

OWNER'S MANUAL

BG2-72 LOW LEVEL ORDER PICKER



ACTUAL PRODUCT MAY NOT APPEAR EXACTLY AS SHOWN



WARNING

Do not operate or service this product unless you have read and fully understand the entire contents of this manual. Failure to do so may result in property damage, bodily injury or death.

BLUE GIANT[®]

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WARNING

Do not operate this vehicle unless you have been authorized and trained to do so, and have read all warnings and instructions in Operator's Manual and on this vehicle. Read, understand and comply with the information on the vehicle's nameplate at all times.

Do not operate this vehicle until you have performed the daily operation's check list. Verify and inspect tires, horn, battery, controller, lift and hydraulic systems, brakes, steering mechanism and guards. Verify that all emergency controls, personal protection and safety devices are in place and functioning correctly and ensure the vehicle is free of fluid leaks and has no loose or missing parts. Report any problems to the designated authority and do not use the vehicle until they are corrected by a qualified mechanic.

This vehicle must not be modified without the manufacturer s consent. Components critical to the vehicles stability such as batteries shall not be replaced with lighter weight components.

Operate vehicle only from designated platform operating position. Use this vehicle indoors on level surfaces only. Never operate on ramps and slopes or uneven floors. This vehicle is not for use on mezzanines or balcony areas. Before operating, inspect the floor area it will be used on and be certain it will support the vehicle at full capacity and lift height. Identify and avoid holes, drop-offs, bumps and obstructions.

Before and during all vehicle operations ensure that adequate clearance is maintained from overhead obstructions and energized electrical conductors and parts.

Before elevating platform be sure guardrail access gates are in place and lowered. Keep feet on platform floor at all times while using vehicle, never climb onto guard rails or platform shelf. Do not use ladders, planks or other devices to achieve additional height on platform.

When transferring loads to platform or platform shelf, do not exceed capacity ratings on vehicle nameplate. Ensure loads are centered and do not contact any obstructions in the vehicle's vicinity. Do not stabilize the platform by contact with adjacent objects such as racks or shelving. Do not use the platform as a crane.

Take care to prevent electrical cords, hoses or other equipment from entangling in platform. Ensure area surrounding the vehicle is free of personnel and equipment before lowering platform.

Maintain a clear view of the ground while traveling and a safe distance from obstacles in the vehicle or platform's path. Ensure personnel in the vicinity are aware of the vehicle's movement. Travel at a safe speed for the conditions the vehicle is operating in.

Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed. Avoid hazardous locations.

Enter and exit platform only through raised access gates and with the platform fully lowered and vehicle stopped. When leaving vehicle unattended, remove key to prevent unauthorized use.

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NOTES

SECTION 1 DESCRIPTION

1-1. INTRODUCTION.

This publication describes the 24 volt lift truck distributed by Blue Giant . Included are operating instructions planned maintenance instructions, lubrication procedures, corrective maintenance procedures and a complete parts list with part location illustrations.

Users shall comply with all requirements indicated in applicable OSHA standards and current edition of A.N.S.I. B56.1 Part II. By following these requirements and the recommendations contained in this manual, you will receive many years of dependable service from your BG2-72 lift truck.

1-2. GENERAL DESCRIPTION

The self-propelled BG2-72 lifts and transports the operator (on the platform portion of the lift carriage) and the payload (on forks or optional payload platform). This permits efficient selection and moving of materials in any area or at any level of the warehouse or storeroom. The design permits one man to perform all operations of selecting the stock, driving the truck, and replacing the stock at the designated place. The battery-powered vehicle is quiet and without exhaust fumes, allowing operation in closed areas without special provisions for ventilation.

The AC motor propels the vehicle in forward or reverse direction. The vehicle can be driven with the platform raised or lowered; however the speed is restricted above 22".

On demand power steering makes the vehicle highly maneuverable.

The control arms are used to operate the work vehicle and provide operator safety.

The operator platform contains the "deadman" foot switch which must be depressed for the vehicle to operate.

The model number will be found on the name plate (Figure 1-1) along with the serial number, lifting capacity, and load center. Figure 1-2 shows the locations of the truck's main components and controls.

MODEL NO.		SERIAL NO.	
MAX CAP LB/KG	LOAD CTR IN/MM	LIFT HGT IN/MM	
ALT CAP LB/KG	LOAD CTR IN/MM	LIFT HGT IN/MM	
TRUCK WT LESS BATTERY LB/KG		BATTERY MIN WT LB/KG	
TRUCK WT WITH BATTERY LB/KG		BATTERY MAX WT LB/KG	
TRUCK TYPE	BATTERY TYPE	CERTIFIED	VOLTAGE
COMPLIES WITH THE APPLICABLE REQUIREMENTS OF ANSI B56.1 AND OSHA STANDARDS			

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Figure 1-1 Name Plate

1-3. SAFETY FEATURES

The BG2-72 is designed engineered to provide maximum safety for operator and payload. Some of the safety features incorporated into the design are:

- Dead-man brake to apply the brake and cut off drive power when the steering arm is released.
- Key-operated power switch to prevent operation by unauthorized personnel.
- High speed limit switch to restrict speed when lift carriage is raised above the preset limit.
- All control functions automatically return to "OFF" when released.
- Emergency brake switch.
- Separately fused control circuits and power circuits.
- Readily accessible horn button.
- Drive wheel position indicator.
- Flow control valve regulates maximum lowering speed within prescribed limits.
- Relief valve maintains hydraulic pressure within prescribed limits.
- High visibility color scheme of truck provides visual alert of truck's presence.
- Battery Indicator.
- Casters.

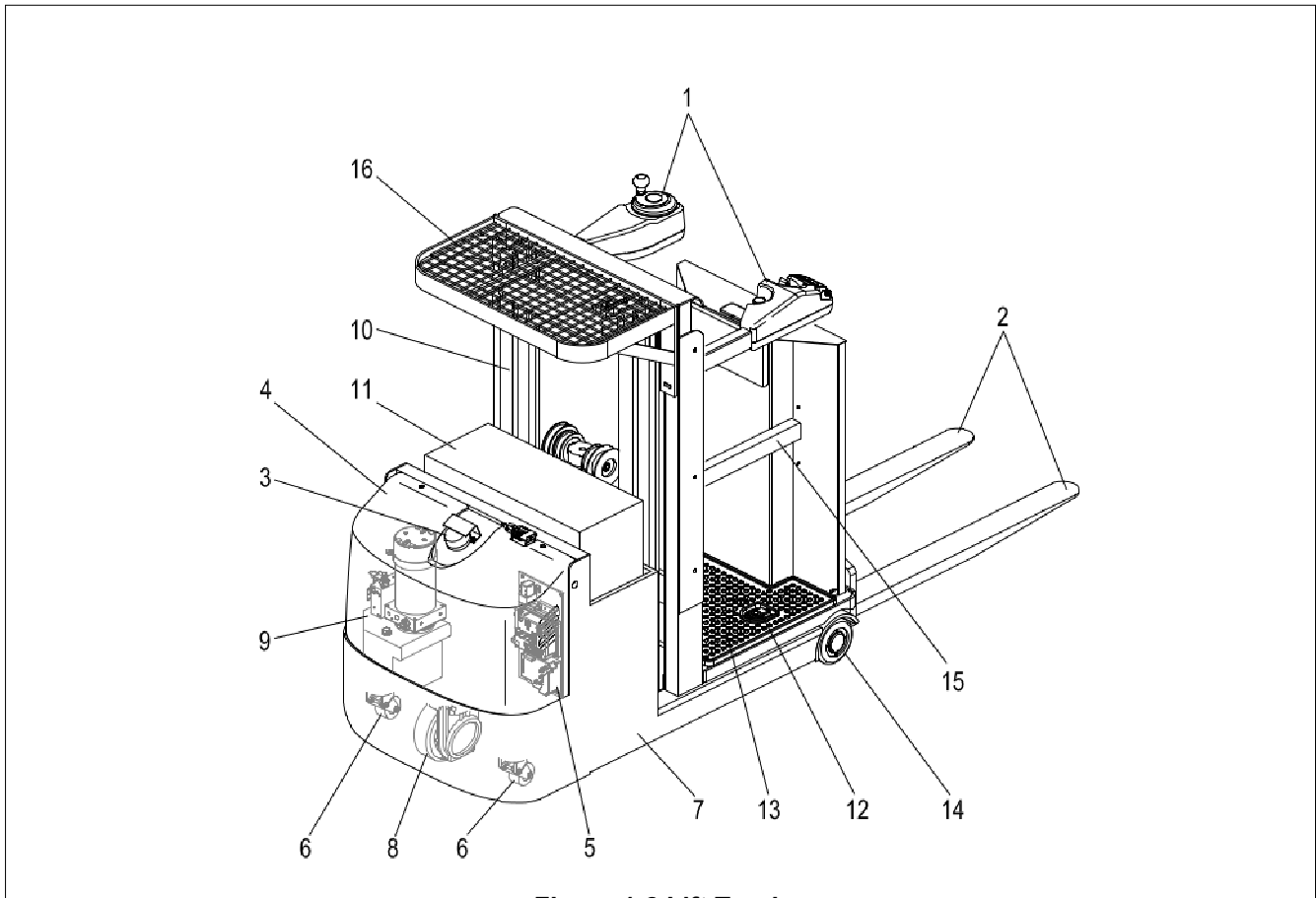


Figure 1-2 Lift Truck

ITEM	COMPONENT	ITEM	COMPONENT
1	Control arms	9	Hydraulic pump and reservoir
2	Fork	10	Mast
3	Warning light	11	Battery
4	Cover	12	Deadman foot switch
5	Electrical panel	13	Operator platform
6	Casters	14	Load wheels
7	Frame	15	Side gates
8	Drive wheel	16	Rear tray

SECTION 2 OPERATION

2-1. GENERAL.

This section gives detailed operating instructions for the lift truck. The instructions are divided into the various phases of operations, such as operating lift, driving, and stopping. Routine precautions are included for safe operation.

2-2. OPERATING PRECAUTIONS

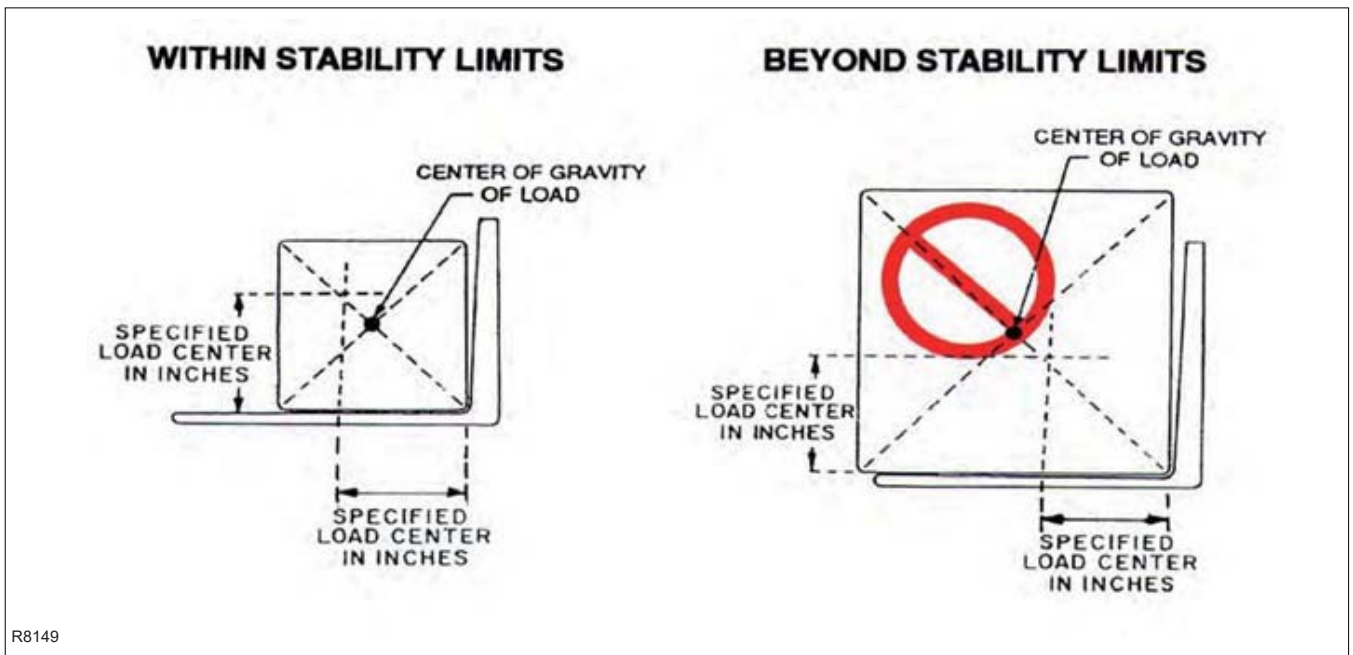
WARNING: Improper operation of the lift truck may result in operator injury, or load and/or lift



truck damage. Observe the following precautions when operating the lift truck.

The following safety precautions must be adhered to at all times.

- Do not operate this truck unless you have been trained and authorized to do so.
- All warnings and instructions must be read and understood before using the equipment.
- Equipment must not be altered in any way.
- Equipment must be inspected by a qualified person on a regular basis.
- Do not exceed the rated capacity. Overloading may result in damage to the hydraulic system and structural components.
- Be certain that the lifting mechanism is operating smoothly throughout its entire height, both empty and loaded.
- Be sure that mast is vertical - do not operate on a side slope.
- Be sure the truck has a firm and level footing.
- Avoid overhead wires and obstructions.
- Check for obstructions when raising or lowering the lift carriage.
- Do not handle unstable or loosely stacked loads. Use special care when handling long, high, or wide loads to avoid tipping, loss of load, or striking bystanders.
- Center and carry the load as far back as possible toward the lift carriage back rest. The center-of-gravity of the load must not exceed the load center listed on the nameplate. See [Figure 2-1](#) for load center limitations.
- Pick up loads on both forks. Do not pick up on only one fork.
- When traveling, always lower the load as far as possible.
- When stacking pallets in racks and it is necessary to move the load in a raised position, use caution. Operate truck smoothly.



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Figure 2-1 Load Center

- Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.
- Operate truck only from designated operation position. Never place any part of your body between the mast uprights. Do not carry passengers.
- Do not allow anyone to stand or pass under load or lifting mechanism.
- When leaving truck, neutralize travel control. Fully lower lifting mechanism and set brake. When leaving truck unattended, turn off key switch, remove key and disengage the emergency stop switch.

2-3. BEFORE OPERATION

Table 2-1 covers important inspection points on the BG2-72 lift truck which should be checked prior to operation. Depending on use, some trucks may require additional checks.

Figure 2-2 shows a sample format for an Operator Checklist, which can be modified as necessary to fit your operation.

WARNING: Periodic maintenance of this truck by a QUALIFIED TECHNICIAN is required.



CAUTION: A QUALIFIED SERVICE TECHNICIAN should check the truck monthly for proper lubrication, proper fluid levels, brake maintenance, motor maintenance and other areas specified in the SECTION 3.



WARNING: If the truck is found to be unsafe and in need of repair, or contributes to an unsafe condition, report it immediately to the designated authority. Do not operate



it until it has been restored to a safe operating condition. Do not make any unauthorized repairs or adjustments. All service must be performed by a qualified maintenance technician.

Table 2-1 Operator Checks

ITEM	PROCEDURE		ITEM	PROCEDURE
Transmission and hydraulic systems.	Check for signs of fluid leakage		Travel controls	Check that travel control on right control arm operates in all speed ranges in forward and reverse.
Forks and rear tray	Check for cracks and damage; that they are properly secured.		Wheels	Check drive wheel for cracks or damage. Move vehicle to check load wheel for freedom of rotation.
Chains, cables and hoses	Check that they are in place, secured correctly, functioning properly and free of binding or damage		Hydraulic controls	Check operation of lift and lower to their maximum positions.
Control arms and guard rails	Check that vehicle operation is disabled when arms and guard rails are raised.		Emergency power disconnect switch	Check that brake actuates when emergency power disconnect switch is depressed.
Safety warning label and nameplate	Check that warning labels, nameplate, etc. are in good condition and legible.		Battery disconnect	Check that battery can be disconnected & reconnected. Check for connector damage.
Horn and flashing lights	Check that horn sounds when operated and flashing lights are operable.		Speed limit switches	Allow for enough space to operate vehicle in all speeds. Test drive the vehicle to check for speed reductions when elevated.
Steering	Check for binding or looseness when steering.		Platform Operation	Check that all controls in the platform operating compartment are operational.



Electric Truck
Daily Operator Check-Off List

Date _____ Operator _____
Truck No. _____ Model No. _____
Dept. _____ Shift _____
Hour Meter
Reading-Drive _____ Hoist _____

Check	O.K.(√)	Need maintenance
Tires		
Load Wheels		
Horn		
Lift-Lower Controls		
Attachment Operation		
Forward & Reverse Controls		
Steering		
Brakes		
Hydraulic Leaks,cylinders, Valves, Hoses, Etc.		

Figure 2-2 Sample of Operator Check List

2-4. INSTRUMENTS AND CONTROLS

(See [Figure 2-3](#))

Steering Wheel (1): Used to control the direction of travel.

Display unit (2): Operating information and warning message display.

Lifting Pushbutton (3): Used to lift the operator's platform from the raised position.

Lowering Pushbutton (4): Used to lower the operator's platform from the raised position.

Horn Pushbutton (5): Used to sound the horn.

Emergency Stop Switch (6): Disconnects the supply current, deactivates all electrical functions, causing the truck to brake automatically.

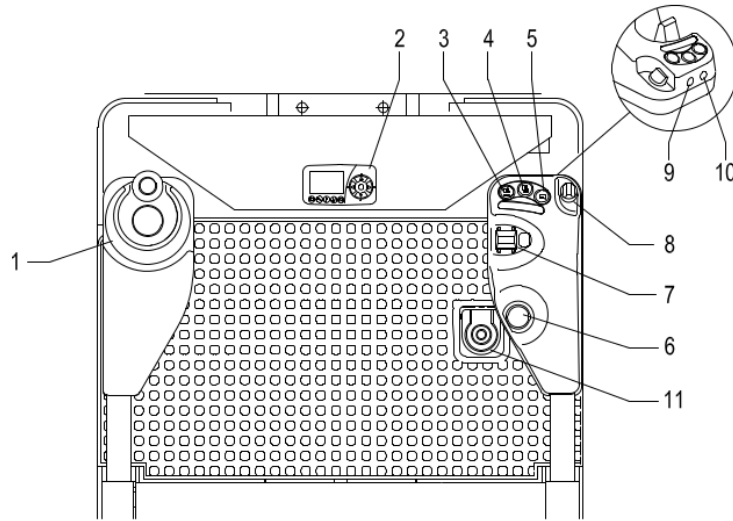
Travel Switch (7): Used to control the direction and speed of the truck.

Key Switch (8): Used to prevent unauthorized personnel from operating the lift truck.

Lowering Pushbutton (9): Used to lower the forks from the raised position.

Lifting Pushbutton (10): Used to lift the forks from the raised position.

Brake Pedal (11): Used to release the mechanical brake when depressed and engage the brake when released.



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Figure 2-3 Instrument and Controls

2-4.1. Instrument Panel (See [Figure 2-4](#)):

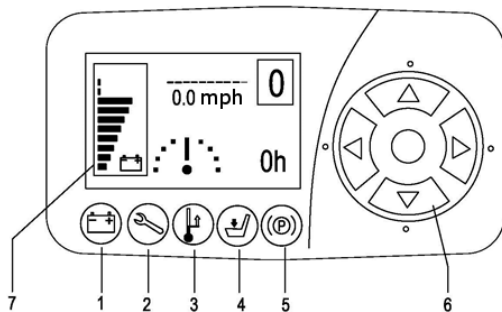


Figure 2-4 Instrument Panel

Low Battery Alarm LED (1)

This LED lights when the measured battery voltage is equal or less than 40% normal battery voltage.

Fault Alarm LED (2)

When a fault is detected, this LED will light. The display (7) will display the warning and fault indication. Report alarm to the designated authority and do not use the vehicle until corrected by a qualified mechanic.

Temperature Alarm LED (3)

When the temperature of the drive motor is too high, the LED will illuminate. Temporarily stop operation until the temperature drop and notify an authorized technician.

“Deadman” Switch Alarm LED (4)

When the “deadman” switch pedal is released, this LED will illuminate.

Brake Alarm (5)

This LED will illuminate when the emergency power disconnect switch on the control arm is actuated.

Function Keys (6)

Use the left arrow button to adjust the speed mode. Use the down arrow button to switch the driving mode.

Display (7) (See Figure 2-5):

The display has the following functions:

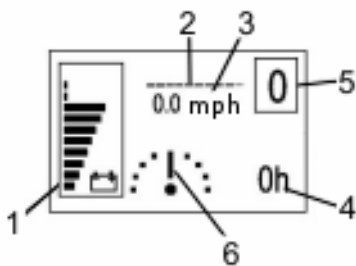


Figure 2-5 Display

Battery Indicator (1): The state of charge is displayed by ten notches. Each notch represents 10% of the battery charge. For example, the illustration shows the battery has 80% charge.

Information Display (2): Displays the warnings and faults. Report warnings and faults to the designated authority and do not use the vehicle until corrected by a qualified mechanic.

Speed Display (3): Indicated the vehicle’s speed.

Hour Meter (4): Indicates the Key Switch On hours.

Speed Mode Display (5) (Also see Figure 2-6):

There are four speed ranges available in both high speed driving mode and the creep speed driving mode. Use the “left function key to select the desired mode. “1” indicates the slowest speed while “4” indicates the highest speed.

CAUTION: When the platform rises the vehicle automatically enters creep speed.



Steering Display (6) (See Figure 2-5): One of nine notches will indicate the steering angle of the drive wheel.

Driving Mode Display (See Figure 2-6): The vehicle can be operated in two driving modes, regular speed or creep speed. Use the “down” function key to switch the driving mode:

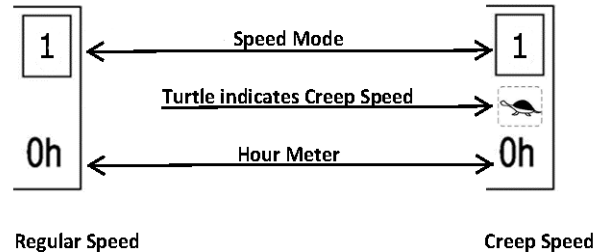


Figure 2-6 Driving Mode

2-5. DRIVING AND STOPPING PROCEDURES

(See Figure 2-3)

1. Close the safety gates and turn the key switch (8) on.
2. Step on the brake pedal (11) to release the brake and to activate the electrical controls.
3. Note position of the drive wheel.
4. Place one hand on the steering wheel (1) and be prepared to steer the vehicle in the desired direction.
5. Use the travel switch(7) to select the required driving direction.

2-5.1. Stopping

The stopping distance of the truck depends on the ground conditions. The driver must take this into account when operating the truck.

The driver must be looking ahead when traveling. If there is no hazard, brake moderately to avoid moving the load.

There are four different ways to stop the truck:

1. Release travel switch (Release braking).
2. Command opposite throttle (Plugging).
3. Remove foot from pedal (Pedal braking).
4. Depress the battery disconnect switch (Emergency braking).

2-6. LIFT AND LOWER CONTROLS

Proceed as follows to raise and lower the liftcarriage:

1. Step onto the platform and stand near the control station.

NOTE: It is not necessary to release the brake. For maximum safety, leave the brake on.

2. Turn on the key switch (8).

WARNING: Check the space above your head and above the entire carriage to be sure that the platform mast or load will not hit any obstructions while being raised.

3. To raise the lift carriage, depress the lift pushbutton switch (3).

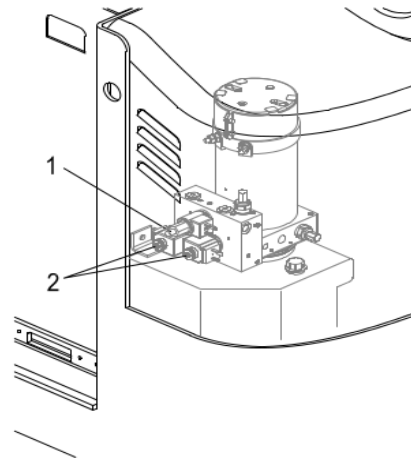
NOTE: The lift carriage will rise as long as the lift pushbutton is depressed, or until the lift carriage reaches maximum height.

4. Release the lift pushbutton when the lift carriage reaches the desired comfortable operating height.
5. To lower the lift carriage, press the lower pushbutton switch (4).
6. When the lift carriage reaches the desired level, release the lower pushbutton switch (4).

2-7. EMERGENCY LOWERING PROCEDURES

If you lose power while elevated in the cage, instruct someone on ground level to push the emergency lowering valve (1&2, [Figure 2-7](#)), which can lower the operator position or fork.

WARNING: Do not climb out of the lift cage while the operator position is elevated. The lift mast cannot be climbed safely. An elevated operator position has a high center of gravity and can be tipped easily. Standing on or leaning out from the outside of a cage rail may cause the lift vehicle to tip over. Tipping the lift vehicle over can cause severe injury or death and equipment damage.



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Figure 2-7 Emergency Lowering Procedures

2-8. EMERGENCY BRAKE SWITCH

In an emergency, all power can be turned off at once by depressing the Emergency Brake Switch (6). Once this circuit is actuated, none of the electrical controls will operate until the circuit is reset, but the lift carriage can be lowered using the manual lowering controls. (See Paragraph [2-7](#).)

2-9. LOADING AND UNLOADING

1. Move truck to location where load is to be picked up.
2. Move the truck into position so forks are within pallet or skid, and the load is centered over the forks and as far back as possible.
3. Raise forks to lift load.
4. Drive to area where load is to be placed.
5. Move truck to align load with its new position.
6. Lower the load until it rests squarely in place and the forks are free.
7. Slowly move the truck out from under the load.

2-10. PARKING

When finished with moving loads, return the truck to its maintenance or storage area. Turn off the key switch and disconnect the battery. Charge battery as necessary. Refer to battery care instructions, [SECTION 3](#).

SECTION 3 PLANNED MAINTENANCE

3-1. GENERAL.

Planned maintenance consists of periodic visual and operational checks, parts inspection, lubrication, and scheduled maintenance designed to prevent or discover malfunctions and defective parts. The operator performs the checks in the Operators Manual, and refers any required servicing to a qualified maintenance technician who performs the scheduled maintenance and any required servicing

3-2. MONTHLY AND QUARTERLY CHECKS

Table 3-1 is a monthly and quarterly inspection and service chart based on normal usage of equipment eight hours per day, five days per week. If the lift truck is used in excess of forty hours per week, the frequency of inspection and service should be increased accordingly. These procedures must be performed by a qualified service technician or your Blue Giant Service Representative.

3-3. BATTERY CARE

3-3.1. General

The BG2-72 may be equipped with maintenance free or industrial wet cell batteries.

The care and maintenance of the battery is very important to obtain efficient truck operation and maximum battery life.

CAUTION: Gases produced by a battery can be explosive. Do not smoke, use an open flame, create an arc or sparks in the vicinity of the battery. Ventilate an enclosed area well when charging.



CAUTION: Batteries contain sulfuric acid which may cause severe burns. Avoid contact with eyes, skin or clothing. In case of contact, flush immediately and thoroughly with clean water. Obtain medical attention when eyes are affected. A baking soda solution (one pound to one gallon of water) applied to spilled acid until bubbling stops, neutralizes the acid for safe handling and disposal.



Leakage voltage from battery terminals to battery case can cause misleading trouble symptoms with the truck electrical system. Since components of the truck electrical system are insulated from truck frame, leakage voltage will not normally affect truck operation unless a short circuit or breakdown of circuit wire insulation to truck frame occurs.

A voltage check from battery connector terminal to battery case should indicate near zero volts. Typically, however, the sum of the voltages at both terminals will equal battery volts. This leakage voltage will discharge the battery. As battery cleanliness deteriorates, the usable charge of the battery decreases due to this self discharge. Although a leakage voltage reading of zero volts may not be possible, a cleaner battery will have more usable charge for truck operation and not affect operation of electronic devices on the unit.

Table 3-1 Monthly and Quarterly Inspection and Service Chart

VISUAL CHECKS	
INTERVAL	INSPECTION OR SERVICE
Monthly	Check electrical brake for proper operation.
Monthly	Inspect wiring for loose connections and damaged insulation.
Monthly	Check wheels for wear and damage.
Monthly	Check deadman foot switch for proper operation.
Monthly	Check lift chain tension, lubrication & operation (see paragraph 3-6).
Quarterly	Check lift cylinder for leakage.
Quarterly	Test electric steering.
Quarterly	Check steering gear for wear and lubricate.
Semi-annually	Inspect for chain wear (See SECTION 8).

3-3.2. Safety Rules

- Wear protective clothing, such as rubber apron, gloves, boots and goggles when performing any maintenance on batteries. Do not allow electrolyte to come in contact with eyes, skin, clothing or floor.
- If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap. A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- If truck is equipped with wet cell batteries, keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings. Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging, is highly explosive. This gas remains in cell long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing will result.
- Do not touch non-insulated parts of DC output connector or battery terminals to avoid possible electrical shock.
- De-energize all AC and DC power connections before servicing battery.
- Do not charge a frozen battery.
- Do not use charger if it has been dropped or otherwise damaged.

3-3.3. Battery Care and Charging

CAUTION: Never smoke or bring open flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.

1. Charge the battery only in areas designated for that use.
2. Make certain the charger being used matches the voltage and amperage of the truck battery.
3. Before disconnecting or connecting batteries to a charger, make sure the charger is "OFF". If an attempt is made to do this while the charger is

"ON", serious injury to you, the battery and the charger could result.

4. Before connecting the battery cable to the trucks receptacle, make sure the key switch is off. The battery cable must be fully connected before the truck is used. If the plug is not making good contact, heat will weld the two parts of the battery connector together, making it difficult to remove and necessary to replace.
5. Battery terminals should be checked and cleaned of corrosion regularly. Good battery terminal contact is essential not only for operation, but also for proper charging of the battery.
6. The charging requirements will vary depending on the use of the truck. The battery should be given as equalizing charge on a weekly basis. This charge should normally be an additional three hours at the finish rate.
7. Make certain battery used meets weight and size requirements of truck. NEVER operate truck with an undersized battery.

3-3.4. Battery Cleaning

Always keep vent plugs tightly in place when cleaning battery. When properly watered and charged, the battery will remain clean and dry. All that is necessary is to brush or blow off any dust or dirt that may accumulate on them. However, if electrolyte is spilled or overflows from a cell, it should be neutralized with a solution of baking soda and water, brushing the soda solution beneath the connectors and removing grime from the covers. Then rinse the battery with cool water from a low pressure supply to remove the soda and loosen dirt. If batteries stay wet consistently, they may be either overcharged or over filled. This condition should be investigated and corrected.

3-4. CHARGING BATTERIES

Charging requirements will vary depending on depth of discharge and temperature. Follow safety rules when placing a battery on charge.

Proceed as follows:

1. Park truck at charging station with carriage lowered and turn the key switch off.
2. Check the condition of the AC cord and battery cables. If there are any cuts in the cable, any exposed wires, loose plugs or connectors, DO NOT attempt to charge the batteries. Contact appropriate personnel for repairs to be made.

3. Disconnect the batteries from the truck and connect the batteries to the charger. Make sure connectors are mated properly.
4. Connect the charger to the appropriate power supply.
5. Follow the instructions for the charger being used.

3-5. LUBRICATION

Refer to [Table 3-2](#) for the recommended types of grease and oil. [Table 3-3](#) in conjunction with [Figure 3-1](#) identifies the items requiring lubrication.

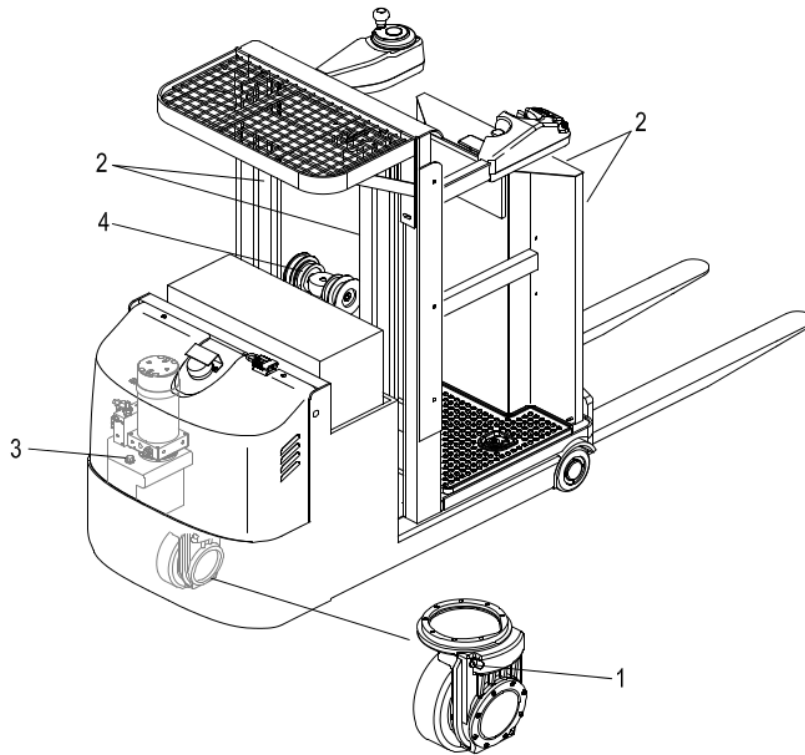
3-6. LIFT CHAIN MAINTENANCE

Fully raise and lower lift carriage while observing chains as they move over chain sheaves. Ensure chain is aligned and tracking properly and all links are pivoting freely. With lift carriage fully lowered, spray or brush on a film of SAE 30 or 40 engine oil.

Table 3-2 Recommended Lubricants
(See [Table 3-3](#) for Application)

No. 1	Transmission Oil - 85W-90 Transmission Oil - 10W-30 (See Note)
No. 2	Dry Moly Lube.
No. 3	Hydraulic oil - Heavy duty with a viscosity of 150 SUS foam suppressing agent and rust and oxidation inhibitors. Hydraulic oil - Heavy duty with viscosity of 100 SUS foam suppressing agent and rust and oxidation inhibitors (See Note)
No. 4.	SAE 30 or 40 Engine lubricating oil

Note: USED ON COLD CONDITIONED TRUCKS.



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Figure 3-1 Lubrication Diagram

Table 3-3 Lubrication Chart

INDEX NO. (FIG 3-4)	LOCATION	METHOD OF APPLICATION	TYPE (Table3-2)	APPLICATION OF LUBRICANT
1	Transmission Capacity - 1.38Litres	Can	No. 1	Fill to level plug opening
2	Inner & Outer Mast	Spray	No. 2	Full length of channel where rollers operate.
3	Hydraulic Reservoir Capacity - 3.56 Liters	Can	No. 3	With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening.
4	Lift Chain	Brush or Spray	No. 4	See Paragraph 3-6.

SECTION 4 TROUBLESHOOTING GENERAL

4-1. GENERAL

Use [Table 4-1](#) as a guide to determine possible causes of trouble. The table is divided into five main categories: Truck and Hydraulic System Will Not

Operate: Truck Does Not Operate Forward or Reverse: Trouble With Braking: Trouble With Lifting Or Lowering, and Miscellaneous malfunctions.

Table 4-1 Troubleshooting Chart

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
VEHICLE AND HYDRAULIC SYSTEM WILL NOT OPERATE	a. Fuse blown.	Check fuse and replace if necessary.
	b. Fuse blown.	Check fuse and replace if necessary.
	c. Battery dead or disconnected.	Check battery connections and check battery voltage.
	d. Key switch defective.	Bypass key switch to determine if it is malfunctioning.
	e. Emergency brake switch defective.	Bypass the switch to determine if it is malfunctioning.
	f. Defective wiring.	Check for open circuit. Repair as required.
	g. Deadman" foot switch not pressed or defective	Press deadman foot switch or bypass pedal to determine if it is malfunctioning.
VEHICLE DOES NOT OPERATE FORWARD OR REVERSE		
Vehicle does not travel forward or reverse. All other functions operate normally	a. Check all wiring. A loose connection may be the cause of malfunction.	Tighten all loose connections before further troubleshooting
	b. Defective main controller.	Check and replace switch if defective.
	c. Defective travel switch.	Check for proper operation and replace if necessary. Check and replace travel switch if defective
Vehicle travels forward but not in reverse.	Defective travel switch in control head	Check and replace travel switch if defective
Vehicle travels reverse but not in forward.	Defective travel switch in control head	Check and replace travel switch if defective
Vehicle travels forward and in reverse at lower speeds; will not travel at high speed	Defective travel switch in control head.	Check and replace travel switch if defective

Table 4-1 TROUBLESHOOTING CHART- CONTINUED

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TROUBLE WITH LIFTING OR LOWERING		
Oil sprays or flows from the top of the lift cylinder	Defective packing in lift cylinder.	Repair lift cylinder.
Squealing sounds when lifting forks	a. Oil level too low	Identify oil leak and fill reservoir.
	b. Lift linkage binding	Apply grease
	c. Out of Adjustment and/or Defective mast or Platform rollers	Adjust or Replace rollers.
Forks do not lift to top.	a. Oil level too low	Add oil to reservoir.
	b. Load larger than capacity	Refer to I.D.plate for capacity
Weak, slow or uneven action of hydraulic system	a. Defective pump or relief valve.	Check pressure. Adjust as necessary.
	b. Worn lift cylinder	Replace cylinder.
	c. Load larger than capacity.	Refer to I.D.platefor capacity
	d. Defective lift motor solenoid	Replace solenoid on pump motor.
	e. Battery charge low	Charge battery
Platform or forks do not lift, pump motor does not run.	a. Battery is dead or disconnected.	Check and recharge if required
	b. Defective wiring	Check and repair as required.
	c. Defect in electrical system for operating pump motor.	Check lift switch in control head as well as the solenoid
Platform or forks do not lift, motor runs	Defect in hydraulic system	Check the oil level in the reservoir and the oil lines to the lift cylinder, and repair as required. If normal, check the hydraulic pump, and relief valve. Repair, o adjust
Platform or forks lift, but will not go down	Defect in hydraulic system	Check lowering control switch in control head & lowering solenoid on valve assembly. Replace required.
Load will not hold	a. Oil bypassing internally in control valve	Replace valve assembly.
	b. Worn lift cylinder or packing.	Repack cylinder.
Platform or forks does not lift to top. Pump motor runs	a. Oil level too low	Add oil to reservoir.
	b. Load larger than capacity.	Refer to nameplate on side of mast for maximum load capacity
	c. Incorrect stopping distance adjustment.	Change batteries
Platform or forks creep downward under load when in a raised position	Leak in hydraulic system, lift cylinder or lowering valve.	Check for leaking fitting in hydraulic line and repair as required. Repack lift cylinder or replace valve assembly

Table 4-1 TROUBLESHOOTING CHART- CONTINUED

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TROUBLE WITH STEERING	a. Faulty fuse.	Test fuses
	b. Check all wiring. A loose connection may be the cause of malfunction	Tighten all loose connections before further troubleshooting
	c. Defective potentiometer.	Check and replace potentiometer if defective
	d. Defective controller.	Check for proper operation and replace if necessary
	e. Defective steer motor.	Replace if necessary

4-2. CONTROLLER TROUBLESHOOTING

4-2.1 Zapi Handset

A Zapi Handset is available that is designed specifically for use with the Zapi controller. It serves multiple functions of reading diagnostic data, testing truck operation, setting options, adjustments and parameter changes of the controller. The Zapi Handset is available through your Blue Giant dealer. If you require dealer location information, contact Blue Giant .

4-2.2 Fault Detection

4-2.2.1 General

The controller provides diagnostics information to assist technicians in troubleshooting problems. When a fault is detected, an alarm is recorded in the log-book. It has a FIFO (First Input First Output) structure that means the oldest alarm is lost when the database is full and a new alarm occurs. The logbook is composed of alarms with the following information:

- The alarm code.
- The number of times that each alarm occurs consecutively.
- The Hour Meter reading (value) when the latest event of every alarm occurred.
- The invert temperature when the latest event of every alarm occurred.

This function permits a deeper diagnosis of problems as the recent history can be revisited.

4-2.2.2 Logbook Access

To view the alarm logbook proceed as follows:

1. Connect the Zapi Handset, refer to paragraph 4-2.1
2. Press the ROLL down button and the ENTER button (3) at the same time to enter the MAIN MENU.
3. Press the ROLL down button (2) or the ROLL up button (1) to find the ALARMS display.
4. Press the ENTER button (3) to view the alarms.
5. Press the OUT button (6) to exit the alarms.

NOTE: Refer to bigjoesupport.com for the Zapi supplement containing detailed information of alarm codes. There are two versions shown. The PDS uses the Standard version which lists the error by: Alarm Name, Repetitions, Temperature and Hour Meter reading.

4-2.3 Testing Truck Operation

The Zapi Handset can be used to test certain truck operations as follows:

1. Connect the Zapi Handset, refer to paragraph 4-2.1.
2. Press the ROLL down button and the ENTER button (3) at the same time to enter the MAIN MENU.
3. Press the ROLL down button (2) or the ROLL up button (1) to find the TESTER display.
4. Press the ENTER button (3) to view the tests.
5. To verify various switch functions, locate the switch on the display and then operate that function to verify operation.
6. Press the OUT button (6) to exit the tests.

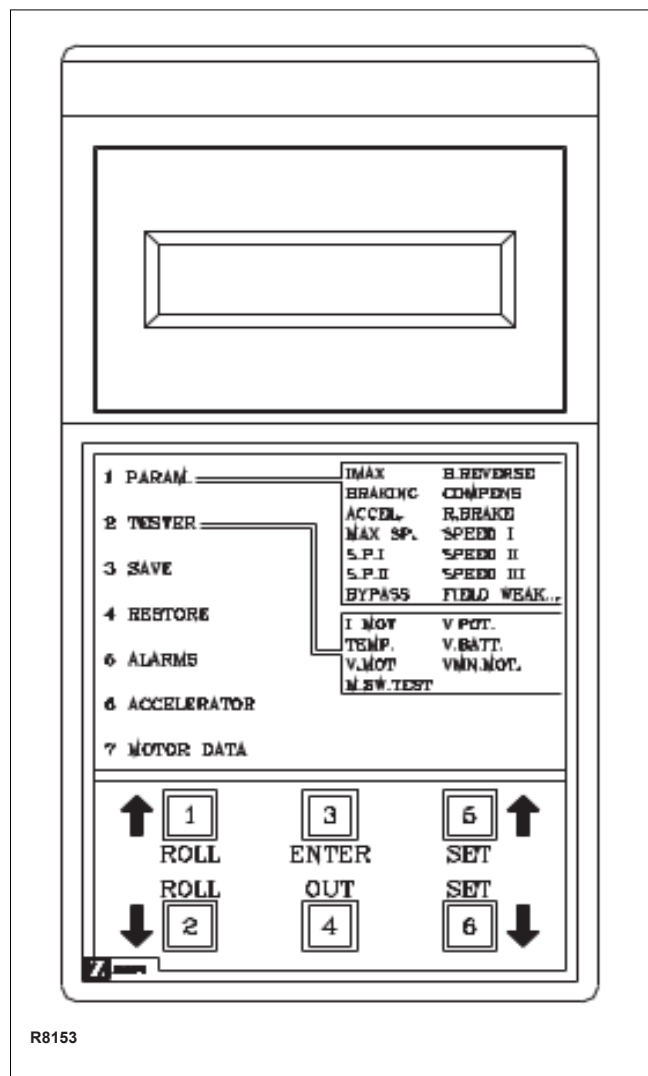


Figure 4-1 Hand Held Programmer

4-2.4 Settings and Adjustments

4-2.4.1 Set Options

To set options proceed as follows and refer to [Table 4-2](#):

1. Connect the Zapi Handset, refer to paragraph [4-2.1](#).
2. Press the ROLL up button and the SET up button (5) at the same time to enter the CONFIG MENU.
3. Press the ROLL down button (1) or the ROLL up button (2) to find the SET OPTIONS display.
4. Press the ENTER button (3) to view the options.
5. Press the ENTER button (3) to view the options.
6. Press the SET up button (5) or the SET down button (6) until the desired value setting is reached. The option is now set at the desired value.
7. Press the OUT button (4) to exit the options.

Table 4-2 TRACTION CONTROLLER

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
99	SLIP PROFILE	This is an error on the choice of the parameters of the slip profile.	So ask for the assistance of a Zapi technicians when this alarm
80	FORW+BACK	This alarm occurs when both the travel (Fwd and Rwd) are active at the same time.	Check the wiring of the Fwd & Rev travel demand inputs (use the readings in the TESTER to facilitate the troubleshooting). Check the micro switches for failures. Failure in the logic is possible too. When you have verified the travel demand switches & wiring are correct, it is necessary to replace controller.
79	INCORRECT START	This is a warning for an incorrect starting sequence.	The possible reasons for this alarm are (use the readings in the TESTER to facilitate the troubleshooting): <ul style="list-style-type: none"> • A travel demand was active at key-on. • Presence man sensor was active at key on. Check the wiring. Check the micro-switches. It could also be an error sequence made by the operator. A failure in the logic is possible too; so when all of the above are checked and nothing was found, replace the controller.
78	VACC NOT OK	The test is made at key-on and after 20 sec that both the travel demands have been turned off. This alarm occurs if the ACCELERATOR reading in the TESTER menu is 1.0V higher than PROGRAM VACC min acquisition when the accelerator is released.	Check the mechanical calibration and the functionality of the potentiometer.

Table 4-2 TRACTION CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
62	TH. PROTECTION	This alarm occurs when the temperature of the base plate is higher than 85°C. Then the maximum current decreases proportionally with the temperature increases from 85°C to 105°C. At 105°C the Current is limited to 0 Amps.	Improve the air cooling of the controller. If the alarm is signaled when the controller is cold, the possible reasons are a thermal sensor failure or a failure in the logic card. In this case, it is necessary to replace the controller.
66	BATTERY LOW	This occurs when the battery charge is calculated being less than or equal to 10% of the full charge and the BATTERY CHECK setting is other than 0 (refer to SET OPTION menu).	Charge the battery. If charging does not help, using a voltmeter, measure the battery voltage & compare the reading with the value in the BATTERY VOLTAGE parameter. If they are different, adjust value of the ADJUST BATTERY function.
71	EEPROM KO	This is due to a HW or SW defect of the non-volatile embedded memory supporting the controller parameters. This alarm does not inhibit the machine operations, but the truck will work with the default values.	Try to execute a CLEAR EEPROM operation (refer to CONSOLE manual). Switch the key off and on to check the result. If the alarm occurs permanently, it is necessary to replace the controller. If the alarm disappears, the previously stored parameters will have been replaced by the default parameters with the temperature increases from 85°C to 105°C.
65	MOTOR TEMPERATURE	This warning occurs when the temperature sensor is opened (If digital) or has overtaken the threshold of 150°C (if analog).	Check the thermal sensor inside the motor (use the MOTOR TEMPERATURE reading in the TESTER menu); check the sensor ohmic value and sensor wiring. If the sensor is OK, improve the air cooling of the motor. If the warning is present when the motor is cool, then the problem is inside the controller.
61	THERMIC SENSOR KO	The output of the controller thermal sensor is out of range.	This type of fault is not related to external components; replace the controller.
	CHECK UP NEEDED	This is just a warning to call for the time programmed maintenance.	It is just enough to turn the CHECK UP DONE option to level ON after the maintenance is executed.
	DATA ACQUISITION	Acquisition of the current gains.	The alarm ends when the acquisition is done.

Table 4-2 TRACTION CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
86	PEDAL WIRE KO	The SW continuously checks for the connection of the two supply ends of the potentiometer in the accelerator. The test consists of reading the voltage drop on a sense diode, connected between NPOT (CNA#30) and GND and cascaded with the potentiometer: if the potentiometer gets disconnected on PPOT (NNA#25) or NPOT, no current flows in the sense diode and the voltage on the NPOT connection collapses down. When the NPOT voltage is less than 0.3V this alarm occurs. This alarm also occurs when the NPOT voltage is higher than 2Vdc (to detect the condition of a broken sense diode).	Check the Voltage on NPOT and the potentiometer connections.
51	TILLER OPEN	Warning: When the tiller is released, after a fixed period of time of standby (30 seconds) the main contactor open.	At the next travel request, the warning will disappear.
92	CURRENT GAIN	The Maximum current gain parameter are at the default values, which means the maximum current adjustment procedure has not been carried out yet.	Ask the assistance of a Zapi technician to do the correct adjustment procedure of the current gain parameters.
68	WAITING FOR NODE	The controller receives from the CAN the message that another controller in the net is in fault condition; as a consequence the ACOE controller itself cannot enter an operative status, but has to WAIT for the other controller coming out from the fault status.	

Table 4-2 TRACTION CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
76	VALVE COIL SHORTED	This alarm occurs when there is a short circuit on an on/off valve coil.	<ul style="list-style-type: none"> • If the fault is present at start up, it is very likely that the hw over current protection circuit is damaged, it is necessary to replace the controller. • If the fault is present when the controller drives the outputs,
74	EV1 DRIVER SHORTED	Electro valve EV1 driver is shorted.	Check if there is a short or a low impedance between the negative of one of these coils and - BAT. Otherwise the driver circuit is damaged and the controller must be replaced.
74	EV2 DRIVER SHORTED	Electro valve EV2 driver is shorted	Check if there is a short or a low impedance between the negative of this coil and BAT. This warning also occurs if the external load is not present and the parameter EV2 in the "Set Options" menu is set "PRESENT", in this case the warning disappears setting the EV2
74	EV3 DRIVER SHORTED	Electro valve EV3 driver is shorted	Check if there is a short or a low impedance between the negative of this coil and BAT. This warning also occurs if the external load is not present and the parameter EV3 in the "Set Options" menu is set "PRESENT", in this case the warning disappears setting the EV3
56	PUMP I NO ZERO	In standby condition (pump motor not driven), the feedback coming from the current sensor in the pump chopper gives a value out of a permitted range.	This type of fault is not related to external components; replace the controller.
52	PUMP I=0 EVER	This test is carried out when the pump motor is running, and it verifies that the current feedback sensor is not constantly stuck to 0.	<ul style="list-style-type: none"> • Check the motor connection, that there is continuity. If the motor connection is opened, the current cannot flow, so the test fails and the error code is displayed. • If everything is OK for what it concerns the motor, the problem could be in the current sen

Table 4-2 TRACTION CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
75	CONT. DRV. EV1	The EV1 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
75	CONT. DRV. EV2	The EV2 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
75	CONT. DRV. EV3	The EV3 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
89	PUMP VACC NOT OK	The minimum of the lift potentiometer is not correctly set.	It is suggested to repeat a "PROGRAM VACC" procedure.
67	SENS. MOT. TEMP. KO	<ul style="list-style-type: none"> • The motor temperature sensor is not correctly connected to A22. • The motor temperature sensor is damaged. 	<ul style="list-style-type: none"> • Check the correct connection of the motor temperature sensor. • If the current sensor is correctly connected, replace it. • If the problem persists, replace
85	VACC OUT RANGE	The voltage on CNC#4 is outside of the parameters' range.	Please re-acquire the VACC parameters with a PROGRAM
11	STALL ROTOR	The traction rotor is stuck or the encoder signal is not correctly received by the controller.	Please check if the sign of FREQUENCY and ENCODER on the tester menu are the same and different than zero during a
48	EVP DRIVER OPEN	The EVP driver is damaged or the EVP coil impedance is too low.	Please check the EVP coil impedance. If the EVP impedance is OK
49	MANY PUMP REQS	More than one pump functions were requested at the same time.	Just one pump function at a time can be requested. Please reset all the requests and try
79	PUMP INC START	This is a warning for a pump incorrect starting sequence.	<p>The possible reasons for this alarm are:</p> <ul style="list-style-type: none"> • Pump request active at key-on. • Pump request active without man presence. <p>Check the wirings. Check the micro- switches. It could also be an error sequence made by the operator. A failure</p>

Table 4-2 TRACTION CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
90	PUMP VACC RANGE	The voltage on CNC#9 is outside of the parameters range.	<p>If the EVP TYPE parameter is set to ANALOG, please acquire again the values of MIN LOWER and MAX LOWER.</p> <p>If the controller is in Combiacx configuration and the PROPORTION. LIFT parameter</p>
13	PARAM RESTORE	This warning appears when the controller restored the default values.	<p>If a CLEAR EEPROM was mode before the last key on-recycle, this warning just means that the EEPROM was correctly cleared. A travel demand or a pump request cancel the alarm.</p> <p>If this alarm appears at key on without any CLEAR EEPROM request by the operator, there</p>

Table 4-3 STEERING CONTROLLER

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
6	SERIAL ERR #1	Main uC and slave uC communicate via a local serial interface. This alarm occurs when the slave uC does not receive the communication from the main uC through this serial interface.	It is necessary to replace the controller.
13	EEPROM KO	It occurs if a test to write and read one location in EEPROM fails. The SW expects to read the written value. It also occurs when the hour meter gives different values between the three redundant locations in which it is recorded. It also occurs when the busy bit of the EEPROM does not rise within 12 m sec.	It is necessary to replace the controller.
16	LOGIC FAILURE #4	This alarm occurs in the rest state if the output of the voltage amplifier of the phase Vw-Vv have a drift larger than ± 0.25 V.	It is necessary to replace the controller.
17	LOGIC FAILURE #3	This alarm occurs in the rest state if the output of the voltage amplifier of the phase Vu-Vw have a drift larger than ± 0.25 V.	It is necessary to replace the controller.
18	LOGIC FAILURE #2	This alarm occurs when the real voltage between phases W and V of the motor is different from the desired voltage.	It is necessary to replace the controller.
19	LOGIC FAILURE #1	This alarm occurs when the real voltage between phases W and U of the motor is different from the desired voltage.	It is necessary to replace the controller.
32	VMN NOT OK	This alarm occurs in the initial rest state after key-on if the inputs of motor voltage amplifiers are not in the window from 2.2 to 2.8 Vdc.	It is necessary to replace the controller.
48	MAIN CONT. OPEN	This alarm occurs only when the setting CAN BUS is PRESENT. Then the EPS-AC0 waits for a via CAN information that the traction controller has closed the main contactor. If this information lacks more than about 1.5 secs, this alarm occurs.	Find, on the traction controller, the reason for keeping the main contactor open.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
53	STBY I HIGH	<p>This alarm occurs two ways:</p> <p>1) In the initial rest state after key- on, if the outputs of the current amplifiers are not comprised in the window 2.2 to 2.8 Vdc.</p> <p>2) After the initial diagnosis this alarm occurs when the outputs of the current amplifiers at rest have a drift larger than $\pm 0.15V$.</p>	It is necessary to replace the controller.
61	HIGH TEM- PERATURE	This alarm occurs if the temperature of the controller base plate overtakes 75 degrees.	Improve the cooling of the controller; otherwise it is necessary to replace the controller.
65	MOTOR TEMPERAT	<p>This alarm occurs only when DIA MOTOR TEMP is on and the thermal sensor inside the motor measures a temperature higher than 150 degrees. It also occurs when trying to acquire the motor resistance with a temperature in the motor higher than 150 degree (still with DIAG MOTOR TEMP to ON).</p>	Check that the thermal sensor in the motor is working correctly. If it is, improve the cooling of the motor.
70	HIGH CURRENT	This alarm occurs if the circuit to limit via hardware the current in the motor is either always active at key-on or repeatedly active when the motor is turning.	Check the motor is suited to work with the EPS-DC0 (not oversized). Otherwise it is necessary to replace the controller.
71	POWER FAILURE #3	This alarm occurs when the current in the phase V of the motor is zero and the motor is commanded for moving.	Check the power fuse is OK. Check the battery positive arrives to the controller. Check the continuity of the wire in the phase V of the motor. Otherwise it is necessary to replace the
72	POWER FAILURE #2	This alarm occurs when the current in the phase U of the motor is zero and the motor is commanded for moving.	Check the power fuse is OK. Check the battery positive arrives to the controller. Check the continuity of the wire in the phase U of the motor. Otherwise it is necessary to replace
73	POWER FAILURE #1	This alarm occurs when the current in the phase W of the motor is zero and the motor is commanded for moving.	Check the power fuse is OK. Check the battery positive arrives to the controller. Check the continuity of the wire in the phase W of the motor. Otherwise it is necessary to replace

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
83	BAD ENCODER SIGN	It occurs in applications with toggle switches when the applied frequency (FREQUENCY) and motor speed (ENC SPEED) have opposite sign.	Swap in between two encoder channels (CNB#7 with CNB#8).
84	STEER SENSOR KO	This alarm occurs if the command potentiometer (CPOC1 on CNA#9 or CPOC2 on CNA#8) changes with a jerk larger than MAX SP SLOPE. This alarm is used to catch a discontinuity in the voltages of the command potentiometer.	Change the steer pot.
85	STEER HAZARD	This is just a warning to inform that the steering controller is limiting the angle in the steering direction. No speed reduction occurs on the traction.	
218	CLOCK PAL NOT OK	The main uC sends an analog signal towards the slave uC to reset the slave uC on demand. When the slave uC detects the analog signal external to a window from 2.2 to 2.8 and not in the range to generate the reset on demand, the slave uC raises this alarm.	It is necessary to replace the controller.
99	INPUT ERROR #1	It occurs when the voltage on CNA#4 (NK1: Lower Potential Terminal of the Safety Contacts) is higher than 12 V before to turn the safety contacts closed.	When the safety contacts are open, the voltage on CNA#4 is expected to be close to 0 Vdc and this is independent from whether the safety contacts are connected to a plus battery or to a minus battery. In the first case (safety contacts connected to a plus battery), when the safety contacts are open, CNA#4 is connected to a minus battery through a load.
212	MICRO SLAVE #8	It occurs when the encoder counting of the main uC is not matched with the encoder counting the slave uC.	It is necessary to replace the controller.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
219	STEPPER MOTOR MISM	This alarm occurs if the frequency and the amplitude of the voltages from the stepper motor lines are mismatched in between. In normal condition when the amplitude of the stepper motor lines increases, the frequency of the stepper motor lines must increase too.	It is necessary to replace the controller.
220	MOTOR LOCKED	This alarm occurs if the current in the steering motor stays close to the maximum current longer than 1 sec.	Search for a mechanical problem locking the motor. To help in the fault finding, set DEBUG OUTPUT to level 11.
221	MICRO SLAVE #4	It occurs in one or the following conditions: (Open loop application only) If the slave uC detects the stator voltage phasor rotates in the opposite direction respect to the sign of the stepper motor speed. (Closed loop application only) If the slave uC detects the stator voltage phasor rotates in the opposite direction respect to the commanded position.	It is necessary to replace the controller.
222	FB POT LOCKED	In application with a feedback potentiometer, this alarm occurs if the feedback potentiometer (CPOT on CNB#6) does not change (or changes in the opposite direction) its value even if commanded to change. In application with toggle switches with ENCODER CONTROL to off, this alarm occurs if the feedback encoder counting does not change its value even if commanded to change.	In application with the feedback potentiometer verify potentiometer is not mechanically loosened. Check there is not a mechanical block of the steered wheel. Be sure the wiper has not reached its own electrical limit because of too much angle of the steered wheel. This alarm may occur at the installation when the motor rotates in the wrong direction turning away from the desired direction.
223	JERKING FB POT	This alarm occurs if the feedback potentiometer (CPOT on CNB#6) changes with a jerk larger than 0.3V in 16 msec. This alarm is used to catch a discontinuity in the voltages of the feedback potentiometer.	Change the feedback potentiometer.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
225	CURRENT GAIN	This alarm occurs when the parameter to compensate for the gain of the current amplifiers (ADJUSTMENT #03 and ADJUSTMENT #04) have the default values.	It is necessary to send the controller to Zapi to perform the maximum current regulation.
226	NO SYNC	Every 16msec, inside the code cycle, the main uC rises and then lowers an input for the slave uC (SYNC). When the slave uC detects no edge for more than 100 msec on this input, this alarm occurs. This is just a watch dog function: when the main uC does not execute the code cycle it does not update the SYNC signal and the slave uC cuts off the steer and traction.	It is necessary to replace the controller.
227	SLAVE COM. ERROR	Main uC and Slave uC communicate via a local serial interface. This alarm occurs when the main uC does not receive the communication from the slave uC through this serial interface.	It is necessary to replace the controller.
237	WAITING DATA	This warning occurs only if CAN BUS is PRESENT. At key-on the EPS-AC0 asks the traction controller to send a list of parameters via CAN BUS. From the request until the parameter are correctly received, this warning occurs. The steer is not activated yet, and the safety relays remain open when this warning is present.	
228	POSITION ERROR	This alarm occurs for a error in the redundant test of the feedback sensors.	Check the potentiometer connected to CNB#6 is working correctly. If toggle switches are connected to CNA#2 and CNA#3, verify they are working correctly and the setting AUX FUNCTION 11 is correct. Verify that sensor bearing in the motor (encoder) has not slipped (the sensor bearing has two rings: one is connected to the rotor shaft; the other is connected to the motor frame). Check these two rings are securely connected to their structure without slippage.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
238	EPS NOT ALIGNED	This is a real alarm that cuts off the traction. It occurs at the initial alignment if the straight ahead condition is not matched within 6 sec. Throughout the 6 sec delay, steering is not activated, the safety relays are open and the traction is stopped.	
239	WAITING FOR TRAC	At key-on the EPS-AC0 needs an assent from the traction controller to close the safety contacts and to turn on the operational mode. Until this happens, this warning occurs. The steer is not activated and the safety relays remain open when this warning is present.	
241	ENCODER ERROR	It occurs when ENCODER CONTROL is set ON and the real frequency does not pursuit the commanded frequency.	This condition is several times due to either, a mismatching between the Encoder resolution used in the SW and the real encoder resolution, or a wrong connection between the two encoder channels. In this latest case, exchange the connections.
242	Q LINE SENSOR KO	This alarm occurs when the mean voltage of the Quadrature line of the stepper motor (connection CNA#8) is not null: the voltage on every stepper motor line is a sine wave with null mean voltage.	Check the continuity of the stepper motor connections. In particular the resistance between CNA#8 and the negative battery (with the stepper motor at rest) is expected to be very low (close to 30 ohms).
243	D LINE SENSOR KO	This alarm occurs when the mean voltage of the Direct line of the stepper motor (connection CNA#9) is not null: the voltage on every stepper motor line is a sine wave with null mean voltage.	Check the continuity of the stepper motor connections. In particular the resistance between CNA#9 and the negative battery (with the stepper motor at rest) is expected to be very low (close to 30 ohms).
245	DATA ACQUISSI- TION	This alarm occurs when acquiring the motor resistance or when adjusting the parameters to compensate for the gain of the current amplifiers (maximum current factory adjusted).	Recycle the key.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
244	GAIN EEPROM KO	The parameters to compensate for the gain of the current amplifiers (ADJUSTMENT #03 & ADJUSTMENT #04 are recorded in a notvolatile memory (eeprom) with a redundant handling. In fact every adjustment is recorded in 3 eeprom locations. If the values in these three location are different, this alarm occurs.	It is necessary to send the controller to Zapi to execute the maximum current regulation.
246	MICRO SLAVE KO	In stepper motor application, this alarm occurs if the main uC is detecting a direction of the stepper motor not matched with the one that the slave uC is detecting. In closed loop application, this alarm occurs if the main uC is detecting a direction of the steering error not matched with the one that the slave uC is detecting. Furthermore, this alarm occurs if the main uC is detecting no steering limitation meanwhile the slave uC is detecting a steering limitation.	It is necessary to replace the controller.
247	CAN BUS KO	This alarm occurs only when the setting CAN BUS is PRESENT. The EPS-AC0 must receive the event messages from the traction controller. If these messages lack more than about 1 sec, this alarm occurs.	Check the CAN Bus communication system and analyze the frames from the traction controller to the steer controllers.
248	S.P OUT OF RANGE	This alarm occurs for a fault on the command potentiometer (CPOC2on CNA#8). When a single command pot is chosen, the alarm occurs if the wiper (CPOC1) exits the range from 0.8 Vdc to 4.2 Vdc. When the twin pot is chosen, the alarm occurs if the sum of the two wiper voltages (CPOC1 + CPOC2) exists the range from 4.5 Vdc to 5.5 Vdc.	Check the connections of the potentiometer. This alarm occurs when one connection of the command potentiometer is broken.

Table 4-3 STEERING CONTROLLER - CONTINUED

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
249	F.B OUT OF RANGE	This alarm occurs for a fault on the feedback potentiometer (CPOT on CNB#6). This alarm occurs in CPOT exits the range from 0.3 Vdc to 4.7 Vdc.	Check the connections of the feedback potentiometer. This alarm occurs when one connection of the feedback potentiometer is broken.
250	MICRO SLAVE	It occurs when the information on the status bus between the main uC and the slave uC is frozen to the OFF value (the slave uC does not update the status bus configuration).	It is necessary to replace the controller.
251	KM OPEN	This alarm occurs if the slave uC detects the safety contact, of the main uC, open when expected being closed.	It is necessary to replace the controller.
252	KS OPEN	This alarm occurs if the slave uC detects the safety contact, of the main uC, open when expected being closed.	It is necessary to replace the controller.
253	KM CLOSED	This alarm occurs at key-on if the slave uC detects the safety contact, of the main uC, closed prior to being commanded.	This alarm occurs if the connection CNA#5 (K1) is around a voltage of 12 Vdc when switching on the key. In fact, when the safety contacts are open, K1 is expected to be plus battery voltage (not 12 V). Search for a harness problem or replace the controller.
254	KS CLOSED	This alarm occurs if the main uC detects the safety contact, of the slave uC, closed prior to being commanded.	This alarm occurs if the connection CNA#4 (NK1) is around a voltage of 12 Vdc when switching on the key. In fact, when the safety contacts are open, NK1 is expected to be a minus battery voltage (not 12 V). Search for harness problem or replace the controller.

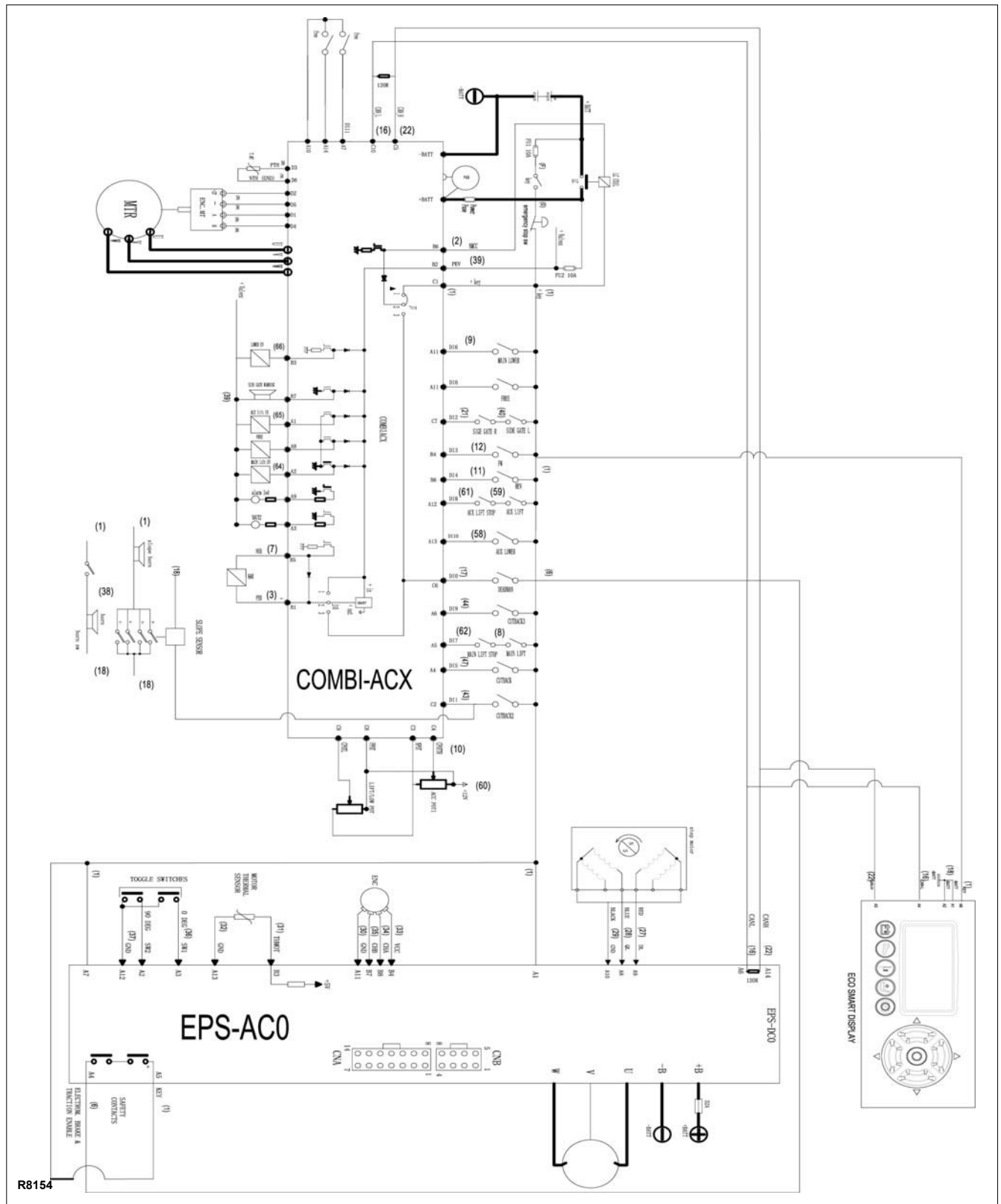


Figure 4-2 Wiring Diagram

NOTES

SECTION 5 OPERATING CONTROL SYSTEM

5-1. CONTROL ARM

2. Remove four screws and two screws. Separate lower cover and upper cover.

5-1.1 Steering Control Removal

1. Engage the emergency stop switch and turn off key switch.

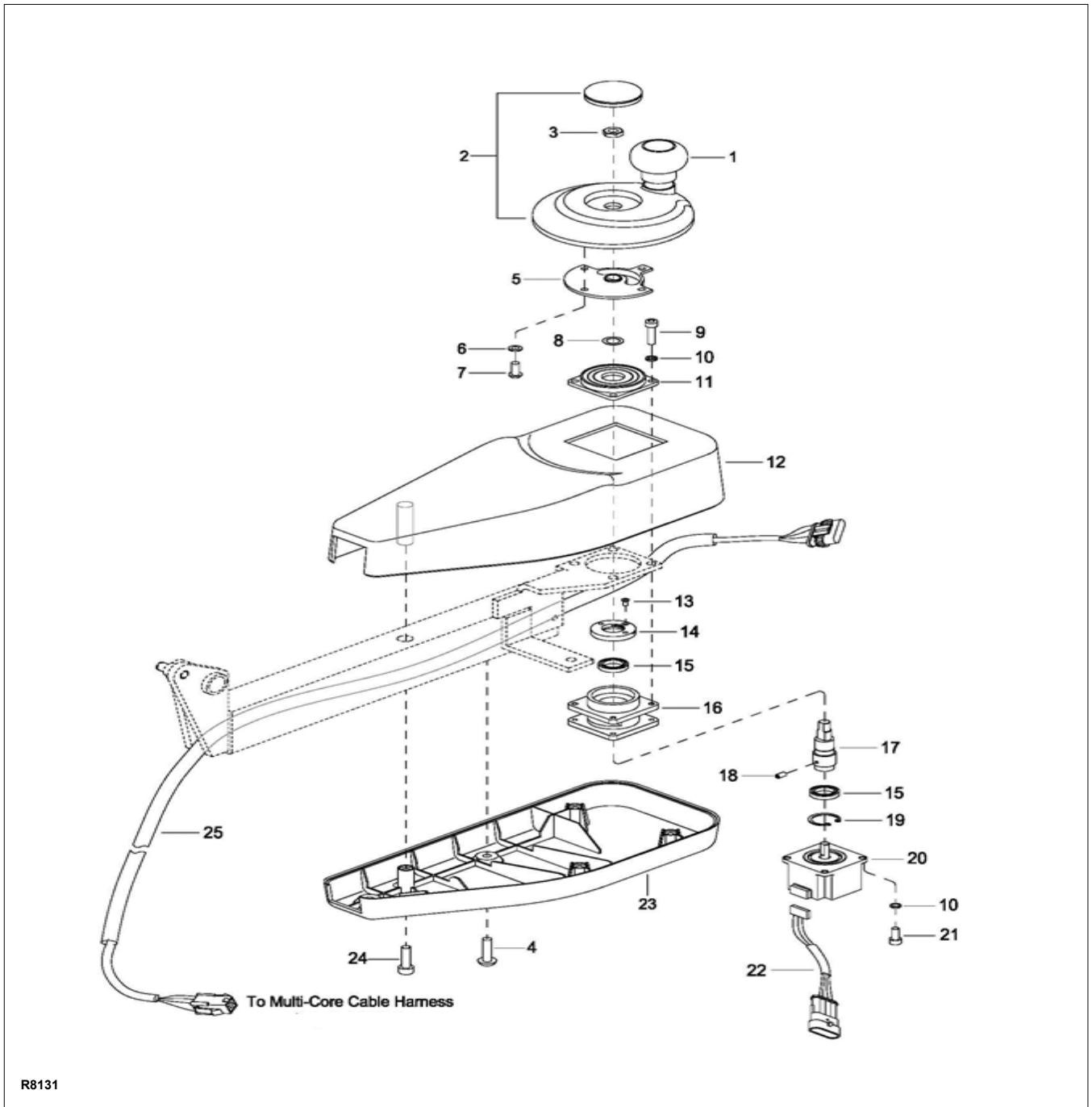


Figure 5-1 Control Arm (Left)

3. Disconnect the two harnesses from each other and from the potentiometer.
4. Remove button plug on top of steering wheel, nut, lock washer, handle and shims.
5. Remove four screws, four lock washers and bracket from handle.
6. Remove four screws, four lock washers and damper.
7. Remove potentiometer from control arm.
8. Remove screw, nut and upper bearing.
9. Remove four screws, four lock washers and remove potentiometer from bearing block.
10. Loosen screw and remove shaft from potentiometer.
11. Remove snap ring and lower bearing from shaft.

5-1.2 Steering Control Installation

1. Install lower bearing and snap ring on shaft.
2. Install shaft on potentiometer and secure with screw.
3. Position potentiometer on bearing block and secure with four screws, and four lock washers.
4. Install upper bearing, nut and screw.
5. Position potentiometer on control arm.
6. Install damper and secure with four screws and four lock washers.
7. Install bracket on handle and secure with four screws and four lock washers.
8. Install shims and handle, engaging bracket with damper.
9. Secure handle with nut and lock washer and install the button plug.
10. Reconnect the two harnesses from to other and to the potentiometer.
11. Install lower cover and upper cover and secure with four screws and two screws.
12. Disengage the emergency stop switch and turn on key switch.

5-2. COMPARTMENT COVER

5-2.1 Cover Removal

1. Engage the emergency stop switch and turn off key switch.
2. Remove two screws.

3. Carefully lift cover up and off the truck.

5-2.2 Cover Installation

1. Carefully position cover on the truck.
2. Install two screws.
3. Disengage the emergency stop switch and turn on key switch.

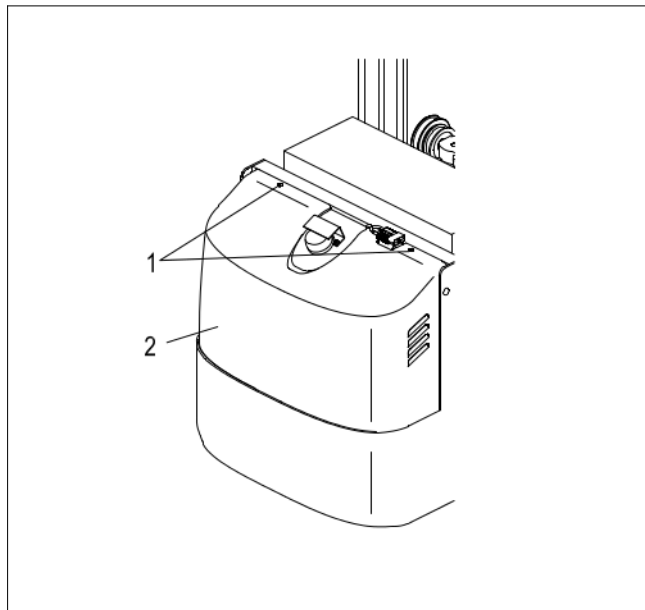
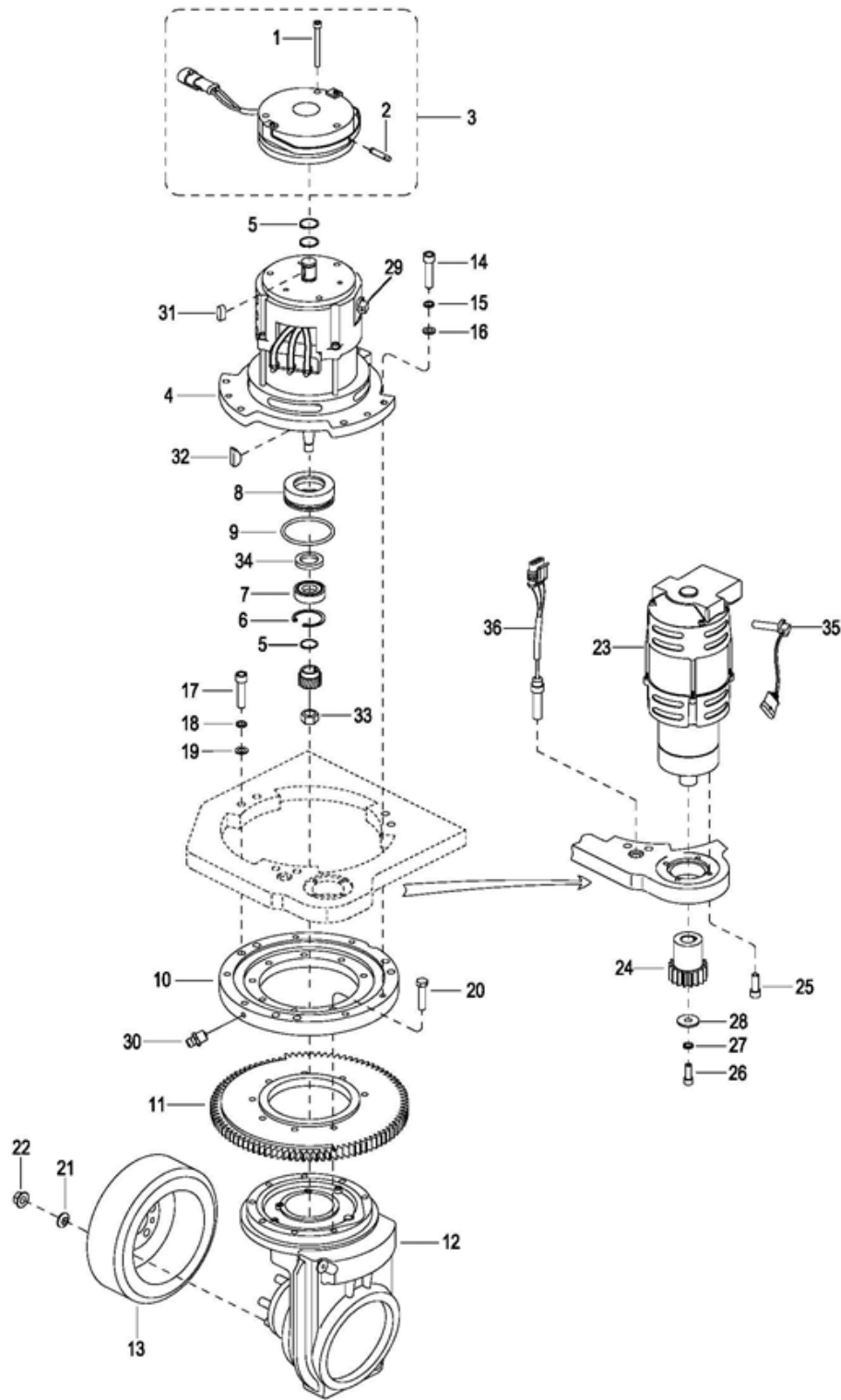


Figure 5-2 Compartment Cover

5-3. STEERING MOTOR

5-3.1 Motor Removal

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment cover as described in [paragraph 5-2.1](#).
3. Disconnect harness and cables from the steering motor.
4. Remove the gear on the bottom of the motor first.
5. Remove four screws from under the vehicle.
6. Remove the steering motor from the top of the vehicle.



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Figure 5-3 TRANSMISSION, MOTOR & BRAKE ASSEMBLY

5-3.2 Motor Installation

1. Position the steering motor in the top of the motor compartment.
2. Secure the motor with four screws from under the vehicle.
3. connect harness and cables from the steering motor.
4. Install the compartment cover as described in [paragraph 5-2.2](#)
5. Disengage the emergency stop switch and turn on key switch.

SECTION 6 BRAKE SERVICING

6-1. BRAKES

The brake system consists of a drive motor mounted brake. This brake is spring applied and electrically released.

6-1.1. MEASUREMENT

The "air gap" is the distance between the magnet body and the rotor plate with the brake applied. As the brake pads and rotor wear normally, the air gap will increase and should be replaced when it measures more than 0.25mm.

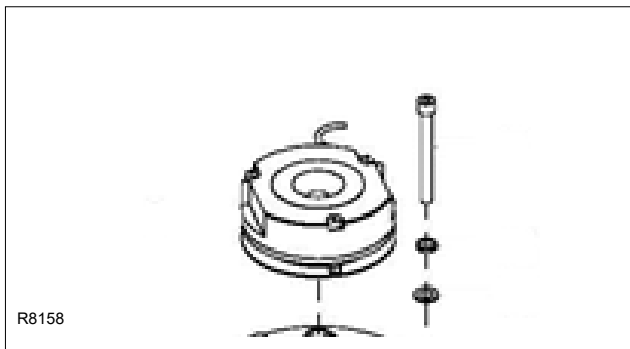


Figure 6-1 Brake Assembly

6-1.2. STOPPING DISTANCE ADJUSTMENT

The stopping distance of the truck should not require adjustment. However, this distance should be checked with each planned maintenance.

Using an unloaded truck, run truck to its top speed on an even dry concrete surface. Move control handle into the lower braking position. Measure length of braking path from the actuation point of the brakes until the truck has stopped. The actual length of the braking path should be between approximately

1.5 - 2.5 ft (0.5-0.7 m) if more than that replace the brake.

6-1.3. BRAKE ASSEMBLY REPLACEMENT

1. Block load wheels.
2. Remove the compartment covers as described in paragraph 5-2.
3. Disconnect electric brake from harness.
4. Remove the three mounting screws (Figure 6-1) and the brake.
5. Place the new brake into position and secure with the three mounting screws.
6. Finally tighten the three mounting screws to 52 inlb (6 Nm).
7. Reconnect electric brake from harness.
8. Remove load wheel blocks and check operation.
9. Install the compartment covers as described in paragraph 5-2.

NOTES

SECTION 7 DRIVING SYSTEM

7-1. DRIVE WHEEL

1. Engage the emergency stop switch and turn off key switch.
2. Jack up the vehicle to gain access to the drive wheel; then securely block the vehicle to prevent movement.
3. Remove five nuts, five washers and drive wheel from transmission.
4. Install new drive wheel in reverse order of removal.
5. Disengage the emergency stop switch and turn on key switch.

7-2. TRANSMISSION

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph 5-2.
3. Remove the brake as described in paragraph 6-1.3. Disconnect harness from drive motor.
4. Remove six screws, six lock washers, plat washers and motor from transmission.
5. Disconnect position switch from harness.
6. Remove position switch from the frame.
7. Support the transmission and remove the six screws, six lock washers and six flat washers.
8. Slowly lower the transmission out the bottom of the frame.
9. Install new transmission by reversing the steps above.

7-3. Load Wheel

7-3.1. Removal

1. Engage the emergency stop switch and turn off key switch.
2. Block the drive wheel to prevent the vehicle from rolling.
3. Jack up the vehicle to raise the load wheels off the floor. Securely block the vehicle in the raised position by positioning supports under both fork tips.
4. Remove four screws and cover.

5. Remove nut, washer and load wheel.
6. Remove seal from load wheel.
7. Remove bearings from load wheel.
8. Inspect bearings and replace if necessary.

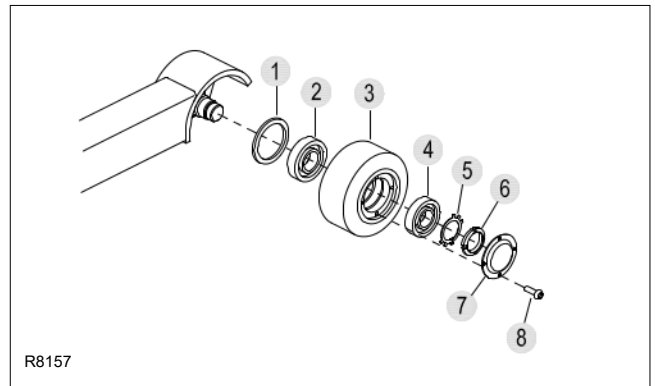


Figure 7-1 Load Wheel

7-3.2. Load Wheel Installation

NOTE: Adjustable straddle shown, fixed straddle similar.

1. Pack bearings with grease.
2. Reassemble bearings in wheel.
3. Position load wheel in the axle and install washer and nut. Tighten nut until there is a slight drag on load wheel. Secure nut with tab on washer.
4. Install cover and secure with four screws.
5. Remove the blocking from under the vehicle and lower it to the ground.
6. Disengage the emergency stop switch and turn on key switch.

NOTES

SECTION 8 ELEVATION SYSTEM SERVICING

8-1. GENERAL

The elevation system includes the outer mast, inner mast, lift linkage, lift chains, lift cylinder and ram head.

8-2. LIFT CHAIN LENGTH ADJUSTMENT

1. Fully lower the lift carriage.
2. Engage the emergency stop switch and turn off key switch.

WARNING: Before attempting any adjustment, make certain power is disconnected

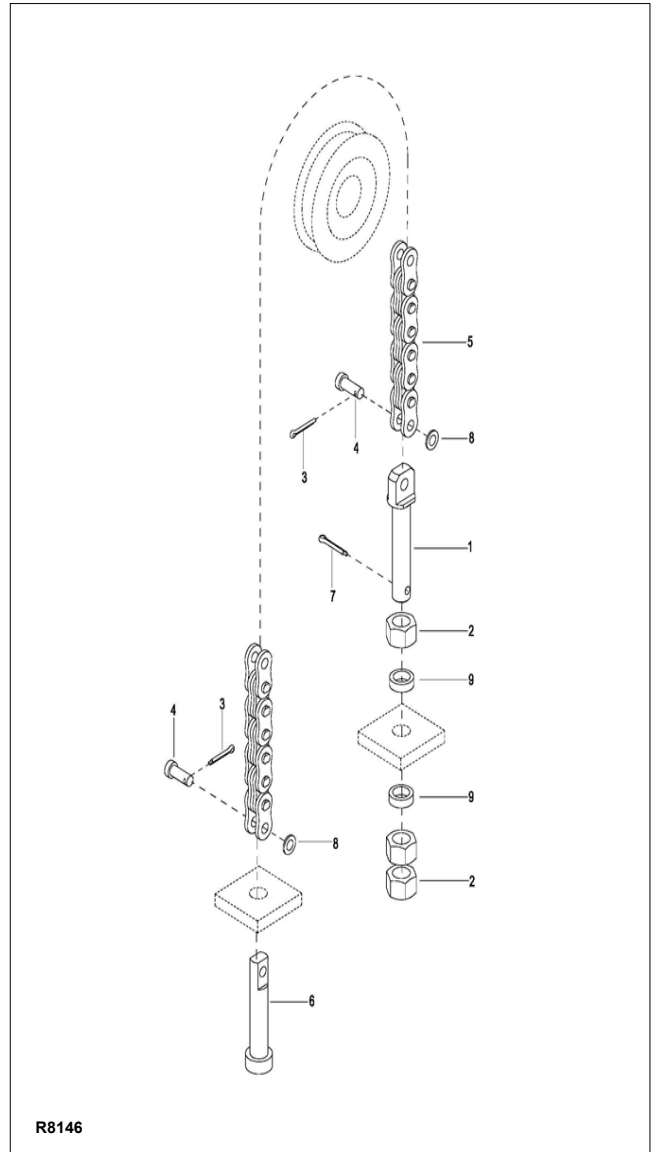


3. Loosen both upper jam nuts to allow for adjustment of middle jam nuts.
4. Break both lower jam nuts free from the middle jam nuts.
5. Take up slack in both lift chains with middle jam nuts (2). Strive for equal tension on both chains.
6. Align anchor so the clevis pins is parallel to the masts.

CAUTION: At least 3 full threads must be present below lower nut after adjustment



7. Tighten jam nuts securely while maintaining alignment of clevis pins.
8. Disengage the emergency stop switch and turn on key switch.
9. Test chain by operating carriage. If slack is still apparent, repeat above procedure.



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Figure 8-1 Chain Assembly

8-3. CHAIN WEAR INSPECTION

Both lift chains should be replaced when either chain is worn enough to increase its length by 3% or more. To make this determination proceed as follows.

Using a section of chain that sees the most frequent operation over the chain sheaves, isolate a vertical portion under tension from the weight of carriage and forks.

Measure the distance between pin centers on 20 vertical links. If the section measures 12.88" or more, the chain should be replaced.

New chain anchor, clevis pins and cotter pins should be installed when chains are replaced. Never replace a partial section of chain and never repair chain. Refer to paragraph 8-4. when installing new chain.

8-4. LIFT CHAIN REPLACEMENT

8-4.1. Platform Lift Chain

1. With the lift truck wheels securely blocked, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that arrangement is secure before proceeding.

WARNING: Before attempting any adjustment, make certain power is disconnected.



3. Engage the emergency stop switch and turn off key switch.
4. Remove cotter pin and clevis pin connecting chain to chain anchor at the lift carriage.
5. Remove cotter pin and clevis pin connecting chain to chain anchor at the outer mast.
6. Remove chain from sheave.
7. Position new chain on sheave.
8. Secure new chain to new chain anchor at the outer mast with new clevis pin and new cotter pin.
9. Connect the opposite end of new chain to new chain anchor at the lift carriage with new clevis pin and new cotter pin.
10. Adjust the chains according to paragraph 8-2..
11. Disengage the emergency stop switch and turn on key switch.

8-4.2. Forks Lift Chain

1. With the lift truck wheels securely blocked, raise the forks approximately three feet from floor and position blocks or strong supports under the lift carriage.
2. Lower forks onto the support. Check that arrangement is secure before proceeding.
3. Engage the emergency stop switch (and turn off key switch).

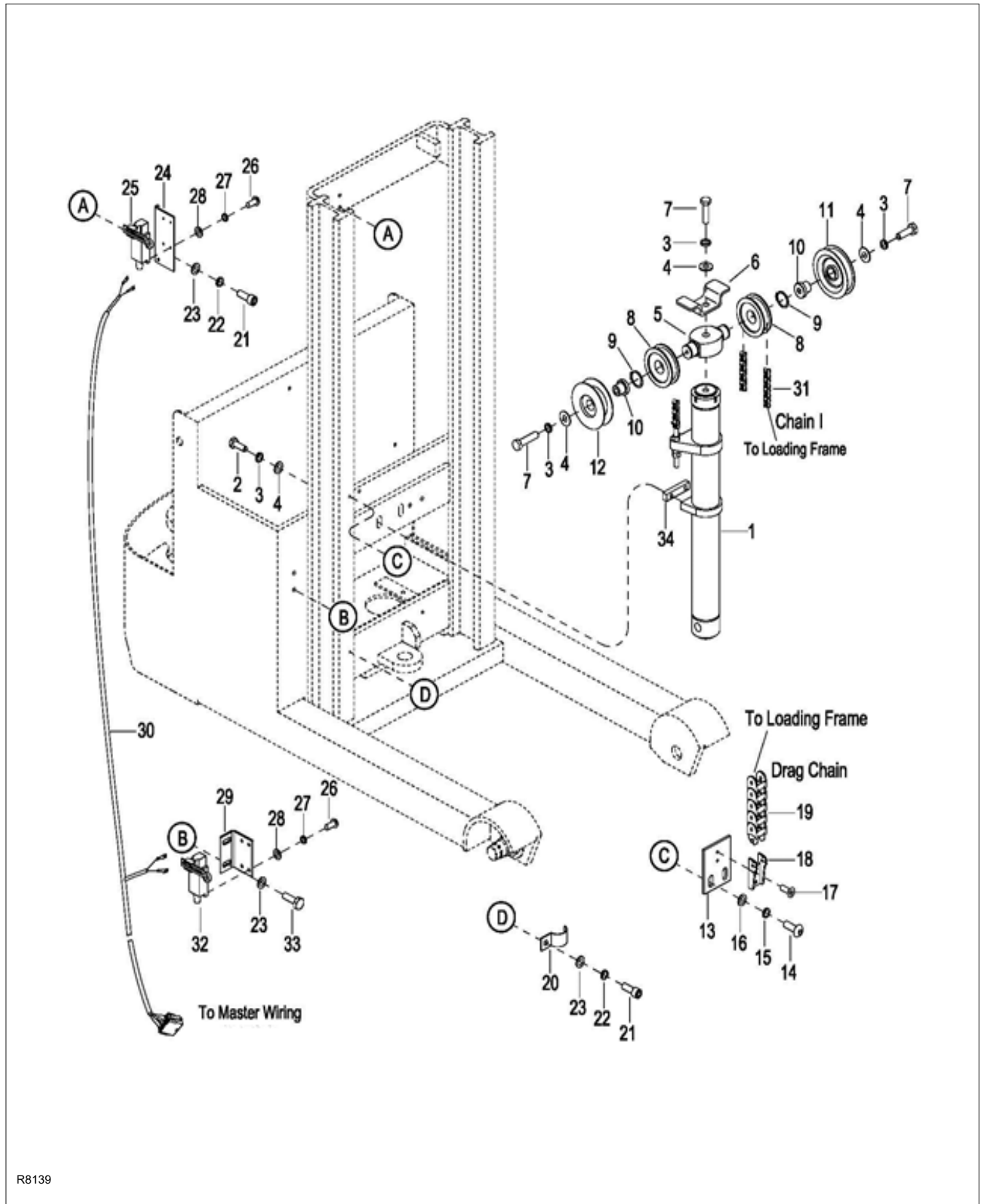
WARNING: Before attempting any adjustment, make certain power is disconnected.



4. Remove cotter pin and clevis pin connecting chain to chain anchor at the lift carriage.
5. Remove cotter pin and clevis pin connecting chain to chain anchor at free lift cylinder.
6. Remove chain from sheave.
7. Position new chain on sheave.
8. Secure new chain to new chain anchor at the outer mast with new clevis pin and new cotter pin.
9. Connect the opposite end of new chain to new chain anchor at the lift carriage with new clevis pin and new cotter pin.
10. Adjust the chains according to paragraph 8-2..
11. Disengage the emergency stop switch and turn on key switch.

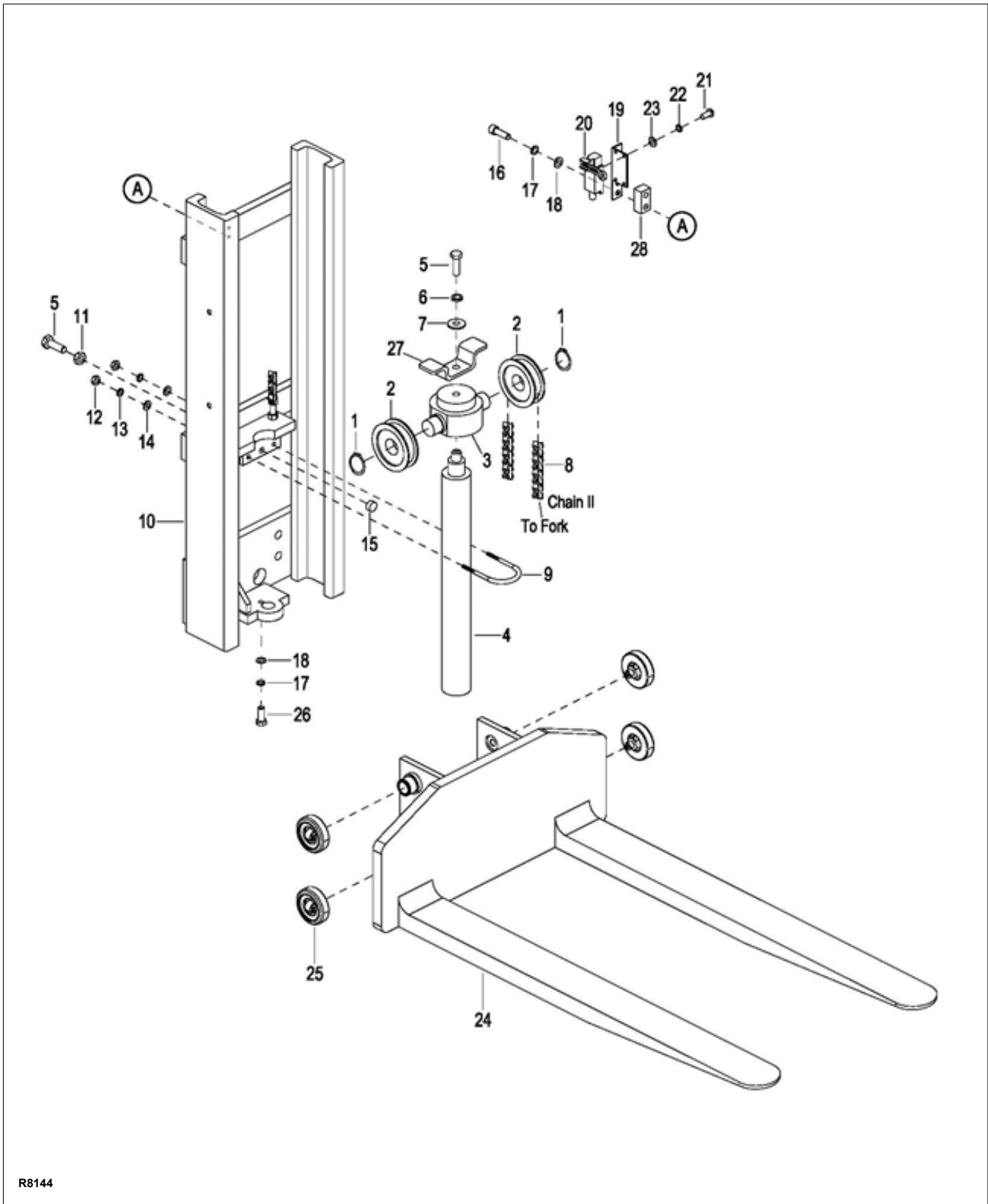
8-5. LIFT CYLINDERS

NOTE: Removal and repair of lift cylinders are covered in SECTION 9.



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Figure 8-2 Mast System



R8144

Figure 8-3 Mini Mast Assembly

SECTION 9 HYDRAULIC SYSTEM SERVICING

9-1. LINES AND FITTINGS

WARNING: When platform and forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered and the batteries disconnected before performing any maintenance on the hydraulic system.



NOTE: Leaking hydraulic fittings may be remedied by simply tightening fittings. If this does not remedy the leak, the fittings or line must be replaced.

1. Lower forks fully.
2. Engage the emergency stop switch and turn off key switch.
3. Remove the compartment covers as described in paragraph 5-2..

CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.



4. Refer to [Figure 9-1](#) and remove leaking line or fitting and replace it with a new line or fitting.
5. Check level of hydraulic oil. With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening. Use hydraulic oil listed in [Table 3-2](#)
6. Disengage the emergency stop switch and turn on key switch.
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check level of hydraulic oil. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
9. Install the compartment covers as described in paragraph 5-2..

9-2. HYDRAULIC PUMP, MOTOR, AND RESERVOIR ASSY

The hydraulic pump/motor assembly can be disassembled and repaired. However, a defective pump.

valve or motor requires replacement of that component.

WARNING: When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered and the batteries disconnected before performing any maintenance on the hydraulic system.



9-2.1. Removal

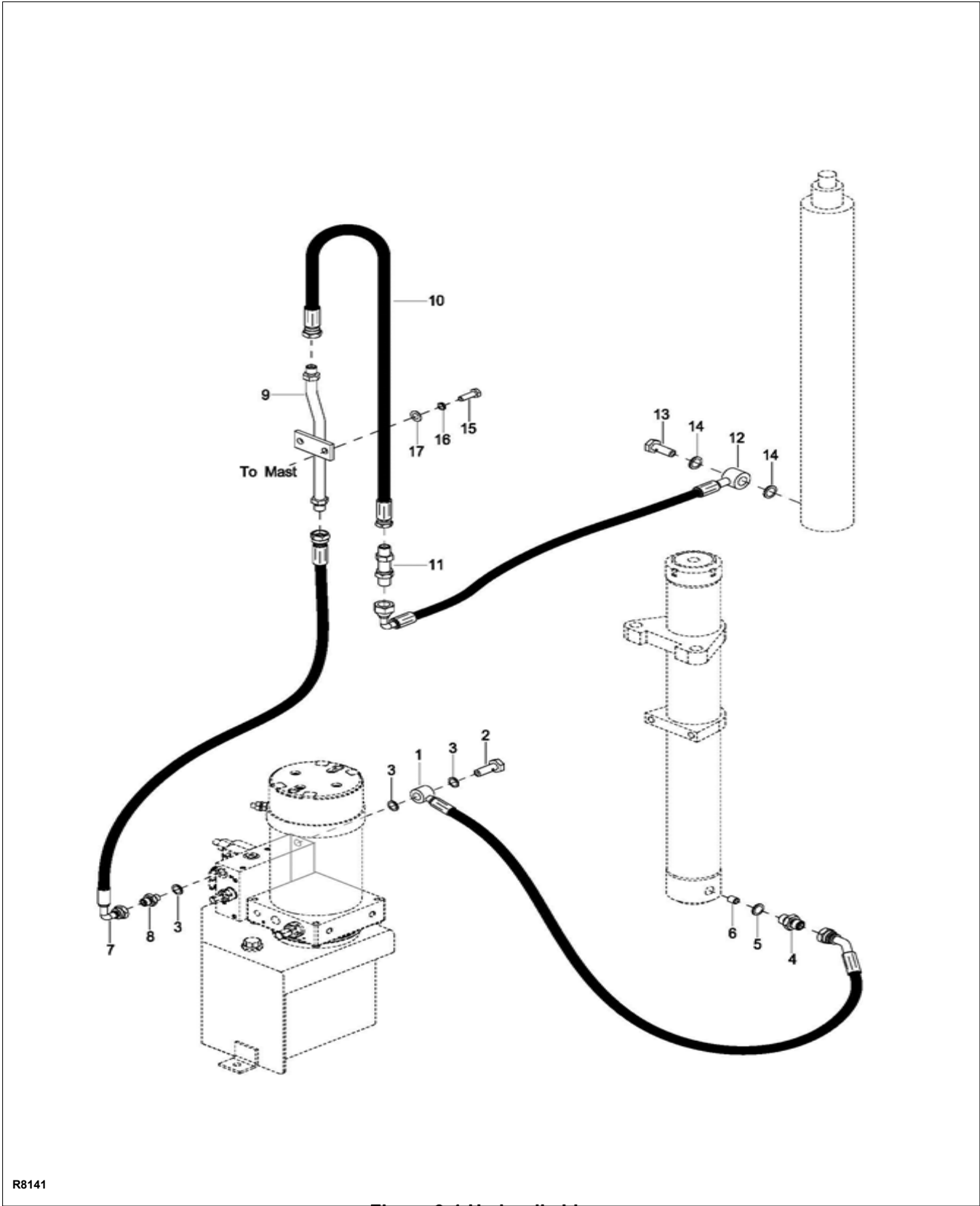
1. Lower forks fully.
2. Engage the emergency stop switch and turn off key switch.
3. Remove the compartment covers as described in paragraph 5-2..

NOTE: The reservoir and hose will be filled with hydraulic oil. Place a container under the pump assembly to catch any hydraulic oil.

4. Tag and disconnect electrical leads from motor and solenoid. Refer to [Figure 10-3](#) and [Figure 10-4](#).
5. Disconnect hoses from pump & motor assembly.
6. While supporting the pump/motor assembly remove four bolts, fourlock washers and four plat washers.
7. Remove the pump/motor assembly.

9-2.2. Disassembly and Reassembly

1. Remove the hydraulic pump/motor assembly as described in paragraph 9-2.1..
2. Refer to [Figure 9-2.3](#). for disassembly and reassembly.



R8141

Figure 9-1 Hydraulic Lines

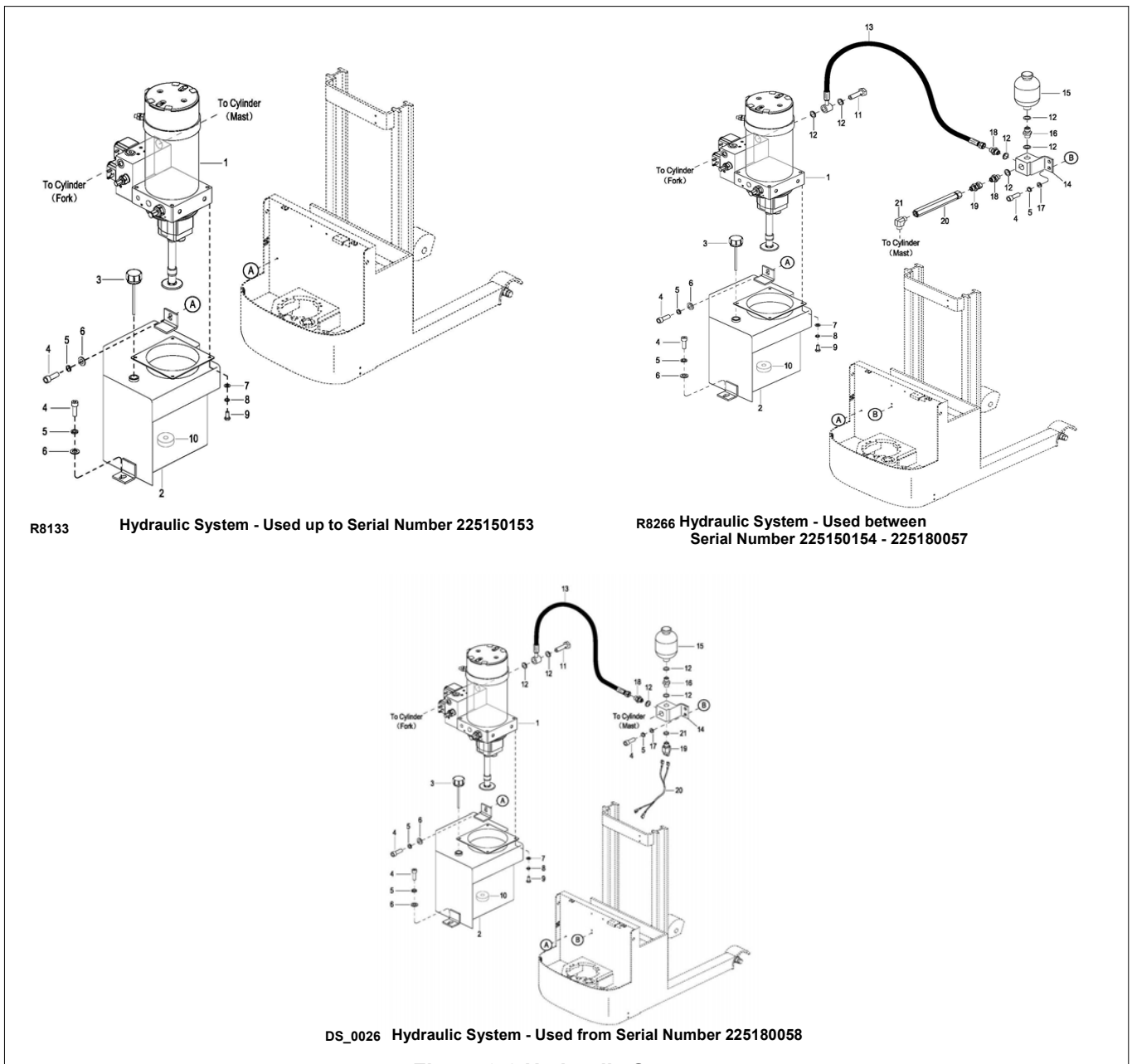


Figure 9-2 Hydraulic System

9-2.3. Installation

1. While supporting the pump & motor assembly (, secure with four bolts, four lock washers and four plat washers.
2. Reconnect hoses to pump & motor assembly.
3. Connect electrical leads to motor and solenoid. Refer to [Figure 10-3](#) and [Figure 10-4](#).
4. Fill the hydraulic reservoir. Use hydraulic oil listed in [Table 3-2](#).
5. Disengage the emergency stop switch and turn on key switch.
6. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.

7. Check level of hydraulic oil. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
8. Install the compartment covers as described in paragraph [5-2..](#)

9-2.4. Lift Cylinder (Platform)

9-2.4.1. Removal

1. With the lift truck wheels securely blocked, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that arrangement is secure before proceeding.
3. Engage the emergency stop switch and turn off key switch.

WARNING: Before attempting any replacement, make certain power is disconnected



4. Remove cotter pin and clevis pin connecting chain to chain anchor at free lift cylinder.
5. Remove chains from sheaves.

CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.



6. Loosen hose at the bottom of lift cylinder and manually push the ram down as far as possible. The chains will become slack and need not be removed.
7. Disconnect the hose from the bottom of lift cylinder.
8. Remove screw, lock washer, flat washer, bracket and ram head from cylinder.

WARNING: Support lift cylinder before performing the following steps to prevent cylinder from falling.



9. Support cylinder and remove two screws, two lock washers and two flat washers.
10. Tilt lift cylinder (1) forward from their position in the lift truck.
11. Raise lift cylinder assembly up and out of truck.

9-2.4.2. Repair

CAUTION: To prevent damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.



1. Secure the lift cylinder in a vise, clamping lightly at the base of the cylinder.
2. Remove gland nut.
3. Remove wiper, O-ring, guide ring, seal and O-ring from gland nut.
4. Pull out piston rod.
5. Remove guide ring, seal and snap ring from piston rod.
6. Coat all parts with hydraulic oil (Table 3-2).
7. Install guide ring and new seal and snap ring on piston rod.
8. Insert rod in cylinder tube.

9. Install new wiper, new O-ring, guide ring., new seal and new O-ring on gland nut.
10. Install gland nut in cylinder tube.

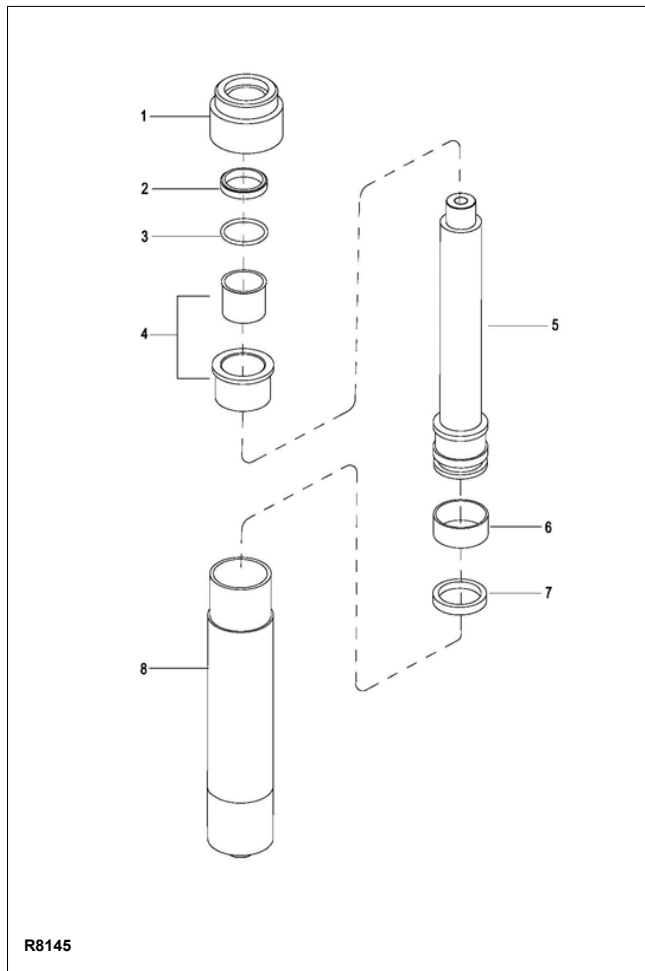


Figure 9-3 Lift Cylinder - Mini Mast

9-2.4.3. Installation

1. Position the cylinder on the frame and secure with two screws, two lock washers and two flat washers.
2. Reconnect the tube to the bottom of the cylinder.
3. Position ram head on cylinder and secure with bracket, screw, lock washer and flat washer.
4. Lift up the lift chains and position them on sheaves.
5. Adjust the chains according to paragraph 8-2..
6. Disengage the emergency stop switch and turn on key switch.
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.

8. Check level of hydraulic oil. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
9. Install the compartment covers as described in paragraph 5-2..

9-2.5. Lift Cylinder (Forks)

9-2.5.1. Removal

1. Fully lower the forks.
2. Engage the emergency stop switch and turn off key switch.

WARNING: Before attempting any replacement, make certain power is disconnected.



3. Using another lift truck or suitable jack, raise the forks far enough to remove pressure on the lift cylinder
4. Remove cotter pin and clevis pin connecting chain to chain anchor at free lift cylinder.
5. Remove chains from sheaves.
6. Remove screw, lock washer, flat washer, bracket and ram head from cylinder.

CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.



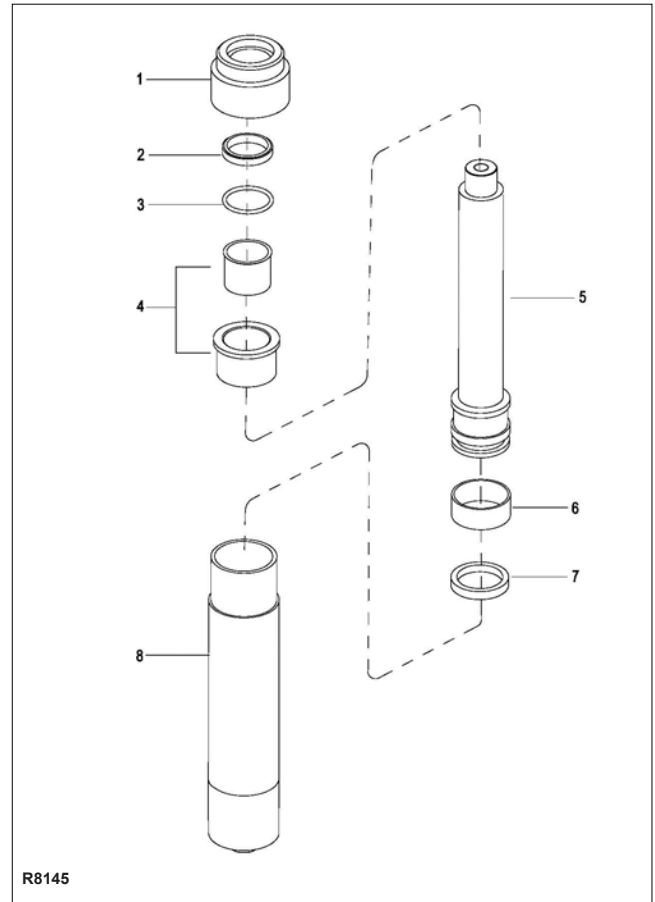
7. disconnect the hose from the bottom of lift cylinder.
8. Support cylinder and remove two nuts, two lock washers two flat washers and U bolt.
9. Raise lift cylinder assembly up and out of truck.

9-2.5.2. Repair

CAUTION: To prevent damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.



1. Secure the lift cylinder in a vise, clamping lightly at the base of the cylinder.
2. Remove gland nut.
3. Remove wiper and O-ring from gland nut.
4. Remove bearing.
5. Pull out piston rod.
6. Remove guide ring and seal from piston rod.



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Figure 9-4 Lift Cylinder (Forks)

7. Coat all parts with hydraulic oil ([Table 3-2](#)).
8. Install guide ring and new seal on piston rod.
9. Insert rod in cylinder tube.
10. Insert bearing.
11. Install wiper and new O-ring on gland nut.
12. Install gland nut in cylinder tube.

9-2.5.3. . Installation

1. Position cylinder on the mast and secure with U bolt and secure with two nuts, two lock washers, two flat washers.
2. Reconnect the tube to the bottom of the cylinder.
3. Position ram head on cylinder and secure with bracket, screw, lock washer, and flat washer.
4. Lift up the lift chains and position them on sheaves.
5. Adjust the chains according to paragraph 8-2.
6. Disengage the emergency stop switch and turn on key switch.

7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check level of hydraulic oil. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-2](#).
9. Install the compartment covers as described in paragraph [5-2](#).

SECTION 10 ELECTRICAL COMPONENTS

10-1. ELECTRICAL CONTROL PANEL

10-1.1. Maintenance

NOTE: Erratic operation of the truck may be caused by defective controller components. Before removing the electrical panel, perform troubleshooting procedures per [SECTION 4](#) to determine corrective action to be taken.

There are no user-serviceable parts inside the controller. No attempt should be made to open the controller. Opening the controller may damage it and will void the warranty.

The controller is programmed at the factory specifically for the truck model on which it is equipped. It is important to replace the controller with the correct preprogrammed unit to assure proper performance settings intended for that particular truck. See [Figure 10-2](#) for the preprogrammed controller number. It is recommended that the controller exterior be cleaned periodically, and if a hand held programmer is available, this periodic cleaning provides a good opportunity to check the controllers diagnostic history file. It is also recommended that the controller s fault detection circuitry be checked whenever the vehicle is serviced.

10-1.2. Cleaning

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph [5-2.](#)
3. Remove any dirt or corrosion from the bus bar area. The controller should be wiped clean with a moist rag. Allow it to dry before reconnecting the battery.
4. Make sure the connections to the buss bars are tight. Use two well insulated wrenches for this task in order to avoid steering the buss bars.

10-1.3. Panel Removal

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph [5-2.](#)
3. Tag and disconnect all electrical cables which connect to the control panel.

4. Remove four screws, four lock washers, four flat washers and control panel.

10-1.4. Panel Disassembly

Refer to [Figure 10-2](#) for location and identity of the major replacement components mounted on the panel and remove defective parts.

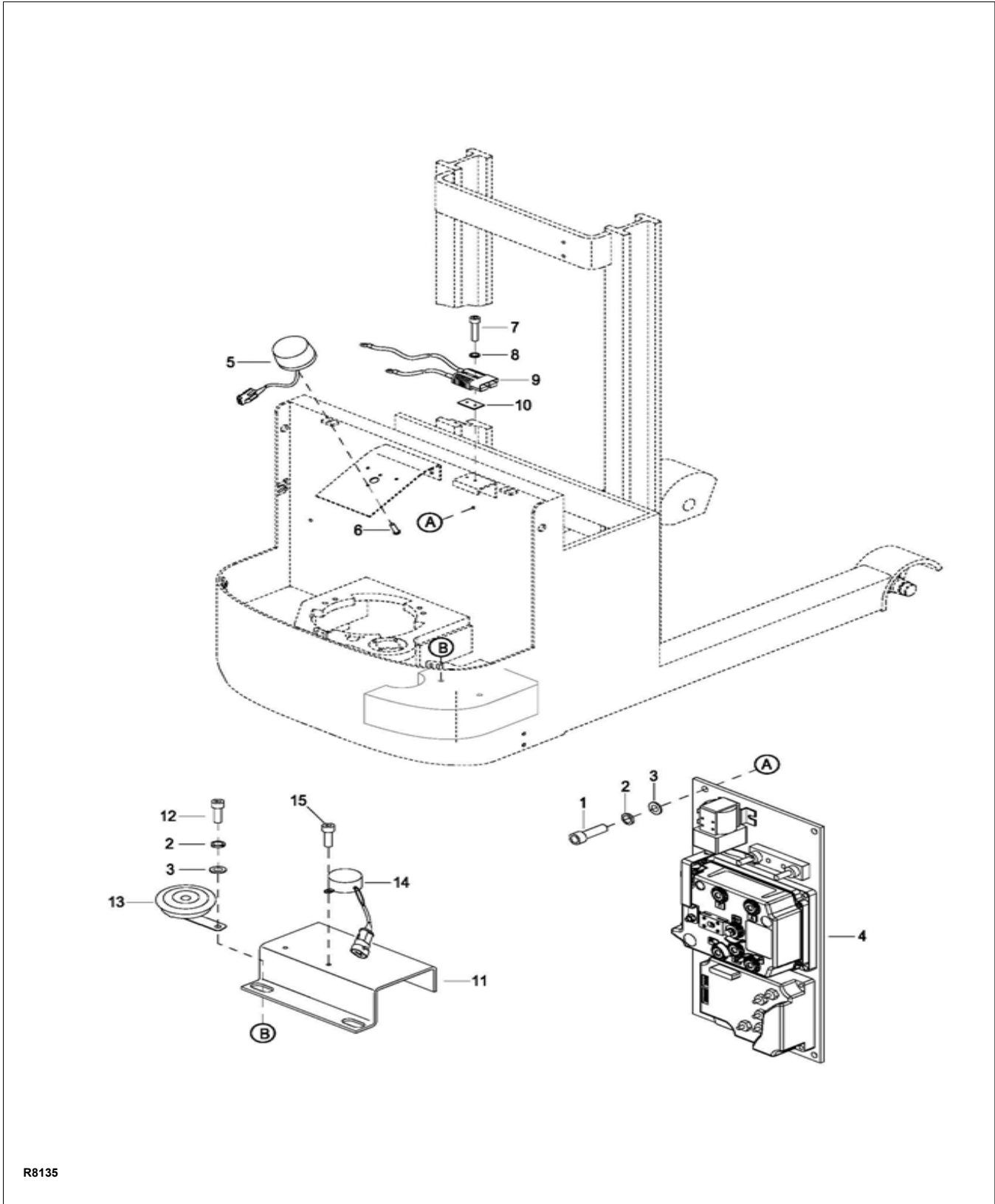
NOTE: Contactor (2 or 4) is not repairable and must be replaced if defective.

10-1.5. Panel Installation

1. Install the control panel and secure with four screws, four lock washers and four flat washers.
2. Refer to [Figure 10-3](#) and [Figure 10-4](#) and connect all electrical cables to the control panel as noted during removal.
3. Install the compartment covers as described in paragraph [5-2.](#)
4. Disengage the emergency stop switch and turn on key switch.

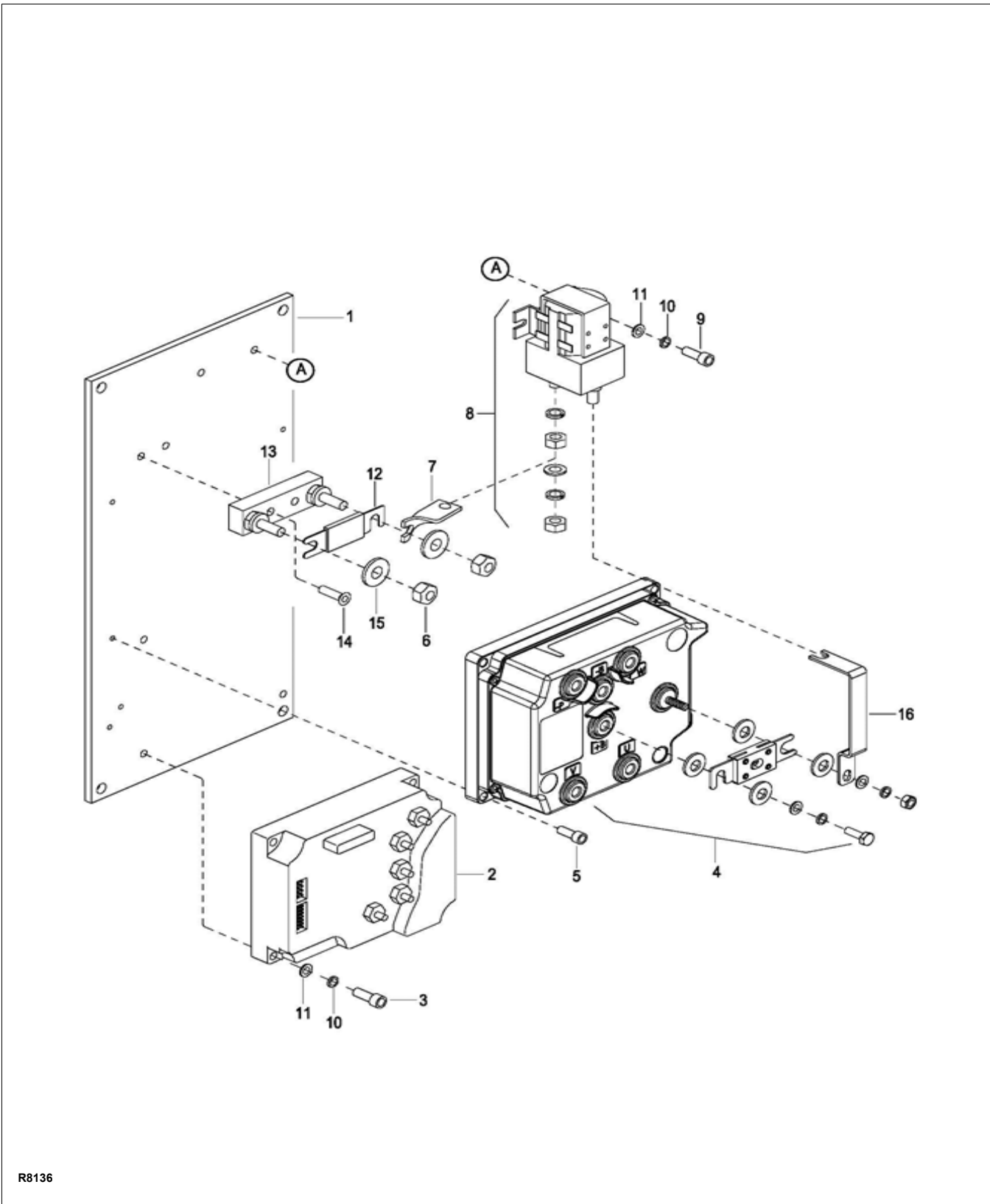
10-2. HORN REPLACEMENT

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph [5-2.](#)
3. Tag and disconnect all electrical connections from horn.
4. Remove screw, lock washer, flat washer and horn.
5. Install new horn and secure with screw, lock washer, flat washer.
6. Install the compartment covers as described in paragraph [5-2.](#)
7. Disengage the emergency stop switch and turn on key switch.



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Figure 10-1 Electrical System



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Figure 10-2 Control Panel Assembly

10-3. LOWERING BUZZER REPLACEMENT

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph 5-2.
3. Tag and disconnect all electrical connections from buzzer.
4. Remove screw and buzzer.
5. Install new buzzer and secure with screw.
6. Reconnect harness to buzzer.
7. Install the compartment covers as described in paragraph 5-2.
8. Disengage the emergency stop switch and turn on key switch.

10-4. WARNING LIGHT REPLACEMENT

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers as described in paragraph 5-2.
3. Tag and disconnect all electrical connections from light.
4. Remove two screws and light.
5. Install new light and secure with two screws.
6. Reconnect harness to light.
7. Install the compartment covers as described in paragraph 5-2.
8. Disengage the emergency stop switch and turn on key switch.

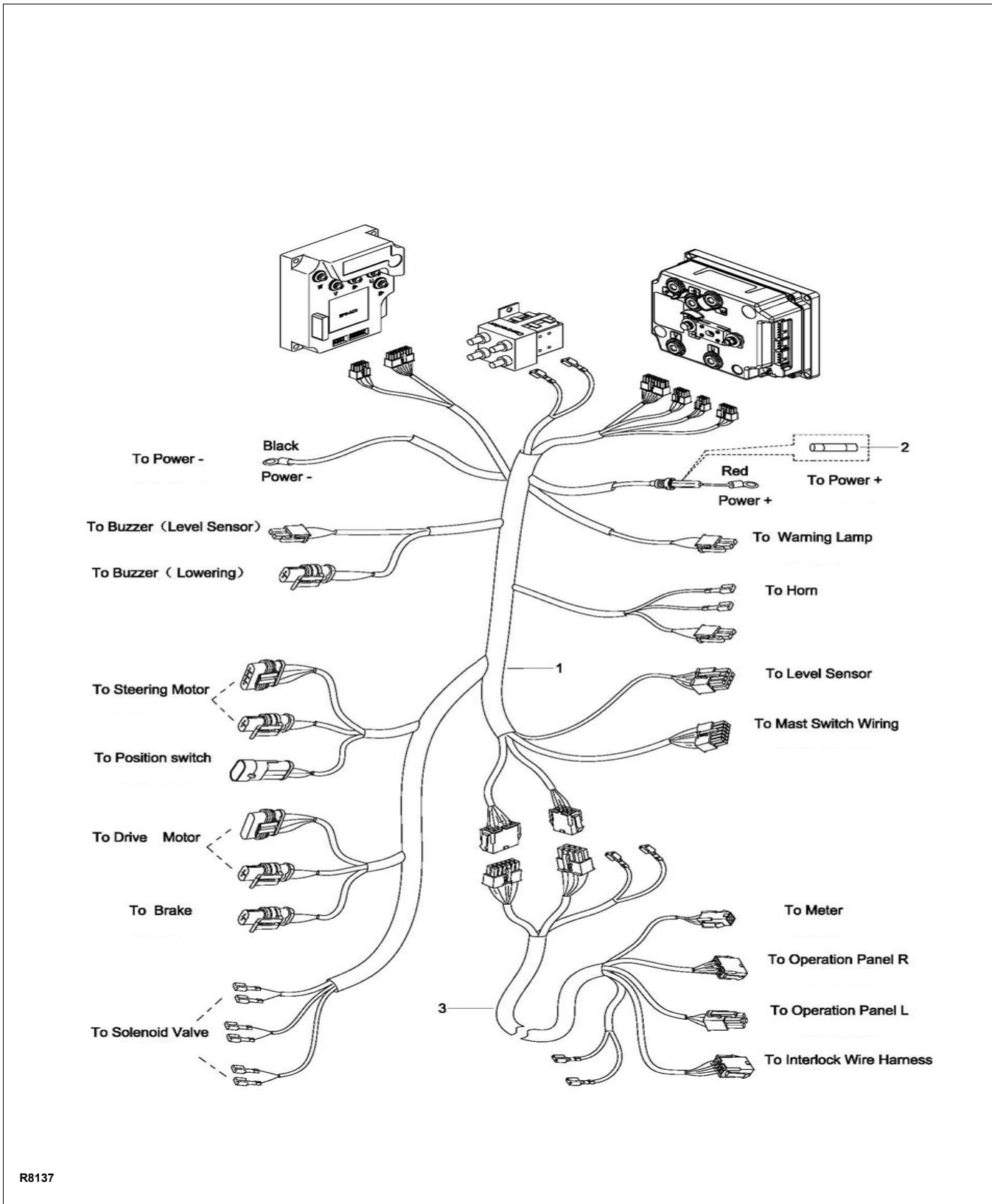
10-5. PLATFORM CABLE REPLACEMENT

1. With the lift vehicle wheels securely blocked, raise the platform approximately three feet and position blocks or strong supports under platform.
2. Lower Platform onto the support. Check that arrangement is secure before proceeding.
3. Engage the emergency stop switch and turn off key switch.
4. Remove the compartment covers as described in paragraph 5-2.
5. Disconnect cable harness from harness.
6. Disconnect cable harness from switch wire harness.
7. Remove two screws and disconnect mount from bracket.

8. Disconnect protective chain from mount.
9. Remove two screws and disconnect mount from bracket.
10. Disconnect protective chain from mount.
11. Remove screw, lock washer, flat washer and clamp.
12. Lift harness with protective chain from sheave.
13. Remove harness from the protective chain.
14. Install new harness by reversing the steps above.

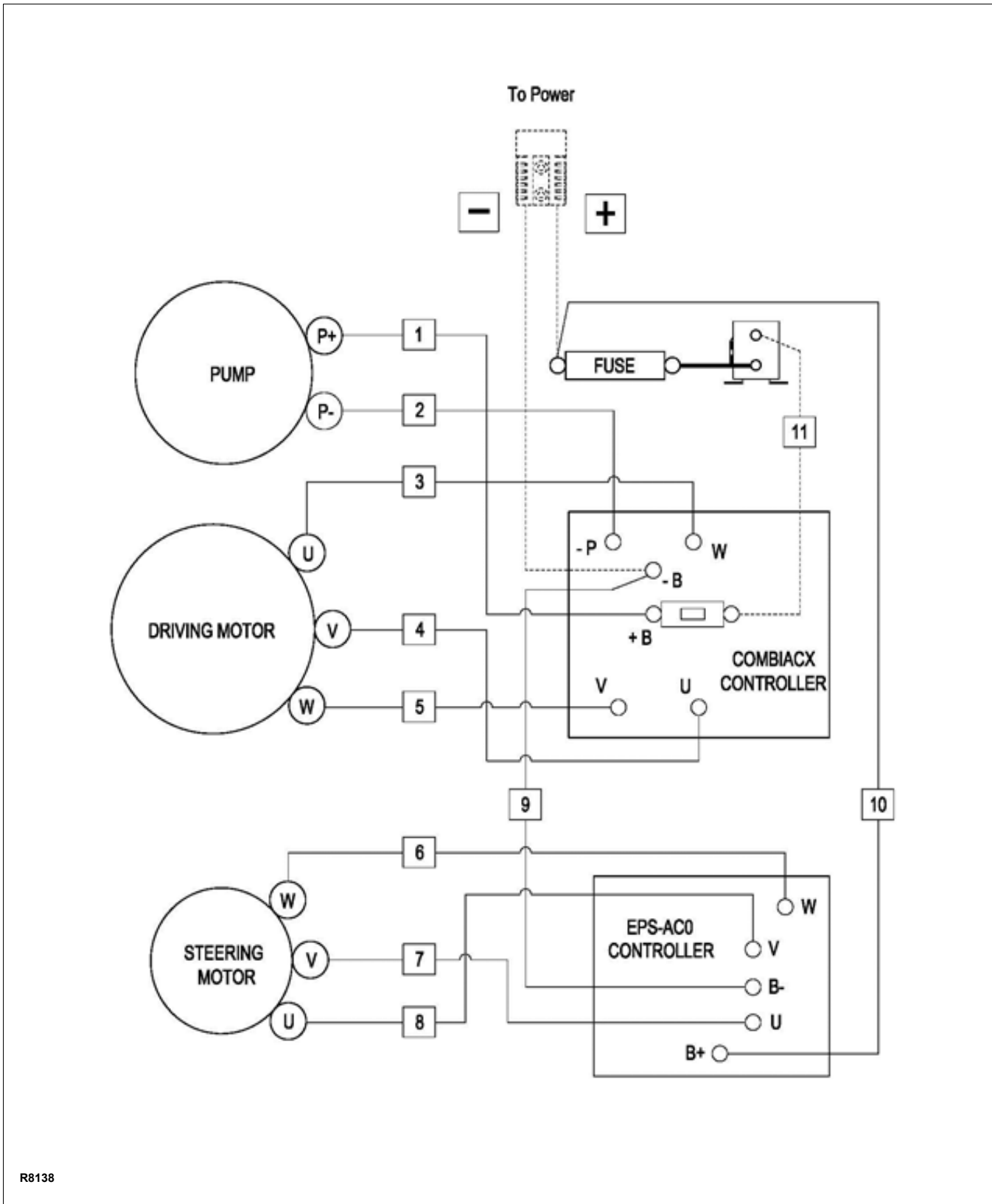
10-6. DEADMAN SWITCH

1. With the lift truck wheels securely blocked, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that arrangement is secure before proceeding.
3. Engage the emergency stop switch and turn off key switch.
4. Remove the plate and disconnect switch wire harness from the deadman switch.
5. Remove three screws, three nuts, three lock washers, three flat washers and bracket.
6. Remove two screws, two nuts, two lock washers, two flat washers and the deadman switch from bracket.
7. Position the new deadman switch by reversing the steps above.



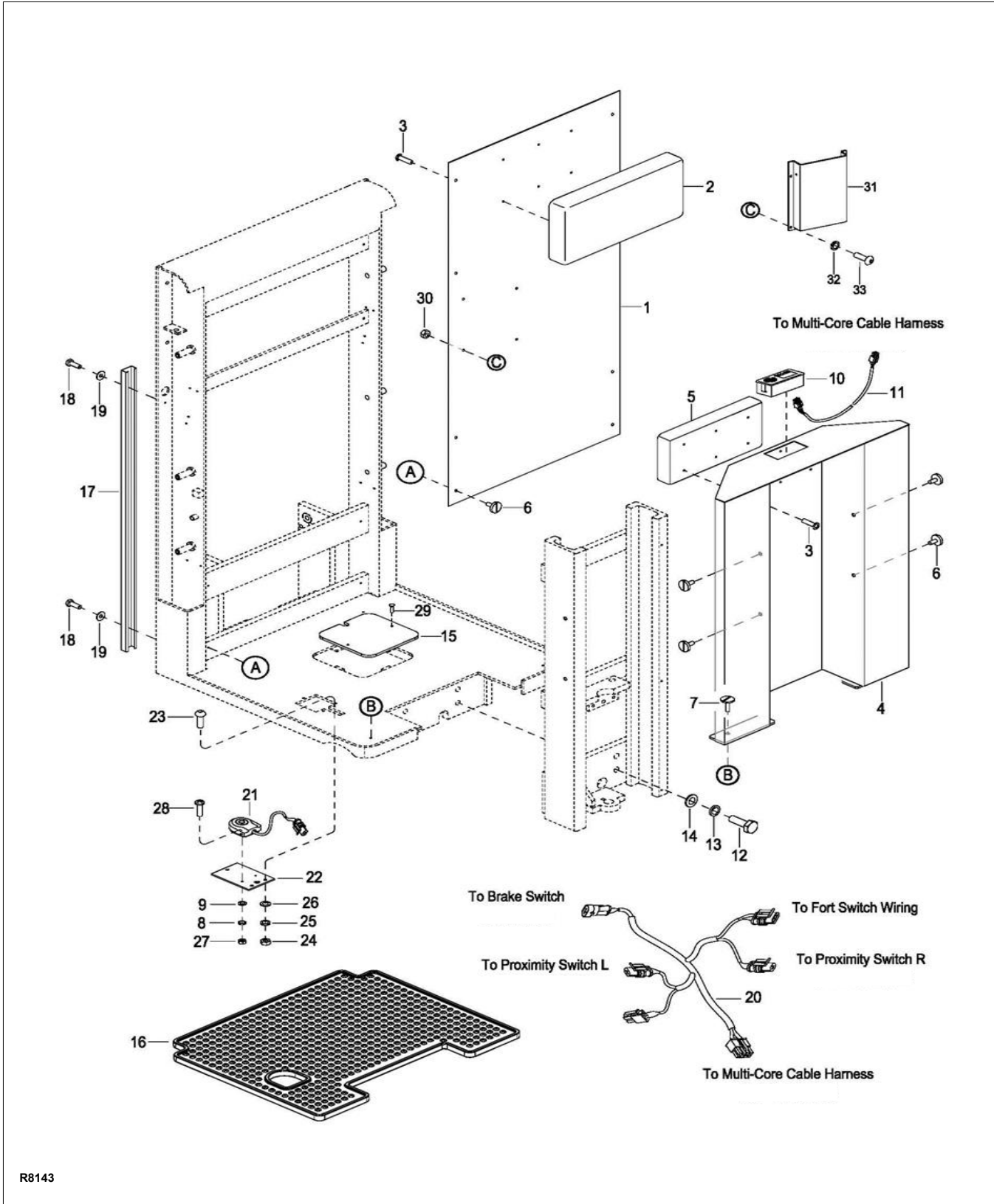
R8137

Figure 10-3 Wire Harness



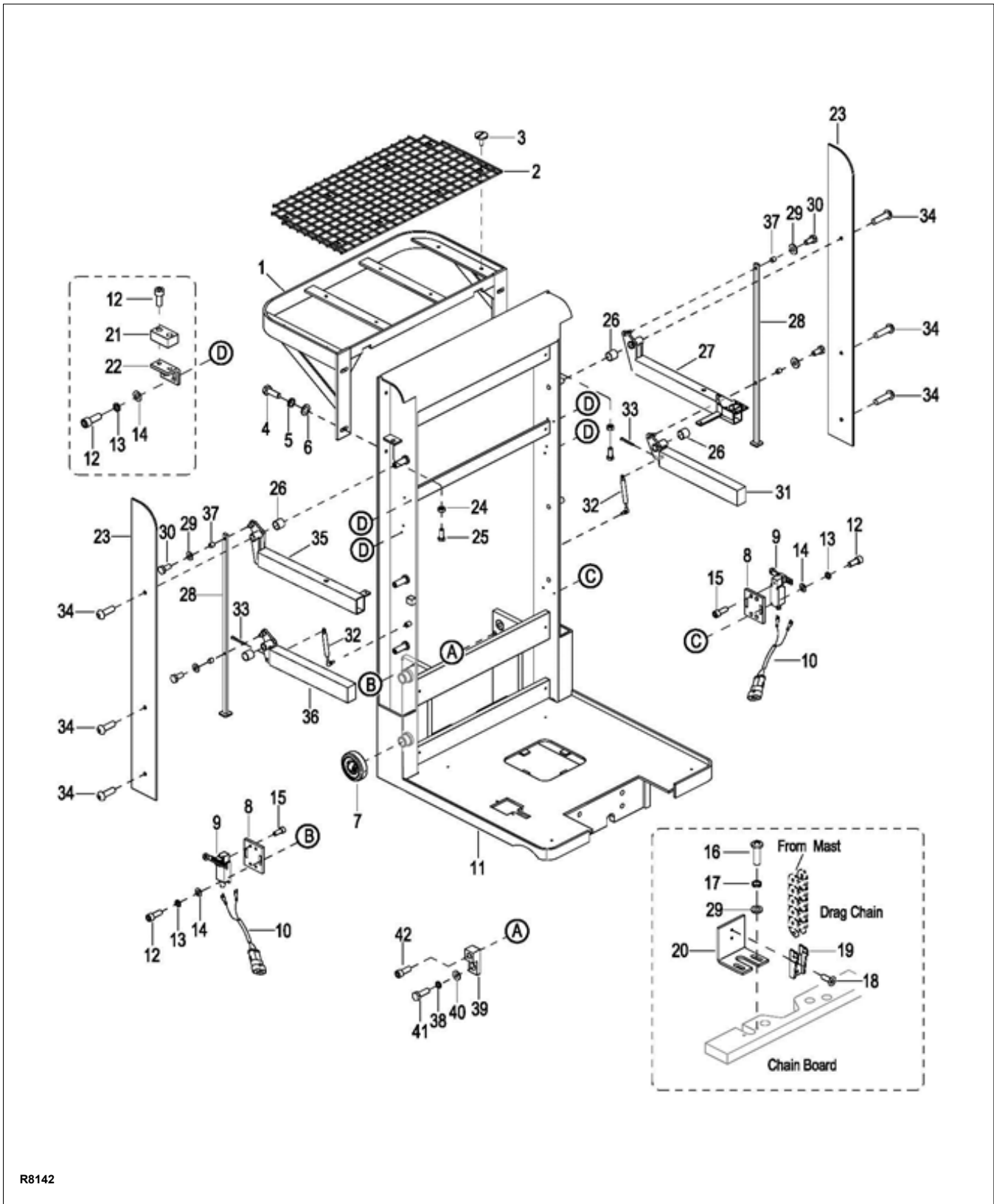
R8138

Figure 10-4 Wiring Cables



R8143

Figure 10-5 Operator Platform Assembly



R8142

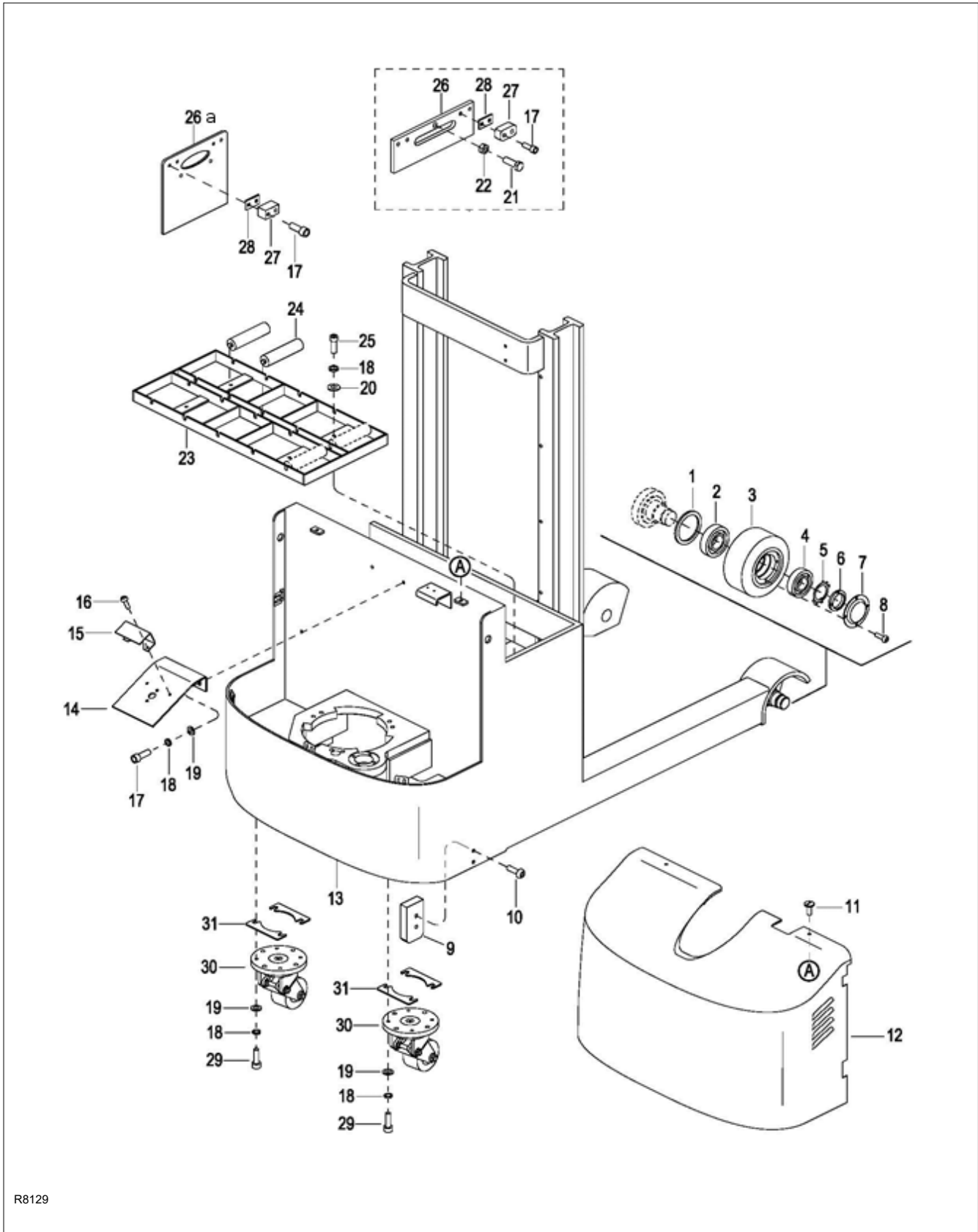
Figure 10-6 Operator Platform Installation

**SECTION 11
OPTIONAL EQUIPMENT**

NOTES

SECTION 12
ILLUSTRATED PARTS BREAKDOWN

Following is an illustrated parts breakdown of assemblies and parts associated with the BG2-72 Lift Truck.

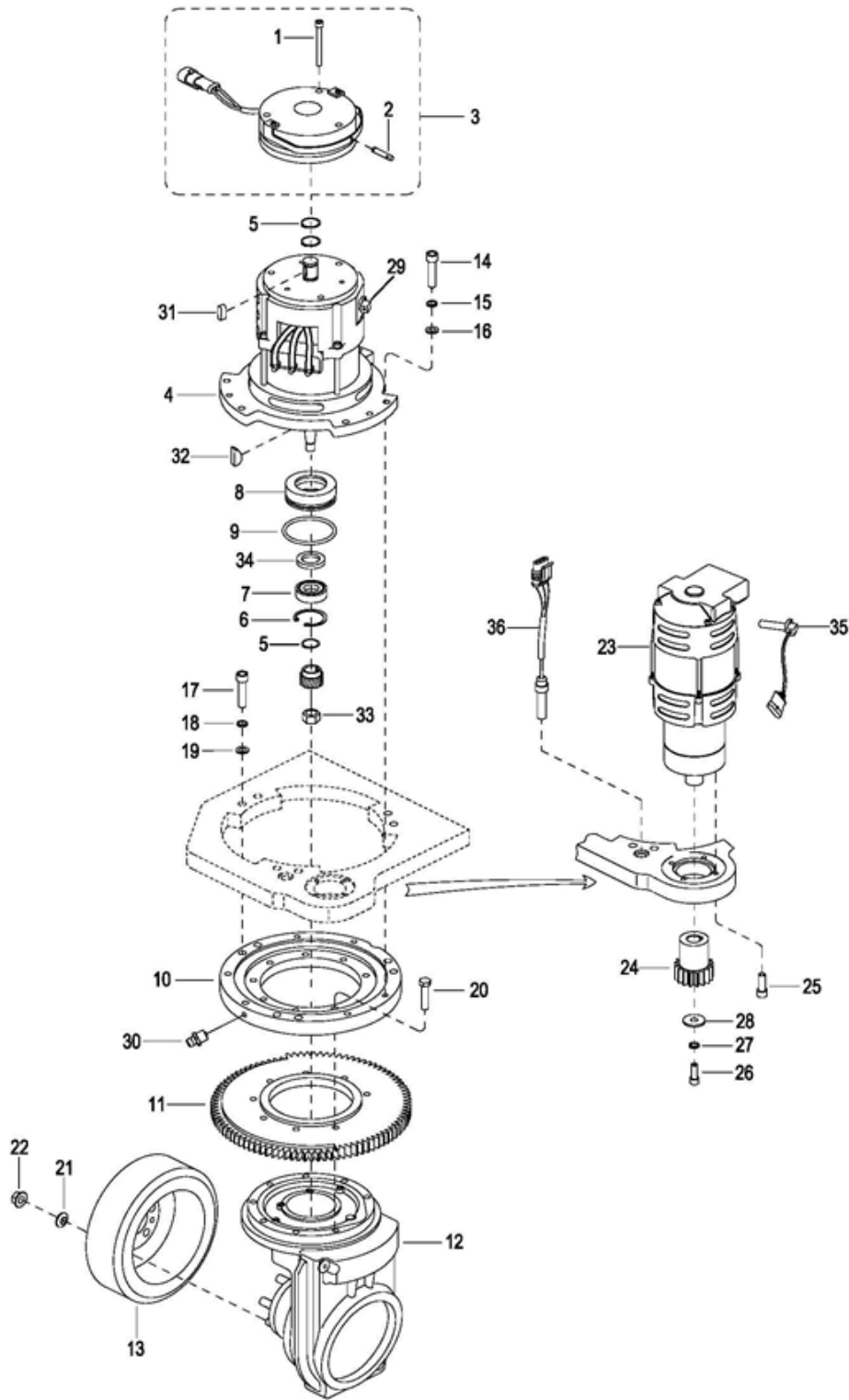


R8129

Figure 12-1 Frame

FRAME

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	0000-000877-00	SEAL WASHER 60×85×8	2	
2	0000-000961-00	BEARING	2	
3	1615-150001-00	LOADING WHEEL,PU	2	
4	0000-000936-00	BEARING	2	
5	0000-000928-00	LOCK WASHER Ø36	2	
6	0000-000927-00	NUT M36×1.5	2	
7	CK11-100005-00	COVER	2	
8	0000-000021-00	SCREW M6×12	8	
9	CK10-100009-00	BLOCK	2	
10	0000-001410-00	SCREW M12×30	4	
11	0000-000185-00	SCREW M8×16	2	
12	CK10-100005-00-03	COVER (YELLOW)	1	Used up to Serial # 225150153
12a	1615-100005-00-03	COVER (YELLOW)	1	Used from Serial # 225150154
12b	CK10-100005-00-02	COVER (RED)	1	Used up to Serial # 225150153
12c	1615-100005-00-02	COVER (RED)	1	Used from Serial # 225150154
13	1615-110000-00	FRAME	1	Used up to Serial # 226170005
13a	1615-110000-0A	FRAME	1	Used from Serial # 226170006
14	CK10-100001-00	BOARD	1	
15	CK10-100004-00	COVER	1	
16	0000-000179-00	SCREW M6×10	2	
17	0000-000109-00	SCREW M8×16	6	
18	0000-000159-00	LOCKWASHER Ø8	14	
19	0000-000176-00	FLATWASHER Ø8	10	
20	0000-000194-00	FLATWASHER Ø8	4	
21	0000-000285-00	BOLT M12×35	1	Used up to Serial # 226120059
22	0000-000630-00	NUT M12	1	Used up to Serial # 226120059
23	1615-121000-00	BATTERY ROLLER BED	1	
24	3316-814000-00	ROLLER	10	
25	0000-000321-00	SCREW M8×20	4	
26	1615-140001-00	BATTERY RETAINER PLATE	1	Used up to Serial # 226120059
26a	1615-140001-2A	BATTERY RETAINER PLATE	1	Used from Serial # 226120060
27	2125-600005-00	BUFFER BLOCK	2	
28	CK10-100010-00	PLATE	A.R.	As Required
29	0000-000322-00	SCREW M8x25	8	
30	1118-140000-00	CASTER ASSEMBLY	2	Used up to Serial # 225170105
30a	CK10-170000-00	CASTER ASSEMBLY	2	Used from Serial # 225170106
31	2140-140005-00	WASHER	A.R.	As Required

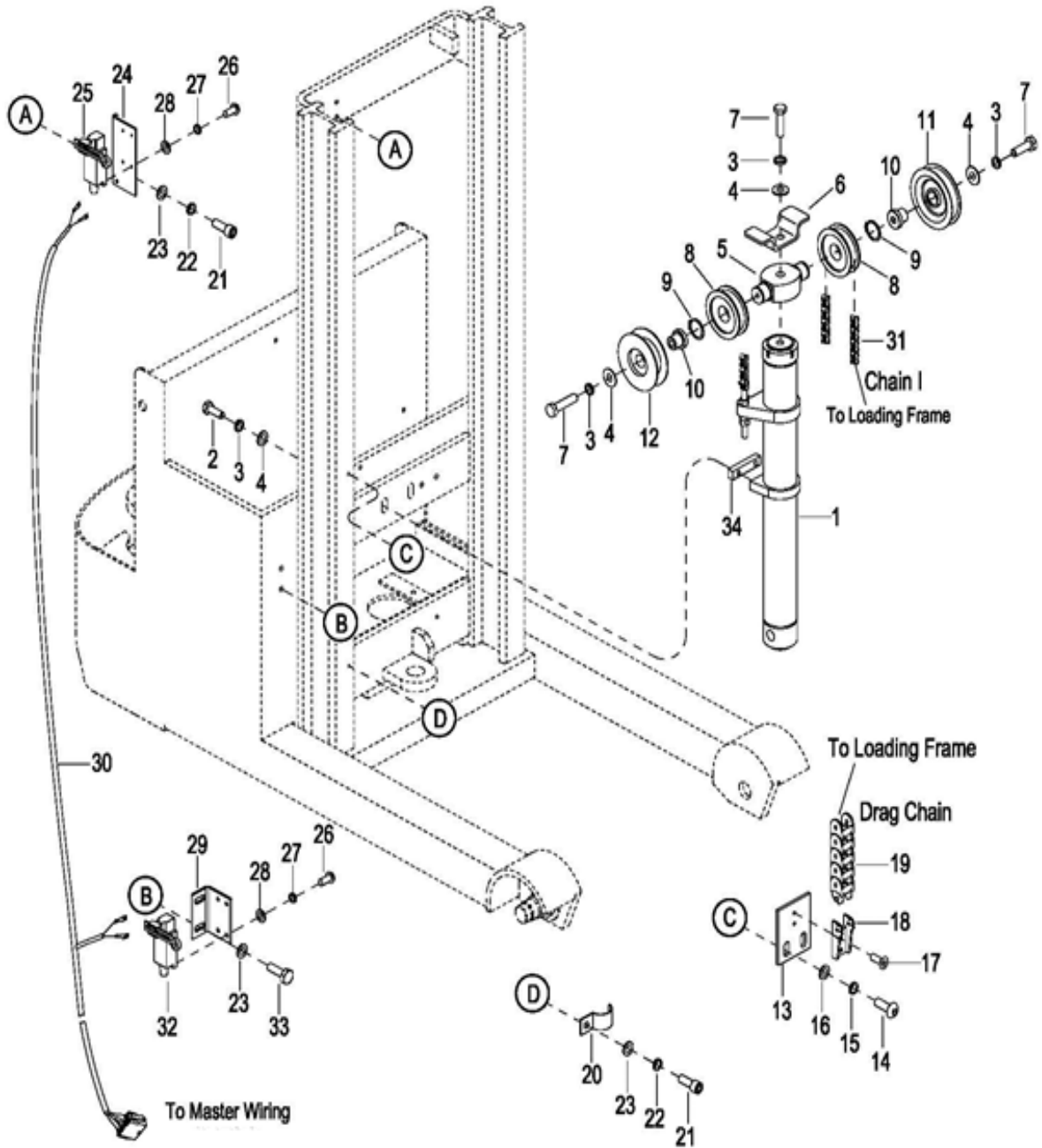


R8130

Figure 12-2 Transmission, Motor & Brake Assembly

TRANSMISSION, MOTOR & BRAKE ASSEMBLY

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	CK10-250002-20	SCREW M5×55	3	
2	CK10-250003-20	ROD	1	
3	CK10-250000-20	BRAKE ASSEMBLY	1	
4	1625-210000-00	DRIVE MOTOR	1	
5	0000-000293-00	RETAINER RING Ø20	3	
6	0000-000849-00	ELASTIC COLLAR Ø47	1	
7	CK10-220002-10	BALL BEARING	1	
8	CK10-220003-10	HUB FOR ENDSHIELD	1	
9	CK10-220004-10	O-RING Ø64.5×3.0	1	
10	1221-230000-00	BEARING	1	
11	1221-200003-00	GEAR	1	
12	1120-240000-10	GEAR CASE ASSEMBLY	1	
13	1120-200001-00	DRIVING WHEEL	1	
14	0000-000154-00	SCREW M8×35	6	
15	0000-000159-00	LOCKWASHER Ø8	6	
16	0000-000176-00	FLATWASHER Ø8	6	
17	0000-000155-00	SCREW M10×40	6	
18	0000-000063-00	LOCKWASHER Ø10	6	
19	0000-000007-00	FLATWASHER Ø10	6	
20	0000-000869-00	BOLT M8×40	8	
21	0000-000025-00	LOCKWASHER Ø12	5	
22	0000-001131-10	NUT M12×1.5	5	
23	CK10-240000-20	STEERING MOTOR	1	
24	CK10-200001-10	GEAR	1	
25	0000-000321-00	SCREW M8×20	4	
26	0000-000386-00	SCREW M6×20	1	
27	0000-000056-00	LOCKWASHER Ø6	1	
28	CK10-200002-10	WASHER	1	
29	1625-210001-00	KB-SENSOR	1	
30	0000-000013-00	GREASE FITTING M8	1	
31	0000-000226-00	KEY 6×6×16	1	
32	0000-000204-00	KEY 3×5×13	1	
33	1625-210002-00	NUT M12×1	1	
34	CK10-220001-10	SHAFT SEAL Ø25×40×7	1	
35	CK10-240001-20	KB-SENSOR,STEERING MOTOR	1	
36	1280-520009-10	SWITCH WIRE HARNESSII	1	Used up to Serial Number 226170005
36a	1280-520009-1A	SWITCH WIRE HARNESSII	1	Used from Serial Number 226170006

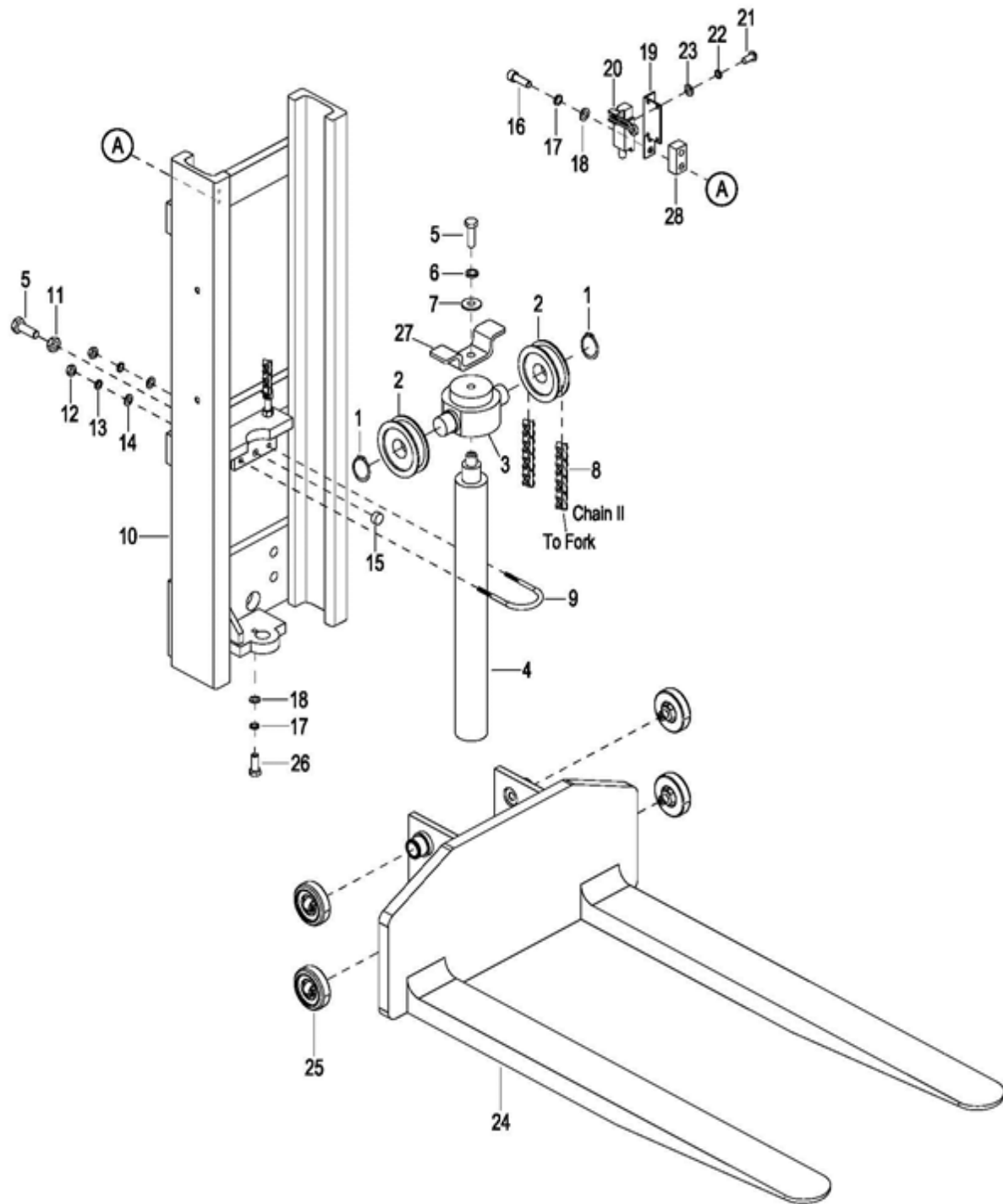


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Figure 12-3 Mast System

MAST SYSTEM

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	CK10-4A0000-20	LIFT CYLINDER ASSEMBLY	1	
2	0000-000878-00	BOLT M12×45	2	
3	0000-000060-00	LOCKWASHER Ø12	5	
4	0000-000438-00	FLATWASHER Ø12	5	
5	CK10-600006-30	ROLLER BRACKET	1	
6	2125-600007-00	CHAIN BRACKET	1	
7	0000-000613-00	BOLT M12×50	3	
8	2214-600001-00	CHAIN ROLLER	2	
9	0000-000183-00	RETAINER RING Ø35	2	
10	2125-600003-30	BUSHING	2	
11	2125-600002-30	ROLLER	1	Used up to Serial Number 226160080
11a	2125-600002-3B	ROLLER	1	Used from Serial Number 226160081
12	CK10-600001-30	NYLON WHEEL I	1	Used up to Serial Number 226160080
12a	CK10-600005-3A	NYLON WHEEL I	1	Used from Serial Number 226160081
13	1615-510004-00	DRAG CHAIN MOUNTING PLATE 1	1	
14	0000-000077-00	SCREW M6×12	2	
15	0000-000056-00	LOCKWASHER Ø6	2	
16	0000-000380-00	FLATWASHER Ø6	2	
17	0000-000416-00	SCREW M4×8	2	
18	CK10-510005-00	DRAG HEAD II	1	
19	CK10-510003-00-08	DRAG CHAIN	1	
20	CK10-510015-00	CLAMP	2	
21	0000-000109-00	SCREW M8×16	3	
22	0000-000159-00	LOCKWASHER Ø8	3	
23	0000-000176-00	FLATWASHER Ø8	5	
24	1615-510002-00	MOUNTING PLATE 1	1	
25	2125-500003-00	PROXIMITY SWITCH	1	
26	0000-000119-00	SCREW M5×12	8	
27	0000-000206-00	LOCKWASHER Ø5	8	
28	0000-000390-00	FLATWASHER Ø5	8	
29	1615-510003-00	MOUNTING PLATE 2	1	
30	1615-520005-00	MAST SWITCH WIRING	1	Used up to Serial Number 226140016
30a	1615-520005-0A	MAST SWITCH WIRING	1	Used from Serial Number 226140017
31	1615-790000-00-01	CHAIN ASSEMBLY I	2	
32	2125-500002-00	PROXIMITY SWITCH	1	
33	0000-000242-00	BOLT M8×16	2	
34	1615-100001-00	PLATE	1	



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Figure 12-4 Mini Mast Assembly

MINI MAST ASSEMBLY

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	0000-000183-00	RETAINER RING Ø35	2	
2	2214-600001-00	CHAIN ROLLER	2	
3	1615-751000-00	CHAIN BRACKET	1	
4	1615-410000-00	LIFT CYLINDER ASSEMBLY	1	
5	0000-000285-00	BOLT M12×35	2	
6	0000-000060-00	LOCKWASHER Ø12	1	
7	0000-000438-00	FLATWASHER Ø12	1	
8	1615-790000-00-02	CHAIN II	2	
9	2125-650000-00	CYLINDER HOOP	1	
10	1615-721000-00	FRONT MAST	1	
10a	1615-721000-10	FRONT MAST	1	Used when Forward Controls on truck.
11	0000-000630-00	NUT M12	1	
12	0000-000108-00	NUT M6	2	
13	0000-000056-00	LOCKWASHER Ø6	2	
14	0000-000380-00	FLATWASHER Ø6	2	
15	2125-650002-00	BOLT BUSHING	1	
16	0000-000026-00	SCREW M8×30	2	
17	0000-000159-00	LOCKWASHER Ø8	3	
18	0000-000176-00	FLATWASHER Ø8	3	
19	1615-510005-00	MOUNTING PLATE	1	
20	2125-500002-00	PROXIMITY SWITCH	1	
21	0000-000119-00	SCREW M5×12	4	
22	0000-000206-00	LOCKWASHER Ø5	4	
23	0000-000390-00	FLATWASHER Ø5	4	
24	1615-731000-00-01	FORK FRAME	1	22" x 36" Fork Carriage
24a	1615-731000-00-02	FORK FRAME	1	22" x 42" Fork Carriage
24b	1615-731000-00-03	FORK FRAME	1	22" x 48" Fork Carriage
25	2125-631100-00	ROLLER ASSEMBLY	4	
26	0000-000279-00	BOLT M8×35	1	
27	1615-700006-00	CHAIN BRACKET	1	
28	1615-500007-00	PLATE	1	

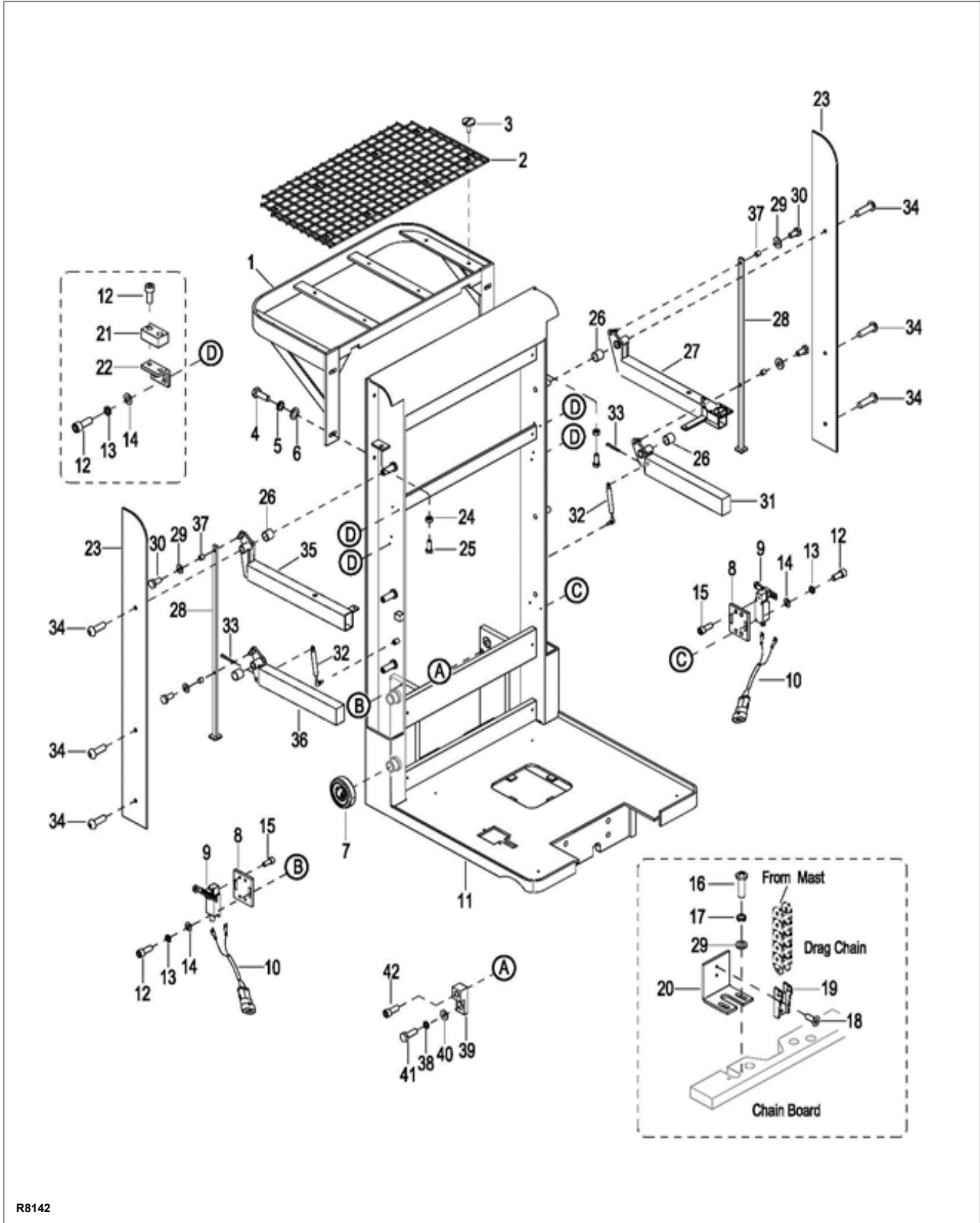
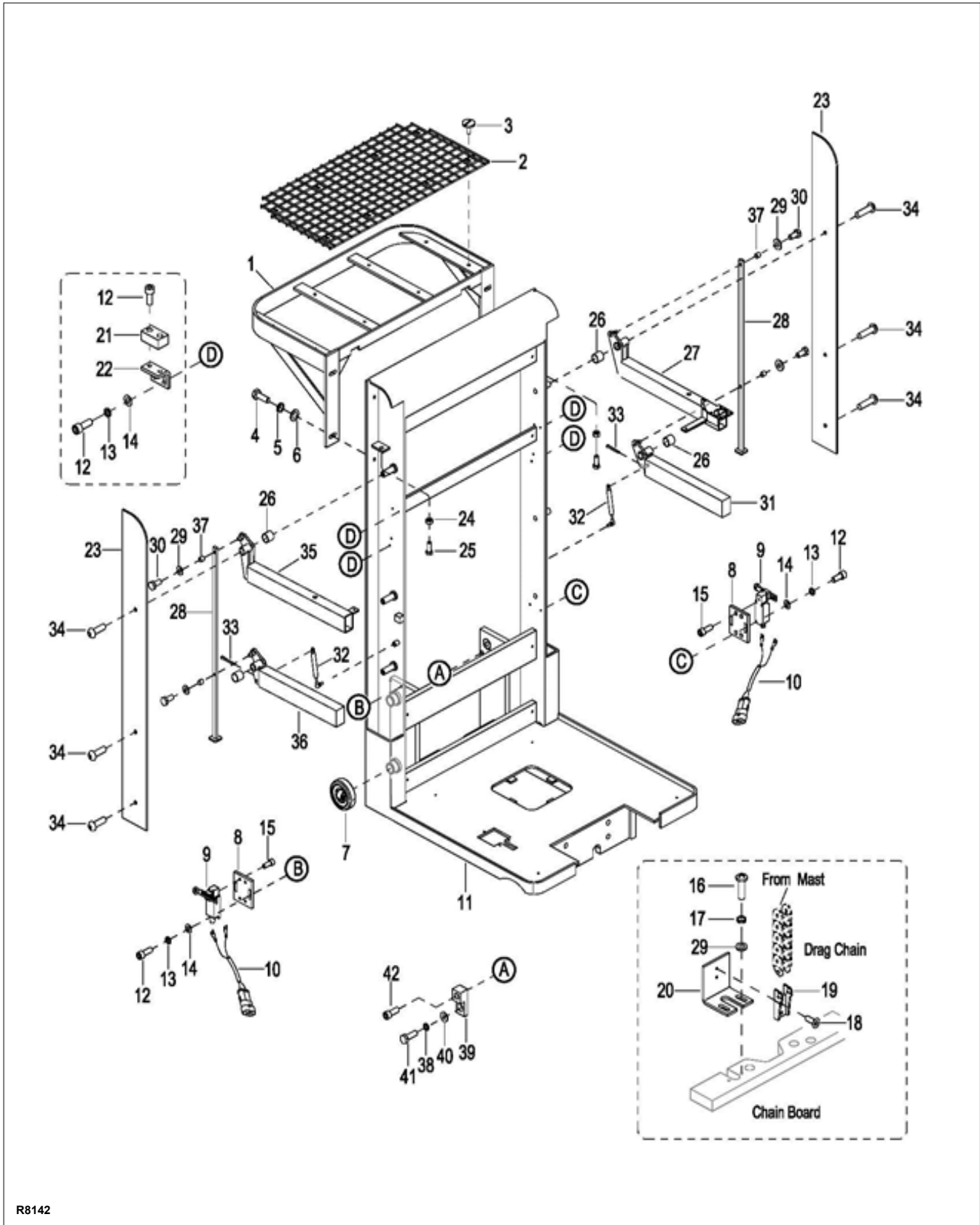


Figure 12-5 Operator Platform Installation

OPERATOR PLATFORM INSTALLATION

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-781000-00	TRAY	1	
2	1615-760000-00	NETWORK MASK	1	
3	2108-100006-00	SCREW M6×10	8	
4	0000-000277-00	BOLT M10×25	4	
5	0000-000063-00	LOCKWASHER Ø10	4	
6	0000-000007-00	FLATWASHER Ø10	4	
7	2125-631100-00	ROLLER ASSEMBLY	4	
8	CK10-510020-00	SWITCH MOUNTING PLATE	2	
9	2125-500003-00	PROXIMITY SWITCH	2	
10	CK10-520013-00	PROXIMITY SWITCH WIRING	2	
11	1615-711000-00	LOADING FRAME	1	
12	0000-000109-00	SCREW M8×16	12	
13	0000-000159-00	LOCKWASHER Ø8	12	
14	0000-000176-00	FLATWASHER Ø8	12	
15	0000-000004-00	SCREW M5×12	8	
16	0000-000618-00	SCREW M6×12	2	
17	0000-000056-00	LOCKWASHER Ø6	2	
18	0000-000416-00	SCREW M4×8	2	
19	CK10-510004-00	DRAG HEAD I	1	
20	1615-510001-00	DRAG CHAIN MOUNTING PLATE	1	
21	2125-600005-00	BUFFER BLOCK	4	
22	CK10-700006-00	MOUNTING PLATE	4	
23	1615-700001-00	COVER PLATE	2	
24	0000-000165-00	NUT M12	2	
25	0000-000623-00	BOLT M12×30	2	
26	CK11-700006-00	BUSHING COB	4	
27	CK10-730000-10	LEFT ARMREST	1	
28	CK10-791000-00	SUPPORTING ROD	2	
29	0000-000380-00	FLATWASHER Ø6	8	
30	0000-000264-00	BOLT M6×12	4	
31	1615-761000-00	LEFT GATE	1	
32	CK11-700007-00	GAS SPRING	2	
33	0000-000296-00	COTTER PIN Ø2×20	2	
34	0000-000655-00	SCREW M10×25	6	

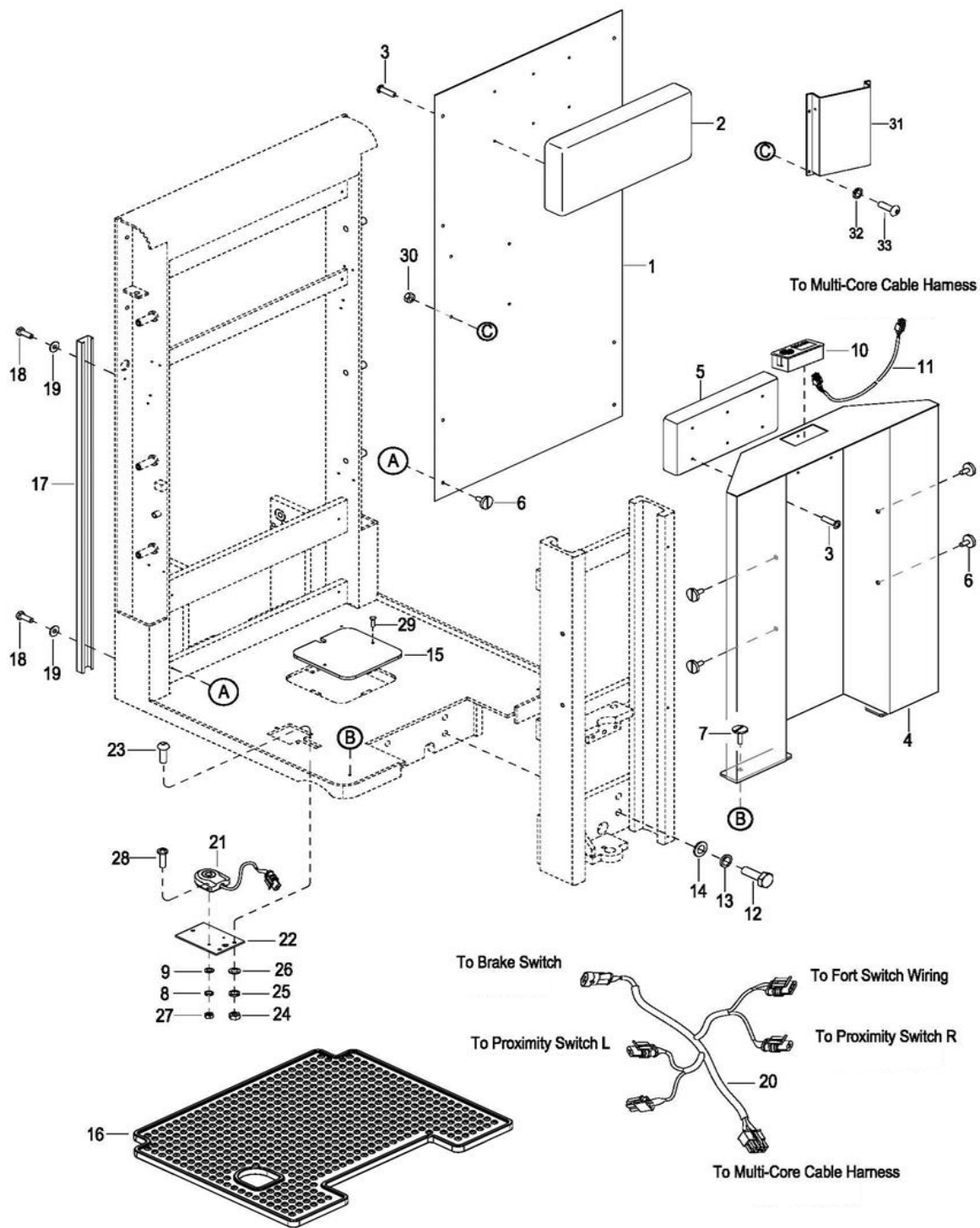


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Figure 12-5 Operator Platform Installation - Continued

OPERATOR PLATFORM INSTALLATION - CONTINUED

Pos.	Part Number	Description	Qty. Reqd.	Notes
35	CK10-740000-10	RIGHT ARMREST	1	
36	1615-771000-00	RIGHT GATE	1	
37	CK10-700009-00	BUSHING	4	
38	0000-000060-00	LOCKWASHER Ø12	1	
39	CK10-700008-0A	PROXIMITY BLOCK	1	
40	0000-000222-00	FLATWASHER Ø12	1	
41	0000-000285-00	BOLT M12×35	1	
42	0000-000322-00	SCREW M8×25	1	

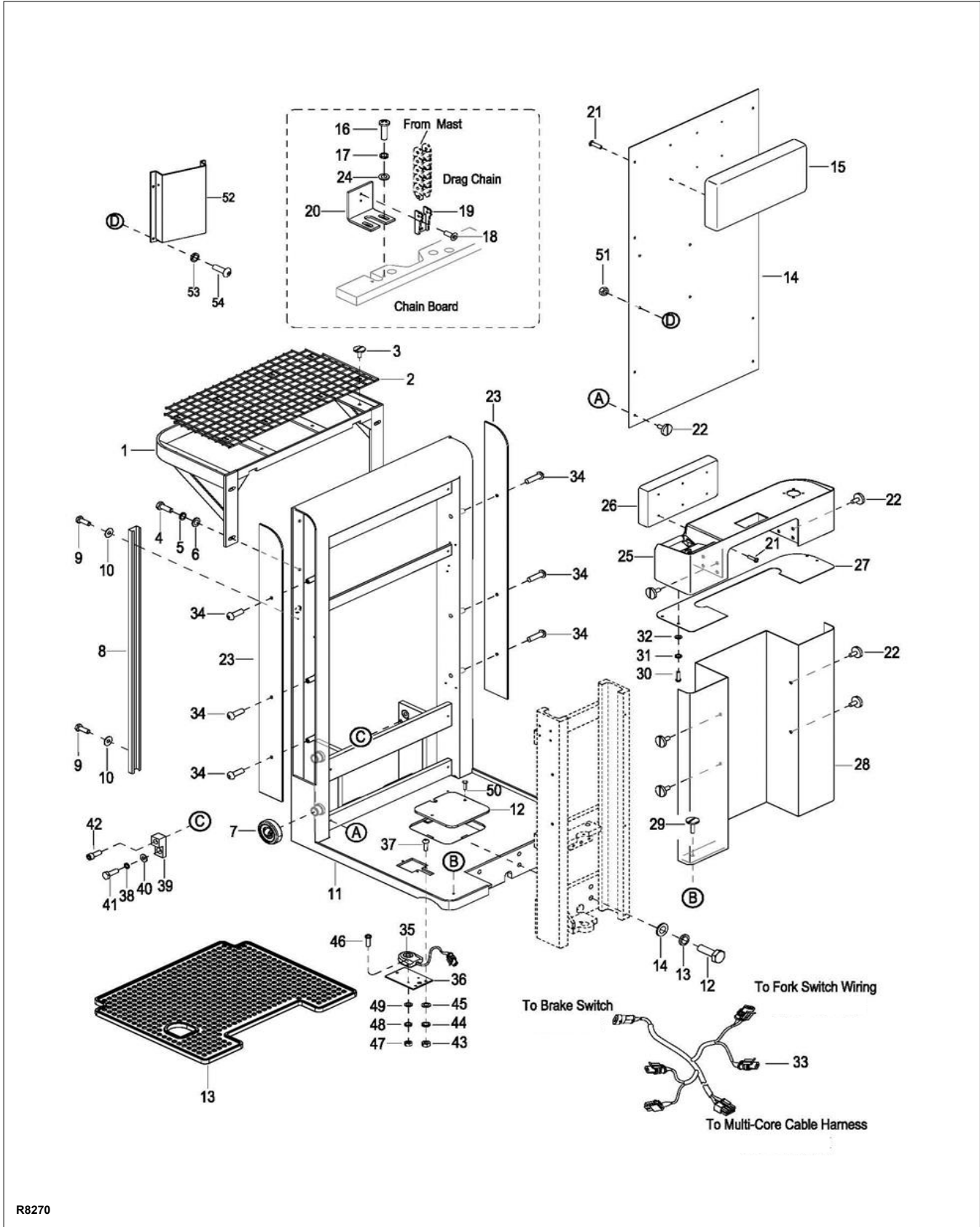


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Figure 12-6 Operator Platform Assembly

OPERATOR PLATFORM ASSEMBLY

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-700002-00	BOARD	1	
2	4230-100001-00	CUSHION	1	
3	0000-000646-00	SCREW M4×10	12	
4	1615-741000-00	COVER	1	
5	1615-700005-00	CUSHION	1	
6	0000-000368-00	SCREW M8×12	12	
7	0000-000649-00	SCREW M8×20	2	
8	0000-000995-00	LOCKWASHER Ø3	2	
9	0000-000991-00	FLATWASHER Ø3	2	
10	CK11-560001-00	METER	1	
11	CK10-520008-00	METER WIRE HARNESS	1	
12	0000-000996-00	BOLT M16×45	4	
13	0000-000191-00	LOCKWASHER Ø16	4	
14	0000-000220-00	FLATWASHER Ø16	4	
15	1615-700003-00	PLATE	1	Used up to Serial Number 226170113
15a	1615-700003-0A	PLATE	1	Used from Serial Number 226170114
16	1615-700004-00	FOOT PAN	1	
17	CK11-700003-00	WIRE GROOVE	2	
18	0000-000275-00	BOLT M6×30	4	
19	0000-000123-00	FLATWASHER Ø6	4	
20	1615-520004-00	INTERLOCK PROXIMITY SWITCH WIRE	1	
21	CK10-520012-00	BRAKE SWITCH ASSEMBLY	1	
22	CK11-510014-00	BRAKE SWITCH PLATE	1	
23	0000-000498-00	SCREW M6×30	3	
24	0000-000166-00	NUT M6	3	
25	0000-000056-00	LOCKWASHER Ø6	3	
26	0000-000380-00	FLATWASHER Ø6	3	
27	0000-000924-00	NUT M3	2	
28	0000-000037-00	SCREW M3x12	2	
29	3020-030000-04	SCREW M6×16	2	Used from Serial Number 226170114
30	0000-000546-00	NUT M5	4	Used from Serial Number 227140143
31	1146-151002-30	MANUAL HOLDER	1	
32	0000-000206-00	LOCKWASHER Ø5	4	
33	0000-000381-00	SCREW M5×10	4	

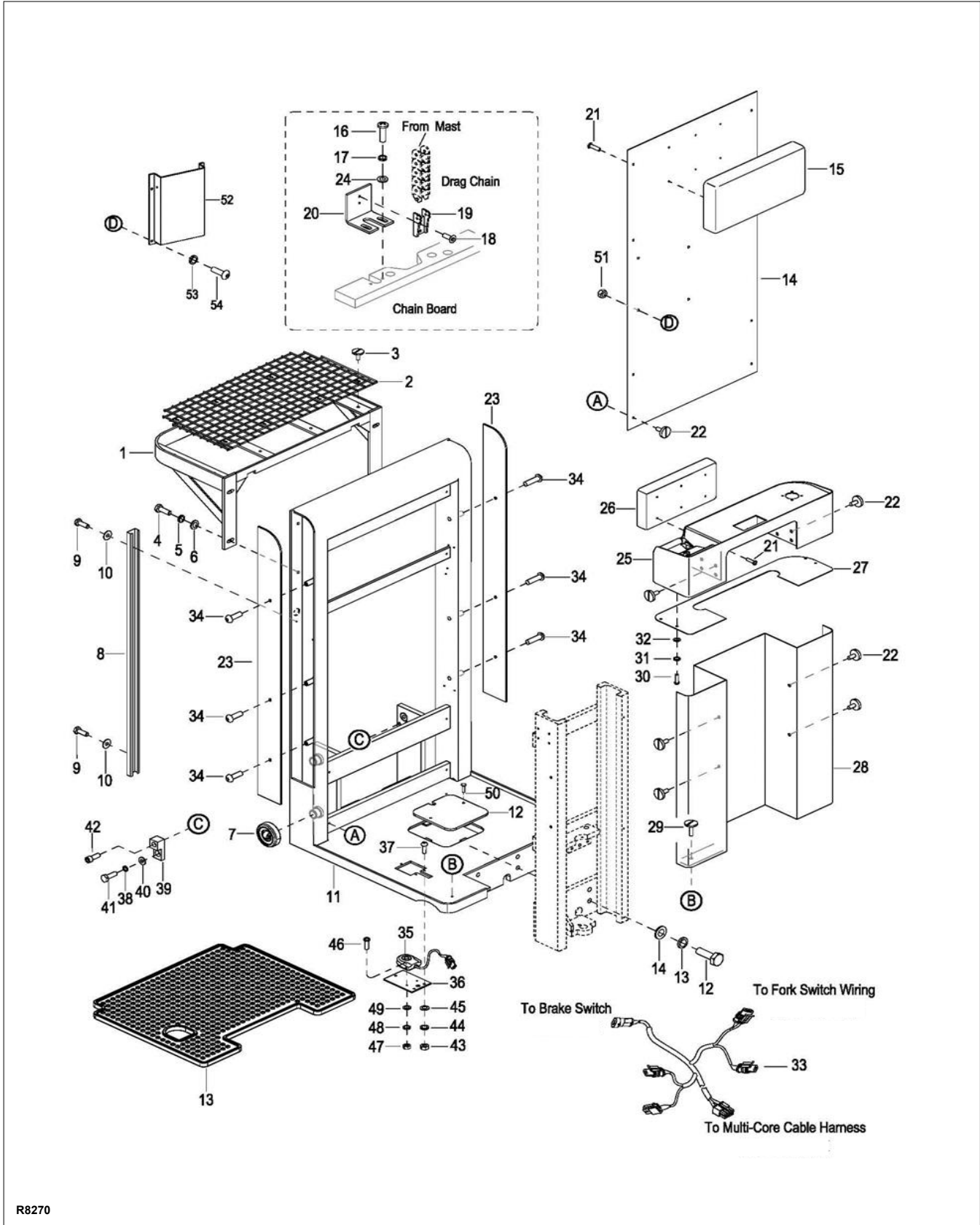


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Figure 12-7 Operator Platform Assembly (with Forward Control Panel)

OPERATOR PLATFORM ASSEMBLY (WITH FORWARD CONTROL PANEL)

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-781000-00	TRAY	1	
2	1615-760000-00	NETWORK MASK	1	
3	2108-100006-00	SCREW M6×10	8	
4	0000-000277-00	BOLT M10×25	4	
5	0000-000063-00	LOCKWASHER Ø10	4	
6	0000-000007-00	FLATWASHER Ø10	4	
7	2125-631100-00	ROLLER ASSEMBLY	4	
8	CK11-700003-00	WIRE GROOVE	2	
9	0000-000275-00	BOLT M6×30	4	
10	0000-000123-00	FLATWASHER Ø6	4	
11	1615-711000-10	LOADING FRAME	1	
12	1615-700003-00	PLATE	1	Used up to Serial Number 226170113
12a	1615-700003-0A	PLATE	1	Used from Serial Number 226170114
13	1615-700004-00	FOOT PAN	1	
14	1615-700002-00	BOARD	1	
15	4230-100001-00	CUSHION	1	
16	0000-000618-00	SCREW M6×12	2	
17	0000-000056-00	LOCKWASHER Ø6	2	
18	0000-000416-00	SCREW M4×8	2	
19	CK10-510004-00	DRAG HEAD I	1	
20	1615-500001-00	DRAG CHAIN MOUNTING PLATE	1	
21	0000-000646-00	SCREW M4×10	12	
22	0000-000368-00	SCREW M8×12	20	
23	1615-700001-00	COVER PLATE	2	
24	0000-000380-00	FLATWASHER Ø6	2	
25	1615-741000-10	CONTROL PANEL	1	
26	1615-700005-00	CUSHION	1	
27	1615-740001-10	PLATE	1	
28	1615-742000-10	COVER	1	
29	0000-000649-00	SCREW M8×20	2	
30	0000-000119-00	SCREW M5×12	4	
31	0000-000206-00	LOCKWASHER Ø5	4	
32	0000-000390-00	FLATWASHER Ø5	4	
33	1615-520004-00	INTERLOCK,PROXIMITY SWITCH WIRE	1	
34	0000-000655-00	SCREW M10×25	6	
35	CK10-520012-00	BRAKE SWITCH ASSEMBLY	1	

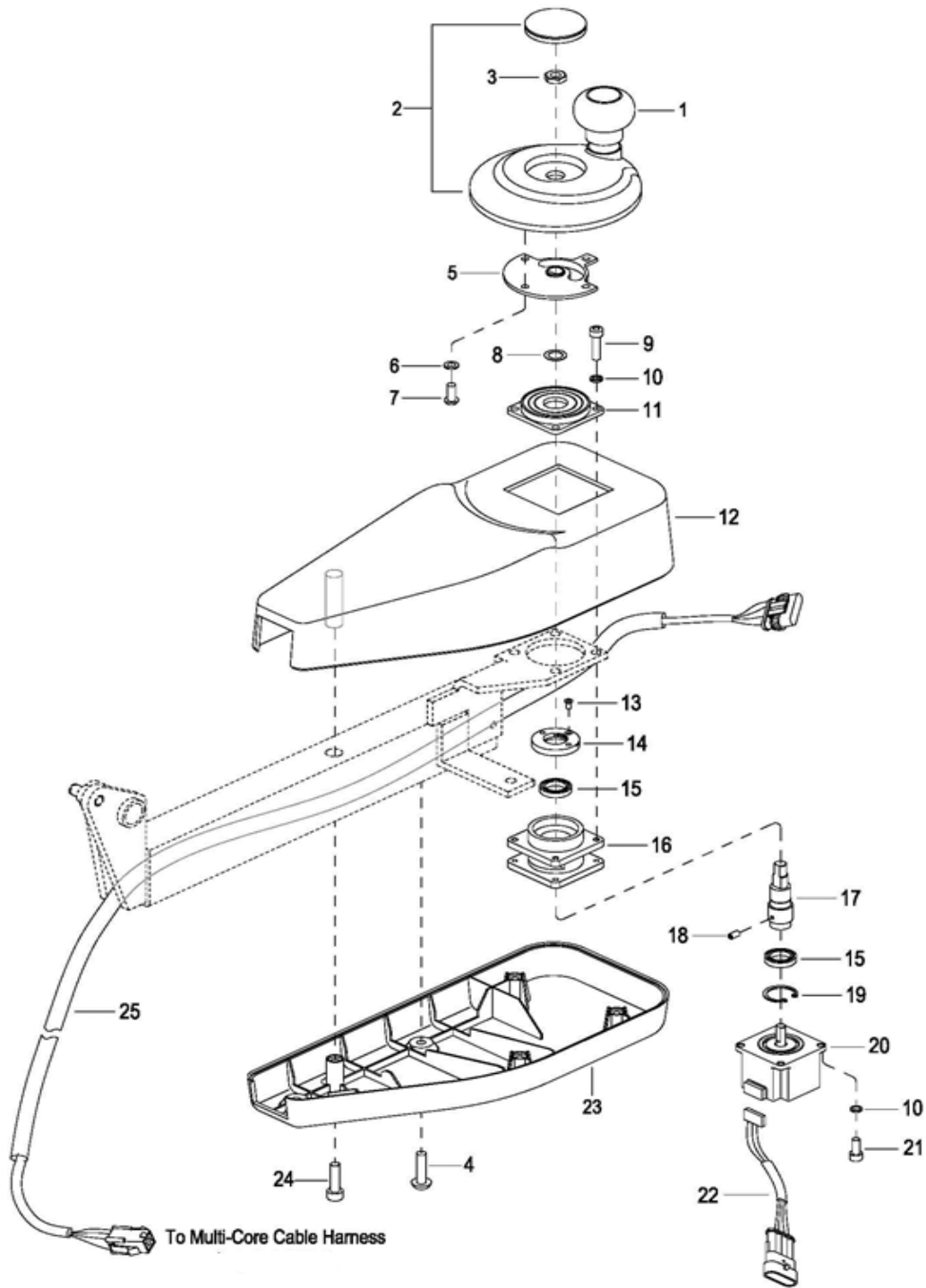


R8270

Figure 12-7 Operator Platform Assembly (with Forward Control Panel) - Continued

OPERATOR PLATFORM ASSEMBLY (WITH FORWARD CONTROL PANEL) - CONTINUED

Pos.	Part Number	Description	Qty. Reqd.	Notes
36	CK11-510014-00	BRAKE SWITCH PLATE	1	
37	0000-000498-00	SCREW M6×30	3	
38	0000-000060-00	LOCKWASHER Ø12	1	
39	CK10-700008-0A	PROXIMITY BLOCK	1	
40	0000-000222-00	FLATWASHER Ø12	1	
41	0000-000285-00	BOLT M12×35	1	
42	0000-000322-00	SCREW M8×25	1	
43	0000-000166-00	NUT M6	3	
44	0000-000056-00	LOCKWASHER Ø6	3	
45	0000-000380-00	FLATWASHER Ø6	3	
46	0000-000037-00	SCREW M3×12	2	
47	0000-000924-00	NUT M3	2	
48	0000-000995-00	LOCKWASHER Ø3	2	
49	0000-000991-00	FLATWASHER Ø3	2	
50	3020-030000-04	SCREW M6×16	2	Used from Serial Number 226170114
51	0000-000546-00	NUT M5	4	Used from Serial Number 227140143
52	1146-151002-30	MANUAL HOLDER	1	
53	0000-000206-00	LOCKWASHER Ø5	4	
54	0000-000381-00	SCREW M5×10	4	

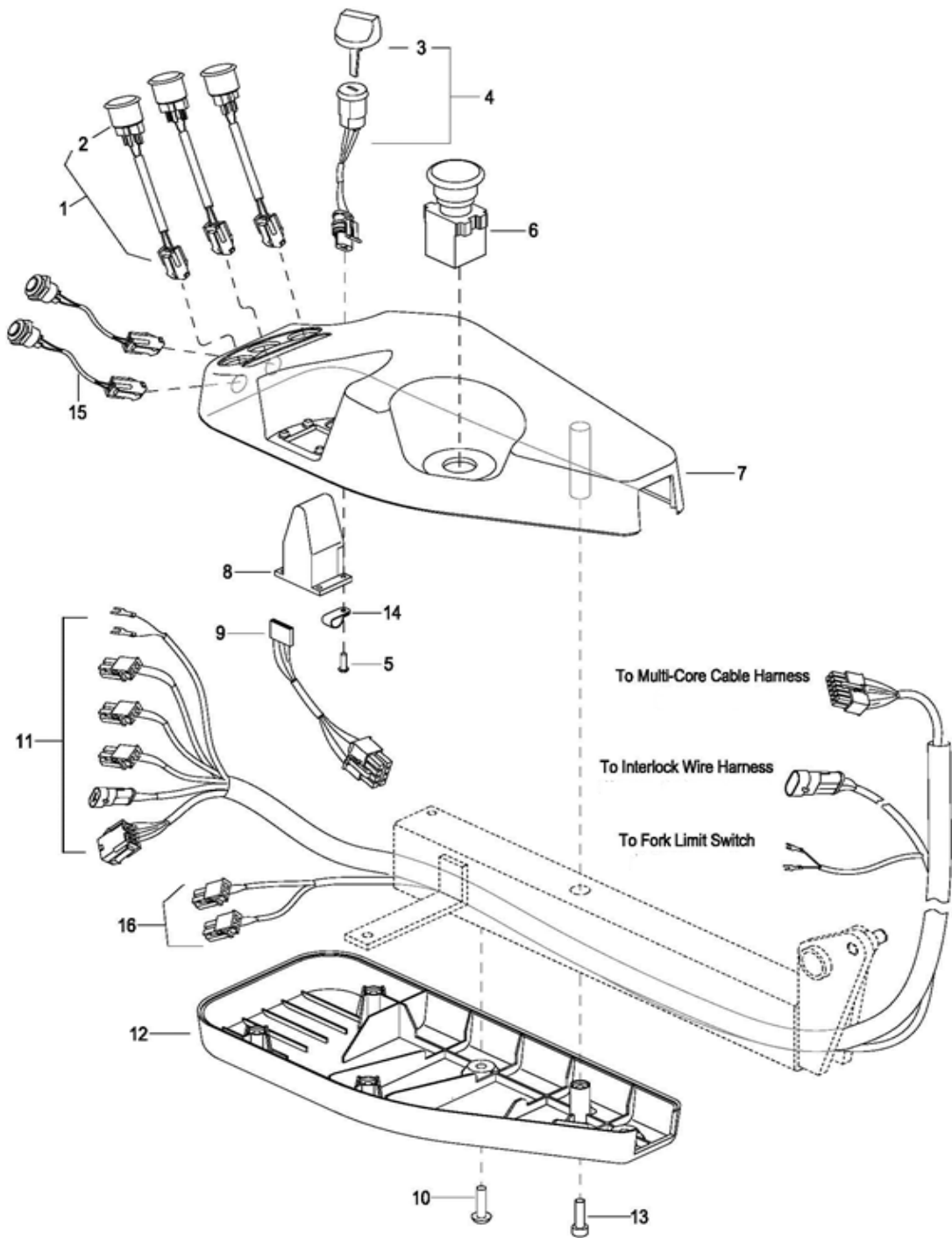


R8131

Figure 12-8 Control Arm Assembly - Left

CONTROL ARM ASSEMBLY - LEFT

Pos.	Part Number	Description	Qty. Reqd.	Notes
0	CK10-310000-00	OPERATING CONTROL ASSEMBLY (LEFT)	1	
1	CK11-311000-00	STEER KNOB	1	
2	CK11-310002-00	STEERING WHEEL	1	
3	0000-000951-00	NUT M10×1.5	1	
4	0000-000001-00	SCREW M6×20	2	
5	3316-311202-00	ROUND BOTTOM	1	
6	0000-000702-00	FLATWASHER Ø4	4	
7	0000-000646-00	SCREW M4×10	4	
8	3316-311204-00	WASHER	A.R.	As Required
9	0000-000035-00	BOLT M5×20	4	
10	0000-000206-00	LOCKWASHER Ø5	8	
11	3316-311203-00	DAMPING STEERING BOX	1	
12	CK10-310003-00	UPPER COVER OF LEFT ARMREST	1	
13	0000-000939-00	SCREW M3×6	1	
14	3316-311205-00	NUT	1	
15	0000-000937-00	BEARING	2	
16	3316-311206-00	BEARING BLOCK	1	
17	3316-311201-00	AXLE	1	
18	3020-050000-17	SCREW M5×8	1	
19	0000-000941-00	ELASTIC COLLAR Φ26	1	
20	CK11-560002-00	STEPPING MOTOR	1	
21	0000-000004-00	SCREW M5×12	4	
22	CK11-520007-00	STEPPING MOTOR WIRE HARNESS	1	
23	CK10-310004-00	LOWER COVER OF LEFT ARMREST	1	
24	0000-000661-00	SCREW M5×20	4	
25	CK10-520002-00	WIRE HARNESS OF OPERATION PANEL(L)	1	

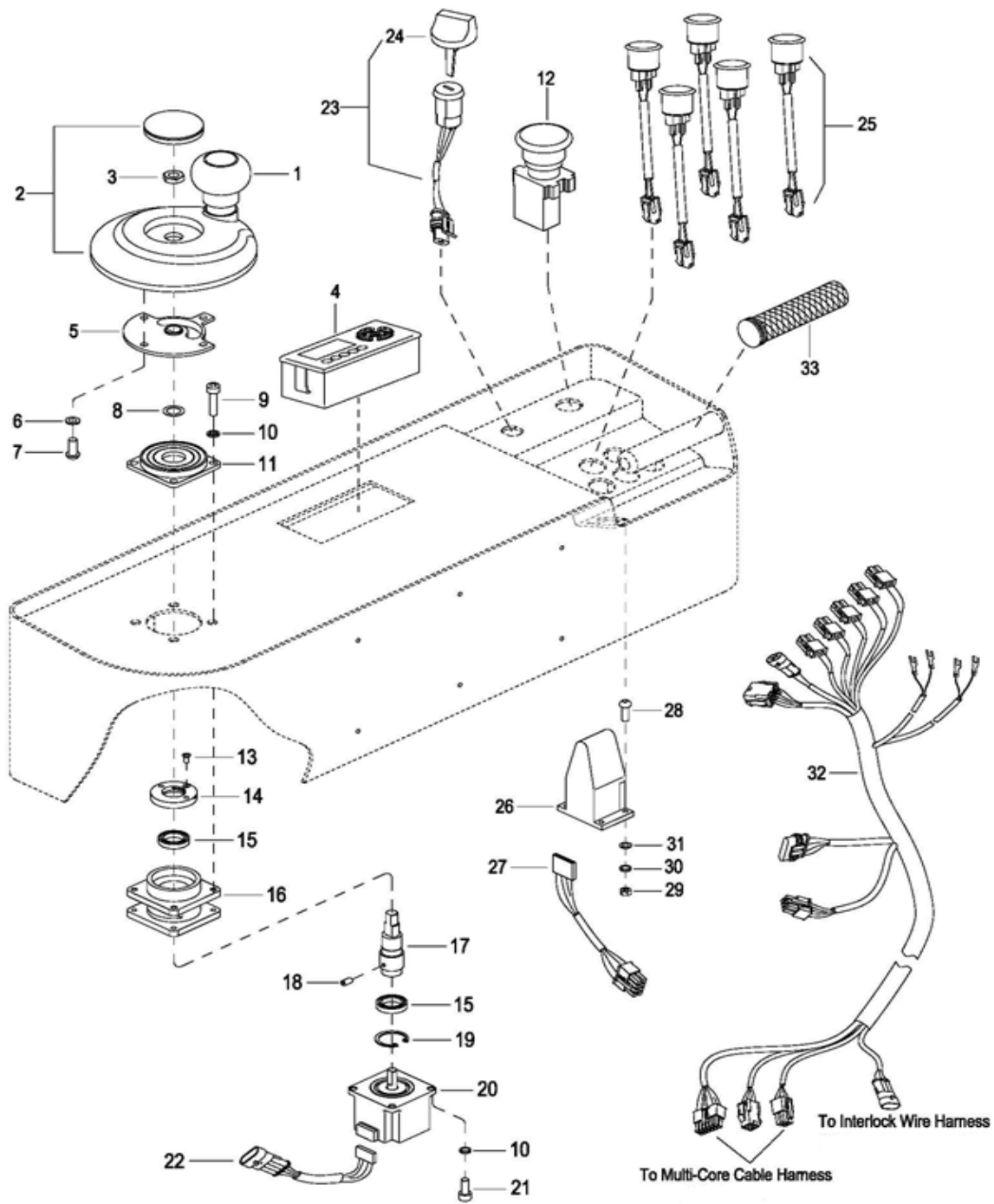


R8132

Figure 12-9 Control Arm Assembly - Right

CONTROL ARM ASSEMBLY - RIGHT

Pos.	Part Number	Description	Qty. Reqd.	Notes
0	1615-320000-00	OPERATING CONTROL ASSEMBLY (RIGHT)	1	
1	CK11-520012-00	BUTTON ASSEMBLY	3	Used up to Serial Number 2291200219
1a	CK11-520012-0A	BUTTON ASSEMBLY	3	Used from Serial Number 2291200220
2	1280-560004-00	BUTTON	3	
3	1115-500016-00	2 WAY SWITCH KEY	2	
4	CK11-520009-00	POWER SWITCH ASSEMBLY	1	
5	0000-000998-00	SCREW M3×8	4	
6	3218-604000-00	EMERGENCY STOP SWITCH	1	
7	CK10-320001-20	UPPER COVER OF RIGHT ARMREST	1	
8	CK11-560003-00	ACCELERATOR SWITCH	1	Used up to Serial Number 227210207
8a	CK11-560003-00-10	ACCELERATOR SWITCH W. WIRE HARNESS	1	Used from Serial Number 227210208 - Incl. pos. # 9
9	CK11-520008-0A	ACCELERATOR SWITCH WIRE HARNESS	1	Used between 05-09-2013 and Serial # 227210207
10	0000-000001-00	SCREW M6×20	2	
11	1615-520003-00	WIRE HARNESS OF OPERATION PANEL(R)	1	
12	CK10-320002-00	LOWER COVER OF RIGHT ARMREST	1	
13	0000-000661-00	SCREW M5×20	4	
14	0000-000490-00	HARNESS CLAMP	1	
15	1615-520006-00	BUTTON	2	
16	1615-520005-20	FORK SWITCH WIRING	1	

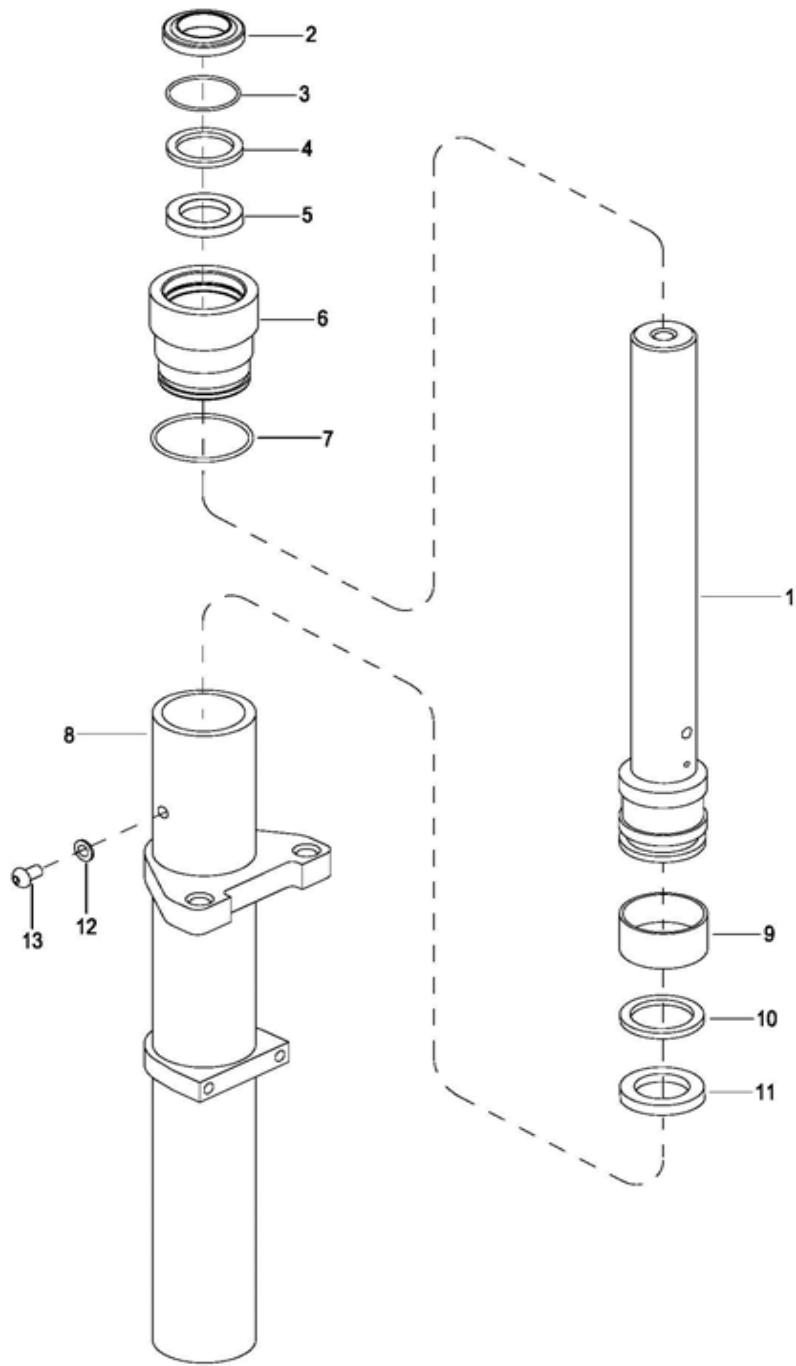


R8269

Figure 12-10 Forward Control Panel

FORWARD CONTROL PANEL

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	CK11-311000-00	STEER KNOB	1	
2	CK11-310002-00	STEERING WHEEL	1	
3	0000-000951-00	NUT M10×1.5	1	
4	CK11-560001-00	INSTRUMENT PANEL	1	
5	3316-311202-00	ROUND BOTTOM	1	
6	0000-000702-00	FLATWASHER Ø4	4	
7	0000-000646-00	SCREW M4×10	4	
8	3316-311204-00	WASHER	A.R.	As Required
9	0000-000035-00	BOLT M5×20	4	
10	0000-000206-00	LOCKWASHER Ø5	8	
11	3316-311203-00	DAMPING STEERING BOX	1	
12	3218-604000-00	EMERGENCY STOP SWITCH	1	
13	0000-000939-00	SCREW M3×6	1	
14	3316-311205-00	NUT	1	
15	0000-000937-00	BEARING	2	
16	3316-311206-00	BEARING BLOCK	1	
17	3316-311201-00	AXLE	1	
18	3020-050000-17	SCREW M5×8	1	
19	0000-000941-00	ELASTIC COLLAR Ø26	1	
20	CK11-560002-00	STEER SENSOR	1	
21	0000-000004-00	SCREW M5×12	4	
22	CK11-520007-00	STEER SENSOR WIRE HARNESS	1	
23	CK11-520009-00	POWER SWITCH ASSEMBLY	1	
24	1115-500016-00	BLACK PLASTIC MOLDED KEY	2	Set of 2 Keys
25	CK11-520012-00	BUTTON ASSEMBLY	5	Used up to Serial Number 2291200219
25 a	CK11-520012-0A	BUTTON ASSEMBLY	5	Used from Serial Number 2291200220
26	CK11-560003-00	ACCELERATOR SWITCH	1	
27	CK11-520008-00	HARNESS SWITCH	1	
28	0000-001238-00	SCREW M3×16	4	
29	0000-000924-00	NUT M3	4	
30	0000-000995-00	LOCKWASHER Ø3	4	
31	0000-000991-00	FLATWASHER Ø3	4	
32	1615-520007-00	WIRE HARNESS - FORWARD CONTROL PANEL	1	
33	1615-740002-10	HANDLE GRIP	1	

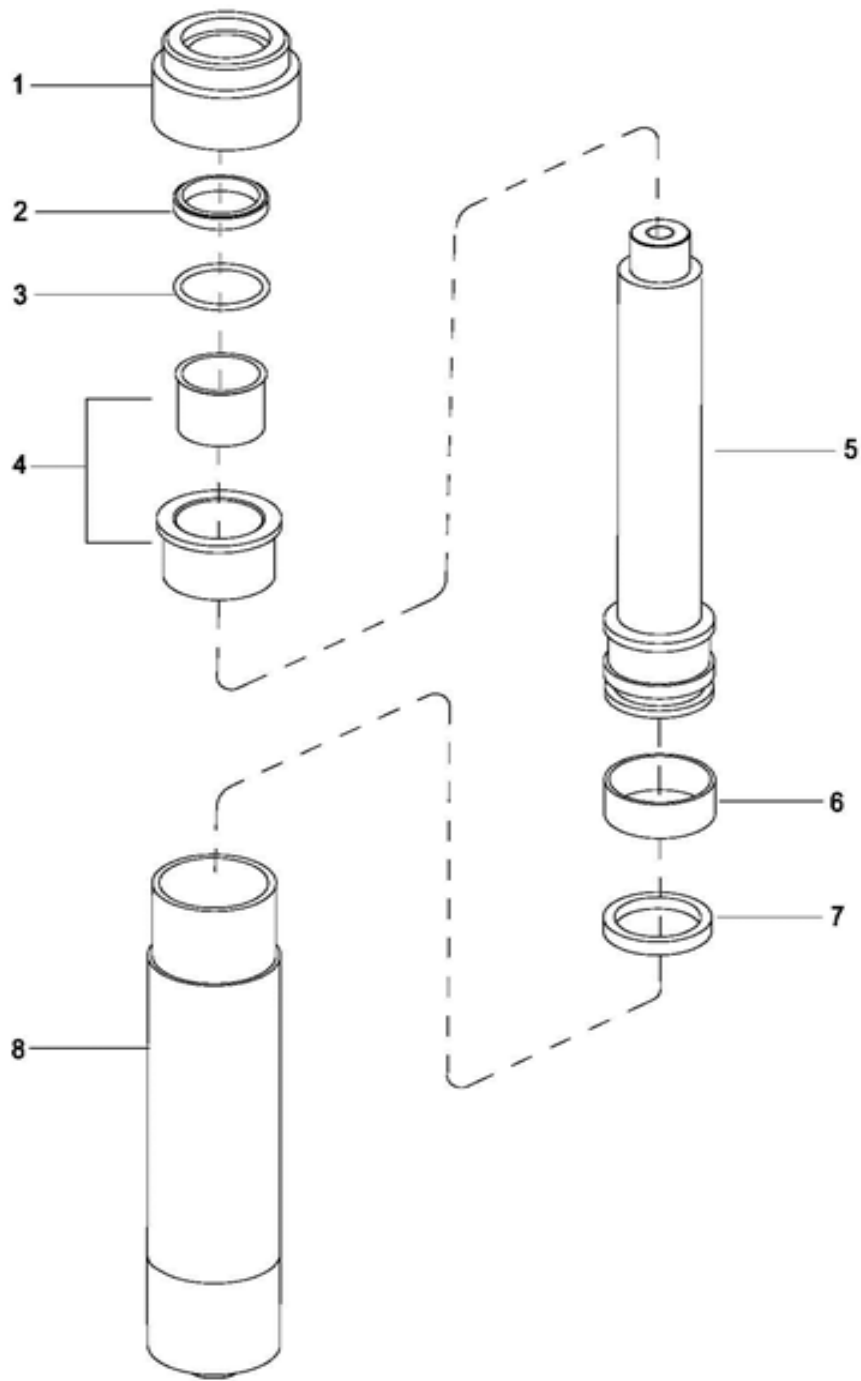


R8140

Figure 12-11 Lift Cylinder (Mast)

LIFT CYLINDER (MAST)

Pos.	Part Number	Description	Qty. Reqd.	Notes
--	CK10-4A0000-20	LIFT CYLINDER ASSEMBLY	1	
KIT	CK10-ZZG-20	SEAL KIT	1	Incl. Pos. # 2,3,5,7 & 11
1	CK10-4A2000-2A	PISTON ROD	1	
2	0000-001087-00	RING WIPER 50×58×5-6.5	1	
3	0000-001154-00	O-RING 55×3.1	1	
4	0000-001088-00	COLLAR 50×60×2	1	
5	0000-001089-00	ROD PACKING 50×60×6	1	
6	CK10-4A0002-30	CAP	1	
7	0000-000690-00	O-RING 60×3.1	1	
8	CK10-4A1000-2A	CYLINDER TUBE	1	
9	CK10-4A0004-30	RING BACK UP 55×20×2.5	1	
10	0000-001090-00	COLLAR 45×55×2	1	
11	0000-001091-00	ROD PACKING 45×55×6	1	
12	0000-000133-00	WASHER Ø6	1	
13	0000-001137-00	SCREW M6×5	1	

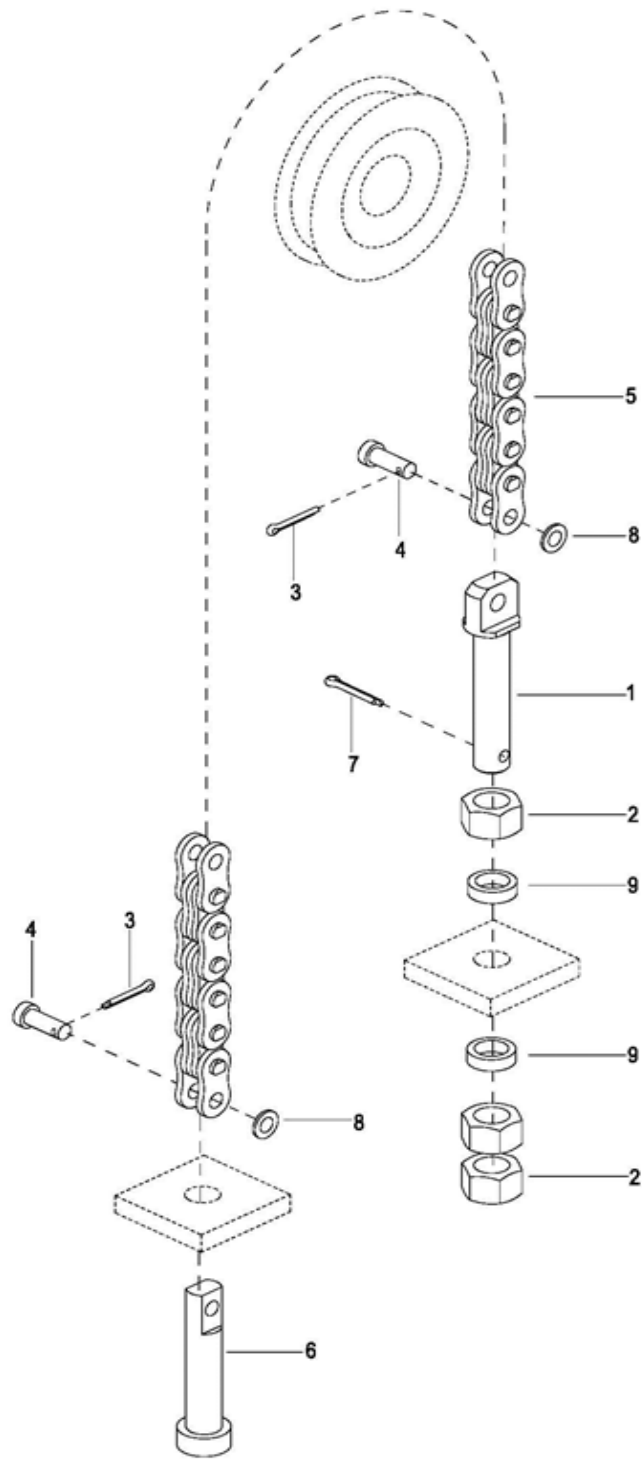


R8145

Figure 12-12 Lift Cylinder - Mini Mast

LIFT CYLINDER - MINI MAST

Pos.	Part Number	Description	Qty. Reqd.	Notes
--	1615-410000-00	LIFT CYLINDER ASSEMBLY	1	Used on Mini Mast
KIT	2125-ZZG-2A	SEAL KIT	1	incl. Pos. # 2,3 & 7
1	2125-410004-00	CAP	1	
2	0000-000084-00	RING WIPER 35×43×5-6.5	1	
3	0000-000370-00	O-RING 40×3.1	1	
4	2125-410006-00	BUSHING	1	
5	1615-412000-00	PISTON ROD	1	
6	2125-410005-0A	RING BACK UP 50×45×15	1	
7	0000-000512-00	ROD PACKING 40×50×6	1	
8	1615-411000-00	CYLINDER TUBE	1	

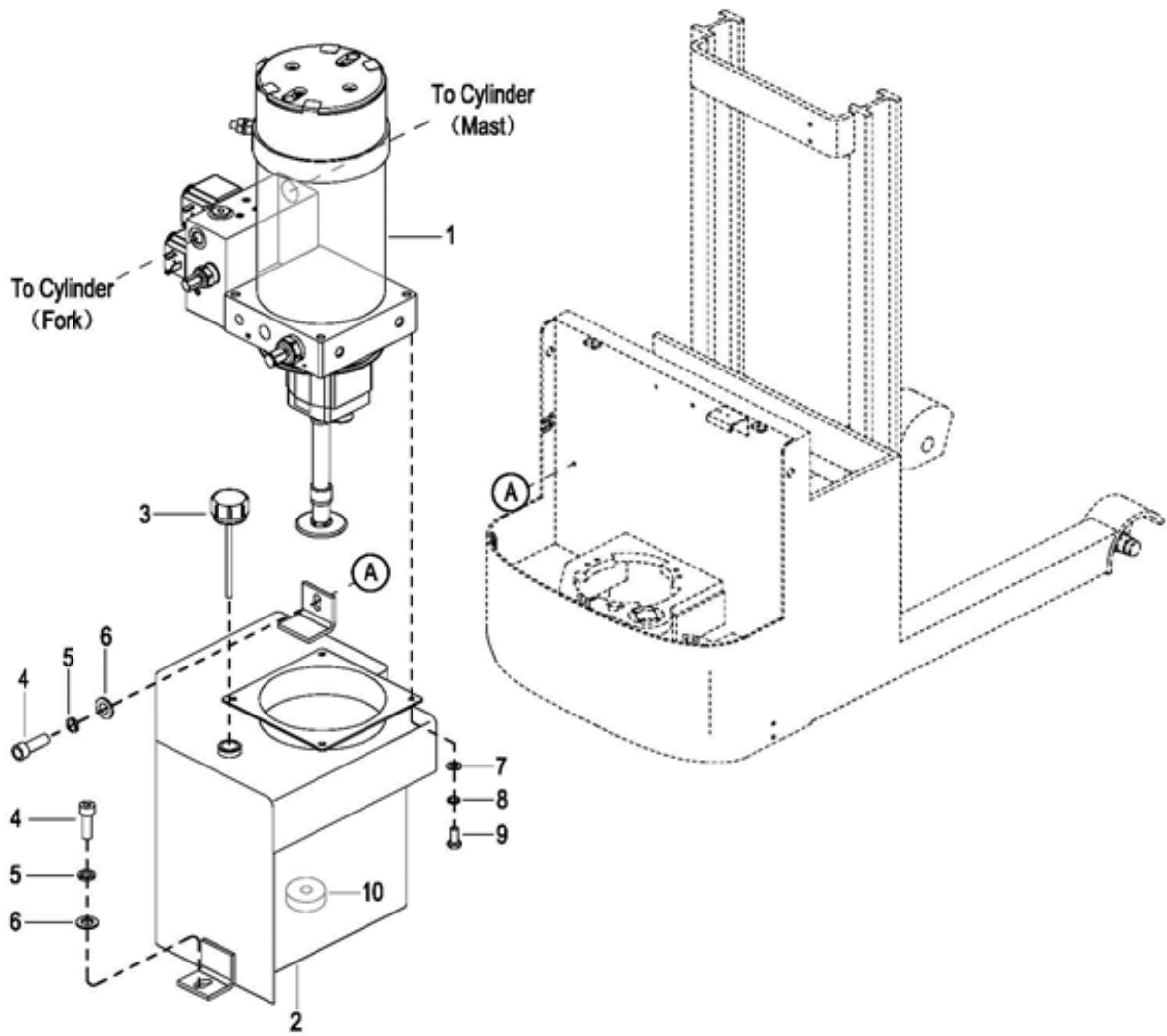


R8146

Figure 12-13 Lift Chain

LIFT CHAIN

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	2125-640001-00	BOLT	1	
2	0000-000187-00	NUT M16×1.5	3	Used up to Serial Number 226170084
2a	3030-250000-01	SPHERICAL NUT M16×1.5	2	Used from Serial Number 226170085 - Only use the two bottom nuts.
3	0000-000188-00	COTTER PIN Ø3.2×20	2	
4	2125-640002-00	PIN	2	
5	1615-790000-00-01	CHAIN	1	Used on Mast
5a	1615-790000-00-02	CHAIN	1	Used on Mini Mast
6	2125-640003-00	CHAIN ANCHOR	1	
7	0000-000686-00	COTTER PIN Ø3.2×32	1	
8	0000-000176-00	FLATWASHER Ø8	2	
9	CK10-600007-00	WASHER	A.R.	As Required

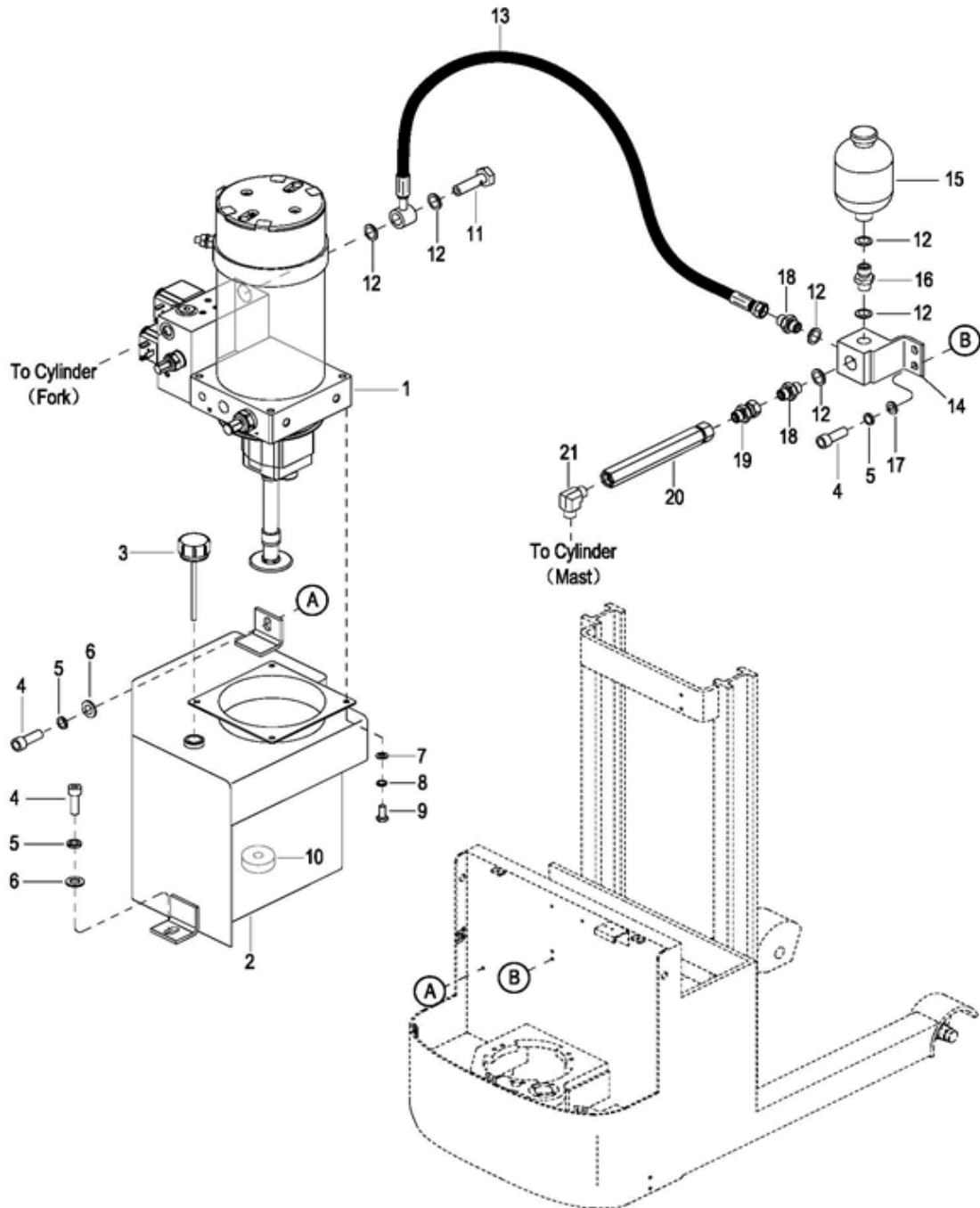


R8133

Figure 12-14 Hydraulic System - Used up to Serial Number 225150153

HYDRAULIC SYSTEM - USED UP TO SERIAL NUMBER 225150153

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-421000-00	HYDRAULIC PUMP ASSEMBLY	1	
2	1615-131000-00	TANK	1	
3	CK10-400002-30	AIR FILTER	1	
4	0000-000433-00	SCREW M8×12	2	
5	0000-000159-00	LOCKWASHER Ø8	2	
6	0000-000194-00	FLATWASHER Ø8	2	
7	0000-000380-00	FLATWASHER Ø6	4	
8	0000-000056-00	LOCKWASHER Ø6	4	
9	0000-000620-00	BOLT M6×16	4	
10	2125-420001-00	MAGNET	1	

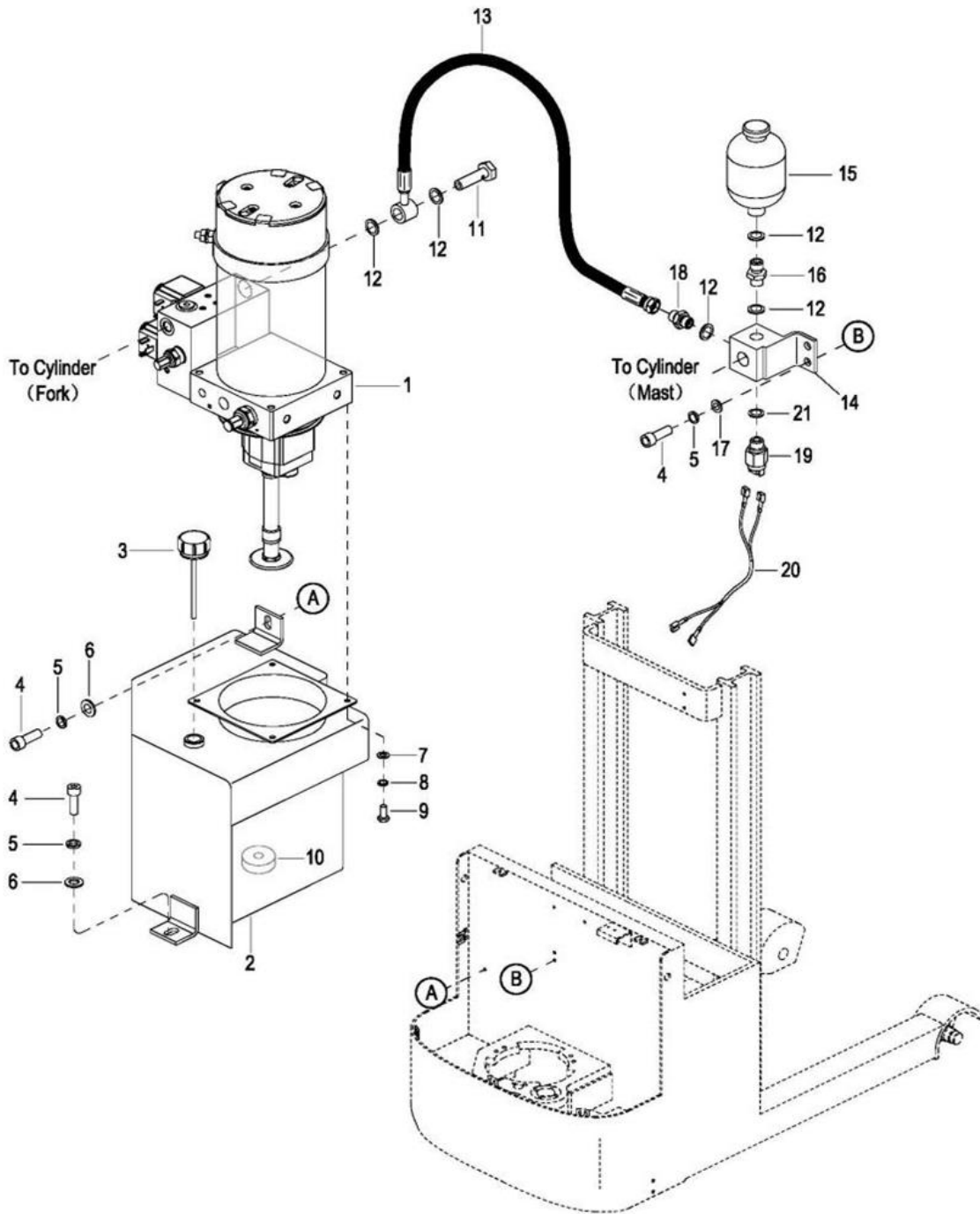


R8266

Figure 12-15 Hydraulic System - Used between Serial Number 225150154 - 225180057

HYDRAULIC SYSTEM - USED BETWEEN SERIAL NUMBER 225150154 - 225180057

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-422000-00	HYDRAULIC PUMP ASSEMBLY	1	
2	1615-131000-00	TANK	1	
3	CK10-400002-30	AIR FILTER	1	
4	0000-000433-00	SCREW M8×12	4	
5	0000-000159-00	LOCKWASHER Ø8	4	
6	0000-000194-00	FLATWASHER Ø8	2	
7	0000-000380-00	FLATWASHER Ø6	4	
8	0000-000056-00	LOCKWASHER Ø6	4	
9	0000-000620-00	BOLT M6×16	4	
10	2125-420001-00	MAGNET	1	
11	2402-143500-00	BOLT G1/4×35	1	
12	0000-000044-00	WASHER Ø14	6	
13	1615-437000-00	OIL PIPE	1	
14	2112-440000-10	BLOCK CROSS	1	
15	CK11-450000-00	ACCUMULATOR	1	
16	2701-141400-00	CONNECTOR M14×1.5-M14×1.5	1	
17	0000-000176-00	FLATWASHER Ø8	2	
18	2702-141600-00	CONNECTOR G1/4-M16×1.5	2	
19	1615-430003-00	CONNECTOR M16×1.5-G5/8	1	
20	1615-423000-00	VALVE	1	
21	1615-430002-00	CONNECTOR G5/8- M16×1.5,	1	

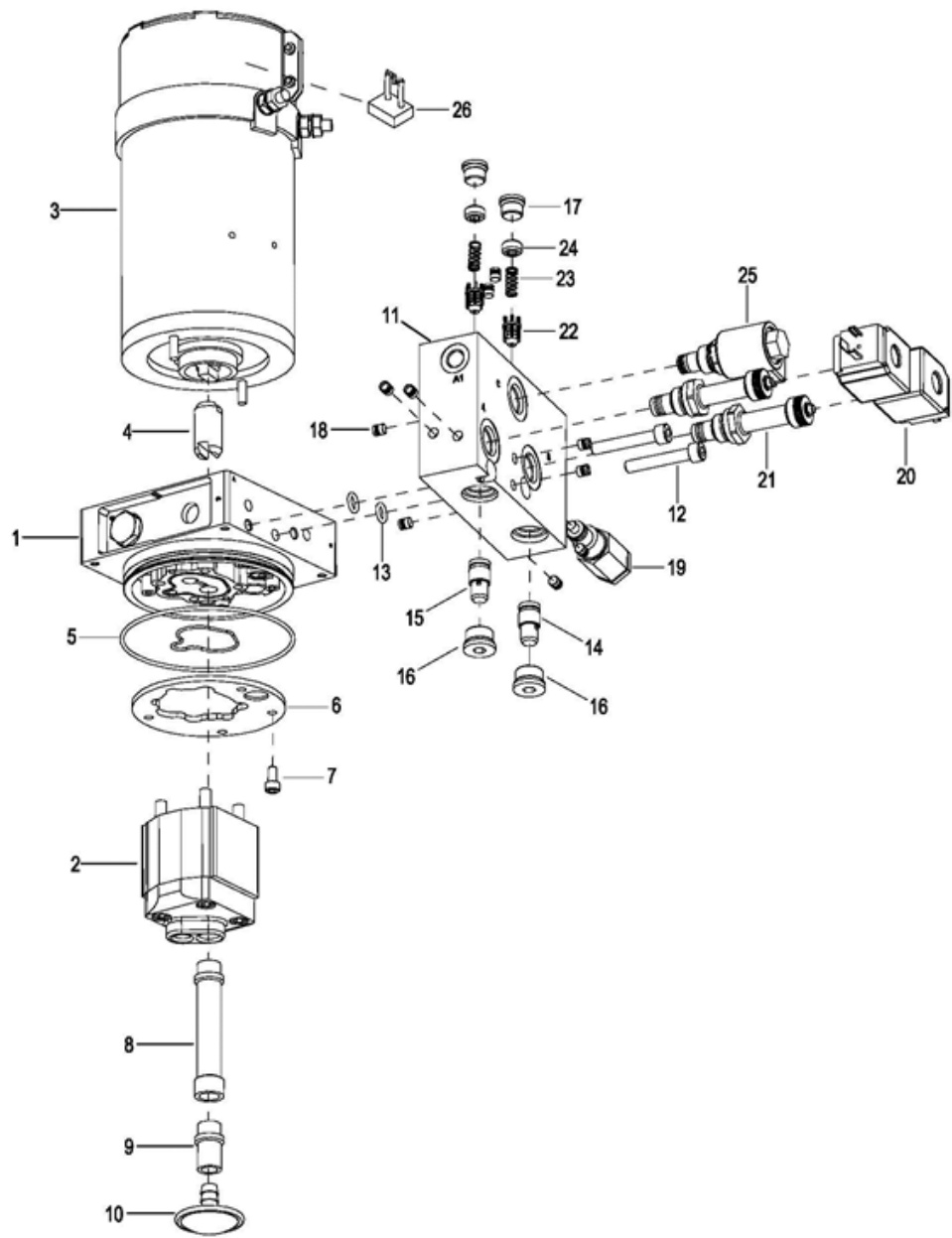


DS_0026

Figure 12-16 Hydraulic System - Used from Serial Number 225180058

HYDRAULIC SYSTEM - USED FROM SERIAL NUMBER 225180058

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-422000-00	HYDRAULIC PUMP ASSEMBLY	1	
2	1615-131000-00	TANK	1	
3	CK10-400002-30	AIR FILTER	1	Used up to Serial Number 227180209
3a	CK10-423000-30	AIR FILTER	1	Used from Serial Number 227180210
4	0000-000433-00	SCREW M8×12	4	
5	0000-000159-00	LOCKWASHER Ø8	4	
6	0000-000194-00	FLATWASHER Ø8	2	
7	0000-000380-00	FLATWASHER Ø6	4	
8	0000-000056-00	LOCKWASHER Ø6	4	
9	0000-000620-00	BOLT M6×16	4	
10	2125-420001-00	MAGNET	1	
11	2402-143500-00	BOLT G1/4×35	1	
12	0000-000044-00	WASHER Ø14	6	
13	1615-437000-00	OIL PIPE	1	
14	CK10-404000-30	BLOCK CROSS	1	
15	CK11-450000-00	ACCUMULATOR	1	
16	2701-141400-00	CONNECTOR M14×1.5-M14×1.5	1	
17	0000-000176-00	FLATWASHER Ø8	2	
18	2702-141600-00	CONNECTOR G1/4-M16×1.5	2	
19	CK10-403000-30	PRESSURE SWITCH	1	
20	CK10-520021-00	SWITCH WIRING	1	Used between Serial Number 225180058-226140016
21	0000-001674-00	WASHER Ø12	1	

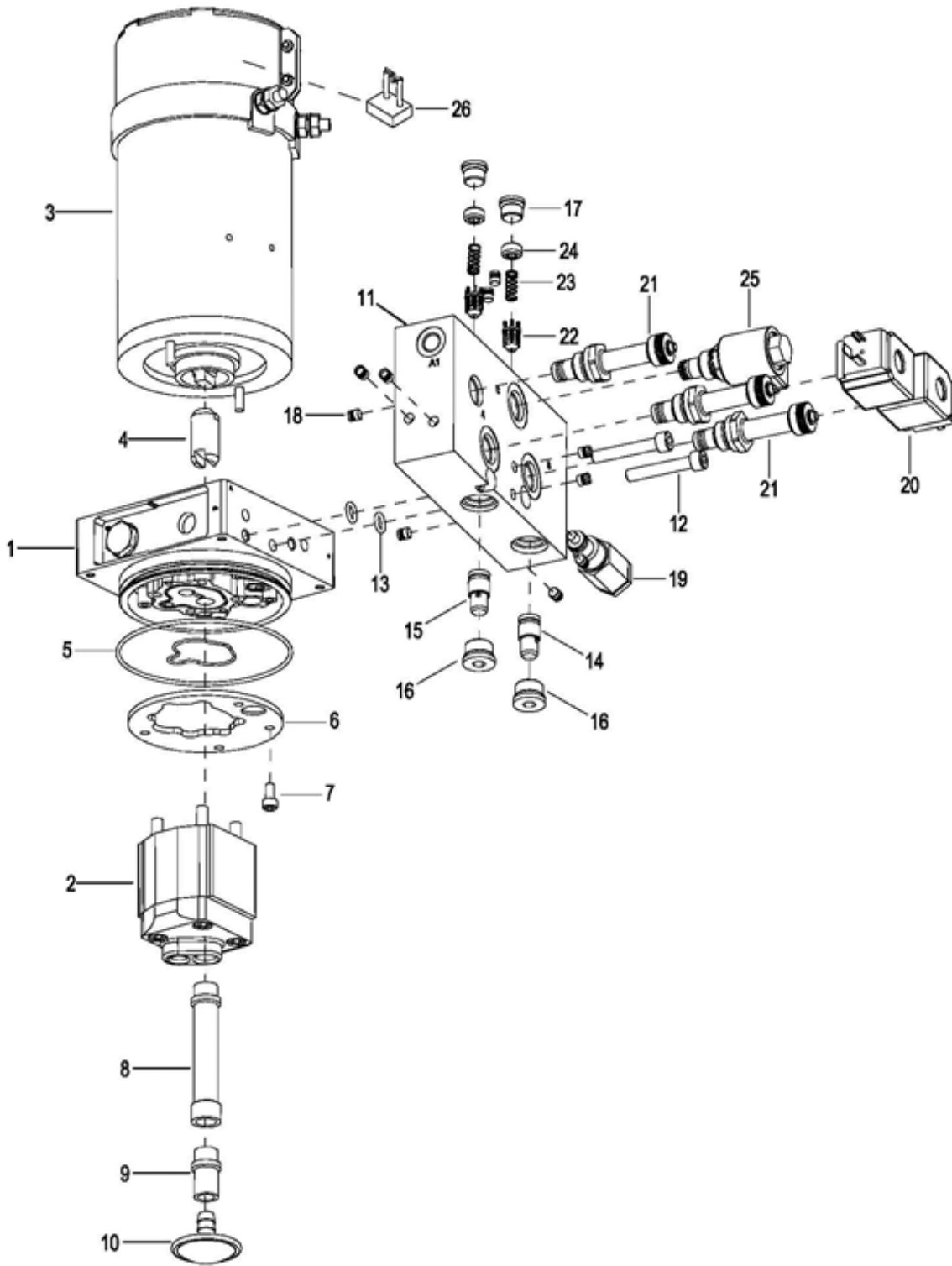


R8134

Figure 12-17 Hydraulic Pump Assembly - Used up to Serial Number 225150153

HYDRAULIC PUMP ASSEMBLY - USED UP TO SERIAL NUMBER 225150153

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	2320-421001-00	ADAPTER	1	
2	2125-430002-00	PUMP	1	
3	1615-421001-00	MOTOR	1	
4	1615-421002-00	COUPLING	1	
5	2125-430006-00	SEAL KIT	1	
6	2125-430007-00	FILTER SCREEN	1	
7	0000-000077-00	SCREW M6×12	4	
8	2130-430008-0A	TUBE PLASTIC	1	
9	1615-421003-00	TUBE PLASTIC	1	
10	2130-430009-0A	FILTER, STEEL	1	
11	1615-421004-00	MANIFOLD	1	
12	0000-001102-00	SCREW M8×50	2	
13	2320-421015-00	O-RING	2	
14	2130-430012-0A	VALVE 12L/MIN	1	
15	1615-421005-00	VALVE 15L/MIN	1	
16	1615-421006-00	PLUG 3/4-16	2	
17	1615-421007-00	PLUG 9/16-18	2	
18	1615-421008-00	PLUG	12	
19	1615-421009-00	RELIEF VALVE	1	
20	1615-421010-00	SOLENOID VALVE	2	
21	1615-421011-00	RELEASE VALVE	2	
22	1615-421012-00	VALVE	2	
23	1615-421013-00	SPRING	2	
24	1615-421014-00	SCREW	2	
25	1615-421016-00	PROPORTIONAL SOLENOID VALVE	1	
26	1615-421015-00	BRUSH	1	

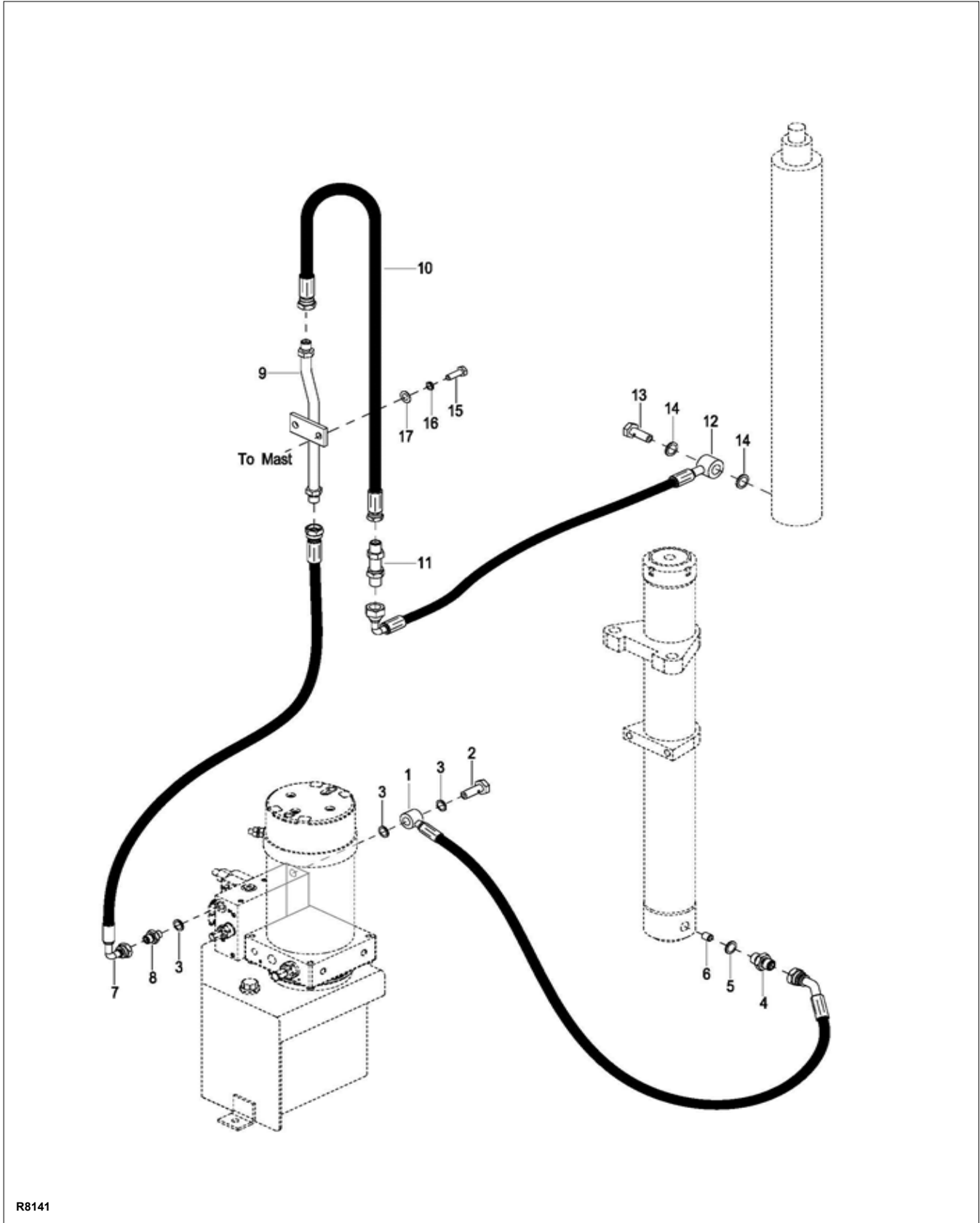


R8267

Figure 12-18 Hydraulic Pump Assembly - Used from Serial Number 225150154

HYDRAULIC PUMP ASSEMBLY - USED FROM SERIAL NUMBER 225150154

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	2320-421001-00	ADAPTER	1	
2	2125-430002-00	PUMP	1	
3	1615-421001-00	MOTOR	1	
4	1615-421002-00	COUPLING	1	
5	2125-430006-00	SEAL KIT	1	
6	2125-430007-00	FILTER SCREEN	1	
7	0000-000077-00	SCREW M6×12	4	
8	2130-430008-0A	TUBE PLASTIC	1	
9	1615-421003-00	TUBE PLASTIC	1	
10	2130-430009-0A	FILTER , STEEL	1	
11	1615-422001-00	MANIFOLD	1	
12	0000-001102-00	SCREW M8×50	3	
13	2320-421015-00	O-RING	2	
14	2130-430012-0A	VALVE 12L/MIN	1	
15	1615-421005-00	VALVE 15L/MIN	1	
16	1615-421006-00	PLUG 3/4-16	2	
17	1615-421007-00	PLUG 9/16-18	2	
18	1615-421008-00	PLUG	12	
19	1615-421009-00	RELIEF VALVE	1	
20	1615-421010-00	SOLENOID VALVE	2	
21	1615-421011-00	RELEASE VALVE	2	
22	1615-421012-00	VALVE	2	
23	1615-421013-00	SPRING	2	
24	1615-421014-00	SCREW	2	
25	1615-422002-00	PROPORTIONAL SOLENOID VALVE	1	
26	1615-421015-00	BRUSH	1	

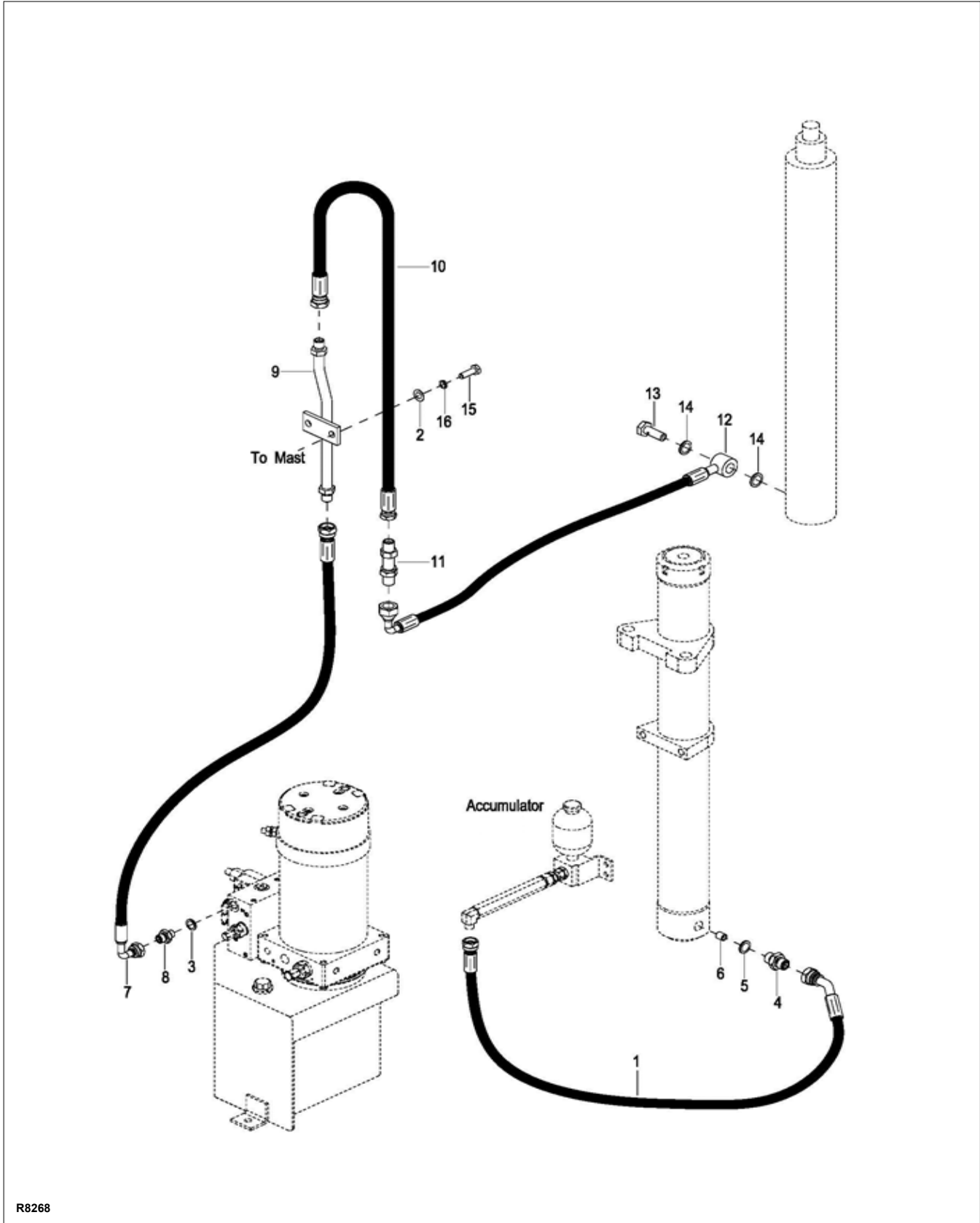


R8141

Figure 12-19 Hydraulic Lines - Used up to Serial Number 225150153

HYDRAULIC LINES - USED UP TO SERIAL NUMBER 225150153

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-431000-00	OIL PIPE	1	
2	2402-143500-00	BOLT G1/4×35	1	
3	0000-000044-00	WASHER Ø14	3	
4	2702-381600-00	CONNECTOR G3/8-M16×1.5	1	
5	0000-000634-00	WASHER Ø18	1	
6	CK10-402000-00	EXPLOSION RELIEF VALVE	1	
7	1615-432000-00	OIL PIPE	1	
8	2702-141600-00	CONNECTOR G1/4-M16×1.5	1	
9	1615-436000-00	METALLIC OIL PIPE	1	
10	1615-433000-00	OIL PIPE	1	
11	1615-435000-00	CONNECTOR	1	
12	1615-434000-30	OIL PIPE	1	
13	2401-163900-00	BOLT M16×1.5×39	1	
14	0000-000069-00	WASHER Ø16	2	
15	0000-000242-00	SCREW M8×16	2	
16	0000-000159-00	LOCKWASHER Ø8	2	
17	0000-000194-00	FLATWASHER Ø8	2	

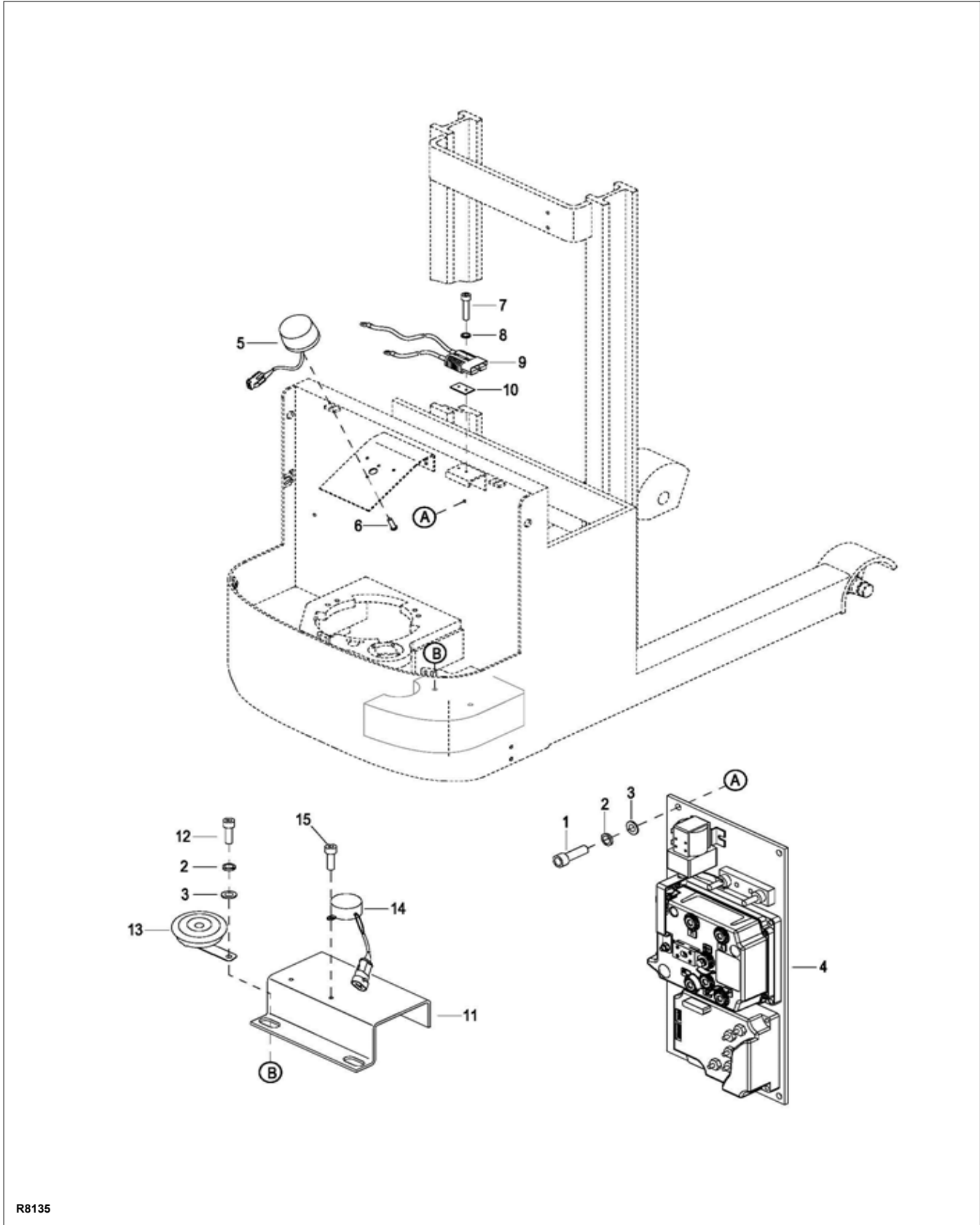


R8268

Figure 12-20 Hydraulic Lines - Used from Serial Number 225150154

HYDRAULIC LINES - USED FROM SERIAL NUMBER 225150154

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-438000-00	OIL PIPE	1	
2	0000-000194-00	FLATWASHER Ø8	2	
3	0000-000044-00	WASHER Ø14	3	
4	2702-381600-00	CONNECTOR G3/8-M16×1.5	1	
5	0000-000634-00	WASHER Ø18	1	
6	CK10-402000-00	EXPLOSION RELIEF VALVE	1	
7	1615-432000-00	OIL PIPE	1	
8	2702-141600-00	CONNECTOR G1/4-M16×1.5	1	
9	1615-436000-00	METALLIC OIL PIPE	1	
10	1615-433000-00	OIL PIPE	1	
11	1615-435000-00	CONNECTOR	1	
12	1615-434000-30	OIL PIPE	1	
13	2401-163900-00	BOLT M16×1.5×39	1	
14	0000-000069-00	WASHER Ø16	2	
15	0000-000242-00	SCREW M8×16	2	
16	0000-000159-00	LOCKWASHER Ø8	2	

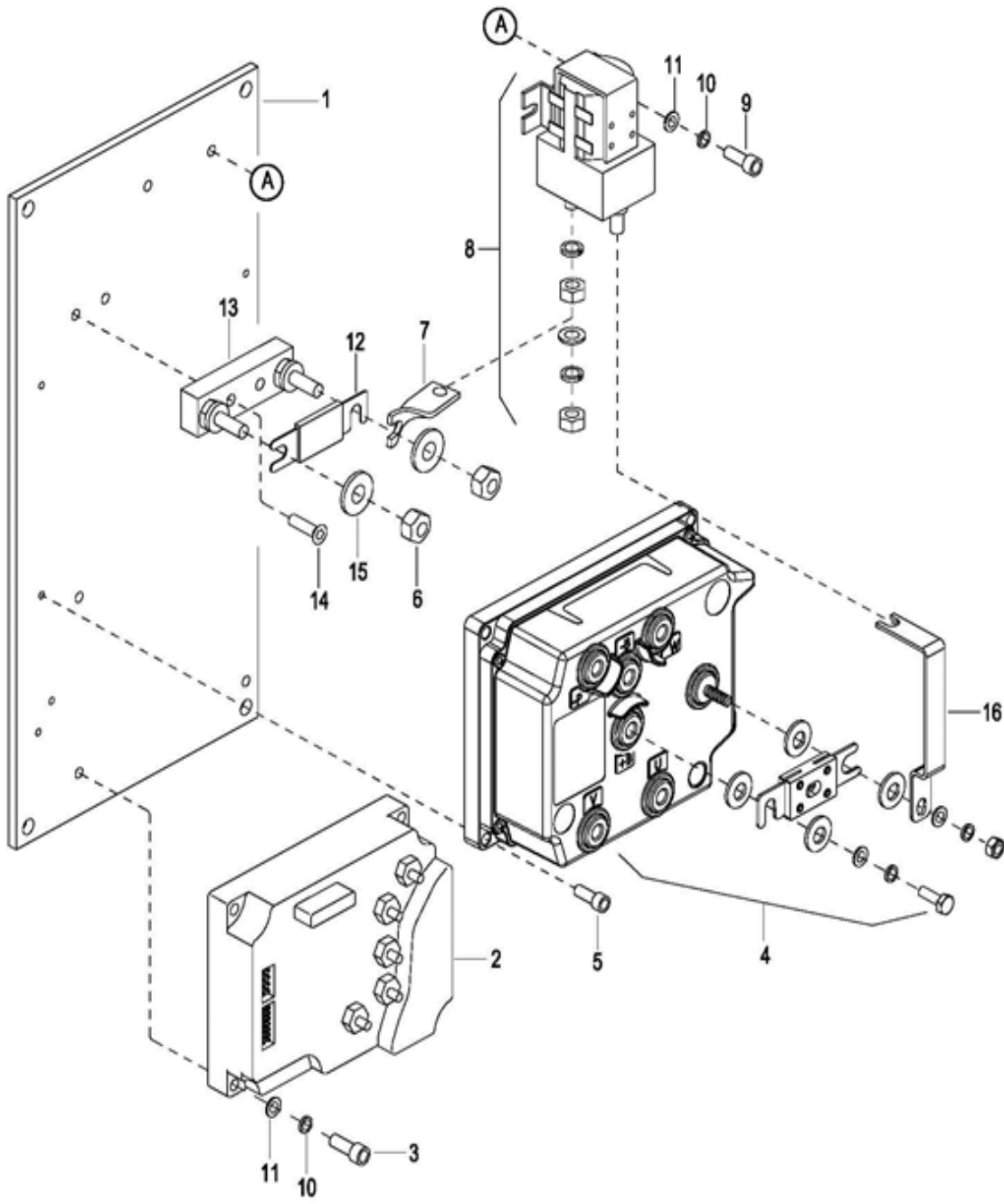


R8135

Figure 12-21 Electrical System

ELECTRICAL SYSTEM

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	0000-000321-00	SCREW M8×20	4	
2	0000-000159-00	LOCKWASHER Ø8	6	
3	0000-000194-00	FLATWASHER Ø8	6	
4	--	CONTROLLER BOARD ASSEMBLY	1	See Control Panel Assembly
5	CK10-520015-00	WARNING LAMP	1	
6	0000-000998-00	SCREW M3×8	2	
7	0000-000430-00	SCREW M6×50	2	
8	0000-000056-00	LOCKWASHER Ø6	4	
9	1615-531000-00	CONNECTOR BATTERY ASSEMBLY	1	
10	1120-112008-00	PLATE	A.R.	As Required
11	CK10-510040-00	BUZZER PLATE	1	
12	0000-000109-00	SCREW M8×16	2	
13	1120-500003-00	HORN	1	
14	CK11-520011-00	BUZZER?LOWERING?	1	
15	0000-000009-00	SCREW M4×12	1	

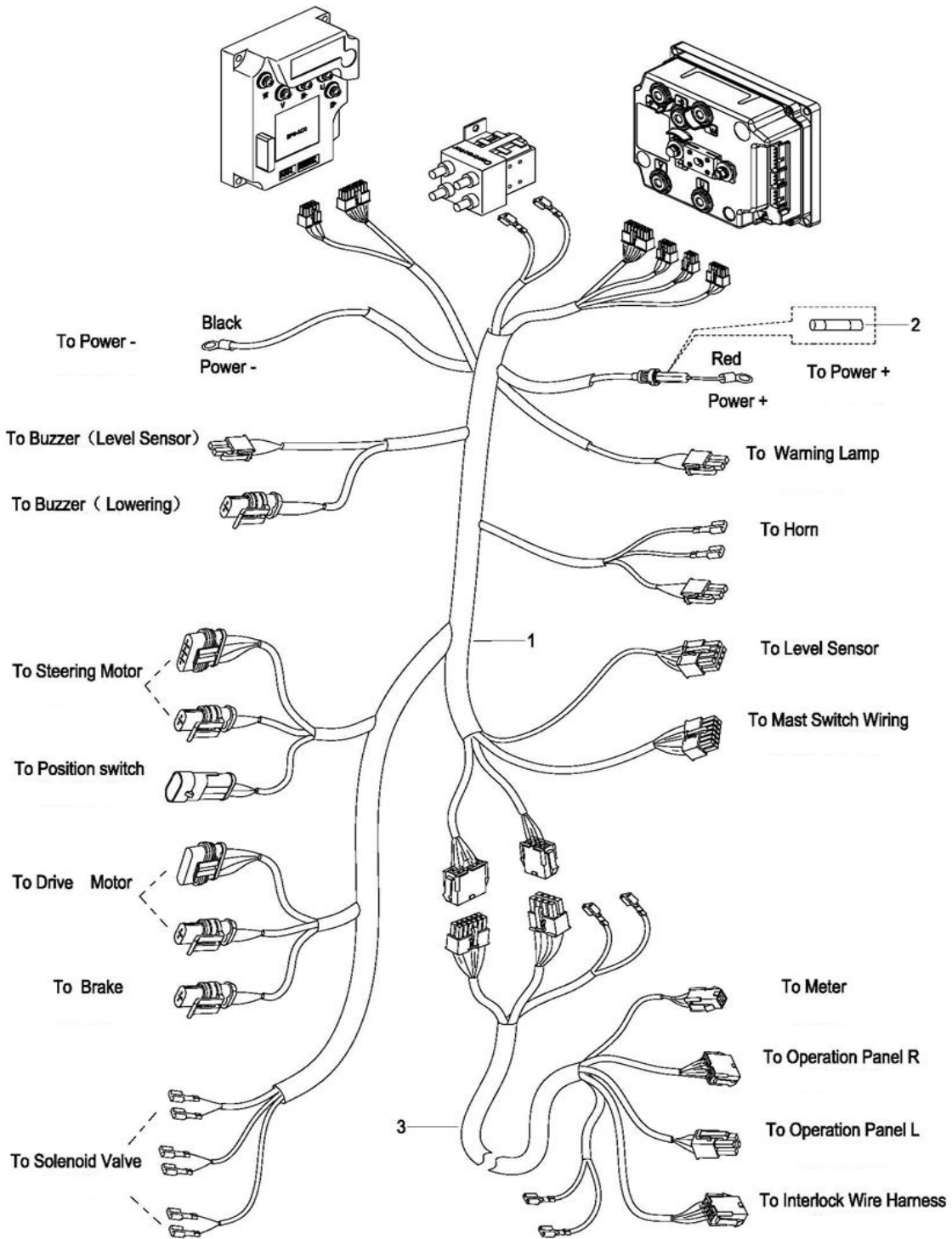


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Figure 12-22 Control Panel Assembly

CONTROL PANEL ASSEMBLY

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	CK11-510001-00	BOARD	1	Used up to serial number 224180023
1a	1615-510006-00	BOARD	1	Used from serial number 224180024
2	1280-560002-00-20	EPS CONTROLLER	1	
3	0000-000032-00	SCREW M6×25	4	
4	SERIAL # REQUIRED	CONTROLLER COMBIACX	1	Please contact Big Lift with a Serial # of the truck so that the correct part # can be quoted
5	0000-000004-00	SCREW M5×12	4	
6	0000-000196-00	NUT M8	2	
7	1120-530006-00	COPPER CONDUCTOR?	1	
8	1120-500005-10	CONTACTOR	1	
9	0000-000077-00	SCREW M6×12	2	
10	0000-000056-00	LOCKWASHER Ø6	6	
11	0000-000380-00	FLATWASHER Ø6	6	
12	1120-540002-00	FUSE 200A	1	
13	1120-540001-00-B	STAND	1	
14	0000-000074-00	SCREW M6×20	2	
15	0000-000210-00	FLATWASHER Ø8	3	
16	1615-510007-00	COPPER CONDUCTOR	1	

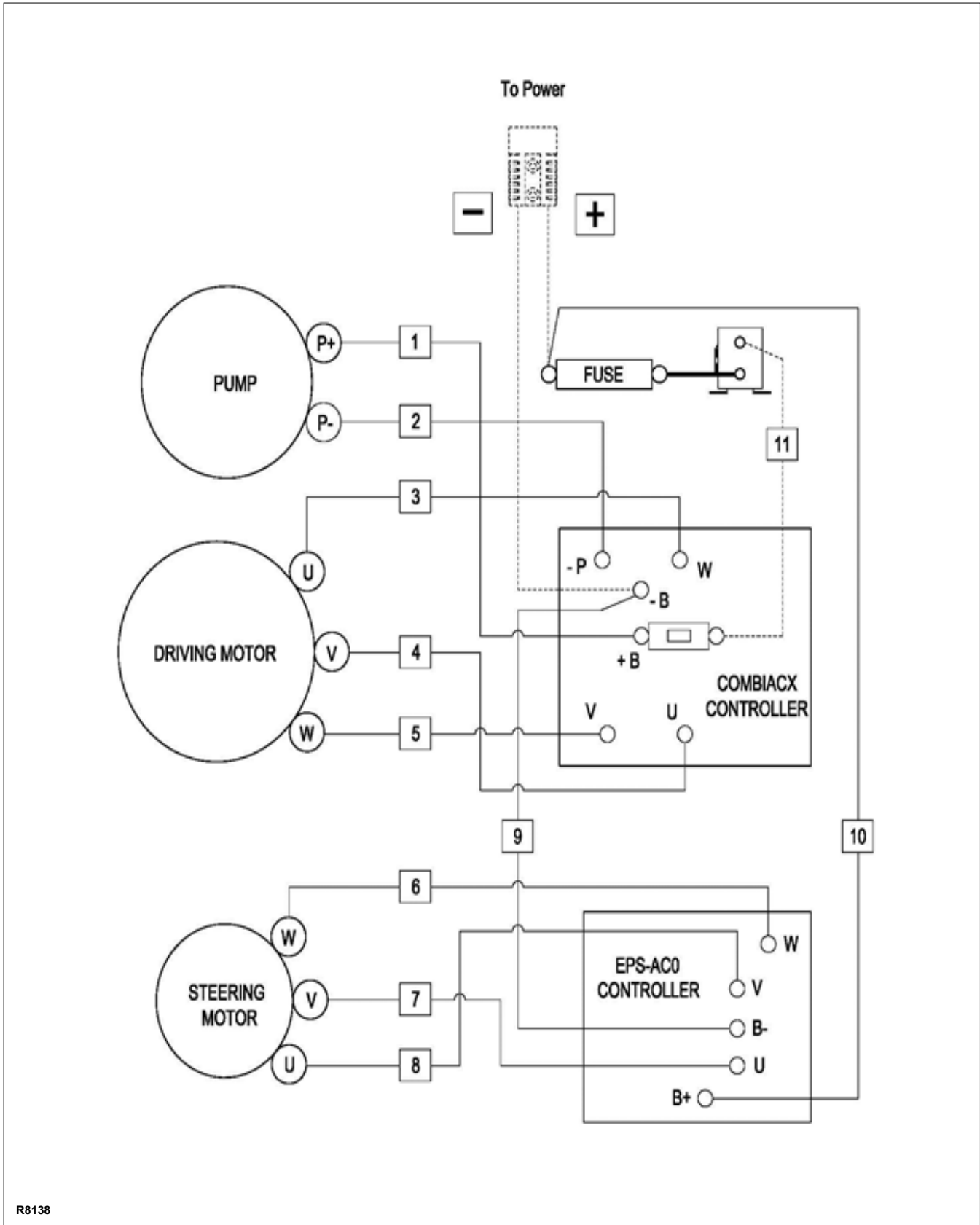


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Figure 12-22 Wire Harness

WIRE HARNESS

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	1615-520001-00	MAIN WIRING HARNESS	1	Used up to Serial Number 226140016
1a	1615-520001-0B	MAIN WIRING HARNESS	1	Used from Serial Number 226140017
2	1120-500010-00	FUSE 10A	1	
3	1615-520002-00-01	MULTI-CORE CABLE HARNESS	1	Used up to Serial Number 226140016 Used for lift height 72"
3a	1615-521000-00-01	MULTI-CORE CABLE HARNESS WITH DRAG CHAIN	1	Used up to Serial Number 226140016 With Drag Chain. Used for Lift Height 72"
3b	1615-520002-0A-01	MULTI-CORE CABLE HARNESS	1	Used between Serial Number 226140017 - 227200016 Used for lift height 72"
3c	1615-521000-0A-01	MULTI-CORE CABLE HARNESS WITH DRAG CHAIN	1	Used between Serial Number 226140017 - 227200016 With Drag Chain. Used for Lift Height 72"
3d	1615-520002-0B-01	MULTI-CORE CABLE HARNESS	1	Used from Serial Number 227200017 Used for lift height 72"
3e	1615-521000-0B-01	MULTI-CORE CABLE HARNESS WITH DRAG CHAIN	1	Used from Serial Number 227200017 With Drag Chain. Used for Lift Height 72"



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Figure 12-23 Wiring Cables

WIRING CABLES

Pos.	Part Number	Description	Qty. Reqd.	Notes
1	CK10-531009-00	PUMP POWER CABLE PA+	1	
2	CK10-531010-00	PUMP POWER CABLE PA -	1	
3	1615-530002-00	DRIVING MOTOR CABLE U	1	
4	1615-530003-00	DRIVING MOTOR CABLE V	1	
5	1615-530004-00	DRIVING MOTOR CABLE W	1	
6	CK10-531006-10	STEERING MOTOR CABLE W	1	
7	CK10-531005-10	STEERING MOTOR CABLE V	1	
8	CK10-531004-10	STEERING MOTOR CABLE U	1	
9	1615-530006-00	(D-AC0) CABLE-	1	
10	1615-530005-00	(EPS-AC0) CABLE+	1	
11	1615-530001-00	(COMBIACX) CABLE+	1	Used up to serial number 224180023

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