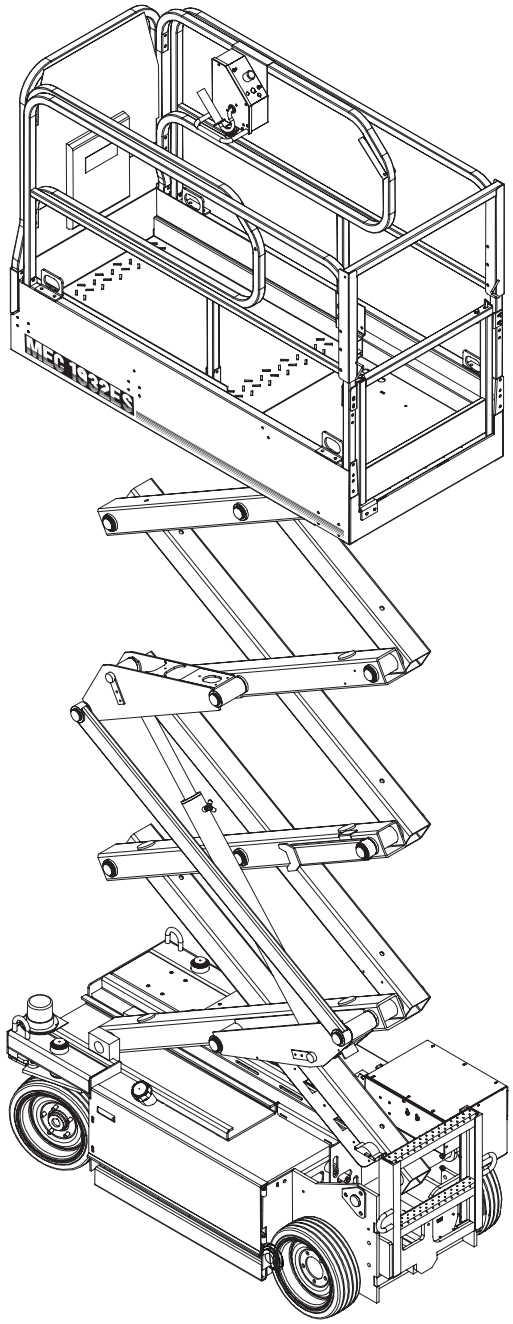
CE SERVICE AND PARTS MANUAL

1532ES / 1932ES



Serial Number Range

1532ES CE: 9001000 - Present

1932ES CE: 9104000 - Present

Part # 90966 R2
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Aerial Platform Sales Corp.

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INTRODUCTION

This manual consists of Service and Parts sections.

The Service Section of this manual is designed to provide you, the customer, with the instructions needed to properly maintain the MEC self-propelled scissor lift. When used in conjunction with the illustrated *Parts Section* and the *Operators Manual* (provided separately), this manual will assist you in making necessary adjustments, repairs, identifying, and ordering the correct replacement parts.

All parts represented here are manufactured and supplied in accordance with MEC's quality standards.

We recommend that you use Genuine MEC parts to insure proper OPERATION and reliable PERFORMANCE.

To obtain maximum benefits from your MEC scissor lift, always follow the proper operating and maintenance procedures. Only trained authorized personnel should be allowed to operate or service this machine. Service personnel should read and study the *Operator's* and *Service and Parts Manual* in order to gain a thorough understanding of the unit prior to making any repairs.

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

"DANGER" INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY. THIS SIGNAL WORD IS LIMITED TO THE MOST EXTREME SITUATIONS.

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

"CAUTION" INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES. "CAUTION" IS USED FOR PROPERTY-DAMAGE ONLY ACCIDENTS.

NOTE: The best method to protect yourself and others from injury or death is to use common sense. If you are unsure of any operation, don't start until you are satisfied that it is safe to proceed and have discussed the situation with your supervisor.

Service personnel and machine operators must understand and comply with all warnings and instructional decals on the machine.

DANGER

MODIFICATIONS OF THIS MACHINE FROM THE ORIGINAL DESIGN AND SPECIFICATIONS WITHOUT WRITTEN PERMISSION FROM MEC ARE STRICTLY FORBIDDEN. A MODIFICATION MAY COMPROMISE THE SAFETY OF THE MACHINE, SUBJECTING OPERATOR(S) TO SERIOUS INJURY OR DEATH.

MEC's policies and procedures demonstrate our commitment to Quality and our relentless ongoing efforts towards Continuous Improvement, due to which product specifications are subject to change without notice.

Any procedures not found within this manual must be evaluated by the individual to assure oneself that they are "proper and safe."

Your MEC Scissor Lift has been designed, built, and tested to provide many years of safe, dependable service. Only trained, authorized personnel should be allowed to operate or service the machine.

MEC, as manufacturer, has no direct control over machine application and operation. Proper safety practices are the responsibility of the user and all operating personnel.

If There Is A Question On Application And/Or Operation Contact:

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GENERAL SAFETY TIPS

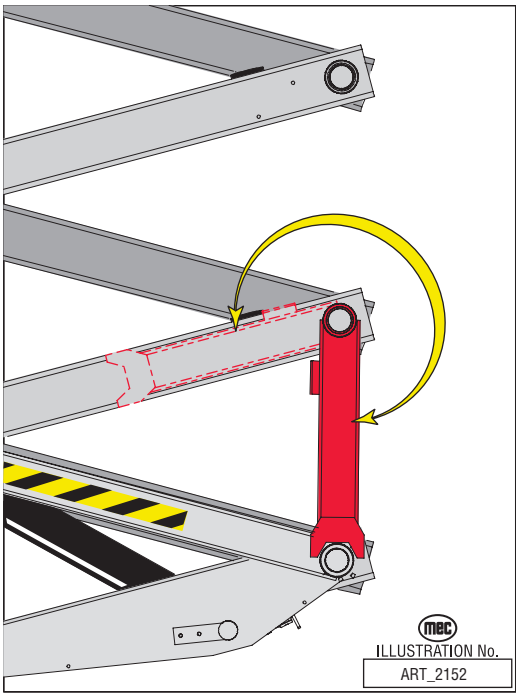
Regular inspection and conscientious maintenance is the key to efficient economical operation of your scissor lift. It will help to assure that your equipment will perform satisfactorily with a minimum of service and repair.

The actual operating environment of the machine governs the inspection schedule. Correct lubrication is an essential part of the preventative maintenance to minimize wear on working parts and ensure against premature failure. By maintaining correct lubrication, the possibility of mechanical failure and resulting downtime is reduced to a minimum.

DANGER

NEVER PERFORM SERVICE ON THE MACHINE (WITH THE PLATFORM ELEVATED) WITHOUT FIRST BLOCKING THE SCISSOR ASSEMBLY IN PLACE USING THE MAINTENANCE LOCK!

- Block scissor assembly using Maintenance Lock if machine is in the elevated/extended position.
- Never leave hydraulic components or hoses open. They must be protected from contamination (including rain) at all times.
- Never open a hydraulic system when there are contaminants in the air.
- Always clean the surrounding area before opening hydraulic systems.
- Use only recommended lubricants. Improper lubricants or incompatible lubricants may be as harmful as no lubrication.
- Watch for makeshift “fixes” which can jeopardize safety as well as lead to more costly repair.



Hydraulic System

WARNING

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

CAUTION

Hydraulic fluid leaks under pressure may not always be visible. Check for pin hole leaks with a piece of cardboard, not your hand.

Electrical System

CAUTION

Prevent damage to battery and/or electrical system;

- **Always disconnect the negative (–) battery cable first.**
- **Always connect the positive (+) battery cable first.**

When connecting battery cables, connect the positive terminal first. If the negative cable is installed first, and contact is made between the positive side of the battery and a metal surface on the machine while connecting the positive cable, a spark will occur. This can cause damage to the electrical system, battery explosion, and personal injury.

Total System

CAUTION

Failure to perform preventive maintenance at recommended intervals may result in the unit being operated with a defect that could result in injury or death of the operator.

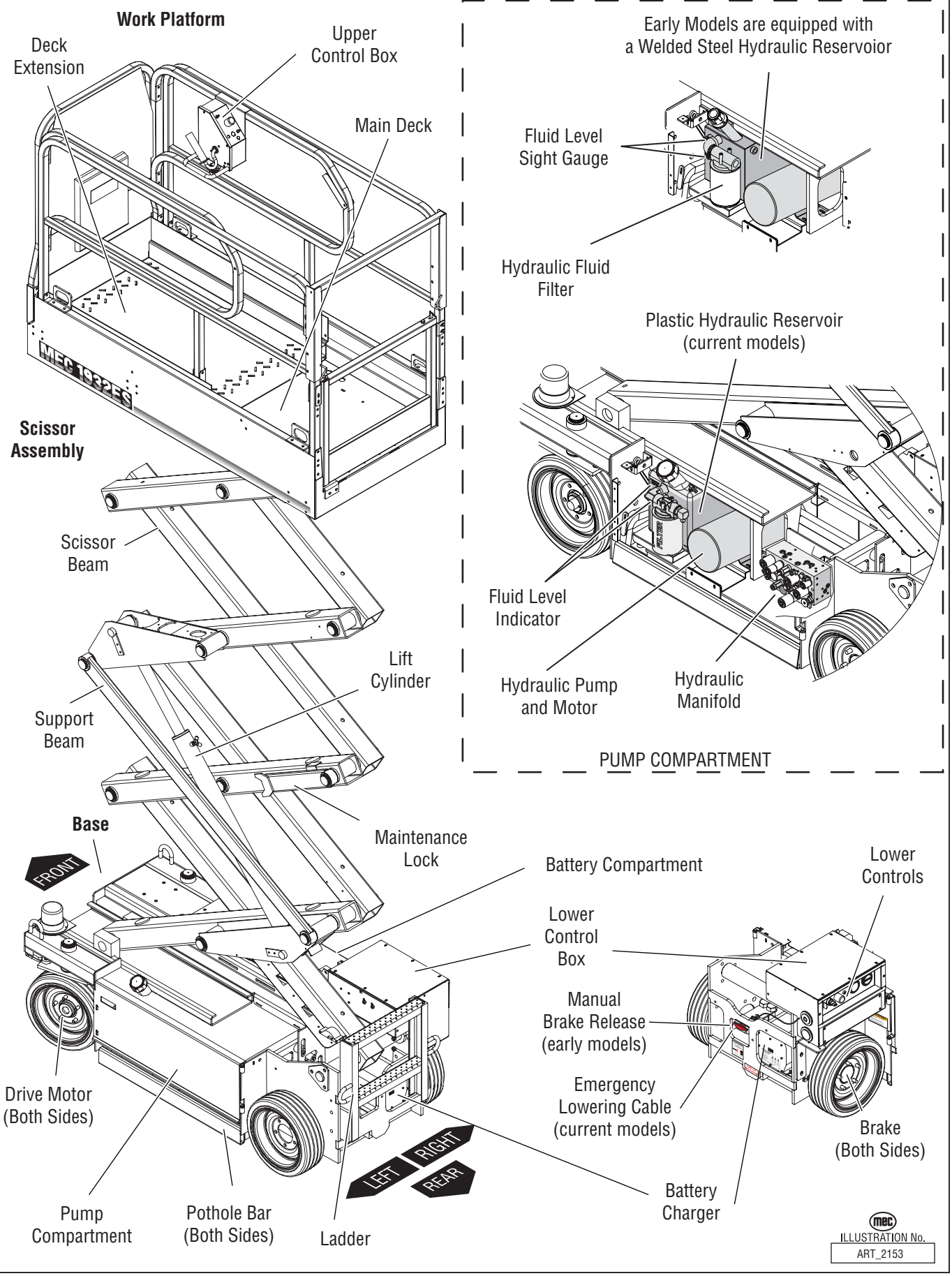
Immediately report to your supervisor any Defect or malfunction. Any defect shall be repaired prior to continued use of the scissor lift.

Inspection and maintenance should be performed by qualified personnel familiar with the equipment.

MACHINE SPECIFICATIONS

	1532ES	1932ES
Working Height*	6.50 m	7.71 m
Platform Height	4.50 m	5.71 m
Stowed Height — Rails Up	1.90 m	2.10 m
Stowed Height — Rails Folded Down	NA	NA
Maximum Number of Occupants	2	2
Lift Capacity (Evenly Distributed)	272 kg	226 kg
Rollout Deck Capacity	113 kg	113 kg
Platform Dimensions		
With Roll-Out Deck Retracted	0.96 x 1.68 m	0.96 x 1.68 m
Guard Rail Height	1.03 m	1.03 m
Toe Board Height	19 cm	19 cm
Rollout Deck Length	0.91 m	0.91 m
Overall Length	1.83 m	1.83 m
Overall Width	0.80 m	0.80 m
Wheel Base	1.27 m	1.27 m
Wheel Track	0.70 m	0.70 m
Turning Radius — Inside	5 cm	5 cm
Turning Radius — Outside	1.8 m	1.8 m
Ground Clearance	0.6.8 m	6.8 m
Machine Weight** (Unloaded) (Approx.)	1236 kg	1390 kg
Drive System (Proportional)		
Drive Speed (Platform Elevated - Forward)	0 - 0.8 km/h	
Drive Speed (Platform Lowered)	0 - 3.7 km/h	
Lift/Lower Speed (Approx.)	17 sec / 20 sec	17 sec / 20 sec
Gradeability	25% / 14°	25% / 14°
Ground Pressure/Wheel (Maximum)	7.4 kg/cm²	7.9 kg/cm²
Wind Speed (Maximum)	0 m/s	0 m/s
Tire Size-Standard (Solid, non-marking rubber)	35.56 cm x 11.43 cm	
Wheel Lug Nut Torque	102 - 115 Nm	
Hydraulic Pressure — Main System	190 bar	190 bar
Hydraulic Pressure — Lift System	131 bar	180 bar
Hydraulic Pressure — Steer	62 bar	62 bar
Hydraulic Fluid Capacity	11.36 liters	11.36 liters
Power System – Voltage	24 Volts DC	24 Volts DC
Battery Charger — Input	100-220 Volt AC, 50/60 Hz, 5.6 Amp	
Battery Charger — Output	24 Volt DC, 25 Amps Tapering, Timed Shutoff	
Batteries — Four 6 Volt deep-cycle	220 Amp hours @ 20 hour rating	
Electric Motor	2.0 h.p. (1.49 kW): 3000 r.p.m.	

Meets requirements of CE.
*Metric equivalent of working height adds 2 m (6.6 ft.) to platform height.
**Weight may increase with certain options or country standards.


Work Platform
Deck Extension
Upper Control Box
Main Deck
Scissor Assembly
Scissor Beam
Support Beam
Lift Cylinder
Base
Maintenance Lock
FRONT
Drive Motor (Both Sides)
Pump Compartment
Pothole Bar (Both Sides)
Ladder
LEFT
RIGHT
REAR
Battery Compartment
Lower Control Box
Manual Brake Release (early models)
Emergency Lowering Cable (current models)
Battery Charger
Lower Controls
Brake (Both Sides)
Early Models are equipped with a Welded Steel Hydraulic Reservoior
Fluid Level Sight Gauge
Hydraulic Fluid Filter
Plastic Hydraulic Reservoir (current models)
Fluid Level Indicator
Hydraulic Pump and Motor
Hydraulic Manifold
PUMP COMPARTMENT
ILLUSTRATION No.
ART_2153

PRIMARY MACHINE COMPONENTS

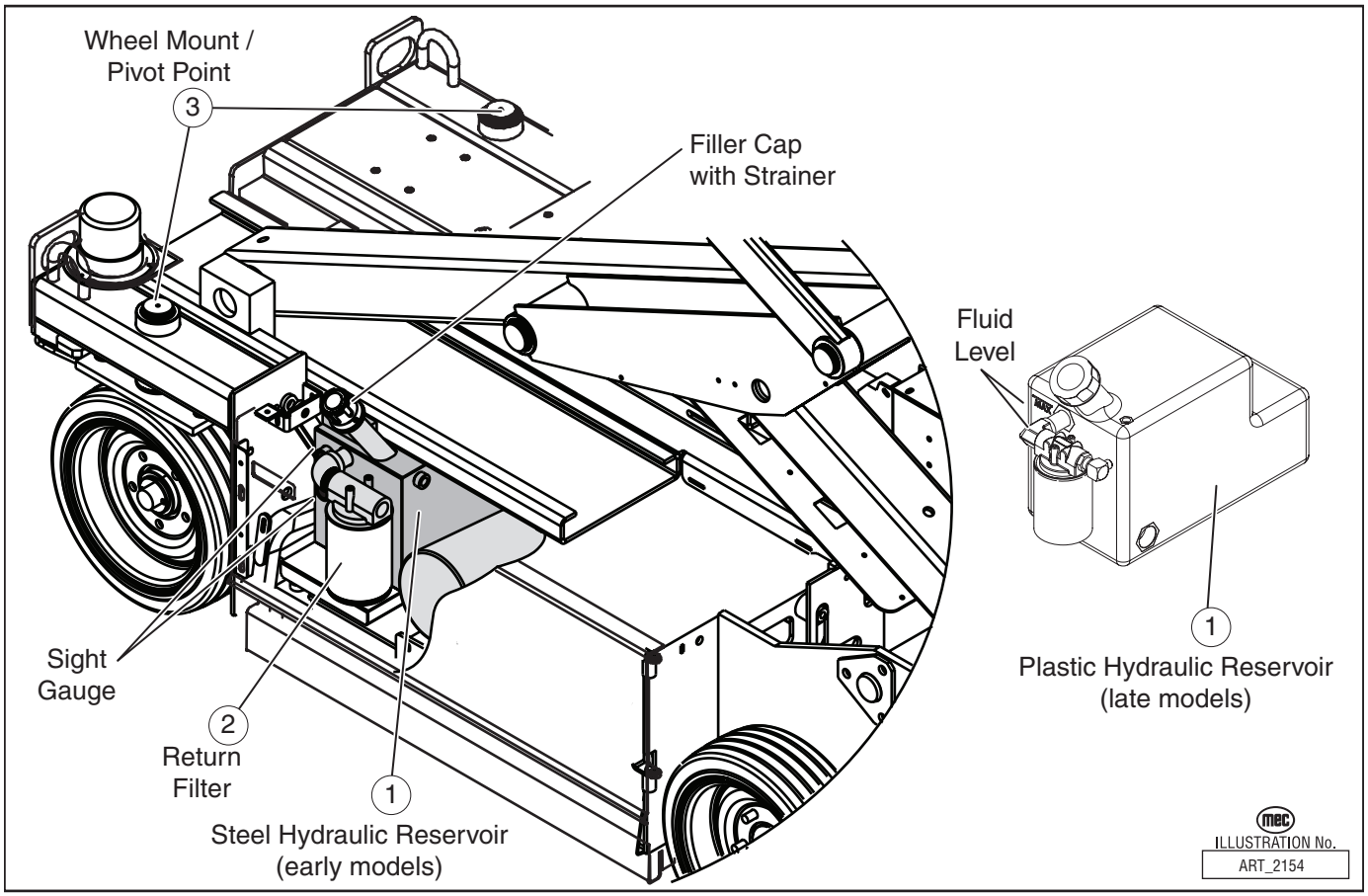
Use this chart to find information relating to a specific component.

Component	Service Section	Parts Section
Platform Assembly		
Upper Controls	2 | 5 | 6	A
Deck and Rails	4	B
Chain Closure		B
Optional Gate		B
Deck Extension		B
Control Terminal Strip	2 | 6	A | B
Horn (optional)	2 | 5 | 6	A | B
Power to Platform		B
Lift Assembly		
Scissor Assembly	4	C
Maintenance Lock	intro	C
Lift Cylinder	1 | 4 | 5 | 6	C
Height Sensor	2 | 3 | 6	C
Overload Sensor	2 | 3 | 6	C
Base Assembly		
Drive Motors	intro | 1 | 4 | 5 | 6	E
Brakes	intro | 1 | 4 | 5 | 6	E
Steering Components	1 | 4 | 5 | 6	E
Wheels & Tires	4	E
Emergency Lowering	1	E
Hoses & Cables	1 | 4	A | B | D
Battery Charger	2 | 5 | 6	E
Pothole Components	4	E
Pothole Switch	2 | 5 | 6	E
Limit Switch	2 | 5 | 6	E
Lubrication Points	intro	C
Brake Release Hand Pump	6	D

Component	Service Section	Parts Section
Pump Compartment		
Hydraulic Pump & Motor	intro |1 | 5 | 6	E
Hydraulic Reservoir	intro | 1	D
Hydraulic Filter	intro | 1	D
Hydraulic Manifold	1 | 5 | 6	D
Battery Compartment		
Battery Pack	2 | 5	E
Lower Control Box		
Lower Controls	2 | 5 | 6	A
Power to Platform	2	A
Diode Board	2 | 5 | 6	A
Motor Controller (PWM)	2 | 5 | 6	A
Battery Disconnect Switch	2	A
Motion Alarm	2 | 6	E
Load Sense	2 | 3 | 5 | 6	A

LUBRICATION

NO.	ITEM	SPECIFICATION	FREQUENCY OF LUBRICATION
1	Hydraulic Reservoir	Fill to the middle of the sight gauge with platform in the stowed position. **Anti-Wear 150 SSU (ISO 32/mil spec 0-5606)**	Check daily. Change yearly or every 1,000 hours, whichever occurs first.
2	Hydraulic Filter	Filter element	Change every six months or 500 hours, whichever occurs first for normal usage. Change every three months or 300 hours, whichever occurs first for severe usage.
3	Wheel Motor Mount	Lithium N.L.G. #2 EP purge old grease	Weekly or every 25 hours, whichever occurs first



SECTION 1

HYDRAULIC SYSTEM

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Hydraulic System Components 1-4
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HYDRAULIC FLUID

Handling Precautions

WARNING

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

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

WARNING

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

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

Fluid Recommendations

MEC recommends the use of ISO Grade 32 hydraulic fluid. A 150SSU EQUIVALENT substitute can be used if absolutely necessary. Mineral-based hydraulic fluids produced by different companies will USUALLY mix with each other satisfactorily, but this IS NOT RECOMMENDED. When in doubt, consult with your supplier.

ISO Grade 32 has proven to be suitable for use in all climates. For continued operation in temperatures below 32 °F (0 °C), use of an ATF hydraulic fluid is satisfactory.

The only exception to the above is to drain and fill the system with ATF fluid or its equivalent. This will also start up at temperatures down to -20 °F (-29 °C). However, use of this fluid will give poor performance at temperatures above 120 °F (49 °C).

System Flushing Procedure

1. With platform fully down, drain hydraulic fluid from hydraulic reservoir into an empty container.
2. When the hydraulic reservoir is empty, remove suction strainer and hoses.
3. Remove return line on the hydraulic reservoir.
4. Remove the bypass filter and hose.
5. Flush the hoses with clean hydraulic fluid.
6. Discard old bypass filter element and replace.
7. Flush out the tank with hoses removed from the hydraulic reservoir.
8. Reinstall all hoses in the previous steps.
9. Fill hydraulic reservoir with filtered, fresh hydraulic fluid (refer to Lubrication Chart).
10. Loosen output hose fittings at pump to flood with hydraulic fluid. Tighten fittings.
11. Briefly operate all functions. Two or three lift cycles may be necessary to purge all air from lift cylinder(s).
12. When the above procedures have been completed, fill hydraulic reservoir to full mark on sight gauge.
13. Check all leaks and correct as necessary. Machine is now ready to be placed back into operation.

    NOTE: Avoid mixing petroleum and synthetic base fluids. It is not advisable to mix fluids of different brands or types, except as recommended.

HYDRAULIC SYSTEM COMPONENTS

Hydraulic Fluid Reservoir

This consists of the tank, a filler cap with breather, a drain plug, and a bypass filler with a 10 micron filter element.

Perform the following steps weekly:

- Check tank for signs of leakage.
- Inspect tank securing bolts for tightness.

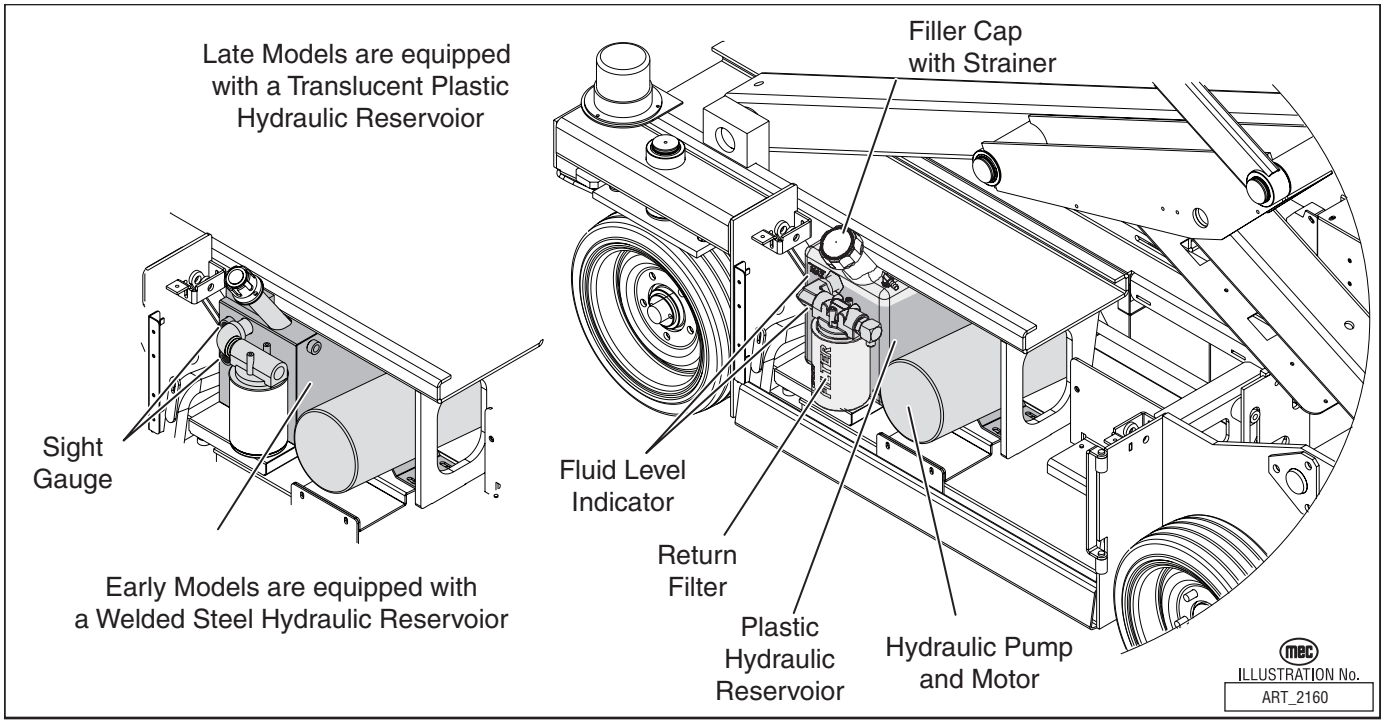
Hydraulic Filter

All machines are equipped with a filter. It is a 10 micron spin-on, bypassing filter. When the filter is clogged, hydraulic flow bypasses the filter element. The filter element must be changed every 6 months or 500 hours. Extremely dirty conditions may require that the filter be replaced more often.

Beware of hot fluid. Contact with hot fluid may cause burns.

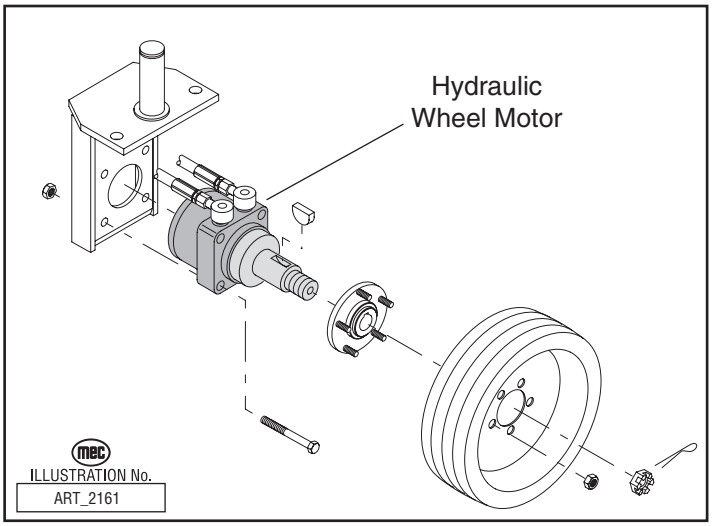
Hydraulic Pump

An electric motor drives the fixed displacement, gear pump. The pump provides hydraulic fluid flow to operate the machine functions at 3 gpm. There are no adjustments on the pump. The pump provides power for the lift, drive, brake and steering functions.



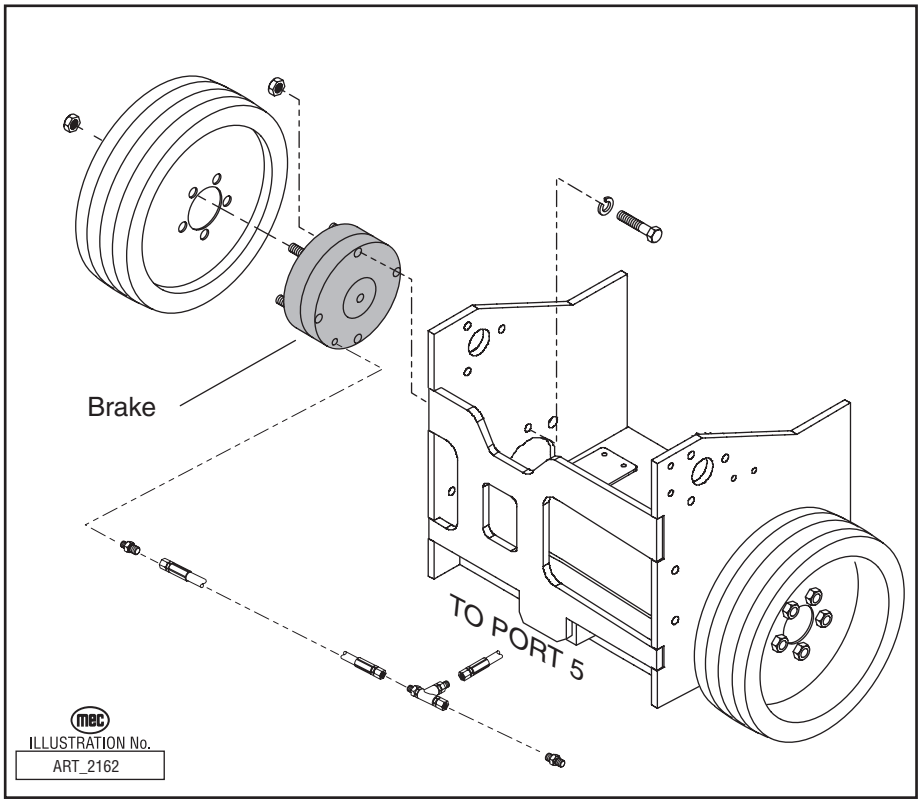
Wheel Drive Circuit

There are two (2) hydraulic, fixed-displacement gear wheel motors to provide power to the two (2) front wheels.



Braking Circuit

Rear brakes are released whenever the machine is commanded to drive.



PARKING BRAKE AND TOWING CIRCUIT

Note: Refer to *Parts Section E* for hose routing.

Machine can be winched or moved short distances in case of power failure at speeds not to exceed 5 mph (8.05 km/h).

CAUTION

PRIOR TO MANUALLY RELEASING BRAKES, INSURE WHEELS ARE CHOCKED TO PREVENT MACHINE FROM MOVING.

Release Brakes Before Towing:

- Open the tow valve by turning counter-clockwise.
- Push in the manual brake release valve located on the main manifold.
- Using the hand pump on the manifold, pump valve until pressure is built.
- Machine is now ready for towing.

DANGER

AFTER RELEASING THE BRAKES, THERE IS NOTHING TO STOP THE MACHINE'S TRAVEL. MACHINE WILL ROLL FREELY ON SLOPES. BE ON GUARD AGAINST RUNAWAY.

To Reset Brakes:

- Close the tow valve by turning it clockwise.
- Brakes will reset when drive function is activated or reset by pulling on manual brake release valve.

EMERGENCY SYSTEMS AND PROCEDURES

WARNING

IF THE CONTROL SYSTEM FAILS WHILE THE PLATFORM IS ELEVATED, HAVE AN EXPERIENCED OPERATOR USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.

DO NOT ATTEMPT TO CLIMB DOWN SCISSOR ASSEMBLY.

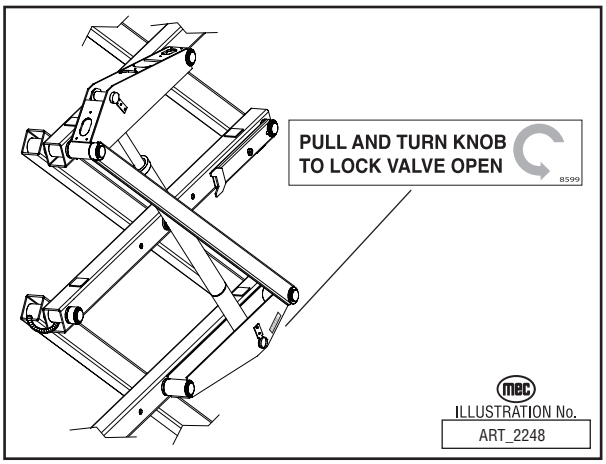
WARNING

BEFORE LOWERING PLATFORM, RETRACT THE DECK EXTENSION.

Emergency Lowering - Early Models

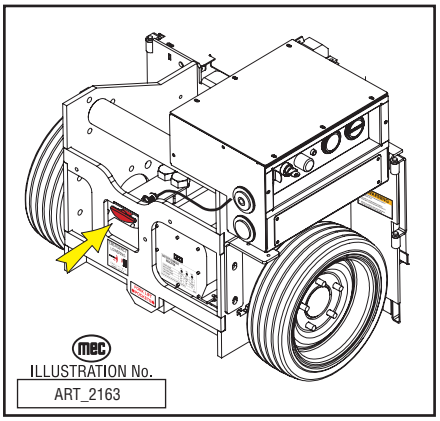
The Emergency Down System is used to lower the platform in case of power or valve failure. To lower the platform, perform the following steps:

1. Pull and turn knurled knob on lift cylinder counterclockwise to lock the valve in open position.
2. Pull manual activator (override valve) on main manifold to lower platform to desired height.
3. To return to normal operation, turn knurled knob on lift cylinder clockwise. Valve will automatically lock.



Emergency Lowering - Current models

Emergency Down system is used to lower the platform in case of power or valve failure. To lower the platform, pull the red “T” handle located at the rear of the machine. Lowering stops when you release the “T” handle.



STEERING CIRCUIT

Note: Refer to *Hydraulic Manifold* and *Relief Pressure Adjustment Procedure*.
Refer to *Section 4* for Remove and Replace instructions.
Refer to *Parts Section E* for hose routing.

The steering system consists of the following components:

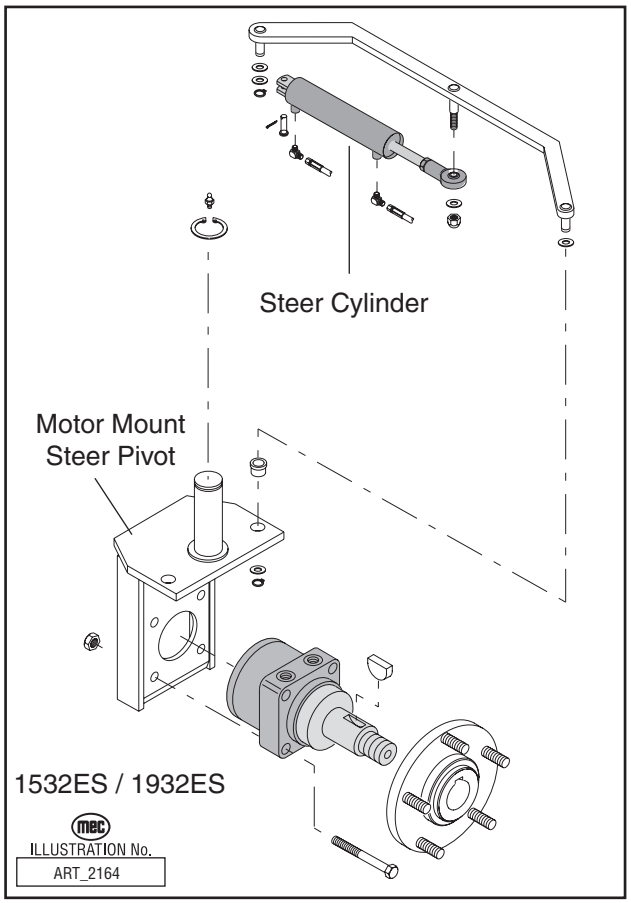
- The wheel motor housings have pivots on the top and bottom, and are mechanically linked together via a tie-rod.
- Steering is accomplished hydraulically by using one (1) double-acting cylinder, and a 4-way 3-position solenoid-operated, hydraulic directional control cartridge valve.
- Maximum steering pressure is limited by the relief valve (refer to *Relief Pressure Adjustment Procedure*).

Steer Cylinder

There is one (1) cylinder utilized in the steering system. This cylinder is a double acting type which requires fluid flow to operate the cylinder rod in both directions. Directing fluid forces the piston to travel towards the rod end of the barrel, extending the cylinder rod.

By directing fluid to the rod side of the cylinder the piston will be forced in the opposite direction and the cylinder rod will retract.

Refer to the Mechanical Section of this manual for cylinder disassembly, or replacement.



PLATFORM LIFT CIRCUIT

Note: Refer to *Hydraulic Manifold* and *Relief Pressure Adjustment Procedure*. Refer to *Section 4* for Remove and Replace instructions.

- The lift system uses the hydraulic pump to obtain proportional lifting function controlled by the lift valve and pump speed.
- Lowering is single speed controlled by the holding valves on the lift cylinder(s) and regulated by a fixed orifice located on the lift cylinder(s).
- Platform capacity is limited by a hydraulic relief valve in the lift circuit. (Refer to Machine Specifications or the Hydraulic Schematic for proper setting).

Lift Cylinder

Note: Refer to *Cylinder Repair*.

1532ES / 1932ES

One (1) single acting type hydraulic cylinder.

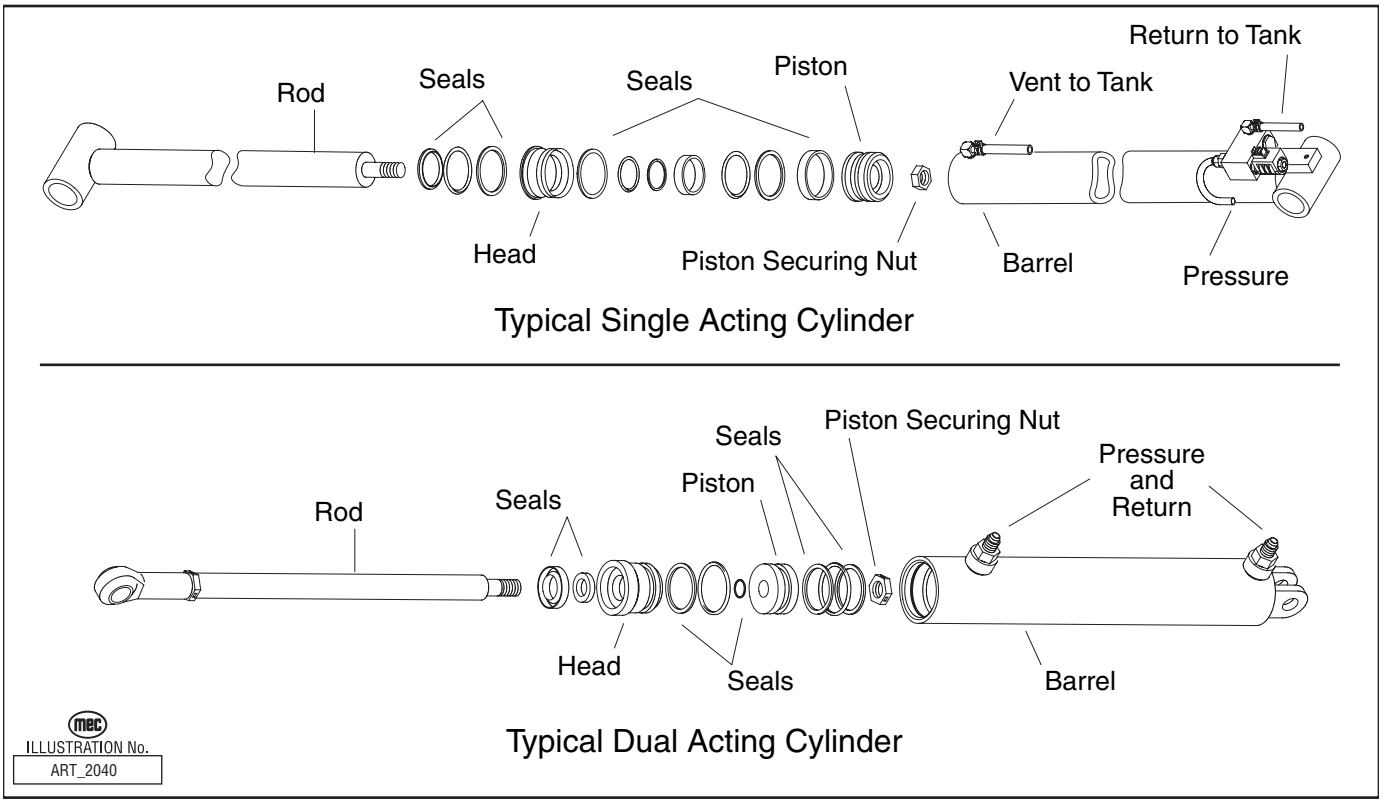
The cylinder has an integrated 2-position, 2-way solenoid operated platform lower valve for holding the platform in position.

The valve is also externally actuated for manually lowering the platform. Early models use a pull-to-release knob at the cylinder, while current models use a cable release with a pull handle located near the ladder (see *Emergency Systems and Procedures*).

CYLINDER REPAIR

WARNING

CYLINDERS ARE HEAVY. SUPPORT CYLINDERS BEFORE REMOVING HARDWARE THAT SECURES THE CYLINDER TO THE MACHINE.



Removal

Note: Refer to *Section 4* for Remove and Replace instructions, and the *Parts Section* for a list of hardware specific to the cylinder being repaired.

1. Tag hoses for proper reassembly.
2. Disconnect hoses and IMMEDIATELY cap the openings to prevent contamination.
3. Remove cylinder from the machine as described in *Section 4*.

Preparation

CAUTION

Take care not to damage rod surface and guard against dirt or other foreign objects entering system.

1. Drain all fluid from cylinder.
2. Clean all dirt and grit from outside of cylinder.
3. Insert cylinder into vise.

Cylinder Disassembly

1. Remove the head from the cylinder body.
2. Remove the shaft assembly from the barrel, pulling in a straight line, so as not to scar the internal parts.
3. Insert shaft into a **soft jawed** vise so that the head and piston can be removed. Be sure the shaft and vise are both clean before using.
4. Remove nut at the end of the shaft and pull head and piston off of the rod.
5. Remove all seals from the head and piston using a non-sharp seal tool. These tools are available from various seal suppliers.
9. Clean all fluid and debris off of the head, piston, shaft, collar and barrel using solvent, rags, and an air hose.
10. Inspect parts for scratches, pits or polishing. Check seal groves and sealing surfaces.
    a. Scratches or pits deep enough to catch the fingernail are unacceptable; replace the cylinder.
    b. Polishing is a sign of uneven loading. Check for roundness. If a polished surface is not round within 0.18 mm replace the cylinder.

Cylinder Assembly

CAUTION:

- **To insure a quality repair, cylinder parts must be thoroughly cleaned, dry, and free of solvents, and assembly must be performed in a clean area free of dust and contamination.**
- **To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to restore to their original shape before assembling the cylinder.**
- **Torque all hardware according to the *Hydraulic Components Torque Table* unless otherwise specified.**

1. Lubricate all components with clean hydraulic fluid.
2. Install new seal kit components. Install all seals on the head and piston using the non-sharp seal tool.
3. Place a small amount of fluid on the inside seals of the head and reinstall it on the shaft, by slipping head over the piston end of the shaft being very careful not to damage the inside seals.
4. Place a small amount of fluid on the inside seals of the piston and reinstall it on the shaft by slowly twisting the piston on over the threads of the shaft being very careful not to damage the inside seals.
5. Reinstall the shaft nut; torque to 217 Nm.
6. Grease the outside seals of the head and piston.
7. Reinstall the shaft into the barrel of the cylinder and push in until groove of the head lines up with the slot in the barrel.

17. Reinstall the cylinder retainer.
18. Cycle the cylinder using air to check for proper operation.

NOTE: It is very important to keep all parts clean when working with hydraulic cylinders, even one small piece of dirt or grit can damage the cylinder.

HYDRAULIC MANIFOLD

Note: Refer to *Section 4* for Remove and Replace instructions, and the *Parts Section* for a list of hardware.
Tag all components as they are removed so as not to confuse their location during reassembly.

Hydraulic Manifold Removal

1. Disconnect the negative battery terminal.
2. Tag and disconnect the solenoid valve leads.
3. Tag and disconnect hydraulic hoses, and IMMEDIATELY cap the openings to prevent contamination.
4. Remove the bolts that hold the manifold to the mounting bracket.
5. Remove the manifold block.

Disassembly

1. Remove coils from solenoid valves.
2. Remove valves.
3. Remove fittings, plugs, springs, balls, and orifices.

Cleaning and Inspection

1. Wash the manifold in cleaning solvent to remove built-up contaminants, then blow out all passages with clean compressed air.
2. Inspect the manifold for cracks, thread damage and scoring where O-rings seal against internal and external surfaces.
3. Wash and dry each component and check for thread damage, torn or cracked O-rings, and proper operation.
4. Replace defective parts and O-rings.

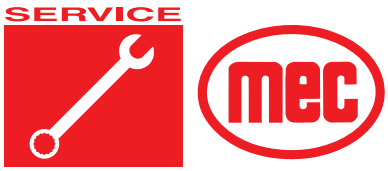
Assembly

Note: Lubricate all O-rings before installation to prevent damage to the O-ring. Seat balls in manifold block by lightly tapping on the ball with a brass drift punch.

1. Install fittings, plugs, springs, balls, and orifices. Use one drop of Locktite #424 or equivalent thread locker on each screw-in orifice.
2. Install valves.

Installation

1. Attach manifold assembly to mounting plate with mounting bolts.
2. Connect solenoid leads (as previously tagged).
3. Connect hydraulic hoses (as previously tagged). Be certain to tighten hoses.
4. Connect the battery.
5. Operate each hydraulic function and check for proper operation and leaks.
6. Adjust valve pressures.



SECTION 2

ELECTRICAL SYSTEM

Electrical System - General 2-2
Deutsch Connectors 2-3
Batteries 2-4
Alarms and Switches 2-8
Continuity Checks 2-11
Diode Board 2-12
Sevcon Motor Speed Controller 2-13
Load Sensing System 2-14

ELECTRICAL SYSTEM - GENERAL

The electrical control system consists of a lower control box and an upper control box.

Lower Control box

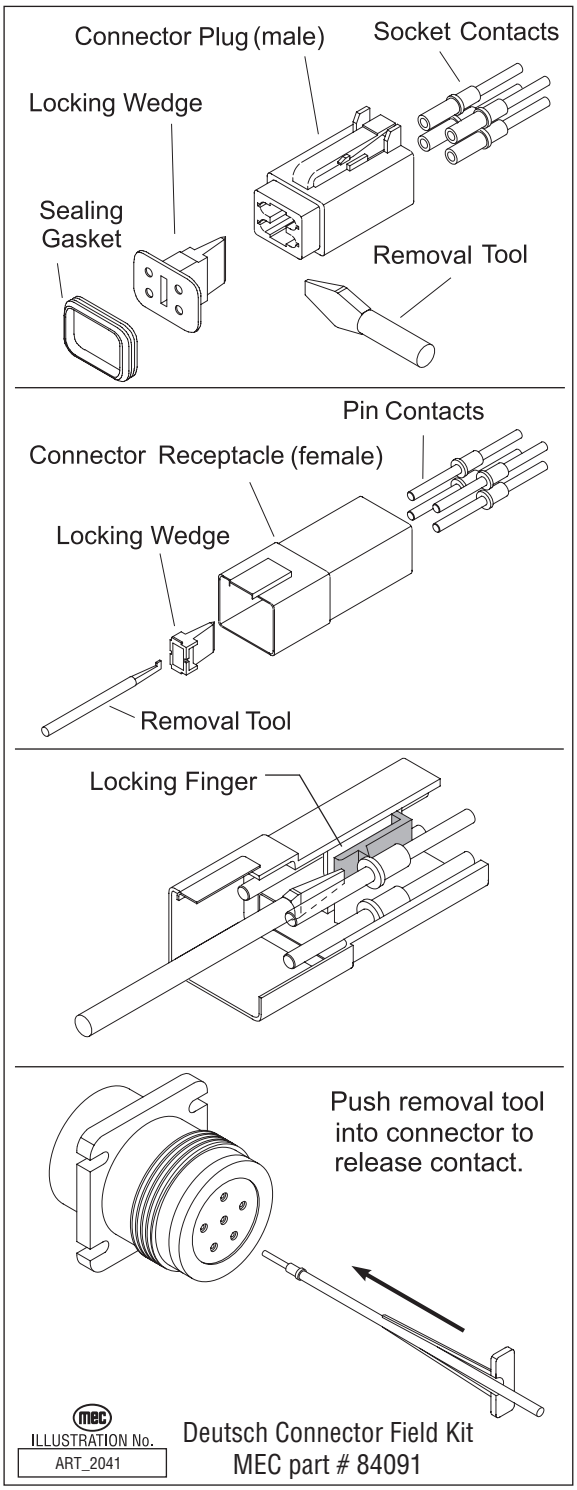
The ground station, when enabled via the Base/Platform Selector Switch, disables the upper station and provides control for a fixed speed Lift UP/DOWN functionality.

Upper Control box

The upper station consists of a joystick controller with enable switch trigger), Lift/Drive Mode (Forward/Down, Reverse/Up and accelerator demand), Steer (Right/Left). A torque mode switch causes both hydraulic motors to operate in parallel rather than in series for speed control mode (normal).

DEUTSCH CONNECTORS

Deutsch connectors used on MEC equipment is designed so that individual parts may be replaced without replacing the entire component. Special tools and detailed instructions are provided in Deutsch Connector field kits, MEC part # 84091.



Male Plug Connector

- Use the flat end of the Removal Tool or a flat blade screwdriver to pry the locking wedge from the connector, taking care not to damage the Sealing Gasket.
- Inspect and replace damaged parts.
- Replace or re-crimp wires and contacts.

Female receptacle Connector

- Use the notched end of the removal tool or a wire hook to pull the locking wedge from the connector
- Replace worn or damaged parts
- Replace or re-crimp wires and contacts.

Locking Fingers

- Remove the locking wedge as outlined above.
- Using the removal tool or a flat blade screwdriver, push the Locking Fingers aside to release the contact.
- Pull the wire and contact out of the connector.

Heavy Duty Plug

- Slide the removal tool along the wire to be replaced and push into the connector to release the contact.
- Pull the wire and contact out of the plug.

Crimping

- Strip 6 mm insulation from the wire.
- Insert the contact into the crimping tool and insert the stripped wire into the contact making sure no wires are outside the contact barrel.
- Close the handles of the crimping tool, then release the handles to remove the crimped contact.

BATTERIES

WARNING

CHARGING BATTERIES CREATE EXPLOSIVE HYDROGEN GAS. KEEP SPARKS, FLAMES AND SMOKING MATERIALS AWAY FROM BATTERIES.

ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH BATTERIES.

BATTERY FLUID IS CORROSIVE. THOROUGHLY RINSE SPILLED FLUID WITH CLEAN WATER.

REPLACE WITH MANUFACTURER APPROVED BATTERIES.

BEFORE DISCONNECTING THE BATTERY NEGATIVE (–) LEAD, MAKE SURE THAT ALL SWITCHES ARE OFF. IF ON, A SPARK WILL OCCUR AT THE GROUND TERMINAL THAT COULD IGNITE HYDROGEN GAS OR FUEL VAPORS.

Four (4), 6 volt batteries supply the 24 volt electrical power required to operate the electrical circuits.

Battery Maintenance (in storage)

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

- Keep battery clean. Electrolyte of “wet” batteries should be checked regularly and kept at proper level.
- Never stack one battery directly on top of another because post or container damage can result. If batteries are stored individually, place supporting boards between layers. Rotate stock so that oldest batteries are used first.
- “Wet” batteries should be kept fully charged. A “wet” battery, while in storage, should be recharged to full charge at recommended intervals. Leaving the MEC charger connected during prolonged storage will maintain battery voltage automatically.

A battery fully (100 %) charged at 80 °F (26.6 °C)
- drops to 65 % at 32 °F (0 °C)
- drops to 40 % at 0 °F (–32 °C)

Recommended Intervals

If Stored At:	**Recharge:**
Below 40 °F (4 °C)	None required
Above 60 °F (15 °C)	Every month
40 ° - 60 °F (4 ° - 15 °C)	Every 2 months

Battery Maintenance (in use)

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

Check battery terminals for:

- Corrosion: Regularly clean connections and apply a nonmetallic grease or protective spray to retard corrosion.
- Loose connections: Be sure all cable connections are tightly secured, and that good contact is made with terminals.
- Broken or Frayed cables: Be sure all connections are good and that no loose or broken wires are exposed. Replace as necessary.

Check battery electrolyte level. Replenish the electrolyte, if necessary. Remove vent caps before filling, and USE ONLY DISTILLED WATER. DO NOT OVERFILL. Fill to level indicator (or 1.25 cm over the top of separators, if there is no level indicator). Fill after charging to prevent overflow of acid due to expansion. Do not use a hose to add water to batteries.

Allowing the electrolyte level to drop below the top of the separators will lead to shortened battery life.

Excessive water usage can indicate that a battery has been overcharged, has been subjected to excessively high temperatures, or is nearing the end of its service life.

Battery Preventative Maintenance:

Every 15 hours (after battery has been charged), spot-check the specific gravity of two or more cells. A fully charged battery should indicate 1.28 specific gravity. If low reading are noted, check the following:

- Check terminals for corrosion, loose connections and broken or frayed cables.
- Check all cells with a hydrometer for variance in specific gravity. A variation of 0.03 points or more between cells is a cause for concern. Mark the low cells.

Recheck specific gravity of all cells after recharging. Wash the top of the battery, making sure all vents are in place. Do not allow cleaning water or other foreign mater to enter the cells. Use a solution of bicarbonate of soda (5 tsp of baking soda per quart of warm water) and water to wash the battery if there is an accumulation of acid.

Battery Specific Gravity and Voltage Table

SPECIFIC GRAVITY		VOLTS DC		
	EACH CELL	PER CELL	6V BATTERY	12V BATTERY
Fully Charged	1.280	2.10	6.30	12.60
Fully Discharged	1.130	1.75	5.19	10.50

Battery Charging

Main Electrical Power

CAUTION

The use of an improper extension cord could result in a risk of fire or electric shock.

The use of long extension cords with the charger should be minimized. If an extension cord is used, ensure that it has three conductors with a ground and that the wire size and length meet your electrical code for the voltages and currents of the Electrical Specifications table. Locate all cords so that they will not be driven over, stepped on, tripped over, or otherwise subjected to damage or stress.

Connect the power supply cord to a properly grounded 100 V / 50 or 60 Hz, 115 V / 60 Hz, or 230 V / 50 or 60 Hz socket. This charger automatically senses and adjusts to the AC input voltage range.

The charger will start automatically within four to six seconds. The charger will start even with severely discharged batteries (down to 1 volt terminal voltage). Once charging starts, the LEDs indicate the charging progress as described in the following Charging State table. If all 3 LEDs blink together there is a problem. Take proper action according to the trouble shooting guide found in *Section 5: Troubleshooting*. The charger goes into an equalizing charge mode after the batteries are charged and all 3 LEDs are ON. The charger will continue to charge at a low current then shut-off automatically when complete.

Charging State & LED Display

		50 %	75 %	100 %
Charging State	**LED**	◉	◉	◉
0 to 50 % charged		Blinking	OFF	OFF
50 % to 75 % charged		ON	Blinking	OFF
75 % to 100 % charged		ON	ON	Blinking
100 % charged		ON	ON	ON
Abnormal Cycle		OFF	OFF	Blinking

Battery Replacement

WARNING

BEFORE REMOVING THE BATTERIES FROM THE MACHINE, TURN OFF THE SELECTOR/KEY SWITCH. THERE SHOULD BE NO POWER.

CAUTION

Prevent damage to battery and/or electrical system;

- **Always disconnect the negative battery cable first.**
- **Always connect the positive battery cable first.**

Main Electrical Power

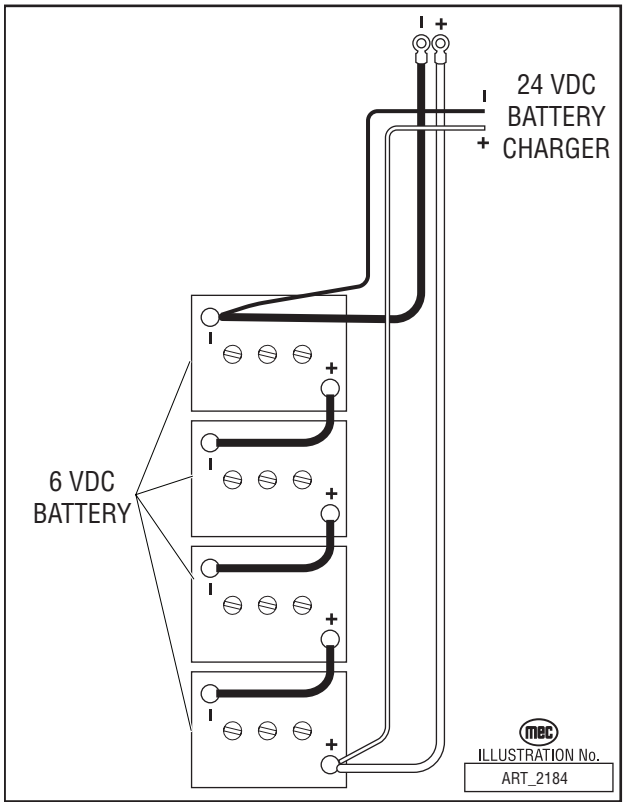
To remove batteries, follow these procedures.

Batteries are located in the side compartment of the machine.

Always disconnect the negative battery cable first.

Remove bolts holding battery. Lift the battery from the compartment. Put the battery to the side and dispose of properly.

To install the battery, reverse the process by positioning the battery in the compartment securely with hold down bolts. Connect battery cables.



ALARMS AND SWITCHES

Emergency Stop Button

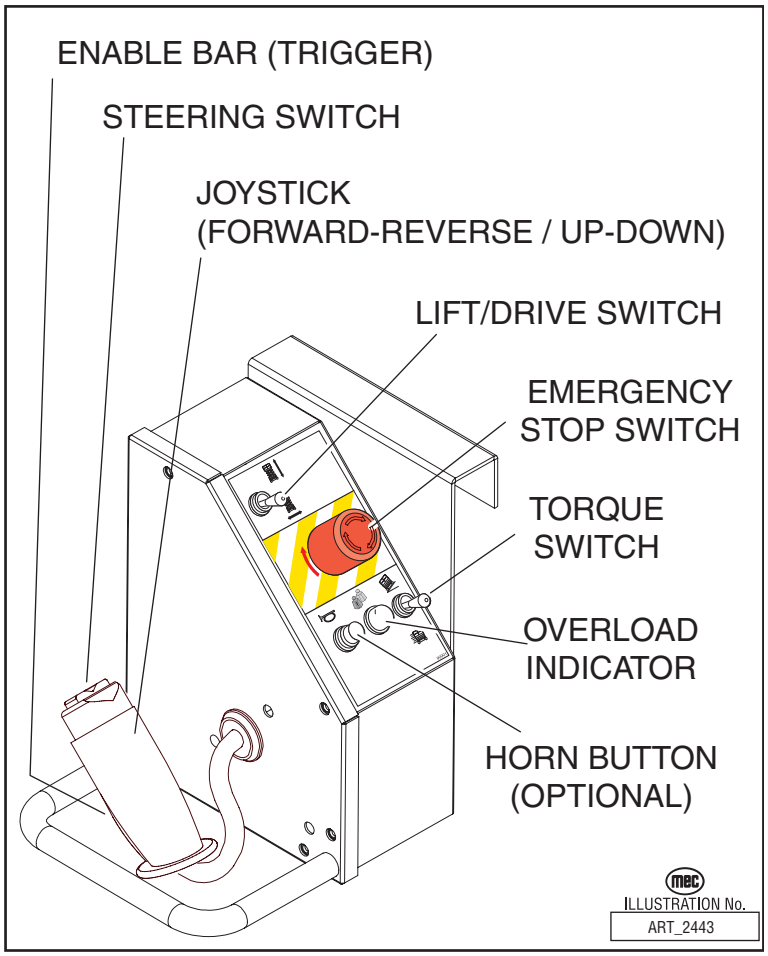
There are two red emergency stop buttons: one located on the upper controls and the other on the lower control panel.

The stop button, when in the ON position, provides power to the desired control box. Also, in the event of an emergency the stop button can be used to turn off the power by pushing IN. All functions stop immediately when depressed.

Turn button clockwise to reset.

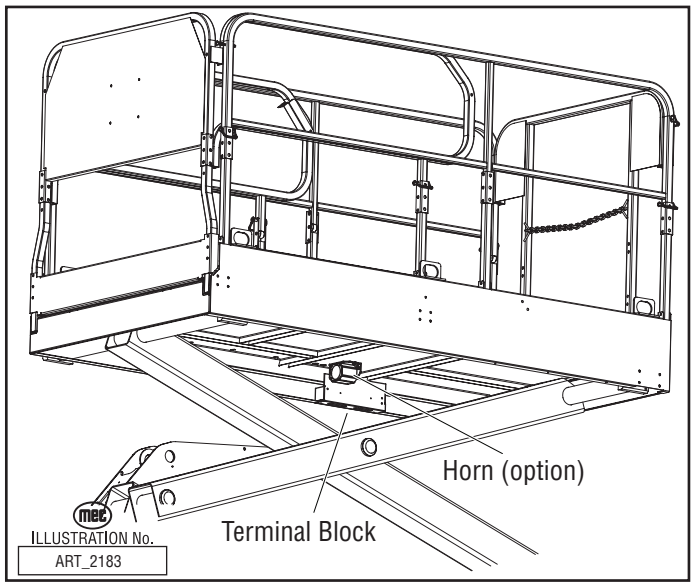
NOTE: As a safety feature, selecting and operating the lower controls will override the upper controls emergency stop button.

The lower control box emergency stop button will stop machine operations, even if the selector switch is switched to upper controls.



Horn

It is activated at the upper controls and sounds at the ground alerting personnel to clear the machine's path to avoid hazards or unsafe conditions.



Selector Switch

Machine can be operated from the lower or upper controls. Activation of one or the other is achieved with this switch.

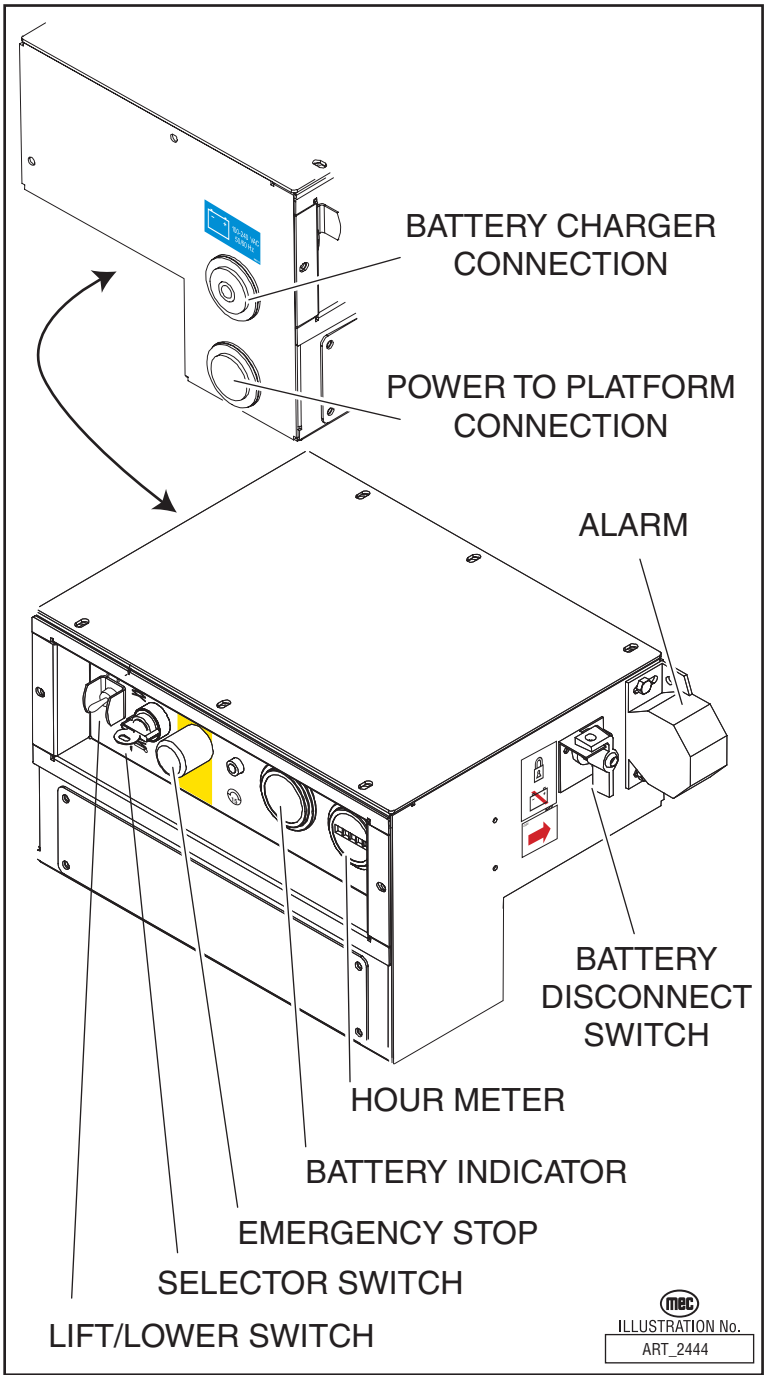
With the upper controls selected, from the lower control panel, if the platform up/lower function is operated there should be NO movement. Similarly, with the lower controls selected, from the upper controls if any machine function is operated, there should be NO movement.

Master Disconnect Switch

The switch is used primarily to shut off control circuit. The battery disconnect is provided to facilitate servicing and also to prevent unauthorized use of the vehicle by using a padlock (to provide security).

Movement Alarm

This alarm is activated as soon as the upper control box joystick (controller) lever is moved off the center “Neutral” position.



WARNING

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

Limit Switch

There is a limit switch to prevent driving in high speed. When the platform is raised above approximately 2.13 meters, the machine will be in the slow speed mode. If the switch is adjusted or replaced the overload sensing system must be recalibrated.

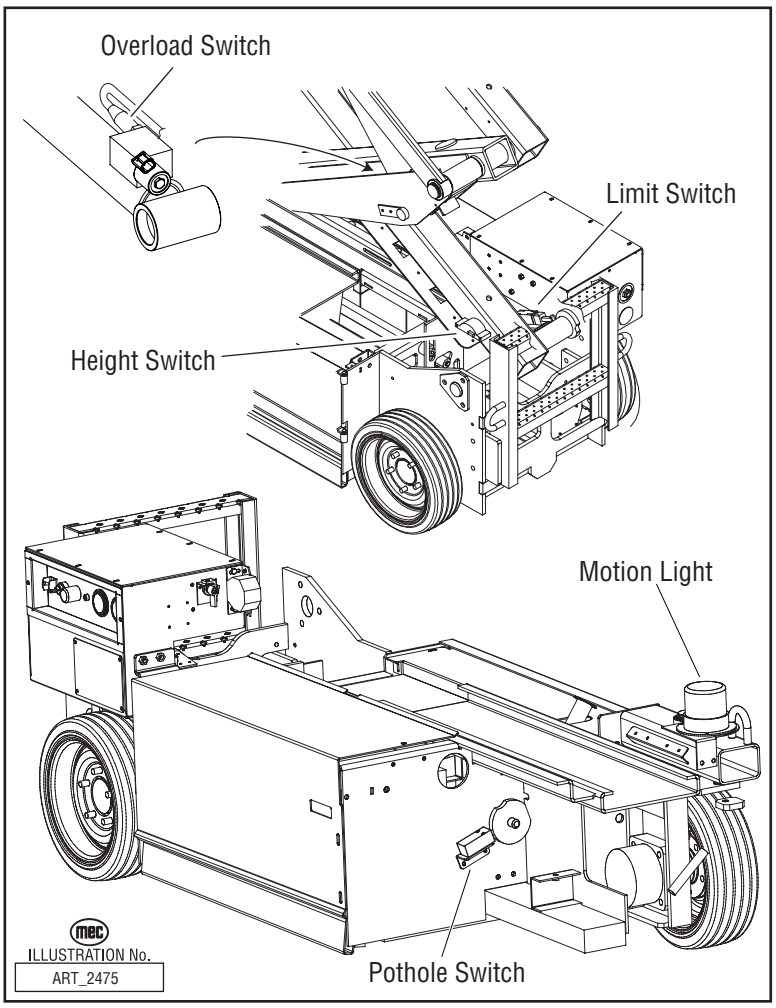
Pothole Switch

When the platform is elevated above 2.13 meters, the pothole switch cam rotates to activate the pothole switch causing the pothole bars to extend.

When the platform is lowered, the pothole switch cam rotates until the switch aligns with the cam low spot to deactivate the switch and cause the pothole bars to retract.

Height / Angle Switch

The height sensor calculates the height of the platform by measuring the angle of the bottom scissor beam. The data is used by the load sensing system to ensure safe machine operation.



Overload / Pressure Switch

The overload switch measures the pressure at the lift cylinder to calculate platform load. The data is used by the load sensing system to prevent operation when the platform is overloaded.

Tilt Alarm

An alarm provided on the platform control box will sound at 10 Hz when the machine is on an unsafe slope, and elevated above the the limit switch. If the alarm sounds, use extreme caution and lower the platform. Reposition the machine on a firm level surface before elevating again.

Tilt Alarm Test

The slope rating is shown on the machine Serial Plate or in the *Specifications* section of this manual. Identify a suitable location where the slope is outside the specified range using an inclinometer. Lower the platform fully before driving onto this slope. Exit the platform and switch selector to Base Controls. Elevate the platform to approximately 2.5 m. An alarm should sound at Upper Control station. If it does not, review *Section 3* for troubleshooting of the Platform Overload Sensing System.

CONTINUITY CHECKS

Check Toggle Switch

- Disconnect wires and connect one probe of ohm meter to the connection on toggle switch and the other probe on the other connection.
- When toggle is open, there should be no reading, and when closed there should be a low resistance reading.

Check Selector Switch

- Disconnect wires and connect one probe of ohm meter to common and the other to normally open terminal.
- With the switch flipped, there should be a low resistance reading.

Check Emergency Stop Button

- Disconnect wires and connect one probe of ohm meter to connection on button and other probe on other connection.
- There should be no reading with the button pressed and a low resistance with it reset.

Check Limit Switch Operation

- Disconnect wires.
- With one probe of ohm meter to common and other probe to open contact, move limit switch arm. Low resistance should be seen.
- With one probe of ohm meter to common and other probe to closed contact, low resistance should be seen. Move limit switch arm and zero-to-very-low resistance should be seen.

DIODE BOARD

The diode board is located inside the lower control box.

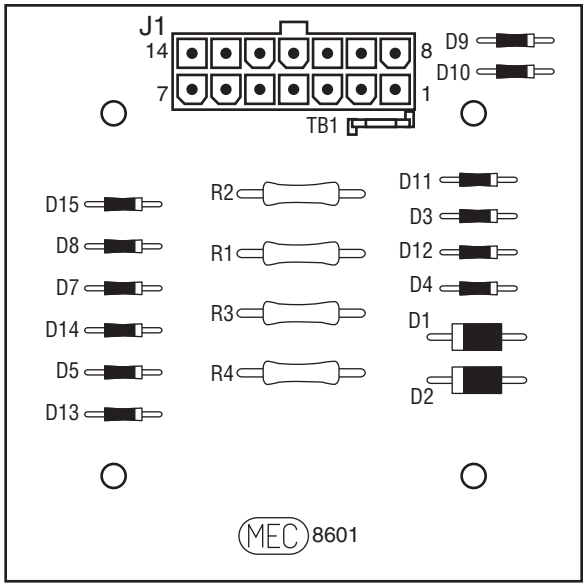


ILLUSTRATION No.
ART_2181

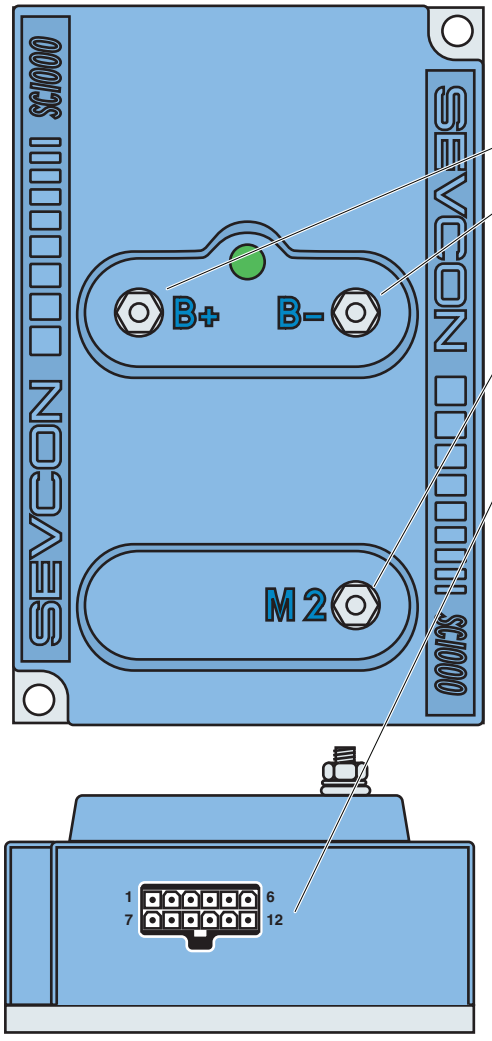
J1 Plug Pin Identification

PIN #	WIRE #	SIGNAL	FUNCTION
1	10	INPUT	Drive Reverse
2	11	INPUT	Drive Forward
3	19	OUTPUT	Brake, Decel Valve signal
4	8	INPUT	Steer Left
5	18	OUTPUT	Steer signal to Sevcon
6	5	INPUT	Down signal
7	20	OUTPUT	Signal to Motion Alarm(s) (optional)
8	17	OUTPUT	Sevcon & Hour Meter (motor function requested)
9	15	INPUT	Battery Negative
10	7	INPUT	Steer Right
11	4	INPUT	Lift Up
12	2	INPUT	Limit Switch (24V = platform down)
13	3	OUTPUT	Enable, from lower Lift switch
14	21	OUTPUT	To Sevcon (for speed cutback)

SEVCON MOTOR SPEED CONTROLLER

The Sevcon Motor Speed Controller, located in the lower control box, is a microprocessor designed with the express purpose of operating the D/C electric motor at varying speeds. The controller uses Pulse-width Modulation (PWM) technology on the Ground side of the motor to control motor speed. Out of concern for operator safety and to prevent short-circuiting, the Controller monitors certain circuits for potential abnormalities. When the controller senses a problem it errs to the side of safety and stops all motor operation. The green LED will flash a code indicating the reason for the shutdown.

Refer to *Section 5: Troubleshooting* for diagnostic codes.



Cable Connection Identification	
B+	Battery Positive Cable from 250 AMP Fuse
B-	Negative Battery Cable and GROUND wire (15) connection
M2	Motor Ground (Pulse-Width Modulated [PWM] variable speed control)

J5 Plug Pin Identification

PIN #	WIRE #	FUNCTION
1	22	B+ power input (power up)
2	17	Lift, Drive or Steer functions input (functions requiring motor)
3	18	Steer Requested (adds additional motor speed for steer)
4	3	Enable Switch signal input
5	21	Speed cut-back (24 Volts = full speed, 0 Volts = creep speed)
6	16	Motor Start Relay signal (GROUND signal to activate Motor Start Relay)
7	41	Lift Valve B- (provides GROUND signal to Lift Valve)
8	none	none
9	14	Accelerator reference signal (3.6 Volts to Potentiometer)
10	none	none
11	none	none
12	none	none

ILLUSTRATION No.
ART_2182

LOAD SENSING SYSTEM

The GP102 control module prevents scissor vehicle operation when its platform is overloaded, and provides a warning alarm for tilted condition. Troubleshooting and calibration of the load sense system are covered in *Section 3*.

GP-102 Load Sense Control Module Connections

J1 (P1)

PIN #	WIRE #	FUNCTION
1	EZ-Cal	DIAGNOSTIC
2	EZ-Cal	AND
3	EZ-Cal	CALIBRATION
4	EZ-Cal	

J2 (P2)

PIN #	WIRE #	FUNCTION
1	–	No Connection
2	–	No Connection
3	4	UP valve (B+ when UP requested)
4	5	DOWN valve (B– when DOWN requested)
5	–	No Connection
6	–	No Connection
7	20A	PCB #7 (B+ for any movement)
8	–	No Connection
9	–	No Connection
10	2	Platform Elevated indication (B+ when platform stowed)
11	15	Supply Negative (connected to B–)
12	22	Supply Positive (connected to B+)

J3 (P3)

PIN #	WIRE #	FUNCTION
1	20	Base Alarm (A8)
2	6	Platform Alarm (A10)
3	12	Overload Light (A1) Normally OFF | ON indicates overload
4	44	Overload Relay Ouput (8) (B+ when not overloaded)
5	45	Overload Relay (7) (B–) (internally linked to P2–11)
6	–	No Connection

J4 (P4)

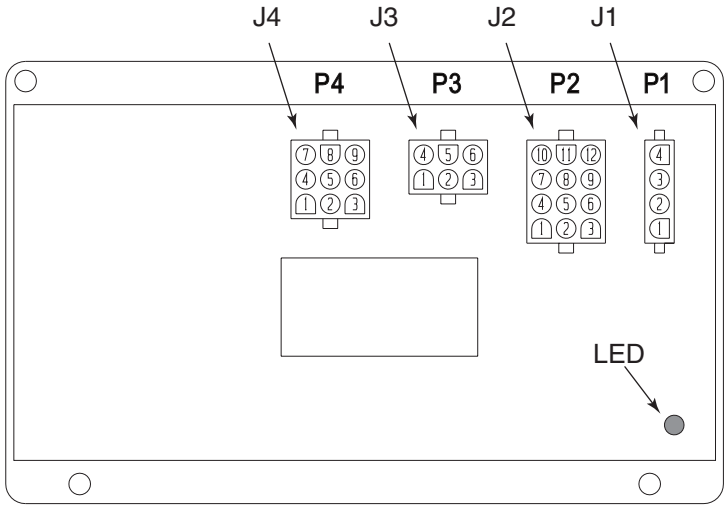
PIN #	WIRE #	FUNCTION
1	–	No Connection
2	42	Overload Sensor
3	43	Height sensor
4	–	No Connection
5	–	No Connection
6	46	Overload Sensor (B+ protected supplies)
7	47	Overload Sensor (B–)
8	48	Height Sensor (B+ protected supplies)
9	49	Height Sensor (B–)

Overload Cutout Relay Connections

RL1

PIN #	WIRE #	FUNCTION
1	–	No Connection
2	–	No Connection
3	5	DOWN requested
4	17	LIFT, DRIVE, or STEER requested
5	5A	Signal to Down Valve Coils
6	17A	Signal to Motor Controller (LIFT, DRIVE, STEER)
7	44	Cutout Relay (B–)
8	45	Cutout Relay (B+ when not overloaded)

GP-102 Load Sense Control Module



RL1 Overload Cutout Relay

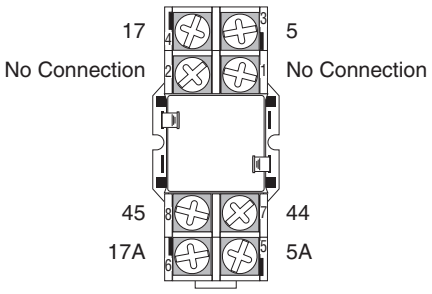


ILLUSTRATION No.
ART_2474

SECTION 3

PLATFORM OVERLOAD SYSTEM

General Description **3-2**

Electrical Connections **3-3**

Troubleshooting **3-4**

GP102 - EZcal Help Messages 3-4

GP102 LED Flash Codes 3-7

Calibration **3-8**

CALIBRATION TROUBLESHOOTING; Failure Messages 3-11

CALIBRATION TROUBLESHOOTING; Information Messages 3-16

GENERAL DESCRIPTION

In combination with a height sensor to measure platform height and a pressure sensor to measure lift cylinder load, the GP102 control module calculates an estimate of load and prevents scissor vehicle operation when its platform is overloaded. The system also includes an integrated tilt sensor that provides a warning alarm for tilted condition. In addition the automatic armguard cutout and descent alarm are controlled by this system. To access the control module for troubleshooting and calibration, the **EZcal** hand held device is required. These are available from MEC Aerial Platform Sales Corp.

WARNING

ONLY TRAINED AND AUTHORIZED PERSONNEL SHALL BE PERMITTED TO CALIBRATE THE PLATFORM OVERLOAD SENSING SYSTEM.

READ ALL INSTRUCTIONS CLOSELY BEFORE ATTEMPTING EACH STEP OF THE CALIBRATION PROCEDURE.

SYMBOL	KEY FUNCTIONS
ESC ENTER	**ESC/ENTER BUTTONS** To move back and forth between menu and sub-menu
◀ ▶	**LEFT/RIGHT BUTTONS** Select menus and setting to be adjusted
▲ ▼	**UP/DOWN BUTTONS** Adjust steeing values

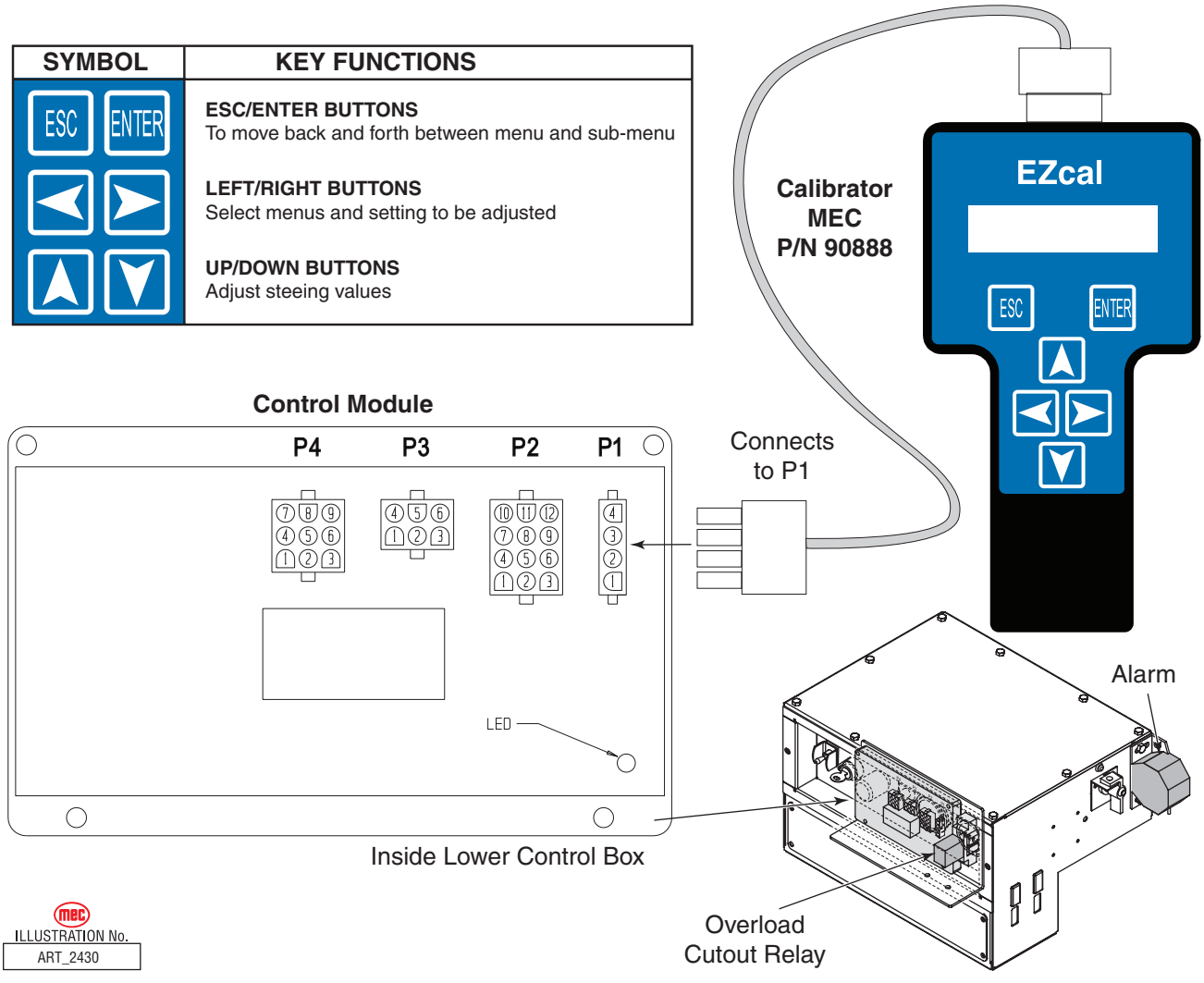


ILLUSTRATION No.
ART_2430

ELECTRICAL CONNECTIONS

P1 (J1) Connects to EZcal hand-held device for diagnostics and calibration.

P2 (J2) Connects to power supply & function switches:

	(J) P2-1	no connect
	(J) P2-2	no connect
RED/BLU 304	(J) P2-3	“UP” valve (B+ when UP requested)
YEL/BLU 105	(J) P2-4	“DOWN” valve (B+ when DOWN requested)
	(J) P2-5	no connect
	(J) P2-6	no connect
GRY/RED 111	(J) P2-7	“FWD” Valve (B+ when Forward commanded)
GRY/BLK 110	(J) P2-8	“REV” Valve (B+ when Reverse commanded)
	(J) P2-9	no connect
TAN/ORG 2	(J) P2-10	“PLATFORM ELEVATED” indication (B+ when platform stowed)
BLK 15	(J) P2-11	SUPPLY NEGATIVE (connected to B-)
RED/WHT 201	(J) P2-12	SUPPLY POSITIVE (connected to B+)

P3 (J3) Provides outputs for cutout Alarms, lamp, and relay

TAN 12	(J) P3-1	Tilt Sensor to Lower Control Box (B+ when not tilted)
BLU/WHT 72	(J) P3-2	Platform and Base Alarm
BLK/RED 74	(J) P3-3	OVERLOAD LAMP output (off normally, turns on to indicate overload)
RED/BLK 44	(J) P3-4	Cutout Relay output (B+ when not overloaded)
BLK 15	(J) P3-5	Cutout Relay B- (internally linked to P2-11)
	(J) P3-6	no connect

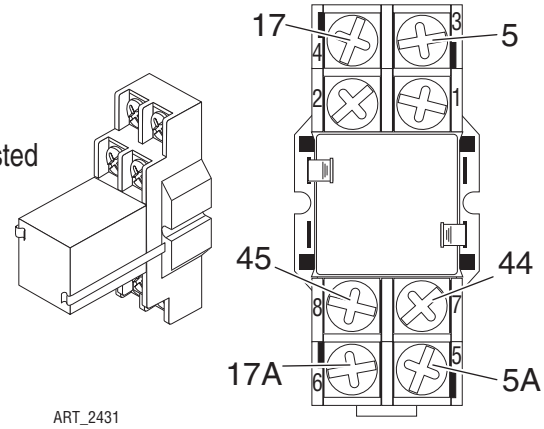
P4 (J4) Connects to lift cylinder pressure sensor and height sensor:

	(J) P4-1	no connect
ORG/GRN 42	(J) P4-2	pressure sensor (0.5V...4.5V analog)
ORG/RED 43	(J) P4-3	height sensor (1V...4V analog)
	(J) P4-4	no connect
	(J) P4-5	no connect
GRY 46	(J) P4-6	B+ protected supplies for pressure sensor
BLK 15	(J) P4-7	B– for pressure sensor
BLK 15	(J) P4-8	B– protected supplies for height sensor
BRN/YEL 49	(J) P4-9	B+ for height sensor

(J)= plug identification as it corresponds to the electrical schematic diagram.

(RL1) Cutout Relay Connections:

	RL1-1	no connect
	RL1-2	no connect
Wire 5	RL1-3	down function requested
Wire 17	RL1-4	Lift, Drive, or Steer Function requested
Wire 5A	RL1-5	signal to down valve coils
Wire 17A	RL1-6	signal to motor controller allowing Lift, Drive, or Steer Function
Wire 45	RL1-7	Cutout Relay B–
Wire 44	RL1-8	Cutout Relay input (B+ when platform not overloaded)



ART_2431

TROUBLESHOOTING

GP102 - EZcal Help Messages

When the **EZcal** hand-held device is connected to the **GP102** control module, the first menu available is “HELP” - just press the **ENTER** button to see a message describing the current status of the **GP102**; this will provide the best information when troubleshooting the load sense system. When an **EZcal** is unavailable, an LED on the **GP102** flashes to provide limited diagnostics. Refer to ***GP102*** *LED Flash Codes* in this section.

The following messages may be displayed on the Ezcal display.

EVERYTHING OK

The **GP102** detects no problems.

If problems are being experienced with the system, use the DIAGNOSTICS menus to check for faulty sensors and/or switches. LED on steady.

ARMGUARD ACTIVE!

The **GP102** has stopped descent at the Armguard height, and is delaying for 5 seconds to “give the operator the opportunity to see whether persons ... could be injured” (per EN 280 5.4.4). Vehicle movement will continue to be stopped after the delay until all functions are released. LED flash code 4.

B+ SUPPLY TOO LOW

The **GP102** is designed for use on 12V and 24V battery powered vehicles; it cannot operate with a supply below about 9V. The “BATTERY” voltage can be checked in the “SENSORS” menu (available in the “DIAGNOSTICS” menu). LED flash code 7.

DRIVE/LIFT SELECT INPUTS FAULTY!

Neither the drive select (P2-7) nor the lift select (P2-8) input is active, or both are active - the **GP102** cannot determine the vehicle use.

All vehicle operation will be prevented until the problem is corrected. LED flash code 2.

ELEVATION SWITCH SHIFTED?

The **GP102** uses the elevation switch in combination with the height sensor to ensure correct functionality of both; any of the following faults may be detected:

- The elevation switch should change state near the point at which it did during load calibration All vehicle operation will be prevented until the problem is corrected. LED flash code 4.

ELEVATION SWITCH STUCK?

The **GP102** uses the elevation switch in combination with the height sensor to ensure correct functionality of both; any of the following faults may be detected:

- When the platform is elevated, the measured height should be above that stored during load calibration
- When the platform is not elevated, the measured height should be below that stored during load calibration

All vehicle operation will be prevented until the problem is corrected. LED flash code 4.

FACTORY OVERRIDE

To allow vehicle movement during manufacture, the **GP102** is delivered in a "FACTORY OVERRIDE" state which disables all functionality. The first load calibration (even if not completed) will terminate this state. LED flash code 15.

FAULT: BAD TILT SENSOR

The **GP102** has detected that its integral tilt sensor is faulty - the module may need to be replaced. IMPORTANT: If the **GP102** is installed incorrectly, this fault may occur erroneously. LED flash code 8.

HEIGHT NOT CALIBRATED

During the first phase of load calibration ("DYNAMIC"), the **GP102** calibrates the minimum and maximum output of the height sensor so that platform height can be determined. This calibration must be successfully completed! LED flash code 1.

IDLE TIMEOUT ACTIVE!

If configured, the **GP102** will turn off all its outputs after a set time with no vehicle functions operated; this saves battery power and silences any alarm still sounding when the vehicle was left. Any vehicle function will end the idle timeout and restore normal operation of the **GP102** outputs. LED stays off.

INVALID HEIGHT - CHECK SENSORS

There is a problem that prevents the vehicle height being determined; there may be a fault with the height sensor, or the vehicle may have been modified or damaged since the last calibration occurred. All vehicle operation will be prevented until the problem is corrected. LED flash code 9.

INVALID LOAD - CHECK SENSORS

There is a problem which prevents the estimated load being determined; there may be a fault with the height sensor or the load sensor, or the vehicle may have been modified or damaged since the last calibration occurred. All vehicle operation will be prevented until the problem is corrected. LED flash code 6.

LOAD NOT CALIBRATED

During the second and third phases of load calibration ("LOADED" and "EMPTY"), the **GP102** calibrates the lift cylinder pressure at various heights corresponding to a fully loaded and unloaded platform. This calibration must be successfully completed! LED flash code 1.

NO LAST CALDATE!

At the end of load calibration, the **GP102** prompts for entry of the current date to aid in vehicle maintenance. A non-zero date must be entered! When load (re)calibration is begun, the last CALDATE is erased and cannot be reentered until calibration is completed; this ensures that a partly calibrated vehicle cannot be operated. LED flash code 1.

P3-4 SHORT TO 0V?

The **GP102** start-up tests detected that something is overloading the output on P3-4. All vehicle operation will be prevented until the problem is corrected. LED flash code 5.

P3-4 SHORT TO SUPPLY?

The **GP102** start-up tests (or the continuous monitoring during any prevention of vehicle movement) detected that something is providing a permanent supply on P3-4 (defeating the internal cutout). All vehicle operation will be prevented until the problem is corrected. LED flash code 3.

TESTING HWFS

When the **GP102** is powered up, it carries out various tests to ensure that it is functioning safely.

TOO HIGH - DRIVE PREVENTED

A drive function has been selected but the platform is raised above the “MAX DRIVE” setting (if enabled). The drive function will be prevented until the platform is lowered. LED flash code 8.

TOO HIGH - LIFT UP PREVENTED

The lift/up function has been selected but the platform is raised above the “MAX LIFT” setting (if enabled). The lift/up function will be prevented until the platform is lowered. LED flash code 8.

UP/DOWN SELECT INPUTS ACTIVE TOGETHER!

The up select (P2-3 and/or P2-5) and the down select (P2-4 and/or P2-6) are active together - the **GP102** cannot determine the vehicle use. All vehicle operation will be prevented until the problem is corrected. LED flash code 2.

VEHICLE OVERLOADED

The estimated load in the platform exceeds the “OVERLOAD AT” setting in the “ADJUSTMENTS” “LOAD” menu. The **GP102** will activate the cutout to prevent vehicle operation until the platform load is reduced. LED flash code 8.

VEHICLE TILTED

Either the “X” or “Y” tilt (measured by the **GP102** integral tilt sensor) exceeds the “X TRIP” or “Y TRIP” setting in the “ADJUSTMENTS” “TILT” menu. LED flash code 8.

WAITING FOR B+ ON P2-12

The supply on P2-12 provides power for the outputs P3-1/2/3/4. The **GP102** cannot function if the supply is not present. Since the supply on P2-12 is switched to P3-4, vehicle operation will be prevented. LED flash code 7.

WAITING FOR NEUTRAL

When the **GP102** is powered up, all controls must be in neutral to allow safe testing of the fail-safe output; no functions are allowed until testing is complete. LED flash code 2.

GP102 LED Flash Codes

The **GP102** has a built-in LED to provide simple diagnostics when no **EZcal** is available. Please note that the use of an **EZcal** provides significantly better diagnostics through the HELP messages. An **EZcal** is also necessary to calibrate a **GP102**.

LED on steady

This indicates no fault with the **GP102**

LED off always

This indicates no power to the **GP102**, or idle timeout (if enabled - activate a lift or drive function to cancel the idle timeout)

LED flash code 1

This indicates the **GP102** has not been properly calibrated.

LED flash code 2

This indicates a fault with the switch inputs to the **GP102**. Check wiring to connector P2.

LED flash code 3

This indicates a fault with the shutdown outputs of the **GP102** - a short to the supply has been detected. Check wiring from pins P3-4.

LED flash code 4

This indicates that armguard is active, or that there is a fault with the elevation switch - the **GP102** verifies correct opening and closing of the elevation switch against the height sensor. Checking the elevation switch on P2-10. If the height sensor has been adjusted or replaced, repeat the CALIBRATE HEIGHT procedure.

LED flash code 5

This indicates a fault with the shutdown outputs of the **GP102** - a short to 0V (ground) has been detected. Check wiring from pins P3-4.

LED flash code 6

This indicates a fault with the load measurement - check the pressure sensor and wiring from it to connector P4.

LED flash code 7

This indicates a fault with the supply to the **GP102** - check battery supply at least 8V on pin P2-12; also check that there is not a short to 0V (ground) on pin P4-1.

LED flash code 8

This is not a fault - it indicates the **GP102** has prevented a function; functions can be prevented if the platform is overloaded, if the machine is tilted too far, or if the platform is too high.

LED flash code 9

This indicates a fault with the height measurement - check the height sensor and wiring from it to connector P4.

LED flash code 10

This indicates the **GP102** is carrying out start-up tests.

LED flash code 15

This indicates the **GP102** is in “FACTORY OVERRIDE” and overload functions are disabled - this aids manufacture by allowing vehicle movement before the machine is built sufficiently to be calibrated. 15 flash will be present whenever a *new* circuit board is installed previous to calibration.

CALIBRATION

Before attempting the calibration procedure, the batteries must be fully charged and battery terminals clean and tight. Move machine to an area that is perfectly level as measured by a spirit level or other leveling device. An Ezcal hand-held device (MEC part # 90888) is required to carry out all calibration procedures on the **GP102** Load sense control module.

Tilt Sensor Calibration

The integral tilt sensor of the **GP102** control module must be leveled to compensate for variations due to installation and vehicle construction. This procedure must be done if the lower control box is ever removed or repositioned, or if the **GP102** module is ever repositioned or replaced.

a.] Drive machine to level ground.

b.] Plug **EZcal** into connector P1 on load sense control module.

- Display reads HELP: PRESS ENTER.

c.] Press right arrow to ACCESS LEVEL 3, Press Enter.

- Display reads CODE 0000.

d.] Press up and right arrow to enter code 1775, Press Enter.

- Display reads ACCESS LEVEL 2.

e.] Right arrow to SETUPS, Press Enter.

- Display reads CHANGE DEFAULTS.

f.] Right arrow to TILT SETUPS, Press Enter.

- Display reads CALIBRATE LEVEL.

g.] Press Enter.

- Display reads CALIBRATE LEVEL: YES:ENTER,NO:ESC.

h.] Press Enter.

- Display reads TILT 0.0',0.0' i. Press ESC, ESC, ESC j. Disconnect **EZcal** from the load sense module.

Platform Load Calibration

Platform load calibration must be done if there are ever any significant repairs to the scissor assembly or if the lift cylinder is removed and serviced or replaced. Also, if any of the components of the Platform Load Sense System are replaced, the system will need re-calibration. During the calibration procedure the vehicle platform is fully raised and lowered three times:

1. "DYNAMIC" calibration – fully loaded platform raised & lowered in one continuous movement. DYNAMIC measurements are taken.
2. "LOADED" calibration – fully loaded platform raised & lowered with stops to take measurements. STATIC measurements are taken.
3. "EMPTY" calibration – unloaded platform raised & lowered with stops to take measurements. STATIC measurements are taken.

The following procedure must be followed COMPLETELY to calibrate the **GP102**; throughout the procedure various checks are made – if any problem is detected the procedure stops and displays a FLASHING failure message. Explanations of each message and suggested corrections can be found in the section of this manual following the calibration procedure.

NOTE: If the calibration procedure is interrupted, completed phases do not need to be repeated. A "REDO" prompt will appear – answer "NO" if there is no reason to repeat the phase, or "YES" if the phase must be repeated (for example because the wrong platform load was used on the previous phase).

a.] Drive machine to level ground, in area where it can reach full elevation.

b.] Place rated load in platform.

c.] Turn selector switch to Base controls.

d.] Remove top cover off of lower control station box, and plug **EZcal** into connector P1 on load sense control module.

EZcal display reads HELP: PRESS ENTER

e.] Press right arrow to ACCESS LEVEL 3, Press Enter.

- Display reads CODE 0000

f.] Press up and right arrow to enter code 1775, Press Enter.

- Display reads ACCESS LEVEL 2.

g.] Press Right Arrow to SETUPS, Press Enter.

- Display reads CHANGE DEFAULTS

h.] Press Enter to verify machine type. Press up and down arrows to change if necessary.

- Display reads 1=1532, 2=1932, 3=2033 …etc. Select appropriate model.

i.] Press Enter. Press Esc. Press Right Arrow to LOAD SETUPS. Press Enter.

- Display reads CALIBRATE LOAD

j.] Press Enter.

- Display reads PLATFORM DOWN? Verify that platform is fully lowered.

k.] Press Enter.

- Display reads PLATFORM LOADED? Verify that rated load is in platform.

l.] Press Enter.

- Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
- Display reads PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position. Release switch. Display reads PLATFORM LOADED?

m.] Press Enter.

- Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch.

NOTE: The platform will lift incrementally during this phase of the calibration. Every third lift cycle the platform will fail to lift even though the circuit is initiated. When this occurs, release the lift switch for 1 second (or more) then reapply. The platform should then rise normally for another two cycles.

- Display reads TOTAL DATA #XX, then PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position. Note: The platform will lower incrementally during this phase on the calibration. Do not release the switch until fully lowered. Release switch.
- Display reads TOTAL DATA #XX, then PLATFORM EMPTY?

NOTE: At this time the load in the platform must be removed. It is best to remove it without moving the machine. If you must switch to platform controls to move the machine, steps a.] through g.] must be repeated. Steps j.] through m.] will generate the REDO prompt. Answer NO. If machine was not moved, proceed to step n.].

n.] Press Enter.

- Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch.

NOTE: The platform will lift incrementally during this phase of the calibration. Every third lift cycle the platform will fail to lift even though the circuit is initiated. When this occurs, release the lift switch for 1 second (or more) then reapply. The platform should then rise normally for two cycles.

- Display reads TOTAL DATA #XX, then PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position.

NOTE: The platform will lower incrementally during this phase on the calibration. Do not release the switch until fully lowered. Once fully lowered, release switch.

- Display reads TOTAL DATA #XX, then BUILDING TABLES, then CALDATE mm/dd/yy.

o.] Enter current date using Up, Down and Right Arrows.

- Display reads FINISHED.

p.] Disconnect **EZcal** from the load sense control module. The Platform Overload Sensing System is now calibrated.

Height Calibration

The height sensor must be calibrated if the height limit switch (LS-1 on electrical schematic) is ever replaced or adjusted. It is not necessary to redo the load calibration if the limit switch is all that was serviced. For this procedure it is not necessary to place any load in the platform.

a.] Drive machine to level ground, in area where it can reach full elevation.

b.] Turn selector switch to Base controls.

c.] Remove top cover off of lower control station box, and plug **EZcal** into connector P1 on load sense control module. **EZcal** display reads HELP: PRESS ENTER

d.] Press right arrow to ACCESS LEVEL 3, Press Enter.

- Display reads CODE 0000

e.] Press Up and Right Arrow to enter code 1775, Press Enter.

- Display reads ACCESS LEVEL 2.

f.] Press Right Arrow to SETUPS, Press Enter.

- Display reads CHANGE DEFAULTS

g.] Press Right Arrow to HEIGHT SETUPS, Press Enter.

- Display reads CALIBRATE HEIGHT

h.] Press Enter.

- Display reads PLATFORM DOWN? Verify that platform is fully lowered.

i.] Press Enter.

- Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch. Display reads PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position. Release switch. Display reads FINISHED.

CALIBRATION TROUBLESHOOTING; Failure Messages

During calibration, various problems can be detected by the that prevent successful calibration. These problems are reported with a flashing message including an “F” code. The following descriptions are helpful in solving the problem:

F01:CHECK HWFS

This message is given if the start-up tests have not completed.

Check HELP message for more information.

F02:NOT GROUND MODE

This message is given if the machine is not in ground mode (P2-2 must be high). Calibration can only be carried out in ground mode.

F03:NOT STOPPED

This message is given if any function switch is closed. Check DIAGNOSTICS / SWITCHES to see which function switch is closed.

F04:TILTED

This message is given if the machine is tilted. Calibration must be carried out with the machine level. If the machine is level, perform the Tilt Calibration procedure above.

F05:BAD HEIGHT

This message is given if the height sensor output (P4-3) is out of range at the start of calibration. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

F06:CHECK ELEV

This message is given if the elevation switch (P2-10) is open at the start of calibration, when the operator has confirmed the “PLATFORM DOWN?” question.

If the platform is down, check the elevation switch wiring.

F08:CHECK ELEV

This message is given if the elevation switch (P2-10) is closed at the end of the DYNAMIC lift, when the platform should be fully raised.

This message would occur if the UP switch was accidentally opened near the start of the DYNAMIC lift.

If the platform is fully raised, check the elevation switch wiring.

F09:BAD HEIGHT

This message is given if the height sensor output (P4-3) is out of range at the start of the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. This is usually due to a wiring problem.

F10:BAD HEIGHT

This message is given if the height sensor output (P4-3) is out of range at the end of the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

F11:NOT UP

This message occurs at the start of the DYNAMIC lift if the operator selects a function other than UP.

F12:TOO MANY

This message occurs if the DYNAMIC lift takes too long.

This message could occur if the UP switch was not released at the end of the dynamic lift.

F13:LOW HEIGHT RANGE

This message occurs at the end of the DYNAMIC lift if the height sensor output did not change sufficiently to give a reasonably accurate platform height estimate. DIAGNOSTICS / SENSORS can be used to check the height sensor output (P4-3) when the platform is fully lowered and fully raised; a difference of at least 1V is to be expected.

This message could occur if the UP switch was accidentally opened too early (when the platform is not fully raised).

F14:BAD HEIGHT

This message occurs if the height sensor output (P4-3) is out of range during the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

F15:CHECK ELEV

This message is given if the elevation switch (P2-10) is open when the platform has been fully lowered after the DYNAMIC lift.

This message would occur if the DOWN switch was accidentally opened before the platform was fully lowered.

If the platform is fully lowered, check the elevation switch.

F16:LOW ELEV.OPEN

This message is given if the elevation switch (P2-10) opened during lift at a too low height (below 5%). Check CALIBRATIONS / HEIGHT CALS; the “ElevUp” value shows the recorded height where the switch opened.

F17:HIGH ELEV.OPEN

This message is given if the elevation switch (P2-10) opened during lift at a too high height (above 25%).

Check CALIBRATIONS / HEIGHT CALS; the “ElevUp” value shows the recorded height where the switch opened.

F18:LOW ELEV.CLOSE

This message is given if the elevation switch (P2-10) closed during lower at a too low height (below 5%).

Check CALIBRATIONS / HEIGHT CALS; the “ElevDown” value shows the recorded height where the switch opened.

F19:HIGH ELEV.CLOSE

This message is given if the elevation switch (P2-10) closed during lower at a too high height (above 25%).

Check CALIBRATIONS / HEIGHT CALS; the “ElevUp” value shows the recorded height where the switch opened.

F20:HEIGHT<>0%
F21:HEIGHT<>0%

This message occurs if the platform height is not 0% after the platform has been fully lowered at the end of a calibration step. The platform must return to the same height each time it is fully lowered.

Check DIAGOSTICS / SYSTEM to check the height.

F22:HEIGHT<>100%
F23:HEIGHT<>100%

This message occurs if the platform height is not 100% after the platform has been fully raised during a calibration step. The platform must return to the same height each time it is fully raised. Check DIAGNOSTICS / SYSTEM to check the height.

F24:TOO MANY

This message occurs if too many static measurements are taken during a calibration step. In the rare event that this occurs, please call MEC for assistance.

F25:CHECK ELEV
F26:CHECK ELEV

This message indicates a problem with the elevation switch (P2-10) during the STATIC phases.

The switch is either staying closed to a higher height, or staying open to a lower height, than that recorded during the DYNAMIC phase.

F27:BAD HEIGHT

This message indicates a problem with the height sensor output (P4-3) during the STATIC calibration phases.

The height sensor output must be between 1.0V and 4.0V at all times.

Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

F30:BAD HEIGHTS

This message indicates that the recorded heights are not increasing during either STATIC lift, or are not decreasing during either STATIC lower.

It may be possible to cause this problem by repeatedly opening and closing the UP or DOWN switch during the STATIC phases.

F31:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

An initial pressure peak when the platform lifted cannot be found between 0% and 15% height.

Check the pressure sensor and lift cylinder hydraulics.

F32:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

There should be a lowest pressure about halfway through the lift (ie: near 50% height); the lowest pressure measured is at too low a height.

Check the pressure sensor and lift cylinder hydraulics.

F33:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

There should be a lowest pressure about halfway through the lift (ie: near 50% height); the lowest pressure measured is at too high a height.

Check the pressure sensor and lift cylinder hydraulics.

F34:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

There is not enough difference between the initial pressure peak and the minimum pressure.

Check the pressure sensor and lift cylinder hydraulics.

F40:REJECT DELTA

This message indicates that there is not enough difference between the loaded & empty pressure.

This message could occur if the platform were not properly loaded during the STATIC LOADED phase, or if the platform were not properly empty during the STATIC EMPTY phase.

This message could also occur if the wrong pressure sensor was fitted (eg: a 5000psi sensor when a 2000psi one is needed).

Check CALIBRATIONS / HEIGHT CALS; the “Height” indicates the first height at which there was insufficient difference and the “Up” and “Down” values show the loaded pressure (first) and the difference between loaded and empty pressure (second).

F42:LOW PRESSURE

This message indicates that the pressure is too low (0.5V or less) when the elevation switch opens during the DYNAMIC lift.

This message would occur if the pressure sensor was disconnected, or if there were some other wiring error.

Check DIAGNOSTICS / SENSORS to check the pressure.

F43:HIGH PRESSURE

This message indicates that the pressure is too high (4.5V or more) when the elevation switch opens during the DYNAMIC lift.

This message would occur if the wrong pressure sensor was fitted, or if there were some other wiring error.

Check DIAGNOSTICS / SENSORS to check the pressure.

F44:LOW PRESSURE

This message indicates that the pressure is too low (0.5V or less) at a STATIC measurement point.

This message would occur if the pressure sensor was disconnected, or if there were some other wiring error.

Check DIAGNOSTICS / SENSORS to check the pressure.

F45:HIGH PRESSURE

This message indicates that the pressure is too high (4.5V or more) at a STATIC measurement point.

This message would occur if the wrong pressure sensor was fitted, or if there were some other wiring error.

Check DIAGNOSTICS / SENSORS to check the pressure.

F46:CHECK ELEV

This message indicates that the elevation switch opened more than once during the DYNAMIC lift.

F47:CHECK ELEV

This message indicates that the elevation switch closed more than once during the DYNAMIC lower.

F48:BAD PRESSURE

This message is given if the pressure sensor output (P4-2) is out of range at the start of calibration.

The height sensor output must be between 0.5V and 4.5V.

Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

CALIBRATION TROUBLESHOOTING; Information Messages

During calibration the following messages may be displayed:

BUILDING TABLES

This message indicates that the STATIC measurements are being used to build calibration data - the process should take no more than 5s.

CALDATE:

This message is prompting for the date to be entered; it is stored to identify when the machine was calibrated.

The last calibrate date can be viewed in DIAGNOSTICS / LOG.

Press LEFT & RIGHT to select the flashing digits.

Press UP & DOWN to change the flashing digits.

Press ENTER when the entry is complete.

IMPORTANT: The date 00/00/00 is not allowed!

FINISHED

This message confirms that calibration is complete and successful.

GO DOWN MORE!

This message occurs if the DOWN switch is released during either STATIC lowering phase, when more measurements are needed (before the platform is fully lowered).

GO UP MORE!

This message occurs if the UP switch is released during either STATIC lifting phase, when more measurements are needed (before the platform is fully raised).

LIFT EMPTY

This message is displayed during the STATIC empty phase while the platform is being raised to the next measurement height.

LIFT LOADED

This message is displayed during the STATIC loaded phase while the platform is being raised to the next measurement height.

LIFTING

This message is displayed during the DYNAMIC phase while the platform is being raised.

LOWER EMPTY

This message is displayed during the STATIC empty phase while the platform is being lowered to the next measurement height.

LOWER LOADED

This message is displayed during the STATIC loaded phase while the platform is being lowered to the next measurement height.

LOWERING

This message is displayed during the DYNAMIC phase while the platform is being lowered.

MEASURING #

This message is displayed when the platform is stopped during either STATIC phase, when the takes a measurement.

There will be a short delay while the machine is allowed to stabilize after movement is stopped.

MUST GO DOWN!

This message occurs if the wrong switch is closed when the is waiting for the platform to be lowered.

MUST GO UP!

This message occurs if the wrong switch is closed when the is waiting for the platform to be raised.

PLATFORM DOWN?

This message is prompting for confirmation that the platform is fully lowered. If necessary the DOWN switch can be activated to lower the platform.

Press ENTER to confirm when the platform is fully lowered.

PLATFORM EMPTY?

This message is prompting for confirmation that the platform is completely empty.

Press ENTER to confirm when the platform is empty.

PLATFORM LOADED?

This message is prompting for confirmation that the platform is loaded to rated load (this will be 100% for the).

Press ENTER to confirm when the platform is loaded.

PLEASE LIFT ...

This message is prompting for the platform to be raised.

The UP switch should be closed.

PLEASE LOWER ...

This message is prompting for the platform to be lowered.

The DOWN switch should be closed.

PLEASE WAIT

This message indicates that the is busy; the delay will be short (no more than 5s).

REDO DYNAMIC:

This message is displayed if the DYNAMIC phase of load calibration has previously been completed.

Press ENTER when “NO” is displayed if there is no need to redo the DYNAMIC phase.

Press UP or DOWN to display “YES” then press ENTER if it is necessary to redo the DYNAMIC phase.

If the previous DYNAMIC calibration was in error, or if the height or pressure sensor is replaced, it will be necessary to redo the DYNAMIC phase.

REDO EMPTY:

This message is displayed if the EMPTY phase of load calibration has previously been completed.

Press ENTER when “NO” is displayed if there is no need to redo the EMPTY phase.

Press UP or DOWN to display “YES” then press ENTER if it is necessary to redo the EMPTY phase.

If the previous EMPTY calibration was in error, or if the pressure sensor is replaced, it will be necessary to redo the EMPTY phase.

REDO LOADED:

This message is displayed if the LOADED phase of load calibration has previously been completed.

Press ENTER when “NO” is displayed if there is no need to redo the LOADED phase.

Press UP or DOWN to display “YES” then press ENTER if it is necessary to redo the LOADED phase.

If the previous LOADED calibration was in error, or if the pressure sensor is replaced, it will be necessary to redo the LOADED phase.

SECTION 4

MECHANICAL COMPONENTS

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Mechanical Components **4-3**

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- Pothole Circuit 4-9
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- Lift Cylinder Removal and Installation 4-11
- Scissor Beam Assembly 4-12

TORQUE SPECIFICATIONS

Fasteners

Use the following values to apply torque unless a specific torque value is called out for the part being used.

AMERICAN STANDARD CAP SCREWS								
SAE GRADE	5				8			
CAP SCREW SIZE - inches -	TORQUE				TORQUE			
	FT. LBS		Nm		FT. LBS		Nm	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1/4 - 20	6.25	7.25	8.5	10	8.25	9.5	11	13
1/4 - 28	8	9	11	12	10.5	12	14	16
5/16 - 18	14	15	19	20	18.5	20	25	27
5/16 - 24	17.5	19	23	26	23	25	31	34
3/8 - 16	26	28	35	38	35	37	47.5	50
3/8 - 24	31	34	42	46	41	45	55.5	61
7/16 - 14	41	45	55.5	61	55	60	74.5	81
7/16 - 20	51	55	69	74.5	68	75	92	102
1/2 - 13	65	72	88	97.5	86	96	116	130
1/2 - 20	76	84	103	114	102	112	138	152
9/16 - 12	95	105	129	142	127	140	172	190
9/16 - 18	111	123	150	167	148	164	200	222
5/8 - 11	126	139	171	188	168	185	228	251
5/8 - 18	152	168	206	228	203	224	275	304
3/4 - 10	238	262	322	255	318	350	431	474
3/4 - 16	274	302	371	409	365	402	495	544
7/8 - 9	350	386	474	523	466	515	631	698
7/8 - 14	407	448	551	607	543	597	736	809
1 - 8	537	592	728	802	716	790	970	1070
1 - 14	670	740	908	1003	894	987	1211	1137

METRIC CAP SCREWS								
METRIC GRADE	8.8				10.9			
CAP SCREW SIZE - millimeters-	TORQUE				TORQUE			
	FT. LBS		Nm		FT. LBS		Nm	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
M6 X 1.00	6	8	8	11	9	11	12	15
M8 X 1.25	16	20	21.5	27	23	27	31	36.5
M10 X 1.50	29	35	39	47	42	52	57	70
M12 X 1.75	52	62	70	84	75	91	102	123
M14 X 2.00	85	103	115	139	120	146	163	198
M16 X 2.50	130	158	176	214	176	216	238	293
M18 X 2.50	172	210	233	284	240	294	325	398
M20 X 2.50	247	301	335	408	343	426	465	577
M22 X 2.50	332	404	450	547	472	576	639	780
M24 X 3.00	423	517	573	700	599	732	812	992
M27 X 3.00	637	779	863	1055	898	1098	1217	1488
M3 X 3.00	872	1066	1181	1444	1224	1496	1658	2027

Torque values apply to fasteners as received from the supplier, dry or when lubricated with normal engine oil.
If special graphite grease, molydisulphide grease, or other extreme pressure lubricants are used, these torque values ***do not apply***.

Hydraulic Components

Use the following values to apply torque to hydraulic components. Always lubricate threads with clean hydraulic oil prior to installation.

TYPE: SAE PORT SERIES	FITTINGS		HOSES	
	FT. LBS.	Nm	FT. LBS.	Nm
#4	9 - 11	12 - 15	16 - 18	22 - 24
#6	19 - 24	25 - 32	28 - 32	38 - 43
#8	39 - 42	53 - 57	38 - 42	52 - 57
#10	58 - 62	78 - 84	58 - 62	79 - 84
#12	79 - 85	107 - 115	83 - 87	113 - 118
#16	136-144	184 - 195	100 - 110	136 - 149

MECHANICAL COMPONENTS

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

Base / Undercarriage

CAUTION

When cleaning the base/undercarriage, cover electrical components to prevent water penetration.

Steam clean the chassis as necessary, and inspect all welds and brackets. Check for cylinder pins that turn in their mounting, which will indicate sheared retaining pins.

Hoses and Cables

Note: Refer to *Parts Section E* for detailed hydraulic hose diagrams.

Inspect all hoses and electrical cables for security and damage. Hoses and cables should be examined for rubbing and chafing.

Check for leaks at fittings. Replace any damaged hose or cable.

1. Tag hoses for proper reassembly.
2. Disconnect hoses and IMMEDIATELY cap the openings to prevent contamination.
3. Torque hose fittings according to the Hydraulic Torque Specification Table.

Raising the Machine

DANGER

THE USE OF SUBSTANDARD LIFTING DEVICES AND/OR JACK STANDS MAY CAUSE THE MACHINE TO FALL RESULTING IN DEATH OR SERIOUS PERSONAL INJURY.

The following are needed to safely raise and support the machine;

- a jack with a lifting capacity of two (2) tons or more.
- jack stands with a rating of one (1) ton or more.

To raise the machine

1. Move machine to a firm level surface capable of supporting the weight of the machine.
2. Chock tires on one end of machine and raise the other end of machine.
3. Position a jack at the end of the machine to be lifted, under a solid lifting point in the center of the frame.
4. Raise the machine and place two (2) suitable jack stands under solid support points at the outer ends of the frame.
5. Lower the machine to rest on the jack stands and inspect for stability.

To lower the machine

1. Raise machine slightly and remove jack stands.
2. Lower the machine remove the jack.
3. Remove chocks.

Tires/Wheels

Tires are solid non marking rubber permanently mounted on a steel wheel. Inspect for cuts, chunking, side-wall damage, or abnormal wear. Any tire faults MUST BE CORRECTED before further machine operation. Refer to Parts Section for replacements.

FAILURE TO USE APPROVED PARTS MAY CAUSE DEATH OR SERIOUS PERSONAL INJURY.

NOTE: Replace tires/wheels with the correct parts to maintain the rating of this equipment.

Changing Tires/Wheels

ALWAYS BLOCK THE MACHINE BEFORE RAISING THE MACHINE.

When a tire / wheel change is necessary, follow these tips:

1. While the machine is on the ground, loosen but ***do not remove*** lug nuts.

   NOTE: Wheels may spin when attempting to loosen lug nuts without the weight of the machine on the wheels. Loosen lug nuts enough to break free, but leave them tight for safety.
2. Raise and support the machine (see *Raising the Machine*).
3. Remove lug nuts and pull the wheel off.
4. Install the replacement wheel and tighten the lug nuts.
5. Lower the machine to the ground.
6. Torque lug nuts to 102 to 115 Nm.
7. Remove the chocks.

Front Drive Motors

There are two (2) hydraulic motors on the front axle. These can be damaged or leaks may occur; repair or replace as necessary. Refer to *Section 1 - Hydraulics* for motor service and repair procedure.

CAUTION:

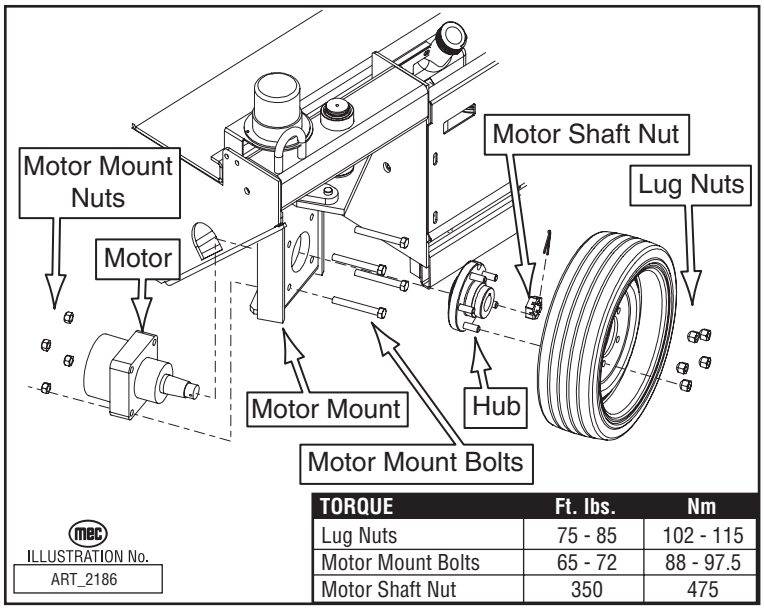
- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings to prevent contamination.

Front Drive Motors

Remove

NOTE: Removal of the motor does not require disconnection or removal of steering components.

1. Loosen the lug nuts.
2. Raise and support the front end of machine (see *Raising the Machine*).
3. Remove the wheel and tire assembly to access drive motor.
4. Remove the cotter pin, motor shaft nut, and hub from the drive motor shaft.
5. Turn the motor housing to gain access to the motor and hose assemblies.
6. Disconnect hose assemblies from drive motor.
7. Remove the cap screws and remove the drive motor.



TORQUE	Ft. lbs.	Nm
Lug Nuts	75 - 85	102 - 115
Motor Mount Bolts	65 - 72	88 - 97.5
Motor Shaft Nut	350	475

Replace

Installation is reverse of removal.

Rear Wheel Brakes

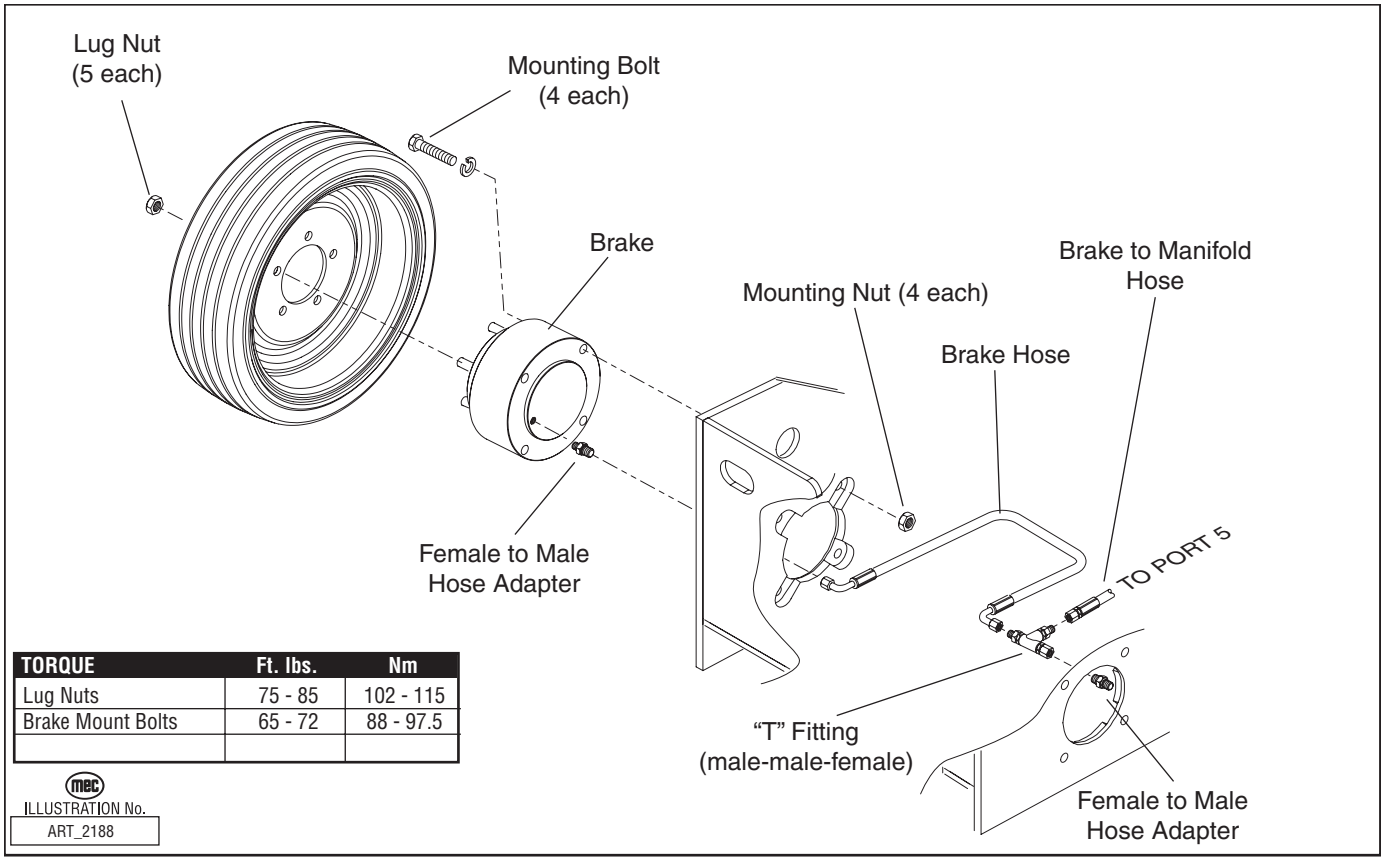
Refer to *Parts Section E* for brake kit.

Remove

1. Raise and support the rear end of machine (see *Raising the Machine*).
2. Remove the wheel and tire assembly to access brake.
3. Disconnect hose assemblies from the brake.
4. Remove the cap screws and remove the brake from the housing.

Replace

Installation is reverse of removal.



TORQUE	Ft. lbs.	Nm
Lug Nuts	75 - 85	102 - 115
Brake Mount Bolts	65 - 72	88 - 97.5

ILLUSTRATION No.
ART_2188

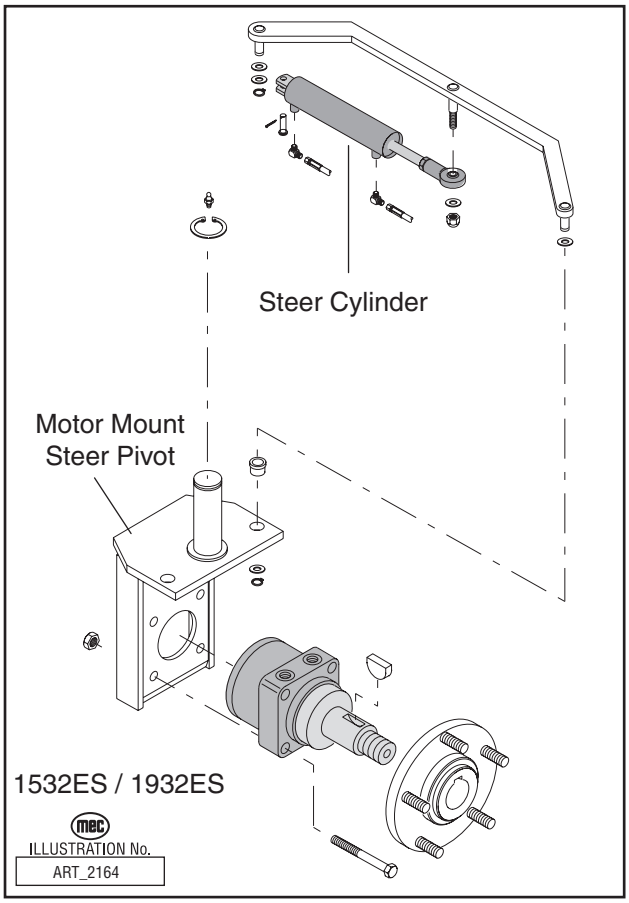
Steer Cylinder

There is one (1) double acting type steer cylinder on this machine. During operation, cylinder should not leak, but a slight damping at the rod seal is acceptable. The pins should be checked for wear.

To Replace Steer Cylinder:

CAUTION:
- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings to prevent contamination.

1. Raise and support the front end of machine (see *Raising the Machine*).
2. Disconnect hydraulic hoses and cap them.
3. Remove the pins and cotter pin holding the steer cylinder to the motor mounting bracket.
4. Remove the pin and cotter pin holding the steer cylinder to the steer axle cross member.
5. Carefully lift off the steer cylinder.
6. Position the new steer cylinder and install pin and cotter pin to hold cylinder to the steer axle cross member.
7. Install pin and cotter pin to hold cylinder to motor mounting bracket.
8. Connect hydraulic hoses.
9. To purge air from cylinder;
   - place a suitable container beneath the hose connections to catch spilled oil,
   - loosen hose fittings slightly,
   - actuate steer function,
   - when all air is purged, tighten hose connections.



Steer Cylinder Seal Replacement

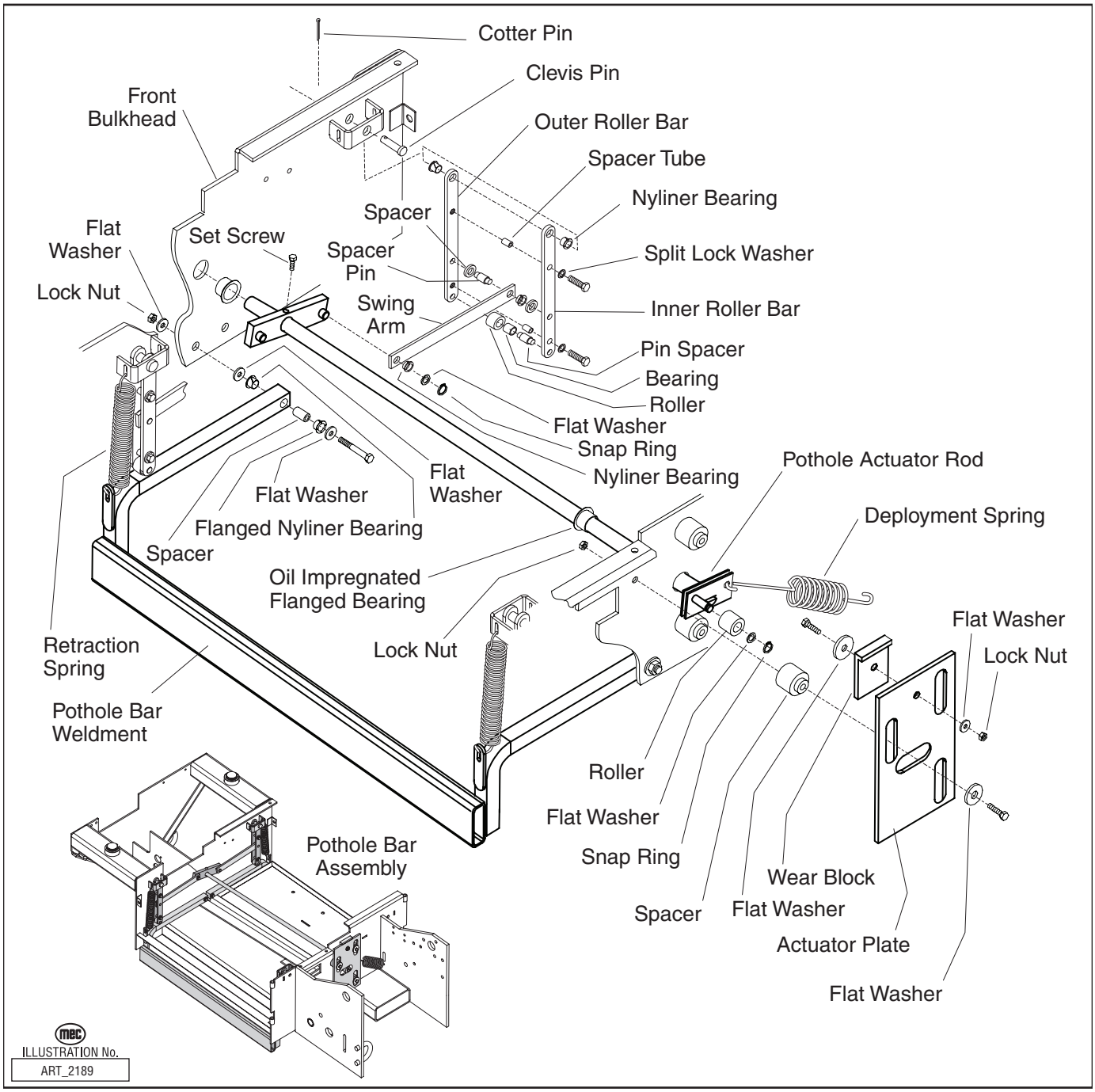
Refer to *Section 1* for seal replacement instructions.

Pothole Circuit

The Pothole Depression Rails are raised and lowered mechanically. When the platform is elevated, the depression rails are pulled into position by spring tension. When the platform is lowered, the bottom fixed beam in the scissor stack presses downward on the pothole actuator and raises the depression rails.

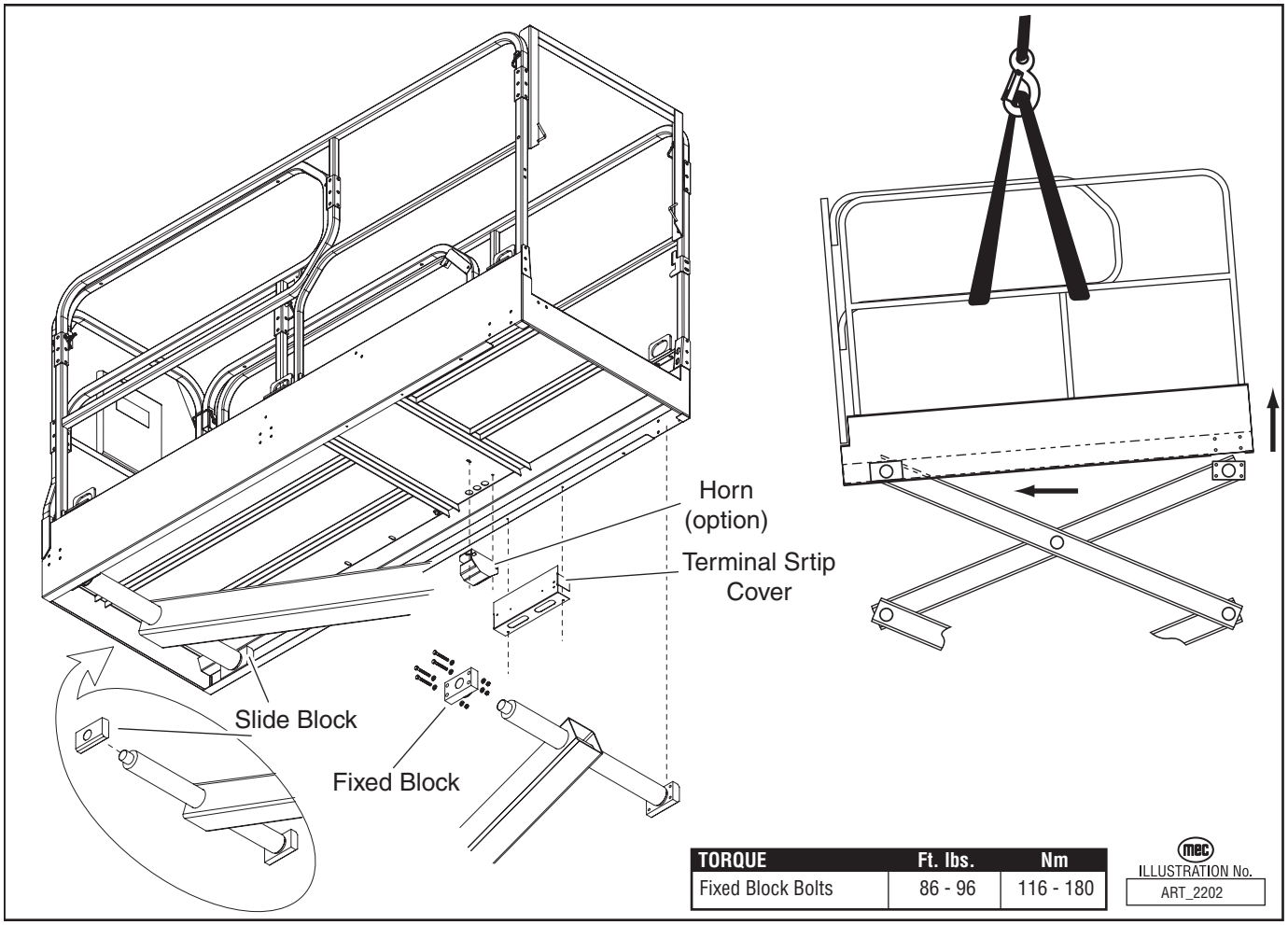
Repair:

1. Raise and support the scissor assembly using the maintenance lock.
2. Refer to the illustration and Section E of the Parts Manual.



Platform Removal

1. Raise platform and support with the maintenance lock (see *General Safety Tips)*.
2. Connect overhead crane by appropriate lifting device to platform.
3. Remove the terminal strip cover and disconnect all platform wires. Remove any components that will obstruct the scissor slide path.
4. Remove the bolts from both fixed blocks at the rear of the platform.
5. Lift the rear of the platform until the fixed blocks are clear.
6. Slide the platform assembly forward until the slide blocks align with the slide track opening at the rear of the platform.
7. Remove the platform assembly.
8. Installation is reverse of removal.



TORQUE	Ft. lbs.	Nm
Fixed Block Bolts	86 - 96	116 - 180

ILLUSTRATION No.
ART_2202

Lift Cylinder Removal and Installation

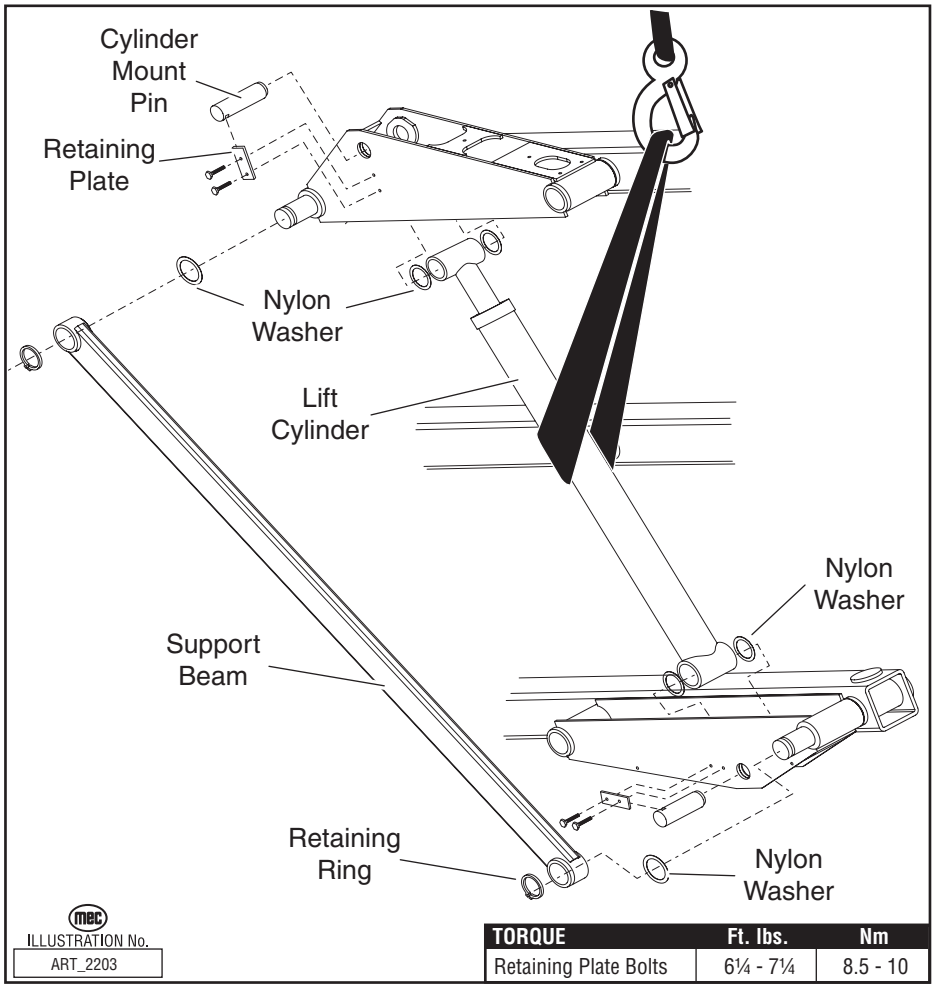
Note: Refer to *Section 1* for seal replacement instructions.
Refer to *Parts Section C* for detailed parts list and illustration.

CAUTION:
- ♦ Clean all fittings before disconnecting hoses.
- ♦ Tag hoses for proper reassembly.
- ♦ Plug all openings to prevent contamination.

1. Raise the scissor arm assembly and support using the maintenance lock.
2. Remove the support beam.
   - ♦ Remove the upper and lower retaining rings.
   - ♦ Remove the upper and lower nylon washers.
3. Disconnect hoses and wires and cables from the lift cylinder(s).
4. Use a suitable lifting device to support the lift cylinder.

   CAUTION: Attach the lifting device to the cylinder body.
   Lifting by the rod end will cause the cylinder to extend.
5. Remove the upper retaining plate, cylinder mount pin, and two (2) nylon washers.
6. Remove the lower retaining plate.
7. While supporting the cylinder, carefully remove the cylinder mount pin and two (2) nylon washers.

   CAUTION: The cylinder may shift suddenly when the pin is removed.
8. Lift the cylinder from the scissor assembly using a suitable lifting device.
9. Clean all parts before reassembly. Replace worn or damaged parts with new parts.
10. Installation is reverse of removal.



TORQUE	Ft. lbs.	Nm
Retaining Plate Bolts	6¼ - 7¼	8.5 - 10

Scissor Beam Assembly

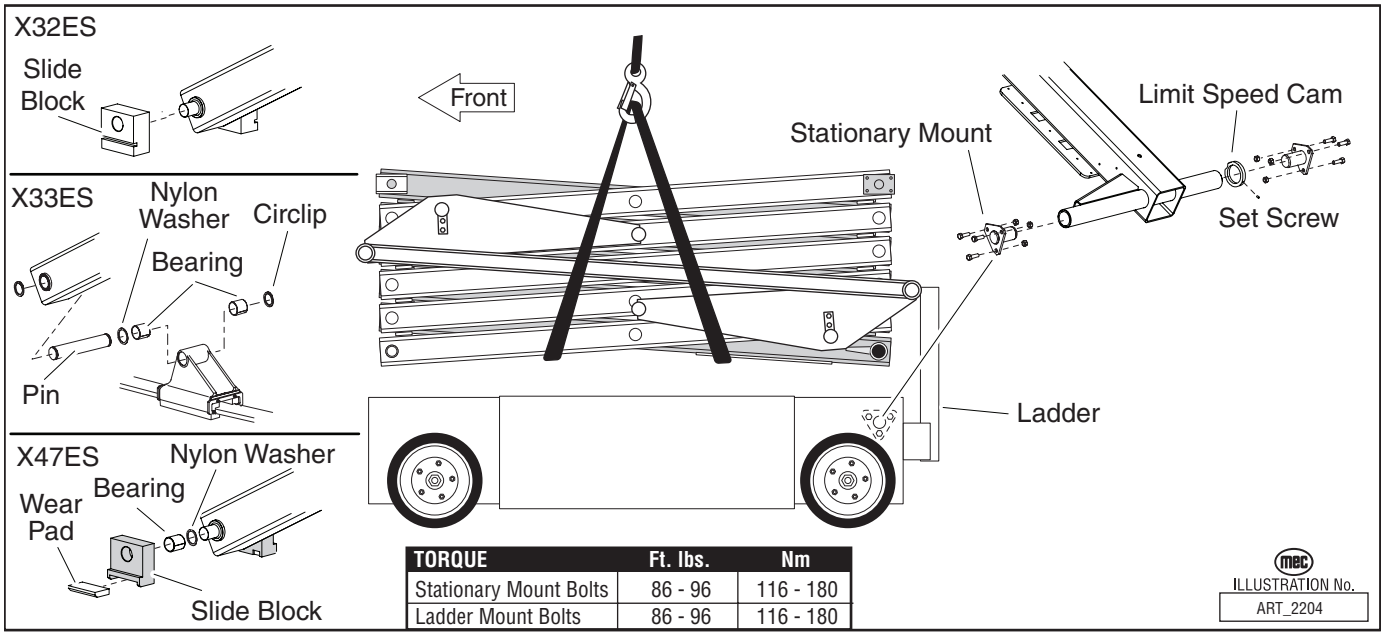
Note: Refer to *Parts Section C* for detailed parts list and illustration.

Clean the scissor assembly once a year or as necessary and inspect along the beam surfaces, especially the welds and brackets.

Scissor Beam Removal

1. Remove the platform and ladder.
2. Attach a suitable lifting device to the scissor assembly.
3. Remove the stationary mounts.
4. Carefully lift until the rear of the scissor is clear and remove the limit speed cam.
5. Slide the scissor assembly to the rear until the slide block reaches the end of slide channel and lift the scissor assembly.

   CAUTION: The scissor assembly may shift suddenly upon clearing the slide channel.
6. Remove slide blocks and wear pads.
7. Clean all parts before installation. Replace worn or damaged parts with new parts.
8. Installation is reverse of removal.



TORQUE	Ft. lbs.	Nm
Stationary Mount Bolts	86 - 96	116 - 180
Ladder Mount Bolts	86 - 96	116 - 180

ILLUSTRATION No. ART_2204

SECTION 5

TROUBLESHOOTING

General Troubleshooting Tips **5-2**

Hydraulic Pressure Adjustment Procedures **5-4**

Troubleshooting **5-6**

Sevcon Motor Speed Controller **5-14**

LED Diagnostics Definitions (Flash Codes) 5-15

Sevcon Motor Speed Controller - Connections 5-17

Troubleshooting Battery Charger **5-19**

GENERAL TROUBLESHOOTING TIPS

The ES series Aerial Work Platform operates on a "Motor Control" theory in which fluid flow volume is controlled by varying the speed of the DC electric motor. 100% of the fluid produced by the pump goes to the selected function.

The ES series is designed for easier troubleshooting. There is a terminal strip located under the platform for checking signals to and from upper controls. There is also an LED's located on the Motor Control Unit located inside the lower control box, that will help in the event the DC electric motor fails to operate (see Motor Controller Flash Codes in this section for troubleshooting with flash codes). It is important to note that not all failures will cause a flash code on the motor controller. Before you begin troubleshooting this model, check the battery state of charge and inspect the battery connections for loosness or corrosion. A fully charged battery set on a 24 V DC system will have a nominal voltage of 25.6 V DC.

Before investigating a malfunction, check the following items:

- Check that battery connections are secure and battery is fully charged.
- Check that the emergency stop button is released (UP/OUT position).
- Check that the hydraulic fluid is at the correct level.
- Check that the brake release valve is open.
- Check that the circuit breaker is in the ON position.

Common Causes of Hydraulic System Malfunctions:

- Incompatible hydraulic fluids mixed, destroying the additives and causing varnish buildup, resulting in the valves sticking.
- Water in the hydraulic fluid due to a damp climate.
- Improper hydraulic fluid used. Viscosity too high in cold climates. Viscosity too low in warm climates.

  NOTES: Contamination always causes failure in any hydraulic system. It is very important to be careful not to introduce any contamination into your hydraulic system during the assembly procedures. Make sure all ports and cavities of the manifold and cylinders are properly covered while other work is performed.

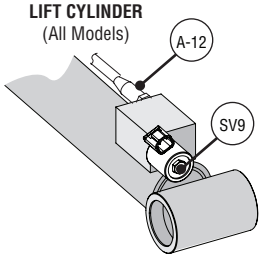
Early Model vs. Current Model

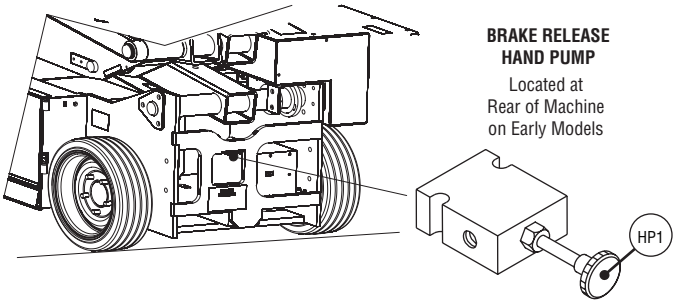
Current model hydraulics are modified in the following ways;

- Electrical componentss use Deutsch style connectors.
- The brake release hand pump is on the main manifold.
- Valve **CV1** is eliminated.
- Valve **SV7** is eliminated.
- Valve **SV8** is eliminated.
- Steering flow control valve **PFC1** and relief valve **RV3** are replaced by a single valve **FRR1.**

Refer to the accompanying illustrations when using the Troubleshooting Guide.

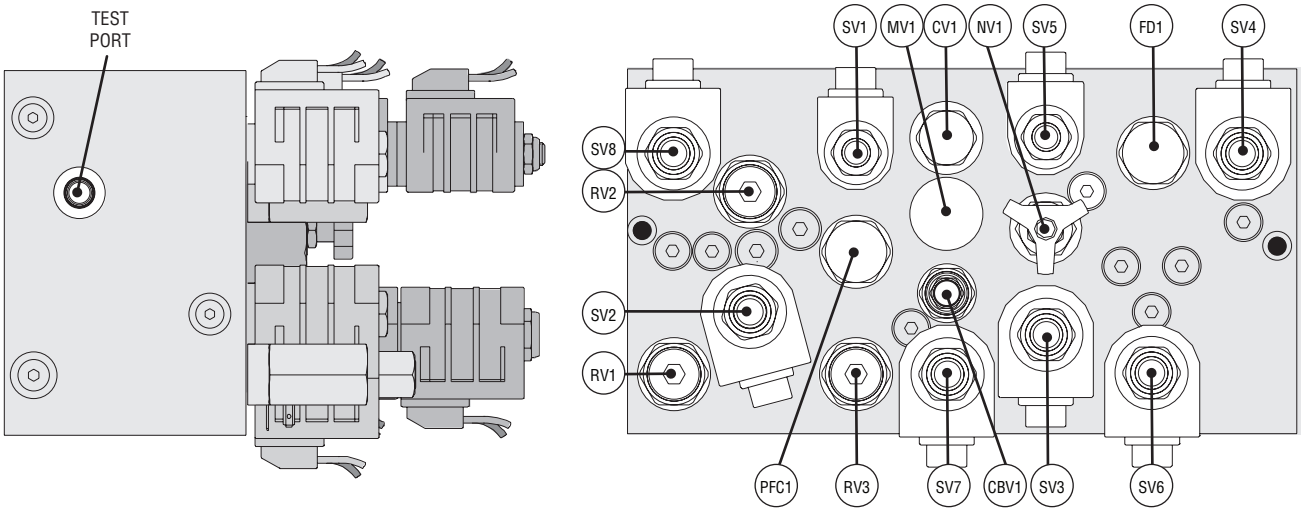
LIFT CYLINDER
(All Models)





BRAKE RELEASE HAND PUMP
Located at Rear of Machine on Early Models

MAIN MANIFOLD
(Early Models)



MAIN MANIFOLD
(Current Models)

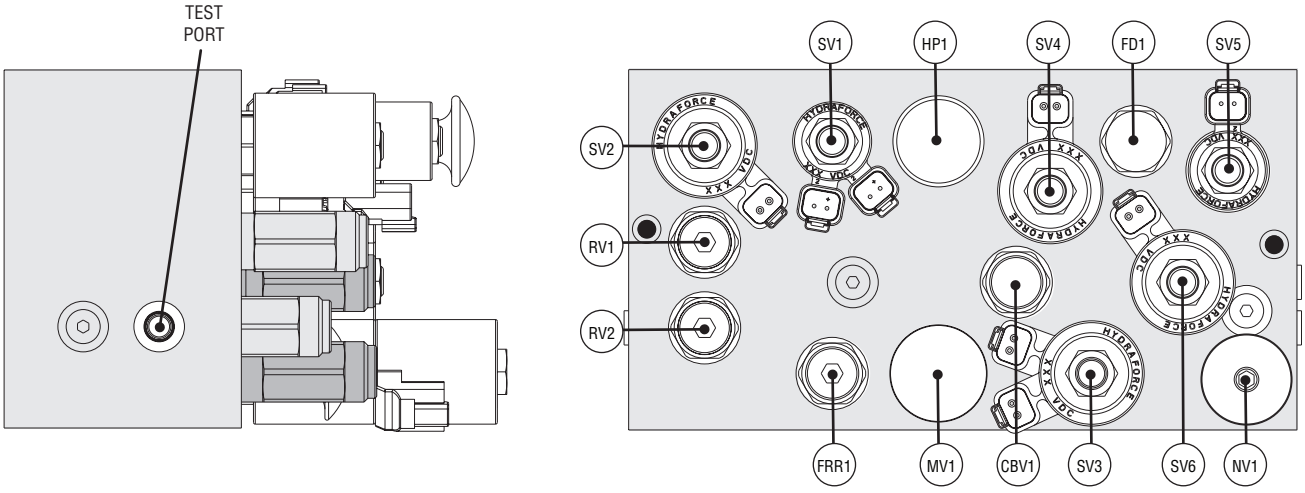


ILLUSTRATION No.
ART_2476

Hydraulic Valve Locations, 1532ES - 1932ES

HYDRAULIC PRESSURE ADJUSTMENT PROCEDURES

- Before attempting to check and/or adjust pressure relief valves, operate the machine for 15 minutes or long enough to sufficiently warm the hydraulic fluid.
- Insert a 0-240 bar (0-3500 psi) gauge onto the pressure test port on the valve manifold using gauge adapter fitting MEC part no. 8434.

Pressure Adjustment Table

MODEL	MAIN		LIFT		STEER		COUNTERBALANCE PRESSURE	
1532ES	2750PSI	190 bar	1900 PSI	131 bar	850 PSI	59 bar	550 PSI	38 bar
1932ES	2750 PSI	190 bar	2600 PSI	180 bar	850 PSI	59 bar	550 PSI	38 bar

Check and Adjust Pressure (except counterbalance)

If adjustment is required, set pressure to the correct setting as follows:

- Connect pressure gauge (0-240 bar) with a female quick disconnect to the main test port.

Main/System

- Disconnect forward or reverse coil of drive valve.
- Energize drive function by moving joystick (lever) in the direction of the already disconnected coil.
- Hold the switch for 10 seconds to get an accurate reading on the pressure gauge.

Lift

- Energize the platform to full extension with **no load on platform**.
- Hold the switch for 10 seconds to get an accurate reading on the pressure gauge.

Steering

- Energize the steering to full left.
- Hold the switch for 10 seconds to get an accurate reading on the pressure gauge.

Early Models

Early models do not have a tamper proof cap.

- Turn adjustment screw “IN” to increase the pressure.
- Turn adjustment screw “OUT” to decrease the pressure.

Current Models

- Remove the tamper proof cap.
- Turn adjustment screw “IN” to increase the pressure.
- Turn adjustment screw “OUT” to decrease the pressure.
- When correct pressure is obtained replace tamper proof cap with a new one.

CAUTION: Do not operate pump with tamper proof cap removed as fluid will emit under pressure.

Setting Counterbalance Valves

- Before attempting to check and/or adjust counterbalance valves, operate the machine for 15 minutes or long enough to sufficiently warm the hydraulic fluid.
- Insert a 0-70 bar (0-1000 psi) guage onto the pressure test port on the valve manifold using gauge adapter fitting MEC part no. 8434.

Check and Adjust Pressure (counterbalance)

If adjustment is required, set pressure to the correct setting as follows:

- Open the freewheel valve (NV1) completely.
- Operate drive in either direction.
- Hold the switch for 10 seconds to get an accurate reading on the pressure gauge.

Early Models

- Loosen the jamnut.
- Turn "counterclockwise" to increase the pressure.
- Turn "clockwise" to decrease the pressure.

Current Models

- Using pliers or other gripping tool, ***carefully*** remove the tamper proof cap.
- Turn adjustment screw "IN" to increase the pressure.
- Turn adjustment screw "OUT" to decrease the pressure.
- When correct pressure is obtained replace tamper proof cap with a new one.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
GENERAL LOSS OF POWER		
No operation from upper or lower control station	Main battery switch turned off	Located on of lower control box
	Emergency switch pushed in or Base-Platform switch turned off	Pull upper and lower emergency stop switches to initiate power
	Circuit breaker tripped	Check for short circuits and Reset Located in lower control box panel
	Damaged upper control box harness	Inspect from harness plug to terminal strip under platform
	Batteries discharged	Look for a 7 or 9 flash code while attempting function. Check battery voltage under load
	Check for motor controller flash codes	See "Sevcon Motor Speed Controller" in this section for troubleshooting flash codes
Functions from lower controls but not from upper controls	Upper Emergency Stop switch pushed in	Pull upper emergency stop switch
	Interlock switch (joystick)	check power to red wire (power to switch) and power to purple wire (power out of switch) at joystick plug
	Damaged harnesses	Check scissor and upper box harness for damage
LIFT		
Partial or intermittent lift from either control station	Low battery voltage, at 18 volts operating	Lift will stop, a 9-flash code will be displayed on the motor controller while attempting to lift
	Platform overloaded	Check platform load and compare with posted Maximum Weight labels, reduce load
	Lift relief valve RV1 out of adjustment	Adjust relief valve to rated capacity
	Lowering valve SV9 pulled out or emergency down cable (if equipped) sticking	Inspect lowering valve, located on lift cylinder Check cable adjustment/operation (if equipped)
	6- flash code at motor controller	Test potentiometer POT1 for open circuit Located in upper control box, replace

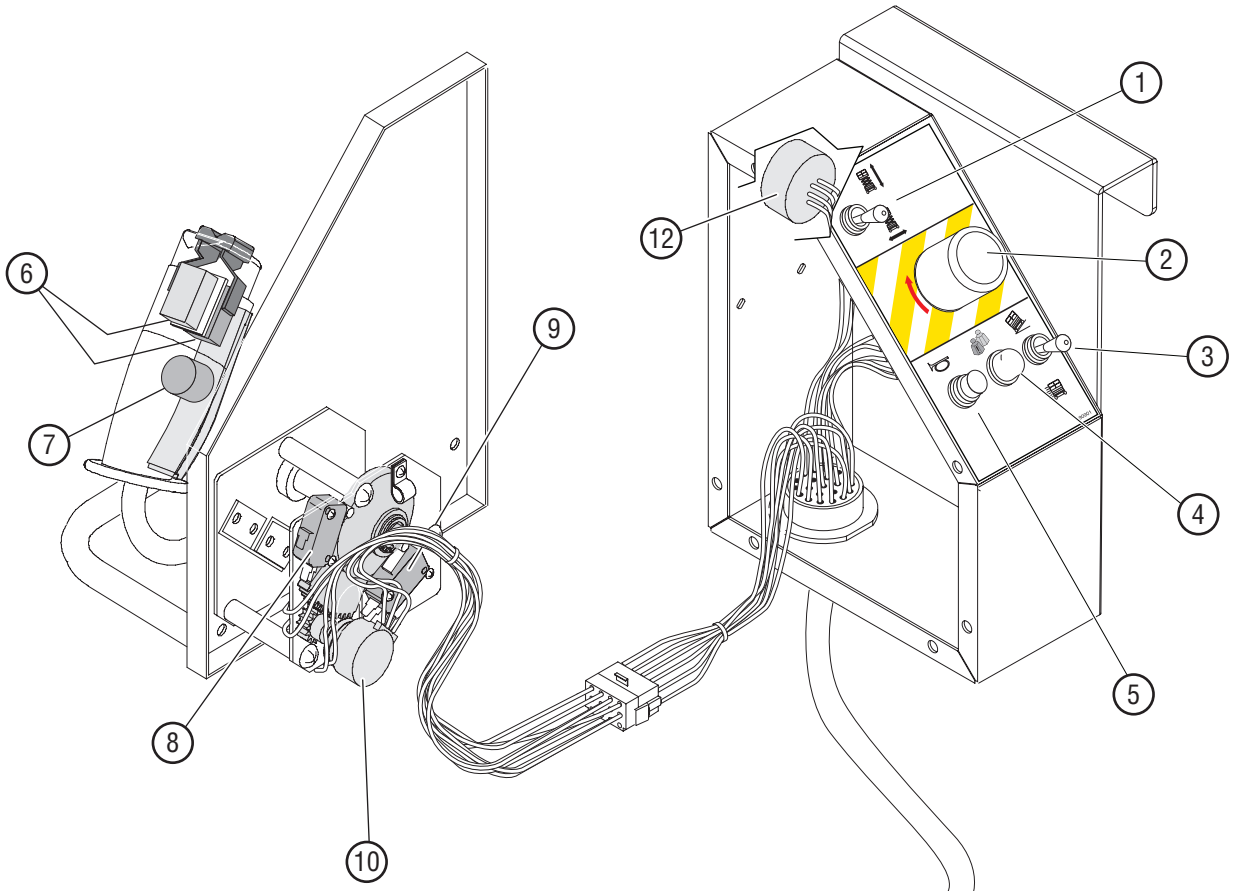
PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
LIFT (CONTINUED)		
No lift from either control station - Pump motor runs	Lift Valve SV2 not energized	Check lift circuit on wire # 4 from control box to lift valve SV2
	Main system pressure inadequate	Checkmain relief RV2 adjustmnt, Check pump output pressure using a flow meter
No lift from either control station - Pump motor *NOT* operating while attempting lift	Micro-switch S7 inoperative	Check operation of micro-switch located in upper control box on joystick
	Mode Selector Switch S6 faulty	Check power through S6 on wire 10
	Damaged wiring or poor plug connection	Check wire 10 through plug connections from upper control box to Diode Board
	Failed diode in diode board	Test diodes on diode board, replace diode board
LOWER		
Platform will not lower	Maintenance lock in maintenance position	Elevate platform slightly and return maintenance lock to the stowed position
	Lowering valve/s not energized SV9 (SV8)	Check lowering circuit wire # 5 from control box to lowering valve, located on lift cylinder On earlier units, check valve SV8 also
	Lowering valve/s not shifting	Clean debris, replace
	Lowering orifice ORF3 plugged	Clean orifice - located under fitting at lift cylinder
Emergency lowering not working	E-down cable freyed (later models only)	replace e-down cable
	Lowering valve not shifting	Clean debris, replace

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
DRIVE		
No drive either direction Pump motor runs while attempting to drive *LOW* pressure indicated at Test Port TP-1	Freewheel Valve NV1 open	Turn counter-clockwise to close
	Brake valve SV5 not shifting	Check power to SV5 Remove SV5 and check for contanimation Replace SV5
	Brake valve SV5 not shifting -no power on wire 19	Check power back to diode board term 3
No drive either direction Pump motor runs while attempting to drive *HIGH* pressure indicated at Test Port TP-1	Drive valve SV3 not shifting	Check power to SV3 Remove SV3 and check for contanimation Replace SV3
	Drive valve SV3 not shifting - no ground to valve coils on wire # 151	Check Limit Switch LS1 for sticking or failure Loosen up with lubricant Replace
	Counterbalance Valve CBV1 failure	Replace CBV1
Reduced, slow or sluggish drive either direction	Freewheel Valve NV1 partially open	Turn counter-clockwise to close
	Torque valve/s SV4 & or SV6 sticking	Inspect torque valves SV4 & SV6, replace
Torque switch *OFF*	Decel valve SV7 inoperative - earlier units only	Check for power to SV7 while driving Check valve for contanimation Replace valve
	One or both Wheel motors WM1 & WM2 internal bi-pass	Test wheel motors Replace wheel motors
	Limit Switch LS1 inoperative	Check power on wire 22 and 2 in limit switch with platform below 6 feet.
	6- flash code at motor controller	Test potentiometer POT1 for open circuit Located in upper control box Replace
Reduced, slow or sluggish drive either direction Torque switch *ON*	One Torque valve SV4 or SV6 not shifting	Check voltage on wire #13 while driving Check valves for contanimation, replace SV4 or SV6
	One or both Wheel motors WM1 & WM2 internal bi-pass	Test wheel motors Replace wheel motors

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
DRIVE (CONTINUED)		
No Drive in *REVERSE* only Pump motor *NOT* operating while attempting to drive	Micro-switch S7 inoperative	Check operation of micro-switch Located in upper control box on joystick
	Mode Selector Switch S6 faulty	Check power through S6 on wire 10
	Damaged wiring or poor plug connection	Check wire 10 through plug connections from upper control box to Diode Board
	Failed diode in diode board	Test diodes on diode board Replace diode board
No Drive in *FORWARD* only Pump motor *NOT* operating while attempting to drive	Micro-switch S8 inoperative	Check operation of micro-switch Located in upper control box on joystick
	Mode Selector Switch S6 faulty	Check power through S6 on wire 11
	Damaged wiring or poor plug connection	Check wire 11 through plug connections from upper control box to Diode Board
	Failed diode in diode board	Test diodes on diode board Replace diode board
No Drive in *REVERSE* only Pump motor *OPERATES* while attempting to drive	Drive valve SV3 not shifting	Check power to SV3, remove SV3 Check for contanimation Replace SV3
No Drive in *FORWARD* only Pump motor *OPERATES* while attempting to drive	Drive valve SV3 not shifting	Check power to SV3, remove SV3 Check for contanimation Replace SV3
Drives in one direction regardless of direction operated	Drive valve SV3 sticking	Check SV3 for contanimation Replace SV3
	Drive valve SV3 powered in one direction	Short in wiring, faulty diode board

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
DRIVE (CONTINUED)		
No Drive above limit switch *HIGH* pressure indicated at Test Port TP-1	Pothole system not deployed	Clear debris from under pothole bars Check pothole linkage operation
	Pothole limit switch/s LS2 & LS3 inoperative	Check switche/s for presence of Ground on wire 151 when pothole bars completely deployed
No Drive above limit switch *LOW* pressure indicated at Test Port TP-1	Decel valve SV7 inoperative - earlier units only	Check for power to SV7 while driving Check valve for contanimation Replace valve
	Pump output reduced due to wear	Test pump with a flow meter Replace
Speed uncontrolable while decending a hill	Counterbalance Valve CBV1 out of adjustment	See "*Setting Counterbalance Valves*" in this section Replace valve
STEER		
No Steer Either direction Pump motor *OPERATES* while attempting to steer	Steer valve SV1 not shifting	Check power to SV1, remove SV1 and check for contanimation Replace SV1
	Steering linkage binding	Inspect - lube linkage, replace as necessary
	No power to SV1	Check for broken wires between lower control box and SV1 valve
	Steering Cylinder internal failure	Inspect, replace seals
No Steer Either direction Pump motor *NOT* operating while attempting to steer	Selector switch S6 inoperative	Check for power on wire 3 and 3a when steer attempted
	Broken wire in joystick	Check for broken Blue wire in joystick handle
No Steer Right only Pump motor *NOT* operating while attempting to steer	Micro-switch S4 inoperative	Check operation of micro-switch located in uppercontrol box in joystick handle
	Damaged wiring or poor plug connection	Check wire 7 through plug connections from upper control box to Diode Board
	Failed diode in diode board	Test diodes on diode board Replace diode board

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
DRIVE (CONTINUED)		
No Steer Left only Pump motor *NOT* operating while attempting to steer	Micro-switch S5 inoperative	Check operation of micro-switch located in uppercontrol box in joystick handle
	Damaged wiring or poor plug connection	Check wire 8 through plug connections from upper control box to Diode Board
	Failed diode in diode board	Test diodes on diode board Replace diode board
No Steer Right only Pump motor *OPERATES* while attempting to steer	Steer valve SV1 not shifting	Check power to SV1 Remove SV1 and check for contanimation Replace SV1
	Steering linkage binding	Inspect - lube linkage, replace as necessary
	Steering Cylinder internal seal failure	Inspect, replace seals
No Steer Left only Pump motor *OPERATES* while attempting to steer	Steer valve SV1 not shifting	Check power to SV1 Remove SV1 and check for contanimation Replace SV1
	Steering linkage binding	Inspect - lube linkage, replace as necessary
	Steering Cylinder internal seal failure	Inspect, replace seals
Drives in one direction regardless of direction request	Steer valve SV1 sticking	Inspect SV1 valve for debris Replace SV1
	Drive valve SV1 powered in one direction	Short in wiring, faulty diode board.



1] Lift/Drive Selector Switch
2] Emergency Stop Switch
3] Torque Switch
4] Overload Warning Light (Red)
5] Horn Button (option)
6] Steering Micro-Switches
7] Drive Enable Switch
8] Reverse/Down Rocker Switch
9] Forward/Up Rocker Switch
10] Potentiometer
11] Terminal Strip
12] Control Box Alarm

ILLUSTRATION No.
ART_2429

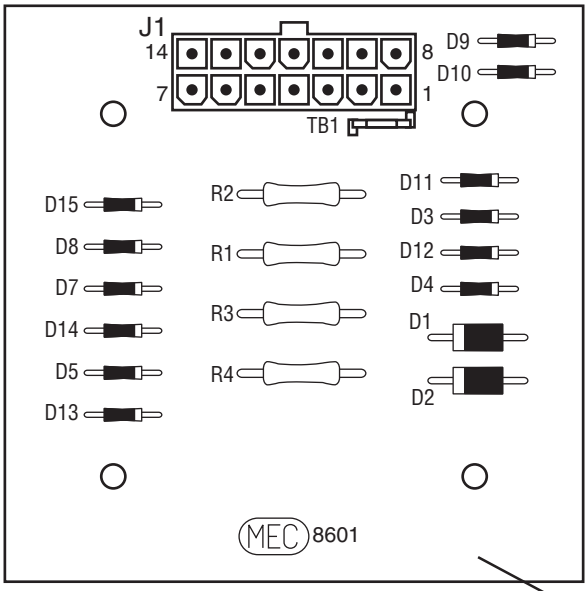
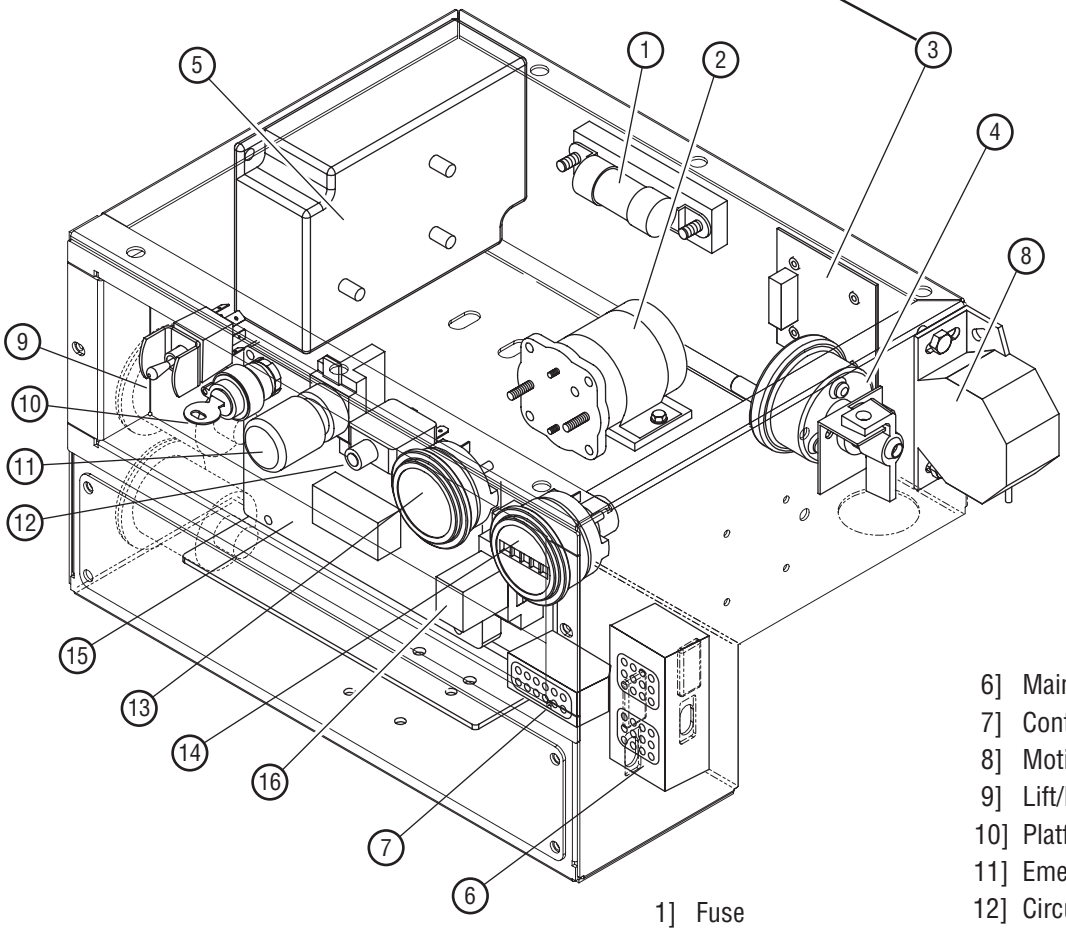


ILLUSTRATION No.
ART_2181

J1 Plug Pin Identification

PIN #	WIRE #	SIGNAL	FUNCTION
1	10	INPUT	Drive Reverse
2	11	INPUT	Drive Forward
3	19	OUTPUT	Brake, Decel Valve signal
4	8	INPUT	Steer Left
5	18	OUTPUT	Steer signal to Sevcon
6	5	INPUT	Down signal
7	20	OUTPUT	Signal to Motion Alarm(s) (optional)
8	17	OUTPUT	Sevcon & Hour Meter (motor function requested)
9	15	INPUT	Battery Negative
10	7	INPUT	Steer Right
11	4	INPUT	Lift Up
12	2	INPUT	Limit Switch (24V = platform down)
13	3	OUTPUT	Enable, from lower Lift switch
14	21	OUTPUT	To Sevcon (for speed cutback)



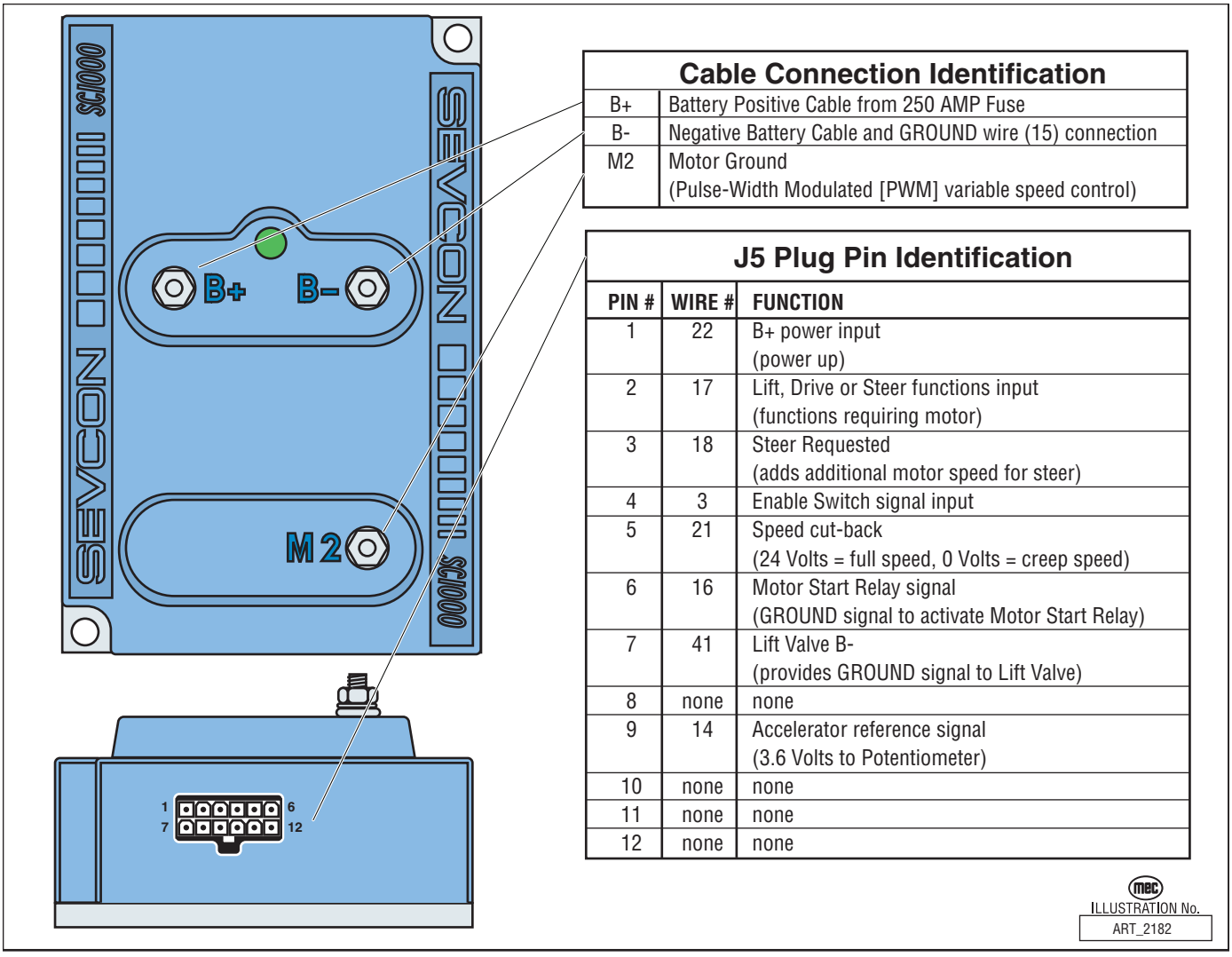
1] Fuse
2] Contactor
3] Circuit (Diode) Board
4] Battery Cutoff Switch
5] MotorControl Unit
6] Main Harness Connection
7] Control Cable Connection
8] Motion Alarm (option)
9] Lift/Lower Switch
10] Platform-Base Selector
11] Emergency Stop Switch
12] Circuit Breaker
13] Battery Gauge
14] Hour Meter
15] GP102 Load Sense Module
16] Overload Cutout Relay

ILLUSTRATION No.
ART_2428

SEVCON MOTOR SPEED CONTROLLER

The Sevcon Motor Speed Controller (MC-1) is a microprocessor designed with the express purpose of operating the D/C electric motor at varying speeds. The controller uses Pulse-Width Modulation (PWM) technology on the Ground side of the motor to control motor speed. Out of concern for operator safety and to prevent short-circuiting, the Controller monitors certain circuits for potential abnormalities. When the controller senses a problem it errs to the side of safety and stops all motor operation. The green LED will flash a code indicating the reason for the shutdown.

Refer to the *LED Diagnostics Definitions* and *Sevcon Motor Speed Controller - Connections* on the following pages.



Cable Connection Identification	
B+	Battery Positive Cable from 250 AMP Fuse
B-	Negative Battery Cable and GROUND wire (15) connection
M2	Motor Ground (Pulse-Width Modulated [PWM] variable speed control)

J5 Plug Pin Identification

PIN #	WIRE #	FUNCTION
1	22	B+ power input (power up)
2	17	Lift, Drive or Steer functions input (functions requiring motor)
3	18	Steer Requested (adds additional motor speed for steer)
4	3	Enable Switch signal input
5	21	Speed cut-back (24 Volts = full speed, 0 Volts = creep speed)
6	16	Motor Start Relay signal (GROUND signal to activate Motor Start Relay)
7	41	Lift Valve B- (provides GROUND signal to Lift Valve)
8	none	none
9	14	Accelerator reference signal (3.6 Volts to Potentiometer)
10	none	none
11	none	none
12	none	none

ILLUSTRATION No.
ART_2182

LED Diagnostics Definitions (Flash Codes)

LED READING	DIAGNOSIS
LED Steady On	Controller is operational and detects no irregularities on monitored circuits.
LED Off	**No power-up** • No power to pin # 1 • No ground to B- post • LED failure or internal controller fault
2 Flashes	**Procedure fault.** • Enable depressed at power up • Enable depressed for more then 15 seconds without function request • No signal on wire 17 pin # 2 when function requested • No B- to diode board • Failed diode/s • Damaged wire harness • Internal controller fault
3 Flashes	**Motor circuit low.** Set with unit at rest and is the result of the voltage at M-2 dropping to approximately 4 volts or lower. Possible causes: • Short to ground in the motor circuit between the motor contactor and the M-2 terminal
4 Flashes	**Motor circuit high**. Set with the unit at rest and is the result of the voltage at M-2 terminal rising above 21 volts. Possible causes: • Motor contactor points are welded shut
5 Flashes	**Motor contactor circuit open**. Set when a function is requested but no current can flow through the motor circuit to the M-2 terminal. Possible causes: • Blown 200 amp fuse • Malfunctioning motor contactor • Worn motor brushes • Incomplete circuit to the Sevcon pin #6 If the motor and contactor circuits are diagnosed as working properly: • Sevcon internal fault

continued...

LED READING	DIAGNOSIS
6 Flashes	**Accelerator fault**. Set with unit at rest, a 6 flash will result in an 80% cutback of motor speed. The Accelerator is the proportional control circuitry for the Sevcon. It works in conjunction with the potentiometer located in the upper control box, which is connected to the joystick handle through a gear arrangement. **Measure voltage at terminals 14 and 15 on the platform terminal strip or at the potentiometer plug connection.** • With the joystick handle in neutral, 3.6 volts should be measured on the accelerator circuit (wire #14) • Voltage proportionally decreases with the travel of the joystick, with 0 volts at full stroke • With the joystick centered, voltages lower than 3.1 or higher than 3.9 will trigger a (6 flash) code
7 Flashes	**Battery voltage fault.** • This includes battery voltage below 12 volts or above 45 volts as measured on pin #1 • This code will disable all functions
8 Flashes	**Thermal cutback.** • Sevcon internal temperatures above 176 degrees F • Will limit motor speed in comparison with over temperature • Resets when cooled
9 Flashes	**Battery voltage at or below 18 volts** • As measured on pin #1 • This code will interrupt or prevent lift function but will allow drive and steer functions When lift is interrupted due to a 9 flash, the electric motor will still run.

Sevcon Motor Speed Controller - Connections

The following two pages describe the connections to the Sevcon Motor Speed Controller with a brief description of their function and the voltage measurements under normal conditions.

Important: Batteries must be fully charged before troubleshooting!
A fully charged battery set on a 24 V DC system will have a nominal voltage of 25.6 V DC

FUNCTION	VOLTAGE READING
PIN 1 – WIRE 22 (WIRE 9 ON EARLY UNITS)	
Battery Positive Input	Switched **5% less than battery voltage** • Controller power-up and reference point for battery state-of-charge • Green LED indicates controller power-up • Power travels through the upper emergency-stop switch with upper controls selected • 7-Flash code and 9-flash code indicate low voltage at this terminal
Pin 2 Wire 17	
Lift, Drive or Steer functions requested	Motorized function is requested **15%-18% less than battery voltage** • Controller begins the motor run sequence with this signal but still requires a signal on pin 4 and a change on pin 9 before the motor will operate
Pin 3 Wire 18	
Steer Function Requested	When steering is operated **15%-18% less than battery voltage** • Adds motor speed to compensate for addition of steer requirement during drive operation • Provides a minimum motor speed for steer requirement when only steer is operated
Pin 4 Wire 3	
Enable signal input	When joystick trigger pulled **5% less than battery voltage**. • Motor will not start without this input • A signal here longer then 15 seconds without a signal on pin-2 or pin-3 will result in a 2-flash code failure
Pin 5 Wire 21	
Speed cut-back signal from limit switch or Lift circuit	Full speed: **24 V DC** Creep speed: **0 V DC**. • Speed cut-back is the elevated drive speed

FUNCTION	VOLTAGE READING
PIN 6 – WIRE 16	
Motor Start Relay ground signal	Idle: **24 V DC** When function requested: **0 V DC** • This is how the Controller maintains control over the motor circuit • Sevcon controls the Motor Start Relay function ground signal • Will not operate the motor start relay when 2, 3, 4 & 7 flash codes occur
PIN 7 – WIRE 41	
Ground signal to Lift solenoid valve	**0 volts** No ground presence until lift is requested • By providing the ground signal, lift function can be prevented anytime battery voltage falls below 18 volts. This will result in a 9 flash code
PIN 9 – WIRE 14	
Accelerator reference signal to the potentiometer (upper control box)	From **3.5 V DC** with joystick in the neutral to **0 V DC** at full stroke • Controller uses this circuit to monitor joystick input after pins 2 & 4 energize • Controls motor speed in reference to the voltage on this circuit • Voltages above 4.0 V DC or below 3.0 V DC will result in a 6 flash code
POST B+	
Battery positive cable from 200 amp fuse	Full battery voltage • No real diagnostic value
POST B–	
Battery positive cable from 200 amp fuse	Battery ground cable connection Ground path for motor operation • All system ground wires (wire #s 15 & 15A) terminate here • Best place to connect ground lead from multi-meter while troubleshooting
POST M-2	
PWM controlled motor ground	Idle: **12 V DC – 13 V DC** During operation, between **5 V DC & 24 V DC** • 12 – 13 volts is reference voltage used by the controller to monitor motor circuit irregularities at idle • 0 volts at idle = 3 flash code • Above 20 volts at idle = 4 flash code • No voltage change after Motor Start Relay signal = 5 flash code

TROUBLESHOOTING BATTERY CHARGER

To be able to use the trouble shooting guide safely and effectively, it is important to read through this guide before beginning any tests.

CAUTION

Do not disassemble charger. Return to MEC when service or repair is required.

DANGER

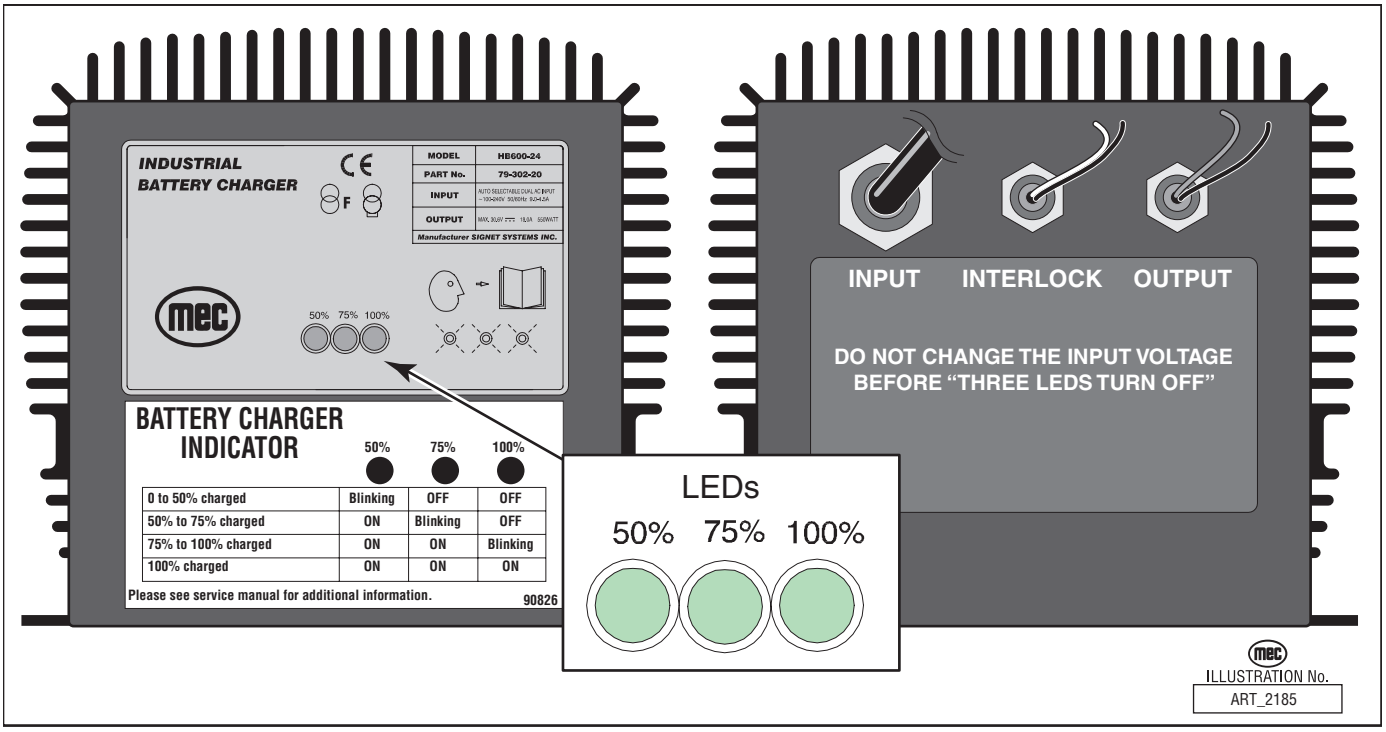
TO REDUCE THE RISK OF ELECTRIC SHOCK, ALWAYS DISCONNECT BOTH THE POWER SUPPLY CORD AND THE OUTPUT WIRES BEFORE ATTEMPTING MAINTENANCE.

WARNING

DO NOT OPERATE THE CHARGER IF IT IS MALFUNCTIONING. PERSONAL INJURY OR PROPERTY DAMAGE MAY RESULT.

Incorrect assembly may result in a risk of electric shock or fire. The following procedures are intended only to determine if a malfunction may exist in the charger. Most returned chargers test good, it is very important that this procedure is followed and that other problems are corrected before assuming the charger has failed.

The MEC battery charger is a fully automatic type with a maintenance feature that will maintain battery voltage indefinately when connected to an AC power source. The battery charger should be plugged into an unswitched AC source if stored for long periods of time.



	LED Status	Description
Fault	All 3 LED lamps blink once simultaneously	Output is open or short, or output voltage is over a limit. Otherwise, output terminals are reversed
	All 3 LED lamps blink twice simultaneously	Input voltage is out of the range
	All 3 LED lamps blink three times simultaneously	The internal temperature of the charger exceeds a limit
	All 3 LED lamps blink four times simultaneously	Output current exceeds a limit
Warning	100% LED lamp blinks	Battery pack has a bad cell

To determine if a charger is malfunctioning, identify the problem from the following list and refer to the appropriate section for detailed instructions.

1.) Charger does not turn on

2.) All 3 LEDs blink simultaneously

3.) 100% LED blinks while 50% and 75% LEDs are "OFF"

4.) Batteries do not fully charge

5.) The AC supply circuit breaker or fuse is blown

If the problem is not listed above, refer the problem to a qualified service agent for additional trouble shooting procedures.

Troubleshooting Battery Charger (continued)

PROBLEM	DIAGNOSIS
Charger does not turn ON	**The AC plug must be disconnected and reconnected to start the charger once it has turned-off from a charge cycle.** • Connect the AC supply cord securely to a live AC outlet • Double check the outlet to ensure it is working by connecting a known good piece of equipment with the outlet • Inspect the DC output wires and connections to be sure they are in good working condition • Refer to LED Flash Codes below if all 3 LEDs are flashing • Replace charger if everything else is correct
All 3 LEDs blink *ONCE* simultaneously	**Output connection error** • Check the battery and charger connection and correct • The output may not be connected to the batteries • The connections to the batteries may have corroded or loosened • The output may be shorted due to improper connection to the batteries or pinched wires • The output may be connected in reverse polarity to the batteries The charger will not be damaged by any of these problems
All 3 LEDs blink *TWICE* simultaneously	**AC input voltage tolerance beyond limit** • Check the AC input voltage. The charger is indicating the AC voltage is too low or too high This is an unusual problem and would most likely occur with a very poorly regulated engine-generator set providing the AC voltage to the charger.
All 3 LEDs blink *THREE TIMES* simultaneously	**Charger is overheated** • No action required. When the charger cools, charging will restart automatically • Check and correct for dirt or other debris on charger that may be reducing cooling
All 3 LEDs blink *FOUR TIMES* simultaneously	**Input or output over current** • No action required, charger will correct and restart automatically
100% LED blinks while 50% and 75% LEDs are "OFF"	**The 18 hour timer has elapsed and stopped charging. Batteries are unable to complete constant current and constant voltage charge cycle.** • Batteries are weak, old, or have one or more bad cells. Batteries will still charge but capacity will be reduced. Replace batteries • Battery pack too large for charger. Use higher output charger or unplug then plug-in charger to restart charge cycle to complete charging

PROBLEM	DIAGNOSIS
Batteries do not fully charge	**If the batteries are charged overnight, make sure the AC supply is not being switched-off at night with other building items.** • Check battery condition following the battery supplier's instructions • Check for dead cells or reduced capacity • Replace charger only if other problems are not found
The AC line circuit breaker or fuse is blown	**A defective circuit breaker or fuse, overloaded circuit, or a charger problem can cause this condition.** • Connect the charger to a different AC outlet (on a different circuit) in the building • If the charger operates properly on other AC outlets, a qualified Person should correct the AC outlet problem • If the AC supply checks good, the charger should be replaced

SECTION 6

SCHEMATICS

Hydraulic Schematics **6-2**
1532ES - Serial # 9001000 - 9001099
1932ES - Serial # 9104000 - 9104999 6-2
1532ES - Serial # 9001100 - Current
1932ES - Serial # 9105000 - Current 6-4

Electric Schematics **6-9**
1532ES, S/N 9000500 - 9001099
1932ES, S/N 9104000 - 9104999 6-10
1532ES, S/N 9002000 - Current
1932ES, S/N 9105000 - Current 6-12

HYDRAULIC SCHEMATICS

1532ES - Serial # 9001000 - 9001099
1932ES - Serial # 9104000 - 9104999

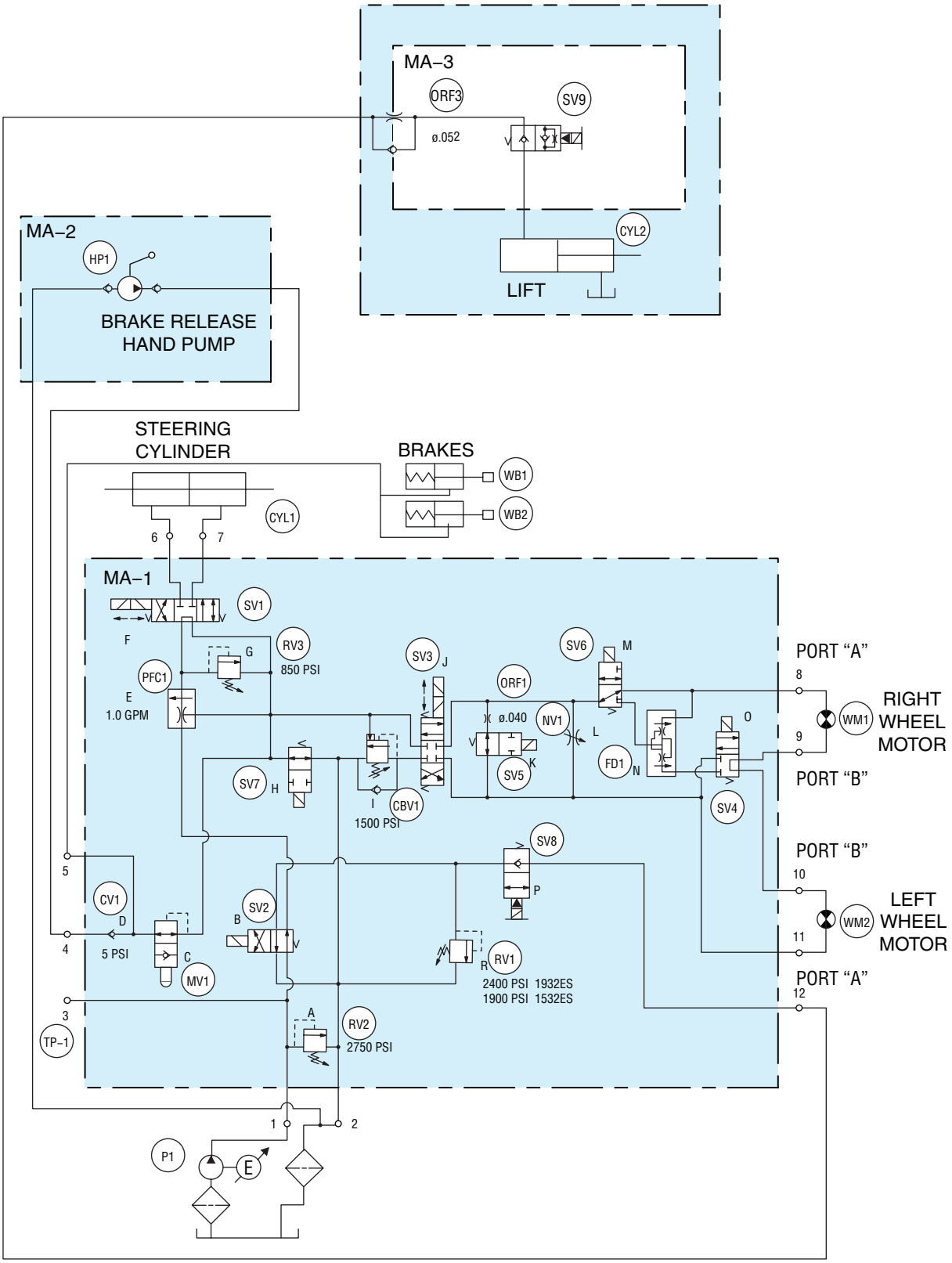
ITEM	DESCRIPTION	Location
CBV1	Counterbalance Valve	Main Manifold (MA-1)
CV1	Check Valve	Main Manifold (MA-1)
CYL1	Steering Cylinder	Machine Base, Front
CYL2	Lift Cylinder, 2047, 2647	Scissor Assembly
FD1	Flow Divider	Main Manifold (MA-1)
HP1	Hand Pump, Brakes	Brake Release Manifold (MA-2)
MA-1	Main Manifold Assembly	Battery Compartment
MA-2	Brake Release Manifold	Battery Compartment
MA-3	Manifold Assembly	Lift Cylinder
MV1	Manifold Valve	Main Manifold (MA-1)
NV1	Needle Valve	Main Manifold (MA-1)
ORF1	Orifice Plug, Wheel Motors	Main Manifold (MA-1)
ORF3	Orifice, Down Valve	Lift Cylinder Manifold (MA-3)
P1	Pump	Pump Compartment
PCF1	Steering Relief Flow Control	Main Manifold (MA-1)
RV1	Relief Valve, Lift Relief	Main Manifold (MA-1)
RV2	Relief Valve, Main Relief	Main Manifold (MA-1)
RV3	Relief Valve, Steering	Main Manifold (MA-1
SV1	Spool Valve, Steering	Main Manifold (MA-1)
SV2	Spool Valve, Lift	Main Manifold (MA-1)
SV3	Spool Valve, Drive	Main Manifold (MA-1)
SV4	Spool Valve, Decel	Main Manifold (MA-1)
SV5	Spool Valve, Torque	Main Manifold (MA-1)
SV6	Spool Valve, Torque	Main Manifold (MA-1)
SV7	Spool Valve, Brakes	Main Manifold (MA-1)
SV8	Poppet Valve, Down	Main Manifold (MA-1)
SV9	Spool Valve, Down	Lift Cylinder Manifold (MA-3)
TP1	Test Port	Main Manifold (MA-1)
WB1	Wheel Brake	Drive Wheel
WB2	Wheel Brake	Drive Wheel
WM1	Wheel Motor, Right Side	Machine Base
WM2	Wheel Motor, Left Side	Machine Base

HYDRAULIC SCHEMATIC

Model: / Serial #

1532ES | 9001000 - 9001099
1932ES | 9104000 - 9104999
2033ES | 8804000 - 8804099
2633ES | 11100000 - 11100599

Reference Art #: 915 | Publication Art #: ART_2194

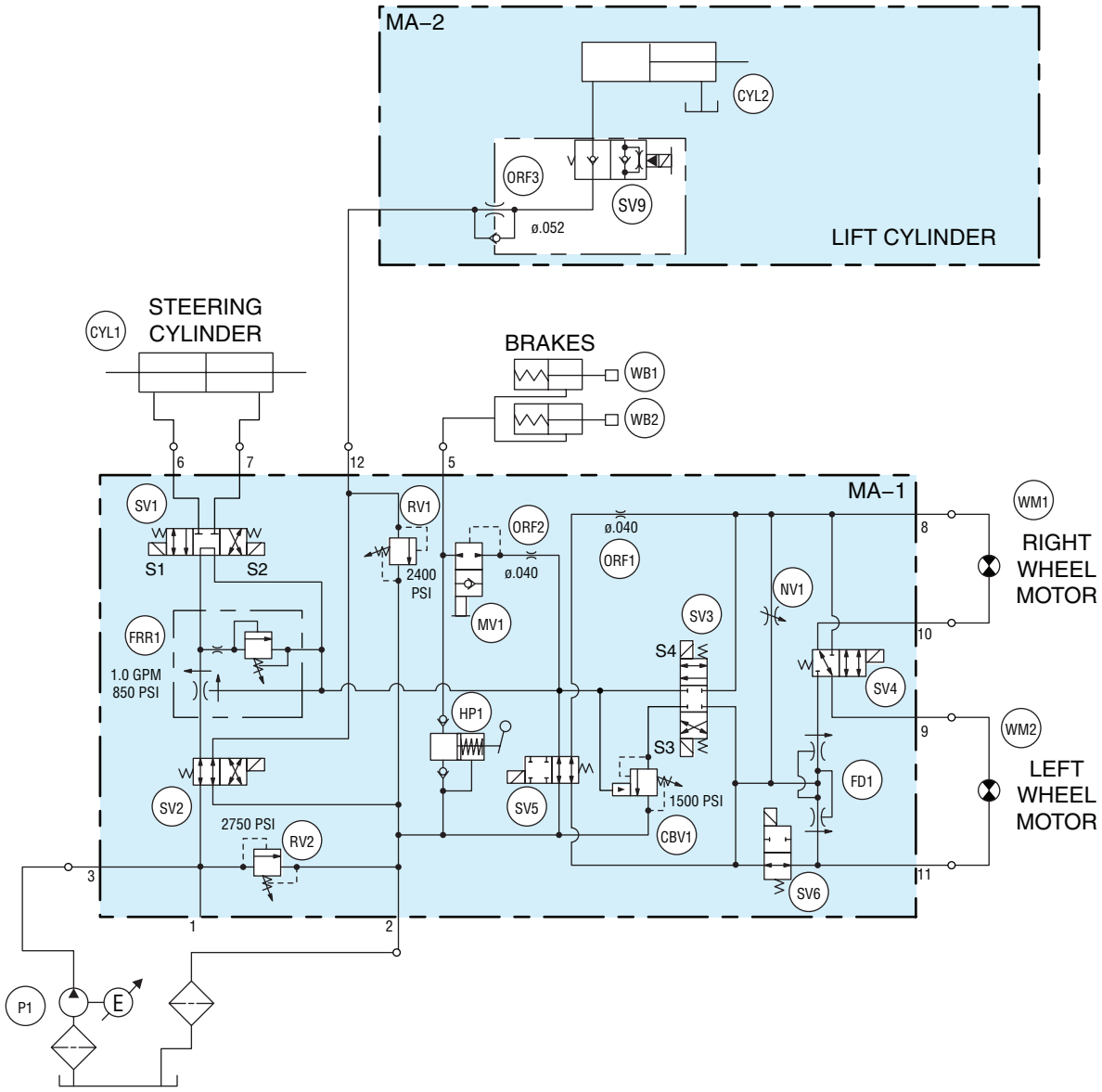


1532ES - Serial # 9001100 - Current
1932ES - Serial # 9105000 - Current

ITEM	DESCRIPTION	Location
CBV1	Counterbalance Valve	Main manifold (MA-1)
CYL1	Steering Cylinder	Machine Base, Front
CYL2	Lift Cylinder	Scissor Assembly
FD1	Flow Divider	Main manifold (MA-1)
FRR1	Steering Relief Flow Control	Main manifold (MA-1)
HP1	Hand Pump, Brakes	Brake Release Manifold (MA-2)
MA-1	Main Manifold Assembly	Machine Base, Battery Compartment
MA-2	Manifold Assembly	Lift Cylinder
MV1	Manifold Valve	Main manifold (MA-1)
NV1	Needle Valve	Main manifold (MA-1)
ORF1	Orifice Plug, Wheel Motors	Main manifold (MA-1)
ORF2	Orifice Disc, Brake Release	Main manifold (MA-1)
ORF3	Orifice, Down Valve	Lift Cylinder Manifold (MA-3)
P1	Pump	Pump Compartment
RV1	Relief Valve, Lift Relief	Main manifold (MA-1)
RV2	Relief Valve, Main Relief	Main manifold (MA-1)
SV1	Spool Valve, Steering	Main manifold (MA-1)
SV2	Spool Valve, Lift	Main manifold (MA-1)
SV3	Spool Valve, Drive	Main manifold (MA-1)
SV4	Spool Valve, Brake/Decel	Main manifold (MA-1)
SV5	Spool Valve, Torque	Main manifold (MA-1)
SV6	Spool Valve, Torque	Main manifold (MA-1)
SV9	Spool Valve, Down	Lift Cylinder Manifold (MA-2)
WB1	Wheel Brake	Drive Wheel
WB2	Wheel Brake	Drive Wheel
WM1	Wheel Motor, Right Side	Machine Base
WM2	Wheel Motor, Left Side	Machine Base

HYDRAULIC SCHEMATIC

Model: / Serial #	
1532ES | 9001100 -	
1932ES | 9105000 -	
2033ES | 8804100 -	
2633ES | 1101000 -	
Reference Art #: 965	Publication Art #: ART_2195



Hydraulic Manifold - early style

Model: / Serial #
1532ES CE | 1932ES
2033ES CE | 2633ES

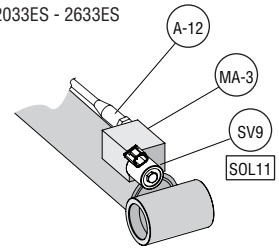
Reference Art #: none | Publication Art #: ART_2460

NOTE: Early style manifold. Refer to Hydraulic Schematic for serial # break

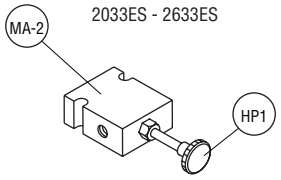
	COMPONENTS		FUNCTION
MA1	CBV1	Relief Valve	Counter Balance
	CV1	Check Valve	Flow Control, Brakes
	SOL1	Coil (SV1)	Steer Right
	SOL2	Coil SV1)	Steer Left
	SOL3	Coil (SV5)	Drive/Decel
	SOL4	Coil (SV2)	Lift
	SOL5	Coil (SV4)	Torque
	SOL6	Coil (SV6)	Torque
	SOL7	Coil (SV3)	Drive Forward
	SOL8	Coil (SV3)	Drive Reverse
	SOL9	Coli (SV7)	Brakes
	SOL10	Coil (SV8)	Down
	FD1	Flow Divider	
	MV1	Manual Valve	Brake Release
	NV1	Needle Valve	Freewheel
	ORF1	Orifice Plug	
	PFC1	Flow Control	Steer Relief
	RV1	Relief Valve	Lift Relief
	RV2	Relief Valve	Main Relief
	RV3	Relief Valve	Steering Relief
	SV1	Spool Valve	Steering Control
	SV2	Spool Valve	Lift Control
	SV3	Spool Valve	Direction Control
	SV4	Spool Valve	Torque
	SV5	Spool Valve	Drive Dump/Decel
	SV6	Spool Valve	Torque
	SV7	Spool Valve	Brakes
	SV8	Poppet Valve	Down
MA2	HP1	Hand Pump	Brake Release
MA3	SOL11	Coil (SV9)	Down, Lift Cylinder
	SV9	Spool Valve	Emergency Lowering
	A12	Pressure Sensor	Overload

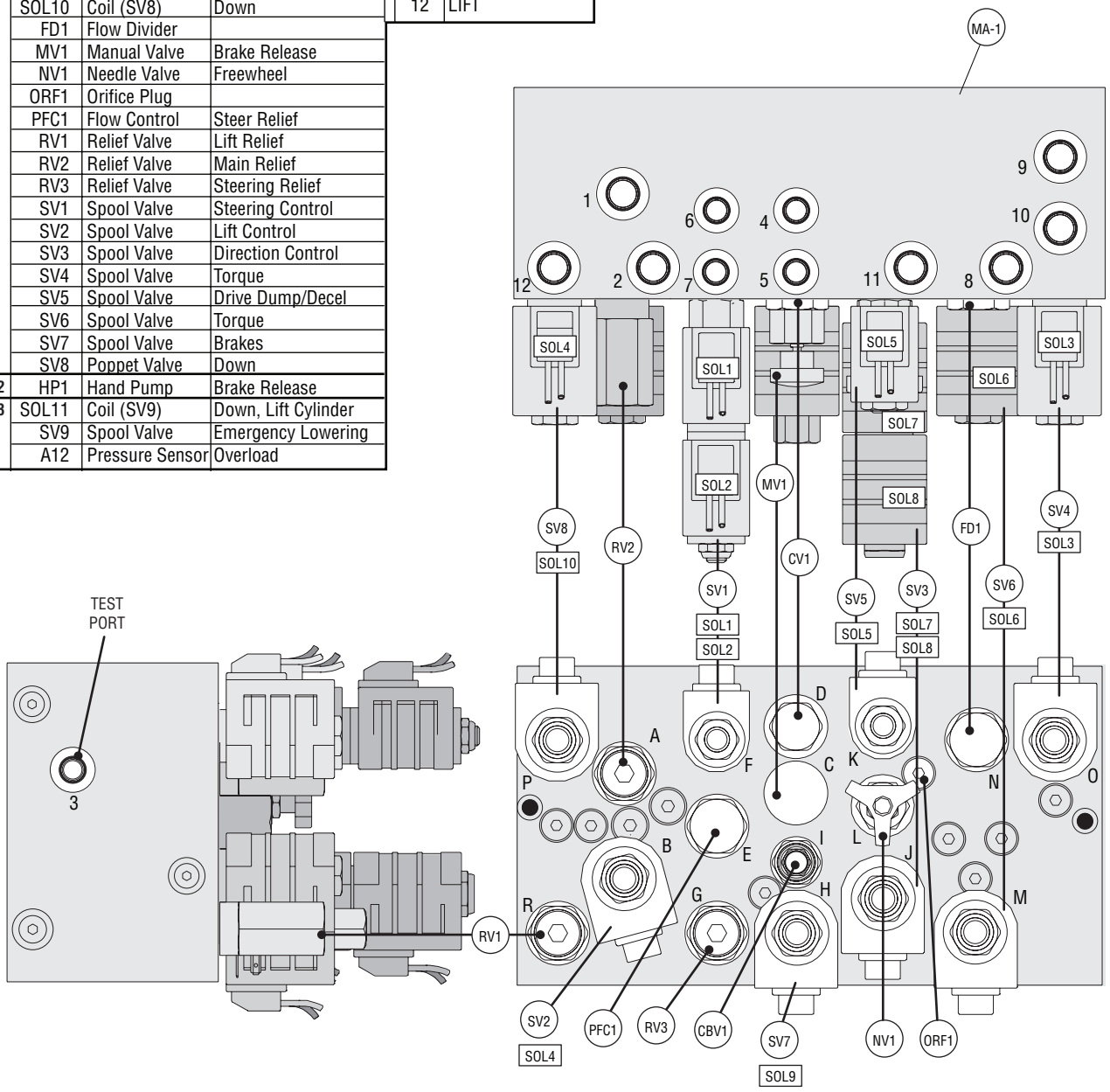
PORTS	
1	PUMP
2	TANK
3	TEST PORT
4	BRAKE RELEASE
5	BRAKE
6	STEER
7	STEER
8	RIGHT A
9	RIGHT B
10	LEFT B
11	LEFT A
12	LIFT

LIFT CYLINDER
1532ES - 1932ES
2033ES - 2633ES



BRAKE RELEASE HAND PUMP
1532ES - 1932ES
2033ES - 2633ES





Hydraulic Manifold - current style

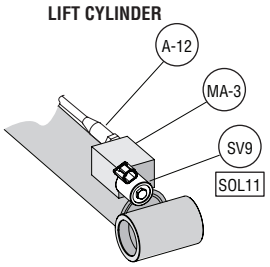
Model: / Serial #
1532ES CE | 1932ES CE
2033ES CE | 2633ES CE

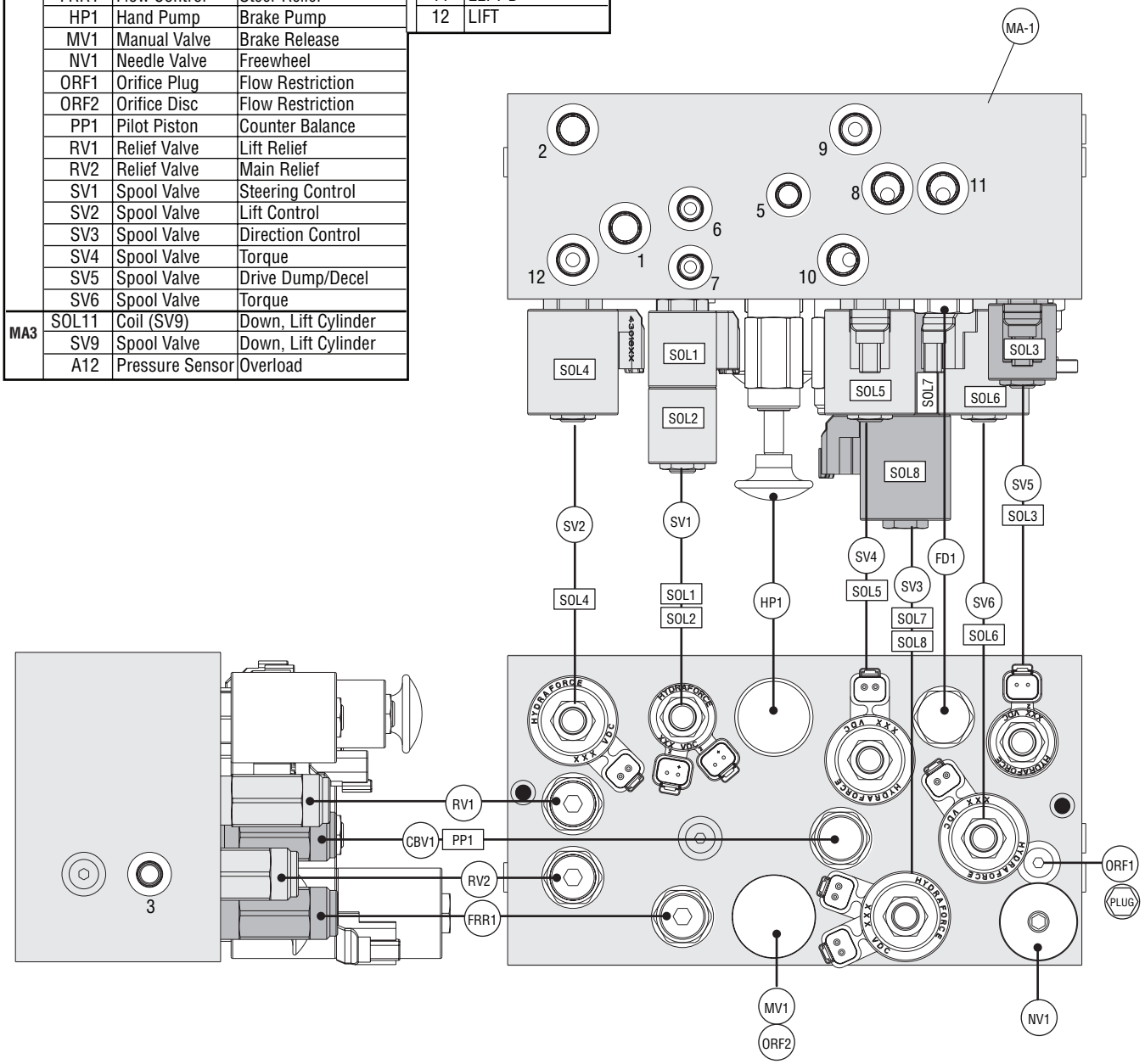
Reference Art #: none | Publication Art #: ART_2459

NOTE: Current style manifold. Refer to Hydraulic Schematic for serial # break

	COMPONENTS		FUNCTION
MA1	CBV1	Relief Valve	Counter Balance
	SOL1	Coil (SV1)	Steer Right
	SOL2	Coil SV1)	Steer Left
	SOL3	Coil (SV5)	Brake/Decel
	SOL4	Coil (SV2)	Lift
	SOL5	Coil (SV4)	Torque
	SOL6	Coil (SV6)	Torque
	SOL7	Coil (SV3)	Drive Forward
	SOL8	Coil (SV3)	Drive Reverse
	FD1	Flow Divider	
	FRR1	Flow Control	Steer Relief
	HP1	Hand Pump	Brake Pump
	MV1	Manual Valve	Brake Release
	NV1	Needle Valve	Freewheel
	ORF1	Orifice Plug	Flow Restriction
	ORF2	Orifice Disc	Flow Restriction
	PP1	Pilot Piston	Counter Balance
	RV1	Relief Valve	Lift Relief
	RV2	Relief Valve	Main Relief
	SV1	Spool Valve	Steering Control
	SV2	Spool Valve	Lift Control
	SV3	Spool Valve	Direction Control
	SV4	Spool Valve	Torque
	SV5	Spool Valve	Drive Dump/Decel
	SV6	Spool Valve	Torque
MA3	SOL11	Coil (SV9)	Down, Lift Cylinder
	SV9	Spool Valve	Down, Lift Cylinder
	A12	Pressure Sensor	Overload

PORTS	
1	PUMP
2	TANK
3	TEST PORT
4	N/A
5	BRAKE
6	STEER
7	STEER
8	RIGHT B
9	LEFT A
10	RIGHT A
11	LEFT B
12	LIFT





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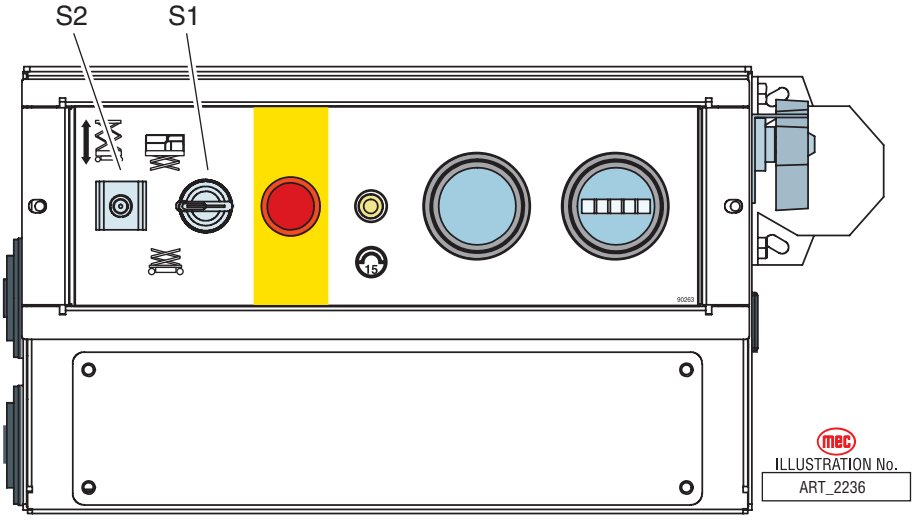
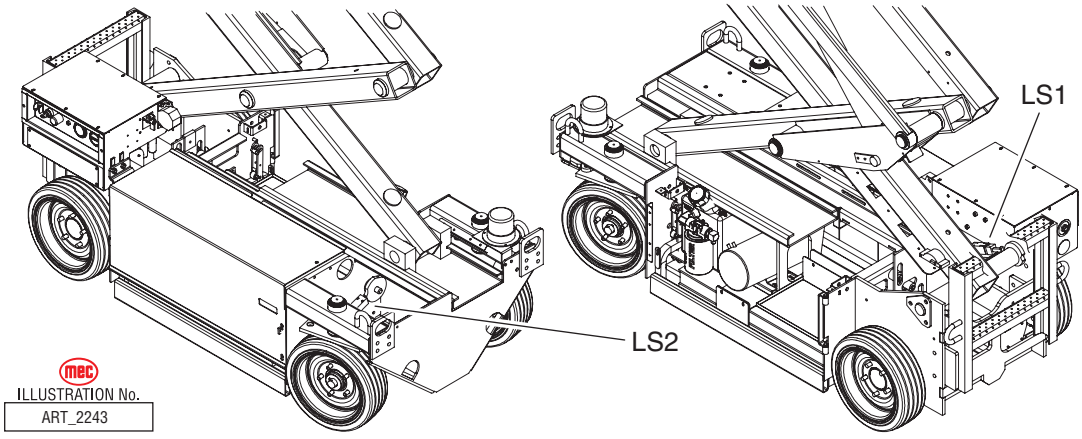
ELECTRIC SCHEMATICS

NOTES: (Unless otherwise specified)

1. Switch **S1 BASE/PLATFORM** makes contact from the CENTER to the LEFT position when placed in **BASE**.
2. Switch **S2 UP/DOWN** makes contact from the CENTER to the LEFT position when the switch is held in the CONTACT position and automatically returns to the CENTER position when released.
3. Switch **LS1** opens the N/C set of contacts and closes the N/O set of contacts when the platform reaches approximately 2 meters.
4. Switch **LS2** closes the N/C set of contacts when the Pothole Bars are down and locked in place.





1532ES, S/N 9000500 - 9001099
1932ES, S/N 9104000 - 9104999

ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Overload Light, 28V	Warn when Machine is Overloaded	Upper Control Box
A5	Push-Button Switch	Activates Horn	On Upper Control Box
A6	Horn, 12V - 48V (option)	Activated by Operator	Under Platform
A7	Overload/Motion Alarm (option)	Warn of Movement	Outside Lower Control Box
A8	Motion Light (option)	Warn of Movement	Front Left Corner of Machine
A9	Hour Meter	Record Machine Usage Time	Lower Control Panel
A10	Platform Alarm	Warn of Platform Overload and Tilt	Upper Control Box
A11	Battery Indicator	Show Battery Status	Lower Control Panel
A12	Pressure Transducer	Measure Lift Cyl Pressure for Load Sense	Lift Cylinder Manifold
A13	Angle Transducer (Height Sensor)	Measure Scissor Angle for Load Sense	Lowest Scissor Beam
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
BD1	Battery Disconnect Switch	Disconnect All Electrical Power	Lower Control Box
CB1	Circuit Breaker, 15AMP Manual	Control Circuit Protection	Lower Control Panel
CH1	Battery Charger	Recharges 24-VDC Battery Pack	Machine Base, Rear
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
D18	Diode	Control Reverse Drive Speed – Elevated	Main Manifold
ES1	Switch, Emergency Stop	Shutdown All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shutdown All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
LS1	Limit Switch, Double Pole	Enable Drive and High Speed	Right Rear Corner of Machine
LS2	Limit Switch, Single Pole	Drive Enable if Pothole Deployed	On pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Inside Pump Compartment
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
R1 - R4	Circuit Board Resistors	Circuit Board Functions	Inside Lower Control Box
RL1	Load Sense Relay	Disable Functions if Platform Overloaded	Lower Control Box
S1	Key Switch, N/O Contact Block	Select Base or Platform Controls	Lower Control Panel
S2	Switch, Toggle	Lift/Lower at Lower Controls	Lower Control Panel
S3	Switch, Push Button	Enable Other Functions at Platform	Upper Control Box Handle
S4	Switch, Micro	Right Turn Switch	Upper Control Box Handle
S5	Switch, Micro	Left Turn Switch	Upper Control Box Handle
S6	Switch, Toggle	Select LIFT or DRIVE	Upper Control Box
S7	Switch, Micro	Reverse or Lift Switch	Upper Control Box
S8	Switch, Micro	Forward or Down Switch	Upper Control Box
S9	Switch, Toggle	Torque Switch	Upper Control Box
SOL1	Coil, Turn Right Solenoid	Activate Turn Right Valve (SV1)	Main Manifold
SOL2	Coil, Turn Left Solenoid	Activate Turn Left Valve (SV1)	Main Manifold
SOL3	Coil, Decel Solenoid	Activate Decel Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5	Coil, Torque Solenoid	Activate Torque Valve (SV4)	Main Manifold
SOL6	Coil, Torque Solenoid	Activate Torque Valve (SV6)	Main Manifold
SOL7	Coil, Reverse Solenoid	Activate Reverse Valve (SV3)	Main Manifold
SOL8	Coil, Forward Solenoid	Activate Forward Valve (SV3)	Main Manifold
SOL9	Coil, Brake Solenoid	Activate Brake Valve (SV7)	Main Manifold
SOL10	Coil, Down Solenoid	Activate Down Valve (SV8)	Main Manifold
SOL11	Coil, Down Solenoid	Activate Down Valve (SV9)	Lift Cylinder Manifold

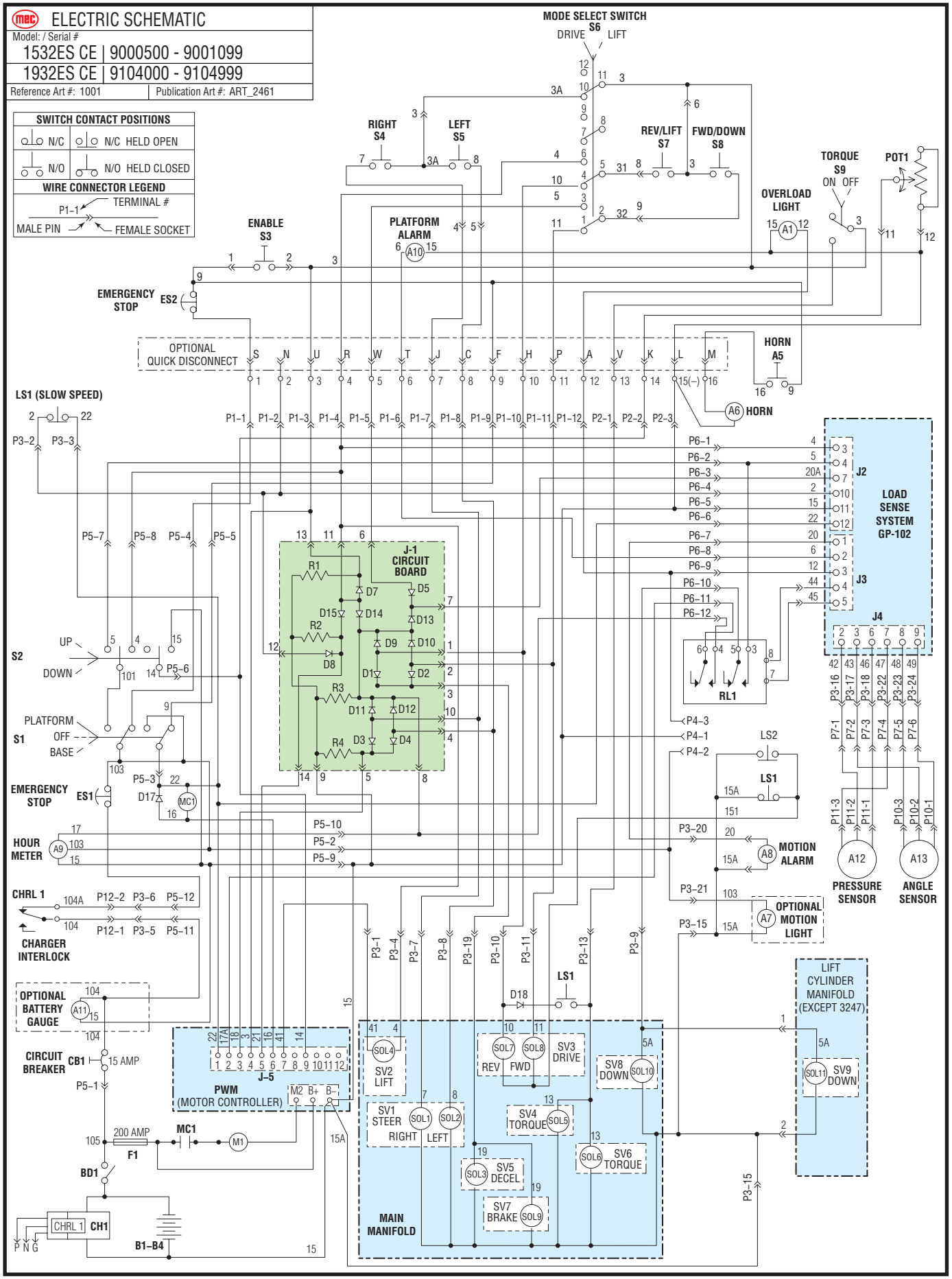
ELECTRIC SCHEMATIC

Model: / Serial #

1532ES CE | 9000500 - 9001099

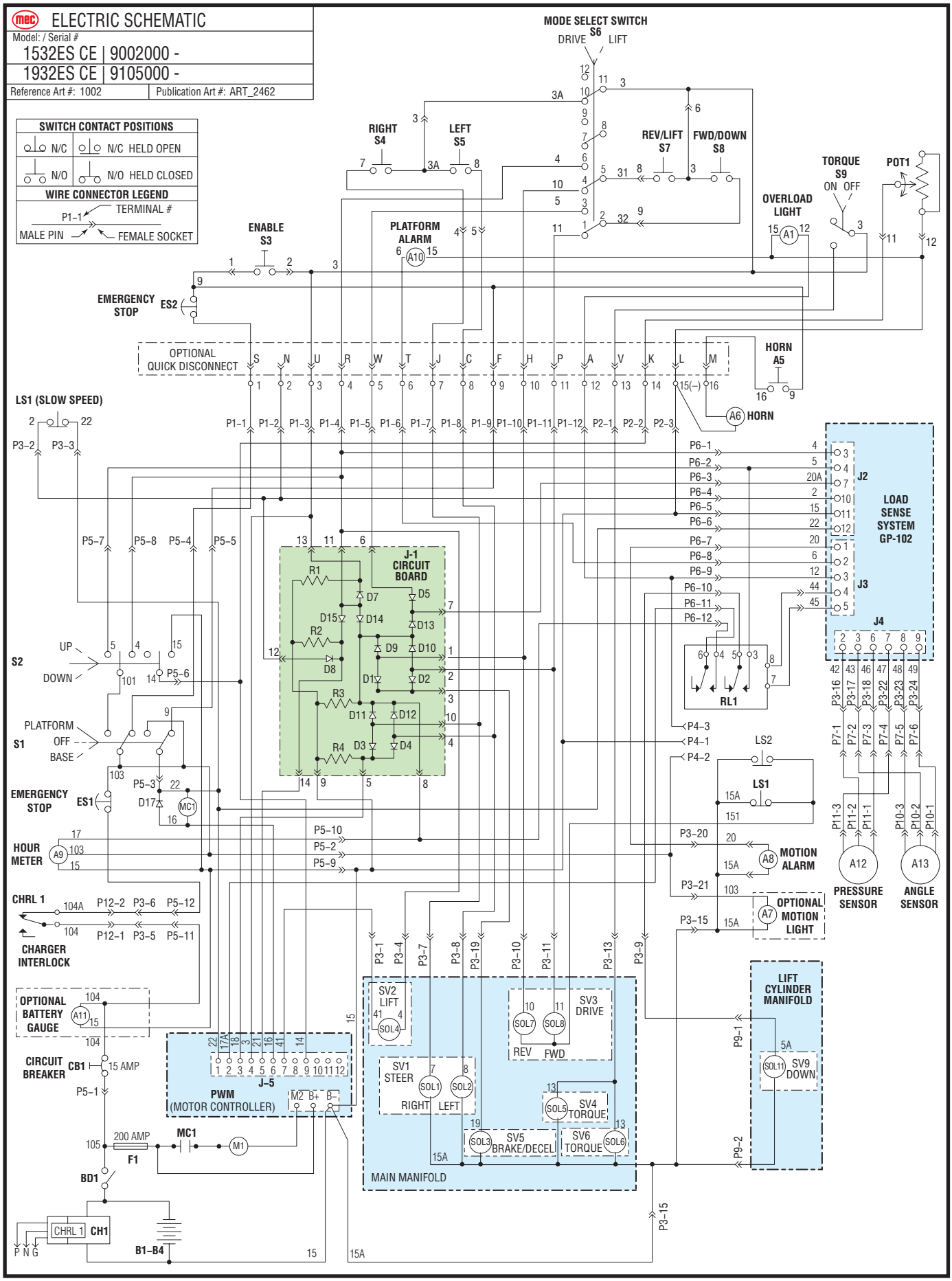
1932ES CE | 9104000 - 9104999

Reference Art #: 1001 | Publication Art #: ART_2461



1532ES, S/N 9002000 - Current
1932ES, S/N 9105000 - Current

ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Overload Light, 28V	Warn when Machine is Overloaded	Upper Control Box
A5	Push-Button Switch	Activates Horn	On Upper Control Box
A6	Horn, 12V - 48V (option)	Activated by Operator	Under Platform
A7	Overload/Motion Alarm (option)	Warn of Movement	Outside Lower Control Box
A8	Motion Light (option)	Warn of Movement	Front Left Corner of Machine
A9	Hour Meter	Record Machine Usage Time	Lower Control Panel
A10	Platform Alarm	Warn of Platform Overload and Tilt	Upper Control Box
A11	Battery Indicator	Show Battery Status	Lower Control Panel
A12	Pressure Transducer	Measure Lift Cyl Pressure for Load Sense	Lift Cylinder Manifold
A13	Angle Transducer (Height Sensor)	Measure Scissor Angle for Load Sense	Lowest Scissor Beam
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
BD1	Battery Disconnect Switch	Disconnect All Electrical Power	Lower Control Box
CB1	Circuit Breaker, 15AMP Manual	Control Circuit Protection	Lower Control Panel
CH1	Battery Charger	Recharges 24-VDC Battery Pack	Machine Base, Rear
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
ES1	Switch, Emergency Stop	Shutdown All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shutdown All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
LS1	Limit Switch, Double Pole	Enable Drive and High Speed	Right Rear Corner of Machine
LS2	Limit Switch, Single Pole	Drive Enable if Pothole Deployed	On pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Inside Pump Compartment
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
R1 - R4	Circuit Board Resistors	Circuit Board Functions	Inside Lower Control Box
RL1	Load Sense Relay	Disable Functions if Platform Overloaded	Lower Control Box
S1	Key Switch, N/O Contact Block	Select Base or Platform Controls	Lower Control Panel
S2	Switch, Toggle	Lift/Lower at Lower Controls	Lower Control Panel
S3	Switch, Push Button	Enable Other Functions at Platform	Upper Control Box Handle
S4	Switch, Micro	Right Turn Switch	Upper Control Box Handle
S5	Switch, Micro	Left Turn Switch	Upper Control Box Handle
S6	Switch, Toggle	Select LIFT or DRIVE	Upper Control Box
S7	Switch, Micro	Reverse or Lift Switch	Upper Control Box
S8	Switch, Micro	Forward or Down Switch	Upper Control Box
S9	Switch, Toggle	Torque Switch	Upper Control Box
SOL1	Coil, Turn Right Solenoid	Activate Turn Right Valve (SV1)	Main Manifold
SOL2	Coil, Turn Left Solenoid	Activate Turn Left Valve (SV1)	Main Manifold
SOL3	Coil, Decel Solenoid	Activate Decel Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5	Coil, Torque Solenoid	Activate Torque Valve (SV4)	Main Manifold
SOL6	Coil, Torque Solenoid	Activate Torque Valve (SV6)	Main Manifold
SOL7	Coil, Reverse Solenoid	Activate Reverse Valve (SV3)	Main Manifold
SOL8	Coil, Forward Solenoid	Activate Forward Valve (SV3)	Main Manifold
SOL11	Coil, Down Solenoid	Activate Down Valve (SV9)	Lift Cylinder Manifold


ELECTRIC SCHEMATIC
Model: / Serial #
1532ES CE | 9002000 -
1932ES CE | 9105000 -
Reference Art #: 1002
Publication Art #: ART_2462
SWITCH CONTACT POSITIONS
N/C
N/C HELD OPEN
N/O
N/O HELD CLOSED
WIRE CONNECTOR LEGEND
TERMINAL #
P1-1
MALE PIN
FEMALE SOCKET
MODE SELECT SWITCH
S6
DRIVE
LIFT
RIGHT
S4
LEFT
S5
REV/LIFT
S7
FWD/DOWN
S8
TORQUE
S9
ON OFF
POT1
OVERLOAD
LIGHT
ENABLE
S3
PLATFORM
ALARM
EMERGENCY
STOP
ES2
OPTIONAL
QUICK DISCONNECT
HORN
A5
A6 HORN
LS1 (SLOW SPEED)
J-1
CIRCUIT
BOARD
LOAD
SENSE
SYSTEM
GP-102
J2
J3
J4
RL1
S2
UP
DOWN
S1
PLATFORM
OFF
BASE
EMERGENCY
STOP
ES1
HOUR
METER
CHRL 1
CHARGER
INTERLOCK
LS2
LS1
MOTION
ALARM
OPTIONAL
MOTION
LIGHT
PRESSURE
SENSOR
ANGLE
SENSOR
OPTIONAL
BATTERY
GAUGE
CIRCUIT
BREAKER
CB1
15 AMP
J-5
PWM
(MOTOR CONTROLLER)
200 AMP
F1
MC1
BD1
CHRL 1
CH1
B1-B4
SV2
LIFT
SV3
DRIVE
REV
FWD
SV1
STEER
RIGHT
LEFT
SV4
TORQUE
SV5
BRAKE/DECEL
SV6
TORQUE
MAIN MANIFOLD
LIFT
CYLINDER
MANIFOLD
SV9
DOWN

Component Locations

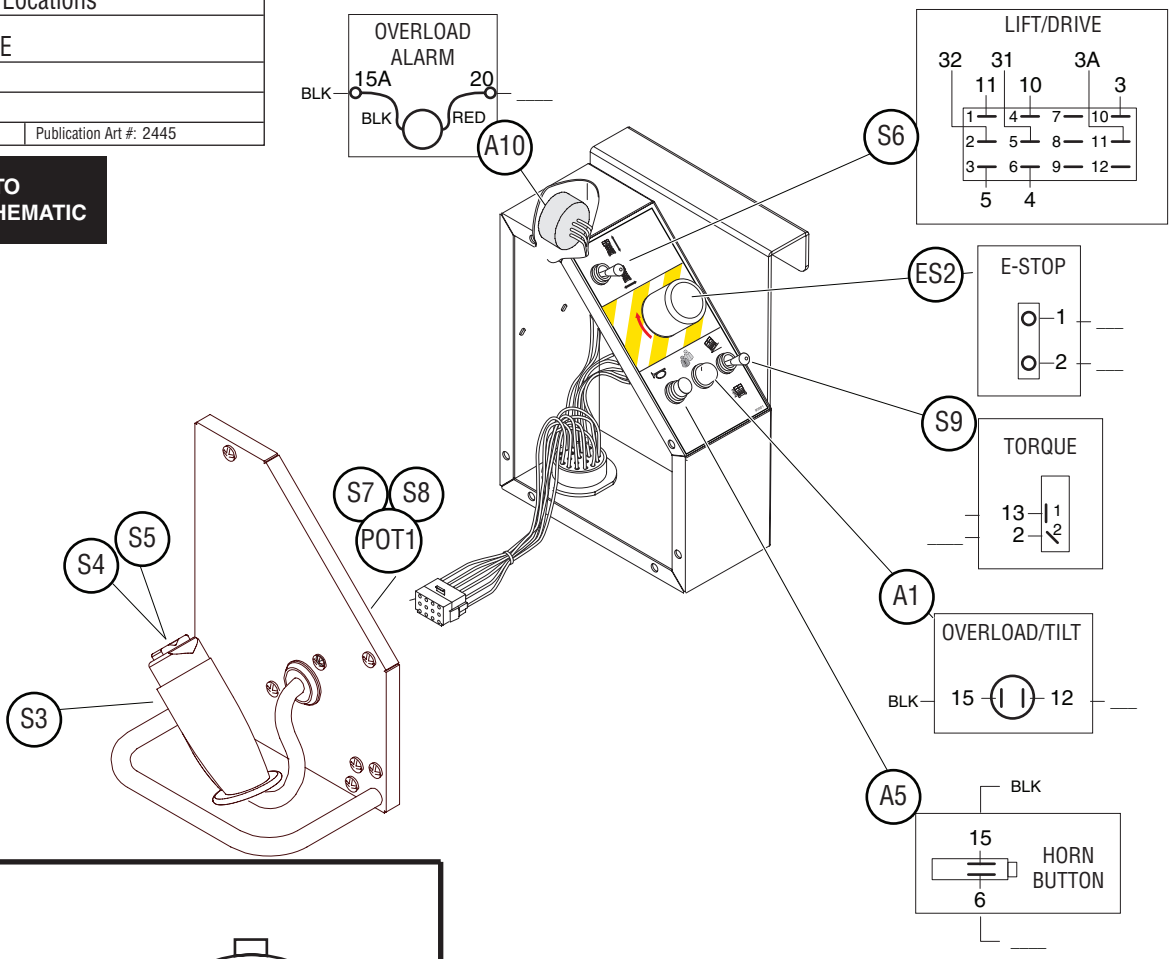
Model: / Serial #
ES Models: all CE

_

_

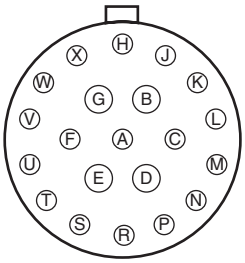
Reference Art #: none | Publication Art #: 2445

REFER TO ELECTRIC SCHEMATIC

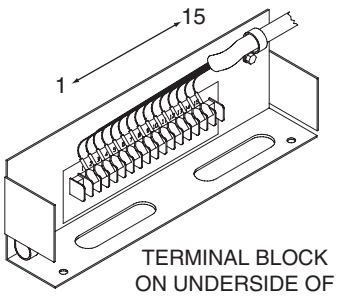


REMOVABLE CONTROL HARNESS

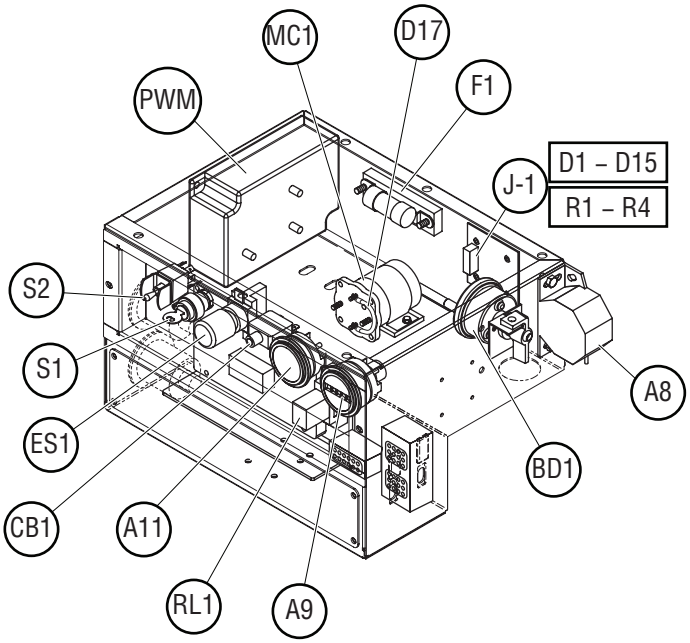
PIN #	WIRE #
S	1
F	9
W	5
R	4
V	13
A	12
H	10
P	11
U	3
T	6
J	7
N	2
C	8
K	14
M	16 (GND)
L	15



END VIEW OF REMOVABLE CONTROL HARNESS (OPTIONAL QUICK DISCONNECT)

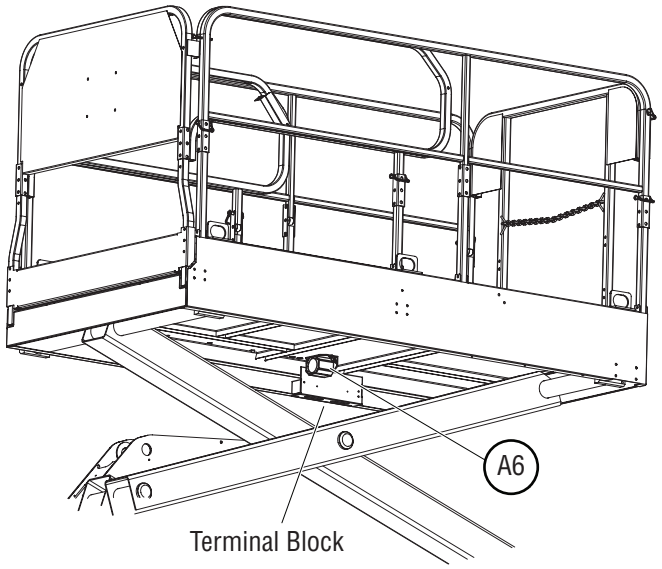


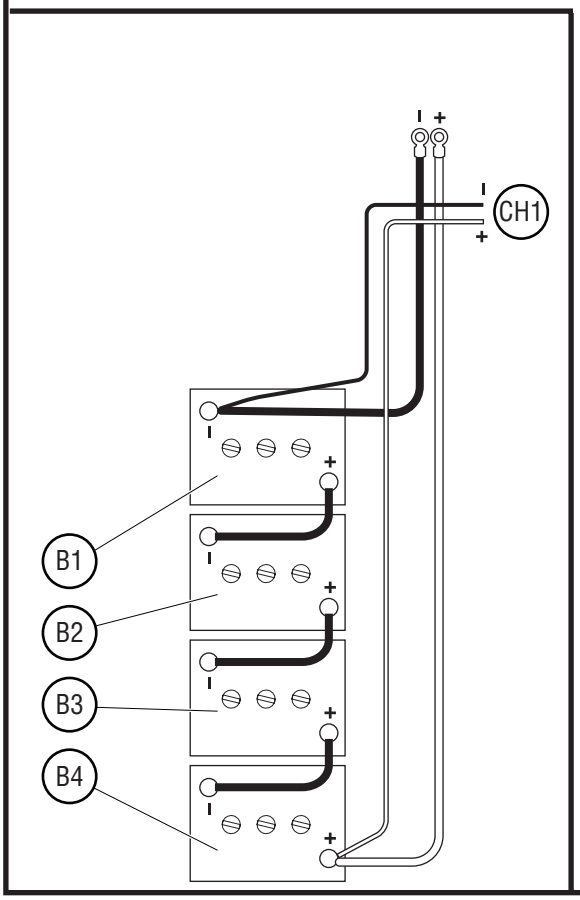
TERMINAL BLOCK ON UNDERSIDE OF PLATFORM DECK

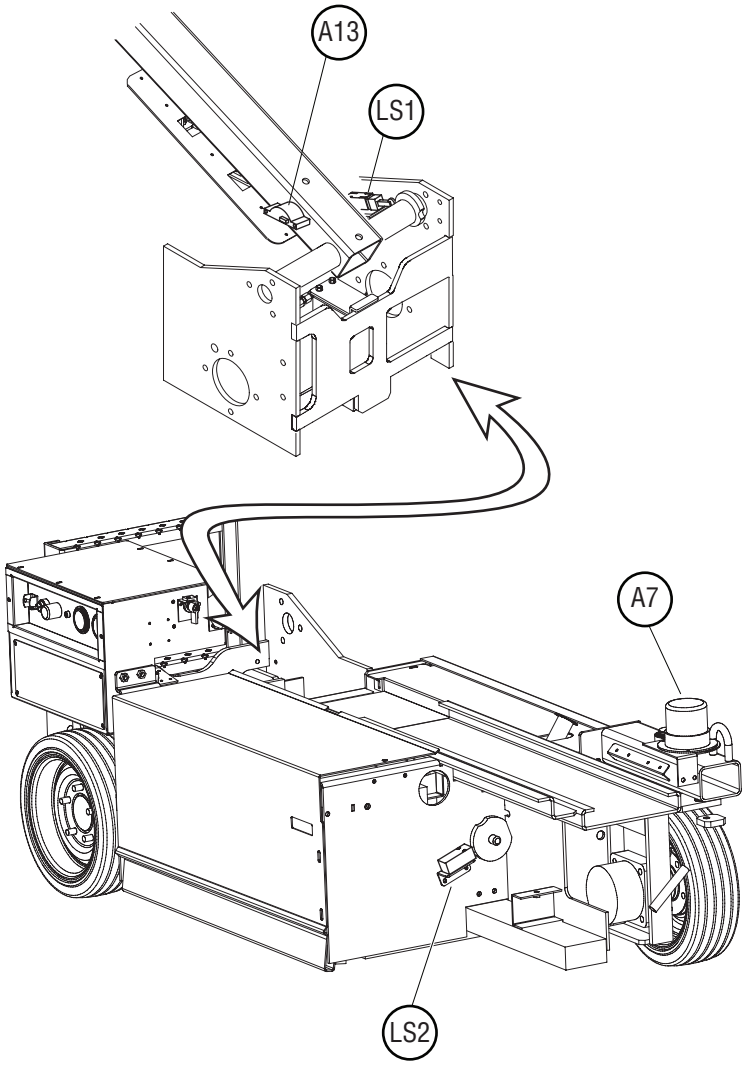


Component Locations	
Model: / Serial # 1532ES - 1932ES: all CE	
_	
_	
Reference Art #: none	Publication Art #: ART_2446

REFER TO ELECTRIC SCHEMATIC







Component Locations

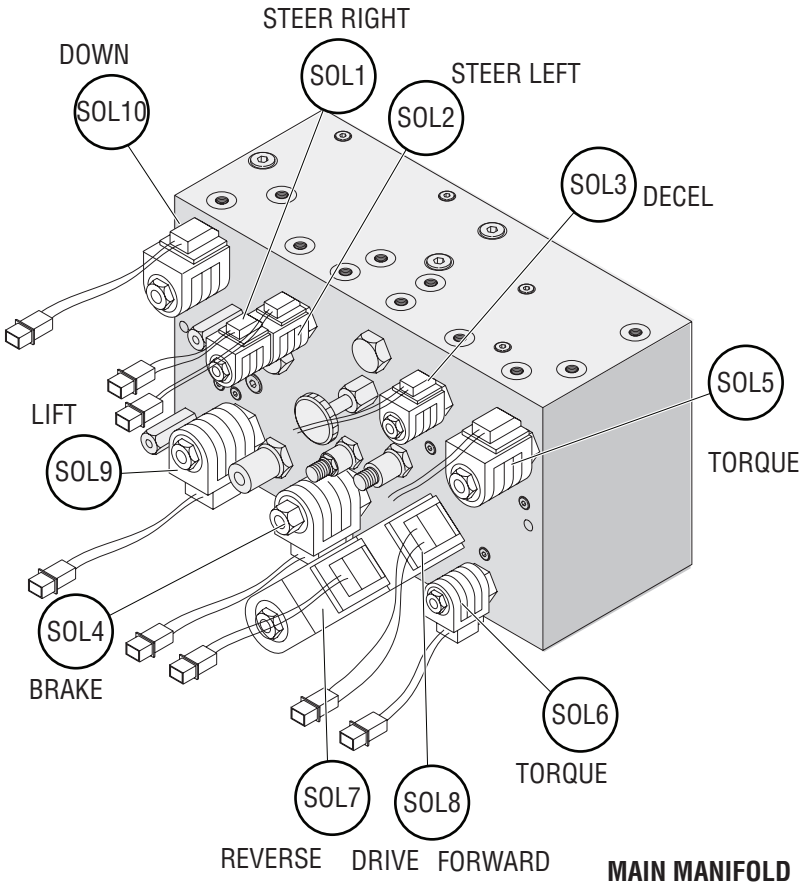
Model: / Serial #
ES Models: all CE

_

_

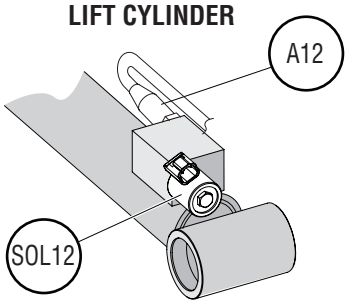
Reference Art #: none | Publication Art #: ART_2447

REFER TO ELECTRIC SCHEMATIC

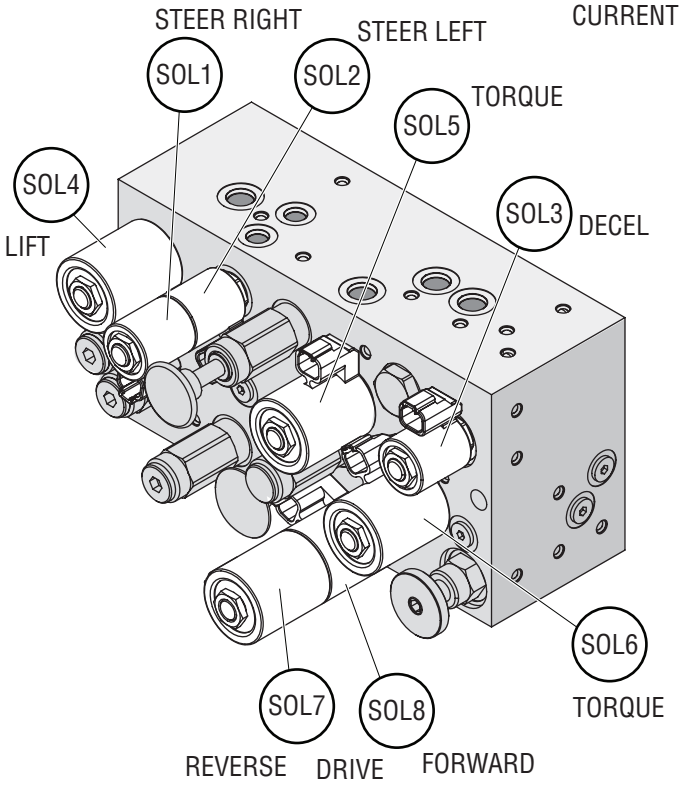


MAIN MANIFOLD
EARLY MODELS

LIFT CYLINDER



MAIN MANIFOLD
CURRENT MODELS



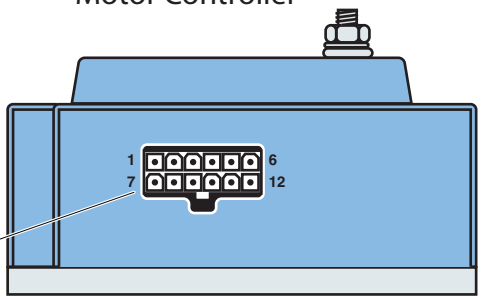
Controller Plug Pin Identicication

Model: / Serial #
ES Models : all

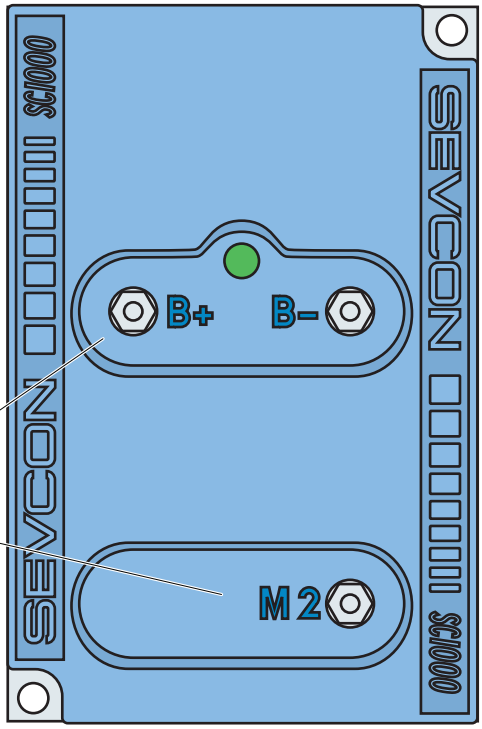
Reference Art #: none | Publication Art #: 2217

REFER TO ELECTRIC SCHEMATIC

PWM
Motor Controller



J5



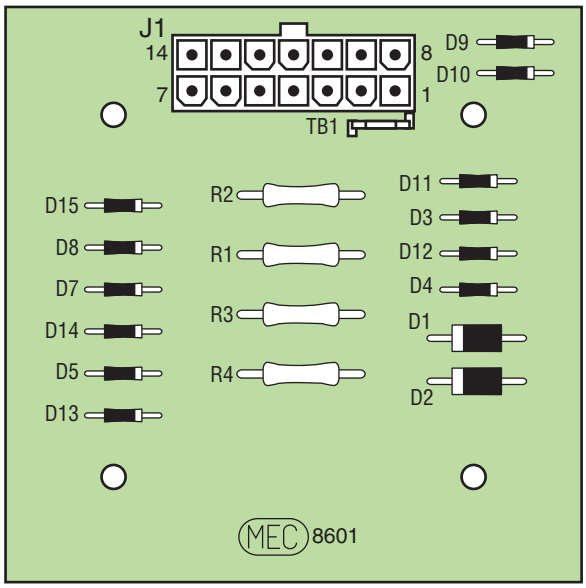
J5 Pin Identification

PIN #	WIRE #	FUNCTION
1	22	B+ power input (power up)
2	17	Lift, Drive or Steer functions requested (functions requiring motor)
3	18	Steer Requested (adds additional motor speed for steer)
4	3	Enable signal input
5	21	Speed cut-back (24 Volts = full speed, 0 Volts = creep speed)
6	16	Motor Start Relay signal (GROUND signal to activate Motor Start Relay)
7	41	Lift Valve B- (provides GROUND signal to Lift Valve)
8	none	none
9	14	Accelerator reference signal (3.6 Volts to Potentiometer)
10	none	none
11	none	none
12	none	none

Terminal Identification

POST	FUNCTION
B+	Battery Positive Cable from 200 AMP Fuse
B-	Negative Battery Cable and GROUND wire (15) connection
M2	Motor Ground (Pulse-Width Modulated [PWM] variable speed control)

Circuit Board



J1 Plug Pin Identification

PIN #	WIRE #	SIGNAL	FUNCTION
1	10	INPUT	Drive Reverse
2	11	INPUT	Drive Forward
3	19	OUTPUT	Brake, Decel Valve signal
4	8	INPUT	Steer Left
5	18	OUTPUT	Steer signal to Sevcon
6	5	INPUT	Down signal
7	20	OUTPUT	Signal to Motion Alarm(s) (optional)
8	17	OUTPUT	Sevcon & Hour Meter (motor function requested)
9	15	INPUT	Battery Negative
10	7	INPUT	Steer Right
11	4	INPUT	Lift Up
12	2	INPUT	Limit Switch (24V = platform down)
13	3	OUTPUT	Enable, from lower Lift switch
14	21	OUTPUT	To Sevcon (for speed cutback)

Load Sense Plug Pin Identification	
Model: / Serial # ES Models: all	
_	
_	
Reference Art #: none	Publication Art #: 2473

GP-102 Load Sense Control Module Connections

J1 (P1)

PIN #	WIRE #	CONNECTION
1	EZ-Cal	DIAGNOSTIC
2	EZ-Cal	AND
3	EZ-Cal	PROGRAMMING
4	EZ-Cal	

J2 (P2)

PIN #	WIRE #	CONNECTION
1	–	No Connection
2	–	No Connection
3	4	P6-1
4	5	P6-2
5	–	No Connection
6	–	No Connection
7	20A	P6-3
8	–	No Connection
9	–	No Connection
10	2	P6-4
11	15	P6-5
12	22	P6-6

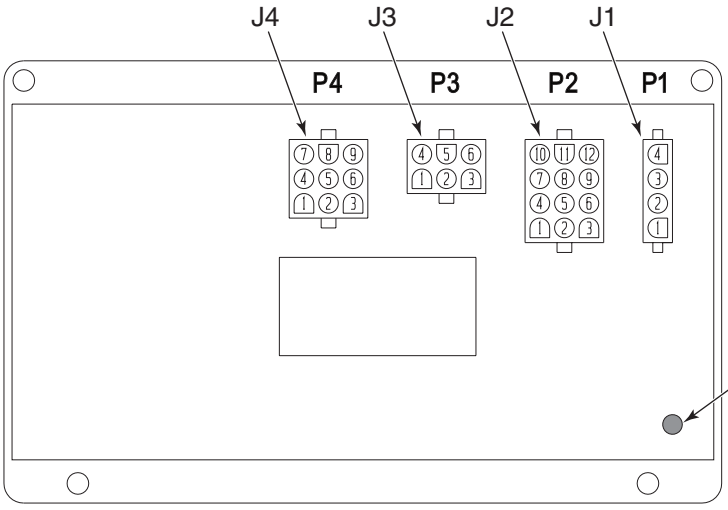
J3 (P3)

PIN #	WIRE #	CONNECTION
1	20	Motion Alarm (A8)
2	6	Alarm (A10)
3	12	Overload Light (A1)
4	44	Overload Relay (8)
5	45	Overload Relay (7)
6	–	

J4 (P4)

PIN #	WIRE #	CONNECTION
1	–	No Connection
2	42	Overload Sensor
3	43	Height sensor
4	–	No Connection
6	46	Overload Sensor
7	47	Overload Sensor
8	48	Height Sensor
9	49	Height Sensor

GP-102 Load Sense Control Module

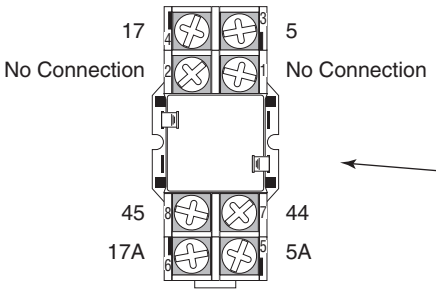


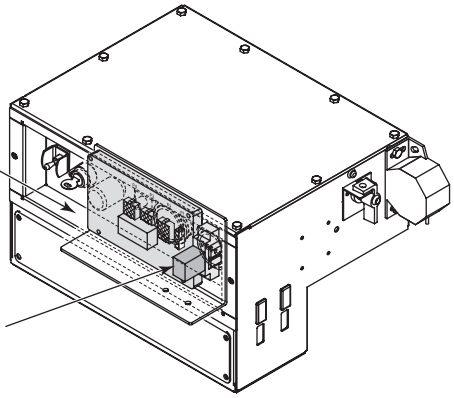
Inside Lower Control Box

Overload Cutout Relay Connections

RL1		
PIN #	WIRE #	CONNECTION
1	–	No Connection
2	–	No Connection
3	5	GP-102 (J2 - Pin 4)
4	17	P6-12
5	5A	P6-10
6	17A	P6-12
7	44	GP-102 (J3 - Pin 4)
8	45	GP-102 (J3 - Pin 5)

RL1 Overload Cutout Relay





Overload Cutout Relay

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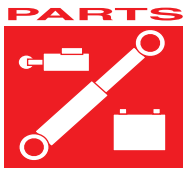

SECTION A

CONTROL BOXES

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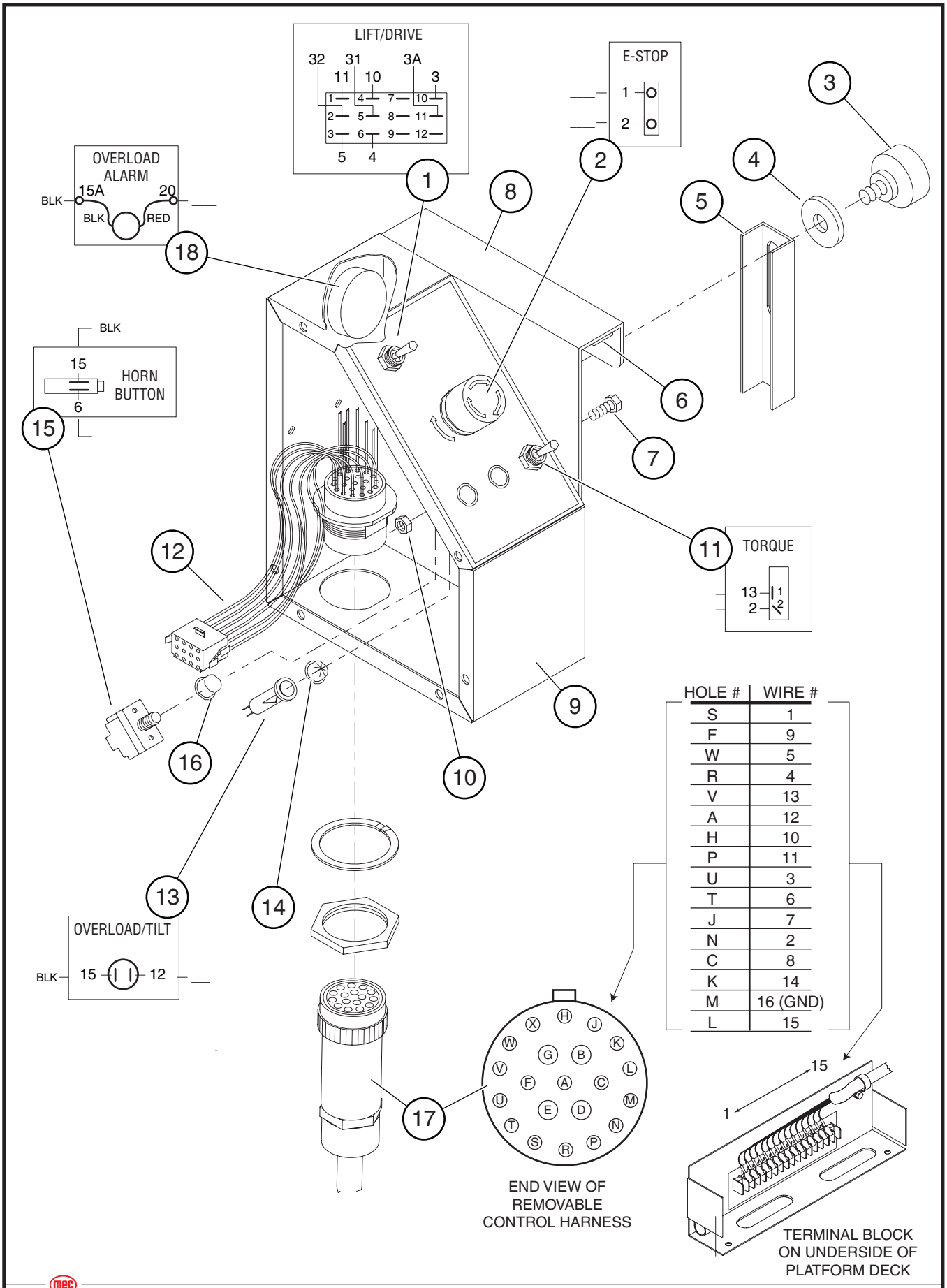


ILLUSTRATION No.
ART_2224

Upper Control Box, Removable, ES Machines, CE

ITEM	PART NO.	QTY	DESCRIPTION
			REMOVABLE CONTROL BOX ASSEMBLY, CE
	90875		REMOVABLE CONTROL BOX ASSEMBLY (OPTION)
1	8638	1	SWITCH, TOGGLE, 2 POSITION, 4 POLE
2	7800	1	EMERGENCY STOP SWITCH ASSEMBLY
	9345	1	BLOCK-CONTACT N.C.
3	8826	1	THUMBSCREW, 5/16" - 18, FLOWER
4	HDW8294	1	WASHER, FLAT
5	13864	1	LOCK, CONTROL ARM BRACKET
6	6350	.5	TAPE, FOAM
7	HDW5724	1	SCREW, 5/16" - 18, 3/4" LG
8	13865	1	BRACKET, CONTROL BOX HOLDER
9	13867	1	WRAPPER, CONTROL BOX
10	HDW7120	1	NUT, 5/16" - 18
11	5630	1	SWITCH, TOGGLE, TORQUE
12	REF	1	WIRE HARNESS, W/CONNECTOR CONTROL BOX (SEE WIRE HARNESS)
13	9179	1	SOCKET, LIGHT
14	9183	1	LENS, RED
	9182	1	LIGHT, BAYONET, 28 VOLT
15	8044	1	SWITCH, (MANUAL HORN) (OPTION)
16	8819	1	BOOT (OPTION)
17	REF	1	CABLE, UPPER CONTROL (SEE WIRE HARNESS)
	6318		PIN REPAIR KIT FOR CABLE
18	7553	1	CONTROL BOX ALARM

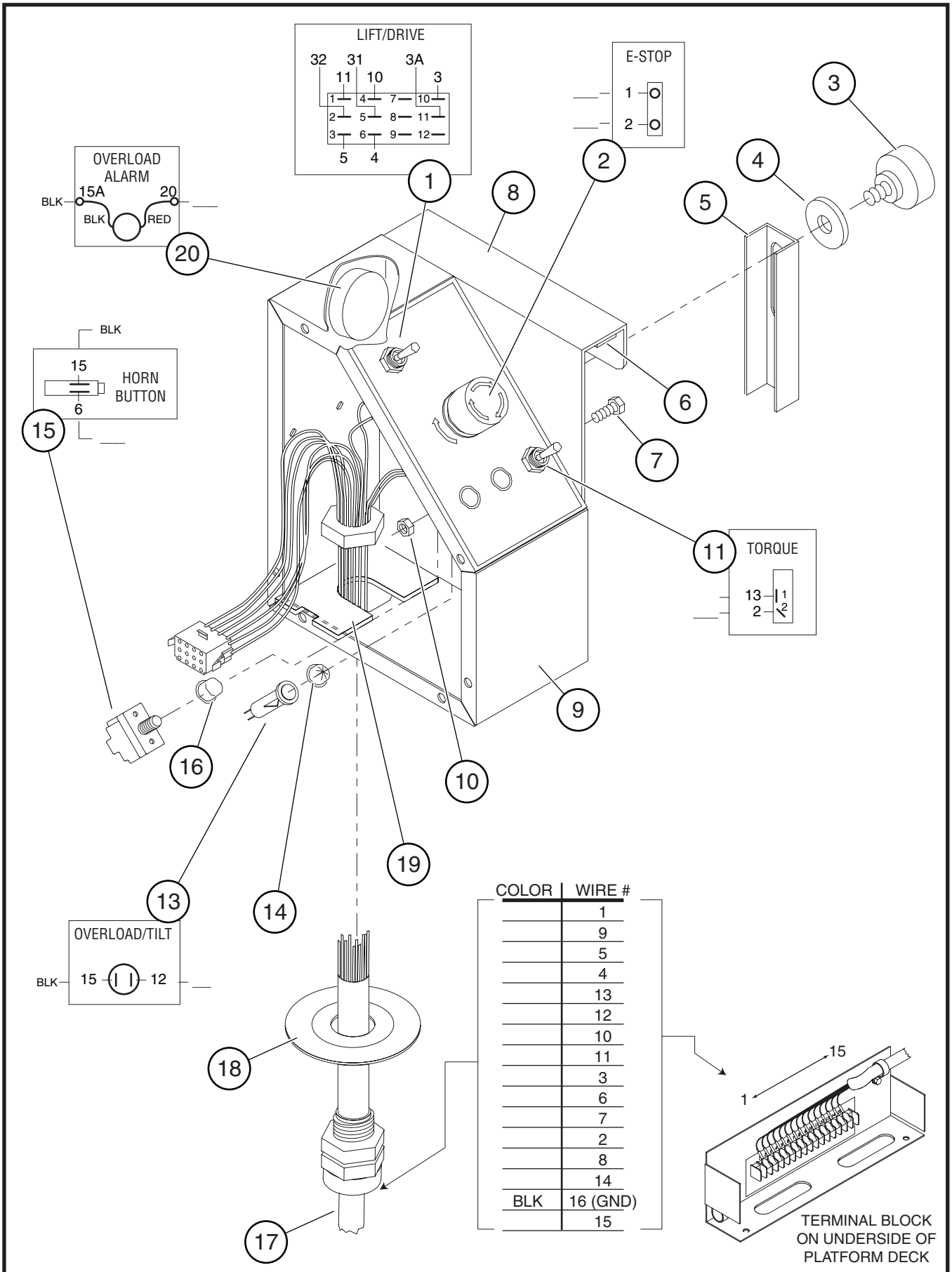


ILLUSTRATION No.
ART_2225

Upper Control Box, Fixed, ES Machines, CE

ITEM	PART NO.	QTY	DESCRIPTION
			FIXED CONTROL BOX ASSEMBLY, CE
	90874		CONTROL BOX ASSEMBLY
1	8638	1	SWITCH, TOGGLE, 2 POSITION, 4 POLE
2	7800	1	EMERGENCY STOP SWITCH ASSEMBLY
	9345	1	BLOCK-CONTACT N.C.
3	8826	1	THUMBSCREW, 5/16" - 18, FLOWER
4	HDW8294	1	WASHER, FLAT
5	13864	1	LOCK, CONTROL ARM BRACKET
6	6350	.5	TAPE, FOAM
7	HDW5724	1	SCREW, 5/16" - 18, 3/4" LG
8	13865	1	BRACKET, CONTROL BOX HOLDER
9	13867	1	WRAPPER, CONTROL BOX
10	HDW7120	1	NUT, 5/16" - 18
11	5630	1	SWITCH, TOGGLE, TORQUE
13	9179	1	SOCKET, LIGHT
14	9183	1	LENS, RED
	9182	1	LIGHT, BAYONET, 28 VOLT
15	8044	1	SWITCH, (MANUAL HORN) (OPTION)
16	8819	1	BOOT (OPTION)
17	REF	1	CONTROL CABLE (SEE WIRE HARNESS)
18	16079	1	STRAIN RELIEF WASHER
19	16120	1	MOUNTING PLATE
20	7553	1	CONTROL BOX ALARM

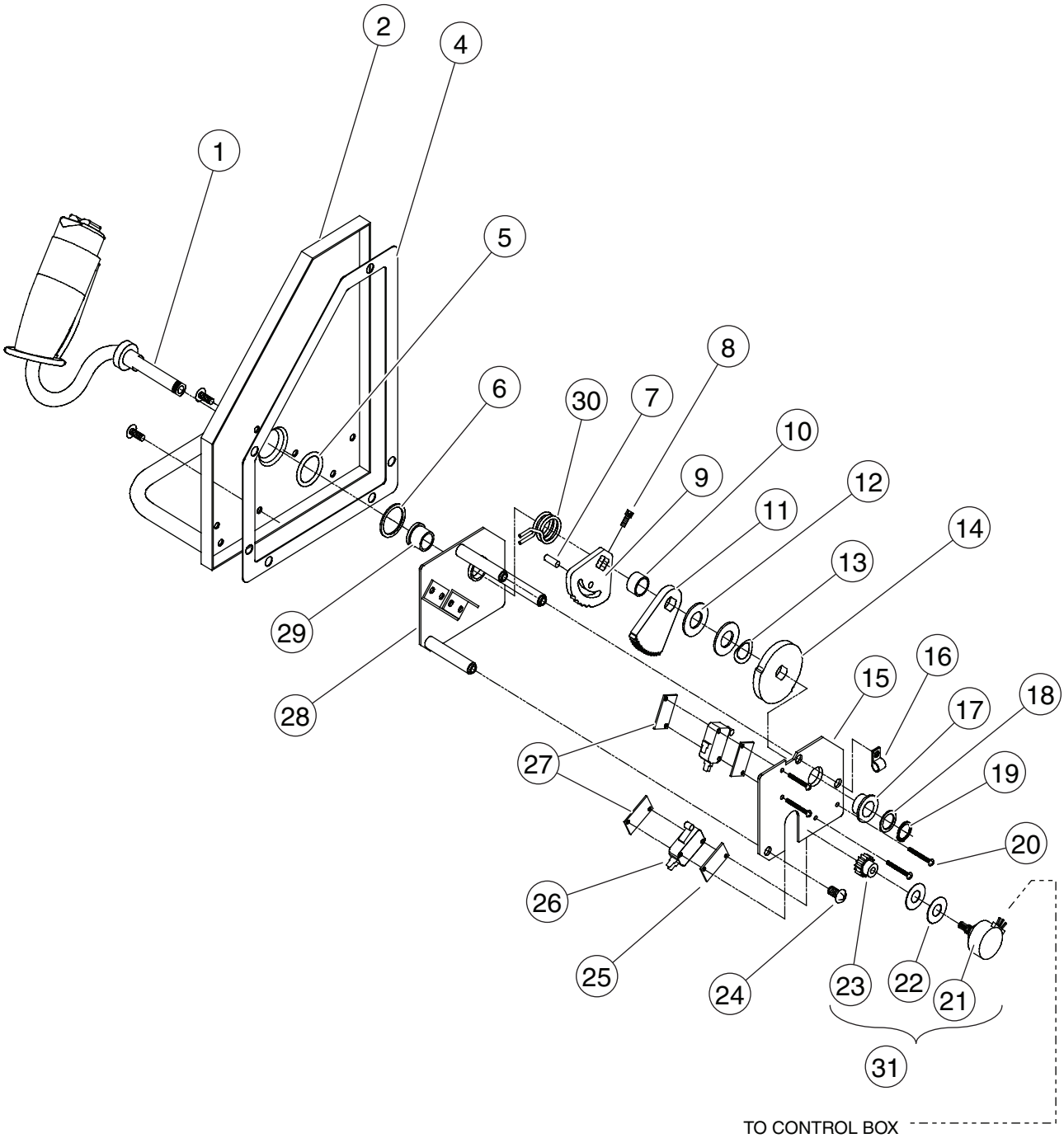


ILLUSTRATION No. ART_2220

Reference: ART_13868

Control Box Cover Assembly, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			Upper Control Box Cover Assembly
	13868		CONTROL BOX COVER ASSEMBLY
1	13647	1	CONTROL ARM
2	3772	1	COVER
4	7875	1	GASKET
5	7882	1	O-RING, 7/8" ID X 1 1/8" OD
6	HDW3768	1	WASHER, FLAT
7	100/8348	1	PIN, HOLD DOWN
8	HDW7887	1	SCREW, #6-32, 1/2" LG
9	13502	1	BRACKET, CENTERING
10	3763	1	SPACER, STEP
11	13402	1	GEAR, LARGE
12	HDW8531	2	WASHER, FLAT
13	HDW7881	1	WASHER, BEVEL
14	3782	1	CAM. DIRECTIONAL
15	13403	1	PLATE, BOTTOM
16	6917	1	CLAMP, CABLE 1/4"
17	7818	1	BEARING, BRONZE, FLANGED
18	HDW3771	1	WASHER, FLAT
19	5736	1	RING, RETAINING, 1/2"
20	HDW8399	4	SCREW, #4 - 40, 5/8" LG
21	8383	1	POTENTIOMETER
22	HDW8567	2	WASHER, FLAT
23	8389	1	GEAR, SPUR
24	HDW7888	12	SCREW, #10 - 32, 1/2" LG
25	3764	2	PLATE, SPACER
26	8696	2	SWITCH, LIMIT, MICRO V7
27	3765	2	PLATE, STRAP
28	3766	1	PLATE, TOP
29	7819	1	BEARING, BRONZE, FLANGED
30	8435	1	SPRING, JOYSTICK, CENTERING
31	13527	1	POTENTIOMETER ASSEMBLY (INCLUDES 21, 22, & 23)
32	8346	1	WIRE HARNESS (NOT SHOWN)

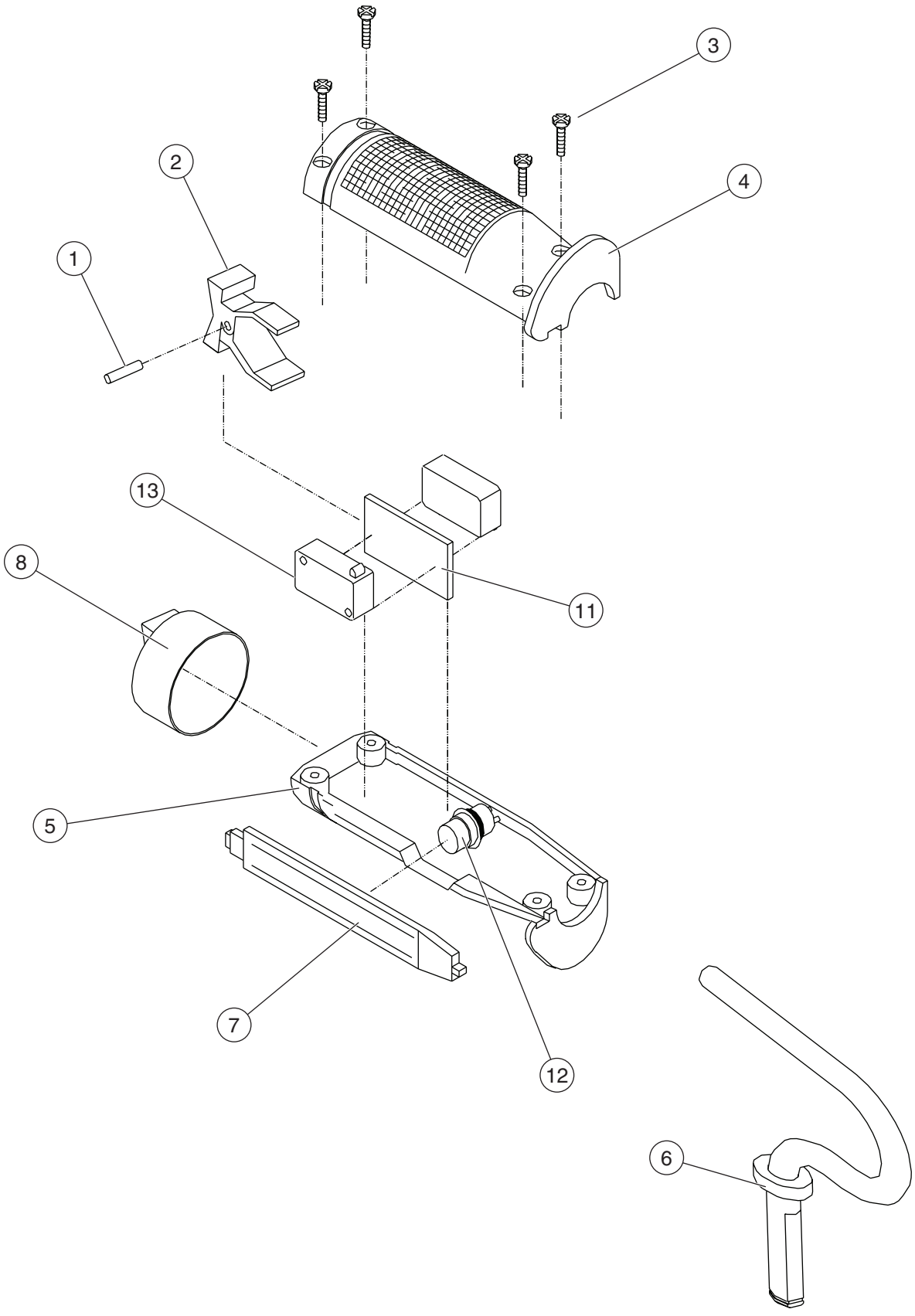


ILLUSTRATION No.
ART_2221

Reference: ART_188

Control Arm (Joystick)

ITEM	PART NO.	QTY	DESCRIPTION
			JOYSTICK
	13647		CONTROL ARM ASSEMBLY
1	8750	1	PIN (SERVICE ONLY)
2	8453	1	SWITCH ACTUATOR (SERVICE ONLY)
3	HDW8455	4	SCREW, 6-1/2" LG (SERVICE ONLY)
4	8752	1	GRIP-TOP HALF (SERVICE ONLY)
5	8751	1	GRIP-BOTTOM HALF (SERVICE ONLY)
6	13638	1	CONTROL ARM WITHOUT WIRE
7	8748	1	TRIGGER (SERVICE ONLY)
8	8456	1	ROCKER BOOT (SERVICE ONLY)
	7476	5	AMP PINS
	8630	1	HANDLE, GRIP
	8761		SWITCH ASSEMBLY (NOT SHOWN)
	8089	1'	WIRE, BLK 18GA 300 V
	7777	2	TERMINAL, PUSH ON, 3/16"
11	8447	1	SWITCH SEPARATOR (SERVICE ONLY)
12	8753	1	MOTION SWITCH, ON-OFF (SERVICE ONLY)
13	8448	2	SWITCH (SERVICE ONLY)

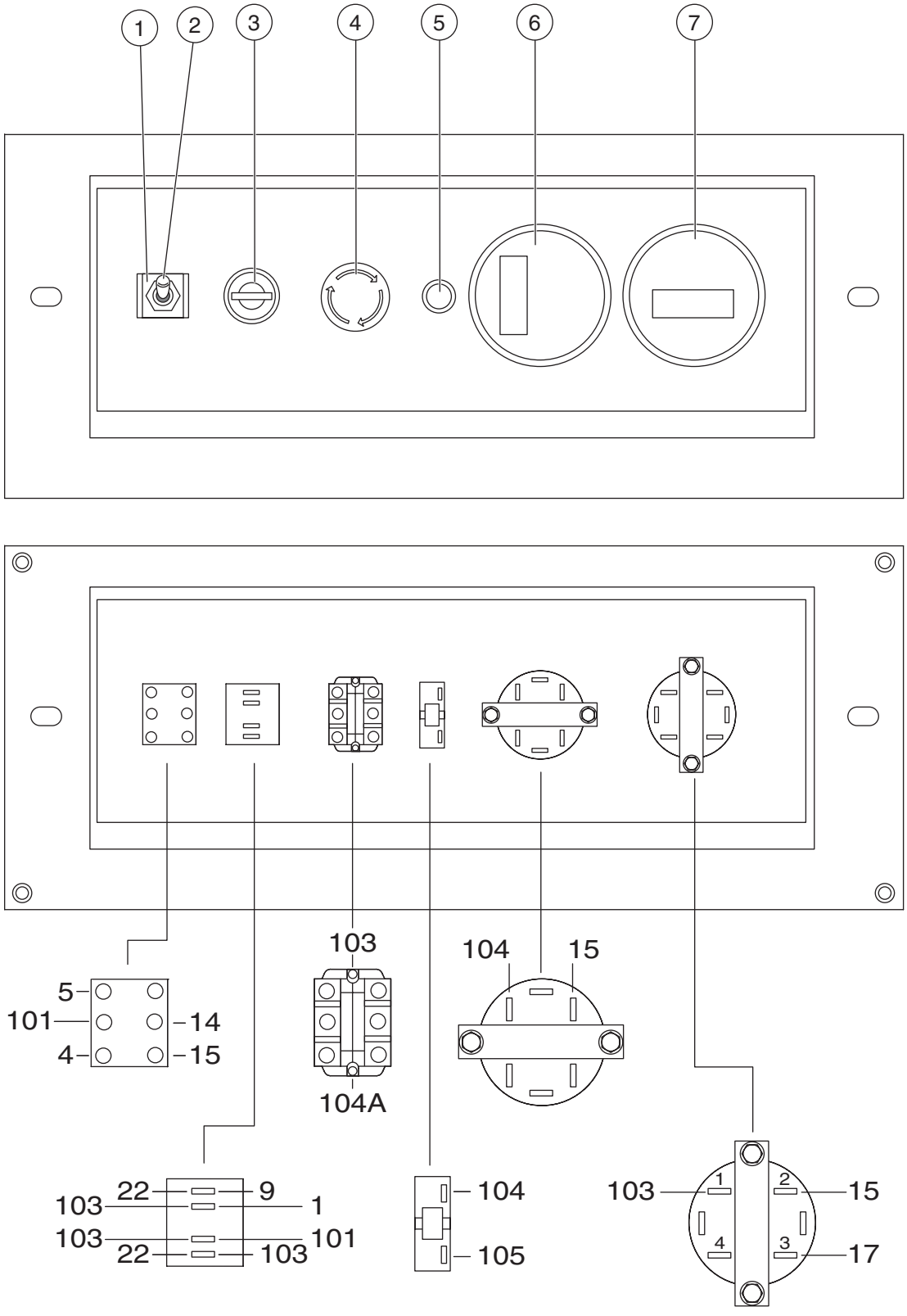


ILLUSTRATION No. ART_2222

Reference: ART_925

Base Controls Panel, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			LOWER CONTROL PANEL
1	1313	1	SWITCH GUARD
2	5694	1	SWITCH, TOGGLE
3	9549	1	TUMBLER, KEY SWITCH
	90714	1	BASE MOUNT WITH 2 N.O. CONTACTS
	8082	4	BLOCK, N.O. CONTACT
4	7800	1	SWITCH, EMERGENCY STOP
	9345	1	BLOCK, CONTACT, N.C. (ABB)
5	7235	1	CIRCUIT BREAKER, 15 AMP
6	7099	1	BATTERY GAUGE, 24 VOLT (OPTIONAL)
	7115	1	PLUG (IF BATTERY GAUGE IS NOT PRESENT)
7	7909	1	METER, HOUR

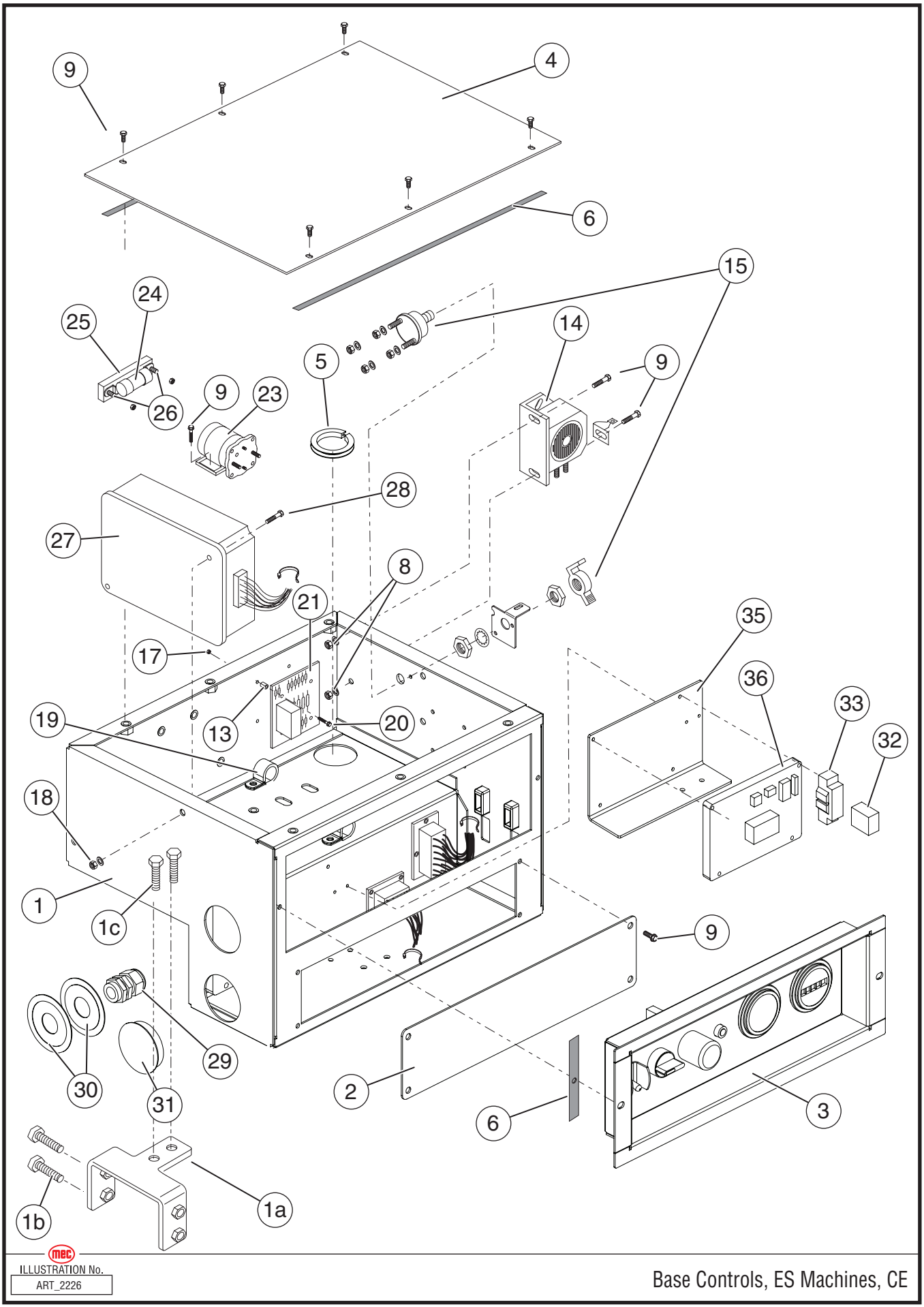


ILLUSTRATION No.
ART_2226

Base Controls, ES Machines, CE

ITEM	PART NO.	QTY	DESCRIPTION
			LOWER CONTROL BOX
			1532ES - SERIAL # 9001000 - 9001010
			1932ES - SERIAL # 9104001 - 9104541
1	16050	1	WELDMENT, BASE CONTROL BOX
1A	25477	1	BRKT, CONTROL BOX MOUNT
1B	HDW5417	2	SCREW
1C	HDW6432	2	SCREW
			1532ES - SERIAL # 9001011 - UP
			1932ES - SERIAL # 9104542 - UP
1	16609	1	WELDMENT, BASE CONTROL BOX
			CONTINUED...

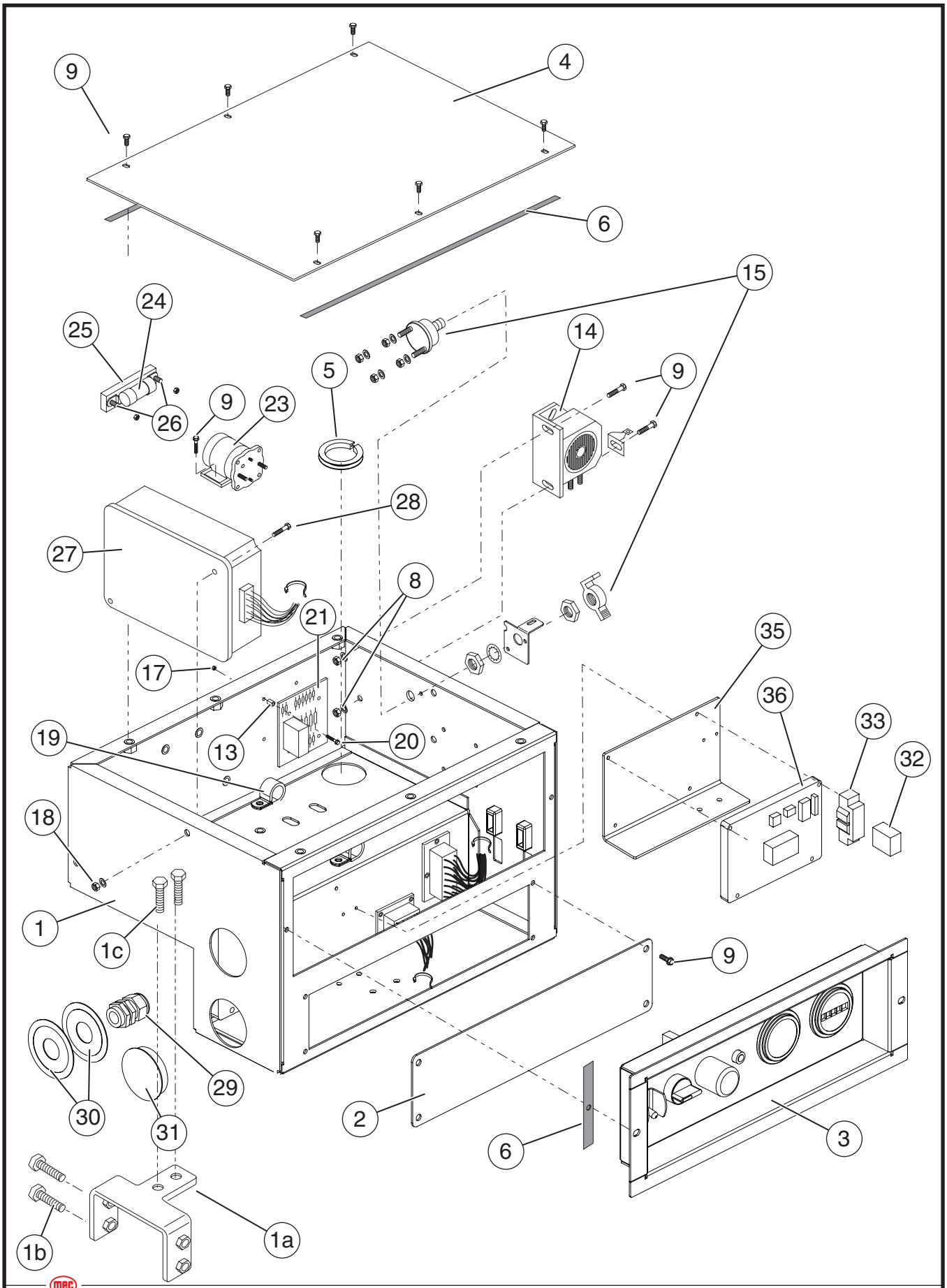


ILLUSTRATION No.
ART_2226

Base Controls, ES Machines, CE

ITEM	PART NO.	QTY	DESCRIPTION
			LOWER CONTROL BOX
			...CONTINUED
2	16608	1	COVER, ACCESS PANEL
3	16053	1	CONTROL PANEL
4	15118	1	COVER, ACCESS PANEL TOP
5	5863	1	GROMMET
6	9454	3 FT.	GASKET STRIP
8	HDW5276	4	NUT, 1/4" - 20
9	HDW6455	14	SCREW, 1/4 -20 X 1/2"
10	HDW90879	2	SCREW, #6 - 32 X 1 1/4"
11	HDW90880	4	SCREW, #10 - 32 X 1"
12	HDW90803	4	LOCKNUT, #10 - 32
13	90814	4	SPACERS, NYLON
14	8698	1	ALARM, BASE (OPTION)
15	8841	1	SWITCH, MASTER DISCONNECT
17	HDW8364	12	NUT #6 - 32
18	HDW6461	2	LOCKNUT, 1/4" - 20
20	HDW90833	10	SCREW, #6 - 32 X 3/4" LG
21	8601	1	CIRCUIT BOARD
23	5967	1	CONTACTOR, 24 V
24	8344	1	FUSE, 200A
25	8345	1	FUSE HOLDER
26	HDW90929	2	SCREW, 1/4" - 20, 1" LG
27	90991	1	MOTOR CONTROLLER
28	HDW90288	2	SCREW, 1/4" - 20, 3" LG
29	90532	1	CHARGER CORD, STRAIN RELIEF
30	90925	2	ADAPTER, RECEPTACLE HOLE
31	7115	1	HOLE PLUG
32	90927	1	RELAY, SPDT 24VDC
33	90871	1	RELAY, BASE
34	90923	1	RELAY, CLIP
35	16064	1	BRACKET, LOAD SENSE
36	90843	1	GP102 LOAD SENSE MODULE

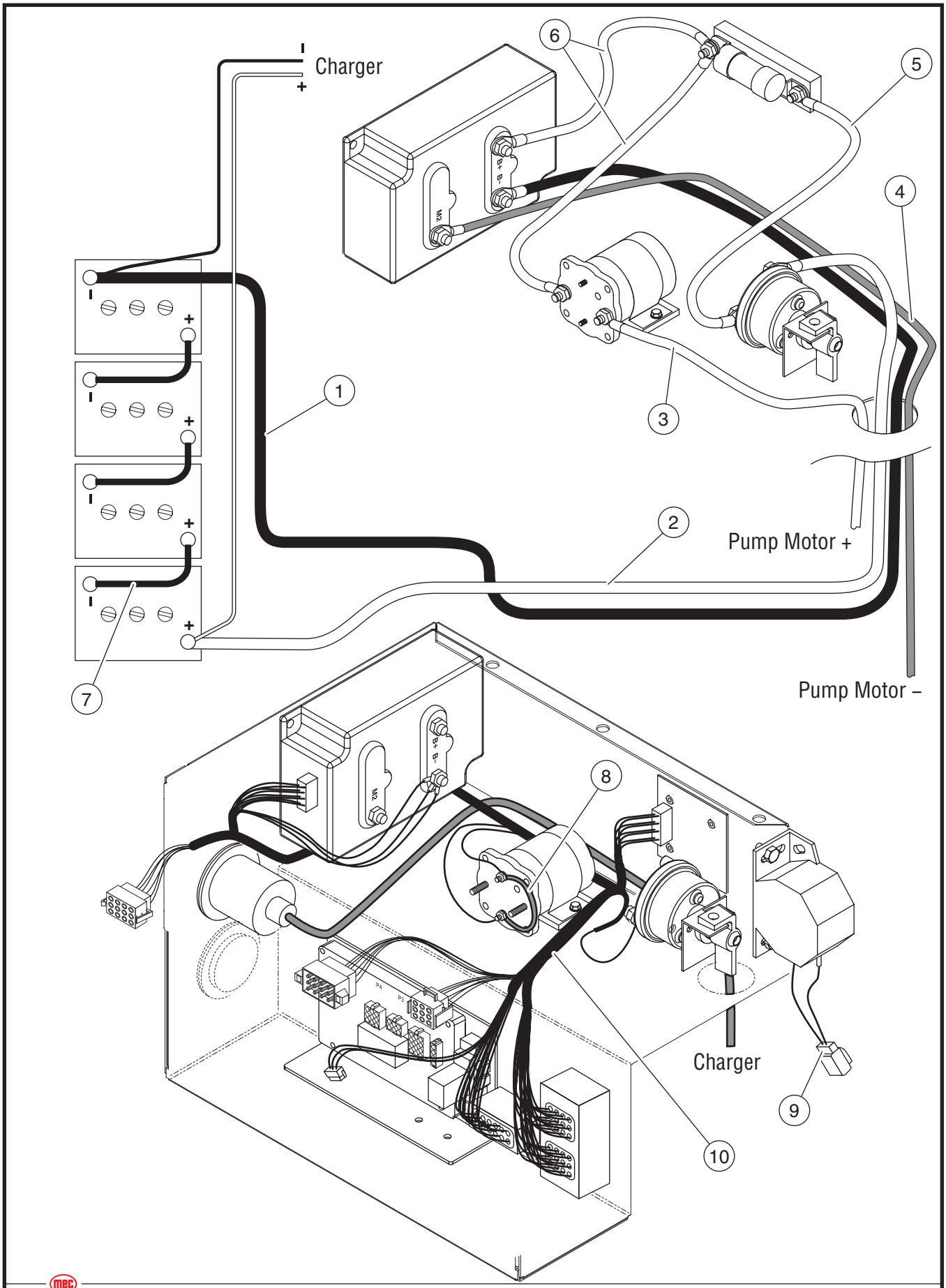


ILLUSTRATION No.
ART_2450

Harnesses and Cables, Lower Control Box, X32ES and X33ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			WIRE HARNESSES, LOWER CONTROLS
1	90962	1	BATTERY CABLE, BLACK
2	9062	1	BATTERY CABLE, RED
3	8836	1	BATTERY CABLE, RED
4	9243	1	BATTERY CABLE, BLACK
5	8837	1	BATTERY CABLE, RED
6	8426	2	BATTERY CABLE, RED
7	6208	3	BATTERY CABLE, BLACK
8	8368	1	DIODE
9	8782	1	HARNESS, BASE ALARM (OPTION)
-	9441	45'	WIRE, 14 GA, CE COLORS
NS	90156	AS REQ	TERMINAL, PUSH ON, 1/4" MALE FI, 22-18
NS	9356	2	CLAMP, NYLON
NS	90781	1	FORK TERMINAL 12 GA
10	90877	1	HARNESS, INSTRUMENT

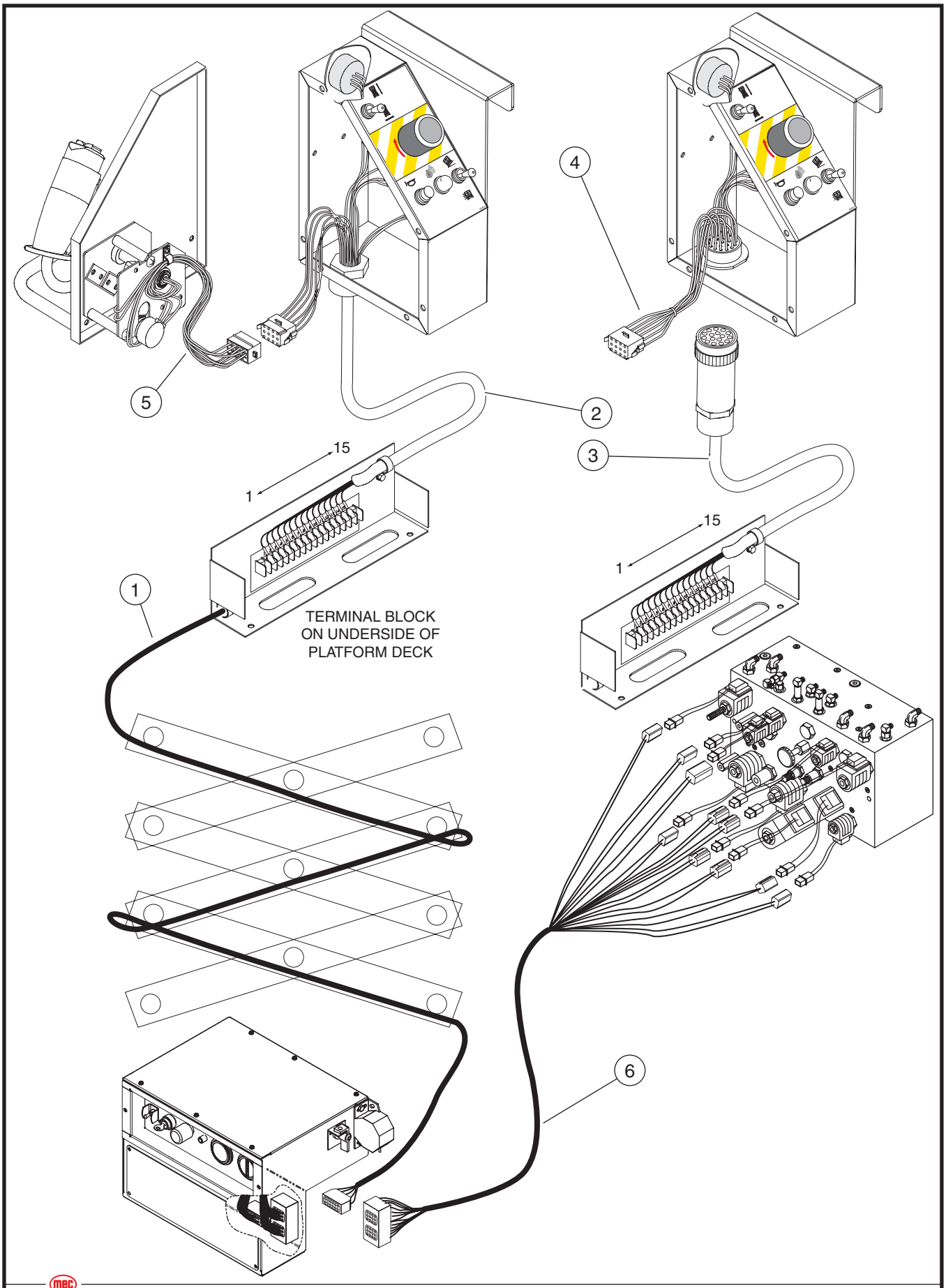


ILLUSTRATION No.
ART_2448

Control Cable and Manifold Harness, ES Series, CE

ITEM	PART NO.	QTY	DESCRIPTION
			WIRE HARNESSES, COMMUNICATION CABLE (EARLY MODELS)
			1532ES SERIAL # 9001000 TO 9001010
			1932ES SERIAL # 9104000 TO 9104541
1	90129	1	COMMUNICATION CABLE, 1532ES
1	90128	1	COMMUNICATION CABLE, 1932ES
			WIRE HARNESSES, UPPER CONTROLS (EARLY MODELS)
			1532ES SERIAL # 9001000 TO 9001099
			1932ES SERIAL # 9104000 TO 9105000
2	90872	1	CONTROLLER CABLE, FIXED
3	7656	1	CONTROLLER CABLE, REMOVABLE (OPTION)
	6318		PIN REPAIR KIT FOR CABLE (SEE PAGE A-2)
4	90100	1	CONTROL BOX HARNESS (USED WITH REMOVABLE CABLE)
5	8346	1	JOYSTICK HARNESS
			WIRE HARNESSES, OTHER (EARLY MODELS)
			1532ES SERIAL # 9001000 TO 9001099
			1932ES SERIAL # 9104000 TO 9105000
6	9978	1	BASE / MANIFOLD HARNESS
NS	9054	1	LIFT CYLINDER HARNESS, DOWN VALVE (NOT SHOWN)
NS	90225	1	SAFETY SWITCH HARNESS (NOT SHOWN)
NS	—	1	HORN (OPTION) SEE SECTION B
NS	—	1	POWER CONVERTER (OPTION) SEE SECTION E, OPTIONS
NS	90870	1	HARNESS, LOAD SENSE BOARD
NS	90878	1	HARNESS, LOAD SENSE TRANSDUCERS

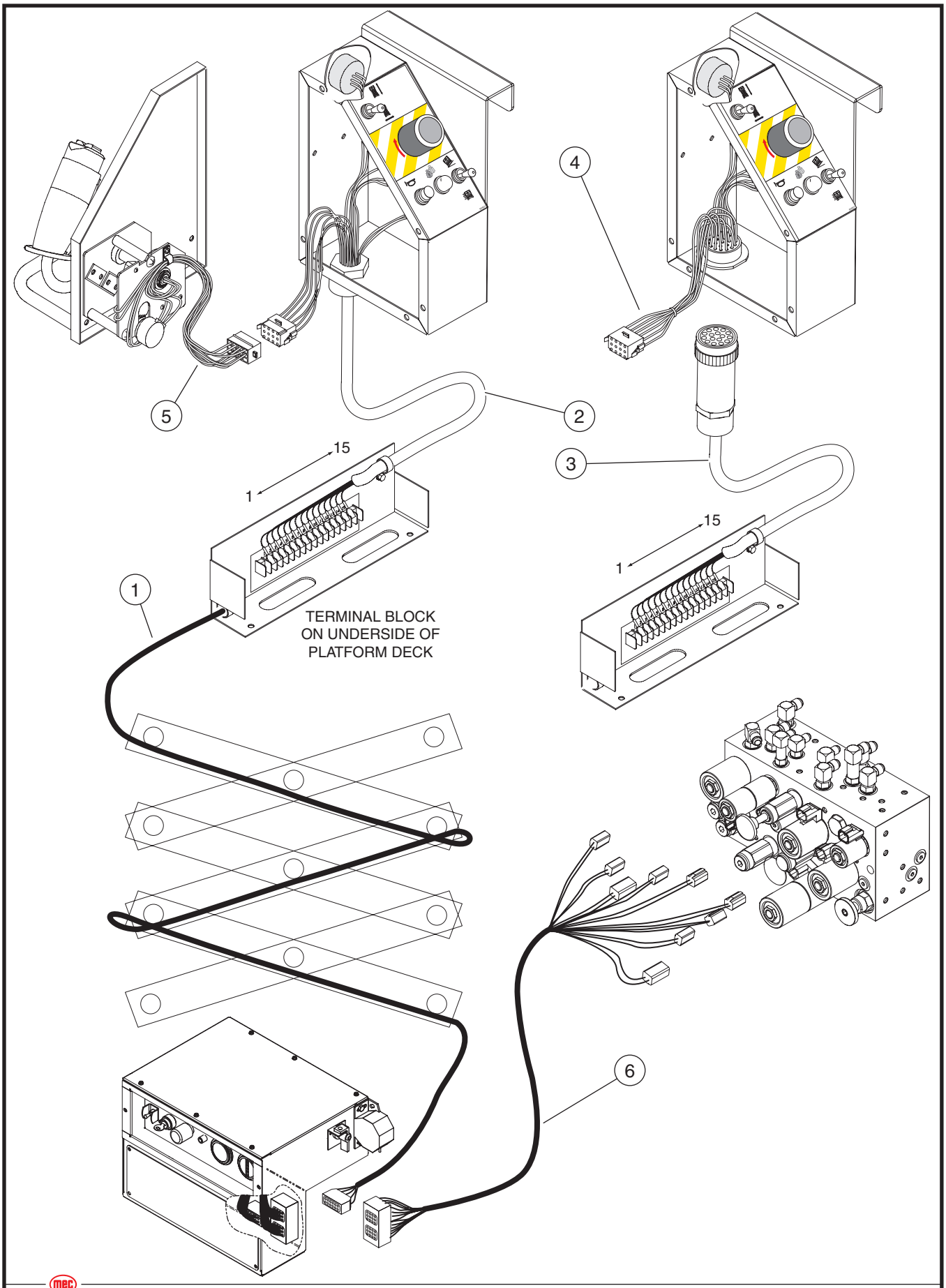
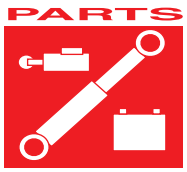


ILLUSTRATION No.
ART_2449

Control Cable and Manifold Harness, ES Series, CE

ITEM	PART NO.	QTY	DESCRIPTION
			WIRE HARNESSES, COMMUNICATION CABLE (CURRENT MODELS)
			1532ES SERIAL # 9001011 UP
			1932ES SERIAL # 9104542 UP
1	90872	1	COMMUNICATION CABLE, 1532ES
1	90812	1	COMMUNICATION CABLE, 1932ES
			WIRE HARNESSES, UPPER CONTROLS (CURRENT MODELS)
			1532ES SERIAL # 9001100 UP
			1932ES SERIAL # 9105001 UP
2	90872	1	CONTROLLER CABLE, FIXED
3	90873	1	CONTROLLER CABLE, REMOVABLE (OPTION)
	6318		PIN REPAIR KIT FOR CABLE (SEE PAGE A-2)
4	90100	1	CONTROL BOX HARNESS (USED WITH REMOVABLE CABLE)
5	8346	1	JOYSTICK HARNESS
			WIRE HARNESSES, OTHER (CURRENT MODELS)
			1532ES SERIAL # 9001100 UP
			1932ES SERIAL # 9105001 UP
6	91071	1	BASE / MANIFOLD HARNESS
NS	91070	1	LIFT CYLINDER HARNESS, DOWN VALVE (NOT SHOWN)
NS	—	1	HORN (OPTION) SEE SECTION B
NS	—	1	POWER CONVERTER (OPTION) SEE SECTION E, OPTIONS
NS	90870	1	HARNESS LOAD SENSE BOARD
NS	90878	1	HARNESS LOAD SENSE TRANSDUCERS



SECTION B

PLATFORM AND RAILS

Platform and Rails B-3
Rollout Deck and Rails B-5
Entry Gate B-7
Swing gate B-9
Rollout Deck Lock B-11
Rollout Deck Roller B-13
Terminal Block B-15
Operator Horn (CE Option) B-15
Airline To Platform (Option) B-15
Power to Platform B-17

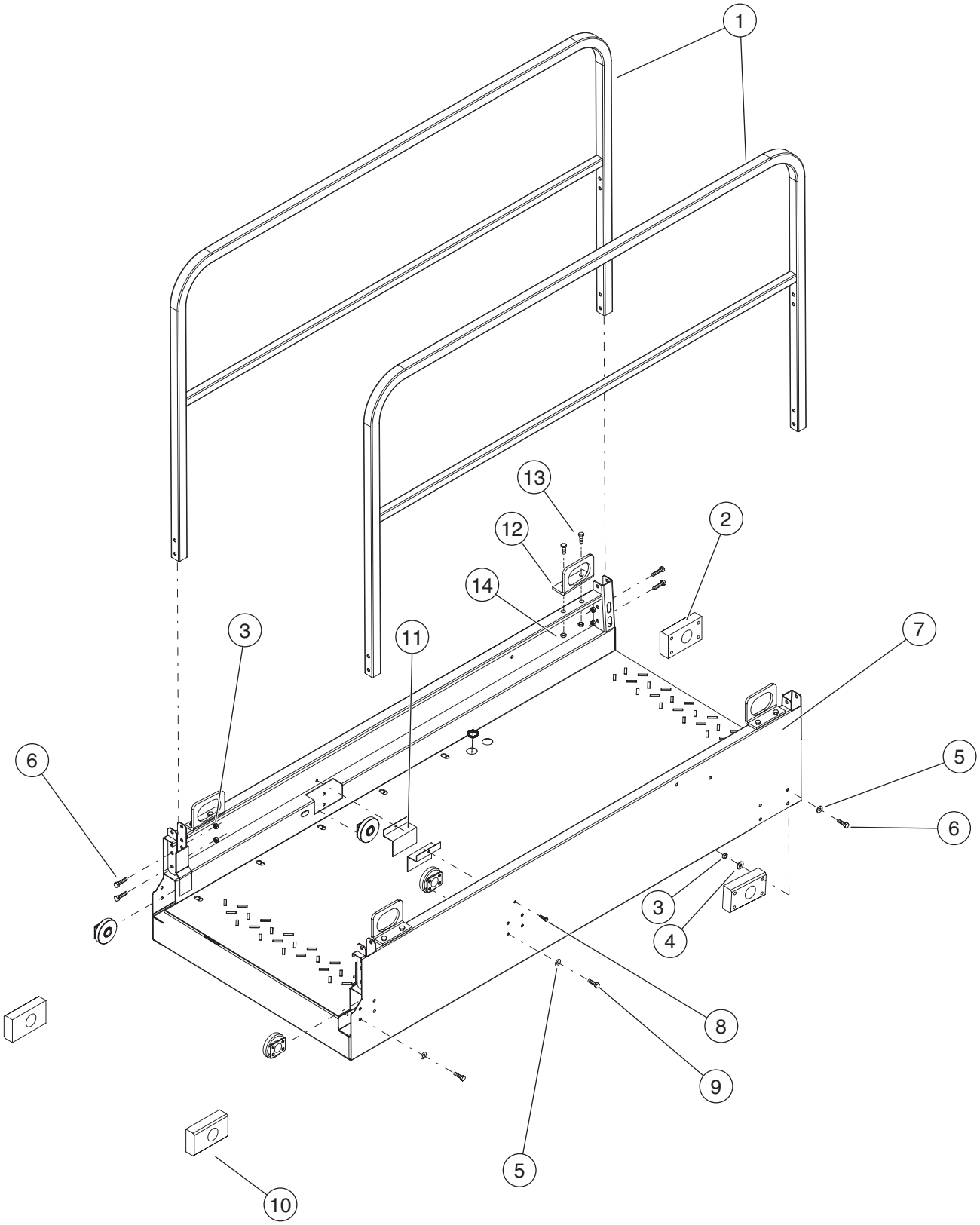


ILLUSTRATION No. ART_2452

Reference: ART_684

Work Platform, Main Deck, X32ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			PLATFORM AND RAILS
1	16016	2	RAIL, MAIN PLATFORM
2	12777	2	PLATFORM FIXED END BLOCK
3	HDW8304	16	NUT, 5/16" - 18
4	HDW8194	8	WASHER, FLAT
5	HDW5217	24	WASHER, FLAT
6	HDW8486	16	SCREW, 5/16" - 18, 1 7/8" LG
7	25502	1	PLATFORM, MAIN
8	HDW6455	2	SCREW, 1/4" - 20, 1/2" LG
9	HDW5724	16	SCREW, 5/16" - 18, 3/4" LG
10	13778	2	BLOCK, SLIDE, PLATFORM
11	13637	2	BRACKET, ROLLER COVER
12	3923	4	BRKT, ATTACHMENT POINT
13	HDW6432	8	SCREW, 3/8" - 16, 3/4" LG
14	HDW5039	8	LOCK NUT, 3/8" - 16

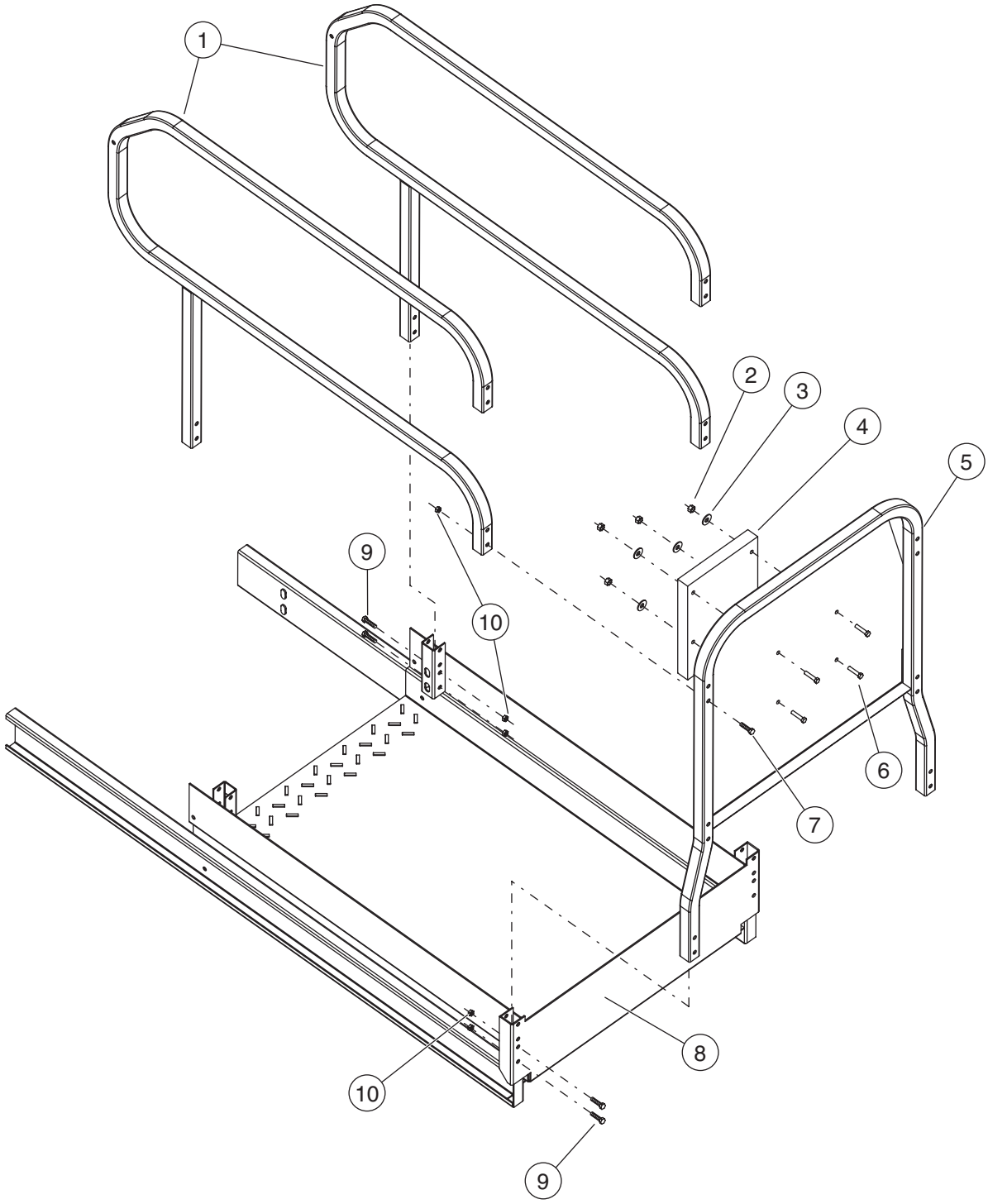


ILLUSTRATION No.
ART_2250

Reference: ART_683

Extension Deck, X32 ES

ITEM	PART NO.	QTY	DESCRIPTION
			Rollout Deck and Rails
1	25057	2	RAIL, MAIN EXTENSION PLATFORM
2	HDW8267	4	LOCK NUT, 1/4" - 20
3	HDW8294	4	WASHER, FLAT
4	8909	1	ENCLOSURE, MANUAL
5	16034	1	RAIL, FRONT, EXTENSION PLATFORM
6	HDW5904	4	SCREW, 1/4" - 20, 3/4" LG
7	HDW7471	8	SCREW, 5/16" - 18, 3" LG
8	25499	1	PLATFORM EXTENSION WELDMENT
9	HDW8486	8	SCREW, 5/16" - 18, 1 7/8" LG
10	HDW8304	16	NUT, 5/16" - 18

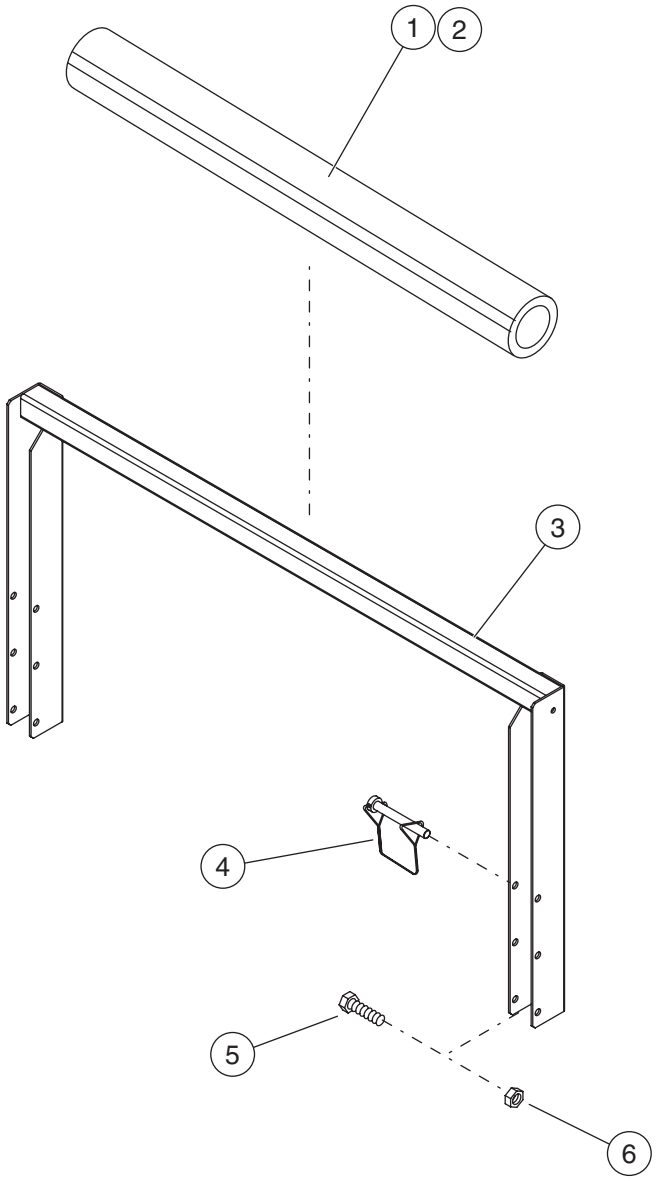


ILLUSTRATION No.
ART_2451

Reference: ART_685

Entry Rail, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			ENTRY GATE
1	7048	1	COVER, RAIL PAD (OPTION ONLY)
2	7805	3 FT.	PAD, RAIL (OPTION ONLY)
3	25051	1	GATE, SHEET LOAD
4	HDW90792	2	PIN, LOCK, 5/16"
5	HDW7119	4	SCREW, 5/16" - 18, 2 1/4" LG
6	HDW8304	4	NUT, 3/8" - 16

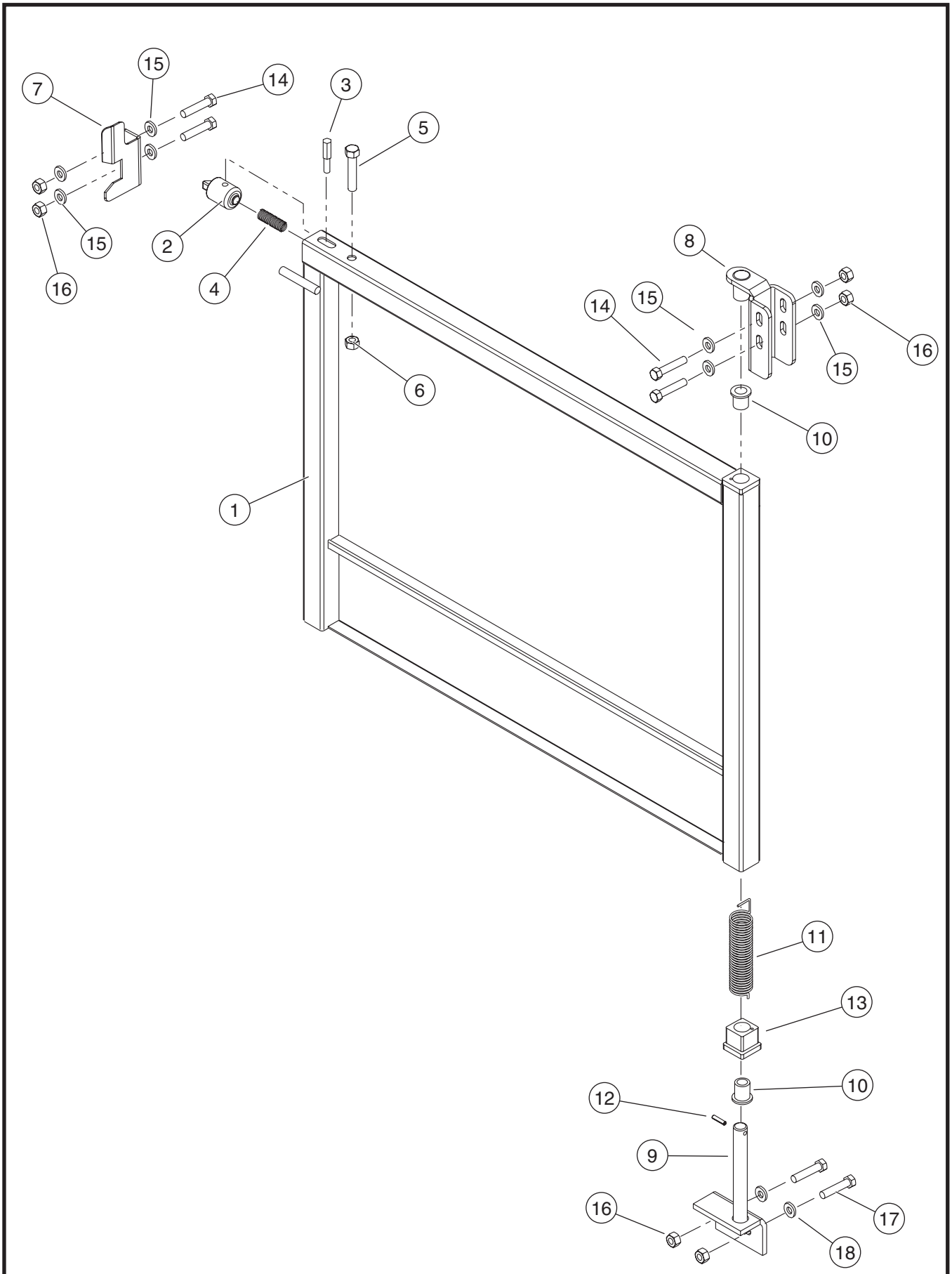


ILLUSTRATION No.
ART_2253

Reference: ART_

Swing Gate, X32ES - X33ES

ITEM	PART NO.	QTY	DESCRIPTION
			SWING GATE
1	25605	1	SWING GATE WELDMENT
2	40003	1	PIN, LATCH
3	40006	1	ROD, LATCH LEVER
4	7055	1	SPRING, LATCH
5	HDW8277	1	SCREW, 3/8" - 16, 1 3/4" LG
6	HDW6281	1	NUT, 3/8" - 16
7	25615	1	BRKT STRIKER SWING GATE
8	15046	1	SWING GATE MOUNT WELD UPPER
9	15043	1	SWING GATE MOUNT WELD LOWER
10	8187	2	BEARING, NYLINER, FLANGED
11	8300	1	SPRING, TORSION, 1" OD, 4" LG
12	HDW7455	1	PIN, SLOTTED SPRING, 3/16" DIA X 3/4" LG
13	13272	1	BLOCK, PIVOT
14	HDW7119	4	HEX CAP SCREW 5/16"-18 X 2.25"
15	HDW8294	8	FLAT WASHER 0.328 ID
16	HDW8304	6	LOCNUT 5/16"-18
17	HDW5724	2	HEX CAP SCREW 5/16"-18 X 3/4"
18	HDW5217	2	FLAT WASHER 11/32" ID

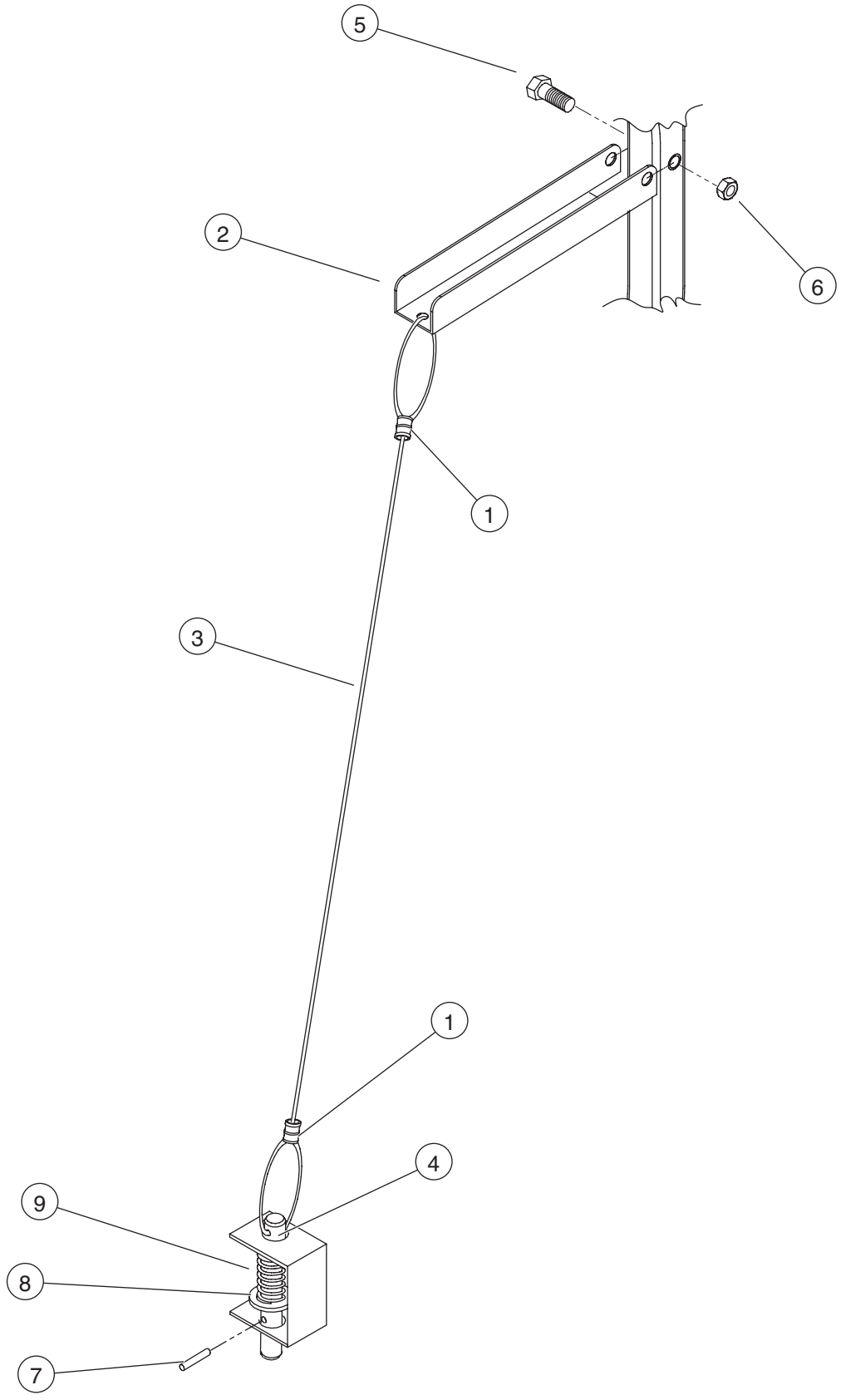


ILLUSTRATION No.
ART_2174

Reference ART_686

Roll-out Deck Lock Pin Assembly

ITEM	PART NO.	QTY	DESCRIPTION
			Rollout Deck Lock
	25297	1	PLATFORM LOCK PIN ASSEMBLY
1	8814	2	SLEEVES, OVAL ALUMINUM
2	13814	1	HANDLE - ROLLOUT PLATFORM
3	7184	3.2FT	WIRE CABLE, COATED & ROLLED
4	13737	1	PIN, EXTENSION LOCK
5	HDW8303	1	SCREW, 5/16" - 18, 2" LG
6	HDW8304	1	NUT, 5/16" - 18
7	HDW8513	1	SPRING PIN, 1/8" DIA, 3/4" LG
8	HDW7031	1	WASHER, 1/2" ID, 7/8" OD
9	7408	1	SPRING, DECK LOCK

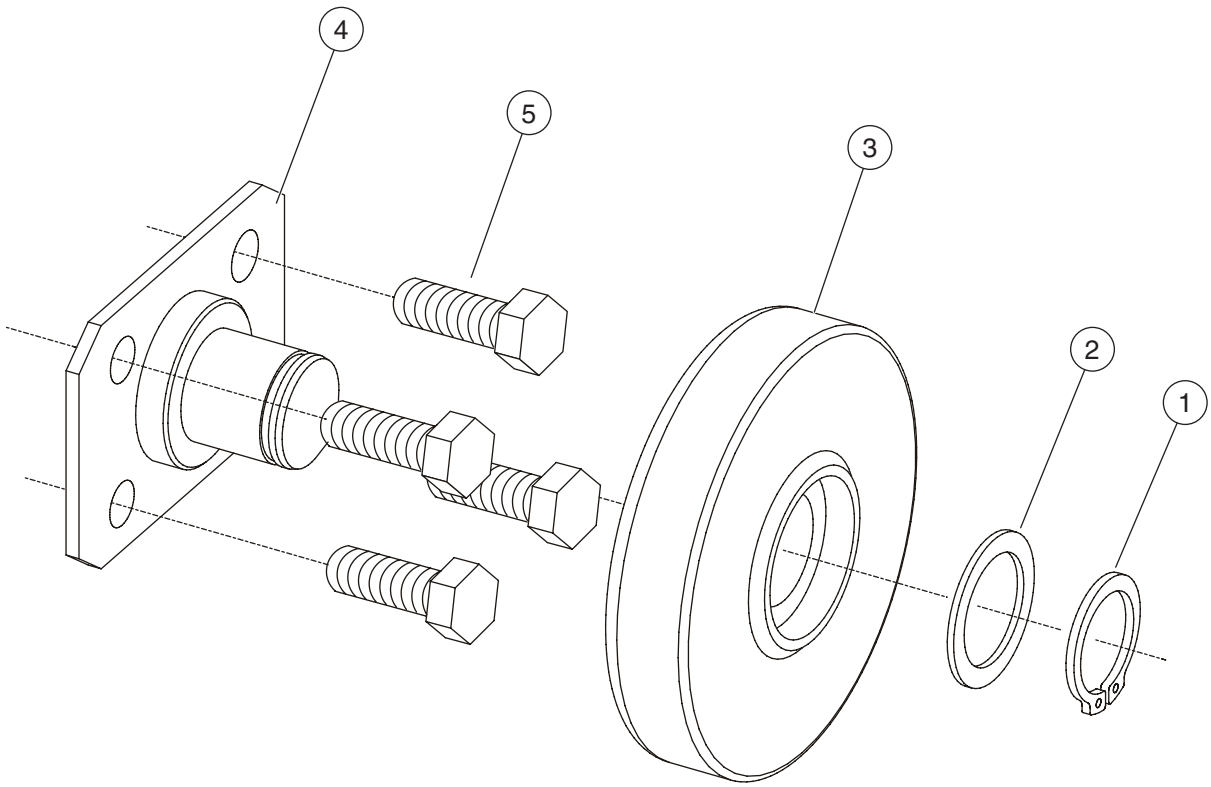


ILLUSTRATION No.
ART_2095

Reference: ART_687

Roll-out Deck Roller

ITEM	PART NO.	QTY	DESCRIPTION
			Rollout Deck Roller
1	5918	1	RING, RETAINING, HEAVY DUTY 1"
2	HDW8370	1	WASHER
3	13230	1	ROLLER
4	13267	1	ROLLER PLATE WELDMENT

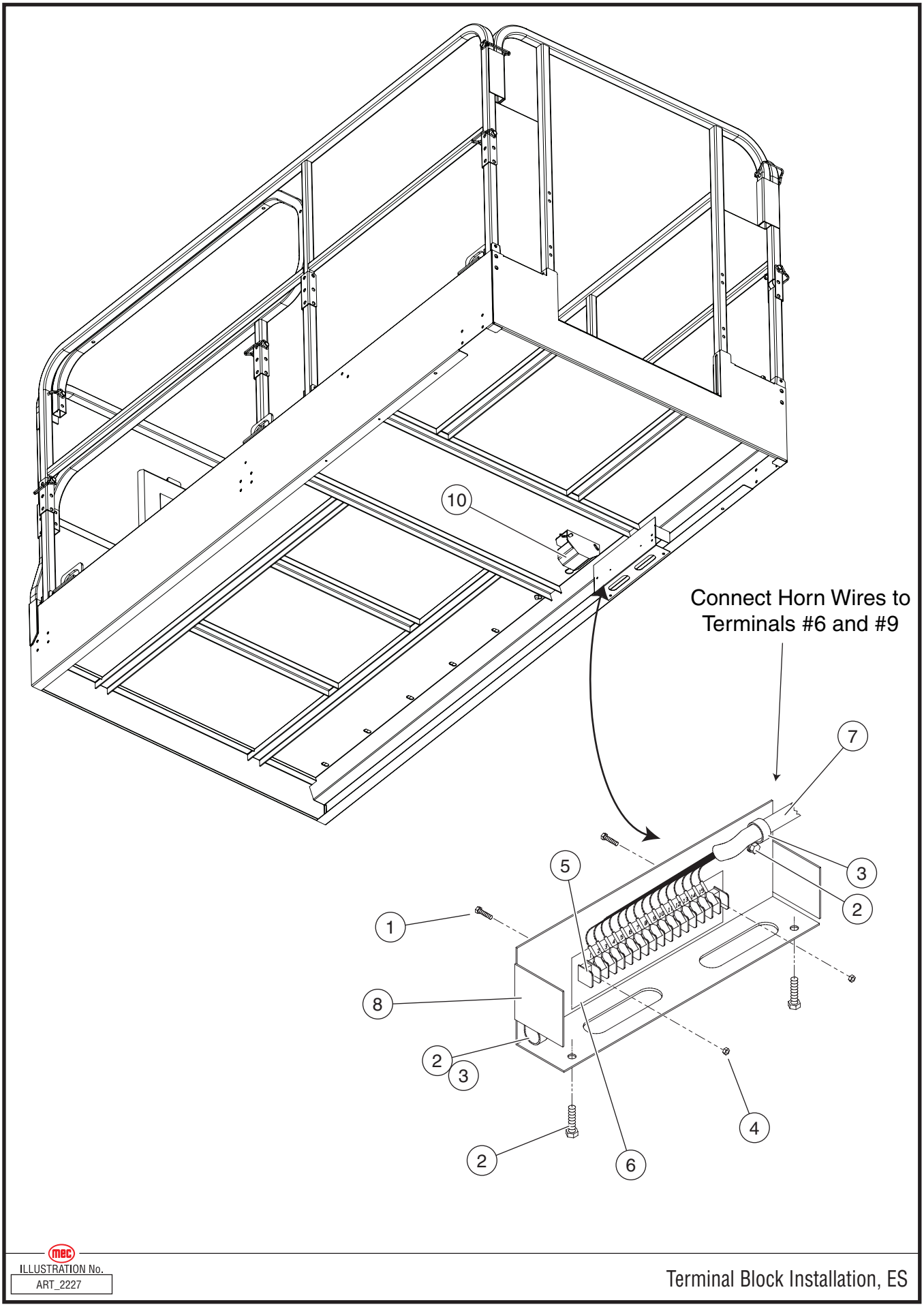


ILLUSTRATION No.
ART_2227

Terminal Block Installation, ES

ITEM	PART NO.	QTY	DESCRIPTION
			TERMINAL BLOCK
1	HDW5363	2	SCREW, 6-32, 1" LG
2	HDW6455	4	SCREW, 1/4" - 20, 1/2" LG
3	5882	2	CABLE CLAMP
4	HDW5364	2	NUT, 6-32
5	5991	1	TERMINAL BLOCK
6	7817	1	STRIP, BACKING, 15 POSITION
7	REF	1	WIRE HARNESS, UPPER CONTROLS
8	25526	1	TERMINAL STRIP COVER
			OPERATOR HORN (CE OPTION)
10	9716	1	HORN, 12-48 VOLT ELECTRONIC
	HDW5723	2	SCREW, 1/4" - 20, 3/4" LG
	HDW5276	2	NUT, 1/4" - 20
	HDW5217	2	WASHER, FLAT
			AIRLINE TO PLATFORM (OPTION)
			(NOT SHOWN)
	5351	1	CABLE TIE
	8543	*	HOSE, 1/4" AIRLINE
			* 1532ES = 27 FT.
			* 1932ES = 33 FT.
	8559	2	CLAMP, HOSE
	HDW5052	2	FITTING, 1/4" MALE, MALE HOSE BARB

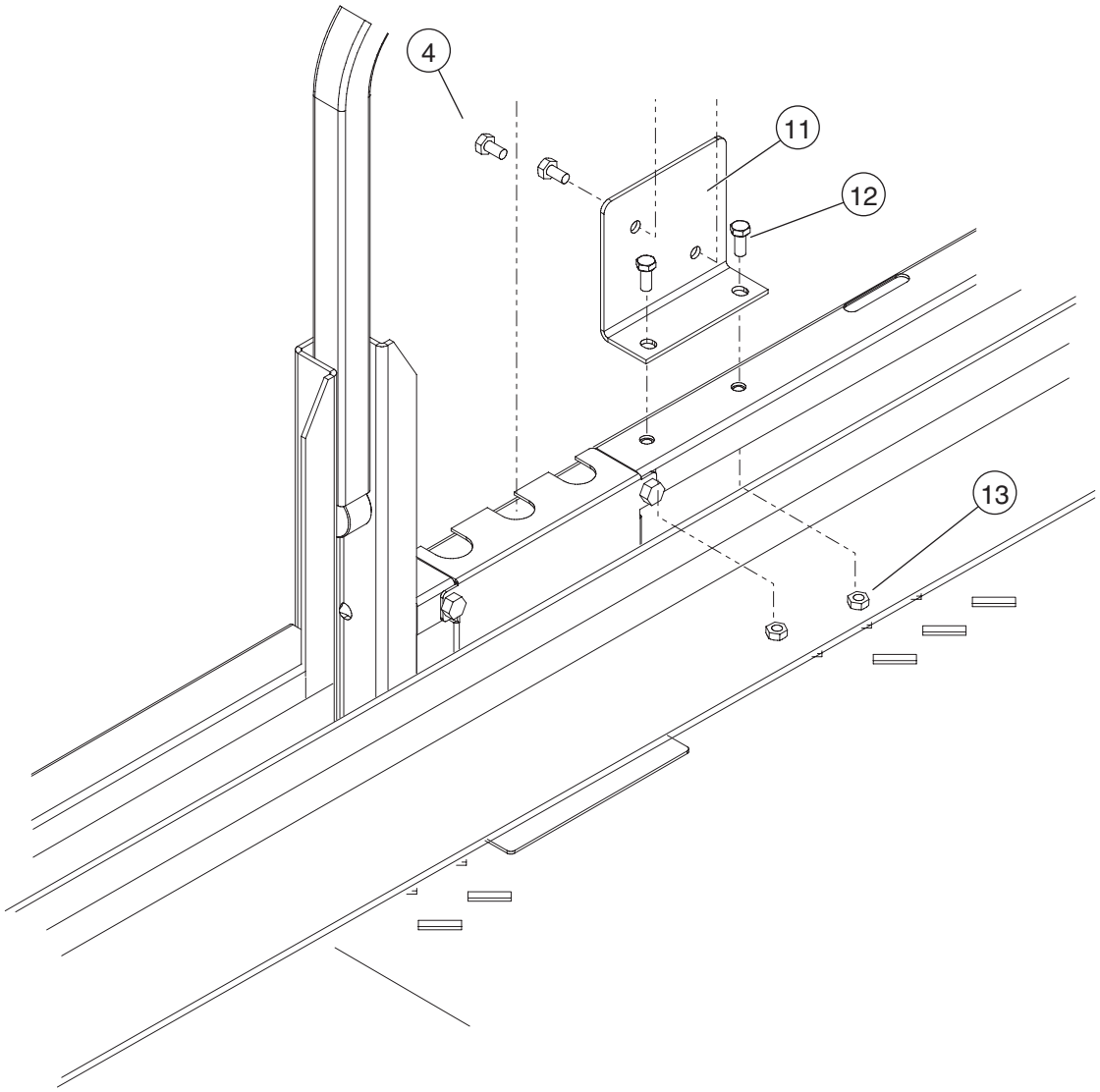
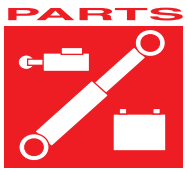


ILLUSTRATION No.
ART_2228

Power to Platform Outlet Installation

ITEM	PART NO.	QTY	DESCRIPTION
			POWER TO PLATFORM
4	HDW6455	2	SCREW, ¼" - 20, ½" LG
11	16221	1	BRACKET
12	HDW5724	2	SCREW, 5/16–18 × ¾"
13	HDW8304	2	NUT, 5/16–18
	HDW8501	2	CLIP, SELF RETAINING
	7617	*	WIRE, 14 GA
		28 FT	*1532ES
		35 FT	* 1932ES
	HDW5217	2	FLAT WASHER 11/32" ID



SECTION C

SCISSORS

Scissors Assembly, 1532ES C-3
Scissors Assembly, 1932ES C-7
Scossors Mount C-11
Lift Cylinder Mount C-13
Lift Cylinder, 25237 ..... C-15
Lift Cylinder, 90801 Without Emergency Lowering Cable C-17
Lift Cylinder, 90801 With Emergency Lowering Cable C-19
Lift Cylinder, 91055 With Emergency Lowering Cable C-21

DENOTES LOCATION OF HDW3802.

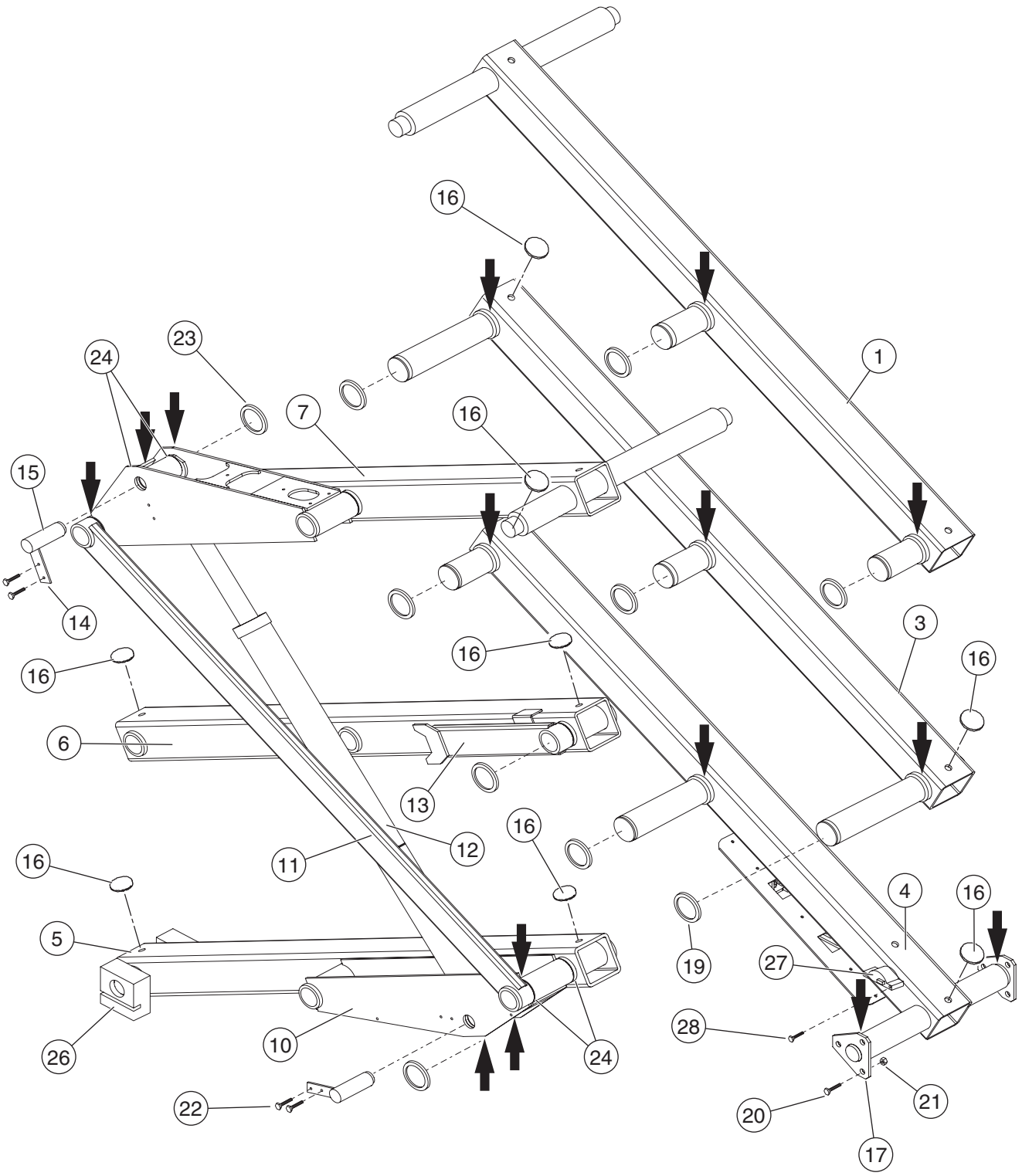


ILLUSTRATION No. ART_2453

Reference: ART_

Scissor Assembly, 1532ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSORS ASSEMBLY, 1532ES
1	25406	1	BEAM, WITH PINS
3	25411	1	BEAM, WITH PINS
4	25558	1	BEAM, WITH BEARINGS
	7160	2	BEARING, 28DU32
5	25413	1	BEAM, WITH BEARINGS
	7160	4	BEARING, 28DU32
6	25409	1	BEAM, WITH BEARINGS
	7160	6	BEARING, 28DU32
7	25405	1	BEAM, WITH BEARINGS
	7160	6	BEARING, 28 DU32
9	25121	1	CYLINDER MOUNT, UPPER
	7160	4	BEARING, 28DU32
10	25119	1	CYLINDER MOUNT, LOWER
	7160	4	BEARING, 28DU32
11	25095	1	SUPPORT, BEAM, 1 X 3
12	REF	1	LIFT CYLINDER (SEE END OF THIS SECTION)
13	25454	1	MAINTENANCE LOCK
	8907	1	BEARING, MSI2832-24
14	25219	2	RETAINING PLATE CYL PIN
15	25142	2	PIN, CYLINDER MOUNT
			(CONTINUED ON NEXT PAGE)

DENOTES LOCATION OF HDW3802.

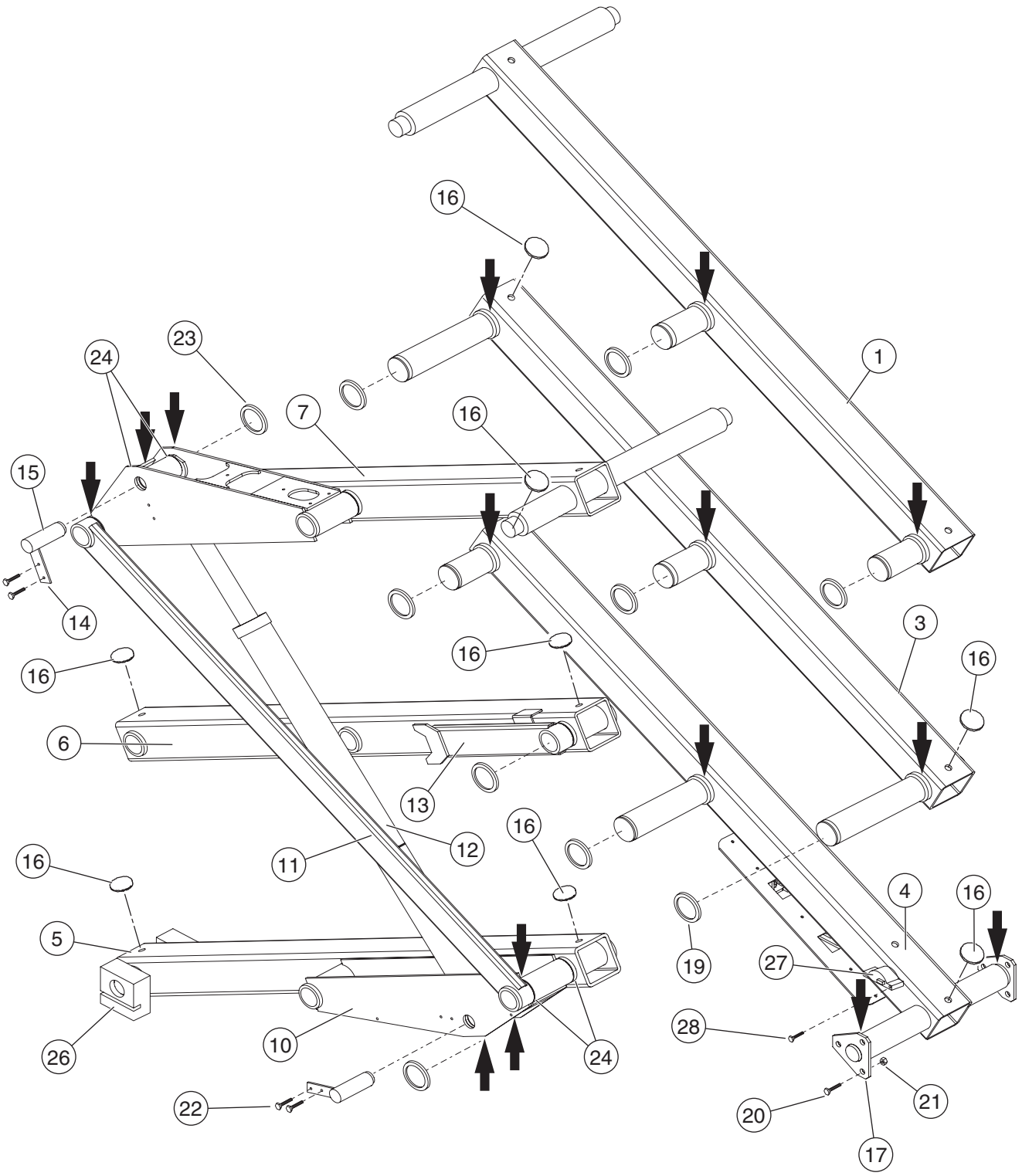


ILLUSTRATION No. ART_2453

Reference: ART_

Scissor Assembly, 1532ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSORS ASSEMBLY, 1532ES (CONTINUED)
16	25429	8	SPACER RUBBER
17	25173	2	PIN, FIXED MOUNT
18	25427	2	SLIDE BLOCK
19	8919	10	RETAINING RING
20	HDW8283	6	SCREW, 1/2" - 13, 1 1/2" LG
21	HDW8457	6	NUT, 1/2" - 13
22	HDW5723	9	SCREW, 1/4" - 20, 3/4" LG, SELF TAPPING
23	6875	2	RETAINING RING
24	HDW13339	4	WASHER, FLAT, NYLON
25	HDW3802	18	WASHER, FLAT NYLATRON
26	25427	2	BLOCK, SLIDE BASE
27	90844	1	ANGLE SENSOR
28	HDW6831	2	SCREW, 1/4" - 20 X 2
NS	7041	5	HOSE CLAMP
NS	9146	1	HOSE CLAMP
NS	90765	11.5'	CABLE WRAP

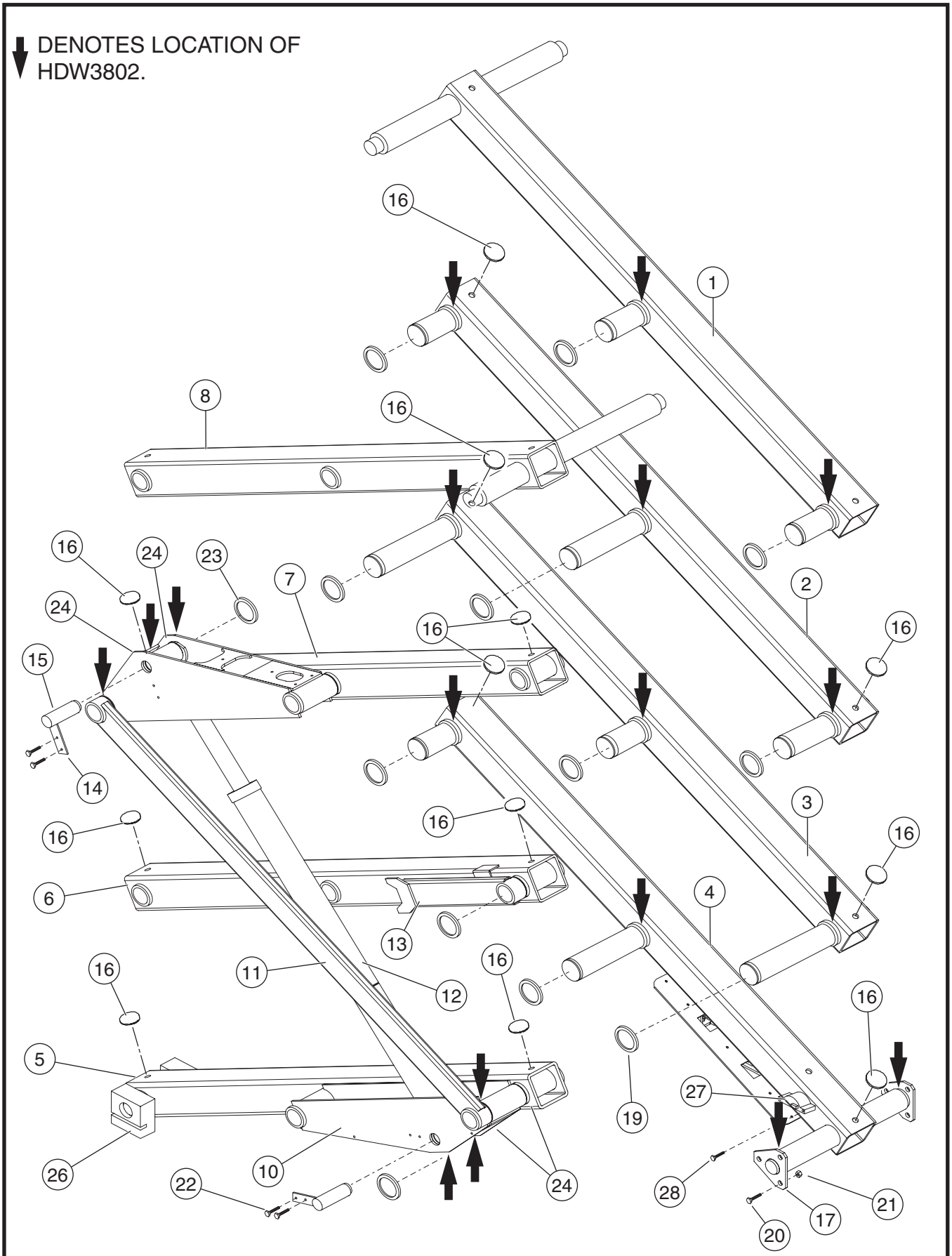


ILLUSTRATION No. ART_2454

Reference: ART_

Scissor Assembly, 1932ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSORS ASSEMBLY, 1932ES
1	25408	1	BEAM, WITH PINS
2	25410	1	BEAM, WITH PINS
3	25411	1	BEAM, WITH PINS
4	25558	1	BEAM, WITH BEARINGS
	7160	2	BEARING, 28DU32
5	25413	1	BEAM, WITH BEARINGS
	7160	4	BEARING, 28DU32
6	25409	1	BEAM, WITH BEARINGS
	7160	6	BEARING, 28DU32
7	25409	1	BEAM, WITH BEARINGS
	7160	6	BEARING, 28 DU32
8	25407	1	BEAM, WITH BEARINGS
	7160	6	BEARING, 28DU32
9	25121	1	CYLINDER MOUNT, UPPER
	7160	4	BEARING, 28DU32
10	25119	1	CYLINDER MOUNT, LOWER
	7160	4	BEARING, 28DU32
11	25095	1	SUPPORT, BEAM, 1 X 3
12	REF	1	LIFT CYLINDER (SEE END OF THIS SECTION)
13	25454	1	MAINTENANCE LOCK
	8907	1	BEARING, MSI2832-24
14	25219	2	RETAINING PLATE CYL PIN
15	25142	2	PIN, CYLINDER MOUNT
16	25429	12	SPACER RUBBER
			(CONTINUED ON NEXT PAGE)

DENOTES LOCATION OF HDW3802.

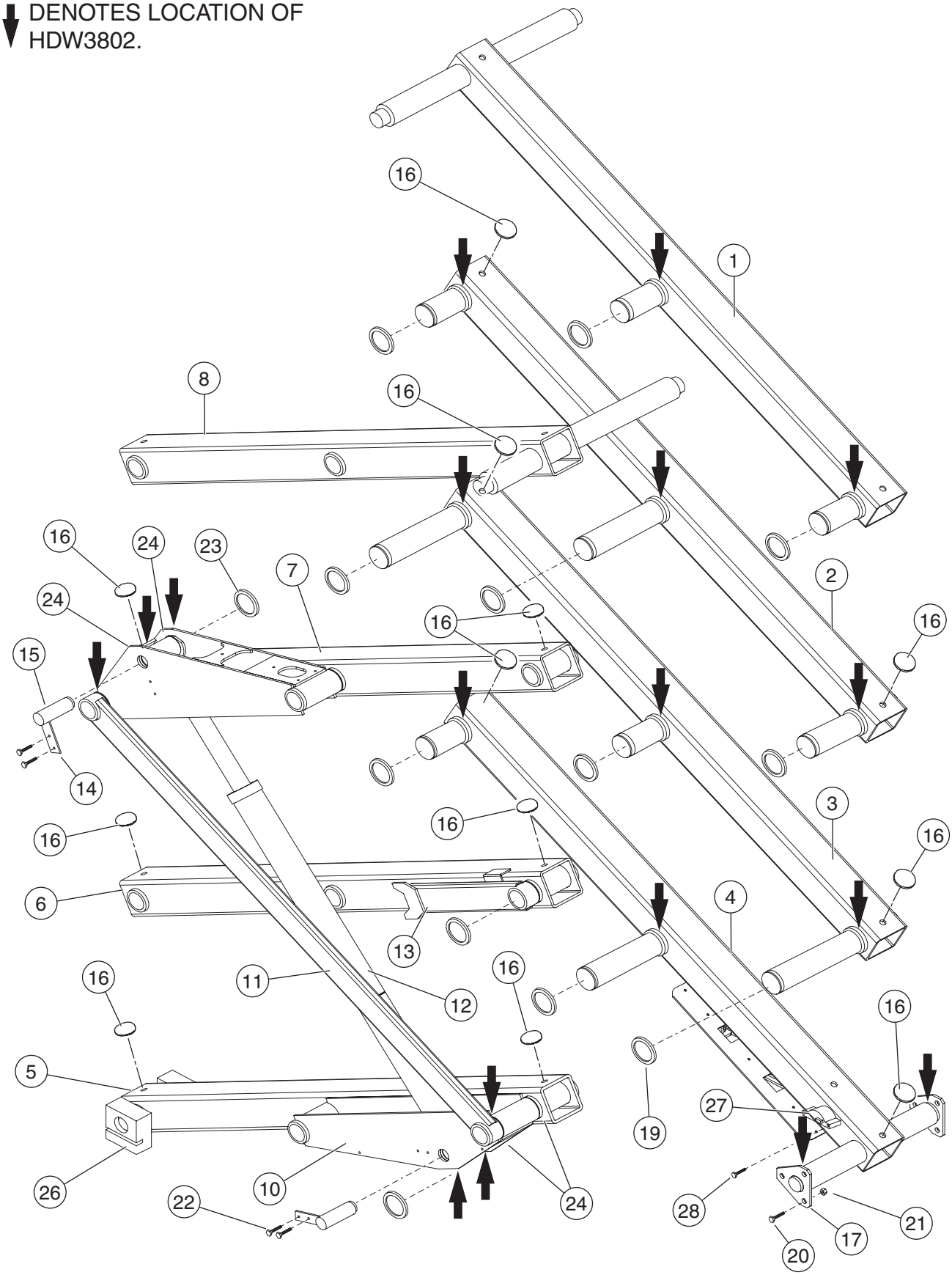
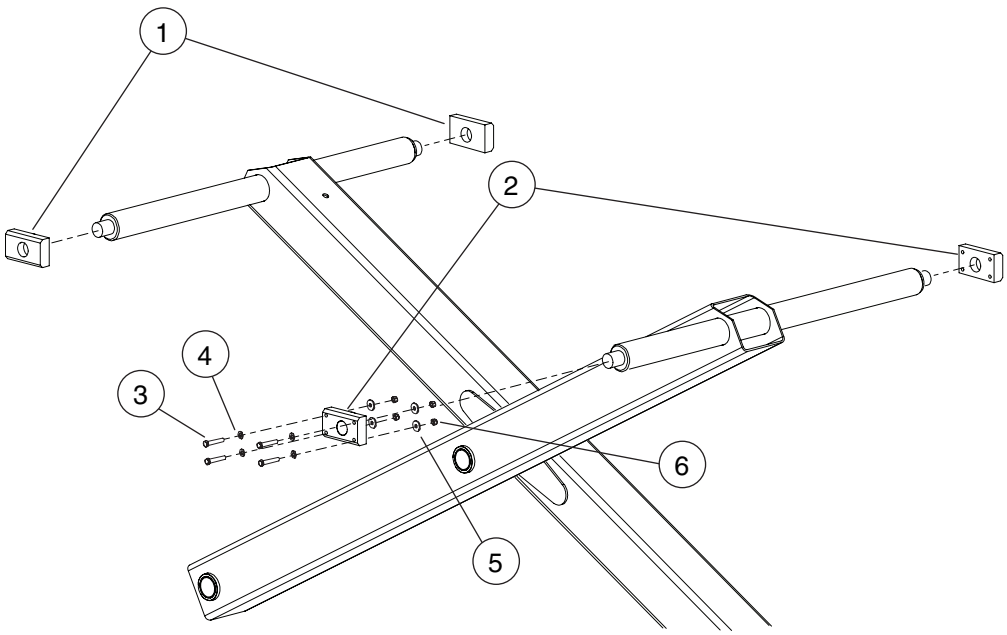


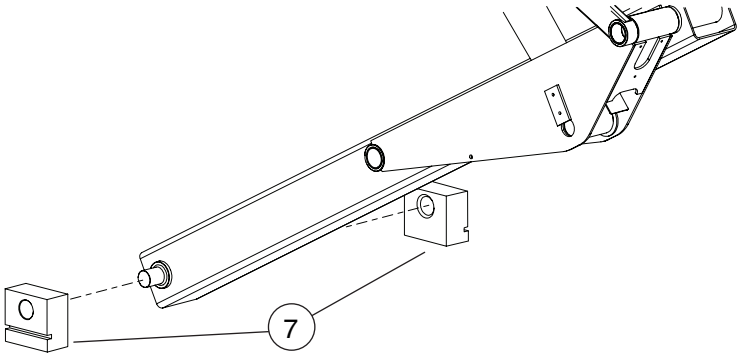
ILLUSTRATION No. ART_2454

Reference: ART_

Scissor Assembly, 1932ES, CE

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSORS ASSEMBLY, 1932ES (CONTINUED)
17	25173	2	PIN, FIXED MOUNT
18	25427	2	SLIDE BLOCK
19	8919	10	RETAINING RING
20	HDW8283	6	SCREW, 1/2" - 13, 1 1/2" LG
21	HDW8457	6	NUT, 1/2" - 13
22	HDW5723	9	SCREW, 1/4" - 20, 3/4" LG, SELF TAPPING
23	6875	2	RETAINING RING
24	HDW13339	4	WASHER, FLAT, NYLON
25	HDW3802	18	WASHER, FLAT NYLATRON
26	25427	2	BLOCK, SLIDE BASE
27	90844	1	ANGLE SENSOR
28	HDW6831	2	SCREW, 1/4" - 20 X 2
NS	7041	5	HOSE CLAMP
NS	9146	1	HOSE CLAMP
NS	90765	11.5'	CABLE WRAP





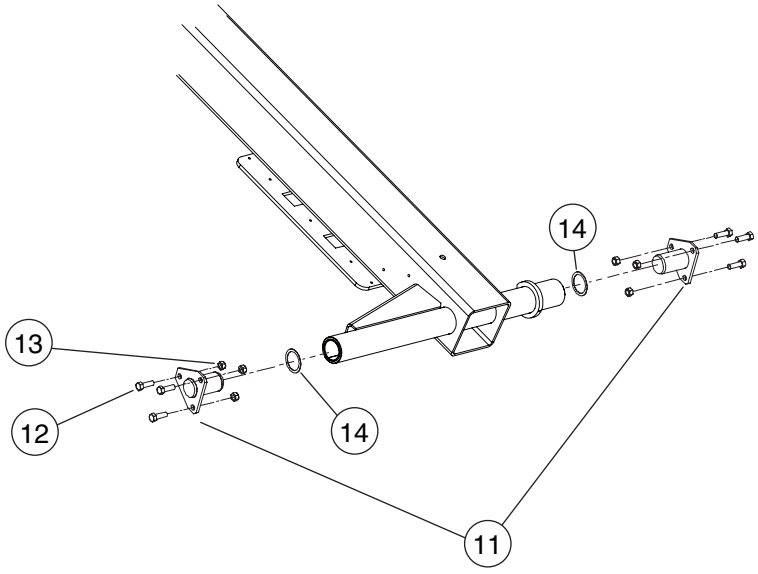


ILLUSTRATION No. ART_2262

Reference: ART_

Scissor Mounting Detail, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			Scossors Mount
1	13778	2	BLOCK, SLIDE PLATFORM
2	13777	2	BLOCK, FIXED PLATFORM
3	HDW8486	4	SCREW, 5/16-18, 1.87 LG, GR 8
4	HDW5217	4	WASHER, .343 ID X .688 OD X .063 THK
5	HDW8294	4	WASHER, .328 ID X 1.000 OD X .100 THK
6	HDW8304	4	NUT, 5/16-18, GR 5
7	25427	2	BLOCK, SLIDE BASE
11	25173	2	PIN WELDMENT STATIONARY MOUNT
12	HDW8283	6	SCREW, 1/2-13, 1.5 LG, GR 8
13	HDW8457	6	NUT, LOCK, 1/2-13
14	HDW13175	16	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK

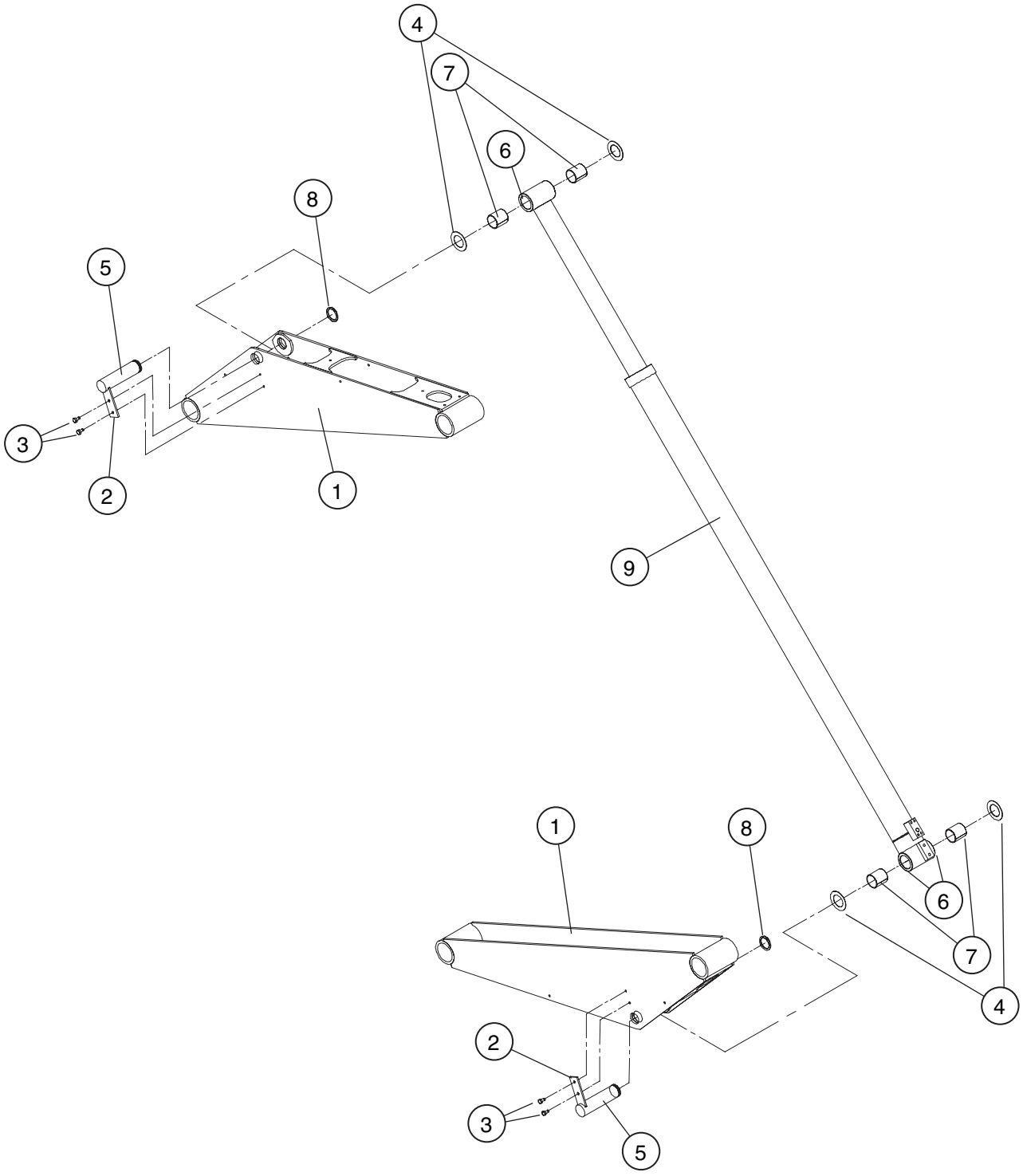


ILLUSTRATION No.
ART_2265

Reference: ART_

Cylinder Mounting Detail, ES

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER MOUNT
1	REF	2	CYLINDER MOUNT WELDMENT
2	25219	2	PLATE RETAINER, CYL MOUNT 3.75 X 1.25 X 0.179
3	HDW6455	4	SCREW, 1/4-20, 1/2 LG, GR 5
4	13339	4	WASHER, NYLON, 1.385 ID X 2.255 OD X .030 THK
5	25142	2	PIN, 1.373 X 5.382 CYL MOUNT
6	6984	4	BEARING, 1.375 X 1.625 LG
7	6669	2	BEARING, 2.0 X 2.0 LG
8	6875	2	RETAINING RING, 1.375 DIA.
9	REF	1	LIFT CYLINDER

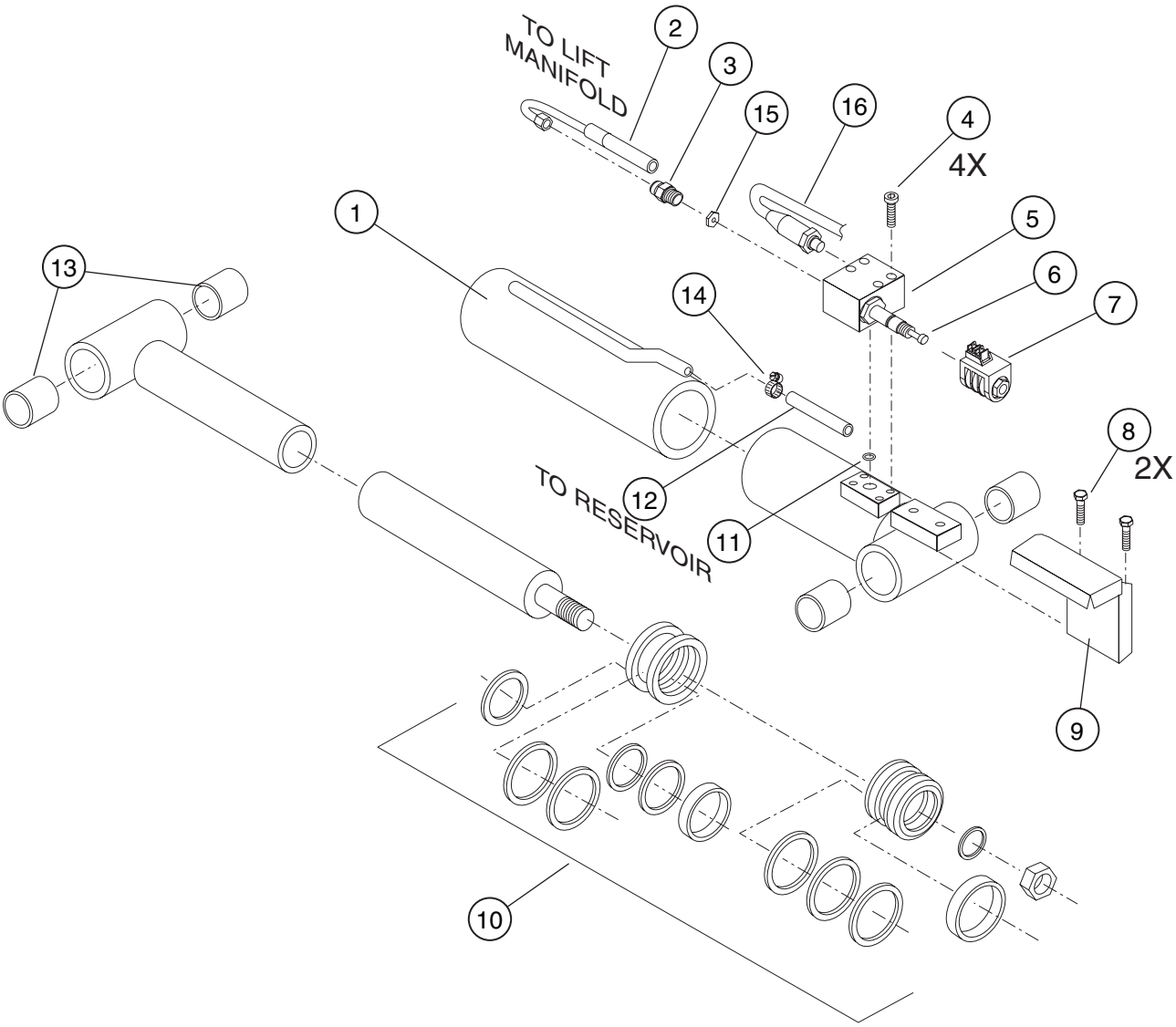


ILLUSTRATION No.
ART_2455

1532ES, CE: Serial # 9001000 - 9001008
1932ES, CE: Serial # 9100000 - 9104470

25237 Hydraulic Cylinder, CE

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER, 25237
			1532ES - SERIAL # 9001000 TO # 9001008
			1932ES - SERIAL # 9100000 TO # 9104470
1	25237	1	CYLINDER, LIFT
2	REF	1	HOSE ASSEMBLY, LIFT CYLINDER (SEE SECTION D)
3	HDW7438	1	FITTING PIPE, ADAPTOR
4	HDW8592	4	SCREW, CAP, SOCKET HD, 1/4"-20 X 1.50, GRADE 8
5	13551	1	MANIFOLD, LIFT CYLINDER-STANDARD
6	8595	1	VALVE, 2 WAY, N.C. W/MANUAL LOCK
7	8914	1	COIL, 24 VOLT, DOUBLE SPADE W/DIODE
8	HDW8663	2	SCREW, CAP, HEX HD, 5/16"-18 X .50, GRADE 2
9	13728	1	BRACKET, CYLINDER VALVE GUARD WELDMENT
10	7078	1	KIT, SEAL-LIFT CYLINDER (SERVICE)
11	6426	1	O-RING, MANIFOLD BLOCK
12	REF	13'	HOSE, RETURN LINE
13	6984	4	BEARING, DU, 1 3/8" ID X 1 5/8" LG
14	7788	1	CLAMP, HOSE
15	90439	1	ORIFICE 0.047 (1932ES)
	90889	1	ORIFICE 0.055 (1532ES)
16	90845	1	PRESSURE SENSOR 3000 PSI
NS	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION E)

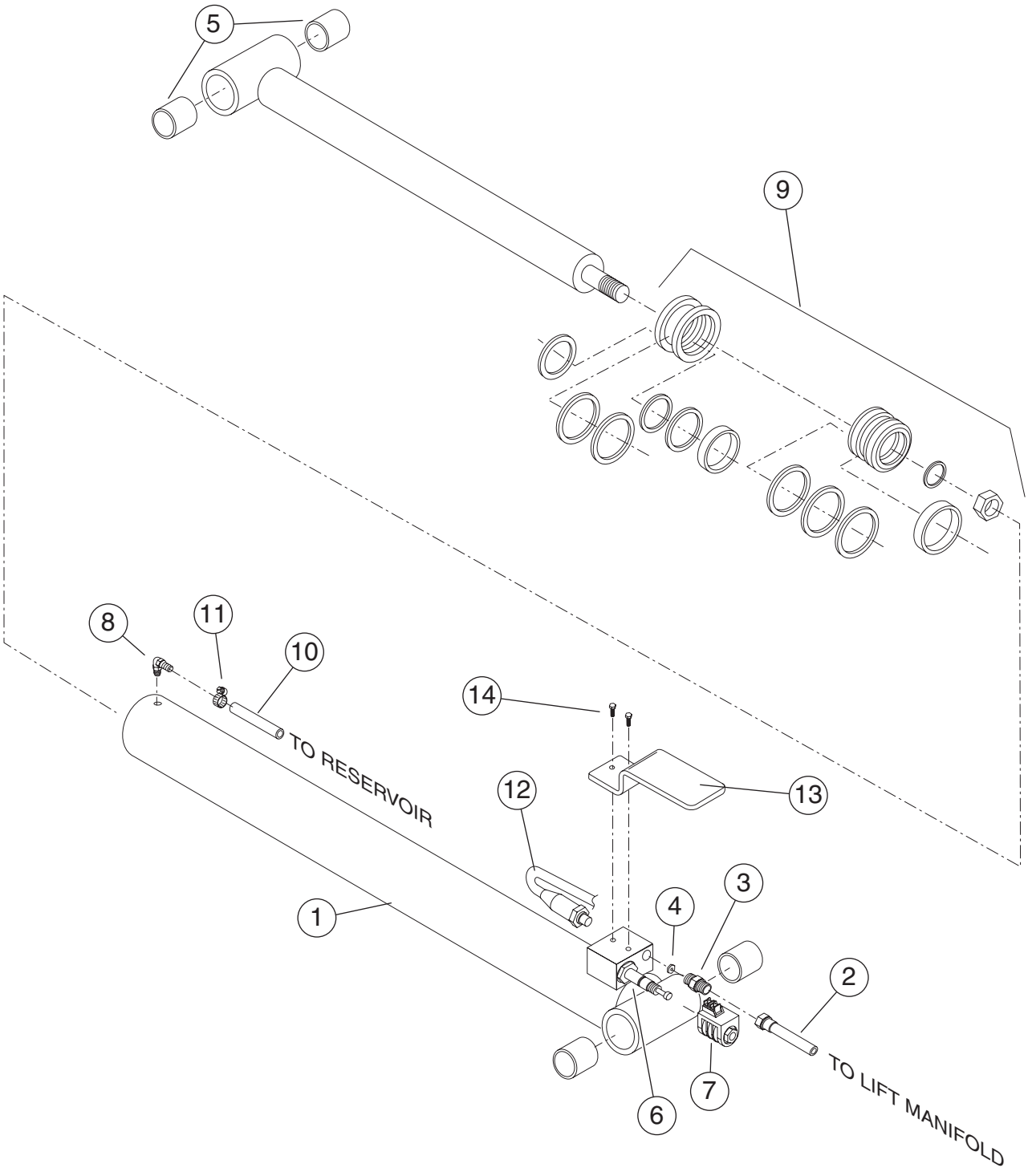
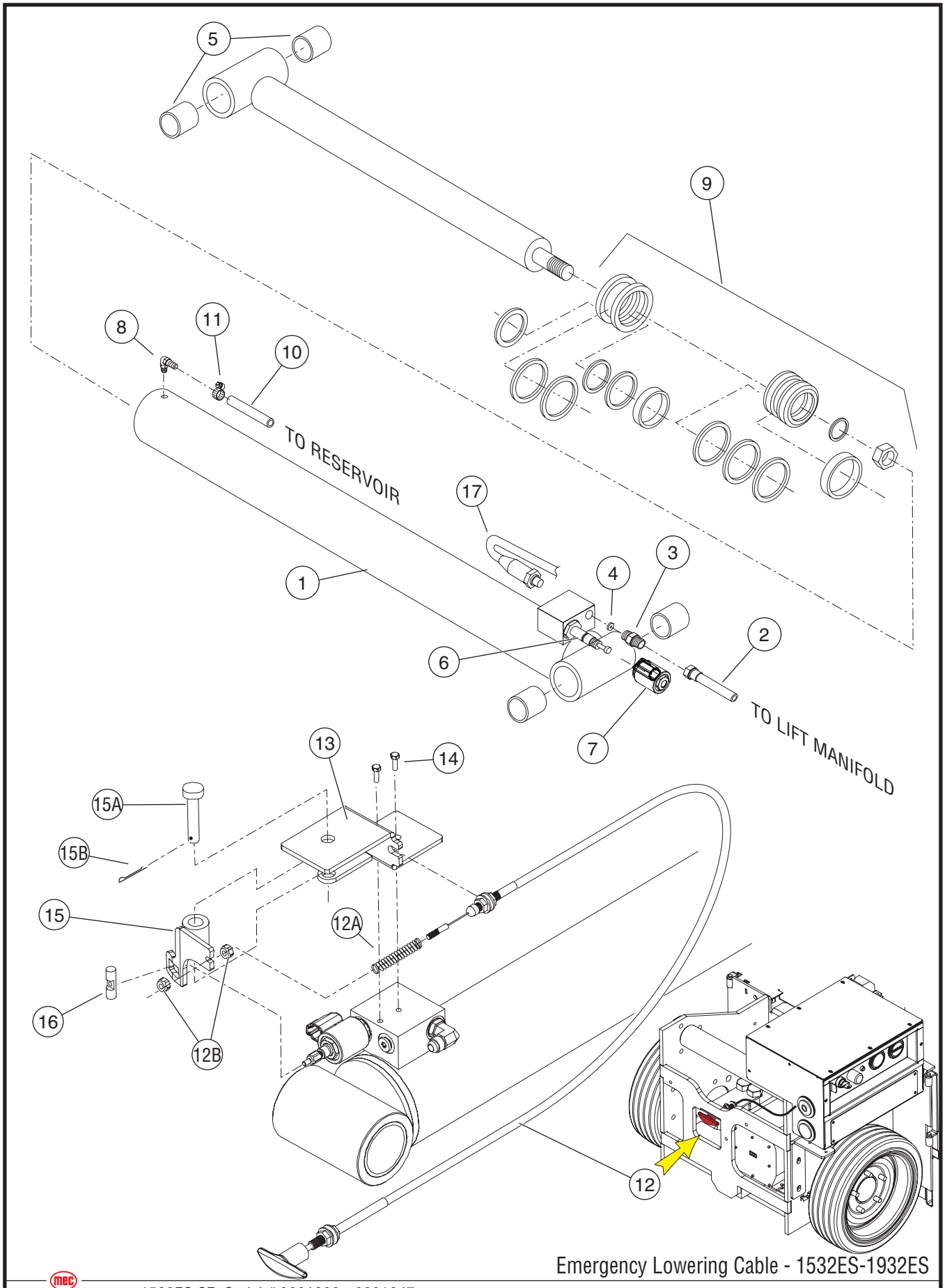


ILLUSTRATION No.
ART_2456

1532ES CE: Serial # 9001009 - 9001031
1932ES CE: Serial # 9104471 - 9105000

90801 Hydraulic Clyinder, CE

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER, 90801 WITHOUT EMERGENCY LOWERING CABLE
			1532ES - SERIAL # 9001009 TO # 9001031 **1932ES - SERIAL # 9104471 TO # 9105000**
1	90801	1	CYLINDER, LIFT
2	REF	1	HOSE ASSEMBLY, LIFT CYLINDER (SEE SECTION D)
3	HDW7438	1	FITTING, PIPE, ADAPTOR
4	90439	1	ORIFICE 0.047 (1932ES)
	90889	1	ORIFICE 0.055 (1532ES)
5	6984	4	BEARING, DU, 1 3/8" ID X 1 5/8" LG
6	91051	1	VALVE, 2 WAY, N.C. CABLE ATTACH
7	90816	1	COIL, 24 VOLT
8	HDW8879	1	FITTING, PIPE 90°, MALE BARB
9	7078	1	KIT, SEAL-LIFT CYLINDER (SERVICE)
10	REF	14'	HOSE, RETURN LINE (SEE SECTION D)
11	7788	1	CLAMP, HOSE
12	90845	1	PRESSURE SENSOR 3000 PSI
13	16162	1	BRACKET, LIFT CYLINDER VALVE GUARD
14	HDW8152	2	SCREW, 1/4–20 X 3/4
NS	REF	1	HARNESS, WIRE, DOWN VALVE (SEE PARTS SECTION A)



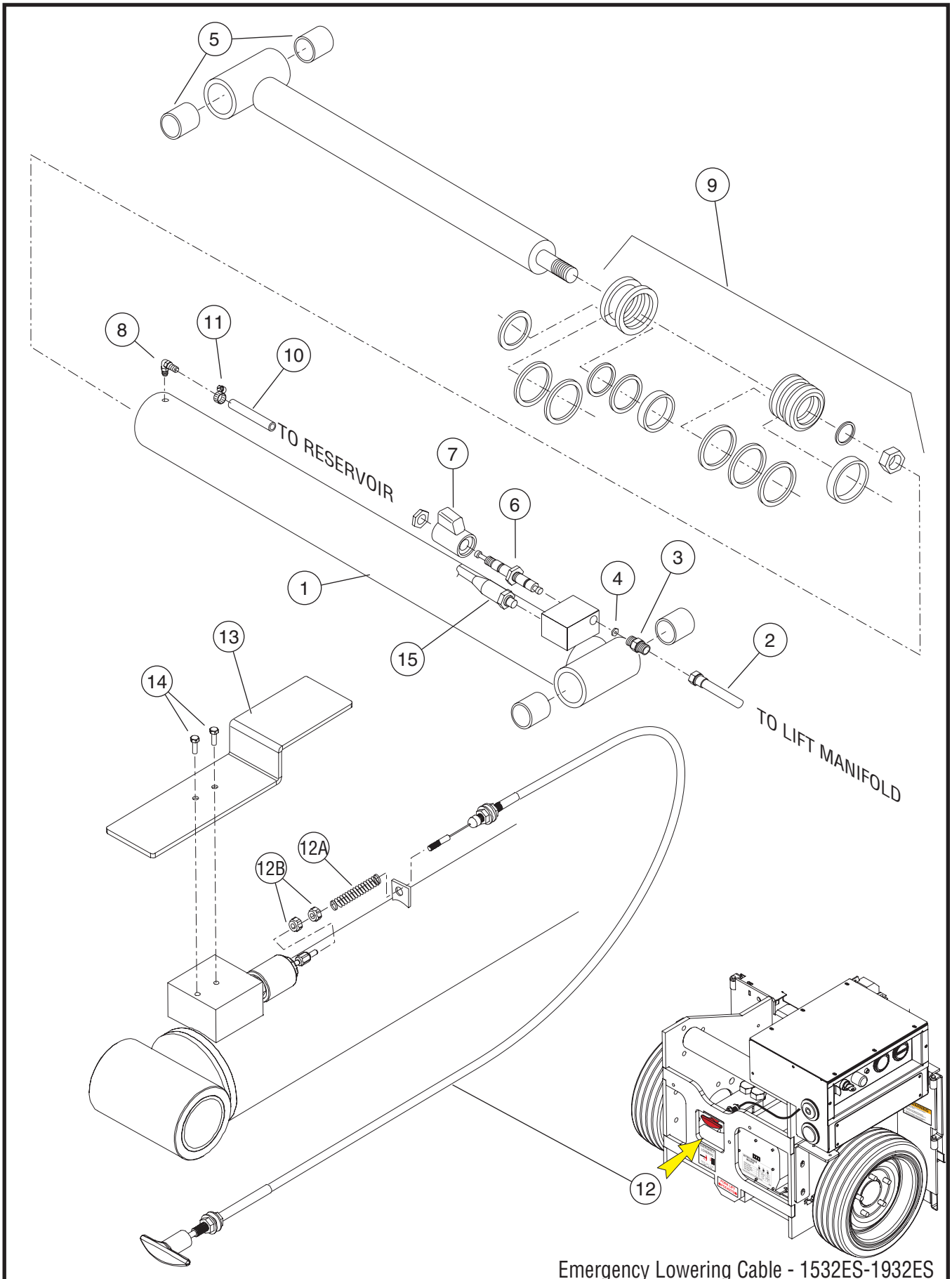
Emergency Lowering Cable - 1532ES-1932ES

ILLUSTRATION No.
ART_2457

1532ES CE: Serial # 9001009 - 9001047
1932ES CE: Serial # 9104470 - 9105458

90801 Hydraulic Clyinder, CE

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER, 90801 WITH EMERGENCY LOWERING CABLE
			1532ES - SERIAL # 9001032 TO # 9001047
			1932ES - SERIAL # 9105001 TO # 9105458
1	90801	1	CYLINDER, LIFT
2	REF	1	HOSE ASSEMBLY, LIFT CYLINDER (SEE SECTION D)
3	HDW7438	1	FITTING, PIPE, ADAPTOR
4	90439	1	ORIFICE 0.047 (1932ES)
	90889	1	ORIFICE 0.055 (1532ES)
5	6984	4	BEARING, DU, 1 3/8" ID X 1 5/8" LG
6	91051	1	VALVE, 2 WAY, N.C. CABLE ATTACH
7	91001	1	COIL, 24 VOLT
8	HDW8879	1	FITTING, PIPE 90°, MALE BARB
9	7078	1	KIT, SEAL-LIFT CYLINDER (SERVICE)
10	REF	14'	HOSE, RETURN LINE (SEE SECTION D)
11	7788	1	CLAMP, HOSE
NS	REF	1	HARNESS, WIRE, DOWN VALVE (SEE PARTS SECTION A)
12	91104	1	CABLE, 80 IN, 1532ES
12	91082	1	CABLE, 100 IN, 1932ES
12A	—	1	SPRING
12B	—	2	CAP LUG
13	16117	1	WELDMENT, CABLE MOUNT ATTACHMENT
14	8152	2	BOLT
15	16121	1	BELL CRANK
15A	—	1	CLEVIS PIN
15B	—	1	COTTER PIN
16	16134	1	E-DOWN PIVOT NUT
17	90845	1	PRESSURE SENSOR 3000 PSI



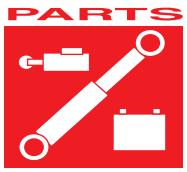
Emergency Lowering Cable - 1532ES-1932ES

ILLUSTRATION No.
ART_2458

1532ES CE: Serial # 9001048 UP
1932ES CE: Serial # 9105459 UP

91055 Hydraulic Clyinder, CE

ITEM	PART NO.	QTY	DESCRIPTION
			Lift Cylinder, 91055 With Emergency Lowering Cable
			1532ES - SERIAL # 9001048 UP
			1932ES - SERIAL # 9105459 UP
1	91055	1	CYLINDER, LIFT
2	REF	1	HOSE ASSEMBLY, LIFT CYLINDER (SEE SECTION D)
3	HDW7438	1	FITTING, PIPE, ADAPTOR
4	90439	1	ORIFICE 0.047 (1932ES)
	90889	1	ORIFICE 0.055 (1532ES)
5	6984	4	BEARING, DU, 1 3/8" ID X 1 5/8" LG
6	91051	1	VALVE, 2 WAY, N.C. CABLE ATTACH
7	91001	1	COIL, 24 VOLT
8	HDW8879	1	FITTING, PIPE 90°, MALE BARB
9	7078	1	KIT, SEAL-LIFT CYLINDER (SERVICE)
10	REF	14'	HOSE, RETURN LINE (SEE SECTION D)
11	7788	1	CLAMP, HOSE
NS	REF	1	HARNESS, WIRE, DOWN VALVE (SEE PARTS SECTION A)
12	91082	1	CABLE, 100 IN
12	91104	1	CABLE. 80 IN
12A	—	1	SPRING
12B	—	2	CAP LUG
13	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
14	8152	2	BOLT
15	90845	1	PRESSURE SENSOR 3000 PSI



SECTION D

HYDRAULICS

Brake Release Manifold, Early Model D-3
Main Manifold Assembly, Early Model D-5
Main Manifold Assembly, Late Models D-9
Hydraulic Reservoir, Steel D-11
Hydraulic Reservoir, Plastic D-13
Hydraulic Hoses, Early Models D-15
Hydraulic Hoses, Late Models D-17

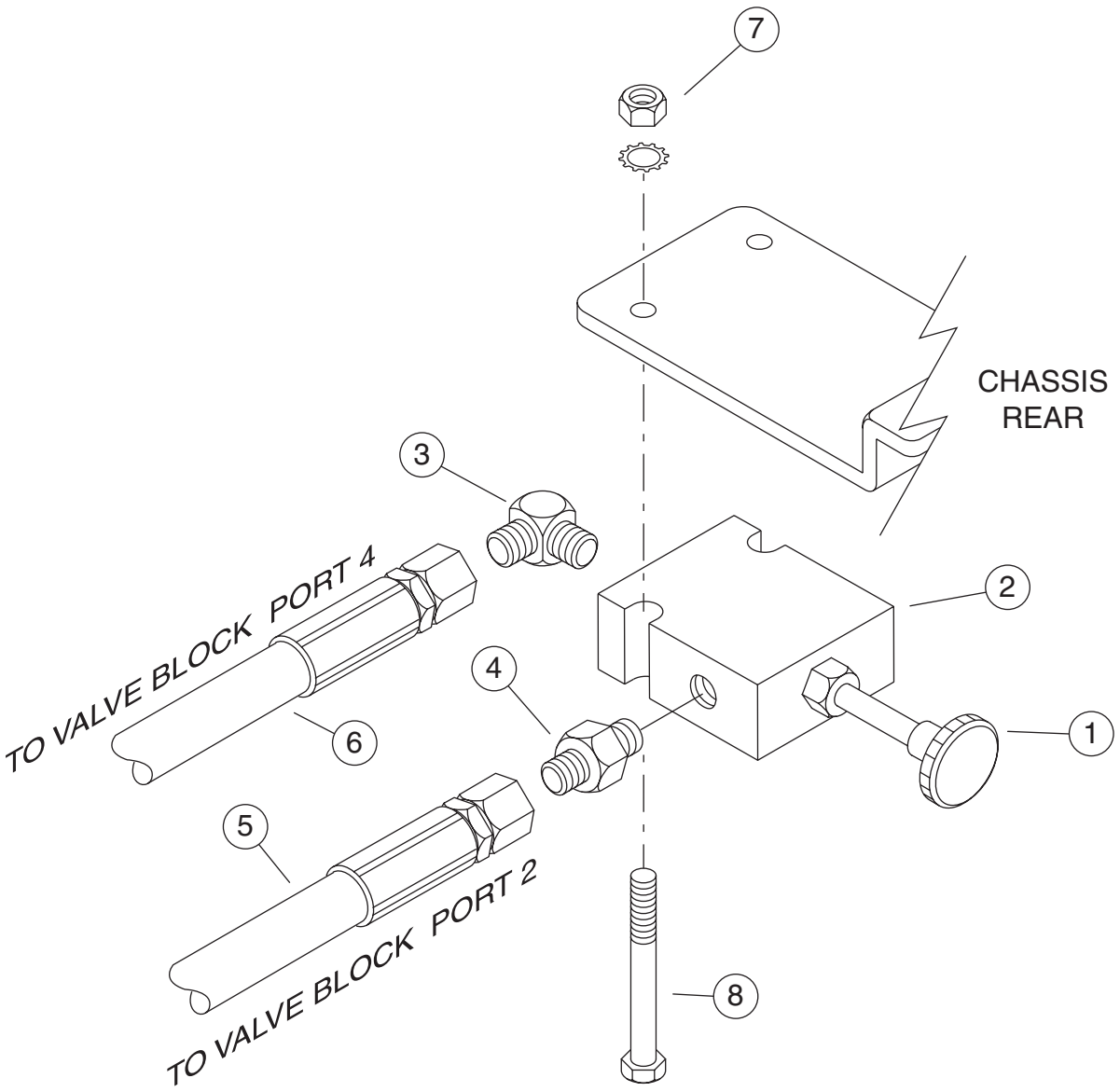
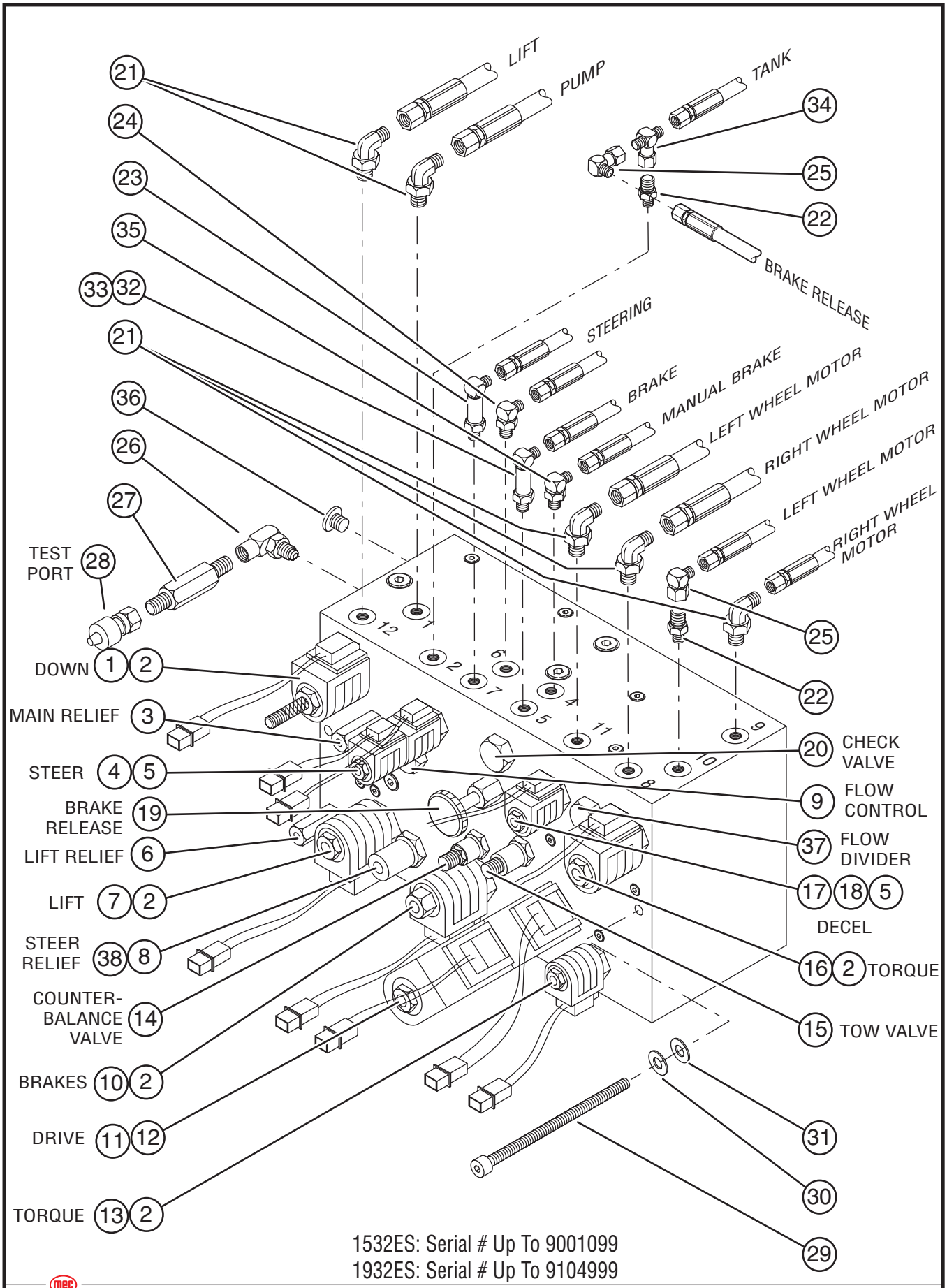


ILLUSTRATION No.
ART_2285

Brake Release Pump, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			BRAKE RELEASE MANIFOLD, EARLY MODEL
			1532ES - SERIAL #9001000 - # 9001099
			1932ES - SERIAL #9104000 - # 9104999
	90234		BRAKE RELEASE MANIFOLD
1	90326	1	VALVE, HYDRAULIC HAND PUMP
2	90325	1	BLOCK, MANIFOLD
3	HDW90329	1	FITTING, 90°, MALE 1/4", O-RING MALE 3/8"
4	HDW7438	1	FITTING, ADAPTOR, MALE 3/8" O-RING MALE 3/8"
5	REF	1	HOSE ASSY
6	REF	1	HOSE ASSY
7	HDW5276	4	NUT, 1/4" - 20
8	HDW6831	2	SCREW, 1/4" - 20, 2" LG
	REF		SEE HYDRAULIC HOSES, THIS SECTION

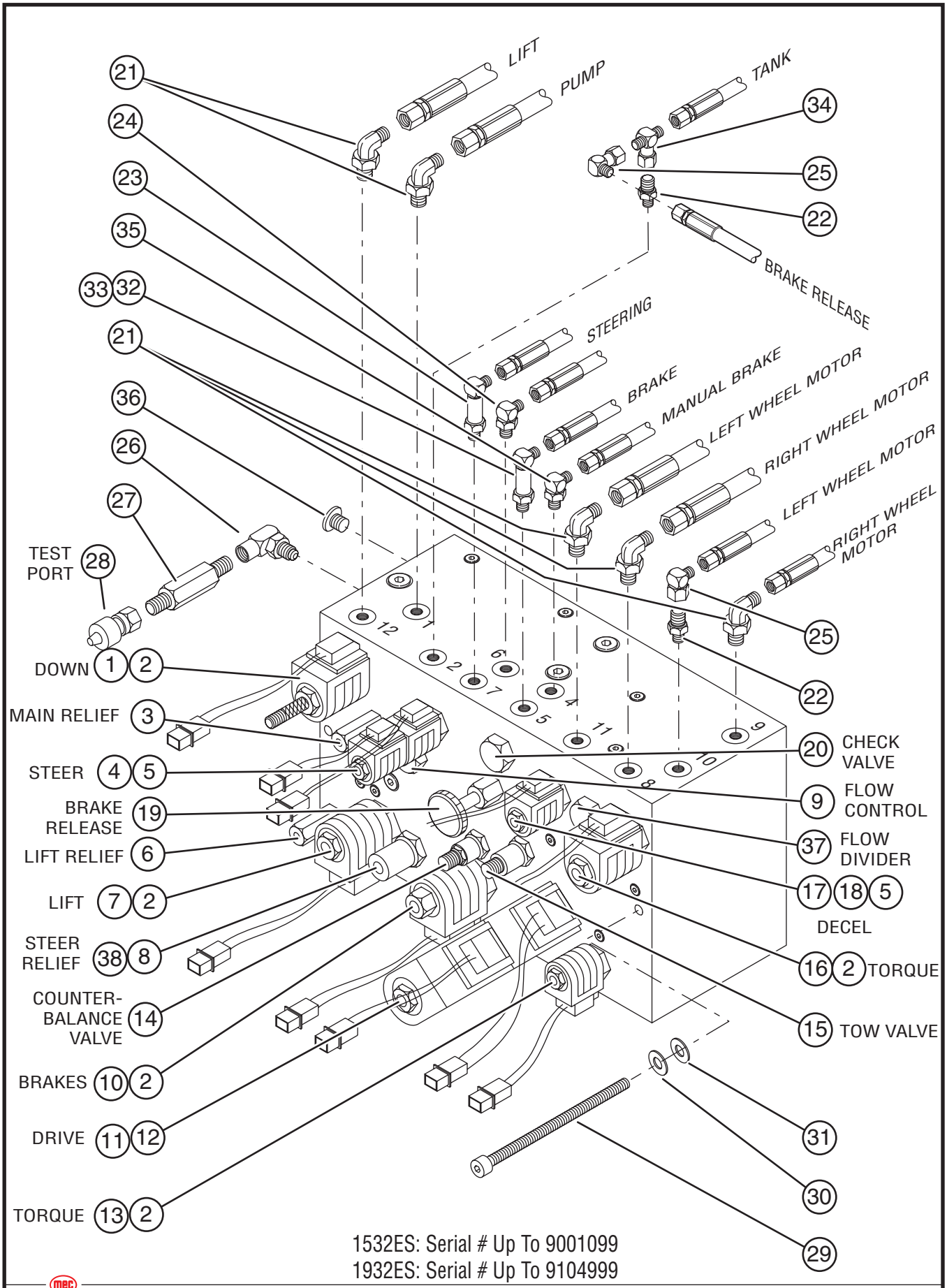


1532ES: Serial # Up To 9001099
1932ES: Serial # Up To 9104999

ILLUSTRATION No.
ART_2286

9999, Hydraulic Manifold Assembly, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			Main Manifold Assembly, Early Model
			1532ES - SERIAL #9001000 - # 9001099
			1932ES - SERIAL #9104000 # 9104999
	9999		MAIN MANIFOLD ASSEMBLY
1	8343	1	VALVE, SPOOL, POP, 2 WAY, N.C. W/MAN OVERRIDE
2	9996	5	COIL, 24 VOLT
3	9992	1	VALVE, RELIEF
4	9986	1	VALVE, SPOOL, 4 WAY, 3 POSITION (STEERING)
5	9988	3	COIL, 24 VOLT
6	9993	1	VALVE, RELIEF
7	9982	1	VALVE, SPOOL, 4 WAY
8	9984	1	VALVE, RELIEF
9	5954	1	VALVE, PRIORITY FLOW CONTROL
10	6975	1	VALVE, SPOOL, N.O.
11	9995	1	VALVE, SPOOL, 4 WAY, 3 POSITION (DRIVE)
12	9997	2	COIL, 24 VOLT
13	6976	1	VALVE, SPOOL, 3 WAY
14	9669	1	VALVE, COUNTER BALANCE
15	90378	1	VALVE NEEDLE (TOW VALVE)
16	8373	1	VALVE, SPOOL, 4 WAY
17	9985	1	VALVE, SPOOL, N.O.
18	9998	1	ORIFICE 0.040 DIA.
19	9665	1	VALVE, MANUAL (BRAKE RELEASE)
20	9990	1	VALVE, CHECK
	25575	-	HOSE KIT, SEE HYDRAULIC HOSES, THIS SECTION
			(CONTINUED ON NEXT PAGE)



1532ES: Serial # Up To 9001099
1932ES: Serial # Up To 9104999

ILLUSTRATION No.
ART_2286

9999, Hydraulic Manifold Assembly, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			MAIN MANIFOLD ASSEMBLY, EARLY MODELS (CONTINUED)
			1532ES - SERIAL #9001000 - # 9001099
			1932ES - SERIAL #9104000 - # 9104999
21	HDW8081	5	FITTING, 90° ELBW, MALE 3/8", MALE 1/2" O-RING
22	HDW7389	2	ADAPTER, MALE 3/8", MALE 3/8" O-RING
23	HDW9157	1	FITTING, 90° ELBW, MALE 3/8", MALE 3/8" O-RING
24	HDW7601	1	FITTING, 90° ELBW, MALE 3/8", MALE 3/8" O-RING
25	HDW90299	2	FITTING, 90° ELBW, MALE 3/8", FML 3/8", MALE 3/8"
26	9980	1	FITTING, 90° ELBW, MALE 3/8" O-RING, FML 1/4" NPT
27	HDW90301	1	UNION, MALE 1/4" NPT, MALE 1/4" NPT,3" LG
28	HDW7971	1	DISCONNECT, MALE 1/4"
29	HDW90287	2	SCREW, 1/4" - 20, 4.5" LG
30	HDW5277	2	WASHER, LOCK
31	HDW5217	2	WASHER, FLAT
32	HDW90327	1	FITTING, 90° ELBW, MALE 1/4", MALE 3/8" O-RING
33	2974	1	PLUG, METERING
34	HDW90285	1	FITTING, MALE 3/8" TEE
35	HDW90329	1	FITTING, 90° ELBW, MALE 1/4", MALE 3/8" O-RING
36	HDW9200	1	FITTING, MALE PLUG 1/4" NPT
37	91014	1	FLOW DIVIDER
38	9971	3	RELIEF VALVE TAMPER PROOF CAP
	25575	-	HOSE KIT, SEE HYDRAULIC HOSES, THIS SECTION

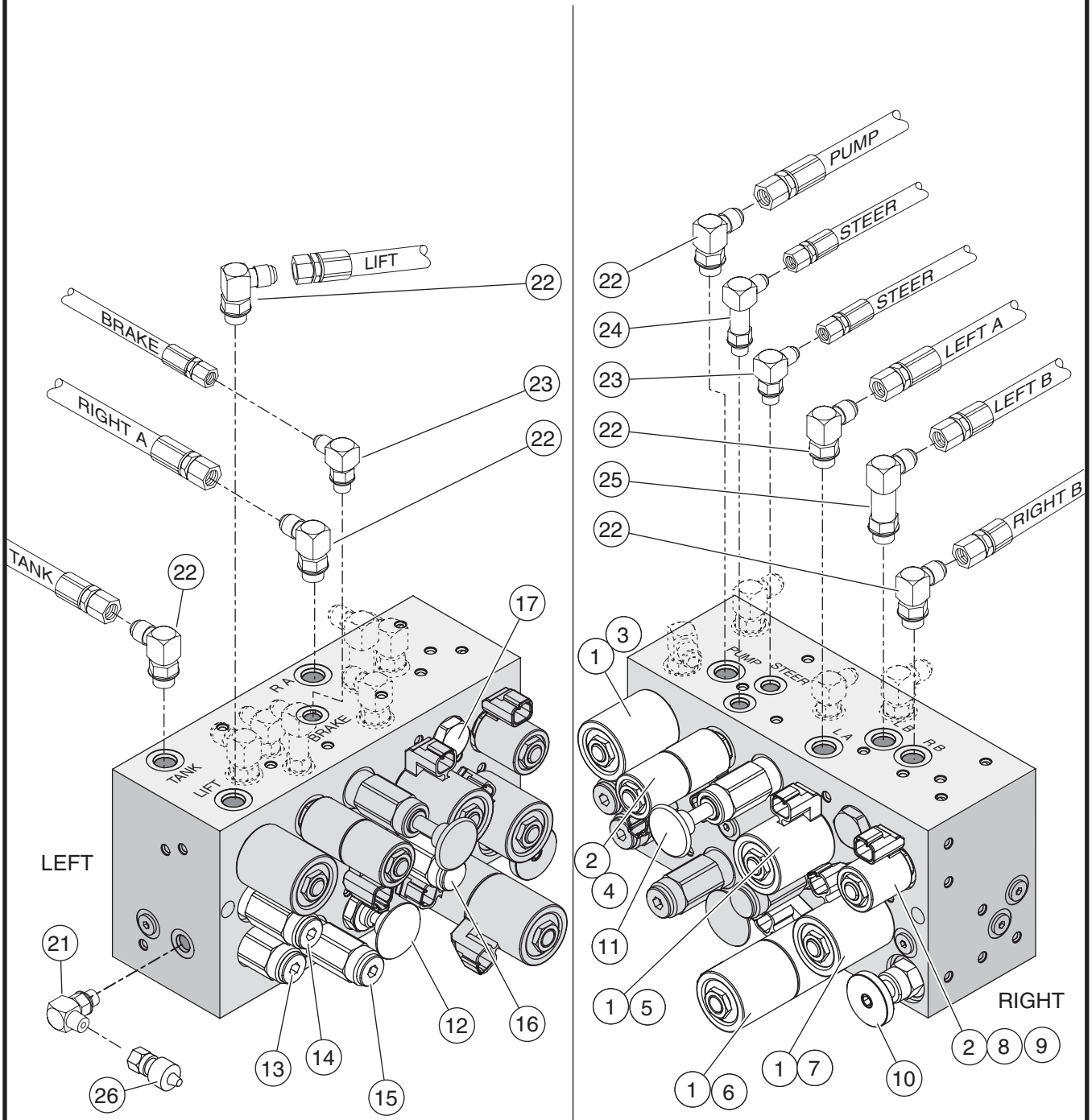


ILLUSTRATION No.
ART_2287

1532ES: Serial # 9001100 - UP
1932ES: Serial # 9105000 - UP

91000, Hydraulic Manifold Assembly, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			Main Manifold Assembly, Late Models
			1532ES - SERIAL # 9001100 UP
			1932ES - SERIAL # 9105000 UP
1	91002	5	COIL
2	91001	3	COIL
3	91003	1	VALVE, SPOOL 4 WAY 2 POSITION (LIFT)
4	91004	1	VALVE, SPOOL 4 WAY 3 POSITION (STEERING)
5	91005	1	VALVE, SPOOL 4 WAY 2 POSITION (TORQUE)
6	91008	1	VALVE, SPOOL 4 WAY 3 POSITION (DRIVE)
7	91007	1	VALVE, SPOOL 2 WAY N.O. (TORQUE)
8	91006	1	VALVE, SPOOL 4 WAY 2 POSITION (DRIVE DUMP/DECEL)
9	9998	1	ORIFICE, 0.040
10	91016	1	VALVE, NEEDLE (TOW/FREEWHEEL)
11	91015	1	PUMP, MANUAL (BRAKE)
12	91012	1	VALVE, MANUAL (BRAKE RELEASE)
13	91010	1	VALVE, RELIEF (MAIN)
14	91009	1	VALVE, RELIEF (LIFT)
15	91011	1	VALVE, RELIEF (STEER/PRIORITY FLOW CONTROL)
16	91013	1	VALVE, RELIEF (COUNTERBALANCE WITH PISTON)
17	91014	1	VALVE, CHECK (FLOW DIVIDER)
21	HDW91080	1	FITTING, 90° ELBOW, MALE ¼" × FML ¼" NPT
22	HDW7601	6	FITTING, 90°, MALE 3/8", 3/8" O-RING MALE
23	HDW8877	2	FITTING, 90° ELBOW, MALE ¼" × MALE ¼"
24	HDW91081	1	FITTING, 90° ELBOW, MALE ¼" × MALE ¼" TALL
25	HDW9157	1	FITTING, 90° ELBW, MALE 3/8", MALE 3/8" O-RING
26	HDW7971	1	TEST PORT
			SEE HYDRAULIC HOSES, THIS SECTION

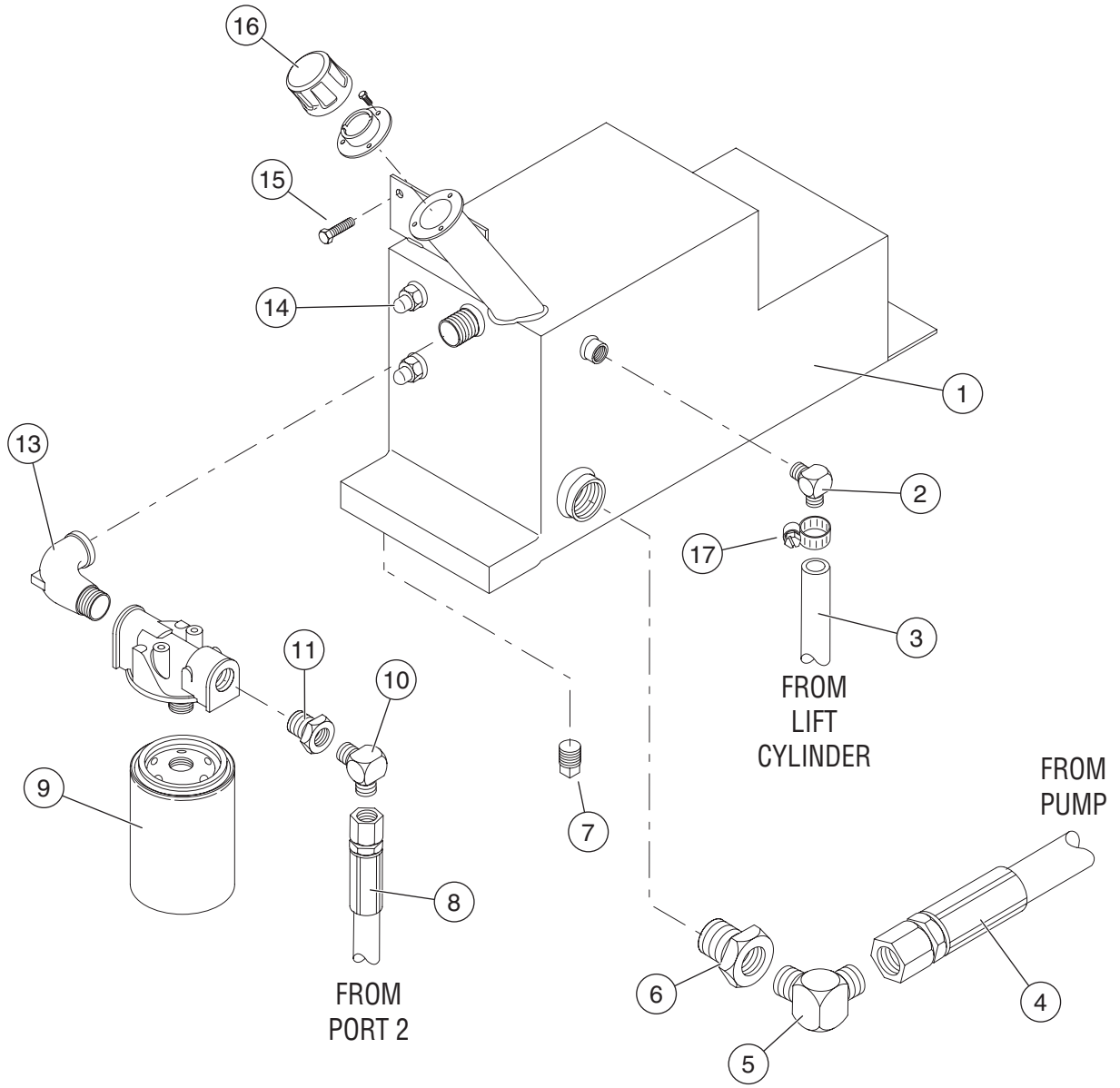


ILLUSTRATION No.
ART_2289

Hydraulic Reservoir Assembly, Steel, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC RESERVOIR, STEEL
			1532ES - SERIAL #9001000 - # 9001039
			1932ES - SERIAL #9104000 - # 9105477
1	25468	1	HYDRAULIC RESERVOIR WELDMENT
2	HDW6727	1	FITTING, ELBOW 90°, MALE 1/4", MALE BARB 1/4"
3	REF	-	HOSE, RETURN LINE
4	REF	1	HOSE ASSY
5	HDW8400	1	FITTING, ELBOW 90°, MALE 1/2" SAE, MALE 1/2" NPT
6	8412	1	SUCTION STRAINER
7	HDW9200	1	FITTING, MALE 1/4"
8	REF	1	HOSE ASSY
9	6156	1	FILTER, OIL CARTRIDGE
10	HDW90300	1	FITTING, ELBOW 90°, MALE 3/8", MALE 1/2"
11	HDW6752	1	ADAPTER, MALE 3/4", FML 1/2"
12	6714	1	FILTER, HEAD
13	90215	1	FITTING, ELBOW 90°, FML 3/4", MALE 3/4"
14	HDW5938	2	FITTING, SIGHT GAUGE
15	HDW6455	2	SCREW, 1/4" - 20, 1/2" - 66
16	90127	1	FILLER BREATHER
17	7788	1	CLAMP, HOSE
NS	5292	3.25	US GAL HYDRAULIC OIL
	REF		SEE HYDRAULIC HOSES, THIS SECTION

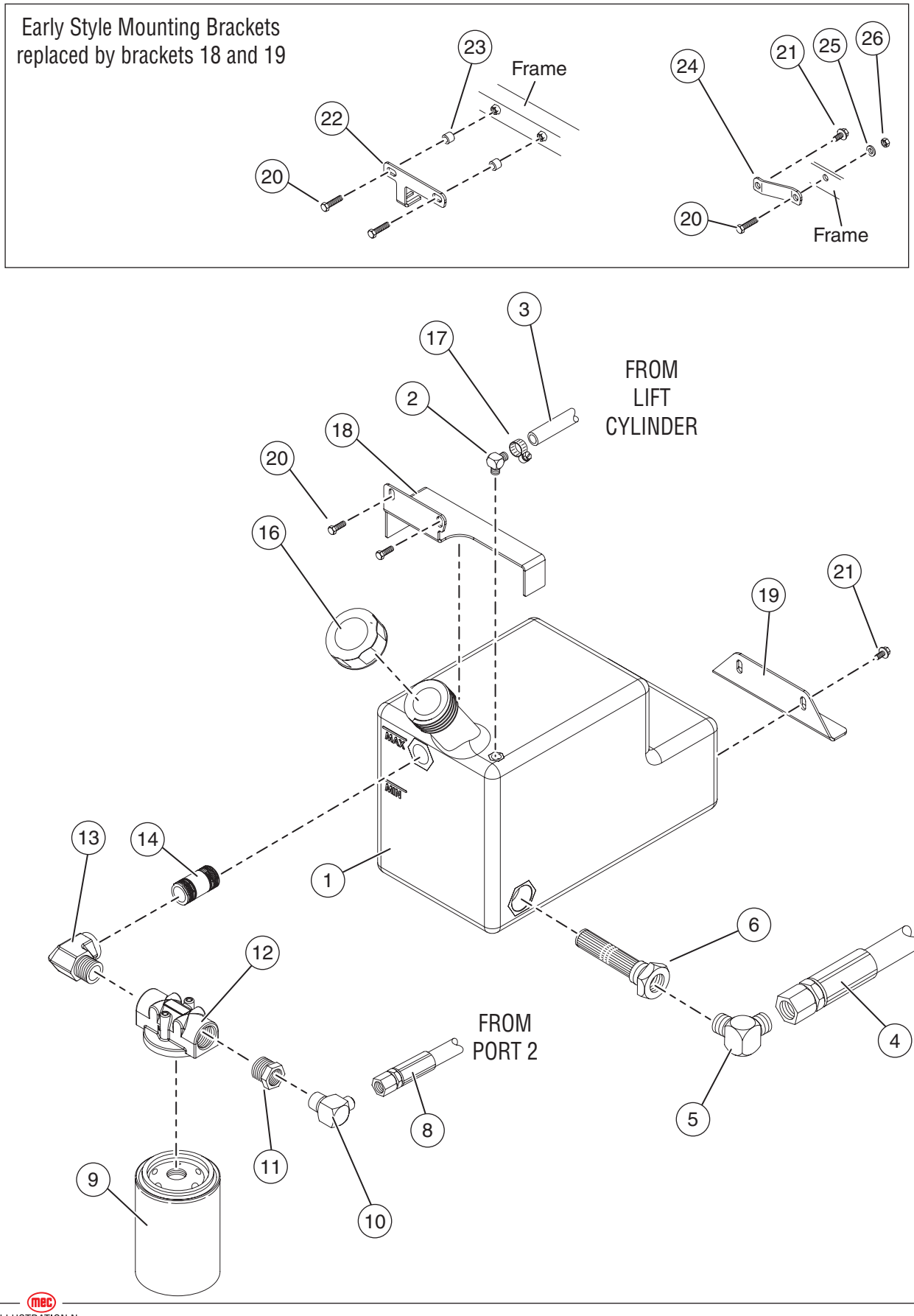
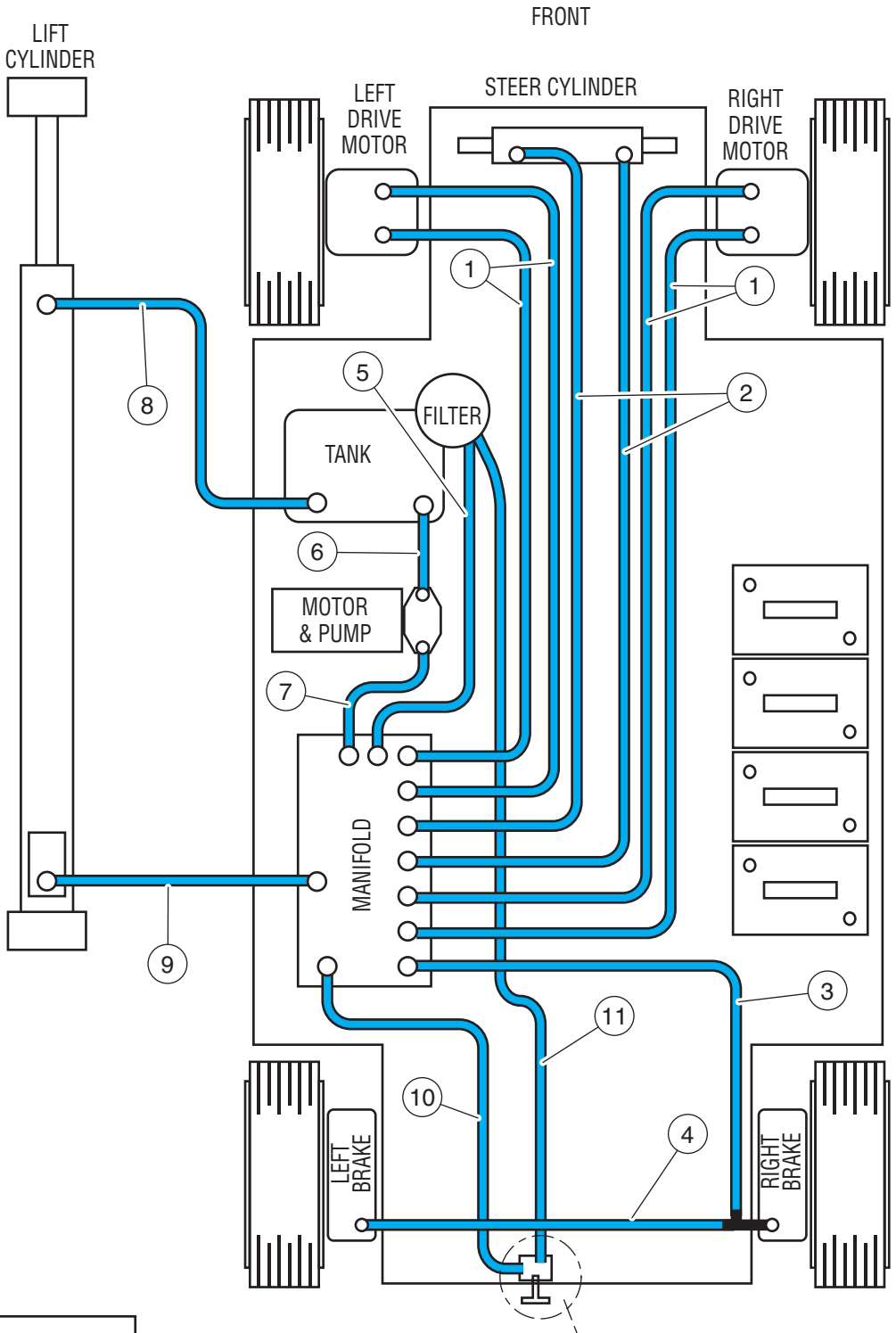


ILLUSTRATION No.
ART_2288

Hydraulic Reservoir - 1532ES & 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC RESERVOIR, PLASTIC
			1532ES - SERIAL #9001040 UP
			1932ES - SERIAL #9105478 UP
1	16119	1	HYDRAULIC RESERVOIR PLASTIC
2	HDW6727	1	FITTING, ELBOW 90°, MALE 1/4", MALE BARB 1/4"
3	REF	-	HOSE, RETURN LINE
4	REF	1	RETURN HOSE
5	HDW8400	1	FITTING, ELBOW 90°, MALE 1/2" SAE, MALE 1/2" NPT
6	8412	1	SUCTION STRAINER
8	REF	1	HOSE ASSY
9	6156	1	FILTER, OIL CARTRIDGE
10	HDW90300	1	FITTING, ELBOW 90°, MALE 3/8", MALE 1/2"
11	HDW6752	1	ADAPTER, MALE 3/4", FML 1/2"
12	6714	1	FILTER, HEAD
13	90215	1	FITTING, ELBOW 90°, FML 3/4", MALE 3/4"
14	91601	2	PIPE NIPPLE, ¾" × 2"
16	90127	1	FILLER BREATHER
17	7788	1	CLAMP, HOSE
18	16713	1	BRACKET, RESERVOIR SADDLE
19	19714	1	BRACKET, RESERVOIR TAB ANCHOR
20	HDW6455	2	SCREW, 1/4" - 20, 1/2" - 66
21	HDW6455	1	SCREW
22	16125	1	BRACKET, TOP, RESERVOIR
23	—	1	SPACER, RESERVOIR BRACKET (NO LONGER USED)
24	16344	1	BRACKET, REAR, RESERVOIR
25	—	1	WASHER (NO LONGER USED)
26	—	1	NUT (NO LONGER USED)
NS	5292	3.25	US GAL HYDRAULIC FLUID, ISO32 OR EQUIVALENT
	REF		SEE HYDRAULIC HOSES



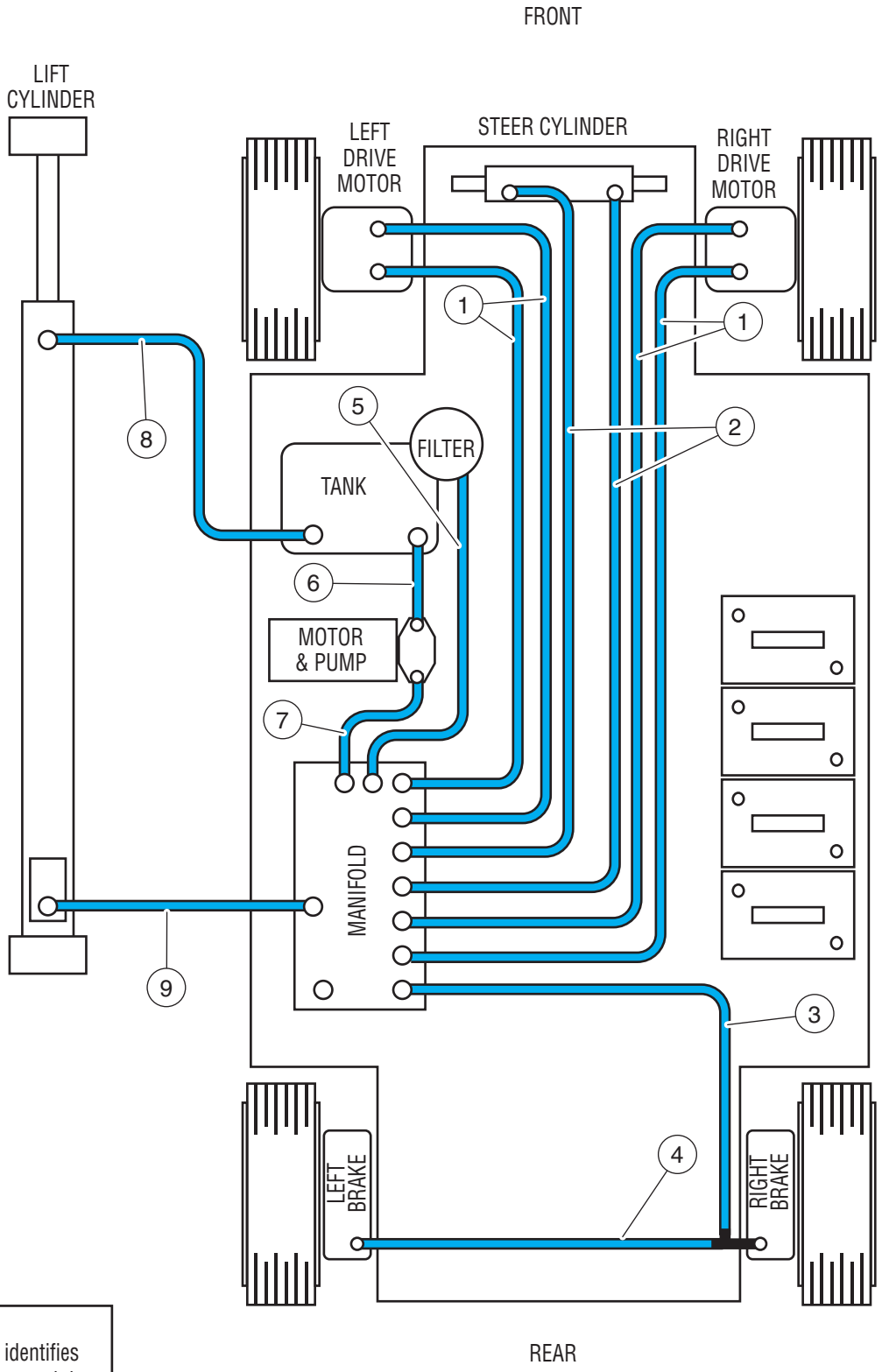
NOTE:
This drawing identifies hydraulic hoses and the component that they connect to, and NOT the actual hose positions on the machine.

MANUAL BRAKE RELEASE HAND PUMP
only used up to:
1532ES - serial #9001099
1932ES - serial #9104999

ILLUSTRATION No.
ART_2238

Hydraulic Hoses, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC HOSES, EARLY MODELS
			11532ES - SERIAL #TO # 9001099
			1932ES - SERIAL # TO # 9104999
1	90286	4	HOSE ASSEMBLY, DRIVE MOTORS
2	9404	2	HOSE ASSEMBLY, STEER CYLINDER
3	90276	1	HOSE ASSEMBLY, BRAKE TO MANIFOLD
4	90275	1	HOSE ASSEMBLY, BRAKE TO BRAKE
5	9038	1	HOSE ASSEMBLY, MANIFOLD TO FILTER
6	9959	1	HOSE ASSEMBLY, SUCTION
7	7598	1	HOSE ASSEMBLY, PRESSURE
8	6458	9 FT	HOSE ASSEMBLY, LIFT CYLINDER TO RESERVOIR, 1532ES
8	6458	13 FT	HOSE ASSEMBLY, LIFT CYLINDER TO RESERVOIR, 1932ES
			1532ES - SERIAL # TO # 9001007
			1932ES - SERIAL # TO # 9104474
9	90819	1	HOSE ASSEMBLY, LIFT CYLINDER
			1532ES - SERIAL # 9001009 TO # 9001099
			1932ES - SERIAL # 9104475 TO # 9104999
9	90819	1	HOSE ASSEMBLY, LIFT CYLINDER
10	90274	1	HOSE ASSEMBLY, HAND PUMP
11	7598	1	HOSE ASSEMBLY, HAND PUMP RETURN



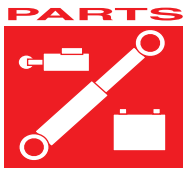
NOTE:
This drawing identifies hydraulic hoses and the component that they connect to, and NOT the actual hose positions on the machine.

1532ES - Serial # 9001100 - UP
1932ES - Serial # 9105000 - UP

ILLUSTRATION No.
ART_2290

Hydraulic Hoses, X32ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC HOSES, LATE MODELS
			1532ES - SERIAL # 9001100 UP
			1932ES - SERIAL # 9105000 UP
1	90286	4	HOSE ASSEMBLY, DRIVE MOTORS
2	9404	2	HOSE ASSEMBLY, STEER CYLINDER
3	90276	1	HOSE ASSEMBLY, BRAKE TO MANIFOLD
4	90275	1	HOSE ASSEMBLY, BRAKE TO BRAKE
5	9038	1	HOSE ASSEMBLY, MANIFOLD TO FILTER
6	90899	1	HOSE ASSEMBLY, SUCTION
7	7598	1	HOSE ASSEMBLY, PRESSURE
8	6458	9 FT	HOSE ASSEMBLY, LIFT CYLINDER TO RESERVOIR, 1532ES
8	6458	13 FT	HOSE ASSEMBLY, LIFT CYLINDER TO RESERVOIR, 1932ES
9	90819	1	HOSE ASSEMBLY, LIFT CYLINDER



SECTION E

BASE

Ladder and Control Box Brackets E-3
Base Covers E-5
Options E-7
Brake Assembly E-9
Steering E-11
Hydraulic Pump Assembly E-13
Pothole Assembly E-15
Wheel Motor E-19
Battery Installation E-21
Pothole Limit Switch E-23
Drive Cutout Switch E-23
Battery Charger E-25

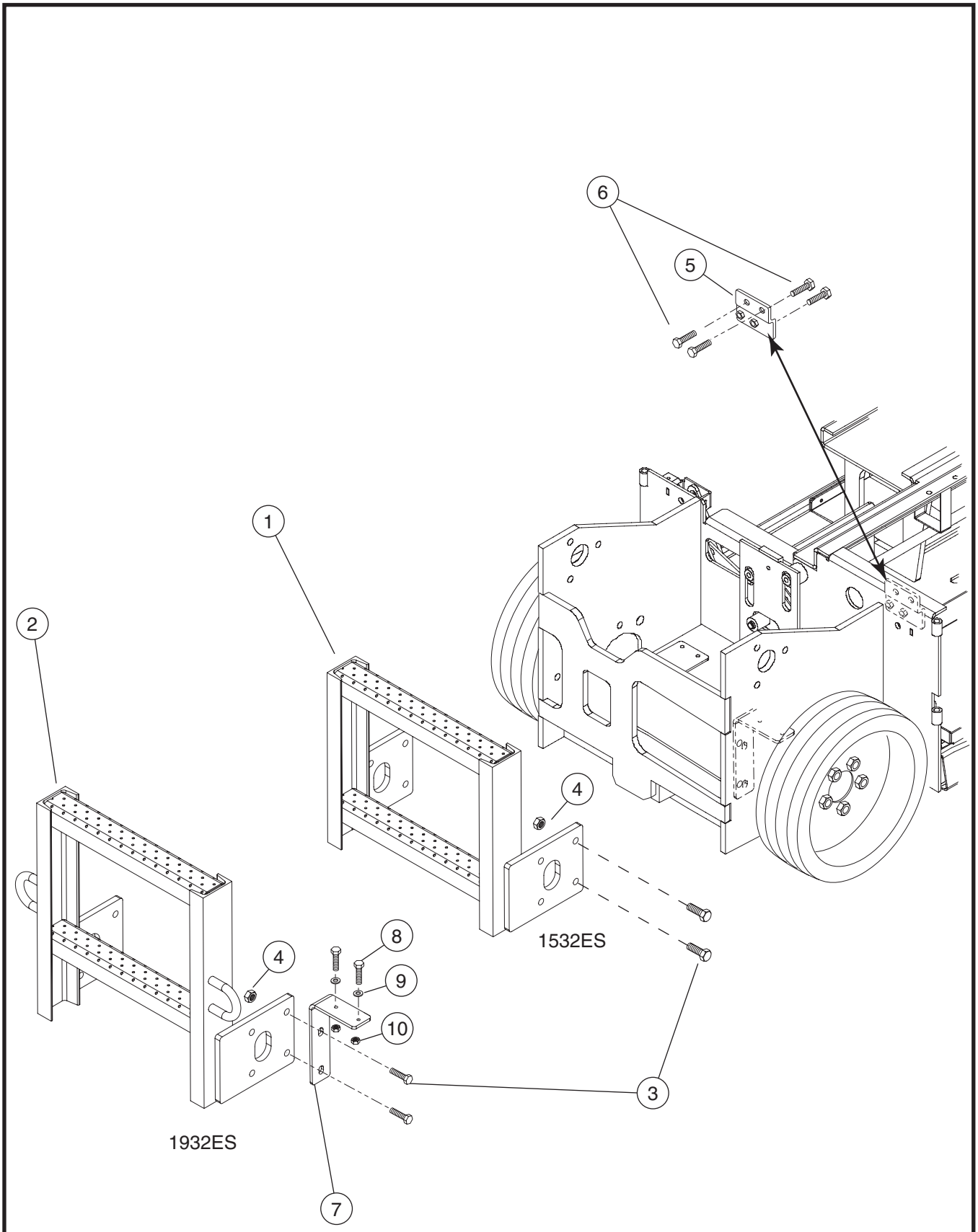


ILLUSTRATION No.
ART_2301

Ladder Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			Ladder and Control Box Brackets
1	16063	1	LADDER (1532ES)
2	16040	1	LADDER (1932ES)
3	HDW8283	4	SCREW, 1/2" - 13, 1 1/2" LG
4	HDW8457	4	NUT, 1/2" - 13
5	25476	1	BRKT, CONTROL BOX MOUNT
6	HDW6432	4	SCREW 3/8" - 16, 3/4" LG
			1532ES: S/N# TO #9001040
			1932ES: S/N# TO # 9105299
7	16149	1	LOWER CONTROL BOX SUPPORT
			1532ES: S/N# TO #9001040
			1932ES: S/N# TO # 9105299
7	16334	1	LOWER CONTROL BOX SUPPORT
8	HDW5904	2	SCREW
9	HDW5470	2	WASHER
10	HDW8767	2	NUT

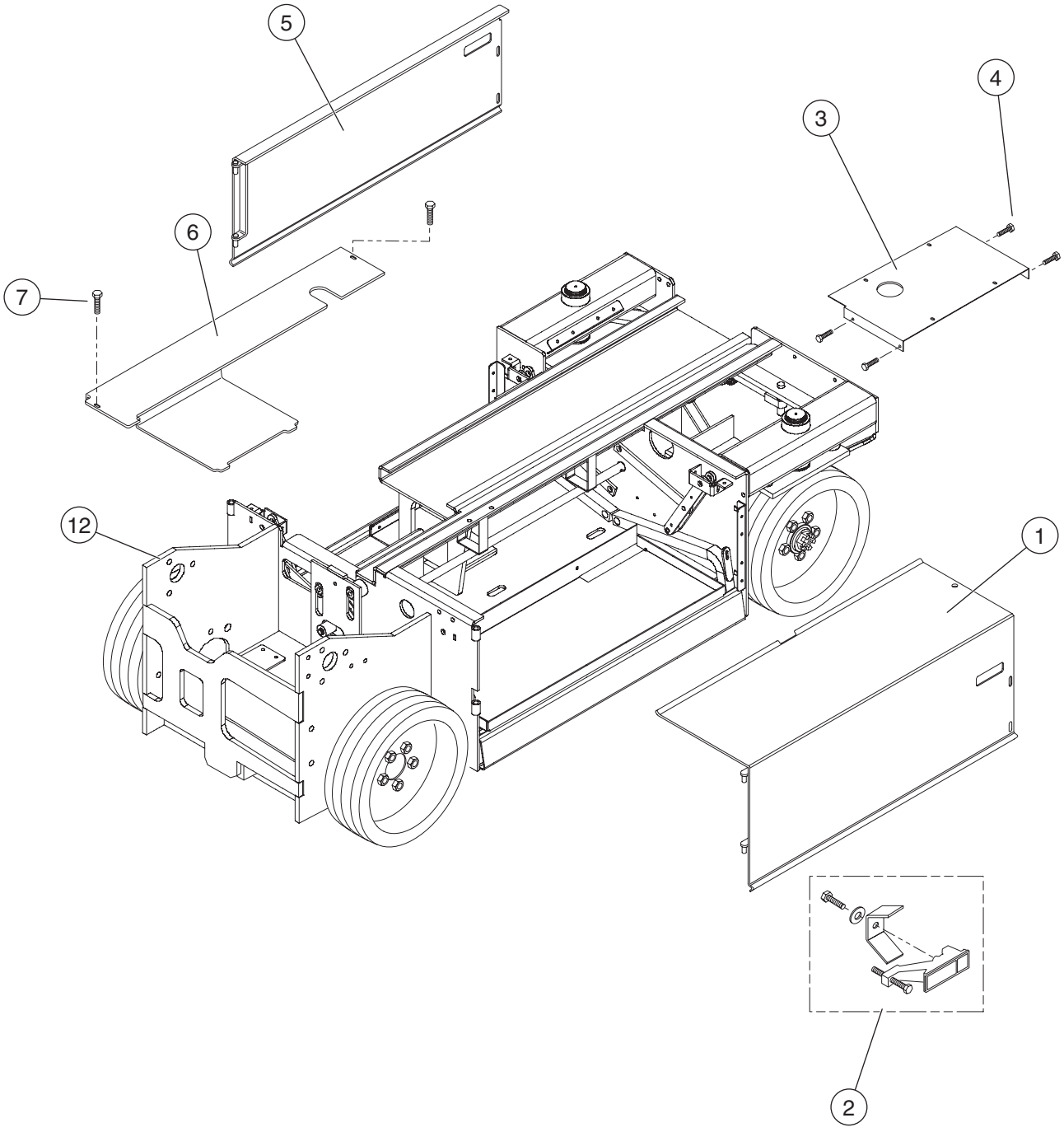
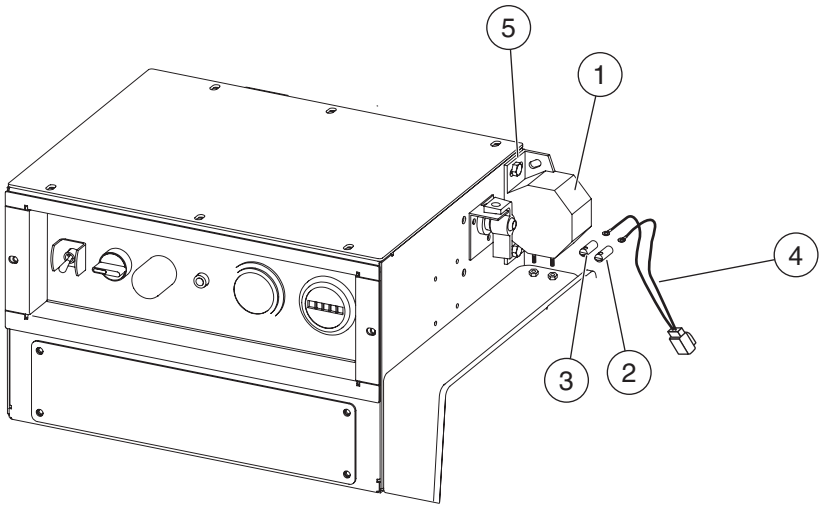
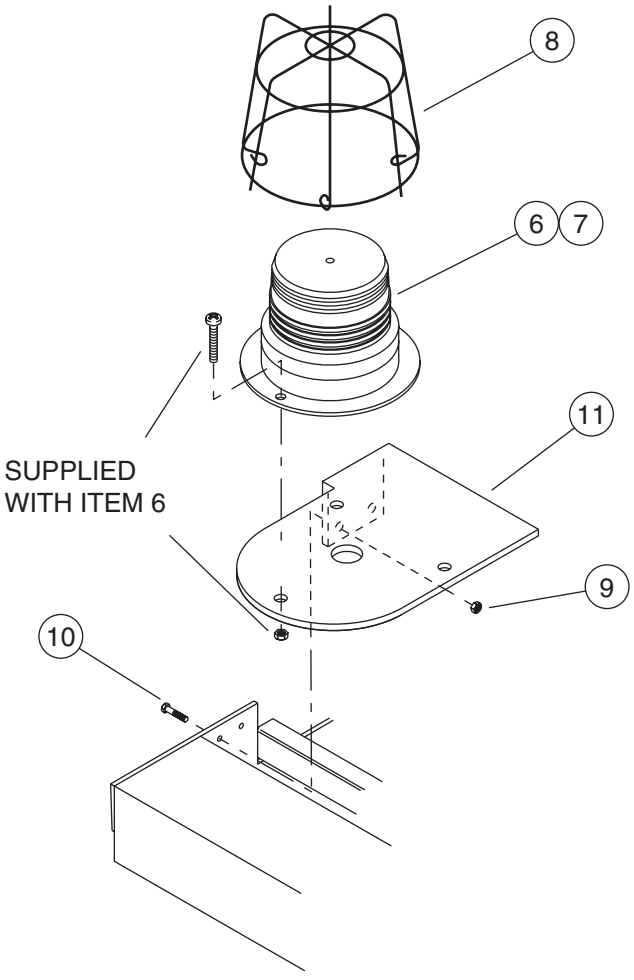


ILLUSTRATION No.
ART_2304

Base and Covers, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			Base Covers
1	25487	1	DOOR, BATTERY
2	8386	2	LATCH
3	25623	1	CONVERTER MOUNT BRKT
4	HDW8273	4	SCREW, 1/4" 0 12, 1.0" LG
5	25597	1	DOOR, HYDRAULIC
6	25453	1	COVER, HYDRAULIC
7	HDW6455	2	SCREW, 1/4" 0 12, 1/2" LG
12	25621	1	BASE WELDMENT





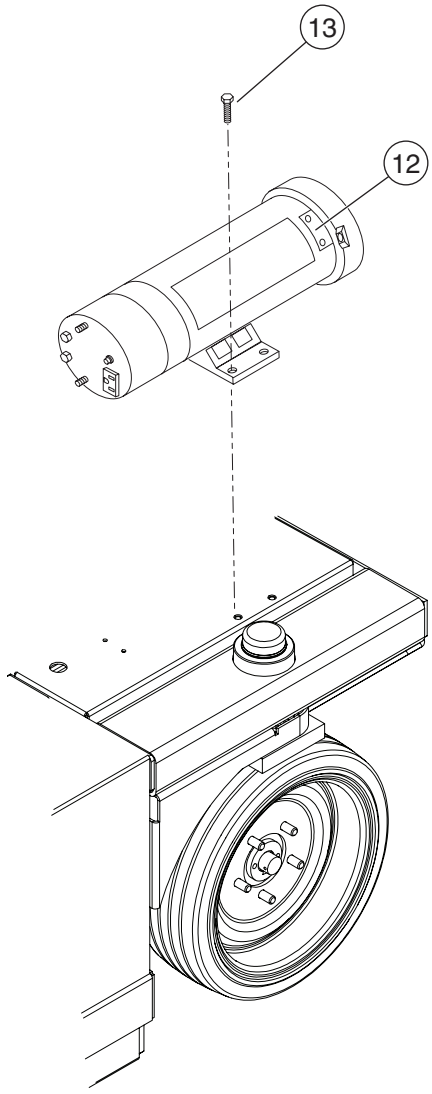


ILLUSTRATION No.
ART_2307

Base Options, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			OPTIONS
			MOTION ALARM
1	8698	1	ALARM, MOTION 12-48 VOLTS
2	8709	1	INSULATOR, TERMINAL, RED
3	8710	1	INSULATOR, TERMINAL, BLACK
4	8782	1	HARNESS, MOTION ALARM
5	HDW6455	2	SCREW, 1/4" - 20, 1/2" LG
			MOTION LIGHT
6	9770	1	LIGHT, STROBE
7	9836	1	TUBE REPLACEMENT
8	90213	1	GUARD, LENS
9	HDW8304	2	NUT, 5/16" - 18
10	HDW8310	2	SCREW, 5/16" - 18, 1 1/4" LG
11	25492	1	BRKT, LIGHT MOUNT
			POWER CONVERTER
12	7103	1	CONVERTER
NS	7109	1	BOOT INSULATOR, BLACK
NS	7110	1	BOOT INSULATOR, RED
NS	7111	1	CABLE, POWER SUPPLY
NS	7112	1	CABLE, POWER SUPPLY
NS	7130	1	CAPACITOR
13	HDW5204	4	SCREW, 5/16" - 18, 1" LG

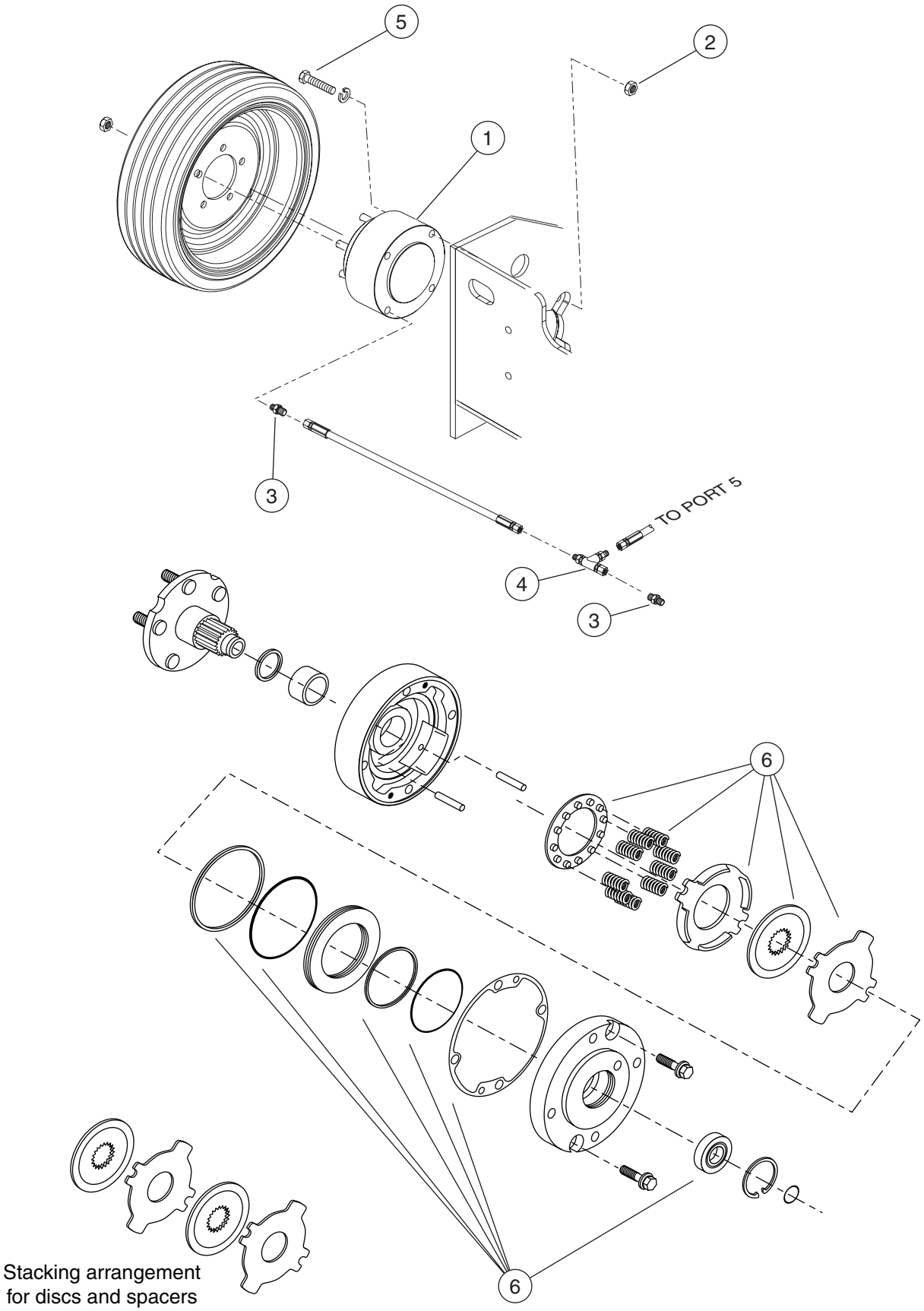


ILLUSTRATION No.
ART_2309

Brake Installation, ES

ITEM	PART NO.	QTY	DESCRIPTION
			BRAKE ASSEMBLY
1	9544	2	HYDRAULIC BRAKE ASSY
2	HDW8457	8	NUT, 1/2" - 13
3	HDW8881	2	ADAPTER, MALE 1/4" O-RING, MALE 1/4"
4	HDW90332	1	FITTING, MALE 1/4", MALE 1/4", FEMALE 1/4" TEE
5	HDW8498	8	SCREW, 1/2" - 13, 4" LG
6	90413	1	BRAKE REPAIR KIT
			SEE HYDRAULIC HOSES (PARTS SECTION D)

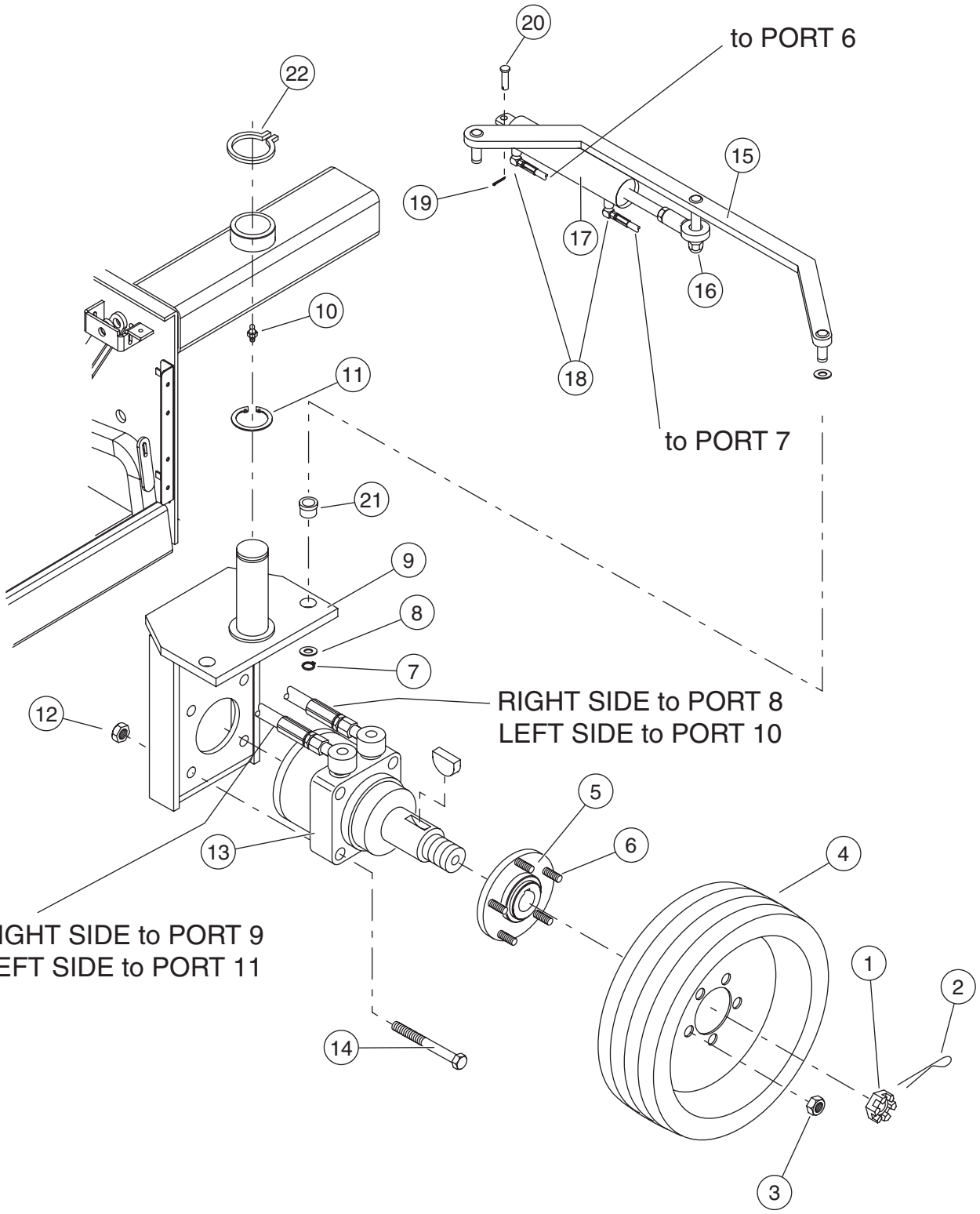


ILLUSTRATION No.
ART_2310

Steering Assembly Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			STEERING
1	HDW8568	2	NUT, SLOTTED, 1 1/8" - 18
2	HDW5290	2	PIN, COTTER
3	HDW6677	10	NUT, LUG, 1/2" - 20
4	8812	2	WHEEL/TIRE NON MARKING
5	25542	2	HUB TAPERED DRIVE
6	HDW6676	10	LUG BOLT 1/2"-20
7	9066	2	RING, RETAINING 5/8"
8	HDW9219	2	WASHER, SPACER
9	25548	2	WELDMENT, WHEEL MOTOR MOUNT
10	5432	2	FITTING, GREASE INSERT
11	HDW3802	2	WASHER, 2 1/2" NYLON
12	HDW8457	8	NUT, 1/2" - 13
13		2	MOTOR, HYDRAULIC WHEEL
	90231		1532ES SERIAL # TO # 9001040
			1932ES SERIAL #TO # 9105299
	90809		1532ES SERIAL # 9001041 -UP
			1932ES SERIAL # 9105300 - UP
14	HDW6435	8	SCREW, 1/2" - 13, 2 1/2" LG
15	25324	1	WELDMENT, TIE ROD
16	HDW6633	1	NUT, 5/8" - 11
17	90865	1	CYLINDER, STEERING
	90990		SEAL KIT, STEER CYLINDER
18	HDW90818	2	FITTING, 90° ELBW, MALE #4 SAE, MALE 3/8" JIC
19	HDW5920	1	PIN, COTTER
20	HDW90770	1	PIN, CLEVIS
21	9170	2	BEARING, FLANGED 5/8"
22	8919	2	RING, RETAINING
			SEE HYDRAULIC HOSES (PARTS SECTION D)

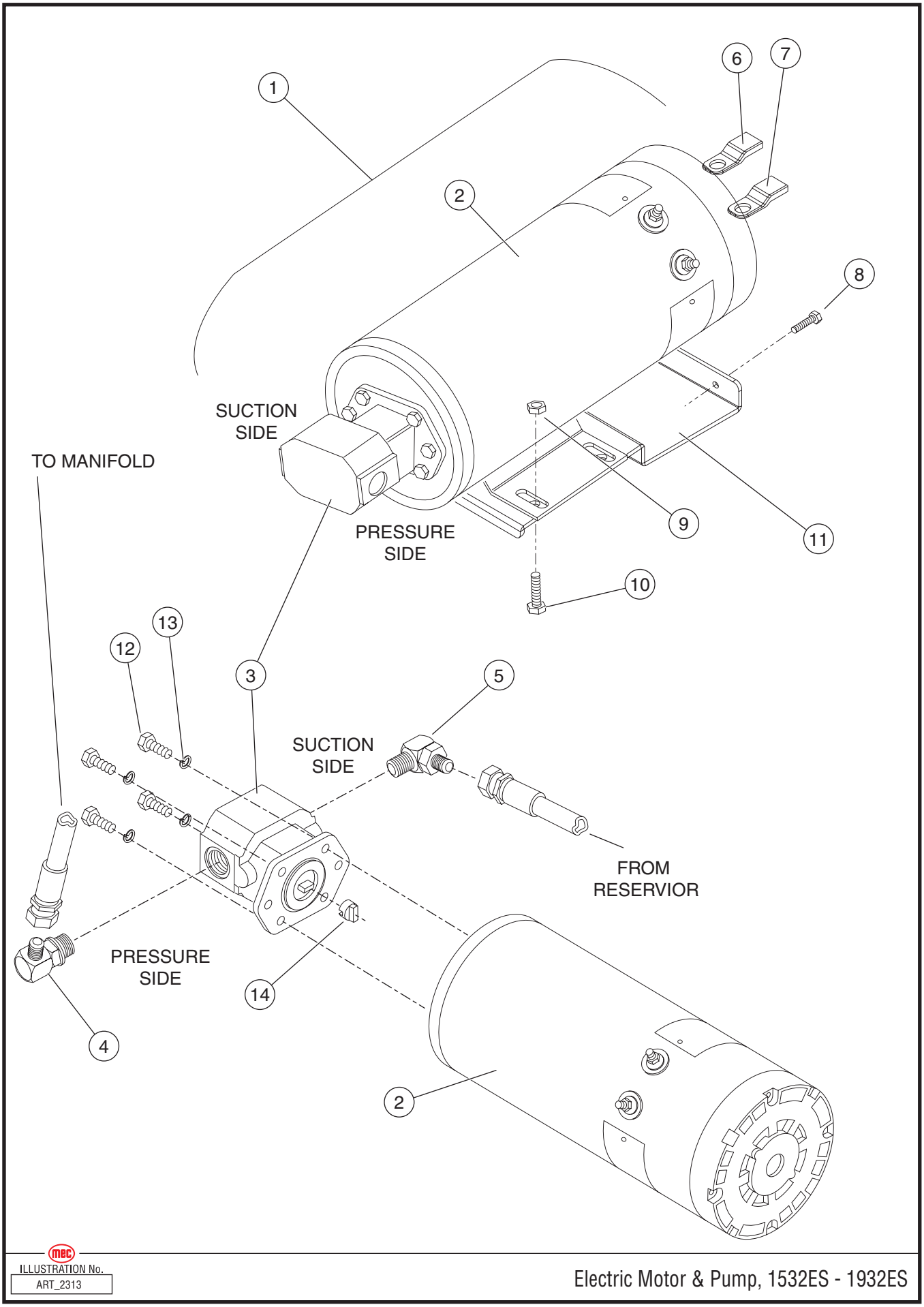


ILLUSTRATION No.
ART_2313

Electric Motor & Pump, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC PUMP ASSEMBLY
			1532ES: S/N# TO #9001040
			1932ES: S/N# TO # 9105299
2	8544	1	MOTOR, 24 VDC, 2 HP
3	8546	1	PUMP
14	6314	1	COUPLER
			1532ES: S/N# 9001041 - UP
			1932ES: S/N# 9105300 - UP
1	90970	1	POWER UNIT ASSEMBLY, MONARCH
2	90997	1	MOTOR, 24 VDC, 2 HP
	91226		BRUSHES
3	90998	1	PUMP
14	90999	1	COUPLER
			ALL MODELS
4	HDW8081	1	FITTING, 90° ELBW, MALE 1/2" O-RING, MALE 3/8" SIZE: 37
5	HDW90967	1	FITTING, 90° ELBW, MALE 3/8" O-RING, MALE 1/2" SIZE: 50
6	REF	1	BATTERY CABLE, RED (SEE HARNESSES, PARTS SEC 1)
-	7172	1	BOOT TERMINAL INSULATOR RED (NOT SHOWN)
7	REF	1	BATTERY CABLE, BLACK, (SEE HARNESSES, PARTS SEC 1)
-	7172	1	BOOT TERMINAL INSULATOR BLACK (NOT SHOWN)
8	HDW6455	2	SCREW, ¼" - 20, ½" LG
9	HDW5005	4	NUT, 5/16" - 18
10	HDW5204	4	SCREW, 5/16" - 18, 1" LG
11	25555	1	BRKT ELECTRIC MOTOR MOUNT
12	HDW5724	4	SCREW, 5/16"–18, 3/4" LG
13	HDW5006	4	LOCKWASHER, 5/16"
			SEE HYDRAULIC HOSES (SECTION D)

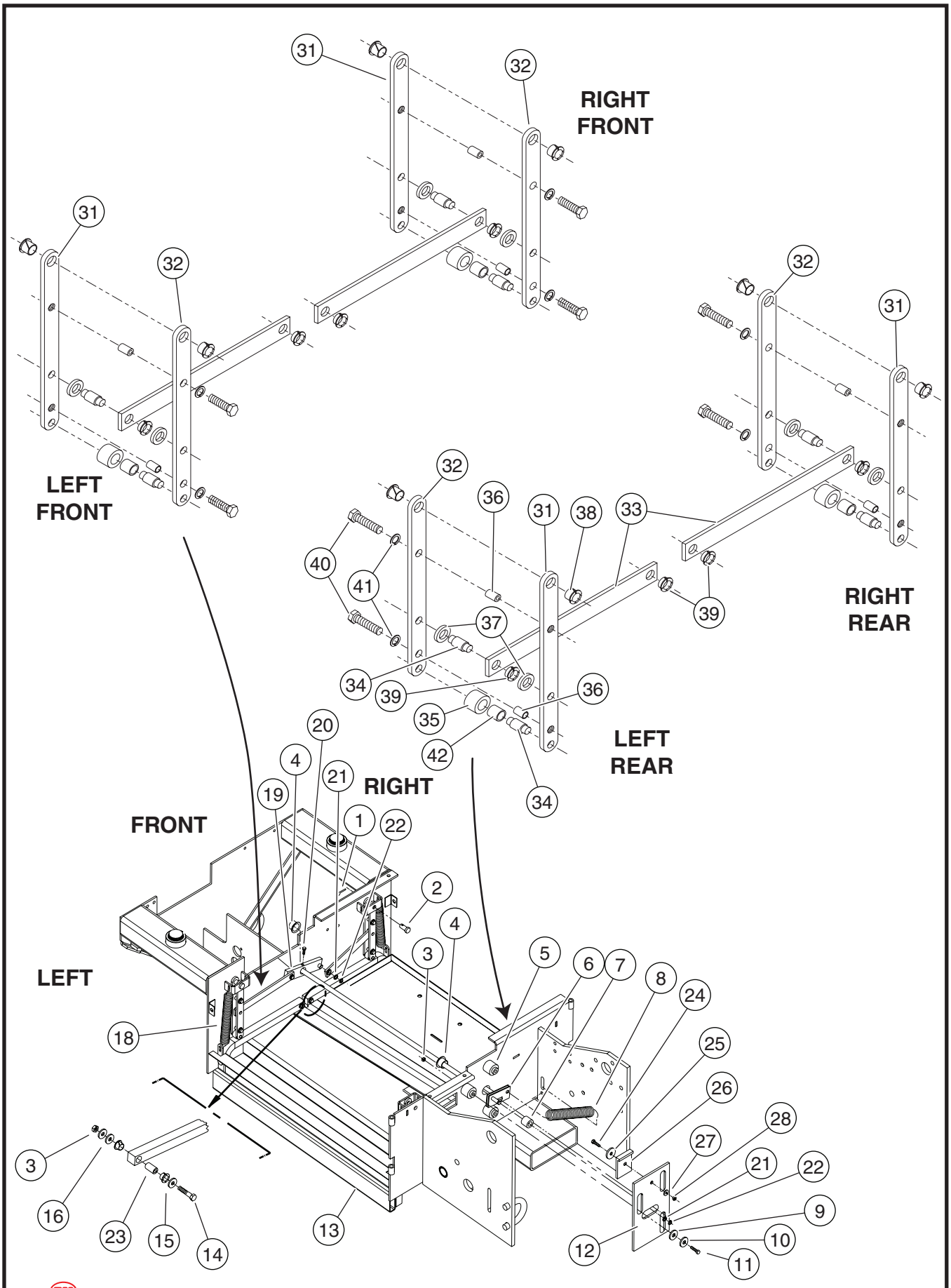


ILLUSTRATION No.
ART_2315

Pothole Assembly Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE ASSEMBLY
1	HDW5920	4	PIN, COTTER, 1/8" X 1"
2	HDW7229	4	PIN, CLEVIS, 1/2" X 2"
3	HDW5039	7	LOCK NUT, 3/8" - 16
4	7260	2	BEARING, OIL IMPREGNATED, 3/4" X 3/4", FLANGED
5	8602	3	SPACER, STEPPED PVC
6	25378	1	POTHOLE ACTUATOR ROD WELDMENT
7	4541	1	ROLLER
8	25307	1	SPRING, TENSION - DEPLOYMENT
9	HDW13556	3	WASHER, FLAT, 3/8" ID, 1 1/2" OD, 1/8" THICK-PLASTIC
10	HDW13338	3	WASHER, FLAT, 3/8" ID, 1 1/2" OD, 1/8" THICK-STEEL
11	HDW8279	3	SCREW, 3/8" - 16, 2 1/2" LG, GRADE 5
12	25246	1	PLATE, POTHOLE ACTUATOR
13	25151	2	POTHOLE BAR WELDMENT
14	HDW8278	4	SCREW, 3/8" - 16, 1 1/4" LG, GRADE 8
15	7202	8	BEARING, 5/8" ID X 7/16" LG, FLANGED
16	HDW11467	12	WASHER, FLAT
18	9027	4	SPRING, TENSION, 1" OD X 5" LG, RETRACTION
19	11129	2	STABILIZER, PIVOT BAR
20	HDW5724	2	SCREW, 5/16" - 18, 3/4" LG, GRADE 5
21	HDW7031	5	WASHER, FLAT, 1/2" ID, 7/8" OD, 1/16" THICK
22	5736	5	RING, RETENTION, 1/2" SHAFT
23	11181	4	SPACER
24	HDW8273	1	SCREW, 1/4" - 20, 1" LG
25	HDW5470	1	WASHER, FLAT, 1 1/2" OD, 9/32" ID X 1/8"
26	25306	1	WEAR BLOCK, POTHOLE ACTUATOR
27	HDW5217	1	WASHER, FLAT, 11/16" OD, 11/32" ID X 1/16"
28	HDW6461	1	LOCK NUT, 1/4" - 20
			(CONTINUED...)

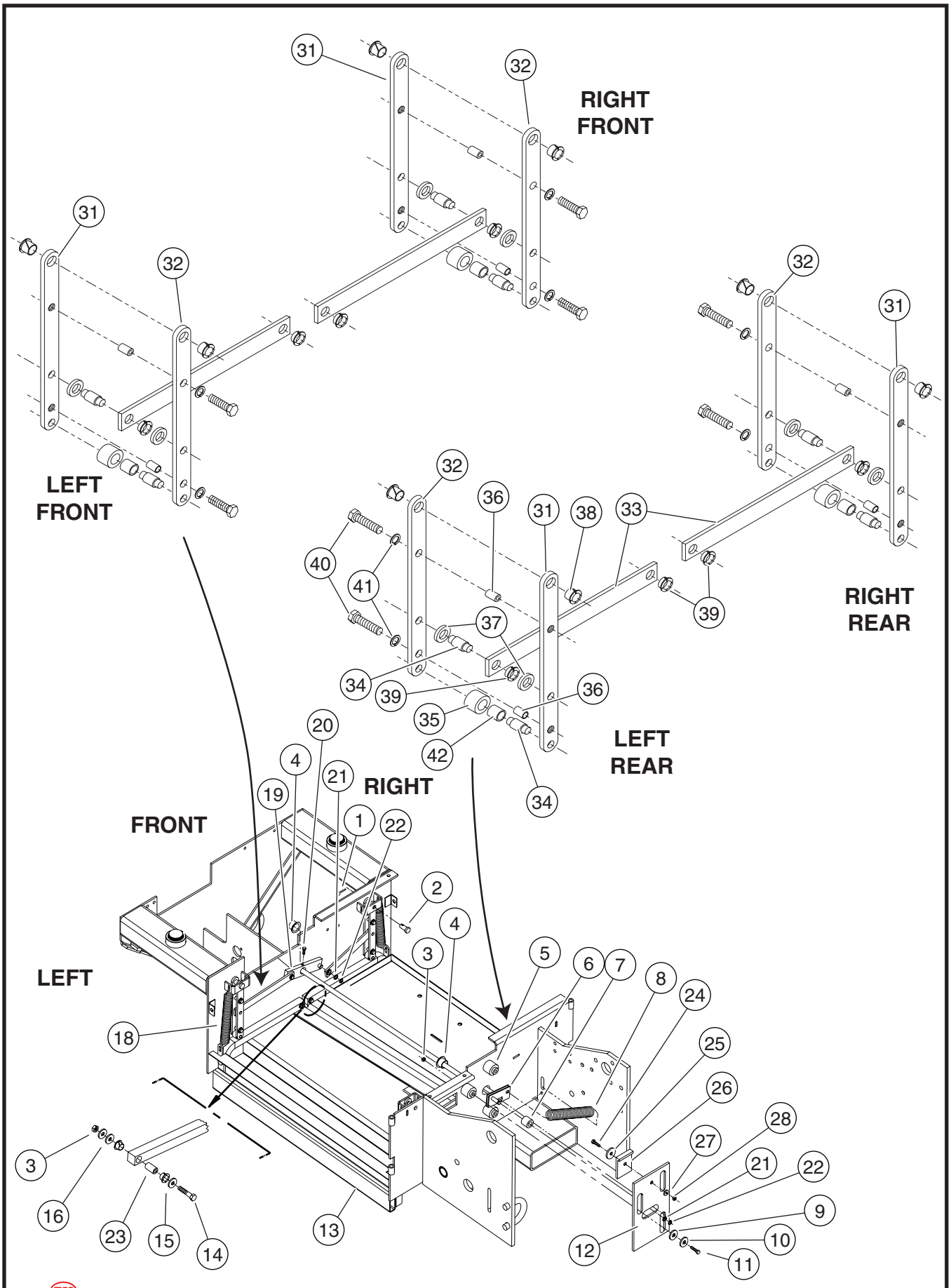


ILLUSTRATION No.
ART_2315

Pothole Assembly Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE ASSEMBLY (CONTINUED)
	25158	1	LEFT REAR ROLLER ARM ASSEMBLY
	25159	1	RIGHT REAR ROLLER ARM ASSEMBLY
	25160	1	LEFT FRONT ROLLER ARM ASSEMBLY
	25161	1	RIGHT FRONT ROLLER ARM ASSEMBLY
31	25146	4	BAR, OUTER ROLLER
32	25145	4	BAR, INNER ROLLER
33	25147	4	SWING ARM, SHORT
34	11120	8	PIN, SPACER
35	4542	4	ROLLER
36	11119	8	TUBE, SPACER
37	11176	8	SPACER, STABILIZER BAR
38	7200	8	BEARING, NYLINER, 1/2" ID, 1/2" LG
39	7220	8	BEARING, NYLINER, 1/2" ID, 7/32" LG
40	HDW5988	8	SCREW, 1/4" - 20 X 1 1/4" LG, GRADE 5
41	HDW5277	8	WASHER, SPLIT LOCK, 1/4"
42	6700	4	BEARING, 08DU10, 1/2" X 5/8"

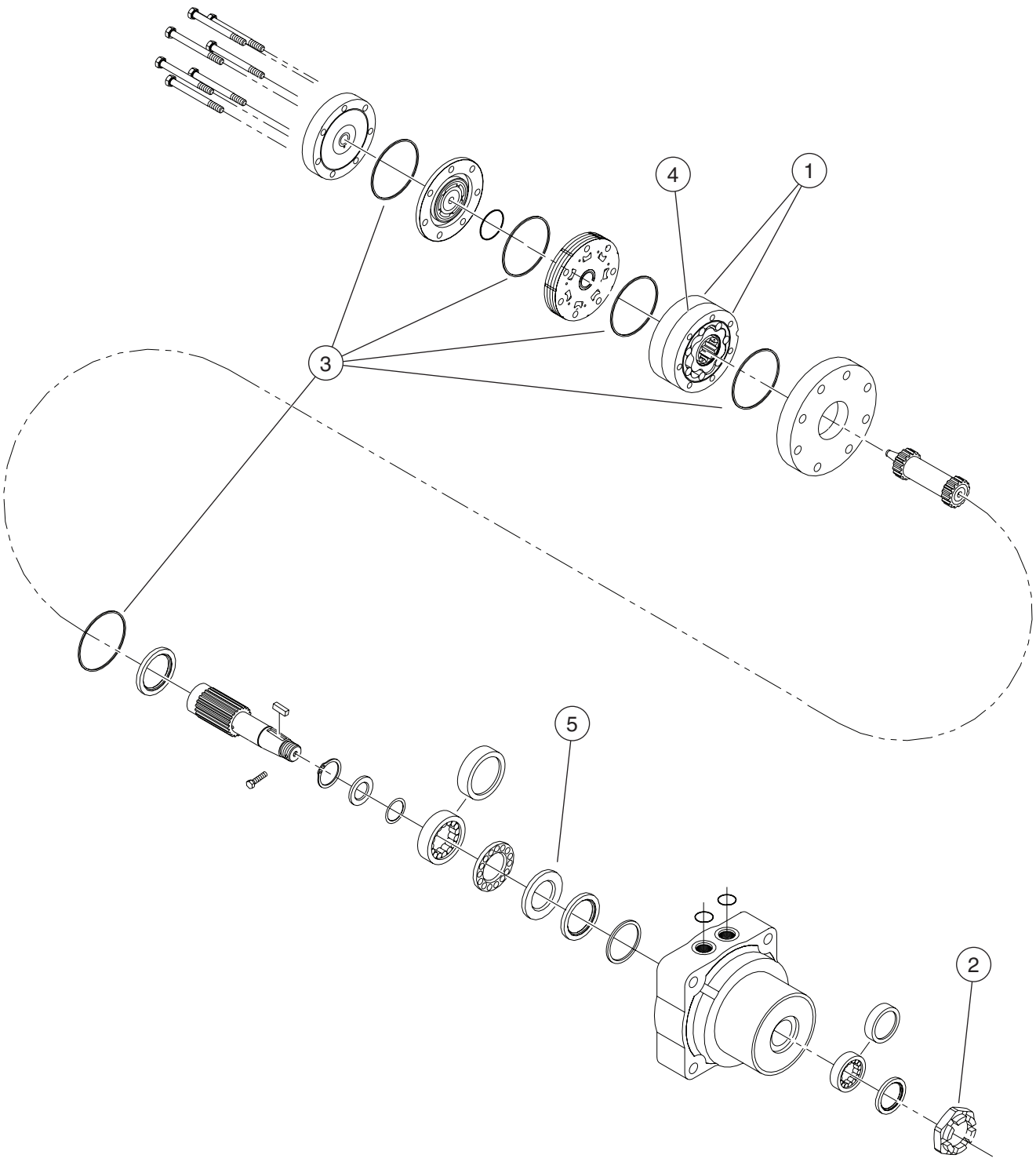


ILLUSTRATION No.
ART_2318

Wheel Motor Assembly, ES

ITEM	PART NO.	QTY	DESCRIPTION
			WHEEL MOTOR
			1532ES - SERIAL # 9001034 **1932ES - SERIAL #TO 9105299**
	90231 90419		WHEEL MOTOR SEAL KIT FOR WHEEL MOTOR 90231
			1532ES - SERIAL # 9001035 UP
	 90809		**1932ES - SERIAL #9105300 UP** WHEEL MOTOR
			SEAL KIT FOR WHEEL MOTOR
			ALL MODELS
1 2	– HDW8568	2 1	STATER HALVES NUT, 1 1/8" - 18
			SEAL KIT
3 4	– –	5 1	SEAL RING SEAL RING BETWEEN HALVES
5	–	1	SHAFT SEAL

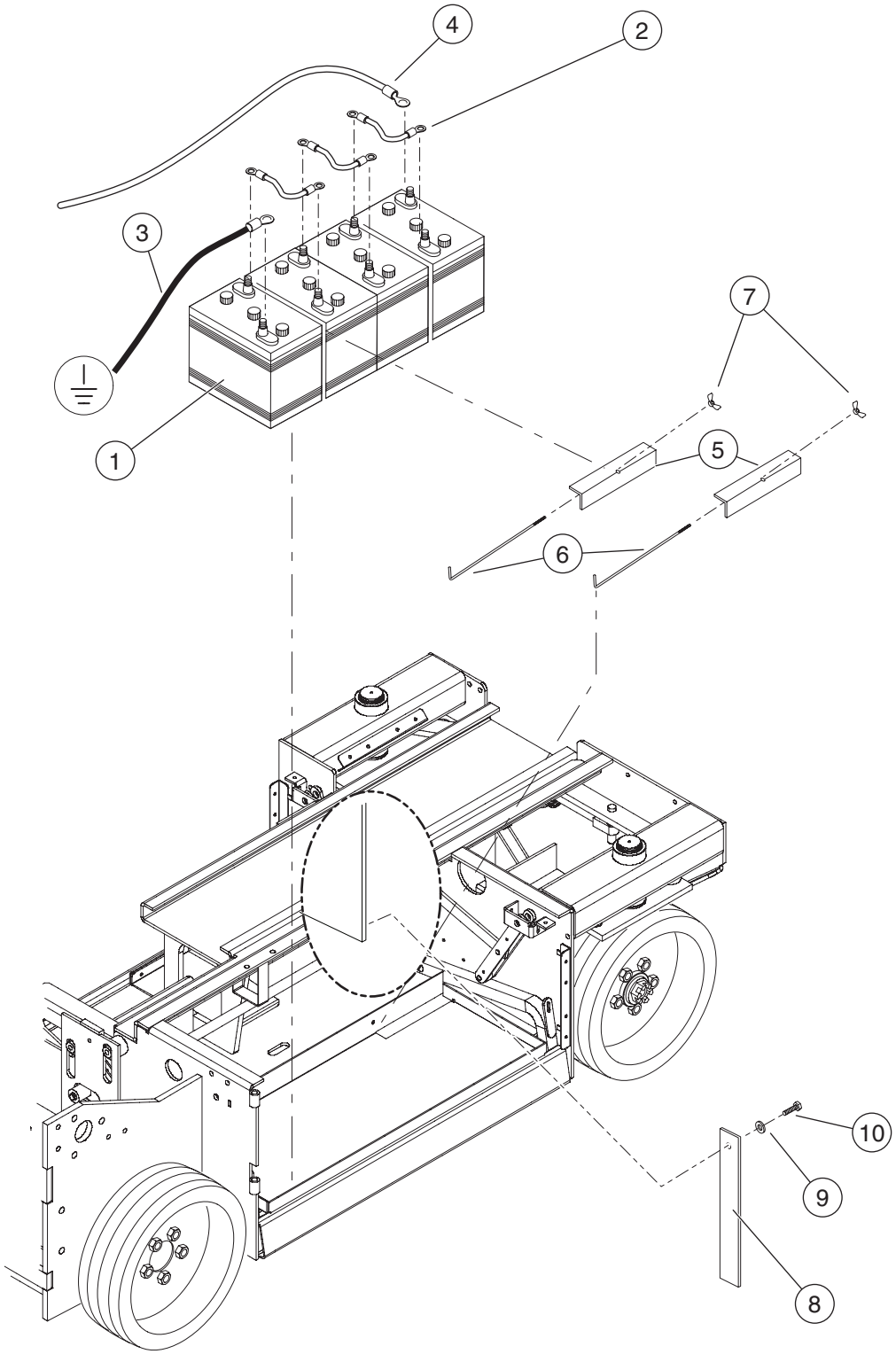


ILLUSTRATION No.
ART_2319

Battery Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			BATTERY INSTALLATION
1	5970	4	BATTERY, 6 VOLT
2	REF	3	CABLE, BLACK (SEE HARNESSES, PARTS SEC A)
3	REF	1	CABLE, BLACK (SEE HARNESSES, PARTS SEC A)
4	9243	1	CABLE, RED (SEE HARNESSES, PARTS SEC A)
	7172	4	BOOT TERMINAL INSULATOR, BLACK (NOT SHOWN)
	7173	4	BOOT TERMINAL INSULATOR, RED (NOT SHOWN)
5	16039	2	HOLD DOWN, BATTERY
6	13263	2	ROD, HOLD DOWN
7	HDW6110	2	NUT, WING, 1/4" - 20
8	7638	1	GROUNDING STRAP
9	HDW5355	1	WASHER, FLAT 7/16"
10	HDW90825	1	SCREW, 7/16" - 14 X 1" LG

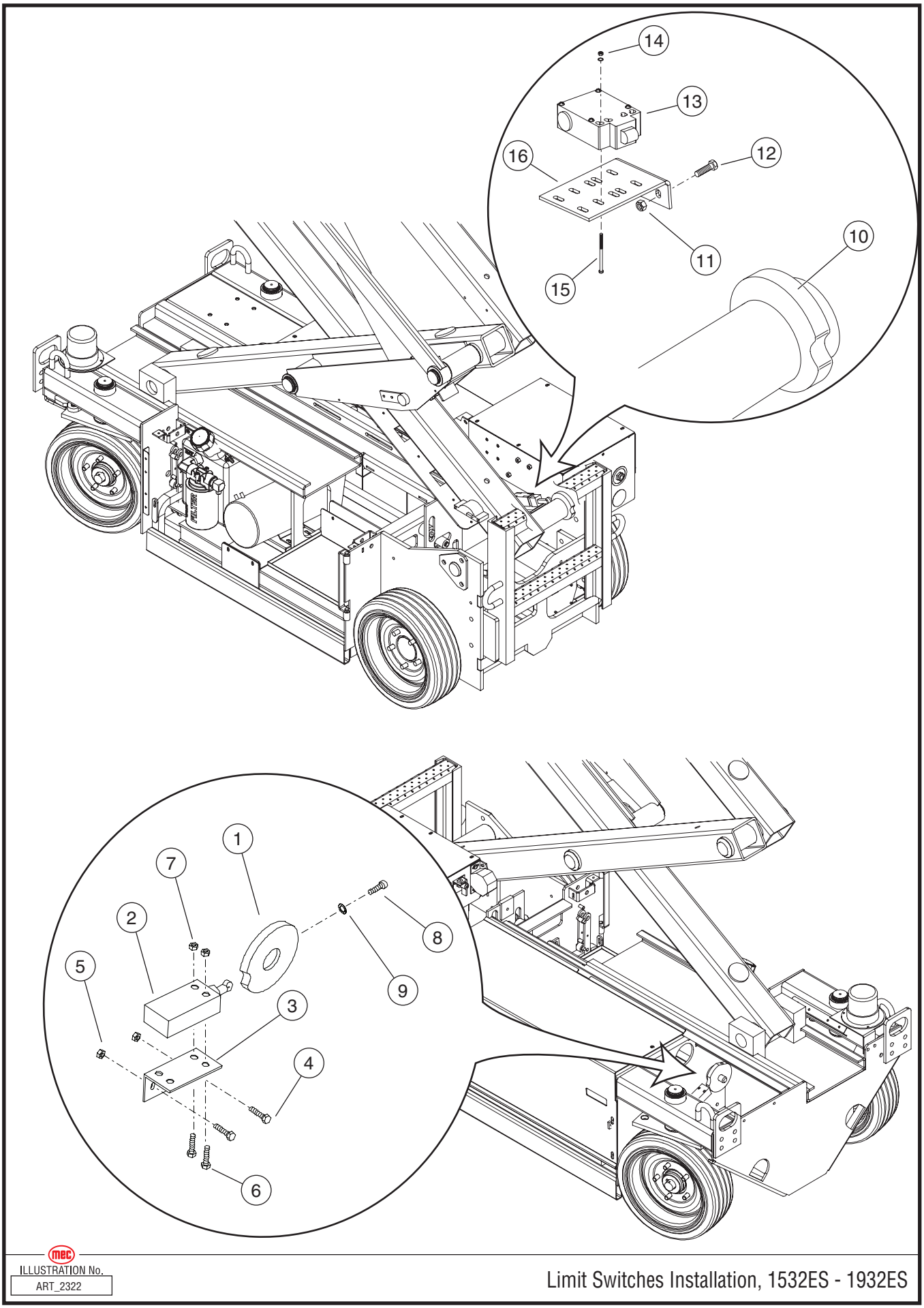


ILLUSTRATION No.
ART_2322

Limit Switches Installation, 1532ES - 1932ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE LIMIT SWITCH
1	25377	1	CAM, DRIVE CUTOUT
2	90531	1	SWITCH, LIMIT
3	13840	1	BRACKET, LIMIT SWITCH
4	HDW5723	2	SCREW, 1/4" - 20, 3/4" LG
5	HDW5276	2	NUT 1/4" - 20
6	HDW8482	2	SCREW #8 - 32, 1 1/2" LG
7	HDW5251	2	NUT #8 - 32
8		1	SET SCREW
9	HDW5006	1	WASHER FLAT
			DRIVE CUTOUT SWITCH
10	25269	1	CAM, LIMIT SPEED
	HDW8870	1	SET SCREW
11	HDW5276	2	NUT 1/4" - 20
12	HDW8482	2	#8 - 32, 1 1/2" LG
13	8932	1	SWITCH, LIMIT SPEED, HONEYWELL BRAND
13	90996	1	SWITCH, LIMIT SPEED, TELEMECANIQUE BRAND
14	HDW5251	2	NUT, #8 - 32
15	HDW8273	2	SCREW, 1/4" - 20, 1" LG
16	13838	1	BRKT, LIMIT SWITCH MOUNT

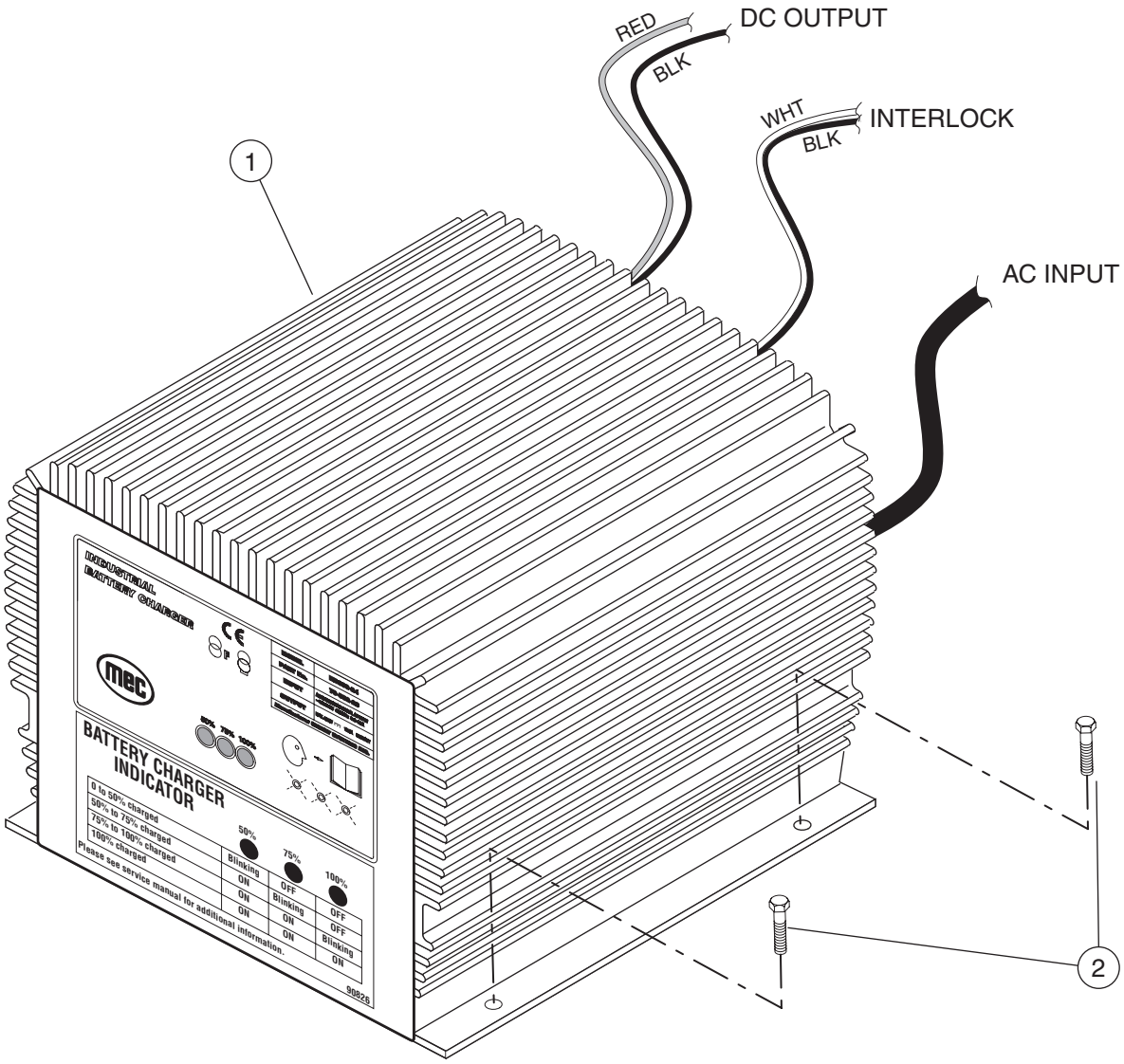
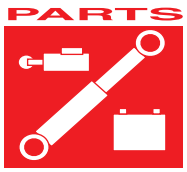


ILLUSTRATION No.
ART_2323

Battery Charger, ES

ITEM	PART NO.	QTY	DESCRIPTION
			BATTERY CHARGER
1	90712	1	CHARGER, 24 VOLT, 110/220V 50/60 H_z
2	HDW7888	4	SCREW, #10 - 32, 1/2" LG



SECTION F

DECALS

DECALS,1532ES - 1932ES CONTROLS F-3
DECALS, 1532ES - 1932ES BASE F-5
DECALS, 1532ES - 1932ES SCISSORS F-7
DECALS, 1532ES - 1932ES PLATFORM F-9

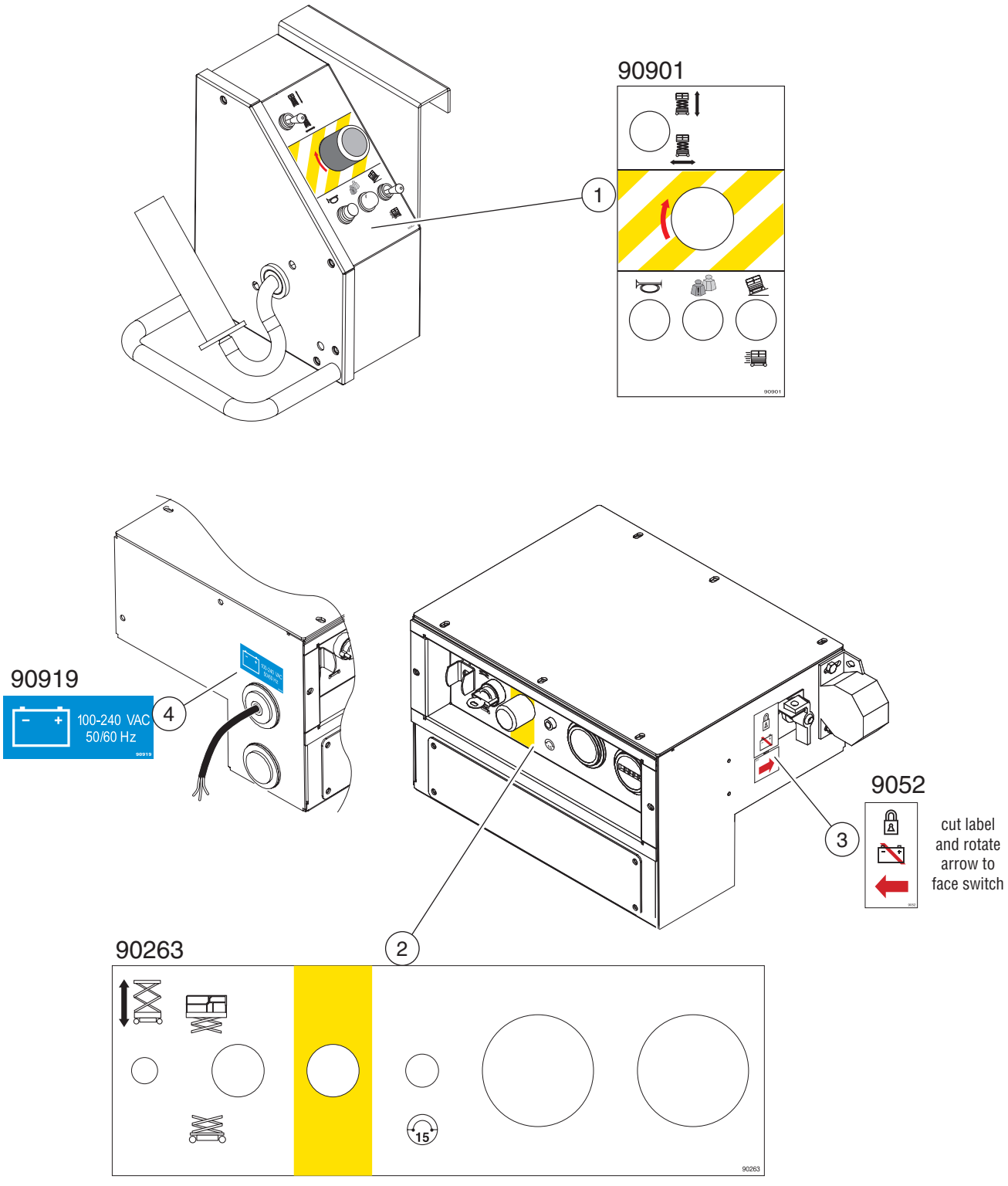


ILLUSTRATION No.
ART_2433

Decals - Controls: All Models - CE

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS,1532ES - 1932ES CONTROLS
1	90901	1	DECAL, FRONT
2	90263	1	DECAL, LOWER CONTROL BOX, FRONT PANEL
3	9052	1	DECAL, BATTERY LOCK
4	90919	1	DECAL, BATTERY CHARGER

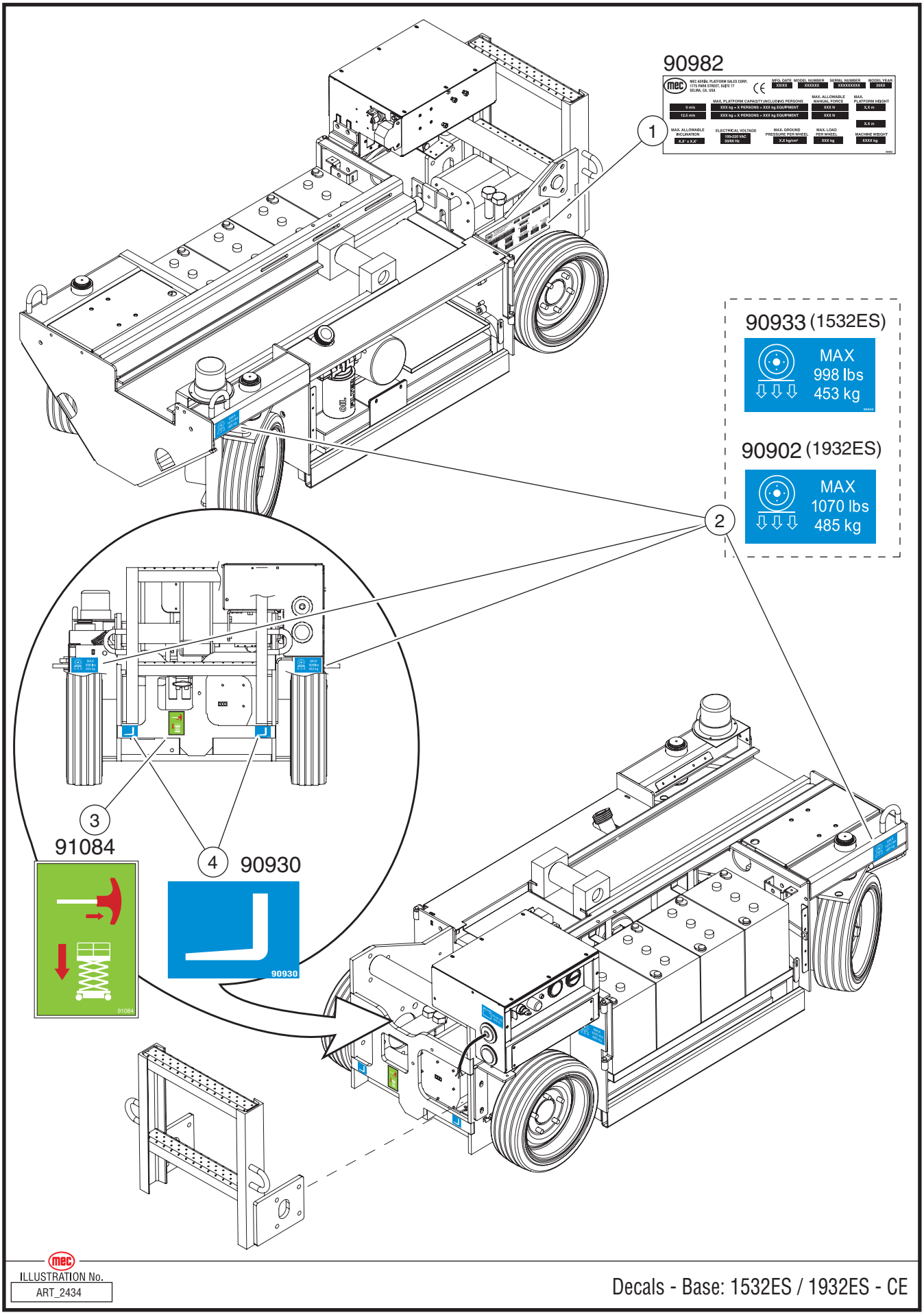
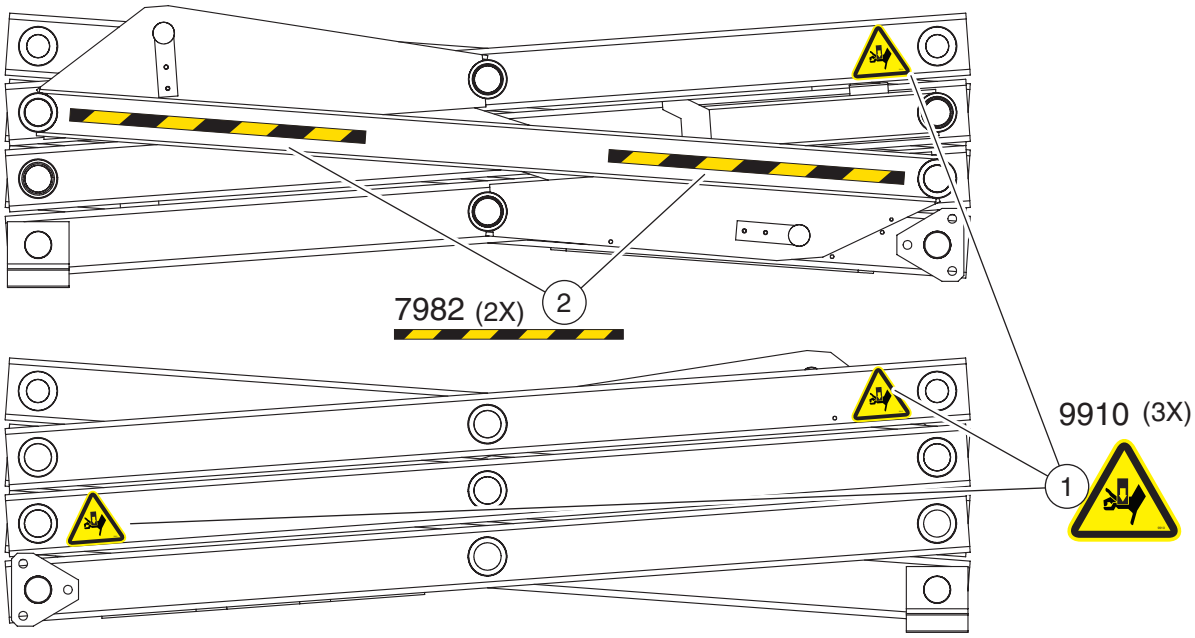


ILLUSTRATION No.
ART_2434

Decals - Base: 1532ES / 1932ES - CE

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 1532ES - 1932ES BASE
			1532ES
1	90982	1	SERIAL PLATE
2	90933	4	DECAL, WHEEL PRESSURE
3	91084	1	DECAL, EMERGENCY LOWERING
4	90930	2	DECAL, FORK LIFT POCKETS
			1932ES
1	90982	1	SERIAL PLATE
2	90902	4	DECAL, WHEEL PRESSURE
3	91084	1	DECAL, EMERGENCY LOWERING
4	90930	2	DECAL, FORK LIFT POCKETS

1532ES



1932ES

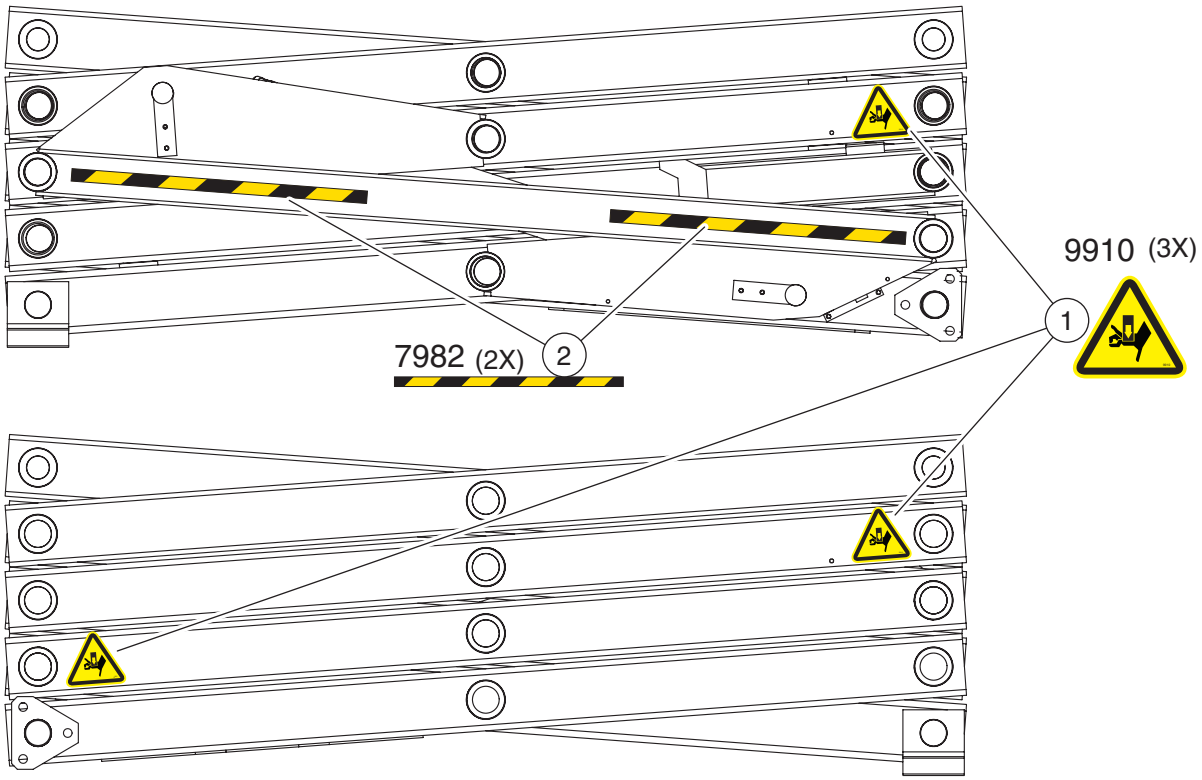


ILLUSTRATION No.
ART_2435

Decals - Scissors: 1532ES / 1932ES - CE

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 1532ES - 1932ES SCISSORS
1	9910	3	DECAL, PINCH POINT
2	7982	2	DECAL, SAFETY STRIPE

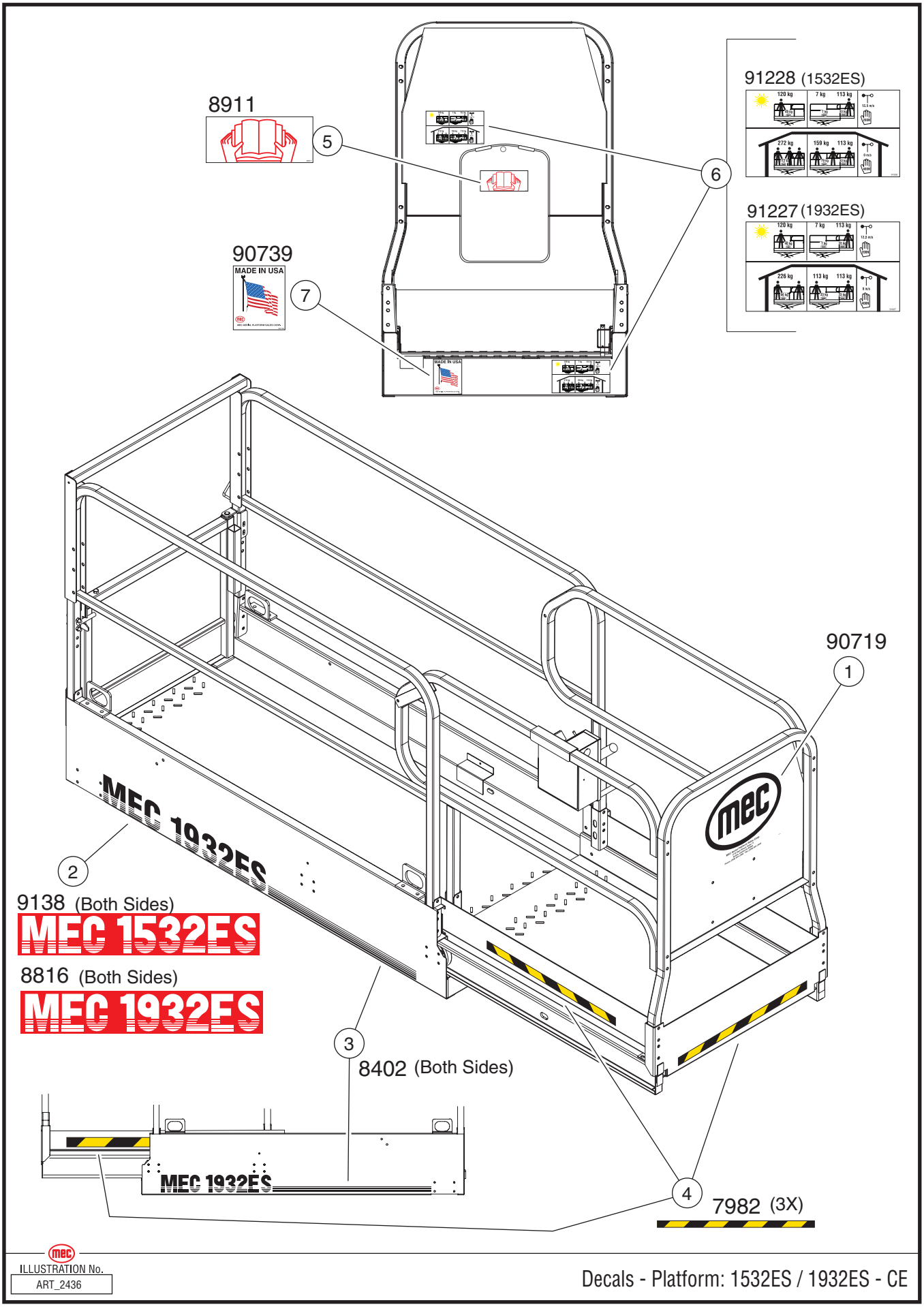


ILLUSTRATION No.
ART_2436

Decals - Platform: 1532ES / 1932ES - CE

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 1532ES - 1932ES PLATFORM
			1532ES
1	90719	1	DECAL, MEC LOGO
2	9138	2	DECAL, MEC 1532ES
3	8402	2	DECAL, RAIL STRIPE
4	7982	3	DECAL, SAFETY STRIPE
5	8911	1	DECAL, MANUALS INSIDE
6	91228	2	DECAL, PLATFORM CAPACITY
7	90739	1	DECAL, MADE IN USA
			1932ES
1	90719	1	DECAL, MEC LOGO
2	8816	2	DECAL, MEC 1932ES
3	8402	2	DECAL, RAIL STRIPE
4	7982	3	DECAL, SAFETY STRIPE
5	8911	1	DECAL, MANUALS INSIDE
6	91227	2	DECAL, PLATFORM CAPACITY
7	90739	1	DECAL, MADE IN USA

Service Parts Order Form
Fax to 559-263-9631

Please fill out completely

Date: _____

Account: _____

Bill to: _____

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Ordered By: _____

Your Fax No.: _____

Ship to: _____

_____

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_____

Purchase Order Number _____

**All orders MUST have a Purchase Order Number

Ship VIA _____

**Fed Ex shipments require Fed Ex account number

Part Number	Description	Quantity	Price

All backordered parts will be shipped when available via the same ship method as original order unless noted below:

- Ship complete order only - no backorders
- Ship all available parts and contact customer on disposition of backordered parts
- other (please specify)

_____

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Service and Examination Record

Aerial Platform Sales Corp.
1775 Park Street, Suite 77 • Selma, CA 93662 USA
800-387-4575 • 559-891-2488 • Fax: 559-891-2493

Model ______________________________
Serial Number ________________________
Date Placed In Service _____ /_____ /_____

This record of service and examinations should be complete and current for each machine. Make copies of this page if you have more than one machine covered by this manual.

Warning: Never modify or alter any MEC aerial work platform without prior written permission from MEC. Always use the proper replacement part specified in this manual.

Caution: Following major repairs or modifications, the machine should be checked and tested to ensure that the manufacturer's specification has been achieved and maintained.

DATE	SERVICE PERFORMED	PARTS REQUIRED	TESTS PERFORMED	RECOMMENDATIONS	WORK DONE BY
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NOTES

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Limited Owner Warranty

MEC Aerial Platform Sales Corp. warrants its equipment to the original purchaser against defects in material and/or workmanship under normal use and service for one (1) year from date of registered sale or date the unit left the factory if not registered. MEC Aerial Platform Sales Corp. further warrants the structural weldments of the main frame and scissor arms to be free from defects in material or workmanship for five (5) years from date of registered sale or date unit left the factory if not registered. Excluded from such warranty is the battery(s) which carries a ninety (90) day warranty from described purchase date. Warranty claims within such warranty period shall be limited to repair or replacement, MEC Aerial Platform Sales Corp's option, of the defective part in question and labor to perform the necessary repair or replacement based on MEC Aerial Platform Sales Corp's then current flat rate, provided the defective part in question is shipped prepaid to MEC Aerial Platform Sales Corp. and is found upon inspection by MEC Aerial Platform Sales Corp. to be defective in material and/or workmanship. MEC Aerial Platform Sales Corp. shall not be liable for any consequential, incidental or contingent damages whatsoever. Use of other than factory authorized parts; misuse, improper maintenance, or modification of the equipment voids this warranty. The foregoing warranty is exclusive and in lieu of all other warranties, express or implied. All such other warranties, including implied warranties of merchantability and of fitness for a particular purpose, are hereby excluded. No Dealer, Sales Representative, or other person purporting to act on behalf of MEC Aerial Platform Sales Corp. is authorized to alter the terms of this warranty, or in any manner assume on behalf of MEC Aerial Platform Sales Corp. any liability or obligation which exceeds MEC Aerial Platform Sales Corp's obligations under this warranty.

Aerial Platform Sales Corp.

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