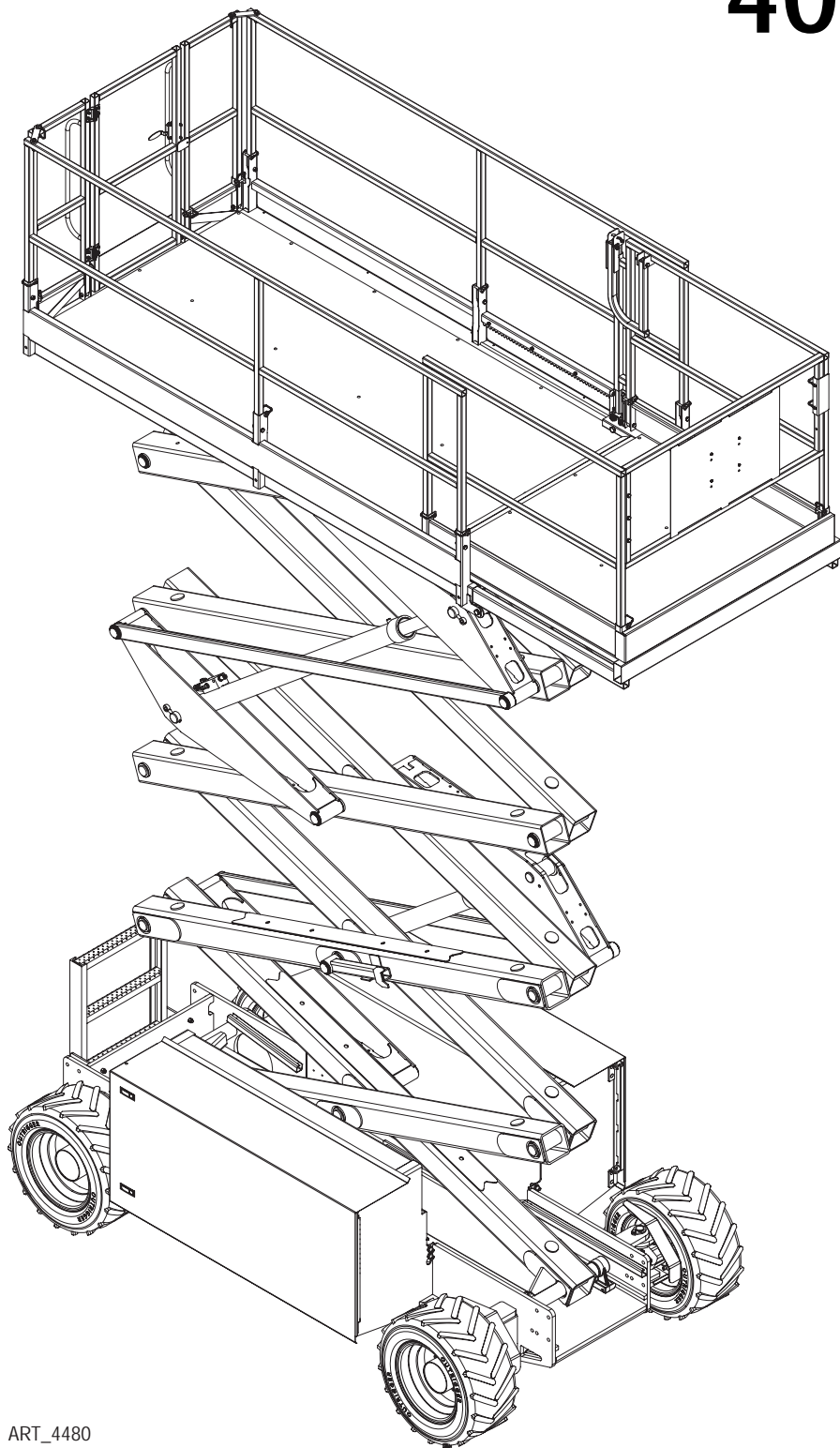




SERVICE AND PARTS MANUAL

4069ERT



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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

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Working Height*	46 ft	14 m
Platform Height	40 ft	12 m
Maximum Drive Height	40 ft	12 m
Stowed Height	Top Guardrail	95.5 in. 2.43 m
	Rails Folded	64 in. 1.63 m
	Platform Floor	51 in. 1.3 m
Guardrail Height	43.5 in.	1.11 m
Toeboard Height	6 in.	15 cm
Machine Weight** (Unloaded)	11,250 lb	5,100 kg
Lift Capacity	Total	900 lb 410 kg
	Platform	600 lb 274 kg
	Sheet Material Rack	300 lb 136 kg
Deck Extension Capacity	1 Person / 250 lb (113 kg)	
Maximum Occupants	2	
Length-Stowed (Overall)	126 in.	3.2 m
Length-Stowed (Without Step)	125 in.	3.18 m
Platform Length (Extended)	166 in.	4.22 m
Platform Length (Retracted)	118 in.	3 m
Width (Overall)	69 in.	1.75 m
Platform Width (Outside)	59 in.	1.5 m
Sheet Rack Width	7 in.	18 cm
Wheel Base	94.5 in.	2.4 m
Turning Radius--Inside	79 in.	2 m
Ground Clearance	10 in.	25 cm
Drive Speed (Proportional)	Platform Stowed	0-3.1 mph 0-5 km/h
	Platform Elevated†	0-.5 mph max.† 0-.8 km/h max.†
Gradability	40%/21.8°	
Breakover Angle	42%/23°	
Optional Outrigger Range Of Motion	10° side to side	
Maximum Ground Pressure, Wheel	123 psi	8.6 kg/cm ²
Maximum Ground Pressure, Outrigger Pad	56 psi	3.9 kg/cm ²
Maximum Wheel Load	3540 lb	1605 kg
Maximum Operating Wind Speed	28 mph / 12.5 m/sec (45 km/h)	
Tire Size	26" x 12" / 66 cm x 33 cm	
Tire Pressure	55 psi	
Wheel Bolt Torque	55 ft/lb	74.6 Nm
Hydraulic Pressure	Drive System	3625 psi/ 250 bar
	Lift System	3200 psi / 220 bar
Hydraulic Fluid Capacity	14 gal / 64 liter	
Power System Voltage	48 Volt DC	
Battery Charger	Input	100-240 V AC, 50-60 Hz, 1000 W
	Output	48 Volt DC, 15 Amp, Automatic Shut-off
Batteries	Eight 6-Volt deep cycle; 375 Ah @ 20 hour rating	
Motor	16 HP (12 kW) 48V Motor	

*Working Height adds 6 feet (2 m) to platform height. **Weight may increase with certain options.

†Drive speed while elevated is inversely proportional to platform height; the higher the platform is, the lower the maximum elevated drive speed. The machine is driveable at full height.

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

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.

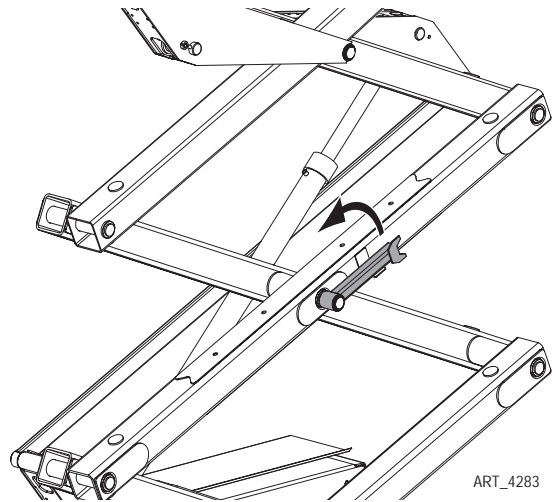
MAINTENANCE LOCK



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



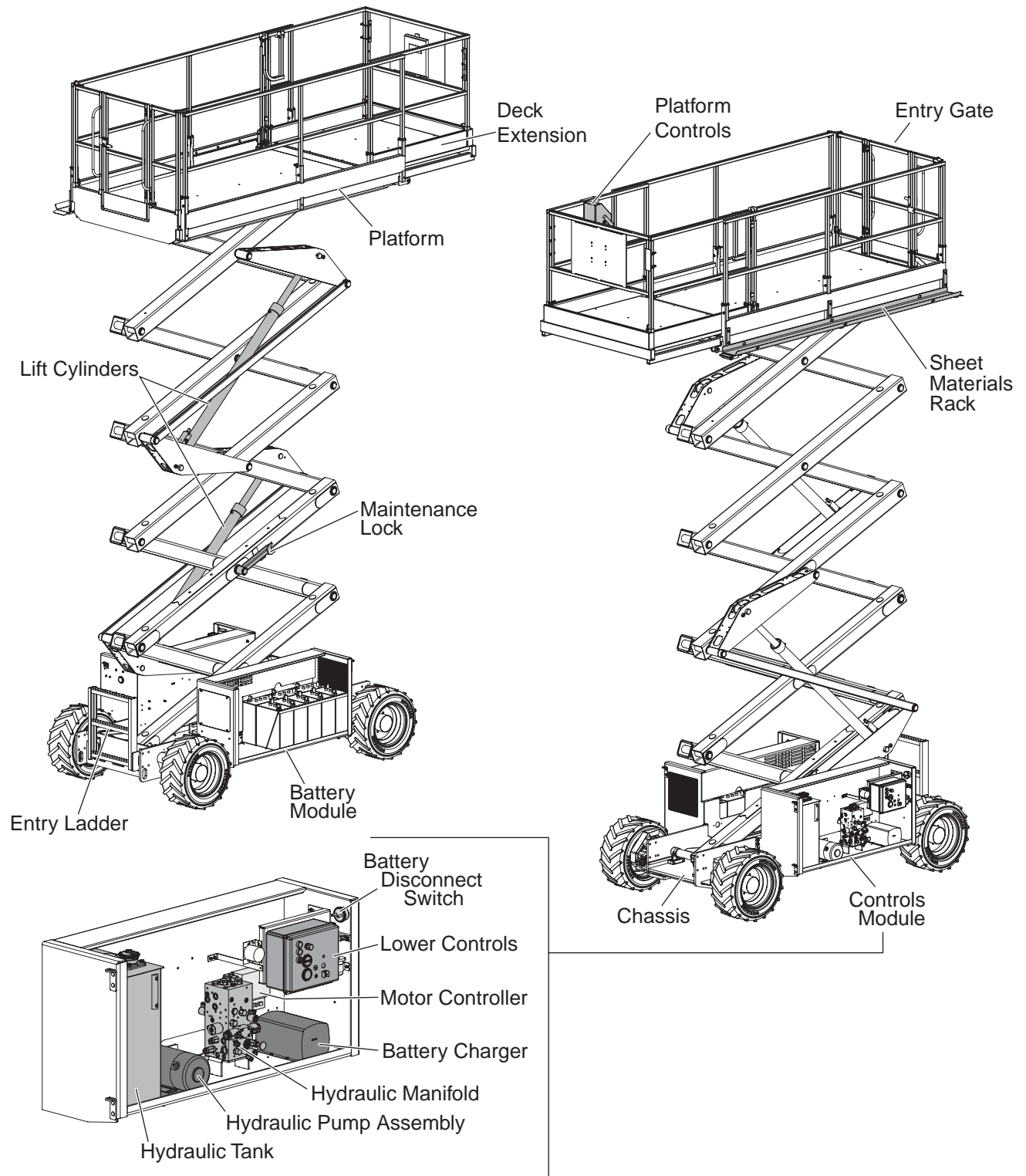
FAILURE TO PERFORM PREVENTIVE MAINTENANCE AT RECOMMENDED INTERVALS MAY RESULT IN THE UNIT BEING OPERATED WITH A DEFECT THAT COULD RESULT IN INJURY OR DEATH OF THE OPERATOR.

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









Module Covers removed for clarity

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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 - inches -									CAP SCREW SIZE - 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>Torque values apply to fasteners as received from the supplier, dry or when lubricated with normal engine oil.</p> <p>If special graphite grease, molydisulphide grease, or other extreme pressure lubricants are used, these torque values <i>do not</i> apply.</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 the platform control box.

- 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.

Figure 1-3: Emergency Stop Buttons



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ART_3866

EMERGENCY LOWERING



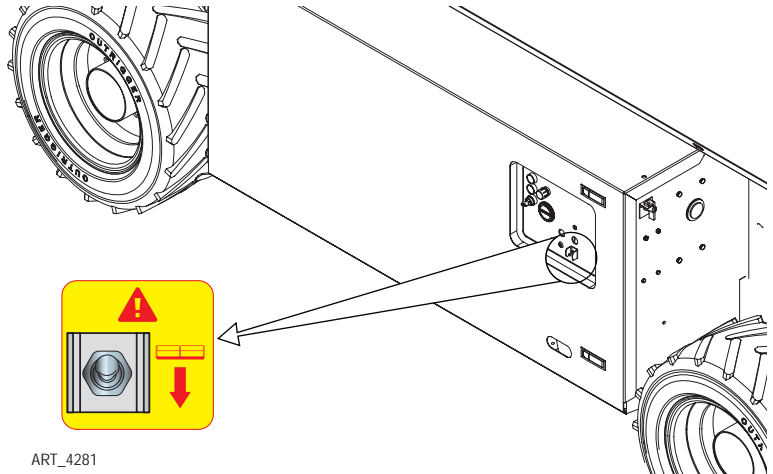
IF THE CONTROL SYSTEM FAILS WHILE THE PLATFORM IS ELEVATED, USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.

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.



FREE-WHEEL CONFIGURATION FOR WINCHING OR TOWING

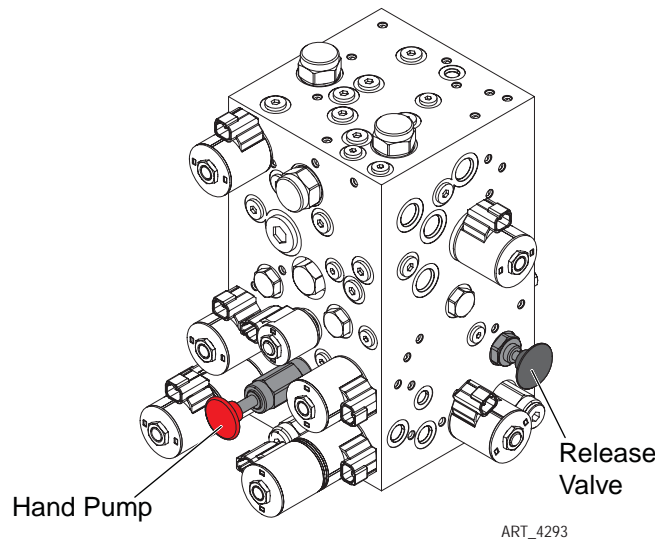


RUNAWAY HAZARD!

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 three (3) tons or more.
- jack stands with a rating of three (3) 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 bolts 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 lug bolts 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

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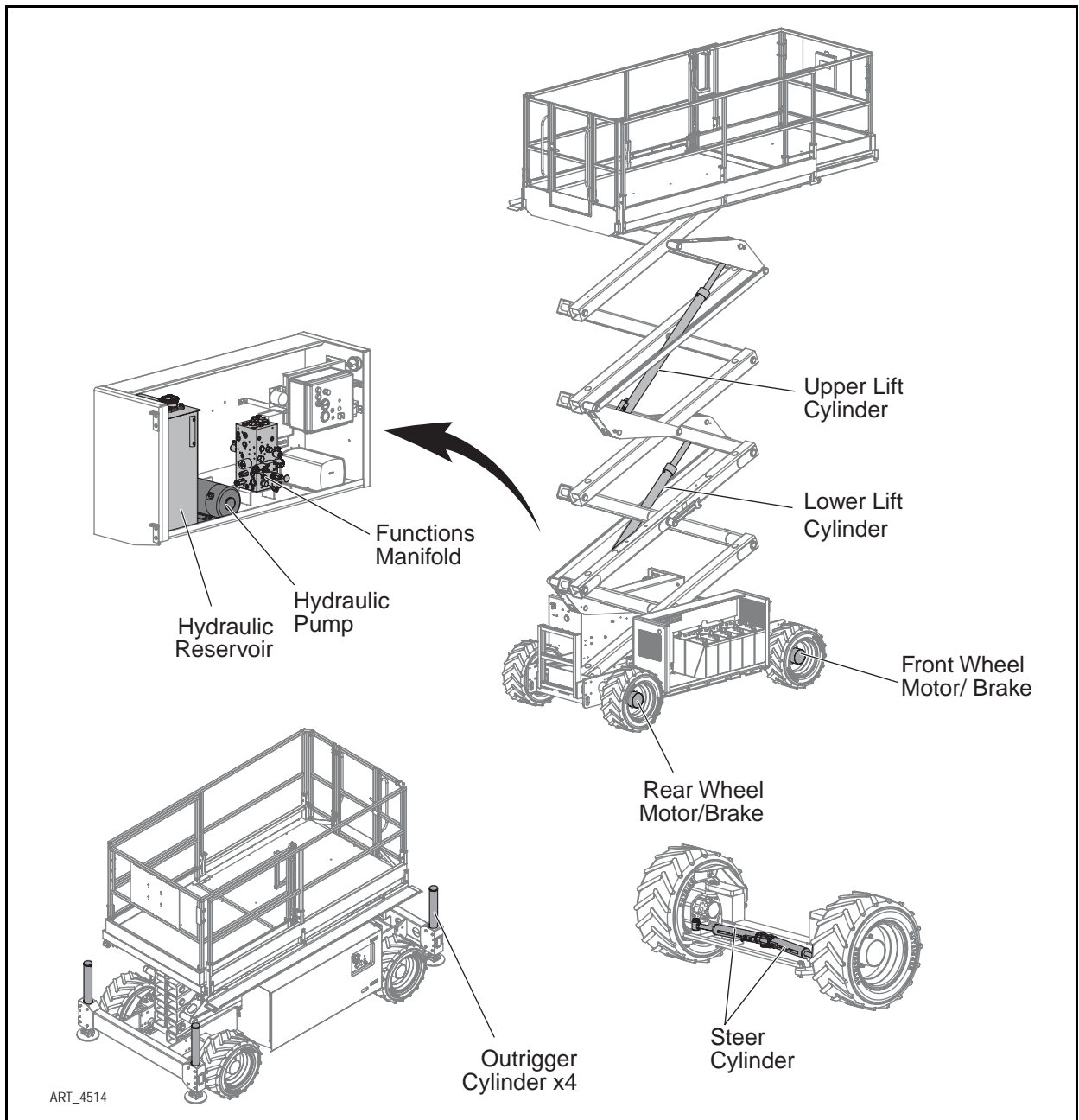
HYDRAULIC SYSTEM – GENERAL

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 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.

If no function is in use, the pump remains on standby and no fluid is pumped to the manifold. Each function has a maximum pressure control limit set by pressure relief valve.

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 pump delivers hydraulic fluid under pressure to the Functions Manifold.

FUNCTIONS MANIFOLD

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

DRIVE AND BRAKE SYSTEM

There are four (4) hydraulic gear wheel motors that provide power to all four wheels.

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

STEERING SYSTEM

Two (2) hydraulic cylinders control steering.

PLATFORM LIFT SYSTEM

The machine is equipped with two (2) hydraulic lift cylinder.

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

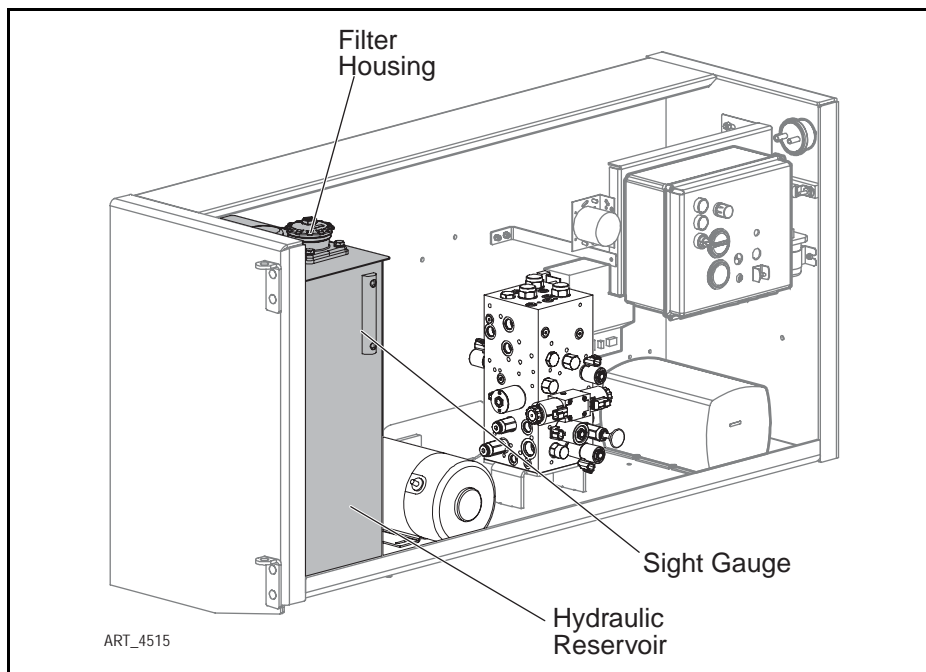
NOTE: Avoid mixing petroleum and synthetic base fluids. It is not advisable to mix fluids of different brands or types, except as recommended.

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 300 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



CAUTION

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

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

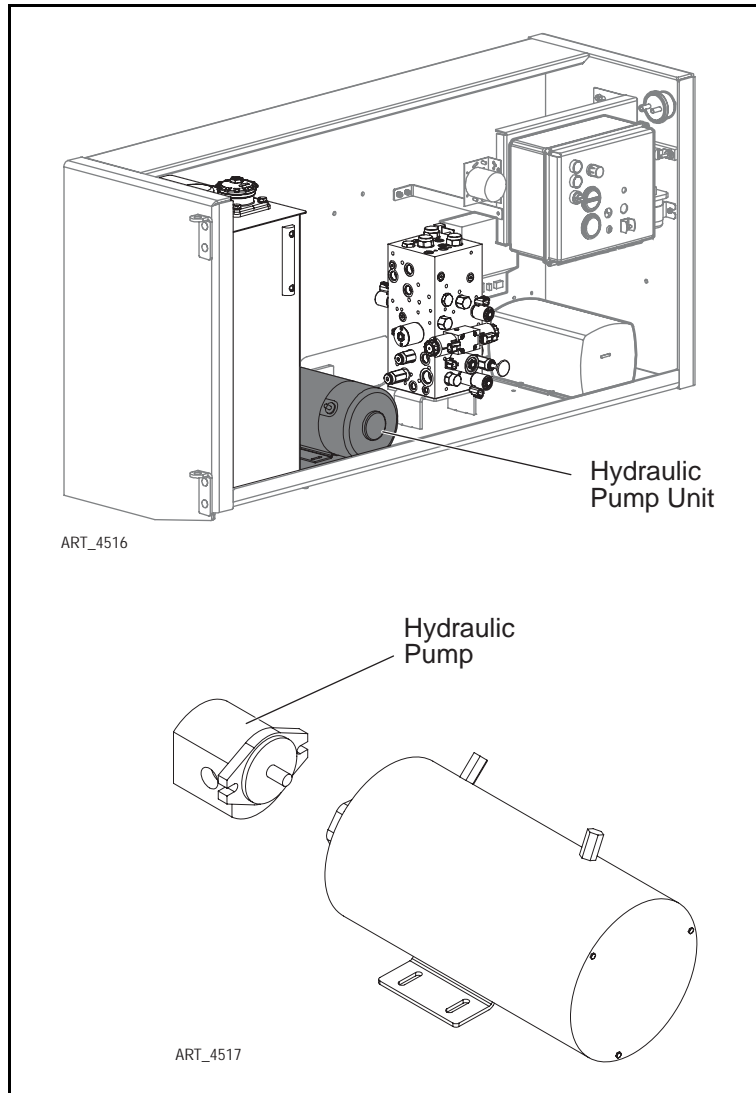
The pump is not repairable and should be replaced if it is not functioning properly.

REMOVE

1. Place a large 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, and IMMEDIATELY cap or cover 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. Use spline grease on the pump shaft. Tighten all bolts to the proper torque specification as shown in the Introduction section. Use Loctite 242 or equivalent on mounting bolts.

Figure 1-3: Hydraulic Pump



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

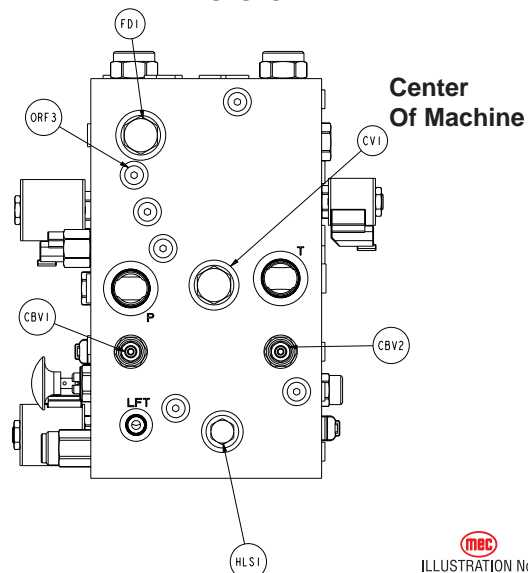
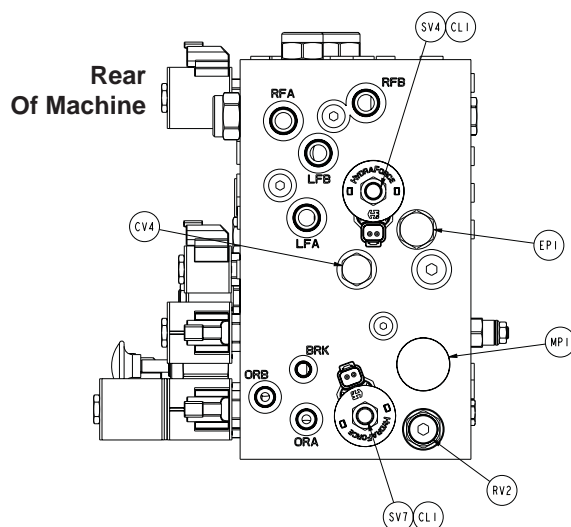
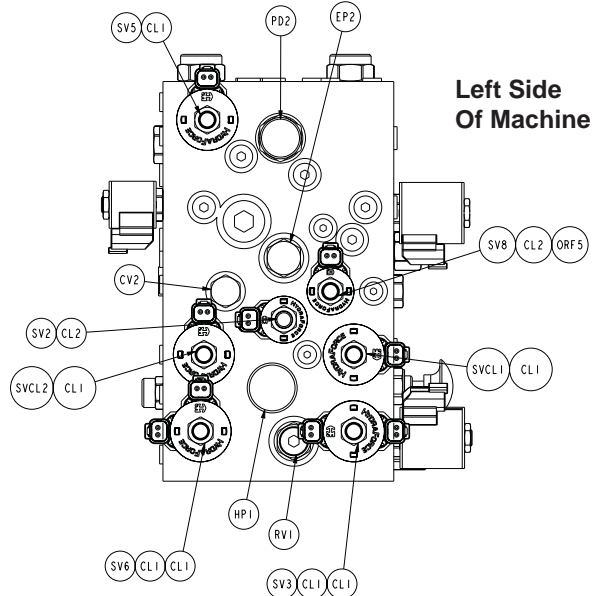
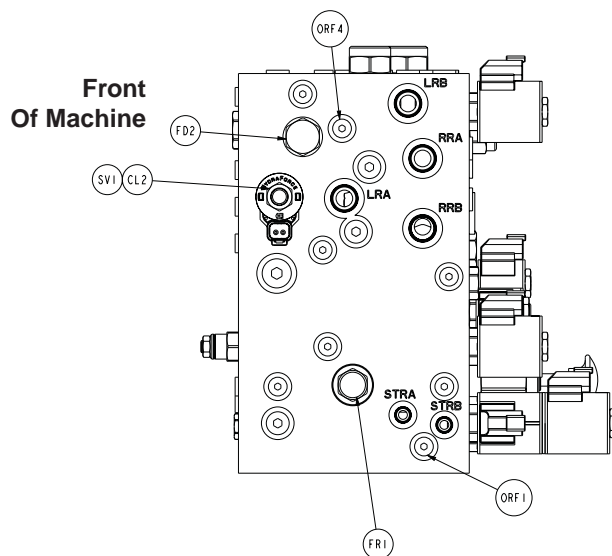
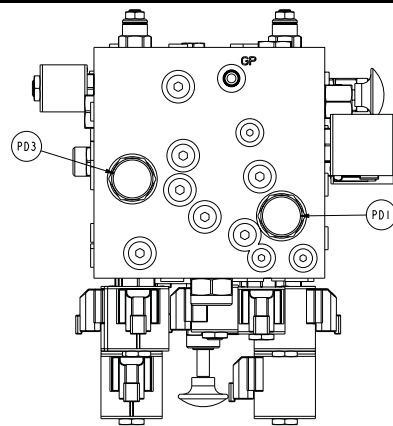
1. Mount the manifold assembly using the mounting bolts.
2. Connect hydraulic hoses (as previously tagged). Be certain to tighten hoses.
3. Connect solenoid leads (as previously tagged).
4. Connect the battery.
5. Operate each hydraulic function and check for proper operation and leaks.
6. Adjust valve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

MANIFOLD & VALVE DIAGRAMS

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

Figure 1-4: Functions Manifold - Components

CL2	COIL #10	SVCL1	SOLENOID VALVE - DRIVE FORWARD
CL1	COIL #8	SVCL2	SOLENOID VALVE - DRIVE REVERSE
CV1	CHECK VALVE - ANTI CAVITATION	EP1	PILOT OP. VALVE - MID SPEED
CV2	CHECK VALVE - ANTI CAVITATION	EP2	PILOT OP. VALVE - LOW SPEED
CV4	CHECK VALVE - ANTI CAVITATION	RV1	RELIEF VALVE - MAIN
HP1	HAND PUMP - BRAKE RELEASE	RV2	RELIEF VALVE - PLATFORM LIFT
SV1	SOLENOID VALVE - HIGH SPEED	FR1	FLOW REGULATING VALVE - BRAKE APPLY
SV2	SOLENOID VALVE - HIGH TORQUE	HLS1	SHUTTLE VALVE - BRAKE RELEASE
SV3	SOLENOID VALVE - OUTRIGGER DIRECTIONAL	ORF1	ORIFICE - STEER SPEED CONTROL
SV4	SOLENOID VALVE - REAR WHEEL BYPASS	ORF3	ORIFICE - FLOW DIVIDER BYPASS
SV5	SOLENOID VALVE - REAR WHEEL BYPASS	ORF4	ORIFICE - FLOW DIVIDER BYPASS
SV6	SOLENOID VALVE - STEER DIRECTIONAL	ORF5	ORIFICE - BYPASS CONTROL
SV7	SOLENOID VALVE - PLATFORM LIFT	PD1	PILOT OP. VALVE - HIGH TORQUE SHIFT
SV8	SOLENOID VALVE - REAR WHEEL BYPASS	PD2	PILOT OP. VALVE - MID RANGE SHIFT
FD1	FLOW DIVIDER VALVE - DRIVE MID & LOW	PD3	PILOT OP. VALVE - HIGH TORQUE SHIFT
FD2	FLOW DIVIDER VALVE - DRIVE MID & LOW	CBV1	COUNTERBALANCE VALVE - DRIVE
MP1	MANUAL OP. VALVE - BRAKE EMR. RELEASE	CBV2	COUNTERBALANCE VALVE - DRIVE



Functions Manifold
4069

mec
ILLUSTRATION No.
ART_4471

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 RV1	Lift Relief RV2	Drive Counterbalance CBV1, CBV2
3500 PSI 246 bar	3200 PSI 220 bar	not adjustable

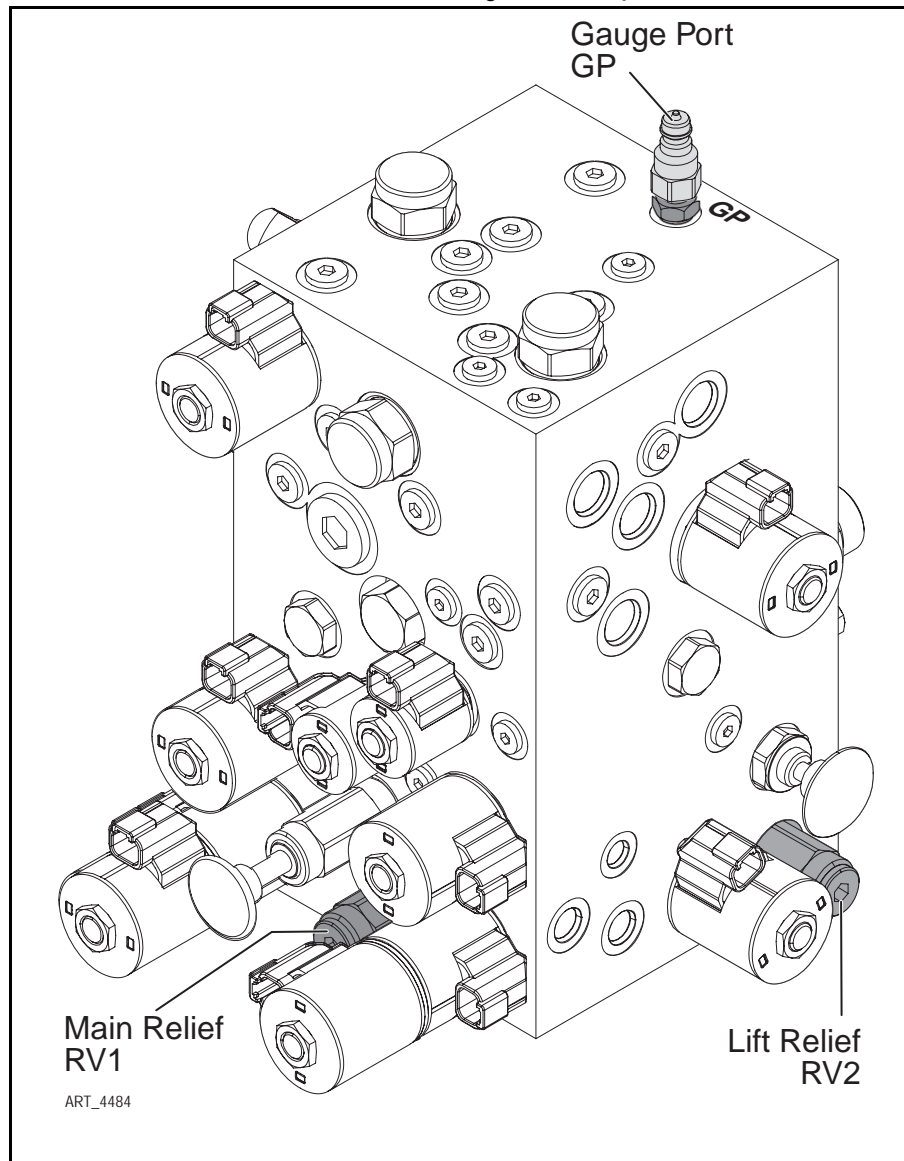
- Before attempting to check or adjust pressure relief valves, operate the machine for 15 minutes or long enough to sufficiently warm the hydraulic fluid.
- Insert a 0-5000 psi gauge into gauge adapter fitting at Port GP of the Functions Manifold.

Figure 1-5: 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.



LIFT RELIEF (RV2)

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 VALVES (CBV1, CBV2)

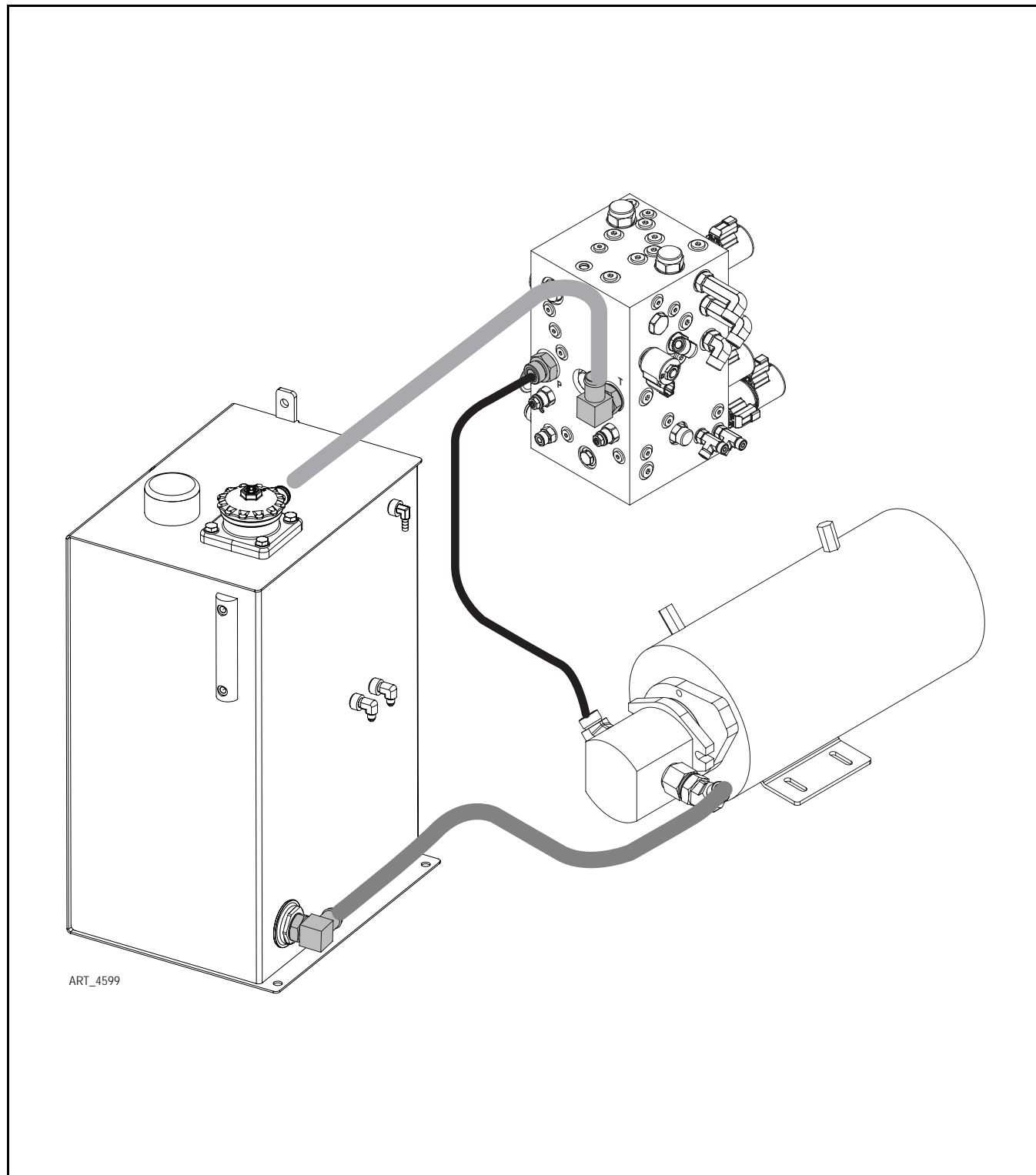
The Drive Counterbalance Valves are not adjustable and should be replaced if they are determined to be malfunctioning.

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 Port P of the Functions Manifold. Unused fluid is routed back to the tank through Port T of the Functions Manifold.

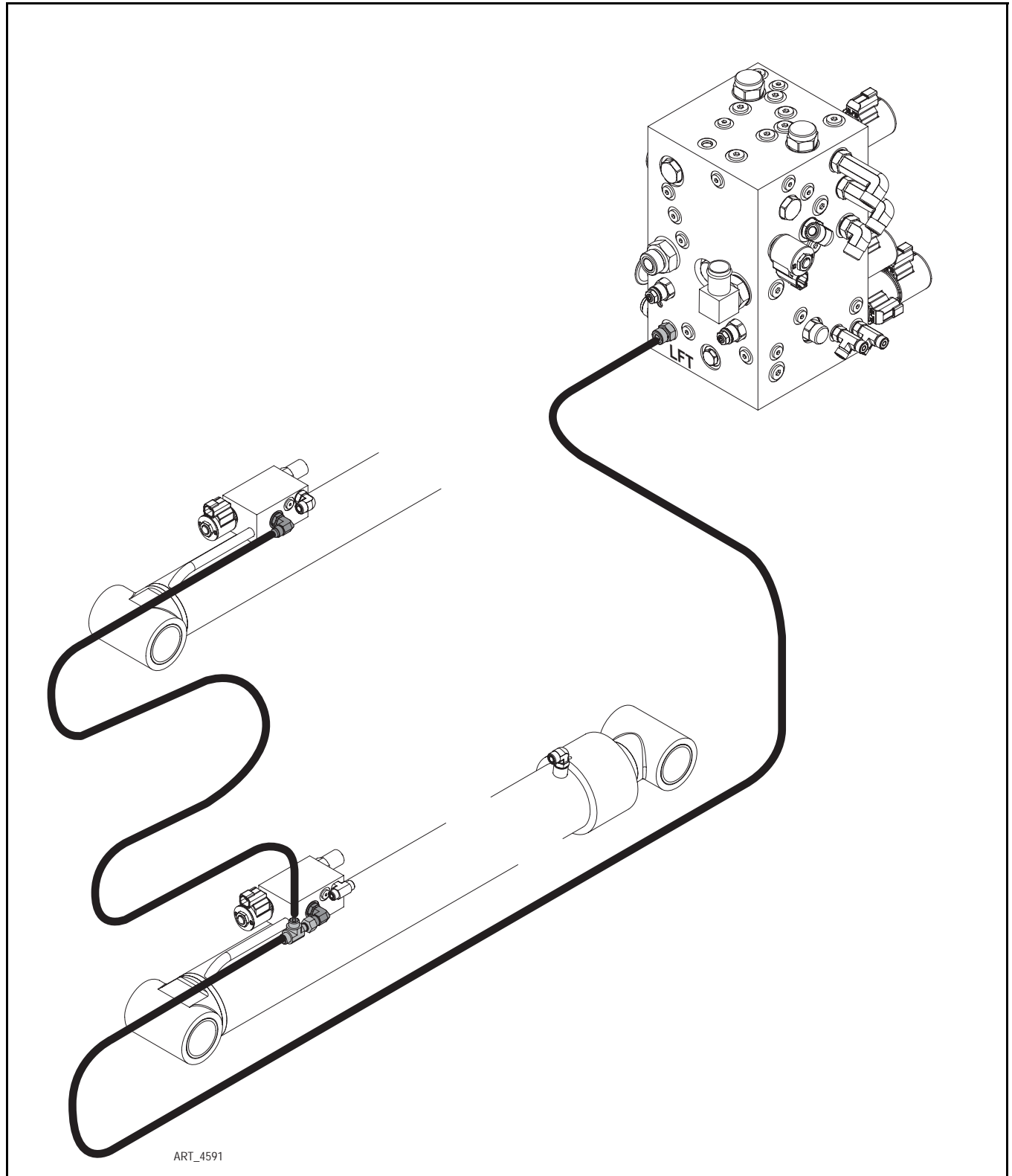
Figure 1-6: Pump Circuit



LIFT CIRCUIT

Hydraulic fluid flows to the lift cylinders from Port LFT on the Functions Manifold and is returned to the manifold through the same hose.

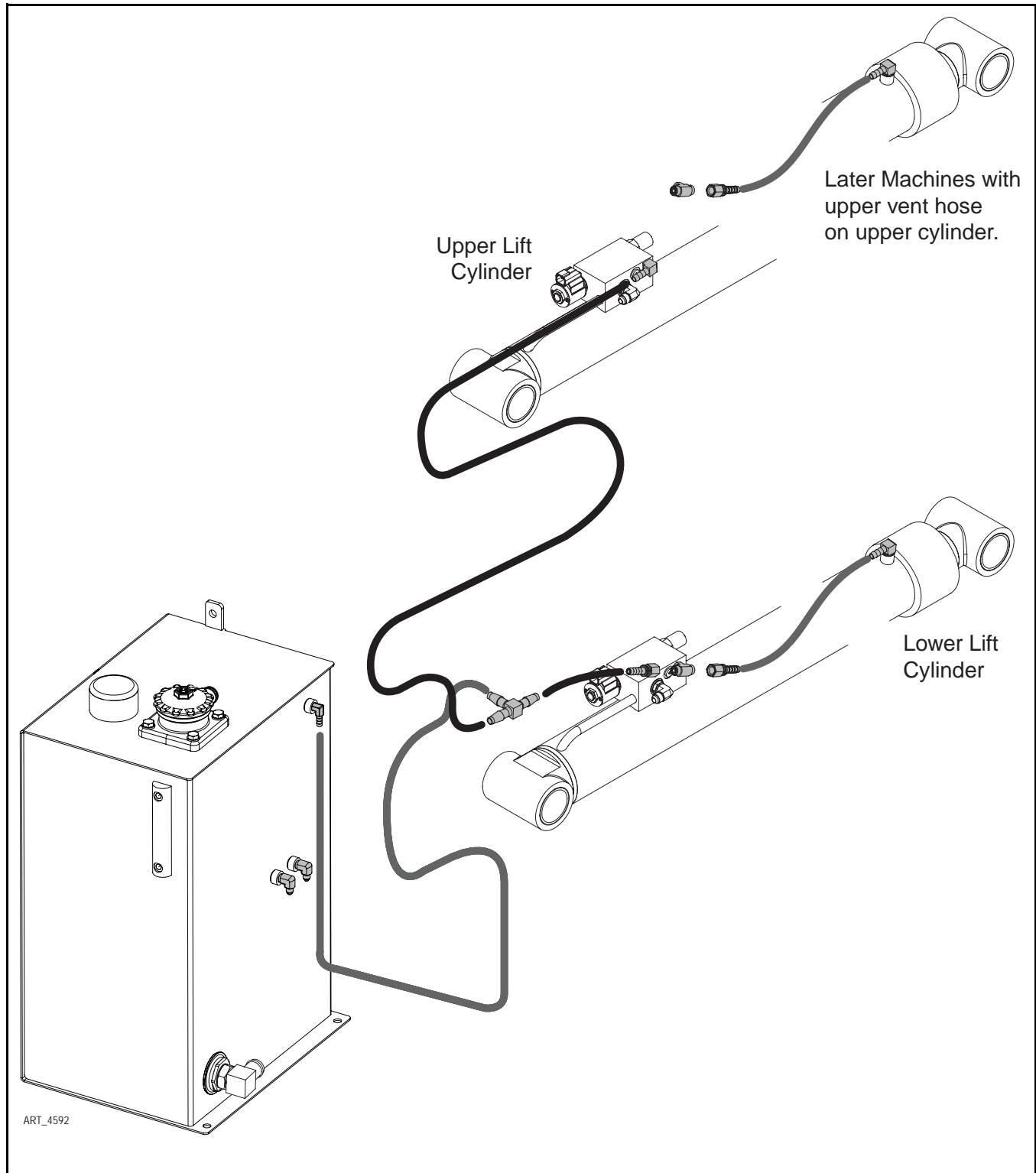
Figure 1-7: Lift Circuit



LIFT VENT CIRCUIT

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.

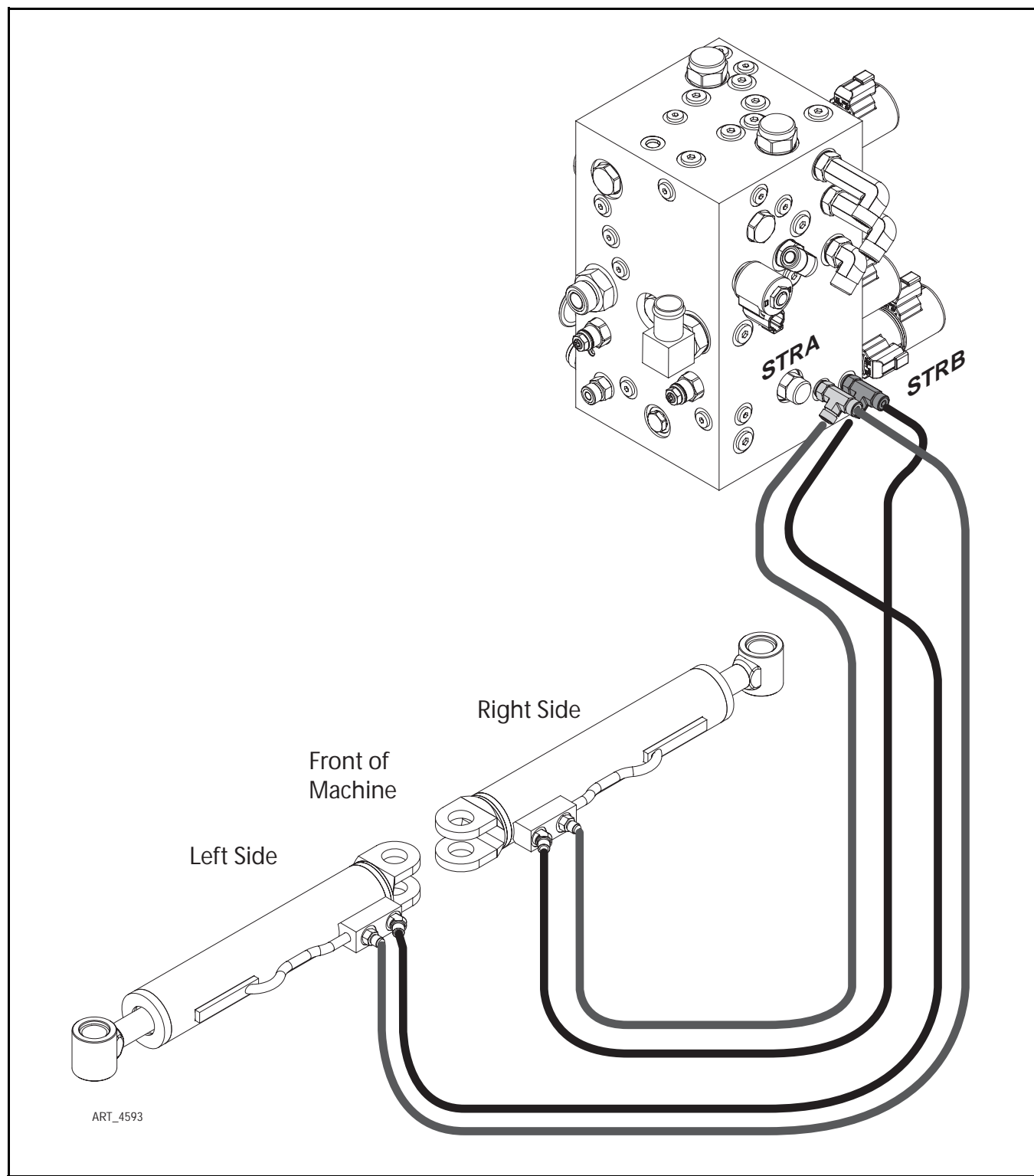
Figure 1-8: Lift Vent Circuit



STEERING CIRCUIT

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

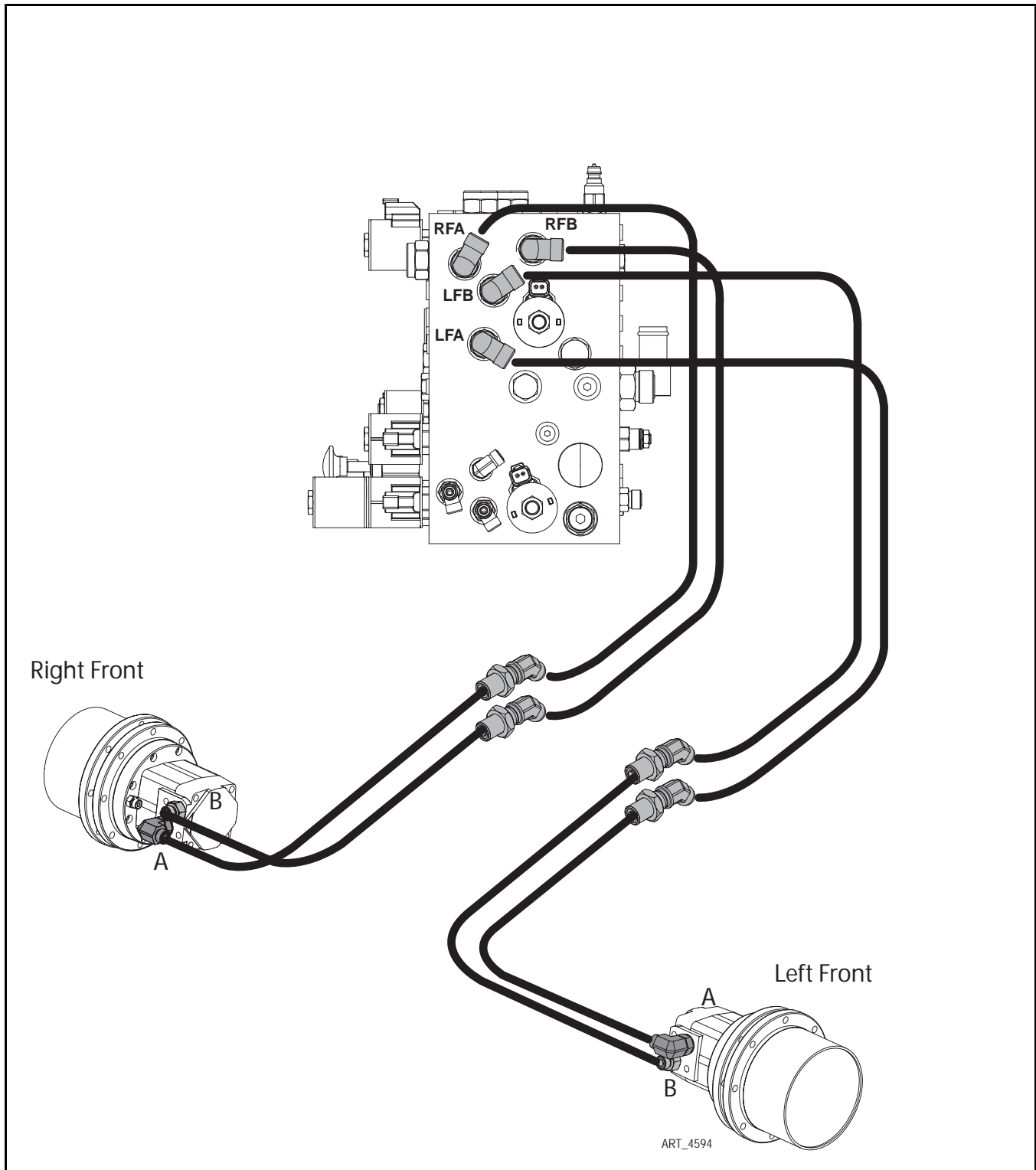
Figure 1-9: Steering Circuit



FRONT DRIVE CIRCUIT

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

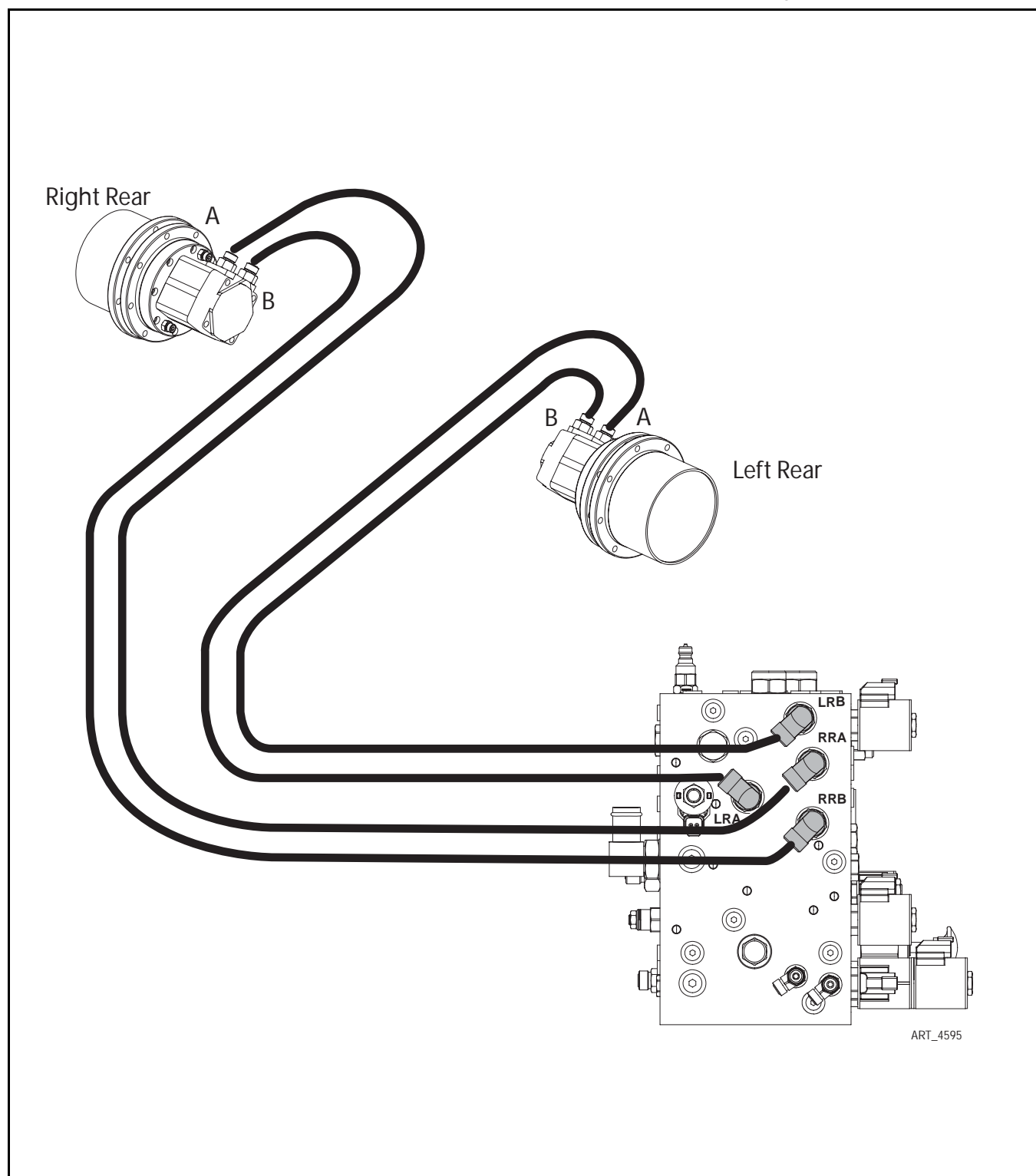
Figure 1-10: Front Drive Circuit



REAR DRIVE CIRCUIT

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

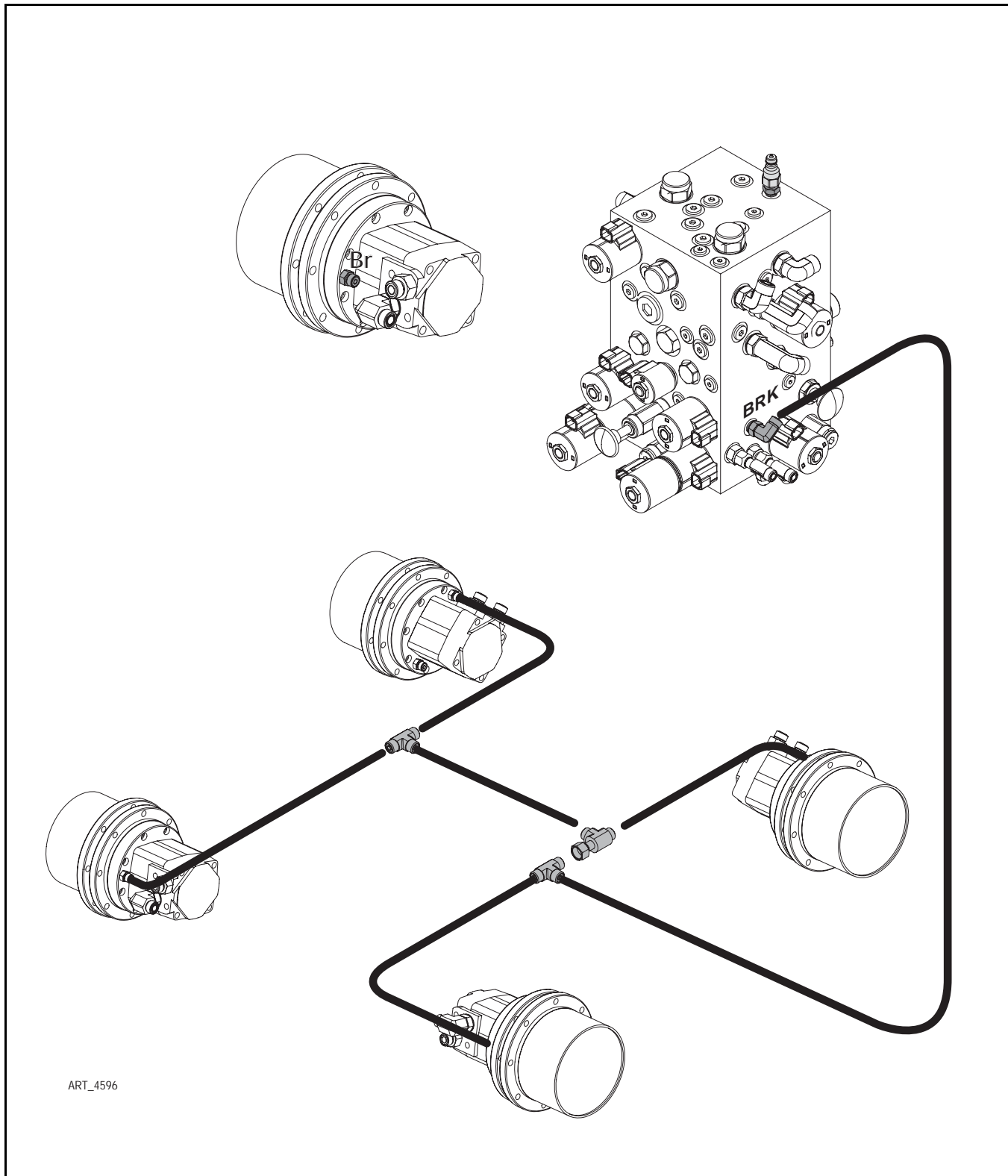
Figure 1-11: Rear Drive Circuit



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.

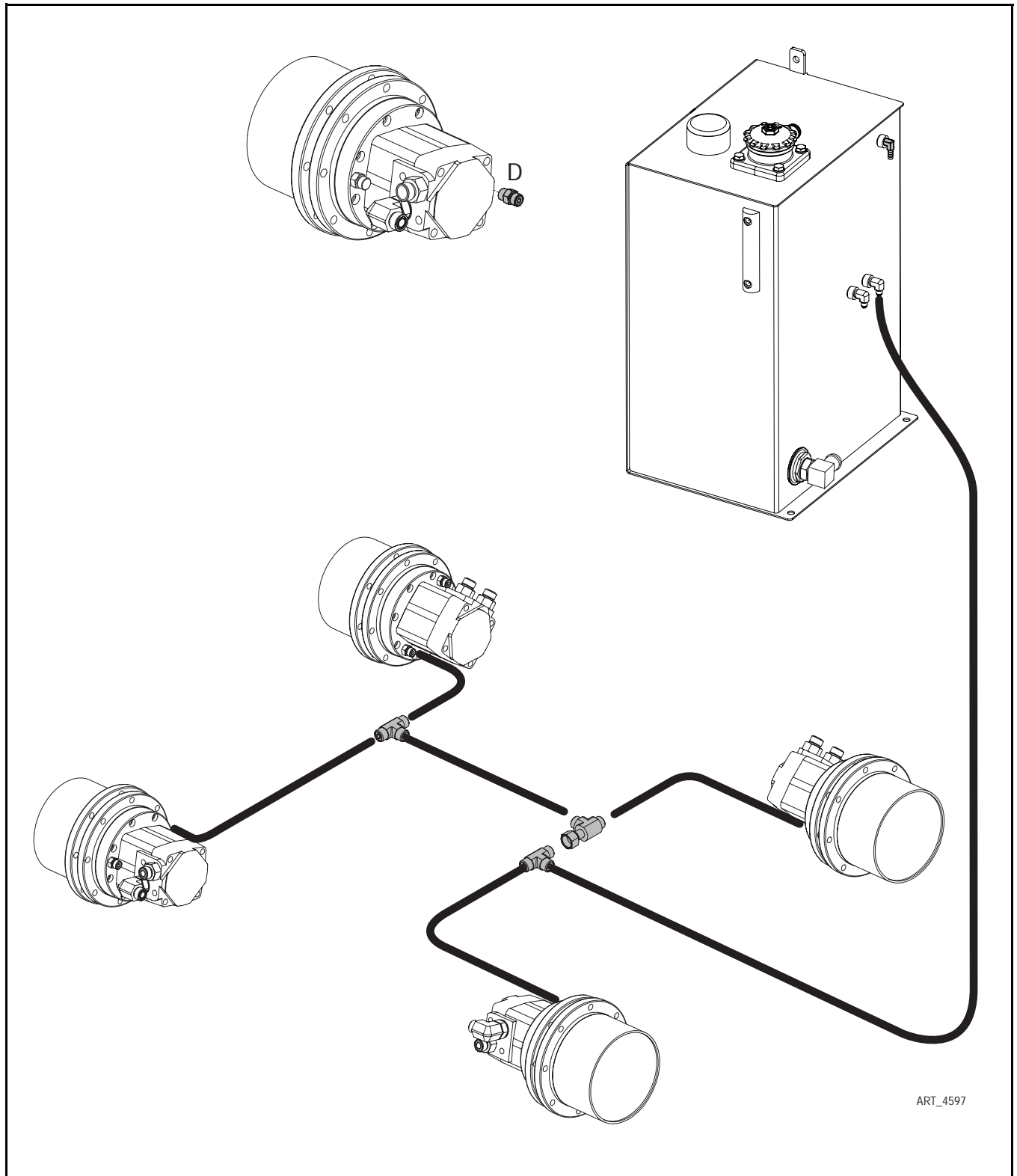
Figure 1-12: Brake Release Circuit



DRIVE CASE DRAIN CIRCUIT

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

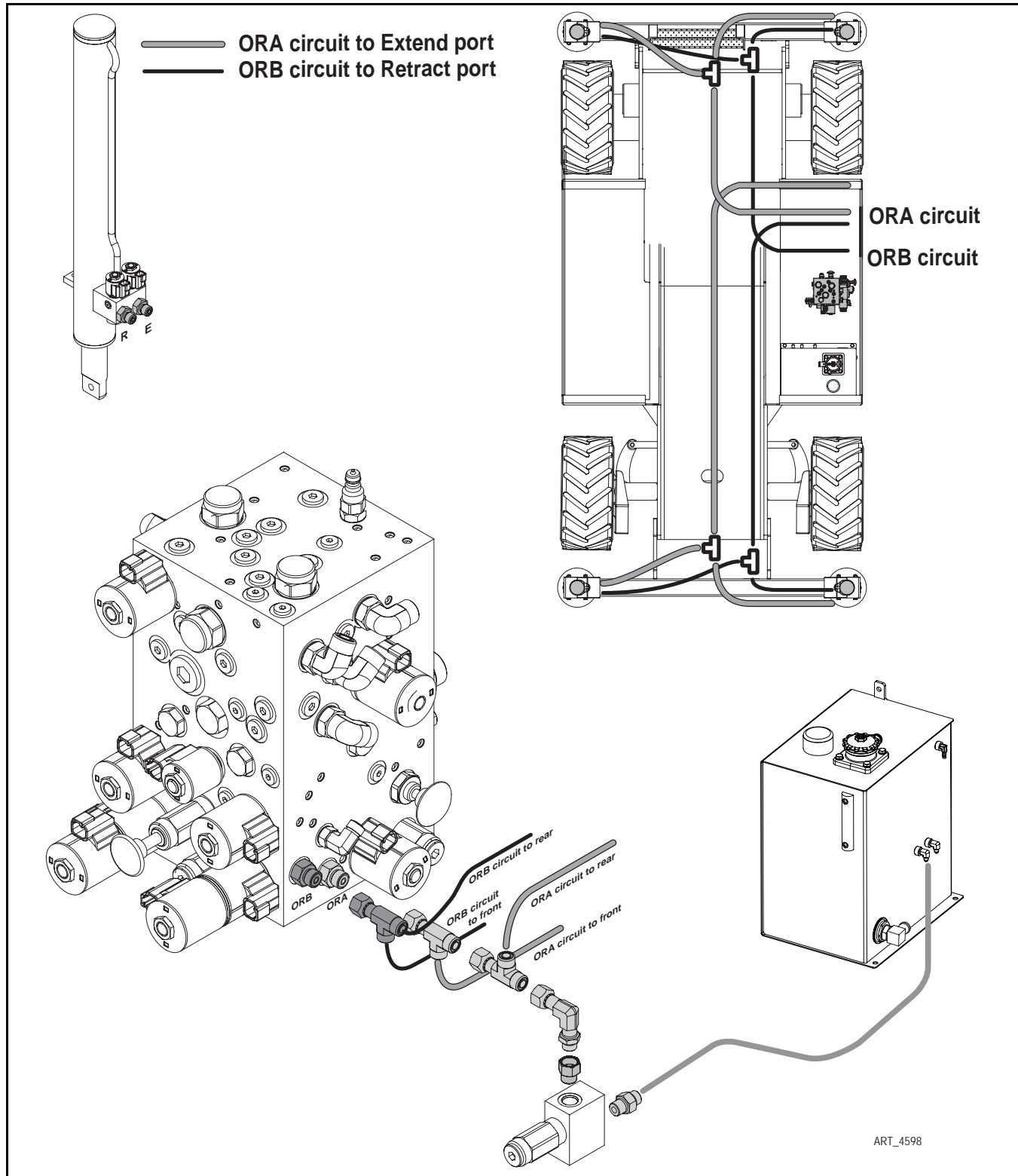
Figure 1-13: Drive Case Drain Circuit



OUTRIGGER CIRCUIT

The Outriggers Cylinders are controlled by Ports ORA and ORB on the Functions Manifold. Pressurized fluid from Port ORA extends the outrigger cylinders. Pressurized fluid from Port ORB retracts them.

Figure 1-14: Outrigger Circuit

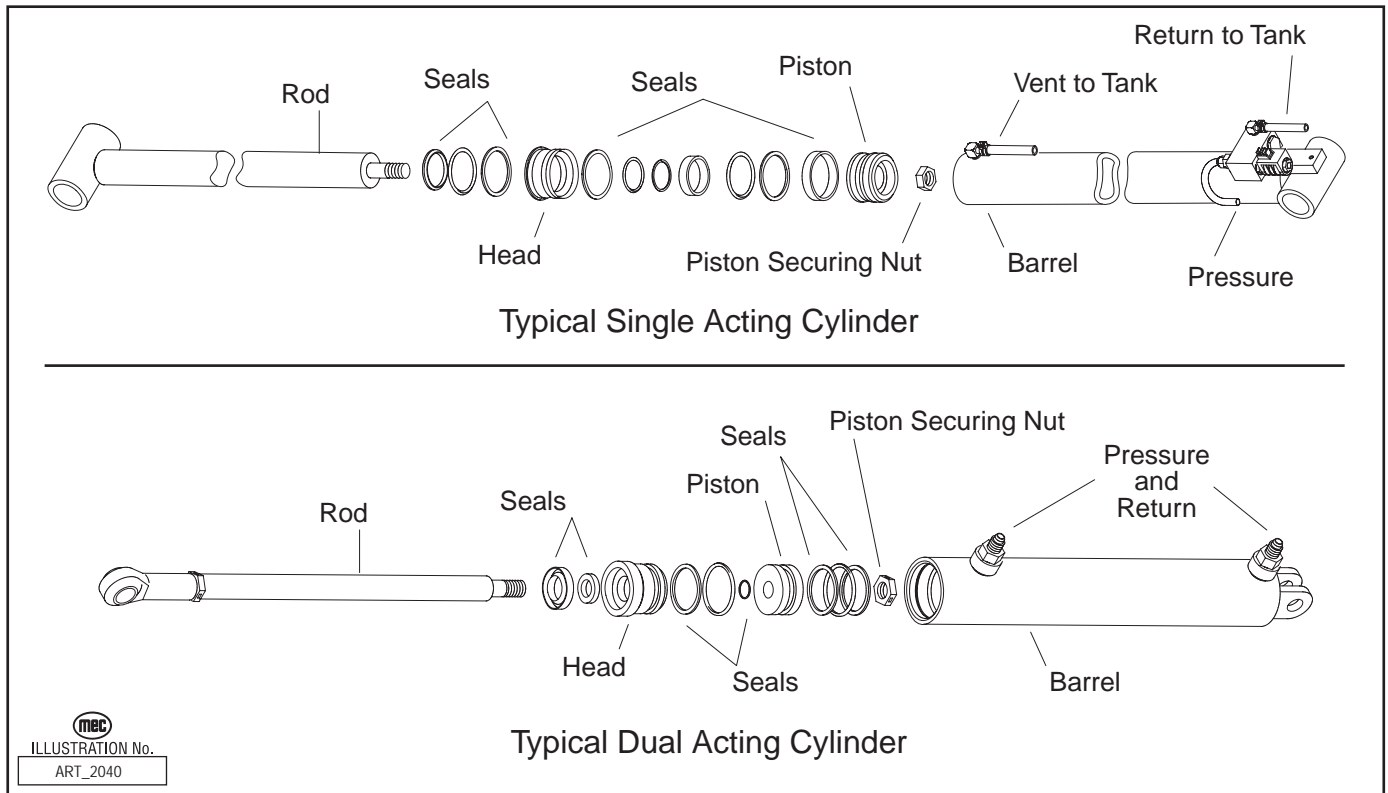


GENERAL CYLINDER REPAIR



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

Figure 1-15: 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. Loosen the set screw from the side of the piston. Using a piston removal tool, unscrew the piston from the rod. It may be necessary to heat the piston to 200° F (93° C) to loosen the Loctite.
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.

Assembly is reverse of disassembly. Lubricate all seals with clean hydraulic fluid before assembly. Use Loctite when securing the piston to the rod.



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 the lift and lower functions, and emergency down.

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.

Emergency Stop Switches



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

EMERGENCY LOWERING SWITCH



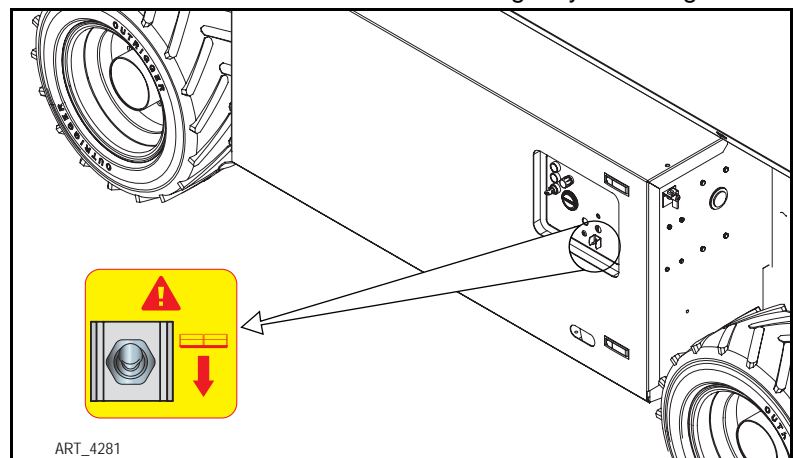
IF THE CONTROL SYSTEM FAILS WHILE THE PLATFORM IS ELEVATED, USE THE EMERGENCY LOWERING PROCEDURE TO SAFELY LOWER THE PLATFORM.

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.

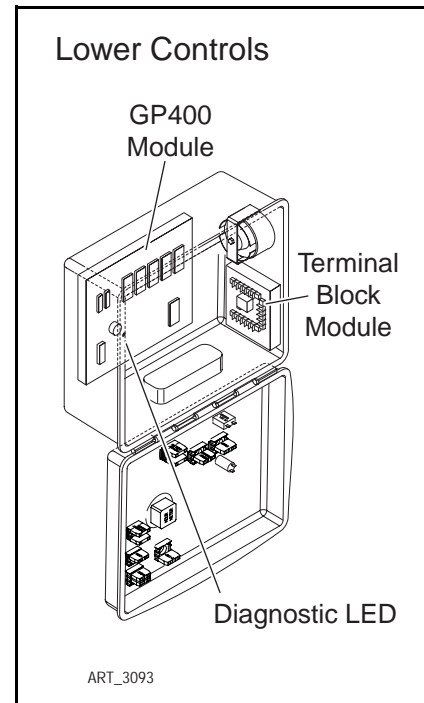
Emergency Lowering Switch



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*.

Diagnostic LED



BATTERIES



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.



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.

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.

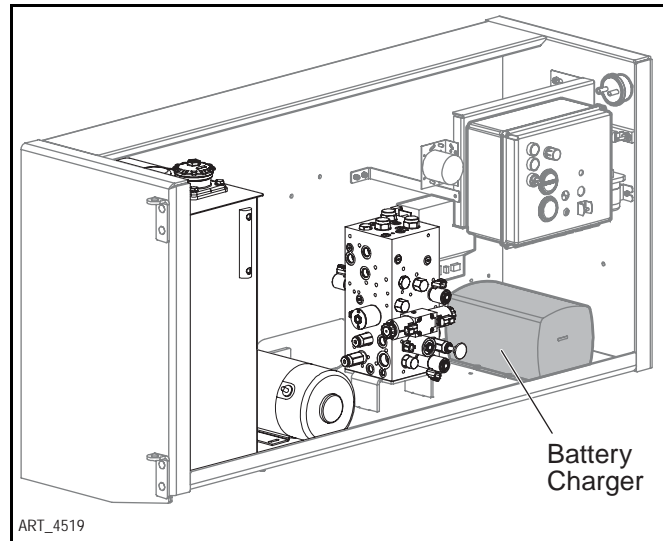
BATTERY CHARGER

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.

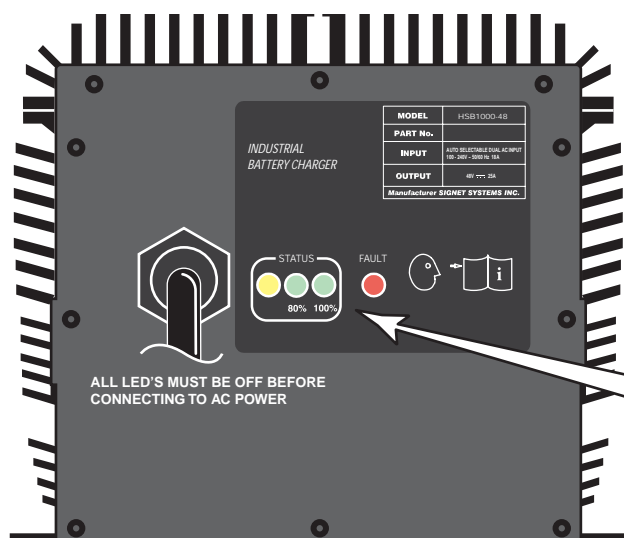


LEAD-ACID BATTERIES GENERATE EXPLOSIVE GASES. KEEP SPARKS, SMOLDERING MATERIALS, AND FLAME AWAY FROM BATTERIES.

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

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.

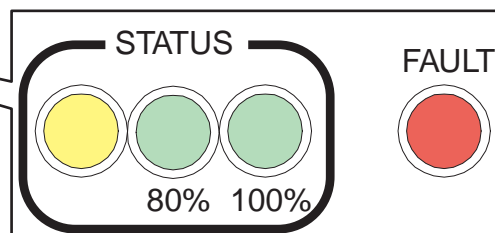


ILLUSTRATION No.

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 15A 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).

Red FAULT LED

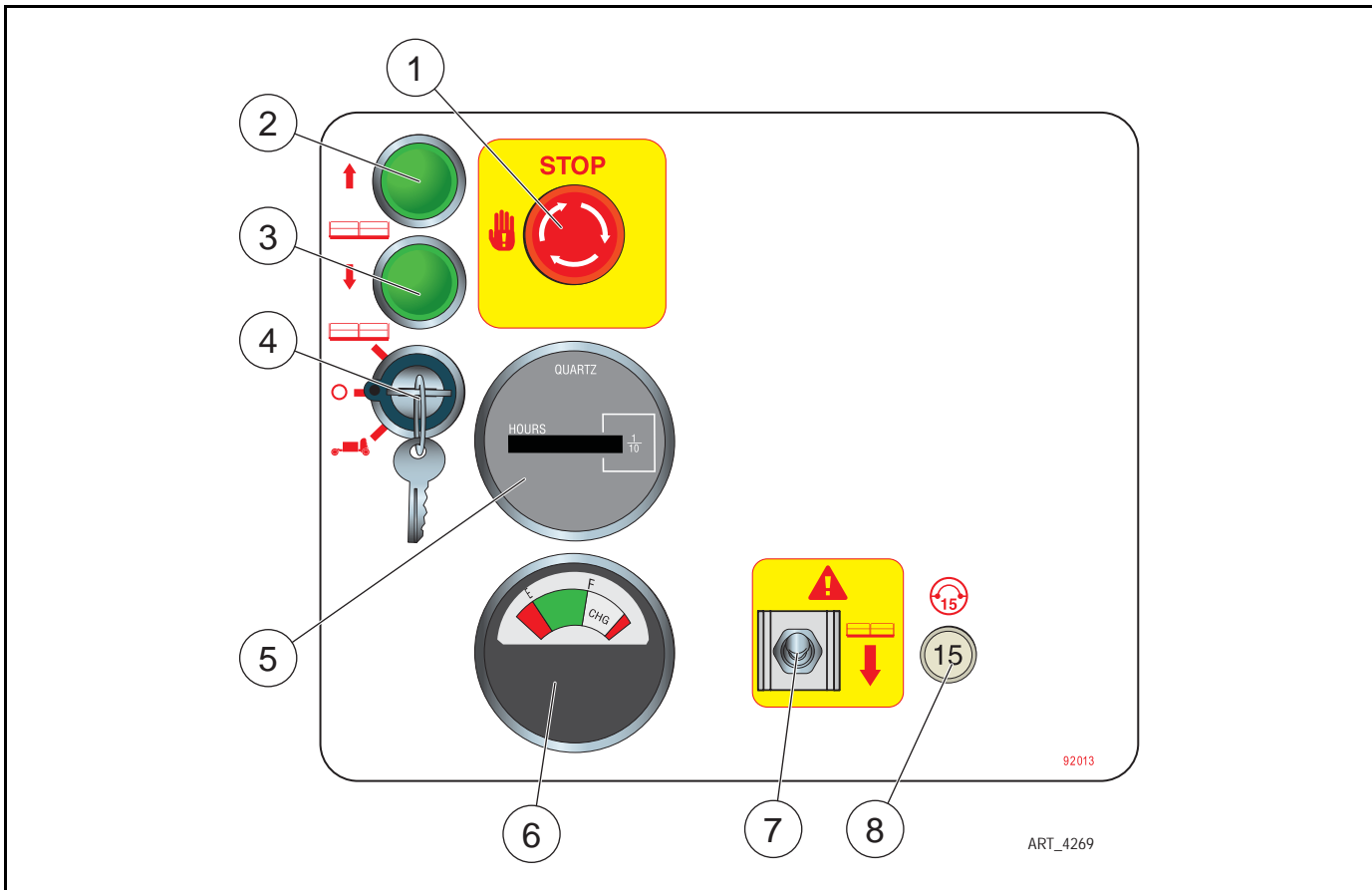
- **ON:** Battery pack probably bad, weak, or a bad cell.
- **1 FLASH:** Open or short circuit. Remove from service until problem is identified and corrected.
- **2 FLASH:** Charger timed out. Battery pack probably bad, weak, or a bad cell. Unplug for 30 seconds, then plug in to start a new charge cycle.

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 2-4: Lower Controls

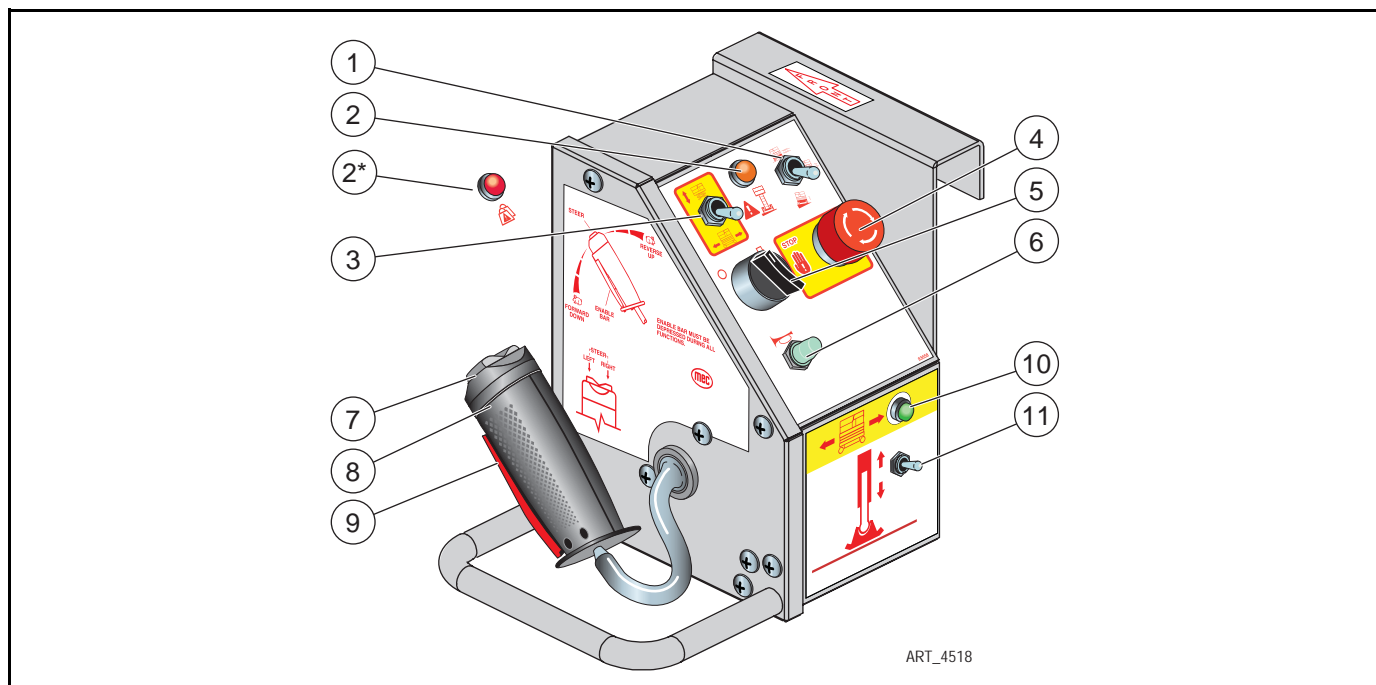


ART_4269

CONTROL		DESCRIPTION
1	Emergency Stop Switch	Press the EMERGENCY STOP switch at any time to stop all machine functions. Turn switch <i>clockwise</i> to reset.
2	Platform Lift Button	Press this button to lift the platform.
3	Platform Lower Button	Press this button to lower the platform.
4	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.
5	Hour Meter	Indicates total elapsed time of machine operation.
6	Battery Charge Indicator	Indicated the state of the battery charge.
7	Emergency Down Switch	Move this switch down to lower the platform in the event of an emergency or power loss.
8	Circuit Breaker	Trips when there is excessive electrical load. Push to reset.

UPPER CONTROLS

Figure 2-5: 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)*	Platform overloaded when light is ON. An audible alarm will sound and all machine functions will stop. Remove weight from the platform to restore function and continue.	
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. Turn switch <i>clockwise</i> to reset.	
5	On/Off Switch	This switch turns power ON or OFF at the platform (does not affect the Lower Controls).	
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	Proportionally controls Forward and Reverse travel.
		LIFT	Proportionally controls Lift and Lower functions.
9	Enable Bar	Squeeze to enable DRIVE, STEER, and LIFT functions from the Joystick.	
10	Drive Enable Indicator (Outrigger Option)	Lamp ON	Outriggers are retracted and machine will drive.
		Lamp OFF	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.

Arm Guard Cutout – On machines equipped with the optional Overload Sensing System, the automatic Arm Guard Cutout function will stop the platform when lowering at approximately 2.5 meter platform height and will sound a fast intermittent beeping alarm. Release the Lower button or control handle.

A three second delay is provided for the operator to verify that there are no hazardous conditions or personnel near the machine. Lowering may resume after these 3 seconds have elapsed when the Lower button is engaged.

LEVEL SENSOR

The Level Sensor is integrated into the GP400 Control Module.

Figure 2-6: EZfit Angle Sensor

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:

- 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.

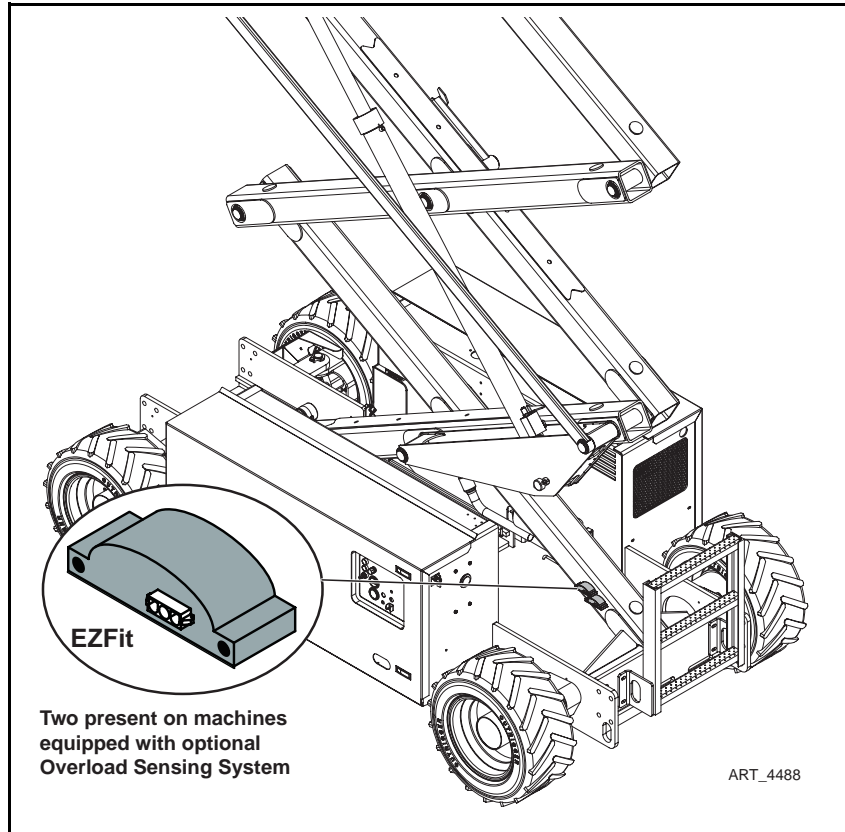


Figure 2-7: Pressure Transducer

LIFT PRESSURE TRANSDUCER

The Lift 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.

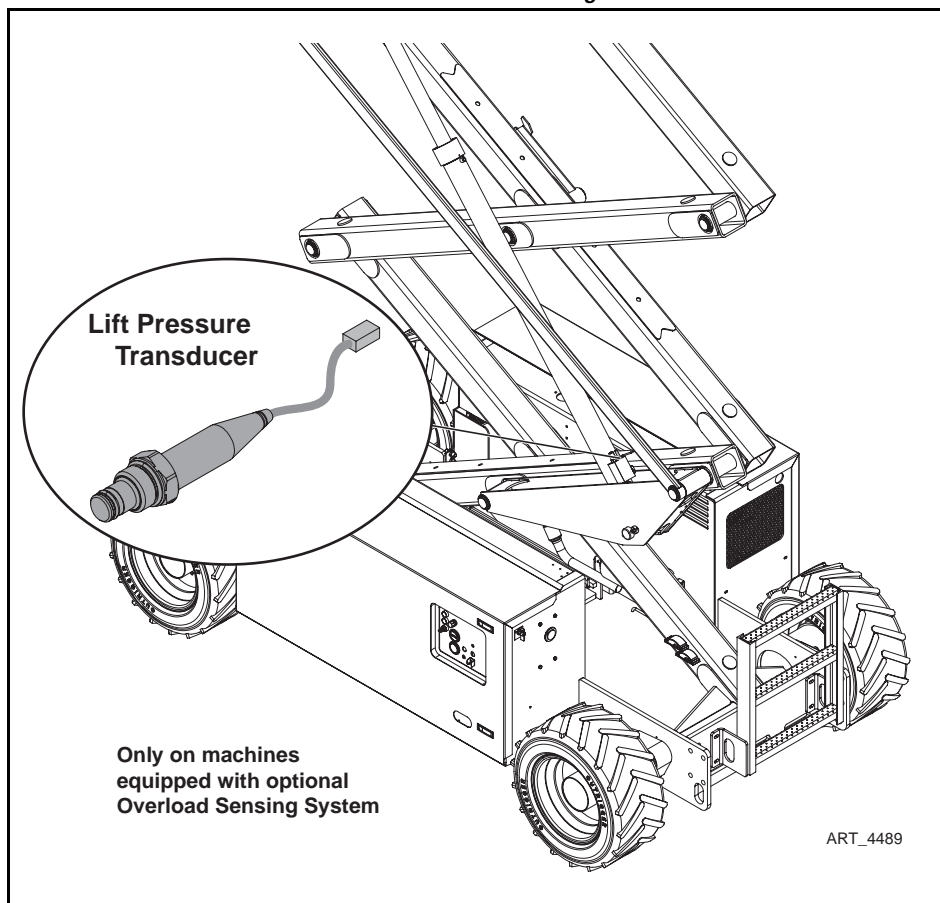
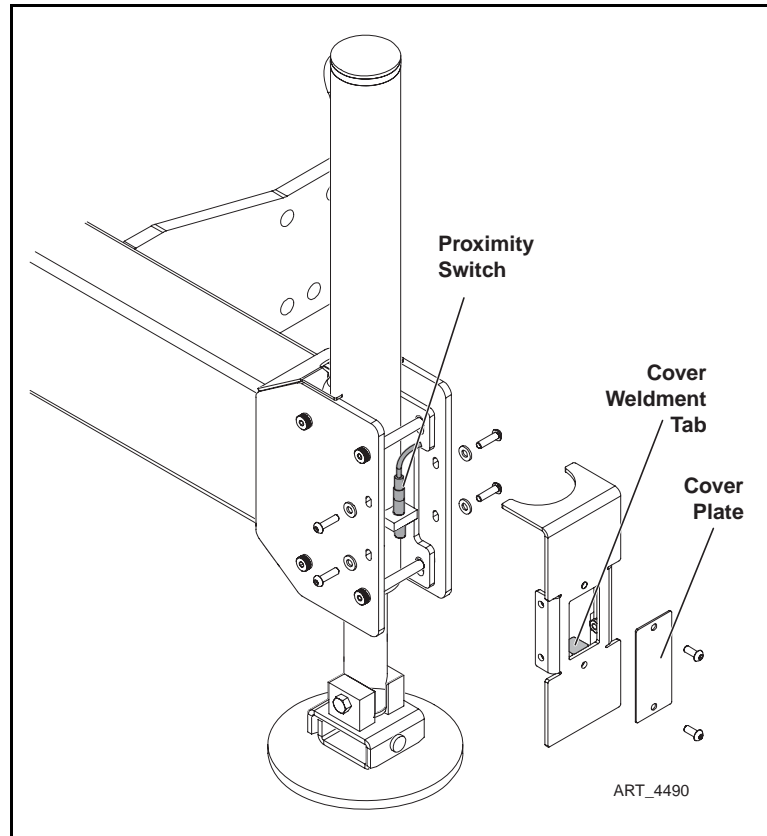


Figure 2-8: Outrigger Proximity Sensor**OUTRIGGER****PROXIMITY SENSOR**

On machines equipped with outriggers, each of the four outriggers has a Proximity Sensor. Pressure from the outrigger cylinder lifts the cylinder slightly and moves this switch away from a tab on the Cover Weldment, indicating 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 2-9: 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

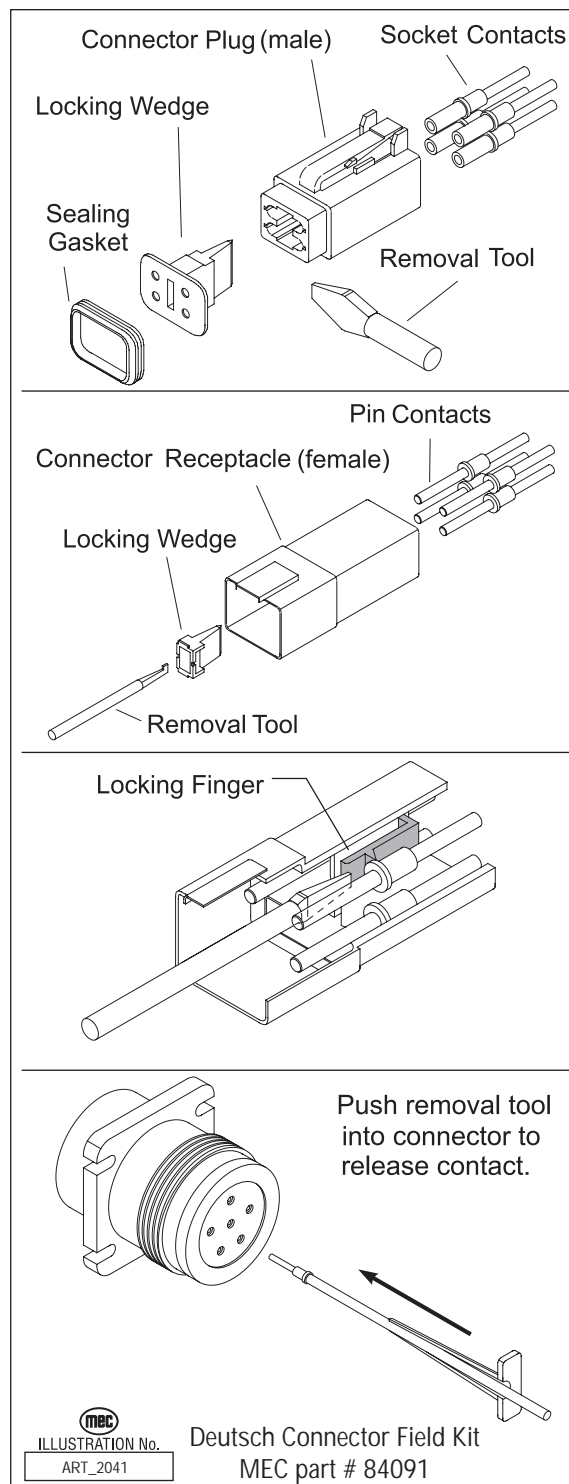
- Remove the locking wedge as outlined above.
- Using the removal tool or a flat blade screwdriver, push the Locking Fingers aside to release the contact.
- Pull the wire and contact out of the connector.

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.

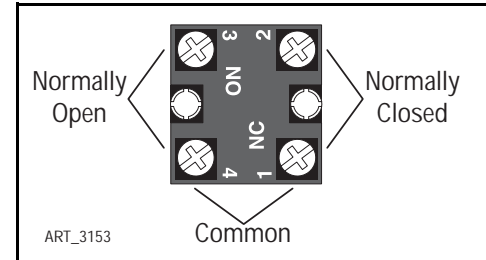


CONTINUITY CHECKS

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.

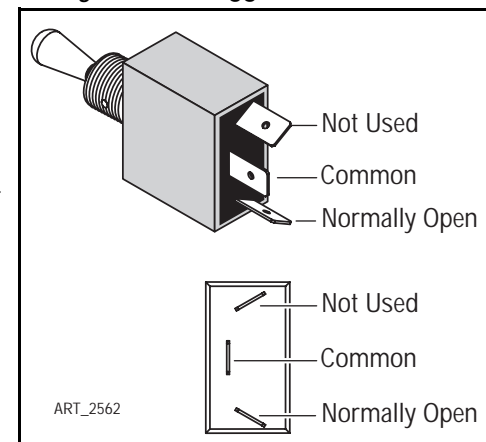
Figure 2-10: Selector Switch



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.

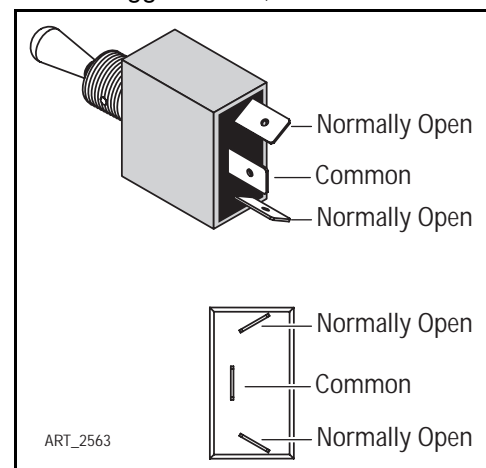
Figure 2-11: Toggle Switch, ON-OFF



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.

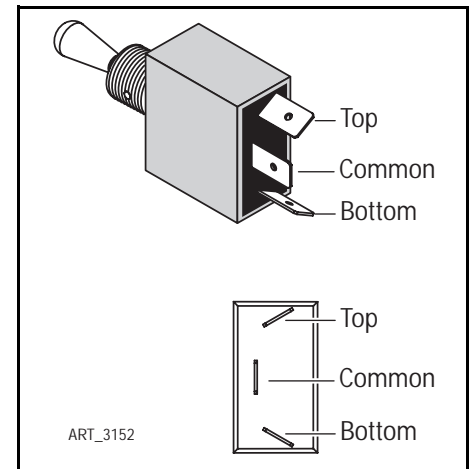
Figure 2-12: Toggle Switch, 1-Pole 2-Position



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 2-13: 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 2-14: Toggle Switch, Momentary

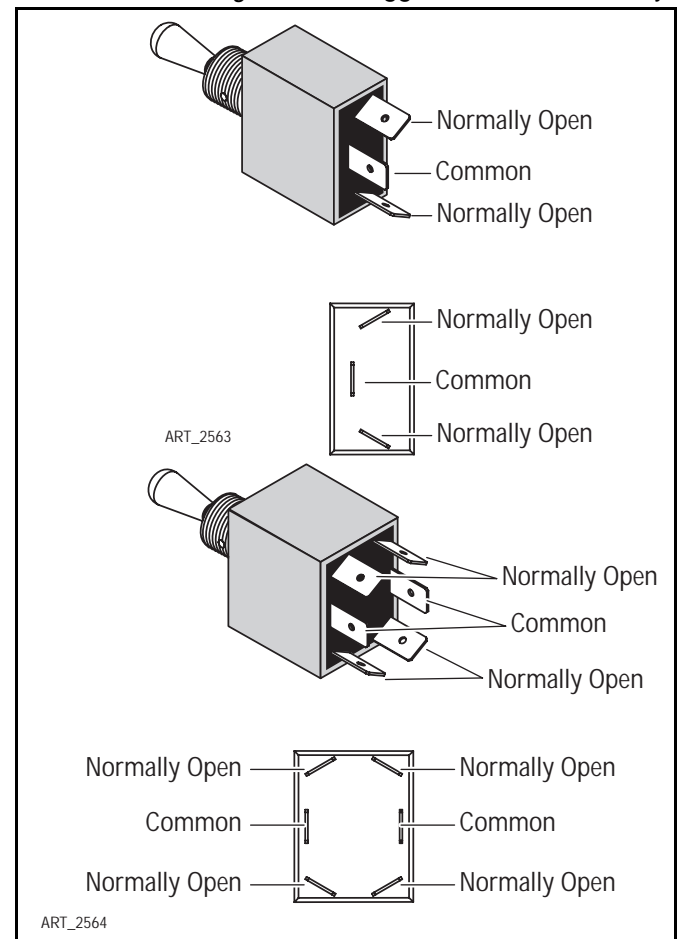


Figure 2-15: Button Switch, Momentary

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

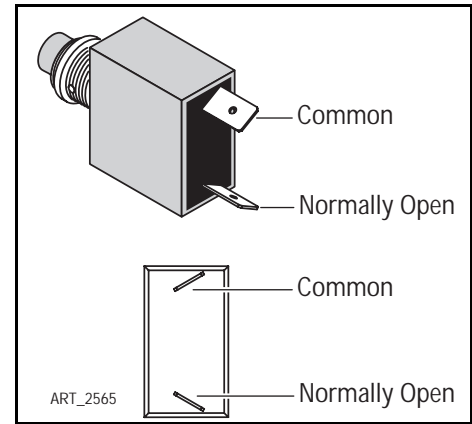


Figure 2-16: Emergency Stop Switch

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.

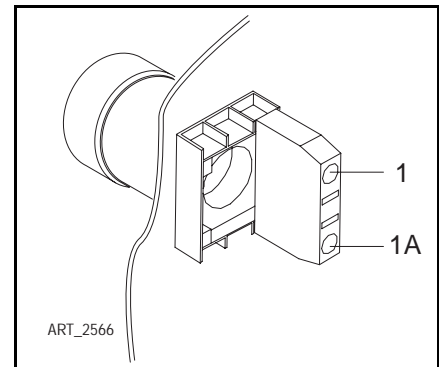
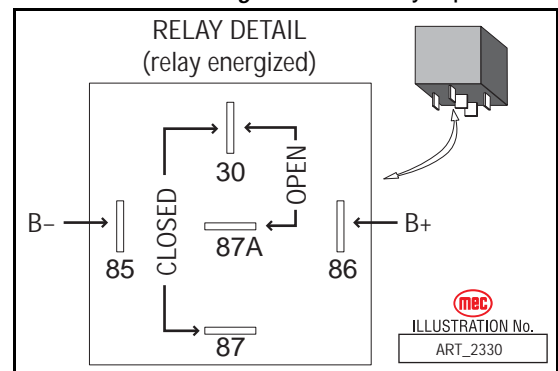


Figure 2-17: Relay Operation

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

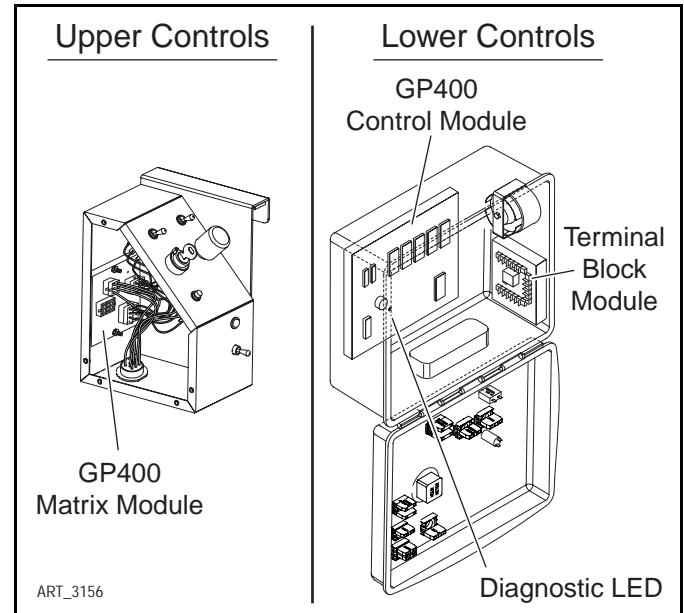
LOCATION

- 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 2-18: Module Locations



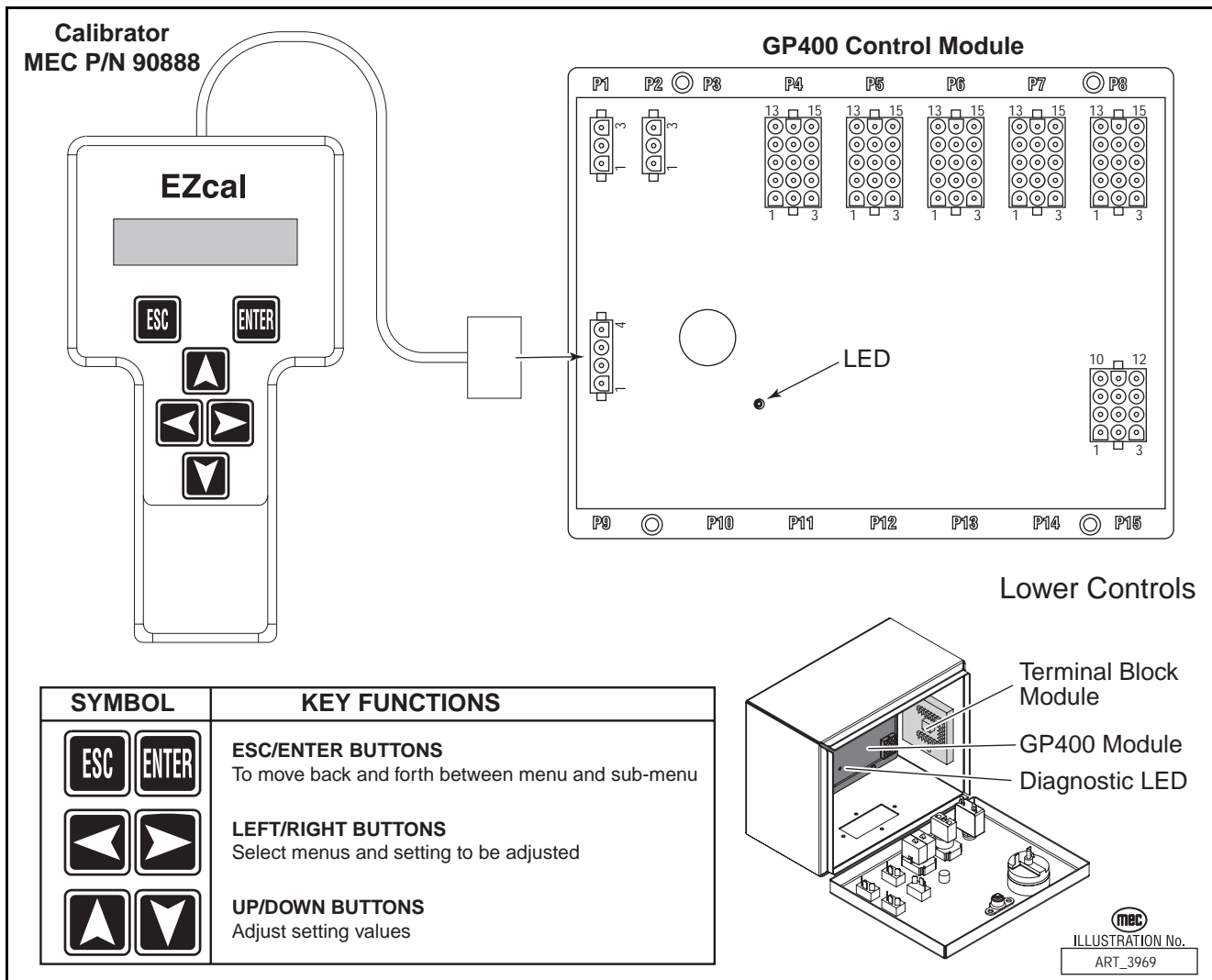
GENERAL DESCRIPTION

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 2-19: 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 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 2-22).

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. Lift the end of machine requiring a tire change and support with jackstands of adequate capacity.
3. Remove lug bolts and pull the wheel off. Note the position of the centering washers.
4. Install the replacement wheel.
5. While ensuring the correct positioning of the centering washers, install lug bolts and torque to 55 lb-ft. (75 Nm).
6. 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.

Remove all tools and materials from the platform before performing this procedure.

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. Arrange the rigging to avoid touching the guardrails and so that it runs **between** the toe board and the sheet materials rack. Apply slight lifting pressure.
3. Tag and disconnect all platform wires.
4. Remove the nuts from the two bolts on each side of the front of the platform (four nuts total). Press the bolts flush with the inner surface of the platform structure. It is not necessary to remove the bolts completely.
5. Remove any components that will obstruct the scissor slide path.
6. Remove the bolts from both fixed blocks at the rear of the platform.
7. Lift the rear of the platform until the fixed blocks are clear.
8. Slide the platform assembly backwards until the slide blocks clear the front of the platform.



THE PLATFORM MAY SHIFT SUDDENLY WHEN IT CLEARS THE SLIDE BLOCKS.

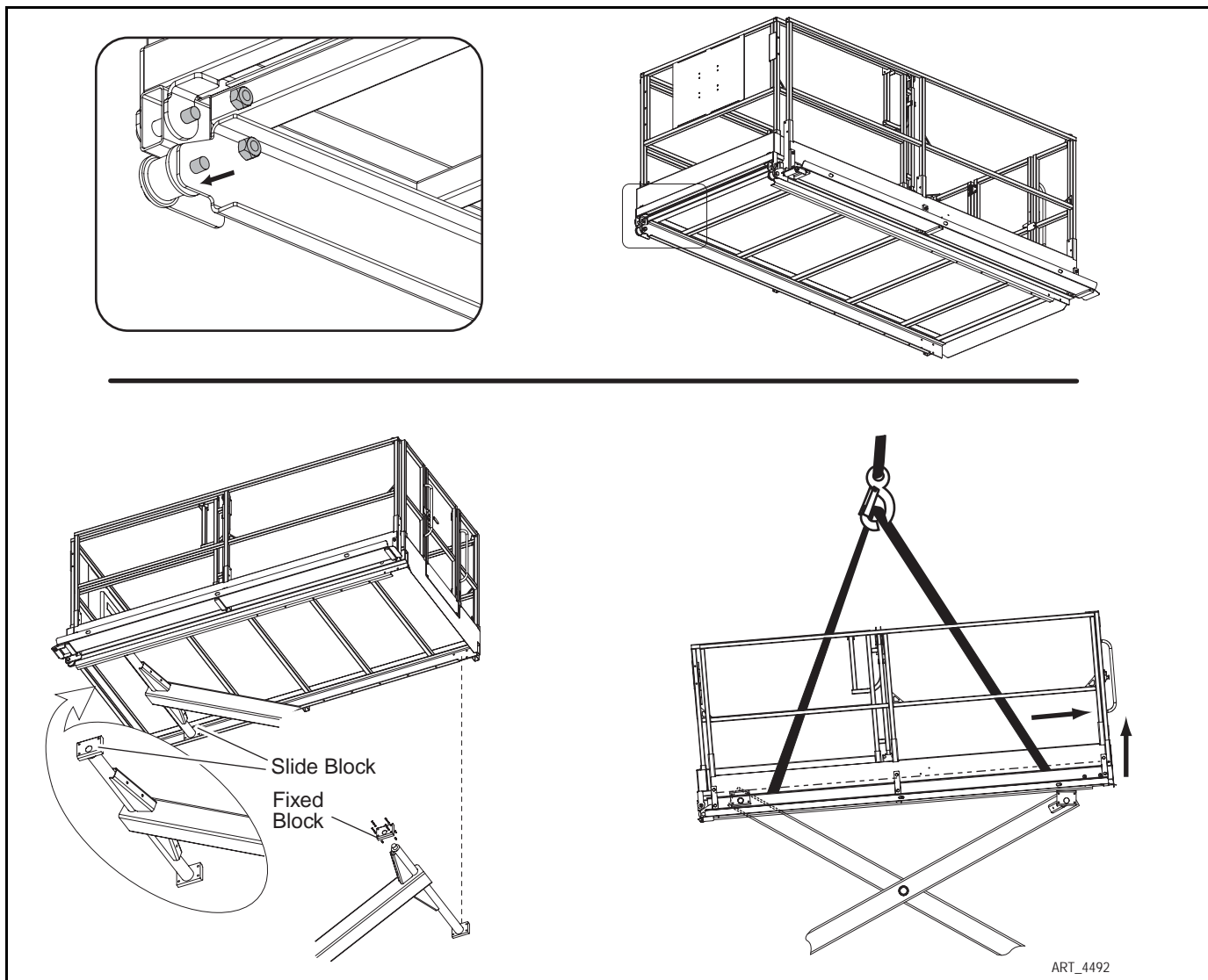
9. Remove the platform assembly.

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.

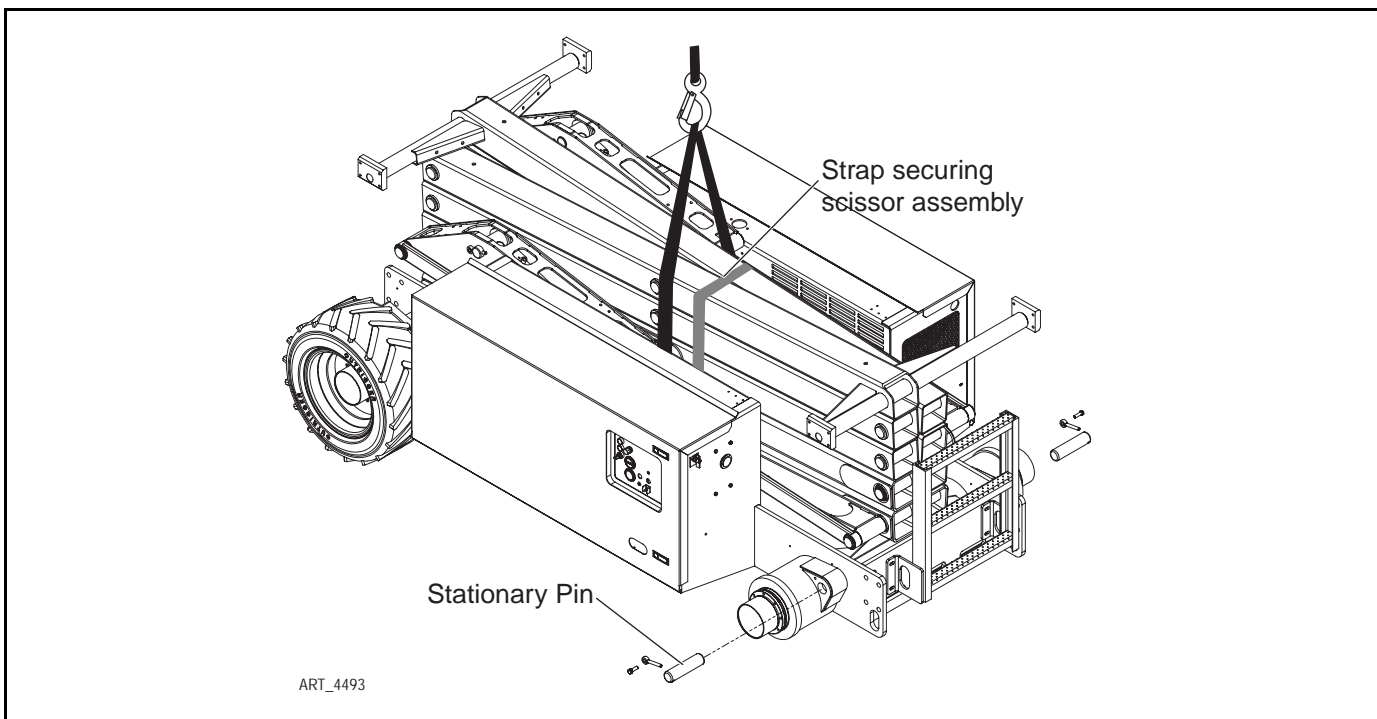
Clean the beams once a year or more often if necessary and inspect the beams' surfaces, especially welds and brackets.

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

REMOVAL

1. Remove the platform and 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

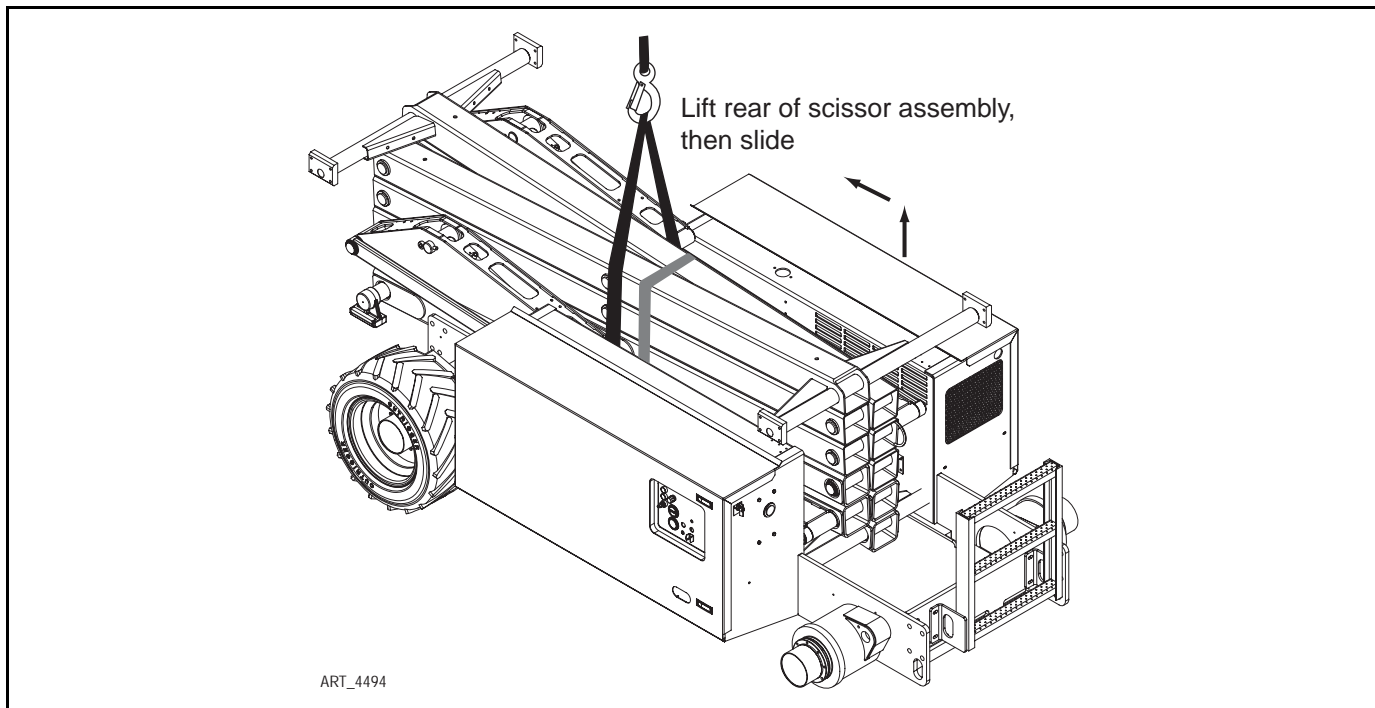


8. Carefully lift until the rear of the scissor is clear.
9. Slide the scissor assembly toward the front until the slide blocks reach the end of slide channel, then lift the scissor assembly.



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 4069 has two lift cylinders. This procedure covers removal of either cylinder without removing the entire scissor stack.

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 pin, cylinder mount pin, and two nylon washers.
6. Remove the lower retaining pin.
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.

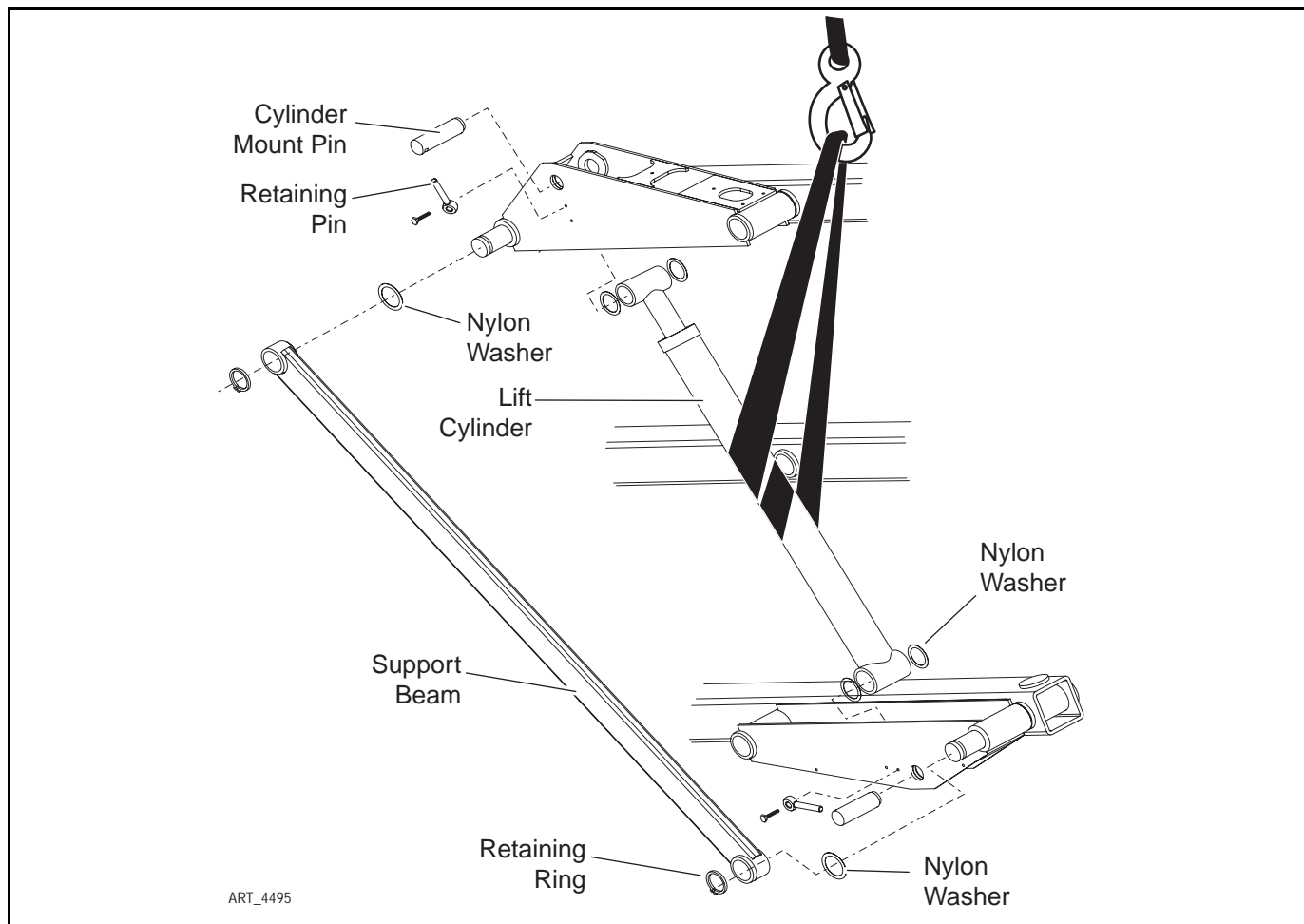
Installation

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.



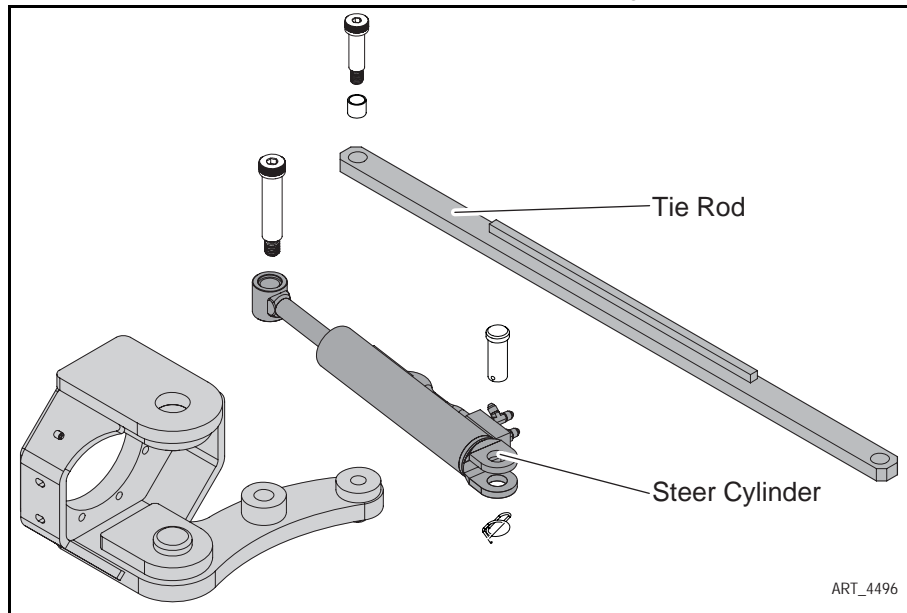
- **Clean all fittings before disconnecting hoses.**
- **Tag hoses for proper reassembly.**
- **Plug all openings to prevent contamination.**

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 tie rod.
4. Remove the shoulder bolt that secures the rod end of the cylinder to the steering yoke. Swing the steering yoke out of the way.
5. Remove the locking cotter pin from the clevis pin that secures the barrel end of the cylinder to the chassis.
6. 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

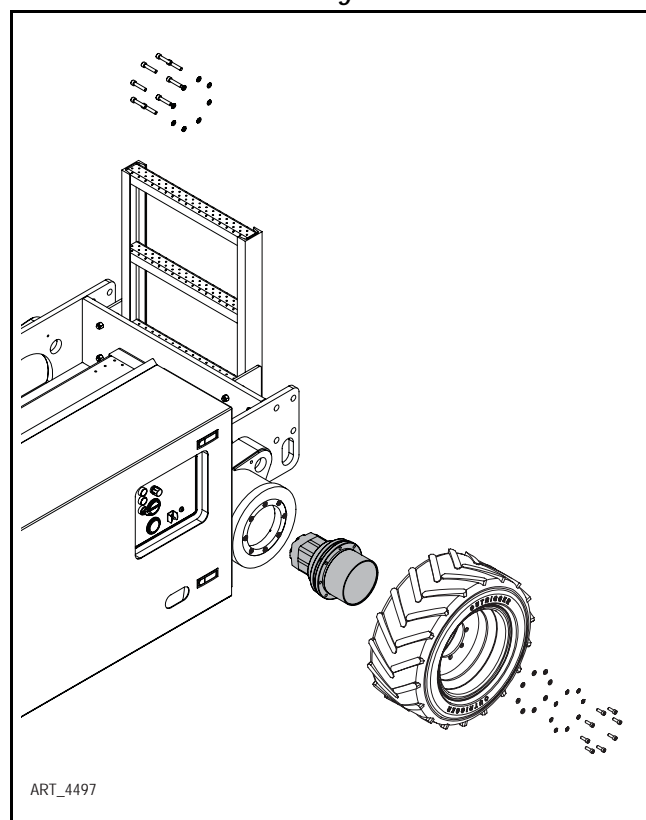
1. Raise and support the rear end of machine.
2. Raise the scissor arm assembly and support using the maintenance lock.
3. Remove the wheel and tire assembly.
4. Label the hydraulic hoses for proper reassembly, then disconnect. Immediately cap and plug all openings to prevent contamination.
5. Remove the bolts that attach the motor to the chassis.

Installation

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to 55 lb-ft (75Nm).

Figure 3-6: Rear Drive Motor

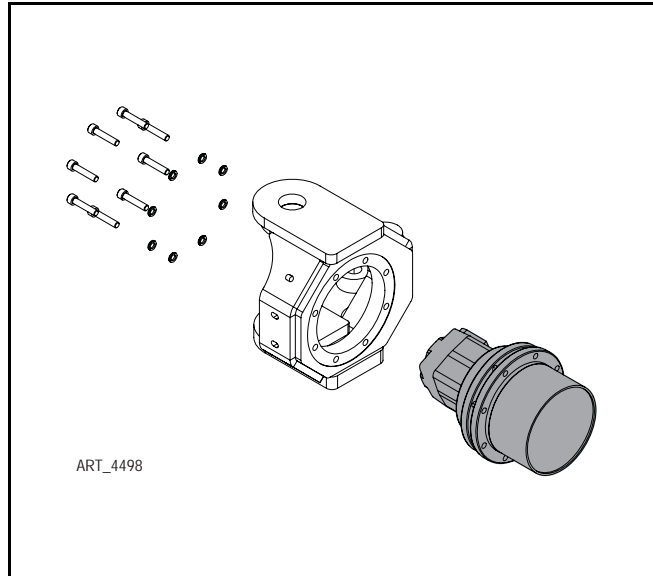


FRONT DRIVE MOTORS

Figure 3-7: Front Drive Motor

Removal

1. Raise and support the machine.
2. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
3. Disconnect the steering tie bar and steer cylinder from the steering yoke.
4. Swing the steering yoke out to access the mounting bolts from behind.
5. Support the motor, then remove the bolts and carefully remove the drive motor from the steering yoke.



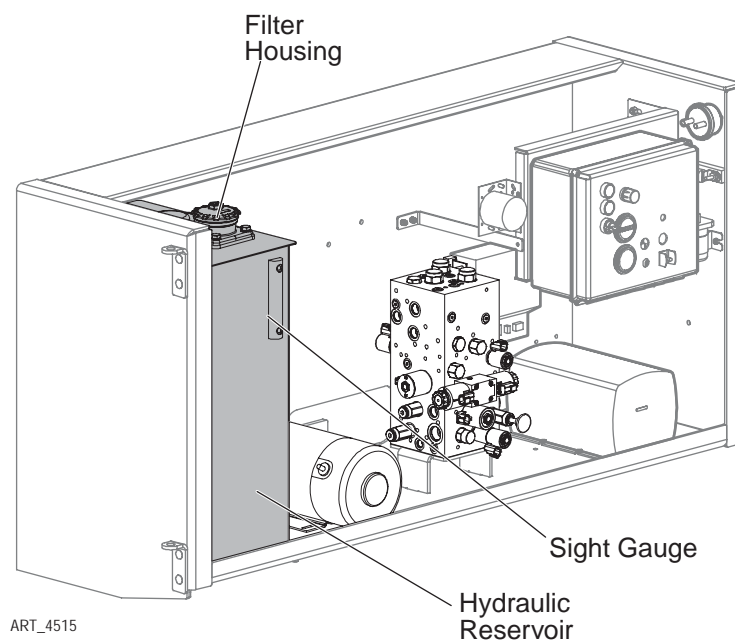
Installation

Installation is reverse of removal.

- Use Loctite 242 or equivalent on mounting bolts.
- Torque all bolts to 55 lb-ft (75Nm).

LUBRICATION

Figure 3-8: Lubrication Points



Lubrication

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

NOTES:



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.

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 was designed for low maintenance and long trouble free operation. The system consists of two microprocessor based 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 short circuit and reverse polarity protected. 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 WITHIN THE VICINITY OF THE MODULES IS HIGHLY DISCOURAGED.

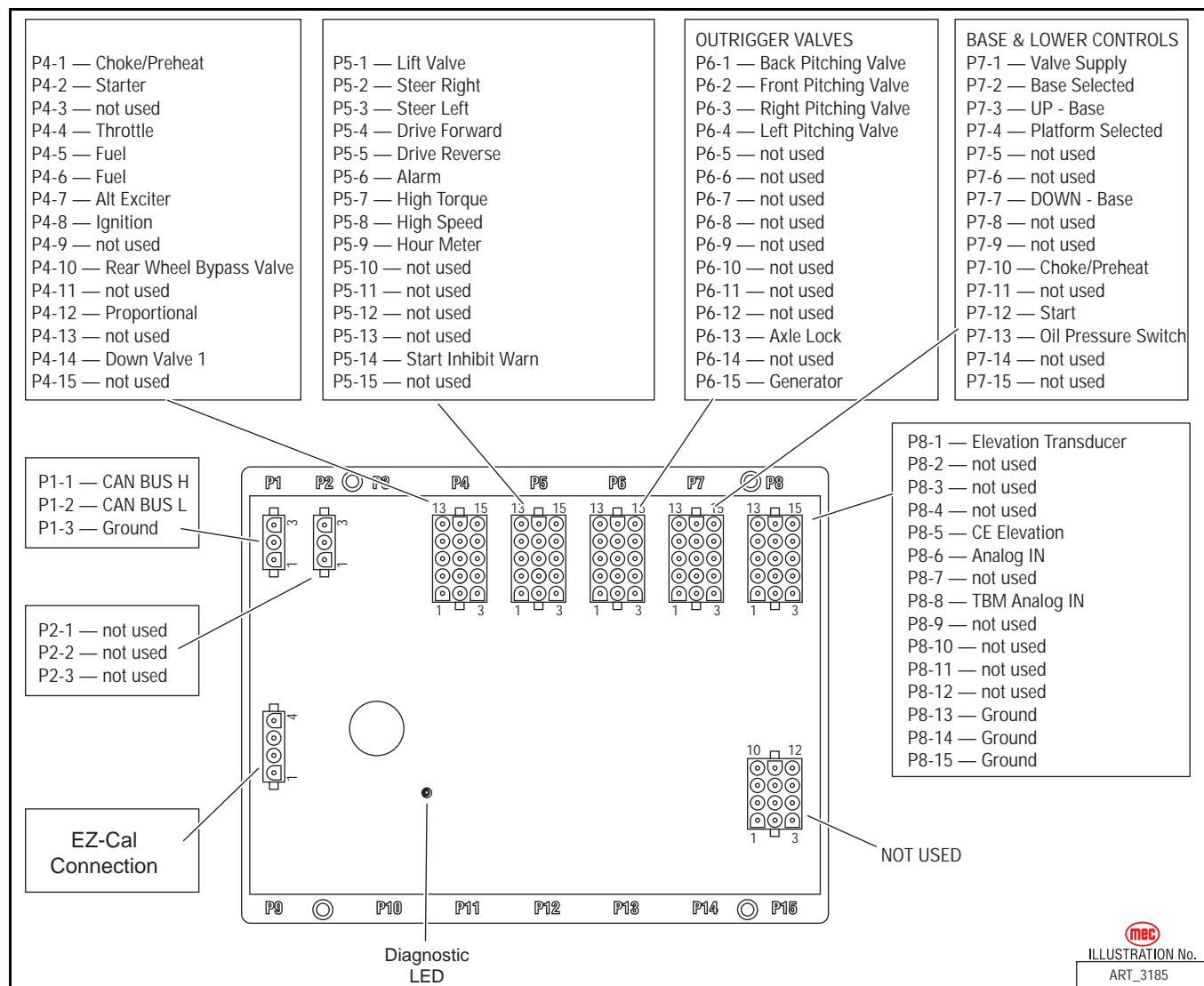
GP400 MODULE

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 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

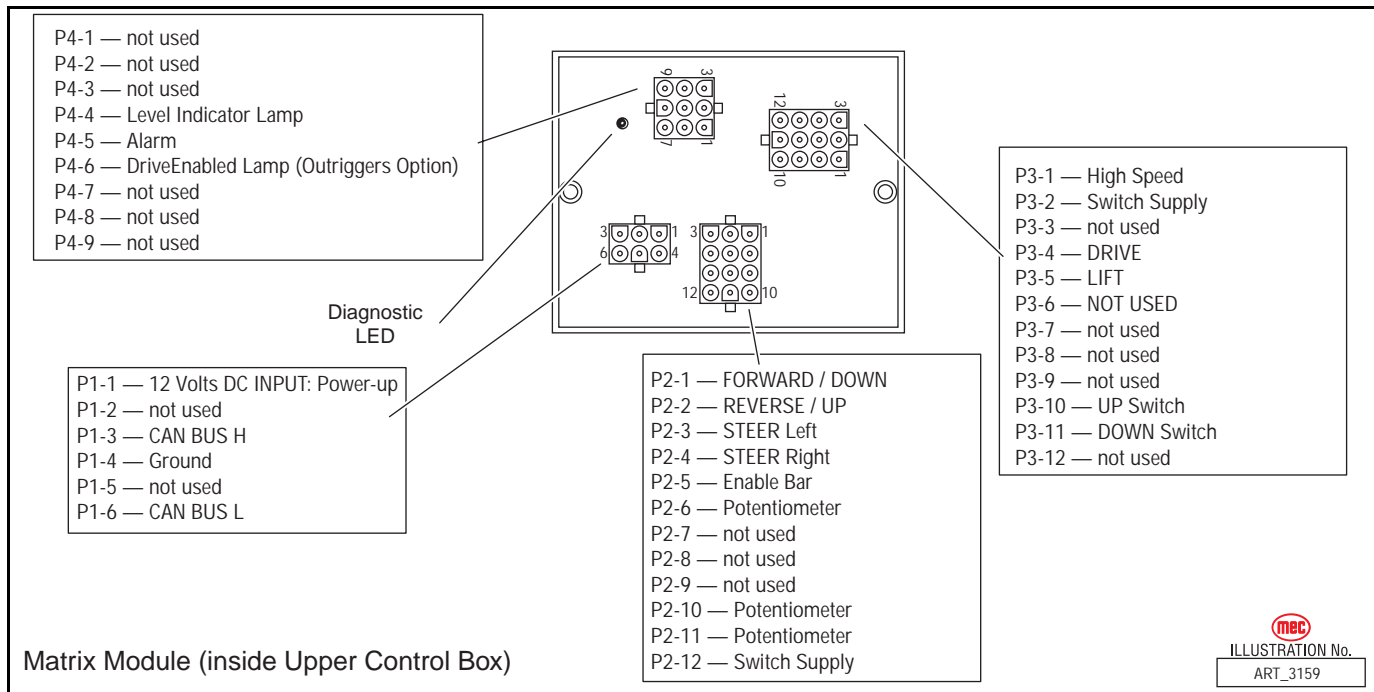
Figure 4a-1: GP400 Module



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.

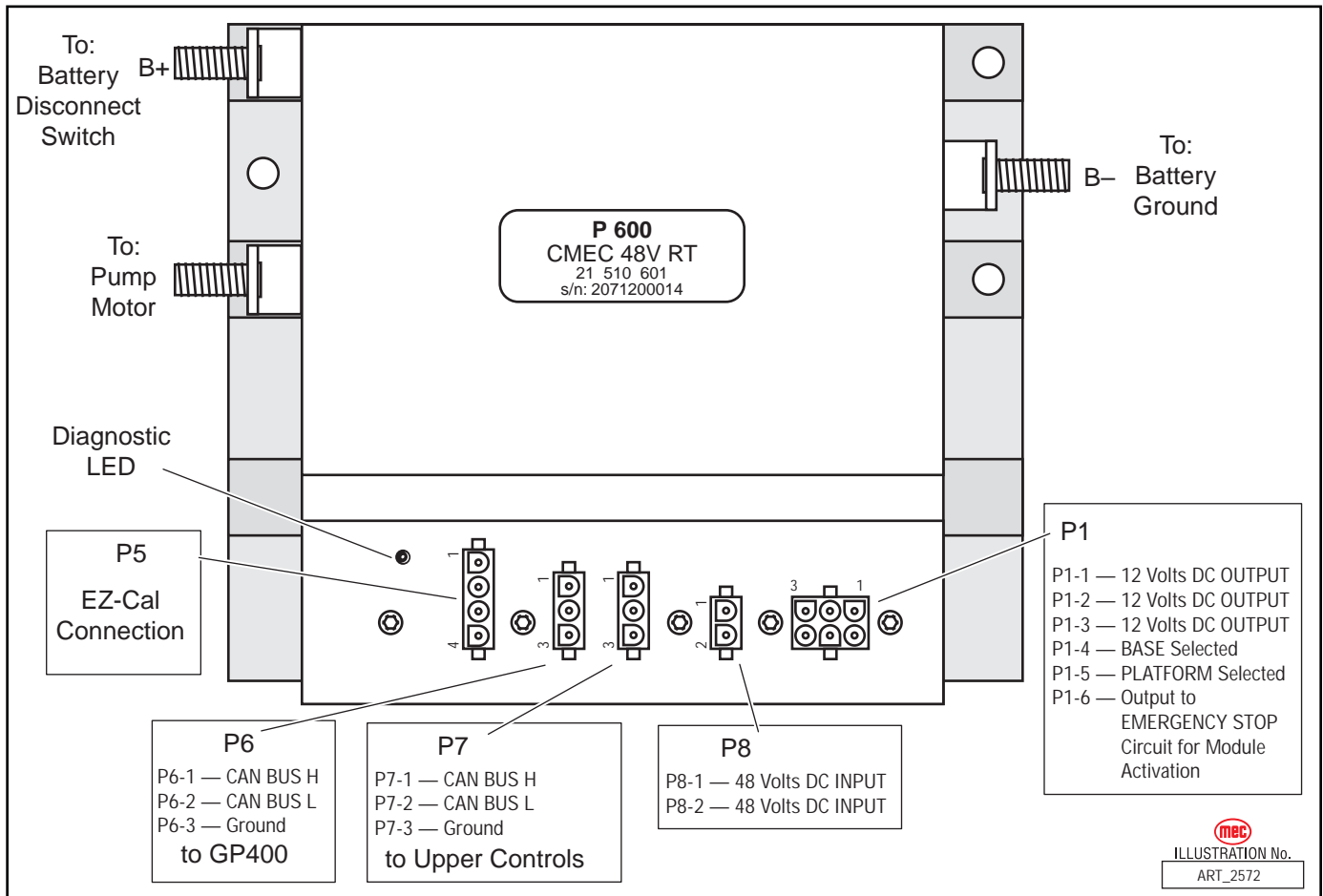
Figure 4a-2: Matrix Module



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 battery voltage (48 volts DC) to 12 volts DC for use throughout the rest of the control system.

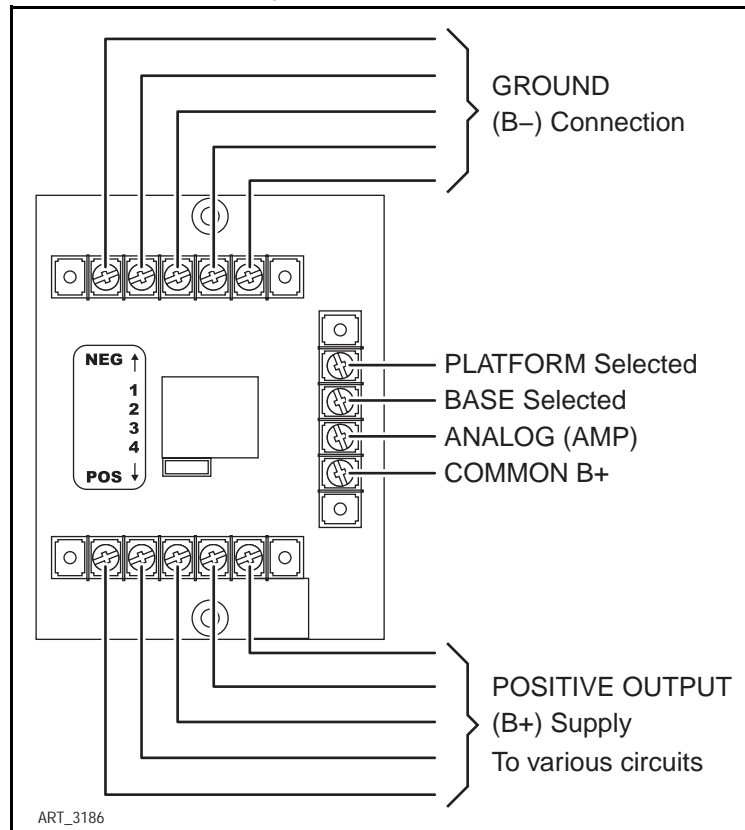
Figure 4b-3: P600 Motor Control Module



TERMINAL BLOCK MODULE (TBM)

There is a module inside the lower control box, called a TBM (Terminal Block Module) 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 ample power to the B+ (positive) terminal strip. This arrangement protects the system against voltage drop conditions that can be detrimental to the electrical system.

Figure 4a-4: Terminal Block Module (TBM)



EZ-CAL SCAN TOOL

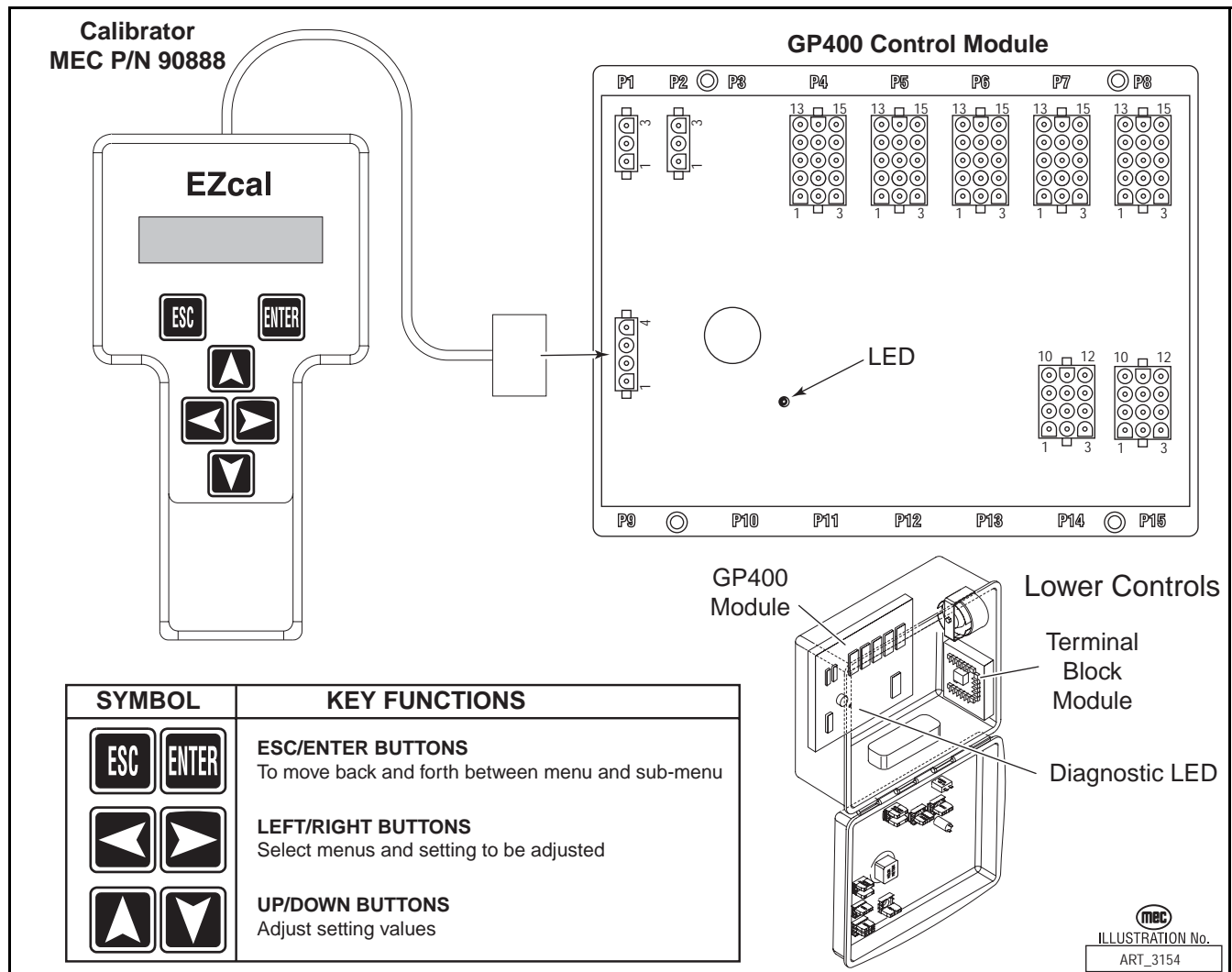
The EZ-Cal (MEC part # 90888; not part of the machine) is a hand-held scan tool that interfaces with the system to provide various information and adjustments. The EZ-cal receives its power from the GP400 when connected. The system must be powered up by closing the Battery disconnect switch and pulling both emergency stop switches. You must also select Base or Platform depending on the station you will operate from.

USING THE EZ-CAL SCAN TOOL

To operate the EZ-cal, plug the cable into the 4-terminal receptacle P9 on the GP400 and power the system 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, press Enter again.
- The up/down arrows are used to change settings only.
- Press ESC to back up one level.

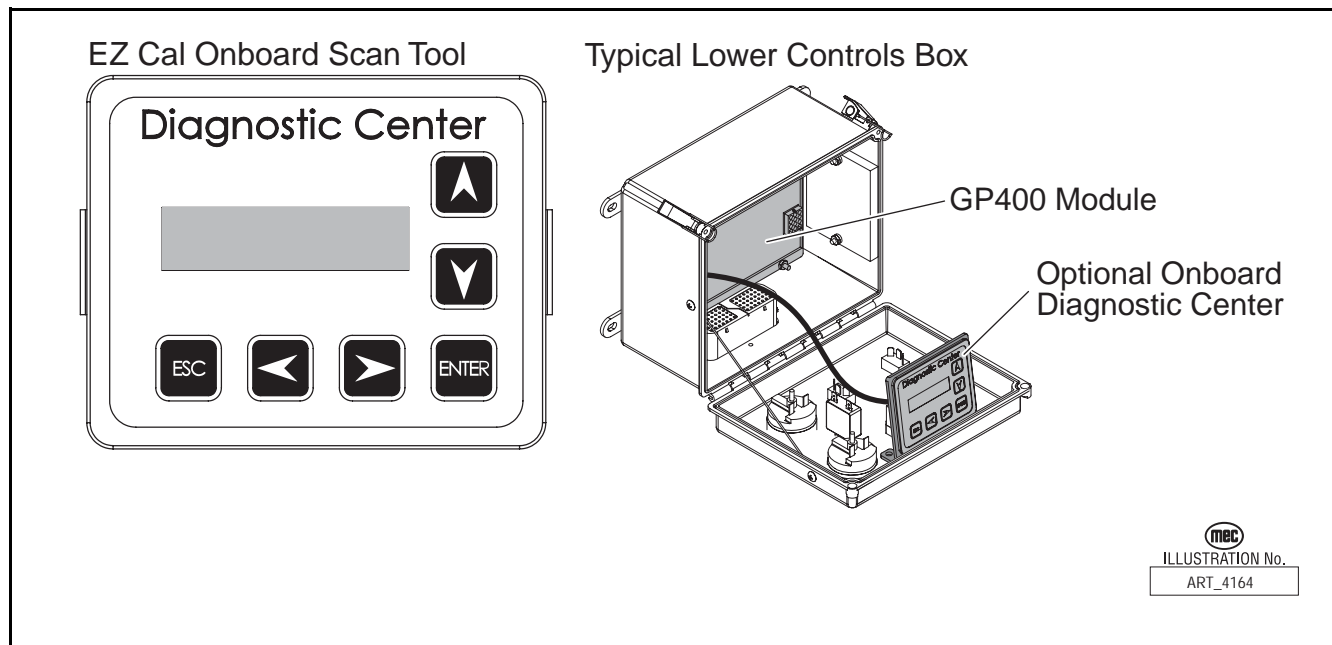
Figure 4a-5: EZ-Cal Scan Tool Connections - GP400 Module



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

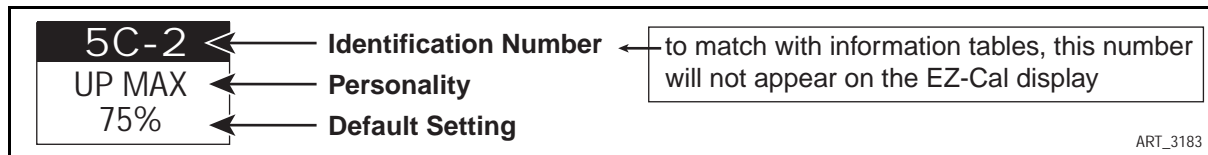
SYMBOL	KEY FUNCTIONS
 	ESC/ENTER BUTTONS To move back and forth between menu and sub-menu
 	LEFT/RIGHT BUTTONS Select menus and setting to be adjusted
 	UP/DOWN BUTTONS Adjust setting values

ART_3710

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 4-18 for flash coded error messages.

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

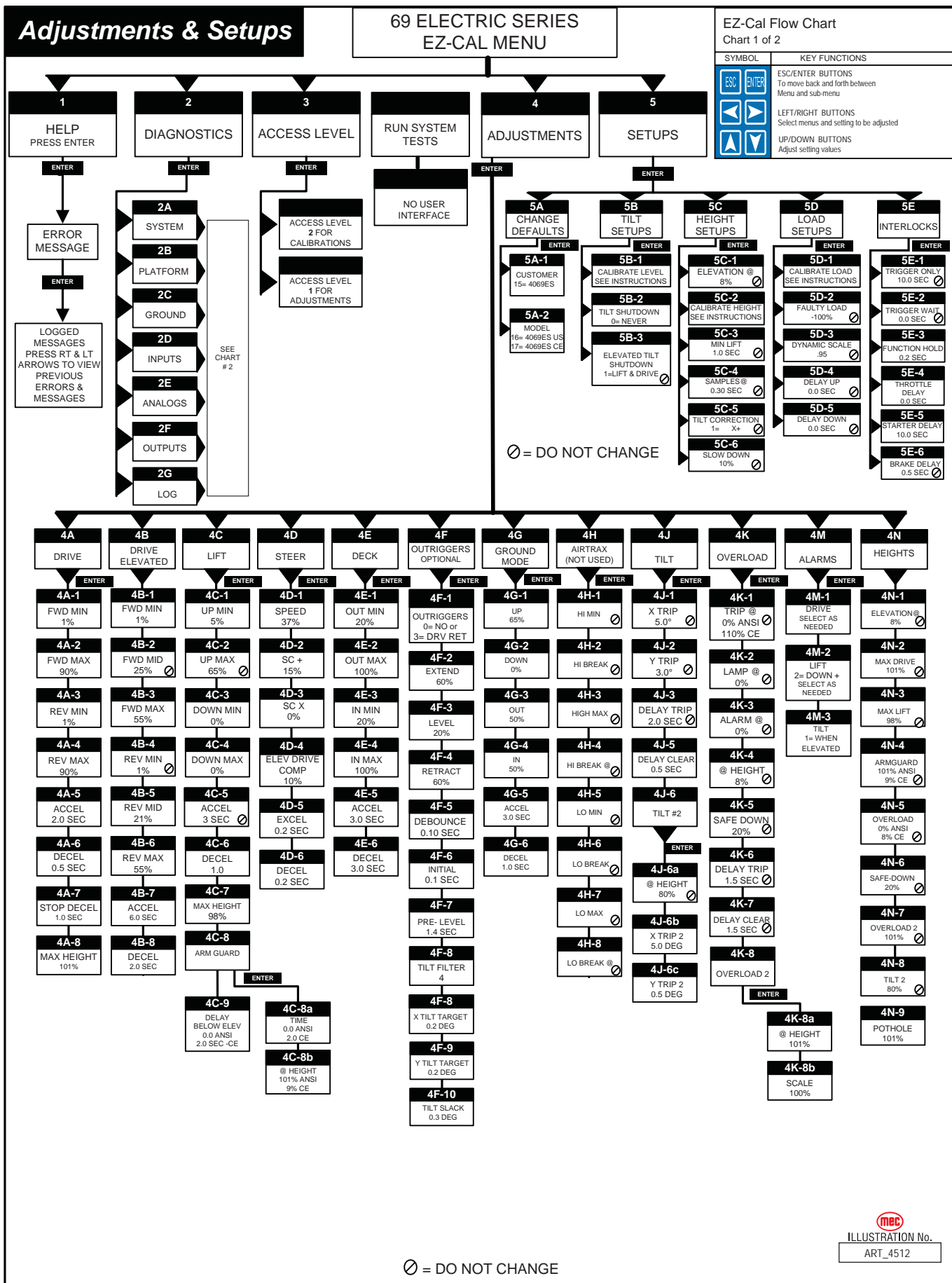
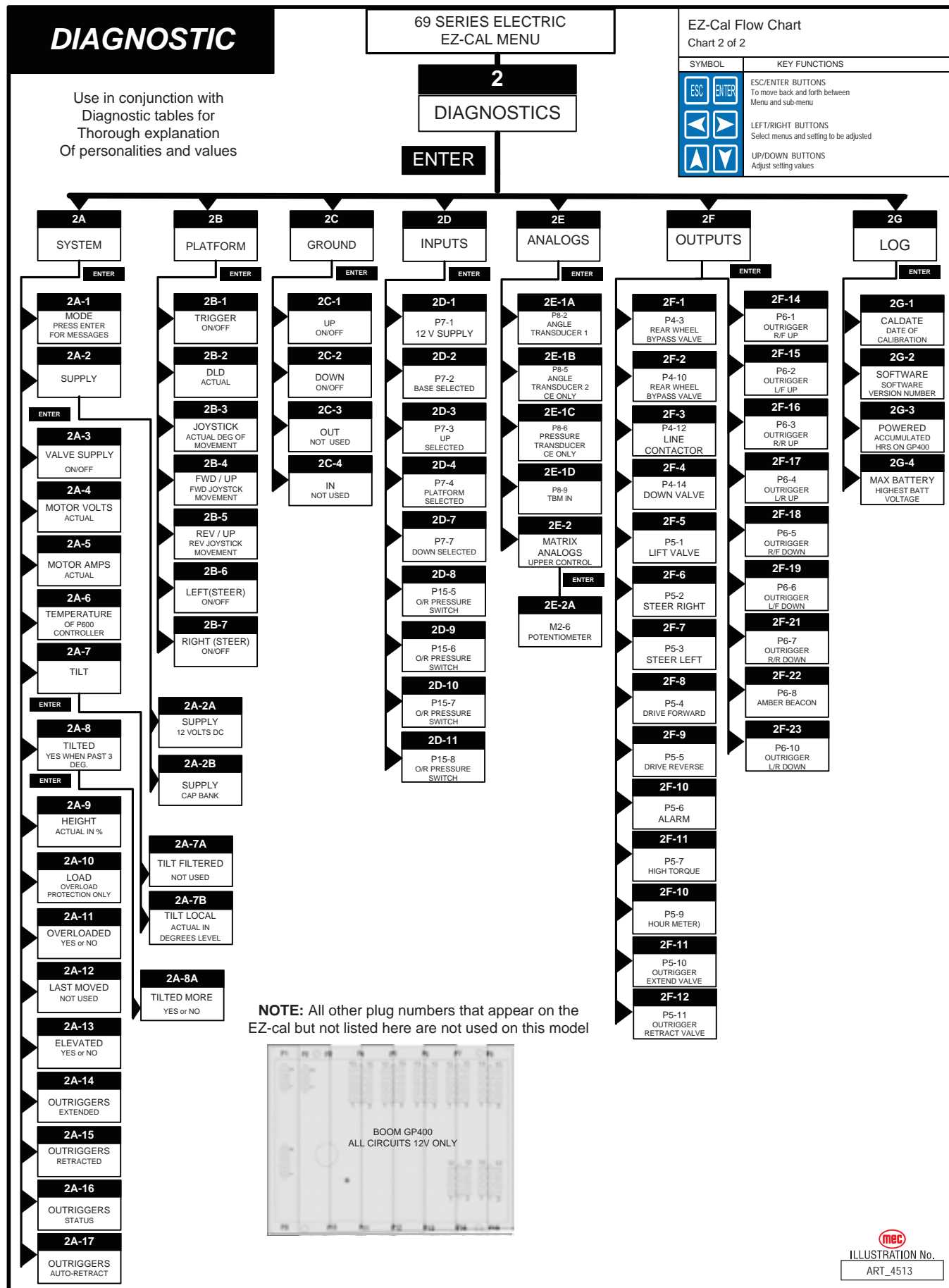


Figure 4-10: EZ-Cal Flow Chart: Diagnostics



EZ-CAL ADJUSTMENTS

Refer to "Using the EZ-Cal Scan Tool" on page 4-10.

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.

EZ-CAL SETUP

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

The Setups Menu is where machine and model settings may be changed. It is also the location where calibrations are performed.

Refer to "Using the EZ-Cal Scan Tool" on page 4-10.

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**.

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.

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

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 OVER-LOAD 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 4-1: Troubleshooting Chart

Problem	Possible Cause	Remedy/Solution
General Power Issue		
No operation from upper or lower control station; no red LED at GP400.	Main battery switch turned off	Located left of lower control box.
	Emergency switch pushed in or ignition switch turned off or defective	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. Battery charger may not operate if battery voltage drops below 20 volts.
	Blown 30 amp fuse	Located just below the battery cutoff switch
	Circuit breaker tripped	Located in lower control box panel
No functions; LED illuminated or flashing on GP400	Blown 300 amp fuse	Located just to the left of lower control station. Check for excessive motor amperage draw. Will receive a 7-7 flash code on GP400.
	Batteries discharged	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge batteries. Battery charger may not operate if battery voltage drops below 20 volts
	Damaged upper control box harness	Inspect from harness plug to terminal strip 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
Functions from lower controls but not from upper controls	Interlock switch (joystick)	Check power to red wire (power to switch) and power to purple wire (power out of switch) at joystick plug
	Loose plug connections on Matrix module	Check plug connections
	Damaged upper control box harness	Inspect from harness plug to terminal strip under platform. May receive 6-6 flash code on GP-400 (CAN bus)
	System interlock	Check HELP messages using EZ-Cal

LIFT/LOWER		
Platform will not raise; electric motor operating.	Excessive weight on platform	Reduce weight to rated platform capacity
	Lift Relief Valve out of adjustment	Adjust relief valve to rated platform capacity
	Lift Valve not energized	Check wiring to lift valve. Check for EZ-Cal message or flash code
	Lowering Valve SV-5 stuck open (located at base of lift cylinder)	Check and remove contamination from valve
	Main system pressure inadequate	Check pump output pressure
Platform will not raise; electric motor NOT operating.	Level sensor out of level (platform elevated above 10')	Reposition machine to firm level surface. Check level sensor function using EZ-Cal See Diagnostic chart 2e1
	Batteries discharged	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge batteries Battery charger may not operate if battery voltage drops below 20 volts
	System interlock	Check HELP messages using EZ-Cal
Platform raises uncommanded when operating other functions	Lift Valve sticking	Clean or replace valve
	Shuttle Valve damaged or contaminated	Clean or replace valve. See hydraulic diagram for location
Platform will not lower or lowers slowly	Maintenance lock in maintenance position	Return maintenance lock to the stowed position
	Lowering valve not energized	Check wiring to lowering valve located on Lift Cylinder. Check for EZ-Cal message or Flash code
	Lowering valve not shifting	Clean debris. Check for damage, replace
	Lowering orifice plugged	Clean orifice located inside hose fitting on lift cylinder
	System interruption	Check HELP messages using EZ-Cal
Platform lowers uncommanded (drift down)	Lowering Valve sticking or contaminated	Deploy Maintenance Lock! Remove and clean or replace lowering valve SV5
	Cylinder internal seal failure	Check, repair seals
Emergency lowering not working	Lowering valve not shifting	Clean debris, check for damage, replace
	Lowering Orifice plugged	Clean orifice, located in Lift cylinder hose port.
	Emergency Down battery discharged	Charge, check charge diode & connections
	Emergency Down supply fuse blown	Replace fuse, check for shorts in wire and coil
	Valve coil failed on cylinder	Test, replace
DRIVE:		
No drive function	Drive Valve not shifting	Check electrical connections at drive valve, check drive valve for contamination.
	Lift/Drive select switch malfunction	Check continuity through switch
	Drive system interlock	Check HELP and MODE messages on EZ-Cal
Drive operates uncommanded when operating other functions	Drive Valve sticking or damaged	Clean, replace valve. See hydraulic diagram.
	Shuttle Valve damaged or contaminated	Clean or replace valve. See hydraulic diagram for location

TROUBLESHOOTING -- TROUBLESHOOTING CHART

No drive elevated	Unit out of level	Lower and re-position the machine.
	Batteries discharged	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge batteries. Battery charger may not operate if battery voltage drops below 20 volts
	System interlock	Check HELP messages using EZ-Cal
Slow drive with platform in stowed position	High torque enabled	Check Speed/Torque Switch at platform controls
	Elevation sensor out of calibration	Use EZ-Cal to monitor platform state of elevation. See Diagnostic chart I.D. 2a13 for elevated status and 2e1 for platform % of elevation input. Failure of the angle transducer will trigger a fault code.
	Malfunctioning rear wheel bypass valve	Located on rear wheel motors only. Check by replacing valves.
	Wheel motor/s not functioning correctly	Inspect wheel motors for excessive bypass
Poor gradability performance	High or Mid Speed enabled	Check Speed/Torque Switch
	Batteries discharged	Will receive 4-4 or 7-7 flash on GP400, Clean, service and charge batteries. Battery charger may not operate if battery voltage drops below 20 volts
	Wheel motor/s not functioning correctly	Inspect wheel motors for excessive bypass
	Malfunctioning Rear wheel bypass valve	Located on rear wheel motors only. Check electrical by disconnecting valves or function by replacing valves
	Malfunctioning Series/Parallel Valves	Located on top of main hydraulic Manifold
	Worn hydraulic pump	Check with flow meter or replace pump
Drive in one direction only	Drive Valve not energizing in one direction	Check 12 volts to appropriate coil, check coil, check valve function
	Counterbalance Valve malfunction	Swap counterbalance valves to see if functioning direction changes.
	No output from GP400	Scan using EZ-Cal and troubleshooting charts. EZ-cal chart I.D 4f-7 - Fwd or 2f-9 - Reverse
No Low Speed (high torque mode)	Speed/torque selector switch inoperative	Check continuity of Speed/Torque switch in platform control box
	Valve SV3 not functioning	Check for 12 volts and ground to valve check for faulty valve spool
	Poppet valve not functioning	Check or replace valve
No Mid Speed	Valve powered and/or shifted	These valves should not have 12 volts, in mid-speed, check valve function
	Speed/torque selector switch malfunction	Check continuity through switch
No High Speed	Speed/torque selector switch inoperative	Check continuity of Speed/Torque switch in platform control box
	Valve not functioning	Check voltage and ground to valve check for faulty valve spool
	EP2 poppet valve not functioning	Check or replace valve
No brake effectiveness	Brake Orifice obstructed	Remove, clean orifice. See hydraulic diagram for location in manifold.
	Brake discs worn past service limit	Replace brake discs located inside rear wheel motors.

LIFT AND DRIVE		
No drive or lift operation motor operates	Main Relief Valve out of adjustment	For test purposes, swap relief valves.
	Pump or pump coupler failure	Inspect, replace as necessary
	Diverter Valve malfunction	Inspect, replace as necessary
	Hydraulic tank empty	Check, fill with approved oil
No drive or lift operation motor does not operate	Motor malfunction	Inspect, replace as necessary
	System interlock	Check HELP messages using EZ-Cal
	Battery discharged	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge batteries. Battery charger may not operate if battery voltage drops below 20 volts.
STEER		
No steer in either direction	Joystick rocker switch inoperative	Check rocker switch output on green and yellow wires, input on blue wire.
	Steering Valve inoperative	Check steering valve for power or damage.
	System interlock	Check HELP messages using EZ-Cal
	Hoses connected incorrectly	See hydraulic section for correct connection.
	Steer Relief Valve set too low	Adjust steer relief valve
Steers in one direction only	Steering Valve inoperative or stuck	Inspect; replace steering valve
	No power to steering coil	Check for power and ground in both directions, repair wiring
	System interlock	Check HELP messages using EZ-Cal
Steers but not fully or steers slowly	One or both steering cylinder internal seal failure	Check steering cylinder seals, replace
	Steer Relief Valve set too low	Adjust steer relief valve
	King pin/s seizing in the bore	Disassemble and inspect, repair, replace bushings
Wheels do not stay in position while driving	One or both steering cylinder internal seal failure	Check steering cylinder seals, replace
Steers uncommanded	Steering Valve sticking or damaged	Remove and inspect for visible debris and stem straightness, clean with solvent and air
	Check Valve damaged or contaminated with debris	Remove and clean or replace check valves see hydraulic diagram for manifold location
No auto-level operation; manual level operates	Switch or switch wiring problem. Located inside upper control box	Check switch and wiring
	Level Sensor not calibrated	See Tilt Sensor Calibration instructions found earlier in this section.
	System Interlock	Check HELP messages using EZ-Cal

Unit will not accurately level platform	Unit on too extreme an angle	Relocate unit to more level ground
	Level valve sticking	Inspect/replace valves located behind lower control box
	Excessive weight on platform	Reduce weight to 1500 lbs max (680Kg)
	Pressure relief valve out of adjustment	Set steering relief valve SV-2 to 2000 PSI (138 bar)
	Tilt sensor not calibrated or not calibrated properly	See Tilt Sensor Calibration instructions found earlier in this section.
	Level cylinder valves wired incorrectly	Refer to schematic diagram for correct wiring.
	Level cylinder hoses connected incorrectly	See Hydraulic section for hose routing detail
Will not stay level; drifts down	Counterbalance valve adjustment or failure	Located on the outrigger cylinder, not adjustable. If valve is suspect it must be replaced
	Failure of cylinder internal seals	Inspect and repair as necessary



Section 5

SCHEMATICS

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HYDRAULIC SCHEMATICS TABLE

Callout	Description
CBV1, CBV2	Counterbalance Valve, Drive
CV1	Check Valve
CV2	Check Valve
CV4	Check Valve
CYL1	Cylinder, Upper Lift
CYL2	Cylinder, Lower Lift
CYL3-CYL4	Cylinder, Steer
CYL5-8	Cylinder, Outtrigger
EP1	Pilot Operated Valve, Mid Speed
EP2	Pilot Operated Valve, Low Speed
FD1	Flow Divider, Drive Mid & Low
FD2	Flow Divider, Drive Mid & Low
FR1	Flow Regulator Valve, Brake Apply
HLS1	Shuttle Valve, Brake Release
HP1	Hand Pump, Brake Release
MLF	Motor, Left Front
MLR	Motor, Left Rear
MP1	Manual Operated Valve, Brake Release
MRF	Motor, Right Front
MRR	Motor, Right Rear
ORF1	Orifice, Steer Speed .063
ORF3	Orifice, Flow Divider Bypass.025

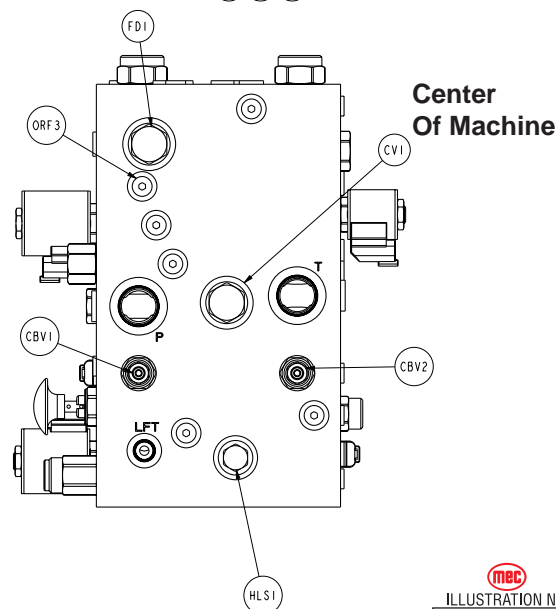
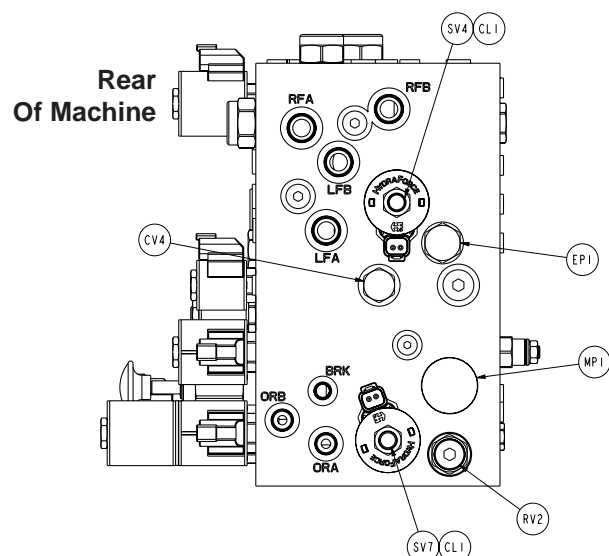
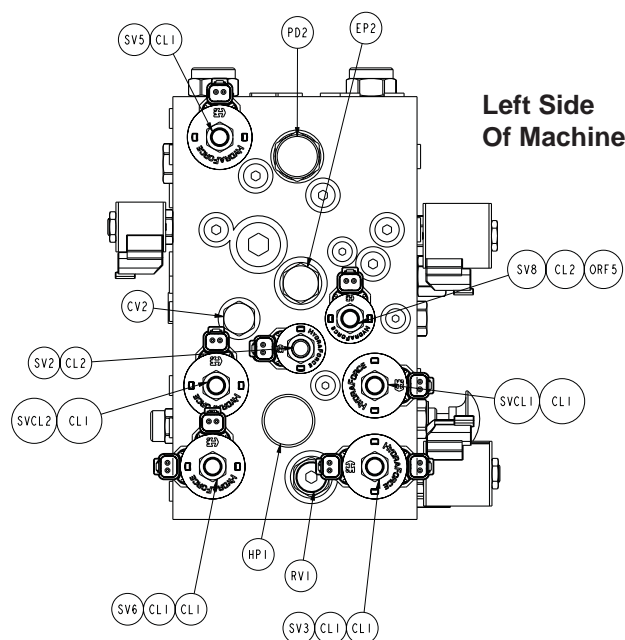
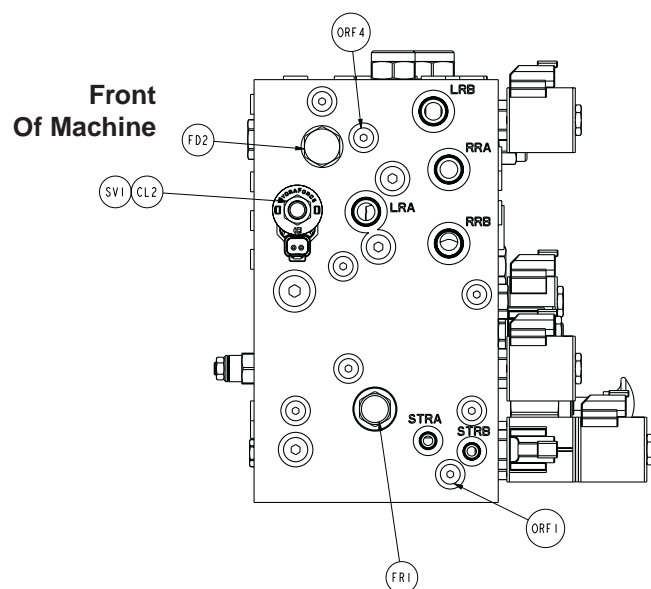
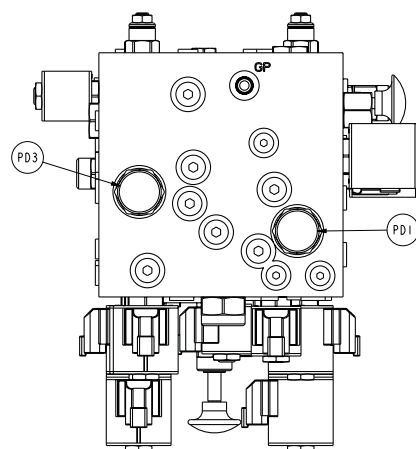
Callout	Description
ORF4	Orifice, Flow Divider Bypass.025
ORF5	Orifice, Bypass Control .060
P1	Pump
PD1	Pilot Operated Valve, High Torque Shift
PD2	Pilot Operated Valve, Mid Range Shift
PD3	Pilot Operated Valve, High Torque Shift
RV1	Relief Valve, Main
RV2	Relief Valve, Lift
SV1	Solenoid Valve, High Speed
SV10-SV17	Solenoid Valve, Outtrigger
SV18	Solenoid Valve, Down Valve, Upper Lift Cyl
SV2	Solenoid Valve, High Torque
SV3	Solenoid Valve, Outtrigger Directional
SV4	Solenoid Valve, Rear Wheel Bypass
SV5	Solenoid Valve, Rear Wheel Bypass
SV6	Solenoid Valve, Steer Directional
SV7	Solenoid Valve, Platform Lift
SV8	Solenoid Valve, Rear Wheel Bypass
SV9	Solenoid Valve, Down Valve, Lower Lift Cyl
SVCL1	Solenoid Valve, Drive Forward
SVCL2	Solenoid Valve, Drive Reverse


ILLUSTRATION No.
ART_4508

Figure 5-2: Functions Manifold

CL2	COIL #10
CL1	COIL #8
CV1	CHECK VALVE - ANTI CAVITATION
CV2	CHECK VALVE - ANTI CAVITATION
CV4	CHECK VALVE - ANTI CAVITATION
HP1	HAND PUMP - BRAKE RELEASE
SV1	SOLENOID VALVE - HIGH SPEED
SV2	SOLENOID VALVE - HIGH TORQUE
SV3	SOLENOID VALVE - OUTRIGGER DIRECTIONAL
SV4	SOLENOID VALVE - REAR WHEEL BYPASS
SV5	SOLENOID VALVE - REAR WHEEL BYPASS
SV6	SOLENOID VALVE - STEER DIRECTIONAL
SV7	SOLENOID VALVE - PLATFORM LIFT
SV8	SOLENOID VALVE - REAR WHEEL BYPASS
FD1	FLOW DIVIDER VALVE - DRIVE MID & LOW
FD2	FLOW DIVIDER VALVE - DRIVE MID & LOW
MP1	MANUAL OP. VALVE - BRAKE EMR. RELEASE

SVCL1	SOLENOID VALVE - DRIVE FORWARD
SVCL2	SOLENOID VALVE - DRIVE REVERSE
EP1	PILOT OP. VALVE - MID SPEED
EP2	PILOT OP. VALVE - LOW SPEED
RV1	RELIEF VALVE - MAIN
RV2	RELIEF VALVE - PLATFORM LIFT
FR1	FLOW REGULATING VALVE - BRAKE APPLY
HLS1	SHUTTLE VALVE - BRAKE RELEASE
ORF1	ORIFICE - STEER SPEED CONTROL
ORF3	ORIFICE - FLOW DIVIDER BYPASS
ORF4	ORIFICE - FLOW DIVIDER BYPASS
ORF5	ORIFICE - BYPASS CONTROL
PD1	PILOT OP. VALVE - HIGH TORQUE SHIFT
PD2	PILOT OP. VALVE - MID RANGE SHIFT
PD3	PILOT OP. VALVE - HIGH TORQUE SHIFT
CBV1	COUNTERBALANCE VALVE - DRIVE
CBV2	COUNTERBALANCE VALVE - DRIVE



Functions Manifold
4069

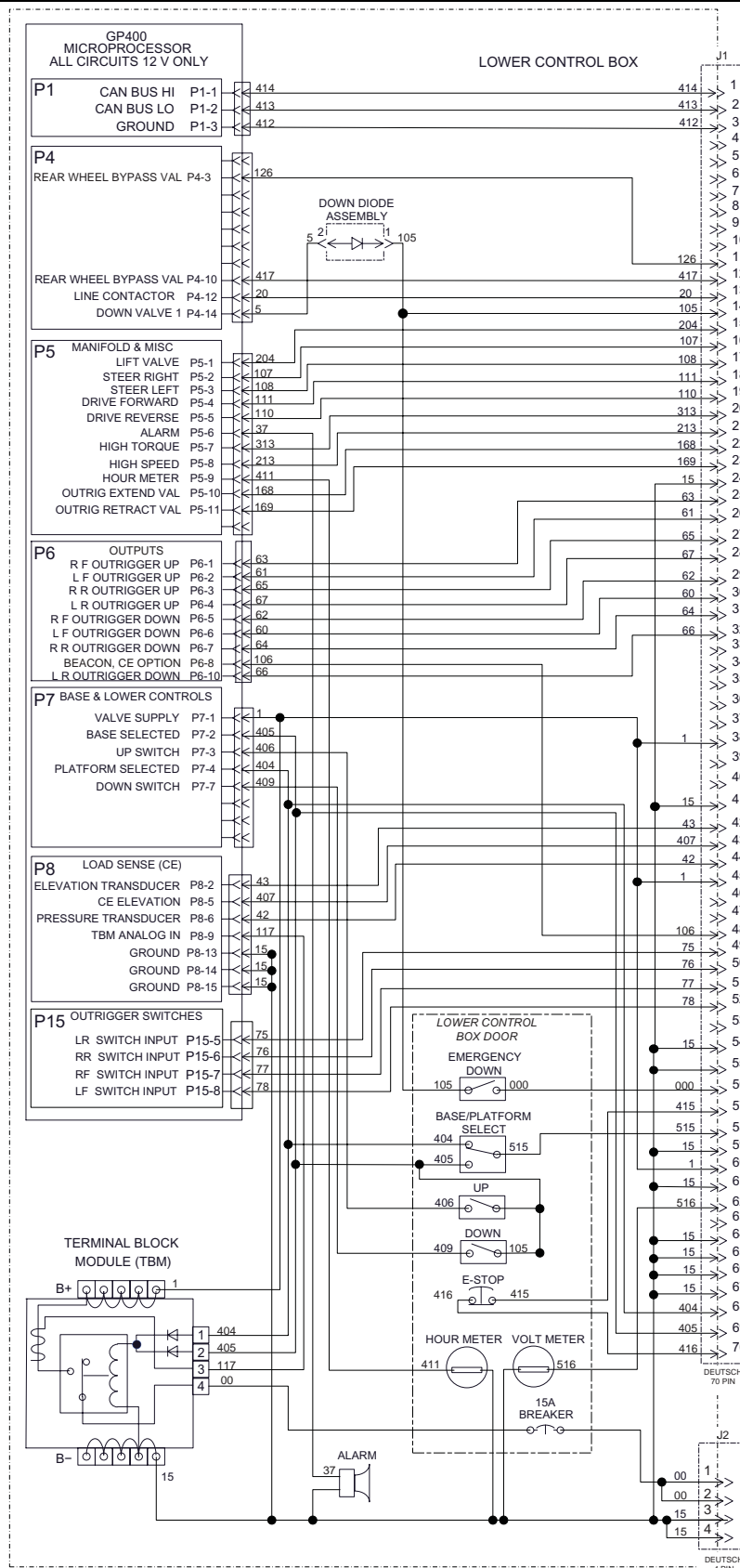
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NOTES:



ELECTRICAL SCHEMATICS

Figure 5-3: Electrical Schematic, 1 of 3



Electrical Schematic, 1 of 3
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ILLUSTRATION No.
ART_4509

Figure 5-4: Electrical Schematic, 2 of 3

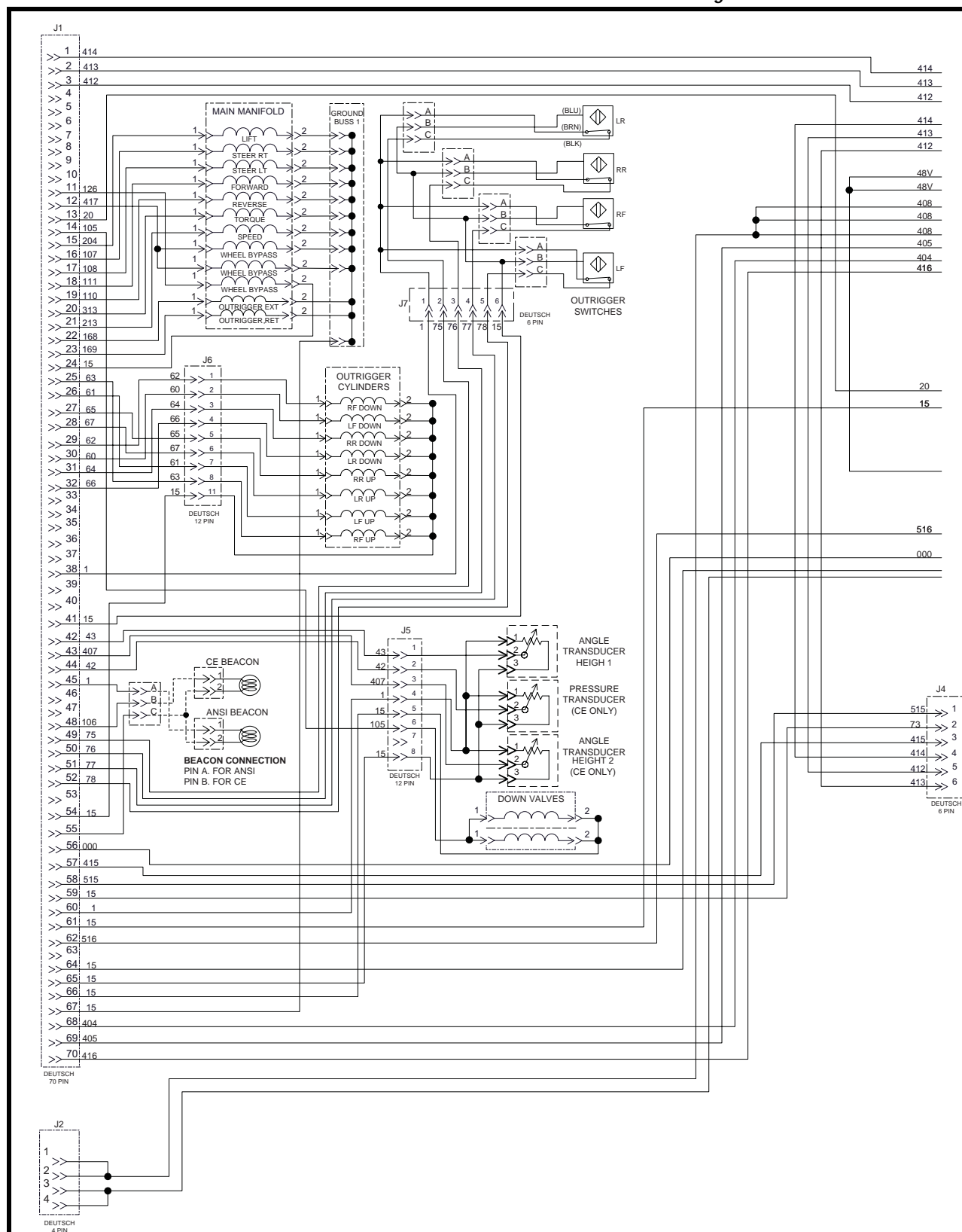
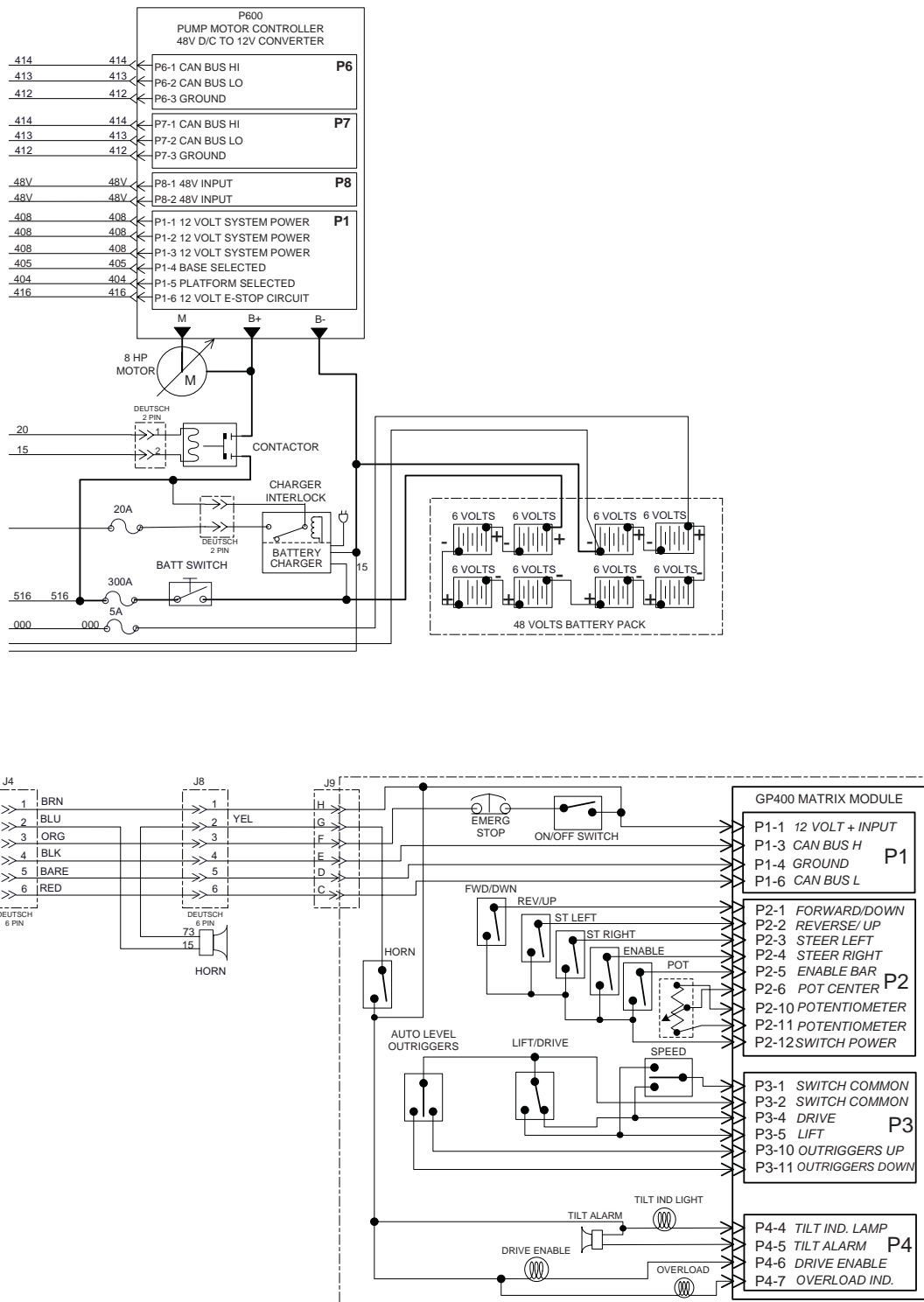
Electrical Schematic, 2 of 3
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ILLUSTRATION No.
ART_4510



Electrical Schematic, 3 of 3
 4069ERT

mec
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 ART_4511

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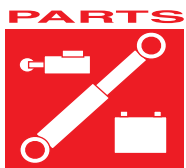
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SECTION A

CONTROLS

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*Std Machine
 -- Amber Lens
 Optional Overload System
 -- Red Lens

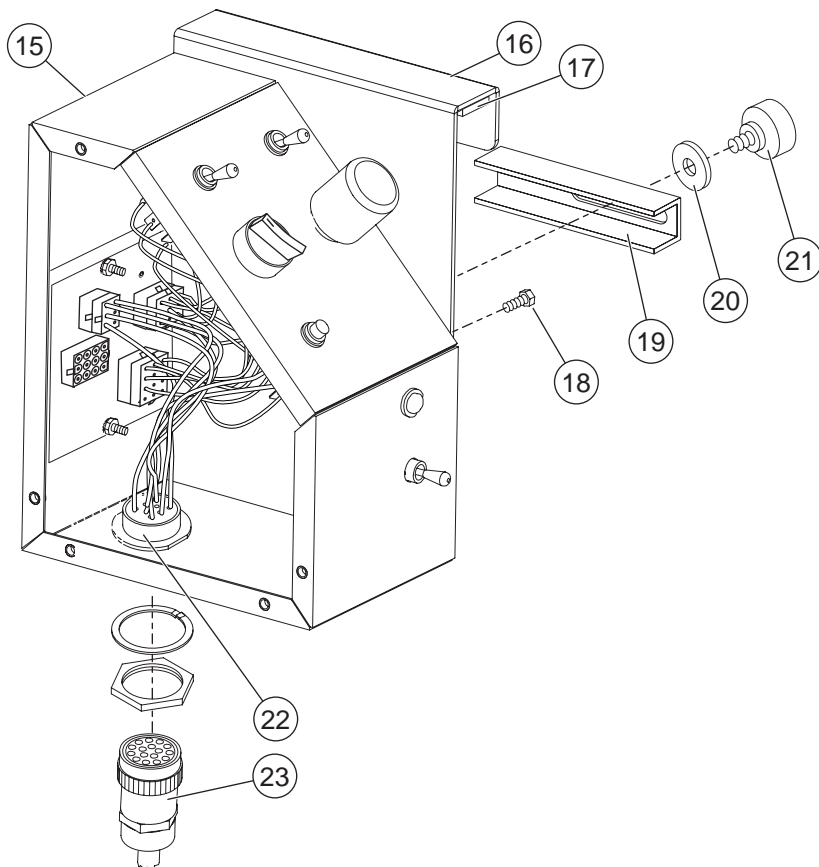
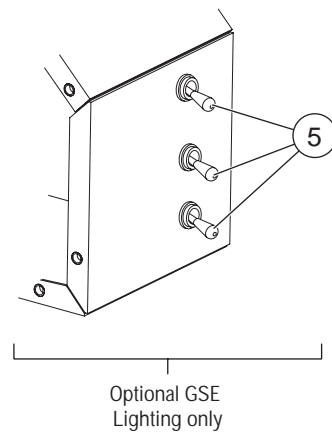
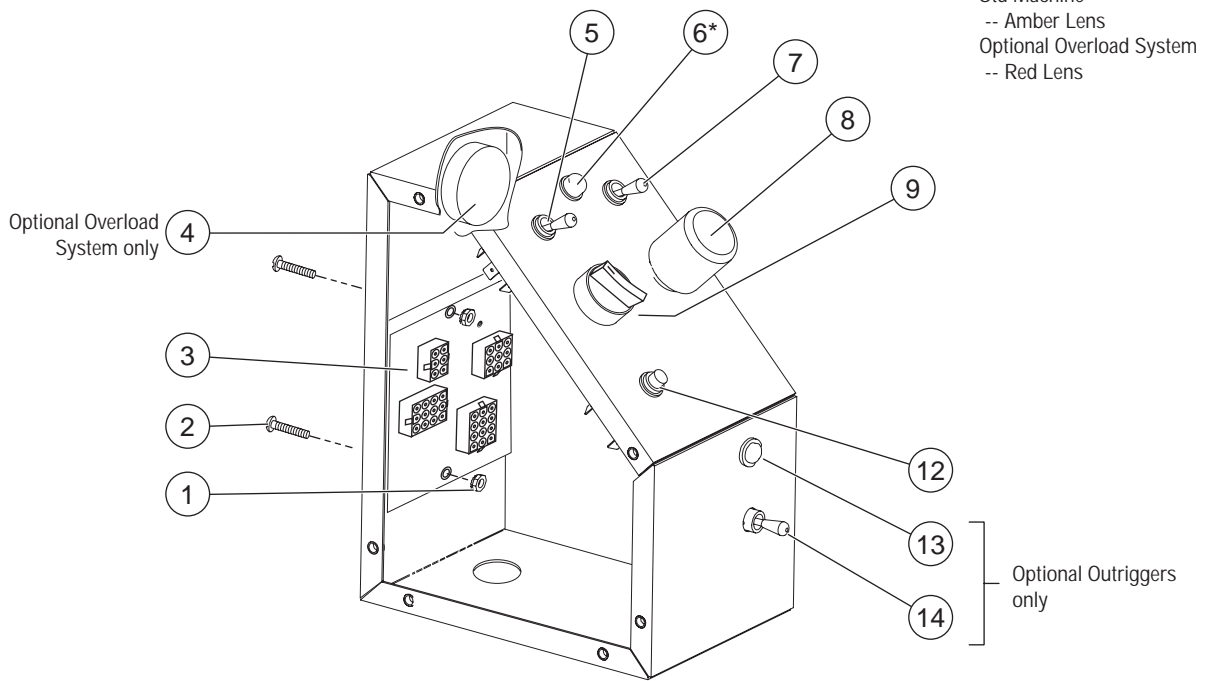


ILLUSTRATION No.
 ART_5001

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Upper Controls

Platform Controls

ITEM	PART NO.	QTY	DESCRIPTION
--	89062	--	Standard Machine -- Upper Control Box Assembly - ERT - No Options
--	89063	--	Standard Machine -- Upper Control Box Assembly - ERT - With Outriggers
--	89064	--	Standard Machine -- Upper Control Box Assembly - ERT - With Horn
--	89065	--	Standard Machine -- Upper Control Box Assembly - ERT - With Outriggers + Horn
--	89081	--	Optional Overload Sensing System -- Upper Control Box Assembly - No Options
--	89082	--	Optional Overload Sensing System -- Upper Control Box Assembly - With Outriggers
--	89084	--	Optional Overload Sensing System -- Upper Control Box Assembly - GSE -
1	HDW90803	2	Nut
2	HDW90879	2	Screw
3	91663	1	Matrix Module
4	7553	1	Optional Overload Sensing System -- Alarm, Overload Warning
5	6234	4	Switch, Toggle, 2-Position
6	9184	1	Std. Machine -- Lens, Amber, Tilt Indicator
	9183	1	Optional Overload Sensing System -- Lens, Red, Overload Indicator
	9188	1	Light, Bayonet, 14 Volt
	9179	1	Socket, Indicator Light
7	6905	1	Switch, Toggle, 3-Position
8	7800	1	Switch, Emergency Stop
9	91926	1	Switch, Power
	90714	1	Switch Base
	8082	1	Contact Block, N.O.
10	--	--	--
11	--	--	--
12	8044	1	Switch, Horn Button (Option)
13	90789	1	LED, Green, Drive Enabled (outrigger-equipped machines)
14	5694	1	Switch, Toggle (outrigger-equipped machines)
15	16242	1	Weldment, Control Box
16	13865	1	Bracket, Control Box Holder
17	6350	0.5 FT	Tape, Foam
18	HDW5724	1	Screw, 5/16-18
19	13864	1	Bracket, Control Box Holder
20	50350	1	Washer, Flat
21	8826	1	Thumb Screw, 5/16-18, Flower
22	REF	1	Harness, Removable (See Wire Harness, Section F)
23	REF	1	Cable, Removable (See Wire Harness, Section F)

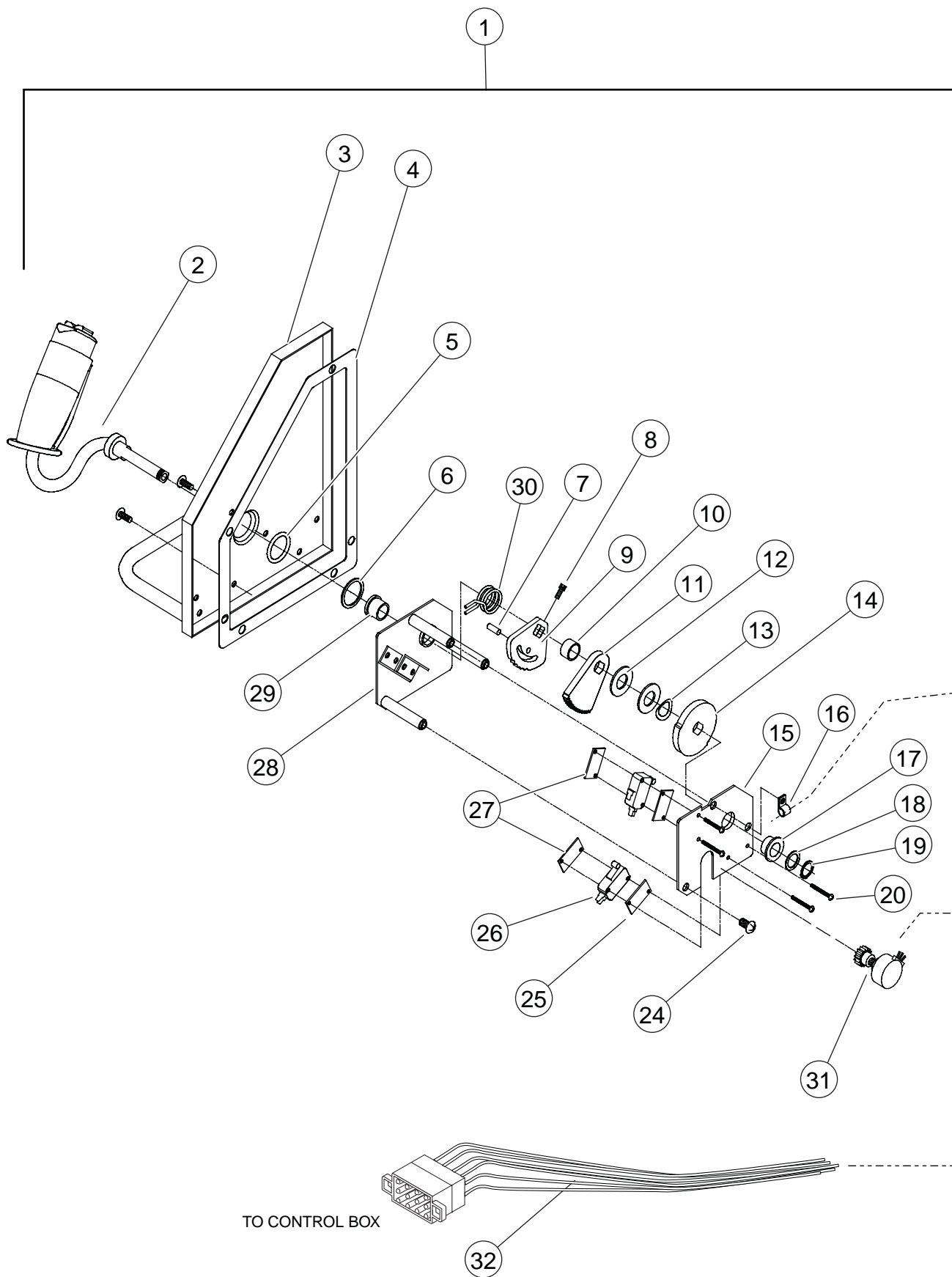


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• REF: Reference only



TO CONTROL BOX

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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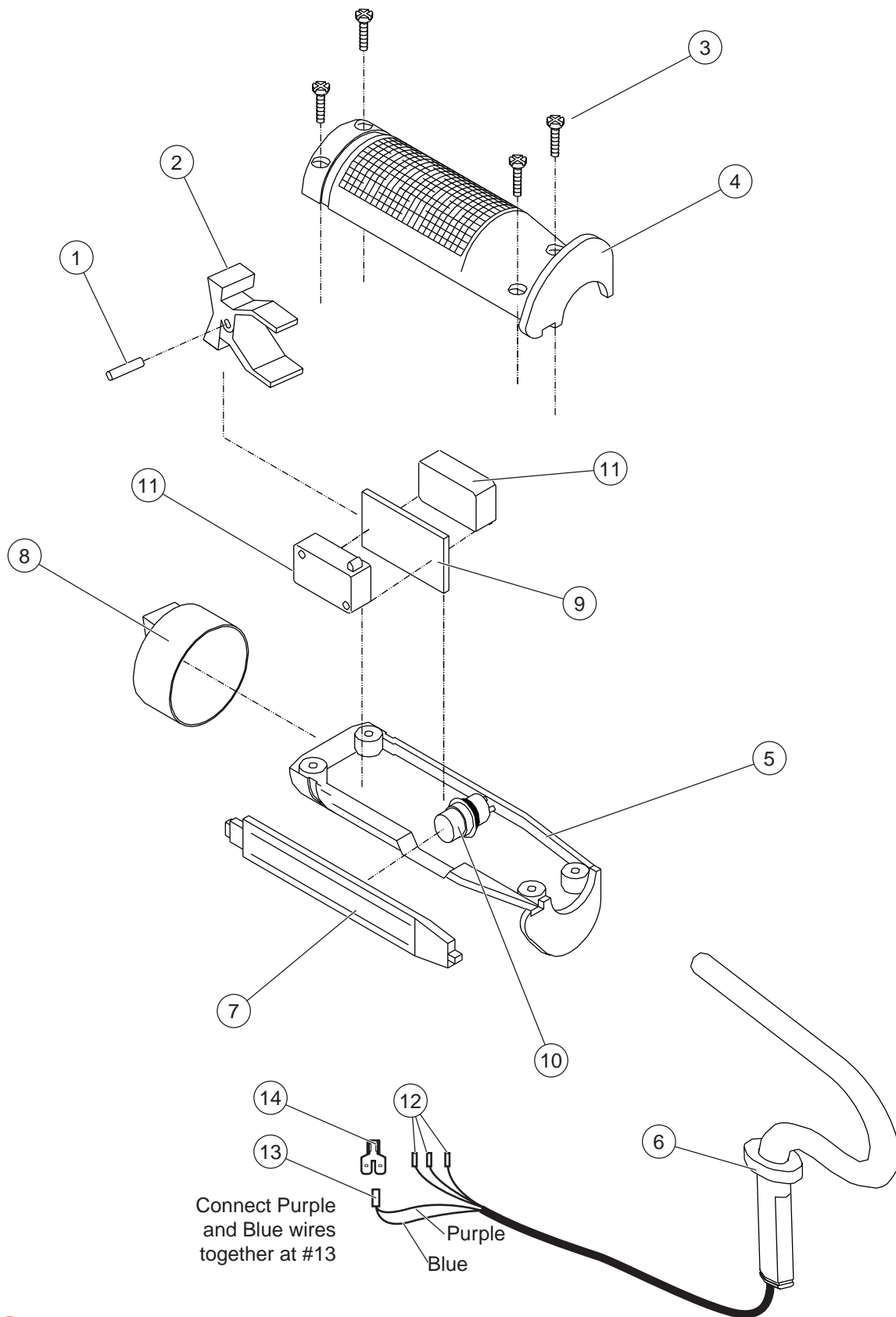


ILLUSTRATION No.
ART_2221 R1

Reference: ART_188

Control Arm (Joystick)



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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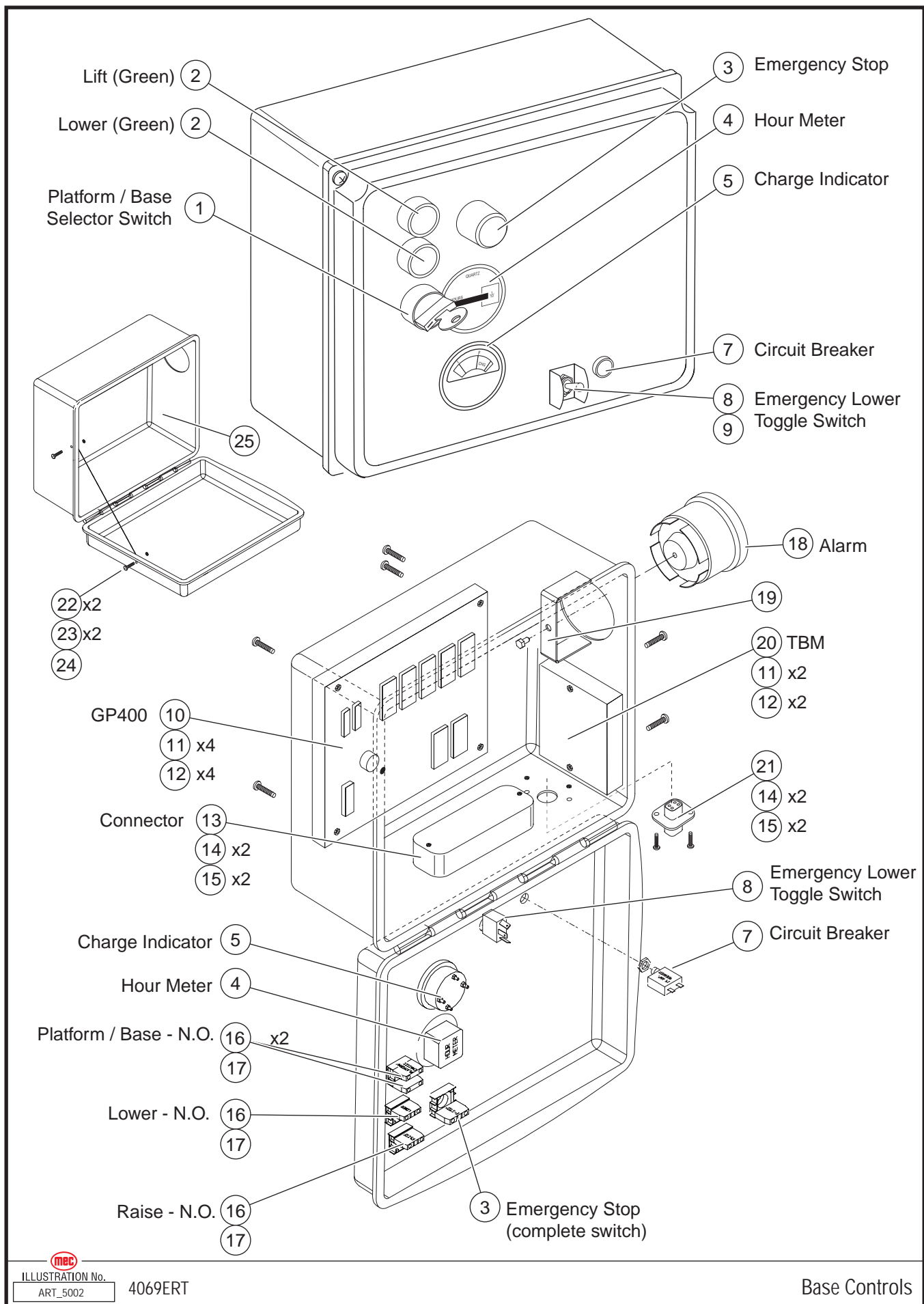


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Base Controls

Base Controls

ITEM	PART NO.	QTY	DESCRIPTION
--	REF	--	Harness -- See Section F
1	9549	1	Switch, 3-Position, Keyed
2	91667	2	Switch, Button, Green
3	7800	1	Switch, Emergency Stop
4	91704	1	Hour Meter
5	91744	1	Battery Charge Indicator
6	--	--	--
7	7235	1	Circuit Breaker
8	7423	1	Switch, Toggle, 1 Pole 2 Position, Emergency Down
9	1313	1	Switch Guard
10	91659	1	System Controller, GP400
11	50229	6	Screw, 10-24 x 1.00
12	50230	6	Nut, 10-24 Nylock
13	91887	1	Deutsch Connector, DRC 12 70P
14	50233	6	Screw, 8-32 x 1.00
15	50231	6	Nut, 8-32 Nylock
16	8082	6	Contact Block, N. O.
17	90714	6	Contact Base
18	91711	1	Alarm, 107dB
19	17082	1	Bracket, Alarm Mount
20	91838	1	Terminal Block Module (TBM)
21	91290	1	Deutsch Connection, DT14-4P-L012
22	92015	1	Control Box
23	91921	1	Lanyard



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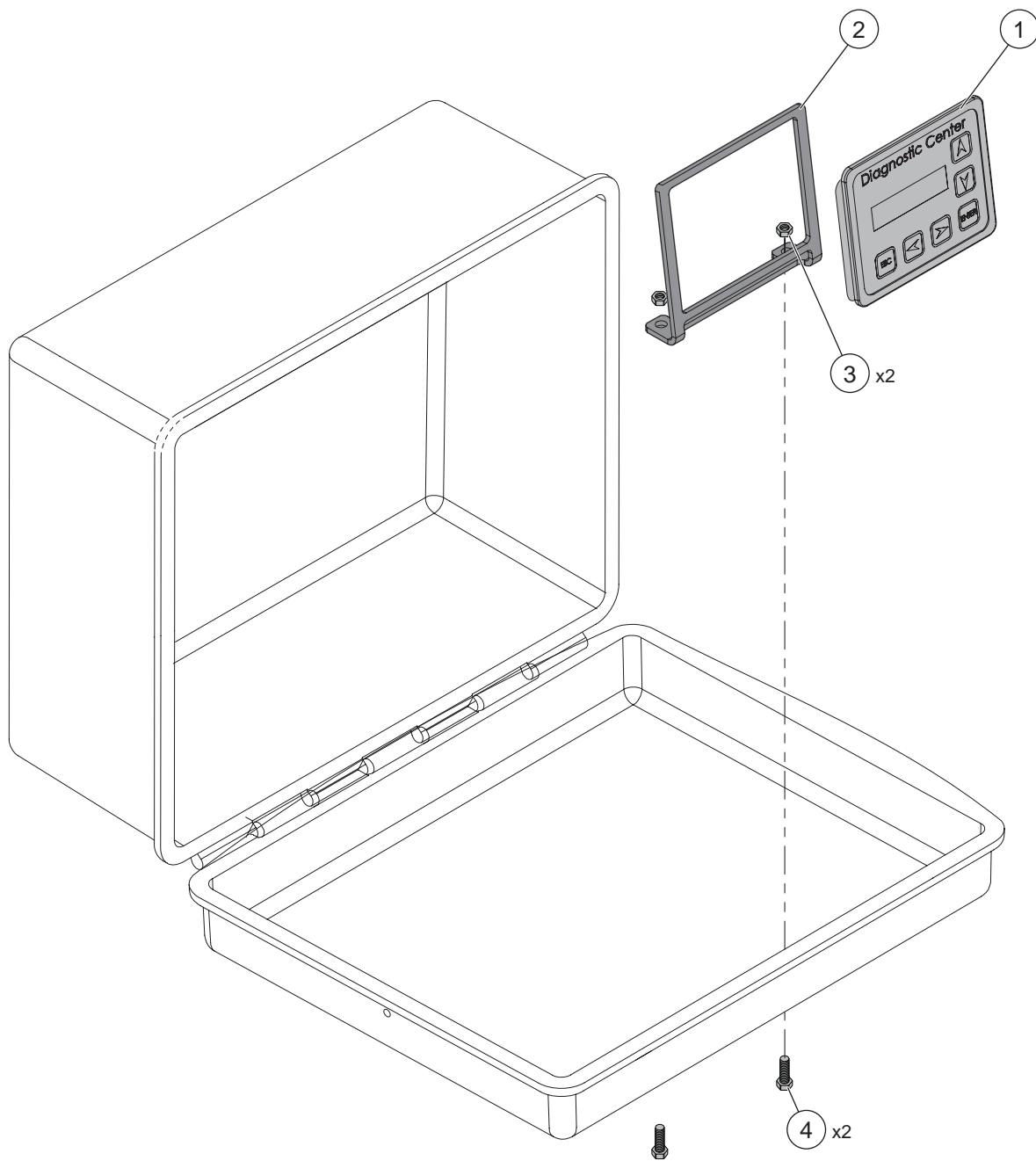


ILLUSTRATION No.
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OPTION -- Onboard Diagnostic Center

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



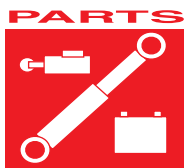
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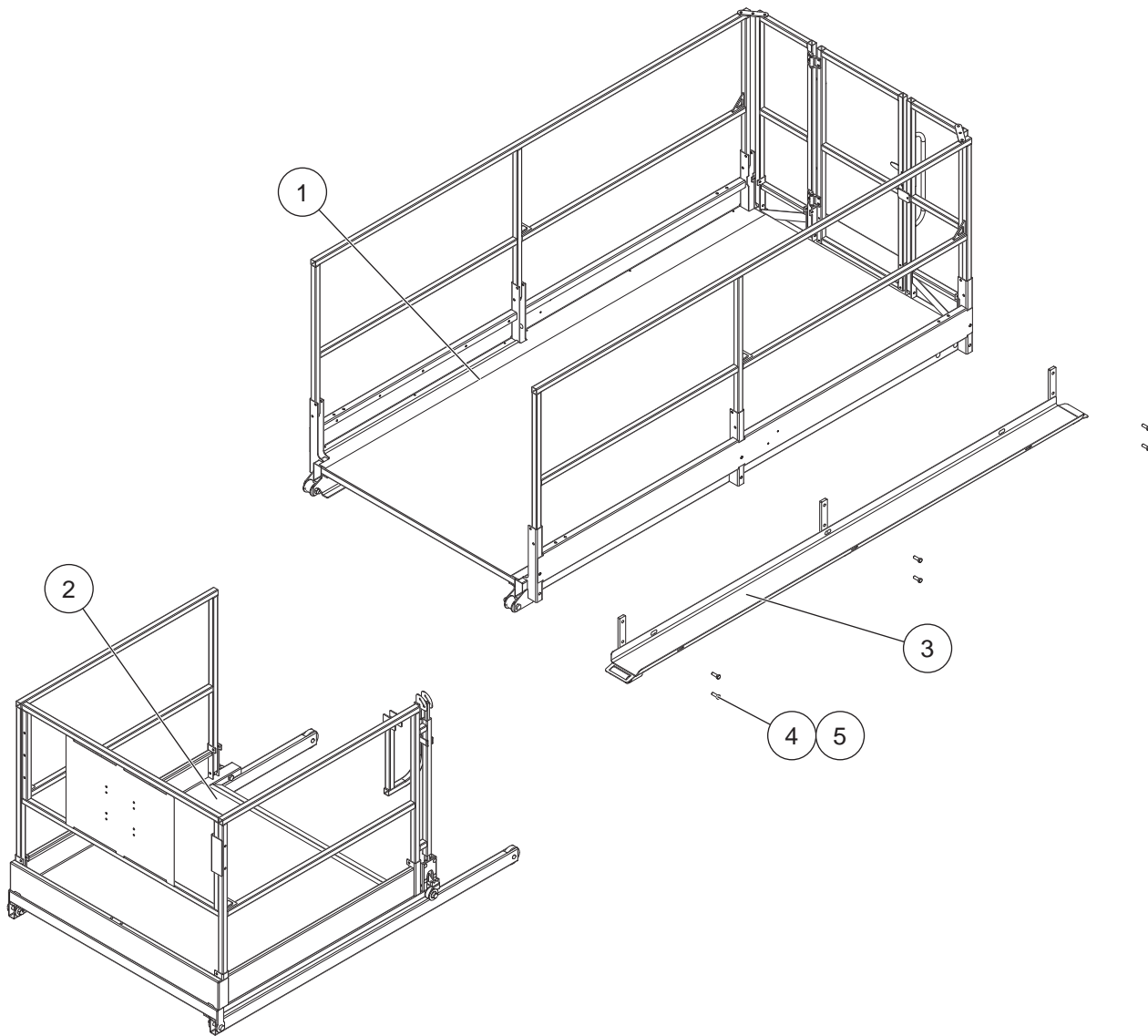


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ART_4459

4069

Platform Assembly

Platform Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	89014	1	Main Platform Assembly
2	89015	1	Deck Extension Assembly
3	89009	1	Sheet Materials Rack
--	26382	1	Roller
--	50361	1	Bolt, Roller, M8 x 140
--	50048	1	Nut, Roller, M8 Nylock
4	50040	6	Bolt, M12 x 35
5	50050	6	Nut, M12 Nylock

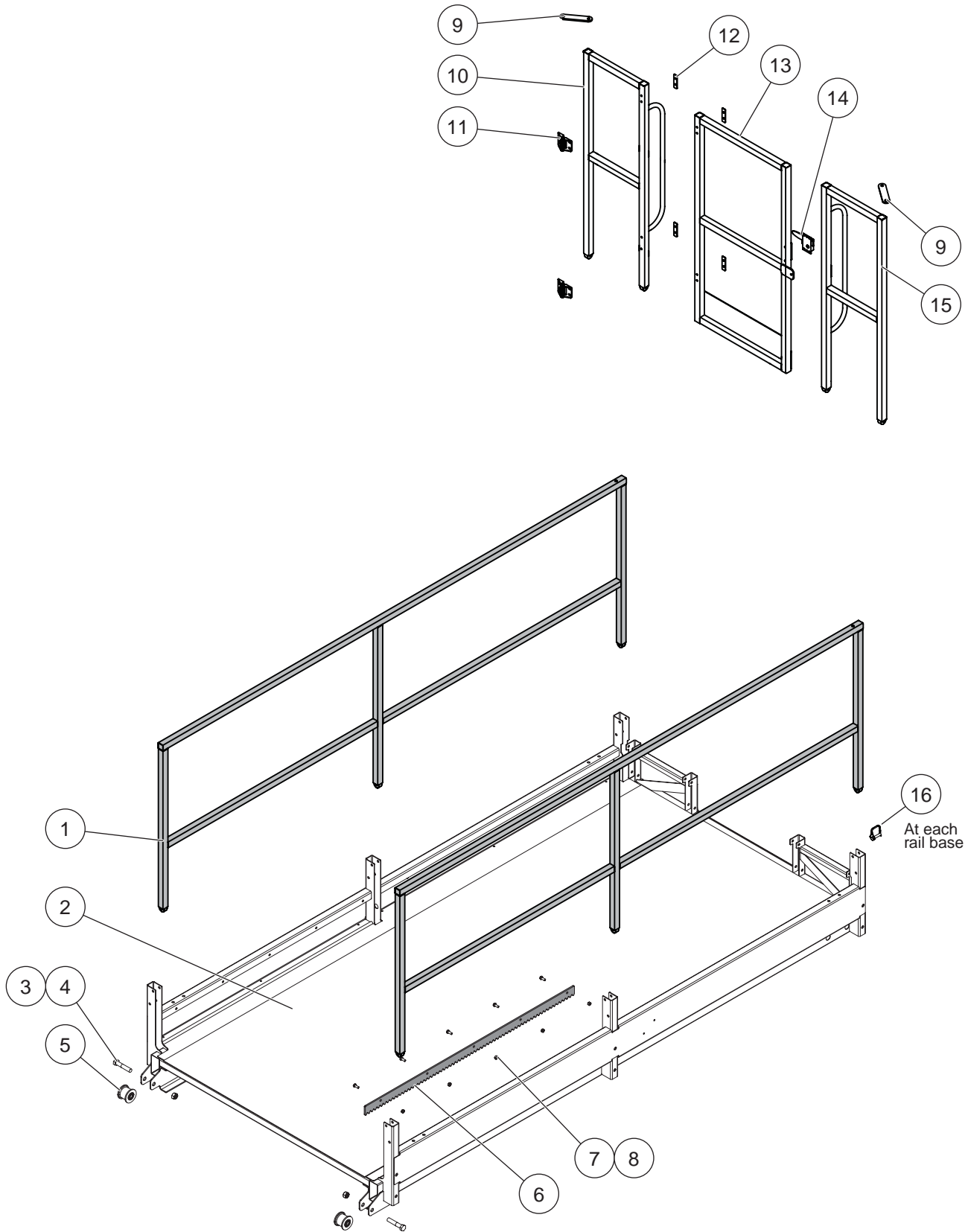


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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Main Platform

ITEM	PART NO.	QTY	DESCRIPTION
1	21386	2	Side Rail
2	21373	1	Main Platform Weldment, without deck plate
--	21389	1	Main Platform Deck Plate
3	50512	2	Bolt, 5/8 x 3.25
4	50398	2	Nut, 5/8 Nylock
5	87125	2	Roller
6	26564	1	Lock Plate
7	50030	5	Bolt, M8 x 20
8	50048	5	Nut, M8 Nylock
9	26566	2	Corner Brace
10	21391	1	Right Side Rear Rail
11	91888	2	Hinge
12	19239	4	Backup Plate
13	26342	1	Personnel Gate, without toe board
--	26347	1	Gate Toe Board
14	92836	1	Gate Latch
15	21390	1	Left Side Rear Rail
16	50182	10	Spring Clip

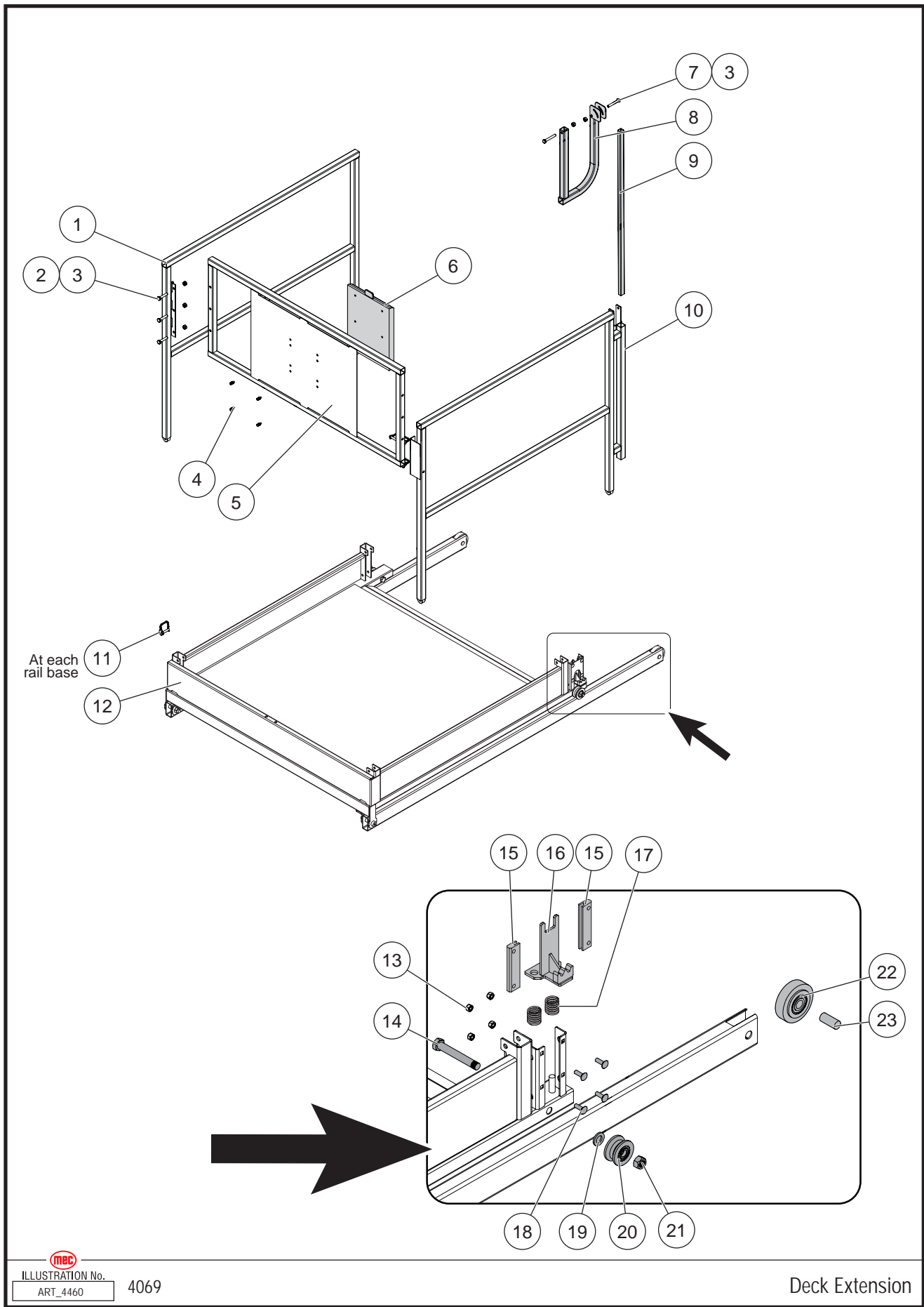


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• NS: Not a Stock item

• REF: Reference only



Deck Extension

ITEM	PART NO.	QTY	DESCRIPTION
1	26348	1	Right Side Rail Weldment
2	50020	3	Bolt, M10 x 50
3	50049	5	Nut, M10 Nylock
4	50028	4	Bolt, M6 x 20
--	50000	4	Washer, M6 std.
--	50047	4	Nut, M6 Nylock
5	21394	1	Front Rail Weldment
6	8909	1	Manual Box
7	50022	2	Bolt, M10 x 70
8	26560	1	Extension Handle
9	26433	1	Extension Release Bar
10	26352	1	Left Side Rail Weldment
11	50182	4	Spring Clip
12	21374	1	Deck Extension Weldment, without deck plate
--	21466	1	Deck Extension Deck Plate
13	50048	4	Nut, M8 Nylock
14	50397	2	Bolt, 5/8 x 4.5
15	26239	2	Deck Release Guide
16	26326	1	Deck Release Weldment
17	92866	2	Spring
18	50418	4	Carriage Bolt, M8 x 25
19	50004	2	Washer M16 Std.
20	87125	2	Roller
21	50398	2	Nut, 5/8 Nylock
22	87124	2	Roller
23	26450	2	Pin



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• NS: Not a Stock item

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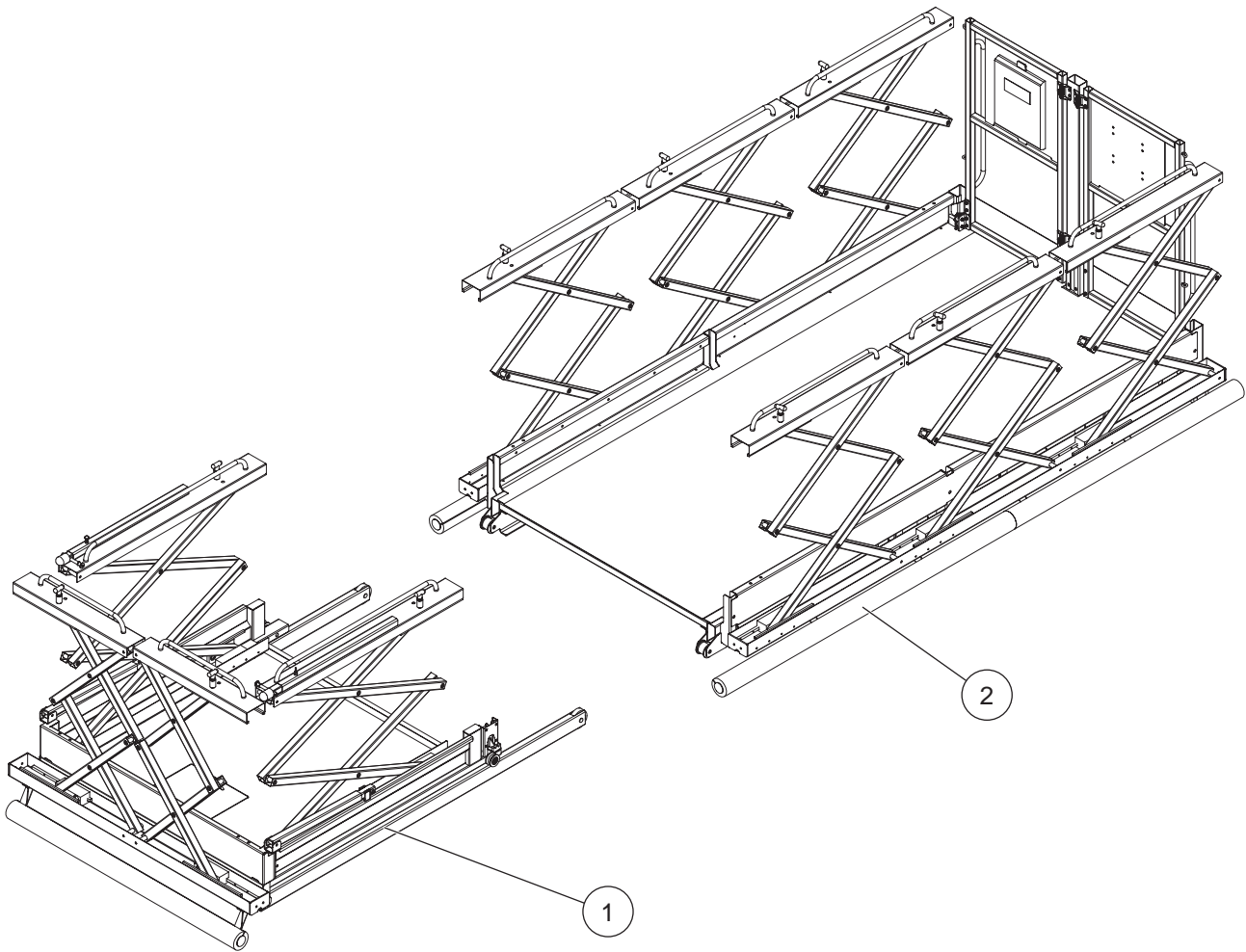


ILLUSTRATION No.
ART_4454

4069

OPTION -- GSE Platform

OPTION -- GSE Platform

ITEM	PART NO.	QTY	DESCRIPTION
--	21618	--	Platform, 4069 GSE Option
1	21617	1	Deck Extension
2	21615	1	Main Platform



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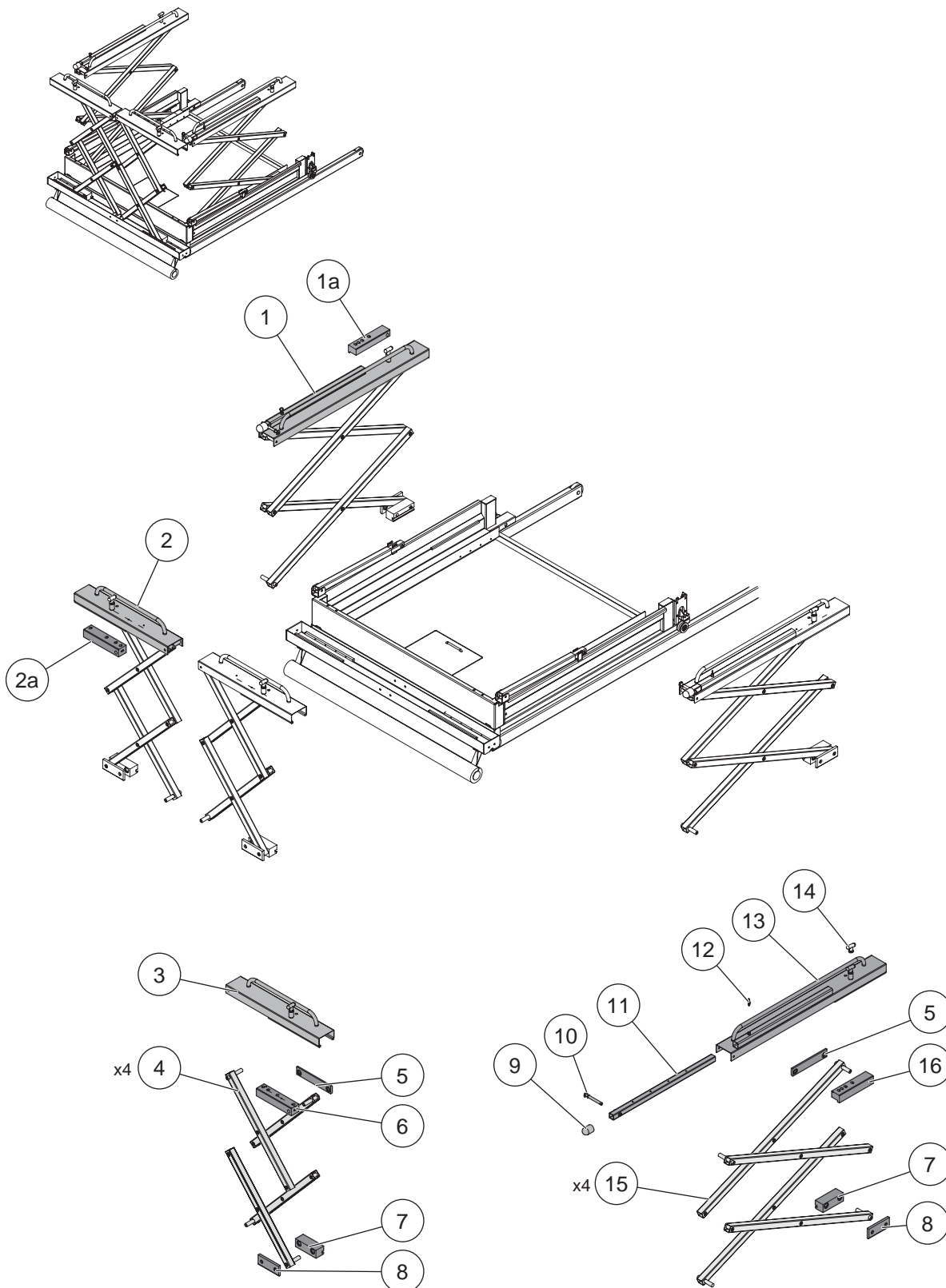


ILLUSTRATION No.
ART_4455

4069

OPTION -- GSE Deck Extension, 1 of 2

OPTION -- GSE Deck Extension, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	21575	1	Right Side Top Tray
1a	21510	1	Wear Pad, Large, Right Side Top
2	21577	1	Right Front Top Tray
2a	21512	1	Wear Pad, Top Front Right
3	21578	1	Left Front Top Tray
4	21521	8	Front Beam
5	21507	2	Front Wear Pad, Small
6	21513	1	Wear Pad, Top Front Left
7	21505	4	Wear Pad, Bottom large
8	21506	4	Wear Pads, Bottom Small
9	93450	2	Rubber Cap
10	93400	2	Pin
11	21609	2	Slide Tube
12	93399	2	Pull Pin
13	21576	1	Left Side Top Tray
14	93359	4	T-Handle
15	21520	8	Side Beam
16	21511	1	Wear Pad, Large, Left Side Top



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

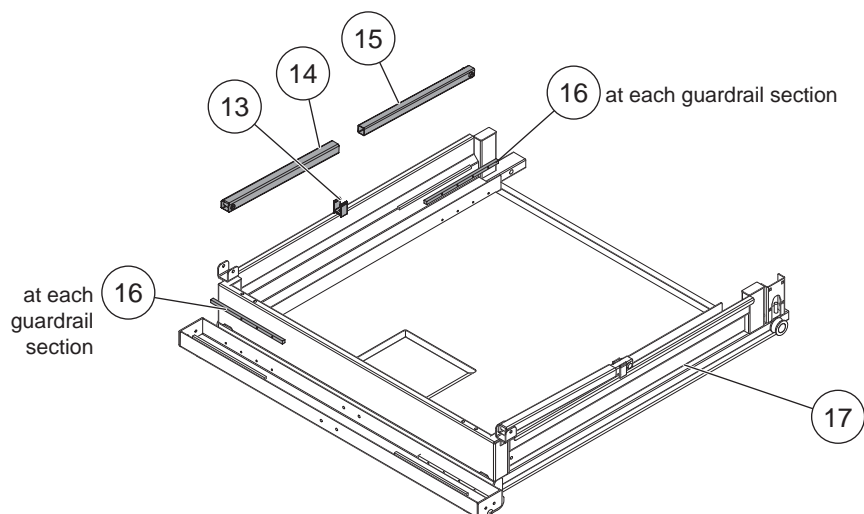
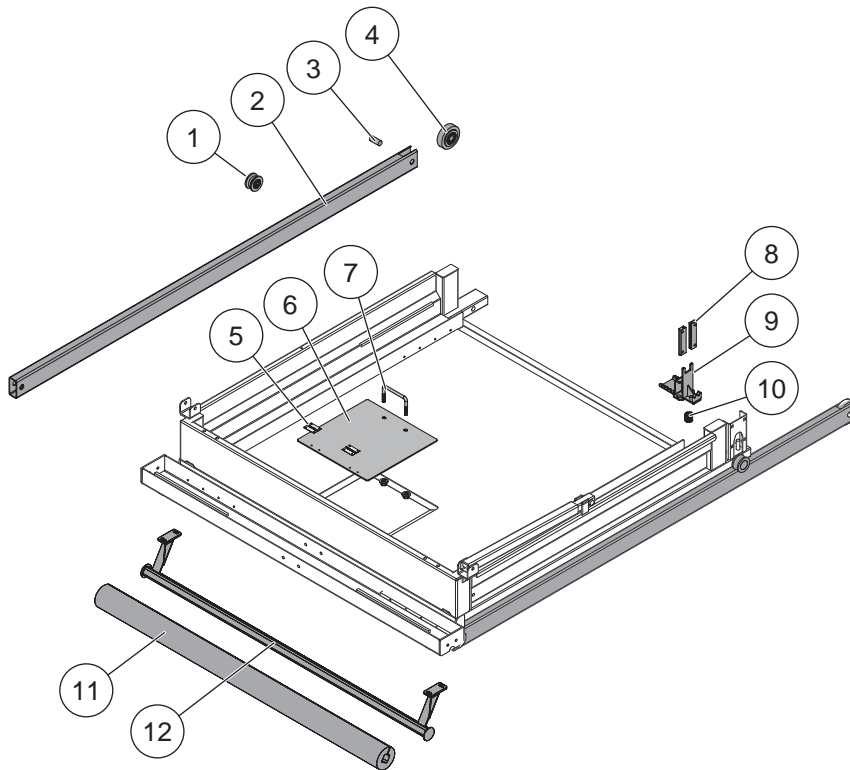
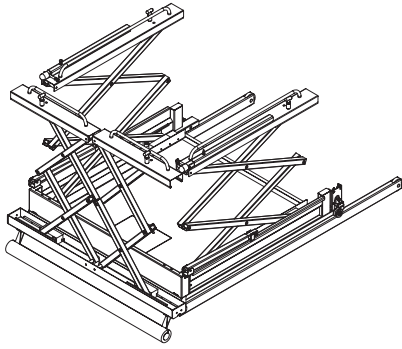


ILLUSTRATION No.
ART_4456

4069

OPTION -- GSE Deck Extension, 2 of 2

OPTION -- GSE Deck Extension, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	87126	2	Roller
2	21480	2	Slide Tube
3	26450	2	Pin
4	87124	2	Roller
5	92213	2	Hinge
6	21561	1	Door
7	93374	1	Square U-Bolt
8	26239	2	Deck Release Guide
9	21564	1	Release Weldment
10	92866	1	Spring
11	21599	1	Foam Bumper
12	21598	1	Bumper Weldment
13	93249	2	Tubing Clip
14	21611	2	Sliding Rail, Outer
15	21613	2	Sliding Rail, Inner
16	21505	4	Wear Pad Guide Rail
17	21541	1	Deck Extension Weldment, without deck plate
--	21583	1	Deck Plate



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

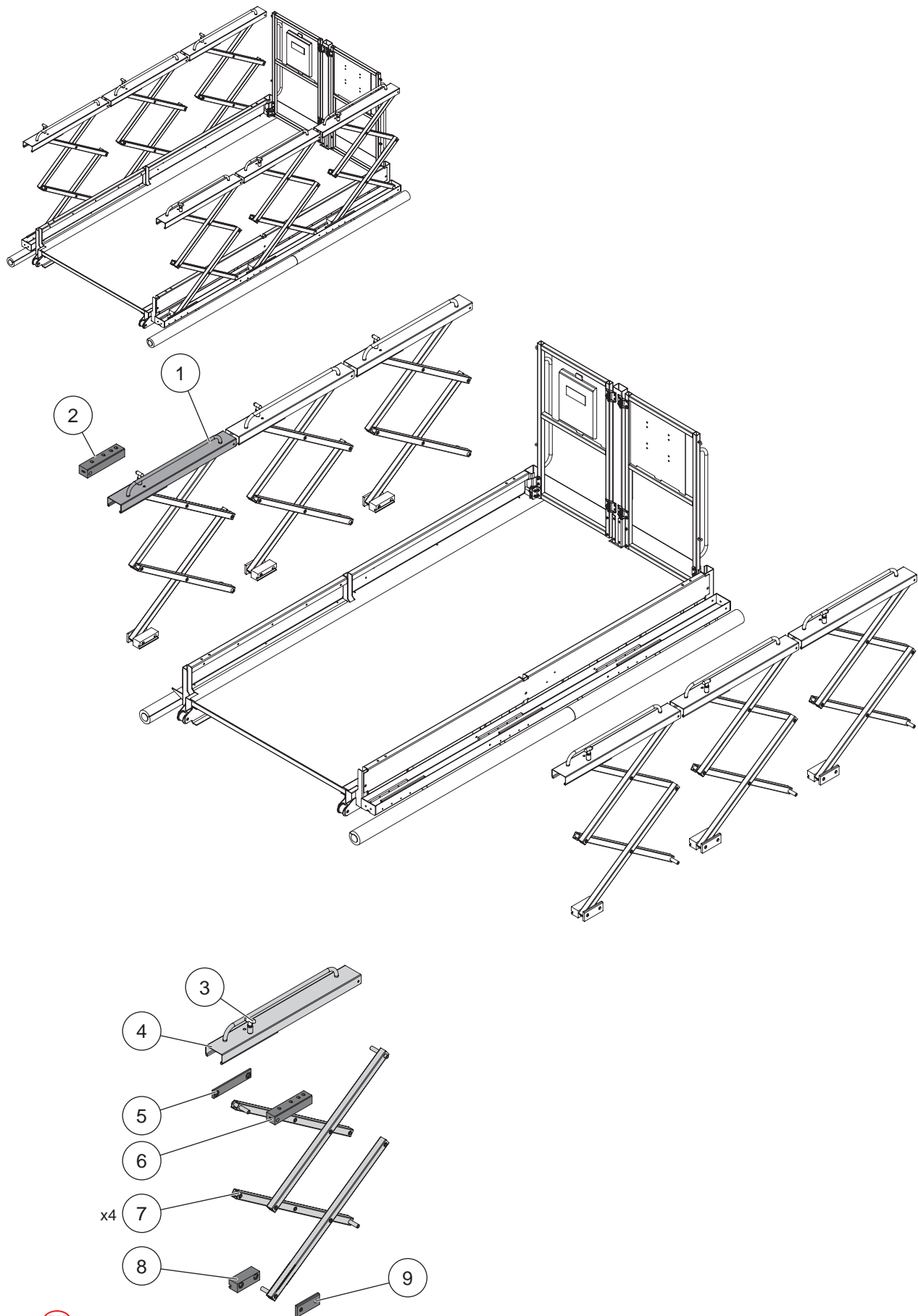


ILLUSTRATION No.
ART_4457

4069

OPTION -- GSE Main Platform, 1 of 2

OPTION -- GSE Main Platform, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	21573	3	Right Side Top Tray
2	21508	3	Wear Pad, Large, Right Side Top
3	93359	6	T-Handle
4	21574	3	Left Side Top Tray
5	21507	6	Wear Pad, Small Top
6	21509	3	Wear Pad, Large, Left Side Top
7	21519	24	Guard Rail Beam
8	21505	6	Wear Pad, Bottom Large
9	21506	6	Wear Pad, Bottom Small

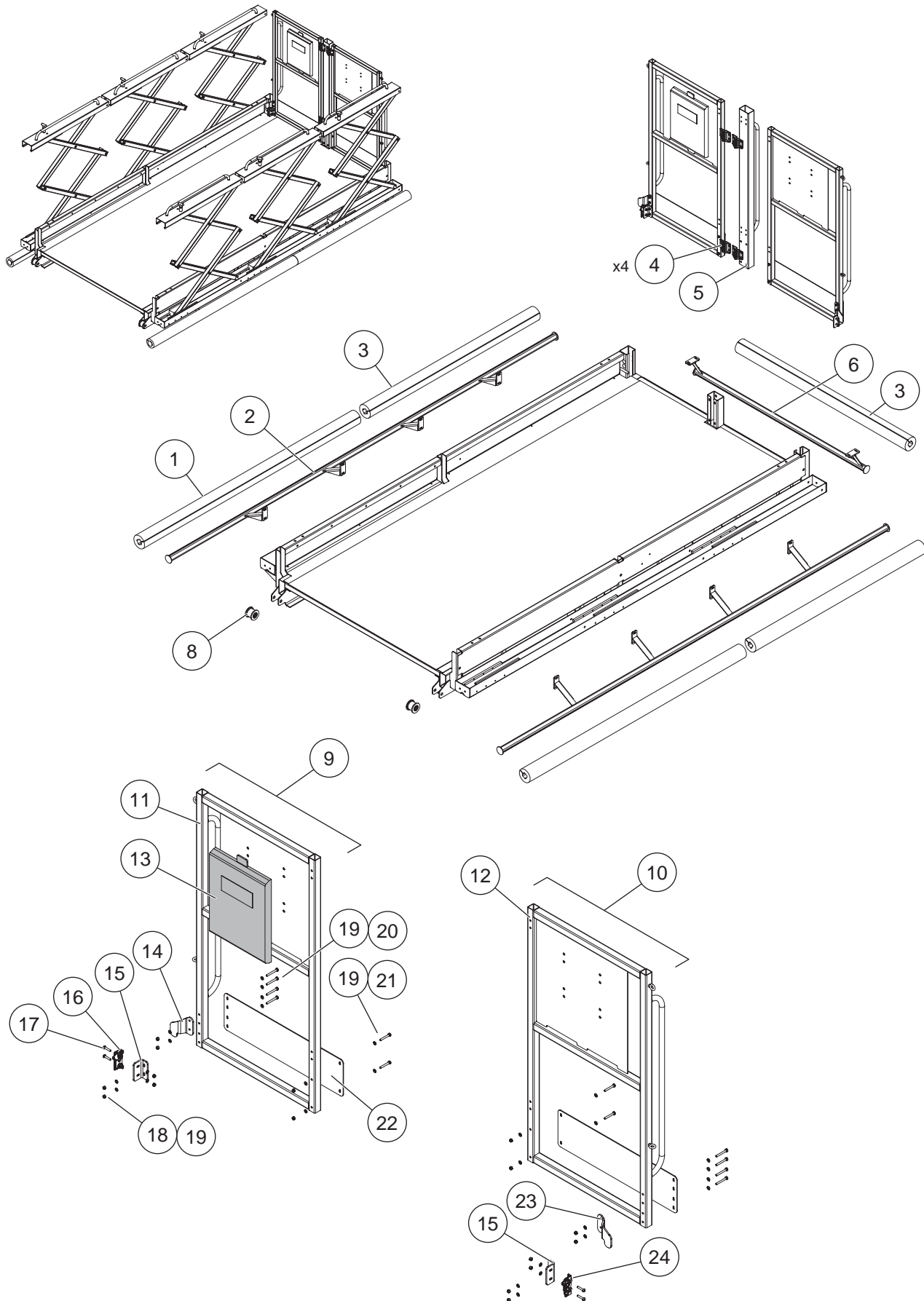


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



OPTION -- GSE Main Platform, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	21593	2	Bumper, Long
2	21595	2	Bumper Weldment
3	21599	3	Bumper, Short
4	91888	4	Hinge
5	21594	1	Gate Post
6	21598	1	Bumper Weldment
7	--	--	--
8	87125	2	Roller
9	21587	1	Right Side Gate Assembly
10	21588	1	Left Side Gate Assembly
11	21585	1	Gate Weldment, Right
12	--	--	--
13	8909	1	Manuals Box
14	21580	1	Gate Stopper, Right
15	21579	2	Gate Latch Bracket
16	92302	1	Gate Latch, Right
17	50375	4	Bolt, M6 x 30 Button Head
18	50047	16	Nut, M6 Nylock
19	50000	28	Washer, M6 Std.
20	50262	8	Bolt, M6 x 50
21	50294	4	Bolt, M6 x 45
22	21586	2	Gate Toe Board
23	21589	1	Gate Stopper, Left
24	92251	1	Gate Latch, Left

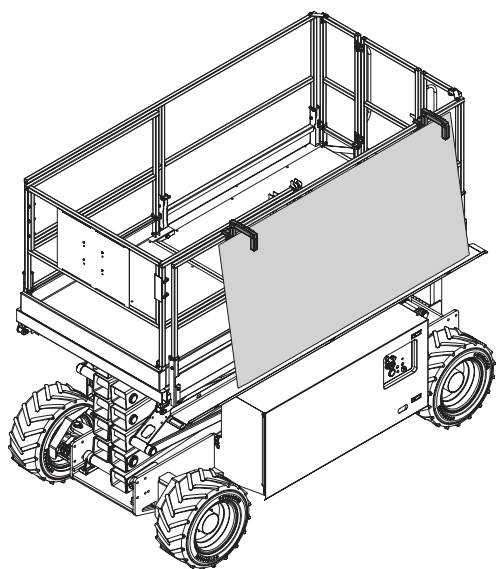
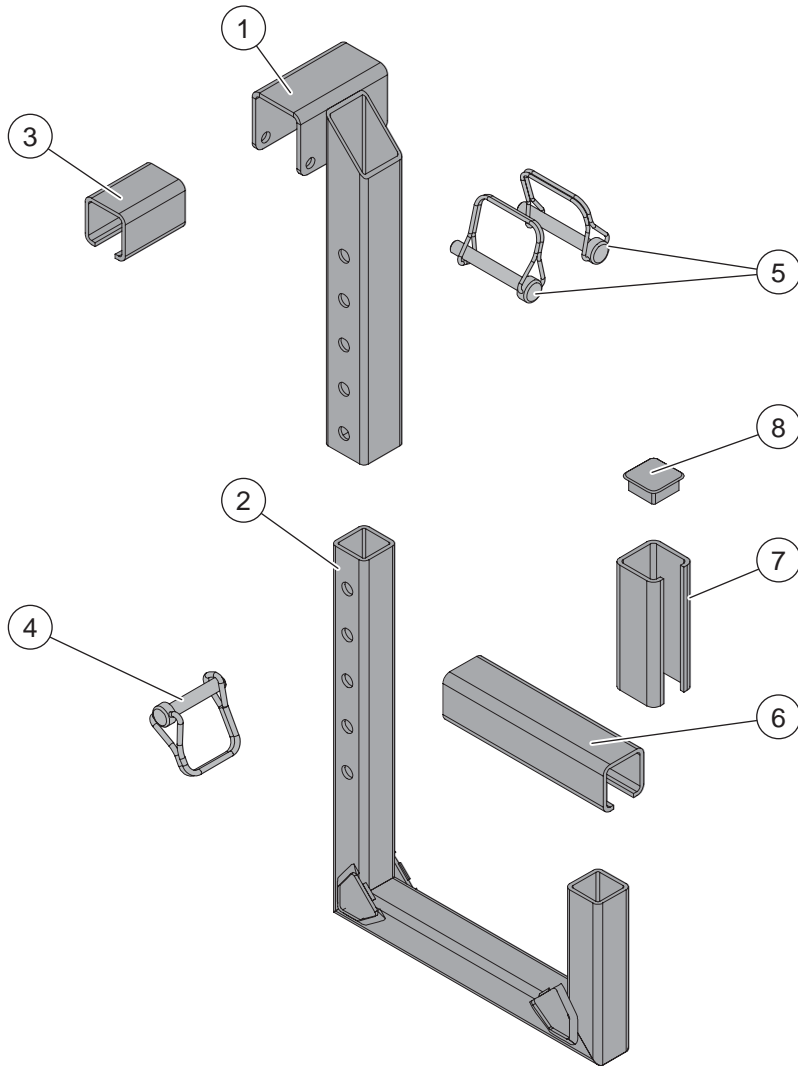


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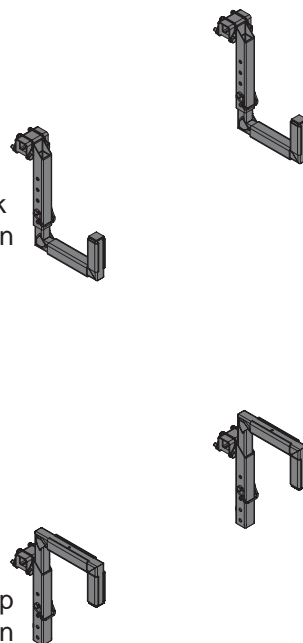
• NS: Not a Stock item

• REF: Reference only



Pipe Rack Configuration

Material Clamp Configuration



OPTION -- Material Clamp/Pipe Rack

ILLUSTRATION No.
ART_4462

4069

OPTION -- Material Clamps/Pipe Racks

NOTE: Material Clamps/Pipe Racks may be used only on the standard platform equipped with the Sheet Material Rack. DO NOT use on the optional GSE platform. See the Operator's Manual for use instructions.

ITEM	PART NO.	QTY	DESCRIPTION
--	84225	--	Material Clamp/ Pipe Rack -- sold in pairs
1	26459	1	Top Weldment
2	26415	1	Sliding Tube Weldment
3	92840	1	Wear Strip
4	50182	1	Spring Clip
5	50401	2	Spring Clip
6	92852	1	Wear Strip
7	92863	1	Wear Strip
8	92942	1	Cap



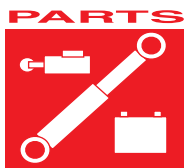
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• REF: Reference only

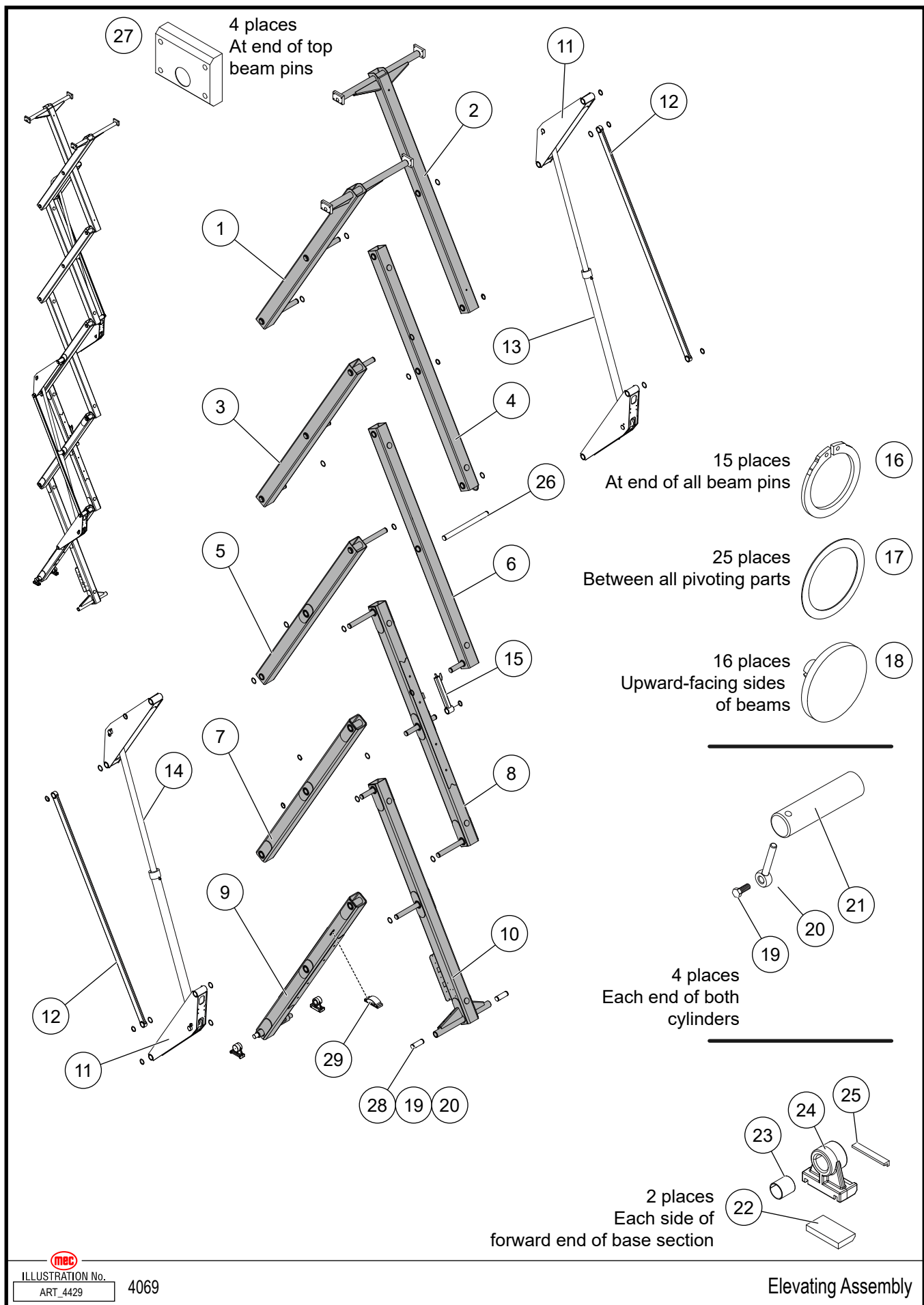
NOTES:



SECTION C

SCISSOR ASSEMBLY

CONTENTS	PAGE
Scissor Assembly	C-3



Scissor Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	21420	1	Standard Machine -- Scissor Beam
	21557	1	GSE Spec Machine -- Scissor Beam
2	21421	1	Standard Machine -- Scissor Beam
	21558	1	GSE Spec Machine -- Scissor Beam
3	21419	1	Scissor Beam
4	21418	1	Scissor Beam
5	21416	1	Scissor Beam
6	21417	1	Scissor Beam
7	21414	1	Scissor Beam
8	21415	1	Scissor Beam
9	21413	1	Scissor Beam
10	21412	1	Scissor Beam
11	21422	4	Cylinder Mount Weldment
12	21288	2	Beam Support Weldment
13	REF	--	Upper Lift Cylinder -- See Section E
14	REF	--	Lower Lift Cylinder -- See Section E
15	21467	1	Maintenance Lock
16	6701	15	Retaining Ring
17	93640	25	Washer, Nylon
18	25429	16	Rubber Spacer
19	50236	6	Bolt, M12 x 40
20	18152	6	Pin Retainer
21	21472	4	Cylinder Pin
22	9587	2	Lower Slide Pad
23	7160	2	Bearing
24	40301	2	Slide Casting
25	90235	2	Upper Slide Pad
26	30407	1	Pin
27	26449	4	Platform Block
28	21372	2	Stationary Pin
29	90844	1	Height Sensor (For Overload Sensing, use 2)



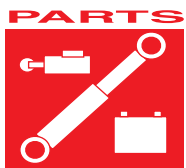
• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

NOTES:



SECTION D

WHEEL ASSEMBLIES

CONTENTS	PAGE
Wheels & Hubs	D-3
Wheel Motors & Steering Yoke Components	D-5
Steering Components	D-7



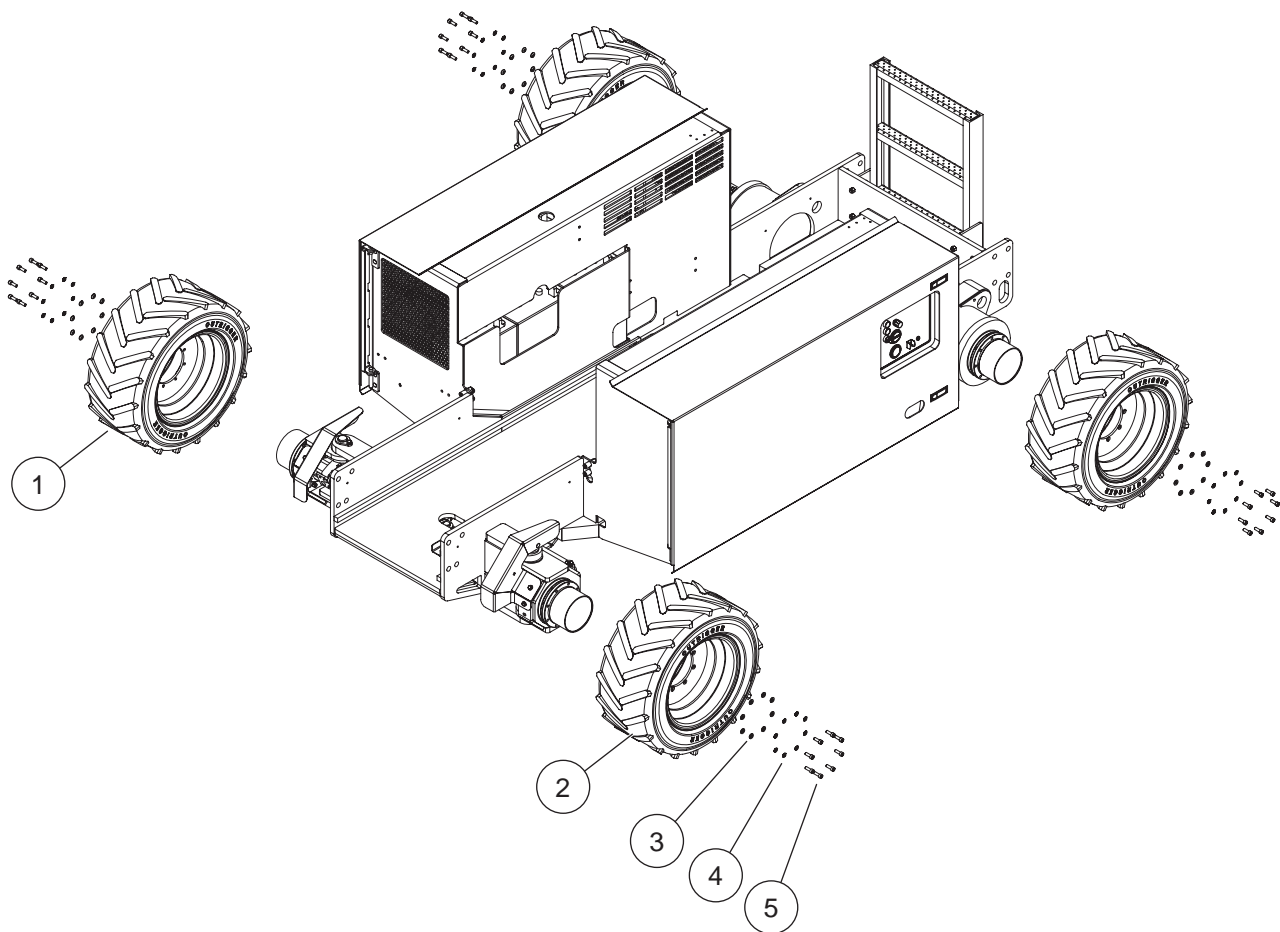


ILLUSTRATION No.
ART_4431

4069

Tires/Wheels

Wheels & Hubs

ITEM	PART NO.	QTY	DESCRIPTION
1	21450	2	Right-Side Wheel/Tire Assembly, Pneumatic
	21452	2	Right-Side Wheel/Tire Assembly, Foam-Filled*
	21454	2	Right-Side Wheel/Tire Assembly, Non-Marking, Pneumatic
	21456	2	Right-Side Wheel/Tire Assembly, Non-Marking, Foam-Filled*
2	21451	2	Left-Side Wheel/Tire Assembly, Pneumatic
	21453	2	Left-Side Wheel/Tire Assembly, Foam-Filled*
	21455	2	Left-Side Wheel/Tire Assembly, Non-Marking, Pneumatic
	21457	2	Left-Side Wheel/Tire Assembly, Non-Marking, Foam-Filled*
--	91181	--	Tire Only, Black
--	92803	--	Tire Only, Non-Marking
--	21403	--	Rim Only, 4069
3	92977	32	Washer, Self-Aligning
4	50006	32	Washer, M10 Nordlock
5	50127	32	Lug Bolt, M10 x 30 Socket Head

*USE ONLY FOAM-FILLED FOR CE AND GSE-SPEC MACHINES.



• as req: as required

• INCL: Included with assembly

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• REF: Reference only

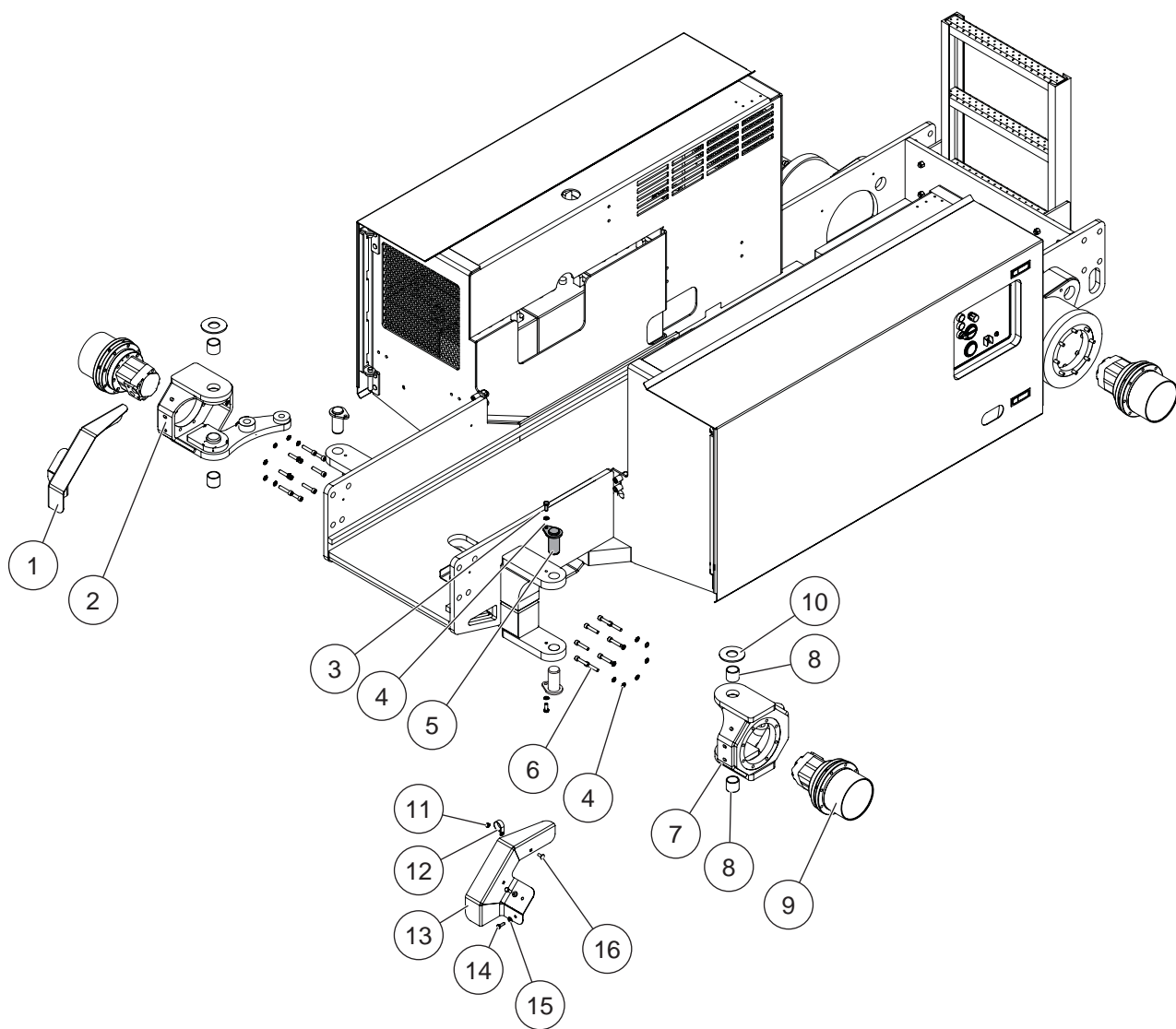


ILLUSTRATION No.
ART_4428

4069

Wheel Motors & Steering Components

Wheel Motors & Steering Yoke Components

ITEM	PART NO.	QTY	DESCRIPTION
1	21353	1	Hose Guard, Right Side
2	21344	1	Steering Yoke, Right Side
3	50033	4	Bolt, M10 x 25
4	50006	36	Washer, M10 Nordlock
5	26057	4	King Pin Weldment
6	50439	32	Bolt, M10 x 50 Socket Head
7	21345	1	Steering Yoke, Left Side
8	92360	4	Bearing
9	REF	4	Motor/Hub Assembly -- See Section E
10	92341	2	Thrust Washer
11	50048	2	Nut, M8 Nylock
12	92787	2	P-Clamp
13	21354	1	Hose Guard, Left Side
14	50031	4	Bolt, M8 x 25
15	50001	4	Washer, M8 Std
16	50025	2	Bolt, M8 Carriage



• as req: as required

• INCL: Included with assembly

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• REF: Reference only

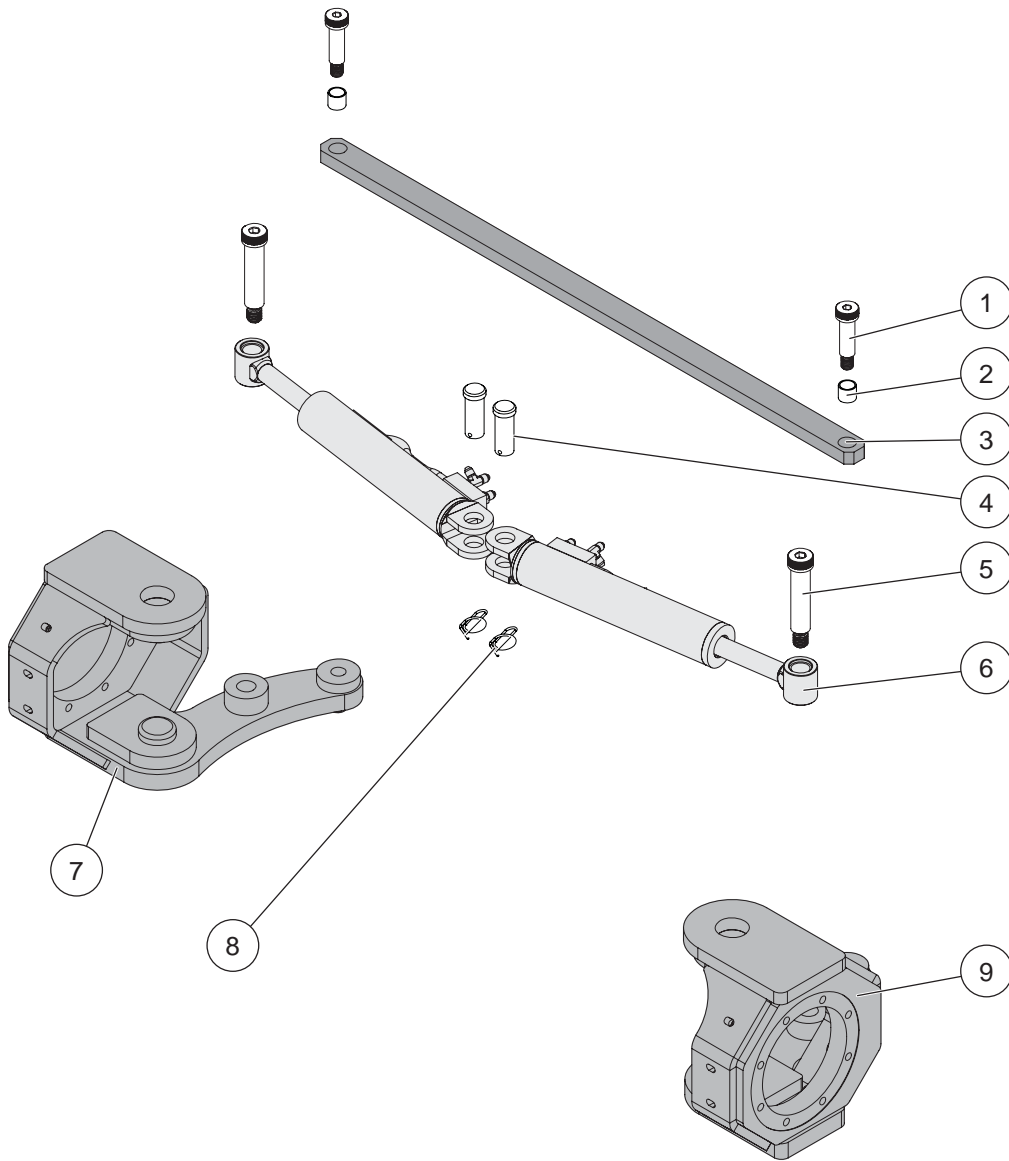
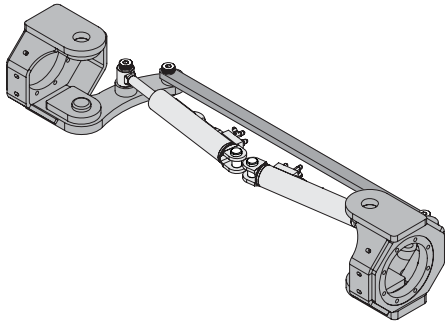


ILLUSTRATION No.
ART_4430

4069

Steering Components



Steering Components

ITEM	PART NO.	QTY	DESCRIPTION
1	50433	2	Shoulder Bolt, M16 Thread Socket Head, M20 x 60 Shoulder
2	93044	2	Bronze Bearing
3	21337	1	Tie Rod
4	17491	2	Clevis Pin
5	50458	2	Shoulder Bolt, 3/4" thread, 1 x 4 shoulder
6	REF	2	Steering Cylinder Assembly -- See Section E
7	21344	1	Steering Yoke, Right Side
8	17492	2	Pin Clip
9	21345	1	Steering Yoke, Left Side



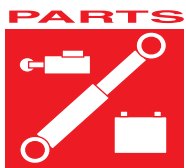
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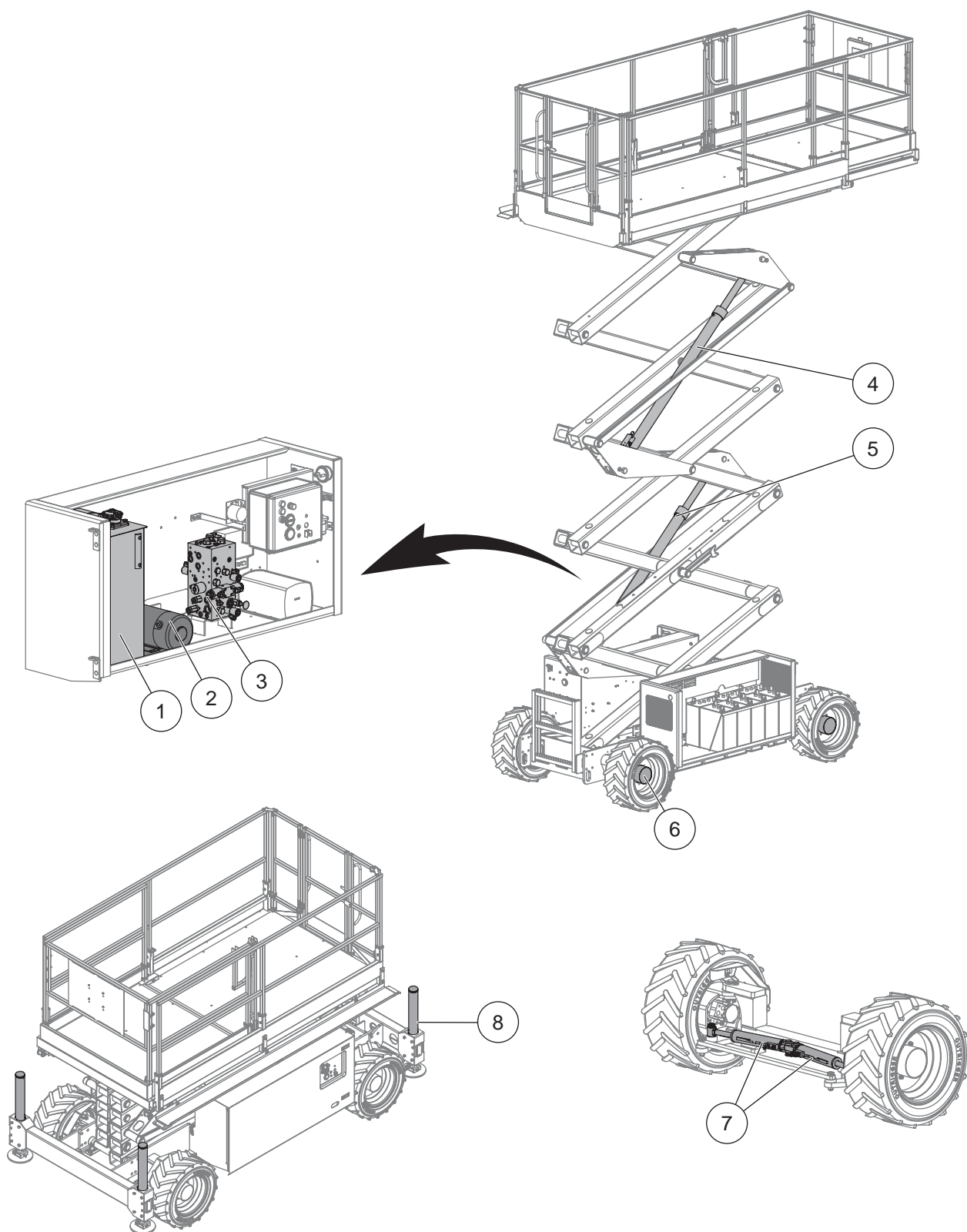
NOTES:



SECTION E

HYDRAULICS

CONTENTS	PAGE
Hydraulic Components	E-3
Functions Manifold, 1 of 2	E-5
Functions Manifold, 2 of 2	E-7
Hydraulic Reservoir	E-9
Hydraulic Pump	E-11
Wheel Motor/Brake Unit	E-13
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Steer Cylinders	E-17
OPTION -- Outrigger Cylinders	E-19
Hoses -- Pump & Manifold	E-21
Hoses -- Lift Circuit	E-23
Hoses -- Lift Cylinder Drain, Current Machines	E-25
Hoses -- Lift Cylinder Drain, Early Machines	E-27
Hoses -- Steer Circuit	E-29
Hoses -- Drive Circuit, Front Wheels	E-31
Hoses -- Drive Circuit, Rear Wheels	E-33
Hoses -- Brake Circuit	E-35
Hoses -- Case Drain Circuit	E-37
Hoses -- Outrigger Circuit	E-39



Machines equipped with optional Outriggers



ILLUSTRATION No.
ART_4503

4069ERT

Hydraulic Components

Hydraulic Components

ITEM	PART NO.	QTY	DESCRIPTION
1	89013	1	Hydraulic Reservoir
2	93143	1	Hydraulic Pump (does not include electric motor)
3	93145	1	Functions Manifold
4	21273	1	Upper Lift Cylinder
5	21272	1	Lower Lift Cylinder
6	92974	4	Wheel Motor/Brake Unit
7	21398	2	Steer Cylinder
8	93031	4	Option -- Outrigger Cylinder

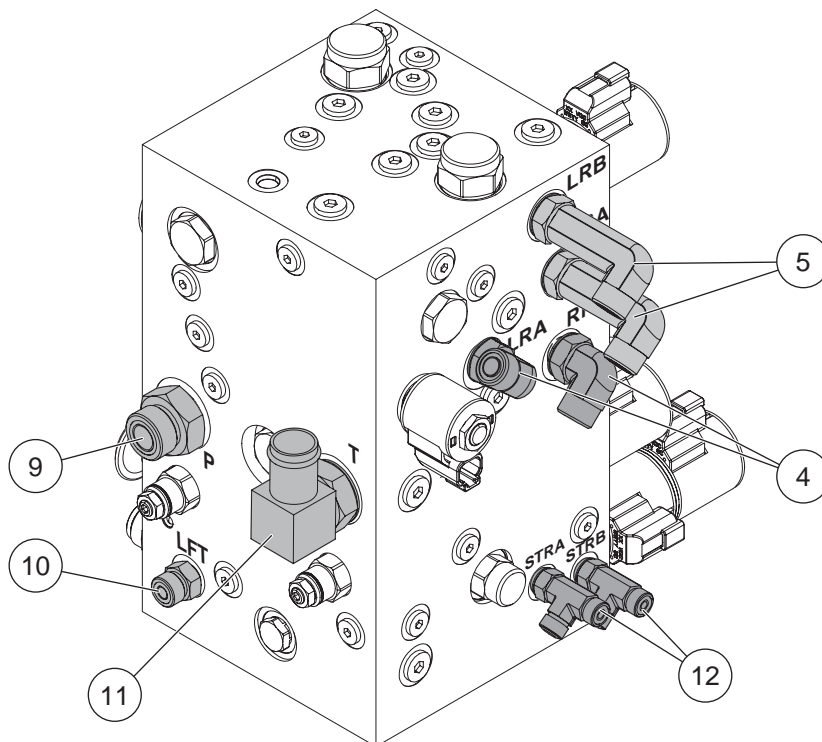
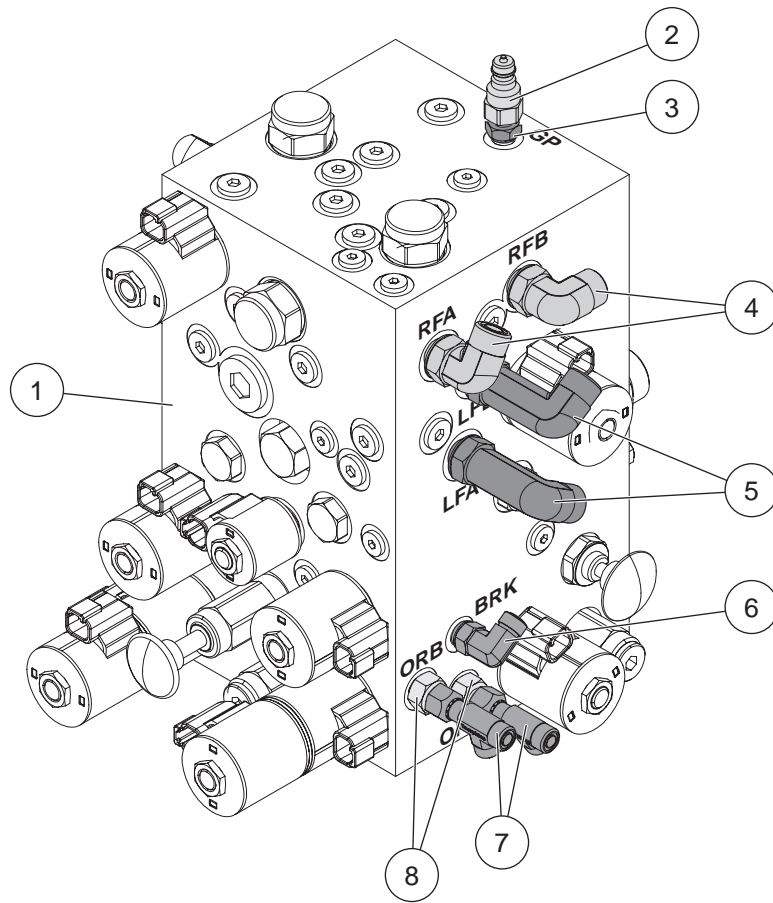


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Functions Manifold, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	93145	1	Functions Manifold Assembly, without fittings
2	HDW7971	1	Fitting, Male Disconnect 1/4npt
3	50950	1	Fitting, MB-MP-4-4
4	50850	4	Fitting, MB-MFFOR90-8-8
5	50853	4	Fitting, MB-MFFOR90LL-8-8
6	50673	1	Fitting, MB-MFFOR90-4-4
7	50809	2	Fitting, MFFOR-MFFOR-FFORX-4
8	50832	2	Fitting, MB-MFFOR-6-4
9	50838	1	Fitting, MB-MFFOR-12-8
10	50835	1	Fitting, MB-MFFOR-6-6
11	51004	1	Fitting, MB-HB90-12-16
12	50858	2	Fitting, MB-MFFOR-MFFORT-4

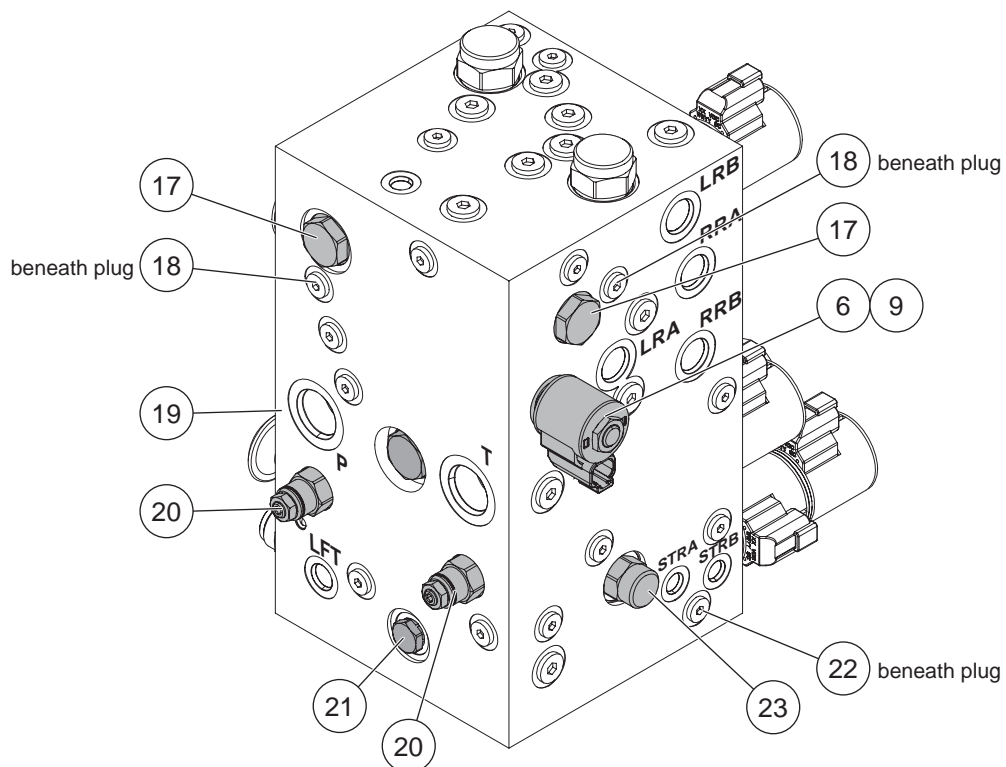
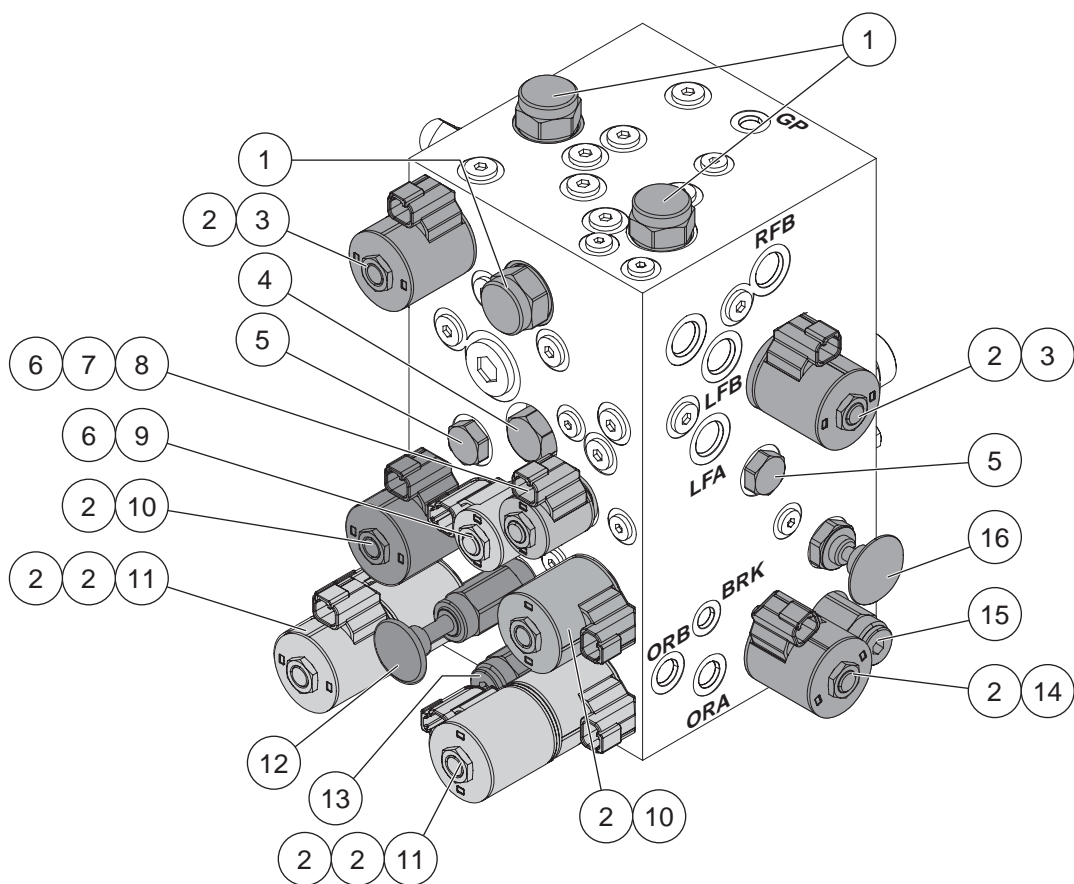


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Functions Manifold, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
--	93145	--	Functions Manifold Assembly, without fittings
1	91151	3	Pilot-Operated Valve
2	91143	9	Coil
3	93502	2	Solenoid Valve, Rear Wheel Bypass
4	91152	2	Pilot-Operated Valve
5	91477	2	Check Valve
6	92173	3	Coil
7	91464	1	Solenoid Valve, Rear Wheel Bypass
8	93501	1	Orifice Disc, .060
9	91147	2	Solenoid Valve, Hogh Torque/High Speed
10	93496	2	Solenoid Valve, Drive
11	91008	2	Solenoid Valve, Outrigger & Steering
12	91015	1	Hand Pump
13	93497	1	Relief Valve
14	91145	1	Solenoid Valve, Lift
15	91009	1	Relief Valve
16	91012	1	Manual Brake Release Valve
17	93494	2	Flow Divider
18	93500	2	Orifice Plug, .025
19	93493	1	Check Valve
20	93503	2	Counterbalance Valve
21	93499	1	Shuttle Valve
22	93495	1	Orifice Plug, .063
23	93498	1	Flow Regulator

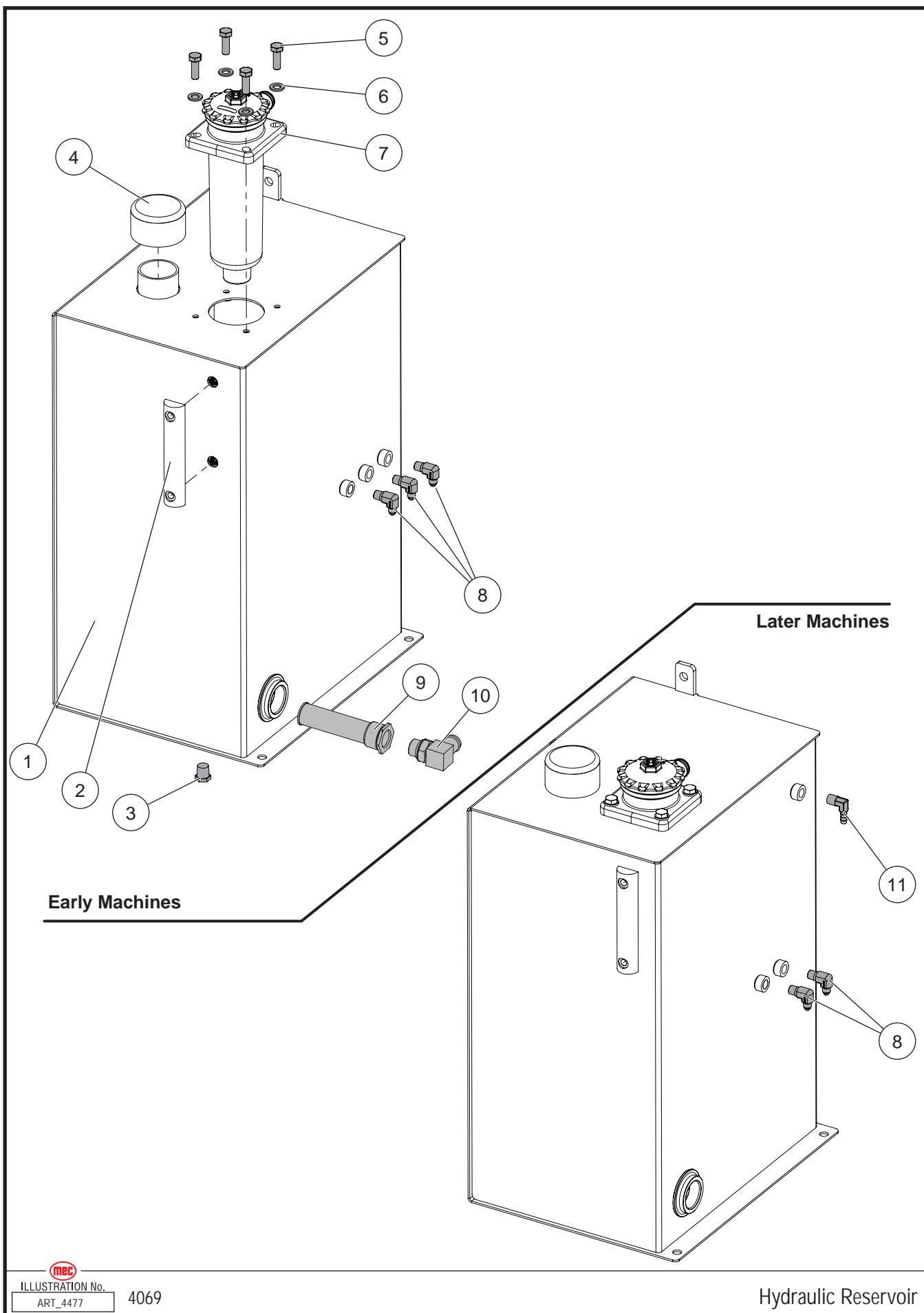


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Hydraulic Reservoir

ITEM	PART NO.	QTY	DESCRIPTION
--	89013	--	Hydraulic Reservoir, Complete as shown
1	21355	1	Tank Weldment
2	9370	1	Sight Gauge
3	51006	1	Plug, 3/8 NPT
4	92335	1	Cap
5	50034	4	Bolt, M10 x 30
6	50002	4	Washer, M10 std.
7	92565	1	Filter Assembly
--	92924	--	Filter Element
8	HDW6727	1	Fitting, 1/4 NPT, 5/16 Barb
9	50664	2	Fitting, MP-MJ-4-4



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

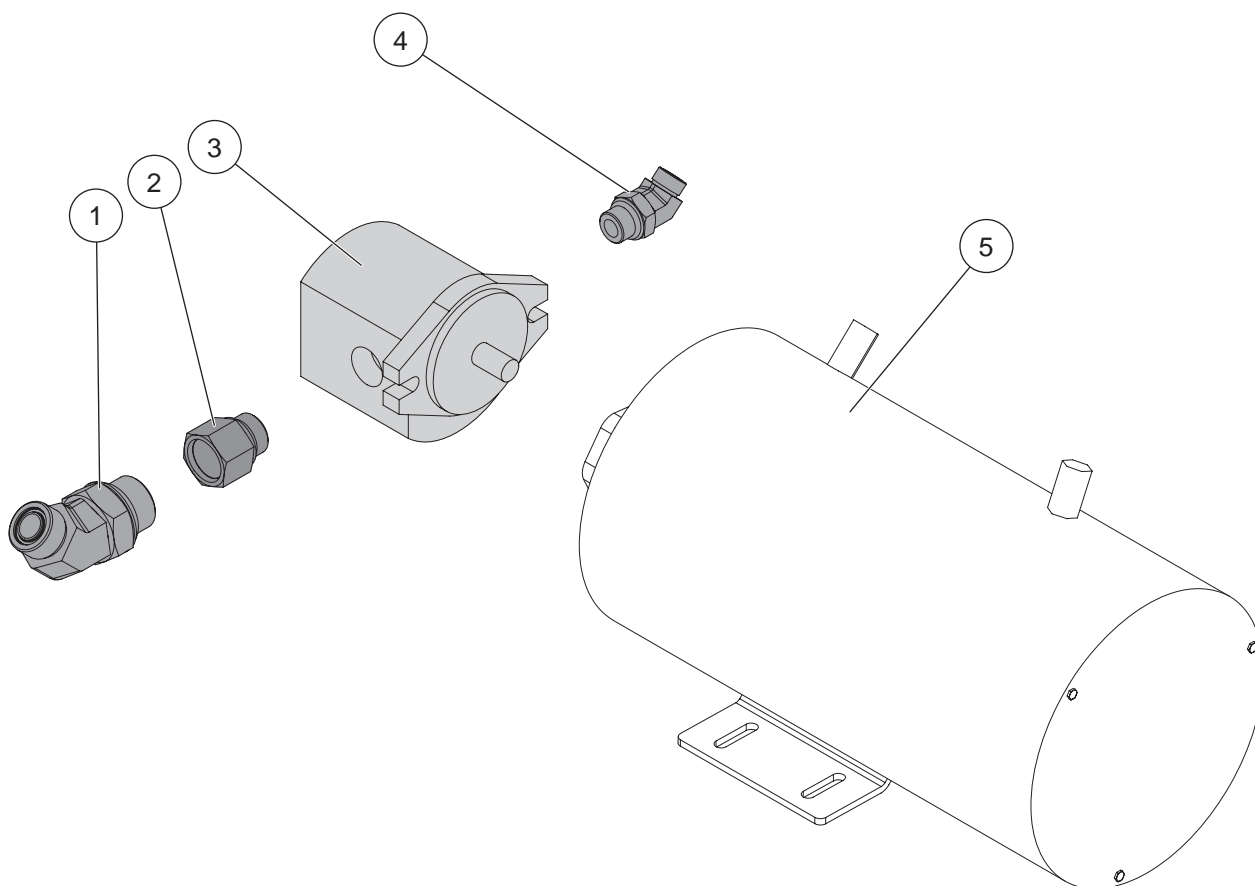


ILLUSTRATION No.
ART_4507

4069ERT

Hydraulic Pump

Hydraulic Pump

ITEM	PART NO.	QTY	DESCRIPTION
1	51105	1	Fitting, HB-MB45-16-12
2	50755	1	Fitting, MB-FB-12-12
3	93143	1	~ Serial #13400150 Hydraulic Pump
	93232	1	Serial #13400151~ Hydraulic Pump
4	51067	1	Fitting, MB-MFFOR45-10-8
5	REF	1	Electric Motor -- See Section F



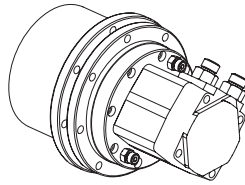
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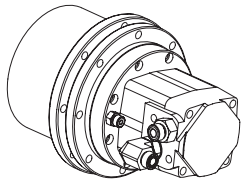
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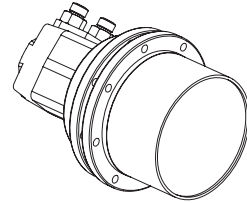
Right Rear



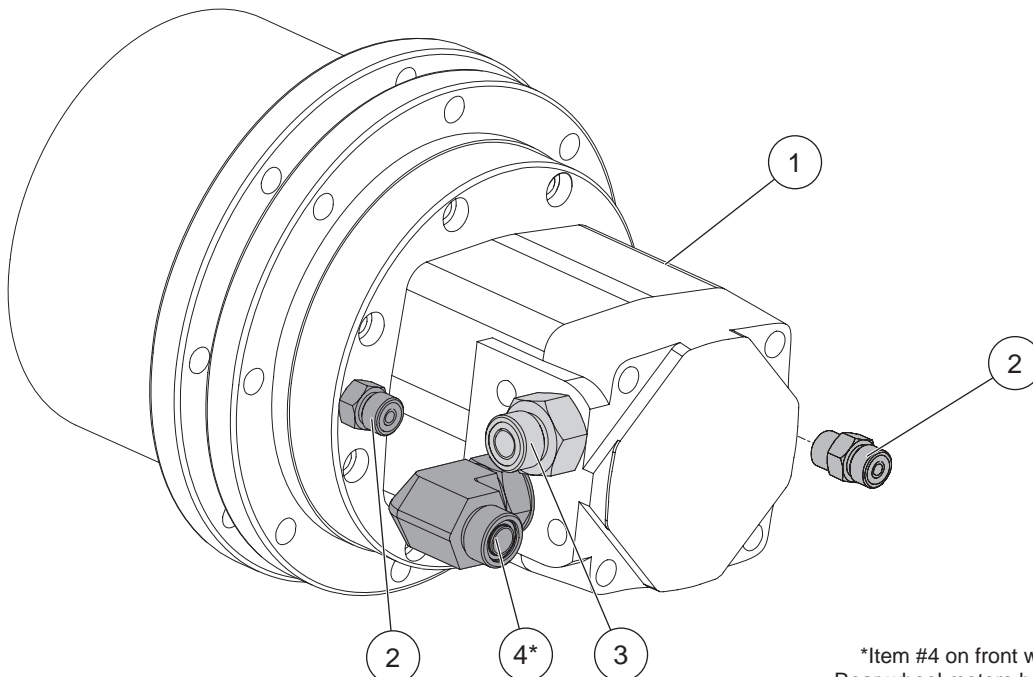
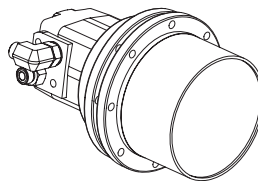
Right Front



Left Rear



Left Front



*Item #4 on front wheel motors only.
Rear wheel motors have two of Item #3

Wheel Motor/Brake Units

Wheel Motor/Brake Unit

ITEM	PART NO.	QTY	DESCRIPTION
1	92974	4	~ Serial #13400150 Wheel Motor/Brake Unit
	93233	4	Serial #13400151~ Wheel Motor/Brake Unit
2	51118	4	Fitting, MFFOR-MBSPP-04-02
3	50837	6	Fitting, MB-MFFOR-10-8
4	50980	2	Fitting, MB-MFFOR90-10-8



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

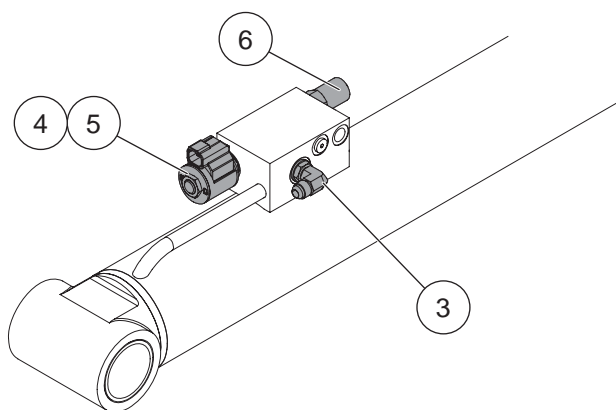
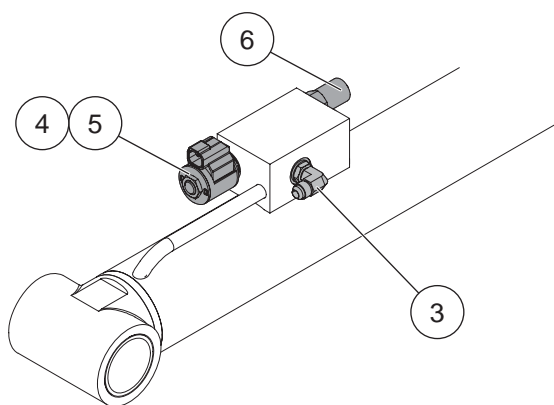
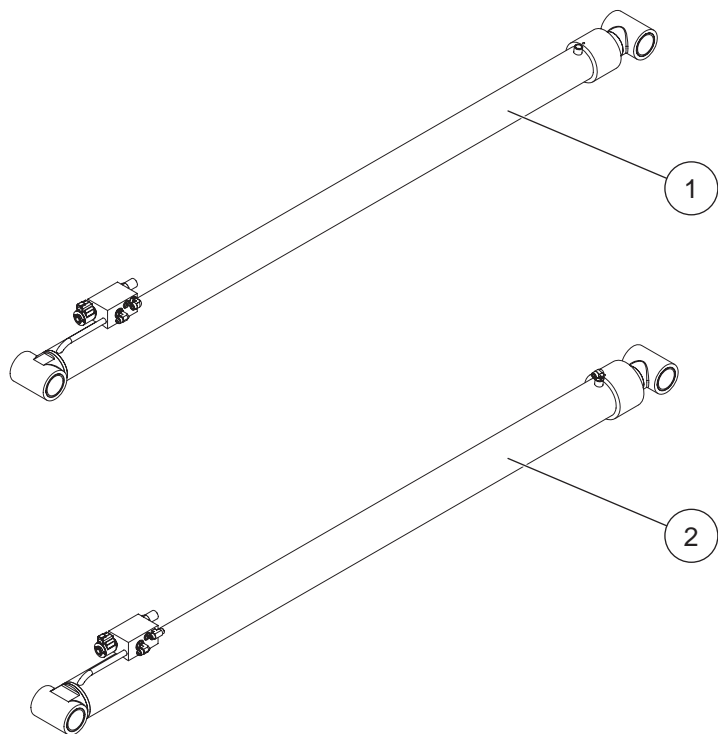


ILLUSTRATION No.
ART_4473

4069

Lift Cylinders

Lift Cylinders -- Old Style

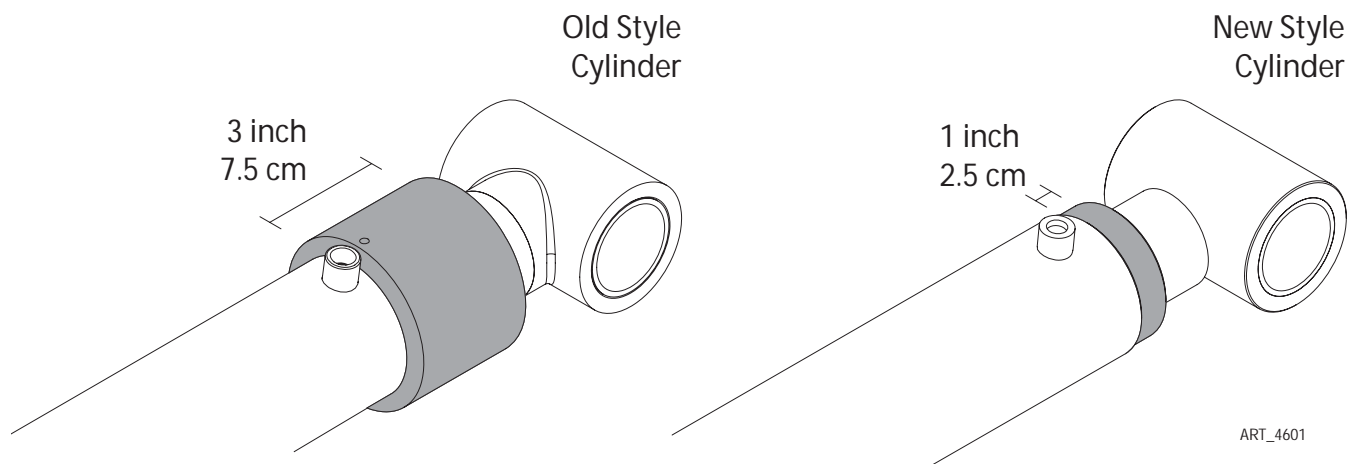
ITEM	PART NO.	QTY	DESCRIPTION
1	21273	1	Upper Lift Cylinder -- Old Style
--	93613	--	Seal Kit
2	21272	1	Lower Lift Cylinder -- Old Style
--	93614	--	Seal Kit
3	50790	2	Fitting, MB-MJ90-6-6
4	91464	2	Valve
5	93615	2	Coil
6	90969	2	Valve, Relief

Lift Cylinders -- New Style

1	93519	1	Upper Lift Cylinder -- New Style
--	93642	--	Seal Kit
2	93518	1	Lower Lift Cylinder -- New Style
--	93643	--	Seal Kit
3	50790	2	Fitting, MB-MJ90-6-6
4	91464	2	Valve
5	93615	2	Coil
6	90969	2	Valve, Relief

Examine the collar at the rod end of the cylinder to determine whether your machine is equipped with Old Style or New Style cylinders

- Old Style cylinders have a 3-inch (7.5 cm) collar.
- New Style cylinders have a 1-inch (2.5 cm) collar.



IMPORTANT -- Both cylinders must be changed out if an Old Style cylinder requires replacement.
DO NOT pair a New Style cylinder with an Old Style cylinder.

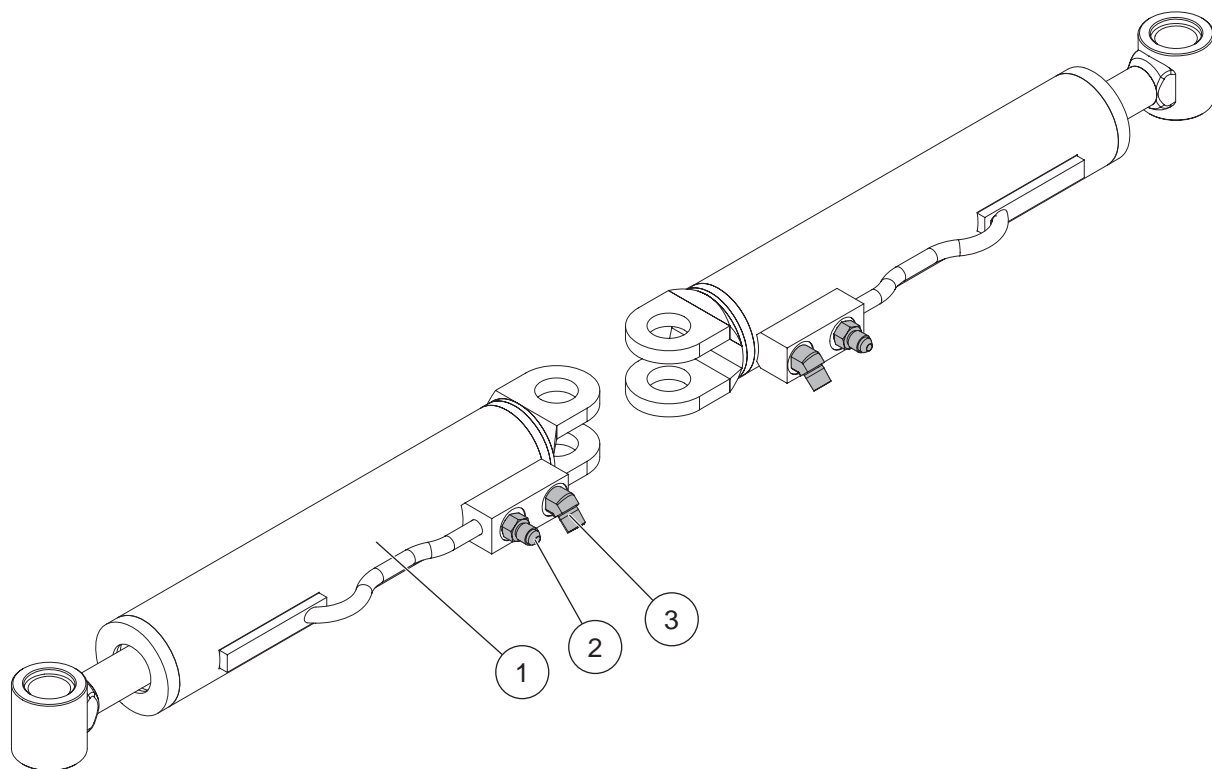


ILLUSTRATION No.
ART_4472

4069

Steer Cylinders

Steer Cylinders

ITEM	PART NO.	QTY	DESCRIPTION
1	21398	2	Steer Cylinder
--	93616	--	Seal Kit
2	50831	2	Fitting, MB-MFFOR-4-4
3	50675	2	Fitting, MB-MFFOR45-4-4



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

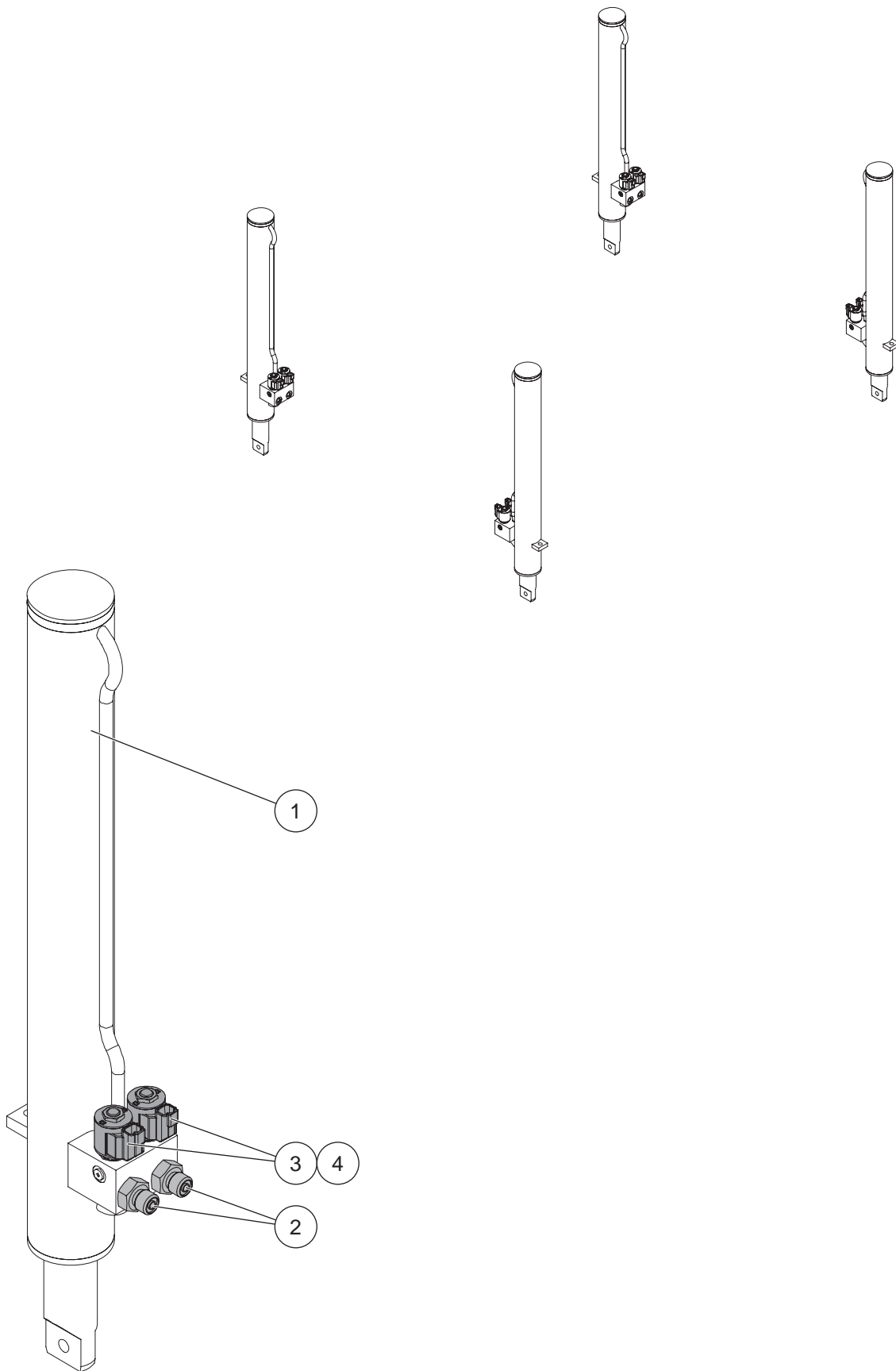


ILLUSTRATION No.
ART_4474

4069

OPTION -- Outrigger Cylinders

OPTION -- Outrigger Cylinders

ITEM	PART NO.	QTY	DESCRIPTION
1	93031	4	Outrigger Cylinder
--	93617	--	Seal Kit
2	50832	8	MB-MFFORT-6-4
3	91464	8	Valve
4	93615	8	Coil



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

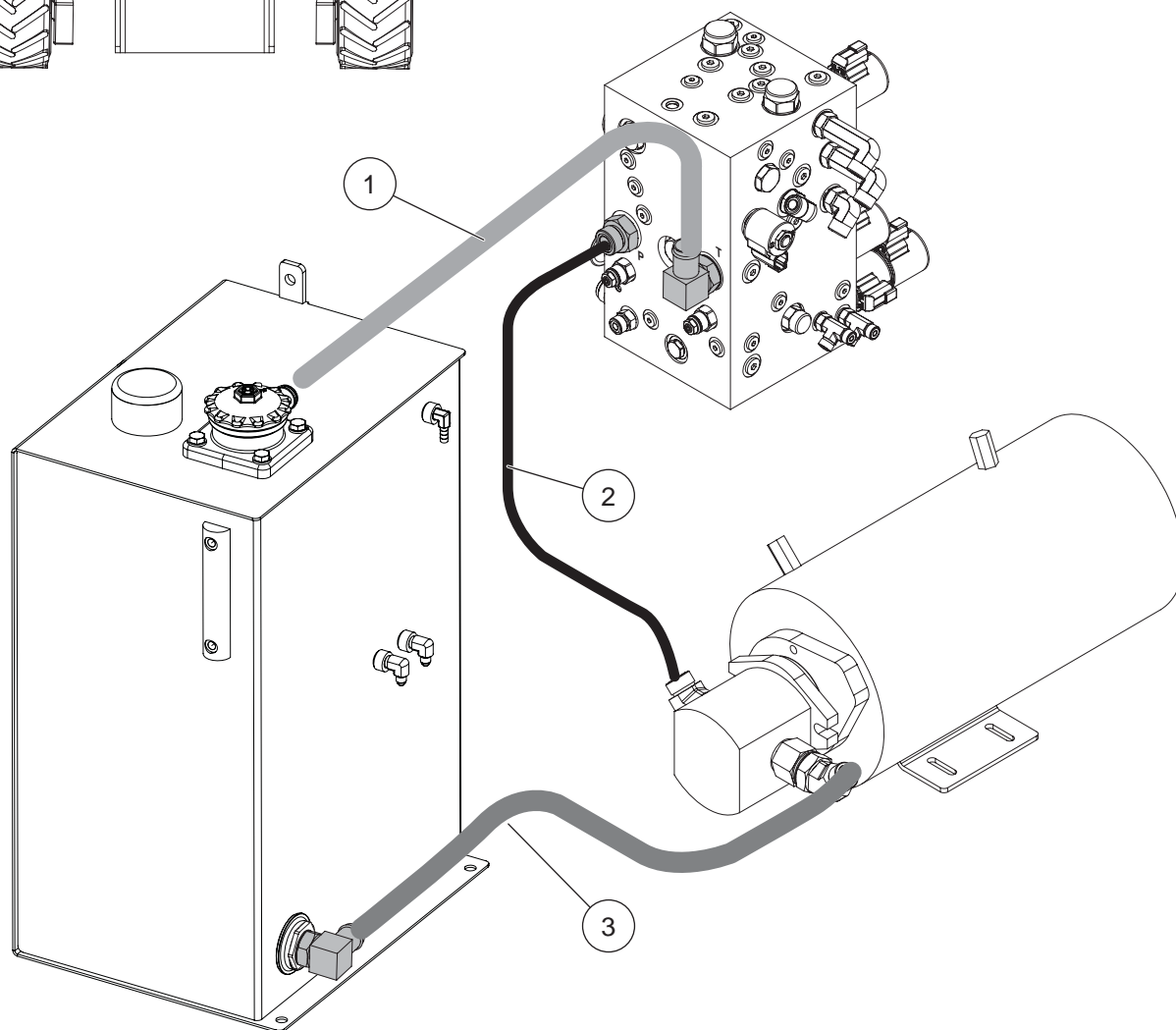
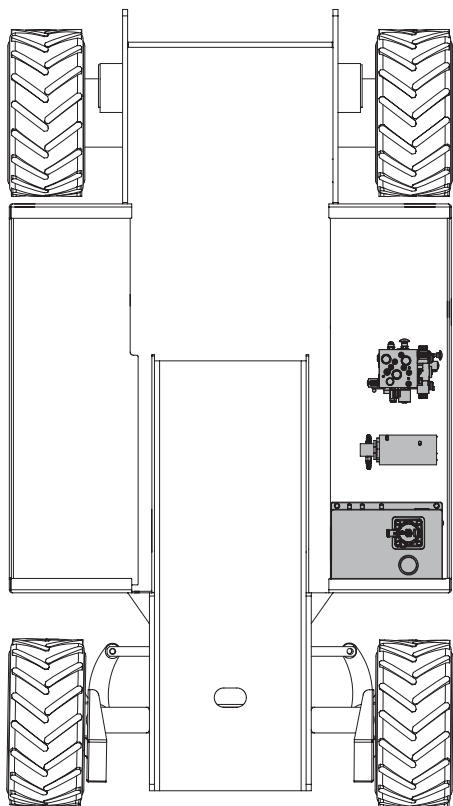


ILLUSTRATION No.
ART_4553

4069ERT

Pump Circuit

Hoses -- Pump & Manifold

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52483	1	Hose, 1" Premoflex x 44	MF-T-R
2	52449	1	Hose Assy, 1/2 x 11.5 inch, 08G-08FFORX -08G-08FFORX90L	PUMP PRESSURE
3	52482	1	Hose Assy, 1" Premoflex x 14.5	T-P-S



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

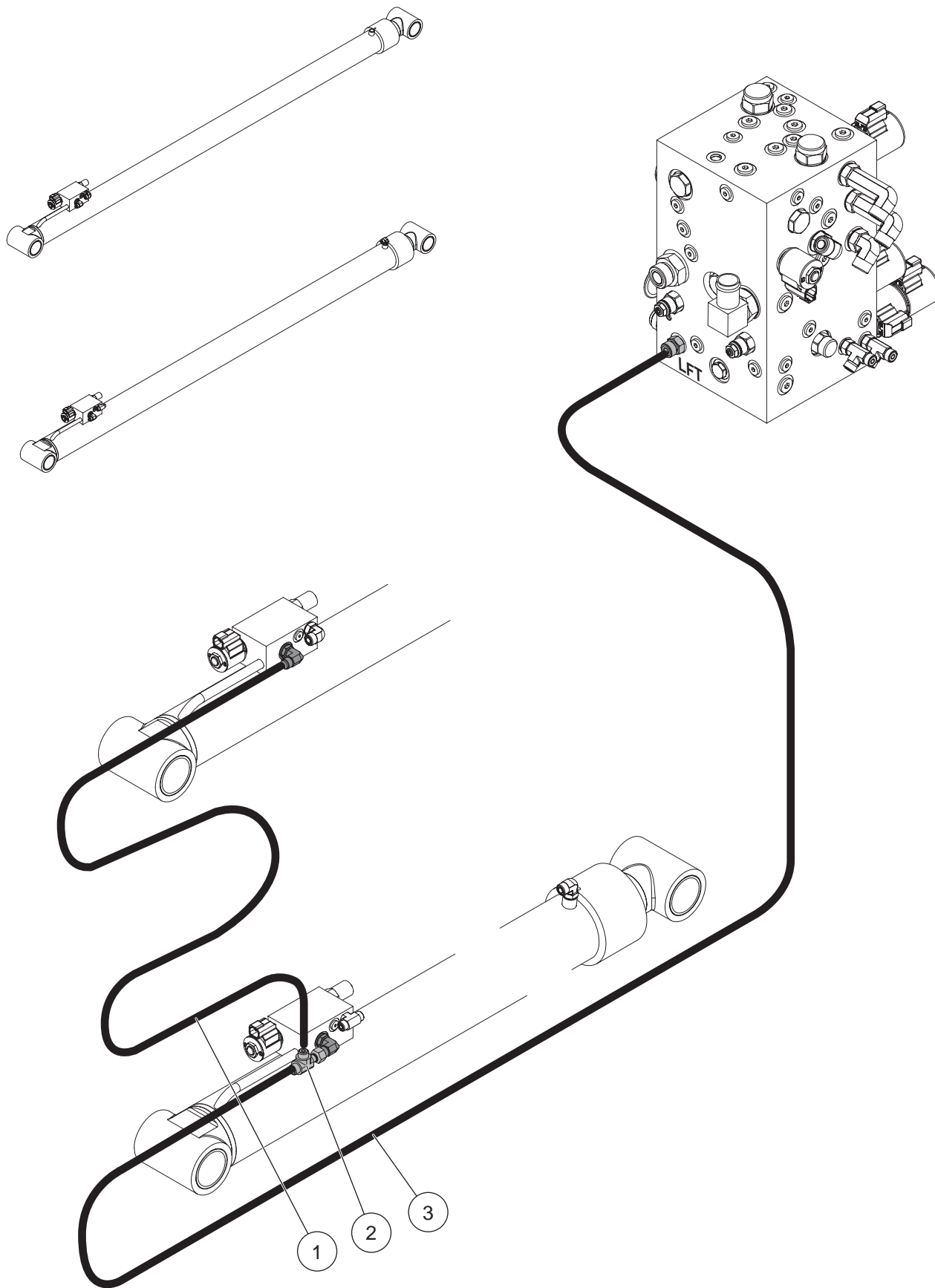


ILLUSTRATION No.
ART_4546

4069

Lift Circuit

Hoses -- Lift Circuit

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52450	1	Hose Assy, 3/8 x 26'9" inch, 06G-06FJX - 06G-06FJX90	UPPER LIFT
2	50902	1	Fitting, MJ-MJ-FXT-6	
3	52451	1	Hose Assy, 3/8 x 161.5" inch, 06G-06FJX -06G-06FFORX90L	LWR LIFT



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

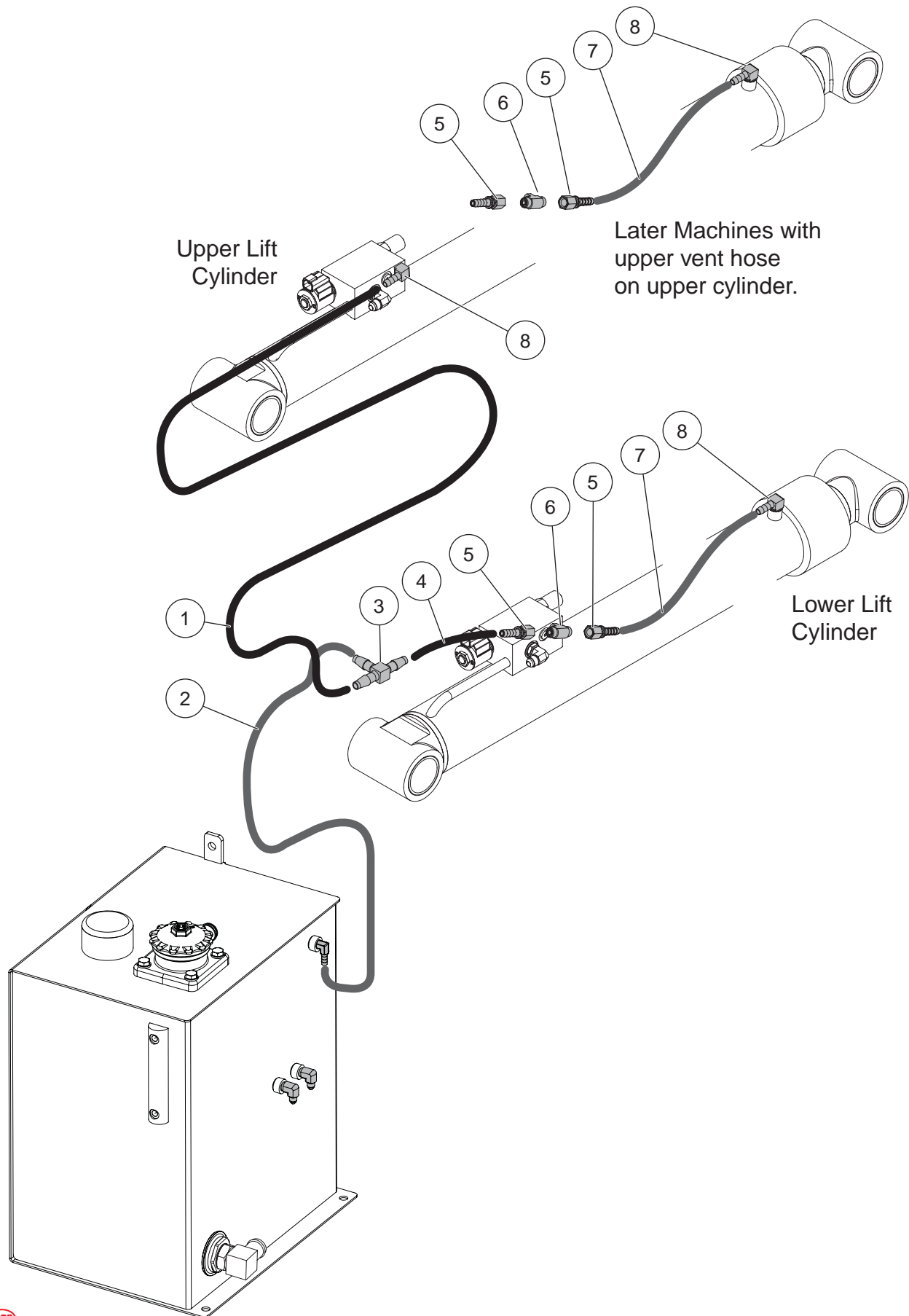


ILLUSTRATION No.
ART_4547

4069

Lift Cylinder Drain, Current Machines

Hoses -- Lift Cylinder Drain, Current Machines

ITEM	PART NUMBER	QTY.	DESCRIPTION
1	50959	as req	Hose, 5/16" Fuel Line
2	50959	as req	Hose, 5/16" Fuel Line
3	51144	1	Fitting, 5/16" Barbed Tee
4	50959	as req	Hose, 5/16" Fuel Line
5	51143	2	Fitting, 5/16" Nipple
6	50905	1	Fitting, MJ-MJ-MPT-5-5-4
7	50959	as req	Hose, 5/16" Fuel Line
8	51142	2	Fitting, 5/16 Barbed 90

Later machines with upper vent hose on upper cylinder

5	51143	4	Fitting, 5/16" Nipple
6	50905	2	Fitting, MJ-MJ-MPT-5-5-4
7	50959	as req	Hose, 5/16" Fuel Line
8	51142	2	Fitting, 5/16 Barbed 90

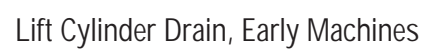


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Hoses -- Lift Cylinder Drain, Early Machines

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52479	1	Hose Assy, 04G-04FJX-04G-04FJX, 322 inches	UPPER VENT
2	52481	1	Hose Assy, 04G-04FJX-04G-04FFORX90S, 198 inches	LOWER VENT
3	50892	1	Fitting, MJ-FJX-MJT-4-4-4	
4	51130	1	Fitting, MJ-MJ-MPT-4-4-4	
5	52480	1	Hose Assy, 04G-04FJX- 04G-04FJX45, 49.5 inches	JUMP VENT
6	50664	3	Fitting, MJ-MP90-4-4	



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

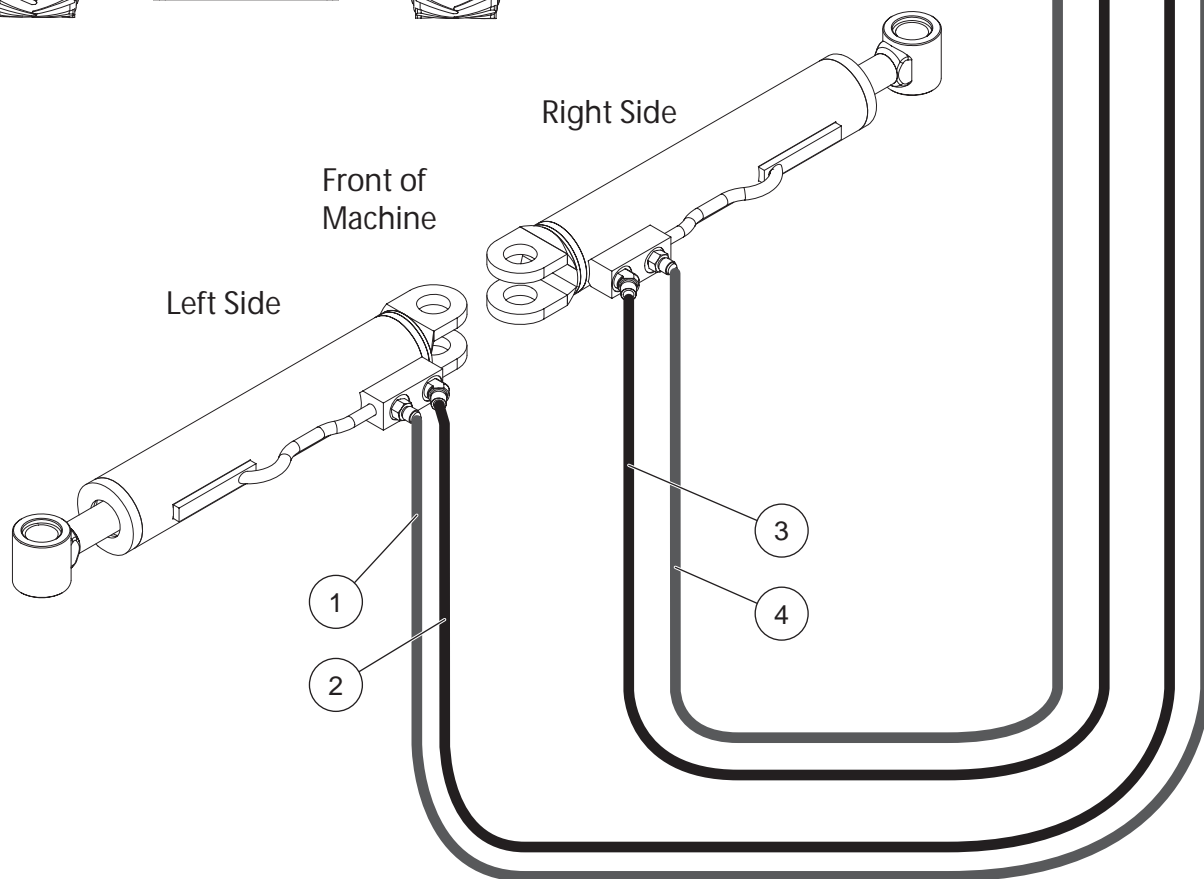
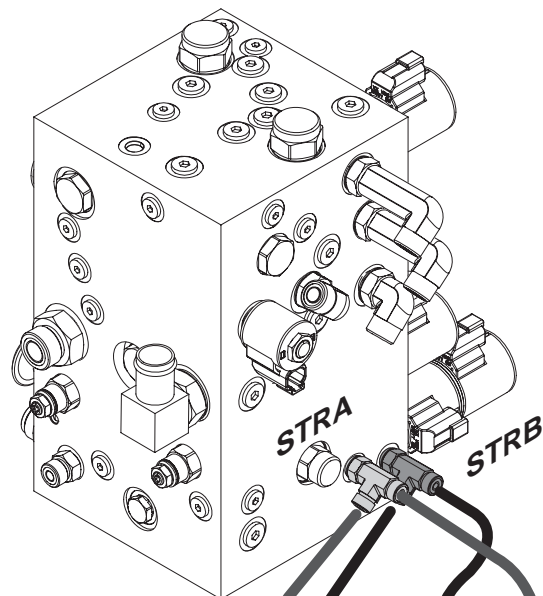
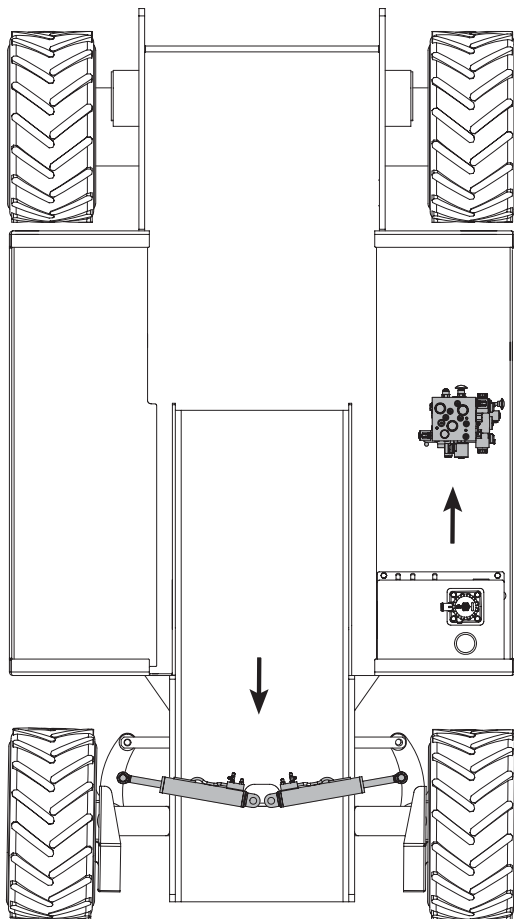


ILLUSTRATION No.
ART_4545

4069

Steer Circuit

Hoses -- Steer Circuit

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52466	1	Hose Assy, 1/4 x 61.5 inch, 04G-04FFORX-04G-04FFORX90S	STL A
2	52460	1	Hose Assy, 1/4 x 60.5 inch, 04G-04FFORX-4G-4FFORX 45	STL B
3	52467	1	Hose Assy, 1/4 x 67 inch, 04G-04FFORX-04G-04FFORX90S	STR-B
4	52459	1	Hose Assy, 1/4 x 67.25 inch, 04G-04FFORX-4G-4FFORX 45	STR A

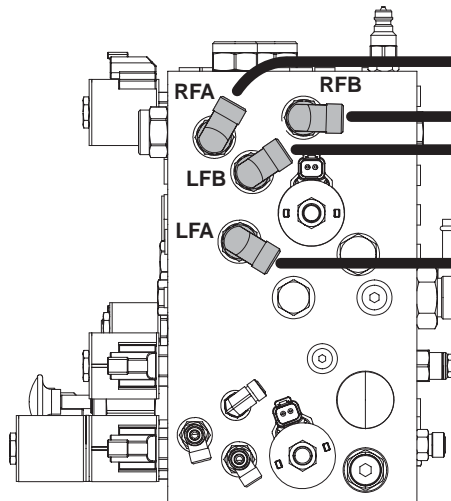
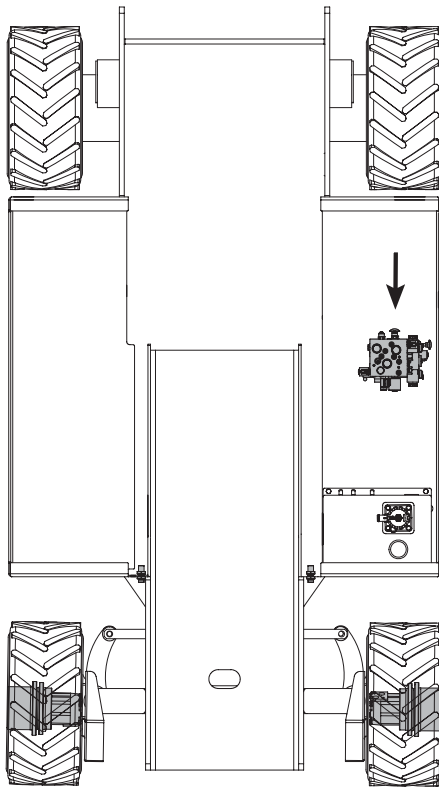


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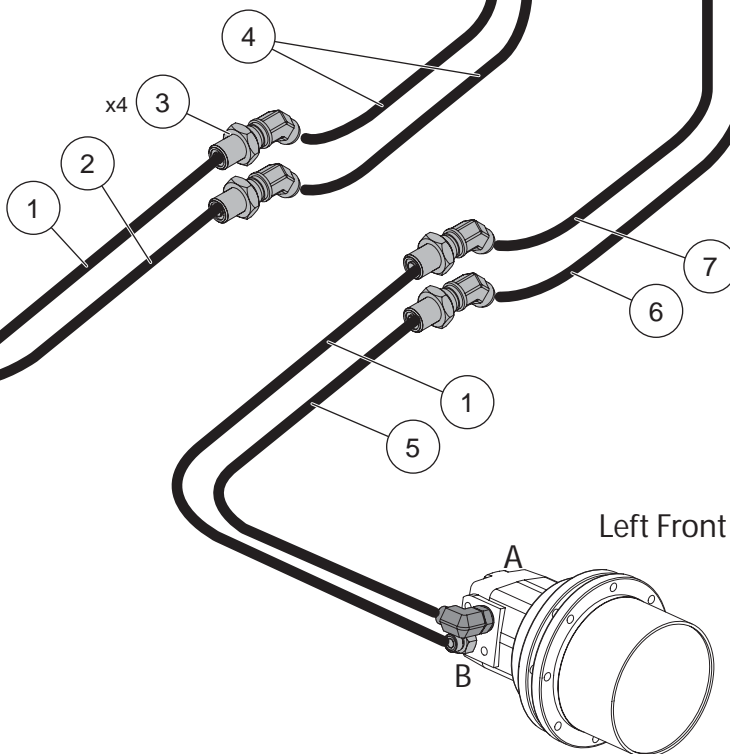
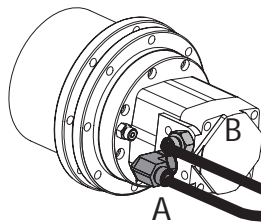
• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Right Front



Left Front

Drive Circuit -- Front Wheels



ILLUSTRATION No.
ART_4548

4069

Hoses -- Drive Circuit, Front Wheels

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52444	2	Hose Assy, 1/2 x 36 inch, 08G-08FFORX -08G-08FFORX90S	D-LF-B-BH/RF-A-BH
2	52445	1	Hose Assy, 1/2 x 33 inch, 08G-08FFORX -08G-08FFORX90S	D-RF-B-BH
3	51112	4	Fitting, MFFOR-MB45-8-8 Bulkhead	
4	52448	2	Hose Assy, 1/2 x 80 inch, 08G-08FFORX -08G-08FFORX	D-RF-B-MF
5	52443	1	Hose Assy, 1/2 x 31.5 inch, 08G-08FFORX -08G-08FFORX90S	D-LF-A-BH
6	52447	1	Hose Assy, 1/2 x 55.5 inch, 08G-08FFORX -08G-08FFORX	D-LF-A-MF
7	52446	1	Hose Assy, 1/2 x 55.5 inch, 08G-08FFORX -08G-08FFORX45S	D-LF-B-MF



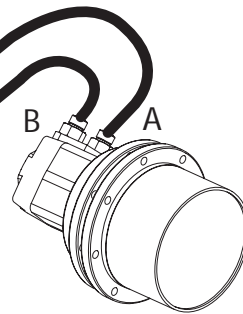
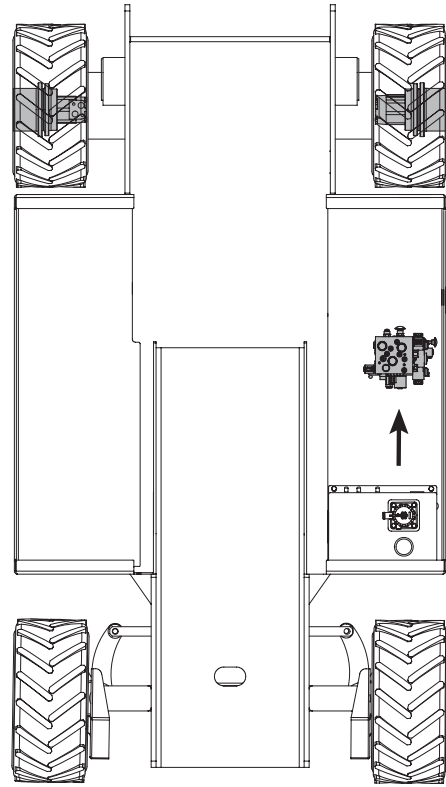
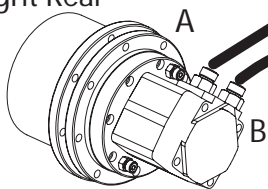
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• NS: Not a Stock item

• REF: Reference only

Right Rear



Left Rear

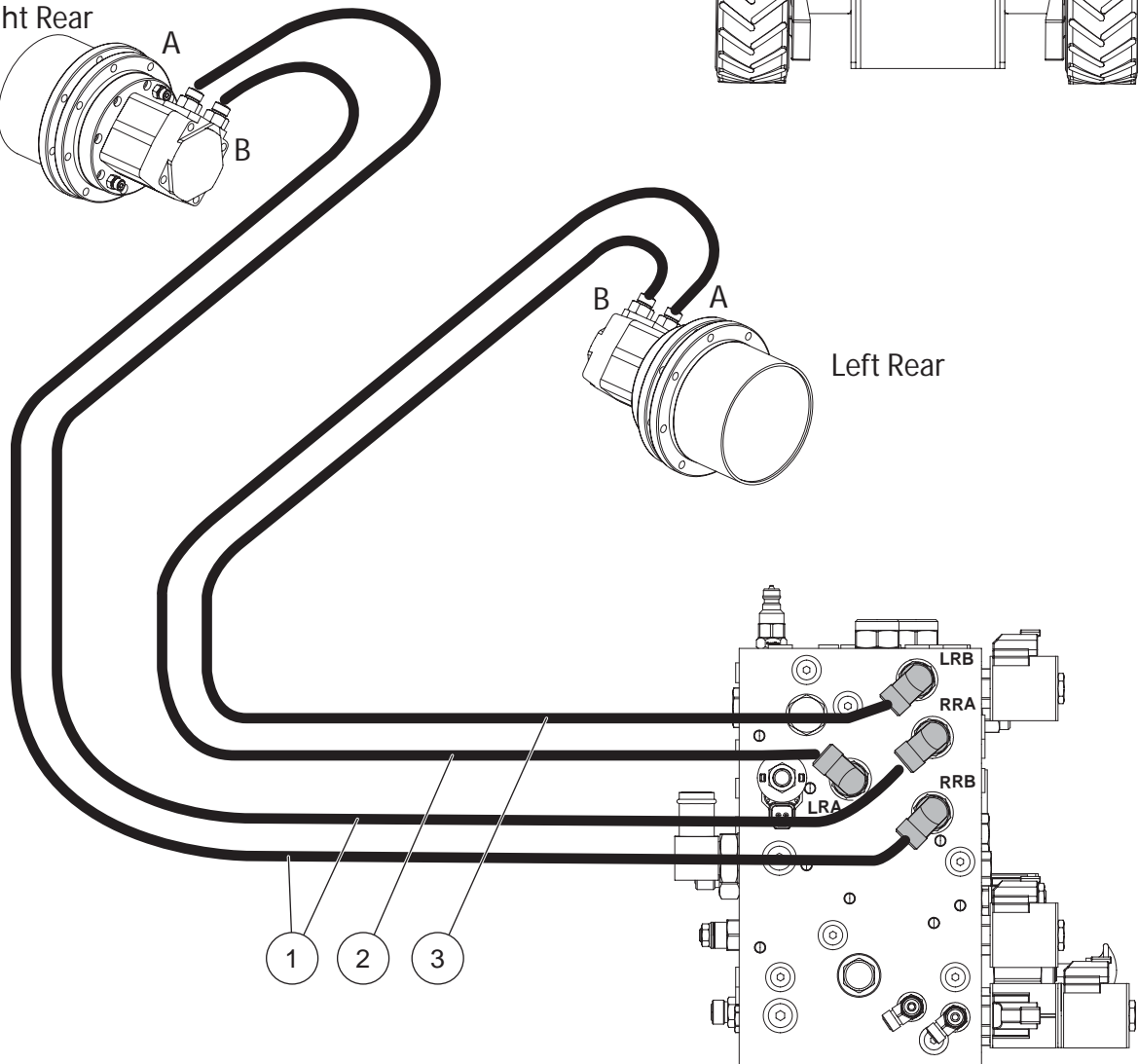


ILLUSTRATION No.
ART_4549

4069

Drive Circuit -- Rear Wheels

Hoses -- Drive Circuit, Rear Wheels

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52442	2	Hose Assy, 1/2 x 90 inch, 08G-08FFORX -08G-08FFORX90S	D-RR-A/B
2	52440	1	Hose Assy, 1/2 x 66 inch, 08G-08FFORX -08G-08FFORX90S	D-LR-A
3	52441	1	Hose Assy, 1/2 x 67 inch, 08G-08FFORX -08G-08FFORX90S	D-LR-B



• as req: as required

• INCL: Included with assembly

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• REF: Reference only

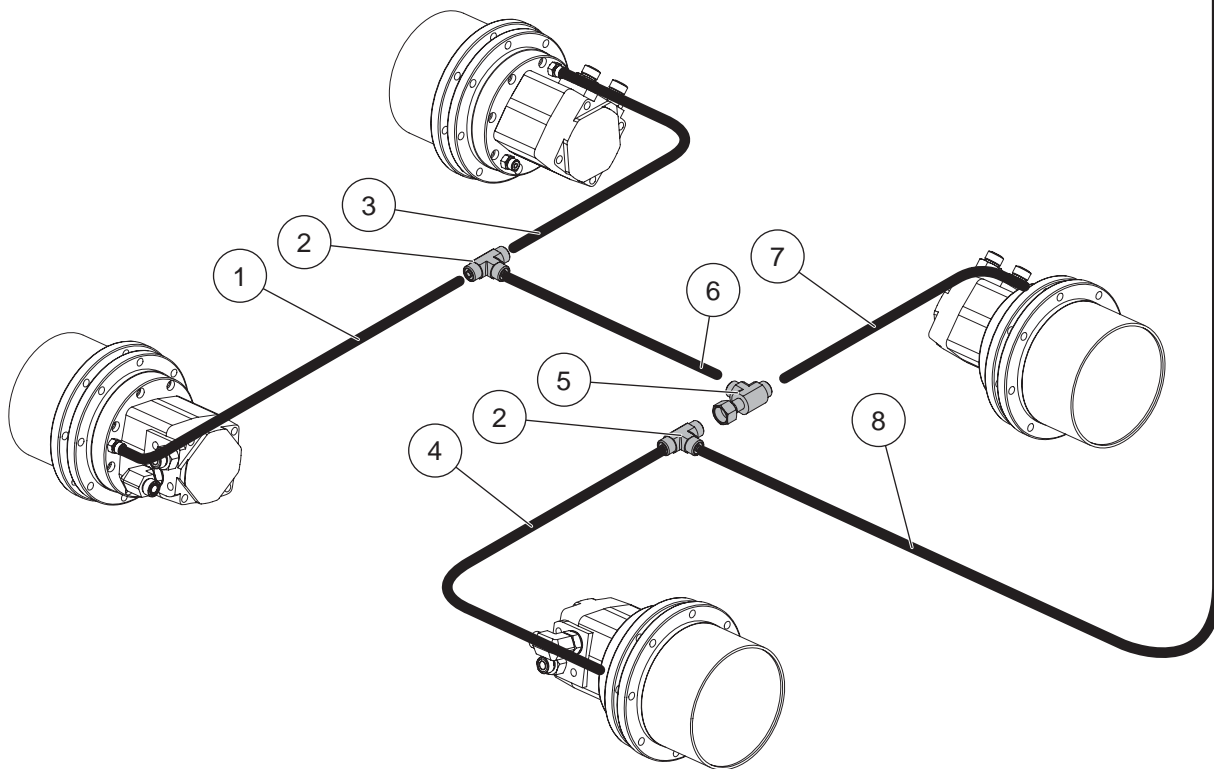
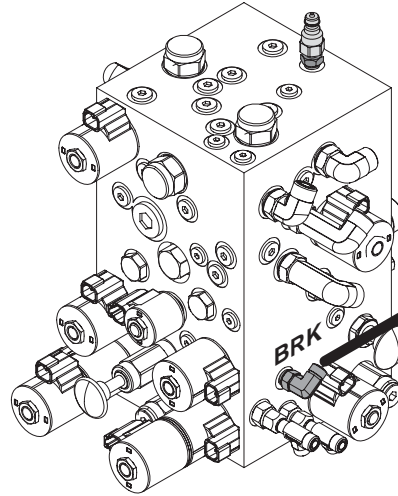
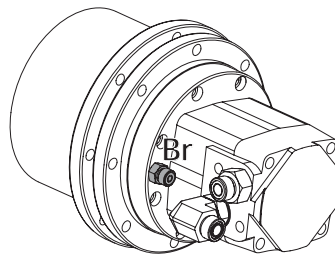
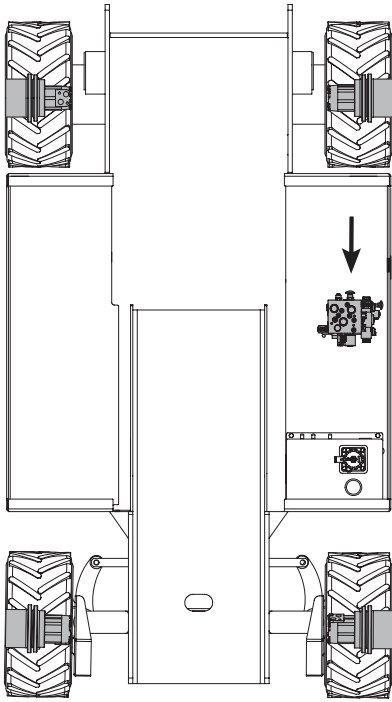


ILLUSTRATION No.
ART_4550

4069

Brake Circuit

Hoses -- Brake Circuit

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52462	1	Hose Assy, 1/4 x 79 inch, 04G-04FFORX-4G-4FFORX 45	RF-BRK
2	50878	2	Fitting, MFFORT-4	
3	52464	1	Hose Assy, 1/4 x 45 inch, 04G-04FFORX-4G-4FFORX 45	RR-BRK
4	52461	1	Hose Assy, 1/4 x 73.5 inch, 04G-04FFORX-4G-4FFORX 45	LF-BRK
5	50864	1	Fitting, MFFOR-MFFOR-FFORX-4	
6	52468	1	Hose Assy, 1/4 x 30 inch, 04G-04FFORX-04G-04FFORX90S	R-BRK-CROSS
7	52463	1	Hose Assy, 1/4 x 48.5 inch, 04G-04FFORX-4G-4FFORX 45	LR-BRK
8	52465	1	Hose Assy, 1/4 x 22 inch, 04G-04FFORX-4G-4FFORX 45	MF-T-BRK



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

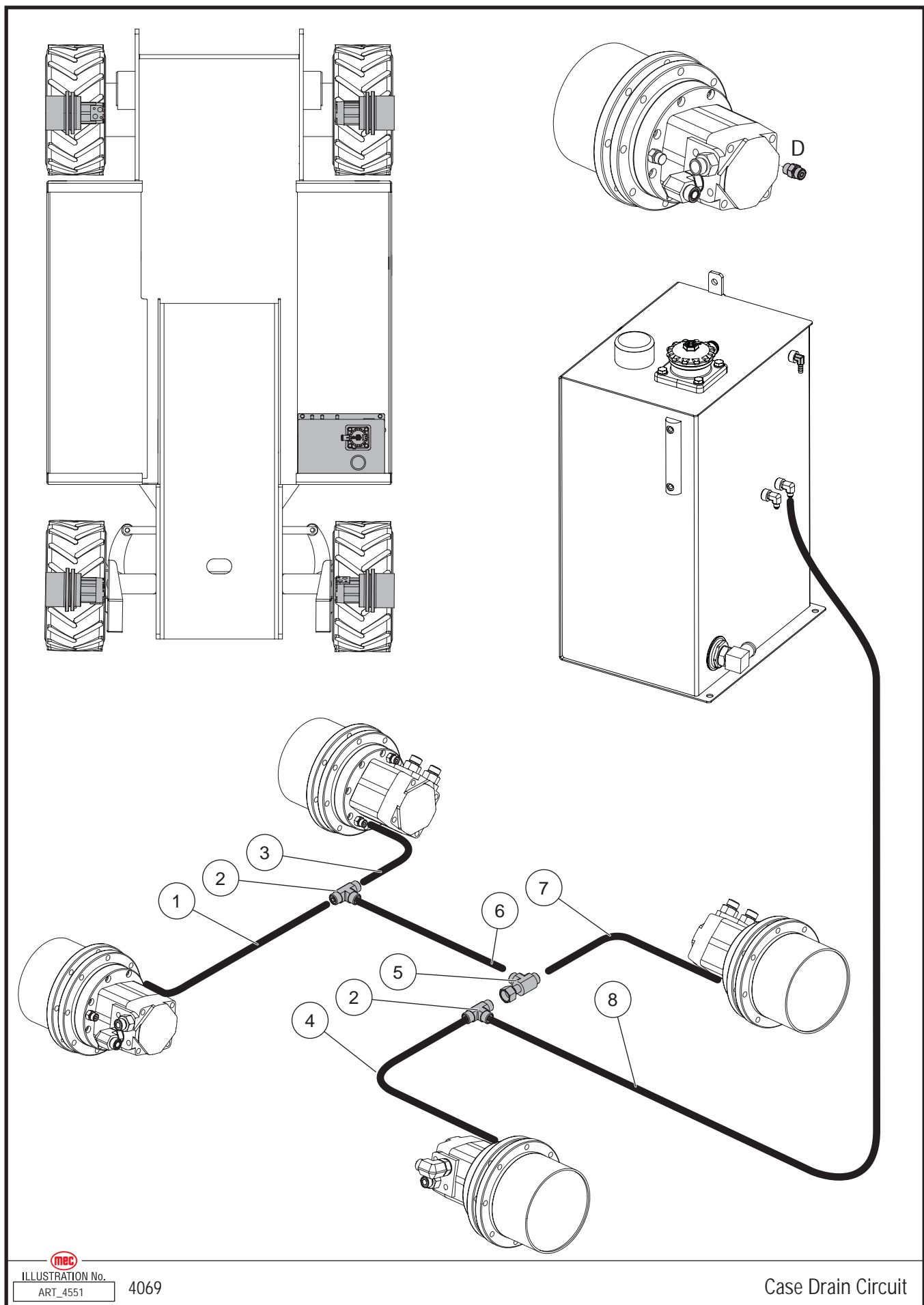


ILLUSTRATION No.
ART_4551

4069

Case Drain Circuit

Hoses -- Case Drain Circuit

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52454	1	Hose Assy, 1/4 x 84.5 inch, 04G-04FFORX-04G-04FFORX	RF-CD
2	50878	2	Fitting, MFFORT-4	
3	52455	1	Hose Assy, 1/4 x 39 inch, 04G-04FFORX-04G-04FFORX	RR-CD
4	52452	1	Hose Assy, 1/4 x 65 inch, 04G-04FFORX-04G-04FFORX	LF-CD
5	50864	1	Fitting, MFFOR-MFFOR-FFORX-4	
6	52469	1	Hose Assy, 1/4 x 44 inch, 04G-04FFORX-04G-04FFORX90S	T-CD
7	52453	1	Hose Assy, 1/4 x 59 inch, 04G-04FFORX-04G-04FFORX	LR-CD
8	52470	1	Hose Assy, 1/4 x 18.25 inch, 04G-04FFORX-04G-04FFORX90S	TNK-CD



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

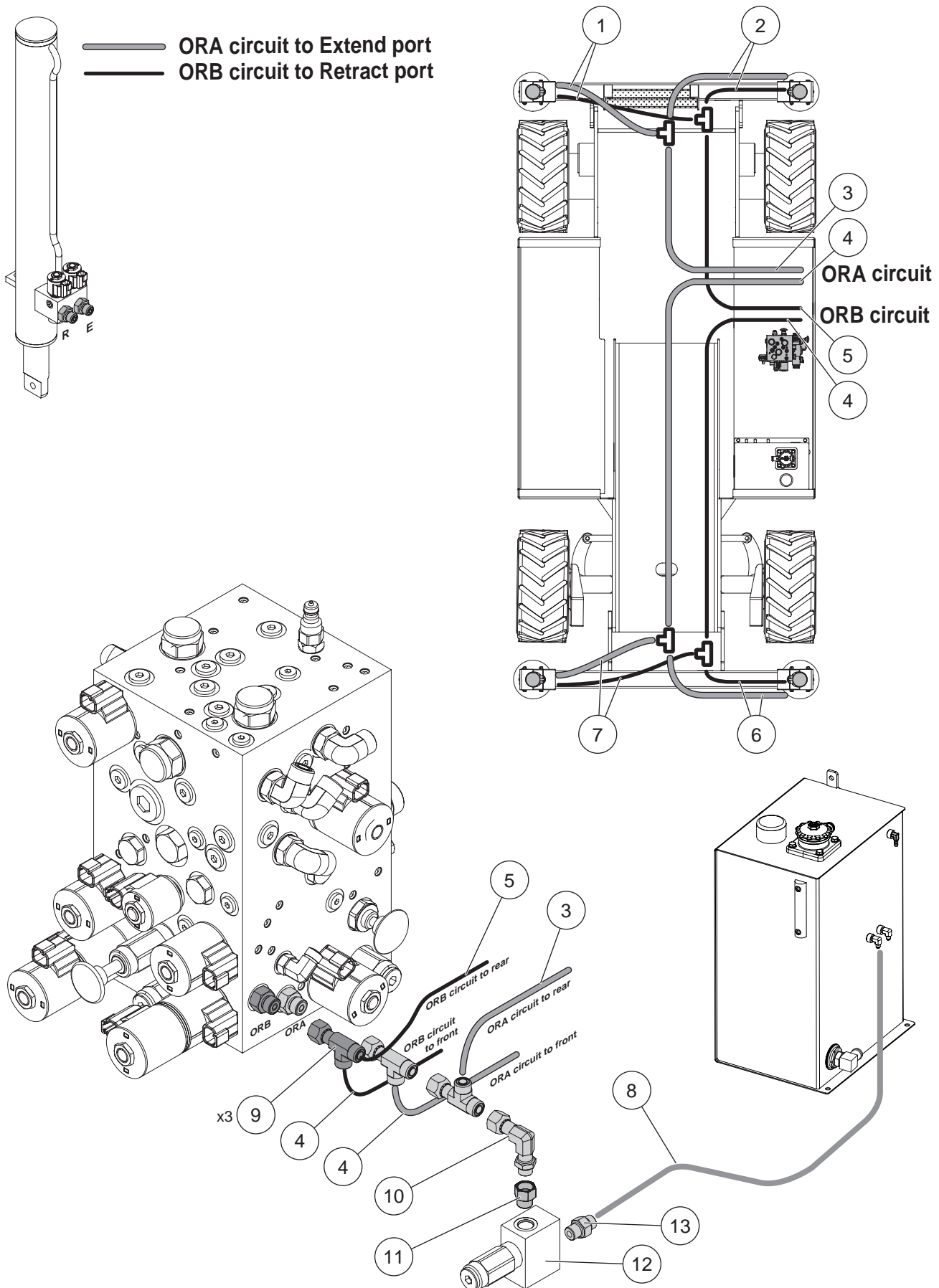


ILLUSTRATION No.
 ART_4552

4069

OPTION -- Outrigger Circuit

Hoses -- Outrigger Circuit

ITEM	PART NUMBER	QTY.	DESCRIPTION	HOSE NAME
1	52474	2	Hose Assy, 1/4 x 43.75 inch, 04G-04FFORX-04G-04FFORX90S	ORR-R-A/B
2	52458	2	Hose Assy, 1/4 x 17.5 inch, 04G-04FFORX-04G-04FFORX	ORR-L-A/B
3	52472	1	Hose Assy, 1/4 x 59 inch, 04G-04FFORX-04G-04FFORX90S	ORR-A
4	52456	2	Hose Assy, 1/4 x 86 inch, 04G-04FFORX-04G-04FFORX	ORF-B/A
5	52471	1	Hose Assy, 1/4 x 61.25 inch, 04G-04FFORX-04G-04FFORX90S	ORR-B
6	52457	2	Hose Assy, 1/4 x 20.5 inch, 04G-04FFORX-04G-04FFORX	ORF-L-A/B
7	52473	2	Hose Assy, 1/4 x 40 inch, 04G-04FFORX-04G-04FFORX90S	ORF-R-A/B
8		1	Hose Assy, 1/4 x 6 inch, 04G-04FFORX-04G-04FFORX90S	OR RET
9	50809	3	Fitting, MFFOR-FFORX-MFFOR-4	
10	51074	1	Fitting, FFORX-MB90-4-4	
11	51137	1	Fitting, MB-FB-6-4	
12	93288	1	Relief Valve Assembly	
13	51127	1	Fitting, MB-MFFOR-6-4	



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

NOTES:



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

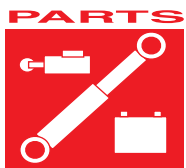


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• REF: Reference only



SECTION F

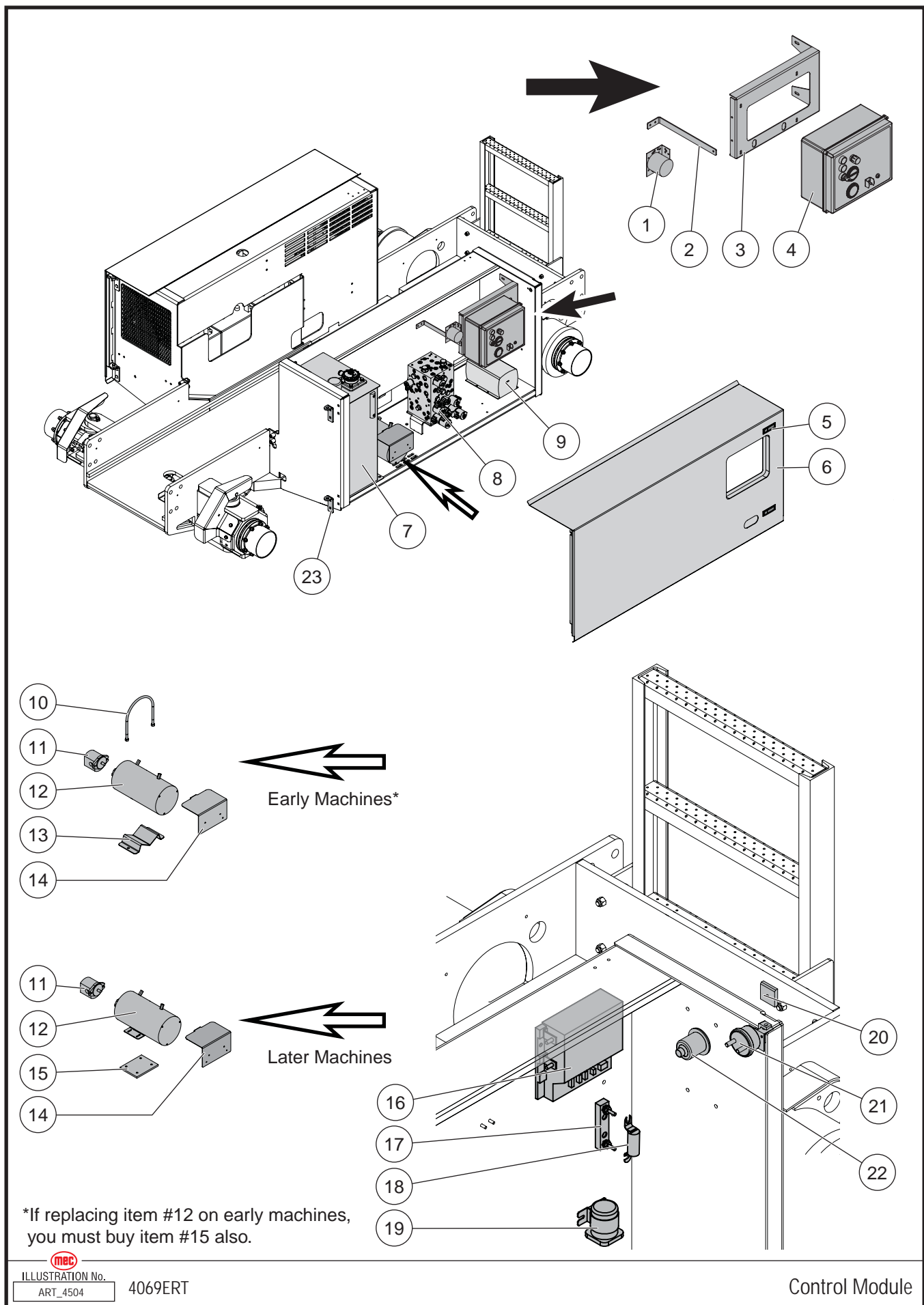
BASE

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Battery Module	F-5
Counterweight Assembly	F-7
Ladders	F-9
OPTION -- Outriggers	F-11





Control Module

ITEM	PART NO.	QTY	DESCRIPTION
1	91539	1	Alarm
2	21462	1	Brace
3	19271	1	Bracket
4	REF	1	Lower Controls -- See Section A
5	8386	1	Door Latch
6	21333	1	Controls Module Door
7	REF	1	Hydraulic Tank -- See Section E
8	REF	1	Functions Manifold -- See Section E
9	91633	1	Battery Charger
10	93111	1	U-Bolt
11	REF	1	Hydraulic Pump -- See Section E
12	93081*	1	Electric Motor, 48v DC
13	21469	1	Motor Bracket
14	21486	1	Splash Guard
15	21484	1	Spacer
16	91658	1	P600 Motor Controller
17	19471	1	Fuse Holder
18	91709	1	300 Amp Fuse
19	91745	1	Contact, 48v
20	14896	1	Door Slide Block
21	8841	1	Switch, Battery Cutoff
22	90749	1	Plug, Power To Platform
23	24146	2	Door Mount

*If replacing item #12 on early machines, you must buy item #15 also.



• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only

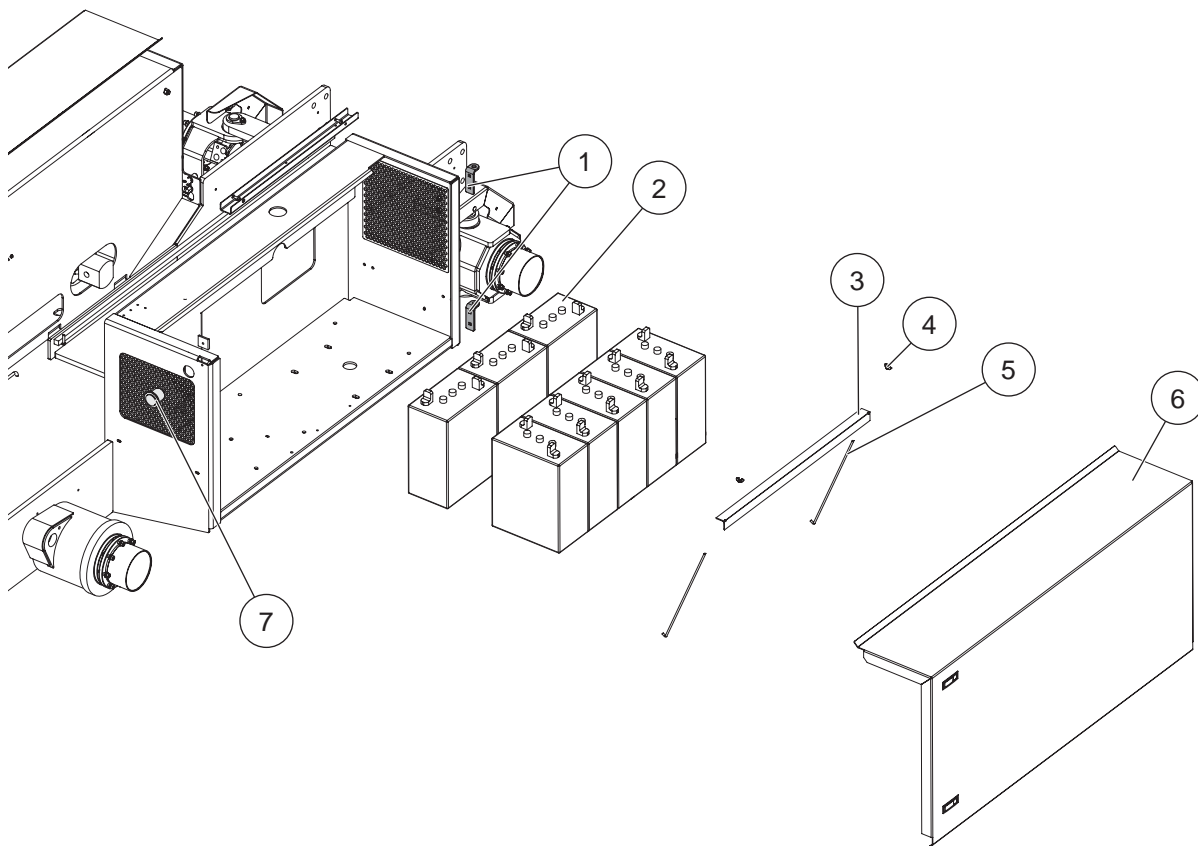


ILLUSTRATION No.
ART_4505

4069ERT

Battery Module

Battery Module

ITEM	PART NO.	QTY	DESCRIPTION
1	24146	2	Door Mount
2	91641	8	Battery, 375aH UL16
3	21376	1	Battery Bracket
4	HDW6110	2	Wing Nut, 1/4-20
5	92976	2	J-Bolt
6	89024	1	Door Assembly
--	8386	--	Door Latch
7	90749	1	Plug, Power To Platform

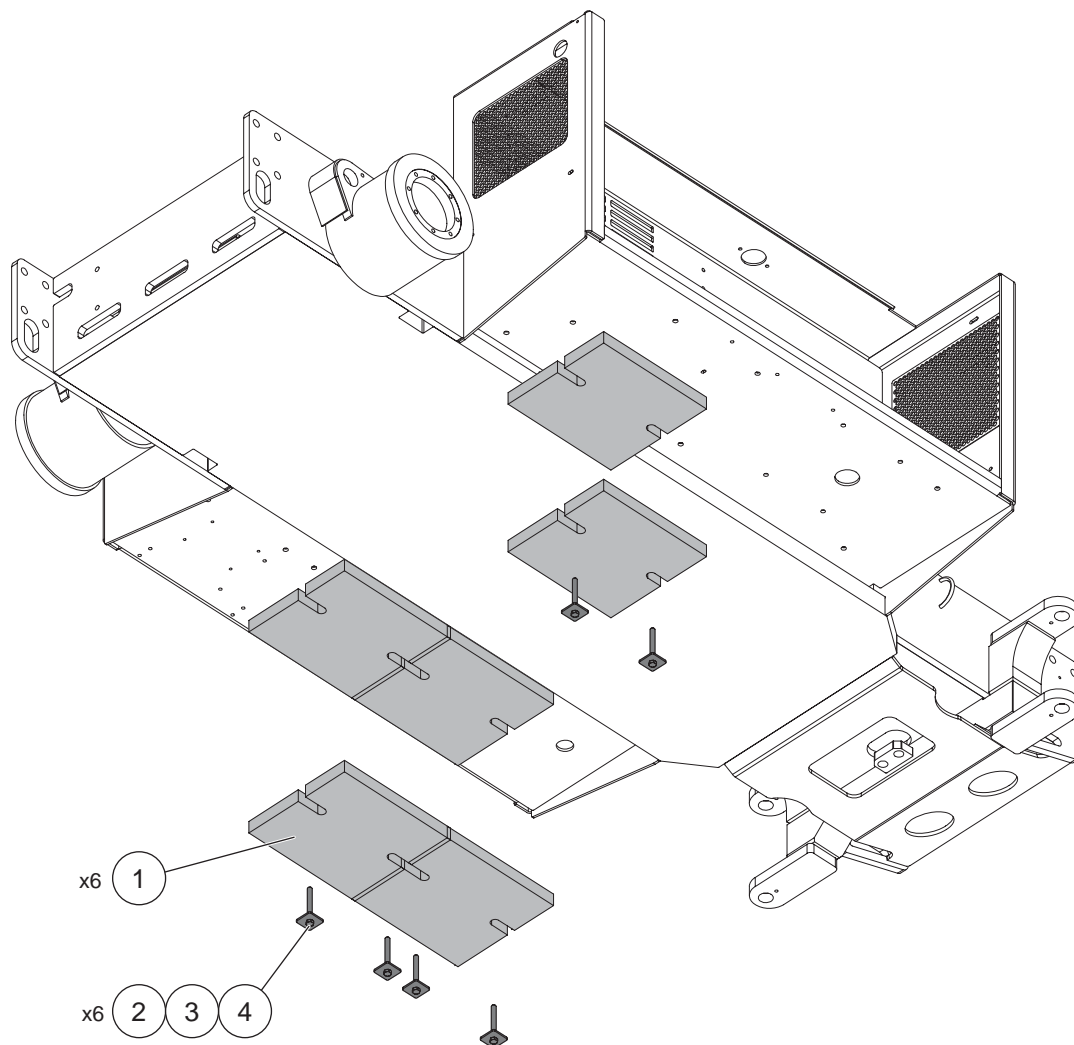


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• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



Counterweight not used on machines
equipped with optional outriggers.

Counterweight Assembly



ILLUSTRATION No.
ART_4506

4069ERT

Counterweight Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	15140*	6	Ballast Plate
2	50250	6/12	Bolt, M12 x 110
3	50417	6/12	Washer, Square, 5/8 x 3/16 x 2
4	50054	6/12	Nut, M12 Nylock

Counterweight not used on machines equipped with optional outriggers.

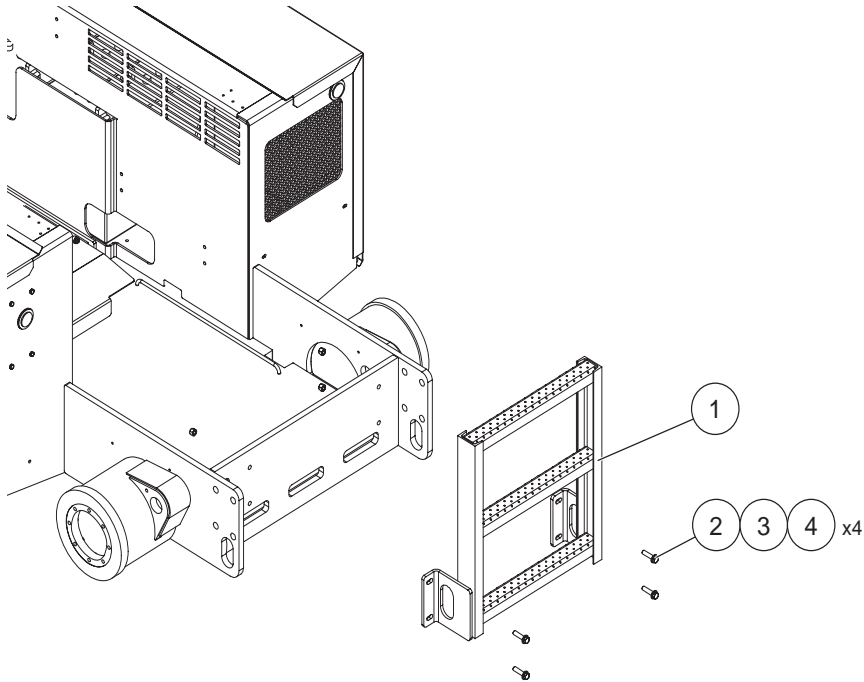


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• NS: Not a Stock item

• REF: Reference only



Standard Machines without Outriggers

Machines with optional GSE Platforms

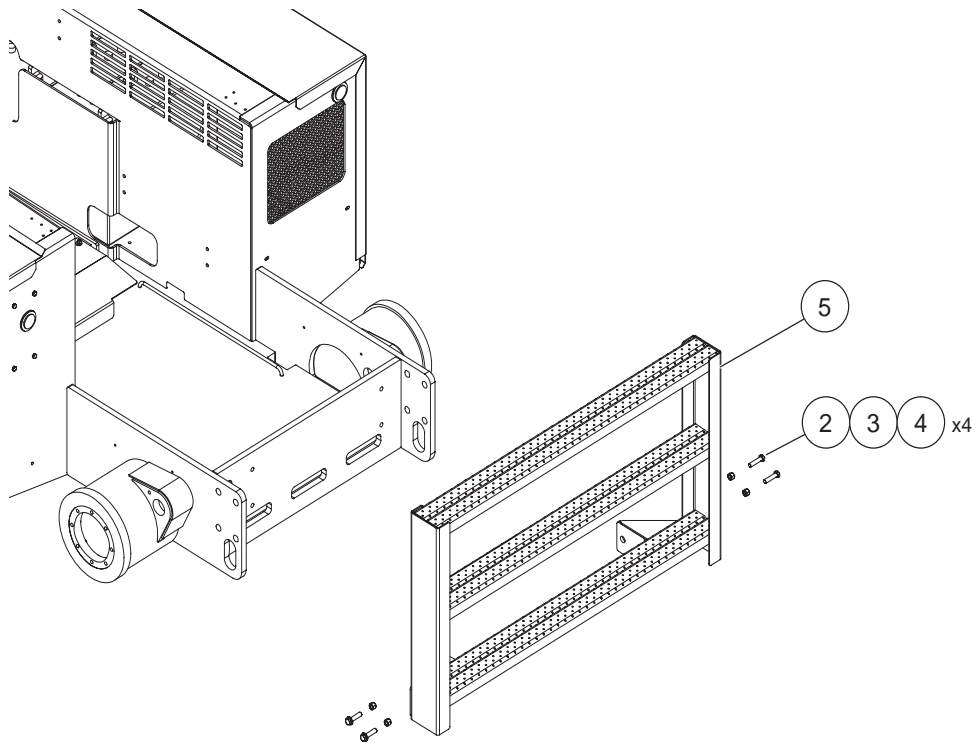


ILLUSTRATION No.
ART_4453

4069

Ladders

Ladders

ITEM	PART NO.	QTY	DESCRIPTION
1	21338	1	Ladder Weldment, Standard
2	50250	4	Bolt, M12 x 50
3	50003	4	Washer, M12 Std
4	50050	4	Nut, M12 Nylock
5	21533	1	Ladder Weldment, GSE Option

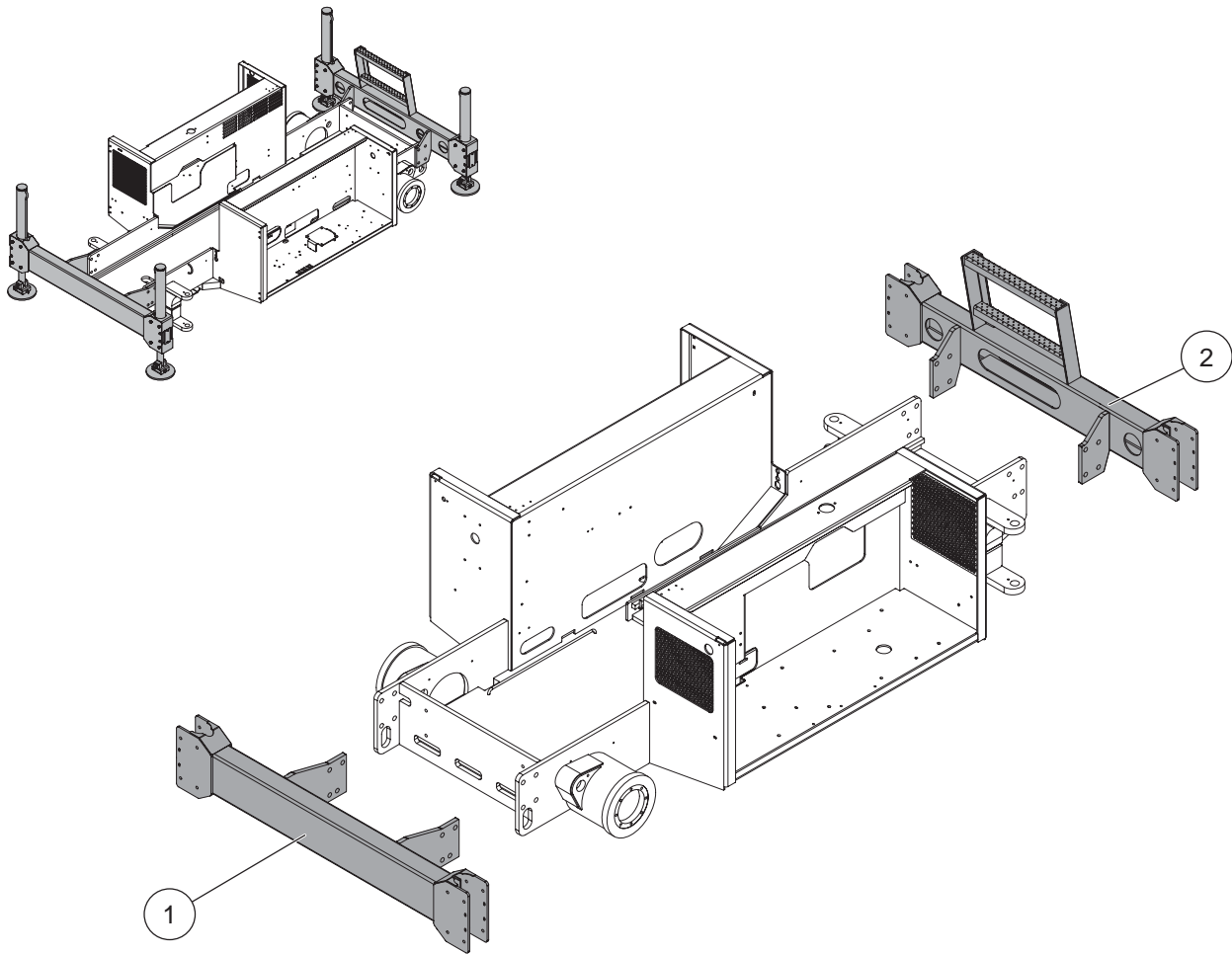


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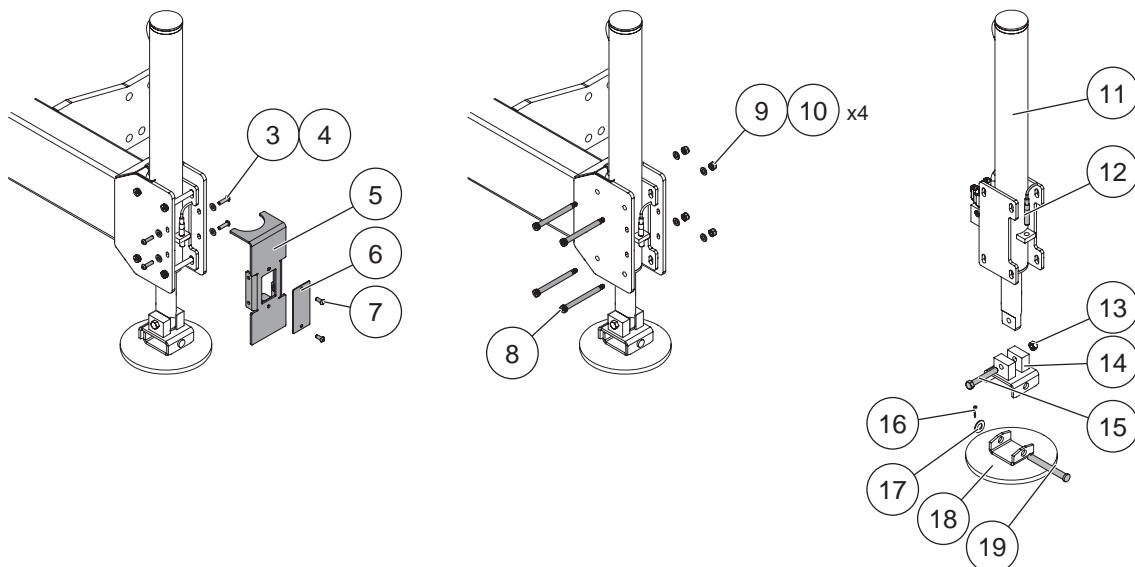
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• NS: Not a Stock item

• REF: Reference only



Each Outrigger



meC
ILLUSTRATION No. 4069
ART_4452

OPTION -- Outriggers

OPTION -- Outriggers

ITEM	PART NO.	QTY	DESCRIPTION
1	21428	1	Front Outrigger Weldment
2	21429	1	Standard Machine -- Rear Outrigger Weldment
	21681	1	Centered Platform Option -- Rear Outrigger Weldment
3	50416	16	Bolt, M8 x 25 Button Head
4	50001	16	Washer, M8 Std.
5	21444	4	Outrigger Cover Weldment
6	21436	4	Outrigger Cover Plate
7	50415	8	Bolt, M8 x 20 Button Head
8	50446	16	Bolt, M12 x 120 Socket Head
9	50003	16	Washer, M12 Std
10	50050	16	Nut, M12 Nylock
11	REF	--	Outrigger Cylinder -- See Section E
12	92934	4	Proximity Sensor
13	HDW8457	4	Nut, 1/2 Nylock
14	20998	4	Outrigger Pivot Bracket
15	50074	4	Bolt, 1/2 x 3.5
16	HDW5920	4	Cotter pin, .120 x 1.00
17	HDW9219	4	Washer, 5/8 Std.
18	21477	4	Outrigger Foot Pad
19	HDW91395	4	Clevis Pin, 5/8 x 5



• as req: as required

• INCL: Included with assembly

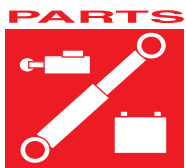
• NS: Not a Stock item

• REF: Reference only

Wiring Harness Components

Harness plug designations (J#) and components listed in parentheses correspond to locations listed on the Electrical Schematics. See Section 5 of the Service portion of this manual.

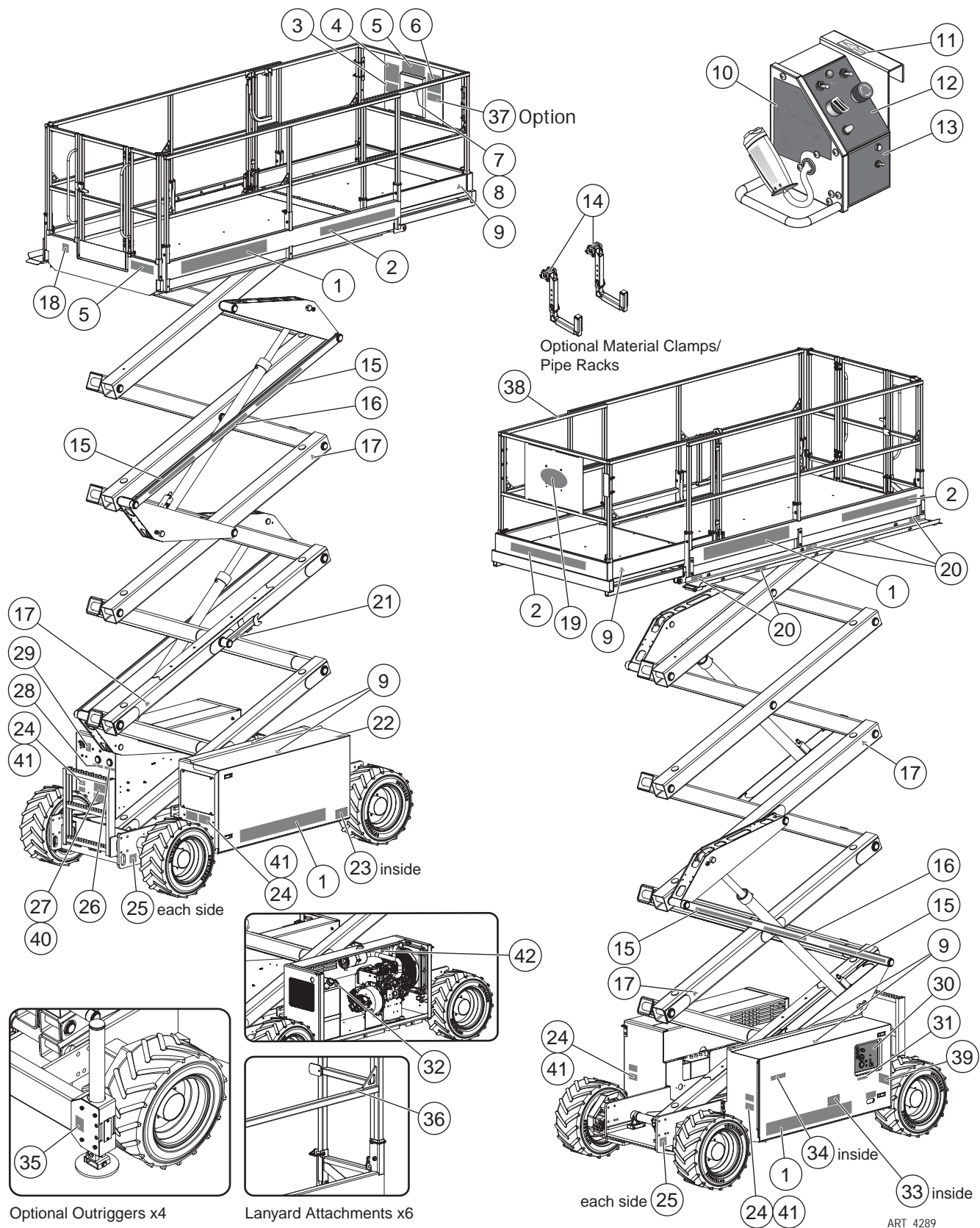
ITEM	PART NO.	QTY	DESCRIPTION
1	21678	1	Harness, Lower Control Box Interior (Interior of Lower Control Box, J1, J2)
2	--	--	--
3	21679	1	Harness, Main Chassis (J1, J3, J4, J5, J6, J7, Functions Manifold)
4	--	--	--
5	21623	1	Harness, Communication Cable (J4, J8)
6	91780	1	Harness, Platform (J8, J9)
7	91761	1	Harness, Upper Control Box Interior
8	9441	71 ft.	Cable, Power To Platform (Plug at rear of Controls Module, Outlet at platform) This length also used to power platform worklights
	93251	75 ft.	Cable, Power To Platform, Arctic (Plug at rear of Controls Module, Outlet at platform)
9	21633	1	Elevating Assembly Harness (J5, Transducers, Down Valves)
10	21631	1	OPTION -- Outrigger Harness (J6, J7, Outriggers)
11	91293	1	Harness, Joystick



SECTION G

DECALS, ANSI MODELS

CONTENTS	PAGE
Decals, ANSI Specification	G-3



Decals, ANSI Specification

ITEM	PART NO.	QTY	DESCRIPTION
1	93209	4	Decal, 4069ERT White
2	92416	3	Decal, Website White
	92547	3	Decal, Website Gray
3	90730	1	Decal, Platform Warning
4	90721	1	Decal, Danger
5	93059	2	Decal, Platform Capacity
6	90722	1	Decal, Warning
7	8911	1	Decal, Manual Inside
8	90718	1	Decal, Inspection
9	91850	6	Decal, Crush
10	90729	1	Decal, Control Handle
11	7156	1	Decal, Front
12	93058	1	Decal, Upper Controls
13	91730	1	Decal, Outrigger
14	92848	2	Decal, Pipe Rack
15	7982	4	Decal, Warning Stripe
16	8503	2	Decal, Keep Clear
17	9910	4	Decal, Pinch
18	90739	1	Decal, Made in USA
19	90719	1	Decal, MEC Oval, White
	93412	1	Decal, MEC Oval, Gray
20	93051	5	Decal, Material Rack Capacity
21	90717	1	Decal, Maintenance Lock
22	8779	1	Decal, Battery Explosion Hazard
23	90726	1	Decal, Battery Weight
24	90725	4	Decal, Tires
25	11026730	4	Decal, Tie Down
26	90751	1	Decal, Power To Platform
27	92767	1	Decal, Serial Plate
28	90750	1	Decal, Battery Charger
29	9052	1	Decal, Battery Disconnect
30	92013	1	Decal, Lower Controls
31	90268	1	Decal, Platform Capacity Small
32	91956	1	Decal, Battery Charger
33	92089	1	Decal, Brake Release
34	6873	1	Decal, Hydraulic Oil
35	9465	4	Decal, Crush
36	8605	6	Decal, Lanyard Point
37	8606	1	Decal, Lanyard Warning
38	7155	1	Decal, Locate
39	90732	1	Decal, Powerwash
40	92054	1	Decal, Patents Pending
41	8502	4	Decal, Inflate Tires

• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

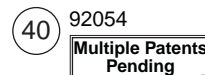
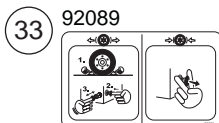
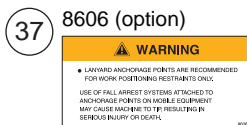
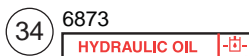
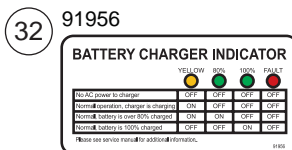
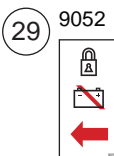
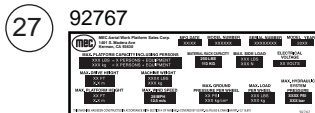
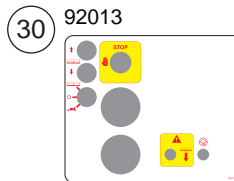
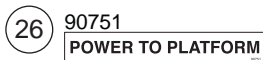
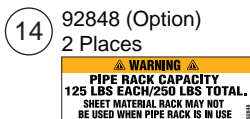
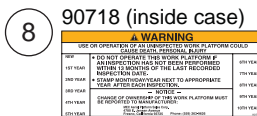
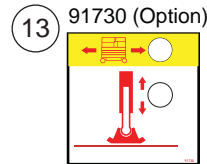
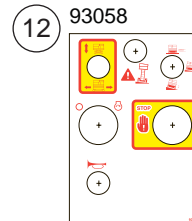
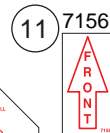
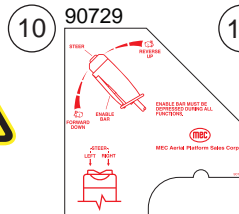
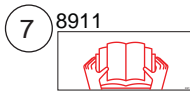
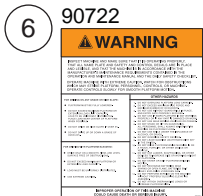
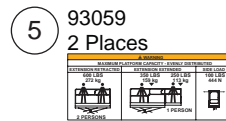
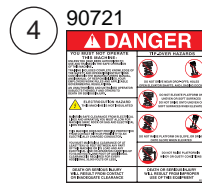
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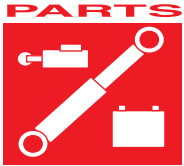


1 93052
4 Places

mec 4069 ERT

2 92416
3 Places
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SECTION H

DECALS, CE MODELS

CONTENTS	PAGE
Decals, CE Specification	H-3
Decals, GSE Diesel Option, CE Specification.	H-7

Decals, CE Specification

ITEM	PART NO.	QTY	DESCRIPTION
1	93052	4	Decal, 4069ERT White
2	92416	3	Decal, Website White
	92547	3	Decal, Website Gray
3	90730	1	Decal, Platform Warning
4	90721	1	Decal, Danger
5	93204	2	Decal, Platform Capacity
6	90722	1	Decal, Warning
7	8911	1	Decal, Manual Inside
8	--	--	--
9	91850	6	Decal, Crush
10	90729	1	Decal, Control Handle
11	7156	1	Decal, Front
12	93187	1	Decal, Upper Controls
13	91730	1	Decal, Outrigger
14	92848	2	Decal, Pipe Rack
15	7982	4	Decal, Warning Stripe
16	8503	2	Decal, Keep Clear
17	9910	4	Decal, Pinch
18	90739	1	Decal, Made in USA
19	90719	1	Decal, MEC Oval, White
	93412	1	Decal, MEC Oval, Gray
20	93205	5	Decal, Material Rack Capacity
21	90717	1	Decal, Maintenance Lock
22	8779	1	Decal, Battery Explosion Hazard
23	90726	1	Decal, Battery Weight
24	90725	4	Decal, Tires
25	11026730	4	Decal, Tie Down
26	90751	1	Decal, Power To Platform
27	92768	1	Decal, Serial Plate
28	90750	1	Decal, Battery Charger
29	9052	1	Decal, Battery Disconnect
30	92013	1	Decal, Lower Controls
31	90268	1	Decal, Platform Capacity Small
32	91956	1	Decal, Battery Charger
33	92089	1	Decal, Brake Release
34	6873	1	Decal, Hydraulic Oil
35	9465	4	Decal, Crush
36	8605	6	Decal, Lanyard Point
37	8606	1	Decal, Lanyard Warning
38	7155	1	Decal, Locate
39	90732	1	Decal, Powerwash
40	92054	1	Decal, Patents Pending
41	93186	4	Decal, Wheel Load
42	92769	2	Decal, No Step
43	93188	4	Decal, Outrigger Load
44	91325	1	Decal, Danger Electrical (Australia only)
45	7982	4	Decal, Warning Stripe (cut short to fit positions shown)

• as req: as required

• INCL: Included with assembly

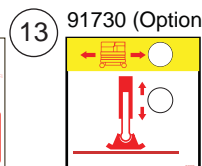
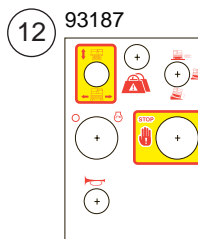
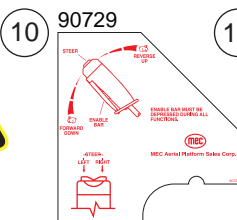
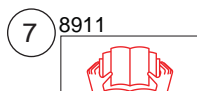
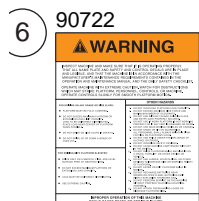
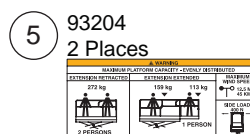
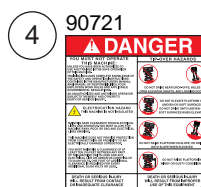
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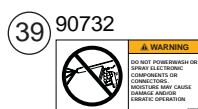
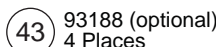
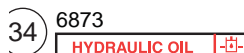
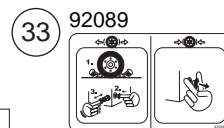
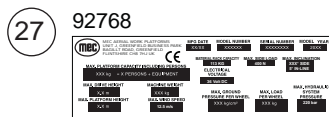
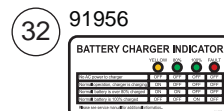
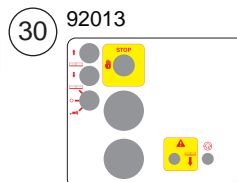
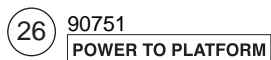
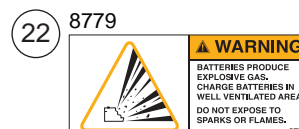
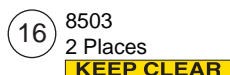
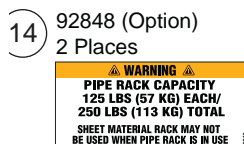


1 93052 -- 4 Places mec 4069 ERT

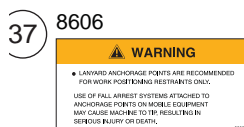
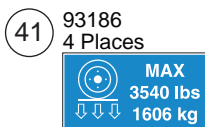
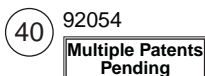
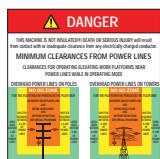
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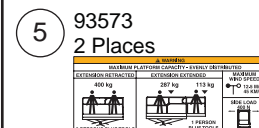
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44 91325 Australia only



Optional Centered Platform



Option omits items
#14, #20, #42

ILLUSTRATION No.
ART_4314

NOTES:

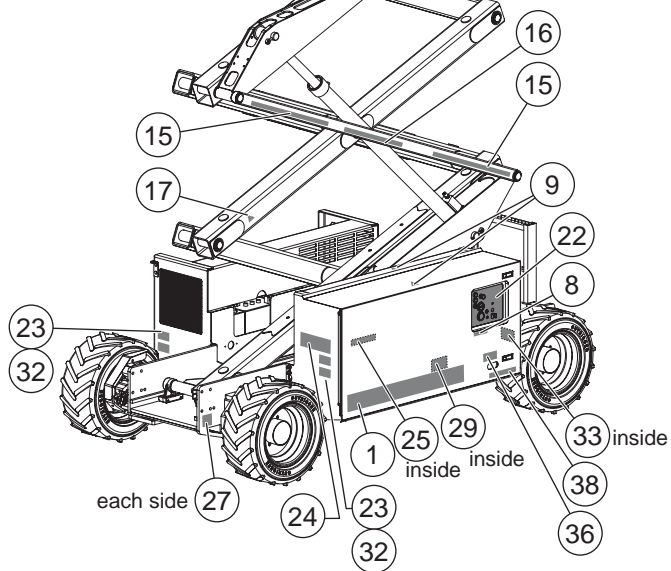
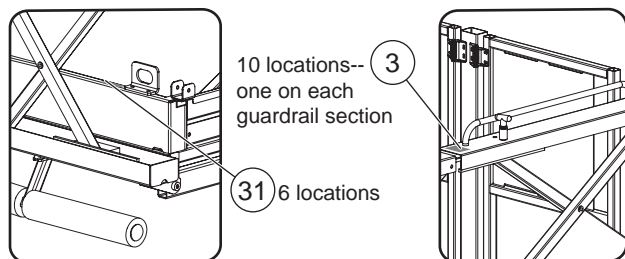
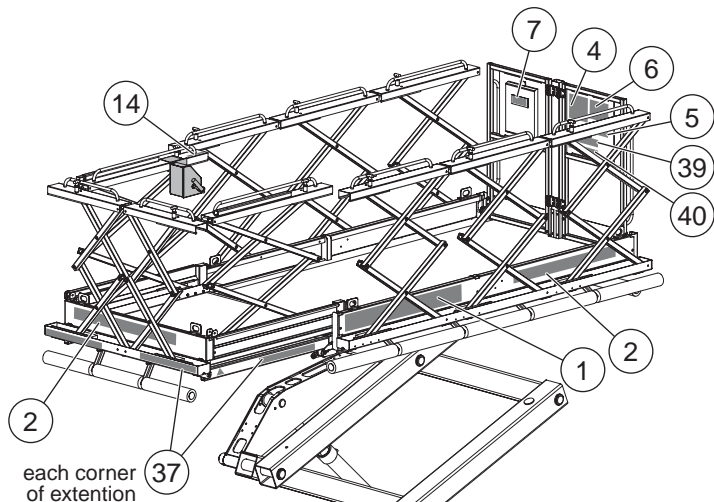
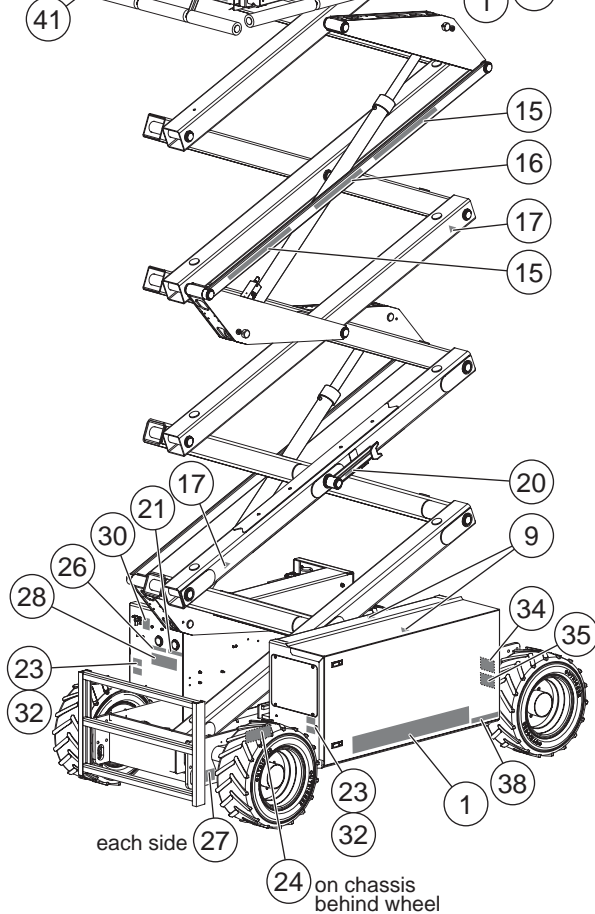
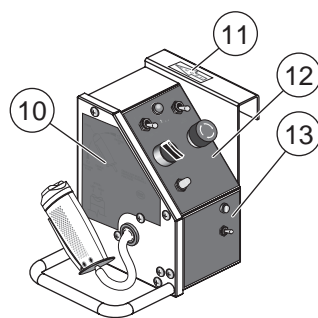
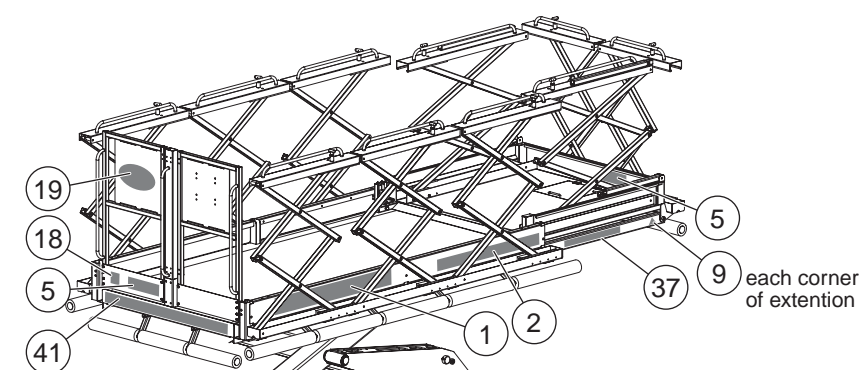


• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



ART_4437

Decals, GSE ELECTRIC Option, CE Specification

ITEM	PART NO.	QTY	DESCRIPTION
1	93403	4	Decal, 4069GSE Gray
2	92547	3	Decal, Website Gray
3	93370	10	Decal, Guardrail Pins
4	90721	1	Decal, Danger
5	93361	2	Decal, Platform Capacity 4069GSE
6	90722	1	Decal, Warning
7	8911	1	Decal, Manual Inside
8	93404	1	Decal, Platform Capacity Small
9	91850	6	Decal, Crush
10	90729	1	Decal, Control Handle
11	7156	1	Decal, Front
12	93187	1	Decal, Upper Controls
13	93214	1	Decal, Lights
14	7155	1	Decal, Locate
15	7982	4	Decal, Warning Stripe
16	8503	2	Decal, Keep Clear
17	9910	4	Decal, Pinch
18	90739	1	Decal, Made in USA
19	93412	1	Decal, MEC Oval, Gray
20	90717	1	Decal, Maintenance Lock
21	90751	1	Decal, Power To Platform
22	92013	1	Decal, Lower Controls
23	90725	4	Decal, Tires
24	92768	1	Decal, Serial Plate
25	6873	1	Decal, Hydraulic Oil
26	90750	1	Decal, Battery Charger
27	11026730	4	Decal, Tie Down
28	92054	1	Decal, Patents Pending
29	92089	1	Decal, Brake Release
30	9052	1	Decal, Battery Disconnect
31	8605	6	Decal, Lanyard Point
32	93186	4	Decal, Wheel Load
33	90732	1	Decal, Powerwash
34	8779	1	Decal, Warning Battery
35	90729	1	Decal, Battery Weight
36	91956	1	Decal, Battery Charger
37	7982	4	Decal, Warning Stripe (cut short to fit positions shown)
38	93369	2	Decal, Engineering
39	93401	1	Decal, Max Wind Speed
40	93402	1	Decal, Harnesses
41	93367	1	Decal, GSE Use Only

• as req: as required

• INCL: Included with assembly

• NS: Not a Stock item

• REF: Reference only



- FOR AIRCRAFT GROUND SUPPORT EQUIPMENT USE ONLY**



Service Parts Order Form

Fax to 559-400-6723

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

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

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

NOTES:



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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info@MECawp.com • www.MECawp.com