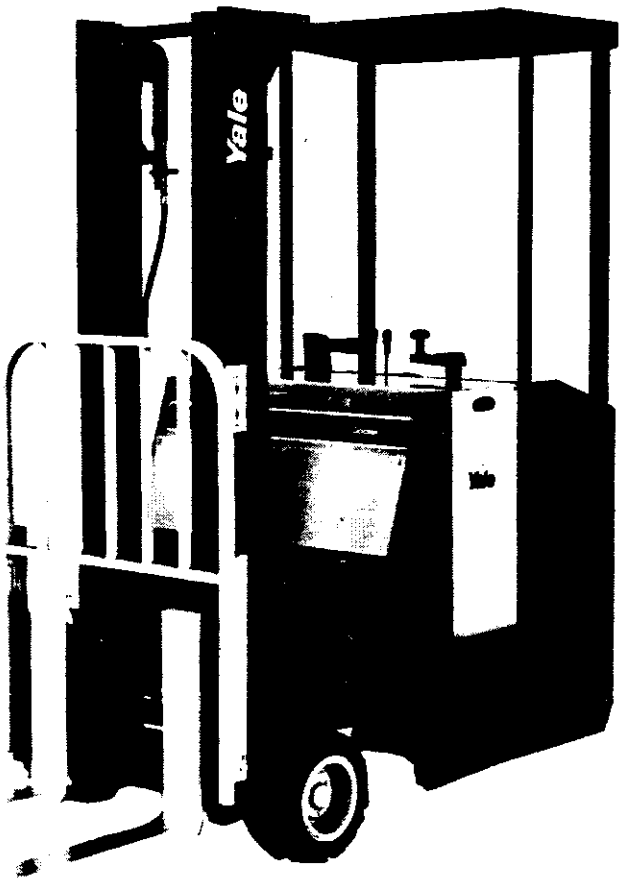
SERVICE MAINTENANCE MANUAL

For Model

ESC-AB

2000, 2500 & 3000 Lb. Capacity



For Service & Parts—Contact

Authorized Dealer

Yale Materials Handling Corp.
1400 Sullivan Drive
Caller No. 12011
Greenville, NC 27834-2011

ITD-1432 ©September 1986

A

Yale
Industrial Trucks

MODEL NOMENCLATURE

E	S	C	0	3	0	A	B	N	2	4	S	V	0	8	3

POWER
E — Electric

TYPE
S — Stand-up Control

TIRES
C — Cushion

RATED CAPACITY
020 — 2000 Lbs.
025 — 2500 Lbs.
030 — 3000 Lbs.

SPECIAL DESIGNATION
(As Assigned)

DESIGN SERIES
A — B — C Etc.

MAST OVERALL HEIGHT
(In Inches)

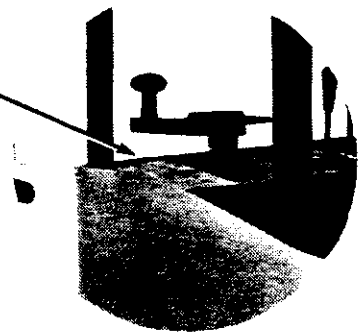
MAST TYPE
V—Simplex
F — Duplex
E — Triplex

CONTROL
S — SCR

VOLTAGE
24

MFG. SOURCE
North America

CAPACITY PLATE LOCATION
SERIAL NUMBER LOCATION
Example — N123456



INDEX

INDEX

Yale
Industrial Trucks

This Maintenance Manual is divided into the major sections listed below. Quick reference to these sections can be made by placing the right thumb on the tab of the desired section and bending the book back to the corresponding tab.

SECTIONS

* Refer to Service Publication ITD 1414 for maintenance information on the mast assembly.

Yale
Industrial Trucks

1	GENERAL TRUCK & LUBRICATION

OPERATOR PRECHECKS AND INSPECTION

It is the operator's responsibility to carry out the following checks and inspections before beginning truck operations.

Do not operate truck if it is in need of repair. If it is in an unsafe condition, or if it might contribute to an unsafe condition, remove the key and report the condition to the proper authority. If the truck becomes unsafe in any way while you are operating it, STOP operating the truck and report the matter immediately to the proper authority.

1. Make sure overhead guard, load backrest extension, and any other safety devices are attached.
2. Make sure all capacity, safety, and warning plates or decals are attached.
3. Inspect truck for any damage that might have occurred during the previous shift.
4. Inspect truck both before and after operating truck, for any signs of external leaking; battery, steering system, or hydraulic system.
5. Operate service and parking brakes, all hydraulic controls (hoist, tilt, and auxiliary, if equipped), accelerator, shifting linkages and steering system. Make sure they operate freely and return to their proper positions.
6. Inspect condition of tires.
7. Inspect forks. Make sure they are properly attached and locking clips are locked in their proper position.
8. Test horn, lights, and all other accessories. Make sure they are properly mounted and in good working order.
9. Operate truck and make sure all gauges and meters are functioning properly.
10. Make sure any unusual noises are investigated immediately.

SHUTDOWN PROCEDURE

When leaving truck unattended, lifting mechanism shall be fully lowered, controls neutralized, power shut off, brakes set, key removed and battery connector disconnected. Block wheels if truck is parked on an incline.

DANGER **WARNING** **CAUTION**

These symbols are used in all Yale service literature to indicate that special care must be exercised by mechanics before attempting repairs or adjustments. This special care is safety related and must be adhered to in order to insure the safety of all personnel. Our manuals describe the safe way to perform maintenance on our trucks.

CAUTION: Before operating this truck read and observe safety information in your Yale operating instruction booklet. Your Yale truck as manufactured meets all the applicable mandatory requirements of ANSI B56.1-1983 Part III Safety Standard. All Standard Trucks conform to the Underwriters' Laboratories requirements for the type designation shown on the capacity plate.

No additions, omissions or modifications should be made that will affect compliance to the above requirements or in any way minimize the effectiveness of the safety devices.

The following instructions have been prepared for your safety and the safety of your fellow workers during maintenance operations and should be strictly followed. Carefully read and understand each one, and read the maintenance procedures before attempting to repair the truck. When in doubt about any maintenance procedure, contact your local Yale dealer.

CAUTION: If this truck is to be operated closer than 1 meter to equipment transmitting in the frequency range of 25 KHz to 150 MHZ, or if the transmitter power exceeds 5 watts, additional electromagnetic shielding may be required on the truck to prevent interference with the traction control operation.

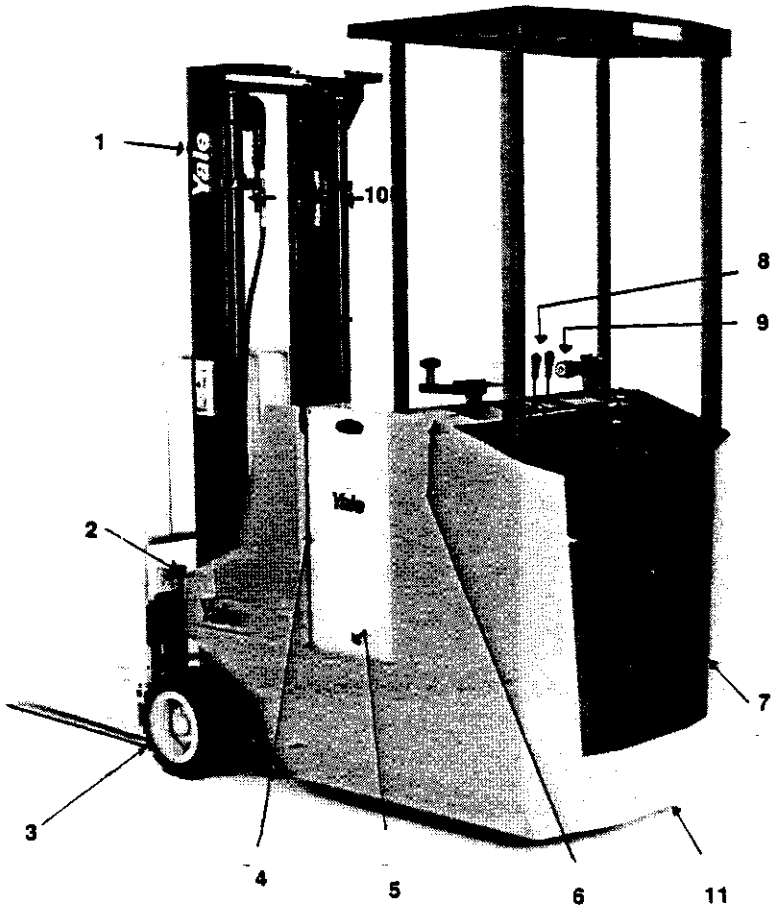


Figure 1-1 — General Truck

ITEM	DESCRIPTION
1	High-Visibility Mast Assembly
2	Carriage Assembly
3	Load Wheels
4	Battery
5	Battery Compartment
6	Steer Handle
7	Operator's Compartment
8	Tilt and Auxiliary Handles
9	Hoist and Drive Controller
10	Lift Cylinders
11	Drive and Steer Wheel

COMPONENT REMOVAL

Load Backrest

a. Remove hex head screws on side of load backrest.

b. Lift load backrest up and off carriage assembly.

Load Forks

a. Lift lock pin and slide forks one at a time to center of carriage.

b. Tilt up toe of fork and place block under heel.

c. Push down on toe and fork should lift off of carriage.

Overhead Canopy Guard

a. Attach overhead hoist to overhead guard.

b. Remove hex head bolts on rear canopy legs and hex head bolts and nuts on front canopy legs.

c. Lift canopy up and off of truck.

Counterweight

On the ESC-A, counterweights are part of the frame — and need not be removed.

Battery

a. Disconnect battery plug.

b. Attach overhead hoist and a proper battery lifter to battery.*

c. Lift up and slide out of battery compartment.

* If truck is so equipped, battery may be rolled out of compartment.

COMPONENTS

Controls

Forward, reverse, speed, lift, and lower controls are conveniently contained in a single controller handle. The tilt handle is also located within inches for fingertip control. All controls are easily operated even while wearing work gloves.

Electrical Wiring

Plug-in wiring harnesses help eliminate shorts, and simplify maintenance.

Load Wheels

The large polyurethane or rubber load wheels provide a greater load-bearing surface than most other trucks on the market.

Forks

The forks are fabricated from heavy gauge steel and are designed for easy entry and exit from under loads.

Drive Unit

The class "H" insulated drive unit does not use belts or chains to transfer torque to the drive wheel. The unit is gear-driven and is cradled in a 72-ball bearing race.

Components General

Contactors, lift pump, and other components are mounted on a frame plate within the compartment located in front of the battery for easier maintenance.

SYSTEMS IDENTIFICATION

Each truck consists of seven systems that power and control truck operation.

- Electrical System
- Drive Unit
- Brake System
- Control Handle Assembly
- Mast Assembly and Load Wheels
- Hydraulic System
- Battery and Charging System

The systems are described as follows:

Electrical System

The electrical system operates every system and function on the truck — travel, lifting, and tilting. Electrical power to the drive motor is controlled by a Cableform Super PC-8 SCR system.

Drive Unit

The drive unit generates the power needed to propel the truck through all speeds.

Brake System

The brake components mounted on the drive unit and in each load wheel provide the braking power needed to stop truck motion.

Control Handle Assembly

The handle contains the control switches and is used during all operations.

Mast Assembly and Load Wheels

The mast carriage and uprights transfer hydraulic lift cylinder movement to the forks (lift or lower). The load wheels support the load.

Hydraulic System

The hydraulic system generates the hydraulic pressure needed to operate the lift and tilt cylinders. A separate hydraulic system operates the power steer system.

Battery and Charging System

The storage battery supplies the electrical power needed to operate all switches, controls, and motors on the truck. The charging system is used to recharge the batteries after prolonged use.

GENERAL MAINTENANCE

Read and observe the following before performing any maintenance procedure.

WARNING

1. Be certain to refer to description of parts on all illustrations to avoid the possibility of stripping threads when replacing screws, studs or nuts.
2. For all torque specifications, unless otherwise listed, refer to the Torque Specifications Charts on Page 1-12 to 1-14 of this manual.
3. This electric-powered industrial truck may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel, and procedures should be provided.
4. Refer to the Recommended Schedule of Maintenance found on Page 1-9 to 1-11 of this manual when inspecting and servicing these trucks.
5. The work area should be properly ventilated. Keep shop clean and floor dry.

6. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect the truck.

7. Brakes, steering mechanism, control mechanism, warning devices, lift and speed limit devices, and guards and safety devices should be inspected regularly and maintained in a safe operating condition.

8. Before performing any maintenance procedure, raise the drive wheel off the floor and support it in this position using chocks or other positive truck positioning devices. When applicable, the battery should also be disconnected.

9. The hydraulic system should be inspected regularly and maintained in conformance with good practice. Hoist cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.

10. When working on hydraulic system components, turn off power to the truck, and ensure that the lift cylinder is in its lowered position and that hydraulic pressure has been relieved in hoses and tubes.

11. Before removing any component from the truck make sure that the lifting mechanism (hoist) and slings used to remove it are of the proper capacity and in good condition.

12. The truck should be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

13. Capacity, operation, and maintenance instruction plates, tags, and decals should be maintained in legible condition.

14. Operation to check performance of the truck should be conducted in an authorized, safe clearance area.

15. Always use Yale replacement parts in order to ensure interchangeability and component quality.

16. Avoid fire hazards and have fire protection equipment present when performing maintenance on these trucks. Do not use an open flame when checking battery level or when checking for electrolyte leakage. Do not use open pans of fuel or flammable cleaning fluids when cleaning parts.

17. All lift mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.

18. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure continued serviceability.

19. Modifications and additions that affect capacity and safe truck operation should not be performed by the customer or user without the manufacturer's prior written approval. Capacity, operation, and maintenance instruction plates, tags or decals should be changed accordingly.

ASSEMBLY AND DISASSEMBLY OF COVERS AND GENERAL COMPONENTS

Drive Unit Cover

- Disconnect battery
- Remove six screws
- Tilt cover back
- Step down on parking brake pedal
- Lift cover up and out

SCR Control Cover

- Disconnect battery
- Loosen two screws
- Remove cover

Control Handle Covers

- Disconnect battery
- Remove seven trim screws
- Remove control handle links
- Remove four cowl screws
- Remove wires from key switch
- Separate control handle plug
- Separate battery discharge indicator plug
- Remove handle for service

RECOMMENDED SCHEDULE OF MAINTENANCE, ELECTRICAL POWERED TRUCK

Timely care and maintenance, commencing upon delivery and installation by a Yale factory trained mechanic, will insure the maximum service life of your Yale lift truck. The recommendations herein are based on our years of experience in serving your material handling needs for maximum safety, productivity and economy.

We recommend that your lift truck operator perform the daily Safety and Operational checks listed, and have a qualified mechanic correct all discrepancies using genuine Yale or Yale-approved parts. Unusual noises or problems should be reported immediately by the operator to his supervisor.

The Yale WARRANTY STATEMENT covering new trucks is available from your Yale dealer. To maintain your Yale WARRANTY in good standing you must follow this schedule and perform the daily safety and operational checks as well as the maintenance functions outlined herein. If you require a Warranty Repair, you must contact your Yale dealer for Warranty Service during the periods outlined in the Warranty Statement. Your Yale dealer has complete details on what components are covered and the types of repairs that are warrantable. When in doubt about your warranty coverage, contact your dealer.

All new Yale trucks will be provided with a STANDARD PARTS MANUAL through your Yale dealer. Additional STANDARD PARTS MANUALS, SPECIAL PARTS MANUALS, and SERVICE MAINTENANCE MANUALS are also available from your Yale dealer for a nominal charge. For the optimum in professional repair and maintenance, we recommend your Yale dealer's factory trained mechanics for Yale service and a Yale Maintenance Agreement.

NOTE: The Occupational Safety and Health Act (OSHA) requires that the user examine his trucks before each shift to be sure they are in safe working order.

The daily SAFETY AND OPERATIONAL CHECKS listed in this publication are available in pad form at a nominal cost from your Yale dealer.

This recommended schedule of maintenance is based on a clean, average single-shift operation. For unusually dusty air, dirty floors, excessive heat or cold, multi-shift or generally more severe operations, maintenance intervals must be more frequent.

Electric-powered trucks require special emphasis in the maintenance of the battery and the electric motors. The battery, battery compartment, electronic control and drive motors should be kept clean, free of dust and corrosion. All wire connections must be clean and tight. A battery charging and maintenance program should be pursued. Compliance with these requirements will save you money and extend the life of your truck.

CHECKING LIFT TRUCK TRAVEL SPEED

Lift truck travel speed should be checked when a problem with acceleration is suspected.

Published travel speeds are determined by tests conducted on a dry concrete track with trucks in good running condition.

Travel speed for an electric-powered unit is affected by battery charge, motor condition, amp draw, electronic control adjustment, tire type, and condition. All tests for electric trucks are at full battery voltage.

Speed can also be affected by dragging brakes, bad wheel bearings and floor conditions. All of these items must be corrected before testing.

For safety, the load must be securely chained in place, and warning that a speed test is being performed must be placed to alert other personnel at intersection points.

The following is the recommended procedure for checking travel speed for Yale trucks:

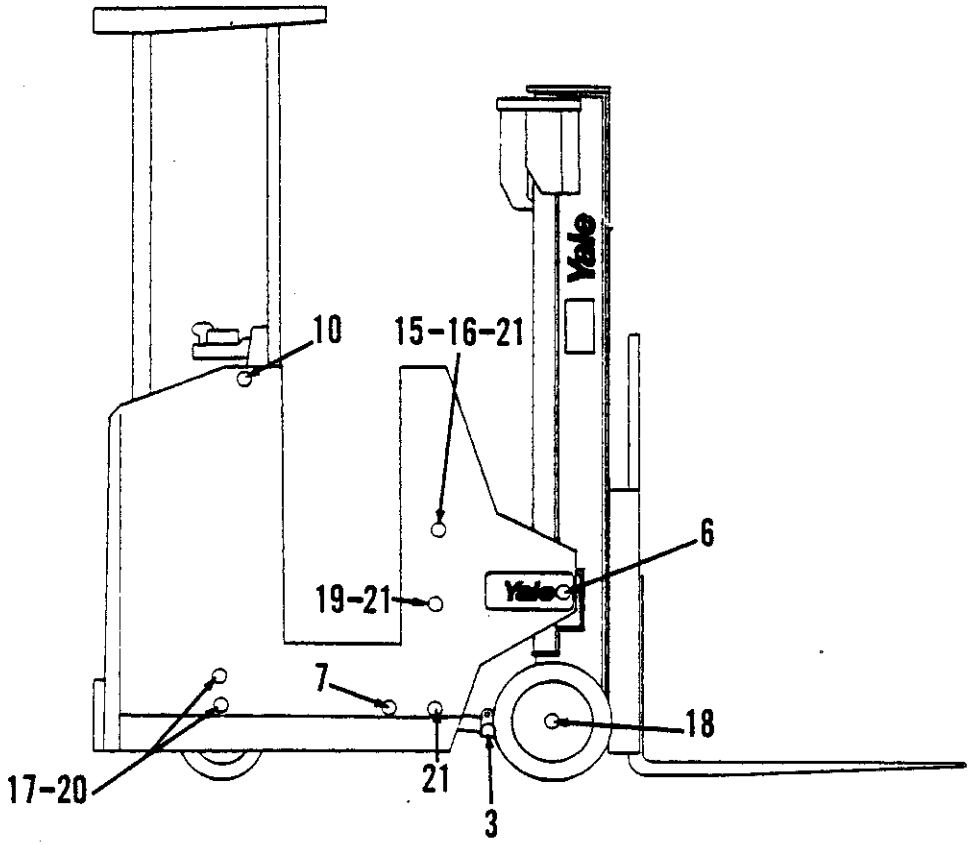
1. Measure distance of 88' (88' is 1/60 of a mile). Allow a running start of 100 feet before start of test, and allow adequate stopping distances.

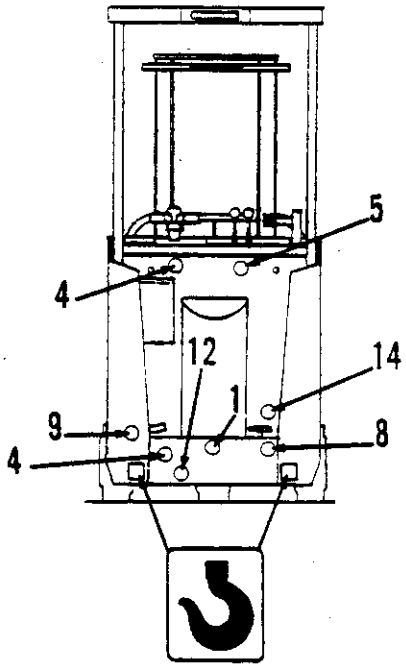
2. Allow the truck to reach full speed before crossing the starting line.
3. Make three (3) round trips empty and three (3) round trips loaded, checking the time with a stop watch or sweep second hand.
4. Average the accumulated times.
5. Divide the number of seconds, in the empty condition, into 60 to obtain the truck speed in M.P.H.
6. Repeat step 5 for loaded condition.
7. Record the following:
   a. Model and Serial number.
   b. Specific gravity of battery (state of charge).
   c. Type of tire — steel, poly, etc. — will affect speed.
   d. Condition of floor.
   e. Average speed loaded (full capacity).
   f. Average speed empty.
   g. Time in seconds empty.
   h. Time in seconds loaded.

SERVICE CHECK

Complete the following service check after initial installation and after maintenance or repairs. All tests are with a rated load in an area clear of potential hazards. Drive carefully and observe all traffic regulations. All unusual noises must be investigated immediately.

General Condition	Visual check.
Brakes	Test for stopping and fluid level.
Gear Noises	Check fluid levels.
Acceleration	Refer to "Checking Travel Speed" at left on this page.
Inching	Check with rated load.
Lifting (hoist)	Check with rated load at 24-inch load center. Raise load and measure downward drift in a 2-minute period: It should not exceed 1 inch. Oil temperature should be approximately 70 degrees F.
Tilt	Check with rated load, mast vertical. The drift should not exceed 1 degree in 2 minutes.
Attachment	Check for proper operation.
Steering	Look for binding or excessive looseness.





(Lift Points)

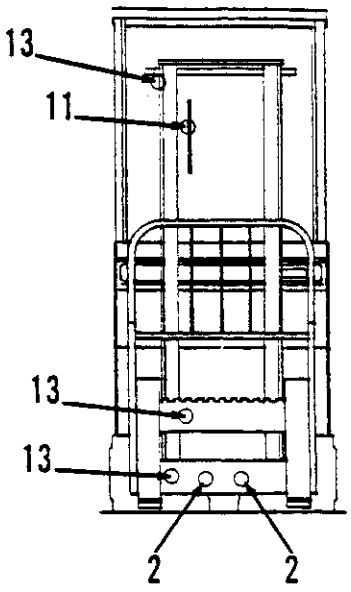


Figure 1-2 — Lube Points

MAINTENANCE SCHEDULE

EVERY 8 HOURS—

Perform all safety and operational checks as outlined in the Recommended Schedule of Maintenance also found in this Section.

Check battery level and add water if necessary to maintain the level that is recommended by the manufacturer. A certain amount of water loss in battery cells is normal. Always replace water at the end of a charge. Use approved tap or distilled water.

EVERY 200 HOURS—

Perform the Service Check shown on previous page.

The following Lubrication instructions are for standard ESC Models. Trucks used for special applications may be equipped with extra lubrication fittings, covers, special oils, etc. Consult your nearest Authorized Yale dealer when servicing these models.

Refer to both the Recommended Schedule of Maintenance Charts and these Lubrication instructions when inspecting, lubricating, and servicing these models. Also, read and observe all safety and operational precautions outlined in this manual before performing any work on this truck.

IMPORTANT: The interval of time referred to in this schedule of lubrication is based on normal operating conditions. If the vehicle is operated in areas of high contamination such as dust, corrosive vapors, etc., the interval of time should be adjusted accordingly.

Refer to the appropriate Lubrication List in this section for the oils and grease that are recommended for use on these models.

Apply lithium base, multi-purpose No. 2 grease with a high pressure gun to the following fittings. Clean lube fittings before and after lubricating.

LOCATION OF LUBE FITTINGS	NO. OF FITTINGS
1. Drive Unit Ring Bearing	4
2. Articulating Chain Anchors—Carriage (when equipped)*	2
3. Tilt Cylinder Rod Ends	1

* When truck is equipped with attachment, apply machine oil with flexible spout at chain end of anchor.

Apply engine oil (SAE 20 or 30) to all friction points of the following with an oil can or spray.

DO NOT OVERLUBRICATE

4. Steering Linkage & Chain
5. Control Valve Linkage
6. Mast Pivot Shaft
7. Tilt Cylinder Pivot Pin
8. Brake Linkage
9. Parking Brake Linkage
10. Controller Linkage
11. Hoist Chains — Wipe off all old oil using a clean cloth, then use compressed air to blow off chains.

    With a clean brush, apply SAE 30 or 40 weight oil to the full length of chain. Oil must penetrate chain joints.

12. Steer Chain — Perform the operation outlined in Step 11.
13. Mast and Carriage Wear Plugs (All Models) — Remove old grease from mast channel and I-Beams. Use a brush to apply a coat of paratac grease with lime or aluminum base to all friction areas.
14. Brake Master Cylinder — Remove rubber boot from reservoir and check fluid level. Proper level is 1/4" from top of reservoir. Use SAE J-1703 hydraulic brake fluid. Capacity is approximately 1 pint (.47 liter).
15. Hydraulic Oil Level — Use the dipstick in the tank to check the hydraulic oil level. Check the oil level when the oil is at normal operating temperature and mast is in lowered position. Check dipstick while filling. DO NOT OVERFILL.

NOTE: After first 200 hours of operation, the hydraulic oil filter must be changed; then every 1200 hours thereafter.

16. Hydraulic Reservoir Breather — Clean breather with a suitable solvent, blow dry with compressed air and reinstall. Replace breather if damaged or if it cannot be cleaned.

EVERY 400 HOURS—

17. Drive Unit — Remove cover. Remove drive unit oil level plug; oil should run out slightly. To add oil, leave oil level plug out. Remove breather in housing top cover. Clean with a suitable solvent and blow dry with compressed air. Replace breather if it cannot be cleaned or is damaged. Add oil into drive unit until oil runs out oil level hole. Replace level plug and breather. DO NOT OVERFILL.

EVERY 1200 HOURS—

18. Wheel Bearings — Remove wheel hubs and bearings. Remove old grease and wash all parts thoroughly with solvent and dry. DO NOT rotate bearings while dry. Repack by forcing lubricant between the rollers and inner race, filling the spaces between the rollers. The wheel hub cavity between the bearing cups should be packed with the same lubricant to a level even with the inner diameter of the bearing cups. Apply a light coat of grease to the spindle and the finished surface on which the oil seal rides. Install the hubs and bearings using the following instructions:

    Tighten the wheel adjusting nut while slowly rotating the wheel until it is tight. Back off adjusting nut (turn counterclockwise) $^{1}/_{16}$ to ¼ turn until slot in locknut lines up with hole in axle shaft. Install cotter pin. Hub should turn freely with .001" to .010" end play.

19. Hydraulic Oil Filter — Remove and discard filter element and install new element. Also, refer to Steps 15 & 16.

EVERY 2400 HOURS—

20. Drive Unit — Remove Cover. Remove drain and oil level plugs to drain oil. Replace drain plug. Remove breather in housing top cover and add flushing oil through breather port. Flush housing and remove drain plug to drain flushing oil. Replace drain plug. Add gear oil through breather port until oil begins to run out oil level hole. Drive unit capacity 1 quart (.95 liter). DO NOT OVERFILL.

21. Hydraulic Oil Tank — Remove drain plug from bottom of tank to drain oil. Perform Steps 16 and 19 before refilling tank. After filling tank, capacity approximately 5.5 gallons (20.8 liters), fully elevate and tilt mast while bringing oil to normal operating temperature. Lower mast and check oil with the dipstick. DO NOT OVERFILL. Refer to Recommended Hydraulic Oil Chart in this section.

LEGEND

A — Every 8 Hours
B — Every 200 Hours
C — Every 400 Hours
D — Every 1200 Hours
E — Every 2400 Hours

X — Visual Inspection, Testing and Adjusting as Required
O — Drain and Refill
R — Replacement
IR — Initial Replacement

SAFETY AND OPERATIONAL CHECKS **Only the 8 hour CHECKS are to be performed by the operator. Have a qualified mechanic correct all discrepancies.**	A	B	C	D	E
Tires — Condition and Pressure (See Note #4)	X				
Overhead Guard — Attached	X				
Load Backrest Extension — Attached	X				
Finger Guards — Attached	X				
Capacity Plate — Attached (Including Attachment Data)	X				
Safety Warnings — Attached (Refer to Parts Manual for Location)	X				
Hour Meter Functioning	X				
Horn	X				
Lights	X				
Shifting Linkage	X				
Accelerator/Controller Linkage	X				
Service Brake	X				
Parking Brake	X				
Steering Operation	X				
Steering (Power) Fluid Level	X				
Hoist and Lowering Control	X				
Tilt Control — Forward and Back	X				
Attachment Control	X				
Mast Operation	X				
Main Hydraulic Tank Level	X				
Hydraulic Leaks — Valves, Hoses, Fittings, Cylinder, etc.	X				
Forks, Top Clip and Heel Condition	X				
Unusual Noises (Must be Investigated Immediately)	X				
Battery Charge and Water Level	X				
Cab (If Equipped) Heater, Defroster, Wipers	X				

LUBRICATION (Blow Off/Clean When Necessary and Inspect For Damage)	A	B	C	D	E
Lubricate Chassis		X			
Lubricate all Linkage		X			
Lubricate Friction Surfaces on Mast and Attachments		X			
Hoist Chains and Anchors: Inspect for Cracks, Elongation, Wear: Measure Chain With Wear Scale and Lubricate Chain Anchors with Oil		X			
Cab — Door Hinges and Locks		X			
Brake Master Cylinder Fluid Level		X			

LUBRICATION (Blow Off/Clean When Necessary and Inspect For Damage) (Continued)	A	B	C	D	E
Intermediate Gear Housing Oil Level		X			O
Differential Gear Oil Level		X			O
Steering Gear Lube Level		X			O
Clean and Repack Wheel Bearings				X	

HYDRAULIC SYSTEM	A	B	C	D	E
Hydraulic Oil Fluid Level (Hoist, Tilt and Power Steer)		X			O
Hydraulic Oil Filter		IR		R	
Hydraulic Tank Breather		X			
Hoist Cylinder for Leaks		X			
Tilt Cylinder for Leaks		X			
Tilt Cylinder Rod End Adjustment/Engagement		X			
Main Hydraulic Pump for Noise and Operation		X			
Power Steer Pump for Noise and Operation		X			
Main Control Valve for Leaks and Operation		X			
Main Relief Valve Setting (Consult Main Control Valve Parts Page)		X			
All Hoses, Tubing and Fittings		X			
Attachment — Operation and Leaks		X			
For General Leaks		X			

MAST — CARRIAGE — PLATFORM — ATTACHMENTS	A	B	C	D	E
Mast and Carriage Safety Stops		X			
Mast Flange Wear		X			
Mast Rollers and Thrust Buttons		X			
Carriage Rollers and Thrust Buttons		X			
Tension Rods — Adjustment/Locknuts		X			
Forks — Pallet — Platform (Visual for Cracks)		X			
Hoist Cylinder Header, Wear Strips and Chain Anchors		X			
Attachments — Check Wear on Sliding and Rotating Parts, Torque all Bolts to Specifications, Oil Chain Anchors			X		
Forks — Fatigue Cracks (See Note #1)					X

DRIVE UNIT	A	B	C	D	E
Service Brake Adjustment		X			
Parking Brake		X			
Brake Drums and Linings			X		
Electric Motor and Drive Train Mounting Bolts			X		
Wheel Bolts — Torque to Specifications			X		
Brake Backing Plate/Slave Cylinder Bolts: Torque			X		
Trunnion Bolts, Mast and Frame (Re-Torque to Specifications or Verify Locking Tab has not Allowed Torqued Bolt to Move)			X		

ELECTRICAL SYSTEM	A	B	C	D	E
Clean all Controls		X			
Interlock Switches		X			
Accelerator Switch and Potentiometer		X			
Electronic Card		X			
Time Delay		X			
Direction Switch		X			
Parking/Seat Switch		X			
Drive Resistor (Magnetic Control)		X			
Valve Hoist and Tilt Switches		X			
All Motors — Clean with Compressed Air		X			
All Motors — Check Brushes and Springs		X			
All Motors — Check Power Wire Terminals		X			
Battery Box and Connectors — Neutralize and Clean		X			
Battery Condition — Physical and Electrical		X			
Charger Operation		X			
All Wire Connections			X		
Contactors — Tips and Wire Connections			X		

GENERAL	A	B	C	D	E
Overhead Guard, Load Backrest Extension — Cracks and Mounting		X			
Capacity Plate — Matches Truck and Attachment		X			
Safety Warnings — All Present and Legible		X			
Steering — King Pins and Knuckles			X		
Drag Links			X		
Ring or Caster Bearings			X		
Tie Rods — Wheel Alignment			X		
Bell Cranks and Steer Chain			X		
All Bolts, Nuts, Cotter Pins, Etc.			X		
Tires — Condition and Pressure (See Note #4)			X		

GENERAL GUIDE TO TORQUE VALUES

Marking		No Mark		3 — Marks		6 — Marks		Socket Head		Flanged — 12 Pt.	
SAE Grade		2		5		8		1960 Series		1936 & 60 Series	
Size	Thd.	Dry	Lub.	Dry	Lub.	Dry	Lub.	Dry	Lub.	Dry	Lub.
1/4"	20	6	4	8	6	12	9	13	10	16	12
1/4"	28	6	5	10	7	14	10	15	11	18	14
5/16"	18	11	8	17	13	25	18	27	20	33	25
5/16"	24	12	9	19	14	25	20	30	22	36	27
3/8"	16	20	15	30	23	45	35	48	36	58	44
3/8"	24	23	17	35	25	50	35	55	41	65	49
7/16"	14	30	24	50	35	70	55	77	58	93	70
7/16"	20	35	25	55	40	80	60	86	65	104	78
1/2"	13	50	35	75	55	110	80	118	89	142	106
1/2"	20	55	40	90	65	120	90	132	99	160	120
9/16"	12	70	55	110	80	150	110	170	127	205	153
9/16"	18	80	60	120	90	170	130	189	141	228	171
5/8"	11	100	75	150	110	220	170	235	176	283	212
5/8"	18	110	85	170	130	240	180	226	200	320	240
3/4"	10	175	130	260	200	380	280	417	313	501	376
3/4"	16	195	145	300	220	420	320	467	350	559	420
7/8"	9	165	125	430	320	600	460	672	504	707	530
7/8"	14	185	140	470	350	660	500	741	562	778	584
1"	8	250	190	640	480	900	680	1006	756	1060	795
1"	12	270	200	700	530	1000	740	1125	833	—	—
1"	14	340	260	750	580	1030	785	1230	883	1190	892
1-1/8"	7	350	270	800	600	1280	960	1283	966	1702	1276
1-1/8"	12	400	300	880	660	1440	1080	1425	1066	1908	1431
1-1/4"	7	500	380	1120	840	1820	1360	1600	1200	2162	1621
1-1/4"	12	550	420	1240	920	2000	1500	1800	1350	2660	1995
1-3/8"	6	660	490	1460	1100	2380	1780	2382	1782	—	—
1-3/8"	12	740	560	1680	1260	2720	2040	2708	2033	—	—
1-1/2"	6	870	650	1940	1460	3160	2360	2800	2100	4177	3133
1-1/2"	12	980	730	2200	1640	3560	2660	3000	2260	4700	3525

NOTES:

1. The term lub includes the application of high stress lubricants to the fastener, and fasteners that are plated with lubrizing cadmium.
2. Dry values include screws that are only lightly oiled, such as, with a rust preventive oil.
3. Torque values shown are minimum. Values 20% higher are permissible.
4. **CAUTION:** Zinc plated fasteners must be torqued to a value approximately 10% higher than the dry value.

GENERAL GUIDE TO TORQUE VALUES

Grade Heading Marking		JIS F4T None		ISO 8.8 — JIS F8T 8.8 or F8T or 8T		ISO 10.9 — JIS F11T 10.9 or F11T or 11T		ISO 12.9 12.9	
Nominal Size	Pitch	Nm Dry	Ft. Lbs. Dry	Nm Dry	Ft. Lbs. Dry	Nm Dry	Ft. Lbs. Dry	Nm Dry	Ft. Lbs. Dry
M4	0.7	—	—	2.9	2	4.1	3	4.9	3.5
M5	0.8	—	—	6	4	8.5	6	10	7
M6	1.0	4.3	3	10	7	14	10	17	12
M8	1.25 1.0	10 10	7 7	25 27	18 20	35 38	25 28	41 45	30 33
M10	1.5 1.25	20 20	14.5 14.5	49 52	35 38	69 73	50 53	83 88	60 64
M12	1.75 1.25	35 35	25 25	86 95	62 69	120 135	87 98	145 160	105 116
M14	2.0 1.5	57 57	41 41	135 150	98 108	190 210	137 152	230 250	166 181
M16	2.0 1.5	88 88	64 64	210 225	152 163	295 315	213 228	355 380	257 275
M18	2.5	—	—	—	—	405	300	—	—
M20	2.5 1.5	172 172	124 124	410 460	297 333	580 640	420 463	690 770	499 557
M24	3.0 2.0	297 297	215 215	710 780	514 564	1000 1100	723 796	1200 1300	868 940
M30	3.5 2.0	591 591	427 427	1450 1600	1049 1157	2000 2250	1447 1627	2400 2700	1736 1953

NOTES:

1. When lubrizing cadmium plated screws are used or high stress lubricants are applied to the fastener, reduce the dry values by approximately 20%.
2. Dry values include screws that are only lightly oiled, such as, with a rust preventive oil.
3. Torque values as shown are standard. Values 20% higher are permissible.
4. **CAUTION:** Zinc plated fasteners must be torqued to a value approximately 10% higher than the dry value.

* RECOMMENDED MAXIMUM TORQUE VALUES FOR HYDRAULIC FITTINGS

* Torque Values Furnished by Air-Way Manufacturing Co., Olivet, Michigan.

JIC FLARED TYPE AND SAE STRAIGHT THD. "O" RING FITTINGS				SWIVEL ADAPTER UNIONS			
		MAX. TORQUE LBS-FT				MAX. TORQUE LBS-FT	
DASH SIZE	THREAD SIZE	SWIVEL NUT	LOCK NUT	DASH SIZE	PIPE SIZE	FEMALE PIPE	MALE PIPE
-2	5/16" - 24	6	6	-2	1/8" - 27	13	12
-3	3/8" - 24	6	6	—	———	—	—
-4	7/16" - 20	10	8	-4	1/4" - 18	20	25
-5	1/2" - 20	15	10	—	———	—	—
-6	9/16" - 18	20	13	-6	3/8" - 18	25	40
-8	3/4" - 16	30	21	-8	1/2" - 14	47	54
-10	7/8" - 14	40	33	—	———	—	—
-12	1-1/16" - 12	70	48	-12	3/4" - 14	84	73
-14	1-3/16" - 12	80	56	—	———	—	—
-16	1-5/16" - 12	90	63	-16	1" - 11-1/2	129	112
—	———	—	—	—	———	—	—
-20	1- 5/8" - 12	120	—	-20	1-1/4" - 11-1/2	152	154
-24	1- 7/8" - 12	131	—	-24	1-1/2" - 11-1/2	152	211
-32	2- 1/2" - 12	300	—	-32	2" - 11-1/2	300	300

NOTE: Values shown are for zinc plated fittings. Values for cadmium plated fittings may vary slightly, but not enough to be of any appreciable difference.


PDF
DOWNLOAD