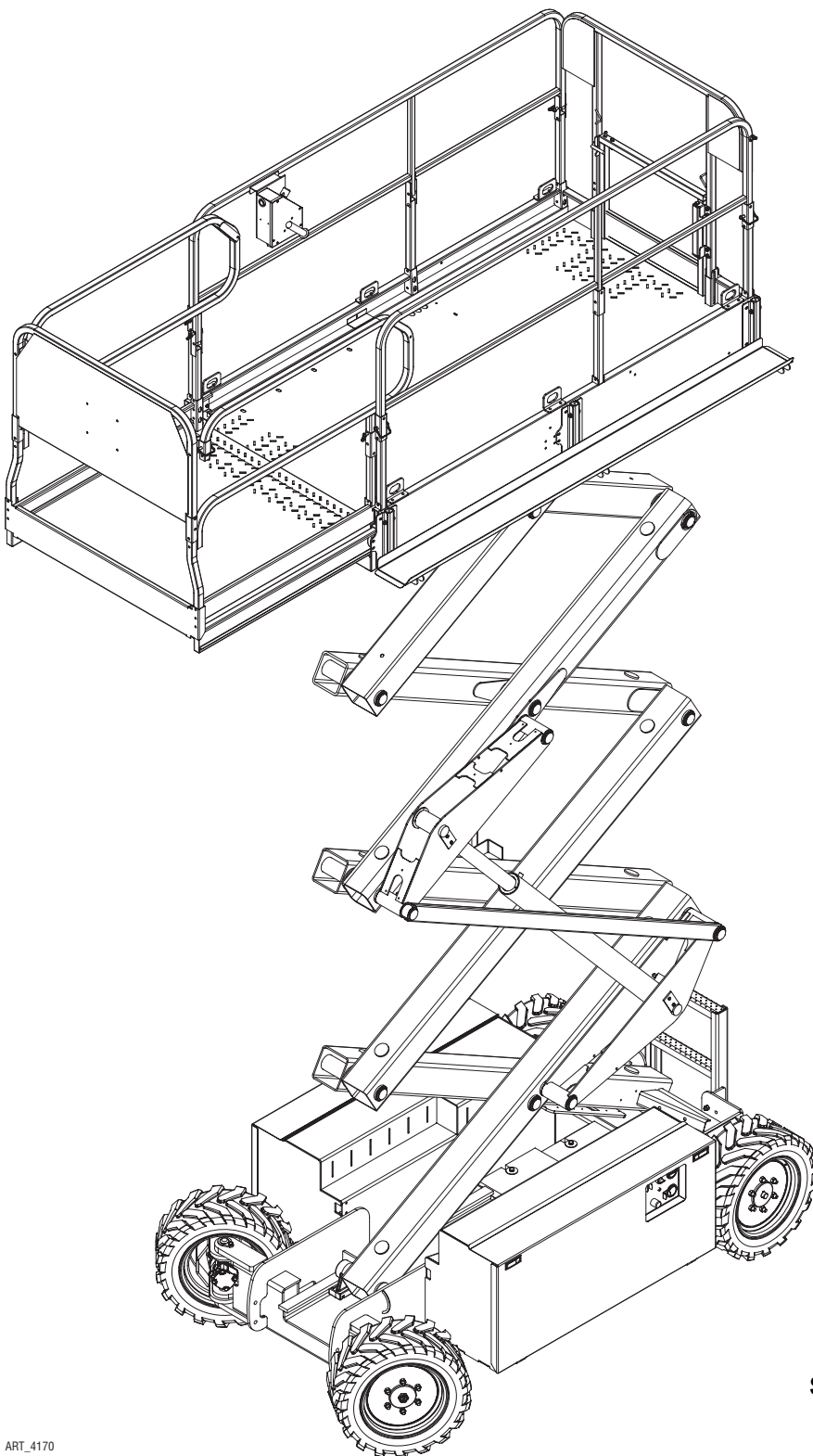




# SERVICE AND PARTS MANUAL

## 59 Series



ART\_4170

Serial Number Range  
13000001 - Up  
13100001 - Up

Part # 92847  
July 2012

## Revision History

Original Release Date: July 2012

| Date    | Reason for Update |
|---------|-------------------|
| 07/2012 | New Release       |
|         |                   |
|         |                   |



**Aerial Platform Sales Corp.**

1401 S. Madera Avenue • Kerman, CA 93630 USA  
Ph: 1-800-387-4575 • 1-559-842-1500 • FAX 1-559-842-1520  
E-mail: [info@mecAWP.com](mailto:info@mecAWP.com) • Web: [www.mecAWP.com](http://www.mecAWP.com)

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**NOTES:**

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# INTRODUCTION

This manual consists of Service and Illustrated 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 aerial work platform. When used in conjunction with the Illustrated Parts Section and the Operators Manual (provided separately), this manual will assist you in making necessary adjustments and repairs, and identifying and ordering the correct replacement parts.

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

We recommend that you use genuine MEC parts to ensure proper operation and reliable performance.

To obtain maximum benefits from your MEC Aerial Work Platform, 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, Service and Parts Manuals in order to gain a thorough understanding of the unit prior to making any repairs.

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# MACHINE SPECIFICATIONS

|  |                     | 2659ERT   |                        | 3259ERT                   |                        |
|--|---------------------|---|------------------------|---------------------------|------------------------|
| Working Height*                              |                     | 32 ft   | 9.92 m                 | 38 ft                     | 11.75m                 |
| Platform Height                              |                     | 26 ft   | 7.92 m                 | 32 ft                     | 9.75 m                 |
| Maximum Drive Height                         |                     | 26 ft   | 7.92 m                 | 32 ft                     | 9.75 m                 |
| Stowed Height                                | Top Guardrail       | 90 in.  | 2.29 m                 | 96 in.                    | 2.44 m                 |
|  | Rails Folded        | 75 in.  | 1.90 m                 | 82 in.                    | 2.09 m                 |
|  | Platform Floor      | 45 in.  | 1.15 m                 | 51 in.                    | 1.30 m                 |
| Guardrail Height                             |                     | 43.5 in.  | 1.10 m                 | 43.5 in.                  | 1.10 m                 |
| Toeboard Height                              |                     | 6 in.   | 15 cm                  | 6 in.                     | 15 cm                  |
| Machine Weight** (Unloaded, no outriggers)   |                     | 6065 lb   | 2750 kg                | 7360 lb                   | 3338 kg                |
| Machine Weight** (Unloaded, with outriggers) |                     | 6565 lb   | 2980 kg                | 7860 lb                   | 3568 kg                |
| Lift Capacity                                | Total               | 1000 lb   | 450 kg                 | 750 lb                    | 340 kg                 |
|  | Platform            | 750 lb  | 340 kg                 | 500 lb                    | 225 kg                 |
|  | Sheet Material Rack | 250 lb  | 113 kg                 | 250 lb                    | 113 kg                 |
| Deck Extension Capacity                      |                     | 1 Person / 250lb (113 kg)                         |                        | 1 Person / 250lb (113 kg) |                        |
| Maximum Occupants                            |                     | 3   |                        | 2                         |                        |
| Length-Stowed (Overall)                      |                     | 103 in.   | 2.62 m                 | 103 in.                   | 2.62 m                 |
| Length-Stowed (Without Step)                 |                     | 105 in.   | 2.67 m                 | 105 in.                   | 2.67 m                 |
| Platform Length (Extended)                   |                     | 133.5 in.   | 3.39 m                 | 133.5 in.                 | 3.39 m                 |
| Platform Length (Retracted)                  |                     | 91 in.  | 2.31 m                 | 91 in.                    | 2.31 m                 |
| Width (Overall)                              |                     | 59 in.  | 1.5 m                  | 59 in.                    | 1.5 m                  |
| Platform Width (Outside)                     |                     | 46 in.  | 1.17 cm                | 46 in.                    | 1.17 cm                |
| Sheet Rack Width                             |                     | 8 in.   | 20 cm                  | 8 in.                     | 20 cm                  |
| Wheel Base                                   |                     | 82 in   | 2.1 m                  | 82 in                     | 2.1 m                  |
| Turning Radius--Inside                       |                     | 59 in.  | 1.5 m                  | 59 in.                    | 1.5 m                  |
| Ground Clearance                             |                     | 6 in  | 15 cm                  | 6 in                      | 15 cm                  |
| Drive Speed (Proportional)                   | Stowed              | 0-3.2 mph   | 0-5 km/h               | 0-3.0 mph                 | 0-4.8 km/h             |
|  | Raised or extended  | 0-.5 mph  | 0-8 km/h               | 0-.5 mph                  | 0-8 km/h               |
| Gradability                                  |                     | 35%/19°   |                        | 31%/17°                   |                        |
| Breakover Angle                              |                     | 30%/16.7°   |                        |                           |                        |
| Ground Pressure/Wheel                        |                     | 93 psi  | 6.5 kg/cm <sup>2</sup> | 104 psi                   | 7.3 kg/cm <sup>2</sup> |
| Maximum Wheel Load                           |                     | 2120 lb   | 960 kg                 | 2430 lb                   | 1100 kg                |
| Maximum Operating Wind Speed                 |                     | 28 mph / 12.5 m/sec (45 km/h)                     |                        |                           |                        |
| Tire Size                                    |                     | 23" x 10" / .58m x .25m                           |                        |                           |                        |
| Tire Pressure                                |                     | 55 psi  |                        |                           |                        |
| Lug Nut Torque                               |                     | 130 ft/lb   |                        | 176 Nm                    |                        |
| Hydraulic Pressure                           | Drive System        | 3200 psi/ 220 bar                                 |                        |                           |                        |
|  | Lift System         | 2400 psi / 165 bar                                |                        |                           |                        |
|  | Steer System        | 1500 psi / 103 bar                                |                        |                           |                        |
| Hydraulic Fluid Capacity                     |                     | 14 gal / 64 liter                                 |                        |                           |                        |
| Power System Voltage                         |                     | 48 Volt DC†                                       |                        |                           |                        |
| Battery Charger                              | Input               | 100-240 V AC, 50-60 Hz, 12 Amp                    |                        |                           |                        |
|  | Output              | 48 Volt DC, 20 Amp, Automatic Shut-off†           |                        |                           |                        |
| Batteries                                    |                     | Eight 6-Volt deep cycle; 250 Ah @ 20 hour rating† |                        |                           |                        |
| Motor  |                     | 8 HP (6kW), 3600RPM 48V Motor†                    |                        |                           |                        |

\*Working Height adds 6 feet (2 m) to platform height.

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

†Machines prior to serial numbers 13000032 (2659) and 13100028 (3259) use 36V systems.

Contact MEC Customer Service for information.

# MEC OPERATOR POLICY

**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 body of the machine, at the ground controls, and platform control console.



***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 Aerial Work Platform 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:**



## **MEC Aerial Work Platform**

1401 S. Madera Avenue  
Kerman, CA 93630 USA  
Ph: 1-800-387-4575  
[www.mecAWP.com](http://www.mecAWP.com)

# SAFETY SYMBOLS

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” without alert symbol indicates a situation which, if not avoided, may result in property damage.**

## GENERAL SAFETY TIPS

Regular inspection and conscientious maintenance is the key to efficient economical operation of your aerial work platform. 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.

- 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.

## MAINTENANCE LOCK

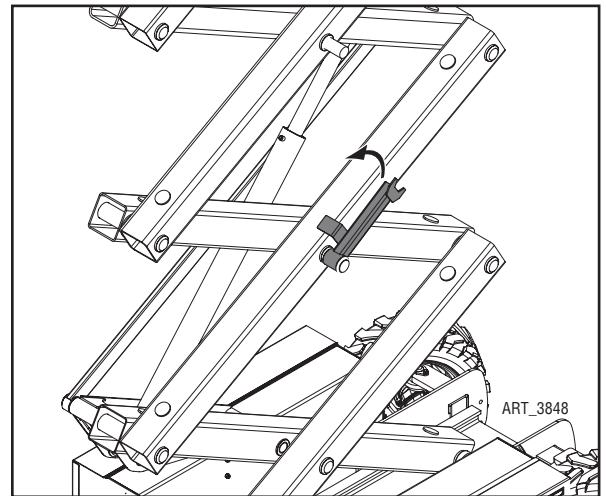


**DEATH OR SERIOUS INJURY HAZARD!**

**NEVER PERFORM WORK OR INSPECTION ON THE MACHINE WITH THE PLATFORM ELEVATED WITHOUT FIRST BLOCKING THE SCISSOR ASSEMBLY WITH THE MAINTENANCE LOCK.**

To set the Maintenance Lock, raise the platform enough to allow the Maintenance Lock to rotate to vertical. Carefully lower the platform until the pin above rests securely on the Maintenance Lock.

*Figure 1-1: Support Platform*



## HYDRAULIC SYSTEM



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

CORRECT LEAKS IMMEDIATELY.



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



Prevent damage to battery and/or electrical system;

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

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

## TOTAL SYSTEM



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.

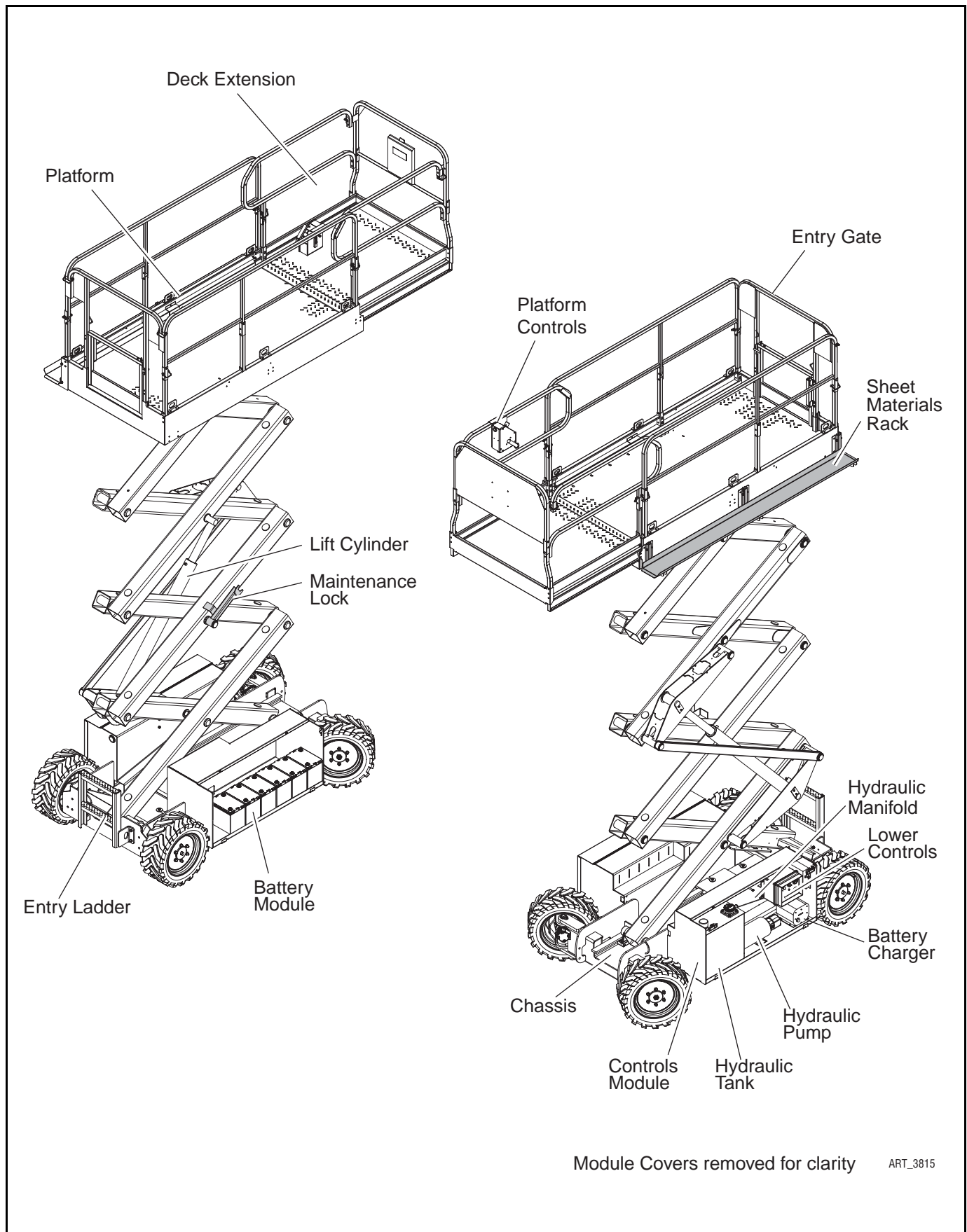
IMMEDIATELY REPORT TO YOUR SUPERVISOR ANY DEFECT OR MALFUNCTION. ANY DEFECT SHALL BE REPAIRED PRIOR TO CONTINUED USE OF THE AERIAL WORK PLATFORM.

INSPECTION AND MAINTENANCE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL FAMILIAR WITH THE EQUIPMENT.



# PRIMARY MACHINE COMPONENTS







Figure 1-2: Component Locations



# 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 |   |      |      |      |   |     |      |      | METRIC CAP SCREWS  |  |      |      |      |   |      |      |      |
|------------------------------|---|------|------|------|---|-----|------|------|--|--|------|------|------|---|------|------|------|
| SAE GRADE                    | 5   |      |      |      | 8   |     |      |      | METRIC GRADE   | 8.8  |      |      |      | 10.9  |      |      |      |
| CAP SCREW SIZE<br>- inches - |  |      |      |      |  |     |      |      | CAP SCREW SIZE<br>- millimeters -  |   |      |      |      |   |      |      |      |
|                              | TORQUE  |      |      |      | TORQUE  |     |      |      |  | TORQUE   |      |      |      | TORQUE  |      |      |      |
|                              | FT. LBS   |      | Nm   |      | FT. LBS   |     | Nm   |      |  | FT. LBS  |      | Nm   |      | FT. LBS   |      | Nm   |      |
|                              | MIN   | MAX  | MIN  | MAX  | MIN   | MAX | MIN  | MAX  |  | MIN  | MAX  | MIN  | MAX  | MIN   | MAX  | MIN  | MAX  |
| 1/4 - 20                     | 6.25  | 7.25 | 8.5  | 10   | 8.25  | 9.5 | 11   | 13   | M6 X 1.00  | 6  | 8    | 8    | 11   | 9   | 11   | 12   | 15   |
| 1/4 - 28                     | 8   | 9    | 11   | 12   | 10.5  | 12  | 14   | 16   | M8 X 1.25  | 16   | 20   | 21.5 | 27   | 23  | 27   | 31   | 36.5 |
| 5/16 - 18                    | 14  | 15   | 19   | 20   | 18.5  | 20  | 25   | 27   | M10 X 1.50   | 29   | 35   | 39   | 47   | 42  | 52   | 57   | 70   |
| 5/16 - 24                    | 17.5  | 19   | 23   | 26   | 23  | 25  | 31   | 34   | M12 X 1.75   | 52   | 62   | 70   | 84   | 75  | 91   | 102  | 123  |
| 3/8 - 16                     | 26  | 28   | 35   | 38   | 35  | 37  | 47.5 | 50   | M14 X 2.00   | 85   | 103  | 115  | 139  | 120   | 146  | 163  | 198  |
| 3/8 - 24                     | 31  | 34   | 42   | 46   | 41  | 45  | 55.5 | 61   | M16 X 2.50   | 130  | 158  | 176  | 214  | 176   | 216  | 238  | 293  |
| 7/16 - 14                    | 41  | 45   | 55.5 | 61   | 55  | 60  | 74.5 | 81   | M18 X 2.50   | 172  | 210  | 233  | 284  | 240   | 294  | 325  | 398  |
| 7/16 - 20                    | 51  | 55   | 69   | 74.5 | 68  | 75  | 92   | 102  | M20 X 2.50   | 247  | 301  | 335  | 408  | 343   | 426  | 465  | 577  |
| 1/2 - 13                     | 65  | 72   | 88   | 97.5 | 86  | 96  | 116  | 130  | M22 X 2.50   | 332  | 404  | 450  | 547  | 472   | 576  | 639  | 780  |
| 1/2 - 20                     | 76  | 84   | 103  | 114  | 102   | 112 | 138  | 152  | M24 X 3.00   | 423  | 517  | 573  | 700  | 599   | 732  | 812  | 992  |
| 9/16 - 12                    | 95  | 105  | 129  | 142  | 127   | 140 | 172  | 190  | M27 X 3.00   | 637  | 779  | 863  | 1055 | 898   | 1098 | 1217 | 1488 |
| 9/16 - 18                    | 111   | 123  | 150  | 167  | 148   | 164 | 200  | 222  | M3 X 3.00  | 872  | 1066 | 1181 | 1444 | 1224  | 1496 | 1658 | 2027 |
| 5/8 - 11                     | 126   | 139  | 171  | 188  | 168   | 185 | 228  | 251  | <p><b>Torque values apply to fasteneers as received from the supplier, dry or when lubricated with normal engine oil.</b></p> <p><b>If special graphite grease, molydisulphide grease, or other extreme pressure lubricants are used, these torque values <i>do not</i> apply.</b></p> |  |      |      |      |   |      |      |      |
| 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 |  |  |      |      |      |   |      |      |      |

## HYDRAULIC COMPONENTS TORQUE TABLE

**NOTE:** Always lubricate threads with clean hydraulic fluid prior to installation.

Use the following values to torque hydraulic components when a specific value is not available. Always check for torque values in the following places before relying on the Hydraulic Components Torque Table:

- parts drawings and service instructions in this manual.
- packaging and instruction sheets provided with new parts.
- instruction manuals provided by the manufacturer of the component being serviced.

| TYPE: SAE PORT SERIES | CARTRIDGE POPPET |           | FITTINGS  |           | HOSES       |           |
|-----------------------|------------------|-----------|-----------|-----------|-------------|-----------|
|                       | FT. LBS          | Nm        | FT. LBS   | Nm        | FT. LBS     | Nm        |
| #4                    | N/A              | N/A       | N/A       | N/A       | 135 - 145   | 15 - 16   |
| #6                    | N/A              | N/A       | 10 - 20   | 14 - 27   | 215 - 245   | 24 - 28   |
| #8                    | 25 - 30          | 31 - 41   | 25 - 30   | 34 - 41   | 430 - 470   | 49 - 53   |
| #10                   | 35 - 40          | 47 - 54   | 35 - 40   | 47 - 54   | 680 - 750   | 77 - 85   |
| #12                   | 85 - 90          | 115 - 122 | 85 - 90   | 115 - 122 | 950 - 1050  | 107 - 119 |
| #16                   | 130 - 140        | 176 - 190 | 130 - 140 | 176 - 190 | 1300 - 1368 | 147 - 155 |

# EMERGENCY SYSTEMS AND PROCEDURES



**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 ELEVATING ASSEMBLY.**

## EMERGENCY STOP

The machine is equipped with an EMERGENCY STOP switch at the base controls and at both platform control boxes.

- Press the EMERGENCY STOP switch at any time to stop all machine functions.
- Turn switch *clockwise* to reset.

### SELECTOR SWITCH SET TO PLATFORM

- Either switch will stop all machine functions.
- Both switches must be reset or machine will not operate.

### SELECTOR SWITCH IS SET TO BASE

- The upper controls are locked out.
- The lower controls switch must be reset or the machine will not operate.
- The machine will operate from the lower controls if the upper controls switch is tripped.

*Figure 1-3: Emergency Stop Buttons*



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# EMERGENCY LOWERING

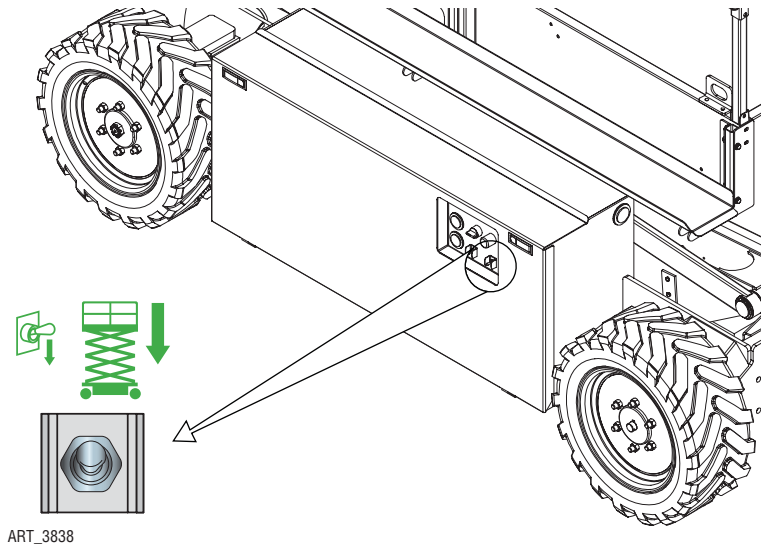


**IF THE CONTROL SYSTEM FAILS WHILE THE PLATFORM IS ELEVATED, USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.**  
**DO NOT CLIMB DOWN THE ELEVATING ASSEMBLY OR EXIT THE PLATFORM.**

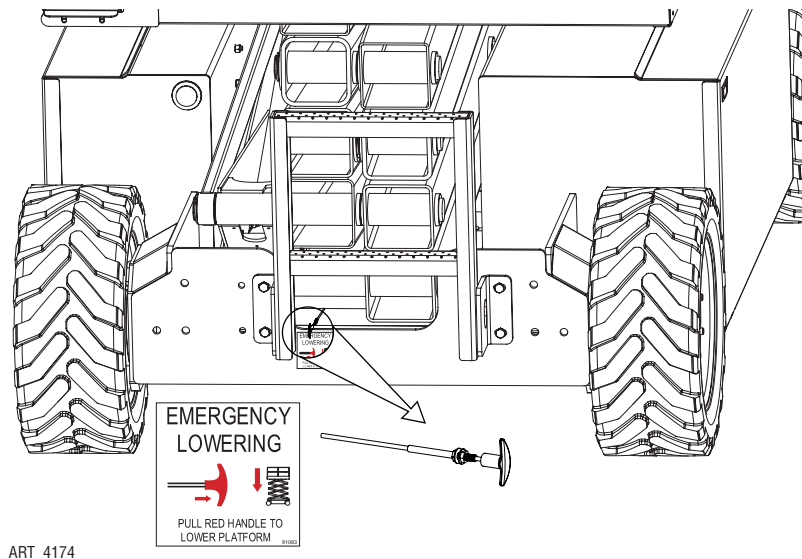
*Figure 1-4: Emergency Lowering*

The Emergency Lowering System is used to lower the platform in case of power failure.

To lower the platform, push down on the Emergency Lowering Switch, located on the Base Control panel.



Early 2659 machines may have been equipped with a pull-cable Emergency Lowering System. On machines so equipped, pull the Emergency Lowering Handle, located at the rear of the scissor assembly near the ladder to lower the platform.



## FREE-WHEEL CONFIGURATION FOR WINCHING OR TOWING

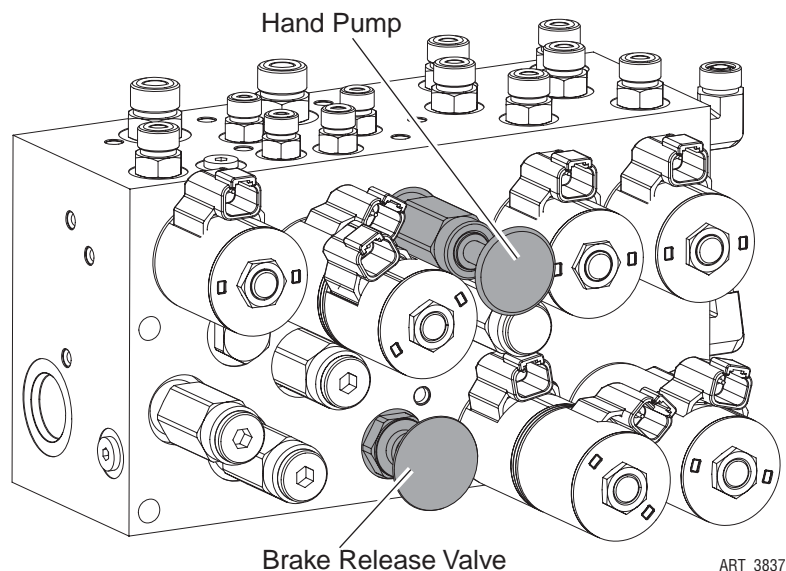


### ***RUNAWAY HAZARD!***

***AFTER RELEASING THE BRAKES THERE IS NOTHING TO STOP MACHINE TRAVEL. MACHINE WILL ROLL FREELY ON SLOPES.***

***ALWAYS CHOCK THE WHEELS BEFORE MANUALLY RELEASING THE BRAKES.***

The machine can be winched or towed short distances at speeds not to exceed 5 MPH (8 km/h). Before towing or winching the machine, it is necessary to release the brakes. Reset the brakes after towing or winching.



### **DISENGAGE BRAKES BEFORE TOWING OR WINCHING**

- Chock the wheels.
- Press and hold the Brake Release Valve, then slowly press the Hand Pump button on the Functions Manifold repeatedly until the brakes release (normally 8-10 full pump strokes).

### **ENGAGE BRAKES BEFORE DRIVING**

The brakes reset automatically when the motor is started.

The brakes may be manually applied by pulling the Brake Release Valve out.



**BE SURE THAT THE BRAKES ARE ENGAGED BEFORE REMOVING THE WHEEL CHOCKS.**

# LIFT AND SUPPORT THE MACHINE



**DEATH OR SERIOUS PERSONAL INJURY MAY RESULT FROM THE USE OF SUBSTANDARD LIFTING DEVICES AND/OR JACK STANDS. ENSURE THAT ALL LIFTING DEVICES AND JACK STANDS ARE OF ADEQUATE CAPACITY AND IN GOOD WORKING CONDITION BEFORE USE.**

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

- a jack with a lifting capacity of two (2) tons or more.
- jack stands with a rating of two (2) tons 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. If wheel is to be removed, break loose but **do not remove** the lug nuts before raising the machine.
4. Position a jack at the end of the machine to be lifted, under a solid lifting point in the center of the frame.
5. Raise the machine and place two (2) suitable jack stands under solid support points at the outer ends of the frame.
6. Lower the machine to rest on the jack stands and inspect for stability.

## **TO LOWER THE MACHINE**

1. Tighten lugs to proper torque (refer to machine specifications).
2. Raise machine slightly and remove jack stands.
3. Lower the machine and remove the jack.
4. Remove chocks.



# Section 1

## HYDRAULIC SYSTEM

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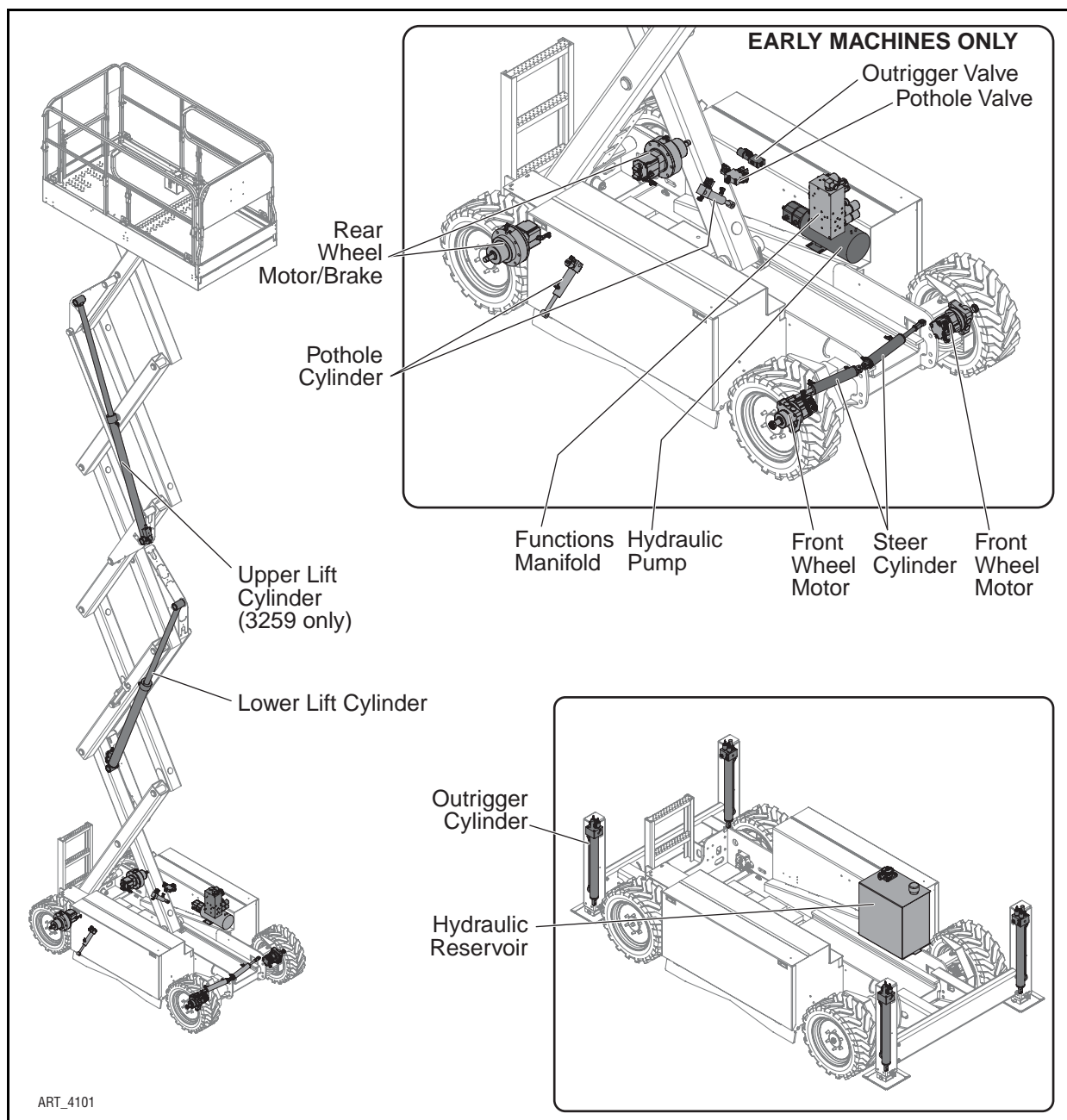
## HYDRAULIC SYSTEM – GENERAL

The hydraulic integrated circuit, generally known as the valve-type manifold system is designed to control all or part of machine functions by integrating various hydraulic cartridge valves into a manifold to provide directional, pressure, flow, and load control.

This is a motor-controlled, variable flow rate, open-loop hydraulic system. Hydraulic fluid is provided by a fixed displacement dual gear pump which is directly coupled to the electric motor. As the motor turns, the hydraulic pump draws fluid from the reservoir and pumps this fluid under pressure to the Functions Manifold.

Generally the motor operates only if a function is demanded, but if the motor is operating and no function is in use, fluid is returned to the tank over relief valves. Each function has a maximum pressure control limit set by relief valves.

**Figure 1-1:** Hydraulic System



## **HYDRAULIC ROADMAP**

### **HYDRAULIC RESERVOIR**

Hydraulic fluid is held in the reservoir for delivery to the various components and then returned to the reservoir. Returning hydraulic fluid is routed through a filter before entering the reservoir. The reservoir also serves as the oil cooling device.

### **PUMP**

The tandem pump delivers hydraulic fluid under pressure to the Functions Manifold.

### **FUNCTIONS MANIFOLD**

The Functions Manifold directs the hydraulic fluid to the hydraulically operated components through the use of electrically operated solenoid valves and returns fluid to the reservoir.

### **DRIVE AND BRAKE SYSTEM**

There are four hydraulic, fixed-displacement geroller wheel motors that provide power to all four wheels.

The rear wheel motors have integral spring-applied brakes. The brakes are released by hydraulic pressure developed in the drive circuit when the drive function is in use. A fixed orifice in the brake circuit controls the deceleration rate and initiates a smooth stop.

### **STEERING SYSTEM**

Two hydraulic cylinders control steering.

### **POTHOLE SYSTEM**

A small hydraulic cylinder on each side of the machine raises and lowers the pothole protection bar.

### **LIFT SYSTEM**

The 2659 is equipped with one hydraulic lift cylinder. The 3259 is equipped with two hydraulic lift cylinders.

### **OUTRIGGER SYSTEM**

On machines equipped with outriggers, four outrigger cylinders level the machine on uneven ground.

# HYDRAULIC FLUID

## HANDLING PRECAUTIONS



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. SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

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. BEWARE OF HOT FLUID. CONTACT WITH HOT FLUID MAY CAUSE SEVERE BURNS.

## FLUID RECOMMENDATIONS

MEC recommends the use of **Mobile Fluid DTE 10, DTE 13 M or AW32** hydraulic fluid. Do not substitute lower grade fluids as pump damage may result.

| ITEM             | SPECIFICATION  | FREQUENCY   |
|------------------|--|---|
| Hydraulic Fluid  | <p><b>Normal ambient temperatures</b><br/>Mobile Fluid DTE 10, DTE 13 M, or AW32<br/><b>Ambient temperatures below 0° F (-18° C)</b><br/>Chevron Rando Premium MV</p> <p><b>Do not substitute other fluids as pump damage may result.</b><br/>Fill to the middle of the sight gauge with platform in the stowed position and outriggers retracted.</p> | <p><b>Routine Maintenance</b><br/>Check sight gauge level daily</p> <p><b>Scheduled Maintenance</b><br/>Change yearly or every 600 hours, whichever occurs first</p>  |
| Hydraulic Filter | <p>Filter Element<br/>(located inside Hydraulic Reservoir)</p>   | <p><b>Scheduled Maintenance</b></p> <p><b>Normal Conditions</b><br/>Change every six months or 300 hours, whichever occurs first</p> <p><b>Severe Conditions--very dusty, exceptionally hot or exceptionally cold conditions</b><br/>Change every three months or 150 hours, whichever occurs first</p> |

## SYSTEM FLUSHING PROCEDURE

Dispose of used hydraulic fluid in accordance with local regulations.

1. With platform fully down, drain the hydraulic fluid from hydraulic reservoir into a clean, empty container.
2. When the hydraulic reservoir is empty, remove the hoses.
3. Flush the hoses with clean hydraulic fluid.

4. Flush out the reservoir with hoses removed from the hydraulic reservoir.
5. Change the hydraulic fluid filter.
6. Reinstall all hoses removed in previous steps.
7. Fill hydraulic reservoir with filtered, fresh hydraulic fluid (refer to Lubrication Chart).
8. Loosen output hose fittings at pump to flood with hydraulic fluid. Tighten fittings.
9. Start up the machine. Briefly operate all functions. Two or three lift cycles may be necessary to purge all air from lift cylinder(s).
10. When the above procedures have been completed, fill hydraulic reservoir to full mark on sight gauge.
11. Check all leaks and correct as necessary. Machine is now ready to be placed back in operation.

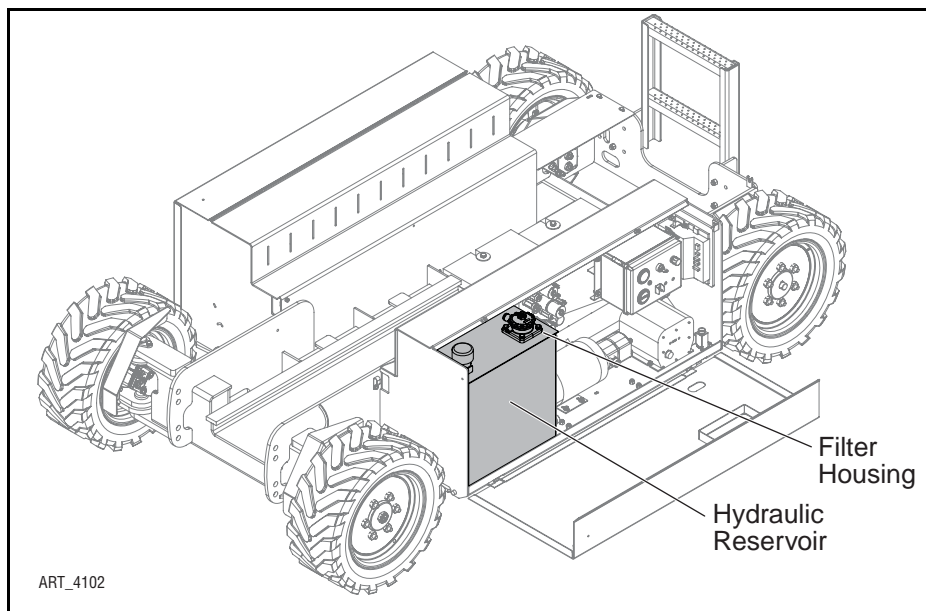
**NOTE:** Avoid mixing petroleum and synthetic base fluids. It is not advisable to mix fluids of different brands or types, except as recommended.

## HYDRAULIC FLUID RESERVOIR

The Hydraulic Fluid Reservoir consists of the reservoir, a filler cap with breather, a return filter assembly, a drain plug, a suction strainer and a sight gauge. Check the reservoir for signs of leakage weekly.

Check the level of the Hydraulic Fluid Reservoir with the platform fully lowered.  
DO NOT overfill.

**Figure 1-2:** Hydraulic Fluid Reservoir



## HYDRAULIC FILTER



**BEWARE OF HOT FLUID. CONTACT WITH HOT FLUID MAY CAUSE SEVERE BURNS.**

All machines are equipped with a bypassing filter where the hydraulic fluid returns to the tank (see Figure 1-2). When the filter is clogged, hydraulic flow bypasses the filter element. The filter element must be changed every six months or 500 hours. Extremely dirty conditions may require the filter to be replaced more often.

To replace:

- Unscrew the filter assembly cap, then remove the filter
- Place the new filter into position and press firmly into place
- Carefully thread the filter assembly cap, then hand-tighten only.

# HYDRAULIC PUMP

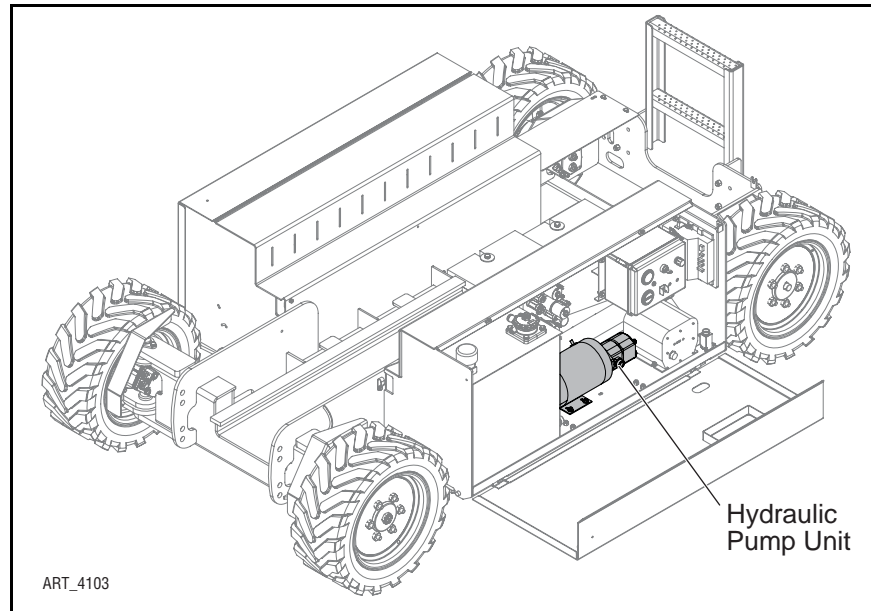


- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings to prevent contamination.

The tandem fixed-displacement gear pump is driven by an electric motor.

The pump is not repairable and should be replaced if it is not functioning properly.

**Figure 1-3:** Hydraulic Pump



## REMOVAL

1. Place a large, flat container under the pump to catch fluid that will be lost during pump replacement. Dispose of used fluid properly.
2. Tag and disconnect hydraulic hoses. Immediately cap or plug the openings to prevent contamination.
3. Remove the two bolts that hold the pump to the motor.
4. Remove the pump.

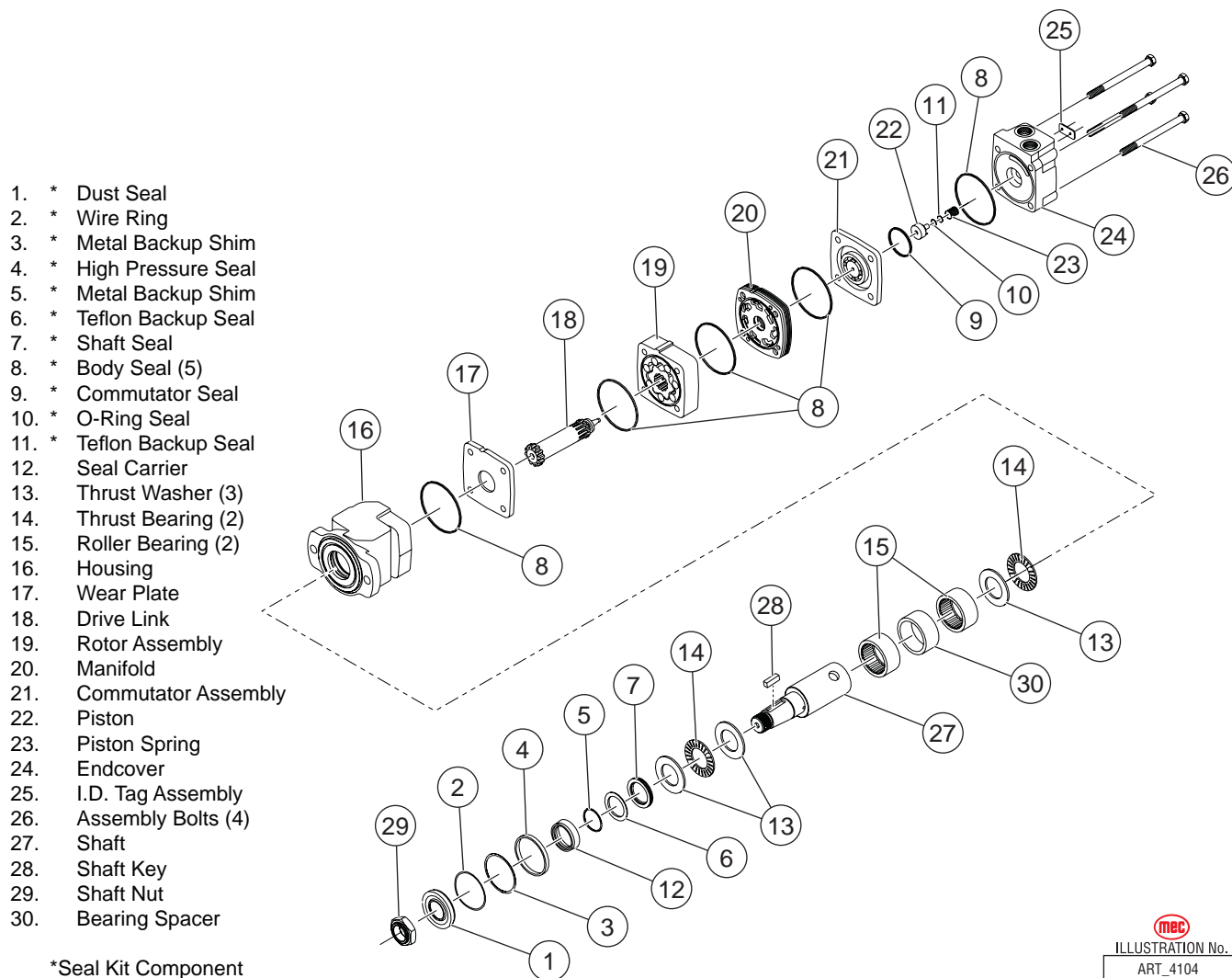
Installation is reverse of removal. Tighten all bolts to the proper torque specification as shown in the Introduction section. Use Loctite 242 or equivalent on mounting bolts.

# FRONT DRIVE MOTOR UNITS

**NOTE:** Refer to *Section 3* for Remove and Install instructions.  
Refer to *Parts Section D*.

There are two fixed-displacement hydraulic gear wheel motor units that provide power to the front wheels.

**Figure 1-4:** Front Drive Motor Assembly



## DISASSEMBLY

To aid in reassembly of the motor, make a “V” shaped set of lines from the endcover to the housing using either paint or a marker.

1. Remove all shaft related components from shaft (27) (i.e. keys, wire rings, nuts). With shaft facing down, secure motor in vise by clamping on to housing (16).
  - Loosen and remove four bolts (26) holding motor assembly together.
  - Remove endcover (24) from motor making sure not to drop endcover piston (22).
  - Using needle nose pliers or two small screwdrivers, lift endcover piston (22) out of endcover (24).
  - Remove white Teflon seal (11) and O-ring seal (10) from endcover piston (22) and discard.
  - Remove the piston spring (23) from endcover (24) and lay aside.



2. Lift commutator container and commutator (21) from motor and lay aside.
  - Place commutator on a flat, clean surface with the seal (9) facing up.
  - Place the tip of a small screwdriver on the seal (9) and gently tap until opposite side of seal lifts from groove. Remove seal (9) and discard.
3. Remove manifold (20), rotor assembly (19) and wear plate (17) from motor.



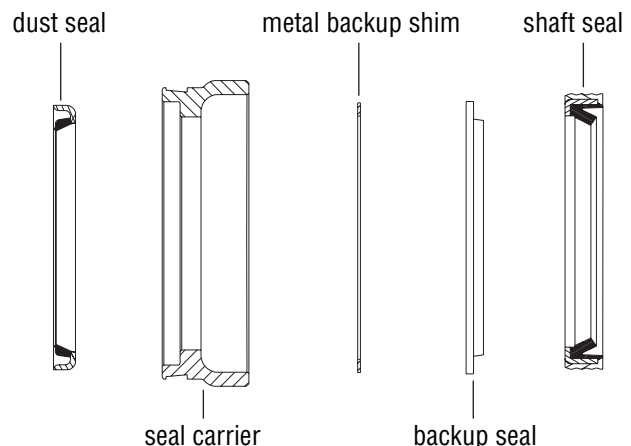
**Caution - Do not allow rolls to drop from rotor assembly when removing rotor assembly for motor**

- Remove all seals (8) from components and discard.
  - Remove drive link (18) from motor and lay aside.
  - Remove the thrust bearing (14) and thrust washer (13) from the housing (16) and lay aside.
  - From front of housing, gently tap shaft (27) upwards and remove through rear of housing.
4. Remove housing (16) from vise and lay on flat surface with dust seal (1) facing up.
    - Using a small thin screwdriver, carefully pry the dust seal (1) from the seal carrier (12) and discard.
    - Using an arbor press and a sleeve, press the seal carrier (12) down into the housing (16) approximately 6.4 mm [.250 inch] until the wire ring (2) in the front of the housing (24) can be removed.
  5. Using a small thin screwdriver, pry the wire ring (2) from the groove in the front housing (16).
    - Also pry the backup shim (3) and the high pressure seal (4) from the groove.
    - Remove the seal carrier (12) from the housing bore and carefully pry the shaft seal (7), Teflon backup seal (6) and backup shim (5) from the seal carrier (12) and discard the items (5,6 & 7).
    - Remove two thrust washers (13) and thrust bearing (14) from housing and lay aside.

At this point, all parts should be cleaned in an oil-based solvent and dried using compressed air (For safety, observe all OSHA safety guidelines). All new seals should be lightly coated in clean oil prior to installation.

## ASSEMBLY

1. Using Figure 1-5 for correct orientation, install backup shim (5), Teflon backup seal (6) and shaft seal (7) into the seal carrier (12).
  - Place side of seal carrier (12) with seal down on a flat surface and press down to seat seals in seal carrier (12).
  - Install the dust seal (1) in the opposite side of the seal carrier (12) using Figure 1 for correct seal lip orientation.
  - Make certain that shaft seal and dust seal are coated with oil to provide start-up lubrication.

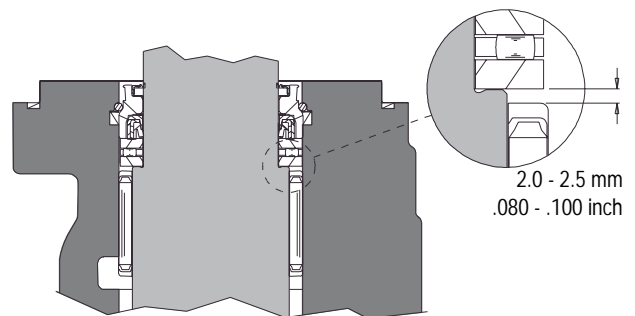


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**Figure 1-5:**



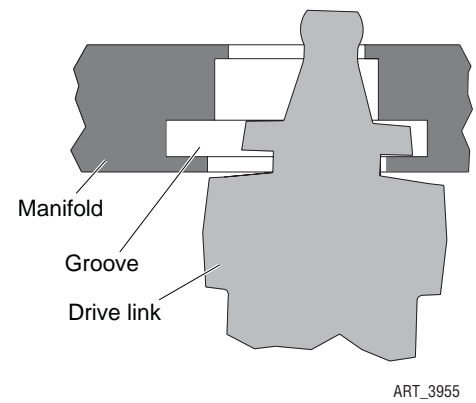
2. With the flange side of the housing face up, place one thrust washer (13), then thrust bearing (14) and second thrust washer (13) against roller bearing in housing.
  - Install the seal carrier assembly (5-7, 12) into the housing (16) making sure that the large O.D. side faces down.
  - Install the high pressure seal (4) into the housing groove.
  - To install the metal backup shim (3), slightly squeeze the shim between the thumb and forefinger to bow the shim. While maintaining the bow, start the shim into the groove and use a small screwdriver to push the shim into the groove.
  - Install the wire ring (2) into the groove making sure that the ends are butted.
3. Place the housing in an arbor press with the mounting flange side facing down.
  - Press down on the rear housing bearing until it is 4.2 - 5.2 mm [.164 - .205 inch] below the surface of the housing. This distance allows for the placement of the thrust washer and thrust bearing to be installed later.

**Figure 1-6:**

4. With output end of shaft facing up, insert shaft into housing and press seal carrier down until it is seated against the wire ring in the front groove. Remove shaft from housing.
  - There should be 2.0 - 2.5 mm [.080 - .100 mm] clearance between the rear-most thrust washer (13) and the front shaft bearing (15) (See Figure 1-6).
  - If the front shaft bearing is against the thrust washer, it must be pushed back into the housing to provide the necessary clearance.
5. Mount the housing in a vise with the mounting flange side facing down.
  - If a 1-1/4" or 32mm shaft is being installed, liberally coat the output end of the shaft with STP®. (Make sure area around key slot is thoroughly coated before installing shaft into housing).
  - With the output end of the shaft facing down, insert into the housing. Place the remaining thrust washer (13) against the shaft end followed by the remaining thrust bearing (14).
6. Place a body seal (8) into the groove in the rear face of the housing.
  - Insert the drive link (18) into the shaft with the tapered end facing up.
  - Place the wear plate (17) over the drive link (18) and onto the housing making sure to use the alignment marks as a guide to assure correct orientation of the wear plate (and the remaining components).
7. Place a body seal (8) into the groove in the face of the rotor assembly (19).
  - With the seal side of the rotor assembly (19) facing the wear plate, line up the splines of the drive link (18) and the rotor assembly (19) and lower the rotor assembly onto the housing (16).

**Figure 1-7:** Manifold/Drive Link Assembly

8. Place a body seal (8) into the groove in each face of the manifold (20).
  - Lift the drive link (18) approximately 2.5 mm [.100 inch] and place the tip of a small screwdriver under the disk-shaped portion of the drive link to hold it up.
  - Make sure that the notch in the manifold is aligned with the notch in the rotor and that the side with the largest holes faces down.
  - Lower the manifold (20) onto the motor and engage the disk shaped portion of the drive link (18) into the groove in the manifold (20) (see Figure 1-9).
  - Remove the screwdriver and lower the manifold (20).
  - If the disk is engaged in the groove, the end of the drive link will protrude above the surface of the manifold. If it doesn't, remove manifold and repeat this step.
  - Using bolts or line up pins align the components assembled thus far. Make sure that components are matching the "V" shape that you drew earlier and that the bolt holes are all aligned.
  - Once everything is aligned make sure that the drive link is still engaged in the manifold. (The motor will not operate if the drive link is not engaged in the manifold).
9. Install the commutator seal (9) into the commutator (21) with the metal side facing up.
  - Use finger pressure to press the seal down flush with the surface of the commutator.
  - Place the commutator container (21) onto the manifold (20) and then place the commutator onto the protruding end of the drive link (18) making sure that the seal side faces up.
10. Install the remaining body seal (8) in the groove in the face of the endcover (24).
  - Install the piston spring (23) into the endcover (24), then the white Teflon seal (11), followed by the O-ring seal (10).
  - Lining up the alignment pin, press the piston (22) into the endcover (24).
  - While holding the endcover piston (22) into the endcover (24), lower the endcover assembly onto the motor.
11. Install the four assembly bolts (26) and pre-torque to 13.6 Nm [10 ft. lb.]. Final torque all bolts to 67.8 Nm [50 ft. lb.].

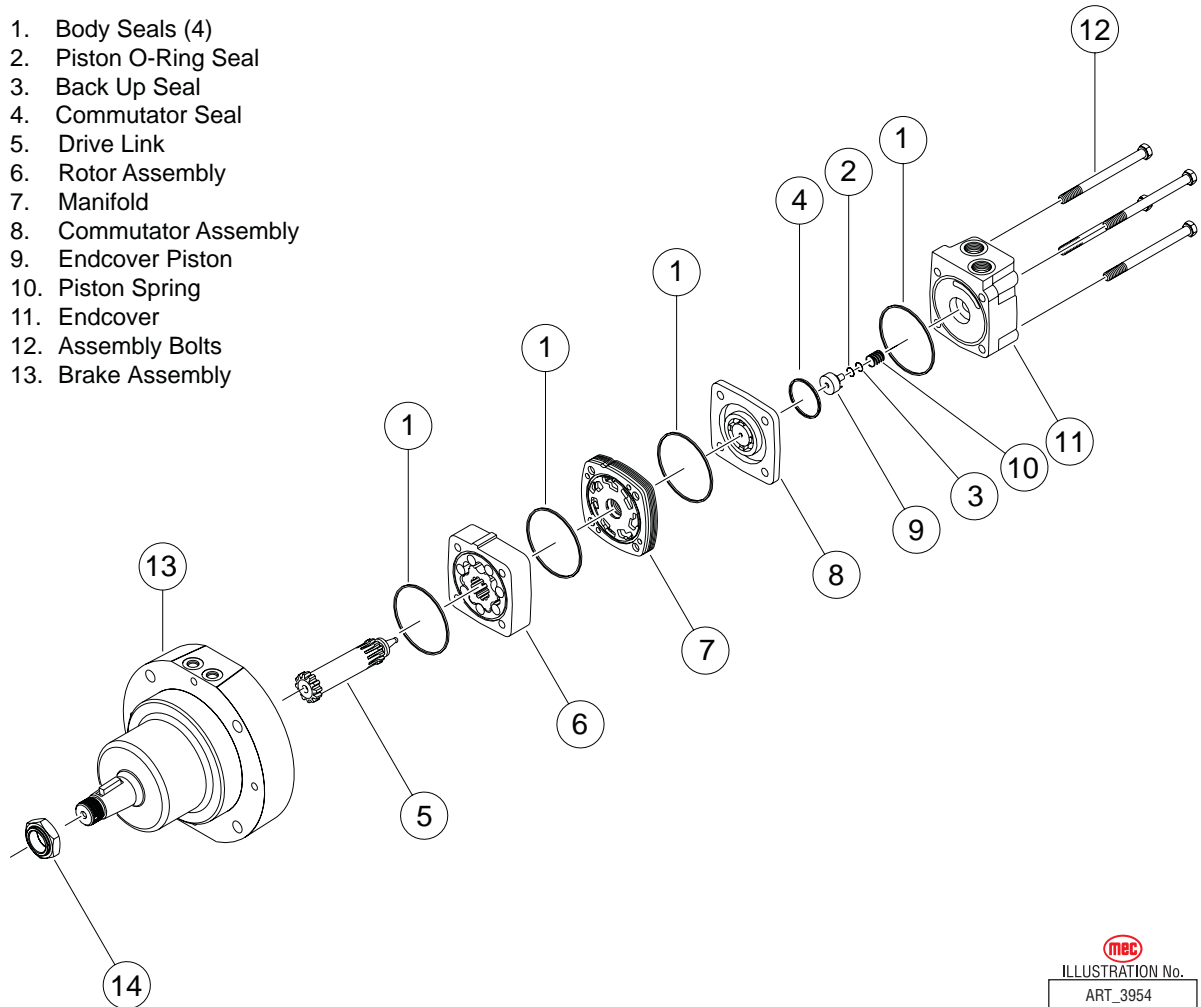


# REAR DRIVE MOTOR/BRAKE UNITS

**NOTE:** Refer to *Section 3* for Remove and Install instructions.  
Refer to *Parts Section D*.

There are two fixed-displacement hydraulic gear wheel motor/brake units that provide power to the rear wheels and braking to the entire machine.

**Figure 1-8:** Rear Drive Motor/Brake Assembly



**MEC**  
ILLUSTRATION No.  
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## DISASSEMBLY

To aid in reassembly of the motor, make a "V" shaped set of lines from the endcover to the housing using either paint or a marker.

1. With shaft facing down, secure motor in vise by clamping on to brake assembly (13).
  - Loosen and remove four bolts (12) holding motor assembly together. Remove endcover (11) from motor making sure not to drop endcover piston (9).
  - Using needle nose pliers or two small screwdrivers, lift endcover piston (9) out of endcover (11).
  - Remove white Teflon seal (3) and O-ring seal (2) from endcover piston (9) and discard.
  - Remove the piston spring (10) from endcover (11) and lay aside.

2. Lift commutator container and commutator (8) from motor and lay aside.
  - Place commutator on a flat, clean surface with the seal (4) facing up.
  - Place the tip of a small screwdriver on the seal (4) and gently tap until opposite side of seal lifts from groove.
  - Remove seal (4) and discard.
3. Remove manifold (7) and rotor assembly from motor.



**Caution - Do not allow rolls to drop from rotor assembly when removing rotor assembly for motor.**

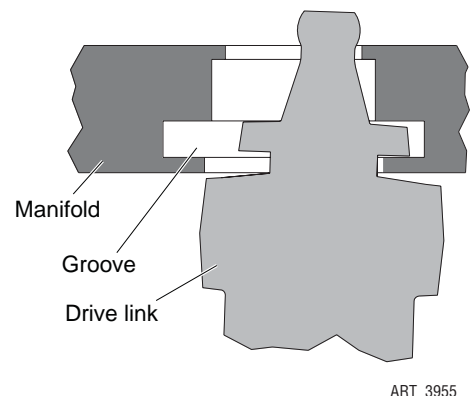
- Remove all seals (1) from components and discard.
- Remove drive link (5) from motor and lay aside.

At this point, all parts should be cleaned in an oil-based solvent and dried using compressed air (For safety, observe all OSHA safety guidelines). All new seals should be lightly coated in clean oil prior to installation.

## ASSEMBLY

1. Insert the drive link (5) into the shaft with the tapered end facing up.
  - Place a body seal (1) into the groove in the face of the rotor assembly (6).
  - With the seal side of the rotor assembly (6) facing the brake assembly (13), line up the splines of the drive link (5) and the rotor assembly (6) and lower the rotor assembly onto the brake assembly (13) making sure to use the alignment marks as a guide to assure correct orientation of the rotor assembly (and the remaining components).
2. Place a body seal (1) into the groove in each face of the manifold (7).
  - Lift the drive link (5) approximately .100 and place the tip of a small screwdriver under the disk-shaped portion of the drive link to hold it up.
  - Making sure that the notch in the manifold is aligned with the notch in the rotor and that the side with the largest holes faces down.
- Lower the manifold (7) onto the motor and engage the disk shaped portion of the drive link (5) into the groove in the manifold (5) (Figure 1-9).
- Remove the screwdriver and lower the manifold (7).
- If the disk is engaged in the groove, the end of the drive link will protrude above the surface of the manifold. If it doesn't, remove manifold and repeat this step.
3. Using bolts or line up pins align the components assembled thus far.
  - Make sure that components are matching the "V" shape that you drew earlier and that the bolt holes are all aligned.
  - Once everything is aligned make sure that the drive link is still engaged in the manifold. (The motor will not operate if the drive link is not engaged in the manifold).

**Figure 1-9:** Manifold/Drive Link Assembly



4. Install the commutator seal (4) into the commutator (8) with the metal side facing up.
  - Use finger pressure to press the seal down flush with the surface of the commutator.
  - Place the commutator container (8) onto the manifold (7) and then place the commutator onto the protruding end of the drive link (5) making sure that the seal side faces up.
5. Install the remaining body seal (1) in the groove in the face of the endcover (11).
  - Install the piston spring (10) into the endcover (11), then the white Teflon seal (3), followed by the O-ring seal (2). Lining up the alignment pin, press the piston (9) into the endcover (11).
  - While holding the endcover piston (9) into the endcover (11), lower the endcover assembly onto the motor.
6. Install the four assembly bolts (12) and pre-torque to 10 ft. lbs.  
Final torque all bolts to 50 ft. lbs.

## **BRAKING FUNCTIONS**

**Dynamic** deceleration of the machine is achieved through a counterbalance valve in the main manifold.

**Static/parking** brake application is performed by the rear wheel motors, which have integral spring-applied brakes. Hydraulic pressure releases the brakes. A fixed orifice in the brake circuit controls the brake application to provide a smooth stop.

The Brake Assembly is not serviceable and should be replaced as a unit.

# FUNCTIONS MANIFOLD & HYDRAULIC VALVES

**NOTE:** Refer to *Parts Section E*.

Tag all components as they are removed to aid in 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 mounting bolts from the manifold.
5. Remove the manifold.

## DISASSEMBLY

1. Mark and remove the coils from solenoid valves.
2. Mark and remove valves.
3. Mark and 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.

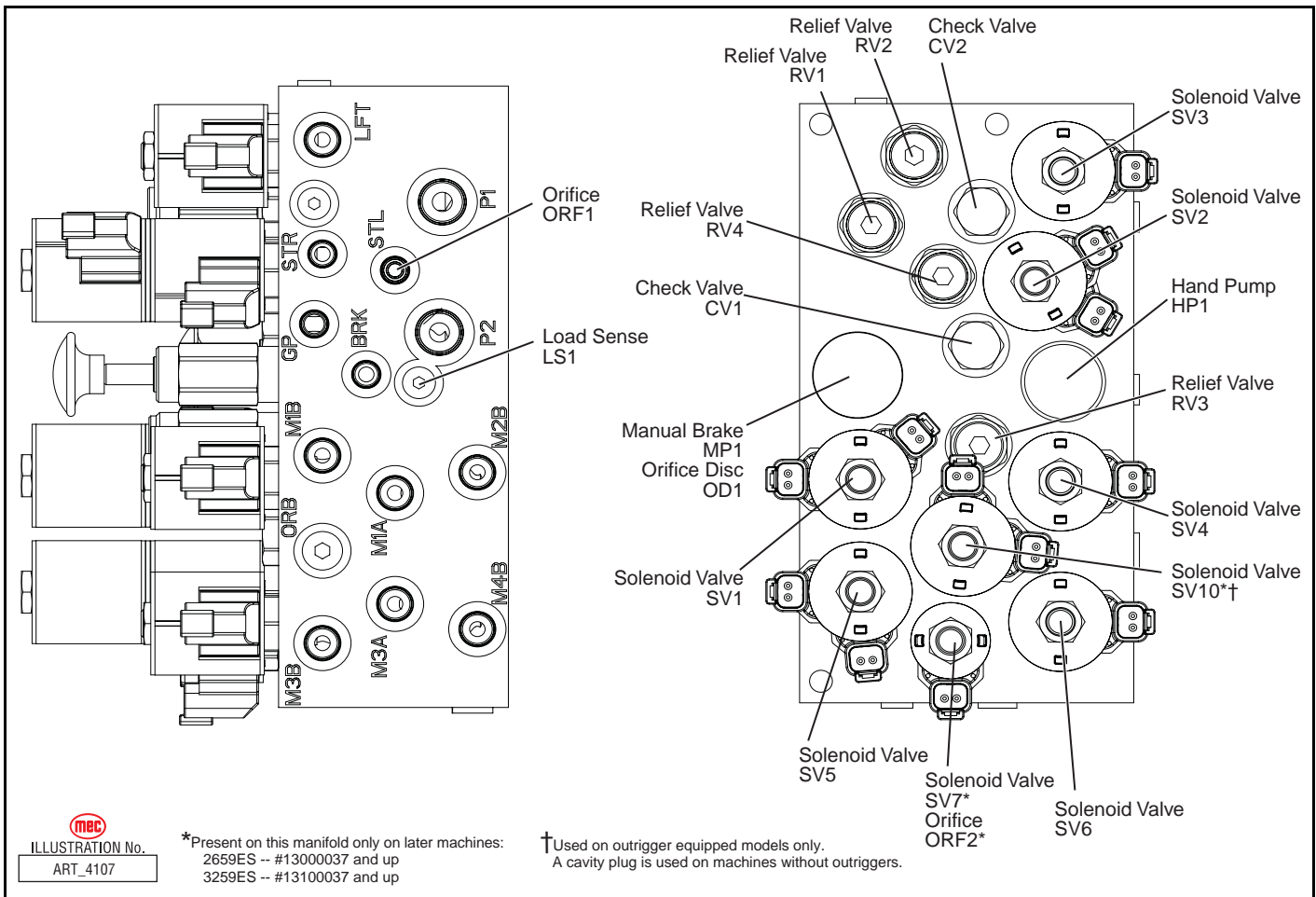
1. Install fittings, plugs, springs, balls, and orifices. Use one drop of Loctite #424 or equivalent thread locker on each screw-in orifice.
2. Install valves.

## INSTALLATION

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

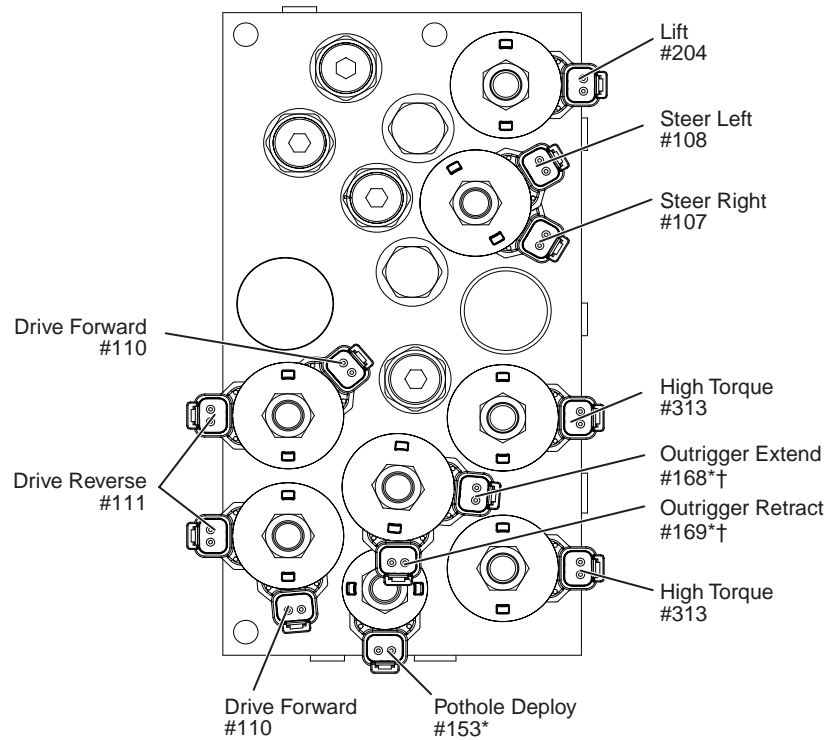
**MANIFOLD & VALVE DIAGRAMS**

See Section E of the Parts Section for component part numbers.

**Figure 1-10:** Functions Manifold - Components

**Figure 1-11: Functions Manifold - Wiring Harness Connections****Function  
Wire #**

All connectors also  
contain a #15 ground wire.

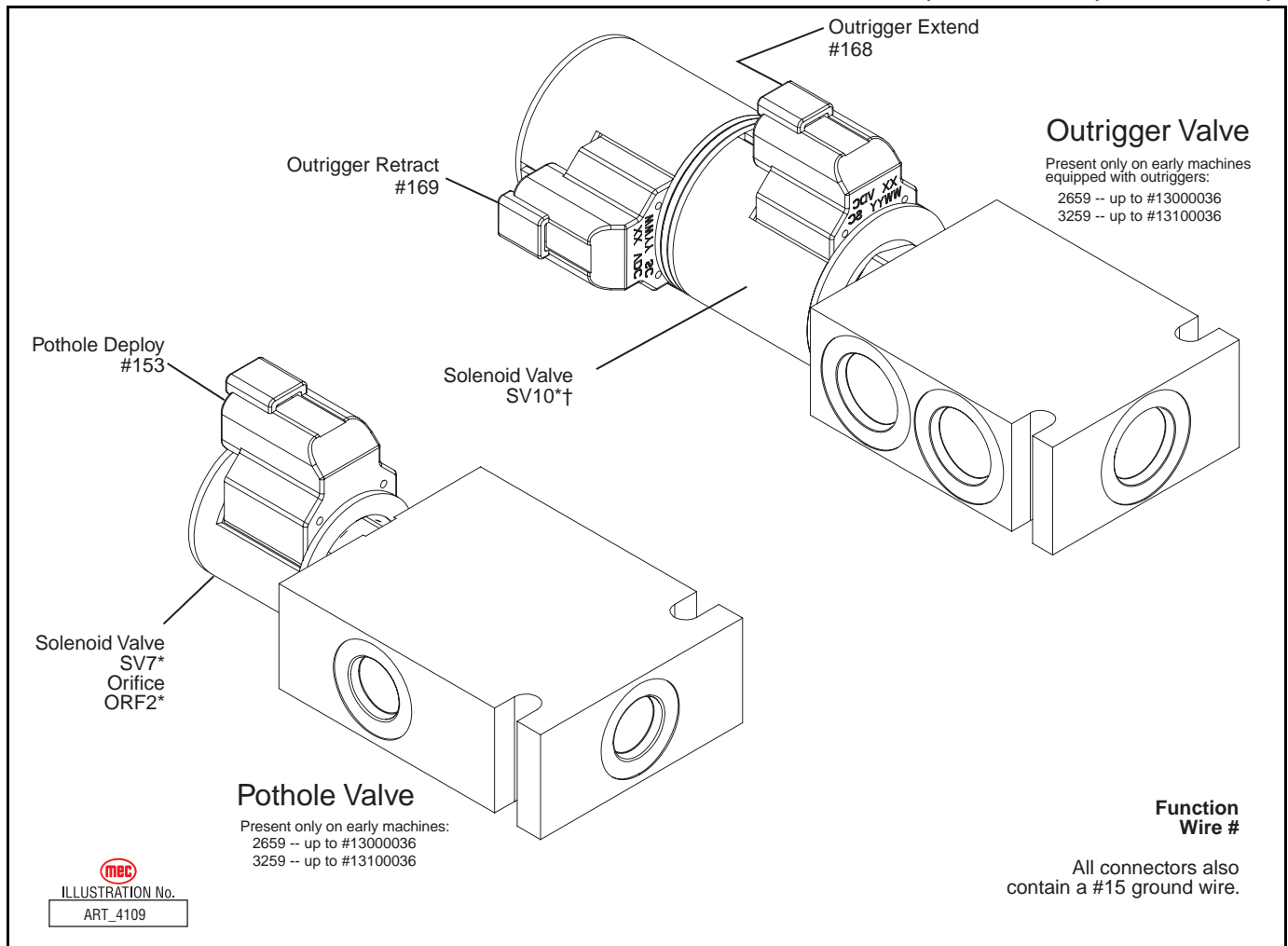


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ART\_4108

\*Present on this manifold only on later machines:  
2659ES -- #13000037 and up  
3259ES -- #13100037 and up

†Used on outrigger equipped models only.  
A cavity plug is used on machines without outriggers.



**Figure 1-12: Auxiliary Valves -- Early Machines Only**

# HYDRAULIC PRESSURE ADJUSTMENT



**Do not operate pump with relief valve cap removed. Fluid will emit under pressure.**

Relief and counterbalance valves should be checked during routine maintenance to ensure proper machine. It is necessary to remove the hex-head relief valve cap from the relief valve if adjustment is needed. Replace the caps before operating the machine.

**Table 1-1:** Hydraulic Pressure Settings

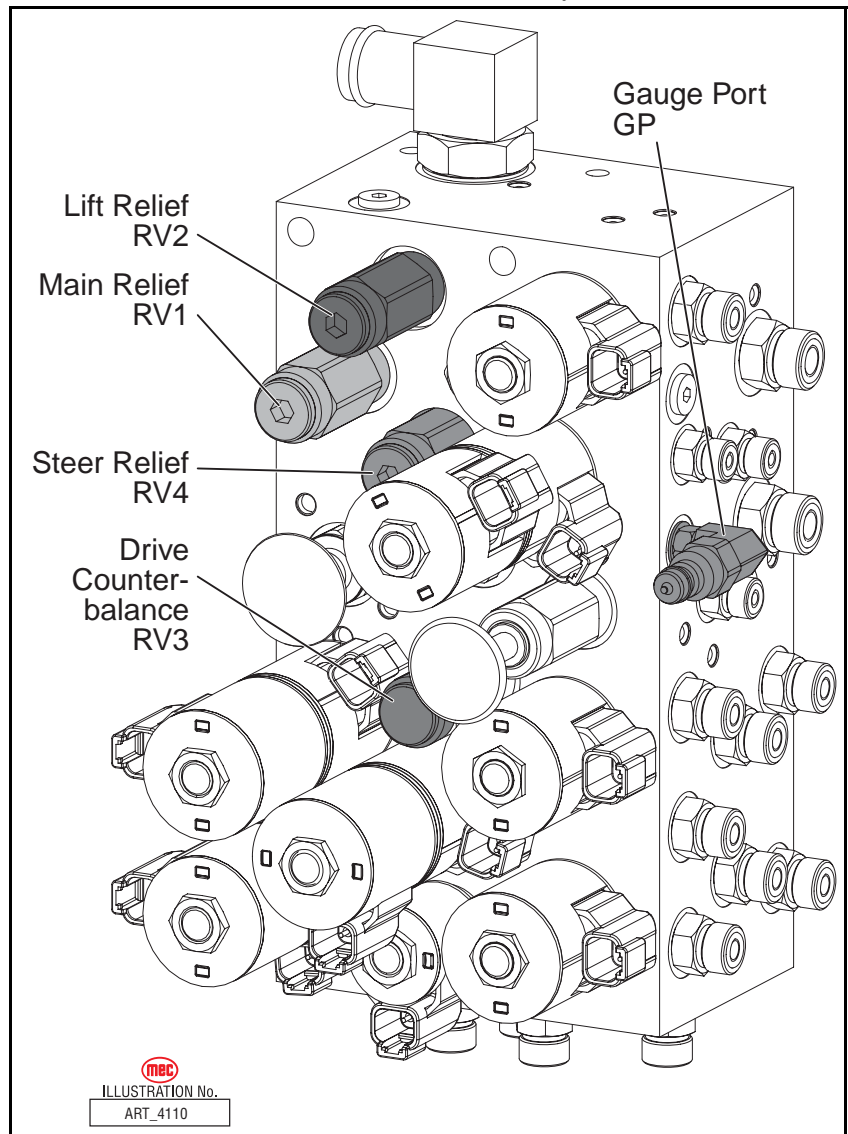
| Main Relief<br>RV1  | Lift Relief<br>RV2  | Drive<br>Counterbalance<br>RV3 | Steering Relief<br>RV4 |
|---------------------|---------------------|--------------------------------|------------------------|
| 3200 PSI<br>221 bar | 2400 PSI<br>165 bar | not adjustable                 | 1500 PSI<br>103 bar    |

- Before attempting to check or adjust pressure relief valves, operate the machine for 15 minutes or long enough to sufficiently warm the hydraulic fluid.
- Insert a 0-5000 psi gauge into gauge adapter fitting at Port GP of the Functions Manifold.

**Figure 1-13:** Adjustable Valve Location**MAIN RELIEF (RV1)**

1. Attach a 0-5000 psi gauge to Port GP.
2. Place a 4 inch x 4 inch (10cm x 10cm) wood block in front of each wheel.
3. Set the Drive Mode to High Speed. Using the Drive function, slowly push the control handle completely forward. Hold for 10 seconds.
4. If pressure is LOW, adjust main relief valve  $\frac{1}{4}$  turn clockwise and recheck.
5. If pressure is HIGH, adjust main relief valve  $\frac{1}{4}$  turn counterclockwise and recheck.

Repeat until the pressure is correct as listed in Table 1-1.



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ART\_4110

**LIFT RELIEF (RV2)**

**IMPORTANT:** The different variations of the Crossover machine have different Lift Relief Valve settings. See Table 1-1 on page 1-20 for the correct Lift Relief setting for the machine you are adjusting.

1. Attach a 0-5000 psi gauge to Port GP.
2. **With no load on platform**, use the Lift function to raise the platform completely.
3. Press and hold the Lift switch for 10 seconds to get an accurate reading on the pressure gauge.
4. If pressure is LOW, adjust lift relief valve  $\frac{1}{4}$  turn clockwise and recheck.
5. If pressure is HIGH, adjust lift relief valve  $\frac{1}{4}$  turn counterclockwise and recheck.

Repeat until the pressure is correct as listed in Table 1-1.

**DRIVE COUNTERBALANCE VALVE (RV3)**

The Drive Counterbalance Valve is not adjustable and should be replaced if it is determined to be malfunctioning.

**STEERING RELIEF (RV4)**

1. Attach a 0-5000 psi gauge to Port GP.
2. Use the Steer function to turn the wheels completely in either direction.
3. Press and hold the Steer switch for 10 seconds to get an accurate reading on the pressure gauge.
4. If pressure is LOW, adjust steer relief valve  $\frac{1}{4}$  turn clockwise and recheck.
5. If pressure is HIGH, adjust steer relief valve  $\frac{1}{4}$  turn counterclockwise and recheck.

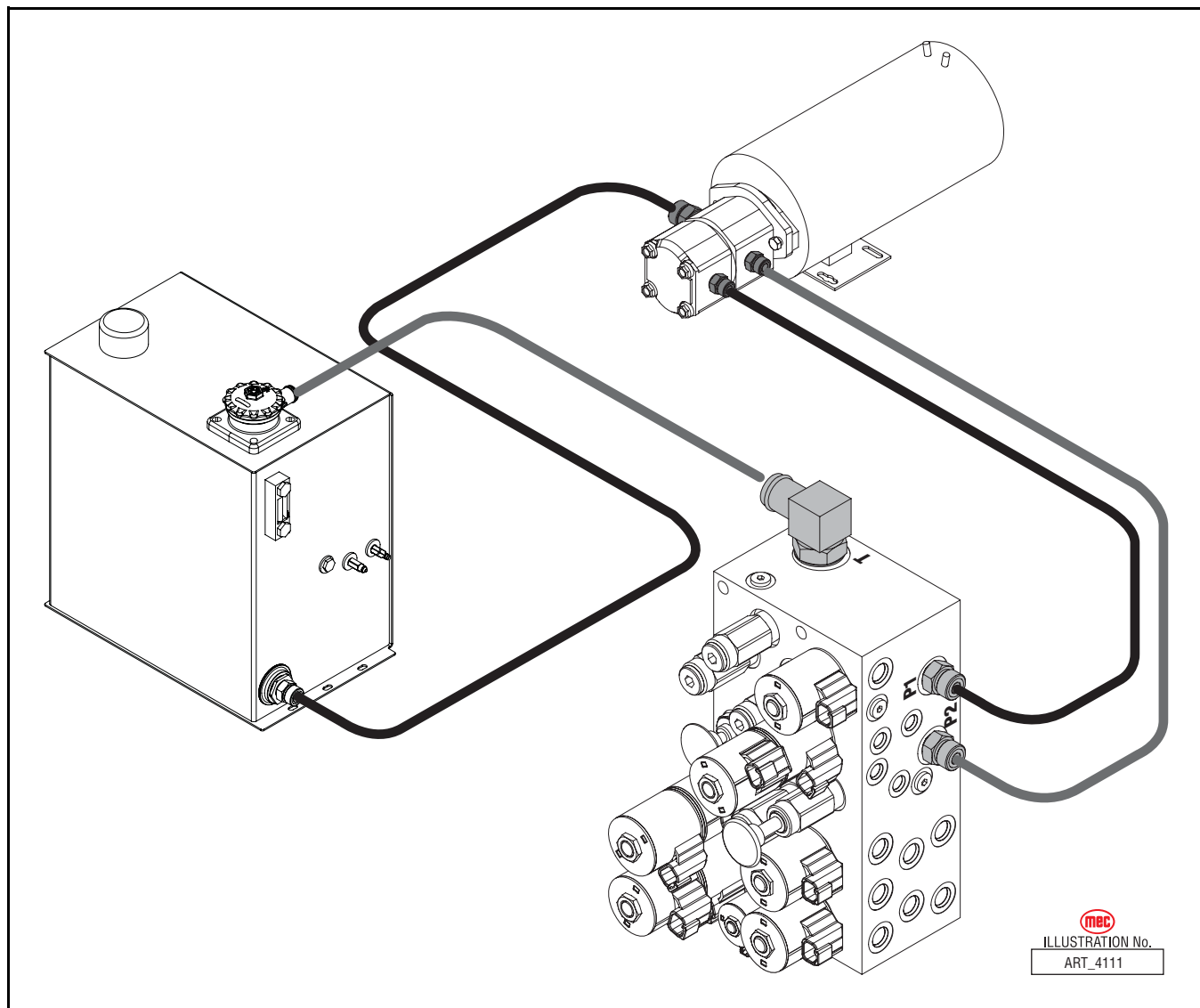
Repeat until the pressure is correct as listed in Table 1-1.

# SYSTEM DESCRIPTIONS

## PUMP CIRCUIT

Hydraulic fluid is pulled from the Hydraulic Tank to the suction port of the Hydraulic Pump. Pressurized fluid leaves the pump and goes to Ports P1 and P2 of the Functions Manifold. Unused fluid is routed back to the tank through Port T of the Functions Manifold.

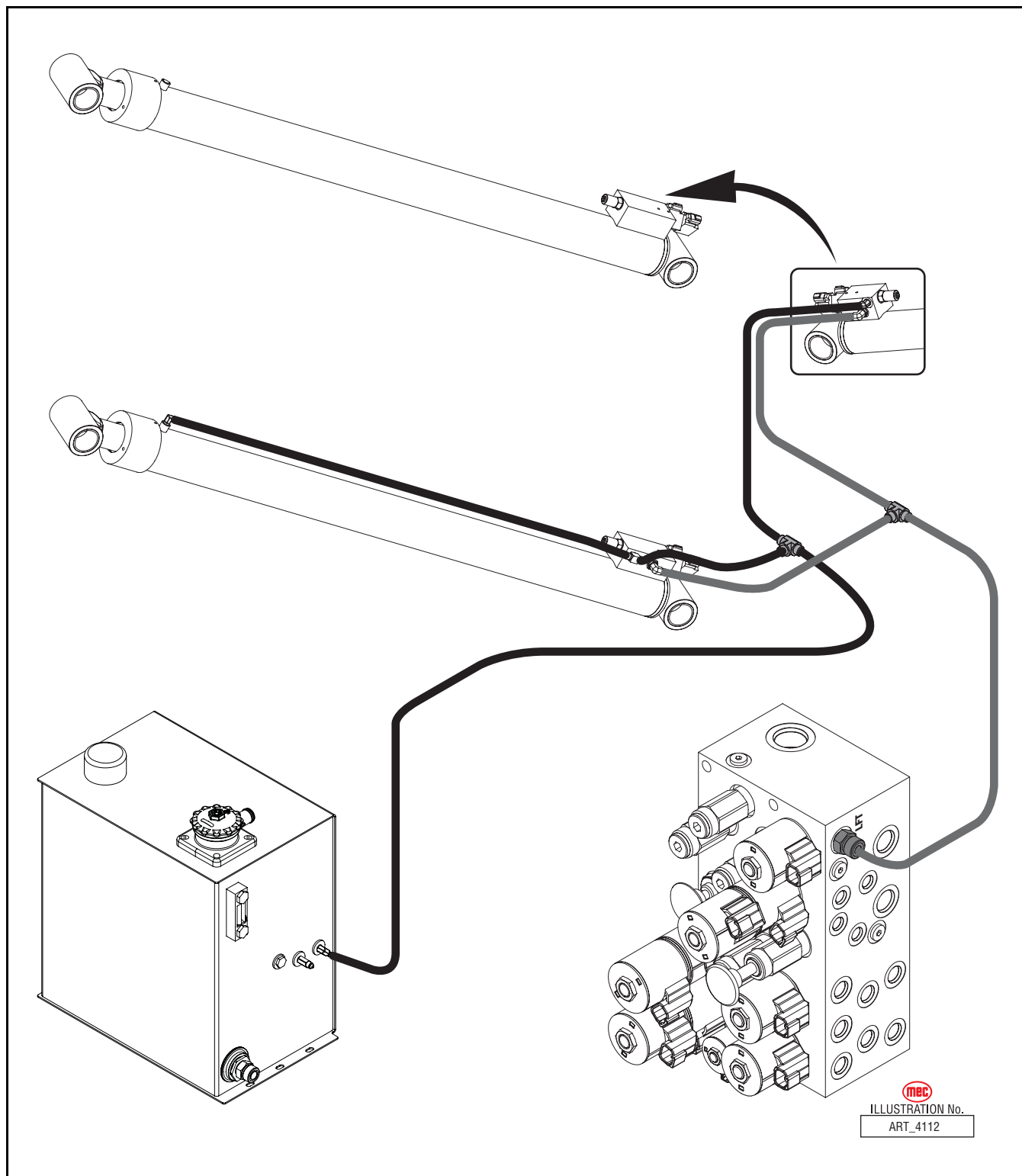
*Figure 1-14: Pump Circuit*



## LIFT CIRCUIT -- 3259

Hydraulic fluid flows to the lift cylinders from Port LFT on the Functions Manifold and is returned to the manifold through the same hose. Vent lines to both cylinders provide a path to the tank for unpressurized hydraulic fluid that has gone over the relief valves in the lift cylinders. The lower cylinder is a piston seal type cylinder, while the upper cylinder is a displacement cylinder.

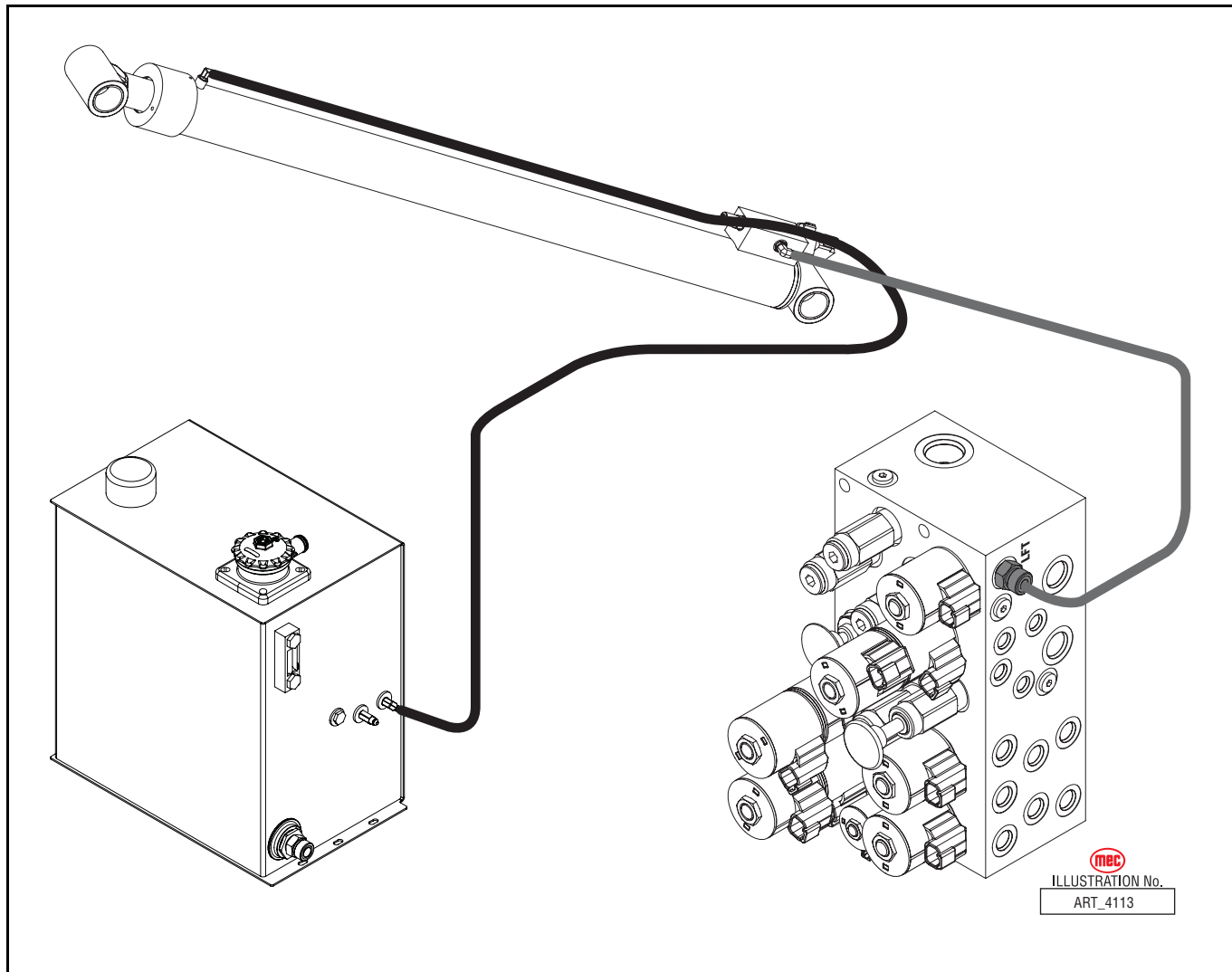
**Figure 1-15:** Lift Circuit -- 3259



## LIFT CIRCUIT -- 2659

Hydraulic fluid flows to the lift cylinders from Port LFT on the Functions Manifold and is returned to the to the manifold through the same hose. Vent lines on the cylinder provide a path to the tank for unpressurized hydraulic fluid that has gone over the relief valve in the lift cylinder.

**Figure 1-16:** Lift Circuit -- 2659

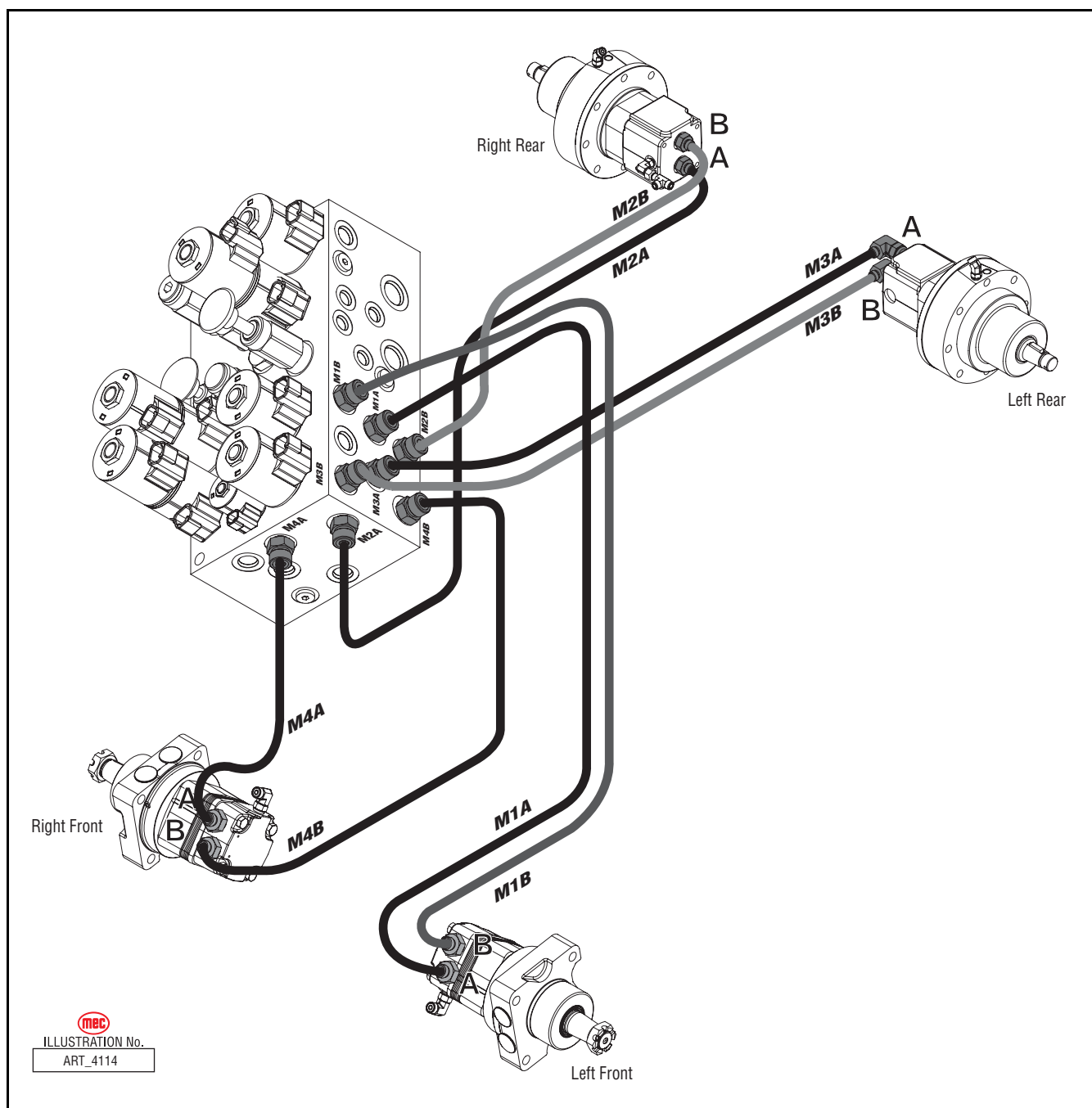


## DRIVE CIRCUIT

Pressurized fluid is supplied to the drive motors as shown below.

| Wheel Port    | Functions<br>Manifold Port | Wheel Port   | Functions<br>Manifold Port |
|---------------|----------------------------|--------------|----------------------------|
| Right Front A | M4A                        | Right Rear A | M2A                        |
| Right Front B | M4B                        | Right Rear B | M2B                        |
| Left Front A  | M1A                        | Left Rear A  | M3A                        |
| Left Front B  | M1B                        | Left Rear B  | M3B                        |

Figure 1-17: Front Drive Circuit

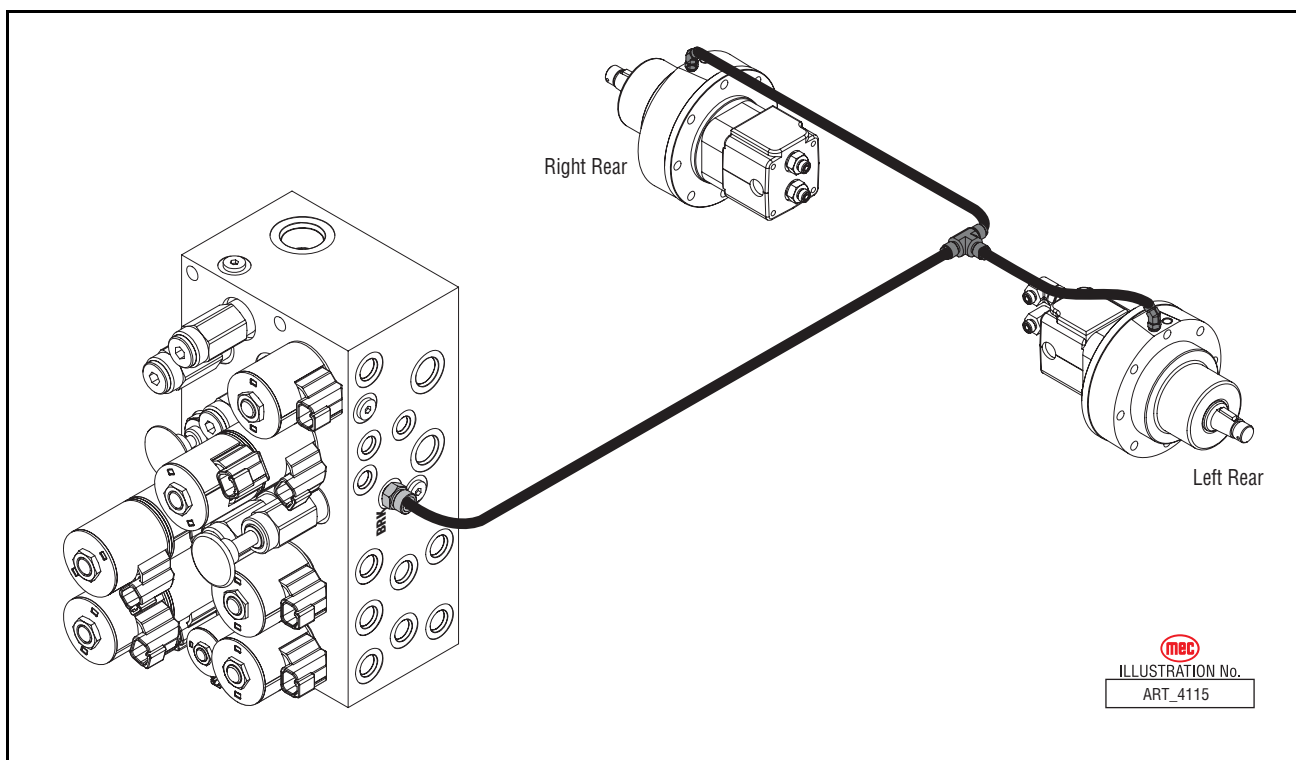




## BRAKE RELEASE CIRCUIT

Pressure from Port BRK on the Functions Manifold provides pressure to the Brake Release Circuit when the Drive function is enabled. When the Drive function is not enabled, fluid flows freely through it to Port T on the Functions Manifold, and from there returns to the tank.

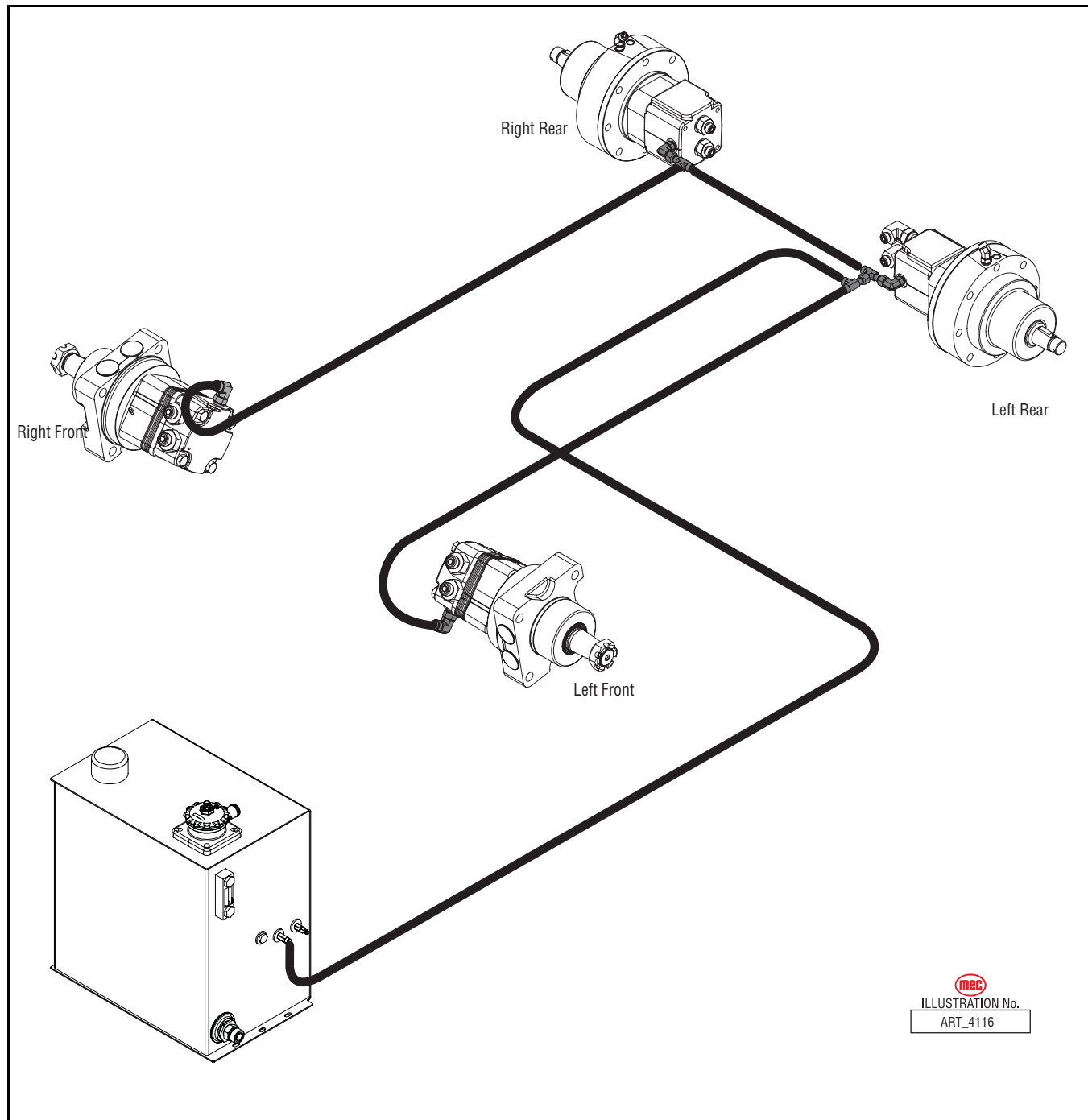
*Figure 1-18: Rear Drive Circuit*



## DRIVE CASE DRAIN CIRCUIT

Hoses connect the Case Drain ports of each wheel motor route the fluid back to the tank at the forward return port of the Hydraulic Reservoir.

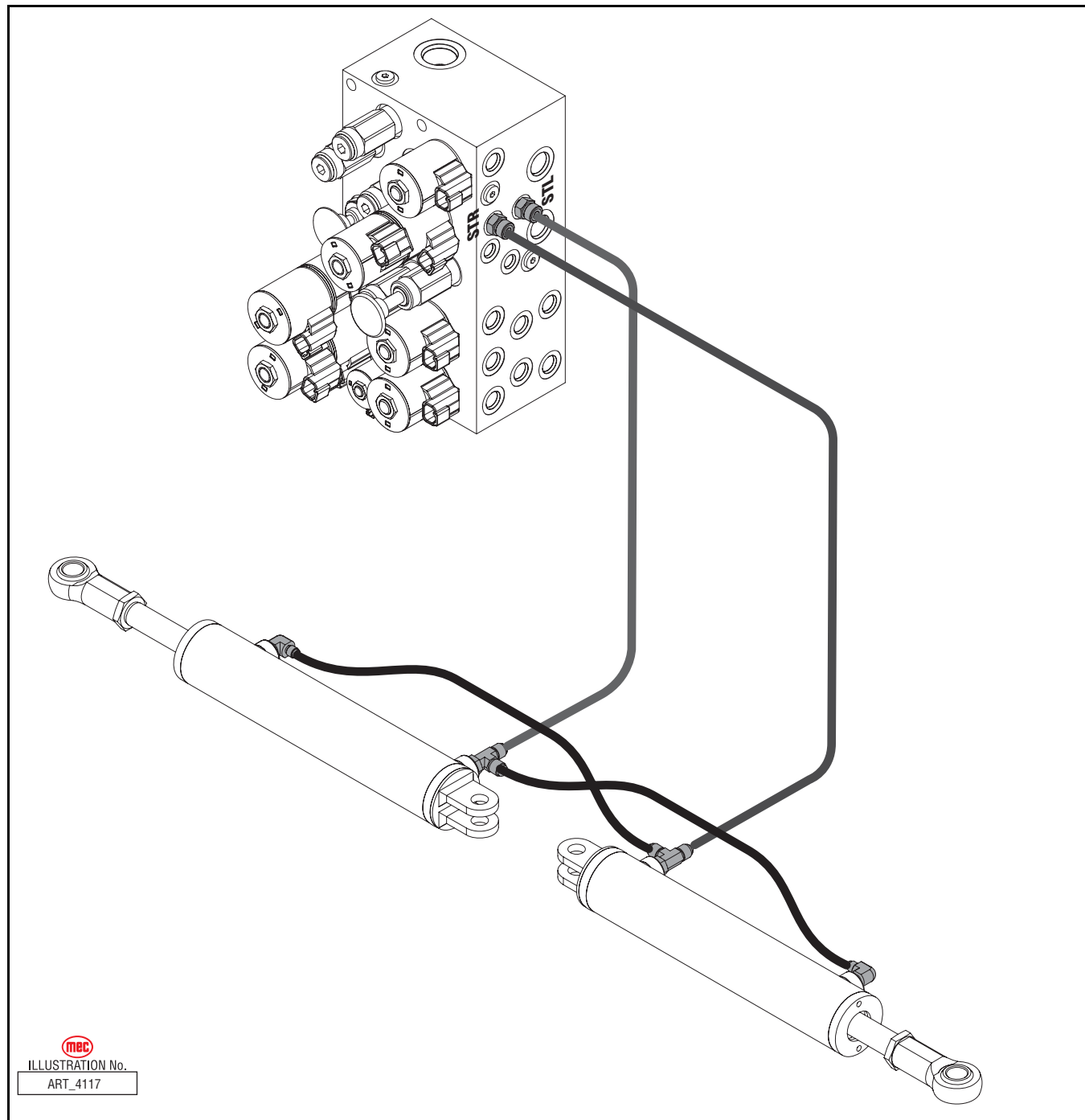
**Figure 1-19:** Drive Case Drain Circuit



## STEER CIRCUIT

Pressurized fluid is supplied to the Steer Cylinders from Ports STR and STL on the Functions Manifold as shown below.

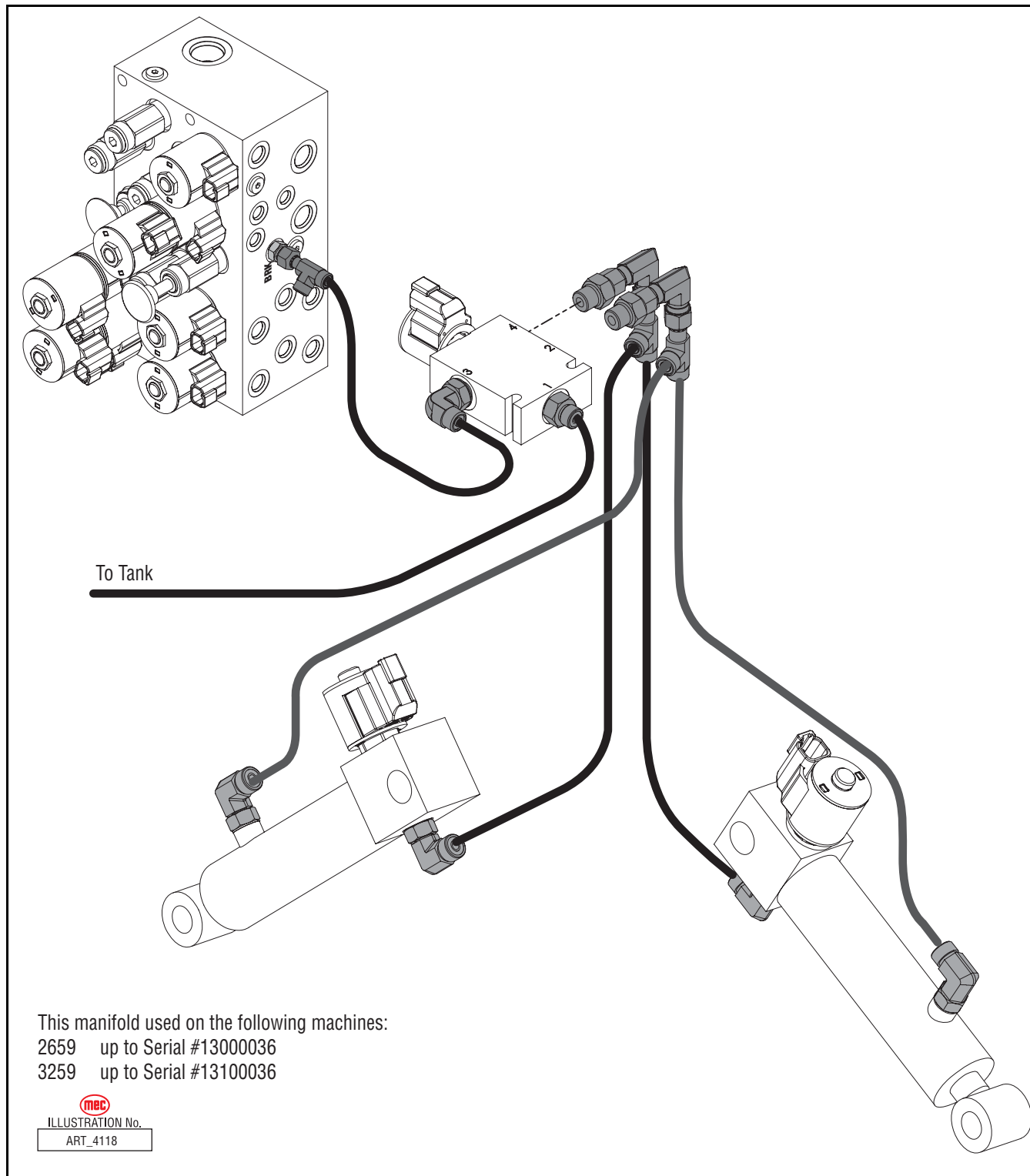
**Figure 1-20:** Brake Release Circuit



## POTHOLE CIRCUIT -- EARLY MACHINES

Pressurized fluid is supplied to the Pothole Cylinders as shown below. The Pothole Extend valve is separate from the Functions Manifold.

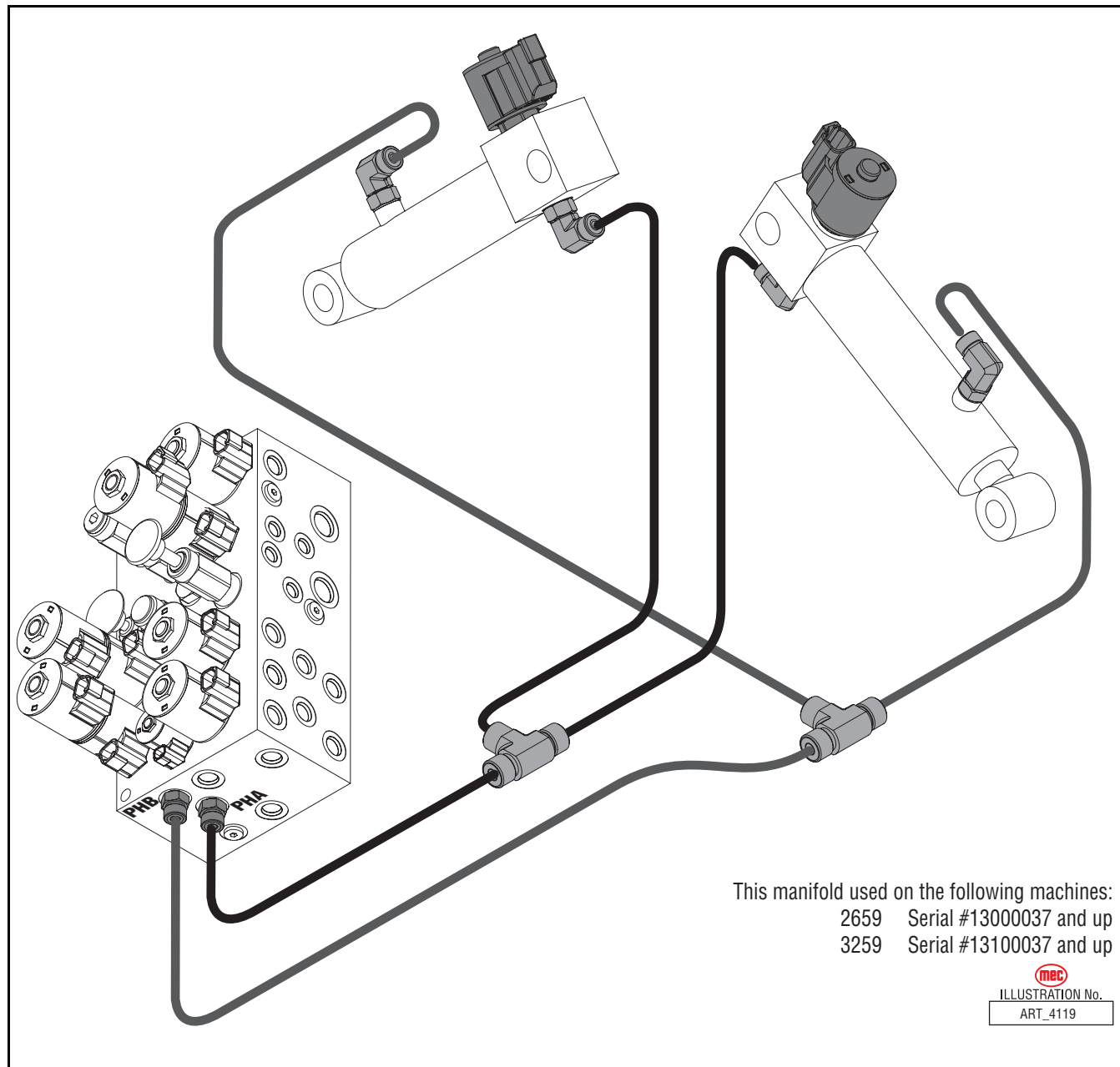
**Figure 1-21:** Steer Circuit



## POTHOLE CIRCUIT -- LATER MACHINES

Pressurized fluid is supplied to the Pothole Cylinders from ports PHA and PHB on the Functions Manifold.

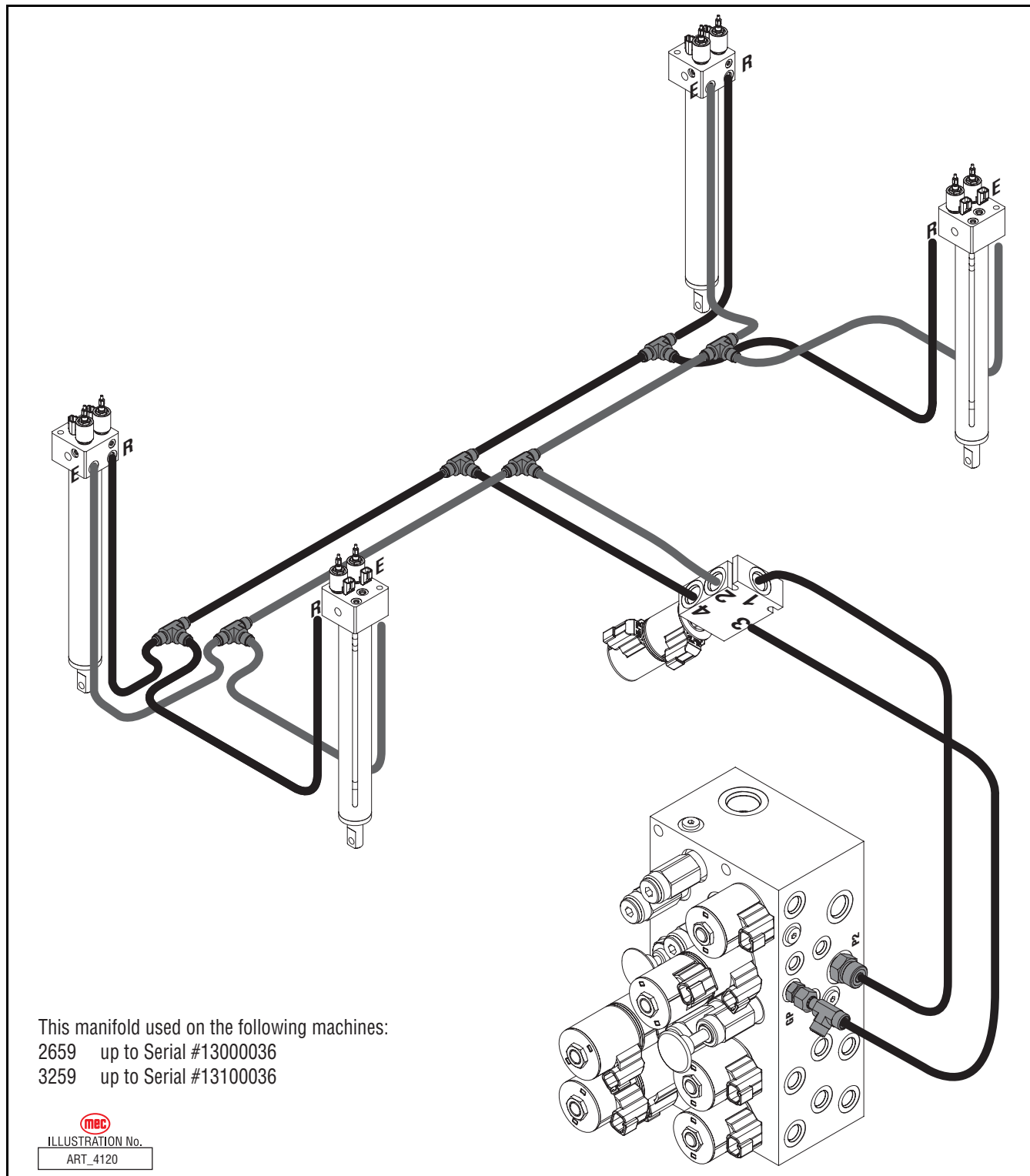
*Figure 1-22: Lift Circuit*



## OUTRIGGER CIRCUIT -- EARLY MACHINES

Pressurized fluid is supplied to the Outriggers Cylinders as shown below. The Outrigger valve is separate from the Functions Manifold.

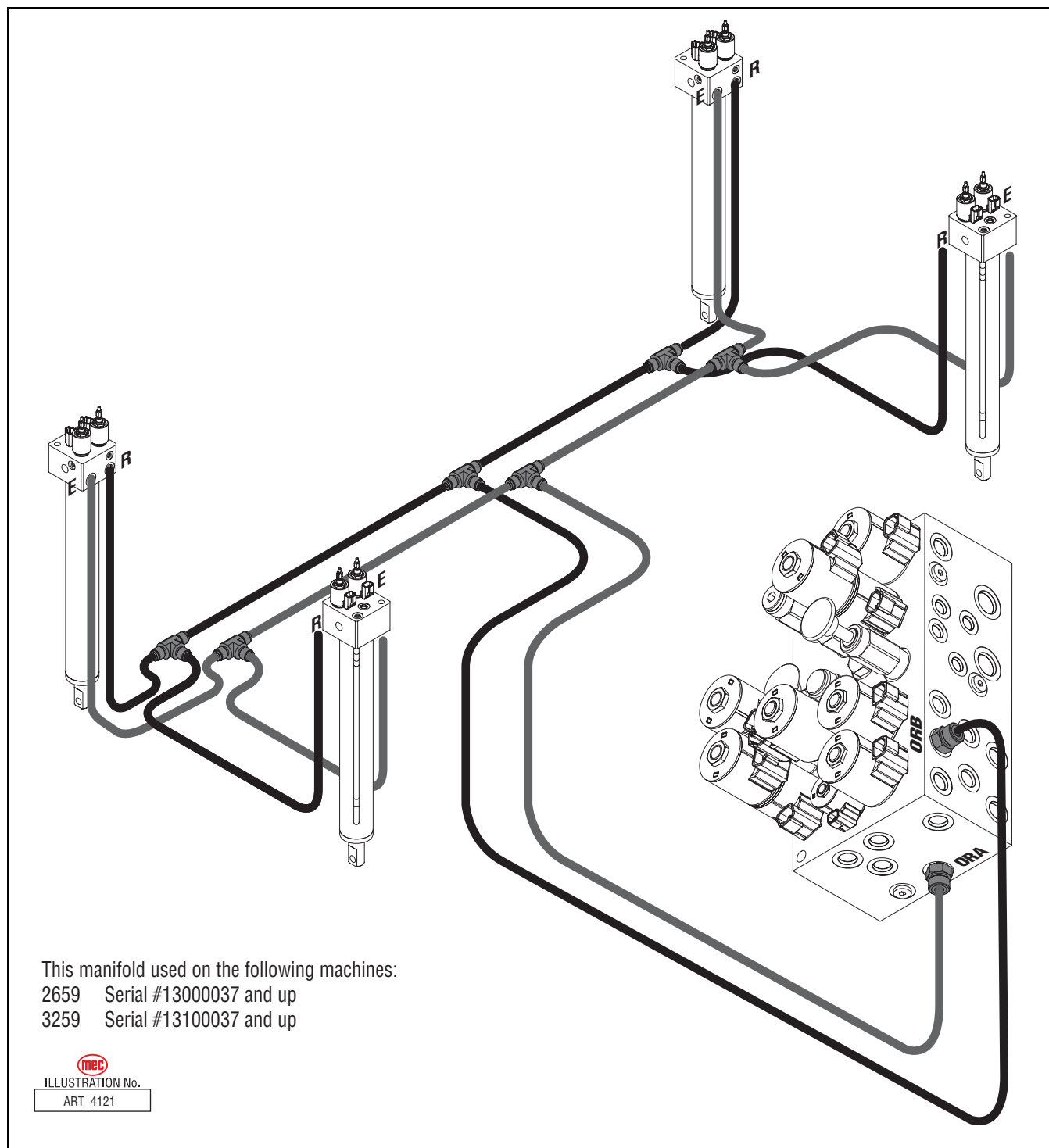
**Figure 1-23:** Steer Circuit



## OUTRIGGER CIRCUIT -- LATER MACHINES

Pressurized fluid is supplied to the Outriggers Cylinders as shown below.

*Figure 1-24: Lift Circuit*



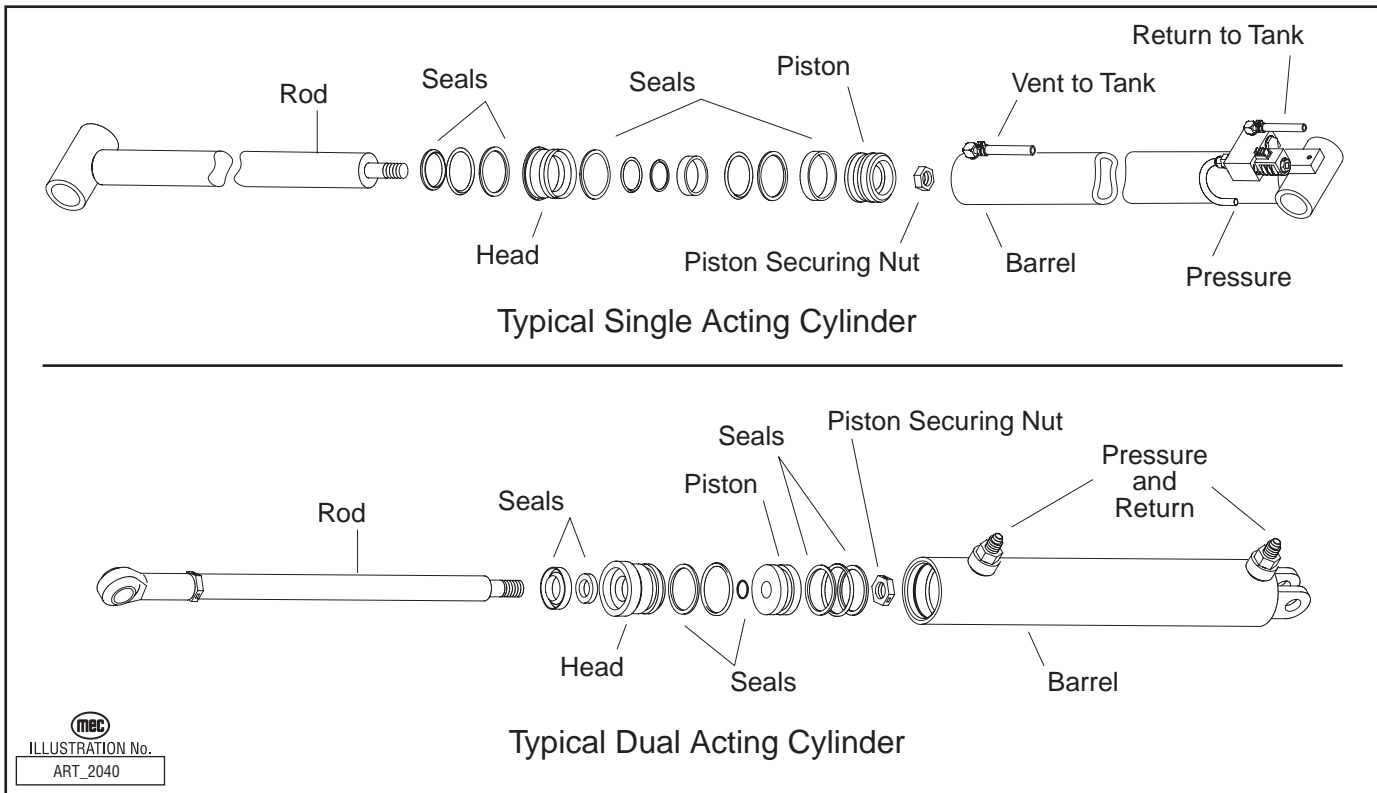
# GENERAL CYLINDER REPAIR



## WARNING

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

*Figure 1-25: Typical Cylinders, Exploded View*



## REMOVAL

**NOTE:** Refer to *Section 3* for Remove and Replace instructions, and the *Parts Manual* 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



**Take precautions to protect the rod surface. 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.
6. Clean all fluid and debris off of the head, piston, shaft, collar and barrel using solvent, rags, and an air hose.
7. Inspect parts for scratches, pits or polishing. Check seal grooves 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.
- Do not use sharp edged tools during seal replacement. After installing seals wait at least one hour before assembling the cylinder to allow the seals to return to their original shape.
- 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 head seals. Reinstall the head on the shaft by slipping head over the piston end of the shaft. Be very careful not to damage the inside seals.
4. Place a small amount of fluid on the inside seals of the piston. Reinstall the piston on the shaft by slowly twisting the piston onto the threads of the shaft. Be very careful not to damage the inside seals.
5. Reinstall the shaft nut. Torque 1 ½" nut to 160 ft. lbs. (216 Nm).
6. Grease the outside seals of the head and piston.
7. Reinstall the shaft into the barrel of the cylinder and push in until groove of the head lines up with the slot in the barrel.
8. Reinstall the cylinder retainer. Installation is reverse of removal.
9. Cycle the cylinder using air to check for proper operation.

**NOTE:** Keep all parts clean when working with hydraulic cylinders. Even one small piece of dirt or grit can damage the cylinder.



## Section 2

# ELECTRICAL SYSTEM

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## ELECTRICAL SYSTEM – GENERAL

The electrical control system consists of lower controls located on the machine base and upper controls located on the machine platform. The emergency lowering switch is also located on the lower controls, and is electrically operated.

### LOWER CONTROLS

The lower controls operate only lift and lower functions.

### UPPER CONTROLS

The upper controls operate all functions including drive, steer, lift, and lower, along with outrigger controls for machines equipped with outriggers. A momentary bi-directional rocker switch on the joystick provides the steering function. The joystick also has an enable bar switch that must be depressed to enable the Lift, Lower and Drive functions. The control system for operation of drive, steer, lift, and lower are electric-over-hydraulic type. The drive and lift systems are proportional systems controlled by position and direction of the upper controls joystick.

### EMERGENCY STOP

There are two red Emergency Stop switches: One located on the upper controls and one on the lower controls. Activation of either Emergency Stop switch will immediately cut electrical power to all controls, thereby stopping all machine functions. Press the switch to stop all electrical power and turn the switch clockwise to reset. When both Emergency Stop switches are “set”, the controls have electrical power and the machine will operate.

**Figure 2-1:** Emergency Stop Switches



**NOTE:** Both switches must be set or the machine will not operate.

### EMERGENCY LOWERING SWITCH



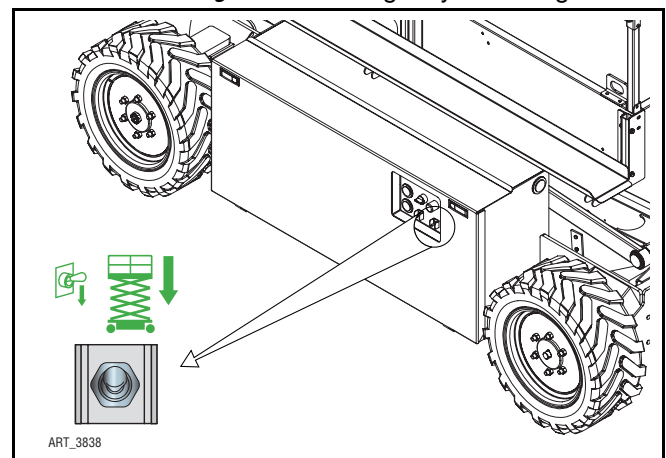
**IF THE CONTROL SYSTEM FAILS WHILE THE PLATFORM IS ELEVATED, USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.**

**DO NOT CLIMB DOWN THE SCISSOR ASSEMBLY OR EXIT THE PLATFORM.**

The Emergency Lowering System is used to lower the platform in case of power failure.

To lower the platform, push down on the Emergency Lowering Switch, located at the Lower Control Box.

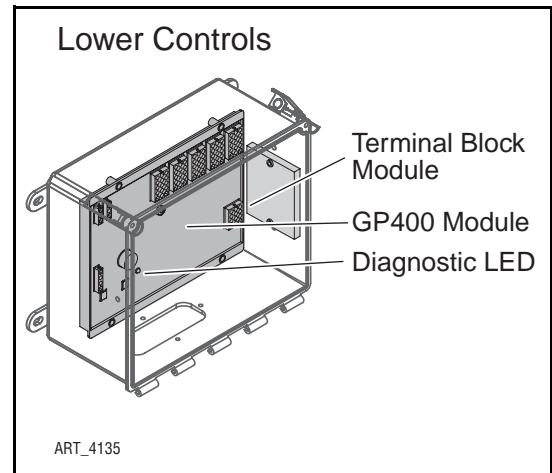
**Figure 2-2:** Emergency Lowering Switch



## DIAGNOSTIC LED

If the machine fails to operate, inspect the GP400 Module located inside the Lower Controls box. The LED located on the module should be *ON*. If the LED is *OFF* or *FLASHING*, refer to *Section 4: Troubleshooting*.

**Figure 2-3:** Diagnostic LED



# 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 ONLY 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.**

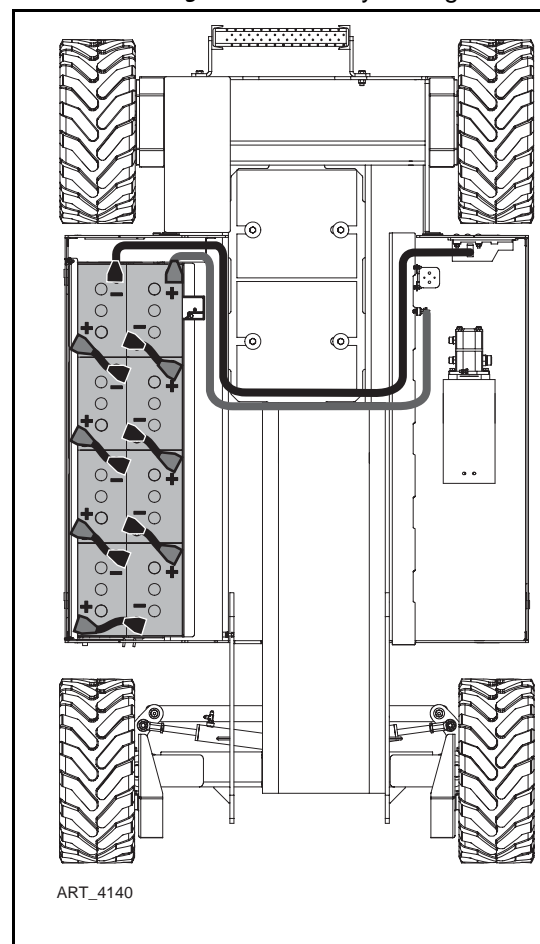
**CAUTION**

**Discharged batteries can freeze, causing damage to the battery and/or battery case. A broken battery case will allow electrolyte to leak out.**

Eight 6-volt DC batteries supply power required to operate the machine.

Early machines were powered by six 6-volt batteries.

*Figure 2-4: Battery Configuration*



## BATTERY MAINTENANCE (IN STORAGE)

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

- Keep batteries clean. Electrolyte of batteries should be checked regularly and kept at proper level.
- Never stack one battery directly on top of another, as post or container damage may occur. If batteries are stored individually, place supporting boards between layers. Rotate stock so that the oldest batteries are used first.
- Batteries should be kept fully charged. A battery, while in storage, should be recharged to full charge at recommended intervals.

### 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)

**Table 2-1:** Recommended Battery Charge Intervals

| If Stored At       | Recharge      |
|--------------------|---------------|
| Below 40°F (4°C)   | Every week    |
| 40°-60°F (4°-15°C) | Every 2 weeks |
| Above 60°F (15°C)  | Every month   |

## BATTERY MAINTENANCE (IN USE)

Check batteries 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 ½ 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 may 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:

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 readings 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 matter to enter the cells. Use a solution of bicarbonate soda (5 tsp. of baking soda per quart of warm water) and water to wash the battery if there is an accumulation of acid.

**Table 2-2:** Battery Specific Gravity and Voltage

|                  | Specific Gravity |          | Volts DC    |  |
|------------------|------------------|----------|-------------|--|
|                  | Each Cell        | Per Cell | 12V Battery |  |
| Fully Charged    | 1.280            | 2.10     | 12.60       |  |
| Fully Discharged | 1.130            | 1.75     | 10.50       |  |

## BATTERY REPLACEMENT

### CAUTION

To prevent damage to the battery and/or electrical system:

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

#### TO REMOVE A BATTERY;

1. Disconnect the negative battery cable, then the positive battery cable. Remove the battery hold-down hardware.
2. Lift the battery from the compartment, put the battery aside and dispose of properly.

#### TO INSTALL A BATTERY;

1. Position the battery in the compartment and secure with hold-down hardware.
2. Connect the positive battery cable, then the negative battery cable.

## BATTERY CHARGER

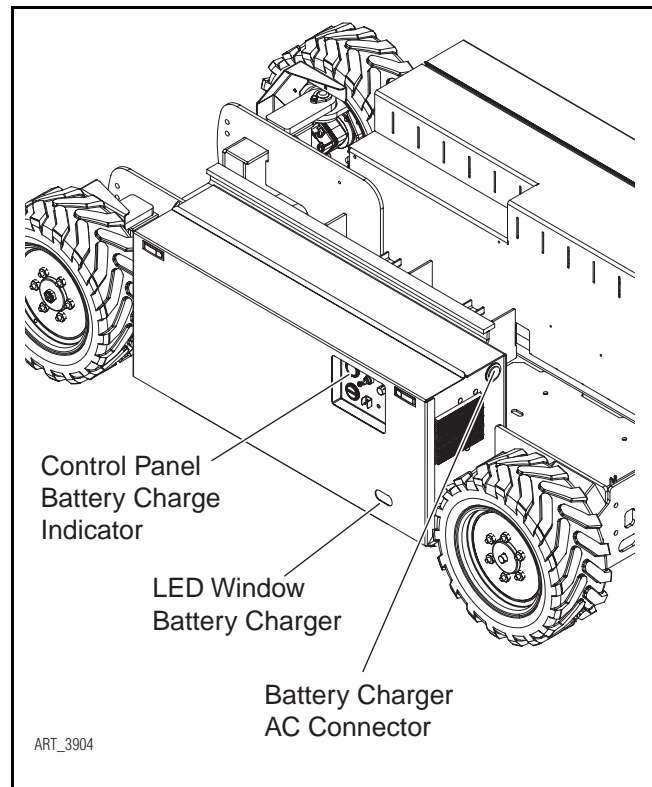
The charger is an advanced, microprocessor controlled, high frequency switching type charger.

The charger will work even with batteries in a severe discharge state with battery terminal voltages as low as 4V. This reduces the need to “boost charge” weak batteries before charging.

The charger has a 22 hour timer in case charging can not be completed due to battery problems. The charger senses and flashes error codes for problems – refer to *Section 4: Troubleshooting*.

Battery charger LEDs can be viewed through a window in the door of the Control Module.

**IMPORTANT:** The machine will not operate when charger is plugged in. Be sure to disconnect the charger from the outlet before attempting to operate the unit.



**LEAD-ACID BATTERIES GENERATE EXPLOSIVE GASES. KEEP SPARKS, SMOLDERING MATERIALS, AND FLAME AWAY FROM BATTERIES.**

**THE CHARGER SURFACE MAY BECOME GET HOT WHILE OPERATING. AVOID CONTACT.**

**TO REDUCE THE RISK OF AN ELECTRIC SHOCK, CONNECT ONLY TO A PROPERLY GROUNDED SINGLE-PHASE (3 WIRE) OUTLET.**

## CHARGE BATTERIES

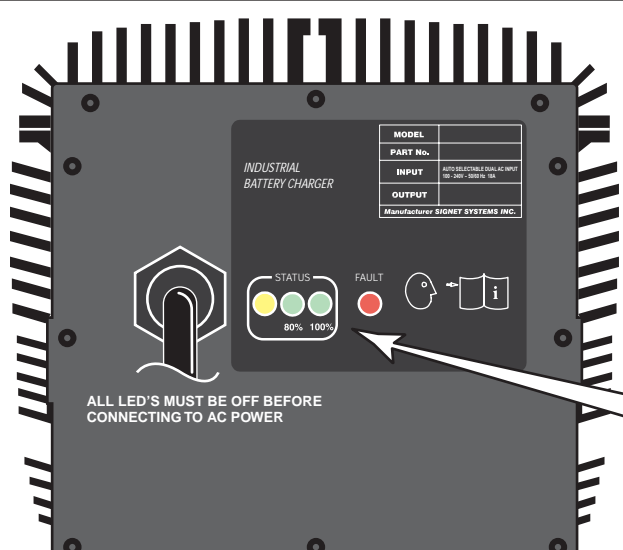
1. Plug the charger into a single phase AC socket with a nominal voltage rating of 100V, 110V, 115V, 120V, 220V, 230V, or 240V and a frequency rating of 50 or 60Hz.
  - The charger automatically senses and adjusts to the AC voltage and frequency.
  - At 110/120V the wall socket circuit breaker should be a 20A breaker with no other loads on the circuit.
2. The charger will start automatically within a few seconds and begin charging the batteries.
3. The LEDs indicate the charging progress.
  - The yellow LED will turn *ON* and remain *ON* throughout the charging cycle.
  - When the battery is 80% charged the green 80% LED will turn *ON*.
  - When the battery is fully charged the green 100% LED will turn *ON* and the green 80% LED will turn *OFF*.
  - When the battery is fully charged the yellow LED will turn *OFF* indicating that the charger is no longer charging.

Charging time is dependent on depth of battery discharge, battery condition, and temperature.

If the charger is left plugged in after charging is complete (100% LED *on*) the charger goes into maintenance mode to keep batteries charged while in storage.

The charger continuously measures battery voltage and restarts the charging cycle if the battery voltage drops below about 50V. This keeps batteries charged while in storage but does not boil-out the electrolyte over time.

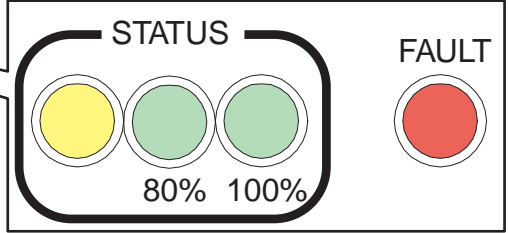
Turn *OFF* charger by unplugging (disconnect from AC voltage).




### BATTERY CHARGER INDICATOR

|                                       | YELLOW | 80% | 100% | FAULT |
|---------------------------------------|--------|-----|------|-------|
| No AC power to charger                | OFF    | OFF | OFF  | OFF   |
| Normal operation, charger is charging | ON     | OFF | OFF  | OFF   |
| Normal, battery is over 80% charged   | ON     | ON  | OFF  | OFF   |
| Normal, battery is 100% charged       | OFF    | OFF | ON   | OFF   |

Please see service manual for additional information.



  
 ILLUSTRATION No.  
 ART\_2374

**Red FAULT LED**

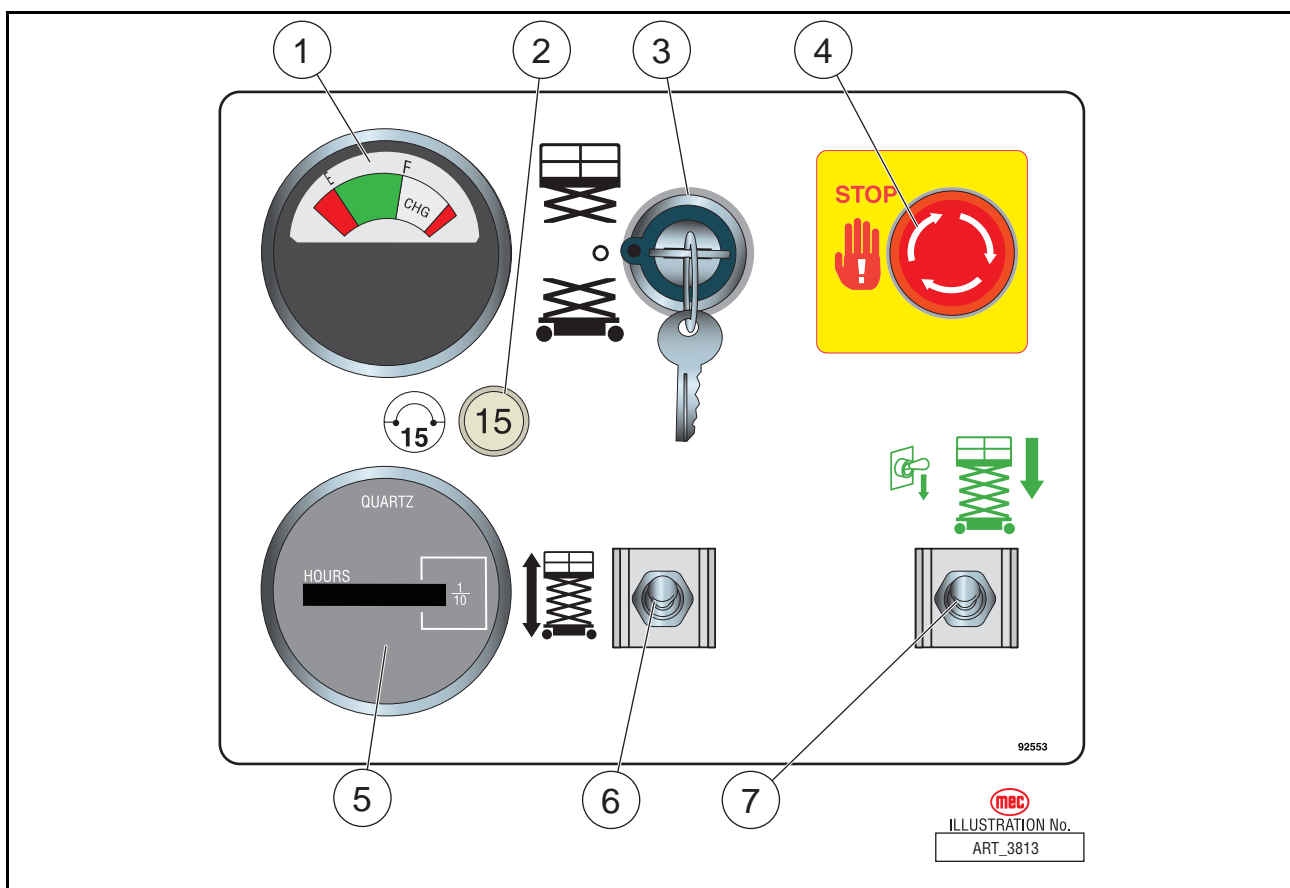
- **ON:** Battery pack probably bad, weak, or a bad cell.
- **1 FLASH:** Open or short circuit. Remove from service until problem is identified and corrected.
- **2 FLASH:** Charger timed out. Battery pack probably bad, weak, or a bad cell. Unplug for 30 seconds, then plug in to start a new charge cycle.

**NOTE:** New batteries sometimes need 20 to 30 charge/discharge cycles before they charge normally. The charger LEDs may only show yellow or 80% LED *ON* after overnight charging. Within a few weeks the 100% LED will turn *ON* at the end of the charge cycle.

# CONTROLS

## LOWER CONTROLS

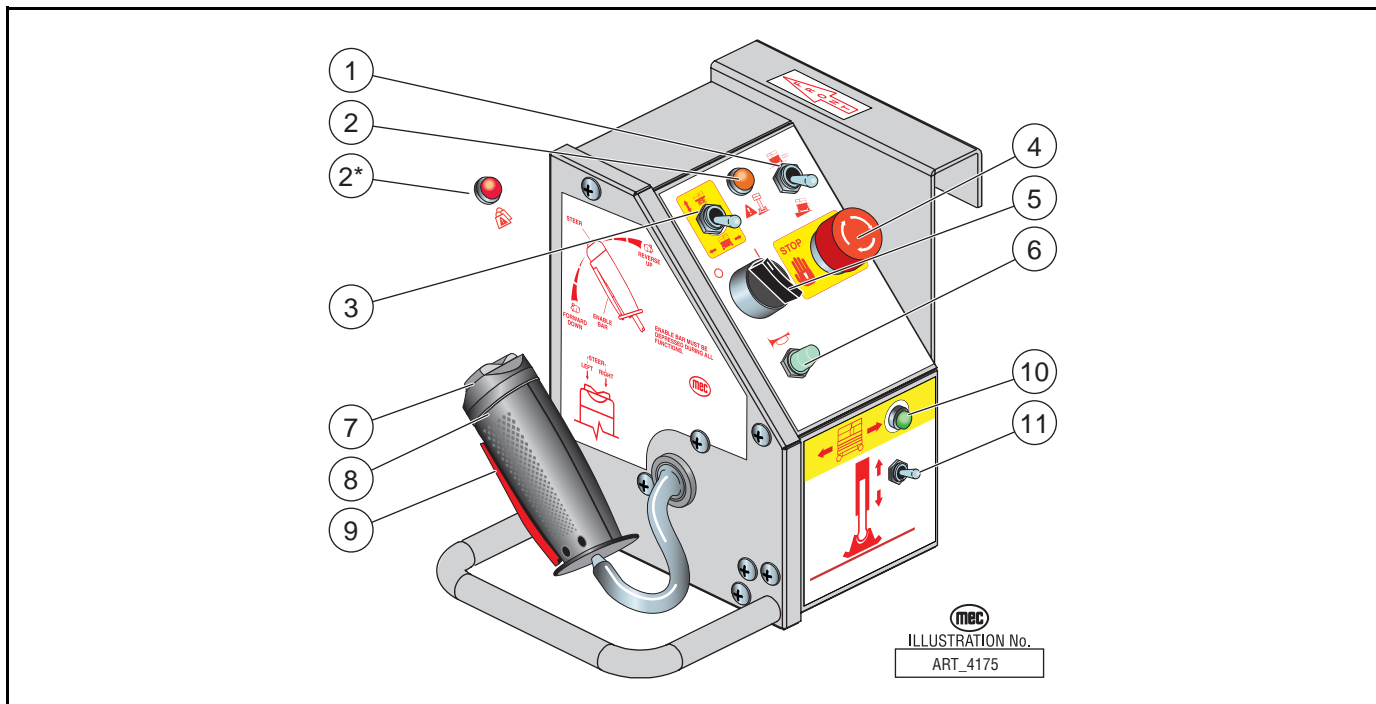
Figure 2-5: Lower Controls



| CONTROL |                            | DESCRIPTION  |
|---------|----------------------------|--|
| 1       | Hour Meter                 | Indicates total elapsed time of machine operation.   |
| 1       | Battery Charge Indicator   | Indicated the state of the battery charge.   |
| 2       | Circuit Breaker            | Trips when there is excessive electrical load. Push to reset.  |
| 3       | Selector Switch            | PLATFORM Select to operate from the platform control panel.  |
|         |                            | BASE Select to operate from the base control panel.  |
|         |                            | OFF Select to stop operation from either control panel.  |
| 4       | Emergency Stop Switch      | Press the EMERGENCY STOP switch at any time to stop all machine functions. Turn switch <i>clockwise</i> to reset       |
| 5       | Hour Meter                 | Indicates total elapsed time of machine operation.   |
| 6       | Platform Lift/Lower Switch | With the Selector Switch in the BASE position, move this switch up to lift the platform or down to lower the platform. |
| 7       | Emergency Down Switch      | Move this switch down to lower the platform in the event of an emergency or power loss.                                |

# UPPER CONTROLS

**Figure 2-6:** Upper Controls



| CONTROL |   | DESCRIPTION   |
|---------|---|---|
| 1       | Speed/Torque Selector Switch              | Move this switch to the up for high speed drive. Push this switch to down for high torque drive.  |
| 2       | Tilt Indicator Light (amber)              | If illuminated, the machine is not level. Carefully lower the platform, then move the machine to a firm, level surface.   |
|         | Overload Indicator Light (red)*           |   |
| 3       | Lift/Drive Switch                         | Move this switch UP to enable the Lift function. Move this switch DOWN to enable the Drive function.  |
| 4       | Emergency Stop Switch                     | Press the EMERGENCY STOP switch at any time to stop all machine functions.<br>Turn switch <i>clockwise</i> to reset   |
| 5       | On/Off Switch                             | This switch turns all power ON or OFF.  |
| 6       | Horn Button (Option)                      | Press to sound warning horn.  |
| 7       | Steer Switch**                            | Using your thumb, press and hold the rocker switch to steer Left or Right.  |
| 8       | Control Handle**                          | DRIVE<br>Proportionally controls Forward and Reverse travel.  |
|         |   | LIFT<br>Controls Lift and Lower functions. Lift is proportional.  |
| 9       | Enable Bar                                | Squeeze to enable DRIVE, STEER, and LIFT functions from the Joystick.   |
| 10      | Drive Enable Indicator (Outrigger Option) | Lamp ON<br>Outriggers are retracted and machine will drive.   |
|         |   | Lamp OFF<br>Outriggers are extended and machine will not drive.   |
| 11      | Extend/Retract (Outrigger Option)         | Push the toggle switch DOWN to extend the outriggers. Continue pushing down until the outriggers stop automatically. Push the toggle switch UP to retract the outriggers. |

\*Machines equipped with optional Overload Sensing System

\*\*These controls operate only when the Enable Bar (#9) is depressed. The Enable Bar must be depressed before operating the function for correct control system safety sequence.

## ALARMS AND SWITCHES

### MOVEMENT ALARM

The Movement Alarm is activated as soon as the DOWN operation is activated from either control station. This is the default setting. If desired, the movement alarm setting can be modified to activate the alarm during other functions (refer to *Section 4: Troubleshooting*).



**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 SENSOR

The Level Sensor is integrated into the GP400 Control Module.

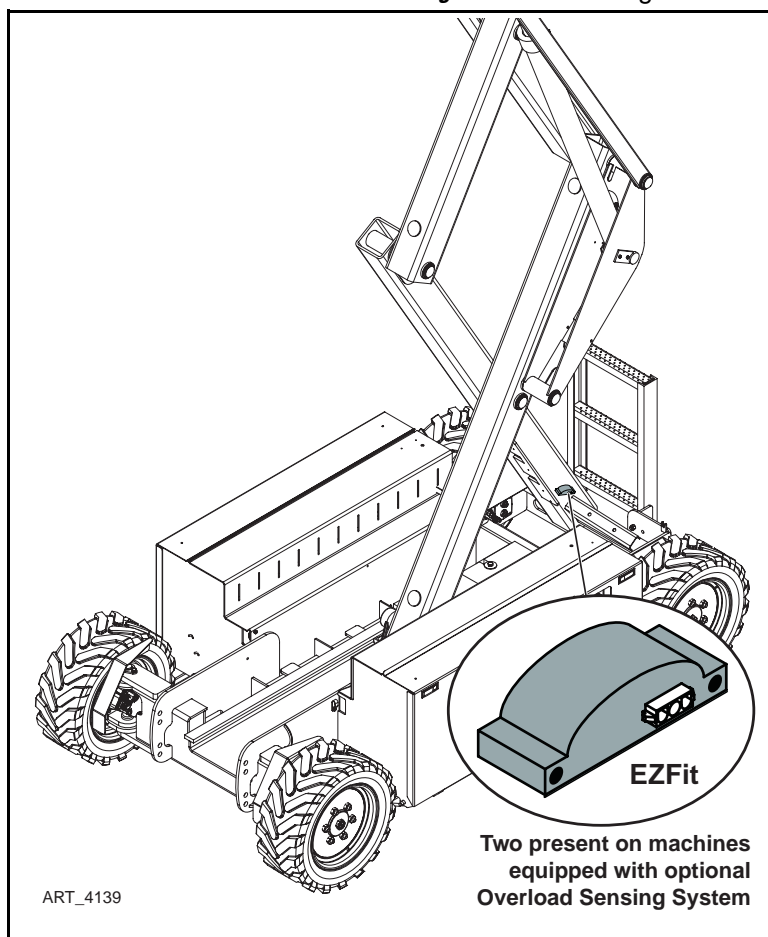
### EZFIT ANGLE SENSOR

The EZfit Angle Sensor provides platform elevation information to the GP400 control module. When the GP400 reads certain outputs from the angle sensor it will:

- deploy or retract the Pothole Bars.
- enable or disable tilt sensor operation.
- reduce drive speed for elevated drive.

On machines equipped with the optional Overload Sensing System, the Angle Sensor works in conjunction with the Pressure Transducer and a second redundant Angle Sensor located beside the first.

**Figure 2-7:** EZfit Angle Sensor



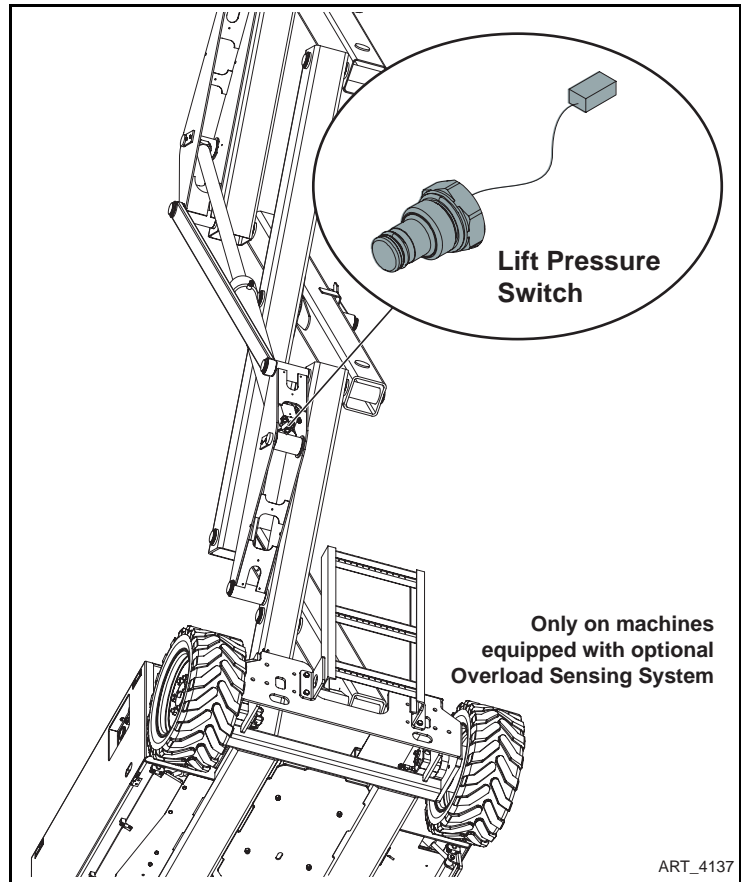
**Figure 2-8: Pressure Transducer****PRESSURE TRANSDUCER**

The Pressure Transducer is used on machines equipped with the optional Overload Sensing System. It provides lift cylinder pressure information to the GP400 and works in conjunction with two EZfit Angle Sensors.

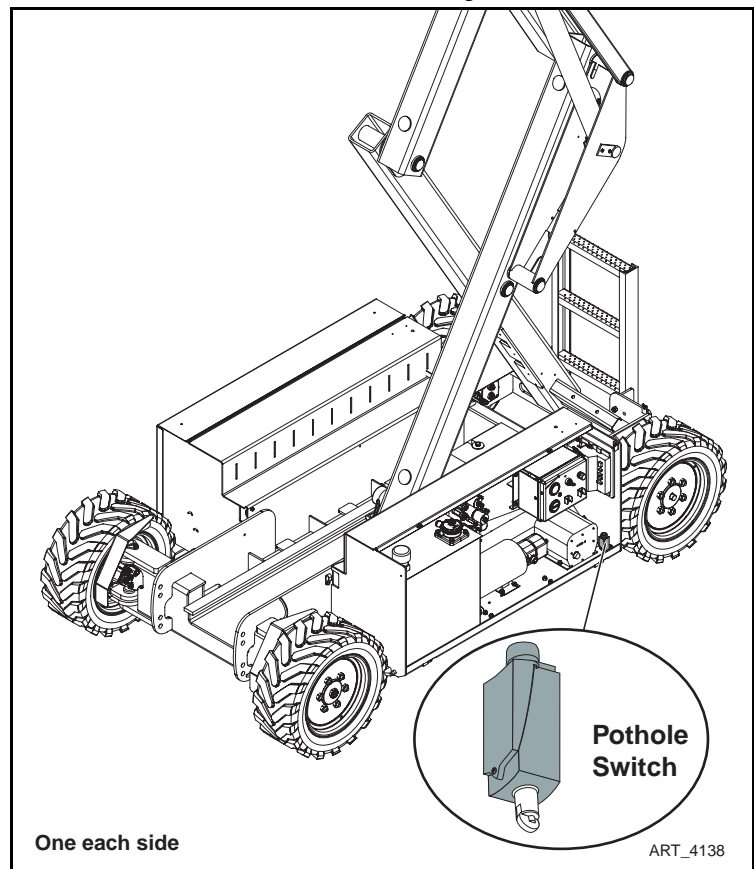
Excessive pressure indicates platform overload. When the GP400 reads a certain output from the pressure sensor it will:

- disable lift, lower and drive operation.
- sound audible alarms.
- turn ON the OVERLOAD light on the upper control panel.

Remove weight from the platform to restore function and continue.

**Figure 2-9: Pothole Switch****POTHOLE SWITCHES**

The pothole bars deploy when the platform is elevated beyond 20 ft. (6 m) for the (2659), and 26 ft. (7.9 m) for the 3259. When the pothole bars have deployed fully, they engage the Pothole Switches and signal the GP400 to allow elevated drive.





## Pothole Switch Adjustment

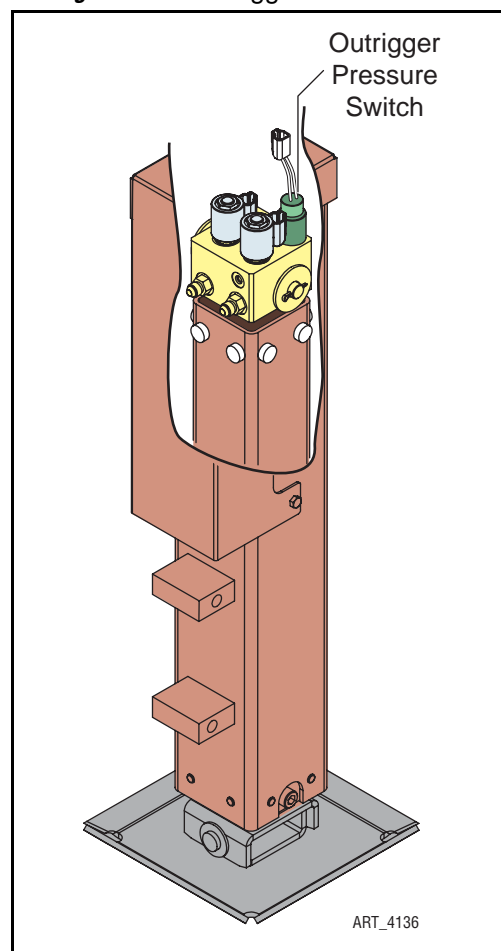
Proper adjustment is vital to safe machine operation. To adjust the switch:

- Raise the platform until the pothole bars deploy completely.
  - Loosen the bolts that secure the Pothole Switch to the bracket mounted to the machine base. **DO NOT** remove the bolts.
  - Lower the Pothole Switch slowly until you hear the switch close with a click.
  - Hold the Pothole Switch in this position while tightening the mounting bolts.
  - Test for proper operation: From the platform, move the machine to a hard, level surface, then elevate the platform until the Pothole Bars deploy. The machine should drive at a reduced speed at this point.
- If the pothole bars deploy fully but the machine does not drive, readjust the switches.  
If the pothole bars do not deploy fully, inspect them for damage or obstruction.

**Figure 2-10:** Outrigger Pressure Switch

## OUTRIGGER PRESSURE SWITCHES

On machines equipped with outriggers, each of the four outriggers has a Pressure Switch. Pressure from the outrigger cylinder on this switch indicates full deployment of the outrigger.



# DEUTSCH CONNECTORS

Deutsch connectors used on MEC equipment are 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 no. 84091.

**Figure 2-11: Deutsch Connectors**

## 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

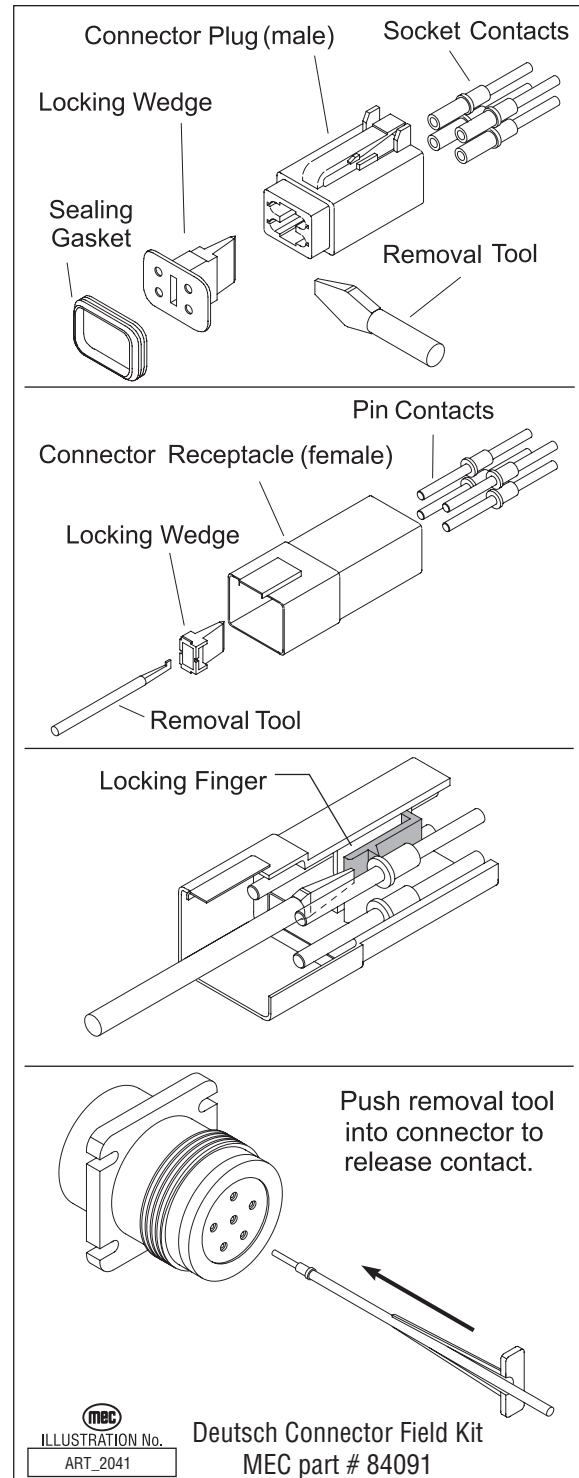
- Remove the locking wedge as outlined above.
- Using the removal tool or a flat blade screwdriver, push the Locking Fingers aside to release the contact.
- Pull the wire and contact out of the connector.

## 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.

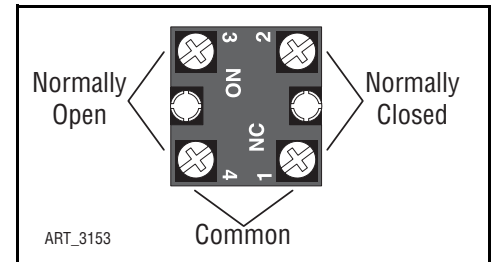


# CONTINUITY CHECKS

## SELECTOR SWITCH – ON-OFF

- Disconnect wires.
- Connect first probe of ohm meter to *common* terminal.
- Connect second probe to any normally open terminal.
- With switch OFF (open) there should be no reading.
- With the switch ON (closed) there should be a low reading.
- Repeat for each normally open terminal.

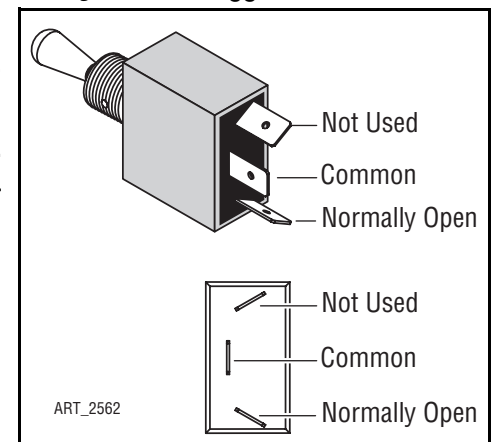
**Figure 2-12:** Selector Switch



## TOGGLE SWITCH – ON-OFF

- Disconnect wires.
- Connect first probe of ohm meter to *common* terminal.
- Connect second probe to normally open terminal.
- With the switch turned OFF there should be no reading.
- With the switch turned ON there should be a low resistance.

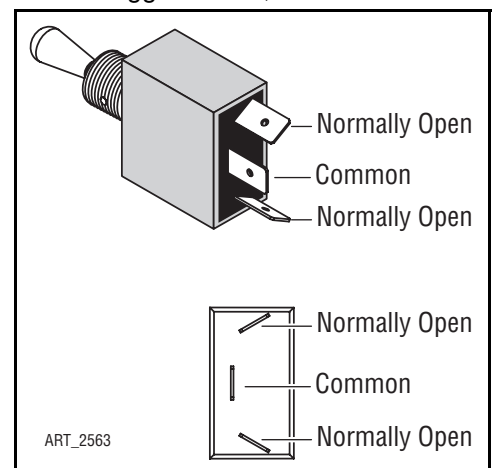
**Figure 2-13:** Toggle Switch, ON-OFF



## TOGGLE SWITCH – 1-POLE 2-POSITION

- Disconnect wires.
- Connect first probe of ohm meter to *common* terminal.
- Connect second probe to *top* normally open terminal.
- With toggle DOWN there should be no reading.
- With the toggle UP there should be a low resistance.
- Move second probe to *bottom* normally open terminal.
- With toggle UP there should be no reading.
- With the toggle DOWN there should be a low resistance.

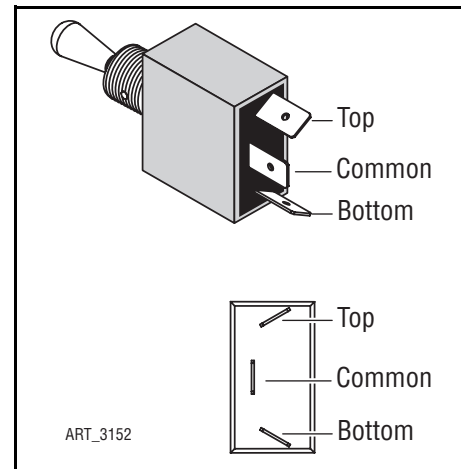
**Figure 2-14:** Toggle Switch, 1-Pole 2-Position



## TOGGLE SWITCH – 1-POLE 3-POSITION

- Disconnect wires.
- Connect first probe of ohm meter to *common* terminal.
- Connect second probe of ohm meter to *top* terminal.
- With the toggle UP or MIDDLE there should be a low resistance.
- Move second probe to *bottom* terminal.
- With the toggle DOWN or MIDDLE there should be a low resistance.
- Connect first probe of ohm meter to *top* terminal.
- Connect second probe of ohm meter to *bottom* terminal.
- With toggle in ANY POSITION there should be no reading.

**Figure 2-15:** Toggle Switch, 1-Pole 3-Position



## TOGGLE MOMENTARY SWITCH

- Disconnect wires.
- Connect first probe of ohm meter to common terminal.

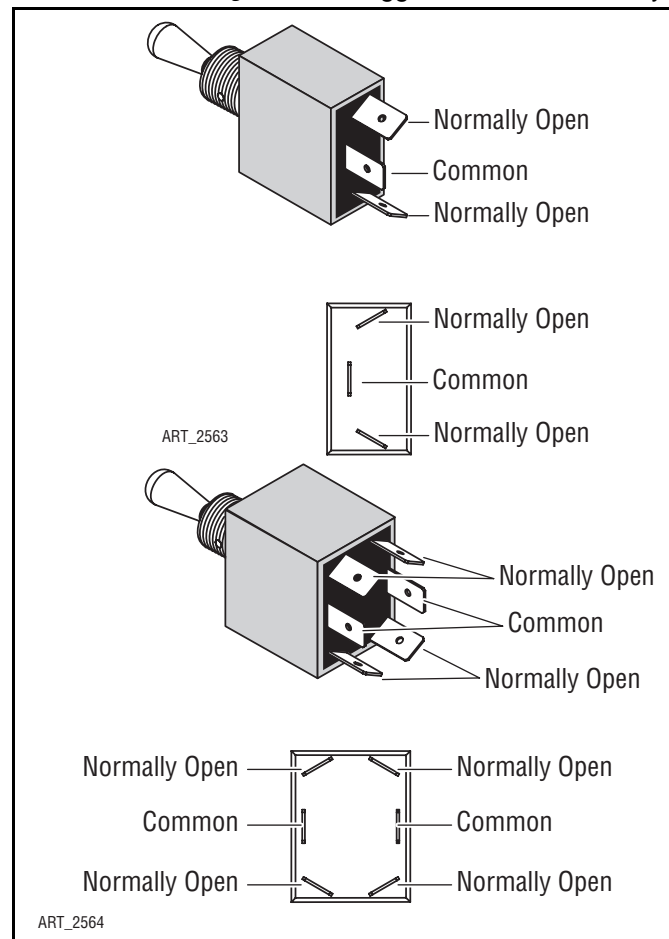
### Test top position

- Connect second probe to *top* normally open terminal.
- With the toggle in the neutral (open) position there should be no reading.
- With the toggle UP (closed) there should be a low resistance.
- With the toggle DOWN (closed) there should be no reading.

### Test bottom position

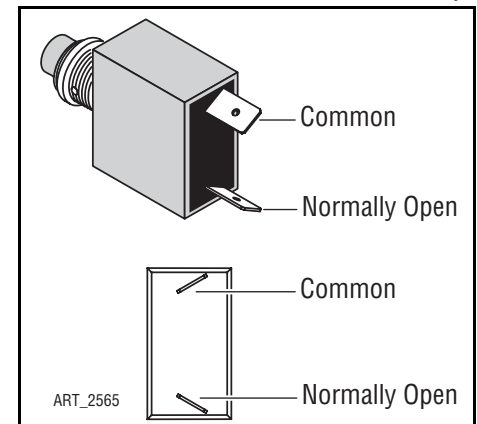
- Move second probe to *bottom* normally open terminal.
- With the toggle in the neutral (open) position there should be no reading.
- With the toggle DOWN (closed) there should be a low resistance.
- With the toggle UP (closed) there should be no reading.
- Repeat for both rows of two-row switch.

**Figure 2-16:** Toggle Switch, Momentary

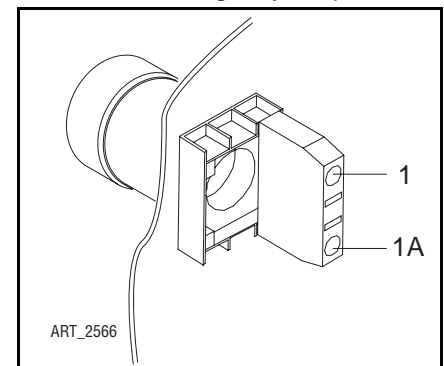


**Figure 2-17:** Button Switch, Momentary**MOMENTARY BUTTON SWITCH**

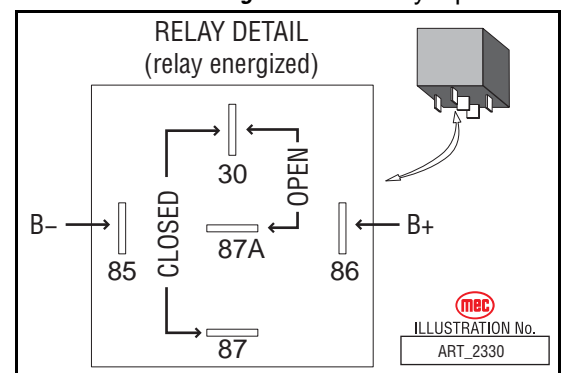
- Disconnect wires.
- Connect one probe of ohm meter each terminal.
- With the button in the neutral (open) position there should be no reading.
- With the button pushed (closed) there should be a low resistance

**Figure 2-18:** Emergency Stop Switch**EMERGENCY STOP BUTTON**

- Disconnect wires.
- Connect one probe of ohm meter each terminal.
- With the button PRESSED there should be no reading.
- With the button RESET there should be a low resistance.

**Figure 2-19:** Relay Operation**RELAY**

- With the #85 terminal grounded, apply voltage to #86 terminal connection.
- Confirm normally closed (#87A) contacts are opening. Continuity with #30 will be broken.
- Confirm normally open (#87) contacts are closing. Continuity with #30 will be made.



# GP400 CONTROL MODULE SETUP

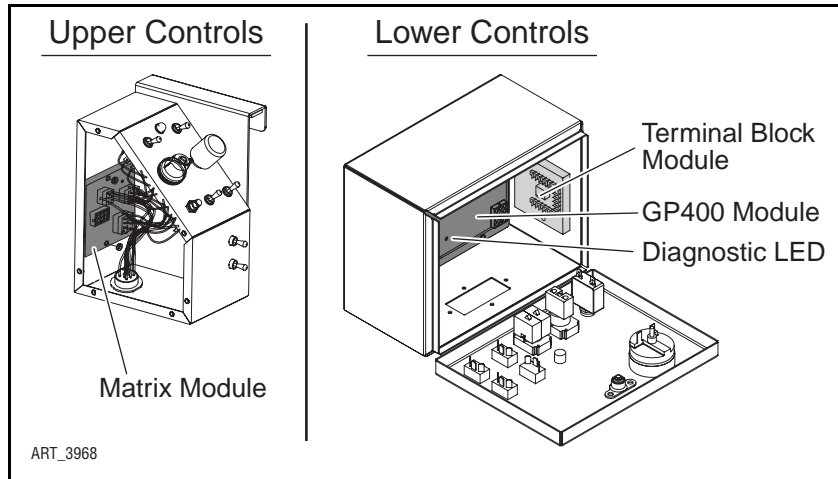
## LOCATION

- The GP400 Control Module processor is located in the lower control box.
- The Matrix Module is located in the upper control box.

Diagnostic information can be found in *Section 4: Troubleshooting*.

Wiring information can be found in *Section 5: Schematics*.

**Figure 2-20:** Module Locations



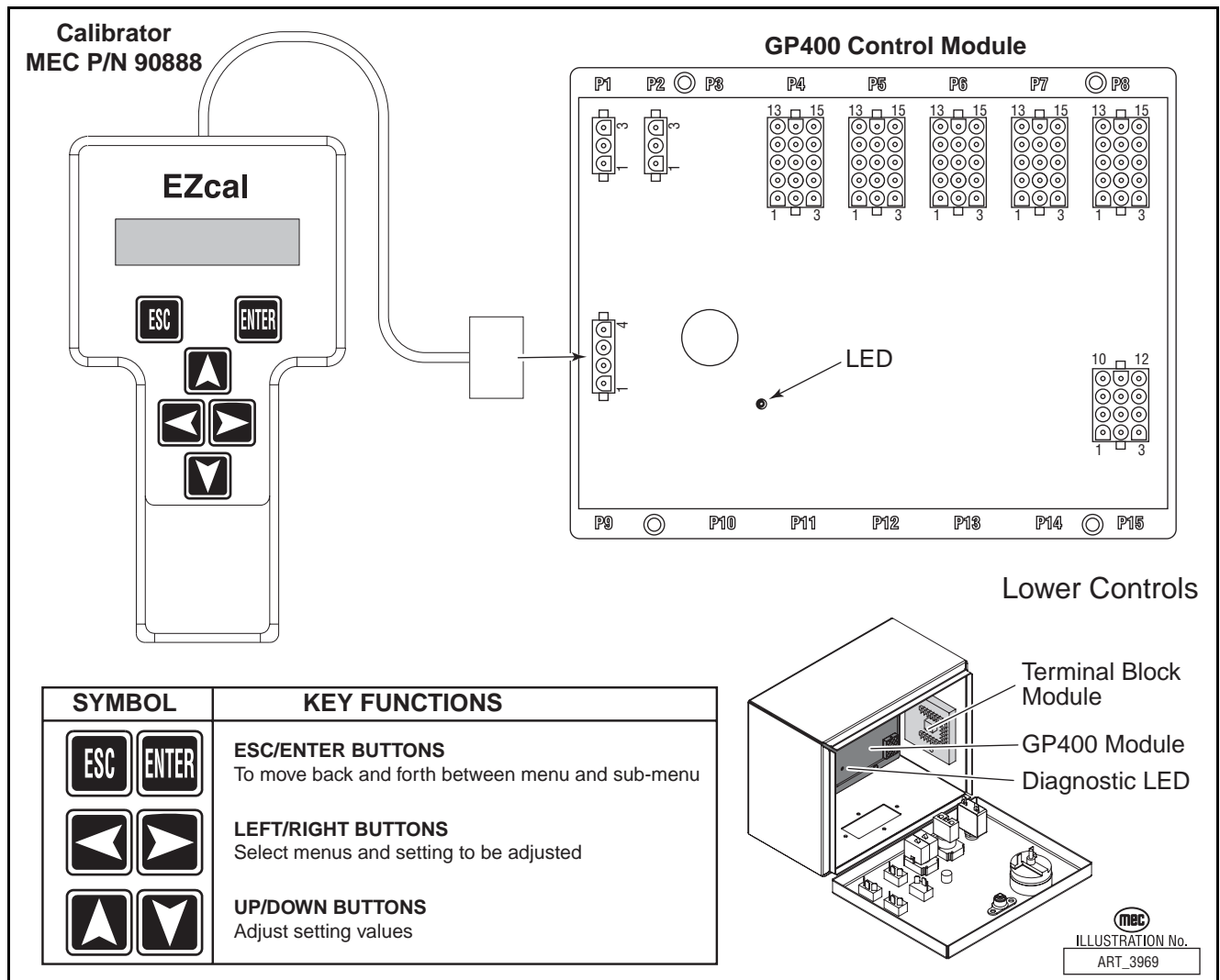
## GENERAL DESCRIPTION

The GP400 control module uses a variety of sensors to maintain proper and safe operation of the machine.

In the event the GP400 requires replacement, a calibration process must be performed before the machine can be operated. The GP400 will operate initially in an “assembly mode” to provide basic machine operation. However, it will divert to a failure mode if not properly calibrated within a few start-up cycles.

Machines may be equipped with an optional Onboard EZ-Cal, which is different in appearance but functions similarly to the hand-held type. See Section 4 of this manual for details.

**Figure 2-21: EZ-Cal Connection**



## GP400 CALIBRATION



**CALIBRATION OF THE GP400 MAY BE PERFORMED ONLY BY QUALIFIED, TRAINED AND AUTHORIZED PERSONNEL.**

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

The EZ-Cal hand-held device (MEC part # 90888) is required to access the GP400 for troubleshooting and calibration.

The GP400 processor relies on sensors to monitor platform elevation at all times. These sensors send varied voltages to the GP400 that relate directly to their respective position. The calibration process is the means by which the GP400 equates these voltages to actual platform elevation.

For example, the Angle Transducer, used to monitor platform elevation, varies its output between 1 and 4 volts through 140 degrees of rotation. During calibration the GP400 may learn that 1.8 volts (fictional number used for explanation) represents the fully stowed position and 3.6 volts represents the fully elevated position and therefore voltages between those figures relate to various heights in between.

All machines are calibrated at the factory and should not require calibration unless the GP400 is replaced or displays a code that indicates the need to recalibrate.

Tilt Sensor Calibration is required on all machines regardless of installed options and must be performed first.

Height Calibration follows Tilt Sensor Calibration for machines not equipped with the optional Optional Overload Sensing System and consists of only height calibration. Skip this procedure if your machine is equipped with the optional Overload Sensing System.

Separate calibration is required of all machines outfitted with the optional Overload Sensing System. All steps in the Overload Sensing System calibration must be performed in the proper sequence before the GP400 will recognize complete and proper calibration. Begin with the Tilt Sensor Calibration, then proceed to the Optional Overload Sensing System Calibrations section.

If the calibration procedure is performed incorrectly or if there is a failure in one of the monitored circuits during the calibration, the GP400 will not allow the operator to continue with the calibration process. An error message will display on the EZ-cal indicating the reason for the interruption.

Additional details of these error messages can be found at the end of the calibration instructions.

This and other procedures can only be performed using an EZ-Cal scan tool. If you do not have an EZ-Cal, please contact MEC to obtain one.



### ***Tilt Sensor Calibration***

Correctly performing the following procedure will ensure that your machine will continue to auto-level correctly and operate safely.

The Tilt Sensor is located within the GP400 Control Module. It is used by the control system to monitor machine level status, and is used on machines equipped with outriggers for auto-leveling. Correctly performing the Tilt Sensor Calibration will ensure that the machine will operate safely and that the outriggers (if equipped) will continue to auto-deploy correctly.

1. Park machine on a flat level surface. Using a spirit level or framer's level, check that the machine is absolutely level, both fore-and-aft and side-to-side.
2. Check the tire pressure (see Specifications in the Introduction section), and check that the tires are in good condition. If the machine is equipped with foam-filled tires, be sure that all tires are in good condition and that the tires are all the same size.
3. Open the lower control box and plug the EZ-cal into plug J-9 (4-pin connector) on the GP400. The display should light up and read "HELP - PRESS ENTER.
  - a. Press the right arrow to access "ACCESS LEVEL 3", press ENTER.
    - The display reads CODE 0000 with the cursor flashing.
  - b. Press the Up and Right arrows to enter code 1775, Press Enter
    - Display reads "ACCESS LEVEL 2"
  - c. Right arrow to SETUPS, Press Enter
    - Display reads "CHANGE DEFAULTS"
  - d. Right arrow to TILT SETUPS, Press Enter
    - Display reads "CALIBRATE LEVEL".
  - e. Press Enter
    - Display reads "CALIBRATE LEVEL YES: ENTER NO: ESC"
  - f. Press Enter
    - Display reads "CALIBRATE LEVEL YES: ENTER NO: ESC" plus has actual tilt percentages.
  - g. Press Enter again.
    - The percentage numbers should be 0.0 - 0.0 (or very close).
  - h. Level calibration is complete. Unplug the EZ-Cal or press ESC ESC ESC.

### ***Height Calibration***

Height calibration must be performed if the GP400 is replaced.

**Skip this procedure if your machine is equipped with the optional Overload Sensing System.**

For this procedure it is not necessary to place any load in the platform.

1. Drive machine to a flat level surface, in area where it can reach full elevation.
2. Turn selector switch to Base controls.
3. Plug **EZ-Cal** into connector P9 on GP400 Control Module. **EZ-Cal** display reads HELP: PRESS ENTER
4. Press right arrow to ACCESS LEVEL 3, Press Enter.
  - Display reads CODE 0000
5. Press Up and Right Arrow to enter code 1775. Press Enter.
  - Display reads ACCESS LEVEL 2.
6. Press Right Arrow to SETUPS, Press Enter.
  - Display reads CHANGE DEFAULTS

7. Press Right Arrow to HEIGHT SETUPS, Press Enter.
  - Display reads CALIBRATE HEIGHT
8. Press Enter.
  - Display reads PLATFORM DOWN? Verify that platform is fully lowered.
9. Press Enter.
  - Display reads PLEASE LIFT.
10. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
  - Display reads PLEASE LOWER.
11. Hold switch in down position until platform is in the fully lowered position. Release switch.
  - Display reads FINISHED.

#### OPTIONAL OVERLOAD SENSING SYSTEM CALIBRATIONS

**Do not perform this procedure UNLESS your machine is equipped with the optional Overload Sensing System.**

##### **Optional Overload Sensing System Platform Load Calibration**

Perform the Tilt Sensor Calibration outlined at the beginning of this section ("Tilt Sensor Calibration" on page 2-23).

Platform Load Calibration must be performed any time the GP400 is replaced or significant repairs are made to the elevating assembly.

During the calibration procedure the platform is fully raised and lowered three times:

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

The following procedure must be followed COMPLETELY to calibrate the optional **Overload Sensing System**. If any problem is detected, the procedure stops and an Error Message will display on the EZ-Cal. Explanations of each message and suggested corrections can be found in the section of this manual following the calibration procedure.

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

1. Drive machine to a flat, level surface where it can reach full elevation. Choose a place where the rated load can be placed in the platform and later removed **without** moving the machine.
2. Place the rated load in platform (see platform labels or serial plate). The load must be evenly distributed on the platform.
3. Turn selector switch to Base controls.
4. Plug **EZ-Cal** into connector P9 on GP400 Control Module. **EZ-Cal** display reads HELP: PRESS ENTER
5. Press right arrow to ACCESS LEVEL 3, Press Enter.
  - Display reads CODE 0000

6. Press up and right arrow to enter code 1775, Press Enter.
  - Display reads ACCESS LEVEL 2.
7. Press Right Arrow to SETUPS, Press Enter.
  - Display reads CHANGE DEFAULTS
8. Press Right Arrow to LOAD SETUPS. Press Enter.
  - Display reads CALIBRATE LOAD
9. Press Enter.
  - Display reads PLATFORM DOWN? Verify that platform is fully lowered.
10. Press Enter.
  - Display reads PLATFORM LOADED? Verify that rated load is evenly distributed in platform.
11. Press Enter.
  - Display reads PLEASE LIFT.
12. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
  - Display reads PLEASE LOWER.
13. Hold switch in down position until platform is in the fully lowered position. Release switch.
  - Display reads PLATFORM LOADED?
14. Ensure that the rated load is distributed evenly in the platform, then press Enter.
  - Display reads PLEASE LIFT.
15. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
  - Display reads TOTAL DATA #XX, then PLEASE LOWER.

**NOTE:** The platform will rise incrementally during this phase on the calibration. Do not release the switch until fully elevated.

16. Hold switch in down position until platform is in the fully lowered position.

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

17. Release switch.
  - Display reads TOTAL DATA #XX, then PLATFORM EMPTY?
18. Remove the load from the platform.

**NOTE:** If you must switch to platform controls to move the machine, steps 1.] through 7.] must be repeated. Steps 12.] through 20.] will generate the REDO prompt. Answer NO. If machine was not moved, proceed to step 22.].

19. Press Enter.
  - Display reads PLEASE LIFT.
20. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
  - Display reads TOTAL DATA #XX, then PLEASE LOWER.
21. Hold switch in down position until platform is in the fully lowered position.
  - Display reads TOTAL DATA #XX, then BUILDING TABLES, then CALDATE mm/dd/yy.
22. Enter current date using Up, Down and Right Arrows.
  - Display reads FINISHED.
23. Disconnect **EZ-Cal**.

The Platform Overload Sensing System is now calibrated.

### ***Optional Overload Sensing System Height Calibration***

For this procedure it is **not** necessary to place any load in the platform.

1. Drive machine to a flat, level surface where it can reach full elevation.
2. Turn selector switch to Base controls.
3. Plug **EZ-Cal** into connector P9 on GP400 Control Module.
  - Display reads HELP: PRESS ENTER
4. Press right arrow to ACCESS LEVEL 3. Press Enter.
  - Display reads CODE 0000
5. Press Up and Right Arrow to enter code 1775. Press Enter.
  - Display reads ACCESS LEVEL 2.
6. Press Right Arrow to SETUPS. Press Enter.
  - Display reads CHANGE DEFAULTS
7. Press Right Arrow to HEIGHT SETUPS. Press Enter.
  - Display reads CALIBRATE HEIGHT
8. Press Enter.
  - Display reads PLATFORM DOWN?
9. Verify that platform is fully lowered. Press Enter.
  - Display reads PLEASE LIFT.
10. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
  - Display reads PLEASE LOWER.
11. Hold switch in down position until platform is in the fully lowered position. Release switch.
  - Display reads FINISHED.

## **CALIBRATION PROBLEMS**

### **FAILURE MESSAGES**

Various problems can be detected by the EZ-Cal that prevent successful calibration. These problems are reported with a flashing message including an “F” code. The following descriptions are helpful in solving the problem. References in parentheses refer to electrical schematic points.

#### **F01:CHECK HWFS**

This message is given if the startup tests have not completed.

Check HELP message for more information.

#### **F02:NOT GROUND MODE**

This message is given if the base/platform selector switch is not in ground mode (P7-2 must be high). Calibration can only be carried out in ground mode.

#### **F03:NOT STOPPED**

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

#### **F04:TILTED**

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

#### **F05:BAD HEIGHT**

This message is given if the height sensor output (P8-2 and P8-6) is out of range at the start of calibration. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

#### **F06:CHECK ELEV**

This message is given if the elevation switch (P7-5) is open at the start of calibration, when the operator has confirmed the “PLATFORM DOWN?” question.

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

#### **F08:CHECK ELEV**

This message is given if the elevation switch (P7-5) is closed at the end of the DYNAMIC lift, when the platform should be fully raised.

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

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

#### **F09:BAD HEIGHT**

This message is given if the height sensor output (P8-2 and P8-6) is out of range at the start of the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. This is usually due to a wiring problem.

#### **F10:BAD HEIGHT**

This message is given if the height sensor output (P8-2 and P8-6) is out of range at the end of the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

#### **F11:NOT UP**

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

**F12:TOO MANY**

This message occurs if the DYNAMIC lift takes too long.

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

**F13:LOW HEIGHT RANGE**

This message occurs at the end of the DYNAMIC lift if the height sensor output did not change sufficiently to give a reasonably accurate platform height estimate. DIAGNOSTICS / ANALOGS can be used to check the height sensor output (P8-2 and P8-6) when the platform is fully lowered and fully raised; a difference of at least 1V is to be expected.

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

**F14:BAD HEIGHT**

This message occurs if the height sensor output (P8-2 and P8-6) is out of range during the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

**F15:CHECK ELEV**

This message is given if the elevation switch (P7-5) is open when the platform has been fully lowered after the DYNAMIC lift.

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

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

**F16:LOW ELEV.OPEN**

This message is given if the elevation switch (P7-5) opened during lift at too low of a height (below 5%). Check CALIBRATIONS / HEIGHT CALS. The "ElevUp" value shows the recorded height where the switch opened.

**F17:HIGH ELEV.OPEN**

This message is given if the elevation switch (P7-5) opened during lift at a too high height (above 25%).

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

**F18:LOW ELEV.CLOSE**

This message is given if the elevation switch (P7-5) closed during lower at a too low height (below 5%).

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

**F19:HIGH ELEV.CLOSE**

This message is given if the elevation switch (P7-5) closed during lower at a too high height (above 25%).

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

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

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

Check DIAGNOSTICS / SYSTEM to check the height.

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

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

**F24:TOO MANY**

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

**F25:CHECK ELEV****F26:CHECK ELEV**

This message indicates a problem with the elevation switch (P7-5) during the STATIC phases.

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

**F27:BAD HEIGHT**

This message indicates a problem with the height sensor output (P8-2 and P8-6) during the STATIC calibration phases.

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

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

**F30:BAD HEIGHTS**

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

This problem may be caused by repeatedly opening and closing the UP or DOWN switch during the STATIC phases.

**F31:REJECT CURVE**

The DYNAMIC pressure curve is unacceptable.

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

Check for proper weight in the platform and check pressure sensor and lift cylinder hydraulics.

**F32:REJECT CURVE**

The DYNAMIC pressure curve is unacceptable.

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

Check for proper weight in the platform and check pressure sensor and lift cylinder hydraulics.

**F33:REJECT CURVE**

The DYNAMIC pressure curve is unacceptable.

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

Check for proper weight in the platform and check pressure sensor and lift cylinder hydraulics.

**F34:REJECT CURVE**

The DYNAMIC pressure curve is unacceptable.





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

Check for proper weight in the platform and check pressure sensor and lift cylinder hydraulics.

#### **F40:REJECT DELTA**

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

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

This message could also occur if the wrong pressure sensor was fitted (e.g.: a 5000psi sensor when a 3000psi one is needed).

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

#### **F42:LOW PRESSURE**

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

#### **F43:HIGH PRESSURE**

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

#### **F44:LOW PRESSURE**

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

#### **F45:HIGH PRESSURE**

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

#### **F46:CHECK ELEV**

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

#### **F47:CHECK ELEV**

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



**F48:BAD PRESSURE**

This message is given if the pressure sensor output (P8-2 and P8-6) is out of range at the start of calibration.

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

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

**F52:NOT CALIBRATED**

This message is a catch-all code which indicates an improper calibration sequence or that one of the phases of calibration was not completed. The skipped phase must be completed or the calibration sequence must be passed through in proper sequence before this message will clear. Re-start the calibration sequence and proceed through each sequence in the specified order.

A "Redo" prompt will appear before each sequence. Answer "NO" if there is no reason to repeat or "YES" if the phase must be completed.

## **INFORMATION MESSAGES**

During calibration the following messages will be displayed. They are informational prompts only and do not indicate a failure.

### **BUILDING TABLES**

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

### **CALDATE:**

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

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

Press LEFT & RIGHT to select the flashing digits.

Press UP & DOWN to change the flashing digits.

Press ENTER when the entry is complete.

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

### **FINISHED**

This message confirms that calibration is complete and successful.

### **GO DOWN MORE!**

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

### **GO UP MORE!**

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

### **LIFT EMPTY**

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

### **LIFT LOADED**

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

### **LIFTING**

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

### **LOWER EMPTY**

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

### **LOWER LOADED**

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

### **LOWERING**

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

### **MEASURING #**

This message is displayed when the platform is stopped during either STATIC phase, when the GP400 takes a measurement.

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

**MUST GO DOWN!**

This message occurs if the wrong switch is operated when the GP400 is waiting for the platform to be lowered.

**MUST GO UP!**

This message occurs if the wrong switch is operated when the GP400 is waiting for the platform to be raised.

**PLATFORM DOWN?**

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

Press ENTER to confirm when the platform is fully lowered.

**PLATFORM EMPTY?**

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

Press ENTER to confirm when the platform is empty.

**PLATFORM LOADED?**

This message is prompting for confirmation that the platform is loaded to rated load: 1500 lbs (US/CSA), 680 Kgs (CE/AU). (100% of the load rating listed on the serial plate).

Press ENTER to confirm when the platform is loaded.

**PLEASE LIFT ...**

This message is prompting for the platform to be raised.

The UP switch should be operated.

**PLEASE LOWER ...**

This message is prompting for the platform to be lowered.

The DOWN switch should be operated.

**PLEASE WAIT**

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

**REDO DYNAMIC:**

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

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

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

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

**REDO EMPTY:**

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

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

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

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

**REDO LOADED:**

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

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

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

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

**TOTAL DATA:**

This message is displayed at the end of each phase, to confirm the number of measurements recorded by the GP400. No operator input is required during this process.



## Section 3

# MECHANICAL COMPONENTS

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## BASE



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

Steam clean the base as necessary, and inspect all welds and brackets. Check for cylinder pins that have turned in their mounting, which may indicate sheared retaining pins.

## TIRES AND WHEELS

Inspect for cuts, chunking, side-wall damage, or abnormal wear. **ANY TIRE FAULTS MUST BE CORRECTED** before further machine operation. Refer to Parts sections for replacement tires.



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

**REPLACE TIRES WITH THE CORRECT TIRES TO MAINTAIN THE RATING OF THE EQUIPMENT.**

**IF FOAM FILLED TIRES WERE FITTED AS ORIGINAL EQUIPMENT THEY MUST BE REPLACED WITH EQUIVALENT SPECIFICATION TIRES AND FOAM-FILL WEIGHT.**

### CHANGING TIRES

Refer to “*Lift and Support The Machine*” in the Introduction Section of this manual for instructions and safety precautions.



**Always block the wheels before lifting the machine.**

1. Chock tires on the end of machine opposite the tire to be changed.
2. Break loose but **do not remove** lug nuts before raising the machine.
3. Lift the end of machine requiring a tire change and support with jackstands of adequate capacity.
4. Remove lug nuts and pull the wheel off.
5. Install the replacement wheel.
6. Install lug nuts and tighten.
7. Lower the machine.
8. Tighten lug nuts to proper torque (Refer to machine specifications).
9. Remove the chocks.

# 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 closely for rubbing and chafing.

Check all ties and clamps that keep hoses secure.

Check for leaks at fittings.

Replace any damaged hose or cable.

## **WHEN DISASSEMBLING ANY HYDRAULIC COMPONENT:**

1. Clean the area of dirt and grease.
2. Tag hoses for proper reassembly.
3. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
4. Torque hose fittings according to the Hydraulic Torque Specification Table. See the Introduction Section of this manual.



# PLATFORM

**NOTE:** Refer to Parts Section B for detailed parts list and illustration.

## REMOVAL

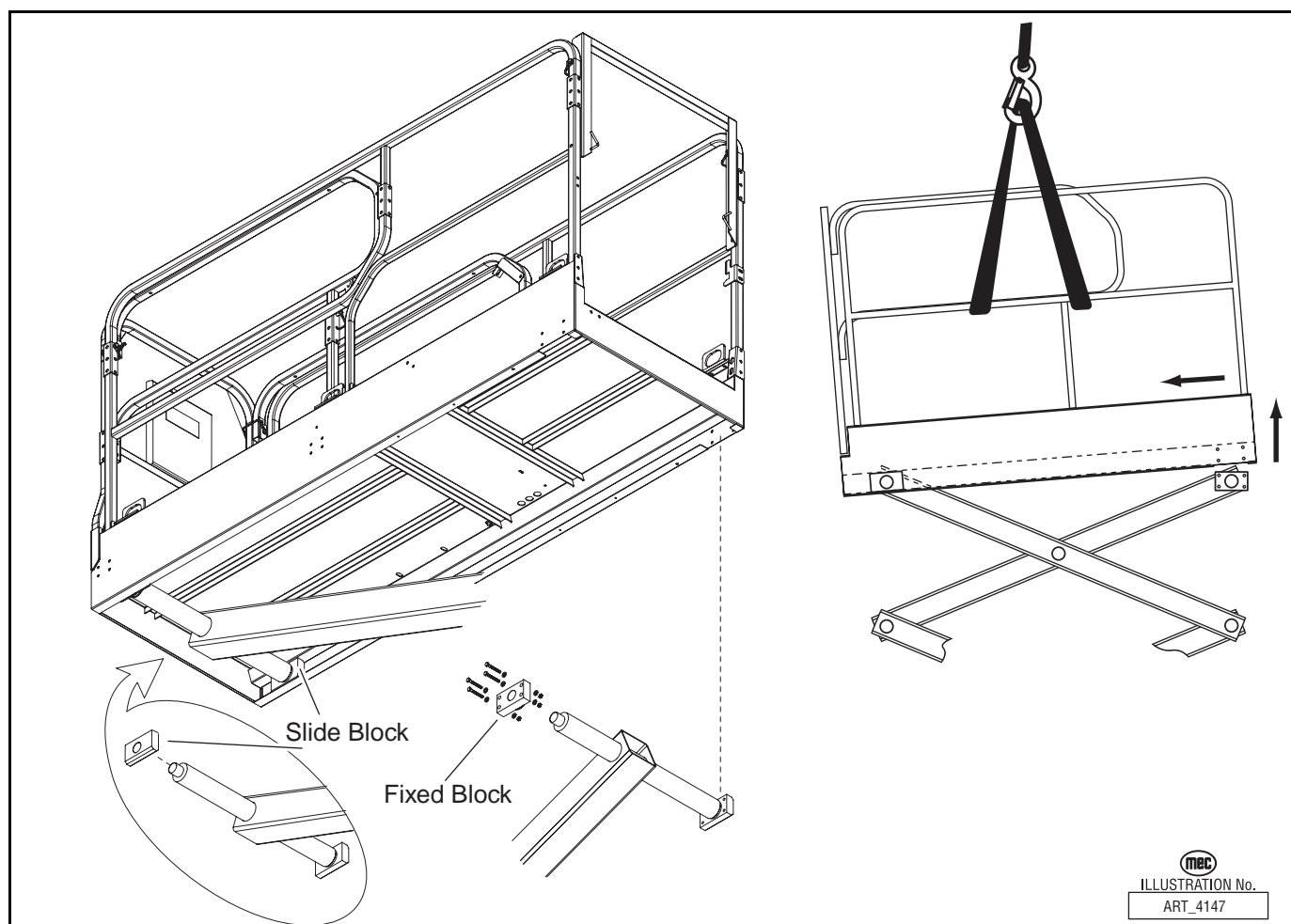
1. Raise the platform and support it with the maintenance lock (see the Introduction Section of this manual).
2. Connect an overhead crane to platform using appropriate slings. Apply slight lifting pressure.
3. Tag and disconnect all platform wires.
4. Remove any components that will obstruct the scissor slide path.
5. Remove the bolts from both fixed blocks at the rear of the platform.
6. Lift the rear of the platform until the fixed blocks are clear.
7. Slide the platform assembly forward until the slide blocks align with the slide track opening at the rear of the platform.
8. Remove the platform assembly.

## Installation

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.

**Figure 3-1:** Platform Removal



# SCISSOR STACK

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



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

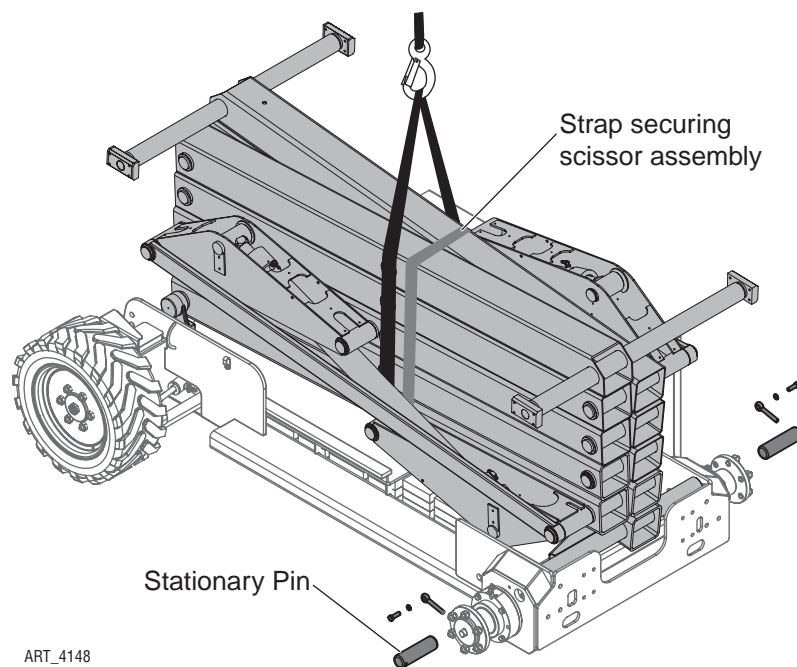
Clean the beams once a year or more often if necessary and inspect the beams' surfaces, especially welds and brackets.

Refer to "Lift and Support The Machine" in the *Introduction* section for instructions and safety precautions.

## REMOVAL

1. Remove the platform and ladder. Lower the scissor stack.
2. Raise and support the rear end of the machine. Remove the rear wheels.
3. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
4. Tag and disconnect all cables.
5. Immobilize the scissor assembly by wrapping a strap tightly around it.
6. Attach a suitable lifting device to the scissor assembly. Apply slight lifting pressure.
7. Remove the stationary pins at the rear end of the machine.

**Figure 3-2:** Scissor Assembly Removal

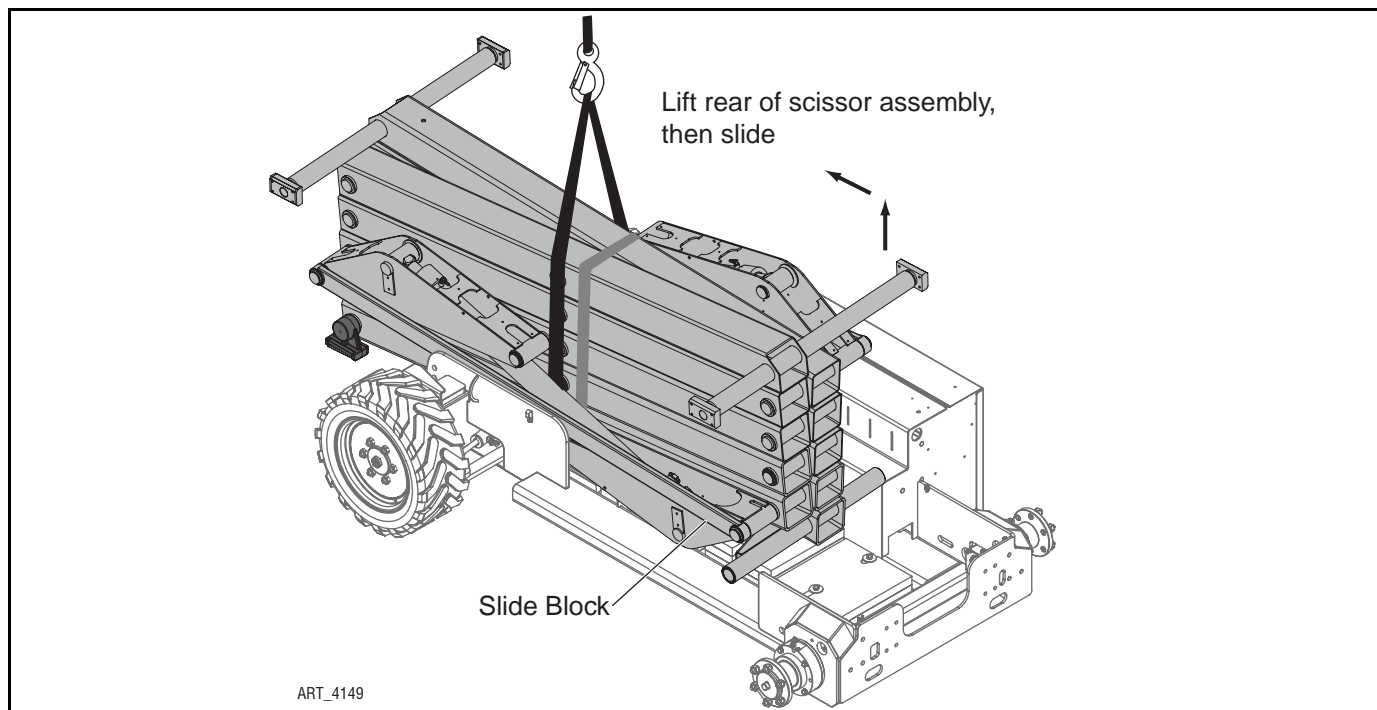


8. Carefully lift until the rear of the scissor is clear.
9. Slide the scissor assembly toward the front until the slide blocks reach the end of slide channel, then lift the scissor assembly.



**THE SCISSOR ASSEMBLY MAY SHIFT SUDDENLY UPON CLEARING THE SLIDE CHANNEL.**

*Figure 3-3: Scissor Assembly Removal, continued*



### Installation

Clean all parts before installation. Replace worn or damaged parts with new parts. Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.

# LIFT CYLINDER(S)

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



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

The 2659 has a single lift cylinder, while the 3259 has two.

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, wires and cables from the lift cylinders.
4. Wrap a lift sling of adequate capacity completely around the barrel of the lift cylinder. Use a suitable lifting device to support the lift cylinder.



**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 nylon washers.
6. Remove the lower retaining plate.
7. While supporting the cylinder, carefully remove the cylinder mount pin and two nylon washers.



**THE CYLINDER MAY SHIFT SUDDENLY WHEN THE PIN IS REMOVED.**

8. Lift the cylinder from the scissor assembly.

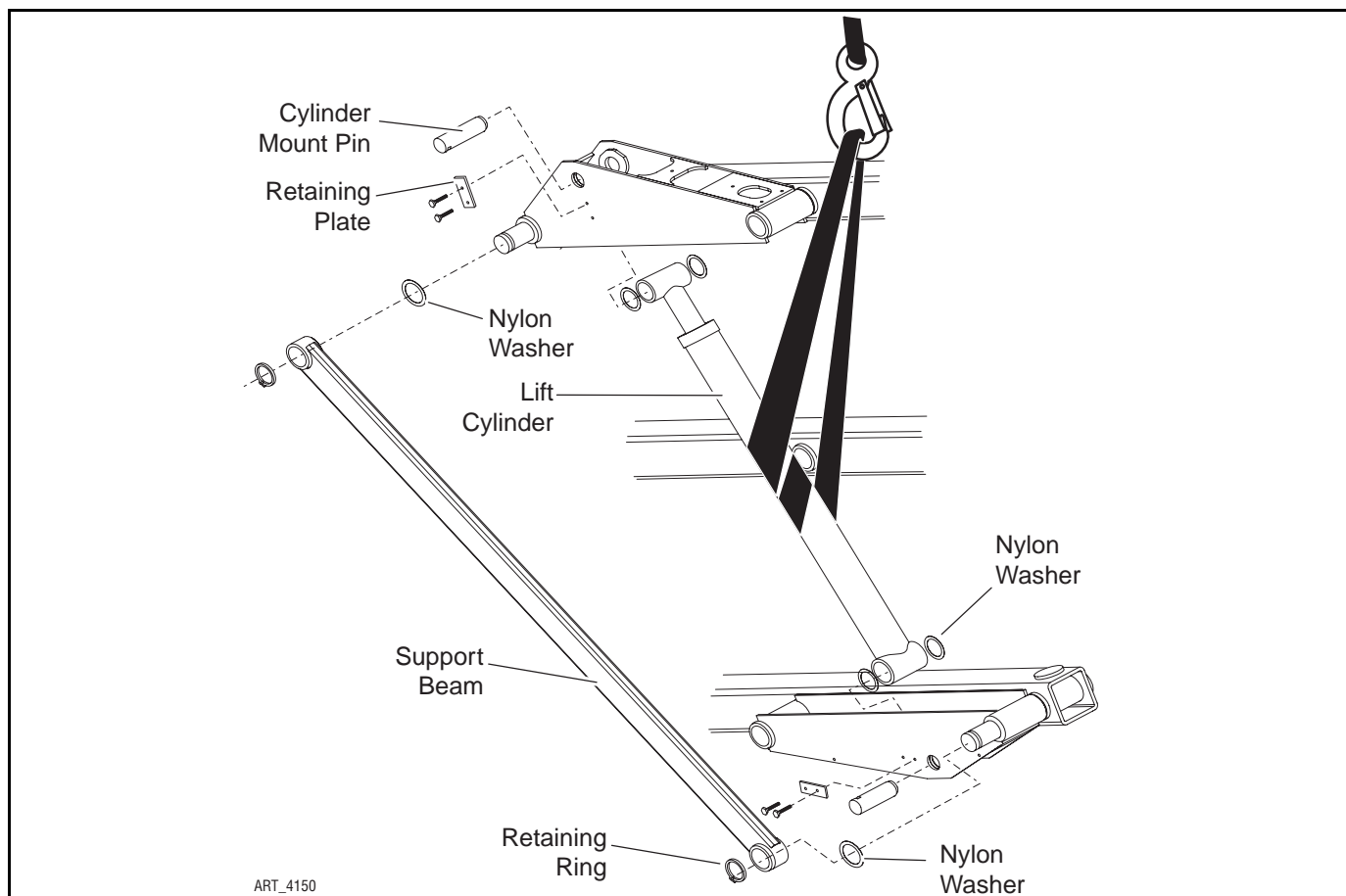
### Installation

Clean all parts before installation. Replace worn or damaged parts with new parts.

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.

**Figure 3-4:** Lift Cylinder



# STEER CYLINDERS

**NOTE:** Refer to Section 1 for seal replacement instructions.  
Refer to Parts Section D and E for detailed parts list and illustration.

There are two double-acting steer cylinders on this machine. During operation, cylinder(s) should not leak, but a slight damping at the rod seal is acceptable. The pins and rod-end joints should be checked for wear.



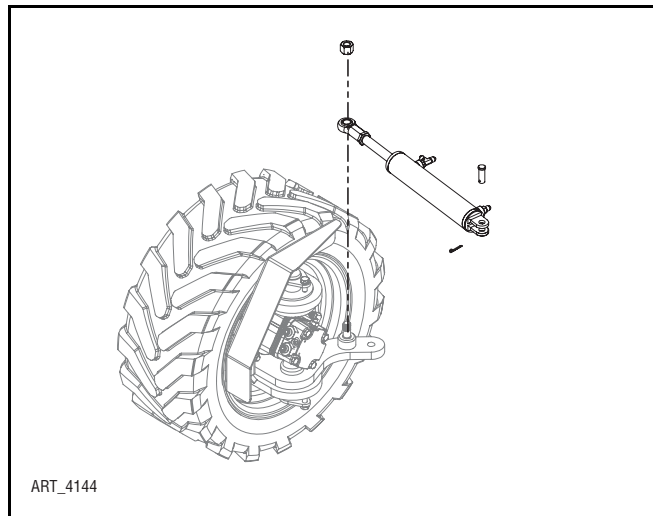
- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings to prevent contamination.

Refer to “Lift and Support The Machine” in the *Introduction* section for instructions and safety precautions.

## Removal

1. Raise and support the machine.
2. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
3. Remove the nut that secures the rod end of the cylinder to the motor assembly.
4. Remove the cotter pin from the pin that secure the barrel end of the cylinder to the chassis.
5. Support the cylinder, then remove the pin. Remove the cylinder.

**Figure 3-5:** Steer Cylinder



## Installation

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.
- To purge air from cylinder, cycle the steering system fully left and right 4-5 times.

# DRIVE MOTORS

**NOTE:** Refer to Section 1 for seal replacement instructions.

Refer to Parts Section D and E for detailed parts list and illustration.

There are four hydraulic drive motors on this machine. Repair or replace as necessary when damage or leaks occur.



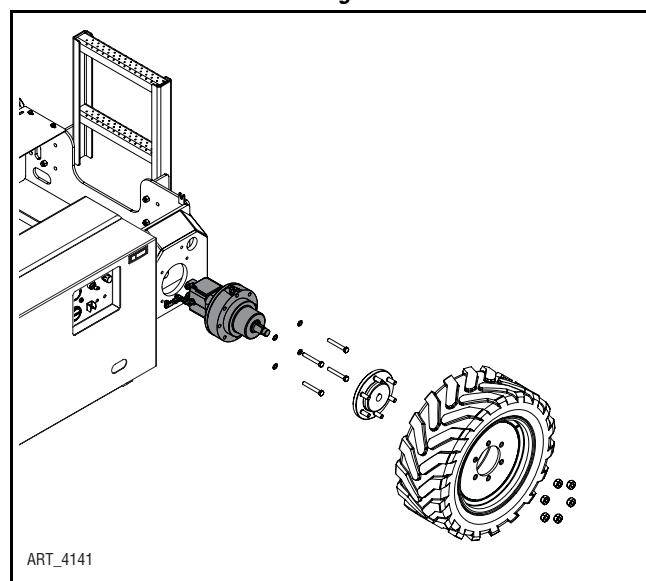
- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings immediately to prevent contamination.

Refer to “Lift and Support The Machine” in the *Introduction* section for instructions and safety precautions.

## REAR DRIVE MOTORS

### Removal

1. Raise and support the rear end of machine.
2. Remove the wheel and tire assembly.
3. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
4. Remove the hub:
  - Remove the cotter pin from the castle nut.
  - Remove the castle nut.
  - Use a suitable hub pulling tool. DO NOT use a hammer on the shaft or hub as this will damage the motor.
  - Remove the shaft key.
5. Remove the four bolts that attach the motor to the chassis.



**Figure 3-6:** Rear Drive Motor

### Installation

Installation is reverse of removal.

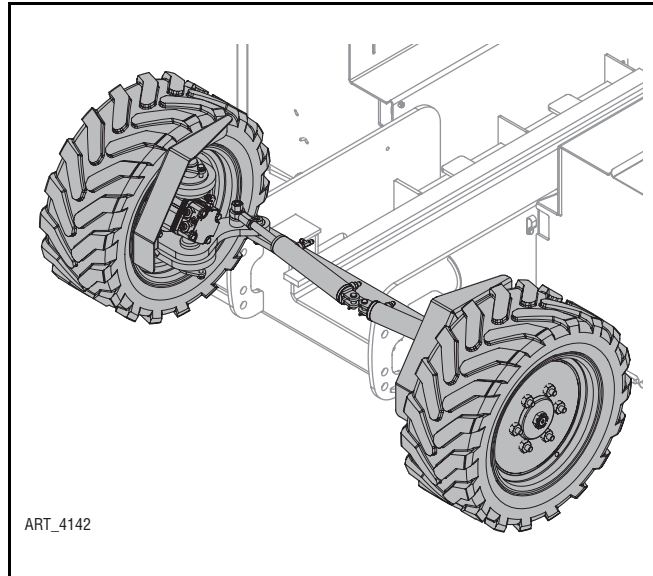
- Use Loctite 242 or equivalent on mounting bolts.
- Torque the castle nuts on the motor spindle to 200 lb/ft (270 Nm). Secure with cotter pin.
- Torque all other bolts to specifications listed in the Introduction Section of this manual.

## FRONT DRIVE MOTORS

### Removal

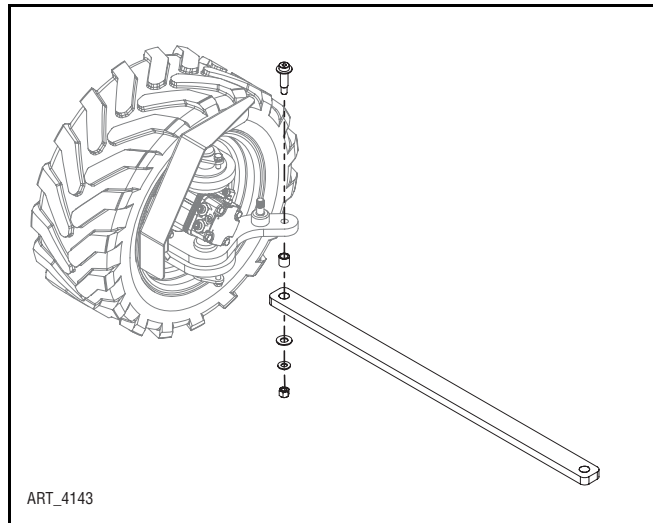
1. Removal of the front wheel motors requires the removal of steering components and the front motor assemblies.
2. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.

**Figure 3-7:** Front Drive Motor



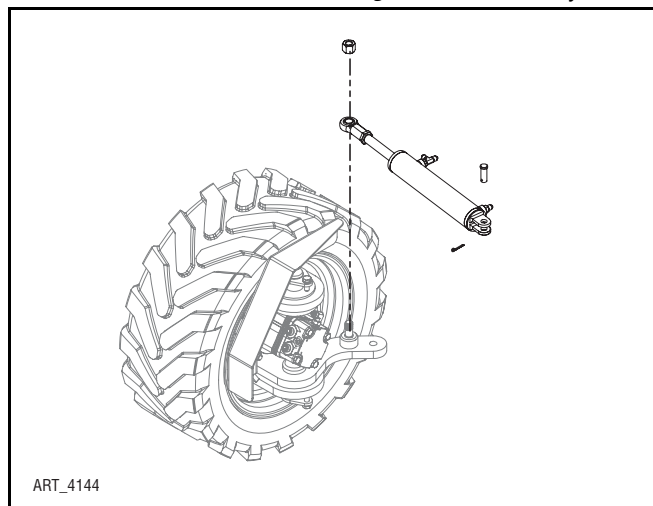
**Figure 3-8:** Tie Bar Removal

3. Remove steering tie bar:
  - Note the orientation of the washers for reassembly.
  - Check the condition of the tie bar bushing before reassembly.



**Figure 3-9:** Steer Cylinder

4. Remove the Steer Cylinder





5. Remove the wheel and tire assembly.

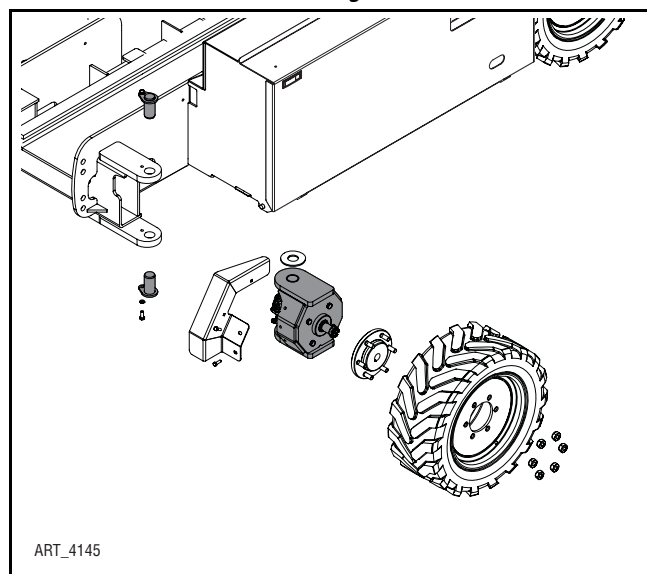
6. Remove the hub:

- Remove the cotter pin from the castle nut.
- Remove the castle nut.
- Use a suitable hub pulling tool. DO NOT use a hammer on the shaft or hub as this will damage the motor.
- Remove the shaft key.

7. Remove the motor assembly:

- Support the motor assembly.
- Remove the lower king pin.
- Remove the upper king pin.
- Using a thin screwdriver, slide the thrust washer out from between the motor assembly and the upper frame member.

**Figure 3-10: Motor Removal**



**DO NOT PLACE YOUR FINGERS BETWEEN THE MOTOR ASSEMBLY AND THE FRAME.**

- Carefully remove the motor assembly.

**Figure 3-11: Hub Removal**

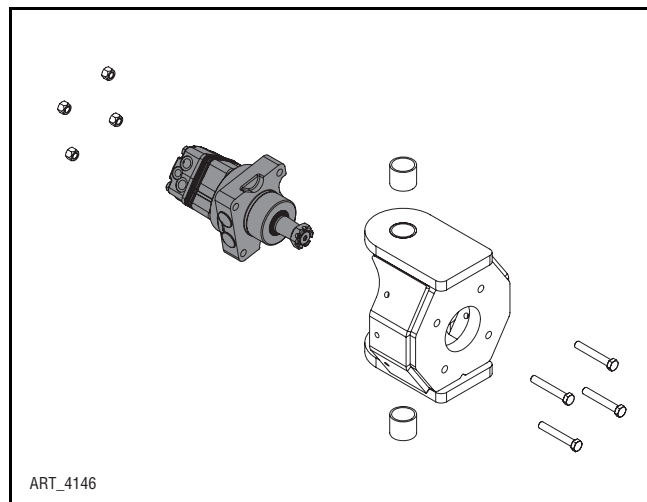
8. Remove the bolts, then remove the drive motor from the motor weldment.

9. Remove and replace the king pin bearings if necessary.

### Installation

Installation is reverse of removal.

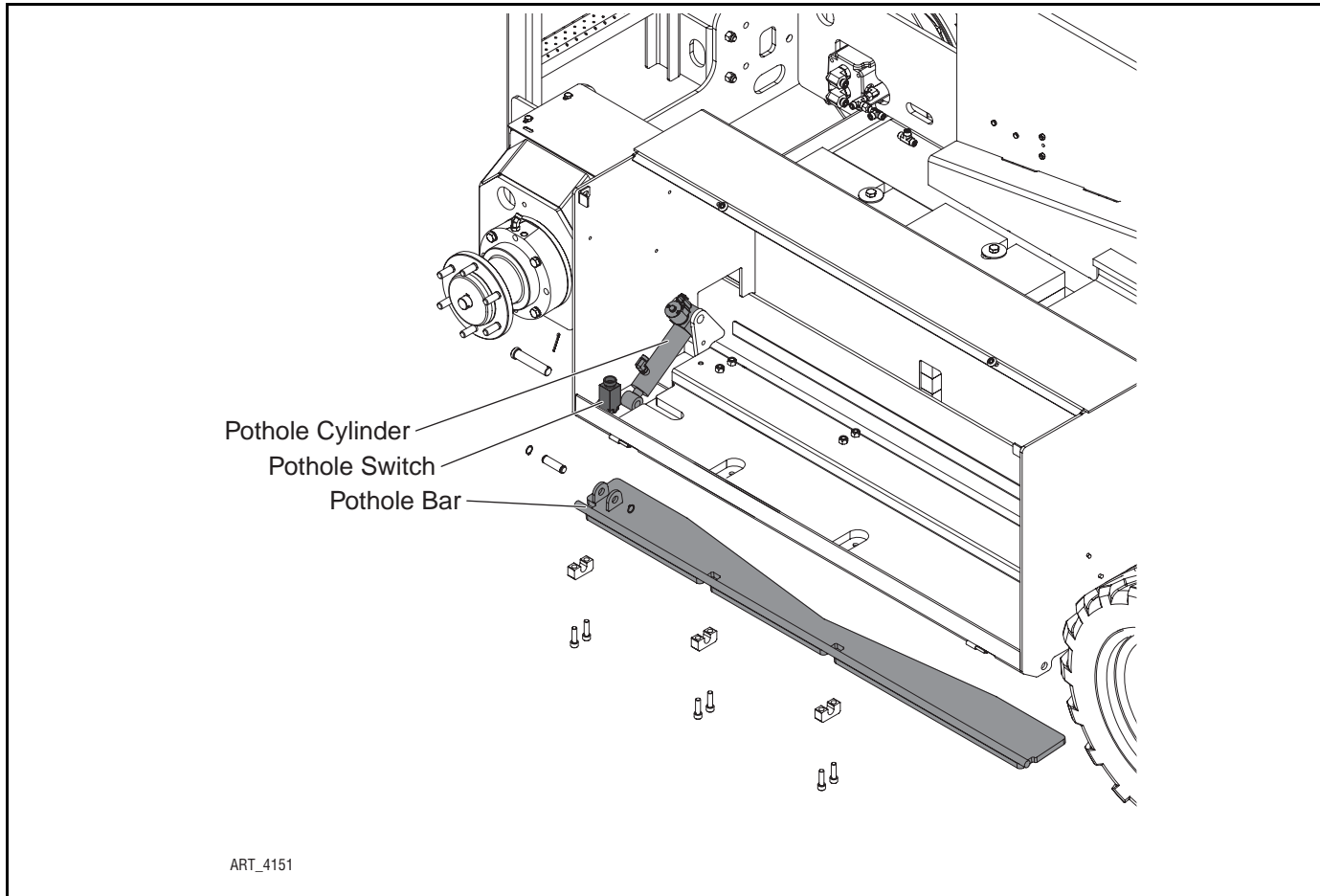
- Use Loctite 242 or equivalent on mounting bolts.
- Torque the castle nuts on the motor spindle to 200 lb/ft (270 Nm). Secure with cotter pin.
- Torque all other bolts to specifications listed in the Introduction Section of this manual.



# POTHOLE SYSTEM COMPONENTS

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

**Figure 3-12:** Pothole System Components



Two Pothole Cylinders extend Pothole Bars on each side of the machine when the platform is elevated beyond 20 ft. (6 m) for the 2659, and 26 ft. (7.9 m) for the 3259. Two Pothole Switches close when the Pothole Bars are fully deployed and send confirmation to the control system.

## POTHOLE CYLINDERS



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

### REMOVAL

1. Park the machine on a level work surface.
2. Raise and support the rear end of the machine. Remove the rear wheels.
3. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.

4. Tag and disconnect all cables.
5. Remove the lower pin that connects the Pothole Cylinder to the Pothole Bar.
6. Remove the upper pin that connects the Pothole Cylinder to the machine base.  
Remove the Pothole Cylinder.

Clean all parts before installation. Replace worn or damaged parts with new parts.

### **INSTALLATION**

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.

## **POTHOLE BARS**

Replace bent or damaged Pothole Bars.

### **REMOVAL**

1. Park the machine on a level work surface.
2. Raise and support the rear end of the machine. Remove the rear wheels.
3. Remove the lower pin that connects the Pothole Cylinder to the Pothole Bar.
4. Remove the three caps that secure the Pothole Bar to the machine base.

### **INSTALLATION**

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.

## **POTHOLE SWITCHES**

The Pothole Switches must be properly adjusted to ensure proper machine function. See Section 2 of this manual for the Pothole Switch Adjustment Procedure.

### **REMOVAL**

1. Ensure that the key switch on the base controls is turned to OFF.
2. Remove the two screws that secure the Pothole Switch to its mounting bracket.
3. Remove the cover from the Pothole Switch and disconnect the wiring harness leads from the switch terminals.

### **INSTALLATION**

Installation is reverse of removal.



**See Section 2 of this manual for the Pothole Switch Adjustment Procedure.**

# OUTRIGGER CYLINDERS

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



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

On machines equipped with outriggers, the outriggers are a one-touch activation system. To deploy the outriggers, push the outrigger toggle switch down until the outriggers level the unit and stop automatically. The platform is now ready to lift. The outrigger controls will level the unit in all but extreme terrain.

- To deploy the outriggers, push the Outrigger Switch down and hold until the electric motor stops. The unit will self-level.
- The outrigger legs cannot be operated individually.
- The outriggers system will not operate when the platform is elevated above approximately 10 feet (3 m).
- Travel is locked out when the outriggers are deployed. The Drive Indicator Light, above the outrigger switch, illuminates when the outriggers are fully retracted and drive is enabled.
- If the slope of the terrain is in excess of the outrigger's leveling capabilities, the outrigger control system will continue to attempt to level and the electric motor will not turn off. In this case, if the platform remains outside of the pre-described tilt sensor parameters, the unit will not elevate above 6 feet (2 m) and the alarm will sound, indicating the out-of-level situation.
- The outrigger system uses a pressure switch on each leg to monitor their load.
- Each outrigger leg uses a retract valve and an extend valve to control cylinder stroke. These are located under the protective cover on top of the outrigger leg.
- On later machines, a valve on the Functions Manifold controls the direction of fluid flow to the outrigger legs. On early machines, a separate Outrigger Valve controls the outriggers. See Section 1 and Parts Section E of this manual for more information and configuration.
- The GP400 Control Module controls all outrigger valve and interlock duties as well as level sensing.

**Figure 3-13:** Outrigger Components**REMOVAL**

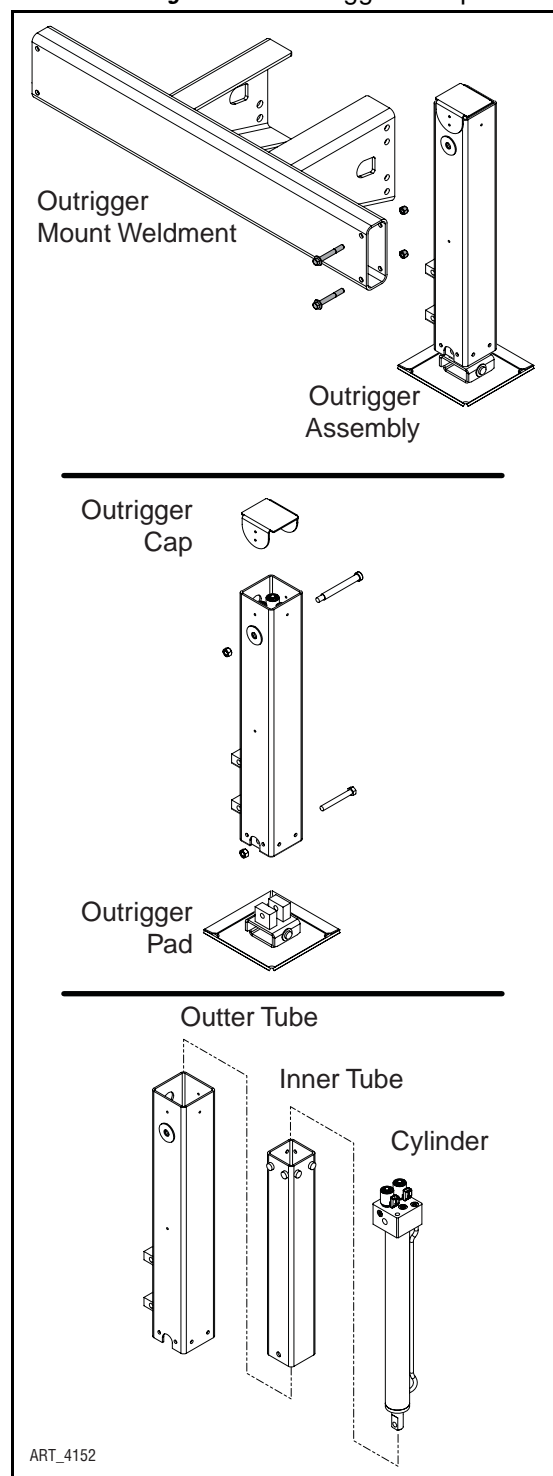
1. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
2. Tag and disconnect all cables.
3. Support the Outrigger Assembly with blocks, then remove the two bolts that secure the Outrigger Assembly to the Outrigger Mount Weldment. Remove the Outrigger Assembly.
4. Remove the Outrigger Cap and Outrigger Pad.
5. Remove the bolt that secures the top of the Outrigger Cylinder to the Outer Tube, then remove the Outrigger Cylinder.
6. Remove the Inner Tube from the Outer Tube.

**Installation**

Clean all parts before installation. Replace worn or damaged parts with new parts.

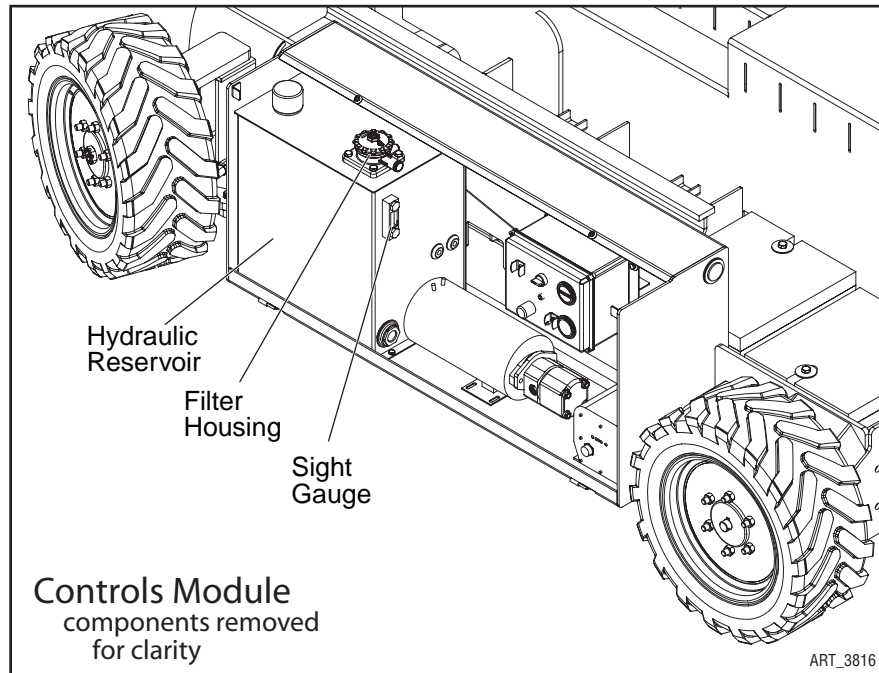
Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to specifications listed in the Introduction Section of this manual.



# LUBRICATION

**Figure 3-14:** Lubrication Points



## Lubrication

| No. | ITEM                | SPECIFICATION  | FREQUENCY   |
|-----|---------------------|--|---|
| 1   | Hydraulic Reservoir | <p><b>Normal ambient temperatures</b><br/>Mobile Fluid DTE 10, DTE 13 M, or AW32<br/><b>Ambient temperatures below 0° F (-18° C)</b><br/>Chevron Rando Premium MV</p> <p><b>Do not substitute other fluids<br/>as pump damage may result.</b><br/>Fill to the middle of the sight gauge with platform in the<br/>stowed position and outriggers retracted.</p> | <p><b>Routine Maintenance</b><br/>Check sight gauge level daily</p> <p><b>Scheduled Maintenance</b><br/>Change yearly or every 600 hours,<br/>whichever occurs first</p>  |
| 2   | Hydraulic Filter    | <p>Filter Element<br/>(located inside Hydraulic Reservoir)</p>   | <p><b>Scheduled Maintenance</b></p> <p><b>Normal Conditions</b><br/>Change every six months or 300 hours, whichever<br/>occurs first</p> <p><b>Severe Conditions--very dusty, exceptionally hot<br/>or exceptionally cold conditions</b><br/>Change every three months or 150 hours,<br/>whichever occurs first</p> |



## Section 4

# TROUBLESHOOTING

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## GENERAL TROUBLESHOOTING TIPS

### HYDRAULIC FLUID PUMP

This machine operates on a "Motor Control" theory in which fluid flow volume is controlled by varying the speed of the DC electric motor driving a tandem fixed displacement pump. 100% of the fluid produced by the pump goes to the selected function.

### BATTERY CHARGE STATE

Before you begin troubleshooting this machine, check the battery state of charge and inspect the battery connections for looseness or corrosion.

- A fully charged battery pack on later 48 Volt DC machines will have a nominal voltage of 52.5–54 Volts DC.
- A fully charged battery pack on early 36 Volt DC machines will have a nominal voltage of 38–42 Volts DC.

#### ***Common Causes of Electrical System Malfunctions:***

- Battery connections are loose or corroded
- Battery is not fully charged.
- Emergency Stop buttons are pushed (OFF position).
- Circuit breaker is in the tripped (OFF position).

#### ***Common Causes of Hydraulic System Malfunctions:***

- Hydraulic fluid level is too low.
- Mixed incompatible hydraulic fluids, destroying the additives and causing varnish build-up and sticking valves.
- Water in the hydraulic fluid due to damp climate.
- Improper hydraulic fluid. Viscosity too high in cold climates. Viscosity too low in warm climates.
- Hydraulic fluid contaminated with debris--filter change interval neglected, or debris introduced into the hydraulic system.



**In machines equipped with the optional cold climate package, MEC uses a multiple viscosity fluid that is light enough for cold climates and resists thinning in warm climates. Use only the recommended hydraulic fluid. Substituting with a lower grade fluid will result in pump failure. Refer to Section 1 of this manual.**

**Contamination always causes failure in any hydraulic system. It is very important to be careful not to introduce any contamination into hydraulic system during the assembly procedures. Please make sure all ports and cavities of the manifold and cylinders are properly capped or plugged during maintenance activities.**

## ELECTRICAL SYSTEM TROUBLESHOOTING

The electronic control system used on this machine is designed for low maintenance and long trouble-free operation. The system consists of two microprocessor modules: the Matrix Module and the GP400 Processor. They communicate through a low voltage digital signal called Can-Bus communication.

To protect against part failure or incorrect plug connections, the modules are fully protected against short circuit and reverse polarity. All electrical plug connections are waterproof to promote longer trouble free operation and to increase terminal life.



**NEVER ATTEMPT TO SUPPLY BATTERY POWER, OR VOLTAGE HIGHER THAN 12 VOLTS TO ANY PART OR MODULE IN THIS SYSTEM, AS CATASTROPHIC FAILURE OF THE MODULES MAY RESULT.**

**USE OF HIGH PRESSURE WASHING EQUIPMENT DIRECTLY ON THE MODULES CAN FORCE WATER INTO SEALED CONNECTION AND CAN CAUSE A TEMPORARY SYSTEM SHUT-DOWN. HIGH PRESSURE WASHING IN THE VICINITY OF THE MODULES IS DISCOURAGED.**

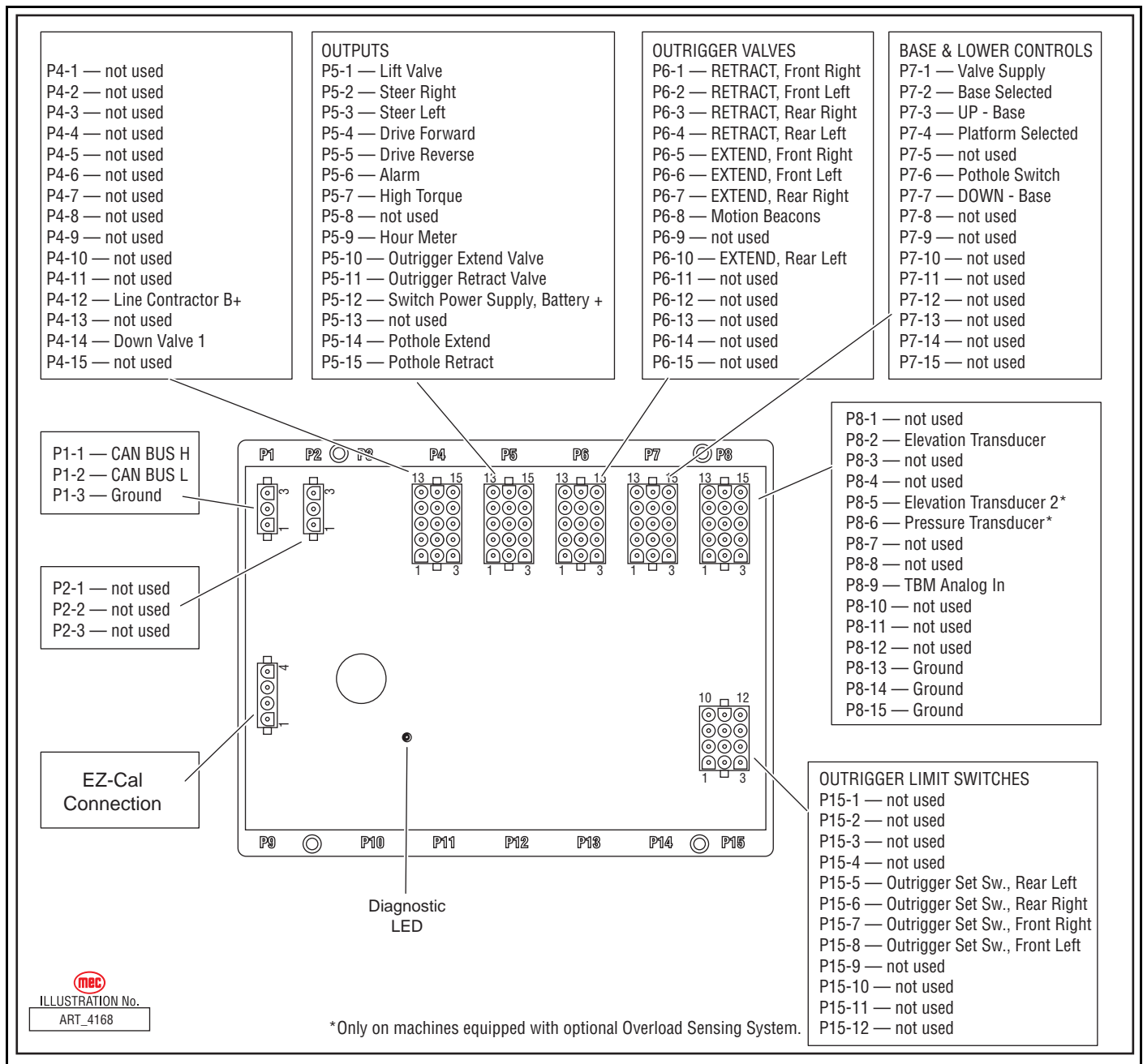
## GP400 MODULE

The GP400 module is “the brains” of the system. It receives and processes a variety of inputs both from the machine and the operator, then controls all the operative functions of the machine. It also has a feature that allows the technician to access and monitor all functionality of the system, along with a technician-friendly series of fault messages that can be accessed through the use of the EZ-Cal scan tool. Flash codes are also provided by the Diagnostic LED in case an EZ-Cal scan tool is not available.

Such information can be used for preventative maintenance and troubleshooting should a problem arise. A comprehensive list of EZ-Cal accessible information can be found later in this section.

The GP400 operates on 12 volts DC and should never be probed or operated with voltage higher than 14 volts DC

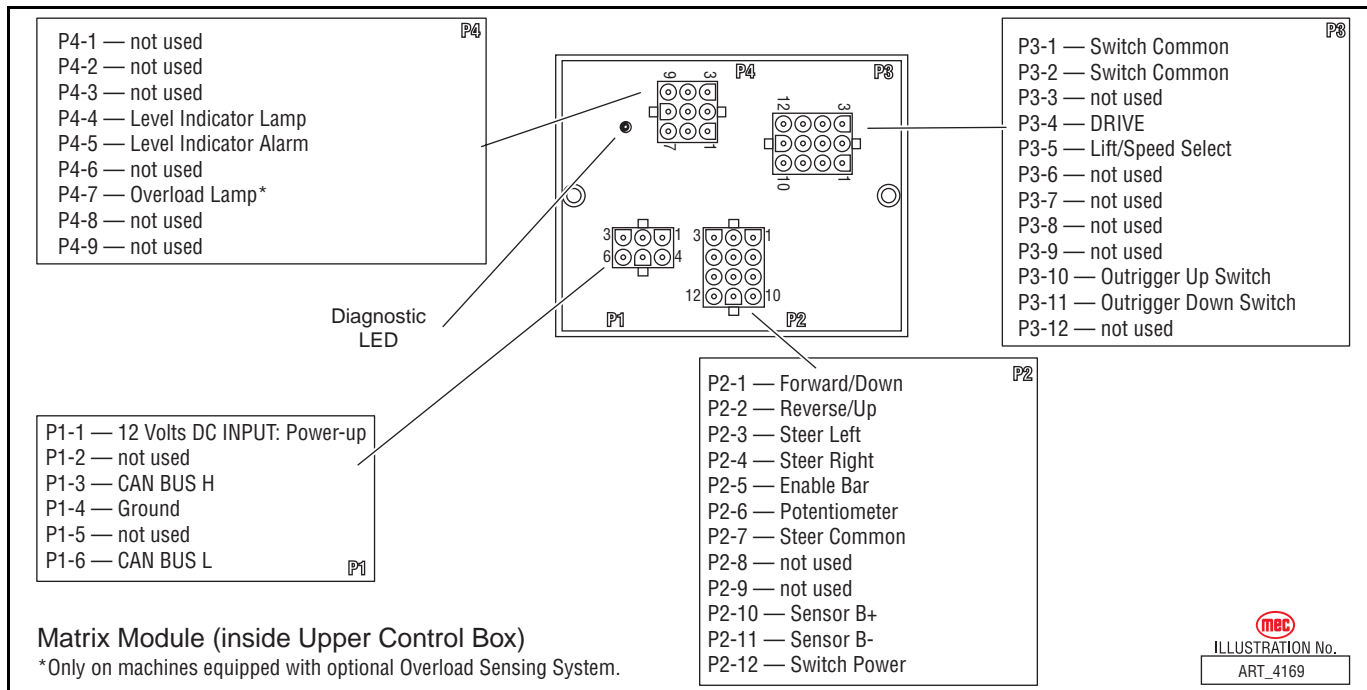
**Figure 4-1:** GP400 Module



## MATRIX MODULE

The Matrix Module is the remote module located inside the upper control box. It received inputs from the operator and relays them to the GP400.

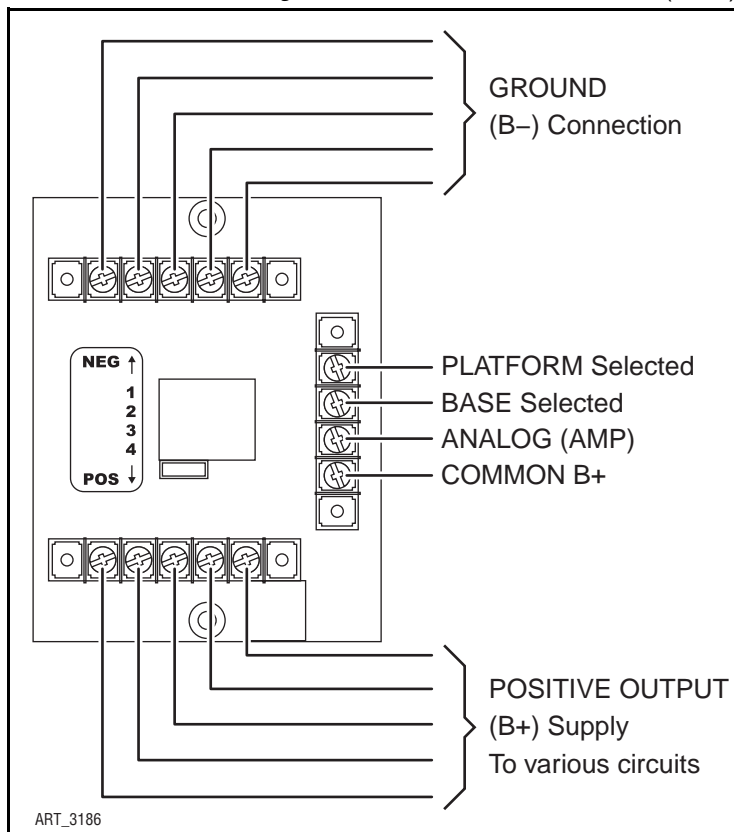
Figure 4-2: Matrix Module



## TERMINAL BLOCK MODULE (TBM)

Figure 4-3: Terminal Block Module (TBM)

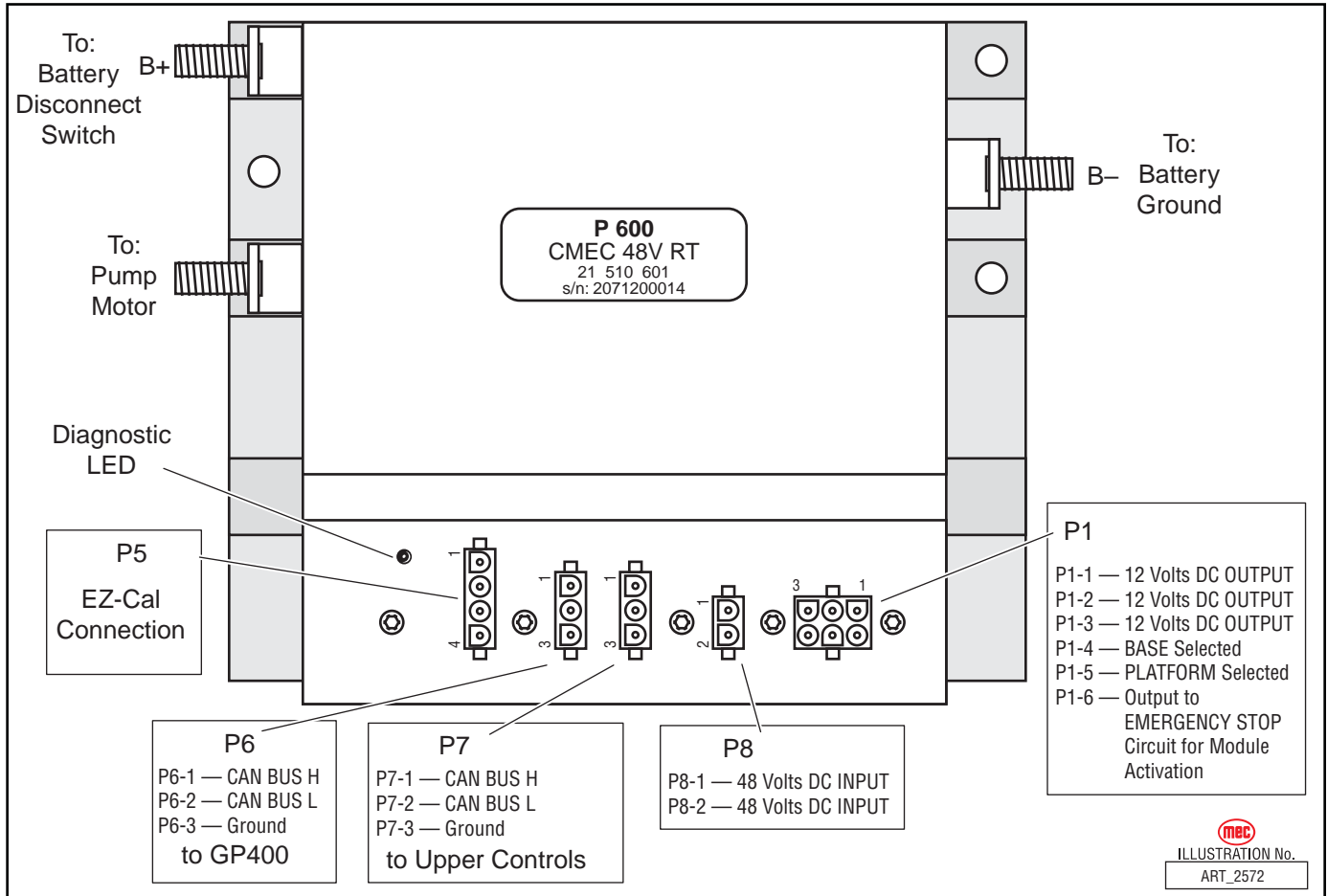
The Terminal Block Module (TBM) is a module located inside the lower control box that provides terminal point connections for both positive and ground circuits. A signal from the Emergency Stop circuit activates a load-reduction relay within the TBM that provides power to the B+ (positive) terminal strip. This arrangement protects the system against voltage drop conditions that can be detrimental to the electrical system.



## P600 Motor Control Module

The Motor Control Module operates the electric pump motor with varied speeds depending on operator commands. Pulse-width Modulation provides smooth and controlled operation with maximum battery efficiency. The Motor Controller also converts 48v DC battery pack voltage to 12v DC for use throughout the control system.

**Figure 4b-4:** P600 Motor Control Module



## EZ-CAL SCAN TOOLS

The EZ-Cal Scan Tools interface with the machine's control system to provide system information and to allow adjustment. The EZ-Cal receives its power from the GP400. The system must be powered up by pulling out both Emergency Stop Switches. You must also select Base or Platform depending on the station from which you will operate.

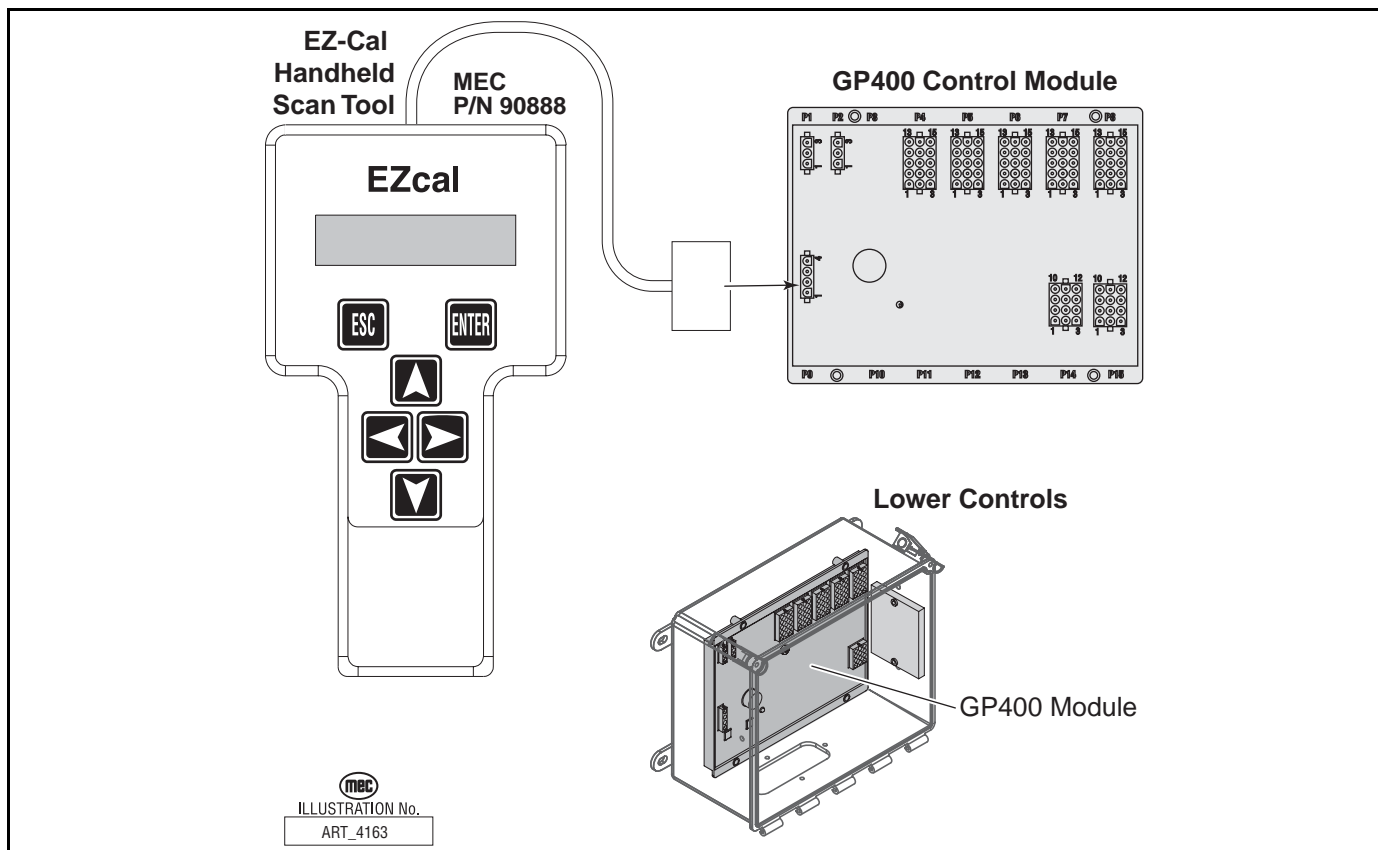
### HANDHELD EZ-CAL

The handheld EZ-Cal is not provided with the machine and is available from the MEC parts department (part #90888).

To use and operate the handheld EZ-Cal:

- Open the lid to the Lower Controls Box
- Plug the EZ-Cal into port P9 of the GP400 module as shown below
- Set the Base/Platform Key Switch to BASE

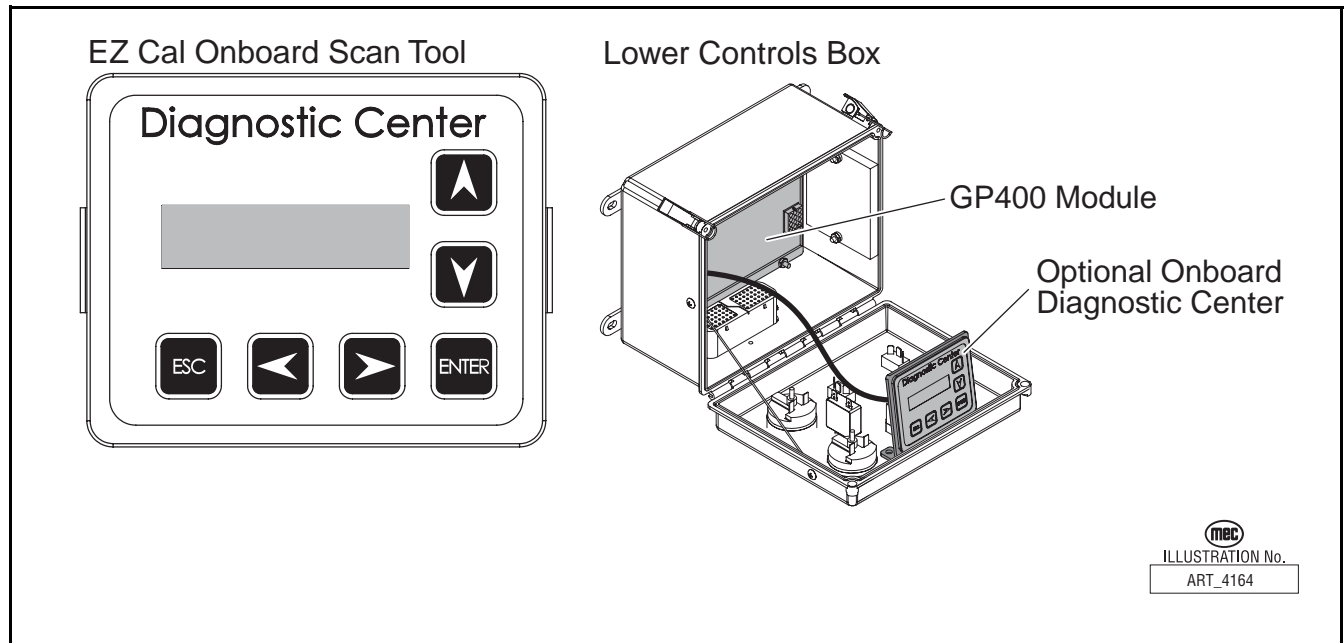
**Figure 4-5:** Handheld EZ-Cal Tool & GP400



## OPTIONAL ONBOARD EZ-CAL

To use and operate the onboard EZ-Cal, set the Base/Platform Key switch to Base or Platform, then open the door to the Lower Controls Box. The onboard EZ-Cal scan tool provides the same functionality as the hand-held unit.

**Figure 4-6:** Onboard EZ-Cal Scan Tool & GP400 Module









## USING THE EZ-CAL SCAN TOOL

- Once, powered up, the EZ-Cal display will illuminate and read “HELP: PRESS ENTER”. From this point, use the right and left arrows to scroll through the base menus.
- Once the desired base menu is obtained (i.e. *ADJUSTMENTS*) press Enter to access sub menus.
- Use the right and left arrows to scroll through sub menus, then press Enter again to choose a sub menu.
- The up/down arrows are used to change settings only.

Press ESC to back up one level.

**Figure 4-7:** EZ-Cal Buttons

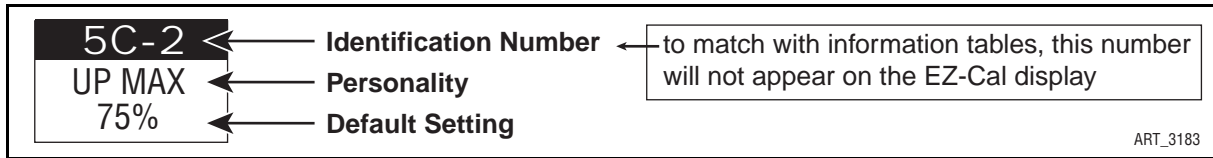
| SYMBOL   | KEY FUNCTIONS  |
|--|--|
|   | <b>ESC/ENTER BUTTONS</b><br>To move back and forth between menu and sub-menu |
|   | <b>LEFT/RIGHT BUTTONS</b><br>Select menus and setting to be adjusted         |
|   | <b>UP/DOWN BUTTONS</b><br>Adjust setting values                              |

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## USING THE EZ-CAL WITH THE FLOW CHARTS

Use the EZ-cal Flow Charts as a guide to locate diagnostic information and make adjustments. Each box in the flow chart will have 3 bits of information.

**Figure 4-8:** EZ-Cal Display Example



**The IDENTIFIER (5c2):** – Used to locate this specific personality in the informational charts. Here you can obtain specific information on the individual personalities.

**The PERSONALITY (Up Max):** – Identifies the individual personalities.

**The DEFAULT SETTING:** – The factory setting. If adjustments are made, they must be returned to default setting.



**ACCESS LEVEL 1 PROVIDES ACCESS TO CHANGE PERSONALITIES NORMALLY PRESET AT THE FACTORY TO PROVIDE PROPER MACHINE MOVEMENT AT SAFE SPEEDS. PERSONALITIES MUST NOT BE CHANGED WITHOUT PRIOR AUTHORIZATION FROM MEC AND MAY ONLY BE RETURNED TO FACTORY SPECIFICATION AS LISTED IN THE FOLLOWING TABLES.**

## FLASH CODES

Flash Codes, provided from the GP400 red LED, will also assist in the event an EZ-cal is not available. However, the EZ-cal yields considerably more relevant information. Refer to *"EZ-Cal HELP Messages"* on page 4-24 for flash coded error messages.



Figure 4-9: EZ-Cal Flow Chart: Adjustments and Setup -- Standard

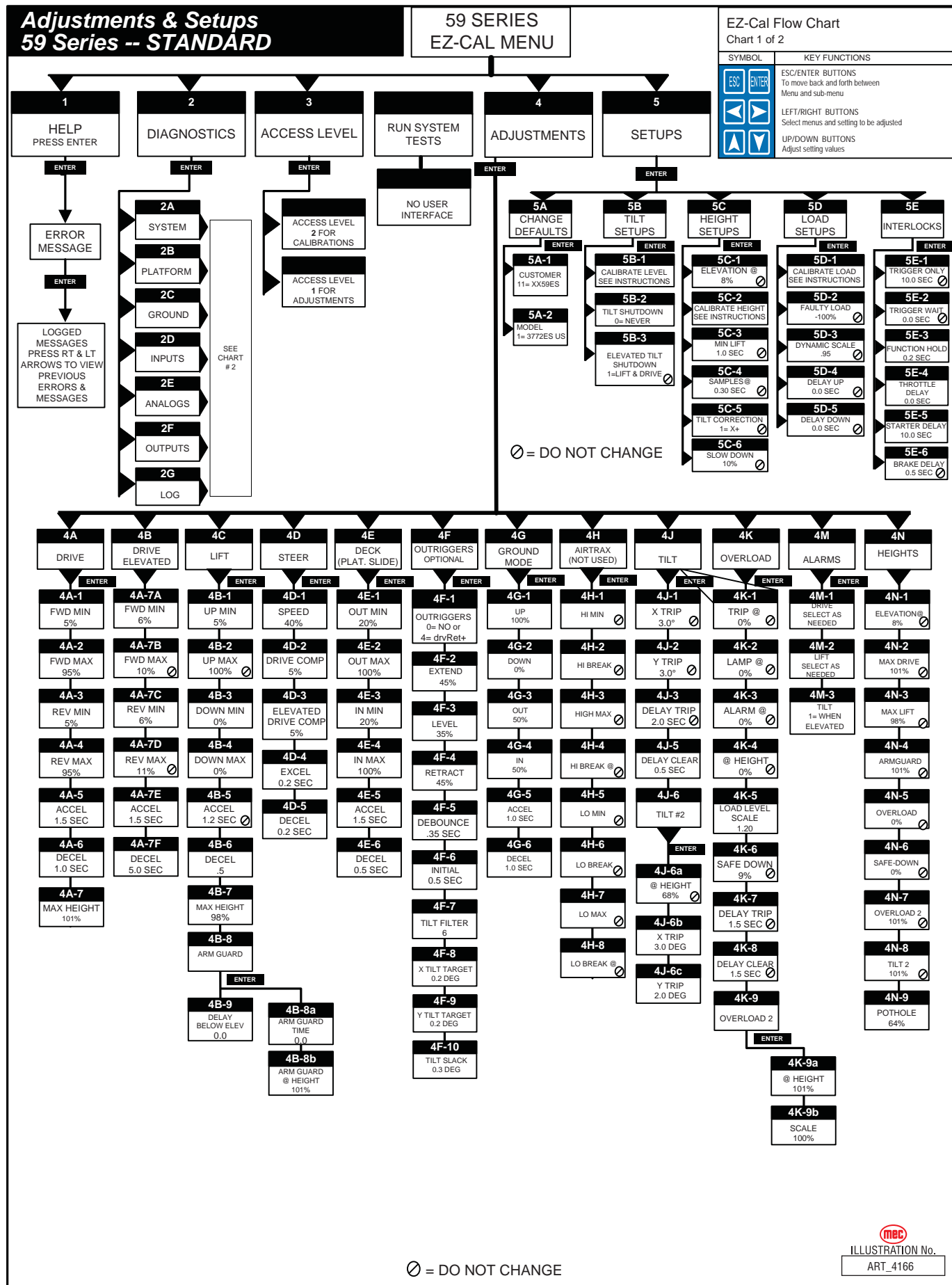


Figure 4-10: EZ-Cal Flow Chart: optional Overload Sensing System Adjustments and Setup

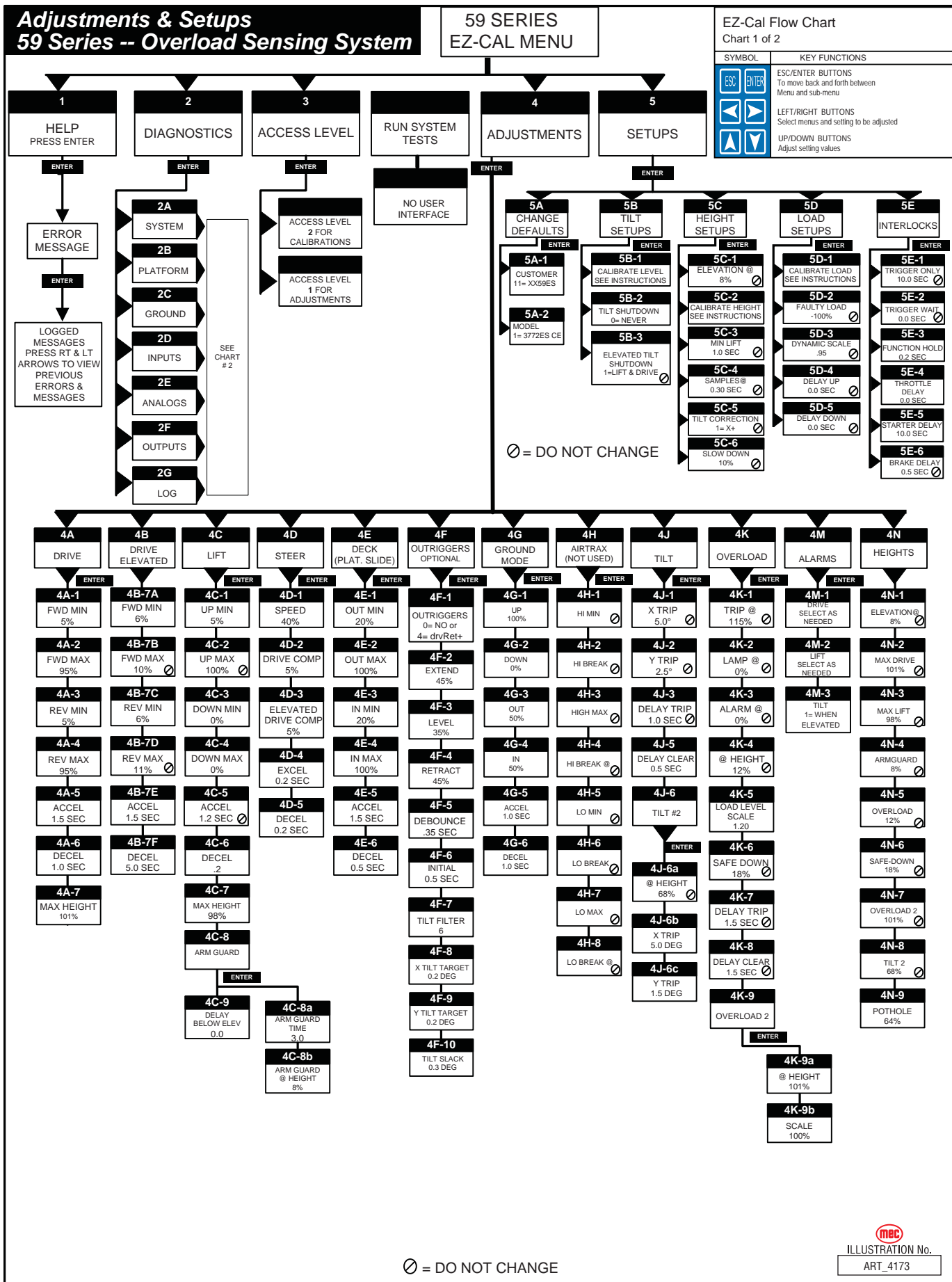
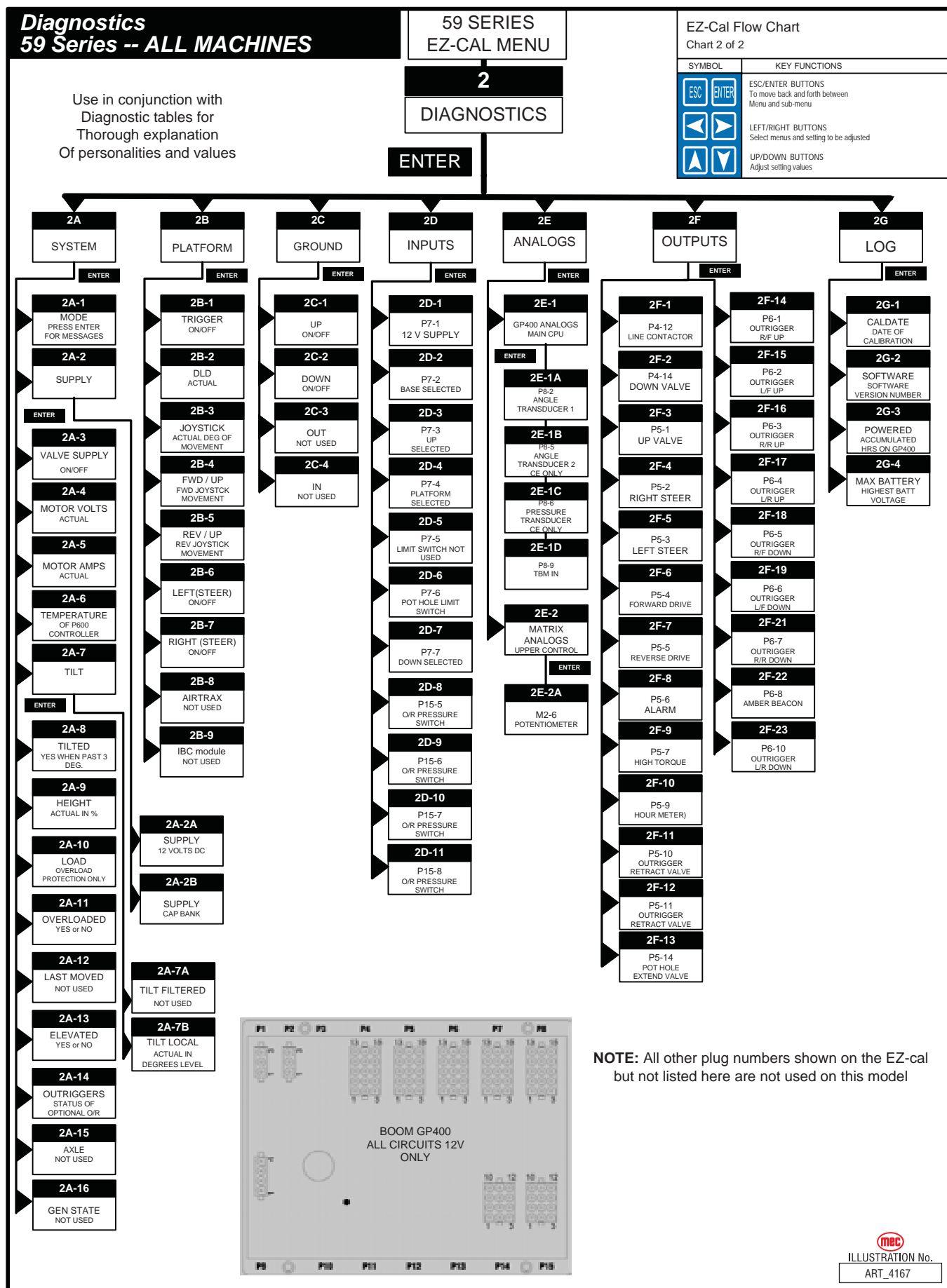


Figure 4-11: EZ-Cal Flow Chart: Diagnostics -- All Machines



## EZ-CAL ADJUSTMENTS

Refer to "Using the EZ-Cal Scan Tool" on page 4-9.

Adjustments are possible **only** in Access Level 1.

Before changing personalities, ensure that the Correct Customer and Model have been selected in the SETUPS menu. Any changes to settings will be lost when the model or customer is changed.

To reach ADJUSTMENTS, first access Level 1, then press --> for ADJUSTMENTS.

Press Enter, then press --> to scroll through the sub-menus.

Once the desired sub-menu is found, press Enter again, then --> to scroll through the personalities. Press the Up or Down arrows to change the personality. Press ESC to go back one or more levels to reach other sub-menus.

**Table 4-1:** EZ-Cal Adjustments

| Operation   | ID  | Personality           | Factory Setting           | Explanation                             |
|---|-----|-----------------------|---------------------------|---|
| <b>4a</b><br><b>DRIVE</b><br>(platform<br>Stowed) | 4a1 | Fwd Min               | 5%                        | Slowest speed possible                  |
|   | 4a2 | Fwd Max               | 95%                       | Maximum speed potential                 |
|   | 4a3 | Rev Min               | 5%                        | Slowest speed possible                  |
|   | 4a4 | Rev Max               | 95%                       | Maximum speed potential                 |
|   | 4a5 | Accel                 | 1.5 sec                   | Ramp up time to maximum                 |
|   | 4a6 | Decel                 | 1.0 sec                   | Ramp down to stop                       |
|   | 4a7 | Max Height            | 101%                      | Maximum drivable height                 |
| <b>4b</b><br><b>DRIVE -</b><br><b>ELEVATED</b>    | 4b1 | Fwd Min               | 8%                        | Slowest speed possible                  |
|   | 4b2 | Fwd Max               | 10%                       | Maximum speed potential                 |
|   | 4b3 | Rev Min               | 8%                        | Slowest speed possible                  |
|   | 4b4 | Rev Max               | 11%                       | Maximum speed potential                 |
|   | 4b5 | Accel                 | 1.5 sec                   | Ramp up time to maximum                 |
|   | 4b6 | Decel                 | 5.0 sec                   | Ramp down to stop                       |
| <b>4c</b><br><b>LIFT</b>                          | 4c1 | Up Min                | 5%                        | Slowest speed possible                  |
|   | 4c2 | Up Max                | 100%                      | Maximum speed potential                 |
|   | 4c3 | Down Min              | 0% (not used)             | Gravity down                            |
|   | 4c4 | Down Max              | 0% (not used)             | Gravity down                            |
|   | 4c5 | Accel                 | 1.2 sec                   | Ramp up time to maximum                 |
|   | 4c6 | Decel                 | 1.5 sec                   | Ramp down to stop                       |
|   | 4c7 | Max Height            | 98%                       | Maximum lift height                     |
|   | 4c8 | Armguard              | 0.0 sec ANSI (3.0 sec CE) | Platform descend interruption (CE only) |
|   | 4c9 | Delay Below Elevation | 0%                        | Not used                                |
| <b>4d</b><br><b>STEER</b>                         | 4d1 | Speed                 | 40%                       | Maximum speed potential                 |
|   | 4d2 | Drive Comp            | 5%                        | Adds additional drive speed             |
|   | 4d3 | Drive comp Elevated   | 5%                        | Adds additional drive speed elevated    |
|   | 4d4 | Accel                 | 0.2                       | Ramp up time to maximum                 |
|   | 4d5 | Decel                 | 0.2                       | Ramp down to stop                       |
| <b>4e</b> <b>DECK</b>                             | 4e1 | Out Min               | 0%                        | Not used on Crossover                   |
|   | 4e2 | Out Max               | 0%                        | Not used on Crossover                   |
|   | 4e3 | In Min                | 0%                        | Not used on Crossover                   |
|   | 4e4 | In Max                | 0%                        | Not used on Crossover                   |
|   | 4e5 | Accel                 | 0                         | Not used on Crossover                   |
|   | 4e6 | Decel                 | 0                         | Not used on Crossover                   |

**Table 4-1:** EZ-Cal Adjustments

| Operation  | ID   | Personality      | Factory Setting        | Explanation                                 |
|--|------|------------------|------------------------|---|
| <b>4f OUTRIGGERS</b>   | 4f1  | Outriggers       | 0= No or 4= drive ret+ | Select "4" if equipped with outriggers      |
|  | 4f2  | Extend           | 50%                    | speed of deployment before legs touch       |
|  | 4f3  | level            | 35%                    | speed of deployment after legs touch        |
|  | 4f4  | Retract          | 55%                    | Speed of retract NOTE: 55% max              |
|  | 4f5  | Debounce         | 0.35 sec               | Wait time for switches to stabilize         |
|  | 4f6  | Initial          | 0.5 sec                | Amount of minimum movement                  |
|  | 4f7  | Tilt filter      | 6                      | Used for leveling                           |
|  | 4f8  | X Tilt target    | 0.2 degrees            | For/aft tilt target                         |
|  | 4f9  | Y Tilt target    | 0.2 degrees            | Side/side tilt target                       |
|  | 4f10 | Tilt Slack       | .3 degrees             | Used for leveling                           |
| <b>4g GROUND MODE lower control operations</b>                                       | 4g1  | Up               | 100%                   | Maximum speed potential                     |
|  | 4g2  | Down             | 0%                     | Not used - Gravity down                     |
|  | 4g3  | Out              | 0%                     | Not used on Crossover                       |
|  | 4g4  | In               | 0%                     | Not used on Crossover                       |
|  | 4g5  | Accel            | 1.0 sec                | Ramp up time to maximum                     |
|  | 4g6  | Decel            | 1.0 sec                | Ramp down to stop                           |
| <b>4J TILT</b>   | 4j1  | X Trip           | 3.0 deg (5.0 deg CE)   | angle tilt sensor signals out of level      |
|  | 4j2  | Y Trip           | 3.0 deg (2.5 deg CE)   | angle tilt sensor signals out of level      |
|  | 4j3  | Delay Trip       | 2.0 sec                | Time delay between signal and trip          |
|  | 4j4  | Delay Clear      | 0.5 sec                | Time delay between clear tip and signal off |
|  | 4j5  | Tilt # 2         |                        | Secondary tilt cutout at higher elevation   |
| <b>Sub Menu</b>  | 4j5a | @ Height         | 68%                    | Height when secondary tilt cutout is active |
|  | 4j5b | X trip2          | 3.0 deg (5.0 deg CE)   | angle tilt sensor signals out of level      |
|  | 4j5c | Y trip2          | 3.0 deg (1.5 deg CE)   | angle tilt sensor signals out of level      |
| <b>4k Overload Used on units equipped with optional overload sensing system only</b> | 4k-1 | Trip @           | 0% ANSI (115% CE)      | Amount of overload that cuts operation      |
|  | 4k-2 | Lamp @           | 0%                     | Follows Trip@                               |
|  | 4k-3 | Alarm@           | 0%                     | Follows Trip@                               |
|  | 4k-4 | @ Height         | 12%                    | Height when system becomes active           |
|  | 4k-5 | Load Level Scale | 1.20                   | Used to calculate load                      |
|  | 4k-6 | Safe Down        | 0% ANSI (18% CE)       | Maximum height when down is possible        |
|  | 4k-7 | Delay Trip       | 1.5 sec                | Time delay before trip                      |
|  | 4k-8 | Delay Clear      | 1.5 sec                | Time delay before clear                     |
|  | 4k-9 | Overload 2       | 101%                   | Not used                                    |
| <b>Sub Menu</b>  | 4k9a | @Height          | 101%                   | Not used                                    |
|  | 4k9b | Scale            | 100%                   | Not used                                    |
| <b>4m ALARMS (Optional)</b>  | 4m1  | Drive yes/no     | Select as needed       | 1=fwd, 2=rev, 3=both, 4= all motion         |
|  | 4m2  | Lift             | Select as needed       | 1=up, 2=dwn, 3=both, 4= all motion          |
|  | 4m3  | Tilt             | 1= when elev           | 1= when elevated, 2= always                 |

**Table 4-1:** EZ-Cal Adjustments

| Operation         | ID  | Personality | Factory Setting   | Explanation                              |
|-------------------|-----|-------------|-------------------|--|
| <b>4n HEIGHTS</b> | 4n1 | Elevation @ | 8%                | Height when system in elevated mode      |
|                   | 4n2 | Max Drive   | 101%              | Used to disable drive at certain heights |
|                   | 4n3 | Max Lift    | 98%               | Used to stop lift at certain heights     |
|                   | 4n4 | Armguard    | 101% ANSI (8% CE) | Not used                                 |
|                   | 4n5 | Overload    | 0% ANSI (12% CE)  | Same as Trip @                           |
|                   | 4n6 | Safe Down   | 0% ANSI (18% CE)  | Same as 4k6                              |
|                   | 4n7 | Overload 2  | 101%              | Not used                                 |
|                   | 4n8 | Tilt # 2    | 68%               | Same as 4h5                              |
|                   | 4n9 | Pothole     | 64%               | Height when pothole bars deploy          |

## EZ-CAL SETUP

Only authorized personnel may have access to and may make changes to personalities.

The ID numbers are provided as a means to match personalities in the EZ-Cal Flow Chart and tables. ID numbers will not appear on the EZ-Cal display.

Refer to "Using the EZ-Cal Scan Tool" on page 4-9.

**Table 4-2:** EZ-Cal Setup Table

| Operation  | ID  | Personality   | Factory Setting                | Explanation   |
|--|-----|---|--------------------------------|---|
| <b>5a<br/>CHANGE<br/>DEFAULTS</b>                                    | 5a1 | Customer  | 11 = XX59ES                    | Changing this personality will cause this model to operate improperly or not operate at all             |
|  | 5a2 | Model<br>(Model to correspond with data on serial plate)                                    | 1 = 3772ES US<br>2 = 3772ES CE | Changing this personality will return all setting to default status possibly limiting machine operation |
| <b>5b<br/>TILT SETUPS</b>  | 5b1 | Calibrate Level? Y=ENTER, N=ESCAPE  |                                | Pressing enter twice will calibrate level sensor  |
|  |     | <b>WARNING! Refer to Tilt Sensor Calibration instructions before attempting calibration</b> |                                |   |
|  | 5b2 | Tilt Shutdown   | 0 = never                      | Function disabled when tilted (stowed)  |
|  | 5b3 | Elevated Tilt Shutdown  | 1 = Lift and Drive             | DO NOT CHANGE   |
| <b>5c<br/>HEIGHT SETUP</b>   | 5c1 | Elevation @   | 12%                            | DO NOT CHANGE   |
|  | 5c2 | Calibrate Height? Y= ENTER N=ESCAPE   |                                | Press Enter to proceed with Height Calibration  |
|  |     | <b>WARNING! Refer to Height Calibration instructions before attempting calibration</b>      |                                |   |
|  | 5c3 | Min Lift  | 1.0 Sec                        | DO NOT CHANGE   |
|  | 5c4 | Samples @   | 0.3 Sec                        | DO NOT CHANGE   |
|  | 5c5 | Tilt Correction   | 3= X+                          | DO NOT CHANGE   |
| <b>5d<br/>LOAD SETUPS<br/>(Overload<br/>Sensing<br/>Option only)</b> | 5d1 | Calibrate Load? Y= ENTER N=ESCAPE   |                                | Press Enter to proceed with Load Calibration  |
|  |     | <b>WARNING! Refer to Load Calibration instructions before attempting calibration</b>        |                                |   |
|  | 5d2 | Faulty Load   | -100%                          | DO NOT CHANGE   |
|  | 5d3 | Dynamic Scale   | .95                            | DO NOT CHANGE   |
|  | 5d4 | Delay Up  | 0.2 sec                        | DO NOT CHANGE   |
|  | 5d5 | Delay Down  | 0.0 sec                        | DO NOT CHANGE   |
| <b>5e<br/>INTERLOCKS</b>   | 5e1 | Trigger Only  | 10 Seconds                     | DO NOT CHANGE   |
|  | 5e2 | Trigger Wait  | 0.0 Sec                        | DO NOT CHANGE   |
|  | 5e3 | Function Hold   | 0.2 Sec                        | DO NOT CHANGE   |
|  | 5e4 | Throttle Delay  | 0.0 Sec                        | Not used  |
|  | 5e5 | Start Delay   | 0.0 Sec                        | Not used  |
|  | 5e6 | Brake Delay   | 0.0 Sec                        | Not used  |



## EZ-CAL DIAGNOSTICS

The EZ-Cal Diagnostics menu provides the ability to view and test individual circuits for irregularities. Whether diagnosing a failure or testing functions during preventative maintenance, the *Diagnostics Menu* provides a quick view at the inputs and outputs as registered by the GP400 Control Module **in real time**. Using the EZ-Cal Flow Chart, compare ID number to this menu for circuit identification and result.

To reach DIAGNOSTICS menu from HELP;

- Press the right arrow and scroll to DIAGNOSTICS and press ENTER.
- Locate the desired sub menu and press ENTER.
- Press the right arrow to scroll through the test points.

**NOTE:** The ID number will not appear on the EZ-Cal display. It is shown in the *Diagnostics Menu* for reference only.

Using the ID number, match specific personalities from the Diagnostic Flow Chart with this table for additional information.

Press **ESC** to go back one level (necessary to change selection).

**Table 4-3:** EZ-Cal Diagnostics Menu

| SELECTION              | ID   | EZ-cal READOUT    | EXPLANATION  |
|------------------------|------|-------------------|--|
| <b>2a<br/>SYSTEM</b>   | 2a1  | MODE              | Current status message/s, press ENTER for interlock information                            |
|                        | 2a2  | Supply            | Indicates output supply voltage from GP400 in DC volts.                                    |
|                        | 2a2a | 12 v Supply       | Indicates supply voltage to GP400 in DC volts.   |
|                        | 2a2b | Cap Bank          | Current voltage of Capacitor bank inside Motor Controller                                  |
|                        | 2a3  | Valve Supply      | Indicates when output voltage from GP400 is On/Off   |
|                        | 2a4  | Motor Volts       | Current voltage to electric motor.   |
|                        | 2a5  | Motor I           | Current amperage draw by the motor   |
|                        | 2a6  | Temperature       | Temperature of Motor Controller heat sink and circuits.                                    |
|                        | 2a7  | Tilt              | Current state of machine level in degrees, as measured by GP400 internal sensor.           |
| <b>SUB MENU</b>        | 2a7a | Tilt Filtered     | not used on Crossover series   |
|                        | 2a7b | Tilt Local        | Actual measurement from GP400 tilt sensor, same as 2a7.                                    |
|                        | 2a8  | Tilted Y/N        | Indicates tilted state. Drive functions interlocked when elevated above ELEVATION@ setting |
|                        | 2a9  | Height            | States current platform elevation in percent   |
|                        | 2a10 | Load              | States current platform load in percent (optional Overload Sensing only)                   |
|                        | 2a11 | Overloaded Y/N    | States weather the platform is overloaded (optional overload sensing only)                 |
|                        | 2a12 | Last Moved        | States last operation input  |
|                        | 2a13 | Elevated Y/N      | Shows platform elevation is above ELEVATION@ setting, drive slows and level sensor active. |
|                        | 2a14 | Outrigger (level) | Details status of outrigger operation.   |
|                        | 2a15 | Axle              | not used on Crossover series   |
|                        | 2a16 | Gen State         | not used on Crossover series   |
| <b>2b<br/>PLATFORM</b> | 2b1  | Trigger On/Off    | Current status of enable trigger, pulled = ON (platform control handle)                    |
|                        | 2b2  | DLD               | Position of Lift/Drive selector switch   |
|                        | 2b3  | Joystick          | Indicates % of stroke from center in real time (potentiometer output).                     |
|                        | 2b4  | Fwd/Down off/on   | Indicates Forward joystick movement (Microswitch activation)                               |
|                        | 2b5  | Rev/Up off/on     | Indicates Reverse joystick movement (Microswitch activation)                               |
|                        | 2b6  | Left off/on       | Status of Left Steer switch  |
|                        | 2b7  | Right off/on      | Status of Right Steer switch   |
|                        | 2b8  | Airtrax           | not used on Crossover series   |
|                        | 2b9  | IBC Module        | not used on Crossover series   |



**Table 4-3:** EZ-Cal Diagnostics Menu

| SELECTION   | ID   | EZ-cal<br>READOUT | EXPLANATION  |
|---|--|-------------------|--|
| <b>2c<br/>GROUND</b>  | 2c1  | Up off/on         | Status of Up switch from lower control station                                   |
|   | 2c2  | Down off/on       | Status of Down switch from lower control station                                 |
|   | 2c3  | Out off/on        | not used on Crossover series   |
|   | 2c4  | In off/on         | not used on Crossover series   |
| <b>2d<br/>INPUTS<br/>Numbers not<br/>listed are not<br/>used</b>  | 2d1  | P7-1              | 12V supply from Motor Controller. ON= Voltage, OFF= no voltage                   |
|   | 2d2  | P7-2              | Base selected, ON= selector on Base position - unit operating from base controls |
|   | 2d3  | P7-3              | Up selected from base controls, ON= Up activated                                 |
|   | 2d4  | P7-4              | Platform Selected. ON= selector in platform position.                            |
|   | 2d5  | P7-5              | Limit Switch (not used)  |
|   | 2d6  | P7-6              | Pothole Limit Switch, ON= Pothole Bars deployed                                  |
|   | 2d7  | P7-7              | Down selected from base controls, ON= Down activated                             |
|   | 2d8  | P15-5             | Outrigger Pressure Switch, ON= outrigger leg deployed                            |
|   | 2d9  | P15-6             | Outrigger Pressure Switch, ON= outrigger leg deployed                            |
|   | 2d10   | P15-7             | Outrigger Pressure Switch, ON= outrigger leg deployed                            |
|   | 2d11   | P15-8             | Outrigger Pressure Switch, ON= outrigger leg deployed                            |
| <b>2e<br/>ANALOGS</b>   | 2e1  | GP400 analogs     | Press ENTER for Analog inputs into GP400 Controller in control station           |
|   | 2e1a   | P6-2              | Angle Transducer 1, Height measuring.  |
|   | 2e1b   | P6-5              | Angle Transducer 2, Height measuring (optional Overload Sensing only).           |
|   | 2e1c   | P6-6              | Pressure Transducer (optional Overload Sensing only).                            |
|   | 2e1d   | P6-9              | TBM current measure (not used),  |
|   | 2E2  | Matrix Analogs    | Press ENTER for Analog inputs from upper control station                         |
|   | 2E2a   | M2-6              | Drive Joystick Hall Effect sensor. Displays position of Joystick in DC volts     |
| <b>2f<br/>OUTPUTS<br/>refers to plug<br/>number and<br/>pin number.<br/><br/>Example:<br/>P5-6<br/><br/>P5 refers to<br/>the plug,<br/>while<br/>6 refers<br/>to pin 6.<br/><br/>Refer to<br/>Schematic<br/>diagram</b> | Numbers NOT listed below but appear on EZ-cal - are not used |                   |  |
|   | 2f1  | P4-12             | Line Contactor (motor solenoid)  |
|   | 2f2  | P4-14             | Down Valve   |
|   | 2f3  | P5-1              | Up valve   |
|   | 2f4  | P5-2              | Right Steer valve  |
|   | 2f5  | P5-3              | Left Steer valve   |
|   | 2f6  | P5-4              | Forward Drive valve  |
|   | 2f7  | P5-5              | Reverse Drive valve  |
|   | 2f8  | P5-6              | Alarm  |
|   | 2f9  | P5-7              | High Torque valves   |
|   | 2f10   | P5-9              | Hour meter   |
|   | 2f11   | P5-10             | Outrigger Retract valve  |
|   | 2f12   | P5-11             | Outrigger Extend Valve   |
|   | 2f13   | P5-14             | Pothole Extend valve   |
|   | 2f14   | P6-1              | Outrigger RF Up valve  |
|   | 2f15   | P6-2              | Outrigger LF Up valve  |
|   | 2f16   | P6-3              | Outrigger RR Up valve  |
|   | 2f17   | P6-4              | Outrigger LR Up valve  |
|   | 2f18   | P6-5              | Outrigger RF Down Valve  |
|   | 2f19   | P6-6              | Outrigger LF Down Valve  |
|   | 2f21   | P6-7              | Outrigger RR Down Valve  |
|   | 2f22   | P6-8              | Amber Beacon   |
|   | 2f23   | P6-10             | Outrigger LR Down Valve  |

**Table 4-3:** EZ-Cal Diagnostics Menu

| SELECTION         | ID  | EZ-cal<br>READOUT | EXPLANATION                                    |
|-------------------|-----|-------------------|--|
| <b>2h<br/>LOG</b> | 2g1 | Cal Date          | Date of Last calibration (height or load)      |
|                   | 2g2 | Software          | MEC specific software.                         |
|                   | 2g3 | Powered           | Accumulated time GP400 powered up (red LED on) |
|                   | 2g4 | Max Battery       | Maximum Battery Voltage applied to system      |

## EZ-CAL RETRIEVE MODE AND HELP MESSAGES

**NOTE:** *It is important to understand that an error message will only be available if the red Diagnostic LED is flashing. If the machine is not operating properly and the red Diagnostic LED is not flashing, the trouble may lie with something not monitored by the electronic control system, i.e. a switch, hydraulic valve or wiring damage.*

There are two different menus that you can access for message retrieval; MODE and HELP.

### MODE MENU

Allows the technician to see the current state of the controller interlocks with a short description. Go to, DIAGNOSTICS/SYSTEM/MODE (EZ-Cal Flow Chart 2, ID# 2a1). Pressing ENTER a second time will provide additional information with certain messages.

### HELP MENU

Provides various HELP messages to identify failure modes.

Some error messages may also be identified by counting the number of times the red LED flashes on the controller so that even without access to an EZ-Cal, some simple diagnostics are possible. However, the EZ-Cal provides a much higher level of diagnostic information. Do not rely on the LED alone.

#### MODE MESSAGE

- Connect the EZ-Cal (see illustration).  
The display will read, "HELP: PRESS ENTER".
- Press the Right Arrow once, then press ENTER twice.
- Refer to the following list of messages to better understand the nature of the message or fault.
- If the GP400 does not register a fault, the display will read EVERYTHING OK.

#### LOGGED MESSAGE

Pressing **ENTER** twice will provide the current message, followed by a log of previous operations and/or errors that occurred immediately prior, starting with most recent.

Press the Right and Left Arrows to view all logged messages.

Other helpful menus available include **DIAGNOSTICS** which allows the technician to monitor specific plug input/output information. Refer to EZ-Cal Flow Chart 2 – Diagnostics.

### MODE MESSAGES

The purpose of **MODE** is to indicate, in real time, the current state of the controller with a short description.

#### INITIALIZING

- The system is preparing to operate, immediately after power-on.

#### SHUTDOWN!

- The system cannot operate – for example both the PLATFORM & GROUND inputs are active together.

#### CHECK CANBUS

- The system cannot operate – CANBUS communications is not successful (for example wire damage to the platform)

**PLATFORM, GROUND**

- The system is ready to operate, from the upper or lower controls as indicated (selected by the Base/Platform selector switch)

**GROUND UP, GROUND DOWN,**

- A ground function is operating normally

**GROUND UP LOCKED, GROUND DOWN LOCKED,**

- A ground function is selected but not allowed (for example, the function switch was closed at power-on)

**GROUND FAULTY**

- Multiple ground function inputs are active at the same time

**WAITING FOR TRIGGER**

- A platform function is selected, but the joystick trigger switch is not closed (close the trigger switch to proceed)

**TRIGGER CLOSED**

- The joystick trigger switch is closed, but no function is selected (select a function to proceed)

**TRIGGER LOCKED**

- The joystick trigger switch was closed at power-on, or closed for too long with no function selected (check trigger switch)

**FORWARD, REVERSE**

- A platform drive function is operating normally

**FORWARD (LEFT), FORWARD (RIGHT), REVERSE (LEFT), REVERSE (RIGHT)**

- A platform drive function is operating normally, with steer also active

**STEER LEFT, STEER RIGHT**

- A platform steer function is operating normally (without drive)

**UP, DOWN**

- A platform lift/lower function is operating normally

**FORWARD LOCKED, REVERSE LOCKED**

- A platform drive function is selected but not allowed (for example, the switch was closed at power-on)

**LEFT LOCKED, RIGHT LOCKED**

- A platform steer function is selected but not allowed (for example, the switch was closed at power-on)

**UP LOCKED, DOWN LOCKED**

- A platform lift/lower function is selected but not allowed (for example, the switch was closed at power-on)

**CHECK DRIVE/LIFT**

- Neither platform drive nor platform lift select is active, or both are active at the same time

**CHECK JOYSTICK**

- Both platform joystick directions are active at the same time

**STEER FAULTY**

- Both platform steer directions are active at the same time

**EXTENDING LEGS**

- Outrigger legs are extending normally

**RETRACTING LEGS**

- Outrigger legs are extending normally

**OUTRIGGERS LOCKED**

- An outrigger function is selected but not allowed (for example, the switch was closed at power-ON)

**INTERLOCKED\*\***

- An interlock shutdown is active, preventing one or more functions. The interlock can be due to many different causes ...

\*\*Press <ENTER> from the **MODE** display to see the precise cause of the interlock (listed below) – press <ESC> from that display to return to the **MODE** display:

**TEST MODE**

- The system test mode is active – switch power off and on again to clear

**TILTED**

- The vehicle is tilted beyond limits, descend, then move vehicle to a more level location

**TOO HIGH**

- The vehicle platform is too high to allow some functions – descend first

**TOO HOT**

- The EZLIFT heatsink has reached 75°C, preventing all functions except lowering. Functions will be allowed again when the heatsink cools to below 70°C.
- The heatsink temperature can be viewed in the DIAGNOSTICS/SYSTEM/ TEMPERATURE display, ID # 2a5.
- The heatsink must be bolted to a significant metal panel of the vehicle, capable of dissipating heat to the environment.

**UNCALIBRATED**

- The height and/or pressure sensors have not been calibrated see CALIBRATION OF OVERLOAD SYSTEM (**CE option only**).
- If machine is not equipped with Overload system, refer to SETUPS table and change those personalities that do not match the figure listed in the table.

**EXTERNAL ALL, EXTERNAL DRIVE, EXTERNAL LIFT**

- An external cutout input is preventing functions – determine the cause of the external cutout (for example, a limit switch)

## EZ-CAL HELP MESSAGES

In addition to the **MODE** messages detailed above, the GP400 provides a **HELP** message to identify failure modes. Some error messages may also be identified by counting the number of times the red LED flashes on the controller so that even without access to an EZ-Cal, some simple diagnostics are possible. However, it is recommended to use an EZ-Cal to diagnose problems, and not rely on the LED! The EZ-Cal provides a much higher detail of information.

- Connect the EZ-Cal (see illustration).  
The display will read, "HELP: PRESS ENTER".
- Press Enter to display the current message.
- Refer to the following list of HELP messages to better understand the nature of the message or fault.
- If the GP400 does not register a fault, the display will read EVERYTHING OK.

**Pressing ENTER twice** will provide a scrolling message of the current message (if one exists) followed by a log of previous operations and/or errors that occurred immediately prior, starting with most recent. **All messages are cleared whenever the system is powered down.**

**NOTE:** When using the LED to attempt diagnosis, please note that a DUAL FLASH code is indicated. The LED will flash on/off a certain number of times, pause off for a short delay, then flash on/off a second certain number of times, followed by a much longer pause off. The sequence will then repeat.

## INFORMATION ONLY MESSAGES

The following are "information only" HELP messages which are not indicative of any possible problem – there is no LED flash code (the LED remains on steady):

### **STARTUP!** \_\_\_\_\_ (no flash code)

- The system has just been powered on and is carrying out some initialization steps prior to being ready to operate. If you select a function during this time, it may be locked out until you release then re-select it.

### **EVERYTHING OK** \_\_\_\_\_ (no flash code)

- There is no problem with the system – it is ready to operate in platform mode when a function is selected.

**NOTE:** If this is the HELP message when a function is selected, check for open-circuit switches or wiring.

### **GROUND MODE ACTIVE!** \_\_\_\_\_ (no flash code)

- There is no problem with the GP400 – it is ready to operate in ground mode when a function is selected.

### **CLOSE TRIGGER** \_\_\_\_\_ (no flash code)

- A platform function is selected but the trigger switch is not closed.

### **VEHICLE TILTED** \_\_\_\_\_ (no flash code)

- The vehicle is tilted beyond the limits, some functions may be prevented.

## FUNCTION ACTIVE MESSAGES

The following **HELP** messages indicate that there is no problem with the GP400 but that a function is active – the vehicle should be moving as requested by the operator.

**DRIVING!** \_\_\_\_\_ (no flash code)

**LIFTING!** \_\_\_\_\_ (no flash code)

**LOWERING!** \_\_\_\_\_ (no flash code)

**STEERING!** \_\_\_\_\_ (no flash code)

**EXTENDING OUTRIGGERS!** \_\_\_\_\_ (no flash code)

**RETRACTING OUTRIGGERS!** \_\_\_\_\_ (no flash code)

## CALIBRATION MESSAGES

The following are “calibration” HELP messages – until the machine is properly calibrated for height and/or pressure (as required), many functions will not be available.

**NOT CALIBRATED** \_\_\_\_\_ **Flash Code: 1/1**

**FUNCTIONS LOCKED - NOT CALIBRATED** \_\_\_\_\_ **Flash Code: 1/1**

- The height and/or pressure sensors have not been calibrated and are required because of the setup of the GP400.
- Calibration procedures are accessible from the **SETUPS/HEIGHT SETUPS** and **SETUPS/LOAD SETUPS** menus.

**FAULT: CUSTOMER** \_\_\_\_\_ **Flash Code: 1/1**

- The system must be configured to the customer requirements – with the EZ-Cal in **SETUPS/CHANGE DEFAULTS** menu, scroll to the correct machine from this menu, the press Right Arrow to select the appropriate model.

**NOTE:** Selecting the incorrect customer or model will cause the machine to operate incorrectly or go into fault mode.

## SHUTDOWN HELP MESSAGES

This section lists “shutdown” HELP messages – functions can be shut down to prevent them being used:

### **SHUTDOWN - CHECK EMS SWITCHES! \_\_\_\_\_ Flash Code: 2/1**

- The Base/Platform selector switch position indicates the mode in which the system must operate if both are active together; the system does not know how to function

### **FUNCTIONS LOCKED - TEST MODE SELECTED \_\_\_\_\_ Flash Code: 2/2**

- Test mode is not accessible with this system. Switch power off/on to reset to normal operation

### **FUNCTIONS LOCKED - TOO HIGH \_\_\_\_\_ Flash Code: 2/2**

- The platform is raised too high to allow some functions. Certain functions may not be allowed above certain elevations.
- Check operator’s manual or ADJUSTMENTS/HEIGHTS/MAX DRIVE and MAX LIFT to see if drive and/or lift is allowed at all heights.

### **FUNCTIONS LOCKED - TILTED \_\_\_\_\_ Flash Code: 2/2**

- The vehicle is tilted too much to allow some functions.
- Check operator’s manual or ADJUSTMENTS/TILT/Xtrip and Ytrip, which determine the maximum allowed vehicle tilt.
- Refer to EZ-Cal Flow Chart 1 – Adjustments and Setup.

### **FUNCTIONS LOCKED - EXTERNAL SHUTDOWN \_\_\_\_\_ Flash Code: 2/2**

- An external shutdown is preventing functions – check DIAGNOSTICS/SYSTEM/ MODE/INTER-LOCK to see which external interlock is active.

### **CHECK GROUND INPUT SWITCHES! \_\_\_\_\_ Flash Code: 2/2**

- There is a problem with the ground function select switches – more than one is active at the same time.

### **SELECT DRIVE/LIFT MODE! \_\_\_\_\_ Flash Code: 2/2**

- There is a problem with the platform drive/lift select switch – neither mode is selected.

### **CHECK DRIVE/LIFT SELECT SWITCH! \_\_\_\_\_ Flash Code: 2/2**

- There is a problem with the platform drive/lift select switch – both modes are selected together.

### **CHECK JOYSTICK SWITCHES! \_\_\_\_\_ Flash Code: 2/2**

- There is a problem with the platform joystick switches – both directions are selected together.

### **RELEASE TRIGGER! \_\_\_\_\_ Flash Code: 2/2**

- The trigger was closed at power-on, or closed for too long with no function selected.

### **RELEASE GROUND SWITCHES! \_\_\_\_\_ Flash Code: 2/2**

- Ground function switches were closed at power-on.

### **RELEASE JOYSTICK SWITCHES! \_\_\_\_\_ Flash Code: 2/2**

- Platform joystick switches were closed at power-on, or closed for too long without trigger switch (see **SETUPS/INTERLOCKS/TRIGGERwait**).

### **RELEASE OUTRIGGER SWITCHES! \_\_\_\_\_ Flash Code: 2/2**

- Outrigger switches were closed at power-on.



## WIRING MESSAGES

The following are “wiring” HELP messages – problems have been detected which are likely due to vehicle wiring issues:

**FAULT: ENERGIZED VALVE - CHECK P5 WIRING! \_\_\_\_\_ Flash Code: 3/2**

**FAULT: VALVE FEEDBACK HIGH - CHECK VALVE WIRING! \_\_\_\_\_ Flash Code: 3/2**

- There is a voltage on one or more valve outputs, when all outputs are off.
- Check each valve output to trace where the invalid supply is coming from.

**FAULT: CAPBANK VOLTAGE TOO HIGH - CHECK LINE CONT! \_\_\_\_ Flash Code: 3/3**

- The voltage on the B+ stud of the controller (connected to an internal voltage stabilization capacitor bank) is too high when the line contactor is off. B+ stud voltage should be approximately 32 volts at idle.
- Check the line contactor tips are not welded, and check the power wiring for errors.

**FAULT: ENERGIZED LINE CONTACTOR - CHECK P5 WIRING! \_\_\_\_ Flash Code: 3/4**

- There is a voltage on the line contactor coil output, when it is off.
- Check wiring to the line contactor coil to trace where the invalid supply is coming from.

**FAULT: MOTOR OVERLOAD! \_\_\_\_\_ Flash Code: 3/5**

- The power protection circuits in the controller have activated to protect from extreme overload.
- Check for short-circuit power wiring; check for a seized or shorted motor.

## SUPPLY MESSAGES

The following are “supply” HELP messages – problems have been detected which are likely due to supply issues:

**FAULT: LOW OIL PRESSURE! \_\_\_\_\_ Flash Code: 4/1**

- Engine oil pressure switch open after start sequence initiated. Engine stalled or unable to start.

**FAULT: BAD INTERNAL 5V! \_\_\_\_\_ Flash Code: 4/2**

- The internal “5V slave” supply is out of range; if the fault remains, the controller may have to be replaced.

**FAULT: BAD INTERNAL SLAVE! \_\_\_\_\_ Flash Code: 4/2**

- The internal “slave” is not operating correctly; if the fault remains, the controller may have to be replaced.

**FAULT: BAD INTERNAL 12V! \_\_\_\_\_ Flash Code: 4/3**

- The internal “12V” supply is out of range;
- 12V Supply is generated by the Motor control module and supplied to the GP400. Check for wiring errors between the two modules. If the fault remains, the Motor Controller may have to be replaced.

**FAULT: BATTERY VOLTAGE TOO LOW! \_\_\_\_\_ Flash Code: 4/4**

- The battery supply is too low – the batteries must be re-charged.

**FAULT: BATTERY VOLTAGE TOO HIGH! \_\_\_\_\_ Flash Code: 4/4**

- The battery supply is too high – check that the correct battery and charger are installed.

**FAULT: BAD 5V SENSOR SUPPLY - CHECK P2-1 WIRING! \_\_\_\_\_ Flash Code: 4/5**

- The “5V sensor” supply is out of range; this supply is available to power external 5V-powered sensors – check that it has not been overloaded or short-circuited to other wiring (CE models).

## CANBUS MESSAGES

This section lists “CANBUS” HELP messages – problems have been detected with CANBUS communications between different modules (of course, only applicable if more than one module is connected together via CANBUS):

### **FAULT: CANBUS!** \_\_\_\_\_ **Flash Code: 6/6**

- There are problems with CANBUS communications between the different modules; messages expected from one or more module are not being received, or messages intended to one or more module cannot be transmitted.
- Check for open- and short- circuit problems with CANBUS wiring; ensure that the CANBUS is wired correctly pin-to-pin; ensure that the vehicle chassis is not erroneously shorted to the chassis (for example, due to insulator breakdown in the motor).

## POWER WIRING MESSAGES

The following are “power wiring” HELP messages – problems have been detected which are likely due to power wiring errors:

### **FAULT: CAPBANK VOLTAGE TOO LOW - CHECK STUD WIRING!** **Flash Code: 7/7**

- The voltage on the B+ stud of the controller (connected to an internal voltage stabilization capacitor bank) is too low (a pre-charge circuit in the module normally applies approximately 32 volts to the capacitor bank and B+ stud).
- Check the 300 amp fuse, line contactor or power wiring for errors. Also check DC motor for internal grounding. Possible motor controller failure.

## OTHER MESSAGES

The following are other HELP messages:

### **SOME BIG BAD PROBLEM!** \_\_\_\_\_ **Flash Code: 9/9**

- This message should not occur!

### **FACTORY OVERRIDE** \_\_\_\_\_ **Flash Code: (fast flashing)**

- When the controller is first shipped, prior to initial calibration, it is configured in a special “factory override” state. In this state, none of the normal shutdowns or interlocks will occur – the vehicle can be freely lifted/lowered and driven irrespective of any calibration needs, vehicle tilt, etc.
- As soon as an EZ-Cal is connected to the controller, the factory override state is ended.
- If calibration does not occur, then the factory override state will recur if the EZ-Cal is disconnected and power is switched off/on.

**IMPORTANT:** – Never use a vehicle in factory override; this state is **ONLY** intended for use during manufacture! While factory override is active, the LED is rapidly flashed on/off.

# TROUBLESHOOTING CHART

The following chart is a guide to help the technician find the area of a problem. In order to benefit from the information, you are advised to fully assess the symptoms by operating all machine functions. There may be some functions that operate while others may not. Record this information and proceed down the left-hand column until you find the failure scenario that best fits the problem. Refer to the information provided to the right for possible causes and remedies. This unit contains a Microprocessor based control system which contains various safety features designed to protect itself and the operator in the event of a failure.

The EZ-Cal scan tool will provide the technician with detailed information related to the failure. ***It is strongly recommended that the technician use the EZ-Cal to read any displayed messages before proceeding to use this Troubleshooting chart.***

Information on the use of the EZ-cal tool plus helpful Flow Charts and graphs can be found earlier in this troubleshooting section. Please read and familiarize yourself with all of the information provided in the troubleshooting section before attempting to diagnose or repair the machine.

**Table 4-4:** Troubleshooting Table

| Problem  | Possible Cause  | Remedy/Solution   |
|--|---|---|
| <b>General Power Issue</b>                                       |   |   |
| <b>No operation from upper or lower control stations</b>         | Main battery switch (optional) turned off                     | Located in battery cabinet if equipped.   |
|  | Emergency Stop Switch pushed in or ignition switch turned off | Upper or lower E-Stop Switch will cut all power, as will the ignition switch in the platform control box.   |
|  | Batteries discharged  | Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge batteries.  |
|  | Base/Platform selector switch failure                         | Check contact blocks and actuator in lower control box panel.   |
|  | Failed 300 amp fuse   | Found behind the lower control station. Will receive a 7-7 flash code on GP400. Check motor amperage draw.  |
|  | Circuit breaker tripped                                       | Located in lower control box panel. Possible short circuit or excessive amperage draw in the 12 volt circuits.  |
|  | Damaged upper control box harness                             | Inspect cable from control box connector to plug under platform - May receive 6-6 flash code on GP-400 (CAN bus).   |
|  | Other fault in system monitored by GP400                      | Check Help message on EZ-cal or check flash code for error.   |
| <b>Functions from lower controls but not from upper controls</b> | Joystick interlock switch inoperative                         | Check switch operation using EZ-cal (flow chart reference 2B1) or using an ohm meter between the red wire (power to switch) and the purple wire (power out of switch) at joystick plug. |
|  | Damaged upper control box harness                             | Inspect cable from control box connector to plug under platform - May receive 6-6 flash code on GP-400 (CAN bus).   |
|  | Base/Platform selector switch failure                         | Check contact blocks and actuator in lower control box panel.   |
|  | Other fault in system monitored by GP400                      | Check Help message on EZ-cal or check flash code for error.   |
| <b>LIFT/LOWER</b>  |   |   |

| Problem   | Possible Cause   | Remedy/Solution  |
|---|--|--|
| <b>Platform will not raise</b>                  | Excessive weight on platform   | Reduce weight to within platform capacity.   |
|   | Lift relief valve out of adjustment  | Adjust relief valve (see Section 1 of this manual).  |
|   | Lift Valve SV-3 not energized/operational  | Check wiring to lift valve. Check valve for debris. Check for EZ-cal message or flash code.  |
|   | Lowering valve SV-11, 12 or 13 stuck open (located at base of lift cylinder/s)     | Check and remove contamination from valve/s. Replace valve/s as necessary.   |
|   | Level sensor out of level (platform elevated above 10')                            | Reposition machine to firm level surface. Check level sensor function using EZ-cal.  |
|   | Main system pressure inadequate  | Check pump output pressure and main relief valve settings.   |
|   | Batteries discharged   | Check battery voltage. Clean, service and charge batteries.  |
|   | System interruption  | Check HELP messages using EZ-cal.  |
| <b>Platform will not lower or lowers slowly</b> | Maintenance lock in maintenance position   | Return maintenance lock to the stowed position   |
|   | Lowering valve(s) not energized  | Check wiring to lowering valve(s) located on Lift Cylinder(s). Check for EZ-cal message or Flash code.   |
|   | Lowering valve(s) not shifting   | Clean debris. Check for damage/replace.  |
|   | Lowering orifice(s) plugged  | Clean orifice(s) located inside hose fitting on each lift cylinder   |
|   | System interruption  | Check HELP messages using EZ-cal.  |
| <b>Lowers but not completely (3259ERT only)</b> | Down valve on one cylinder inoperative   | Check wiring to lowering valve(s) located on Lift Cylinder(s). Check for EZ-cal message or Flash code.   |
| <b>Emergency lowering not working</b>           | Connection broken to Emergency Down switch   | Check connection from batteries to switch.   |
|   | Lowering valve not shifting  | Clean debris. Check for damage/replace.  |
|   | Lowering orifice plugged   | Clean orifice.   |
|   | E-down battery discharged  | Charge. Check charge diode & connections.  |
|   | Valve coil failed on cylinder(s)   | Test and replace as necessary.   |
| <b>DRIVE:</b>                                   |  |  |
| <b>No drive function</b>                        | One or more outriggers slightly or fully deployed (outrigger equipped models only) | Check for green Drive Enabled LED on upper control box. Operate outrigger retract switch   |
|   | Lift/Drive select switch inoperative   | Check switch operation using EZ-cal (flow chart reference 2B2) or using an ohm meter   |
|   | Joystick interlock switch inoperative  | Check switch operation using EZ-cal (flow chart reference 2B1) or using an ohm meter between the red wire (power to switch) and the purple wire (power out of switch) at joystick plug |
| <b>No drive elevated</b>                        | Unit out of level  | Lower and re-position the machine.   |
|   | Pothole Protection Bars not deployed (above 25 feet of elevation)                  | Check for obstruction under machine. Check valve (SV7) for operation, check deploy limit switches.   |
|   | Low battery voltage  | Check battery voltage with multi-meter or EZ-cal. Clean, service and charge batteries.   |
|   | System interruption  | Check HELP messages using EZ-cal.  |

| Problem  | Possible Cause                             | Remedy/Solution   |
|--|--|---|
| <b>Slow drive with Platform in stowed position</b> | High torque enabled                        | Check speed/torque switch position in platform box. Check switch output using ohm meter.  |
|  | Batteries discharged                       | Check battery voltage with multi-meter or EZ-cal. Clean, inspect and charge batteries.  |
|  | Potentiometer malfunction or adjustment    | Check operation using ohm meter or using EZ-cal (flow chart reference 2B3).   |
|  | Torque valve not shifting                  | Inspect SV4 and SV6 valves. Clean or replace as necessary.  |
|  | Drive valve not operational                | Check SV1 and SV5 Drive valves for power. Check SV1 and SV5 Drive valves for contamination.   |
|  | Wheel motor(s) not functioning correctly   | Inspect wheel motors for excessive bypass.  |
| <b>Poor Gradability Performance</b>                | High Speed enabled                         | Check speed/torque switch position in platform box. Check switch output using ohm meter.  |
|  | Batteries discharged                       | Check battery voltage with multi-meter or EZ-cal. Clean, inspect and charge batteries.  |
|  | Potentiometer malfunction or adjustment    | Check operation using ohm meter or using EZ-cal (flow chart reference 2B3).   |
|  | Torque valve not shifting                  | Inspect SV4 and SV6 valves. Clean or replace as necessary.  |
|  | Drive valve not operational                | Check SV1 and SV5 Drive valves. Clean or replace as necessary.  |
|  | Wheel motor(s) not functioning correctly   | Inspect wheel motors for excessive bypass.  |
|  | Hydraulic pump excessive bypass            | Inspect tandem pumps.   |
| <b>Drive in one direction only</b>                 | Joystick micro switch inoperative          | Check using ohm meter or using EZ-cal (flow chart reference 2B4 and 2B5)  |
|  | No output from GP400                       | Scan using EZ-cal and troubleshooting charts (flow chart reference 4f-7 - Fwd or 2f-9 - Reverse)                                    |
| <b>STEER</b>                                       |  |   |
| <b>No steer in either direction</b>                | Joystick rocker switch inoperative         | Check rocker switch using ohm meter on Green and Yellow wires with Blue wire. Check using EZ-cal (flow chart reference 2B6 and 2B7) |
|  | Steering valve inoperative                 | Check steering valve SV2 for power or damage.   |
|  | System interruption                        | Check HELP messages using EZ-cal.   |
|  | Hoses connected incorrectly                | See Section 1 of this manual for correct connection.  |
|  | Pressure relief valve set too low          | Set steer relief valve RV2 to 2000 PSI .  |
| <b>Steers in one direction only</b>                | Steering Valve inoperative                 | Check steering valve SV2 for power or damage.   |
|  | No power to steering coil                  | Check for power and ground in both directions. Repair wiring.   |
|  | System interruption                        | Check HELP messages using EZ-cal.   |
| <b>Steers but not fully or steers slowly</b>       | One or both steering cylinder seals failed | Check steering cylinder internal seals. Replace.  |
|  | Pressure relief valve set too low          | Set steer relief valve RV2 to 2000 PSI.   |
|  | King pin(s) seizing in the bore            | Disassemble and inspect. Repair/replace bushings.   |
| <b>OUTRIGGER</b>                                   |  |   |

| Problem  | Possible Cause                                  | Remedy/Solution  |
|--|---|--|
| <b>No outrigger operation</b>                                | Platform elevated                               | Lower platform.  |
|  | Joystick interlock switch inoperative or pulled | Check switch operation using EZ-cal (flow chart reference 2B1) or using an ohm meter between the red wire (power to switch) and the purple wire (power out of switch) at joystick plug |
|  | Angle Transducer output incorrect               | Check angle transducer output using EZ-cal (flow chart reference 2A9 and 2A13). Recalibrate height (see instructions in Section 2 of this manual)                                      |
|  | Outrigger toggle switch inoperative             | Check using ohm meter or using EZ-cal (flow chart reference 2A14)  |
|  | Directional Valve not functioning               | Check Outrigger directional valve SV10 for power or damage.  |
| <b>Outriggers deploy unevenly and/or unit will not level</b> | Unit on excessive angle                         | Relocate machine to more level ground.   |
|  | Outrigger extend valve sticking                 | Inspect/replace deploy valve found atop each outrigger cylinder.   |
|  | Pressure switch failed open or closed           | Check pressure switches. Switches should be open with outriggers retracted.  |
|  | Tilt sensor not properly calibrated             | Recalibrate Level (see instructions in Section 2 of this manual).  |
|  | Damage to one or more outrigger legs            | Inspect and replace as needed.   |
|  | Outrigger hoses connected incorrectly           | See Section 1 of this manual for hose routing detail.  |
|  | Pressure relief valve set too low               | Set main relief valve RV1 to 3400PSI.  |

## BATTERY CHARGER

Current machines use a 48V charger (model NBS1000-48), while early 36V machines used a 36V charger (model NBS1000-36). The model number is indicated at the bottom right corner of the battery charger's front panel.

Figure 4-12: Battery Charger

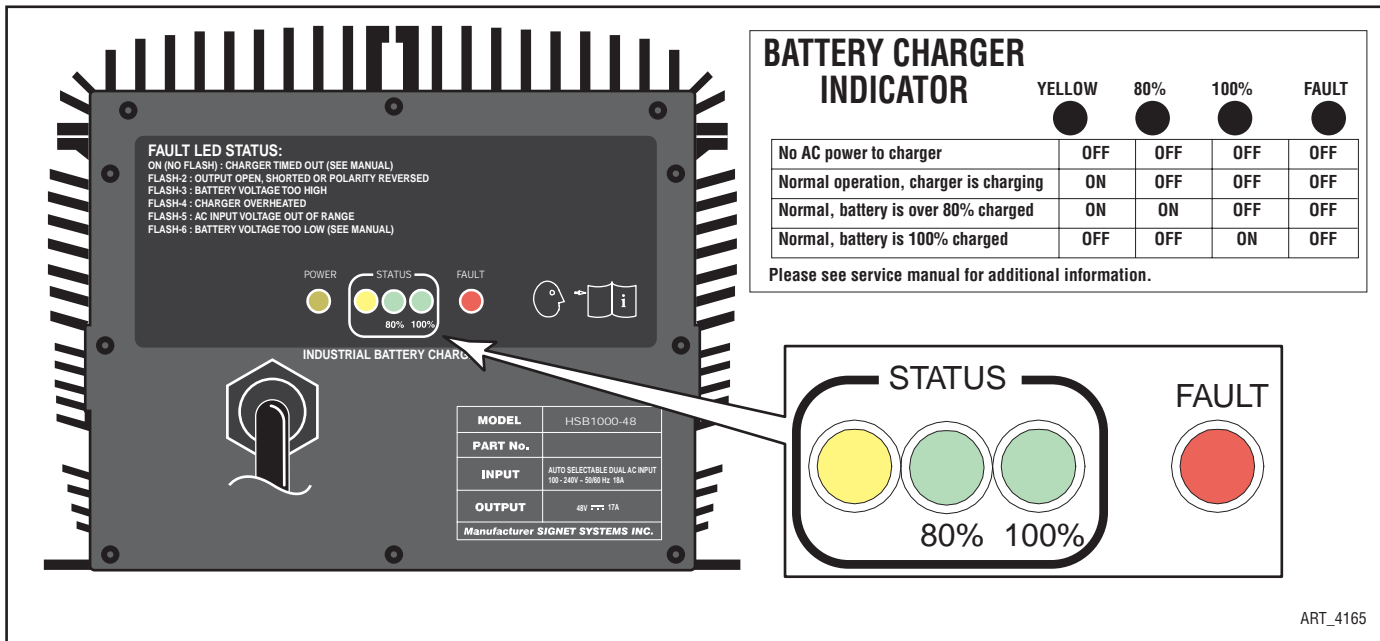


Table 4-5: Battery Charger Simplified Fault Codes

| Fault LED Status | Fault Condition                           |
|------------------|---|
| ON (no flash)    | Charger timed out                         |
| 2 Flash          | Output open, shorted or polarity reversed |
| 3 Flash          | Battery voltage too high                  |
| 4 Flash          | Charger overheated                        |
| 4 Flash          | AC input voltage out of range             |
| 5 Flash          | Battery voltage too low                   |

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

1. Charger does not turn ON -or- no yellow LED
2. Red FAULT LED is ON or BLINKING
3. Batteries do not fully charge
4. The AC supply circuit breaker is tripped or fuse is blown

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

**NOTE:** Over 1/2 of all battery chargers returned as "failed" are good. Please follow the troubleshooting procedures carefully and check all other items before returning the charger.



**Table 4-6:** Battery Charger Troubleshooting

| Yellow<br>AC On<br>LED | Yellow<br>CHARGE<br>LED | Green<br>80%<br>LED | Green<br>100%<br>LED | Red<br>FAULT<br>LED | Condition  |
|------------------------|-------------------------|---------------------|----------------------|---------------------|--|
| X                      | X                       | X                   | X                    | X                   | No AC power to charger or inside auxiliary power supply failure.   |
| On                     | X                       | X                   | X                    | X                   | AC power on but charger is not operating, major failure inside including fuse  |
| On                     | On                      | X                   | X                    | X                   | Normal operation. Charger is charging  |
| On                     | On                      | On                  | X                    | X                   | Normal. Battery is over 80% charged  |
| On                     | X                       | X                   | On                   | X                   | Normal. Battery is 100% charged  |
| On                     | X                       | X                   | On                   | X                   | Normal. The charger will limit the charge time to between 2 to 3 hours if charging is started with a fully charged battery. Normal charge completion is shown.   |
| On                     | X                       | X                   | X                    | On                  | Charger has timed-out at 20 hrs - battery pack probably bad or a bad cell. Charger will stay off, even if the battery voltage drops below the automatic restart level, until the AC is unplugged to reset the charger.   |
| On                     | X                       | X                   | X                    | 2 Flash             | Output open circuit or short circuit or reverse polarity connection of charger to battery (with buzzer sounding)   |
| On                     | X                       | X                   | X                    | 3 Flash             | Battery voltage is too high (may be connected to wrong voltage battery) (with buzzer sounding)   |
| On                     | On                      | Off or On           | X                    | 4 Flash             | Charger is OK but output has been reduced due to overheating. No operator action required except to make sure charger fins are clean. A Four flash may occur anywhere in charge cycle with overheat.   |
| On                     | X                       | X                   | On                   | 4 Flash             | Charger has completed charging the battery but the charger overheated at some point during the charge cycle. The four flash will continue until AC is disconnected.  |
| On                     | X                       | X                   | X                    | 5 Flash             | AC Voltage too high or too low.<br>Check AC voltage and connect charger to correct voltage (with buzzer sounding)  |
| On                     | On                      | X                   | X                    | 6 Flash             | No operator action required.<br>Charging current is cut-back to 9 to 10A because battery voltage is less than 39V (29V for 36V machines). When battery voltage increases above 39V (29V for 36V machines) full charging current of 19 to 20A will be restored and the "six flash" will stop. |

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**NOTES:**

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## Section 5

# SCHEMATICS

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# HYDRAULIC SCHEMATICS TABLE

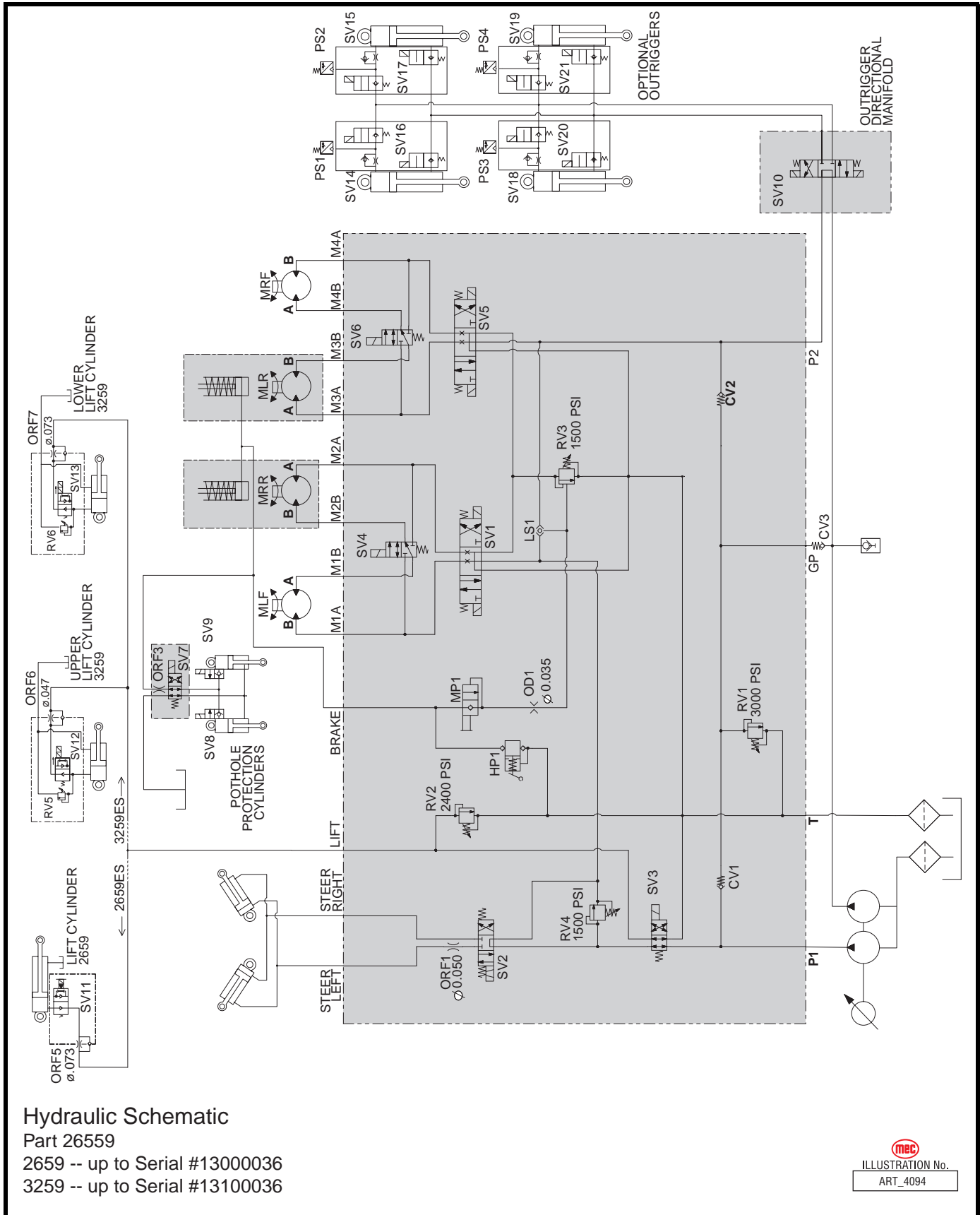
The Callout designations on the following table apply to Figure 5-1 through Figure 5-5.

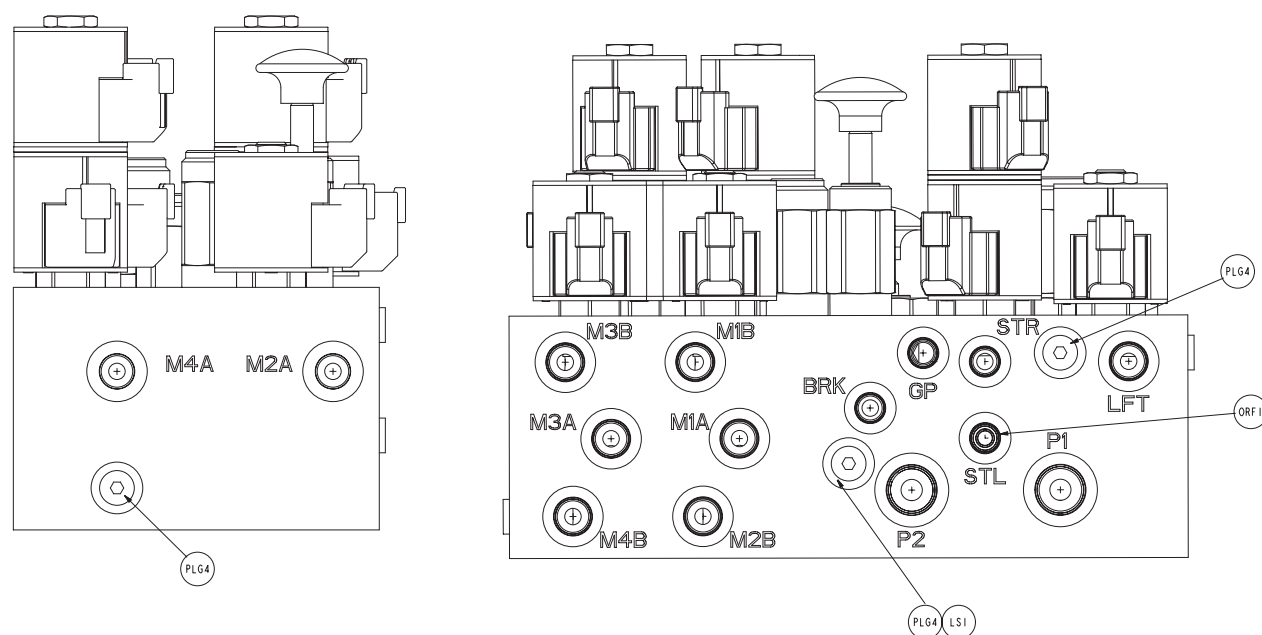
| Callout     | Description                 |
|-------------|-----------------------------|
| <b>CV1</b>  | Check Valve                 |
| <b>CV2</b>  | Check Valve                 |
| <b>HP1</b>  | Hand Pump                   |
| <b>LS1</b>  | Load Sense                  |
| <b>MLF</b>  | Motor, Left Front           |
| <b>MLR</b>  | Motor, Left Rear            |
| <b>MP1</b>  | Manual Brake Engage/Release |
| <b>MRF</b>  | Motor, Right Front          |
| <b>MRR</b>  | Motor, Right Rear           |
| <b>OD1</b>  | Orifice Disk                |
| <b>ORF1</b> | Orifice                     |
| <b>ORF2</b> | Orifice                     |
| <b>ORF3</b> | Orifice                     |
| <b>ORF4</b> | Orifice                     |
| <b>ORF5</b> | Orifice                     |
| <b>ORF6</b> | Orifice                     |
| <b>ORF7</b> | Orifice                     |
| <b>PS1</b>  | Pressure Switch, Outrigger  |
| <b>PS2</b>  | Pressure Switch, Outrigger  |
| <b>PS3</b>  | Pressure Switch, Outrigger  |
| <b>PS4</b>  | Pressure Switch, Outrigger  |
| <b>RV1</b>  | Relief Valve, Steer         |
| <b>RV2</b>  | Relief Valve, Lift          |
| <b>RV3</b>  | Relief Valve, Drive         |

| Callout     | Description                               |
|-------------|---|
| <b>RV4</b>  | Relief Valve, 2659 Lift Cylinder          |
| <b>RV5</b>  | Relief Valve, 3259 Lower Lift Cylinder    |
| <b>RV6</b>  | Relief Valve, 3259 Upper Lift Cylinder    |
| <b>SV1</b>  | Solenoid Valve, Drive Directional         |
| <b>SV2</b>  | Solenoid Valve, Steer                     |
| <b>SV3</b>  | Solenoid Valve, Lift/Drive                |
| <b>SV4</b>  | Solenoid Valve, Series/Parallel Drive     |
| <b>SV5</b>  | Solenoid Valve, Drive Directional         |
| <b>SV6</b>  | Solenoid Valve, Series/Parallel Drive     |
| <b>SV7</b>  | Solenoid Valve, Pothole Extend            |
| <b>SV8</b>  | Solenoid Valve, Pothole Retract           |
| <b>SV9</b>  | Solenoid Valve, Pothole Retract           |
| <b>SV10</b> | Solenoid Valve, Outrigger                 |
| <b>SV11</b> | Solenoid Valve, 2659 Down                 |
| <b>SV12</b> | Solenoid Valve, 3259 Down, Lower Cylinder |
| <b>SV13</b> | Solenoid Valve, 3259 Down, Upper Cylinder |
| <b>SV14</b> | Solenoid Valve, Outrigger Retract         |
| <b>SV15</b> | Solenoid Valve, Outrigger Retract         |
| <b>SV16</b> | Solenoid Valve, Outrigger Extend          |
| <b>SV17</b> | Solenoid Valve, Outrigger Extend          |
| <b>SV18</b> | Solenoid Valve, Outrigger Retract         |
| <b>SV19</b> | Solenoid Valve, Outrigger Retract         |
| <b>SV20</b> | Solenoid Valve, Outrigger Extend          |
| <b>SV21</b> | Solenoid Valve, Outrigger Extend          |

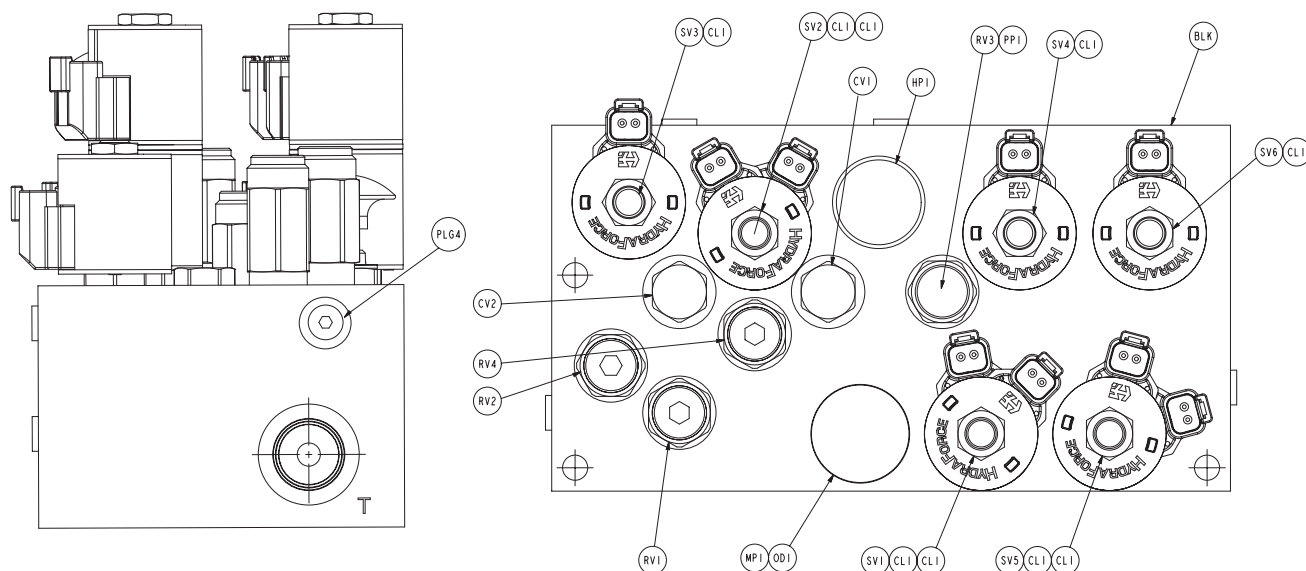
# HYDRAULIC SCHEMATICS -- EARLY MACHINES

Figure 5-1: Hydraulic Schematic, Early Machines



**Figure 5-2: Functions Manifold, Early Machine****VALVE IDENTIFICATION**

| POS  | FUNCTION             | POS | FUNCTION             |
|------|----------------------|-----|----------------------|
| CV1  | PUMP SEPARATION      | RV3 | COUNTERBALANCE VALVE |
| CV2  | PUMP SEPARATION      | RV4 | RELIEF VALVE - STEER |
| HP1  | EMR BRAKE REL PUMP   | SV1 | DRIVE VALVE LF & RR  |
| LS1  | LOAD SHUTTLE - BRAKE | SV2 | STEER VALVE          |
| MP1  | EMR BRAKE REL VALVE  | SV3 | LIFT VALVE           |
| OD1  | BRAKE REL ORIFICE    | SV4 | TORQUE VALVE         |
| ORF1 | STEER SPEED ORIFICE  | SV5 | DRIVE VALVE RF & LR  |
| RV1  | RELIEF VALVE - MAIN  | SV6 | TORQUE VALVE         |
| RV2  | RELIEF VALVE - LIFT  |     |                      |

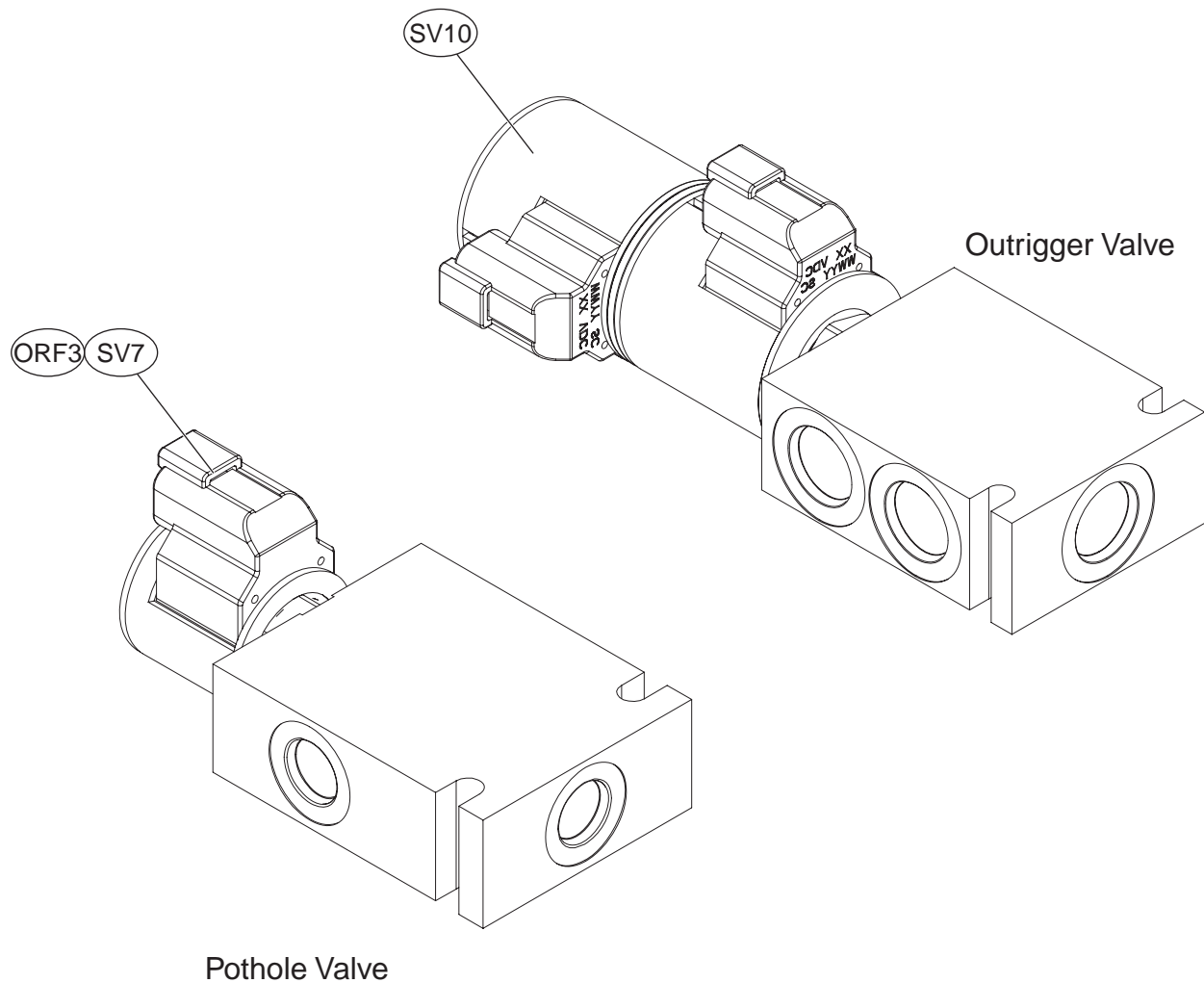
**Function Manifold Valve Identification**

Part 92561

2659 -- up to Serial #13000036

3259 -- up to Serial #13100036

**mec**  
ILLUSTRATION No.  
ART\_4098

**Figure 5-3:** Pothole & Outrigger Valve Assemblies, Early Machines

### Pothole & Outrigger Valve Identification

Part 92379 & 92890

2659 -- up to Serial #13000036

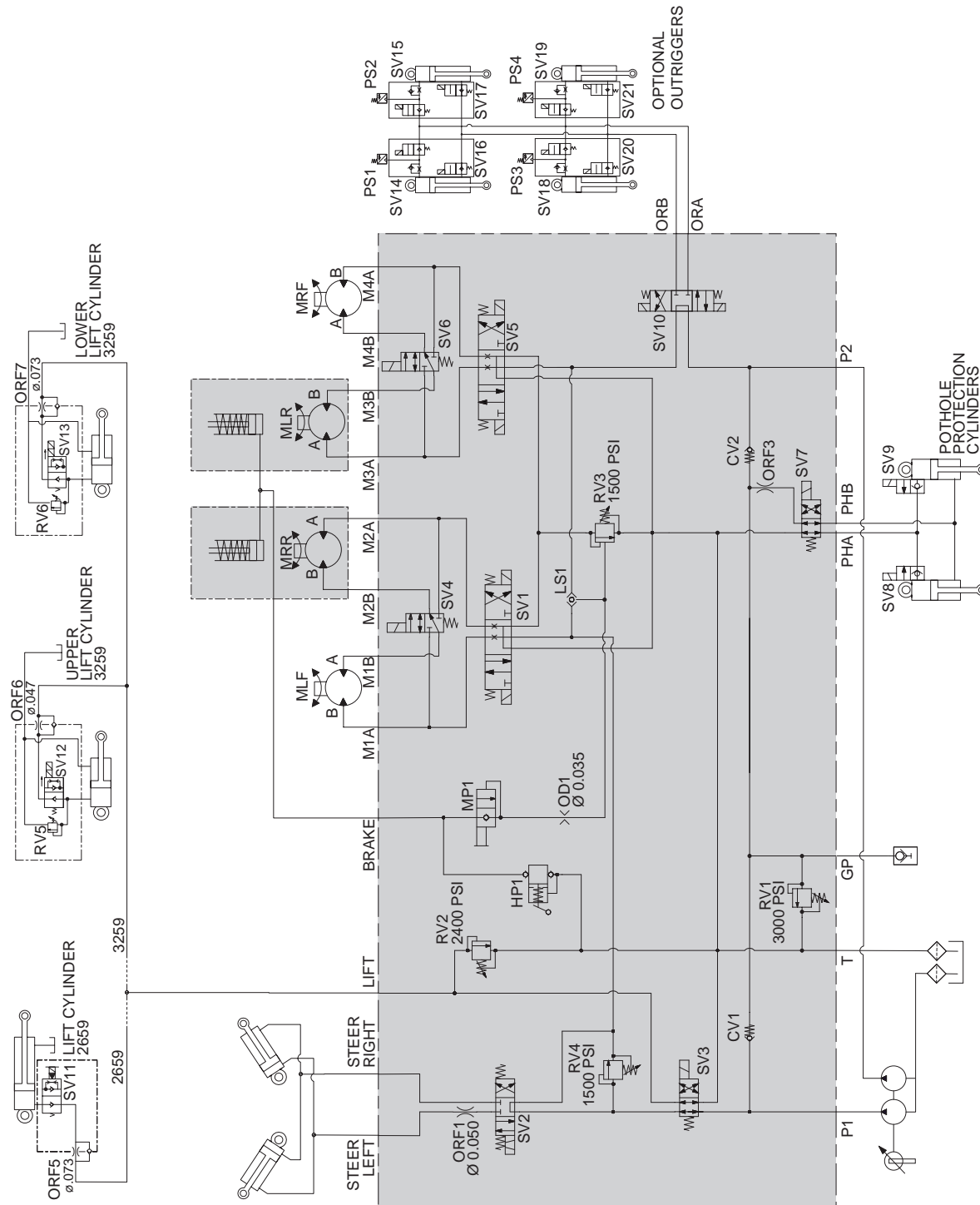
3259 -- up to Serial #13100036



ILLUSTRATION No.  
ART\_4097

# HYDRAULIC SCHEMATICS -- LATER MACHINES

Figure 5-4: Hydraulic Schematic, Later Machines



## Hydraulic Schematic

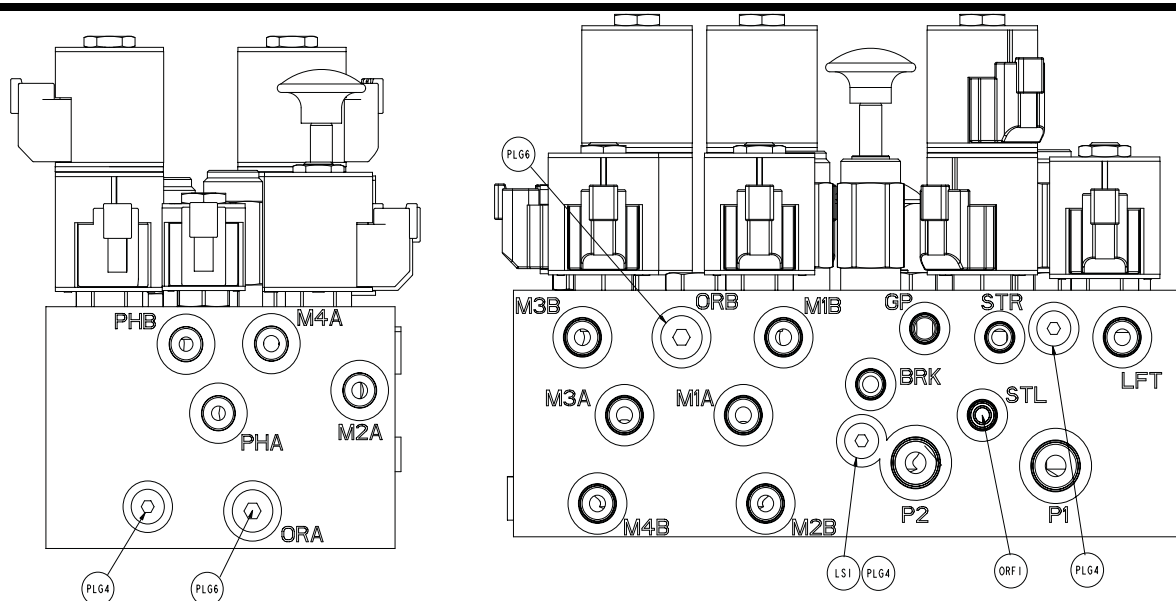
Part 26499

2659 -- Serial #13000037 and up

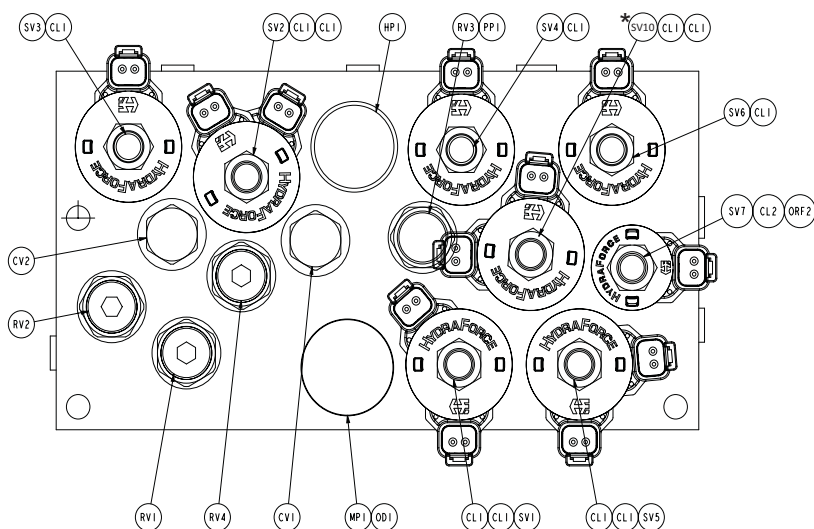
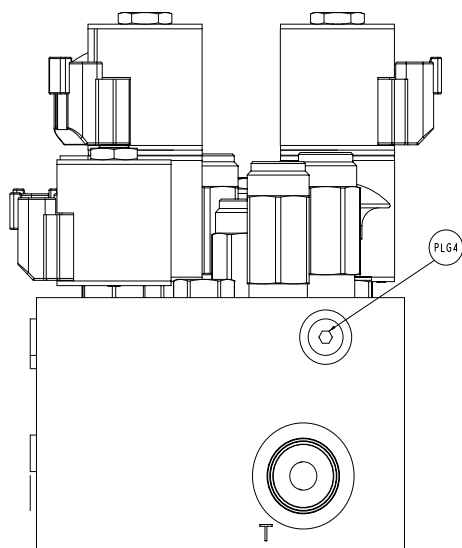
3259 -- Serial #13100037 and up

**mec**  
ILLUSTRATION No.  
ART\_4095



**Figure 5-5:** Functions Manifold, Later Machine**VALVE IDENTIFICATION**

| POS  | FUNCTION             | POS  | FUNCTION              |
|------|----------------------|------|-----------------------|
| CV1  | PUMP SEPARATION      | RV4  | RELIEF VALVE - STEER  |
| CV2  | PUMP SEPARATION      | SV1  | DRIVE VALVE LF & RR   |
| HP1  | EMR BRAKE REL PUMP   | SV2  | STEER VALVE           |
| LS1  | LOAD SHUTTLE - BRAKE | SV3  | LIFT VALVE            |
| MP1  | EMR BRAKE REL VALVE  | SV4  | TORQUE VALVE          |
| OD1  | BRAKE REL ORIFICE    | SV5  | DRIVE VALVE RF & LR   |
| ORF1 | STEER SPEED ORIFICE  | SV6  | TORQUE VALVE          |
| RV1  | RELIEF VALVE - MAIN  | SV7  | POTHOLE DEP VALVE     |
| RV2  | RELIEF VALVE - LIFT  | SV10 | O/R DIRECTIONAL VALVE |
| RV3  | COUNTERBALANCE VALVE |      |                       |



\* SV10 USED ON OUTRIGGER EQUIPPED MODELS ONLY  
A CAVITY PLUG IS USED ON MODELS WITHOUT OUTRIGGERS

**Function Manifold Valve Identification**

Part 92784

2659 -- Serial #13000037 and up

3259 -- Serial #13100037 and up

mec

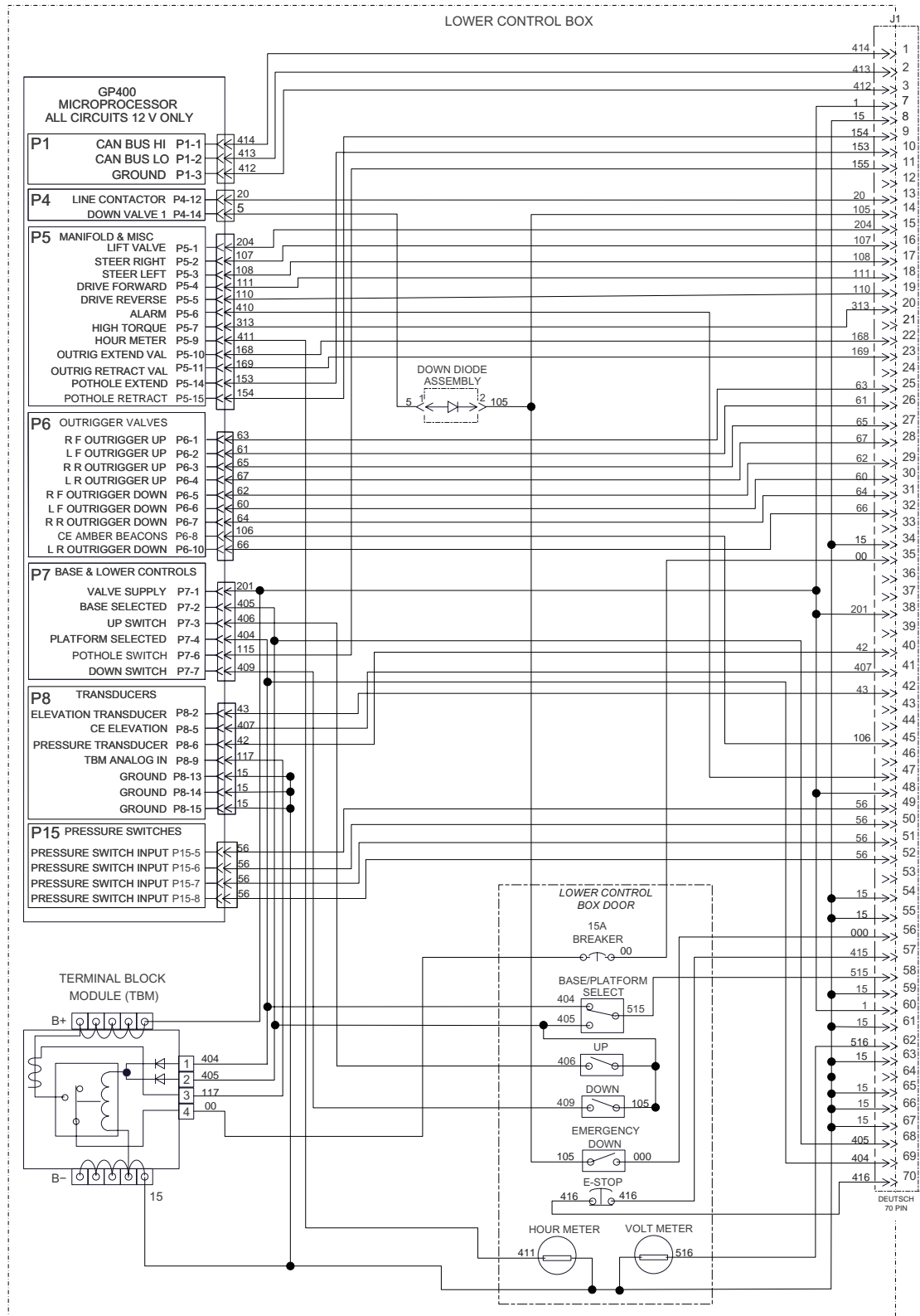
ILLUSTRATION No.  
ART\_4096

**NOTES:**

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# ELECTRICAL SCHEMATICS -- EARLY MACHINES

Figure 5-6: Electrical Schematic -- Early Machines, 1 of 3



Electrical Schematic, 1 of 3

Part #26090

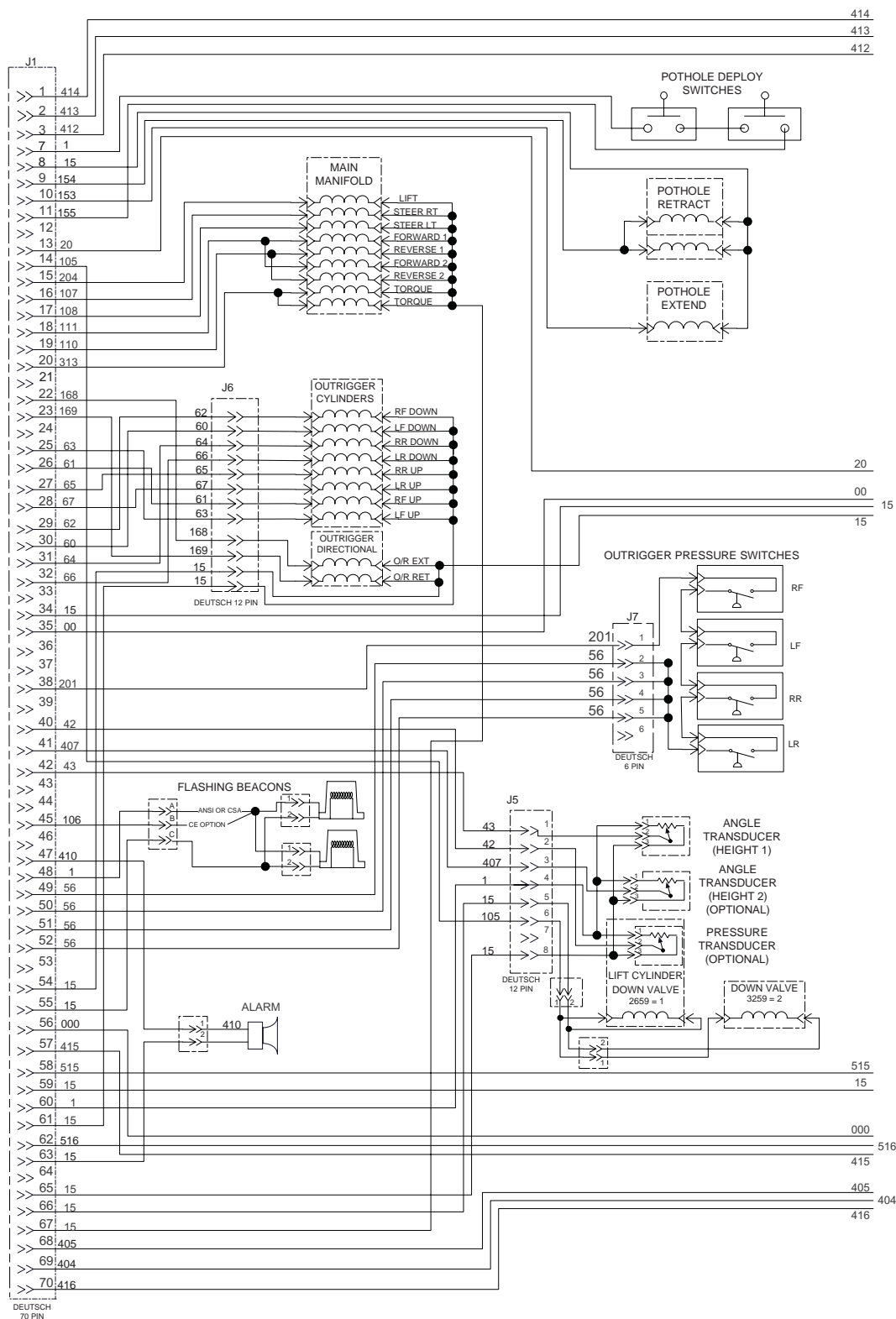
2659 -- up to Serial #13000036

3259 -- up to Serial #13100036

**MEC**  
ILLUSTRATION No.  
ART\_4088



Figure 5-7: Electrical Schematic -- Early Machines, 2 of 3



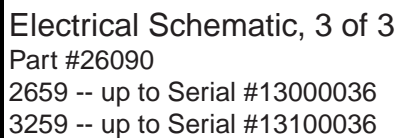
## Electrical Schematic, 2 of 3

Part #26090

2659 -- up to Serial #13000036

3259 -- up to Serial #13100036

**mec**  
ILLUSTRATION No.  
ART\_4089

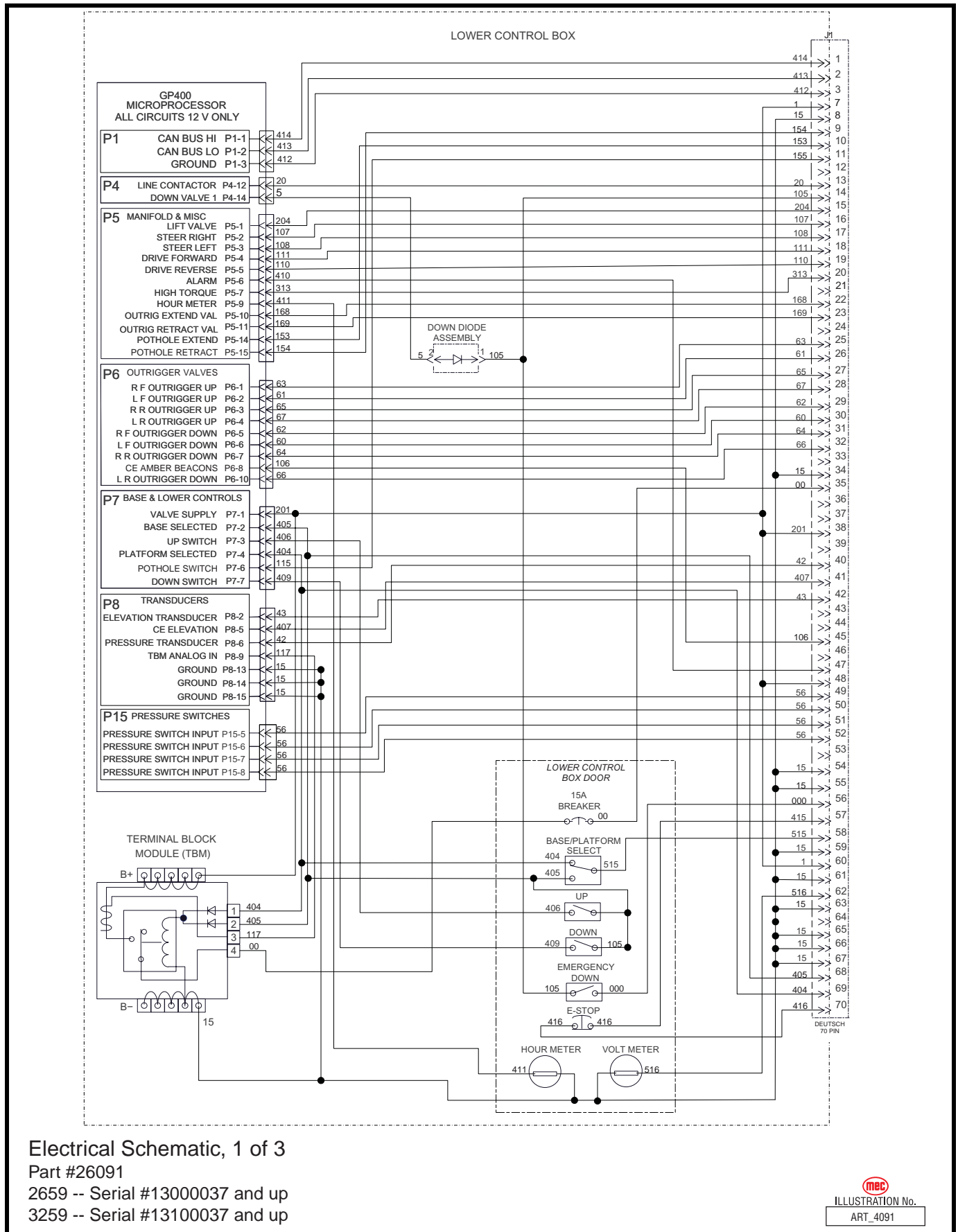


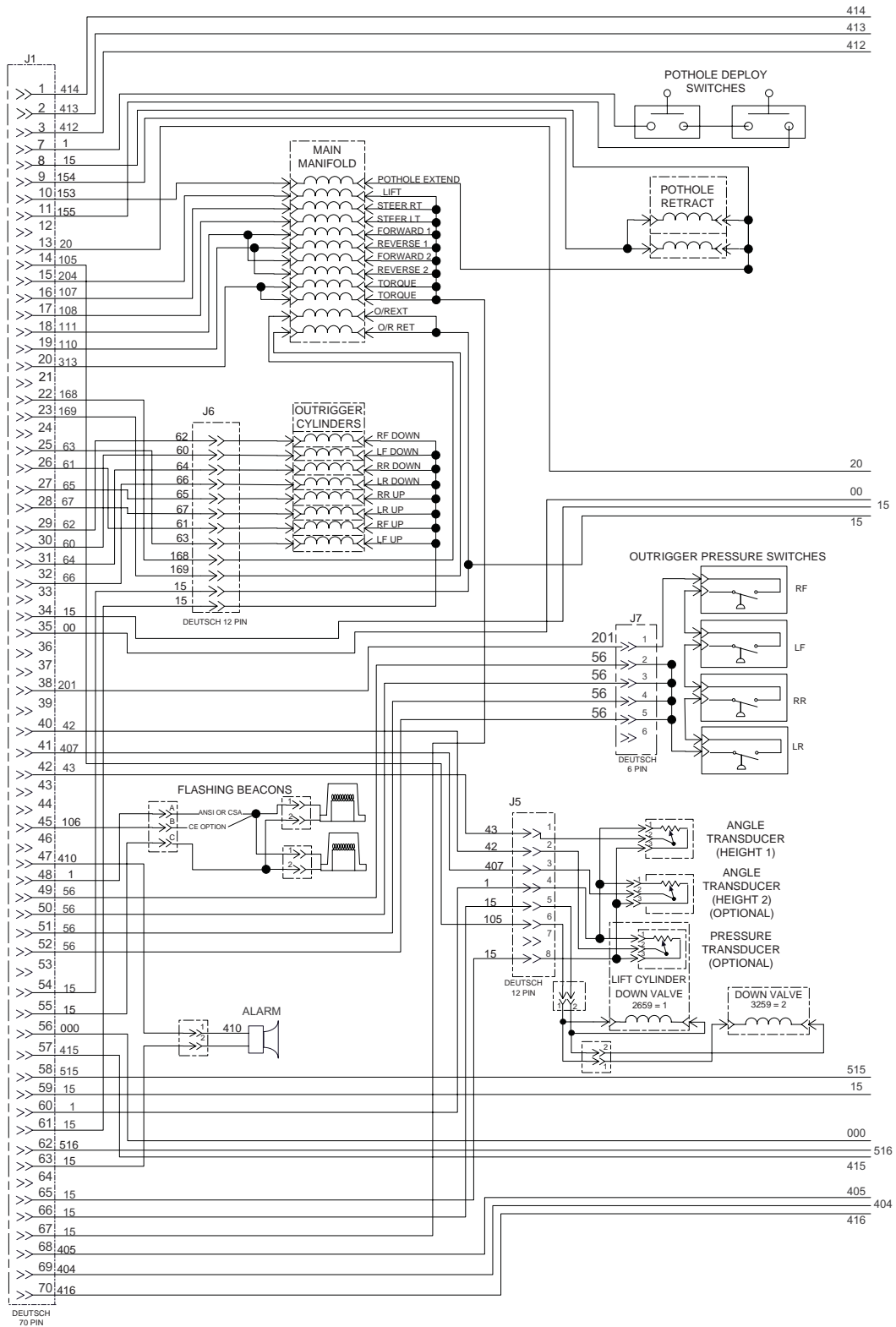
**NOTES:**

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# ELECTRICAL SCHEMATICS -- LATER MACHINES

Figure 5-9: Electrical Schematic -- Later Machines, 1 of 3



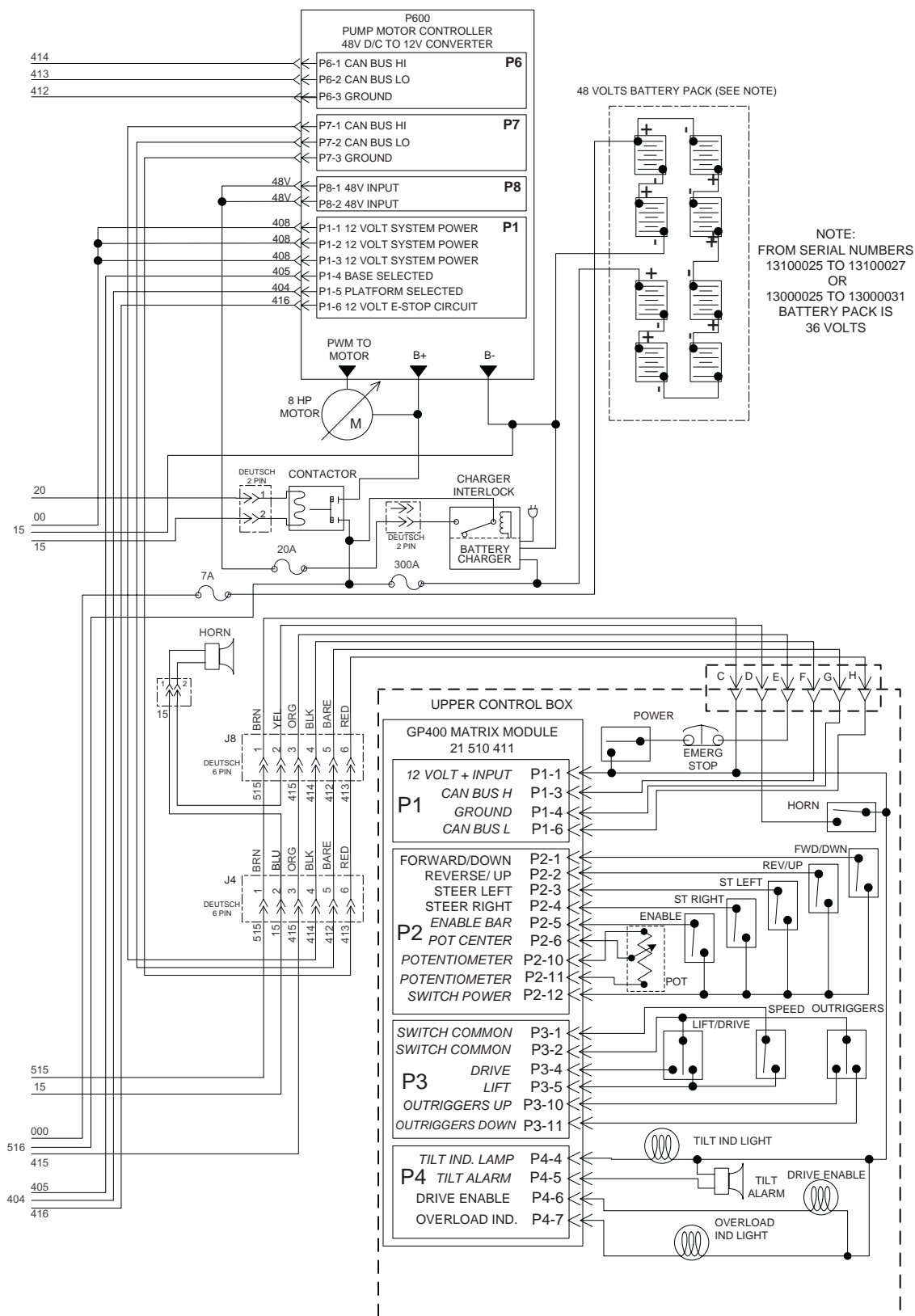


Electrical Schematic, 2 of 3  
 Part #26091  
 2659 -- Serial #13000037 and up  
 3259 -- Serial #13100037 and up

**mec**  
 ILLUSTRATION No.  
 ART\_4092



Figure 5-11: Electrical Schematic -- Later Machines, 3 of 3



Electrical Schematic, 3 of 3

Part #26091

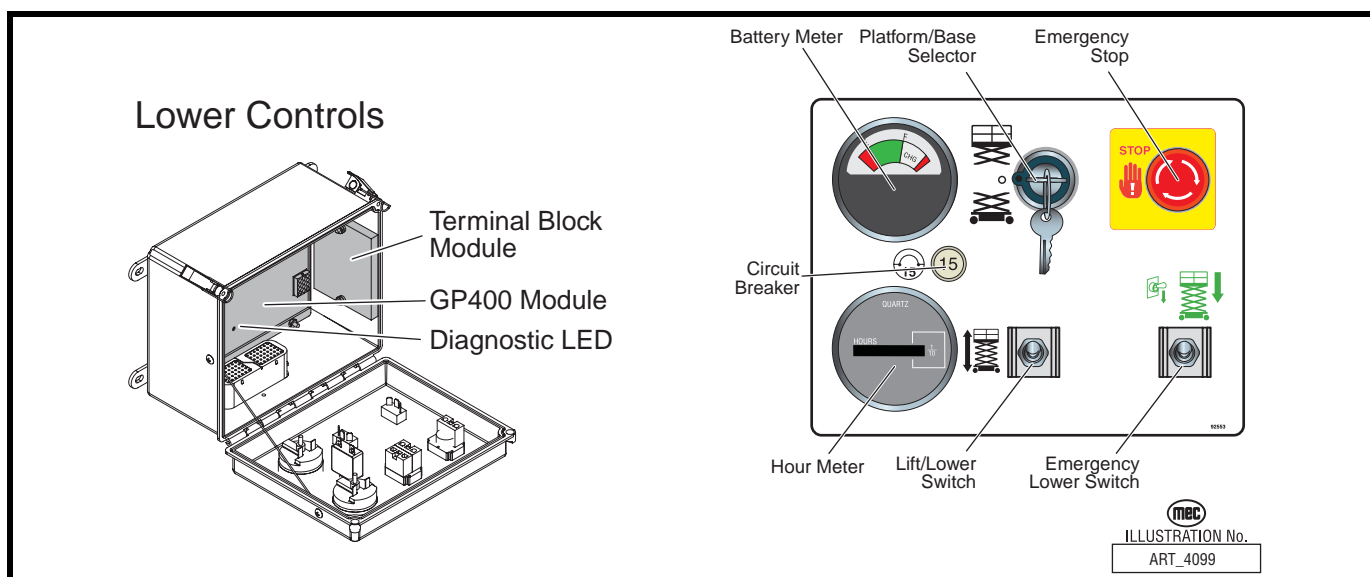
2659 -- Serial #13000037 and up

3259 -- Serial #13100037 and up

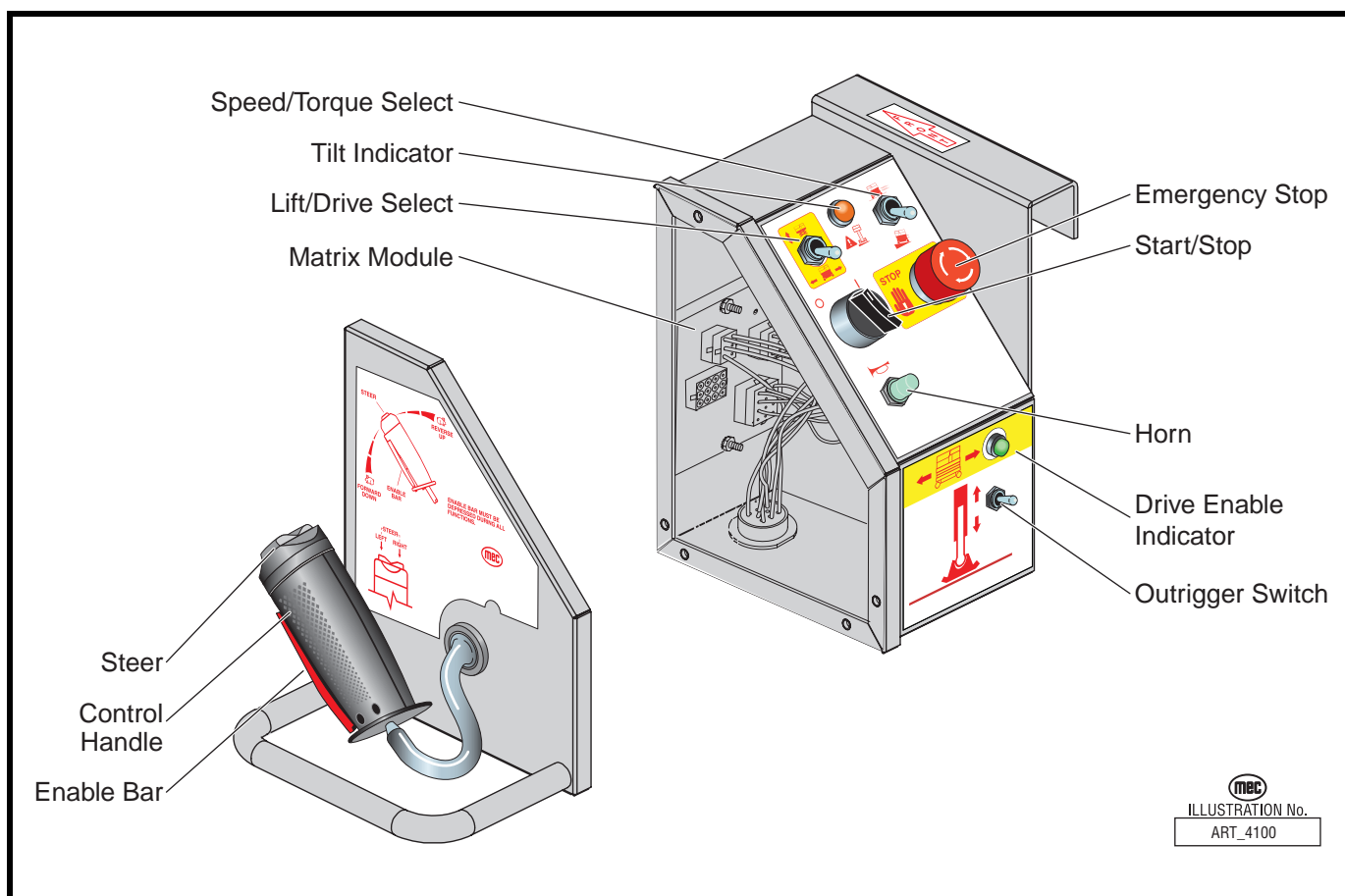
**ILLUSTRATION No.**  
ART\_4093

# CONTROLS

**Figure 5-12: Lower Controls**



**Figure 5-13: Upper Controls**



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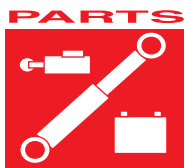
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# SECTION A

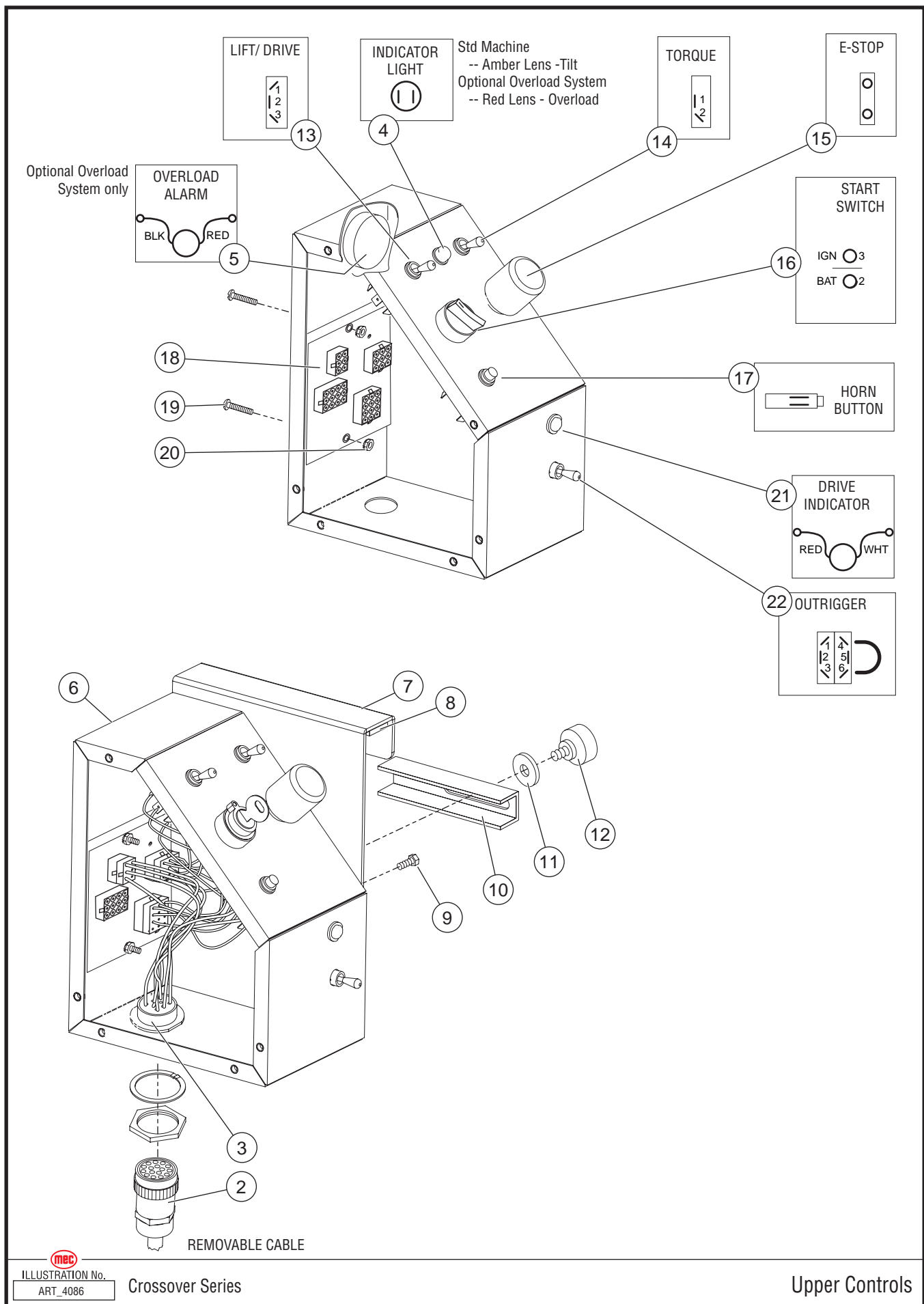
## CONTROLS

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## Platform Controls

| ITEM | PART NO. | QTY    | DESCRIPTION  |
|------|----------|--------|--|
| --   | 87196    | --     | Assy, Upper Control Box Without Horn Or Outriggers - XX59 ANSI           |
| --   | 87197    | --     | Assy, Upper Control Box With Horn - XX59 ANSI                            |
| --   | 87198    | --     | Assy, Upper Control Box With Outriggers - XX59 ANSI                      |
| --   | 87199    | --     | Assy, Upper Control Box With Horn And Outriggers - XX59 ANSI             |
| 1    | --       | --     | --   |
| 2    | REF      | 1      | Cable, Removable (See Wire Harness, Section F)                           |
| 3    | REF      | 1      | Harness, Removable (See Wire Harness, Section F)                         |
| 4    | 9184     | 1      | <b>Std. Machine</b> -- Lens, Amber, Tilt Indicator                       |
|      | 9183     | 1      | <b>Optional Overload Sensing System</b> -- Lens, Red, Overload Indicator |
|      | 9188     | 1      | Light, Bayonet, 14 Volt  |
|      | 9179     | 1      | Socket, Indicator Light  |
| 5    | 7553     | 1      | <b>Optional Overload Sensing System</b> -- Alarm, Overload Warning       |
| 6    | 16242    | 1      | Weldment, Control Box  |
| 7    | 13865    | 1      | Bracket, Control Box Holder  |
| 8    | 6350     | 0.5 FT | Tape, Foam   |
| 9    | HDW5724  | 1      | Screw, 5/16-18   |
| 10   | 13864    | 1      | Bracket, Control Box Holder  |
| 11   | 50350    | 1      | Washer, Flat   |
| 12   | 8826     | 1      | Thumb Screw, 5/16-18, Flower   |
| 13   | 6234     | 1      | Switch, Toggle, Lift/Drive   |
| 14   | 6905     | 1      | Switch, Toggle, Speed/Torque   |
| 15   | 7800     | 1      | Switch, Emergency Stop   |
| 16   | 91926    | 1      | Switch, Start  |
|      | 90714    | 1      | Switch Base  |
|      | 8082     | 1      | Contact Block, N.O.  |
| 17   | 8044     | 1      | Switch, Horn Button (Option)   |
| 18   | 91663    | 1      | Matrix Module  |
| 19   | HDW90879 | 2      | Screw  |
| 20   | HDW90803 | 2      | Nut  |
| 21   | 90789    | 1      | LED, Green, Drive Enabled (outrigger-equipped machines)                  |
| 22   | 5694     | 1      | Switch, Toggle (outrigger-equipped machines)                             |



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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

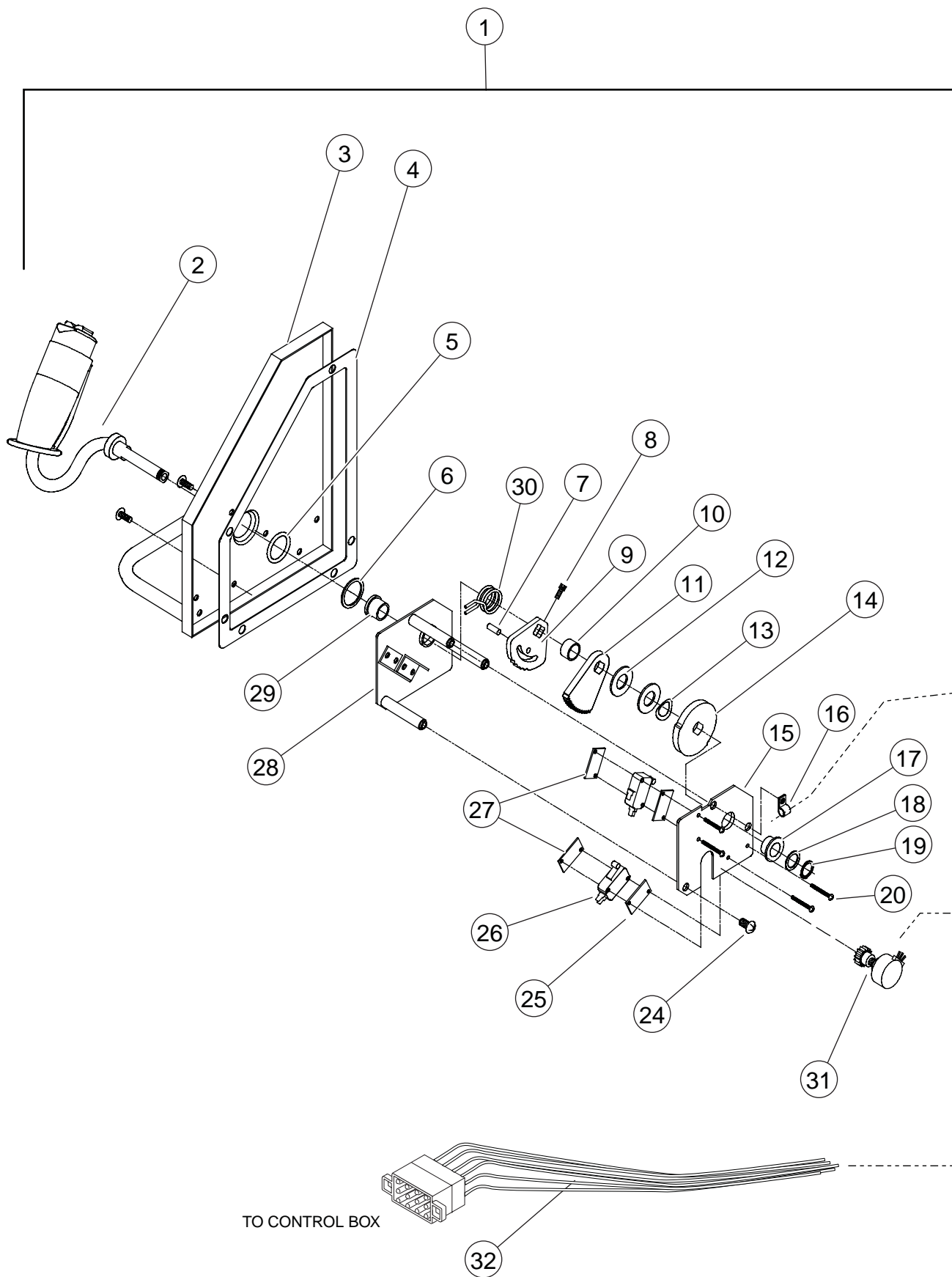


ILLUSTRATION No.  
ART\_2220 R3

Reference: ART\_13868

Control Box Cover Assembly



## Upper Control Box Cover Assembly

| ITEM | PART NO. | QTY | DESCRIPTION                                 |
|------|----------|-----|---|
| 1    | 83076    | 1   | Control Box Cover Assembly                  |
| 2    | 92199    | 1   | Joystick Assembly                           |
| 3    | 3772     | 1   | Cover                                       |
| 4    | 7875     | 1   | Gasket                                      |
| 5    | 7882     | 1   | O-Ring                                      |
| 6    | HDW3768  | 1   | Washer, Flat                                |
| 7    | 1008348  | 1   | Pin, Hold Down                              |
| 8    | 50155    | 1   | Screw, 6-32 x 1/2 inch                      |
| 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 inch                      |
| 17   | 7818     | 1   | Bearing, Bronze, Flanged                    |
| 18   | HDW3771  | 1   | Washer, Flat                                |
| 19   | 5736     | 1   | Ring, Retaining, 1/2 inch                   |
| 20   | 50139    | 4   | Screw, 4-40 x 5/8 inch                      |
| 21   | --       | --  | --  |
| 22   | --       | --  | --  |
| 23   | --       | --  | --  |
| 24   | 50191    | 12  | Screw, 10-32 x 1/2 inch                     |
| 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   | 91824    | 1   | Potentiometer Assembly                      |
| 32   | REF      | 1   | Wire Harness, (see Wire Harness, Section F) |



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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

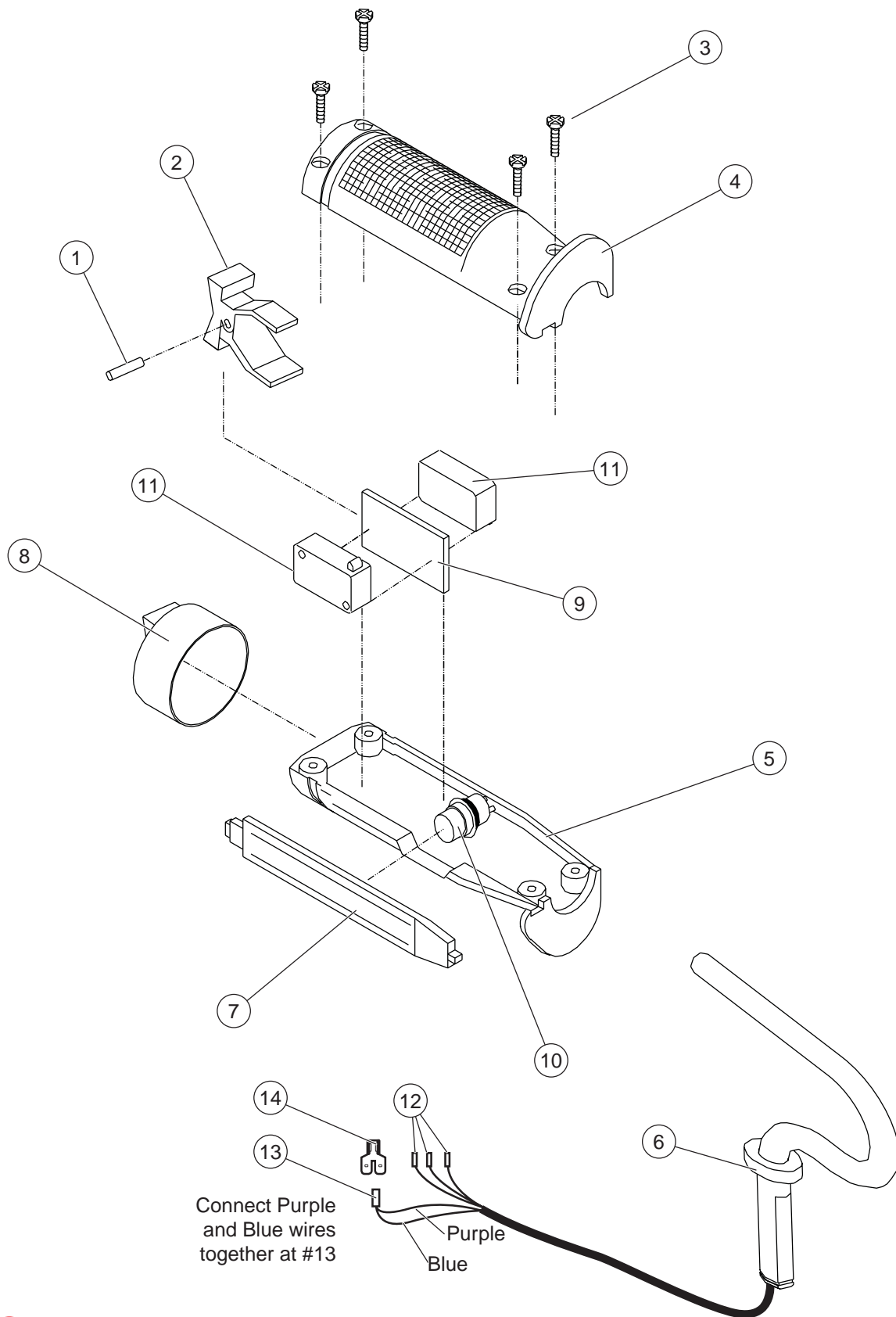


ILLUSTRATION No.  
ART\_2221 R1

Reference: ART\_188



## Upper Control Joystick

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| --   | 92199    | --  | Joystick Assembly   |
| --   | 8630     | --  | Joystick Assembly without Control Arm (#6)  |
| 1    | 8750     | 1   | Pin   |
| 2    | 8453     | 1   | Switch Actuator   |
| 3    | HDW8455  | 4   | Screw   |
| 4    | 8752     | 1   | Grip, Top Half  |
| 5    | 8751     | 1   | Grip, Bottom Half   |
| 6    | 13638    | 1   | Control Arm without wire  |
| 7    | 8748     | 1   | Trigger   |
| 8    | 8456     | 1   | Rocker Boot   |
| 9    | 8447     | 1   | Switch Separator  |
| 10   | 8753     | 1   | Motion Switch, OFF-ON   |
| 11   | 8448     | 2   | Switch  |
| 12   | 91839    | 3   | Amp Socket  |
| 13   | 92194    | 1   | Push Connector, 3/16"   |
| 14   | 92198    | 1   | Adapter, 2-to-1   |
| --   | 8761     | --  | Switch Assembly (not shown) -- includes item #9, item #11 (x2), wire and connectors |



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• NS: Not a Stock item

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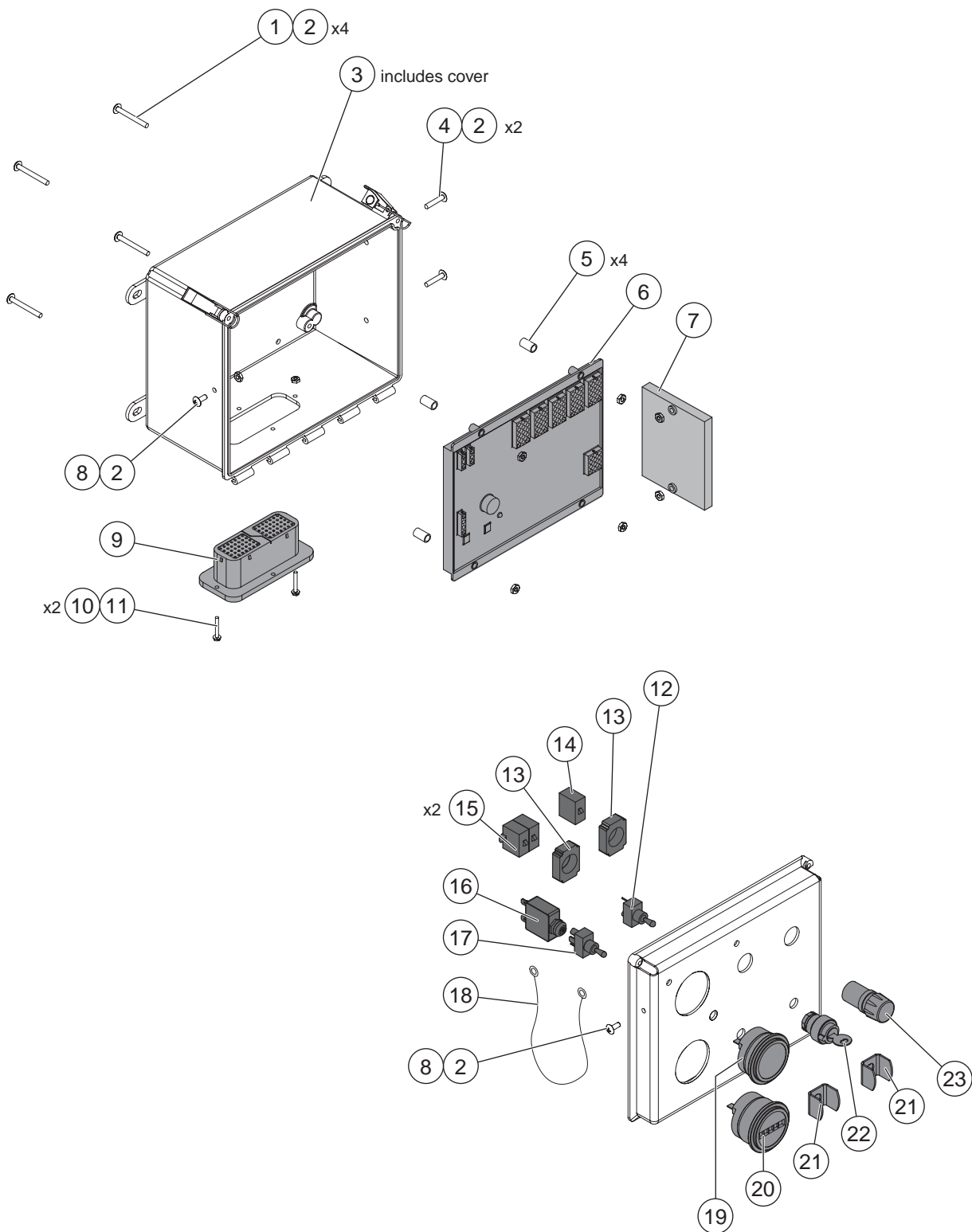


ILLUSTRATION No.  
ART\_4087

Crossover Series

Base Controls

## Base Controls

| ITEM | PART NO. | QTY | DESCRIPTION                  |
|------|----------|-----|------------------------------|
| 1    | 50403    | 4   | Screw, 10/32 x 1.75          |
| 2    | 50238    | 8   | Nut, 10/32 Nylock            |
| 3    | 92224    | 1   | Control Box (includes cover) |
| 4    | 50330    | 2   | Screw, 10/32 x 1             |
| 5    | 11119    | 4   | Spacer                       |
| 6    | 91659    | 1   | GP400                        |
| 7    | 91838    | 1   | Terminal Block Module        |
| 8    | 50191    | 2   | Screw, 10/32 x .5            |
| 9    | 91887    | 1   | Connector, 70-Pin            |
| 10   | 5363     | 2   | Screw, 6/32 x 1              |
| 11   | 5364     | 2   | Nut, 6/32 Nylock             |
| 12   | 7423     | 1   | Switch, 2 Position Momentary |
| 13   | 90714    | 2   | Switch Base                  |
| 14   | 8083     | 1   | Contact Block, NC            |
| 15   | 8082     | 2   | Contact Block, NO            |
| 16   | 7235     | 1   | Circuit Breaker, 15 A        |
| 17   | 91954    | 1   | Switch, 3 Position Momentary |
| 18   | 91921    | 1   | Lanyard Cable                |
| 19   | 91744    | 1   | Battery Charge Indicator     |
| 20   | 91704    | 1   | Hour Meter                   |
| 21   | 1313     | 2   | Guard, Switch                |
| 22   | 9549     | 1   | Switch, Keyed Selector       |
| 23   | 92408    | 1   | Button, Emergency Stop       |



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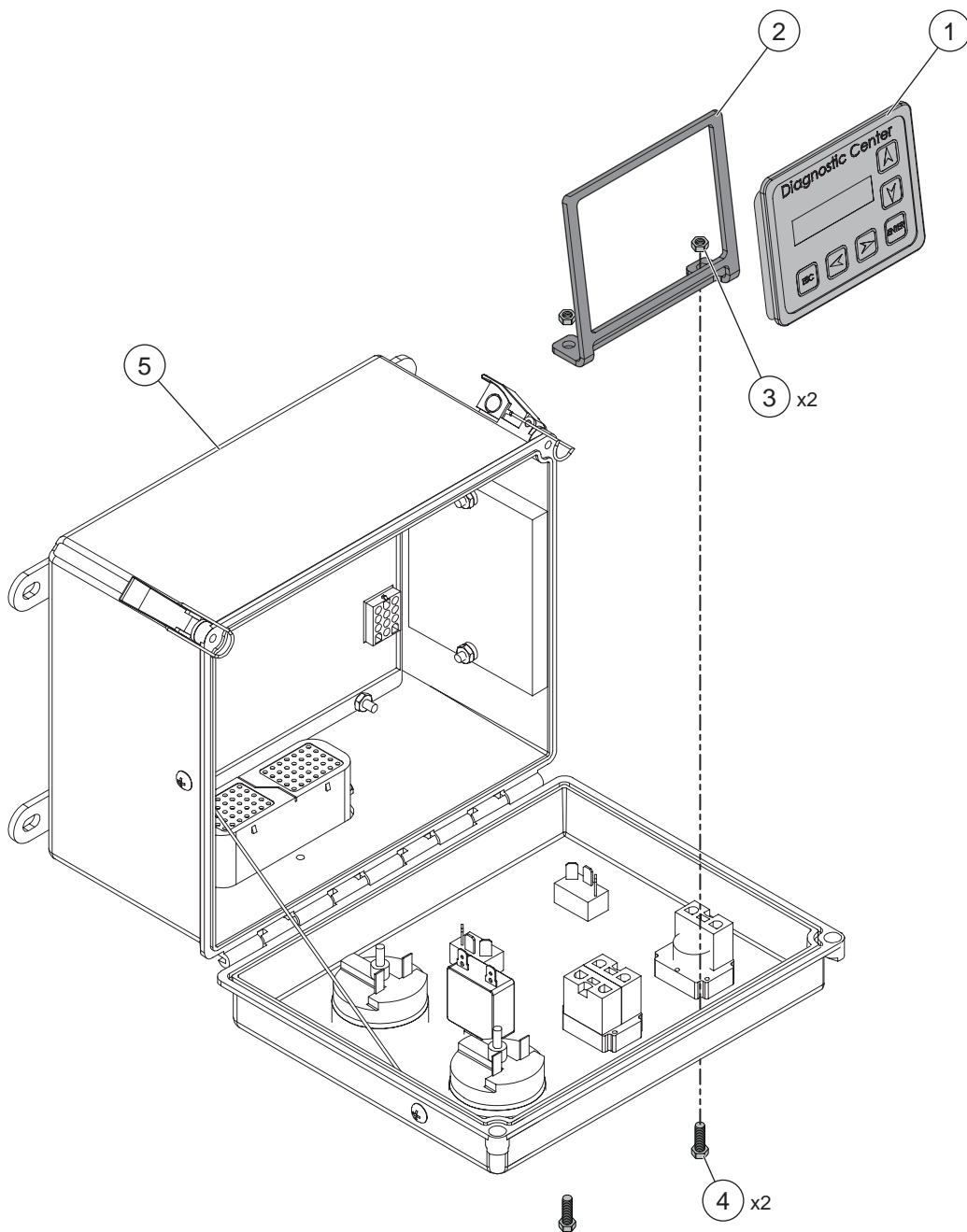


ILLUSTRATION No.  
ART\_4177

Crossover Series

Option -- Onboard Diagnostic Center

## Option -- Onboard Diagnostic Center

| ITEM | PART NO. | QTY | DESCRIPTION                         |
|------|----------|-----|-------------------------------------|
| 1    | 92003    | 1   | Onboard Diagnostic Center           |
| 2    | 26571    | 1   | Bracket, Onboard Diagnostics Center |
| 3    | 50422    | 2   | Screw, Button Head Cap M6 x 18      |
| 4    | 50047    | 2   | Nut, M6 Nylock                      |
| 5    | REF      | --  | Base Controls Assembly              |



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• INCL: Included with assembly

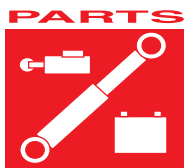
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**NOTES:**

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# SECTION B

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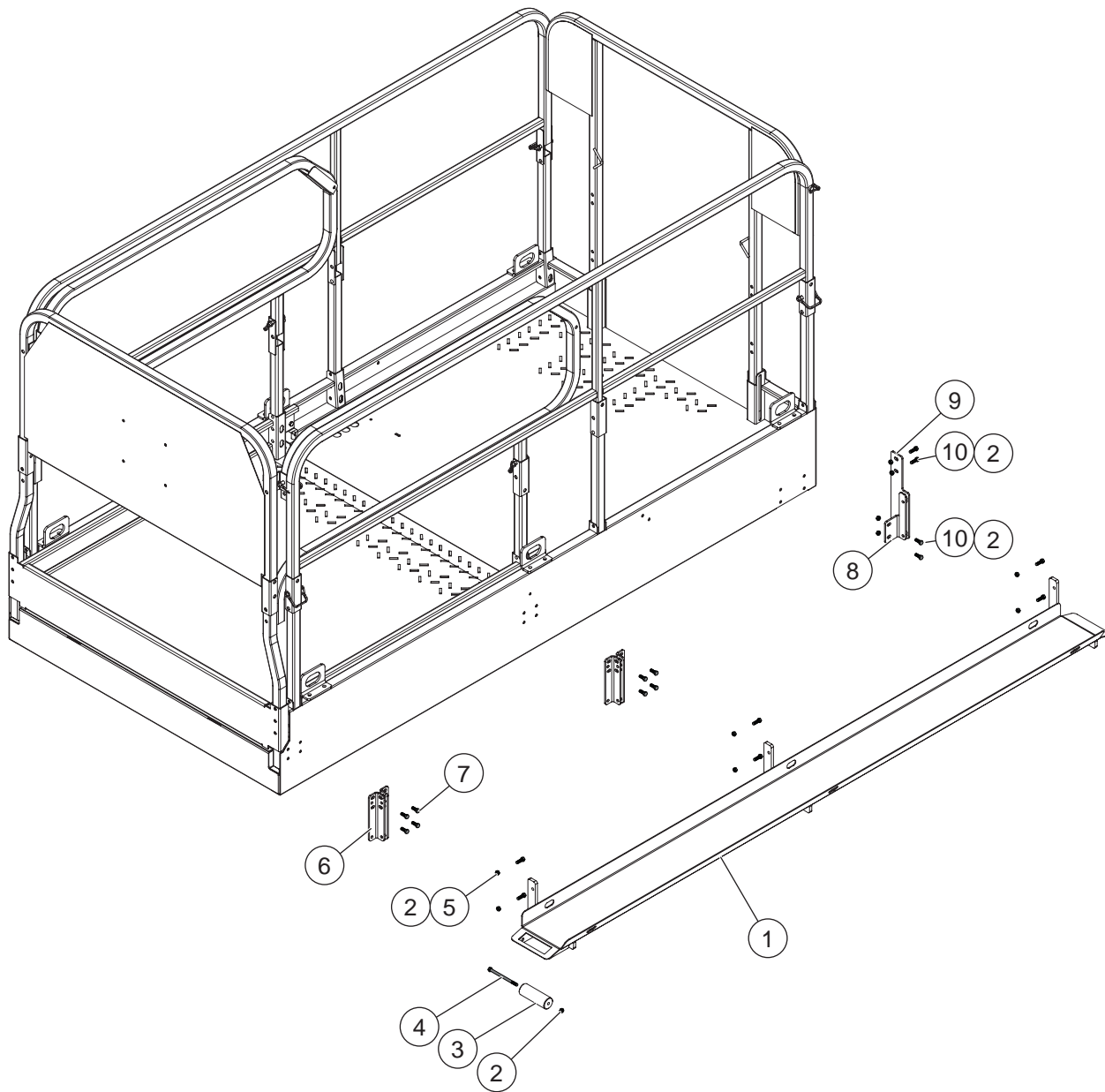


ILLUSTRATION No.  
ART\_4045

Crossover Series

Sheet Materials Rack

## Sheet Materials Rack

| ITEM | PART NO. | QTY | DESCRIPTION          |
|------|----------|-----|----------------------|
| 1    | 26265    | 1   | Sheer Materials Rack |
| 2    | 50048    | 11  | Nut, M8 Nylock       |
| 3    | 26382    | 1   | Roller               |
| 4    | 50361    | 1   | Bolt, M8 x 140       |
| 5    | 50032    | 6   | Bolt, M8 x 30        |
| 6    | 26385    | 4   | Bracket              |
| 7    | 50109    | 8   | Bolt, 5/16 x .75     |
| 8    | 26389    | 1   | Bracket              |
| 9    | 26388    | 1   | Bracket              |
| 10   | 50016    | 4   | Bolt, M8 x 55        |



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• NS: Not a Stock item

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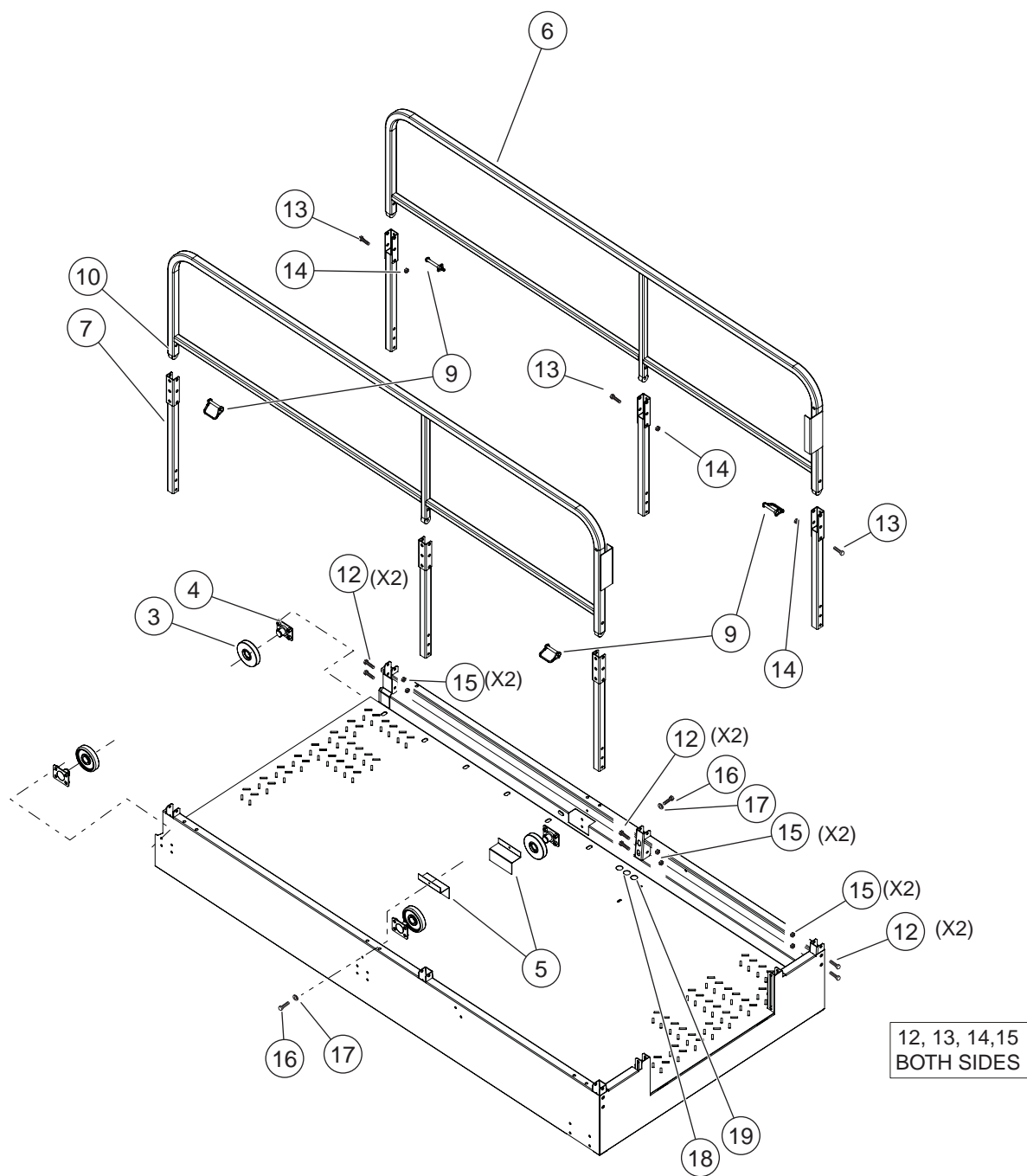


ILLUSTRATION No.  
ART\_4046

Crossover Series

Main Deck & Rails

## Main Deck & Rails, Standard Deck

| ITEM | PART NO. | QTY | DESCRIPTION                       |
|------|----------|-----|-----------------------------------|
| 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               |
| 8    | --       | --  | --                                |
| 9    | HDW91057 | 4   | Pin Wire Lock 3/8" X 2.25 W/chain |
| 10   | 16573    | 1   | Rail Weld Main Upper Lh           |
| 11   | --       | --  | --                                |
| 12   | 50106    | 12  | Screw, 5/16" - 18, 2" Lg          |
| 13   | 50099    | 6   | Screw 3/8"-16 X 2.00              |
| 14   | HDW5039  | 6   | Lock Nut 3/8"-16                  |
| 15   | HDW8304  | 12  | Nut 5/16"-18                      |
| 16   | 50195    | 2   | Screw, Hex Head, 1/4" - 20 X 1/2" |
| 17   | 50157    | 2   | Flat Washer, 11/32" Id            |
| 18   | 90208    | 1   | Cap, Steel 1.0" Dia Hole          |
| 19   | 8479     | 2   | Bushing, 3/4" Id                  |



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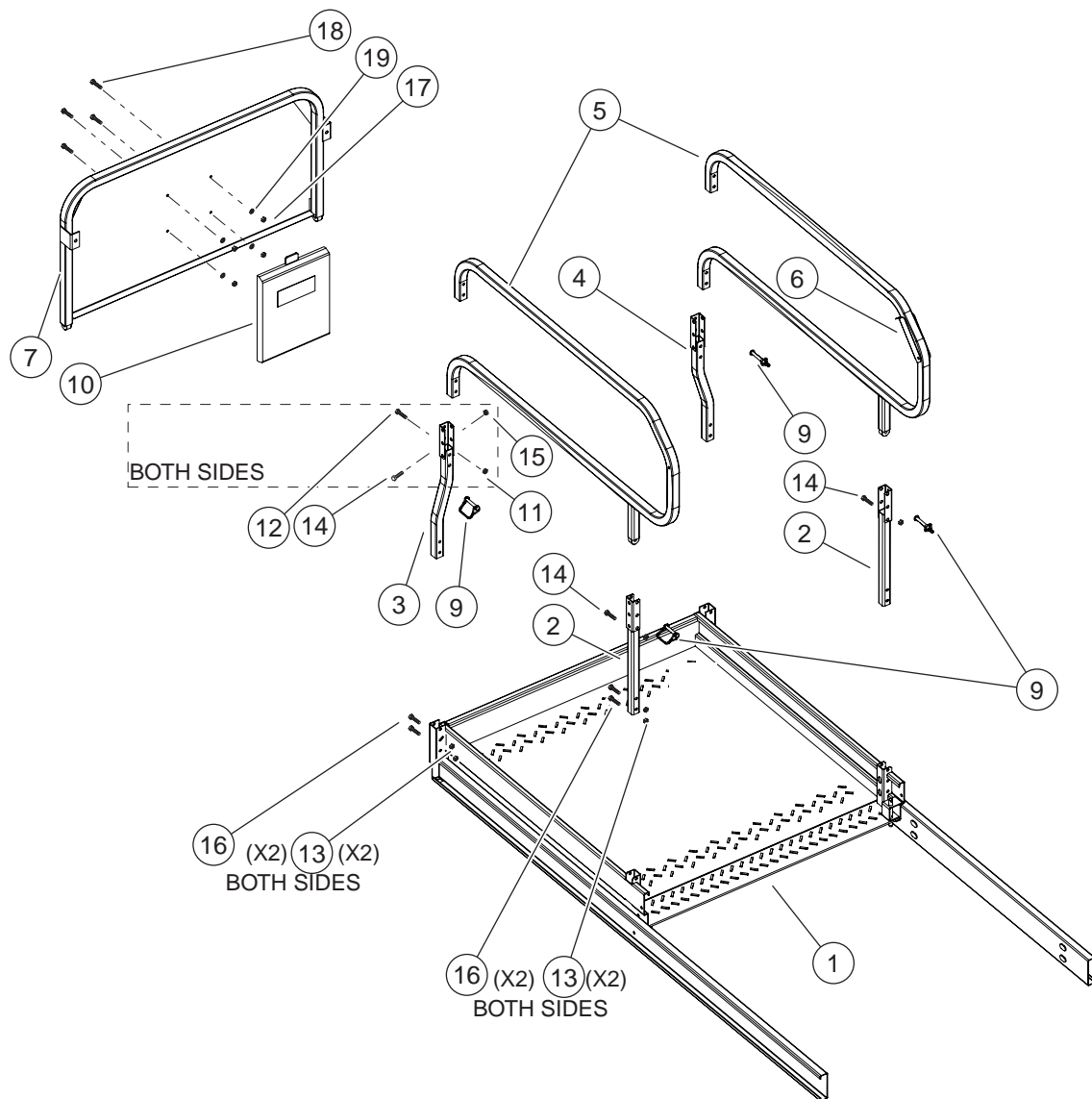


ILLUSTRATION No.  
ART\_4047

Crossover Series

Deck Extension



## Deck Extension, Standard Deck

| ITEM | PART NO. | QTY | DESCRIPTION                       |
|------|----------|-----|-----------------------------------|
| 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          |
| 11   | 50048    | 2   | Nut, M8 Nylock                    |
| 12   | 50018    | 2   | Bolt, M8 x 80                     |
| 13   | HDW8304  | 8   | Nut 5/16"-18                      |
| 14   | 50099    | 4   | Hex Cap Screw 3/8"-16 X 2.00      |
| 15   | HDW5039  | 4   | Locknut 3/8"-16                   |
| 16   | 50106    | 8   | Hex Cap Screw 5/16"-18 X 2"       |
| 17   | 50166    | 4   | Lock Nut 1/4"-20                  |
| 18   | 50091    | 4   | Hex Cap Screw 1/4"-20 X 3/4"      |
| 19   | 50157    | 4   | Flat Washer 11/32" Id             |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only





## Deck Extension Roller Assembly, Standard Deck

| ITEM | PART NO. | QTY | DESCRIPTION           |
|------|----------|-----|-----------------------|
| 1    | 5918     | 1   | Retaining Ring        |
| 2    | HDW8370  | 1   | Washer                |
| 3    | 13230    | 1   | Roller                |
| 4    | 13267    | 1   | Roller Plate Weldment |
| 5    | 50350    | 4   | Washer, 5/16 std      |
| 6    | 50126    | 4   | Bolt, HHCS 5/16 x .75 |



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• INCL: Included with assembly

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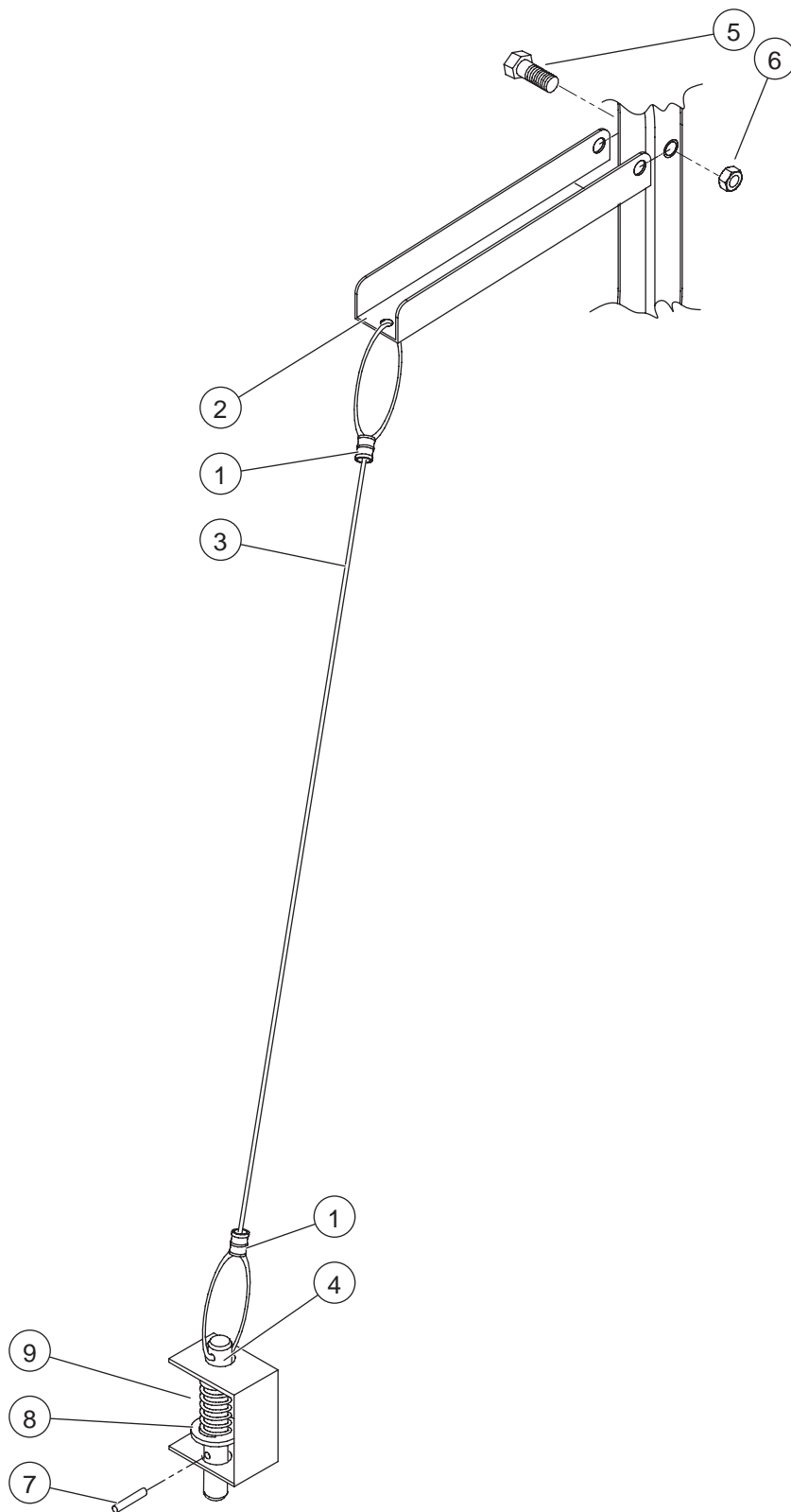


ILLUSTRATION No.  
ART\_4051

Crossover Series

Deck Extension Locking Pin Assembly

## Deck Extension Locking Pin Assembly

| ITEM | PART NO. | QTY   | DESCRIPTION                   |
|------|----------|-------|-------------------------------|
| --   | 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    | 50106    | 1     | Screw, 5/16" - 18, 2" Lg      |
| 6    | HDW8304  | 1     | Nut, 5/16" - 18               |
| 7    | 50180    | 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             |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

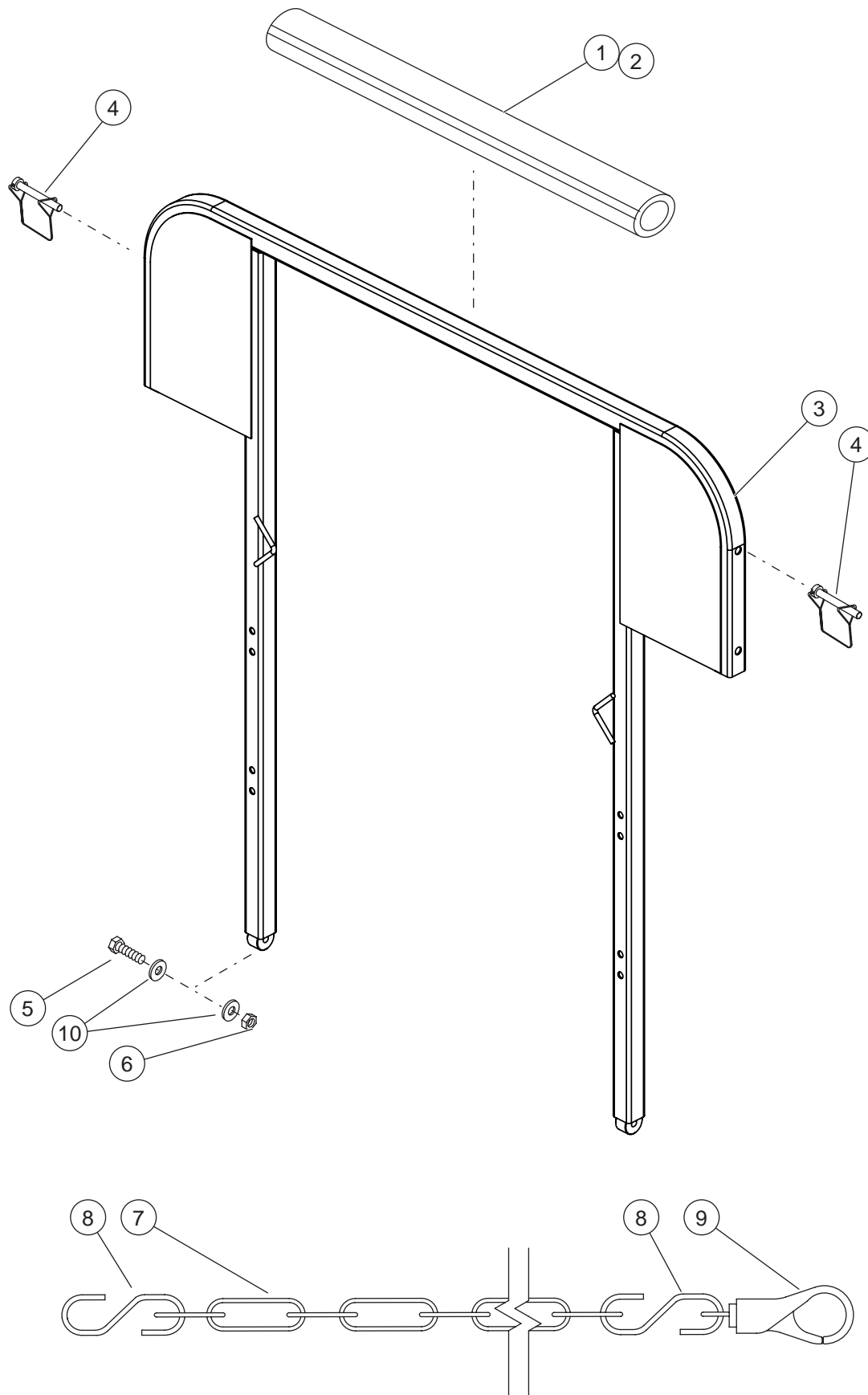


ILLUSTRATION No.  
ART\_4049

Crossover Series

Entry Chain & Top Rail

## Entry Chain & Top Rail

| ITEM | PART NO. | QTY   | DESCRIPTION                                |
|------|----------|-------|--|
| 1    | 7048     | 1     | Cover, Rail Pad (Option Only)              |
| 2    | 7805     | 3 FT. | Pad, Rail (Option Only)                    |
| 3    | 16581    | 1     | Gate, Sheet Load                           |
| 4    | 50186    | 2     | Pin, Lock                                  |
| 5    | 50106    | 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   | 50157    | 4     | Flat Washer 11/32" Id                      |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

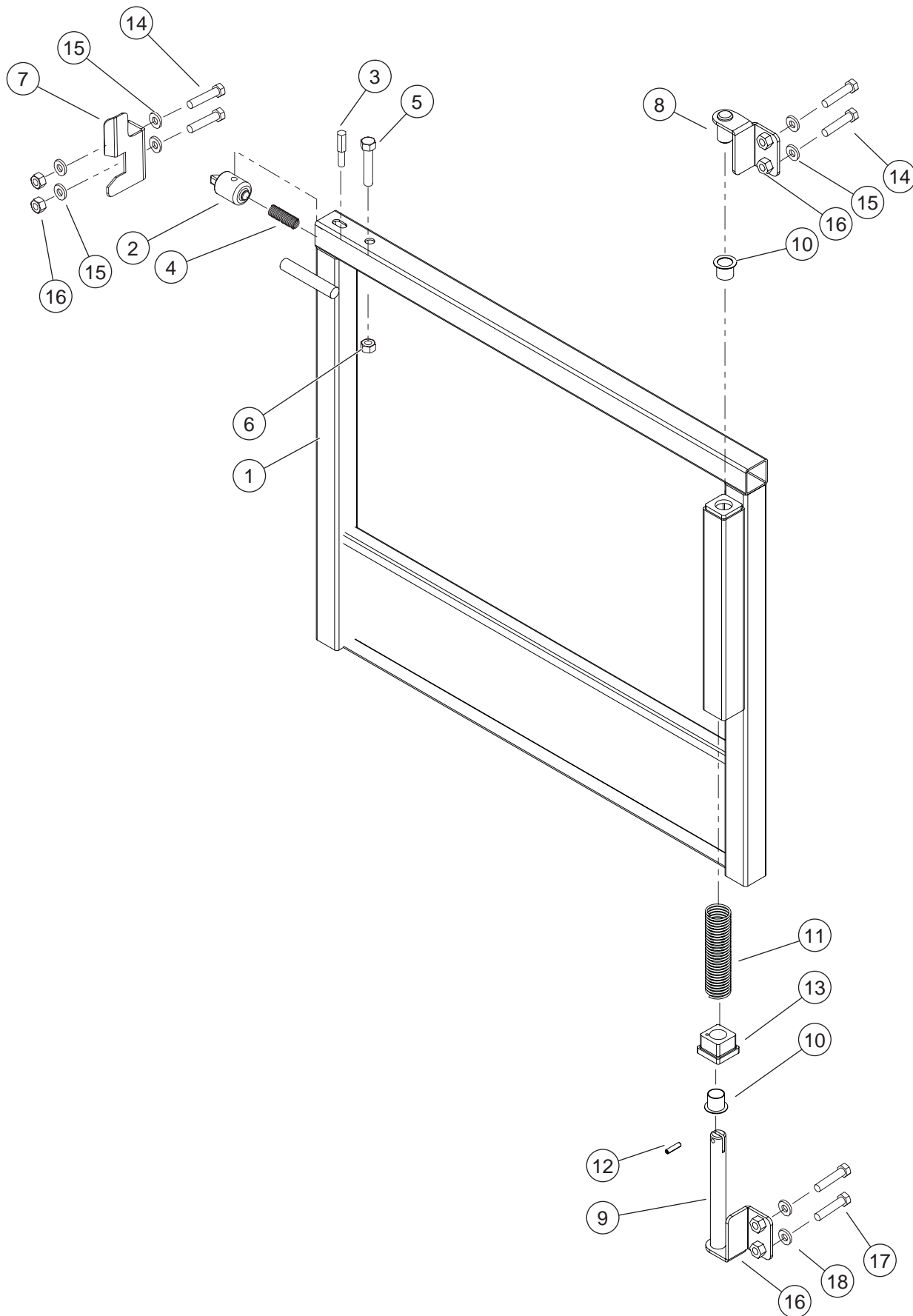


ILLUSTRATION No.  
ART\_4050

Crossover Series

Option -- Swing Gate

## Option -- Swing Gate

| ITEM | PART NO. | QTY | DESCRIPTION                              |
|------|----------|-----|--|
| 1    | 16635    | 1   | Swing Gate Weldment                      |
| 2    | 40003    | 1   | Pin, Latch                               |
| 3    | 40006    | 1   | Rod, Latch Lever                         |
| 4    | 7055     | 1   | Spring, Latch                            |
| 5    | 50096    | 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   | 50181    | 1   | Pin, Slotted Spring, 3/16" Dia X 3/4" Lg |
| 13   | 13272    | 1   | Block, Pivot                             |
| 14   | 50104    | 4   | Hex Cap Screw 5/16"-18 x 2.25"           |
| 15   | 50063    | 8   | Flat Washer 0.328 ID                     |
| 16   | HDW8304  | 6   | Locnut 5/16"-18                          |
| 17   | 50109    | 2   | Hex Cap Screw 5/16"-18 x 3/4"            |
| 18   | 50157    | 2   | Flat Washer 11/32" ID                    |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

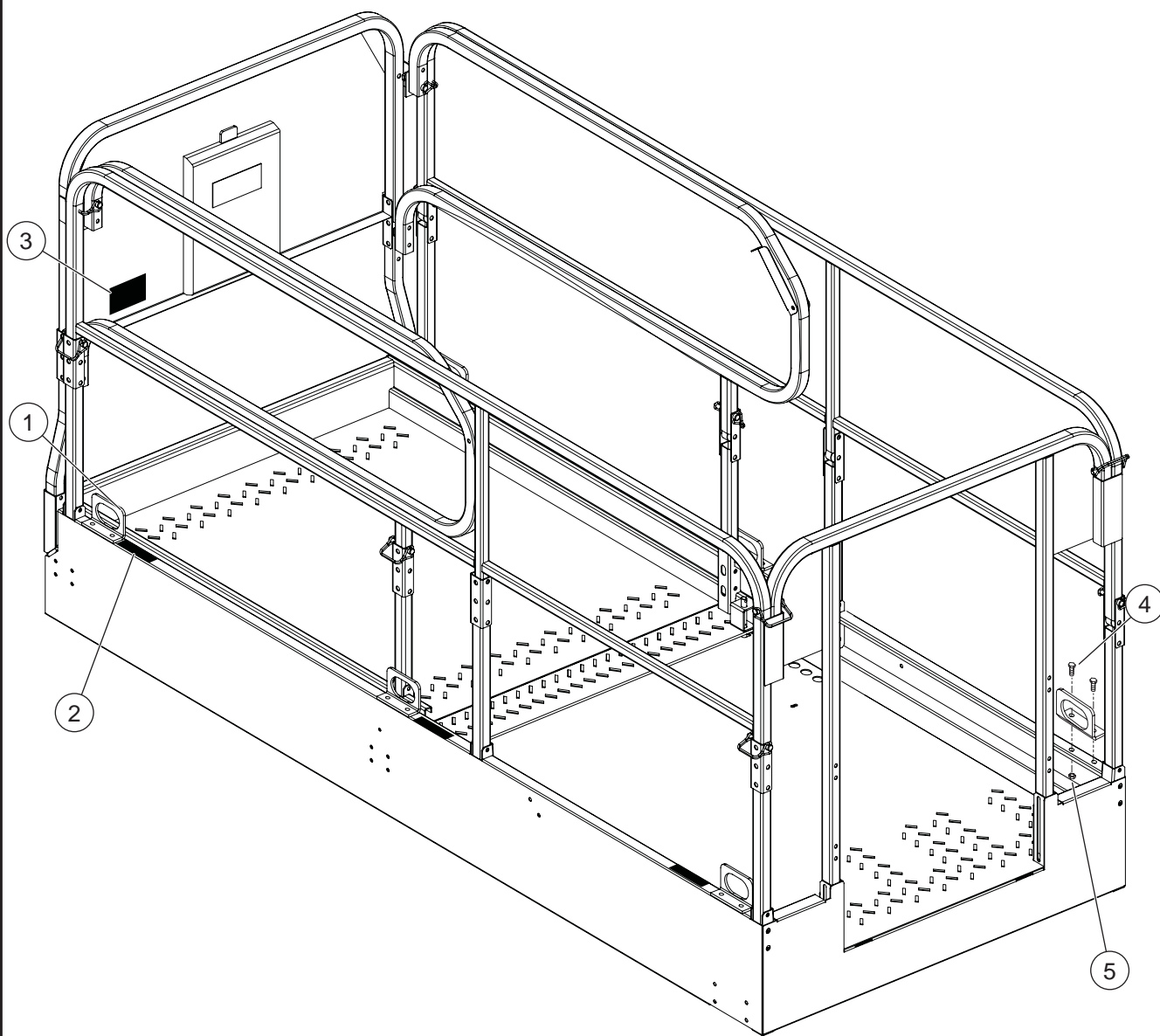


ILLUSTRATION No.  
ART\_4048

Crossover Series

Lanyard Attachment Option



## Option -- Lanyard Attachment Points

| ITEM | PART NO. | QTY | DESCRIPTION               |
|------|----------|-----|---------------------------|
| 1    | 3923     | 6   | Brkt, Attachment Point    |
| 2    | 8605     | 6   | Decal, Lanyard Attachment |
| 3    | 8606     | 1   | Decal, Warning Restraint  |
| 4    | 50148    | 12  | Screw, 3/8" - 16, 3/4" Lg |
| 5    | HDW5039  | 12  | Lock Nut, 3/8" - 16       |

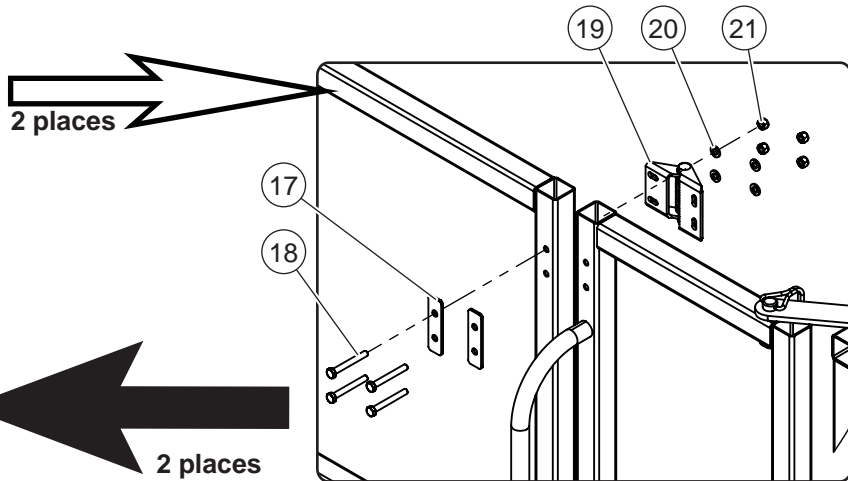
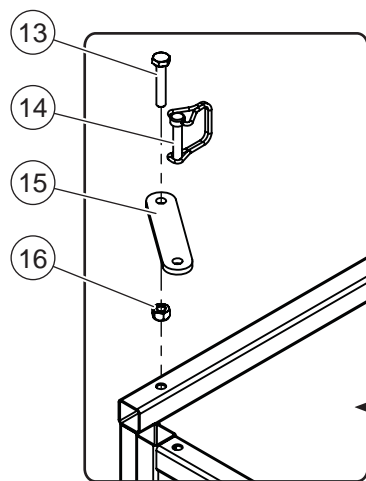
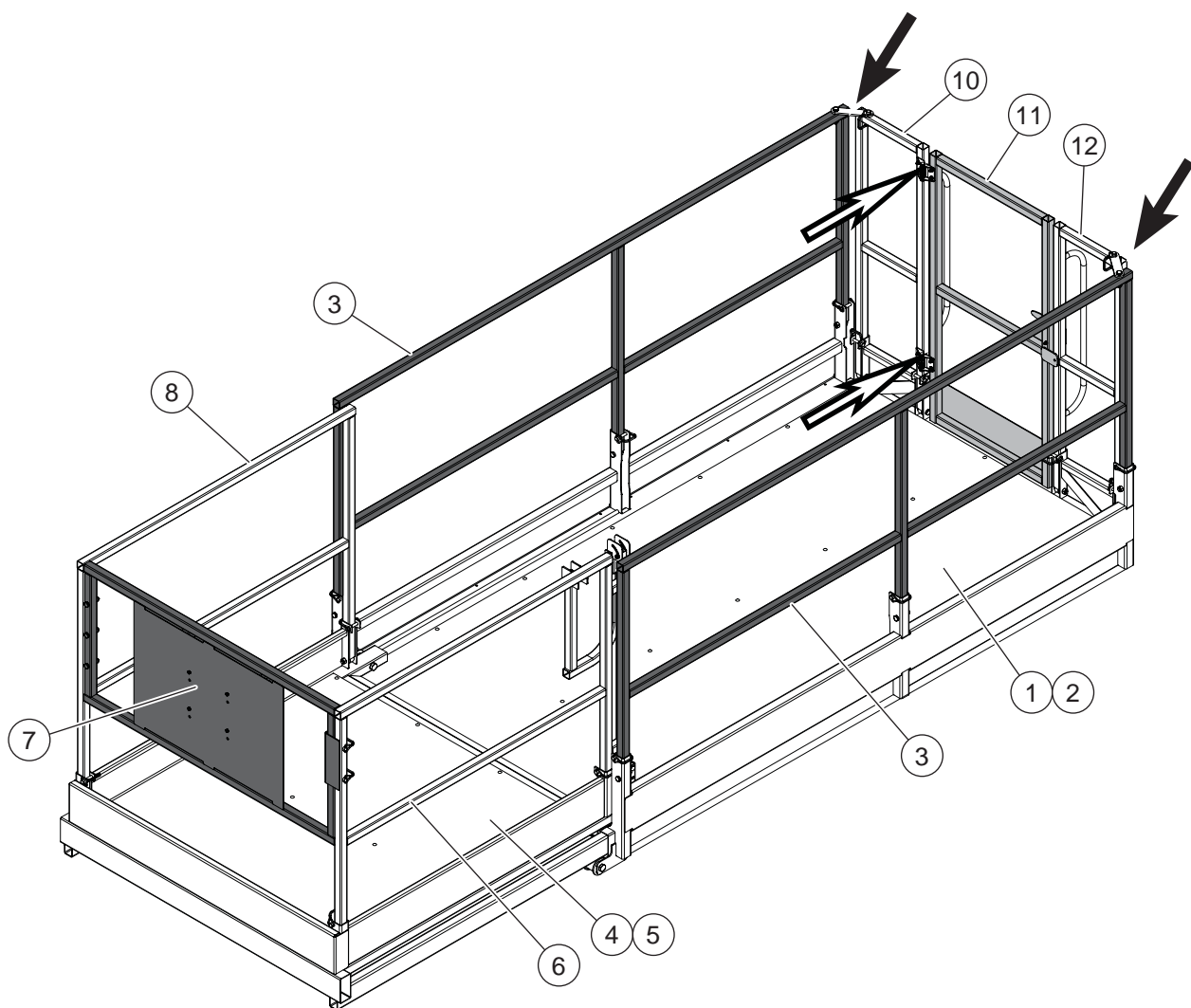


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## Option -- 55" Deck, 1 of 3

| ITEM | PART NO. | QTY | DESCRIPTION                 |
|------|----------|-----|-----------------------------|
| 1    | 26444    | 1   | Platform Weldment           |
| 2    | 26435    | 1   | Platform Decking, Main      |
| 3    | 26330    | 2   | Rail Weldment               |
| 4    | 26445    | 1   | Deck Extension Weldment     |
| 5    | 26436    | 1   | Platform Decking, Extension |
| 6    | 26352    | 1   | Rail Weldment               |
| 7    | 26441    | 1   | Material Gate Weldment      |
| 8    | 26348    | 1   | Rail Weldment               |
| 9    | --       | --  | --                          |
| 10   | 26440    | 1   | Rail Weldment               |
| 11   | 26342    | 1   | Gate Weldment               |
| 12   | 26439    | 1   | Rail Weldment               |
| 13   | 50021    | 2   | Bolt, HHCS M10 x 55         |
| 14   | 50186    | 2   | Locking Pin                 |
| 15   | 26566    | 2   | Corner Cap                  |
| 16   | 50049    | 2   | Nut, M10 Nylock             |
| 17   | 19239    | 4   | Hinge Plate                 |
| 18   | 50262    | 8   | Bolt, HHCS M6 x 50          |
| 19   | 91888    | 2   | Hinge                       |
| 20   | 50000    | 8   | Washer, M6 std              |
| 21   | 50047    | 8   | Nut, M6 Nylock              |

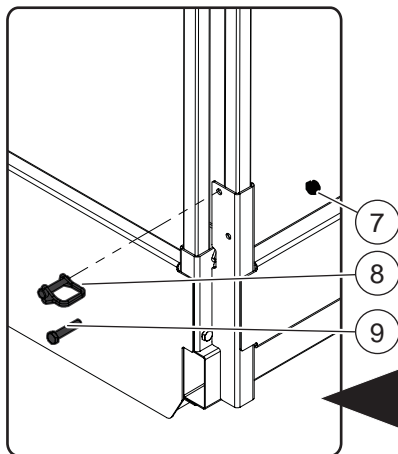
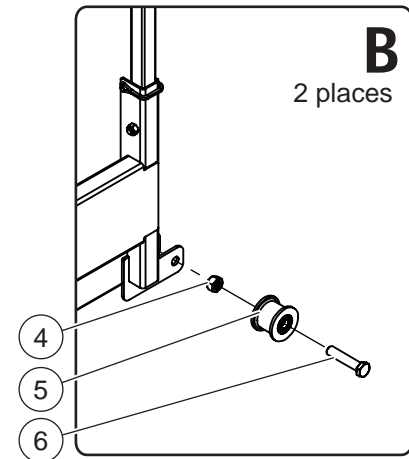
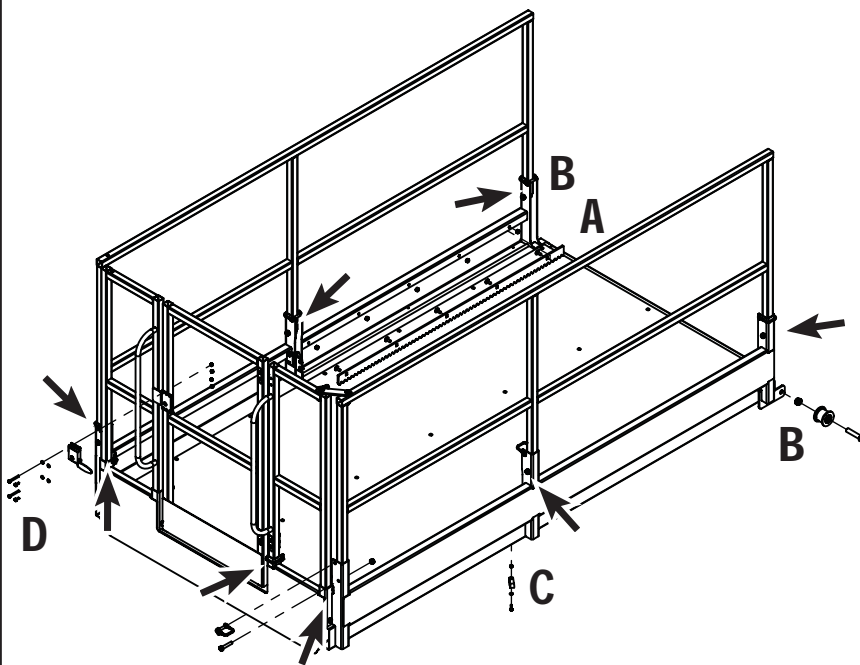
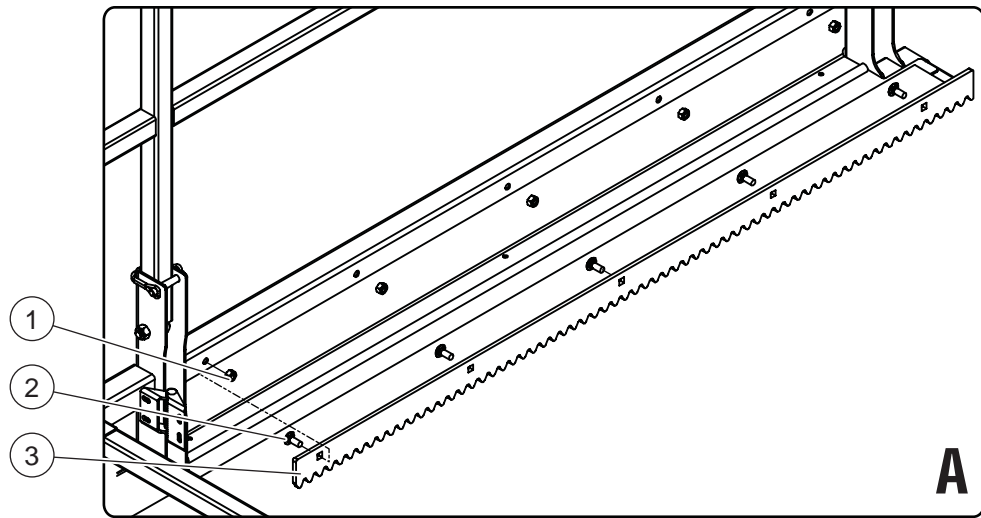


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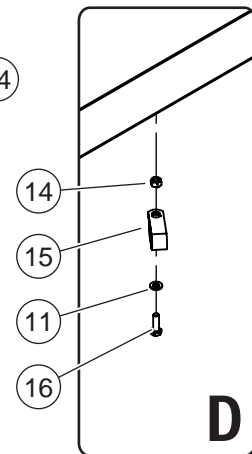
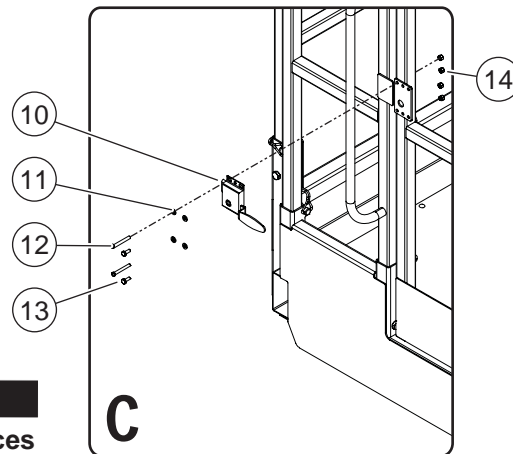
• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



8 places



Option -- 55" Deck, 2 of 3

## Option -- 55" Deck, 2 of 3

| ITEM | PART NO. | QTY | DESCRIPTION         |
|------|----------|-----|---------------------|
| 1    | 50048    | 5   | Nut, M8 Nylock      |
| 2    | 50225    | 5   | Bolt, CARB M8 x 20  |
| 3    | 26564    | 1   | Lock Plate          |
| 4    | 50398    | 2   | Nut, 5/8 Nylock     |
| 5    | 87126    | 2   | Roller              |
| 6    | 50153    | 2   | Bolt, HHCS 5/8 x 3  |
| 7    | 50049    | 8   | Nut, M10 Nylock     |
| 8    | 50182    | 8   | Locking Pin         |
| 9    | 50021    | 8   | Bolt, HHCS M10 x 55 |
| 10   | 92836    | 1   | Gate Latch          |
| 11   | 50000    | 4   | Washer, M6 std      |
| 12   | 50135    | 2   | Bolt, HHCS M6 x 45  |
| 13   | 50296    | 2   | Bolt, HHCS M6 x 15  |
| 14   | 50047    | 5   | Nut, M6 Nylock      |
| 15   | 7041     | 1   | P-Clip              |
| 16   | 50028    | 1   | Bolt, HHCS M6 x 20  |

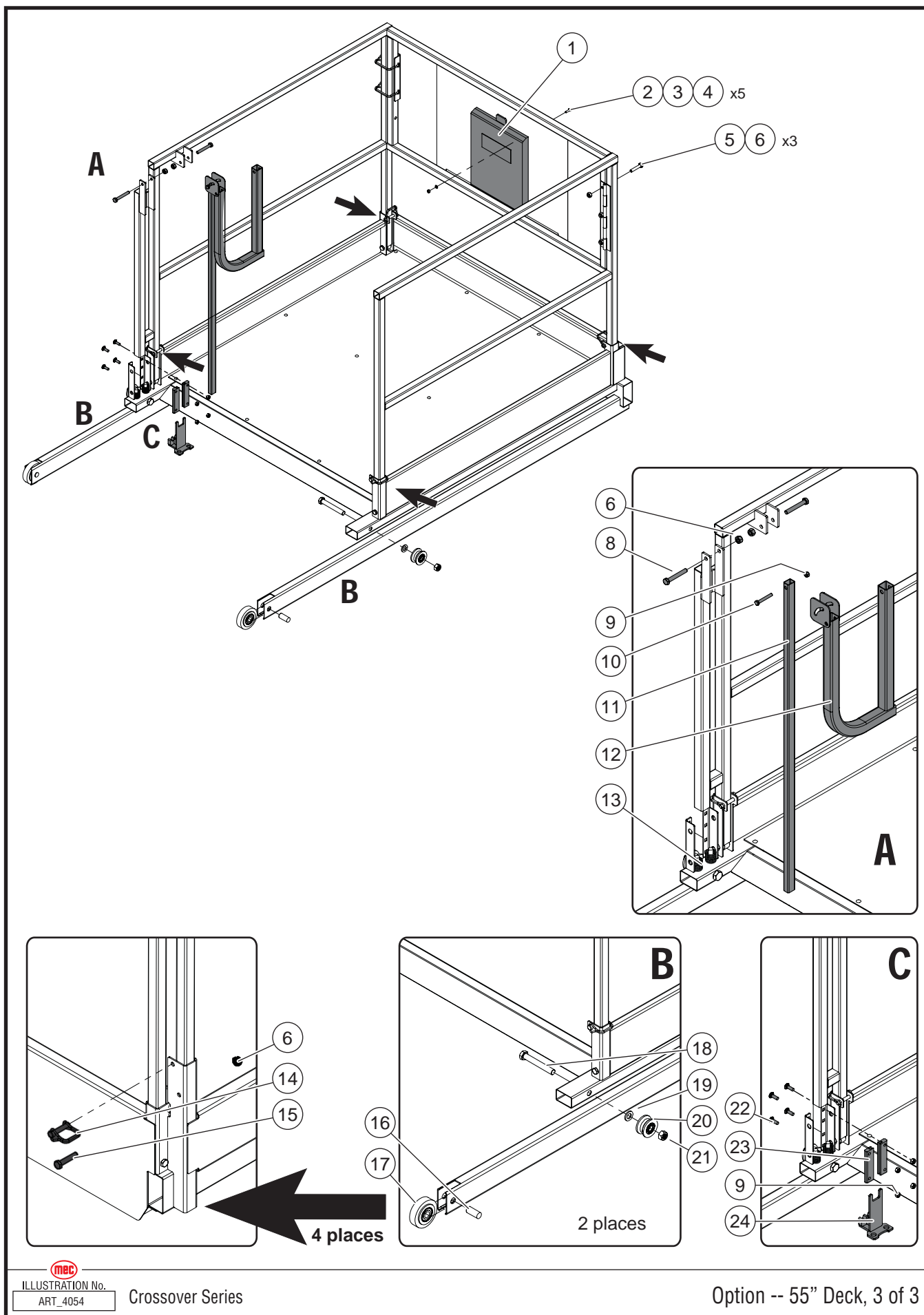


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## Option -- 55" Deck, 3 of 3

| ITEM | PART NO. | QTY | DESCRIPTION                    |
|------|----------|-----|--------------------------------|
| 1    | 8909     | 1   | Manual Case                    |
| 2    | 50028    | 5   | Bolt, HHCS M6 x 20             |
| 3    | 50000    | 5   | Washer, M6 std                 |
| 4    | 50047    | 5   | Nut, M4 Nylock                 |
| 5    | 50020    | 3   | Bolt, HHCS M10 x 50            |
| 6    | 50049    | 8   | Nut, M10 Nylock                |
| 7    | --       | --  | --                             |
| 8    | 50022    | 2   | Bolt, HHCS M10 x 70            |
| 9    | 50048    | 5   | Nut, M8 Nylock                 |
| 10   | 50015    | 1   | Bolt, HHCS M8 x 50             |
| 11   | 26443    | 1   | Inner Actuator, Deck Extension |
| 12   | 26560    | 1   | Release Handle                 |
| 13   | 92866    | 2   | Spring                         |
| 14   | 50182    | 4   | Locking Pin                    |
| 15   | 50021    | 4   | Bolt, HHCS M10 x 55            |
| 16   | 26450    | 2   | Bearing Pin                    |
| 17   | 87124    | 2   | Roller                         |
| 18   | 50397    | 2   | Bolt, HHCS 5/8 x 4.5           |
| 19   | 50004    | 2   | Washer, M16 std                |
| 20   | 87126    | 2   | Roller                         |
| 21   | 50398    | 2   | Nut, 5/8 Nylock                |
| 22   | 50418    | 4   | Bolt, CARB M8 x 25             |
| 23   | 26329    | 2   | Release Guide                  |
| 24   | 26326    | 1   | Release                        |

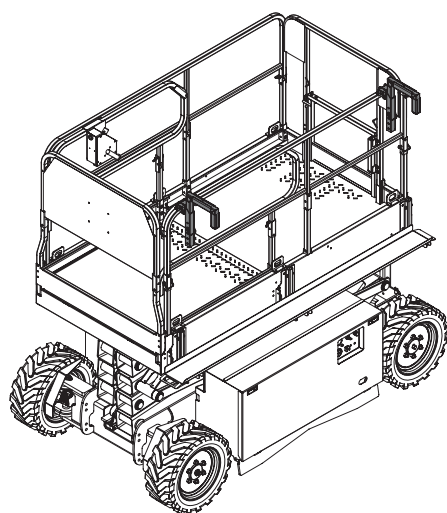
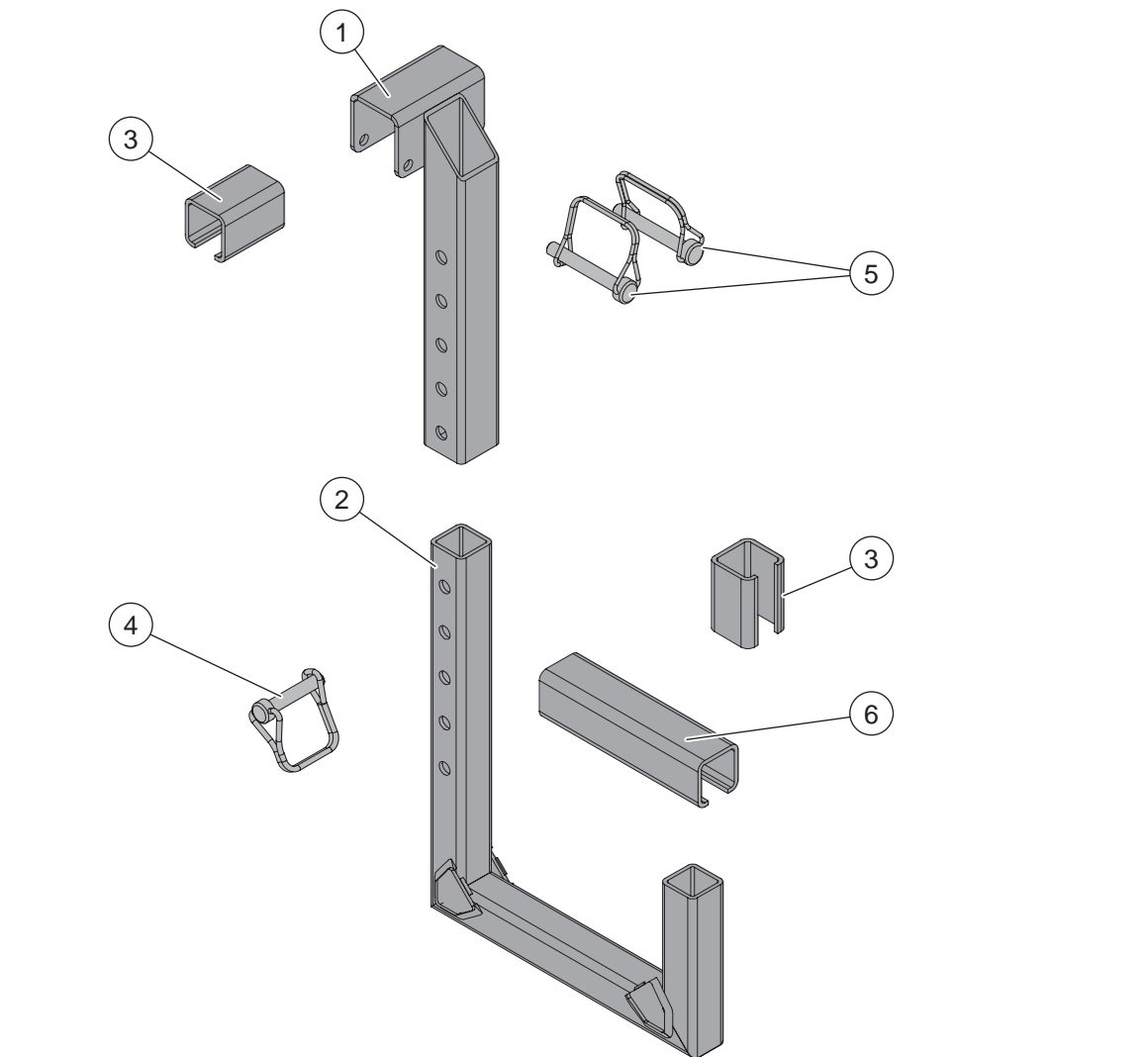


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• INCL: Included with assembly

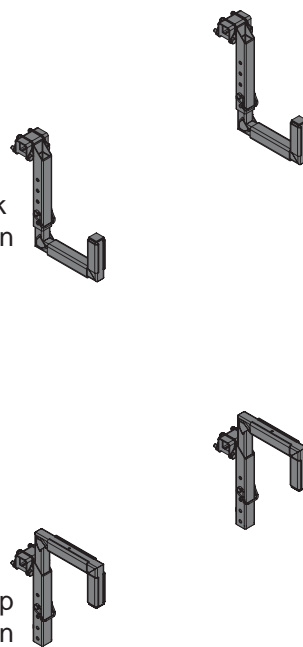
• NS: Not a Stock item

• REF: Reference only



Pipe Rack Configuration

Material Clamp Configuration





## Option -- Material Clamps/Pipe Racks

NOTE: Material Clamps/Pipe Racks may be used only on the 47" (1.2 m) deck equipped with the Sheet Material Rack. DO NOT use on the optional 55" (1.4 m) wide deck. See the Operator's Manual for use instructions.

| ITEM | PART NO. | QTY | DESCRIPTION                                |
|------|----------|-----|--|
| --   | 26458    | --  | Material Clamp/ Pipe Rack -- sold in pairs |
| 1    | 26459    | 1   | Top Weldment                               |
| 2    | 26415    | 1   | Sliding Tube Weldment                      |
| 3    | 92840    | 2   | Wear Strip                                 |
| 4    | 50182    | 1   | Spring Clip                                |
| 5    | 50401    | 2   | Spring Clip                                |
| 6    | 92852    | 1   | Wear Strip                                 |



• as req: as required

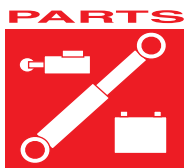
• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

**NOTES:**

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# SECTION C

## SCISSOR ASSEMBLY

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Item #9 -- HDW13175 -- 17 places



Item #21 -- 11 places



Item #28 -- 12 places

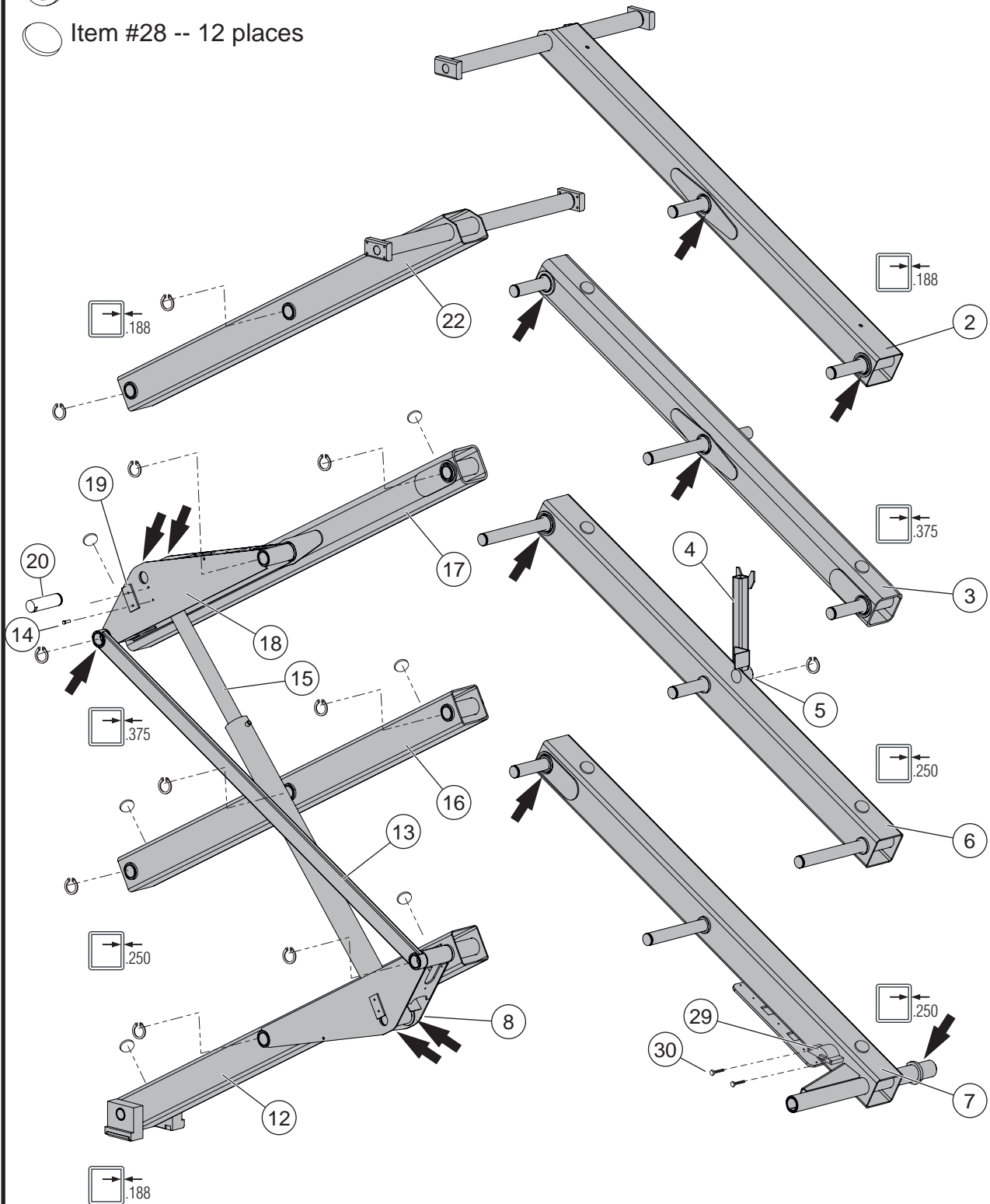


ILLUSTRATION No.  
ART\_4036

Crossover Series

Scissor Assembly, 2659

## Scissor Assembly, 2659 Standard

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | --       | --  | --  |
| 2    | 16746    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16601    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| 3    | 16599    | 1   | Beam Section, with pins                             |
| 4    | 30518    | 1   | Maintenance Lock                                    |
| 5    | 8675     | 2   | Bearing   |
| 6    | 16600    | 1   | Beam Section, with pins                             |
| 7    | 16598    | 1   | Beam Section, with pins                             |
| 8    | HDW8899  | 4   | Retaining Ring                                      |
| 9    | HDW13175 | 17  | Thrust Bearing                                      |
| 10   | --       | --  | --  |
| 11   | --       | --  | --  |
| 12   | 16602    | 1   | Beam Section, with bearings                         |
| --   | 6669     | 4   | Bearing   |
| 13   | 13931    | 1   | Beam Support  |
| 14   | HDW6455  | 4   | Screw, 1/4-20 x .5                                  |
| 15   | REF      | --  | Lift Cylinder -- See Section E                      |
| 16   | 16603    | 1   | Beam Section, with bearings                         |
| --   | 6669     | 6   | Bearing   |
| 17   | 16502    | 1   | Beam Section, with bearings                         |
| --   | 6669     | 6   | Bearing   |
| 18   | 16512    | 2   |   |
| 19   | 14538    | 2   | Cylinder Mount                                      |
| 20   | 14537    | 2   | Cylinder Retaining Bracket                          |
| 21   | 6701     | 11  | Retaining Ring                                      |
| 22   | 16747    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16605    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| 23   | --       | --  | --  |
| 24   | --       | --  | --  |
| 25   | --       | --  | --  |
| 26   | --       | --  | --  |
| 27   | --       | --  | --  |
| 28   | 25429    | 12  | Spacer Pad  |
| 29   | 90844    | 1   | Angle Sensor  |
| 30   | HDW6831  | 2   | Screw, 1.4-20 x 2                                   |



Item #14 -- 13 places



Item #15 -- 14 places



Item #16 -- 12 places

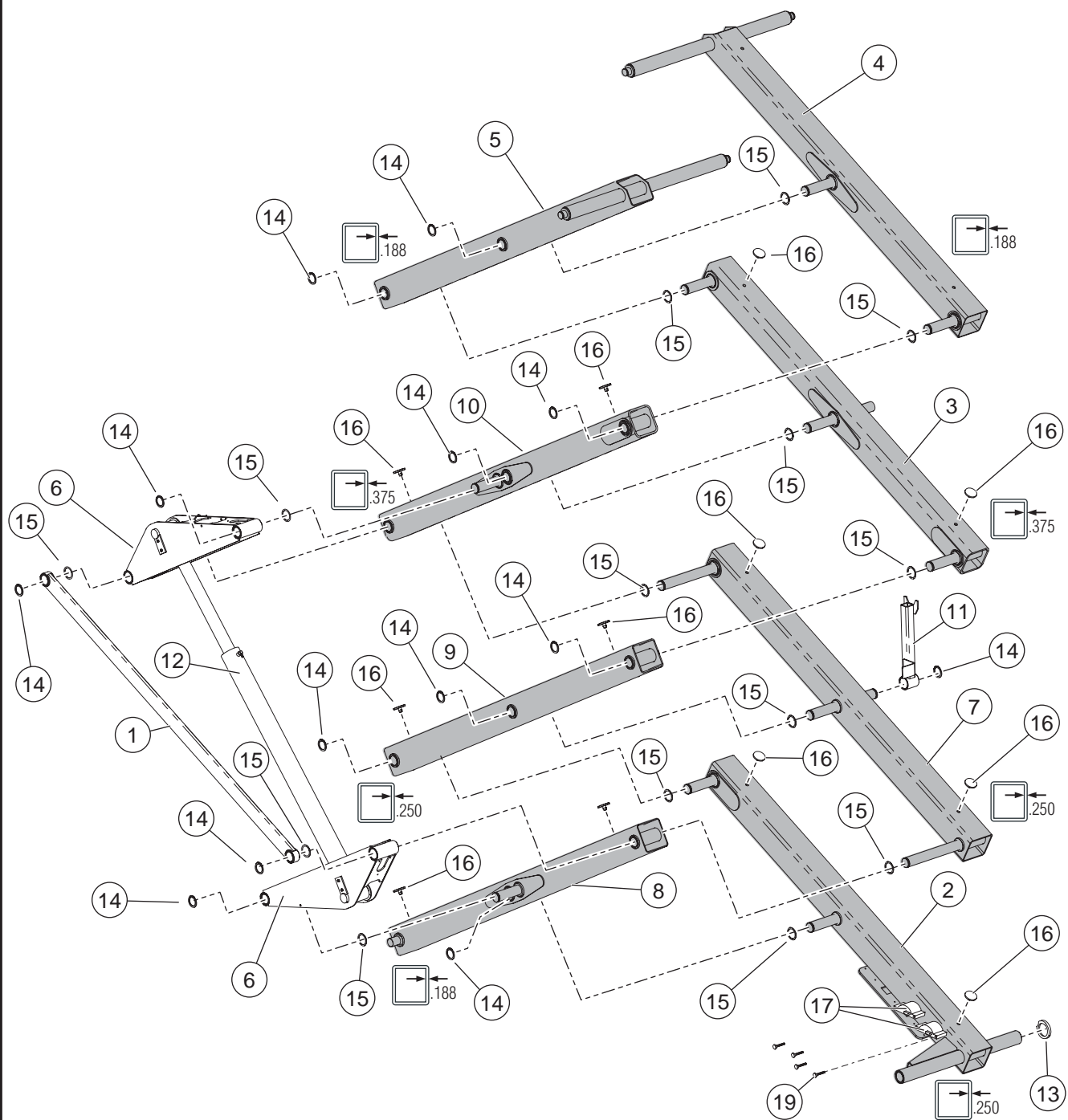


ILLUSTRATION No.  
ART\_4037

Crossover Series

Scissor Assembly, 2659 with optional Overload Sensing System

## Scissor Assembly, 2659 w/ optional Overload System

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 16585    | 1   | Beam Support  |
| 2    | 16695    | 1   | Beam Section, with pins                             |
| 3    | 16696    | 1   | Beam Section  |
| 4    | 16746    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16601    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| 5    | 16747    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16605    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| 6    | 16676    | 2   | Cylinder Mount                                      |
| 7    | 16600    | 1   | Beam Section, with pins                             |
| 8    | 16692    | 1   | Beam Section  |
| 9    | 16603    | 1   | Beam Section, with pins                             |
| 10   | 16693    | 1   | Beam Section  |
| 11   | 30518    | 1   | Maintenance Lock                                    |
| 12   | REF      | 1   | Lift Cylinder -- See Section E                      |
| 13   | --       | --  | --  |
| 14   | 6701     | 13  | Retaining Ring                                      |
| 15   | HDW13175 | 14  | Thrust Bearing                                      |
| 16   | 25429    | 12  | Spacer Pad  |
| 17   | 90844    | 2   | Angle Sensor  |
| 18   | --       | --  | --  |
| 19   | HDW6831  | 4   | Screw, 1.4-20 x 2                                   |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

○ Item #13 -- 16 places

↓ ○ Item #14 -- 30 places

○ Item #31 -- 15 places

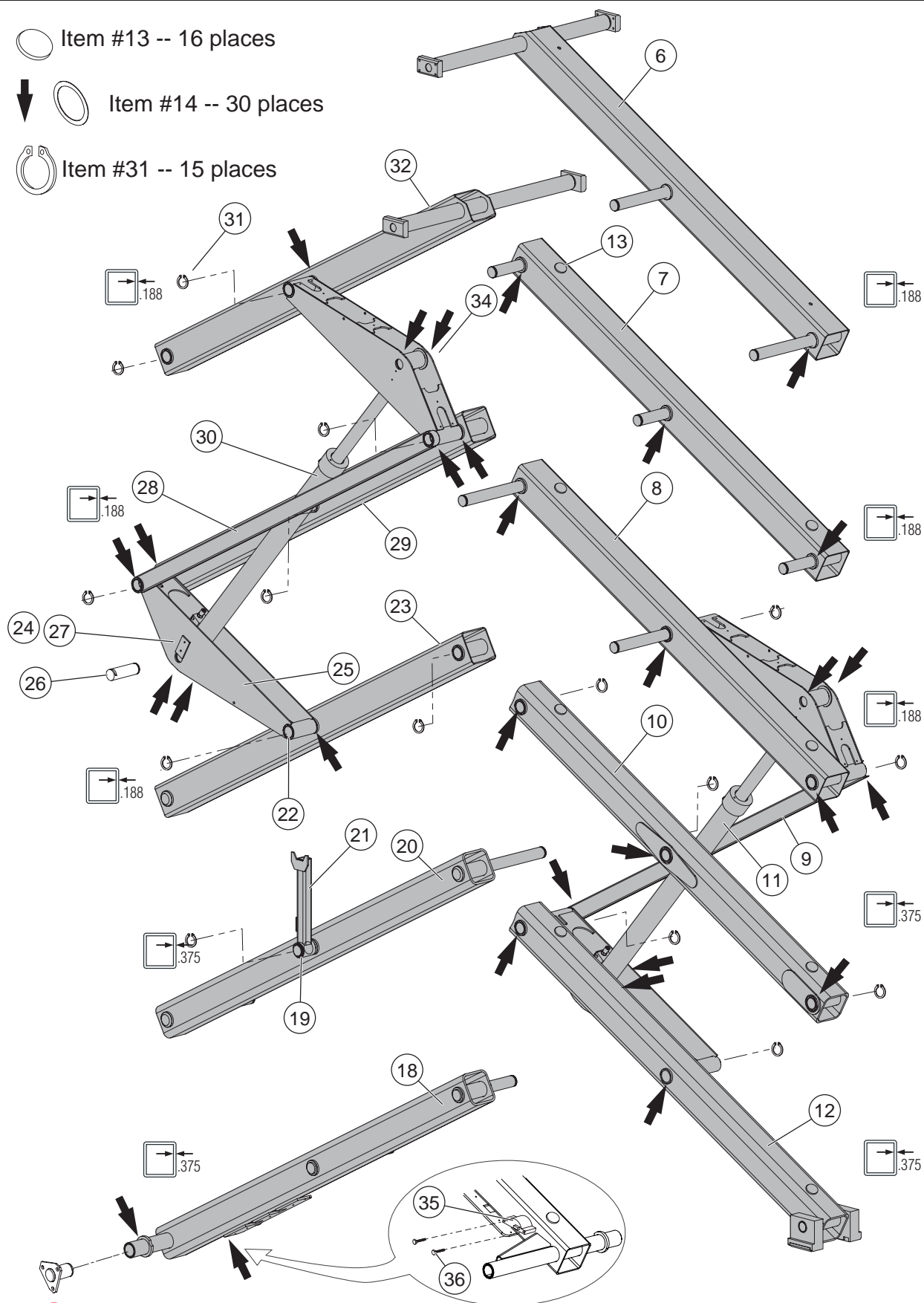


ILLUSTRATION No.  
ART\_4038

Crossover Series

Scissor Assembly, 3259



## Scissor Assembly, 3259 Standard

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | --       | --  | --  |
| 2    | --       | --  | --  |
| 3    | --       | --  | --  |
| 4    | --       | --  | --  |
| 5    | --       | --  | --  |
| 6    | 16748    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16506    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| 7    | 16505    | 1   | Beam, with pins                                     |
| 8    | 16503    | 1   | Beam, with bearings                                 |
| --   | 6669     | 4   | Bearing   |
| 9    | 13931    | 1   | Beam Support  |
| 10   | 16502    | 1   | Beam, with bearings                                 |
| --   | 6669     | 6   | Bearing   |
| 11   | REF      | --  | Lower Lift Cylinder -- See Section E                |
| 12   | 16500    | 1   | Beam, with bearings                                 |
| --   | 6669     | 4   | Bearing   |
| 13   | 25429    | 16  | Spacer Pad  |
| 14   | HDW13175 | 30  | Thrust Bearing                                      |
| 15   | --       | --  | --  |
| 16   | --       | --  | --  |
| 17   | --       | --  | --  |
| 18   | 16507    | 1   | Beam, with pins                                     |
| 19   | 8675     | 2   | Bearing   |
| 20   | 16508    | 1   | Beam, with pins                                     |
| 21   | 30518    | 1   | Maintenance Lock                                    |
| 22   | 30407    | 1   | Pin   |
| 23   | 16509    | 1   | Beam, with pins                                     |
| 24   | 14538    | 4   | Retaining Bracket                                   |
| 25   | 16512    | 4   | Cylinder Mount                                      |
| 26   | 14537    | 4   | Pin, Cylinder Mount                                 |
| 27   | HDW6455  | 8   | Screw, 1/4-20 x .5                                  |
| 28   | 16585    | 1   | Beam Support  |
| 29   | 16510    | 1   | Beam, with bearings                                 |
| --   | 6669     | 6   | Bearing   |
| 30   | REF      | --  | Upper Lift Cylinder -- See Section E                |
| 31   | 6701     | 15  | Retaining Ring                                      |
| 32   | 16749    | 1   | <b>Standard Deck</b> -- Beam Section, with pins     |
|      | 16511    | 1   | <b>Optional 55" Deck</b> -- Beam Section, with pins |
| --   | 6669     | 4   | Bearing   |
| 33   | 14488    | 2   | Slide Block   |
| 34   | HDW8899  | 8   | Retaining Ring                                      |
| 35   | 90844    | 1   | Angle Sensor  |
| 36   | HDW6831  | 2   | Screw. 1/4-20 x 2                                   |

• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only





Item #3 -- 26 places



Item #4 -- 18 places



Item #19 -- 16 places

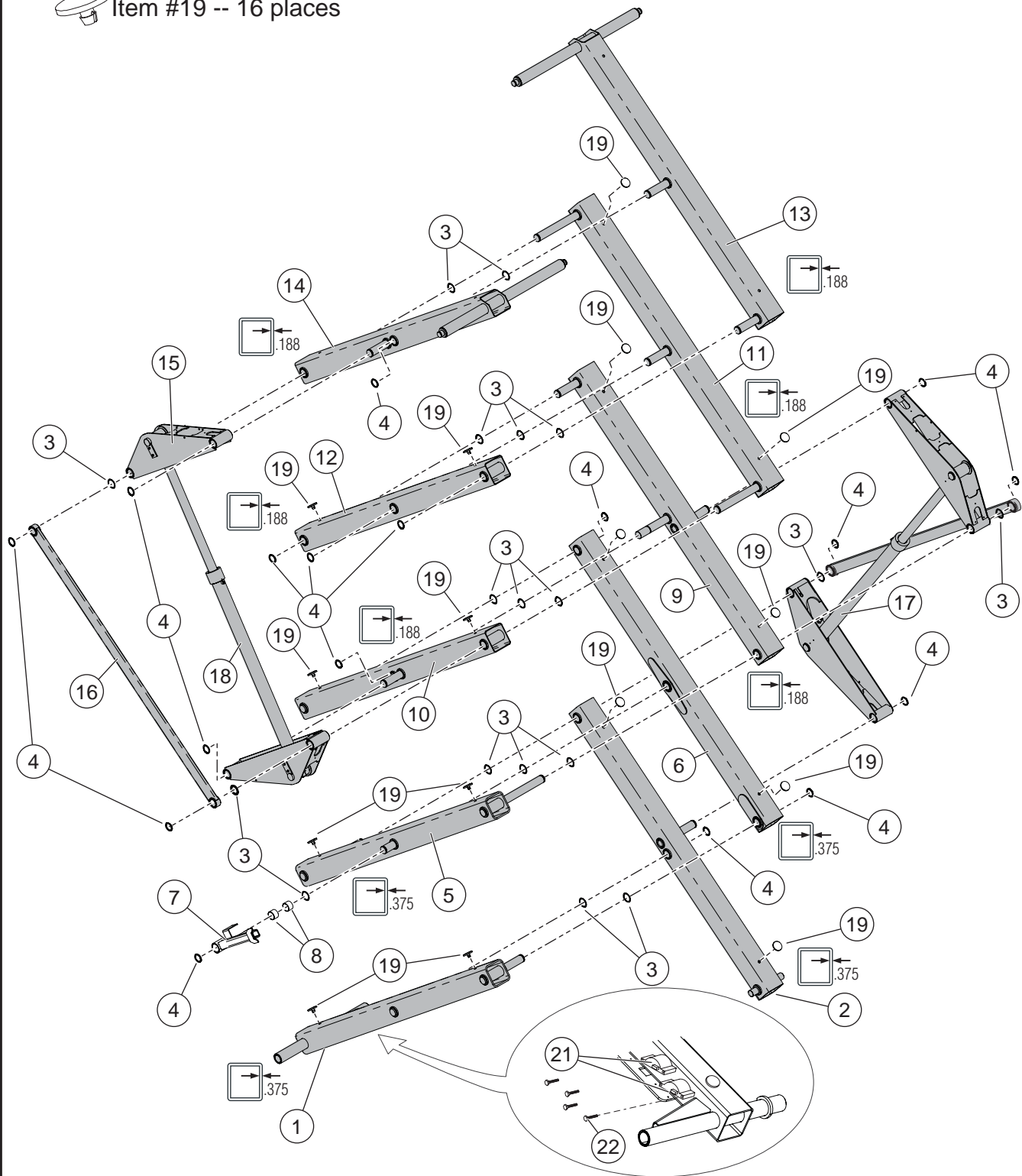


ILLUSTRATION No.  
ART\_4039

Crossover Series

Scissor Assembly, 3259 with optional Overload Sensing System

## Scissor Assembly, 3259 w/ optional Overload System

| ITEM | PART NO. | QTY | DESCRIPTION                          |
|------|----------|-----|--------------------------------------|
| 1    | 16673    | 1   | Beam                                 |
| 2    | 16670    | 1   | Beam                                 |
| 3    | HDW13175 | 26  | Thrust Bearing                       |
| 4    | 6701     | 18  | Retaining Ring                       |
| 5    | 16508    | 1   | Beam                                 |
| 6    | 16502    | 1   | Beam                                 |
| 7    | 30518    | 1   | Maintenance Lock                     |
| 8    | 8675     | 2   | Bearing                              |
| 9    | 16671    | 1   | Beam                                 |
| 10   | 16674    | 1   | Beam                                 |
| 11   | 16682    | 1   | Beam                                 |
| 12   | 16510    | 1   | Beam                                 |
| 13   | 16744    | 1   | <b>Standard Deck</b> -- Beam         |
|      | 16672    | 1   | <b>Optional 55" Deck</b> -- Beam     |
| 14   | 16745    | 1   | <b>Standard Deck</b> -- Beam         |
|      | 16675    | 1   | <b>Optional 55" Deck</b> -- Beam     |
| 15   | 16676    | 4   | Cylinder Mount                       |
| 16   | 16585    | 2   | Beam Support Weldment                |
| 17   | REF      | --  | Lower Lift Cylinder -- See Section E |
| 18   | REF      | --  | Upper Lift Cylinder -- See Section E |
| 19   | 25429    | 16  | Spacer Pad                           |
| 20   | --       | --  | --                                   |
| 21   | 90844    | 2   | Angle Sensor                         |
| 22   | HDW6831  | 4   | Screw, 1/4-20 x 2                    |

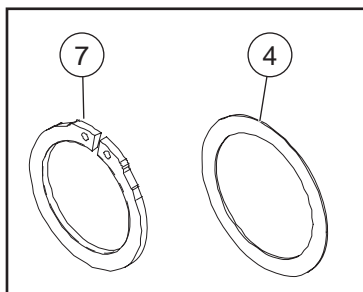
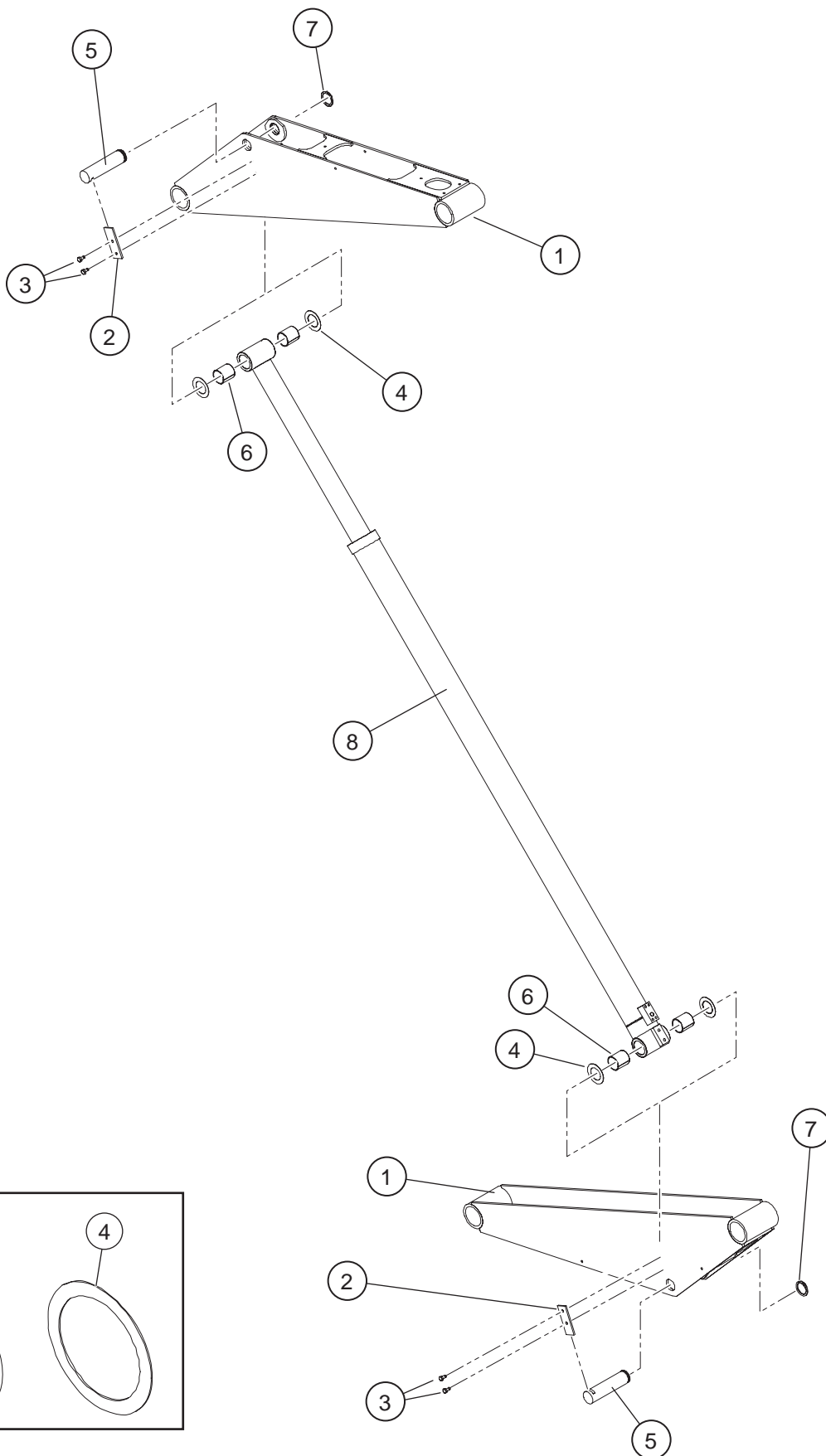


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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Cylinder Mounting Detail

## Cylinder Mounting Detail

| ITEM | PART NO. | QTY | DESCRIPTION                    |
|------|----------|-----|--------------------------------|
| 1    | REF      | --  | Cylinder Mount Weldment        |
| 2    | 25219    | 2   | Retainer Plate                 |
| 3    | HDW6455  | 4   | Screw, 1/4-20 x .5             |
| 4    | 13339    | 4   | Thrust Bearing                 |
| 5    | 25142    | 2   | Pin                            |
| 6    | 6984     | 4   | Bearing                        |
| 7    | 6875     | 2   | Retaining Ring                 |
| 8    | REF      | --  | Lift Cylinder -- See Section E |

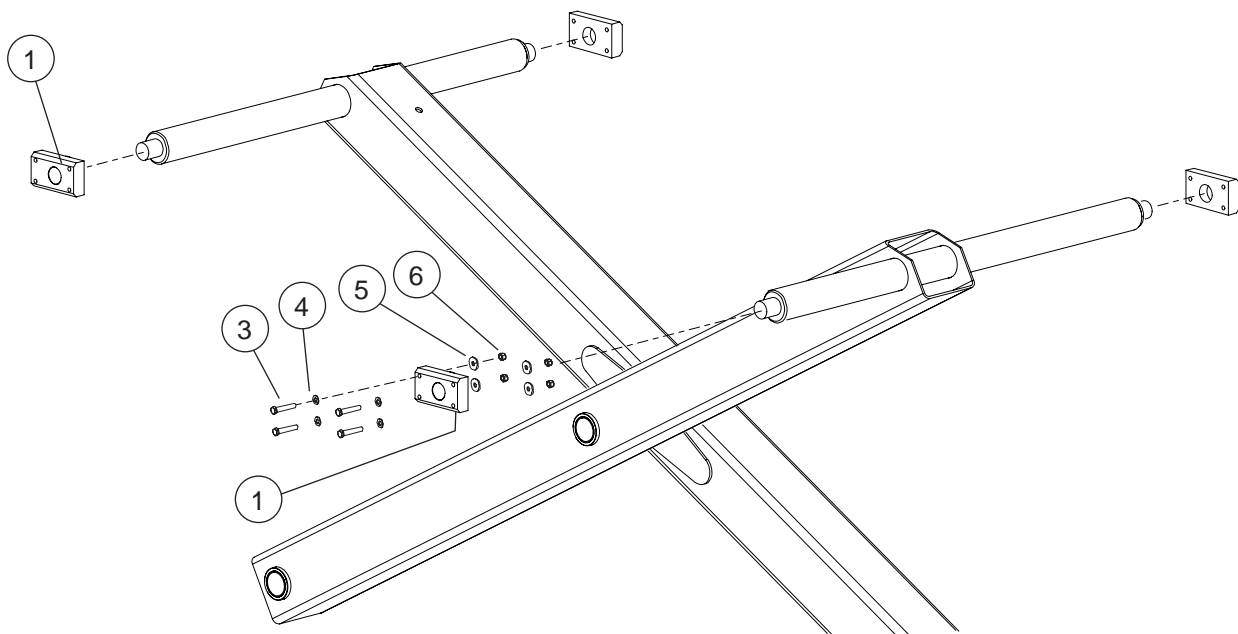


• as req: as required

• INCL: Included with assembly

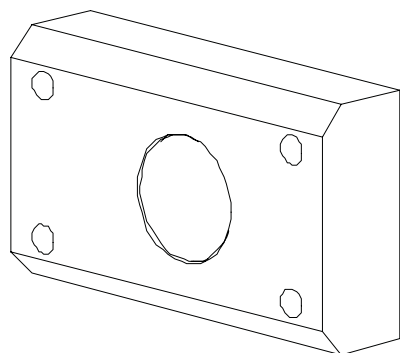
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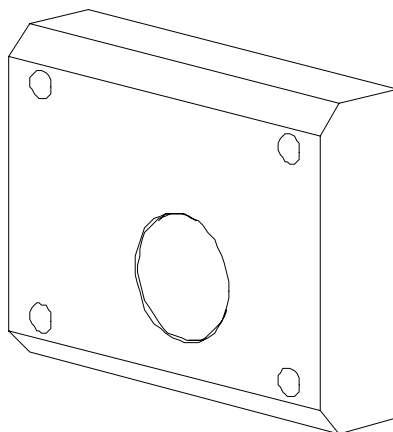


Bolts and washers  
used at rea of machine only

Item #1 for  
Standard Platform  
with Sheet Material Rack



Item #1 for  
Optional 55" Wide Platform



## Platform Mounting Detail

| ITEM | PART NO. | QTY | DESCRIPTION                                  |
|------|----------|-----|--|
| 1    | 13777    | 4   | Block, Std Platform with Sheet Material Rack |
|      | 26449    | 4   | Block, 55" Wide Platform                     |
| 2    | --       | --  | --   |
| 3    | HDW8303  | 8   | Bolt, 5/16 x 2                               |
| 4    | HDW5317  | 8   | Washer, Flat                                 |
| 5    | HWD8294  | 8   | Washer, Flat                                 |
| 6    | HDW8304  | 8   | Nut, 5/16 Nylock                             |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

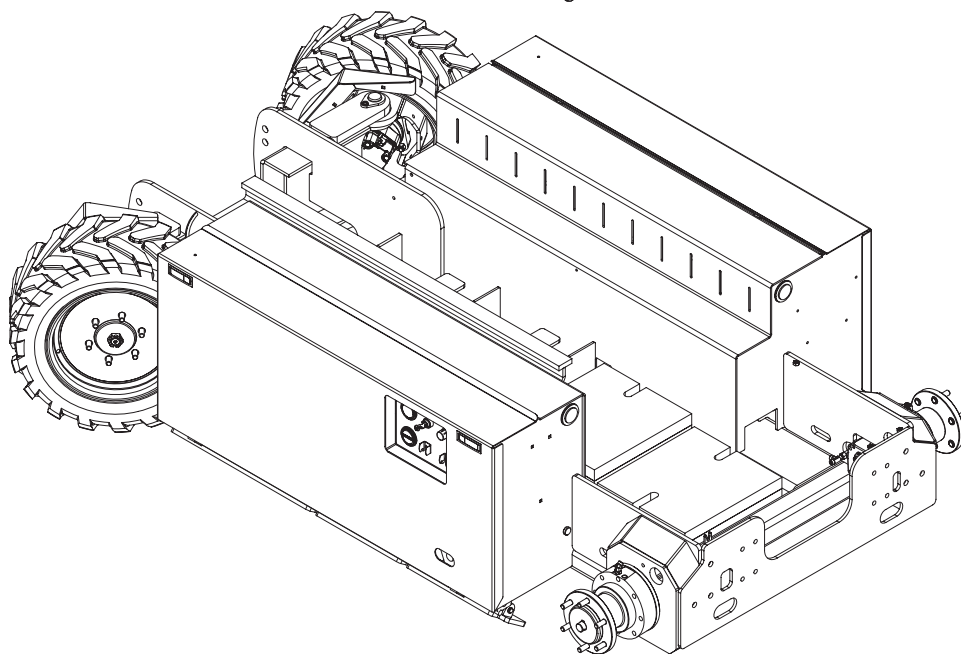
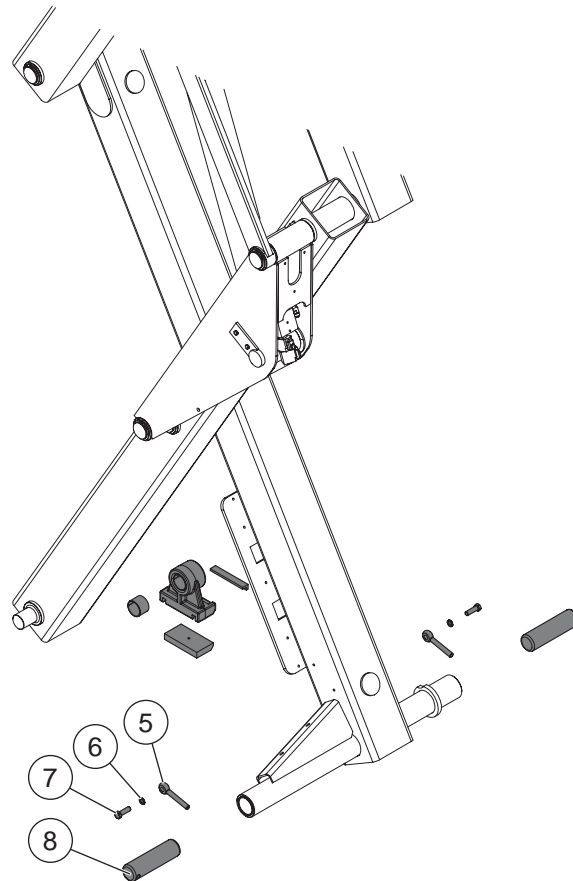
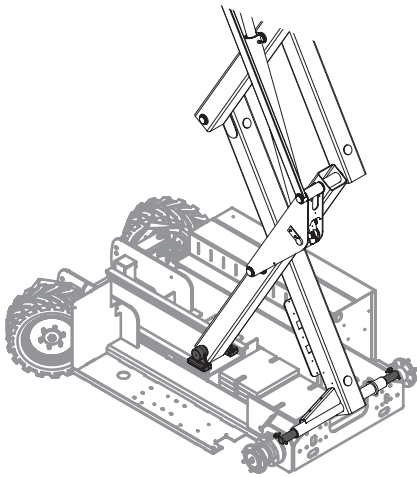


ILLUSTRATION No.  
ART\_4042

Chassis Mounting Detail



## Chassis Mounting Detail

| ITEM | PART NO. | QTY | DESCRIPTION               |
|------|----------|-----|---------------------------|
| 1    | 7160     | 2   | Bearing                   |
| 2    | 40306    | 2   | Slide Block w/ Slide Pads |
| --   | 5432     | 2   | Grease Fitting            |
| 3    | 90235    | 2   | Slide Pad, Top            |
| 4    | 17244    | 2   | Slide Pad, Bottom         |
| 5    | 18152    | 2   | Retaining Pin             |
| 6    | 50007    | 2   | Washer, M12 Nordlock      |
| 7    | 50236    | 2   | Bolt, M12 x 40            |
| 8    | 26245    | 2   | Pin                       |



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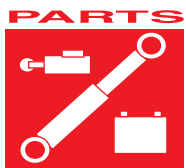
• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

**NOTES:**

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# SECTION D

## WHEEL ASSEMBLIES

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| Steering Components ..... | D-5 |



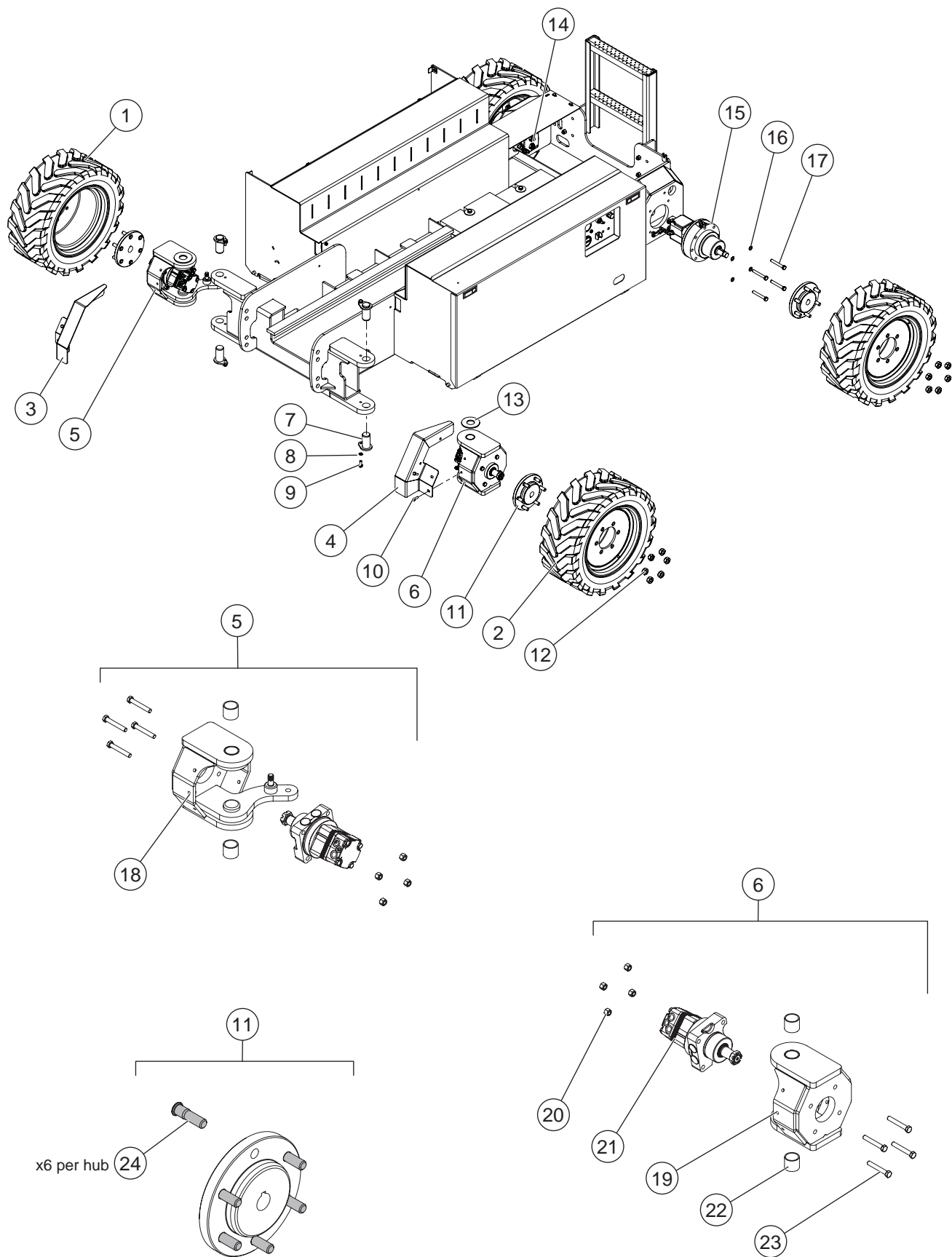


ILLUSTRATION No.  
ART\_4022

Crossover Series

Wheels & Hubs

## Wheels & Hubs

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 26010    | 2   | Right Wheel Assembly, Standard Tire, Air-Filled*    |
|      | 26362    |     | Right Wheel Assembly, Non-Marking Tire, Air-Filled  |
|      | 26360    |     | Right Wheel Assembly, Standard Tire, Foam-Filled**  |
|      | 26364    |     | Right Wheel Assembly, Non-Marking Tire, Foam-Filled |
| 2    | 26031    | 2   | Left Wheel Assembly, Standard Tire, Air-Filled*     |
|      | 26363    |     | Left Wheel Assembly, Non-Marking Tire, Air-Filled   |
|      | 26361    |     | Left Wheel Assembly, Standard Tire, Foam-Filled**   |
|      | 26365    |     | Left Wheel Assembly, Non-Marking Tire, Foam-Filled  |
| 3    | 26268    | 1   | Hose Guard Bracket Rh                               |
| 4    | 26267    | 1   | Hose Guard Bracket Lh                               |
| 5    | 87104    | 1   | Right Yoke Assembly                                 |
| 6    | 87103    | 1   | Left Yoke Assembly                                  |
| 7    | 26057    | 4   | King Pin Weldment                                   |
| 8    | 50006    | 4   | Washer, M10 Nordlock                                |
| 9    | 50033    | 4   | Bolt, M10 x 025                                     |
| 10   | 50031    | 4   | Bolt, M8 x 25                                       |
| 11   | 27375    | 4   | Hub Assembly  |
| 12   | 50365    | 24  | Lug Nut 9/16-18                                     |
| 13   | 92341    | 2   | Thrust Washer 1.51" x 3.5" x 3/16"                  |
| 14   | REF      | 1   | Right Rear Drive Motor W/ Fittings -- See Section E |
| 15   | REF      | 1   | Left Rear Drive Motor W/ Fittings -- See Section E  |
| 16   | 50007    | 8   | Washer, M12 Nordlock                                |
| 17   | 50379    | 8   | Bolt, M12 x 085                                     |
| 18   | 26237    | 1   | Yoke Weldment, Right                                |
| 19   | 26236    | 1   | Yoke Weldment, Left                                 |
| 20   | 50054    | 8   | Nut, M12 Nylock                                     |
| 21   | REF      | 2   | Drive Motor -- See Section E                        |
| 22   | 92360    | 4   | Bearing   |
| 23   | 50362    | 8   | Bolt, M12 x 80                                      |
| 24   | 92637    | 24  | Wheel Stud  |

\*Standard machines

\*\*Machines equipped with optional 55" platform or optional Overload Sensing System.  
These machines MAY NOT use air-filled tires.

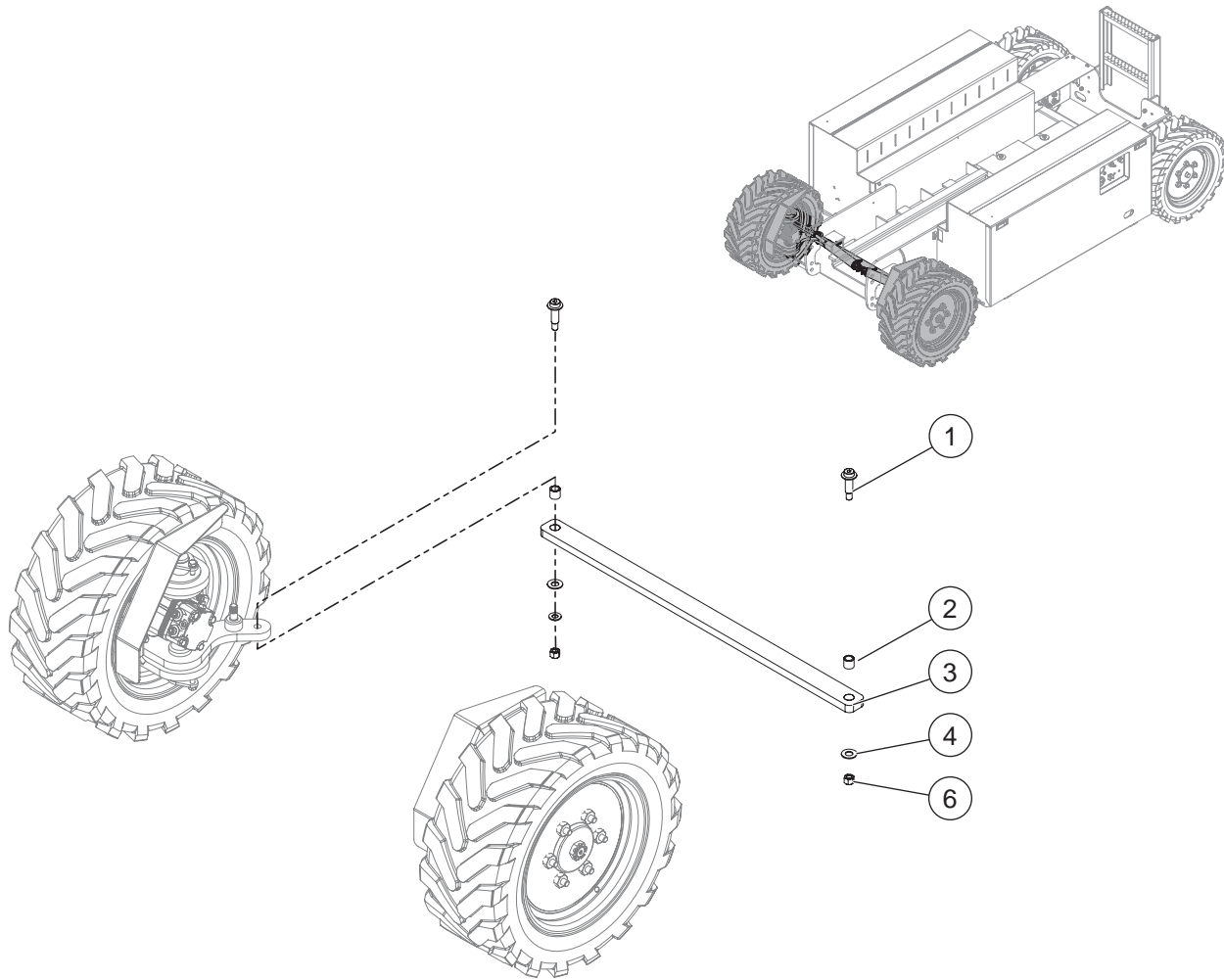


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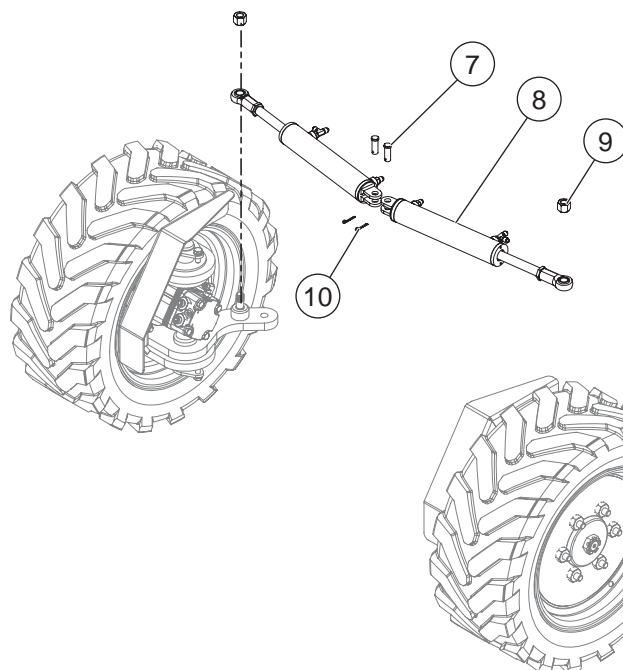
• NS: Not a Stock item

• REF: Reference only



Tie Rod Components

## Steering Cylinders



Steering Components



ILLUSTRATION No.  
ART\_4023

Crossover Series

## Steering Components

| ITEM | PART NO. | QTY | DESCRIPTION              |
|------|----------|-----|--------------------------|
| 1    | 50409    | 2   | Shoulder Bolt 5/8 x 1.50 |
| 2    | 92694    | 2   | Bearing                  |
| 3    | 26026    | 1   | Tie Rod                  |
| 4    | 50004    | 4   | Washer, M16 Std.         |
| 5    | --       | --  | --                       |
| 6    | 50201    | 2   | Nut, 1/2 Nylock          |
| 7    | 50172    | 2   | Clevis Pin, .5 x 1.38    |
| 8    | REF      | --  | Steer Cylinder           |
| 9    | 50205    | 2   | Nut, 5/8-11 Nylock       |
| 10   | 50178    | 2   | Cotter Pin, 1/8" X 1.00" |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

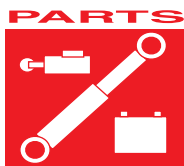
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**NOTES:**

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# SECTION E

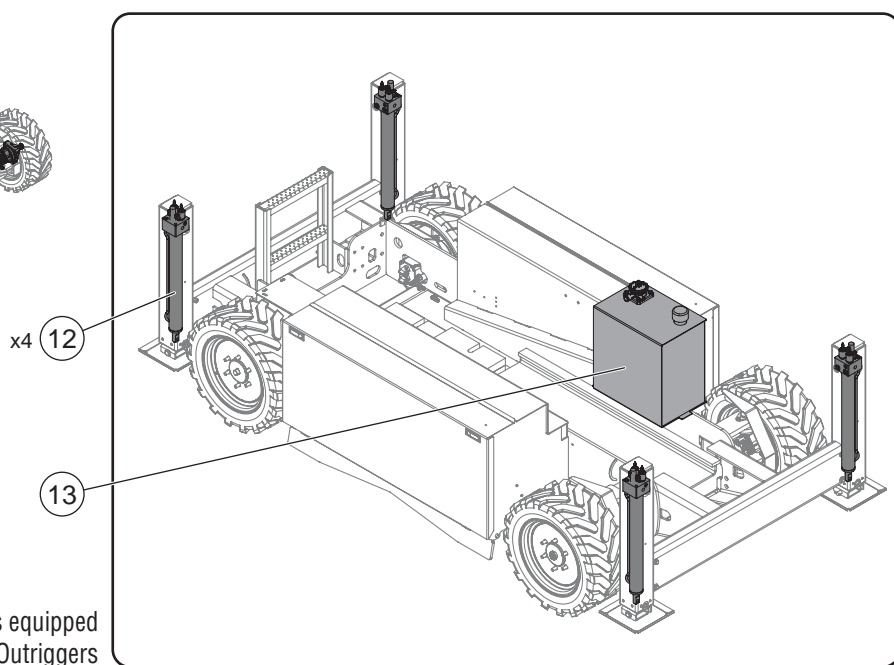
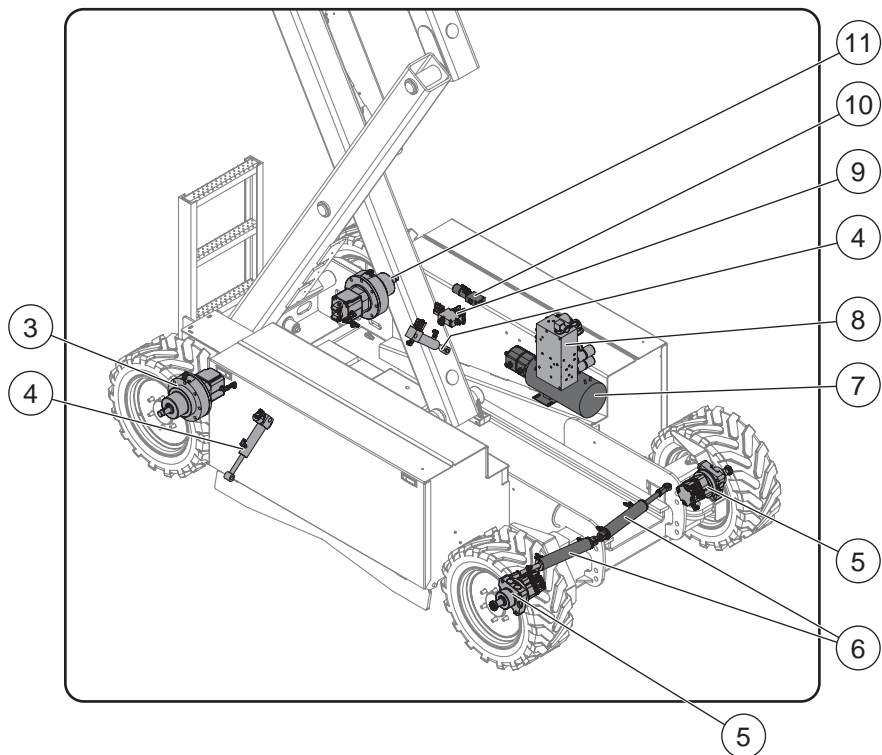
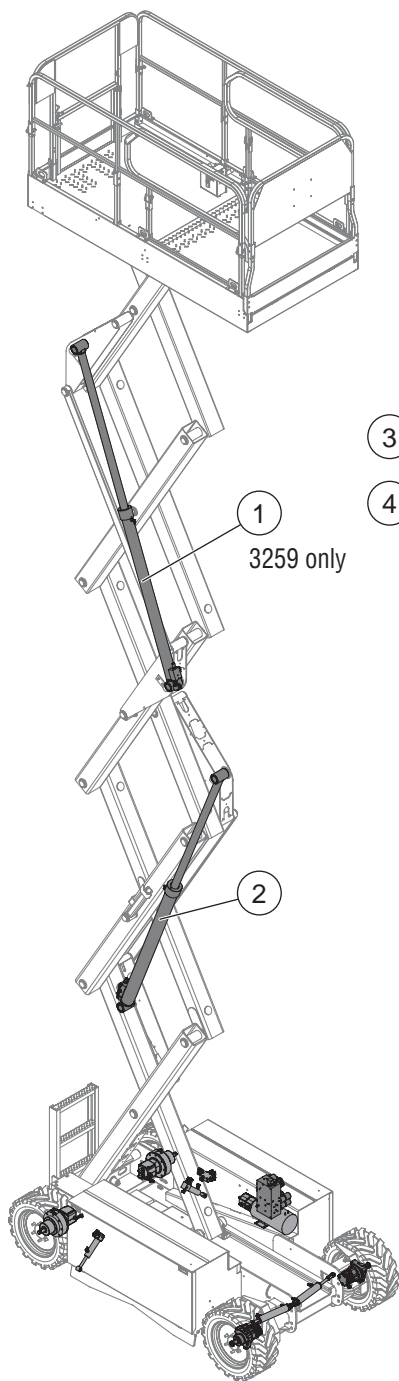
## HYDRAULICS

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Machines equipped  
with Outriggers



ILLUSTRATION No.  
ART\_4056

Crossover Series

Hydraulic Components

## Hydraulic Components

| ITEM   | PART NO. | QTY  | DESCRIPTION                                  |
|--|----------|--|--|
| 1  | 91053    | 1  | <b>3259 only</b> -- Upper Lift Cylinder      |
| 2  | 91054    | 1  | <b>3259</b> -- Lift Cylinder Assembly        |
|  | 91052    | 1  | <b>2659</b> -- Lift Cylinder Assembly        |
| 3  | 87120    | 1  | Drive Motor/Brake Assembly, Right Rear Wheel |
| 4  | 87117    | 2  | Pothole Bar Cylinder Assembly                |
| 5  | 92564    | 2  | Drive Motor, Front Wheel                     |
| 6  | 26060    | 2  | Steering Cylinder                            |
| 7  | 87006    | 1  | Pump Assembly                                |
| 8  | 87115*   | 1  | Functions Manifold                           |
|  | 87133†   | 1  | Functions Manifold                           |
| 9  | 87119*   | 1  | Pothole System manifold                      |
| 10   | 92890*   | 1  | Outrigger Valve Manifold                     |
| 11   | 87121    | 1  | Drive Motor/Brake Assembly, Left Rear Wheel  |
| 12   | 91728    | 4  | Outrigger Cylinder Assembly                  |
| 13   | 87105    | 1  | Hydraulic Tank Assembly                      |
| <b>CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS</b> |          |  |  |
| *  |          | <b>2659 -- up to Serial # 13000036</b><br><b>3259 -- up to Serial # 13100036</b>   |  |
| †  |          | <b>2659 -- Serial # 13000037 and up</b><br><b>3259 -- Serial # 13100037 and up</b> |  |

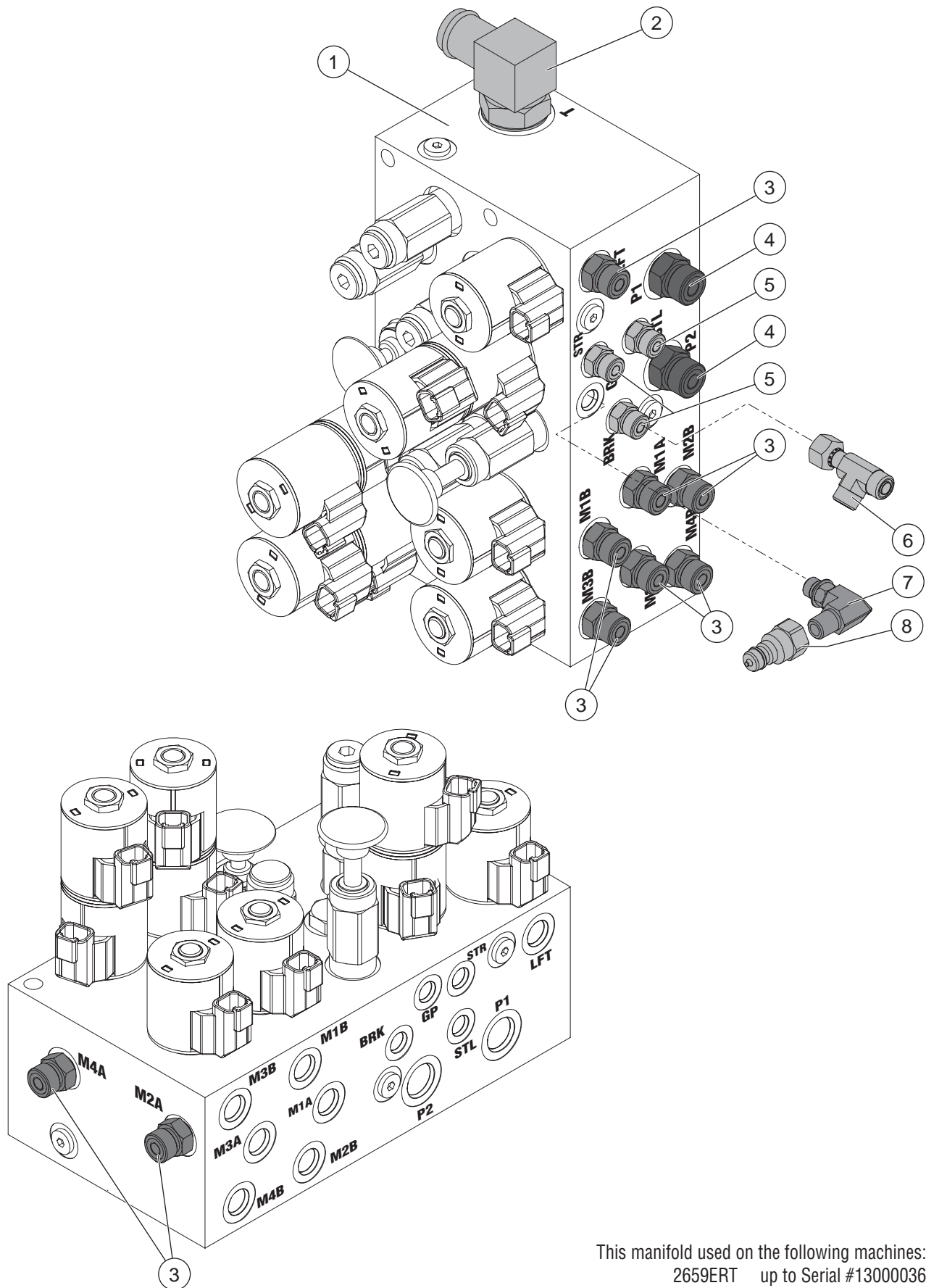


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:  
 2659ERT up to Serial #13000036  
 3259ERT up to Serial #13100036

**MEC**  
 ILLUSTRATION No.  
 ART\_4059

Crossover Series

Functions Manifold Fittings -- Early Machines

## Functions Manifold Assembly, Early Machines, 1 of 2

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- up to Serial # 13000036

3259 -- up to Serial # 13100036

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| --   | 87115    | --  | Functions Manifold Assembly, with fittings    |
| 1    | 92561    | 1   | Functions Manifold Assembly, without fittings |
| 2    | 51004    | 1   | Fitting, MB-Hose-12-16                        |
| 3    | 50835    | 9   | Fitting, MB-MFFOR-6-6                         |
| 4    | 50841    | 2   | Fitting, MB-MFFOR-8-8                         |
| 5    | 50831    | 3   | Fitting, MB-MFFOR-4-4                         |
| 6    | 50809    | 1   | Fitting, FFORX-MFFOR-MFFOR-4                  |
| 7    | 51010    | 1   | Fitting, MB-MP90-4-6                          |
| 8    | 51011    | 1   | Fitting, GP-FP-6-6                            |

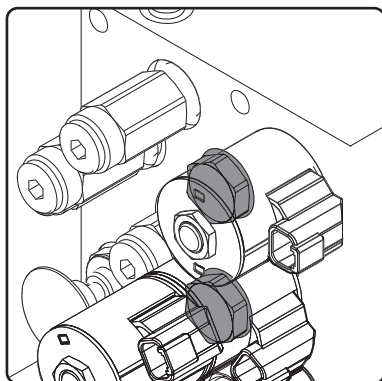
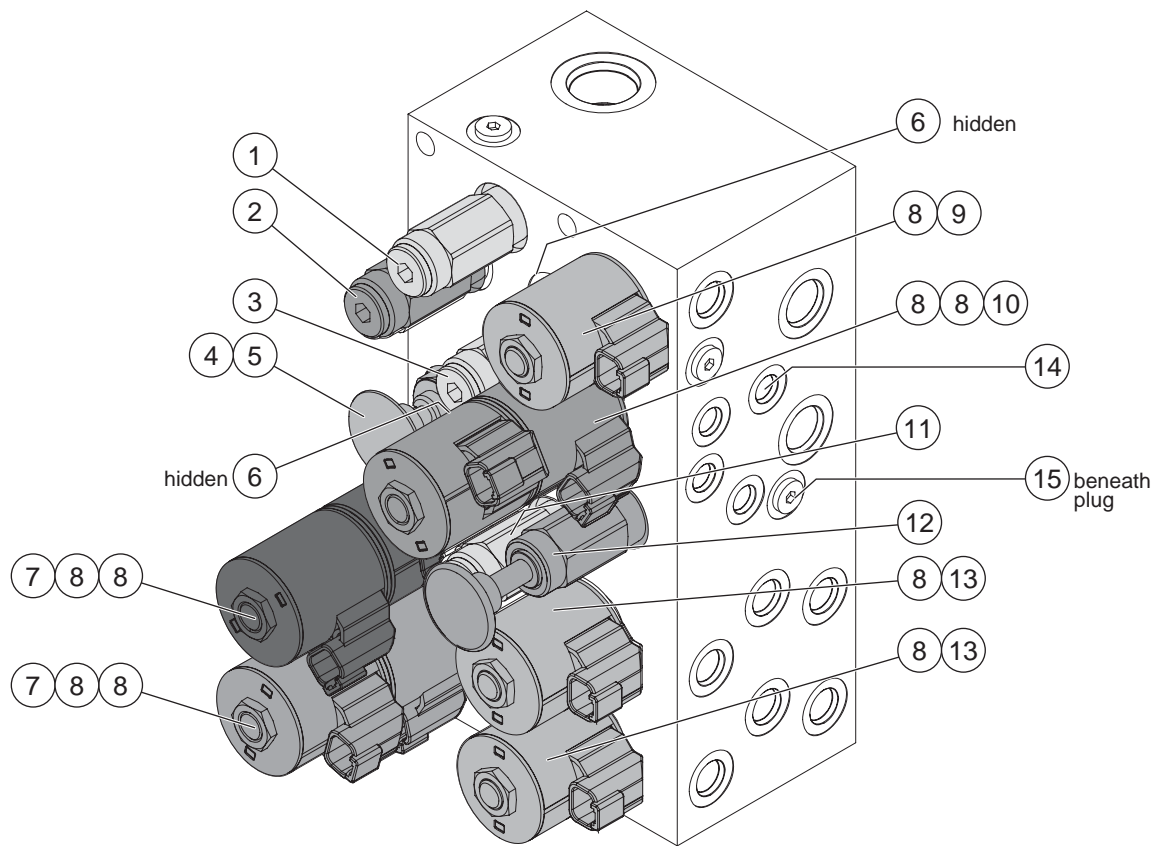


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Item #6  
x2

This manifold used on the following machines:  
 2659ERT up to Serial #13000036  
 3259ERT up to Serial #13100036

## Functions Manifold Assembly, Early Machines, 2 of 2

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- up to Serial # 13000036

3259 -- up to Serial # 13100036

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| --   | 92561    | --  | Functions Manifold Assembly, without fittings |
| 1    | 91009    | 1   | Valve, Lift Relief                            |
| 2    | 91476    | 1   | Valve, Main Relief                            |
| 3    | 92813    | 1   | Valve, Steer Relief                           |
| 4    | 91012    | 1   | Valve, Manual Brake Release                   |
| 5    | 91354    | 1   | Orifice, Disc .030                            |
| 6    | 91477    | 2   | Valve, Check                                  |
| 7    | 92908    | 2   | Valve, Solenoid, Drive                        |
| 8    | 91143    | 9   | Coil  |
| 9    | 91003    | 1   | Valve, Solenoid, Lift                         |
| 10   | 92579    | 1   | Valve, Solenoid, Steer                        |
| 11   | 91013    | 1   | Valve, Brake Relief                           |
| 12   | 91015    | 1   | Pump, Manual Brake Release                    |
| 13   | 91005    | 2   | Valve, Solenoid, Speed/Torque Select          |
| 14   | 92608    | 1   | Plug, Orifice                                 |
| 15   | 91154    | 1   | Load Shuttle                                  |

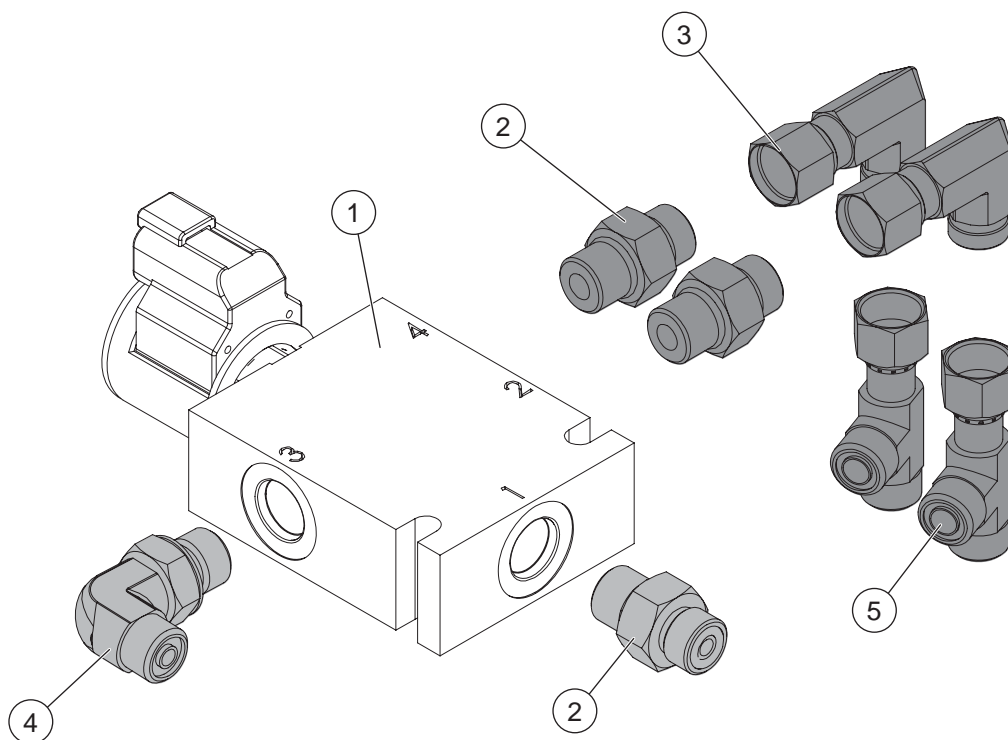


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:  
 2659ERT up to Serial #13000036  
 3259ERT up to Serial #13100036



## Pothole System Manifold, Early Machines

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- up to Serial # 13000036

3259 -- up to Serial # 13100036

| ITEM | PART NO. | QTY | DESCRIPTION                            |
|------|----------|-----|--|
| --   | 87119    | --  | Pothole System Manifold, with fittings |
| 1    | 92379    | 1   | Valve Assembly, without fittings       |
| 2    | 50832    | 3   | Fitting, MB-MFFOR-6-4                  |
| 3    | 50671    | 2   | Fitting, FFORX-MFFOR90-4-4             |
| 4    | 50846    | 1   | Fitting, MB-MFFOR-6-4                  |
| 5    | 50809    | 2   | Fitting, FFORX-MFFOR-MFFOR-4           |

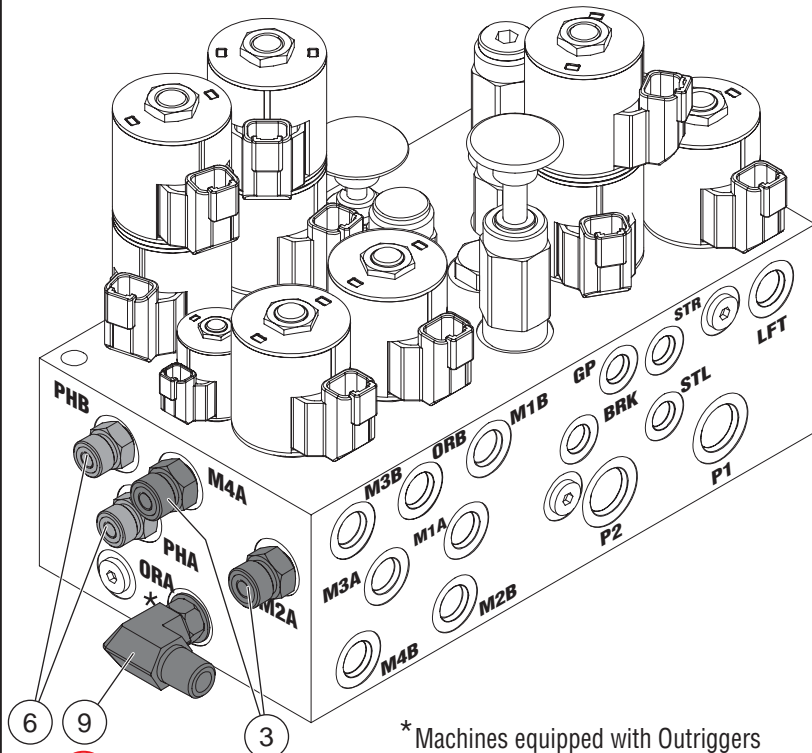
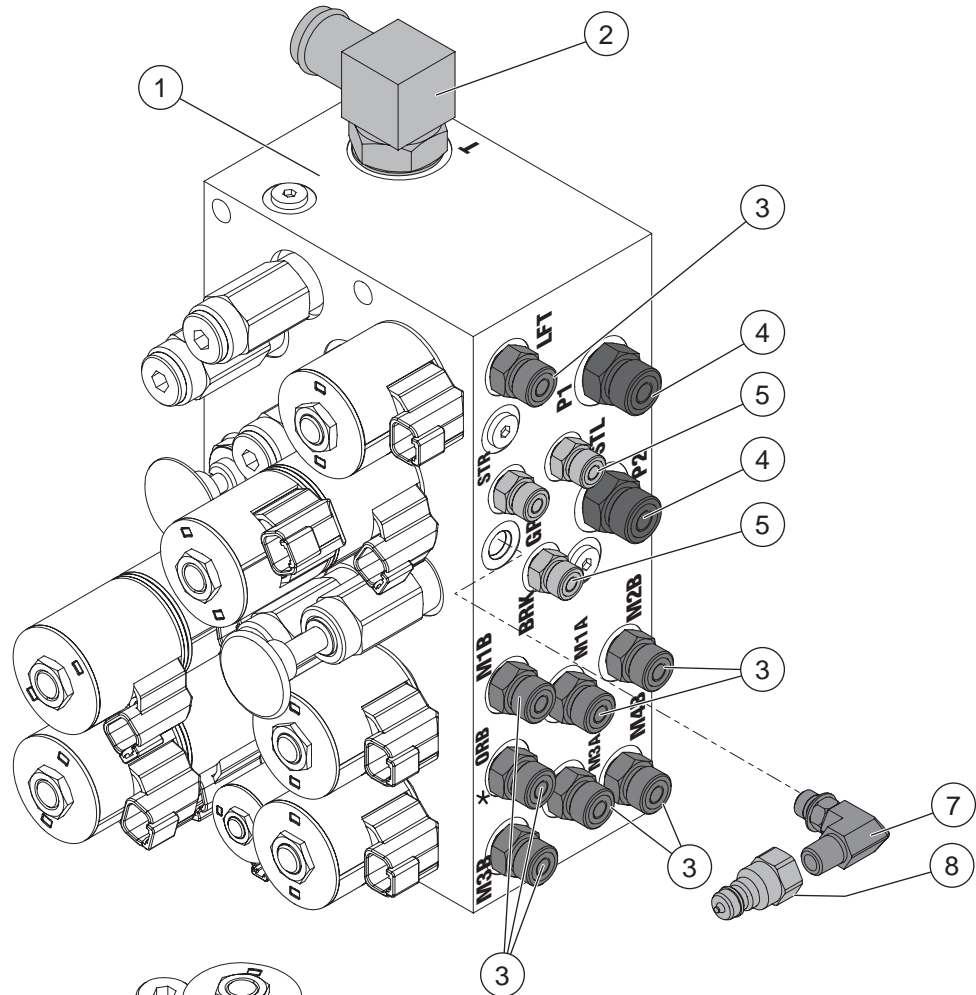


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



\* Machines equipped with Outriggers

This manifold used on the following machines:  
 2659ERT Serial #13000037 and up  
 3259ERT Serial #13100037 and up

ILLUSTRATION No.  
 ART\_4061

Crossover Series

Functions Manifold Fittings -- Later Machines

## Functions Manifold Assembly, Later Machines, 1 of 2

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- Serial # 13000037 and up

3259 -- Serial # 13100037 and up

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| --   | 87133    | --  | Functions Manifold Assembly, with fittings    |
| 1    | 92784    | 1   | Functions Manifold Assembly, without fittings |
| 2    | 51004    | 1   | Fitting, MB-Hose-12-16                        |
| 3    | 50835    | 11  | Fitting, MB-MFFOR-6-6                         |
| 4    | 50841    | 2   | Fitting, MB-MFFOR-8-8                         |
| 5    | 50831    | 3   | Fitting, MB-MFFOR-4-4                         |
| 6    | 50832    | 2   | Fitting, MB-MFFOR-6-4                         |
| 7    | 51010    | 1   | Fitting, MB-MP90-4-6                          |
| 8    | 51011    | 1   | Fitting, GP-FP-6-6                            |
| 9    | 50674    | 1   | Fitting, MB-MFFOR90-6-6                       |

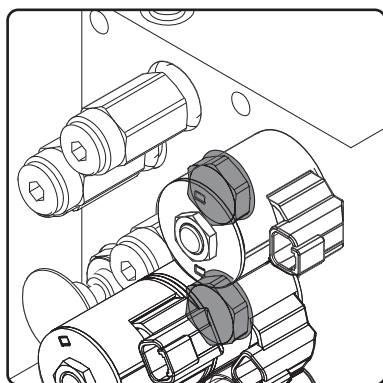
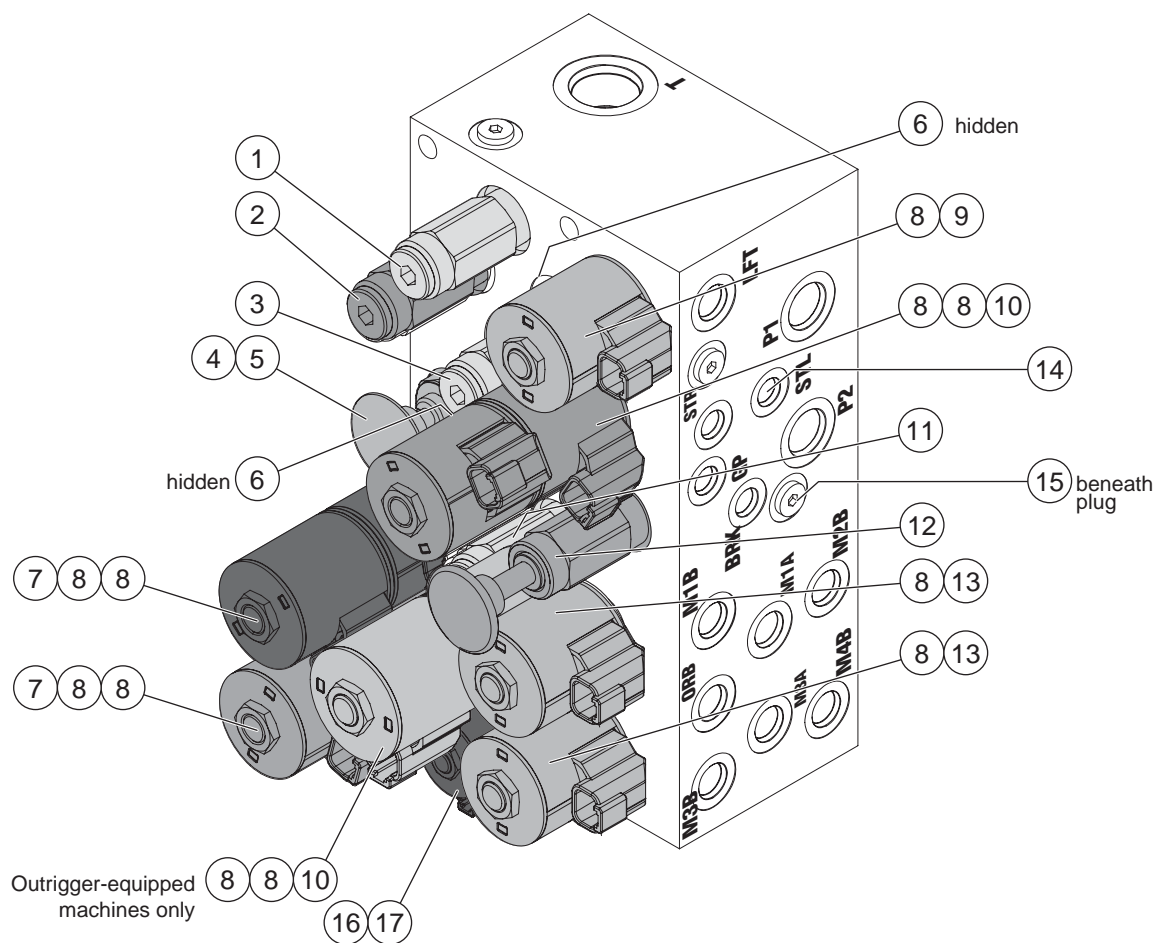


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Item #6  
x2

This manifold used on the following machines:  
 2659ERT Serial #13000037 and up  
 3259ERT Serial #13100037 and up

**MEC**  
 ILLUSTRATION No.  
 ART\_4062

Crossover Series

Functions Manifold Valves -- Later Machines

## Functions Manifold Assembly, Later Machines, 2 of 2

**CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS**

**2659 -- Serial # 13000037 and up**

**3259 -- Serial # 13100037 and up**

| ITEM                                    | PART NO. | QTY | DESCRIPTION                          |
|---|----------|-----|--------------------------------------|
| --                                      | 92784    | --  | Functions Manifold, without fittings |
| 1                                       | 91009    | 1   | Valve, Lift Relief                   |
| 2                                       | 91476    | 1   | Valve, Main Relief                   |
| 3                                       | 92813    | 1   | Valve, Steer Relief                  |
| 4                                       | 91012    | 1   | Valve, Manual Brake Release          |
| 5                                       | 91354    | 1   | Orifice, Disc .030                   |
| 6                                       | 91477    | 2   | Valve, Check                         |
| 7                                       | 92908    | 2   | Valve, Solenoid, Drive               |
| 8                                       | 91143    | 9*  | Coil                                 |
| 9                                       | 91003    | 1   | Valve, Solenoid, Lift                |
| 10                                      | 92579    | 1*  | Valve, Solenoid, Steer/Outrigger     |
| 11                                      | 91013    | 1   | Valve, Brake Relief                  |
| 12                                      | 91015    | 1   | Pump, Manual Brake Release           |
| 13                                      | 91005    | 2   | Valve, Solenoid, Speed/Torque Select |
| 14                                      | 92608    | 1   | Plug, Orifice                        |
| 15                                      | 91154    | 1   | Load Sense Check Valve               |
| 16                                      | 91147    | 1   | Valve, Solenoid, Pothole Deploy      |
| 17                                      | 92173    | 1   | Coil                                 |
| *For machines equipped with outriggers: |          |     |                                      |
| 8                                       | 91143    | 11  | Coil                                 |
| 10                                      | 92579    | 2   | Valve, Solenoid, Steer/Outrigger     |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

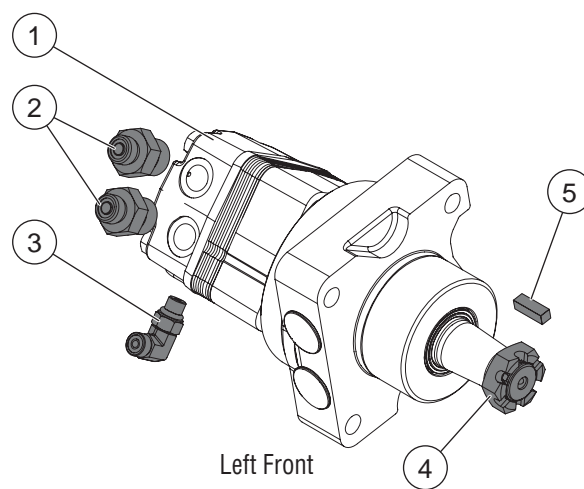
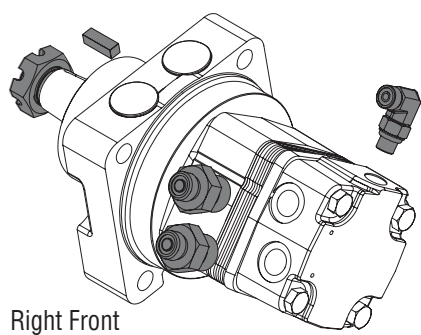


ILLUSTRATION No.  
ART\_4057

Crossover Series

Front Wheel Motors

## Front Wheel Motors

| ITEM | PART NO. | QTY | DESCRIPTION             |
|------|----------|-----|-------------------------|
| 1    | 92564    | 2   | Wheel Motor             |
| 2    | 50834    | 4   | Fitting, MB-MFFOR-10-6  |
| 3    | 50673    | 2   | Fitting, MB-MFFOR90-4-4 |
| 4    | 50420    | 2   | Castle Nut, 1"-20       |
| --   | 50177    | 2   | Cotter Pin              |
| 5    | 92883    | 2   | Shaft Key               |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

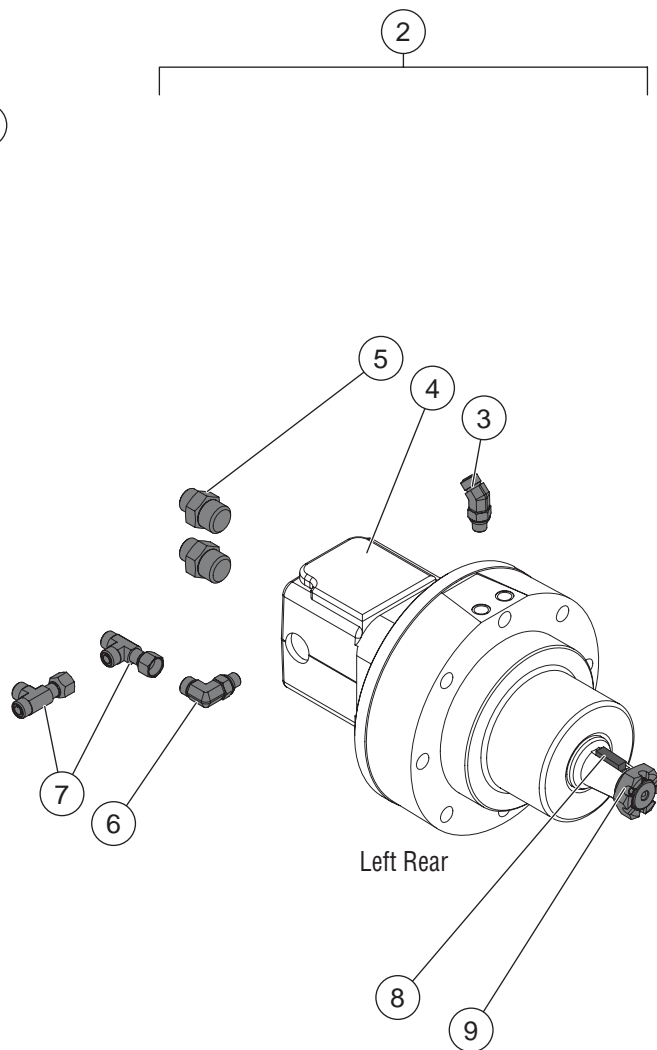
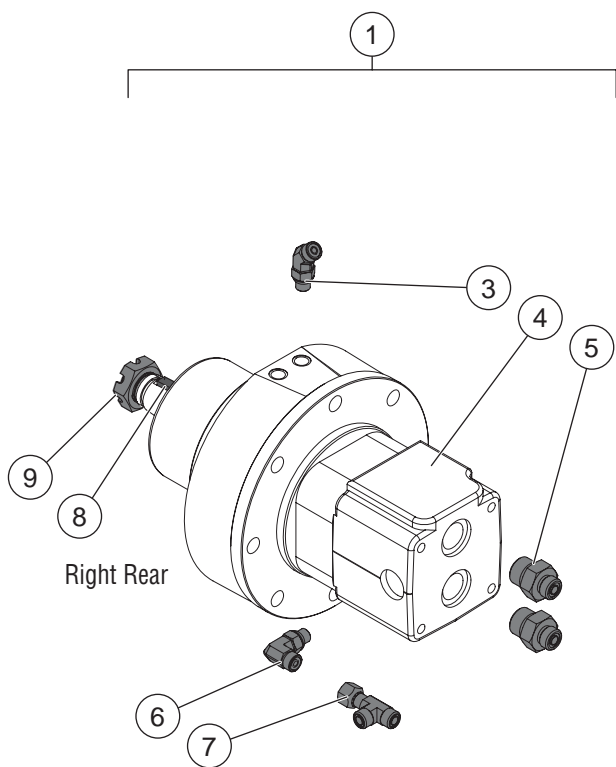


ILLUSTRATION No.  
ART\_4058

Crossover Series

Rear Wheel Motors



## Rear Wheel Motors

| ITEM | PART NO. | QTY | DESCRIPTION                      |
|------|----------|-----|----------------------------------|
| 1    | 87120    | 1   | Wheel Motor Assembly, Right Rear |
| 2    | 87121    | 1   | Wheel Motor Assembly, Left Rear  |
| 3    | 50675    | 2   | Fitting, MB-MFFOR45-4-4          |
| 4    | 92566    | 2   | Motor/Brake                      |
| 5    | 50834    | 2   | Fitting, MB-MFFOR-10-6           |
| 6    | 50673    | 2   | Fitting, MB-MFFOR90-4-4          |
| 7    | 50809    | 3   | Fitting, FFORX-MFFOR-MFFOR-4     |
| 8    | 92883    | 2   | Shaft Key                        |
| 9    | 50420    | 2   | Castle Nut, 1"-20                |
| --   | 50177    | 2   | Cotter Pin                       |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

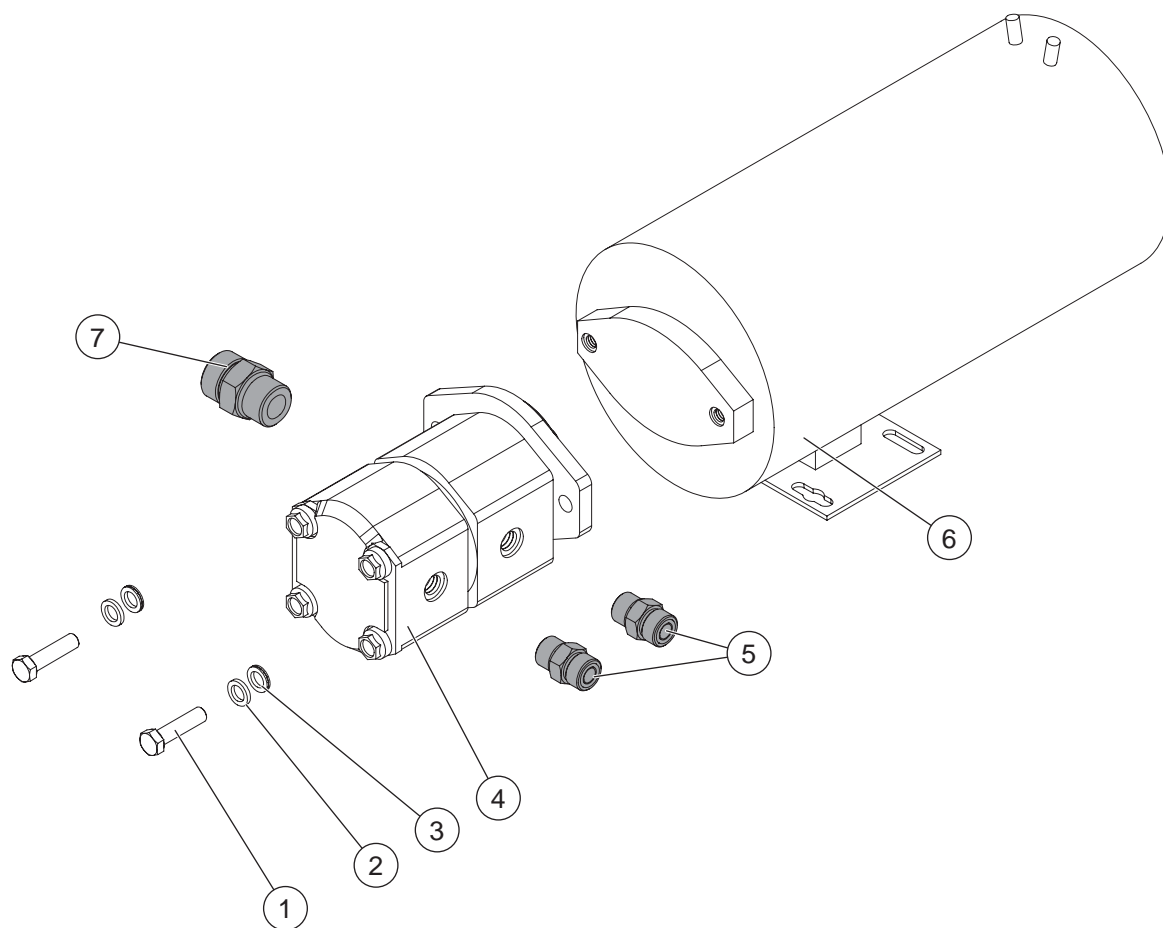


ILLUSTRATION No.  
ART\_4065

Crossover Series

Pump Assembly

## Pump Assembly

| ITEM   | PART NO. | QTY  | DESCRIPTION             |
|--|----------|--|-------------------------|
| --   | 87006*   | --   | Pump Assembly, 36V      |
|  | 87128†   |  | Pump Assembly, 48V      |
| 1  | 50188    | 2  | Bolt, 3/8-24 x 1.5      |
| 2  | 50002    | 2  | Washer, M10 Std         |
| 3  | 50006    | 2  | Washer, M10 Nordlock    |
| 4  | 92823    | 1  | Pump                    |
| 5  | 50841    | 2  | Fitting, MB-MFFOR-8-8   |
|  | 9675     | 1  | Motor, 36V              |
| 6  | 91640    |  | Motor, 48V              |
| 7  | 50826    | 1  | Fitting, MB-MFFOR-12-12 |
|  |          |  |                         |
| <b>CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS</b> |          |  |                         |
| *  |          | 2659 -- up to Serial # 13000031<br>3259 -- up to Serial # 13100027   |                         |
| †  |          | 2659 -- Serial # 13000032 and up<br>3259 -- Serial # 13100028 and up |                         |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

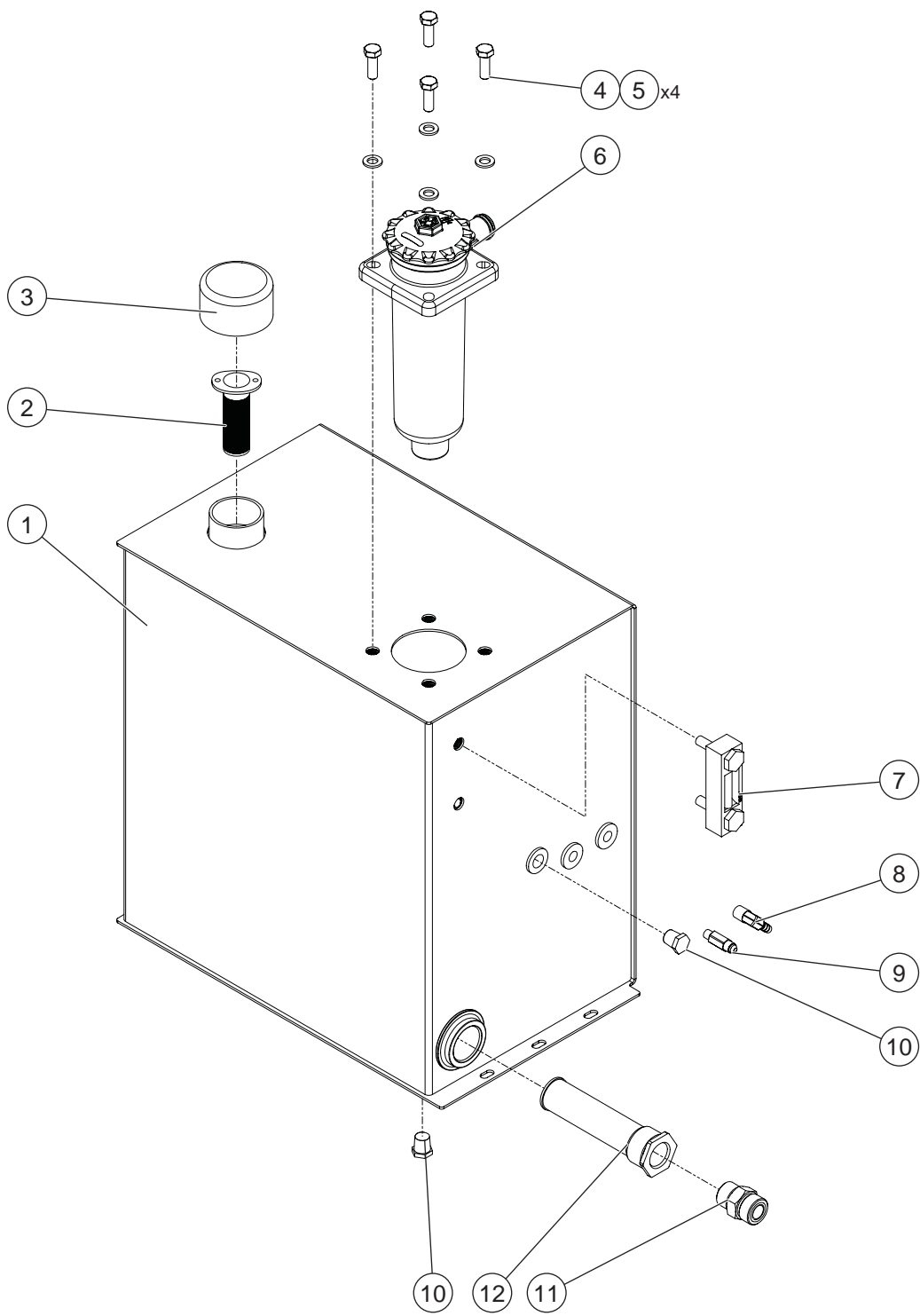


ILLUSTRATION No.  
ART\_4066

Crossover Series

Hydraulic Tank

## Hydraulic Reservoir

| ITEM | PART NO. | QTY | DESCRIPTION                  |
|------|----------|-----|------------------------------|
| --   | 87105    | --  | Hydraulic Tank Assembly      |
| 1    | 26230    | 1   | Hydraulic Tank Weldment      |
| 2    | 92967    | 1   | Strainer                     |
| 3    | 92335    | 1   | Breather Cap                 |
| 4    | 50034    | 4   | Bolt, M10 x 30               |
| 5    | 50002    | 4   | Washer, M10 std.             |
| --   | 92565    | 1   | Filter Assembly              |
| 6    | 92924    | --  | Filter Element               |
| 7    | 92562    | 1   | Sight Gauge                  |
| 8    | HDW6727  | 1   | Fitting, 1/4" NPT-5/16" Barb |
| 9    | 50912    | 1   | Fitting, MJ-MP-4             |
| 10   | 51006    | 2   | Plug, 3/8" NPT               |
| 11   | 50826    | 1   | Fitting, MB-MFFOR-12-12      |
| 12   | 92569    | 1   | Strainer                     |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

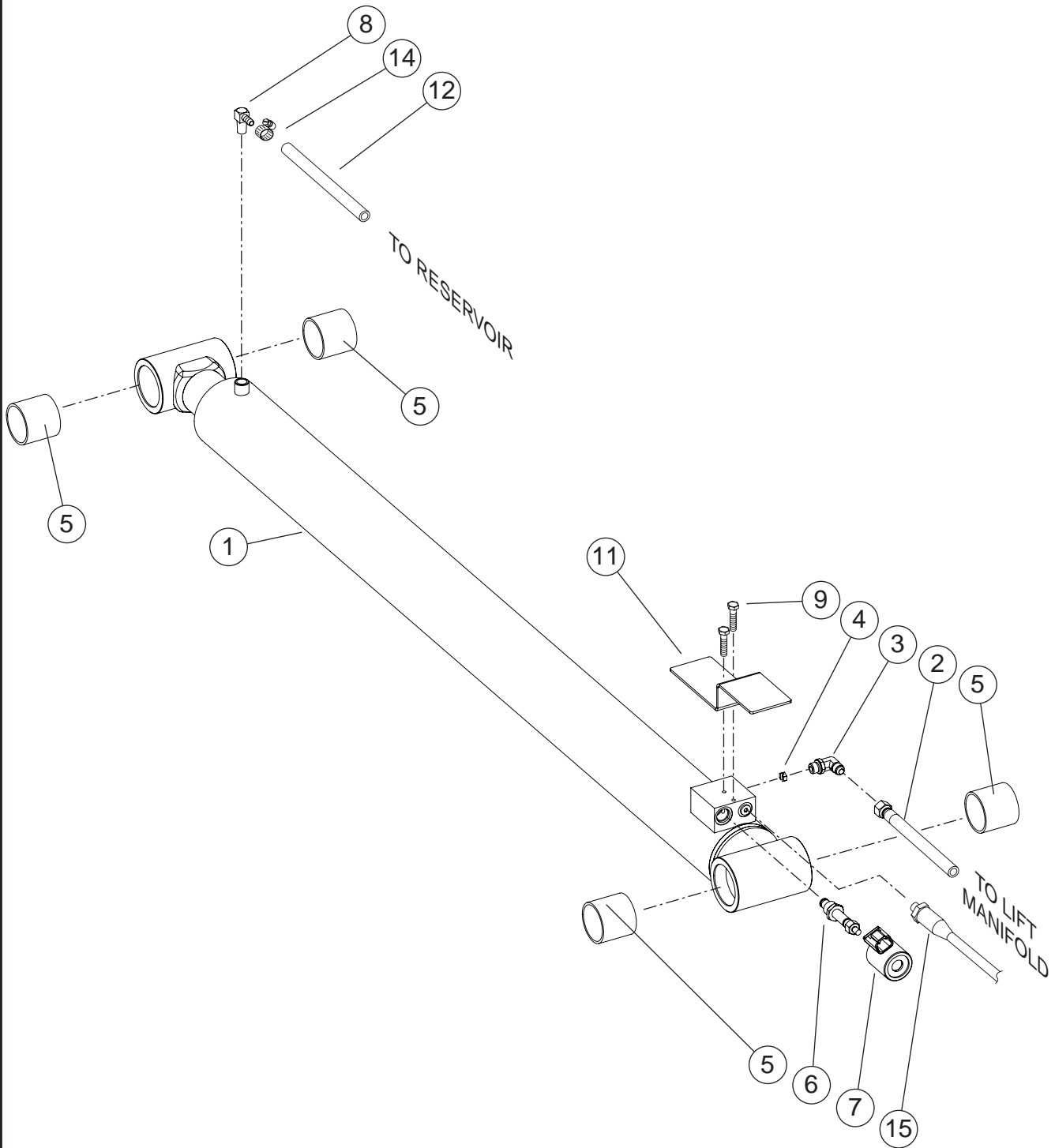


ILLUSTRATION No.  
ART\_4067

Crossover Series

Lift Cylinder, 2659

## Lift Cylinder, 2659

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 91052    | 1   | Cylinder, Lift  |
| 2    | REF      | --  | Hose Assy -- See Circuit Drawings later in this section         |
| 3    | 50790    | 1   | Fitting, Elbow Adaptor  |
| 4    | 90361    | 1   | Orifice   |
| 5    | 90993    | 4   | Bearing, Bronze   |
| 6    | 91051    | 1   | Valve, 2 Way,   |
| 7    | 91141    | 1   | Coil  |
| 8    | HDW6727  | 1   | Fitting, Pipe 90°, Male Barb                                    |
| 9    | 50092    | 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      | --  | Hose, Return Line -- See Circuit Drawings later in this section |
| 13   | --       | --  | --  |
| 14   | 7788     | 1   | Clamp, Hose   |
| 15   | 90845    | 1   | Pressure Sensor, 3000 Psi                                       |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

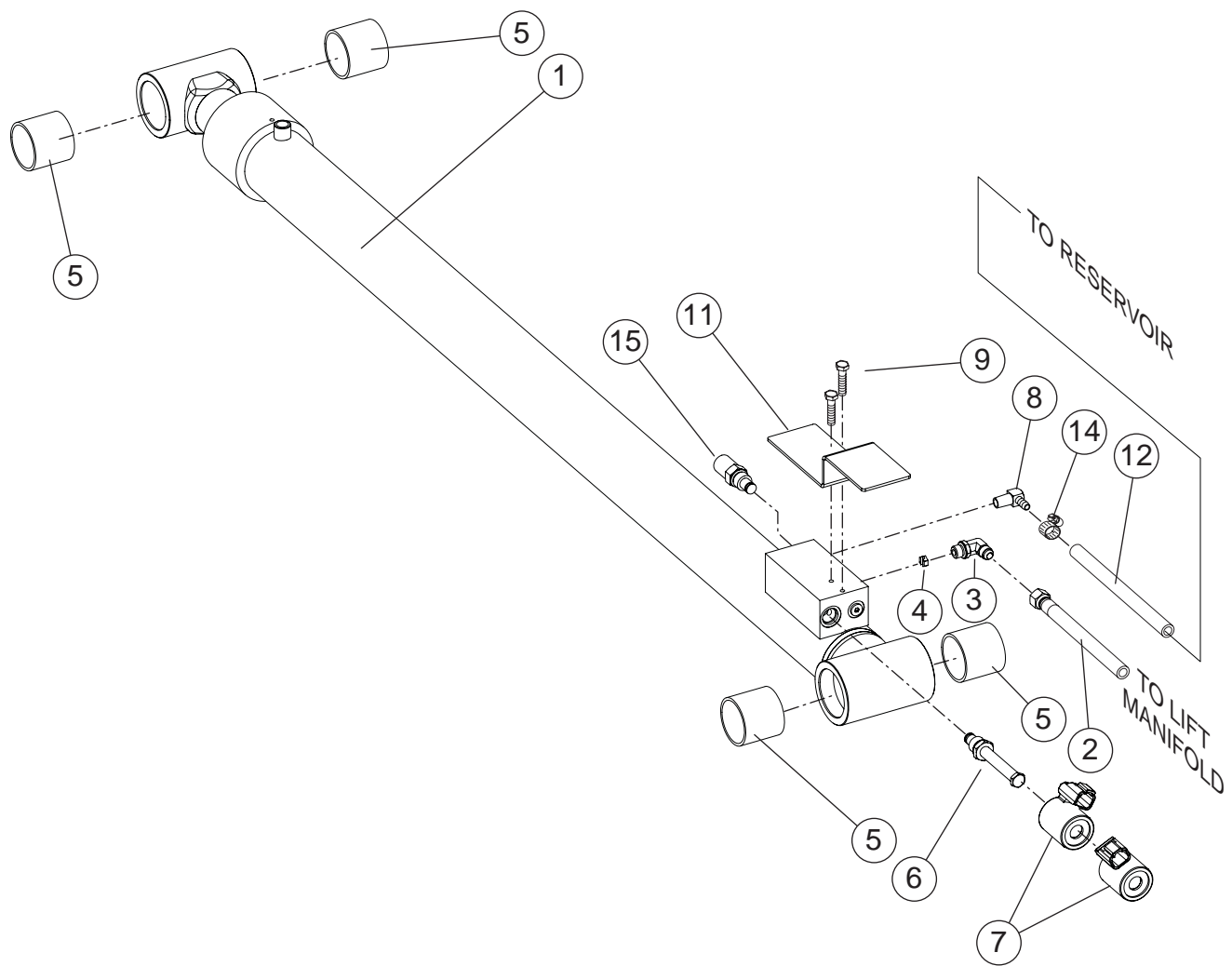


ILLUSTRATION No.  
ART\_4068

Crossover Series

Upper Lift Cylinder, 3259



## Upper Lift Cylinder, 3259

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 91053    | 1   | Cylinder, Lift  |
| --   | 90987    | --  | Seal Kit  |
| 2    | REF      | 1   | Hose Assy -- See Circuit Drawings later in this section         |
| 3    | 50790    | 1   | Fitting, Elbow Adaptor  |
| 4    | 90439    | 1   | Orifice   |
| 5    | 90993    | 4   | Bearing, Bronze   |
| 6    | 90968    | 1   | Valve, 2 Way  |
| 7    | 91141    | 2   | Coil, 12 Volt   |
| 8    | HDW6727  | 1   | Fitting, Pipe 90°, Male Barb                                    |
| 9    | 50092    | 2   | Screw, 1/4" - 20 X 3/4" Lg                                      |
| 10   | --       | --  | --  |
| 11   | 16062    | 1   | Bracket, Lift Cylinder Valve Guard                              |
| 12   | REF      | --  | Hose, Return Line -- See Circuit Drawings later in this section |
| 11   | --       | --  | --  |
| 14   | 7788     | 1   | Clamp, Hose   |
| 15   | 90969    | 1   | Relief Valve  |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

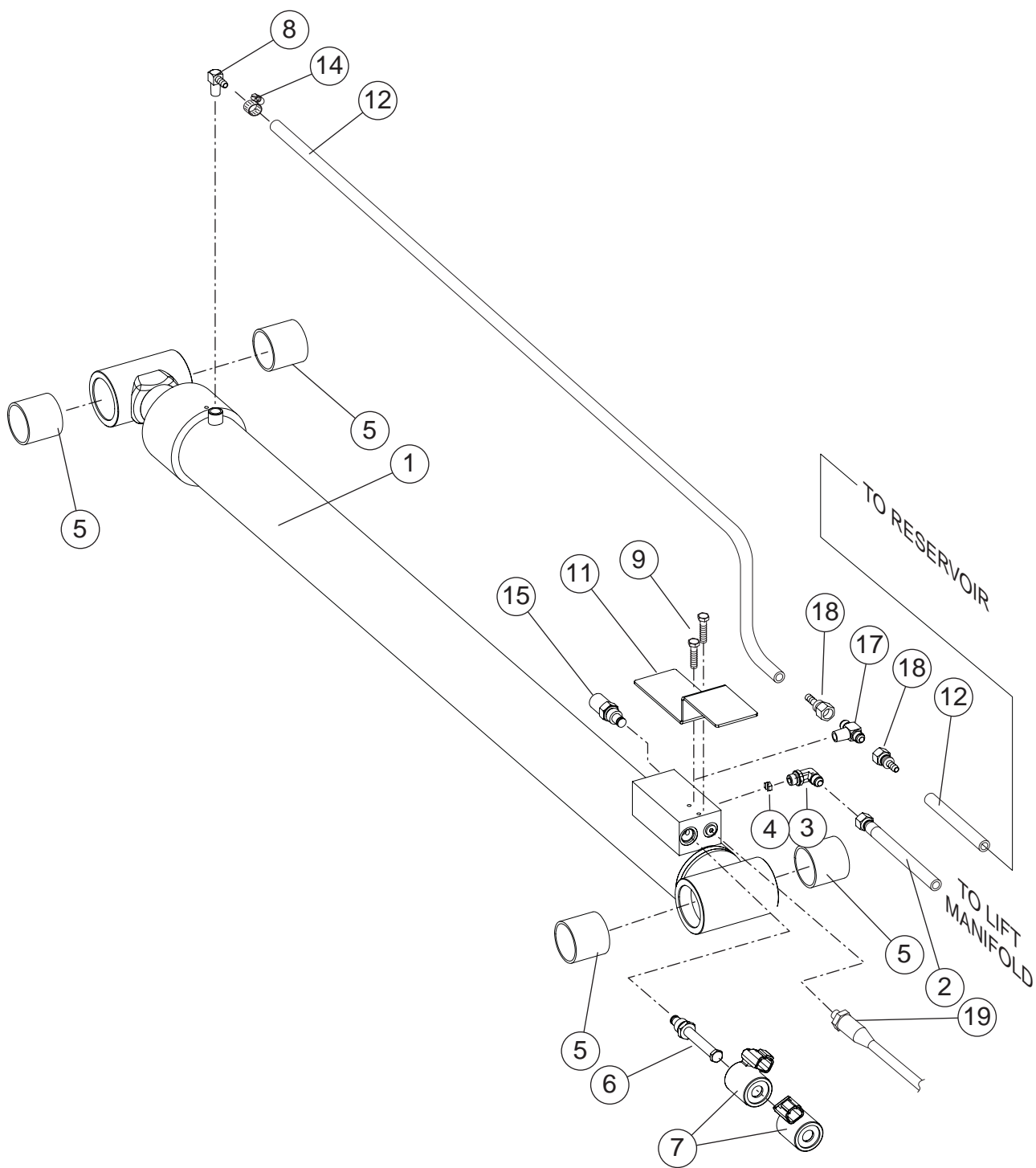


ILLUSTRATION No.  
ART\_4069

Crossover Series

Lower Lift Cylinder, 3259

## Lower Lift Cylinder, 3259

| ITEM | PART NO. | QTY   | DESCRIPTION   |
|------|----------|-------|---|
| 1    | 91054    | 1     | Cylinder, Lower Lift  |
| --   | 90988    | --    | Seal Kit  |
| 2    | REF      | 1     | Hose Assy -- See Circuit Drawings later in this section         |
| 3    | 50790    | 1     | Fitting, Elbow Adaptor  |
| 4    | 93606    | 1     | Orifice   |
| 5    | 90993    | 4     | Bearing, Bronze, 2" Id X 2" Lg                                  |
| 6    | 90968    | 1     | Valve, 2 Way, N.c.  |
| 7    | 91141    | 2     | Coil, 12 Volt   |
| 8    | HDW6727  | 1     | Fitting, Pipe 90°, Male Barb                                    |
| 9    | 50092    | 2     | Screw, 1/4" - 20 X 3/4" Lg                                      |
| 10   | --       | --    | --  |
| 11   | 16062    | 1     | Bracket, Lift Cylinder Valve Guard                              |
| 12   | REF      | 21 FT | Hose, Return Line -- See Circuit Drawings later in this section |
| 14   | 7788     | 1     | Clamp, Hose   |
| 15   | 90969    | 1     | Relief Valve  |
| 16   | --       | --    | --  |
| 17   | 50905    | 1     | Fitting, Tee Adaptor  |
| 18   | HDW90945 | 2     | Fitting, Female Swivel  |
| 19   | 90845    | 1     | Pressure Sensor, 3000 Psi                                       |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

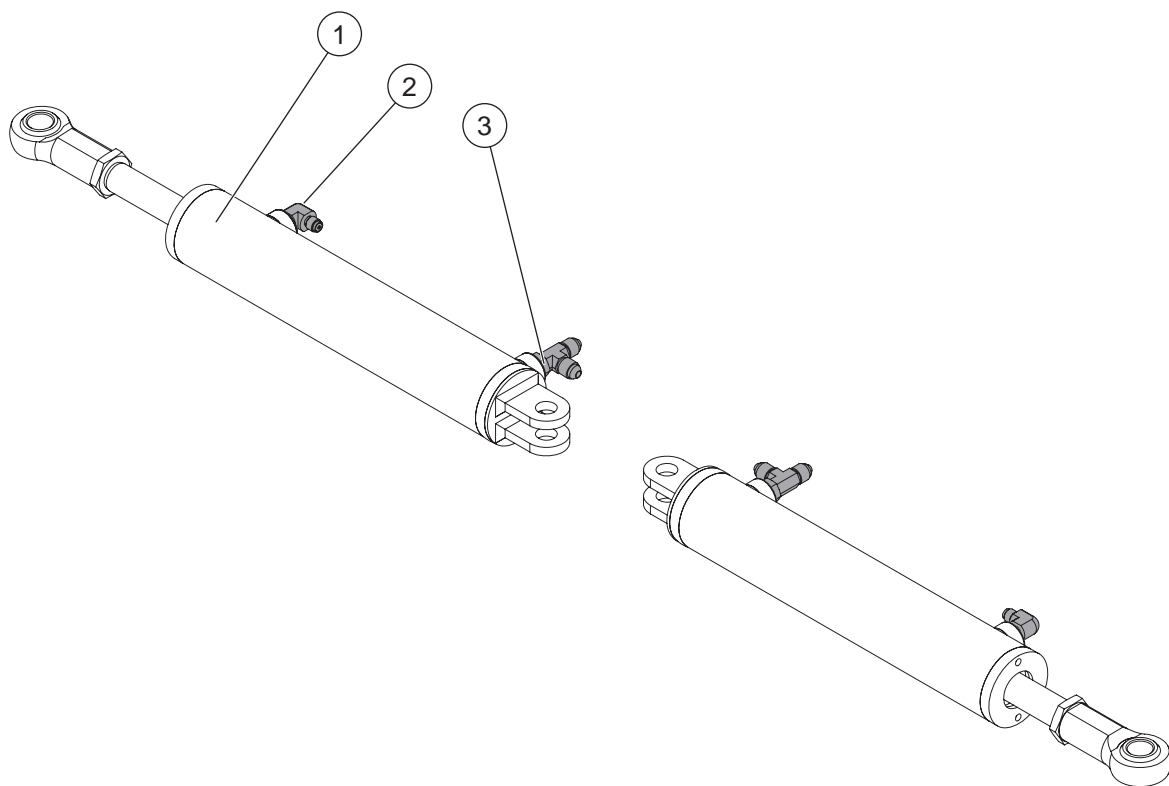


ILLUSTRATION No.  
ART\_4070

Crossover Series

Steering Cylinders

## Steering Cylinders

| ITEM | PART NO. | QTY | DESCRIPTION          |
|------|----------|-----|----------------------|
| 1    | 26060    | 2   | Cylinder             |
| --   | 90990    | --  | Seal Kit             |
| 2    | 50665    | 2   | Fitting, MB-MJ90-4   |
| 3    | 50962    | 2   | Fitting, MB-MJ-MJT-4 |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

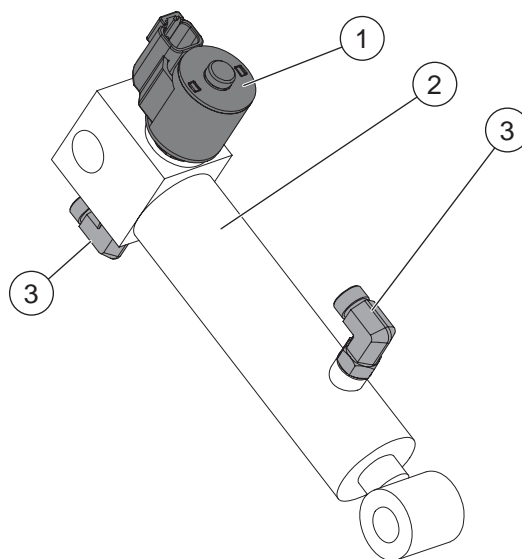
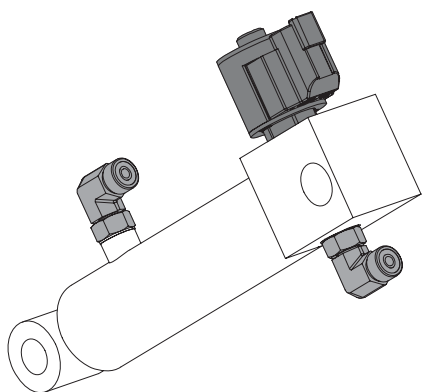


ILLUSTRATION No.  
ART\_4071

Crossover Series

Pothole Cylinders

## Pothole Cylinders

| ITEM | PART NO. | QTY | DESCRIPTION               |
|------|----------|-----|---------------------------|
| --   | 87117    | --  | Pothole Cylinder Assembly |
| 1    | 92540    | 2   | Valve, with Coil          |
| --   | 92173    | --  | Coil                      |
| 2    | 92673    | 2   | Cylinder                  |
| --   | 92966    | --  | Seal Kit                  |
| 3    | 50673    | 4   | Fitting, MB-MFFOR90-4-4   |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

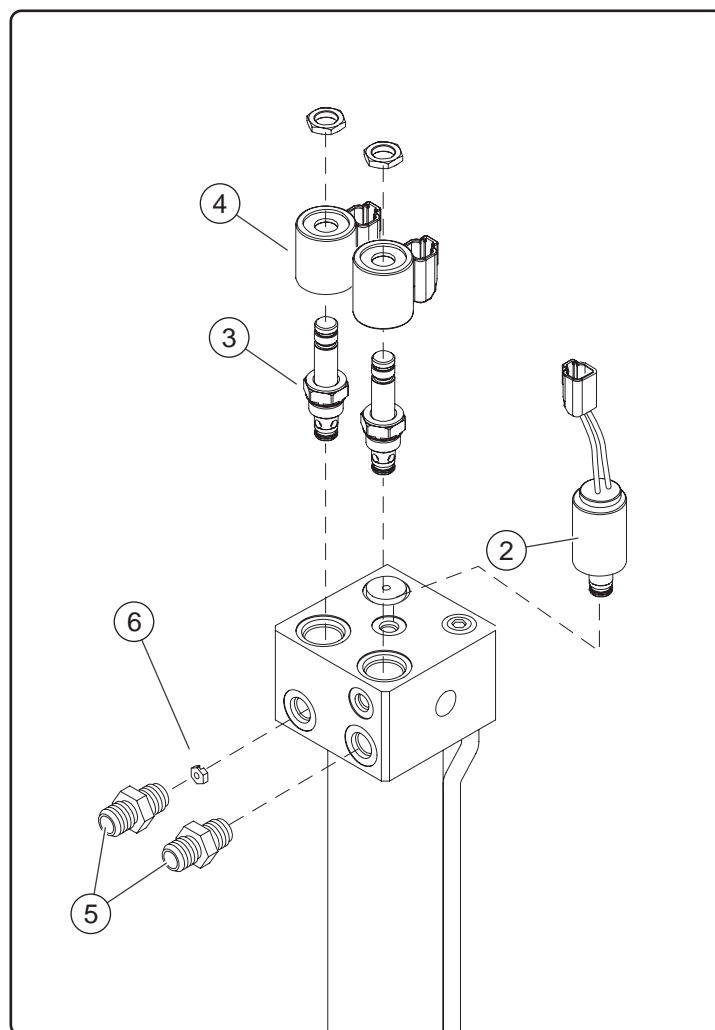
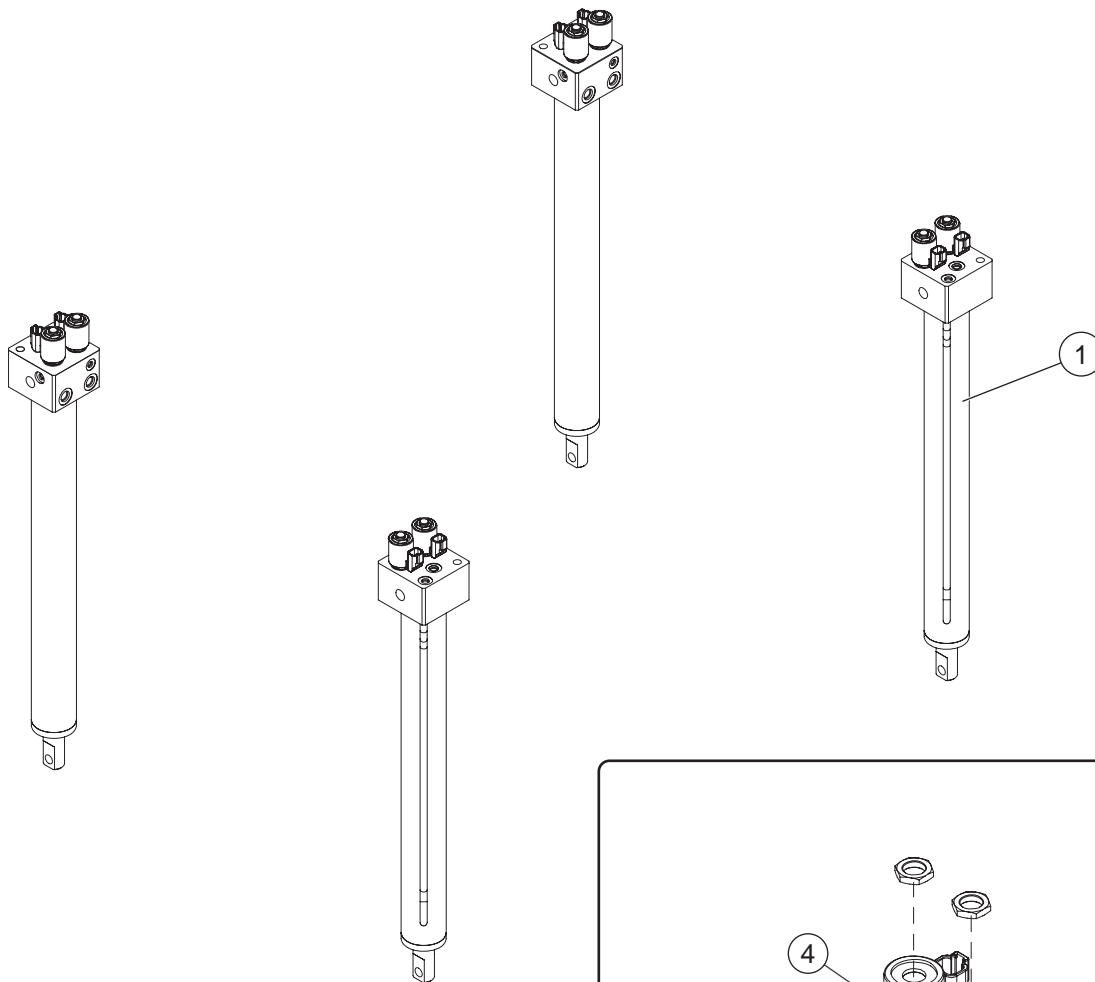


ILLUSTRATION No.  
ART\_4072

Crossover Series

Outrigger Cylinders



## Outrigger Cylinders

| ITEM           | PART NO. | QTY | DESCRIPTION                              |
|----------------|----------|-----|--|
| 1              | 91278    | 4   | Cylinder                                 |
| --             | 91463    | --  | Seal Kit                                 |
| Each Cylinder: |          |     |  |
| 2              | 91281    | 1   | Pressure Switch                          |
| 3              | 91464    | 2   | Valve                                    |
| 4              | 91141    | 2   | Coil, 12v                                |
| 5              | HDW91465 | 2   | Adapter, 3/8 Male O-Ring -- 1/4 Male JIC |
| 6              | 90439    | 1   | Orifice                                  |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

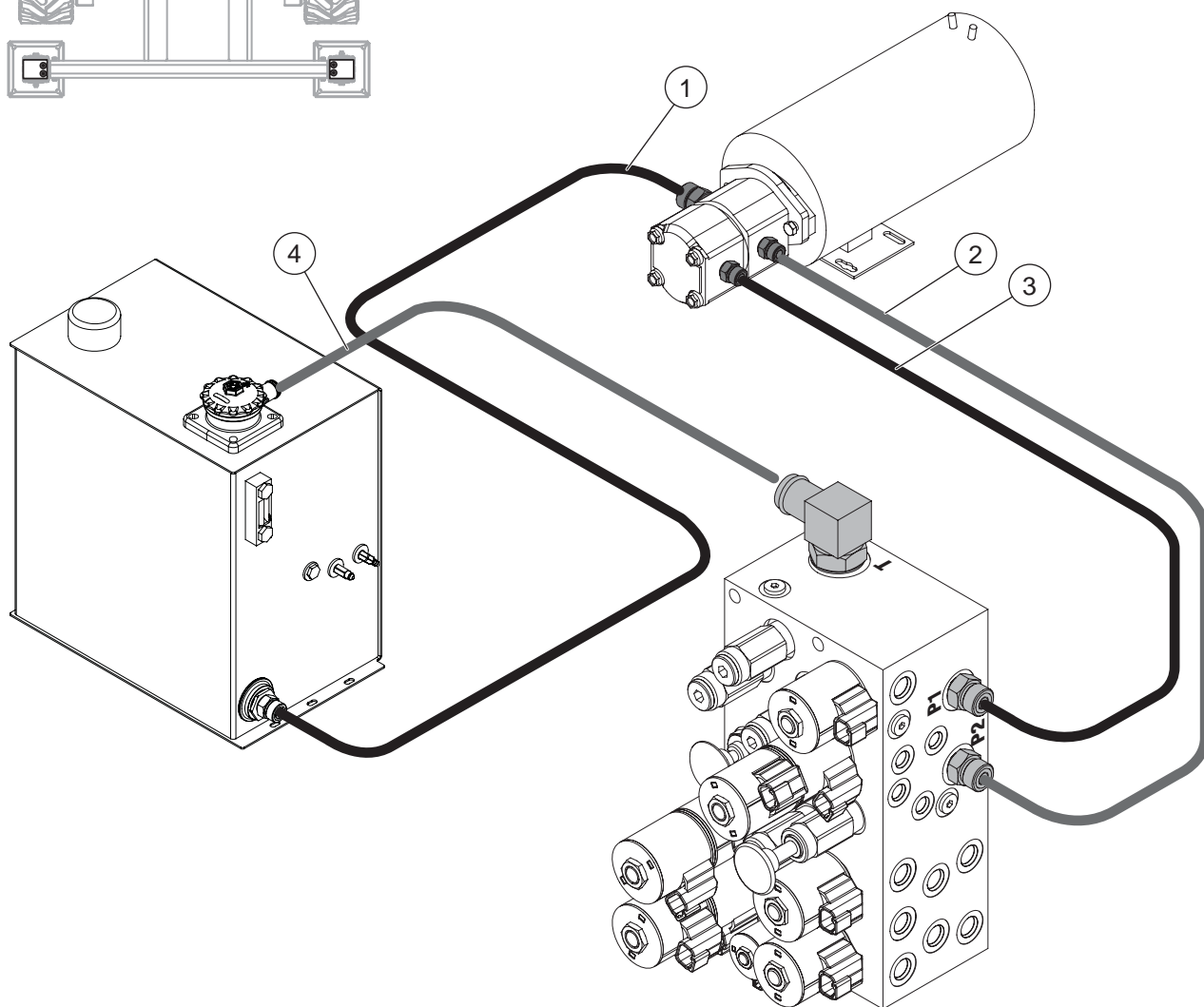
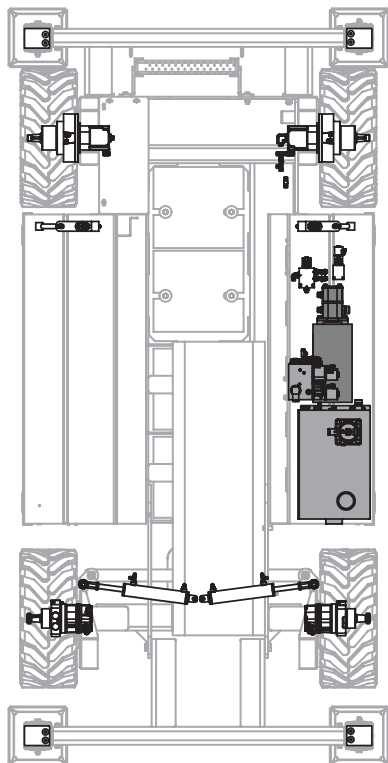


ILLUSTRATION No.  
ART\_4075

Crossover Series

Tank / Pump / Functions Manifold Hoses

## Tank/Pump/Manifold Hoses

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 52224    | 1   | Hose Assy, 3/4" x 14.25", 12G12FFORx90 x 12G12FFORX |
| 2    | 52206    | 1   | Hose Assy, 1/2" x 15.5", 8G8FFORX x 8G8FFORX90      |
| 3    | 52205    | 1   | Hose Assy, 1/2" x 22.25", 8G8FFORX x 8G8FFORX90     |
| 4    | 52203    | 1   | Hose , 1" x 10.5"                                   |
| --   | 92537    | 2   | Hose Clamp  |

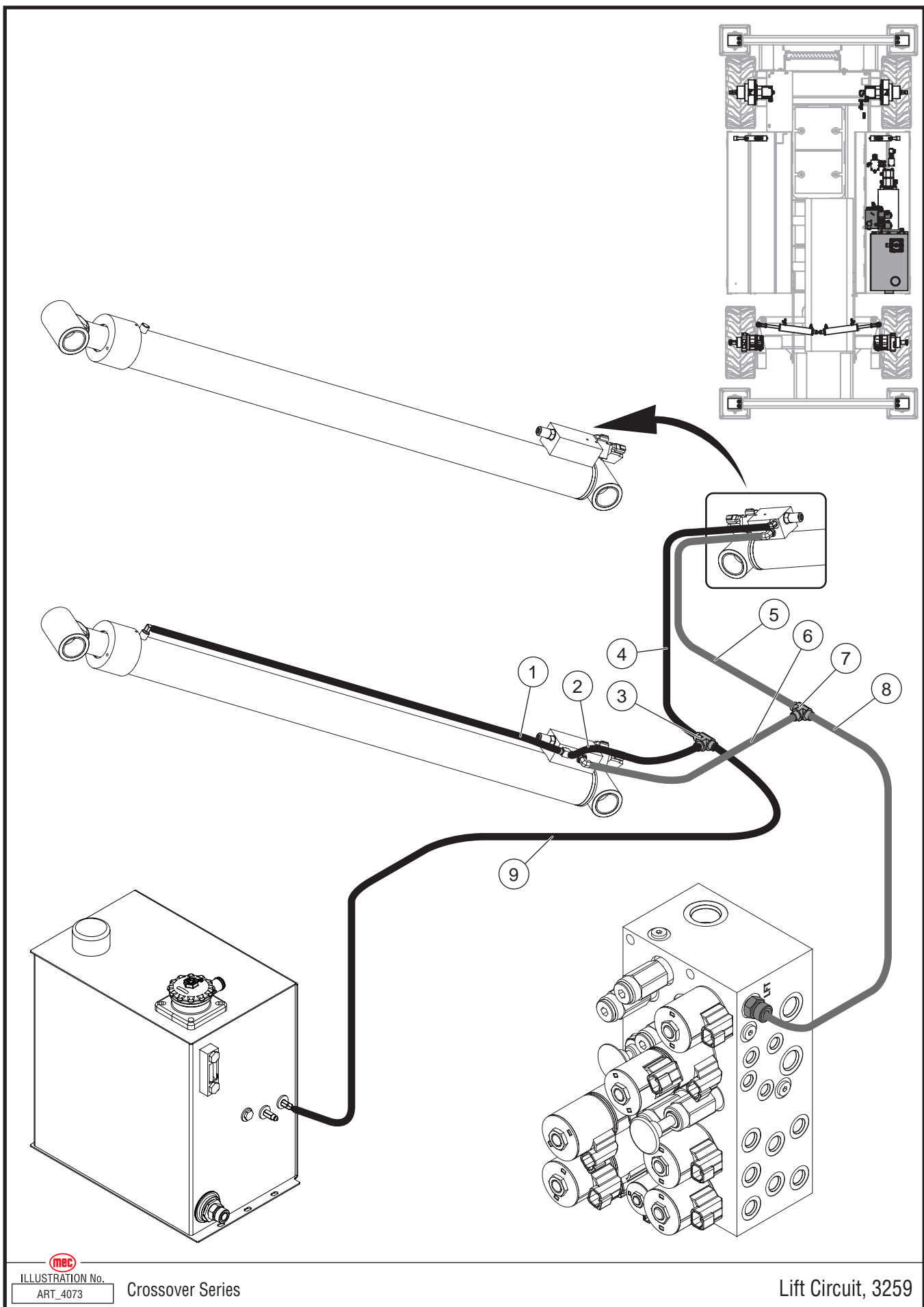


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## Lift Circuit, 3259

| ITEM | PART NO. | QTY    | DESCRIPTION                             |
|------|----------|--------|---|
| 1    | 50959    | 3 ft   | Hose, 5/16"                             |
| 2    | 50959    | 8.5 ft | Hose, 5/16"                             |
| 3    | HDW91249 | 1      | Fitting, 5/16" Tee, Barbed              |
| 4    | 50959    | 36 ft  | Hose, 5/16"                             |
| 5    | 52243    | 1      | Hose Assy, 3/8" x 341", 6G6FJX-6G6FJX   |
| 6    | 52242    | 1      | Hose Assy, 3/8" x 42", 6G6FJX-6G6FJX    |
| 7    | 50928    | 1      | Fitting, MJT-6                          |
| 8    | 52204    | 1      | Hose Assy, 3/8" x 144", 6G6FFORX-6G6FJX |
| 9    | 50959    | 5 ft   | Hose, 5/16"                             |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

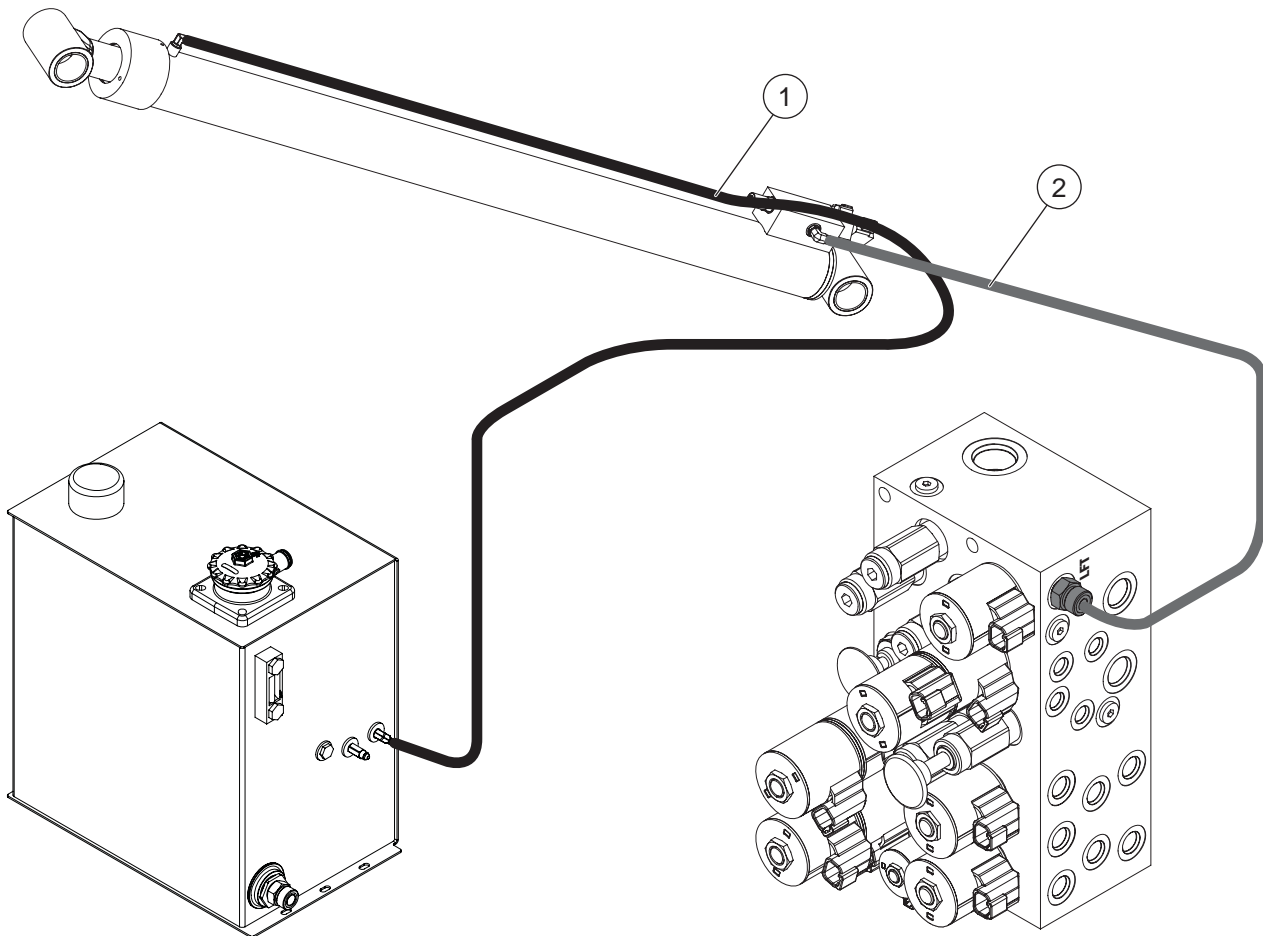
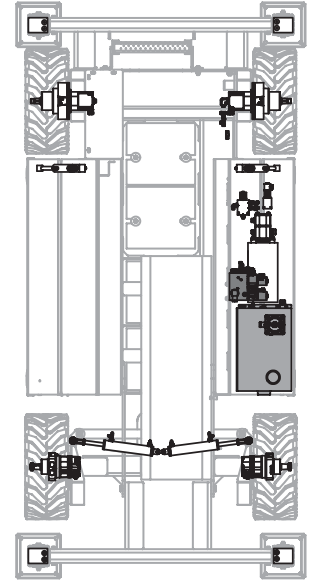


ILLUSTRATION No.  
ART\_4074

Crossover Series

Lift Circuit, 2659

## Lift Circuit, 2659

| ITEM | PART NO. | QTY      | DESCRIPTION                           |
|------|----------|----------|---------------------------------------|
| 1    | 50959    | 16.25 ft | Hose, 5/16" Return                    |
| 2    | 52204    | 1        | Hose Assy, 3/8" x 144", 6G6FFOR-6G6FJ |

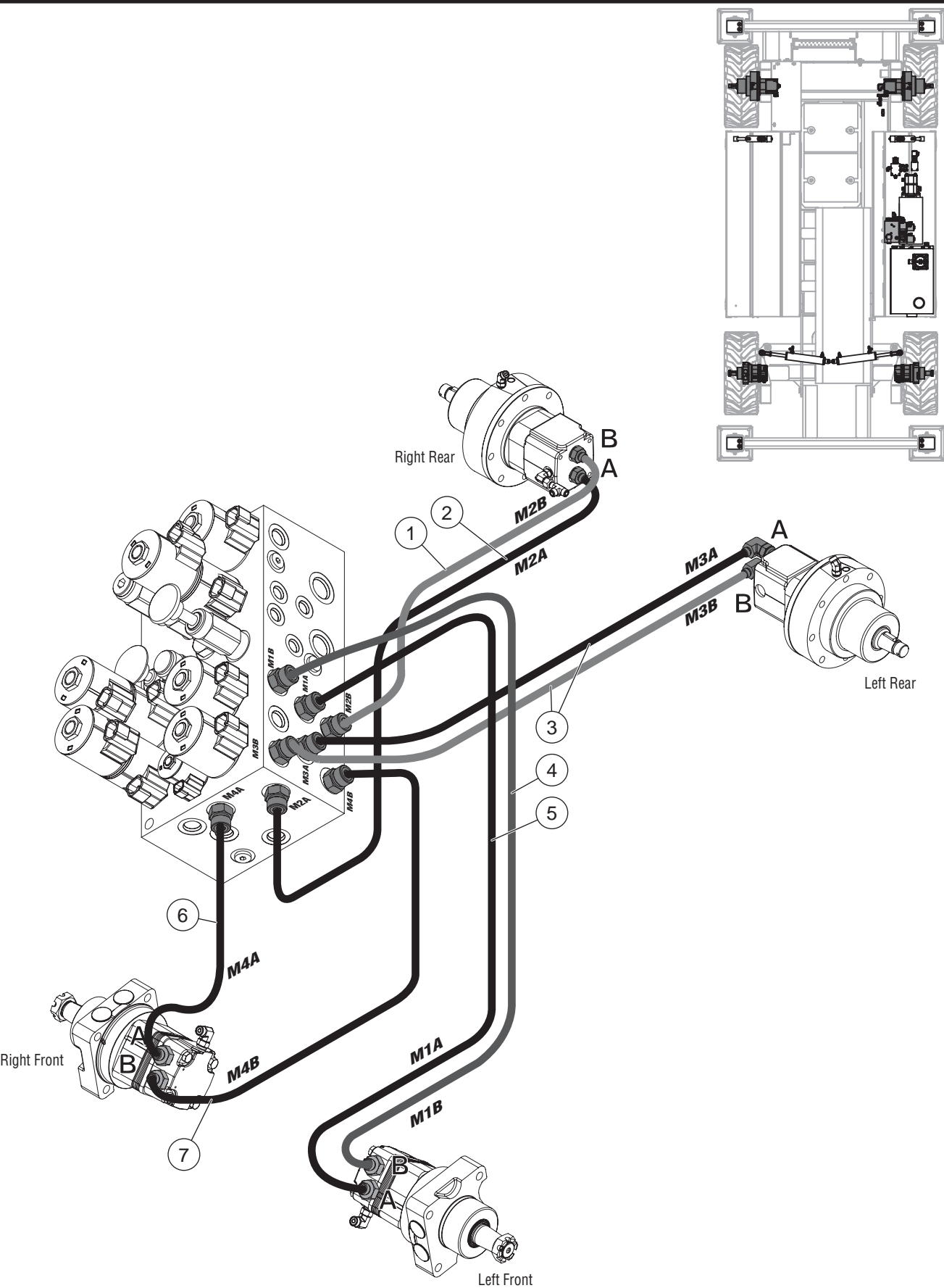


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only





## Drive Circuit

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| 1    | 52215    | 1   | Hose Assy, 3/8" x 64.5", 6G6FFORX-6G6FFORX    |
| 2    | 52214    | 1   | Hose Assy, 3/8" x 65.5 ", 6G6FFORX-6G6FFORX45 |
| 3    | 52217    | 2   | Hose Assy, 3/8" x 40.25", 6G6FFORX-6G6FFORX   |
| 4    | 52213    | 1   | Hose Assy, 3/8" x 80.5", 6G6FFORX-6G6FFORX    |
| 5    | 52212    | 1   | Hose Assy, 3/8" x 82", 6G6FFORX-6G6FFORX      |
| 6    | 52218    | 1   | Hose Assy, 3/8" x 107.5", 6G6FFORX-6G6FFORX45 |
| 7    | 52219    | 1   | Hose Assy, 3/8" x 108.5 ", 6G6FFORX-6G6FFORX  |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

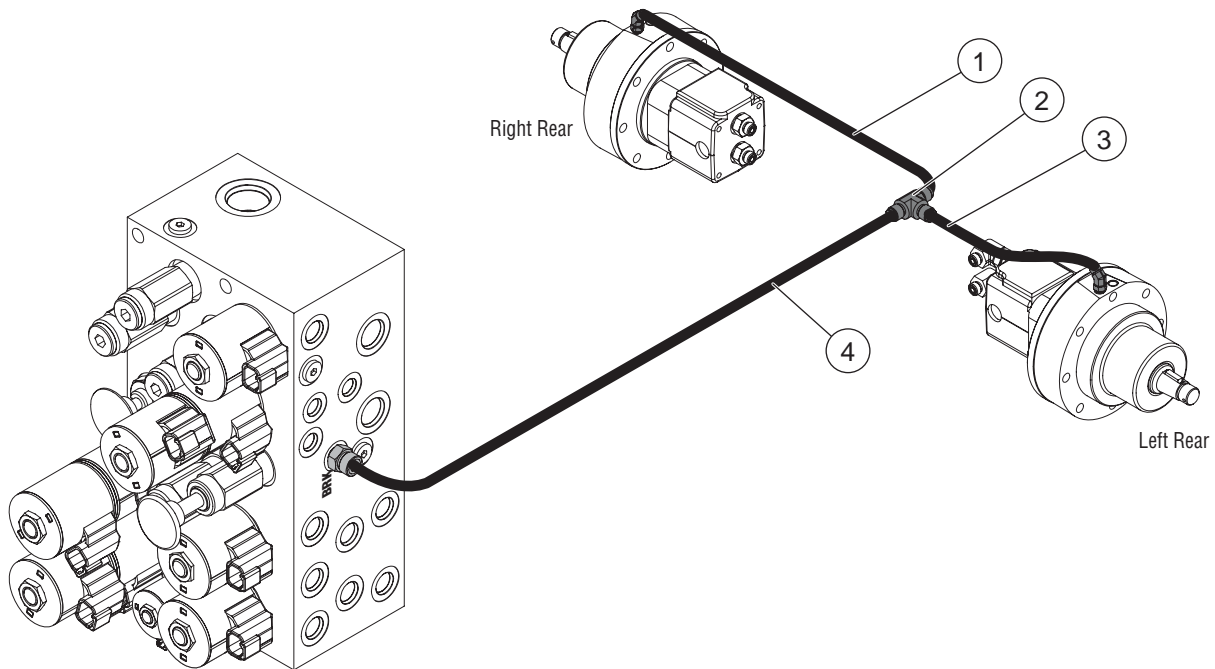
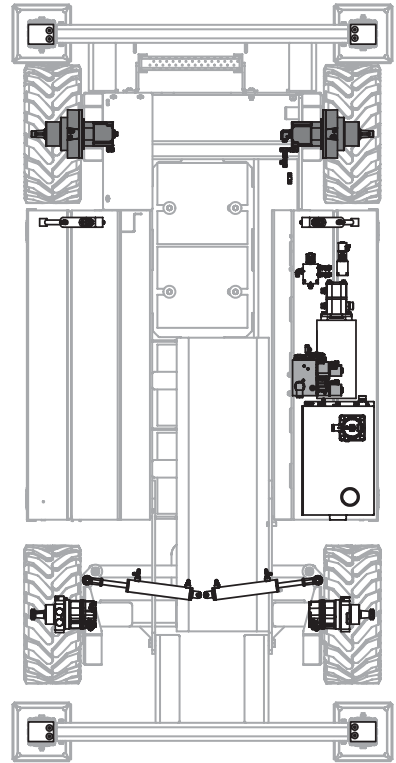


ILLUSTRATION No.  
ART\_4077

Crossover Series

Brake Circuit

## Brake Circuit

| ITEM | PART NO. | QTY | DESCRIPTION                                 |
|------|----------|-----|---|
| 1    | 52209    | 1   | Hose Assy, 1/4" x39 ", 4G4FFORX-4G4FFORX45  |
| 2    | 50879    | 1   | Fitting, MFFORT-4                           |
| 3    | 52210    | 1   | Hose Assy, 1/4" x 9.5", 4G4FFORX-4G4FFORX   |
| 4    | 52211    | 1   | Hose Assy, 1/4" x 33.25", 4G4FFORX-4G4FFORX |

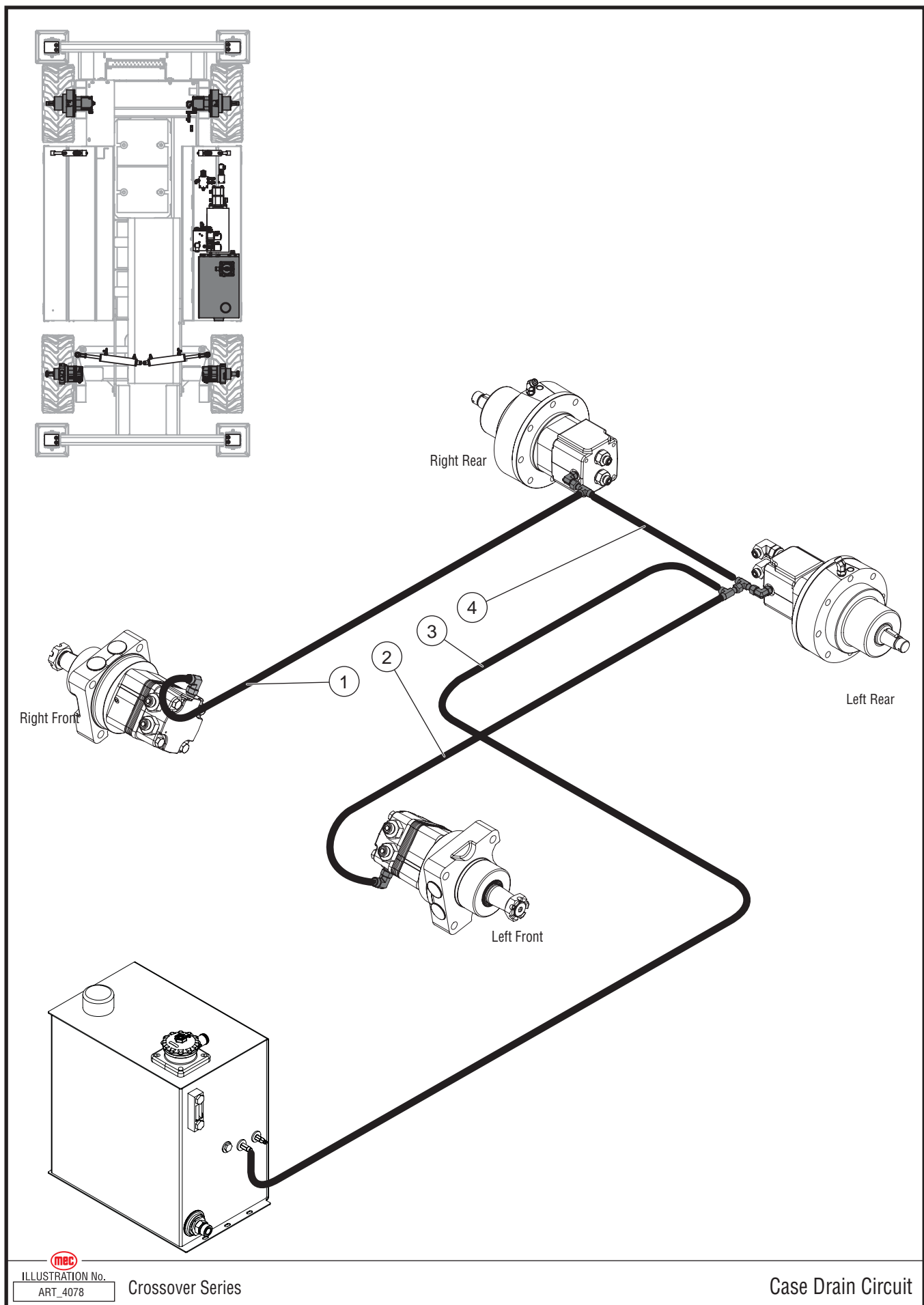


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## Case Drain Circuit

| ITEM | PART NO. | QTY | DESCRIPTION                                    |
|------|----------|-----|--|
| 1    | 52221    | 1   | Hose Assy, 1/4" x 100.25", 4G4FFORX-4G4FFORX45 |
| 2    | 52223    | 1   | Hose Assy, 1/4" x 100.5", 4G4FFORX-4G4FFORX    |
| 3    | 52222    | 1   | Hose Assy, 1/4" x 45.5", 4G4MJ-4G4FFORX90      |
| 4    | 52220    | 1   | Hose Assy, 1/4" x 27", 4G4FFORX-4G4FFORX       |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

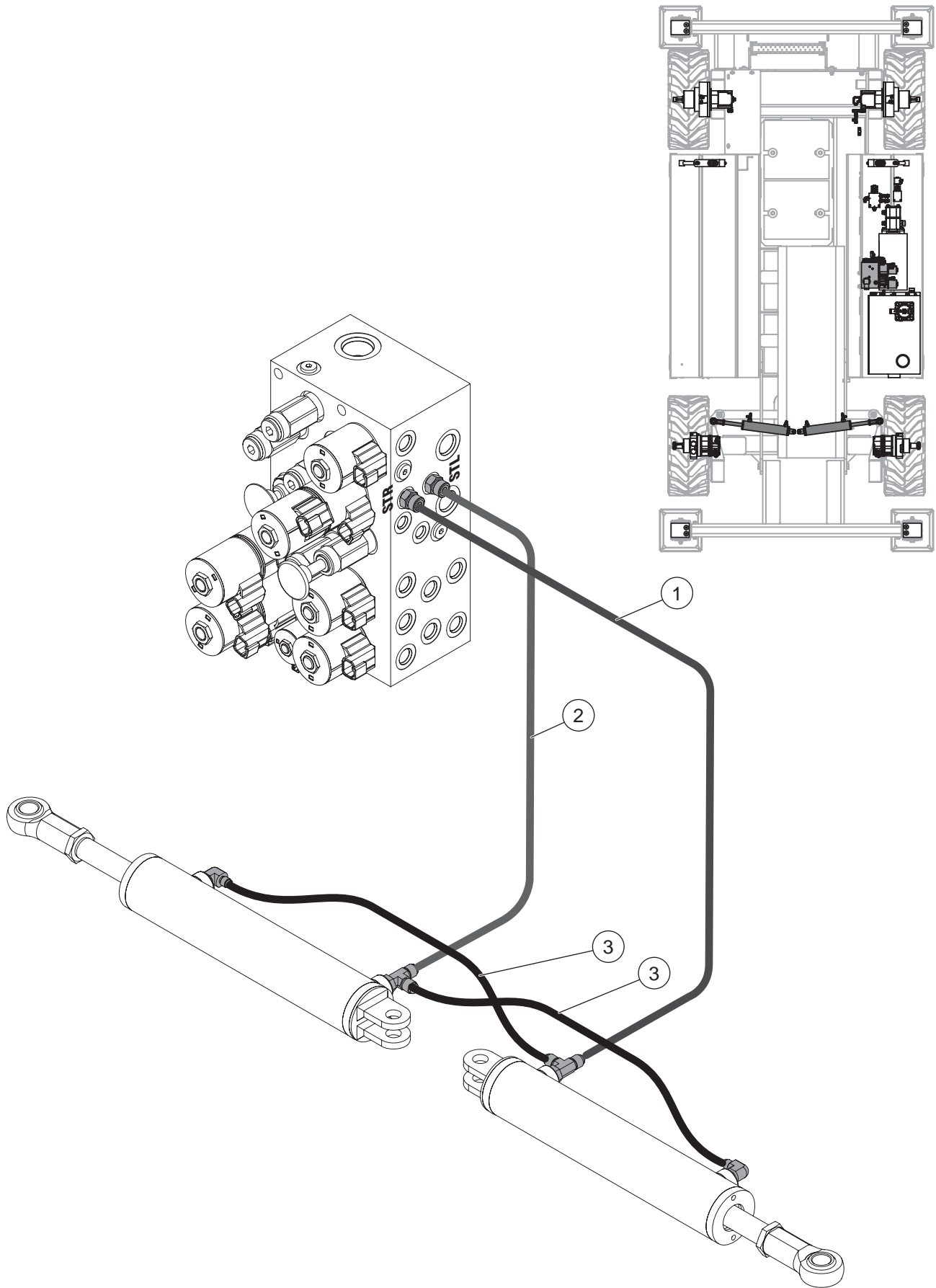


ILLUSTRATION No.  
ART\_4079

Crossover Series

Steer Circuit

## Steer Circuit

| ITEM | PART NO. | QTY | DESCRIPTION                              |
|------|----------|-----|--|
| 1    | 26504    | 1   | Hose Assy, 1/4" x 67.5", 4G4FFORX-4G4FJX |
| 2    | 26505    | 1   | Hose Assy, 1/4" x 71.5", 4G4FFORX-4G4FJX |
| 3    | 26523    | 2   | Hose Assy, 1/4" x 12.75", 4G4FJX-4G4FJX  |

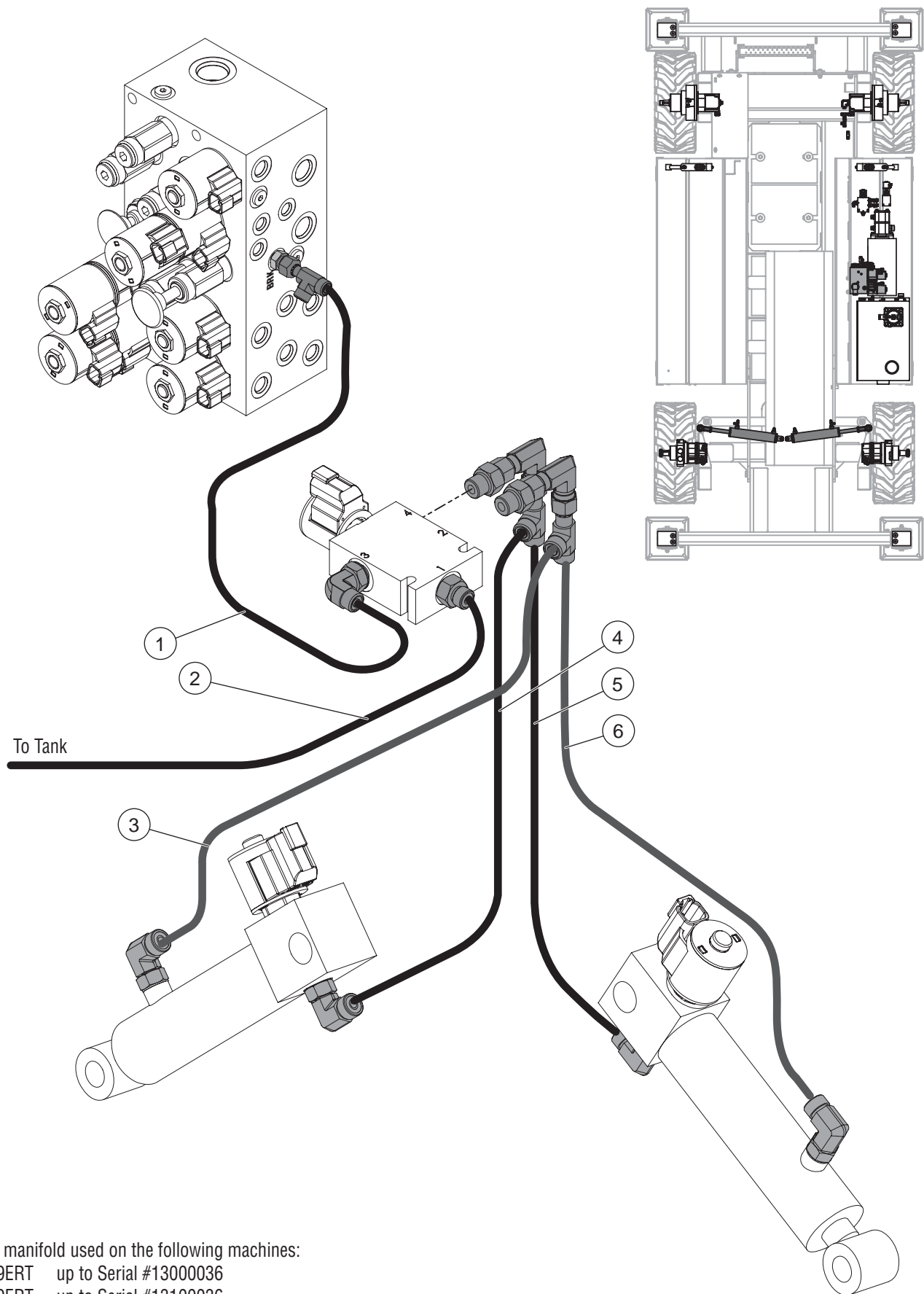


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:

2659ERT up to Serial #13000036

3259ERT up to Serial #13100036



ILLUSTRATION No.  
ART\_4082

Crossover Series

Pothole Circuit, Early Machines



## Pothole Circuit, Early Machines

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- up to Serial # 13000036

3259 -- up to Serial # 13100036

| ITEM | PART NO. | QTY | DESCRIPTION                                  |
|------|----------|-----|--|
| 1    | 52232    | 1   | Hose Assy, 1/4" x 20", 4G4FFORX-4G4FJX       |
| 2    | 52231    | 1   | Hose Assy, 1/4" x 13.5", 4G4FFORX-4G4FFORX90 |
| 3    | 52228    | 1   | Hose Assy, 1/4" x 83", 4G4FFORX-4G4FFORX90   |
| 4    | 52230    | 1   | Hose Assy, 1/4" x 75", 4G4FFORX-4G4FFORX90   |
| 5    | 52229    | 1   | Hose Assy, 1/4" x 22", 4G4FFORX-4G4FFORX45   |
| 6    | 52227    | 1   | Hose Assy, 1/4" x 32", 4G4FFORX-4G4FFORX     |

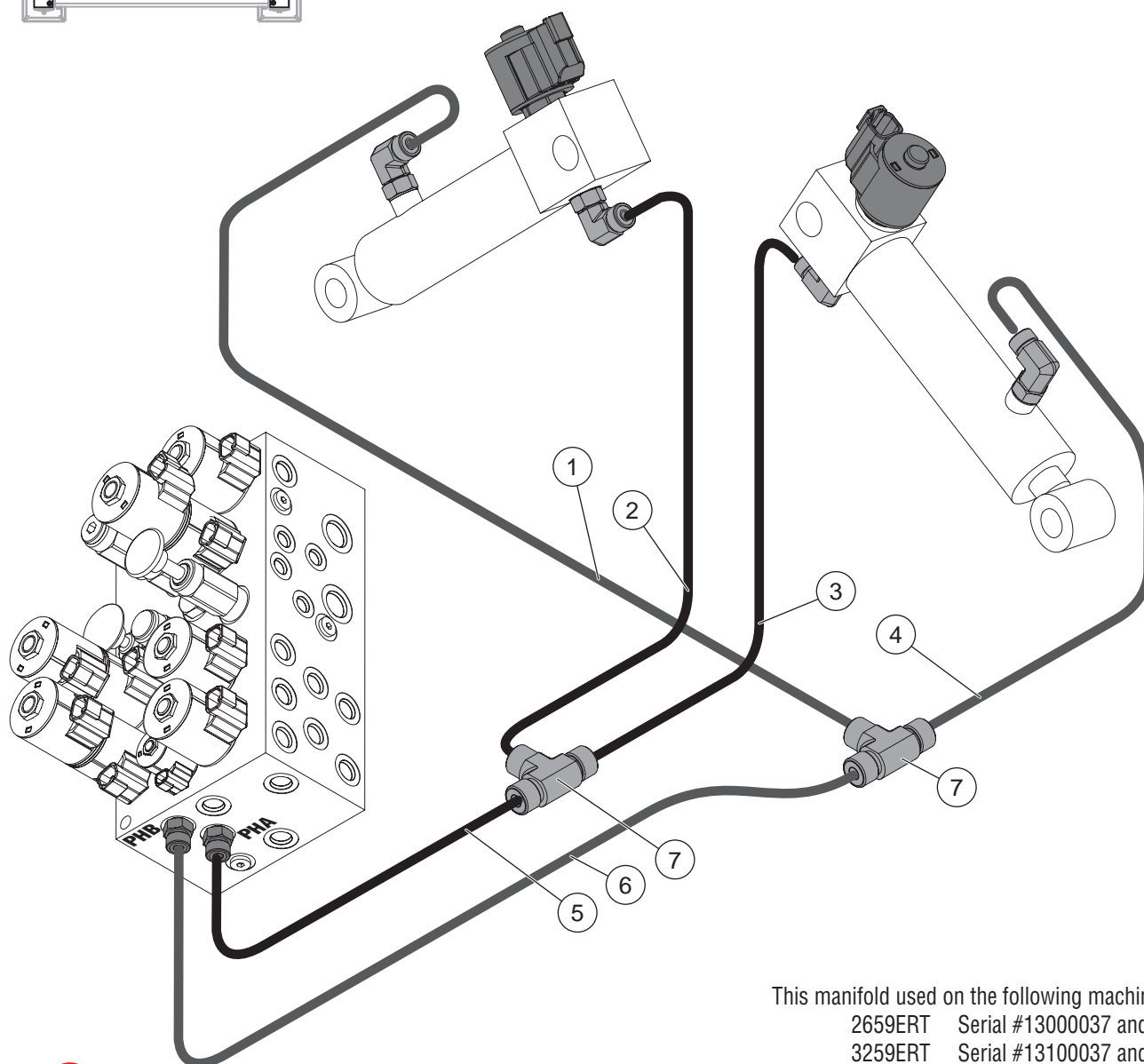
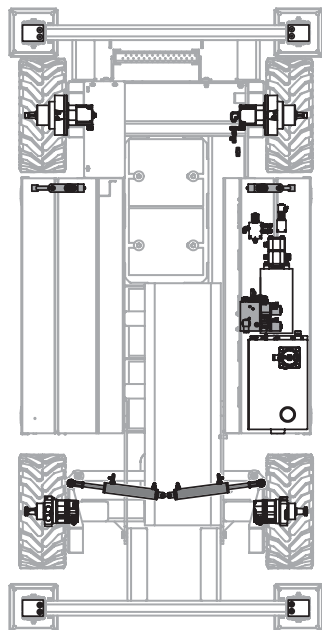


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:  
 2659ERT Serial #13000037 and up  
 3259ERT Serial #13100037 and up



ILLUSTRATION No.  
ART\_4080

Crossover Series

Pothole Circuit, Later Machines

## Pothole Circuit, Later Machines

**CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS**

**2659 -- Serial # 13000037 and up**

**3259 -- Serial # 13100037 and up**

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| 1    | 52228    | 1   | Hose Assy, 1/4" x 83", 4G4FFORX-4G4FFORX90    |
| 2    | 52230    | 1   | Hose Assy, 1/4" x 75", 4G4FFORX-4G4FFORX90    |
| 3    | 52229    | 1   | Hose Assy, 1/4" x 22", 4G4FFORX-4G4FFORX45    |
| 4    | 52227    | 1   | Hose Assy, 1/4" x 32", 4G4FFORX-4G4FFORX      |
| 5    | 52231    | 1   | Hose Assy, 1/4" x 13.25", 4G4FFORX-4G4FFORX45 |
| 6    | 52232    | 1   | Hose Assy, 1/4" x 13.25", 4G4FFORX-4G4FFORX45 |
| 7    | 50878    | 2   | Fitting, MFFORT-4                             |

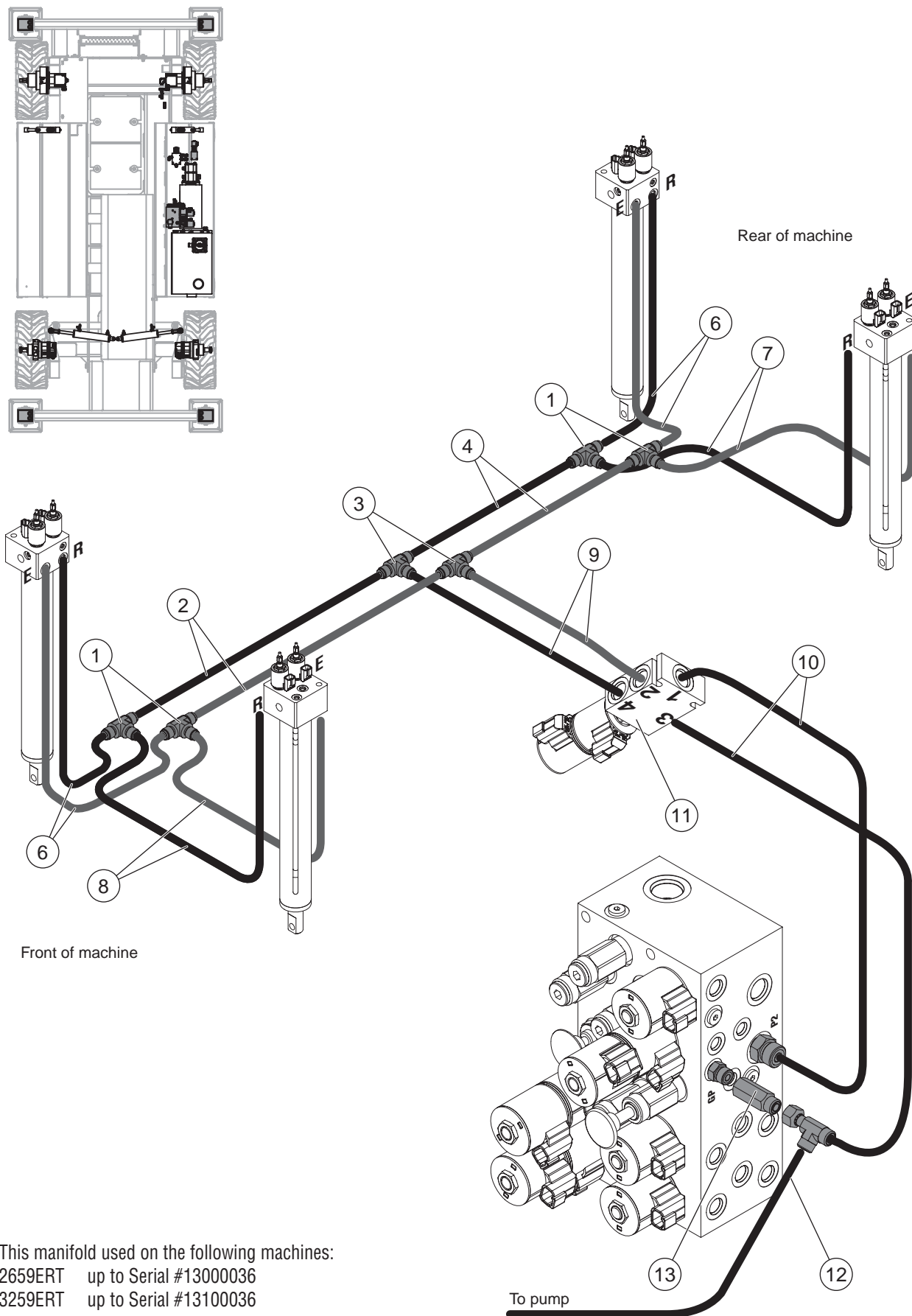


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:  
 2659ERT up to Serial #13000036  
 3259ERT up to Serial #13100036

**MEC**  
 ILLUSTRATION No.  
 ART\_4081

Crossover Series

Outrigger Circuit, Early Machines

## Outrigger Circuit, Early Machines

**CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS**

**2659 -- up to Serial # 13000036**

**3259 -- up to Serial # 13100036**

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| 1    | 51016    | 4   | Fitting, MFFORT-4-6-4                         |
| 2    | 52246    | 2   | Hose Assy, 1/4" x 70", 4G4FFORX-4G4FFORX      |
| 3    | 50879    | 2   | Fitting, MFFORT-6                             |
| 4    | 52248    | 2   | Hose Assy, 1/4" x 47.75", 4G4FFORX-4G4FFORX   |
| 5    | --       | --  | --  |
| 6    | 52250    | 4   | Hose Assy, 1/4" x 30", 4G4FFORX-4G4FFORX90    |
| 7    | 52252    | 2   | Hose Assy, 1/4" x 56", 4G4FFORX-4G4FFORX90    |
| 8    | 52254    | 2   | Hose Assy, 1/4" x 49.75", 4G4FFORX-4G4FFORX90 |
| 9    | 52244    | 2   | Hose Assy, 3/8" x 48.5", 6G6FFORX-6G6FFORX    |
| 10   | 52259    | 2   | Hose Assy, 3/8" x 22.5", 6G6FFORX-6G6FFORX    |
| 11   | 92890    | 1   | Outrigger Valve Manifold                      |
| --   | 92889    | --  | Valve, with Coil                              |
| --   | 92579    | --  | Valve, no Coil                                |
| --   | 91143    | --  | Coil  |
| 12   | 52258    | 1   | Hose Assy, 3/8" x 8", 6G6FFORX-6G6FFORX       |
| 13   | 92893    | 1   | Check Valve                                   |

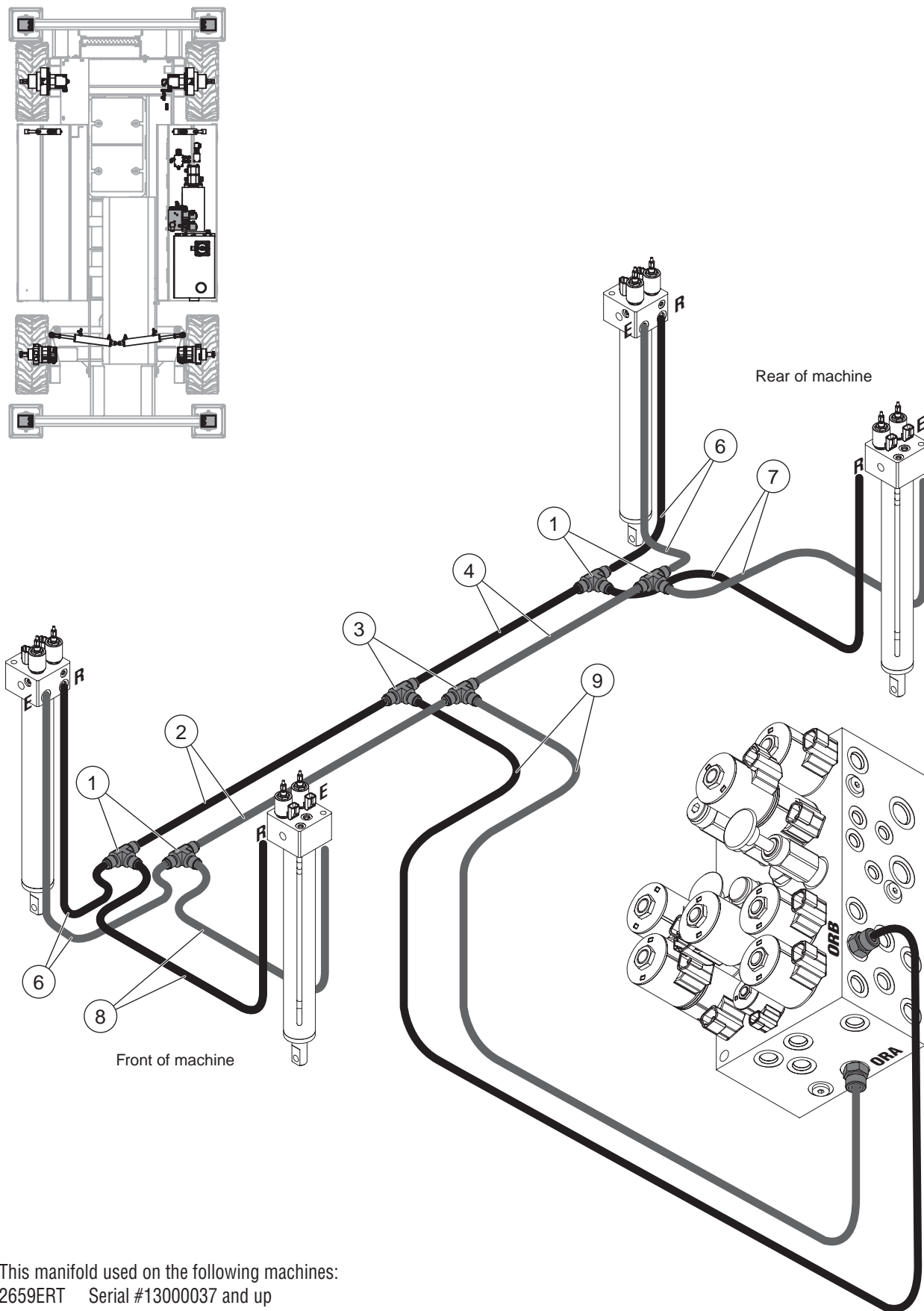


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



This manifold used on the following machines:

2659ERT Serial #13000037 and up

3259ERT Serial #13100037 and up

**MEC**  
ILLUSTRATION No.  
ART\_4081

Crossover Series

Outrigger Circuit, Later Machines

## Outrigger Circuit, Later Machines

CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS

2659 -- Serial # 13000037 and up

3259 -- Serial # 13100037 and up

| ITEM | PART NO. | QTY | DESCRIPTION                                   |
|------|----------|-----|---|
| 1    | 51016    | 4   | Fitting, MFFORT-4-6-4                         |
| 2    | 52238    | 2   | Hose Assy, 1/4" x 70", 4G4FFORX-4G4FFORX      |
| 3    | 50879    | 2   | Fitting, MFFORT-6                             |
| 4    | 52248    | 2   | Hose Assy, 1/4" x 47.75", 4G4FFORX-4G4FFORX   |
| 5    | --       | --  | --  |
| 6    | 52233    | 4   | Hose Assy, 1/4" x 30", 4G4FFORX-4G4FFORX90    |
| 7    | 52234    | 2   | Hose Assy, 1/4" x 56", 4G4FFORX-4G4FFORX90    |
| 8    | 52235    | 2   | Hose Assy, 1/4" x 49.75", 4G4FFORX-4G4FFORX90 |
| 9    | 52237    | 2   | Hose Assy, 3/8" x 48.5", 6G6FFORX-6G6FFORX    |



• as req: as required

• INCL: Included with assembly

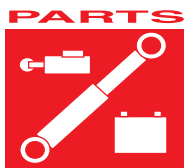
• NS: Not a Stock item

• REF: Reference only

**NOTES:**

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# SECTION F

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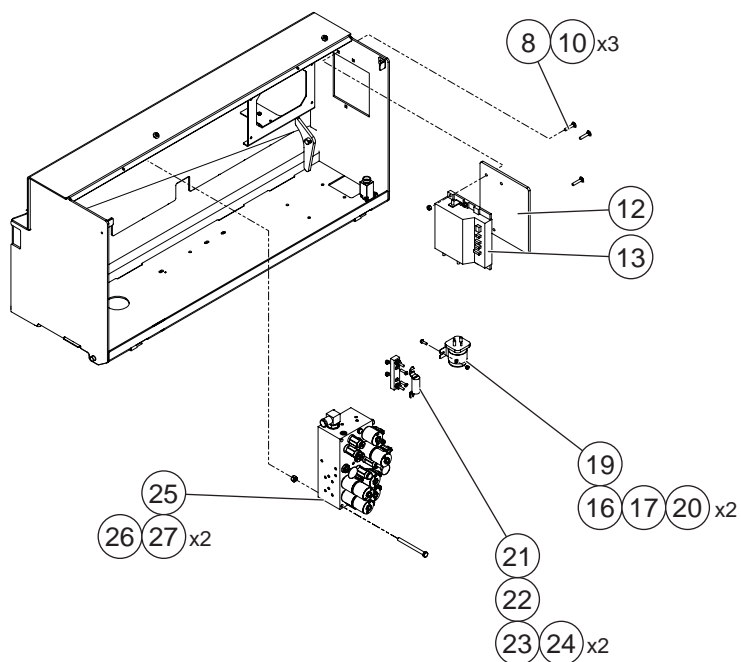
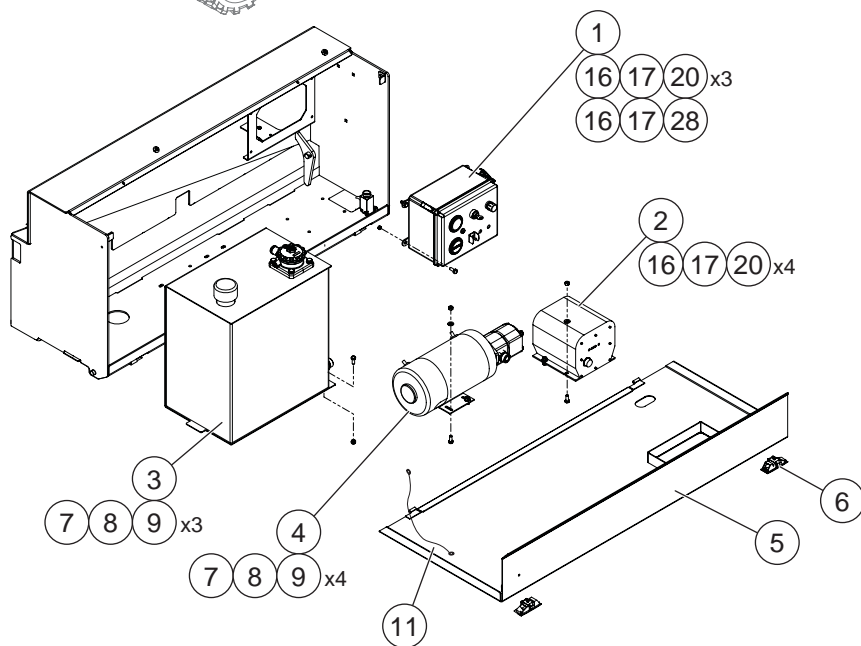
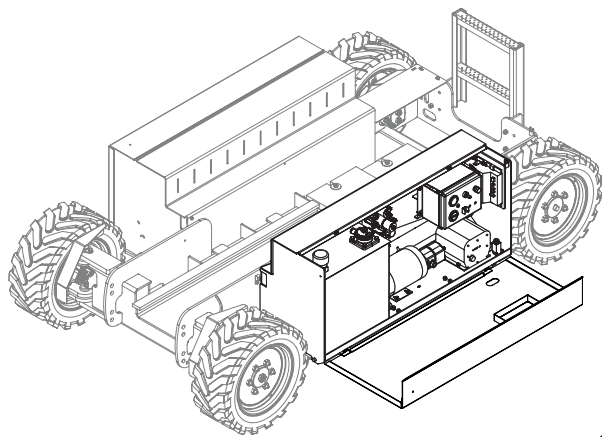


ILLUSTRATION No.  
ART\_4024

Crossover Series

Control Module

## Control Module

| ITEM   | PART NO. | QTY  | DESCRIPTION  |
|--|----------|--|--|
| 1  | REF      | --   | Lower Control Box Assembly -- See Section A                                |
| 2  | 92212*   | 1  | Battery Charger, 36V   |
|  | 92824†   | 1  | Battery Charger, 48V   |
| 3  | REF      | 1  | Hydraulic Tank Assembly -- See Section E                                   |
| 4  | REF      | --   | Motor/Pump Assembly -- See Section E                                       |
| 5  | 87111    | 1  | Control Module Door Assembly -- includes door latches                      |
| 6  | 8386     | 2  | Door Latch   |
| 7  | 50030    | 19   | Bolt, M8 x 20  |
| 8  | 50048    | 21   | Nut, M8 Nylock   |
| 9  | 50001    | 8  | Washer, M8 std   |
| 10   | 50225    | 3  | Carriage Bolt, M8 x 20   |
| 11   | 26575    | 1  | Cable, Door Stop   |
| 12   | 19276    | 1  | Heat Sink, Finned (early machines; fins fit through cutout in module wall) |
|  | 26447    | 1  | Heat Sink, No Fins (later machines; no fins; no cutout in module wall)     |
| 13   | 91658    | 1  | Motor Controller   |
| 14   | --       | --   | --   |
| 15   | 50294    | 2  | Bolt, M6 x 45  |
| 16   | 50000    | 4  | Washer, M6 std   |
| 17   | 50047    | 8  | Nut, M6 Nylock   |
| 18   | --       | --   | --   |
| 19   | 91745    | 1  | Contactor, 12v   |
| 20   | 50028    | 2  | Bolt, M6 x 020   |
| 21   | 8945     | 1  | Fuse Block   |
| 22   | 91709    | 1  | 300 Amp Slow Blow Fuse   |
| 23   | 50382    | 2  | Cap screw 1/4-20 X 1   |
| 24   | 50166    | 2  | Nut, 1/4-20 Nylock   |
| 25   | REF      | --   | Functions Manifold -- See Section E  |
| 26   | 50366    | 2  | Bolt, M10 x 120  |
| 27   | 50049    | 2  | Nut, M10 Nylock  |
| 28   | 50296    | 3  | Bolt, M6 x 15  |
| <b>CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS</b> |          |  |  |
| *  |          | 2659 -- up to Serial # 13000031<br>3259 -- up to Serial # 13100027   |  |
| †  |          | 2659 -- Serial # 13000032 and up<br>3259 -- Serial # 13100028 and up |  |

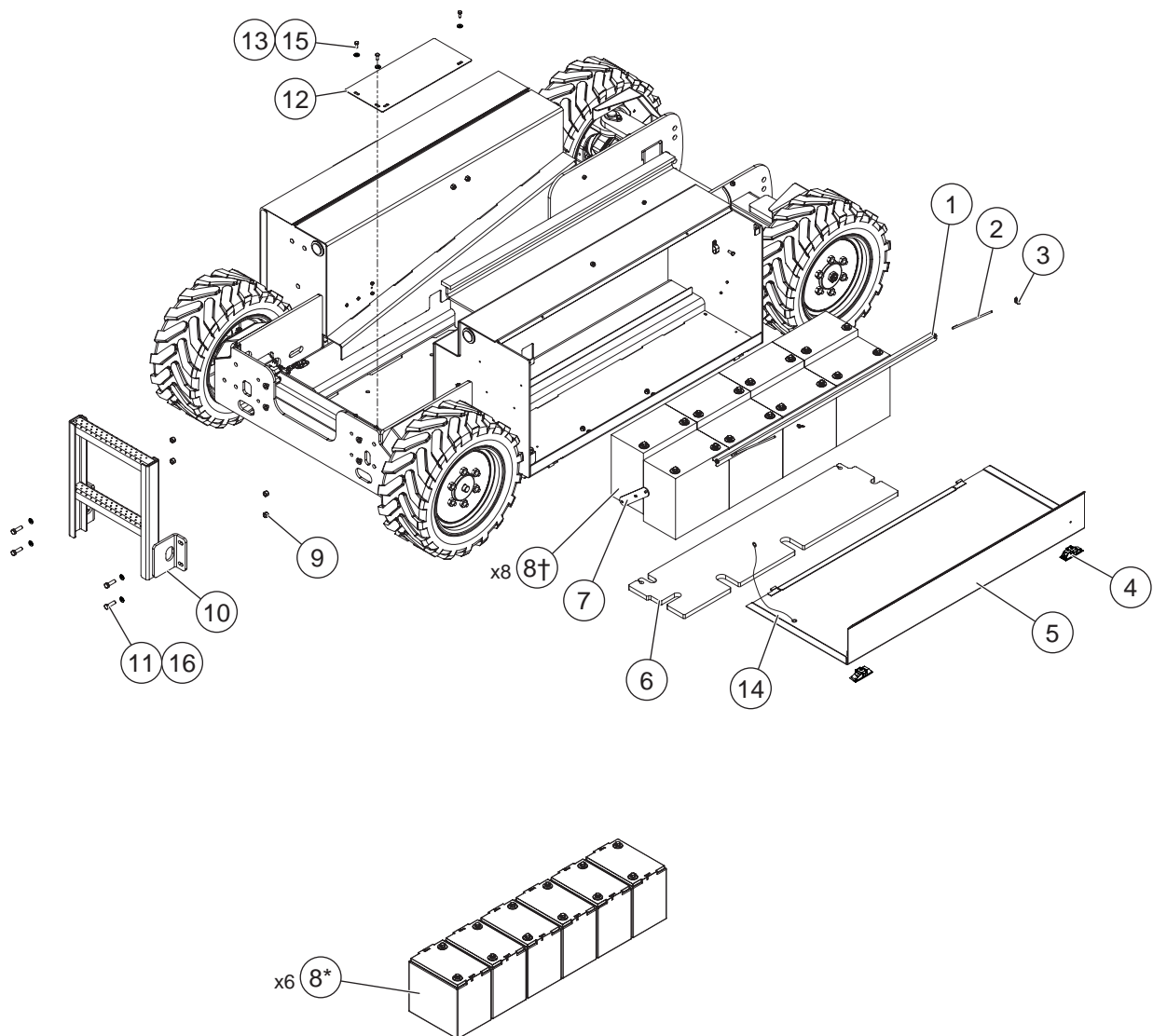
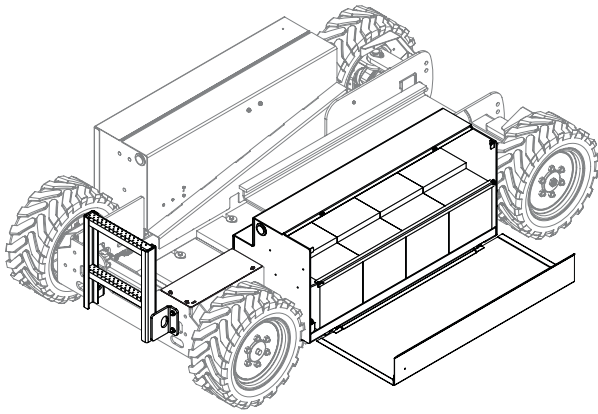


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## Battery Module & Entry Ladder

| ITEM   | PART NO. | QTY  | DESCRIPTION   |
|--|----------|--|---|
| 1  | 26418    | 1  | Battery Bracket                                       |
| 2  | 22563    | 2  | Battery Holdown Bolt                                  |
| 3  | HDW6110  | 2  | 1/4"-20 Wing Nut                                      |
| 4  | 8386     | 2  | Door Latch  |
| 5  | 87110    | 1  | Battery Module Door Assembly -- includes door latches |
| 6  | 26288    | 1  | Battery Module Counterweight                          |
| 7  | 26419    | 1  | Battery Hold Down Bracket                             |
| 8  | 92825†   | 8  | Battery, 6V 250ah                                     |
|  | 91714*   | 6  | Battery, 6V 375ah                                     |
| 9  | 50054    | 4  | Nut, M12 Nylock                                       |
| 10   | 26240    | 1  | Ladder Weldment                                       |
| 11   | 50236    | 4  | Bolt, M12 x 40  |
| 12   | 26391    | 1  | Chassis Cover   |
| 13   | 50030    | 3  | Bolt, M8 x 20   |
| 14   | 26575    | 1  | Cable, Door Stop                                      |
| 15   | 50001    | 3  | Washer, M8 Std  |
| 16   | 50003    | 4  | Washer, M12 Std                                       |
| <b>CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS</b> |          |  |   |
| *  |          | 2659 -- up to Serial # 13000031<br>3259 -- up to Serial # 13100027   |   |
| †  |          | 2659 -- Serial # 13000032 and up<br>3259 -- Serial # 13100028 and up |   |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

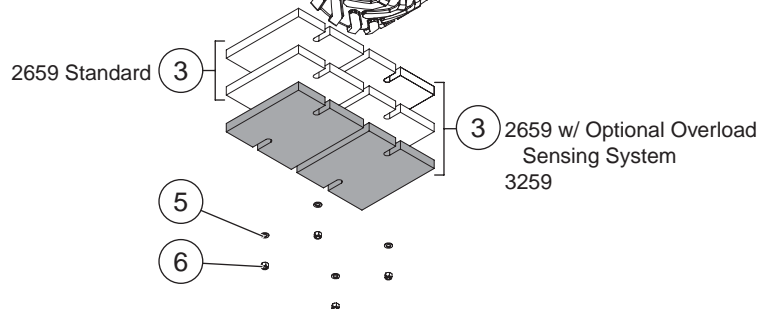
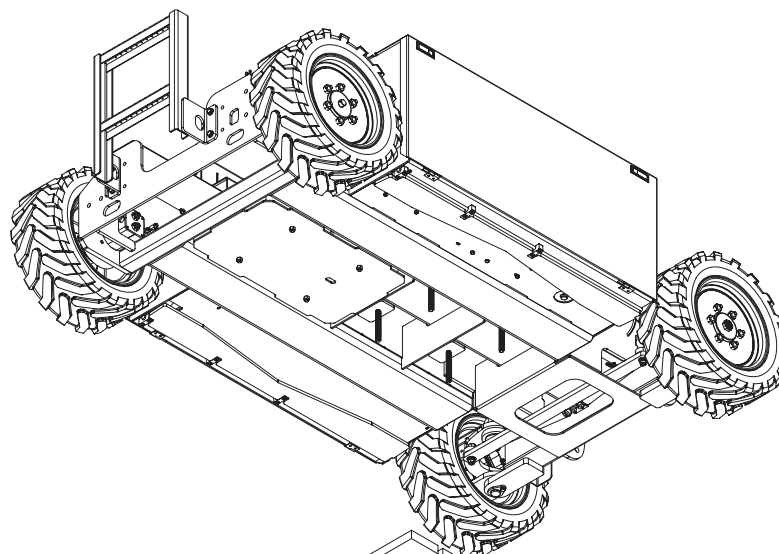
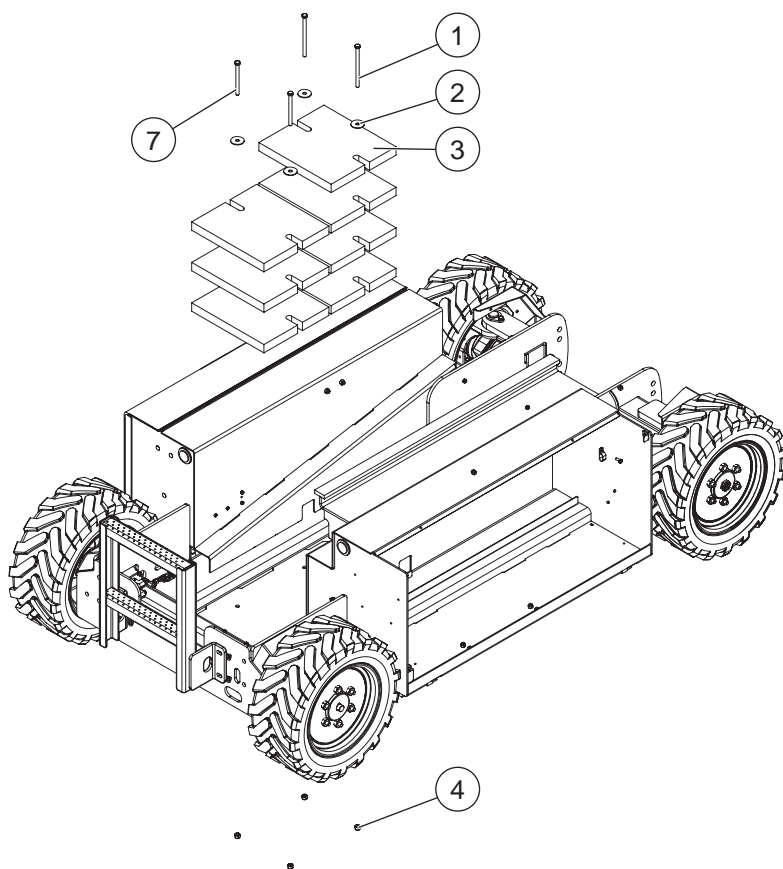


ILLUSTRATION No.  
ART\_4025

Crossover Series

Chassis Counterweight

## Chassis Counterweight

| ITEM | PART NO. | QTY | DESCRIPTION  |
|------|----------|-----|--|
| 1    | 50080    | 2   | Bolt, 1/2-13 x 7.5   |
| 2    | 50411    | 4   | Washer, 1/2" Square  |
| 3    | 15140    | 11  | <b>2659 Std.</b> -- Counterweight Bar  |
|      |          | 13  | <b>2659 with optional Overload Sensing System, 3259</b> -- Counterweight Bar |
| 4    | 50305    | 4   | Nut, 1/2" Toplock  |
| 5    | 50004    | 4   | Washer, M16 std.   |
| 6    | 50051    | 4   | Nut, M16 Nylock  |
| 7    | 50390    | 2   | Bolt, 1/2-13 x 6   |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

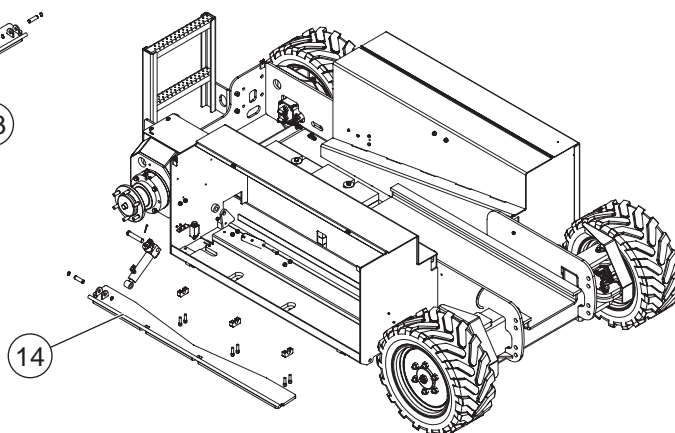
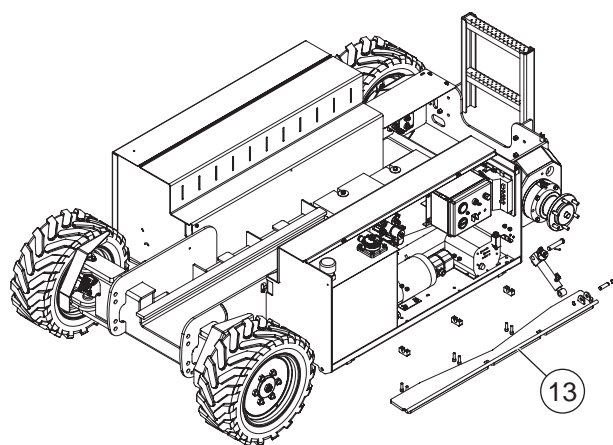
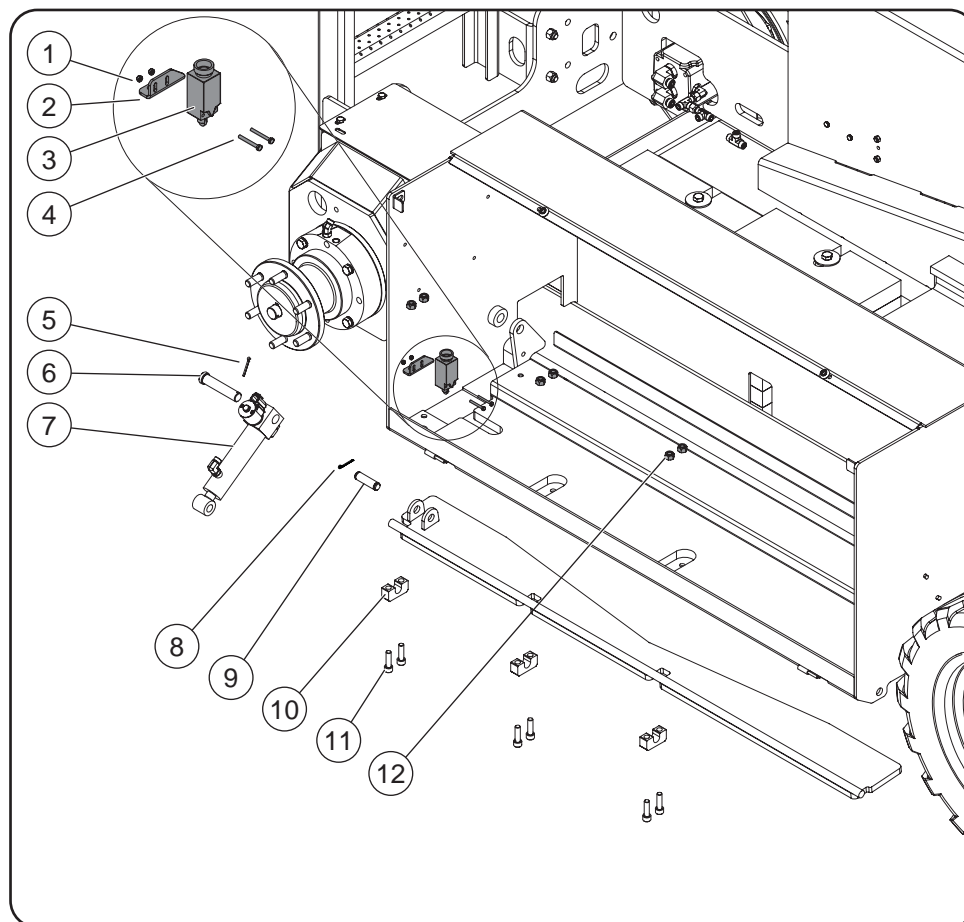


ILLUSTRATION No.  
ART\_4027

Crossover Series

Pothole System Components



## Pothole System Components

| ITEM | PART NO. | QTY | DESCRIPTION                                 |
|------|----------|-----|---|
| 1    | 50231    | 4   | Nut, 8-32 Nylock                            |
| 2    | 26393    | 1   | Bracket, Pothole Switch, Left Side          |
|      | 26394    | 1   | Bracket, Pothole Switch, Right Side (shown) |
| 3    | 90996    | 2   | Limit Switch                                |
| 4    | 50410    | 4   | Bolt, 8-32 x 1.75                           |
| 5    | 92760    | 2   | Cotter Pin, 1/16" x 0.75"                   |
| 6    | 92759    | 2   | Clevis Pin, .75" X 3.5"                     |
| 7    | REF      | 2   | Pothole Cylinder Assembly -- See Section E  |
| 8    | 92276    | 2   | Cotter Pin, 1/16" x .75"                    |
| 9    | 92861    | 2   | Clevis Pin, 5/8 x 2.25"                     |
| 10   | 26272    | 6   | Pothole Protection Mount                    |
| 11   | 50378    | 12  | Cap Screw, M10 x 35                         |
| 12   | 50053    | 12  | Nut, M10 Nylock                             |
| 13   | 26284    | 1   | Pothole Protection Weldment Left            |
| 14   | 26285    | 1   | Pothole Protection Weldment Right           |

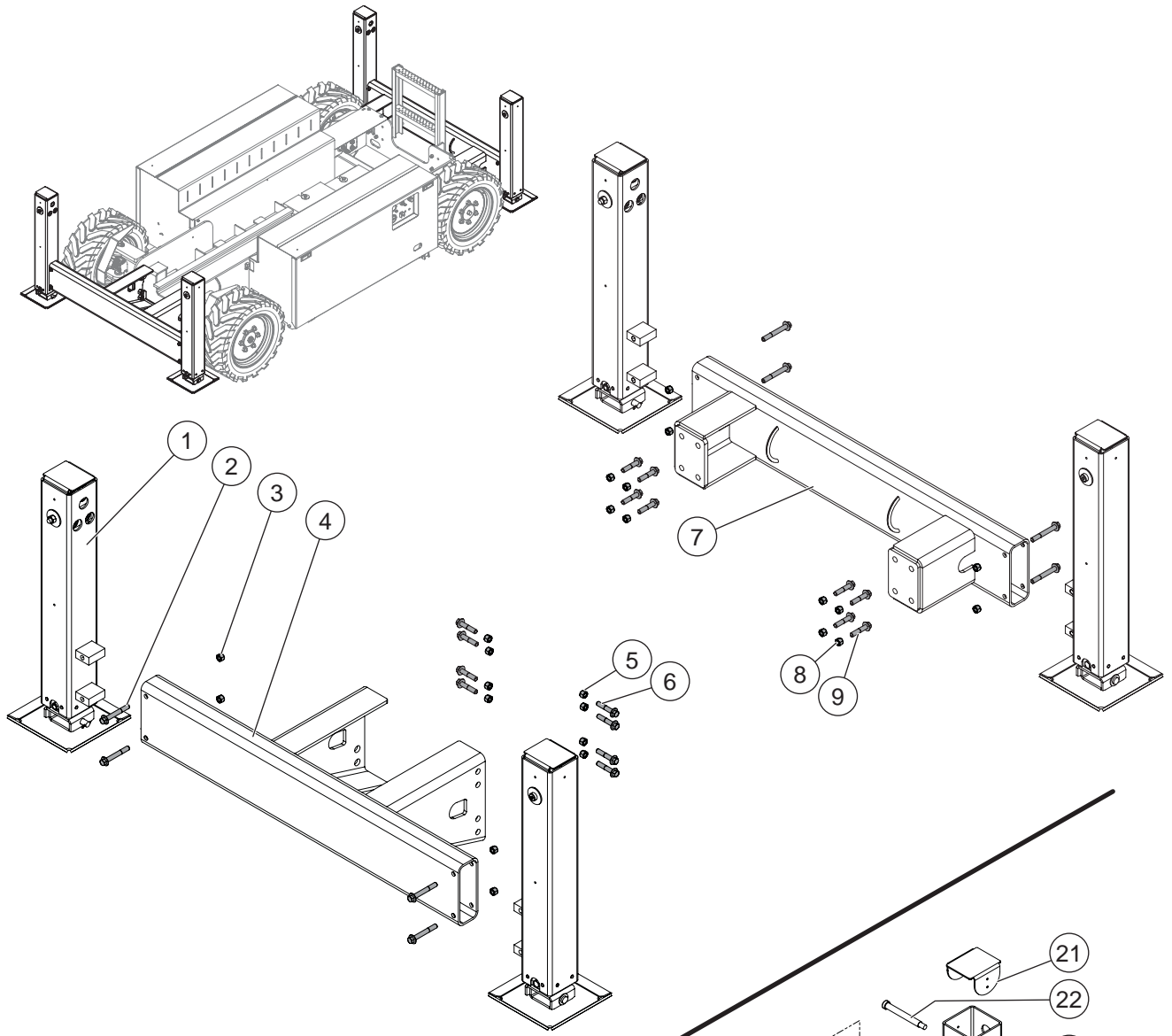


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• NS: Not a Stock item

• REF: Reference only



Item #1

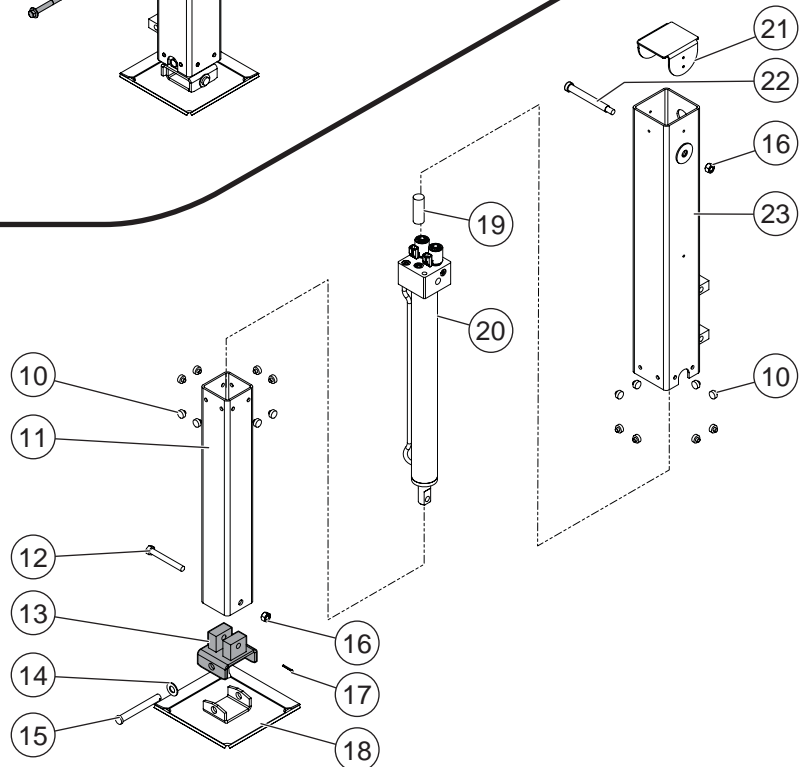


ILLUSTRATION No.  
ART\_4028

Crossover Series

Outrigger Components

## Outrigger Components

| ITEM | PART NO. | QTY | DESCRIPTION                                       |
|------|----------|-----|---|
| 1    | 87116    | 4   | Outrigger Assembly                                |
| 2    | 50323    | 8   | Bolt, M12 x 100                                   |
| 3    | 50054    | 8   | Nut, M12 Nylock                                   |
| 4    | 26073    | 1   | Front Outrigger Weldment                          |
| 5    | 50392    | 8   | Bolt, M20 x 50                                    |
| 6    | 50052    | 8   | Nut, M20 Nylock                                   |
| 7    | 26074    | 4   | Rear Outrigger Assembly                           |
| 8    | 50051    | 8   | Nut, M16 Nylock                                   |
| 9    | 50393    | 8   | Bolt, M16 x                                       |
| 10   | 90663    | 64  | Slide Pad   |
| 11   | 10335    | 4   | Inner Tube  |
| 12   | HDW8498  | 4   | Bolt, 1/2 x 4                                     |
| 13   | 20998    | 4   | Pivot Bracket                                     |
| 14   | HDW9219  | 4   | Washer, 5/8 std.                                  |
| 15   | HDW91395 | 4   | Clevis Pin, 5/8 x 5                               |
| 16   | HDW8457  | 8   | Nut, 1/2"   |
| 17   | HDW5920  | 4   | Cotter Pin, .12 x 1                               |
| 18   | 21002    | 4   | Outrigger Pad Weldment                            |
| 19   | 91281    | 4   | Pressure Switch                                   |
| 20   | REF      | --  | Outrigger Cylinder -- See Section E               |
| 21   | 26298    | 4   | Tube Cover  |
| 22   | HDW91328 | 4   | Bolt, Shoulder, 5/8 x 4.75                        |
| 23   | 26293    | 4   | Outer Tube  |
| --   | REF      | --  | Wiring Harness, Outrigger Option -- See page F-13 |
| --   | REF      | --  | Hose Set, Outrigger Option -- See Section E       |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

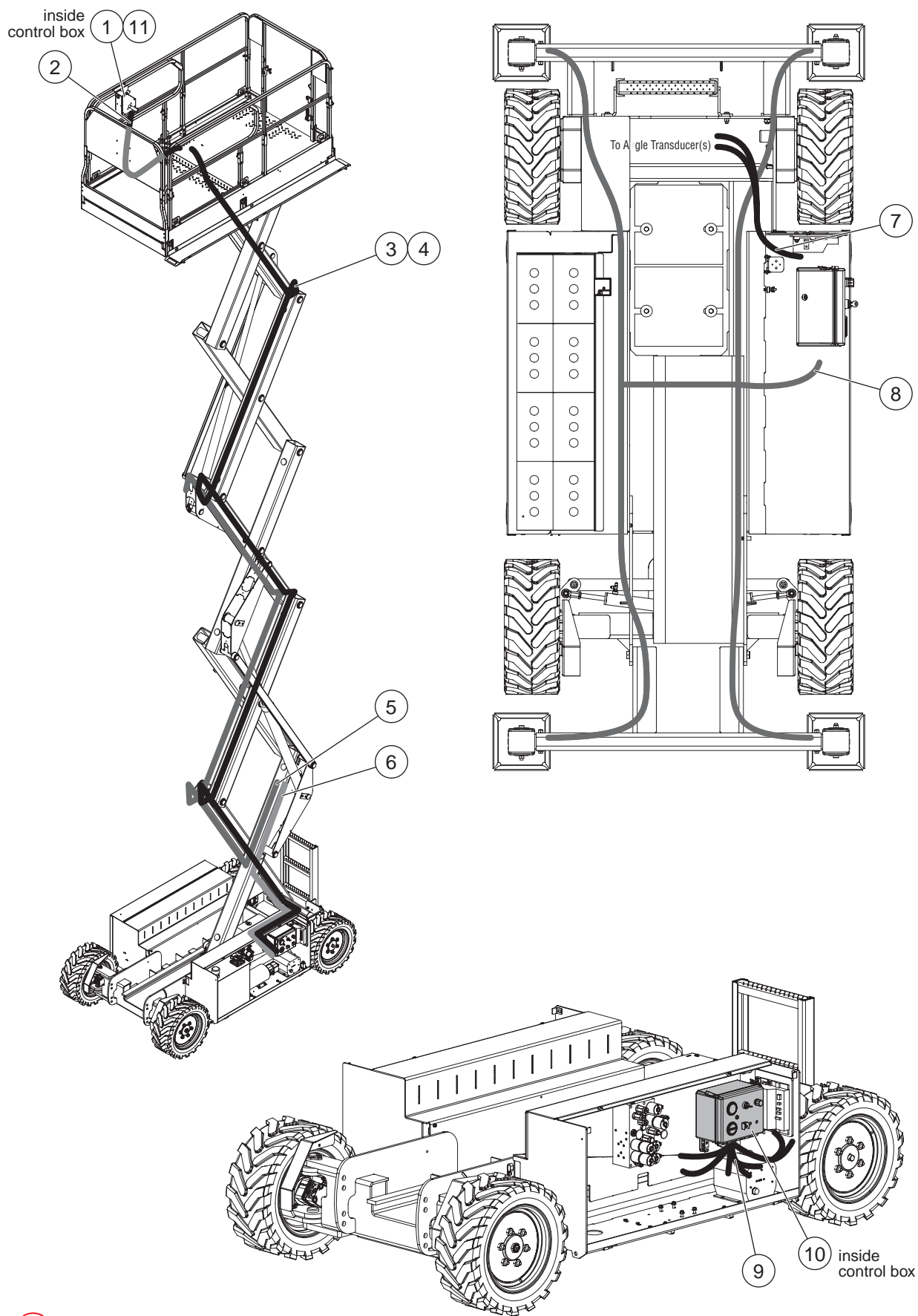


ILLUSTRATION No.  
ART\_4085

Crossover Series

Electrical Control Harness

## Electrical Control Harness

Harness connections in parentheses (see Service Section 5 for schematic).

| ITEM | PART NO.  | QTY   | DESCRIPTION   |
|------|---|-------|---|
| 1    | 91761   | 1     | Control Box Harness, Upper Control Box  |
| 2    | 91780   | 1     | Control Harness, Upper Control Box to Platform Underside  |
| 3    | 26086   | 1     | <b>2659, Std Platform</b> -- Control Harness, Chassis to Platform Underside (J4, J8)                      |
|      | 26087   | 1     | <b>2659, 55" Platform</b> -- Control Harness, Chassis to Platform Underside (J4, J8)                      |
|      | 26088   | 1     | <b>3259, Std Platform</b> -- Control Harness, Chassis to Platform Underside (J4, J8)                      |
|      | 26089   | 1     | <b>3259, 55" Platform</b> -- Control Harness, Chassis to Platform Underside (J4, J8)                      |
| 4    | Electrical Cable, Power To Platform (battery module to electrical outlet in platform)<br>(Not shown; follows Control Cable Route) |       |   |
|      | 9141  | 58 ft | <b>2659, Std Platform</b>   |
|      |   | 60 ft | <b>2659, 55" Platform</b>   |
|      |   | 66 ft | <b>3259, Std Platform</b>   |
|      |   | 69 ft | <b>3259, 55" Platform</b>   |
| 5    | 91086   | 1     | <b>3259</b> -- Control Harness, Upper Lift Cylinder Down Valve  |
| 6    | 91085   | 1     | Control Harness, Lift Cylinder Down Valve   |
| 7    | 92854   | 1     | Control Harness, Lift Cylinder & Angle Transducers (J5)   |
| 8    | 92857   | 1     | Control Harness, Outriggers to Main Harness (J6, J7)<br>(Found only on machines equipped with outriggers) |
| 9    | 92853   | 1     | Control Harness, Main (J1, J4, J5, J6, J7)  |
| 10   | 92851   | 1     | Control Harness, Lower Control Box (J1)   |
| 11   | 92193   | 1     | Control Box Harness, Upper Control Box Cover  |



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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

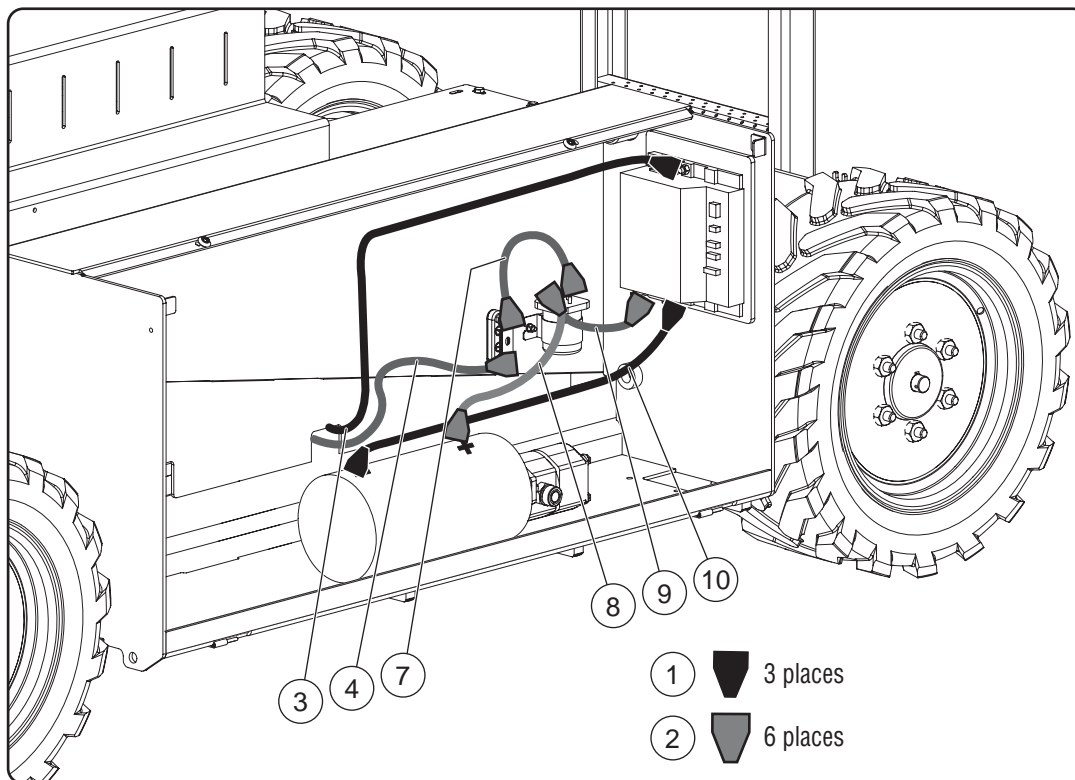
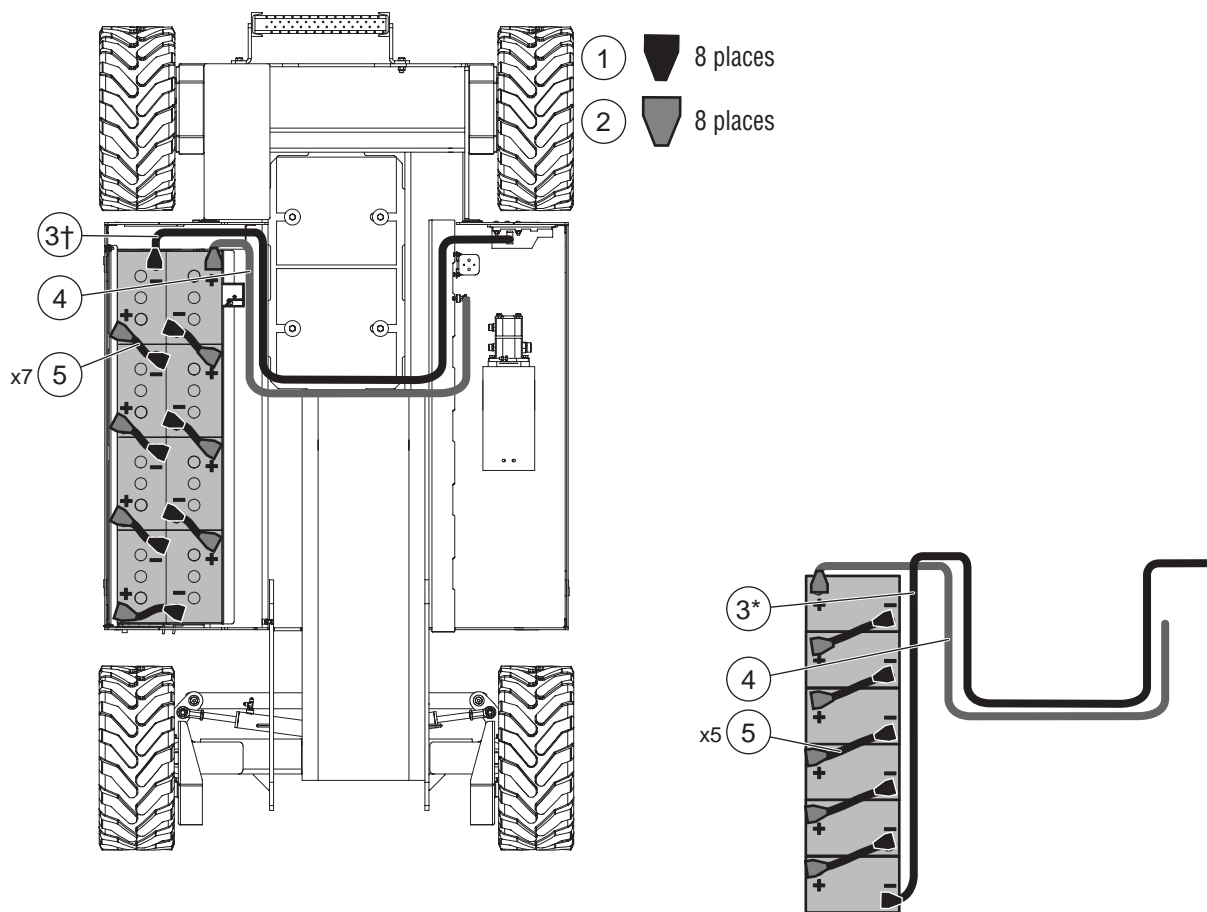


ILLUSTRATION No.  
ART\_4084

Crossover Series

Electrical Cables



## Electrical Cables

| ITEM   | PART NO. | QTY  | DESCRIPTION  |
|--|----------|--|--|
| 1  | 7172     | 11   | Terminal Boot, Black                                 |
| 2  | 7173     | 14   | Terminal Boot, Red                                   |
| 3  | 92860†   | 1  | Electrical Cable, #2 Black, 96", 5/16" eyes          |
|  | *        | 1  | Electrical Cable, #2 Black, 145", 5/16" eyes         |
| 4  | 92859    | 1  | Electrical Cable, #2 Red, 60", 5/16" eyes            |
| 5  | 6208     | 7  | Electrical Cable, #2 Black, 8", 5/16" eyes           |
| 6  | --       | --   | --   |
| 7  | 92920    | 1  | Electrical Cable, #2 Red, 8", 5/16" eyes             |
| 8  | 92921    | 1  | Electrical Cable, #2 Red, 29", 5/16" and 3/8" eyes   |
| 9  | 92922    | 1  | Electrical Cable, #2 Red, 6", 5/16" eyes             |
| 10   | 92923    | 1  | Electrical Cable, #2 Black, 40", 5/16" and 3/8" eyes |
| <b>CHECK MACHINE SERIAL NUMBER BEFORE ORDERING PARTS</b> |          |  |  |
| *  |          | 2659 -- up to Serial # 13000031<br>3259 -- up to Serial # 13100027   |  |
| †  |          | 2659 -- Serial # 13000032 and up<br>3259 -- Serial # 13100028 and up |  |



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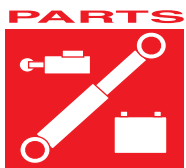
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• REF: Reference only

**NOTES:**

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# SECTION G

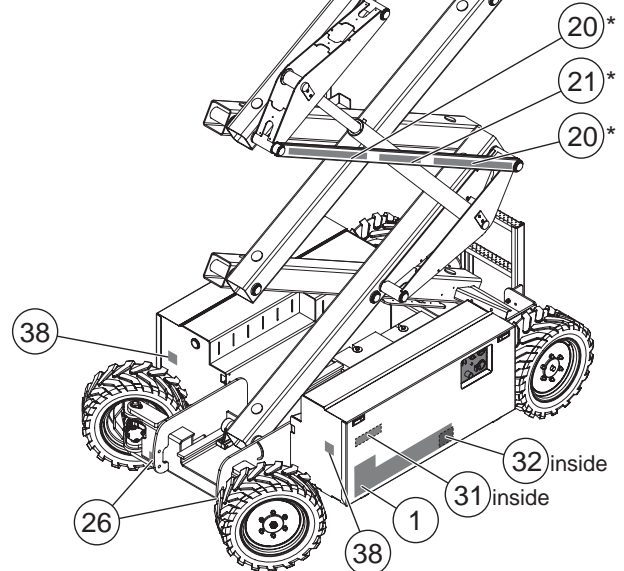
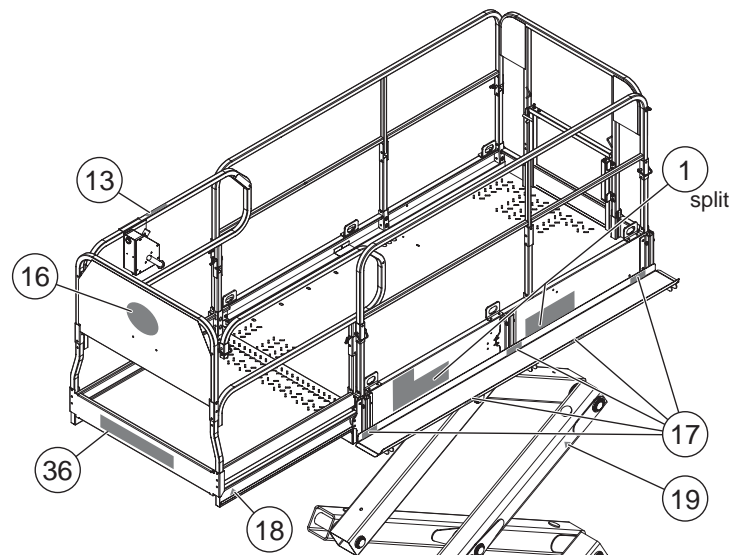
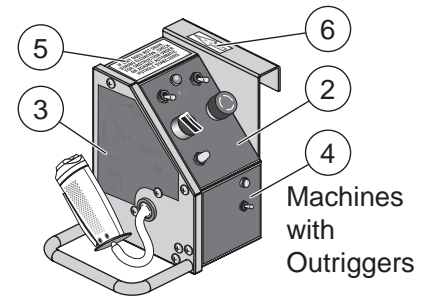
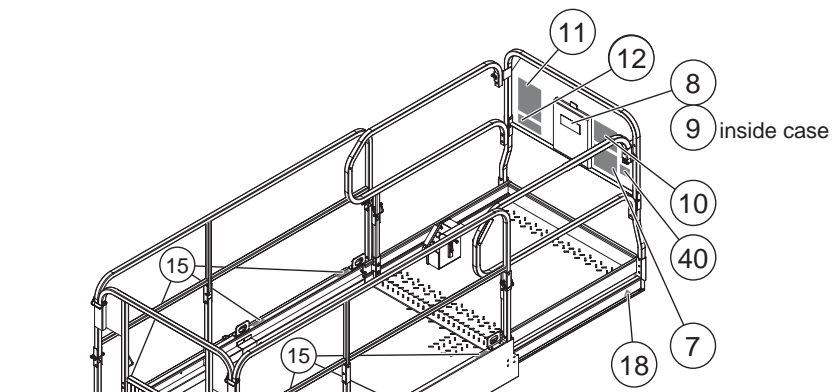
## DECALS, ANSI MODELS

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\*2659 -- as shown; 3259 -- each side

ART\_3833

## Decals, ANSI Specification

| ITEM | PART NO. | QTY | DESCRIPTION   |
|------|----------|-----|---|
| 1    | 92842    | 4   | <b>2659</b> -- Decal, Crossover 2659 ERT                    |
|      | 92843    | 4   | <b>3259</b> -- Decal, Crossover 3259 ERT                    |
| 2    | 92680    | 1   | Decal, Upper Controls                                       |
| 3    | 90729    | 1   | Decal, Control Handle                                       |
| 4    | 91730    | 1   | Decal, Outrigger Operation                                  |
| 5    | 90735    | 1   | Decal, Pothole  |
| 6    | 7156     | 1   | Decal, Front  |
| 7    | 90730    | 1   | Decal, Platform Warning                                     |
| 8    | 8911     | 1   | Decal, Manual Inside  |
| 9    | 90718    | 1   | Decal, Inspection   |
| 10   | 90721    | 1   | Decal, Danger   |
| 11   | 90722    | 1   | Decal, Warning  |
| 12   | 92552    | 2   | <b>2659 std, 3259 w/ 55" deck option</b> -- Decal, Capacity |
|      | 92683    | 2   | <b>3259 std</b> -- Decal, Capacity                          |
|      | 92849    | 2   | <b>2659 w/ 55" deck option</b> -- Decal, Capacity           |
| 13   | 7155     | 1   | Decal, Locate   |
| 14   | 90739    | 1   | Decal, Made in USA  |
| 15   | 8605     | 6   | Decal, Lanyard Point  |
| 16   | 90719    | 1   | Decal, MEC Oval   |
| 17   | 92554    | 5   | Decal, Material Rack Capacity                               |
| 18   | 91850    | 2   | Decal, Crush  |
| 19   | 9910     | 3   | Decal, Pinch  |
| 20   | 7982     | 2   | <b>2659</b> -- Decal, Warning Stripe                        |
|      |          | 4   | <b>3259</b> -- Decal, Warning Stripe                        |
| 21   | 8503     | 1   | <b>2659</b> -- Decal, Keep Clear                            |
|      |          | 2   | <b>3259</b> -- Decal, Keep Clear                            |
| 22   | 90717    | 1   | Decal, Maintenance Lock                                     |
| 23   | 90750    | 1   | Decal, Battery Charger                                      |
| 24   | 90751    | 1   | Decal, Power To Platform                                    |
| 25   | 92054    | 1   | Decal, Patents Pending                                      |
| 26   | 11026730 | 4   | Decal, Tie Down   |
| 27   | 92767    | 1   | Decal, Serial Plate   |
| 28   | 90726    | 1   | Decal, Battery Weight                                       |
| 29   | 8779     | 1   | Decal, Battery Explosion Hazard                             |
| 30   | 90732    | 1   | Decal, Powerwash  |
| 31   | 6873     | 1   | Decal, Hydraulic Oil  |
| 32   | 92700    | 1   | Decal, Brake Release  |
| 33   | 92681    | 1   | Decal, Lower Controls                                       |
| 34   | 90269    | 1   | <b>2659 std, 3259 w/ 55" deck option</b> -- Decal, Capacity |
|      | 90401    | 1   | <b>3259 std</b> -- Decal, Capacity                          |
|      | 9935     | 1   | <b>2659 w/ 55" deck option</b> -- Decal, Capacity           |
| 35   | 91956    | 1   | Decal, Battery Charger                                      |
| 36   | 92416    | 1   | Decal, Website  |
| 37   | 9465     | 4   | Decal, Crush  |
| 38   | 90725    | 4   | Decal, Tires  |
| 39   | 92848    | 2   | Decal, Pipe Rack  |
| 40   | 8606     | 1   | Decal, Lanyard Warning                                      |

• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



## mec CROSSOVER 2659 ERT

1 92842 (2659)  
4 Places

2 92680

3 90729

4 91730 (Option)

5 90735  
IF UNIT DOES NOT DRIVE DURING ELEVATION, CHECK FOR OBSTRUCTION UNDER OR AGAINST AUTOMATIC POTHOLE STABILIZERS

6 7156

7 90730  
**WARNING**

8 8911

9 90718 (inside case)  
**WARNING**

10 90721  
**DANGER**

11 90722  
**WARNING**

12 92552 (2659 std, 3259 w/ 55" deck option)  
2 Places

12 92683 (3259 std)  
2 Places

12 92849 (2659 w/ 55" deck option)  
2 Places

13 7155  
LOCATE CONTROL BOX HERE  
FOR NORMAL OPERATION OF THIS UNIT

14 90739  
MADE IN USA

15 8605 (option)  
6 Places  
CERTIFIED LANYARD ANCHORAGE POINT

16 90719  
mec

17 92554  
5 Places  
**WARNING**  
MATERIAL RACK CAPACITY  
250 LBS (113 KG)

18 91850  
2 Places

19 9910  
3 Places

20 7982  
2 Places\*

21 8503\*  
KEEP CLEAR

22 90717  
MAINTENANCE LOCK  
REFER TO PARTS AND SERVICE MANUAL FOR PROPER USE

23 90750  
BATTERY CHARGER

24 90751  
POWER TO PLATFORM

25 92054  
Multiple Patents Pending

26 11026730  
4 Places

27 92767

28 90726  
**WARNING**

29 8779  
**WARNING**

30 90732  
**WARNING**

31 6873  
HYDRAULIC OIL

32 92700

33 92681

34 90401 (3259 std)  
PLATFORM CAPACITY  
500 LBS (226kg)

34 90269 (2659 std, 3259 w/ 55" deck option)  
PLATFORM CAPACITY  
750 LBS (340kg)

34 9935 (2659 w/ 55" deck option)  
PLATFORM CAPACITY  
1000 LBS (454 kg)

35 91956  
BATTERY CHARGER INDICATOR

36 92416  
www.mecawp.com

37 9465 (Option)  
4 Places

38 90725  
4 Places  
**WARNING**

39 92848 (Option)  
2 Places  
**WARNING**

40 8606  
**WARNING**

## mec CROSSOVER 3259 ERT

1 92843 (3259)  
4 Places

7 90730  
**WARNING**

9 90718 (inside case)  
**WARNING**

12 92552 (2659 std, 3259 w/ 55" deck option)  
2 Places

12 92683 (3259 std)  
2 Places

12 92849 (2659 w/ 55" deck option)  
2 Places

13 7155  
LOCATE CONTROL BOX HERE  
FOR NORMAL OPERATION OF THIS UNIT

14 90739  
MADE IN USA

17 92554  
5 Places  
**WARNING**  
MATERIAL RACK CAPACITY  
250 LBS (113 KG)

18 91850  
2 Places

19 9910  
3 Places

20 7982  
2 Places\*

21 8503\*  
KEEP CLEAR

22 90717  
MAINTENANCE LOCK  
REFER TO PARTS AND SERVICE MANUAL FOR PROPER USE

23 90750  
BATTERY CHARGER

24 90751  
POWER TO PLATFORM

28 90726  
**WARNING**

29 8779  
**WARNING**

34 90401 (3259 std)  
PLATFORM CAPACITY  
500 LBS (226kg)

34 90269 (2659 std, 3259 w/ 55" deck option)  
PLATFORM CAPACITY  
750 LBS (340kg)

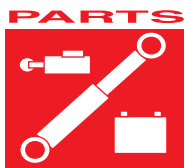
34 9935 (2659 w/ 55" deck option)  
PLATFORM CAPACITY  
1000 LBS (454 kg)

39 92848 (Option)  
2 Places  
**WARNING**

40 8606  
**WARNING**

**ILLUSTRATION No.**  
ART\_3834

\*2659 -- as shown; 3259 -- each side



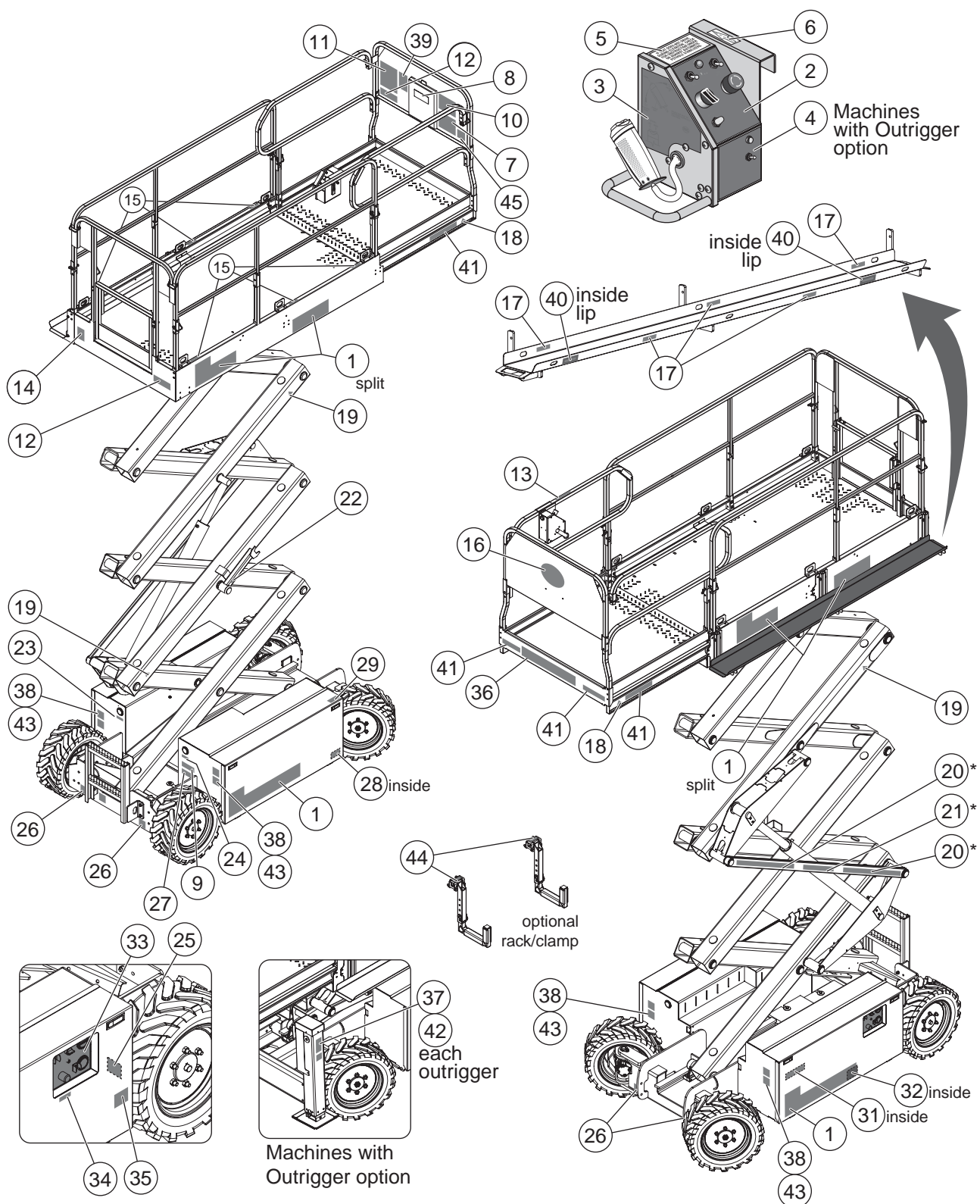
# SECTION H

## DECALS, CE MODELS

### CONTENTS

### PAGE

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| Decals, CE Specification ..... | H-3 |
|--------------------------------|-----|



\*2659 -- as shown; 3259 -- each side

ART\_3929

## Decals, CE Specification

| ITEM | PART NO. | QTY | DESCRIPTION                               |
|------|----------|-----|---|
| 1    | 92842    | 4   | <b>2659</b> -- Decal, Crossover 2659 ERT  |
|      | 92843    | 4   | <b>3259</b> -- Decal, Crossover 3259 ERT  |
| 2    | 92766    | 1   | Decal, Upper Controls                     |
| 3    | 90729    | 1   | Decal, Control Handle                     |
| 4    | 91730    | 1   | Decal, Outrigger Operation                |
| 5    | 90735    | 1   | Decal, Pothole                            |
| 6    | 7156     | 1   | Decal, Front                              |
| 7    | 90730    | 1   | Decal, Platform Warning                   |
| 8    | 8911     | 1   | Decal, Manual Inside                      |
| 9    | 92054    | 1   | Decal, Patents Pending                    |
| 10   | 90721    | 1   | Decal, Danger                             |
| 11   | 90722    | 1   | Decal, Warning                            |
| 12   | 92761    | 2   | <b>2659</b> -- Decal, Capacity            |
|      | 92764    | 2   | <b>3259</b> -- Decal, Capacity            |
| 13   | 7155     | 1   | Decal, Locate                             |
| 14   | 90739    | 1   | Decal, Made in USA                        |
| 15   | 8605     | 6   | Decal, Lanyard Point                      |
| 16   | 90719    | 1   | Decal, MEC Oval                           |
| 17   | 92762    | 5   | Decal, Material Rack Capacity             |
| 18   | 91850    | 2   | Decal, Crush                              |
| 19   | 9910     | 3   | Decal, Pinch                              |
| 20   | 7982     | 2   | <b>2659</b> -- Decal, Warning Stripe      |
|      |          | 4   | <b>3259</b> -- Decal, Warning Stripe      |
| 21   | 8503     | 1   | <b>2659</b> -- Decal, Keep Clear          |
|      |          | 2   | <b>3259</b> -- Decal, Keep Clear          |
| 22   | 90717    | 1   | Decal, Maintenance Lock                   |
| 23   | 90750    | 1   | Decal, Battery Charger                    |
| 24   | 90751    | 1   | Decal, Power To Platform                  |
| 25   | 90732    | 1   | Decal, Powerwash                          |
| 26   | 11026730 | 4   | Decal, Tie Down                           |
| 27   | 92768    | 1   | Decal, Serial Plate                       |
| 28   | 90726    | 1   | Decal, Battery Weight                     |
| 29   | 8779     | 1   | Decal, Battery Explosion Hazard           |
| 30   | --       | --  | --  |
| 31   | 6873     | 1   | Decal, Hydraulic Oil                      |
| 32   | 92700    | 1   | Decal, Brake Release                      |
| 33   | 92681    | 1   | Decal, Lower Controls                     |
| 34   | 92709    | 1   | <b>2659</b> -- Decal, Capacity            |
|      | 92710    | 1   | <b>3259</b> -- Decal, Capacity            |
| 35   | 91956    | 1   | Decal, Battery Charger                    |
| 36   | 92416    | 1   | Decal, Website                            |
| 37   | 9465     | 4   | Decal, Crush                              |
| 38   | 90725    | 4   | Decal, Tires                              |
| 39   | 91325    | 1   | Decal, Danger Electrical (Australia only) |
| 40   | 92769    | 2   | Decal, No Step                            |

... continued

• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only





1 92842 (2659)  
4 Places  
**mec CROSSOVER 2659 ERT**

2 92766

3 90729

4 91730 (Option)

5 90735  
IF UNIT DOES NOT DRIVE DURING ELEVATION, CHECK FOR OBSTRUCTION UNDER OR AGAINST AUTOMATIC POTHOLE STABILIZERS

6 7156  
FRONT

7 90730  
**WARNING**

8 8911

9 92054  
Multiple Patents Pending

10 90721  
**⚠ DANGER**

11 90722  
**⚠ WARNING**

12 92761 (2659)  
2 Places

12 92764 (3259)  
2 Places

13 7155  
LOCATE CONTROL BOX HERE  
FOR NORMAL OPERATION OF THIS UNIT

14 90739  
MADE IN USA

15 8605 (option)  
6 Places  
CERTIFIED LANYARD ANCHORAGE POINT

16 90719  
**mec**

17 92762  
5 Places  
**⚠ WARNING**  
MATERIAL RACK CAPACITY 113 KG

18 91850  
2 Places

19 9910  
3 Places

20 7982  
2 Places\*

21 8503\*  
**KEEP CLEAR**

22 90717  
MAINTENANCE LOCK  
REFER TO PARTS AND SERVICE MANUAL FOR PROPER USE

23 90750  
BATTERY CHARGER

24 90751  
POWER TO PLATFORM

25 90732  
**⚠ WARNING**

26 11026730  
4 Places

27 92768

28 90726  
**⚠ WARNING**  
EACH REPLACEMENT BATTERY MUST WEIGH A MINIMUM OF 60 POUNDS / 27.3 kg  
FAILURE TO MEET MINIMUM WEIGHT REQUIREMENT MAY CAUSE MACHINE INSTABILITY.

29 8779  
**⚠ WARNING**  
BATTERIES PRODUCE EXPLOSIVE GAS, CHARGE BATTERIES IN WELL VENTILATED AREA DO NOT EXPOSE TO SPARKS OR FLAMES.

30 not used

31 6873  
HYDRAULIC OIL

32 92700

33 92681

34 92709 (2659)  
PLATFORM CAPACITY 340kg

34 92710 (3259)  
PLATFORM CAPACITY 227kg

35 91956  
BATTERY CHARGER INDICATOR

36 92416  
www.mecAWP.COM

37 9465 (Option)  
4 Places  
**⚠ DANGER**  
STAND CLEAR  
OUTRIGGER CONTACT WILL CAUSE SERIOUS CRUSHING INJURY

38 90725  
4 Places  
**⚠ WARNING**

39 91325 Australia only  
**⚠ DANGER**

40 92769  
2 Places  
**⚠ NO STEP**

41 7982 cut short to fit  
4 Places

42 92773 (2659 w/ outriggers)  
4 Places  
MAX 2495 lbs 1130 kg

42 92774 (3259)  
4 Places  
MAX 2635 lbs 1195 kg

43 92770 (2659 no outriggers)  
4 Places  
MAX 2350 lbs 1065 kg

43 92772 (3259)  
4 Places  
MAX 2635 lbs 1195 kg

43 92771 (2659 w/ outriggers)  
4 Places  
MAX 2495 lbs 1130 kg

44 92848 (Option)  
2 Places  
**⚠ WARNING**  
PIPE RACK CAPACITY 125 LBS EACH/250 LBS TOTAL. SHEET MATERIAL RACK MAY NOT BE USED WHEN PIPE RACK IS IN USE.

45 8606  
**⚠ WARNING**

1 92843 (3259)  
4 Places  
**mec CROSSOVER 3259 ERT**

**mec**  
ILLUSTRATION No.  
ART\_3924

\*2659 -- as shown; 3259 -- each side



## Decals, CE Specification (continued)

| ITEM | PART NO. | QTY | DESCRIPTION  |
|------|----------|-----|--|
| 41   | 7982     | 4   | Decal, Warning Stripe (cut short to fit positions shown) |
| 42   | 92773    | 4   | <b>2659 w/ Outriggers--</b> Decal, Outrigger Load        |
|      | 92774    | 4   | <b>3259 --</b> Decal, Outrigger Load                     |
| 43   | 92770    | 4   | <b>2659 without Outriggers--</b> Decal, Wheel Load       |
|      | 92771    | 4   | <b>2659 w/ Outriggers--</b> Decal, Wheel Load            |
|      | 92772    | 4   | <b>3259 --</b> Decal, Wheel Load                         |
| 44   | 92848    | 2   | Decal, Pipe Rack   |
| 45   | 8606     | 1   | Decal, Lanyard Warning                                   |



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

**NOTES:**

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## Service Parts Order Form

### Fax to 559-263-9631

Please fill out completely

Date: \_\_\_\_\_

Ordered By: \_\_\_\_\_

Account: \_\_\_\_\_

Your Fax No.: \_\_\_\_\_

Bill to: \_\_\_\_\_

Ship to: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Purchase Order Number** \_\_\_\_\_

**Ship VIA** \_\_\_\_\_

\*\*All orders MUST have a Purchase Order Number

\*\*Fed Ex shipments require Fed Ex account number

| Part Number | Description | Quantity | Price |
|-------------|-------------|----------|-------|
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|             |             |          |       |

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)

\_\_\_\_\_

**NOTES:**

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## Limited Owner Warranty

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



**Aerial Platform Sales Corp.**

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1401 S. Madera Avenue • Kerman, CA 93630 USA  
Ph: 1-800-387-4575 • 1-559-842-1510 • FAX 1-559-842-1520  
E-mail: [info@mecAWP.com](mailto:info@mecAWP.com) • Web: [www.mecAWP.com](http://www.mecAWP.com)