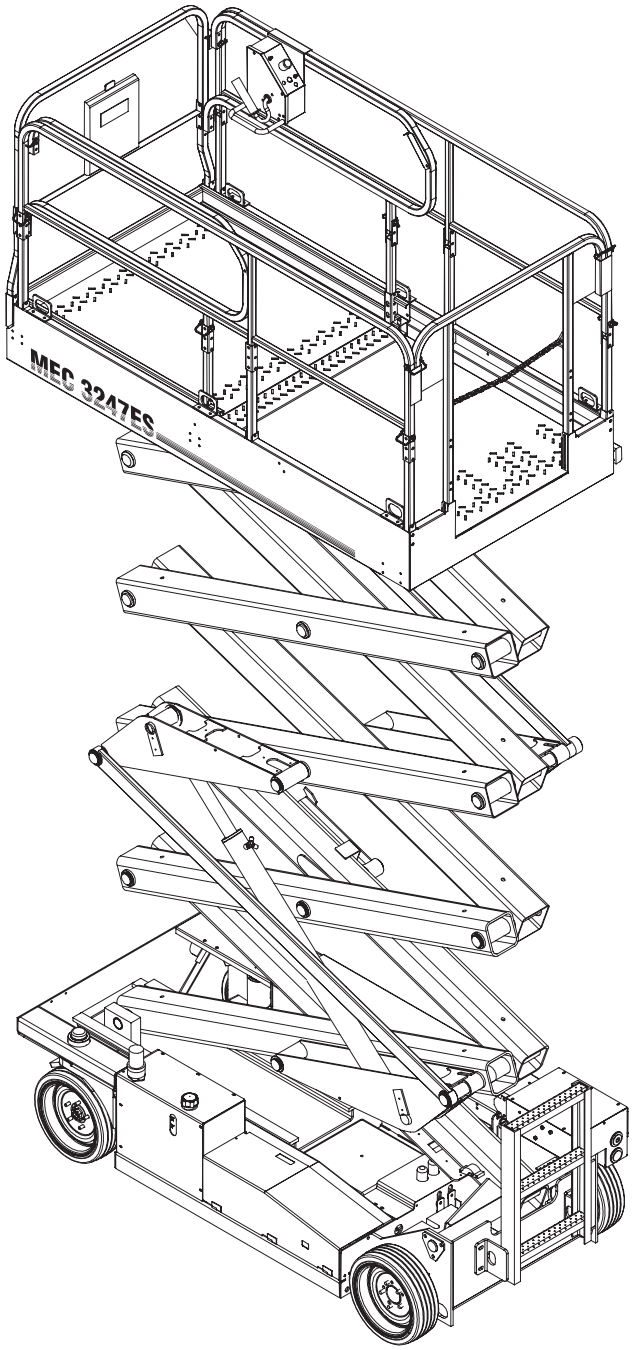
SERVICE AND PARTS MANUAL

2047ES / 2647ES / 3247ES



Serial Number Range

2047ES:	**9801000 - Present**
2647ES:	**9901000 - Present**
3247ES:	**10001000 - Present**

Part # 90909 R4
October 2008

Revision History:

March 2008

Pages	Reason for update
	Service Section 5
5-13	Update Electrical Schematic

March 2008

Pages	Reason for update
	Table of Contents
	Update to include new pages in Section 5
	Section 1
1-8	Update illustration: Steering assembly
	Section 5
5-1	Update contents
5-5	Update hydraulic schematic: RV1 Pressures - current models
5-14 – 15	Add Canadian electric schematic
5-16 – 20	Update page numbers
	Parts Table of Contents
	Update to include new pages in Section C
	Section A
A-1	Update contents
A-13	Update parts list: Lower Control Box
A-14	Update illustration: Lower Control Box
A-20	New illustration, Cutout Relays, Canadian
A-21	New parts list, Cutout Relays, Canadian
	Section C
All Pages	Update illustrations: Scissor Assembly, all models Update parts list: Scissor Assembly, all models Update illustration: Lift Cylinder installation Update parts list: Emergency Lowering Cable Update page numbers
	Section D
D-19	Update parts list: Hydraulic Hoses, 2047ES - 2647ES
D-21	Update parts list: Hydraulic Hoses, 3247ES
	Section E
E-1	Update contents
E-7	Update parts list: Base Covers (steel reservoir) - Battery Cover
E-9	Update parts list: Base Covers (steel reservoir) - Battery Cover
E-15	Update parts list: Brake Assembly
E-21	Update parts list: Steering Components
E-31	Update illustration: Battery Installation

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Parts Manual

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.

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

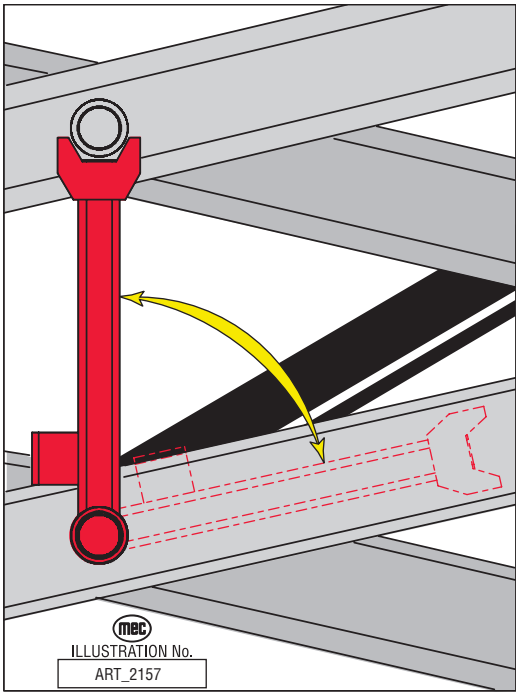
Regular inspection and conscientious maintenance is the key to efficient economical operation of your scissor lift. It will help to assure that your equipment will perform satisfactorily with a minimum of service and repair.

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.

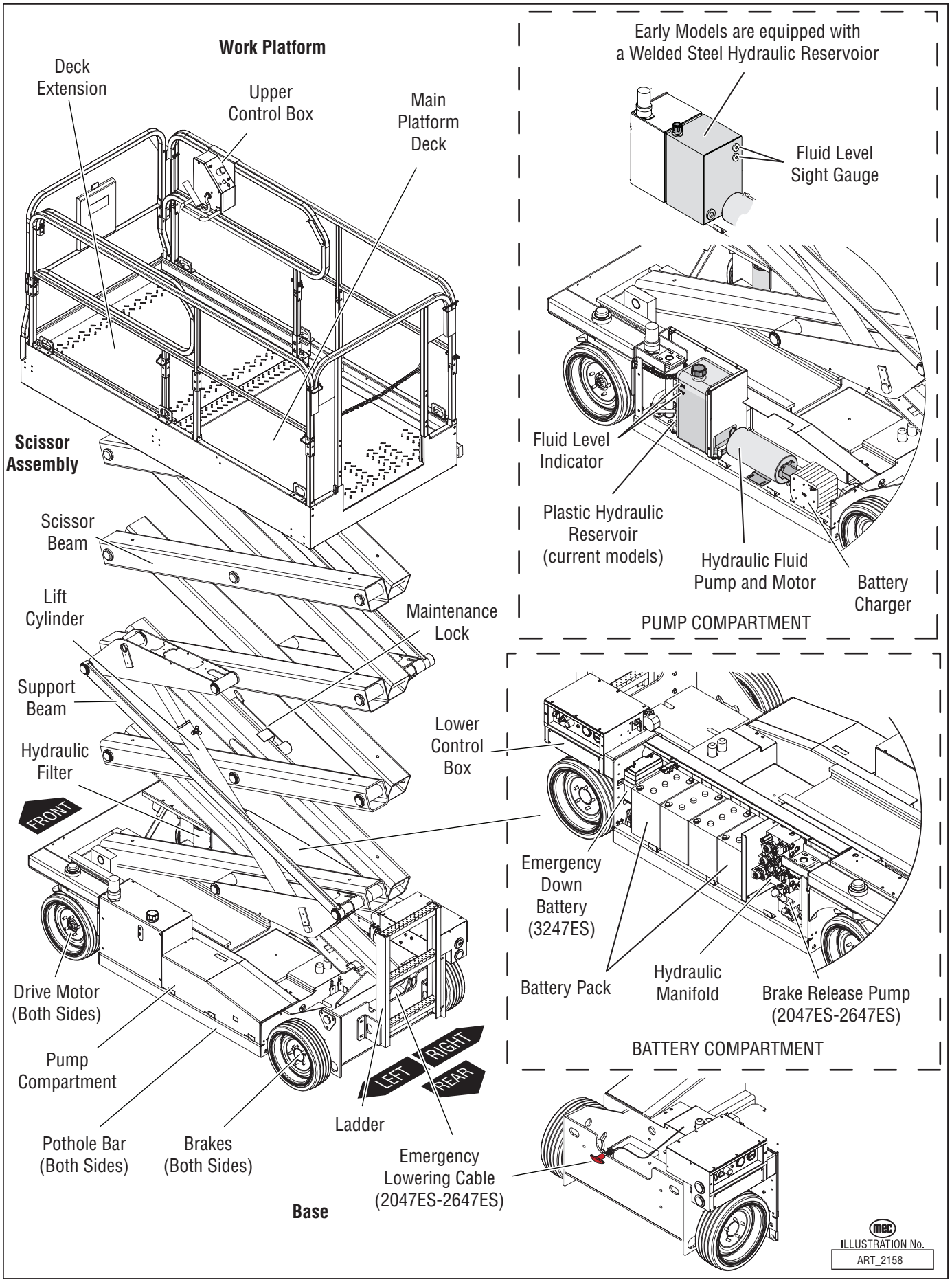
MACHINE SPECIFICATIONS

	2047ES		2647ES		3247ES	
Working Height*	**26 ft.**	8.10 m	**32 ft.**	9.92 m	**38 ft.**	11.75 m
Platform Height	**20 ft.**	6.10 m	**26 ft.**	7.92 m	**32 ft.**	9.75 m
Stowed Height – Rails Up	**82.6 in.**	2.10 m	**88.8 in.**	2.26 m	**95.1 in.**	2.42 m
Stowed Height – Rails Folded Down	**63.8 in.**	1.62 m	**70.0 in.**	1.78 m	**76.3 in.**	1.94 m
Maximum Number of Occupants – 0 m/s wind	**3**	3	**3**	3	**2**	2
Maximum Number of Occupants – 12.5 m/s wind	**1**	1	**N/A**	N/A	**N/A**	N/A
Lift Capacity (Evenly Distributed)	**1,250 lbs.**	567 kg	**1,000 lbs.**	454 kg	**700 lbs.**	317 kg
Rollout Deck Capacity	**250 lbs.**	113 kg	**250 lbs.**	113 kg	**250 lbs.**	113 kg
Platform Dimensions						
With Deck Extended	**133.5 in.**	3.39 m	**133.5 in.**	3.39 m	**133.5 in.**	3.39 m
With Deck Retracted	**91 in.**	2.31 m	**91 in.**	2.31 m	**91 in.**	2.31 m
Guardrail Height	**43.4 in.**	1.10 m	**43.4 in.**	1.10 m	**43.5 in.**	1.10 m
Toeboard Height	**6 in.**	15 cm	**6 in.**	15 cm	**6 in.**	15 cm
Deck Extension Length	**42.1 in.**	1.07 m	**42.1 in.**	1.07 m	**42.1 in.**	1.07 m
Overall Length	**99 in.**	2.51 m	**99 in.**	2.51 m	**99 in.**	2.51 m
Overall Width	**47 in.**	1.19 m	**47 in.**	1.19 m	**47 in.**	1.19 m
Wheelbase	**71 in.**	1.80 m	**71 in.**	1.80 m	**71 in.**	1.80 m
Wheel Track	**41 in.**	1.04 m	**41 in.**	1.04 m	**41 in.**	1.04 m
Turning Radius – Inside	**0 in.**	0 cm	**0 in.**	0 cm	**0 in.**	0 cm
Turning Radius – Outside	**94 in.**	2.39 m	**94 in.**	2.39 m	**94 in.**	2.39 m
Ground Clearance	**3.5 in.**	8.9 cm	**3.5 in.**	8.9 cm	**3.5 in.**	8.9 cm
Machine Weight** (Unloaded) (Approx.)	**4,450 lbs.**	2018 kg	**5,300 lbs.**	2404 kg	**5,990 lbs.**	2717 kg
Drive System (Proportional)						
Drive Speed (Platform Elevated - Forward)	**0–0.62 mph**	0–1.0 km/h	**0–0.62 mph**	0–1.0 km/h	**0–0.62 mph**	0–1.0 km/h
Drive Speed (Platform Lowered)	**0–2.5 mph**	0–4.0km/h	**0–2.5 mph**	0–4.0km/h	**0–2.5 mph**	0–4.0km/h
Lift/Lower Speed (Approx.)	**28/35 sec.**	28/35 sec.	**30/35 sec.**	30/35 sec.	**42/45 sec.**	42/45 sec.
Gradeability	**25% / 14°**	25% / 14°	**25% / 14°**	25% / 14°	**25% 14°**	25% 14°
Ground Pressure/Wheel (Maximum)	**180 psi**	12.7kg/cm²	**194 psi**	13.6kg/cm²	**205 psi**	14.4kg/cm²
Wind Speed (Maximum)	**0 m/s**	0 m/s	**0 m/s**	0 m/s	**0 m/s**	0 m/s
Tire Size-Standard (Solid, non-marking rubber)	**16 in. D x 5 in. W**			40.6cm D x 12.7cm W		
Wheel Lug Nut Torque	**75 - 85 ft. lbs.**			102 - 115 Nm		
Hydraulic Pressure – Main System	**2750 psi**	190 bar	**3000 psi**	207 bar	**3000 psi**	207 bar
Hydraulic Pressure – Lift System	**2500 psi**	172 bar	**2500 psi**	172 bar	**2045 psi**	141 bar
Hydraulic Pressure – Steer	**1100 psi**	76 bar	**1100 psi**	76 bar	**1100 psi**	76 bar
Hydraulic Fluid Capacity	**4.5 gal**	17.0 liters	**4.5 gal**	17.0 liters	**4.5 gal**	17.0 liters
Power System – Voltage	**24 Volts DC**	24 Volts DC	**24 Volts DC**	24 Volts DC	**24 Volts DC**	24 Volts DC
Battery Charger – Input / Output	100-220 Volt AC, 50/60 Hz, 5.6 Amp 24 Volt DC, 25 Amps Tapering, Timed Shutoff					
Batteries – Four 6 Volt deep-cycle	220 Amp hrs. @ 20 hr. rating				240 Amp hrs. @ 20 hr. rating	
Electric Motor – Early Models	2.0 h.p. (1.49 kW): 3000 r.p.m.					
Electric Motor – Current Models	4.0 h.p. (2.98 kW): 3000 r.p.m.					

Meets Requirements of ANSI A92.6-2006 Section 4

*Metric equivalent of working height adds 2m to platform height. U.S. adds 6 ft. to platform height.

**Weight may increase with certain options or country standards.



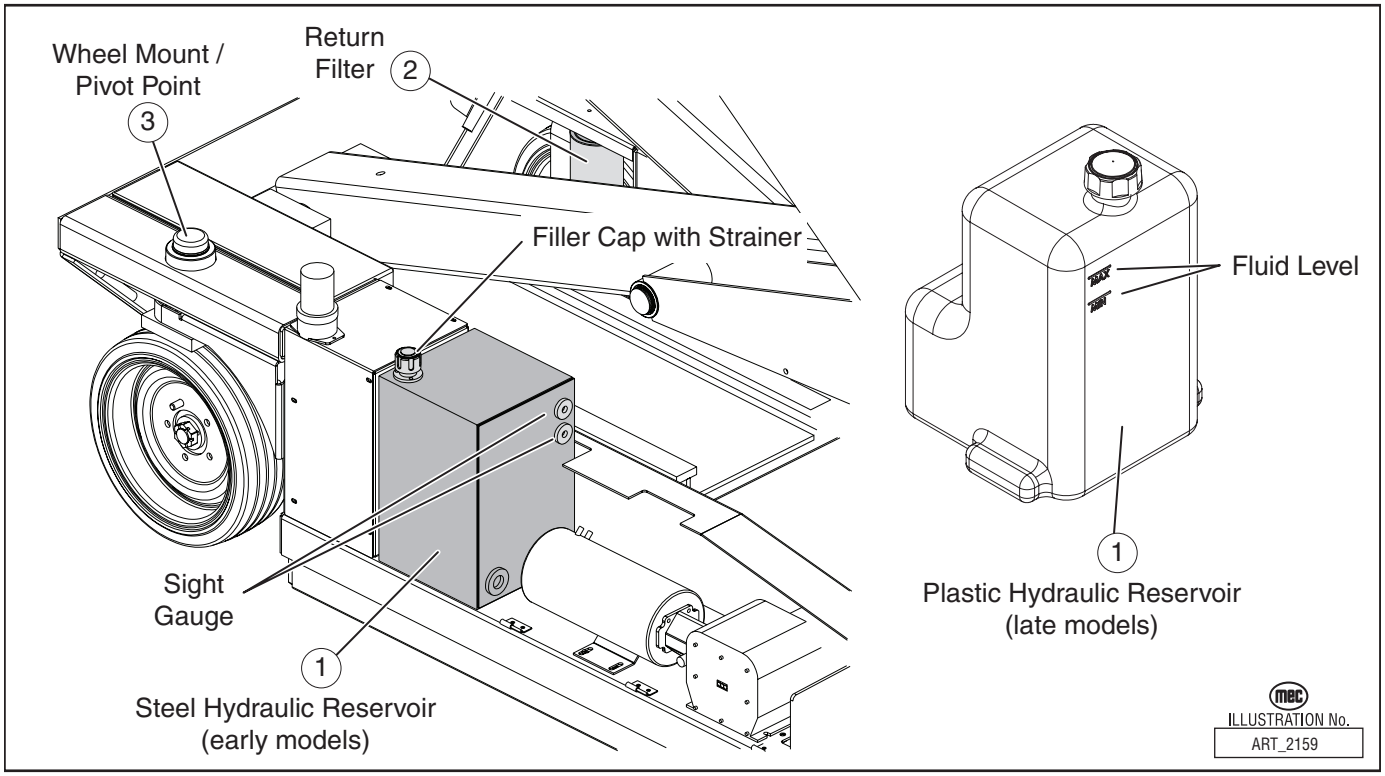
PRIMARY MACHINE COMPONENTS

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

Component	Service Section	Parts Section	Component	Service Section	Parts Section
Platform Assembly			**Pump Compartment**		
Upper Controls	2 | 4 | 5	1	Hydraulic Pump & Motor	intro |1 | 4 | 5	5
Deck and Rails	3	2	Hydraulic Reservoir	intro | 1	4
Chain Closure		2	Battery Charger	2 | 4 | 5	5
Optional Gate		2			
Deck Extension		2			
Control Terminal Strip	2 | 5	1 | 2			
Horn (optional)	2 | 4 | 5	1 | 2			
Power to Platform		2			
Lift Assembly			**Battery Compartment**		
Scissor Assembly	3	3	Battery Pack	2 | 4	5
Maintenance Lock	intro	3	E-Down Battery	2 | 4	5
Lift Cylinders	1 | 3 | 4 | 5	3	E-Down Switch	2 | 4	5
			Hydraulic Manifold	1 | 4 | 5	4
			Brake Release Hand Pump	5	4
Base Assembly			**Lower Control Box**		
Drive Motors	intro | 1 | 3 | 4 | 5	5	Lower Controls	2 | 4 | 5	1
Brakes	intro | 1 | 3 | 4 | 5	5	Power to Platform	2	1
Steering Components	1 | 3 | 4 | 5	5	Tilt Sensor	2 | 4 | 5	1
Wheels & Tires	3	5	Diode Board	2 | 4 | 5	1
Emergency Lowering	1	5	Motor Controller (PWM)	2 | 4 | 5	1
Hoses & Cables	1 | 3	1 | 2 | 4	Battery Disconnect Switch	2	1
Pothole Components	3	5	Motion Alarm	2 | 5	5
Pothole Switch	2 | 4 | 5	5			
Limit Switch	2 | 4 | 5	5			
Lubrication Points	intro	3			
Hydraulic Filter	intro | 1	4			

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

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.

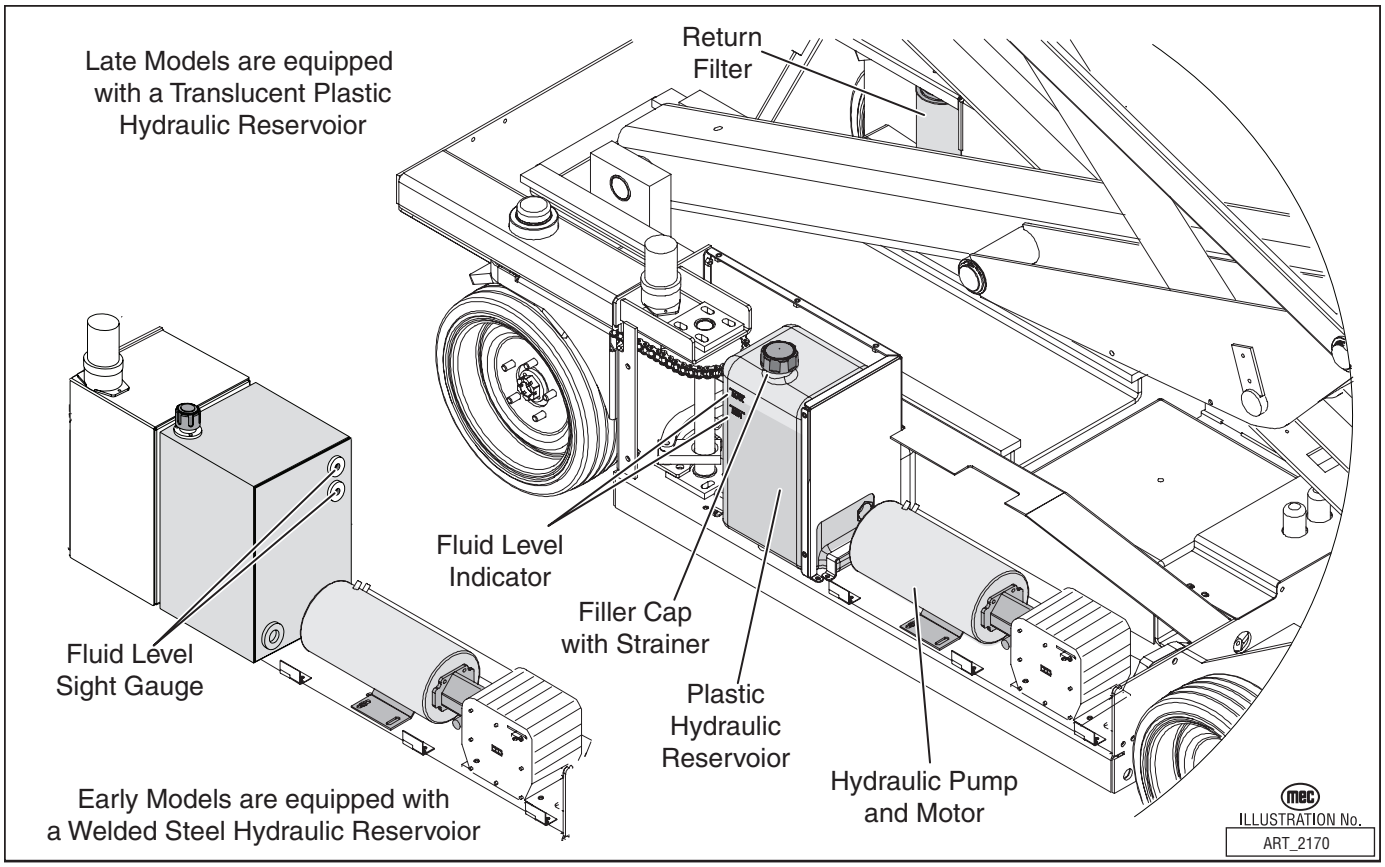
Hydraulic Filter

All machines are produced 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.

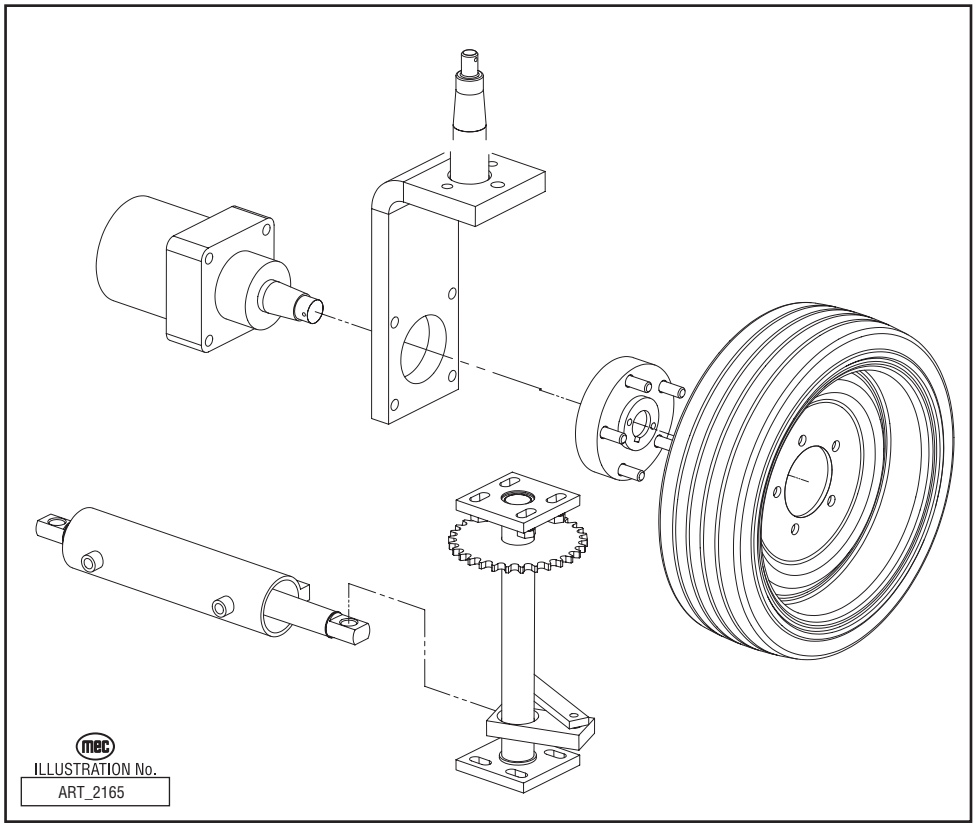
Hydraulic Pump

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



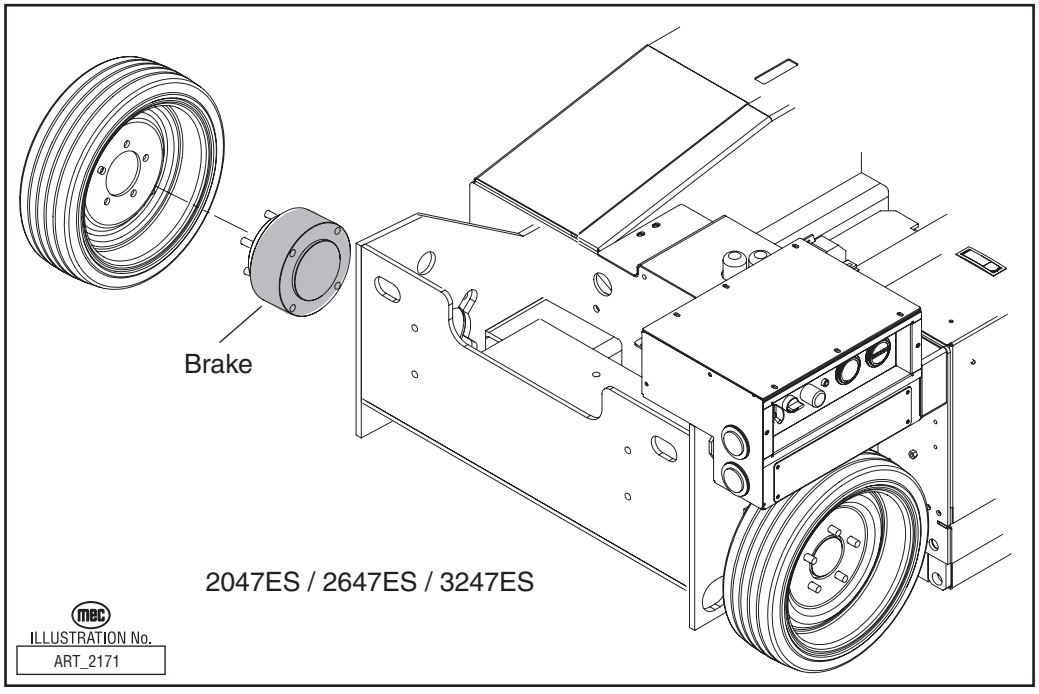
Wheel Drive Circuit

There are two (2) hydraulic, fixed-displacement gear wheel motors to provide power to 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 m.p.h. (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 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.

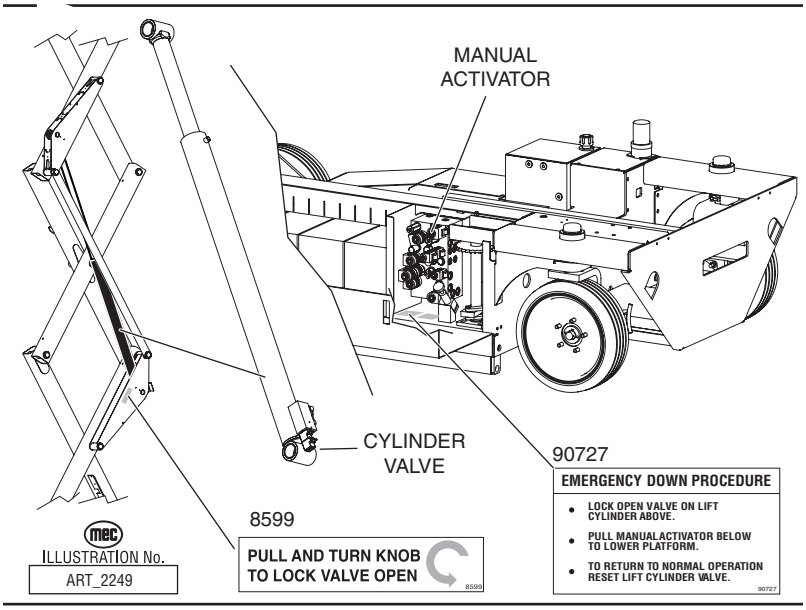
DO NOT ATTEMPT TO CLIMB DOWN SCISSOR ASSEMBLY.

BEFORE LOWERING PLATFORM, RETRACT THE DECK EXTENSION.

Emergency Lowering - 2047ES and 2647ES (early models)

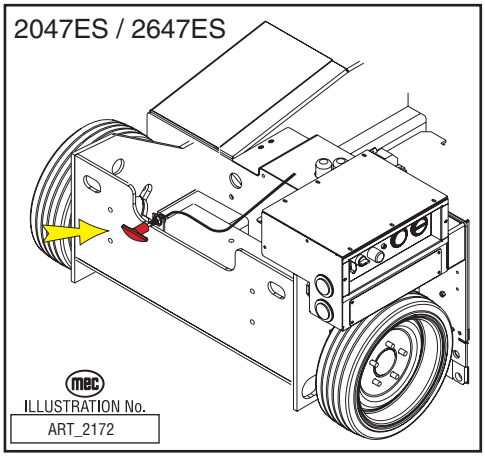
The Emergency Down System is used to lower the platform in case of power or valve failure. To lower the platform, perform the following steps:

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 - 2047ES and 2647ES (current models)

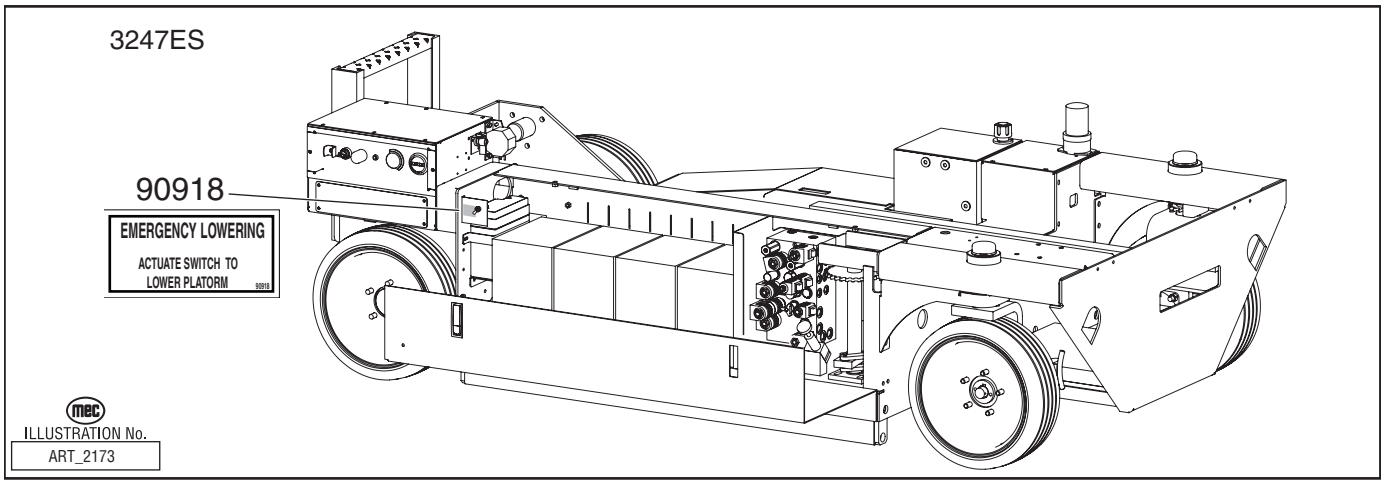
Emergency Down system is used to lower the platform in case of power or valve failure. To lower the platform, pull the red “T” handle located at the rear of the machine. Lowering stops when you release the “T” handle.



Emergency Lowering - 3247ES (all 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. Push down on the toggle switch and hold it to lower the platform to the desired height.
2. Once the platform is fully lowered, release the toggle switch to close the valve



STEERING CIRCUIT

Note: Refer to *Hydraulic Manifold* and *Relief Pressure Adjustment Procedure*.
Refer to *Section 3* for Remove and Replace instructions.
Refer to *Parts Section E* for hose routing.

The steering system consists of the following components:

- Each wheel motor housings has a pivot and chain sprocket on the top.
- A hydraulic steering cylinder is mechanically linked via tie rods to two (2) chain-and-sprocket assemblies (one [1] for each motor housing).
- Steering is accomplished hydraulically by using one (1) double-acting cylinder, and a 4-way 3-position solenoid-operated, hydraulic directional control cartridge valve.

Steer Cylinder

There is one (1) cylinder utilized in the steering system. This cylinder is a double acting double sided type which requires fluid flow to operate the cylinder rod in both directions. Directing fluid forces the piston to travel to one side or the other, thereby extending one rod end and retracting the other.

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

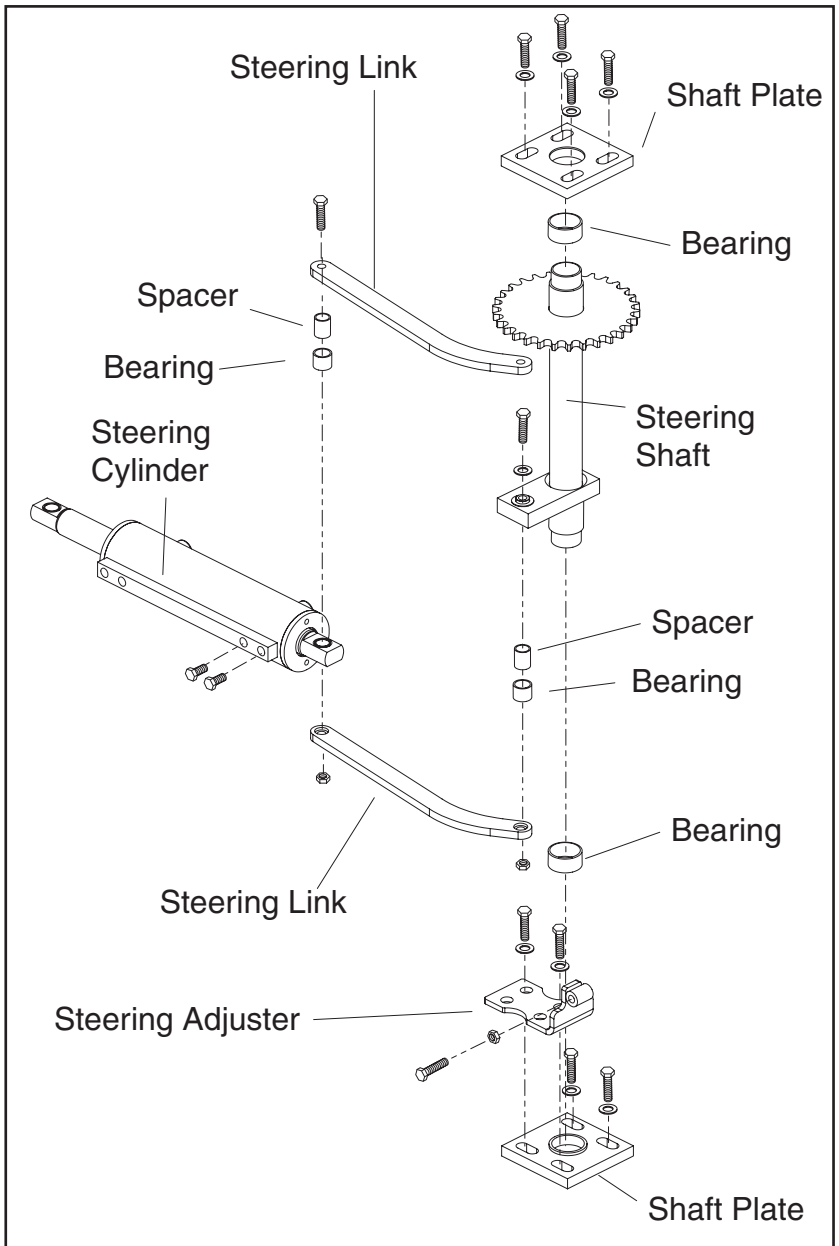


ILLUSTRATION No.
ART_2792

TORQUE	Ft. lbs.	Nm
Cylinder Mount Bolts	102 - 112	138 - 152
Shaft Plate Bolts	86 - 96	113 - 130
Steering Link Bolts	26 - 28	35 - 38

PLATFORM LIFT CIRCUIT

Note: Refer to *Hydraulic Manifold* and *Relief Pressure Adjustment Procedure*. Refer to *Section 3* 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*.

2047ES / 2647ES

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*).

3247ES

Two (2) single acting type hydraulic cylinders.

Each cylinder has an integrated 2-position, 2-way solenoid operated platform lower valve for holding the platform in position (see *Emergency Systems and Procedures*).

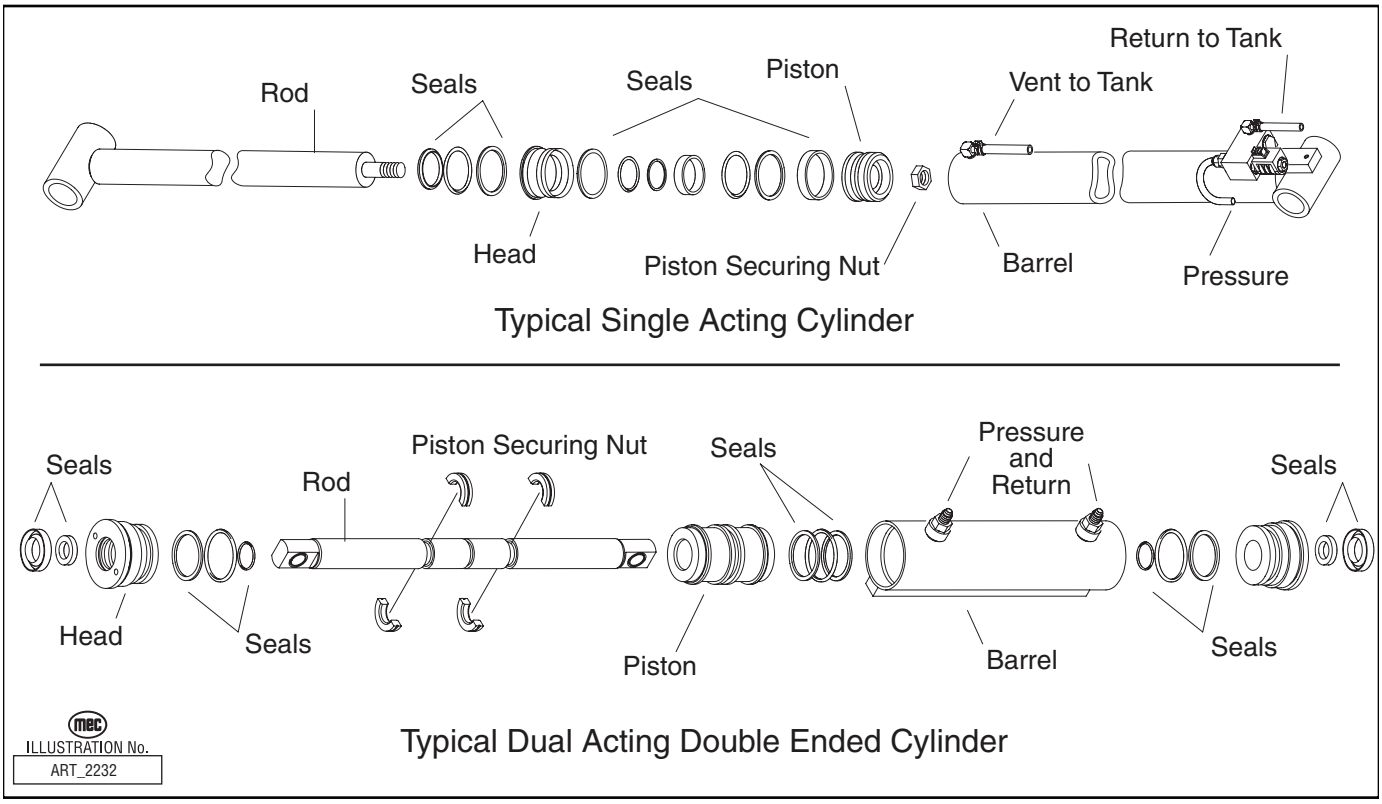
The valves are also externally actuated via a toggle switch for manually lowering the platform.

The normally closed holding valve prevents retraction of the cylinder rod should a hydraulic line rupture or a leak develop between the cylinder and its related control valve.

CYLINDER REPAIR

! WARNING !!!

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



Removal

Note: Refer to *Section 3* 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 3*.

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 .007 in (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 1 ½" nut to 160 ft.-lbs.
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. Installation is reverse of removal.
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 3* 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

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

Lower Control box

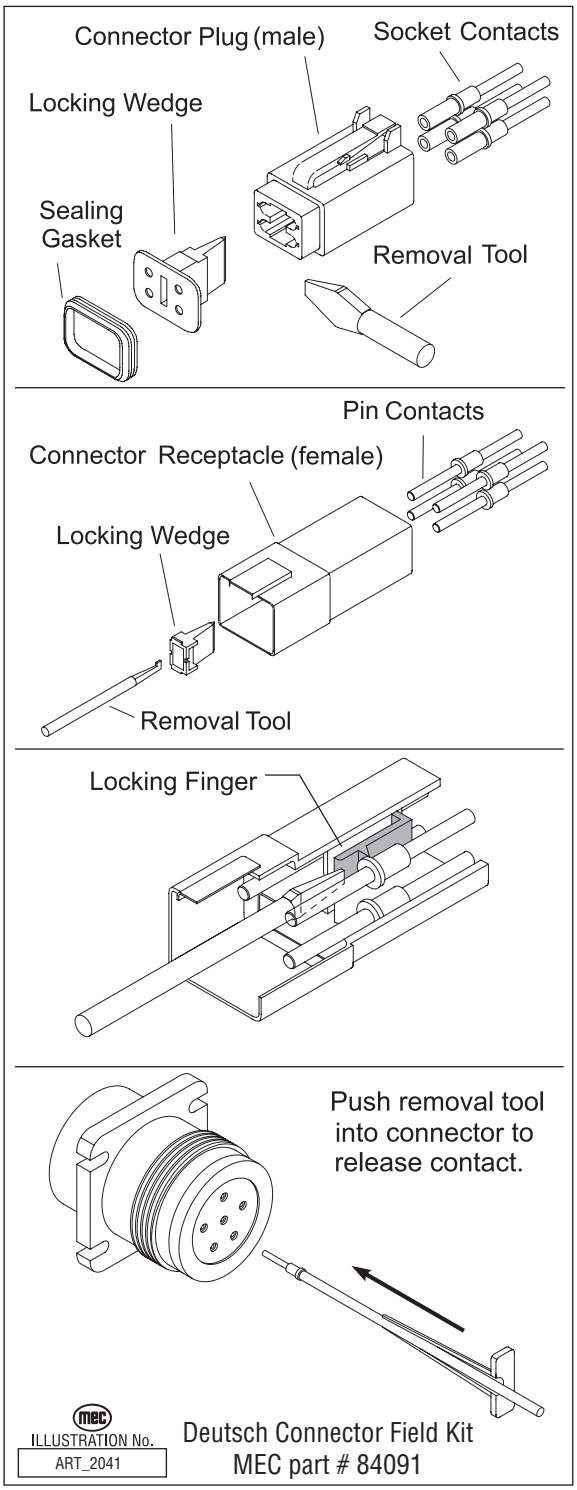
The ground station, when enabled via the Base/Platform Selector Switch, disables the upper station and provides control for a fixed speed Lift UP/DOWN functionality.

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 number 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 1/4 in (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.

One (1) 12 volt battery supplies power to operate the Emergency Lowering circuit for the 3247ES.

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 1/2 inch 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 volt / 50 or 60 Hz, 115 v/ 60 Hz, or 230 volt / 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 4: 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.

		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

Emergency Lowering System - 3247ES

Battery charging current is regulated by a diode in the charger supply cable. Refer to the illustration on the following page.

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

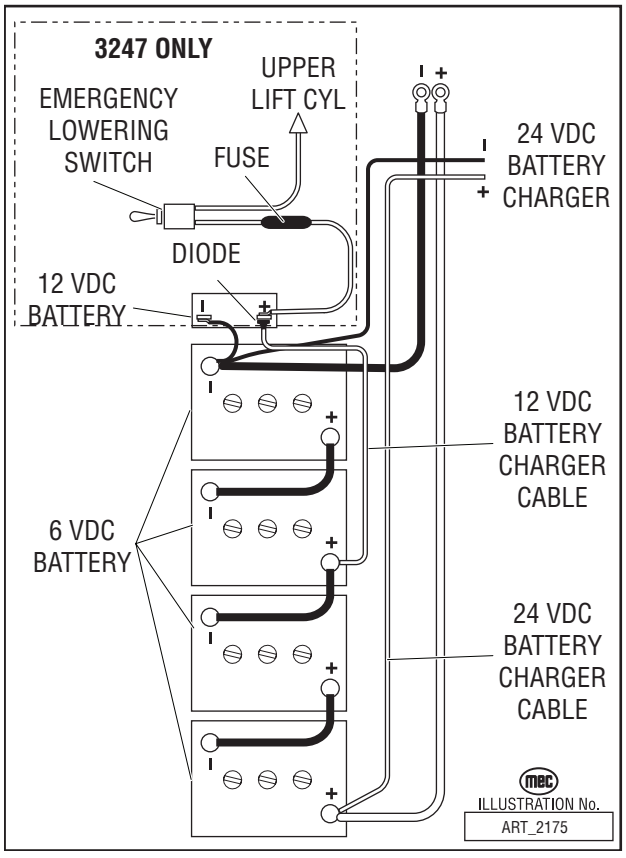
To remove batteries, follow these procedures.

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

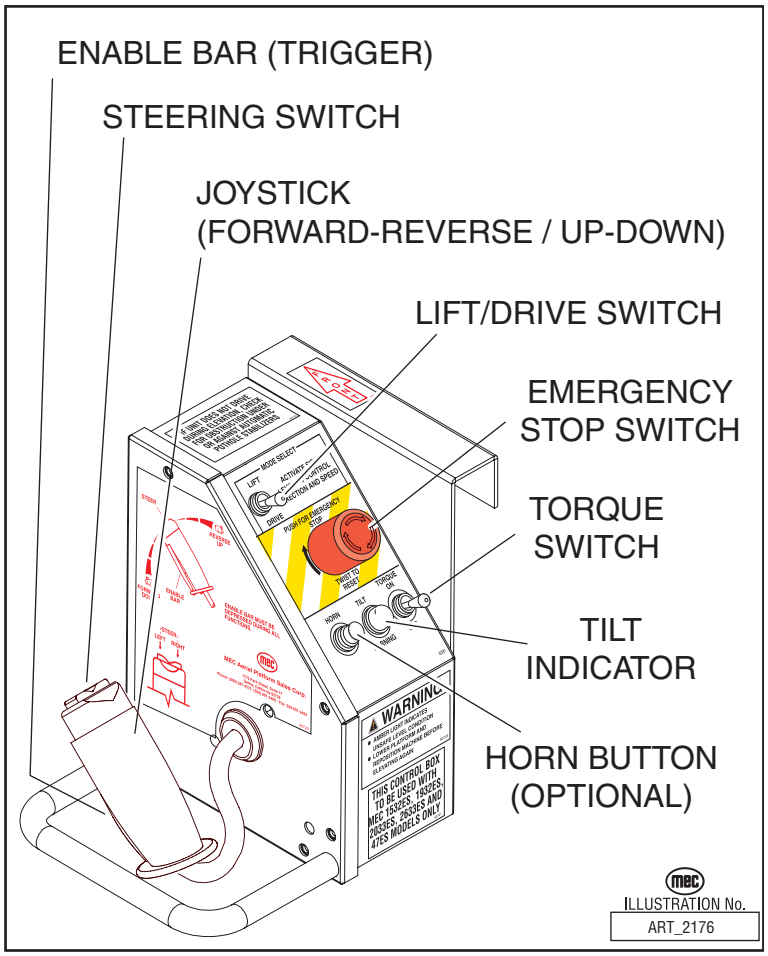
There are two red emergency stop buttons: one located on the upper controls and the other on the lower control panel.

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

Turn button clockwise to reset.

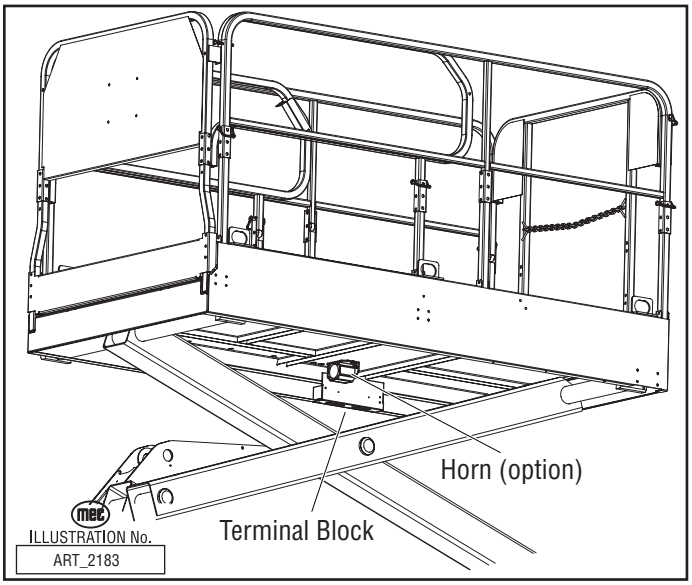
NOTE: As a safety feature, selecting and operating the lower controls will override the upper controls emergency stop button.

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.

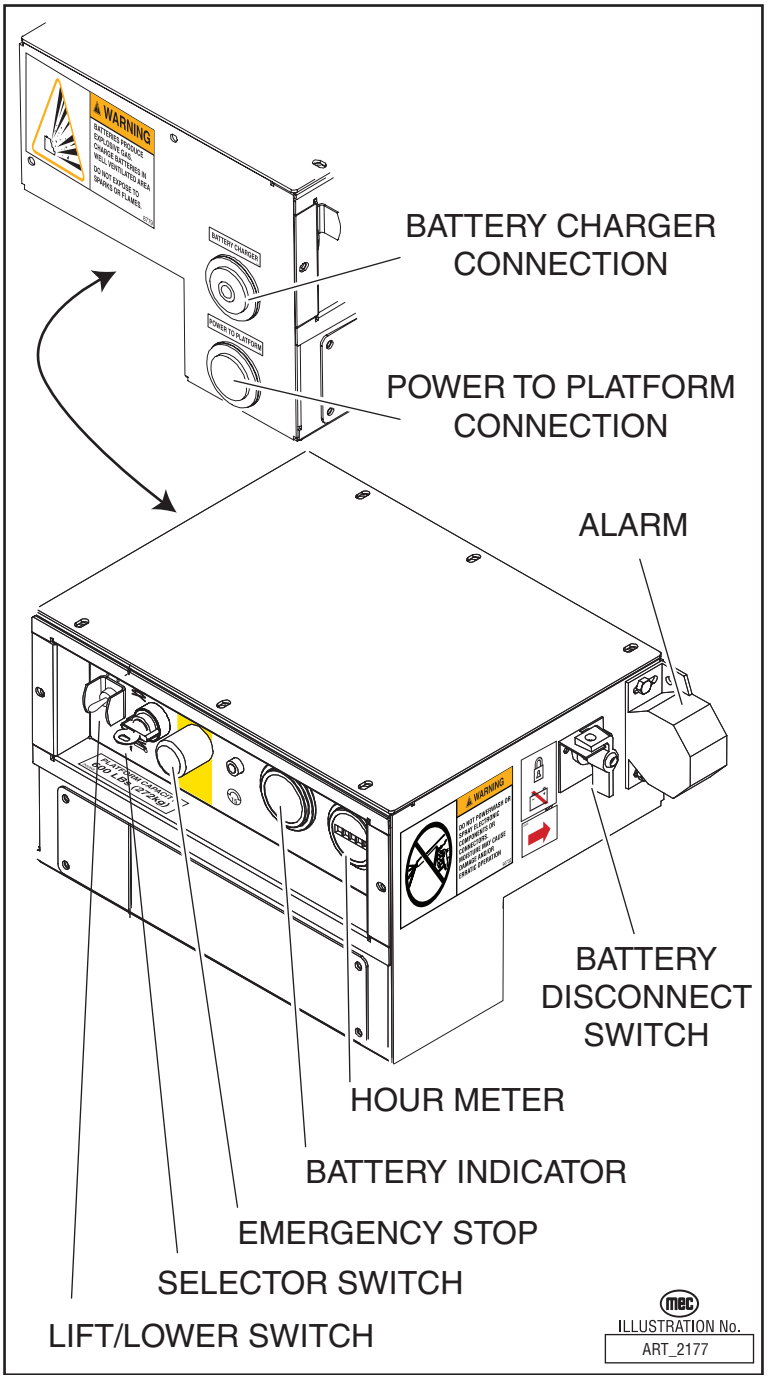
With the upper controls selected, from the lower control panel, if the platform up/lower function is operated there should be NO movement. Similarly, with the lower controls selected, from the upper controls if any machine function is operated, there should be NO movement.

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.

Tilt Alarm

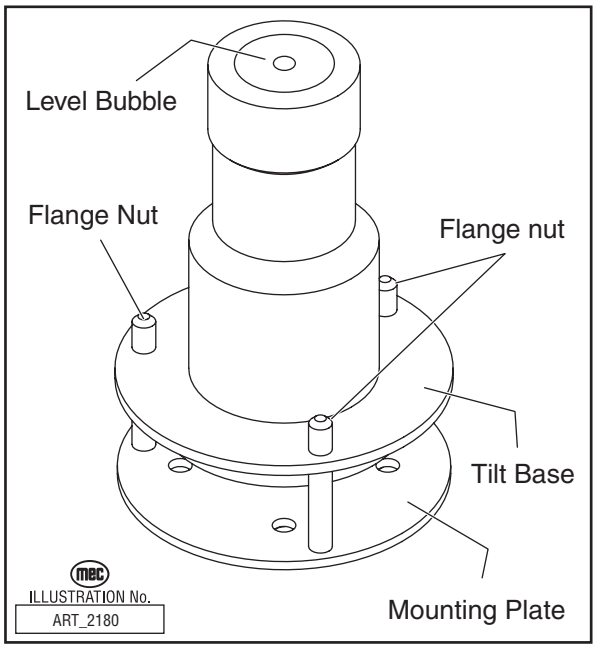
The tilt sensor is located in the Lower Control Box

Tilt Alarm Visual

A warning light provided at the upper console will give a visual warning when the machine is at an unsafe angle; the platform should not be elevated when the warning indicator light is on.

Tilt Alarm Test

This can be tested by tipping the sensor. This “Push-To-Test” feature enables the tilt alarm to be tested without losing its adjustment. Individually push down on each of the three fastened corners of the tilt alarm. There should be enough travel to cause the alarm to sound as each corner is pressed. (There is approximately a 1-3 second delay). It the alarm does not sound, the flange nuts have been tightened too far. Loosen the nut on the 90° corners and repeat this test procedure.



Tilt Alarm Sensor Adjustment

- Before attempting to adjust the alarm, park the machine on a firm, flat, level surface. Use of an inclinometer is recommended to ensure front and rear of chassis is level.
- Open the lower control panel to access the sensor. Adjust the three flange nuts until the bubble on top of the sensor is centered.
- Check that the electrical connections are correct and secured tight.
- Close/shut the lower control panel.

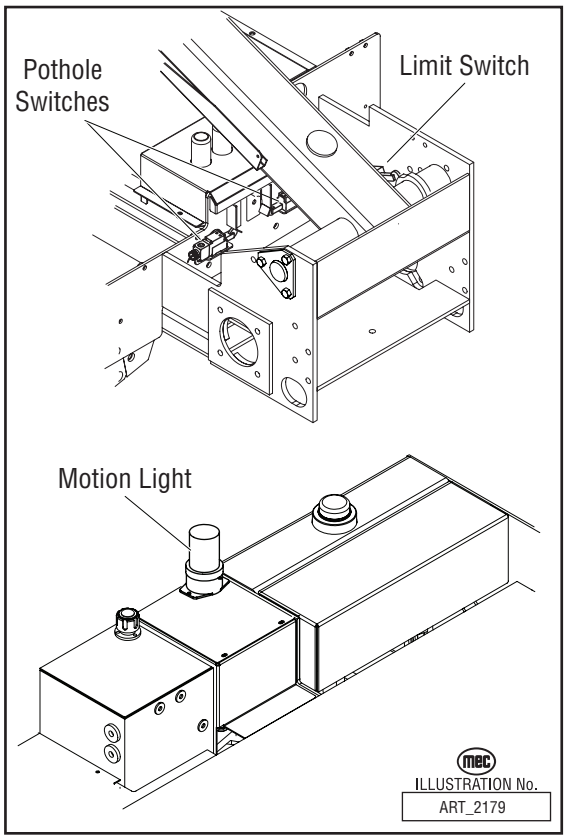
Limit Switch

There is a limit switch to prevent driving in high speed. When the platform is raised above approximately 7 feet (2.3 meters), the machine will be in the slow speed mode.

Pothole Switch

When the platform is elevated above ___feet, the pothole switch activators raise, activating the two (2) pothole switches and causing the pothole bars to extend.

When the platform is lowered, the pothole switch activators lower, depressing the two (2) switches and causing the pothole bars to retract.



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 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.

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 no resistance should be seen.

DIODE BOARD

The diode board is located inside the lower control box.

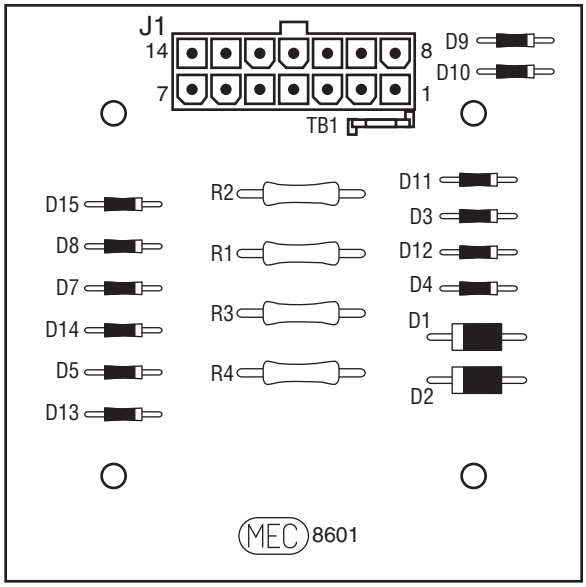


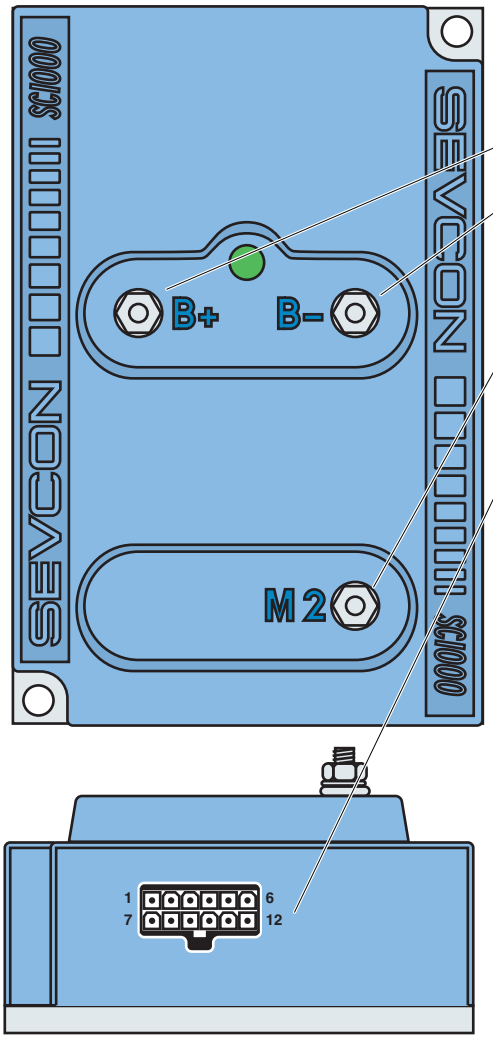
ILLUSTRATION No.
ART_2181

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 4: 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

SECTION 3:
MECHANICAL COMPONENTS

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 eater 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 and 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 and remove the chocks.
6. Torque lug nuts to 75 to 85 ft.-lbs. (102 to 115 Nm).

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

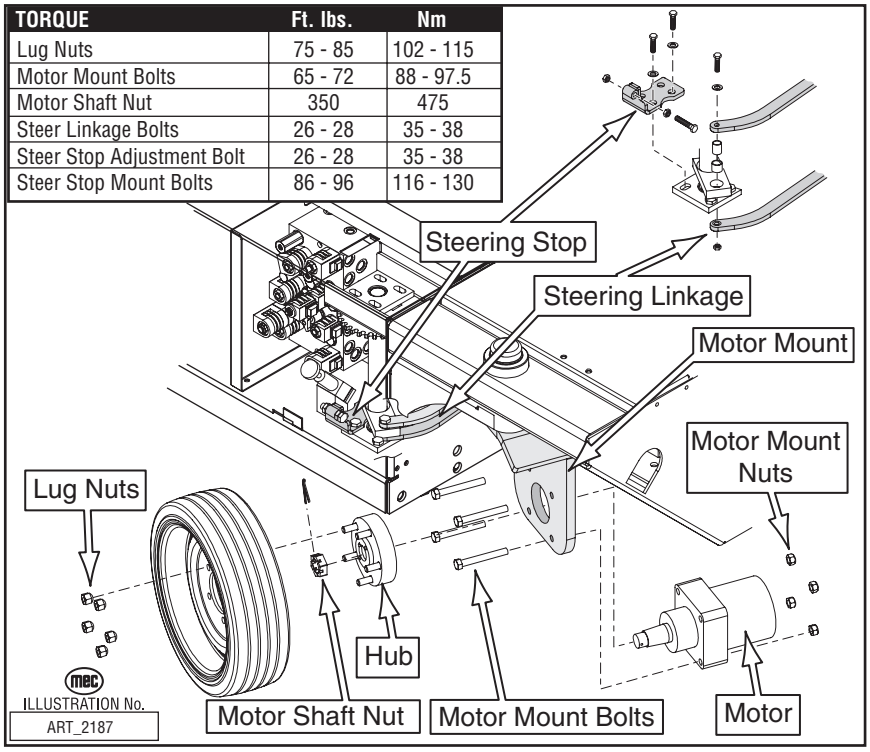
Remove.

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. Disconnect the Steering Linkage (refer to illustration).
5. Remove the steering stop (refer to illustration).
6. Remove the cotter key, motor shaft nut, and hub from the drive motor shaft.
7. Turn the motor housing to gain access to the motor and hose assemblies.
8. Disconnect hose assemblies from drive motor.
9. Remove the cap screws and remove the drive motor.

Replace

Installation is reverse of removal.

TORQUE	Ft. lbs.	Nm
Lug Nuts	75 - 85	102 - 115
Motor Mount Bolts	65 - 72	88 - 97.5
Motor Shaft Nut	350	475
Steer Linkage Bolts	26 - 28	35 - 38
Steer Stop Adjustment Bolt	26 - 28	35 - 38
Steer Stop Mount Bolts	86 - 96	116 - 130



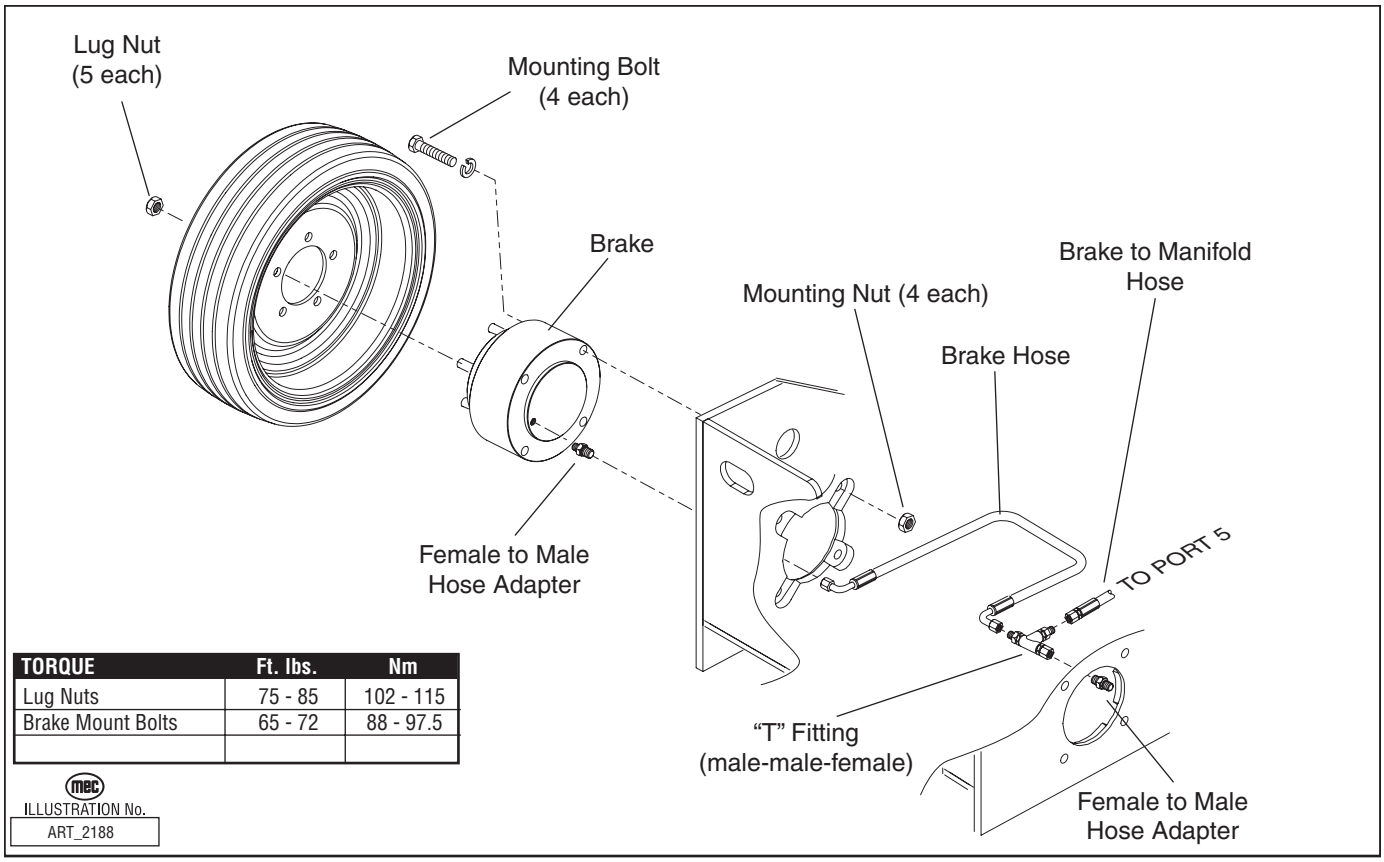
Rear Wheel Brakes

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 relief valve.
5. 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

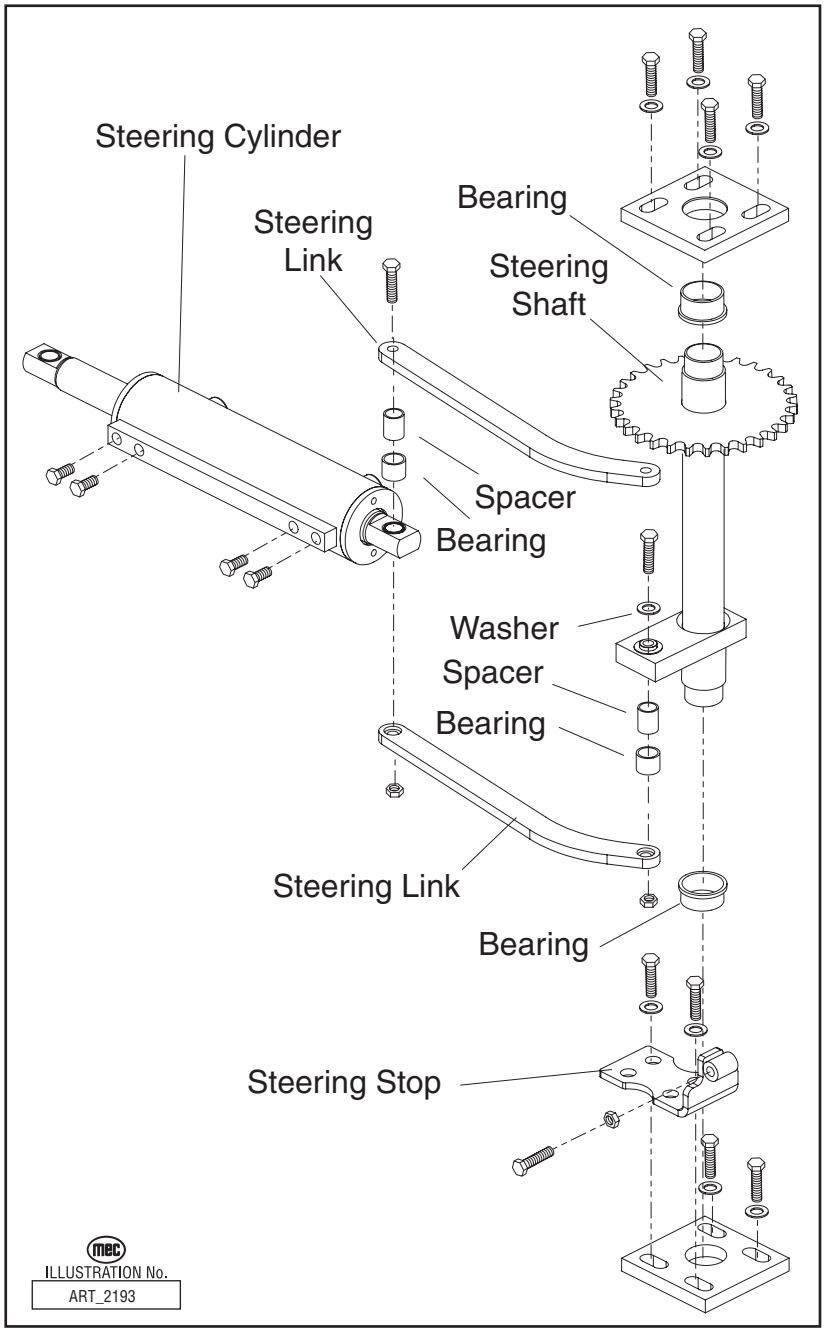
Steer Cylinder

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.

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 bolts holding the steering cylinder to the steering links and move the steering links away from the cylinder.
4. Remove the steer cylinder mounting bolts.
5. Carefully remove the steer cylinder.
6. Position the new steer cylinder and install the mounting bolts.
7. Move the steering links into position and install the hardware.
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

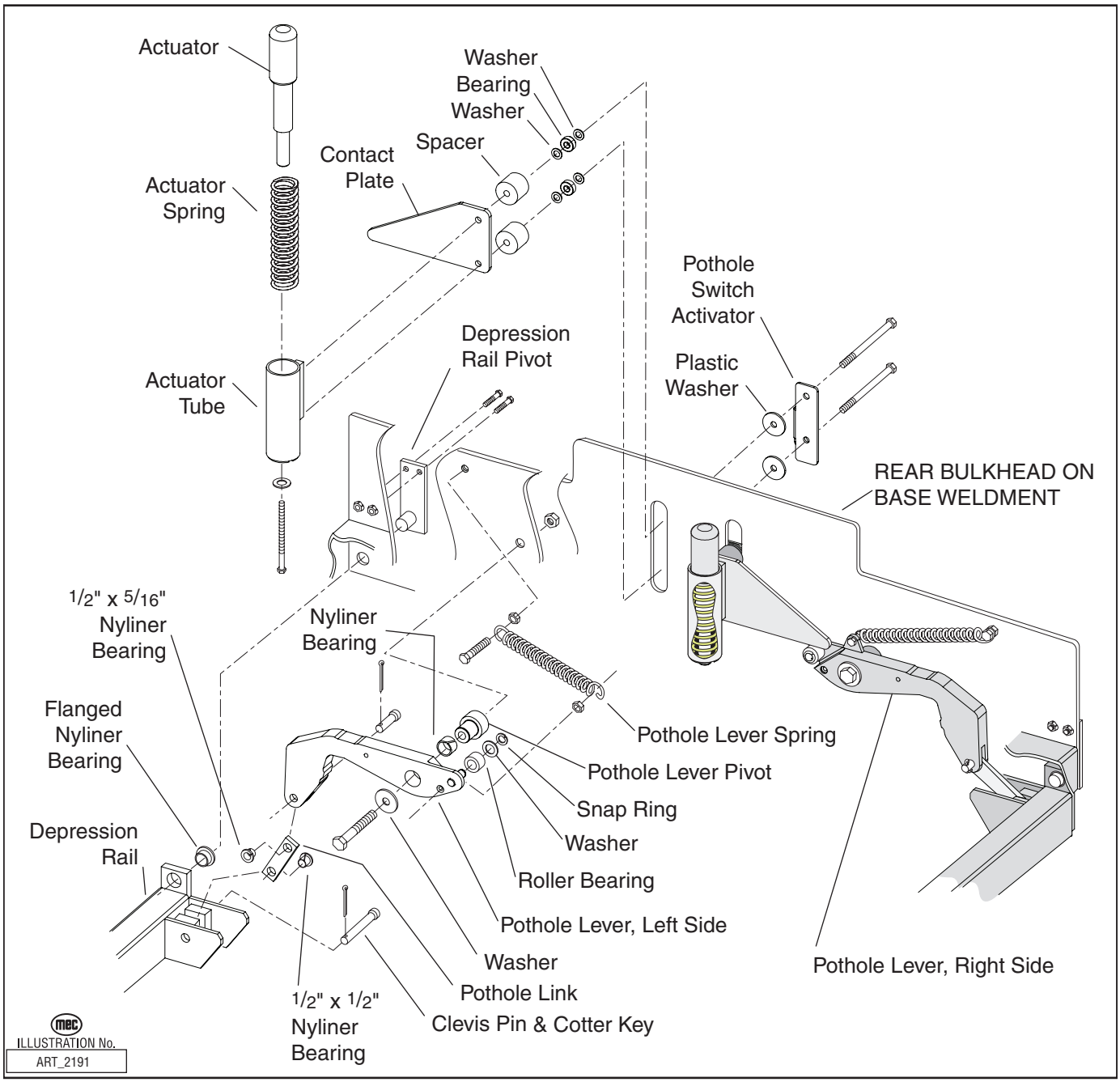
Refer to *Section 1* for seal replacement instructions.

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.

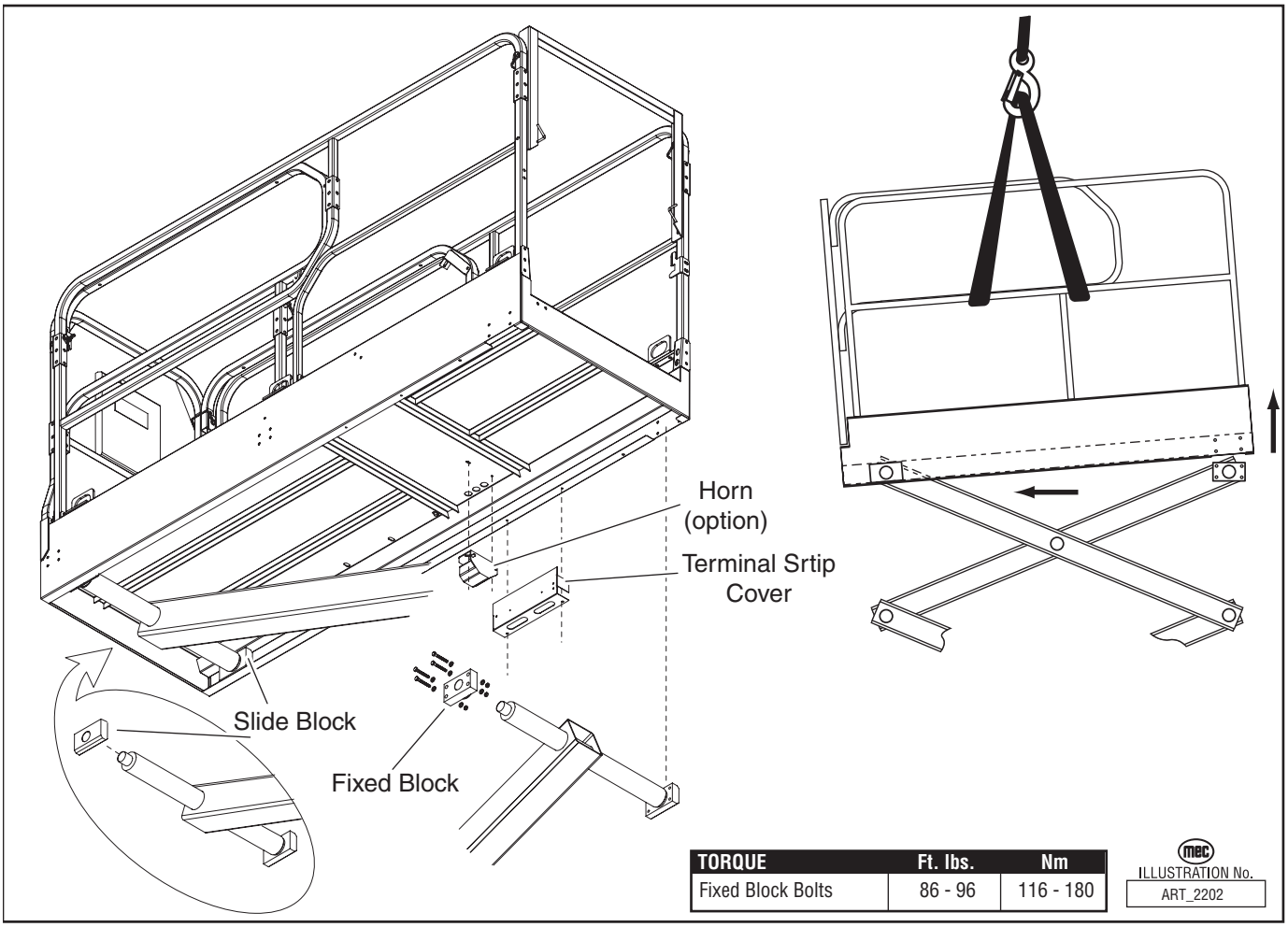
Repair:

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



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

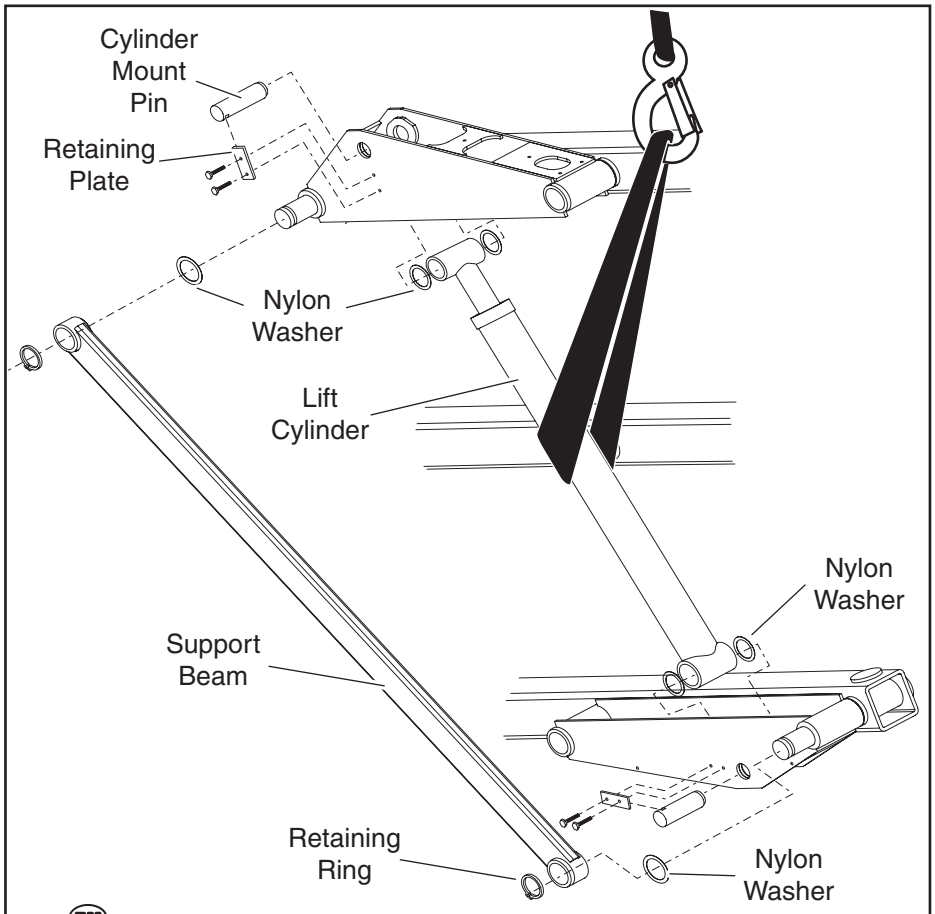
Note: Refer to *Section 1* for seal replacement instructions.
Refer to *Parts Section C* for detailed parts list and illustration.

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

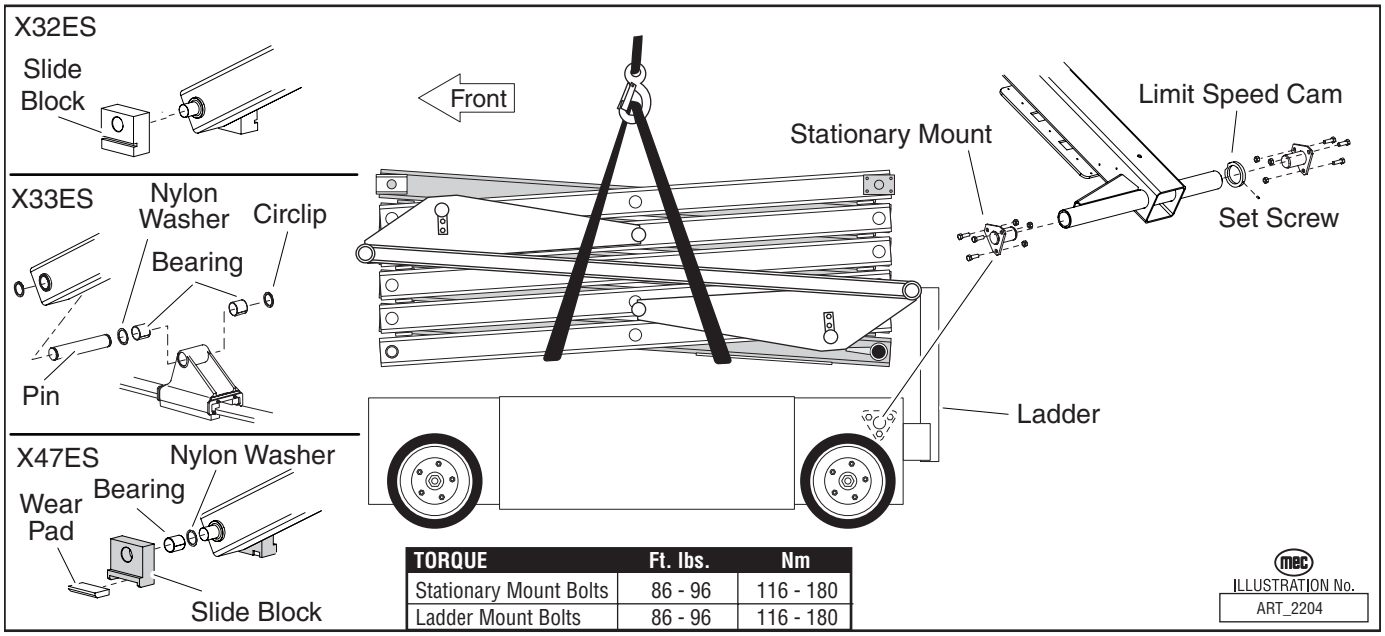
Note: Refer to *Parts Section C* for detailed parts list and illustration.

Clean the beams once a year or as necessary and inspect along the beam's surface, especially 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 4:
TROUBLESHOOTING

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 components 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.

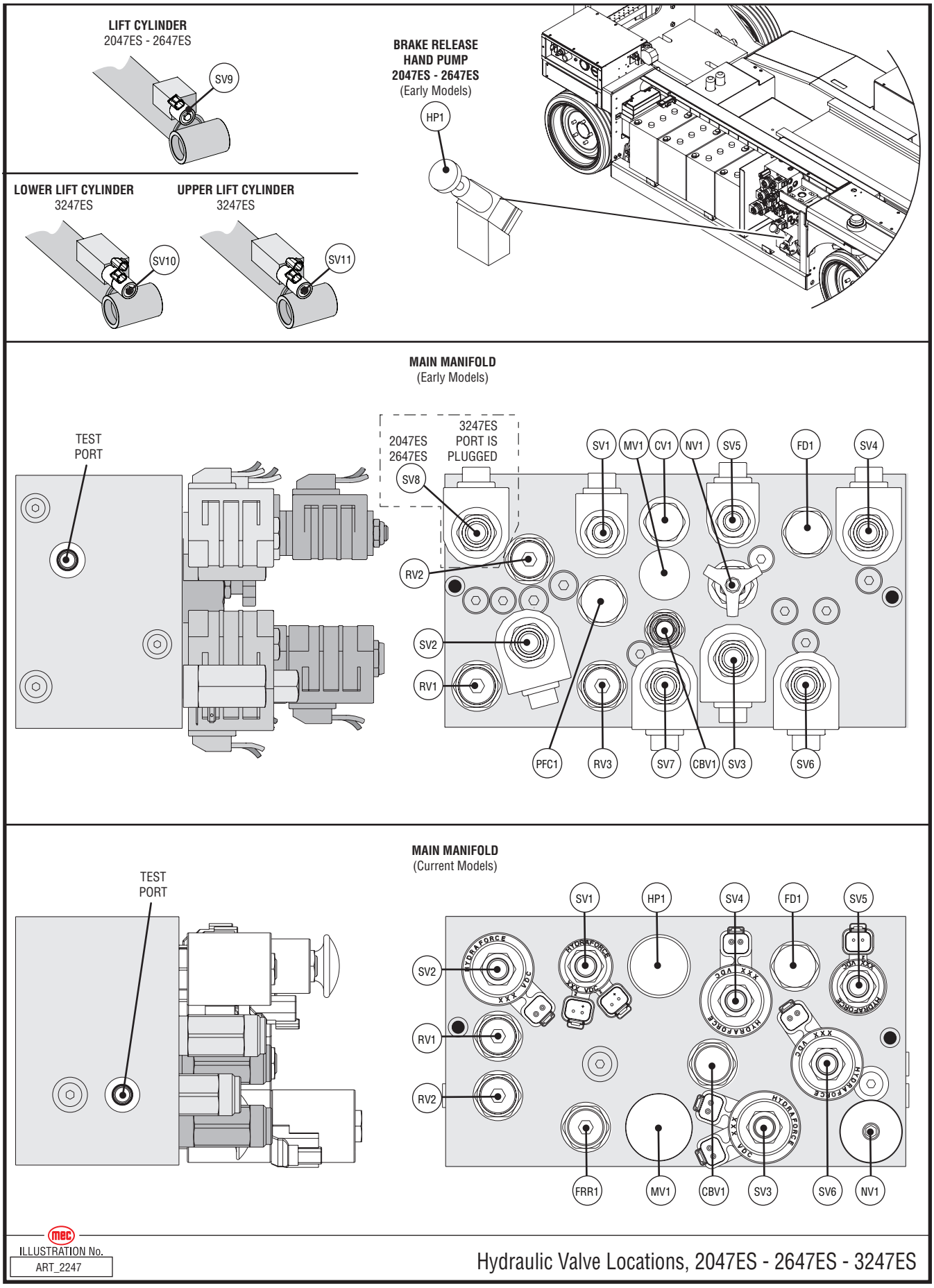


ILLUSTRATION No.
ART_2247

Hydraulic Valve Locations, 2047ES - 2647ES - 3247ES

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 0-3500 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
2047ES	2750 PSI 190 bar	2500 PSI 172 bar	1100 PSI 76 bar	550 PSI 38 bar
2647ES	3000 PSI 207 bar	2500 PSI 172 bar	1100 PSI 76 bar	550 PSI 38 bar
3247ES	3000 PSI 207 bar	2045 PSI 141 bar	1100 PSI 76 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 (0-3500 psi) 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 0-1000 psi gauge 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 jam nut.
- 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

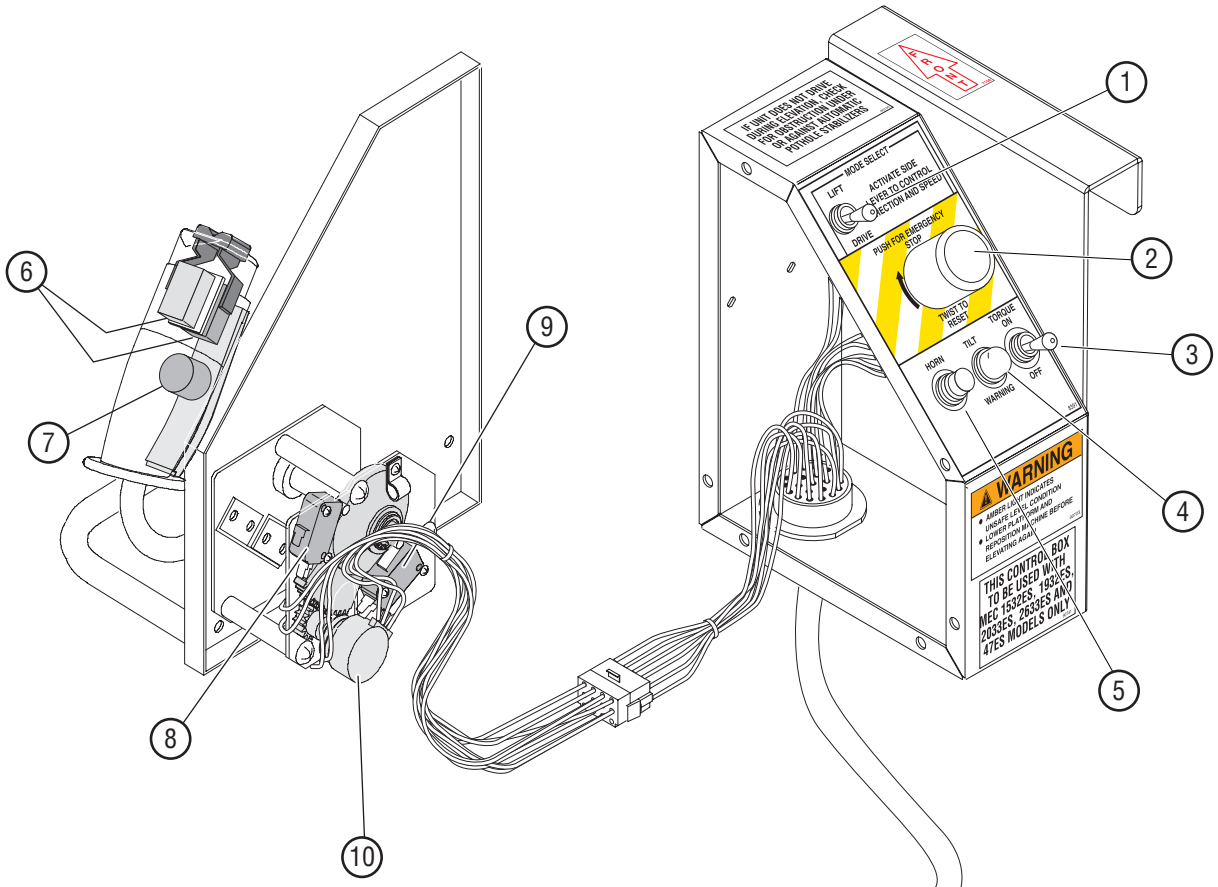
PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
LIFT (CONTINUED)		
No lift from either control station - Pump motor runs	Lift Valve SV2 not energized	Check lift circuit on wire # 4 from control box to lift valve SV2
	Main system pressure inadequate	Check main relief RV2 adjustment, Check pump output pressure 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
Lowers but not completely (3247ES only)	Down valve on one cylinder inoperative	Check valves and coils located on cylinders
Emergency lowering not working	E-down cable frayed (later models only)	Replace e-down cable
	Lowering valve not shifting	Clean debris, replace
3247ES only	E-down battery discharged - should charge during normal battery charge cycle	Check charge diode D18 located at positive terminal of battery, check charge wire connection
	Valve coil failed on either cylinder	Test, replace
Lowers but not completely - 3247ES only	Down valve on one cylinder inoperative	Check valve coils, wiring

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 contamination 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 contamination 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 Torque switch *OFF*	Freewheel Valve NV1 partially open	Turn counter-clockwise to close
	Torque valve/s SV4 & or SV6 sticking	Inspect torque valves SV4 & SV6, replace
	Decel valve SV7 inoperative - earlier units only	Check for power to SV7 while driving Check valve for contamination 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 contamination, 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 contamination 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 contamination Replace SV3
Drives in one direction regardless of direction operated	Drive valve SV3 sticking	Check SV3 for contamination 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 switch/es 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 contamination Replace valve
	Pump output reduced due to wear	Test pump with a flow meter Replace
Speed uncontrollable while descending 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 contamination 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 handle	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 upper control 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 upper control 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 contamination 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 contamination 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] Tilt Warning Light
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

ILLUSTRATION No.
ART_2234

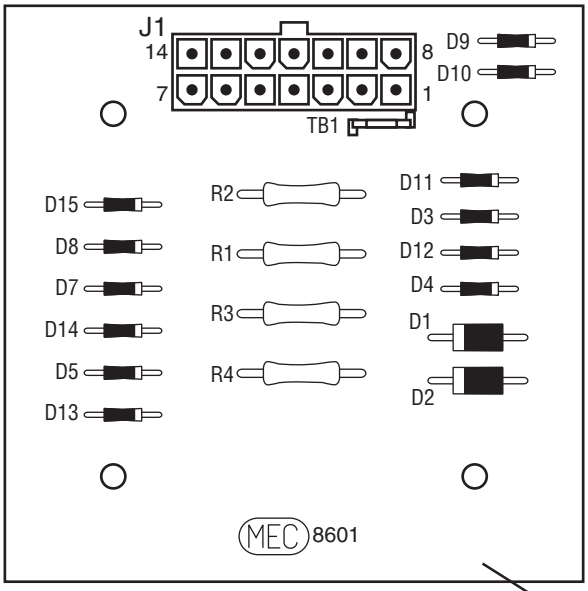


ILLUSTRATION No.
ART_2181

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)

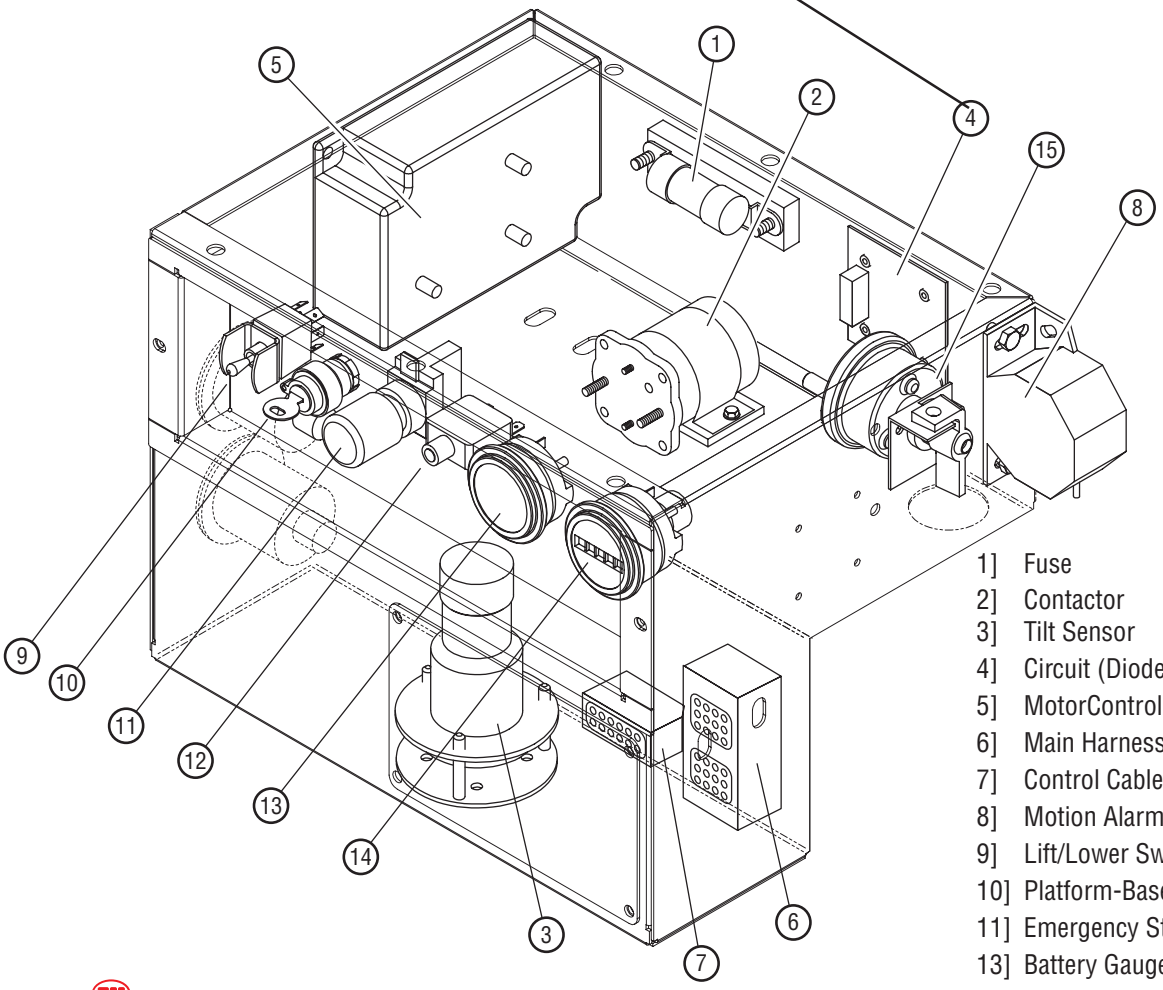


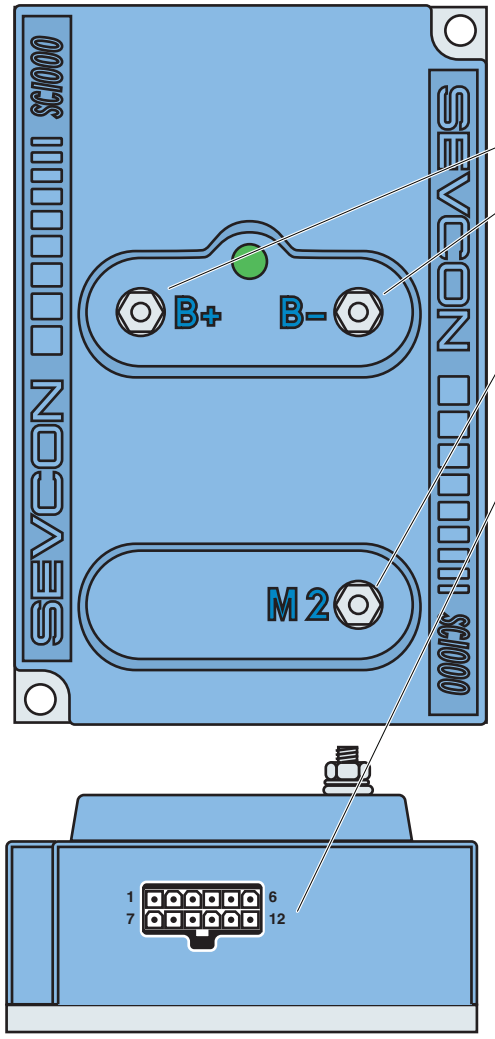
ILLUSTRATION No.
ART_2233

1] Fuse
2] Contactor
3] Tilt Sensor
4] Circuit (Diode) Board
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
13] Battery Gauge
14] Hour Meter
15] Battery Cutoff Switch

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 cutback signal from limit switch or Lift circuit	Full speed: **24 V DC** Creep speed: **0 V DC**. • Speed cutback 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 multimeter 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.

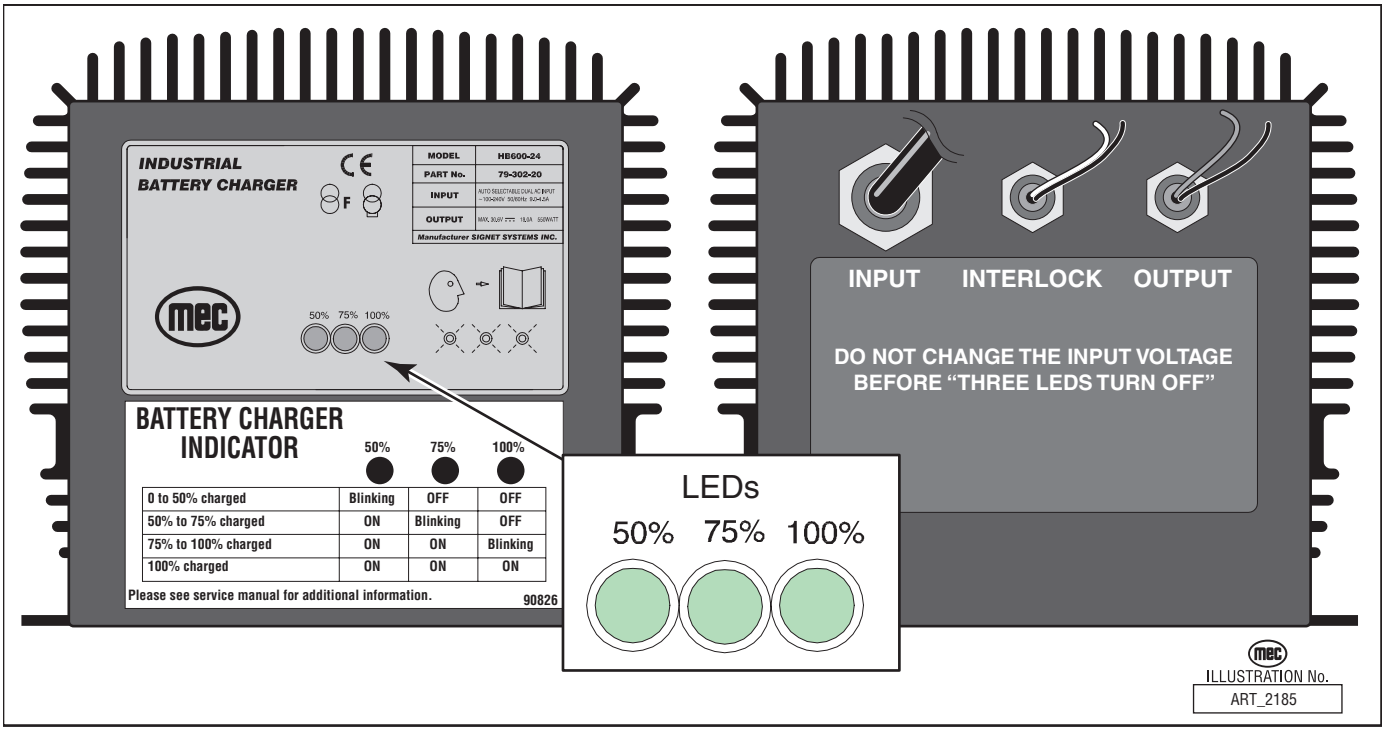
Do not disassemble charger. Return to MEC when service or repair is required.

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

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 indefinitely 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.

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 5: SCHEMATICS

HYDRAULIC SCHEMATICS

2047ES - Serial # 9801000 - 9801099
2647ES - Serial # 9901000 - 9901199
3247ES - Serial # 10001000 - 10001199

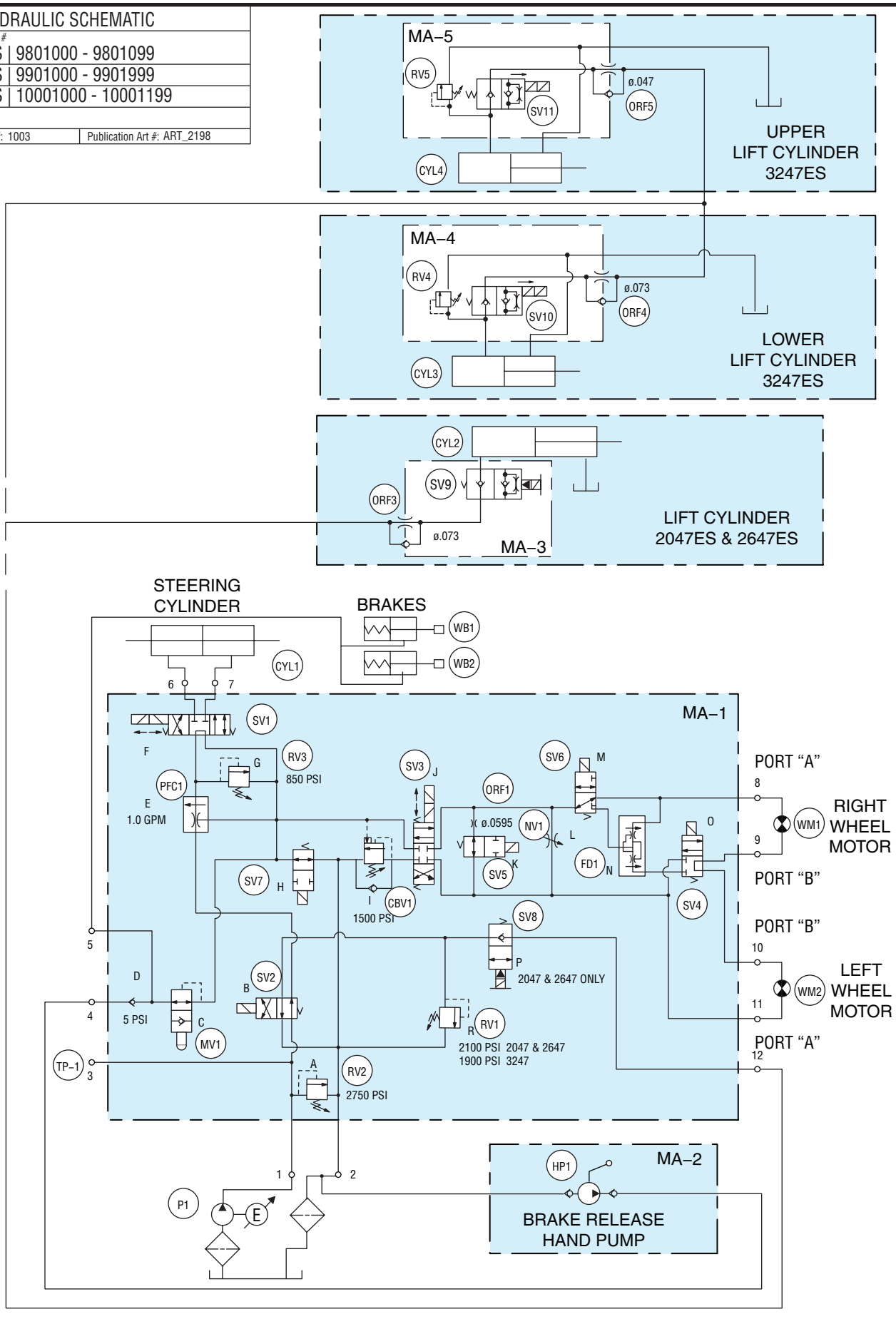
ITEM	DESCRIPTION	Location
CBV1	Counterbalance Valve	Main Manifold (MA-1)
CYL1	Steering Cylinder	Machine Base, Front
CYL2	Lift Cylinder, 2047, 2647	Scissor Assembly
CYL3	Lift Cylinder, Lower, 3247	Scissor Assembly
CYL4	Lift Cylinder, Upper, 3247	Scissor Assembly
FD1	Flow Divider	Main Manifold (MA-1)
FRR1		
HP1	Hand Pump, Brakes	Brake Release Manifold (MA-2)
MA-1	Main Manifold Assembly	Machine Base, Battery Compartment
MA-2	Brake Release Manifold	Battery Compartment
MA-3	Manifold Assembly	Lift Cylinder, 2047ES and 2647ES only
MA-4	Manifold Assembly	Lower Lift Cylinder, 3247ES only
MA-5	Manifold Assembly	Upper Lift Cylinder, 3247ES only
MP1	Manual Pump	Main Manifold (MA-1)
NV1	Needle Valve	Main Manifold
ORF1	Orifice Plug, Wheel Motors	Main Manifold (MA-1)
ORF3	Orifice, Down Valve	Lift Cylinder Manifold (MA-3), 2047ES and 2647ES only
ORF4	Orifice, Down Valve	Lower Lift Cylinder Manifold (MA-4), 3247ES only
ORF5	Orifice, Down Valve	Upper Lift Cylinder Manifold (MA-5), 3247ES only
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)
RV4	Relief Valve, Lift Cylinder	Lower Lift Cylinder Manifold (MA-4), 3247ES only
RV5	Relief Valve, Lift Cylinder	Upper Lift Cylinder Manifold (MA-5), 3247ES only
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), 2047ES and 2647ES only
SV9	Spool Valve, Down	Lift Cylinder Manifold (MA-3), 2047ES and 2647ES only
SV10	Spool Valve, Down	Lower Lift Cylinder Manifold (MA-4), 3247ES only
SV11	Spool Valve, Down	Upper Lift Cylinder Manifold (MA-5), 3247ES only
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 #

2047ES | 9801000 - 9801099
2647ES | 9901000 - 9901999
3247ES | 10001000 - 10001199

Reference Art #: 1003 | Publication Art #: ART_2198



2047ES - Serial # 9801100 - Up
2647ES - Serial # 9901200 - Up
3247ES - Serial # 10001200 - Up

ITEM	DESCRIPTION	Location
CBV1	Counterbalance Valve	Main manifold (MA-1)
CYL1	Steering Cylinder	Machine Base, Front
CYL2	Lift Cylinder, 2047, 2647	Scissor Assembly
CYL3	Lift Cylinder, Lower, 3247	Scissor Assembly
CYL4	Lift Cylinder, Upper, 3247	Scissor Assembly
FD1	Flow Divider	Main manifold (MA-1)
FRR1	Steering Relief Flow Control	Main manifold (MA-1)
HP1	Hand Pump, Brakes	Main manifold (MA-1)
MA-1	Main Manifold Assembly	Machine Base, Battery Compartment
MA-3	Manifold Assembly	Lift Cylinder, 2047ES and 2647ES only
MA-4	Manifold Assembly	Lower Lift Cylinder, 3247ES only
MA-5	Manifold Assembly	Upper Lift Cylinder, 3247ES only
MP1	Manual Pump	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), 2047ES and 2647ES only
ORF4	Orifice, Down Valve	Lower Lift Cylinder Manifold (MA-4), 3247ES only
ORF5	Orifice, Down Valve	Upper Lift Cylinder Manifold (MA-5), 3247ES only
P1	Pump	Pump Compartment
RV1	Relief Valve, Lift Relief	Main manifold (MA-1)
RV2	Relief Valve, Main Relief	Main manifold (MA-1)
RV4	Relief Valve, Lift Cylinder	Lower Lift Cylinder Manifold (MA-4), 3247ES only
RV5	Relief Valve, Lift Cylinder	Upper Lift Cylinder Manifold (MA-5), 3247ES only
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-3), 2047, 2647
SV10	Spool Valve, Down	Lower Lift Cylinder Manifold (MA-4), 3247
SV11	Spool Valve, Down	Upper Lift Cylinder Manifold (MA-5), 3247
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

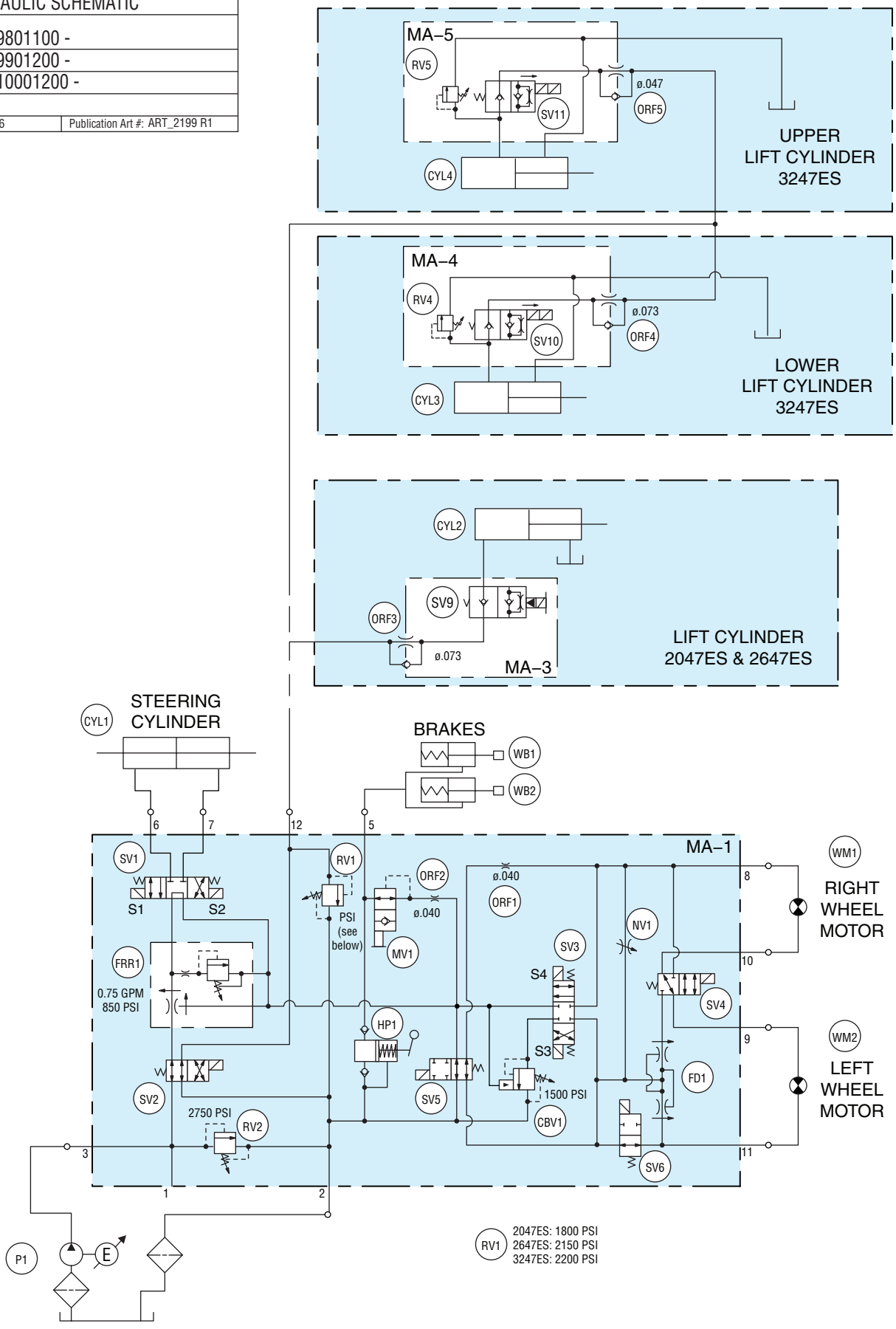
Model: / Serial #

2047ES | 9801100 -

2647ES | 9901200 -

3247ES | 10001200 -

Reference Art #: 966 | Publication Art #: ART_2199 R1



Hydraulic Manifold - early style

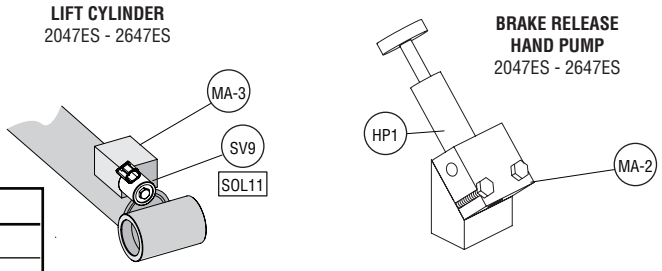
Model: / Serial #
2047ES | 2641 | 3247ES

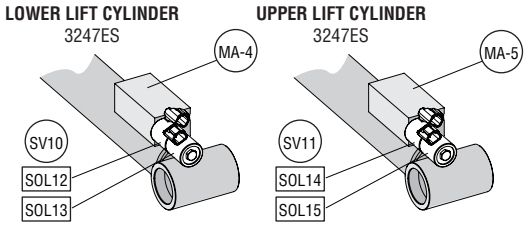
Reference Art #: none | Publication Art #: ART_2200

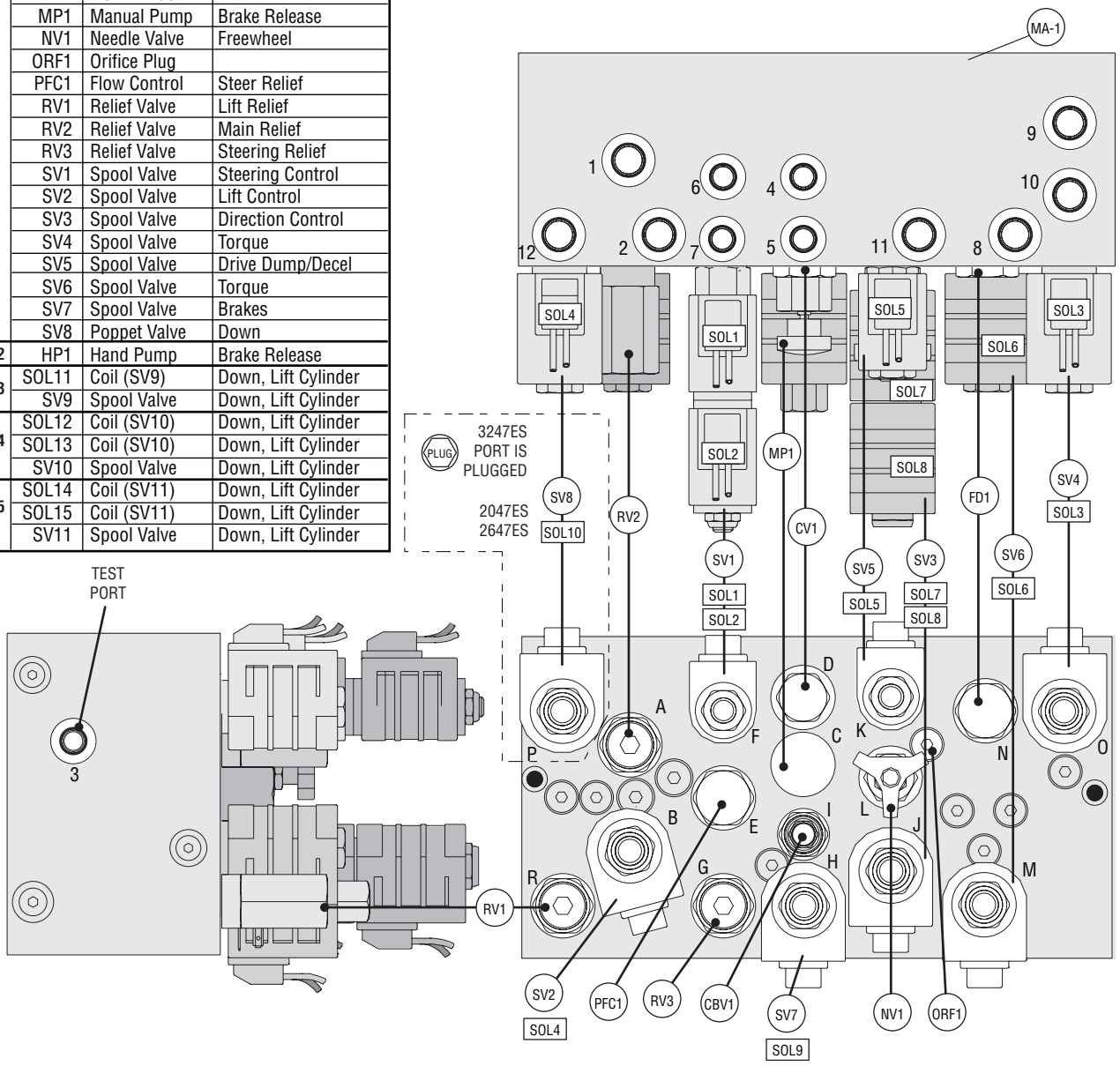
NOTE: Early style manifold. Refer to Hydraulic Schematic for serial # break

	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	
	MP1	Manual Pump	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	Down, Lift Cylinder
MA4	SOL12	Coil (SV10)	Down, Lift Cylinder
	SOL13	Coil (SV10)	Down, Lift Cylinder
	SV10	Spool Valve	Down, Lift Cylinder
MA5	SOL14	Coil (SV11)	Down, Lift Cylinder
	SOL15	Coil (SV11)	Down, Lift Cylinder
	SV11	Spool Valve	Down, Lift Cylinder

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







Hydraulic Manifold - current style

Model: / Serial #
2047ES | 2647ES | 3247ES

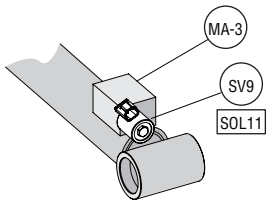
Reference Art #: none | Publication Art #: ART_2201

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

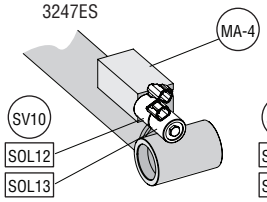
	COMPONENTS		FUNCTION
MA1	CBV1	Relief Valve	Counter Balance
	SOL1	Coil (SV1)	Steer ?RIGHT?
	SOL2	Coil SV1)	Steer ?LEFT?
	SOL3	Coil (SV5)	Brake/Decel
	SOL4	Coil (SV2)	Lift
	SOL5	Coil (SV4)	Torque
	SOL6	Coil (SV6)	Torque
	SOL7	Coil (SV3)	Drive Forward
	SOL8	Coil (SV3)	Drive Reverse
	FD1	Flow Divider	
	FRR1	Flow Control	Steer Relief
	HP1	Hand Pump	Brake Pump
	MP1	Manual Pump	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
MA4	SOL12	Coil (SV10)	Down, Lift Cylinder
	SOL13	Coil (SV10)	Down, Lift Cylinder
	SV10	Spool Valve	Down, Lift Cylinder
MA5	SOL14	Coil (SV11)	Down, Lift Cylinder
	SOL15	Coil (SV11)	Down, Lift Cylinder
	SV11	Spool Valve	Down, Lift Cylinder

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

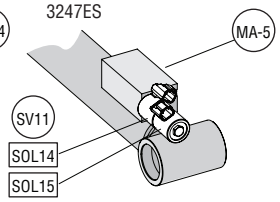
LIFT CYLINDER
2047ES - 2647ES

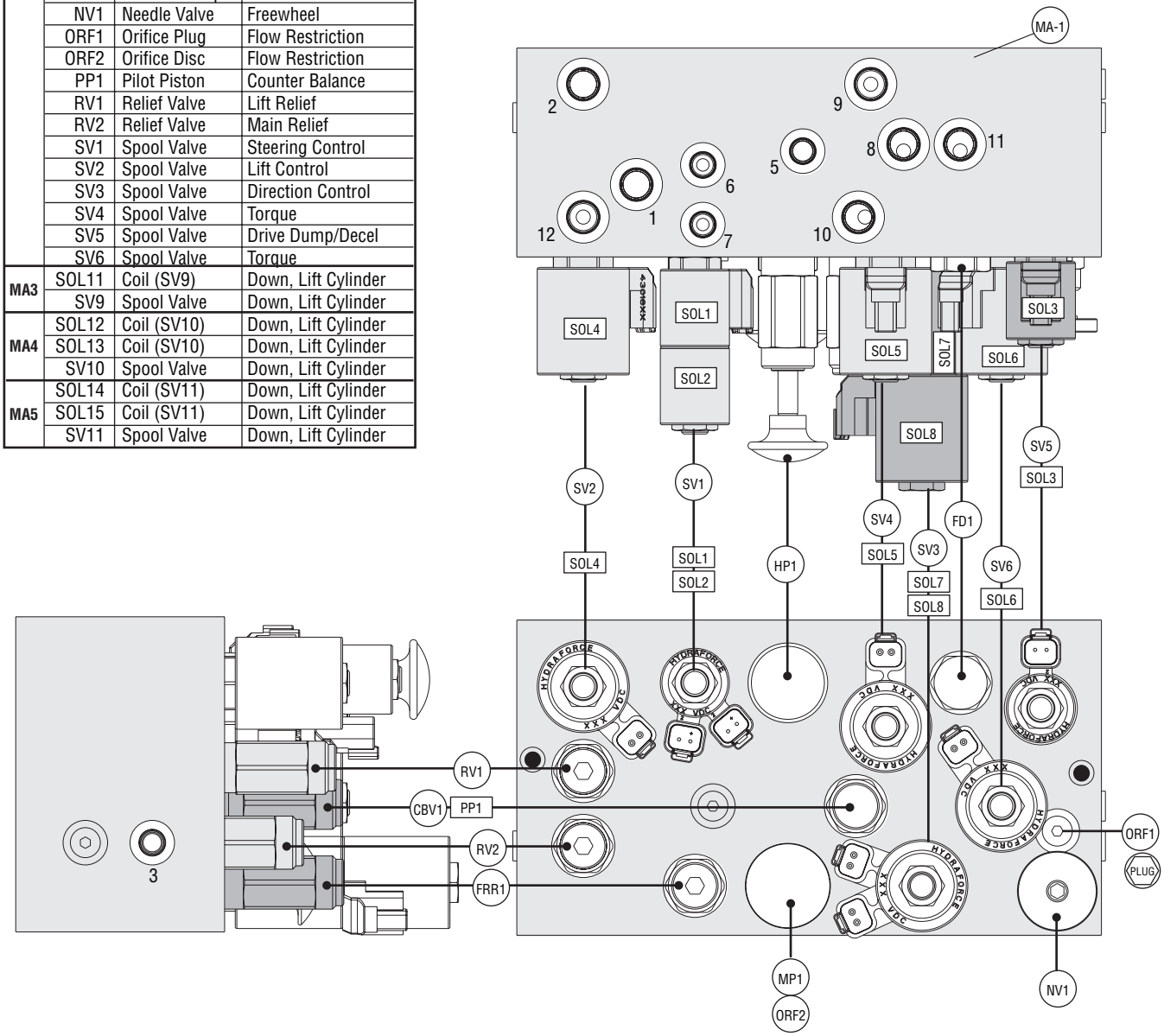


LOWER LIFT CYLINDER
3247ES



UPPER LIFT CYLINDER
3247ES





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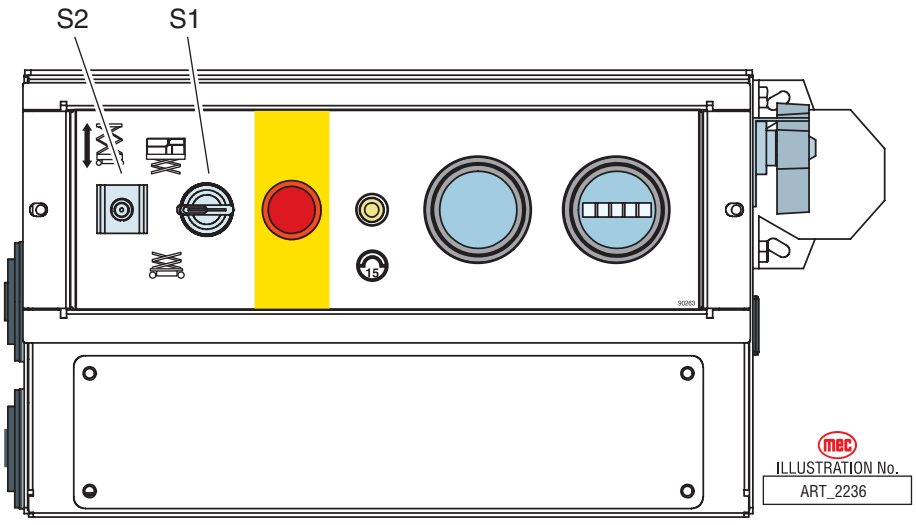
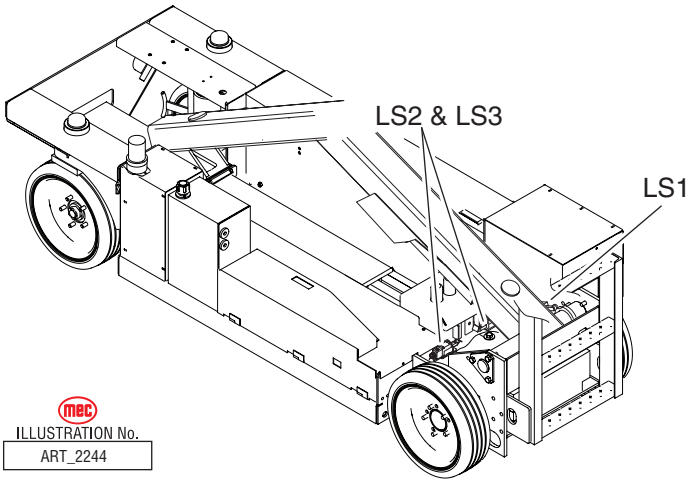
ELECTRIC SCHEMATICS

NOTES: (Unless otherwise specified)

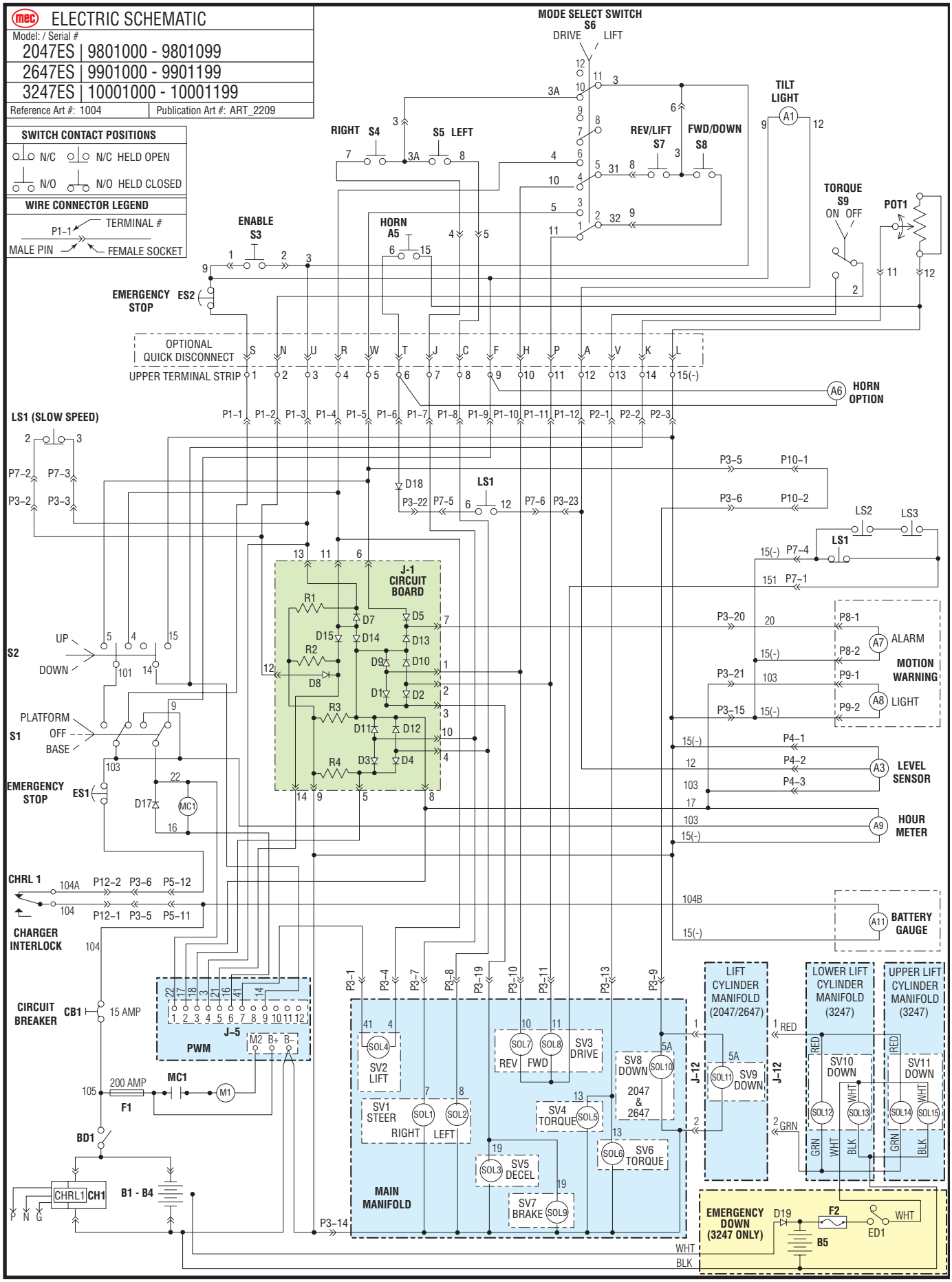
1. Switch **S1 BASE/PLATFORM** makes contact from the CENTER to the LEFT position when placed in **BASE**.
2. Switch **S2 UP/DOWN** makes contact from the CENTER to the LEFT position when the switch is held in the CONTACT position and automatically returns to the CENTER position when released.
3. Switch **LS1** breaks the N/C set of contacts and makes the N/O set of contacts when the platform reaches approximately 7 feet.
4. Switch **LS2 and LS3** makes the N/C set of contacts when the Pothole Bars are down and locked in place.





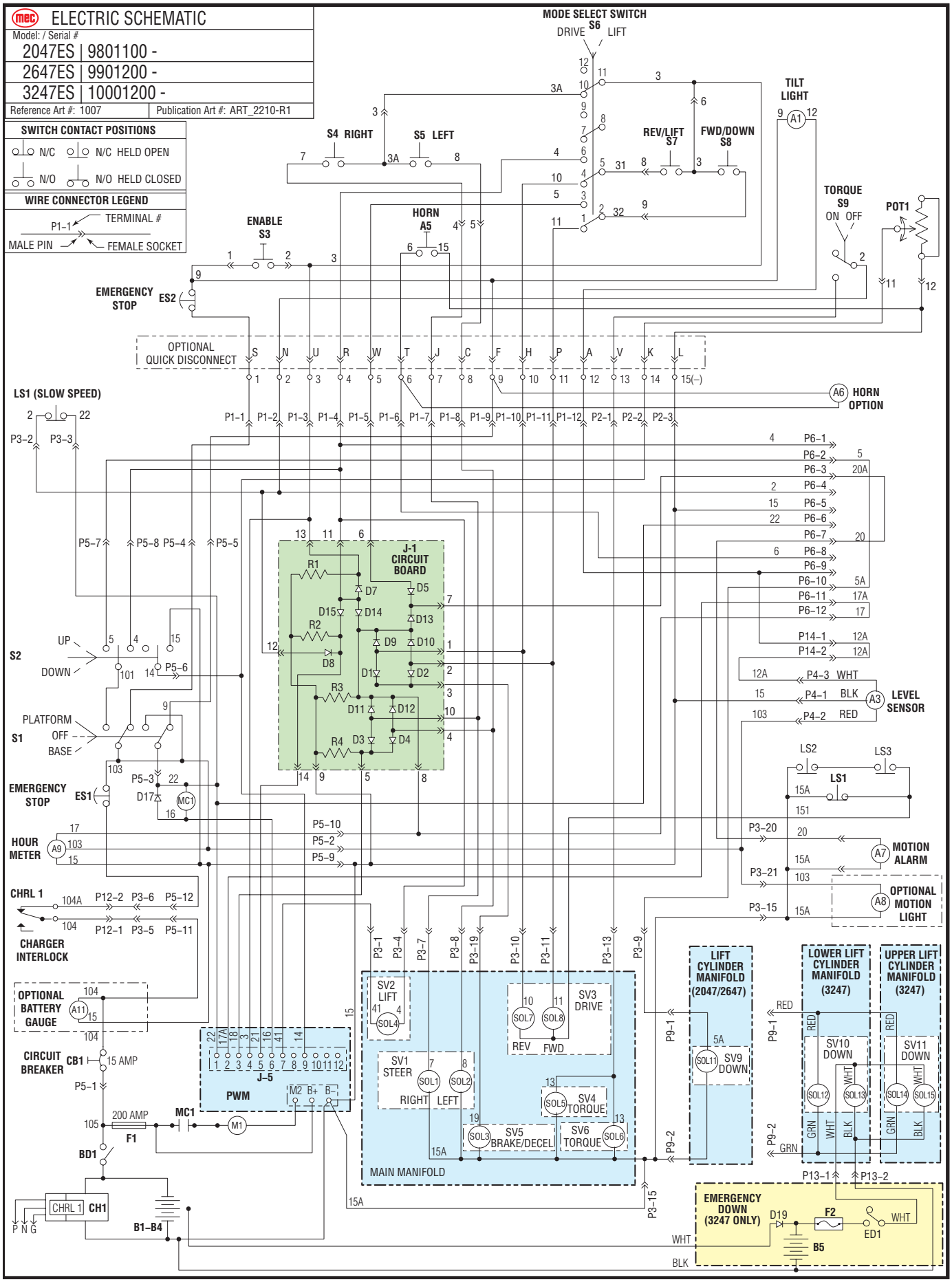
2047ES - Serial # 9801000 - 9801099
2647ES - Serial # 9901000 - 9901199
3247ES - Serial # 10001000 - 10001199

ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Tilt Light, 28V	Warn when Machine is Tilted	Upper Control Box
A3	Level Sensor	Activates Tilt Light	Inside Lower Control Box
A5	Push-Button Switch	Activates Horn	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
A11	Battery Indicator	Show Battery Status	Lower Control Panel
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
B5	12-V Battery	Power for Emergency Down Circuit	Battery Compartment, 3247ES ONLY
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	Inside Pump Compartment
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			
D19	Diode w/Stud Base 10-32UNF-2A	Emergency Down Battery Charger	Battery Compartment
ED1	Switch, Emergency Down	Actuates Emergency Down Valves	Battery Compartment, 3247ES ONLY
ES1	Switch, Emergency Stop	Shut down All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shut down All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
F2	Fuse, 8AMP	Emergency Down Fuse	Battery Compartment, 3247ES ONLY
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
LS3	Limit Switch, Single Pole	Enable Drive if Pothole Deployed	On Pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	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		Inside Lower Control Box
S1	Key Switch, N/O Contact Block	Select Lower or Upper 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
SO5-6	Coil, Torque Solenoid	Activate Torque Valves (SV4) (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, 2047/2647 ONLY
SOL12	Coil, Down Solenoid	Activate Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL13	Coil, E-Down Solenoid	Activate Emergency Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL14	Coil, Down Solenoid	Activate Down Valve (SV11)	Upper Lift Cylinder, 3247 ONLY
SOL15	Coil, E-Down Solenoid	Activate Emergency Down Valve (SV11)	Lower Lift Cylinder, 3247 ONLY



2047ES - Serial # 9801100 - Up
2647ES - Serial # 9901200 - Up
3247ES - Serial # 10001200 - Up

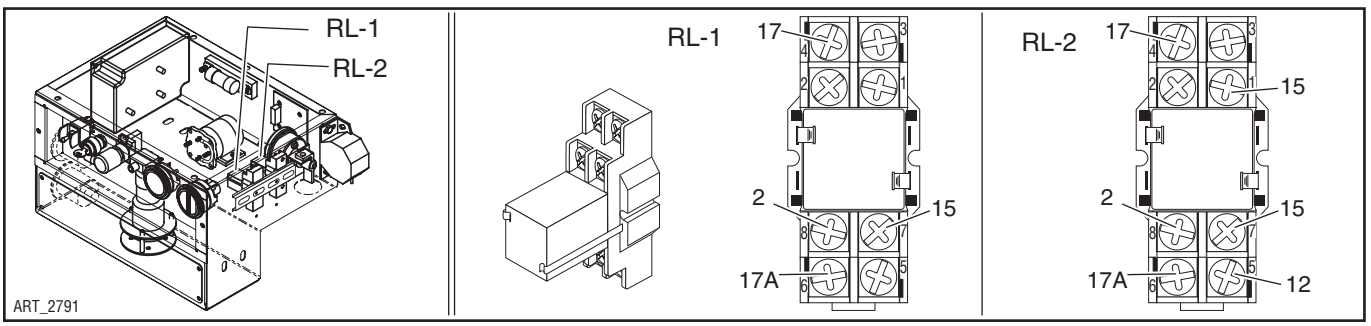
ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Tilt Light, 28V	Warn when Machine is Tilted	Upper Control Box
A3	Level Sensor	Activates Tilt Light	Inside Lower Control Box
A5	Push-Button Switch	Activates Horn	Upper Control Box
A6	Horn, 12V - 48V (option)	Activated by Operator	Under Platform
A7	Overload/Motion 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
A11	Battery Indicator	Show Battery Status	Lower Control Panel
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
B5	12-V Battery	Power for Emergency Down Circuit	Battery Compartment, 3247ES ONLY
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	Inside Pump Compartment
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
R1 - R4	Circuit Board Resistors		Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
D19	Diode w/Stud Base 10-32UNF-2A	Emergency Down Battery Charger	Battery Compartment, 3247ES ONLY
ED1	Switch, Emergency Down	Actuates Emergency Down Valves	Battery Compartment, 3247ES ONLY
ES1	Switch, Emergency Stop	Shut down All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shut down All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
F2	Fuse, 8AMP	Emergency Down Fuse	Battery Compartment, 3247ES ONLY
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
LS3	Limit Switch, Single Pole	Enable Drive if Pothole Deployed	On Pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Pump Compartment
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
S1	Key Switch, N/O Contact Block	Select Lower or Upper 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/Brake Solenoid	Activate Decel/Brake Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5-6	Coil, Torque Solenoid	Activate Torque Valves (SV5)(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, 2047/2647 ONLY
SOL12	Coil, Down Solenoid	Activate Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL13	Coil, E-Down Solenoid	Activate Emergency Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL14	Coil, Down Solenoid	Activate Down Valve (SV11)	Upper Lift Cylinder, 3247 ONLY
SOL15	Coil, E-Down Solenoid	Activate emergency Down Valve (SV11)	Upper Lift Cylinder, 3247 ONLY

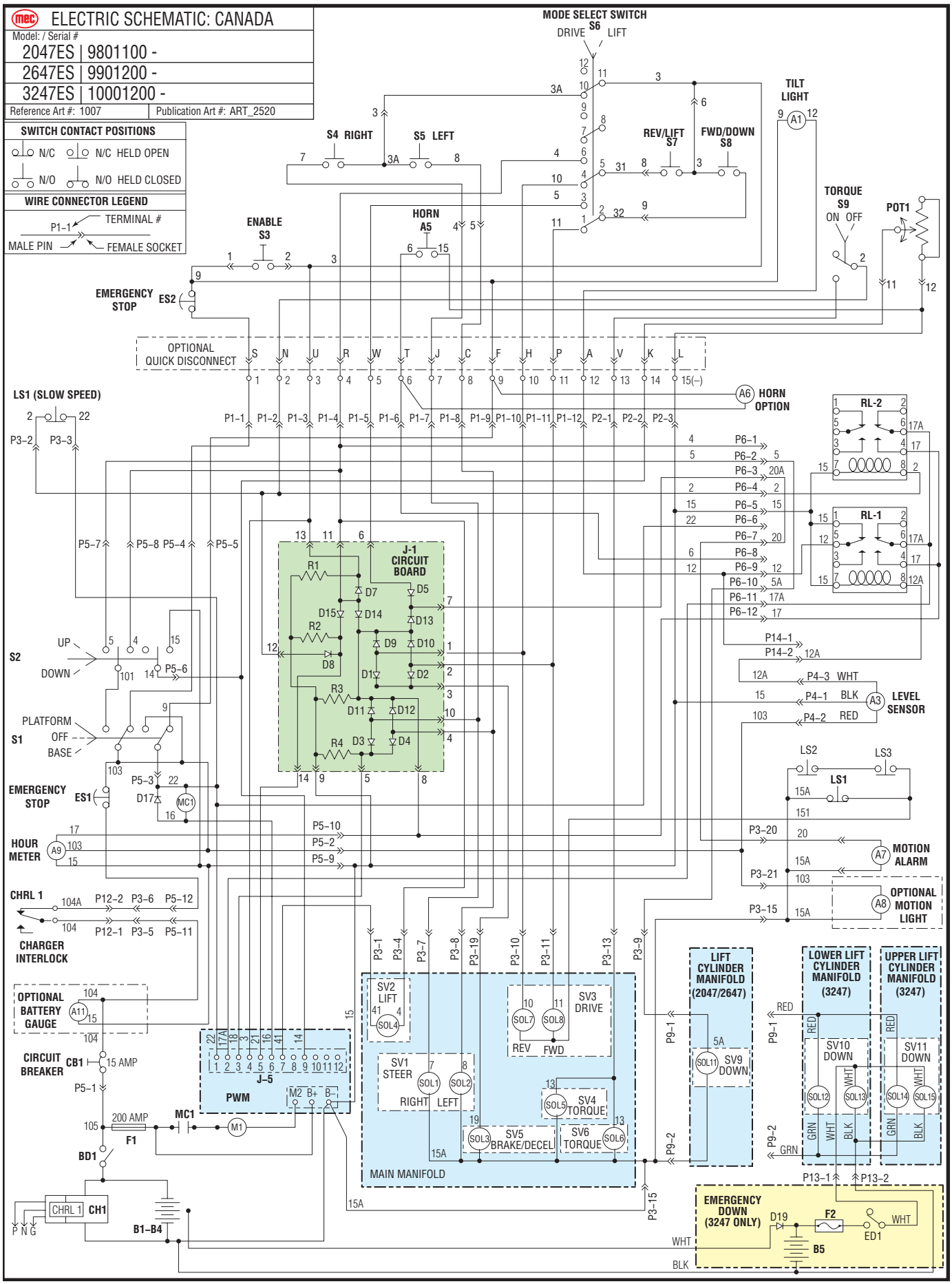


Canadian Models

2047ES - Serial # 9801100 - up | 2647ES - Serial # 9901200 - up | 3247ES - Serial # 10001200 - up

ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Tilt Light, 28V	Warn when Machine is Tilted	Upper Control Box
A3	Level Sensor	Activates Tilt Light	Inside Lower Control Box
A5	Push-Button Switch	Activates Horn	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
A11	Battery Indicator	Show Battery Status	Lower Control Panel
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
B5	12-V Battery	Power for Emergency Down Circuit	Battery Compartment, 3247ES ONLY
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	Inside Pump Compartment
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
R1 - R4	Circuit Board Resistors		Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
D19	Diode w/Stud Base 10-32UNF-2A	Emergency Down Battery Charger	Battery Compartment, 3247ES ONLY
ED1	Switch, Emergency Down	Actuates Emergency Down Valves	Battery Compartment, 3247ES ONLY
ES1	Switch, Emergency Stop	Shut down All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shut down All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
F2	Fuse, 8AMP	Emergency Down Fuse	Battery Compartment, 3247ES ONLY
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
LS3	Limit Switch, Single Pole	Enable Drive if Pothole Deployed	On Pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Pump Compartment
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
RL-1 - RL-2	Relay, SPDT 2-Pole	Cutout Function when Tilted	Inside Lower Control Box
S1	Key Switch, N/O Contact Block	Select Lower or Upper 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/Brake Solenoid	Activate Decel/Brake Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5-6	Coil, Torque Solenoid	Activate Torque Valves (SV5)(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, 2047/2647 ONLY
SOL12	Coil, Down Solenoid	Activate Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL13	Coil, E-Down Solenoid	Activate Emergency Down Valve (SV10)	Lower Lift Cylinder, 3247 ONLY
SOL14	Coil, Down Solenoid	Activate Down Valve (SV11)	Upper Lift Cylinder, 3247 ONLY
SOL15	Coil, E-Down Solenoid	Activate emergency Down Valve (SV11)	Upper Lift Cylinder, 3247 ONLY



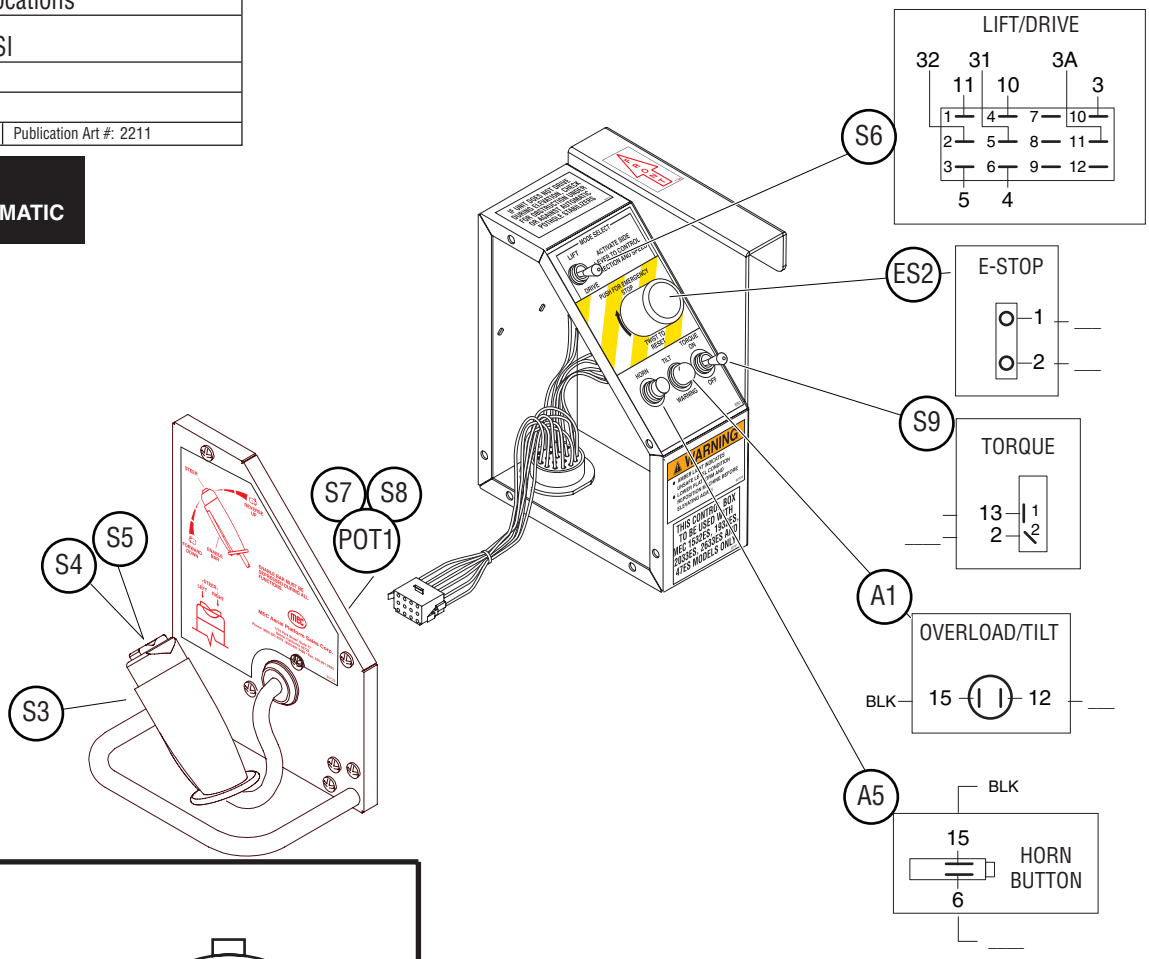


Component Locations

Model: / Serial #
ES Models: all ANSI

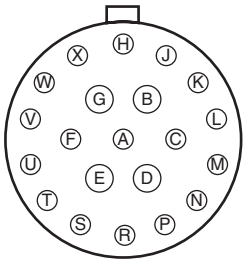
Reference Art #: none | Publication Art #: 2211

REFER TO ELECTRIC SCHEMATIC

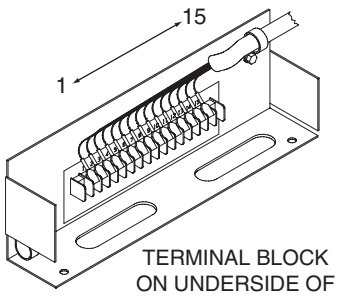


REMOVABLE CONTROL HARNESS

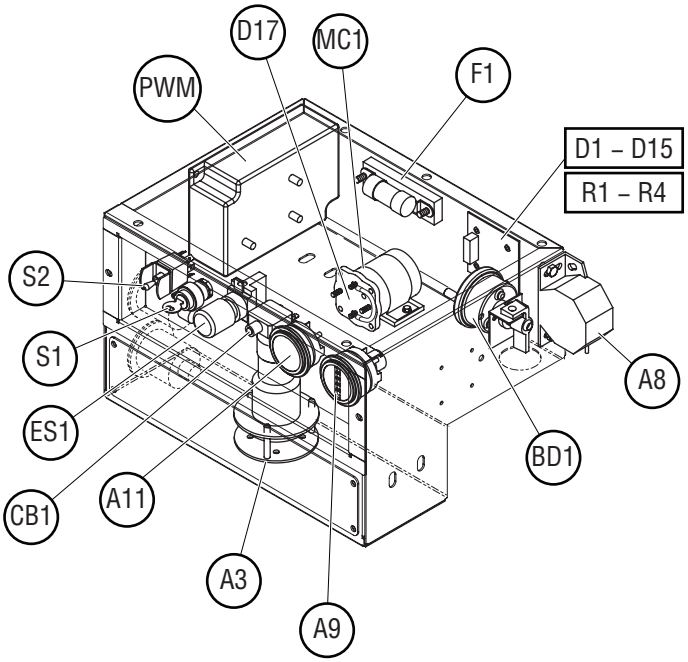
PIN #	WIRE #
S	1
F	9
W	5
R	4
V	13
A	12
H	10
P	11
U	3
T	6
J	7
N	2
C	8
K	14
M	16 (GND)
L	15



END VIEW OF REMOVABLE CONTROL HARNESS (OPTIONAL QUICK DISCONNECT)

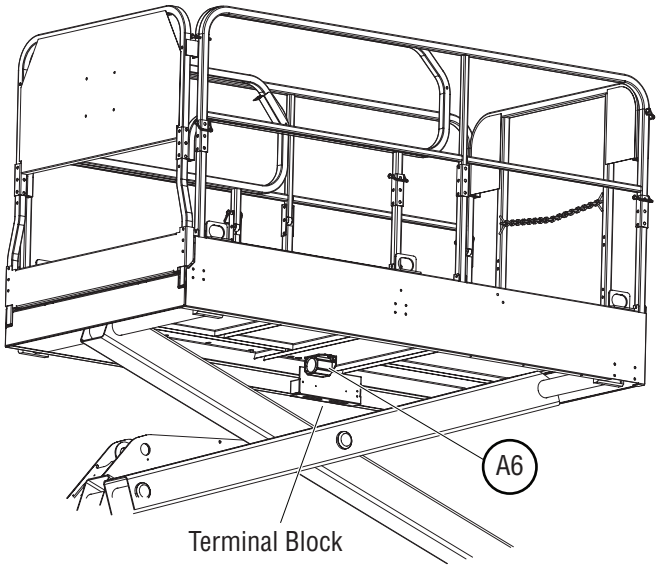


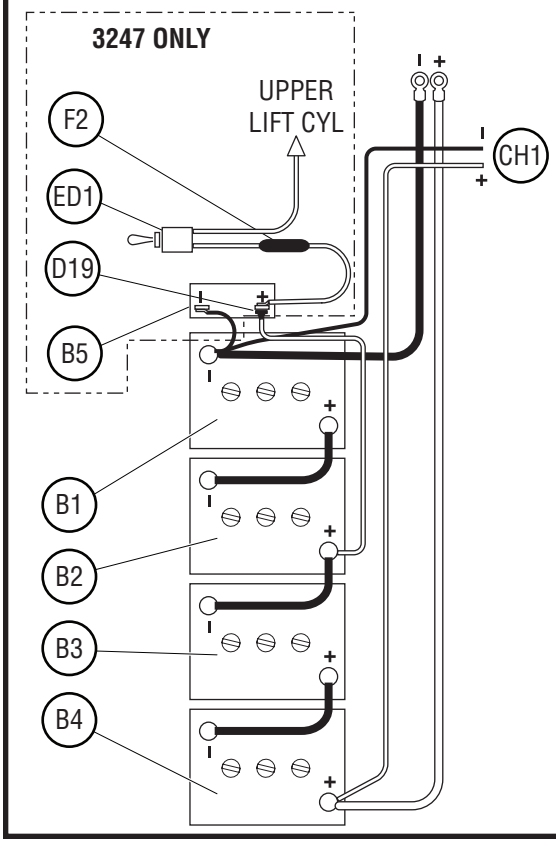
TERMINAL BLOCK ON UNDERSIDE OF PLATFORM DECK

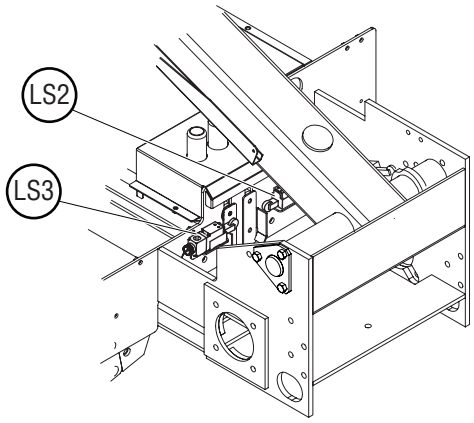


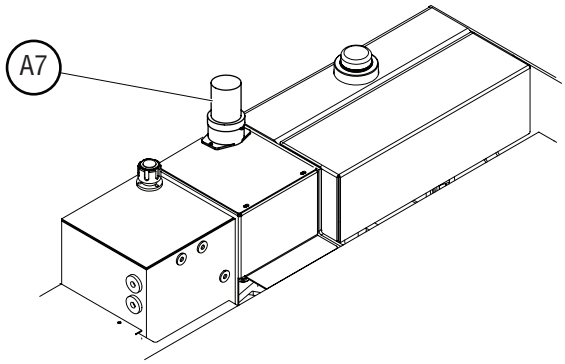
Component Locations	
Model: / Serial # 2047ES - 2647ES - 3247ES: all	
_	
_	
Reference Art #: none	Publication Art #: ART_2216

REFER TO ELECTRIC SCHEMATIC









Component Locations

Model: / Serial #
ES Models: all

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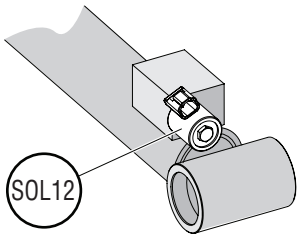
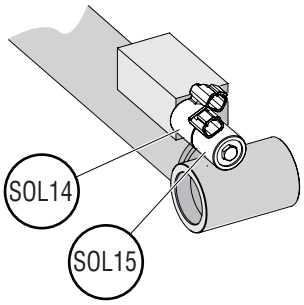
Reference Art #: none | Publication Art #: ART_2214

REFER TO ELECTRIC SCHEMATIC

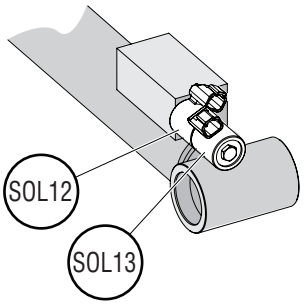
LIFT CYLINDER
2047ES - 2647ES

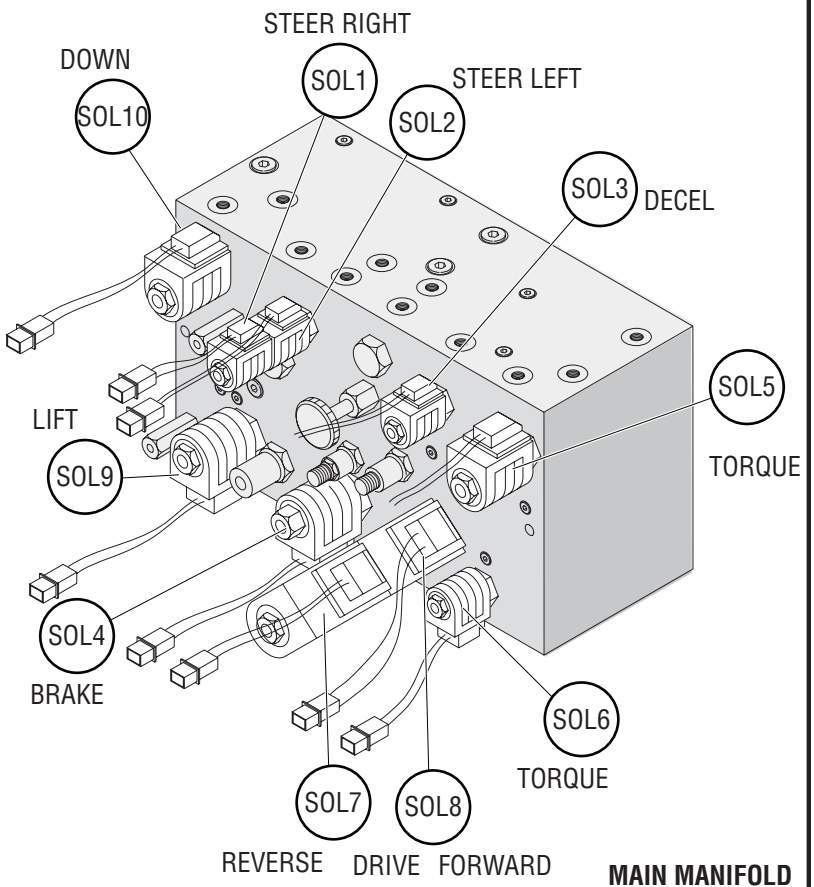


UPPER LIFT CYLINDER
3247ES



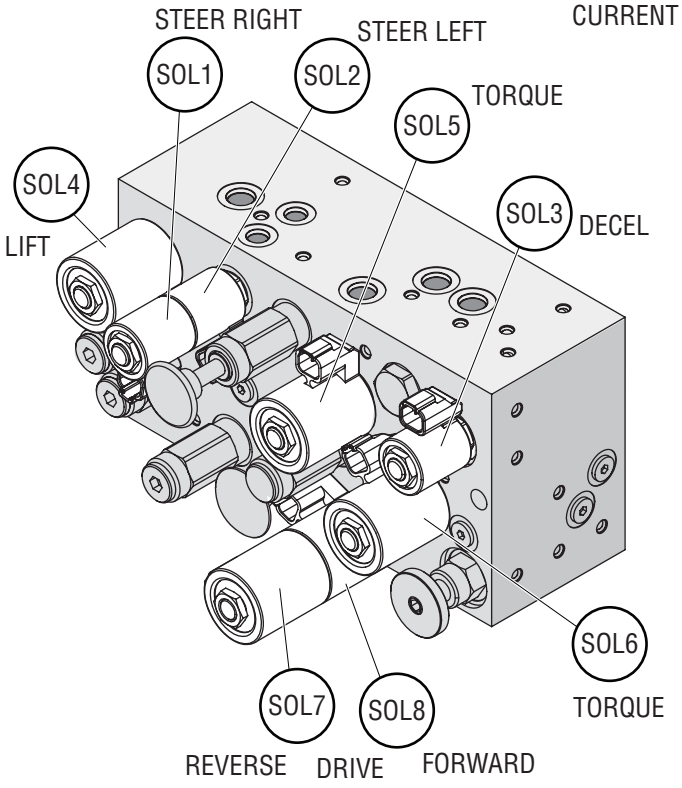
LOWER LIFT CYLINDER
3247ES





MAIN MANIFOLD
EARLY MODELS

MAIN MANIFOLD
CURRENT MODELS



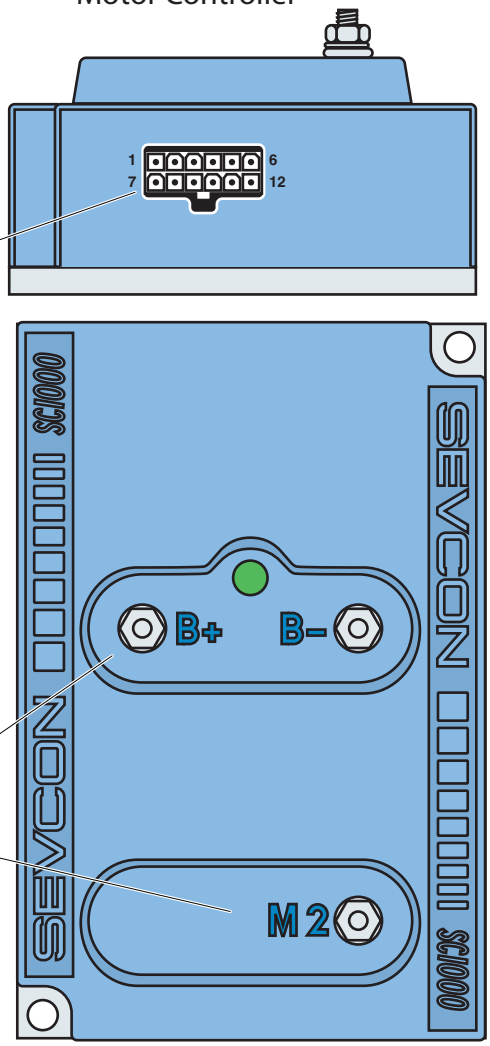
Controller Plug Pin Identicication

Model: / Serial #
ES Models : all

Reference Art #: none | Publication Art #: 2217

REFER TO ELECTRIC SCHEMATIC

PWM
Motor Controller



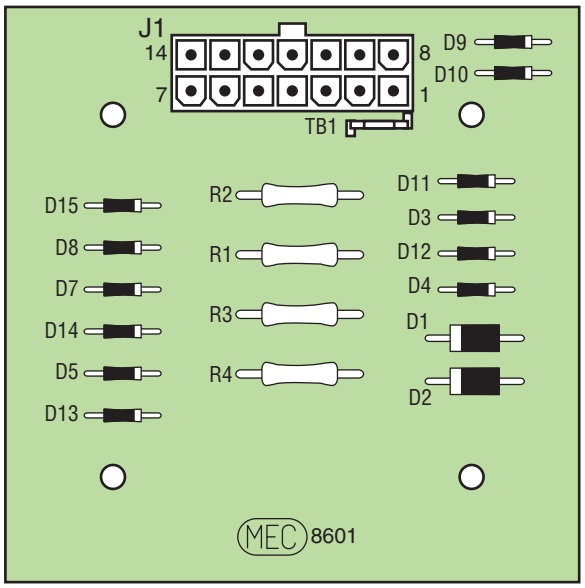
J5 Pin Identification

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)

Parts Section
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SECTION B: PLATFORM AND RAILS

SECTION C: SCISSORS

Parts Section
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SECTION D: HYDRAULICS

SECTION E: BASE

SECTION F: DECALS

SECTION A:
CONTROL BOXES

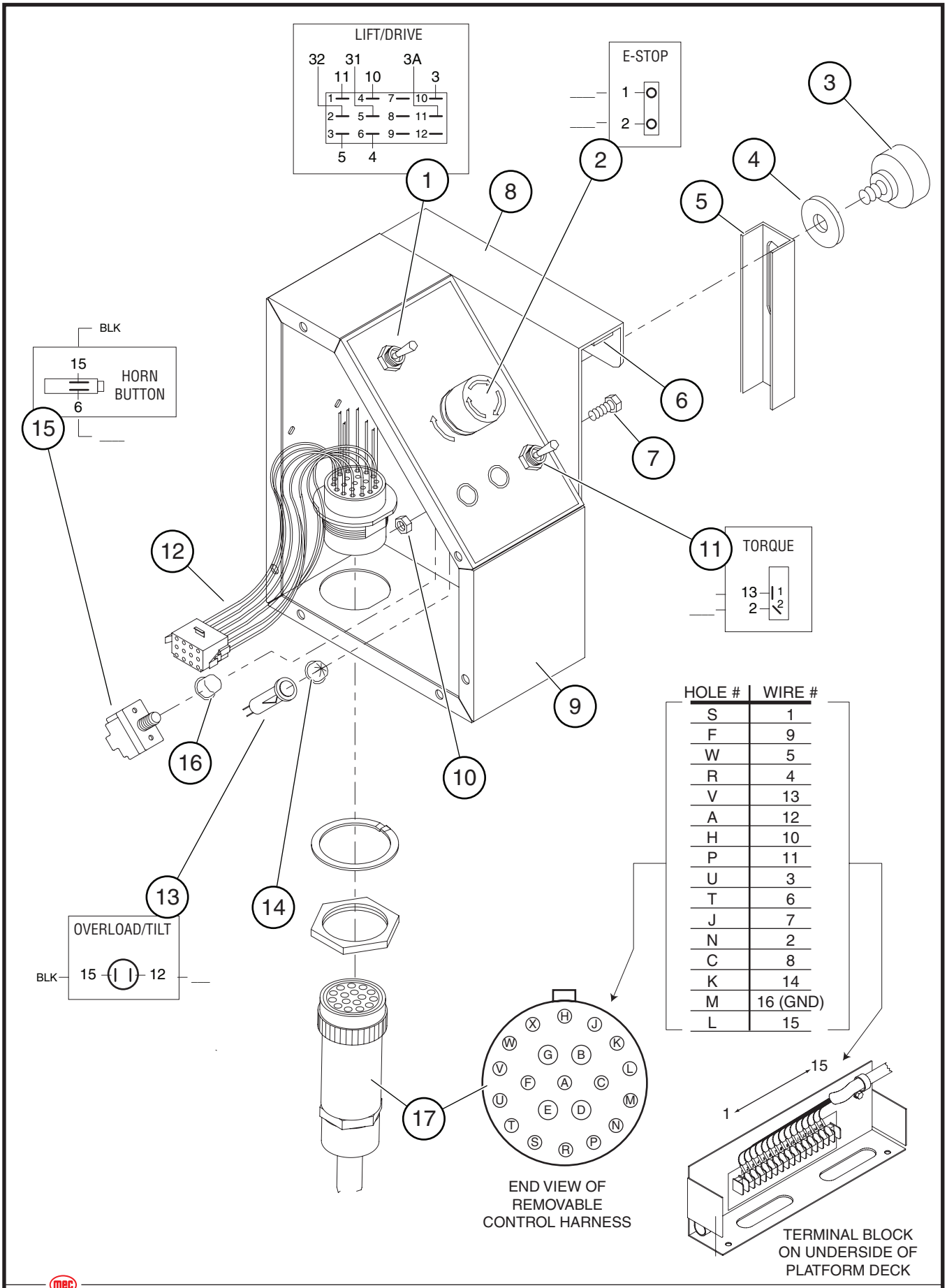


ILLUSTRATION No.
ART_2218

Upper Control Box, Removable, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			REMOVABLE CONTROL BOX ASSEMBLY
	25525		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	90873	1	WIRE HARNESS, W/CONNECTOR CONTROL BOX
13	9179	1	SOCKET, LIGHT
14	9184	1	LENS, YELLOW
14	9183	1	LENS, RED
	9182	1	LIGHT, BAYONET, 28 VOLT
15	8044	1	SWITCH, (MANUAL HORN) (OPTION)
16	8819	1	BOOT (OPTION)
17	7656	1	CABLE, UPPER CONTROL
	6318		PIN REPAIR KIT FOR CABLE

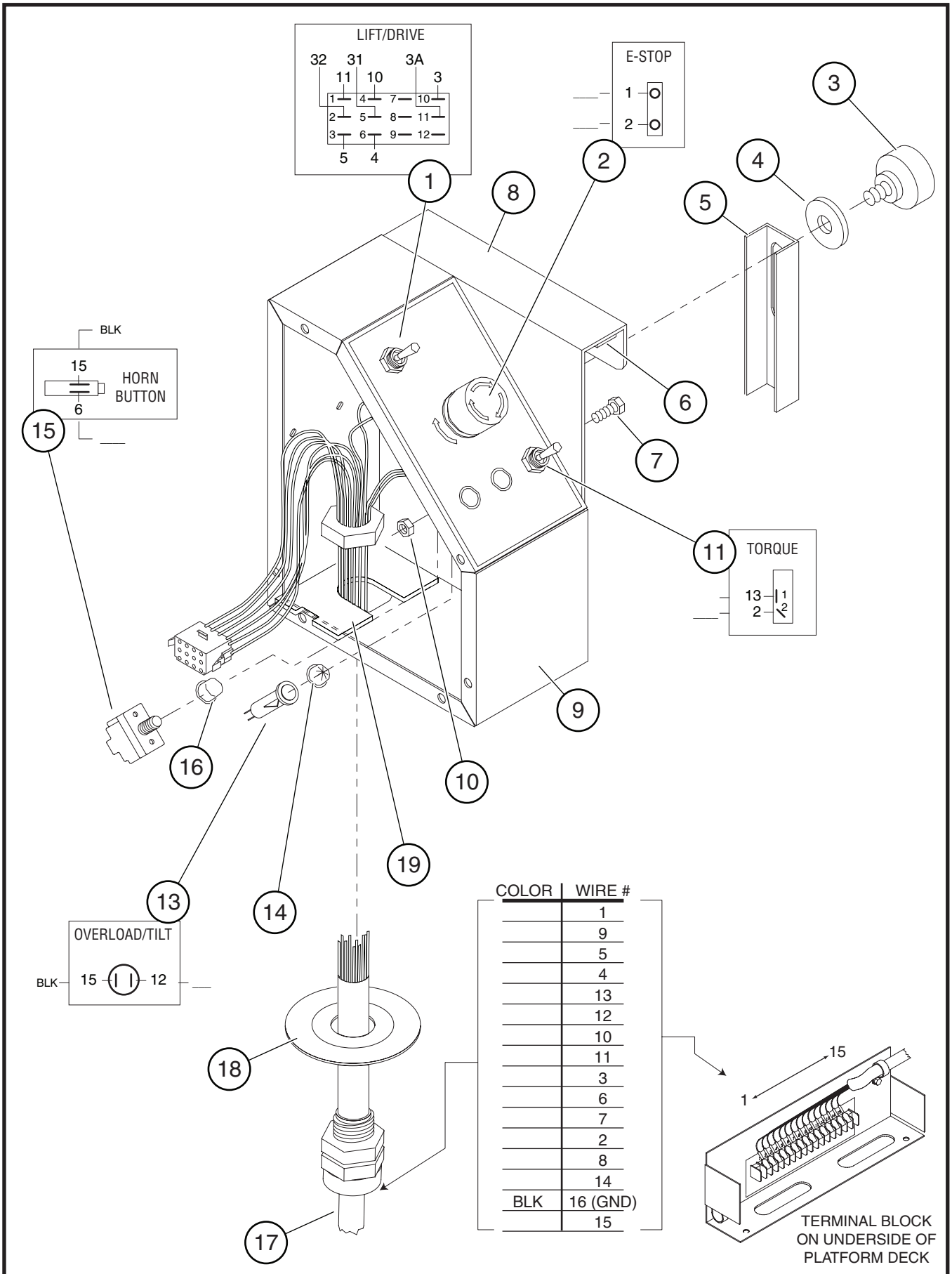


ILLUSTRATION No.
ART_2219

Upper Control Box, Fixed, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			FIXED CONTROL BOX ASSEMBLY
	90824		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	9184	1	LENS, YELLOW
	9182	1	LIGHT, BAYONET, 28 VOLT
15	8044	1	SWITCH, (MANUAL HORN) (OPTION)
16	8819	1	BOOT (OPTION)
17	90817	1	CONTROL CABLE
18	16079	1	STRAIN RELIEF WASHER
19	16120	1	MOUNTING PLATE

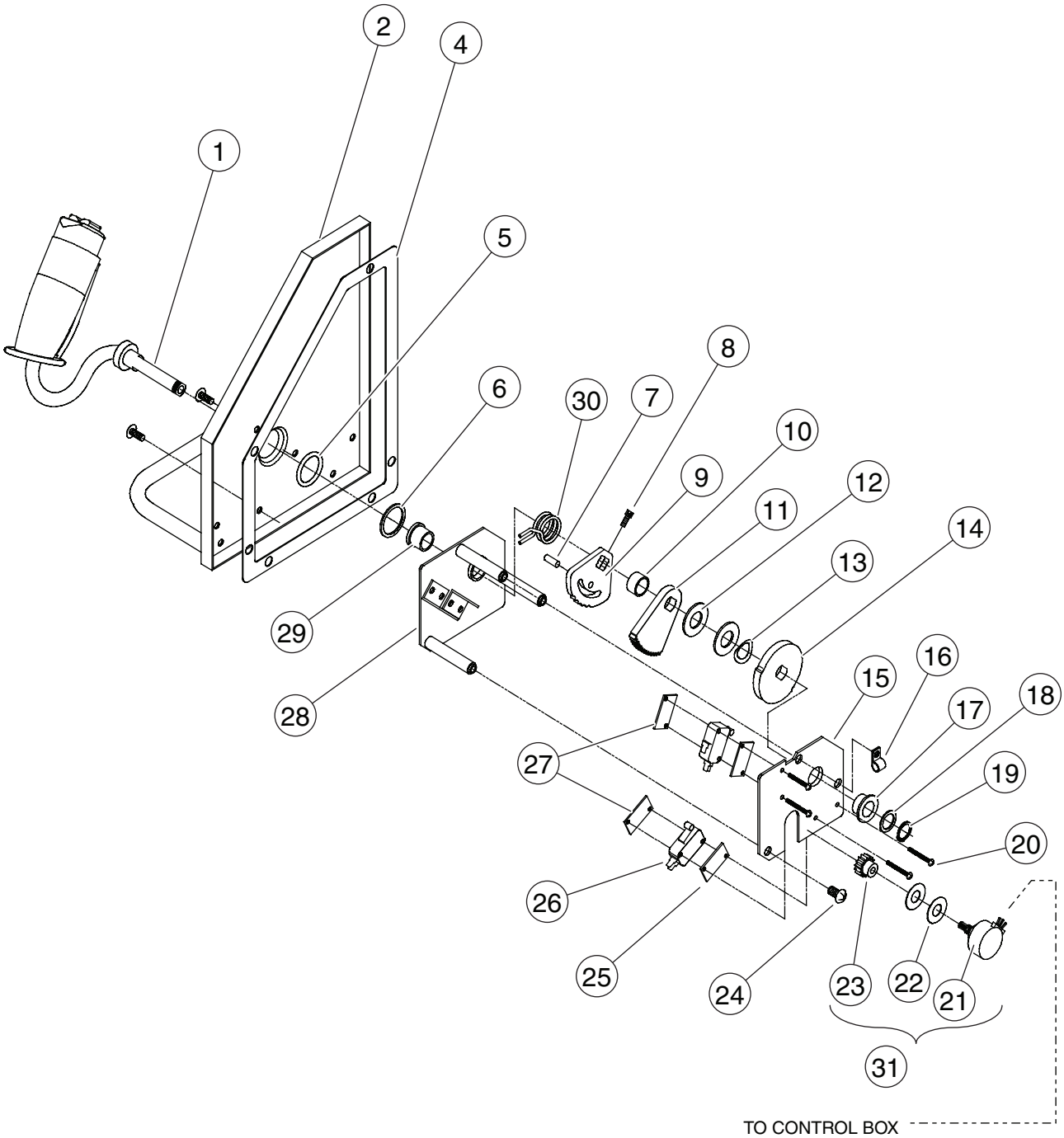


ILLUSTRATION No. ART_2220

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)

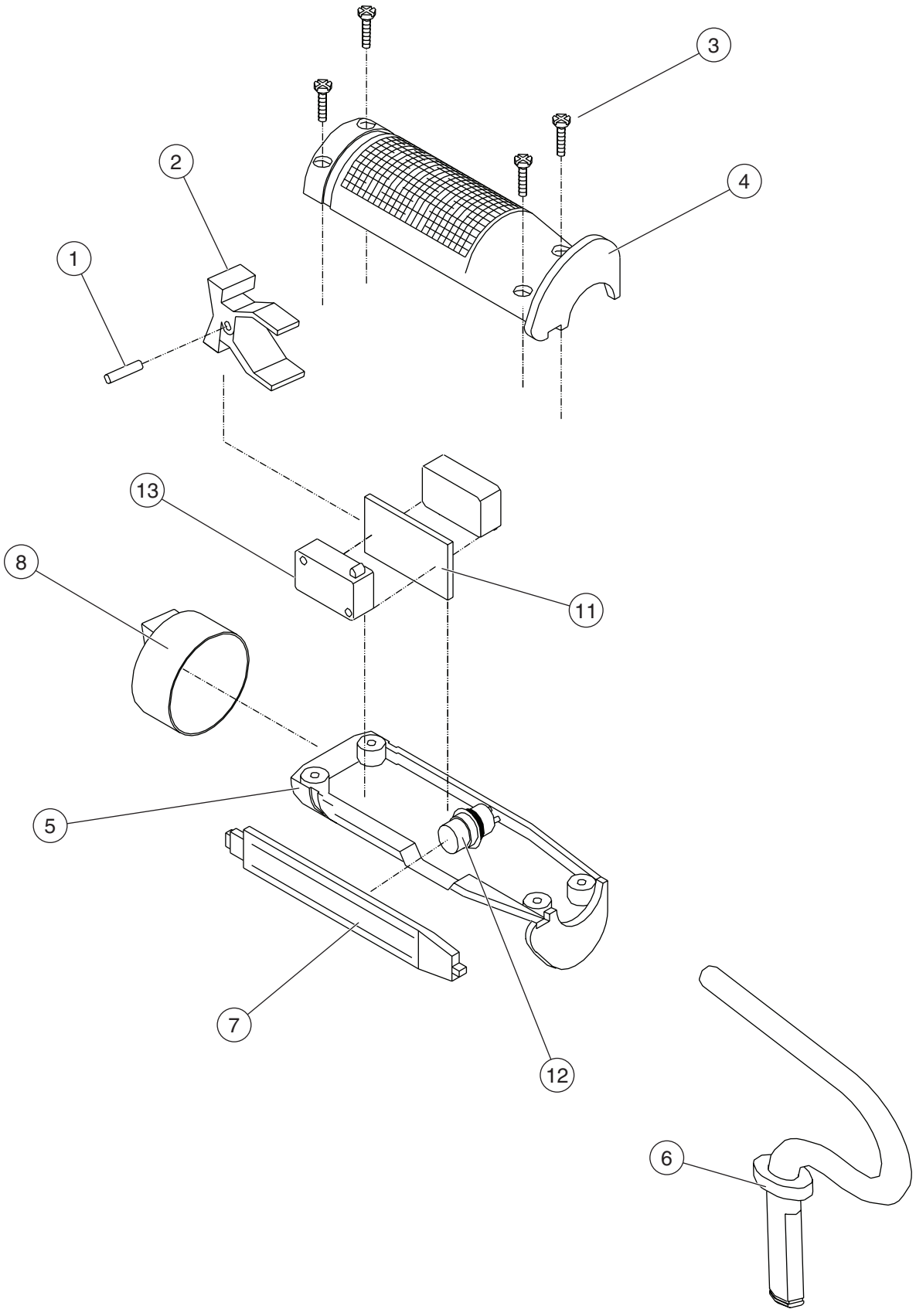


ILLUSTRATION No.
ART_2221

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)

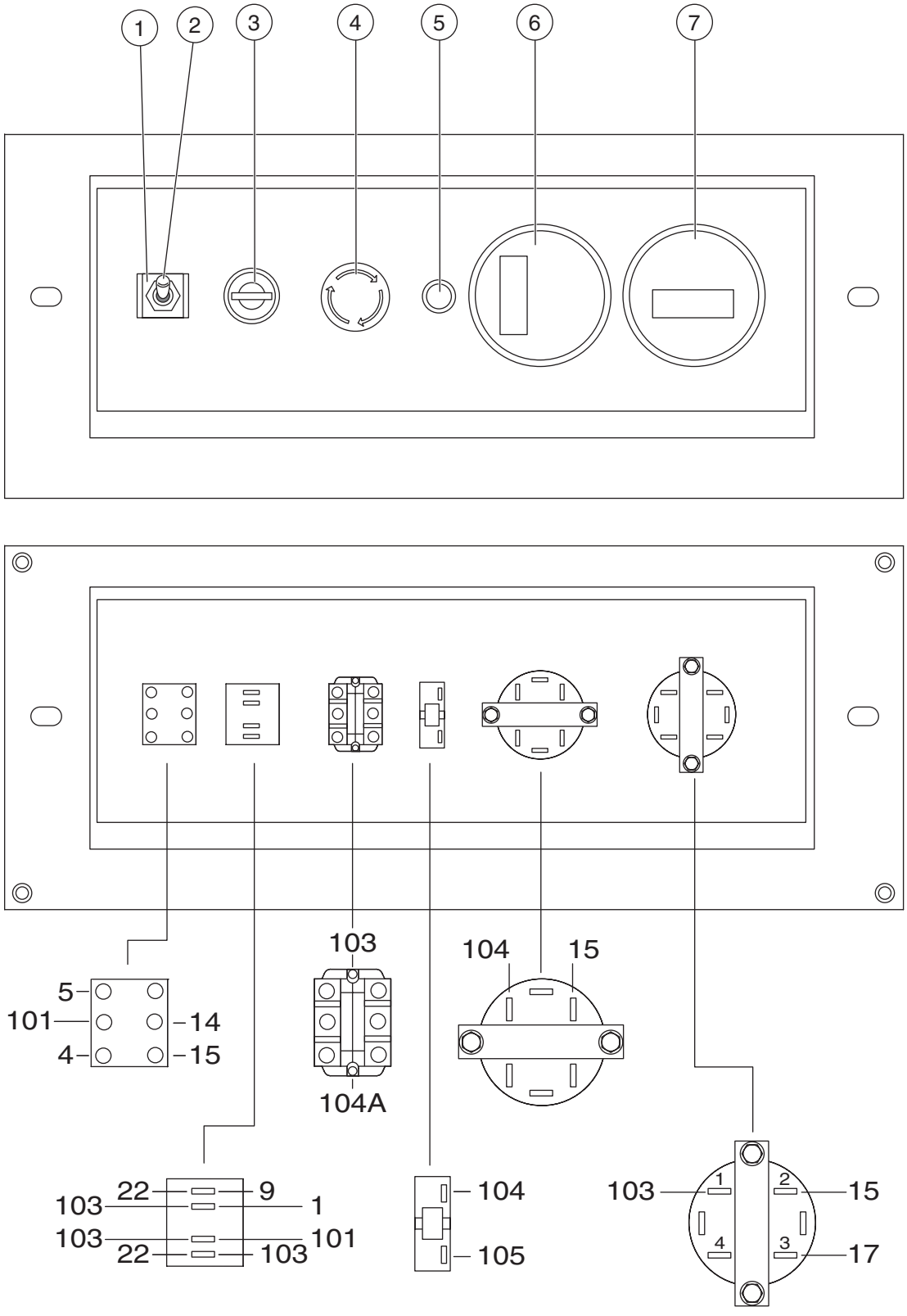


ILLUSTRATION No. ART_2222

Reference: ART_925

Base Controls Panel, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			CONTROL PANEL, BASE
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

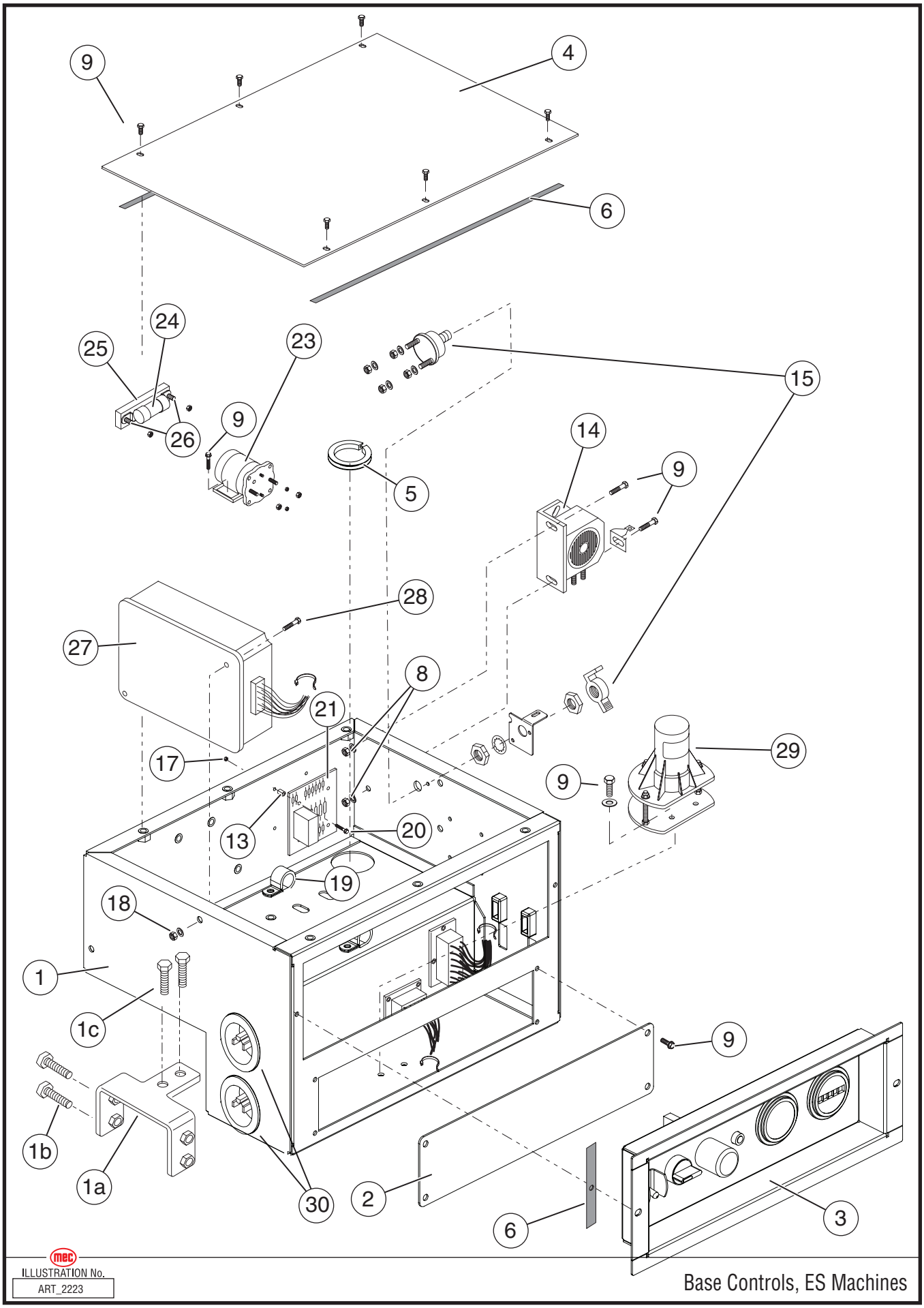


ILLUSTRATION No.
ART_2223

Base Controls, ES Machines

ITEM	PART NO.	QTY	DESCRIPTION
			CONTROL BOX, BASE
1	16609	1	WELDMENT, BASE CONTROL BOX
1a	25477	1	BRACKET
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	90217	1	TILT SENSOR
30	90749	2	RECEPTACLE

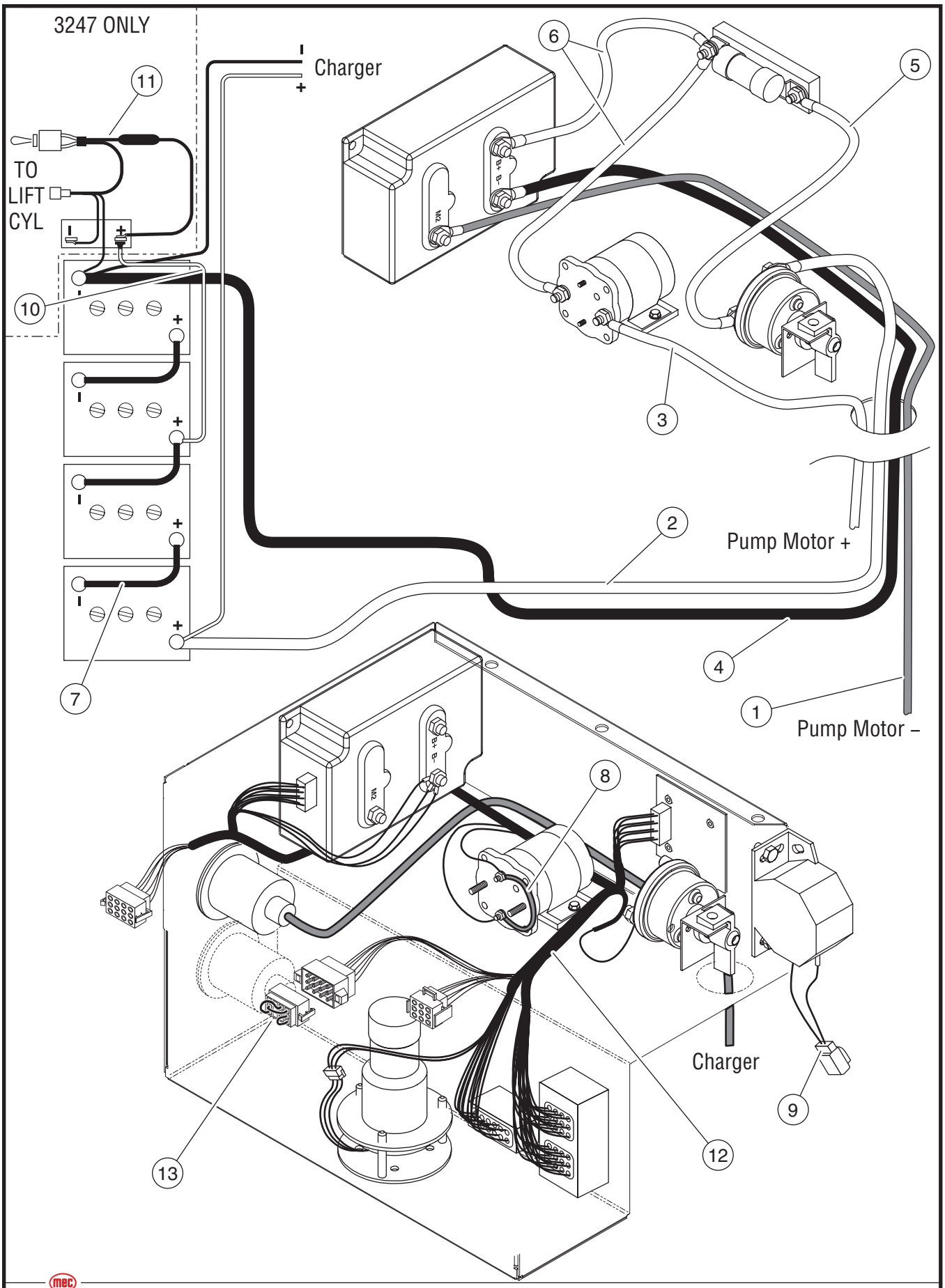


ILLUSTRATION No.
ART_2329 R1

Harnesses and Cables, Lower Control Box, 2047ES - 2647ES - 3247ES

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)
10	90905	1	HARNESS, E-DOWN CHARGE WIRE W/DIODE (3247ES)
11	91072	1	HARNESS, E-DOWN TO BATTERIES (3247ES)
-	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
			2047ES - SERIAL # 9801000 - 9801099
			2647ES - SERIAL # 9901000 - 9901199
			3247ES - SERIAL # 10001000 - 10001199
12	90810	1	HARNESS, INSTRUMENTS
			2047ES - SERIAL # 9801100 - UP
			2647ES - SERIAL # 9901200 - UP
			3247ES - SERIAL # 10001200 - UP
12	90810	1	HARNESS, INSTRUMENTS
13	90896	1	JUMPER WIRE, ANSI

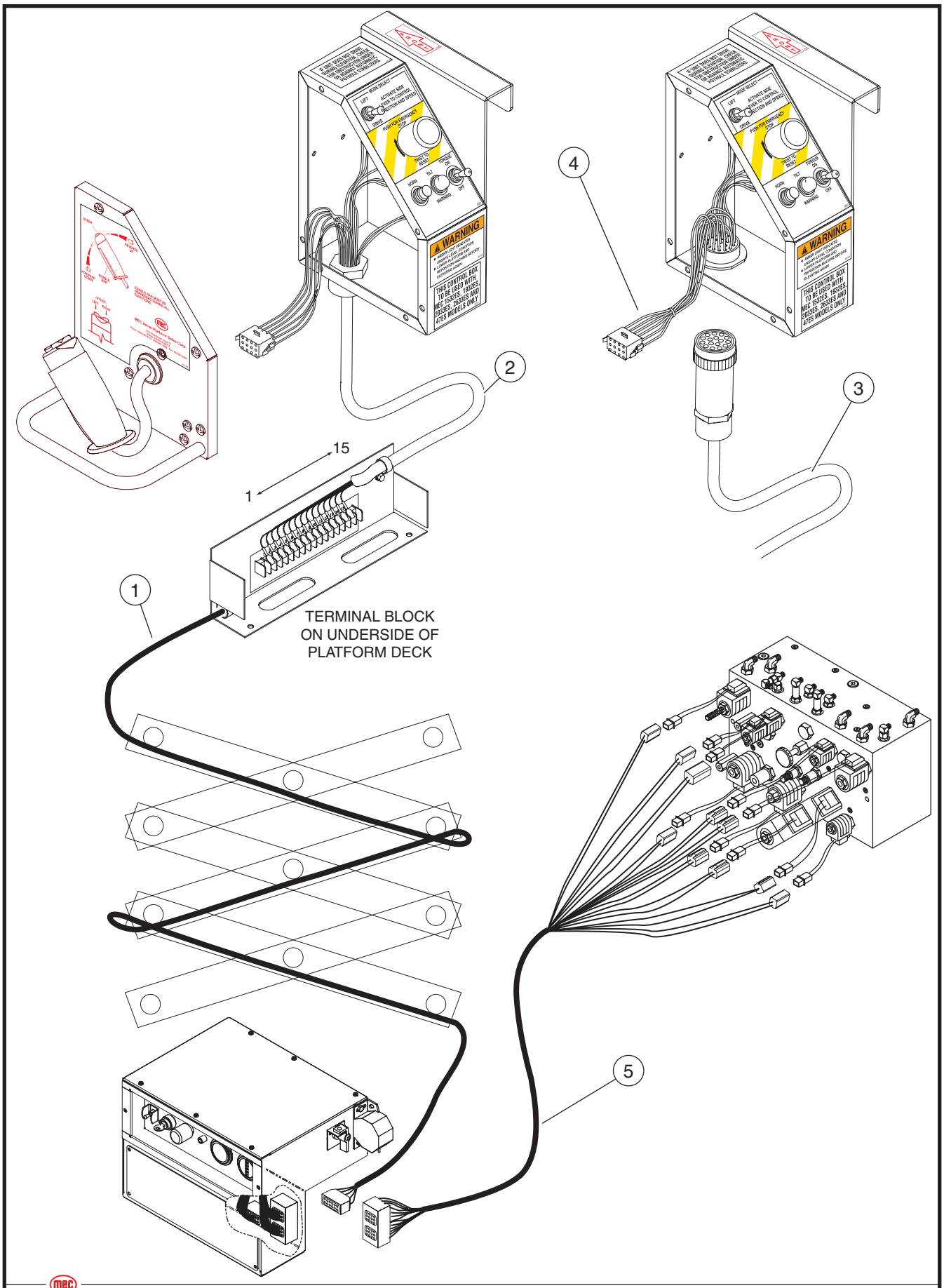


ILLUSTRATION No.
ART_2394

Control Cable and Manifold Harness

ITEM	PART NO.	QTY	DESCRIPTION
			WIRE HARNESSES, COMMUNICATION CABLE (EARLY MODELS)
1	90847		2047ES COMMUNICATION CABLE
1	90848		2647ES COMMUNICATION CABLE
1	90849		3247ES COMMUNICATION CABLE
			WIRE HARNESSES, UPPER CONTROLS (EARLY MODELS)
2	90817	1	CONTROLLER CABLE, FIXED
3	7656	1	CONTROLLER CABLE, REMOVABLE (OPTION)
4	90100		CONTROL HARNESS (USED WITH REMOVABLE CABLE)
			2047ES - SERIAL # 9801000 - 9801099
			2647ES - SERIAL # 9901000 - 9901199
			3247ES - SERIAL # 10001000 - 10001199
5	90684	1	BASE / MANIFOLD HARNESS
NS	90683	1	LIFT CYLINDER HARNESS (2047ES/2647ES)
NS	90955	1	LIFT CYLINDER HARNESS - LOWER CYL (3247ES)
NS	90956	1	LIFT CYLINDER HARNESS - UPPER CYL (3247ES)
			WIRE HARNESSES, OTHER (EARLY MODELS)
NS	90686		LIMIT SWITCH HARNESS
NS	90685	1	POTHOLE SWITCH HARNESS
NS	—	1	HORN (OPTION) SEE SECTION B
NS	—		MOTION LIGHT (OPTION) SEE SECTION E, OPTIONS
NS	—		POWER CONVERTER (OPTION) SEE SECTION E, OPTIONS

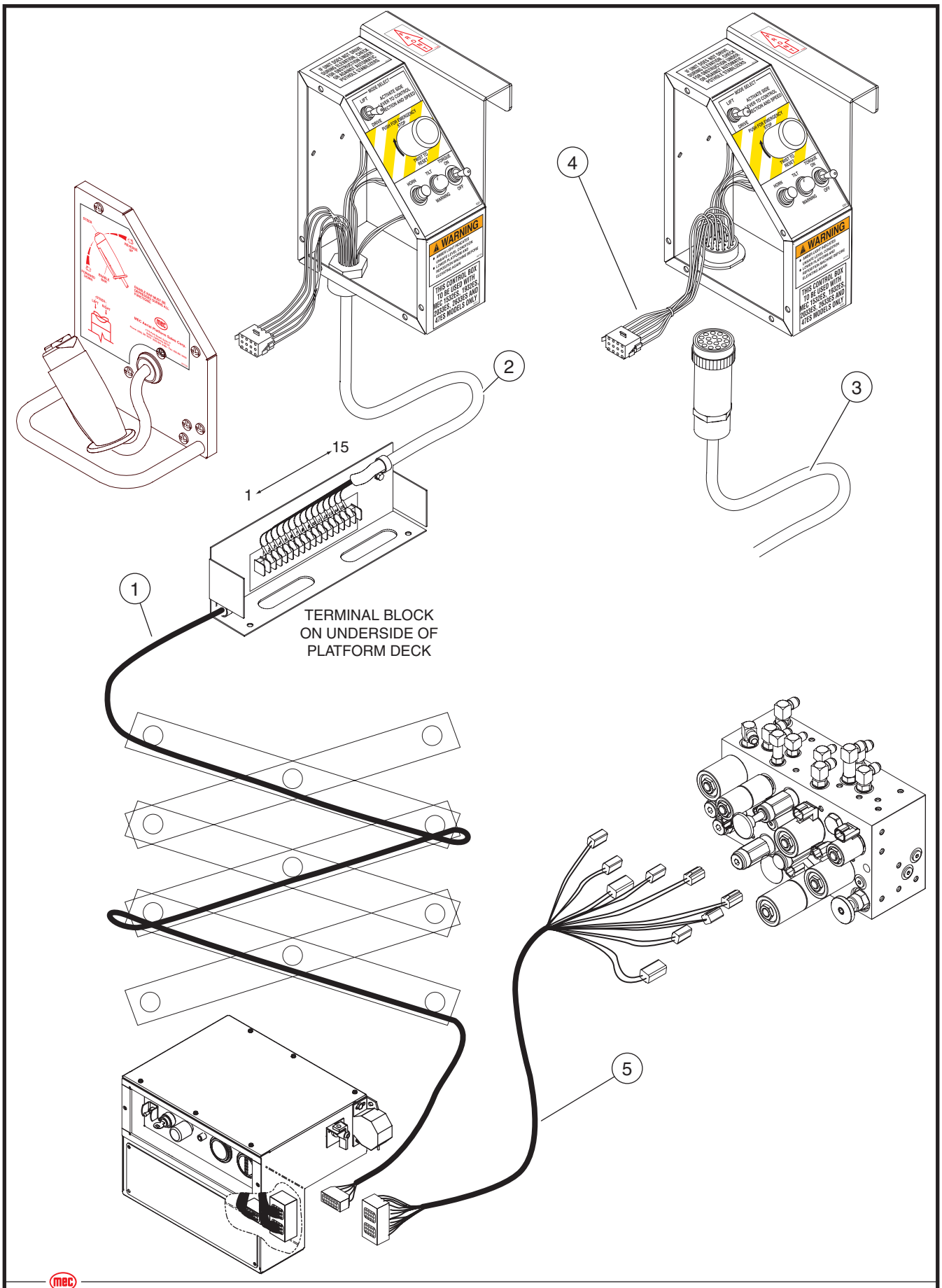


ILLUSTRATION No.
ART_2235

Control Cable and Manifold Harness

ITEM	PART NO.	QTY	DESCRIPTION
			WIRE HARNESSES, COMMUNICATION CABLE (CURRENT MODELS)
1	90847		2047ES COMMUNICATION CABLE
1	90848		2647ES COMMUNICATION CABLE
1	90849		3247ES COMMUNICATION CABLE
			WIRE HARNESSES, UPPER CONTROLS (CURRENT MODELS)
2	90817	1	CONTROLLER CABLE, FIXED
3	7656	1	CONTROLLER CABLE, REMOVABLE (OPTION)
4	90100		CONTROL HARNESS (USED WITH REMOVABLE CABLE)
			2047ES - SERIAL # 9801100 - UP
			2647ES - SERIAL # 9901200 - UP
			3247ES - SERIAL # 10001200 - UP
5	91066	1	BASE / MANIFOLD HARNESS
NS	91069	1	LIFT CYLINDER HARNESS (2047ES/2647ES)
NS	91085	1	**LOWER** LIFT CYLINDER HARNESS (3247ES)
			EXCEPT SERIAL # 10001211 - #10001217
NS	90955	1	**LOWER** LIFT CYLINDER HARNESS (3247ES)
			SERIAL # 10001211 - #10001217
NS	91086	1	**UPPER** LIFT CYLINDER HARNESS (3247ES)
			EXCEPT SERIAL # 10001211 - #10001217
NS	90956	1	**UPPER** LIFT CYLINDER HARNESS (3247ES)
			SERIAL # 10001211 - #10001217
			WIRE HARNESSES, OTHER (CURRENT MODELS)
NS	NOT USED		LIMIT SWITCH HARNESS
NS	91066	1	POTHOLE SWITCH HARNESS
NS	—	1	HORN (OPTION) SEE SECTION B
NS	—		MOTION LIGHT (OPTION) SEE SECTION E, OPTIONS
NS	—		POWER CONVERTER (OPTION) SEE SECTION E, OPTIONS

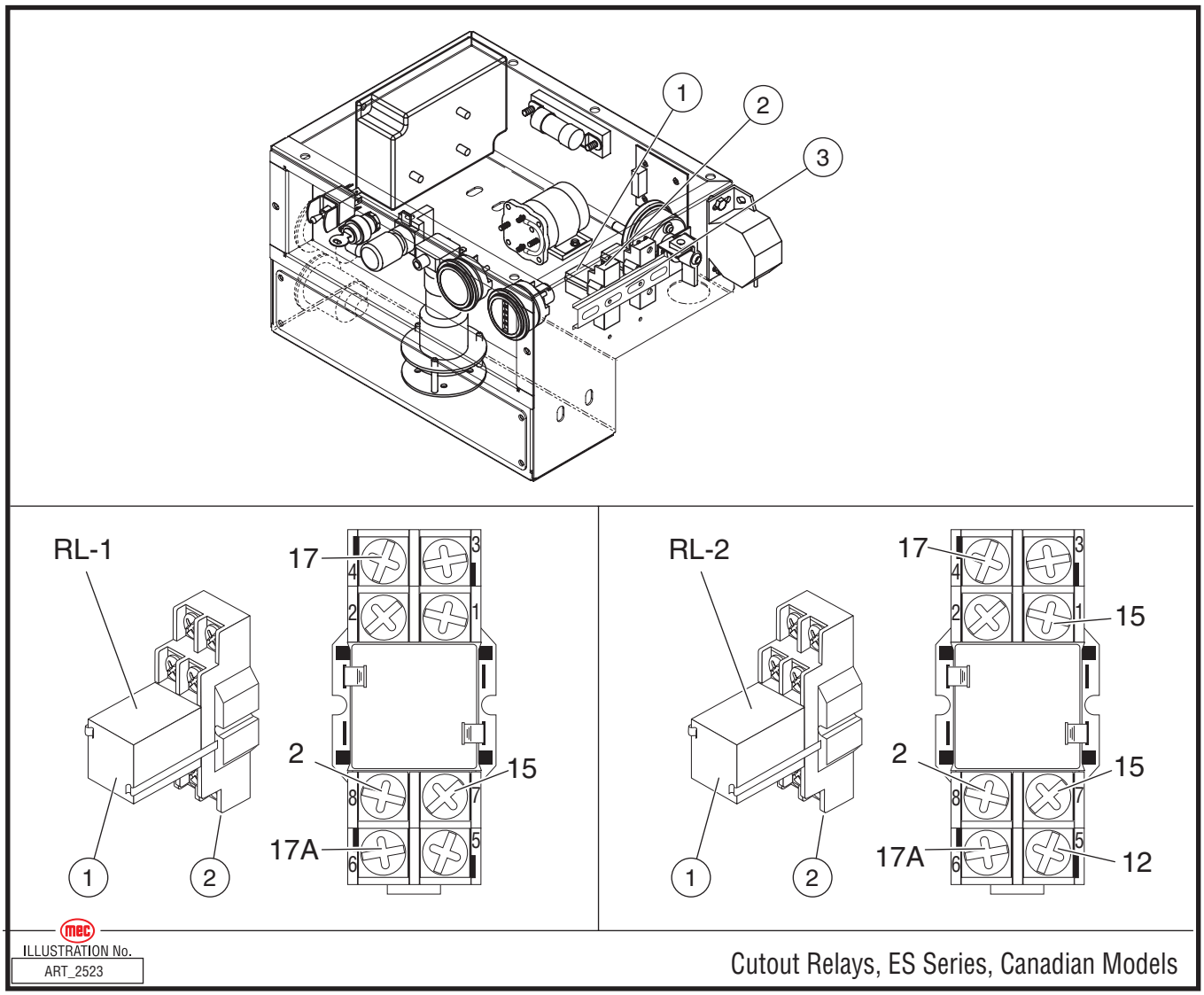


ILLUSTRATION No.
ART_2523

Cutout Relays, ES Series, Canadian Models

ITEM	PART NO.	QTY	DESCRIPTION
			CUTOUT RELAYS, CANADIAN MODELS
1	90927	2	RELAY, SPDT 2-POLE
2	90871	2	BASE, RELAY
3	16333	1	BRACKET, RELAY

SECTION B:
PLATFORM AND RAILS

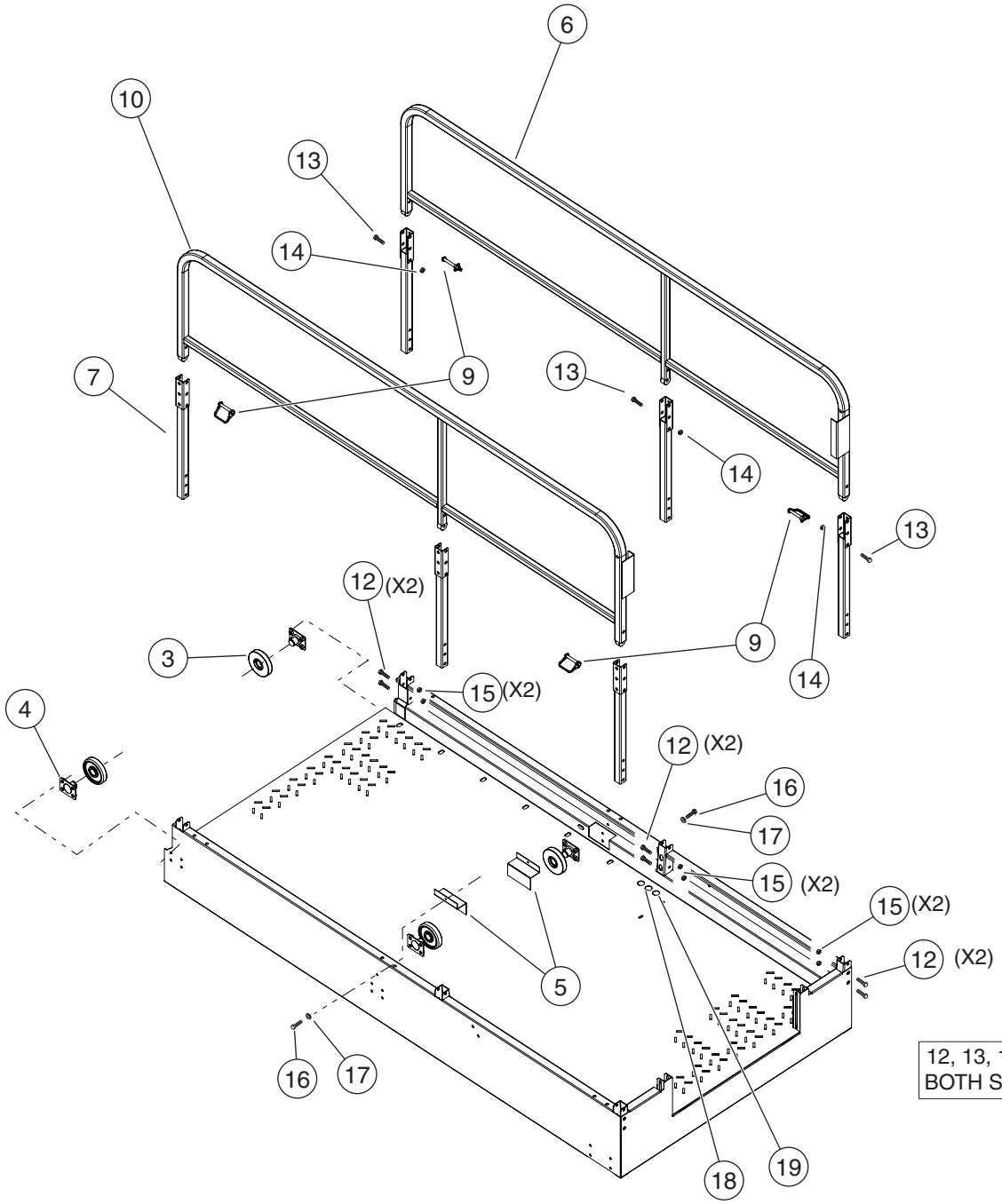


ILLUSTRATION No.
ART_2256

Reference: ART_

Main Deck and Rails, X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			PLATFORM AND RAILS
1	16516	1	MAIN PLATFORM
2	13777	2	BLOCK, FIXED PLATFORM
3	13230	4	ROLLER
4	13267	4	PLATE ROLLER WELDMENT
5	13637	2	BRACKET, ROLLER COVER
6	16634	1	RAIL WELD MAIN UPPER RH
7	16564	6	RAIL WELD EXT LOWER
9	HDW91057	4	PIN WIRE LOCK 3/8" X 2.25 W/CHAIN
10	16573	1	RAIL WELD MAIN UPPER LH
12	HDW8303	12	SCREW, 5/16" - 18, 2" LG
13	HDW6434	6	SCREW 3/8"-16 X 2.00
14	HDW5039	6	LOCK NUT 3/8"-16
15	HDW8304	12	NUT 5/16"-18
16	HDW6455	2	SCREW, HEX HEAD, 1/4" - 20 X 1/2"
17	HDW5217	2	FLAT WASHER, 11/32" ID
18	90208	2	CAP, STEEL 1.0" DIA HOLE
19	8479	1	BUSHING, 3/4" ID

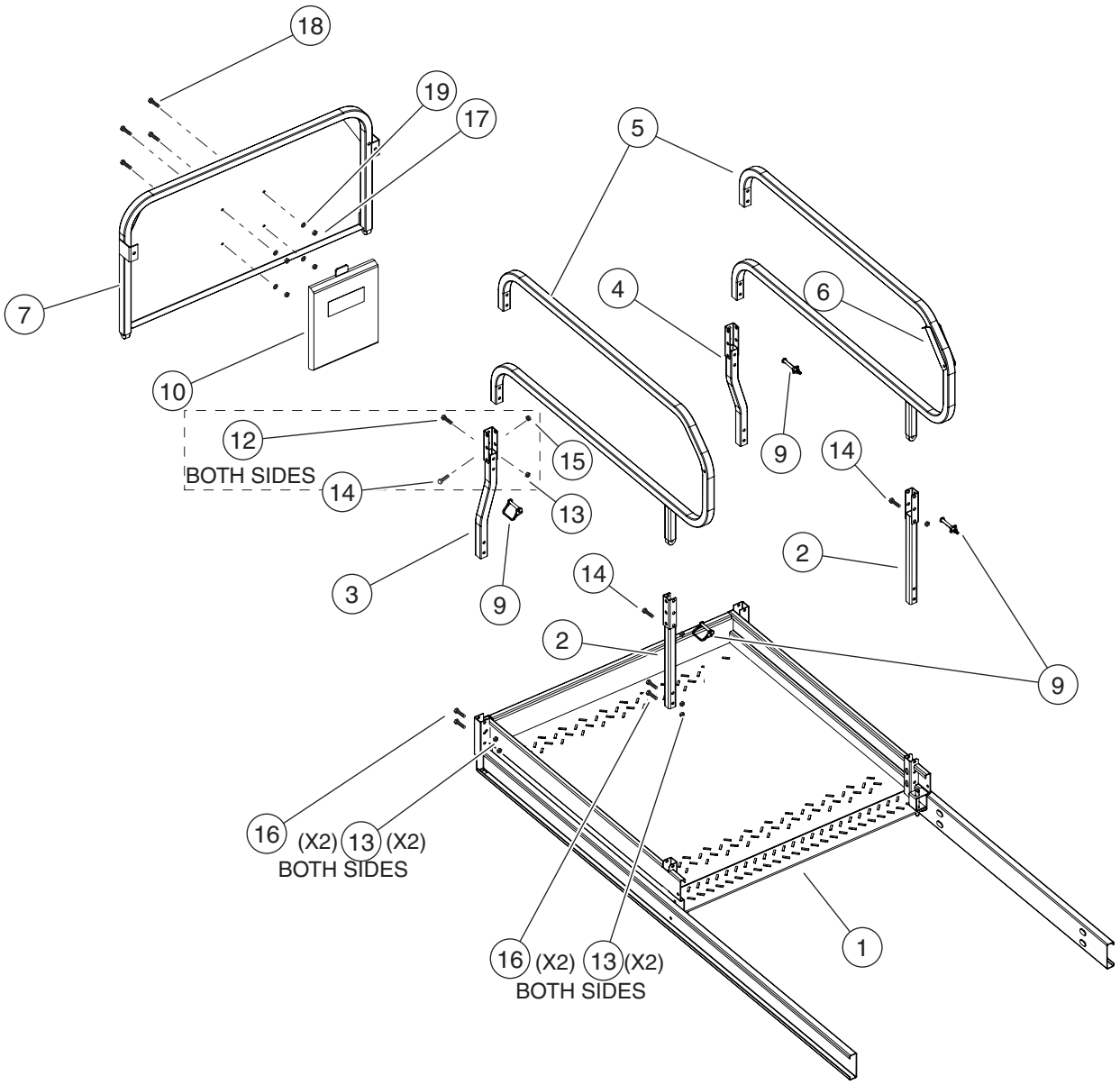


ILLUSTRATION No.
ART_2257

Reference: ART_

Extension Deck, X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			Rollout Deck and Rails
1	16523	1	PLATFORM EXTENSION
2	15089	2	RAIL WELD EXT REAR LOWER
3	16580	1	RAIL WELD EXT LOWER FRONT LH
4	16579	1	RAIL WELD EXT LOWER FRONT RH
5	15085	2	RAIL WELD EXT SIDE
6	13814	1	HANDLE R/O PLATFORM
7	16566	1	RAIL WELD EXT FRONT UPPER
9	HDW91057	4	PIN WIRE LOCK 3/8" X 2.25 W/CHAIN
10	8909	1	ENCLOSURE SERVICE MANUAL
12	HDW7471	2	SCREW 5/16"-18 X 3.00
13	HDW8304	10	NUT 5/16"-18
14	HDW6434	4	HEX CAP SCREW 3/8"-16 X 2.00
15	HDW5039	4	LOCKNUT 3/8"-16
16	HDW8303	8	HEX CAP SCREW 5/16"-18 X 2"
17	HDW6461	4	LOCK NUT 1/4"-20
18	HDW5904	4	HEX CAP SCREW 1/4"-20 X 3/4"
19	HDW5217	4	FLAT WASHER 11/32" ID

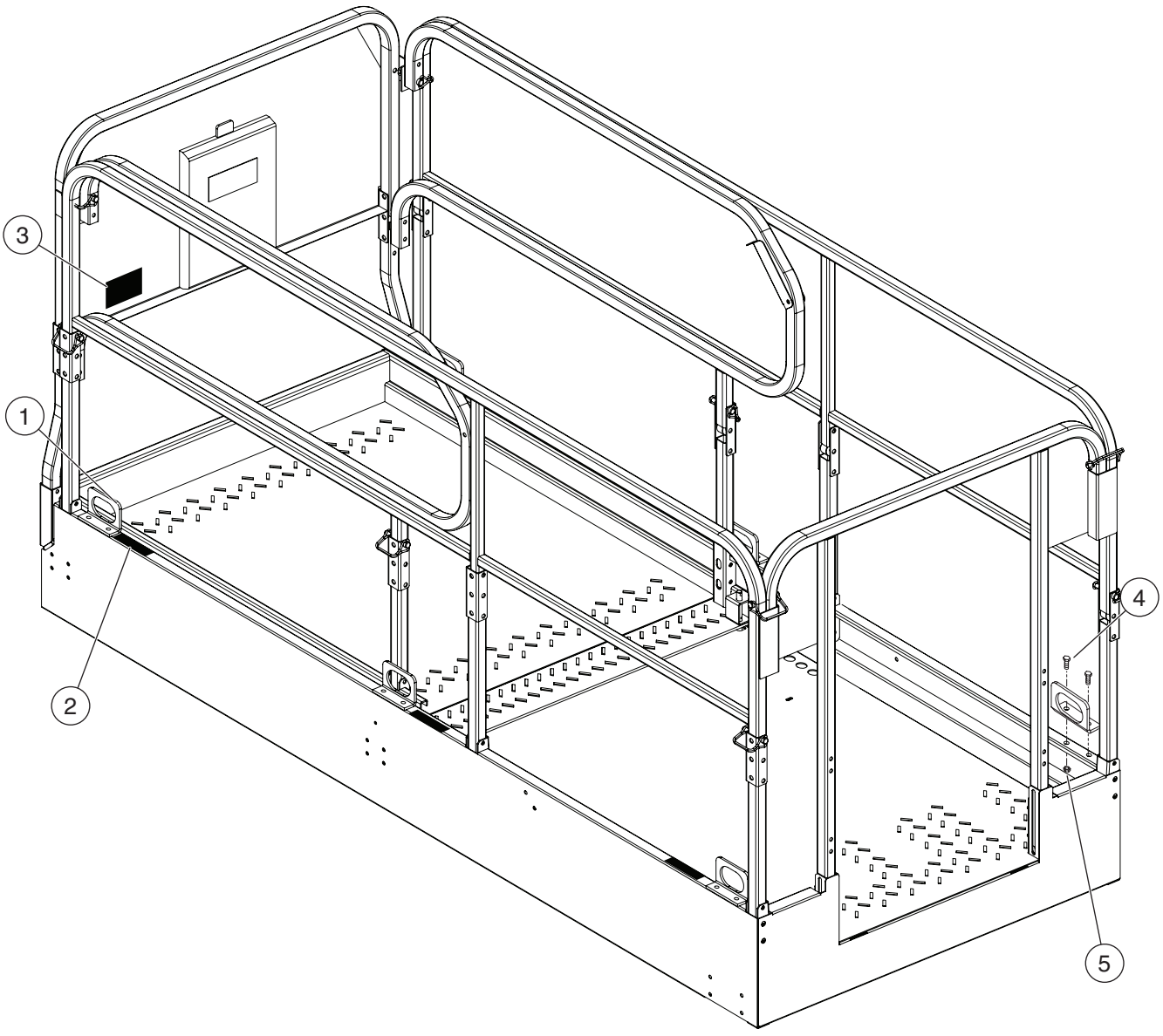


ILLUSTRATION No.
ART_2231

Lanyard Attachment Option, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			LANYARD ATTACHMENT
1	3923	6	BRKT, ATTACHMENT POINT
2	8605	6	DECAL, LANYARD ATTACHMENT
3	8606	1	DECAL, WARNING RESTRAINT
4	HDW6432	12	SCREW, 3/8" - 16, 3/4" LG
5	HDW5039	12	LOCK NUT, 3/8" - 16

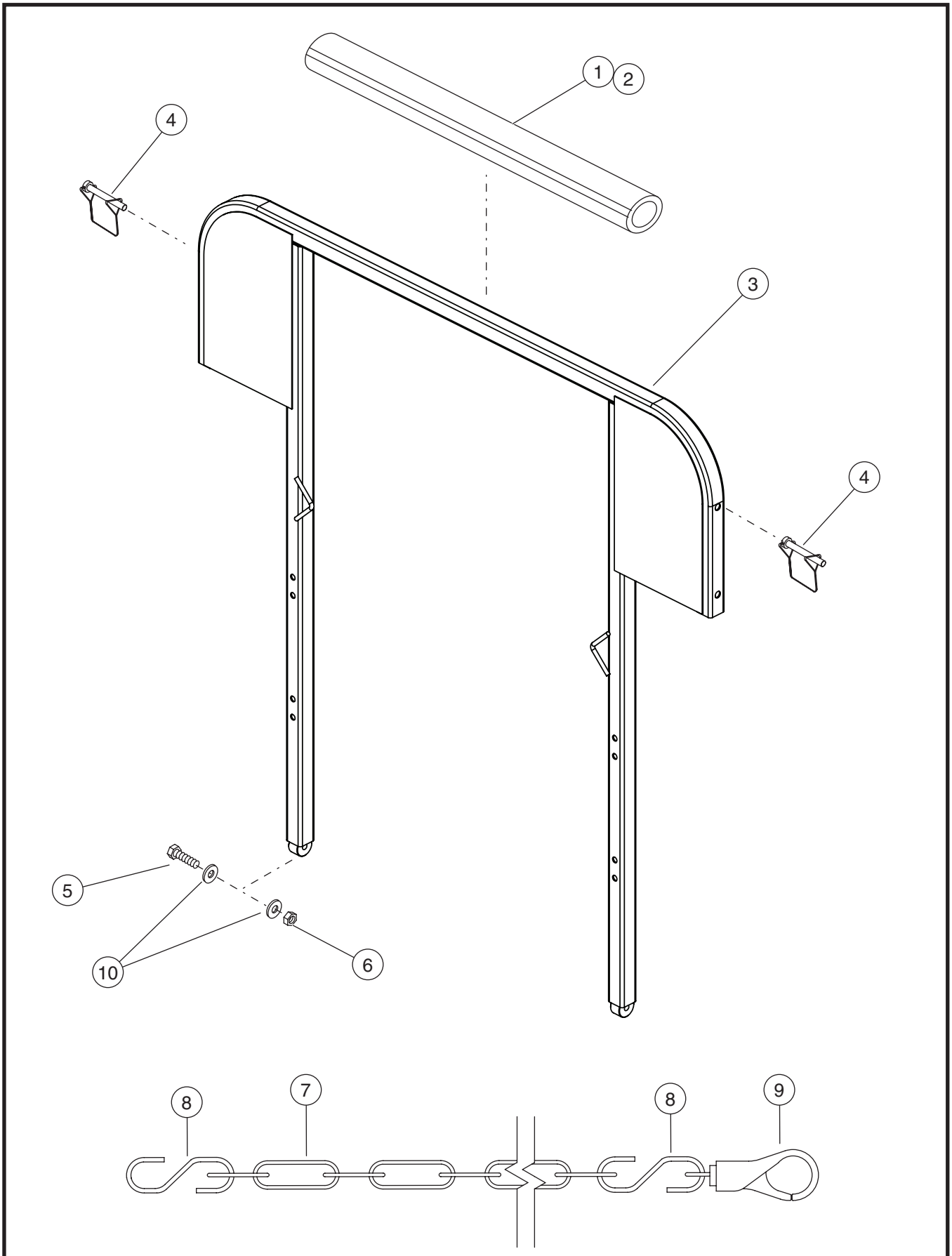


ILLUSTRATION No.
ART_2258

Reference: ART_

Entry Chain and Top Rail, X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			ENTRY GATE
1	7048	1	COVER, RAIL PAD (OPTION ONLY)
2	7805	3 FT.	PAD, RAIL (OPTION ONLY)
3	16581	1	GATE, SHEET LOAD
4	HDW90944	2	PIN, LOCK
5	HDW8303	2	HEX CAP SCREW, 5/16" - 18 X 2.00
6	HDW8304	2	NUT, 3/8" - 16
7	1366	1	GUARD CHAIN
8	5239	2	LINK, CONNECTING, S-HOOK
9	8781	1	CHAIN LINK SNAP
—	2510	1	CHAIN GUARD ASSY (INCLUDES ITEMS 7, 8 & 9)
10	HDW5217	4	FLAT WASHER 11/32" ID

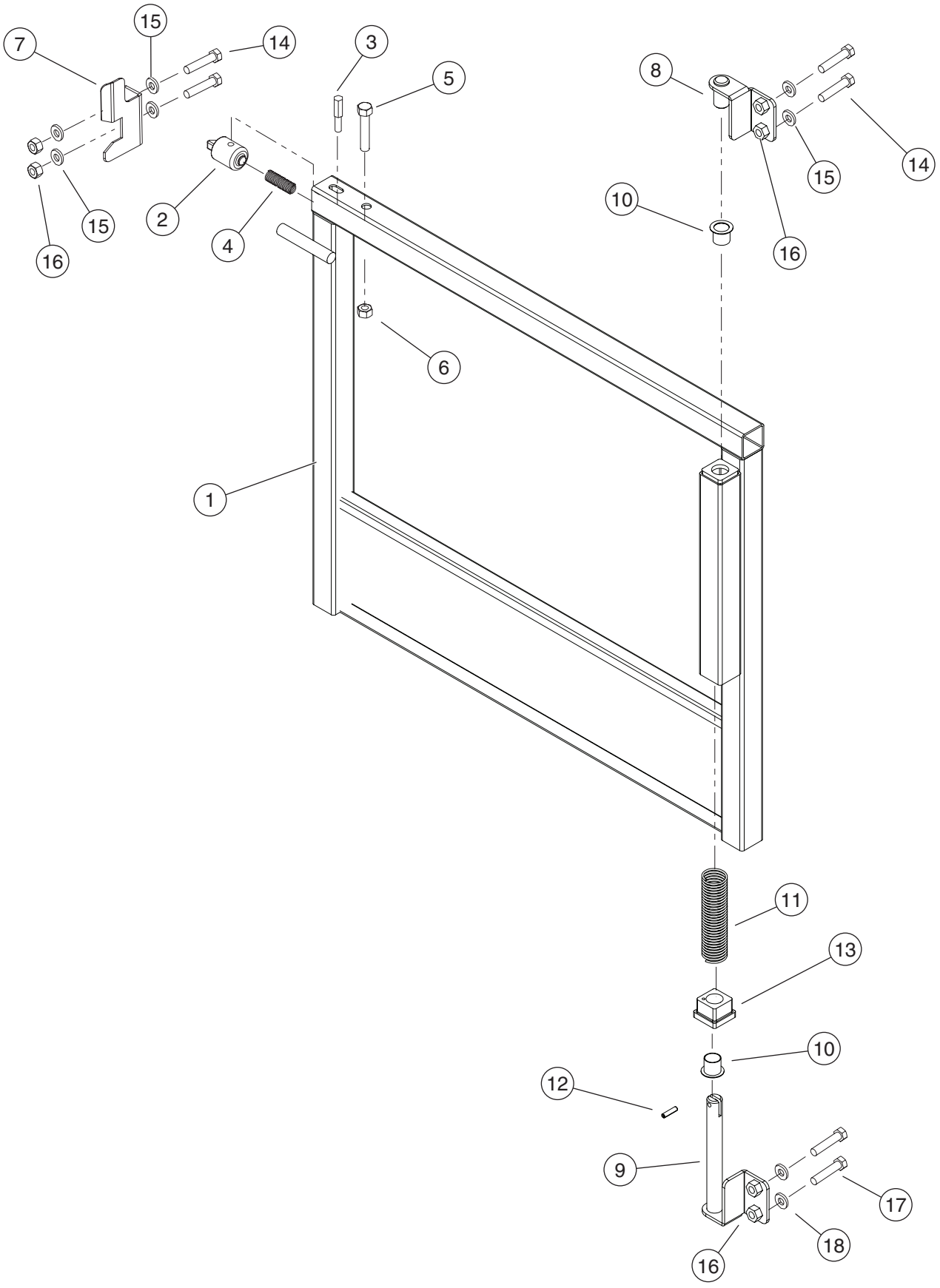


ILLUSTRATION No.
ART_2259

Reference: ART_

Swing Gate, X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			SWING GATE (OPTION)
1	16635	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	40014	1	SWING GATE MOUNT WELD UPPER
9	40015	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

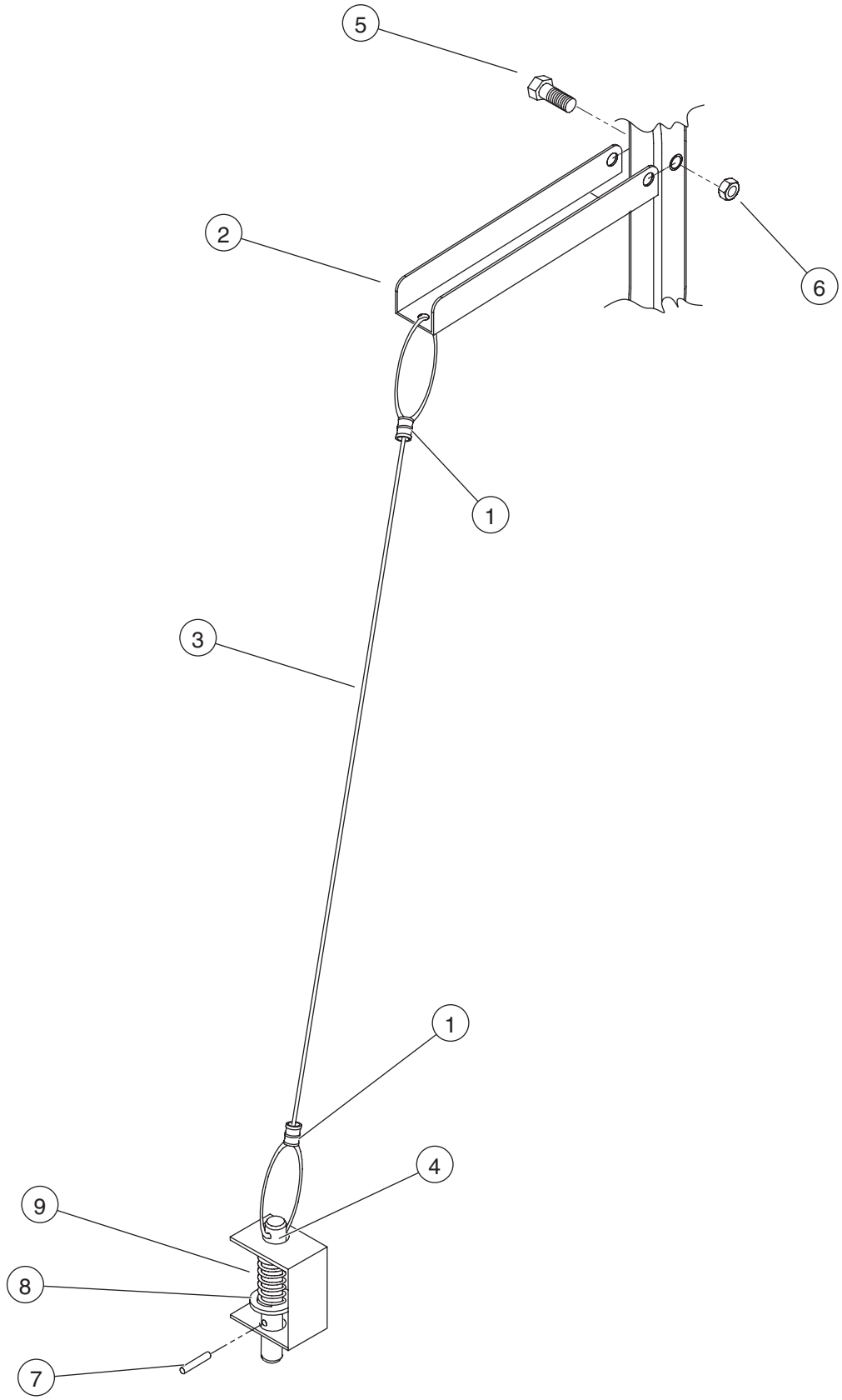


ILLUSTRATION No.
ART_2174

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

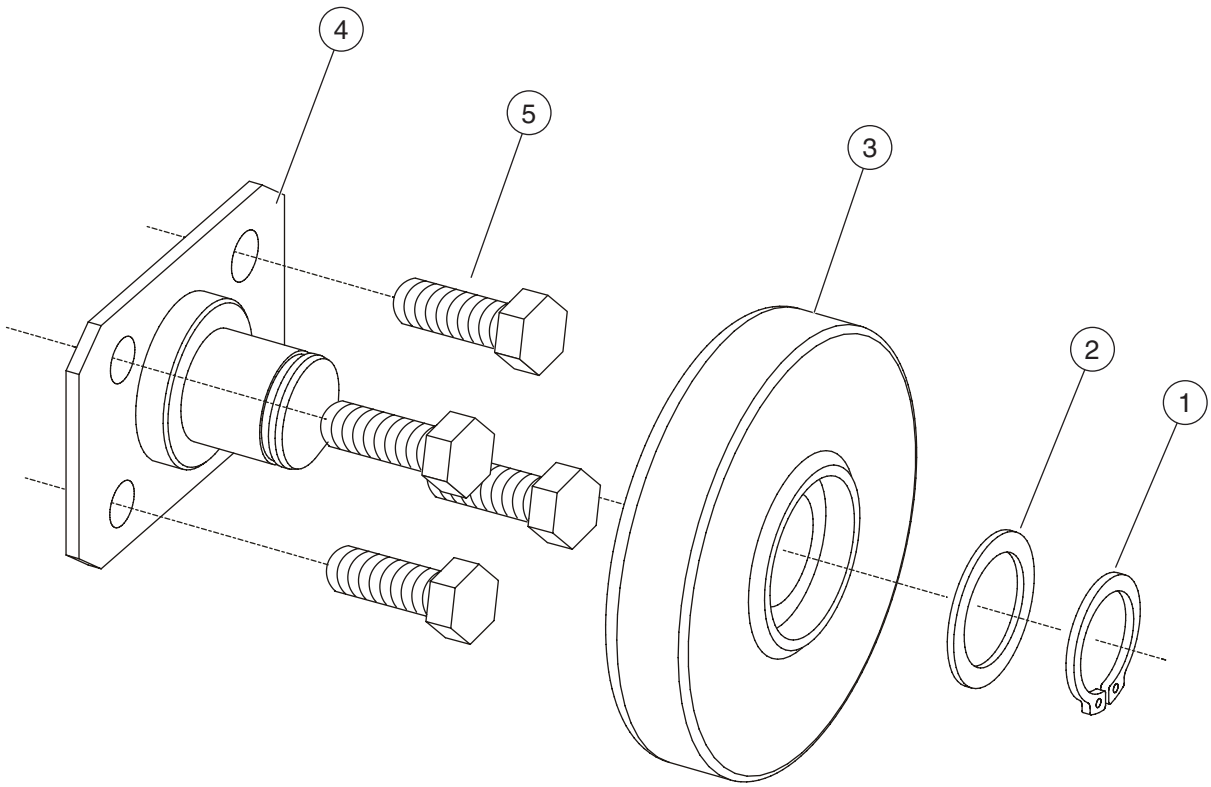


ILLUSTRATION No.
ART_2095

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

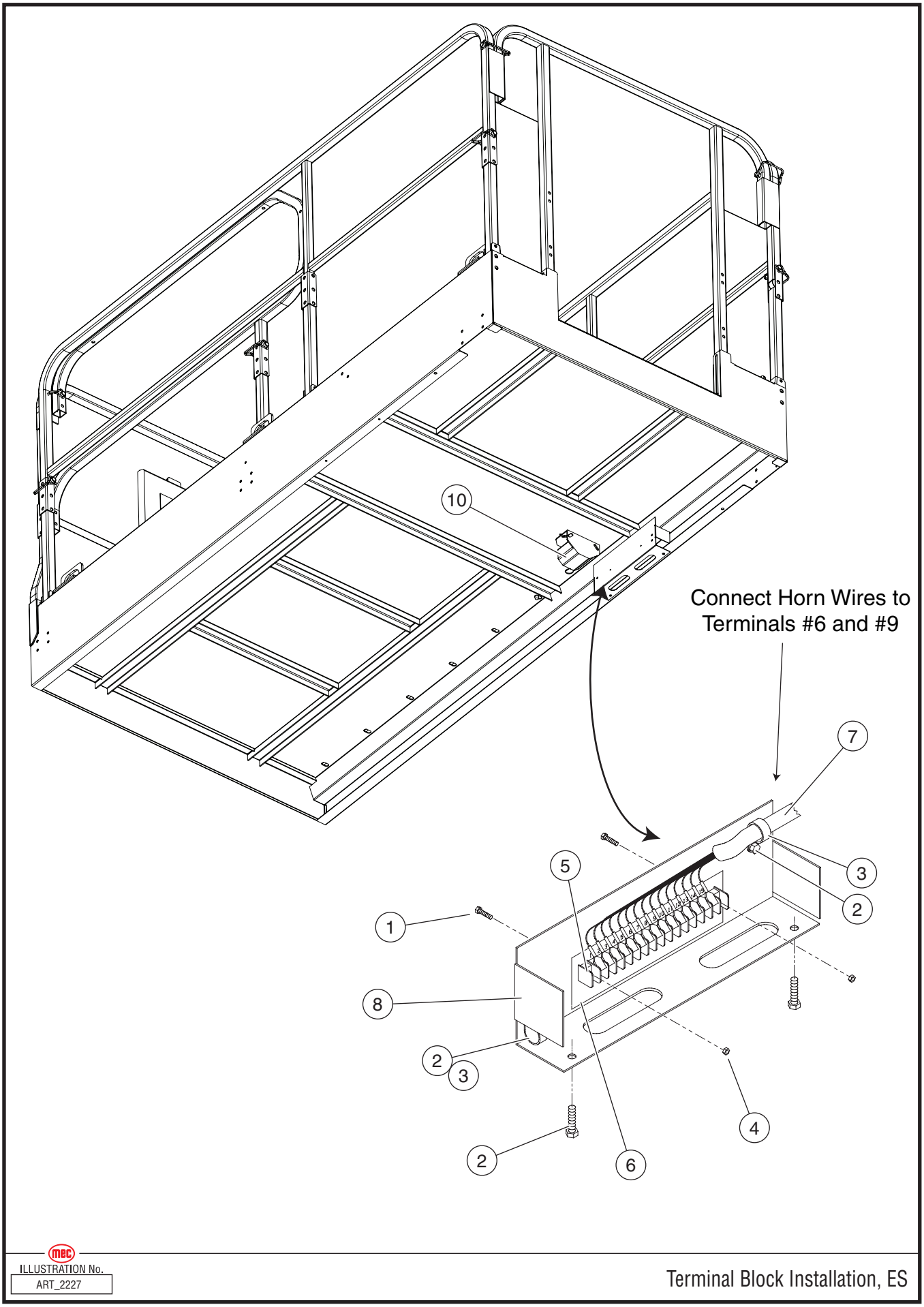


ILLUSTRATION No.
ART_2227

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 (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
			* 2047ES = 34 FT.
			* 2647ES = 41 FT. 6 IN.
			* 3247ES = 49 FT.
	8559	2	CLAMP, HOSE
	HDW5052	2	FITTING, 1/4" MALE, MALE HOSE BARB

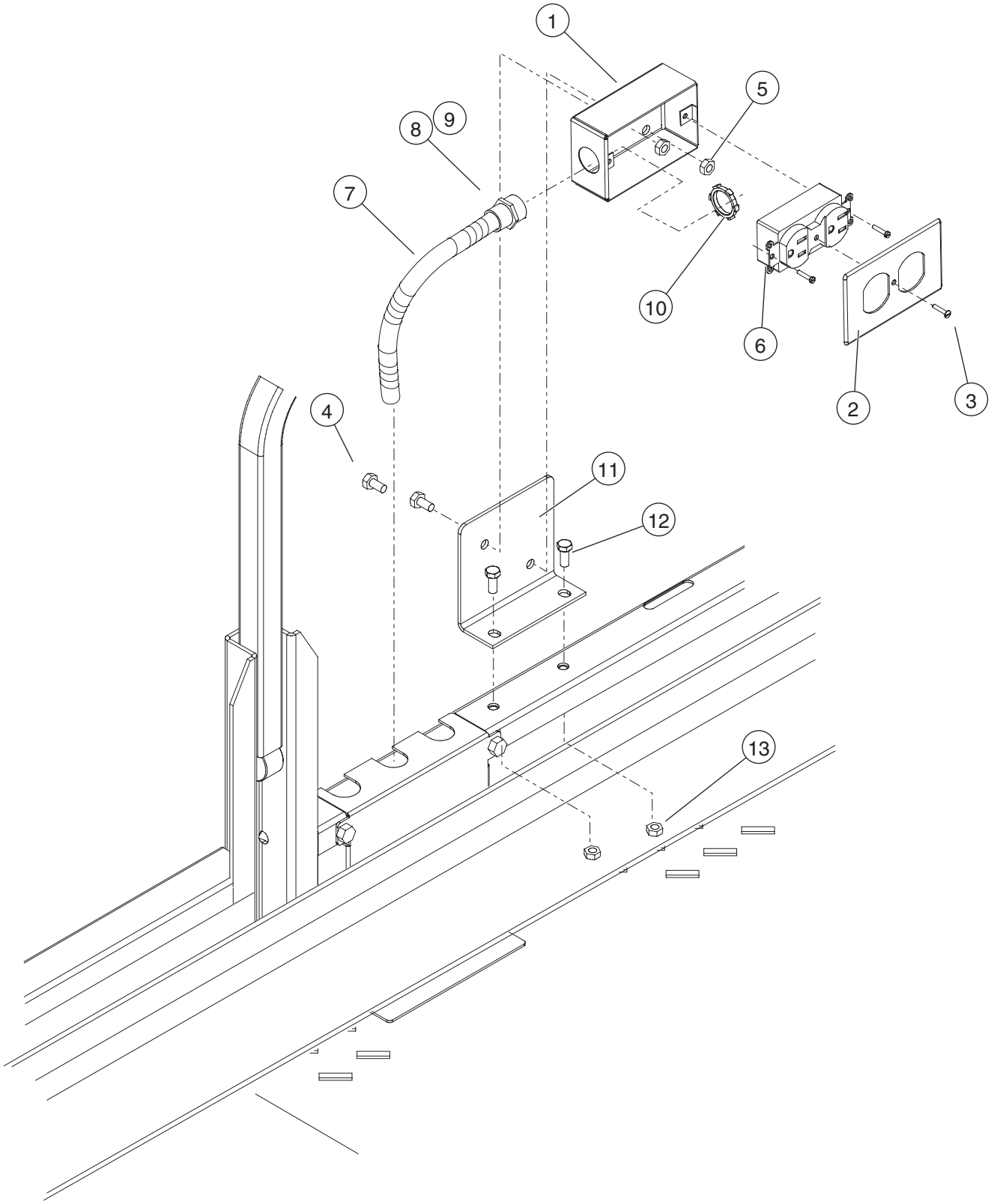


ILLUSTRATION No.
ART_2228

Power to Platform Outlet Installation

ITEM	PART NO.	QTY	DESCRIPTION
			POWER TO PLATFORM
1	90827	1	BOX, RECEPTACLE
2	90828	1	DUPLEX RECEPTACLE COVER
3	HDW5636	1	SCREW #6 - 32 × 0.25"
4	HDW6455	2	SCREW, ¼" - 20, ½" LG
5	HDW8267	2	LOCKNUT ¼" - 20
6	5381	1	RECEPTACLE, DUPLEX
7	8208	1	CONDUIT, 3/8" FLEXIBLE
8	8209	1	FERRULE, 3/8"
9	8479	1	BUSHING, ¾" ID
10	8833	1	CONNECTOR, OUTLET BOX 3/8" CONDUIT
11	16221	1	BRACKET
12	HDW5724	2	SCREW, 5/16–18 × ¾"
13	HDW8304	2	NUT, 5/16–18
NS	HDW8501	2	CLIP, SELF RETAINING
NS	7617	*	WIRE, 14 GA
			* 2047ES = 50 FT. * 2647ES = 58 FT.
			* 3247ES = 66 FT.
	HDW5217	2	FLAT WASHER 11/32" ID

SECTION C:
SCISSORS

14 DENOTES LOCATION OF HDW13175

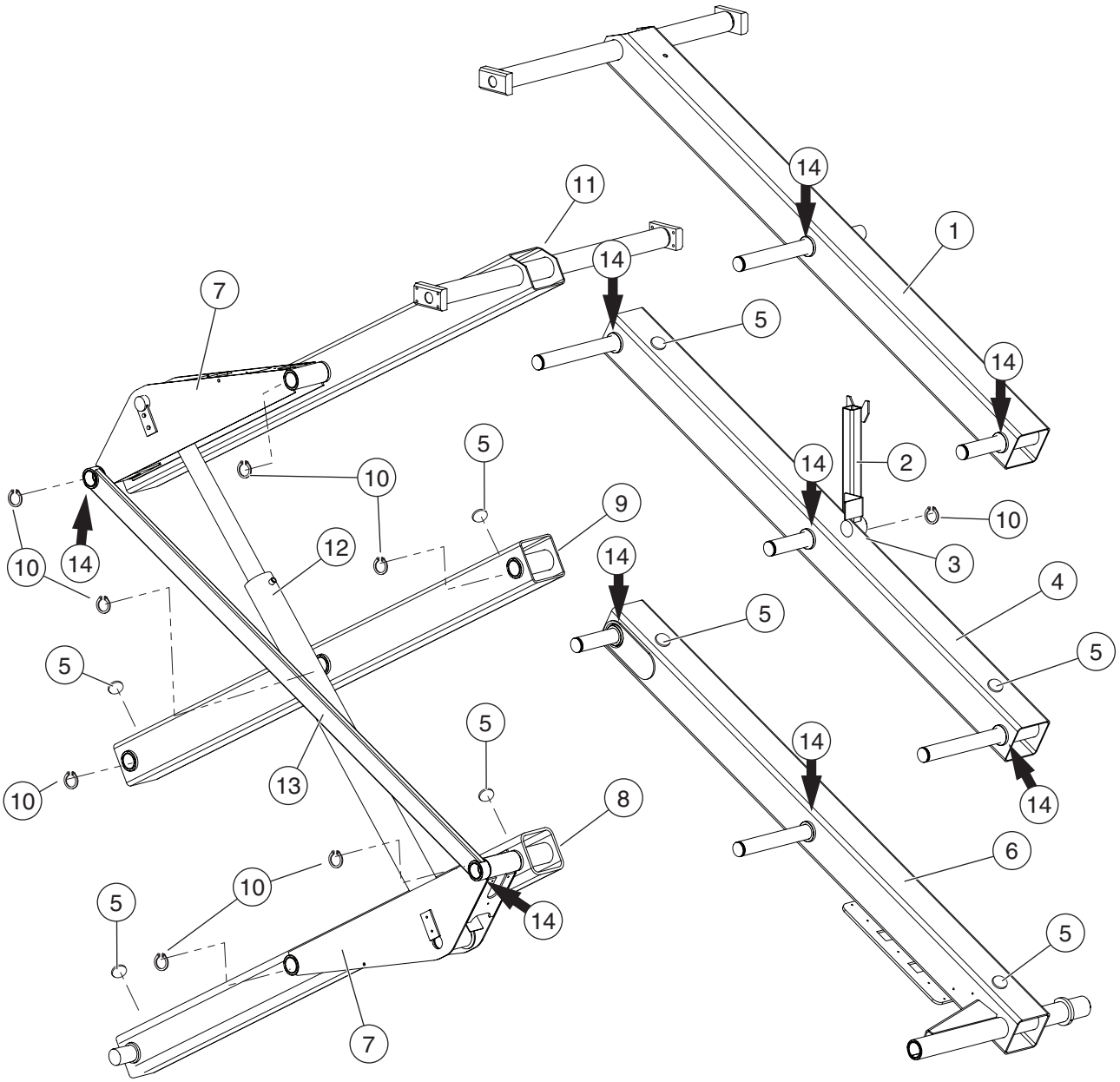
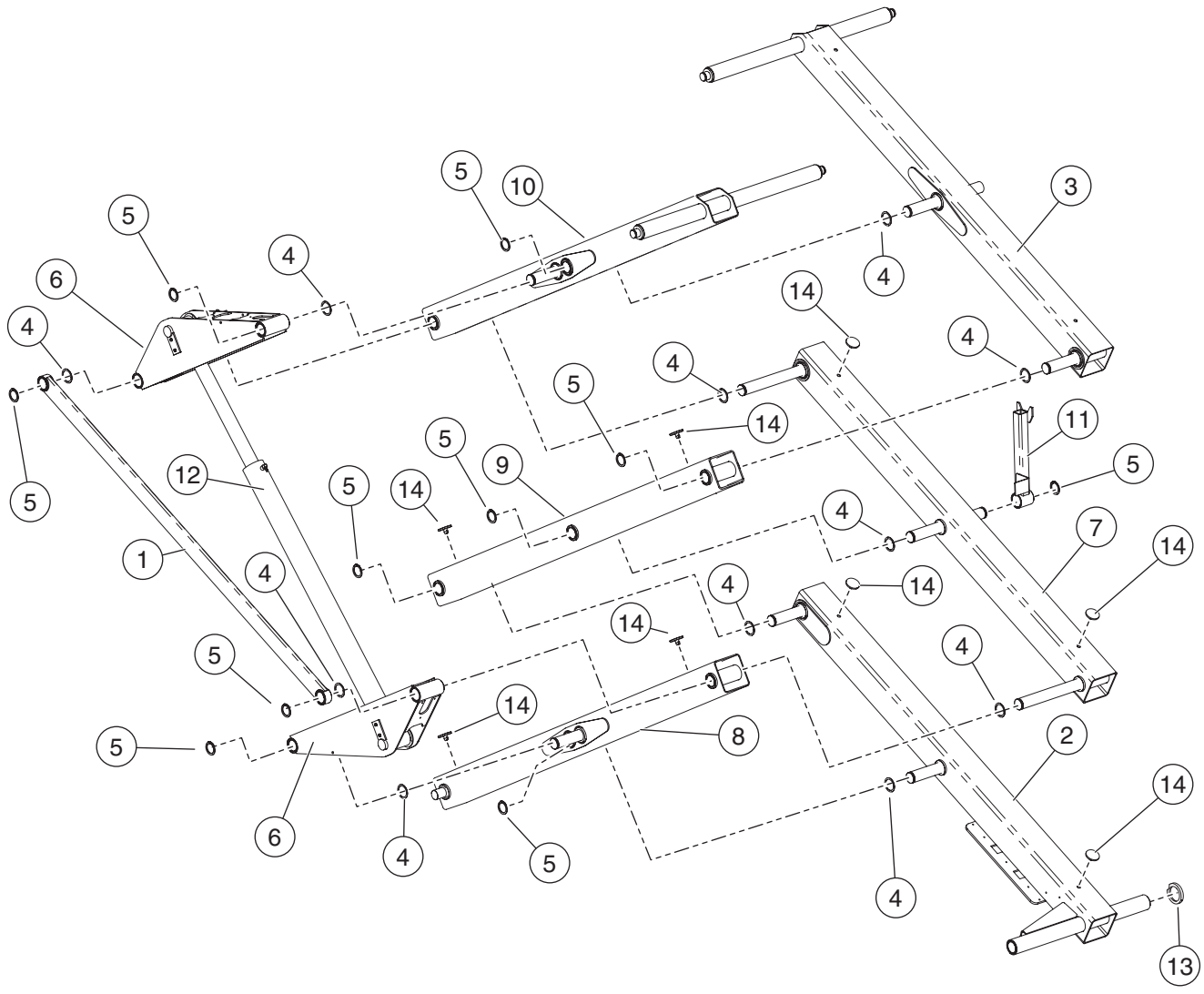


ILLUSTRATION No. ART_2276 R1

Serial # Up to 9801099

Scissor Assembly, 2047ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 2047ES, SERIAL # UP TO 9801099
1	16607	1	BEAM, WITH PINS
2	30518	1	MAINTENANCE LOCK
3	8675	2	BEARING, 2 2/4" X 2" X 1 1/2" LG
4	16606	1	BEAM, WITH PINS
5	25429	8	SPACER BLOCK
6	16598	1	BEAM, WITH PINS
7	16512	2	CYLINDER MOUNT
8	16500	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
9	16603	1	BEAM, WITH BEARINGS
	6669	6	BEARING, 32DU32
10	6701	8	RING, RETAINING, 2" SHAFT
11	16511	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
12	REF	1	CYLINDER, LIFT (SEE END OF THIS SECTION)
13	16585	1	SUPPORT, BEAM, 1X3
14	HDW13175	9	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK



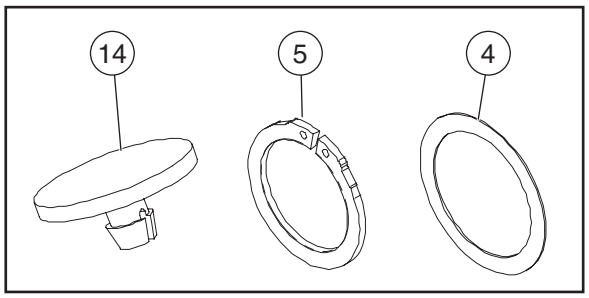


ILLUSTRATION No. ART_2797

Serial # 9801100 - Up

Scissor Assembly, 2047ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 2047ES, SERIAL # 9801100 - UP
1	–	1	BEAM SUPPORT WELDMENT W/BEARINGS
2	–	1	BEAM, BF W/PINS
3	–	1	BEAM
4	HDW13175	11	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK
5	6701	10	RING, RETAINING, 2" SHAFT
6	16676	2	CYLINDER MOUNT
7	–	1	BEAM
8	–	1	BEAM
9	–	1	BEAM
10	–	1	BEAM
11	30815	1	MAINTENANCE LOCK WELDMENT
12	REF	1	LIFT CYLINDER (SEE END OF THIS SECTION)
13	13837	1	CAM, SPEED AND POTHOLE SWITCH
14	25429	8	SPACER, RUBBER

16 DENOTES LOCATION OF HDW13175

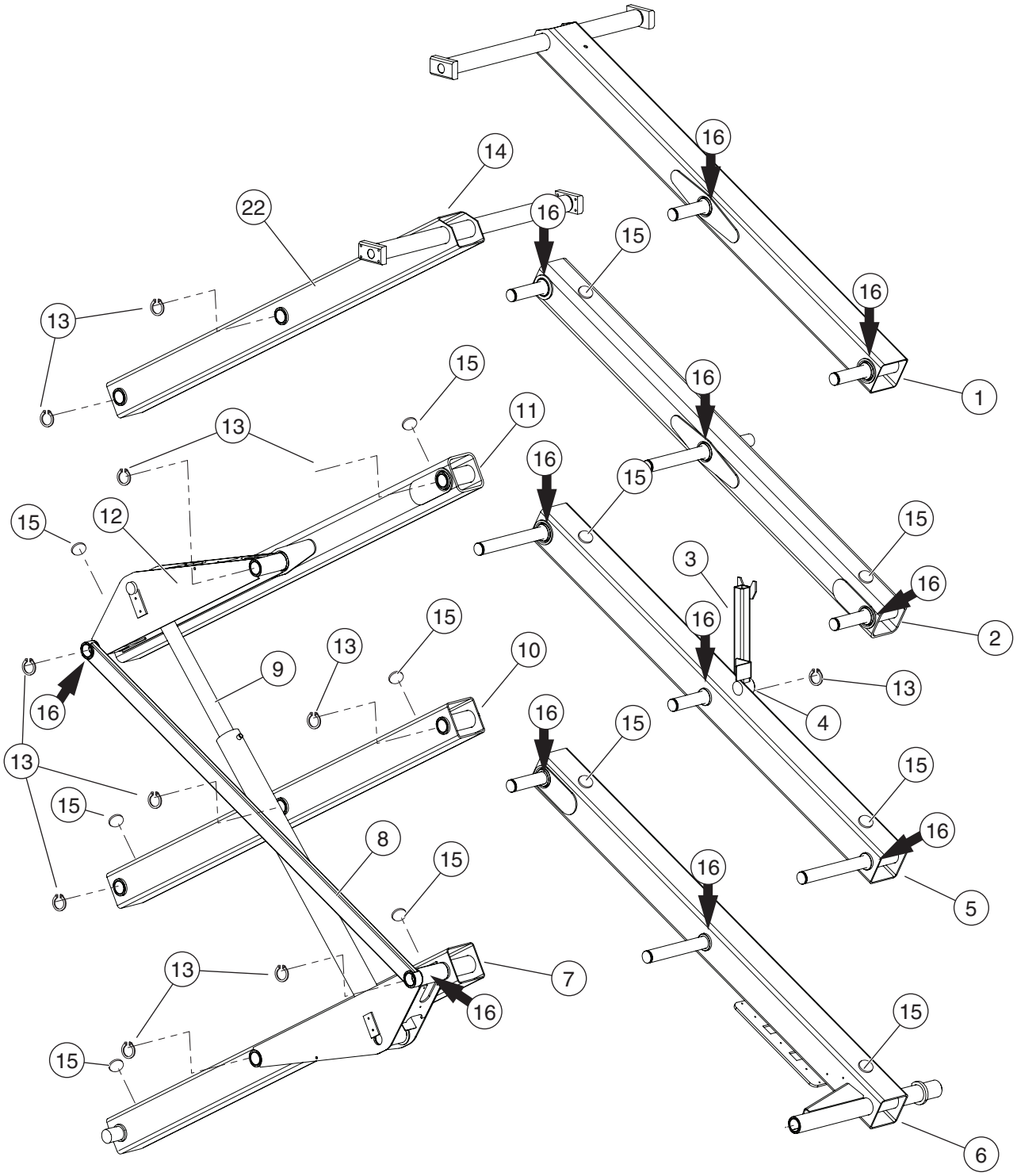
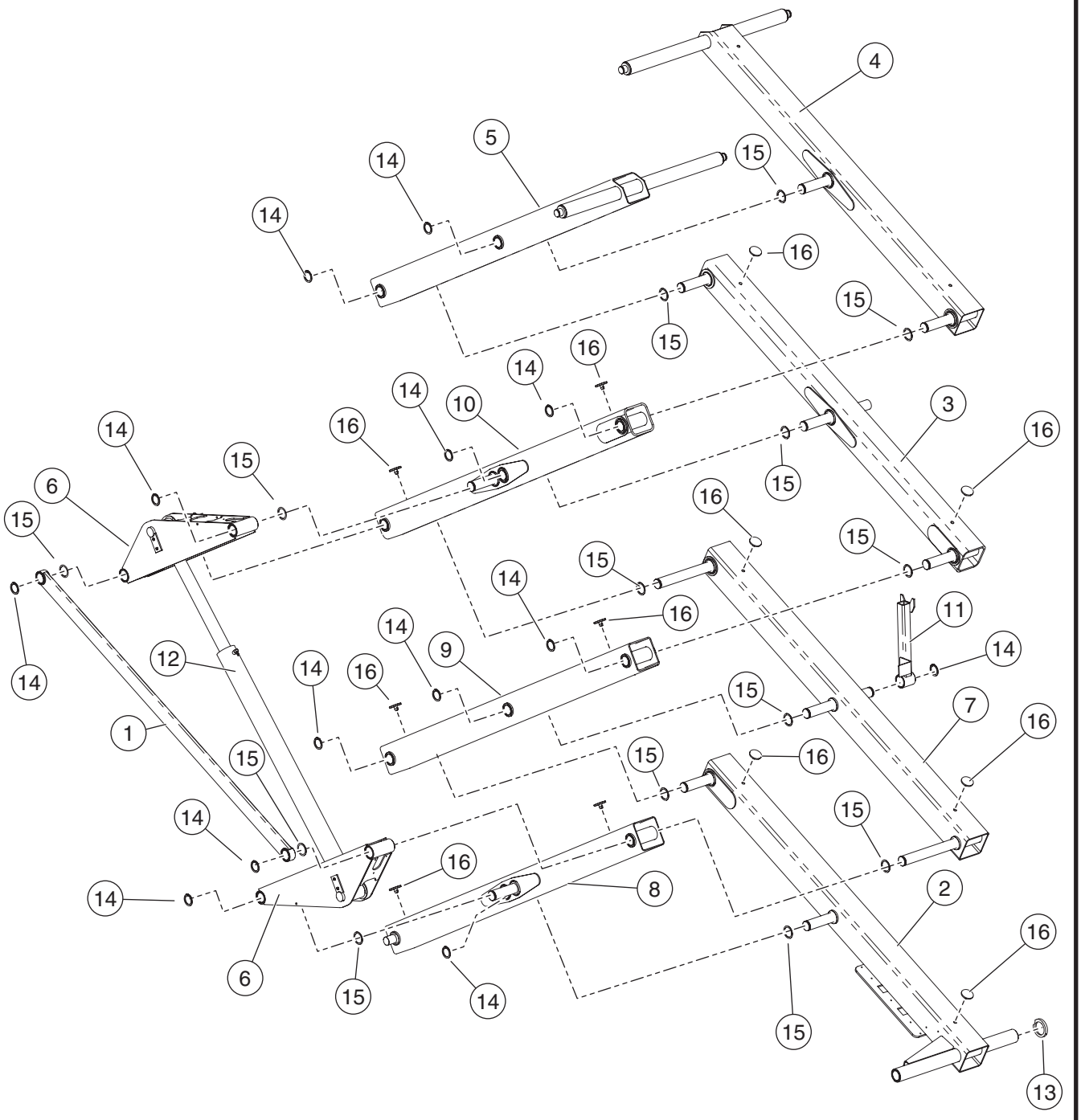


ILLUSTRATION No. ART_2277 R1

Serial # Up to 9901399

Scissor Assembly, 2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 2647ES, SERIAL # UP TO 9901399
1	16601	1	BEAM, WITH PINS
2	16599	1	BEAM, WITH PINS
3	30518	1	MAINTENANCE LOCK
4	8675	2	BEARING, 2 2/4" X 2" X 1 1/2" LG
5	16600	1	BEAM, WITH PINS
6	16598	1	BEAM, WITH PINS
7	16602	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
8	13931	1	SUPPORT, BEAM, 1X3
9	REF	1	CYLINDER, LIFT (SEE END OF THIS SECTION)
10	16603	1	BEAM, WITH BEARINGS
	6669	6	BEARING, 32DU32
11	16502	1	BEAM, WITH BEARINGS
	6669	6	BEARING, 32DU32
12	16512	2	CYLINDER MOUNT
13	6701	11	RING, RETAINING, 2" SHAFT
14	16605	1	BEAM, WITH PINS
15	25429	12	SPACER BLOCK
16	HDW13175	12	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK



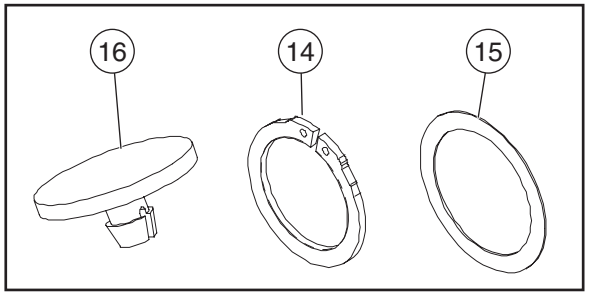
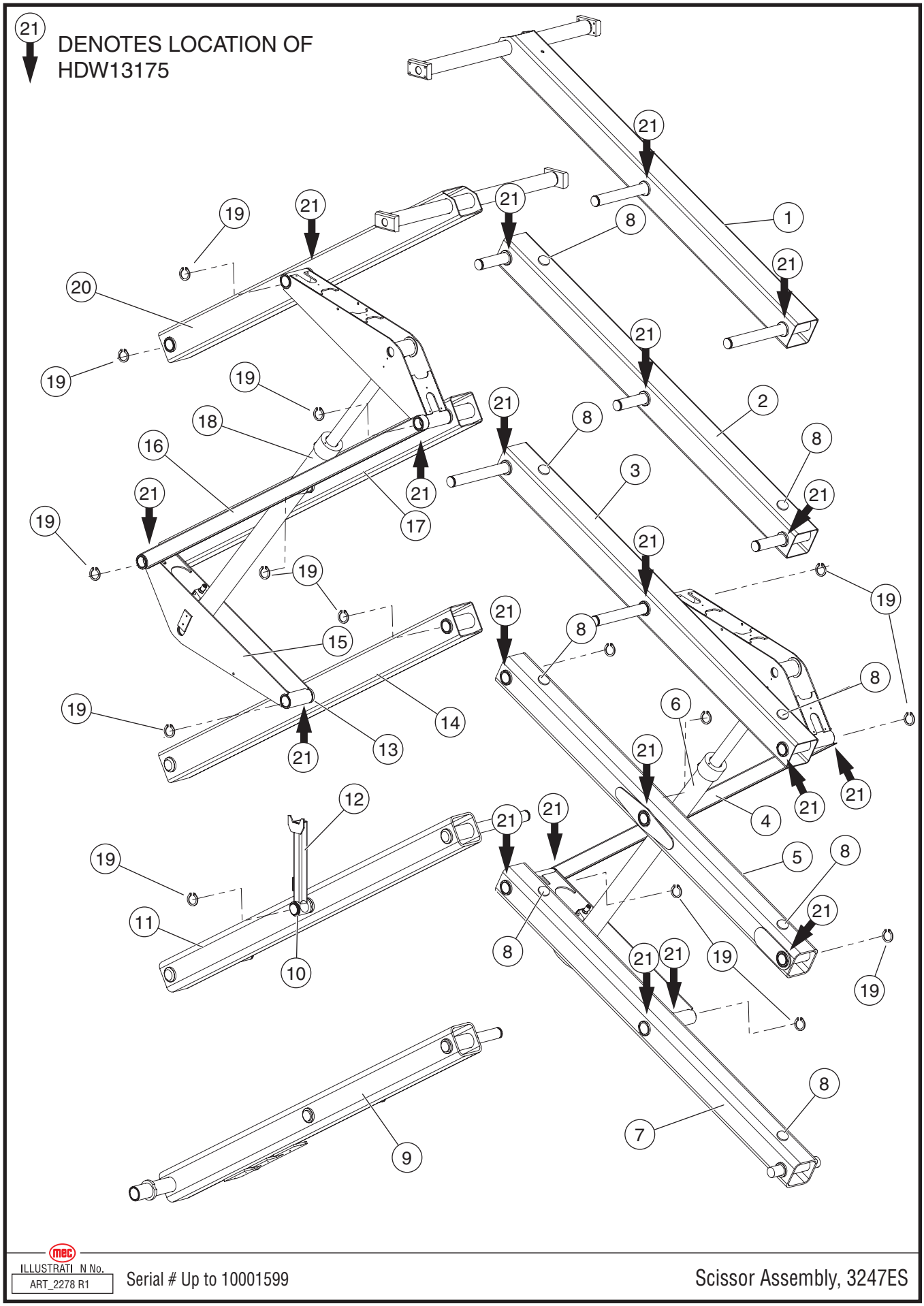


ILLUSTRATION No.
ART_2798

Serial # 9901400 - Up

Scissor Assembly, 2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 2647ES, SERIAL # 9901400 - UP
1	16585	1	BEAM SUPPORT WELDMENT W/BEARINGS
2	16695	1	BEAM, BF W/PINS
3	16696	1	BEAM, 6X6X.375
4	16601	1	BEAM, 6X6X.188, WELD, W/PINS
5	16605	1	BEAM, 6X6X.188, TS W/BEARINGS
6	16676	2	CYLINDER MOUNT
7	16600	1	BEAM, 6X6X,250, WELD, W/PINS
8	16692	1	BEAM, 6X6X.188
9	16603	1	BEAM. 6X6X.250, WELD, W/PINS
10	16693	1	BEAM, 6X6X.375
11	30518	1	MAINTENANCE LOCK WELDMENT
12	REF	1	LIFT CYLINDER (SEE END OF THIS SECTION)
13	13837	1	CAM, SPEED AND POTHOLE SWITCH
14	6701	13	RING, RETAINING, 2" SHAFT
15	HDW13175	14	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK
16	25429	12	SPACER BLOCK



ILLUSTRATI N No.
ART_2278 R1

Serial # Up to 10001599

Scissor Assembly, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 3247ES, SERIAL # UP TO 10001599
1	16506	1	BEAM, WITH PINS
2	16505	1	BEAM, WITH PINS
3	16503	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
4	13931	1	SUPPORT, BEAM, 1X3, LOWER
5	16502	1	BEAM, WITH BEARINGS
	6669	6	BEARING, 32DU32
6	REF	1	CYLINDER, LIFT
7	16500	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
8	25429	16	SPACER BLOCK
9	16507	1	BEAM, WITH PINS
10	8675	2	BEARING, 2 1/4" X 2" X 1 1/2"
11	16508	1	BEAM, WITH PINS
12	30518	1	MAINTENANCE LOCK
13	30407	1	PIN, 2"
14	16509	1	BEAM, WITH PINS
15	16512	4	CYLINDER MOUNT
16	16585	1	SUPPORT, BEAM, 1X3, UPPER
17	16510	1	BEAM, WITH BEARINGS
	6669	6	BEARING, 32DU32
18	REF	1	CYLINDER, LIFT
19	6701	15	RING, RETAINING, 2" SHAFT
20	16511	1	BEAM, WITH BEARINGS
	6669	4	BEARING, 32DU32
21	HDW13175	26	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK

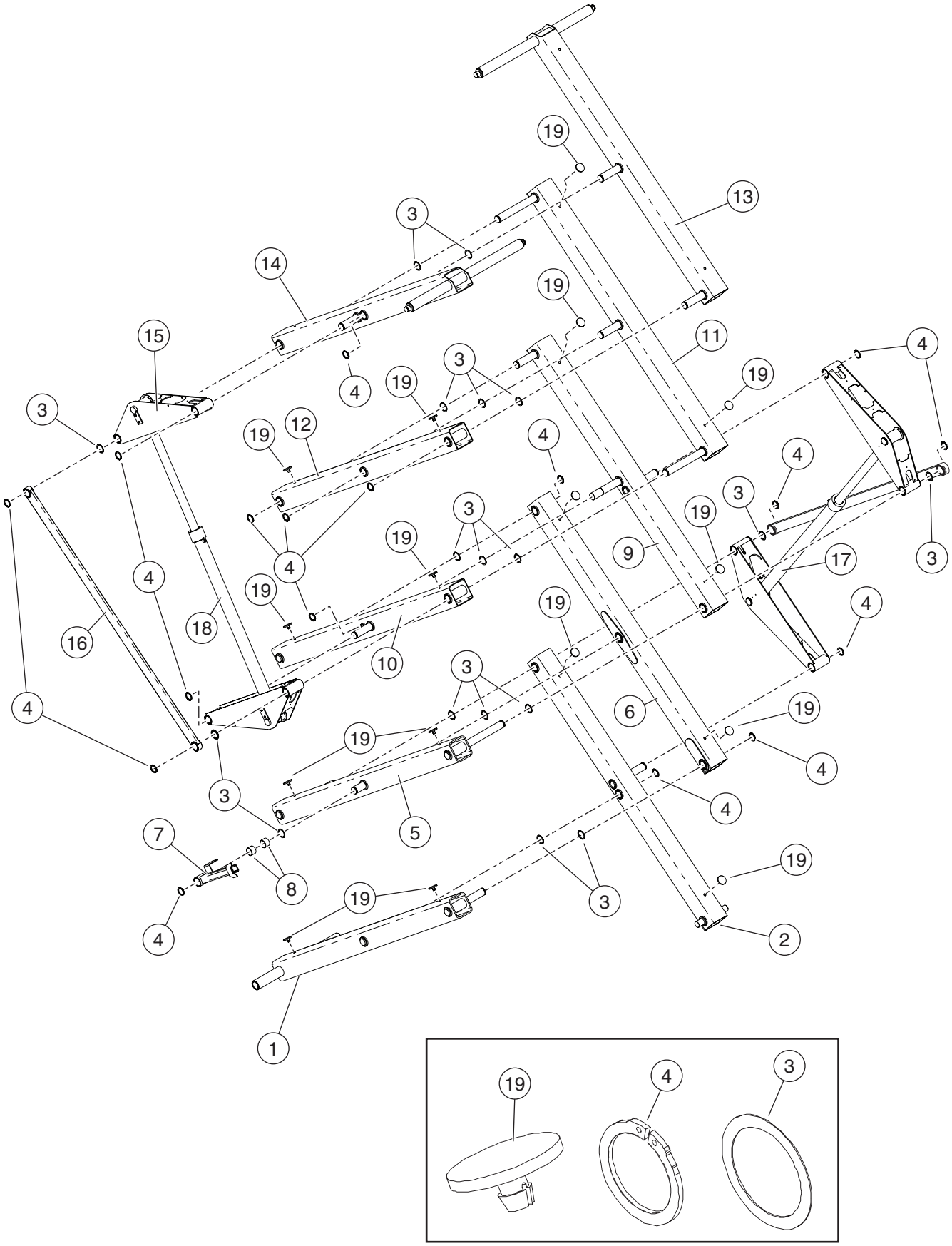
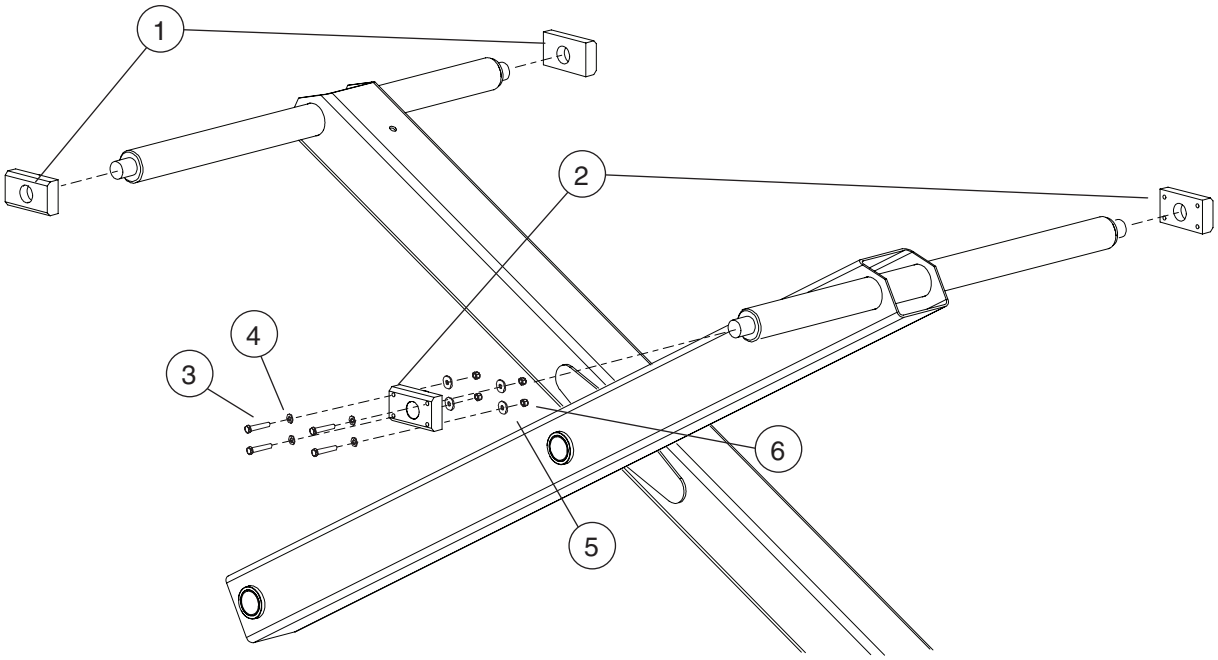


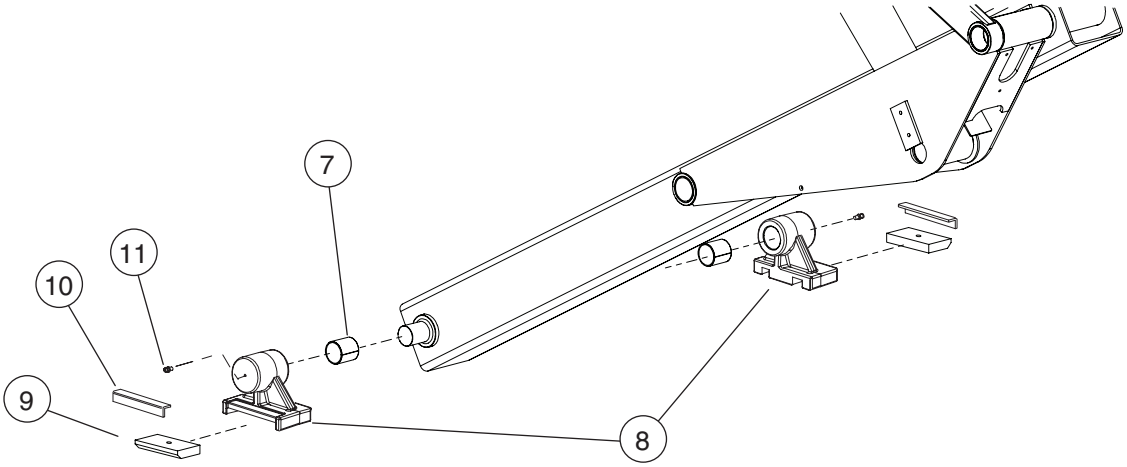
ILLUSTRATION No.
ART_2799

Serial # Up to 10001600

Scissor Assembly, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			SCISSOR ASSEMBLY - 3247ES, SERIAL # 10001600 - UP
1	16637	1	BEAM, 6X6X.375
2	16670	1	BEAM, 6X6X.375
3	HDW13175	26	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK
4	6701	18	RING, RETAINING, 2" SHAFT
5	16508	1	BEAM, 6X6X..375, WELD, W/PINS
6	16502	1	BEAM, 6X6X.375 W/BEARINGS
7	30518	1	MAINTENANCE LOCK WELDMENT
8	8675	2	BEARING, 2.25 OD X 2 ID X 1.5 LG
9	16671	1	BEAM, 6X6X.188, WELD
10	16674	1	BEAM, 6X6X.188
11	16682	1	BEAM, 6X6X.188
12	16510	1	BEAM, 6X6X.188, WELD, W/BEARINGS
13	16672	1	BEAM, 6X6X.188
14	16675	1	BEAM, 6X6X.188
15	16676	4	CYLINDER MOUNT
16	16585	2	BEAM SUPPORT WELDMENT W/BEARINGS
17	REF	1	LOWER LIFT CYLINDER (SEE END OF THIS SECTION)
18	REF	1	UPPER LIFT CYLINDER (SEE END OF THIS SECTION)
19	25429	16	SPACER BLOCK





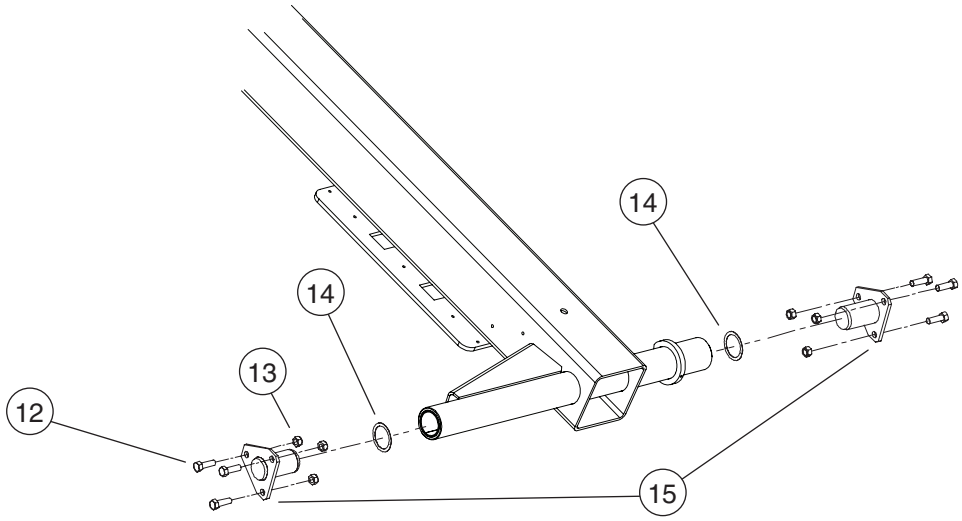


ILLUSTRATION No.
ART_2264 R1

Scissor Mounting Detail, X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			SLIDE BLOCK ASSEMBLY
1	14488	2	BLOCK, SLIDE PLATFORM
2	13777	2	BLOCK, FIXED PLATFORM
3	HDW8303	8	SCREW, 5/16" - 18, 2" LG
4	HDW5217	8	WASHER, FLAT
5	HDW8294	8	WASHER, FLAT
6	HDW8304	8	NUT, 5/16" - 18
7	7160	2	BEARING, 28DU32
8	40306	2	SLIDE BLOCK WITH BEARINGS REPLACES 30699: SLIDE BLOCK WITH BEARINGS
9	17244	2	WEAR PAD REPLACES 9587: WEAR PAD, AND 8785: TAPE
10	90235	2	WEAR PAD, ANGLE, SLIDE BLOCK TOP
11	5432	2	GREASE FITTING
12	HDW8283	6	SCREW, 1/2-13, 1.5 LG, GR 8
13	HDW8457	6	NUT, LOCK, 1/2-13
14	HDW13175	2	WASHER, NYLON, 2.06 ID, 2.62 OD, .030 THK
15	13101	2	PIN WELDMENT STATIONARY MOUNT

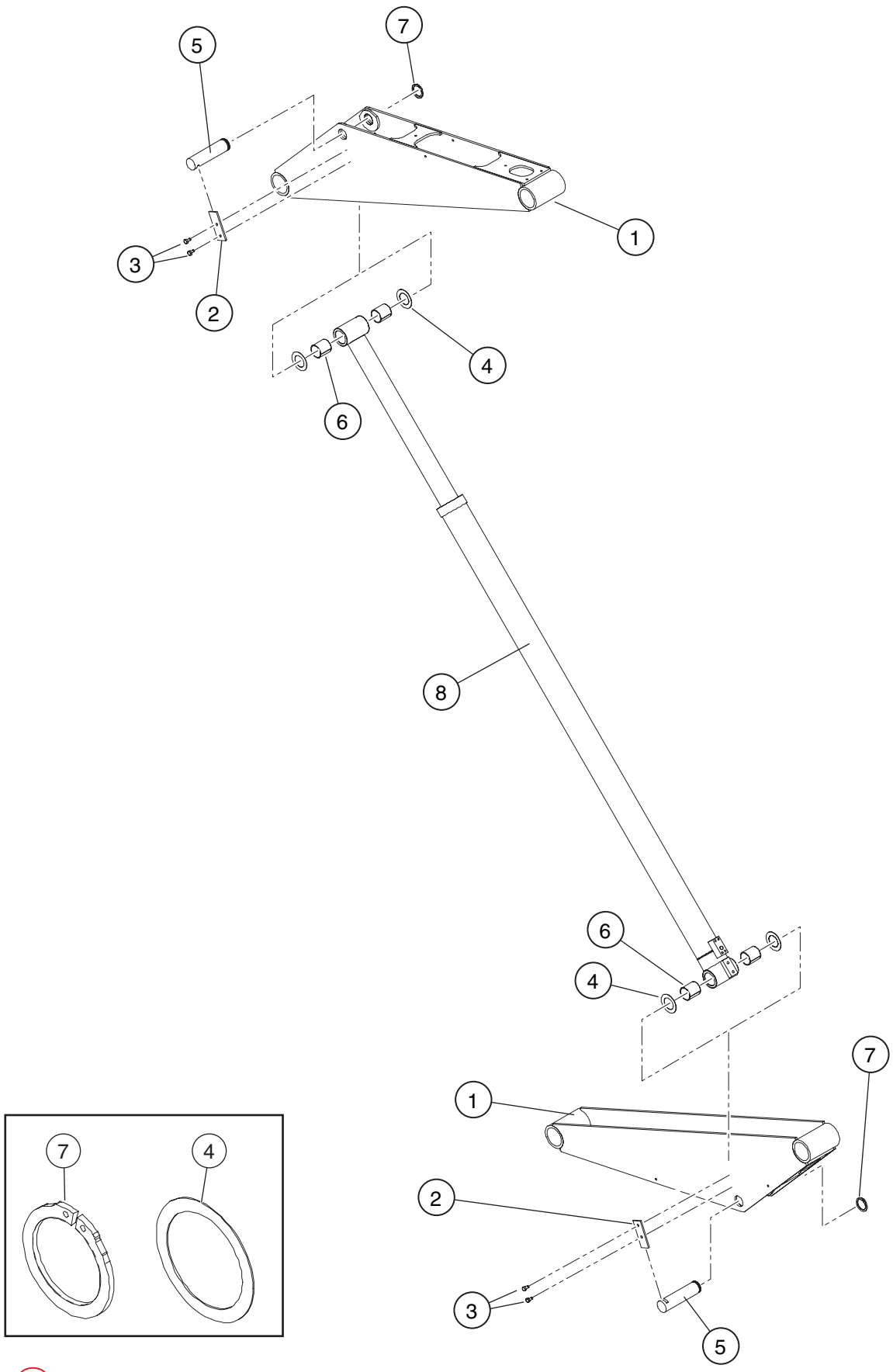


ILLUSTRATION No.
ART_2265 R1

Cylinder Mounting Detail

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	6875	2	RETAINING RING, 1.375 DIA.
8	REF	1	LIFT CYLINDER (SEE FOLLOWING PAGES)

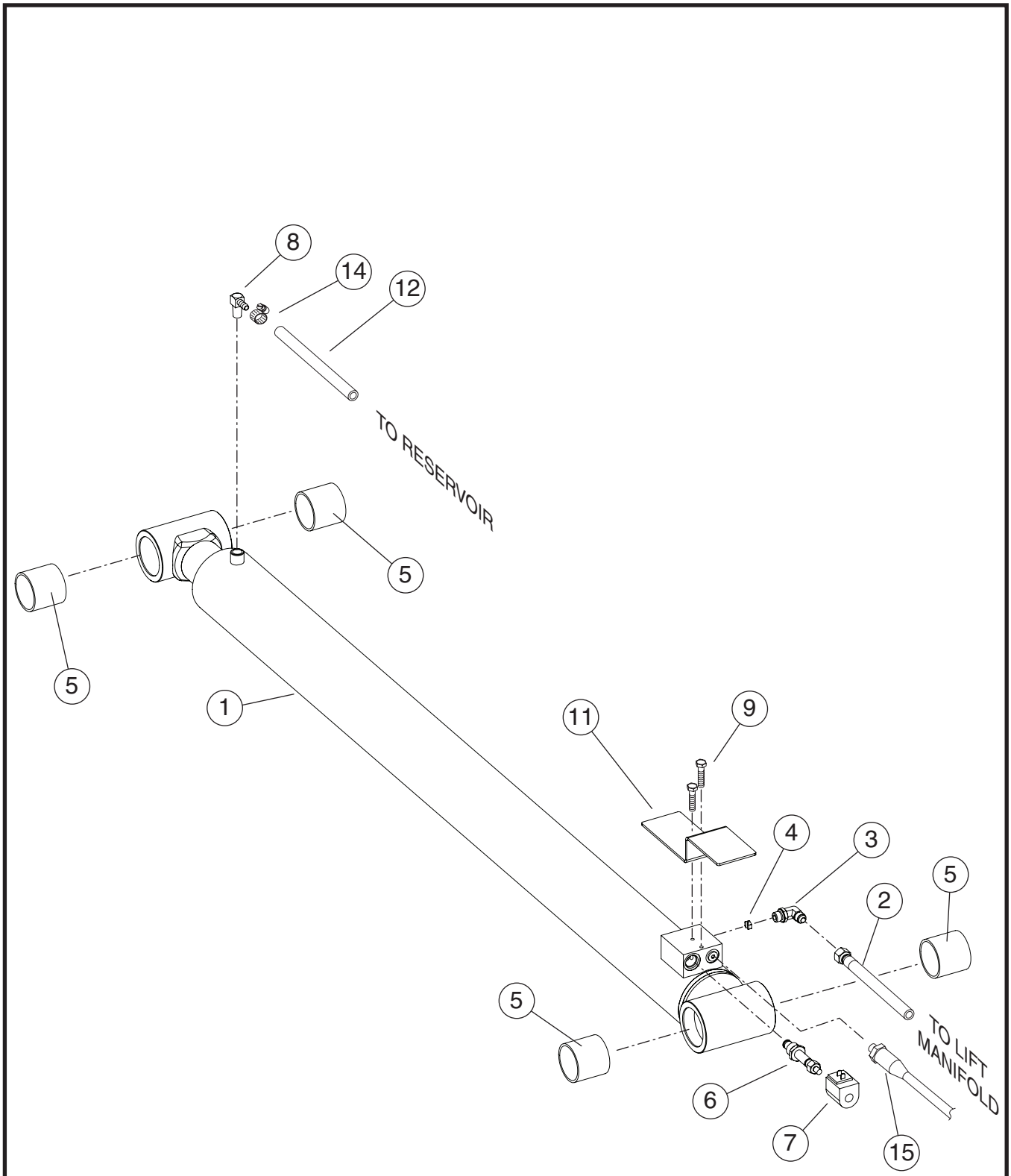


ILLUSTRATION No.
ART_2279

90834 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER - 2047ES / 2647ES, EARLY MODELS
			2047ES - SERIAL #9801000 TO # 9801099 **2647ES - SERIAL #9901000 TO # 9901199**
1	90834	1	CYLINDER, LIFT
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90361	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	90815	1	VALVE, 2 WAY, N.C. W/MANUAL LOCK
7	90816	1	COIL, 24 VOLT, DOUBLE SPADE W/DIODE
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90986	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	21 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90845	1	PRESSURE SENSOR, 3000 PSI (OPTION)
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

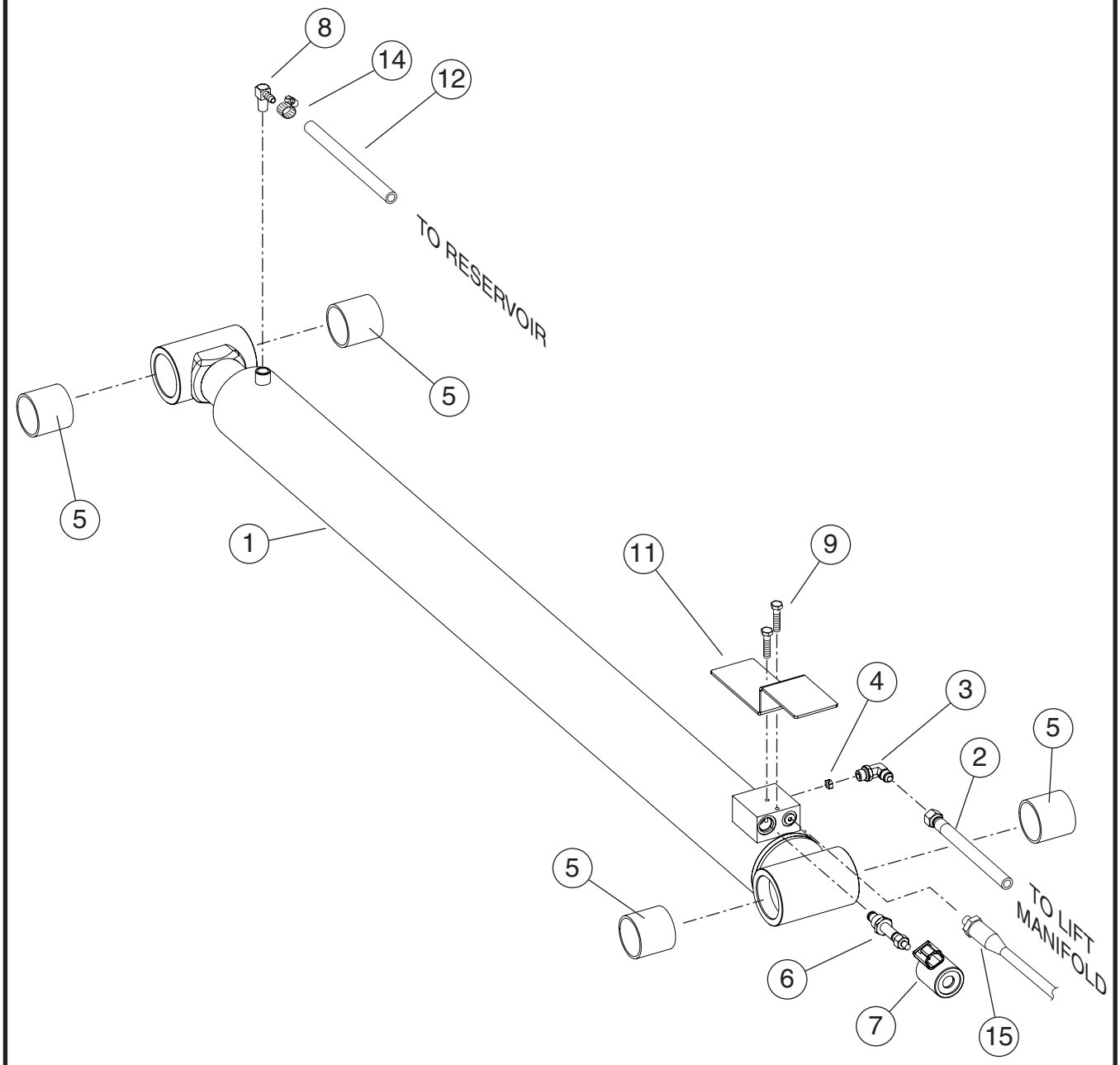


ILLUSTRATION No.
ART_2280

91052 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			LIFT CYLINDER - 2047ES / 2647ES, LATE MODELS
			2047ES - SERIAL # 9801100 - 9801024 **2647ES - SERIAL # 9901200 - 9901245**
1	91052	1	CYLINDER, LIFT
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90361	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	91051	1	VALVE, 2 WAY, N.C. W/MANUAL LOCK
7	91001	1	COIL
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90986	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	21 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90845	1	PRESSURE SENSOR, 3000 PSI
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

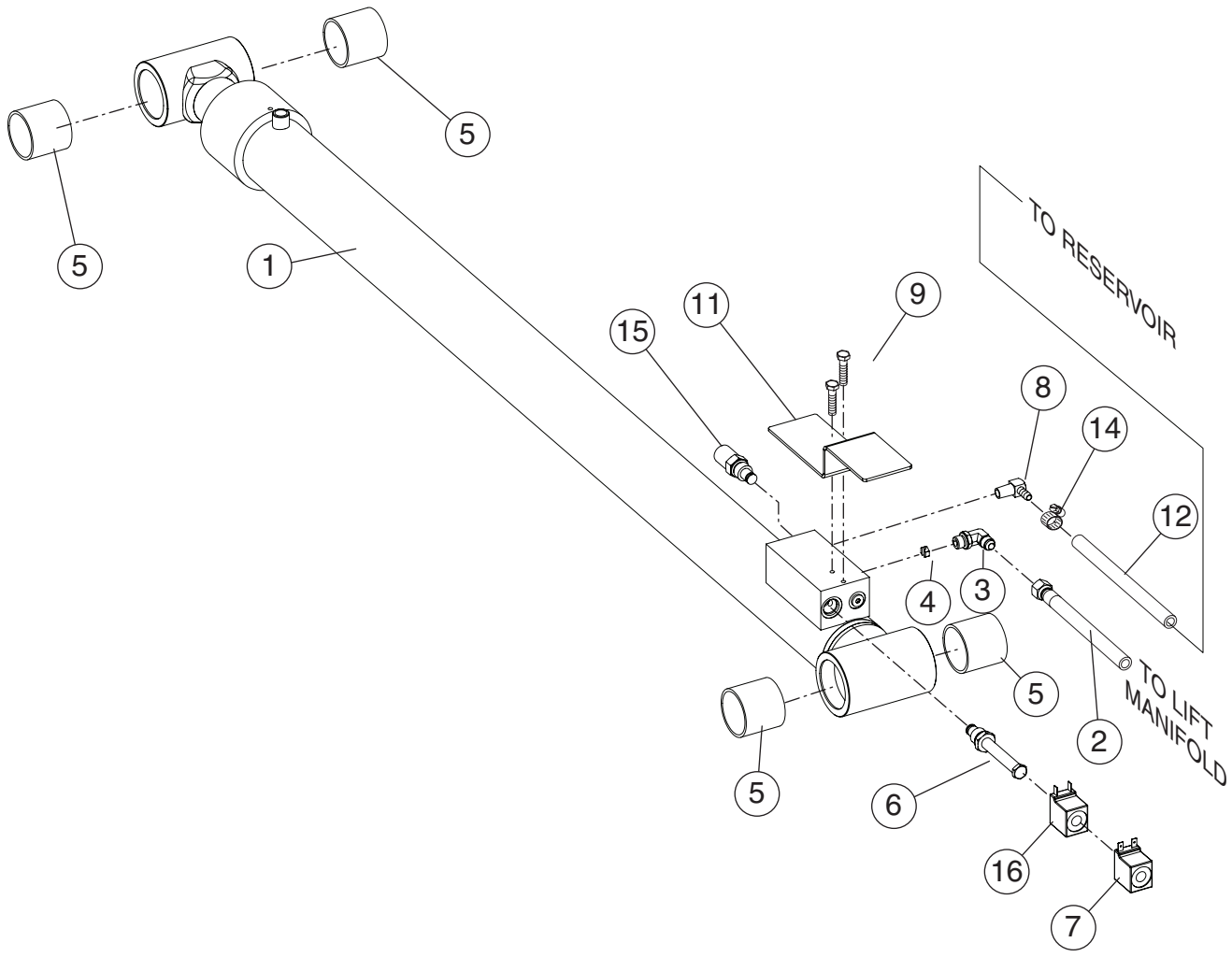


ILLUSTRATION No.
ART_2281

90835 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			UPPER LIFT CYLINDER - 3247ES, EARLY MODELS
			SERIAL # 10001000 # 10001199
1	90835	1	CYLINDER, LIFT
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90439	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	90968	1	VALVE, 2 WAY, N.C.
7	90957	1	COIL, 24 VOLT, DOUBLE SPADE W/DIODE
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90987	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	40 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90969	1	RELIEF VALVE
16	90958	1	COIL, 12 VOLT, DOUBLE SPADE W/DIODE
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

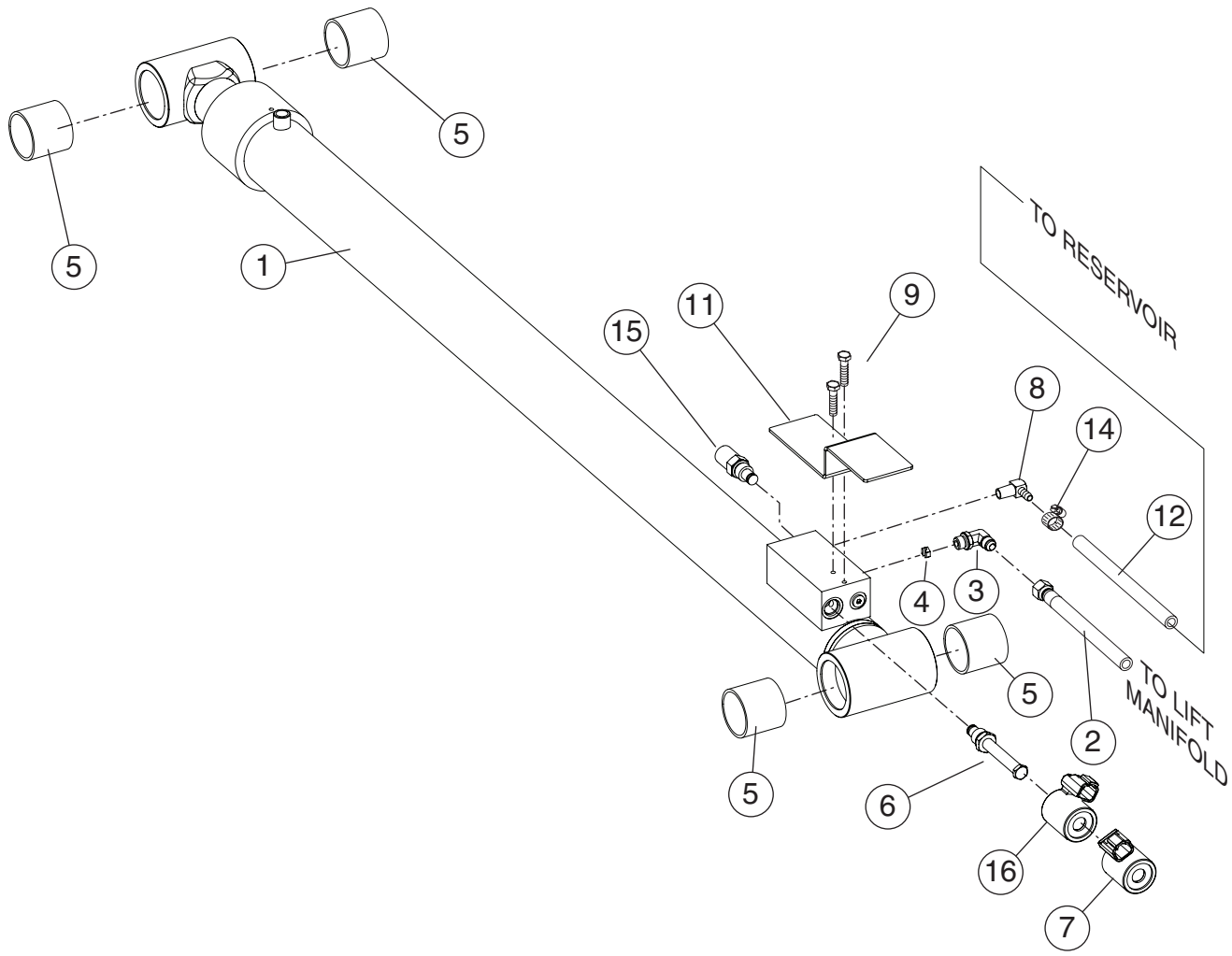


ILLUSTRATION No.
ART_2282

91053 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			UPPER LIFT CYLINDER - 3247ES, LATE MODELS
			SERIAL # 10001200 UP
1	91053	1	CYLINDER, LIFT
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90439	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	90968	1	VALVE, 2 WAY, N.C.
7	91048	1	COIL, 20 VOLT **EXCEPT SERIAL # 10001211 - #10001217**
7	90957	1	COIL, 24 VOLT **SERIAL # 10001211 - #10001217**
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90987	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	40 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90969	1	RELIEF VALVE
16	91049	1	COIL, 10 VOLT **EXCEPT SERIAL # 10001211 - #10001217**
16	90958	1	COIL, 12 VOLT **SERIAL # 10001211 - #10001217**
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

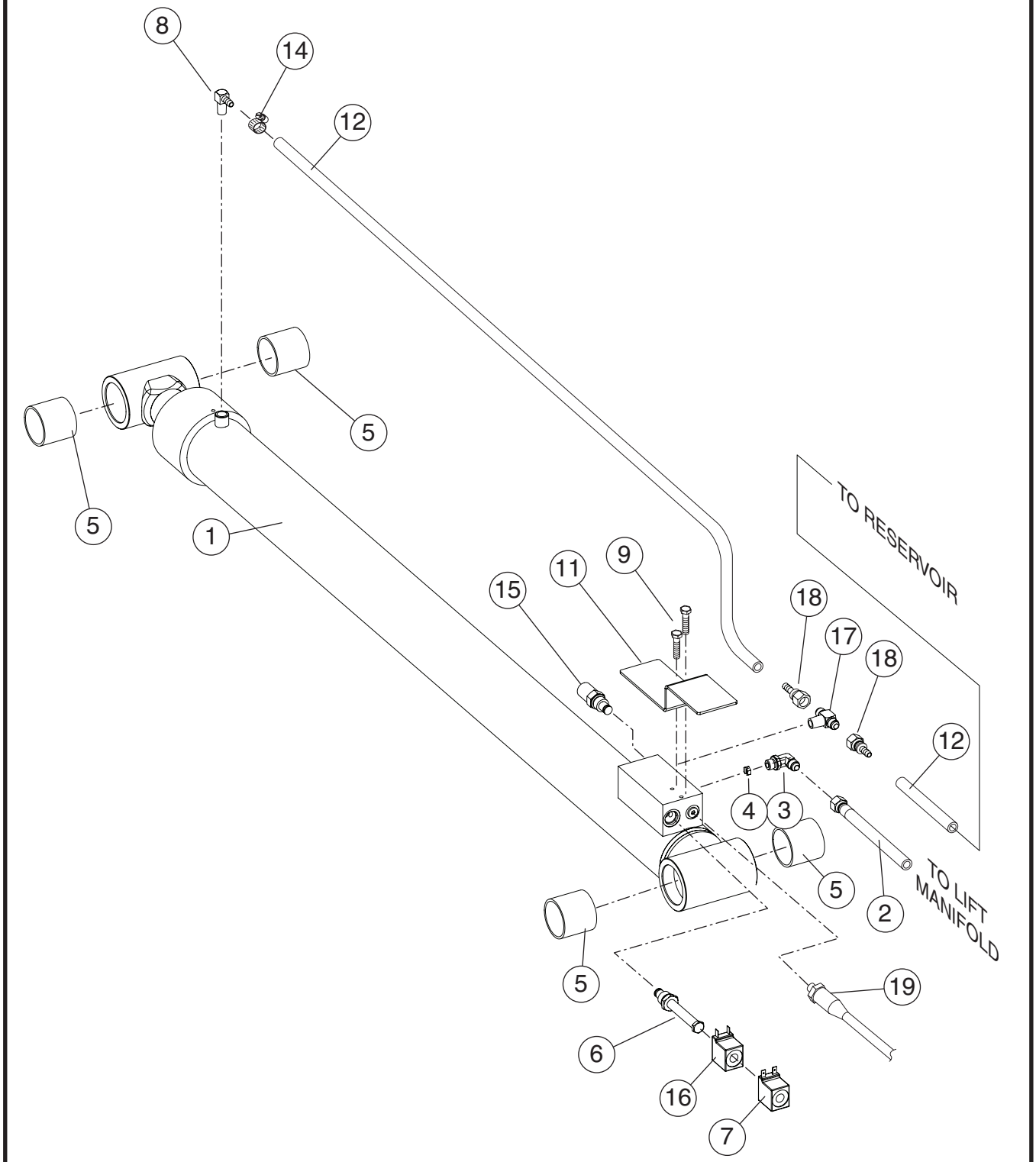


ILLUSTRATION No.
ART_2283

90836 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			LOWER LIFT CYLINDER - 3247ES, EARLY MODELS
			3247ES - SERIAL # 10001000 # 10001199
1	90836	1	CYLINDER, LIFT (3247ES - LOWER)
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90361	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	90968	1	VALVE, 2 WAY, N.C.
7	90957	1	COIL, 24 VOLT, DOUBLE SPADE W/DIODE
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90988	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	21 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90969	1	RELIEF VALVE
16	90958	1	COIL, 12 VOLT, DOUBLE SPADE W/DIODE
17	HDW90943	1	FITTING, TEE ADAPTOR
18	HDW90945	2	FITTING, FEMALE SWIVEL
19	90845	1	PRESSURE SENSOR, 3000 PSI
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

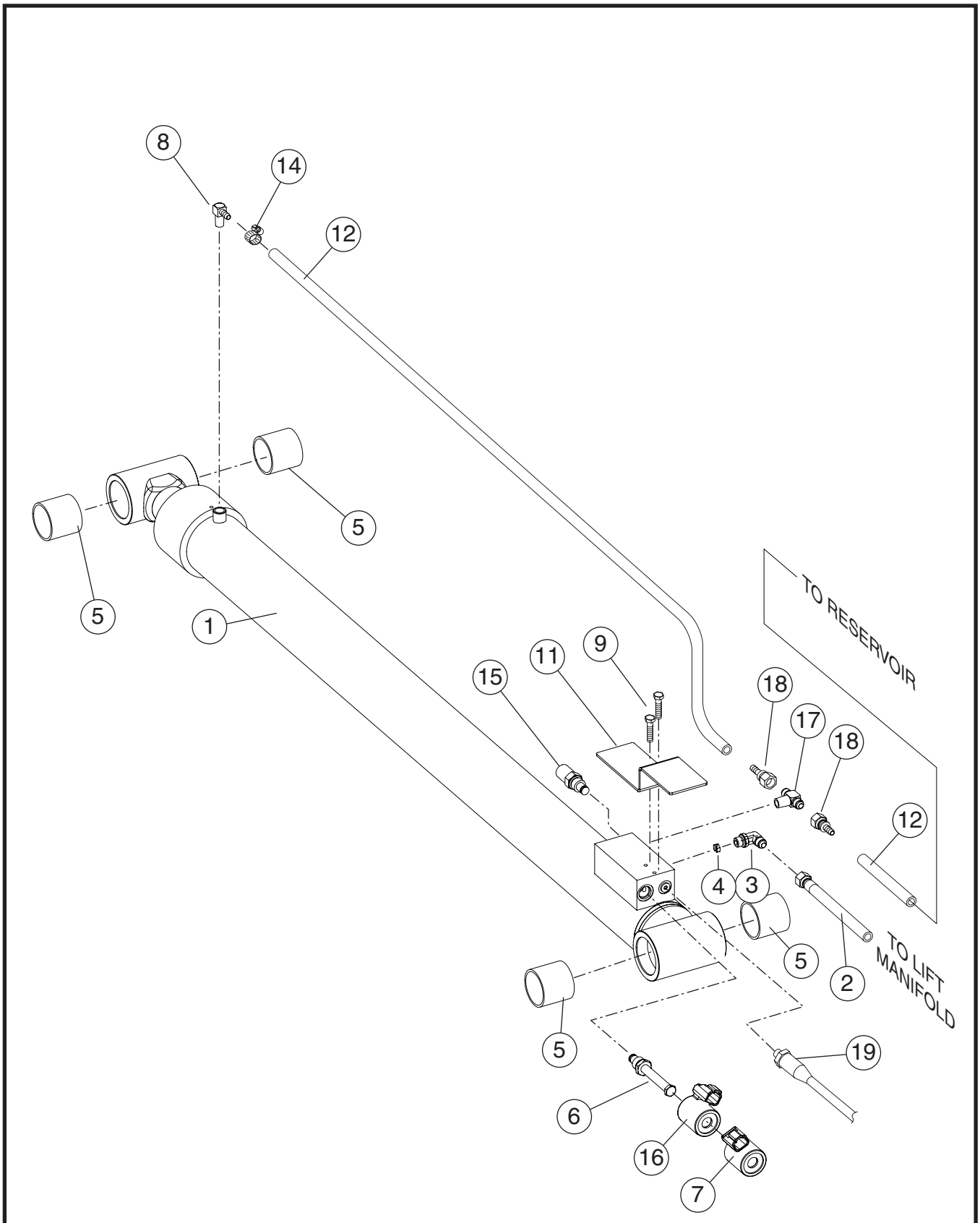


ILLUSTRATION No.
ART_2284

91054 Hydraulic Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
			LOWER LIFT CYLINDER - 3247ES, LATE MODELS
			3247ES - SERIAL # 10001200 UP
1	91054	1	CYLINDER, LIFT (3247ES - LOWER)
2	REF	1	HOSE ASSY (SEE SECTION D)
3	HDW7601	1	FITTING, ELBOW ADAPTOR
4	90361	1	ORIFICE
5	90993	4	BEARING, BRONZE, 2" ID X 2" LG
6	90968	1	VALVE, 2 WAY, N.C.
7	91048	1	COIL, 20 VOLT **EXCEPT SERIAL # 10001211 - #10001217**
7	90957	1	COIL, 24 VOLT **SERIAL # 10001211 - #10001217**
8	HDW6727	1	FITTING, PIPE 90°, MALE BARB
9	HDW8152	2	SCREW, 1/4" - 20 X 3/4" LG
10	90988	1	KIT, SEAL-LIFT CYLINDER (SERVICE) (NOT SHOWN)
11	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
12	REF	21 FT	HOSE, RETURN LINE (SEE SECTION D)
14	7788	1	CLAMP, HOSE
15	90969	1	RELIEF VALVE
16	91049	1	COIL, 10 VOLT **EXCEPT SERIAL # 10001211 - #10001217**
16	90958	1	COIL, 12 VOLT **SERIAL # 10001211 - #10001217**
17	HDW90943	1	FITTING, TEE ADAPTOR
18	HDW90945	2	FITTING, FEMALE SWIVEL
19	90845	1	PRESSURE SENSOR, 3000 PSI
—	REF	1	HARNESS, WIRE DOWN, VALVE (SEE PARTS SECTION A)

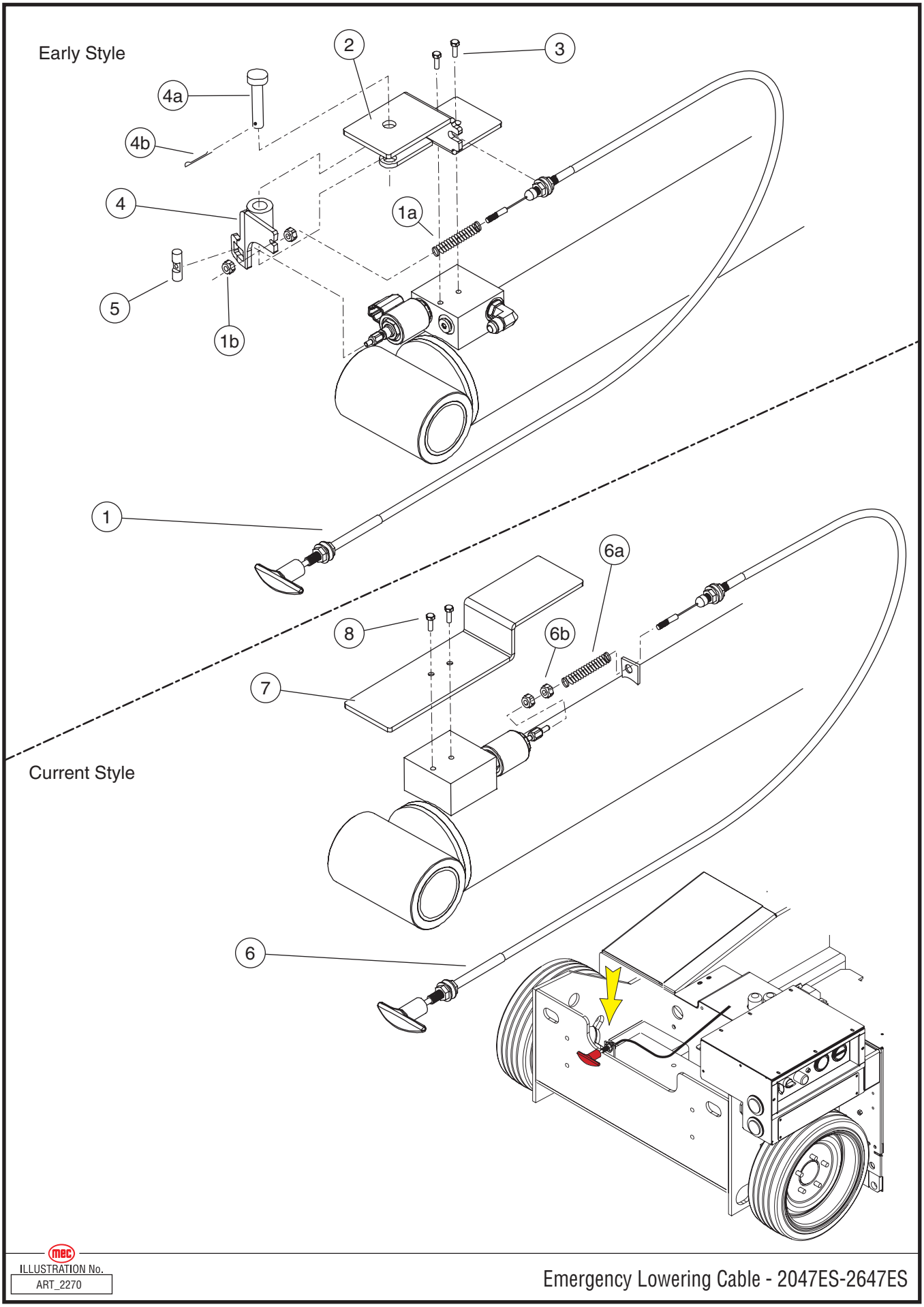
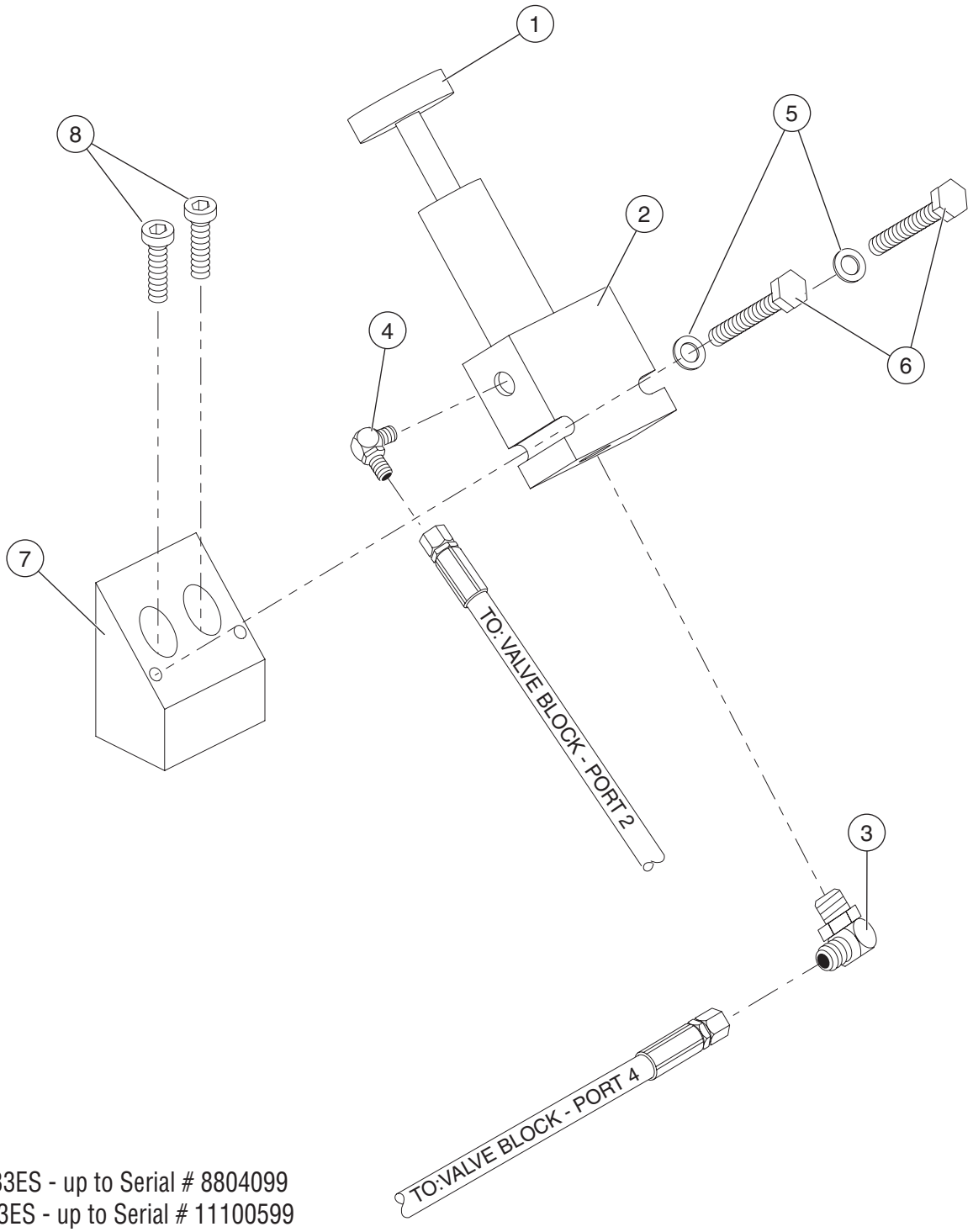


ILLUSTRATION No.
ART_2270

Emergency Lowering Cable - 2047ES-2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			EMERGENCY LOWERING CABLE
			2047ES - SERIAL # 9801000 - #9801024
			2647ES - SERIAL # 9901000 - #9901245
			3247ES - NOT USED
1	91104	1	CABLE, 80 IN (2047ES)
1	91082	1	CABLE, 100 IN (2647ES)
1a	—	1	SPRING
1b	—	1	CAP LUG
2	16117	1	WELDMENT, CABLE MOUNT ATTACHMENT
3	8152	2	BOLT
4	16121	1	BELL CRANK
4a	—	1	CLEVIS PIN
4b	—	1	COTTER PIN
5	16134	1	E-DOWN PIVOT NUT
			2047ES - SERIAL # 9801025 UP
			2647ES - SERIAL # 9901246 UP
			3247ES - NOT USED
6	91082	1	CABLE, 100 IN (2047ES)
6	91182	1	CABLE, 144 IN (2647ES)
6a	—	1	SPRING
6b	—	1	CAP LUG
7	16062	1	BRACKET, LIFT CYLINDER VALVE GUARD
8	8152	2	BOLT

SECTION D:
HYDRAULICS



2033ES - up to Serial # 8804099
2633ES - up to Serial # 11100599
2047ES - up to Serial # 9801100
2647ES - up to Serial # 9901200
3247ES - NOT USED

ILLUSTRATION No.
ART_2291

Brake Release Pump, 2033ES-2633SE and 2047ES-2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			BRAKE RELEASE MANIFOLD, EARLY MODELS
			NOT USED ON LATE MODELS
			2047ES - SERIAL #9801000 - # 9801099
			2647ES - SERIAL # 9901000 - # 9901199
			3247ES - SERIAL # 10001000 - # 10001199
	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	HDW7601	1	FITTING, 90°, MALE 3/8", 3/8" O-RING MALE
5	HDW5217	2	WASHER
6	90746	2	SCREW, 5/16-18, 1.5" LG
7	16000	1	MOUNT, BRAKE RELEASE HAND PUMP
8	HDW6831	2	SCREW, 1/4-20, 2" LG
			SEE HYDRAULIC HOSES, THIS SECTION

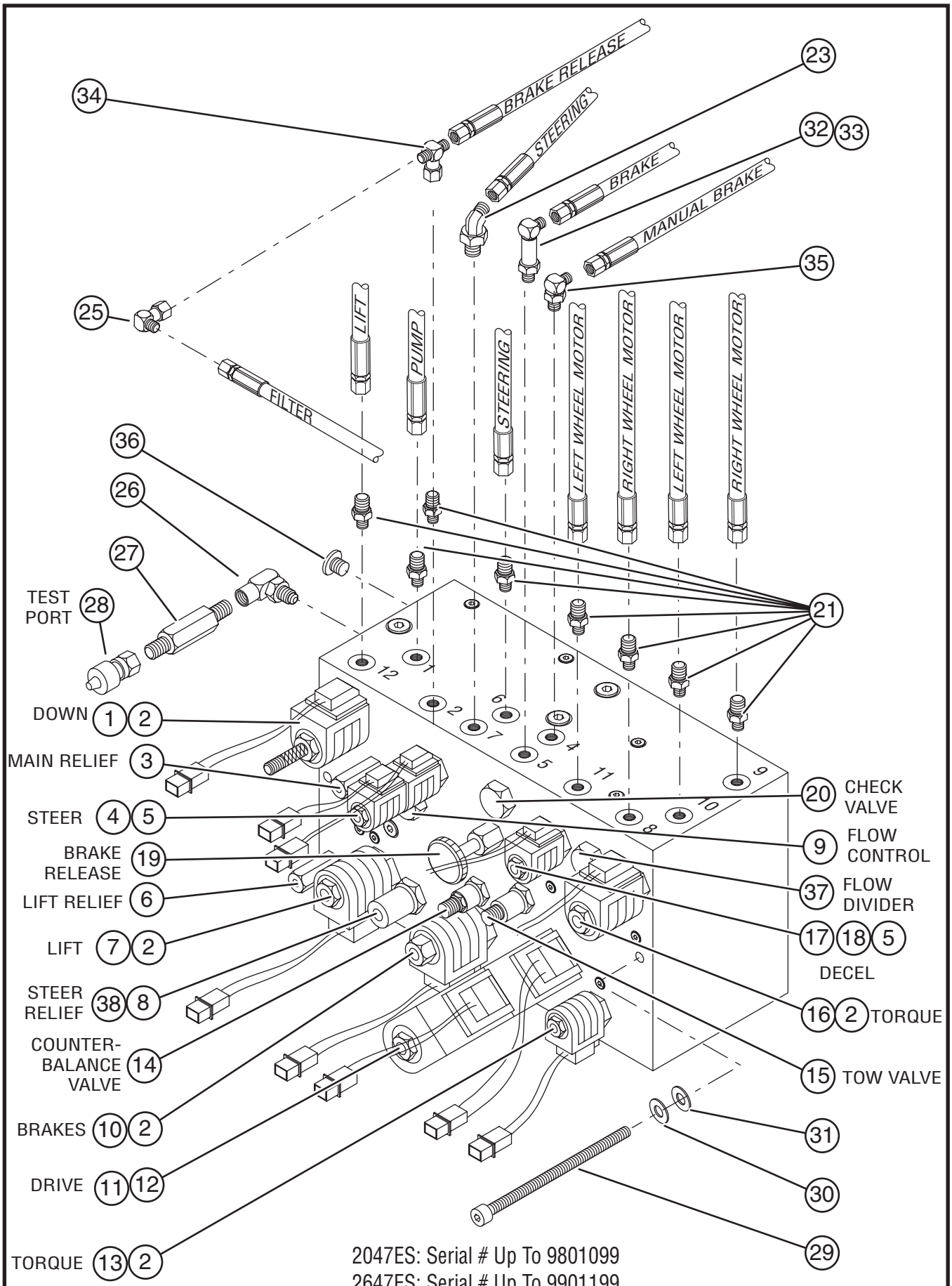


ILLUSTRATION No.
ART_2297

90667, Hydraulic Manifold Assembly, 2047ES - 2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			MAIN MANIFOLD ASSEMBLY, 2047ES-2647ES, EARLY MODELS
			2047ES - SERIAL #9801000 - # 9801099 **2647ES - SERIAL #9901000 - # 9901199**
	90667		MAIN MANIFOLD ASSEMBLY
1	8343	1	VALVE, SPOOL, POP, 2 WAY, N.C. W/MAN OVERRIDE
2	9996	5	COIL, 24 VOLT (2047ES, 2647ES)
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
			(CONTINUED ON NEXT PAGE)

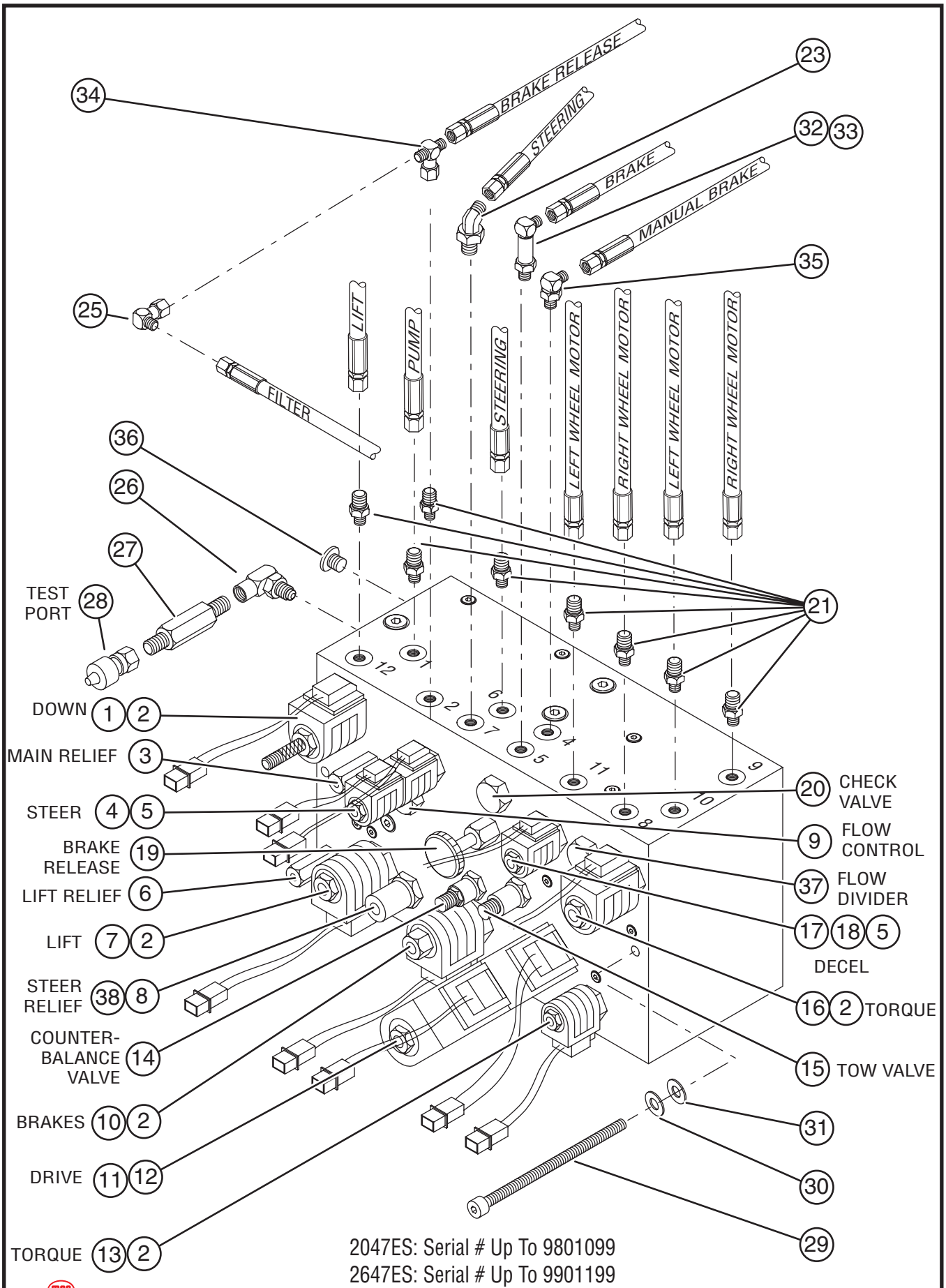
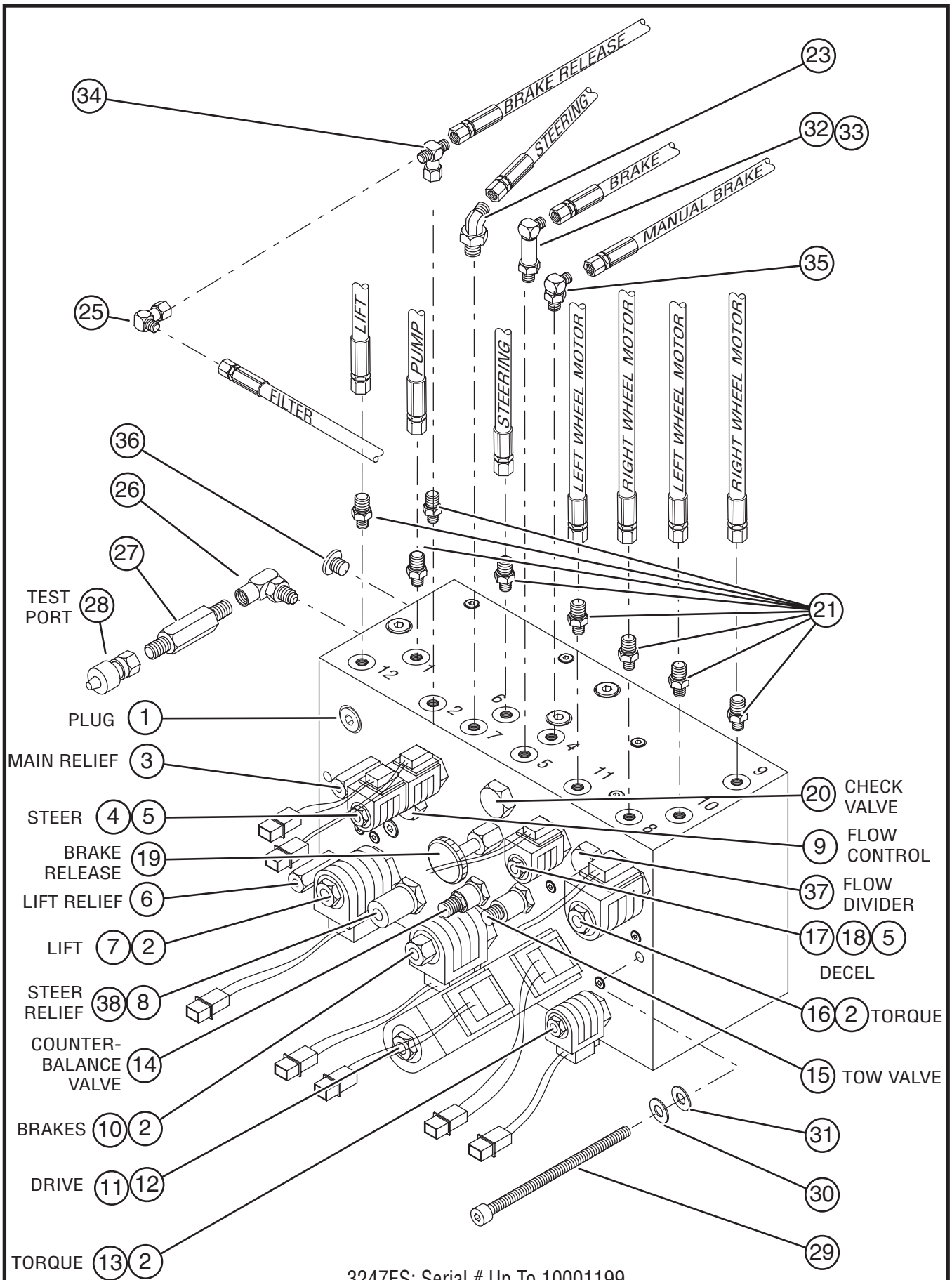


ILLUSTRATION No.
ART_2297

90667, Hydraulic Manifold Assembly, 2047ES - 2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			MAIN MANIFOLD ASSEMBLY, 2047ES-2647ES, EARLY MODELS (CONTINUED)
			2047ES - SERIAL #TO # 9801099 **2647ES - SERIAL #TO # 9901199**
21	HDW7389	8	ADAPTER, MALE 3/8", MALE 3/8" O-RING
23	HDW90364	1	FITTING, 45° 6MB-6MJ
25	HDW90299	1	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
37	91014	1	FLOW DIVIDER
38	9971	3	RELIEF VALVE TAMPER PROOF CAP
	REF		SEE HYDRAULIC HOSES, THIS SECTION

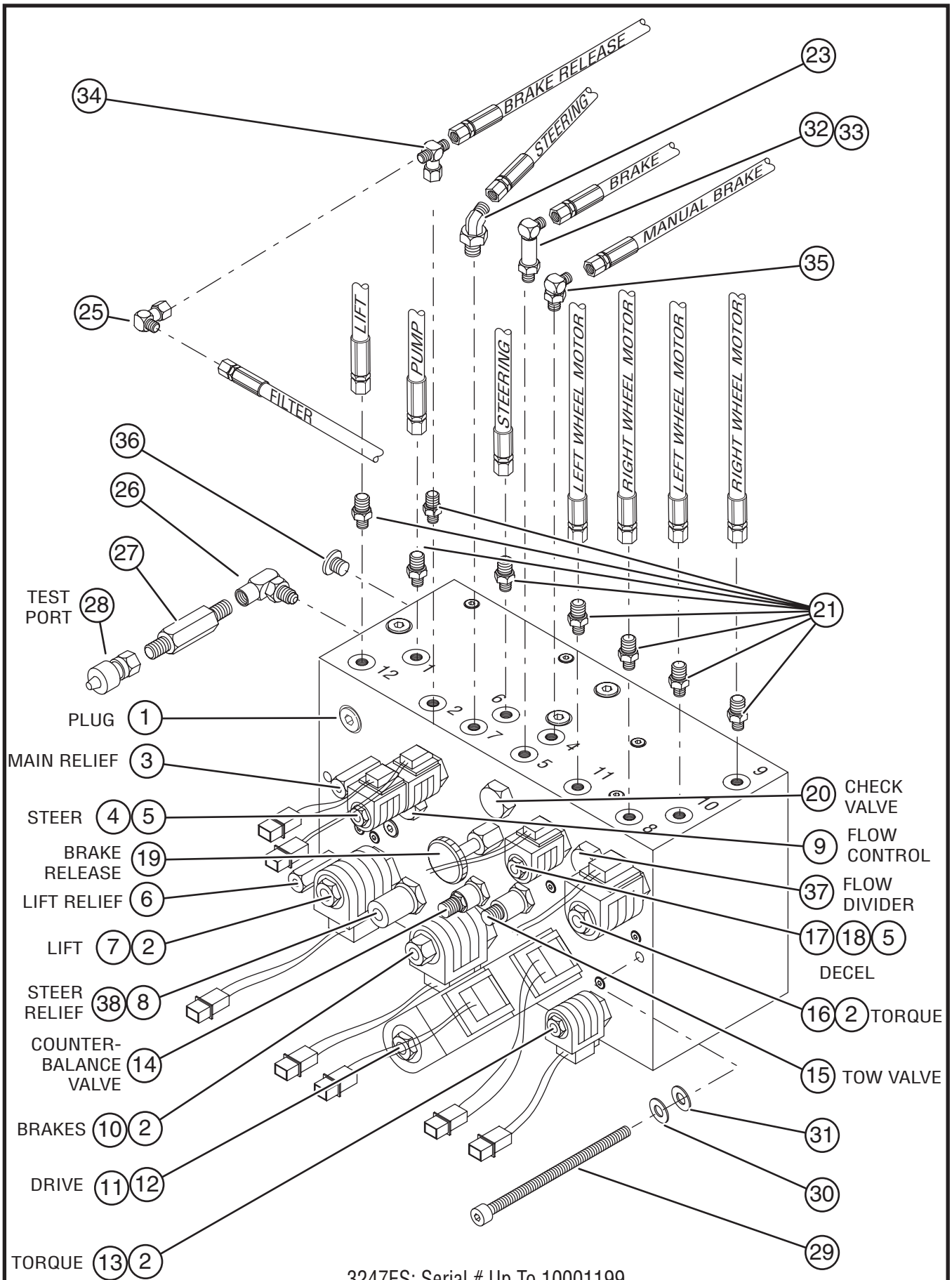


3247ES: Serial # Up To 10001199

ILLUSTRATION No.
ART_2298

90667, Hydraulic Manifold Assembly, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			MAIN MANIFOLD ASSEMBLY - 3247ES, EARLY MODELS
			SERIAL #10001000 # 10001199
	90667		MAIN MANIFOLD ASSEMBLY
1	HDW90952	1	PLUG (3247ES ONLY)
2	9996	4	COIL, 24 VOLT(3247ES)
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
			(CONTINUED ON NEXT PAGE)

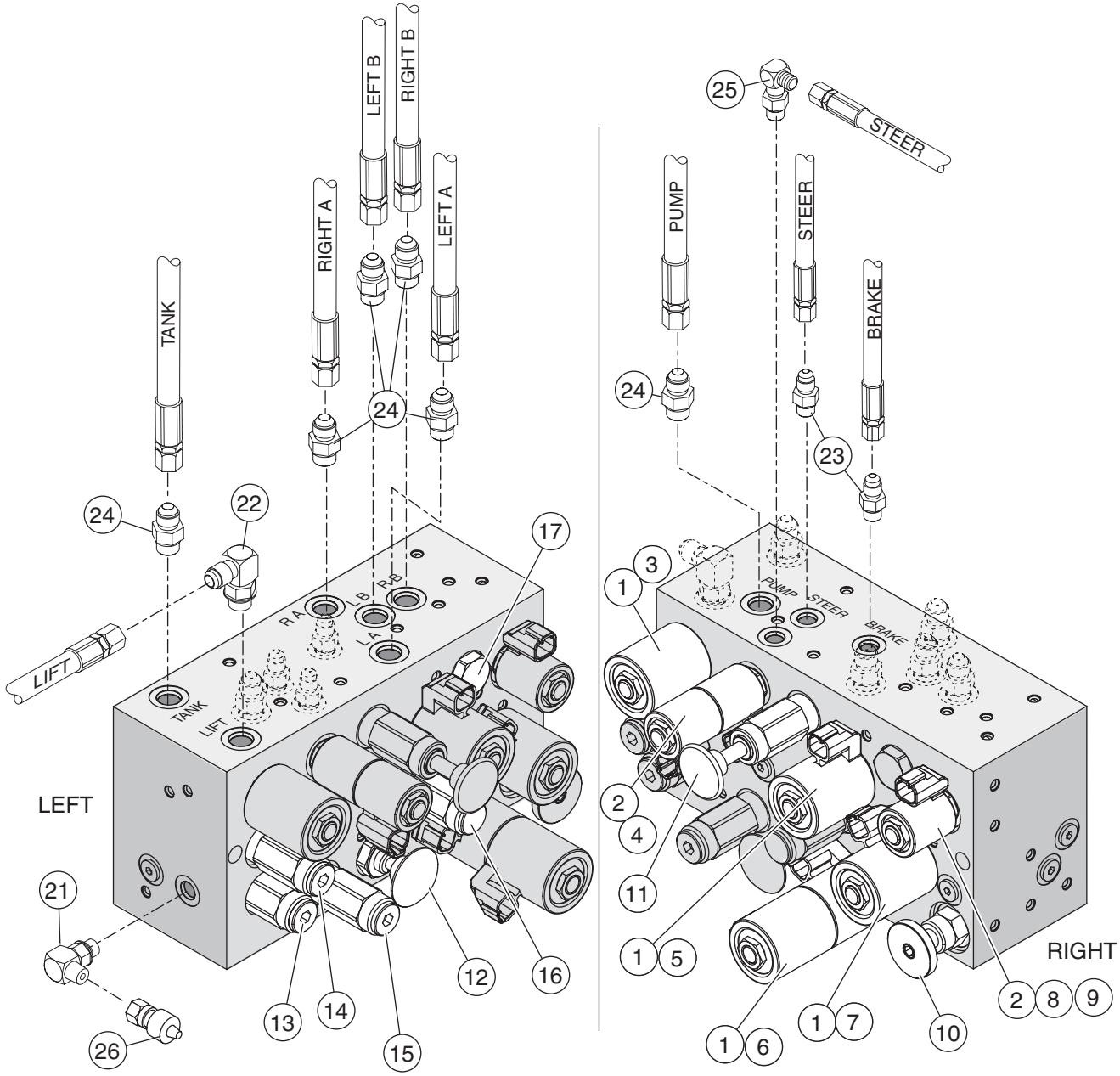


3247ES: Serial # Up To 10001199

ILLUSTRATION No.
ART_2298

90667, Hydraulic Manifold Assembly, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			MAIN MANIFOLD ASSEMBLY - 3247ES, EARLY MODELS (CONTINUED)
			3247ES - SERIAL #10001000 # 10001199
21	HDW7389	8	ADAPTER, MALE 3/8", MALE 3/8" O-RING
23	HDW90364	1	FITTING, 45° 6MB-6MJ
25	HDW90299	1	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
37	91014	1	FLOW DIVIDER
38	9971	3	RELIEF VALVE TAMPER PROOF CAP
			SEE HYDRAULIC HOSES, THIS SECTION



2033ES: Serial # 8804100- UP
2633ES: Serial # 11100600- UP

2047ES: Serial # 9801100- UP
2647ES: Serial # 9901200- UP

3247ES: Serial # 10001200- UP

ILLUSTRATION No.
ART_2293

91000, Hydraulic Manifold Assembly, X33ES and X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			Main Manifold Assembly, Late Models
			2047ES - SERIAL # 9801100 - UP
			2647ES - SERIAL # 9901200 - UP
			3247ES - SERIAL # 10001200 - 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, ¼" MALE O-RING × ¼" MALE NPT
22	HDW7601	1	FITTING, 90° ELBOW, 3/8" MALE O-RING × 3/8" MALE JIC
23	HDW8881	3	FITTING, ¼" MALE O-RING × ¼" MALE JIC
24	HDW7438	6	FITTING, 3/8" MALE O-RING × 3/8" MALE JIC
25	HDW8877	1	FITTING, 90° ELBOW, ¼" MALE O-RING × ¼" MALE JIC
26	HDW7971	1	DISCONNECT, MALE 1/4"
			SEE HYDRAULIC HOSES, THIS SECTION

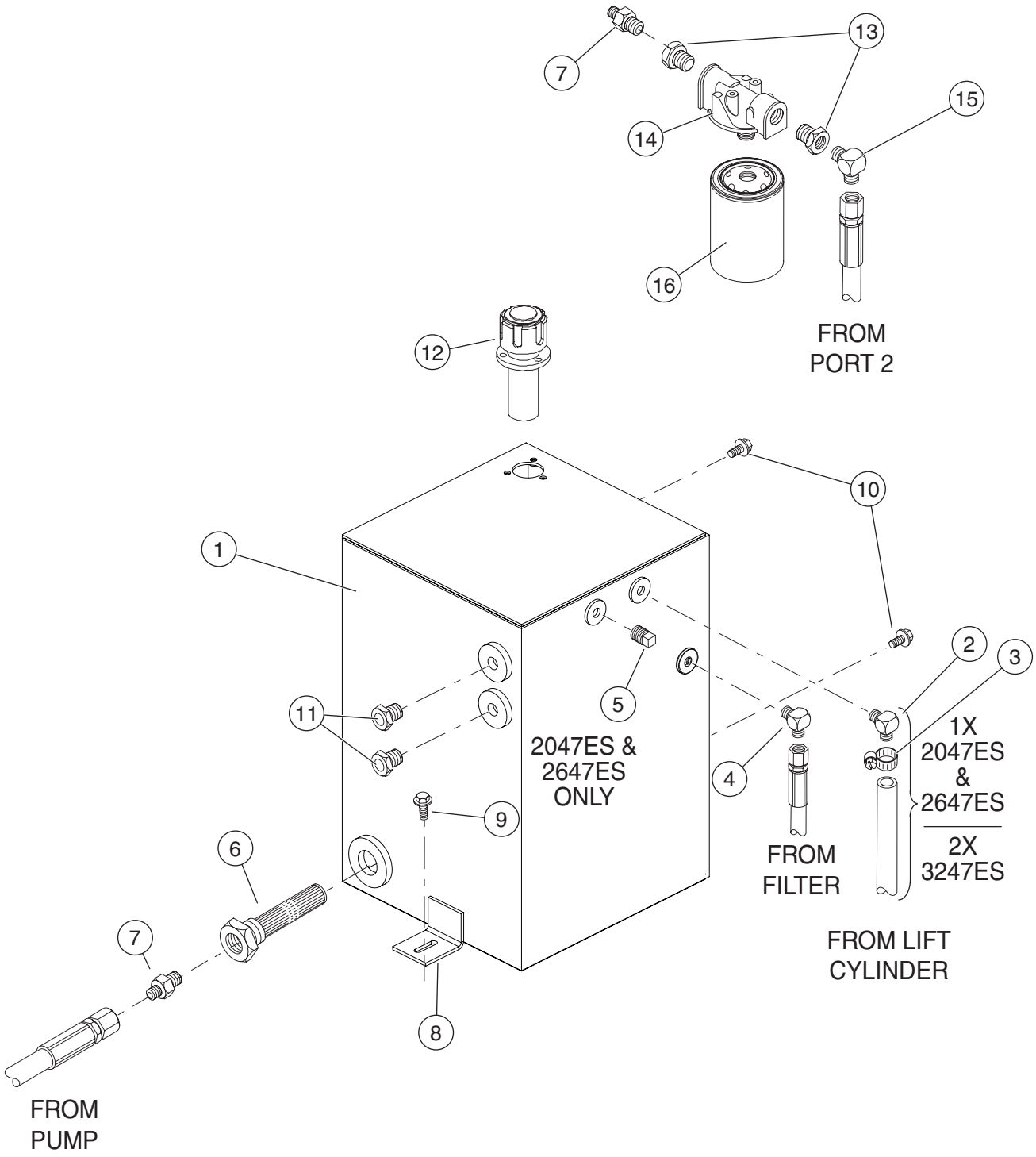


ILLUSTRATION No.
ART_2299

Hydraulic Reservoir Assembly, Steel - 2047ES, 2647ES and 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC RESERVOIR, STEEL
			2047ES - SERIAL NOT USED
			2647ES - SERIAL #9901000 - #9901199
			3247ES - SERIAL #10001000 - #10001269
1	16544	1	HYDRAULIC RESERVIOR WELDMENT
2	HDW6727	*	FITTING, ELBOW 90°, MALE 1/4", MALE BARB 1/4"
3	7788	*	CLAMP, HOSE
*	—	1	2047ES AND 2647ES
*	—	2	3247ES
4	HDW7500	1	FITTING, ELBOW 90°, MALE 1/4" NPT, MALE 3/8" JIC
5	HDW9200	1	PLUG (2047ES, 2647ES ONLY)
6	8412	1	SUCTION STRAINER - 1"
7	HDW90917	2	FITTING, ADAPTER, MALE 1/2" NPT, MALE 1/2" JIC
8	15133	1	BRACKET, RESERVOIR MOUNTING
9	HDW5723	1	SCREW, SELF-TAP & FORM HEX HD 1/4" - 20 - .75" LG
10	HDW6455	2	SCREW, 1/4" - 20 - .5" LG
11	HDW5938	2	FITTING, SIGHT GAUGE
12	90127	1	BREATHER VENT ASSY
13	HDW6752	2	ADAPTER, MALE 3/4", FML 1/2"
14	6714	1	FILTER, HEAD
15	HDW90300	1	FITTING, ELBOW 90°, MALE 3/8", MALE 1/2"
16	6156	1	FILTER, OIL CARTRIDGE
NS	5292	6	US GALHYDRAULIC FLUID, ISO32 OR EQUIVALENT
			SEE HYDRAULIC HOSES, THIS SECTION

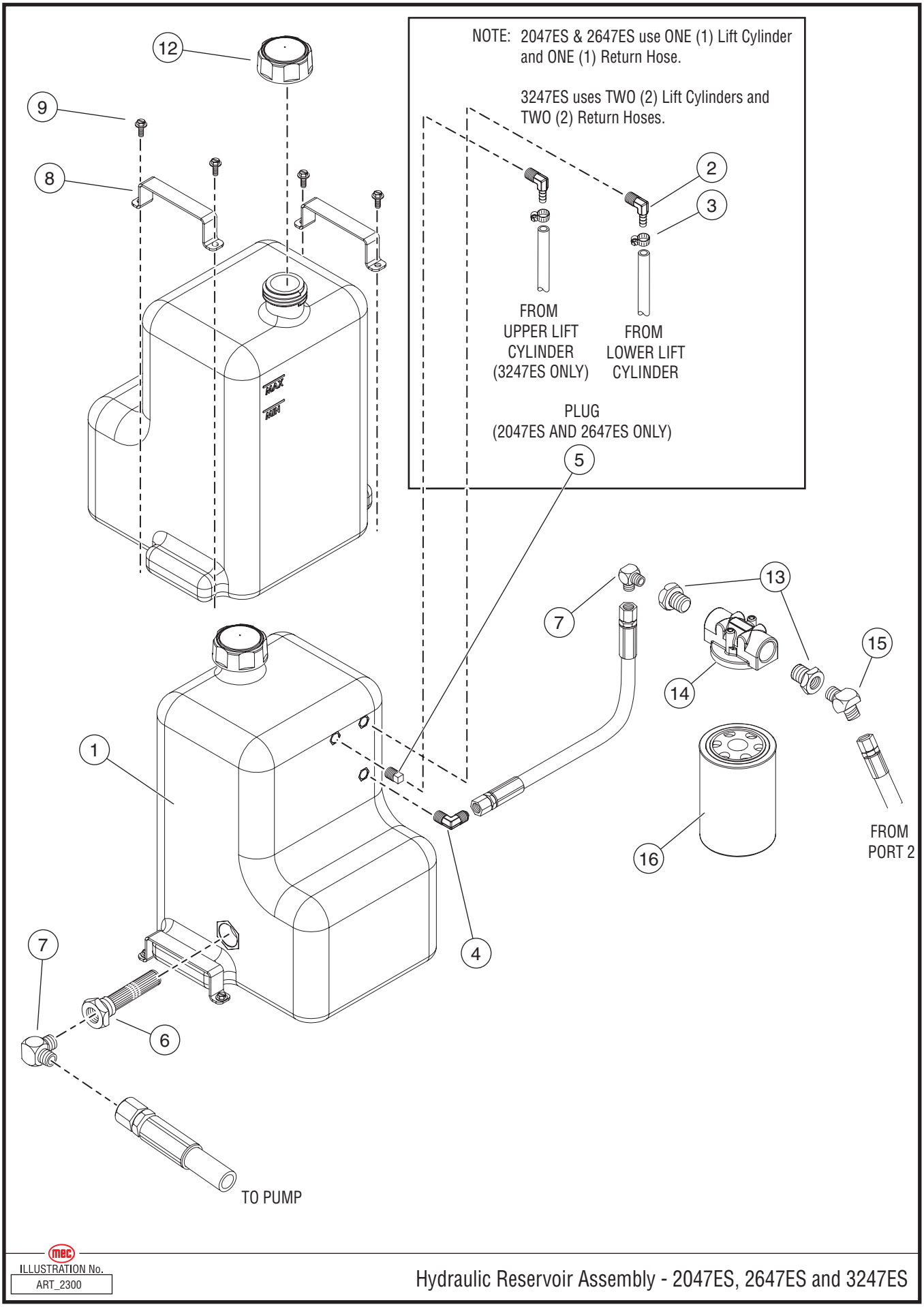
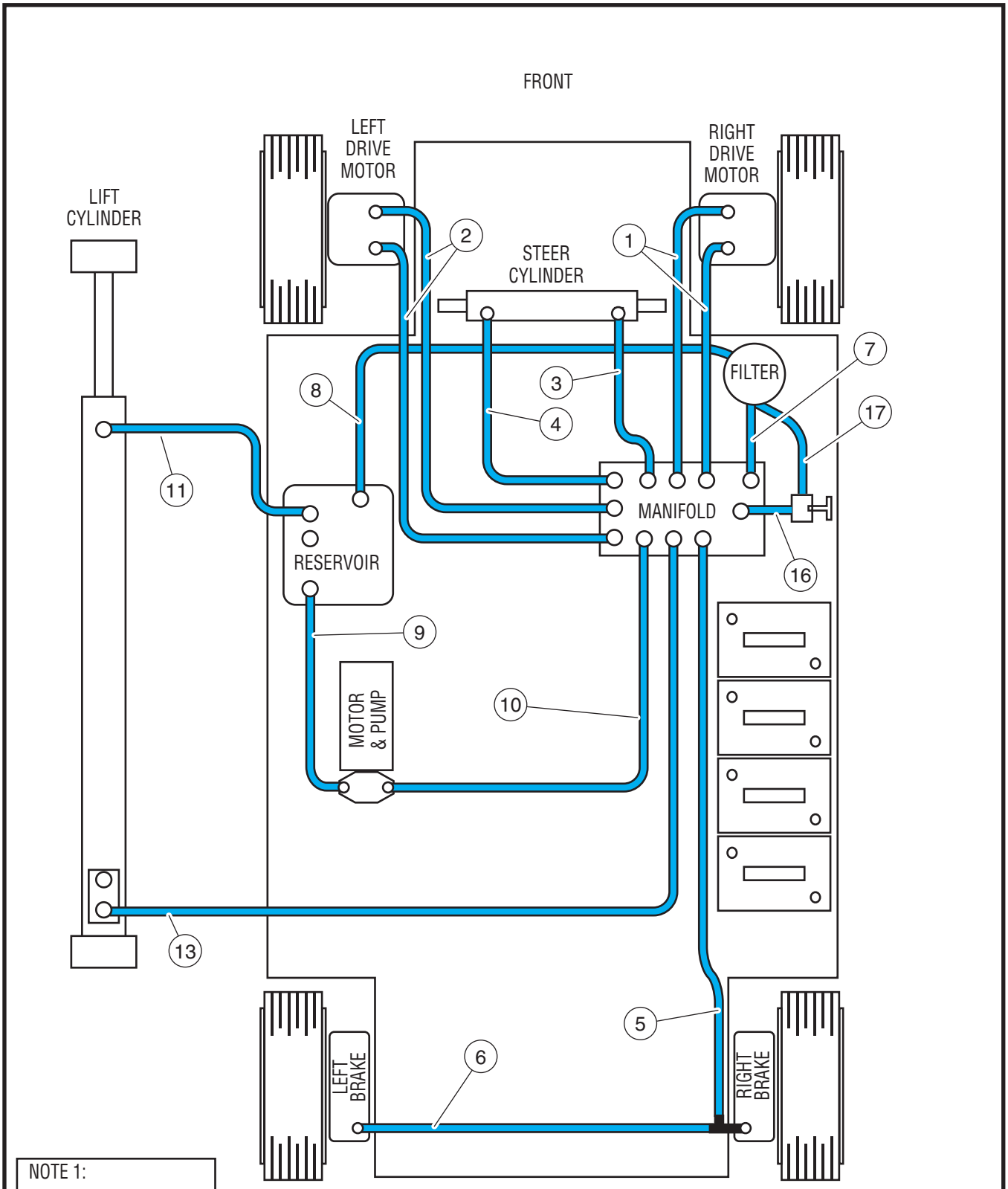


ILLUSTRATION No.
ART_2300

Hydraulic Reservoir Assembly - 2047ES, 2647ES and 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC RESERVOIR, PLASTIC
			2047ES - SERIAL #9801000 - UP
			2647ES - SERIAL #9901200 - UP
			3247ES - SERIAL #10001270 - UP
1	16127	1	HYDRAULIC RESERVIOR, PLASTIC
2	HDW6727	*	FITTING, ELBOW 90°, MALE 1/4", MALE BARB 1/4"
3	7788	*	CLAMP, HOSE
*	—	1	2047ES AND 2647ES
*	—	2	3247ES
4	HDW7500	1	FITTING, ELBOW 90°, MALE 1/4" NPT, MALE 3/8" JIC
5	HDW9200	1	PLUG (2047ES, 2647ES ONLY)
6	8412	1	SUCTION STRAINER - 1"
7	HDW90917	2	FITTING, ADAPTER, MALE 1/2" NPT, MALE 1/2" JIC
8	16128	1	BRACKET, RESERVOIR MOUNTING
9	HDW5723	1	SCREW, SELF-TAP & FORM HEX HD 1/4" - 20 - .75" LG
12	91091	1	BREATHER CAP
13	HDW6752	2	ADAPTER, MALE 3/4", FML 1/2"
14	6714	1	FILTER, HEAD
15	HDW90300	1	FITTING, ELBOW 90°, MALE 3/8", MALE 1/2"
16	6156	1	FILTER, OIL CARTRIDGE
NS	5292	6	US GALHYDRAULIC FLUID, ISO32 OR EQUIVALENT
			SEE HYDRAULIC HOSES, THIS SECTION



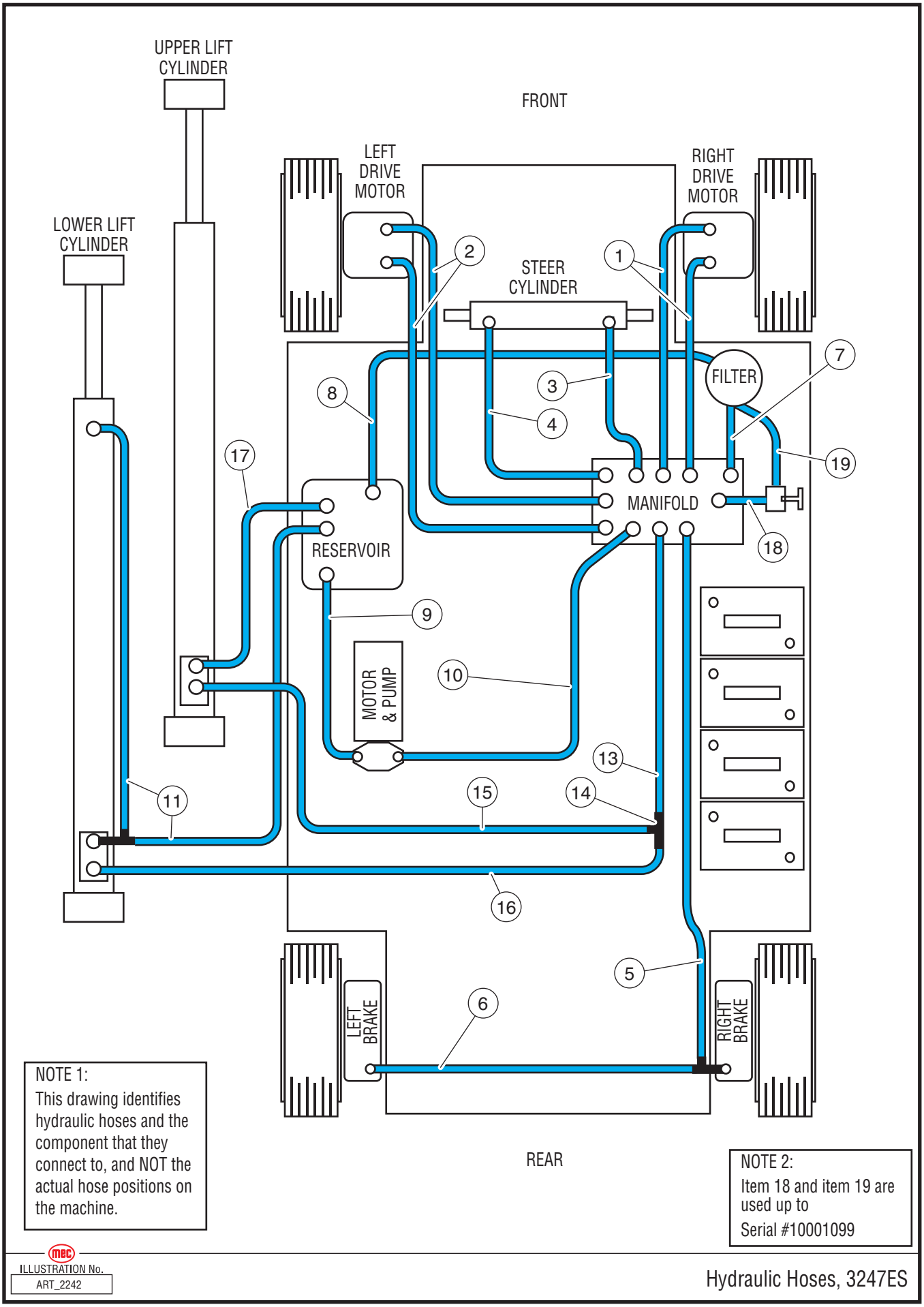
NOTE 1:
This drawing identifies hydraulic hoses and the component that they connect to, and NOT the actual hose positions on the machine.

NOTE 2:
Item 16 and item 17 are used up to
2047ES: serial #9801099
and
2647ES: serial #9901199

ILLUSTRATION No.
ART_2240

Hydraulic Hoses, 2047ES - 2647ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC HOSES, 2047ES - 2647ES
1	90672	2	HOSE ASSEMBLY, DRIVE MOTOR, RIGHT
2	90673	2	HOSE ASSEMBLY, DRIVE MOTOR, LEFT
3	90276	1	HOSE ASSEMBLY, STEER CYLINDER
4	91076	1	HOSE ASSEMBLY, STEER CYLINDER
5	9847	1	HOSE ASSEMBLY, BRAKE TO MANIFOLD
6	9754	1	HOSE ASSEMBLY, BRAKE TO BRAKE
7	7598	1	HOSE ASSEMBLY, MANIFOLD TO FILTER
8	9029	1	HOSE ASSEMBLY, FILTER TO TANK
9	90669	1	HOSE ASSEMBLY, SUCTION
10	90884	1	HOSE ASSEMBLY, PRESSURE
11	6458	21 FT	HOSE ASSEMBLY, LIFT CYLINDER TO TANK
13	91075	1	HOSE ASSEMBLY, LIFT CYLINDER
			2047ES - SERIAL #9801000 # 9801099
			2647ES - SERIAL #9801000 # 9901199
16	90275	1	HOSE ASSEMBLY, HAND PUMP
17	90763	1	HOSE ASSEMBLY, HAND PUMP RETURN
			2047ES - SERIAL # 9801100 - UP
			2647ES - SERIAL # 9901200 - UP
16	—	—	NOT USED
17	—	—	NOT USED



NOTE 1:
This drawing identifies hydraulic hoses and the component that they connect to, and NOT the actual hose positions on the machine.

NOTE 2:
Item 18 and item 19 are used up to
Serial #10001099

ILLUSTRATION No.
ART_2242

Hydraulic Hoses, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC HOSES, 3247ES
1	90672	2	HOSE ASSEMBLY, DRIVE MOTOR, RIGHT
2	90673	2	HOSE ASSEMBLY, DRIVE MOTOR, LEFT
3	90276	1	HOSE ASSEMBLY, STEER CYLINDER
4	91076	1	HOSE ASSEMBLY, STEER CYLINDER
5	9847	1	HOSE ASSEMBLY, BRAKE TO MANIFOLD
6	9754	1	HOSE ASSEMBLY, BRAKE TO BRAKE
7	7598	1	HOSE ASSEMBLY, MANIFOLD TO FILTER
8	9029	1	HOSE ASSEMBLY, FILTER TO TANK
9	90669	1	HOSE ASSEMBLY, SUCTION
10	90884	1	HOSE ASSEMBLY, PRESSURE
11	6458	21 FT	HOSE ASSEMBLY, LOWER LIFT CYLINDER RETURN
	REF		TEE FITTING (SEE *SECTION C* FOR HARDWARE)
13	91074	1	HOSE ASSEMBLY, LIFT CYLINDERS
14	HDW7391	1	TEE FITTING
15	90885	1	HOSE ASSEMBLY, UPPER LIFT CYLINDER
16	9039	1	HOSE ASSEMBLY, LOWER LIFT CYLINDER
17	6458	40 FT	HOSE ASSEMBLY, UPPER LIFT CYLINDER RETURN
			SERIAL #10001000 # 10001199
18	90275	1	HOSE ASSEMBLY, HAND PUMP
19	90763	1	HOSE ASSEMBLY, HAND PUMP RETURN
			SERIAL # 10001200 - UP
18	—	—	NOT USED
19	—	—	NOT USED

SECTION E:
BASE

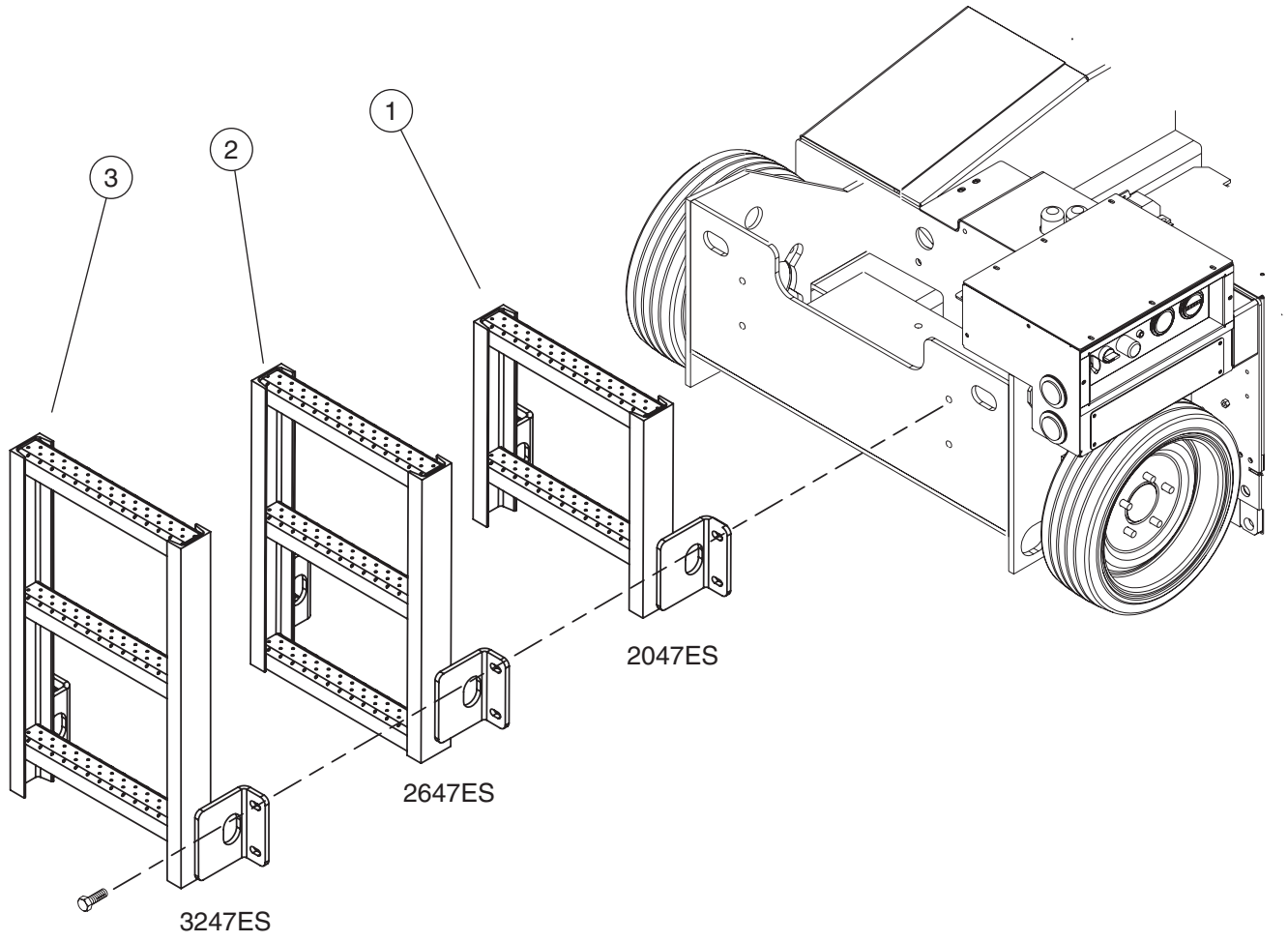


ILLUSTRATION No.
ART_2303

Ladder Installation, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			LADDER
1	16546	1	LADDER (2047ES)
2	16547	1	LADDER (2647ES)
3	16574	1	LADDER (3247ES)
	HDW8457	4	NUT, 1/2" - 13
	HDW8283	4	SCREW, 1/2" - 13, 1 1/2" LG

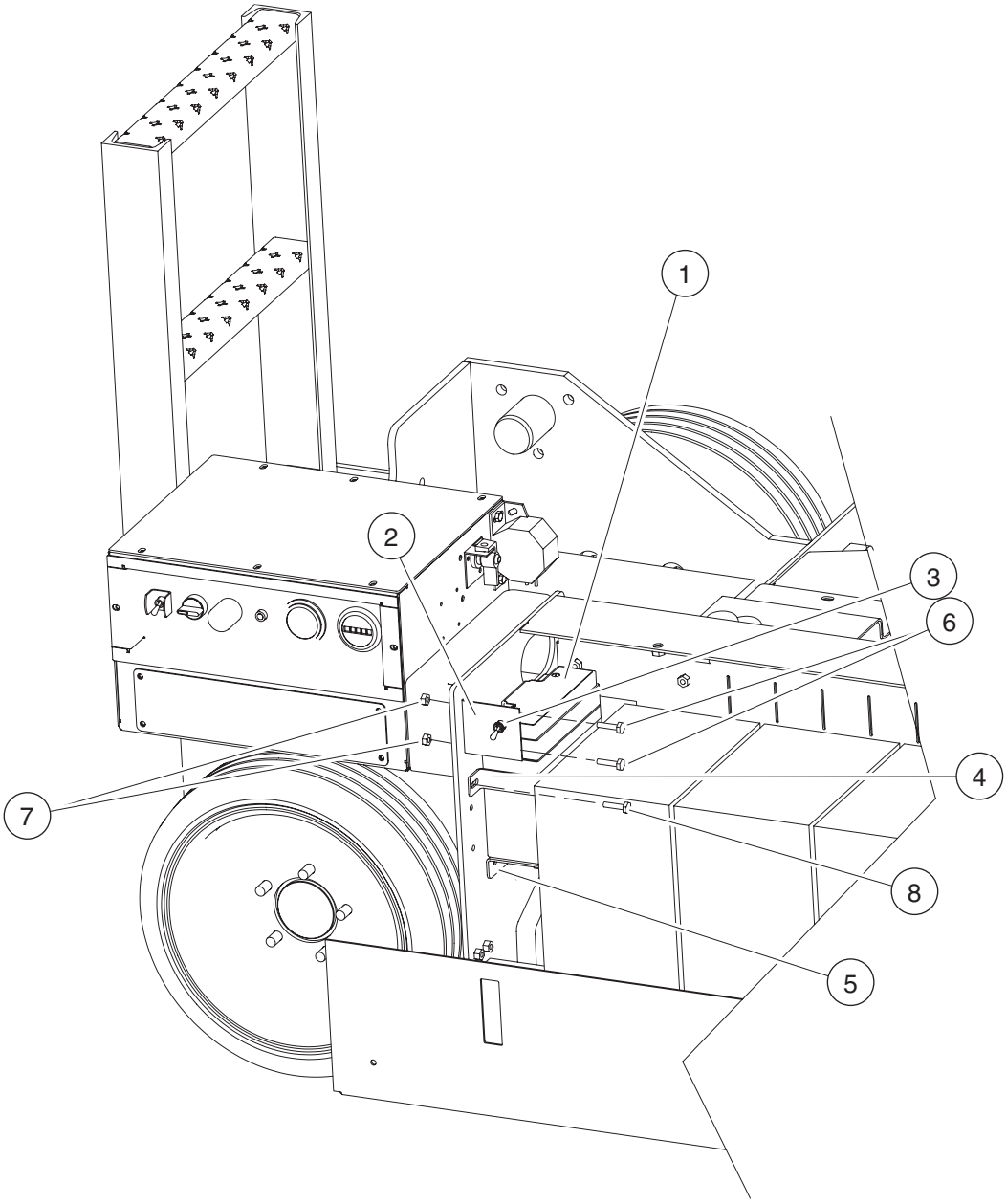


ILLUSTRATION No.
ART_2328

Emergency Lowering Switch and Battery, 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			EMERGENCY LOWERING SWITCH - 3247ES
1	90898	1	BATTERY 12V
2	25480	1	GUARD BRACKET
3	7423	1	SWITCH, TOGGLE, 1 POLE 2 POS
4	16619	1	BATTERY CROSS BRACE
5	16620	1	BATTERY BRACKET MOUNT
6	HDW90833	2	SCREW, 6–32 X 3/4" LG
7	HDW5364	2	NUT, 6 –32
8	HDW6455	4	SCREW, 1/4" – 20 X 1/2"
			SEE WIRE HARNESSES, PARTS SECTION A

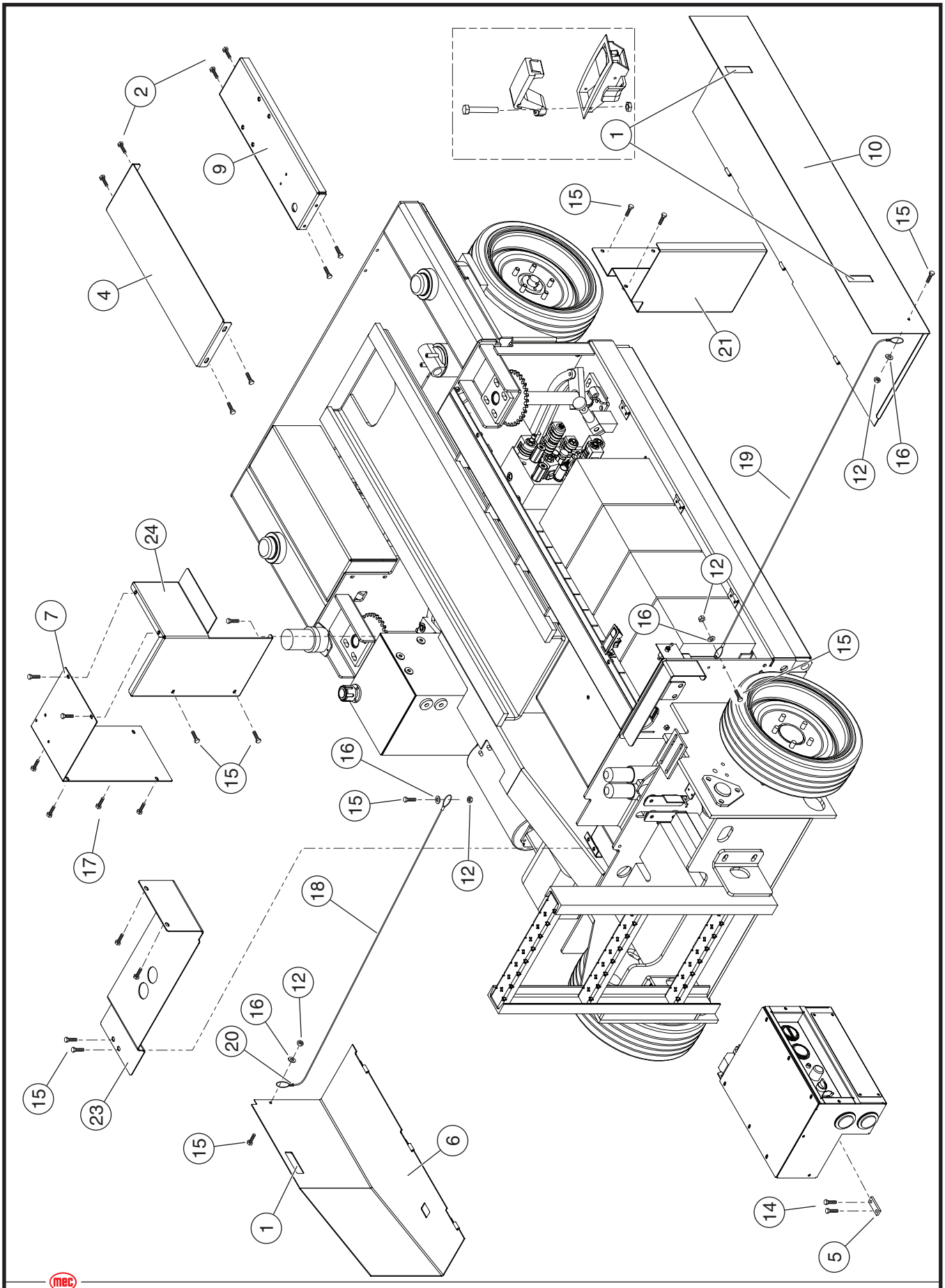


ILLUSTRATION No.
ART_2306

with Steel Hydraulic Fluid Reservoir

Base and Covers, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			Base Covers (Steel Hydraulic Fluid Reservoir)
1	8386	3	LATCH
2	HDW6455	8	SCREW, 1/4"-20, 1/2" LG
3	16540	1	BASE WELDMENT
4	16554	1	WEBBING COVER PLATE
5	16629	1	MOUNTING BLOCK LOWER CONTROL BOX
6	16616	1	COVER, PUMP MOTOR CHARGER
7	16553	1	TOP COVER, FRONT LH STEERING
9	15143	1	BRACKET MOUNT OIL FILTER
10	15126	1	COVER, BATTERY CABINET
11	90752	6	HINGE SLIP, MALE HALF LH W/ HOLES
12	HDW5276	4	NUT, 1/4"
14	HDW6433	4	SCREW, 3/8"-16, 1" LG
15	HDW5904	20	SCREW, 1/4"-20, 3/4" LG
16	HDW5217	4	FLAT WASHER
17	HDW5723	6	MACHINE SCREW, SELF TAPPING, 1/4"-20, 3/4"LG
18	7184	18"	WIRE CABLE, COATED & ROLLED
19	7184	21"	WIRE CABLE, COATED & ROLLED
20	8814	4	SLEEVE, OVAL ALUMINUM
21	15124	1	BULKHEAD MANIFOLD CABINET
23	16632	1	COVER POTHOLE PLUNGER
24	16551	1	STEERING CABINET
25	HDW6432	2	SCREW, 3/8"-16, 3/4" LG

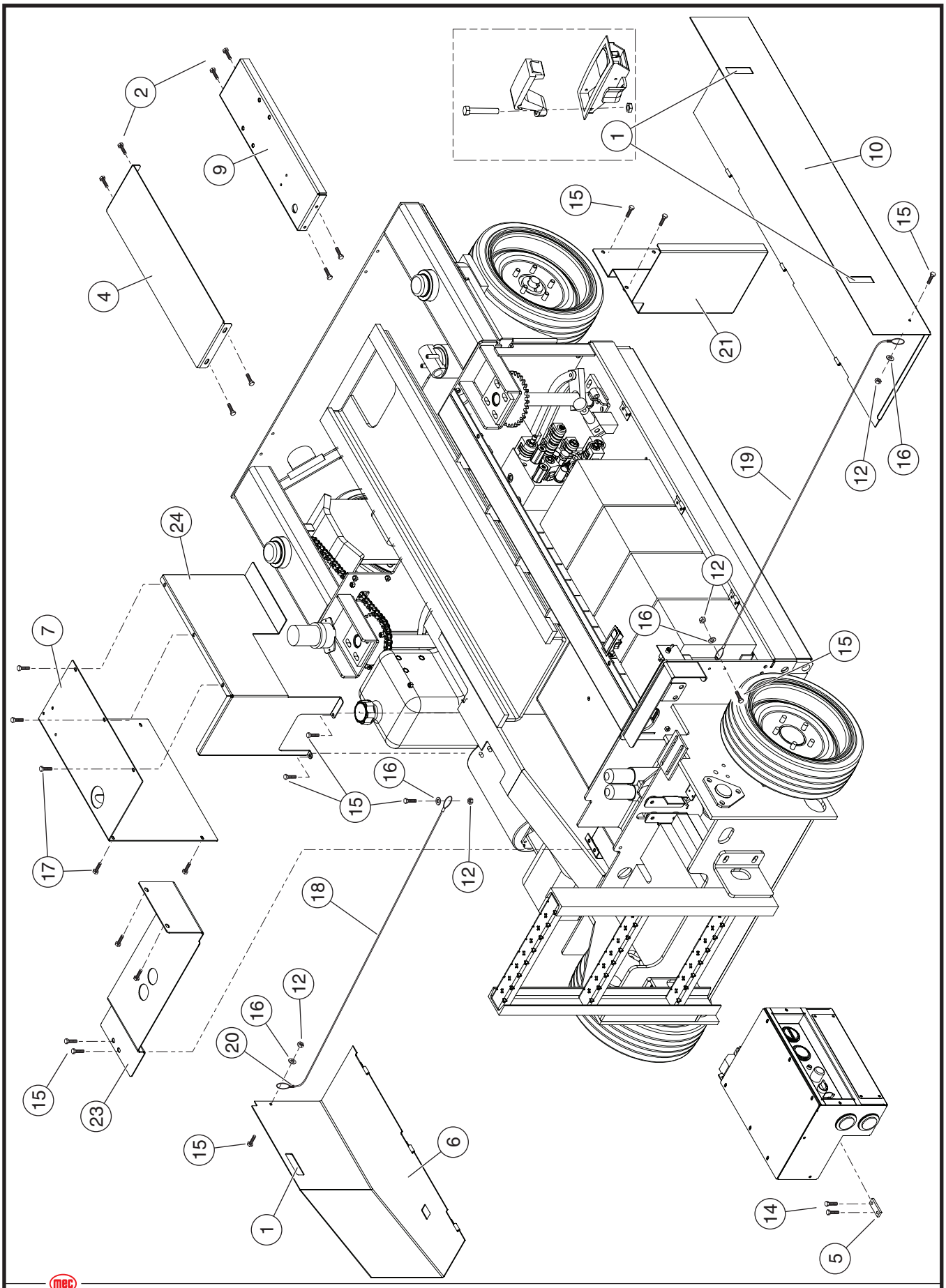


ILLUSTRATION No.
ART_2395

with Plastic Hydraulic Fluid Reservoir

Base and Covers, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			Base Covers (Plastic Hydraulic Fluid Reservoir)
1	8386	3	LATCH
2	HDW6455	8	SCREW, 1/4"-20, 1/2" LG
3	16540	1	BASE WELDMENT
4	16554	1	WEBBING COVER PLATE
5	16629	1	MOUNTING BLOCK LOWER CONTROL BOX
6	16616	1	COVER, PUMP MOTOR CHARGER
7	16183	1	TOP COVER, FRONT LH STEERING
9	15143	1	BRACKET MOUNT OIL FILTER
10	15126	1	COVER, BATTERY CABINET
11	90752	6	HINGE SLIP, MALE HALF LH W/ HOLES
12	HDW5276	4	NUT, 1/4"
14	HDW6433	4	SCREW, 3/8"-16, 1" LG
15	HDW5904	20	SCREW, 1/4"-20, 3/4" LG
16	HDW5217	4	FLAT WASHER
17	HDW5723	7	MACHINE SCREW, SELF TAPPING, 1/4"-20, 3/4"LG
18	7184	18"	WIRE CABLE, COATED & ROLLED
19	7184	21"	WIRE CABLE, COATED & ROLLED
20	8814	4	SLEEVE, OVAL ALUMINUM
21	15124	1	BULKHEAD MANIFOLD CABINET
23	16632	1	COVER POTHOLE PLUNGER
24	16182	1	STEERING CABINET
25	HDW6432	2	SCREW, 3/8"-16, 3/4" LG

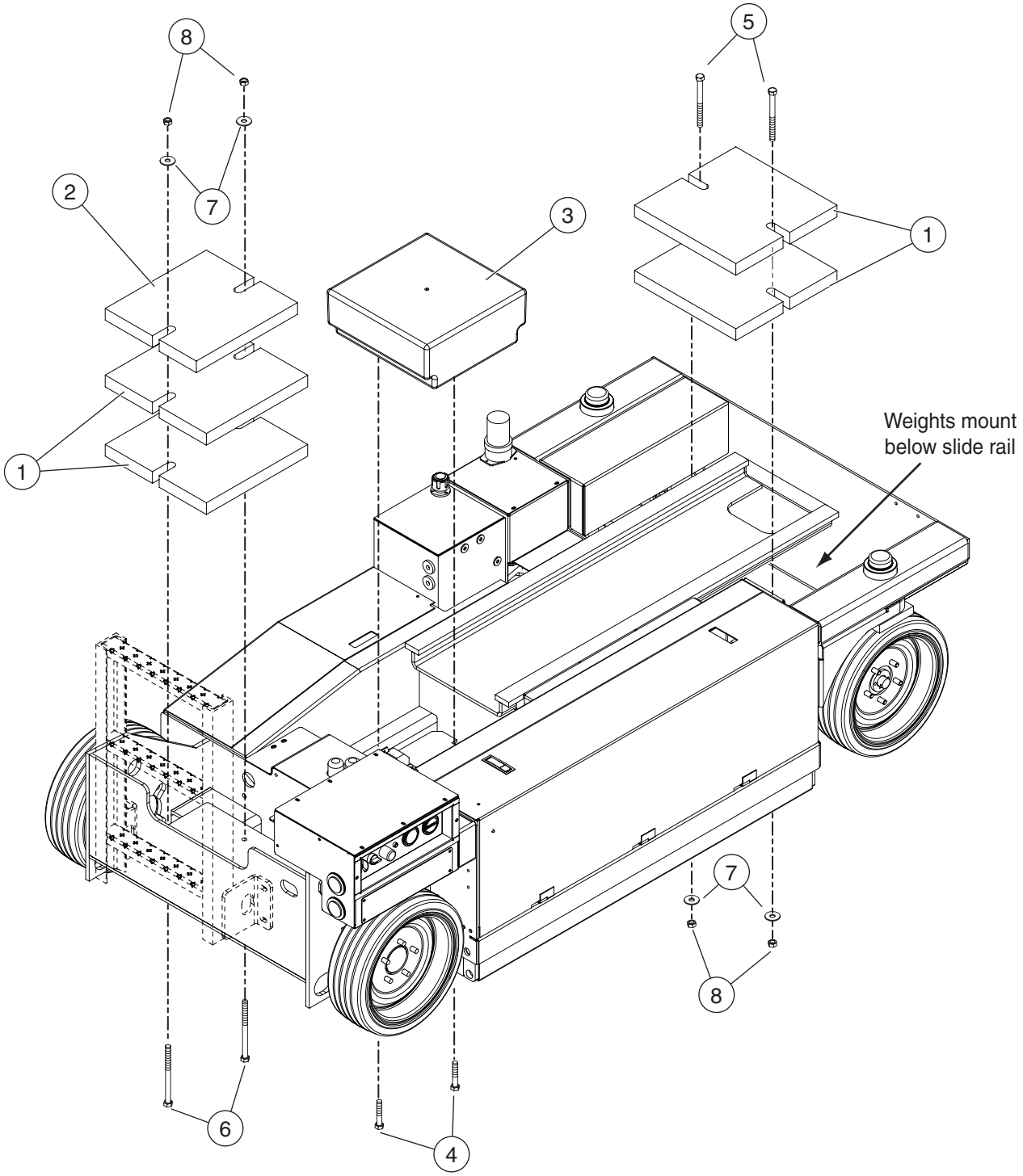
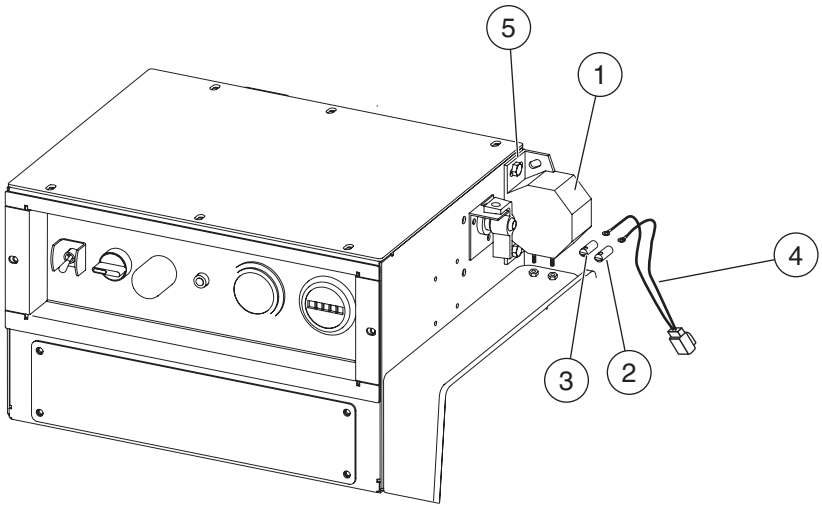
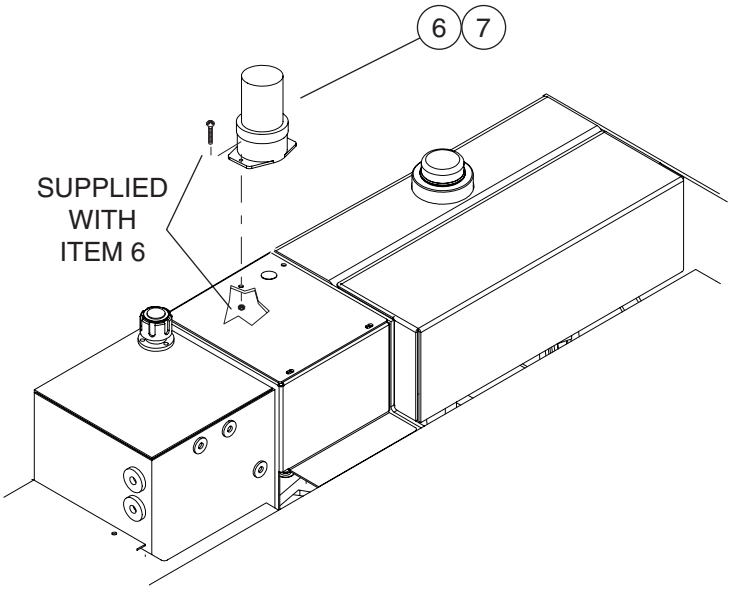


ILLUSTRATION No.
ART_2325

Machine Ballase, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			BALLAST
1	15071	4	BALLAST, 1.5X15X15
2	15140	1	BALLAST, 1.5X15X13.5 (3247ONLY)
3	16100	1	CAST COUNTERWEIGHT
4	HDW90928	2	HEX HEAD SCREW 3/4"-10 X 1.5" LG
5	HDW7312	2	HEX HEAD SCREW 1/2"-13 X 4.5" LG
6	HDW90951	2	HEX HEAD SCREW 1/2"-13 X 6" LG
7	HDW13195	4	FLAT WASHER
8	HDW8457	4	LOCKNUT 1/2"-13





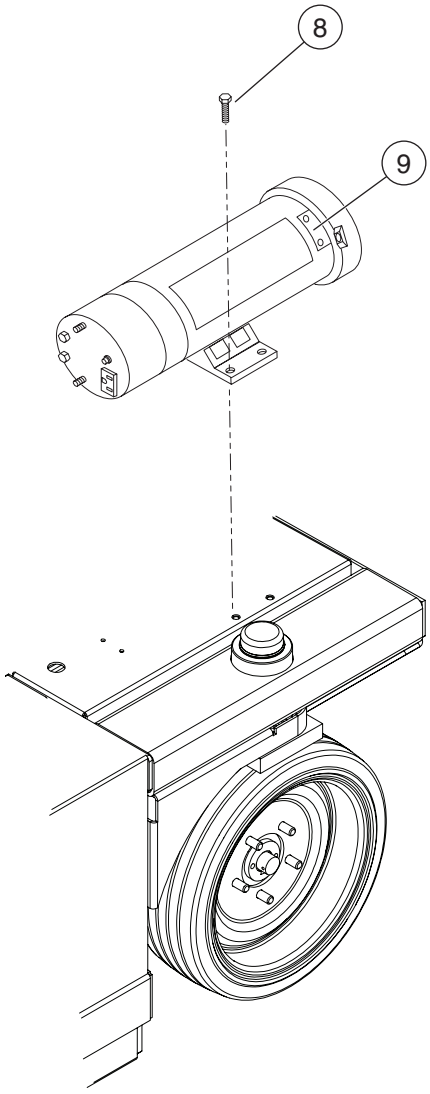


ILLUSTRATION No.
ART_2308

Base Options, X33ES - X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			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 (OPTION)
6	90164	1	LIGHT, STROBE
7	90776	1	TUBE REPLACEMENT
	7476	2	TERMINAL, AMP CONNECTOR PIN
	7640	1	CONNECTOR, AMP 2 PIN
			POWER CONVERTER (OPTION)
8	HDW5204	4	SCREW, 5/16" - 18, 1" LG
9	7103	1	CONVERTER
	7109	1	BOOT INSULATOR, BLACK
	7110	1	BOOT INSULATOR, RED
	7111	1	CABLE, POWER SUPPLY
	7112	1	CABLE, POWER SUPPLY
	7130	1	CAPACITOR

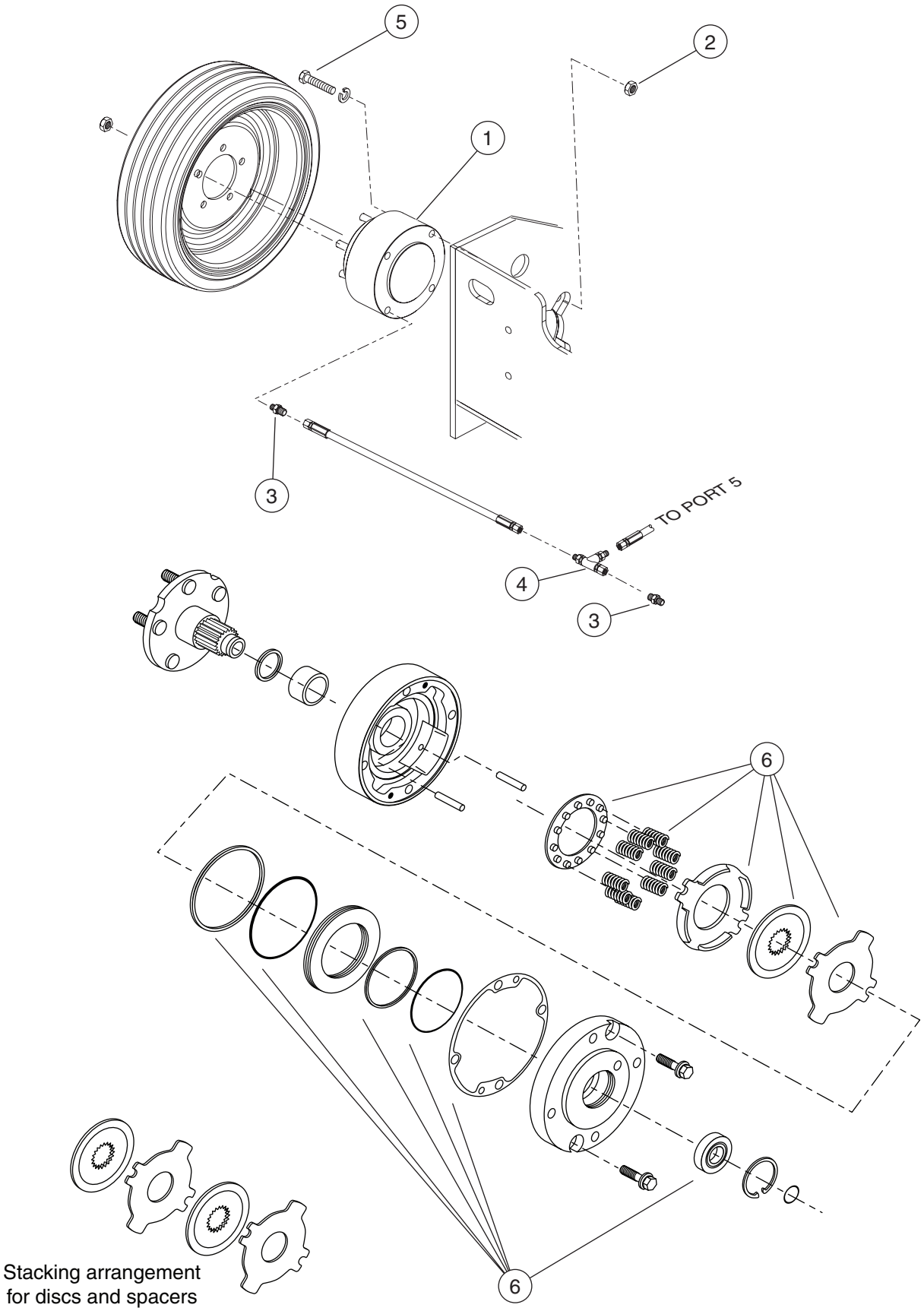


ILLUSTRATION No.
ART_2309

Brake Installation, ES

ITEM	PART NO.	QTY	DESCRIPTION
			BRAKE ASSEMBLY
1	90715	2	**HYDRAULIC BRAKE ASSY - MICO BRAND** **2047ES SERIAL #9801000 - 9801048**
			2047ES SERIAL #9901000 - 9901306 **2047ES SERIAL #10001000 - 10001223**
1	91599	2	**HYDRAULIC BRAKE ASSY - AUSCO BRAND**
			2047ES SERIAL #9801049 - UP **2047ES SERIAL #9901307 - UP**
			2047ES SERIAL #10001224 - UP
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	91380	1	BRAKE REPAIR KIT
	REF		SEE HYDRAULIC HOSES (PARTS SECTION D)

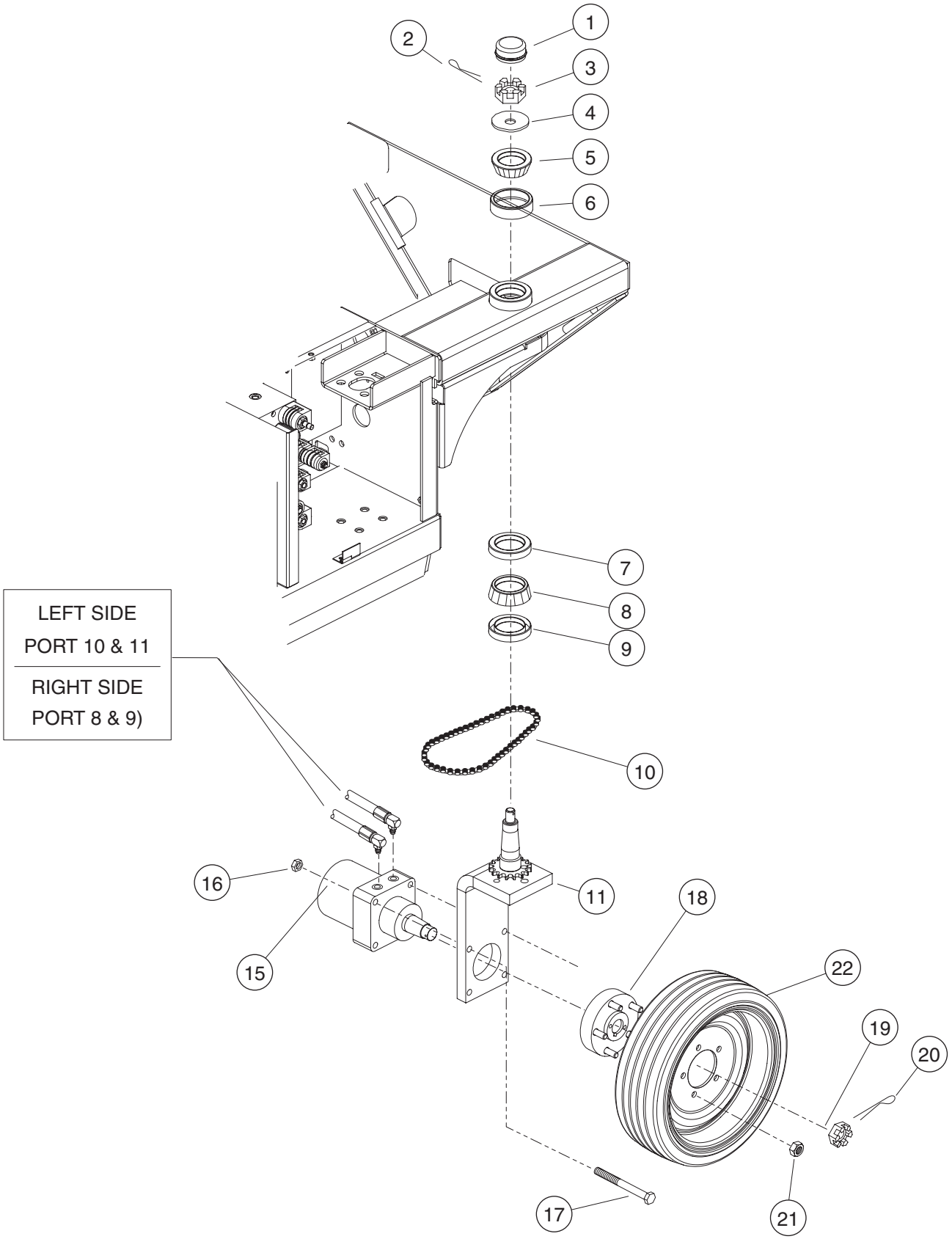


ILLUSTRATION No.
ART_2326

Reference: ART_

Wheel/Motor Mount, X33ES and X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			FRONT AXLE
1	7719	2	CAP, GREASE
2	HDW5738	2	COTTER PIN HAMMER LOCK .18Ø 1.50
3	HDW5737	2	NUT, SLOTTED HEX, .750-16 UNC
4	HDW3801	2	FLAT WASHER, .765 ID X 2.024 OD X .127 THK
5	7715	2	BEARING, TAPERED ROLL - 1.25" ID
6	7717	2	RACE, BEARING TAPERED
7	7716	2	RACE, BEARING TAPERED
8	7714	2	BEARING, TAPERED ROLL - 1.5" ID
9	8159	2	SEAL, GREASE 1-3/4" SHAFT
10	8173	2	CHAIN ROLLER #50, 74 LINKS
	6541		CHAIN LINK CONNECTOR #50 (REPLACEMENT PART)
11	13724	2	WHEEL MOTOR BRACKET WELDMENT
			2047ES - SERIAL #9801000 - #9801019
			2647ES - SERIAL #9901000 - #9901218
			3247ES - SERIAL #10001000 #10001275
11	16115	2	WHEEL MOTOR BRACKET WELDMENT
			2047ES - SERIAL #9801020 UP
			2647ES - SERIAL #9901219 UP
			3247ES - SERIAL #10001276 UP
			(CONTINUED)

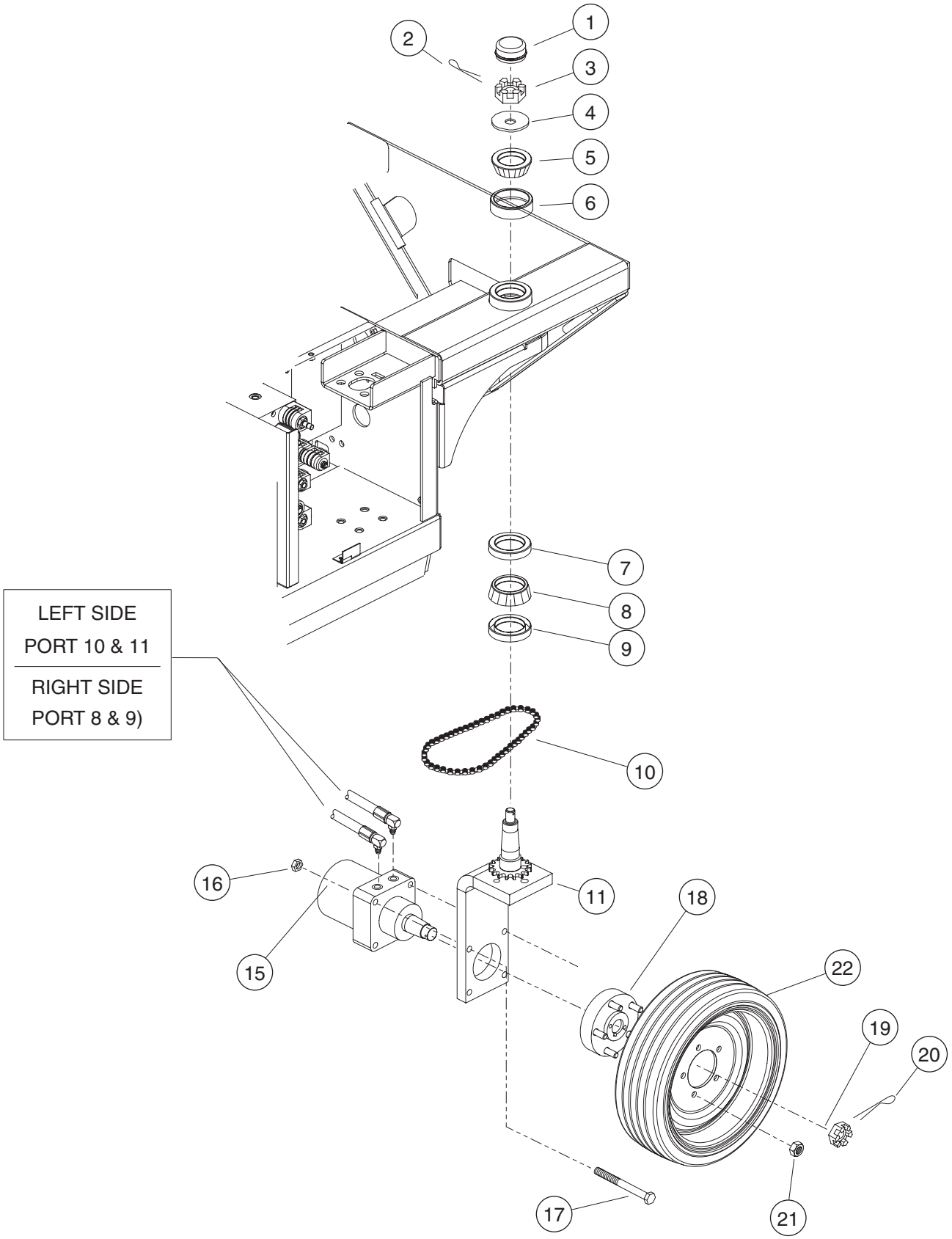


ILLUSTRATION No.
ART_2326

Reference: ART_

Wheel/Motor Mount, X33ES and X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			FRONT AXLE (CONTINUED)
13	REF	2	HOSE ASSY
14	REF	2	HOSE ASSY
15	90846	2	HYDRAULIC WHEEL MOTOR
16	HDW8457	8	HEX TOP LOCK NUT .500-13
17	HDW8498	8	SCREW, CAP, .500 -13, 4" LG GRADE 5
18	15131	2	FRONT HUB ASSEMBLY
19	HDW8568	2	SLOTTED HEX NUT 1 1/8" - 18
20	HDW5290	2	COTTER PIN HAMMER LOCK .16Ø 1.75
21	HDW6677	10	HEX LUG NUT .500-20
22	91065	2	WHEEL
23	13436	1	CYLINDER, DOUBLE END, HYDRAULIC ASSY
24	HDW7438	1	FITTING, MALE 3/8", MALE 3/8" O-RING
25	HDW90299	1	FITTING, 90° MALE 3/8", FEMALE 3/8"
26	HDW7601	1	FITTING, 90° MALE 3/8", MALE 3/8" O-RING
27	REF	1	HOSE ASSY
28	REF	1	HOSE ASSY
29	13422	2	STEER IDLER SHAFT WELDMENT
NS	90765	3'	CABLE WRAP
	REF		SEE HYDRAULIC HOSES (PARTS SECTION D)

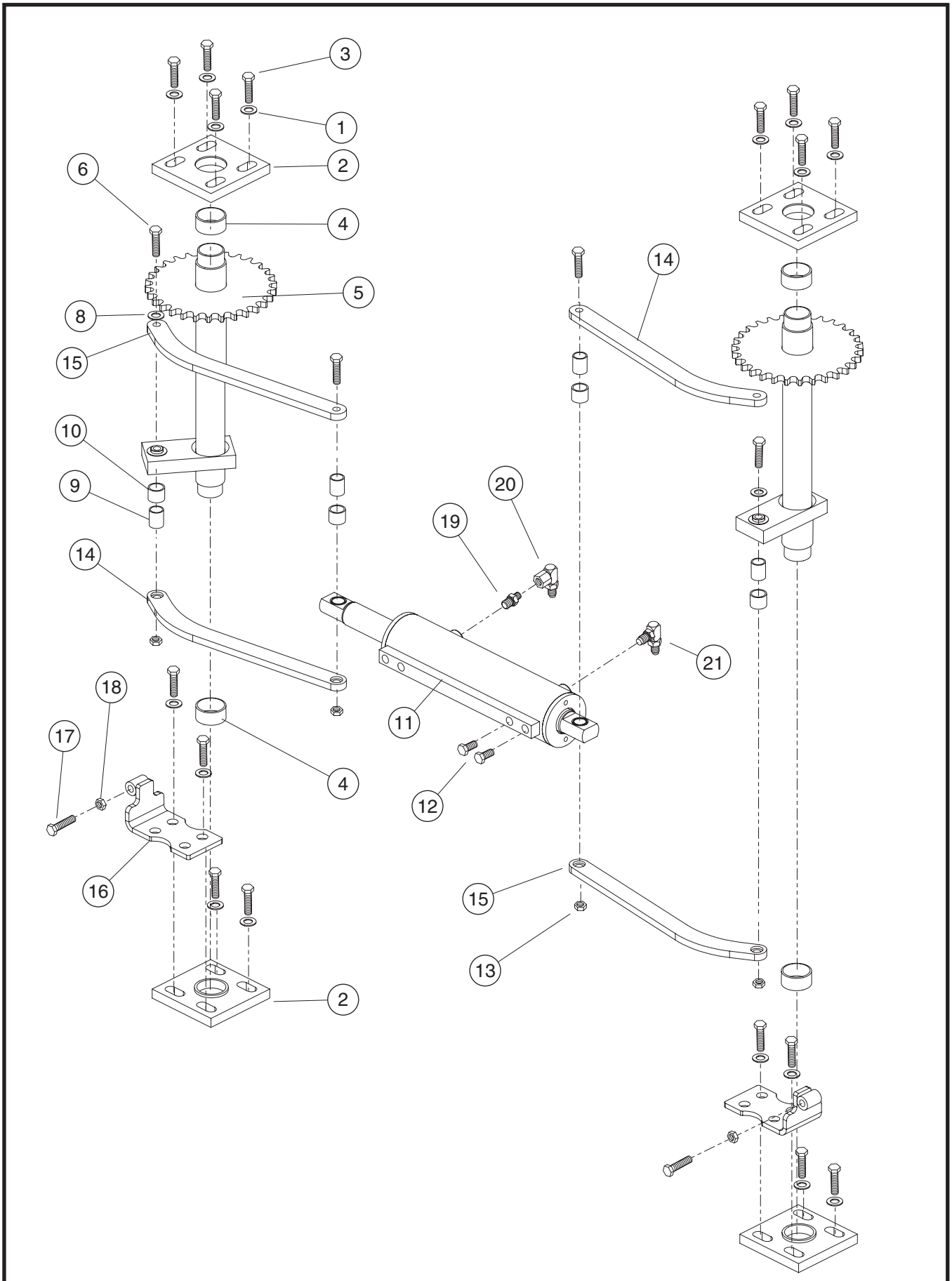


ILLUSTRATION No.
ART_2312

Steering Assembly Installation, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			STEERING COMPONENTS
1	HDW90784	16	WASHER, FLAT, .531 ID, 1.063 OD, .0104 THK
2	13251	4	PLATE, LOWER ADJUST IDLET SHAFT
3	HDW8283	16	BOLT, CAP, HEX HD, 1/2-13 X 1.50 GRADE 8
4	8248	4	BEARING, OILITE, 1.25 X 5
5	13422	2	STEER IDLER SHAFT WELDMENT
6	HDW6434	4	SCREW, CAP, HEX HEAD, 3/8-16 X 2.00 GRADE 5
8	HDW13423	2	WASHER, FLAT, .632 ID, 1.008 OD, .030 THK, NYLON
9	13421	4	SPACER
10	8433	4	BEARING, 10DU12
11	13436	1	CYLINDER, DOUBLE END, HYDRAULIC
—	91806	–	SEAL KIT
12	HDW8287	4	BOLT, CAP, HEX HD, 1/2-20 X .75, GRADE 8
13	HDW5039	4	LOCKNUT, 3/8-16
14	16622	2	LINK, INTERMEDIATE STEERING
15	16621	2	LINK, INTERMEDIATE STEERING
16	16646	2	STEERING ADJUSTER
17	HDW8494	2	SCREW, 3/8"–16 X 2" LG
18	HDW90994	4	JAM NUT, 3/8"–16
19	HDW7438	1	FITTING, MALE 3/8", MALE 3/8" O-RING
20	HDW90299	1	FITTING, 90° MALE 3/8", FEMALE 3/8"
21	HDW7601	1	FITTING, 90° MALE 3/8", MALE 3/8" O-RING

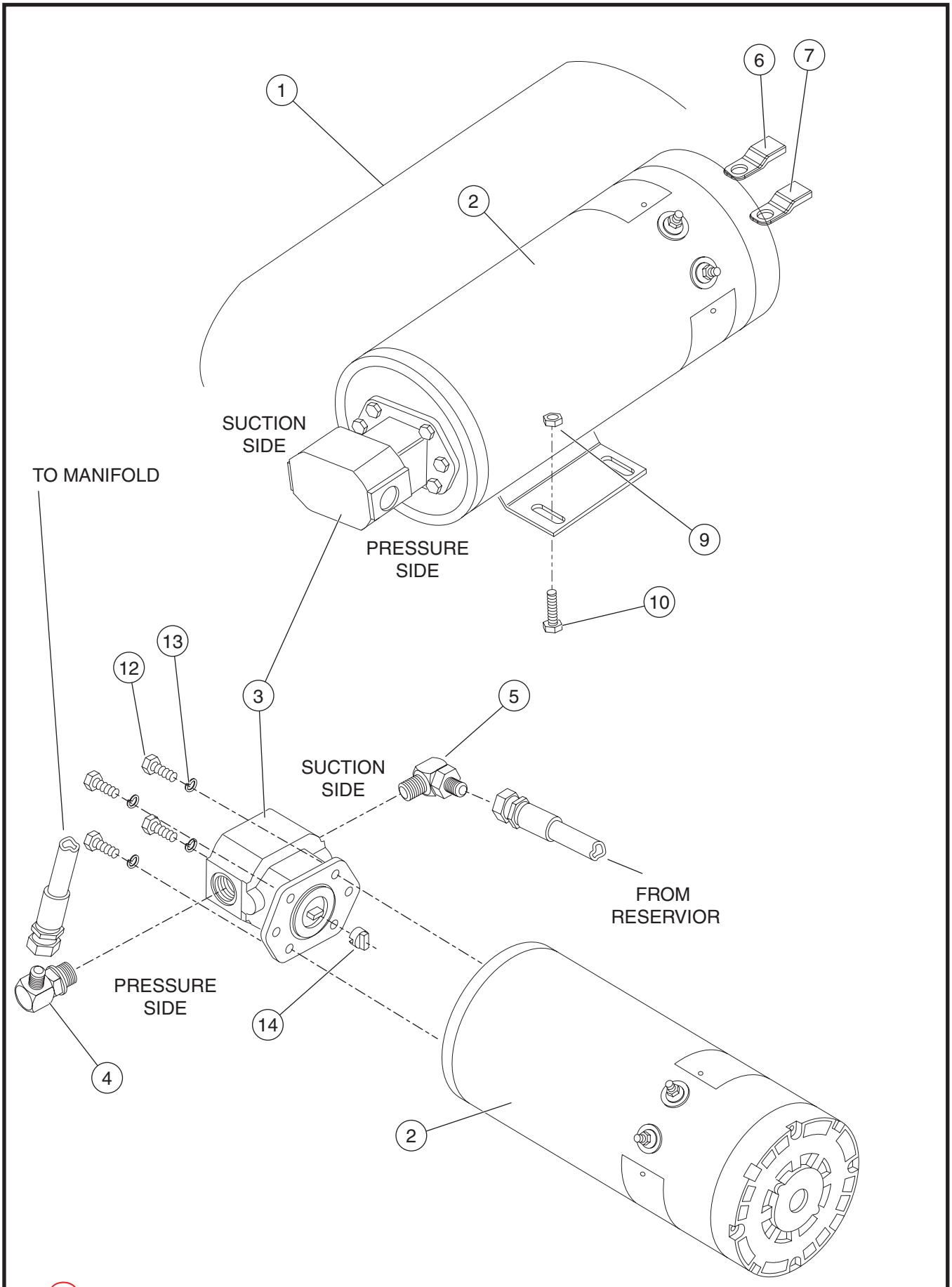


ILLUSTRATION No.
ART_2314

Electric Motor & Pump, X33ES - X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			HYDRAULIC PUMP ASSEMBLY
			2047ES: S/N# 9801000 TO 9801007
			2647ES: S/N# 9901000 TO 9901035
2	8544	1	MOTOR, 24 VDC, 2 HP
3	8546	1	PUMP
14	6314	1	COUPLER
			2047ES: S/N# 9801008 TO CURRENT
			2647ES: S/N# 9901036 TO CURRENT
			3247ES: S/N# 10001000 TO CURRENT
1	90970	1	POWER UNIT ASSEMBLY
2	90997	1	MOTOR, 24 VDC, 2 HP
	91226	1	BRUSHES
3	90998	1	PUMP
14	90999	1	COUPLER
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 A)
-	7172	1	BOOT TERMINAL INSULATOR RED (NOT SHOWN)
7	REF	1	BATTERY CABLE, BLACK, (SEE HARNESSES, PARTS SEC A)
-	7172	1	BOOT TERMINAL INSULATOR BLACK (NOT SHOWN)
9	HDW5005	4	NUT, 5/16" - 18
10	HDW5204	4	SCREW, 5/16" - 18, 1" LG
12	HDW5724	4	SCREW, 5/16"–18, 3/4" LG
13	HDW5006	4	LOCKWASHER, 5/16"
			SEE HYDRAULIC HOSES (SECTION D)

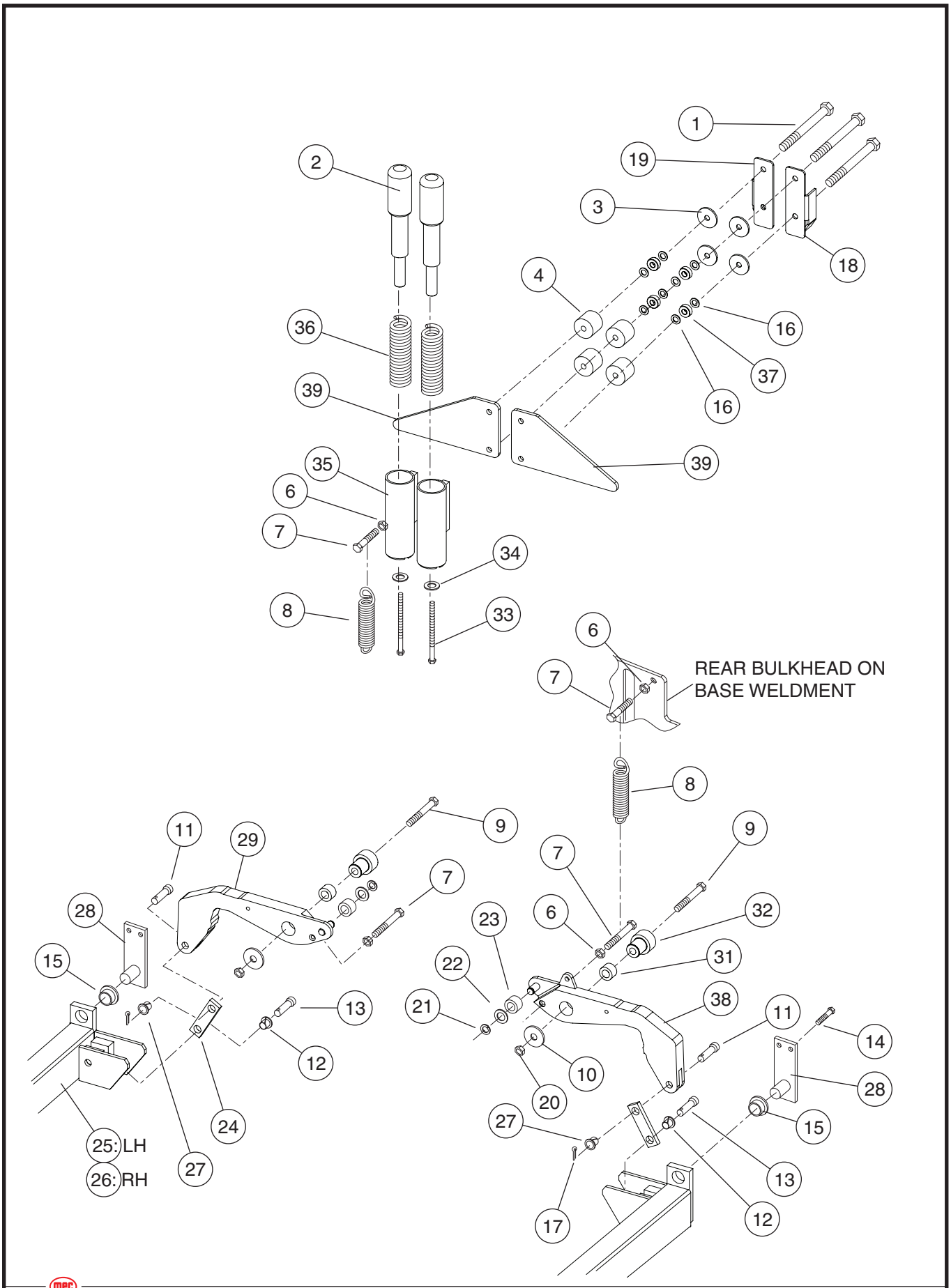


ILLUSTRATION No.
ART_2317

Pothole Assembly, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE ASSEMBLY
1	HDW8279	4	BOLT, CAP HEX HD, 3/8" -16, 2.50" LG, GRADE 5, ZI/CL
2	16587	2	ROD, ACTUATOR SPRING TUBE
3	HDW13556	4	WASHER, FLAT, PLASTIC, ID .391", OD 1.5", .125" THK
4	16624	4	SPACER, STEPPED, PVC
6	HDW8312	4	NUT, HEX, 5/16"-18, CLASS 5, ZI/CL
7	HDW8310	4	BOLT, CAP, HEX HD, 1/2"-13, 3.00" LG, GRADE 5, ZI/CL
8	8226	2	SPRING, TENSION, .75" X .564" X 5", K9.3+3.5
9	HDW7018	2	BOLT, CAP, HEX HD, 1/2"-13, 3.00" LG, GRADE 5, ZI/CL
10	HDW13195	2	WASHER, FLAT, ID .515", OD 1.512", .098" THK, ZI/YEL
11	HDW90770	1	PIN, CLEVIS, 1/2" X 1.375" LG, ZI/CL
12	7200	2	BEARING, 1/2" ID X 1/2" LG, NYLINER
13	HDW8179	2	PIN, CLEVIS, 1/2" X 2.62" LG, ZI/YEL
14	HDW8273	8	BOLT, CAP, HEX HD, 1/4"-20, 1.00" LG, GRADE 5, ZI/CL
15	7015	4	BEARING, FLANGED, NYLINER
16	HDW16625	8	THRUST WASHER
17	HDW5920	4	PIN, COTTER, HAMMERLOCK, 1/8" X 1.00", ZI/CL
18	13842	1	BRACKET, POTHOLE SWITCH ACTIVATOR, RH
19	13839	1	BRACKET, POTHOLE SWITCH ACTIVATOR, LH
20	HDW8457	2	NUT, LOC, HEX HD, 1/2"-13, CLASS B, ZI/CL
21	5736	2	RING, RETAINING, EXTERNAL, 1/2" SHAFT
22	HDW7031	2	WASHER, FLAT, ID .5", OD .875", .074 THK, ZI/YEL
23	4542	2	ROLLER
24	13770	2	LINK, POTHOLE
25	13766	1	BAR, POTHOLE, LH
26	13767	1	BAR, POTHOLE, RH
27	8181	2	BEARING, 1/2" X 5/16", NYLINER
28	13178	4	WELDMENT, PIVOT PIN
29	15039	1	WELDMENT, LEVER
			(CONTINUED)

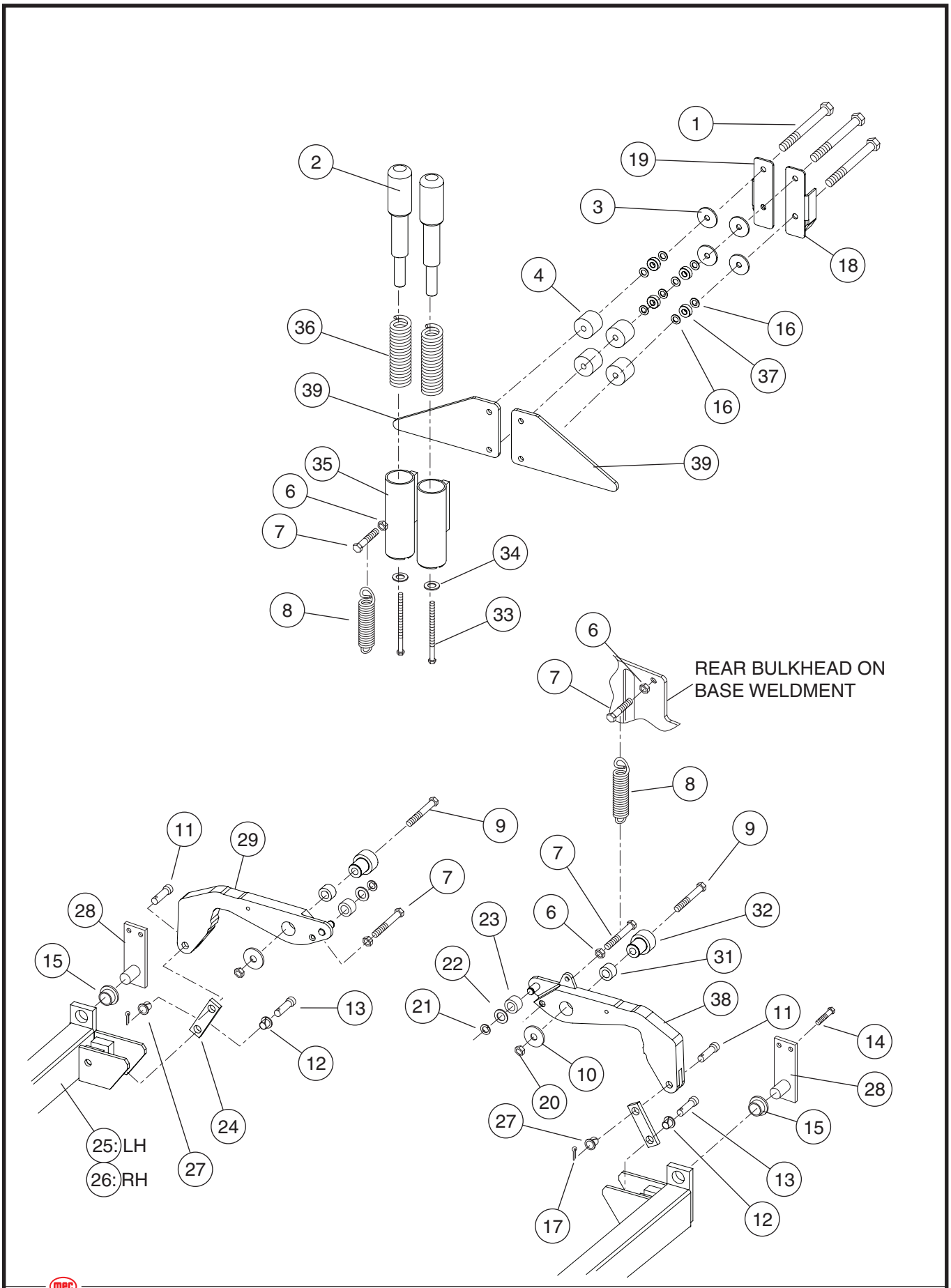


ILLUSTRATION No.
ART_2317

Pothole Assembly, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE ASSEMBLY (CONTINUED)
31	8225	2	BEARING, NYLINER, 16L16
32	13194	2	TUBE, PIVOT-POTHOLE LEVER
33	HDW8494	2	BOLT, TAP, HEX HD, 3/8"-16, 2.00" LG, GRADE 5, ZI/CL
34	HDW5355	2	WASHER, FLAT, ID .438", OD 1.00", .078" THK, ZI/CL
35	13464	2	WELDMENT, ACTUATOR SPRING TUBE
36	13478	2	SPRING, COMP, 1.68" X 1.251" X 7.00"
37	90921	4	BEARING, BALL .375" ID X .875" OD X .375" THK
38	16644	1	ACTIVATOR, POTHOLE BAR WELDMENT
39	16561	2	PLATE CONTACT DEPRESSION RAIL

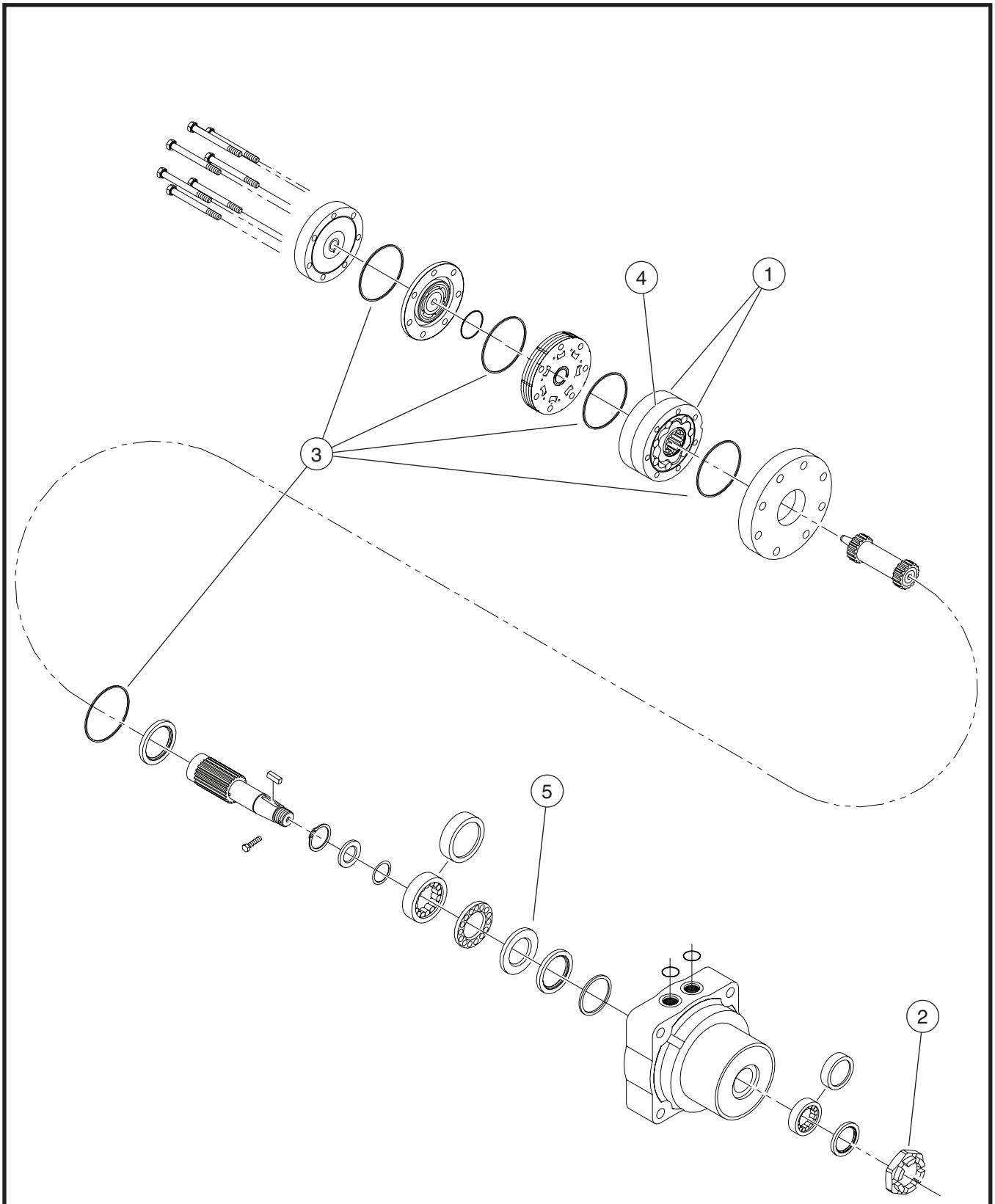


ILLUSTRATION No.
ART_2318

Wheel Motor Assembly, ES

ITEM	PART NO.	QTY	DESCRIPTION
			WHEEL MOTOR
	90846		WHEEL MOTOR
	90857		SEAL KIT FOR WHEEL MOTOR 90846
1	–	2	STATER HALVES
2	HDW8568	1	NUT, 1 1/8" - 18
			SEAL KIT
3	–	5	SEAL RING
4	–	1	SEAL RING BETWEEN HALVES
5	–	1	SHAFT SEAL

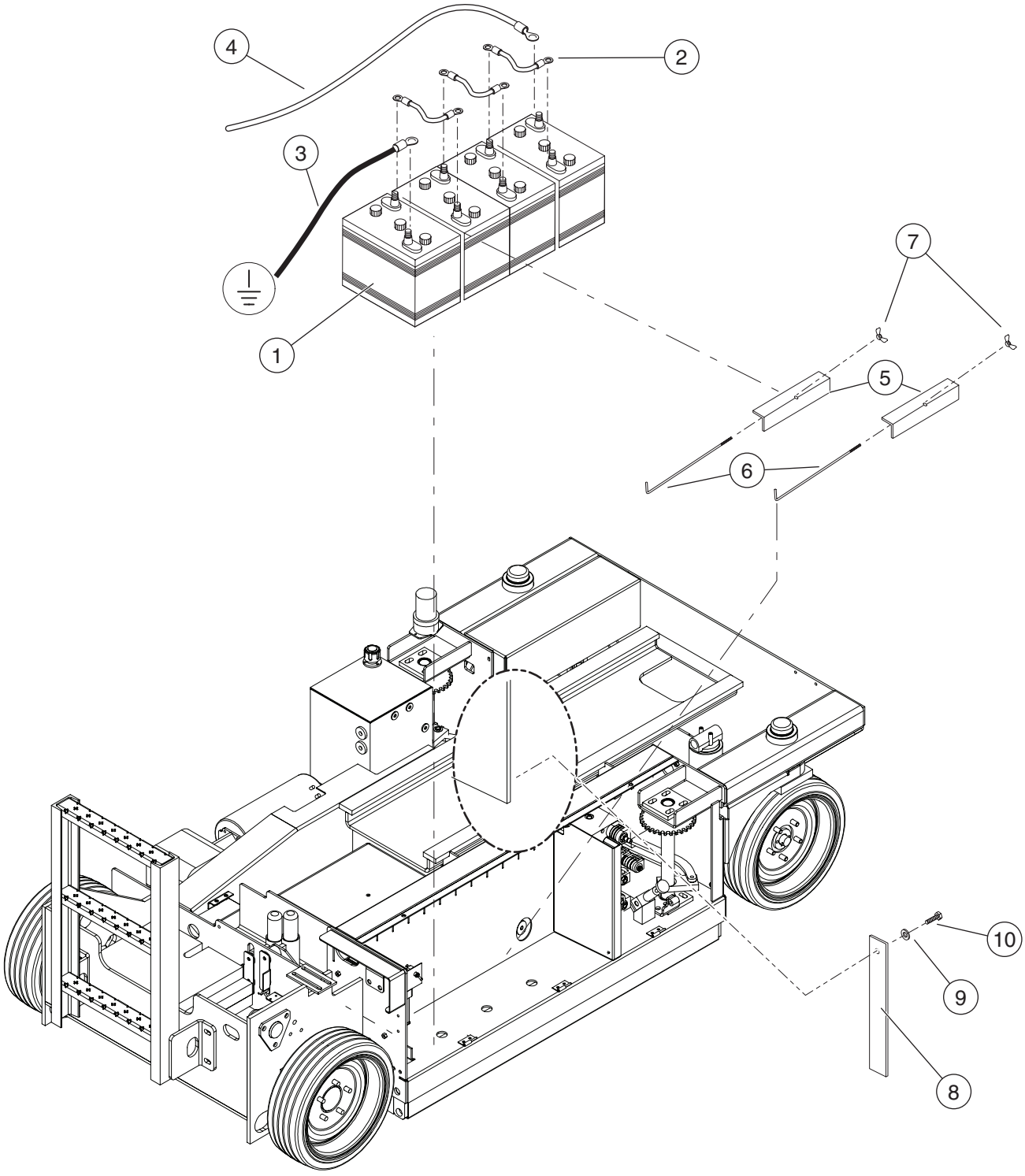


ILLUSTRATION No.
ART_2321

Battery Installation, 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			BATTERY INSTALLATION
1	5970	4	BATTERY, 6 VOLT **(2047ES, 2647ES)**
1	90780	4	BATTERY, 6 VOLT **(3247ES)**
2	REF	3	CABLE, BLACK (SEE HARNESSES, PARTS SEC A)
3	REF	1	CABLE, BLACK (SEE HARNESSES, PARTS SEC A)
4	9062	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
			SEE "EMERGENCY LOWERING SWITCH - 3247ES" IN THIS SECTION FOR E-DOWN 12V BATTERY

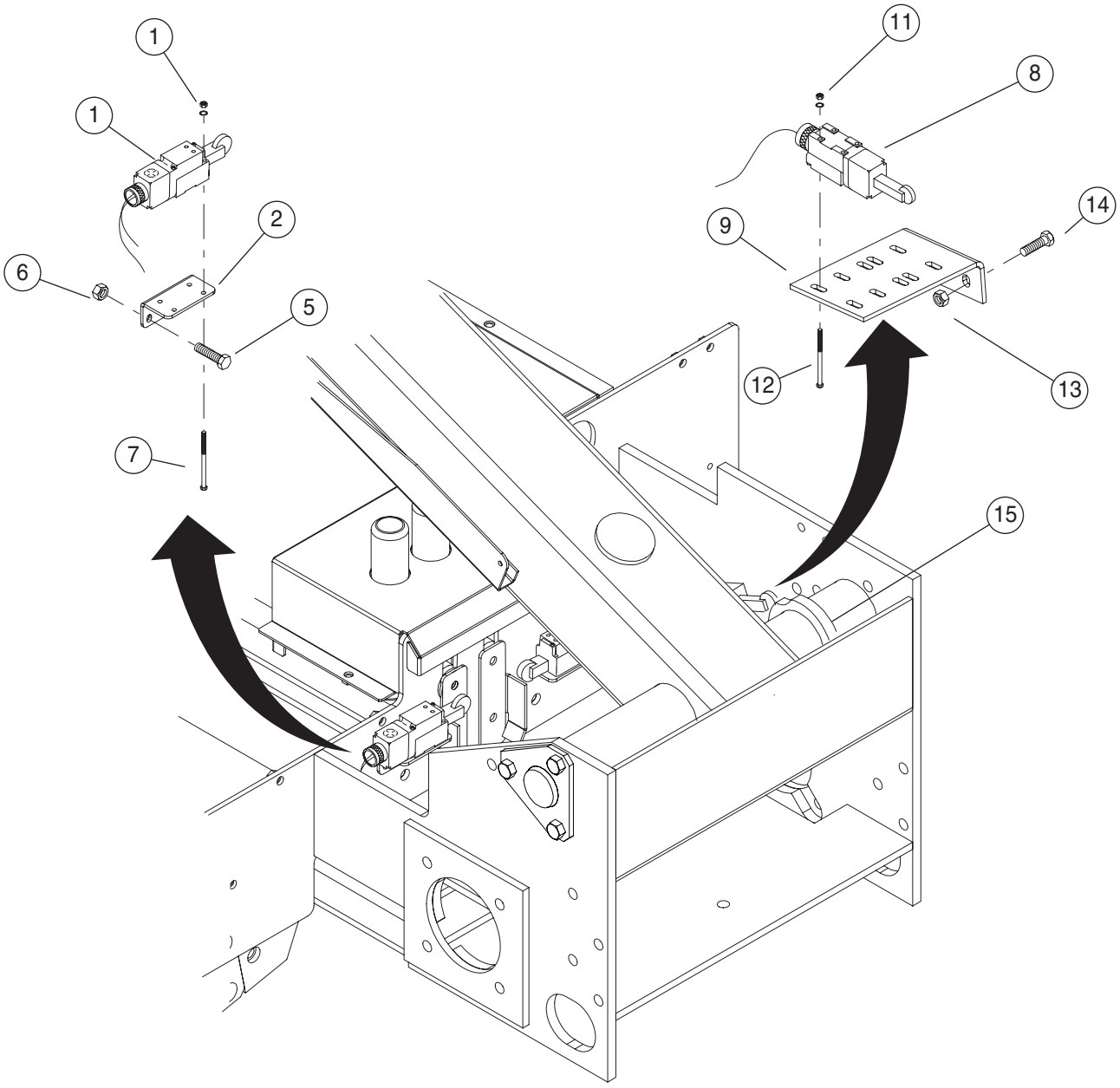


ILLUSTRATION No.
ART_2327

Limit Switches Installation, X33ES - X47ES

ITEM	PART NO.	QTY	DESCRIPTION
			POTHOLE LIMIT SWITCH
1	90531	2	SWITCH, POTHOLE
2	13840	2	BRACKET, POTHOLE SWITCH MOUNT
3	90685	1	POTHOLE SWITCH HARNESS
4	HDW5251	2	NUT #8
5	HDW8273	2	SCREW, CAP, HEX HD, 1/4" X 1" LG
6	HDW5276	2	NUT, 1/4"
7	HDW8482	2	SCREW, MACHINE, #8 X 1.5" LG
			DRIVE LIMIT SWITCH
8	8932	2	SWITCH, LIMIT SPEED, HONEYWELL BRAND
8	90996	2	SWITCH, LIMIT SPEED, TELEMECANIQUE BRAND
9	13838	1	BRKT, LIMIT SWITCH MOUNT
10	90686	1	SAFETY SWITCH HARNESS
11	HDW5251	2	NUT, #8 - 32
12	HDW8273	2	SCREW, 1/4" - 20, 1" LG
13	HDW5276	2	NUT 1/4" - 20
14	HDW8482	2	#8 - 32, 1 1/2" LG
15	13837	1	CAM, LIMIT SPEED
	HDW8870	1	SET SCREW
NS	6064	2	HOSE CLAMP, PLASTIC MOLDED
NS	HDW5217	2	WASHER
NS	HDW6502	1	SCREW, 1/4"-20 X 2 1/2" LG

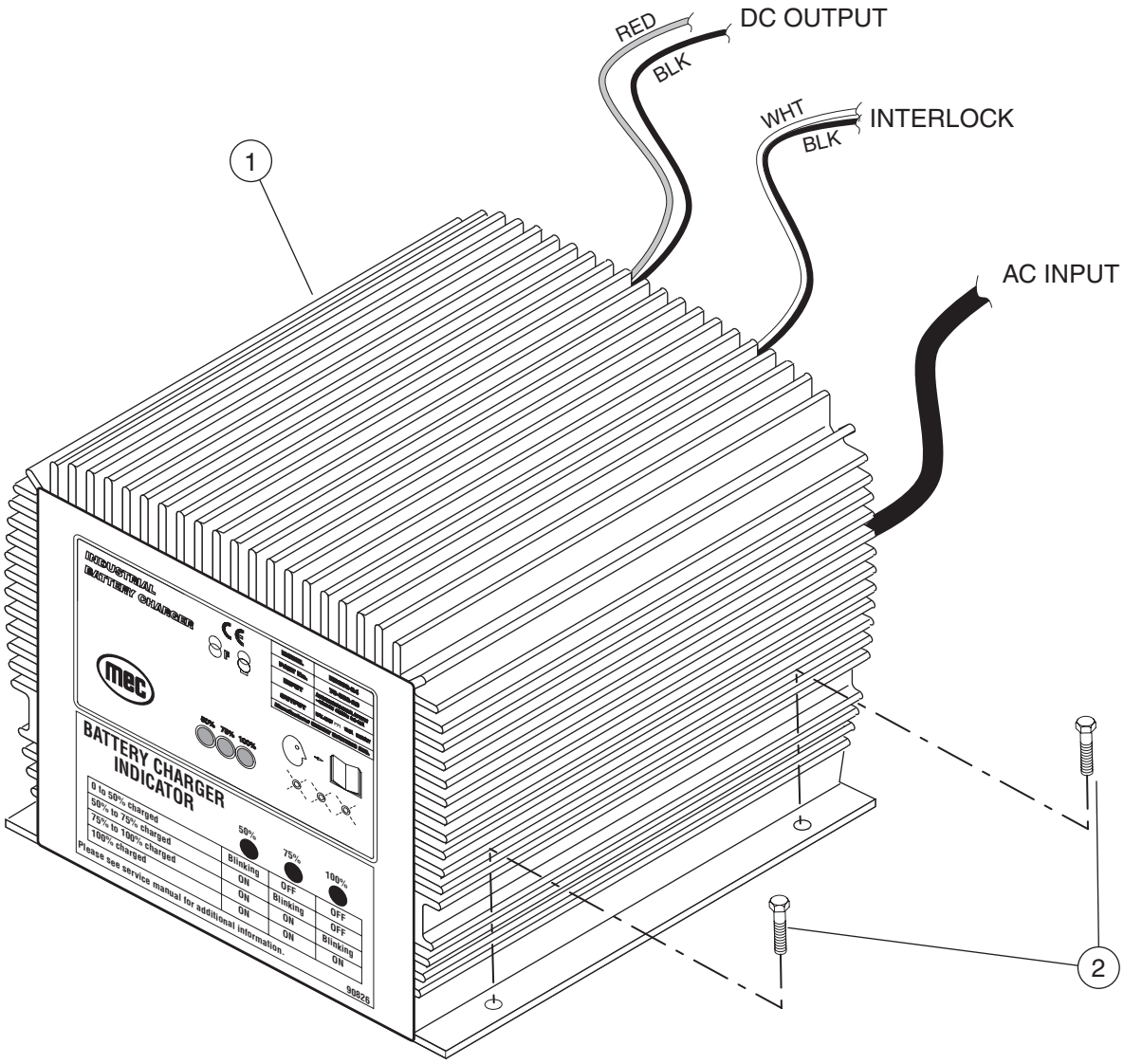


ILLUSTRATION No.
ART_2323

Battery Charger, ES

ITEM	PART NO.	QTY	DESCRIPTION
			BATTERY CHARGER
1	90799	1	CHARGER, 24 VOLT, 110/220V 50/60 Hz
2	HDW7888	4	SCREW, #10 - 32, 1/2" LG

SECTION F:
DECALS

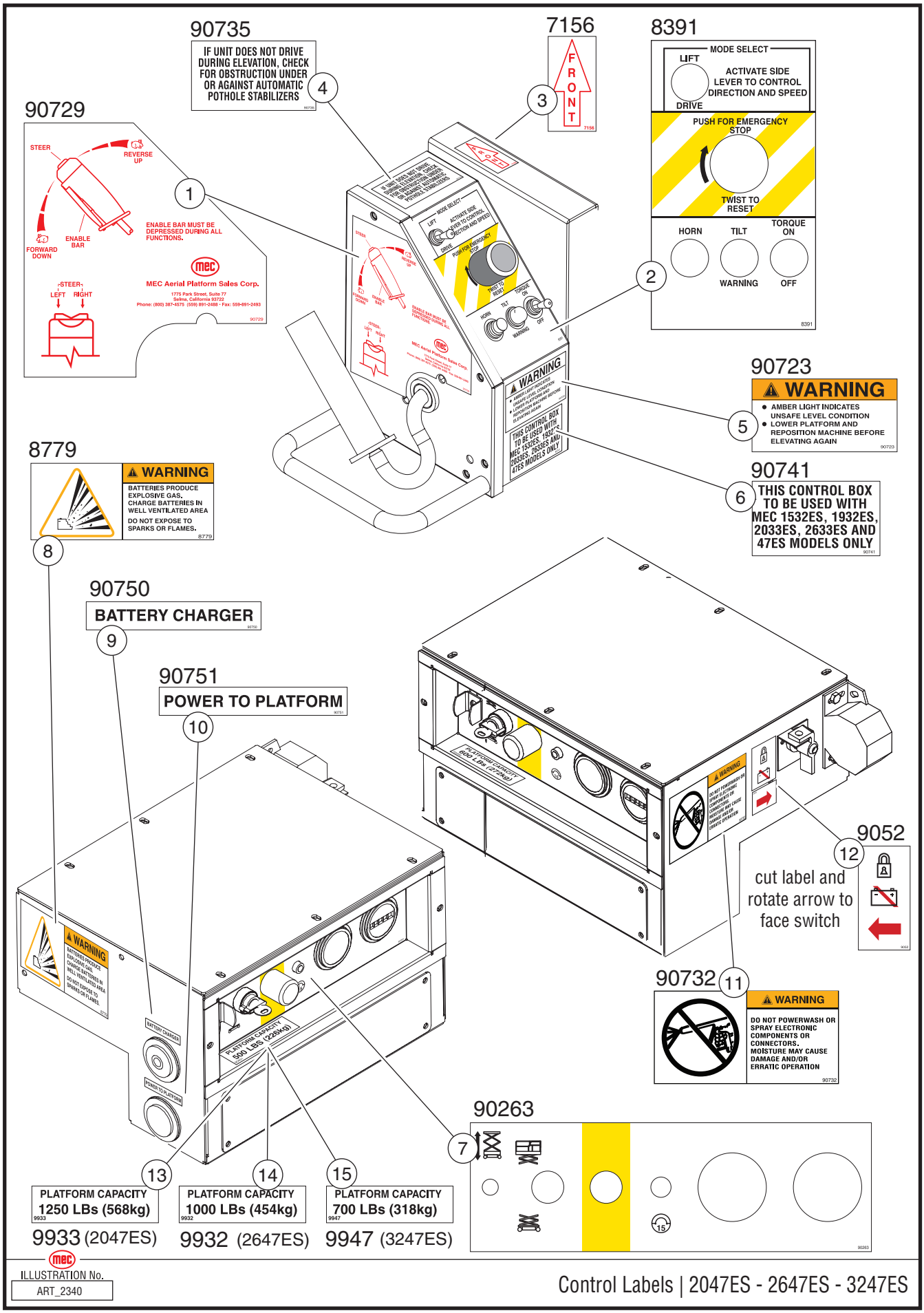
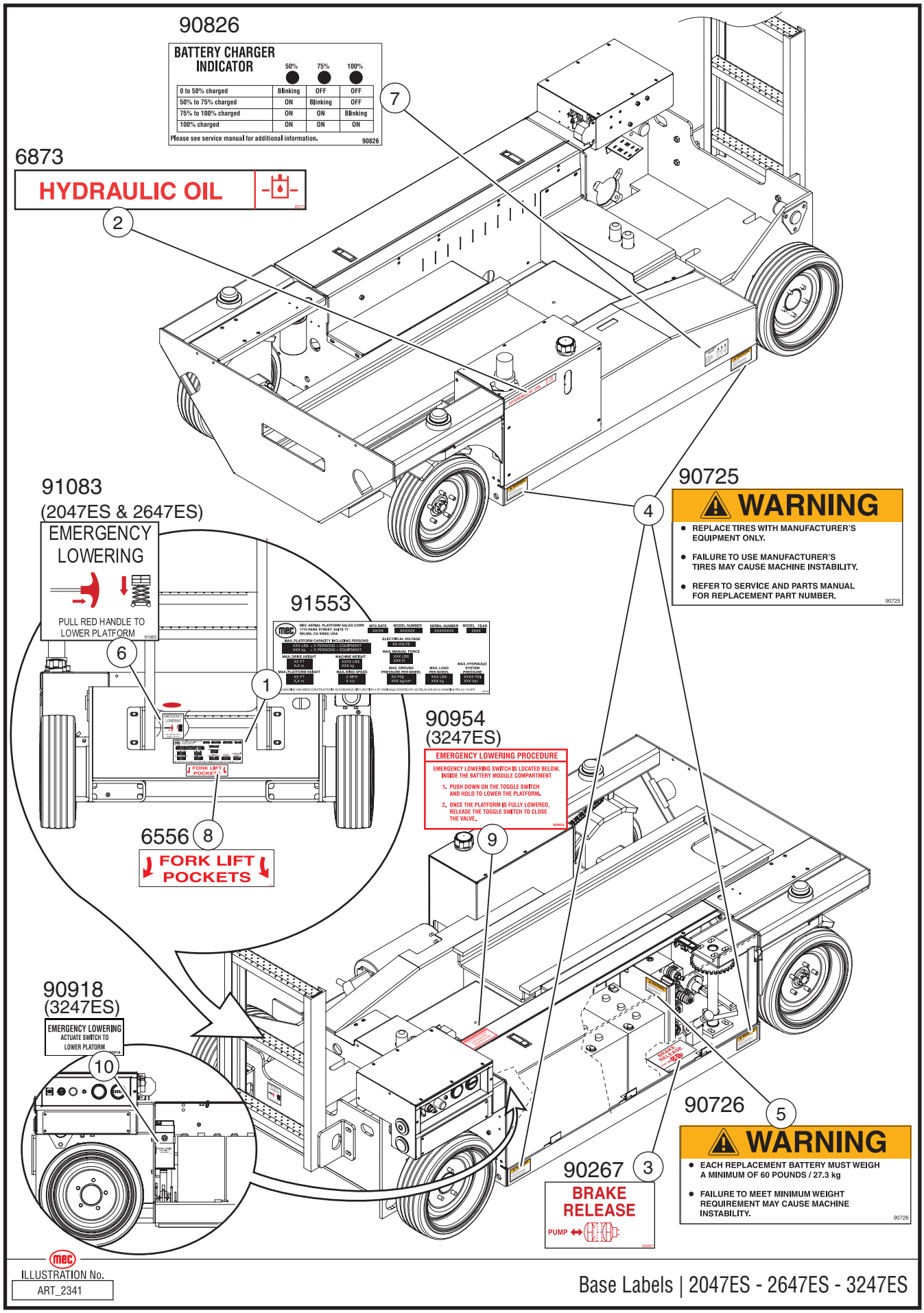


ILLUSTRATION No.
ART_2340

Control Labels | 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 2047ES - 2647ES - 3247ES CONTROLS
1	90729	1	DECAL, UPPER CONTROL BOX, SIDE
2	8391	1	DECAL, UPPER CONTROLS
3	7156	1	DECAL, FRONT
4	90735	1	DECAL, POTHOLE
5	90723	1	DECAL, WARNING, LEVEL
6	90741	1	DECAL, CONTROL BOX MODEL, X72RT
7	90263	1	DECAL, LOWER CONTROL BOX, FRONT PANEL
8	8779	1	DECAL, WARNING, BATTERY
9	90750	1	DECAL, BATTERY CHARGER
10	90751	1	DECAL, POWER TO PLATFORM
11	90732	1	DECAL, WARNING, DO NOT PRESSURE WASH
12	9052	1	DECAL, BATTERY LOCK
13	9933	1	DECAL, PLATFORM CAPACITY (2047ES)
14	9932	1	DECAL, PLATFORM CAPACITY (2647ES)
14	9947	1	DECAL, PLATFORM CAPACITY (3247ES)



ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 2047ES - 2647ES - 3247ES BASE
1	91553	1	SERIAL PLATE
2	6873	1	DECAL, HYDRAULIC OIL
3	90267	1	DECAL, BRAKE RELEASE
4	90725	4	DECAL, WARNING, TIRE REPLACEMENT
5	90726	1	DECAL, WARNING, BATTERY REPLACEMENT
6	91083	1	DECAL, EMERGENCY LOWERING (2047ES & 2647ES)
7	90826	1	DECAL, BATTERY CHARGER INDICATOR
8	6556	1	DECAL, FORK LIFT POCKETS
9	90954	1	EMERGENCY LOWERING INSTRUCTIONS (3247ES)
10	90918	1	EMERGENCY LOWERING (3247ES)

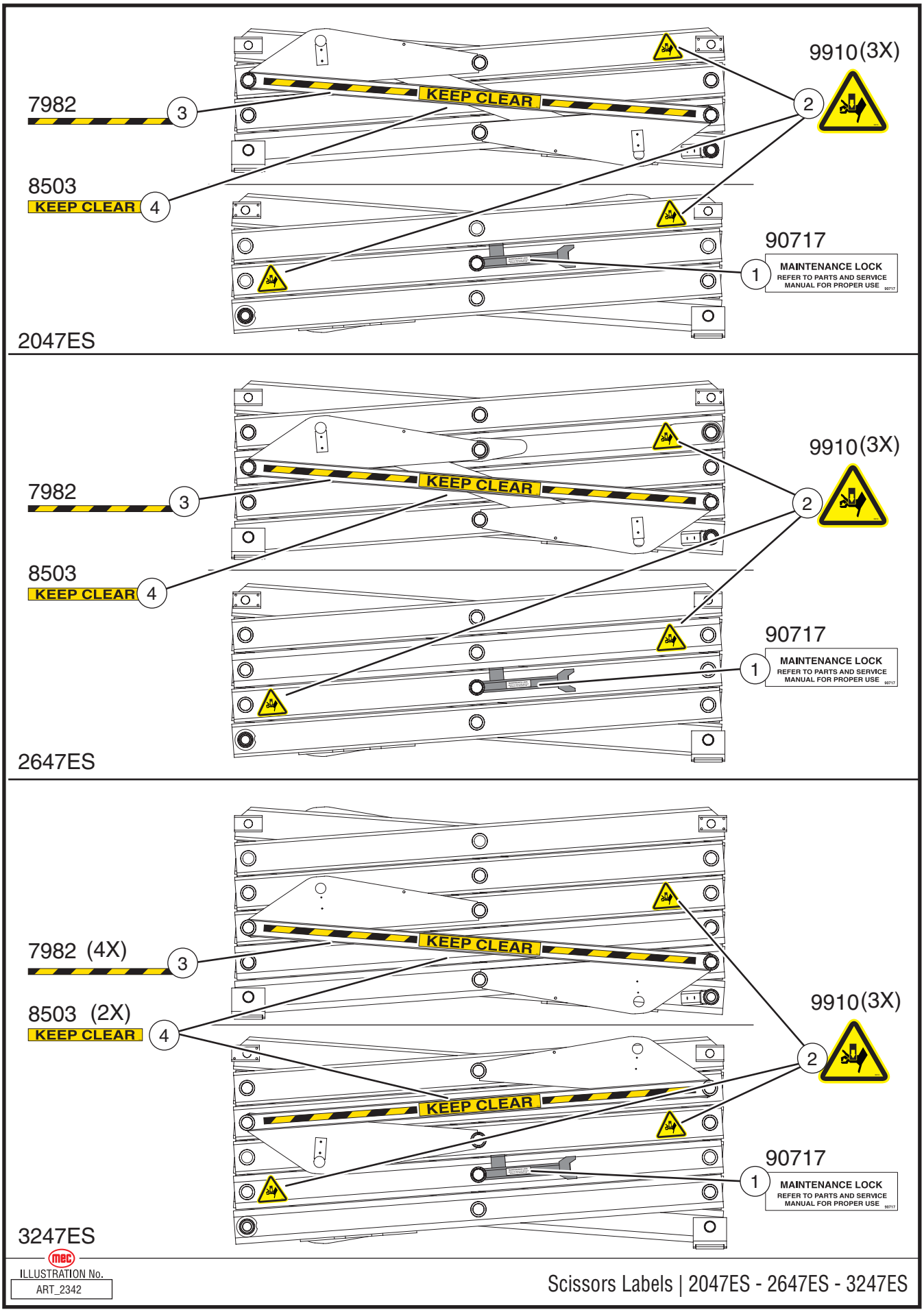


ILLUSTRATION No.
ART_2342

Scissors Labels | 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 22047ES - 2647ES - 3247ES SCISSORS
1	90717	1	DECAL, MAINTENANCE LOCK
2	9910	3	DECAL, PINCH POINT
3	7982	2	DECAL, SAFETY STRIPE (2047ES & 2647ES)
3	7982	4	DECAL, SAFETY STRIPE (3247ES)
4	8503	1	DECAL, KEEP CLEAR (2047ES & 2647ES)
4	8503	2	DECAL, KEEP CLEAR (3247ES)

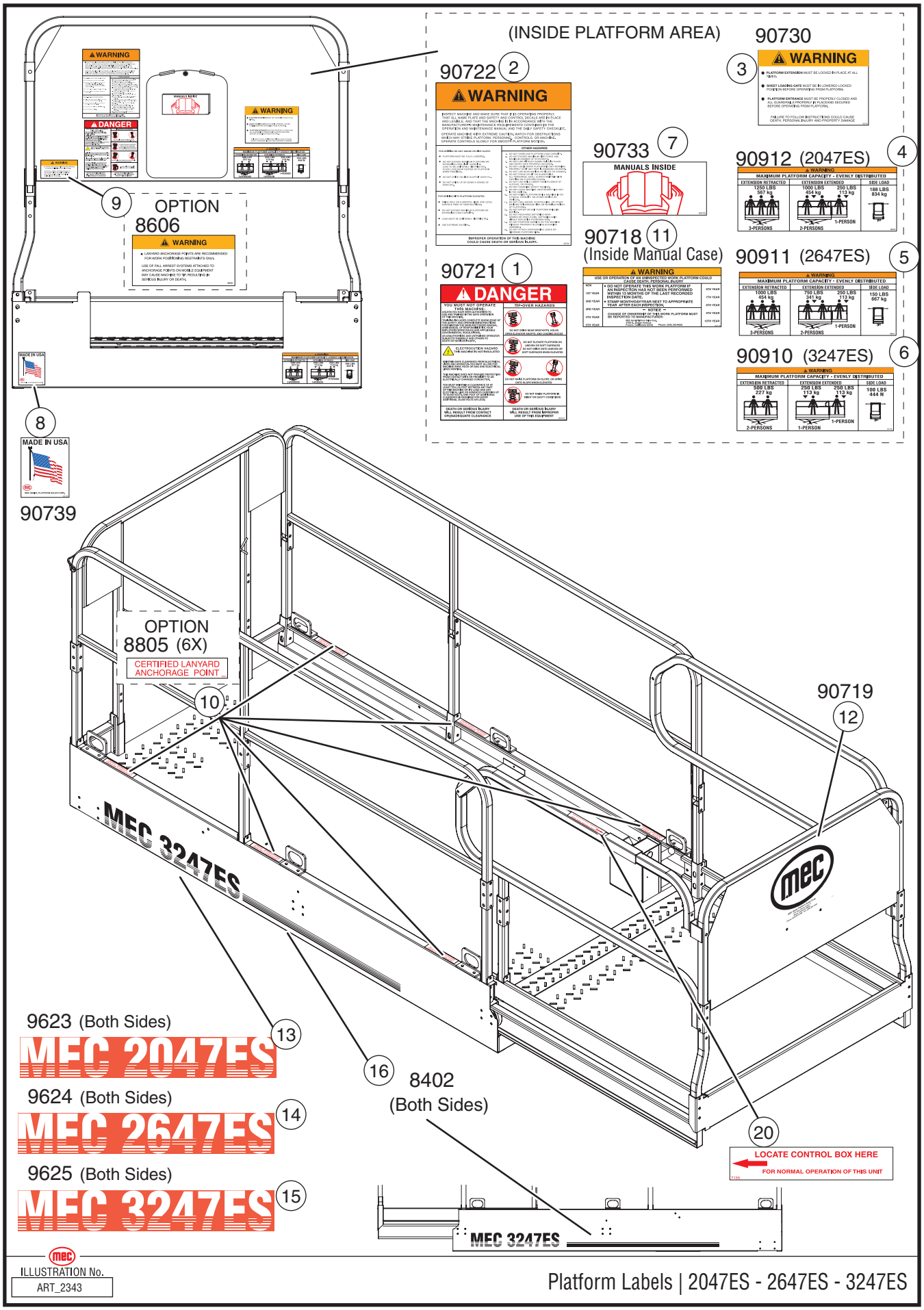


ILLUSTRATION No.
ART_2343

Platform Labels | 2047ES - 2647ES - 3247ES

ITEM	PART NO.	QTY	DESCRIPTION
			DECALS, 2047ES - 2647ES - 3247ES PLATFORM
1	90721	1	DECAL, DANGER, TIP OVER
2	90722	1	DECAL, WARNING, MAINTENANCE
3	90730	1	DECAL, WARNING, PLATFORM LOCK
4	90912	2	DECAL, WARNING, PLATFORM CAPACITY(2047ES)
5	90911	2	DECAL, WARNING, PLATFORM CAPACITY (2647ES)
6	90910	2	DECAL, WARNING, PLATFORM CAPACITY (2347ES)
7	90733	1	DECAL, MANUALS INSIDE
8	90739	1	DECAL, MADE IN USA
9	8806	1	DECAL, WARNING, LANYARD (OPTION)
10	8805	6	DECAL, ANCHORAGE POINTS (OPTION)
11	90718	1	DECAL, WARNING, INSPECTION
12	90719	1	DECAL, MEC LOGO
13	9623	2	DECAL, MEC 2047ES
14	9624	2	DECAL, MEC 2647ES
15	9625	2	DECAL, MEC 3247ES
16	8402	2	DECAL, RAIL STRIPE
20	7155	1	DECAL, LOCATE CONTROL BOX HERE

Service Parts Order Form
Fax to 559-263-9631

Please fill out completely

Date: _____

Account: _____

Bill to: _____

_____

_____

_____

_____

Ordered By: _____

Your Fax No.: _____

Ship to: _____

_____

_____

_____

_____

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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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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