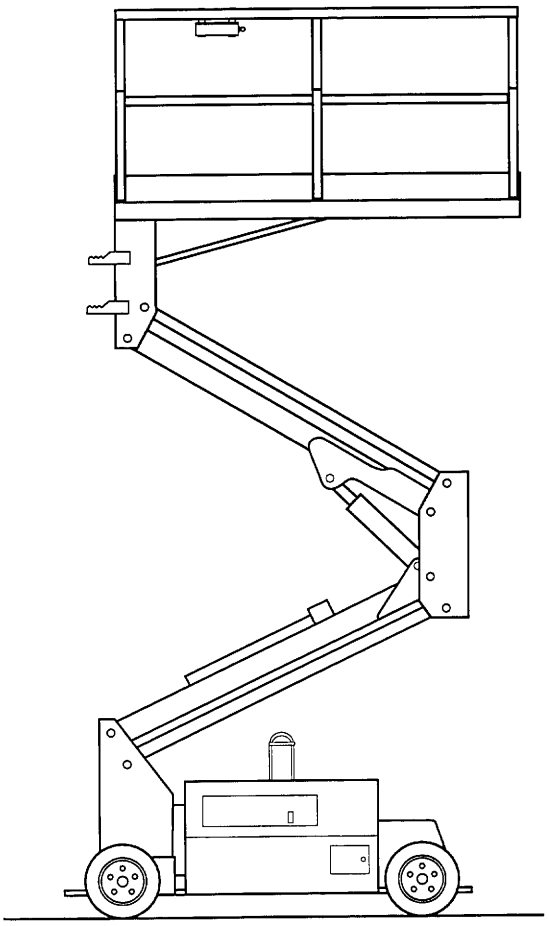
TEREX AERIALS

SERVICE MANUAL

SELF-PROPELLED VERTICAL LIFT
MODEL TV20



Art # A00.00712E

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Appendix

INTRODUCTION

This Service Manual is designed to provide you with the instructions needed to properly maintain the aerial lift. When used in conjunction with the Operators and Parts manuals (provided separately) this Service Manual will assist you in making necessary adjustments or repairs.

Terex aerial lifts are designed and built to provide many years of safe, dependable service. To obtain full benefits from your aerial lift, always follow the proper operating and maintenance procedures. Only trained, authorized personnel should be allowed to operate or service this machine. Service personnel should read and study the Operators, Service and Parts Manuals in order to gain a thorough understanding of the unit prior to making any repairs. Exercise all necessary safety precautions when performing maintenance not covered in this manual.

To help you recognize important safety information, we have identified warnings and instructions that directly impact on safety with the following signals:

⚠ DANGER

DANGER INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

⚠WARNING

WARNING INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

⚠ CAUTION

Caution indicates a potentially hazardous situation or alerts against unsafe practices. It is also used for "property damage only" hazards.

Service personnel and machine operators must understand and comply with all warnings and instructional decals on the body of the machine, and at the ground controls and platform control console.

⚠ DANGER

MODIFICATIONS OF THIS MACHINE FROM THE ORIGINAL DESIGN ARE STRICTLY FORBIDDEN WITHOUT WRITTEN PERMISSION FROM SIMON AERIALS INC. AND WILL VOID ANY REMAINING WARRANTY.

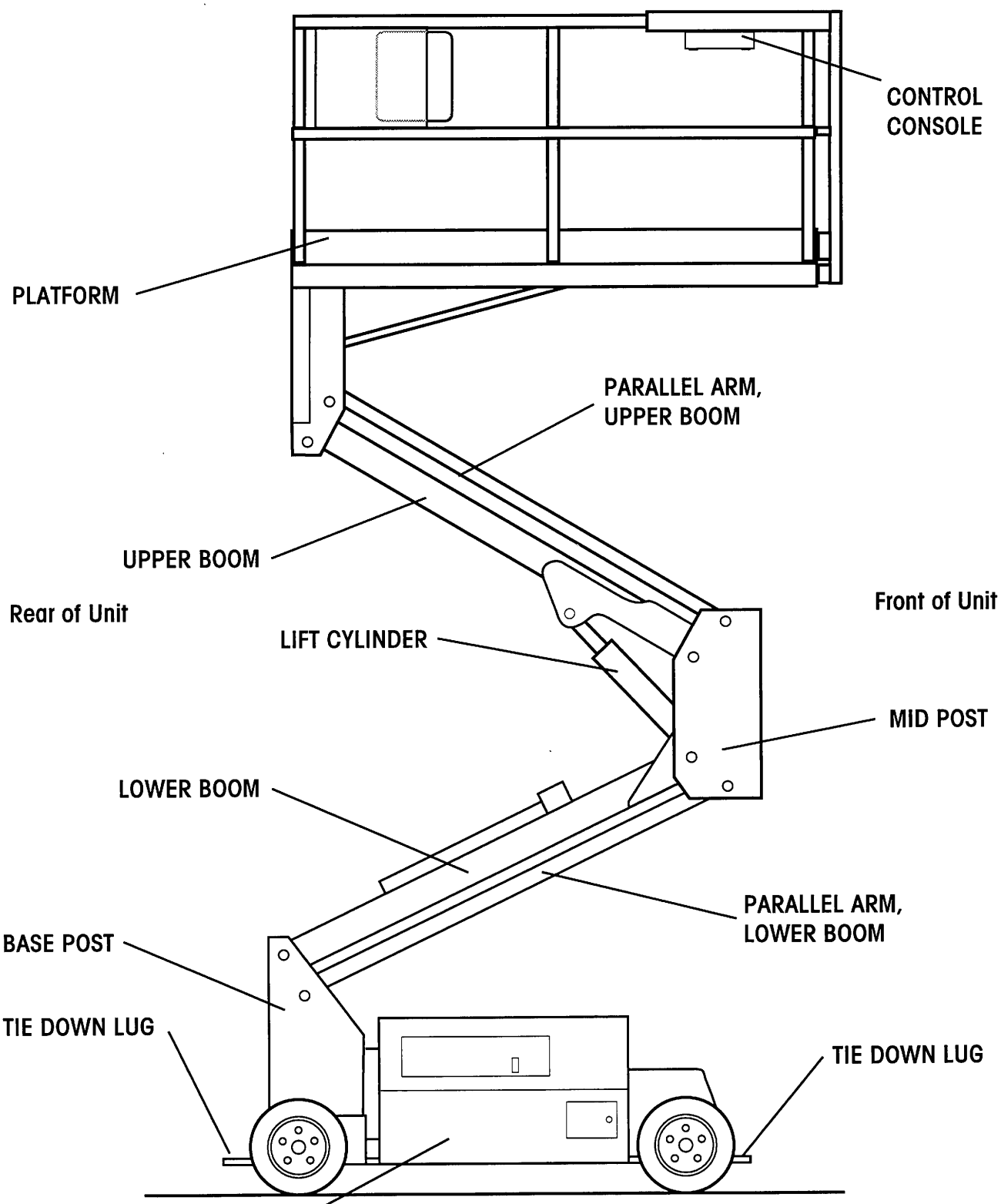
TEREX AERIALS reserves the right to change, improve, modify or expand features of its equipment. Therefore, specifications, models or equipment are subject to change without notice, and without incurring obligations.

All TEREX AERIALS manuals are periodically updated to reflect changes that occur in the equipment. Please contact the factory for information regarding changes which may affect your machine.

MACHINE SPECIFICATIONS

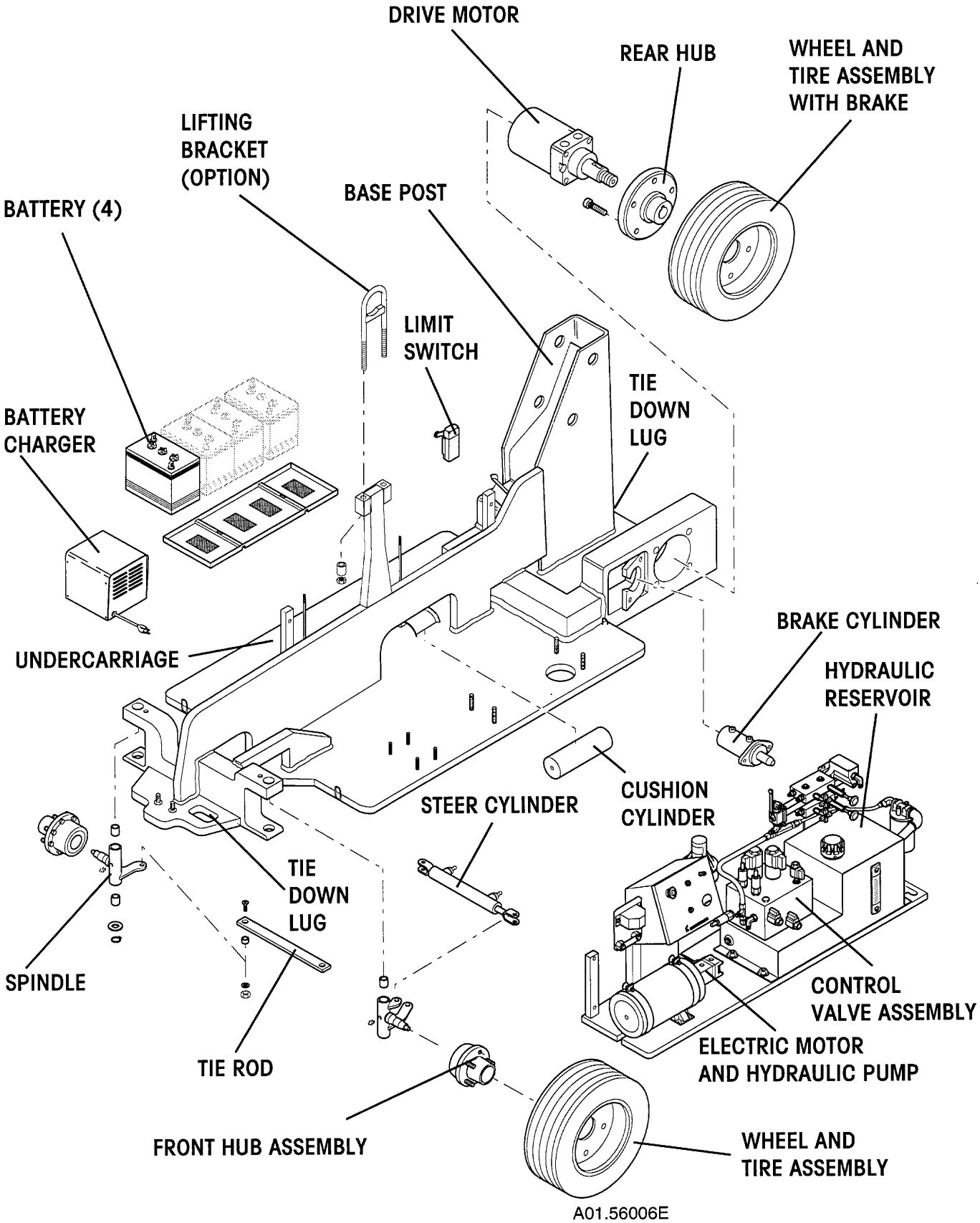
WORKING HEIGHT (MAX.)	25 FT (6.35 M)
PLATFORM HEIGHT (MAX.)	19 FT 6 IN. (5.94 M)
STOWED HEIGHT	35.5 IN. (0.9 0M)
PLATFORM CAPACITY (UNRESTRICTED):	
WITH STANDARD DECK	750 LBS. (340 KG)
WITH OPTIONAL DECK EXTENSION	750 LBS. (340 KG)
DECK EXTENSION CAPACITY	250 LBS. (110 KG)
PLATFORM DIMENSIONS:	
W/ STANDARD DECK	31 IN. (0.79 M) x 96 IN. (2.44 M)
WITH OPTIONAL DECK EXTENDED	31 IN. (0.79 M) x 132 IN. (3.36 M)
LENGTH (WITHOUT OPTIONAL DECK EXTENSION)	96 IN. (2.44 M)
(WITH OPTIONAL DECK EXTENSION)	98.5 IN. (2.50 M)
WIDTH	34 IN. (0.86 M)
WHEELBASE	66 IN. (1.67 M)
WHEEL TRACK	28.6 IN. (0.73 M)
OUTSIDE TURNING RADIUS	8 FT 6 IN. (2.59 M)
INSIDE TURNING RADIUS	3 FT 5 IN. (1.04 M)
GROUND CLEARANCE	4 IN. (0.10 M)
GROSS VEHICLE WEIGHT (APPROX.)	3,500 LBS. (1,587 KG)
TRAVEL SPEED-PLATFORM STOWED	2 MPH (3.2 KPH)
TRAVEL SPEED-PLATFORM ELEVATED	0.5 MPH (0.8 KPH)
GRADEABILITY (on hard surface) (ref. page vi)	11.3° (20%)
TIRES	4" x 8" x 16" SOLID
HYDRAULIC FLUID CAPACITY	3.5 GAL. (13.3 L)
HYDRAULIC OPERATING PRESSURE	2600 PSI (179 BAR)
WHEEL LUG NUT TORQUE	65-70 FT LBS.
POWER SYSTEM (ELECTRIC)	24 VOLT DC (FOUR 6 VOLT, 220 AMP/HR. LEAD-ACID BATTERIES IN SERIES)
ELECTRIC MOTOR	4 HP (2.98 KW)

PRIMARY MACHINE COMPONENTS



Art # A00.00710E

UNDERCARRIAGE COMPONENTS



A01.56006E

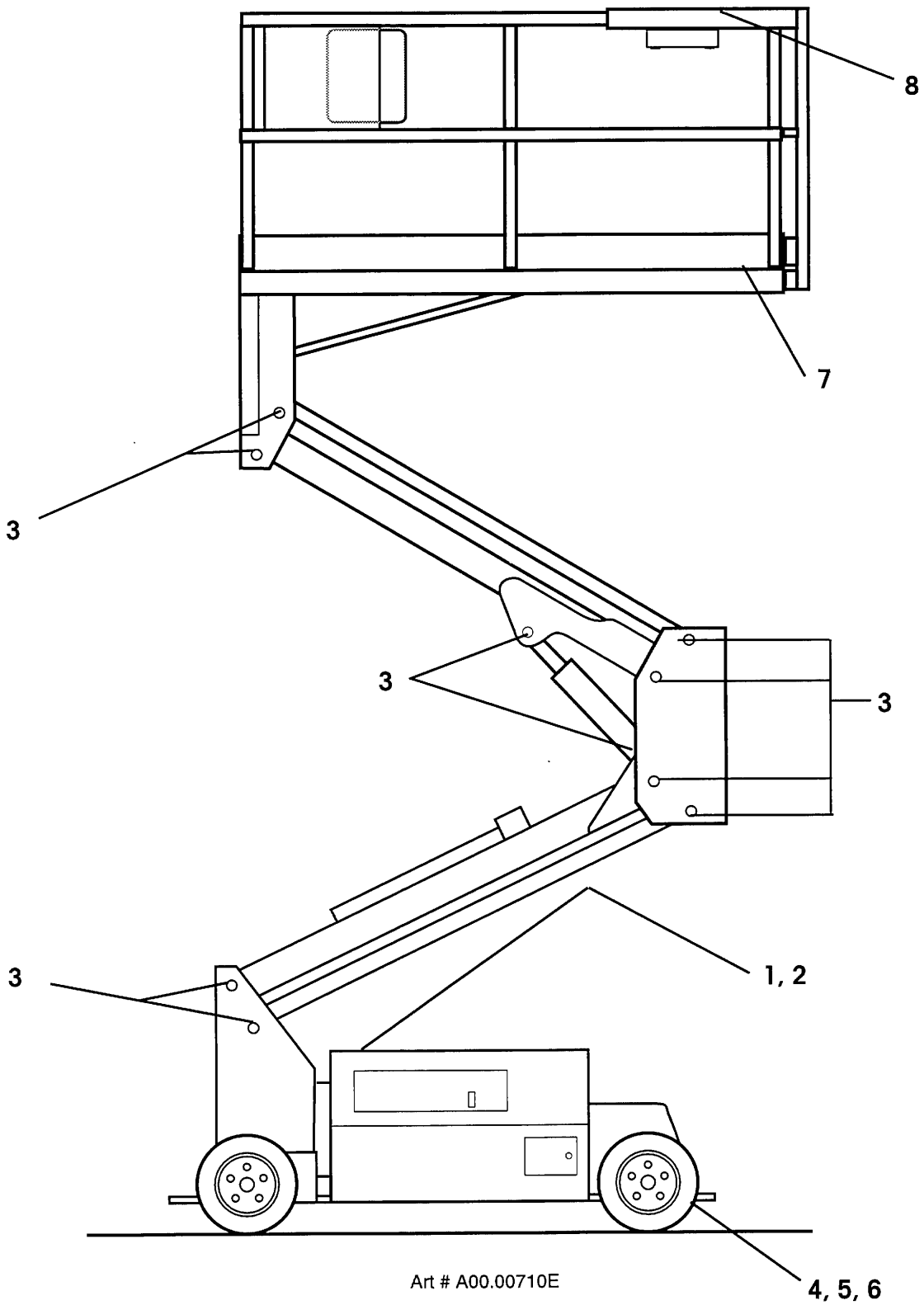
LUBRICATION CHART

NO.	ITEM	SPECIFICATION AND QUANTITY	FREQUENCY OF LUBRICATION
1.	Hydraulic reservoir	Mobil DTE 13 M to 2" from top of tank with platform fully lowered.	Check daily. Analyze every 6 months or 500 hours.*† Change yearly or every 1,000 hours.*†
2.	Hydraulic return filter	Filter element.	Change every 6 months or 500 hours.*†
3.	Pivot pins	Mobilgrease Special or equivalent (N.L.G.I. #2 EP Lithium, plus EP & Moly) Purge old grease.	Monthy or every 100 hours.*† Lubricate at every 3 feet (1M) of vertical displacement.
4.	Steering spindles	Lithium N.L.G.I. #2 EP. Purge old grease.	Monthly or every 100 hours.*†
5.	Steering hubs	Lithium N.L.G.I. #2 EP. Clean and repack.	Change every 6 months or every 500 hours.*†
6.	Steering linkage	Silicone spray.	Monthly or every 100 hours.*†
7.	Deck extension roller pins (Option)	Silicone spray.	Monthly or every 100 hours.*†
8.	Deck extension tubes (Option)	Coat with petroleum jelly.	Every 6 months or every 500 hours.*†

* Whichever occurs first.

† Different requirements for severe duty applications. See check lists.

LUBRICATION DIAGRAM



Art # A00.00710E

SECTION 1: TRANSPORTATION AND EMERGENCY PROCEDURES

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- Fork Lifting of the Falcon Series Lift 1-3
- Truck Transport of the Falcon Series Lift 1-3
- Single Point Lifting Hook 1-3

Emergency System and Procedures
- Emergency Lowering 1-4
- Emergency Drive 1-4
- Emergency Procedures 1-5

TRANSPORTING THE UNIT

Platform should be in the stowed position when the unit is being transported. Do not raise the unit while it is being transported or towed.

MOVING OF THE AERIAL LIFT

If your aerial lift is equipped with the UNPOWERED MOVEMENT OPTION, it can be winched or moved short distances in case of power failure. The brake release valve is located on the valve block with the black palm button, inside the hydraulic compartment. The motor free-wheel valve is the hand lever located to the left of the brake release valve.

- Fully close the brake release valve by turning the knob clockwise. Fully open the motor free-wheel valve by pulling the hand lever up.
- Operate the brake release hand pump (black palm button) to release brake.
- The unit is now ready to move.

To return to normal operation, fully open the brake release valve by turning the knob counterclockwise. Fully close the motor free-wheel valve by pushing the hand lever down.

⚠ CAUTION

Do not use tie down lugs to lift the aerial lift.

FORK LIFTING OF THE AERIAL LIFT

- Lift the aerial lift from the sides only. Position forks under the modules, between the front and rear wheels and as near to the rear (driving) wheels as possible. Ensure that lift truck used has adequate capacity to lift the machine (see "Machine Specifications" for weight).

TRUCK TRANSPORT OF THE AERIAL LIFT

- The aerial lift may be winched onto a transporting vehicle IF THE UNIT IS EQUIPPED WITH THE UNPOWERED MOVEMENT OPTION. Return both tow valves to normal operating position (engaging the brake) when the unit is on the transporting vehicle.
- Always chock the wheels of the unit while on the transporting vehicle.
- Securely attach the machine to the transporting vehicle using the tie down lugs, located at the center front and center rear of the undercarriage. Ensure that chains or straps have adequate load capacity, and DO NOT OVERTIGHTEN.
- Disconnect negative battery cables for long distance transport.

SINGLE POINT LIFTING HOOK (OPTION)

- Lift unit by engaging overhead crane to lifting eye located directly below and through the center portion of platform.

UNLOADING PROCEDURES

- Inspect the outside of the unit for damage. Inspect all hoses, boom sections and hoses/ cables for chafing or road damage. Confirm that all wheel lug nuts are tight.
- Open both side compartments. Inspect all electrical and hydraulic connections for damage to see if they are tight.
- Connect battery cables to batteries if required. Check electrolyte level.
- Check fluid level from the sight gauge on the hydraulic tank, and add fluid as required (see Lubrication Chart).
- Close side compartment covers.
- Attach the unit to a winch for the unloading.

⚠WARNING

ALWAYS ATTACH THE UNIT TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER. WE DO NOT RECOMMEND UNASSISTED LOADING OR UNLOADING OF ANY MOBILE PLATFORM.

READ AND UNDERSTAND ALL SAFETY, CONTROL AND OPERATING INFORMATION FOUND ON THE MACHINE AND IN OPERATOR'S MANUAL BEFORE OPERATING THE UNIT.

- Remove all machine tie downs. Remove wheel chocks.
- Turn on machine at the ground controls.
- Enter the platform, and start the electric motor using the platform controls. Select the "HIGH" speed, and test all platform functions.
- Carefully drive the unit off the truck or trailer with the winch still attached.
- Before placing the unit into service, all operators must read and understand the contents of the Operator's Manual.

  Upon initial unloading of the machine the Predelivery Inspection Report must be completed and returned in order to activate the Terex Limited Warranty.

  An Operator's Manual and a Predelivery Inspection Report are included with each machine leaving the factory.

EMERGENCY SYSTEM AND PROCEDURES

⚠ DANGER

IF PLATFORM SHOULD FAIL TO LOWER, DO NOT ATTEMPT TO CLIMB DOWN THE BOOM ASSEMBLY. SERIOUS INJURY MAY RESULT.

HAVE AN EXPERIENCED OPERATOR USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.

THIS MACHINE IS NOT INSULATED AND EXTREME CARE MUST BE TAKEN WHEN WORKING AROUND POWER LINES.

DO NOT TOUCH THE UNIT IF THERE IS A CHANCE IT IS IN CONTACT WITH POWER LINES. WAIT UNTIL THE POWER TO THE LINES HAS BEEN SHUT OFF.

EMERGENCY LOWERING WITH HAND PUMP

- Close the emergency lowering valve by turning the handle clockwise. (This valve is located on the valve block with the red palm button, inside the hydraulic compartment.) Pump red palm button by hand and the platform will lower.

  NOTE: Drive and steer functions should not be used when using the emergency lowering valve.

  IMPORTANT: The emergency lowering system is designed to be used only for emergency descent.

- Once the platform has been fully lowered, open the emergency lowering valve by turning the handle counterclockwise.

  NOTE: Platform will not elevate if this valve is closed.

- **Report the incident to your supervisor immediately.**

EMERGENCY DRIVE

The emergency lowering system will not provide control or operation of the drive or steering functions. Should it be necessary to move the unit, see "Transporting the Unit", earlier in this section.

EMERGENCY PROCEDURES

It is not possible for us to foresee every emergency situation that could arise during operation of this machine. The following information describes three such emergency situations, and lists appropriate actions that can be taken.

When faced with an emergency, above all please remember:

- Stay calm.
- Think through the situation before operating the machine.
- Get help if necessary.

SITUATION ONE: Platform elevated, operator not incapacitated, but unit will not respond to control console.

⚠ DANGER

DO NOT TRY TO CLIMB DOWN THE BOOM ASSEMBLY.
SERIOUS INJURY MAY RESULT

POSSIBLE CONDITION:

- One or more functions not operating correctly.
- Unit movement from unselected control.
- Unit function will not stop unless power is switched off.

CORRECTIVE ACTION

1. Press the emergency stop button.
2. Contact an experienced operator to lower (and reposition, if necessary) the machine using the emergency lowering procedure.
3. **Report the incident to your supervisor immediately.**

SITUATION TWO: Unit elevated, with operator incapacitated at controls.

⚠ DANGER

DO NOT TOUCH UNIT !!!

DETERMINE THE CAUSE OF THE PROBLEM BEFORE YOU TOUCH THE MACHINE.

CORRECTIVE ACTION

1. Have someone summon first aid or rescue squad.
2. Attempt to talk to operator before taking any rescue measures.
3. **Check to see if operator is in a pinned position, or would be endangered if platform is moved, before attempting emergency lowering procedure.**
4. After establishing that the machine is not in contact with live power lines, lower the platform and reposition the unit, if necessary, using the emergency procedure.
5. Render first aid to the operator.

SITUATION THREE: Platform in contact with live power lines and operator incapacitated.

⚠ DANGER

DO NOT TOUCH UNIT !!!

ELECTROCUTION HAZARD!!!

CORRECTIVE ACTION

1. Have someone summon first aid or rescue squad.
2. Contact authorized personnel to disconnect power supply touching unit.
3. If operator is unconscious, check to see if he is in a pinned position, or would be endangered if platform is moved.
4. AFTER POWER IS CUT, use the emergency lowering procedure to bring platform with operator to a safe location to render first aid.

IMPORTANT: Any incident involving personal injury must be immediately reported to the local Terex Aerials Distributorship as well as to Terex Aerials Inc.

SECTION 2:
HYDRAULIC SYSTEM

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Counterbalance Valves (Drive) 2-7
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Limit Switch 2-7

HYDRAULIC FLUID

HANDLING PRECAUTIONS

⚠WARNING

PERSONS IN REGULAR CONTACT WITH MINERAL-BASED HYDRAULIC FLUID NEED TO BE AWARE OF THE IMPORTANCE OF THOROUGH HYGIENE, AND THE PROPER METHODS FOR HANDLING MINERAL OILS IN ORDER TO AVOID POTENTIAL HAZARDS TO HEALTH.

If mineral-based hydraulic fluid is SPLASHED INTO THE EYES, it must be WASHED OUT THOROUGHLY using abundant quantities of water. If irritation persists, medical advice should be sought.

Mineral oils act as solvents on the natural oils in the skin. FREQUENT AND PROLONGED SKIN CONTACT CAN CAUSE DERMATITIS OR SEVERE IRRITATION. Mineral-based hydraulic fluids normally present no health hazard when used properly. Protective clothing and proper washing facilities should be provided or be accessible.

⚠WARNING

HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE AND BURN THE SKIN, DAMAGE EYES, AND MAY CAUSE SERIOUS INJURY, BLINDNESS, AND EVEN DEATH.

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

IF MINERAL-BASED HYDRAULIC FLUID HAS PENETRATED THE SKIN, IT MUST BE MEDICALLY TREATED, WITHIN A FEW HOURS, BY A DOCTOR FAMILIAR WITH THIS TYPE OF INJURY.

FLUID RECOMMENDATIONS

We strongly recommend the use of MOBIL DTE 13M HYDRAULIC FLUID. An EQUIVALENT substitute can be used if absolutely necessary. Mineral-based hydraulic fluids produced by different companies will USUALLY mix with each other satisfactorily, but this IS NOT RECOMMENDED. When in doubt, consult your supplier.

HYDRAULIC FLUID ANALYSIS

Use the following as a guide to determine when analysis of the hydraulic fluid is necessary.

- Any time the hydraulic pump is replaced.
- If fluid discoloration is noticed in the hydraulic reservoir sight tube.
- If, after the first 50 hours of operation, the hydraulic filter elements are plugged.
- Any time the hydraulic filter elements show signs of metal contamination.
- Once every six months, under normal operating conditions.
- Every 3 months, in extremely dusty or dirty operating conditions.

The hydraulic fluid analysis must be done by a qualified laboratory. To ensure that you receive

accurate recommendations about the fluid being analyzed, always provide the following information with the test sample.

- Type of hydraulic fluid (see Lubrication Chart).
- Model and serial number of unit from which sample was taken.
- Purpose of analysis: pump failure, discoloration, etc.
- Type of analysis: complete to show additive breakdown, acid buildup, viscosity, type and percent of contaminants; also, comparison to new fluid and recommendations.

Comply with contamination analysis and recommendations to achieve a clean, contamination free hydraulic system.

Following the above guidelines will prevent premature failure of pumps, cylinder seals and drive motors, and unnecessary down time.

If system flushing and replacement of fluid is recommended, refer to the flushing procedure.

SYSTEM FLUSHING PROCEDURE

1. With platform fully down, drain hydraulic fluid from hydraulic tank into a clean, empty container. Use an oil filter cart so the fluid may be reused if analysis is good.
2. When the hydraulic tank is empty, remove suction hoses and return line hose.
3. Remove all hoses.
4. Flush the hoses.
5. Discard old return filter element and replace.
6. Remove suction strainer and clean by flushing with clean water and dry.
7. With hoses removed from the hydraulic tank, flush out the tank.
8. Reinstall all hoses removed in the previous steps.
9. If the hydraulic fluid removed from the reservoir is good, pump it through a filter cart back into the tank. If fluid is not usable, dispose of it properly. Fill hydraulic tank with filtered, fresh hydraulic fluid (refer to Lubrication Chart).
10. Loosen hose fittings at pump (and rod end of lift cylinder, if so equipped) to allow pump to flood with hydraulic fluid. Tighten fittings.
11. Start up the unit. Briefly operate all functions. Two or three full lift cycles may be necessary to purge all air from lift cylinder.
12. When the above procedures have been completed, fill hydraulic tank to full mark on sight gauge (if so equipped) or to within 2" from top of tank.
13. Check for leaks and correct as necessary. Unit is now ready to be placed back in operation.

HYDRAULIC SYSTEM COMPONENTS

HYDRAULIC FLUID RESERVOIR

The hydraulic fluid reservoir consists of the tank, a filler cap with strainer and breather, and a drain plug.

Perform the following steps on a weekly basis.

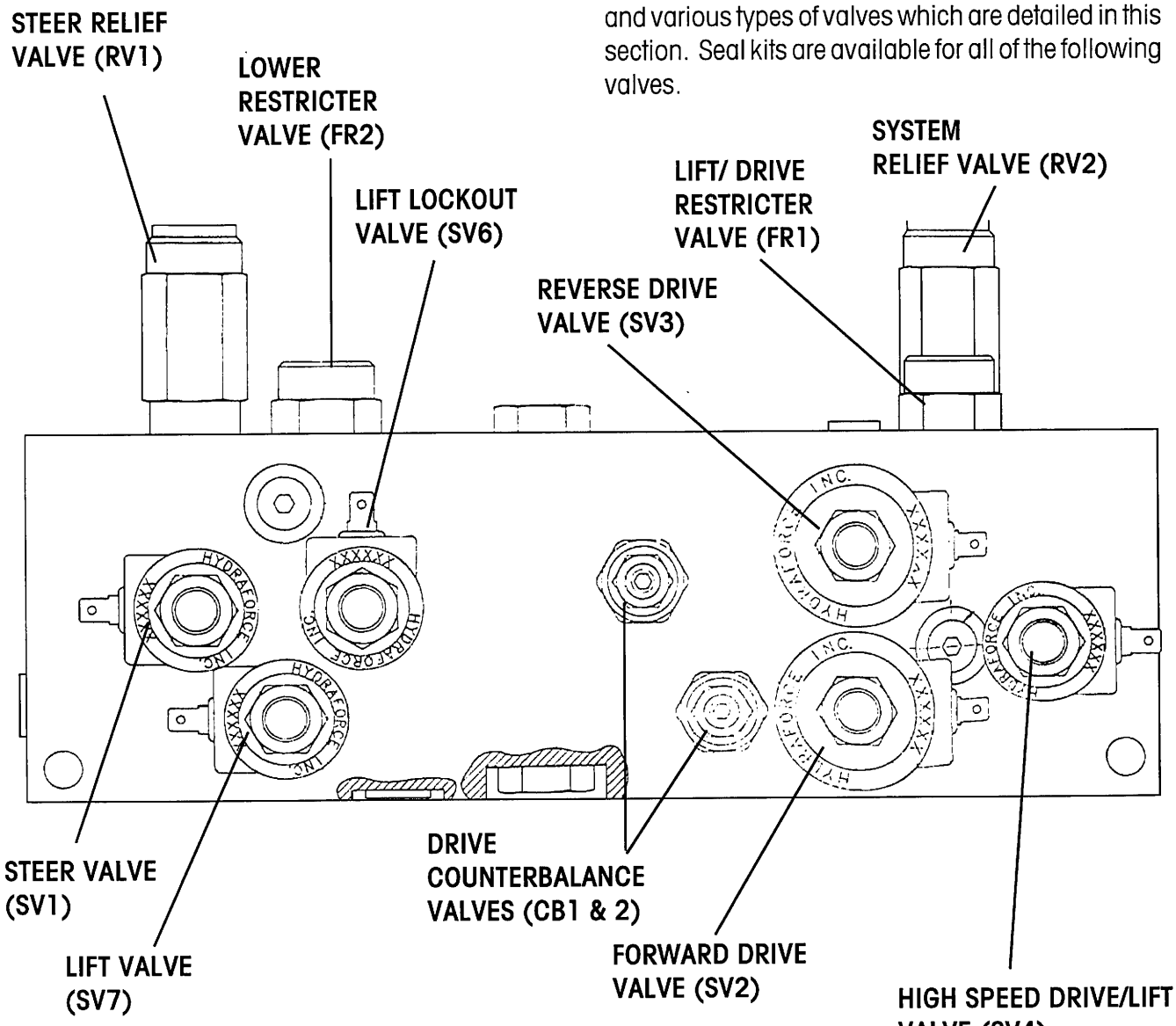
- Check tank for signs of leakage.
- Inspect tank securing bolts for tightness.
- Clean cap filter and, and drain tank to clean suction strainer by flushing with clean water and dry.

HYDRAULIC PUMP

A 24 VOLT DC, 150 AMP permanent magnet motor rated at 4 HP (2.98 Kw) 3600 RPM drives the two section gear pump. The pump provides hydraulic fluid flow to the functions. There are no adjustments on the pump.

CONTROL VALVE ASSEMBLY

The control valve assembly is a combination valve which controls the hydraulic fluid flow from the pump to the functions. It consists of a valve block and various types of valves which are detailed in this section. Seal kits are available for all of the following valves.



Control Valve Assembly.

SYSTEM AND STEER RELIEF VALVES

These valves, located in port RV2 (System) and RV1 (Steer) on the control valve assembly, are differential poppet relief valves. They are screw-in, cartridge-style, direct-acting valves used as pressure limiting devices. The System relief valve opens at 2900 PSI (200 Bar, 204 kg/ cm^2) and is factory set. The Steer relief valve opens at 1500 PSI (103.4 Bar, 105.5 kg/ cm^2), and also is factory set. A seal kit is also available (Refer to Illustrated Parts Catalog).

To adjust the system relief valve:

1. Install a pressure gauge in Port G2.
2. Loosen seal nut.
3. Lift the platform fully in low speed, while continuing to dead head lift, and use a hex key to adjust pressure. Backing out hex socket screw decreases pressure.
4. Tighten seal nut.

To set the steer relief valve:

1. Install a pressure gauge in Port G1.
2. Loosen seal nut.
3. Steer fully in either direction. While continuing to dead head steer, use a hex key to adjust pressure. Backing out hex socket screw decreases pressure.
4. Tighten seal nut.

To clean valve:

- Rinse in clean solvent and blow dry with air.

LIFT VALVE

This valve, located in port SV7, is a solenoid-operated, 2-way, normally open valve. It is a screw-in, cartridge-style, and poppet-type valve. There are no adjustments to this valve, but the solenoid can be replaced if it malfunctions. A seal kit is also available (Refer to Illustrated Parts Catalog).

LIFT LOCKOUT VALVE

This valve, located in port SV6, is a solenoid-operated, 2-way, normally open valve. It is screw-in, cartridge-style, and piloted poppet-type valve. This valve is open when lifting and closed while driving and steering. There are no adjustments to this valve, but the solenoid can be replaced if it malfunctions. A seal kit is also available (Refer to Illustrated Parts Catalog).

STEER VALVE

This valve, located in port SV1 on the control assembly, is a solenoid-operated, 4-way, 3-position, tandem center valve. It is screw-in, cartridge-style, and direct-acting, for use to open and close flow to the steer cylinder. The steer valve opens when the steer toggle is pressed in either direction to allow steer right and left functions. There are no adjustments to this valve, but the solenoids can be replaced if they malfunction. A seal kit is also available (Refer to Illustrated Parts Catalog).

HIGH SPEED VALVE

This valve, located in port SV4 on control assembly, is a solenoid-operated, 2-way, normally closed valve. It is a screw-in, cartridge-style piloted poppet-type valve used to allow hydraulic fluid to drive rear hydraulic motors and lift cylinders. In one position it allows high speed, while in the other position it directs flow through a restricter (FR1) which decreases flow to 0.8 GPM (creep speed). It requires no adjustments, but the solenoid can be replaced if it malfunctions. A seal kit is also available (Refer to Illustrated Parts Catalog).

FORWARD AND REVERSE DRIVE VALVES

These valves, located in ports SV2 and SV3, are solenoid-operated, 3-way, spool-type valves. They allow hydraulic fluid to drive rear hydraulic motors. Directional valve SV2 drives the hydraulic motors in the forward direction, while SV3 drives the hydraulic motors in reverse. They require no adjustments, but the solenoids can be replaced if they malfunction. A seal kit is also available (Refer to Illustrated Parts Catalog).

COUNTERBALANCE VALVES (DRIVE)

These identical valves are located in ports CB1 and CB2. They are used for overrunning the load control and hydraulic load locking, and restrain flow through the motors to prevent cavitation. They also function as deceleration controls when driving down hill. They are factory set at 3700 PSI (255 Bar, 260 kg/cm^2) load induced pressure. Under normal use, these valves require no adjustment. Consult with Terex Service, if necessary. A seal kit is also available (Refer to Illustrated Parts Catalog).

To clean valve rinse in clean solvent and blow dry with air.

CYLINDERS

There are four (4) cylinders in the aerial lift hydraulic circuit, including the steering, drive cushion, brake, and lift cylinders. On later units all cylinders are of the double acting type. On earlier units, all cylinders are of the double acting type except the lift cylinder, which is single acting type. Refer to the Mechanical Section of this manual for assembly and disassembly, repair or replacement procedures.

DRIVE MOTORS

There is a seal kit available if a drive motor leaks hydraulic fluid.

LIMIT SWITCH

The limit switch located on the hydraulic tank automatically puts the machine in low speed when the platform is elevated.

SECTION 3:
ELECTRICAL SYSTEM

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ELECTRICAL SYSTEM

The following section is a description of maintenance for the major components of the aerial lift electrical system.

BATTERY

Four 6 volt batteries supply the electrical current required to operate the electrical circuits for the aerial lift.

BATTERY MAINTENANCE (IN STORAGE)

Follow these procedures for maintenance of batteries on a machine not in use:

Keep batteries clean. Electrolyte of "wet" batteries should be checked regularly, and kept at proper levels.

Never stack one battery directly on top of another, because post or container damage can result. If batteries are stored individually, place supporting boards between layers. Do not stack more than three high, and rotate stock so that the oldest batteries are used first.

"Wet" batteries should be kept fully charged. A "wet" battery, while in storage, should be recharged to full charge at the following intervals:

If stored at:	Recharge:
Below 40° F (4° C)	None required
40° to 60° F (4° to 15° C)	Every 2 months
Above 60° F (15° C)	Every month

BATTERY MAINTENANCE (IN USE)

Check battery and surrounding area for signs of damage or corrosion.

Check battery terminals for:

- **Corrosion**. Regularly clean connections and apply a non-metallic grease or protective spray to retard corrosion.
- **Loose connections.** Be sure all cable connections are tight, and that good contact is made to terminals.
- **Broken or frayed cables.** Be sure all cable connections are good, and that no loose or broken wires are exposed. Replace as needed.

Check battery electrolyte level. Replenish the electrolyte, if necessary. Remove vent caps before filling, and USE ONLY DISTILLED WATER. Fill all cells to the proper level. Do not overfill. Fill to level indicator (or 1/2 inch over the top of the separators if there is no level indicator). Fill after charging to prevent overflow of acid due to expansion. Do not use a hose to add water to batteries.

Allowing the electrolyte level to drop below the top of the separators will lead to shortened battery life. Excessive water usage can indicate that a battery has been overcharged, has been subjected to excessively high temperatures, or is nearing the end of its service life.

Keep battery clean. Wash the top of the battery, making sure all vent caps are in place. Do not allow cleaning water or other foreign matter to enter the cells. Use a solution of bicarbonate of soda and water to wash the battery if there is an accumulation of acid.

BATTERY PREVENTIVE MAINTENANCE

Once a month, after battery has been charged, spot check the specific gravity of two or more cells. A fully charged battery should indicate 1.28 specific gravity. If low readings are noted, check the following:

- Check terminals for corrosion, loose connections and broken or frayed cables.

- Check all cells with a hydrometer for variation in specific gravity. A variation of 0.03 points or more between cells is cause for concern. Mark the low cells.

Recheck specific gravity of all cells after recharging.

BATTERY REPLACEMENT

To remove the batteries, follow these procedures:

⚠WARNING

BEFORE REMOVING BATTERIES FROM THE UNIT, TURN OFF THE IGNITION SWITCH. THERE SHOULD BE NO POWER TO THE MACHINE.

Always disconnect the negative battery cables first.

Remove bolts holding battery to undercarriage.

Lift the batteries from the undercarriage. Put the batteries to the side and dispose of properly.

⚠ CAUTION

Always connect the positive battery cable first.

To install batteries lift and position them on undercarriage. Secure batteries in position with wing nuts and battery hold downs. Connect battery cables.

MOVEMENT ALARM (OPTIONAL)

The movement alarm is activated as soon as the platform console drive toggle is moved off the center "Neutral" position.

⚠WARNING

THE MOVEMENT ALARM IS PROVIDED FOR YOUR PROTECTION, AND THE PROTECTION OF PERSONS WORKING IN THE IMMEDIATE AREA. DISABLING THIS IMPORTANT SAFETY DEVICE MAY RESULT IN DEATH OR SERIOUS INJURY.

The movement alarm is supported by a weldment above the hydraulic pump. To replace it, remove the movement alarm from the weldment and disconnect the wires.

TILT ALARM (OPTIONAL)

The tilt alarm gives an audible warning when the machine is five degrees or more out of level. It is supported by a weldment above the hydraulic pump. To replace the tilt alarm, remove it from the support and disconnect the wires.

TILT ALARM TEST

The alarm can be tested by manually tipping the alarm sensor. This "Push-to-Test" feature enables tilt alarm to be tested without losing its adjustment.

On the tilt alarm, there are three LED's. The green LED indicates the unit has power. The red LED indicates the sensor is tilted byond 4-1/2°. The yellow LED indicates the sensor is tilted beyond 5-1/2° and the 3 second delay has expired (tilt alarm should sound at the platform.) There is an in-line 2 amp fuse. Check the fuse first, if the alarm sounds continuously when the sensor is level. Then, check the flange nuts.

TILT ALARM ADJUSTMENT

The tilt alarm can be adjusted. Before attempting to adjust the alarm, park the machine on a flat, level surface.

Level the base of the alarm by adjusting each of the three flange nuts until the level bubble is centered.

DESCENT ALARM (OPTIONAL)

The descent alarm gives an audible warning when the platform is being lowered. It is supported by a weldment on the hydraulic module. To replace the descent alarm, remove it from the support and disconnect the wires.

AUTOMATIC WARNING BEACON (OPTIONAL)

The optional warning beacon has a rotating reflector with an amber light. The beacon activates whenever thekey is on. During drive or lift, when the emergency stop button is pressed, the beacon deactivates.

RELAYS

There are relays located in the hydraulic module.

(Refer to the schematic at the end of this manual for relay functions and interconnect.)

EMERGENCY STOP BUTTON

There is an emergency stop button on the aerial control console and the ground station.

When the emergency stop button is pressed, all functions stop immediately and the wheel brake is automatically applied. Turn the button clockwise to reset.

To replace the emergency stop button at the aerial control console, remove the four control console cover screws to gain access for button removal. Remove the appropriate button mounting screws and wires.

To replace the emergency stop button at the station, remove the ground station keeper screw and lower the ground station on its hinge. Remove the appropriate button mounting screws and wires.

SECTION 4:
MECHANICAL COMPONENTS

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MECHANICAL COMPONENTS

Following is a description of the major mechanical components of the aerial lift.

UNDERCARRIAGE

Two removable covers are used to protect the items mounted on the undercarriage.

⚠ CAUTION

When steam cleaning the undercarriage, cover the battery charger and other electrical components, to prevent water damage.

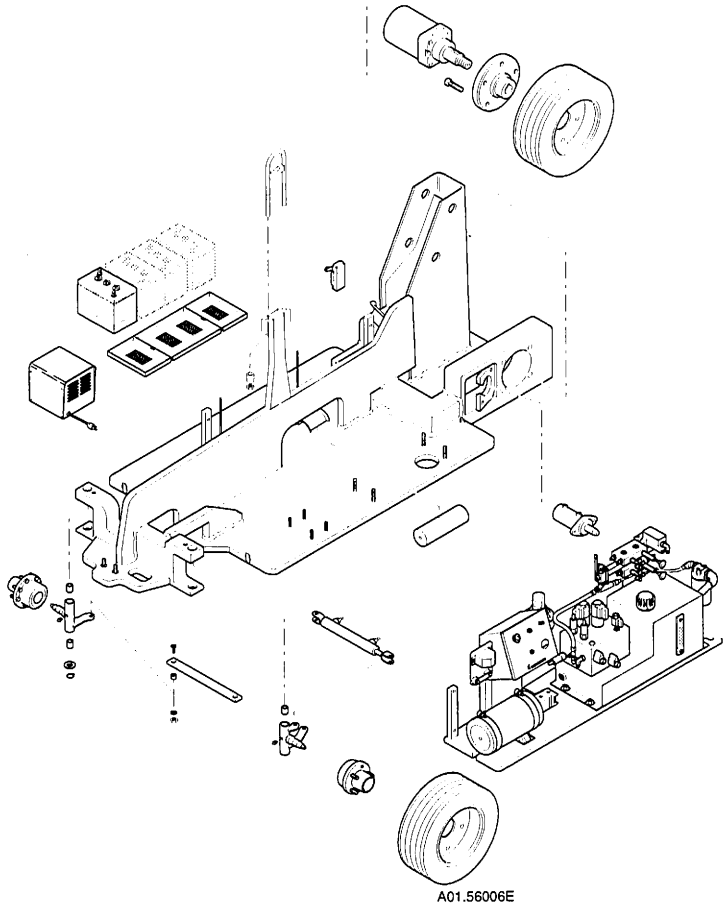
Steam clean the undercarriage once a year, and inspect all welds and brackets. Check for cylinder pins that turn in their mountings, which will indicate sheared pin lock pins.

TIRES

The aerial lift uses 8" x 4" (204 mm x 102 mm) solid rubber tires with 3.75" split rims. Inspect tires for cuts, chunking, sidewall damage or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation.

CHANGING TIRES

When a tire change is necessary, ALWAYS BLOCK THE WHEELS before you raise the machine. Loosen and remove lug nuts, and pull off the wheel. Install the replacement wheel. Fasten lug nuts, and tighten to proper torque (see Machine Specifications). Lower the machine and remove the blocks.



Components Found on the Undercarriage.

WHEELS AND LUG NUTS

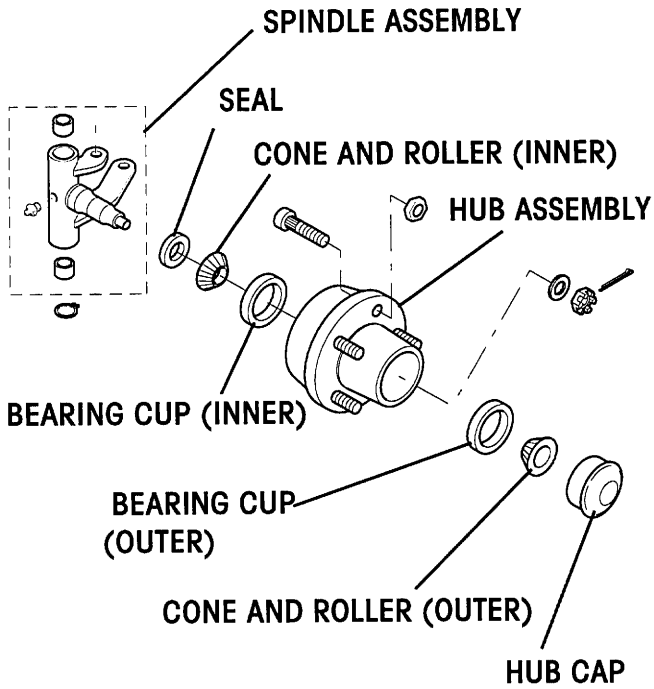
Check the torque of the wheel lug nuts (see Machine Specification for proper torque) and examine the wheel rims for tightness and damage.

FRONT HUB ASSEMBLY

The front hub assemblies for the right and left side are identical, but should not be interchanged. Each consists of a hub, an inner and outer bearing cup, wheel mounting studs, and seal, as well as associated hardware.

REPACKING FRONT WHEEL BEARINGS

1. Block the rear tires and raise the front end of undercarriage.
2. Remove front wheels.
3. Remove hub cap.
4. Remove cotterpin, 3/4"-16 castle nut and flat washer from each hub assembly.



Front Hub Assembly.

5. Pull the front hub assembly from the spindle assembly.
6. Remove the seal, and the inner and outer bearing cone and roller .
7. Inspect the inner and outer bearing cups for wear. If they are excessively worn or damaged, replace the appropriate front hub assembly.
8. Thoroughly clean the inner and outer bearings. Inspect them for signs of wear. If they are excessively worn or damaged, replace them.
9. Pack the inner and outer cone and roller bearings with grease. (Refer to lubrication chart, earlier in this manual.)
10. Assemble the front hub and install it on the spindle assembly.
11. Replace the wheels and tighten to proper torque. (Refer to "Machine Specifications".)

DRIVE MOTORS

The drive motors are not field repairable. If they are leaking or damaged, replace them.

STEER CYLINDER SEAL REPLACEMENT

The steer cylinder is of the double acting type. During operation, the cylinder should not leak, but a slight dampness at the rod seal is acceptable. The pins should be checked for wear.

1. Disconnect and plug the two hydraulic hoses.

⚠ CAUTION

To prevent damaging the internal components of the steer cylinder, keep the hydraulic hose ends free from contamination.

Take care not to damage rod surface and guard against dirt entering system.

2. Take the steer cylinder from the undercarriage by removing the two pins that hold it in place.
3. Remove rod gland.
4. Remove cylinder rod and piston.
5. Replace seals.
6. Carefully, slide the cylinder rod and piston into the cylinder body assembly.
7. Secure the rod gland in place.
8. Secure the steer cylinder in place with the two pins.
9. Unplug and reconnect the two hydraulic hoses.

BRAKE CYLINDER SEAL REPLACEMENT

The brake cylinder is of the double acting type. The rod is extended by an internal spring, and retracted hydraulically. During operation, the cylinder should not leak, but a slight dampness is acceptable at the rod seal.

1. Disconnect and plug the two hydraulic hoses.

⚠ CAUTION

To prevent damaging the internal components of the brake cylinder, keep the hydraulic hose ends free from contamination.

Take care not to damage the rod surface and guard against dirt entering the system.

2. Take off the brake cylinder from undercarriage by removing the two bolts that hold it in place.
3. Remove gland nut. (Internal spring may be under compression.)
4. Remove cylinder rod, spring and piston.
5. Inspect spring for damage.
6. Replace seals.
7. Carefully, slide the cylinder rod spring, and piston into the cylinder body assembly.
8. Secure the gland nut in place.
9. Secure the brake cylinder in place with the two bolts.
10. Unplug and reconnect the two hydraulic hoses.

HOSES AND CABLES

Inspect all hoses and electrical cables for security and damage. Cables and hoses should be examined for rubbing and chafing. Check for leaks at fittings. REPLACE ANY DAMAGED HOSES OR CABLES.

BOOM

Clean the boom once a year and inspect along the boom structure, especially all welds and brackets.

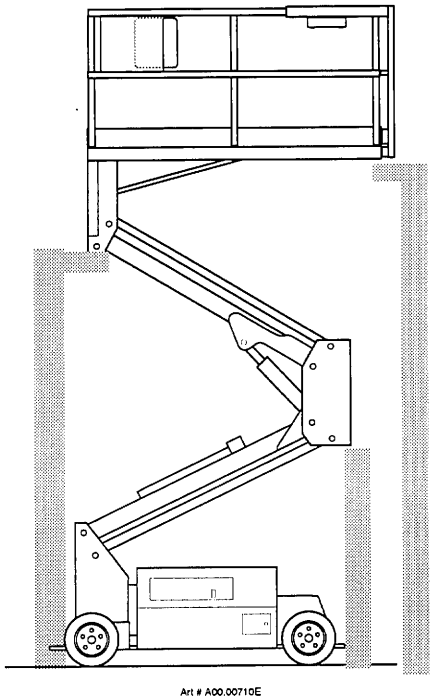
BOOM LIFT CYLINDER

The boom lift cylinder is of the double acting type for all units. During operation, the cylinder should not leak, but a slight dampness at the rod seal - is acceptable. The pins should be checked for wear. Check the pin locking bolts for tightness. The cylinder and the block for the holding valve should be inspected for fluid leakage, damage and security.

BOOM LIFT CYLINDER REMOVAL

1. Support the booms.

IMPORTANT: When performing repairs to the cylinder, they must be supported at both the front and rear ends. Install blocking to support mid and upper posts. Support should be positioned so that the lower parallel arm does not interfere with support when pin is removed to lower parallel arm. Supports should be capable of holding 2,500 lbs.



Art # A00.00710E

Supporting the Boom.

⚠WARNING

MID POST SHOULD BE LOWERED ONTO SUPPORT UNTIL POSITIVE CONTACT IS MADE, BUT NOT TO A POINT THAT THE STEER TIRES LOSE CONTACT WITH THE GROUND. RAISE THE FRONT PLATFORM SUPPORT LAST UNTIL POSITIVE CONTACT IS MADE WITH THE PLATFORM BASE.

2. Remove sheet metal covers from both sides of undercarriage.

3. Disconnect and plug the hydraulic hoses.

⚠ CAUTION

To prevent damaging internal components of boom lift cylinder, keep hydraulic hose ends free from contamination.

4. Disconnect the lowering valve wire.

5. Remove the cylinder base pin.

6. Remove the front upper parallel arm pin, supporting the arm to eliminate the weight on the cylinder.

7. Support the cylinder and remove the cylinder rod end pin.

8. Remove the cylinder.

BOOM LIFT CYLINDER REPLACEMENT

1. Carefully position the new cylinder in the machine with the holding valve and hose connections facing upward.

2. Connect the base end of cylinder to the machine by reinstalling the pin and all retainers.

3. Support the rod end of the cylinder and reconnect the hoses and wires to the cylinder.

4. Use the controls to extend or retract the cylinder to align the cylinder so the rod end pin can be installed. Install the pin and retainers.

5. Reconnect the lower parallel arm and retainers.

6. Use plastic wire ties to fasten the hose to the

cylinder as it was prior to this installation.

7. Grease both ends of the cylinder at the two (2) grease fittings.

8. Raise the platform with the lower controls and remove any blocking, straps, or chains which were used to support the platform.

9. Raise and lower the platform several times to confirm correct operation and purge all air from the cylinder. Initially, there may be a hesitation due to the presence of air in the cylinder.

BOOM LIFT CYLINDER SEAL REPLACEMENT

1. Remove lift cylinder.

⚠ CAUTION

Take care not to damage the rod surface and guard against dirt entering the system.

2. Remove end gland from lift cylinder.

3. Remove cylinder shaft and piston.

4. Remove seals.

5. Replace boom lift cylinder seals.

6. Replace cylinder shaft and piston.

7. Secure end gland to lift cylinder.

8. Replace boom lift cylinder in the unit.

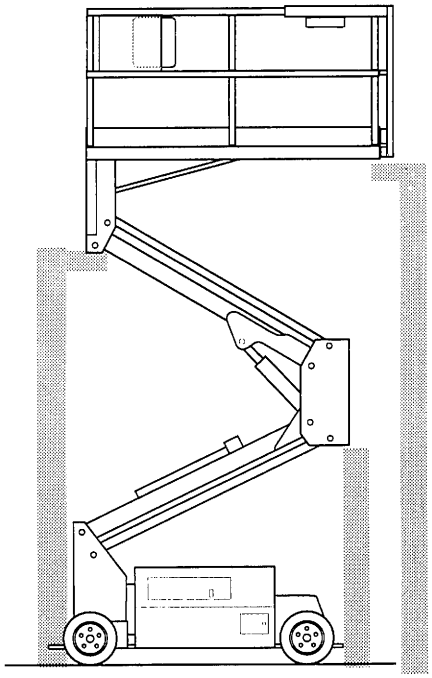
BOOM AND PARALLEL ARM PIVOT PIN REPLACEMENT

Pivot pin removal from the boom is required if they are worn or damaged.

1. Support boom.

   - If replacing pivot pins on the mid post, have the unit fully lowered. No need for support but chock the tires.

   - If replacing pivot pins on upper or lower posts, support the unit as shown in following illustration, and chock tires.



Art # A00.00710E

Supporting the Boom.

⚠ WARNING

MID POST SHOULD BE LOWERED ONTO SUPPORT UNTIL POSITIVE CONTACT IS MADE, BUT NOT TO A POINT THAT THE STEER TIRES LOSE CONTACT WITH THE GROUND. RAISE THE FRONT PLATFORM SUPPORT LAST UNTIL POSITIVE CONTACT IS MADE WITH THE PLATFORM BASE.

2. Remove retaining rings and lock pin.

3. Remove the boom pivot pin.

4. Lubricate the new boom pin with a light grade of oil, and slide it in place.

5. Replace retaining rings and lock pin.

6. Grease the bearing surface through the grease fitting with the appropriate lubricant (refer to lubrication chart).

7. Remove boom supports and tire chocks.

BOOM AND PARALLEL ARM PIVOT PIN BUSHING REPLACEMENT

1. Disassemble the boom.

   Remove the appropriate sections of the boom to allow access to the bushings. This step should only be attempted in a well-equipped shop by experienced mechanics.

2. Split the bushings with a hammer and chisel, and remove them.

3. Seat replacement bushings, using an arbor press.

4. Reassemble the boom and grease the bushing (refer to lubrication chart).

LIFT CYLINDER HOLDING VALVE REPLACEMENT

The holding valve is integrated into the upper side of the lift cylinder.

The solenoid valve cartridge has a 100 mesh screen and solenoid valve coil. Make certain that all power is off and that lift cylinder bears no load before repairing.

CUSHION CYLINDER REPLACEMENT

The cushion cylinder is a rodless double acting type which acts as an accumulator to provide smooth starting and stopping when driving.

1. Disconnect and plug the six hydraulic hoses.

⚠ CAUTION

To prevent damaging internal components of cushion cylinder, keep hydraulic hose ends free from contamination.

Take care not to damage the rod surface and guard against dirt entering the system.

2. Take the cushion cylinder from the undercarriage by removing the two hose clamps that hold it in place.

3. Remove both end glands.

4. Remove spring and piston.

5. Replace seals.

6. Carefully, slide the piston and springs into the cylinder body assembly.

7. Secure the end glands in place.

8. Secure the cushion cylinder in place with the two hose clamps.

9. Unplug and reconnect the six hydraulic hoses.

SECTION: 5
TROUBLESHOOTING

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GENERAL TROUBLESHOOTING TIPS

Before investigating a malfunction, check the following items:

- The Main Power Key Switch should be in the "ON" position.
- Check that battery connections are secure and batteries are fully charged.
- Check that the Emergency Stop Buttons are released.
- Check that hydraulic fluid is at the correct level.

Common Causes of Hydraulic System Malfunctions:

- Incompatible hydraulic fluids mixed, destroying the additives and causing varnish build up resulting in the valves to stick.
- Water in the hydraulic fluid due to a damp climate.
- Improper hydraulic fluid used; viscosity too high for cold climates, viscosity too low for warm climates.

  NOTE: Mobil AW 32 is a multiple viscosity oil that is light enough for cold climates and resists thinning in warm climates.

- Fuel in the hydraulic fluid lowers the viscosity and lubricity of the fluid.

TROUBLESHOOTING CHART

Problem	Probable Cause	Solution
• Execssive heat will cause excessive wear on seals and metal parts due to lowered viscosity. Symptoms to watch for are: pump case turns brown, hydraulic fluid darkens and premature pump failure.	• Excessive water in the hydraulic fluid. • Improper oil viscosity. • Improper lubrication and hydraulic fluid.	• Drain and flush hydraulic system. • Replace hydraulic fluid with the correct fluid. • Drain and flush hydraulic system.
• Water in hydraulic fluid. Symptoms to watch for are: pitting and etching of pump gear causing heat build up and premature pump failure.	• Damp climate or condensation in the reservoir. • Hydraulic fitting or port open to contaminants.	• Drain and flush hydraulic system. • Drain and flush hydraulic system. Replace worn pump components.
• Varnish, the dark brownish residue left from oxidation of hydraulic fluids. Symptoms to watch for are: residue will cause spools to stick and will hang up moving parts with close tolerances.	• Incompatible fluids or poor quality fluids. • Excessive heating of the fluids.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant. • Drain and flush hydraulic system, then fill with recommended hydraulic fluid.
• Poor lubrication, parts break through lubricant causing metal to metal contact. Symptoms to watch for are: pump gear wear and side gear clearance and excessive heat build up.	• Hydraulic fluid viscosity low. • Improper or poor grade hydraulic fluid or lubricant without proper anti wear additives.	• Drain and flush hydraulic system, then fill with recommended hydraulic fluid. • Drain and flush hydraulic system, then fill with recommended hydraulic fluid and lubricant.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Cavitation, a gaseous condition within the fluid stream where the pressure is reduced to the vapor pressure of the fluid. The higher the system pressure the more violent the reaction will be. Symptoms to watch for are: catastrophic pump failure or loss of pump pressure.	• Low reservoir fluid level.	• Add hydraulic fluid.
	• Air leaks in suction line.	• Repair any suction hose leaks.
	• Improper hydraulic fluid.	• Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid.
	• Vaporization of water.	• Have fluid analyzed regularly and drain and flush hydraulic system, then fill with recommended hydraulic fluid.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No high speed function for lift or drive.	• Emergency Stop Button, Key Switch, High Lift/Drive Selector Switch, high speed coil, high speed valve, no pump output.	• A breakdown of any one of these components will cause the high speed function to be inoperable.
• No high speed function for drive only.	• Limit switch. • High Lift/Drive Switch	• Check limit switch by wiring around component, and replace if faulty. • Check switch.
• Movement alarm will not sound.	• Forward or reverse diodes, movement alarm relay, or the travel alarm itself is faulty.	• A breakdown in any one of these components will cause the alarm not to function. Trace the available voltage to the horn. Replace the component(s) that are bad.
• Lift cylinder drifts down.	1. Holding valve cartridge dirty or faulty. 2. Cylinder packing is damaged.	1. Clean, repair or replace the holding valve. 2. Replace cylinder packing.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No pump output.	• Broken pump drive shaft.	• Check for broken pump drive shaft and replace if broken.
	• Fluid leaks.	• Check for excessive charge circuit leakage and fluid at pump inlet.
	• Motor not turning.	• Low battery voltage. • Check that motor functions properly.
	• Motor relay not engaging	• Faulty diode. • Low battery voltage • Check for proper motor relay operation and replace if broken.
• Hydraulic functions slow.	• Low pressure.	• Check for low system pressure and adjust to correct pressure.
	• Component failure.	• Bench test pump output.
	• Excessive side gear clearance.	• Replace pump.
	• Slow motor speed.	• Low battery voltage. • Loose wire connections.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Excessive pump pressure.	• Main relief valve.	• Readjust main relief valve.
• Pump noise or squeal.	• Low pressure.	• Check for low system pressure and adjust for correct pressure.
	• Pump cavitation.	• Check hydraulic reservoir oil level.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No steer function.	1. Steer toggle switch is bad. 2. Directional valve not shifting. 3. Faulty diodes. 4. Faulty sequence valve.	1. Check voltage available to the toggle switch. 2. Check voltage supply to valve and replace if necessary. 3. Check diodes and replace if necessary. 4. Check pressure setting.
• Steers left, but not right.	• Solenoid malfunction in steer valve. • Sequence valve	• Replace coil in solenoid. • Replace sequence valve.
• Steers right, but not left.	• Solenoid malfunction in steer valve. • Sequence valve	• Replace coil in solenoid. • Replace sequence valve.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Unit will not steer; all other functions operate.	1. Mechanical malfunction.	1. Steer cylinder may not be mechanically connected to steering linkage. Check for disconnected or damaged steering linkage; connect steering linkage and/ or replace.
	2. Steering directional control valve.	2. The steering directional control valve may not be shifting. The valve spools may be stuck. The directional control valve is defective or a valve spool is obstructed. Remove valve and inspect, clean, repair or replace as needed.
	3. Faulty diodes (open circuit).	3. Check diodes.
	4. Toggle switch or directional coils have no voltage.	4. Check voltage available to the toggle switch and directional coils.
• Drives forward, but not reverse.	• Solenoid malfunction in drive valve. • Low voltage at coils.	• Replace valve coil. • Check battery charge.
• Drives reverse, but not forward.	• Solenoid malfunction in drive valve. • Low voltage at coils.	• Replace valve coil. • Check battery charge.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No drive function.	1. Brakes do not release.	1. Check pressure supply to brakes. If no pressure, consult factory.
	2. Drive enable valve (SV6) inoperative.	2. Test for operation of valve.
	3. Motor shaft key is sheared.	3. Inspect, repair or replace.
	4. Drive directional control valve.	4 The drive directional control valve may not be shifting. The valve spools may be stuck. The directional control valve is defective or a valve spool is obstructed. Remove valve and inspect, clean, repair or replace as needed.
	5. Toggle switch or directional coils have no voltage.	5. Check voltage available to the toggle switches and directional coils.
	6. Lift/ drive relief valve.	6. Adjust for proper pressure..
	7. Faulty diodes (open circuit).	7. Check diodes.
	8. Free-wheel valve open or faulty.	8. Close or replace.
	9. Motion control valve.	9. Clean, adjust or replace.
	10. Faulty lift valve.	10. Check, clean, or replace.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Wheel drive motor failure.	• Hydraulic Fluid.	• Check for contamination of hydraulic fluid; drain and replace.
		• Check that the hydraulic system has been flushed after component failure in the drive system.
		• Check that the correct grade of hydraulic fluid is used.
	• Wheel drive motor.	• Wheel drive motor failure; replace motor.
	• Motor shaft key sheared.	• Check, and replace if failed.
	• Unit was towed improperly.	• Tow with option only.
• Unit will not go into high speed drive with boom lowered.	• Speed range toggle switch in low.	• Switch to high speed.
	• Faulty limit switch.	• Check limit switch by wiring around and replace if faulty
	• Faulty high speed drive relay.	• Check for a bad high speed drive relay; replace if necessary.
	• No/low voltage at coil.	• Check battery charge.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• No lift (hoist) function.	1. Toggle switch or lift coils have no voltage.	1. Check voltage available to toggle switch and lift coils.
	2. Faulty cylinder.	2. Possibly plugged lines, cylinder ports or damaged cylinder packings. Inspect, repair or replace cylinder.
	3. Faulty relay.	3. Check and replace as required.
	4. Main relief pressure setting too low.	4. Readjust pressure.
	5. Faulty diode (open circuit)	5. Check diode.
	6. Emergency hand pump.	6. Disengage hand pump.
	7. No/low voltage at valve(s).	7. Check battery charge.
	8. Faulty Lift Enable (SV7) valve.	8. Check that valve is operative.
• No lower function.	• Electrical problem.	• Operate manual hand pump. If machine lowers, problem is electrical.
	• Toggle switch or lower/ lock coils have no voltage.	• Check voltage available to toggle switch and lower/ lock valve coils.
	• Lower/ lock valve faulty.	• With platform fully down, remove, inspect, or clean.

TROUBLESHOOTING CHART (CONTINUED)

Problem	Probable Cause	Solution
• Abrupt start or stop.	• Cushion cylinder.	• Check cushion cylinder for piston seal leakage. Repair as necessary.
• Parking brake doesn't release.	• Brake release shuttle not sealing.	• Replace brake shuttle release valve.
	• Brake cylinder piston seal leaking.	• Check brake cylinder for piston seal leakage. Replace as necessary.
• Parking brake doesn't engage.	• Brake release needle valve is closed.	• Adjust brake needle valve.
	• Brake cylinder spring failure.	• Check brake cylinder for broken spring. Repair or replace as necessary.

SECTION 6:
MAINTENANCE SCHEDULE

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MAINTENANCE SCHEDULE

The control system is designed to require a minimum amount of maintenance. However, it is essential that the specified services be performed at the indicated intervals, and that the instructions contained in this manual are followed to ensure safety and reliability.

⚠ DANGER

DEATH OR SERVERE INJURY MAY RESULT IF MACHINE OPERATED IN AN UNSAFE CONDITION. DO NOT OPERATE ANY MACHINE IF UNSAFE OPERATING CONDITION.

GENERAL MAINTENANCE TIPS

- ALWAYS clean the surrounding area before opening hydraulic components.
- Never open a hydraulic system when there are contaminants in the air.
- Never leave components or hoses open. They must be protected from contamination (including rain) at all times.
- Use only recommended lubricants (see Lubrication Chart in front of this machine). Improper lubricants or incompatible lubricants may be as harmful as no lubrication.
- Watch for makeshift "fixes", which can jeapordize safety as well as lead to more costly repairs.
- Any work platform found not to be in safe operating condition should be removed from service until repaired. All repairs should be made by authorized personnel in conformance with the manufacturer's operating, maintenance, and repair manuals.

FIRST THREE MONTHS OF OPERATION

As with any new machine, minor fluid leaks may occur until the various hydraulic components and pipe fittings are fully seated.

It is particularly important that, for the first three months of operation, all hydraulic components, hoses and pipe fittings be checked regularly for leaks and tightness, and corrective action taken as required.

Correction of minor fluid leaks and general tightening of machine components during this initial period are not considered as reimbursible expenses under the Terex Limited Warranty.

The hydraulic pump, electric motor, cylinders and pressure valves are self-lubricating.

ROUTINE SERVICING

NOTE: The following recommendations are based on advice of suppliers, and the requirements of various safety regulations. They should be followed with discretion based on factors such as amount and type of machine usage, environmental conditions, and local safety regulations.

IMPORTANT: Make certain that the unit is inspected per the operational checklists at the end of this section.

DAILY SERVICE

Hydraulic System

Before checking the hydraulic fluid level, ensure that the machine booms are stowed in the traveling position, and the machine is standing on level ground. Fluid level must be to full mark on sight gauge, located on the side of tank. Refer to Lubrication Chart for correct grade of hydraulic fluid.

After checking the hydraulic fluid level, ensure that the filler cap is secure to prevent entry of water or other impurities into the tank.

Tire Condition

Check that the tires are not damaged and the tires have the correct tire pressure.

Platform Rails and Safety Gate

Check security of platform top rail and safety gate.

Steering

Check the steering cylinder for fluid leakage. Inspect steering linkage for signs of wear.

Pivot Pins

Examine all pivot pins on booms and cylinders to ensure that they are positively secured in position.

Test All Machine Systems

Test the operation of the drive assembly, including drive motor and steering.

Test the operation of all machine boom functions.

Checklist

Perform all items on the Shift Checklist found later in this section.

WEEKLY SERVICE

Hydraulic System

Pressurize the hydraulic circuit and inspect the system for any signs of leakage, particularly at flexible hoses, connections and hydraulic components.

Check hydraulic fluid color. If the hydraulic fluid does not flow clear amber, but has a cloudy appearance, it is usually an indication that water is present. A dark brown color, accompanied by a strong "burnt" smell, indicates that the fluid has overheated. If either condition occurs, a complete hydraulic fluid and filter change will be necessary.

The cause of hydraulic fluid deterioration should be investigated and rectified. Have fluid analyzed by a qualified laboratory.

Checklist

Perform all items on the Weekly Checklist found later in this section.

MONTHLY SERVICE

Chassis Bolts

Check all bolts for signs of looseness.

Cylinders

Check all cylinders for hydraulic fluid leakage.

Pivot Pins and Grease Fittings

Lubricate all pivot pins and grease fittings.

Platform Mounting

Check that platform weldments and platform frame members are in good condition.

Checklist

Perform all items on the Monthly Checklist found later in this section.

SEMI-ANNUAL SERVICE

Boom Cylinders

Fully retract, then extend the boom lift cylinder. At each extreme position, check that there is no movement between cylinder rod and bearing housing, or between cylinder cap and tube.

Checklist

Perform all items on the Semi-Annual Checklist found later in this section.

ANNUAL SERVICE

Flexible Hoses

Inspect all hoses over their complete length. Replace any hoses showing looseness or corrosion at the end fittings. Replace hoses exhibiting cracking, blistering or excessive wear of outer protective covering.

Hydraulic Fluid

If the hydraulic system has been properly maintained, the fluid should only need to be changed once each year. This, of course, will depend on machine application, amount of use, temperature, atmospheric conditions and other factors.

Hydraulic Fluid Tank

Carefully check the condition of the fluid inside the tank to ensure that it flows easily and is of clear, amber color. In cases of gross contamination, it will be necessary to completely drain and refill the entire hydraulic system.

Place a suitable waste oil container under the drain tap, or attach a suitable hose from the drain tap to the container.

Open the drain tap, and completely drain the fluid from the tank.

Clean or replace the suction hose, and close the drain tap. Refill the tank to the correct level.

Structural Examination

A thorough examination of the machine should be carried out for signs of corrosion, misalignment, material fractures, and other damage. Particular attention should be given to the condition of welded joints.

FOUR YEAR INTERVAL SERVICE

Pivot Pins and Bearings

Remove the pivot pins for examination. Check the pivot pin bearings with the pivot pins removed. Replace with the correct type of pins and bearings, as necessary.

SHIFT OPERATIONAL CHECKLIST

All checks must be completed before operation of the aerial lift.

DATE _____ **INSPECTED BY** _____

MODEL NUMBER _____ **SERIAL NUMBER** _____

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your aerial lift clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT THE BEGINNING OF EACH SHIFT. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform a visual inspection of all machine components, i.e. missing parts, torn or loose hoses, hydraulic fluid leaks, torn or disconnected wires, damaged tires etc. Replace components as necessary. The module covers on both sides can be opened to inspect components inside.
_____	2. Check battery charge level and connections.
_____	3. Check hydraulic fluid level with the unit in stowed position.
_____	4. Check tires for damage.
_____	5. Check hoses and cables for worn areas.
_____	6. Check platform rails and safety chains for damage.

Continued on following page . . .

SHIFT OPERATIONAL CHECKLIST (CONTINUED)

INITIAL	DESCRIPTION
_____	7. Check pivot pins for security.
_____	8. Check that all warning and instructional labels are legible and secure.

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
_____	9. Check hydraulic system for leakage after every eight (8) hours of operation.

WEEKLY OPERATIONAL CHECKLIST

All checks must be completed before operation of the aerial lift.

DATE _____ INSPECTED BY _____

MODEL NUMBER _____ SERIAL NUMBER _____

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your aerial lift clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED WEEKLY. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Shift Operational Checklist.
_____	2. Check battery electrolyte level and specific gravity (fully charged specific gravity should be 1.265).
_____	3. Check wheel lug nuts for proper torque (65-70 ft. lbs.).

ADDITIONAL MAINTENANCE REQUIREMENTS FOR SEVERE USAGE APPLICATIONS

INITIAL	DESCRIPTION
_____	4. Inspect condition of hydraulic fluid in the reservoir. Oil should have a clear amber color.
_____	5. Lubricate all grease fittings (see Lubrication Chart).
_____	6. Lubricate all steering linkages and pivot points.

MONTHLY OPERATIONAL CHECKLIST

DATE _____ **INSPECTED BY** _____

MODEL NUMBER _____ **SERIAL NUMBER** _____

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your aerial lift clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED MONTHLY. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Shift and Weekly Operational Checklists.
_____	2. Lubricate all grease fittings (see Lubrication Chart).
_____	3. Lubricate all steering linkages and pivot points.
_____	4. Lubricate deck extension roller surfaces (if so equipped).
_____	5. Inspect condition of hydraulic fluid in the reservoir. Oil should have a clear amber color.
_____	6. Inspect the entire machine for signs of damage, broken welds, loose bolts, improper or makeshift repairs.
_____	7. Check the electric motor brushes.
_____	8. Check pin joints and retaining bolts for security.
_____	9. Check hydraulic system pressure.
_____	10. Check left and right spindles for free turning with no end play.
_____	11. Visually inspect power wheel mounting bolts. Bolts should be flush to retainer, with no gap between retainer and hub flange. (Refer to "Machine Specifications" for torque value.)

SEMI - ANNUAL OPERATIONAL CHECKLIST

DATE _____ **INSPECTED BY** _____

MODEL NUMBER _____ **SERIAL NUMBER** _____

GENERAL INFORMATION

1. Keep inspection records up-to-date.
2. Record and report all discrepancies to your supervisor.
3. A dirty machine cannot be properly inspected.
   Keep your aerial lift clean!!

⚠WARNING

THIS CHECKLIST MUST BE USED AT SIX MONTH INTERVALS. FAILURE TO DO SO COULD ENDANGER THE LIFE OF THE OPERATOR. ALWAYS REMEMBER, A LITTLE PREVENTIVE MAINTENANCE CAN SAVE MUCH MORE THAN IT COSTS.

INITIAL	DESCRIPTION
_____	1. Perform all checks listed on Shift, Weekly and Monthly Operational Checklist.
_____	2. Have hydraulic fluid sample analyzed at a test laboratory. Comply with test results and recommendations to ensure long, trouble free operation.

IMPORTANT: If hydraulic fluid has been regularly maintained, it should only require changing once every year, depending on maintenance, temperature, application, duty cycle, and atmospheric conditions.

_____	3. Check tightness of platform frame and linkage pins.
_____	4. Check overall platform stability.
_____	5. Check the electrical mounting and hardware connections for security.
_____	6. Replace return filter element.
_____	7. Repack front wheel bearings.

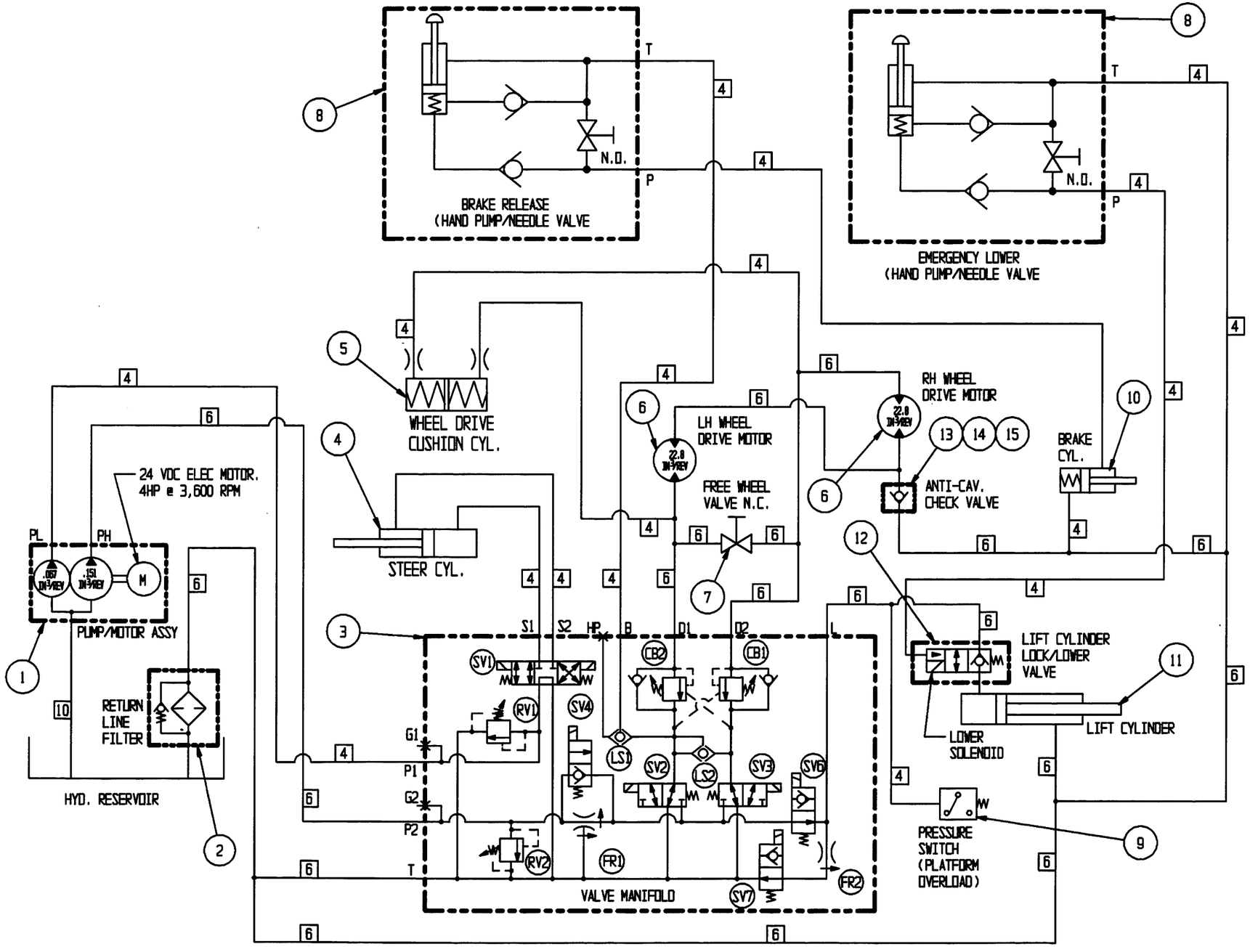
APPENDIX

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Hydraulic Schematic

Electric Schematic

APPENDIX



BILL OF MATERIAL			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	01244200	PUMP/MOTOR ASSEMBLY
2	1	01081500	FILTER, RETURN LINE
3	1	01249800	VALVE, MANIFOLD ASSEMBLY
4	1	04034300	CYLINDER, HYDRAULIC, STEERING
5	1	04033800	CYLINDER, HYDRAULIC, CUSHION WHEEL DRIVE
6	2	01097300	MOTOR, HYDRAULIC, 22.8in³/REV.
7	1	01107800	BALL VALVE, HIGH PRESSURE
8	2	01209800	HAND PUMP, NEEDLE VALVE
9	1	01081300	HYDRAULIC PRESSURE SWITCH
10	1	04037600	BRAKE CYLINDER
11	1	04037500	CYLINDER, HYDRAULIC, BOOM LIFT
12	1	01222400	VALVE, LOCK/LOWER, SOL./HYD CONTROL
14	1	B-2310710	BODY, ANTI-CAV. CHECK VALVE
15	1	01013801	BALL, CHECK VALVE
16	1	B-2312620	HYDRAULIC, FITTING MODIFIED

KEY-LINE SIZES

4	1/4" I.D. HOSE
6	3/8" I.D. HOSE
8	1/2" I.D. HOSE
10	5/8" I.D. HOSE

COMPONENT LIST FOR MANIFOLD

CB1 & CB2	COUNTERBALANCE VALVE SET @ 3,700 P.S.I.
FR1	FLOW CONTROL VALVE W/BYPASS, .8 G.P.M. MAX. FLOW
FR2	FLOW CONTROL VALVE, 2.8 G.P.M. MAX. FLOW
LS1 & LS2	SHUTTLE VALVE
RV1	RELIEF VALVE, STEER SET @ 1,500 P.S.I.
RV2	RELIEF VALVE, WHEEL DRIVE/LIFT SET @ 2,900 P.S.I.
SV1	VALVE, DIRECTIONAL, STEER
SV2 & SV3	VALVE DIRECTIONAL, WHEEL DRIVE
SV4	VALVE DIRECTIONAL, HIGH SPEED LIFT & DRIVE
SV6	VALVE DIRECTIONAL, DRIVE
SV7	VALVE DIRECTIONAL, LIFT (UP)

REF:TV-20 TOMEN CORP., JAPAN

REV	BY	DATE	DESCRIPTION
REL	JNF	2-6-98	ECN-3307
			DO NOT SCALE PRINT

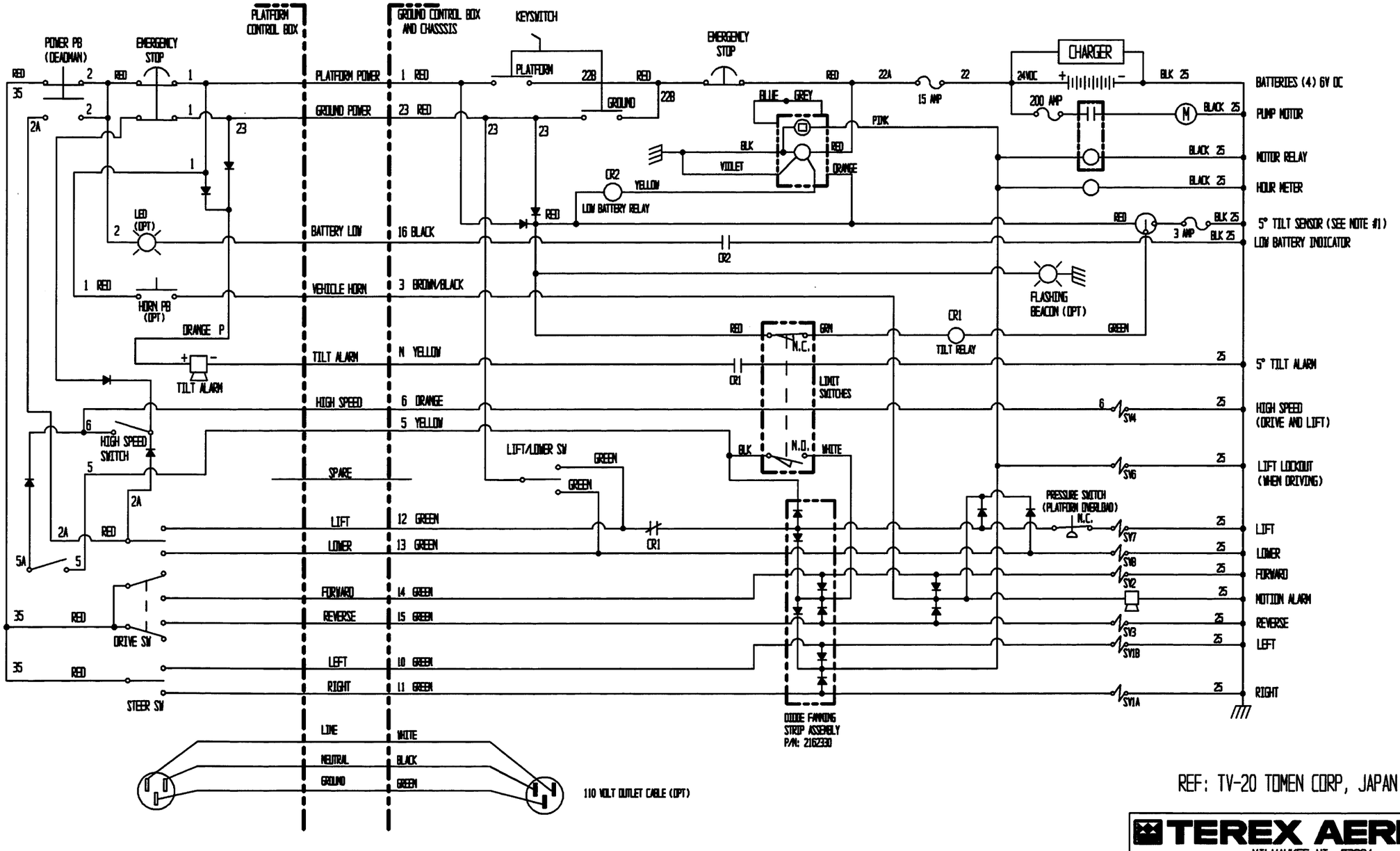
TEREX AERIALS
MILWAUKEE, WI. 53224

TITLE: HYDRAULIC, SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
1:2	JNF	2-6-98	JTH	JTH	D-2378740

ALL WORK MUST BE IN ACCORDANCE WITH A.N.S.I. STANDARDS B.3.1-1982,B.11.1-81 OR B30.5-68
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REF: TV-20 TOMEN CORP, JAPAN

NOTE #1: SCHEMATIC SHOWN WITH POWER COMPONENTS SENSOR P/N LS36-04.5L202 TEREX P/N: 03487100

REV	BY	DATE	DESCRIPTION
REL	JMF	2-16-98	ECN-3313

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TEREX AERIALS
MILWAUKEE, WI. 53224

TITLE: ELECTRIC SCHEMATIC

CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
1:1	JMF	2-16-98	JTH	JTH	C-2378770

IMPLIED TOLERANCE	
X.X	± .1
X.XX	± .05
X.XXX	± .015
FRACTIONAL	± 1/8
ANGULAR	± 0.5 deg.