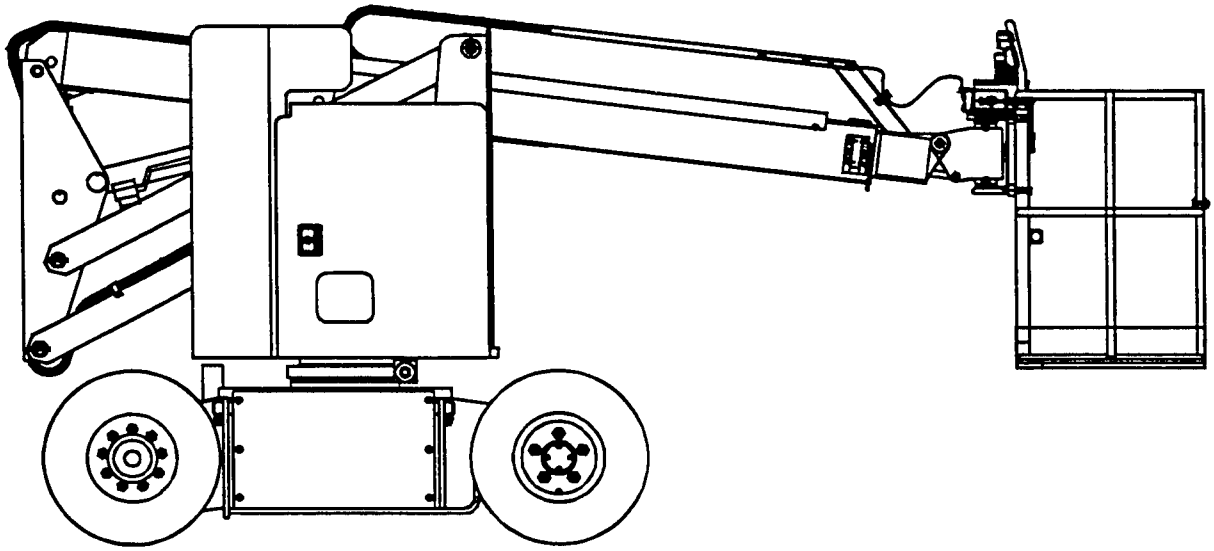
Mark Industries

SELF-PROPELLED KNUCKLE BOOM
MODEL: CH30KBN



SERVICE AND MAINTENANCE MANUAL

MARK INDUSTRIES
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P/N 17xxx

MARK INDUSTRIES

SERVICE AND MAINTENANCE

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WARNING

IF OPERATION OF THIS MACHINE IS REQUIRED TO PERFORM SERVICE OR MAINTENANCE, THEN THE OPERATOR MUST FIRST READ AND UNDERSTAND ALL THE INSTRUCTIONS IN THE OPERATOR'S MANUAL BEFORE OPERATING THE AERIAL LIFT.

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INTRODUCTION

Owners, Users, and Operators:

Mark Industries appreciates your choice of our machine for your application. Our number one priority is user safety which is best achieved by our joint efforts. We feel that you can make a major contribution to safety if you as the equipment users and operators:

1. **Comply** with OSHA, Federal, State, and Local Regulations.
2. **Read, Understand, and Follow** the instructions in this and other manuals supplied with this machine.
3. **Use Good, Safe Work Practices** in a common sense way.
4. **Only have trained operators** — directed by informed and knowledgeable supervision — running the machine.
5. **Only have qualified aerial lift mechanics** perform the service and maintenance procedures provided in the "Service and Maintenance Manual".

The information, specifications, vendor information, and illustrations in this publication are based on the information available at the time of approval for printing. Do to on-going changes and revisions by our many suppliers, it is often impossible to show all changes or variations. We reserve the right to make changes at any time without obligation.

If there is anything in this manual that is not clear or which you believe should be added, please send your comments to Manager of Publications, Mark Industries, 106 12th Street, S.E., Waverly, Iowa 50677; or contact us by telephone at (319) 352-3920.

Thank you!



**THIS SYMBOL MEANS YOUR SAFETY IS INVOLVED!
READ, UNDERSTAND, AND FOLLOW ALL
DANGER, WARNING, AND CAUTION DECALS
ON YOUR MACHINE.**

INTRODUCTION

Aerial lift longevity and low-cost performance depend on Periodic Maintenance, Troubleshooting and proper Service and Adjustment procedures.

It is responsibility of the owner, user, and operator to detect any unusual, sounds, odors, or other signs of abnormal performance that could indicate trouble ahead.

By detecting any problems in their early stages, you can save yourself unnecessary downtime and your employer a lot of money! Therefore, it is also your responsibility to use good judgment in detecting failures in quickly and repairing them. If you don't, one failure can lead to another.

NOTE: THE SERVICE AND MAINTENANCE PROCEDURES PROVIDED IN THIS MANUAL SHOULD ONLY BE PERFORMED BY A QUALIFIED AERIAL LIFT MECHANIC.

Before attempting to make an adjustment yourself, ask yourself if you have the RIGHT TOOLS, IF you have the PROPER TEST EQUIPMENT and IF you can accurately DIAGNOSE the cause of the problem.

If you can't answer YES to all three questions, rely on your Distributor Serviceman. He has the right tools, testing equipment and service knowledge to pin-point the problem in minutes instead of the hours consumed in hit-or-miss methods. TIME IS MONEY! He will save it for you.

If you decide to attempt an adjustment yourself, follow a logical TROUBLE SHOOTING PROCEDURE. Don't simply replace parts until the trouble is found.

Once the cause of problem or malfunction has been diagnosed, take the corrective action specified in this manual. Follow the procedures given for the specific problem. If the difficulty is not covered, consult your Mark Distributor, or the Mark Industries Product Support Department.

GENERAL INFORMATION

SECTION 2

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GENERAL INFORMATION

GENERAL SERVICE INFORMATION

Keep parts in order when large components are disassembled, particularly so when it has a great number of similar parts. Loosely reassemble assemblies whenever possible to prevent small parts from being lost. Keep sub-assembly parts together, but be careful not to get right and left hand parts mixed up.

When an assembly is removed to correct only one difficulty, it is good practice to recondition the whole assembly at that time to avoid repetition of work at a later date.

Bolts and nuts should be placed into their respective holes when removing guards, cases, etc. so that the proper bolts will be on hand for reassembling.

Safety should always be the first consideration when performing maintenance or service to equipment.

Always be conscious of a component's weight. Never attempt to move a heavy part without a proper lifting device. Ensure that adequate support is provided and that objects are set in a stable position.

Any hydraulic component disassembly or reassembly must be done in a clean, enclosed environment by personnel familiar with hydraulic systems and cleanliness procedures.

GENERAL INFORMATION

RECEIVING A NEW MACHINE

Before removing a new machine from the delivery vehicle:

1. Check and follow the Operation & Maintenance Manual for unloading procedure.
2. Check battery/batteries for cracks and for proper water level (if applicable).
3. Check for bent, broken or otherwise damaged functional components
4. Check for sufficient oil levels, both hydraulic and engine (if applicable).
5. Check for fluid leaks in hydraulic or fuel delivery systems.
6. Check lug nuts for looseness.

Upon receipt of a new machine the customer must:

1. Remove all packing materials and inspect for any damage incurred during transport.
2. Complete the NEW EQUIPMENT CONDITION REPORT
3. Complete the WARRANTY REGISTRATION.
4. If your machine is an export model, the export preservative must be removed.

EXPORT PRESERVATIVE REMOVAL

Before an export machine leaves the factory the exterior surfaces are given a coating designed to protect the paint from the environment encountered when shipping items overseas or for great distances. This coating can be removed using **warm soapy water**.

Do not use a steam cleaner to clean or wash this machine.

Do not spray water directly on **any** control panels or electrical compartments.

This preservative is applied to **export machines only.**

GENERAL INFORMATION

MACHINE STORAGE

Machines being placed in storage must be adequately protected from deterioration during the period of idleness. This will ensure that they can be restored to active service with a minimum effort.

Before removing this aerial lift from service for extended periods, it should be prepared for storage as prescribed in the following paragraphs. The specific procedure to be followed depends upon the expected period of storage.

SHORT TERM STORAGE - 30 DAYS OR LESS

Short term storage requires minimal preparation.

The **AERIAL LIFT** should be thoroughly cleaned, lubricated in accordance with Section 3, and painted surfaces retouched where the paint has deteriorated. Exposed portions of all hydraulic cylinders should be coated with multipurpose grease. Coat unpainted metal surfaces with multipurpose grease after removing any rust accumulations.

LONG TERM STORAGE - 30 DAYS OR MORE

Long term storage requires greater preparation than short term storage and must be undertaken with greater care.

The **MACHINE** should be prepared as follows:

1. Perform the short term machine storage preparation, making certain that All points with grease fittings are liberally lubricated.

2. Drain and refill the hydraulic reservoir. Refer to Section 3 when servicing the reservoir.

3. Distribute the new hydraulic fluid to all parts of the system by operating all functions.

4. The battery charger may be left connected to the batteries and should be turned on for a full charge period once a month. In extremely cold conditions it may be necessary to charge more frequently. After each charge cycle the charger should be checked to insure that it has turned off. Severe overcharging and possible damage to the batteries could result if the charger remains on for prolonged periods of time.

5. If the batteries are to be removed for storage, disconnect the charger from the batteries and clean and tape the battery cables.

6. Fill the hydraulic reservoir to the top *AFTER THE MACHINE IS PARKED IN ITS STORAGE SPOT.*

8. Coat exposed cylinder rods with grease.

RESTORING AERIAL LIFT TO SERVICE

Remove the **AERIAL LIFT** from storage via the following procedure:

1. Remove preservative lubricants from all surfaces.

2. Check all fluid levels, adding or draining as required.

3. If the batteries have been removed for storage, then install the batteries and reconnect the battery charger.

4. Perform all maintenance and lubrication of the aerial lift in accordance with the maintenance chart on pages 3 - 2 and 3 - 3.

GENERAL CLEANING, INSPECTION AND PREPARATION FOR MAJOR COMPONENT OVERHAUL

A. Clean parts having ground and polished surfaces, such as gears, bearings, and shafts with solvent type cleaners such as emulsion cleaners, or petroleum solvents excluding gasoline. Do not clean these parts in a hot tank solution or sodium hydroxide, orthosillcates or phosphates. When cleaning, remember to clean and/or replace breathers if applicable.

⚠CAUTION

Exercise extreme care to avoid skin rashes, fire hazards and inhalation of vapors when using solvent-type cleaners.

B. Rough parts such as gear case housings may be cleaned hot solution tanks with mild alkali solutions providing these parts are not ground and polished. The parts should remain in the tank long enough to be thoroughly cleaned and heated through. This will aid and speed up the evaporation of the cleaning solution and the rinse water.

⚠CAUTION

Exercise care to avoid skin rashes and inhalation of vapors when using alkali cleaners.

Parts cleaned in solution tanks or with alkali cleaners should be thoroughly rinsed after cleaning to remove all traces of alkali.

C. Parts should be thoroughly dried immediately after cleaning. Use soft, clean, lint-free absorbent paper towels or wiping rags free of abrasive material such as lapping compound, metal filings or contaminated oil. Bearings should never be dried by spinning with compressed air.

D. To prevent corrosion, parts that have been cleaned and dried, then inspected, should be reassembled immediately and coated with a light film of oil.

E. It is impossible to overstress the importance of careful and thorough *inspection* of component parts prior to reassembly. Thorough visual inspection for indications of wear or stress, and the replacement of such parts as are necessary will eliminate costly and avoidable unit failure.

1. Inspect all bearings and replace any that are worn, pitted or damaged in any way. Remove parts needing replacement with a suitable puller or in a press with sleeves. Avoid the use of drifts and hammers, as they may easily mutilate or severely distort component parts.

2. Inspect all gears for wear or damage. Gears which are scored, pitted, ridged or worn should be replaced.

F. If repair is evident, replace all worn or damaged parts. Hex nuts with rounded corners, all lock washers, oil seals, o-rings and gaskets should all be replaced at the time of overhaul.

WELDING INSTRUCTIONS

CAUTION

When doing repair welding on your aerial lift take precaution attaching your ground to the component being repaired. This will eliminate the chance of arcing through a bearing, cylinder, etc., damaging the component. Paint should be removed from the surface to be used as the "ground" (earth).

CAUTION

Use necessary precaution when welding around fuel tanks, oil reservoir, batteries, tubing and pressure systems.

CAUTION

When welding close to glass, cylinder rods, or any polished surface, provide adequate protection from splatter.

CAUTION

Always disconnect the battery cables and applicable grounds before welding. If equipped with an engine, never weld when the engine is running.

CAUTION

Do not weld on wet surfaces since this will cause hydrogen embrittlement of the weld.

CAUTION

Always have a fire extinguisher on hand in case of fire. Adequate ventilation and dry area are necessary. Protective clothing should be used and all persons in the welding area should have protection for their eyes.

AWS CLASS E7018 Low hydrogen rod for normal repairs on low allow to medium carbon steel. All position welding, good penetration and crack resisting up to 80,000 yield. Also suitable for repair of previous intershield welds.

AWS CLASS E11018G Low hydrogen rod for repair on high strength allow steel such as T-1, 80,000 to 100,000 yield. All position welding, good penetration and high tensile strength up to 110,000.

NOTE: Low hydrogen rod E7018 must be used within four (4) hours upon removal from a freshly opened container or from a storage oven.

Low hydrogen rod E11018G must be used within 1/2 hour upon removal from its container or from a storage oven.

SPECIFICATIONS

SECTION 2

DESCRIPTION **PAGE NO.**

SPECIFICATIONS TABLE . . . . . 2 - 7 - 1

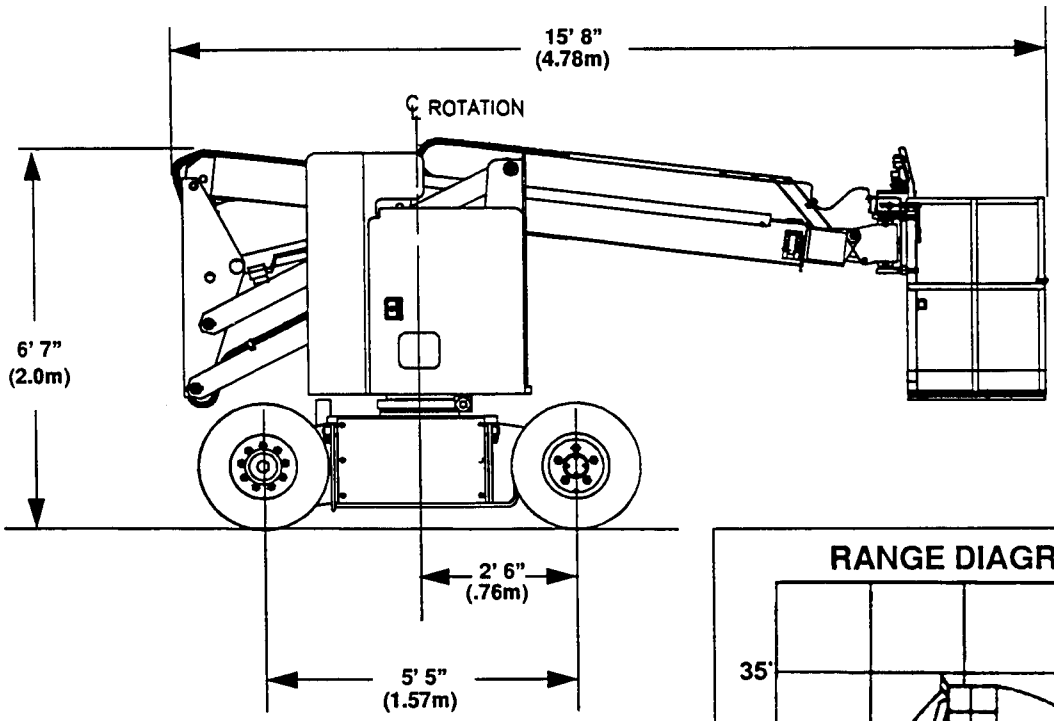
GENERAL SPECIFICATIONS & RANGE DIAGRAM . . . . . 2 - 7 - 2

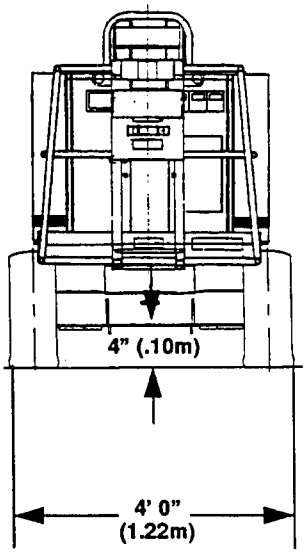
SPECIFICATIONS

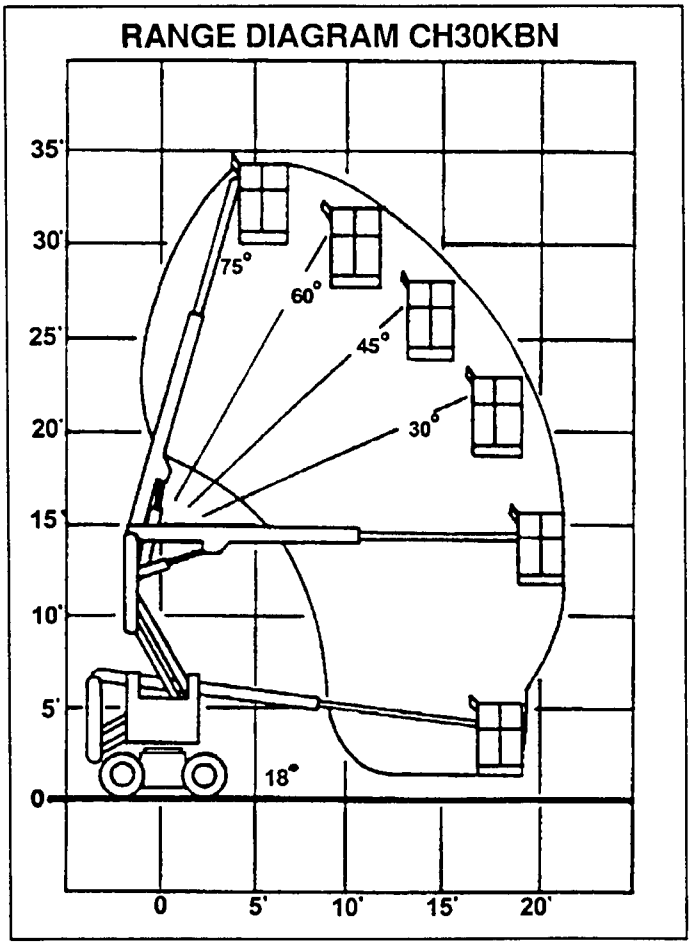
	CH30KBN
*Working Height (Maximum)	36 ft (10.97 m)
Platform Height (Maximum)	30 ft (9.14 m)
Stowed Height	6 ft 7 in (2.0 m)
Length (stowed)	15 ft 8 in (4.78 m)
Width	4 ft (1.22 m)
Platform - Dimensions	30 in x 48 in (.76 x 1.22 m)
Horizontal Reach	21 ft 8 in (6.60 m)
Load capacity	500 lbs. (226.8 kg)
Wheelbase	5 ft 2 in (1.57 m)
Wheel track	40 1/2 in (1.01 m)
Tailswing	zero @ 15 ft pivotal hgt.
Turret Rotation	350° non-continuous
Travel speed	0 to 3.2 m.p.h. (0 to 5.15 km/h)
Power source	48 volts D.C. (8 @ 6V-350AH)
Controls Function Drive	 proportional/hydraulic proportional/electric
Tires (Solid Non-marking)	7.00 x 12
Ground clearance	4 in (.10 m)
Approx. shipping weight	13,600 lbs. (6169 kg)
Turning Radius Inside Outside	 5 ft 6 in (1.68 m) 10 ft 2 in (3.09 m)
Wheel loading Floor Loading Pressure (concentrated) Wheel Load (maximum)	 56.3 psi 4923 lbs. (2235 kg)
Wind speed rating	10 MPH
Gradeability	20%

*** Clearance must be allowed for body parts for this and other work heights**

SPECIFICATIONS & RANGE DIAGRAM







TORQUE CHART

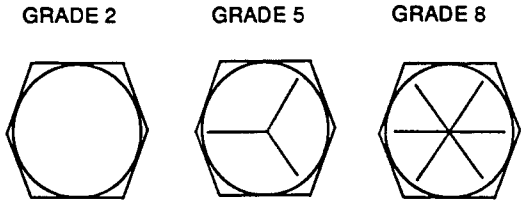
The following table contains many of the more common torques used when perfuming service or maintenance on the machine, and may be used as a quick reference

Table 1:

AREA	TORQUE
STEERING WHEEL RETENTION NUTS	90 - 95 ft. lbs. (122-128 N•m) Dry
DRIVE WHEEL RETENTION NUTS	240-280 ft. lbs
TORQUE HUB MOUNTING BOLTS	240-280 ft. lbs. (back off to 1st available hole)
TURRET ROTATION RING GEAR BOLTS	30-35 ft. lbs. (back off to 1st available hole)
DRIVE MOTOR MOUNTING BOLTS	45 ft. lbs. (apply Loc-Tite 242 or equiv.)
BRAKE TO DRIVE MOTOR MOUNTING BOLTS	53 ft. lbs.
PLATFORM TO ROTATOR MOUNTING BOLTS	55 - 60 ft. lbs. (75-82 N•m) Lubed
SCISSOR ASSEMBLY TRUNNION BOLTS	226 ft. lbs. (apply Loc-Tite 242 or equiv.)
STEERING CYLINDER PISTON NUT	75 - 85 ft. lbs. (102-115 N•m) Lubed
RISER/BOOM LIFT CYLINDER PISTON NUT	650 ft. lbs. (889 N•m) Lubed
EXTENSION CYLINDER PISTON NUT	33 - 44 ft. lbs. (apply Loc-Tite 242 or equiv.)

NOTE: CAPSCREW OR BOLT REPLACEMENT: Any bolt or capscrew replacement should be of the same grade or greater than the original. Grade markings are shown below:

BOLT HEAD MARKING



TORQUE RATINGS

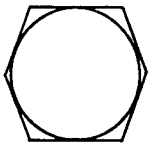
ES - 100.0
TORQUE RATINGS
FOR
DRY - UNCOATED FASTENERS

TORQUE VALUES TO BE WITHIN 5%
ALL FIGURES IN FOOT POUND

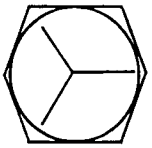
THIS TABLE DOES NOT APPLY TO HYDRAULIC CONNECTIONS. WHEN TORQUING HYDRAULIC CONNECTIONS REFER TO ES-100.1

NOM. DIA. IN.	GRADE 2	GRADE 5	GRADE 8
1/4	6 - * 4	8	12
5/16	12 - * 7	20	25
3/8	20 - * 12	30	45
7/16	35 - * 20	50	75
1/2	50 - * 30	80	110
9/16	75 - * 45	115	160
5/8	100 - * 60	160	225
3/4	180 - * 110	280	400
7/8	175	450	640
1	265	680	970
1-1/8	375	840	1,380
1-1/4	530	1,200	1,930
1-3/8	700	1,570	2,540
1-1/2	930	2,080	3,380
1-3/4	1,460	2,090	5,300
2	2,200	3,200	7,990
2-1/4	3,200	5,350	11,690
2-1/2	4,400	7,300	15,990

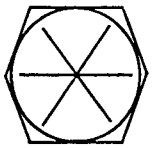
BOLT HEAD MARKING



GRADE 2



GRADE 5



GRADE 8

The above information was compiled for U.N.C. Threaded Fasteners.

NOTE: If threads are not lubricated prior to assembly or are not plated use Torque Spec. ES-100.0

** = Torque Values for Bolts and Screws longer than 6"*

Fasteners as supplied by the vendor are considered not lubricated.

TORQUE RATINGS

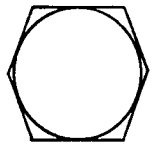
ES - 100.1
TORQUE RATINGS
FOR
LUBRICATED OR PLATED FASTENERS

TORQUE VALUES TO BE WITHIN 5%
ALL FIGURES IN FOOT POUND

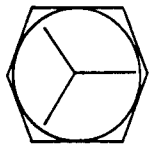
REFER TO THIS TABLE WHEN TORQUING HYDRAULIC CONNECTIONS (Piping & Cylinders).

NOM. DIA. IN.	GRADE 2	GRADE 5	GRADE 8
1/4	5 - * 3	7	10
5/16	9 - * 5	14	20
3/8	16 - * 9	25	35
7/16	25 - * 15	40	55
1/2	40 - * 20	60	85
9/16	55 - * 30	85	120
5/8	75 - * 45	120	170
3/4	135 - * 80	210	300
7/8	130	340	485
1	200	515	720
1-1/8	280	635	1,030
1-1/4	400	890	1,450
1-3/8	520	1,175	1,900
1-1/2	695	1,560	2,530
1-3/4	1,100	1,825	3,980
2	1,650	2,750	6,000
2-1/4	2,400	4,000	8,760
2-1/2	3,300	5,500	12,000

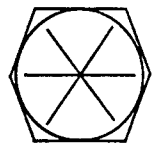
BOLT HEAD MARKING



GRADE 2



GRADE 5



GRADE 8

The above information was compiled for U.N.C. Threaded Fasteners.

NOTE: If threads are not lubricated prior to assembly or are not plated use Torque Spec. ES-100.0

** = Torque Values for Bolts and Screws longer than 6"*

Fasteners as supplied by the vendor are considered not lubricated.

SUGGESTED SPARE PARTS LIST: KNUCKLE BOOM

CH30KBN

NOTE: 1 THE PARTS LISTED REFLECT ITEMS WHICH IT MAY BE DESIROUS TO HAVE ON HAND TO ENABLE RAPID REPAIR OF YOUR CH30KBN KNUCKLE BOOM DURING THE COURSE OF ITS NORMAL SERVICE LIFE. IT IS NOT INTENDED TO BE ALL INCLUSIVE, OTHER PARTS MAY BE REQUIRED DUE TO UNFORESEEN CIRCUMSTANCES, PART NUMBERS ARE SUBJECT TO CHANGE AS A CONSEQUENCE OF THE CONTINUED DEVELOPMENT OF THIS PRODUCT.

Ref.	Part No.	Description	Qty	Remarks
		GENERAL PARTS (DECALS, PAINT, ETC.)		
1	3900-115	PAINT, WHITE, TOUCH-UP	2	AEROSOL SPRAY CAN
2	3900-131	PAINT, TBLUE, OUCH-UP	1	AEROSOL SPRAY CAN
3	182925	DECAL, AERIAL CONTROL BOX, TOP	1	
4	182926	DECAL, AERIAL CONTROL BOX, FRONT	1	
5	182729	DECAL, GROUND CONTROL BOX, FACE	1	
6	182829	DECAL, FWD ARROW	2	2 REQUIRED
7	182709	DECAL, DIRECTIONAL ARROW, GREEN	2	2 REQUIRED
8	182710	DECAL, DIRECTIONAL ARROW, BLUE	2	2 REQUIRED
9	181113	DECAL, OPER. & MAINT. MANUAL	1	
10	182107	DECAL, HAND PUMP OPERATION	1	
11	182127	DECAL, OPERATING INSTRUCTIONS	1	
12	181322	DECAL, LOAD CAPACITY, 500 LBS	2	2 REQUIRED
13	182307	DECAL, ATTACH SAFETY BELT...	2	2 REQUIRED
14	20419	DECAL, ELECTRICAL HAZARD	2	2 REQUIRED
15	12400-223	DECAL, DANGER, KEEP CLEAR OF...	2	2 REQUIRED
16	181328	DECAL, PINCH POINT	1	
17	2003	DECAL, BATTERY WATER LEVEL	2	2 REQUIRED
18	22449	DECAL, NO SMOKING...	2	2 REQUIRED
		ELECTRICAL PARTS (CONTROLS, SWITCHES, ETC.)		
1	66345	LENS, UNSTABLE CONDITION INDIC. LIGHT	1	
2	69146	BULB, UNSTABLE CONDITION INDIC. LIGHT	2	
3	69247	ALARM, UNSTABLE CONDITION WARNING	1	
4	69242	SWITCH, PUSH BUTTON	3	3 REQUIRED
5	69245	SWITCH, TOGGLE, DRIVE SPEED SELECT	1	
6	69232	SWITCH, TOGGLE, PLATFORM FUNCTIONS	2	

RECOMMENDED SPARE PARTS LIST

Ref.	Part No.	Description	Qty	Remarks
		ELECTRICAL PARTS (CONTINUED)		
7	69168	RELAY, FUNCTION SELECT	3	AERIAL/GROUND BOX
8	69246	RELAY, "K-10"	1	IN AERIAL BOX
9	69166	EMERGENCY STOP SWITCH	1	AERIAL/GROUND BOX
10)	69198	SWITCH, STEERING	2	DRIVE STEER CONTROL
11	69180	BOOT, TOP (FOR P/N 69252)	1	DRIVE/STEER CONTROL
12	69046	BOOT, BOTTOM (FOR P/N 69252)	1	
13	67486	MICRO- SWITCH (FOR P/N 69251/69252)	2	
14	69072	POTENTIOMETER (FOR P/N 69251)	1	BOOM/TURRET CONTROL
15	69071	BOOT, BOTTOM (FOR P/N 69251)	1	BOOM/TURRET CONTROL
16	441 6834	PROXIMITY SWITCH	1	
17	441 6835	CABLE, PROXIMITY SWITCH	1	
18	66336	MICRO-SWITCH (FOR P/N 92202)	1	FOOT OPERATED SWITCH
19	69172	CIRCUIT BREAKER, 10 AMP, W/BOOT	1	
20	69164	SWITCH, TOGGLE, FUNCTIONS	2	GROUND CONTROL
21	69162	SWITCH, TOGGLE, GROUND/AERIAL SELECT	1	
22	2717	KEY SWITCH	1	
23	66961	KEY, "SPARE"	1	FOR P/N 2717
24	441 6836	SLOPE SENSOR	1	
25	69241	HOUR METER	1	
26	600594	FUSE, 325 AMP	1	MAIN POWER
27	600598	REPAIR KIT, DRIVE CONTACTOR TIPS	1	FOR P/N 600595
28	N/A THIS TIME	BRUSH, PUMP MOTOR (P/N 69406)		"OHIO" MOTOR
29	N/A THIS TIME	SPRING, MOTOR BRUSH		USE WITH P/N T.B.A.
30	N/A THIS TIME	COIL, SOLENOID VALVE (P/N 69994)	1	STEERING VALVE
31	N/A THIS TIME	COIL, SOLENOID VALVE (P/N 69990)	1	PROPORTIONAL VALVE
32	N/A THIS TIME	COIL, SOLENOID VALVE (P/N 69992/69995)	2	FUNCTION VALVES
33	66727	FUSE ASSEMBLY, BATTERY CHARGER	1	FOR P/N 70526
34	600021	TIMER KIT, BATTERY CHARGER	1	FOR P/N 70526
35	600022	RELAY, TIMER KIT	1	FOR P/N 600021
36	600019	DIODE ASSEMBLY, BATTERY CHARGER	1	FOR P/N 70526
37	70362	RELAY, HYDRAULIC PUMP ELECT. MOTOR	1	

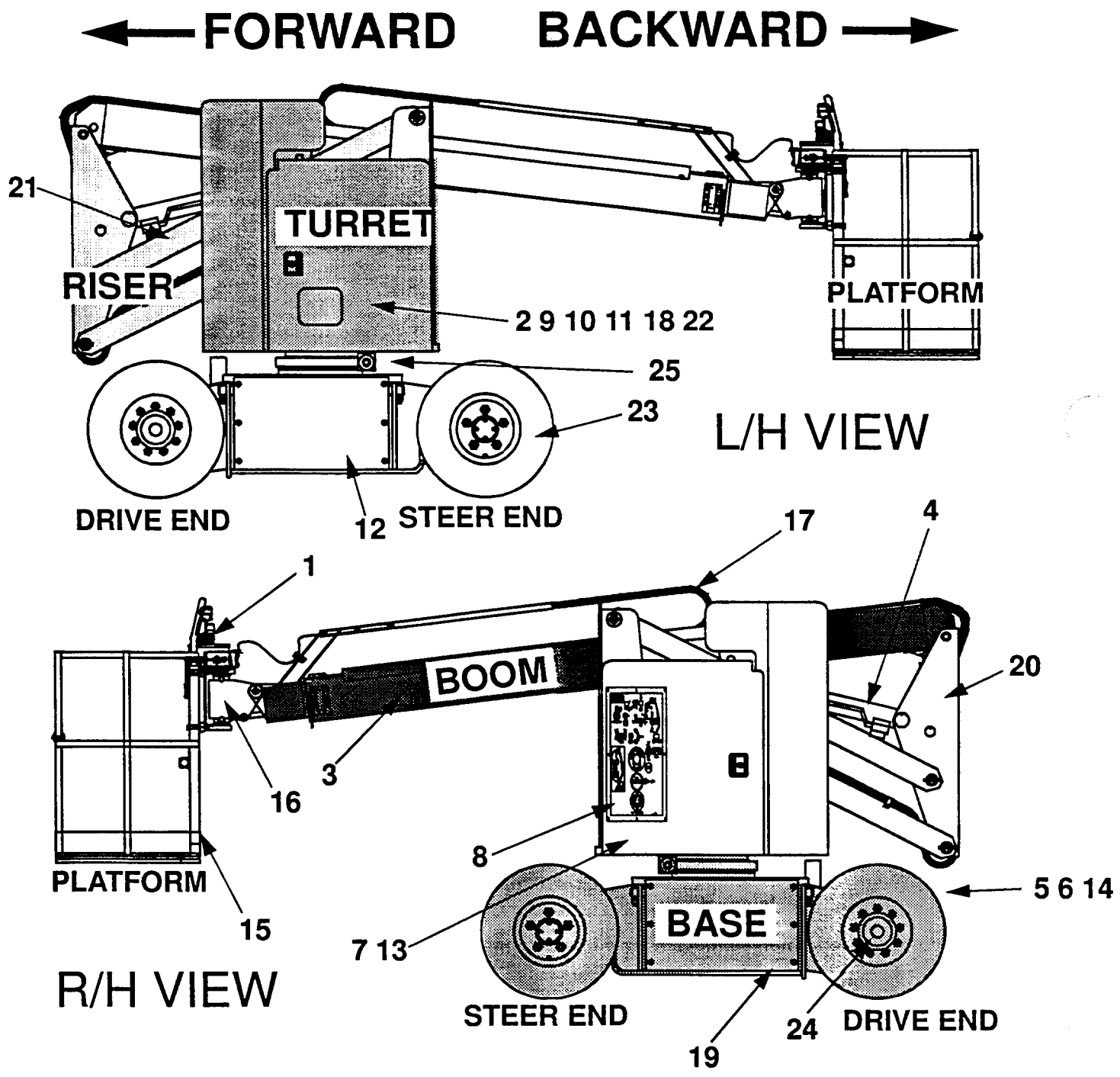
RECOMMENDED SPARE PARTS LIST

Ref.	Part No.	Description	Qty	Remarks
		HYDRAULIC PARTS (VALVES, SEALS, ETC.)		
1	81205	HOLDING/COUNTERBALANCE VALVE	1	BOOM/RISER CYLINDER
2	68729	SEAL, INPUT SHAFT, HYDRAULIC PUMP	1	FOR P/N 68086 PUMP
3	69988	SEAL KIT, HAND PUMP (P/N 81522)	1	
4	600865	SWITCH, PRESSURE, 1000 PSI	1	BRAKE RELEASE
5	600867	SWITCH, PRESSURE, 2000 PSI	1	BRAKE RELEASE
6	69995	SOLENOID VALVE, BRAKE "HOLD"	1	
7	69992	SOLENOID VALVE, FUNCTIONS	2	
8	69990	SOLENOID VALVE, PROPORTIONAL	1	
9	69994	SOLENOID VALVE, STEERING	1	
10	67338	VALVE, DIFFERENTIAL PRESSURE SENSING	1	
11	69748	FILTER ELEMENT, 10 MICRON	5	
12	N/A THIS TIME	SEAL KIT, BOOM/RISER CYLINDER	1	("ROSENBLOOM")
13	69968	SEAL KIT, EXTEND CYLINDER (P/N 81490)	1	("ROSENBLOOM")
14	600564	SEAL KIT, MASTER LEV. CYL. (P/N 140896)	1	("SIERRA")
15	67997	SEAL KIT, MASTER LEV. CYL. (P/N 140896)	1	("TEXAS HYDRAULICS")
16	600564	SEAL KIT, SLAVE LEV. CYL. (P/N 140890)	1	("SIERRA")
15	67997	SEAL KIT, SLAVE LEV. CYL. (P/N 140890)	1	("TEXAS HYDRAULICS")
16	N/A THIS TIME	SEAL KIT, PARKING BRAKE	1	
17	600219	SEAL KIT, TORQUE HUB	1	
18	69043	SEAL KIT, STEERING CYLINDER	1	("ROSENBLOOM")
19	600565	SEAL KIT, PLATFORM ROTATOR	1	
		MECHANICAL PARTS (BUSHINGS, PINS, ETC.)		
1	23824	POWER-TRACK (CABLE & HOSE CARRIER)	10	45 REQUIRED
2	65945	LUG NUT, TORQUE HUB	5	
3	65945	LUG NUT, STEERING HUB	5	
4	160697	STRAP, BATTERY BOX COVER	2	
5	140389	BUSHING, RISER ARM RISER END	4	
6	140388	BUSHING, RISER ARM COLUMN END	4	
7	140099	BUSHING, BOOM PIVOT		

NOTES

GENERAL INFORMATION

MAJOR COMPONENT IDENTIFICATION



KEY: MAJOR COMPONENT IDENTIFICATION

1 AERIAL CONTROL BOX
2 BATTERY CHARGER
3 BOOM ASSEMBLY
4 BOOM LIFT CYLINDER
5 CONTACTOR PANEL
6 DRIVE MOTORS
7 FUNCTION VALVE ASSEMBLY
8 GROUND CONTROL BOX
9 HYDRAULIC PUMP & MOTOR ASSEMBLY
10 HYDRAULIC RESERVOIR
11 HYDRAULIC RETURN FILTER
12 L/H BATTERY PACK
13 MANUAL PUMP
14 PARKING BRAKES
15 PLATFORM ASSEMBLY
16 PLATFORM ROTATOR
17 POWER-TRACK ASSEMBLY
18 PUMP MOTOR RELAY
19 R/H BATTERY PACK
20 RISER
21 RISER ARMS
22 RISER LIFT CYLINDER (HIDDEN)
23 STEERING WHEELS
24 TORQUE HUB
25 TURRET ROTATION GEAR ASSEMBLY

ABBREVIATIONS

AC	ALTERNATING CURRENT
ADPTR	ADAPTER
AMP	AMPERE
APPROX	APPROXIMATELY
AR	AS REQUIRED
ASSY	ASSEMBLY
AVAIL	AVAILABLE
BRG	BEARING
BRKT	BRACKET
CCW	COUNTER CLOCKWISE
CFM	CUBIC FEET PER MINUTE
CHRG	CHARGING
CTSK	COUNTERSUNK
CVR	COVER
CW	CLOCKWISE
CYL	CYLINDER
°	DEGREE
DC	DIRECT CURRENT
DIA	DIAMETER
DRV	DRIVE
ENG	ENGINE
EXH	EXHAUST
EXT	EXTERNAL
FT	FEET
GAL	GALLON
GR	GRADE
GSK	GASKET
HD	HEAD
HEX	HEXAGON
HP	HORSEPOWER
HSG	HOUSING
HT	HEAT TREATED
HYD	HYDRAULIC
HZ	HERTZ
ID	INSIDE DIAMETER
INCL	INCLUDES
"	INCHES
INT	INTERNAL
INV	INVERTED
LG	LENGTH
LH	LEFT HAND
MAX	MAXIMUM
MIN	MINIMUM
MM	MILLIMETER
MTG	MOUNTING
P/N	PART NUMBER
NO	NUMBER
NSS	NOT SOLD SEPARATELY
OD	OUTSIDE DIAMETER
PTO	POWER TAKE-OFF
#	POUND
QTY	QUANTITY
RD	ROUND
REF	REFERENCE
RH	RIGHT HAND
ROT	ROTATION
RPM	REVOLUTIONS PER MINUTE
SL	SLOTTED
SM	SMALL
SPD	SPEED
STD	STANDARD
T	TOOTH
THK	THICK
THRU	THROUGH
TEMP	TEMPERATURE
V	VOLT
VAC	VOLTS ALTERNATING CUR-RENT
VARI	VARIABLE
VS	VARIABLE SPEED
W/	WITH
W/0	WITHOUT

GENERAL INFORMATION

NOTES

MAINTENANCE & LUBRICATION

SECTION 3

DESCRIPTION	PAGE NO.
INTRODUCTION.	3 - 1
PERIODIC INSPECTION & MAINTENANCE SCHEDULE	3 - 2
OWNER'S INSPECTION RECORD	3 - 4
RECOMMENDED LUBRICANTS	3 - 5
MAINTENANCE PROCEDURES.	3 - 6
HYDRAULIC SYSTEM.	3 - 6
HYDRAULIC RESERVOIR & FILTER	3 - 6
HYDRAULIC CYLINDERS	3 - 6
TORQUE HUB	3 - 7
BATTERY WATER LEVEL	3 - 8
BATTERY CHARGING.	3 - 10

MAINTENANCE & LUBRICATION

INTRODUCTION

In addition to the "Before Operation Checks" described in the "Operator's Manual" a regular program of periodic preventive maintenance is essential to prolong aerial lift life, maximize efficient service and minimize downtime. This section details a series of checks and procedures which are to be performed at daily, weekly, monthly and semi-annual intervals.

Even if the operator is not directly responsible for the maintenance of the aerial lift, the operator should perform daily, all of the inspections listed in the "Before Operation Check", Section 5 of the "Operator's Manual".

NOTE: Replace all worn or damaged parts, or decals discovered during the "Before Operation Check". The operator should be assured that the aerial lift has been properly maintained and inspected before operating it.

MAINTENANCE SCHEDULE

The checks prescribed for longer intervals include all the checks required for the shorter intervals. Thus, the weekly check includes all items in the daily check, the monthly check includes weekly and daily checks, and so on through the semi-annual check, which includes the quarterly, monthly, weekly and daily checks.

This maintenance schedule is a guide which ensures that basic preventive maintenance requirements will be met under average operating conditions. Conditions which impose greater wear, loads or strain on the aerial lift may dictate reduced check intervals. Before altering the maintenance schedule, reevaluate aerial lift operation and review the owner's inspection records. Consider all factors involved and develop a revised schedule adequate to meet routine maintenance requirements.

OWNER'S INSPECTION RECORD

Periodic maintenance of the aerial lift is the responsibility of the owner. The "Aerial Lift Inspection Report" shown on page 3-3 is to be used for recording the date of each inspection, person(s) performing the inspection, any deficiencies found, and corrective action.

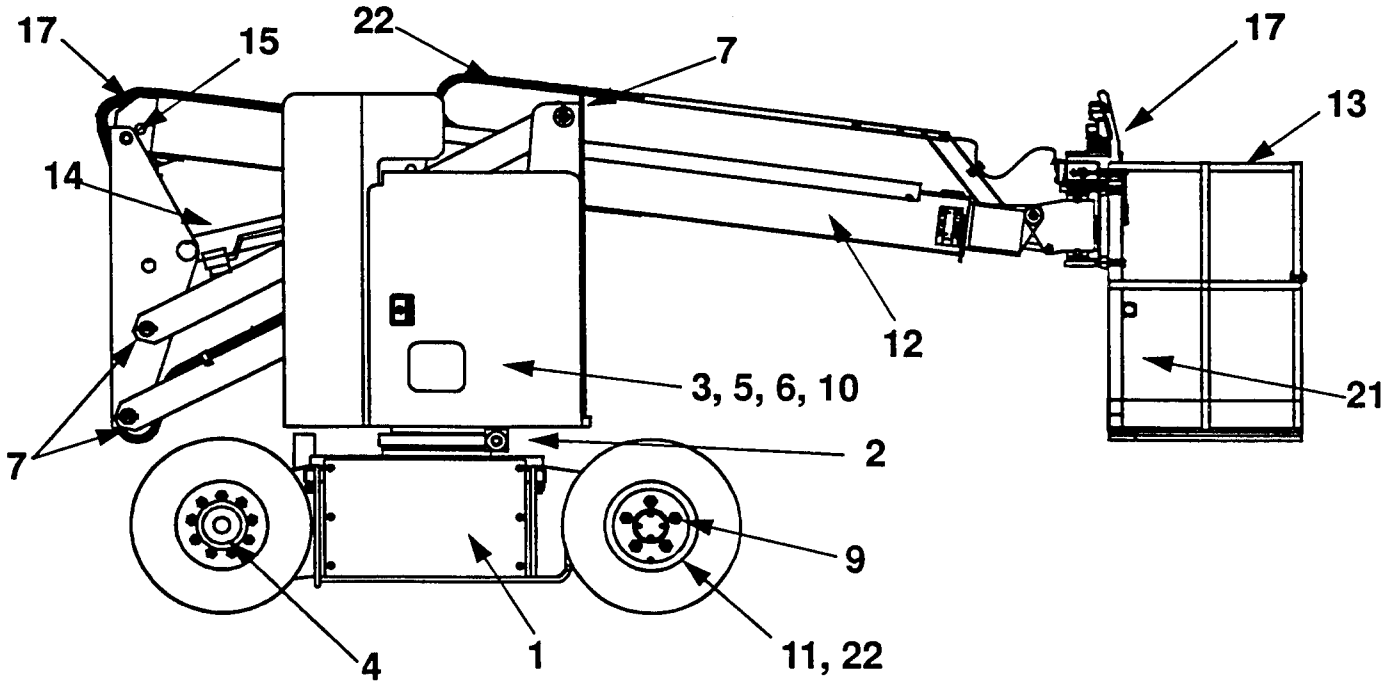
This record also serves as a tool detecting problem areas and reanalyzing maintenance requirements.

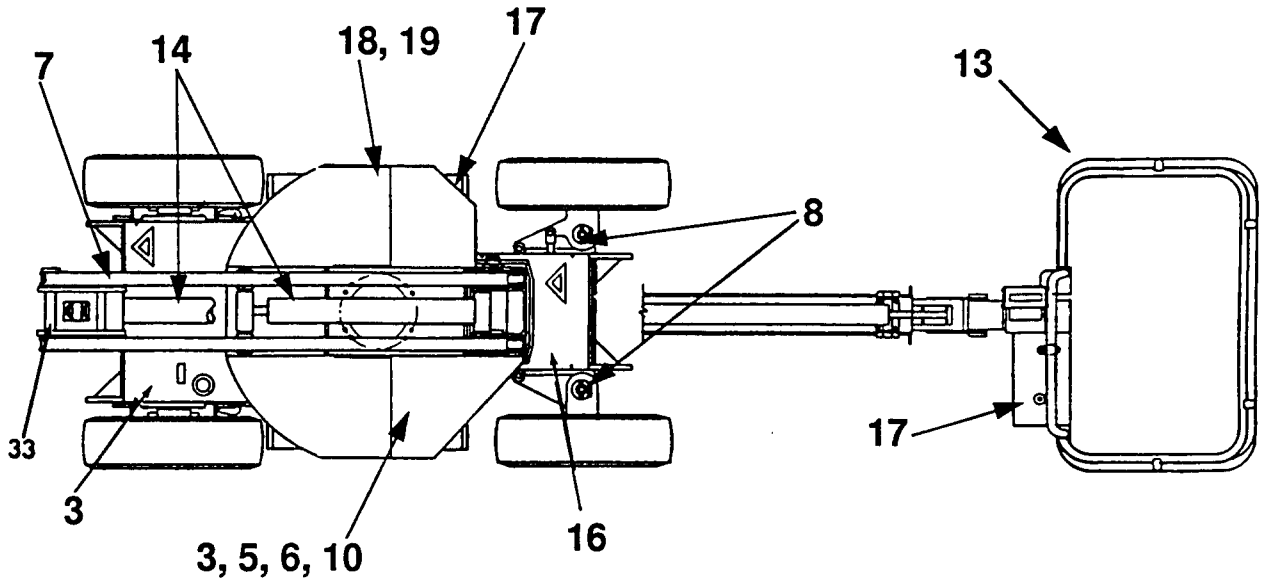
⚠ WARNING

DO NOT WORK BENEATH THE BOOM OR RISER UNLESS IT IS PHYSICALLY RESTRAINED FROM LOWERING. FAILURE TO DO SO MAY RESULT IN DEATH OR SERIOUS INJURY!

MAINTENANCE & LUBRICATION

PERIODIC INSPECTION AND MAINTENANCE SCHEDULE





MAINTENANCE SCHEDULE

Table 1: PERIODIC INSPECTION AND MAINTENANCE SCHEDULE

ITEM	ITEM DESCRIPTION	LUBRICANT	SERVICE/FREQUENCY
1	Batteries		Charge Daily, Check Water Level Weekly
2	Ring Gear - (Race) (Gear Teeth)	Multi-Purpose Grease EP-2 (rotate while greasing) Mobilcote Type - S	Lubricate Monthly
3	Hydraulic Reservoir Fluid	Dexron II or equivalent	Check Daily Replace Yearly
4	Torque Hubs	Gear Oil - SAE EP 90	Check Monthly Replace Yearly
5	Hydraulic Tank Strainer		Clean Yearly
6	Hydraulic Return Line Filter		Replace 100 Hours (minnimum)
7	Riser Pivot Pins	Mobilcote Type - S	Check Daily, Lubricate Monthly
8	Steering King Pins	Mobilcote Type - S	Lubricate Monthly
9	Wheel Bearings	Multi-purpose Grease EP-1	Repack Yearly
10	Hydraulic Pump Motor		Check Brushes Monthly
11	Wheel Lug Nuts		Check Daily
12	Boom Assembly		Check Daily
13	Platform Assembly		Check Daily
14	Boom & Riser Cylinders		Check Daily
15	Boom Pivot Pin		Check Daily
16	Steering Assembly		Check Daily
17	Controls		Check Daily
18	Functions Valve		Check Daily
19	Hand Pump		Check Daily
20	Decals		Check Daily
21	Operator's Manual		Check Daily
22	Tires		Check Daily
23	Electrical Wiring		Check Daily
24	Hydraulic Hoses		Check Daily

Check each of the above items for security, looose or missing fasteners, signs of leakage, chafing, wear, or evidence of cracks. **Check** all visible electric wiring and hydraulic hoses for cracking, loose connections, or excessive wear. If a problem is found with any of the following items, **do not operate** the aerial lift until repaired by a qualified aerial-lift technician.

Mark Industries

Return To: **Mark Industries**
106 12th Street S.E.
Waverly, IA 50677-9466

AERIAL LIFT INSPECTION REPORT

PRE-DELIVERY ❑ DELIVERY ❑ 30-DAY INSPECTION ❑ YEARLY INSPECTION ❑

MACHINE: SCISSOR LIFT ❑ BOOM LIFT ❑ KNUCKLE BOOM ❑

DEMO ❑ RENTAL ❑ OWNED ❑

DISTRIBUTOR _____ ENGINE S/N _____

ADDRESS _____ MODEL _____ SERIAL NO. _____

CUSTOMER _____ HOUR METER _____

MACHINE LOCATION _____ DATE DELIVERED _____

Scissors - Inspections	OK	NOT OK	N/A
1. Platform Gate Latch	❑	❑	❑
2. Platform Gate	❑	❑	❑
3. Platform Deck	❑	❑	❑
4. Collars on Scissor-pivot Pins	❑	❑	❑
5. Hydraulic Pump	❑	❑	❑
6. Wear (Slide) Pads	❑	❑	❑
7. Tires and Wheels	❑	❑	❑
8. Wheel Bearings	❑	❑	❑
9. Wheel KIngpins	❑	❑	❑
10. Wheel Lug Nuts	❑	❑	❑
11. Hydraulic Reservoir Fluid	❑	❑	❑
12. Hydraulic-fluid Inlet Strainer	❑	❑	❑
13. Hydraulic-fluid Return Filter	❑	❑	❑
14. Lift Cylinder and Pins	❑	❑	❑
15. Hydraulic Valve	❑	❑	❑
16. Batteries	❑	❑	❑
17. Battery Housings	❑	❑	❑
18. Battery Tops, Terminals, and Cables	❑	❑	❑
19. Limit Switches (Proximity)	❑	❑	❑
20. Drive Motors	❑	❑	❑
21. Steering Cylinder and Pins	❑	❑	❑
22. Extendable Platform Deck (Slide, Roller, and Handle Assemblies)	❑	❑	❑
23. Hoses	❑	❑	❑
24. Electrical Wiring	❑	❑	❑
35. Decals	❑	❑	❑
26. Operation and Maintenance Manual in Platform	❑	❑	❑

Booms - Inspections	OK	NOT OK	N/A
1. Platform Gate Latch	❑	❑	❑
2. Platform Gate	❑	❑	❑
3. Platform Deck	❑	❑	❑
4. Boom Pivot Pin	❑	❑	❑
5. Air Filter	❑	❑	❑
6. Engine Oil	❑	❑	❑
7. Torque Hub	❑	❑	❑
8. Torque Ring-gear Bolts	❑	❑	❑
9. Boom	❑	❑	❑
10. Platform Rotator	❑	❑	❑
11. Tie Rod Pin	❑	❑	❑
12. Steering-yoke King Pins	❑	❑	❑
13. Steering Cylinder	❑	❑	❑
14. Fuel Tank	❑	❑	❑
15. Return-line filter	❑	❑	❑
16. Hydraulic Reservoir Fluid	❑	❑	❑
17. Hydraulic Pump	❑	❑	❑
18. Hydraulic Valve	❑	❑	❑
19. Wheel Lug Nuts	❑	❑	❑
20. Extend-cable Equalizer Bracket	❑	❑	❑
21. Extend Cable	❑	❑	❑
22. Limit Switches (Proximity)	❑	❑	❑
23. Boom-lift Cylinder Pins	❑	❑	❑
24. Boom-lift cylinder	❑	❑	❑
25. Rotation Gear Box	❑	❑	❑
26. Power Track	❑	❑	❑
27. Operation and Maintenance Manual in Platform	❑	❑	❑
28. Guard Rail	❑	❑	❑
29. Toe Plate Mesh	❑	❑	❑
30. Tires	❑	❑	❑
31. Decals	❑	❑	❑
32. Electrical Wiring	❑	❑	❑

INSPECTED BY: _____ DATE: _____ TITLE: _____

Explain any deficiencies found, corrective action taken, and identification of the person(s) performing the repair: _____

MAINTENANCE & LUBRICATION

RECOMMENDED LUBRICATION TYPES

ITEM	ITEM DESCRIPTION	LUBRICANT TYPE
1	Hydraulic Oil	Dexron II (or equivalent)
2	Wheel Bearings	General (Multi) Purpose EP2 Grease —High-pressure Injection
3	Wheel Kingpin	General (Multi) Purpose EP2 Grease —High-pressure Injection

MIXING

Various companies use different additives which, when mixed together, may cause problems in a hydraulic system. This type of problem is rare but can cause sludge which can plug the oil filters or acid which will etch the pump. Any of the above conditions can result in the warranty being voided. If, knowing all this, you still choose to add oil different from the initial fill, stay with a single brand as this will minimize the likelihood of problems occurring. Then at the first complete oil change, you may switch to the brand you prefer to use.

If hydraulic oil needs to be added, the aerial lift owner must be contacted to find out what brand and viscosity of oil is being used. Use the same brand and viscosity of oil that is current in the aerial lift when adding additional oil.

HYDRAULIC OIL

Check the hydraulic oil level on a daily basis. The oil level is checked using the dipstick which is attached to the filler cap located on top of the hydraulic tank The oil level must be between the "FULL" and "LOW" marks on the dipstick. Add oil as needed in the filler cap opening of the hydraulic tank. The hydraulic system was filled at the factory with Nortran automatic transmission fluid (equivalent to Dexron II). Any oil used in this aerial lift's hydraulic system must meet the specifications of Dexron II.

MAINTENANCE & LUBRICATION

HYDRAULIC SYSTEM

HYDRAULIC RESERVOIR CHECK & FILL

Check the hydraulic oil level on a daily basis. The oil level must be visible in the sight glass of the hydraulic reservoir. Add oil as needed via the filler cap. The hydraulic system was filled at the factory with Nortran automatic transmission fluid (equivalent to Dexron II). Any oil used in this aerial lift's hydraulic system must meet the specifications of Dexron II.

HYDRAULIC SYSTEM RETURN LINE FILTER

The hydraulic system return line filter should be changed a minnimum of every 100 hours or quarterly.

HYDRAULIC SYSTEM BLEEDING

The hydraulic system is self-bleeding. After the hydraulic system has been drained, such as during the replacement of a hydraulic system component, raise and lower the platform three complete cycles. Recheck the oil level and fill as required.

HYDRAULIC CYLINDER INSPECTION

Wash the cylinder bore and all the components with solvent and make the following inspections:

CYLINDER BORE For signs of scoring and deep scratches. In the event of any defects, reassemble the entire cylinder and contact your distributor.

CYLINDER SHAFT For dents, deep scratches, or damaged chrome plating. File any sharp edges on ends of shaft to protect the seals upon reassembly. Always protect the shaft finish when clamping in a vice or when welding against weld splatter.

PISTON RINGS For cracks or other damage. Particularly check the interlocking ends that they are not missing or broken.

PISTON SEALS For signs of severe damage. Do not remove unless replacement is necessary.

PISTON & HEAD GLAND It is not normally necessary to replace the piston, piston rings, or head gland.

MAINTENANCE & LUBRICATION

TORQUE HUB

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

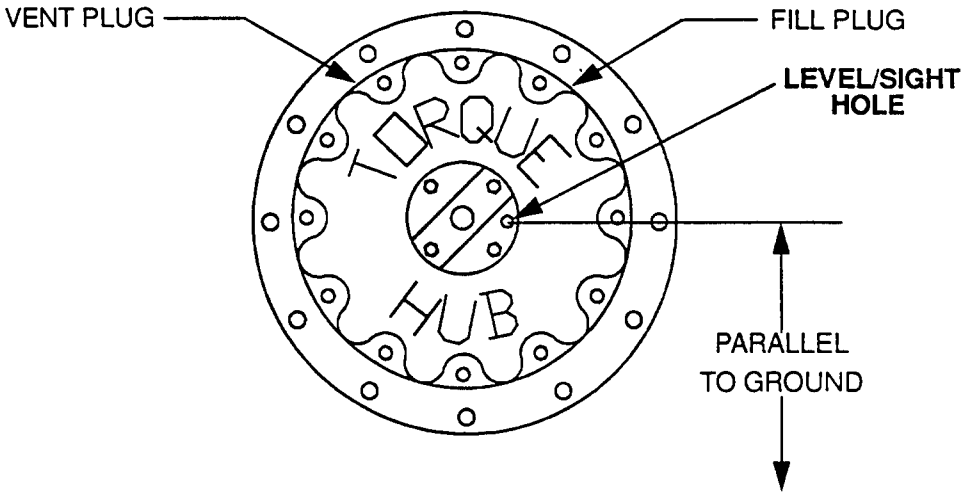
Initial - After 50 hours. Preferably in a loaded condition.

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

4. Oil Fill Level

Remove fill plug
Remove vent plug
Pour oil into fill plug
Fill to half - full (approximately 44 oz.)

Fill at a slow pace to allow air to escape.



MAINTENANCE & LUBRICATION

BATTERY-WATER LEVEL



⚠ WARNING

TO AVOID SERIOUS BURNS, EXTREME CARE SHOULD BE USED WHEN HANDLING OR WORKING NEAR BATTTERIES.

Avoid Battery Hazards!

- **Batteries produce flammable and explosive gasses. Keep** electric arcs, sparks, flames, and lit cigarettes (pipes, cigars, etc.) away from batteries.
- **Battery acid will damage eyes or skin on contact. Always** wear a face shield during battery maintenance to avoid getting acid in eyes. **Always** 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.

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 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 battery-cell caps down on a dirty surface. Replace the caps immediately after checking the water level.

BATTERY-WATER LEVEL

Battery Fill Instructions

MATERIALS AND EQUIPMENT REQUIRED

1. Battery Filler Bottle

2. Distilled Water

3. Hydrometer

FILLING THE BATTERY

Use a hydrometer to see how much charge the battery has. A reading of 1.260 or more in all cells indicates a fully-charged condition. (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.

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

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

MAINTENANCE & LUBRICATION

CHARGING BATTERIES

CHARGING BATTERIES

1. Lower platform completely.
2. Remove battery covers.
3. Check battery "water" (electrolyte) level. Ensure that plates are covered to a minimum depth of 1/2 inch. DO NOT add additional water if plates are covered!
4. Reinstall battery caps before charging!
5. Plug charger into 120 VAC, 60 Hz power source. Charger will turn off automatically when batteries are fully charged.
6. Unplug charger and allow battery temperature to stabilize.
7. Recheck battery "water" level. Fill to indicator ring or approximately 1/2 in depth over top of separator plates and reinstall caps.

CHARGING NOTES:

1. Temperature does effect the power reserve in a battery.

   A. A battery that is 100% charged at 80°F:
   - drops to 65% at 32°F.
   - drops to 40% at 0°F.

   B. A battery that is 46% charged at 80°F:
   - drops to 32% at 31°F.
   - drops to 21% at 0°F.

2. When battery temperature reaches 125°F, battery should be taken off charge and cooled to room temperature or the charging rate should be lowered.
3. Batteries should be brought to full charge as soon as possible after use
4. Do not allow plates in batteries to become exposed to air. Lead plates in discharged batteries become hardened and sulfated. The battery eventually will not deliver its rated capacity or come up to a full change.

CHARGING BATTERIES

NORMAL OPERATION

1. Ensure that that there is adequate ventilation for both batteries and charger. The convection-cooled charger design requires an unobstructed flow of cooling air for proper operation.

2. Connect charger AC input cord to appropriate power supply.

3. Charger will turn "on" automatically and charge rate will adjust automatically according to battery power level. Charger shuts off automatically once batteries have been fully charged.

The state of discharge of the batteries will be slightly different each time they are put on charge, but the charger varies automatically the initial charge rate, and taper of charge rate over the charge period. For well discharged batteries the charge rate at the start of the charge period should correspond to the "DC AMPS" rating on the charger nameplate. The rate should then taper gradually down to a lower finish rate. Normal charging at the low finish rate during the last 1-3 hours is necessary to achieve equalization of all battery cells. This equalization period allows the specific gravity of the battery electrolyte solution to rise to its full charge value. Since the taper of the charging rate (in amps. as indicated by the ammeter needle) is controlled by the rising voltage of the batteries being charged, proper performance of the charger and resulting good battery life is dependent upon the following factors:

A. An adequate AC line to handle the power required. Request your electrician or power company to survey your installation.

B. All cells of the batteries must be good, rising to approximately 2.5 DC volts per cell while still on charge or near the end of a charging period. When in doubt, check each cell with a single cell voltmeter while still on charge. If a low reading is obtained, check the low cells with a temperature corrected hydrometer. NOTE: Hydrometer float must be thoroughly clean to obtain accurate specific gravity readings.

C. Connections on the battery terminals and connector wiring must be clean and tight.

The necessity of adding water more frequently than two of three weeks, and/or hot battery cases at the end of the charging cycle, indicates the finish rate is too high, due to one or both of the following:

A. One or more bad cells in the batteries.

B. Batteries are starting to age to the point where hours of charge should be reduced gradually to obtain prolonged battery life.

4. State of charge at start of day's use can be approximated by plugging charger "in" and monitoring the charge rate. Drop of ammeter needle to a low finish rate of less than 6 to 7 amps within approximately 15 minutes indicates that batteries are near full capacity of charge.

MAINTENANCE & LUBRICATION

CHARGING BATTERIES

CARE OF MOTIVE POWER BATTERIES

1. New batteries should be given a full charge before their first use because it is difficult to know how long the batteries have been in storage without a charge.

2. Limit use of new batteries between charges for the first 5 cycles, New batteries and older batteries which have been in storage are not capable of their rated output until they have been discharged and charged a number of times.

3. During the first month of use, particularly when temperatures are below 60°F, new batteries should be given an extra full charge once a week. The ampere-hours of energy that batteries can deliver and their charge acceptance varies directly with battery temperature.

4. As long as the charger tapers down to the specified finish charge rate near the end of the charge cycle, the batteries should be given a full charge. All cells in a set of batteries do not react identically to the same discharge, and charge current. In a normal charge, the last 1 to 3 hours at the low finish charge rate equalize the cells for better battery life.

5. When batteries age to the point where the charge rate will no longer taper into the low finish rate area, reduce the hours of charge progressively. Reducing the charge period will prevent excessive battery heating and the resultant high water use rate.

6. Prior to each day's use, turn the charger on and check to see if charger ammeter needle jumps smartly upward and then tapers down to the finish rate area within 15 minutes. This will provide a very simple means of verifying that the batteries were charged.

7. Add water carefully to the proper level in cells as required after they have been fully charged. Do not fill them so high that they bubble over while charging. New batteries require very little addition of water, whereas very old batteries may need additional water two or three times a week. Water (electrolyte) level in the cells settles when batteries are discharged and rises during charge. The probability of overfilling can be reduced by adding water when batteries are fully charged.

8. When the temperature falls below 65°F, batteries should be placed on charge as soon after use as possible. In these low temperatures a 4 hour equalizing charge once a week will improve state of charge and battery life.

9. Keep tops of batteries and battery hold-downs clean and dry at all times. This will reduce the amount of current leakage between batteries and the frame.

CHARGING BATTERIES

Temperature/Specific Gravity Correction Table For Batteries
Actual Hydrometer Reading At Actual Temperature°
Table 1:

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° (-54°C)	Approx. State of Charge —%
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

Table 2: Specific Gravity

Corrected to 80°F (17°C)	Freezing Temperatures
1.280	-90°F (-68°C)
1.250	-62°F (-52°C)
1.200	-16°F (-27°C)
1.150	+05°F (-15°C)
1.000	+19°F (-07°C)

SERVICE & ADJUSTMENTS

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SERVICE & ADJUSTMENTS

INTRODUCTION

This section contains service and adjustment information and procedures.

SERVICE describes items that require repair or replacement

ADJUSTMENTS describes any adjustments necessary to ensure proper operation of the aerial lift and adjustments required after the replacement or repair of components.

NOTE: THE SERVICE AND ADJUSTMENT PROCEDURES PROVIDED IN THIS MANUAL SHOULD ONLY BE PERFORMED BY A QUALIFIED AERIAL LIFT MECHANIC.

Before attempting to make an adjustment yourself, ask yourself if you have the RIGHT TOOLS, IF you have the PROPER TEST EQUIPMENT and IF you can accurately DIAGNOSE the cause of the problem.

If you can't answer YES to all three questions, rely on your Distributor Serviceman. He has the right tools, testing equipment and service knowledge to pin-point the problem in minutes instead of the hours consumed in hit-or-miss methods. TIME IS MONEY! He will save it for you.

If you decide to attempt an adjustment yourself, follow a logical TROUBLE SHOOTING PROCEDURE. Don't simply replace parts until the trouble is found. Refer to Section 5 Troubleshooting for general and specific troubleshooting information.

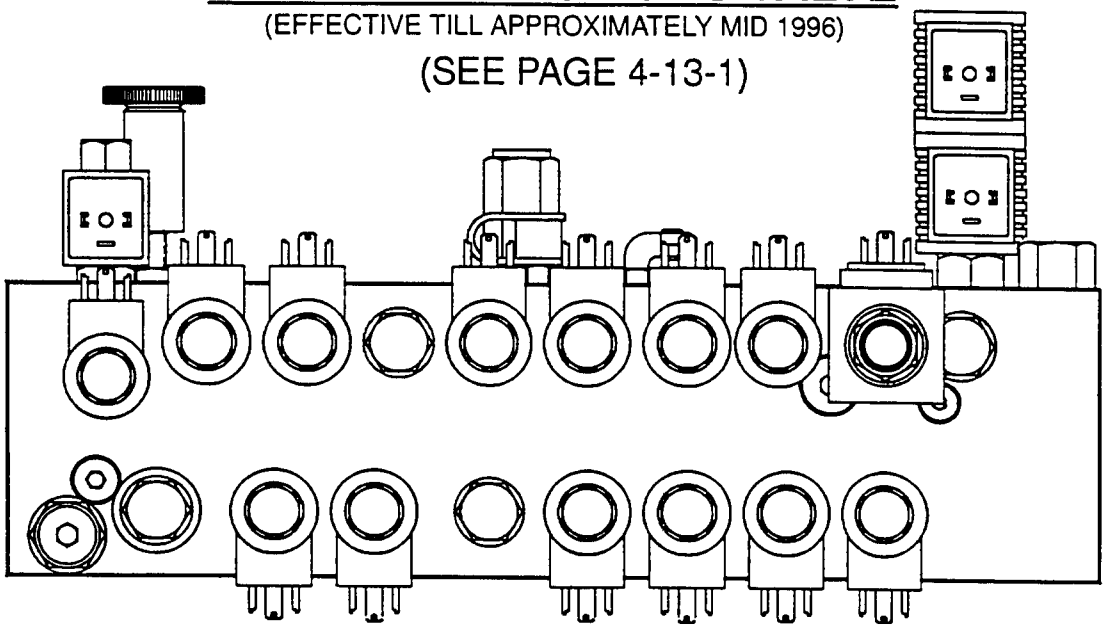
Once the cause of problem or malfunction has been diagnosed, take the corrective action specified in this manual. Follow the procedures given for the specific problem. If the difficulty is not covered, consult your Mark Distributor, or the Mark Industries Product Support Department.

HYDRAULIC INSTALATION

P/N 81541 FUNCTIONS VALVE

(EFFECTIVE TILL APPROXIMATELY MID 1996)

(SEE PAGE 4-13-1)

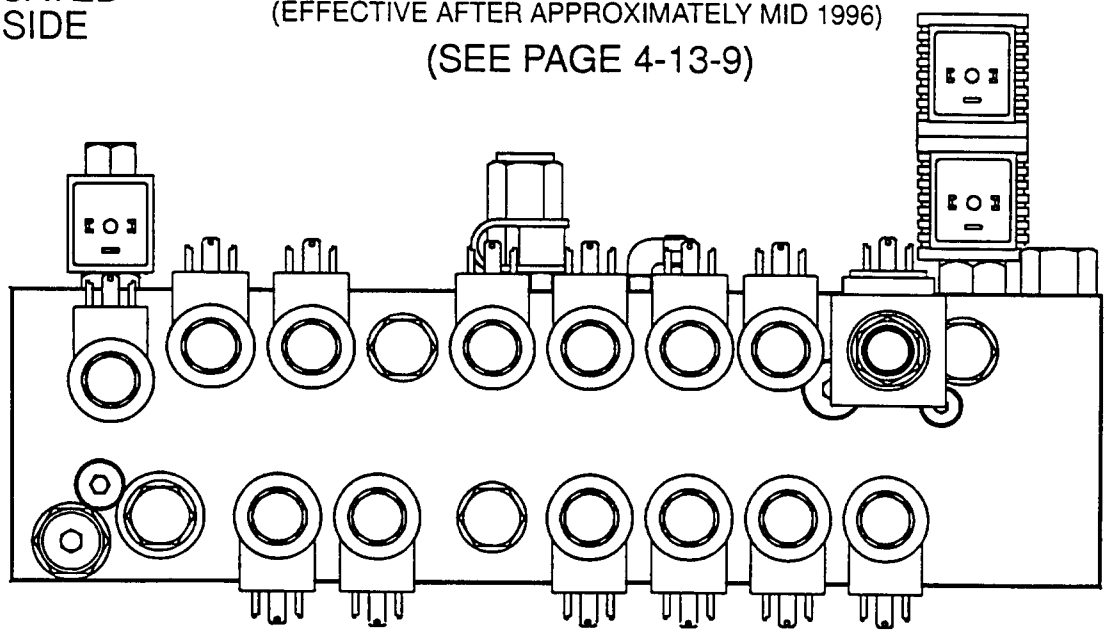


P/N LOCATED THIS SIDE

P/N 81542 FUNCTIONS VALVE

(EFFECTIVE AFTER APPROXIMATELY MID 1996)

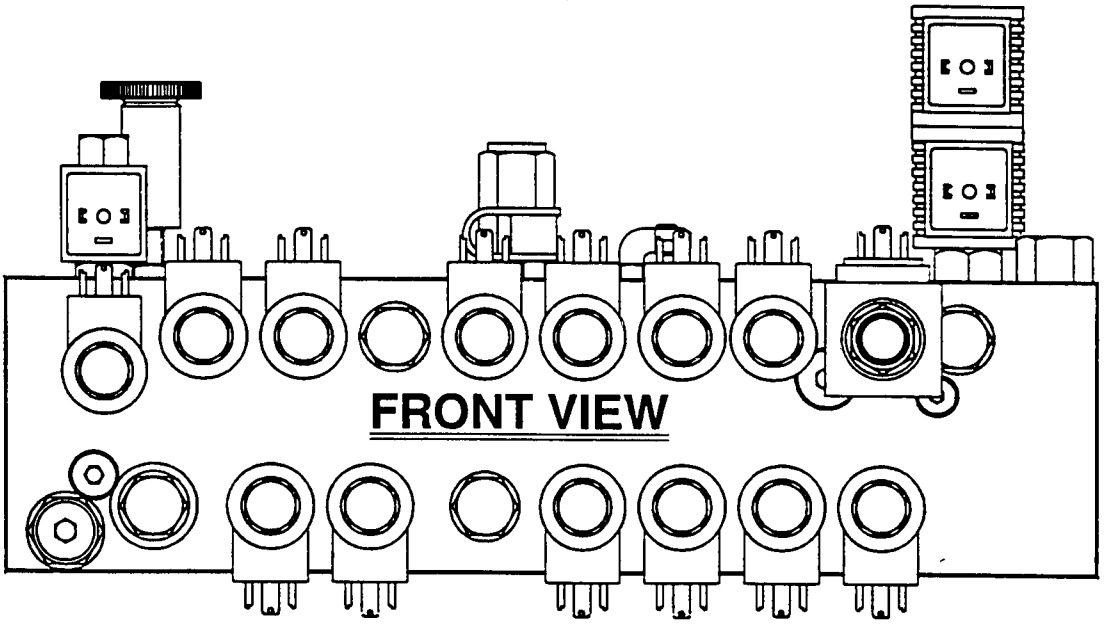
(SEE PAGE 4-13-9)

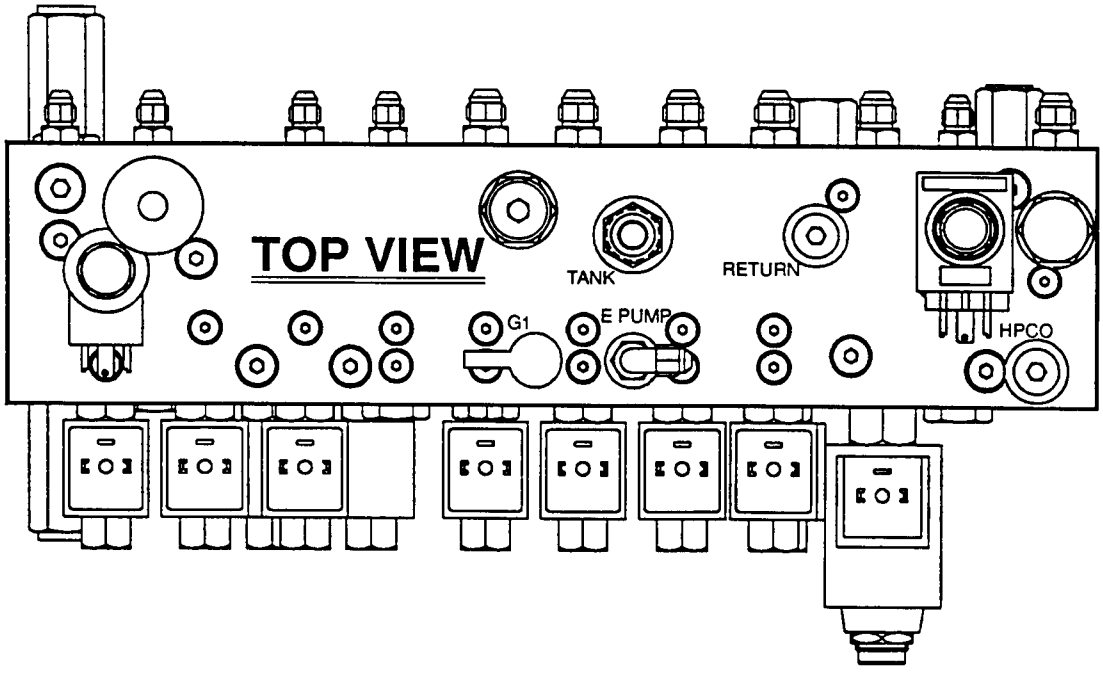


HYDRAULIC INSTALATION

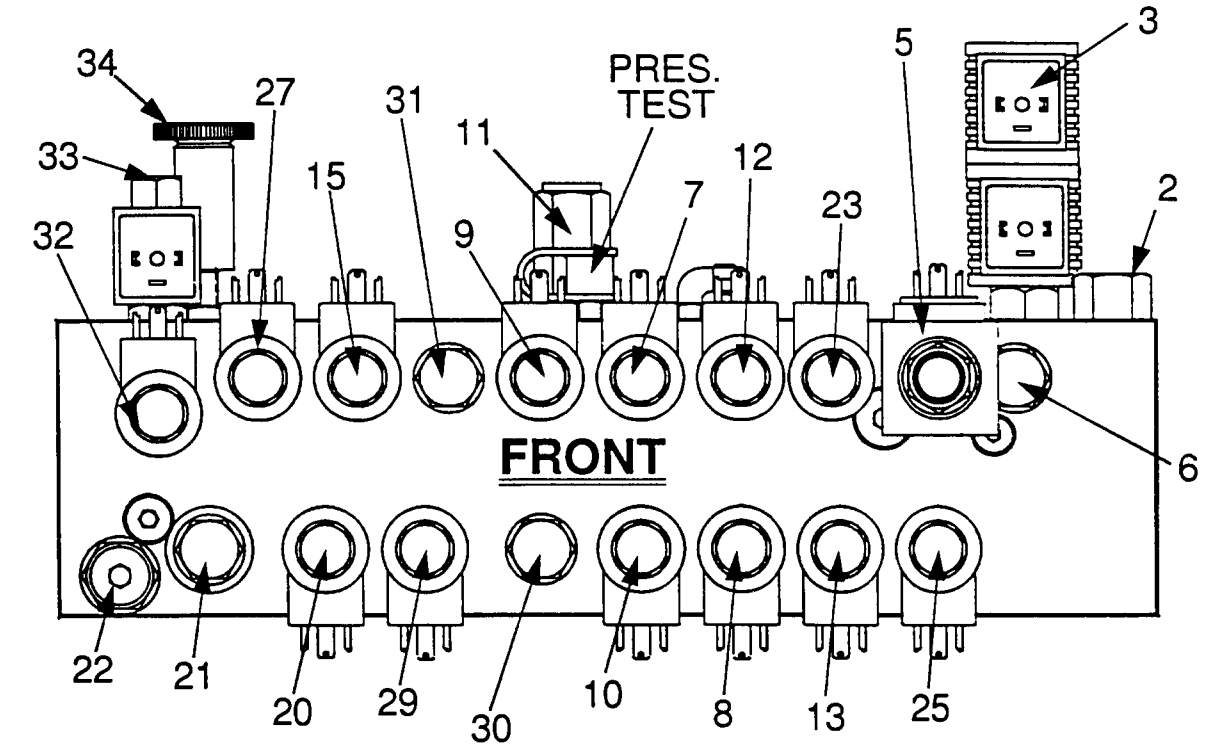
P/N 81541 FUNCTIONS VALVE

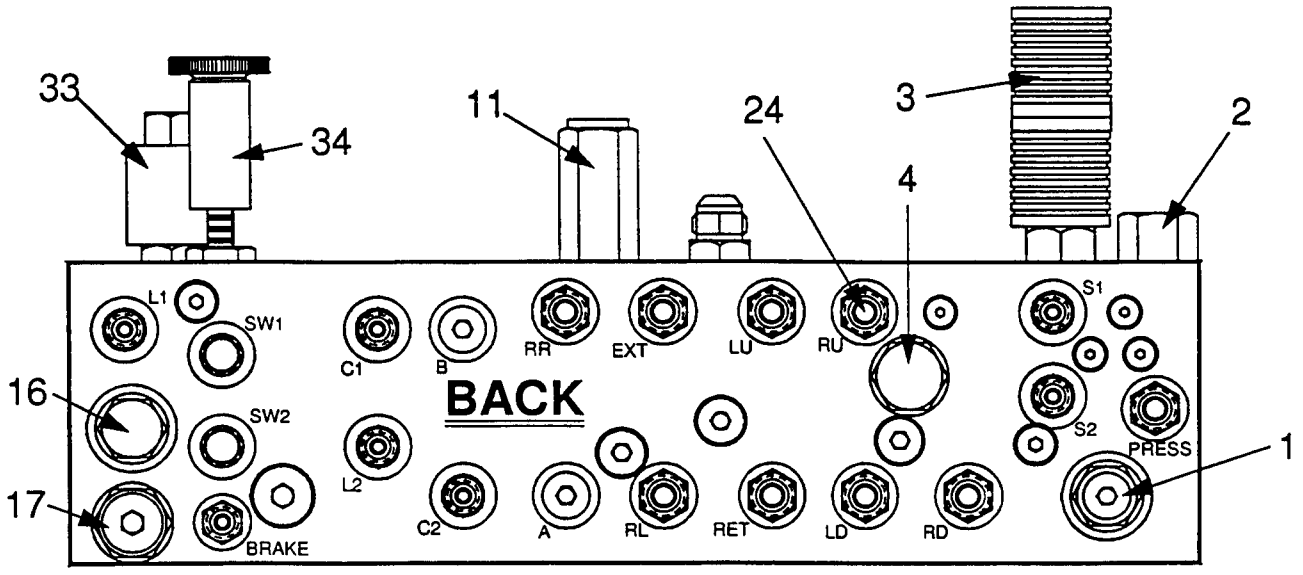
(EFFECTIVE TILL APPROXIMATELY MID 1996)





81541 FUNCTIONS VALVE

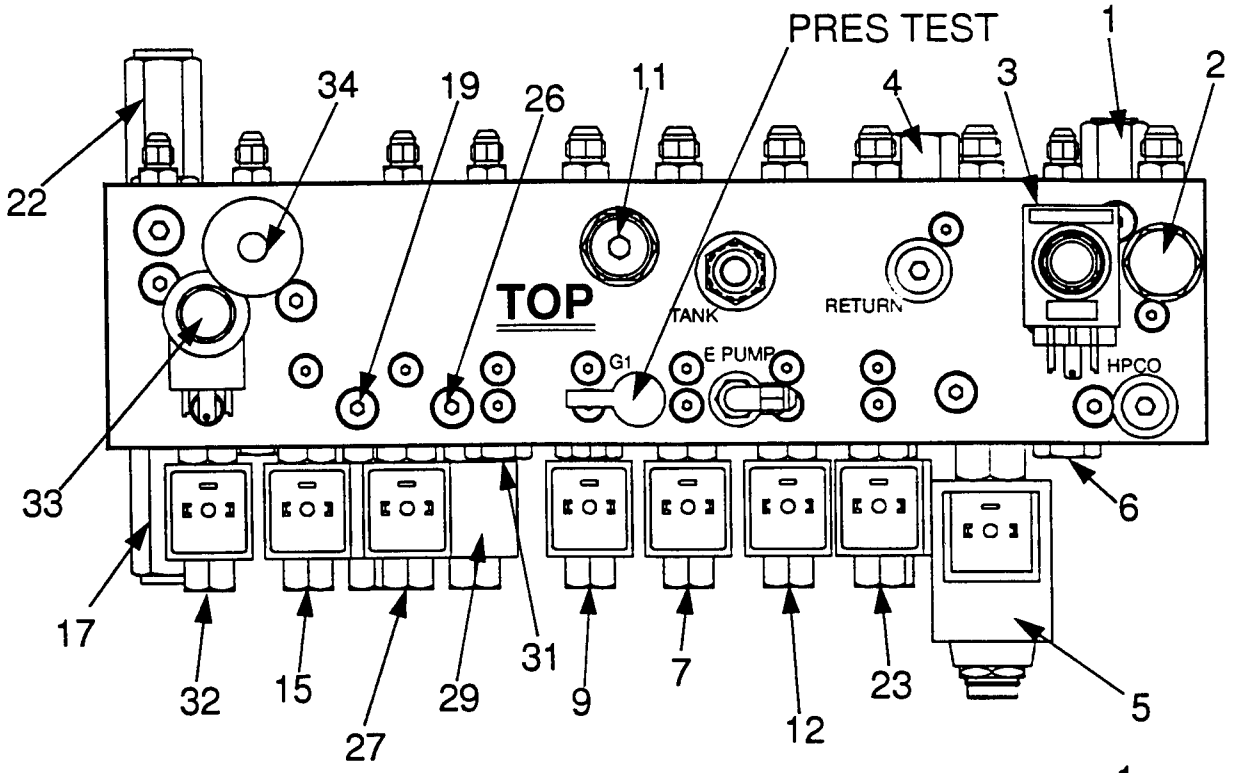


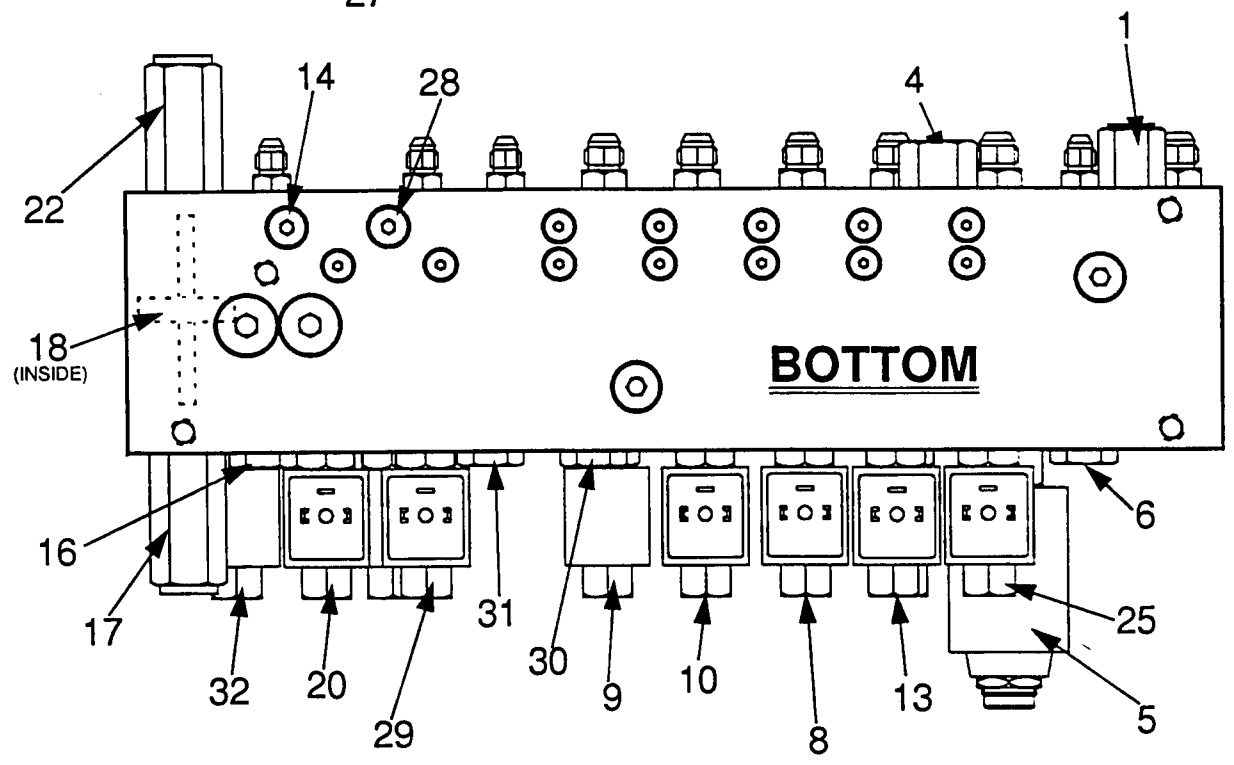


81541 FUNCTIONS VALVE

1. .....SYSTEM RELIEF VALVE
2. .....STEERING FLOW REGULATOR
3. .....STEERING DIRECTIONAL CONTROL VALVE
4. .....DIFFERENTIAL PRESSURE SENSING VALVE
5. .....PROPORTIONAL SOLENOID VALVE
6. .....EMERGENCY PUMP CHECK VALVE
7. .....BOOM OUT SOLENOID VALVE
8. .....BOOM IN SOLENOID VALVE
9. .....TURRET ROTATE RIGHT SOLENOID VALVE
10. .....TURRET ROTATE LEFT SOLENOID VALVE
11. .....TURRET ROTATION RELIEF VALVE
12. .....BOOM UP SOLENOID VALVE
13. .....BOOM DOWN SOLENOID VALVE
14. .....PLATFORM LEVEL UP FLOW RESTRICTOR
15. .....PLATFORM LEVEL UP SOLENOID VALVE
16. .....PLATFORM LEVEL UP COUNTERBALANCE VALVE BYPASS CHECK
17. .....PLATFORM LEVEL UP COUNTERBALANCE VALVE
18. .....PLATFORM LEVEL COUNTERBALANCE VALVE PILOT PISTON
19. .....PLATFORM LEVEL DOWN FLOW RESTRICTOR
20. .....PLATFORM LEVEL DOWN SOLENOID VALVE
21. PLATFORM LEVEL DOWN COUNTERBALANCE VALVE BYPASS CHECK
22. .....PLATFORM LEVEL DOWN COUNTERBALANCE VALVE
23. .....RISER UP SOLENOID VALVE
24. .....RISER UP/DOWN OPERATION FLOW RESTRICTOR
25. .....RISER DOWN SOLENOID VALVE
26. .....PLATFORM ROTATE CLOCKWISE FLOW RESTRICTOR
27. .....PLATFORM ROTATE CLOCKWISE SOLENOID VALVE
28. .....PLATFORM ROTATE COUNTERCLOCKWISE FLOW RESTRICTOR
29. .....PLATFORM ROTATE COUNTERCLOCKWISE SOLENOID VALVE
30. .....PLUG (RESERVED FOR OPTION)
31. .....PLUG (RESERVED FOR OPTION)
32. .....BRAKE RELEASE SOLENOID VALVE
33. .....BRAKE HOLD SOLENOID VALVE
34. .....BRAKE ADJUST NEEDLE VALVE

81541 FUNCTIONS VALVE

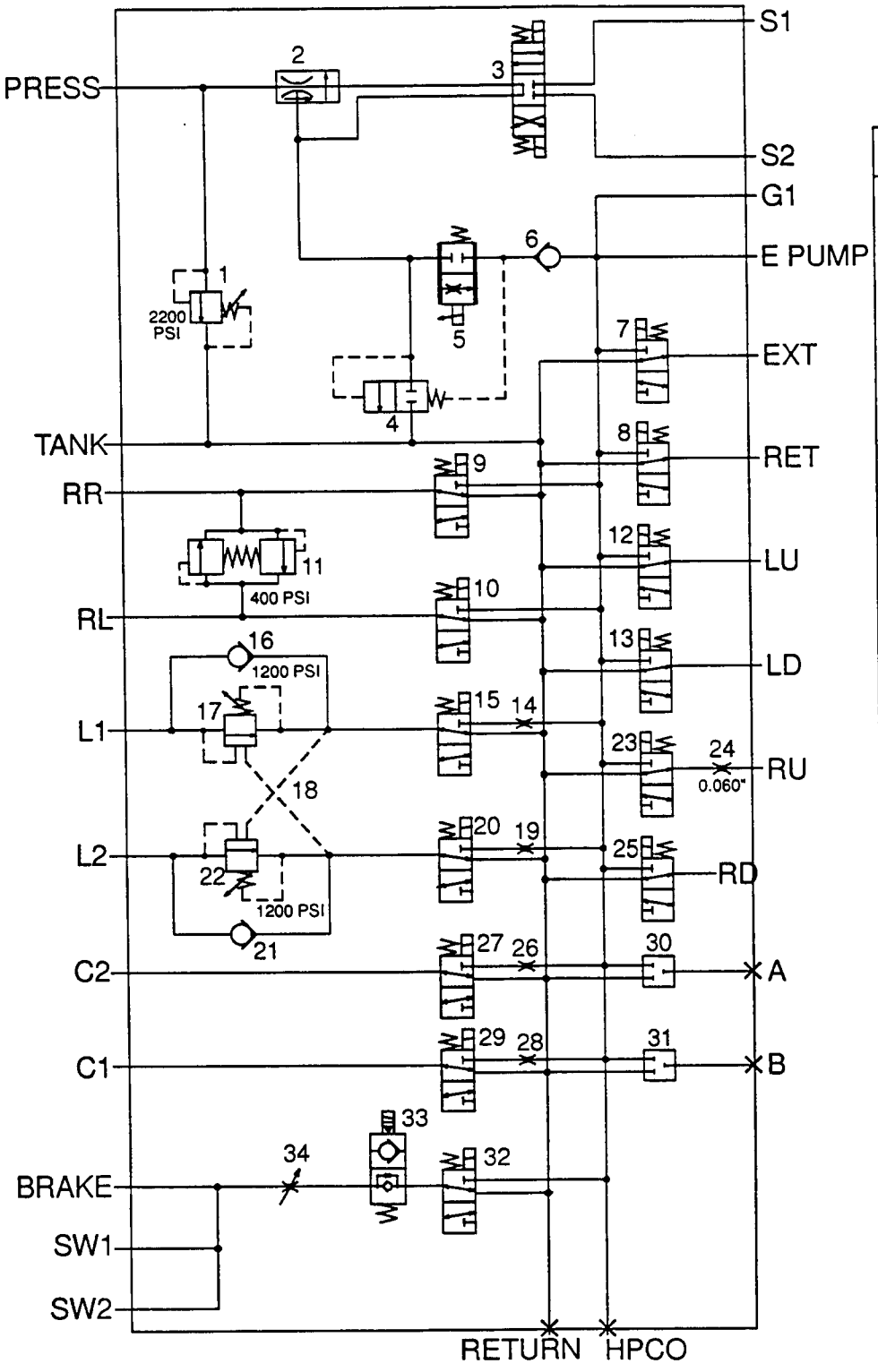




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81541 FUNCTIONS VALVE



KEY; PORT I.D./FUNCTION	
A	(OPTION)
B	(OPTION)
BRAKE	BRAKE RELEASE
C1	PLAT. ROTATE CCW
C2	PLAT. ROTATE CW
E PUMP	EMER. PUMP INLET
EXT	BOOM OUT
G1	PRESURE TEST
HPCO	N/A (BLOCKED)
L1	PLATFORM LEVEL UP
L2	PLAT. LEVEL DOWN
LD	BOOM DOWN
LU	BOOM UP
PRESS	MAIN PUMP INLET
RD	RISER DOWN
RET	BOOM IN
RETURN	N/A (BLOCKED)
RL	TURRET ROT. LEFT
RR	TURRET ROT. RIGHT
RU	RISER UP
S1	STEER LEFT
S2	STEER RIGHT
SW1	1000 PSI PRES. SW.
SW2	2000 PSI PRES. SW.
TANK	TANK RETURN

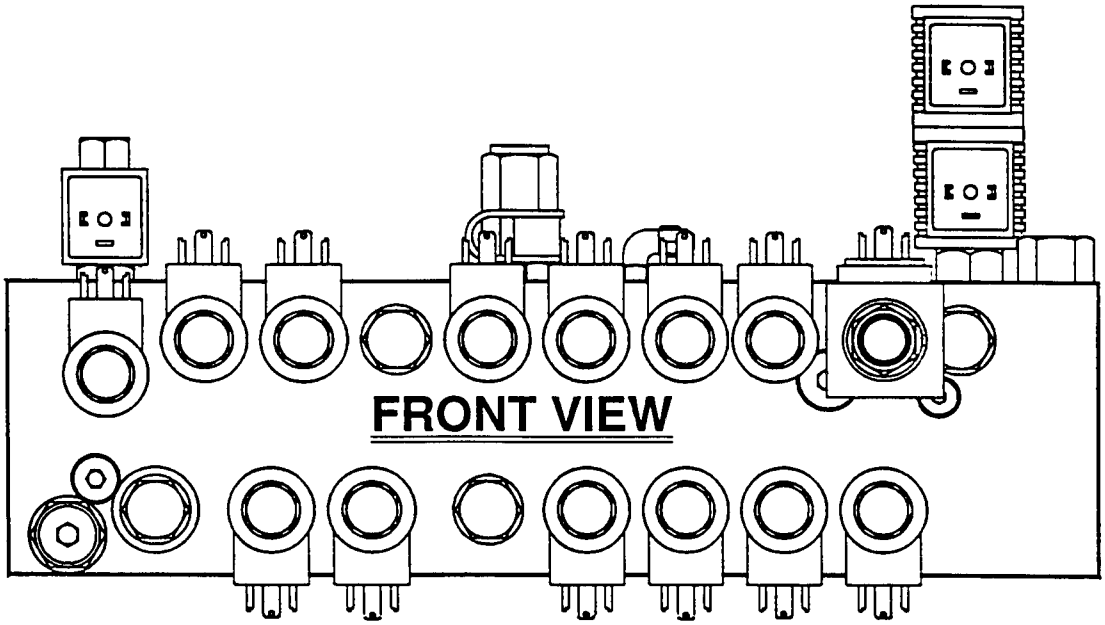
81541 FUNCTIONS VALVE

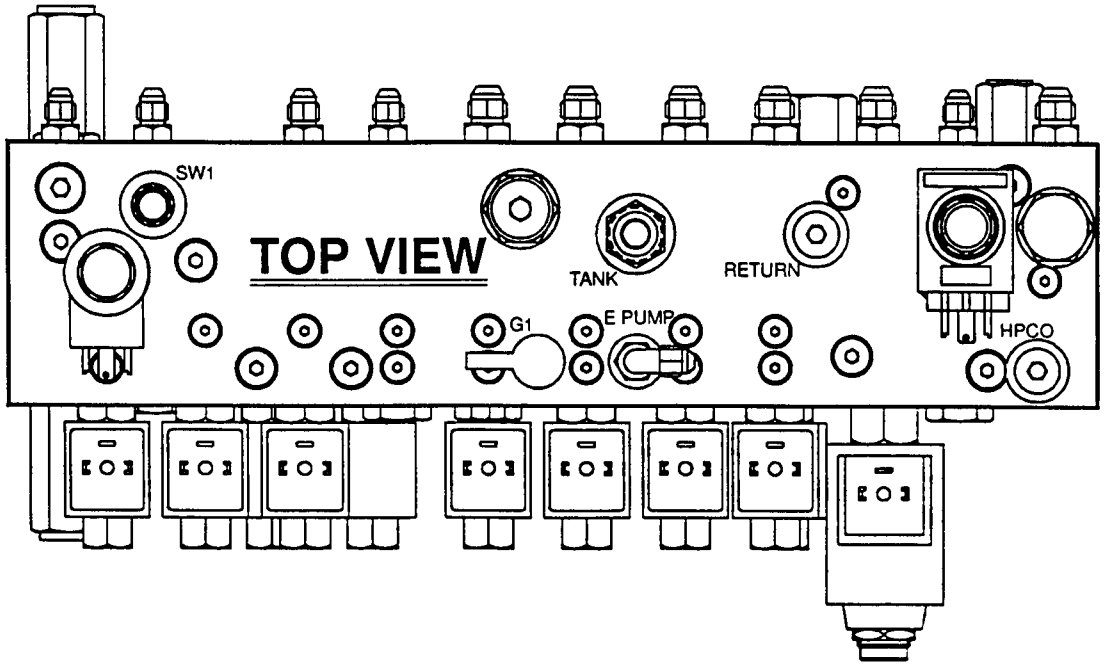
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12.....BOOM UP SOLENOID VALVE
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14.....PLATFORM LEVEL UP FLOW RESTRICTOR
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32.....BRAKE RELEASE SOLENOID VALVE
33.....BRAKE HOLD SOLENOID VALVE
34.....BRAKE ADJUST NEEDLE VALVE

HYDRAULIC INSTALATION

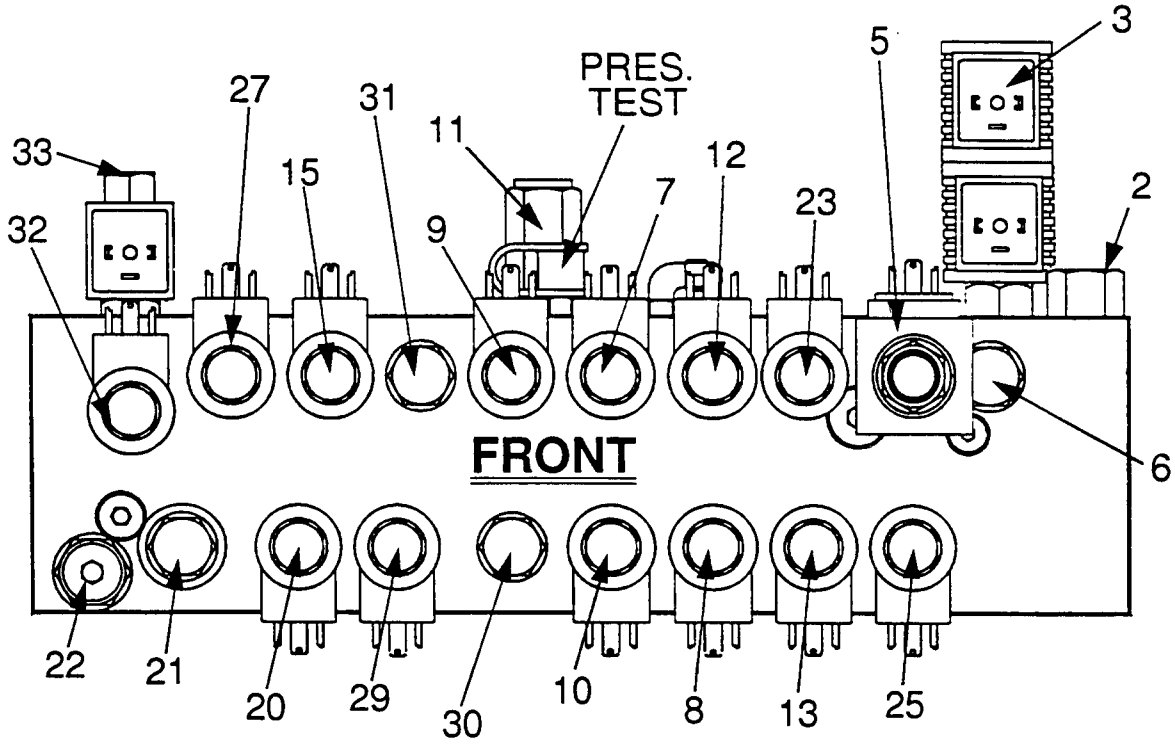
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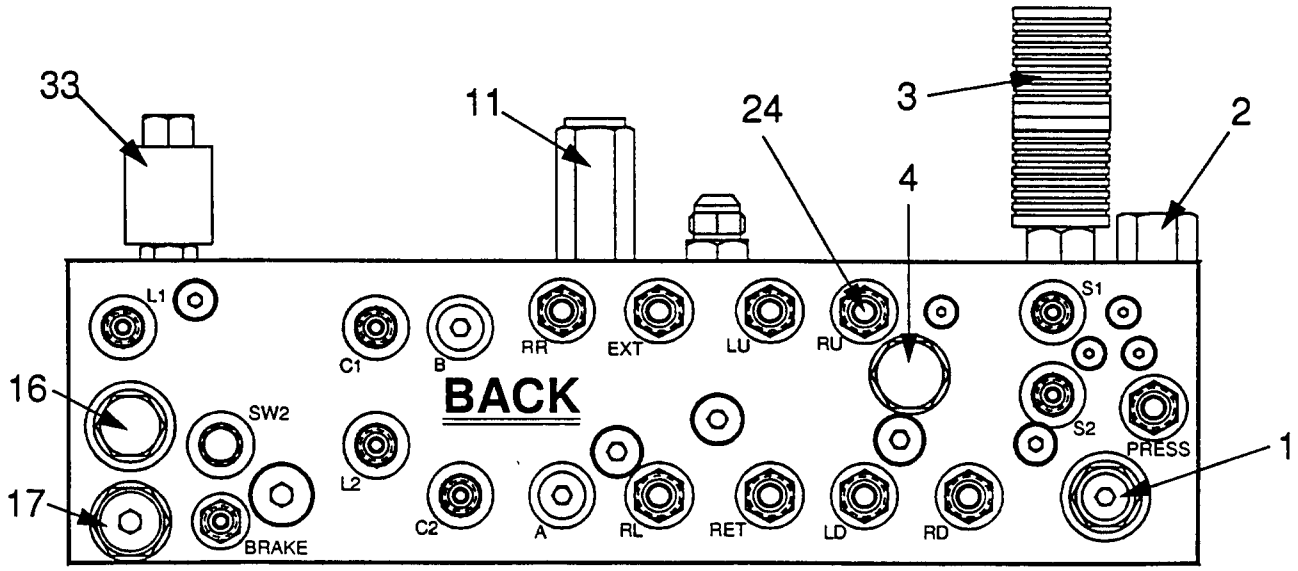
(EFFECTIVE APPROXIMATELY MID 1996)





81542 FUNCTIONS VALVE

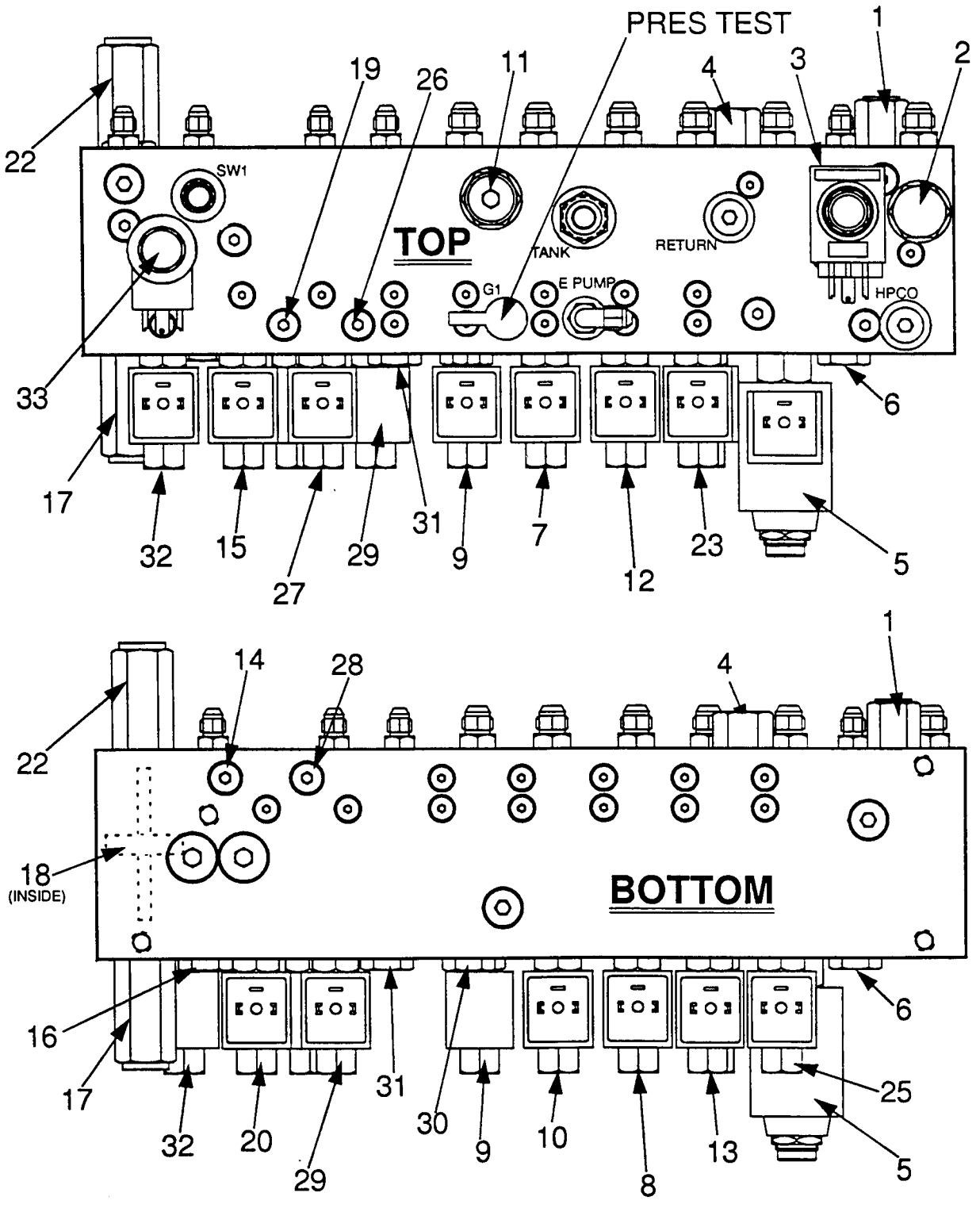




81542 FUNCTIONS VALVE

1. .....SYSTEM RELIEF VALVE
2. .....STEERING FLOW REGULATOR
3. .....STEERING DIRECTIONAL CONTROL VALVE
4. .....DIFFERENTIAL PRESSURE SENSING VALVE
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6. .....EMERGENCY PUMP CHECK VALVE
7. .....BOOM OUT SOLENOID VALVE
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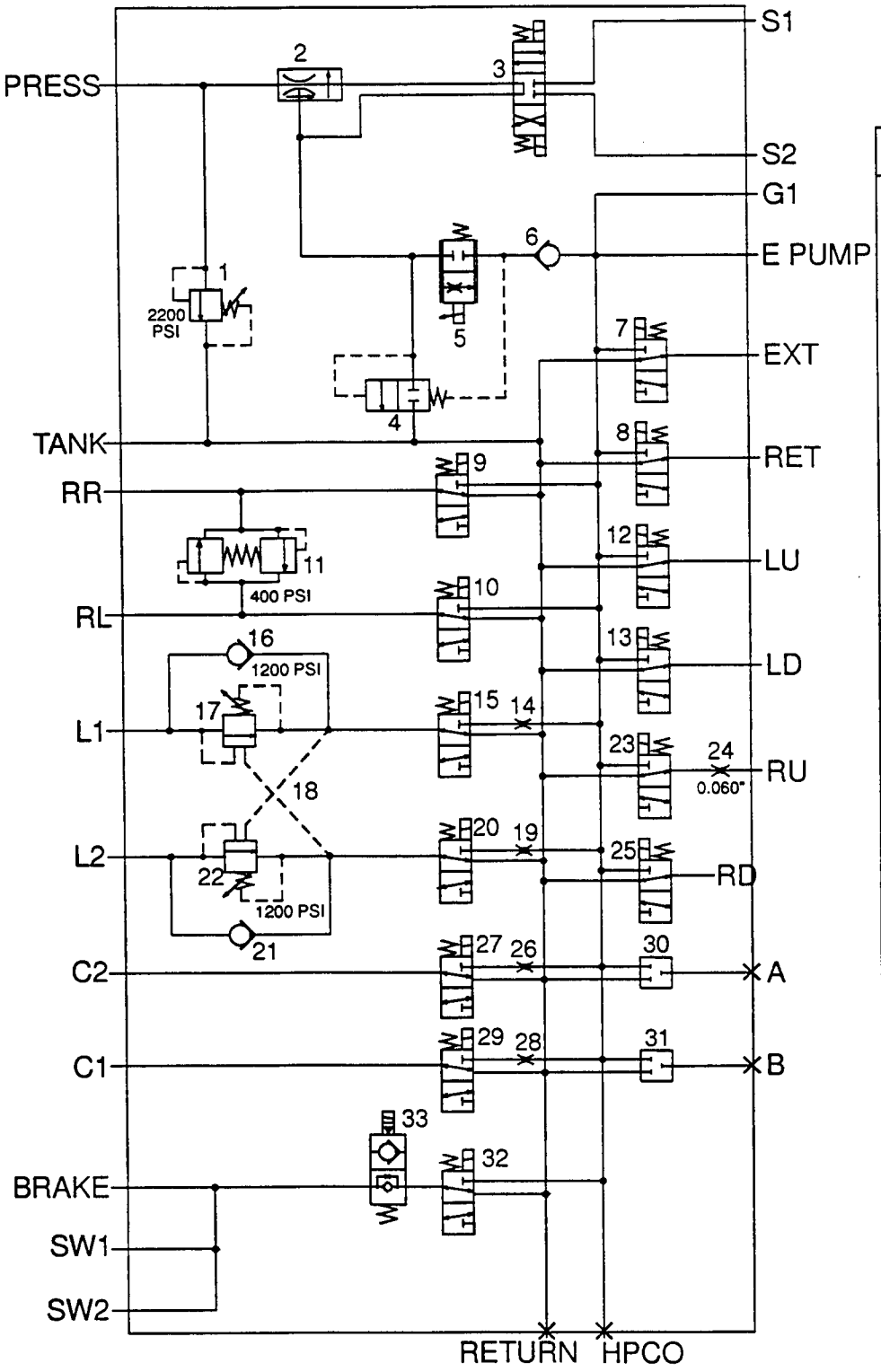
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81542 FUNCTIONS VALVE



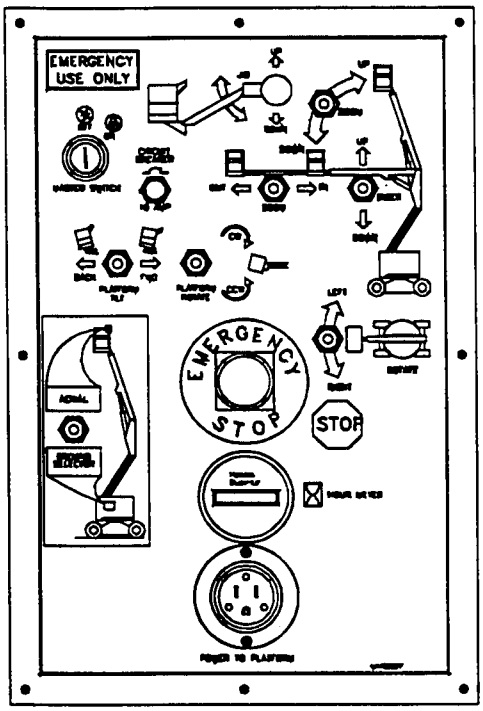
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C2	PLAT. ROTATE CW
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EXT	BOOM OUT
G1	PRESURE TEST
HPCO	N/A (BLOCKED)
L1	PLATFORM LEVEL UP
L2	PLAT. LEVEL DOWN
LD	BOOM DOWN
LU	BOOM UP
PRESS	MAIN PUMP INLET
RD	RISER DOWN
RET	BOOM IN
RETURN	N/A (BLOCKED)
RL	TURRET ROT. LEFT
RR	TURRET ROT. RIGHT
RU	RISER UP
S1	STEER LEFT
S2	STEER RIGHT
SW1	1000 PSI PRES. SW.
SW2	2000 PSI PRES. SW.
TANK	TANK RETURN

81542 FUNCTIONS VALVE

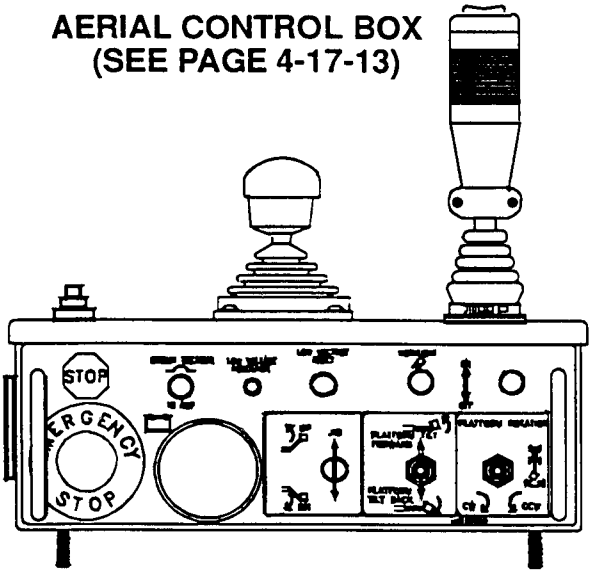
1. .....SYSTEM RELIEF VALVE
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4. .....DIFFERENTIAL PRESSURE SENSING VALVE
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ELECTRICAL INSTALATION

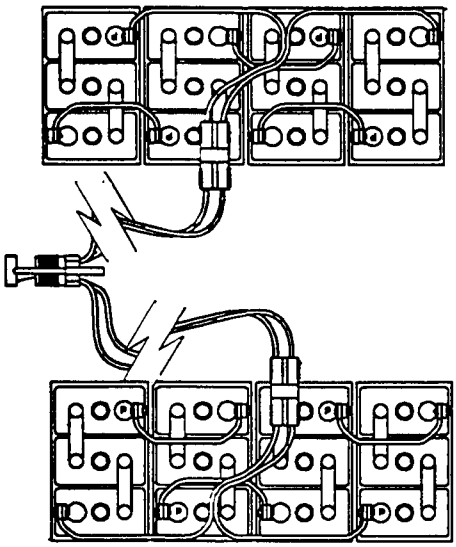
GROUND CONTROL BOX
(SEE PAGE 4-17-1)



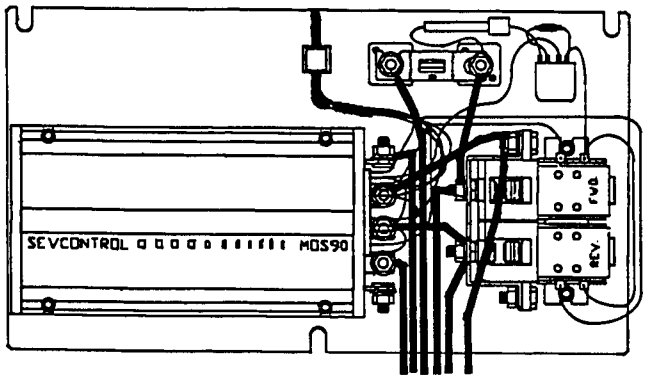
AERIAL CONTROL BOX
(SEE PAGE 4-17-13)



BATTERY INSTALATION
(SEE PAGE 4-17-22)



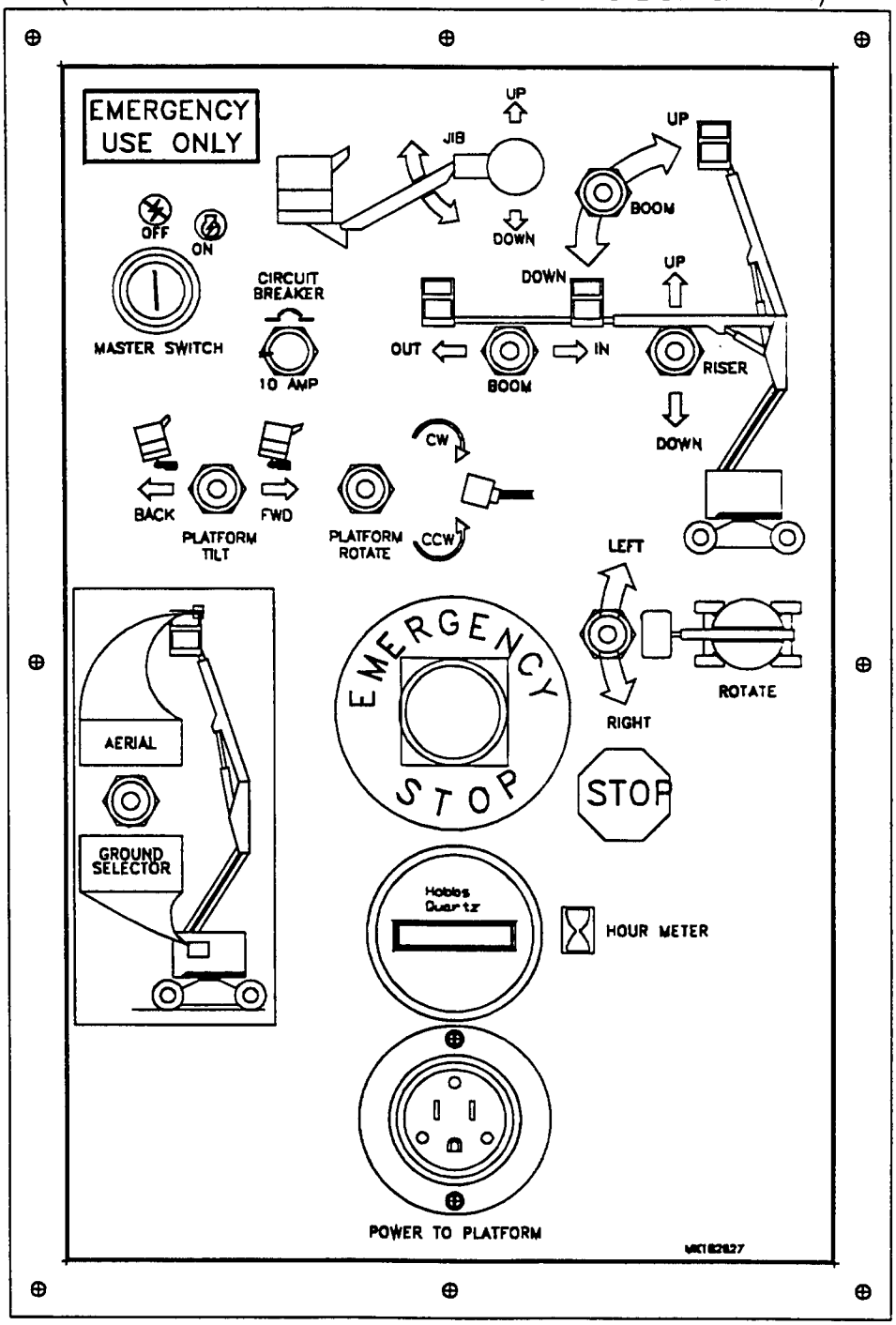
CONTACTOR PANEL
(SEE PAGE 4-17-21)



ELECTRICAL INSTALATION

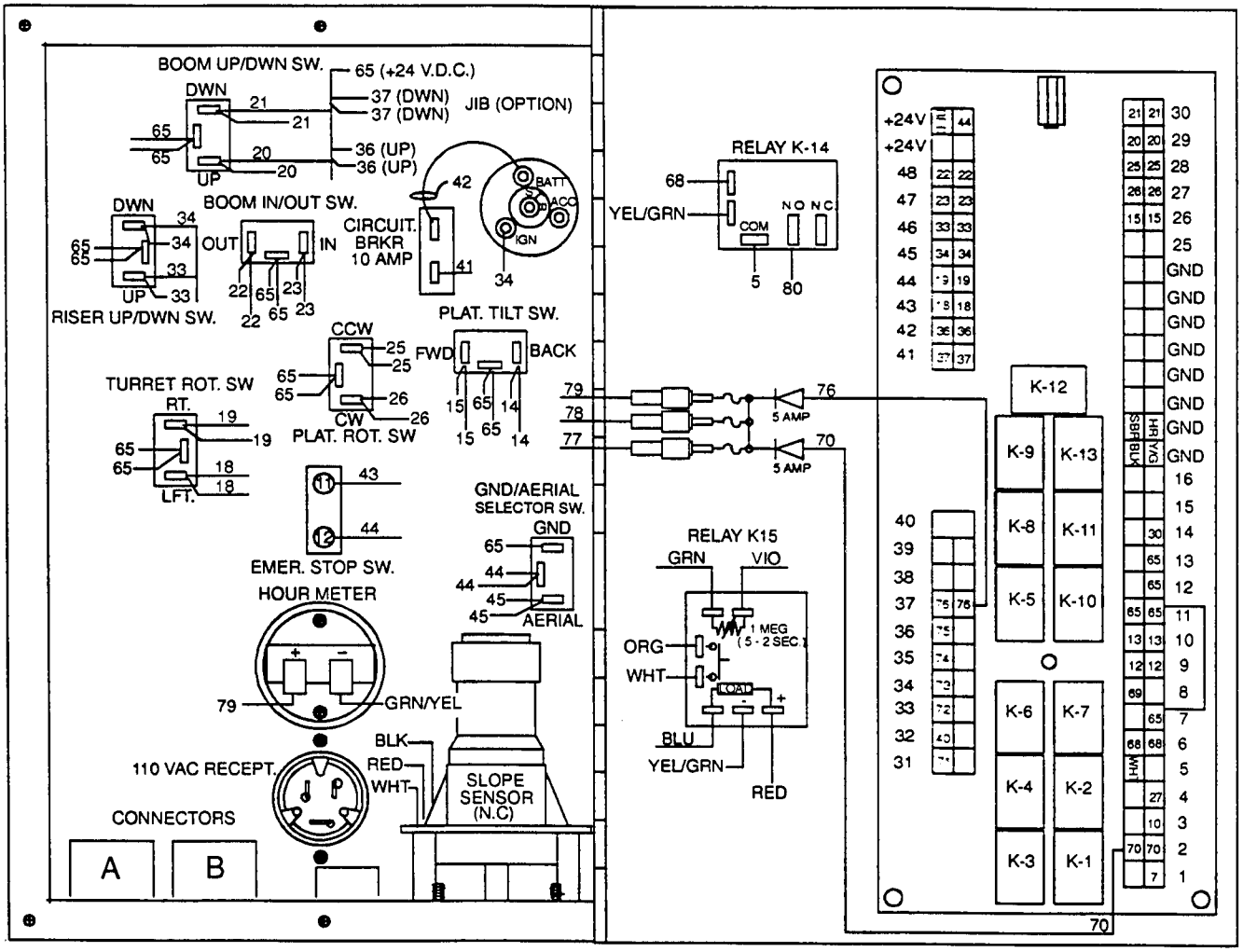
GROUND CONTROL BOX P/N 141776

(GROUND CONTROL BOXES PRIOR TO BOX S/N 174)

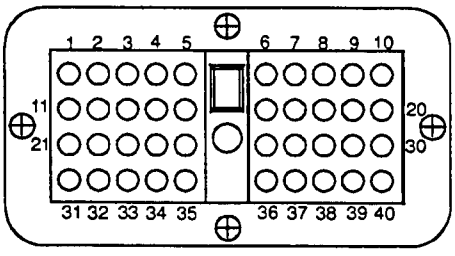


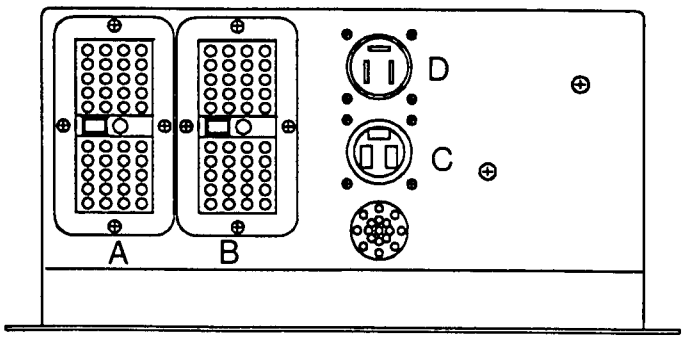
ELECTRICAL INSTALATION

(GROUND CONTROL BOXES PRIOR TO BOX S/N 174)



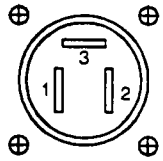
TYP. FOR CONNECTOR A & B





TYP. FOR CONNECTOR C



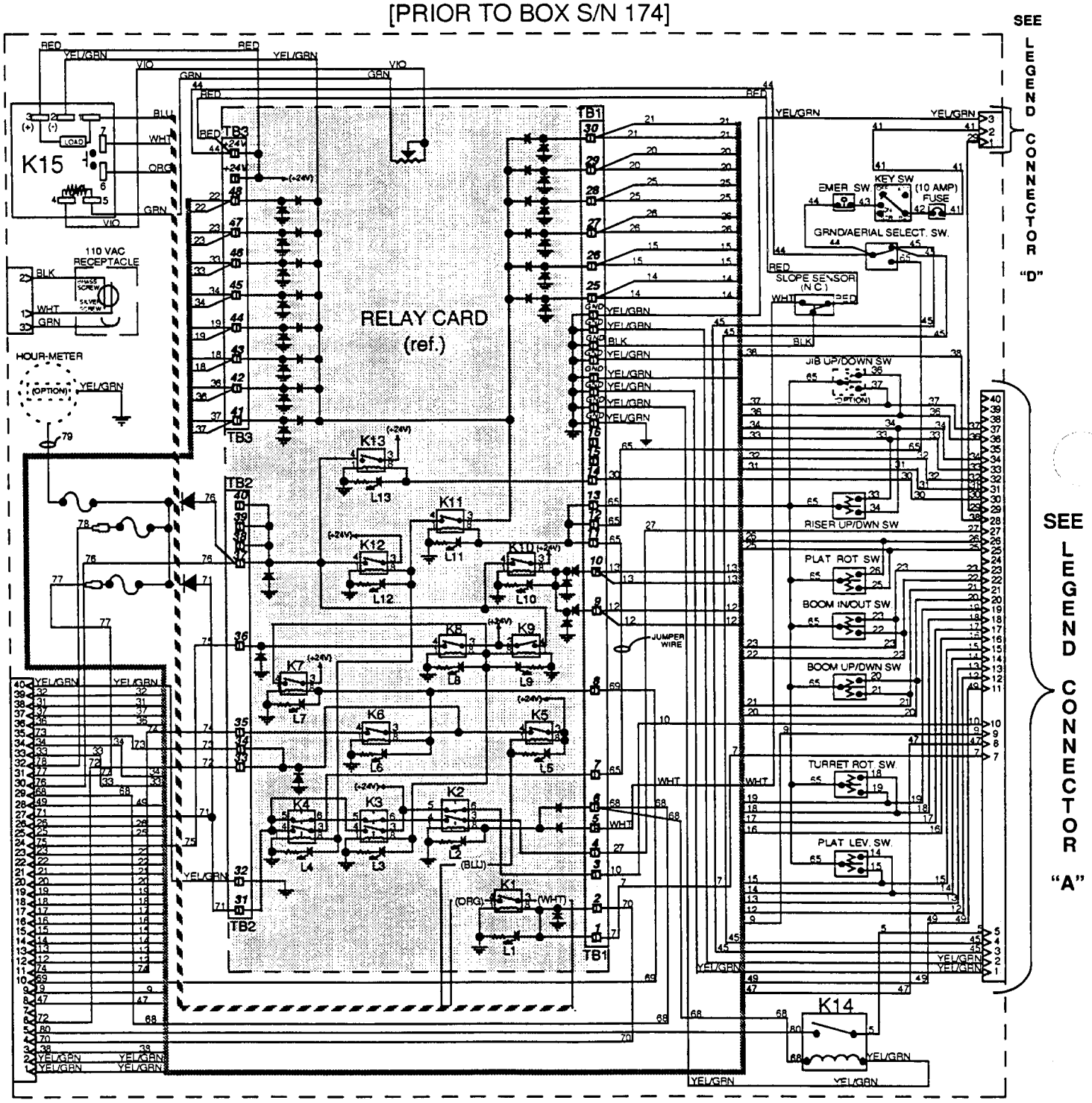


TYP. FOR CONNECTOR D

ELECTRICAL INSTALATION

GROUND CONTROL BOX (P/N 141776)

[PRIOR TO BOX S/N 174]



LEGEND: CONNECTOR "D" (FROM BATTERY DISCONNECT)

PIN NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

1 - 29 - INPUT, BATTERY (+) 48 VOLTS DC TO PIN 29 CONNECTOR "A"
2 - 41 - INPUT, BATTERY (+) 24 VOLTS DC TO "CONTROL" CIRCUIT POWER FUSE
3 - YEL/GRN - BATTERY (-)/"GROUND" TO GROUND "BUSS" ON RELAY CARD

LEGEND: CONNECTOR "A" (TO AERIAL BOX)

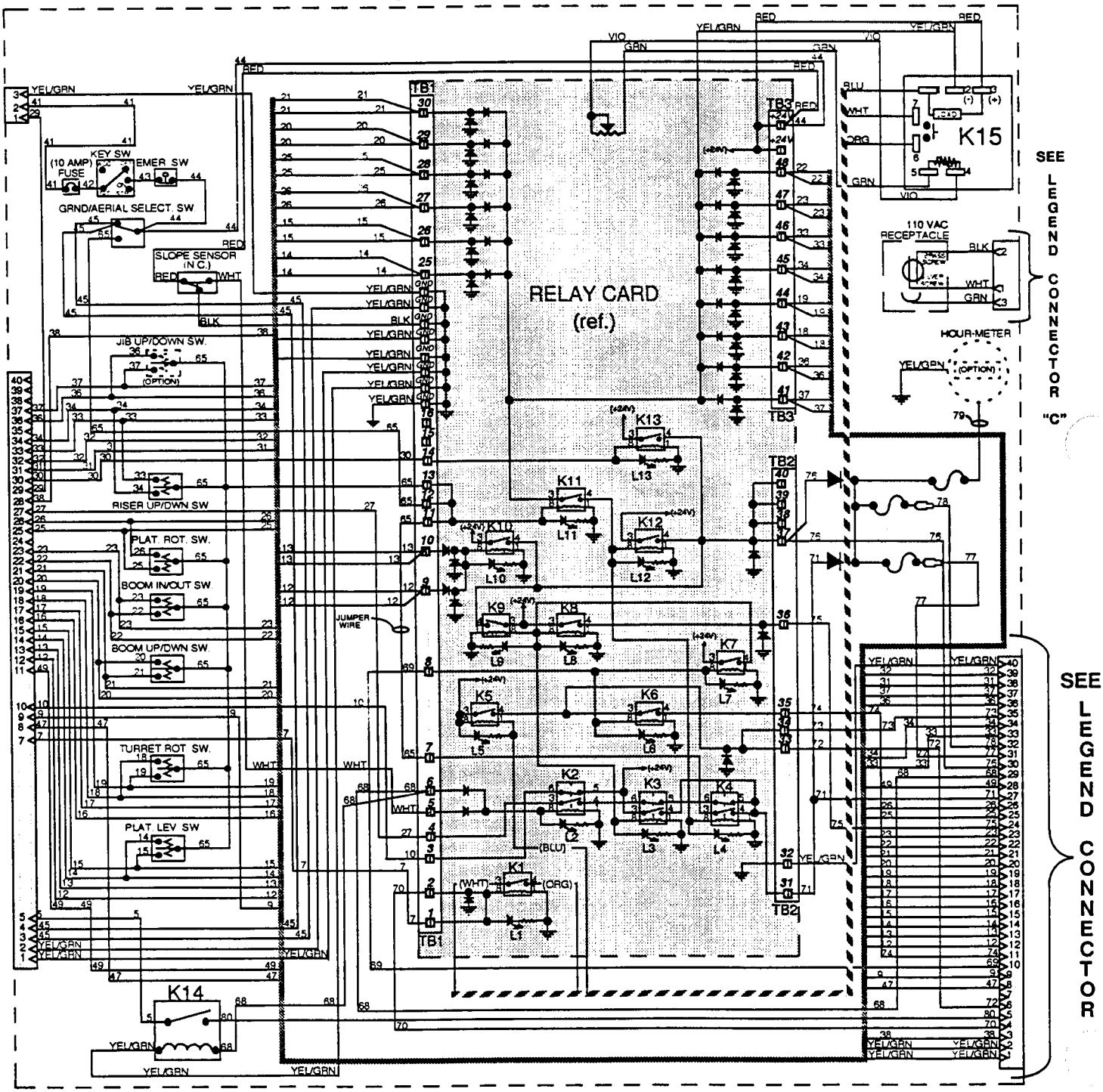
PIN NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

1 - (YEL/GRN) - BAT. (-)/ "GROUND" FROM GRND BUSS ON RELAY CARD TO AERIAL BOX
2 - (YEL/GRN) - BAT. (-)/ "GROUND" FROM GRND BUSS ON RELAY CARD TO AERIAL BOX
3 - 45 - OUTPUT, BAT. (+)/24 VDC TO AERIAL
4 - 45 - OUTPUT, BAT. (+)/24 VDC TO AERIAL
5 - 80 - INPUT, FROM HI-SPD SELECT SW. TO "COMMON" CONTACT OF RELAY K14
6 - x - NO PIN INSTALLED, NOT USED
7 - 7 - INPUT, DRIVE ENABLE FROM DRIVE AUX. (K11) IN AERIAL BOX TO TERM. 1 ON RELAY CARD
8 - 47 - INPUT, 24 VDC FROM EMER. STOP SW.TO PIN 8 CONNECTOR "B"
9 - 9 - INPUT, "VARIABLE SPD. SIGNAL" (10K TO 0 OHMS) FROM DRIVE LEVER TO PIN 9 CONNECTOR "B"
10 - 10 - OUTPUT, 24 VDC FROM TERM. 3 OF RELAY CARD (RELAY K2) TO INSTAB. ALARM
11 - 49 - INPUT, 24 VDC FROM FOOT SW. TO PIN 28 OF CONNECTOR "B"
12 - 12 - INPUT, FROM STEER LEFT SW. TO TERM. 9 ON RELAY CARD & PIN 12 CONNECTOR "B"
13 - 13 - INPUT, FROM STEER RIGHT SW. TO TERM. 10 ON RELAY CARD & PIN 13 CONNECTOR "B"
14 - 14 - INPUT, FROM PLAT. TILT FWD. SW. TO TERM. 25 ON RELAY CARD & PIN 14 CONNECTOR "B"
15 - 15 - INPUT, FROM PLAT. TILT REV. SW. TO TERM. 26 ON RELAY CARD & PIN 15 CONNECTOR "B"
16 - 16 - INPUT, FROM DRIVE FWD. SW. TO PIN 16 CONNECTOR "B"
17 - 17 - INPUT, FROM DRIVE REV. SW. TO PIN 17 CONNECTOR "B"
18 - 8 - INPUT, FROM TURRET ROT. RIGHT/CW TO TERM. 43 ON RELAY CARD & PIN 18 CONNECTOR "B"
19 - 19 - INPUT, FROM TURRET ROT. LEFT/CCW TO TERM. 44 ON RELAY CARD & PIN 19 CONNECTOR "B"
20 - 20 - INPUT, FROM BOOM UP TO TERM. 29 ON RELAY CARD & PIN 20 CONNECTOR "B"
21 - 21 - INPUT, FROM BOOM DOWN TO TERM. 30 ON RELAY CARD & PIN 21 CONNECTOR "B"
22 - 22 - INPUT, FROM BOOM OUT/EXT. TO TERM. 48 ON RELAY CARD & PIN 22 CONNECTOR "B"
23 - 23 - INPUT, FROM BOOM IN/RET. TO TERM. 47 ON RELAY CARD & PIN 23 CONNECTOR "B"
24 - x - NO PIN INSTALLED, NOT USED
25 - 25 - INPUT, FROM PLAT. ROT. RIGHT/CCW SW. TO TERM. 28 ON RELAY CARD & PIN 25 CONNECTOR "B"
26 - 26 - INPUT, FROM PLAT. ROT. LEFT/CW SW. TO TERM. 27 ON RELAY CARD & PIN 26 CONNECTOR "B"
27 - 27 - INPUT, PROPORTIONAL SIGNAL FROM BOOM/TURRET CONTROLLER TO TERM. 4 OF RELAY CARD
28 - 38 - (OPTION) INPUT, 24 VDC FROM AUX. SW. TO PIN 3 CONNECTOR "B"
29 - 29 - OUTPUT, 48 VDC TO LOW BATT. WARNING L.E.D./BATTERY INDICATOR
30 - 30 - INPUT, 24 VDC AUX. FROM BOOM FUNCTIONS TO TERM. 14 OF RELAY CARD
31 - 31 - (OPTION) INPUT/OUTPUT, LOW VOLTAGE RESET
32 - 32 - (OPTION) INPUT/OUTPUT, LOW VOLTAGE RESET
33 - 33 - INPUT, FROM RISER UP TO TERM. 46 ON RELAY CARD & PIN 33 CONNECTOR "B"
34 - 34 - INPUT, FROM RISER DOWN TO TERM. 45 ON RELAY CARD & PIN 34 CONNECTOR "B"
35 - x - NO PIN INSTALLED, NOT USED
36 - 36 - (OPTION) INPUT, JIB UP SW. TO TERM. 42 OF RELAY CARD & PIN 36 CONNECTOR "B"
37 - 37 - (OPTION) INPUT, JIB DOWN SW. TO TERM. 41 OF RELAY CARD & PIN 37 CONNECTOR "B"
38 - x - NO PIN INSTALLED, NOT USED
39 - x - NO PIN INSTALLED, NOT USED
40 - x - NO PIN INSTALLED, NOT USED

ELECTRICAL INSTALATION

GROUND CONTROL BOX (P/N 141776)

[PRIOR TO BOX S/N 174]



LEGEND: CONNECTOR "B" (TO VALVE ASSY. AND BASE)

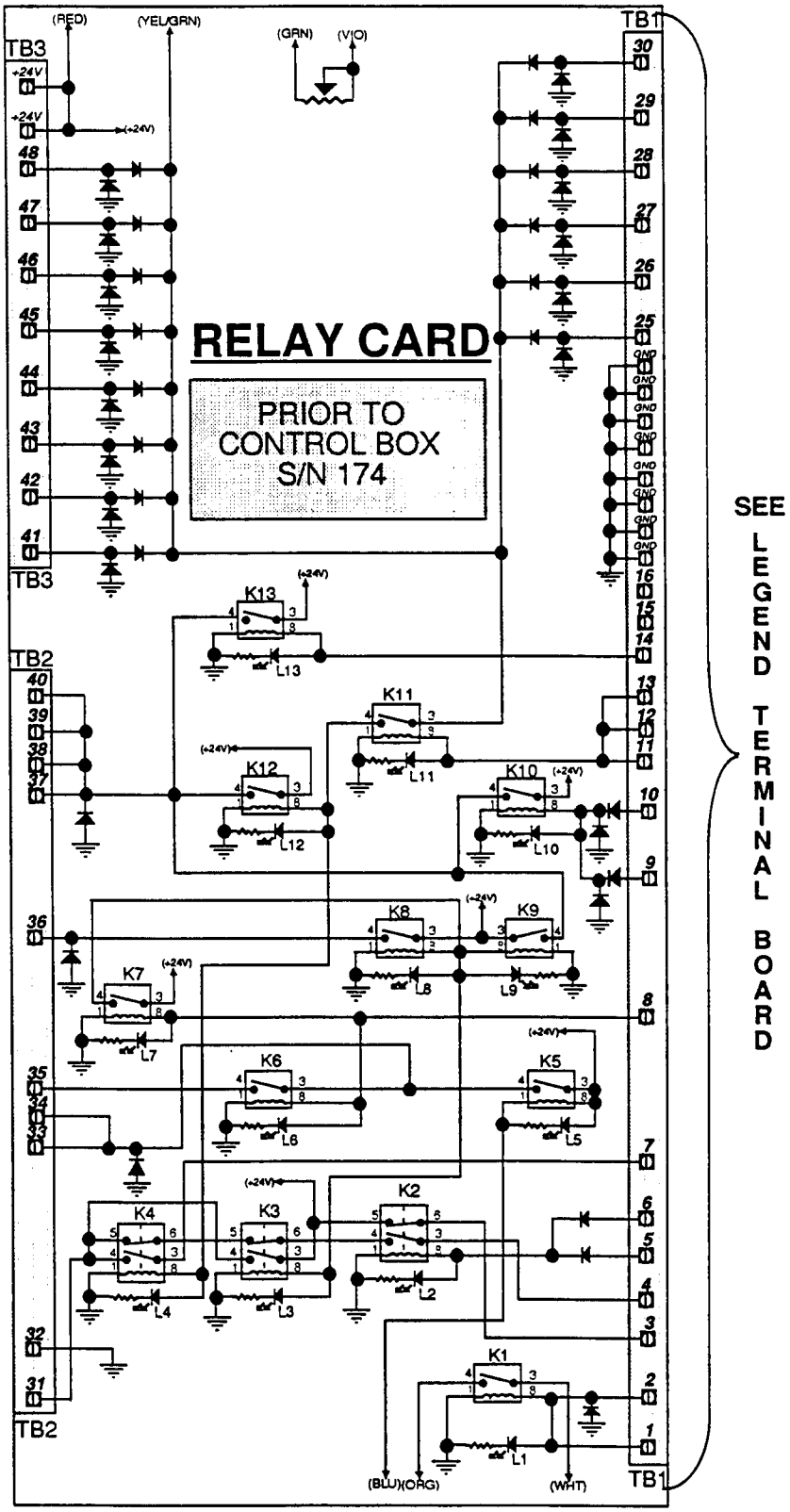
PIN NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

1 - (YEL/GRN) - BAT. (-)/ "GROUND" TO VALVE ASSY. WIRING HARNESS
2 - (YEL/GRN) - BAT. (-)/ "GROUND" TO VALVE ASSY. WIRING HARNESS
3 - 38 - (OPTION) AUX. SW. OUTPUT
4 - 70 - OUTPUT, 24 VDC TO TRAVEL ALARM FROM TERM. 2 OF RELAY CARD
5 - 80 - OUTPUT, 24 VDC FROM "N.O." CONTACT OF RELAY K14 TO PIN 4 (HI-SPD INPUT) OF DRIVE CNTRLR.
6 - 72 - OUTPUT, 24 VDC FROM TERM. 23 OF RELAY CARD TO 1000 PSI BRAKE PRES. SW.
7 - x - NO PIN INSTALLED, NOT USED
8 - 47 - OUTPUT, 24 VDC FROM FOOT SW. TO PIN 6 (DRIVE ENABLE) OF DRIVE CONTROLLER
9 - 9 - OUTPUT, VARIABLE 0 TO 5K OHMS FROM DRIVE LEVER TO PIN 14 (ACCEL.) OF DRIVE CONTROLLER
10 - 69 - OUTPUT, 24 VDC FROM TERM. 8 OF RELAY CARD TO 2000 PSI BRAKE PRES. SW.
11 - 74 - INPUT, 24 VDC FROM 1000/2000 PSI BRAKE PRES SW. TO TERM. 35 OF RELAY CARD
12 - 12 - OUTPUT, TO STEER LEFT COIL OF STEERING DIRECTIONAL CONTROL VALVE
13 - 13 - OUTPUT, TO STEER RIGHT COIL OF STEERING DIRECTIONAL CONTROL VALVE
14 - 14 - OUTPUT, TO COIL OF PLATFORM TILT FWD. SOLENOID VALVE
15 - 15 - OUTPUT, TO COIL OF PLATFORM TILT REV. SOLENOID VALVE
16 - 16 - OUTPUT, TO COIL OF DRIVE FWD. CONTACTOR & PIN 8 OF DRIVE CONTROLLER
17 - 17 - OUTPUT, TO COIL OF DRIVE REV. CONTACTOR & PIN 5 OF DRIVE CONTROLLER
18 - 18 - OUTPUT, TO COIL OF TURRET ROT. RIGHT/CW SOLENOID VALVE
19 - 19 - OUTPUT, TO COIL OF TURRET ROT. LEFT/CCW SOLENOID VALVE
20 - 20 - OUTPUT, TO COIL OF BOOM UP SOLENOID VALVE
21 - 21 - OUTPUT, TO COIL OF BOOM DOWN SOLENOID VALVE
22 - 22 - OUTPUT, TO COIL OF BOOM OUT/EXT. SOLENOID VALVE
23 - 23 - OUTPUT, TO COIL OF BOOM IN/RET. SOLENOID VALVE
24 - 75 - OUTPUT, 24 VDC TO COIL OF BRAKE RELEASE SOLENOID VALVE FROM TERM.36 OF RELAY CARD
25 - 25 - OUTPUT, TO COIL OF PLAT. ROT. RIGHT/CCW SOLENOID VALVE
26 - 26 - OUTPUT, TO COIL OF PLAT. ROT. LEFT/CW SOLENOID VALVE
27 - 71 - OUTPUT, TO COIL OF PROPORTIONAL SOLENOID VALVE FROM TERM. 31 OF RELAY CARD
28 - 49 - OUTPUT, 24 VDC TO HI-SPD. ENABLE PROX. SW.
29 - 68 - INPUT, 24VDC FROM HI-SPD. ENABLE PROX. SW.
30 - 76 - OUTPUT, 24 VDC TO COIL OF PUMP MOTOR RELAY FROM TERM. 36 OF RELAY CARD
31 - 77 - OUTPUT, 24VDC TO BEACON LIGHT (OPTION)
32 - 78 - OUTPUT, 24 VDC TO ALL MOTION ALARM (OPTION)
33 - 33 - OUTPUT, TO COIL OF RISER UP SOLENOID VALVE
34 - 34 - OUTPUT, TO COIL OF RISER DOWN SOLENOID VALVE
35 - 73 - OUTPUT, TO COIL OF BRAKE HOLD/RELEASE SOLENOID VALVE
36 - 36 - OUTPUT, TO COIL OF JIB UP SOLENOID VALVE(OPTION)
37 - 37 - OUTPUT, TO COIL OF JIB DOWN SOLENOID VALVE
38 - 31 - (OPTION) INPUT/OUTPUT, LOW VOLTAGE RESET
39 - 32 - (OPTION) INPUT/OUTPUT, LOW VOLTAGE RESET
40 - 40 - "GROUND",COIL OF PROPORTIONAL SOLENOID VALVE TO TERM. 32 OF RELAY CARD

LEGEND: CONNECTOR "C" (110 VAC)

PIN NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

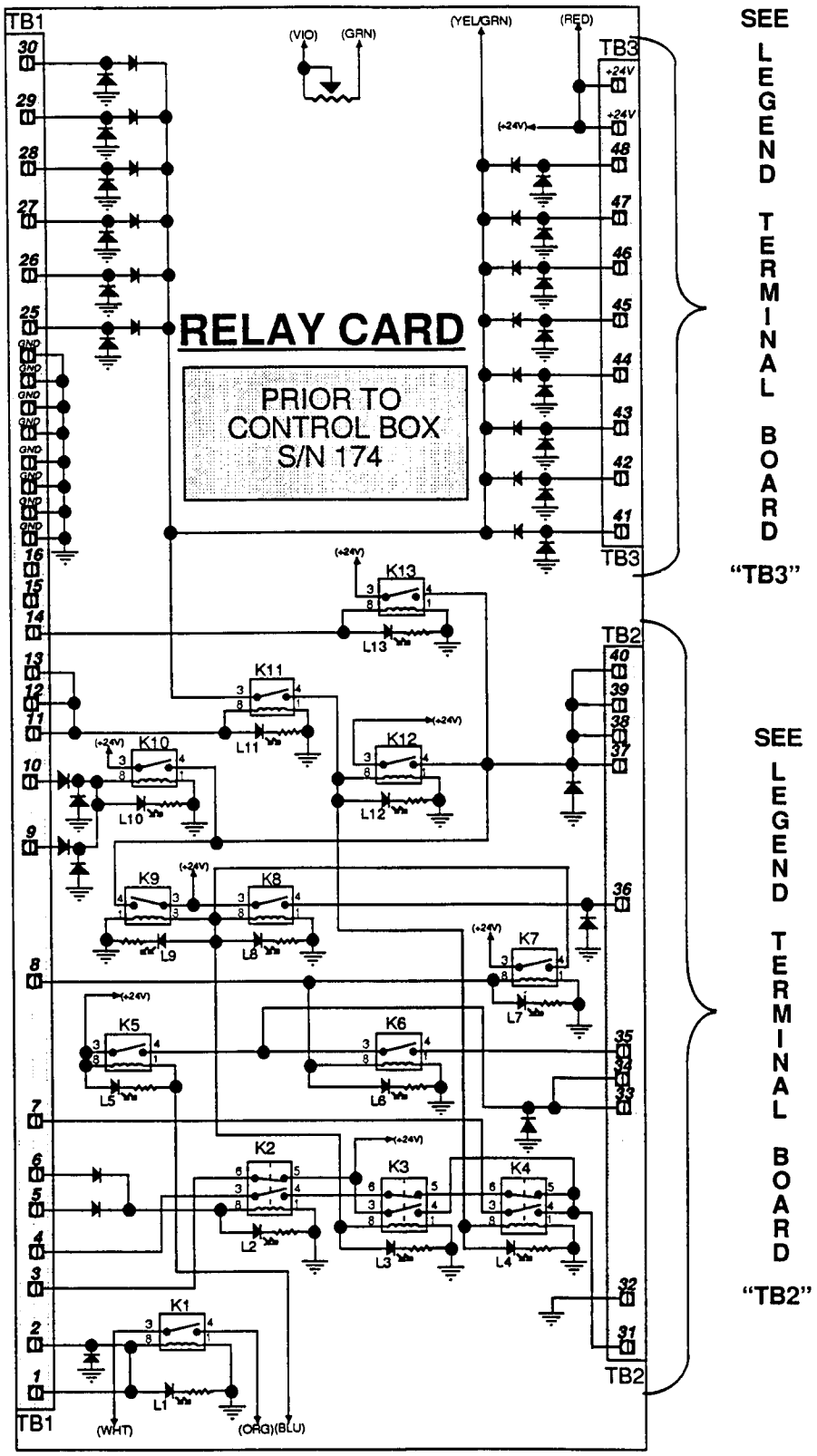
1 - WHITE - "NUETRAL", 110 VOLT A.C. INPUT FROM "SILVER" SCREW ON RECEPTACLE IN GROUND BOX
2 - BLACK - "HOT", 110 VOLT A.C. INPUT FROM "GOLD" SCREW ON RECEPTACLE IN GROUND BOX
3 - GREEN - "GROUND"/"EARTH", FROM RECEPTACLE IN GROUND BOX


RELAY CARD
PRIOR TO CONTROL BOX S/N 174
TB1
TB2
TB3
(RED)
(YEL/GRN)
(GRN)
(V/O)
(+24V)
K1
K2
K3
K4
K5
K6
K7
K8
K9
K10
K11
K12
K13
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
(BLU)(ORG)
(WHT)
SEE LEGEND TERMINAL BOARD

LEGEND: "TB1" (TERMINAL STRIP #1)

TERMINAL NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

GND - YEL/GRN - BATTERY NEGATIVE (-)
GND - YEL/GRN - VALVE HARNESS GRND
GND - YEL/GRN - VALVE HARNESS GRND
GND - YEL/GRN - AERIAL BOX GRND
GND - YEL/GRN - AERIAL BOX & K15 GRND
GND - BLK - SLOPE SENSOR GRND
GND - YEL/GRN - K14 GRND
GND - YEL/GRN - CHASSIS GRND
1 - 7 - DRIVE FUNCTION ENABLE
2 - 70 -TRAVEL ALARM POWER
3 - 10 - INSTAB. ALARM "INPUT"
4 - 27 - BOOM/TURRET CONTROL PROPORTIONAL VALVE "OUTPUT"
5 - WHT - SLOPE SENSOR "OUTPUT"
6 - 68 - K14 & PROX. SW. POWER
7 - 65 - "JUMPER" TO TERM. 11
8 - 69 - 2000 PSI PRES. SW. POWER
9 - 12 - STEER LEFT. SW. "INPUT"
10 - 13 - STEER RIGHT. SW. "INPUT"
11 - 65 - JUMPER" FROM TERM. 7
12 - 65 - GRND/AERIAL SELECT. SW. "INPUT"
13 - 65 - GRND BOX FUNCTION TOGGLE SW. POWER
14 - 30 - BOOM FUNCTION ENABLE
25 - 14 - PLAT. TILT FWD. "INPUT"
26 - 15 - PLAT TILT REV. "INPUT"
27 - 26 - PLAT. ROT. LEFT/CW "INPUT"
28 - 25 - PLAT. ROT. RIGHT/CCW "INPUT"
29 - 20 - BOOM UP "INPUT"
30 - 21 - BOOM DOWN "INPUT"
48 - 22 - BOOM OUT/EXT. "INPUT"
47 - 23 - BOOM IN/RET. "INPUT"
46 - 33 - RISER UP "INPUT"
45 - 34 - RISER DOWN "INPUT"
44 - 19 -TURRET ROT. LEFT/CW "INPUT"
43 - 18 - TURRET ROT. RIGHT/CCW "INPUT"
42 - 36 - JIB UP "INPUT" (OPTION)
41 - 37 - JIB DOWN "INPUT" (OPTION)


RELAY CARD
PRIOR TO CONTROL BOX S/N 174
TB1
TB2
TB3
(VIO)
(GRN)
(YEL/GRN)
(RED)
(+24V)
K1
K2
K3
K4
K5
K6
K7
K8
K9
K10
K11
K12
K13
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
(WHT)
(ORG)(BLU)
SEE LEGEND TERMINAL BOARD "TB3"
SEE LEGEND TERMINAL BOARD "TB2"

LEGEND: "TB2" (TERMINAL STRIP #2)

TERMINAL NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

+24VDC - 44 - KEY SW. "INPUT"
+24VDC - RED - SLOPE SENSOR "INPUT"

LEGEND: "TB3" (TERMINAL STRIP #3)

TERMINAL NUMBER - WIRE NUMBER - FUNCTION/PURPOSE

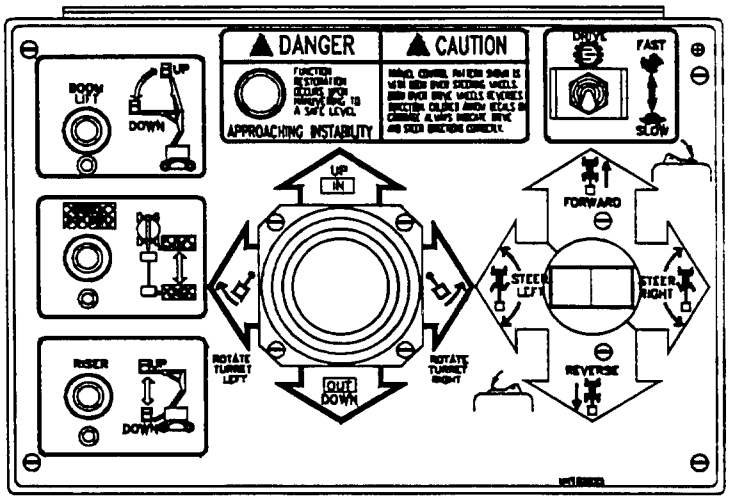
31 - 71 - BOOM/ROT. PROP. "OUTPUT"
32 - YEL/GRN - PROP. VALVE GRND
GND - YEL/GRN - BATTERY NEGATIVE (-)
33 - 72 - 1000 PSI PRES. SW. POWER
34 - 73 - BRAKE ON/OFF VALVE POWER
35 - 74 - BRAKE PRES. SW. "INPUT"
36 - 75 - BRAKE RELEASE VALVE POWER
37 - 76 - PUMP MOTOR RELAY POWER
39 - NONE - NOT USED

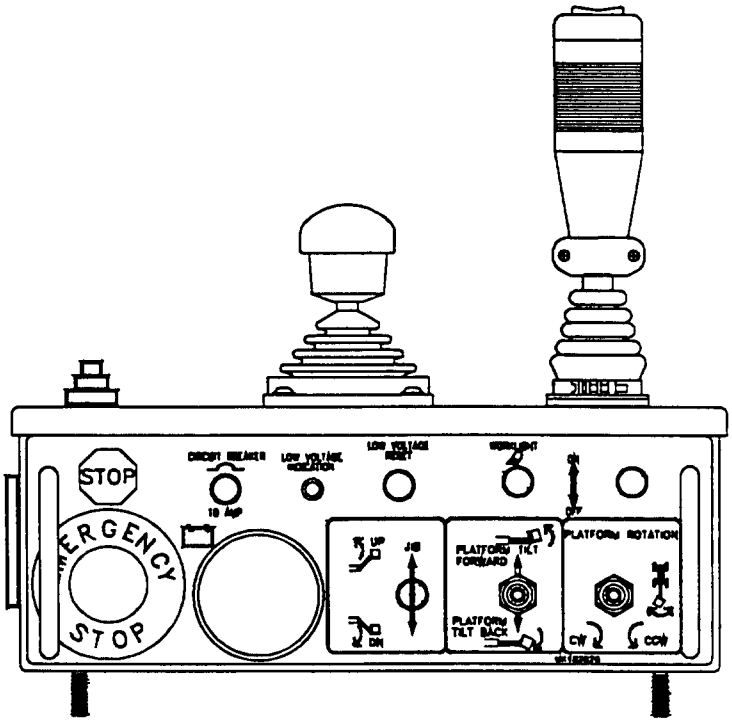
LEGEND: RELAY USAGE

RELAY NUMBER - FUNCTION/PURPOSE

K - 1 = PARKING BRAKE APPLICATION RATE(K-15) ENABLE.
K - 2 = INSTABILITY ALARM WARNING/BOOM OPERATION FUNCTION CUT-OUT
K - 3 = GROUND/AERIAL "RUN".
K - 4 = PROPORTIONAL VALVE "ON" FOR GROUND OPERATION.
K - 5 = POWER "OUT" TO 1000 PSI PRESSURE SW AND BRAKE RELEASE VALVE.
K - 6 = POWER "OUT" TO 2000 PSI PRESSURE SW.
K - 7 = PROPORTIONAL VALVE "ON" FOR BRAKE RELEASE OPERATION.
K - 8 = BRAKE "HOLD" (NOT APPLIED) RELAY.
K - 9 = PUMP MOTOR "ON" RELAY
K-10 = STEER OPERATION PUMP MOTOR "ON" RELAY
K-11 = NON-PROPORTIONAL FUNCTIONS PROPORTIONAL VALVE "ON" RELAY
K-12 = NON-PROPORTIONAL FUNCTIONS PUMP MOTOR "ON" RELAY
K-13 = "OPTION RELAY" (ALL MOTION ALARM, HOUR METER, ETC.)

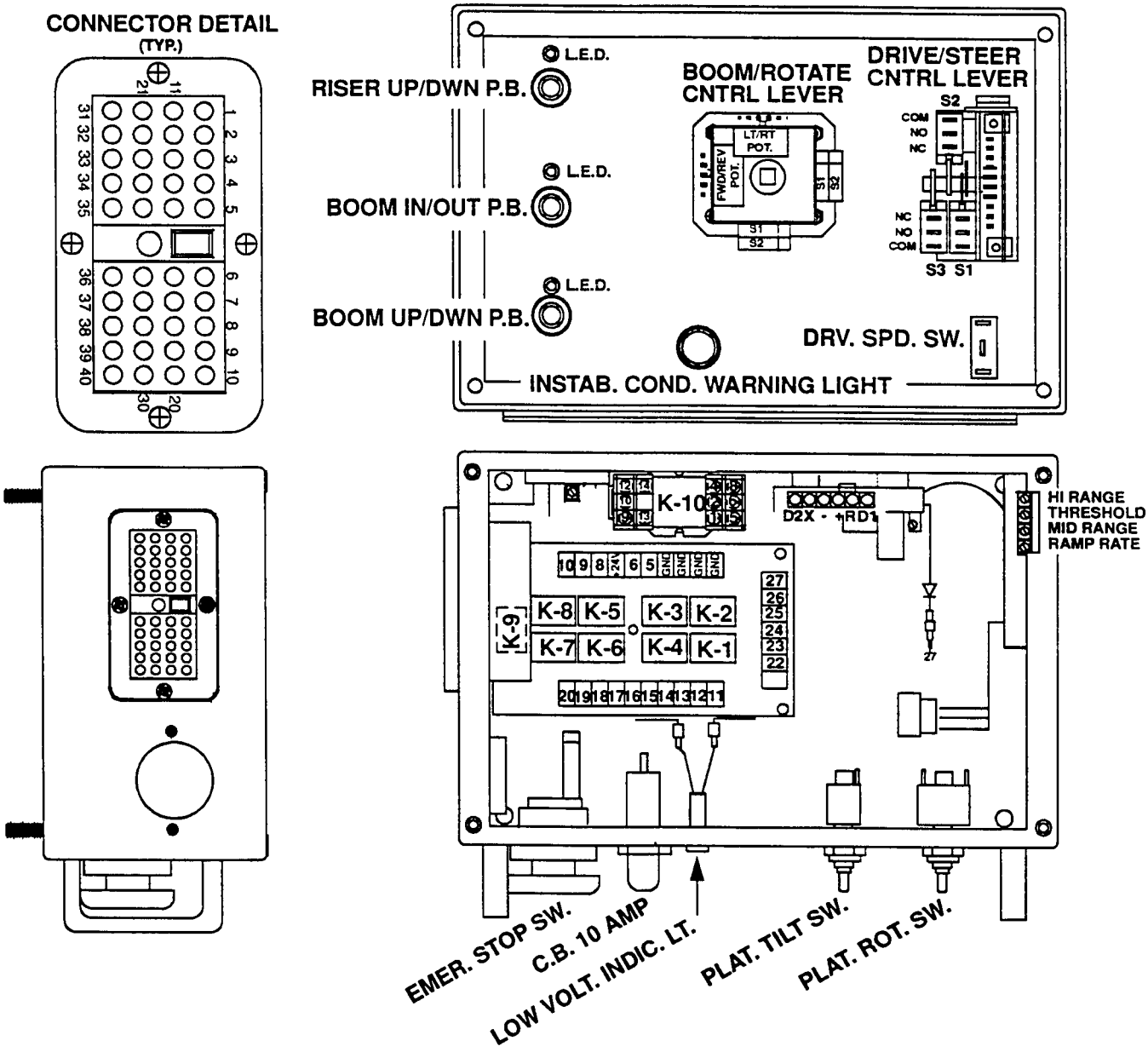
AERIAL CONTROL BOX P/N 141775

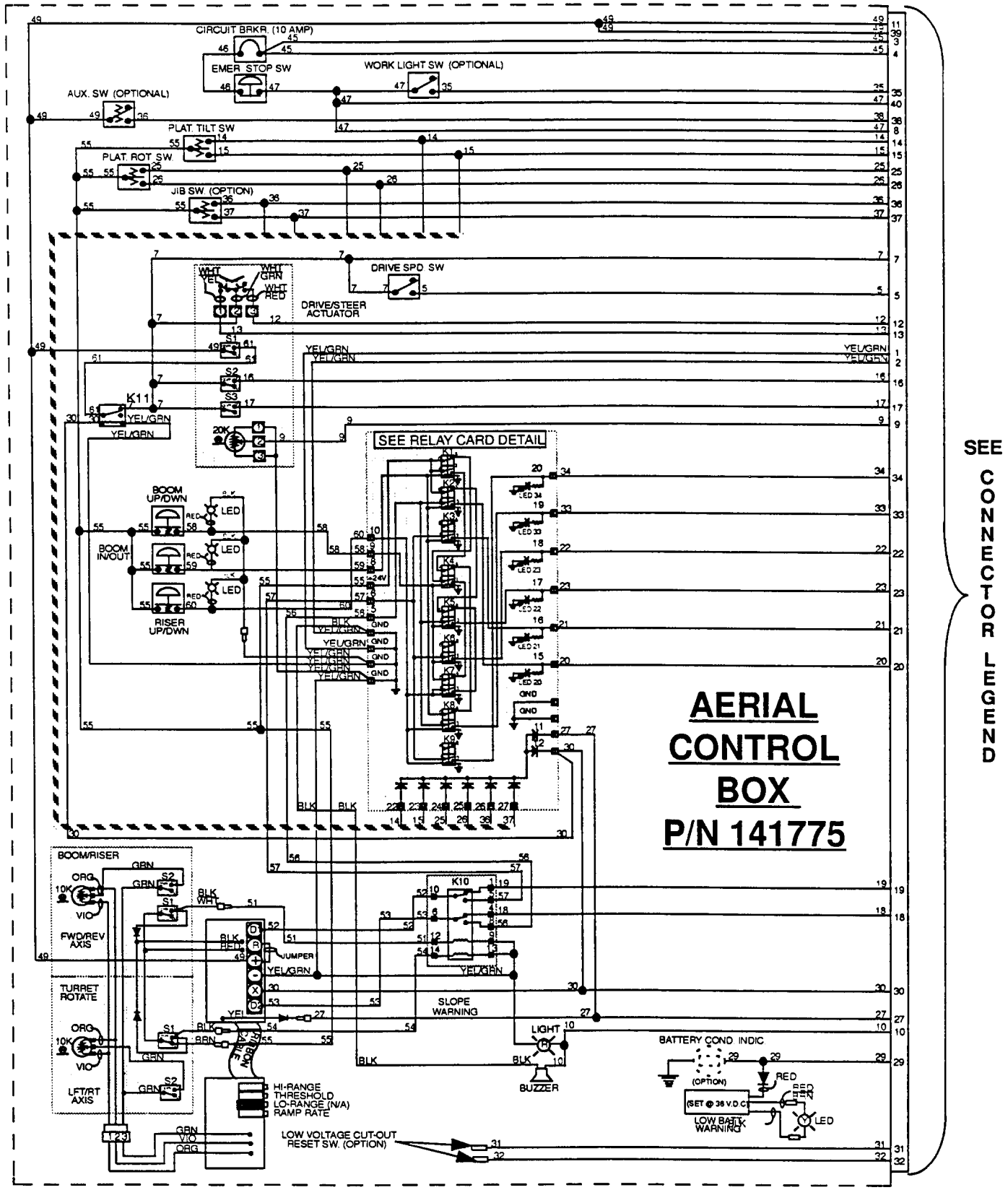




ELECTRICAL INSTALATION

AERIAL CONTROL BOX P/N 141776



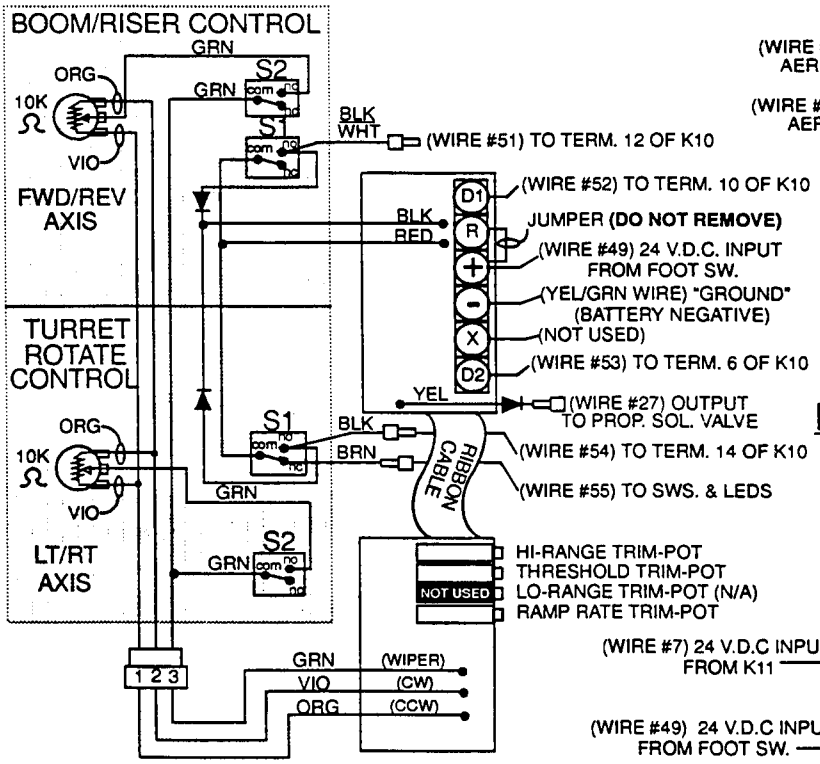

CIRCUIT BRKR. (10 AMP)
EMER. STOP SW
WORK LIGHT SW (OPTIONAL)
AUX. SW (OPTIONAL)
PLAT. TILT SW
PLAT. ROT. SW.
JIB SW. (OPTION)
DRIVE SPD. SW
DRIVE/STEER ACTUATOR
SEE RELAY CARD DETAIL
BOOM UP/DWN
BOOM IN/OUT
RISER UP/DWN
AERIAL CONTROL BOX P/N 141775
BOOM/RISER
FWD/REV AXIS
TURRET ROTATE
LFT/RT AXIS
JUMPER
SLOPE WARNING
LIGHT
BUZZER
BATTERY COND. INDIC.
(OPTION)
(SET @ 36 V.D.C.)
LOW BATT. WARNING
HI-RANGE
THRESHOLD
LO-RANGE (N/A)
RAMP RATE
LOW VOLTAGE CUT-OUT RESET SW. (OPTION)
SEE CONNECTOR LEGEND

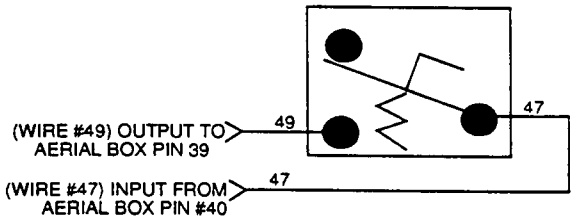
LEGEND: CONNECTOR (AERIAL CONTROL BOX)

PIN NUMBER - WIRE NUMBER - FUNCTION/DESCRIPTION

1 - 1 - BAT. (-)/GRND. (YEL/GRN) TO "GND" ON RELAY CARD IN AERIAL CNTRL.BOX
2 - 2 - BAT. (-)/GRND (YEL/GRN) TO "GND" ON RELAY CARD IN AERIAL CNTRL.BOX
3 - 45 - INPUT, BAT. (+)/24 VDC TO CIRCUIT BREAKER (10 AMP)
4 - 45 - INPUT, BAT. (+)/24 VDC TO CIRCUIT BREAKER (10 AMP)
5 - 5 - OUTPUT, FROM HI-SPD SELECT SW. TO RELAY K14 IN GRND. CNTRL. BOX
6 - x - NO PIN INSTALLED, NOT USED
7 - 7 - OUTPUT, FROM K11 TO TERM. 1 OF RELAY CARD IN GRND. CNTRL. BOX
8 - 47 - OUTPUT, 24 VDCTO DRIVE MOTOR CONTROLLER ("SEVCON")FROM EMER.STOP SW.
9 - 9 - "VARIABLE SPD. SIGNAL" (10K TO 0 OHMS) FROM DRIVE ACTUATOR TO CONTROLLER
10 - 10 - INPUT, 24 VDC FROM TERM. 3 OF RELAY CARD IN GRND BOX (RELAY K2) TO INSTAB. ALARM
11 - 49 - OUTPUT, 24 VDC FROM FOOT SW.TO HI SPD. ENABLE PROX. SW.
12 - 12 - OUTPUT, STEER LEFT TO TERM. 9 ON RELAY CARD & PIN 12 CONNECTOR "B"
13 - 13 - OUTPUT, STEER RIGHT TO TERM. 10 ON RELAY CARD & PIN 13 CONNECTOR "B"
14 - 14 - OUTPUT, PLAT. TILT FWD. TO TERM. 25 ON RELAY CARD & PIN 14 CONNECTOR "B"
15 - 15 - OUTPUT, PLAT. TILT REV. TO TERM. 26 ON RELAY CARD & PIN 15 CONNECTOR "B"
16 - 16 - OUTPUT, DRIVE FWD. TO PIN 16 CONNECTOR "B"
17 - 17 - OUTPUT, DRIVE REV. TO PIN 17 CONNECTOR "B"
18 - 18 - OUTPUT, TURRET ROT. RIGHT/CW TO TERM. 43 ON RELAY CARD & PIN 18 CONNECTOR "B"
19 - 19 - OUTPUT, TURRET ROT. LEFT/CCW TO TERM. 44 ON RELAY CARD & PIN 19 CONNECTOR "B"
20 - 20 - OUTPUT, BOOM UP TO TERM. 29 ON RELAY CARD & PIN 20 CONNECTOR "B"
21 - 21 - OUTPUT, BOOM DOWN TO TERM. 30 ON RELAY CARD & PIN 21 CONNECTOR "B"
22 - 22 - OUTPUT, BOOM OUT/EXT. TO TERM. 48 ON RELAY CARD & PIN 22 CONNECTOR "B"
23 - 23 - OUTPUT, BOOM IN/RET. TO TERM. 47 ON RELAY CARD & PIN 23 CONNECTOR "B"
24 - x - NO PIN INSTALLED, NOT USED
25 - 25 - OUTPUT, PLAT. ROT. RIGHT/CCW TO TERM. 28 ON RELAY CARD & PIN 25 CONNECTOR "B"
26 - 26 - OUTPUT, PLAT. ROT. LEFT/CW TO TERM. 27 ON RELAY CARD & PIN 26 CONNECTOR "B"
27 - 27 - OUTPUT, PROP. SIG. FROM BOOM/TURRET CONTROLLER TO TERM. 4 OF RELAY CARD
28 - x - NO PIN INSTALLED, NOT USED
29 - 29 - INPUT, 48 VDC TO LOW BATT. WARNING L.E.D./BATTERY INDICATOR (OPTION)
30 - 30 - OUTPUT, TERM.12 OF CARD & BOOM/ROT. CNTRLR. TO TERM. 14 OF CARD IN GND. BOX
31 - 31 - (OPTION) INPUT/OUTPUT LOW VOLTAGE RESET
32 - 32 - (OPTION) INPUT/OUTPUT LOW VOLTAGE RESET
33 - 33 - OUTPUT, RISER UP TO TERM. 46 ON RELAY CARD & PIN 33 CONNECTOR "B"
34 - 34 - OUTPUT, RISER DOWN TO TERM. 45 ON RELAY CARD & PIN 34 CONNECTOR "B"
35 - x - NO PIN INSTALLED, NOT USED
36 - (OPTION) OUTPUT, JIB UP TO TERM. 42 OF RELAY CARD & PIN 36 CONNECTOR "B"
37 - (OPTION) OUTPUT, JIB DOWN TO TERM. 41 OF RELAY CARD & PIN 37 CONNECTOR "B"
38 - 38 - OUTPUT, 24 VDC FROM AUX. SW. (OPTION) TO PIN 3 CONNECTOR "B"
39 - 49 - INPUT, 24 VDC FROM FOOT SW.TO AERIAL BOX
40 - 47 - OUTPUT, 24 VDC FROM AERIAL BOX.TO FOOT SW

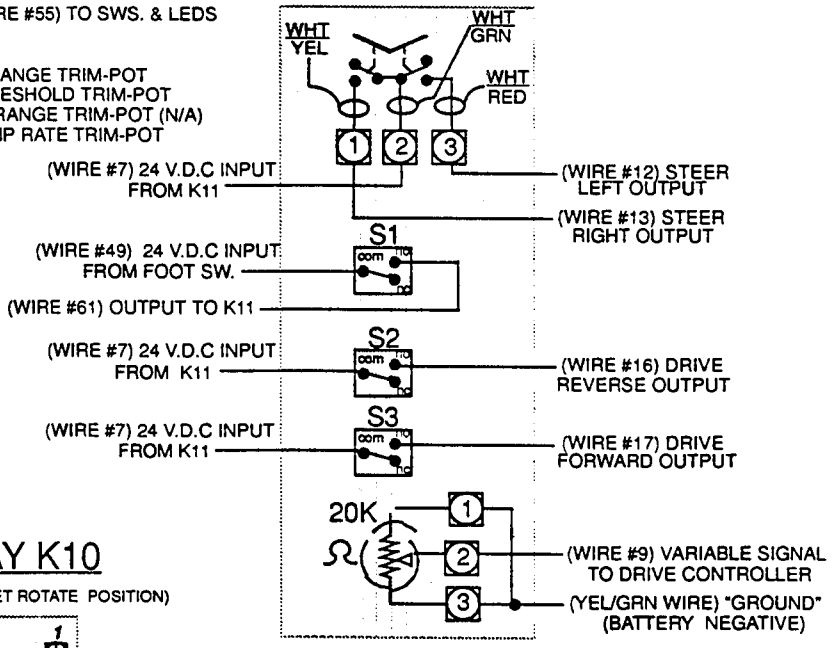
DETAIL: BOOM/ROTATE CONTROL LEVER





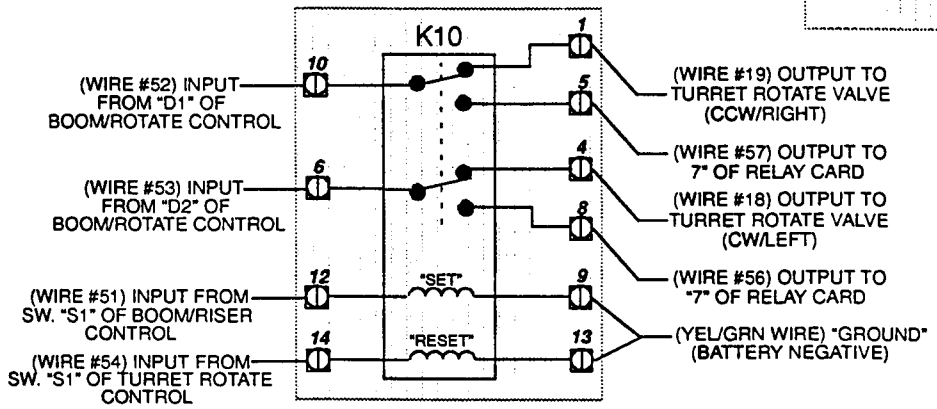
DETAIL: FOOT SW.

DETAIL: DRIVE/STEER ACTUATOR

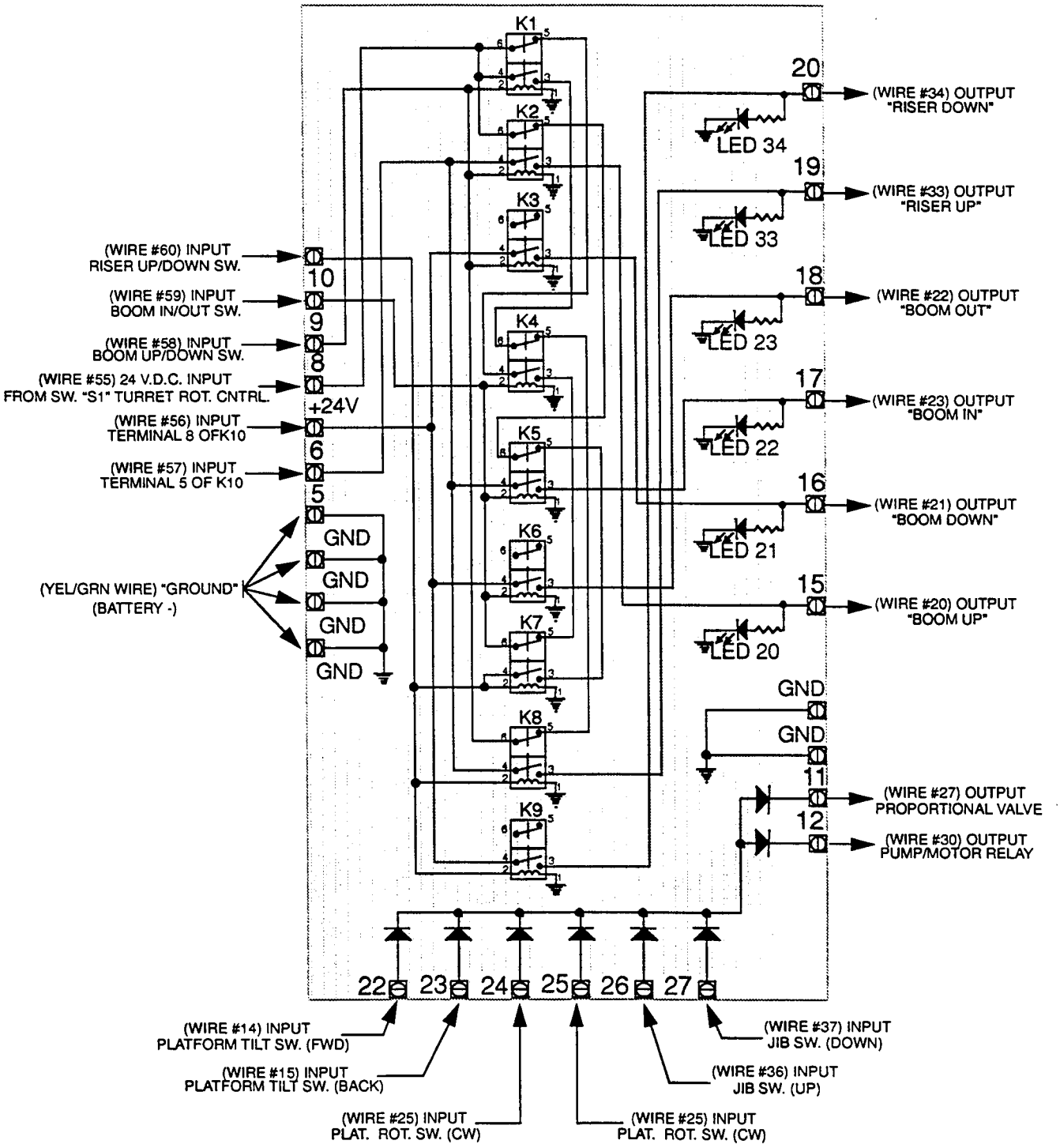


DETAIL: RELAY K10

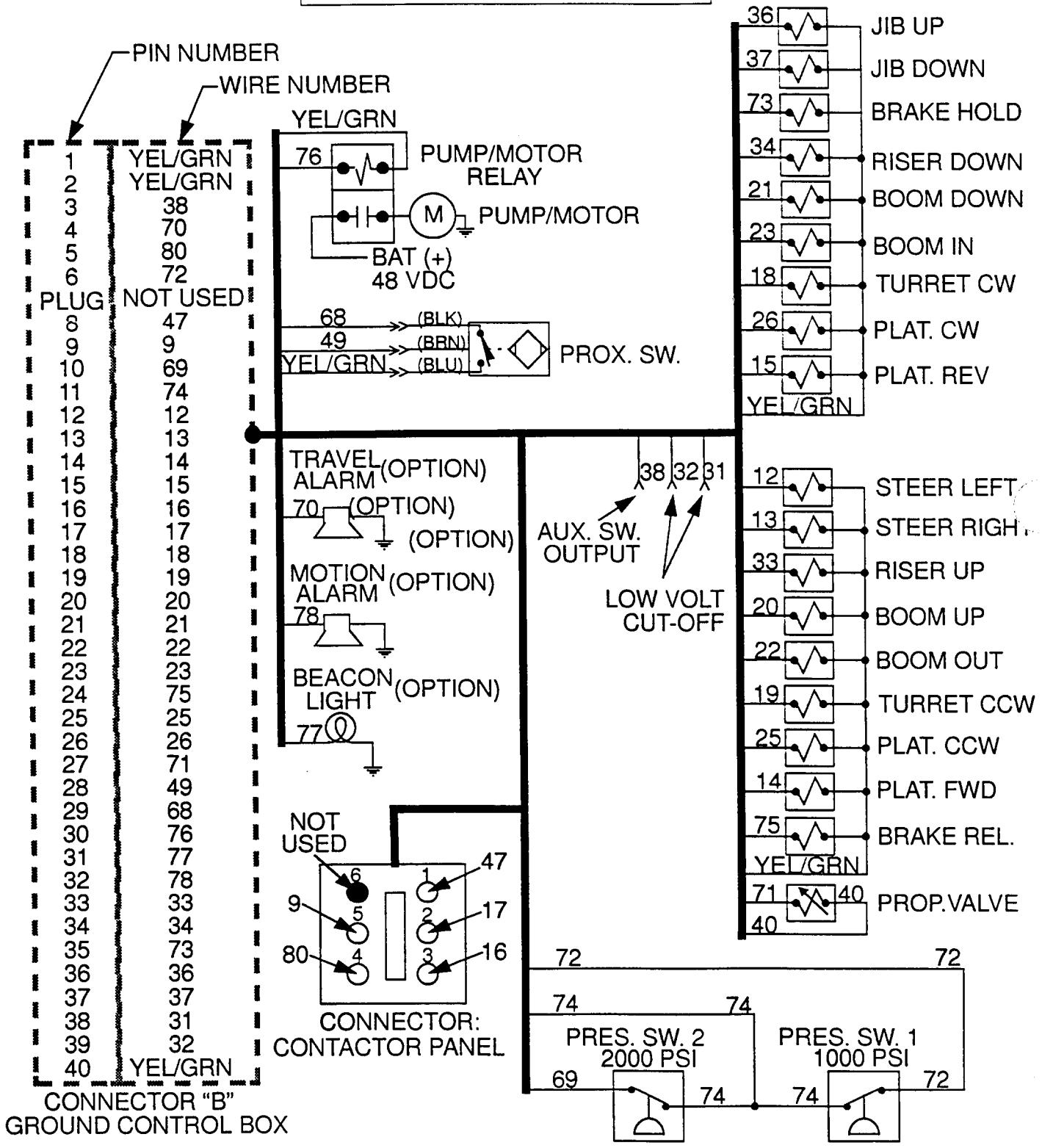
(RELAY SHOWN "LATCHED" TO TURRET ROTATE POSITION)



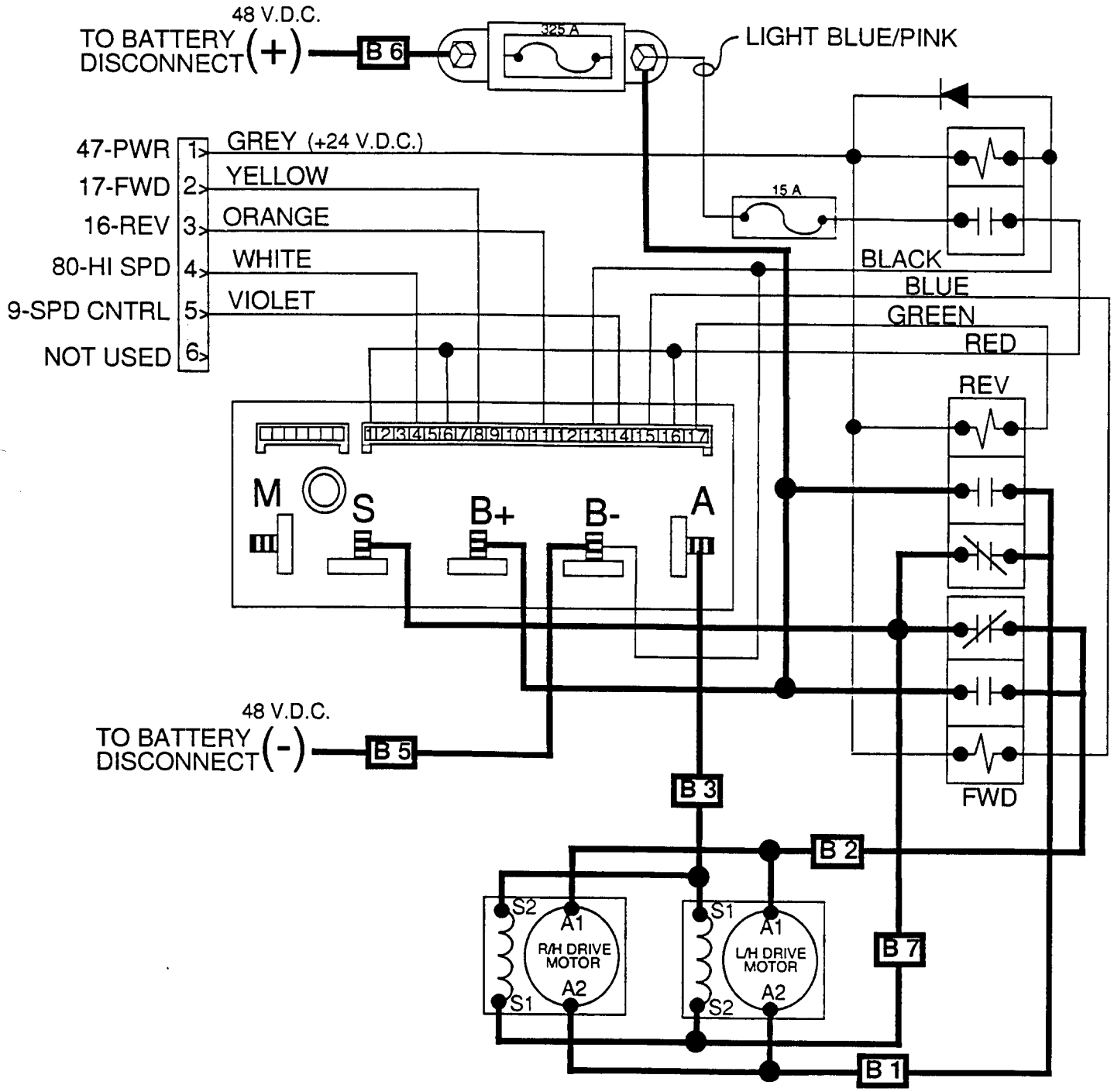
DETAIL: RELAY CARD



DETAIL: BASE & VALVE WIRING



DETAIL: CONTACTOR PANEL



DETAIL: BATTERY INSTALATION

