TMX®

TOWABLE MINI-EXCAVATOR

OPERATOR'S MANUAL

OCTOBER 2009

THE PERFECT SOLUTION FOR DO-IT-YOURSELF EXCAVATION

TMX®
TOWABLE MINI-EXCAVATOR

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PART NO. T9800 REV. 0203

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.

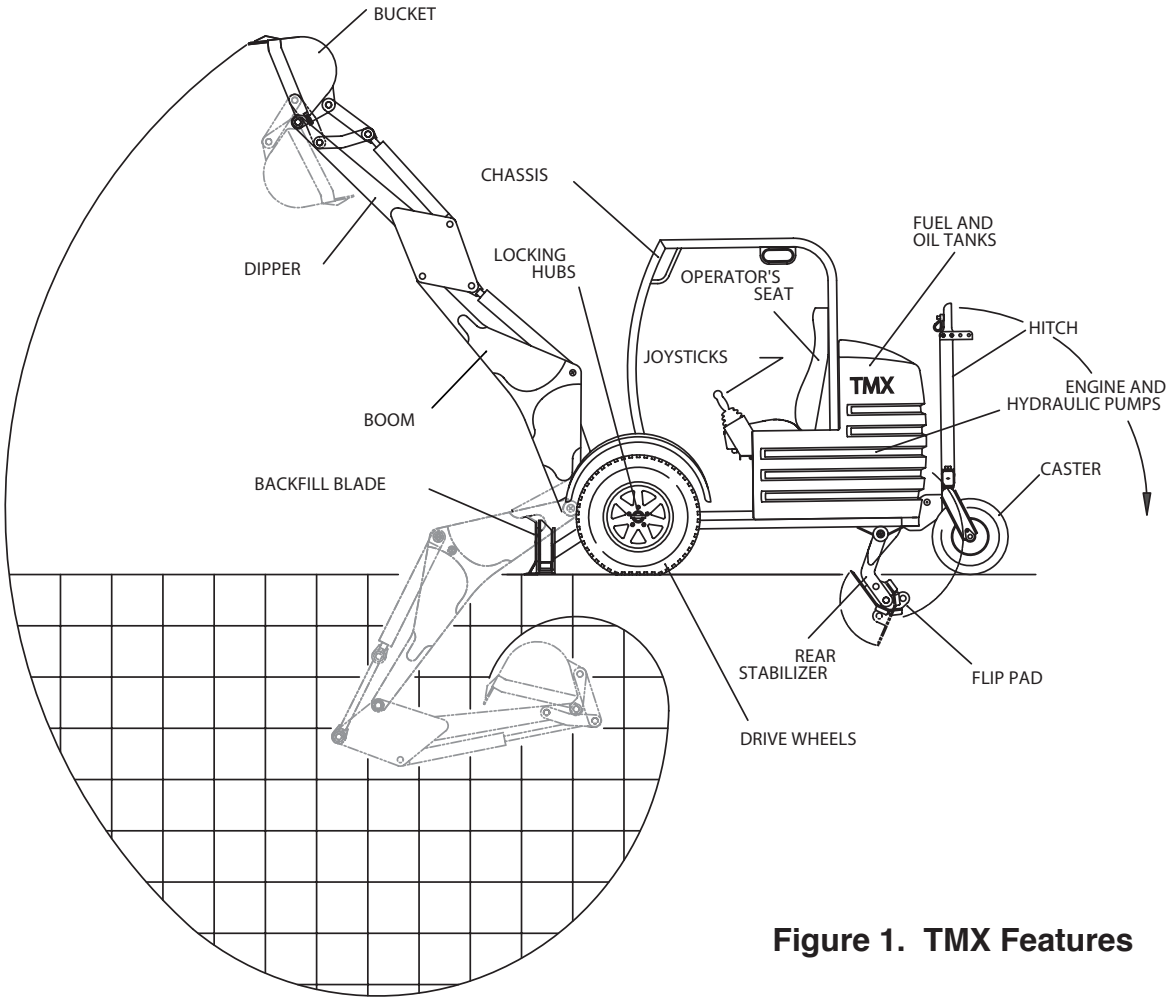


Figure 1. TMX Features

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.

⚠ DANGER

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.

⚠ WARNING

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.

⚠ CAUTION

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 us at www.tmx-excavator.com

SAFETY continued

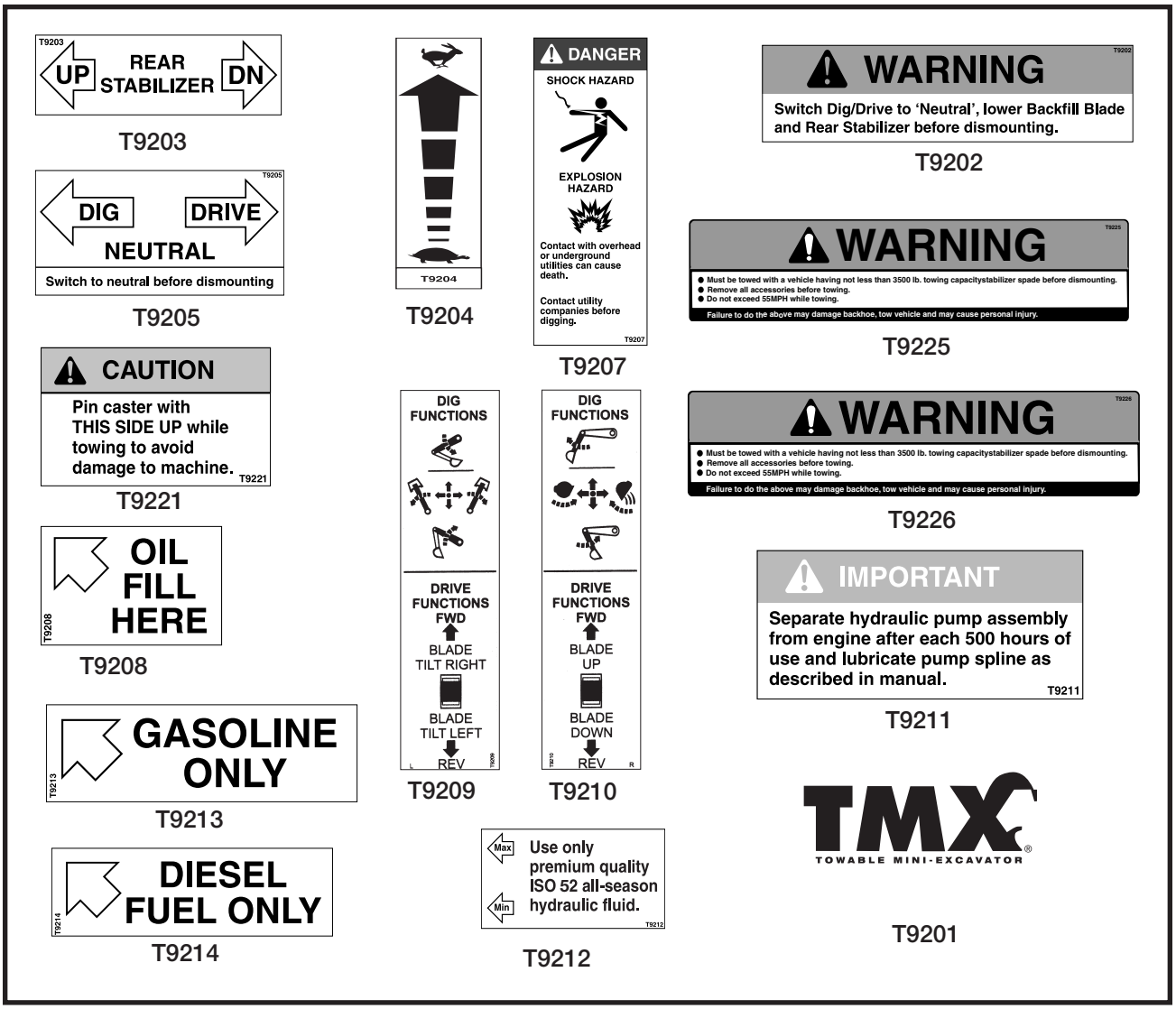


Figure 1. TMX Decals

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 situations.

Always travel up or down the slope--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. Use the 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 that has 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 conections 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 and 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

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-

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.

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 F2 and F3.
6. Fill fuel as required
7. Check drive tires inflation and condition (40 psi).

LUBRICATION & MAINTENANCE

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)

BREAK-IN	25 HOURS	100 HOURS	200 HOURS	500 HRS OR ANNUALLY	PROCEDURE	COMMENTS
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 - 5W30 API SJ or higher
	X				Service engine pre-cleaner element	
	X				Check all bushings for wear	Replace as needed
		X			Replace engine air cleaner element	More often if needed
		X			Change engine oil, 5W30 API SJ or higher	2 US quarts (synthetic oil prefered)
		X			Change engine oil filter	
		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		Check spark plug condition and gap	0.030" / 0.76mm
				X	Change hydraulic system fluid and two filters	ISO 52
				X	Remove hydraulic pumps	lubricate pump drive spline (Molybdenum grease)
				X	Change oil in both disengaging hubs	6 fl. oz. 5W30 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

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 supplement.

DRIVING

It is easier to engage or disengage the hubs with the wheels off the ground. This can be a accomplished by raising the machine with the backfill blade.

Engaging the drive wheels: see Figure C-2-a Pull Drive Hub "Tee" handle outward, turn 90 degrees and release (both hubs). Spring force will pull handle into engagement. (Position closest to wheel.)

Disengaging drive wheels see Figure C-2-b Pull Drive Hub "Tee" handle outward, turn 90 degrees, fit tee handle into "disengagement" storage position. (Position away from wheel.)

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).
4. Speed control: see Figure C-3-a

   a. Straight Forward or Back: Move both joystick levers the same amount at the same time. The further you move the control, the faster you will go.
   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.

⚠ CAUTION

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

LOWERING/RAISING BACKFILL BLADE & STABILIZER SPADE

-ALWAYS-

1. Set and retract backfill blade and stabilizer spade slowly.
2. Angle backfill blade to match slope before contacting the ground.

Figure C-2-a:

Figure C-2-b:

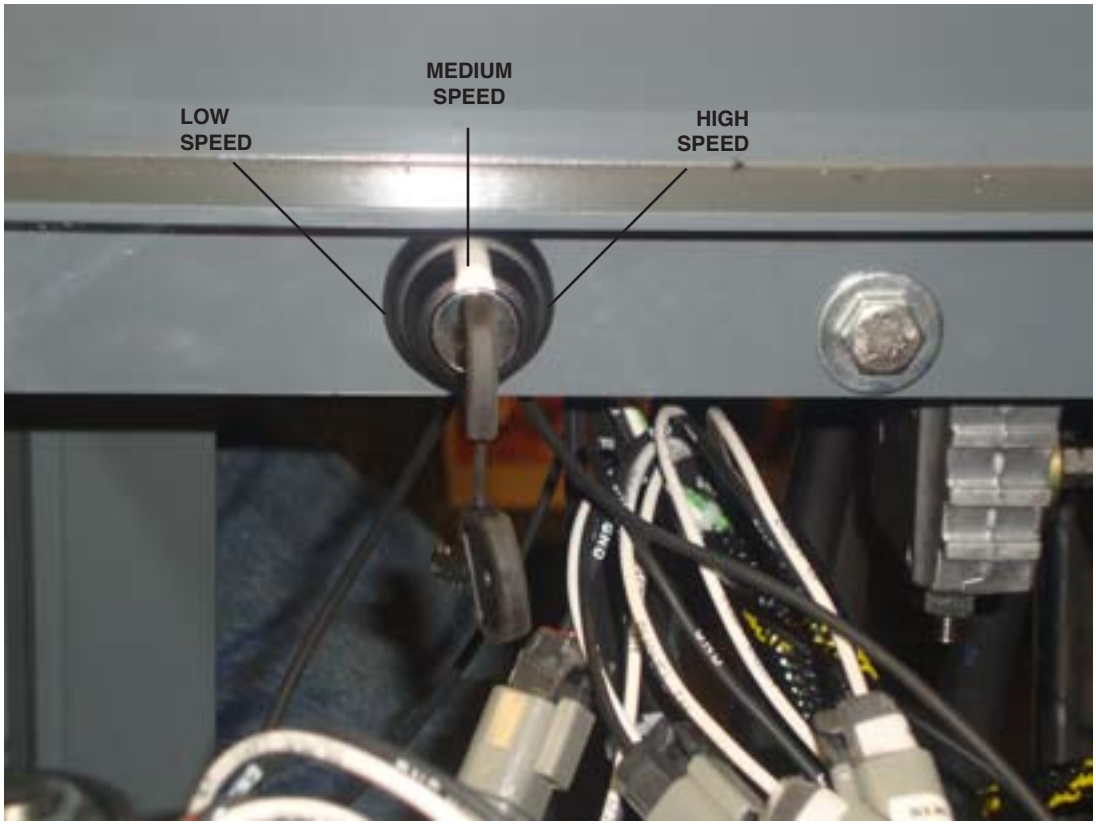


Figure C-3: Speed control, located under the seat, is a 3-position keyed switch shown in middle position (shipped in this configuration.) Turn to the left for low speed and to the right for high speed.

Figure C-4-a:

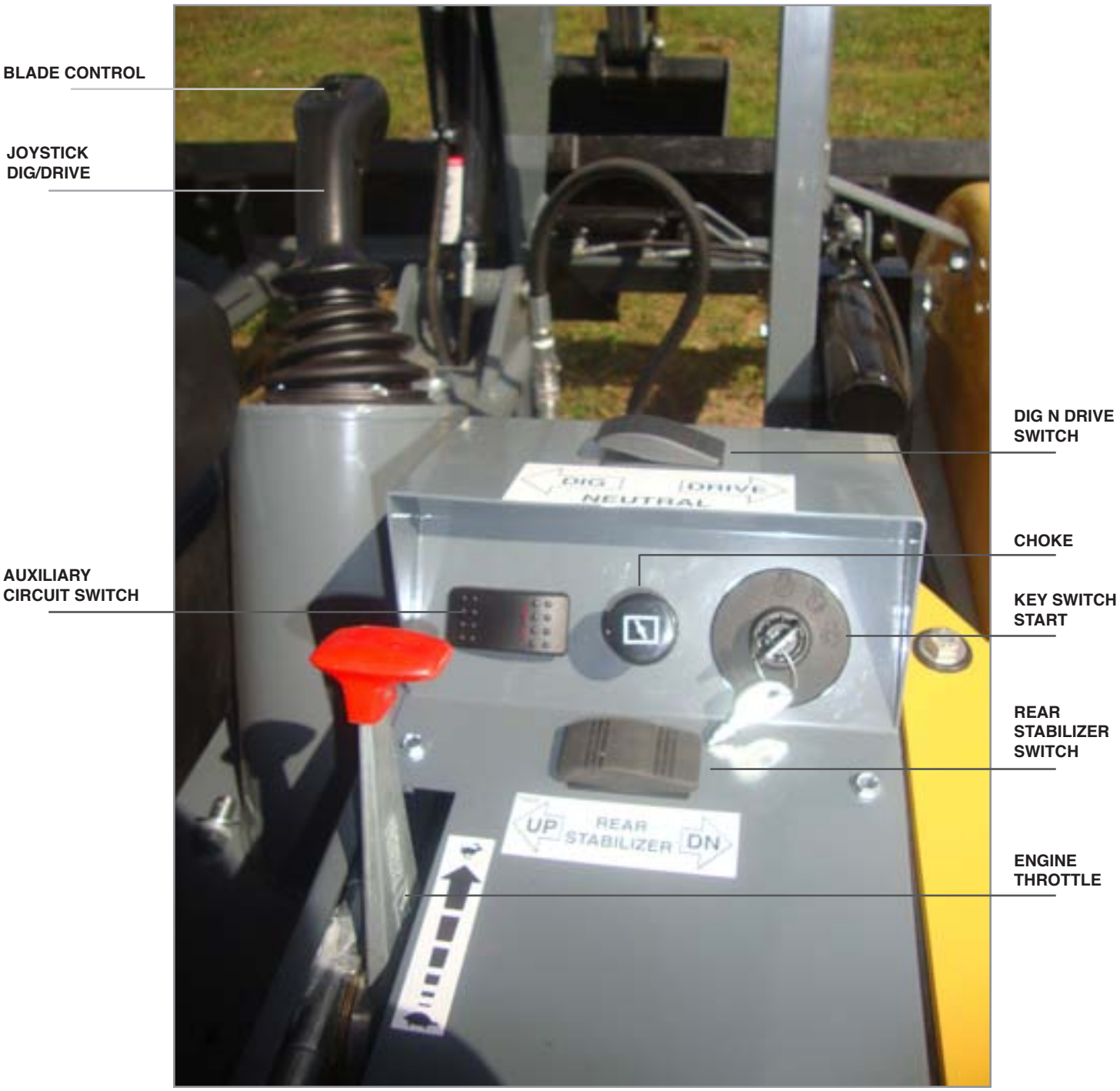

BLADE CONTROL
JOYSTICK DIG/DRIVE
AUXILIARY CIRCUIT SWITCH
DIG N DRIVE SWITCH
CHOKE
KEY SWITCH START
REAR STABILIZER SWITCH
ENGINE THROTTLE
DIG
DRIVE
NEUTRAL
UP
REAR STABILIZER
DN

Figure C-5-a:


VOLTS
LIGHTS
FLASHER
ERROR
AUX
OIL
Hobbs
QUARTZ
HOURS
VOLT METER
HOUR METER
WORK LIGHT SWITCH
HAZARD LIGHT SWITCH
BLADE CONTROL
JOYSTICK DIG/DRIVE

LOWERING/RAISING BACKFILL BLADE & STABILIZER SPADE cont.

1. Move the Stabilizer Control Switch in the desired direction as indicated on the Operator's Console. Move RH joystick switch down to lower the backfill blade. Move RH joystick switch up to raise the backfill blade. Move LH joystick switch down to tilt the backfill blade down to the right. Move LH joystick switch up to tilt the 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", on page C-2)

<u>The drive train will be damaged if the machine is towed with the drive wheels engaged.</u>

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. 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 stoping (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 soil without spilling into hole or having to over-extend Boom.
4. Push soil 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 (10 gpm 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 soil 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
Hydraulic Wheel Motors

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 52 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.

The switches on the joysticks (RH) will raise and lower the backfill blade and (LH) will tilt the backfill blade. This is active in Drive or Dig Mode.

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 switch 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 10 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) Close supply line from Hydraulic Tank.

2) Disconnect the hose between the filter and the hydrostatic pumps. Have a suitable container available to catch any spills.

3) Tag and remove all lines to the hydrostatic pumps.

4) 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 52 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) Close valve on hydraulic reservoir or plug the supply hose leading to the lower, forward port on the control valve stack (# 8 JIC male plug).
2) Tag and remove the tank line at the upper, forward port.

SERVICE continued

3) Tag and remove all 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 electrical lines and hoses to the correct control valve stack sections.

3) 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 through 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 – 2.5" 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 52 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.

TROUBLESHOOTING

PROBLEM: No or low hydraulic pressure

Causes	Solutions
Dirty hydraulic filter	Replace filter element
Main relief valve stuck or out of adjustment	Remove and clean, adjust relief valve to 2500 PSI
Defective pump	Replace pump

PROBLEM: Slow cylinder movement

Causes	Solutions
Slow engine speed	Adjust engine throttle
Low fluid level	Add fluid
Cold weather	Increase warm-up time
Dirty hydraulic filter	Replace filter element
Relief valve out of adjustment	Adjust relief valve
Defective pump	Replace pump
Wrong fluid	Use recommended fluid
Suction line blocked	Clean or replace
Internal cylinder damage	Replace worn or damaged parts

PROBLEM: No cylinder movement

Causes	Solutions
Defective dig/drive switch or circuit	Check circuit, replace switch
Low fluid level	Add fluid
Dirty hydraulic filter	Replace filter element
Defective pump	Replace pump
Dirty or defective dig/drive cartridge valve	Clean or replace
Blocked suction line	Clean or replace
Internal cylinder damage	Replace damaged or worn parts
(Water) contaminated	Drain tank, flush, fill with new oil

PROBLEM: Unintended dig/drive function

Causes	Solutions
Dirty or defective dig/drive cartridge valve	Clean or replace

PROBLEM: No dig functions, drive OK

Causes	Solutions
Blown Fuse	Replace fuse
Defective dig/drive selector switch	Replace switch

TROUBLESHOOTING continued

PROBLEM: Erratic cylinder movement

Causes	Solutions
Low fluid level	Add fluid and check for leaks
Air in hydraulic lines	Tighten suction line fittings
Incorrect fluid viscosity	Use proper fluid

PROBLEM: Cylinder drifting

Causes	Solutions
Hydraulic line leak	Repair or replace
Cylinder seal leak	Repair or replace
Dirt in valve load check	Clean load check
Leaking valve section	Center valve section spool or replace valve section

PROBLEM: Loss of drive wheel power

Causes	Solutions
Defective dig/drive switch or circuit	Check circuit, replace switch
Broken spline sleeve inside hub	Replace spline sleeve

PROBLEM: Wheel creep

Causes	Solutions
Hydrostat controller out of adjustment	Adjust stud at rear of pilot control unit at bottom of hydrostat, See Figure F-1-a
Dirty or defective dig/drive cartridge valve at A, C, E, or G manifold locations	Clean or replace

ADJUSTMENTS

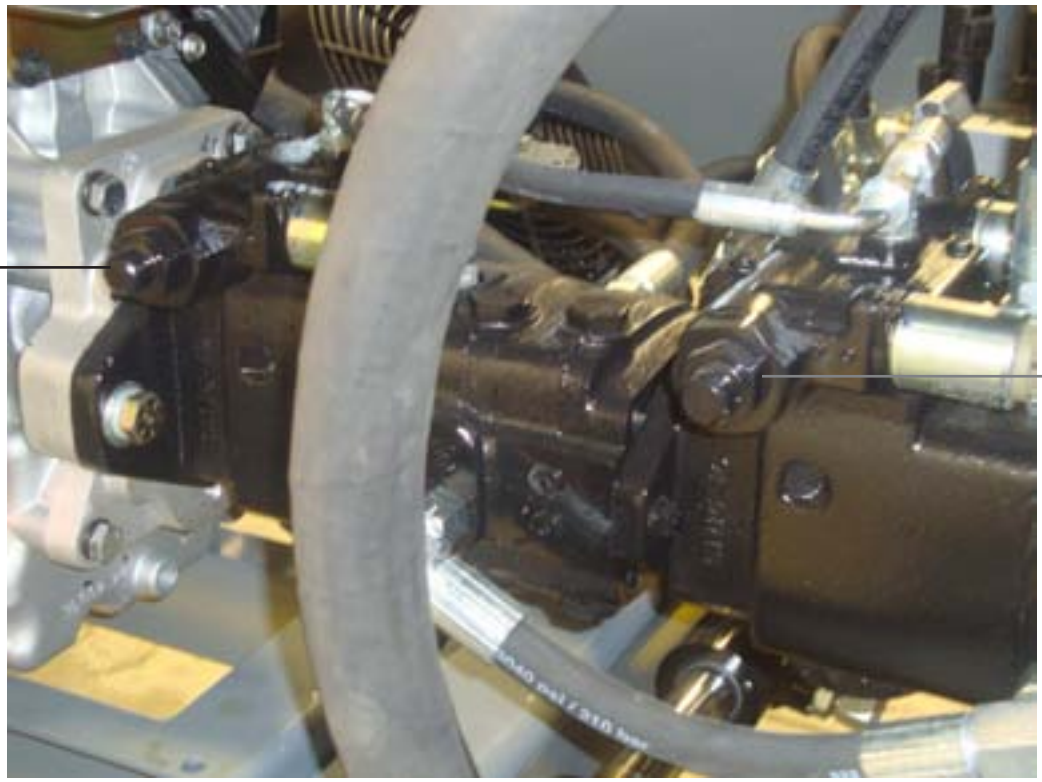
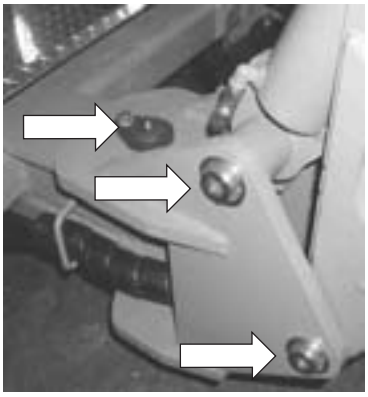


Figure F-1-a

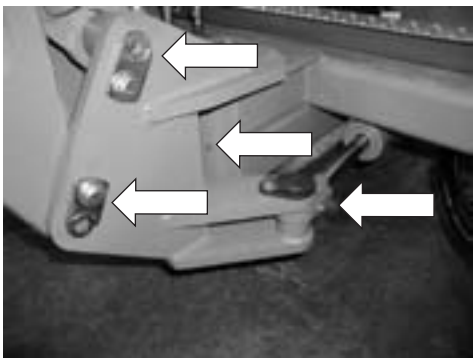
Figure F-1-b
Auxiliary Hydraulic Output

TMX BOOM LUBRICATION

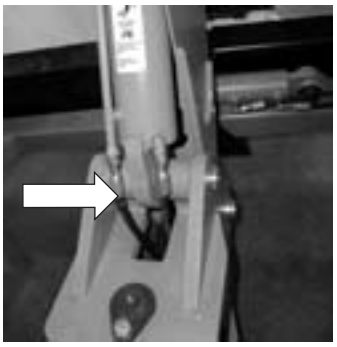
BOOM SWING



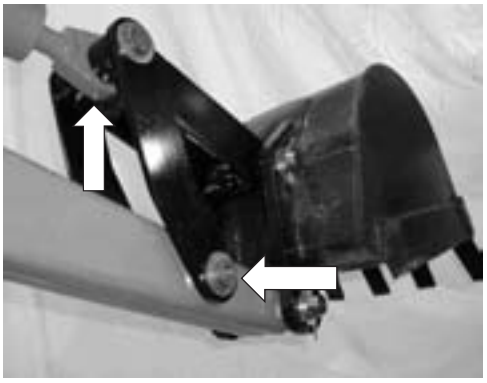
BOOM SWING



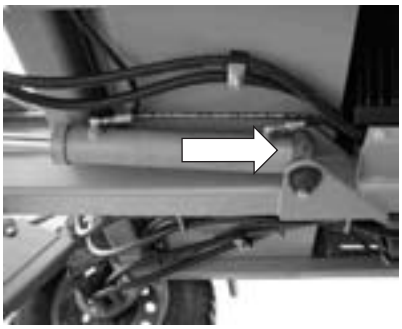
BOOM CYLINDER



BUCKET LINK

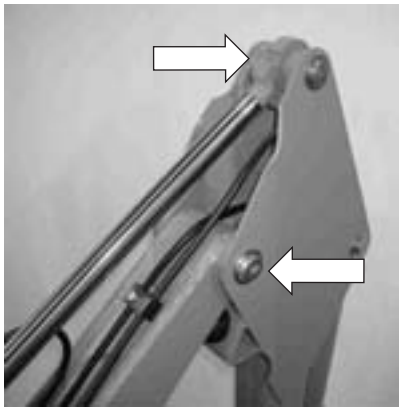


BOOM SWING CYLINDER

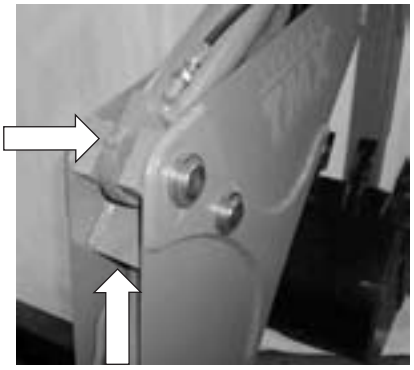


END OF DIPPER

DIPPER PIVOT

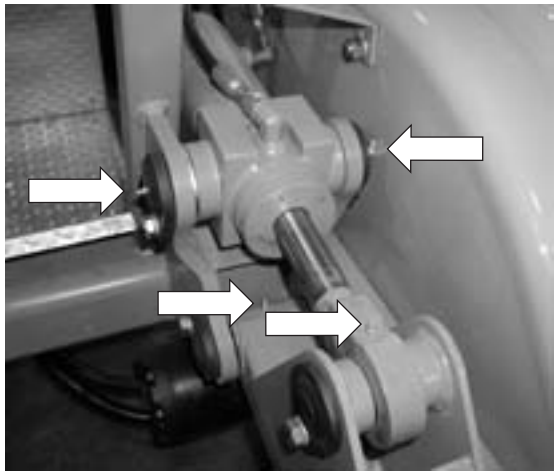


BOOM & DIPPER CYLINDER

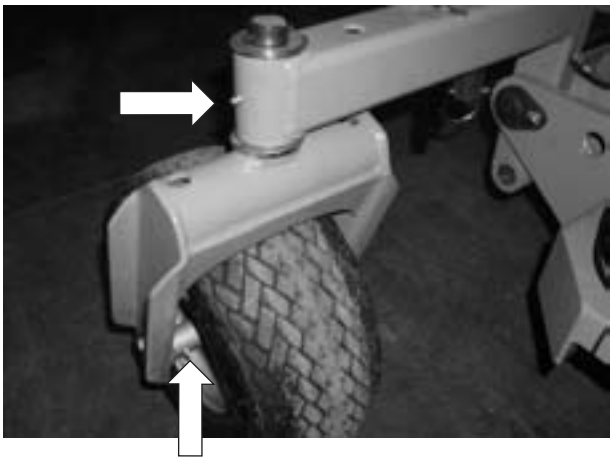


TMX CHASSIS LUBRICATION

BACKFILL BLADE

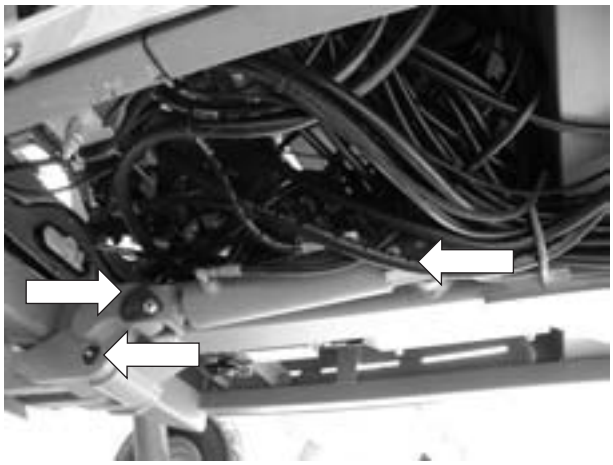


CASTER STEM & AXLE

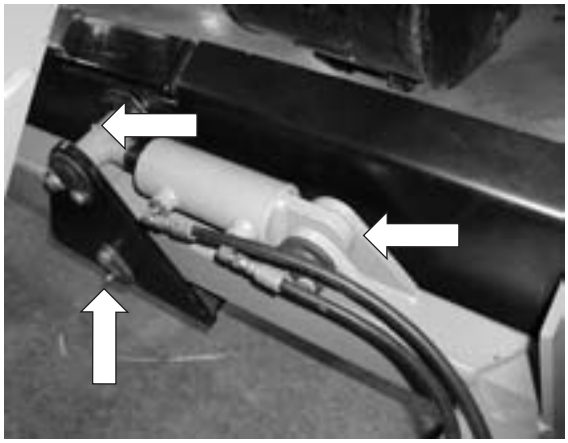


SUSPENSION PIVOT

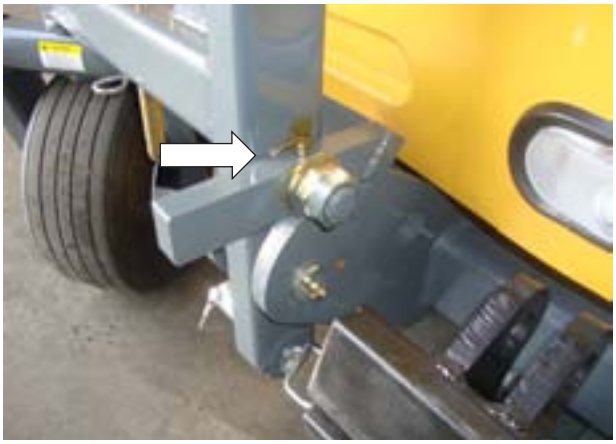
REAR STABILIZER



BACKFILL BLADE TILT



HITCH LOCK



TMX TECHNICAL SPECIFICATIONS

ENGINE	
Make	Kohler
Model	Command Pro CH20
Fuel	Gasoline
Cooling	Air
Displacement	38 cid (624cc)
Horsepower	20 hp (14.9kw) @ 3600rpm
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	2,941 lbs. (1334 kg)
Tongue Weight	380 lbs. (172 kg)

HYDRAULIC SYSTEM	
Hydraulic Pumps	2
Type	Tandem hydrostatic (closed loop) pump, electronic controlled, output flow (4.1 gpm ea @1800 rpm)
Displacement Dig Functions	5.7 gpm (21.5 l/min) @ 3600 rpm
Displacement Tool Circuit	10 gpm @ 3600 rpm
Cooler	Air to oil, with fan
Filtration	Suction & return, 10 micron
System Relief Pressure	2500 psi (17000kPa)
Hoses	Abrasion resistant

DRIVE SYSTEM	
Hydrostatic Pumps	Twin, 6.73 gpm (25.5 l/min)
Wheel Motors	High efficient orbital motor with tapered roller bearings on output shaft for high loads, with disengaging hubs
Drive Tires	LT235/75R15 Mud-Terrain

PERFORMANCE	
Max Travel Speed	3 speed Key Switched 100% 6mph, 75% 4.5 mph and 50% 3mph
Turning Radius	Zero
Digging Depth	8' (244 cm)
Loading Height	7' 2" (218 cm)

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

SWING SYSTEM	
Min. Swing Radius	62 in. (157.5 cm)
Boom Swing	140 degrees (70 right + 70 left)

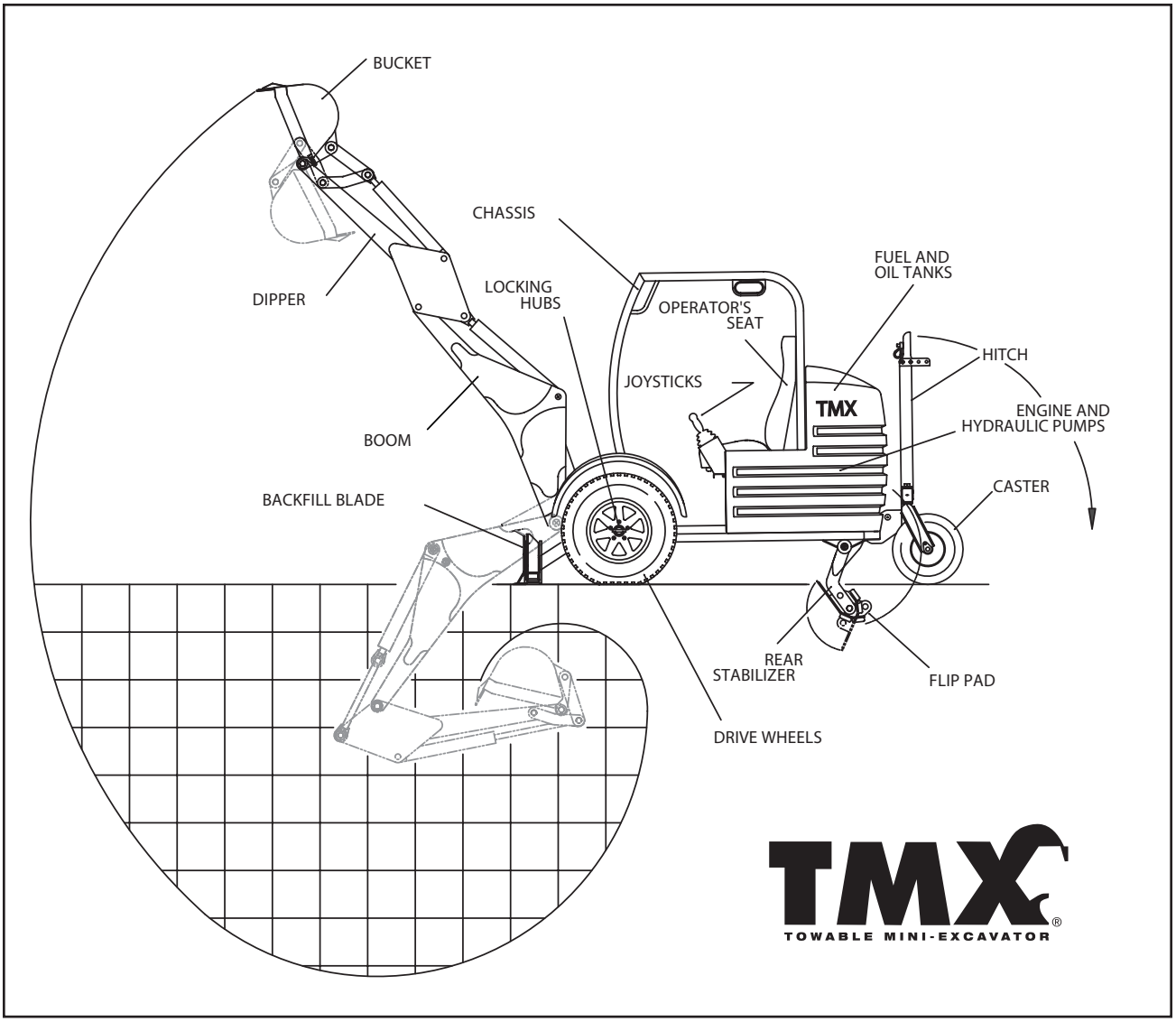
BACKFILL BLADE	
Blade Width	72 in. (183 cm)
Max Machine Lift	9.5 in. (24.13 cm)
Blade Tilt	21 degrees total (10.5 right + 10.5 left)

TOOL CIRCUIT	
Flow	10 gpm (37 l/min) @ 3600 rpm
Pressure	2000 psi (13750 kPa)
3/8" Flat Face - Quick Disconnects	

Specifications subject to change without notice.

Notes

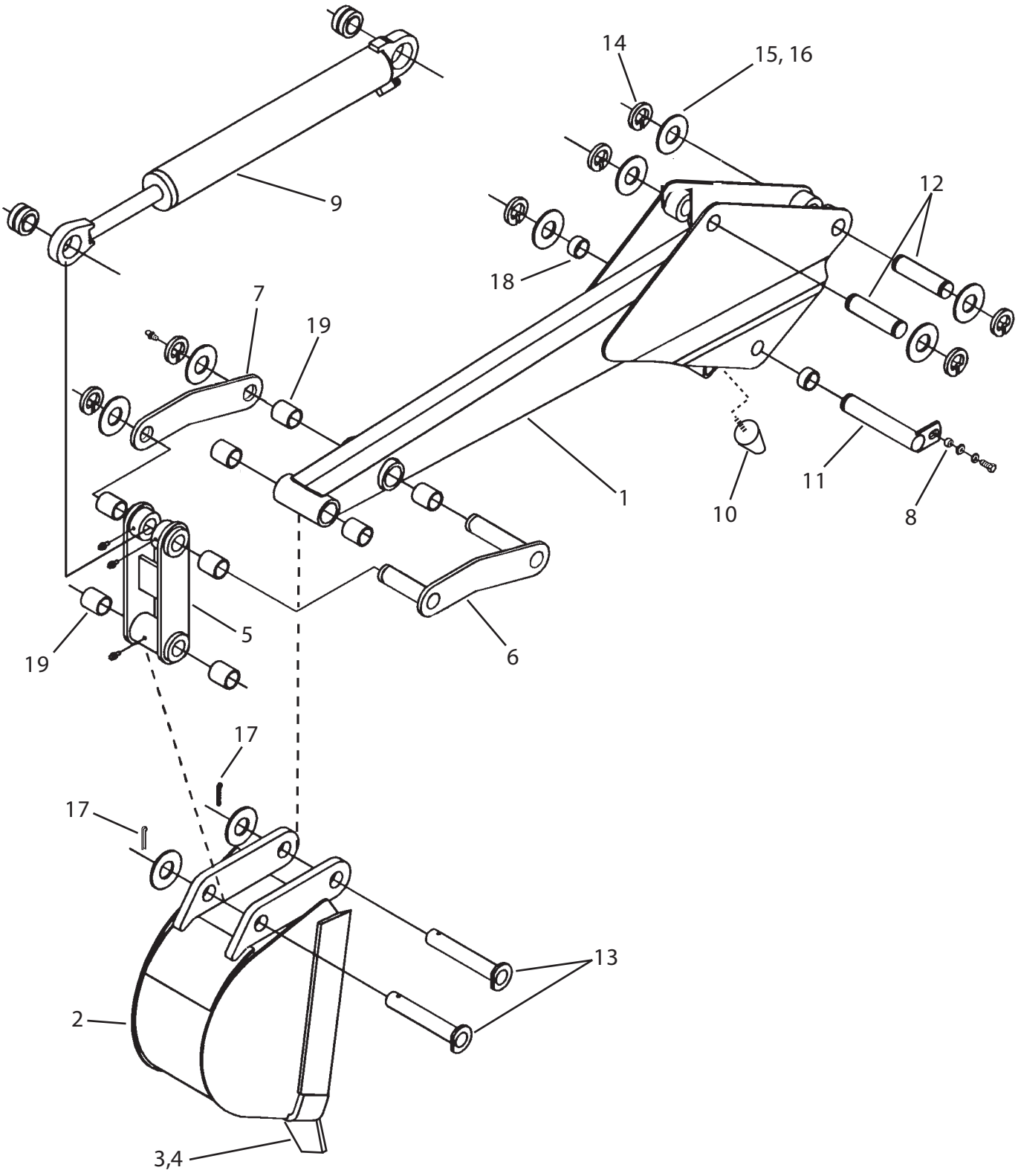
Illustrated Parts List



For parts: Contact your TMX dealer or factory parts department

FAX: 715.241.9305

DIPPER / BUCKET GROUP

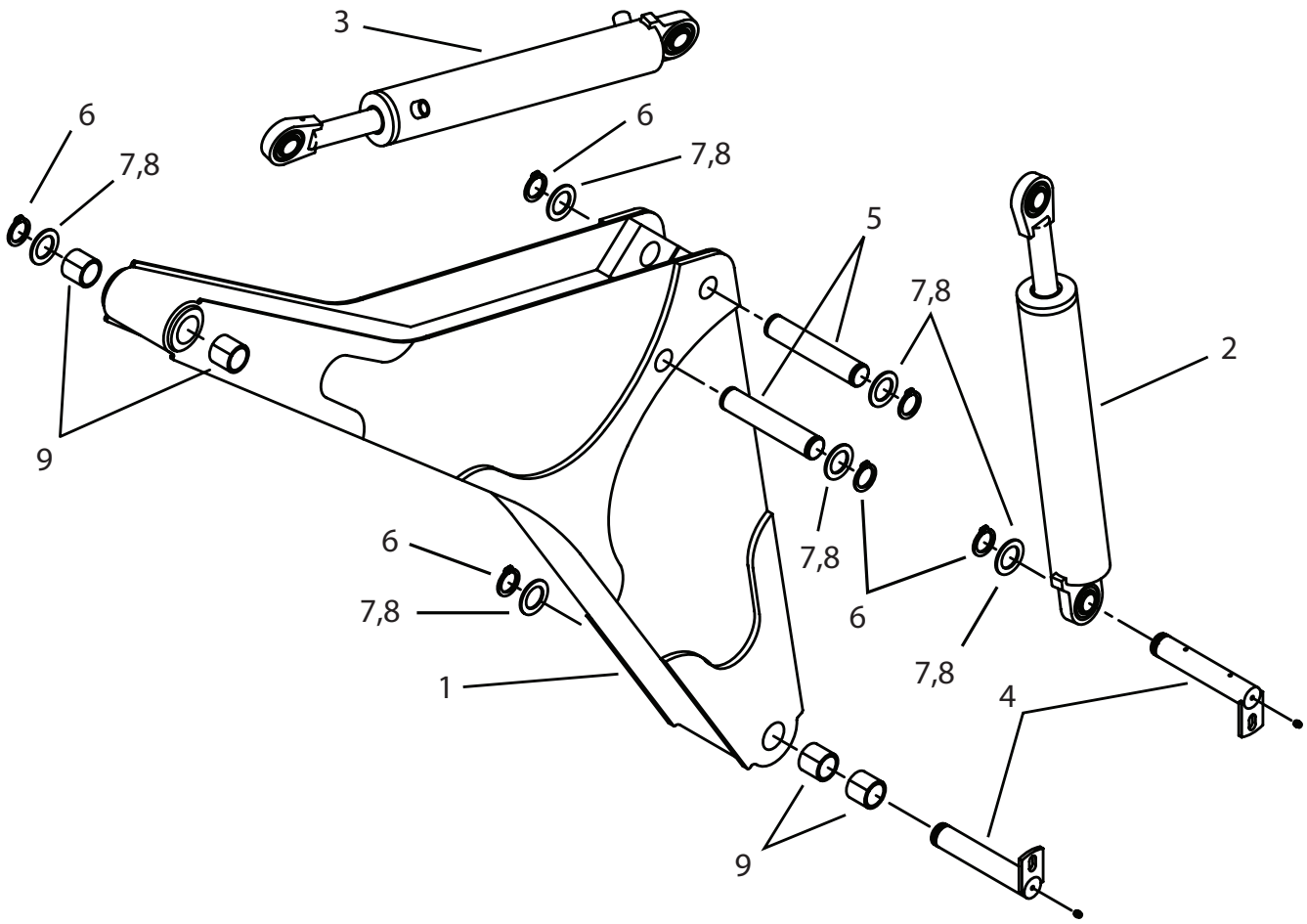


DIPPER / BUCKET GROUP

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"
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
10	2	T10042	Bumper, Rubber (Dipper)
11	1	T10045	Pin, Boom to Dipper
12	2	T10046	Pin, Bucket & Dipper Cyls. To Dipper (Pin, Snap Ring)
13	2	T10047	Pin, Bucket To Dipper, Bucket to Link
14	A/R*	T10048	Snap Ring (1650)
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 (81610)
19	8	T10159	Bushing, Bucket/Link Pivot

* As required

BOOM GROUP

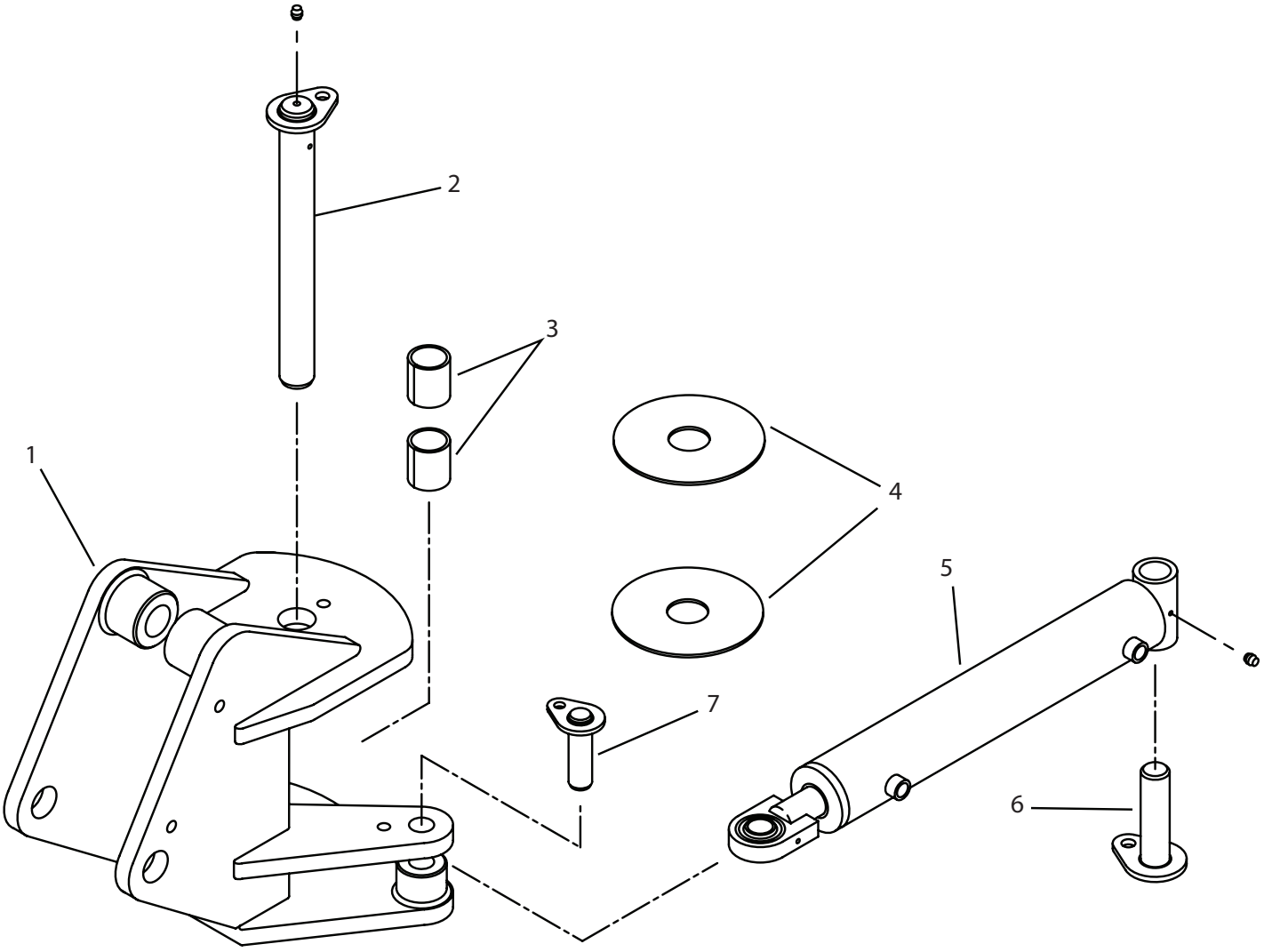


BOOM GROUP

Item	Qty.	Part Number	Description
1	1	T10024	Boom Weldment
2	1	T10035	Cylinder Assembly, Boom
2A	1	T10036	Repair Seal Kit
3	1	T10038	Cylinder Assembly, Dipper
3A	1	T10039	Repair Seal Kit
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

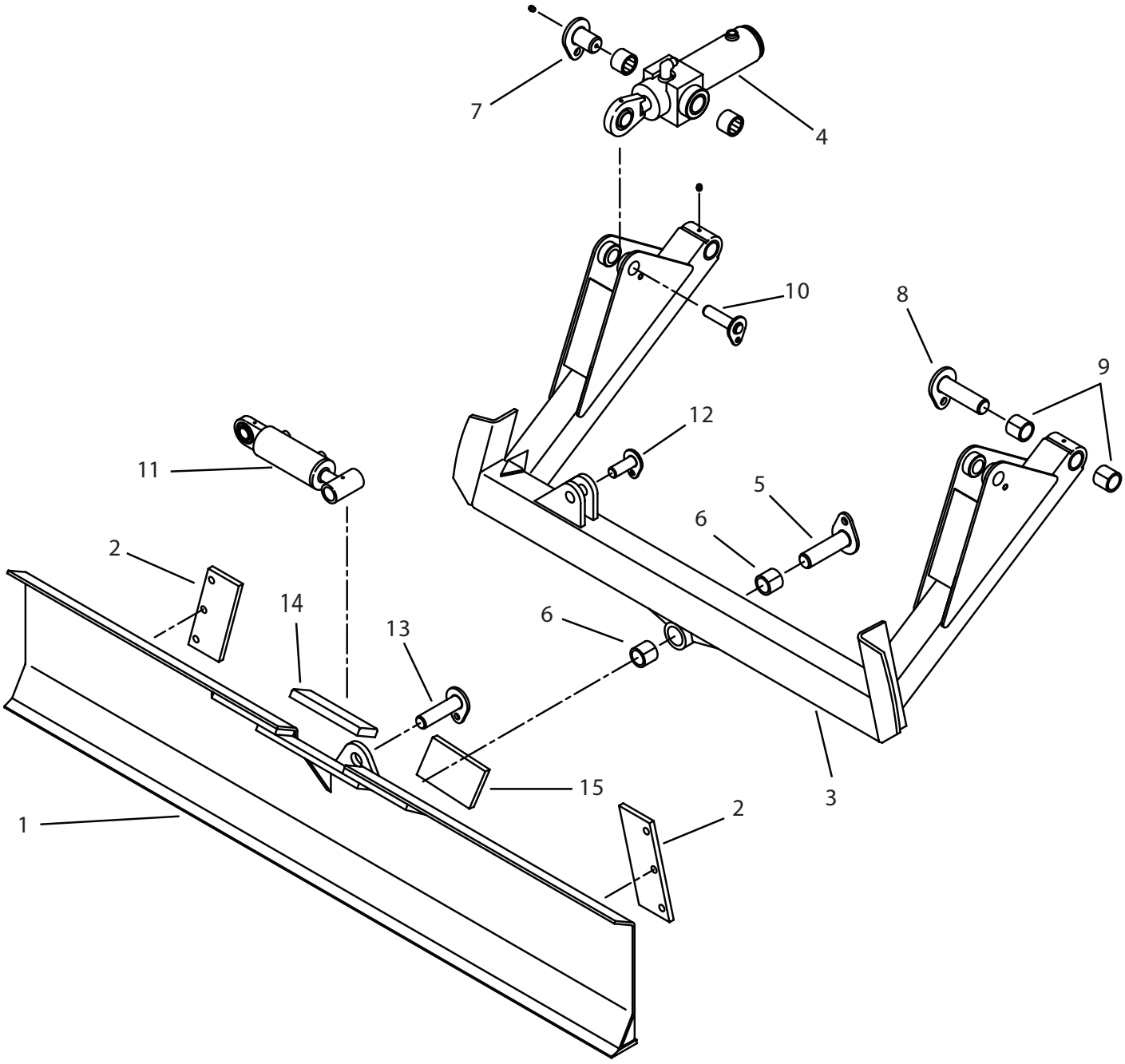
SWING GROUP



SWING GROUP

Item	Qty.	Part Number	Description
1	1	T3000	Swing Weldment
2	1	T9000	Swing Pin
3	2	T10077	Bushing
4	2	T10104	Washer, Thrust - 4"
5	1	T10067	Cylinder Assembly, Boom Swing
5A	1	T10068	Repair Seal Kit
6	1	T9009	Pin, Swing Cyinder to Chassis
7	1	T9012	Pin, Swing Cyinder Rod to Swing

BACKFILL BLADE GROUP

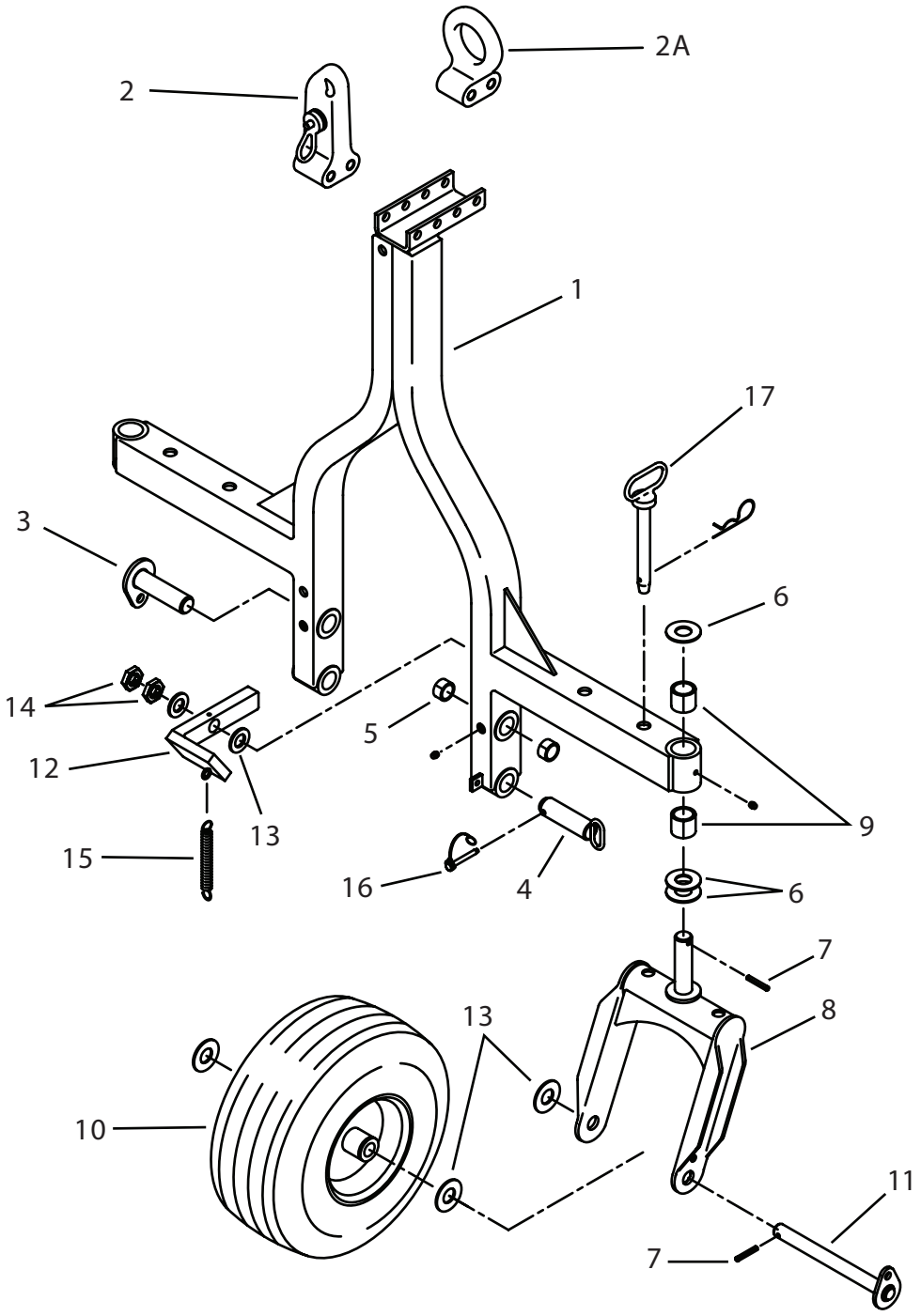


BACKFILL BLADE GROUP

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	Nylon Bushing
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
15	1	T5115	Block, Spacer

*As Required

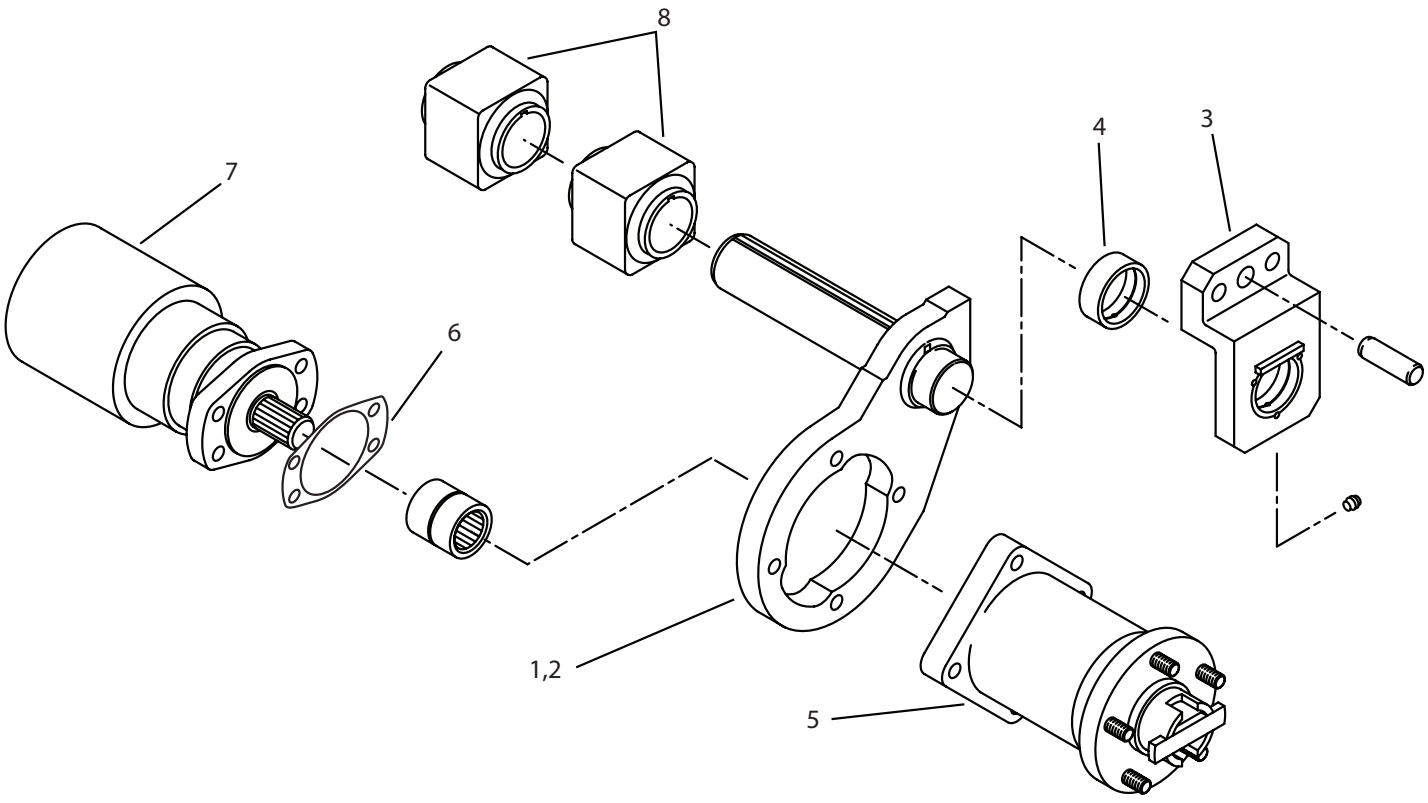
HITCH GROUP



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	T8203	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 (Castor Lock Pin) [includes hairpin]

DRIVE HUB GROUP

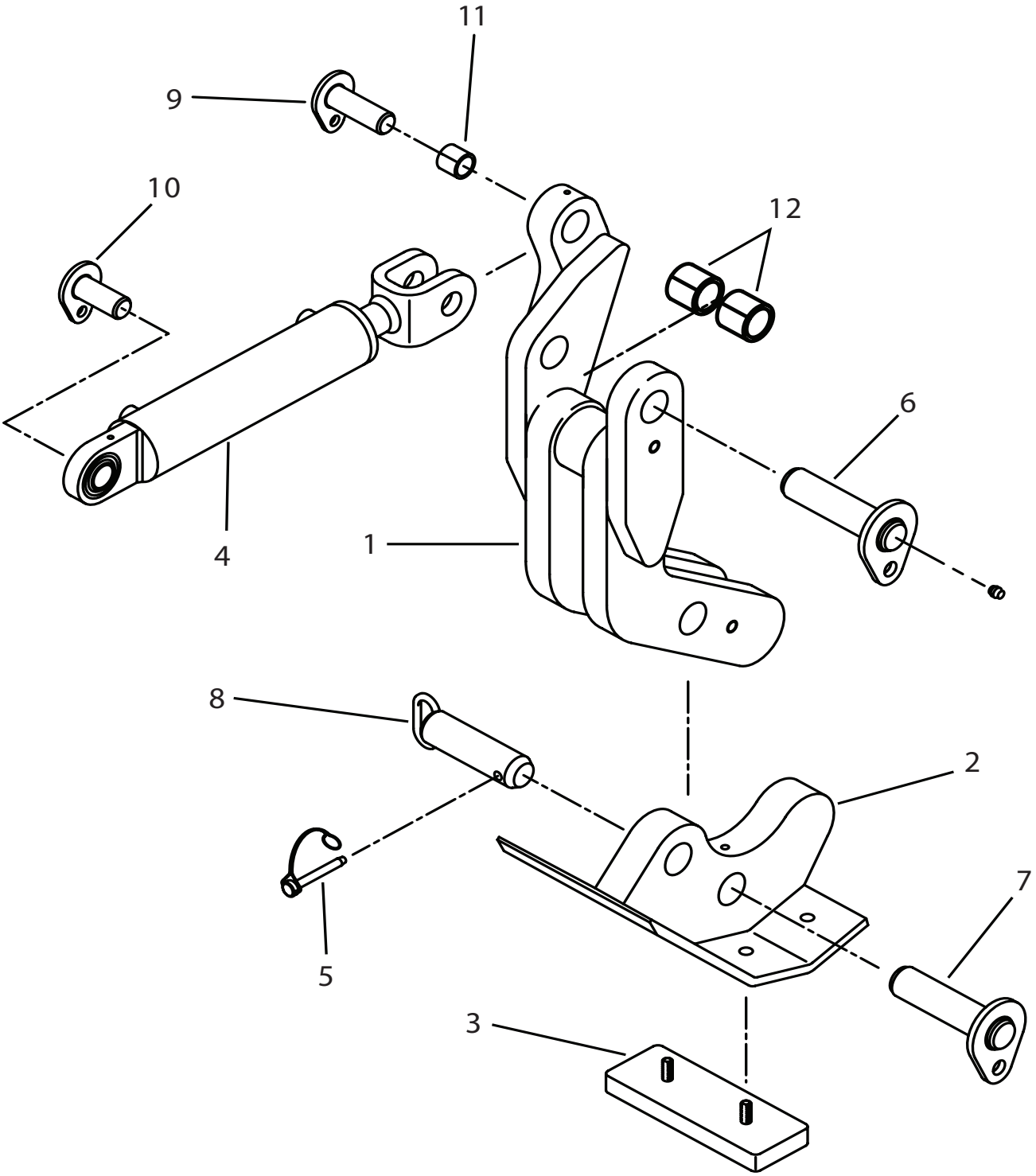


DRIVE HUB GROUP

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 (Bracket Assembly Suspension)
4	2	T10080	Bearing, Bronze - Outer Support
5	2	T10023	Hub, Disengaging Includes Spline Sleeve
6	2	T10096	Gasket, 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

*Not Shown

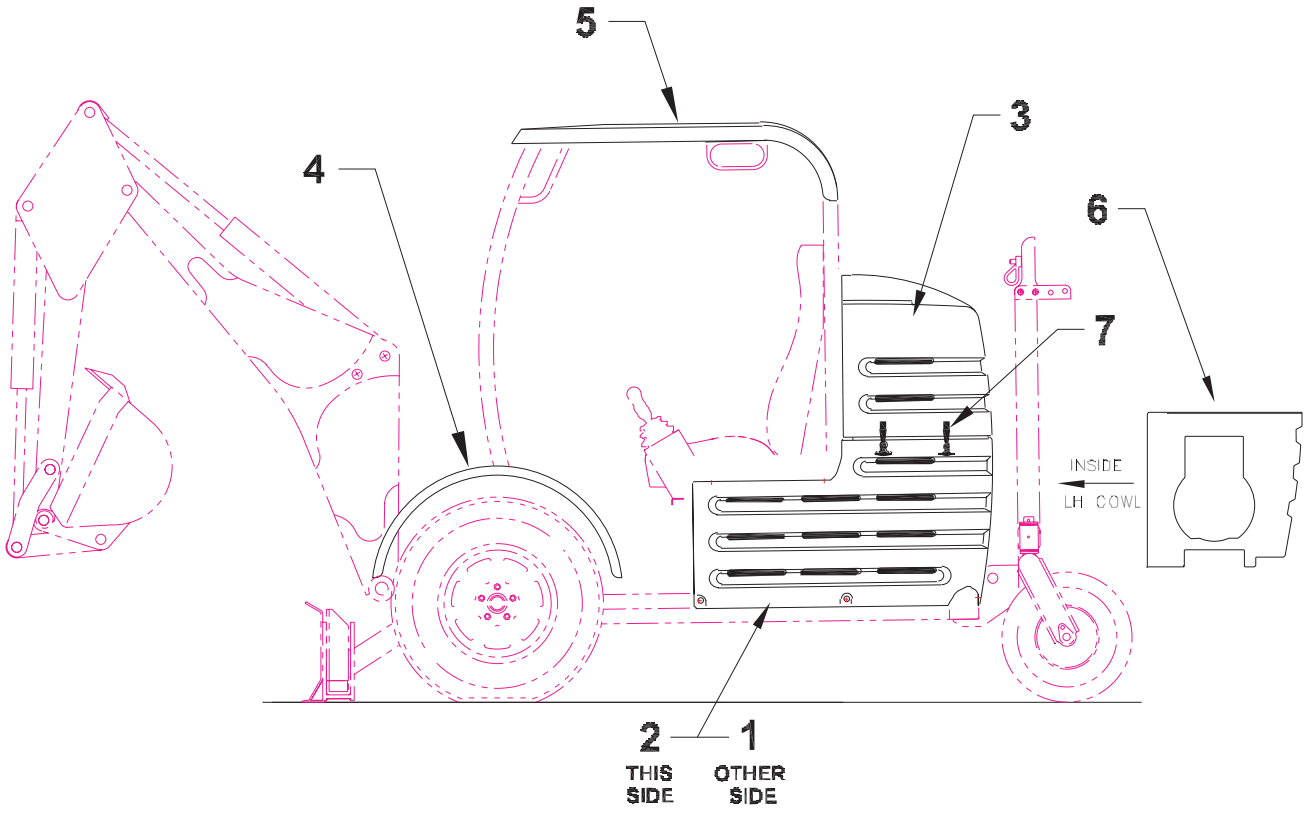
REAR STABILIZER GROUP



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
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

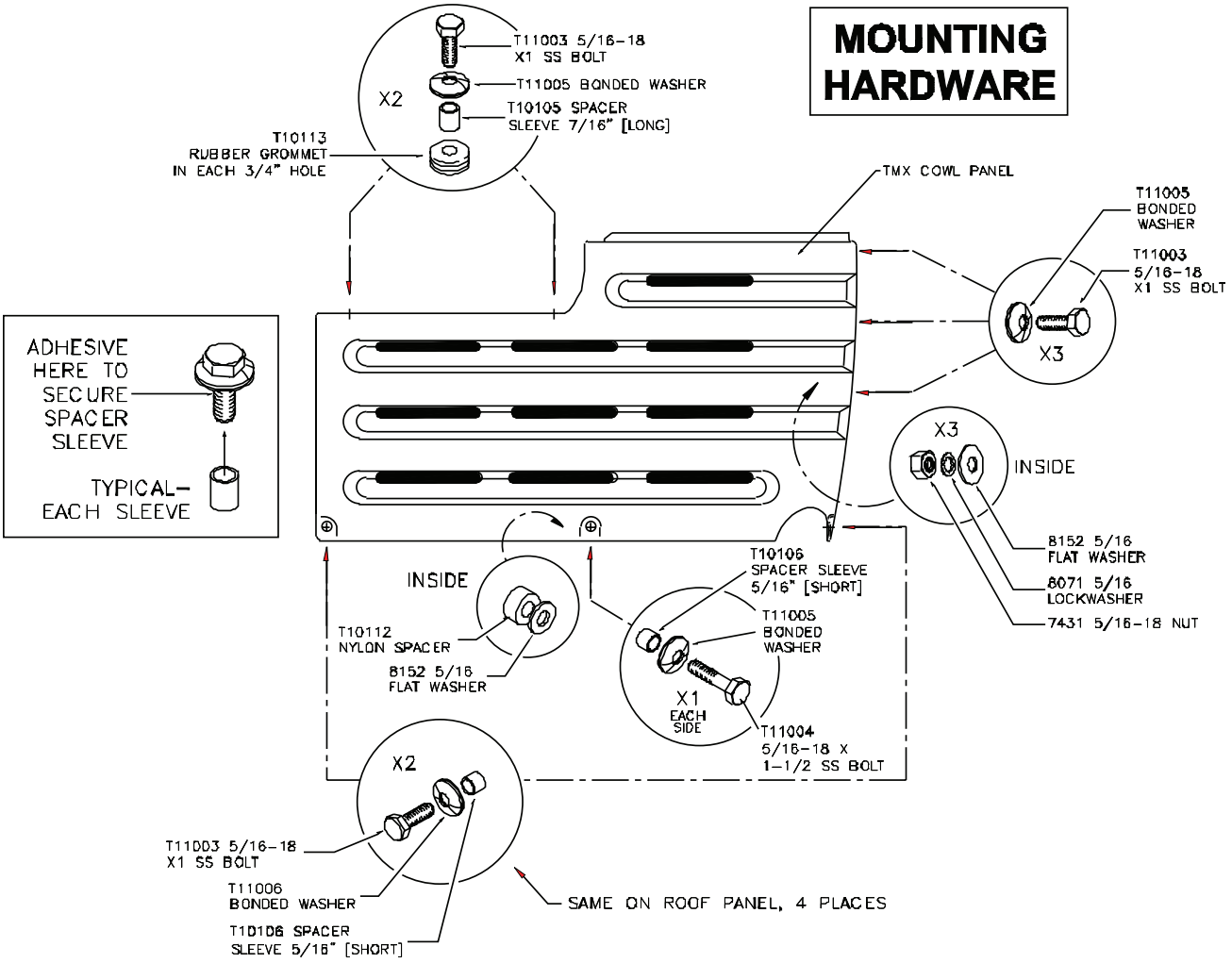


Important Note:

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



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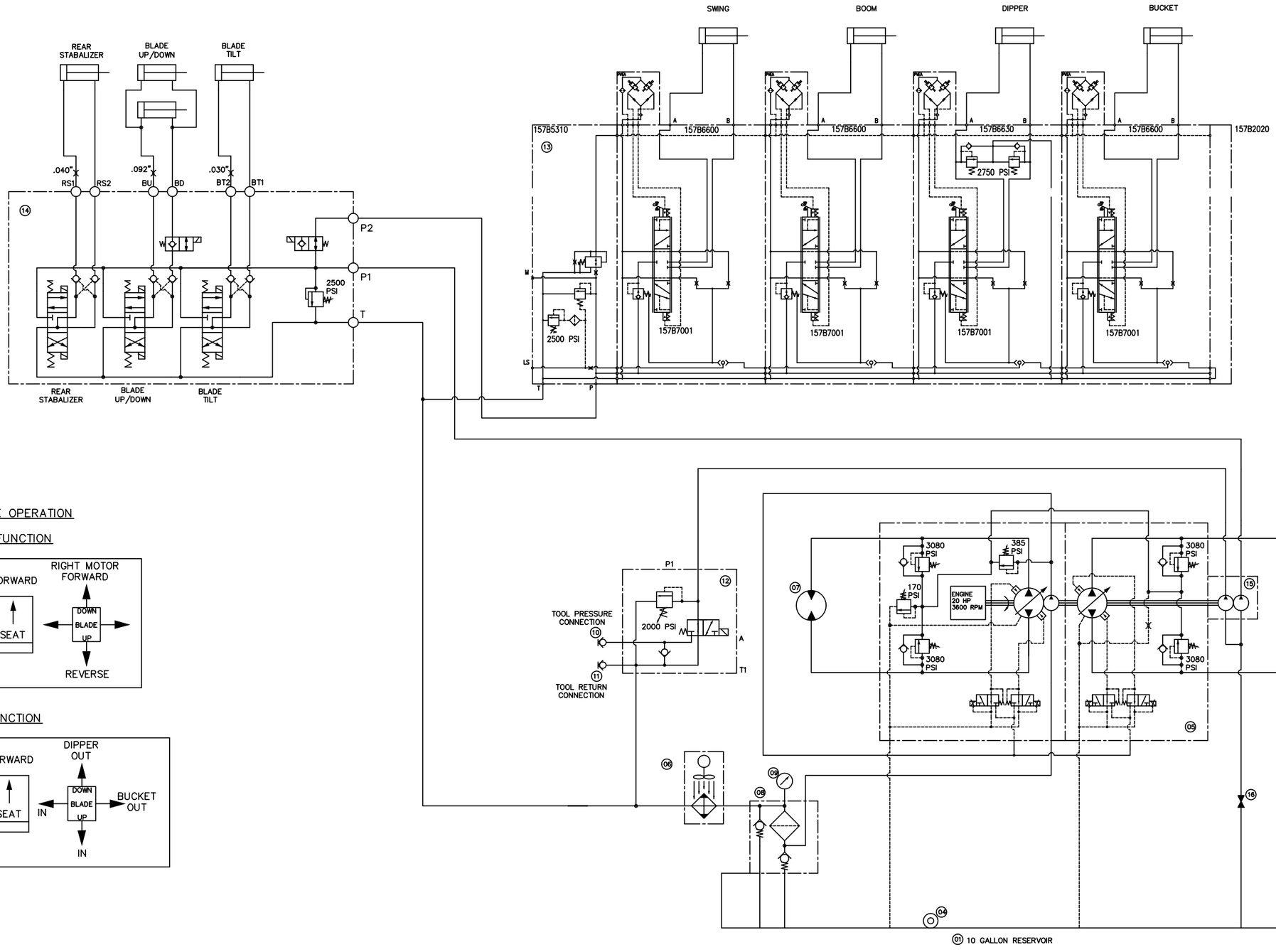


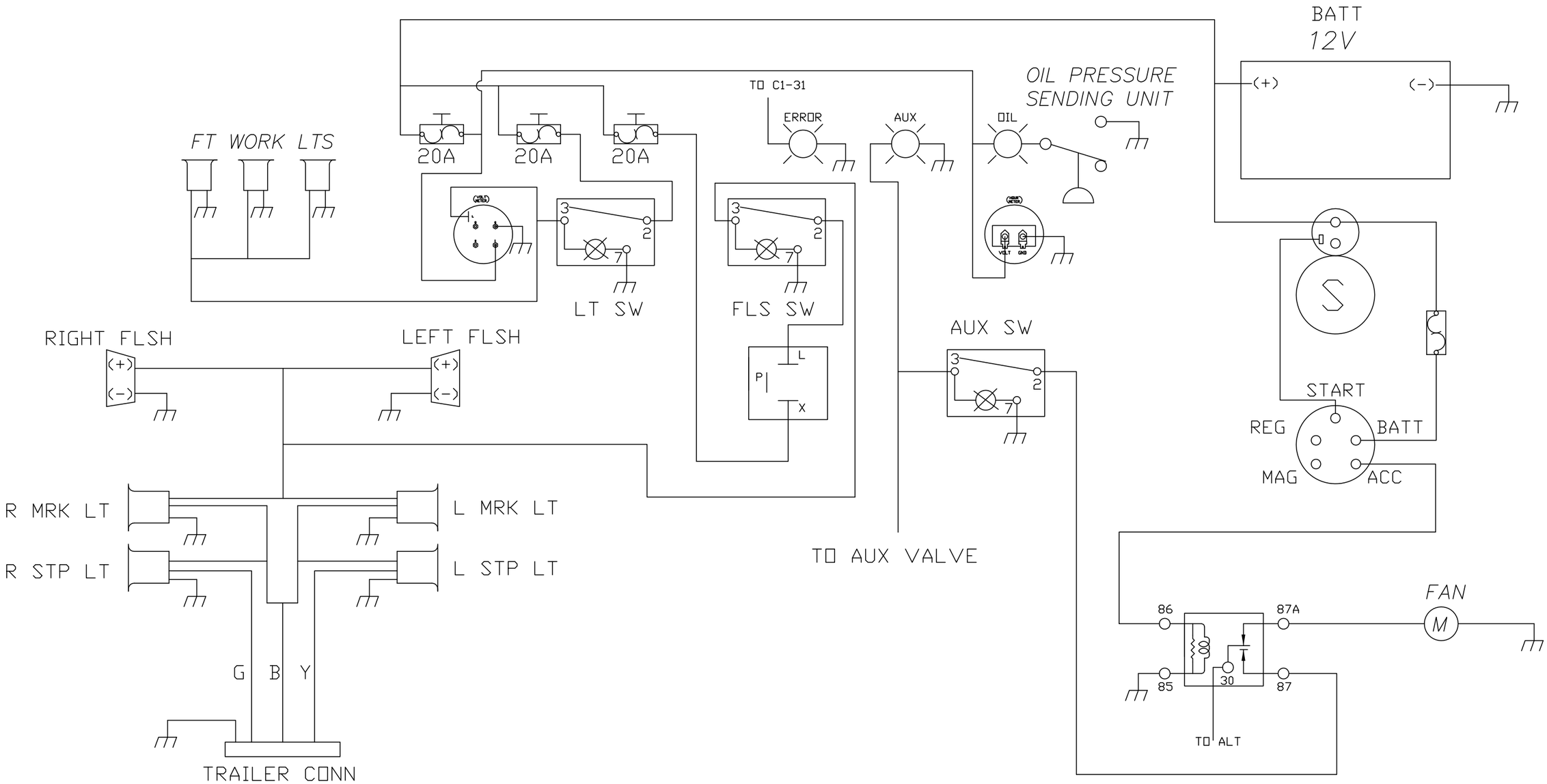
JOYSTICK OPERATION

DRIVE FUNCTION

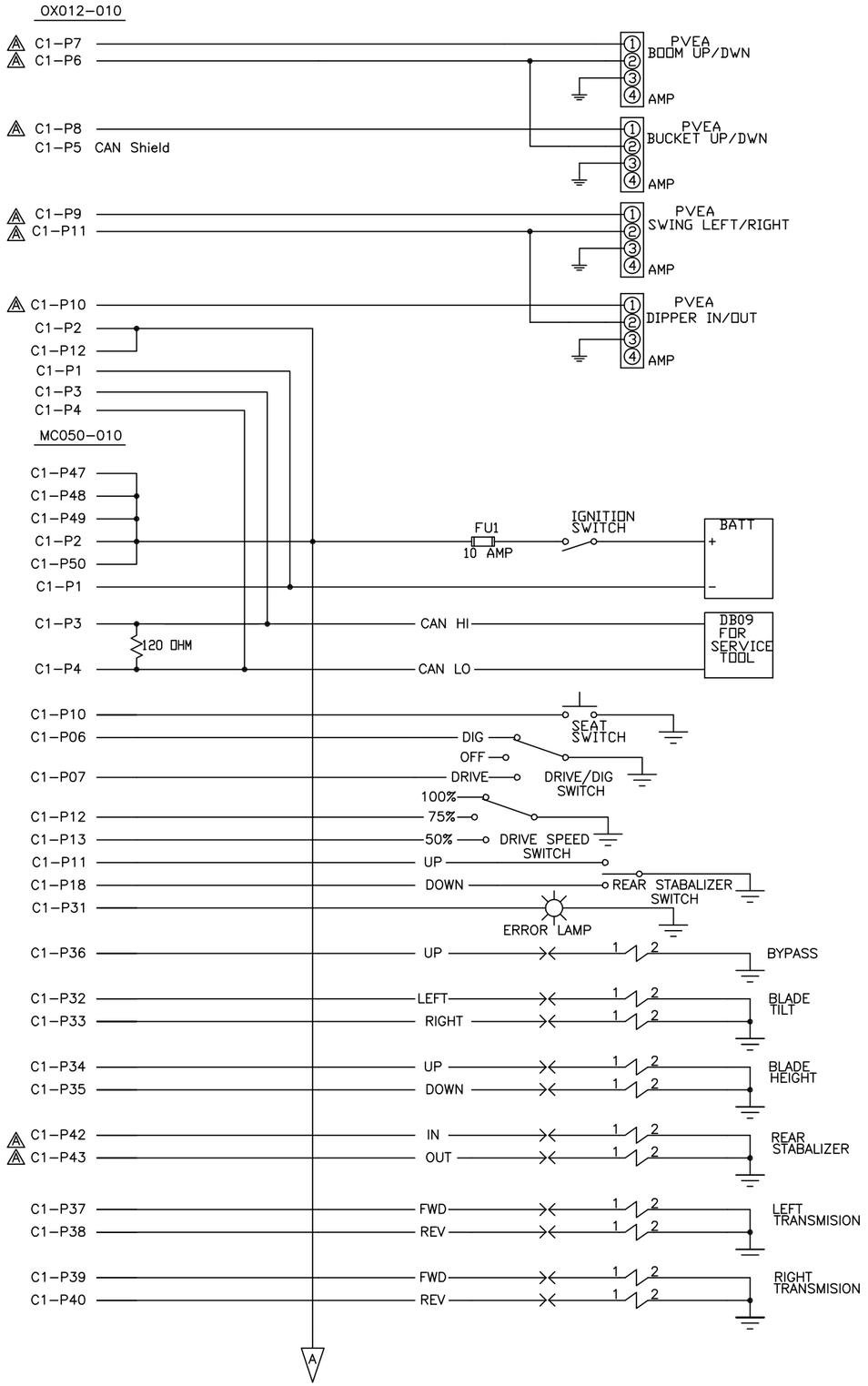
DIG FUNCTION

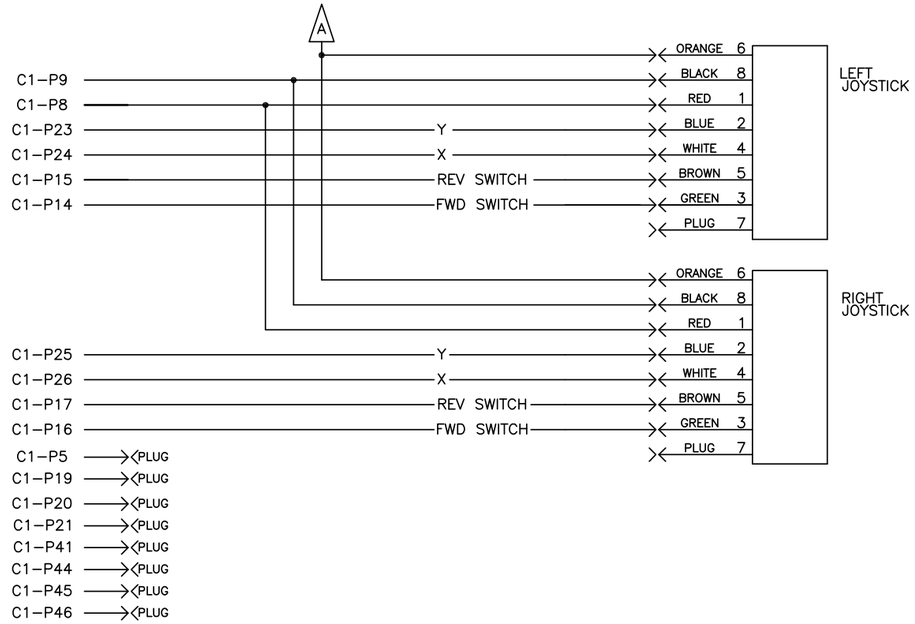
PUMP DISPLACEMENTS:
1) HYDROSTIC PUMPS – .67 Cu. In./Rev.
2) CHARGE PUMP – .425 Cu. In./Rev.
3) Tool Circuit Pump – .70 Cu. In./Rev.
4) Work Circuit Pump – .39 Cu. In./Rev.

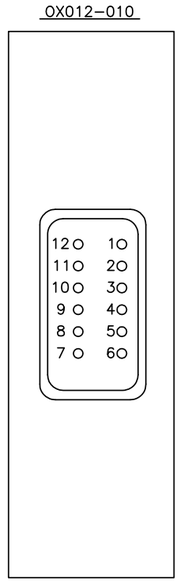
TMX Hydraulic System Section H–1

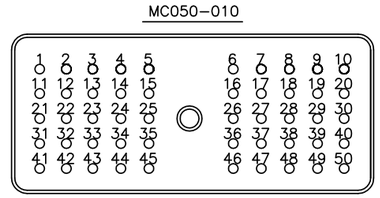


TMX Electrical
Diagram
Gas Engine
Section I
Rev 9/3/09 Page I-1







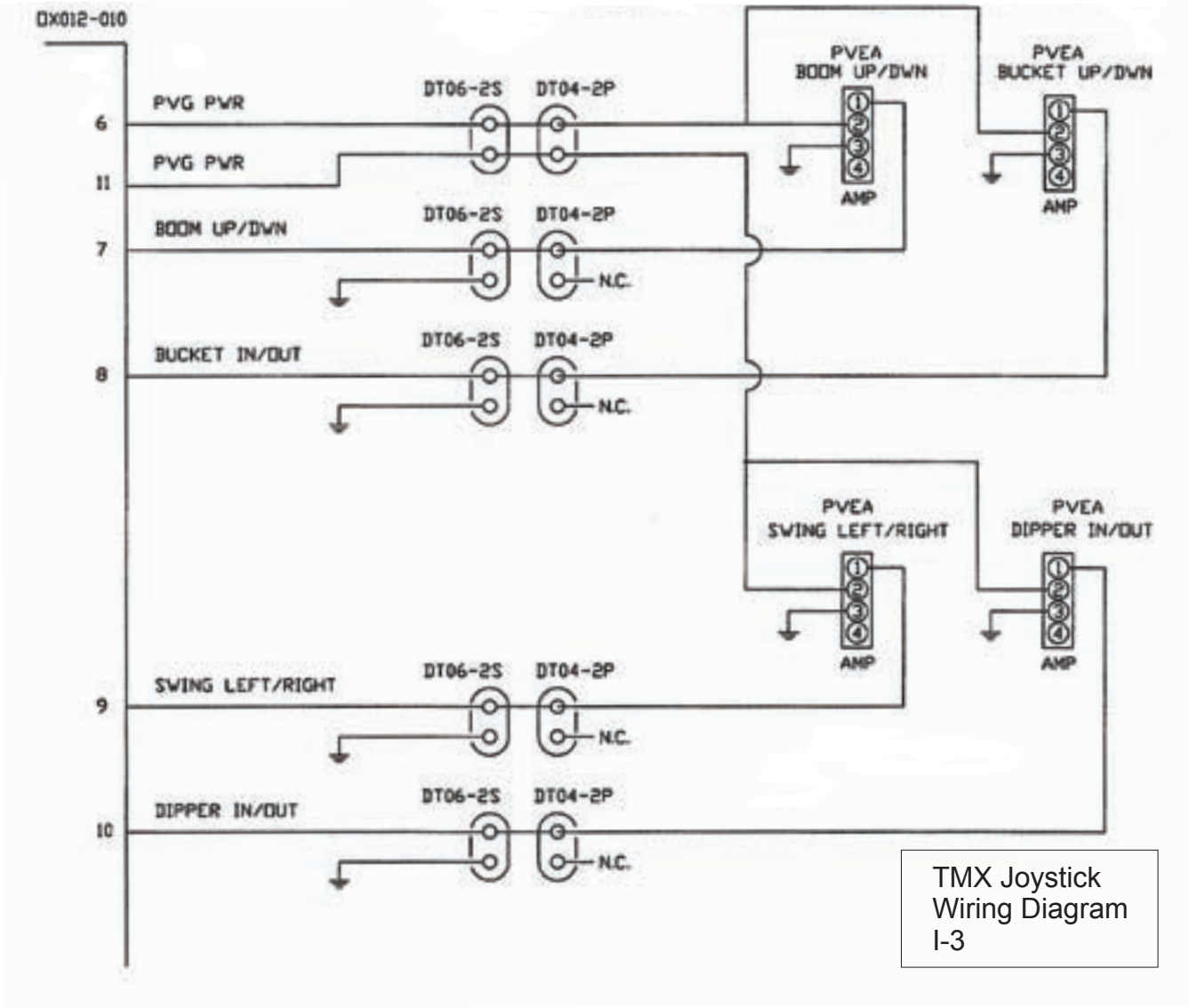


NOTES:

DEUTCH CONNECTOR

DO NOT USE STAMPED SOCKET PINS FOR DEUTSCH CONNECTORS USE ONLY SOLID SOCKETS

TMX Hydraulic Wiring Plus+1



TMX Joystick
Wiring Diagram
I-3

TMX LIMITED WARRANTY

PERIOD OF WARRANTY

Extend Manufacturing, LLC (hereafter referred to as 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

The Manufacturer 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 the Manufacturer 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. The Manufacturer 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 the Manufacturer:

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

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

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

COMPONENTS NOT WARRANTED BY THE MANUFACTURER OR THEIR ORIGINAL MANUFACTURER

Component parts not manufactured by and not warranted by the Manufacturer 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 Extend Manufacturing, LLC 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 Extend Manufacturing, LLC.

Notes

TMX WARRANTY REGISTRATION FORM

This sheet must be completed in full and mailed within ten (10) days to Extend Manufacturing, LLC

Date Purchased: _____

Purchaser's Name: _____

Company Name: _____ Unit #: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone Number: (_____) _____ Fax Number: (____) _____

E-Mail: _____

Engine Model #: _____ Engine Serial Number: _____

Signed: _____ Date: _____

To assist Extend Manufacturing, LLC in processing warranty claims, please complete this Customer Service Guide:

1. What type of business is your company involved in?

2. What will be your primary uses for the TMX?

3. How did you first become aware of the TMX product line?

After completing this form completely, remove, fold, affix postage, and mail to Extend Manufacturing, LLC. Thank you for registering your new TMX excavator.

TAPE HERE

AFFIX
FIRST
CLASS
POSTAGE

EXTEND MANUFACTURING, LLC
WARRANTY REGISTRATION
8404 VENTURE CIRCLE
SCHOFIELD, WI 54476

FOLD *FOLD*

TMX®
TOWABLE MINI-EXCAVATOR

Extend Manufacturing, LLC
8404 Venture Circle
Schofield, WI 54476
888.359.3002 • FAX 715.241.9305
www.tmx-excavator.com