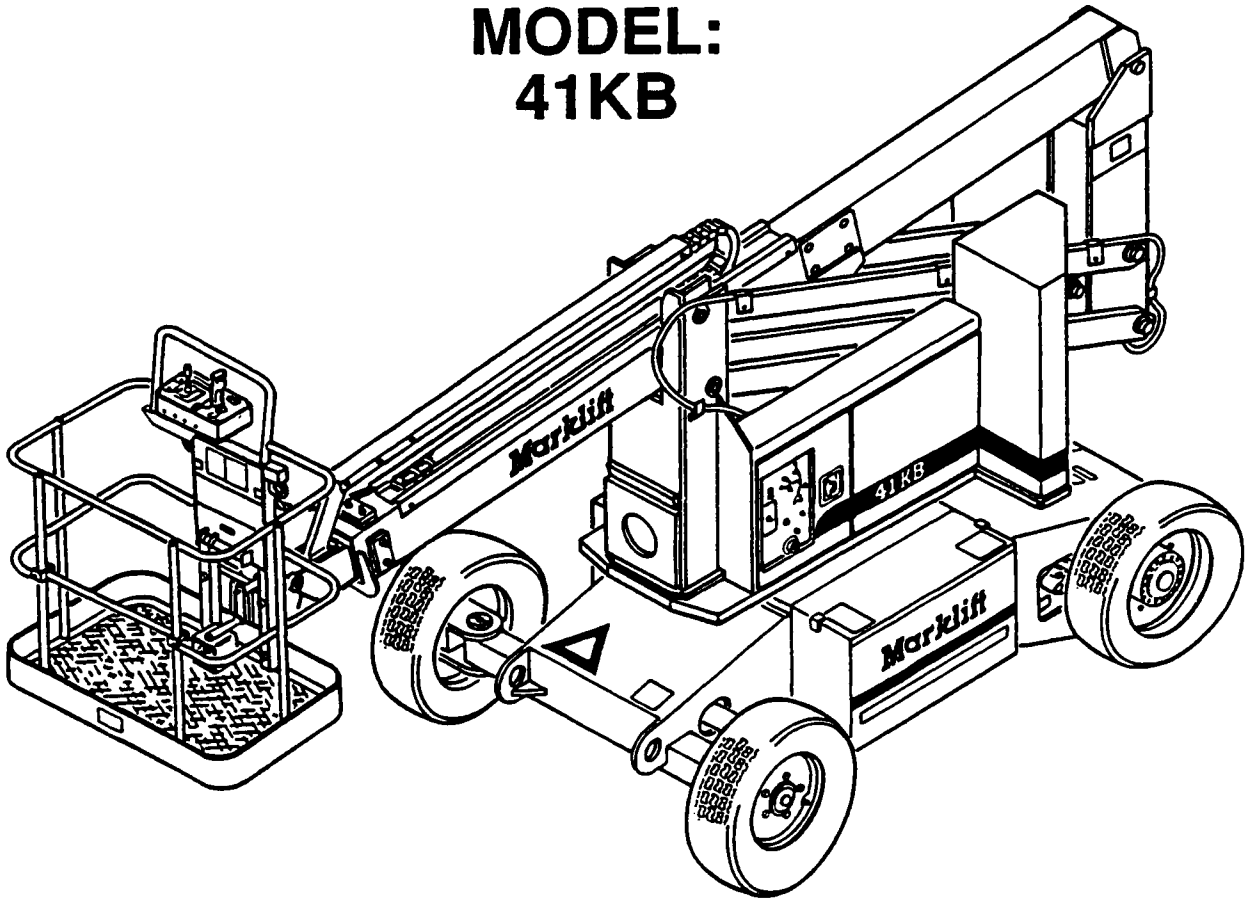
The Marklifts.®

A Product of Mark Industries

SELF-PROPELLED KNUCKLEBOOM OPERATION MAINTENANCE AND PARTS MANUAL

MODEL: 41KB



APRIL 1990

Mark Industries

P.O. Box 2255
Brea, California 92622
205 South Puente Street, Brea, California 92621
(714) 879-6275, FAX (714) 879-8884

17305

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SERVICE BULLETINS

The purpose of this manual is to provide the customer with operation, safety, maintenance and parts information that will enhance the reliable performance of the **MARKLIFT**.

Schematic and vendor information is also furnished. If additional information is needed, we urge the customer to contact the local authorized **MARKLIFT** dealer. If this is impossible, please contact the Mark Industries Customer Service Department at (714) 879-MARK.

WARNING: IMPROPER USE OF THIS MACHINE WILL RESULT IN **SERIOUS INJURY OR DEATH!** TO PROTECT YOURSELF AND THE EQUIPMENT, **STUDY THIS MANUAL BEFORE OPERATING THE MARKLIFT.**

The platform capacity, hydraulic system pressure settings and serial number can be found on the ID plate mounted on the carriage assembly. The serial number should be referenced whenever ordering parts. This will help our parts department give prompt and accurate service.

All **MARKLIFTS** are tested and operated to assure their proper operating condition before shipment. At this time, all necessary adjustments are made and an overall physical inspection is conducted. After the unit is delivered, some minor adjustments and inspections must be made before putting the unit into service. These are outlined in the **INSPECTION AND CHECKOUT** instructions in the operation section of this manual.

MARK INDUSTRIES reserves the right to continually make product and safety improvements. Your participation in implementing such improvements will be required.

Description	Model 41KB
Working Height	47' 0" (14.33m)
Platform Height	41' 0" (12.50m)
Load capacity	500 lbs. (226.8 kg)
Platform dimensions	30" x 48" (.76m x 1.22m)
Platform rotation	Manual - 180 °
Horizontal reach	
centerline rotation	28' 10" (8.80m)
clear reach	25' 11" (7.90m)
Length (stowed)	19' 1" (5.82m)
Width	5' 9" (1.75m)
Height (stowed)	6' 11" (2.11m)
Wheelbase	6' 0" (1.83m)
Tailswing	zero
Turret rotation	350° noncontinuous
Travel speed	0-3.6mph (0-5.80 km/hr)
Controls	
function	Proportional / hydraulic
drive	Proportional / electric
Turning radius	
inside	6' 8" (2.03m)
outside	13' 0" (3.96m)
Tires	8.75 X 16.5 (pneumatic)
Ground clearance	8" (.20m)
Power source	48 volts D. C. (8 @ 6V-350AH)
Weight	14,040 lbs (6369 kg)
Shipping Cube	759.19 cu. ft. (21.5 m^3)

Specifications are nominal and are subject to change due to continuous design improvements.

MANUFACTURERS' LIMITED WARRANTY

Mark Industries makes no warranty, expressed or implied, on any product manufactured or sold by Mark Industries except for the following limited warranty against defect in materials and workmanship on products manufactured by Mark Industries.

> Mark Industries warrants the products manufactured by Mark Industries to be free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment. This limited warranty does not extend to any product of another manufacturer or to any part, component, accessory or attachment not manufactured by Mark Industries. The warranty, if any, with respect to any product of another manufacturer or to any part, component, accessory or attachment not manufactured by Mark Industries is limited to the warranty, if any, extended to Mark Industries by the manufacturer of the other product, part, component, accessory or attachment.

This limited warranty does not extend to any product (or any part or parts on any product) which has been subject to improper use or application, misuse, abuse, operation beyond its rated capacity, repair or maintenance except in accordance with the sales and service manuals and special instructions of Mark Industries, or modification without the prior written authorization of Mark Industries (whether by the substitution of nonapproved parts or otherwise).

The sole obligation and liability of Mark Industries under this limited warranty (and the exclusive remedy for any purchaser, owner or user of Mark Industries products) is limited to the repair or replacement, at the option of Mark Industries, of any product (or any part or parts on any product) manufactured by Mark Industries which, within one (1) year from the date of shipment, shall have been returned to the Mark Industries facility in Brea, California (or any other location within the United States as shall be designated by Mark Industries), at no expense to Mark Industries, and demonstrated to the satisfaction of Mark Industries as being defective in material or workmanship.

To make a claim under this limited warranty, contact Mark Industries or the Mark Industries distributor from whom the product was originally purchased. A statement giving the model and serial number of the allegedly defective product, the date and a description of the alleged defect, the date of the purchase and proof of purchase and purchase date must accompany the returned product (or any part or parts of any product). Any product (or any part or parts of any product) determined by Mark Industries to be defective will be repaired or replaced, at the option of Mark Industries, free of charge, f.o.b. Brea, California. No credit will be given for any allegedly defective product (or any part or parts of any product) not returned to Mark Industries.

There are no other warranties, expressed or implied, in addition to this limited warranty. **This limited warranty is exclusive and in lieu of all other warranties, expressed or implied (in fact or by operation of law or otherwise), including the implied warranties of merchantability and fitness for a particular purpose.**

Mark Industries shall not be liable for any special, indirect or consequential damages. Further, no representation or warranty made by any person, including any representative of Mark Industries, which is inconsistent or in conflict with, or in addition to the terms of the foregoing limited warranty (or the limitations of the liability of Mark Industries as set forth above) shall be binding upon Mark Industries unless reduced to writing and approved by an officer of Mark Industries.

Tires, batteries, filter elements, electrical components are specifically excluded from this limited warranty.

Mark Industries

P. O. Box 2255, Brea, CA 92622-2255
714-879-6275 800-448-MARK
TELEX 194402 FAX 1-714-879-8884

WARRANTY REGISTRATION

Purchaser/Dealer:

Company Name:

Address:

Telephone:

Date shipment received:

Date of invoice:

Date unit put into service:

Unit will be placed into rental fleet:

Unit will be sold:

Unit will be used for:

- ☐ Inspection
- ☐ Mining
- ☐ Welding
- ☐ Construction
- ☐ Scaffolding
- ☐ Mechanical
- ☐ General maintenance
- ☐ Heating/Air conditioning
- ☐ Carpentry
- ☐ Plumbing
- ☐ Electrical
- ☐ Sprinkler
- ☐ Painting/Sandblast
- ☐ Steel fabrication
- ☐ Rigging
- ☐ Roofing
- ☐ Glazing
- ☐ Other

Comments

Inspection completed by: Title:

Warranty will be void unless this inspection report is postmarked to Mark Industries not more than fourteen (14) days from the date shipment is received.

Filling in the Warranty: Please refer to the applicable decals on your machine for the figures and quantities needed to fill in the blanks below (Items 1, 20, 24).

		YES	NO
1.	Platform capacity decal _____ lbs.	☐	☐
2.	All warning, caution and emergency decals installed	☐	☐
3.	Operation instructions properly installed	☐	☐
4.	Operation and safety handbook received	☐	☐
5.	All controls (aerial & ground) are identified and operate correctly	☐	☐
6.	Stop switches operate properly (aerial & ground)	☐	☐
7.	Platform access gate works properly	☐	☐
8.	Horn and beacon operate properly (optional)	☐	☐
9.	Brakes adjusted and operate correctly	☐	☐
10.	Circuit breakers operate properly	☐	☐
11.	All Hydraulic cylinders free of trapped air	☐	☐
12.	All hydraulic cylinder rods free of paint or scratches	☐	☐
13.	Hydraulic pump free of leaks	☐	☐
14.	Hydraulic hoses and fittings free of leaks	☐	☐
15.	Hydraulic oil level	☐	☐
16.	Hydraulic tank and fittings free of leaks	☐	☐
17.	Drive motors free of leaks	☐	☐
18.	Battery water level	☐	☐
19.	System pressure _____ PSI	☐	☐
20.	All electrical connections tight	☐	☐
21.	Manifold valve and fittings free of leaks	☐	☐
23.	Wheel lug nuts torqued to _____ lbs	☐	☐

MODEL	SERIAL NUMBER
INSPECTOR	OPTIONS

When loading and unloading the **MARKLIFT**, it may be necessary to use a combination of winching and driving the boom in low drive speed. **The operator in the basket must wear a safety belt attached with lanyard to the safety rings provided.**

Make sure that the parking brake is adjusted for immediate braking by opening the parking brake control valve. (Seefigure 1.)

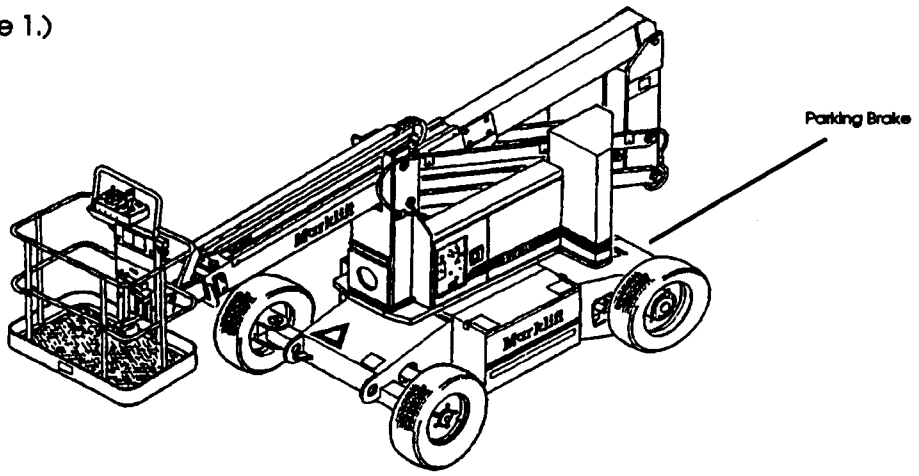


Figure 1: Parking Brake Control Valve

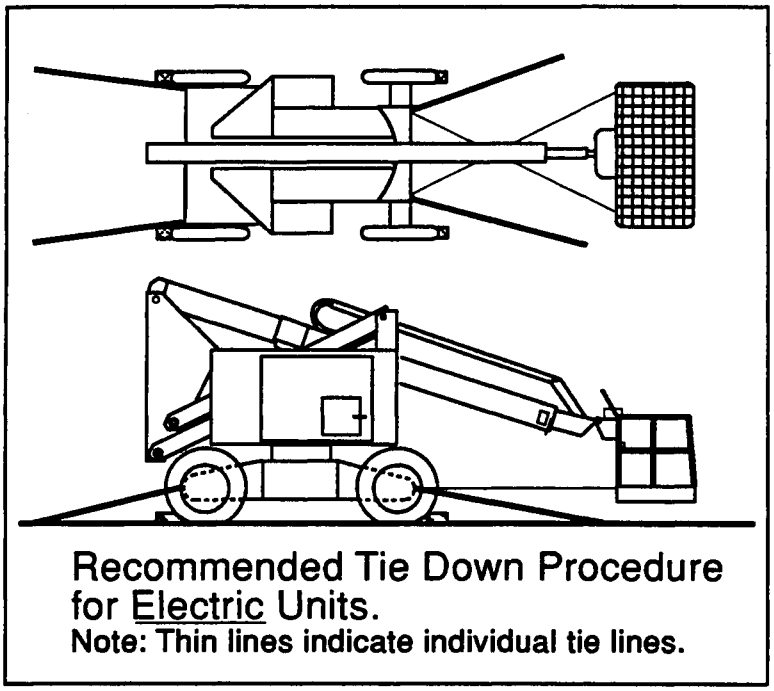
LOADING

1. With the trailer on level ground, align the tires of the **MARKLIFT** with the ramps of the trailer.

2. Attach the winch cable to the unit at the drive wheel end of the base through the tow eye.

3. Exercise great care while driving and steering the unit up the ramp, keeping all slack out of the winch cable. If the ramp is too steep for the unit to climb, the winch will pull the unit up. **You must keep the drive function engaged while winching, otherwise the parking brakes will prevent the wheels from rolling.**

4. When the **MARKLIFT** is on the truck and properly located, chain the unit down as shown in figure 2 of this instruction.



Do not use binders. Individual tie lines can be tensioned by extending the boom or tilting the platform up.

Figure 2: Securing the MARKLIFT to the platform

UNLOADING

1. With the trailer on level ground, disconnect the tie-down chains from the MARKLIFT and make sure that the winch cable is still properly attached to the unit.

2. Use great care while driving and steering the unit off the trailer. Keep all slack out of the winch cable.

Warning:	**Do Not** allow slack in the winch cable when going down the ramp, because of the possibility of snapping the cable should the unit descend the ramp too fast.

3. When all the wheels are on level ground, disconnect the the winch cable from the unit.

4. Re-adjust the boom parking brakes as follows: First, close the needle valve completely. Open the valve approximately 1/8 turn then place the unit on a flat surface, with approximately 20 feet of running space. Position the boom in the cradle and completely retract the boom.

Drive the **MARKLIFT** approximately 15 feet with the controller handle in maximum (full on) position. Release the controller when the wheel passes next to a marker (visual indicator) on the ground. A good slowing and braking distance would be 3 feet measured from the marker to the center line of the same wheel after the unit has completely stopped. Adjust the brake control valve on the parking brakes to achieve this distance.

Warning: Do Not drive on uneven, sloping, or soft terrain that sets the unit in an out-of-level condition.

After the unit is delivered and unloaded, some minor inspections must be made before putting the unit into service. The following must be checked:

For All Units:

1. Visually inspect all exposed parts of the **MARKLIFT.** Secure any loose bolts and nuts. Replace any damaged hydraulic lines or broken wires. Check for any structural damage, including cut or damaged tires.

2. Check hydraulic oil level - sight gauge shows full with unit in stowed position.

3. Check batteries for 1.200 ± 50 reading on the hydrometer. Charge the batteries if the readings are below 1.100. If batteries require water, fill to proper level AFTER charging.

4. Check the hydraulic valve manifolds for leaks, loose fittings or loose wires.

5. Position ground/aerial selector switch to "Ground" then operate boom function switches. Check hoses for leaks.

6. After the ground control functions have been checked out, position the selector switch to "Aerial" for operation at the work platform. After entering the platform, depress the footswitch before using any control function switches. This electrically completes the circuit to the controls.

The **MARKLIFT** conforms to applicable ANSI and OSHA requirements at the time of shipment. Since the safety requirements made by ANSI, OSHA and the various safety boards in your area are subject to change, it is the responsibility of the owner to instruct the operators about all such current requirements.

Every operator of the MARKLIFT must read, understand and follow the safety rules set forth herein. The **MARKLIFT** self-propelled aerial work platform is a personnel lifting device, and it is essential that it be properly maintained and operated to perform all functions with maximum safety and efficiency. The operation of any new and unfamiliar equipment can be hazardous in the hands of untrained operators.

1. Inspect the machine periodically as specified in the Inspection and Checkout, and Preventive Maintenance sections and as required by ANSI, OSHA, local safety boards and the owner. All unsafe items must be corrected by a qualified service technician before use of the machine.

2. Only trained operators must be assigned to operate the **MARKLIFT.**

3. It is the responsibility of the operator to read and understand this manual and to follow all recommendations made.

4. Never exceed manufacturer's recommended platform load capacity. Remember, the load capacity of the **MARKLIFT** is the total combined weight of personnel and tools, fixtures, accessories, etc.

5. Always distribute the load evenly over the platform floor area.

6. It is recommended that head gear (hard hats) be worn by all personnel on the work platform.

7. **The MARKLIFT** platform is equipped with safety belt rings. **Each operator of the MARKLIFT must wear a body belt. The safety belt must be attached with lanyard to the provided anchor points.**

8. **Do Not** change, vary, or alter the equipment in any way.

9. **Do Not** override any hydraulic, mechanical, or electrical safety devices.

10. **Do Not** store loose material in the work platform such as pipe, rope, extension cords, wire or miscellaneous boxes. If necessary to store such items, they must be positioned in such a way that no one will trip over them when operating or working in the platform.

11. **Do Not** work on the platform if your physical condition is such that you feel dizzy or unsteady in any way.

12. The **MARKLIFT** is a non-insulated personnel carrier and must not be operated within 10 feet of a 50,000 volt line. (See Table X, Division of Industrial Safety.)

13. Under no circumstances should horseplay be tolerated on the **MARKLIFT**.

14. **Do Not** operate boom functions in an out-of-level condition.

15. **Do Not** drive on uneven, sloping or soft terrain, unless the boom is fully retracted and below horizontal.

16. **Do Not** drive the carriage or platform into objects.

17. **Do Not** lean over platform rails to perform work.

18. **Do Not** use ladders or scaffolding on the platform to obtain greater height.

19. **Do Not** raise or lower the boom into objects.

20. The **MARKLIFT** structure must not be used as a welding ground. Disconnect both battery leads prior to performing any welding operations.

21. **Do Not** jump start other vehicles using the **MARKLIFT** BATTERY.

TITLE 8 DIVISION OF INDUSTRIAL SAFETY 358.38.113
(Register 73, No. 30—7-28-73)
Article 86. Provisions for Preventing Accidents
Article 86. Provision for Preventing Accidents Due to Proximity to Overhead Lines

2946. Provisions for Preventing Accidents Due to Proximity to Overhead Lines.

(a) **General.** No person, firm, or corporation, or agent of same, shall require or permit any employee to perform any function in proximity to energized high-voltage lines; to enter upon any land, building, or other premises and thereto engage in any excavation, demolition, construction, repair, or other operation; or to erect, install, operate, or store in or upon such premises any tools, machinery, equipment, materials, or structures (including scaffolding, house moving, well drilling, pile driving, or hoisting equipment) unless and until danger from accidental contact with said high-voltage lines has been effectively guarded against.

(b) **Clearances or Safeguards Required.** Except where electrical distribution and transmission lines have been de-energized and visibly grounded or effective barriers have been erected to prevent physical and arcing contacts with the high-voltage lines, the following provisions shall be met:

(1) **Over Lines.** The operation, erection, or handling of tools, machinery, apparatus, supplies, or materials, or any part thereof, over energized high-voltage lines shall be prohibited.

(2) **Equipment and Materials in Use.** The operation, erection, or handling of tools, machinery, equipment, apparatus, materials, or supplies, or any part thereof within the minimum clearances from energized lines set forth in Table X shall be prohibited.

TABLE X
Required Clearances from Overhead High-Voltage Lines

Nominal Voltage (Phase to Phase)				Minimum Required Clearance (Feet)
	750	-	50,000	10
over	50,000	-	75,000	11
over	75,000	-	125,000	13
over	125,000	-	175,000	15
over	175,000	-	250,000	17
over	250,000	-	370,000	21
over	370,000	-	550,000	27
over	550,000	-	1,000,000	42

(3) **TRANSPORTATION OR TRANSIT.** The transportation or transit of any tool, machinery, equipment, or apparatus, or the moving of any house or other building in proximity to overhead high-voltage lines shall be expressly prohibited if at any time during such transportation or transit such tool, machinery, equipment, apparatus, or building, or any part thereof, can come closer to high-voltage lines than the minimum clearances set forth in Table Y.

Article 86. Provisions for Preventing Accidents

Except where the boom of boom-type equipment is lowered and no load is imposed thereon, the equipment in transit shall conform to the minimum required clearances set forth in Table X.

Table Y
Required Clearances from Energized High-Voltage Conductors
(While in Transit)

Nominal Voltage (Phase to Phase)			Minimum Required Clearance (Feet)
750	-	50,000	6
over 50,000	-	345,000	10
over 345,000	-	750,0000	16
over 750,000	-	1,000,000	20

(4) **Storage.** The storage of tools, machinery, equipment, supplies, materials, or apparatus under, by, or near energized high-voltage lines is hereby expressly prohibited if at any time during such handling or other manipulation it is possible to bring such tools, machinery, equipment, supplies materials, or apparatus, or any part thereof, within the minimum required clearances from high-voltage lines as set forth in Table X.

(C) The specified clearance shall not be reduced by movement due to any strains impressed (by attachments or otherwise) upon the structures supporting the high-voltage line or upon any equipment, fixtures, or attachments thereon.

(D) Insulated cage-type boom guards, boom stops, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the required clearances set forth in Table X.

(E) Any overhead conductor shall be considered to be energized unless and until the person owning or operating such line verifies that the line is not energized, and the line is visibly grounded at the work site.

2947. **Warning Signs Required.** The owner, agent, or employer responsible for the operations of equipment shall post and maintain in plain view of the operator and driver on each crane, derrick, power shovel, drilling rig, hay loader, hay stacker, pile driver, or similar apparatus, a durable warning sign legible at 12 feet reading: **"Unlawful To Operate This Equipment Within 10 Feet of High-Voltage Lines of 50,000 Volts or Less."**

In addition to the above wording, the following statement in small lettering shall be provided on the warning sign: **"For Minimum Clearances of High-Voltage Lines in Excess of 50,000 Volts, See Article 86, Title 8, High-Voltage Electrical Safety Orders."**

Marklift Units With Lead Counterweight

If your MARKLIFT has lead counterweights, please refer to OSHA 29 CFR 19.10.1025 for requirements concerning occupational exposure to lead. It is your responsibility to obtain the regulations that pertain to lead usage for your place of employment and for the protection of your employees.

If you are unable to obtain said regulations, you may contact Mark Industries directly for assistance at (714) 879-MARK. You may also contact Mark Industries for a copy of the Material Safety Data Sheet for Lead.

OBSERVE ALL DANGER, WARNING, CAUTION AND EMERGENCY DECALS AT THE VARIOUS LOCATIONS ON THE **MARKLIFT** IN ORDER TO TAKE TIMELY PREVENTIVE AND CORRECTIVE ACTIONS.

> It is the primary responsibility of the user and operator to be thoroughly knowledgeable of all decal information, definition and location.

The following page illustrates a chart in which decals for the **MARKLIFT** are listed. This will enable you to replace the existing decal(s) if they become worn-out, torn, or illegible. It is essential that all decals be in a readable condition for the safe operation of the **MARKLIFT**. It is therefore recommended that they be properly maintained.

Danger, Warning and Caution are used to identify levels of hazard seriousness. Given below is a definition of each term as it applies to the decals:

- Danger (indicated in red):
  Immediate hazards which Will result in severe personal injury or death.

- Warning (indicated in orange):
  Hazards or unsafe practices which Could result in severe personal injury or death.

- Caution (indicated in yellow):
  Hazards or unsafe practices which Could result in minor personal injury or product or property damage.

DANGER, WARNING, EMERGENCY AND CAUTION DECALS

CAUTION

UNLAWFUL TO OPERATE THIS EQUIPMENT WITHIN 10 FEET OF HIGH VOLTAGE LINES UP TO 50,000 VOLTS

REFER TO OPERATING HANDBOOK FOR SAFE DISTANCE AT HIGHER VOLTAGES

CAUTION

STANDARD AERIAL OPERATING PROCEDURE

1. WITH MASTER SWITCH AT GROUND CONTROL STATION TO 'ON' AND SELECTOR SWITCH TO 'AERIAL' ENTER PLATFORM. ATTACH YOUR SAFETY BELT FIRST. THEN START MACHINE. (DO NOT DEPRESS FOOT SWITCH WHEN ATTEMPTING TO START MACHINE)
2. TOGGLE SWITCHES ARE SOLENOID FUNCTIONS AND ARE OPERATED BY DEPRESSING FOOT SWITCH FIRST.

OPERATE ALL PROPORTIONAL FUNCTIONS IN THE FOLLOWING MANNER

A. DEPRESS FOOT SWITCH AND LIFT CONTROLLER LOCKING STEM UPWARD, BEFORE ATTEMPTING TO MOVE HANDLE FORWARD OR BACK.
B. MOVE CONTROLLER HANDLE SLOWLY IN DIRECTION DESIRED.
FUNCTION SPEED WILL RESPOND IN PROPORTION TO AMOUNT OF HANDLE MOVEMENT.

DRIVE AND STEERING DIRECTION, AS INDICATED ON CONTROLS. APPLIES WHEN BOOM IS OVER STEERING WHEELS. THE DIRECTION IS REVERSED, WHEN BOOM IS OVER NON-STEERING WHEELS. (FORWARD TRIANGLE DECALS, ON BASE, ALWAYS INDICATE DRIVE DIRECTION CORRECTLY)

3. THE DRIVE SELECTOR SWITCH, ALLOWS THE MARKLIFT TO TRAVEL AT HIGHER SPEEDS, WHEN THE BOOM IS BELOW HORIZONTAL AND FULLY RETRACTED.

EMERGENCY OVERRIDE

DEPRESS FOOT SWITCH, THEN TURN OR EMERGENCY PUMP TO RESTORE CONTROLS. (IF UNIT IS SO EQUIPPED)
OR – DEPRESS PROPER SWITCH FOR EMERGENCY BOOM DESCENT OR RETRACTION.

IT IS THE OPERATOR'S RESPONSIBILITY TO READ AND UNDERSTAND, THE OPERATION & SAFETY HANDBOOK AND ALL DECALS BEFORE USING THIS MACHINE!

MARK INDUSTRIES

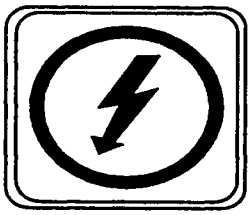
140547

DANGER

ELECTROCUTION HAZARD
KEEP CLEAR

DEATH OR SERIOUS INJURY CAN RESULT FROM CONTACT WITH THIS EQUIPMENT OR VEHICLE IF IT SHOULD BE ELECTRICALLY CHARGED

20419



LOAD CAPACITY 500 LBS.
(EVENLY DISTRIBUTED LOAD)

2022

ATTACH SAFETY BELT

22386

DANGER

AN UNTRAINED OPERATOR
SUBJECTS HIMSELF AND
OTHERS TO

DEATH AND SERIOUS INJURY

YOU MUST NOT OPERATE
THIS "Marklift®" UNLESS
YOU HAVE BEEN TRAINED IN THE SAFE
OPERATION OF THIS MACHINE.

YOU READ, UNDERSTAND AND FOLLOW
1) THE "OPERATION AND SAFETY HANDBOOK"
FOR THIS MODEL.
2) YOUR EMPLOYER'S RULES.
3) APPLICABLE GOVERNMENT REGULATIONS.

YOU INSPECT UNIT AND ALL FUNCTIONS.

181108

DANGER

FAILURE TO OBEY THE FOLLOWING

CAN RESULT IN
DEATH OR SERIOUS INJURY
TO YOU OR OTHERS

- UNLAWFUL TO OPERATE THIS "Marklift®" WITHIN 10 FEET (3.05 METERS) OF HIGH VOLTAGE LINE UP TO 50,000 VOLTS.

VOLTAGE (PHASE TO PHASE)	MINIMUM SAFE APPROACH DISTANCE	
	(FEET)	(METERS)
OVER 50,000 TO 200,000 VOLTS	15	4.60
OVER 200,000 TO 380,000 VOLTS	20	6.10
OVER 380,000 TO 500,000 VOLTS	25	7.62
OVER 500,000 TO 750,000 VOLTS	35	10.67
OVER 750,000 TO 1,000,000 VOLTS	45	13.72

- ATTACH YOUR SAFETY BELT FIRST!
- BE SURE TO USE ALL SAFETY EQUIPMENT AS REQUIRED BY O.S.H.A.
- DO NOT LOAD BEYOND RATED CAPACITY.

181108

DANGER

NO SMOKING OR OPEN FLAMES WHEN CHARGING BATTERY



22449

ATTACH YOUR SAFETY BELT FIRST!

CAUTION OPERATING THIS MACHINE WITHOUT CORRECT SAFETY BELT ATTACHMENT COULD REBULT IN DEATH OR SERIOUS INJURY CAUTION

22385

WARNING

FAILURE TO OBEY THE FOLLOWING CAN RESULT IN

DEATH OR SERIOUS INJURY

- Do not sand, grind, flame cut , brase or weld on lead counterweights or couterweight's dry primer paint without air respirator (NIOSH/MSHA TC-19C), eye protection, gloves, and protective clothing.
- Wash hands and face thoroughly after performing any of the above tasks before eating, drinking or smoking.

183301

WARNING

This counterweight contains pure LEAD, known to the State of California to cause birth defects or other reproductive harm. Wash thoroughly after handling and before eating, drinking or smoking.

DO NOT grind, drill or perform other machining on counterweight unless all requirements of OSHA 29 CFR 1910.1025 are followed. FAILURE TO DO SO CAN CAUSE LEAD POISONING. Refer to the Operation and Maintenance and Parts Manual for copy of OSHA requirements.

183302

GENERAL DECALS
41KB

DECAL P/N	DECAL DESCRIPTION 41KB	ASSEMBLY	QTY
600181	Decal Set	All Standard Decals	1
182747	Upper Control	Upper control panel	1
181766	Tie Down	Final Assembly	1
20462	Forward arrow aft	Final Assembly	1
20896	Brake	Final Assembly	1
140547	Caution aerial operating instructions	Final Assembly	1
22385	Caution attach your safety belt	Final Assembly	1
181103	Danger obey the following	Final Assembly	2
181102	Danger, Do not operate unless...	Final Assembly	2
2022	Load capacity 500 lbs.	Final Assembly	1
140496	Hand pump	Final Assembly	1
140495	Emergency	Final Assembly	1
20410	Logo MARK INDUSTRIES	Final Assembly	1
2017	Hydraulic System Fluid	Final Assembly	1
20461	Forward arrow	Final Assembly	1
22386	"D" Ring attach safety belt	Final Assembly	2
20419	Danger keep clear	Final Assembly	2
22449	No smoking for electrical booms	Final Assembly	2
2003	Battery water level	Final Assembly	2
130820	Operation & Safety handbook	Final Assembly	1
181752	Blue Stipe (41KB)	Final Assembly	1
181754	Blue Stripe (30KB, 41KB)	Final Assembly	1
181755	Standard MARKLIFT (30, 30KBN, 41KB)	Final Assembly	2
181757	R. H. Panel Stripe	Final Assembly	2
181763	Battery charger door stripe (30KB, 41KB)	Final Assembly	1
181759	R. H. Panel Stripe (30KB)	Final Assembly	1
181762	CT' W Stripe (30KB, 41KB)	Final Assembly	2

181765	41KB	Final Assembly	2
183400	Battery Disconnect (30KB, 41KB)	Final Assembly	1
183401	Drive Controller Cover (30KB, 41KB)	Final Assembly	1
181908	Marklift Boom	Final Assembly	2
20661	ANSI Plate A92	Final Assembly	1
20660	Identification Nameplate	Final Assembly	1
182716	Ground Control	Final Assembly	1
183301	Warning failure to obey	Final Assembly	1
183302	Warning, Lead counterweight	Final Assembly	1

OPERATION

The **MARKLIFT** can be operated from either the ground control or aerial control station. To operate from either station, the key switch must be in the "On" position.

Drive

The **MARKLIFT** Knuckle Boom can be driven only from the aerial control platform. The unit may be driven with the boom and/or turret positioned in various positions.

1. While depressing the footswitch, lift the controller handle to unlock the controller and then push forward or pull backward on the drive control lever (located on the right side of the panel) to move the **MARKLIFT** forward or reverse. The directional arrow decals on each end of the base indicate drive direction.

2. The **MARKLIFT** may be driven at higher speeds when the boom is below horizontal and fully retracted (in the cradle). When the boom is out of cradle, the unit will travel in low speed only. Gradually increase speed, adjusting speed according to conditions of the terrain.

3. Movement of the drive control lever automatically releases the parking brakes. When the drive control handle is returned to the center position, the brakes will automatically apply.

STEERING

1. The **MARKLIFT** may be steered from the aerial control only. Make right and left turns by depressing the footswitch and turning the steering switch on top of the drive controller right or left. Avoid oversteering. The steering angle will remain in the last selected position until repositioned by the operator.

2. It is not necessary to operate the steering in the same direction after the steering cylinder has reached its extreme stroke.

BOOM

Boom functions are fully proportional and selected by toggle switches located on the left side of the aerial control panel next to the boom controller. Push and hold the switch to the desired operation, depress the footswitch, then lift the controller locking stem upward and push the controller handle forward or backward.

TURRET ROTATION

Turret rotation is grouped with the boom controls and is operated by pushing the toggle switch in the desired direction while depressing the footswitch.The turret may be rotated 350° noncontinuously. When rotated from normal travel position, the "FORWARD" indicating decals on the base of the unit provide reference for the drive direction and platform orientation.

NOTE: If the turret is rotated 180°, the steering and drive orientation will be reversed!

PLATFORM LEVELLING

The **MARKLIFT** platform is automatically levelled as it is raised or lowered. However, the operator may want to adjust the platform while driving the unit on a slope for extended periods of time or to achieve a more natural position when the boom is extended horizontally.

To level the platform, first depress the footswitch then operate the "Platform Levelling" switch to the up or down position. The platform will maintain this attitude until repostioned by the operator.The Platform Levelling switch is a momentary switch which will return to neutral when released.

PLATFORM ROTATION

Toggle Operation (Optional)

The Knuckle Boom platform may be rotated 180° (90° either side of center) which allows acess to a larger work area. To rotate the platform, push the toggle switch in the desired direction while depressing the footswitch. The toggle switch is a momentary switch which will return to neutral when released.

Manual Operation

Manual platform rotation is a standard feature of the **MARKLIFT.** The manual rotator is located below the aerial control station. Rotate the platform by lifting the lower part of the platform rotation handle, then push the handle to the right or left to obtain the desired position

EMERGENCY AERIAL CONTROL

In case of an emergency, the MARKLIFT is equipped with an emergency stop switch located on the aerial control station. To operate, depress the footswitch and simultaneously operate the "Emergency Stop" toggle switch and the selected function.

EMERGENCY GROUND CONTROL

1. On the ground control panel, select the boom or turret functions and activate switch in the desired direction.

2. To operate the handpump:

   A. Make sure that the master switch is turned on.

   B. Position the ground/aerial selector switch to "Ground".

   C. Push the Emergency Stop/Start switch to "Start".

   D. Move the handle of the handpump forward and backward while operating the selected function switch until the desired position is attained.

SHUTDOWN

1. Fully retract the boom, rotate the turret so that the boom is positioned between the wheels, on the steer axle, then completely lower the riser.

2. Depress the safety cover on the Emergency switch, placing the switch to "STOP".

3. Turn the master switch (at the ground control station) to "OFF" and remove the ignition key.

The following preventive maintenance information is intended as a general guide. Please refer to the vendor section of this manual for detailed information on the engine, battery, etc.

MARK INDUSTRIES recommends that the following items be checked according to the schedules indicated. Any machine not in safe operating condition must be removed from service until it is repaired by a qualified service person.

DAILY (Before use on each work shift)

1. Make sure that operation and safety decals are in place and readable.
2. Check the water level in the batteries.
3. Check for loose or worn hardware.
4. Make sure the operating controls perform correctly.
5. Check for and correct any structural damage.
6. Check for and correct any hydraulic leaks.
7. Check for wear on cables and hoses.

WEEKLY

1. Check the condition of the tires. Make sure they are free of serious cuts or defects.
2. Check that operation and safety decals are in place and readable.
3. Check for proper brake operation.
4. Make sure the batteries are fully charged.
5. Clean the unit by removing all dirt, oil, and grease. The machine may be washed with soap and water. (remain clear of any exposed electrical panels.)
6. Check for and correct any hydraulic leaks.
7. Check for and correct any structural damage.
8. Check overall performance.

9. Check for wear on cables and hoses.

10. Check for proper hydraulic and engine oil level.

MONTHLY (or every 100 hours)

1. Check and lubricate, if necessary. (See lubrication instructions.)

2. Check condition of the batteries.

3. Change the hydraulic oil return filter.

4. Grease ring gear .

5. Grease steering linkage.

6. Check torque hub oil level.

YEARLY

1. Re-pack all wheel bearings.

2. Change the hydraulic oil.

3. Change the hydraulic oil return filter.

4. Change the torque hub oil.

5. Check the ring gear bolts for proper torque.

MARKLIFT SELF-PROPELLED BOOM
MODEL 41KB

1. Type — EP 90

   For normal application, use EP 90. For applications where the lubricant must meet special requirements, the manufacturer of the lubricant should be able to recommend a suitable substitute.

2. Oil Temperature

   Continuous — 160° F
   Intermittent — 200° F

3. Oil Change

   Initial — After 50 hours or 50,000 revolutions of operation. Preferable in a loaded condition.

   Subsequent — 1000 hours or (1) year whichever comes first. Higher temperatures make it necessary to change oil more frequently.

4. Oil Fill Level

   To fill, open both fill plugs. Position one plug parallel to the ground. Pour oil into the top fill plug. Fill at slow pace to allow air to escape. When oil begins to leak from the fill plug which is parallel to the ground, stop filling. Close both fill plugs.

Battery Fill Instructions

Water or Acid Loss to Batteries

Water loss from the battery is mainly due to evaporation brought on by temperature rises during heavy charging cycles. A very small amount of water is lost due to hydrogen and oxygen formed during charging. Acid is lost only if the case becomes cracked or if the battery is allowed to tip over. Therefore, acid is seldom needed.

Checking the Water Level

When checking the water level, don't allow dirt to enter into the battery cells once the caps have been removed. Take particular care to avoid setting the caps down on a dirty surface. Replace the caps immediately after checking the water level.

Materials and Equipment Required

1. Battery Filler Bottle
2. Distilled Water (if available)
3. Hydrometer

Filling the Battery

Use a hydrometer to see how much charge the battery has. A reading 1.260 and above in all cells indicates fully charged. (See chart on following page.) If the battery is fully charged, add water up to the level indicator.

If the battery's water level is below the lead plates, add only enough water to barely cover the plates before charging. After the batteries are fully charged, add water up to the level indicator.

Avoid Battery Hazards !

- Batteries produce flammable and explosive gasses. Keep electric arcs, sparks, flames and lighted tabacco away from batteries.

- Battery acid will damage eyes or skin on contact. Always wear a face shield during battery maintenance to avoid acid in eyes. Also wear rubber gloves and protective clothing to keep acid off skin.

- Never check the battery by placing a metal object across the posts. Serious burns or an explosion can result.

- Charge batteries only in a well ventilated area.

Either excessive overcharge or moderate undercharge can shorten battery life. With proper attention to water level and charging time, compared to hydrometer readings, the batteries should give a long useful life.

TEMPERATURE/SPECIFIC GRAVITY CORRECTION TABLE FOR BATTERIES

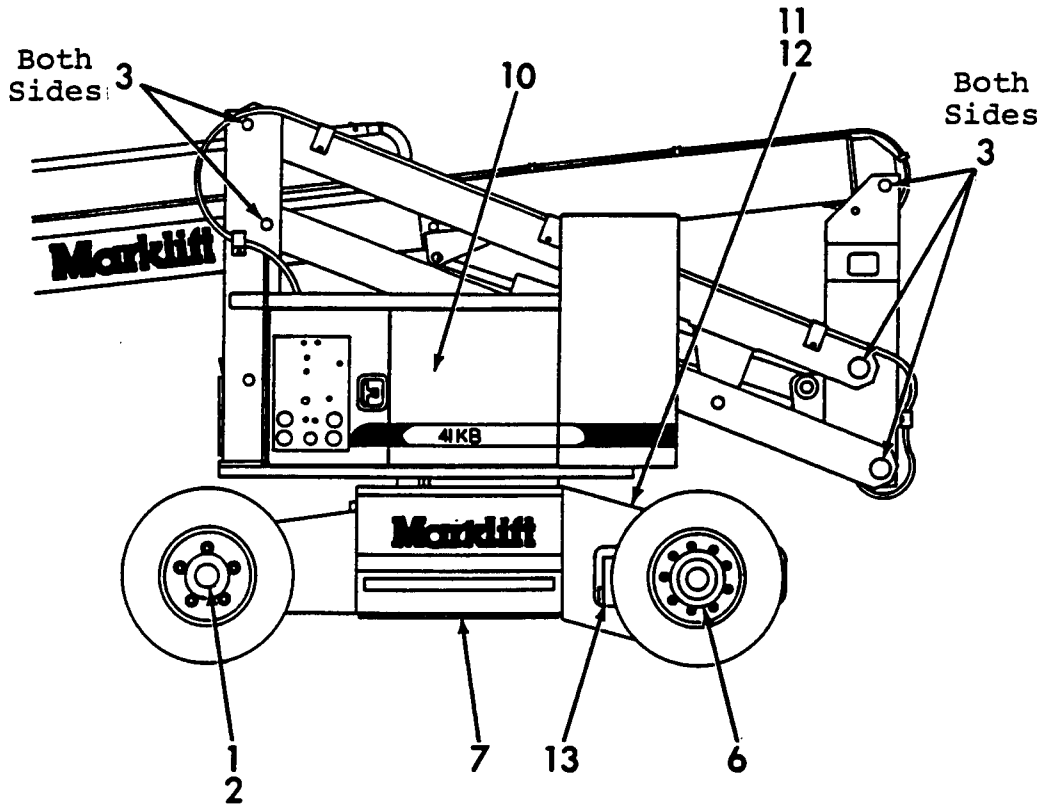
ACTUAL HYDROMETER READING AT ACTUAL TEMPERATURE°

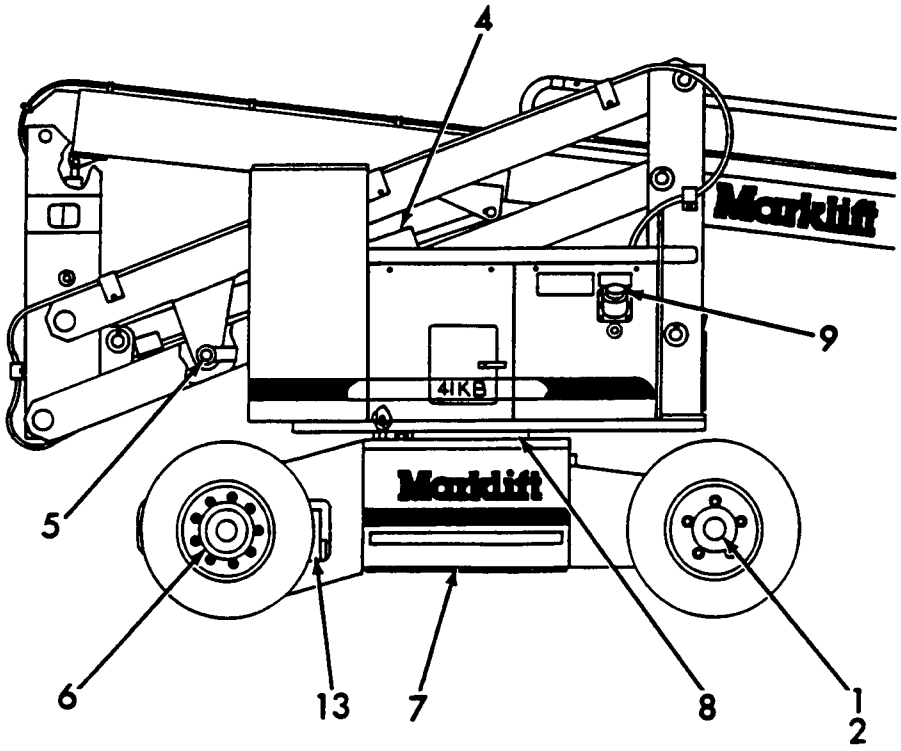
80°F (27°C)	0°F (-18°C)	-10°F (-23°C)	-20°F (-29°C)	-30°F (-34°C)	-45°F (-43°C)	-65°F (-54°C)	Approx. State of Charge In%
1.280	1.312	1.316	1.320	1.324	1.330	1.338	100
1.250	1.282	1.286	1.290	1.294	1.300	1.308	75
1.220	1.252	1.256	1.260	1.264	1.270	1.278	50
1.190	1.222	1.226	1.230	1.234	1.240	1.248	25
1.160	1.192	1.192	1.200	1.204	1.210	1.218	0

Specific Gravity

Corrected to 80°F (17°C)	Freezing Temperature	
1.280	-90°F	-68°C
1.250	-62°F	-52°C
1.200	-16°F	-27°C
1.150	+ 5°F	-15°C
1.000	+19°F	- 7°C

Note: Cold temperatures have a numbing effect on the electromechanical action of the battery, greatly reducing its capacity. Therefore, it is highly recommended that the battery be kept in an almost fully charged condition during cold weather.


Both Sides
3
10
11
12
Both Sides
3
Marklift
41KB
Marklift
1
2
7
13
6


4
Marklift
9
41KB
Marklift
5
6
13
7
8
1
2

LUBRICATION CHART

ITEM	DESCRIPTION	LUBRICANT	FREQUENCY
1.	Steering Yoke King Pins	Grease-Mobil (VA6L36AG)	Monthly
2.	Wheel Bearings	Grease-Mobil (VA6L36AG)	Yearly
3.	Pivot Pins [1]	Grease-Mobil (VA6L36AG)	Monthly
4.	Boom Lift Cylinder (Grease Fittings)	Grease-Mobil (VA6L36AG)	Monthly
5.	Boom Riser Cylinder (Grease Fittings)	Grease-Mobil (VA6L36AG)	Monthly
6.	Torque Hubs [2]	Gear Oil SAE 90	Check Monthly/ Change Yearly
7.	Batteries	Add Water Check Specific Gravity Chart	Weekly
8.	Turntable (Ring Gear) Bearing [3]	Grease- Mobil (VA6L36AG)	Monthly
9.	Hydraulic Oil	ATF Dexron II	Check Level Daily/ Change Yearly
10.	Hydraulic Return Filter	Element 67213	100 Hours/Monthly
11.	Hydraulic Oil (Brake Reservoir)	ATF Dexron II	Yearly
12.	Filter (Hydraulic Brakes)	81343	100 Hours/Monthly
13.	Brake Calipers	Grease Mobile (VA6L36AG)	Monthly

Note:

1. Inspect all pivot pins to ensure they have accepted grease by cycling the unit and visually inspecting points of concern.
2. See torque hub lubrication sheet for instructions.
3. Rotate turret throughout the entire turning radius in 20° increments, while lubricating.

ELECTRICAL

Whenever troubleshooting any problem, begin by checking the basics. This means checking to make sure that the batteries are in good shape and have at least a three quarter charge. Determine the charge by using a hydrometer and following the battery maintenance instructions. A large percentage of electrical problems are often due to poorly charged or defective batteries.

A. If a problem seems to be electrical, refer to the schematic, (see the SCHEMATIC section for more information) and use a volt ohm meter to trace the power flow, starting at the battery and continuing through the system until the problem is located.

B. Keep in mind, if you **DO NOT** have a good ground to a valve coil, relay, etc., (even if you have enough electrical power to operate the coil or relay), these items will not function properly.

HYDRAULIC

A. The various hydraulic boom functions are controlled by electric solenoid valves in conjunction with a proportional valve. When operating boom functions at a reduced speed, a portion of hydraulic fluid is routed back to the tank by the proportional unloading valve, reducing the speed of that function.

B. Directional control valves have two opposed electrical coils with a moveable spool between the coils.

C. Two-position valves are either normally open to allow hydraulic fluid to circulate through them until electrically closed, or normally closed to prevent passage of fluid until electrically energized.

MARKLIFT will not run.

1. Check the batteries for proper charge. (See Battery Maintenance.)
2. Check battery connections.
3. Check main power fuse.
4. Check the circuit breaker.
5 Refer to your authorized MARKLIFT dealer.

HYDRAULIC PUMP

Hydraulic pump producing excessive noise.

1. Check hydraulic oil level.
2. Check suction line fittings for tightness.
3. Check suction hose from tank to pump for kinks.
4. Refer to your authorized MARKLIFT dealer.

BOOM LIFT / RISER

MARKLIFT lift function will not work.

1. Check electric connector to lift/riser solenoid valves for security.
2. Check lift/ riser solenoid valve coil for defect.
3. Check lift/ riser solenoid valve for defect.
4. Check lift/ riser cylinder holding valve for defect.
5. Slope sensor circuit inoperative.
6. Check lift / riser function selector switch.
7. Refer to your authorized MARKLIFT dealer.

BOOM

Problems extending and retracting.

1. Check electric connector to solenoid valves for good connecton.
2. Check solenoid valve for defect.
3. Check function selector switch.
4. Slope sensor circuit inoperative.
5. Check regenerative valve for mal-functions.
6. Refer to your authorized MARKLIFT dealer.

TURRET ROTATION

Turret will not rotate.

1. Check electric connection to solenoid valve for good connection.
2. Check solenoid valve for defects.
3. Check function selector switch.
4. Slope sensor circuit inoperative.
5. Inspect woodruff key between worm gear box and orbit motor.
6. Refer to your authorized MARKLIFT dealer.

STEERING

MARKLIFT steers in only one direction.

1. Check electrical wire connection at valve coils.

2. Check valve coils for defects.

3. Check valve cartridge for defects.

4. Check controller for proper electrical connection.

5. Refer to authorized MARKLIFT dealer.

DRIVE

No forward or reverse drive.

1. Check to see if drive controller output is in both directions.

2. Check forward / reverse drive contactors to see if tips are burned. (If so refer to your authorized MARKLIFT dealer.

3. Check for loose wire connections in drive contol panel.

4. Refer to authorized MARKLIFT dealer.

No high speed.

1. Check to see if high speed limit switch arm is out of adjustment.

2. Check high speed limit switch for defects.

3. Check drive motors .

No drive operation.

1. Make sure parking brake releases.

2. Check drive controller command output (LED illuminates).

3. Refer to authorized MARKLIFT dealer.

Mark Industries

NEW EQUIPMENT MAINTENANCE RECORD

MODEL	SERIAL NUMBER
DATE	EQUIPMENT NUMBER
LOCATION	MECHANIC

ITEM	CODE	COMMENTS	ITEM	CODE	COMMENTS
Engine oil			Safety cut-outs		
Engine oil filter			Bushings		
Air filter			Rollers		
Fuel filter			Wear pad		
Tune-up			Front end assembly		
Choke			Tire pressure		
Engine RPM			Tire condition		
Charging system			Wheel nuts		
Fuel system LPG/gas			Wheel bearing		
Batteries			Nuts and bolts		
Battery terminals			Guard rails		
Motor brushes			Lubrication		
Hydraulic fluid			Warning decals		
Hydraulic oil filter			Operating inst.		
Hydraulic systems			General decals		
Hydraulic pressure			Paint		
Hydraulic hoses			All operations		
Cylinders			Lift		
Drive motors			Steering		
Brakes			Forward drive		
Aerial control box			Tilt switches		
Ground control box			Fuel level		
Relays			Literature		
Wire connections			Options		

Code

F = Filled
R = Repaired
C = Checked
A = Adjusted
X = Needs repair
NA = Not available

Comments

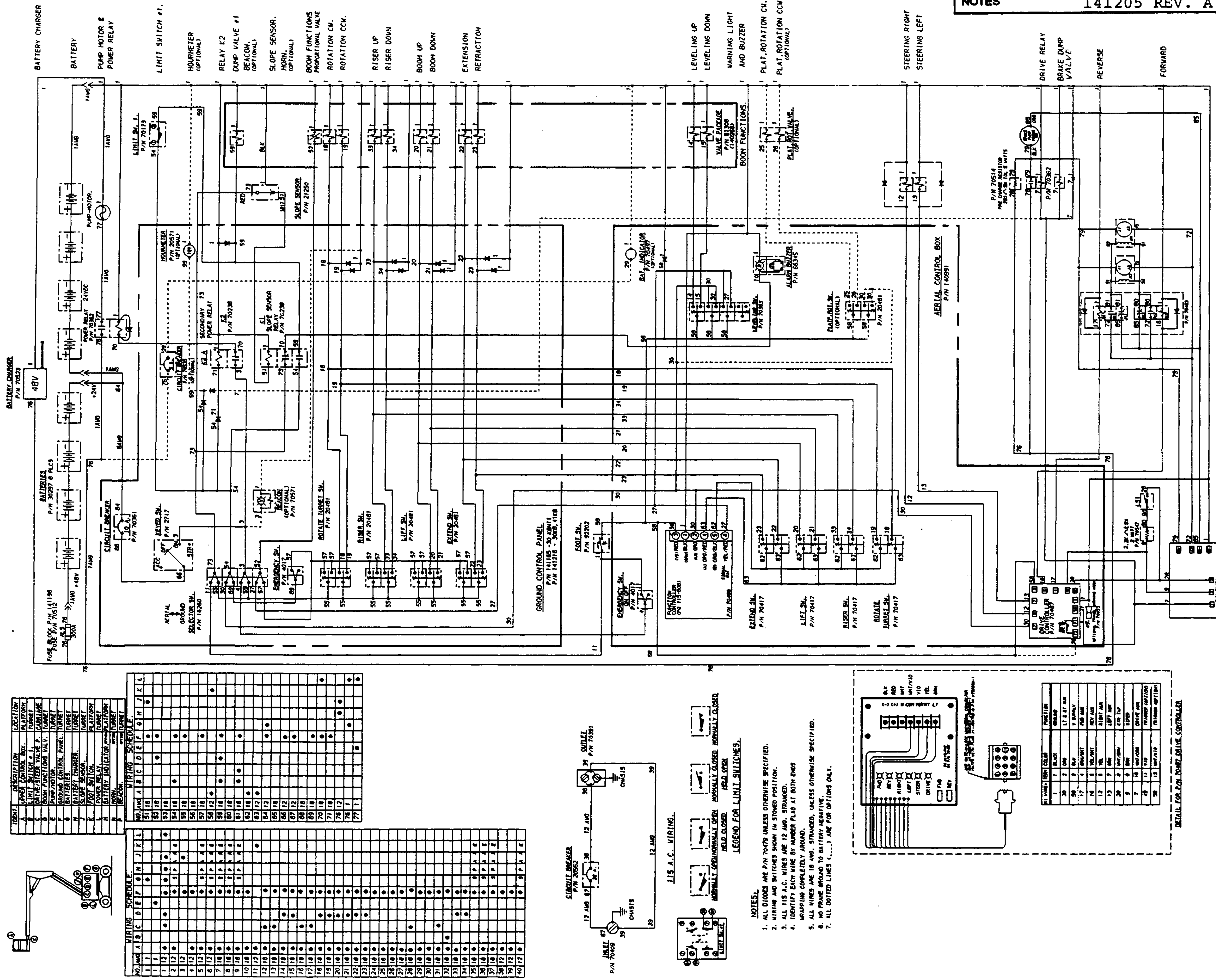
HYDRAULIC FLUID TABLE

Milestone			Hydraulic fluid			
Oil company			Chevron	Gulf	Shell	Union
Brand Name			ATF Dexron II	ATF Dexron II	Donaz-T6	ATF Dexron
Viscosity	SUS AT 100°F (37.8°C)		187.4	195	200	200
	SUS AT 210°F (98.9°C)		49.2	50.4	50	52.3
	Index	°F	153°	155°	160°	172°
		°C	67.2°	68.3°	71.1°	77.8°
Flash point		°F	400°	405°	390°	395°
		°C	204.4°	207.2°	198.9°	201.7°
Pour point		°F	-40°	-50°	-50°	-45°
		°C	-40°	-45.6°	-45.6°	-42.8°

Mark Industries

TITLE	ELECTRICAL SCHEMATIC
MODEL	41KB
NOTES	141205 REV. A

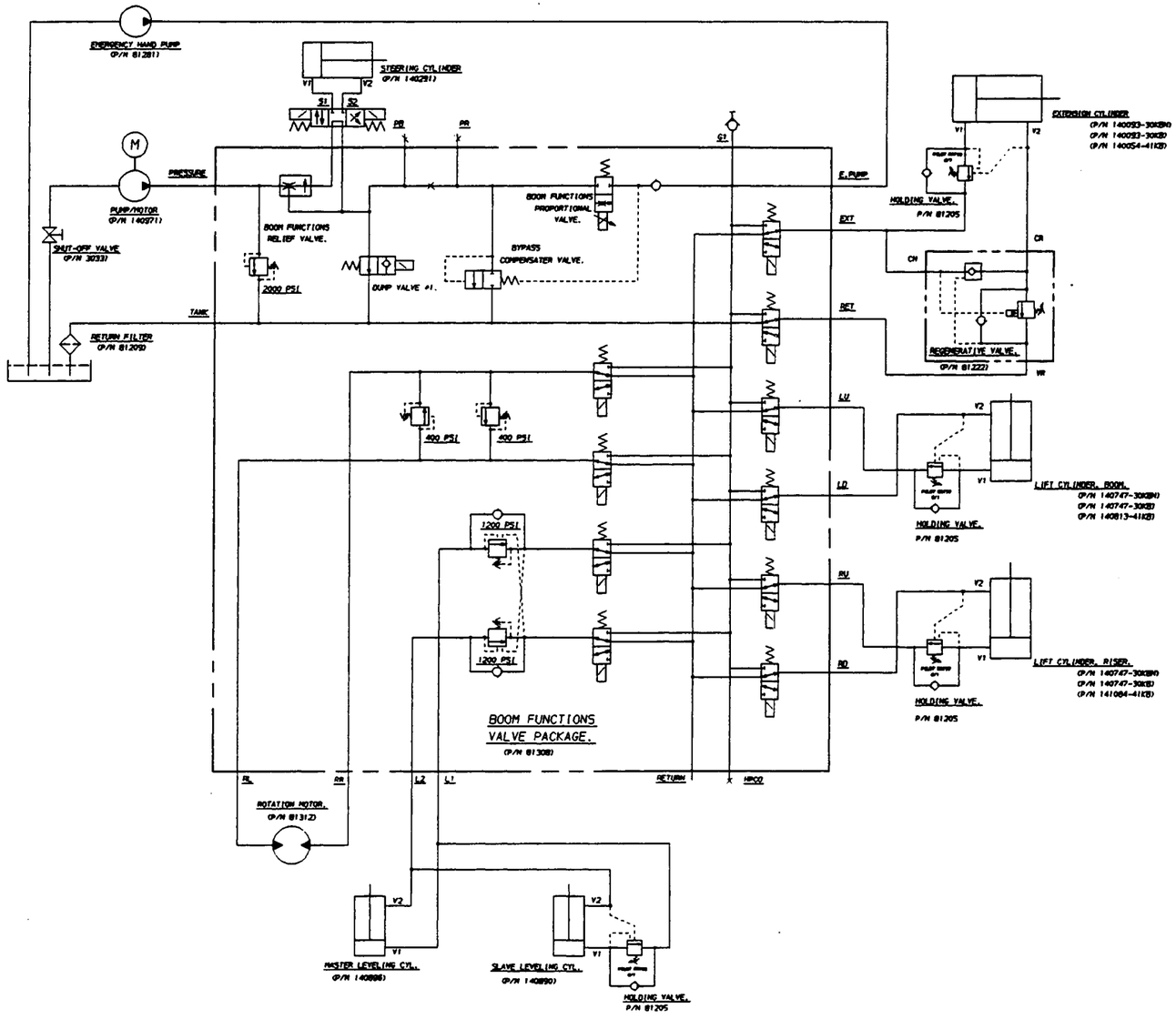
SCHEMATIC PAGE 1

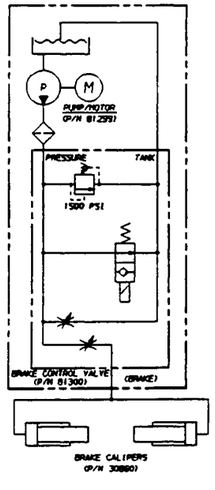


Mark Industries

TITLE	HYDRAULIC SCHEMATIC
MODEL	(ELECTRIC DRIVE) 41KB
NOTES	141194 REV. NC

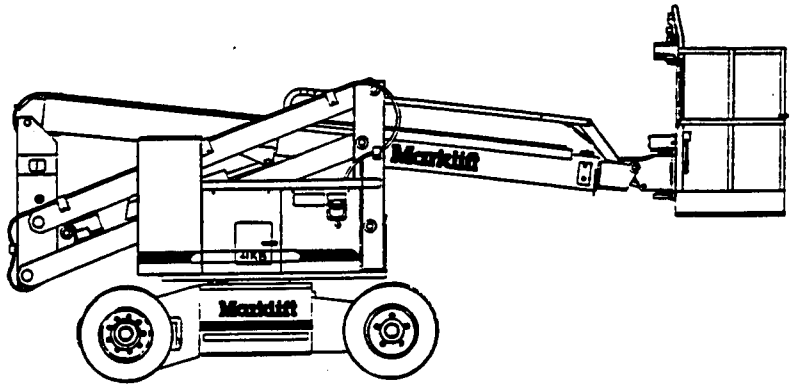
SCHEMATIC
PAGE 2

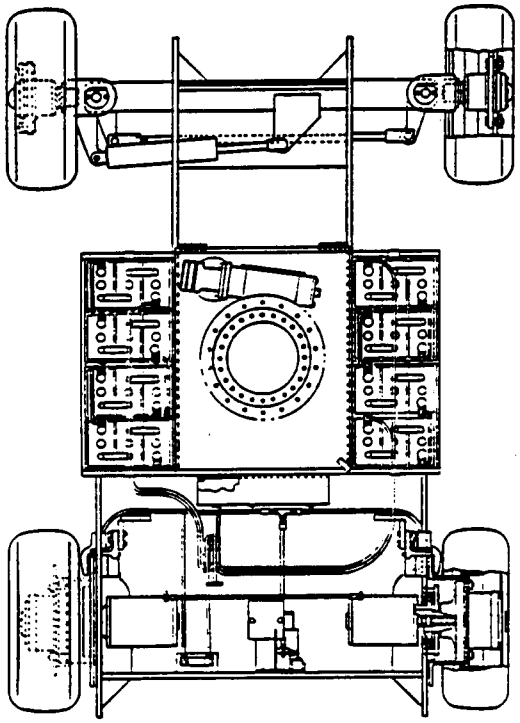


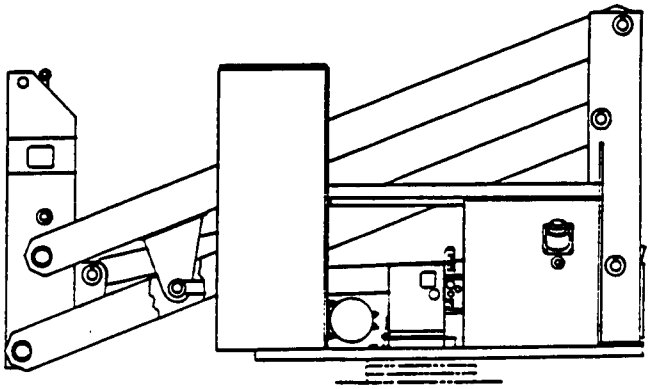


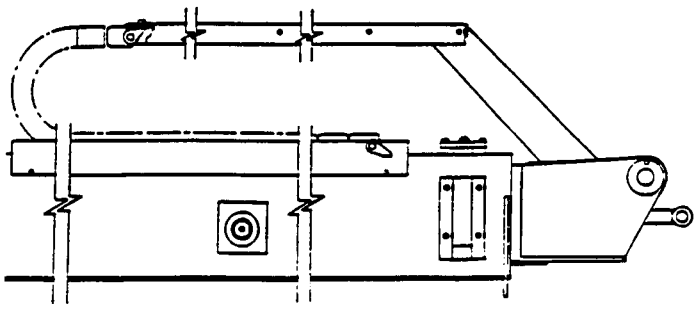
THIS SECTION 1 CONTAINS THE FOLLOWING MATTER:

PAGE NO.	TITLE
1	NOTICE TO USERS
2	TABLE OF CONTENTS
4	HOW TO USE THE PARTS CHAPTER
6	HOW TO ORDER PARTS









DISCLAIMER

MARK INDUSTRIES strives to include in the Parts Chapter, information and illustrations that are accurate, complete, and current. Due to on-going changes and revisions by our many suppliers, it is often impossible to show all variations of a given assembly. Therefore, this information is subject to change without notice.

Despite the care and effort taken in preparing this Parts Chapter, MARK INDUSTRIES makes **no warranties** that the information and illustrations herein are totally accurate and complete.

NOTICE

The Parts Chapter, though sometimes helpful in the process of assembly/ disassembly, is **NOT** intended to be assembly/disassembly instructions.

THIS PARTS CHAPTER CONTAINS:

SECTION 1	INTRODUCTION TO THE PARTS CHAPTER
PAGE NO.	TITLE
1	NOTICE TO USERS
2	TABLE OF CONTENTS
4	HOW TO USE THE PARTS CHAPTER
6	HOW TO ORDER PARTS

SECTION 2	FINAL ASSEMBLY
FIG. NO.	TITLE
1	FINAL ASSEMBLY
2	DECAL SET
3	PLATFORM ASSEMBLY
4	AERIAL CONTROL BOX ASSEMBLY
5	GROUND CONTROL & DOOR ASSEMBLY
6	PLATFORM MANUAL ROTATOR ASSEMBLY (USED FROM JULY TO DEC. 1989)
6A	PLATFORM MANUAL ROTATOR ASSEMBLY (SINCE DEC. 1989)
7	HYDRAULIC HOSE KIT DIAGRAM

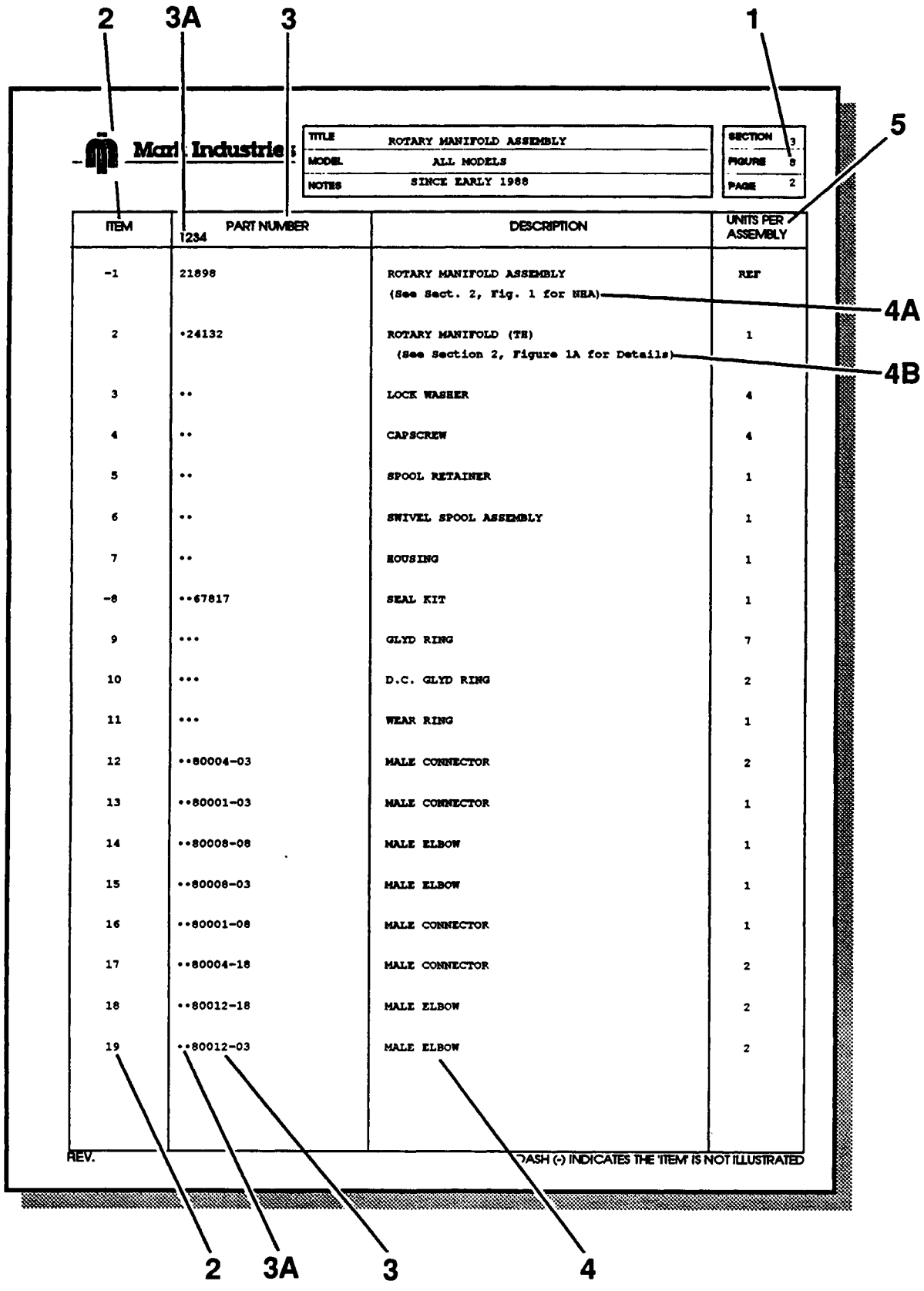
SECTION 3	CARRIAGE ASSEMBLY
FIG. NO.	TITLE
1	CARRIAGE ASSEMBLY
2	STEERING CYLINDER ASSEMBLY (SE)
2A	STEERING CYLINDER ASSEMBLY (TH)
3	TRANSISTORIZED CONTROLLER ASSEMBLY
4	BRAKE RELEASE ASSEMBLY

SECTION 4	TURRET ASSEMBLY
FIG. NO.	TITLE
1	TURRET ASSEMBLY
2	RISER LIFT CYLINDER (SE)
2A	RISER LIFT CYLINDER (TH)
3	FUNCTION CONTROL VALVE ASSEMBLY
4	HYDRAULIC OIL TANK ASSEMBLY

SECTION 4	TURRET ASSEMBLY (CONT'D)
FIG. NO.	TITLE
5	BATTERY CHARGER (DOMESTIC)
6	BATTERY CHARGER (INTERNATIONAL)

SECTION 5	BOOM ASSEMBLY
FIG. NO.	TITLE
1	FINAL BOOM ASSEMBLY
2	INNER BOOM ASSEMBLY
3	EXTENSION CYLINDER (SE)
3A	EXTENSION CYLINDER (GB)

SECTION 6	OPTIONS	
FIG. NO.	TITLE	PART NO.
1	LIFTING LUG	141224
2	POWERED PLATFORM ROTATOR ASSEMBLY	141345
3	AIRLINE TO PLATFORM	140673
4	ALL MOTION ALARM	140660
5	TRAVEL WARNING HORN	140657
6	HOURMETER	140680
7	BATTERY CONDITION INDICATOR GAUGE	140023
8	HYDRAULIC LINE TO PLATFORM	140671



Mark Industries

TITLE	ROTARY MANIFOLD ASSEMBLY
MODEL	ALL MODELS
NOTES	SINCE EARLY 1988

SECTION	3
FIGURE	8
PAGE	2

ITEM	PART NUMBER (1234)	DESCRIPTION	UNITS PER ASSEMBLY
-1	21898	ROTARY MANIFOLD ASSEMBLY (See Sect. 2, Fig. 1 for NHA)	REF
2	•24132	ROTARY MANIFOLD (TH) (See Section 2, Figure 1A for Details)	1
3	••	LOCK WASHER	4
4	••	CAPSCREW	4
5	••	SPOOL RETAINER	1
6	••	SWIVEL SPOOL ASSEMBLY	1
7	••	HOUSING	1
-8	••67817	SEAL KIT	1
9	•••	GLYD RING	7
10	•••	D.C. GLYD RING	2
11	•••	WEAR RING	1
12	••80004-03	MALE CONNECTOR	2
13	••80001-03	MALE CONNECTOR	1
14	••80008-08	MALE ELBOW	1
15	••80008-03	MALE ELBOW	1
16	••80001-08	MALE CONNECTOR	1
17	••80004-18	MALE CONNECTOR	2
18	••80012-18	MALE ELBOW	2
19	••80012-03	MALE ELBOW	2

REV.

DASH (-) INDICATES THE ITEM IS NOT ILLUSTRATED

1. The Parts Chapter Pagination.

   A. **SECTION** refers to the major divisions of the Parts Chapter.

   B. **FIGURE** refers to the items illustrated separately in each section.

   C. **PAGE** indicates the page number of the figure illustrated.

2. The **Item Number** corresponds to the item number shown for the part in the illustration. (Parts with *item numbers* preceded by a **dash** (-), are not illustrated.)

3. Items that carry a Mark Industries **part number**.

   A. The **Indenture System** used in the Parts Chapter of this Technical Manual shows the relationship of one part to another.

   Part Number

   1 2 3 4

   . Items ***included*** as part of the **figure**.

   . . Items ***included*** as part of the **single indentured** item listed directly above it.

   . . . Items ***included*** as part of the **double indentured** item listed directly above it.

   . . . . Items ***included*** as part of the **triple indentured** item listed directly above it.

4. Elements of the **Description**.

   A. **NHA** (**N**ext **H**igher **A**ssembly) corresponds to the Section and Figure to be referred to for the major assembly that this item is part of.

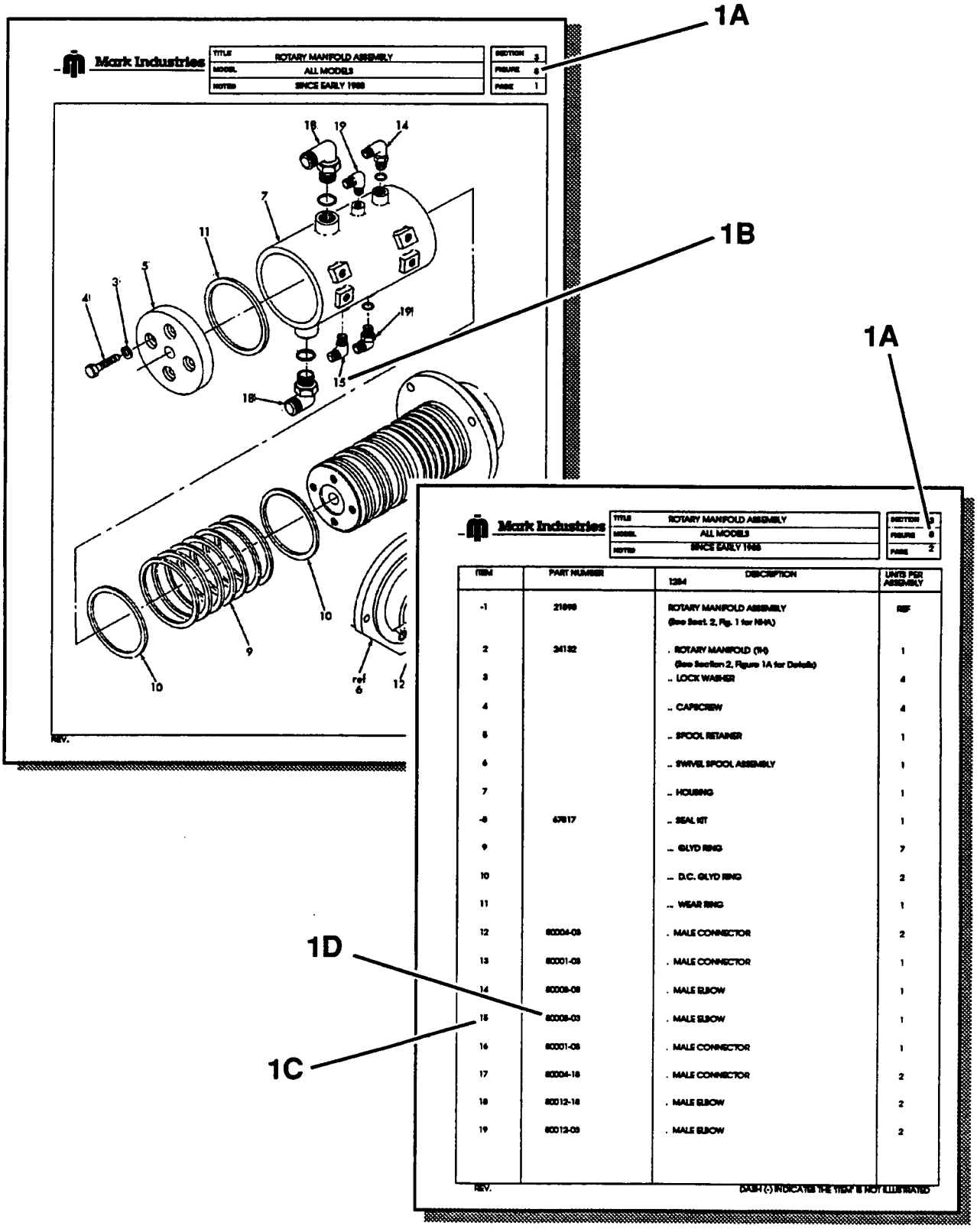
   B. **DETAILS** corresponds to the Section and Figure to be referred to for a more detailed breakdown of this item.

5. **UNITS PER ASSEMBLY** entries are as follows:

   A. **REF** indicates the item is already listed in the NHA figure.

   B. **AR** indicates the part is used in a quantity *As Required.*

   C. A **number** indicates the *quantity* of the part used in the next higher assembly.


1A
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1A
1D
1C
Mark Industries
TITLE ROTARY MANIFOLD ASSEMBLY
MODEL ALL MODELS
NOTES SINCE EARLY 1988
SECTION 3
FIGURE 6
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Mark Industries
TITLE ROTARY MANIFOLD ASSEMBLY
MODEL ALL MODELS
NOTES SINCE EARLY 1988
SECTION 3
FIGURE 6
PAGE 2
ITEM
PART NUMBER
1284 DESCRIPTION
UNITS PER ASSEMBLY
-1 21699 ROTARY MANIFOLD ASSEMBLY (See Sect. 2, Fig. 1 for NHA) REF
2 24132 . ROTARY MANIFOLD (RH) (See Section 2, Figure 1A for Details) 1
3 .. LOCK WASHER 4
4 .. CAPSCREW 4
5 .. SPOOL RETAINER 1
6 .. SWIVEL SPOOL ASSEMBLY 1
7 .. HOUSING 1
-8 47817 .. SEAL KIT 1
9 .. GLYD RING 7
10 .. D.C. GLYD RING 2
11 .. WEAR RING 1
12 60004-08 . MALE CONNECTOR 2
13 60001-08 . MALE CONNECTOR 1
14 60008-08 . MALE ELBOW 1
15 60008-03 . MALE ELBOW 1
16 60001-06 . MALE CONNECTOR 1
17 60004-16 . MALE CONNECTOR 2
18 60012-16 . MALE ELBOW 2
19 60012-09 . MALE ELBOW 2
REV.
DASH (-) INDICATES THE ITEM IS NOT ILLUSTRATED

1. Finding the Mark Industries Part Number.

   A. Using the Table of Contents, find the Section and Figure Number. Locate the correct page by referencing these numbers.

   B. Match the required part to the figure illustration. Note the Item Number.

   C. Find the Item Number on the part listing that follows the figure.

   D. Use the Mark Industries Part Number listed next to the Item Number when ordering.

2. Ordering: Listed below are the methods of ordering parts. The **preferred** method of ordering parts is by **FAX**.

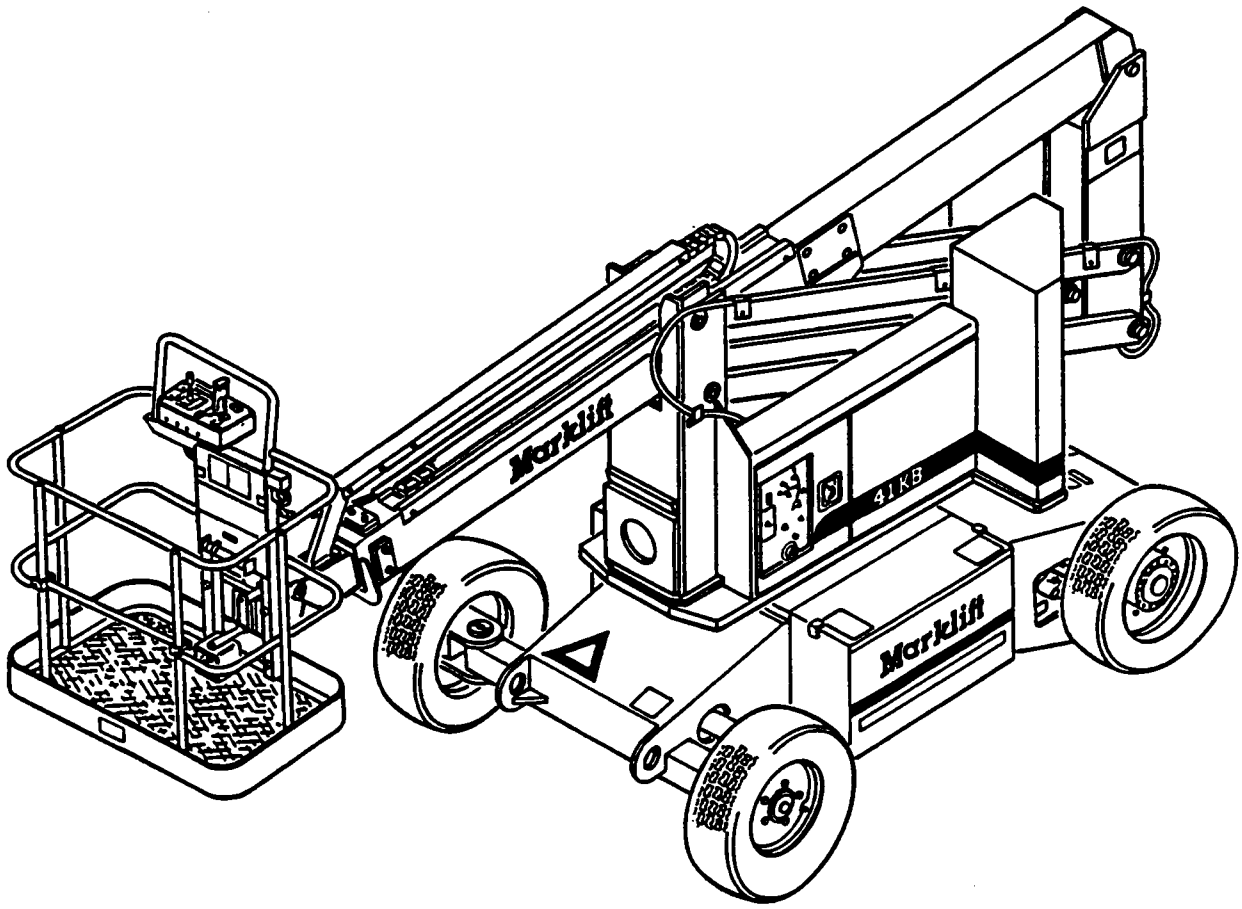
   A. By **FAX**: **(714) 879-8884**

   B. By Phone: (714) 879-MARK

   C. By Mail: MARK INDUSTRIES
   ATTENTION: PARTS DEPARTMENT
   P.O. BOX 2255
   BREA, CA. 92622

SECTION 2 CONTAINS:

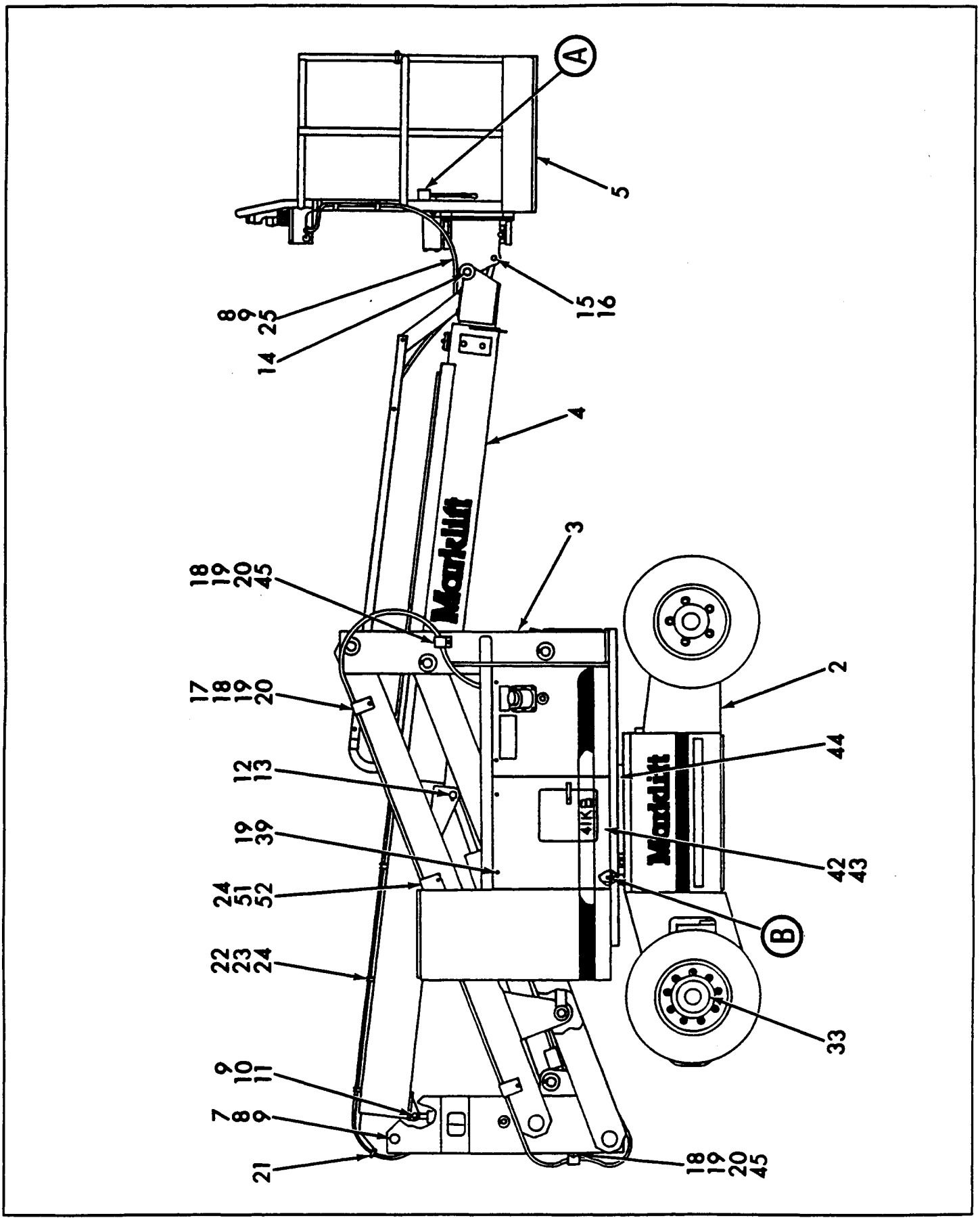
FIG. NO.	TITLE
1	FINAL ASSEMBLY
2	DECAL SET
3	PLATFORM ASSEMBLY
4	AERIAL CONTROL BOX ASSEMBLY
5	GROUND CONTROL & DOOR ASSEMBLY
6	TYPICAL MANUAL ROTATOR (FROM MID 1987 UNTIL EARLY 1990)
6A	PLATFORM MANUAL ROTATOR ASSEMBLY (SINCE EARLY 1990)
7	HYDRAULIC HOSE KIT DIAGRAM



Mark Industries

TITLE	FINAL ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	1
PAGE	1

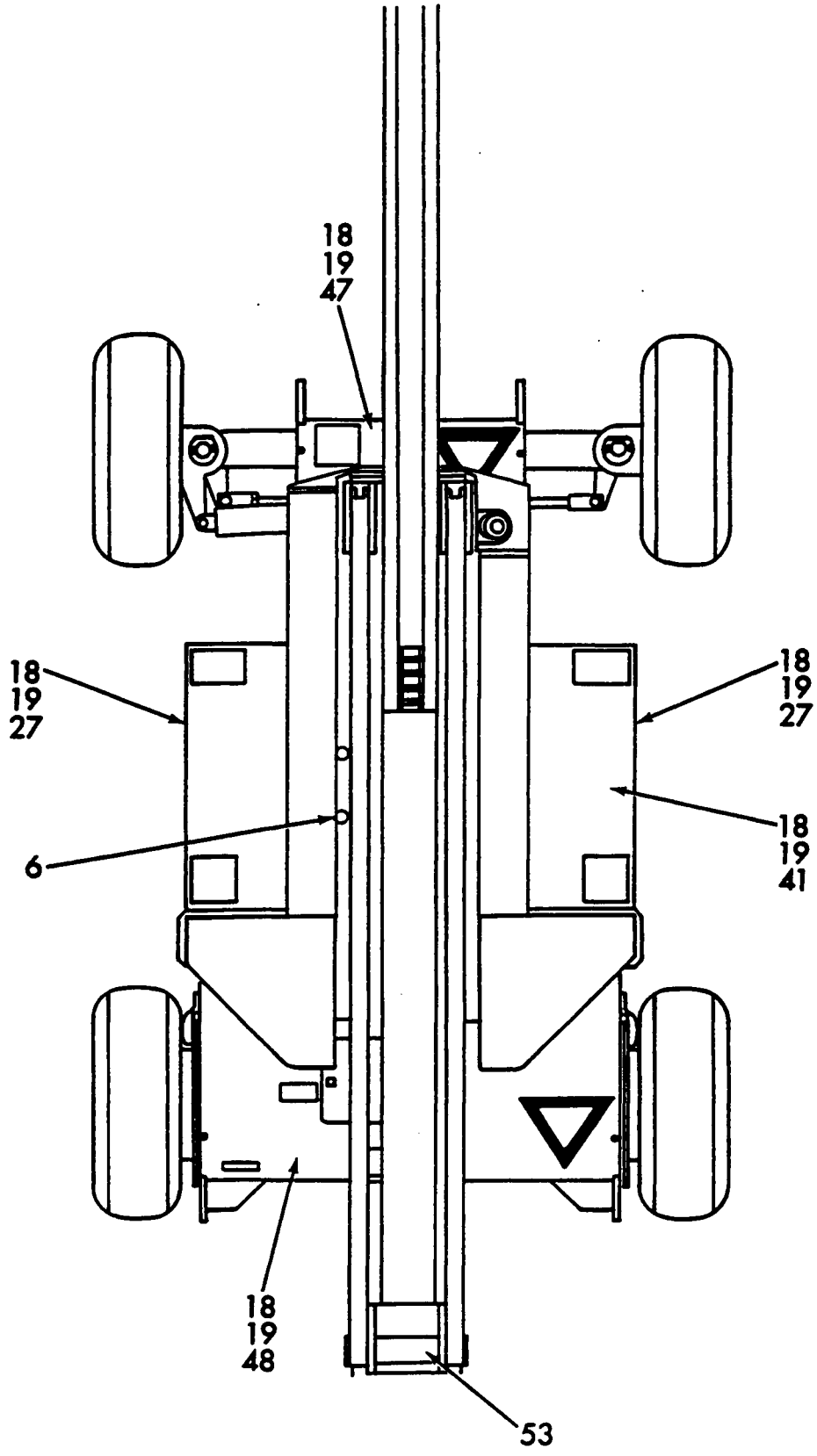


REV.

Mark Industries

TITLE	FINAL ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	1
PAGE	2

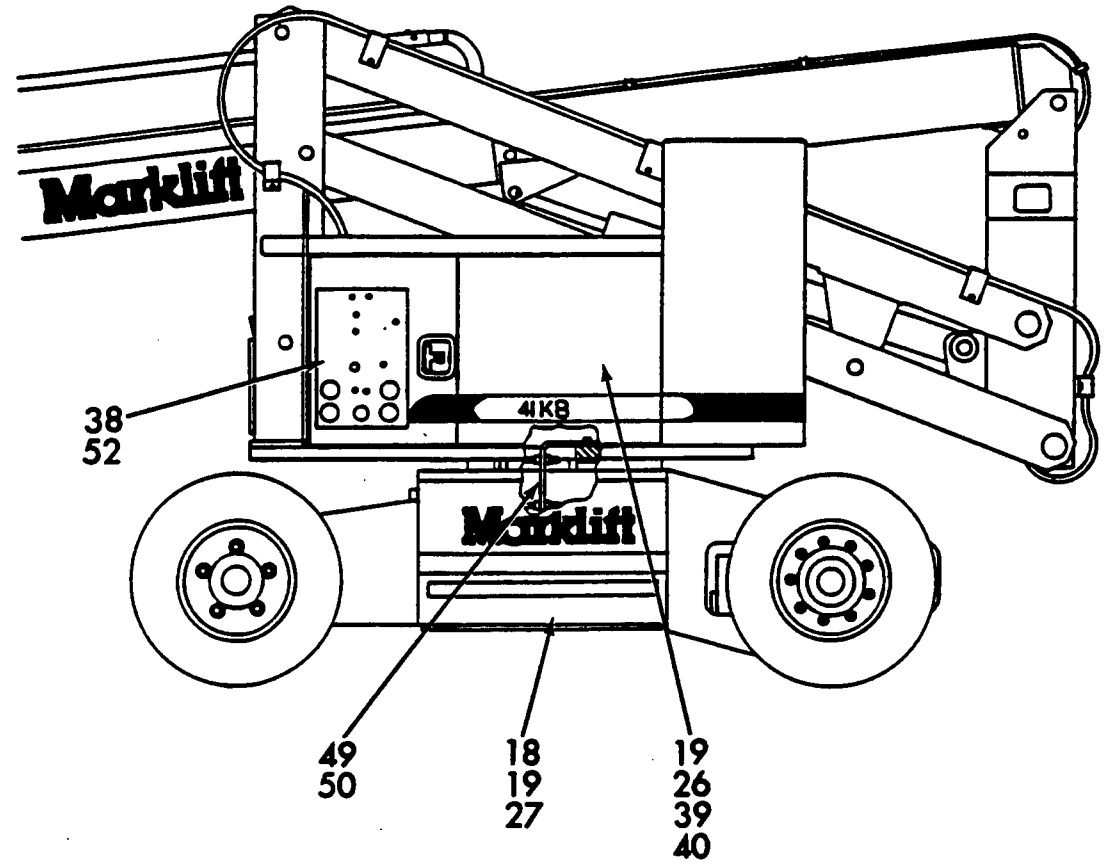


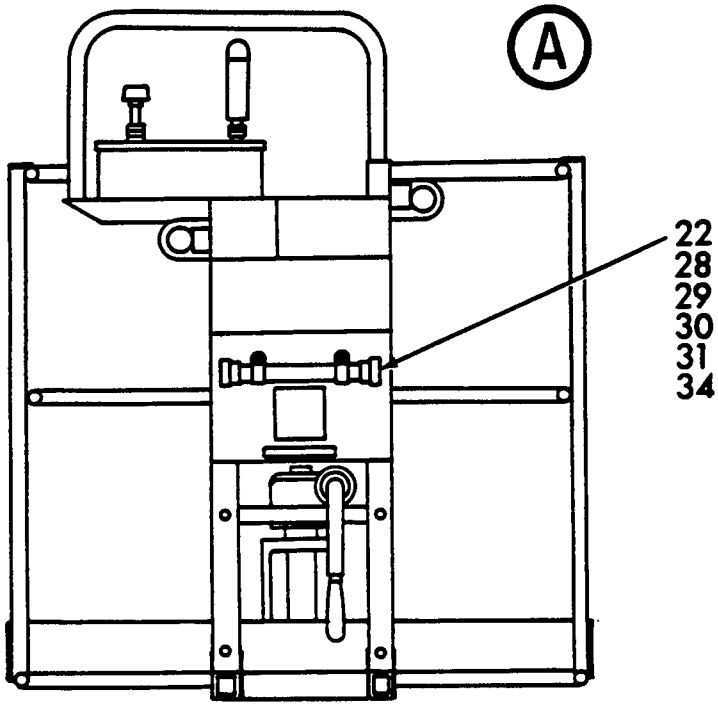
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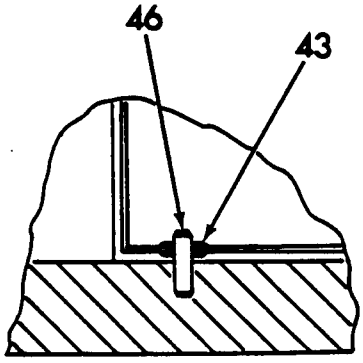
Mark Industries

TITLE	FINAL ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	1
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Mark Industries

TITLE	FINAL ASSEMBLY	SECT. 2
MODEL	41KB	FIG. 1
NOTES		PAGE 4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140012	ASSEMBLY, FINAL	REF
2	.141025	ASSEMBLY, CARRIAGE (See Sect. 3, Fig. 1 for Details)	1
3	.141158	ASSEMBLY, TURRET (See Sect. 4, Fig. 1 for Details)	1
4	.140122	ASSEMBLY, FINAL BOOM (See Sect. 5, Fig. 1 for Details)	1
5	.141000	ASSEMBLY, PLATFORM (See Sect. 2, Fig. 3 for Details)	1
6	.60636	SCREW, CAP	18
7	.140601	PIN, BOOM/KNUCKLE	1
8	.60343	SCREW, CAP	2
9	.63319	WASHER, LOCK	3
10	.140431	PIN, MASTER CYLINDER/BOOM	1
11	.60325	SCREW, CAP	1
12	.140489	PIN, LIFT CYLINDER ROD END	1
13	.62229	SCREW, SET	2
14	.140436	PIN, ROTATOR	1
15	.140437	PIN, SLAVE CYLINDER ROD END	1
16	.64209	PIN, ROLL	1
17	.140602	ASSEMBLY, CLAMP	4
18	.60322	SCREW, CAP	24
19	.63302	WASHER, LOCK	28
20	.63402	WASHER, FLAT	24
21	.256	TIE, CABLE	55
22	.16268	CLAMP, HOSE	8
23	.60353	SCREW, CAP	6

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
24	.63301	WASHER, LOCK	6
25	.65322	COIL, PLASTIC PROTECTIVE	5
26	.141227	PANEL, TURRET	1
27	.140988	COVER, BATTERY SIDE	2
28	.130927	CONTAINER, PLASTIC	1
29	.65842	CAP, ANTI-ROLL	2
30	.60315	SCREW, CAP	2
31	.60711	NUT, HEX	2
-32	.141246	DIAGRAM, HOSE KIT (See Sect. 2, Fig. 7 for Details)	1
33	.65106	OIL, GEAR (90 WT.)	1
34	.17415	HANDBOOK, OPERATION & SAFETY	1
-35	.65116	OIL, HYDRAULIC	10
-36	.16608	PAINT, WHITE WATER-BASE	2
37	.63654	RIVET, POP	8
38	.141216	ASSEMBLY, GROUND CONTROL & DOOR (See Sect. 2, Fig. 5 for Details)	1
39	.61808	SCREW, CAP	4
40	.160254	NUT, LUG	8
41	.140987	COVER, BATTERY TOP	2
42	.141226	PANEL, TURRET R.H.	1
43	.160249	GROMMET	4
44	.141333	SPACER, TURRET PLATE	1
45	.140612	ASSEMBLY, ARM CABLE CLAMP	4
46	.160305	PIN, ROLL	4
47	.141187	COVER, CARRIAGE (STEERING END)	1

Mark Industries

TITLE	FINAL ASSEMBLY
MODEL	41KB
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SECT.	2
FIG.	1
PAGE	6

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
48	.141211	COVER, CARRIAGE (DRIVE END)	1
49	.141321	BRACKET, POWER TWIST	1
50	.160017	U-BOLT	2
51	.140791	GUARD, ARM CABLE	2
52	.61921	SCREW, CAP	9
53	.27289	TUBE, ROUND	1

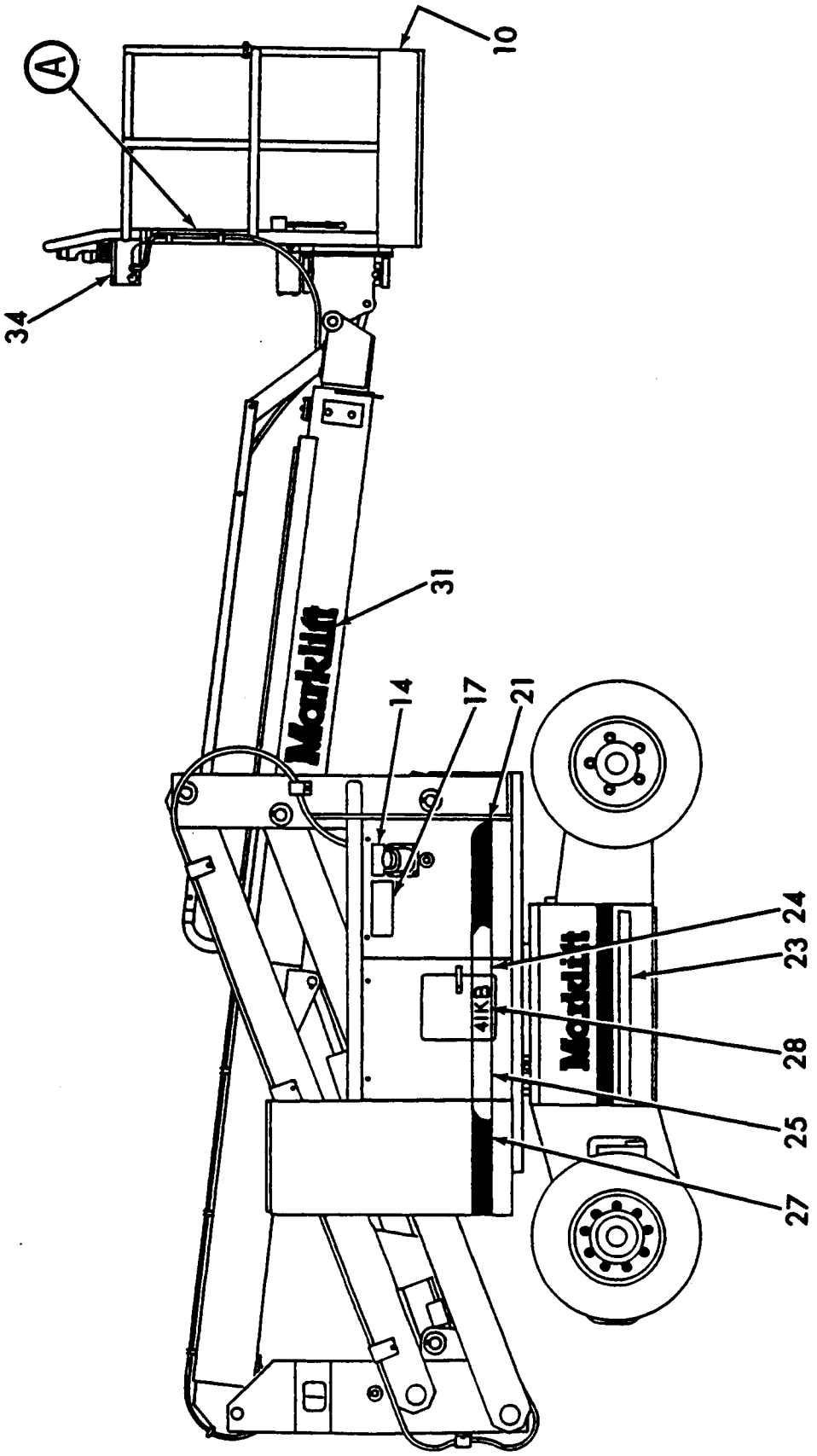
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Mark Industries

TITLE	DECAL SET
MODEL	41KB
NOTES	

SECTION	2
FIGURE	2
PAGE	1

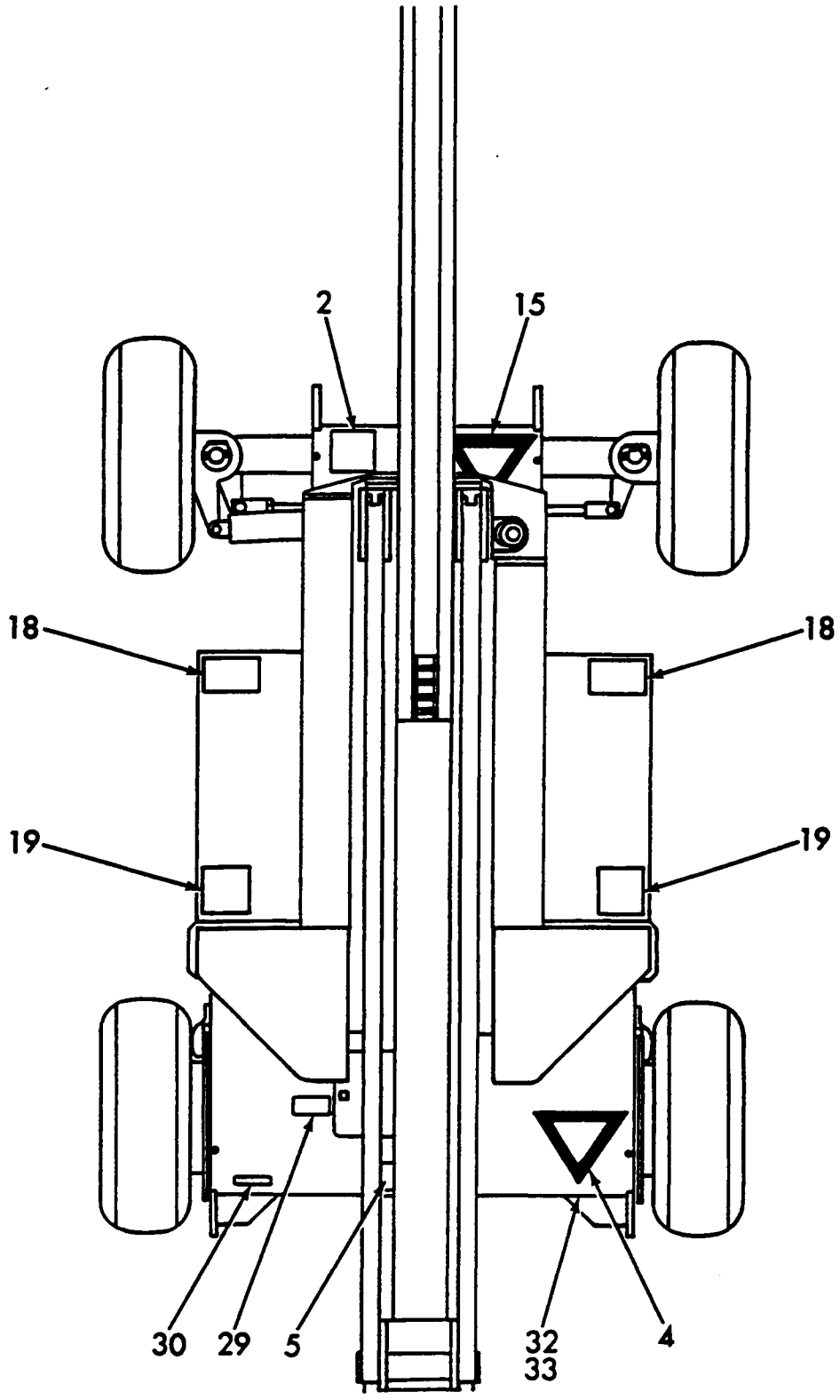


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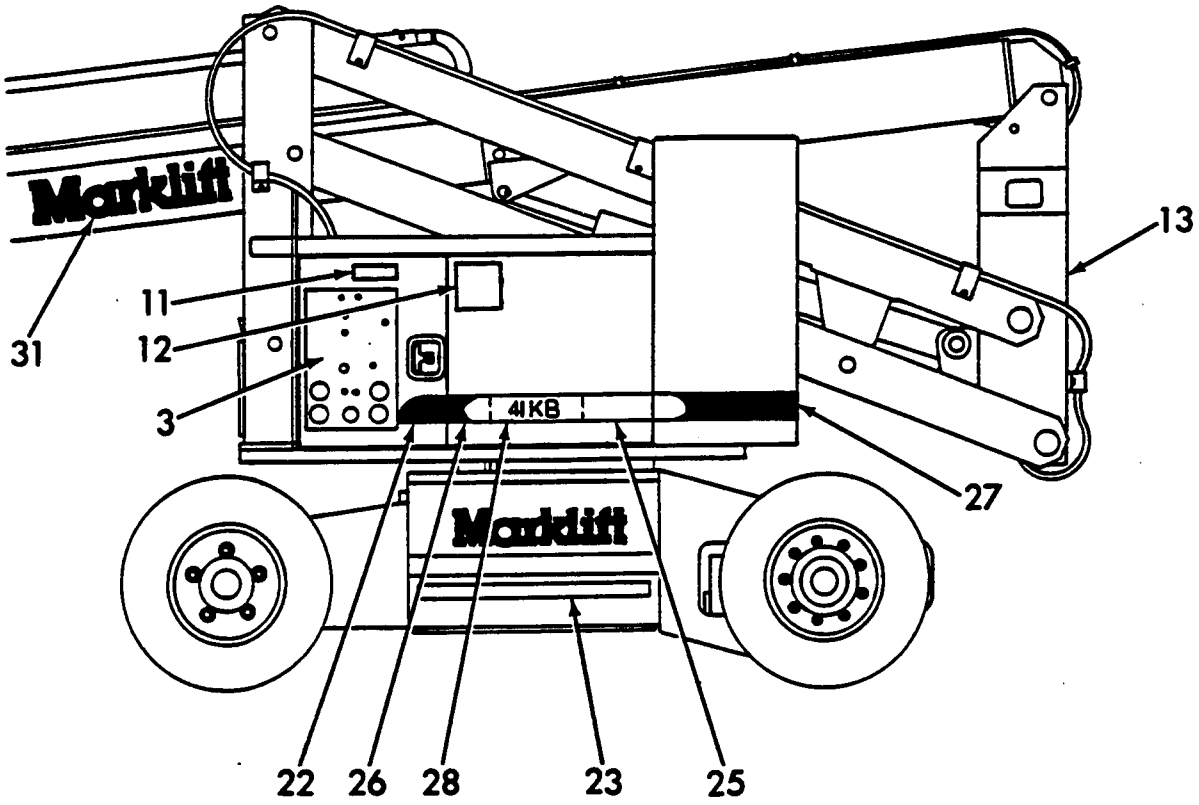
Mark Industries

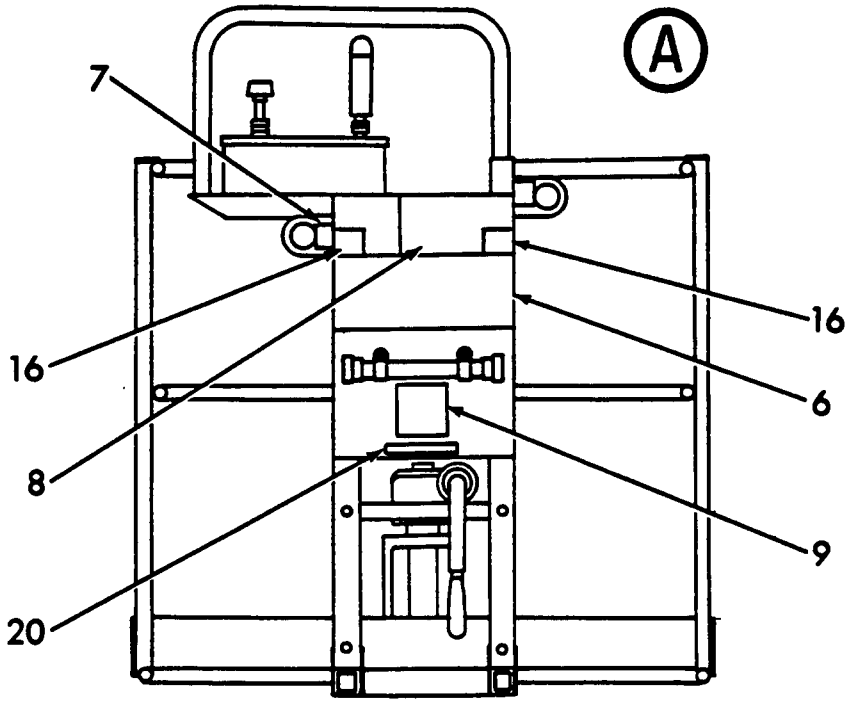
TITLE	DECAL SET
MODEL	41KB
NOTES	

SECTION	2
FIGURE	2
PAGE	2



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TITLE	DECAL SET	SECT.	2
MODEL	41KB	FIG.	2
NOTES		PAGE	4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	600181	SET, DECAL	REF
2	.181766	DECAL, TIE DOWN	1
3	.182716	DECAL, GROUND CONTROL	1
4	.20462	DECAL, FORWARD ARROW	1
5	.20896	DECAL, BRAKE	1
6	.182101	DECAL, DANGER & AERIAL OPERATING INSTR.	1
7	.22385	DECAL, CAUTION ATTACH SAFETY BELT	2
8	.181103	DECAL, DANGER OBEY THE FOLLOWING	2
9	.181102	DECAL, DANGER DO NOT OPERATE	2
10	.2022	DECAL, LOAD CAPACITY 500 LBS.	1
11	.140496	DECAL, EMERGENCY HAND PUMP	1
12	.140495	DECAL, HAND PUMP OPERATION	1
13	.20410	DECAL, LOGO - MARK INDUSTRIES	1
14	.2017	DECAL, HYDRAULIC SYSTEM FLUID	1
15	.20461	DECAL, FORWARD/AFT ARROW	1
16	.22386	DECAL, "D" RING ATTACH SAFETY BELT	2
17	.20419	DECAL, DANGER KEEP CLEAR	2
18	.22449	DECAL, NO SMOKING FOR ELECTRICAL	2
19	.2003	DECAL, BATTERY WATER LEVEL	2
20	.130820	DECAL, OPERATION & SAFETY HANDBOOK	1
21	.181752	DECAL, BLUE STRIPE	1
22	.181754	DECAL, BLUE STRIPE	1
23	.181755	DECAL, STANDARD MARKLIFT	2
24	.181757	DECAL, PANEL STRIPE	2
25	.181763	DECAL, BATTERY CHARGER DOOR	1

Mark Industries

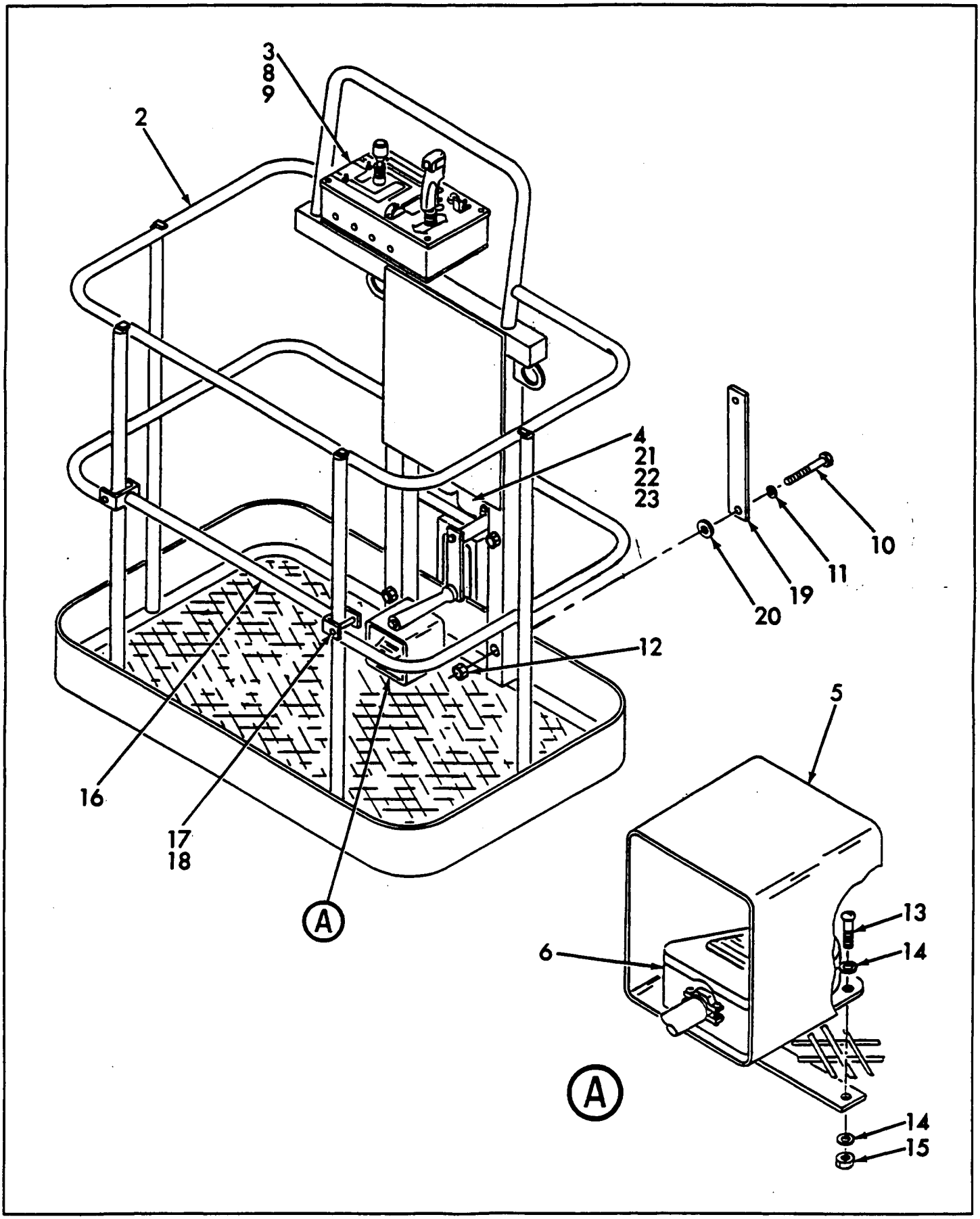
TITLE	DECAL SET	SECT.	2
MODEL	41KB	FIG.	2
NOTES		PAGE	5

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
26	.181759	DECAL, PANEL STRIPE	1
27	.181762	DECAL, C'T'W STRIPE	2
28	.181765	DECAL, 41KB	2
29	.183400	DECAL, BATTERY DISCONNECT	1
30	.183401	DECAL, DRIVE CONTROLLER COVER	1
31	.181908	DECAL, MARKLIFT BOOM	2
32	.20661	PLATE, ANSI A92	1
33	.20660	NAMEPLATE, IDENTIFICATION	1
34	.182747	DECAL, UPPER CONTROL	1

Mark Industries

TITLE	PLATFORM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	3
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Mark Industries

TITLE	PLATFORM ASSEMBLY
MODEL	41KB
NOTES	

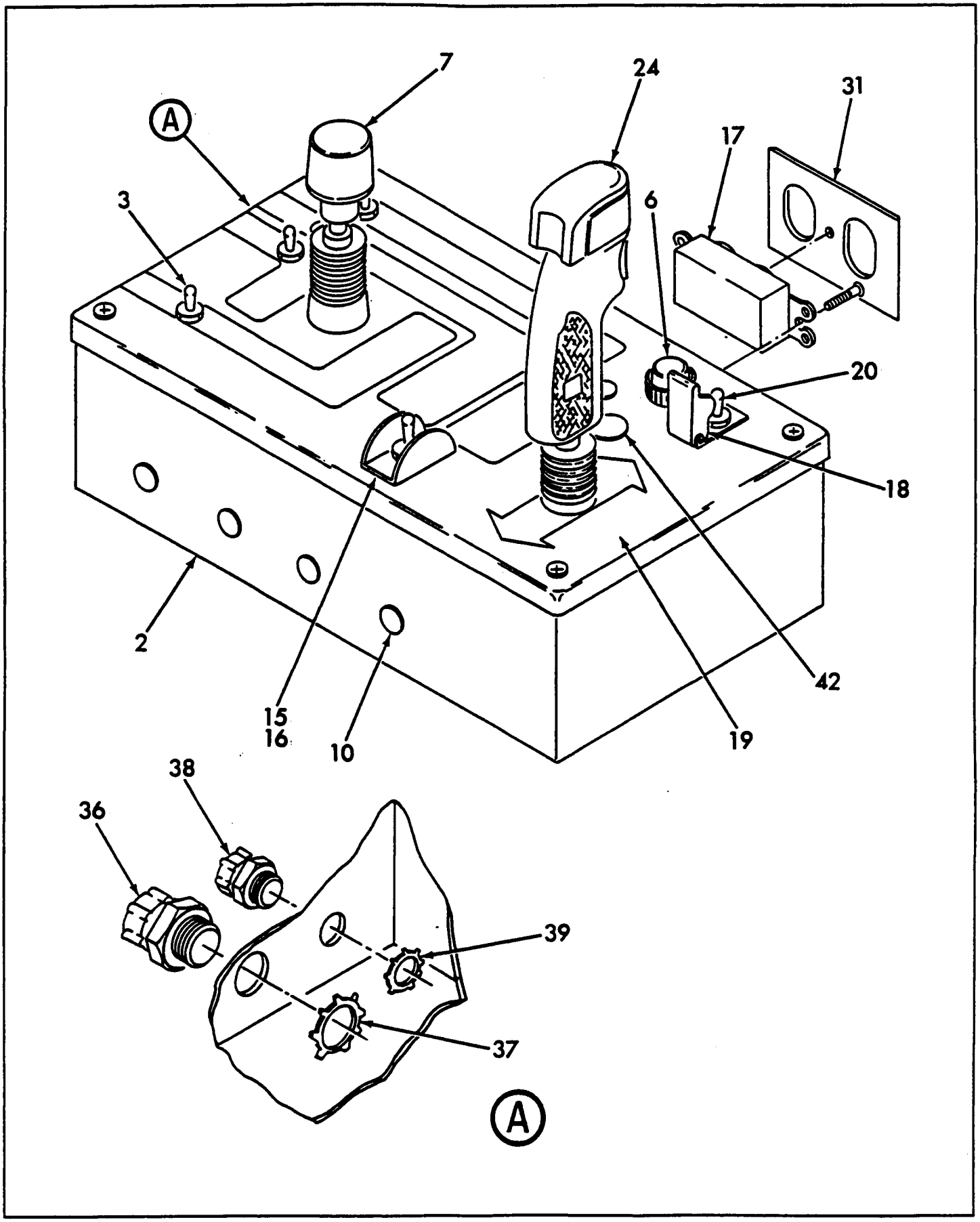
SECT.	2
FIG.	3
PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141000	ASSEMBLY, PLATFORM (See Sect. 2, Fig. 1 for NHA)	REF
2	.140964	WELDMENT, PLATFORM	1
3	.140991	ASSEMBLY, AERIAL CONTROL BOX (See Sect. 2, Fig. 4 for Details)	1
4	.81373	ROTATOR, MANUAL (See Sect. 2, Fig. 6 & 6A for Details)	1
5	.23846	COVER, FOOT SWITCH	1
6	.92202	SWITCH, FOOT	1
-7	..66336	MICROSWITCH	1
8	.60353	SCREW, CAP	4
9	.63401	WASHER, FLAT	4
10	.60549	SCREW, CAP	5
11	.63415	WASHER, FLAT	4
12	.61242	NUT, LOCK	4
13	.62714	SCREW, MACHINE	2
14	.63413	WASHER, FLAT	2
15	.61241	NUT, LOCK	2
16	.141080	WELDMENT, SLIDE BAR	1
17	.160212	PIN, CLEVIS	2
18	.160213	PIN, COTTER	2
19	.141244	WELDMENT, PLATFORM ROTATION STOP	2
20	.141287	WASHER, PLATFORM/ROTATOR	4
21	.60325	SCREW, CAP	2
22	.62319	WASHER, LOCK	2
23	.60558	SCREW, CAP	1

Mark Industries

TITLE	AERIAL CONTROL BOX ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	4
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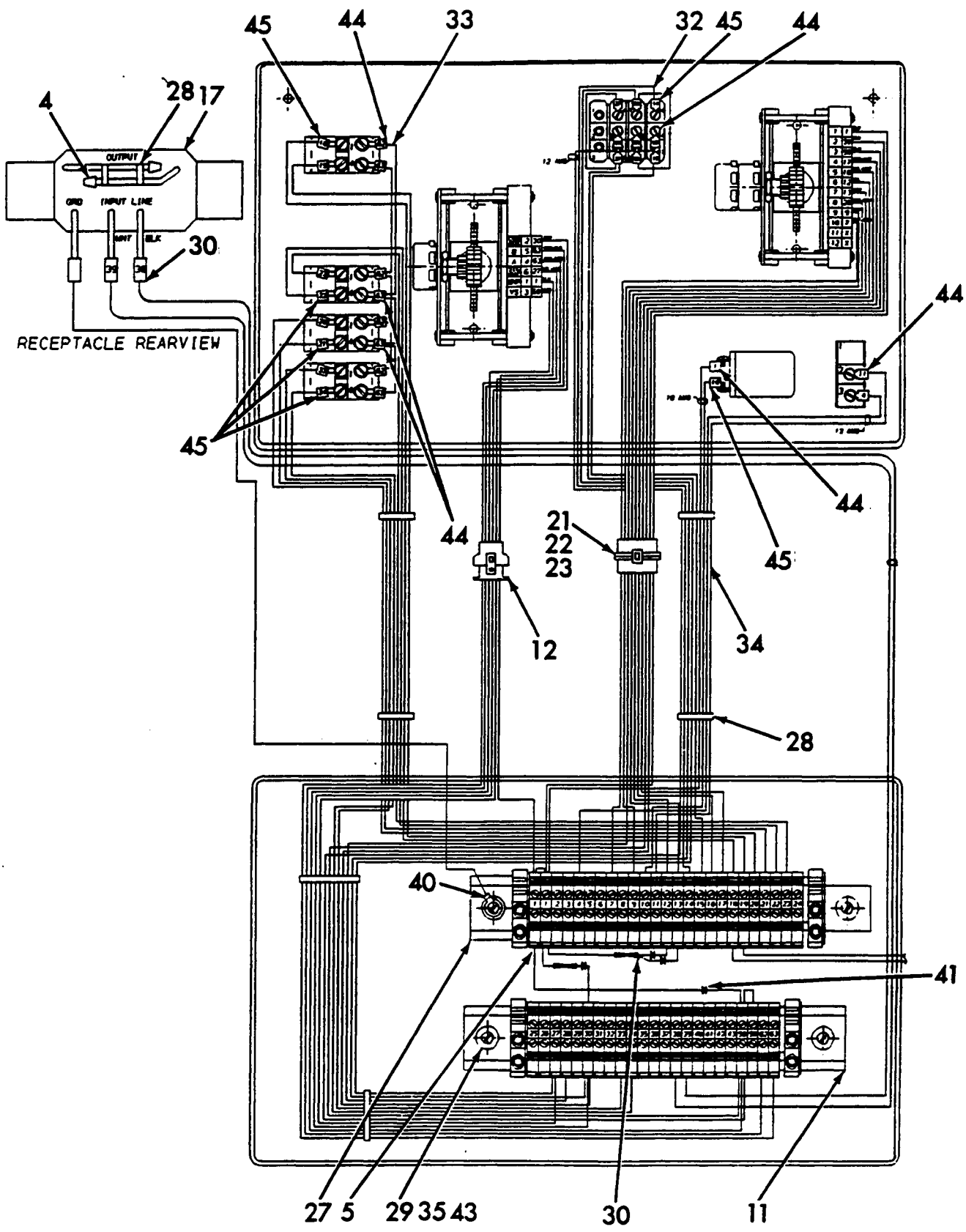


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Mark Industries

TITLE	AERIAL CONTROL BOX ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	4
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REV.

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140991	ASSEMBLY, AERIAL CONTROL BOX (See Sect. 2, Fig. 1 for NHA)	REF
2	.140965	MACHINING, AERIAL CONTROL BOX	1
3	.70417	SWITCH, TOGGLE	4
4	.70394	CONNECTOR, TWIST-ON WIRE	2
5	.70008	WIRE, YELLOW WITH GREEN	5
6	.66345	BUZZER, ALARM	1
7	.70488	CONTROLLER (ROTATE)	1
-8	..67812	BOARD, ENCAPSULATED CONTROLLER	1
-9	..600006	POTENTIOMETER (WITH WIRES)	1
10	.771	PLUG	5
11	.141170	ASSEMBLY, TERMINAL BLOCK	1
12	.141144	ASSEMBLY, BOOM FUNCTION WIRE HARNESS	1
-13	..70502	PLUG, CONNECTOR	1
-14	..70503	PIN	6
15	.20884	GUARD, SWITCH	1
16	.70383	SWITCH, LEVELING	1
17	.70391	RECEPTACLE	1
18	.70303	SWITCH, GUARD	1
19	.182747	DECAL, UPPER CONTROL	1
20	.4017	SWITCH, TOGGLE	1
21	.141147	ASSEMBLY, DRIVE WIRE HARNESS	1
22	..70516	PLUG, CONNECTOR	1
23	..70517	PIN	12
24	.70487	CONTROLLER (DRIVE)	1
-25	..67811	BOARD, ENCAPSULATED CONTROLLER	1

Mark Industries

TITLE	AERIAL CONTROL BOX ASSEMBLY
MODEL	41KB
NOTES	

SECT.	2
FIG.	4
PAGE	4

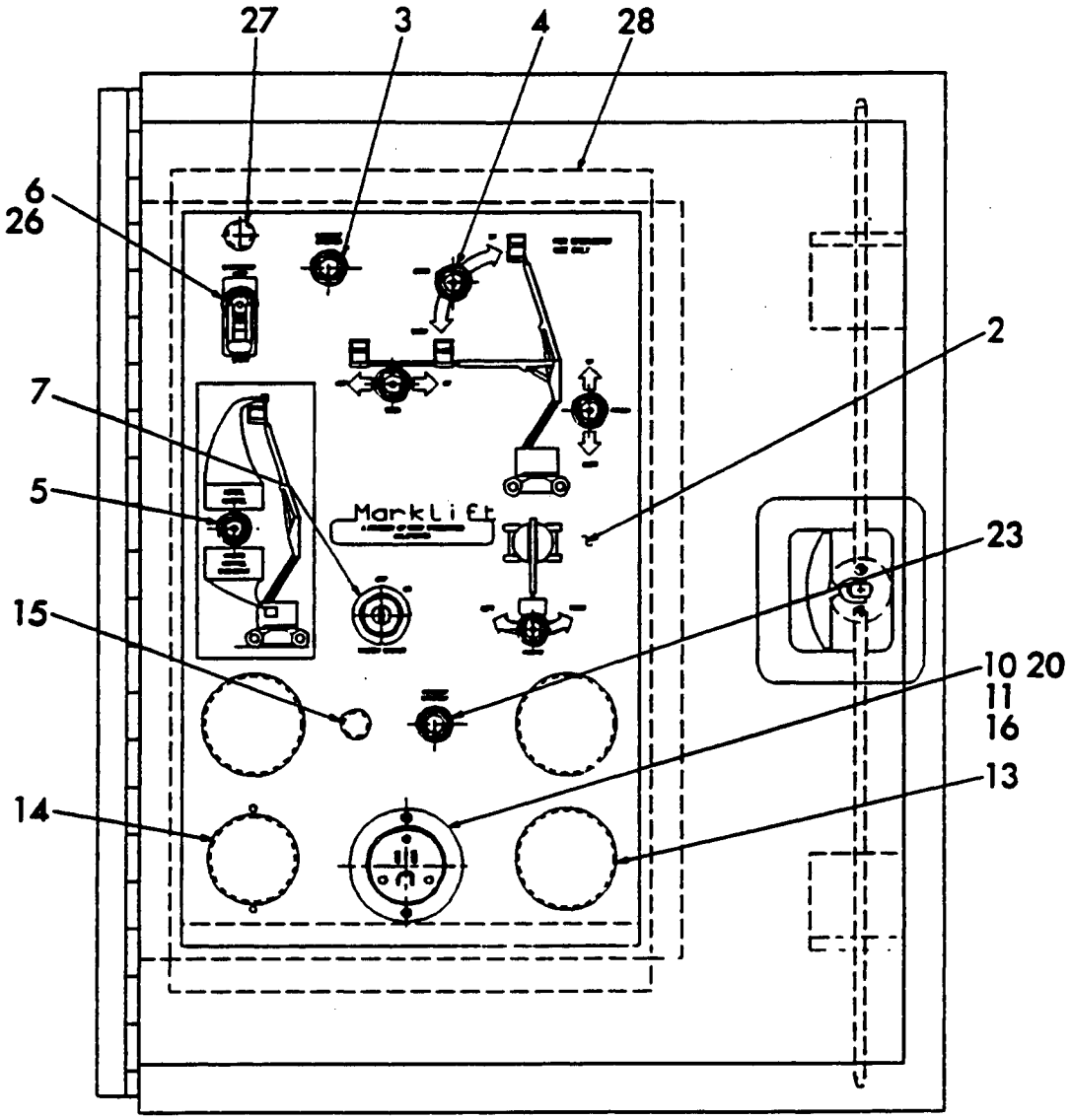
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-26	..600174	ASSEMBLY, DUAL POTENTIOMETER	1
27	.141172	ASSEMBLY, TERMINAL BLOCK	1
28	.256	TIE, CABLE	40
29	.62612	SCREW, MACHINE	4
30	.70162	BUTT, TERMINAL	5
31	.70392	COVER, RECEPTACLE	1
32	.2991	WIRE, WHITE (12 AWG STRANDED)	10
33	.2990	WIRE, WHITE (18 AWG STRANDED)	90
34	.70098	WIRE, YELLOW WITH GREEN STRIPE	5
35	.63312	WASHER, LOCK	4
36	.16215	RELIEF, STRAIN	1
37	.16105	NUT, LOCK	1
38	.2806	RELIEF, STRAIN	1
39	.2808	NUT, LOCK	1
40	.117-C	RING, CONNECTOR	2
41	.70479	DIODE (6 AMP/1000 VOLT)	3
42	.772	PLUG	1
43	.61502	NUT, HEX	4
44	.117-B	CONNECTOR	14
45	.70149	CONNECTOR	13

DASH (-) INDICATES THE 'ITEM' IS NOT ILLUSTRATED

Mark Industries

TITLE	GROUND CONTROL & DOOR ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	5
PAGE	1

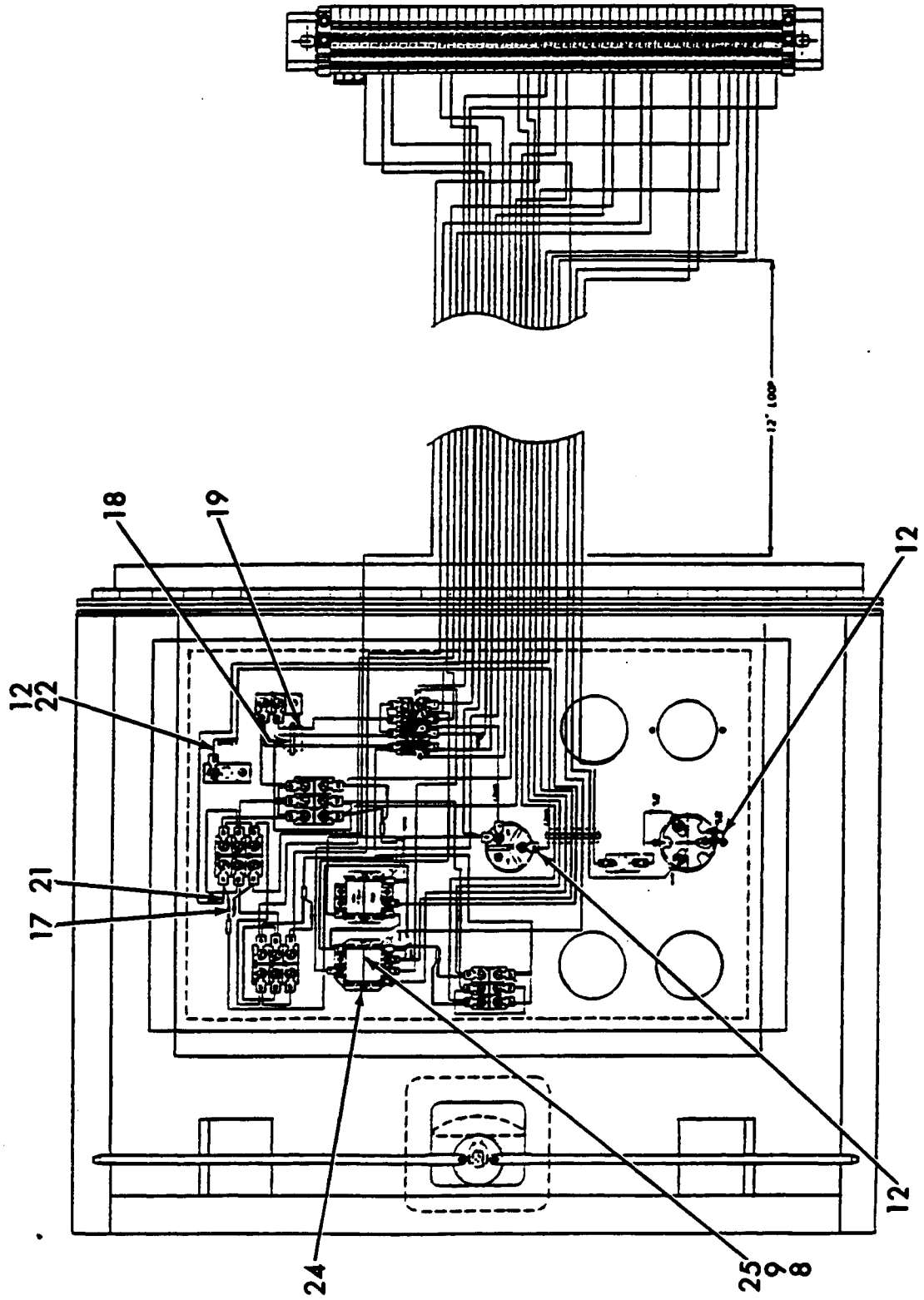


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Mark Industries

TITLE	GROUND CONTROL & DOOR ASSEMBLY
MODEL	41KB
NOTES	

SECTION	2
FIGURE	5
PAGE	2



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Mark Industries

TITLE	GROUND CONTROL & DOOR ASSEMBLY
MODEL	41KB
NOTES	

SECT.	2
FIG.	5
PAGE	3

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141216	ASSEMBLY, CONTROL PANEL (See Sect. 2, Fig. 1 for NHA)	REF
2	.182716	DECAL, GROUND CONTROL	1
3	.70361	BREAKER, CIRCUIT (10 AMP WITH BOOT)	1
4	.20481	SWITCH, TOGGLE	4
5	.16260	SWITCH, TOGGLE	1
6	.4017	SWITCH, TOGGLE	1
7	.2717	SWITCH, IGNITION	1
8	.30215	CLIP, RELAY HOLD DOWN	2
9	.70238	RELAY	2
10	.62636	SCREW, MACHINE	2
11	.63312	WASHER, LOCK	2
12	.117-C	RING, CONNECTOR	60
13	.65244	PLUG	3
14	.65243	PLUG	1
15	.65240	PLUG	2
16	.61502	NUT, HEX	2
17	.70479	DIODE (6 AMP/1000 VOLT)	1
18	.256	TIE, CABLE	45
19	.16214	MOUNT	8
20	.70409	INLET, FLANGED	1
21	.2990	WIRE, WHITE (18 AWG STRANDED)	90
22	.2991	WIRE, WHITE (12 AWG STRANDED)	12
23	.20562	BREAKER, CIRCUIT	1
24	.61721	SCREW, SHEET METAL	4
25	.784-A	SOCKET, 8 PIN OCTAL	2

Mark Industries

TITLE	GROUND CONTROL & DOOR ASSEMBLY
MODEL	41KB
NOTES	

SECT.	2
FIG.	5
PAGE	4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
26	.70303	SWITCH, GUARD	1
27	.775	PLUG, HOLE	1
28	.141200	WELDMENT, CONTROL PANEL DOOR	1

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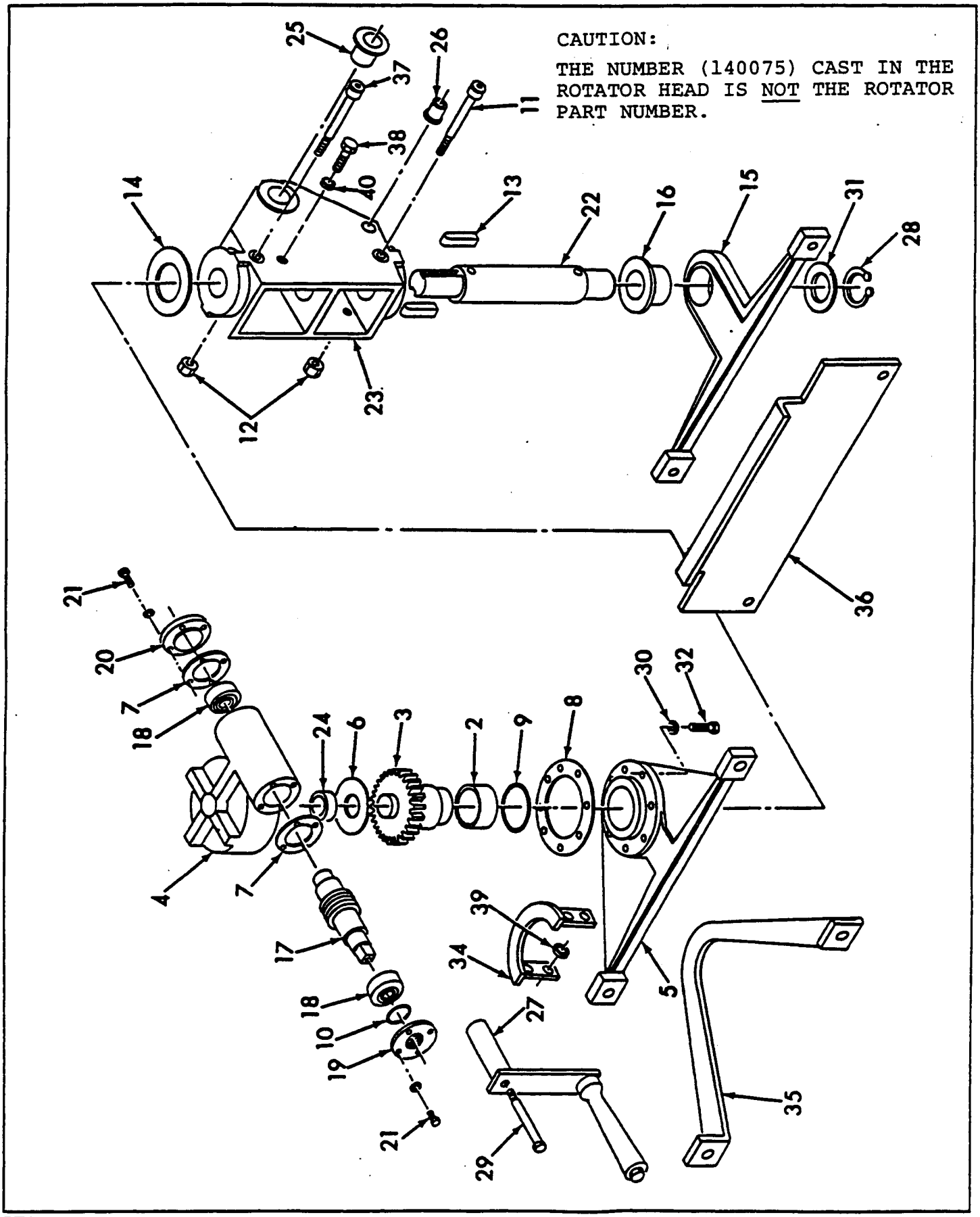
Mark Industries

TITLE	TYPICAL MANUAL ROTATOR
MODEL	41KB
NOTES	FROM MID 1987 UNTIL EARLY 1990

SECTION	2
FIGURE	6
PAGE	1

CAUTION:

THE NUMBER (140075) CAST IN THE ROTATOR HEAD IS NOT THE ROTATOR PART NUMBER.



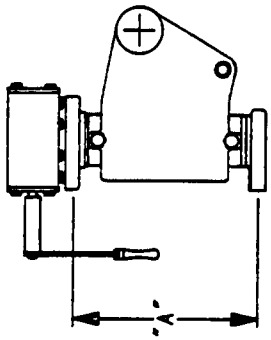
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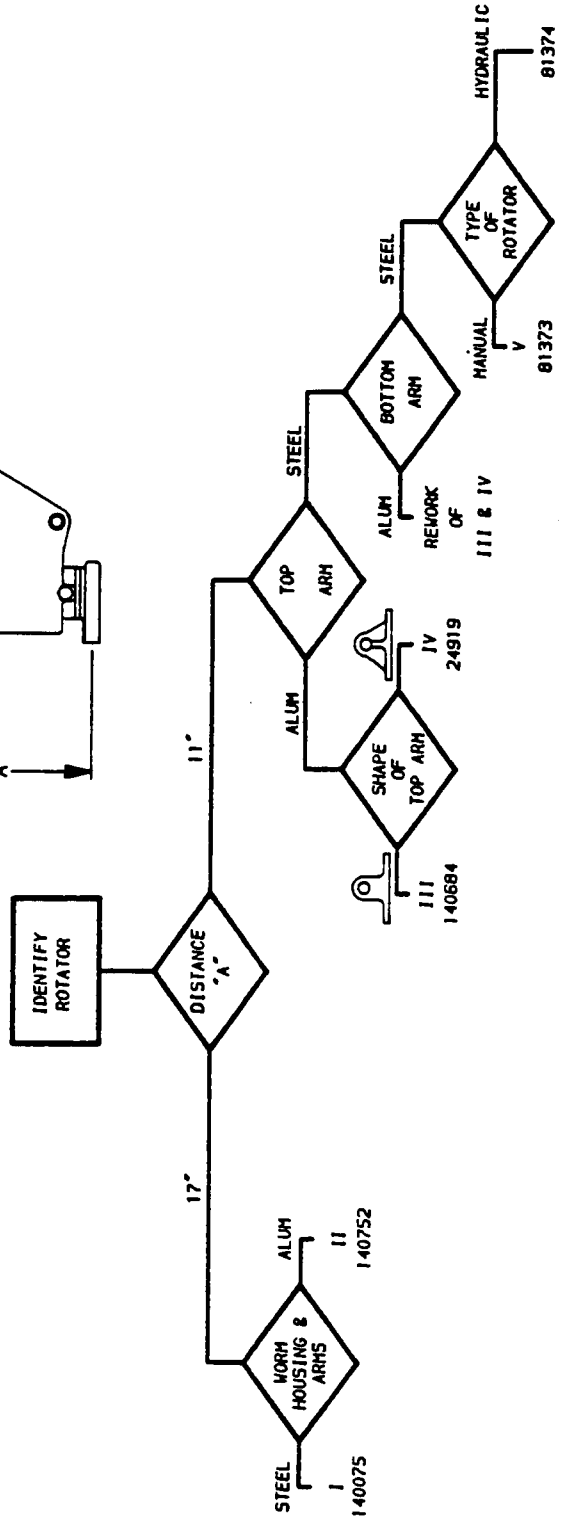
Mark Industries

TITLE	TYPICAL MANUAL ROTATOR
MODEL	41KB
NOTES	FROM MID 1987 UNTIL EARLY 1990

SECTION	2
FIGURE	6
PAGE	2

ROTATOR IDENTIFICATION FLOW CHART





REV.

Mark Industries

TITLE	TYPICAL MANUAL ROTATOR
MODEL	41KB
NOTES	FROM MID 1987 UNTIL EARLY 1990

SECTION	2
FIGURE	6
PAGE	3

ITEM	M.I.P/N (I)	M.I.P/N (II)	M.I.P/N (III)	M.I.P/N (IV)	DESCRIPTION	QTY
-1	140075	140752	140684	24919	ASSEMBLY, ROTATOR (SEE SEC 2 FIG 1 FOR NHA)	REF
2	68030	68030	68030	68030	BUSHING	1
3	** 600278	** 600279	** 600279	600280	GEAR, BULL	1
4	+ 68033	68032	68032	68032	HOUSING, GEAR	1
5	** 68036	* 81378	* 81378	* 81378	ARM, TOP	1
6	68037	68037	68037	68037	WASHER, THRUST	1
7	68038	68038	68038	68038	GASKET, END CAP	2
8	68039	68039	68039	68039	GASKET, GEARBOX	1
9	68040	68040	68040	68040	O-RING	1
10	68041	68041	68041	68041	O-RING	1
11	600187	600187	600187	600187	BOLT	1
12	600188	600188	600188	600188	NUT W/NYLOCK	2
13	600189	600189	600189	600189	KEY	2
14	68044	68043	68043	68042	WASHER, THRUST	1
15	** 600282	600283	600283	600283	ARM, BOTTOM	1
16	68045	68045	68045	68045	BUSHING, FLANGED	1
17	600284	600285	600286	600286	GEAR, WORM	1
18	68046	68046	68046	68046	BEARING, ROLLER	2
19	600287	* 600288	600288	600288	CAP, END (THRU)	1
20	68048	68047	68047	68047	CAP, END	1
21	600192	600190	600190	600190	BOLT	8
22	** 600289	** 600290	600291	600291	PIN, MAIN	1
23	++	++	++	++	YOKE	1
24	68049	68049	68049	68049	BUSHING	1
25	68050	68050	68050	68050	BUSHING, FLANGED	2
26	68051	68051	68051	68051	BUSHING, FLANGED	2
27	* 68052	* 68052	68052	68052	CRANK, HAND	1
28	N/A	N/A	68054	68054	RING, SNAP	1
29	* 600191	* 600191	600191	600191	BOLT	1
30	N/A	N/A	63302	63302	WASHER, LOCK	8
31	N/A	N/A	N/A	600292	WASHER, FLAT	1
32	600186	600186	600186	600186	BOLT	8
-33	600193	600193	600193	600193	KIT, PROD. IMPROVEMENT	REF
34	141342	141342	141342	141342	RETAINER, COLLAR	1
35	141341	141341	141341	141341	COLLAR, ROTATOR	1
36	141344	141344	141344	141344	BRACKET, ANGLE	1
37	60558	60558	60558	60558	SCREW, CAP	1
38	60338	60338	60338	60338	SCREW, CAP	2
39	63402	63402	63402	63402	WASHER, FLAT	4
40	63303	63303	63303	63303	WASHER, LOCK	2

* Parts are not original, but are a newer "direct replacement."

** Special Order items; allow 90 days lead time.

\+ Originally made of "cast iron"; replacements are "aluminum".

++ If the yoke requires replacement, the ENTIRE rotator MUST be replaced W/81373. {Modification is necessary if the "original" rotator is P/N 140075 or 140752.}

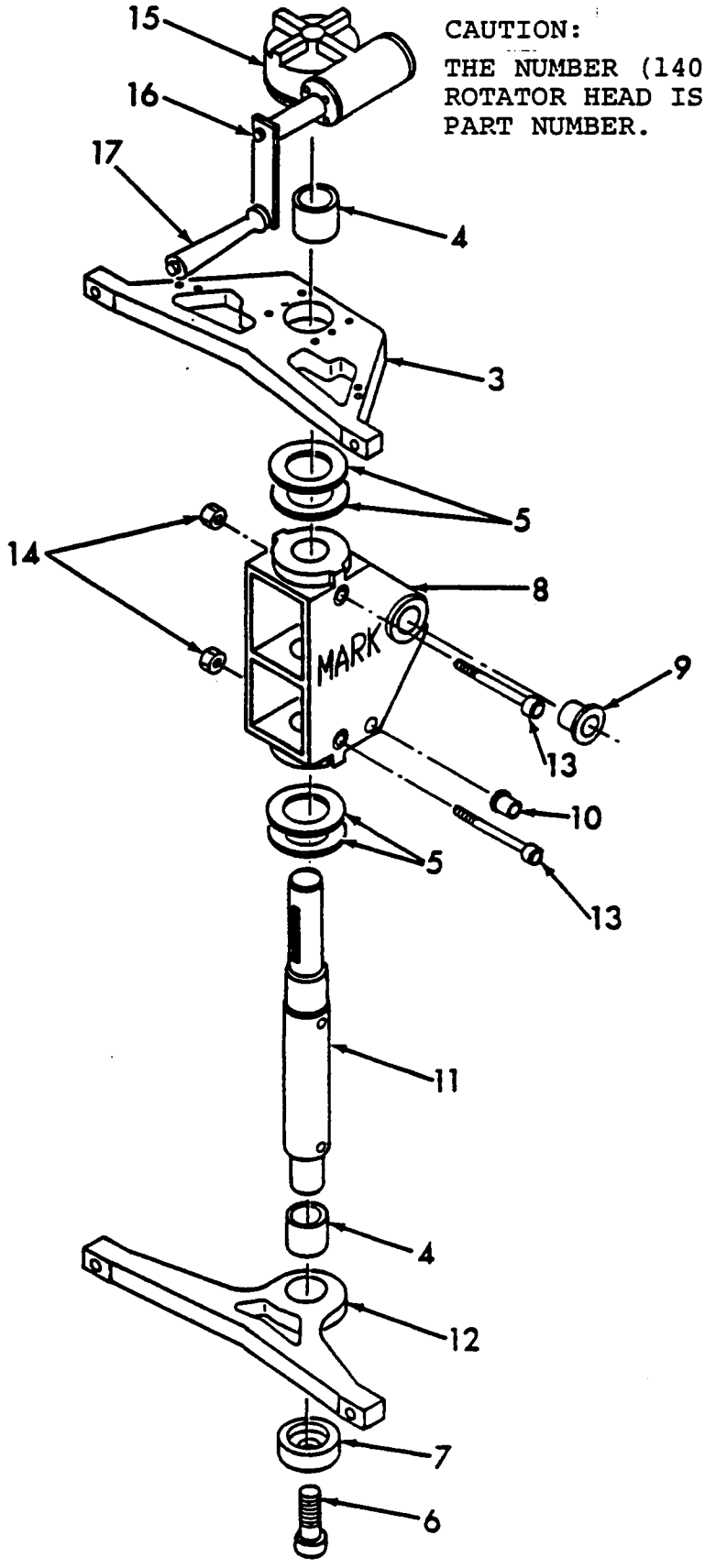
NOTE: SEE THE "ROTATOR IDENTIFICATION FLOW CHART" TO DETERMINE WHICH ROTATOR IS APPLICABLE.

REV.

Mark Industries

TITLE	PLATFORM MANUAL ROTATOR ASSEMBLY
MODEL	41KB
NOTES	SINCE EARLY 1990

SECTION	2
FIGURE	6A
PAGE	1



CAUTION:

THE NUMBER (140075) CAST IN THE ROTATOR HEAD IS NOT THE ROTATOR PART NUMBER.

REV.

Mark Industries

TITLE	PLATFORM MANUAL ROTATOR ASSEMBLY
MODEL	41KB
NOTES	SINCE EARLY 1990

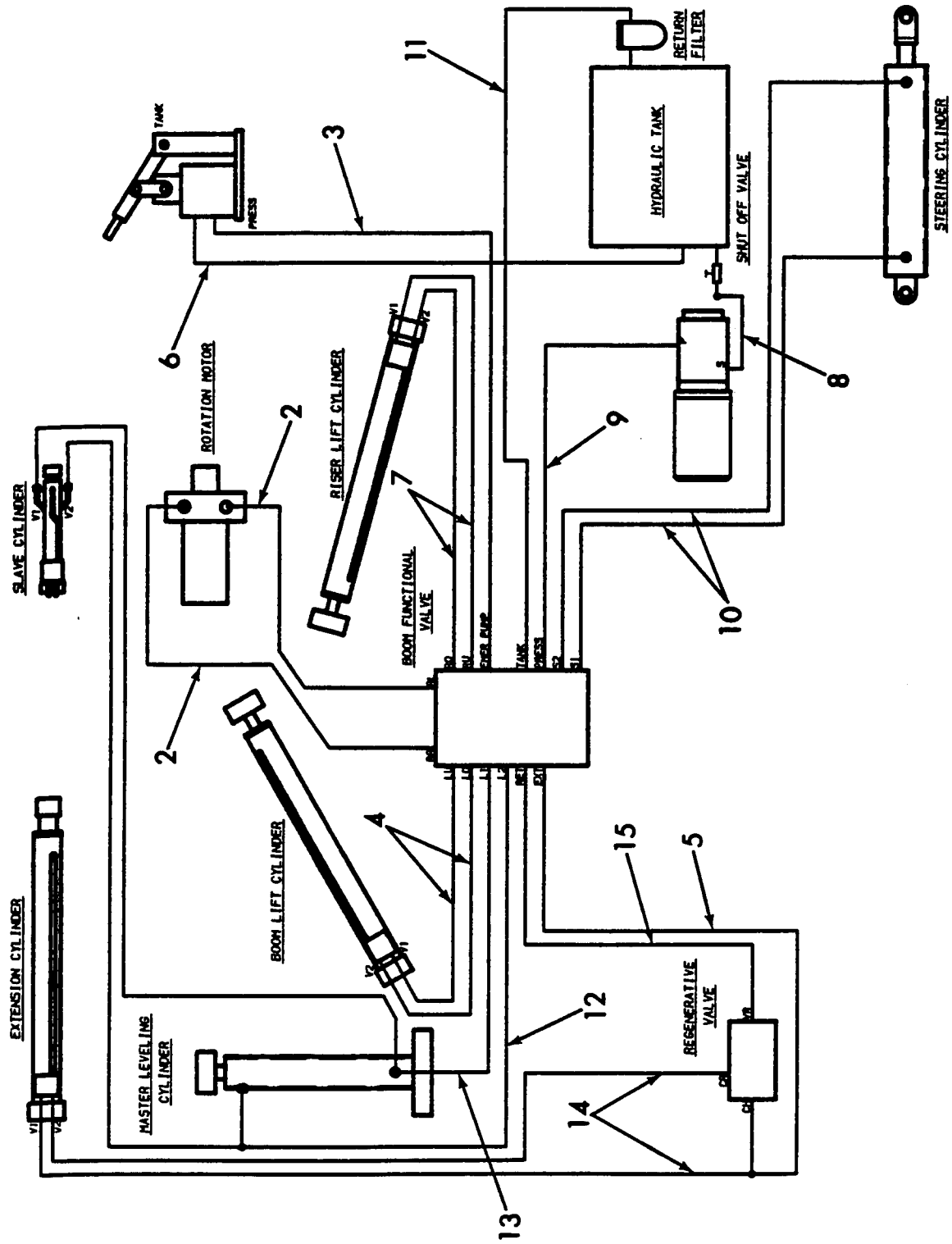
SECT.	2
FIG.	6A
PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	81373	ROTATOR, MANUAL (See Sect. 2, Fig. 3 for NHA)	REF
-2	.81369	BASE, ROTATOR	REF
3	..600221	ARM, STEEL TOP	1
4	..600222	BUSHING	2
5	..600223	WASHER, THRUST	4
6	..600224	BOLT	1
7	..600225	WASHER, RETAINING	1
8	..	YOKE, ROTATOR	1
9	...68050	BUSHING, FLANGED	2
10	...68051	BUSHING, FLANGED	2
11	...600226	PIN, MAIN	1
12	...600227	ARM, STEEL BOTTOM	1
13	...600187	BOLT	2
14	...600188	NUT (WITH NYLOCK)	2
15	.81374	GEARHEAD	1
16	..600191	BOLT	1
17	..600281	HANDLE, CRANK	1

Mark Industries

TITLE	HYDRAULIC HOSE KIT DIAGRAM
MODEL	41KB
NOTES	

SECTION	2
FIGURE	7
PAGE	1



REV.

Mark Industries

TITLE	HYDRAULIC HOSE KIT DIAGRAM
MODEL	41KB
NOTES	

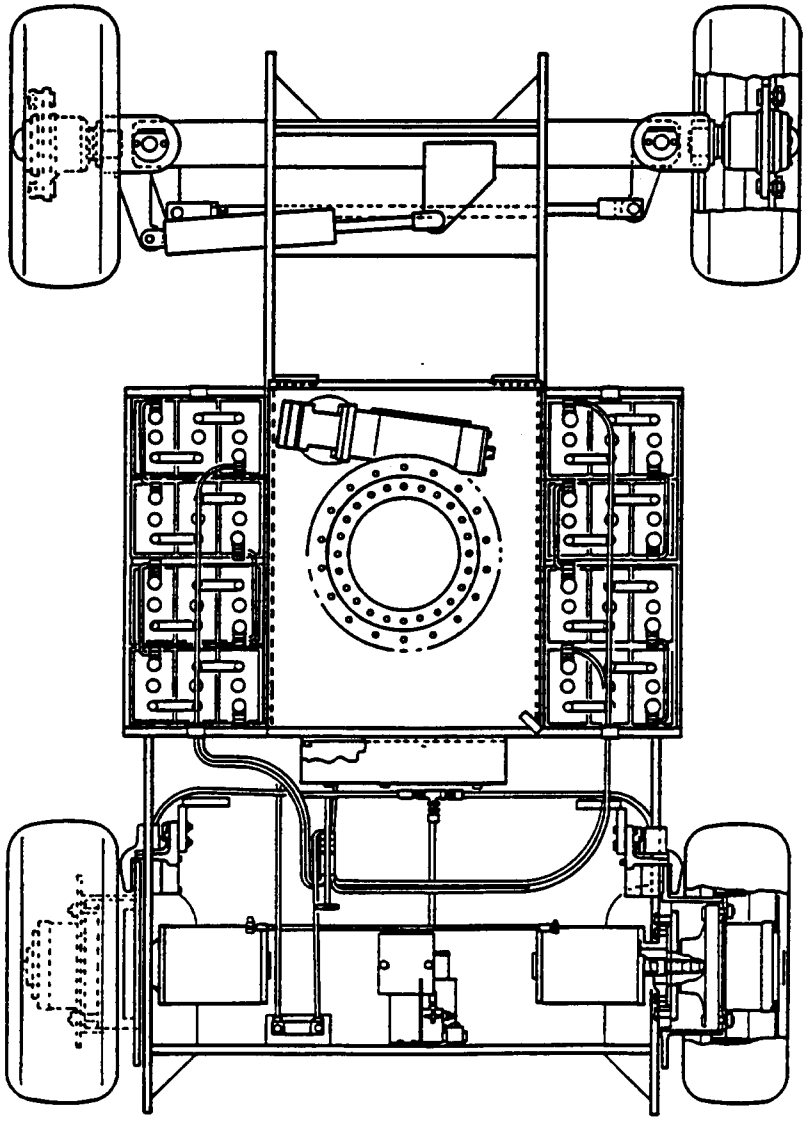
SECT.	2
FIG.	7
PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141246	DIAGRAM, HOSE KIT (See Sect. 2, Fig. 1 for NHA)	REF
2	.13211-06-0800	ASSEMBLY, HOSE	2
3	.13210-04-0250	ASSEMBLY, HOSE	1
4	.13229-04-2160	ASSEMBLY, HOSE	2
5	.13211-06-0290	ASSEMBLY, HOSE	1
6	.13210-04-0100	ASSEMBLY, HOSE	1
7	.13211-06-0420	ASSEMBLY, HOSE	2
8	.13210-12-0370	ASSEMBLY, HOSE	1
9	.13210-06-0140	ASSEMBLY, HOSE	1
10	.13213-04-1360	ASSEMBLY, HOSE	2
11	.13213-10-0230	ASSEMBLY, HOSE	1
12	.13228-03-2600	ASSEMBLY, HOSE	1
13	.13228-03-2500	ASSEMBLY, HOSE	1
14	.13210-06-2890	ASSEMBLY, HOSE	2
15	.13211-06-0260	ASSEMBLY, HOSE	1

DASH (-) INDICATES THE 'ITEM' IS NOT ILLUSTRATED

SECTION 3 CONTAINS:

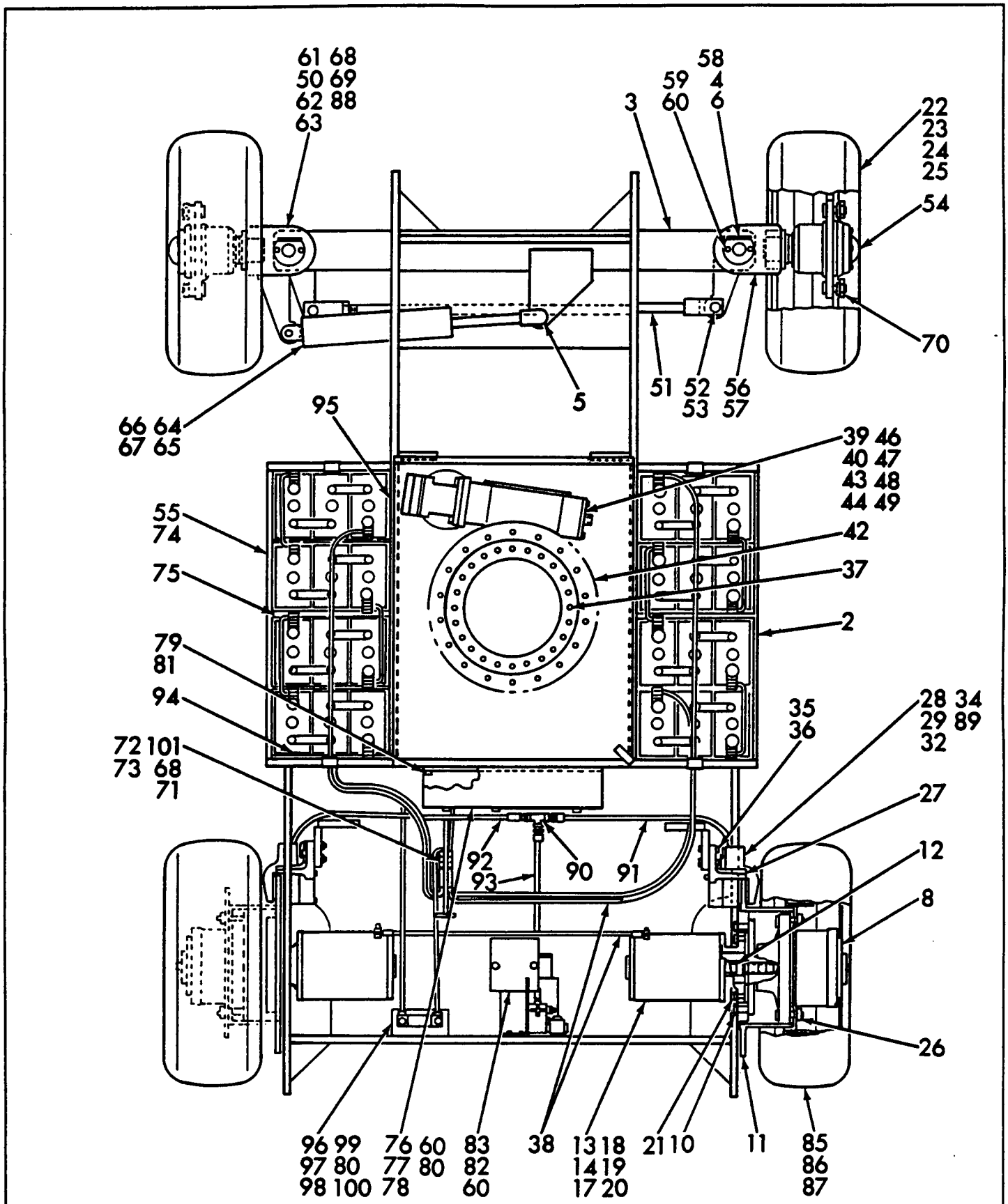
FIG. NO.	TITLE
1	CARRIAGE ASSEMBLY
2	STEERING CYLINDER ASSEMBLY (SE)
2A	STEERING CYLINDER ASSEMBLY (TH)
3	TRANSISTORIZED CONTROLLER ASSEMBLY
4	BRAKE RELEASE ASSEMBLY



Mark Industries

TITLE	CARRIAGE ASSEMBLY
MODEL	41KB
NOTES	

SECTION	3
FIGURE	1
PAGE	1



REV.

Mark Industries

TITLE	CARRIAGE ASSEMBLY
MODEL	41KB
NOTES	

SECT.	3
FIG.	1
PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141025	ASSEMBLY, CARRIAGE (See Sect. 2, Fig. 1 for NHA)	REF
2	.141023	WELDMENT, CARRIAGE	1
3	..140039	MACHINING, STEERING AXLE	1
4	...64910	BUSHING, FLANGED	2
5	...2265	BUSHING	1
6	...64934	BEARING, SLEEVE	2
-7	..141028	SPACER, DRIVE MOUNT	2
8	.140891	HUB, TORQUE (See Vendor Chapter for Details)	2
-9	..600219	KIT, SEAL	1
10	.60621	SCREW, CAP	12
11	.141054	MACHINING, BRAKE ROTOR	2
12	.140923	COUPLING, ADAPTER	2
13	.141059	ASSEMBLY, ELECTRIC MOTOR & ADAPTER	2
14	..70480	MOTOR, ELECTRIC (See Vendor Chapter for Details)	2
-15	...600149	SEAL, SHAFT	1
-16	...600142	BRUSH & PARTS	2
17	..140945	MACHINING, ADAPTER	2
18	..60618	SCREW, CAP	8
19	..62319	WASHER, LOCK	8
20	..141294	GASKET, MOTOR/TORQUE HUB	2
21	.60602	SCREW, CAP	4
22	.140167	ASSEMBLY, WHEEL	2
23	..140040	WHEEL	2
24	..140317	VALVE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
25	..140165	TIRE	2
26	.65945	NUT, CONICAL	18
27	.160183	BRACKET, CALIPER MOUNTING	2
28	.141237	ASSEMBLY, BRAKE CALIPER	2
29	..30860	BRAKE, DISC (See Vendor Chapter for Details)	2
-30	...600109	KIT, SEAL REPAIR	1
-31	...600108	KIT, LINING	1
32	..160236	FITTING, GREASE	2
33	..80004-03	CONNECTOR, STRAIGHT THREAD	2
34	..65366	CAP, GREASE	2
35	.60393	SCREW, CAP	8
36	.61305	NUT, LOCK	8
37	.60636	SCREW, CAP	24
38	.141252	KIT, BATTERY CABLE	1
39	.141271	ASSEMBLY, MOTOR/SLEW DRIVE ROTATOR	1
40	..141277	ASSEMBLY, WORM BOX	1
-41	...600120	SEAL, OUTBOARD	1
42	..23722	GEAR, RING	1
43	..62017	SCREW, CAP	2
44	..81362	MOTOR, HYDRAULIC (See Vendor Chapter for Details)	1
-45	...600123	KIT, SEAL	1
46	..62011	SCREW, CAP	2
47	..80001-11	CONNECTOR, MALE	2
48	..65781	CAP, PLUG	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
49	..63305	WASHER, LOCK	2
50	.65103	FITTING, GREASE	2
51	.140237	ASSEMBLY, STEERING TIE ROD	1
52	.65966	SCREW, SHOULDER	2
53	.61236	NUT, LOCK	2
54	.140089	ASSEMBLY, HUB	2
55	.30297	BATTERY, 6 VOLT	8
56	.140329	ASSEMBLY, L.H. SPINDLE & YOKE	1
57	..2265	BUSHING	1
58	.140338	PIN, KING	2
59	.60338	SCREW, CAP	4
60	.63302	WASHER, LOCK	11
61	.140328	ASSEMBLY, R.H. SPINDLE & YOKE	1
62	..2265	BUSHING	1
63	..64935	BEARING, SLEEVE	1
64	.140291	ASSEMBLY, STEERING CYLINDER	1
65	..140059	CYLINDER, STEERING (See Sect. 3, Fig. 2 & 2A for Details)	1
66	..80004-03	CONNECTOR, STRAIGHT THREAD	1
67	..80012-03	ELBOW, STRAIGHT THREAD	1
68	.63301	WASHER, LOCK	2
69	.140759	SPACER (STEERING YOKE)	2
70	.65117	NUT, BALL	10
71	.70410	CONNECTOR, BATTERY	2
72	.60352	SCREW, CAP	2
73	.60701	NUT, HEX	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
74	.141222	PAD, BATTERY	2
75	.141223	SEPARATOR, BATTERY	2
76	.140998	ASSEMBLY, TRANSISTORIZED CONTROLLER (See Sect. 3, Fig. 3 for Details)	1
77	.141006	COVER, TRANSISTORIZED CONTROLLER	1
78	.141017	BRACKET, WIRE CLAMP	1
79	.60343	SCREW, CAP	4
80	.60702	NUT, HEX	9
81	.63303	WASHER, LOCK	4
82	.60322	SCREW, CAP	3
83	.141353	ASSEMBLY, BRAKE RELEASE (See Sect. 3, Fig. 4 for Details)	1
-84	.140166	ASSEMBLY, FRONT AXLE WHEEL	2
85	..140280	WHEEL, FRONT AXLE	2
86	..140321	VALVE	2
87	..140165	TIRE	2
88	.65366	CAP, GREASE	2
89	.80004-03	CONNECTOR, STRAIGHT THREAD	2
90	.80031-03	TEE	1
91	.13228-04-0150	ASSEMBLY, HOSE	1
92	.13228-04-0410	ASSEMBLY, HOSE	1
93	.13229-04-0390	ASSEMBLY, HOSE	1
94	.28572	SHEET	2
95	.28573	SHEET	2
96	.141196	TERMINAL, FUSE BLOCK	1
97	.70512	FUSE (300 AMPS)	1

Mark Industries

TITLE	CARRIAGE ASSEMBLY
MODEL	41KB
NOTES	

SECT.	3
FIG.	1
PAGE	6

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
98	.60339	SCREW, CAP	2
99	.60355	SCREW, CAP	3
100	.63434	WASHER, FLAT	6
101	.141189	ASSEMBLY, DOUBLE DISCONNECT	1
-102	..141183	WELDMENT, BATTERY DISCONNECT	1
-103	..70410	CONNECTOR, BATTERY	2
-104	..60352	SCREW, CAP	2
-105	..60701	NUT, HEX	2
-106	..63301	WASHER, LOCK	2

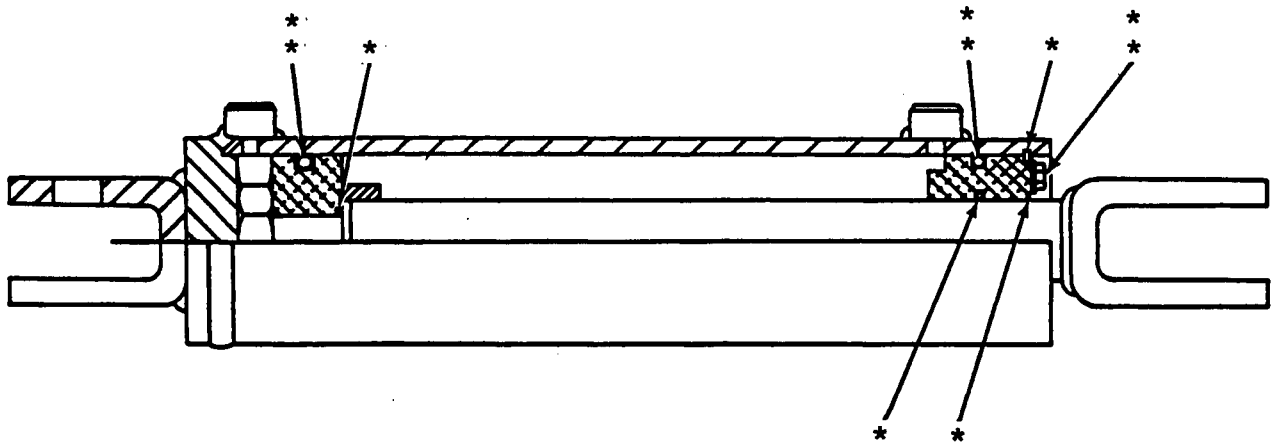
REV.

DASH (-) INDICATES THE 'ITEM' IS NOT ILLUSTRATED

Mark Industries

TITLE	STEERING CYLINDER ASSEMBLY (SE)
MODEL	41KB
NOTES	BEFORE LATE 1989

SECTION	3
FIGURE	2
PAGE	1



NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

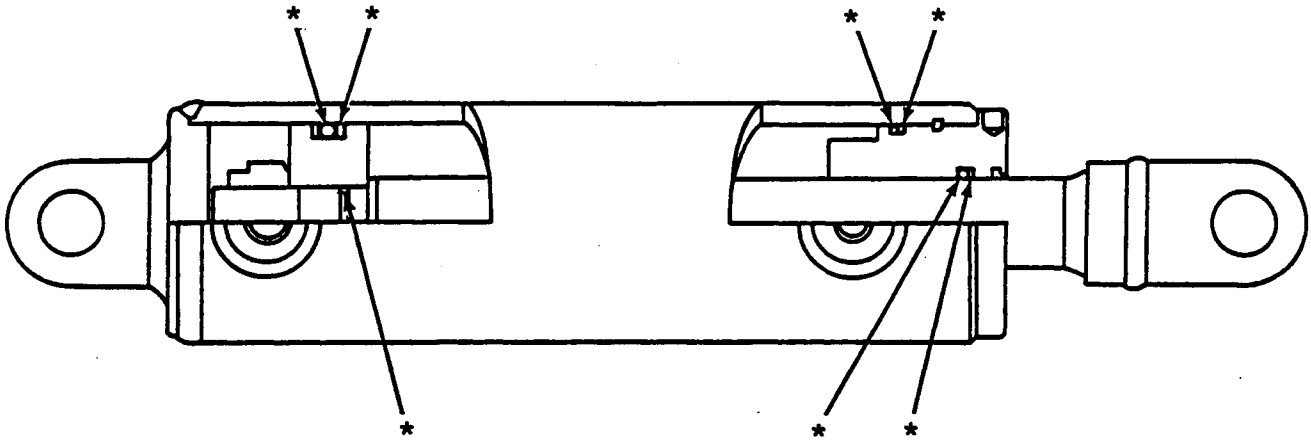
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140059	CYLINDER, STEERING (See Sect. 3, Fig. 1 for NHA)	REF
-2	.66861	KIT, SEAL	1
		NOTE 3: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.

Mark Industries

TITLE	STEERING CYLINDER ASSEMBLY (TH)
MODEL	41KB
NOTES	AFTER LATE 1989

SECTION	3
FIGURE	2A
PAGE	1

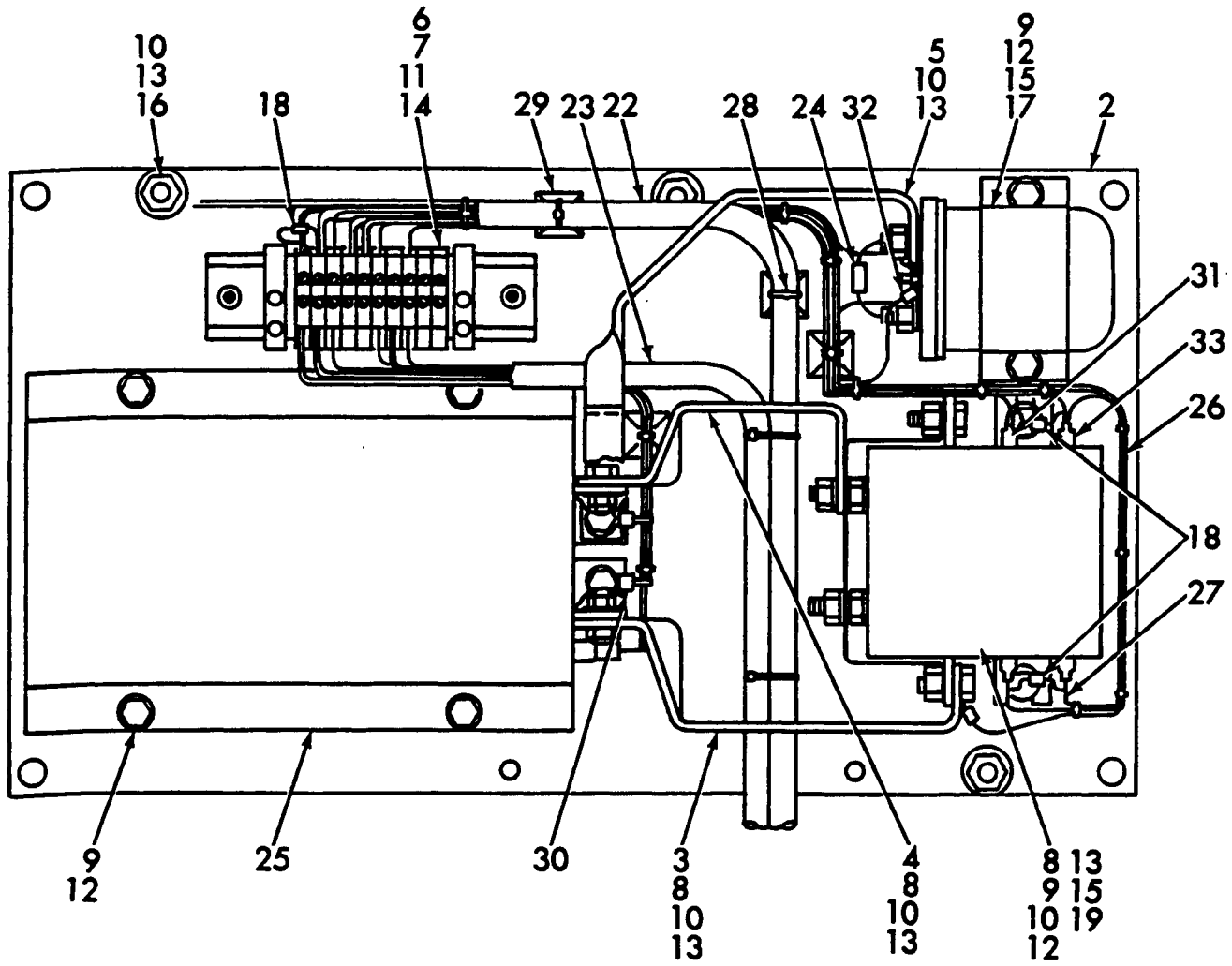


NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140059	CYLINDER, STEERING (TH) (See Sect. 3, Fig. 1 for NHA)	REF
-2	.600033	KIT, SEAL	1
-3	.68005	PIN, CLEVIS	2
-4	.68006	PIN, CUP	4
		NOTE 3: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.



ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140998	ASSEMBLY, TRANSISTORIZED CONTROLLER (See Sect. 3, Fig. 1 for NHA)	REF
2	.140976	PLATE, PMC MOUNTING	1
3	.141009	BAR, BUS	1
4	.141010	BAR, BUS	1
5	.141203	BAR, BUS	1
6	.141218	ASSEMBLY, TERMINAL BLOCK	1
7	.63412	WASHER, FLAT	2
8	.60367	SCREW, CAP	8

Mark Industries

TITLE	TRANSISTORIZED CONTROLLER ASSEMBLY
MODEL	41KB
NOTES	

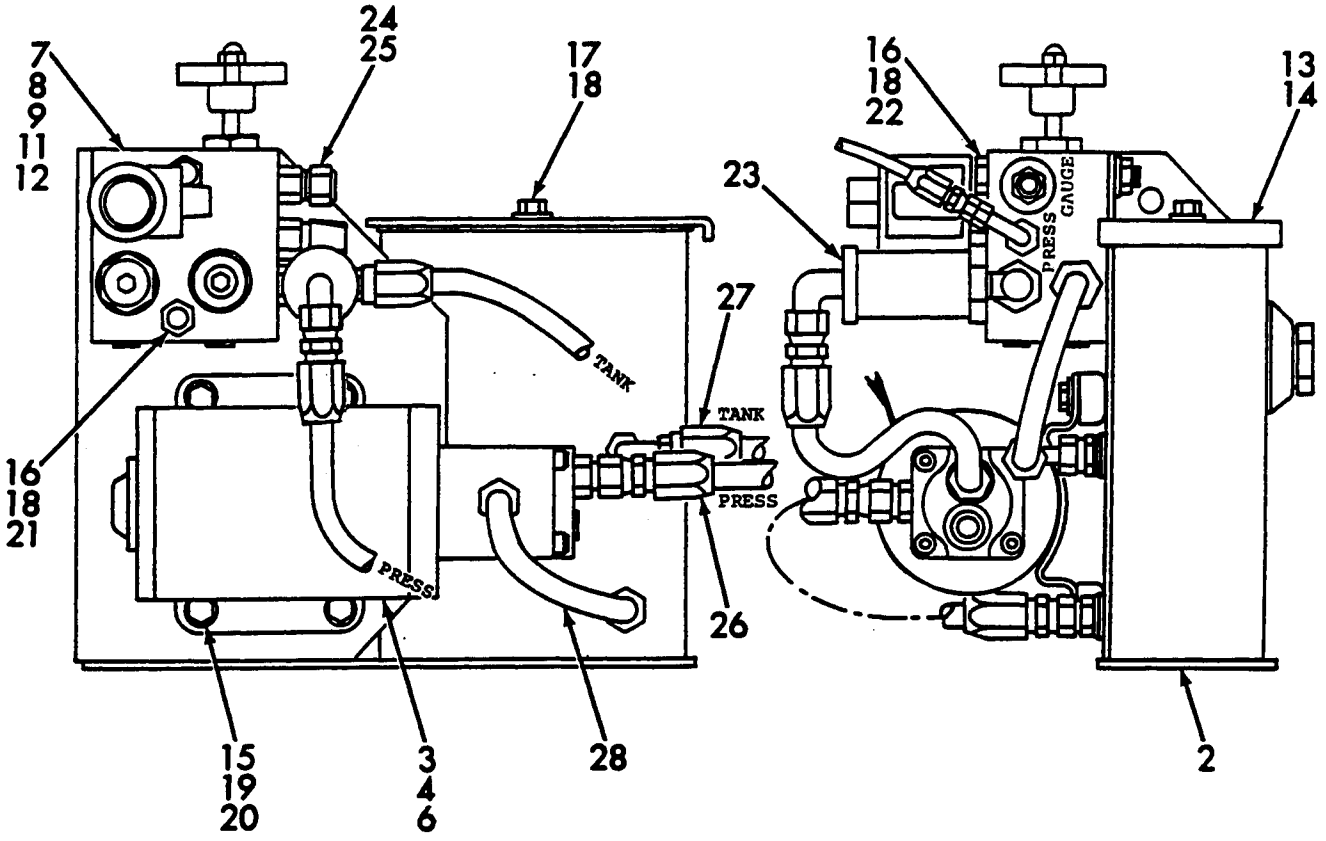
SECT.	3
FIG.	3
PAGE	2

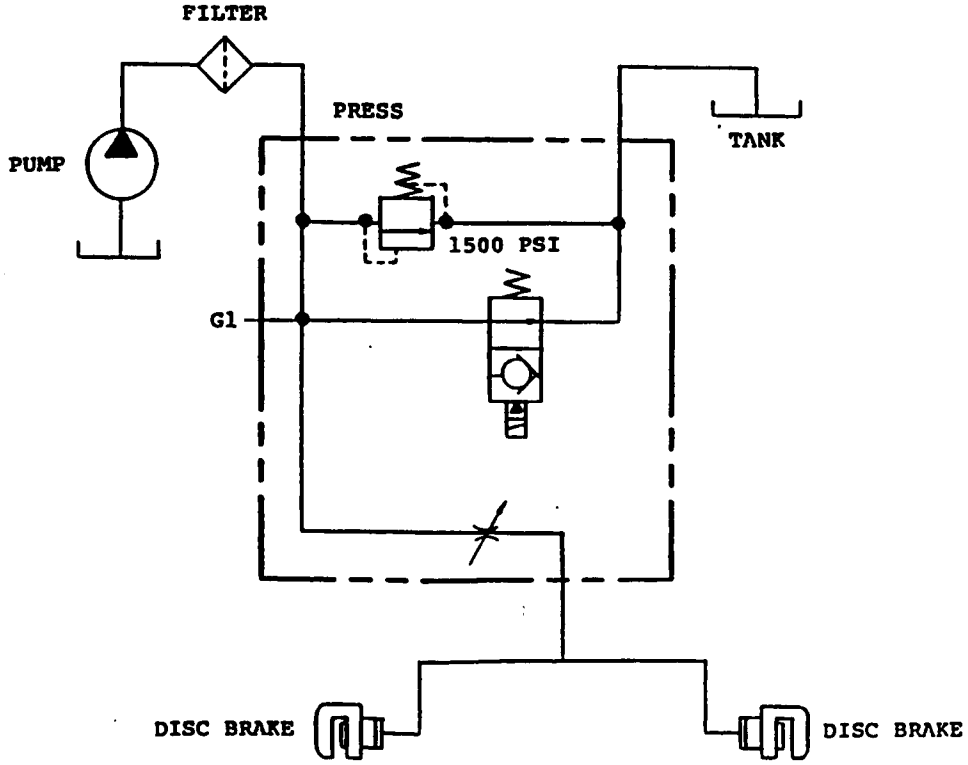
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
9	.60633	SCREW, CAP	8
10	.60702	NUT, HEX	17
11	.62612	SCREW, MACHINE	3
12	.63301	WASHER, LOCK	8
13	.63429	WASHER, FLAT	12
14	.63312	WASHER, LOCK	3
15	.63401	WASHER, FLAT	4
16	.63686	ROD, THREADED	3
17	.70362	RELAY, 24 VDC	1
18	.70479	DIODE (6 AMP, 1000 VOLT)	3
19	.70483	CONTACTOR (2X SPDT)	1
-20	..600164	KIT, SPARE CONTACT	1
-21	..600167	ASSEMBLY, COIL & MAGNETIC FRAME	2
22	.70385	CABLE (8 CONDUCTOR, 18 GUAGE)	12
23	.2912	CABLE (18 GUAGE)	12
24	.70514	RESISTOR	1
25	.70484	CONTROLLER (NO TRIMPOTS)	1
26	.2991	WIRE, WHITE (12 AWG STRANDED)	5
27	.70008	WIRE, YELLOW WITH GREEN (16 AWG)	2
28	.256	TIE, CABLE	27
29	.16214	MOUNT	5
30	.70255	TERMINAL (16-14 AWG)	3
31	.117-E	TERMINAL, PUSH-ON	10
32	.117-C	RING, CONNECTOR	3
33	.117-N	CONNECTOR	1

Mark Industries

TITLE	BRAKE RELEASE ASSEMBLY
MODEL	41KB
NOTES	

SECTION	3
FIGURE	4
PAGE	1





REV.

Mark Industries

TITLE	BRAKE RELEASE ASSEMBLY	SECT.	3
MODEL	41KB	FIG.	4
NOTES		PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141353	ASSEMBLY, BRAKE RELEASE (See Sect. 3, Fig. 1 for NHA)	REF
2	.141354	WELDMENT, BRAKE RELEASE PANEL	1
3	.81299	ASSEMBLY, PUMP/MOTOR	1
4	..600176	PUMP	1
-5	...600178	KIT, SEAL	1
6	..600177	MOTOR	1
7	.81300	VALVE, CONTROL BRAKE	1
8	..600106	VALVE, RELIEF (NON-ADJUSTABLE)	1
9	..600107	VALVE, NEEDLE	1
-10	...600032	KIT, KNOB EXTENSION	1
11	..67986	VALVE, SOLENOID	1
12	...600028	COIL, 20 VOLT (ROUND)	1
13	.141338	COVER, RESERVOIR BRAKE	1
14	.141339	GASKET, BRAKE RELEASE COVER	1
15	.60323	SCREW, CAP	4
16	.60355	SCREW, CAP	2
17	.60338	SCREW, CAP	1
18	.60702	NUT, HEX	2
19	.63402	WASHER, FLAT	4
20	.61246	NUT, LOCK	4
21	.160185	PLUG, LIQUID LEVEL SIGHT	1
22	.63302	WASHER, LOCK	3
23	.81343	FILTER, IN-LINE PRESSURE	1
24	.80004-03	CONNECTOR, STRAIGHT THREAD	3
25	.80059-03	CAP	1

Mark Industries

TITLE	BRAKE RELEASE ASSEMBLY	SECT.	3
MODEL	41KB	FIG.	4
NOTES		PAGE	3

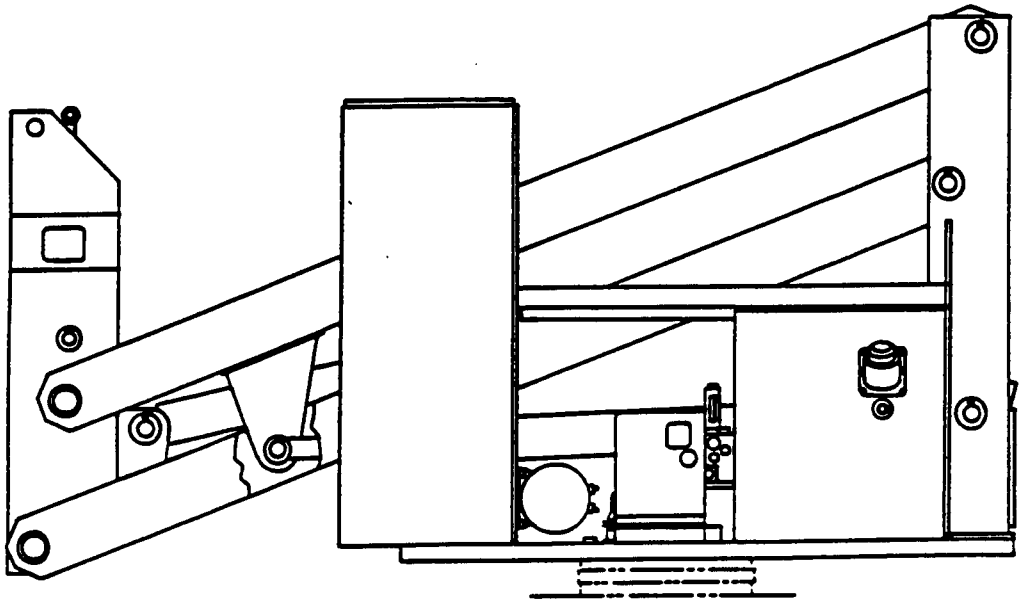
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
26	.13229-03-0120	ASSEMBLY, HOSE	1
27	.13229-03-0190	ASSEMBLY, HOSE	1
28	.13228-03-0200	ASSEMBLY, HOSE	1

REV.

DASH (-) INDICATES THE 'ITEM' IS NOT ILLUSTRATED

SECTION 4 CONTAINS:

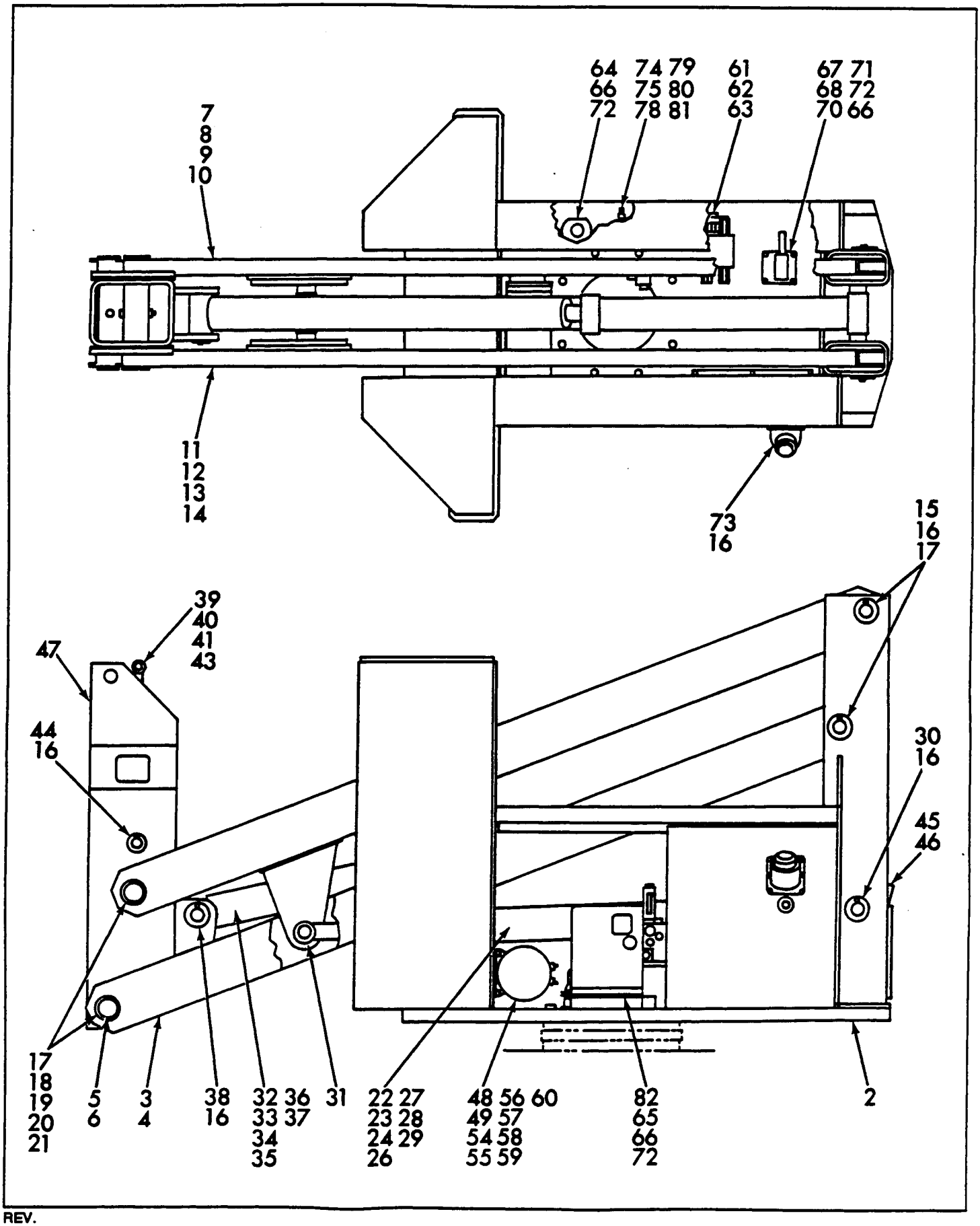
FIG. NO.	TITLE
1	TURRET ASSEMBLY
2	RISER LIFT CYLINDER (SE)
2A	RISER LIFT CYLINDER (TH)
3	FUNCTION CONTROL VALVE ASSEMBLY
4	HYDRAULIC OIL TANK ASSEMBLY
5	BATTERY CHARGER (DOMESTIC)
6	BATTERY CHARGER (INTERNATIONAL)



Mark Industries

TITLE	TURRET ASSEMBLY
MODEL	41KB
NOTES	

SECTION	4
FIGURE	1
PAGE	1



REV.

Mark Industries

TITLE	TURRET ASSEMBLY
MODEL	41KB
NOTES	

SECT.	4
FIG.	1
PAGE	2

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141158	ASSEMBLY, TURRET (See Sect. 2, Fig. 1 for NHA)	REF
2	.141102	WELDMENT, TURRET	1
3	.141168	ASSEMBLY, RISER ARM/LOWER	2
4	..141167	WELDMENT, RISER ARM/LOWER	2
5	..140385	BUSHING, RISER	2
6	..140386	BUSHING, COLUMN	2
7	.141091	ASSEMBLY, RISER ARM/UPPER (L.H.)	1
8	..140385	BUSHING, RISER	1
9	..140386	BUSHING, COLUMN	1
10	..141089	WELDMENT, RISER ARM/UPPER (L.H.)	1
11	.141092	ASSEMBLY, RISER ARM/UPPER (R.H.)	1
12	..140385	BUSHING, RISER	1
13	..140386	BUSHING, COLUMN	1
14	..141090	WELDMENT, RISER ARM/UPPER (R.H.)	1
15	.140423	PIN, ARM COLUMN	4
16	.65984	SCREW, CAP	9
17	.65103	FITTING, GREASE	8
18	.140422	PIN, ARM/RISER	2
19	.60614	SCREW, CAP	2
20	.61301	NUT, LOCK	2
21	.64216	PIN, ROLL	6
22	.141085	ASSEMBLY, RISER CYLINDER	1
23	..141084	CYLINDER, RISER (TH)	1
24	...600062	BUSHING	4
-25	...600185	KIT, SEAL	1

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
26	..60319	SCREW, CAP	3
27	..63301	WASHER, LOCK	3
28	..80004-08	CONNECTOR, STRAIGHT THREAD	2
29	..81205	VALVE, HOLDING	1
30	.140421	PIN, ARM/CYLINDER COLUMN	1
31	.141113	PIN, ARM/CYLINDER ROD END	1
32	.140814	ASSEMBLY, RISER LIFT CYLINDER	1
33	..140813	CYLINDER RISER LIFT (See Sect. 4, Fig. 2 for Details)	1
34	..60319	SCREW, CAP	3
35	..63301	WASHER, LOCK	3
36	..80004-08	CONNECTOR, STRAIGHT THREAD	2
37	..81205	VALVE, HOLDING	1
38	.140430	PIN, BOOM LIFT/RISER	1
39	.140947	ASSEMBLY, MASTER CYLINDER	1
40	..140896	CYLINDER, MASTER (TH)	1
41	...67999	BUSHING	1
-42	...67997	KIT, SEAL	1
43	..80036-03	TEE, BRANCH	2
44	.140548	PIN, MASTER CYLINDER/RISER	1
45	.141228	PAD, BOOM REST	1
46	.61830	SCREW, CAP	2
47	.141082	MACHINING, RISER	1
48	.140971	ASSEMBLY, PUMP/MOTOR	1
49	..70486	MOTOR/PUMP	1
-50	...600127	MOTOR	1

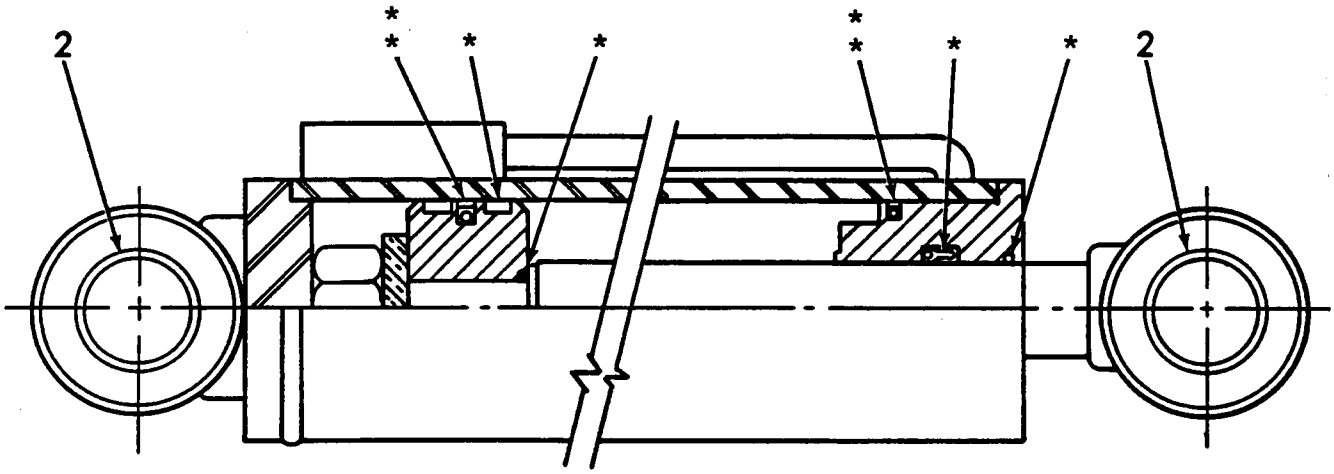
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-51	600128	BRUSH	4
-52	...600125	VALVE, IN-LINE CHECK	1
-53	...600124	PUMP	1
54	..80004-20	CONNECTOR, STRAIGHT THREAD	1
55	..80004-08	CONNECTOR, STRAIGHT THREAD	1
56	..65804	CAP, PLUG	1
57	..160254	NUT, LUG	4
58	..60346	SCREW, CAP	4
59	.63302	WASHER, LOCK	6
60	.60702	NUT, HEX	4
61	.140968	ASSEMBLY, FUNCTION CONTROL VALVE (See Sect. 4, Fig. 3 for Details)	1
62	.60343	SCREW, CAP	4
63	.63319	WASHER, LOCK	4
64	.21250	SENSOR, SLOPE	1
65	.60701	NUT, HEX	4
66	.63301	WASHER, LOCK	12
67	.140806	ASSEMBLY, EMERGENCY PUMP	1
68	..81281	PUMP, EMERGENCY	1
-69	...600031	KIT, SEAL	1
70	..80008-04	ELBOW, MALE	1
71	..80001-04	CONNECTOR, MALE	1
72	.60342	SCREW, CAP	12
73	.141202	ASSEMBLY, HYDRAULIC OIL TANK (See Sect. 4, Fig. 4 for Details)	1
74	.140532	SUB-ASSEMBLY, REGENERATIVE VALVE	1

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
75	..81222	VALVE, REGENERATIVE	1
-76	...67360	VALVE, COUNTERBALANCE	1
-77	...67361	VALVE, CHECK	1
78	..80036-10	TEE, BRANCH	1
79	..80012-10	ELBOW, STRAIGHT THREAD	1
80	..80004-10	CONNECTOR, STRAIGHT THREAD	1
81	.60360	SCREW, CAP	2
82	.70523	CHARGER, BATTERY (DOMESTIC) (See Sect. 4, Fig. 5 for Details)	1
83	.70526	CHARGER, BATTERY (INTERNATIONAL) (See Sect. 4, Fig. 6 for Details)	1

Mark Industries

TITLE	RISER LIFT CYLINDER (SE)
MODEL	41KB
NOTES	UNTIL LATE 1989

SECTION	4
FIGURE	2
PAGE	1



NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

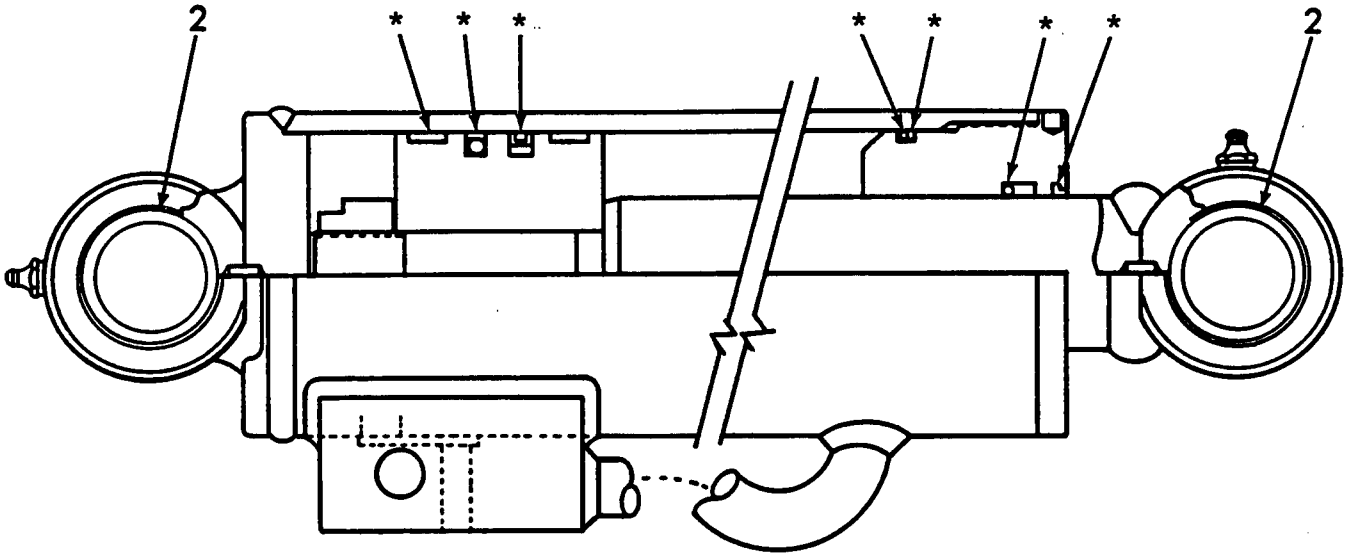
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140813	CYLINDER, RISER LIFT (SE) (See Sect. 4, Fig. 1 for NHA)	REF
2	.66882	BUSHING	4
-3	.67230	KIT, SEAL	1
		NOTE: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.

Mark Industries

TITLE	RISER LIFT CYLINDER (TH)
MODEL	41KB
NOTES	SINCE LATE 1989

SECTION	4
FIGURE	2A
PAGE	1



NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

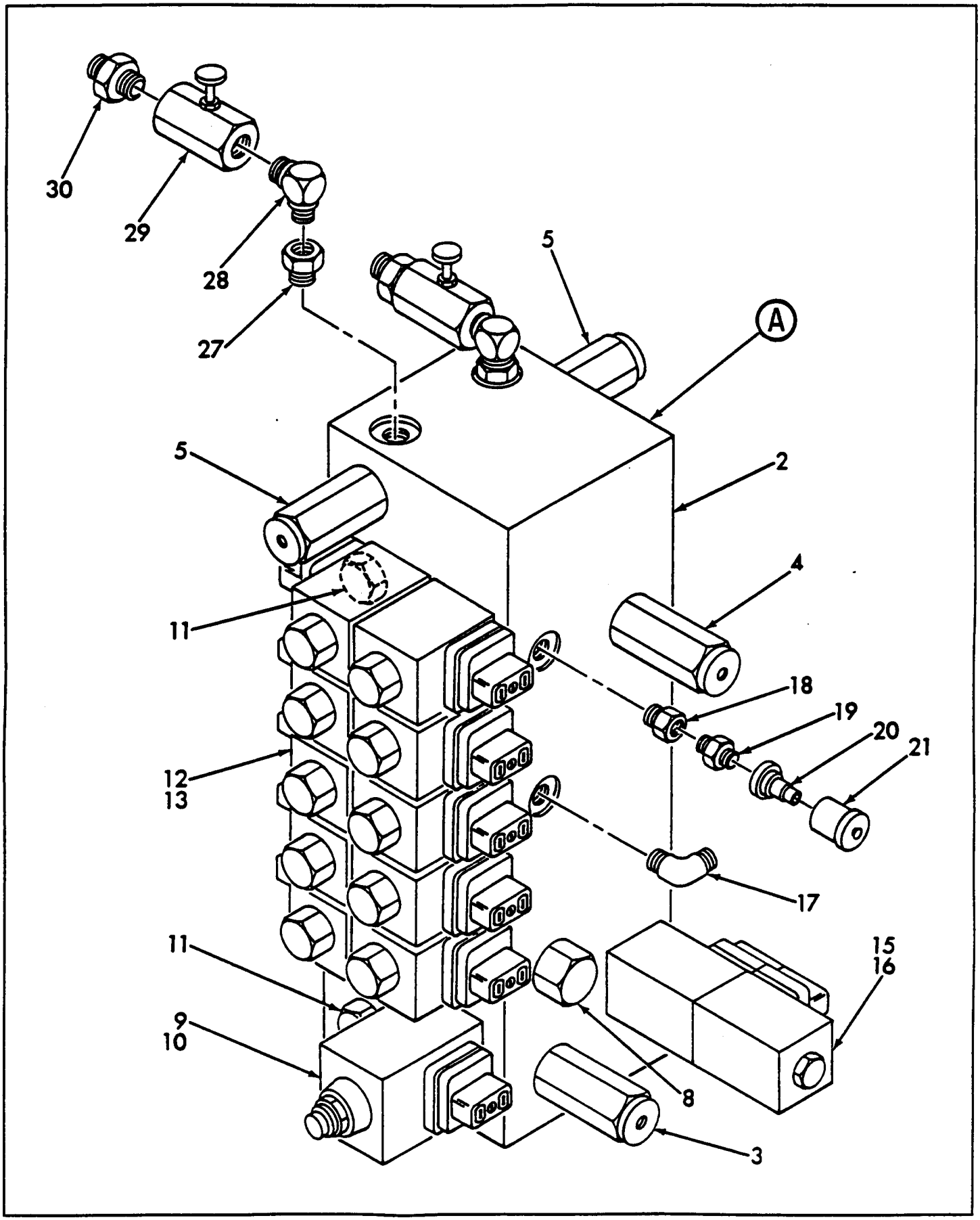
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140813	CYLINDER, RISER LIFT (TH) (See Sect. 4, Fig. 1 for NHA)	REF
2	.600062	BUSHING	4
-3	.600059	KIT, SEAL	1
		NOTE: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.

Mark Industries

TITLE	FUNCTION CONTROL VALVE ASSEMBLY
MODEL	41KB
NOTES	

SECTION	4
FIGURE	3
PAGE	1

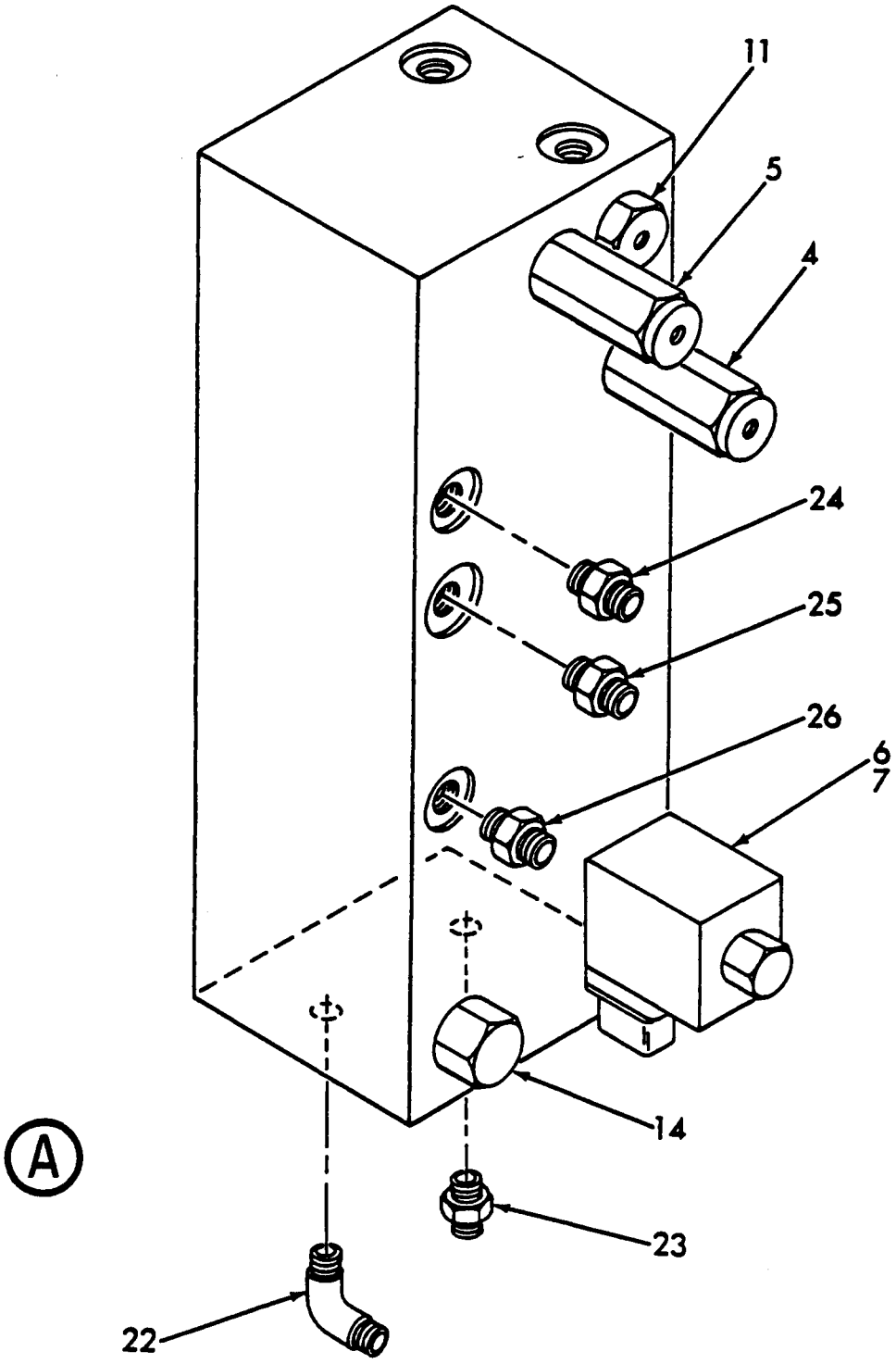


REV.

Mark Industries

TITLE	FUNCTION CONTROL VALVE ASSEMBLY
MODEL	41KB
NOTES	

SECTION	4
FIGURE	3
PAGE	2



REV.

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140968	ASSEMBLY, FUNCTION CONTROL VALVE (See Sect. 4, Fig. 1 for NHA)	REF
2	.81308	VALVE, FUNCTION CONTROL	1
*3	..68060	VALVE, RELIEF	1
*4	..67218	VALVE, RELIEF	1
*5	..68057	VALVE, RELIEF	1
6	..67000	VALVE, SOLENOID	1
7	...66865	COIL (20 VOLT)	1
8	..67338	VALVE, DIFFERENTIAL SENSING	1
9	..67815	SOLENOID, PROPORTIONAL	1
10	...600113	COIL (24 VOLT)	1
11	..66674	VALVE, CHECK	1
12	..67346	VALVE, SOLENOID	10
13	...66865	COIL (20 VOLT)	10
14	..67229	REGULATOR, FLOW	1
15	..67341	VALVE, 3 POSITION 4 WAY	1
16	...66865	COIL (20 VOLT)	2
17	.80012-03	ELBOW, STRAIGHT THREAD	1
18	.51903	ADAPTER, FEMALE PIPE	1
19	.80052-03	NIPPLE, PIPE	1
20	.2527	COUPLING, QUICK DISCONNECT	1
21	.845	CAP, QUICK DISCONNECT	1
22	.80012-08	ELBOW, STRAIGHT THREAD	3
		NOTE: PRIOR TO USE, RELIEF VALVES WITH ASTERISK (*) MUST BE ADJUSTED TO THE PRESSURE INDICATED ON THE SPECIFIC MACHINE'S HYDRAULIC SCHEMATIC.	

Mark Industries

TITLE	FUNCTION CONTROL VALVE ASSEMBLY
MODEL	41KB
NOTES	

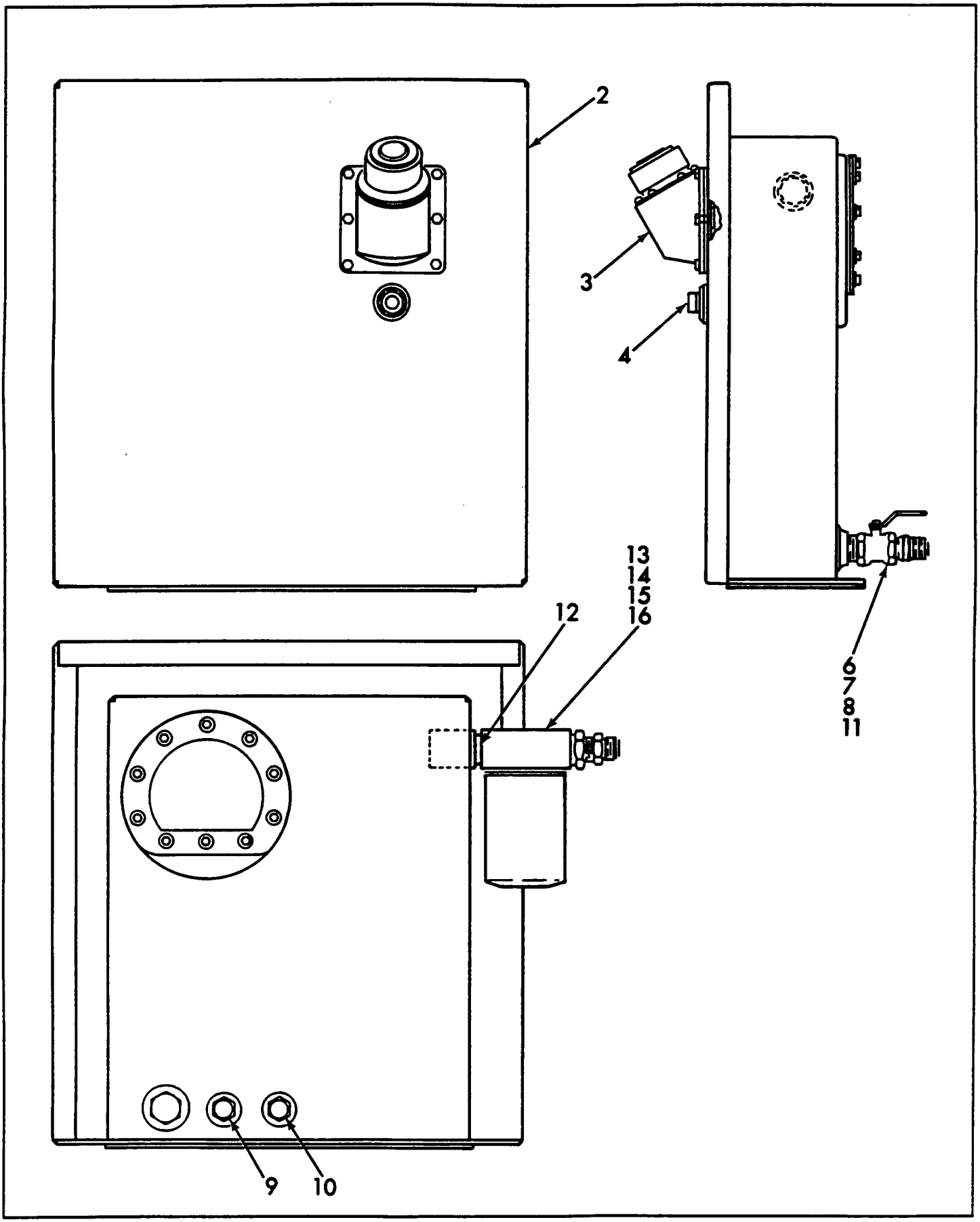
SECT.	4
FIG.	3
PAGE	4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
23	.80004-16	CONNECTOR, STRAIGHT THREAD	1
24	.80004-08	CONNECTOR, STRAIGHT THREAD	8
25	.80004-09	CONNECTOR, STRAIGHT THREAD	1
26	.140765	CONNECTOR, MODIFIED STRAIGHT THREAD	1
27	.80063-01	ADAPTER, FEMALE PIPE	2
28	.80022-04	ELBOW, MALE	2
29	.20357	VALVE, NEEDLE	2
30	.80001-04	CONNECTOR, MALE	2

Mark Industries

TITLE	HYDRAULIC OIL TANK ASSEMBLY
MODEL	41KB
NOTES	

SECTION	4
FIGURE	4
PAGE	1



REV.

Mark Industries

TITLE	HYDRAULIC OIL TANK ASSEMBLY
MODEL	41KB
NOTES	

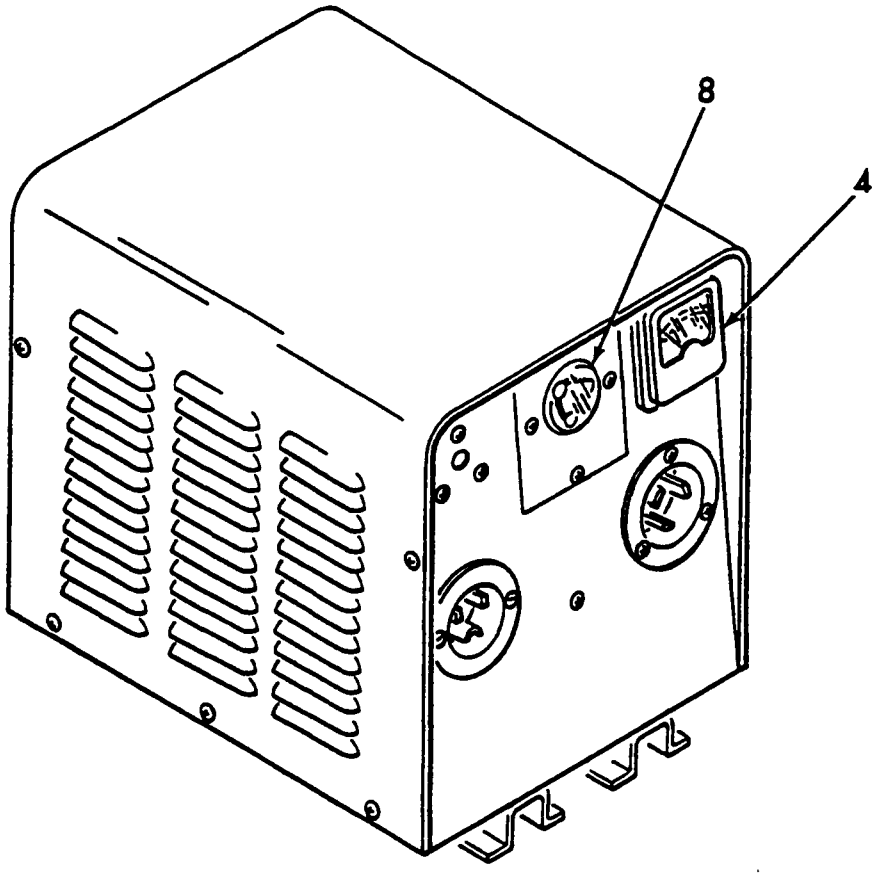
SECT.	4
FIG.	4
PAGE	2

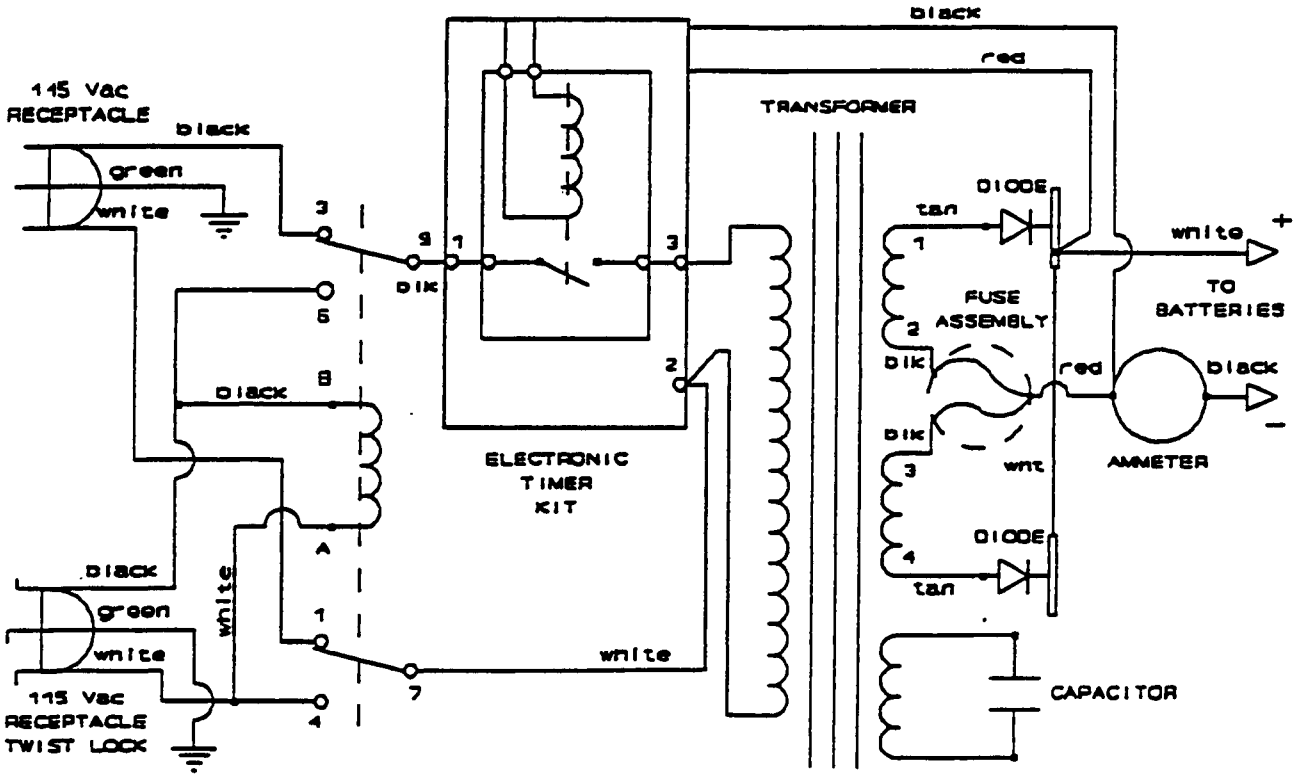
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141202	ASSEMBLY, HYDRAULIC OIL TANK (See Sect. 4, Fig. 1 for NHA)	REF
2	.141201	WELDMENT, HYDRAULIC OIL TANK	1
3	.81337	BREATHER/FILTER	1
4	.160186	GUAGE, SIGHT	1
-5	.160338	COMPOUND, GASKET	1
6	.2493	NIPPLE, CLOSE	1
7	.3033	VALVE, BALL	1
8	.80001-19	CONNECTOR, MALE	1
9	.80001-05	CONNECTOR, MALE	1
10	.80048-05	PLUG, HOLLOW HEX	1
11	.65804	CAP, PLUG	1
12	.160314	NIPPLE, CLOSE	1
13	.81209	FILTER, RETURN	1
14	..67213	CARTRIDGE, FILTER	1
15	.80057-16	REDUCER, PIPE THREAD	1
16	.80001-14	CONNECTOR, MALE	1

Mark Industries

TITLE	BATTERY CHARGER (DOMESTIC)
MODEL	41KB
NOTES	120 VAC/60 HZ, 48 VDC/25 AMP

SECTION	4
FIGURE	5
PAGE	1





REV.

Mark Industries

TITLE	BATTERY CHARGER (DOMESTIC)
MODEL	41KB
NOTES	120 VAC/60 HZ, 48 VDC/25 AMP

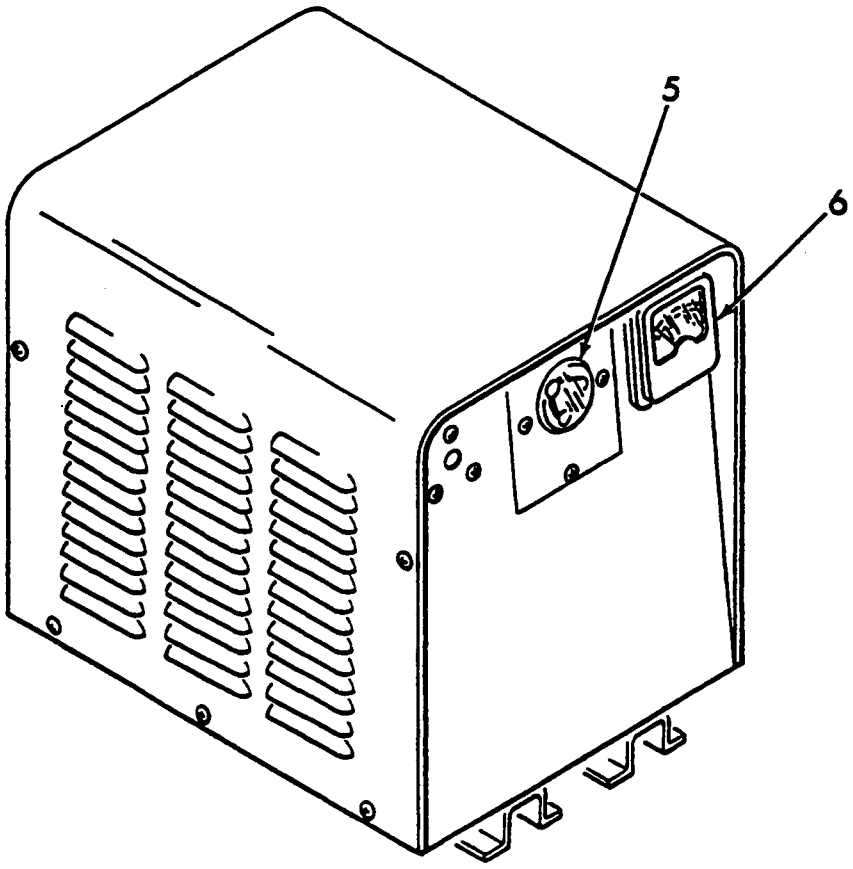
SECT.	4
FIG.	5
PAGE	2

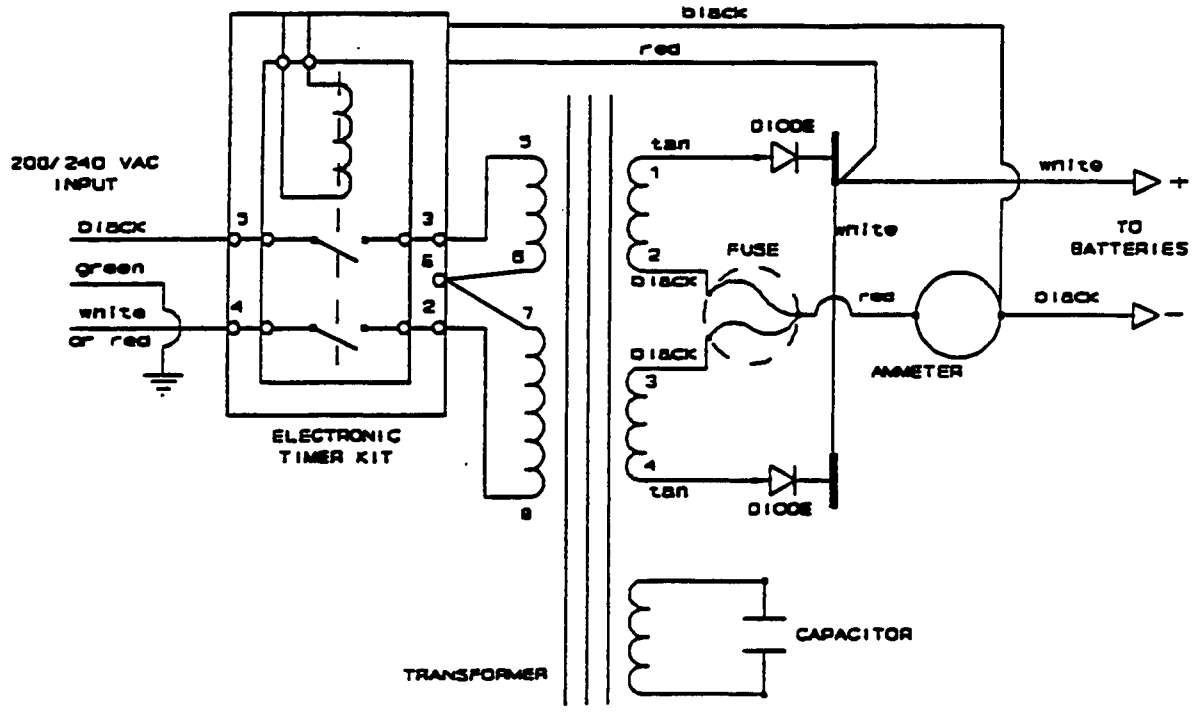
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	70523	CHARGER, BATTERY (DOMESTIC) (See Sect. 4, Fig. 5 for NHA) (See Vendor Chapter for Details)	REF
-2	.600135	ASSEMBLY, TRANSFORMER	1
-3	.600019	ASSEMBLY, HEAT SINK (WITH DIODES)	
4	.600020	AMMETER	1
-5	.600134	ASSEMBLY, ELECTRONIC TIMER	1
-6	.66750	CAPACITOR (6.0 MFD, 660 VAC)	1
-7	.66728	RELAY (120 VAC, DPDT, 15 AMP)	1
8	.600136	ASSEMBLY, FUSE (WITH PANEL)	1

Mark Industries

TITLE	BATTERY CHARGER (INTERNATIONAL)
MODEL	41KB
NOTES	240 VAC/50 HZ, 48 VDC/25 AMP

SECTION	4
FIGURE	6
PAGE	1



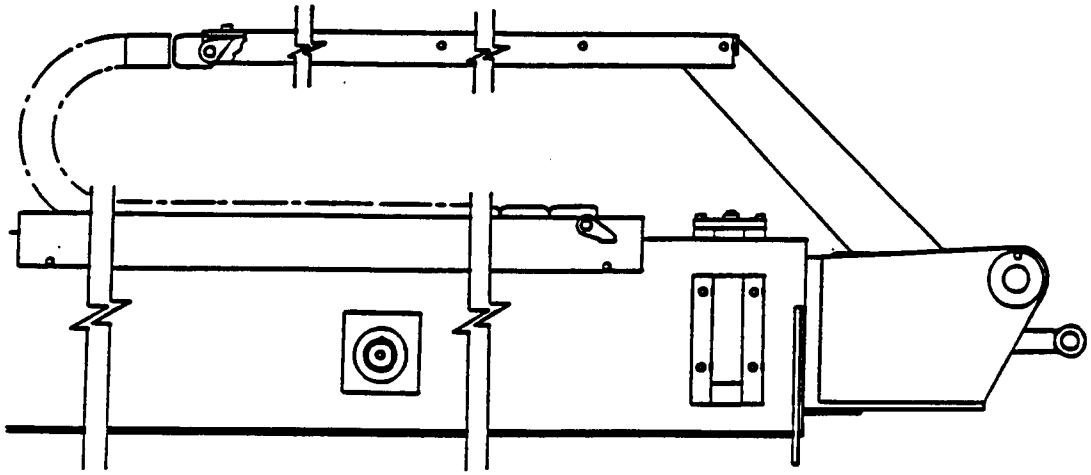


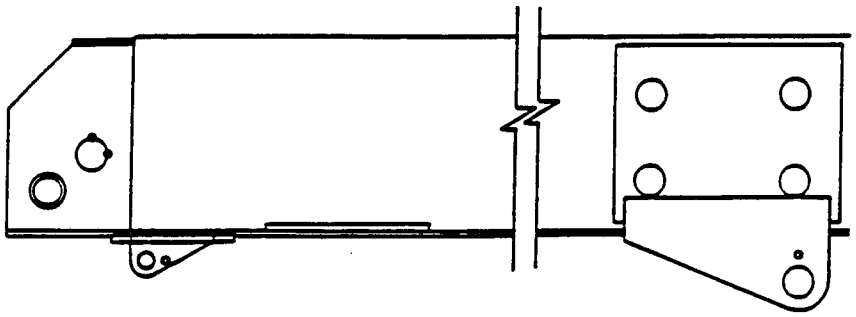
REV.

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	70526	CHARGER, BATTERY (INTERNATIONAL) (See Sect. 4, Fig. 6 for NHA) (See Vendor Chapter for Details)	REF
-2	.600018	ASSEMBLY, TRANSFORMER	1
-3	.66750	CAPACITOR (6.0 MFD, 660 VAC)	1
-4	.600019	ASSEMBLY, HEAT SINK (WITH DIODES)	1
5	.66727	ASSEMBLY, FUSE	1
6	.600020	AMMETER	1
-7	.600021	KIT, ELECTRONIC TIMER	1
-8	..600022	RELAY, TIMER KIT	1

SECTION 5 CONTAINS:

FIG. NO.	TITLE
1	FINAL BOOM ASSEMBLY
2	INNER BOOM ASSEMBLY
3	EXTENSION CYLINDER (SE)
3A	EXTENSION CYLINDER (GB)

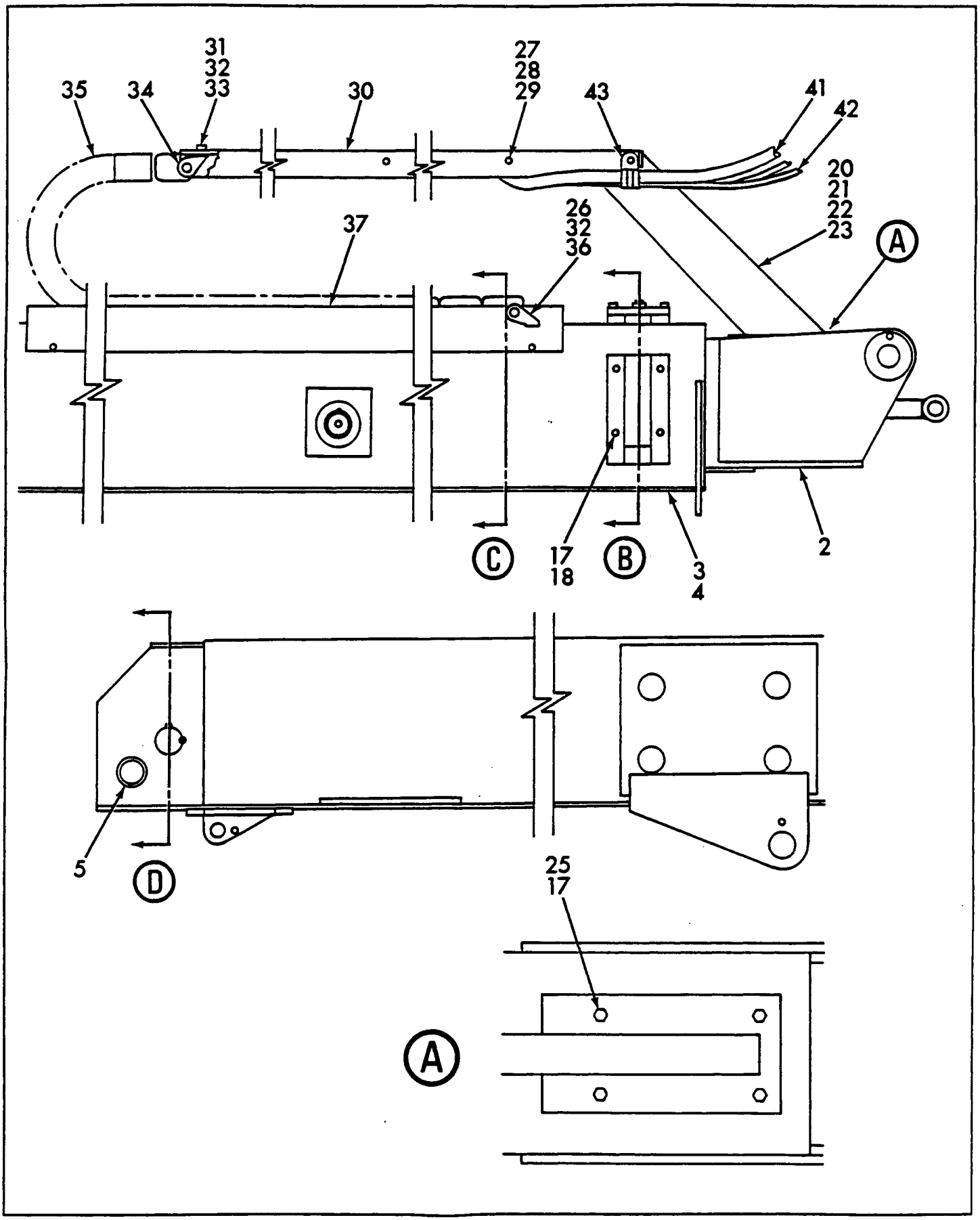




Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	1
PAGE	1

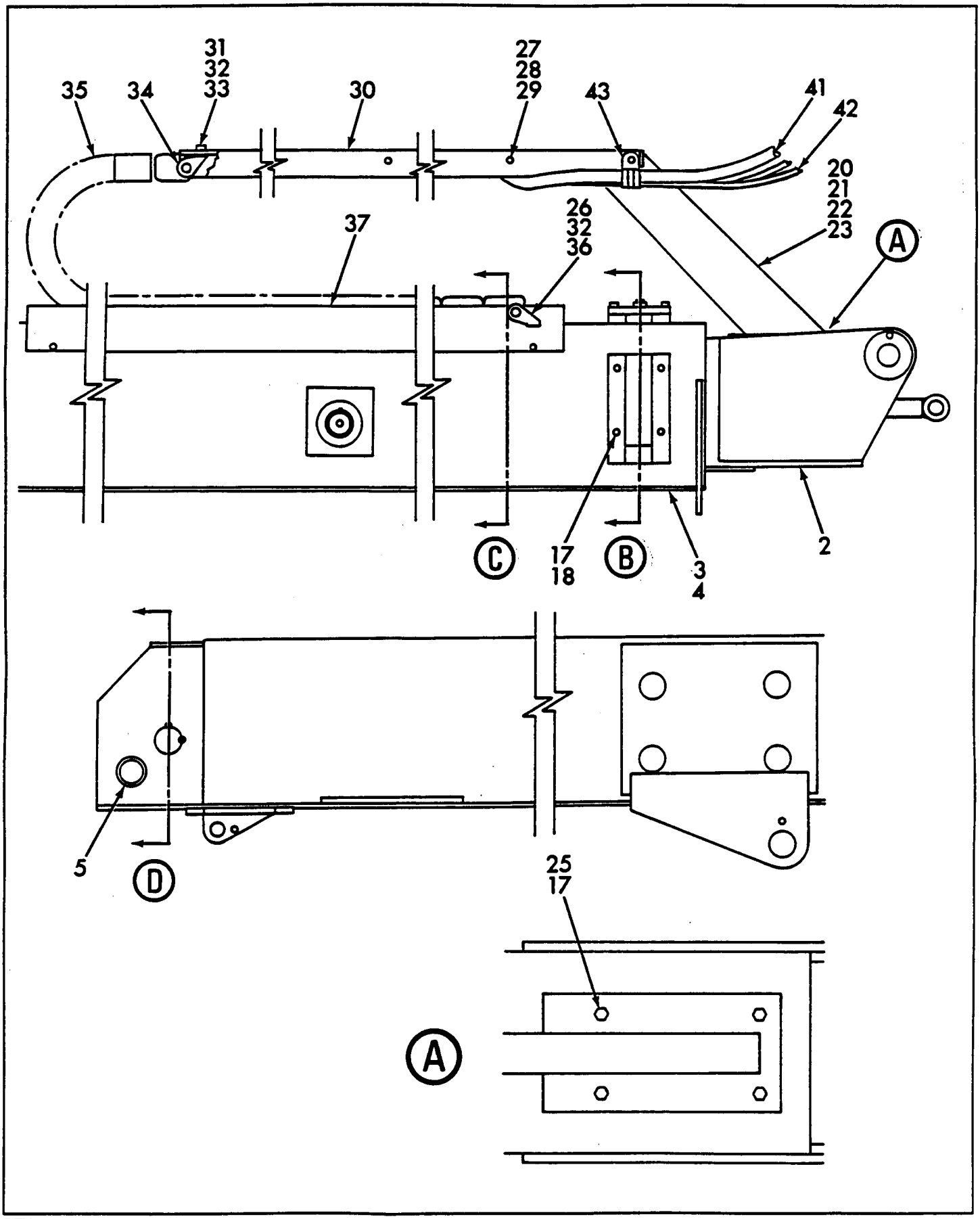


REV.

Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	1
PAGE	1

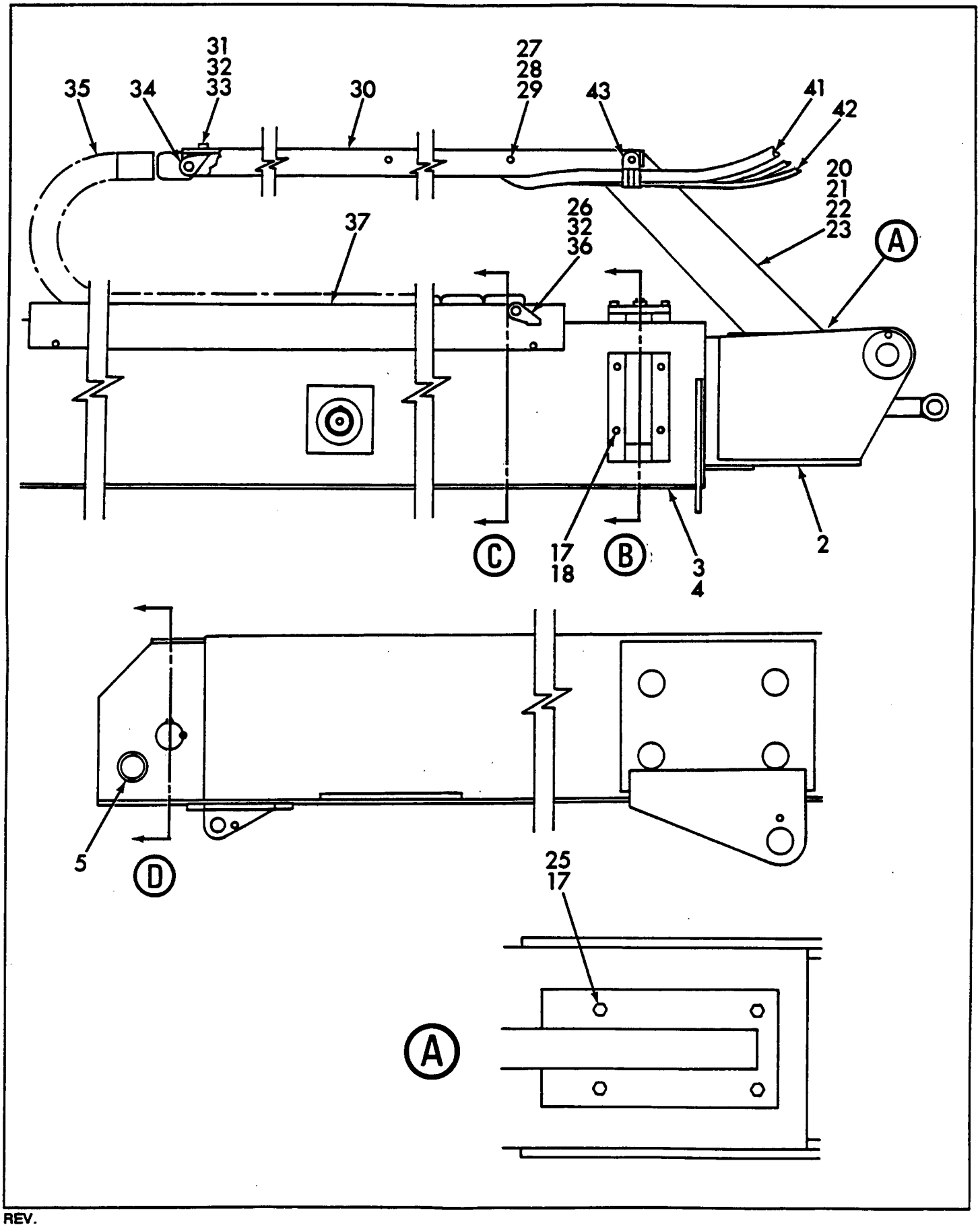


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Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

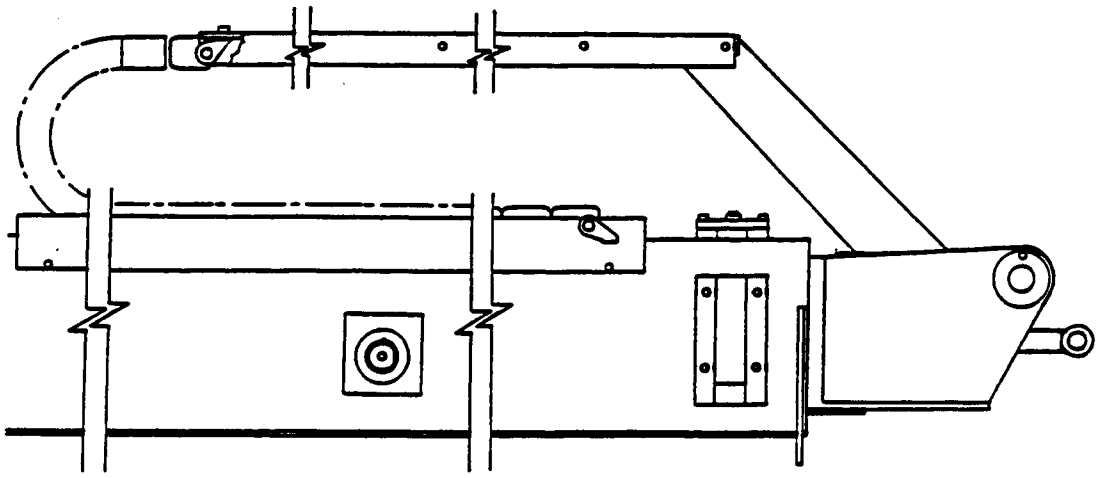
SECTION	5
FIGURE	1
PAGE	1

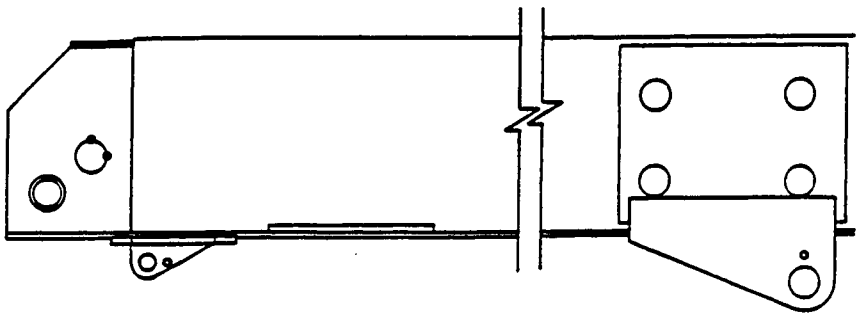


REV.

SECTION 5 CONTAINS:

FIG. NO.	TITLE
1	FINAL BOOM ASSEMBLY
2	INNER BOOM ASSEMBLY
3	EXTENSION CYLINDER (SE)
3A	EXTENSION CYLINDER (GB)

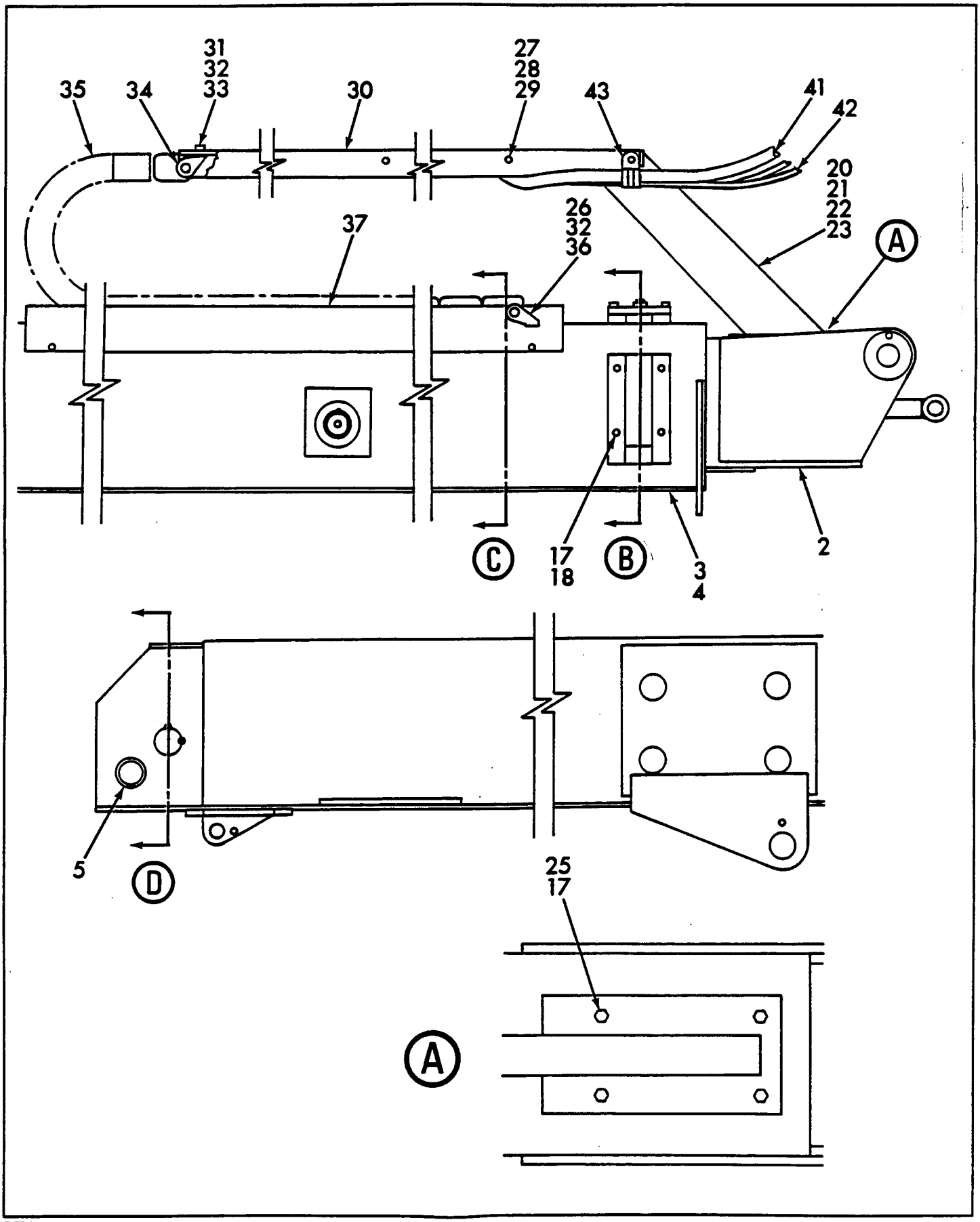




Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	1
PAGE	1

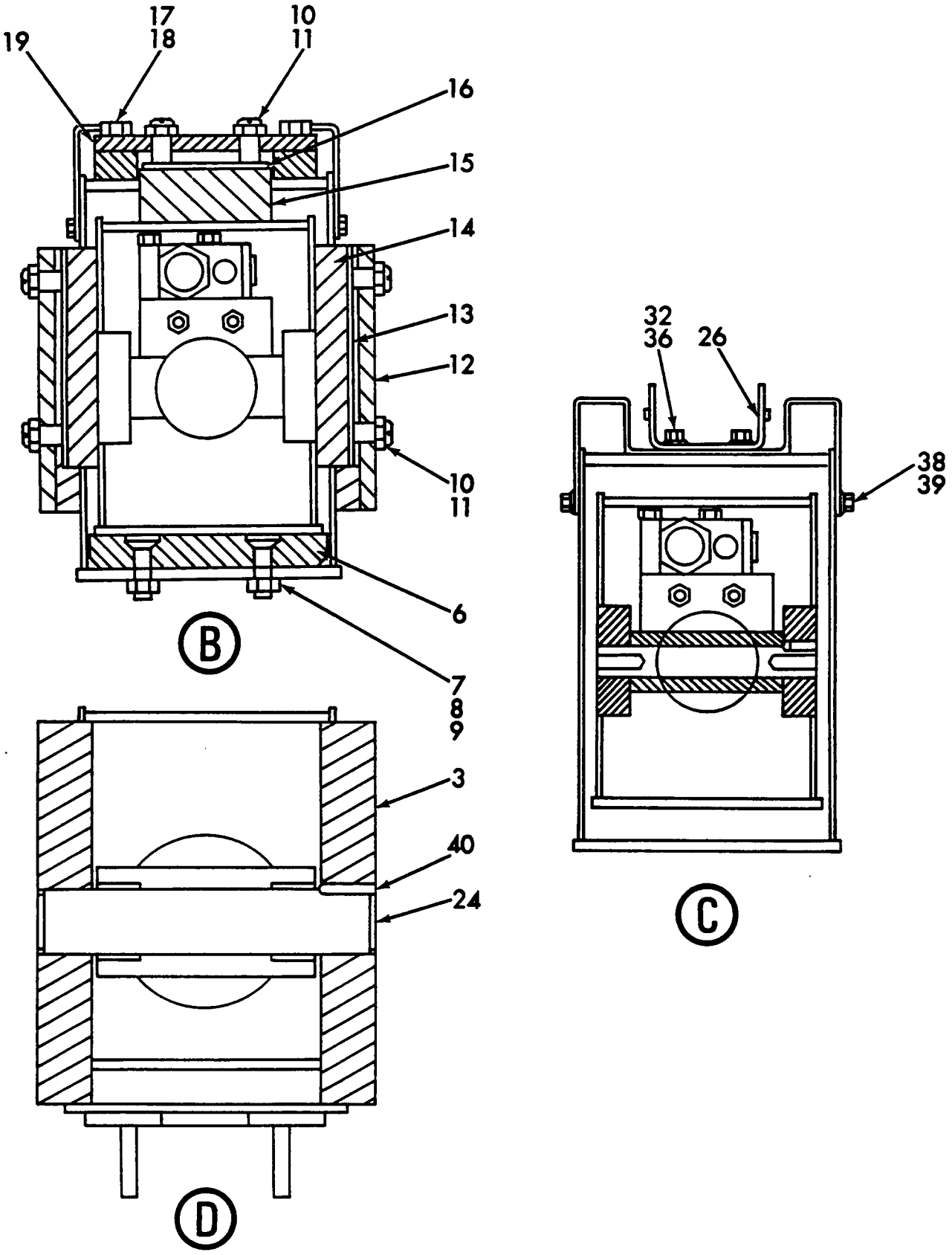


REV.

Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	1
PAGE	2



REV.

Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECT.	5
FIG.	1
PAGE	3

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140122	ASSEMBLY, FINAL BOOM (See Sect. 2, Fig. 1 for NHA)	REF
2	.140120	ASSEMBLY, INNER BOOM (See Sect. 5, Fig. 2 for Details)	1
3	.140029	MACHINING, OUTER BOOM	1
4	..140031	WELDMENT, OUTER BOOM	1
5	..140121	BUSHING	2
6	.140396	PAD, WEAR (OUTER BOOM BOTTOM)	1
7	.61821	SCREW, CAP	4
8	.63319	WASHER, LOCK	4
9	.60703	NUT, HEX	4
10	.62210	SCREW, SET	6
11	.60901	NUT, JAM	6
12	.140402	PLATE, SIDE COVER	2
13	.27258	STRIP	2
14	.140403	PAD, WEAR (SIDE)	2
15	.140405	PAD, WEAR (TOP)	1
16	.27259	STRIP	1
17	.63302	WASHER, LOCK	12
18	.60338	SCREW, CAP	12
19	.140406	PLATE, TOP COVER	1
20	.140399	WELDMENT, POWER TRACK BRACKET	1
21	..140400	SPACER, TUBE	1
22	..140784	TUBE, MOUNTING	1
23	..140340	BRACKET, POWER TRACK	1
24	.140429	PIN, EXTENSION CYLINDER (CAP END)	1

Mark Industries

TITLE	FINAL BOOM ASSEMBLY
MODEL	41KB
NOTES	

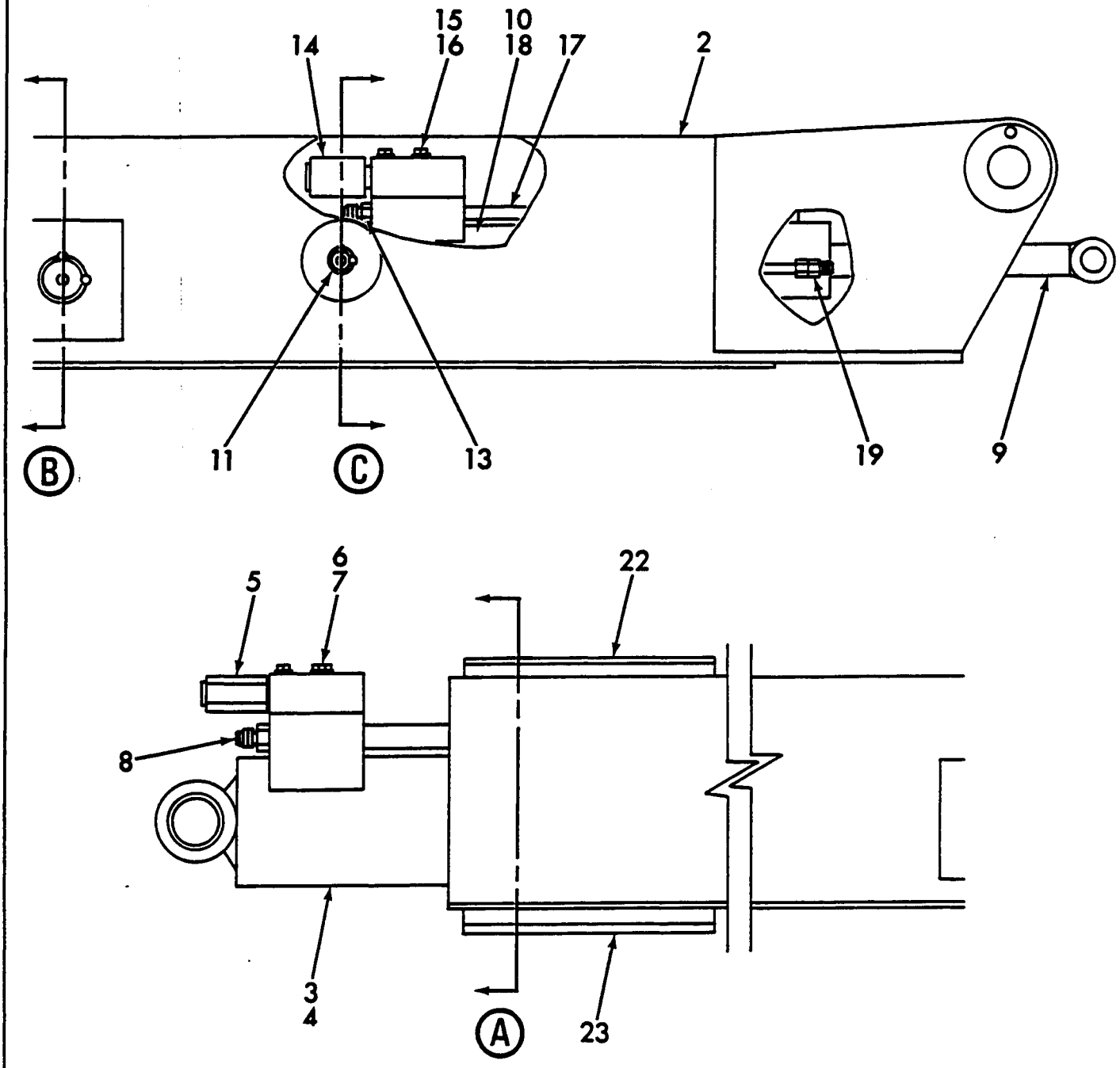
SECT.	5
FIG.	1
PAGE	4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
25	.60367	SCREW, CAP	4
26	.23875	BRACKET, STATIONARY (MALE)	1
27	.60429	SCREW, CAP	3
28	.61322	NUT, LOCK	3
29	.63429	WASHER, FLAT	3
30	.140347	SUPPORT, POWER TRACK	1
31	.60353	SCREW, CAP	2
32	.63433	WASHER, FLAT	4
33	.60711	NUT, LOCK	2
34	.23874	BRACKET, MOVABLE (FEMALE)	1
35	.23824	TRACK, POWER	45
36	.60422	SCREW, CAP	2
37	.140201	GUIDE, POWER TRACK	1
38	.61729	SCREW, MACHINE	4
39	.63313	WASHER, LOCK	4
40	.62229	SCREW, SET	2
41	.70528	CABLE, CONDUCTOR (65 FT)	1
42	.2568	HOSE, HYDRAULIC (50 FT)	2
43	.65867	CLAMP	3

Mark Industries

TITLE	INNER BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	2
PAGE	1

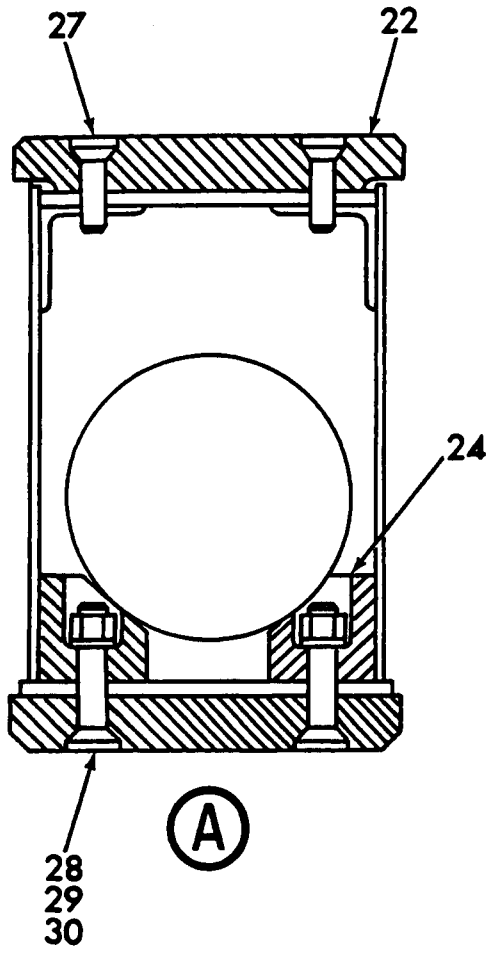


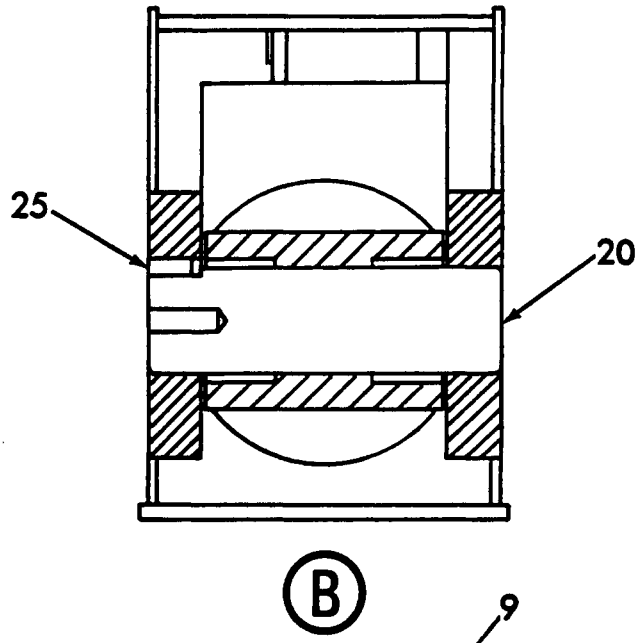
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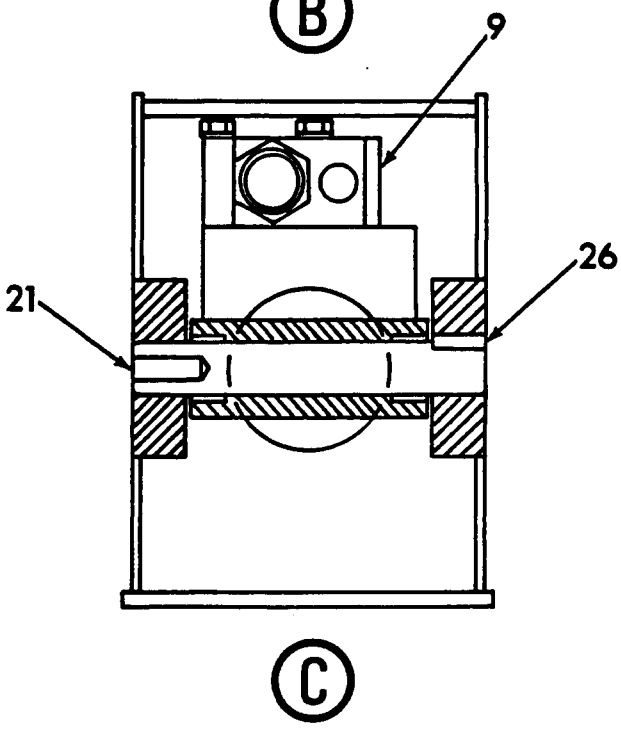
Mark Industries

TITLE	INNER BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECTION	5
FIGURE	2
PAGE	2







REV.

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140120	ASSEMBLY, INNER BOOM (See Sect. 5, Fig. 1 for NHA)	REF
2	.140124	MACHINING, INNER BOOM	1
3	.140055	ASSEMBLY, EXTENSION CYLINDER	1
4	..140054	CYLINDER, EXTENSION (See Sect. 5, Fig. 3 for Details)	1
5	..81205	VALVE, HOLDING	1
6	..60319	SCREW, CAP	3
7	..63301	WASHER, LOCK	3
8	..80004-11	CONNECTOR, STRAIGHT THREAD	2
9	.140946	SUB-ASSEMBLY, SLAVE CYLINDER	1
10	..140890	CYLINDER, SLAVE (TH)	1
11	...67999	BUSHING	4
-12	...67997	KIT, SEAL	1
13	..80004-03	CONNECTOR, STRAIGHT THREAD	2
14	..81205	VALVE, HOLDING	1
15	..60319	SCREW, CAP	3
16	..63301	WASHER, LOCK	3
17	..140058-6	ASSEMBLY, TUBE	2
18	..65111	STRAP	1
19	..80042-03	CONNECTOR, UNION	2
20	.140424	PIN, EXTENSION CYLINDER (ROD END)	1
21	.140415	PIN, SLAVE CYLINDER (CAP END)	1
22	.140398	PAD, WEAR (INNER BOOM TOP)	1
23	.140397	PAD, WEAR (INNER BOOM BOTTOM)	1
24	.140395	PAD, WEAR (EXTENSION CYLINDER)	2

Mark Industries

TITLE	INNER BOOM ASSEMBLY
MODEL	41KB
NOTES	

SECT.	5
FIG.	2
PAGE	4

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
25	.62239	SCREW, SET	2
26	.62235	SCREW, SET	2
27	.61829	SCREW, CAP	4
28	.61824	SCREW, CAP	4
29	.61318	NUT, LOCK	4
30	.63403	WASHER, FLAT	4

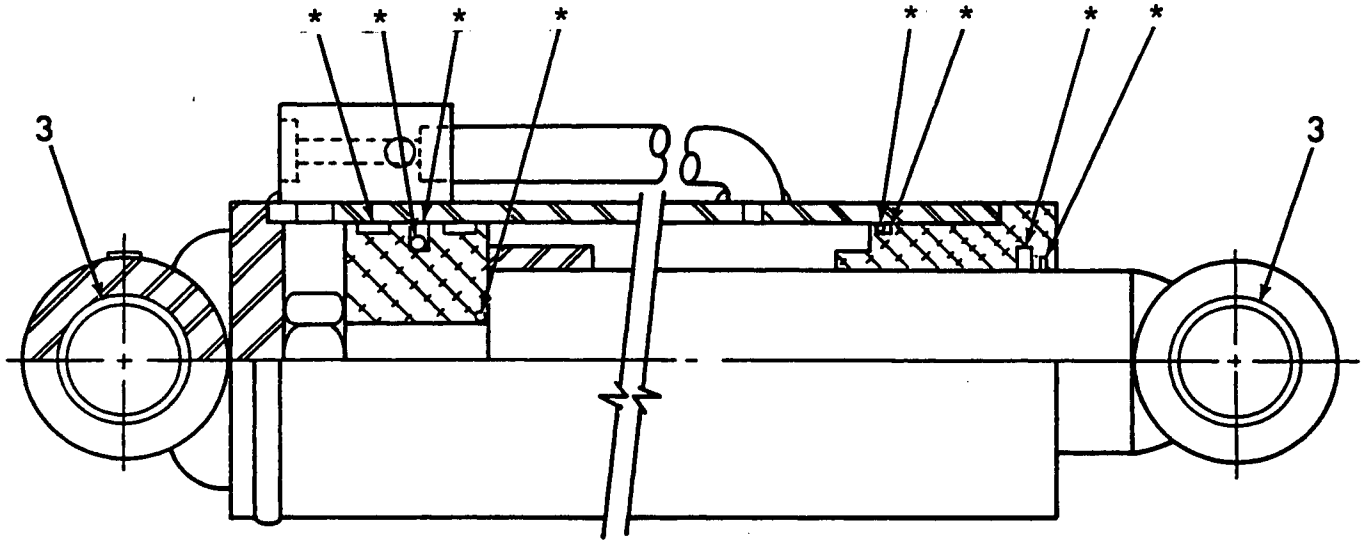
REV.

DASH (-) INDICATES THE 'ITEM' IS NOT ILLUSTRATED

Mark Industries

TITLE	EXTENSION CYLINDER (SE)
MODEL	41KB
NOTES	BEFORE LATE 1989

SECTION	5
FIGURE	3
PAGE	1



NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

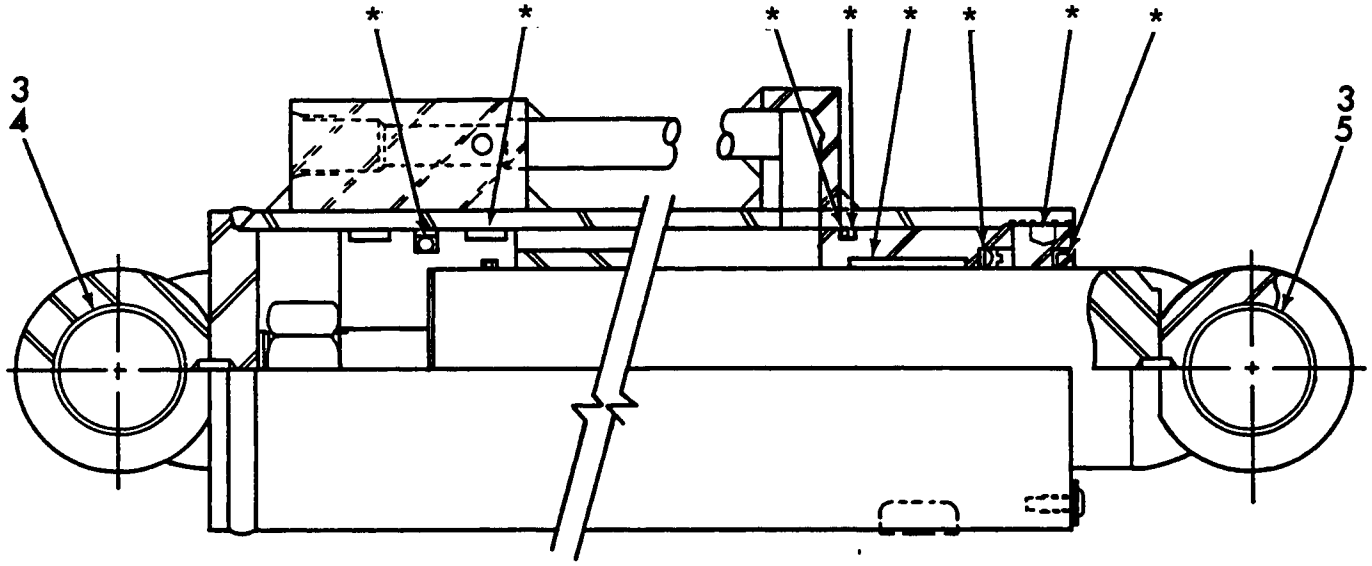
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140054	CYLINDER, EXTENSION (SE) (See Sect. 5, Fig. 2 for NHA)	REF
-2	.67186	KIT, SEAL	1
3	.67180	BUSHING	4
		NOTE 3: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.

Mark Industries

TITLE	EXTENSION CYLINDER (GB)
MODEL	41KB
NOTES	AFTER LATE 1989

SECTION	5
FIGURE	3A
PAGE	1



NOTE 1: DUE TO ONGOING VENDOR/MFG. REVISIONS, WHEN POSSIBLE, PROVIDE ALL NUMBERS FROM THE CYLINDER I.D. TAG.

NOTE 2: THE SEAL KIT INCLUDES ITEMS SHOWN WITH AN ASTERISK (*).

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140054	CYLINDER, EXTENSION (GB) (See Sect. 5, Fig. 2 for NHA)	REF
-2	.600084	KIT, SEAL	1
3	.67180	BUSHING	4
4	.600160	SPACER, PINEYE (BARREL END)	1
5	.600103	SPACER, PINEYE (ROD END)	1
		NOTE 3: INTERNAL SERVICE REPLACEMENT PARTS AVAILABLE ON A SPECIAL ORDER BASIS.	

REV.

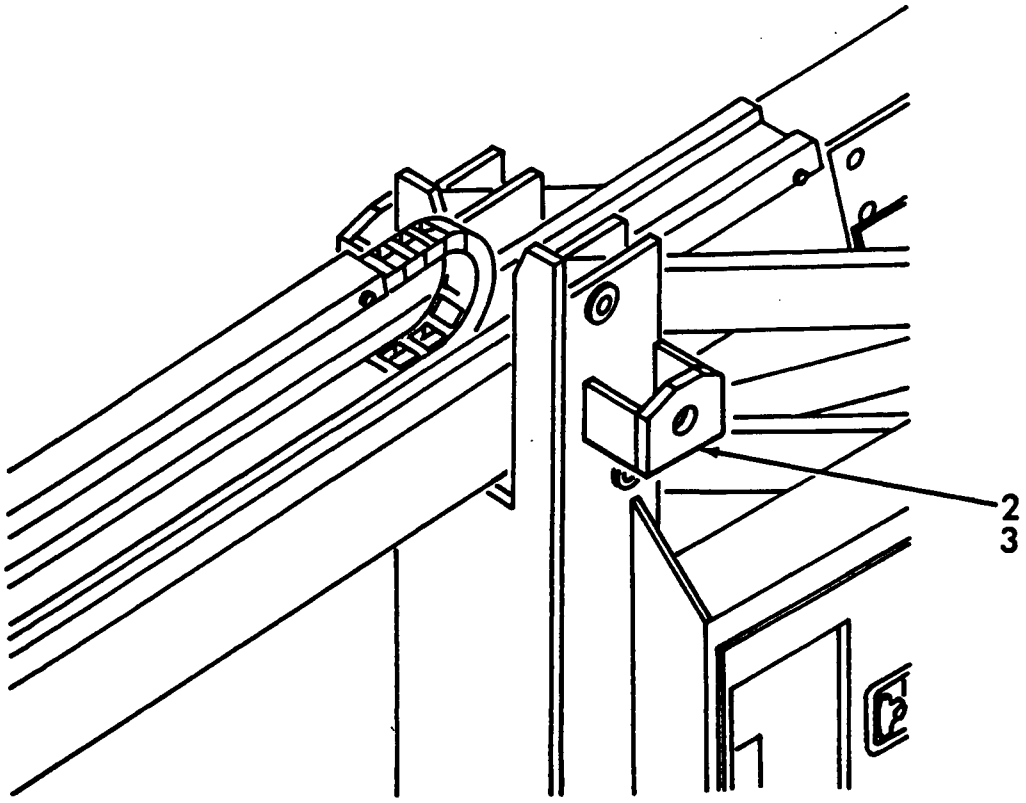
SECTION 6 CONTAINS:

FIG. NO.	TITLE	PART NO.
1	LIFTING LUG	141224
2	POWERED PLATFORM ROTATOR ASSEMBLY	141345
3	AIRLINE TO PLATFORM	140673
4	ALL MOTION ALARM	140660
5	TRAVEL WARNING HORN	140657
6	HOURMETER	140680
7	BATTERY CONDITION INDICATOR GAUGE	140023
8	HYDRAULIC LINE TO PLATFORM	140671

Mark Industries

TITLE	LIFTING LUG
MODEL	41KB
NOTES	

SECTION	6
FIGURE	1
PAGE	1



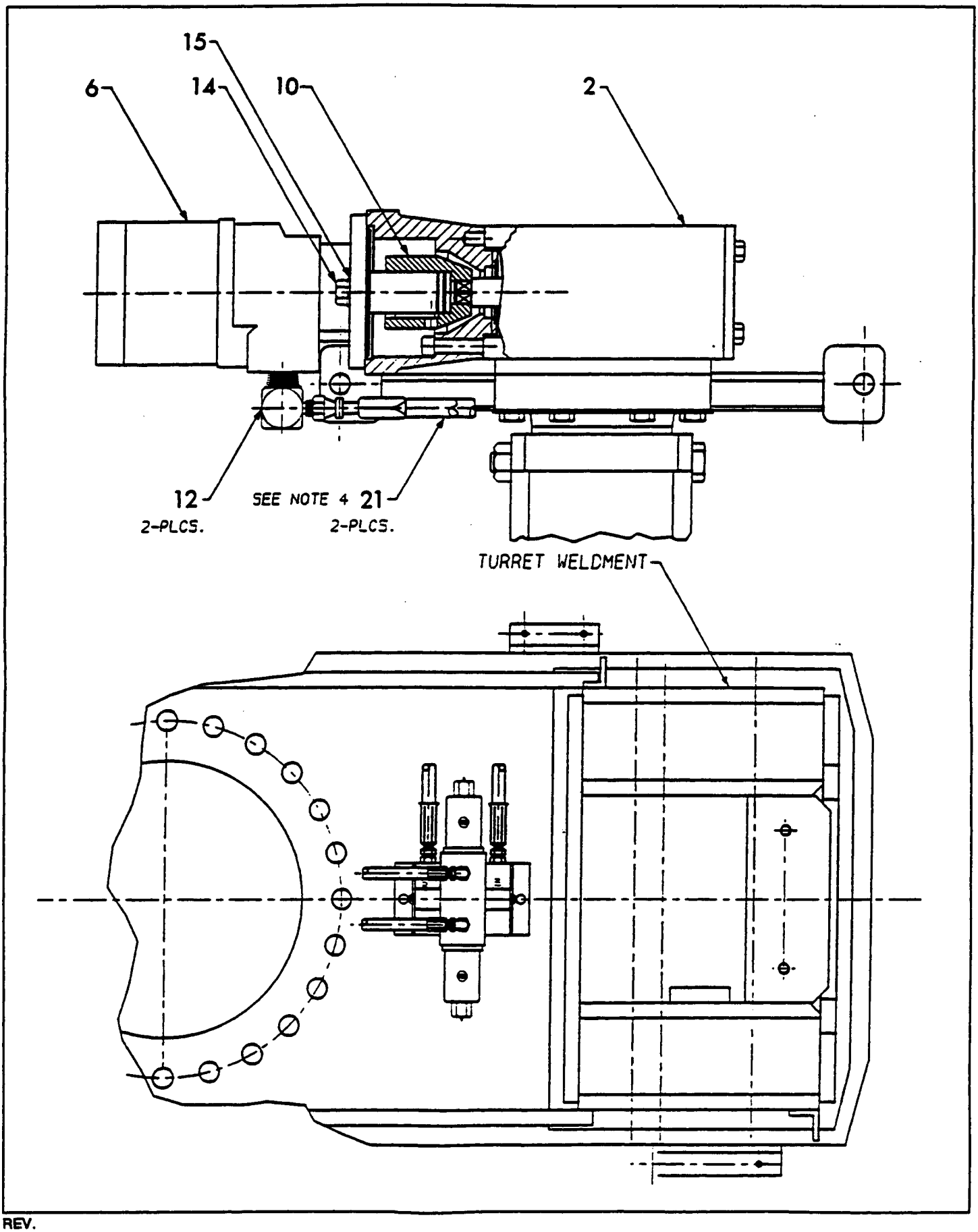
ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141224	LUG, LIFTING	1
2	.140644	WELDMENT, LIFTING LUG	2
3	.181501	DECAL, CAUTION LIFTING LUGS	2

REV.

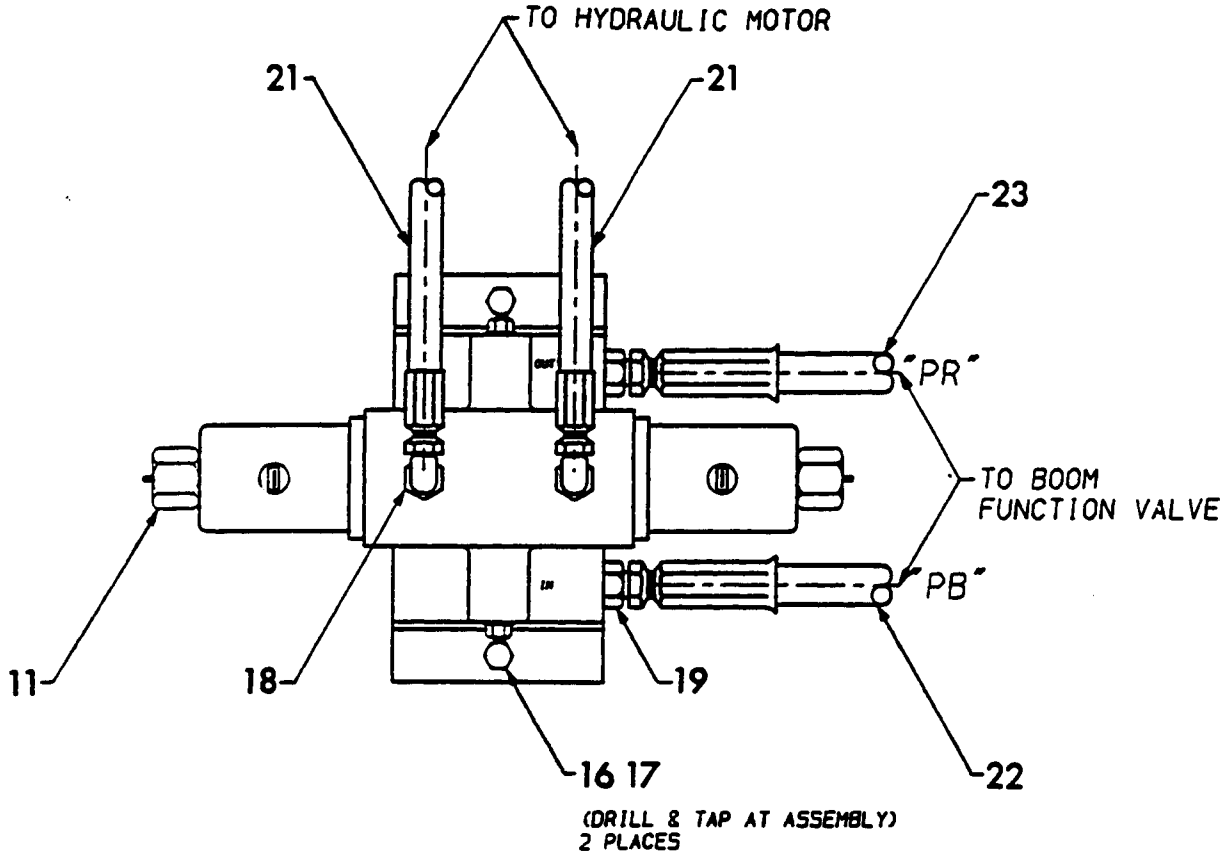
Mark Industries

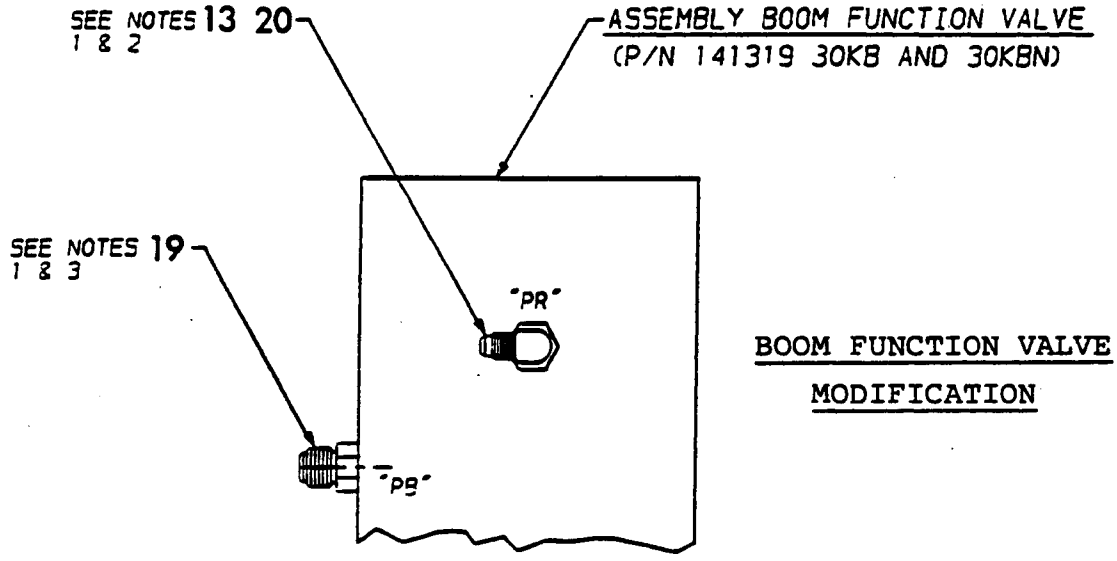
TITLE	POWERED PLATFORM ROTATOR ASSEMBLY
MODEL	41KB
NOTES	UNTIL DEC. 1989

SECTION	6
FIGURE	2
PAGE	1



REV.





BOOM FUNCTION VALVE MODIFICATION

NOTES:

1. REMOVE EXISTING PLUGS ON VALVE MANIFOLD STAMPED "PB" AND "PR".
2. INSTALL ITEMS 13 AND 20 ON "PR" PORT.
3. INSTALL ITEM19 ON "PB" PORT.
4. HOSES MUST BE INSTALLED IN THE BOOM SECTIONS BEFORE FITTINGS ARE ASSEMBLED.
5. REFER TO ELECTRICAL SCHEMATIC DRAWING 141205 FOR WIRING.

Mark Industries

TITLE	POWERED PLATFORM ROTATOR ASSEMBLY
MODEL	41KB
NOTES	UNTIL DEC. 1989

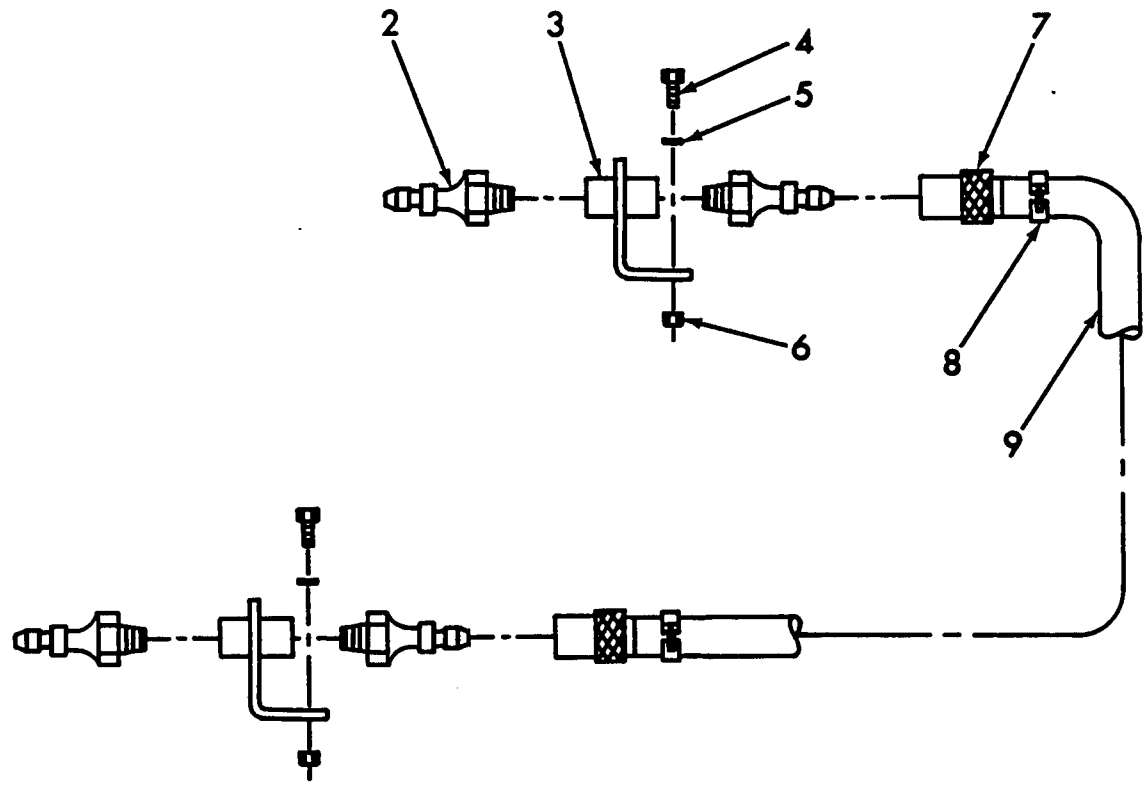
SECT.	6
FIG.	2
PAGE	3

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	141345	ASSEMBLY, POWERED PLATFORM ROTATOR	1
2	.141136	SUB-ASSEMBLY, HYDRAULIC POWERED	1
-3	..24919	ROTATOR, MANUAL	1
-4	..140818	ADAPTER, MOTOR	1
-5	..62017	SCREW, CAP	4
6	.81274	MOTOR, HYDRAULIC	1
-7	..67688	KIT, SEAL	1
-8	..67690	LINK, DRIVE	1
-9	..67698	SHAFT, COUPLING	1
10	.140819	COUPLING	1
11	.160273	VALVE, CROSSOVER RELIEF	1
12	.80008-05	ELBOW, MALE	2
13	.80048-02	PLUG	2
14	.60308	SCREW, CAP	2
15	.63305	WASHER, LOCK	2
16	.60325	SCREW, CAP	2
17	.62319	WASHER, LOCK	2
18	.80012-05	ELBOW, STRAIGHT THREAD	2
19	.80004-08	CONNECTOR, STRAIGHT THREAD	3
20	.80012-08	ELBOW, STRAIGHT THREAD	1
21	.13232-04-6000	ASSEMBLY, HOSE	2
22	.13213-06-0250	ASSEMBLY, HOSE	1
23	.13213-06-0200	ASSEMBLY, HOSE	1

Mark Industries

TITLE	AIRLINE TO PLATFORM
MODEL	41KB
NOTES	

SECTION	6
FIGURE	3
PAGE	1



ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140673	PLATFORM, AIRLINE TO	1
2	.160112	PLUG, MPT (AIR)	4
3	.140851	WELDMENT, AIRLINE BRACKET	2
4	.60312	SCREW, CAP	4
5	.63301	WASHER, LOCK	4
6	.60701	NUT, HEX	4
7	.160111	SOCKET, HOSE	2
8	.160113	CLAMP, HOSE	2
9	.160140	HOSE, AIR (61 FT.)	1

REV.

Mark Industries

TITLE	ALL MOTION ALARM
MODEL	41KB
NOTES	

SECTION	6
FIGURE	4
PAGE	1

ILLUSTRATION NOT AVAILABLE

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140660	ALARM, ALL MOTION	1
-2	.70053	HORN, WARNING	1
-3	.60312	SCREW, CAP	2
-4	.63301	WASHER, LOCK	2
-5	.60701	NUT, HEX	2
-6	.4045	DIODE (6 AMP, 200 VOLT)	2

REV.

Mark Industries

TITLE	TRAVEL WARNING HORN
MODEL	41KB
NOTES	

SECTION	6
FIGURE	5
PAGE	1

ILLUSTRATION NOT AVAILABLE

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140657	HORN, TRAVEL WARNING	1
-2	.70053	HORN, WARNING	2
-3	.60312	SCREW, CAP	2
-4	.63301	WASHER, LOCK	2
-5	.60701	NUT, HEX	2

REV.

Mark Industries

TITLE	HOURMETER
MODEL	41KB
NOTES	

SECTION	6
FIGURE	6
PAGE	1

ILLUSTRATION NOT AVAILABLE

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140680	HOURMETER	1
-2	.20571	HOURMETER	1
-3	.66356	TERMINAL	2

REV.

Mark Industries

TITLE	BATTERY CONDITION INDICATOR GAUGE
MODEL	41KB
NOTES	

SECTION	6
FIGURE	7
PAGE	1

ILLUSTRATION NOT AVAILABLE

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140023	GAUGE, BATTERY CONDITION INDICATOR	1
-2	.70497	METER, BATTERY VOLTAGE	1

REV.

Mark Industries

TITLE	HYDRAULIC LINE TO PLATFORM
MODEL	41KB
NOTES	

SECTION	6
FIGURE	8
PAGE	1

ILLUSTRATION NOT AVAILABLE

ITEM	PART NUMBER 1234	DESCRIPTION	UNITS PER ASSY
-1	140671	PLATFORM, HYDRAULIC LINE TO	1
-2	.2527	COUPLING, QUICK DISCONNECT	4
-3	.845	CAP, QUICK DISCONNECT	4
-4	.140851	WELDMENT, BRACKET	4
-5	.65564	COUPLING, FULL	4
-6	.60312	SCREW, CAP	8
-7	.63301	WASHER, LOCK	8
-8	.13232-04-6000	ASSEMBLY, HOSE	2
-9	.80001-04	CONNECTOR, MALE	4

REV.

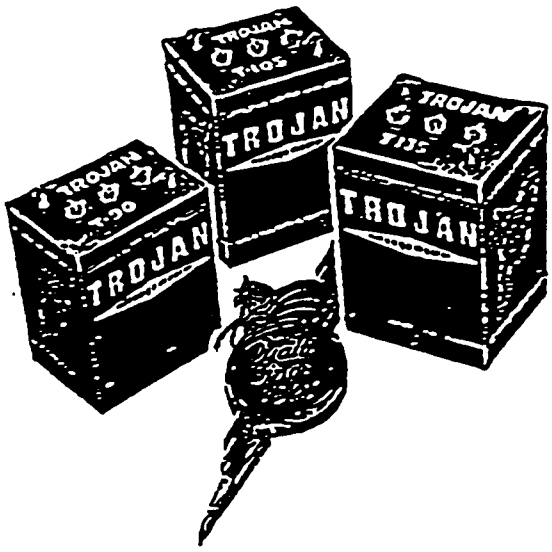
Mark Industries

TITLE	VENDOR CHAPTER
MODEL	41KB

SECTION	DESCRIPTION	
1	AUTOMATIC BATTERY CHARGER	P/N 70523, 70526
2	MICO 530 SERIES SPRING BRAKE	P/N 30860
3	FAIRFIELD TORQUE-HUB FINAL DRIVES	P/N 140891
4	GENERAL ELECTRIC MOTOR	P/N 70480
5	TROJAN BATTERY	P/N 30297
6	EATON HYDRAULIC MOTOR	P/N 81362

Fairfield

EATON



mico

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OPERATING INSTRUCTIONS

LESTRONIC II BATTERY CHARGER

1. Connect power supply cord to properly grounded outlet of the proper voltage and frequency as specified on the charger nameplate. Circuit breaker or fuse protection in the AC line must be adequate to handle the input power requirements. When it is necessary to use an AC extension cord to the charger use a three conductor, 12 guage cord with ground and keep as short as possible.

   If DC output cord is connected to batteries, charger will automatically turn on after a short delay.

2. Connect DC output cord to batteries (if not already connected).

3. Monitor ammeter for correct charge rate. Normal charging at the finish charge rate for the last 3 to 5 hours is important to achieve equalization of all battery cells every time the batteries are charged. New batteries or batteries charged in cold temperatures (below 50 Degrees F) will require more time to achieve full charge.

4. Charger turns off automatically when batteries are fully charged.

CAUTION

Do not leave charger on while unattended for more than two consecutive days. Severe overcharging and possible damage to batteries will result if charger should fail to turn off.

INSTALLATION AND SERVICE INSTRUCTIONS

530 Series SPRING BRAKE

BE SURE TO READ GENERAL INSTALLATION GUIDELINES SHEET BEFORE PROCEEDING

GENERAL INFORMATION

When installing the MICO 530 Series Spring Brake, it is of utmost importance that the caliper be centered evenly and squarely over the disc to insure even lining to disc contact. After linings have been worn to the point of replacement, they may be replaced with MICO Lining Kit 20-060-021. The MICO 530 Series Spring Brakes are designed to be used with a disc of 1/2" thickness.

CAUTION: MINIMUM RECOMMENDED DISC THICKNESS FOR THIS CALIPER ASSEMBLY IS 7/16". FOR OTHER DISC THICKNESSES, CONTACT THE FACTORY.

MOUNTING PROCEDURE

1. Figures 2 thru 5 illustrate the two ways of mounting the 530 Series Brakes. The mounting surface to disc face dimension should be closely held.
2. Use the Table below to determine A or B dimensions and locate carrier mounting holes.

At this point the 2700 lb. brakes differ from the 4000 or 6000 lb. brakes. The 4000 and 6000 lb. brakes come with the locknut and adjusting screw already in place on the brakes. The 2700 lb. brakes do not. If you have a 2700 lb. brake it will be necessary to use a collar tool. This tool is used to retract the piston until sufficient clearance is obtained between linings, thus enabling the brake to slide over the disc.

3. Follow appropriate procedure for your brake:

4000 and 6000 LB. BRAKES
Loosen lock nut and back off adjusting screw slightly. Push lining and piston assembly back into brake housing.

2700 LB. BRAKES
Assemble locknut, adjusting screw and collar tool as shown in Figure 1 and thread into piston approximately 1/2". Tighten locknut until piston is retracted.

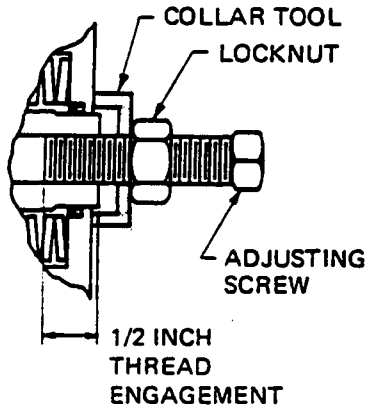
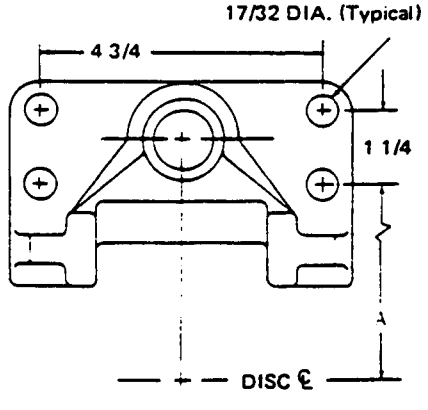


FIGURE 1

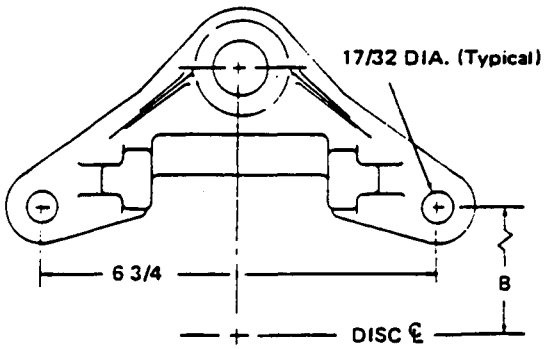
4. Mount brakes on disc and install grade 5 or better mounting bolts.
5. Install hydraulic lines and pressurize system checking for leaks.
6. See Brake Adjustment for further instructions.



CARRIER A

DISC CENTERLINE TO MOUNTING HOLE DIMENSION

DISC DIA.	CARRIER A	CARRIER B
9	6 1/8	4 5/8
10	6 5/8	5 1/8
12	7 5/8	6 1/8
14	8 5/8	7 1/8
16	9 3/4	8 1/8
18	10 3/4	9 1/8
20	11 3/4	10 1/8
22	12 3/4	11 1/8
24	13 3/4	12 1/8



CARRIER B

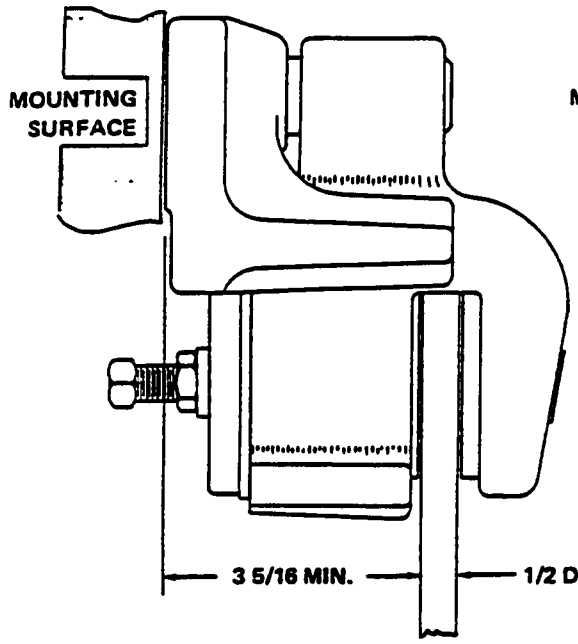


FIGURE 2

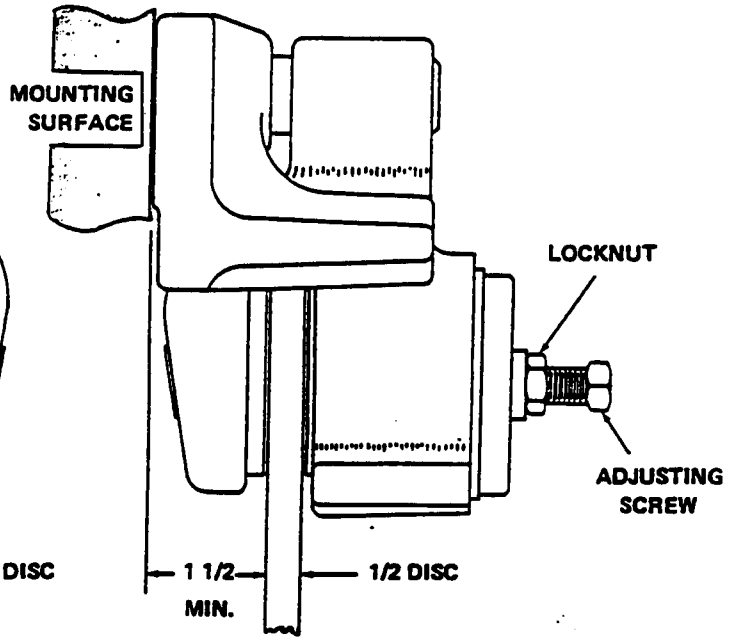


FIGURE 3

NOTE: Mounting surface to disc face dimension typical of both style carriers.

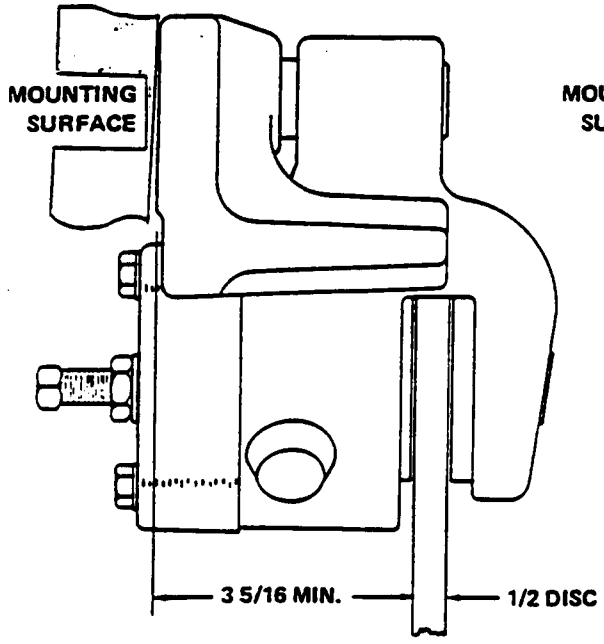


FIGURE 4

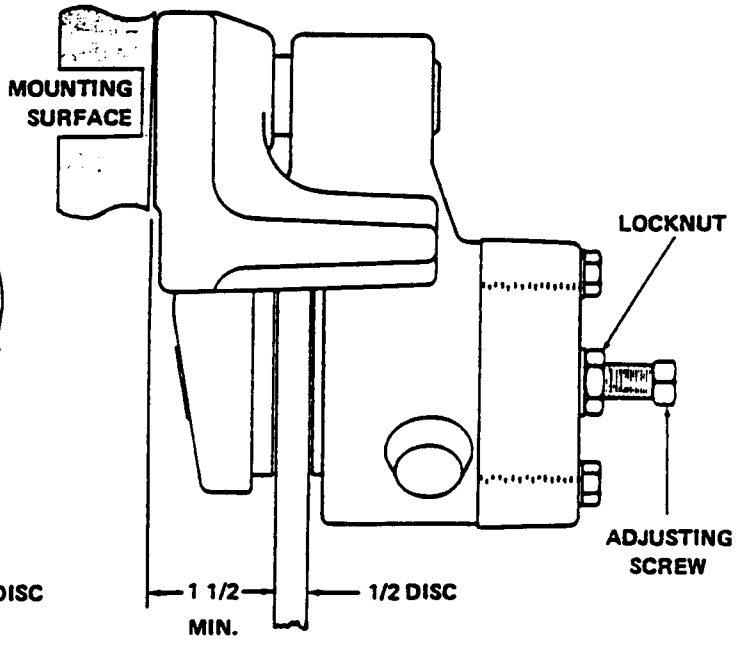


FIGURE 5

PLUMBING PROCEDURE

1. After caliper assembly is mounted on vehicle, install hydraulic lines. NOTE: All porting is designed for J.I.C. o-ring type fittings.
2. Bleed the system making sure all air is eliminated. Apply hydraulic pressure and check for leaks.

CHANGE LINING PROCEDURE

1. Loosen locknut (item 2) and back off adjusting screw (item 1).
2. Remove brake from vehicle by disconnecting necessary fluid lines and removing mounting bolts. Drain fluid from brake before proceeding.
3. Place brake in soft jawed vise with disc clearance slot facing up (see Figure 6) clamping on the two machined surfaces.
4. Remove cap screws (item 4). Using a thin blade tool, pry lining (item 6) from housing. Remove lining through disc clearance slot.
5. Force lining assembly (item 3) from housing bore by advancing adjusting screw (item 1). Remove lining assembly through disc clearance slot.
6. Remove locknut (item 2) and adjusting screw (item 1).
7. Install new piston and lining assembly (item 3) by inserting through disc clearance slot.
8. Through disc clearance slot, reinstall lining assembly (item 3) into housing bore.
9. Install inserts (item 5) into new lining pad (item 6). Then install pad into housing through disc clearance slot. Line up holes in lining with holes in housing. Secure lining to housing using cap screws (item 4).
10. Insert adjusting screw and locknut through collar tool (see Figure 1). Turn adjusting screw (item 1) into piston until approximately 1/2" of thread engagement is obtained. Tighten locknut (item 2) against collar tool until piston retracts enough for installation. Push lining assembly back – brake is ready to be mounted.
11. Reinstall brake on vehicle and connect fluid lines.
12. Remove collar tool, reverse and reinstall locknut (item 2) and adjusting screw (item 1).
13. Bleed the system making sure all air is eliminated. Apply hydraulic pressure and check for leaks.
14. Adjust linings as described in BRAKE ADJUSTMENT section.

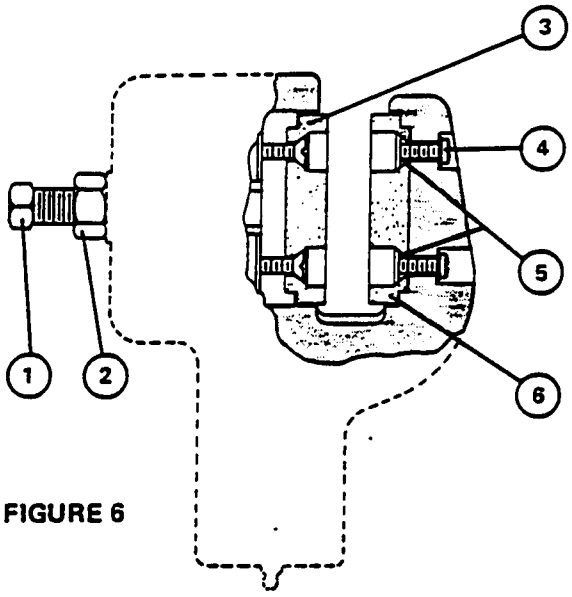


FIGURE 6

Use Lining Replacement Kit 20-060-021 for all 530 Series Spring Brakes

BRAKE ADJUSTMENT

CAUTION: The collar tool on 2700 lb. Brakes will have to be reversed, as shown in Figure 7, before proceeding.

1. Pressurize brakes to system pressure.
2. Place .012 shim between lining and disc. Tighten adjusting screw until shim can be moved.
3. Holding screw stationary, tighten locknut. Remove shim and release hydraulic pressure.

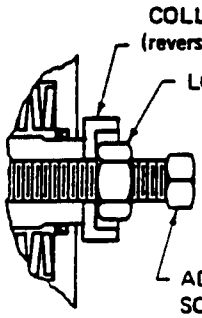


FIGURE 7

SEAL REPLACEMENT PROCEDURE

(For 2700 lb. Spring Brakes)

CAUTION: When removing seals and back-up rings be careful not to scratch or mar pistons. When installing new seals in the brake, make sure the seal kit used is the proper one for the system fluid used.

1. Loosen locknut and adjusting screw assembly (item 5).
2. Remove caliper from vehicle by disconnecting necessary fluid lines and removing mounting bolts. Drain fluid from brake before proceeding.
3. Position brake in soft jawed vise, clamping on machined surfaces.
4. Remove end cap (item 1) and spacer (item 3) using a 2 3/8" spanner wrench. Using a thin blade tool, remove seal (item 2) from end cap.
5. Remove belleville spring washers (items 4) (NOTE STACK ARRANGEMENT).

6. Remove piston (item 9) from caliper bore. Remove o-ring (item 8) and back-up ring (item 7) from piston.
7. Remove piston (item 12) from caliper bore. Remove o-rings (items 10 & 13) and back-up rings (items 11 & 14) from piston.
8. Wash pistons (items 9 & 12) and caliper bore thoroughly and allow to dry.
9. Lubricate all o-rings and back-up rings from seal kit in clean system fluid.
10. Install new seal, o-rings and back-up rings from kit. Make sure they are all installed in proper position in grooves (see Figure 8).

CAUTION: When installing back-up rings, it is essential that surfaces of diagonal splice match with each other after back-up ring is installed in groove.

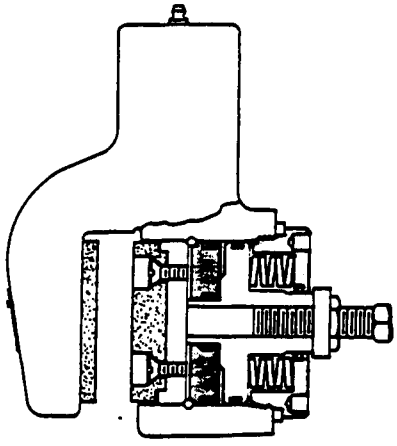


FIGURE 8

11. Lubricate caliper bore and pistons (items 9 & 12) with clean system fluid.
12. Reinstall piston (item 12) into caliper bore. Note direction of piston.

CAUTION: When inserting piston, be careful not to pinch o-ring on inlet ports.

13. Make sure push rod (item 6) is in bore of piston (item 9). Then install piston assembly (item 9) into caliper bore.
14. Install belleville spring washers (items 4) following stacking sequences shown in Figures 8 & 9.
15. Install spacer (item 3) and end cap (item 1). Torque end cap to approximately 15 ft. lbs.
16. To continue assembly refer to Mounting Procedure and Brake Adjustment Sections.

2700 LB. SPRING BRAKE

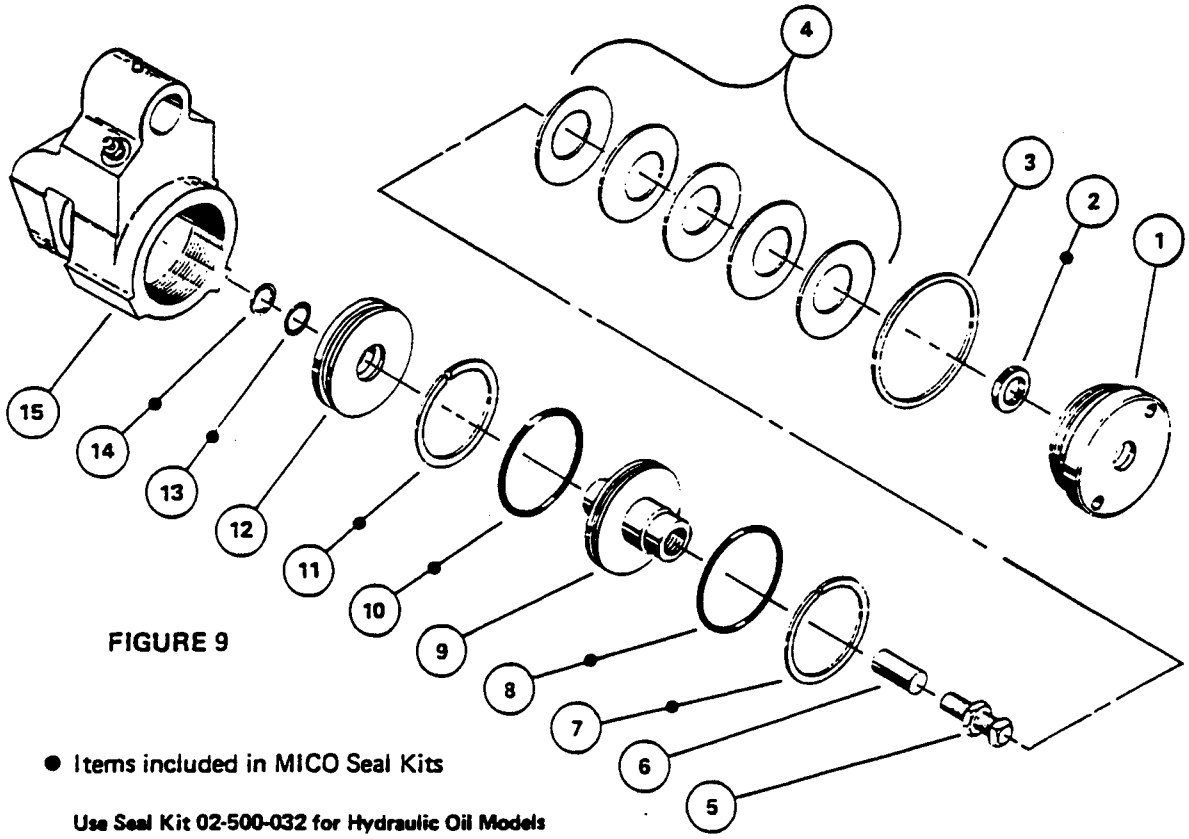


FIGURE 9

● Items included in MICO Seal Kits

Use Seal Kit 02-500-032 for Hydraulic Oil Models
Use Seal Kit 02-500-033 for Brake Fluid Models

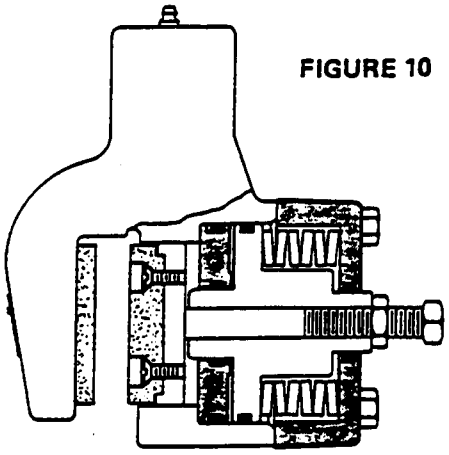


FIGURE 10

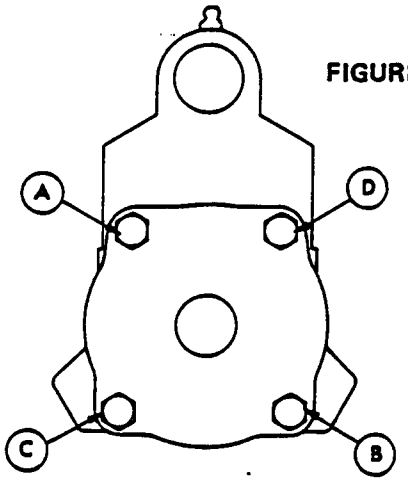


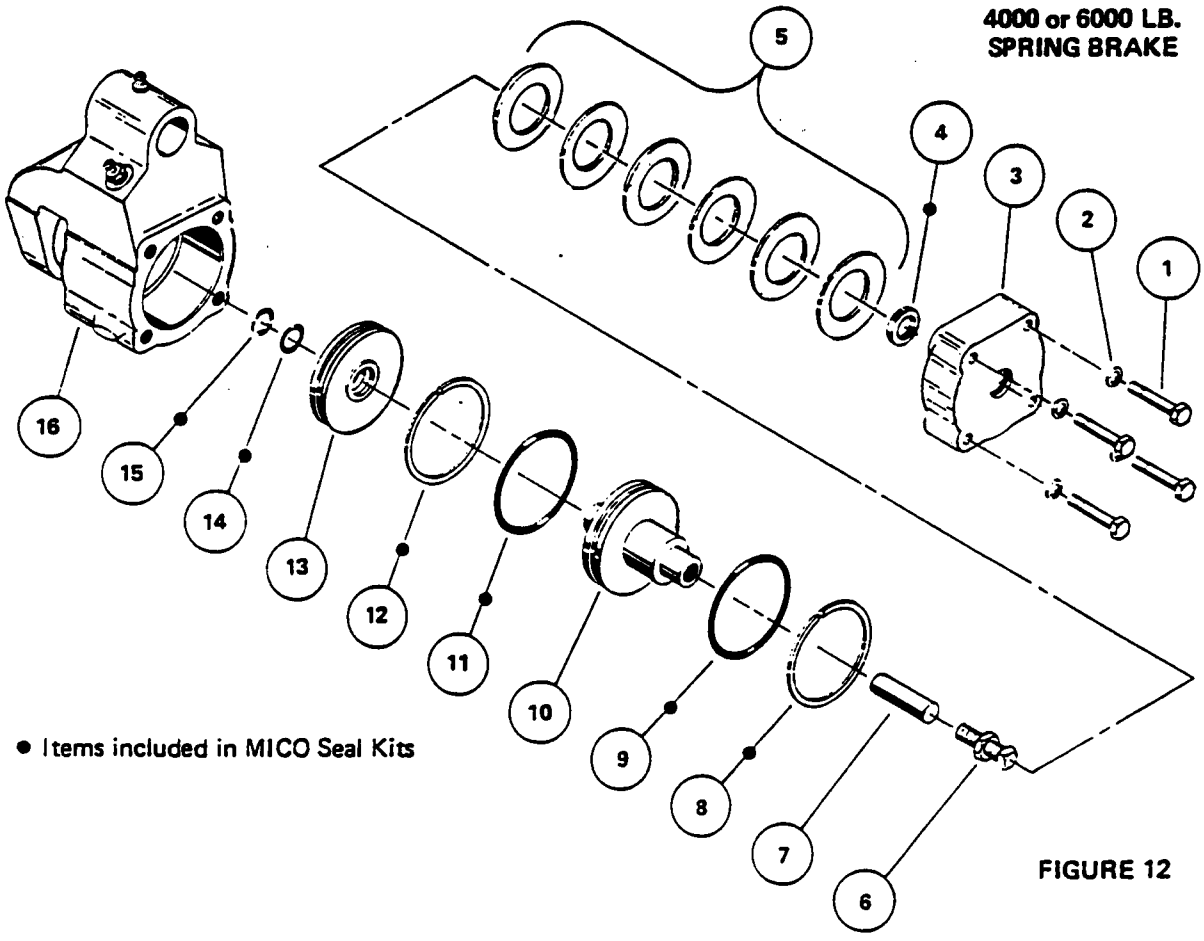
FIGURE 11

SEAL REPLACEMENT PROCEDURE

(For 4000 and 6000 lb. Spring Brakes)

CAUTION: When removing seals and back-up rings be careful not to scratch or mar pistons. When installing new seals in the brake, make sure the seal kit used is the proper one for the system fluid used.

1. Loosen locknut and adjusting screw assembly (item 6).
2. Remove caliper from vehicle by disconnecting necessary fluid lines and removing mounting bolts. Drain fluid from brake before proceeding.



• Items included in MICO Seal Kits

FIGURE 12

3. Position caliper in a soft jawed vise clamping on machined surfaces. Remove end cap (item 3) by loosening the 4 bolts (A, B, C, D). See Figure 11. Loosen the bolts evenly and in the following sequence; A, B, C and D until spring preload is released. Remove end cap and bolts.
4. Using a thin blade tool, remove seal (item 4) from end cap (item 3).
5. Remove belleville spring washers (item 5) (NOTE STACK ARRANGEMENT).
6. Remove piston (item 10) from caliper bore. Then remove o-ring (item 9) and back-up ring (item 8) from piston.
7. Remove piston (item 13) from caliper bore. Then remove o-rings (items 11 & 14) and back-up rings (items 12 & 15) from piston.
8. Wash pistons (items 10 & 13) and caliper bore thoroughly and allow to dry.
9. Lubricate all o-rings and back-up rings, from seal kit, in clean system fluid.
10. Install new seal, o-rings and back-up rings from kit. Make sure back-up rings are installed in proper position in grooves. See Figure 10.

    CAUTION: When installing back-up rings it is essential that the surfaces of diagonal splice match with each other after back-up ring is installed in groove.

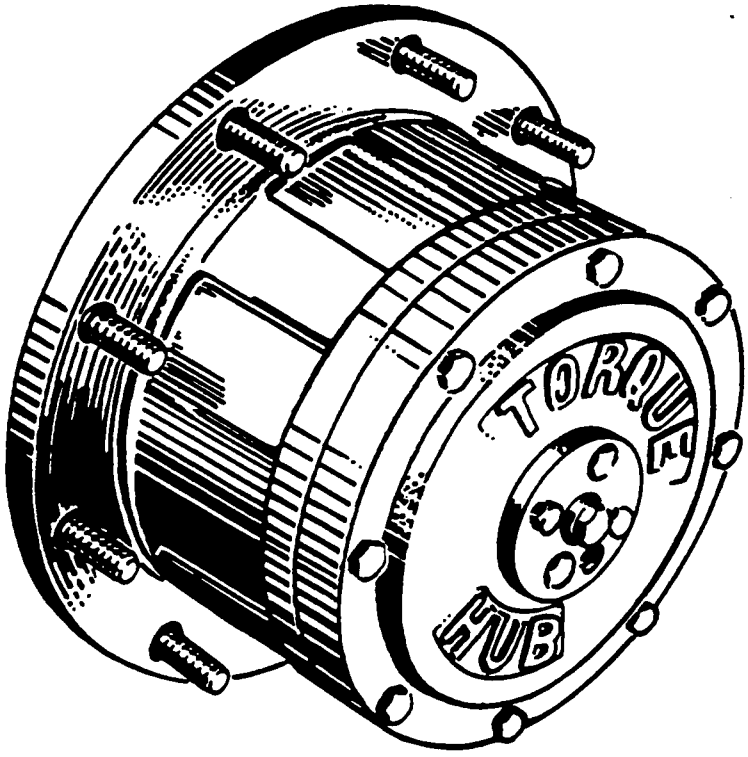
11. Lubricate caliper bore and pistons (items 10 & 13) with clean system fluid.
12. Reinstall piston (item 13) into caliper bore.

    CAUTION: When inserting piston, be careful not to pinch o-ring on inlet ports.

13. Make sure push rod (item 7) is in bore of piston (item 10). Then install piston assembly (item 10) into caliper bore.
14. Install belleville spring washers (items 5) following stacking sequence shown in Figures 10 & 12.
15. Install end cap (item 3) and 4 bolts. Tighten bolts evenly following sequence (A, B, C, D) shown in Figure 11. Torque bolts to 10 - 12 ft. lbs.
16. To continue assembly refer to Mounting Procedure and Brake Adjustment Section.

Torque-Hub® Final Drives

Service Manual



Fairfield

THE DRIVE PEOPLE

REV.

Introduction

This Service Manual is a step-by-step guide designed for the customer or shop mechanic who is servicing or repairing a particular model of Torque-Hub Final Drive. (The model covered by this copy of the Manual is specified on the Manual cover.)

Included are —

1. assembly and exploded view drawings
2. disassembly procedure
3. main assembly procedure (assuming all sub-assemblies to be intact)
4. sub-assembly procedures.

At the time of printing, this Manual was complete for the specific Torque-Hub model designated. However, Fairfield Manufacturing Co., Inc., reserves the right to update and improve its products at any time. All specifications and procedures are therefore subject to change without notice.

Safety

Standard safety practices should be followed during the disassembly and assembly procedures described. Safety glasses and safety shoes should be worn; heavy, heat resistant gloves should be used when heated components are handled. Be especially alert when you see a caution symbol (⚠). This symbol indicates that a particular operation could cause personal injury if not performed properly or if certain safety procedures are not followed.

W1A-W1B
Disassembly Procedure

1. Loosen all 16 Cover Bolts and drain the oil from the unit.

2. Remove the 16 Cover Bolts and lift off the Cover Sub-Assembly. Discard the 'O' ring Seal from the Cover counterbore.

3. Lift out the Carrier Sub-Assembly and the top Thrust Washer. The Thrust Washer may stick inside the Cover.

4. Pry the Ring Gear loose and remove it. Discard the 'O' ring Seal from the Hub counterbore.

5. Remove the Input Shaft, Input Gear, and the Thrust Spacers that are on the Input Shaft.

6. Lift out the Internal Gear and Thrust Washer. The Thrust Washer may stick to the bottom of the Carrier.

7. Remove the Retaining Ring from the Spindle and discard; then lift the hub off the Spindle.

8. The inside Bearing Cone and the Bearing Shim can now be removed.

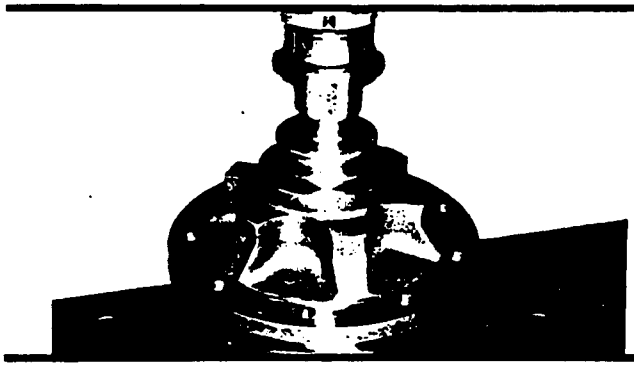
9. The Seal can be pried out of the Hub with a screw driver or pry bar. This will also allow the outside Bearing to be removed.

   Note: If bearing replacement is necessary, the Bearing Cups can be removed with a "slide hammer puller" or driven out with a punch.

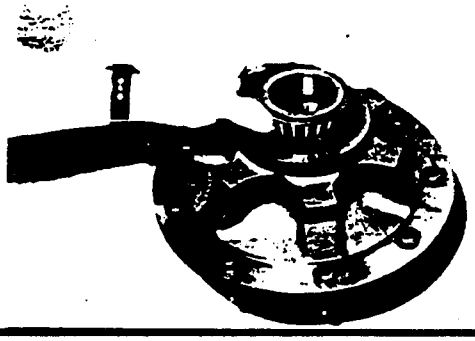
10. To remove the Cluster Gears from the Carrier, drive the anti-roll pin into the Planet Shaft of the Cluster Gear. After the Planet Shaft is removed the roll pin should be driven out of the Planet Shaft.

WARNING: When rebuilding the unit, the 'O' rings and Retaining Rings should <u>always</u> be replaced.

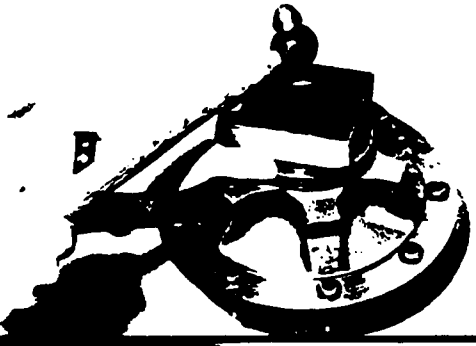
Main Assembly Procedure



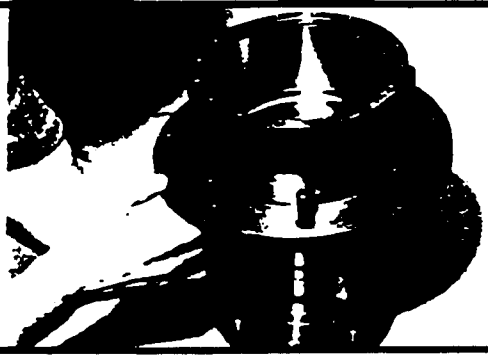
1. Using an arbor type press if available, press Bearing Cups with large inside diameters facing out, into Hub counterbores. Cup #JLM506810 will go into small end of Hub, and Cup #JM205110 will go into large end of Hub. If Studs are being used, they can be pressed in at this time. Solid support must be used in this operation.



2. Place Bearing cone #JLM506849 into Bearing Cup in small end of Hub.



3. Press Seal into Hub counterbore with flat metal side facing in. Use a flat object to assure that Seal is pressed evenly and is flush with Hub face.



4. Lower Hub onto Spindle with large open end up.



5. Place Bearing Cone #JM205149 over end of Spindle and into Bearing cup.

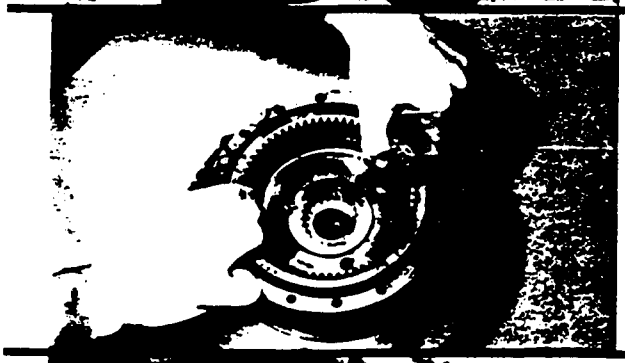


6. Place Bearing Shim over end of Spindle and against Bearing Cone.



7. Secure Retaining Ring completely into Spindle groove and against Bearing Shim. Be sure that Retaining Ring is entirely in groove.

   ⚠ Eye protection should be worn during Retaining Ring installation.



8. Place Internal Gear onto end of Spindle.

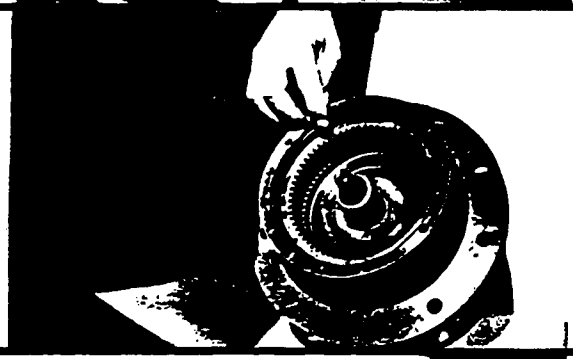


9. Place Input Shaft Assembly into Spindle bore with unsplined end facing out.

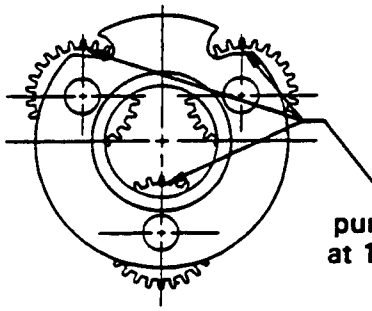
Main Assembly



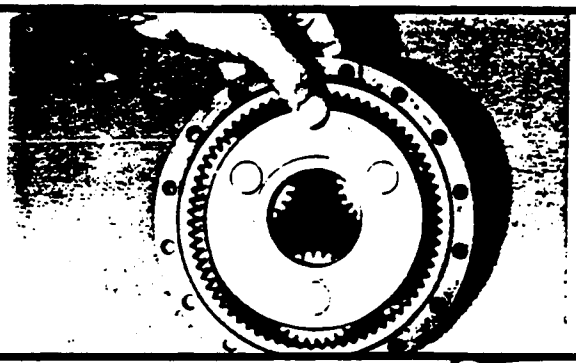
10. Place narrow Thrust Spacer over Input Shaft with counterbore side facing Spindle.



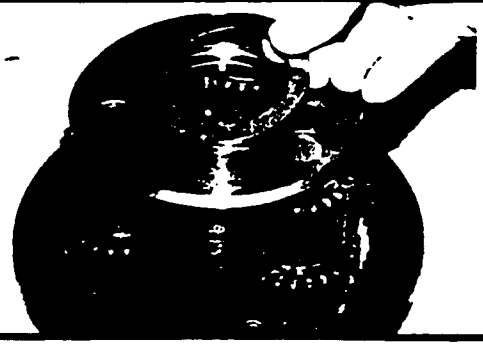
11. Place 'O' Ring into Hub counterbore. Use petroleum jelly or grease to hold 'O' Ring in place. Slight stretching of the 'O' Ring may be necessary to insure proper seating.



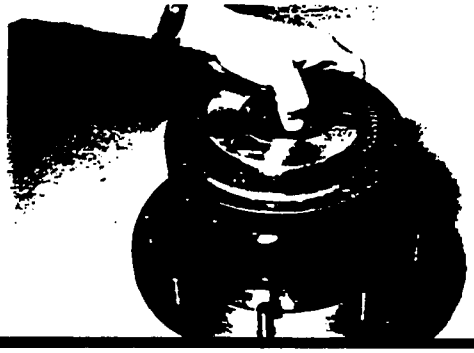
12. Place Carrier Assembly on a flat surface with the large gears up and positioned as shown. Find the punch marked tooth on each large gear and locate at 12 o'clock (straight-up) from each planet pin. Marked tooth will be located just under the Carrier on upper two gears.



13. With shoulder side of Ring Gear facing down, place Ring Gear over (into mesh with) large gears. Be sure that punch marks remain in correct location during Ring Gear installation.

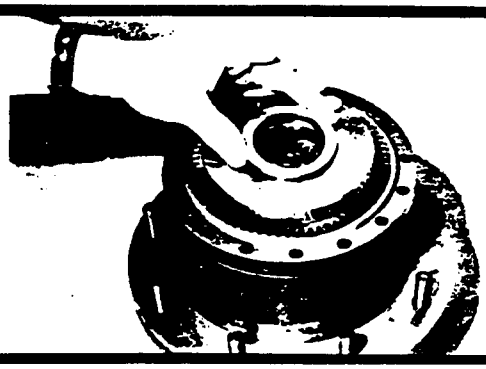


14. Turn over Carrier Assembly and Ring Gear while keeping gears in mesh. Place Thrust Washer into Carrier counterbore. Use petroleum jelly or grease to hold washer in place.



15. While holding Ring Gear, Input Gear and Cluster Gears in mesh, place small side of Cluster Gears into mesh with the Internal Gear. On the Ring Gear locate the hole marked "X" over one of the counterbored holes in Hub. Mark these holes on outside diameter for later use.

Note: If gears do not mesh easily or Carrier Assembly does not rotate freely, then remove the Carrier and Ring Gear and check the Cluster Gear timing.

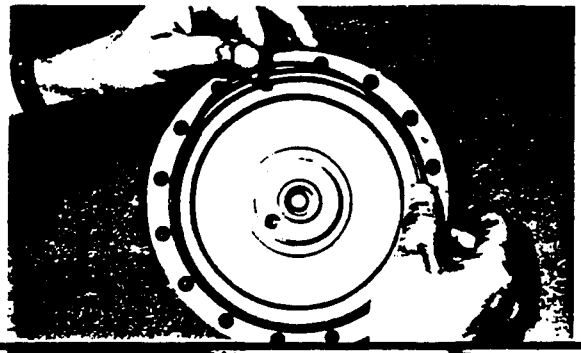


16. Place Thrust Washer into Carrier counterbore.

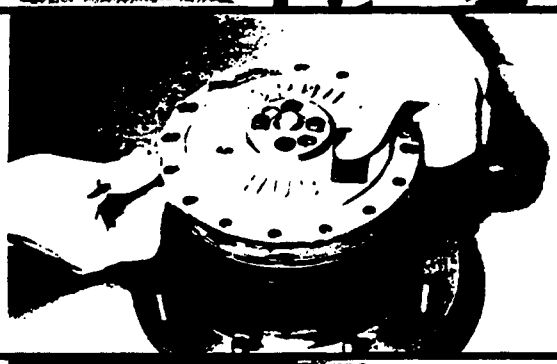


17. The Input Gear is now installed into the carrier meshing with the large diameter cluster gear. The counterbore in the bore of the Input Gear must be to the inside of this assembly.





19. Place 'O' Ring into Cover Assembly counterbore. Use petroleum jelly or grease to hold 'O' Ring in place.



20. Place Cover Assembly over Ring Gear with oil level check plug in Cover located approximately 90° from oil fill plug in Hub.



21. Locate four Shoulder Bolts with flat washers, 90° apart into counterbored holes in Hub marked in step 16. Torque Shoulder Bolts to 23-27 ft. lbs.



22. Use standard grade 8-5/16-18x2¼ bolts with flat washers in remaining holes. Torque to 23-27 ft. lbs.



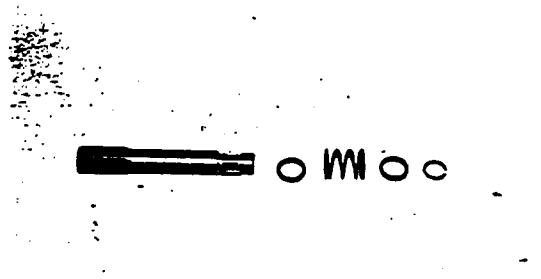
23. Place Coupling into Spindle and onto Input Shaft.

This completes the Torque-Hub Assembly. The unit must be filled one-half full of EP90 lubricant before operation.

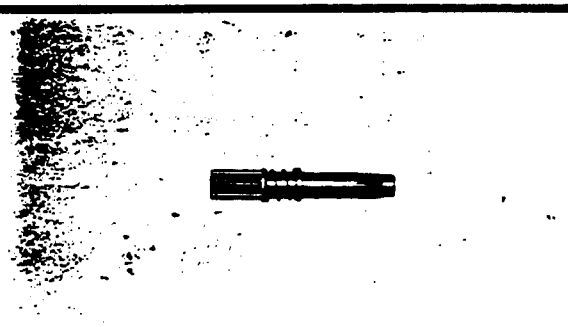
Assembly Procedure

For Sub-Assemblies

Input Shaft Sub-Assembly



1. Place Washer, Spring and Washer, in that order, onto Input Shaft.



2. Install Retaining Ring into Input Shaft groove to secure Spacers and Spring to shaft.

   ⚠ Eye protection should be worn during Retaining Ring installation.

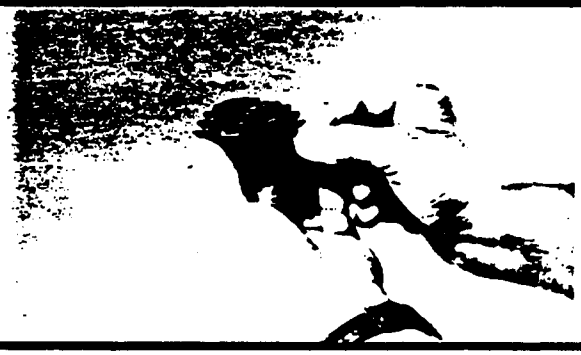
Carrier Sub-Assembly



1. Apply a coat of grease or petroleum jelly to Cluster Gear bore.



2. Place sixteen Needle Rollers into Cluster Gear bore.



3. Place Spacer washer into opposite side of Cluster Gear and against Needle Rollers.

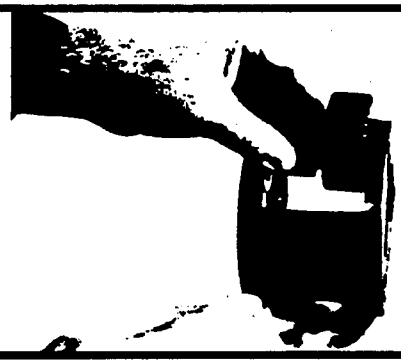


4. Place second set of sixteen Needle Rollers into Cluster Gear.



5. Apply grease or petroleum jelly to the tang side of two Thrust Washers. Place Thrust Washers against bosses in Carrier with washer tang fitting into slot in Carrier outside diameter.

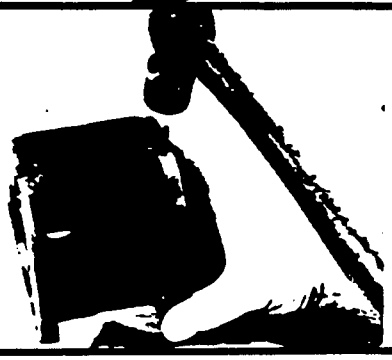
   Note: Some old style Carriers will not have slots and tangs should be located inside boss relief.



6. While keeping Thrust Washers in place, slide Cluster Gear into Carrier with the larger gear on the side with the small pin hole.



7. Line up Cluster Gear and thrust Washers with hole in Carrier and slide Planet Shaft through. Line up chamfered side of hole in Planet Shaft with pin hole in Carrier.

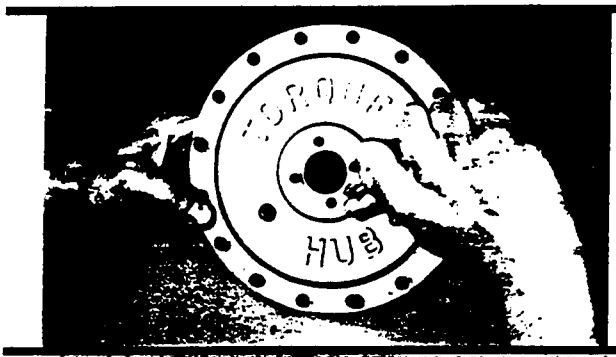


8. Drive Anti-Roll Pin flush into Carrier hole, thereby locking Planet Shaft into place.

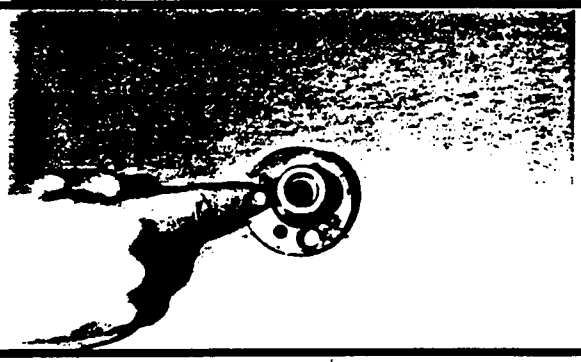
   Repeat these steps for remaining two Cluster Gears to complete Carrier Sub Assembly.

Carrier Sub-Assembly

Cover Sub-Assembly



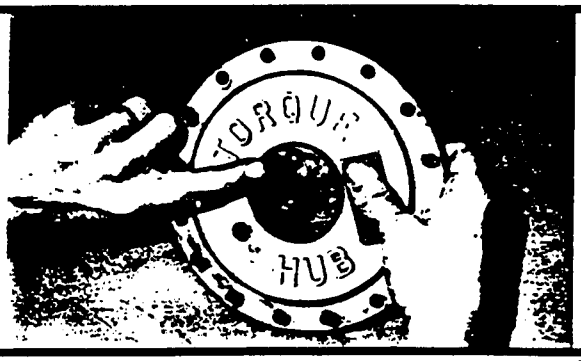
1. Screw Pipe Plug into Cover.



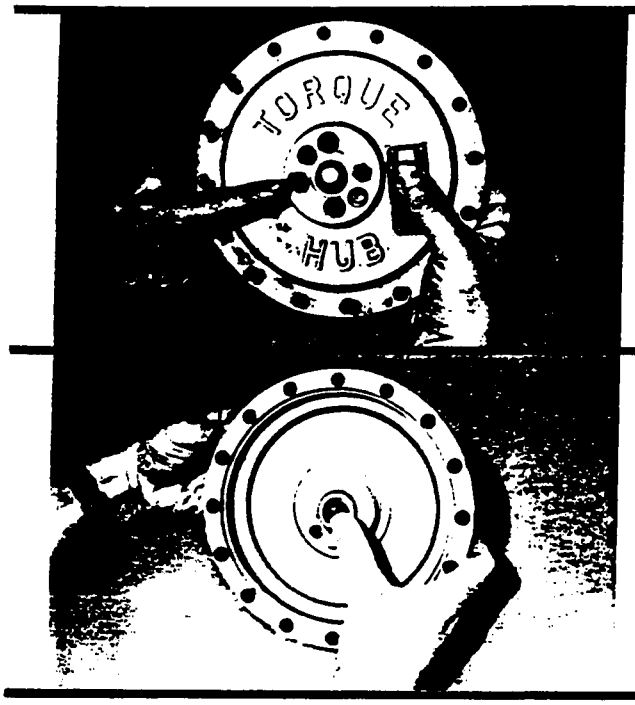
2. Slip 'O' Ring over Cover Cap and against face.



3. Place 'O' Ring into Cover Cap internal groove. The Disconnect Rod may be used to push 'O' Ring into groove.



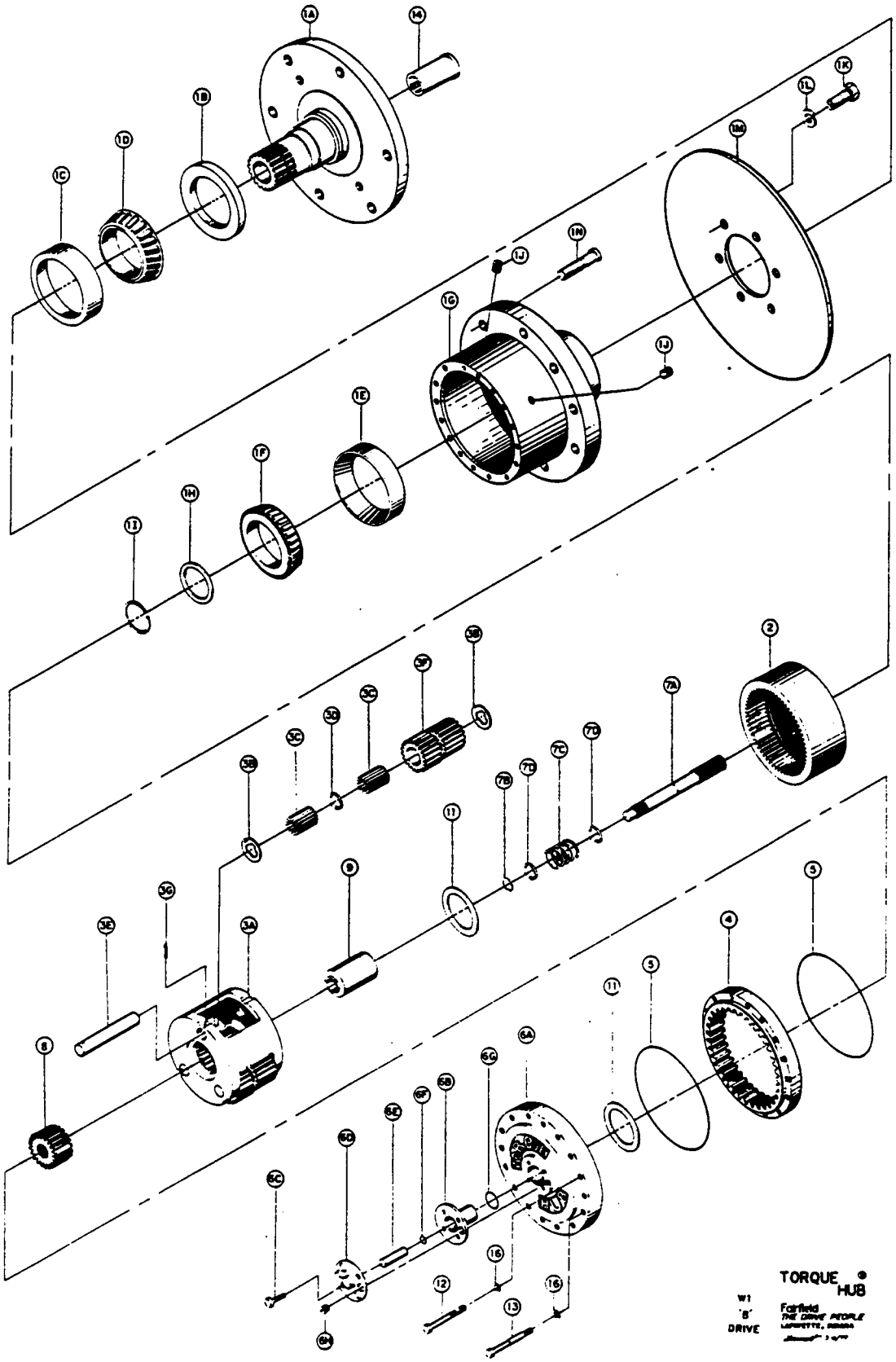
4. Place Cover Cap into Cover with large hole located over Pipe Plug. Secure Cover Cap to Cover with two ¼-20x¾ bolts. Torque bolts to 70-80 in. lbs.



5. Place Disconnect Cap over Cover Cap with nipple facing out. Secure Disconnect Cap to Cover with two ¼-20x¾ bolts. Torque bolts 70-80 in. lbs.

6. Turn Cover over and push Disconnect Rod into Cover Cap. Rod will be held in place by friction from the 'O' Ring.

Cover Sub-Assembly


TORQUE HUB
W1
'B'
DRIVE
Fairfield

GENERAL ELECTRIC MOTOR
M.I. P/N 70480

INSTRUCTIONS

EXAMINATION: Examine the motor to see that it has not been damaged in shipment.

LUBRICATION: Motors have ball bearings which are packed with sufficient grease for approximately five years operation under normal conditions. After five years, the bearings and bearing housings should be cleaned thoroughly. Repack each bearing and the cavity back of the bearing one-third full with G-E ball-bearing grease.

If the motor is operated 24 hours per day every day or under other severe conditions, the bearings should be regreased every two or three years.

CONNECTIONS: Connect the motor to a direct current circuit of the voltage stamped on the motor nameplate.

CARE: Occasionally blow the dirt and carbon dust out of the windings and off the brush holders.

To clean the commutator, wipe it with a clean, dry cloth. (Do not use emery cloth). Never use oil or other lubricants on the commutator or brushes. To smooth a rough commutator, use sandpaper, grade 4/0 or finer.

THE 10 COMMANDMENTS OF GOOD BATTERY CARE

1. Add approved water only--never acid.
2. Keep electrolyte level above separator protectors.
3. Keep battery top clean and dry.
4. Keep flame and metal away from battery top.
5. Keep vent caps tightly in place.
6. Do not use battery with specific gravity below 1.120.
7. Cool before charging or operating if battery is above 115°F.
8. Charge only at proper voltage and ampere-hours.
9. Keep truck compartment and battery cover open during charging.
10. When in doubt, call your Trojan Battery service representative for long, reliable battery life.

Watering Instructions

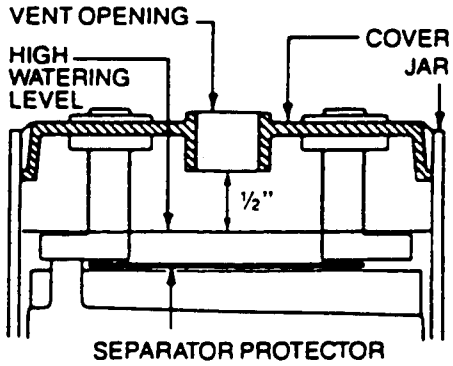
Approved Water

In most areas of the United States, tap water is satisfactory for use in lead acid batteries. The local Trojan Battery office will advise, upon request, if the public water is approved. Use distilled water when in doubt or if the public water source is not approved.

CAUTION—DO NOT OVERFILL. MOISTURE ON THE TOPS OF THE BATTERIES INDICATES OVERFILLING HAS OCCURRED.

Proper Electrolyte Level

The electrolyte level must be kept between the "High Warning Level" and the separator protectors as shown in the sketch The batteries should be filled only at the end of the charging cycle



1. NEW BATTERY RECEIVAL AND INSTALLATION

1. **Always** inspect incoming shipments of batteries for damage.

   Look for and pay particular attention for damage to or wet spots on the shipping cartons, examine those batteries for signs of breakage.

2. If damaged batteries are found secure acknowledgment of the damage from the carrier's representative and file a claim against the transportation company. Contact your supplier for battery replacement.

3. If batteries are received wet and **not** immediately placed in service, they must be charged at regular intervals as follows:

Storage Temperature	Charge
Below 40° F	None required
40° F to 60° F	Every 2 months
60° F and above	Once a month

4. Never stack one battery directly on top of another. Post damage and/or container damage can occur from improper stacking. If batteries are stored individually, place supporting boards between layers. **Do not** stack layers more than three (3) high and rotate stock so that the oldest batteries can be used first.

5. Dry charge batteries should be activated in accordance with instructions of the battery manufacturer.

6. Batteries should be installed in accordance with the vehicle manufacturer's instructions. Connections should be made tight enabling good contact between connector lugs and battery terminals. Always charge sets of batteries immediately after installation into the car.

2. MAINTENANCE-INSPECTION PROCEDURES

1. **Water batteries at least once a week.**

   a. Add only approved water to the cells. Distilled water is recommended, high mineral content water must not be used. Maximum allowable impurities in percent-iron (.003), chloride (.004), fixed residue (.075).

   b. Remove vent caps and water batteries preferable after charging to prevent over flow of acid due to expansion.

   c. Fill all cells to the proper level. **Do not overfill cells.** Fill to level indicator or 1/2 inch over the top of the separators if there is no level indicator. Do not use a hose to water batteries.

   d. Spot check cells between weekly waterings to assure electrolyte is above separators. Excess water usage indicates the presence of any one or all of the following conditions which should be checked.

      1. Overcharging
      2. High temperature operation
      3. Nearing end of service life

   e. **Do not allow the electrolyte level to drop** below the top of the separators since this will lead to shortened battery life.

2. **Clean batteries after weekly watering or when washing cars.**

   a. Wash the tops of the batteries making sure the vent caps are in place. Do not allow water or other foreign matter to enter the cells.

   b. Use a solution of bicarbonate of soda and water to wash batteries if there is an accumulation of acid.

3. **Inspection** to insure good conditions which will give better battery service.

   a. When watering batteries inspect battery and other terminal connections for:

      1. **Corrosion** -- If any exists, clean connection and apply a non-metallic grease or protective spray to retard further corrosion.

      2. **Loose Connections** -- Be sure all connections are tight and that good contact is made between terminals.

3. **Broken or Frayed Cables** -- Be sure all cable connections are good and that no loose or broken wires are exposed. Replace any which look suspicious.

b. Once a week after the batteries have been charged, spot check two (2) or more cells for specific gravity reading. Gravity should be 1.250-1.280. If low readings are noted:

1. Check charger to insure that proper charge is being returned to the batteries.

2. Check connections as specified under **inspection 3a.**

3. Check all cells to determine if batteries are near the end of life. This should be done to the same procedure as called for under **Section IV** covering **"Troubleshooting" of batteries.**

c. On a regular interval, check car as outlined in the instruction manual for:

1. Brake drag
2. Proper tire pressure
3. Proper alignment
4. Proper lubrication
5. Proper operation of electrical system
6. Proper operation of drive and transmission system
7. Condition of charger plug and receptacle in car

Any of these conditions which are detrimental to car operation will shorten battery life.

3. CHARGING PROCEDURE

1. Become familiar with instructions issued with the charger car manual.

2. Batteries are to be charged after each day's use as soon as play has been completed. Charging between rounds is permissible if it is determined feasible to do so.

3. **Do not charge batteries** if car was not used that day.

4. **Do not allow batteries to sit in discharged condition** for prolonged periods of time.

5. **Always be sure batteries are fully charged** each day prior to starting play.

4. TROUBLE SHOOTING FOR WEAK OR BAD BATTERIES

When a car fails to operate properly performing less than one round of gold, the car is to be brought into the shop and the batteries examined as follows:

1. Check terminal connections for corrosion, loose connections and broken or frayed cables.

2. If terminal connections appear to be in good condition, check all cells with a hydrometer for variation in specific gravity among cells. A variation of .030 points or more between cells of a battery is cause for suspect. Mark the low cells.

3. Recharge the batteries as recommended by the manufacturer.

4. Read all gravities again after recharge. Be sure that batteries are fully charged at gravities of 1.250 to 1.280. If cells vary by .030 points or more it is an indication of possible trouble within that battery.

5. Connect a load tester to the set of batteries and discharge the batteries at 75 Amps and record the time to a terminal voltage of 31.5 volts. Testers are now available having an automatic Shut-Off at this voltage. New batteries should run a minimum of 75 minutes on this test.

    a. If the batteries run less than 40 minutes they have either reached the end of life or a defective battery is in the circuit. Battery replacement is then necessary.

    b. If batteries run 40-50 minutes they have lost capacity and may be nearing the end of their useful life. In golf car service one round of golf may be expected on an average golf course.

    c. If batteries run more than 50 minutes, they are in good condition and satisfactory for continued service. Prior to putting the car back in serviced it should be checked for the existence of other trouble as outlined in the instruction manual.

5. BATTERY REPLACEMENT

Defective Batteries (Premature Failures)

1. Defective battery can be determined either by observation of gravity variance at the end of the 75 Amp discharge (.030 or more points between cells of a battery) or by turning the discharge tester back on and determining the battery or cell which is defective by use of a voltmeter.
2. Mark the defective battery.
3. Recharge the batteries with the defective battery in the circuit.
4. Remove the defective battery and replace with new battery or battery of comparable age which is fully charged.

Worn Out Batteries

1. Remove old set of batteries.
2. Clean and recondition battery trays, holddowns and cables.
3. Inspect new batteries for broken containers and proper electrolyte level before installing in the car.
4. Install batteries in car being sure that they are properly held down, firm but not too tight.
5. Replace cables, being sure terminals and connectors are clean and connections are tight.
6. Apply a light coating of non-metallic grease or protective coating.

6. WINTER STORAGE OF WET BATTERIES

1. Prior to storing car, batteries should be cleaned, fully charged and properly leveled.

2. While in storage the batteries should be recharged to full charge at time intervals shown below:

Storage Temperature	Charge
Below 40° F	None required
40° F to 60° F	Every 2 months
60° F and above	Once a month

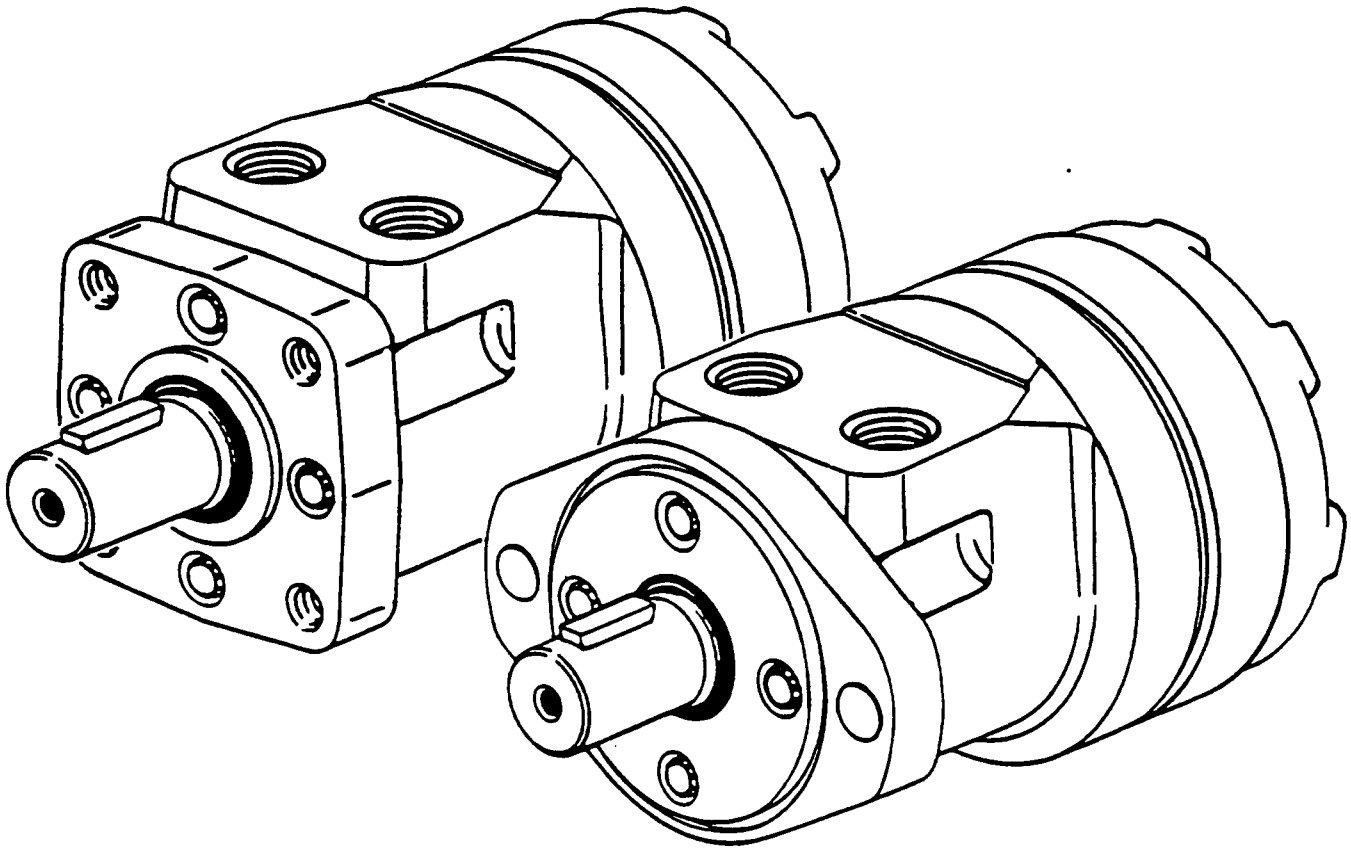
3. Check batteries after car has been removed from storage and before service begins. Follow **inspection and troubleshooting procedures** to determine the condition of the batteries.

NO. 7-116

Eaton Hydraulics Division

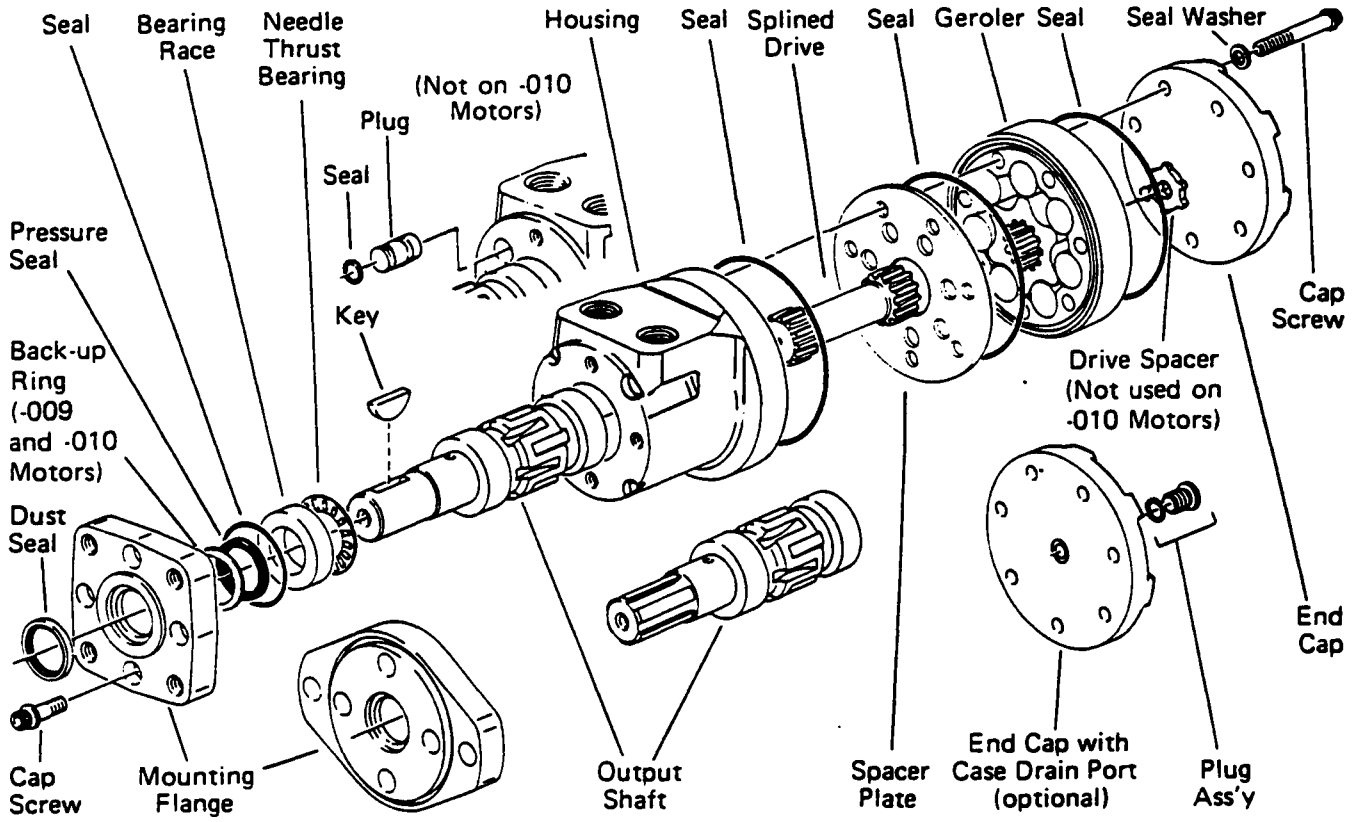
Repair Information

S Series Char-Lynn® Motors 008 009 010



EATON

REV.



Tools required for disassembly and reassembly.

- Torque wrench (300 lb-in [34Nm] capacity)
- 12-16 in. [300-400mm] breaker bar
- *5/16 in.–12 point socket no. 5422 (Heavy Duty–500 lb-in [56Nm] Capacity)
- Small screwdriver (6-8x1/4 in. [150-200x6mm] flat blade), see page 6 for tooling information.
- 3/16 in. [5mm] hex key
- *Shaft pressure seal installation tool for 008 motor P/N 600470
- *Shaft pressure seal installation tool for 009 and 010 motors P/N 600523
- Seal sleeve or bullet P/N 600304 (1 in. dia. shaft), P/N 600466 (⅞ in. dia. shaft)

The following tools are not necessary for disassembly and reassembly but are extremely helpful.

- Small propane torch

* Tools available–by special order–through our service department.

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Disassembly

Instructions in this manual are for "S" Series motors (103-xxxx-008, 009 and 010).

Cleanliness is extremely important when repairing these motors. Work in a clean area. Before disconnecting the lines, clean port area of motor. Remove key when used. Check shaft and key slot, remove burrs, nicks or sharp edges and polish around the key slot. Before starting disassembly, drain oil from motor, then plug ports and thoroughly clean exterior of motor.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly. Follow the clamping procedures explained throughout the manual.

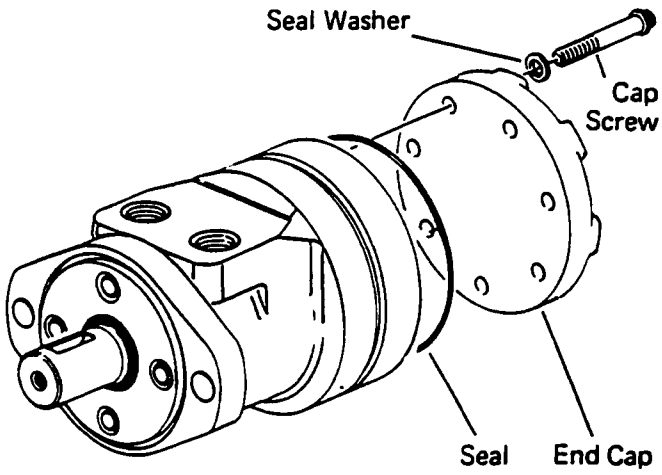
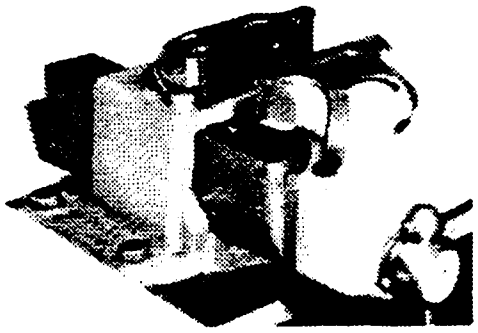


Figure 2

Geroler End



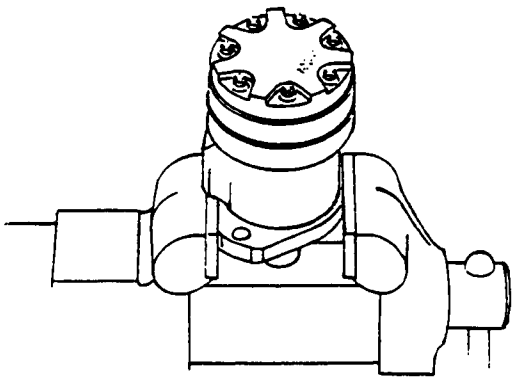


Figure 1

1 Place motor in vise, clamp across edge of flange with output shaft down. When clamping, use protective device on vise, such as special soft jaws, pieces of hard rubber or board, see Fig. 1.

2 Some motors may have a case drain plug in the end cap. If external case drain is not used, it is not necessary to replace the seal unless leakage occurs.

3 Remove cap screws and seal washers from end cap (seal washers used on 3.6, 4.2 and 5.8 cu. in. [59, 69 and 95 cu. cm.] displacement motors only).

4 Remove end cap.

5 Remove seal from Geroler.

6 Remove Geroler–retain rollers in the outer Geroler ring, see Fig. 3.

7 Remove seal from Geroler, see Fig. 3.

8 Remove drive spacer (not used on 5.8 and 9.7 cu. in. [95 and 159 cu. cm.] displacement motors for the 008 and 009 motors and not used at all on 010 motors).

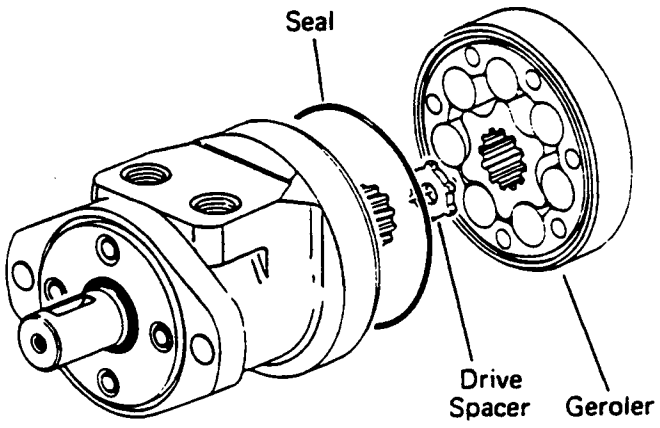


Figure 3

Disassembly

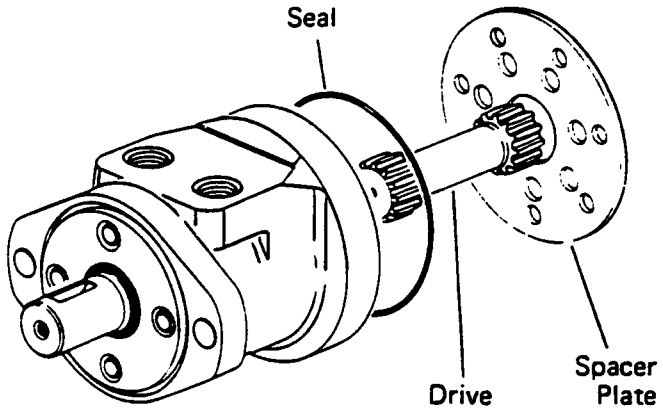


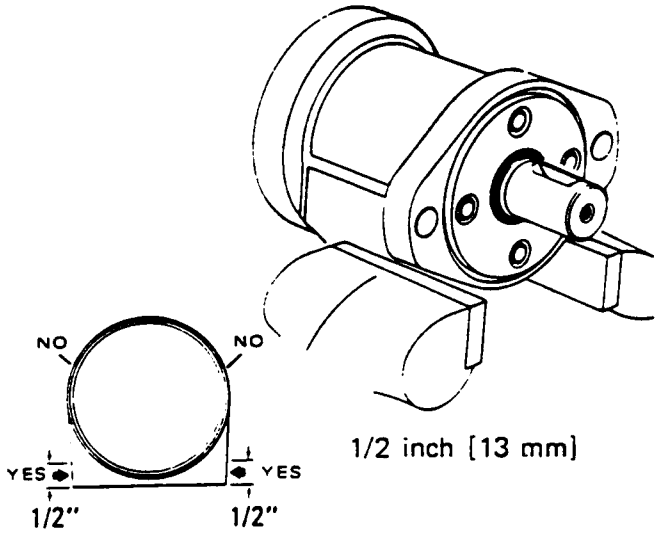
Figure 4

9 Remove spacer plate.

10 Remove drive, see Fig. 4.

11 Remove seal from housing.

Shaft End



Clamp across ports not across housing. Excessive clamping pressure causes distortion.

Figure 5

12 Reposition motor in vise. Clamp across ports as shown in Fig. 5, not on side of housing. Do not over tighten jaws. Excessive clamping force may distort housing.

13 Remove the 4 cap screws from the mounting flange. These motors are assembled using Loctite on the screws to hold them in place.

The screws will require approximately 300-400 lb-in [34-45Nm] of torque to break loose and approximately 100 lb-in [11Nm] torque to remove after they are broken loose. Do not use an impact wrench on Loctited screws, this may result in rounded heads or broken sockets.

Note: If higher torque than given above is required to break the screws loose, apply heat according to the following instructions. When heated the Loctite partially melts and the torque required to remove the screw is greatly reduced. Follow the instructions carefully, and be careful not to overheat and cause damage to the motor. Use a small flame propane torch to heat a small area of the housing, where the screw enters, see Fig. 6. Apply torque to the screw with a **socket** wrench gradually as heat is applied for 8 to 10 seconds. As soon as the screw breaks loose, remove heat from the housing and continue turning the screw until it is completely removed.

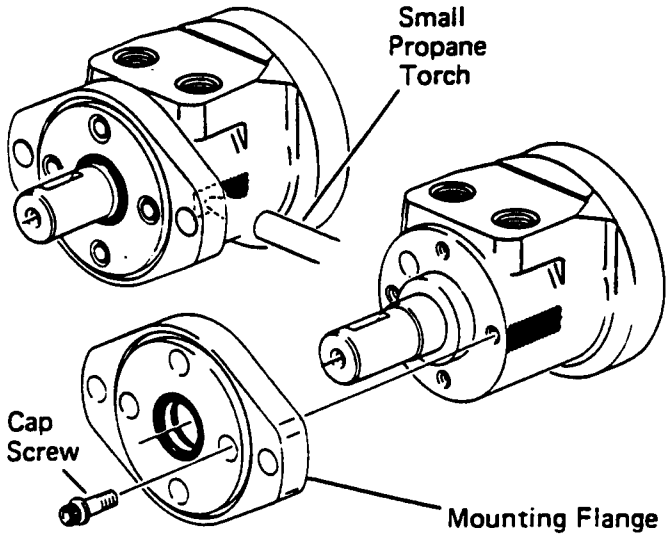


Figure 6

14 Remove motor from vise. Place on clean flat surface. Carefully lift flange from housing with a twisting motion.

Disassembly

15 The dust seal, pressure seal and oil seal will come off with the flange. Use a seal remover tool, like the one shown in Fig. 7, to remove the dust seal and pressure seal, as shown in Fig. 8 and 9.

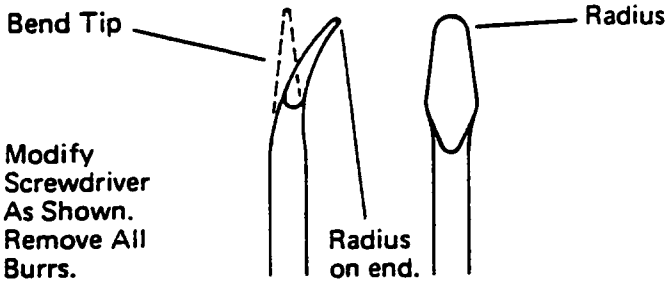
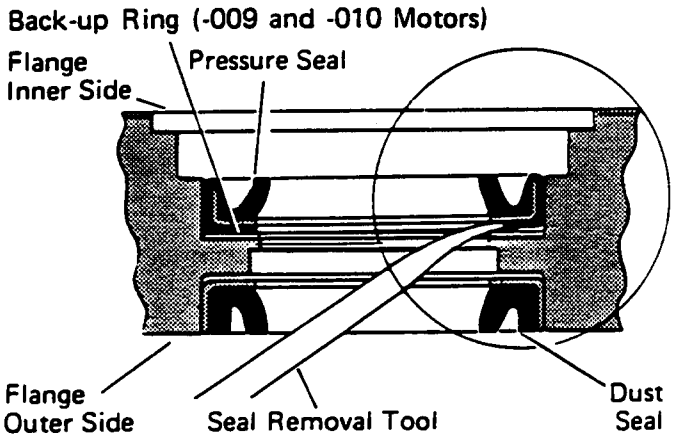


Figure 7



Work from outer side for both (either) seals.

Figure 8

Work nose of tool between pressure seal and flange. Pry seal partway. Remove tool and repeat at a point 180° away. Push seal completely out of cavity, see Fig. 8.

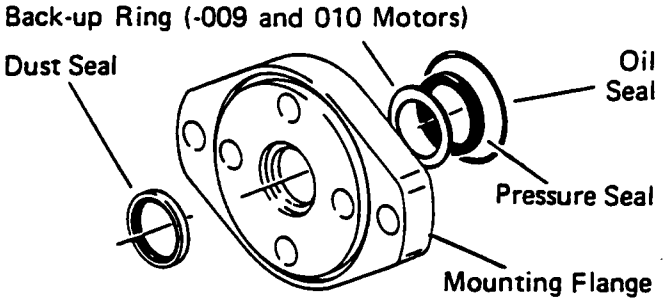


Figure 9

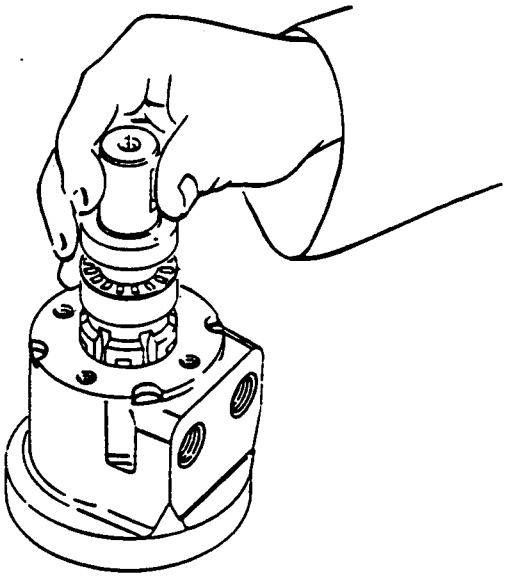


Figure 10

16 Remove output shaft from housing.

17 Remove bearing race and needle thrust bearing from shaft.

18 Some older housings have plugs. To remove the plug, use a 3/16 in. [5mm] hex key, inserted through port opening, to push them out.

Reassembly

Shaft End

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage or damage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe parts with cloth or paper towel, lint or other matter can get into the hydraulic system and cause damage. Check around the key slot and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling. Remove nicks or burrs with a hard smooth stone (such as an Arkansas stone). Do not try to file or grind motor parts.

Note: Lubricate all seals with petroleum jelly such as Vaseline. Use new seals when reassembling the motor. Refer to parts list (6-125) for proper seal kit number.

Important: Do not stretch seals before installing.

Cleanliness is extremely important in the successful application of Loctite. Use the following procedures to properly clean all parts.

A. Wash the housing with non-petroleum base solvent to remove oil, grease and debris. Petroleum base solvents may leave residue detrimental to successful Loctiting. Pay particular attention to 4 tapped holes on the flange end.

Note: Fully cured Loctite resists most solvents, oils, gasoline, kerosene, and is not affected by cleaning operations.

B. Blow dry with compressed air. Clean and dry the tapped holes.

Note: It is not necessary to remove the cured Loctite that is securely bonded in the tapped holes; however, any loose particles of cured Loctite should be removed.

C. Wire brush the screw threads to remove cured Loctite and other debris. Discard any screws that have damaged threads or a corroded, damaged, or rounded head.

D. Wash the screws with non-petroleum base solvent. Blow dry with compressed air jet.

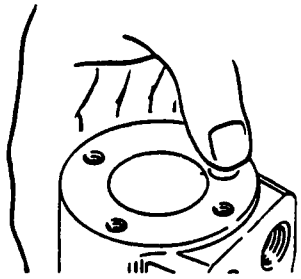


Figure 11

19 If you removed check valves, or plug(s), replace seal(s). Lubricate new seal(s). Install on check valves, or plug(s). Carefully push check valves, or plug(s), in housing until flush with housing face. Do not damage seal(s).

20 Lubricate output shaft with clean hydraulic oil, then install shaft in housing.

Important: Do not permit oil to get into the 4 tapped holes.

Note: To help with timing procedures, a timing dot is machined on output shaft. See figures 18 and 19.

Reassembly

21 Install needle thrust bearing then bearing race on shaft. Pull shaft partially out of housing, then push all three parts in housing together. The bearing race must rotate freely when in position.

Important Note: Prior to installing high pressure shaft seal it is necessary to break the sharp corner of the flange seal seat, see Fig. 12. Use 400 grit paper to break corner.

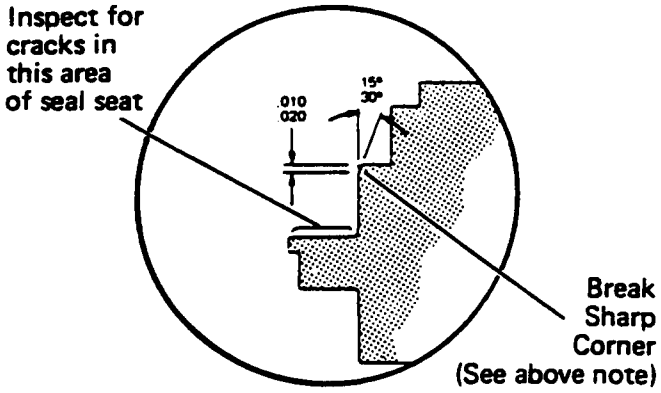


Figure 12

22 Clean mounting flange of all loose metallic chips, particles, dirt or other contamination, including oil. During cleaning, visually check seal seat in mounting flange for scratches or other marks that might damage the pressure seal. Check for cracks in flange that might cause leakage, see Fig. 12.

Important: If a pressure seal installation tool isn't available, temporarily install flange without seals. Then install 2 cap screws to secure flange to housing. Install seals in flange, and apply loctite, after you reassemble Gerotor end of motor (see step 41 thru 45 page 11).

Note: If you have a pressure seal installation tool, continue reassembly, starting with step 23.

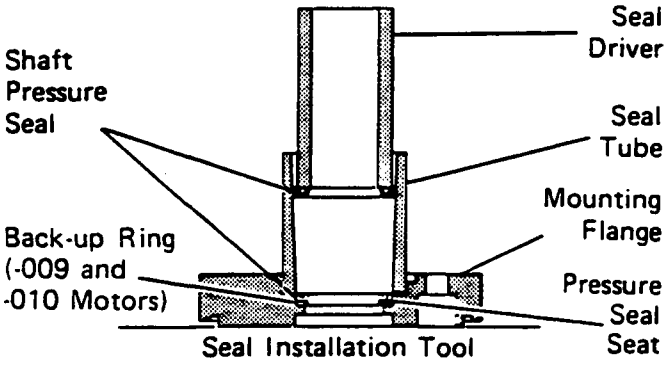


Figure 13

23 Lubricate I.D. of seal tube and O.D. of shaft pressure seal with a light film of clean petroleum jelly. Align small I.D. end of seal tube with seal seat in mounting flange. Install back-up ring and pressure seal in tube—lips of seal face up—see above. Then insert seal driver in tube to firmly push (by hand with rotating action) seal in seal seat.

Important: After installing seal in flange, examine seal condition. If cut, damaged, or improperly installed, you must replace it before continuing reassembly.

24 Install dust seal in flange, see Fig. 15. Press the dust seal into place carefully. To eliminate damage to rubber portion or distortion of metal container, use a tool (flat-round face 1-3/8 to 1-5/8 in. [35-41mm] diameter) which provides proper guiding and positioning.

25 Install 1-15/16 in. [50mm] I.D. seal in flange.

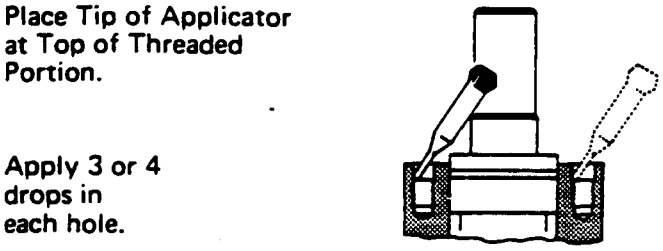


Figure 14

Caution: Do not use excessive amount of Loctite.

26 Apply 3 or 4 drops of Loctite adhesive (Loctite no. 601 sealant) at top of threads in each of 4 holes in housing, see Fig. 14. Do not allow parts with Loctite applied to surface to contact any metal parts other than their proper assembly. Wipe off excess Loctite from housing face, using a non-petroleum base solvent. Do not apply Loctite to threads more than 15 minutes before installing screws. If housing stands for more than 15 minutes, repeat application. No additional cleaning or removal of previous Loctite is necessary.

Reassembly

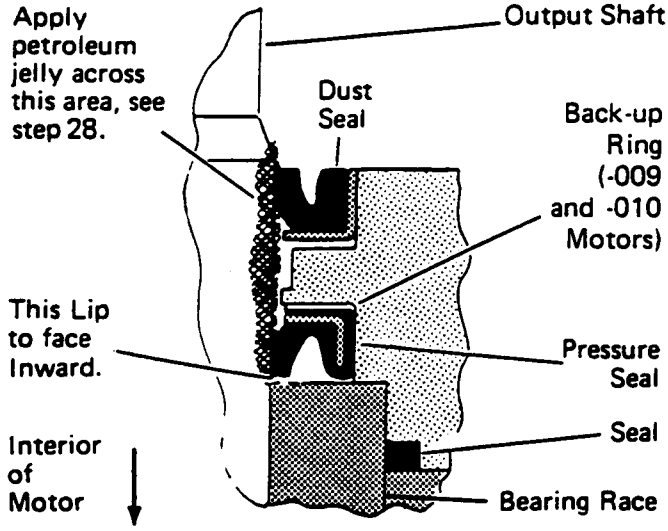


Figure 15

27 Before installing the flange and seal assembly over the shaft, place a protective sleeve or bullet over the shaft. Then, lubricate space between dust seal and pressure seal, as well as lips of both seals, see Fig. 15. Install flange. Rotate flange slowly while pushing down over shaft. Be careful not to invert or damage the seals.

28 Clamp motor in vise as shown in Fig. 5, then install dry screws and alternately torque immediately to 250 lb-in [28Nm]. If you use primer, allow to cure for 10-15 minutes, without primer, allow 6 hours before subjecting motor to high torque reversals. On all other applications you can run the motor immediately. If you use new bolts, make sure they are the correct length, 7/8 in. [22mm] under head length, see parts list for correct part number. Longer screws will not permit proper seal between the flange and housing. Install key in key slot of shaft.

Geroler End

29 Clamp housing in a vise, Gerotor end up. See Step 1 for correct clamping procedure.

Important Note: To aid installation of seals, apply light coating of clean petroleum jelly, such as Vaseline, to seals before installing.

Important: Do not stretch seals before installing.

30 Pour approximately 35 cc of clean hydraulic oil in output shaft cavity.

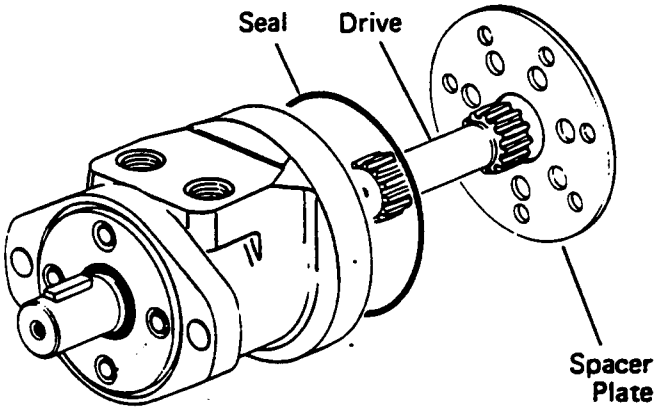


Figure 16

31 Install 3-19/32 in. [90mm] I.D. seal in housing seal groove. Avoid twisting seal.

32 Install drive, observe proper timing procedure (Fig. 18).

33 Place spacer plate carefully on the housing, align bolt holes.

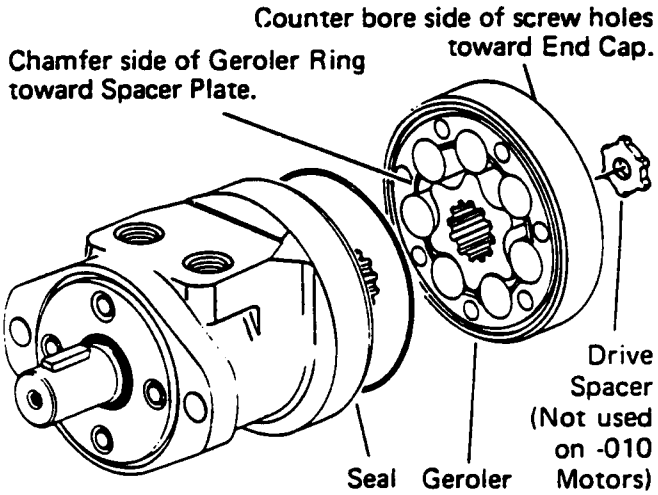


Figure 17

34 Install 3-19/32 in. [90mm] I.D. seal in Gerotor seal groove, see Fig. 17. Avoid twisting seal.

35 Carefully place Gerotor on the spacer plate, see Fig. 17. Observe proper timing procedure, see Fig. 18.

Reassembly

Timing Procedure

A. Align shaft timing dot with any bolt hole.

B. Install drive. For the 3.6 and 4.5 cu. in. [59 and 74 cu. cm.] displacements on the 010 motors, install the wide end of the drive in the output shaft. Install either end of the drive in the output shaft for the 010 motor displacements ranging from 5.9 to 22.6 cu. in. [97 to 370 cu. cm.].

C. Install spacer plate. Remember which bolt hole was aligned with the shaft timing dot.

D. Place gerotor on wear plate, positioning any star point over the bolt hole aligned with the timing dot.

E. Rotate gerotor to line up bolt holes. Be careful not to disengage star from drive or disturb gerotor seal.

Standard Rotation

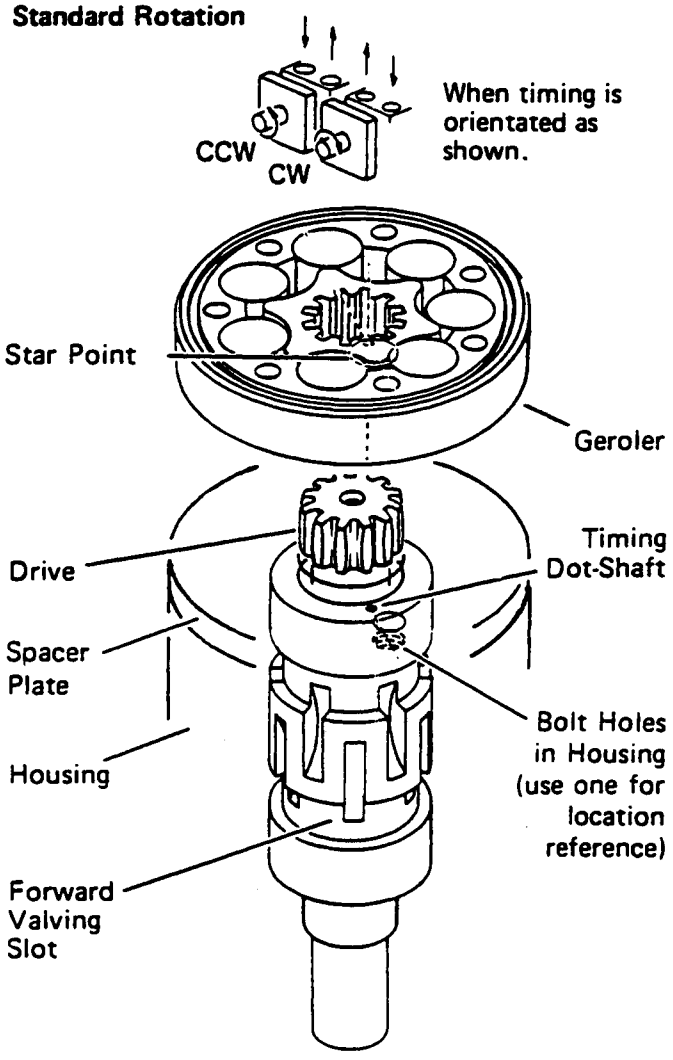


Figure 18

Reverse rotation is obtained by positioning any star valley, rather than any star point, over the aligned bolt hole.

Reverse Rotation

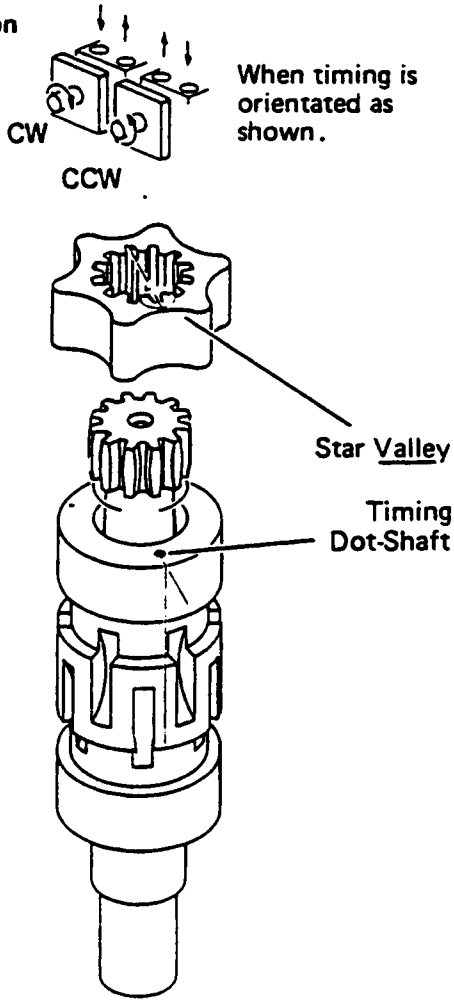


Figure 19

36 Install drive spacer (not used on 5.8 and 9.7 cu. in. [97 and 159 cu. cm] displacements on the 008 and 009 motors and not used at all on 010 motors). See figure 17.

37 Install 3-19/32 in. [90mm] I.D. seal in Geroler seal groove. Avoid twisting seal.

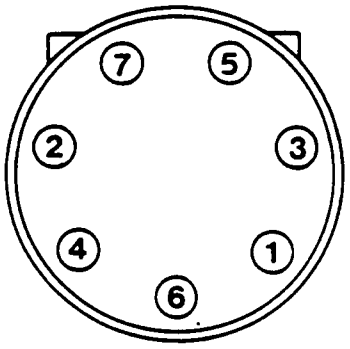
38 Install end cap, see Figs. 20 and 21.

Reassembly

39 Install cap screws (and seal washers when required, see information below) in end cap.

On 5.9 cu. in. displacement motors or less, use seal washers. Pre-tighten all screws to 15-40 lb-in[2-5Nm]. Make sure Geroler section seals are properly seated before torquing screws. Then torque screws to 200 lb-in[23Nm] in sequence, as shown in Fig. 21.

On 7.3 cu. in. displacement motors or larger, omit seal washers. Pretighten all screws to 15-40 lb-in[2-5Nm]. Make sure Geroler section seals are properly seated before torquing screws. Then torque screws to 300 lb-in[34Nm] in sequence, as shown in Fig. 21.



Bolt Torquing Sequence

Figure 21

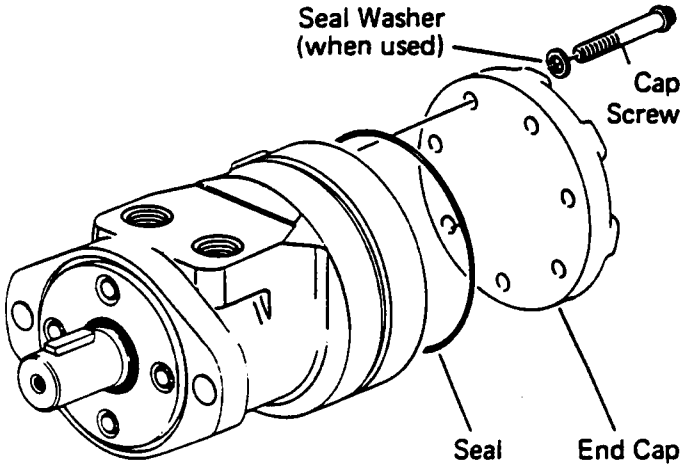


Figure 20

Note: Steps 41 through 45 cover mounting flange seal installation without using a seal installation tool.

40 Clamp motor in vise with output shaft up, see Fig. 23. Remove cap screws and flange.

41 Prepare seal seat of flange, see step 22.

42 Lubricate dust seal O.D. Then install dust seal in flange. Make sure dust seal is flush with flange, see step 24.

Reassembly

43 Install pressure seal flush against bearing race, see Fig. 22. Lightly lubricate pressure seal O.D.

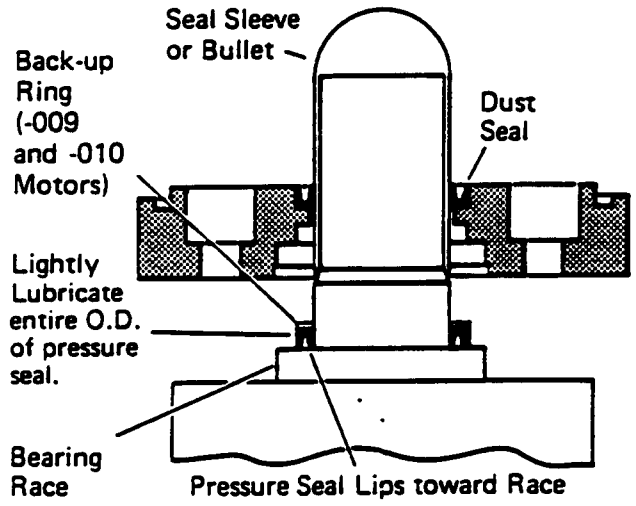


Figure 22

44 Place a seal sleeve or bullet over shaft. Twist flange down shaft until flush against pressure seal. The pressure seal must enter into seat evenly and gradually. Install 4 cap screws. Gradually and evenly finger tighten cap screws (criss-cross pattern). Then use a hand socket wrench to lightly snug tighten screws until flange is flush against housing. DON'T TIGHTEN SCREWS MORE THAN 1 FULL ROTATION AT A TIME–(criss-cross pattern).

45 Use a hand torque wrench to gradually and evenly tighten cap screws (criss-cross pattern) until they reach 250 lb-in[28Nm]. See caution and important notes below.

Caution: Do not use air socket wrench on cap screws for this type of seal installation.

Important: Proper pressure seal installation is important. You must remove cap screws and flange to examine seal condition. If you've cut or damaged the pressure seal, you must replace it with a new one. If seal is in good condition continue flange reassembly–starting with procedure step 24, page 8.

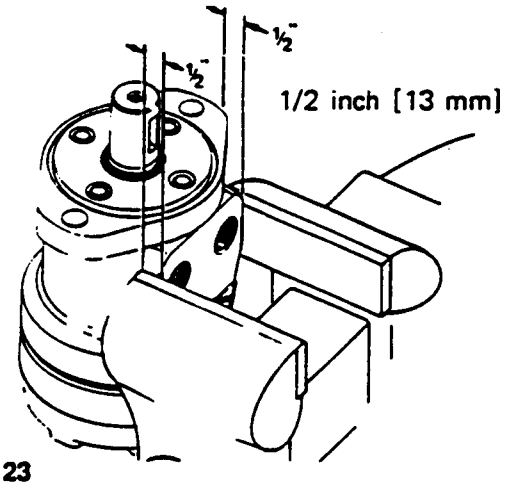


Figure 23

SERVICE BULLETINS

As we make improvements to the **MARKLIFTS**, we like to supply you, the customer, with updated information which applies to your machine.

This section is provided as a place to store Service Bulletins as you receive them from MARK INDUSTRIES.