

SAFETY

ATTENTION!!! READ THIS SECTION FIRST.

This portion of the manual is concerned with safety considerations pertaining to towing, driving, operation and maintenance of the TMX (Towable Mini eXcavator).

In this manual, the TMX Excavator is sometimes referred to as "the machine" or as "TMX." All these terms refer to the TMX Towable Mini eXcavator.

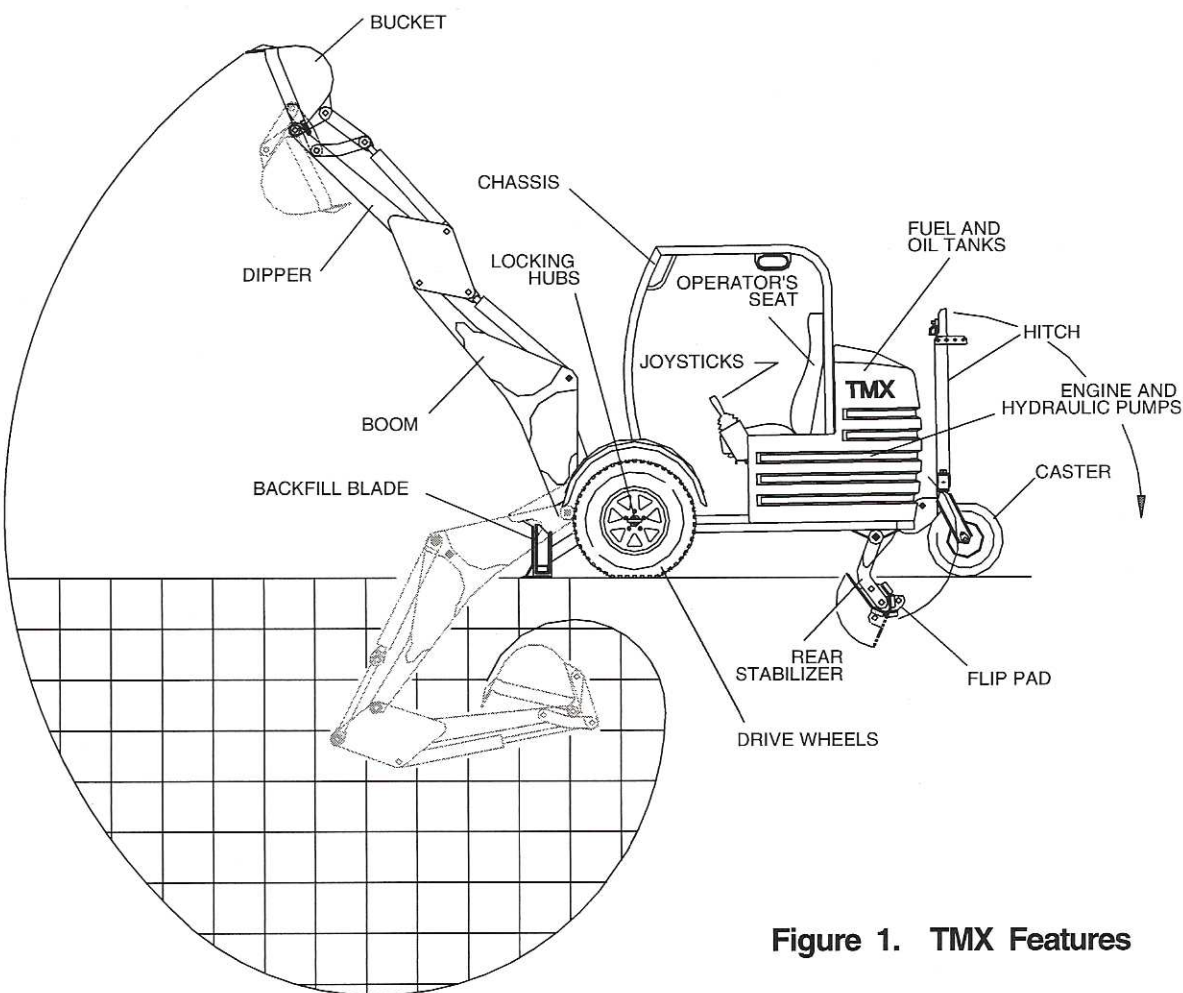


Figure 1. TMX Features

DO NOT operate the TMX Excavator without first becoming familiar with the machine and its controls (see figure 1 for features). The Excavator is intended for use by persons who are familiar with the operation of powered equipment and digging with machines. Read the "Operation & Controls" section of this manual and become familiar with the operating controls of the machine before attempting to operate the machine.

SAFETY

SIGNAL WORDS AND SYMBOLS



This is the safety - alert symbol. When you see this symbol on your TMX or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices. Your safety and the safety of others depends significantly upon your knowledge and understanding of all correct operating practices and procedures of this machine.

Signal words:

A signal word - **DANGER**, **WARNING** or **CAUTION** is used with the safety - alert symbol. **DANGER** identifies the most serious hazards.



Safety signs with the signal word "**DANGER**" denotes that an extremely hazardous situation exists on or near the machine that could result in high probability of death or irreparable injury if proper precautions are not taken.



Safety signs with the signal word "**WARNING**" denotes that a hazard exists on or near the machine that can result in injury or death if proper precautions are not taken.



Safety signs with the signal word "**CAUTION**" is a reminder of safety practices on or near the machine that could result in personal injury if proper precautions are not taken.

LEARN MACHINE SAFETY

Carefully read this manual. Learn how to operate the TMX and how to use the controls properly.

Do not let anyone operate this machine without complete safety and operating instructions.

Unauthorized modifications to the TMX may impair the function and/or safety and affect machine life.

FOLLOW SAFETY INSTRUCTIONS



Carefully read this operator's manual.

Learn how to safely operate the machine.

Keep your TMX in proper working condition.

Follow recommended maintenance and repair procedures.

OBSERVE SAFETY SIGNS

Carefully read all safety messages in this manual and on the TMX safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs.

Replacement safety labels are available at **NO CHARGE**. Contact ETC at:
www.excavationtechnology.com

SAFETY continued

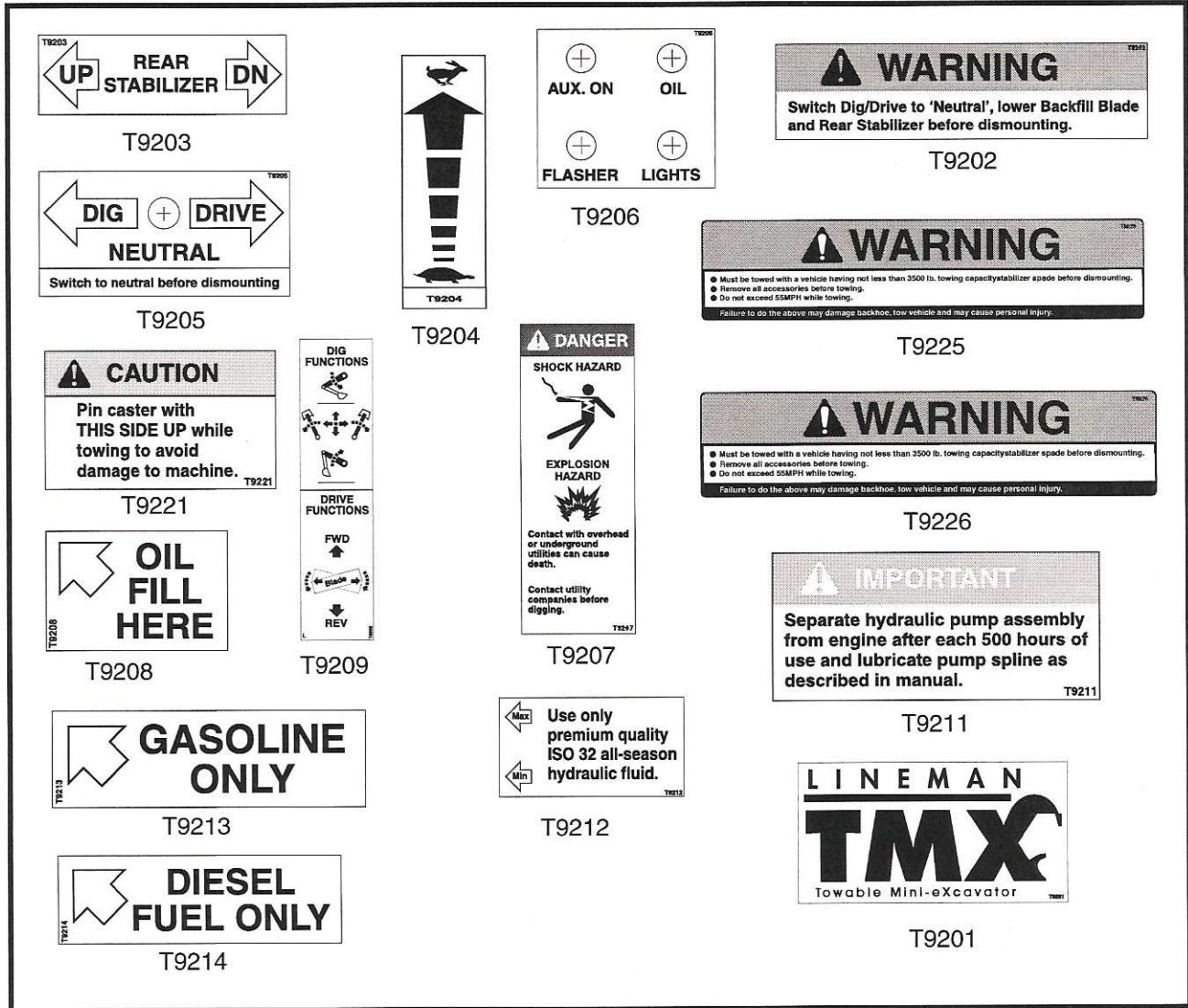


Figure 1. TMX Decals

WEAR PROTECTIVE CLOTHING

- Wear close fitting clothing and safety equipment appropriate to the job.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises. Prolonged exposure to loud noise can cause impairment or loss of hearing.
- A hard hat is required when overhead hazard exists.

PROTECT CHILDREN

- Keep children and others away when you operate machine. **BEFORE YOU BACK UP:**
- Look behind the TMX for children.
- DO NOT let children operate the TMX.
- DO NOT let children ride on the TMX.

SAFETY continued

AVOID TIPPING

DO NOT OPERATE WHERE MACHINE COULD SLIP OR TIP. Stay alert for holes, rocks, and roots in the terrain and other hidden hazards. Keep a safe distance from drop-offs and unshored excavation.

Never operate the TMX on an incline of more than 15 degrees.

Slow down before making turns.

Driving backward out of a ditch or mired condition or up a steep slope could cause the TMX to tip over forward (backhoe end). Drive forward (backhoe first) in these situation.

Always travel up or down the slope, whenever possible--NEVER across slope.

Always keep the front (backhoe end) on the uphill side when ascending or descending inclines.

KEEP RIDERS OFF MACHINE

Only allow the operator on the TMX. Keep riders off all areas of the unit. Never use the backhoe to lift persons in or out of the trench.

USE SAFETY LIGHTS AND DEVICES

Stop, Turn and Tail Lights may be required by state or local authorities when towing the TMX on public roads.

Keep safety items in good condition. Replace missing or damaged items.

Use 4-way flasher whenever the TMX is operated near roadways or traffic areas.

PARK MACHINE SAFELY

Before working on the machine:

- ◆ Lower all components to the ground.
- ◆ Stop the engine and remove the key.
- ◆ Disconnect the battery ground strap.
- ◆ Hang a "DO NOT OPERATE" tag in operator station.

USE A SAFETY CHAIN

Safety chains will help control the TMX should it accidentally separate from the tow vehicle.

Using the appropriate adapter parts, attach the chain to the vehicle hitch or other specified anchor location. Cross chains so that they may "cradle" the hitch and prevent it from ground contact in the event of hitch failure. Provide only enough slack in the chain to permit turning.

The TMX safety chain may only be replaced with a chain with a strength rating equal to or greater than the gross weight of the towed machine.

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

SAFETY continued

HANDLE FUEL SAFELY - AVOID FIRES

Handle fuel with care; it is highly flammable and explosive. Do not refuel the machine while smoking, when near open flame or sparks or when the engine is hot.

Always stop engine.

Allow engine to cool.

Fill fuel tank outdoors.

Prevent fires by keeping machine clean of accumulated trash, grease and debris. Always clean up spilled fuel.

AVOID HIGH-PRESSURE FLUIDS

Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before unhooking hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard to search for leaks.

If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene or other infection may result.

UNDERSTAND CORRECT SERVICE

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil. Catch draining fuel, oil, or other fluids in suitable containers. Do not use food or beverage containers that may mislead someone into drinking from them. Wipe up spills at once.

WORK IN A VENTILATED AREA

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 60 Fahrenheit (16 Celsius).

Most battery explosions are caused by incorrect "jump-starting" procedures. The first choice for safety is DO NOT "jump-start." If you must "jump-start" your equipment, use proper procedures. First, connect the positive (+) end of the cables to the "good" battery and the positive (+) post on the starter.

Next, connect the negative (-) end of the other cable to the negative (-) post of the "good" battery and then connect the other end of the cable to the frame of your equipment. Reverse this procedure when disconnecting.

SAFETY continued

PREVENT ACID BURNS

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing and cause blindness if splashed into eyes.

Avoid the hazard by:

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoid breathing fumes when electrolyte is added.

PRACTICE SAFE MAINTENANCE

Understand service procedures before doing work. Keep area clean and dry.

Never lubricate or service machine while it is moving. Keep hands, feet and clothing from power-driven parts. Lower all equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil or debris.

To avoid damage to the TMX electrical system, disconnect battery ground cable (negative -) before making adjustments on electrical systems or welding on machine.

OPERATE MACHINE SAFELY

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing or necklace when you work near machine, tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglements in moving parts.

Watch pinch points when operating machine.

Watch boom and dipper swing and use care to avoid injury to other workers.

When lowering backfill blade and stabilizer spade, be sure all workers are clear of operation.

SAFETY NOTES

Read and become familiar with these safety notes and the safety manual. They are repeated throughout Section B (Operation) of this manual.

-ALWAYS-

Be aware of all underground electrical cables, phone lines, sewage connections or other underground facilities in the digging area. **Call your utility or "diggers hotline" (listed in your telephone directory) before digging.**

Operate the machine only in areas free of obstructions.

Mark off an area 20 feet beyond the machine's operating range. Keep all persons clear of this area.

SAFETY continued

-NEVER-

Use backfill blade and stabilizer spade to anchor machine before digging. The TMX Excavator is the most stable for digging when all wheels are off the ground.

Set and retract backfill blade and stabilizer spade.

Tilt backfill blade to level the machine when working on inclines.

Raise TMX on its backfill blade and stabilizer spade when parking on an incline.

Take note of job site conditions, such as soft or wet ground, overhead wires, obstructions, before operating the TMX.

Take extra precautions when digging on or near hillsides, close to ditches, or anywhere danger of tipping or sliding exists.

Avoid sudden starts and stops when operating.

Position backfill blade to approximately 6 inches above ground level when driving or maneuvering machine with digging arm.

Back down inclines (towing hitch first.)

Watch rear of machine while turning; turning axis is ahead of driver's seat.

When dismounting the TMX, relax the hydraulic system with bucket, backfill blade and stabilizer spade, rest on the ground and turn off the ignition key.

Perform operator maintenance checks and services daily before operating the TMX excavator.

NEVER operate the TMX Excavator from any location other than the driver's seat.

NEVER leave driver's seat while engine is running.

NEVER contact the backfill blade with the digging arm during digging operations.

NEVER use boom or bucket to transport persons or for any purpose other than digging.

NEVER operate the TMX on an incline of more than 15 degrees.

NEVER operate machine in poorly ventilated areas. Deadly CARBON MONOXIDE from the engine is no different than an automobile exhaust.

NEVER rely on hydraulic wheel motors as parking brakes. Lower the backfill blade and rear stabilizer to the ground.

NEVER operate the TMX without fastening the seatbelt.

TMX - GENERAL DESCRIPTION

The TMX towable excavator is a *fully hydraulic* excavation and finish grading piece of light construction equipment. It may be safely towed at highway speeds by a properly equipped vehicle. Once at the job site, the TMX transforms from the transport mode to the digging mode in just seconds by simply engaging the wheel hubs and raising the towing hitch. The size, durability and mobility of the TMX make it the ideal machine for:

- Sewer, septic and water line installation and repair
- Gas, buried electric and telephone line hookup and repair
- Buried, cable/pipe splicing and directional boring pits
- Tree and shrub planting on new construction and existing lawns
- Cemetery grave openings and closings
- Finish grading of topsoil, stone, gravel and other loose materials

Built to Last and Last in the Toughest Applications

The TMX is built using only the highest grade industrial materials and components to provide thousands of hours of trouble free service with minimal routine maintenance. The engine is equipped with a low oil pressure indicator light to prevent inadvertent engine damage. A forced air heat exchanger is standard equipment and ensures smooth, cool and long life to all of the hydraulic components. All of the pivot pins are oversized with replaceable hardened steel bushings. High carbon steel is used on all ground engaging parts. TMX uses an independent elastomer wheel suspension for smooth towing on rough, potholed roads and prolong the equipment's life. Even the tires are either foam filled or completely steel belted to reduce tire failures. The TMX stays looking new too through the extensive use of GEPAX on the engine cowling sunshade, and fenders. GEPAX is a composite material that is colored completely

through and resists cracking, rust, chipping, or fading for years of normal operation of your TMX.

Ergonomics

The design of the TMX places the operator close to the working movements with an unobstructed view of the digging and grading operations. The seat and armrest controls provide the operator with armchair comfort and is offset from the digging boom to retain the operator's proper posture during operation. Even the towing hitch is counterweighted to ensure that the manual flip operation from towing to digging mode is effortless. A sunshade is standard equipment. Plus, the engine heat and hydraulic pumps are located far from the operator behind an insulated firewall for maximum operator comfort. This modern work station greatly reduces the operator's arm, wrist, hand and back strain, thereby reducing fatigue and greatly improving the operator's productivity.

Performance

At 6,600 pounds of combined bucket and dipper breakout force (SAE Rated), the TMX is the most powerful digging machine in the world for its size and weight. The machine's extremely low center of gravity, zero radius turn capability and light weight allows the TMX to tackle tasks that were previously restricted to hand labor. Zero turns may be performed without creating damage to manicured turf unlike tracked or skidsteer type machines. Plus, the Tilting Backfill Blade System of the TMX makes short work of backfilling operations, and enables the machine to precisely finish grade, (grass seed, sod ready), once again reducing costly, backbreaking hand labor.

Powers an Array of Additional Hydraulic Tools

There is no need to drag an air compressor out to the job site any longer. The TMX has hydraulic power built right in. A "wet stick" or hydraulic power take-off with an activation indicator dash lamp is standard equipment on the TMX. This HyPTO provides up to 9gpm and gives the TMX the full capability to power:

- Water and Trash Pumps up 600 gph
- Mounted Concrete Breakers (outworks 3 men with jackhammers)
- Concrete Saws - Handheld or walking "cart" mount
- Handheld Concrete Breakers
- Impact Wrenches, Crimping Tools, "Jaws of Life" type shears
- Earth Augers (Postholes to 18")

There are a wide array of hydraulic tools available that may be powered by the TMX.

Safety

Special care was taken in the design of the TMX to keep the operator out of harm's way during its use. For example:

Boom Locking - Unlike competitive machines that require the operator's hands, or even his entire body to enter "pinch zones" to activate a mechanical boom

locking device, the TMX incorporates the boom locking function into the hydraulic functions of the unit so that the operator may remain seated and belted during its activation.

Function Locks - When the TMX key switch is off, not only does the engine stop, but everything is non-operational. The lights and all hydraulic functions are dead when the key is in the off position. The operator can safely dismount the unit without fear of hitting a control that would lower the boom on somebody, or be concerned that a child may be able to hurt himself or a playmate fooling around with an unattended machine.

Backfill Blade/Stabilizer Hydraulic Locks - Whether the engine is running or not, the Backfill Blade and the rear stabilizer do not "drift" during operation due to an integrated hydraulic lock in these systems.

Horn - Although a warning horn is not required on this size/HP machine, TMX keeps the horn button at your fingertips at all times - just to be safe.

MAINTENANCE

All maintenance other than daily operator maintenance should be performed by skilled technician.

DAILY OPERATION

1. Check hydraulic fluid level.
2. Check engine oil level.
3. Inspect chassis for cracks or broken welds, loose or missing pins, leaks, rubbing or chafed hoses. Correct as needed.
4. Check mechanisms for rocks, roots or other debris and remove.
5. Lubricate zerk (grease) fitting as shown on pages G3 and G4.
6. Fill fuel as required
7. Check tire inflation and condition (40 psi).

LUBRICATION & MAINTENANCE

				PROCEDURE	COMMENTS
	BREAK-IN				
	25 HOURS				
	100 HOURS				
	200 HOURS				
			500 HRS OR ANNUALLY		
X				Check wheel lug nuts and all hardware for proper tightness	Lug nuts - 90 ft. lbs.
X				Change engine oil and filter at 5 hours	2 US quarts - 10W30 API SJ or higher
X				Service engine pre-cleaner element	Replace as needed
X				Check all bushings for wear	
X				Replace engine air cleaner element	More often if needed
X				Change engine oil, 10W30 API SJ or higher	2 US quarts (synthetic oil preferred)
X				Remove engine cooling shroud	Clean cooling areas
X				Check torque of wheel motor & hub bolts	75 ft. lbs.
X				Check torque of lugnuts	90 ft. lbs.
X				Change engine oil filter	
X				Check spark plug condition and gap	0.030" / 0.76mm
				X Change hydraulic system fluid and two filters	ISO 32
				X Remove hydraulic pumps	lubricate pump drive spline (Molybdenum grease)
				X Change oil in both disengaging hubs	6 fl. oz. 10W30 API SJ or higher
				X Change engine fuel filter	
				X Service engine starter bendix	By Kohler Engine Service Dealer
				X Disassemble and clean engine solenoid shift	By Kohler Engine Service Dealer

Compatible Greases:

- Lidok EP #2 (found at industrial shops)
- Ronex MP (Exxon service stations)
- Shell Alvania (Shell service stations)
- Mobilux #2 (Mobil service stations)
- Super Lub M EP #2 (Conoco service stations)

OPERATION & CONTROLS

Operators should be familiar with the controls before operating the machine. Operating with a smooth, steady motion reduces wear and tear on the mechanical and hydraulic parts, extends machine life and increases efficiency.

-ALWAYS-

- PERFORM OPERATOR MAINTENANCE CHECKS AND SERVICES DAILY BEFORE OPERATING THE MACHINE.
- Watch rear end (Hitch End) while turning; turning axis is ahead of driver's seat.
- Keep the backhoe end uphill when ascending or descending grades.

STARTING THE ENGINE

- 1 Sit in operator's seat and fasten seat belt.
- 2 Ensure that the dig/drive selector switch is in the neutral (center position.)
- 3 Insert key into ignition switch.
- 4 Move throttle to approximately 3/4 open.
- 5 Adjust choke to "full" in cold weather or on cold engine.
- 6 Turn key to start position until engine starts. Release key to "run" position as soon as the engine is running.
- 7 Adjust choke as required.

For diesel engine starting, refer to the diesel engine manual that came with your machine.

DRIVING

Engaging the drive wheels

Pull Drive Hub "Tee" handle outward, turn 90 degrees and release (both hubs). Spring force will pull handle into engagement.

Disengaging drive wheels

Pull Drive Hub "Tee" handle outward, turn 90

degrees, fit tee handle into "disengagement" storage position.

1. ALWAYS SIT IN THE SEAT WHILE THE TMX EXCAVATOR ENGINE IS RUNNING.
2. Move Dig/Drive switch to "Drive" position.
Raise rear stabilizer spade completely.
3. Raise backfill blade approximately 6" (minimum).

Driving:

- a. Straight Forward or Back: Move both joystick levers the same amount at the same time.
- b. Large Radius Turns: Move the lever for the outside wheel more than the inside wheel.
- c. "Zero" turns or Tight Area Turns: Move the joystick levers in the opposite directions.

-NEVER-

- NEVER operate machine in poorly ventilated areas. CARBON MONOXIDE from the engine can cause sickness or death.
- NEVER use boom or bucket to transport persons.
- NEVER leave driver's seat while engine is running.



Turning axis is ahead of the driver.
Watch the rear of the machine when turning.

LOWERING/RAISING BACKFILL BLADE & STABILIZER SPADE

-ALWAYS-

1. Move Dig/Drive switch to the "Drive" position.
2. Set and retract backfill blade and stabilizer spade slowly.
3. Angle backfill blade to match slope before contacting the ground.

LOWERING/RAISING BACKFILL BLADE & STABILIZER SPADE cont.

1. Move the Stabilizer Control Lever in the desired direction as indicated on the Operator's Console. Move RH joystick to the right to lower backfill blade. Move RH joystick to the left to raise backfill blade. Move LH joystick to the right to tilt backfill blade down to the right. Move LH joystick to the left to tilt backfill blade down to the left.

SECURING BOOM FOR TOWING

Set Dig/Drive Switch to "Dig."

Center boom on chassis and raise fully. Switch to "Drive" and raise the backfill blade until it contacts the boom.

HITCHING TO TOWING VEHICLE

1. Ensure that the hitch on the towing vehicle is Class II or higher with a 2" ball.
2. Make sure that the machine is in the following configuration before towing:
 - Backfill blade and Stabilizer Spade full "up".
 - Boom full "up"
 - Boom centered and supported by backfill blade
 - Dipper full "in"
 - Bucket full "curl"
 - Drive Wheels disengaged.
 (See "Disengaging Drive Wheels" above)

The drive train will be damaged if the machine is towed with the drive wheels engaged.

3. Lower rear stabilizer spade until the caster tires are off the ground.
4. Remove two Hitch Securing Pins and lower hitch to towing position, securing with pins. Ensure that the two (2) hitch pins are in the correct positions.

5. Position towing vehicle under machine hitch coupler
6. Start TMX Excavator engine.
7. Raise Rear Stabilizer Spade, lowering machine hitch coupler onto towing ball.
8. Lock tow coupler onto ball
9. Shut off engine
10. Connect and check towing lights
11. Cross and connect safety chains.

TOWING

1. Avoid sudden stops.
2. Avoid high speed turns.
3. Surfaced road towing speed should not exceed 55 mph. Rough road or cross country towing speed should not exceed 15 mph.
4. Check machine during stops.
5. Allow extra distance for stopping (minimum two times normal distance.)

UNHITCHING FROM TOWING VEHICLE

1. Shut off towing vehicle engine.
2. Set towing vehicle parking brake.
3. Release safety chains, disconnect tail light wiring and release coupler locking mechanism from towing ball.
4. Start TMX Excavator engine.
5. Slowly lower Rear Stabilizer Spade, raising towing hitch from towing vehicle.
6. Remove Hitch Securing Pins and raise towing hitch to the stowed position. Ensure that the Hitch Securing Pins are secured in the correct storage holes.

DIGGING INSTRUCTIONS

1. For best results, the Dipper should be at an angle to the ground. Do not extend Boom into a straight line.

DIGGING INSTRUCTIONS cont.

2. After filling Bucket, do not pull bucket any closer to the machine than required to clear excavation.
3. When Bucket is clear, swing it to one side to dump. Plan dumping so that there is enough space to contain all spoil without spilling into hole or having to over-extend Boom.
4. Push spoil aside while swinging Boom to clear working area.
5. Make digging passes just long enough so that Bucket is full at the end of the pass. Do not continue to dig once Bucket is filled with loose material. Continued digging with a full bucket will compact wet and moist soils and make discharge of materials very difficult. Depth of pass will depend on type of soil. Control pass depth by working the Bucket and Dipper controls alternately.
6. Set Bucket teeth at a slight angle to obtain a level bottom. Maintain this angle by gradually uncurling the Bucket while retracting the Dipper and Boom.

USING THE AUXILIARY CIRCUIT


CAUTION

Energize the auxiliary circuit only when an accessory is connected to the circuit.

1. Ensure that hydraulic accessory is compatible with the output of the Auxiliary Circuit (9gpm at 2000 psi). Call TMX Service Department if required.
2. Connect accessory hydraulic lines to the Auxiliary Circuit quick disconnects.
3. Set engine speed to full.
4. Move Auxiliary Circuit Switch to "on."
5. Shut off engine to relieve line pressure prior to disconnecting hydraulic lines.

DIGGING NOTES

-ALWAYS-

- Operate the machine in areas free of overhead obstructions.
- Mark off an area 20 feet beyond the machine's operating range. Keep all persons clear of this area.
- Avoid sudden starts and stops when operating.
- Level the machine before digging. The TMX Excavator is most stable for digging when all wheels are off the ground.
- Set and retract backfill blade and stabilizer spade slowly.
- Be aware of all underground electrical cables, phone lines, sewage connections or other underground facilities in the digging area. Call your utility or diggers' hotline" (listed in the telephone directory) whenever digging.
- Know ground conditions, such as soft or wet ground before digging.
- Keep the machine level.
- Dump spoil up slope.
- Take extra precautions when digging on hillsides, close to ditches or anywhere danger of tipping or sliding exists.
- Use rear street pads when digging on hard surfaces to reduce sliding and enhance machine stability.
- Keep the front (backhoe end) on the uphill side when ascending or descending inclines.
- Lower backfill blade and rear stabilizer until all wheels are off the ground.

-NEVER-

- NEVER dig on an incline of more than 15 degrees.
- NEVER dig or excavate under or near backfill blade.
- NEVER slam boom against stops.

HYDRAULIC SYSTEM MAINTENANCE AND SERVICE

HYDRAULIC SYSTEM

The TMX hydraulic system consists of these high-quality components:

- Oil Reservoir
- Filtration System
- Hydraulic Pumps
- Joystick Controls
- Diverter Manifold
- Control Valve Stack
- Cylinders
- Connecting Hoses
- Oil Cooler

The system is under pressure whenever the engine is running. All mechanical components should be lowered to the ground to relieve pressure when engine is shut down.

! DANGER

Hoses are under pressure.
 Escaping fluids can penetrate the skin.
 Relieve pressure before servicing.
 Never work on a hydraulic system while
 the engine is running.

HYDRAULIC PUMP

Note: The hydraulic pumps and cartridge valves are not repairable. Contact your TMX dealer for replacement components. Hydraulic hoses and fittings may be repaired or replaced by the user.

The system provides for multiple function control where the fluid will always take the path of least resistance, operating the lighter load when more than one function is demanded.

After replacing hydraulic hoses or fittings, refill the oil reservoir (premium-grade ISO 32 hydraulic oil only), run the TMX and check for leak-free operation.

The TMX hydraulic system consists of three separate circuits:

- 1) Twin hydrostatic pumps to power the drive wheels.
- 2) A fixed displacement gear pump to supply oil to the dig, backfill blade and rear stabilizer functions.
- 3) A fixed displacement gear pump to supply oil to the auxiliary (HyPTO) circuit to power tools.

! CAUTION

Never run a pump or hydraulic system without fluid.

Since the multi-pump assembly is mounted directly to the engine and driven by a spline shaft, its alignment is unlikely to change over time. The pump mounting bolts should be checked periodically for tightness (29 ft.-lbs./ 22Nm - see TMX Maintenance Chart).

The multi-pump assembly must be removed from the engine after each 500 of service to lubricate the pump drive spline with molybdenum grease.

A Dig/Drive Switch on the right hand operator's console shifts a series of cartridge valves on the diverter manifold mounted under the operator's seat. This switches the joystick control between dig and drive functions.

When switched to the "Dig" position, the joysticks will control backhoe swing, boom, dipper, and bucket functions.

SERVICE continued

When the selector switch is in the “Drive” position, the joysticks control the forward and reverse rotation of the TMX drive wheels, and the raise/lower and tilt functions of the backfill blade.

When the selector switch is in the “Neutral” position between “Dig” and “Drive” a neutral valve is actuated, blocking pilot oil supply to the joysticks, rendering the joysticks inactive. No dig or drive functions are possible in this “Neutral” position.

The manual valve lever on the operator’s right hand console actuates the rear stabilizer at any time that the TMX engine is running and is independent of the joystick controls.

The joysticks provide variable pilot oil flow to the hydrostatic pump controls and to the main control valve stack. This allows progressive control of the dig and wheel drive functions. Moving the joystick farther sends more oil to these functions for faster motion.

The auxiliary (HyPTO) circuit provides 9 GPM (34 l/min) @ 2000 PSI @ 3100 RPM (13750 kPa) thru a 3-way cartridge valve actuated by the HyPTO switch. A hose ‘pigtail’ at the front of the operator’s footboard is equipped with flat face quick disconnects to exclude dirt from the system and to allow quick attachment of auxiliary hydraulic tools.

HYDRAULIC PUMP REMOVAL

- 1) Disconnect the hose between the filter and the hydrostatic pumps. Have a suitable container available to catch any spills.
- 2) Tag and remove the 4 pressure and 4 pilot lines to the hydrostatic pumps.
- 3) Disconnect the pilot pressure line from the hydrostatic pumps to the neutral valve.

- 4) Disconnect 2 case drain lines at the rear of the hydrostatic pumps.
- 5) Remove suction hose from the top of gear pump section to the right.
- 6) Remove and tag 2 pressure lines from the underside 2 gear pumps.
- 7) Remove 2 bolts attaching the pump assembly to the mounting flange on the engine.

Slide the pump spline from the engine taking care not to allow the weight of the pump assembly to bear on the spline

HYDRAULIC PUMP INSTALLATION

- 1) Lubricate the pump drive spline shaft liberally with Dow-Corning G-N molybdenum disulfide grease.
- 2) Pump assembly and hose installation is the reverse of disassembly.
- 3) Torque pump attachment bolts to (29 ft.-lbs./ 22Nm).
- 4) Refill hydraulic reservoir with 10 gallons (38 liters) of premium quality all-season ISO 32 hydraulic oil.
- 5) Start engine, check for leak free operation.
- 6) Pilot pressure supply from the hydrostatic pump must be set to 400 PSI (+/- 25 PSI) by means of a relief valve located next to the banjo fitting at the rear of the right hand hydrostatic pump. (See page G1)

CONTROL VALVE REMOVAL

- 1) Drain hydraulic reservoir or plug the supply hose leading to the lower, forward port on the control valve stack (# 8 JIC male plug).

SERVICE continued

- 2) Tag and remove the tank line at the upper, forward port.
- 3) Tag and remove the pilot lines and work port hoses.
- 4) Remove 3 bolts securing the control valve stack to the machine.
- 5) Remove the control valve.

CONTROL VALVE INSTALLATION

- 1) Mount valve to machine chassis.
- 2) Connect hydraulic pilot lines and hoses to the correct control valve stack sections.
- 3) System pressure is pre-set to 2500 PSI (17000 kPa) by means of a relief valve cartridge at the top, forward surface of the control valve.
- 4) Start the machine and check for leaks and proper functions.

HYDRAULIC FILTRATION SYSTEM

The primary cause of hydraulic system failure is contaminated fluid. Regular filter and oil changes should prevent problems. A clogged filter will go into bypass and allow unfiltered fluid to circulate through the system.



CAUTION

Release all hydraulic system pressure before servicing the hydraulic system

The returning oil from dig and auxiliary functions passes thru the oil cooler and then through a large capacity in-tank filter in the top of the hydraulic reservoir. This filter element should be replaced when indicated by the restriction gauge on the filter head.

HYDRAULIC CYLINDERS

The hydraulic cylinders on the TMX are:

- 1) Boom – 3.0” bore x 13.5” stroke.
- 2) Dipper – 2.75” bore x 21.06” stroke.
- 3) Bucket – 2.75” bore x 18.09” stroke.
- 4) Swing – 2.5” bore x 12” stroke.
- 5) Backfill Blade Lift – 2.75” bore x 7.65” stroke [2 required].
- 6) Backfill Blade Tilt – 2.5” bore x 3.0” stroke.
- 7) Rear Stabilizer – 2.5” bore x 8” stroke.

The hydraulic cylinders are controlled by the main control valve located inside the console to the right of the operator’s seat.

HYDRAULIC CYLINDER REMOVAL

- 1) Disconnect and plug hydraulic hoses to cylinder.
- 2) Remove pivot pins.
- 3) Operate cylinder by hand to expel as much hydraulic fluid as possible.

SERVICE continued

HYDRAULIC HOSES

The TMX hydraulic hoses are rated for the pressures in each system of the machine. [Safe working pressure is marked on the exterior jacket of the hose]. Replace cracked, cut or leaky hoses with hoses of the same or higher rating. Never route hoses so that they rub against sharp edges or chafe against moving parts.

HYDRAULIC RESERVOIR

The hydraulic fluid reservoir is located behind the driver's seat at the right rear of the TMX. A breather is located to the right of the in-tank return filter. Remove this breather to fill or top up the reservoir. Tank capacity is 10 U.S. gallons [38 liters].

HYDRAULIC FLUID

The hydraulic fluid used in the TMX is premium quality ISO 32 hydraulic oil. At temperatures below 10 F [-12C], allow the machine to run at part throttle for a few minutes to warm the oil.

TIRE CARE

Proper tire maintenance is one of the most important factors in the satisfactory performance of your TMX machine. Observe the following tire care rules for best results:

- 1) Maintain Proper inflation of the drive tires (as noted on side wall of tire), but no less than 40 PSI [275 kPa]. A correctly inflated tire results in good traction with the least wear.

Under-inflation diminishes the tire load carrying capacity and may cause heat build-up while towing, which can cause excessive wear and the danger of a blow-out.

Over-inflation may cause internal damage to the tire and cause the drive wheels to slip under load and cause accelerated wear because a smaller surface of the tire tread is in contact with the ground.

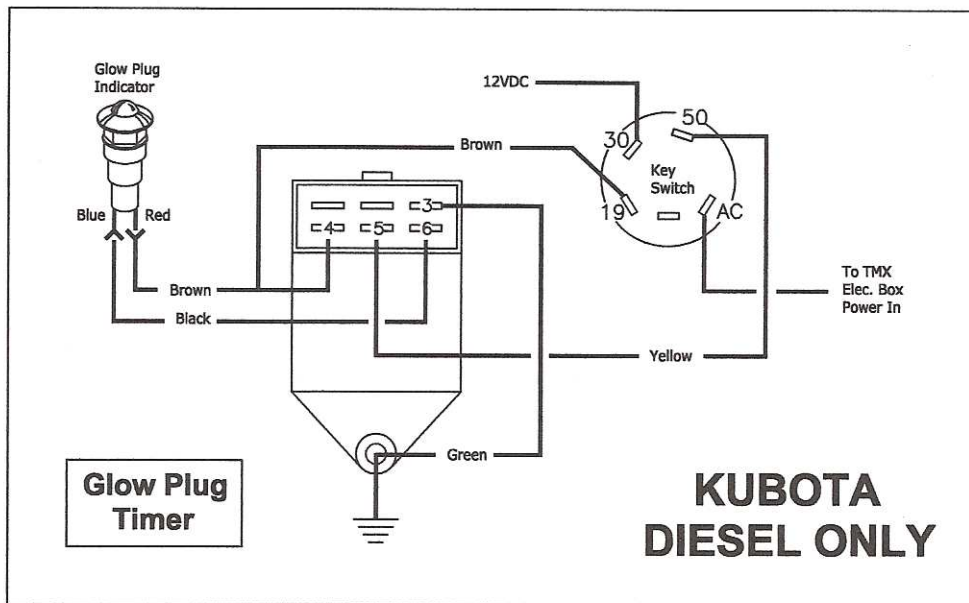
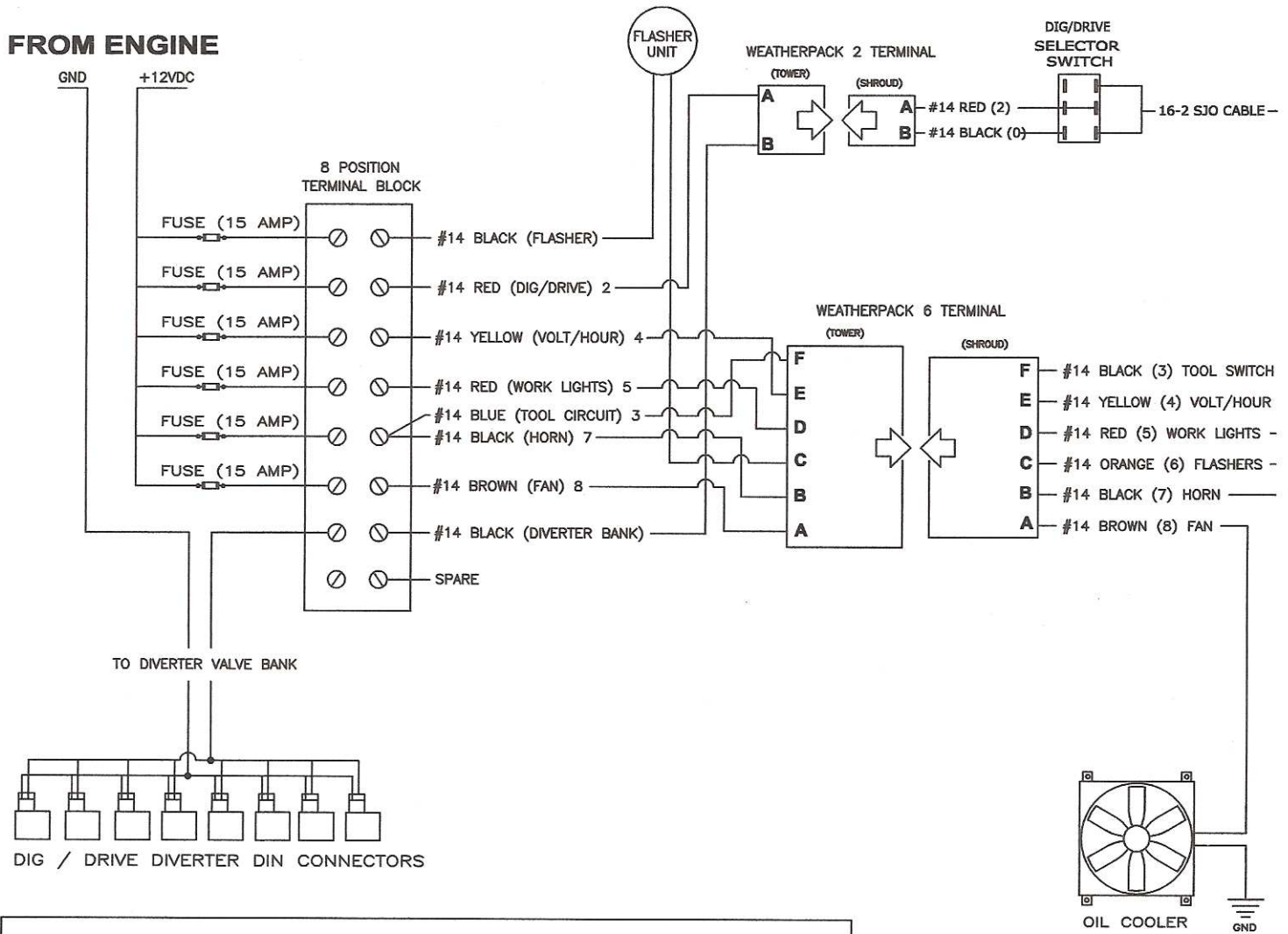
- 2) Avoid driving or towing over sharp objects, which may cut or puncture the drive tires.
- 3) Avoid 'bruising' the drive tires by striking hard objects, curbs, etc. at speed.
- 4) Immediately clean spilled oil or fuel from tires. Petroleum products attack rubber and may weaken the sidewalls of the tire.
- 5) The caster tires are foam-filled at the factory and require no inflation. Periodically inspect the caster tire tread for wear and replace tires as required.

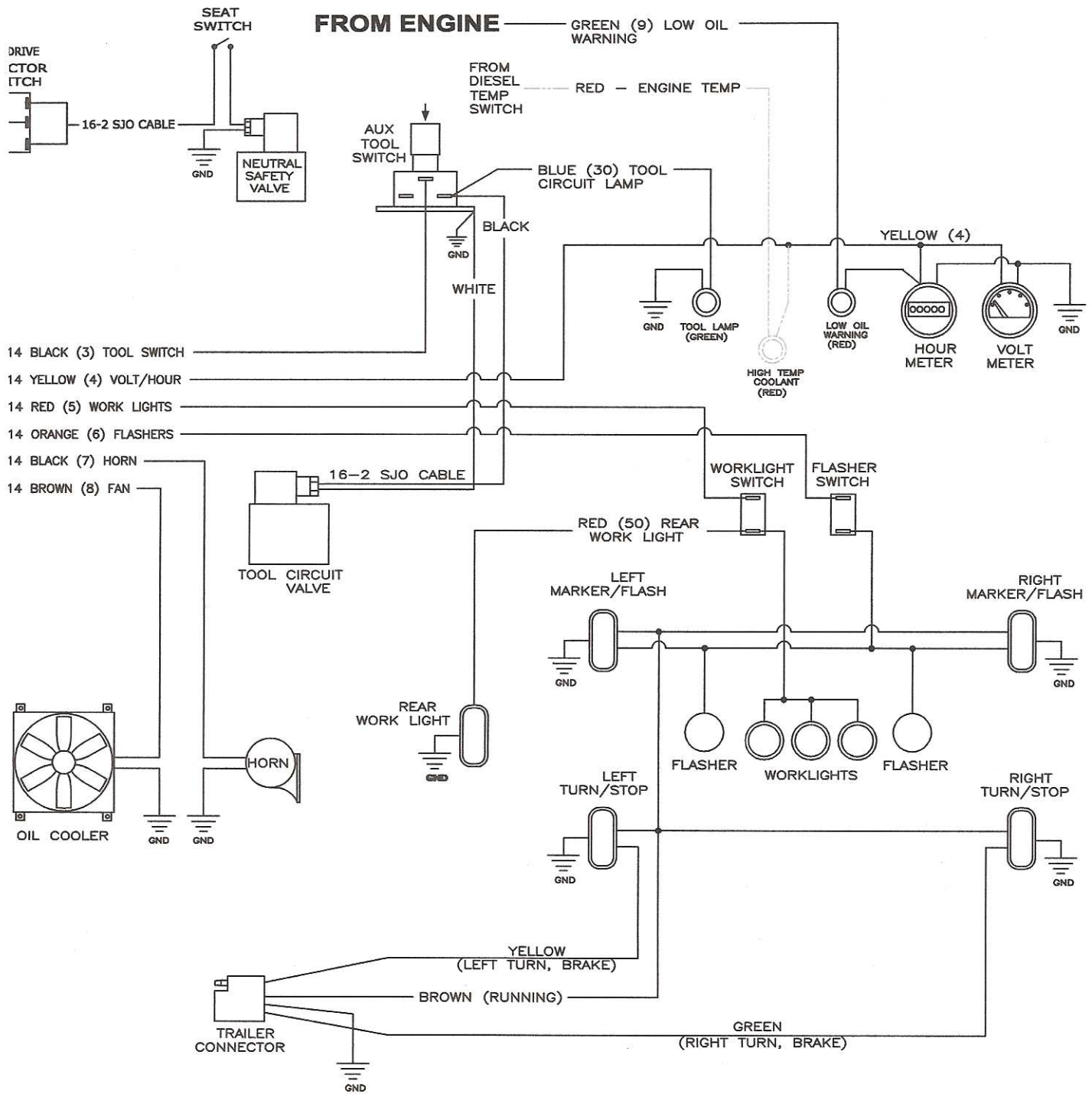
ENGINE

The TMX has a gasoline or diesel engine to supply motive power to the hydraulic pump for the hydraulic circuits, and a starter/alternator for electrical power and battery charging. Refer to the engine manufacturer's owners' manual for detailed operating and adjustment instructions.

The engine has a factory set maximum speed of 3600 rpm. For warranty purposes, the engine may not be operated over 3600 rpm. To set the engine speed, see the engine manufacturer's owners' manual.

FROM ENGINE





REV 10.15.01

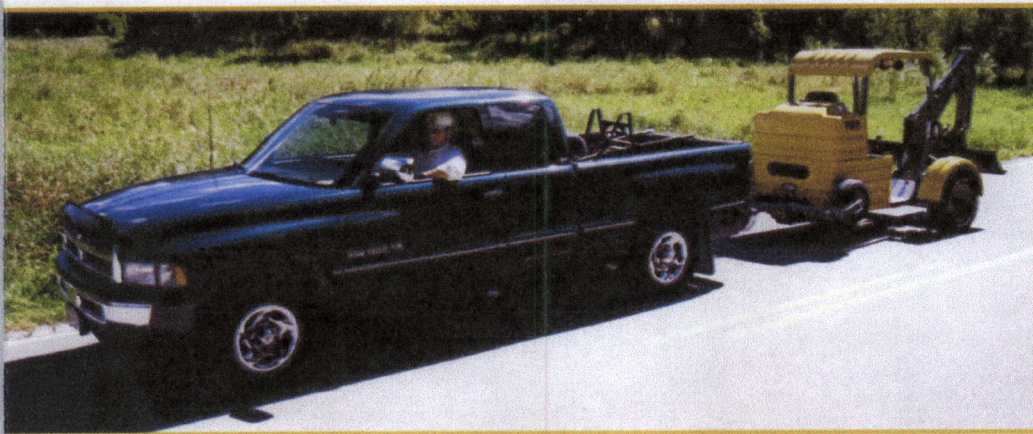
TMX ELECTRICAL DIAGRAM Section J

L I N E M A N

TMX[®]

Towable Mini-eXcavator
from Excavation Technology Corporation

TMX



The perfect
solution
for your
multi-location
and small
excavation
needs

TMX

Power • Efficiency • Comfort • Convenience

BIG POWER IN A COMPACT PACKAGE...

The TMX produces 6,600 pounds of digging force, making it the most powerful excavator in the world for its size and weight.



EFFICIENT BACKFILL AND FINISH GRADING...

Site restoration is quick and easy with the 4-way blade and powerful hydrostatic drive action of the TMX's Backfill Blade System.



NO TRAILER OR CDL REQUIRED...

The TMX is always ready to work with its own built-in trailer and lock-out drive hubs.

You can tow it at freeway speeds (55 mph) with any 6,500 pound GVWR vehicle.



STRICTLY "BUSINESS CLASS" SEATING...

Trying to get work done when you are seated in "Coach" is tough. With the TMX, you get "Business Class" seating for comfort and productivity with these features:

- Armrest-mounted joystick controls for both digging and grading.
- Unobstructed operator view of the digging arm and backfill blade operation.
- Offset from center seating position for an unobstructed view of the bucket.



TMX

Maneuverable • Easy to Operate • Versatile



Quick-on, quick-off hitch system gets you working faster



Zero-turn rotation helps you get in and out of tight spots with ease



The versatile TMX lets you cradle objects between the backhoe and the backfill blade



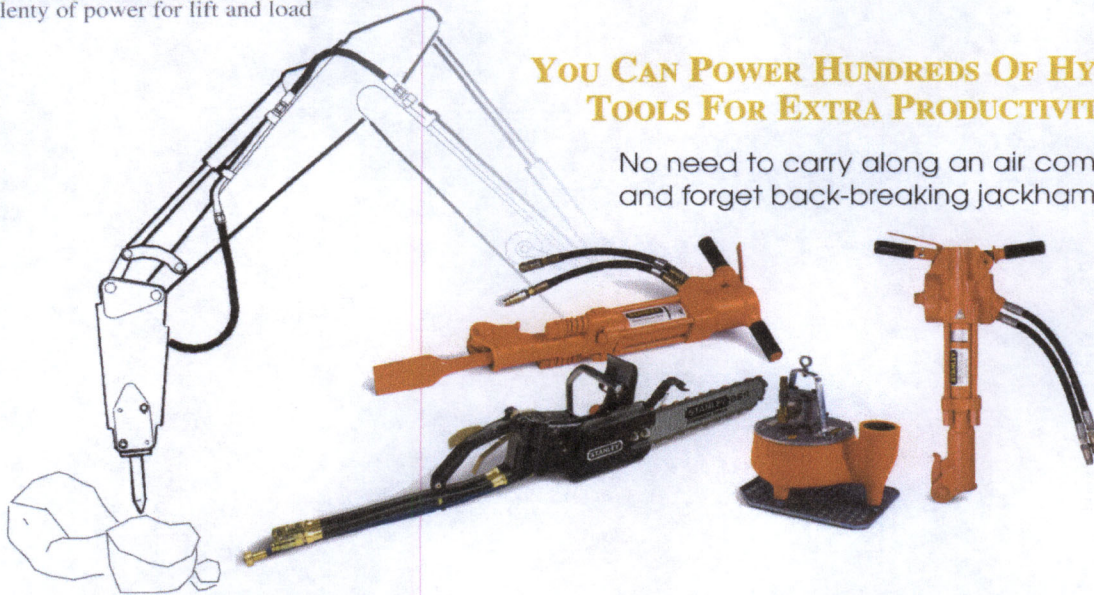
Convenient joystick controls make the TMX easy to operate and comfortable



Plenty of power for lift and load

YOU CAN POWER HUNDREDS OF HYDRAULIC TOOLS FOR EXTRA PRODUCTIVITY...

No need to carry along an air compressor... and forget back-breaking jackhammers.



ENGINE

MakeKohler
 ModelCommand Pro CH20
 FuelGasoline
 CoolingAir
 Displacement38 cid (624cc)
 Horsepower20 hp (14.9kW) @ 3600rpm
 Torque32.5 lbs. - ft. (44.2 N/m)

DIMENSIONS

Length151 in. (384 cm)
 Width74.5 in. (189.3 cm)
 Height79 in. (201 cm)
 Weight2941lbs. (1334 kg)
 Tongue Weight380 lbs. (172 kg)

HYDRAULIC SYSTEM

Hydraulic Pumps ... 2
 - TypeGear
 - Displacement
 Dig Functions ... 5.7 gpm (21.5 l/min) @ 3600 rpm
 - Displacement
 Tool Circuit 9 gpm (34 l/min) @ 3100 rpm
 CoolerAir to oil, with fan
 FiltrationSuction & return, 10 micron
 System Relief
 Pressure2500 psi (17000 kPa)
 HosesAbrasion resistant

DRIVE SYSTEM

Hydrostatic Pumps ...Twin, 6.73 gpm (25.5 l/min)
 Wheel MotorsGeroller Type,
 with disengaging hubs
 Drive TiresLT235/75R15 Mud-Terrain

PERFORMANCE

Max. Travel Speed ...2.5 mph (4.0 km/hr)
 Turning RadiusZero
 Digging Depth8 ft. (244 cm)
 Loading Height7 ft. - 2 in. (218 cm)

DIGGING FORCE

Bucket4050 lbs. (1835 kg)
 Dipper2550 lbs. (1155 kg)

SWING SYSTEM

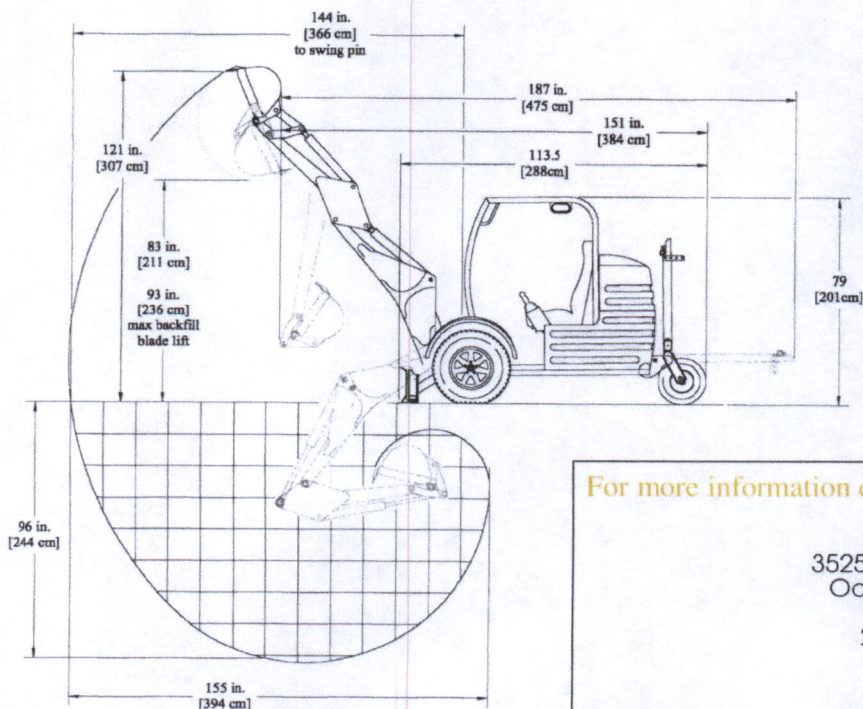
Min. Swing Radius ...62 in. (157.5 cm)
 Boom Swing140 degrees (70 Right + 70 Left)

BACKFILL BLADE

Blade Width72 in. (183 cm)
 Max Machine Lift ...6 in. (15.2 cm)
 Blade Tilt21 degrees total
 (10.5 Right + 10.5 Left)

TOOL CIRCUIT

Flow9 gpm (34 l/min) @ 3100 rpm
 Pressure2000 psi (13750 kPa)
 3/8" Flat Face - Quick-Disconnects



US patents pending.



For more information contact your local dealer:

3525 Waterville Road
 Oconomowoc, WI
 53066-9263
 262-965-3681

www.etc-tmxc.com

The Product

(12) **United States Patent**
Cook et al.

(10) Patent No.: **US 6,668,471 B1**
(45) Date of Patent: **Dec. 30, 2003**

(54) TOWABLE EARTH DIGGING APPARATUS

(75) Inventors: Paul Cook, Oconomowoc, WI (US);
Karl Schultz, Brookfield, WI (US)

(73) Assignee: Excavation Technology Corporation,
Oconomowoc, WI (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 65 days.

(21) Appl. No.: 09/654,356

(22) Filed: Sep. 1, 2000

(51) Int. Cl.⁷ E02E 3/96

(52) U.S. Cl. 37/410; 414/685

(58) Field of Search 37/241, 403, 407,
37/405, 406, 410; 414/685, 690, 694

(56) **References Cited**

U.S. PATENT DOCUMENTS

467,810 A	1/1892	Hughes	
1,528,222 A	3/1925	Miller	
2,502,681 A	4/1950	Swanson	
2,718,312 A	* 9/1955	Pilch	37/410
3,362,548 A	1/1968	Cunningham	
3,466,770 A	* 9/1969	Morrison et al.	37/410
3,909,963 A	* 10/1975	Patel	37/410
4,552,503 A	11/1985	Mouri et al.	
4,848,011 A	* 7/1989	Zimmerman	37/410
4,848,483 A	* 7/1989	Heiple	172/821
4,889,362 A	* 12/1989	Lagsdin	280/763.1
4,925,358 A	* 5/1990	Cook	414/685
5,171,124 A	12/1992	Foster	
5,209,307 A	* 5/1993	Hette	172/445.2
5,562,398 A	10/1996	Kautson	
5,822,892 A	10/1998	Ohbatake et al.	

FOREIGN PATENT DOCUMENTS

EP 0409244 A2 * 1/1991 37/410

OTHER PUBLICATIONS

Brochure describing Ditch Witch Model 4010, Mar. 1987.
Advertisement, R. H. & M Machine Co., "Go-For-Digger
4" with Backhoe Specifications for Digger 4 (2 pages).

Advertisement, R. H. & M Machine Co., "Go For Digger 5"
with Backhoe Specifications for Digger 4 (2 pages).

Front and rear views of Go For Digger 4 Stabilizer (1 page).

Front and rear views of Go For Digger 5 Stabilizer (1 page).

Front view, Front Stabilizer, and Front Stabilizer Tipped of
Go For Digger II (2 pages).

Front view, Front Stabilizer, and Front Stabilizer Tipped of
Go For Digger 4 (2 pages).

Advertisement, R. H. & M Machine Co., "Go-For-Digger
6" with Backhoe Specifications for Digger 6 (2 pages).

Front view, Front Stabilizers, Front Stabilizers Tipped, Front
Stabilizers Lifting on Uneven Surface, Front Stabilizers
Cylinders, and Digger 5 Positioned for Digging, of Go For
Digger 5 (3 pages).

* cited by examiner

Primary Examiner—Thomas B. Will

Assistant Examiner—Meredith Petravick

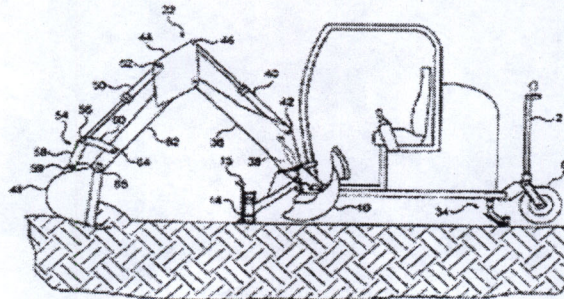
(74) Attorney, Agent, or Firm—Dorsey & Whitney LLP

(57)

ABSTRACT

A multifunctional, self-contained towable backhoe apparatus adapted for direct over-the-road trailering by a towing vehicle, has a support frame having a front and a rear, and a trailering hitch attached to the front. Wheels support the frame at the front and the rear. The rear wheels can function as drive wheels. A backfill blade is movably attached to the rear of the frame. An articulated arm assembly is pivotably mounted on the rear of the frame. A stabilizer with a street pad, a spade, or both, can be secured to the front of the frame for stabilizing the apparatus while in a digging position. The movable backfill blade is capable of movement to a raised position for supporting the articulated arm during transport and movement to at least one lowered ground-engaging position capable of stabilizing the apparatus, of earth moving, or a combination thereof. One end of the articulated arm is adapted for attachment of a tool, including a digging bucket, a pavement breaker, an auger, a grapple, or a fork. The self-contained towable backhoe apparatus can also have a pad on the backfill blade capable of cushioning the articulated arm assembly.

24 Claims, 8 Drawing Sheets



TROUBLESHOOTING

PROBLEM: No or low hydraulic pressure

Causes

Dirty hydraulic filter
Main relief valve stuck or out of adjustment

Defective pump

Solutions

Replace filter element
Remove and clean, adjust relief valve to 2500 PSI
Replace pump

PROBLEM: Slow cylinder movement

Causes

Pilot pressure out of adjustment
Slow engine speed
Low fluid level
Cold weather
Dirty hydraulic filter
Relief valve out of adjustment
Defective pump
Wrong fluid
Suction line blocked
Restricted valve spool movement
Internal cylinder damage

Solutions

Adjust pilot pressure to 400 PSI
Adjust engine throttle
Add fluid
Increase warm-up time
Replace filter element
Adjust relief valve
Replace pump
Use recommended fluid
Clean or replace
Check sections, replace as required
Replace worn or damaged parts

PROBLEM: No cylinder movement

Causes

Defective dig/drive switch or circuit
Pilot pressure out of adjustment
Low fluid level
Dirty hydraulic filter
Defective pump
Dirty or defective dig/drive cartridge valve
Blocked suction line
Internal cylinder damage

Solutions

Check circuit, replace switch
Adjust pilot pressure to 400 PSI
Add fluid
Replace filter element
Replace pump
Clean or replace
Clean or replace
Replace damaged or worn parts

PROBLEM: Unintended dig/drive function

Causes

Dirty or defective dig/drive cartridge valve

Solutions

Clean or replace

PROBLEM: No dig functions, drive OK

Causes

Blown Fuse
Defective dig/drive selector switch

Solutions

Replace fuse
Replace switch

TROUBLESHOOTING continued

PROBLEM: Erratic cylinder movement

Causes

Pilot pressure out of adjustment
Low fluid level
Air in hydraulic lines
Incorrect fluid viscosity

Solutions

Adjust pilot pressure to 400 PSI
Add fluid and check for leaks
Tighten suction line fittings
Use Proper fluid

PROBLEM: Cylinder drifting

Causes

Hydraulic line leak
Cylinder seal leak
Dirt in valve load check
Leaking valve section

Solutions

Repair or replace
Repair or replace
Clean load check
Center valve section spool
Replace valve section

PROBLEM: Valve spools sticking

Causes

Cold weather
Lever linkage binding
Contaminated hydraulic fluid
Damaged center spring assembly
Excessive valve stack tie rod torque

Solutions

Allow 10 minute warm-up
Free linkage, adjust pivot, clean linkage
Clean system, replace filters and fluid
Replace
Re-torque

PROBLEM: Loss of drive wheel power

Causes

Defective dig/drive switch or circuit
Broken spline sleeve inside hub

Solutions

Check circuit, replace switch
Replace spline sleeve

PROBLEM: Wheel creep

Causes

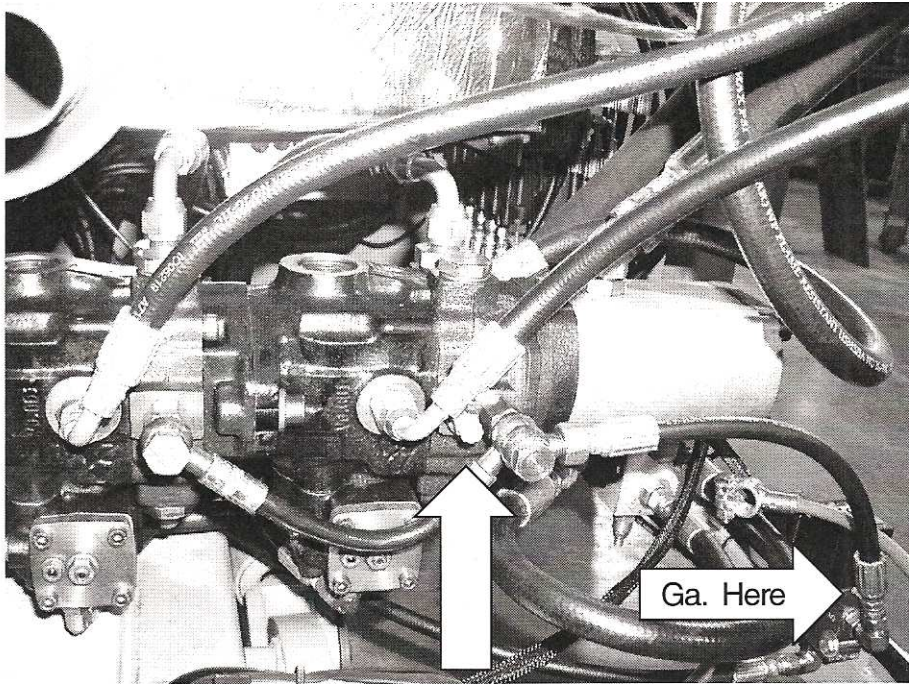
Joystick out of adjustment
Hydrostat controller out of adjustment

Dirty or defective dig/drive cartridge valve @
A, C, E, or G manifold locations

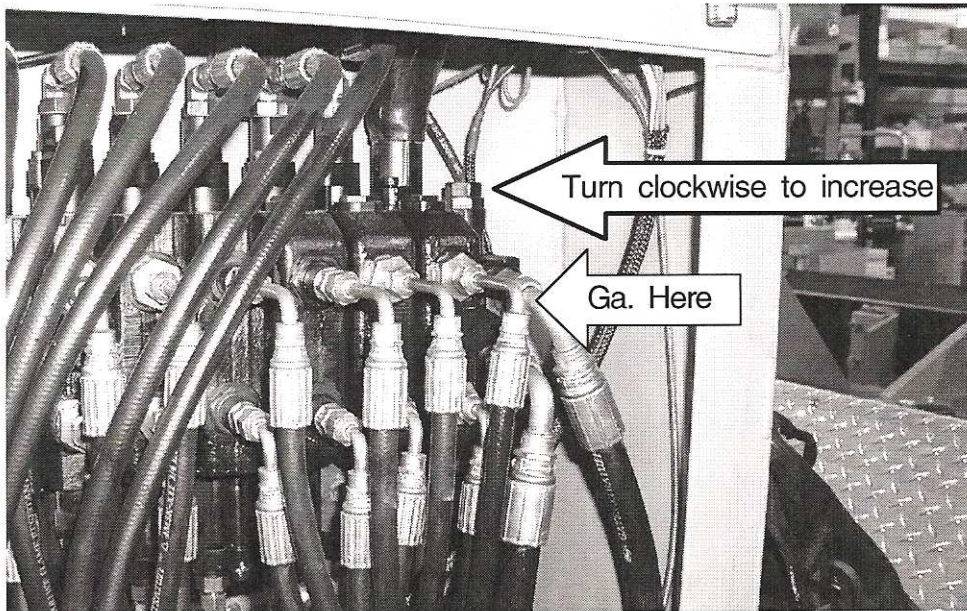
Solutions

Adjust ring under joystick below boot
Adjust stud at rear of pilot control unit at
bottom of hydrostat
Clean or replace

ADJUSTMENTS



Pilot Pressure Setting (400 psi, 2720 kPa). Turn clockwise to increase.

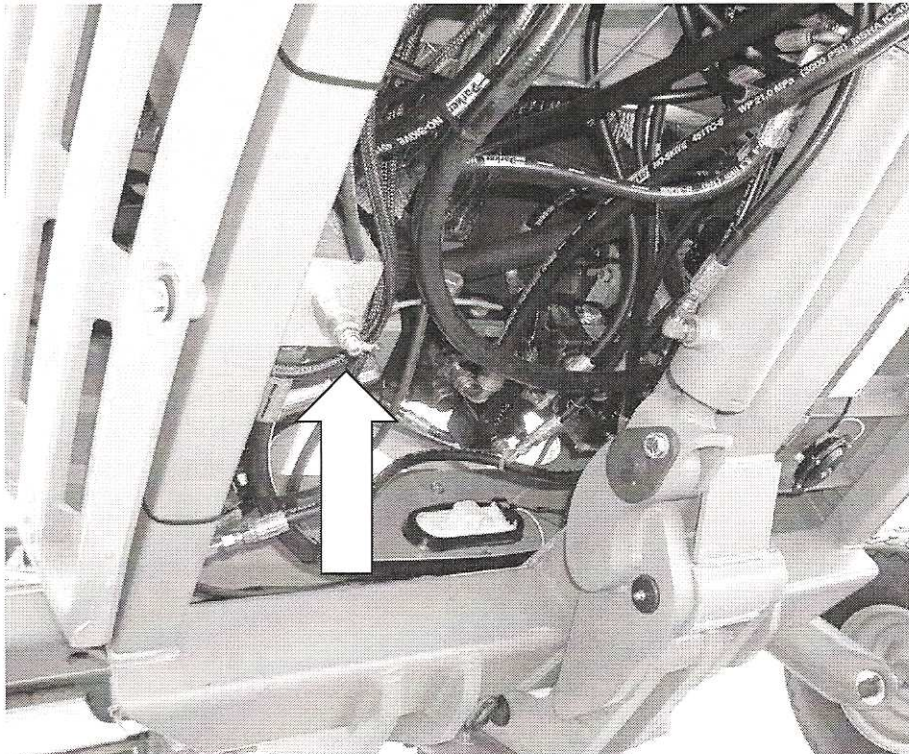


Main System Pressure Setting (2500 psi, 17000 kPa)

ADJUSTMENTS



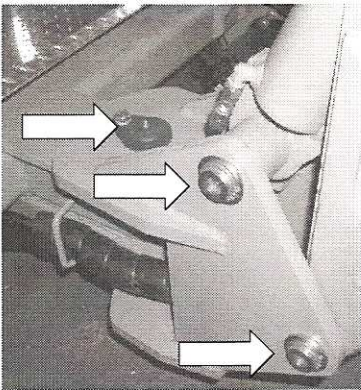
Auxiliary Circuit (HYPTO) Setting. Set to 2000 psi (13750 kPa).



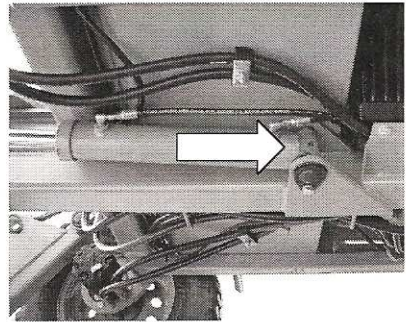
Turn clockwise to increase (under right hand side of TMX).

TMX BOOM LUBRICATION

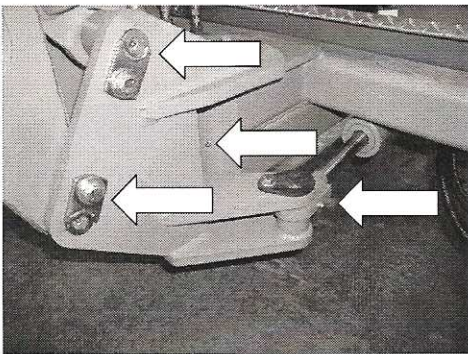
BOOM SWING



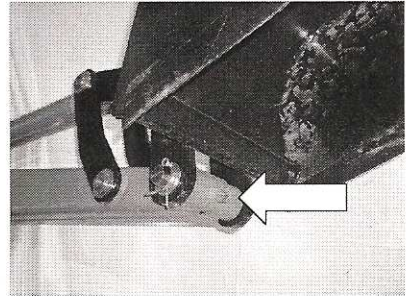
BOOM SWING CYLINDER



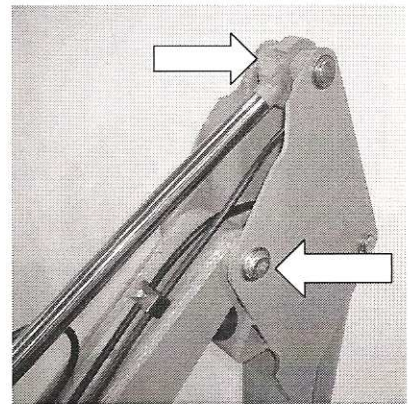
BOOM SWING



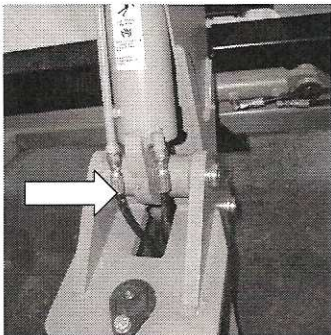
END OF DIPPER



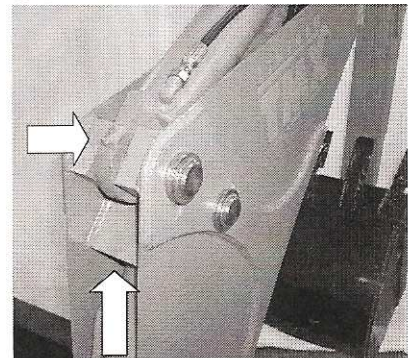
DIPPER PIVOT



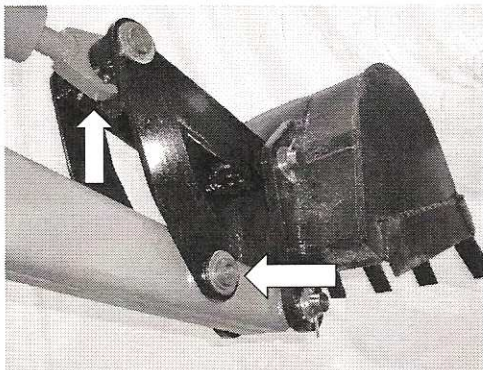
BOOM CYLINDER



BOOM & DIPPER CYLINDER

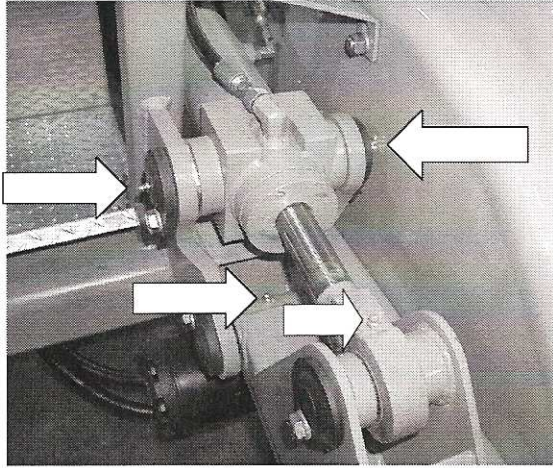


BUCKET LINK

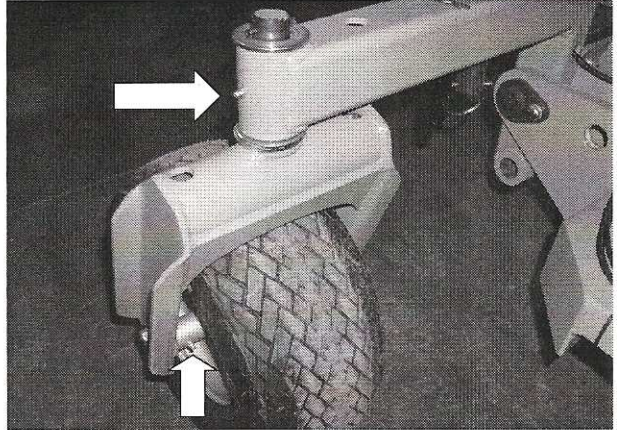


TMX CHASSIS LUBRICATION

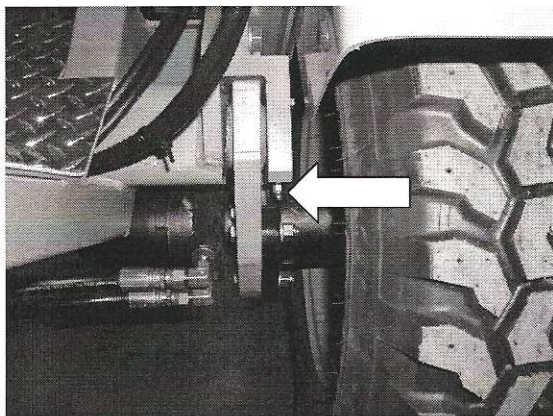
BACKFILL BLADE



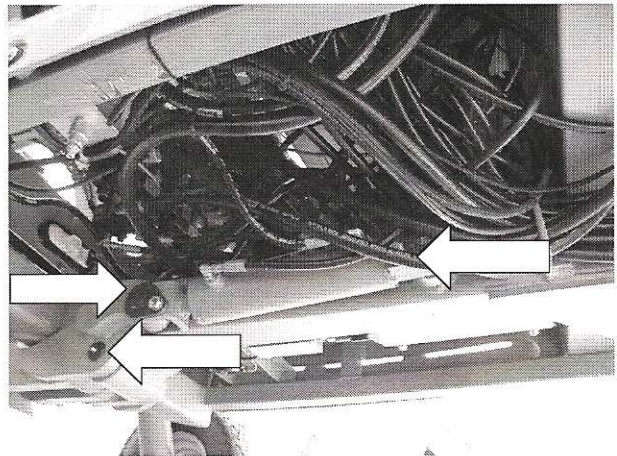
CASTER STEM & AXLE



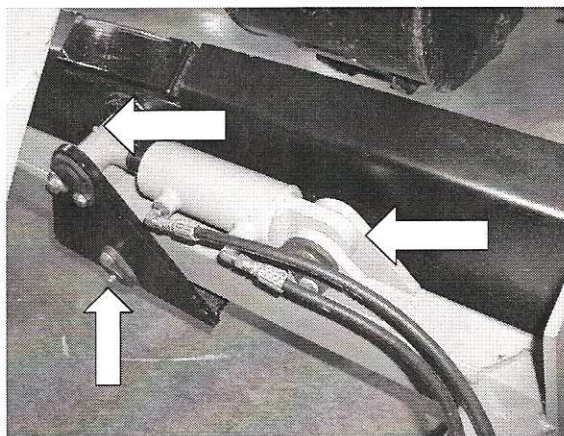
SUSPENSION PIVOT



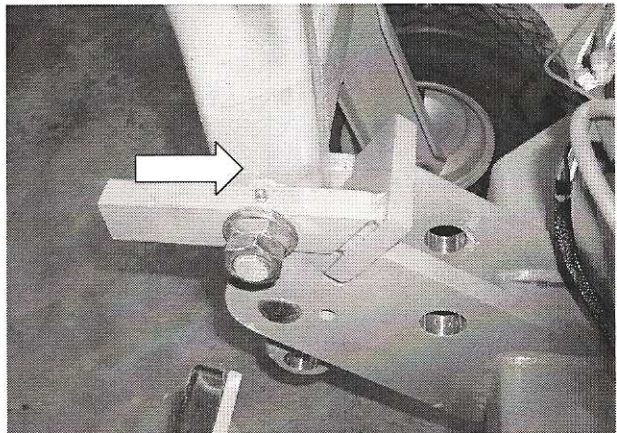
REAR STABILIZER



BACKFILL BLADE TILT



HITCH LOCK



TMX TECHNICAL SPECIFICATIONS

Engine

Make	Kohler
Model	Comand Pro CH20 V-twin
Fuel	Gasoline
Cooling	Air
Displacement	38 cid (624cc)
Horsepower	20 hp (14.9kw) @ 3600 rpm
Torque	32.5 lbs. - ft. (44.2 N/m)

Dimensions

Length	151 in. (384 cm)
Width	74.5 in (189.3 cm)
Height	79 in (201 cm)
Weight	2941 lbs. (1334 kg) Gas only. 2995 lbs. (1359 kg) Diesel Only
Tongue Weight	380 lbs. (172 kg) Gas only 420 lbs. (190 kg) Diesel only

Hydraulic System

Hydraulic Pumps	2
Type	Gear
Displacement	
Dig Functions	5.7 gpm (21.5 l/min) @ 3600 rpm
Tool Circuit	9 gpm (34 l/min) @ 3600 rpm
Cooler	Air to oil, with fan)
Filtration	Suction & return, 10 micron
System Relief Pressure	2500 psi (17000 kPa)
Hoses	Abrasion resistant

Drive System

Hydrostatic Pumps	Twin, 6.73 gpm (25.5 l/m)
Wheel Motors	Geroller Type, with disengaging hubs
Drive Tires	LT 235/75R15 Mud-Terrain

Performance

Max. Travel Speed	2.5 mph (4.0km/hr)
Turning Radius	Zero
Digging Depth	8 ft. (244 cm)
Loading Height	7 ft., 2 in. (218 cm)

Digging Force

Bucket	4050 lbs. (1835 kg)
Dipper	2550 lbs. (1155 kg)

Backfill Blade

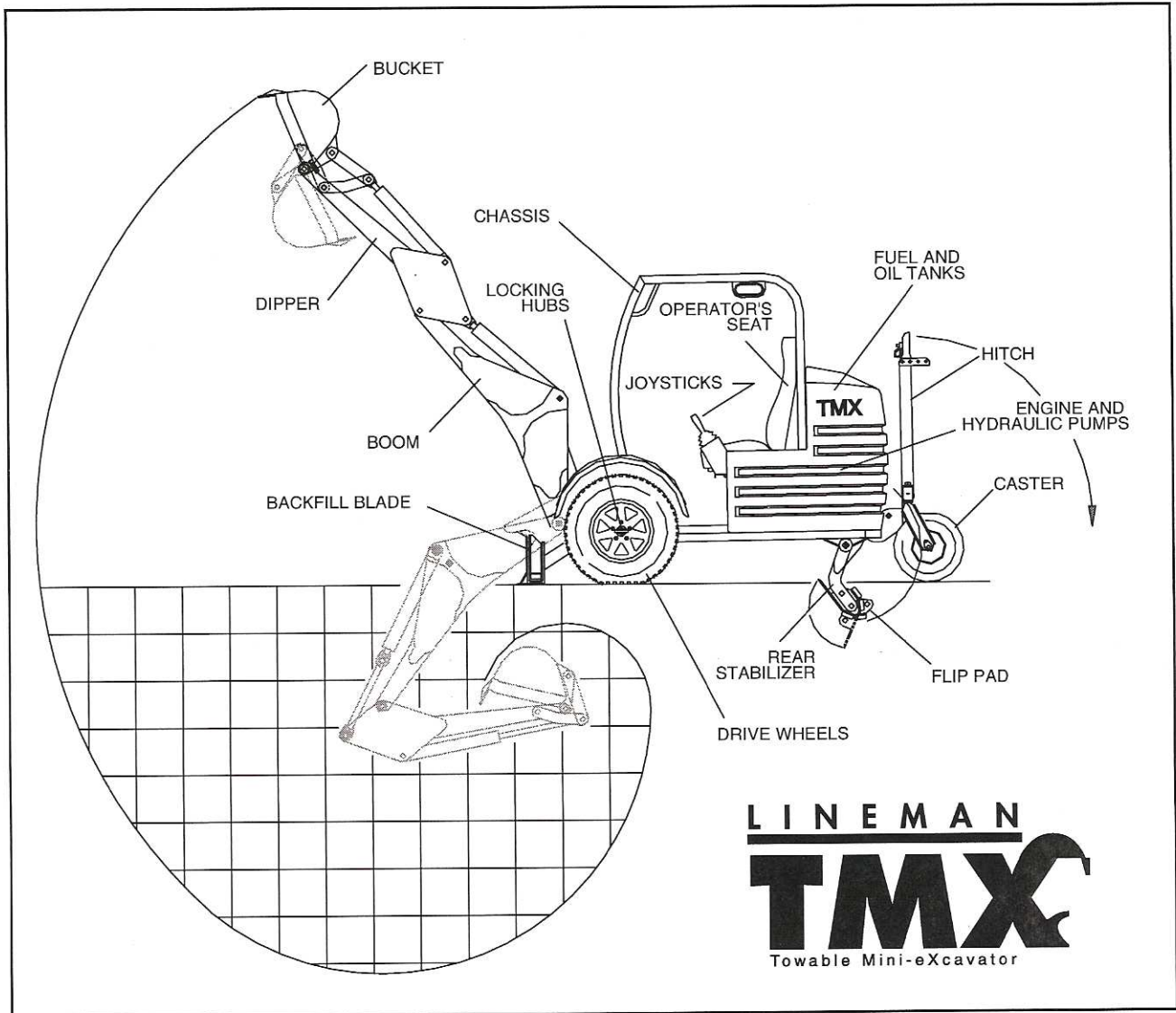
Blade width	72 in. (183 cm)
Max Machine Lift	6 in. (15.2 cm)
Blade Tilt	21 degrees total

Tool Circuit

Flow	9 gpm (34 l/min) @ 3600 rpm
Pressure	2000 psi (13750 kPa)
3/8" Flat Face - Quick-Disconnects	

Specifications subject to change without notice.

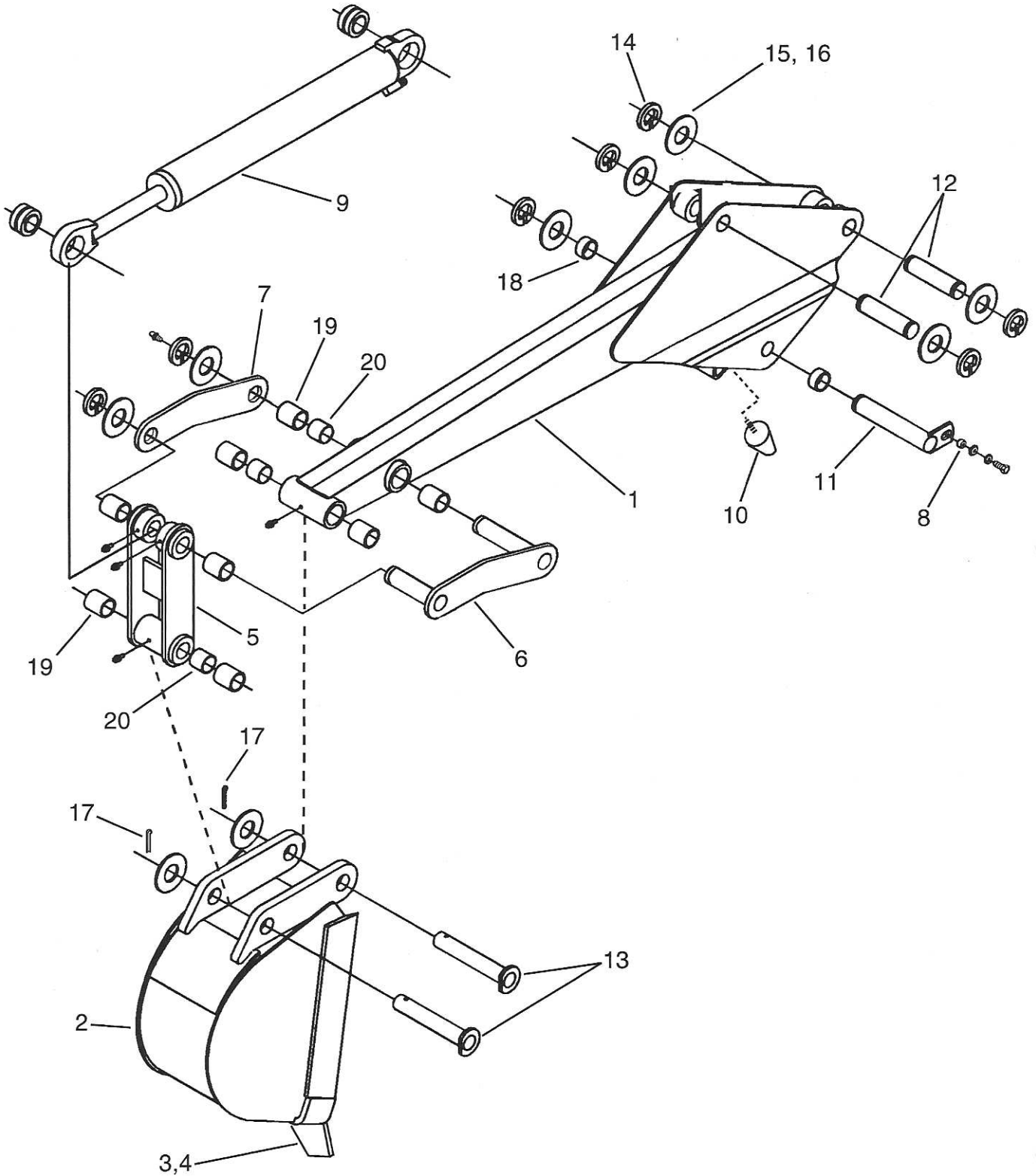
Illustrated Parts List



For parts: Contact your TMX
dealer or factory parts department

Fax: 262-641-9409

DIPPER / BUCKET GROUP



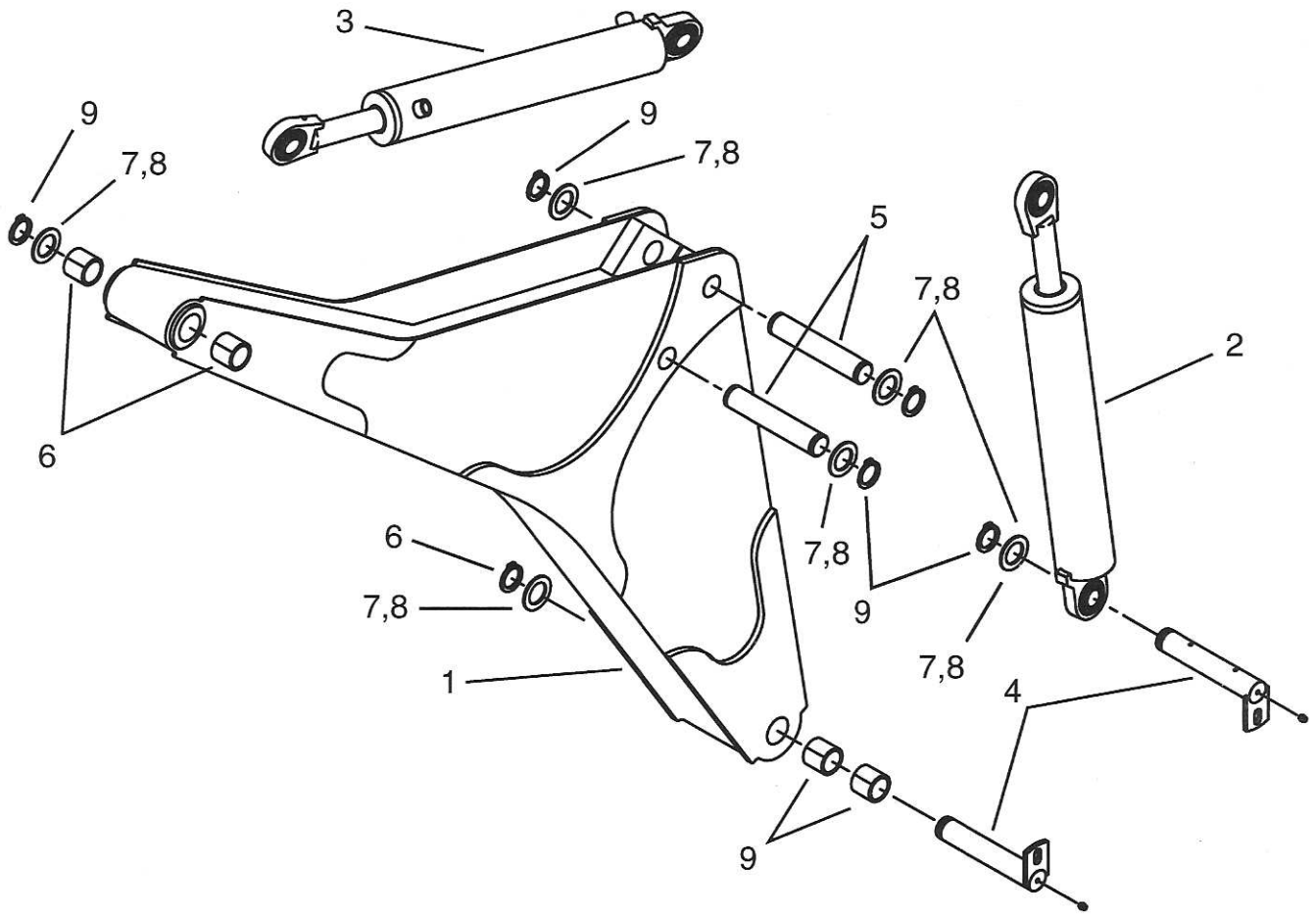
DIPPER / BUCKET GROUP

Item	Qty.	Part Number	Description
1	1	T10025	Dipper Assembly Includes (4) T10159 Bushings (2) T10158 Bushings and (2) T10160 Spacers [Bushings installed with LocTite 610]
2	1	T10026	Bucket - 16" Standard
2A		T10027	Bucket - 10"
2B		T10028	Bucket - 12"
2C		T10029	Bucket - 18"
2D		T10030	Bucket - 24"
2E		T10126	Bucket - 36"
3	1	T10156	Bucket Tooth
4	1	T10157	Tooth and Shank
5	1	T10031	Bucket Link Assembly Includes (4) T10159 Bushings and (1) T10160 Spacer [Bushings installed with LocTite 610]
6	1	T10032	Dipper Link Weldment
7	1	T10033	Dipper Link Plate
8	1	T10034	Tube, Bolt Spacing
9	1	T10040	Cylinder Assembly, Bucket
9A		T10041	Repair Seal Kit
9B		T10037	Spherical Bearing
10	2	T10042	Bumper, Rubber
11	1	T10045	Pin, Boom to Dipper
12	2	T10046	Pin, Bucket & Dipper Cyls. To Dipper
13	2	T10047	Pin, Bucket To Dipper, Bucket to Link
14	A/R*	T10048	Snap Ring
15	A/R*	T10049	Thrust Washer 1.38" x 0.90"
16	A/R*	T10050	Thrust Washer 1.38" x 0.125"
17	2	T10051	Cotter Pin 1/4"
18	2	T10158	Bushing, Boom/Dipper Pivot
19	8	T10159	Bushing, Bucket/Link Pivot
20	4	T10160	Spacer, bushing

* As required

*As Required

BOOM GROUP

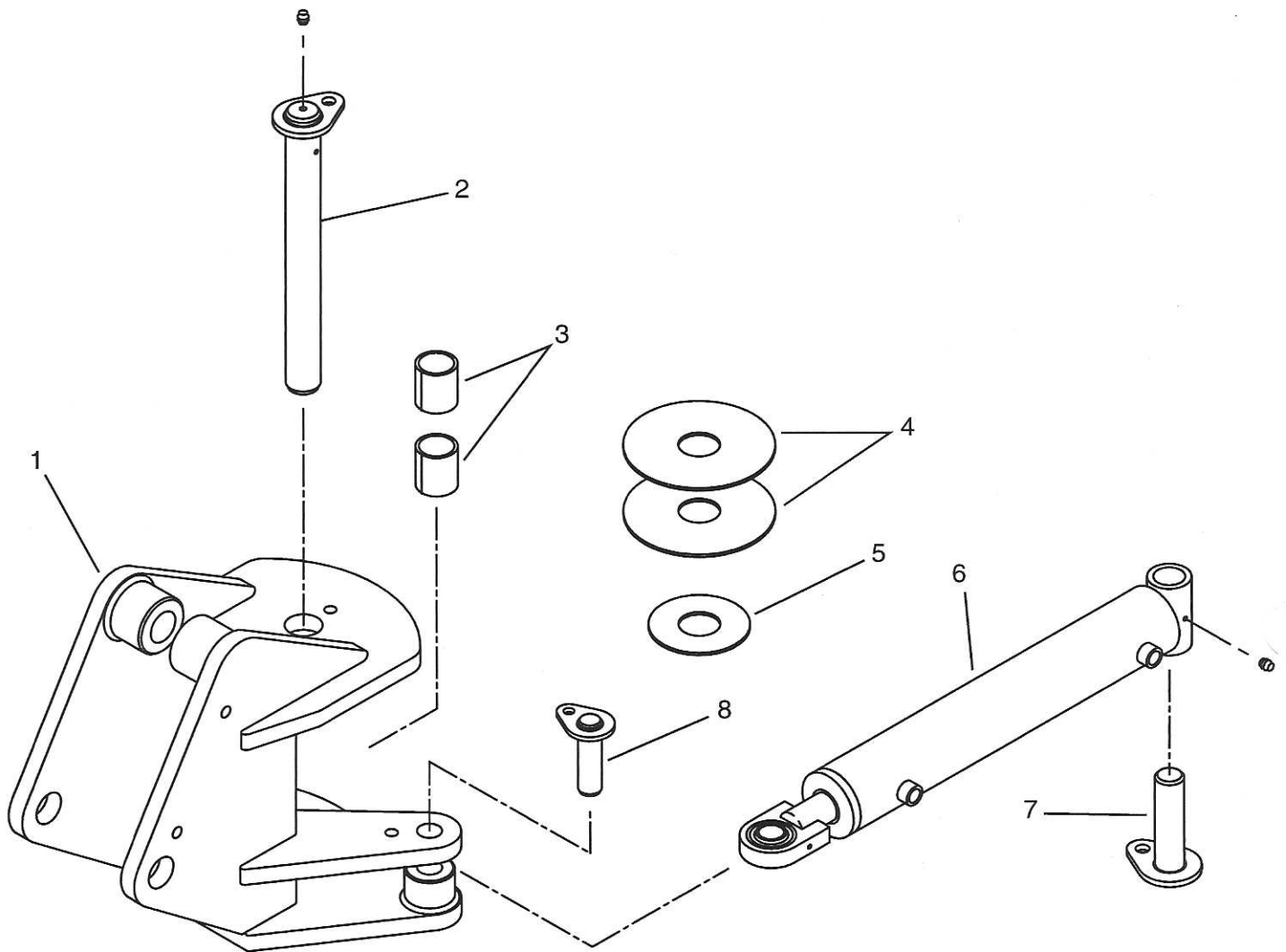


BOOM GROUP

Item	Qty.	Part Number	Description
1	1	T10024	Boom Weldment
2	1	T10035	Cylinder Assembly, Boom
2A	1	T10036	Repair Seal Kit
2B	2	T10037	Spherical Bearing
3	1	T10038	Cylinder Assembly, Dipper
3A	1	T10039	Repair Seal Kit
3B	2	T10161	Spherical Bearing
4	2	T10043	Pin, Boom and Boom Cyl. to TMX
5	2	T10044	Pin, Dipper and Boom Cyls. to Boom
6	A/R*	T10048	Snap Ring
7	A/R*	T10049	Thrust Washer 1.38" x 0.90"
8	A/R*	T10050	Thrust Washer 1.38" x 0.125"
9	4	T10159	Bushing, Boom Ends

* As Required

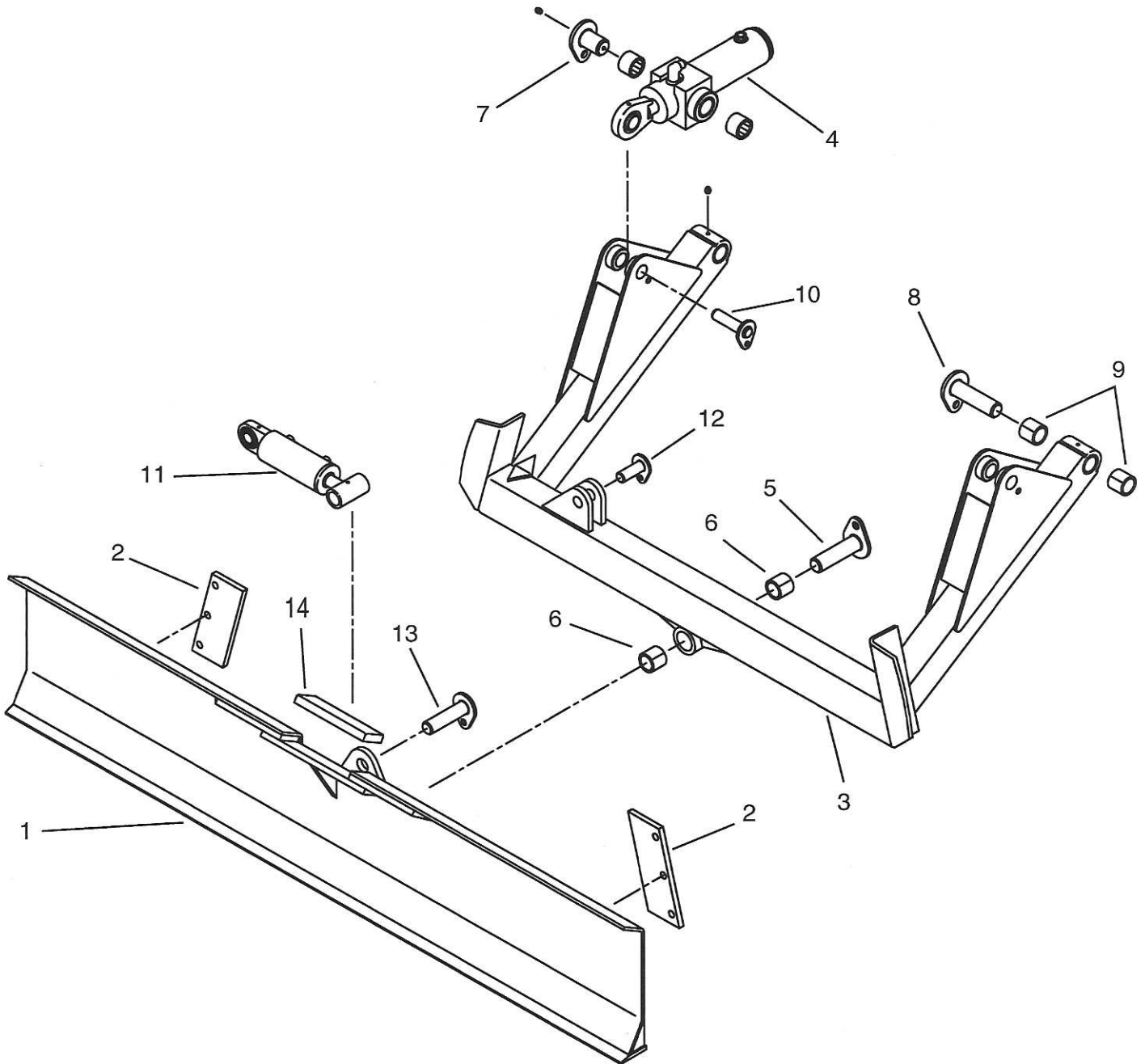
SWING GROUP



SWING GROUP

Item	Qty.	Part Number	Description
1	1	T3000	Swing Weldment (to s/n 1100)
		T3010	Swing Weldment (s/n 1101 - on)
2	1	T9000	Swing Pin (to s/n 1100)
		T9036	Swing Pin (s/n 1101 - on)
3	2	T10077	Bushing
4	2	T10103	Washer, Thrust - 6"
5	1	T10104	Washer, Thrust - 4"
6	1	T10067	Cylinder Assembly, Boom Swing
6A	1	T10068	Repair Seal Kit
6B	1	T10069	Spherical Bearing
7	1	T9009	Pin, Swing Cyinder to Chassis
8	1	T9012	Pin, Swing Cyinder Rod to Swing

BACKFILL BLADE GROUP

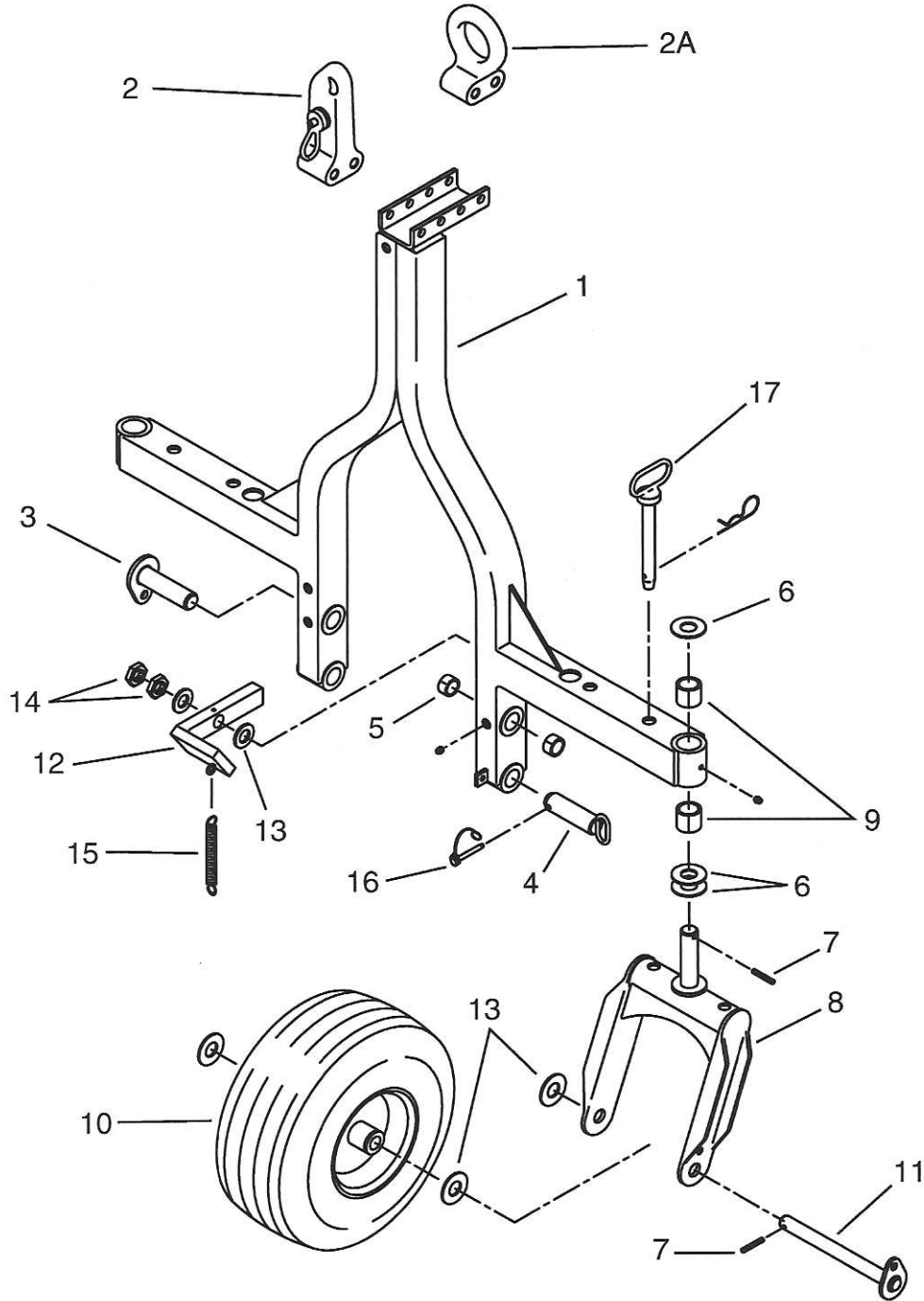


BACKFILL BLADE GROUP

Item	Qty.	Part Number	Description
1	1	T5100	Backfill Blade Weldment
2	2	T5114	Retaining Plate
3	1	T5500	Backfill Arm Weldment
4	2	T10072	Cylinder Assembly, Backfill Blade Lift
4A	1	T10073	Repair Seal Kit
4B	2	T10074	Needle Bearing
4C	1	T10075	Spherical Bearing
5	1	T9001	Pin, Blade Pivot
6	2	T10078	Bushing, Blade Pivot
7	2	T9002	Pin, Blade Lift Cylinder to Chassis
8	2	T9005	Pin, Blade Arm to Chassis
9	4	T10108	Bushing, Arm Pivot
10	2	T9008	Pin, Cylinder Rod to Blade Arm
11	1	T10070	Cylinder Assembly, Backfill Blade Tilt
11A	1	T10071	Repair Seal Kit
11B	1	T10069	Spherical Bearing
12	1	T9010	Pin, Tilt Cylinder to Blade Arm
13	1	T9009	Pin, Tilt Cylinder Rod to Blade
14	1	T10179	Pad, Boom Support

*As Required

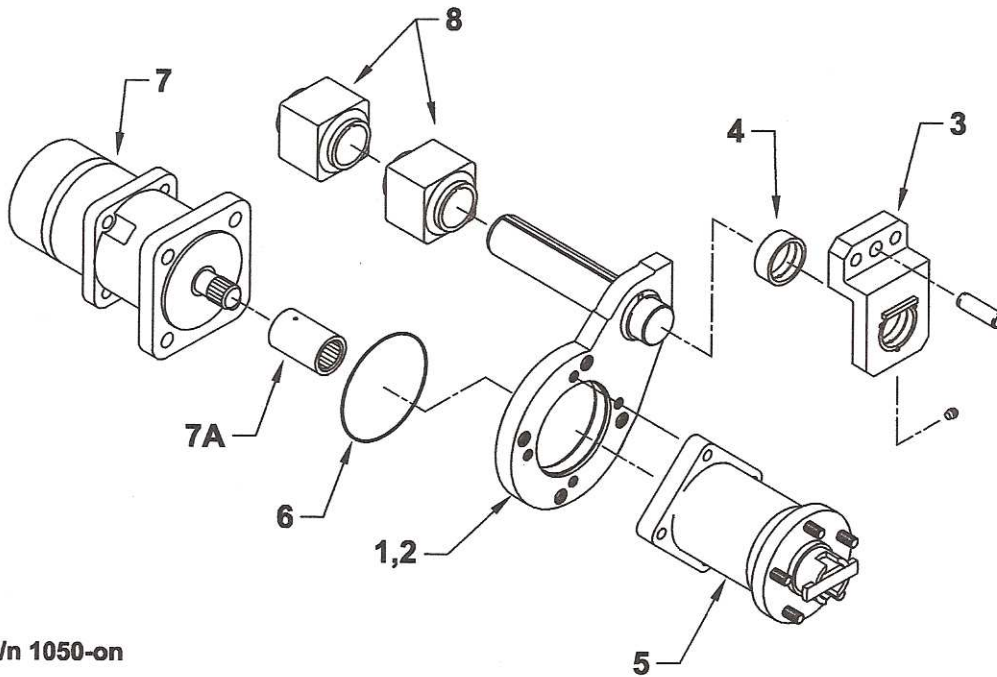
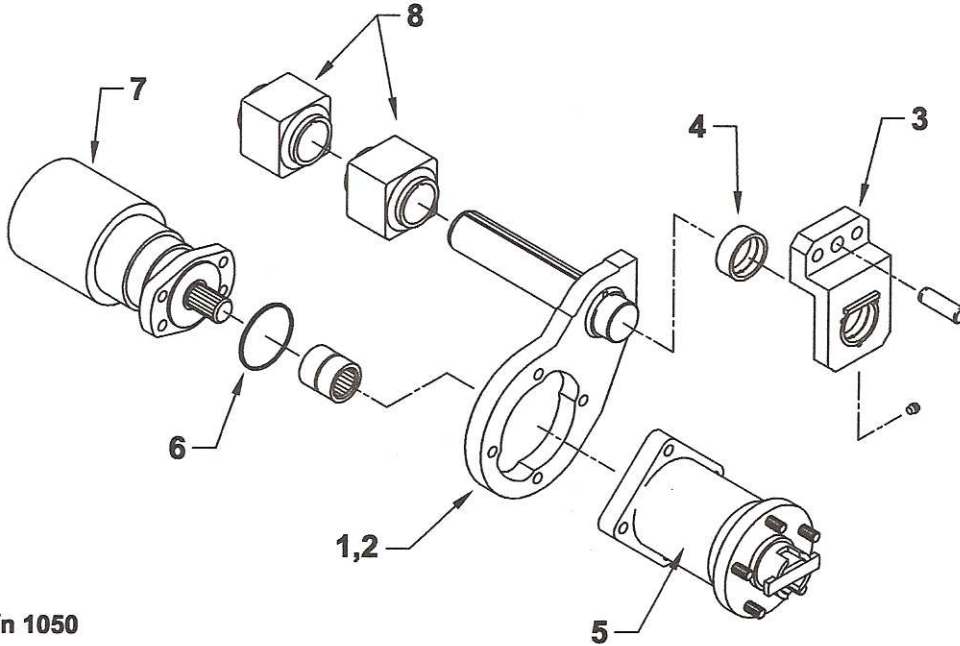
HITCH GROUP



HITCH GROUP

Item	Qty.	Part Number	Description
1	1	T4100	Hitch Weldment
2	1	T10065	Ball Coupler, 2"
2A	Opt.	T10064	Ring Coupler, Zinc Plated
3	2	T9006	Pin, Hitch Pivot
4	2	T9007	Pin, Hitch Lock
5	4	T10107	Bushing, Hitch Pivot
6	6	T11018	Washer, 1-3/8" Narrow Series ZP
7	4	T11019	Spring Pin, 5/16 x 2"
8	2	T4500	Caster Weldment
9	4	T10108	Bushing, Caster Stem
10	2	T10089	Caster Wheel/Tire, Foam Filled
11	2	T9011	Axle, Caster Wheel
12	1	T4110	Hitch Lock Weldment
13	8	8203	Washer, 1" Narrow Series ZP
14	2	T11017	Jamnut, 1"-8 ZP
15	1	T10115	Extension Spring
16	2	T10120	PTO Pin, 5/16 x 2-1/4
17	2	T2075	Hitch Pin, 7/8 Dia x 6-1/2 [includes hairpin]

DRIVE HUB GROUP



DRIVE HUB GROUP

Item	Qty.	Part Number	Description
1	1	T2500	Suspension Swing Arm - RH
2	1	T2501	Suspension Swing Arm - LH
3	2	T2100	Outer Support, Swing Arm
4	2	T10080	Bearing, Bronze - Outer Support
5	2	T10023	Hub, Disengaging Includes Spline Sleeve
6	2	T10096	O-ring, Wheel Motor to Hub
7	2	T10021	Hydraulic Motor, Wheel Drive RH
7A	1	T10022	Hydraulic Motor, Wheel Drive LH
8	4	T10087	Torsion Block
9*	10	T10118	Lugnut
10*	2	T10090	Tire
11*	2	T10088	Wheel
12*	2	T10181	Wheel & Tire Assembly

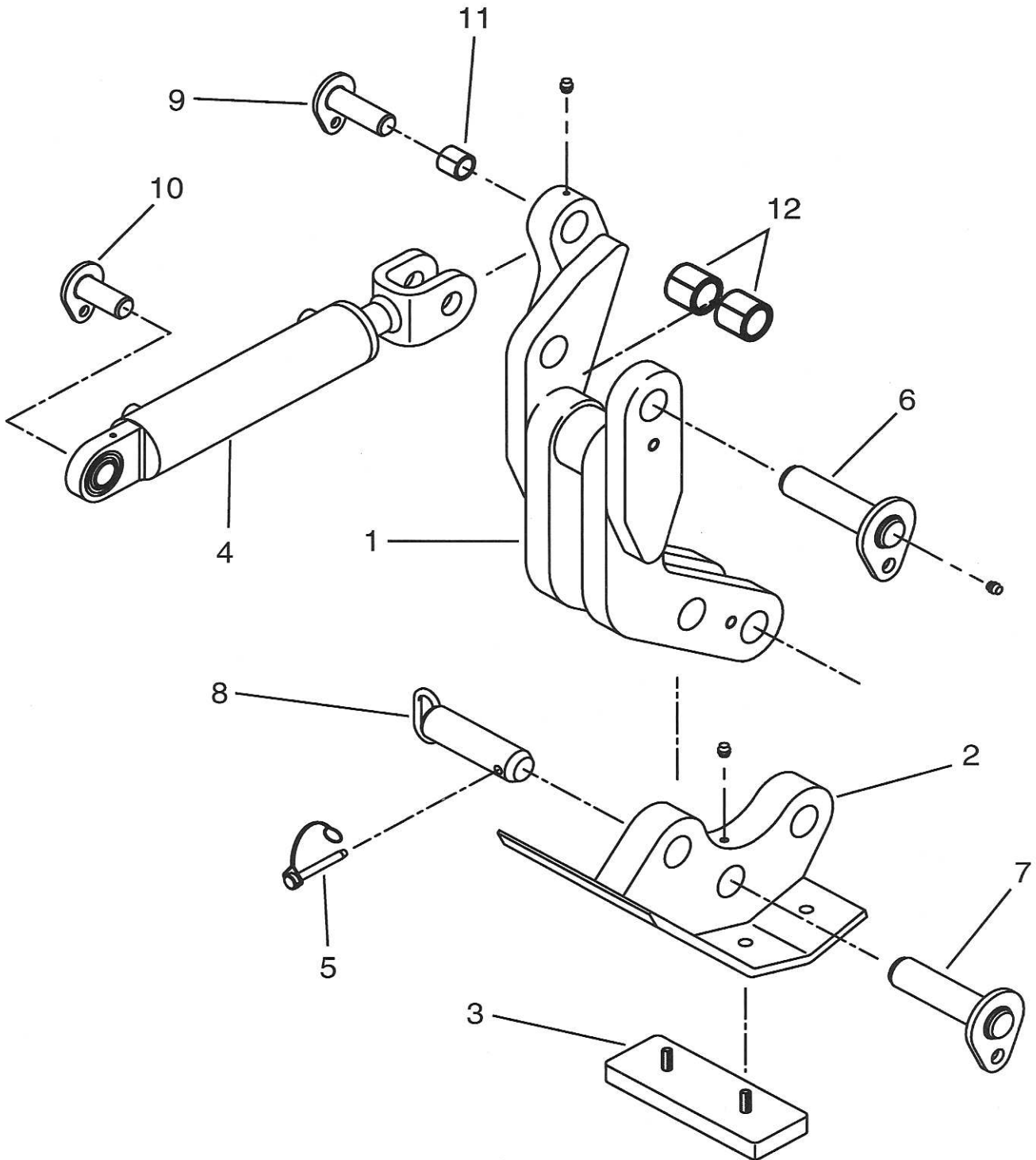
Drive Hub Group (s/n 1050-on)

Item	Qty.	Part Number	Description
1	1	T2509	Suspension Swing Arm - RH
2	1	T2510	Suspension Swing Arm - LH
3	2	T2100	Outer Support, Swing Arm
4	2	T10080	Bearing, Bronze - Outer Support
5	2	T10023	Hub, Disengaging
6	As Req'd	See Note	Sealant, Oil Resistant
7	2	T10259	Hydraulic Motor, Wheel Drive
7A	2	T10218	Spline Sleeve
8	4	T10087	Torsion Block
9	10	T10118	Lug Nut
10*	2	T10090	Tire
11*	2	T10088	Wheel
12*	2	T10181	Wheel & Tire Assembly

*Not Shown

Note: Apply bead of sealant to each side of trailing arm

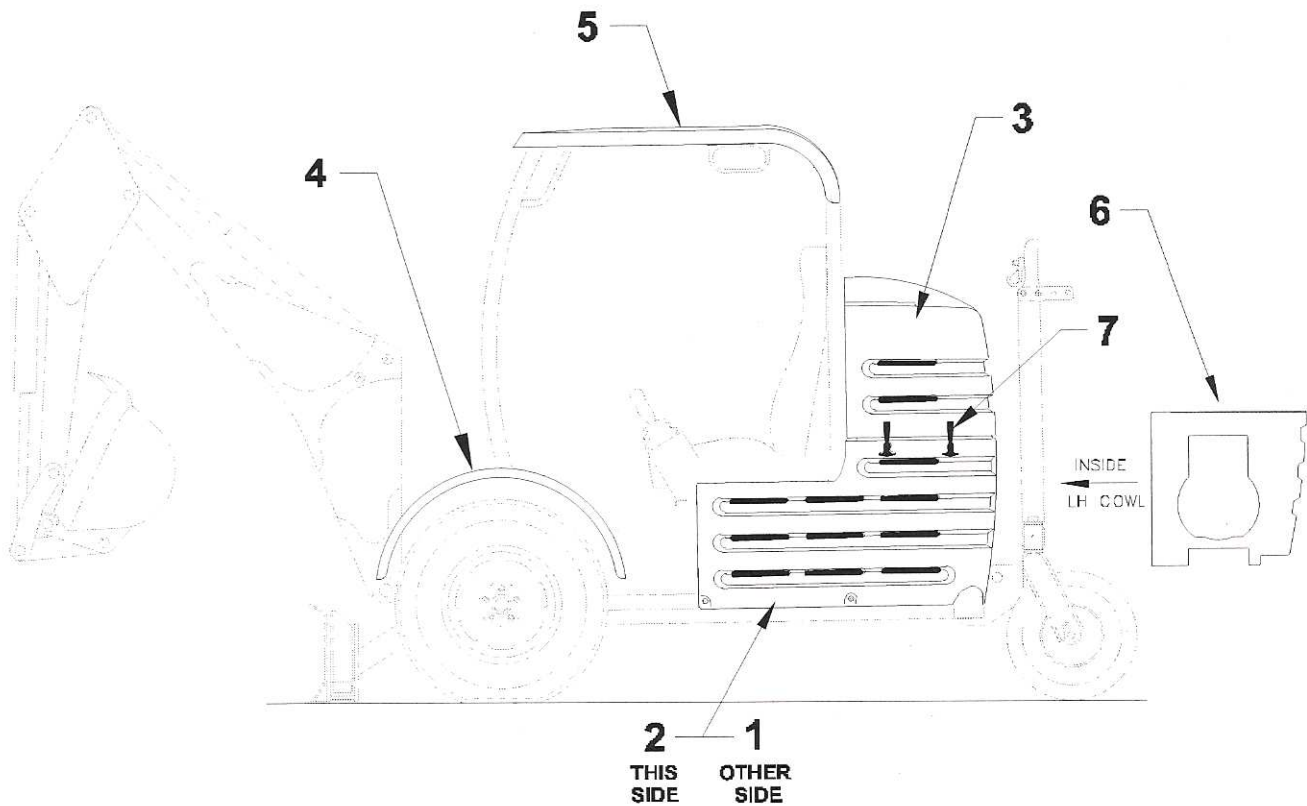
REAR STABILIZER GROUP



REAR STABILIZER GROUP

Item	Qty.	Part Number	Description
1	1	T6000	Rear Stabilizer Weldment
2	1	T6100	Flip Pad Weldment
3	3	T10066	Pavement Pad
4	1	T10076	Cylinder Assembly, Rear Stabilizer
4A		T10071	Repair Seal Kit
4B		T10069	Spherical Bearing
5	1	T10120	PTO Pin, 5/16 x 2-1/4
6	1	T9004	Pin, Rear Stabilizer Pivot
7	1	T9006	Pin, Flip Pad Pivot
8	1	T9007	Pin, Flip Pad Lock
9	1	T9010	Pin, Cylinder Rod to Stabilizer
10	1	T9013	Pin, Rear Stabilizer Cyl. to Chassis
11	1	T10163	Bushing, Cyl to Stabilizer
12	2	T10109	Bushing, Stabilizer to Chassis

COWL GROUP

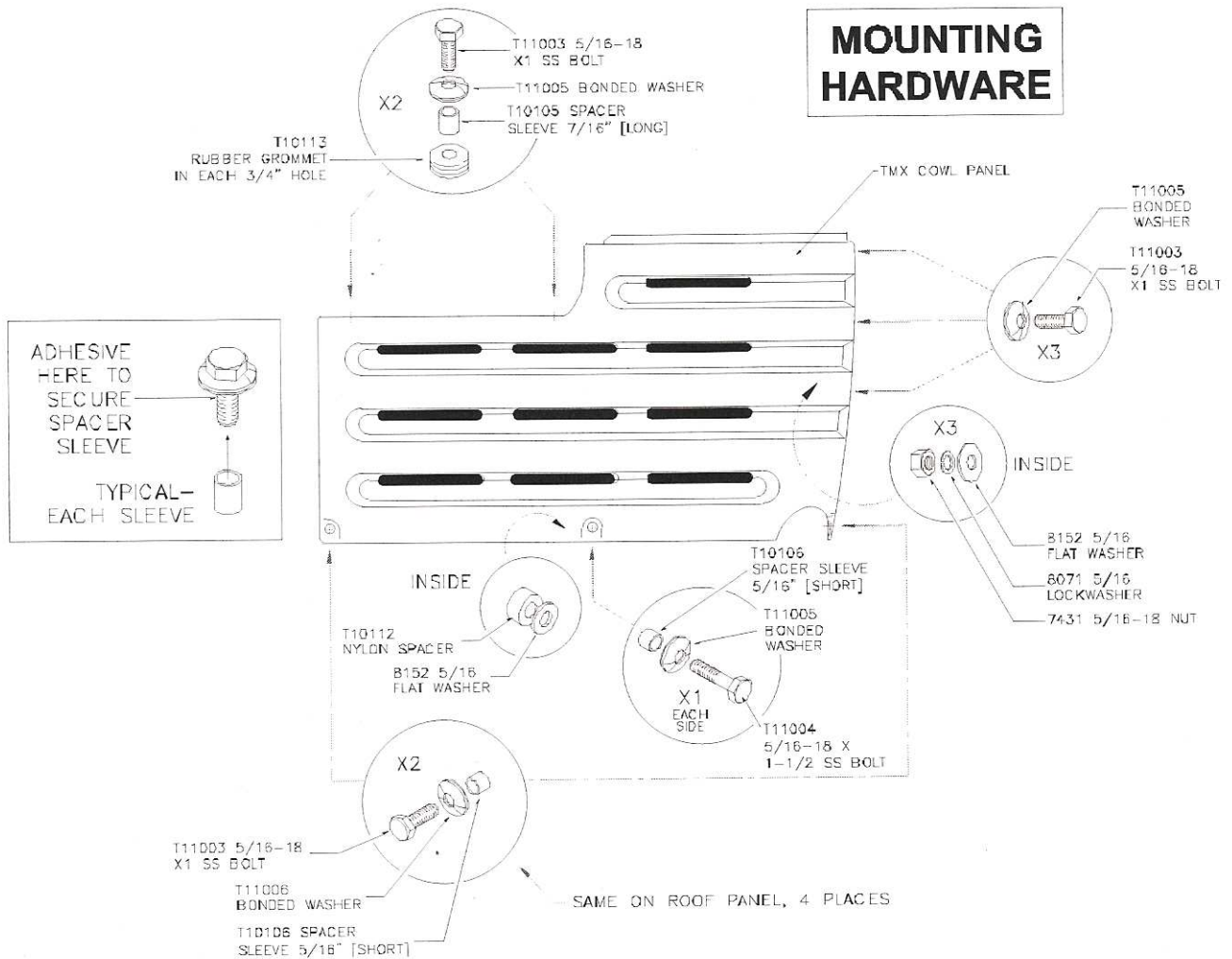


Important Note:

Cowl parts expand and contract with temperature changes at a different rate than the steel TMX chassis. Make sure that elastomer grommets are fitted to the attachment points and that spacer sleeves are used on attachment bolts to avoid pinching cowl panels, which may result in cracking.

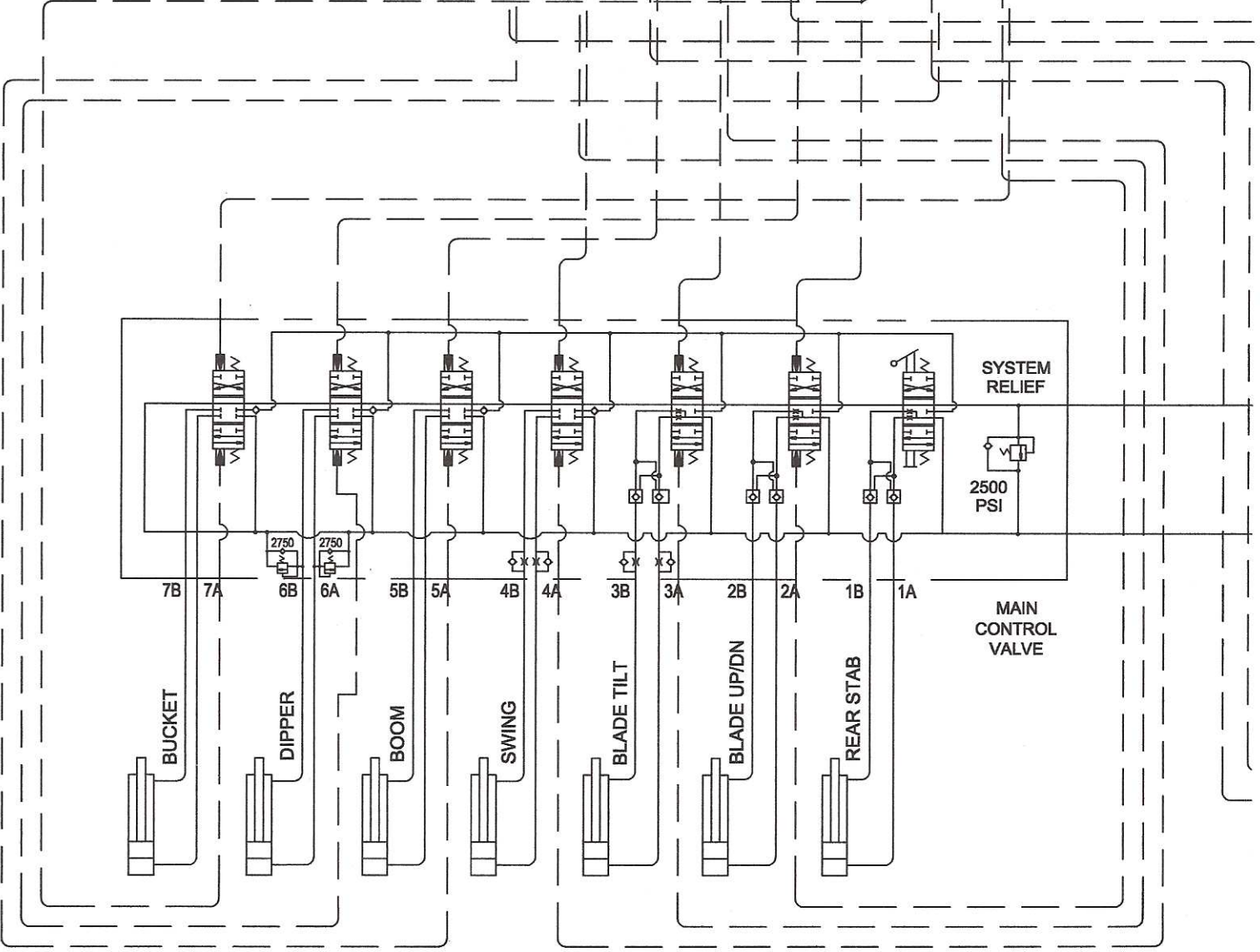
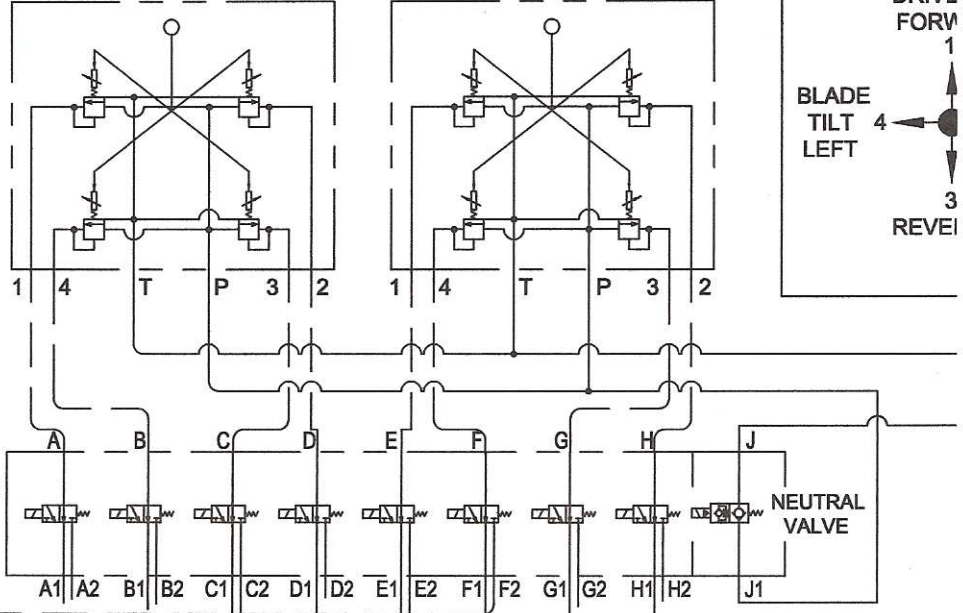
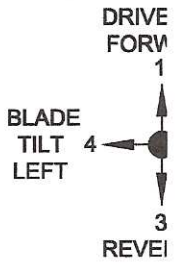
COWL GROUP

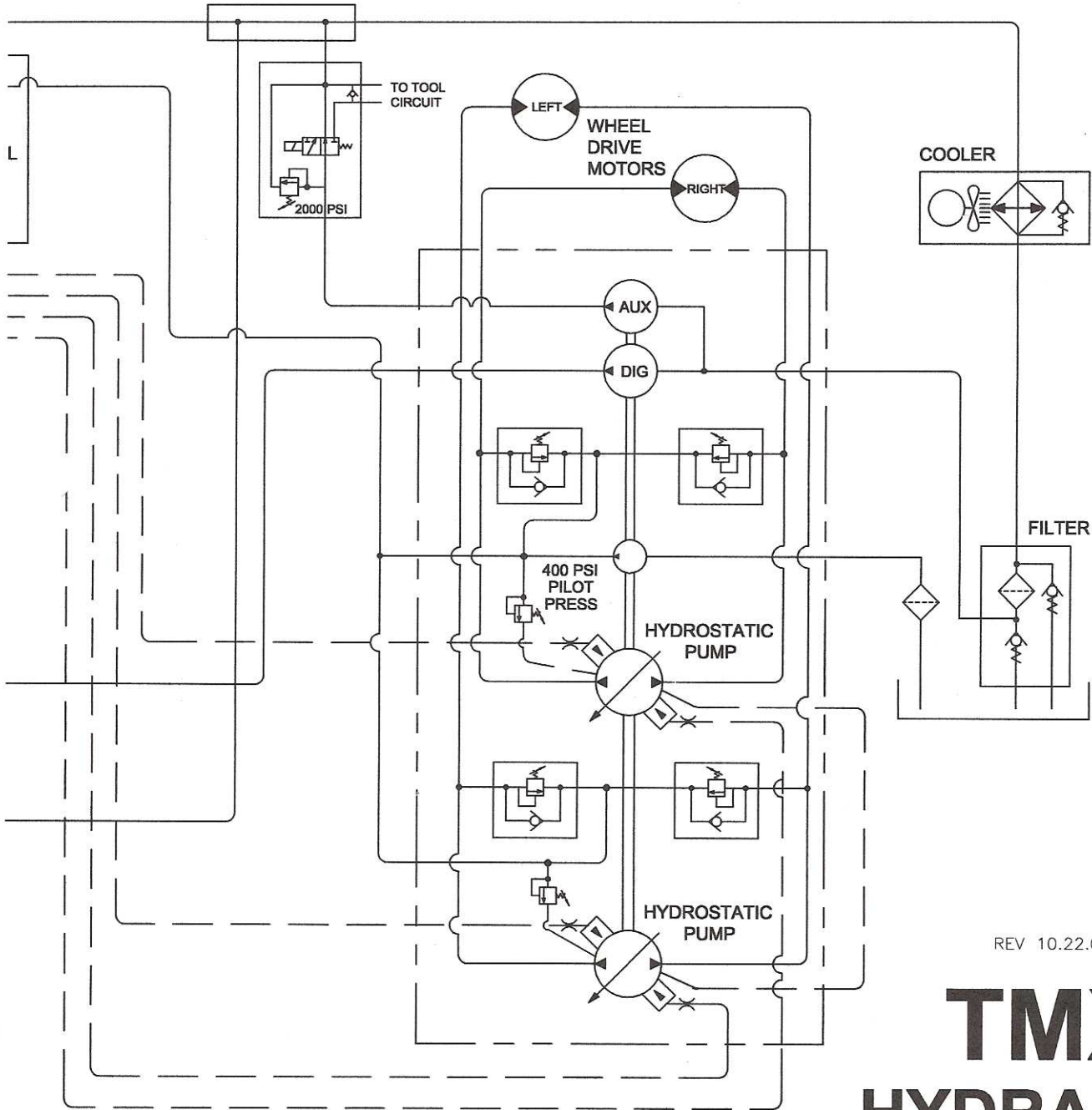
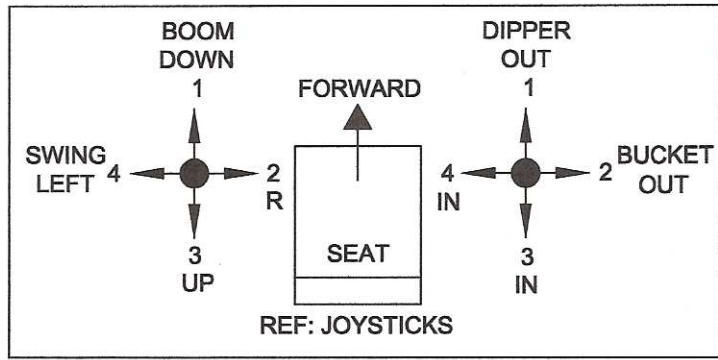
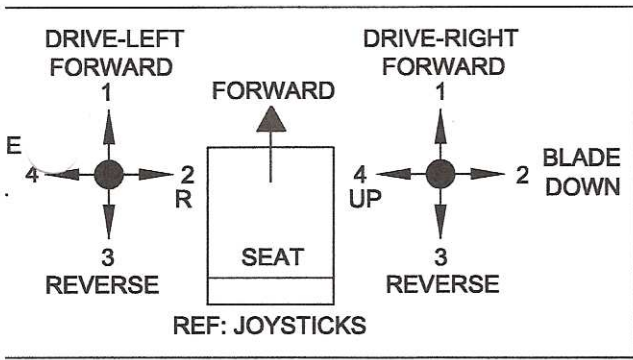
Item	Qty.	Part Number	Description
1	1	T10056	Cowl Panel, Engine, RH
2	1	T10057	Cowl Panel, Engine, LH
3	1	T10058	Hood Assembly
4	2	T10059	Fender, RH or LH
5	1	T10060	Sunshade Roof Panel
6	1	T10061	Cooling Duct, Gas Engine Only
7	2	T10114	Latch, Tee Handle



LH JOYSTICK

RH JOYSTICK

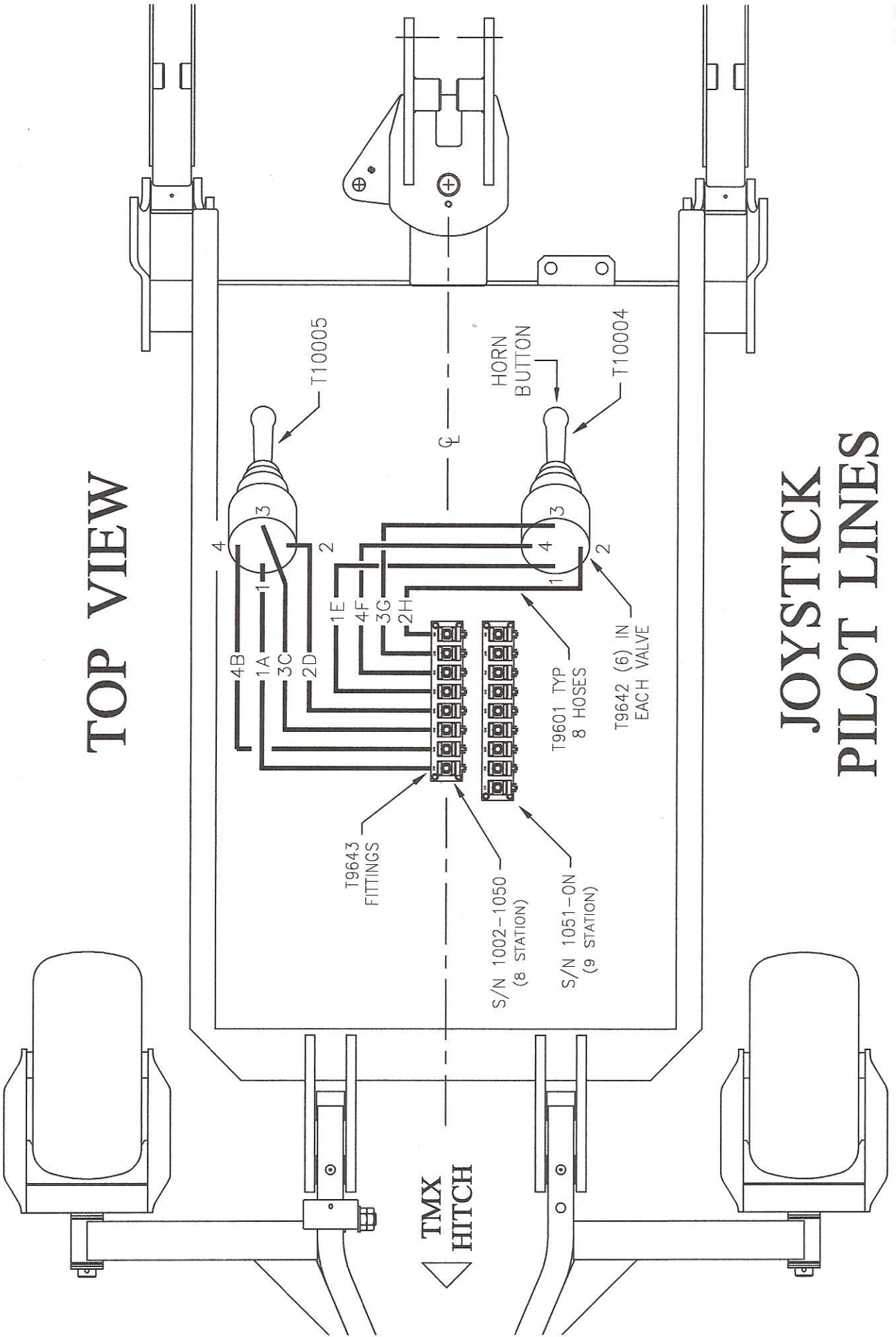




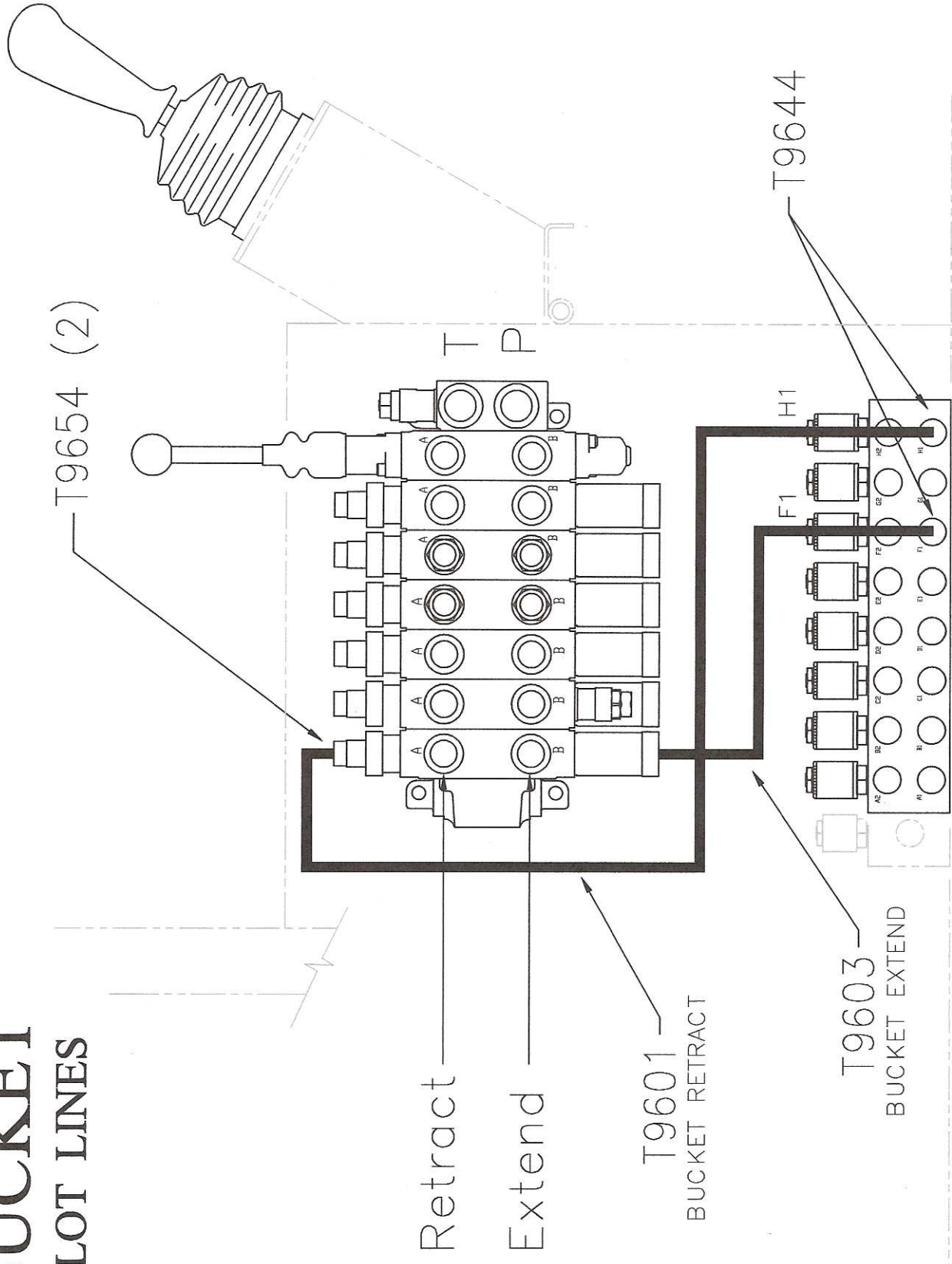
REV 10.22.02

TMX HYDRAULIC DIAGRAM Section I

Use only premium
quality ISO grade 32
all-season hydraulic oil



BUCKET PILOT LINES



T9654 (2)

Retract

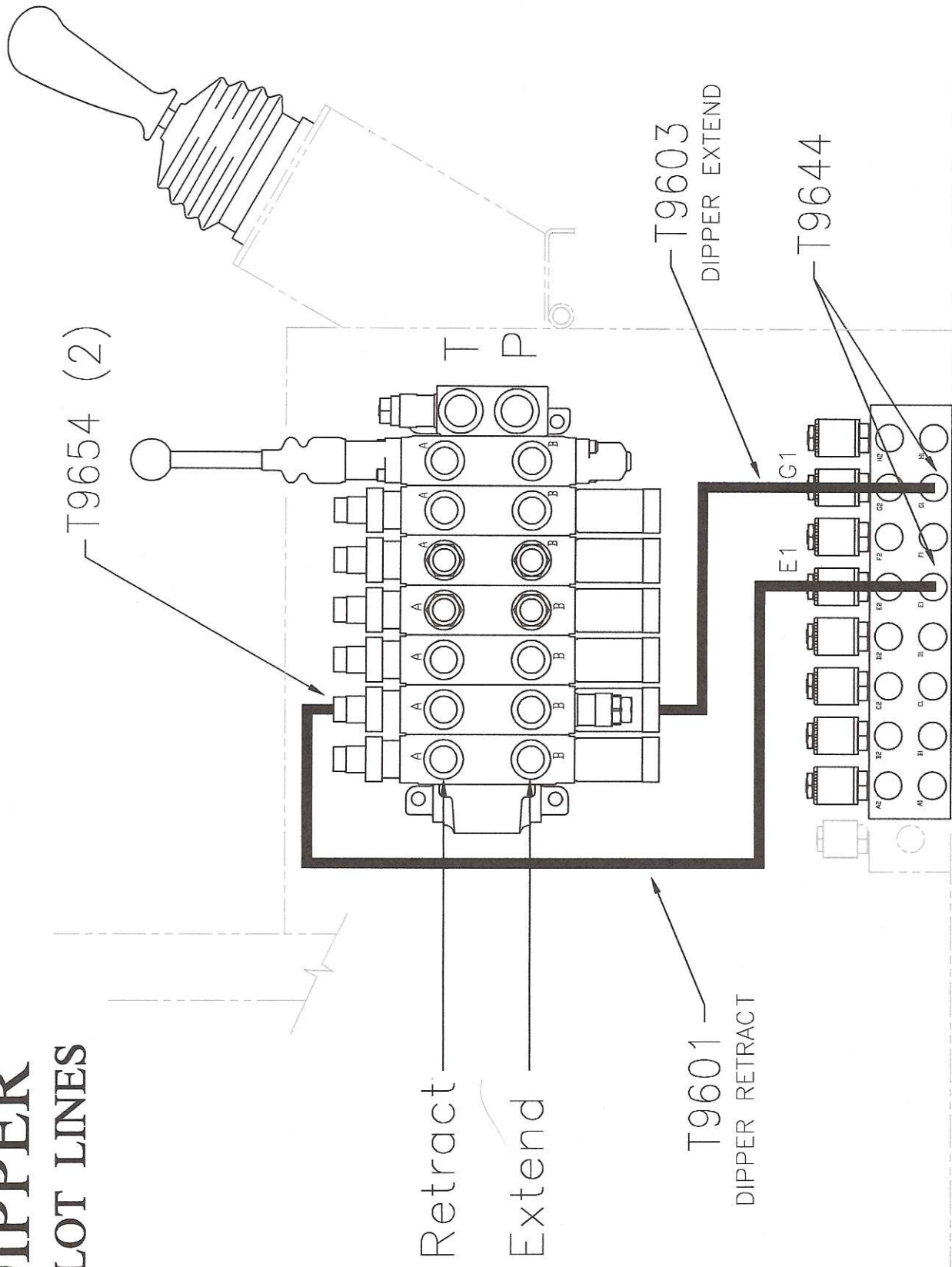
Extend

T9601
BUCKET RETRACT

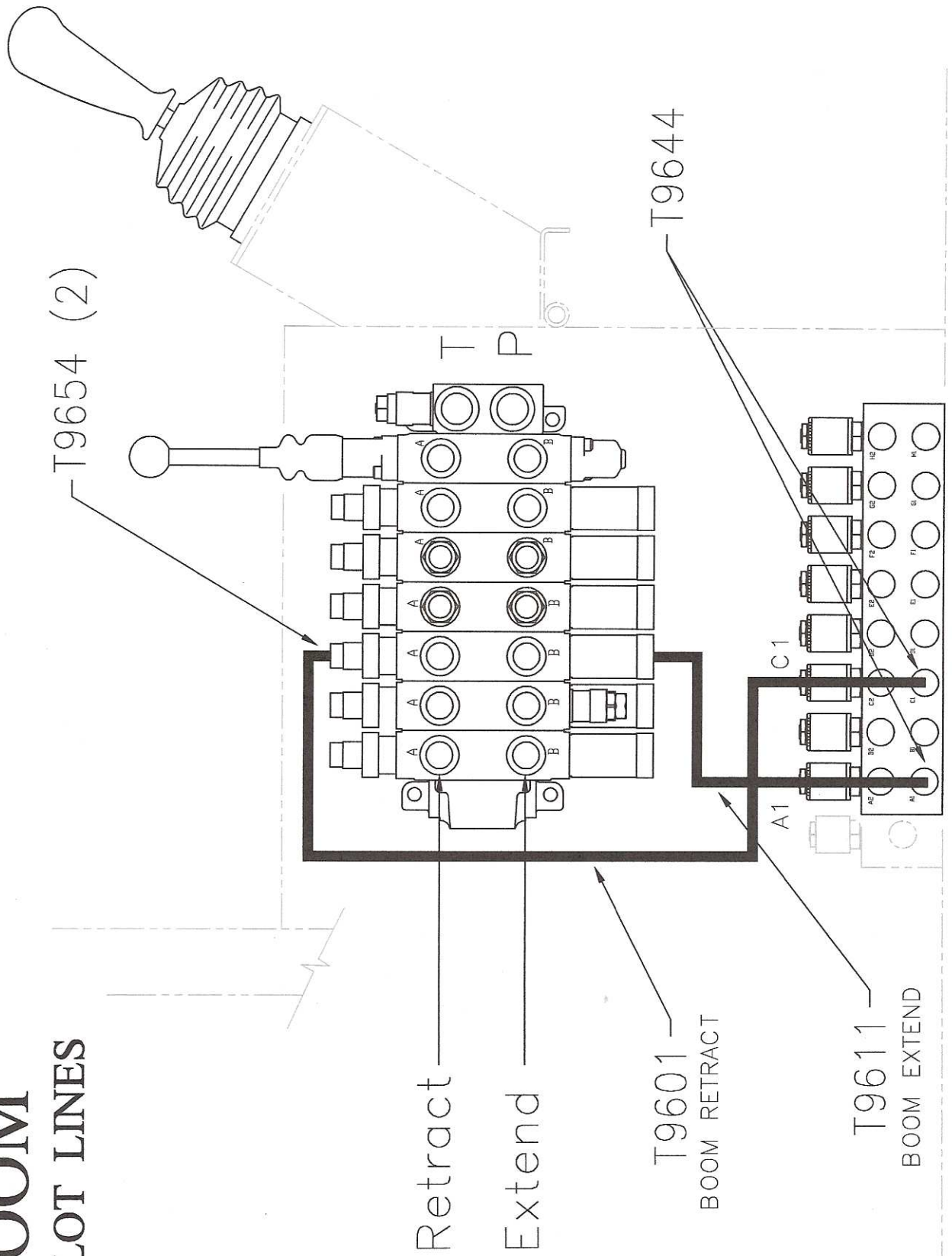
T9603
BUCKET EXTEND

T9644

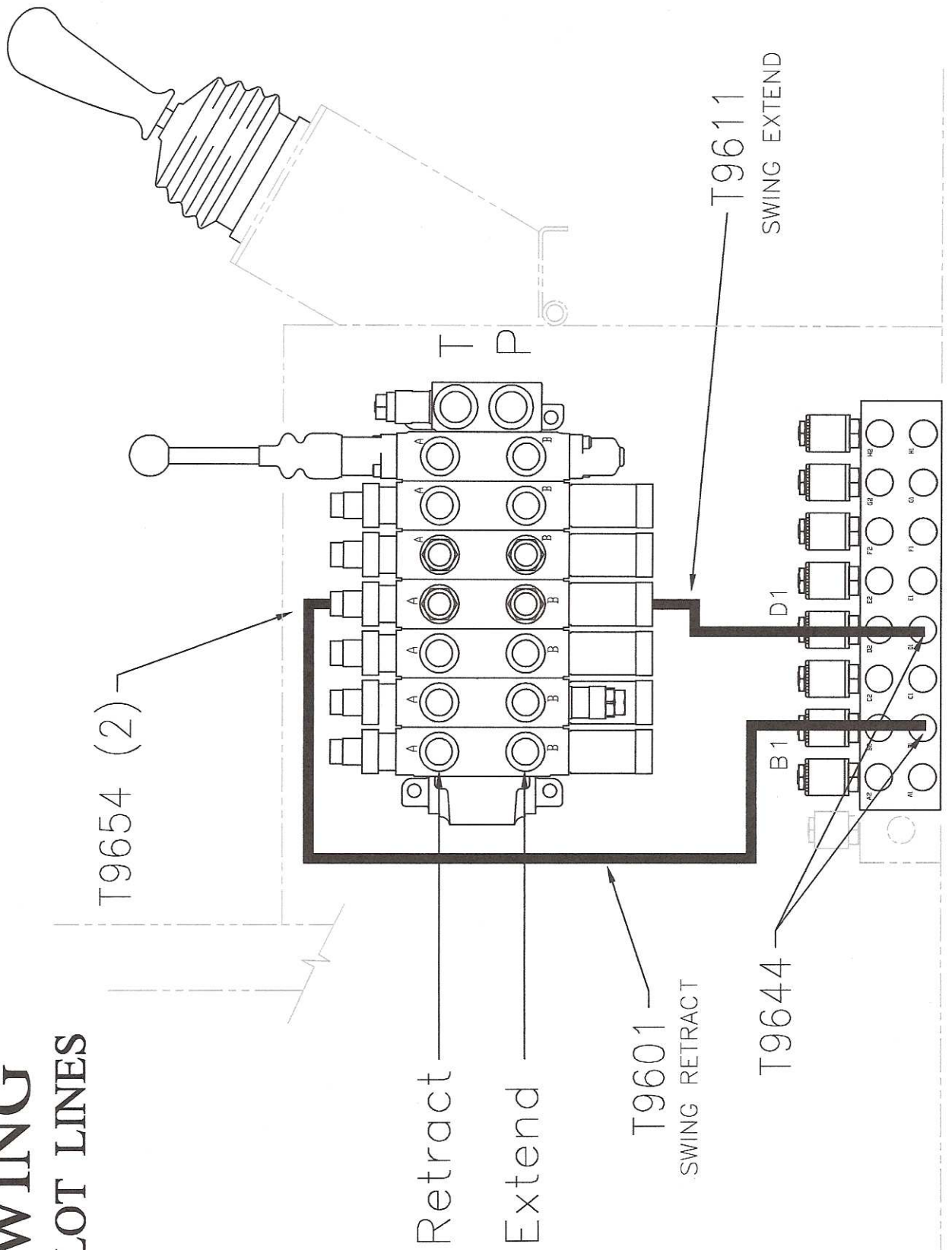
DIPPER PILOT LINES



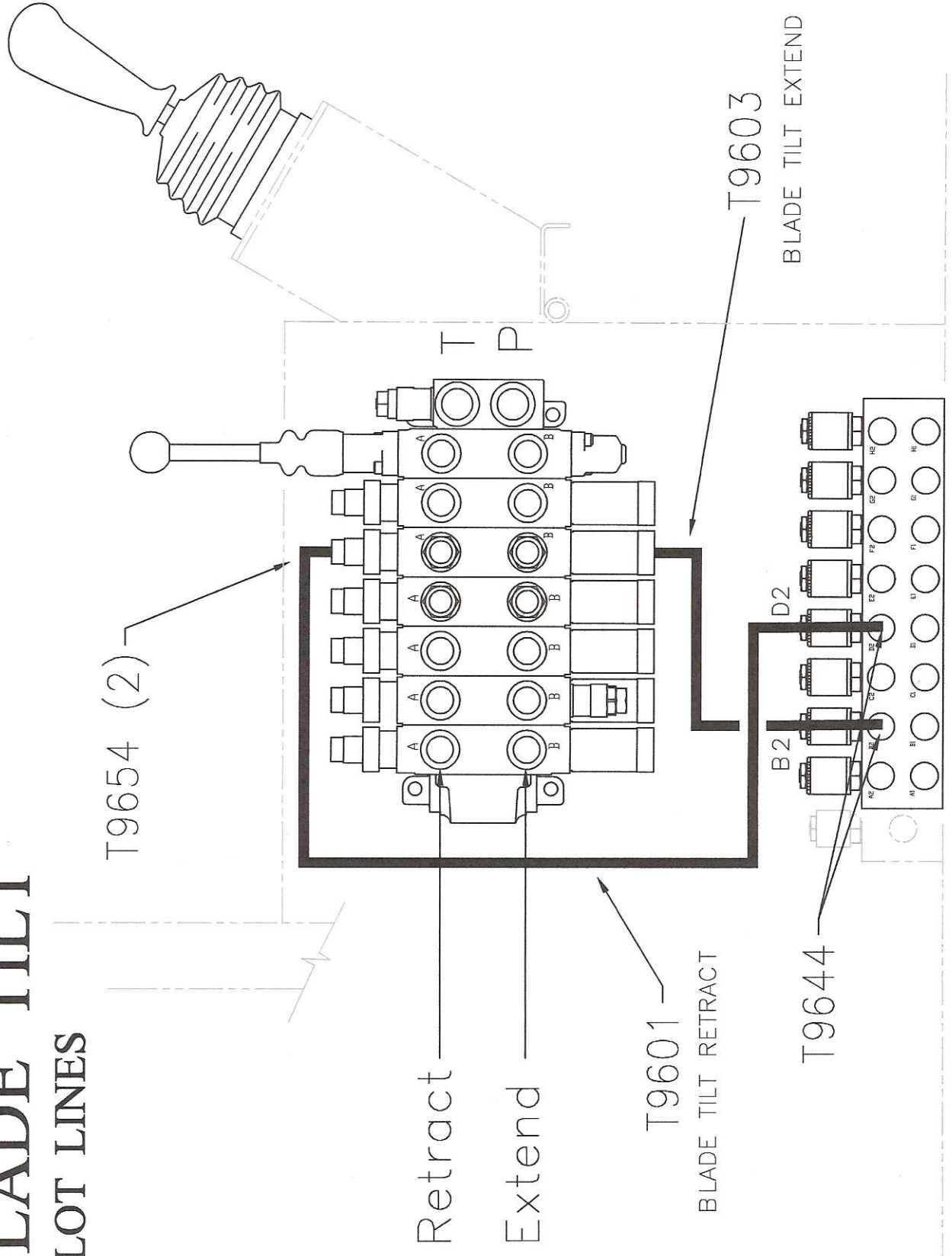
BOOM PILOT LINES



SWING PILOT LINES

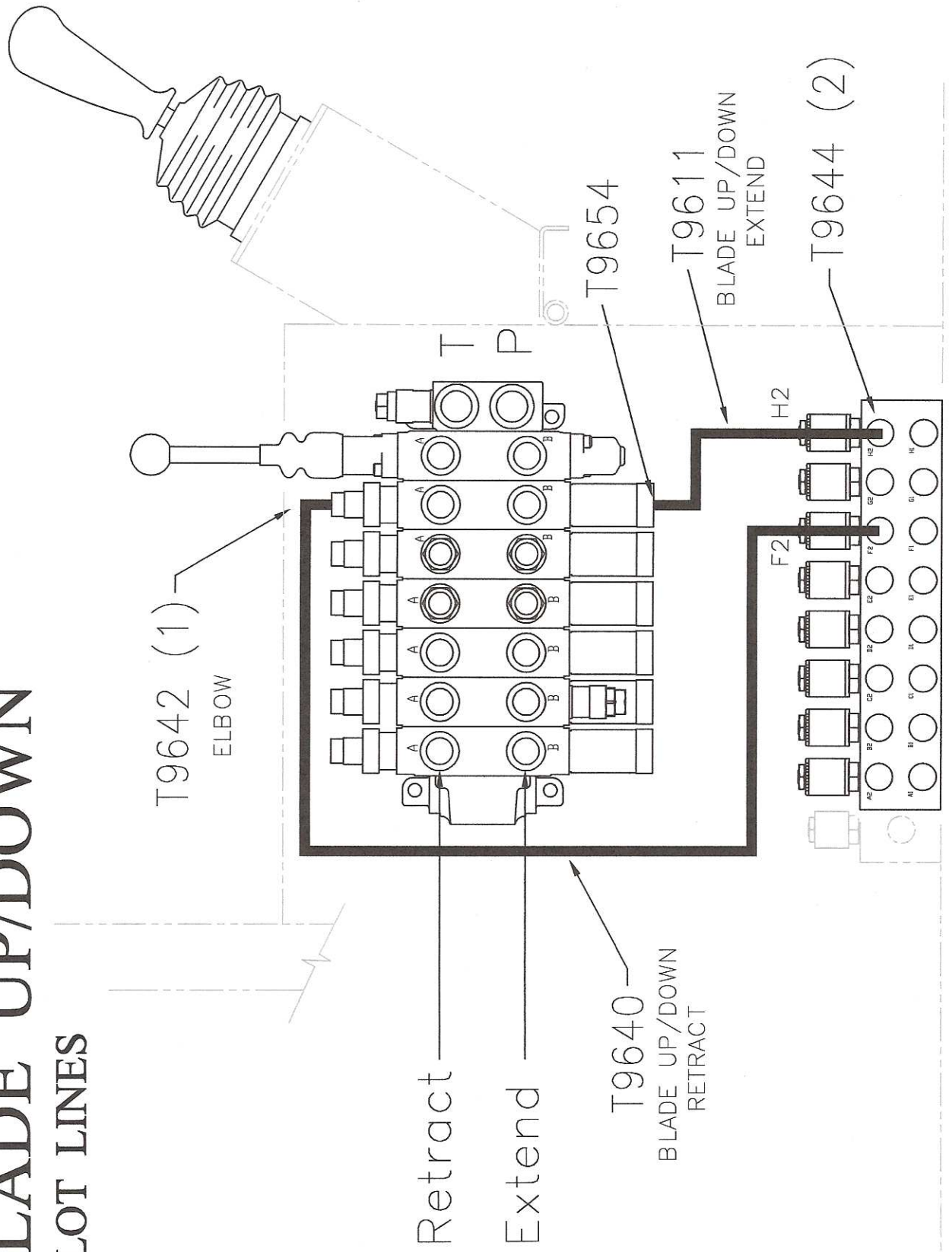


BLADE TILT PILOT LINES



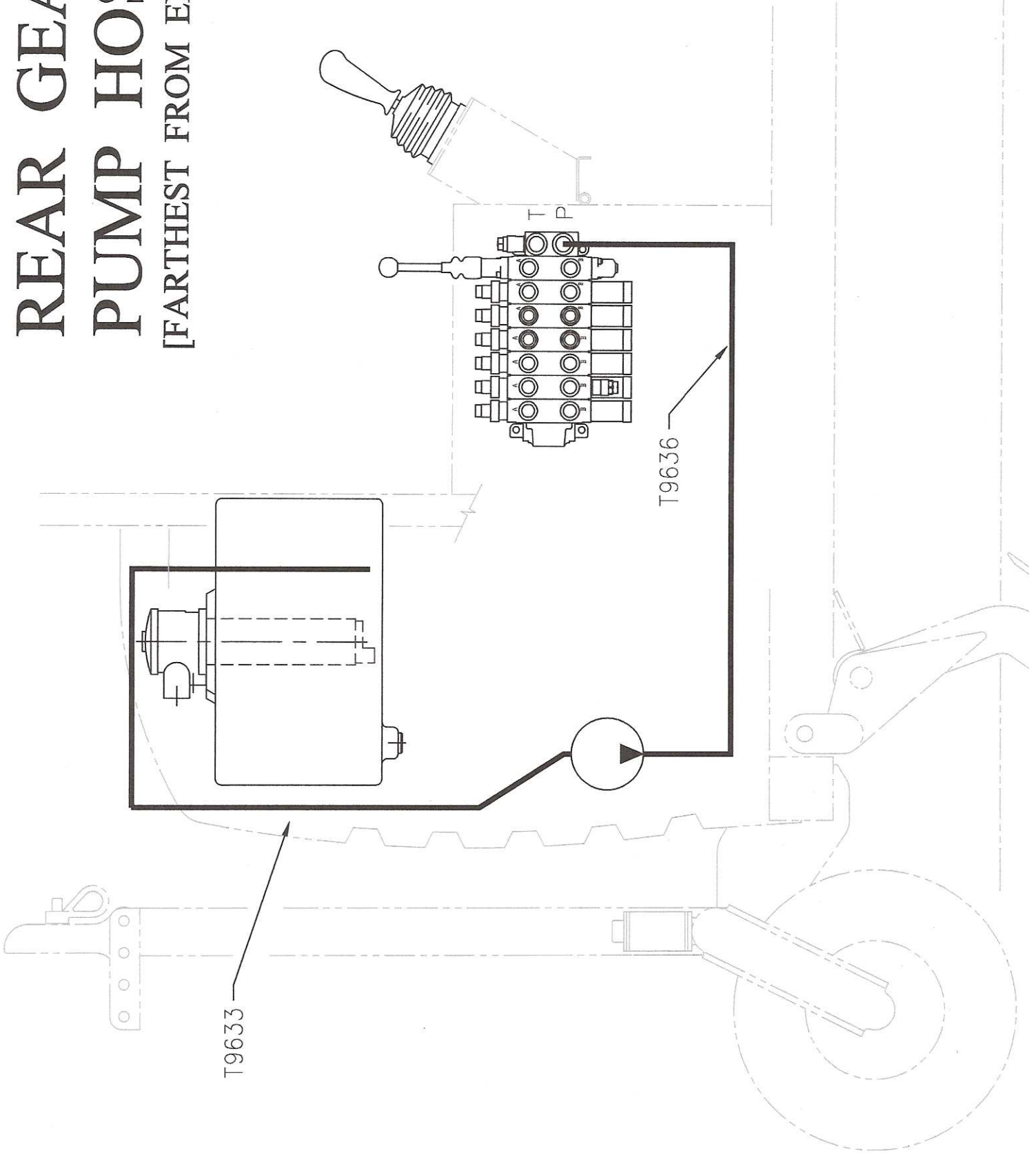
BLADE UP/DOWN

PILOT LINES



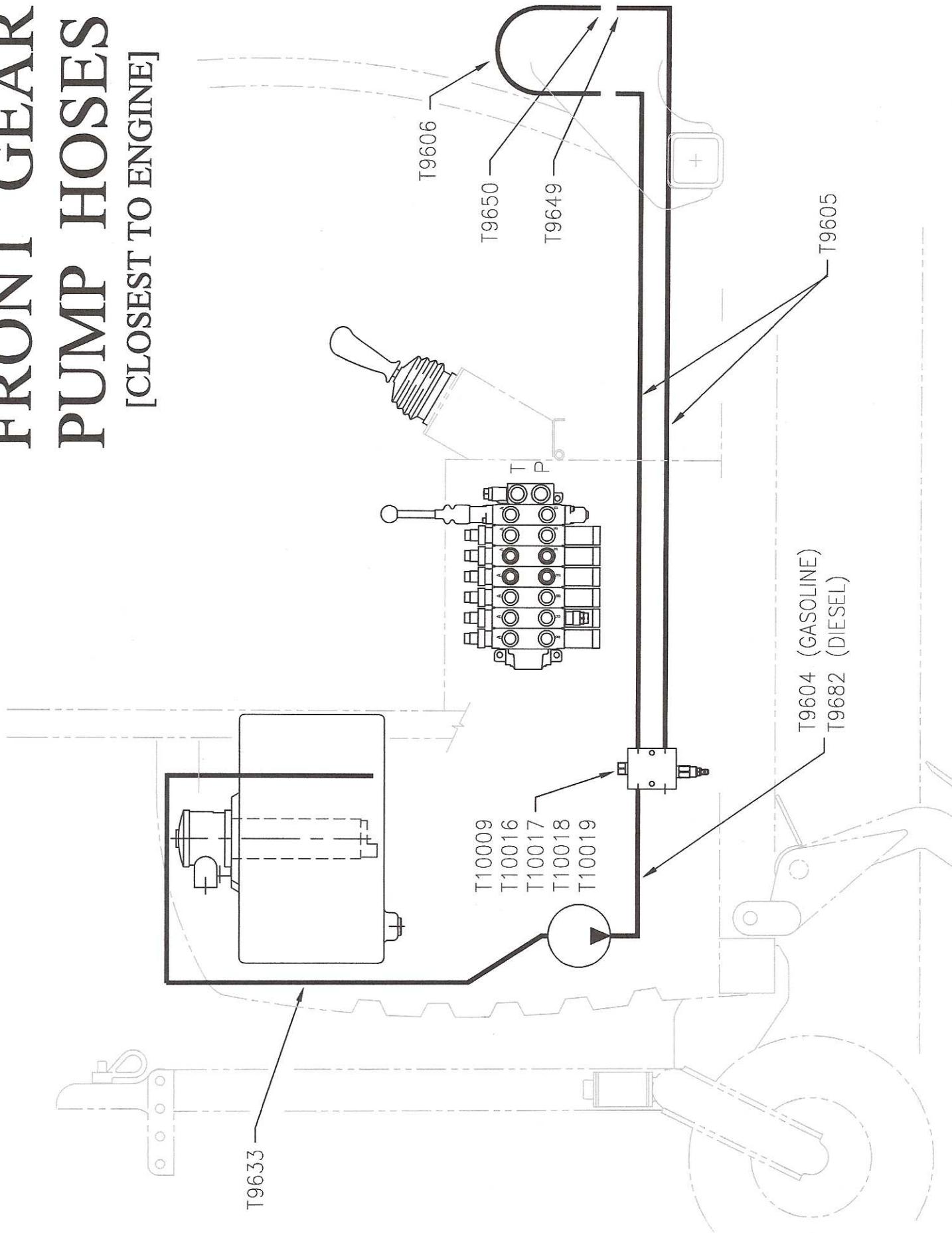
REAR GEAR PUMP HOSES

[FARTHEST FROM ENGINE]



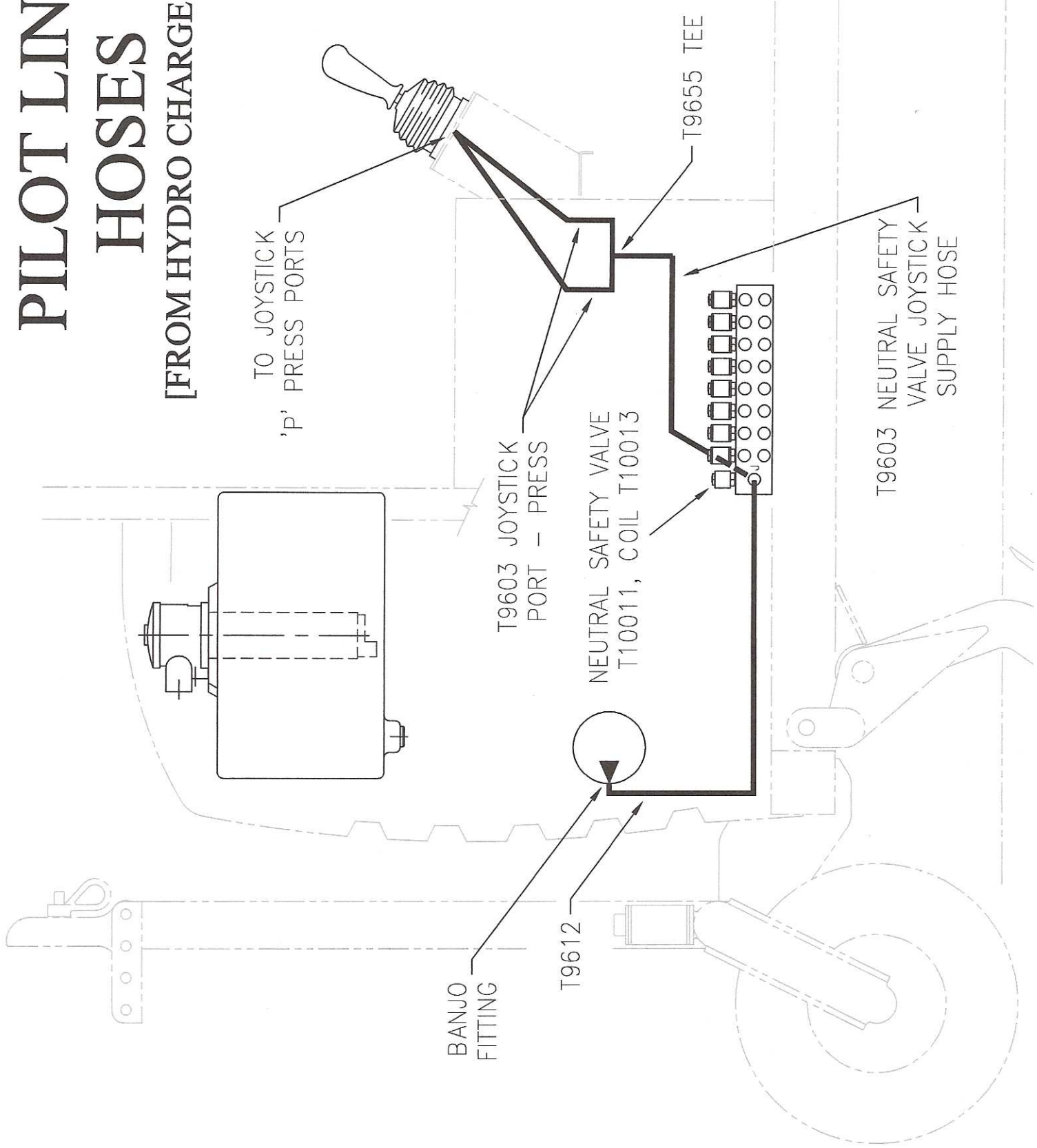
FRONT GEAR PUMP HOSES

[CLOSEST TO ENGINE]

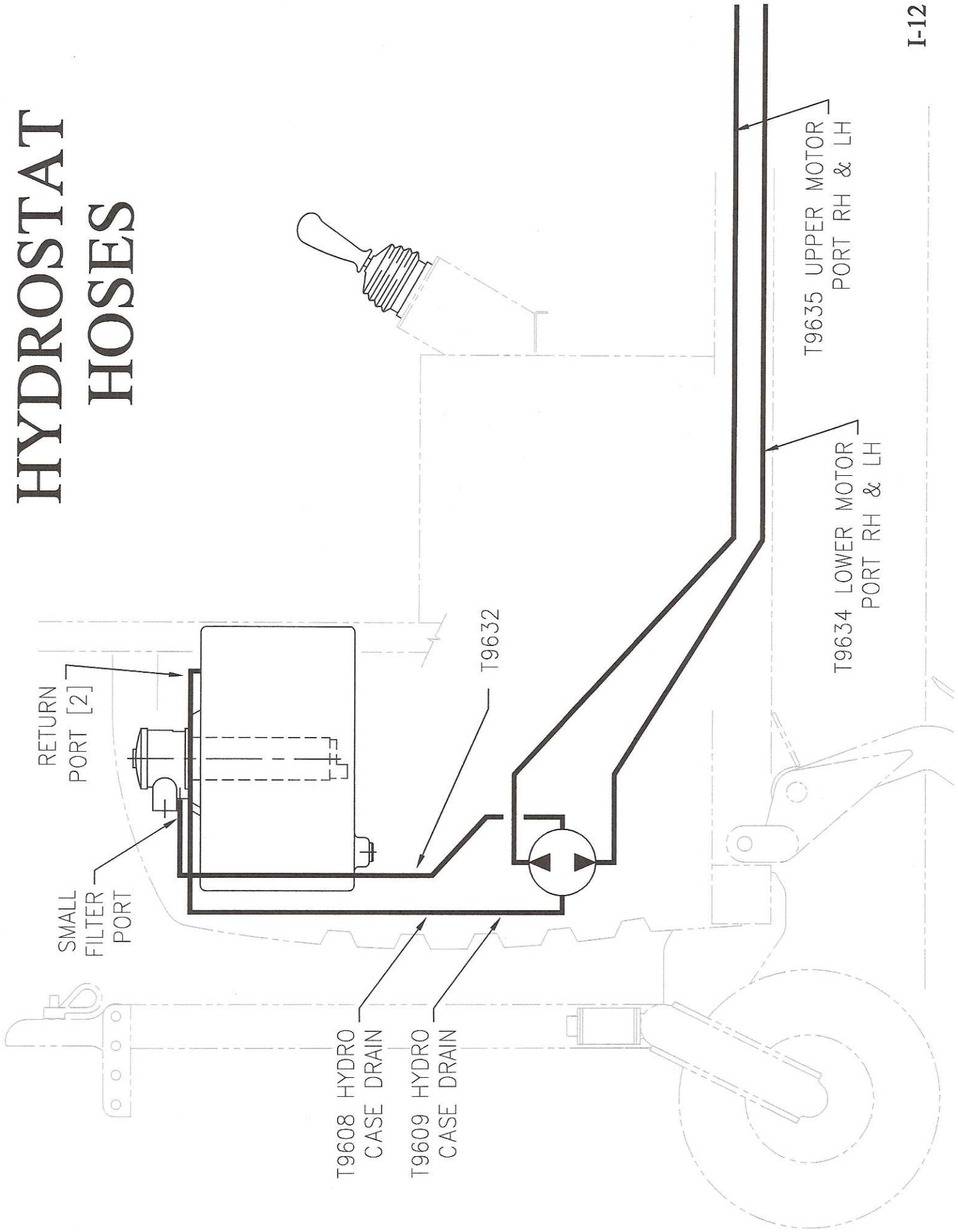


PILOT LINE HOSES

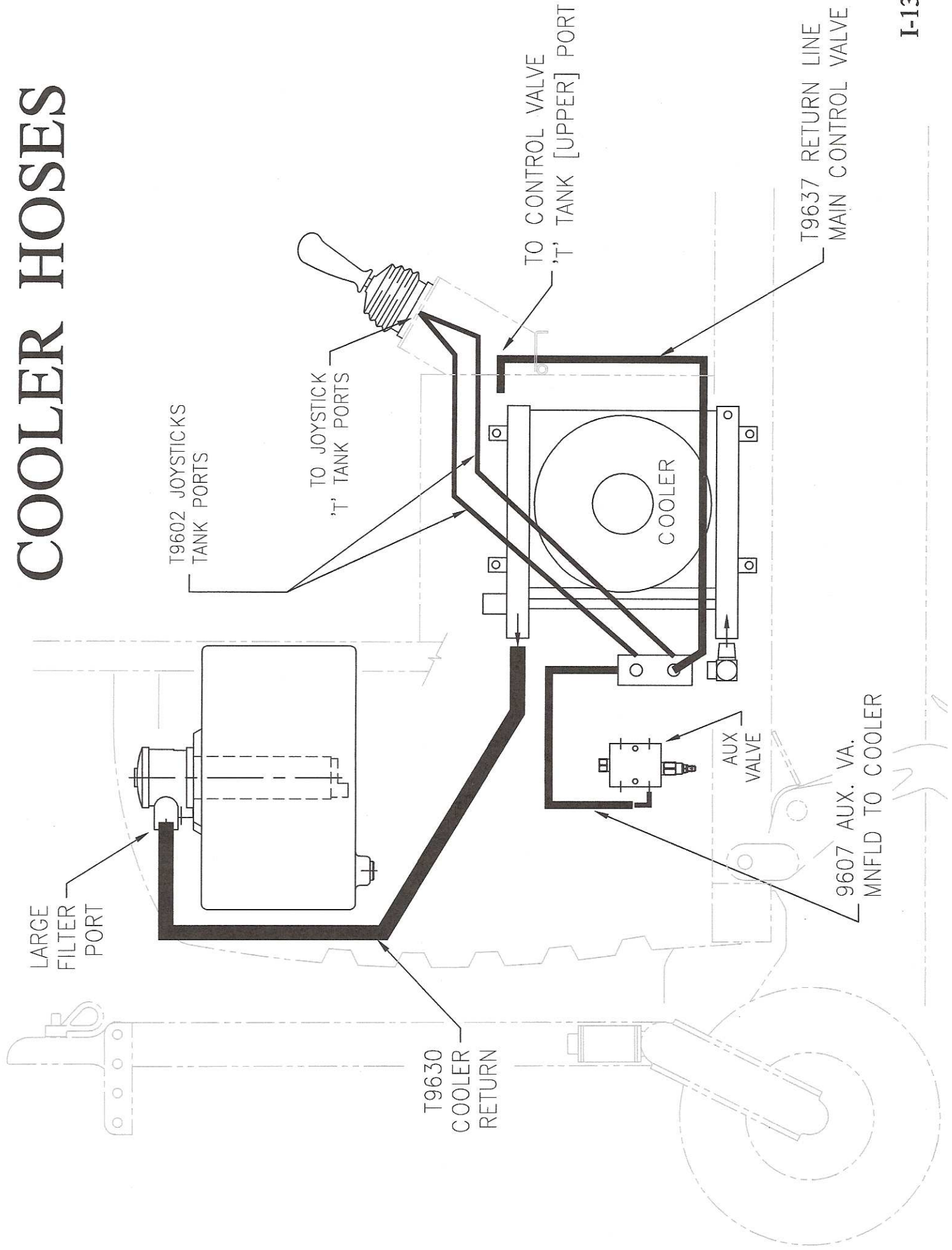
[FROM HYDRO CHARGE PUMP]



HYDROSTAT HOSES

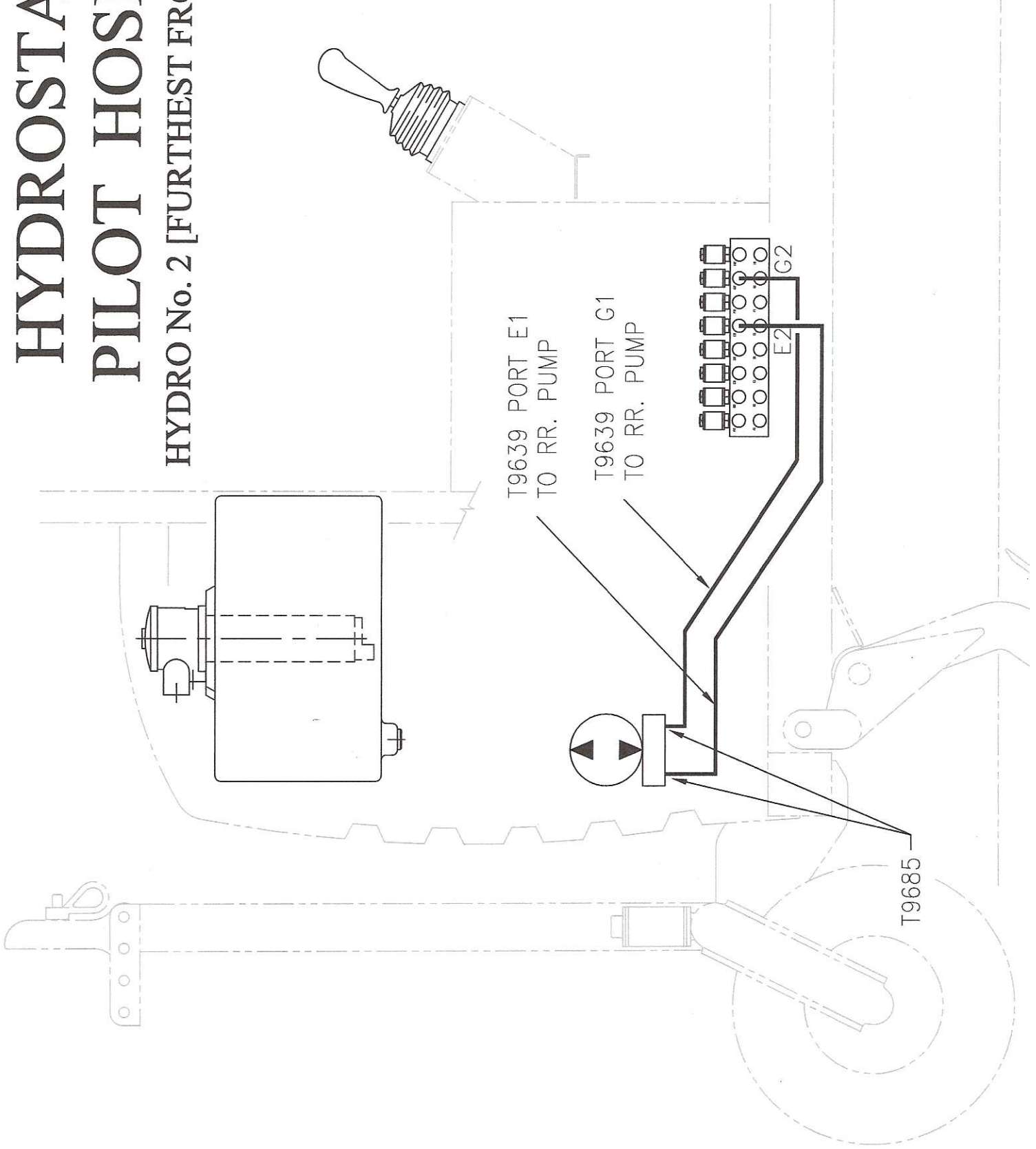


COOLER HOSES



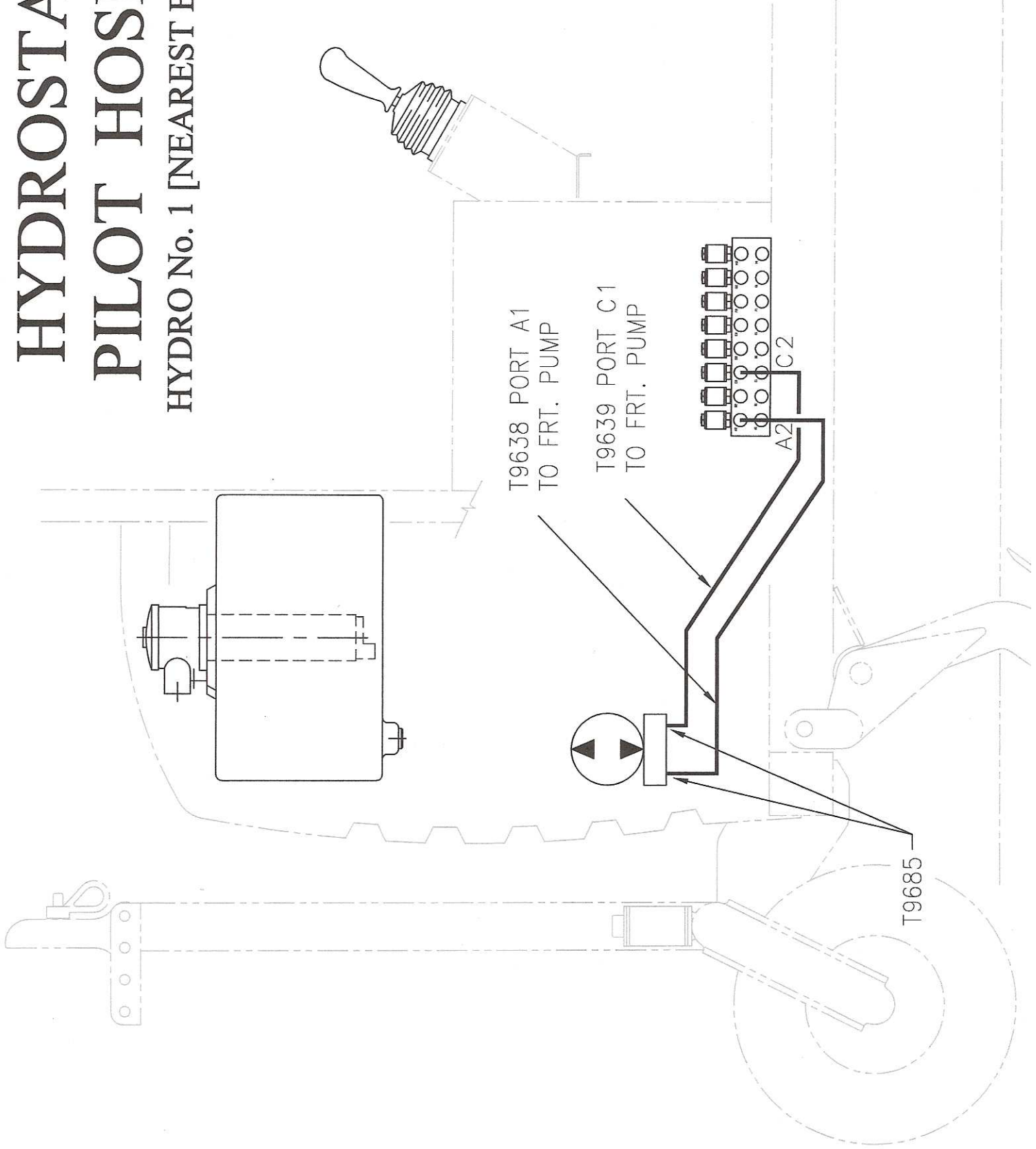
HYDROSTAT PILOT HOSES

HYDRO No. 2 [FURTHEST FROM ENGINE]

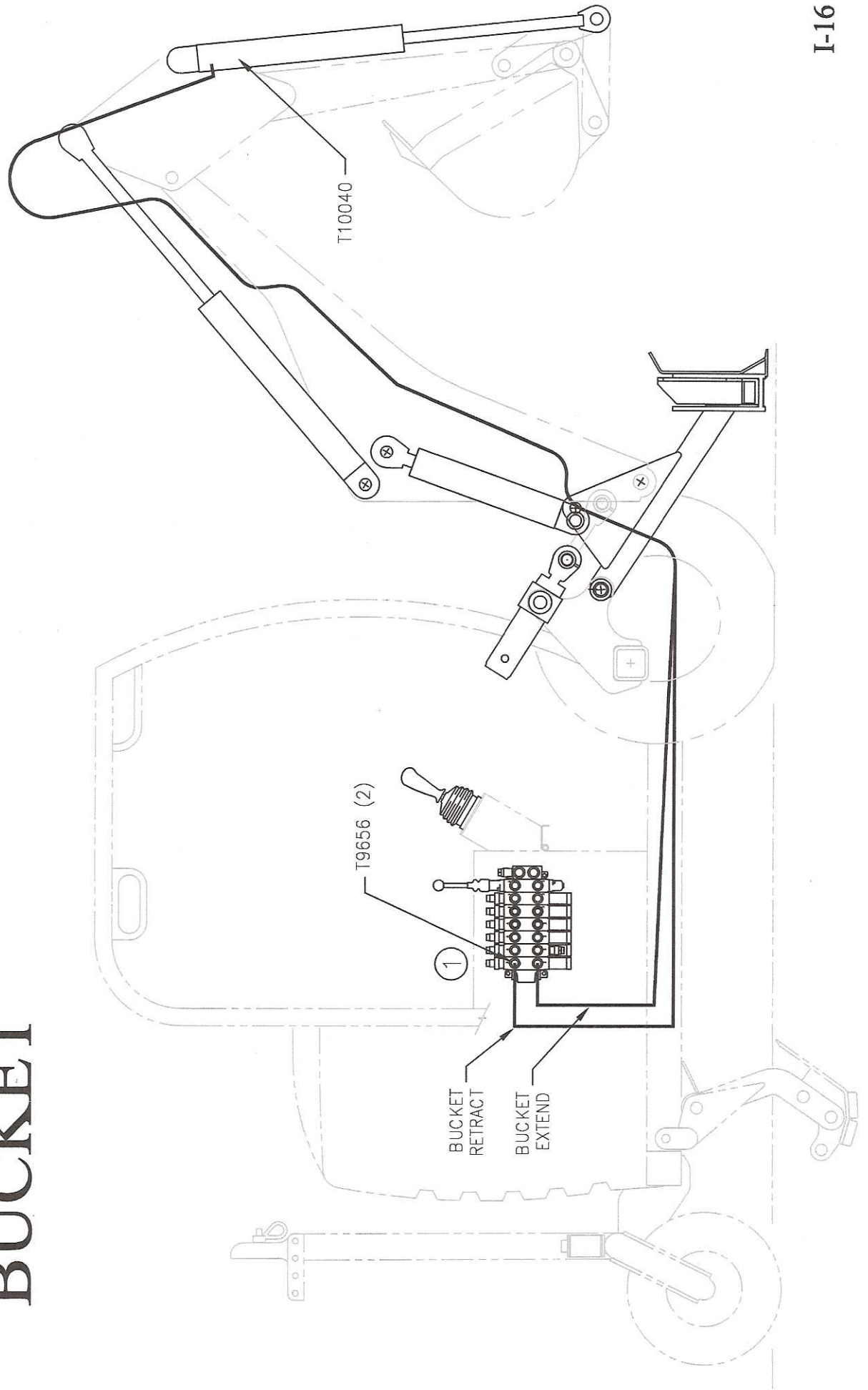


HYDROSTAT PILOT HOSES

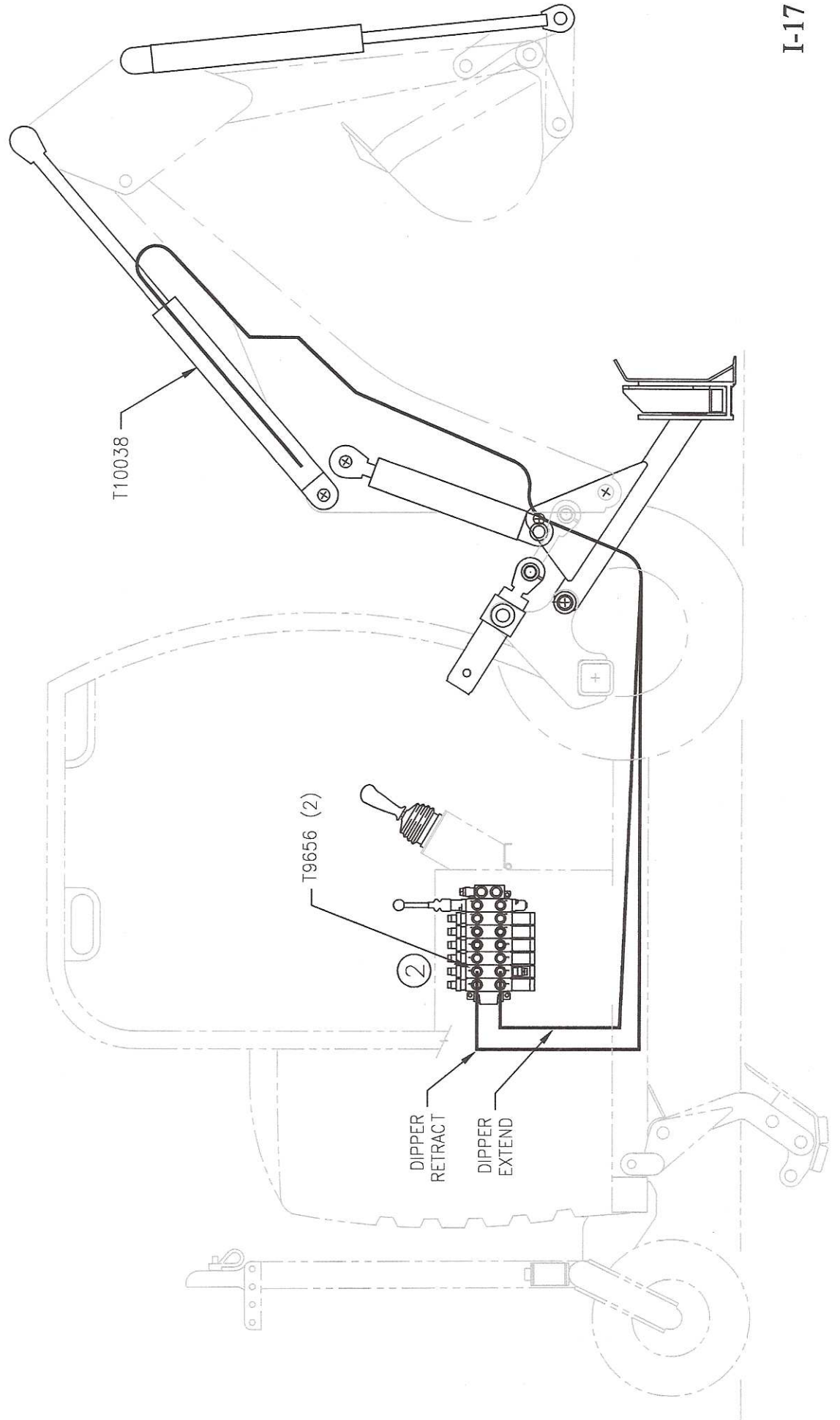
HYDRO No. 1 [NEAREST ENGINE]



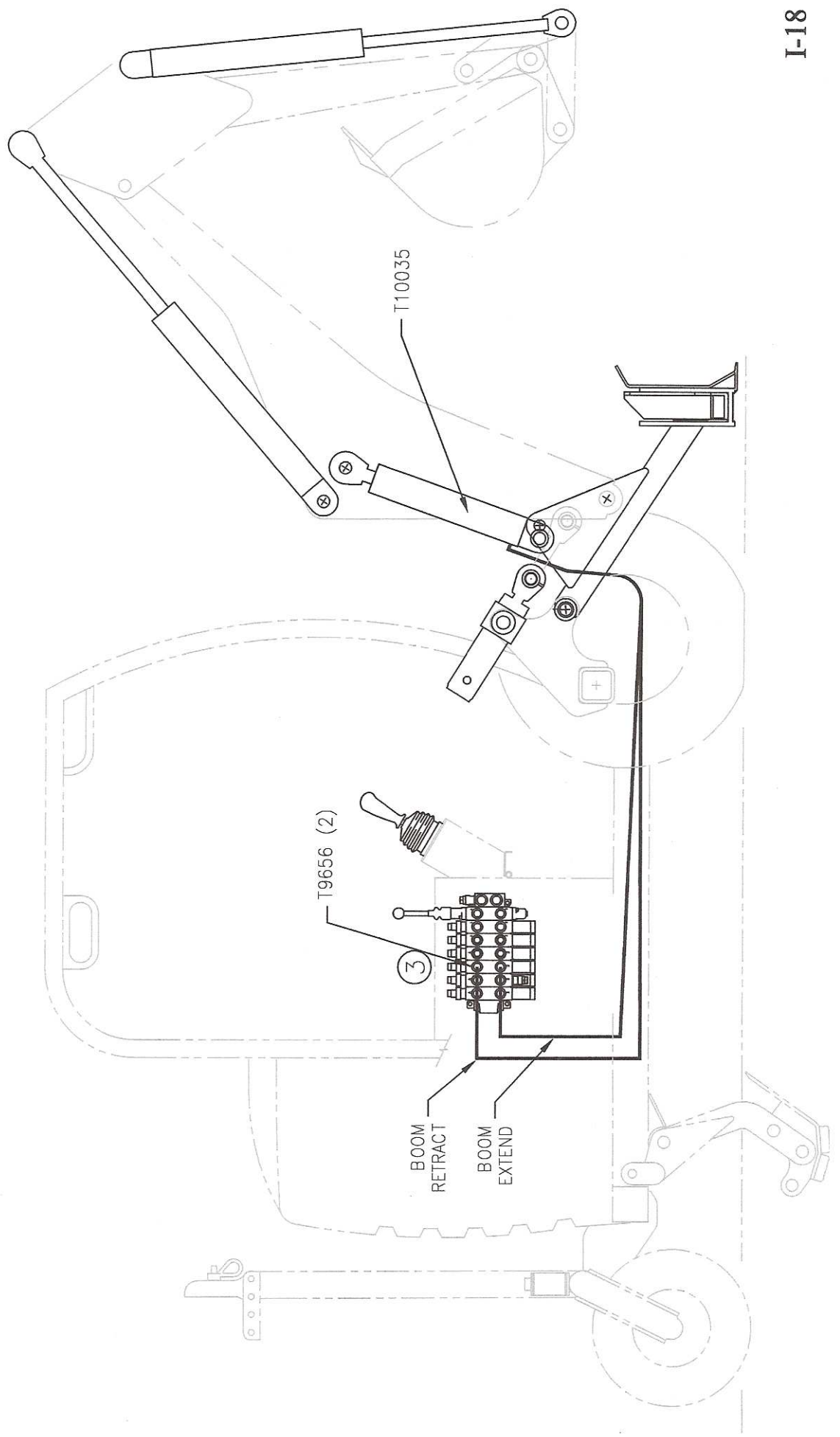
BACKHOE BUCKET



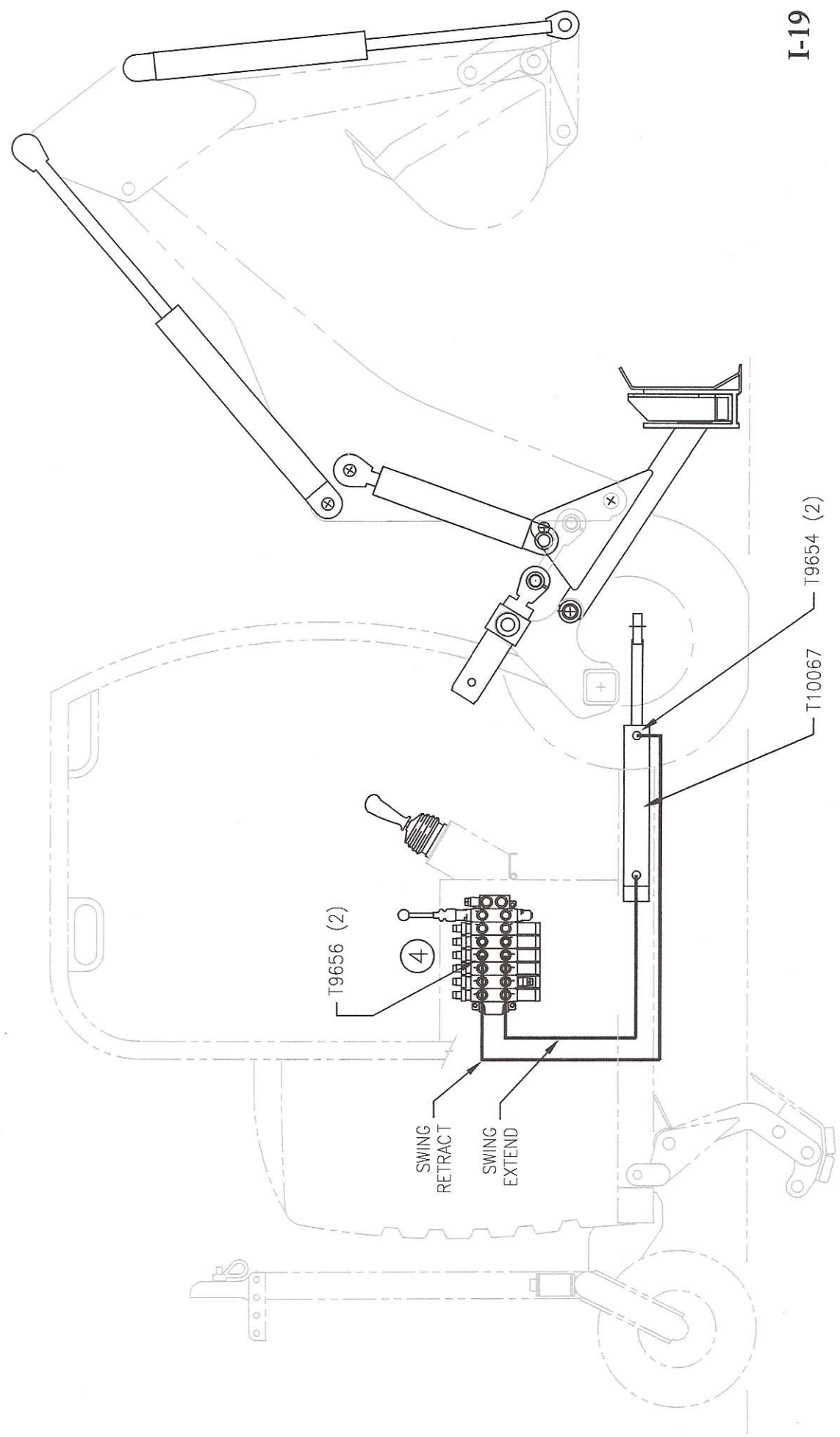
BACKHOE DIPPER



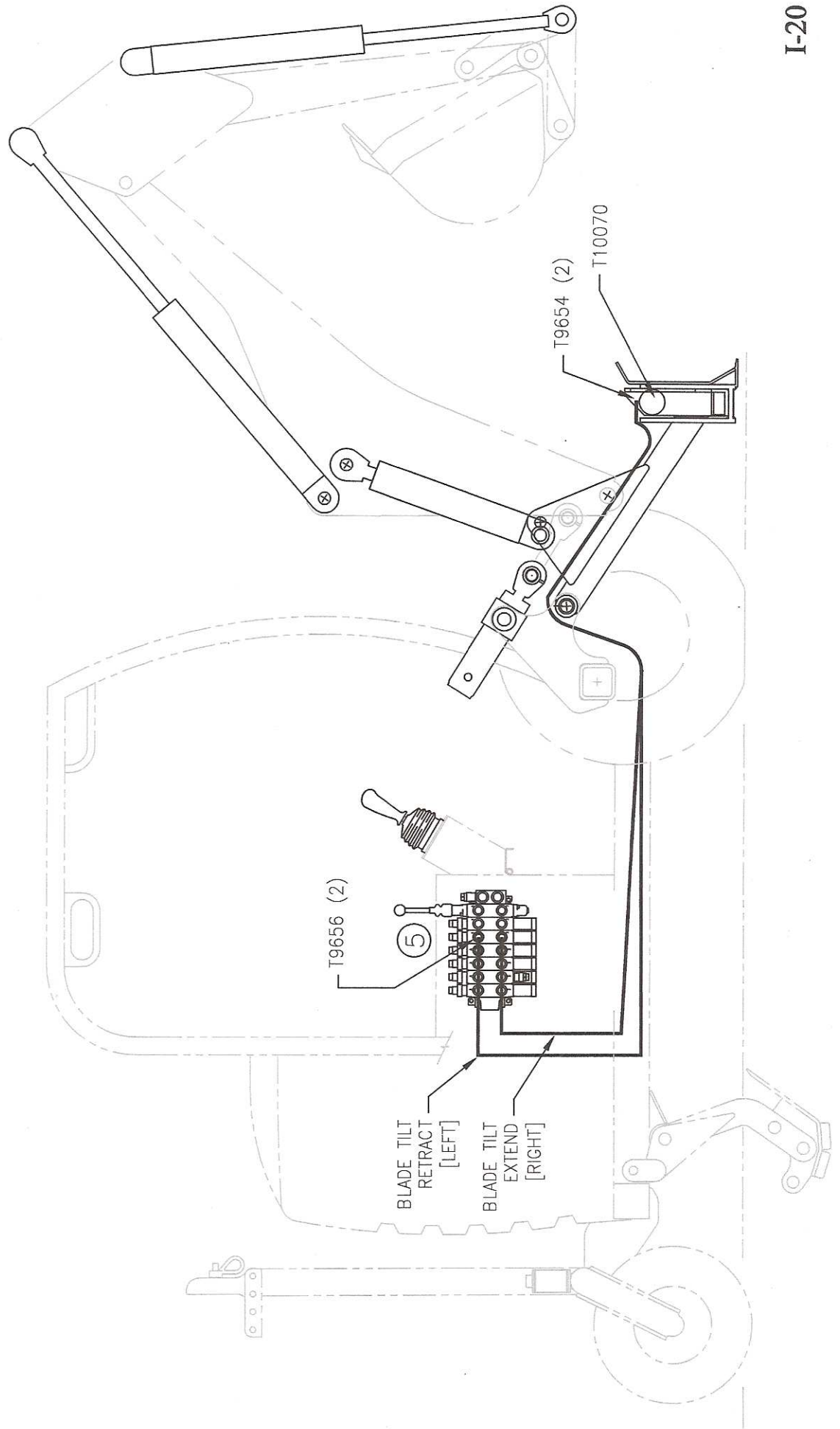
BACKHOE BOOM



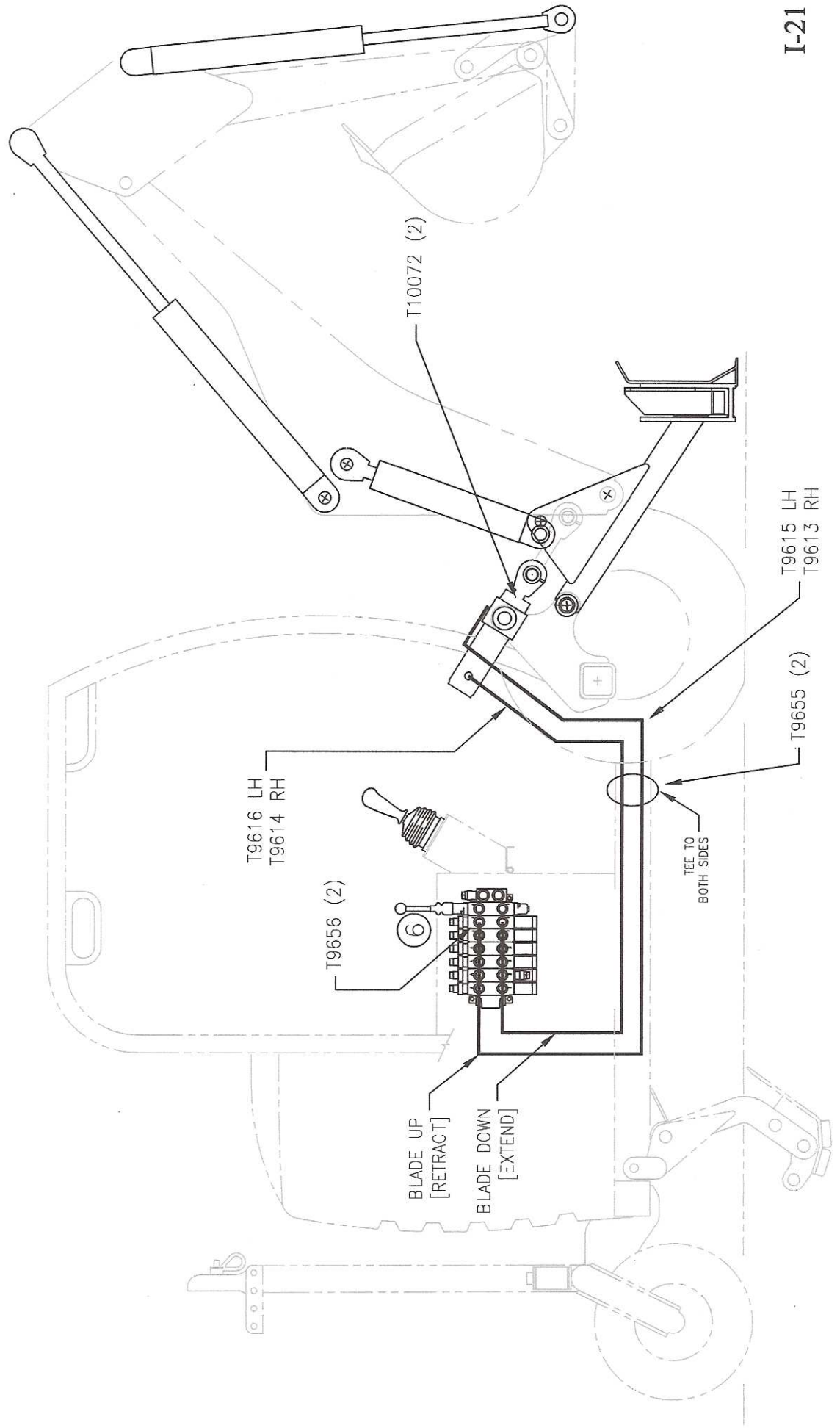
BACKHOE SWING



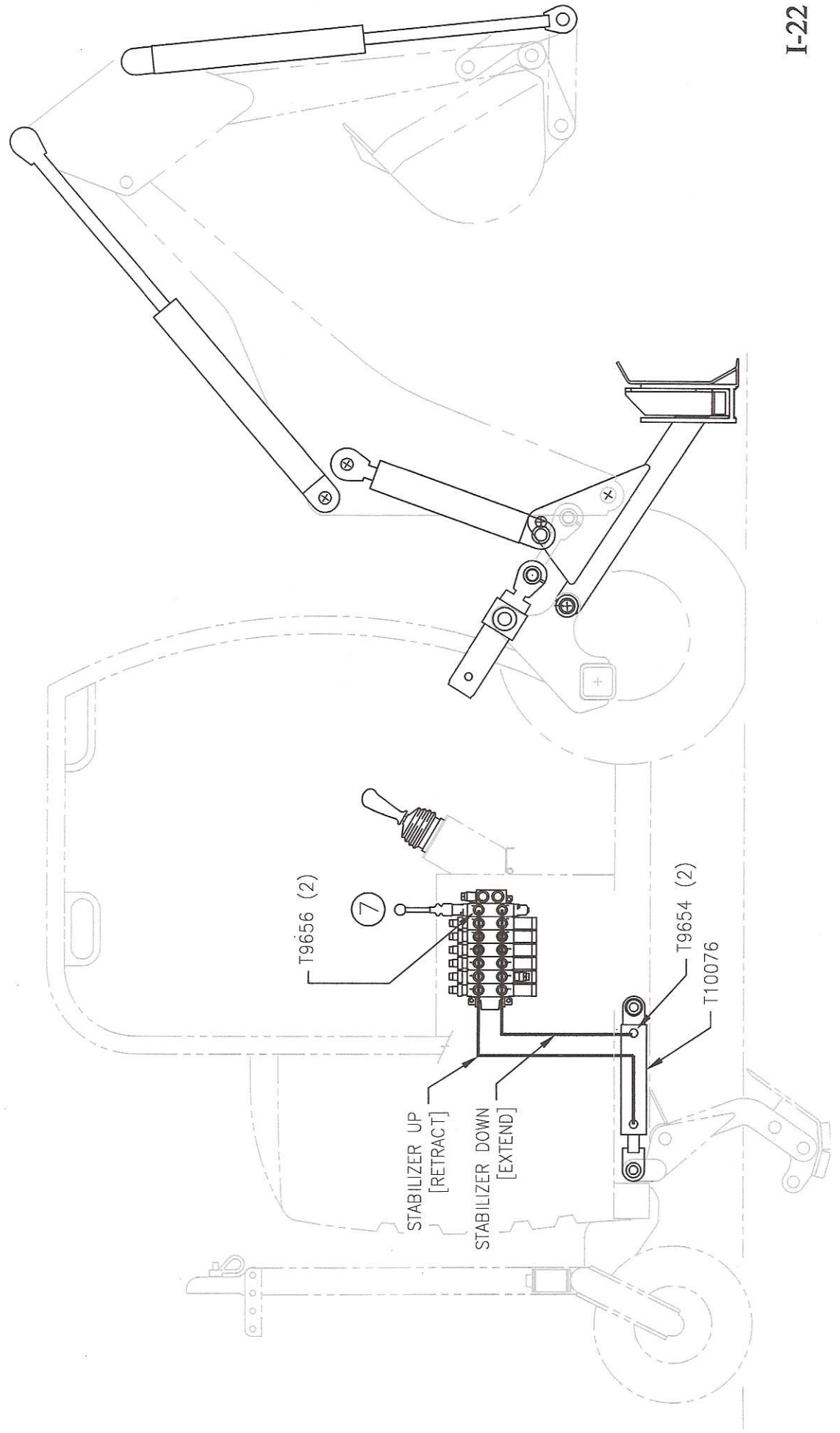
BLADE TILT RIGHT / LEFT



BLADE UP / DOWN



STABILIZER UP / DOWN



L I N E M A N

TMX

Towable Mini-eXcavator



Operator's Manual





TABLE OF CONTENTS

SECTION	SUBJECT
A.	General Safety Instructions & Signal Words
B.	TMX - General Description
C.	Lubrication & Maintenance
D.	Operation & Controls
E.	Hydraulic System Maintenance & Service
F.	Troubleshooting
G.	Adjustments, Lubrication & Specifications
H.	Illustrated Parts List
I.	TMX Hydraulic Diagrams
J.	TMX Electrical Diagram
K.	Limited Warranty Statement
L.	Warranty Registration Form

Excavation Technology Corp.
3 Danada Square East, Suite #255
Wheaton, IL 60187
www.etc-tmx.com

PART NO. T9800 REV. 0203

TMX LIMITED WARRANTY

PERIOD OF WARRANTY

Excavation Technology Corporation (hereafter referred to as ETC or the Manufacturer) warrants the TMX Excavator to be free from defects in material and workmanship for a period of one (1) year after the date of delivery to the end user or of the date of initial use, whichever date comes first.

WARRANTY DETERMINATION

ETC will (at its option) replace, repair or have repaired, any parts or components which are found to be defective in material or workmanship. This warranty does not in any way obligate ETC to be responsible for transportation, removal or installation charges in connection with said inspection, replacement or repair of defective parts.

EXCLUSIONS AND RESERVATIONS OF WARRANTY

This warranty is expressed in lieu of any other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability on the part of the manufacturer. ETC neither assumes nor authorizes any other person to assume for it any other liability in connection with such equipment.

The TMX Excavator is designed as a digging machine. This warranty does not apply to any TMX Excavator or parts thereof which, in the opinion of ETC:

- have been used for purposes other than those for which they were designed;
- or have been subjected to excessive and unreasonable use;
- or have been improperly or negligently installed, maintained or operated;
- or have been damaged by accident;
- or have been replaced as a result of normal and routine machine maintenance or service;
- or have been altered without the express written consent of ETC.

ETC reserves the right to discontinue the manufacturing of any model or type of products to make changes in design and to add improvements without incurring any obligation to install the same on products previously ordered.

COMPONENTS WARRANTED BY THEIR ORIGINAL MANUFACTURER

Component parts of the TMX Excavator not originally manufactured by ETC are not covered by this warranty; but are limited to the warranties of the original manufacturer. Component parts not manufactured or warranted by ETC include, but are not limited to:

- Engine
- Hydraulic valves
- Hydraulic Drive Motors
- Hydraulic Cylinders
- Hydraulic Pump & Lines

COMPONENTS NOT WARRANTED BY ETC OR THEIR ORIGINAL MANUFACTURER

Component parts not manufactured by and not warranted by ETC or by their original manufacturer include, but are not limited to:

Common Hardware Items (screws, nuts, bolts, cotter pins, securing and safety chains, etc.)
Tires and Wheels
Ground Contacting Parts (e.g., Buckets & Teeth)

TIME LIMITS

All parts found defective and covered under this warranty must be returned to Excavation Technology Corporation within thirty (30) days of discovery of defect to receive full credit.

VALIDITY

This warranty is valid only if the warranty sheet is completed and mailed to Excavation Technology Corporation.