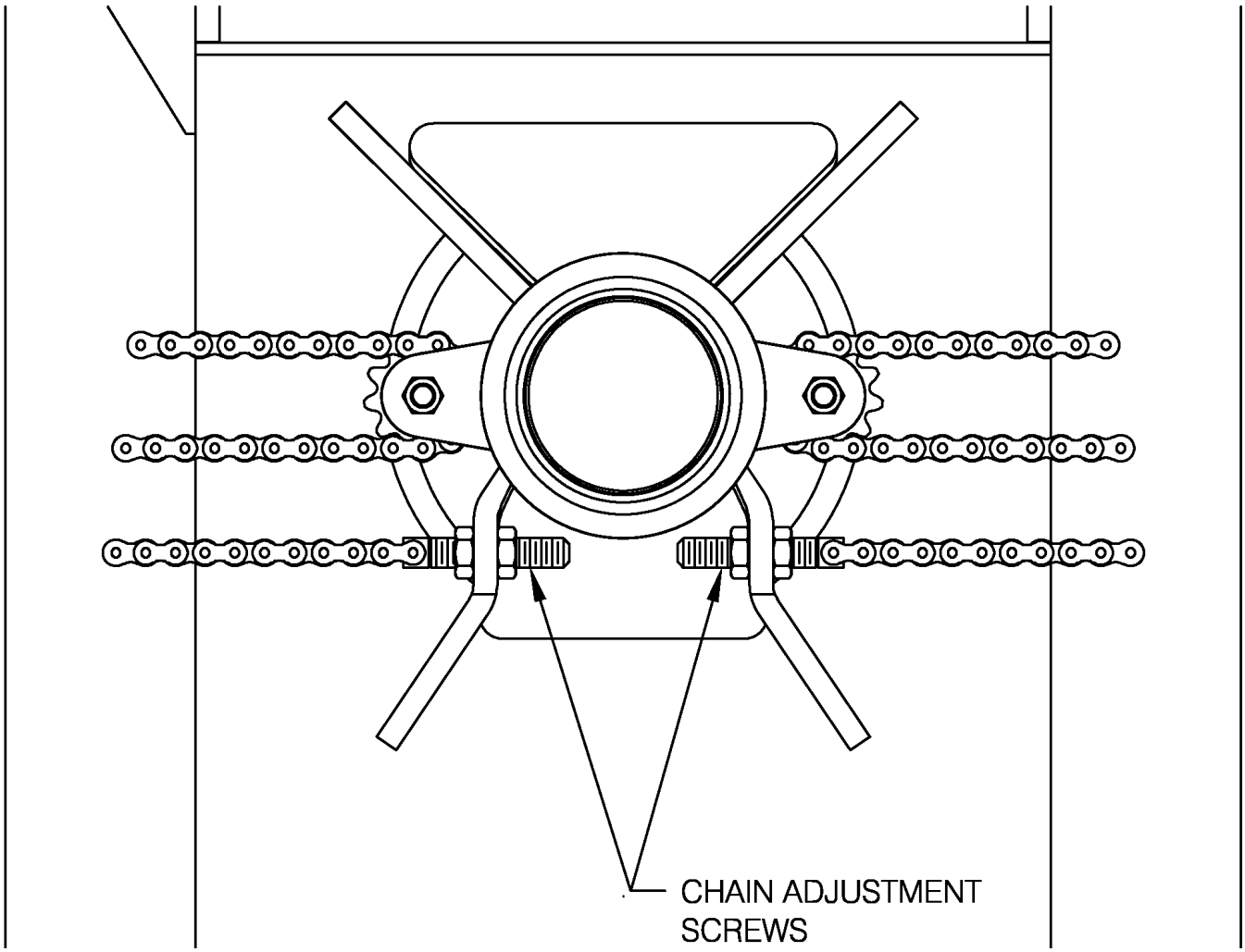


Figure 7-3
SIDESHIFT CHAIN ADJUSTMENT

PROXIMITY SENSOR - electronic stroke control option

The proximity sensor is located on the right hand side of the sheave housing at the top of the lead. To adjust the proximity sensor, refer to Figure 7-4 and use the following procedure:

1. Lay the leads down onto the lead rest.
2. Remove the two bolts securing the sensor to the sheave housing.
3. Remove the sensor bracket (with the sensor attached).
4. Move the sheave until the hub contacts the side of the sheave housing which has the sensor mounting hole.

NOTE: Excessive sheave side play can result in erratic operation of the unit, or damage to the sensor.

5. Measure the distance between the spoke on the sheave and the outer face of the sheave housing.
6. Subtract 1/8" (3.2 mm) from the dimension obtained in step 5. This dimension is dimension "A". (Refer to Figure 7-4)
7. Adjust the distance from the sensor face to the bracket face to dimension "A".
8. Reinstall the sensor bracket and sensor to the sheave housing.

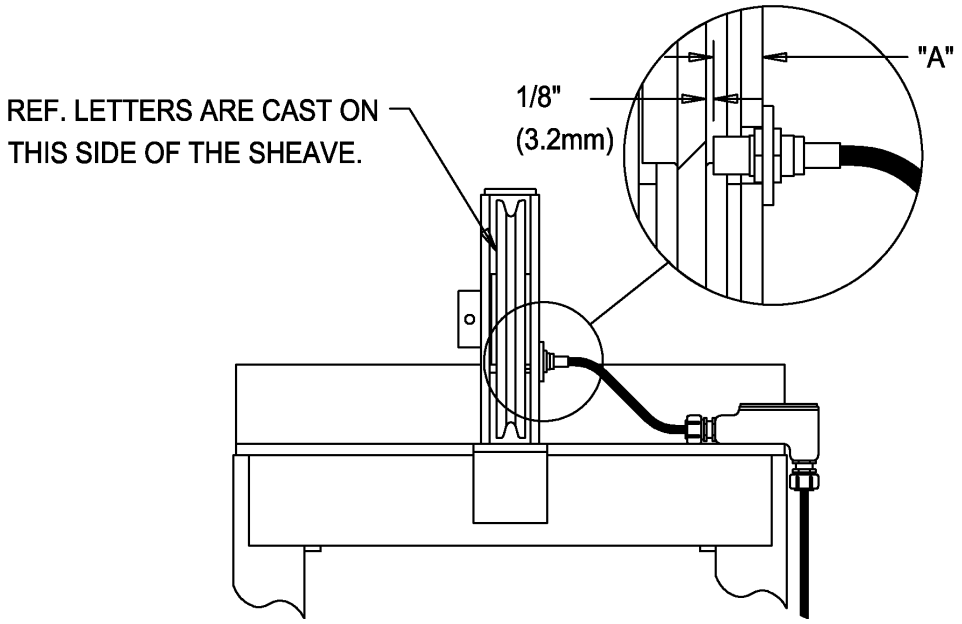


Figure 7-4
SHEAVE SENSOR ADJUSTMENT

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.