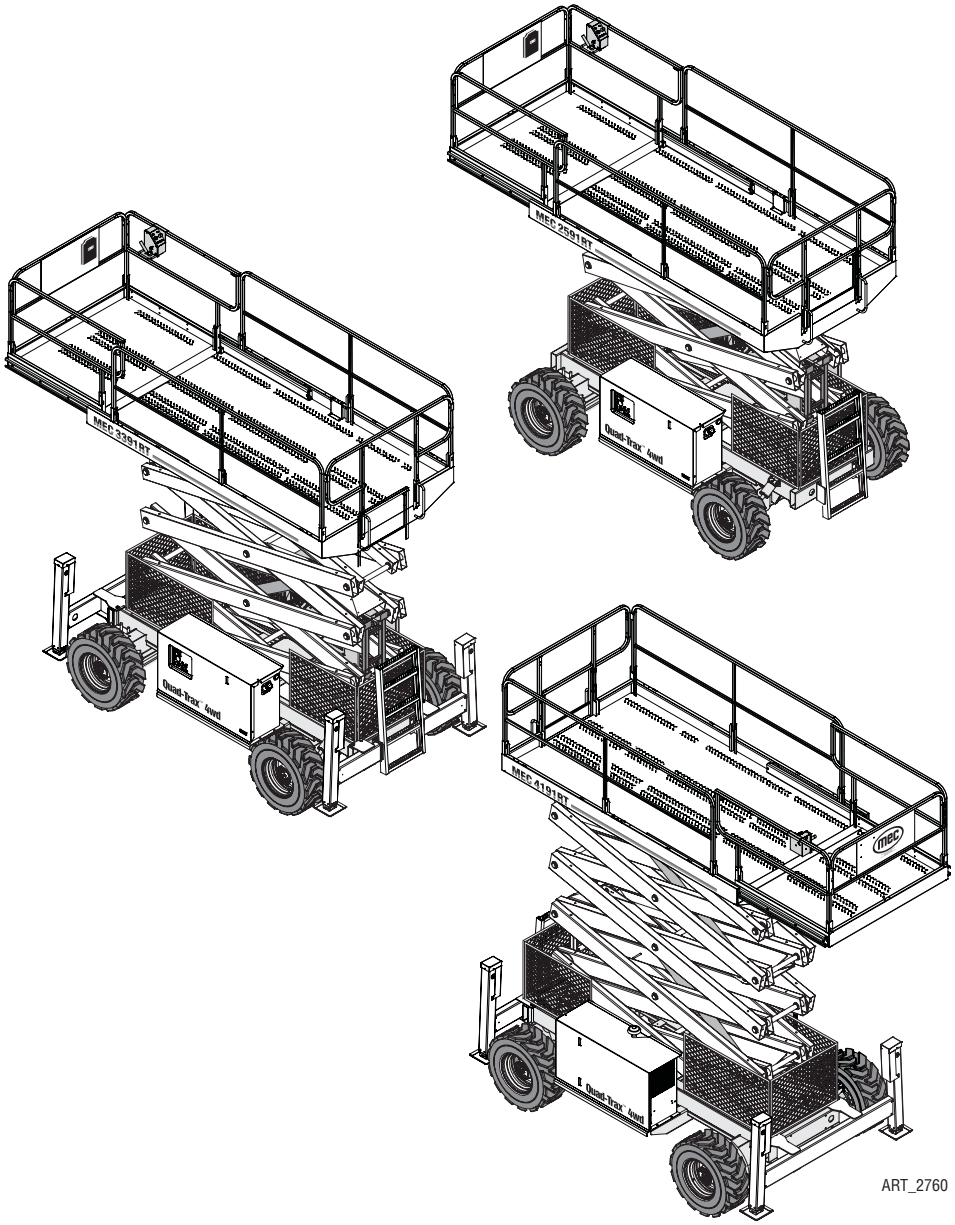
SERVICE AND PARTS MANUAL

2591RT / 3391RT / 4191RT: CE Models



ART_2760

Serial Number Range

2591RT: 9401000 - Up
3391RT: 9501000 - Up
4191RT: 9601000 - Up

Part # 91803
September 2008

Aerial Platform Sales Corp.

1775 Park Street, Suite 77 • Selma, CA 93662 USA
Ph: 1-800-387-4575 • 559-891-2488 • Fax: 559-891-2448
E-mail:info@mecawp.com • Web:www.mecawp.com

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INTRODUCTION

This manual consists of Service and Parts illustrations 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 scissors lift. When used in conjunction with the illustrated parts section and the Operators Manual (provided separately), this manual will assist you in making necessary adjustments, repairs, identifying, and ordering the correct replacement parts.

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

We recommend that you use Genuine MEC parts to insure proper operation and reliable performance.

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

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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.

DANGER

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

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

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

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

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

If there is a question on application and/or operation contact:

MEC Aerial Platform Sales Corp.

1775 Park Street, Suite 77
Selma, CA 93662 USA

Ph: 1-800-387-4575
559-891-2488
Fax: 559-891-2448

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 avoded, 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.

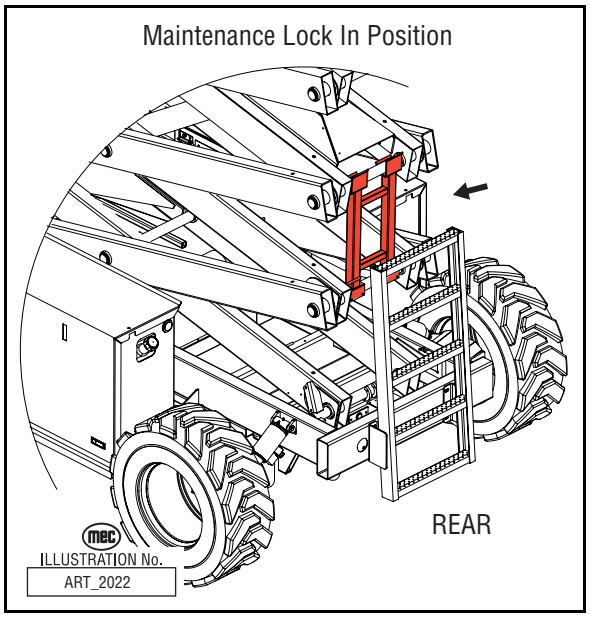
The actual operating environment of the machine governs the inspection schedule. Correct lubrication is an essential part of the preventative maintenance to minimize wear on working parts and ensure against premature failure. By maintaining correct lubrication, the possibility of mechanical failure and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

DANGER

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

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

Figure 1-1: Maintenance Lock



Hydraulic System

WARNING

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

CAUTION

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

Electrical System

CAUTION

Prevent damage to battery and/or electrical system;
- **Always disconnect the negative battery cable first.**
- **Always connect the positive battery cable first.**

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

Total System

CAUTION

Engine coolant level must be checked only after engine has cooled. If radiator cap is removed while the coolant is at normal operating temperature, pressure within the coolant system will force hot liquid out through the filler opening and possibly cause severe scalding.

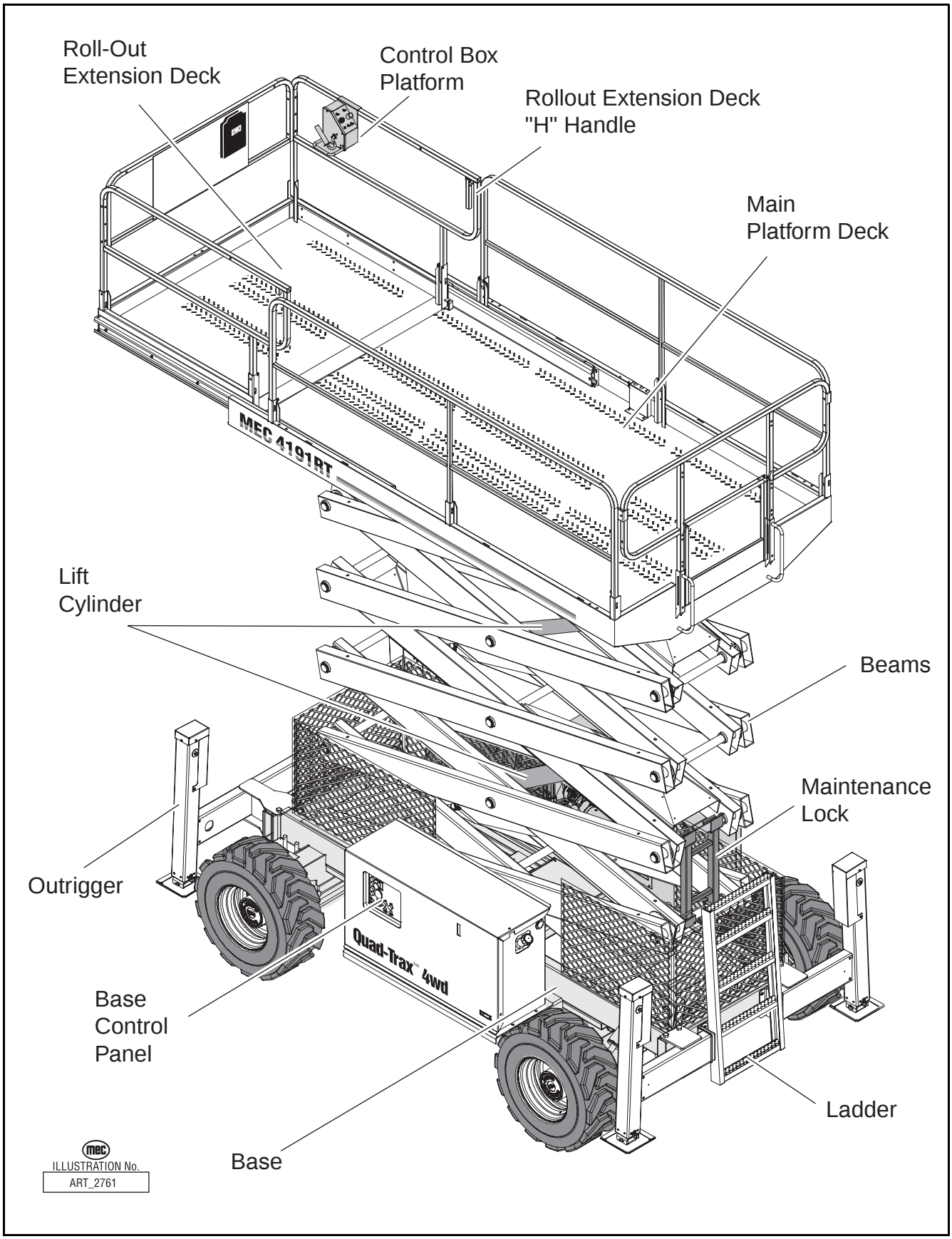
Failure to perform preventive maintenance at recommended intervals may result in the unit being operated with a defect that could result in injury or death of the operator.

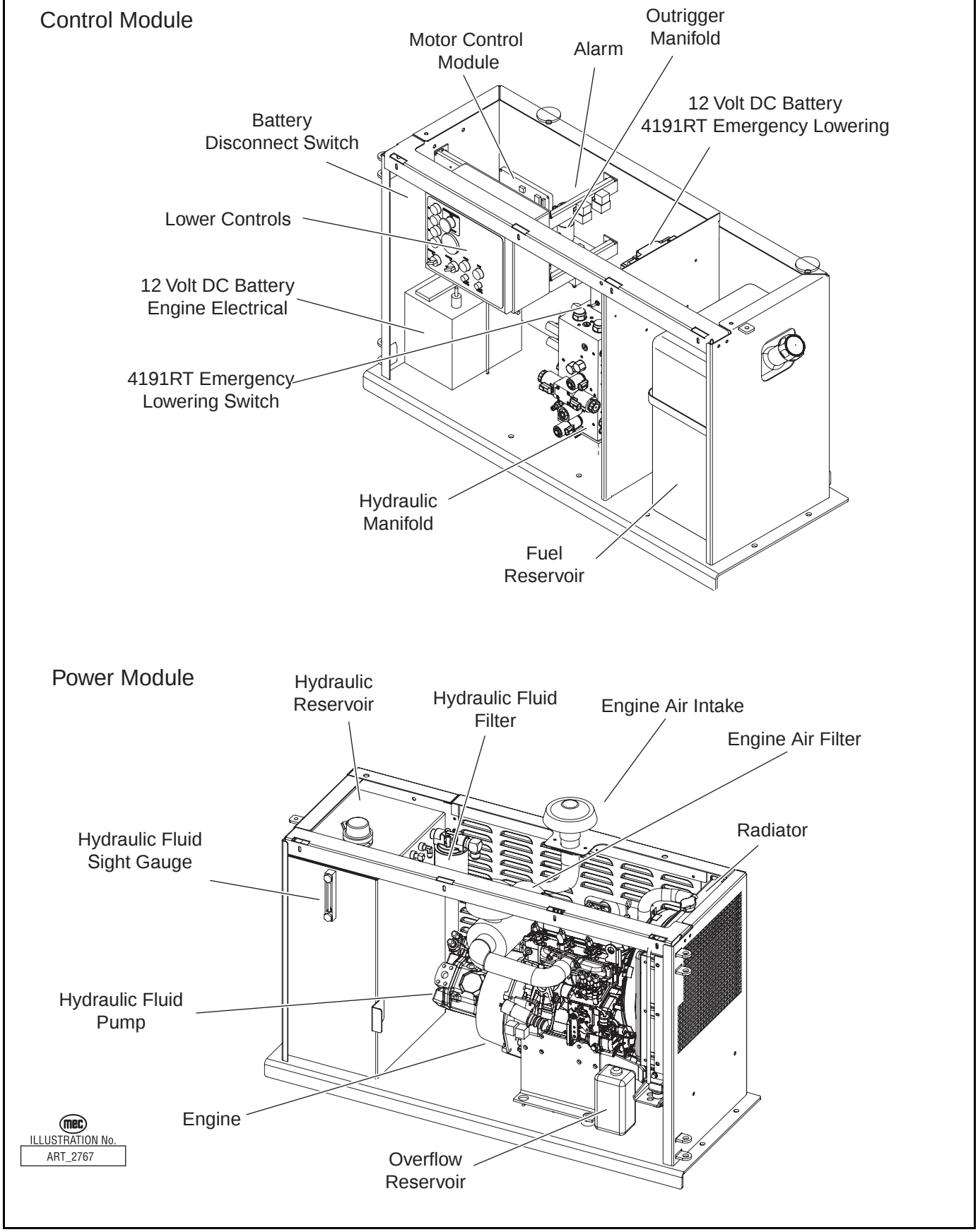
Immediately report to your supervisor any Defect or malfunction. Any defect shall be repaired prior to continued use of the scissors lift.

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

PRIMARY MACHINE COMPONENTS

Figure 1-2: Component Locations




Control Module
Motor Control Module
Alarm
Outrigger Manifold
12 Volt DC Battery 4191RT Emergency Lowering
Battery Disconnect Switch
Lower Controls
12 Volt DC Battery Engine Electrical
4191RT Emergency Lowering Switch
Hydraulic Manifold
Fuel Reservoir
Power Module
Hydraulic Reservoir
Hydraulic Fluid Filter
Engine Air Intake
Engine Air Filter
Radiator
Hydraulic Fluid Sight Gauge
Hydraulic Fluid Pump
Engine
Overflow Reservoir
ILLUSTRATION No.
ART_2767

LUBRICATION

Figure 1-4: Lubrication Points

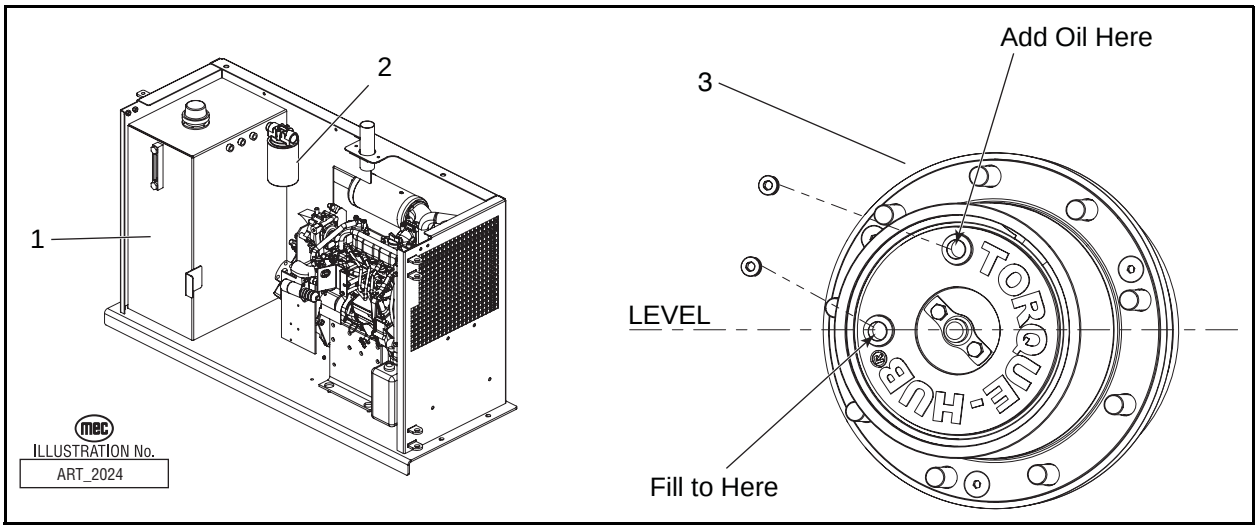


Table 1-1: Lubrication

No.	ITEM	SPECIFICATIONS	FREQUENCY
1	Hydraulic Reservoir	Fill to the middle of the sight gauge with platform in the stowed position – Mobile Fluid 424 – *Do not substitute with lower grade fluids as pump damage may result*	Check daily. Change yearly or every 1,000 hours, whichever occurs first.
2	Hydraulic Filter	Filter Element	**Normal Usage** Change every six months or 500 hours, whichever occurs first **Severe Usage** Change every three months or 300 hours, whichever occurs first
3	Hubs	SAE 90 Multipurpose Hypoid Gear Oil. API Service Classification GL5	Check Every Three Months or 250 Hours, whichever occurs first for Normal Usage Change Yearly or every 1000 Hours, whichever occurs first for Severe Usage.

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 -	TORQUE				TORQUE				CAP SCREW SIZE - millimeters-	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									
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									

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

Hydraulic Components 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

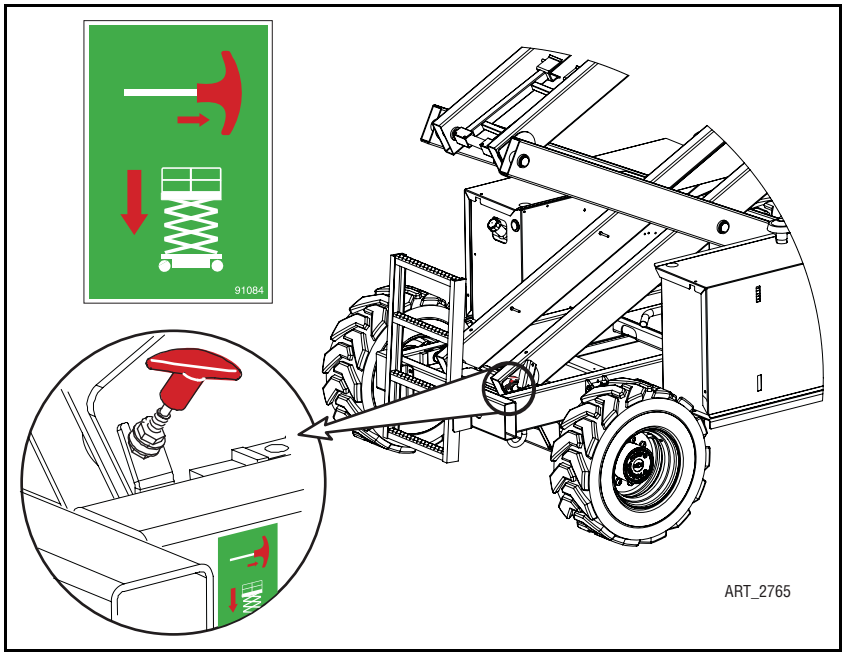
WARNING

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

DO NOT ATTEMPT TO CLIMB DOWN SCISSOR ASSEMBLY (BEAMS).

BEFORE LOWERING PLATFORM, RETRACT THE DECK EXTENSION.

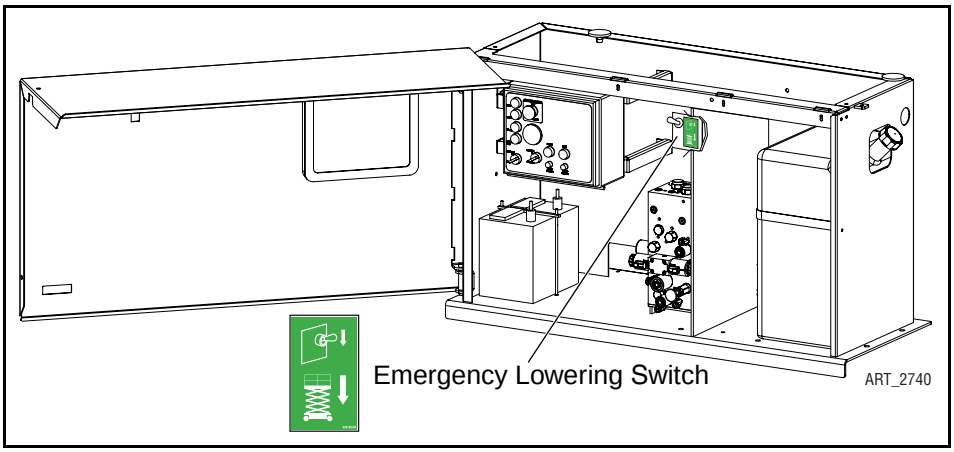
Figure 1-5: Emergency Lowering Handle, 2591RT - 3391RT



EMERGENCY LOWERING - 2591RT AND 3391RT

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

Figure 1-6: Emergency Lowering Switch, 4191RT



EMERGENCY LOWERING - 4191RT

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

1. Push and hold the toggle switch down to lower the platform.
2. Once the platform is fully lowered, release the toggle switch to close the valve.

Parking Brake and Towing Circuit

Machine can be winched or moved short distances in case of power failure at speeds not to exceed 5 MPH (8.05 kph).

Towing/ Winching The Machine

Your machine is equipped with a hub disengage mechanism.

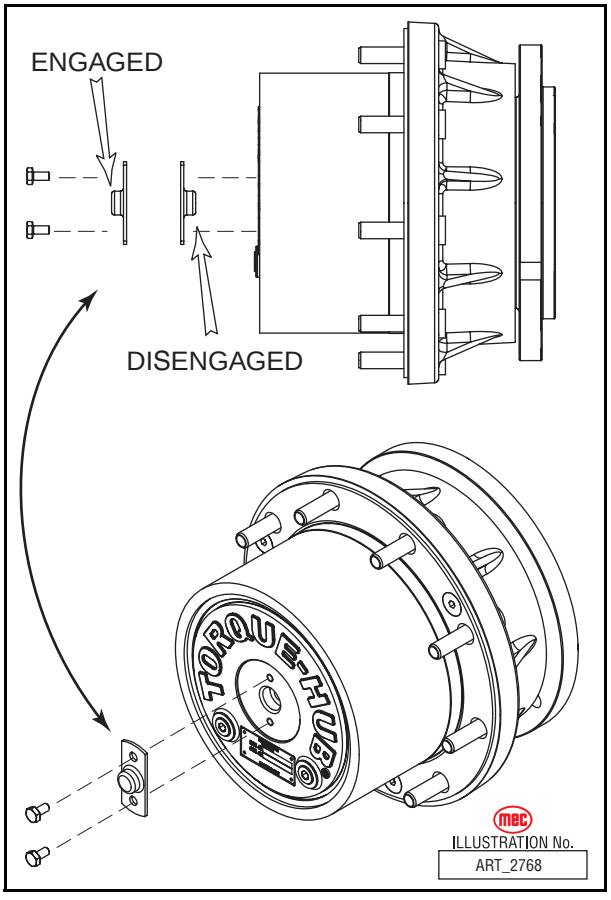
CAUTION

Prior to manually releasing brakes, insure wheels are chocked to prevent machine from moving.

Disengage Brakes Before Towing:

- Chock the wheels.
- Remove the Torque Engage Cap and reinstall with the bump facing *inward* on all four hubs (see illustration).
- Machine is now ready for towing.

Figure 1-7: Torque Hub Disengage



DANGER

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

Engage Hubs Before Driving:

- Remove the Torque Engage Cap and reinstall with the bump facing *outward* on all four hubs.
- Machine is now ready for driving.

Lift and Support the Machine

DANGER

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

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

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

To raise the machine

1. Move machine to a firm level surface capable of supporting the weight of the machine.
2. Chock tires on one end of machine and raise the other end of machine.
3. If wheel is to be removed, loosen but ***do not remove*** lugs before raising the machine.
4. Position a jack at the end of the machine to be lifted, under a solid lifting point in the center of the frame.
5. Raise the machine and place two (2) suitable jack stands under solid support points at the outer ends of the frame.
6. Lower the machine to rest on the jack stands and inspect for stability.

To lower the machine

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

NOTES:

MACHINE SPECIFICATIONS

		2591RT		3391RT		4191RT	
Working Height*		**31.6 ft***	9.62 m*	**39.6 ft***	12.06 m*	**47.6 ft***	14.5 m*
Platform Height		**25.0 ft**	7.62 m	**33.0 ft**	10.06 m	**41.0 ft**	12.5 m
	Platform Entry Height	**5.6 ft**	1.7 m	**5.6 ft**	1.7 m	**6.2 ft**	1.9 m
Stowed Height	**Rails Up**	**8.5 ft**	2.6 m	**9.2 ft**	2.8 m	**9.8 ft**	3 m
	Rails Folded Down	**5.9 ft**	1.8 m	**6.6 ft**	2 m	**7.3 ft**	2.24 m
Maximum Number of Occupants	**0 m/s Wind (indoors)**	5		4		4	
	12 m/s Wind (outdoors)	5		4		4	
Lift Capacity	**Evenly Distributed**	**2000 lb**	907 kg	**1499 lb**	680 kg	**1000 lb**	454 kg
	Rollout Deck Capacity	**500 lb**	227 kg	**500 lb**	227 kg	**500 lb**	227 kg
Maximum Operating Inclination		3°		3°		3° up to 9.1 m (30 ft) 1.5° up to 12.5 m (41 ft)	
Platform Dimensions	**Roll-Out Deck Extended**	**181.1 in**	4.6 m	**181.1 in**	4.6 m	**181.1 in**	4.6 m
	Roll-Out Deck Retracted	**131.9 in**	3.35 m	**131.9 in**	3.35 m	**131.9 in**	3.35 m
	Deck Width	**72.0 in**	1.83 m	**72.0 in**	1.83 m	**72.0 in**	1.83 m
	Guard Rail Height	**44.5 in**	1.13 m	**44.5 in**	1.13 m	**44.5 in**	1.13 m
	Toe Board Height	**7.1 in**	18 cm	**7.1 in**	18 cm	**7.1 in**	18 cm
	Rollout Deck Length	**48.0**	1.22 m	**48.0**	1.22 m	**48.0**	1.22 m
Overall Length		**144.1 in**	3.66 m	**144.1 in**	3.66 m	**144.1 in**	3.66 m
	With Outriggers	**181.1 in**	4.6 m	**181.1 in**	4.6 m	**181.1 in**	4.6 m
Overall Width		**90.1 in**	2.3 m	**90.1 in**	2.3 m	**90.1 in**	2.3 m
Wheel Base		**102.4 in**	2.6 m	**102.4 in**	2.6 m	**102.4 in**	2.6 m
Wheel Track		**78.7 in**	2.0 m	**78.7 in**	2.0 m	**78.7 in**	2.0 m
Turning Radius	**Inside**	**76.0 in**	1.93 m	**76.0 in**	1.93 m	**76.0 in**	1.93 m
	Outside	**194.9 in**	4.95 m	**194.9 in**	4.95 m	**194.9 in**	4.95 m
Ground Clearance		**12.0 in**	30.5 cm	**12.0 in**	30.5 cm	**12.0 in**	30.5 cm
Machine Weight (Unloaded) (Approx.)**		**8000 lb****	3629 kg**	**8699 lb****	3946 kg**	**9700 lb****	4400 kg**
Drive System (Proportional)		2 Wheel Drive Standard, 4 Wheel Drive Option					
	Drive Speed (Platform Elevated)	**0 – 0.8 mph**	0 –1.3 km/h	**0 – 0.8 mph**	0 –1.3 km/h	**0 – 0.8 mph**	0 –1.3 km/h
	Drive Speed (Platform Lowered)	**0 – 3.8 mph**	0 – 6.1 km/hr	**0 – 3.8 mph**	0 – 6.1 km/hr	**0 – 3.8 mph**	0 – 6.1 km/hr
Brakes		Multi disc		Multi disc		Multi disc	
Lift/Lower Speed (Approx.)		25 sec / 30 sec		33 sec / 35 sec		40 sec / 50 sec	
Gradeability		45% / 24.2°		45% / 24.2°		45% / 24.2°	
Ground Pressure/Wheel (Maximum)		**121 psi**	8.50 kg/cm²	**137 psi**	9.63 kg/cm²	**140 psi**	9.84 kg/cm²
Wind Speed		**28 mph**	12.5 m/sec	**28 mph**	12.5 m/sec	**28 mph**	12.5 m/sec
Noise Level		86 dB		86 dB		86 dB	
Vibration***		< 2.5m/s²		< 2.5m/s²		< 2.5m/s²	
Tire Size-Standard		12-16.5 NHS "Outrigger"		12-16.5 NHS "Outrigger"		12-16.5 NHS "Outrigger"	
	12 PLY Foam Filled	Foam Filled		Foam Filled		Foam Filled	
Wheel Load		**2,998 lb**	1360 kg	**3,060 lb**	1388 kg	**3,210 lb**	1456 kg
Wheel Lug Nut Torque		**150-166 ft/lb**	204-225 Nm	**150-166 ft/lb**	204-225 Nm	**150-166 ft/lb**	204-225 Nm
Hydraulic Pressure	**Main System**	**3000 psi**	207 bar	**3000 psi**	207 bar	**3000 psi**	207 bar
	Lift System	**2500 psi**	172 bar	**2500 psi**	172 bar	**2500 psi**	172 bar
	Steer	**1500 psi**	103 bar	**1500 psi**	103 bar	**1500 psi**	103 bar
Hydraulic Fluid Capacity		**23 GAL**	87 liters	**23 GAL**	87 liters	**23 GAL**	87 liters
Fuel Capacity		**15 GAL**	57 liters	**15 GAL**	57 liters	**15 GAL**	57 liters
Power System – Voltage		12 Volts DC		12 Volts DC		12 Volts DC	
Alternator (Lighting Coil)		40 Amp		40 Amp		40 Amp	
Engine Availability		Kubota D1105, 25 HP (8.7kW), Diesel, Liquid Cooled					

Meets requirements of CE

*Metric equivalent of working height adds 2 m (6.6 ft.) to platform height.
**Weight may increase with certain options or country standards.
***Vibration is not significant

SERVICE

Section 1

HYDRAULIC SYSTEM

CONTENTS PAGE

FIGURES PAGE

Hydraulic System – General

The hydraulic system is an open center, open–loop type. Generally in this type of system, hydraulic fluid is provided by a variable displacement, pressure compensated, piston type pump which is directly coupled to the engine. As the engine turns, the hydraulic pump drains fluid from the reservoir and pumps this fluid to the valve packages.

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

Hydraulic integrated circuit, generally known as the manifold system (valve type) 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.

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.

Pump

When required, the variable displacement pump delivers hydraulic fluid under pressure to the main hydraulic manifold. Pump volume is controlled by a load sense system.

Hydraulic Manifold

The main 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

2 Wheel Drive machines are equipped with two (2) hydraulically operated drive motors.

4 Wheel Drive machines are equipped with four (4) hydraulically operated drive motors.

Each motor is connected to a gear reduction hub. The hubs on the rear drive motors are equipped with spring applied - hydraulically released brakes.

Floating Axle Lock Cylinders

Two (2) hydraulic cylinders control the floating axle on the rear of the machine. When platform is elevated, the cylinders lock into place to increase machine stability.

Steering System

Two (2) hydraulic cylinders control steering.

Lift System

The 2591RT and 3391RT are equipped with one (1) hydraulic lift cylinder.

The 4191RT is equipped with two (2) hydraulic lift cylinders.

Optional Outrigger System

If equipped, the *main hydraulic manifold* delivers fluid to the *outrigger hydraulic manifold*. Hydraulic fluid is then directed to four (4) hydraulic cylinders, one at each corner of the machine.

Optional Generator System

If equipped, the generator is driven by a hydraulic motor which receives hydraulic fluid directly from the pressure port of the pump.

Hydraulic Fluid

Handling Precautions

WARNING

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

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

WARNING

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

FULID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

Fluid Recommentations

MEC recommends the use of **Mobil Fluid 424** hydraulic fluid. Do not substitute with lower grade fluids as pump damage may result.

System Flushing Procedure

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

Consists of the reservoir, a filler cap with breather, a drain plug, a sight gauge, and a bypass filter with a 10 micron filter element.

- Check reservoir for signs of leakage, every week.

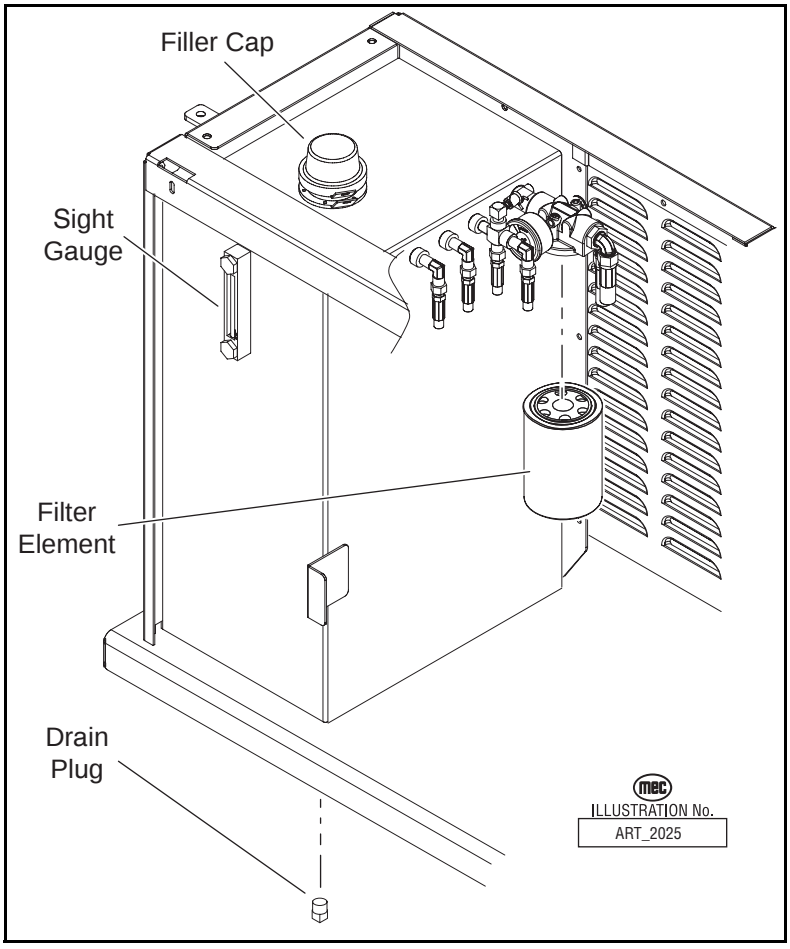
Hydraulic Reservoir Assembly

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

CAUTION

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

Figure 1-1: Hydraulic Fluid Reservoir



Hydraulic Pump

NOTE: Refer to *Section 4 – Hydraulic Pressure Adjustment Procedures*.
Refer to *Parts Section F.*

An internal combustion engine drives a variable displacement axial piston pump. Flow is proportional to drive speed and displacement.

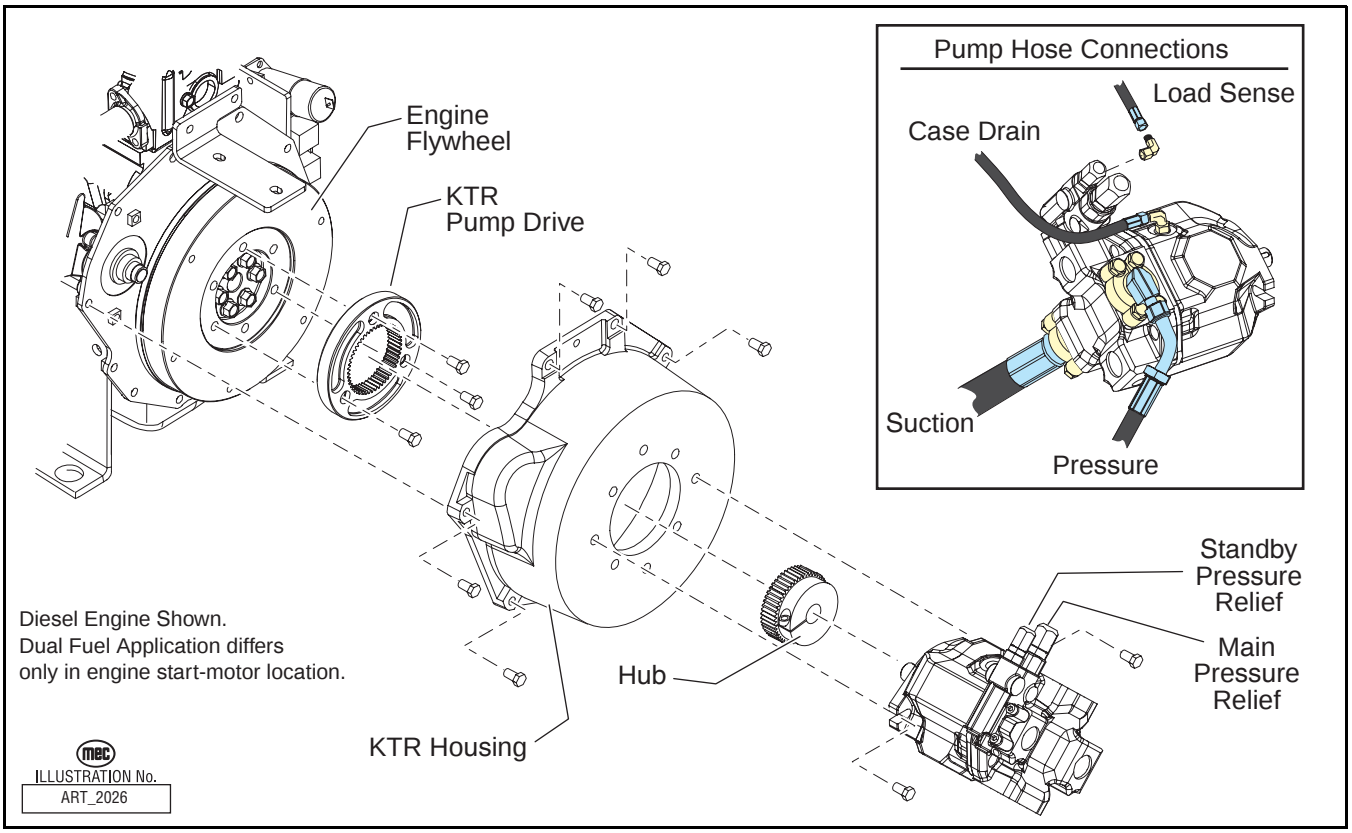
Remove

1. Turn the Battery Disconnect Switch (inside Control Module) to the OFF position.
2. Tag and disconnect hydraulic hoses, and IMMEDIATELY cap or cover the openings to prevent contamination.
3. Remove the two (2) bolts that hold the pump to the housing.
4. Remove the pump.

Install

1. Install drive hub onto pump shaft. Torque bolt to 45 Ft. Lbs. (61 Nm).
2. Position the pump to the housing. Turn the pump until the splines on the hub align allowing the pump to become flush with the housing.
3. Turn the pump until the bolt holes align with the mounting holes on the housing and install the bolts. Torque to 25-28 Ft. Lbs. (35-38 Nm).
4. Install the hydraulic hoses.
5. Turn the Battery Disconnect Switch to the ON position.
6. Check for leaks and check all hydraulic pressures (refe*r to Section 4)*.

Figure 1-2: Hydraulic Pump



Hydraulic Pump Seals

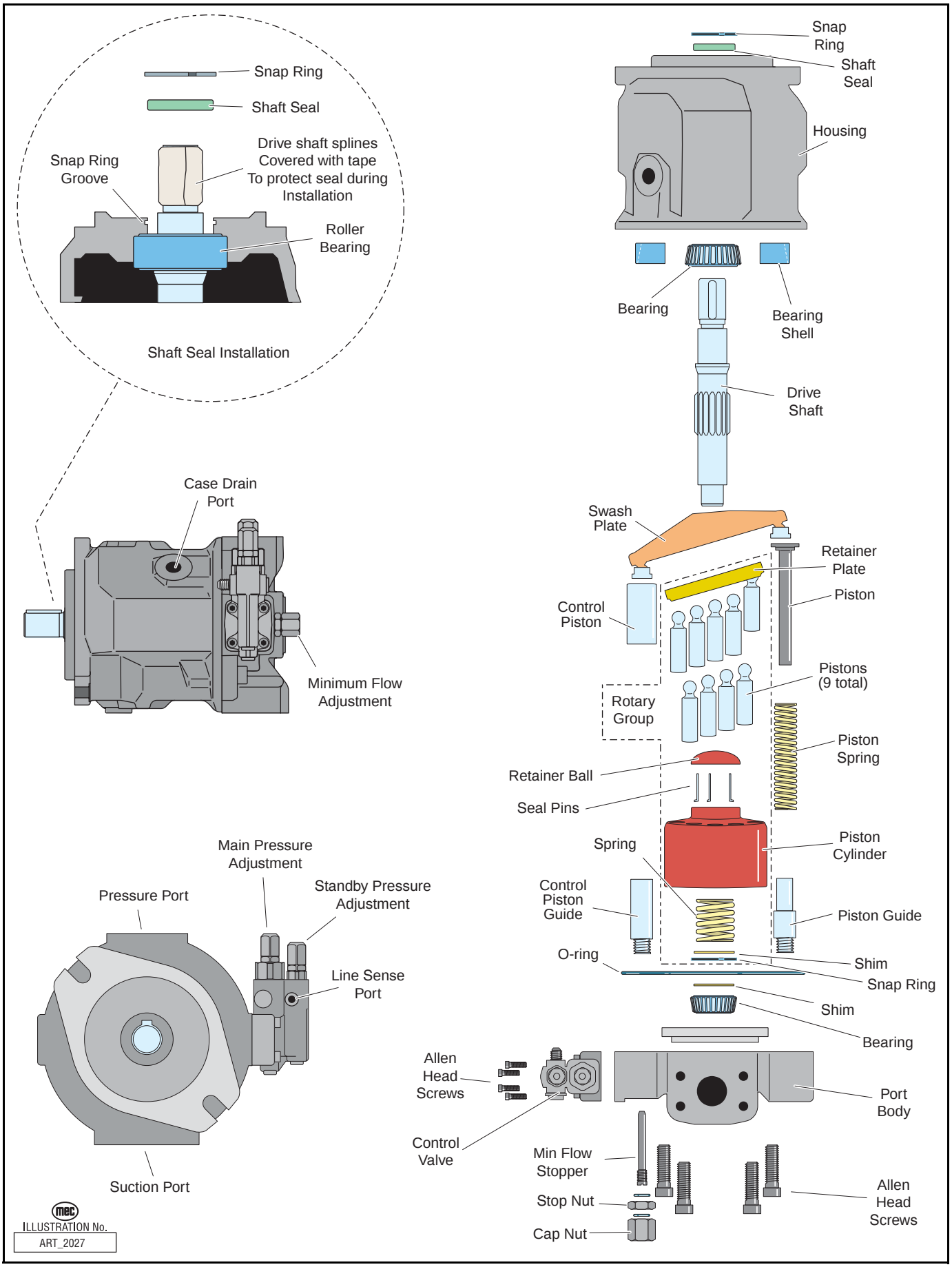
Drive Shaft Seal Replacement

Caution: Be careful not to damage the drive shaft when removing the old seal.

1. Remove the shaft key.
2. Remove the snap ring.
3. Remove the shaft seal.
   - Check the surface of the shaft and the housing for imperfections.
4. Install new shaft seal.
   - Cover the drive shaft with tape to prevent damage to the seal during installation.
   - Coat the shaft seal with grease.
   - Seat the shaft seal with a seal setting tool.
5. Install the snap ring.
6. Install the shaft key.

Hydraulic Pump Rebuild

Pump rebuild should only be performed by a qualified mechanic. Contact MEC Technical Support before attempting to rebuild the pump.


Snap Ring
Shaft Seal
Drive shaft splines
Covered with tape
To protect seal during
Installation
Snap Ring
Groove
Roller
Bearing
Shaft Seal Installation
Case Drain
Port
Minimum Flow
Adjustment
Main Pressure
Adjustment
Standby Pressure
Adjustment
Pressure Port
Line Sense
Port
Suction Port
ILLUSTRATION No.
ART_2027
Snap
Ring
Shaft
Seal
Housing
Bearing
Bearing
Shell
Drive
Shaft
Swash
Plate
Retainer
Plate
Piston
Control
Piston
Pistons
(9 total)
Rotary
Group
Piston
Spring
Retainer Ball
Seal Pins
Spring
Piston
Cylinder
Control
Piston
Guide
Piston Guide
O-ring
Shim
Snap Ring
Shim
Bearing
Allen
Head
Screws
Port
Body
Control
Valve
Min Flow
Stopper
Stop Nut
Cap Nut
Allen
Head
Screws

Hydraulic Manifold

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 bolts that hold the manifold to the mounting bracket.
5. Remove the manifold block.

Disassembly

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

Cleaning and Inspection

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

Assembly

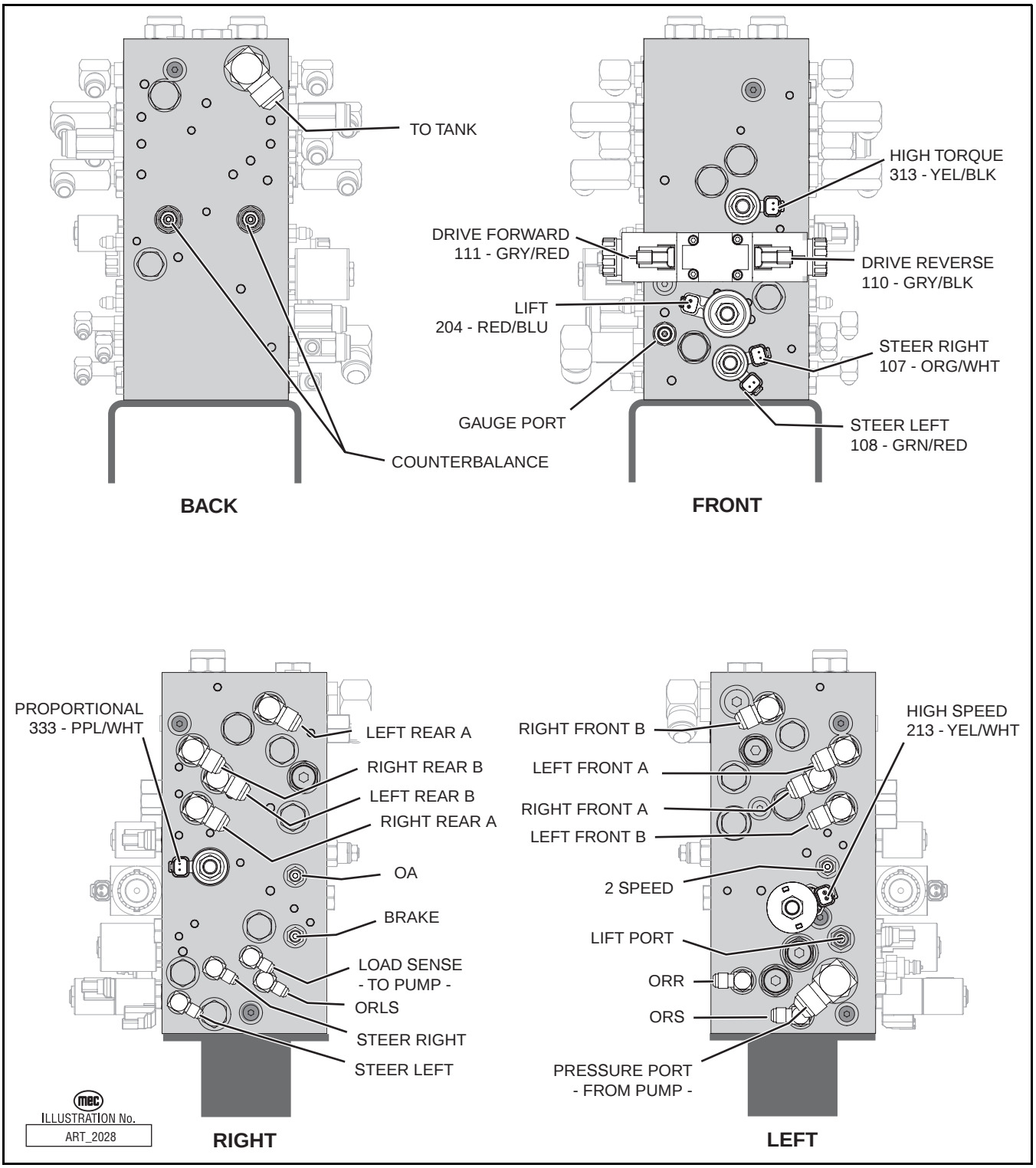
NOTE: Lubricate all O-rings before installation to prevent damage to the O-ring. Seat balls in manifold block by lightly tapping on the ball with a brass drift punch.

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

Installation

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

Figure 1-4: Hydraulic Manifold



Drive and Brake System

Wheel Drive

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

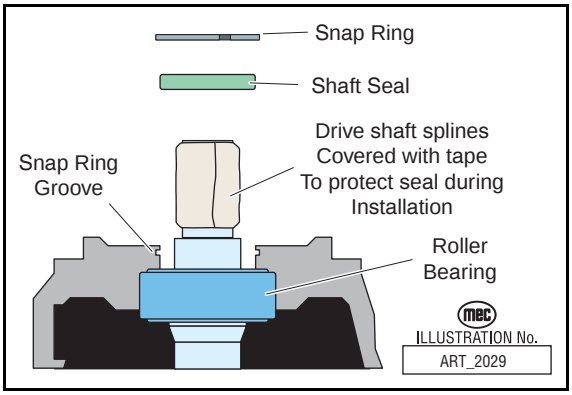
Drive motors are axial piston hydraulically operated. Each motor is connected to a gear reduction hub. Braking is a function of the gear reduction hub.

2-Wheel Drive machines are equipped with two (2) drive motors.

4-Wheel Drive machines are equipped with four (4) drive motors.

Drive Shaft Seal Replacement

Figure 1-5: Drive Shaft Seal



Caution: Be careful not to damage the drive shaft when removing the old seal.

1. Remove the snap ring.
2. Remove the shaft seal.
   - Check the surface of the shaft and the housing for imperfections.
3. Install new shaft seal.

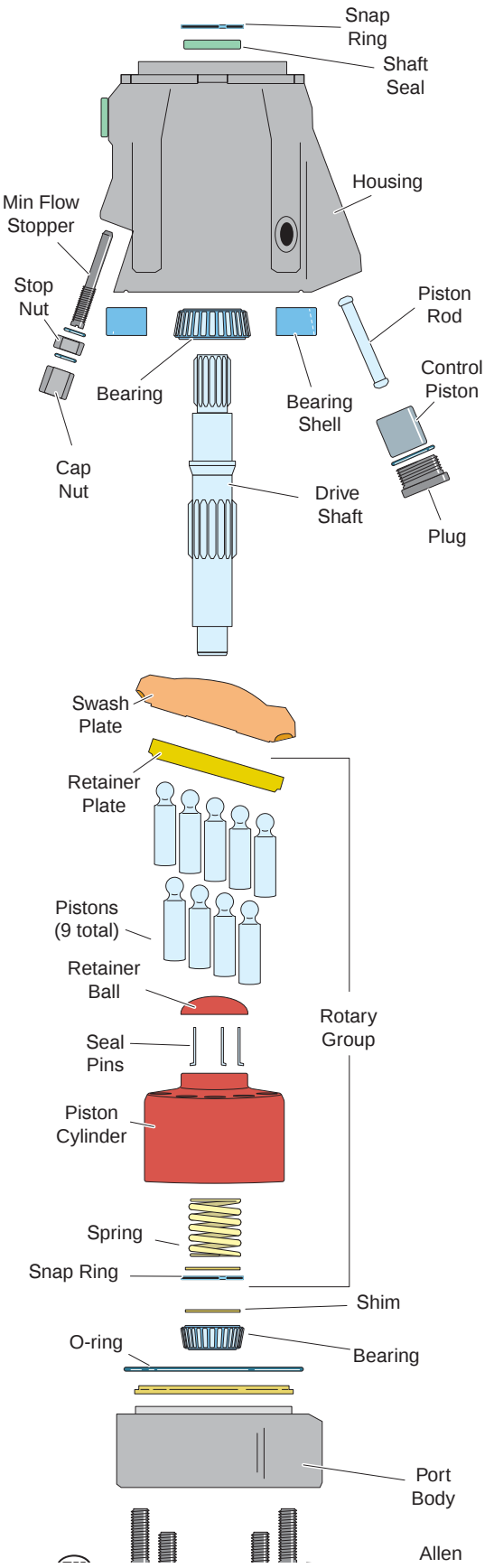
   Cover the drive shaft splines with tape to prevent damage to the seal during installation.

   Coat the shaft seal with grease.
   - Seat the shaft seal with a seal setting tool.
4. Install the snap ring.

Hydraulic Motor Rebuild –

Motor rebuild should only be performed by a qualified mechanic. Contact MEC Technical Support before attempting to rebuild the pump.

Figure 1-6: Drive Motor, Exploded View



Gear Reduction Hubs with Brakes

NOTE: Refer to *Section 3* for Remove, Replace, and Service instructions.
Refer to *Parts Section E*.

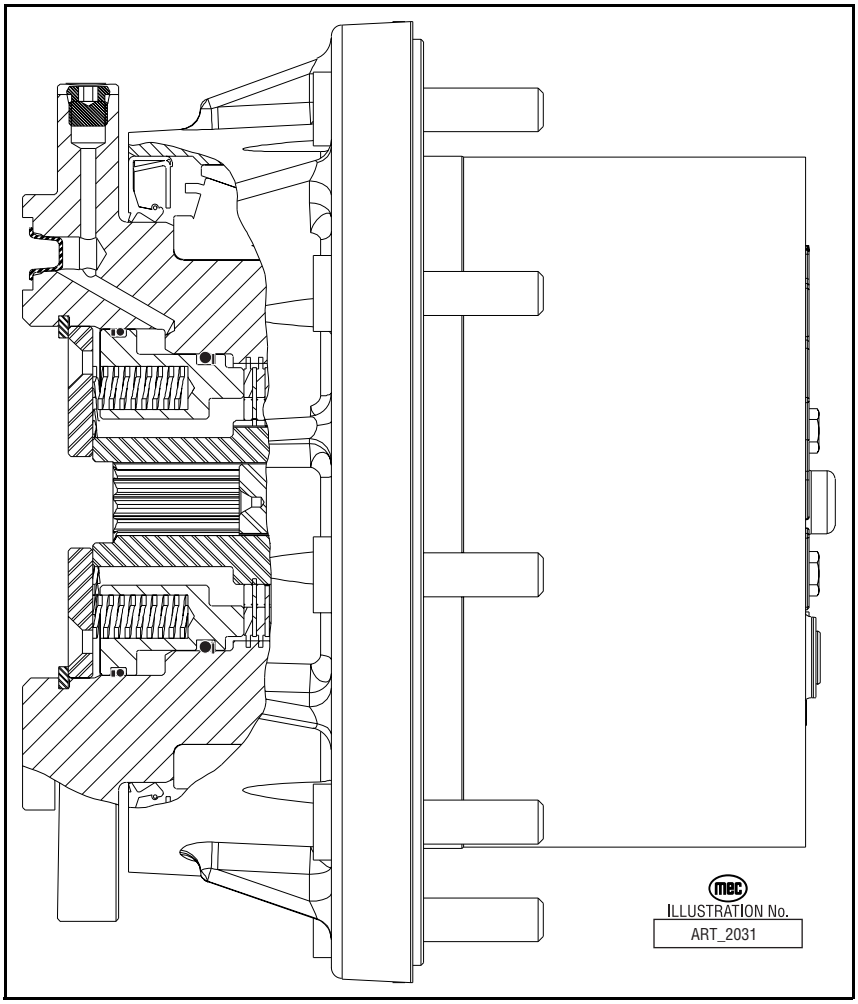
All machines are equipped with two (2) gear reduction hubs with spring applied - hydraulically released brakes.

4 Wheel Drive machines are equipped with four (4) gear reduction hubs. Only the rear hubs are equipped with spring applied - hydraulically released brakes.

Service and Repair

Refe*r to Section 3* for brake repair and all other service for the Gear Reduction Hubs.

Figure 1-7: Gear Reduction Hub

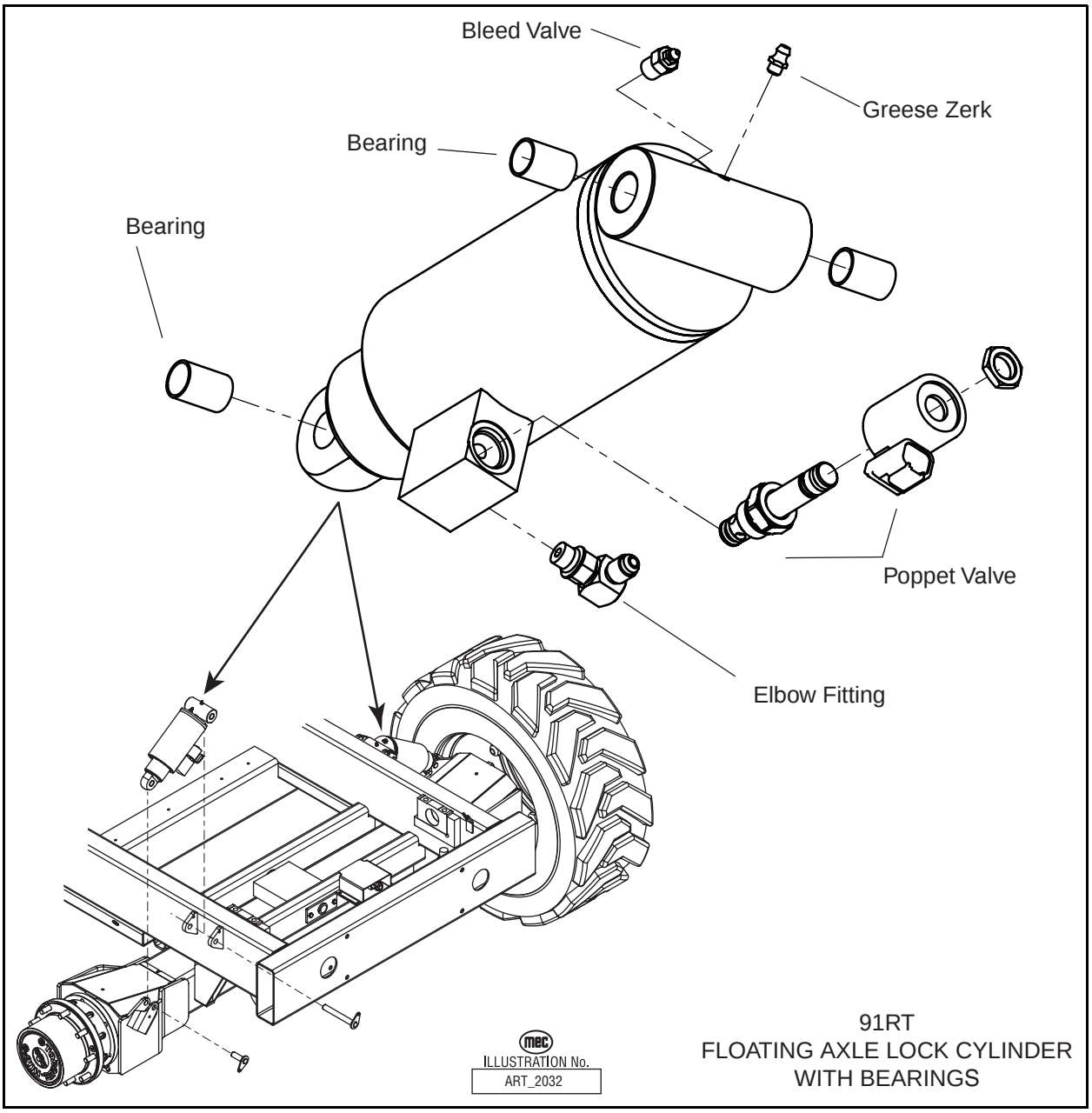


Floating Axle Lock Cylinder

NOTE: Refer to *Cylinder Repair*.
Refer to *Section 3* for Remove and Replace instructions.
Refer to the *Parts Manual, Section E* for parts list.

There are two (2) cylinders utilized in the floating axle system. These cylinders allow fluid to transfer from one side to the other while the platform is in the stowed position. When the platform is elevated, the electrically operated valve closes, preventing fluid flow and thereby locking the cylinders.

Figure 1-8: Rear Wheel Motor



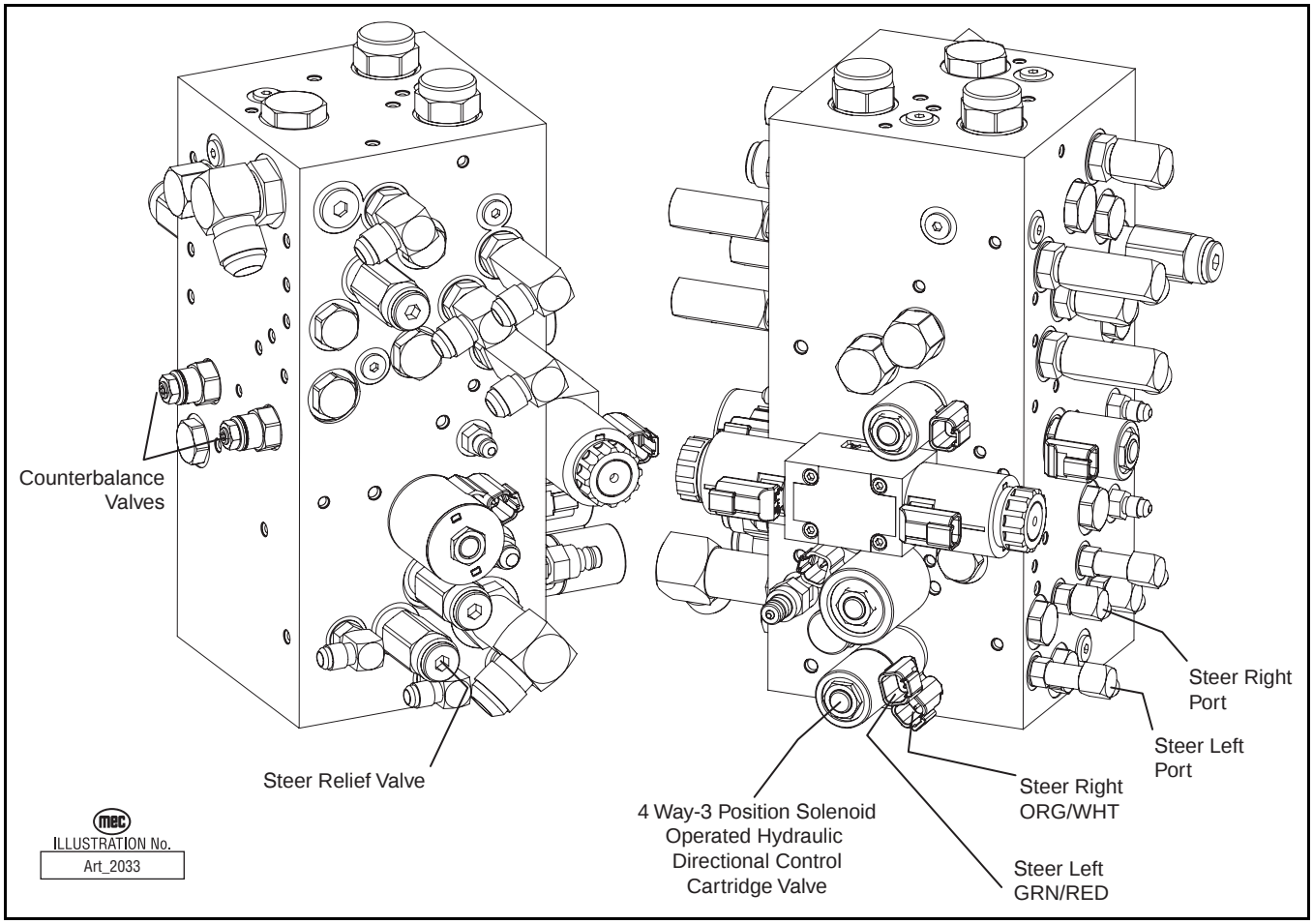
STEERING CIRCUIT

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

The steering system consists of the following components:

- The wheel motor housings have pivots on the top and bottom, and are mechanically linked together via a tie-rod.
- Steering is accomplished hydraulically by using two (2) double-acting cylinders, and a 4-way 3-position solenoid-operated, hydraulic directional control cartridge valve.
- Maximum steering pressure is limited by the steering relief valve (refer to *Relief Pressure Adjustment Procedure*).

Figure 1-9: Steering Ports, Main Hydraulic Manifold

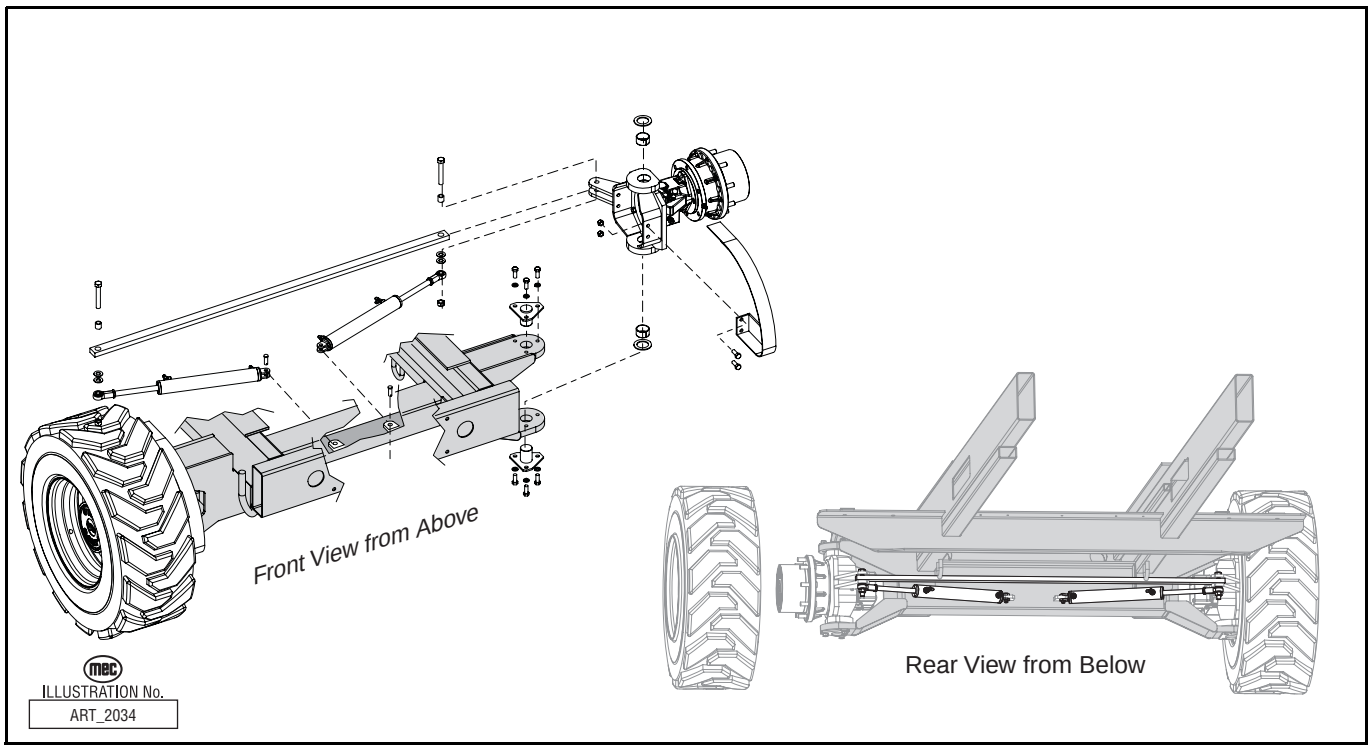


STEERING CYLINDER

NOTE: Refer to *Cylinder Repair*.
Refer to *Section 3* for Remove and Replace instructions.
Refer to the *Parts Manual, Section E* for parts list.

There are two (2) cylinders utilized in the steering system. These cylinders are a double acting type which requires fluid flow to operate the cylinder rod in both directions. Directing fluid forces the piston to travel towards the rod end of the barrel, extending the cylinder rod. By directing fluid to the rod side of the cylinder the piston will be forced in the opposite direction and the cylinder rod will retract.

Figure 1-10: Steering Cylinders



Platform Lift Circuit

NOTE: Refer to *Hydraulic Manifold* and *Relief Pressure Adjustment Procedure*.
Refer to *Section 3* for Remove and Replace instructions.

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

Lift Cylinder

NOTE: Refer to *Cylinder Repair*.

2591RT AND 3391RT

One (1) single acting type hydraulic cylinder.

The cylinder has an integrated 2-position, 2-way solenoid operated platform lower valve for holding the platform in position. The valve is also externally actuated via a cable for manually lowering the platform.

4191RT

Two (2) single acting type hydraulic cylinders.

Each cylinder has an integrated 2-position, 2-way solenoid operated platform lower valve for holding the platform in position. The valves are also electrically actuated via a toggle switch for manually lowering the platform.

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

Figure 1-11: Platform Lift, Main Hydraulic Manifold

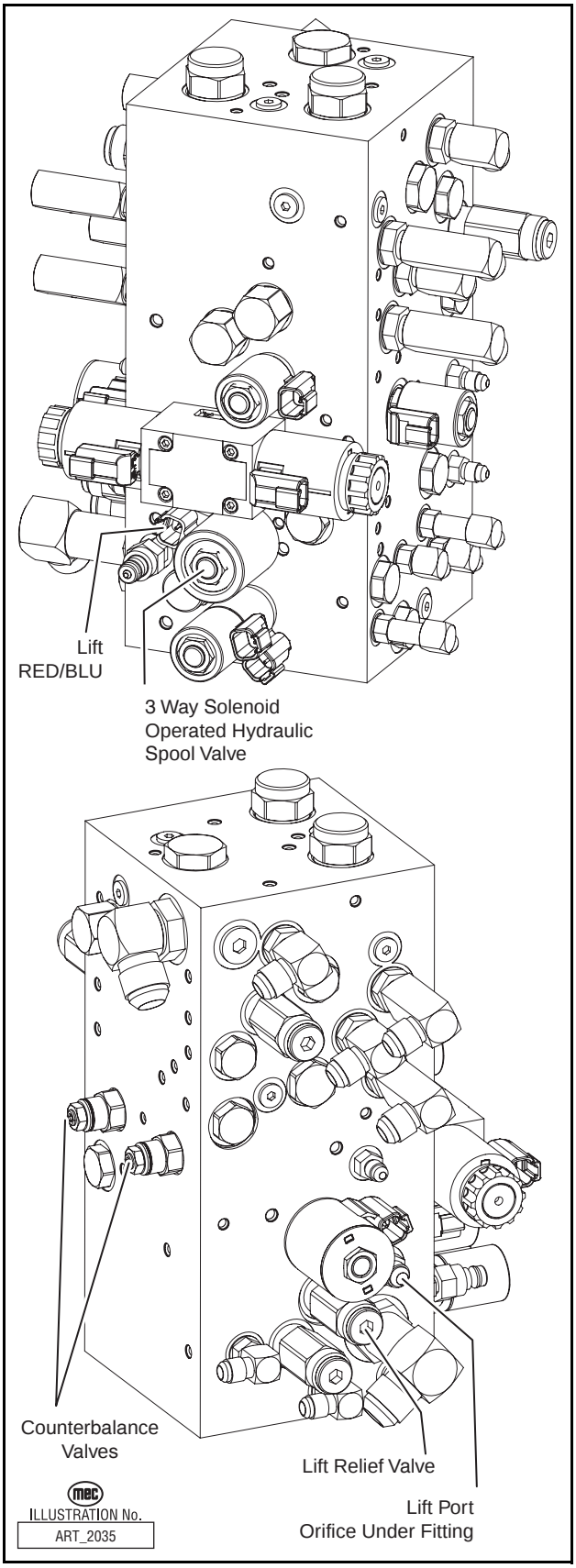
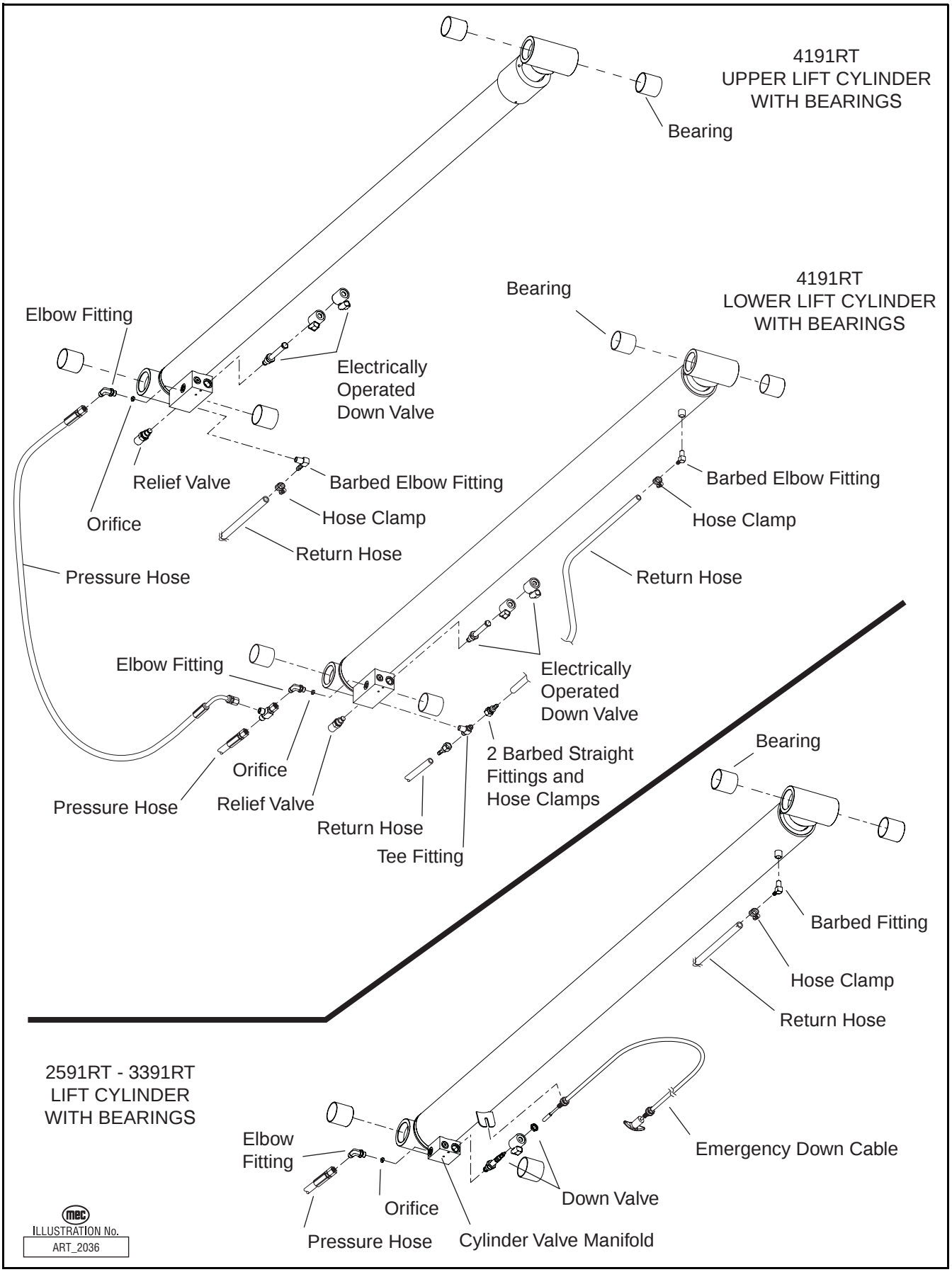


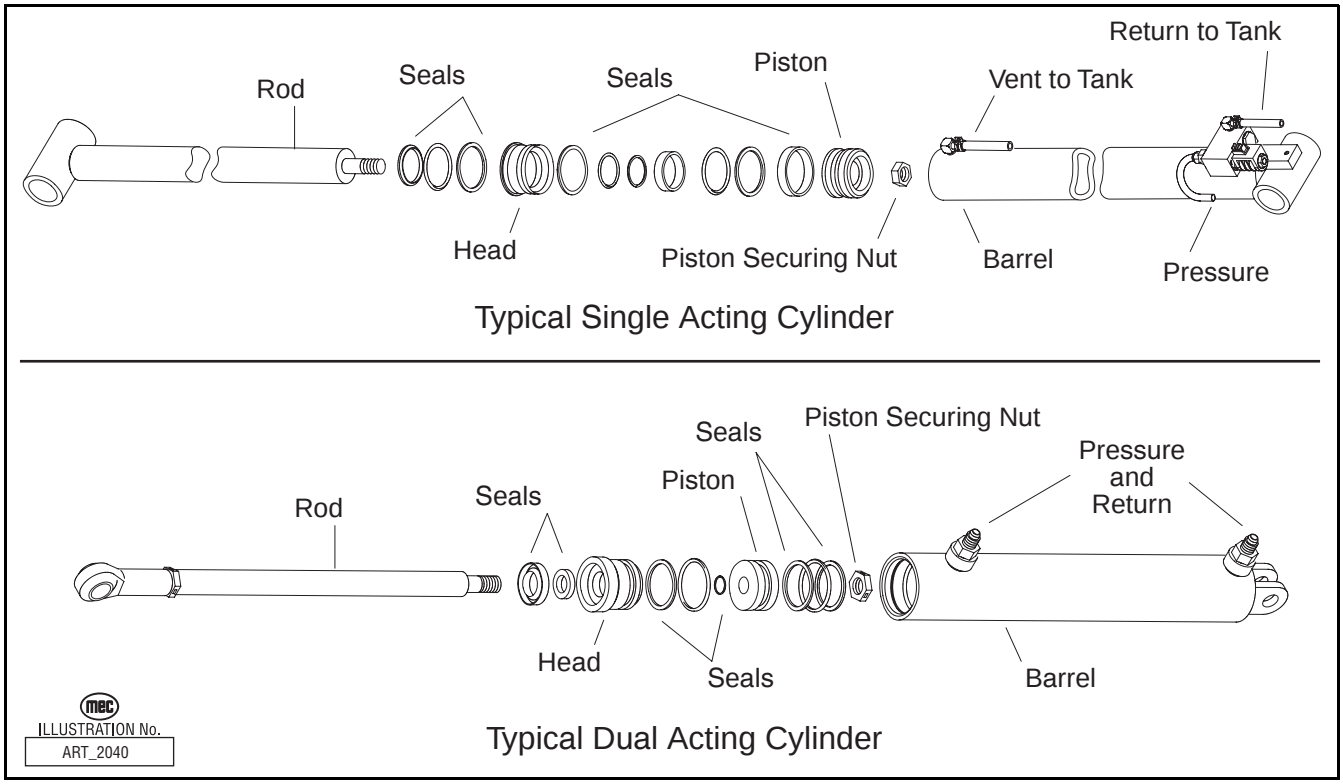
Figure 1-12: Lift Cylinders



WARNING

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

Figure 1-13: 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

CAUTION

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

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

Cylinder Disassembly

1. Remove the head from the cylinder body.
2. Remove the shaft assembly from the barrel, pulling in a straight line, so as not to scar the internal parts.
3. Insert shaft into a **soft jawed** vise so that the head and piston can be removed. Be sure the shaft and vise are both clean before using.
4. Remove nut at the end of the shaft and pull head and piston off of the rod.
5. Remove all seals from the head and piston using a non-sharp seal tool. These tools are available from various seal suppliers.
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 groves and sealing surfaces.
   a. Scratches or pits deep enough to catch the fingernail are unacceptable; replace the cylinder.
   b. Polishing is a sign of uneven loading. Check for roundness. If a polished surface is not round within .007 in. (0.18 mm) replace the cylinder.

Cylinder Assembly

CAUTION:

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

1. Lubricate all components with clean hydraulic fluid.
2. Install new seal kit components. Install all seals on the head and piston using the non-sharp seal tool.
3. Place a small amount of fluid on the inside seals of the head and reinstall it on the shaft, by slipping head over the piston end of the shaft being very careful not to damage the inside seals.
4. Place a small amount of fluid on the inside seals of the piston and reinstall it on the shaft by slowly twisting the piston on over the threads of the shaft being very careful not to damage the inside seals.
5. Reinstall the shaft nut; torque 1 ½" nut to 160 ft. lbs. (216 Nm).
6. Grease the outside seals of the head and piston.
7. Reinstall the shaft into the barrel of the cylinder and push in until groove of the head lines up with the slot in the barrel.
8. Reinstall the cylinder retainer. Installation is reverse of removal.
9. Cycle the cylinder using air to check for proper operation.

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

Optional Outriggers

NOTE: Refer to *Section 3* for detailed description and troubleshooting.
Refer to *Cylinder Repair*.

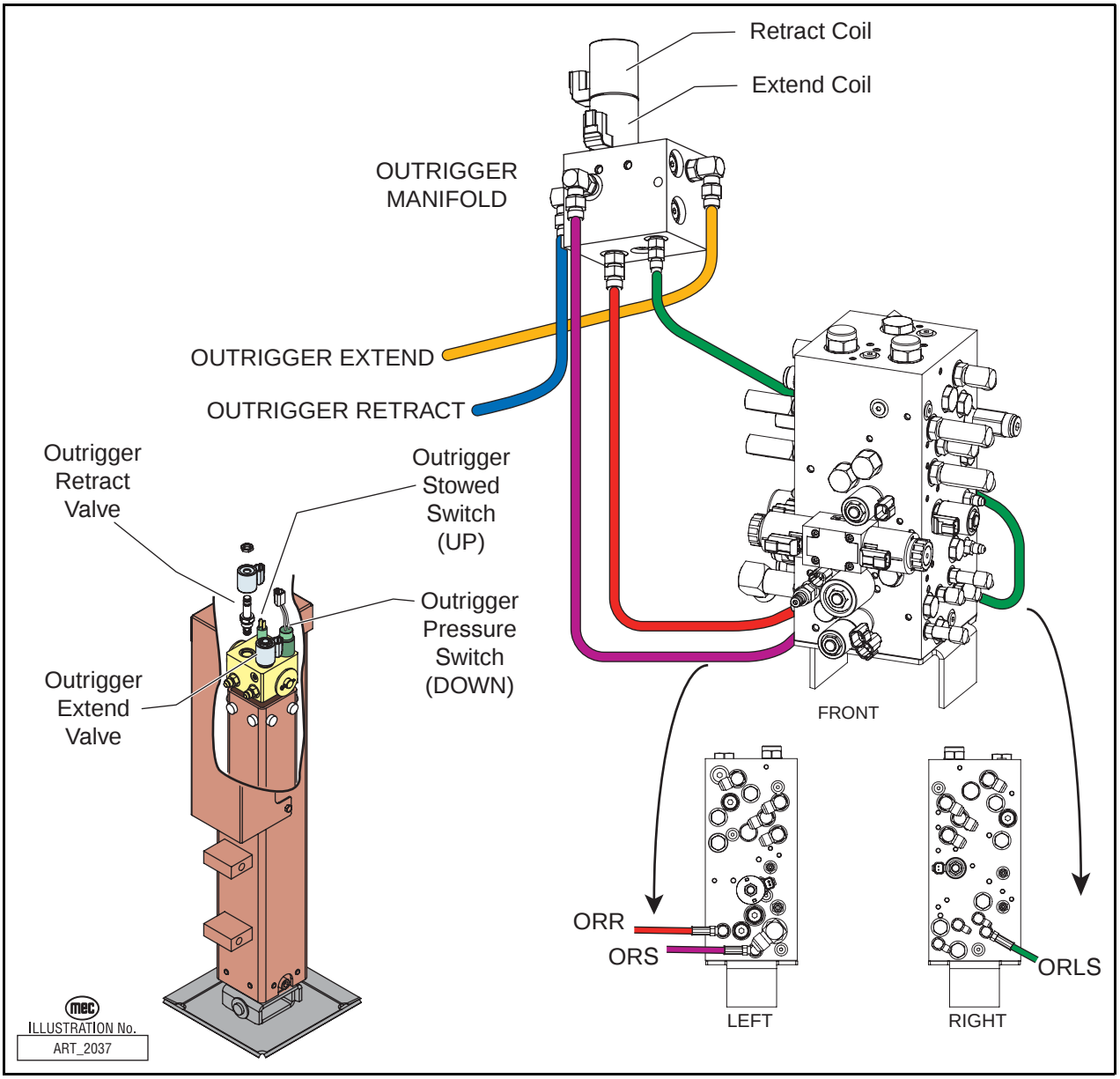
Outrigger Hydraulic Manifold

The Optional outrigger manifold is located in the Control Module behind the Lower Control Box.

Cylinders

Four (4) double acting type hydraulic cylinders.

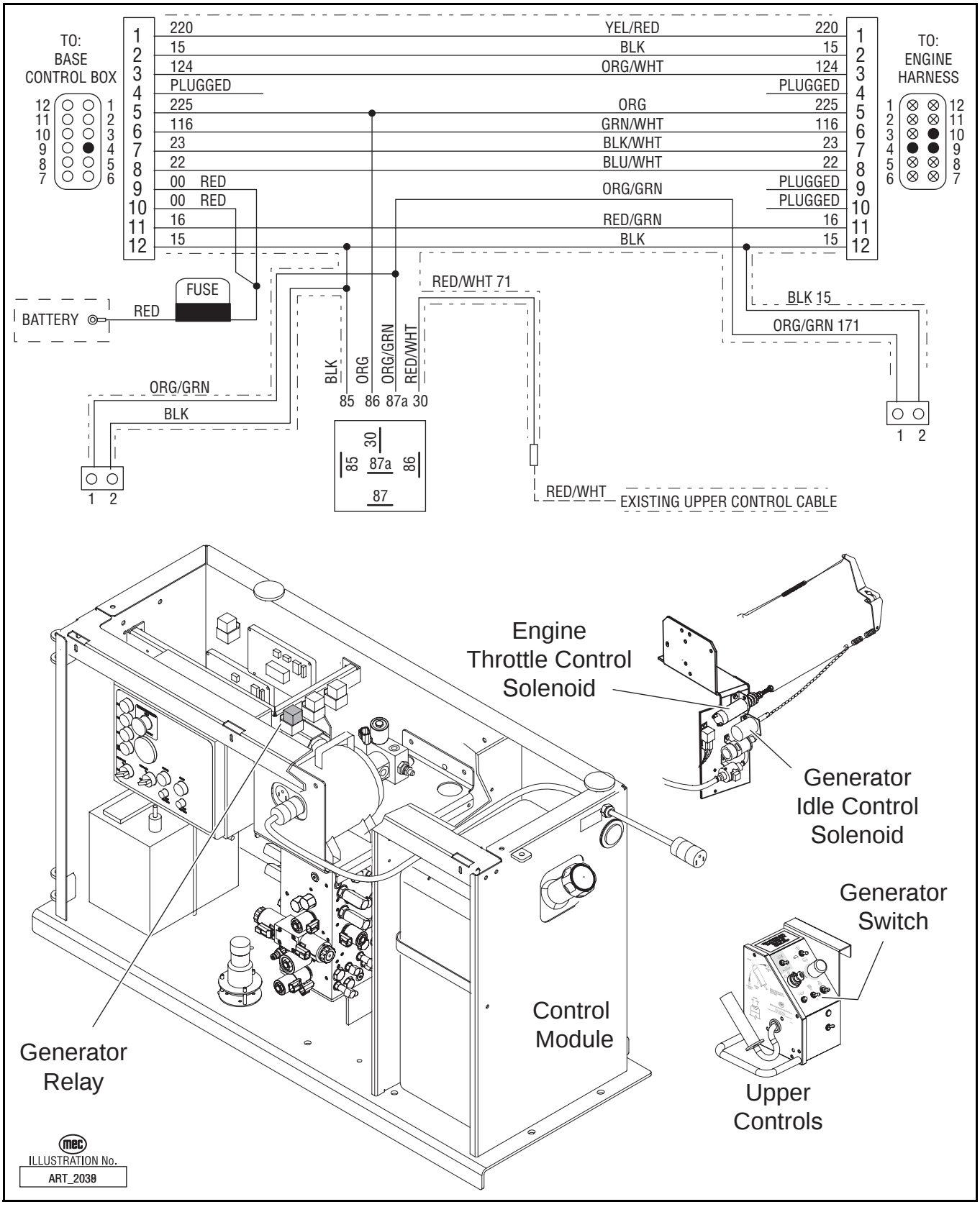
Figure 1-14: Outrigger Hydraulic Connections



Optional Generator

NOTE: Refer to *Section 6*,
Refer to *Parts Sections E and F*

Figure 1-15: Optional Generator Connections



SERVICE

Section 2

ELECTRICAL SYSTEM

CONTENTS

FIGURES

Electrical System – General

The electrical control system consists of a base control station and a platform control station.

Base Control Station

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

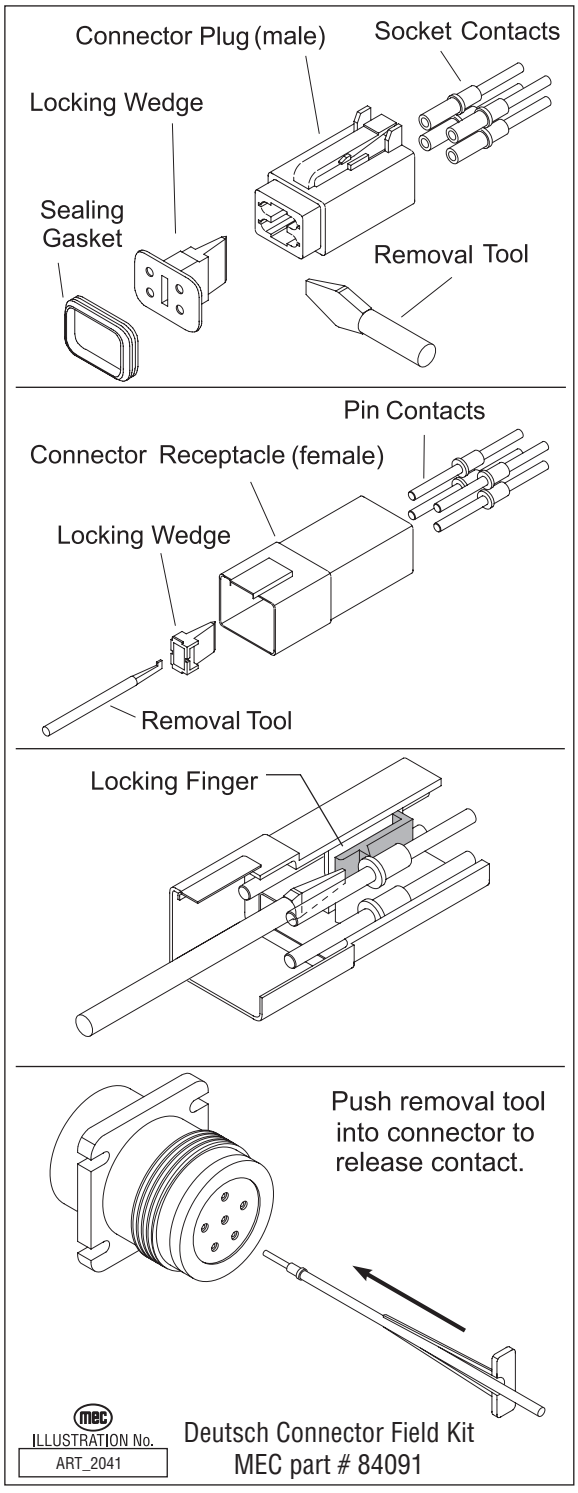
Platform Control Station

The platform control station will operate all functions including drive/steer and lift/lower. Momentary bidirectional rocker switch on the drive controller handle (joystick) provides the steering function. The control system for operation of drive/steer and lift/lower are electric-over-hydraulic type. The drive and lift system is a proportional system controlled by position and direction of the upper control box controller handle (joystick).

Deutsch Connectors

Deutsch connectors used on MEC equipment is designed so that individual parts may be replaced without replacing the entire component. Special tools and detailed instructions are provided in Deutsch Connector field kits, MEC part no. 84091.

Figure 2-1: 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.

BATTERY

WARNING

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

ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH BATTERIES.

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

REPLACE WITH MANUFACTURER APPROVED BATTERIES.

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

A 12 volt battery supplies the electrical power required to start the engine and operate the electrical circuits.

BATTERY MAINTENANCE (IN STORAGE)

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

- Keep battery clean. Electrolyte of batteries should be checked regularly and kept at proper level.
- Never stack one battery directly on top of another because post or container damage can result. If batteries are stored individually, place supporting boards between layers. Rotate stock so that 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)	None required
Above 60°F (15°C)	Every month
40°-60°F (4°-15°C)	Every 2 months

Battery Maintenance (in use)

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

Check battery terminals for:

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

Check battery electrolyte level. Replenish the electrolyte, if necessary. Remove vent caps before filling, and USE ONLY DISTILLED WATER. DO NOT OVERFILL. Fill to level indicator (or 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 can indicate that a battery has been overcharged, has been subjected to excessively high temperatures, or is nearing the end of its service life.

Battery Preventative Maintenance:

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

WARNING

BEFORE REMOVING THE BATTERY FROM THE MACHINE, TURN OFF THE MAIN POWER SWITCH.

CAUTION

Prevent damage to the battery and/or electrical system;

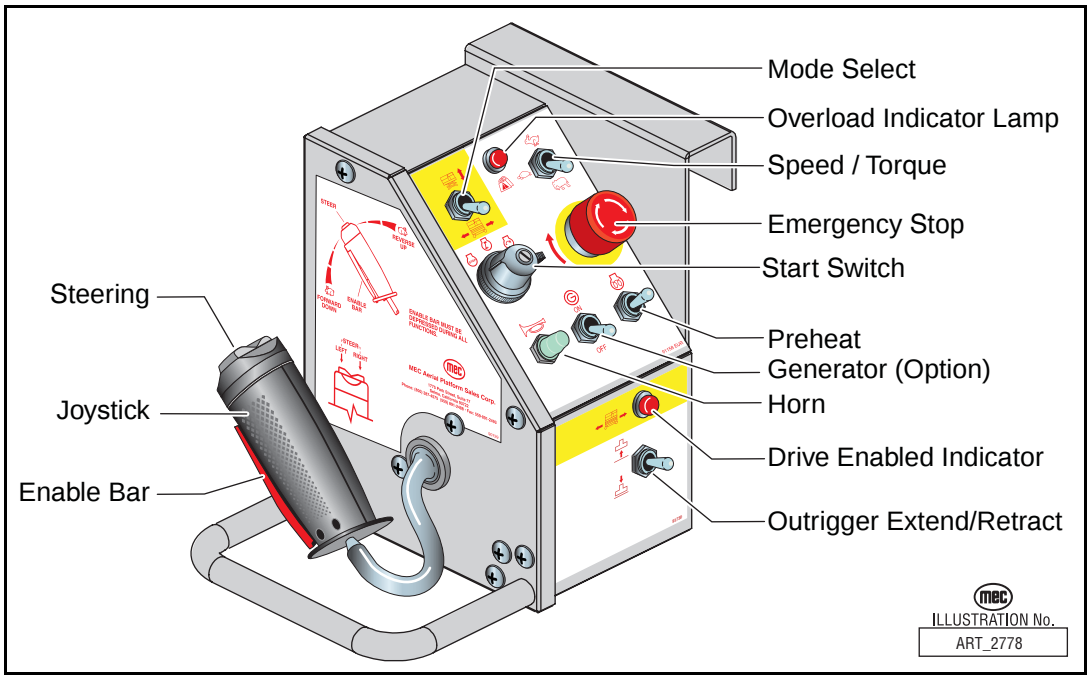
- **Always disconnect the negative battery cable first.**
- **Always connect the positive battery cable first.**

Always disconnect the negative battery cable first.

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

To install battery, reverse the process by positioning the battery in the compartment securely with hold down bolts. Connect battery cables. Always connect the positive cable first.

Figure 2-2: Upper Controls



EMERGENCY STOP BUTTON

There are two red emergency stop buttons: one located on the platform control console and the other on the base control panel. This stop button, when in the “OUT” (ON) position, provides power to the desired control station. Also, the stop button, in the event of an emergency can be used to turn off the power by pushing “IN” (OFF). All functions stop immediately when button is depressed.

Turn the button clockwise to reset.

NOTE: As a safety feature, selecting and operating the base controls will override all platform controls, except for the platform emergency stop button.
The base control emergency stop button will stop all machine operations, even if the selector switch is switched to platform controls.

MASTER DISCONNECT SWITCH

Battery disconnect is provided in the Control Module to facilitate servicing and also to prevent unauthorized use of vehicle by using a padlock (to provide security).

MOVEMENT ALARM – LIGHT (OPTIONAL)

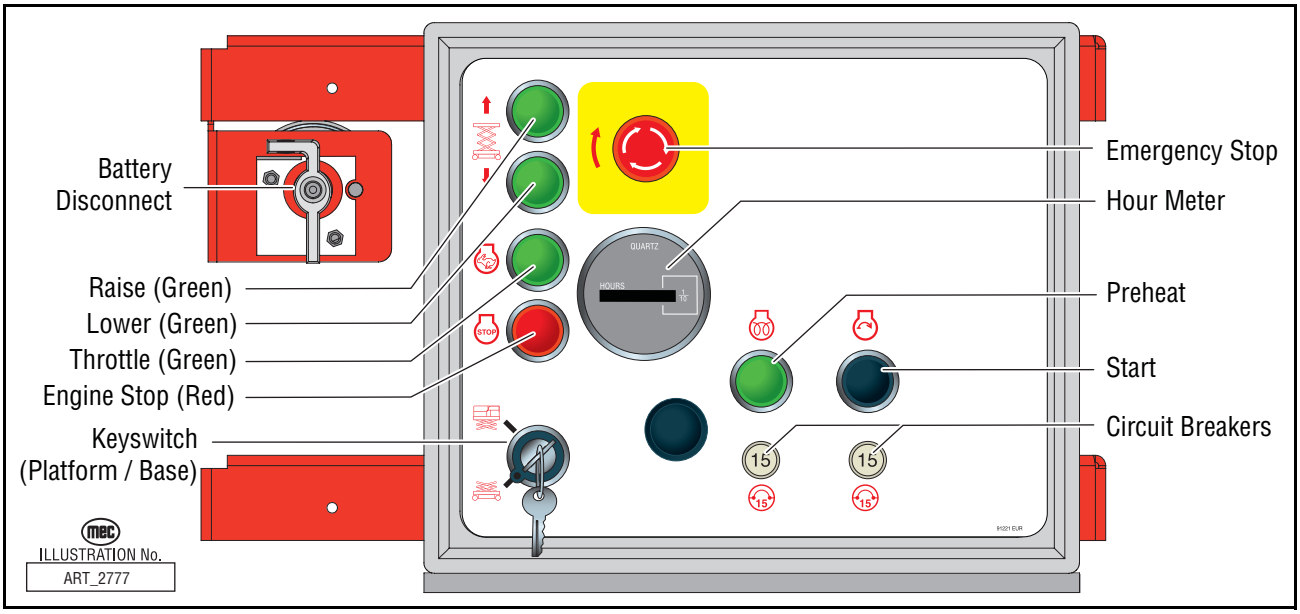
This light is activated as soon as the platform control console joystick (controller) lever is moved off the center “Neutral” position.

WARNING

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

Platform / Base Selector key Switch

Figure 2-3: Lower Controls



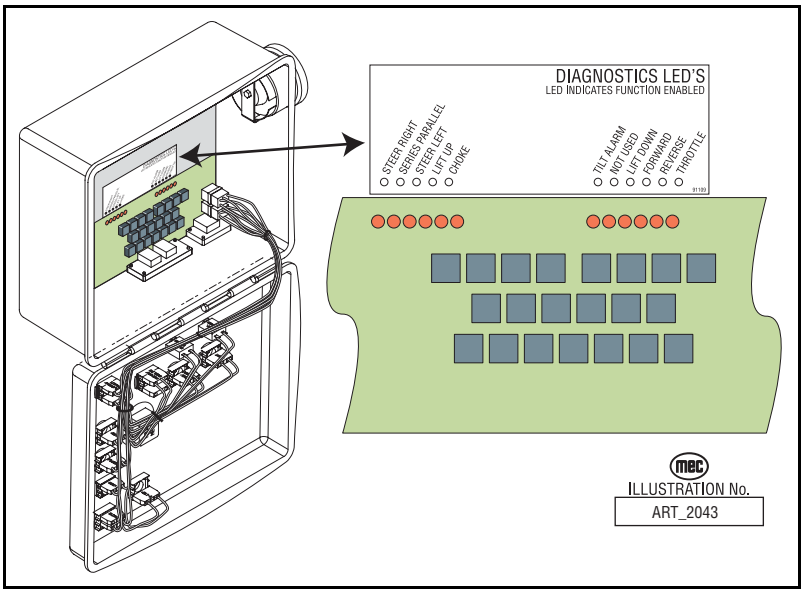
Machine can be operated from the base/ground or platform controls. Activation of one or the other is achieved with this switch.

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

Diagnostic LEDs

Figure 2-4: Diagnostic LEDs

There are Diagnostic LED's located on the Printed Circuit Board inside the Base Control box. Each LED represents a function. When the LED is ON the function is ENERGIZED. Refer to the *DIAGNOSTIC LED'S* label to identify the LED function.



RELAYS

There are relays located inside the control module and inside the Upper Controls. (Refer to the Section 5 for relay functions and interconnect).

TORQUE/SPEED RELAY

Purpose – Disperses power to Torque Solenoid Valve when high speed or low speed is selected.

OUTRIGGER RELAY (OPTION)

Purpose – Cuts power to Lift circuits until Outriggers are fully deployed and in firm contact with the ground.

THROTTLE RELAY

Purpose – The electric throttle solenoid receives its power through the Throttle Relay.

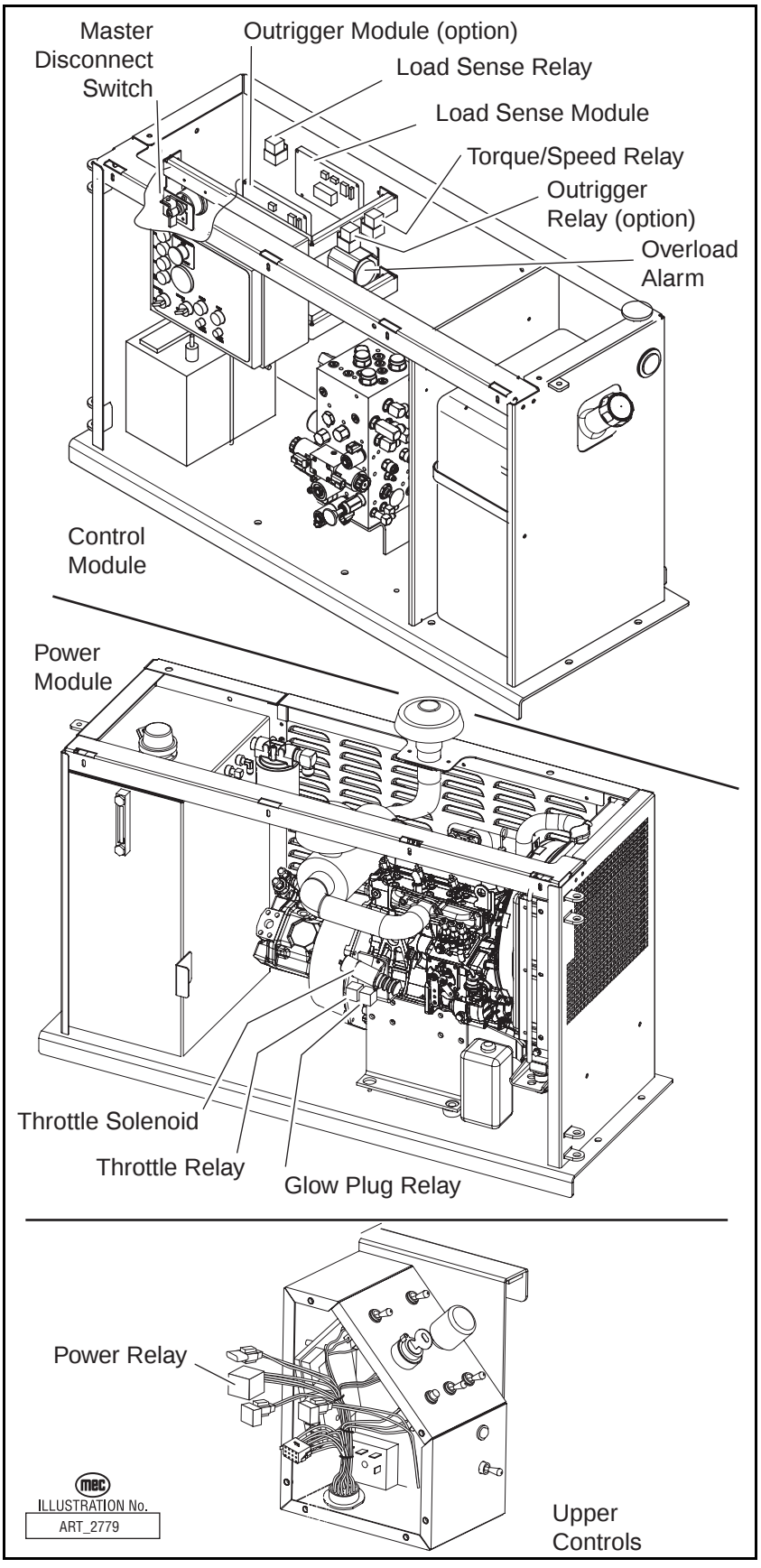
GLOW PLUG RELAY

Purpose – The diesel engine glow plug receives its power through the Glow Plug Relay.

UPPER CONTROL POWER RELAY

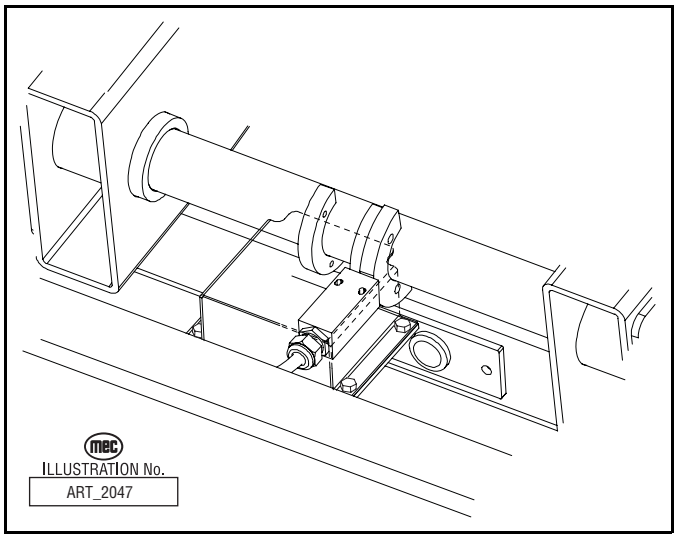
Purpose – Cuts power to Upper Controls when Lower Controls are selected.

Figure 2-5: Relay Locations



Limit Switch

Figure 2-6: Limit Switch



The Limit Switch indicates Platform Height above approximately 10 feet (3 m). The switch operates in conjunction with the circuit board located in the lower control box and the proportional circuit board located in the upper control box.

Lower Controls Circuit Board Function

When the platform is elevated above 10 feet (3 m). The limit switch is depressed and opened, causing the circuit board to;

- enable tilt sensor cutout operation.
- lock-out high torque and high speed.
- lockout outrigger operation.
- prevent drive when axle is not centered.

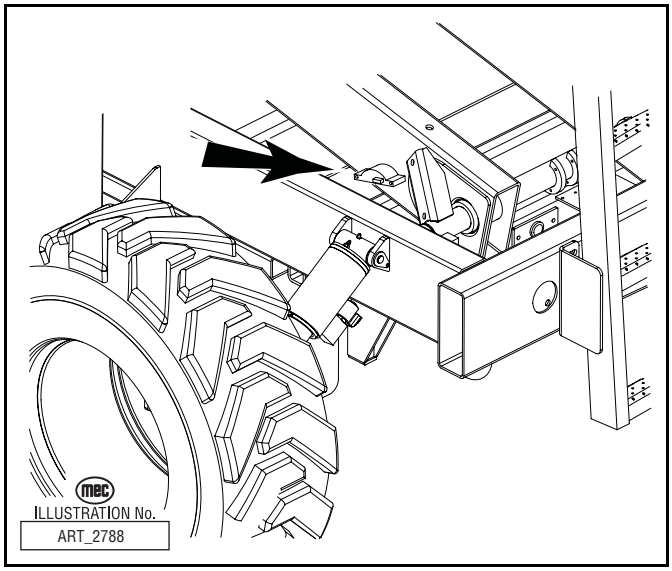
Upper Controls Proportional Circuit Board Function

When the platform is elevated above 10 feet (3 m). The limit switch is depressed and opened, causing the proportional circuit board to;

- limit proportional output to approximately 25% in drive (elevated drive speed).

Height Sensor

Figure 2-7: Height Sensor



The Height Sensor works in conjunction with the Load Sense Control Module to prevent operation when the platform is overloaded.

Optional Outriggers Switches

If the machine is equipped with outriggers, each of the four (4) outriggers has a Stowed Switch and a Pressure Switch.

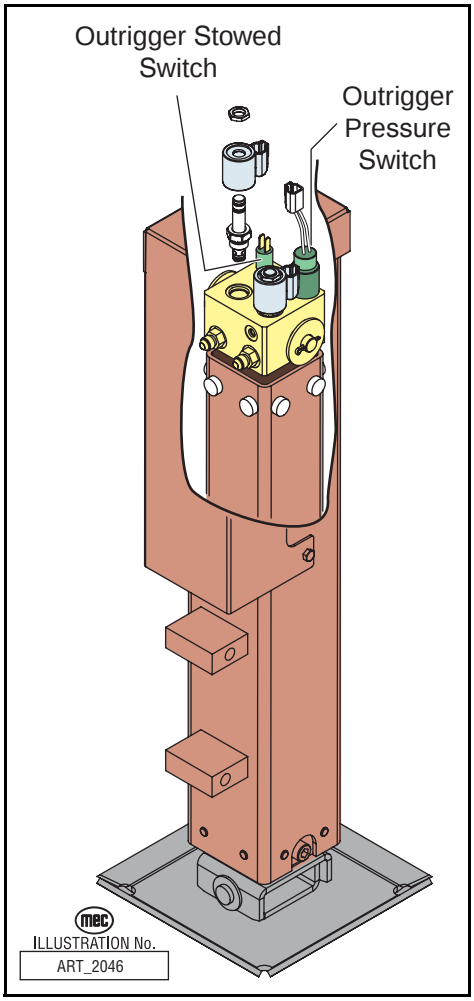
Outrigger Stowed Switch

- Indicates full retraction of the outrigger cylinder.
- **Drive Function:** The machine will drive when the Outrigger Stowed Switch on all four (4) outriggers is engaged. If one (1) or more Outrigger Stowed Switch is open (not engaged) the machine *will not drive*.
- **Lift Function:** If one (1) or more Outrigger Stowed Switch is open (not engaged) the machine *will not lift* unless all four (4) outriggers are fully deployed.

Outrigger Pressure Switch

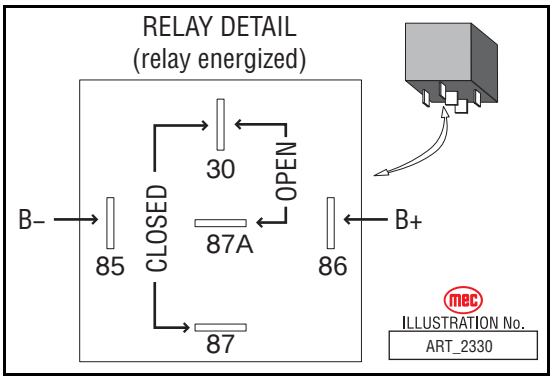
- Indicates full deployment of the outrigger.
- **Lift Function:** When deployment begins the Outrigger Stowed Switches open and lift function is disabled. When all four (4) outriggers reach full deployment the Outrigger Pressure Switches close (engage) and lift function is restored.

Figure 2-8: Outrigger Cylinder Switches



Continuity Checks

Figure 2-9: Relay Operation



Check Toggle Switch:

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

Check Selector Switch

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

Check Emergency Stop Button

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

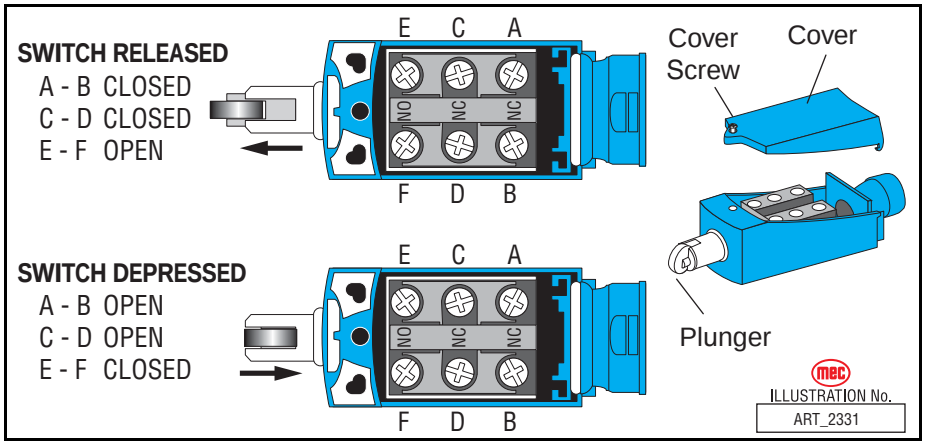
Check Relay Operation

- 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.

Check Limit Switch Operation

- Loosen cover screw and lift cover from switch.
- Mark and disconnect wires.
- With one probe of ohm meter to “A” and other probe to “B”, release the plunger.
  - Low resistance should be seen. Same result should be seen between “C” and “D”.
- With one probe of ohm meter to “A” and other probe to “B”, depress the plunger.
  - High resistance should be seen. Same result should be seen between “C” and “D”.
- “E” and “F” should show opposite results as seen on previous tests though there may not be any circuits on these terminals.

Figure 2-10: Limit Switch Operation



Section 3

OVERLOAD SENSING SYSTEM

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FIGURES — PAGE

General Description

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

WARNING

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

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

Figure 3-1: EZcal Connection

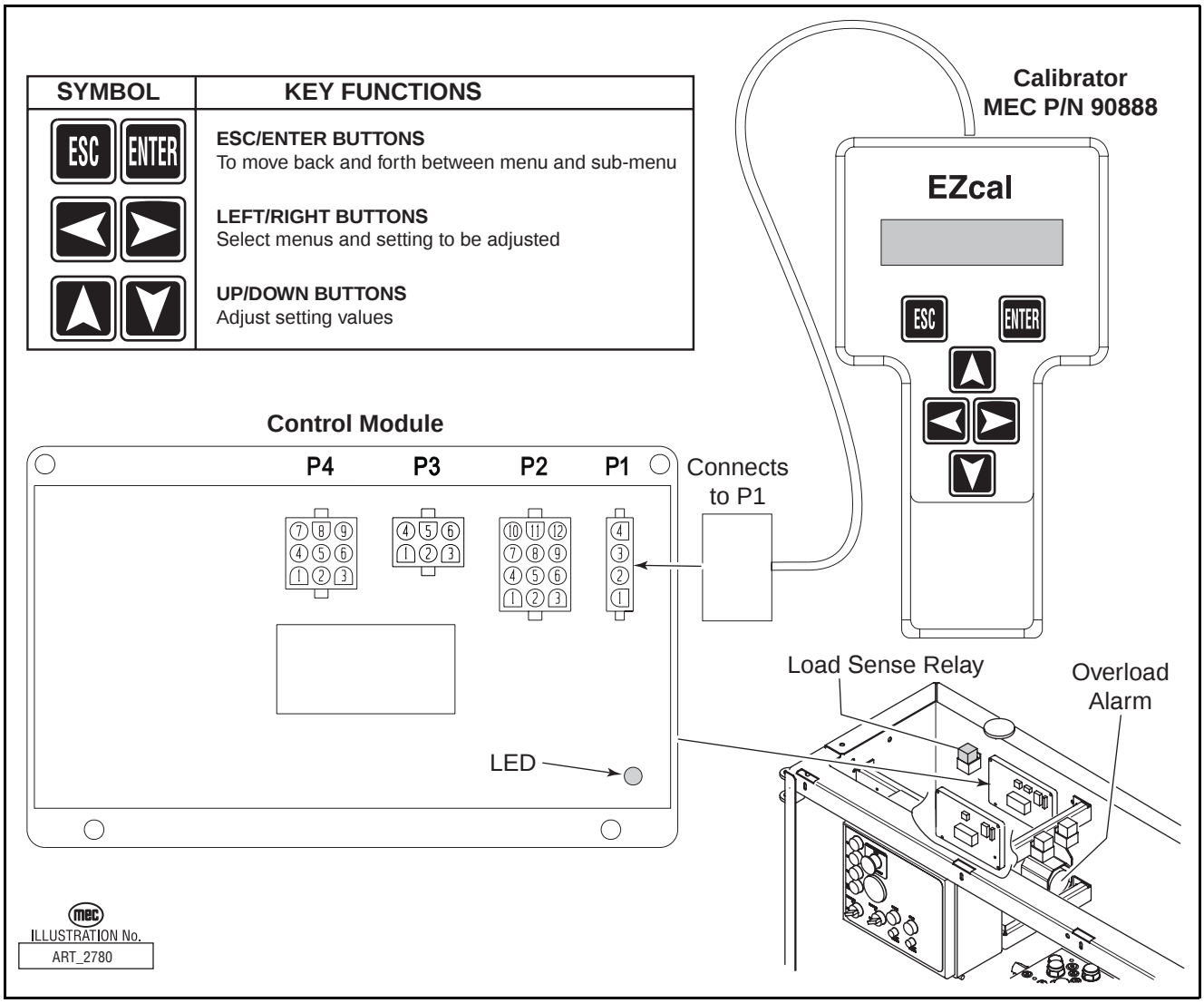
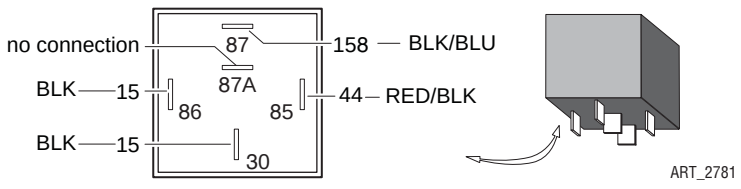


Table 3-1: Electrical Connections

P1	**Connects to EZcal hand-held device for diagnostics and calibration.**	
P2 (J17)	**Connects to power supply and function switches**	
	(J) P2-1	no connect
	(J) P2-2	no connect
RED/BLU 304	(J) P2-3	“UP” valve (B+ when UP requested)
YEL/BLU 105	(J) P2-4	“DOWN” valve (B+ when DOWN requested)
	(J) P2-5	no connect
	(J) P2-6	no connect
GRY/RED 111	(J) P2-7	“FWD” Valve (B+ when Forward commanded)
GRY/BLK 110	(J) P2-8	“REV” Valve (B+ when Reverse commanded)
	(J) P2-9	no connect
TAN/ORG 2	(J) P2-10	“PLATFORM ELEVATED” indication (B+ when platform stowed)
BLK 15	(J) P2-11	SUPPLY NEGATIVE (connected to B-)
RED/WHT 201	(J) P2-12	SUPPLY POSITIVE (connected to B+)
P3 (J16)	**Provides outputs for cutout alarms, lamp, and relay**	
TAN 12	(J) P3-1	Tilt Sensor to Lower Control Box (B+ when not tilted)
BLU/WHT 72	(J) P3-2	Platform and Base Alarm
BLK/RED 74	(J) P3-3	OVERLOAD LAMP output (off normally, turns on to indicate overload)
RED/BLK 44	(J) P3-4	Cutout Relay output (B+ when not overloaded)
BLK 15	(J) P3-5	Cutout Relay B- (internally linked to P2-11)
	(J) P3-6	no connect
P4	**Connects to lift cylinder pressure sensor and height sensor**	
	(J) P4-1	no connect
ORG/GRN 42	(J) P4-2	pressure sensor (0.5V...4.5V analog)
ORG/RED 43	(J) P4-3	height sensor (1V...4V analog)
	(J) P4-4	no connect
	(J) P4-5	no connect
GRY 46	(J) P4-6	B+ protected supplies for pressure sensor
BLK 15	(J) P4-7	B– for pressure sensor
BLK 15	(J) P4-8	B– protected supplies for height sensor
BRN/YEL 49	(J) P4-9	B+ for height sensor
(J)= plug identification as it corresponds to the electrical schematic diagram.		
J18	**Cutout Relay Connections**	
BLK 15	30	
RED/BLK 44	85	
BLK 15	86	
BLK/BLU 158	87	



TROUBLESHOOTING

GP102 - EZCAL HELP MESSAGES

When the **EZcal** hand-held device is connected to the **GP102** control module, the first menu available is “HELP” - just press the **ENTER** button to see a message describing the current status of the **GP102**; this This will provide the best information when troubleshooting the load sense system.

When an **EZcal** is unavailable, an LED on the **GP102** flashes to provide limited diagnostics. Refer to ***GP102*** *LED Flash Codes* in this section.

The following messages may be displayed on the Ezcal display.

EVERYTHING OK

The **GP102** detects no problems.

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

ARMGUARD ACTIVE!

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

B+ SUPPLY TOO LOW

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

DRIVE/LIFT SELECT INPUTS FAULTY!

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

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

ELEVATION SWITCH SHIFTED?

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

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

ELEVATION SWITCH STUCK?

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

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

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

FACTORY OVERRIDE

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

FAULT: BAD TILT SENSOR

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

HEIGHT NOT CALIBRATED

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

IDLE TIMEOUT ACTIVE!

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

INVALID HEIGHT - CHECK SENSORS

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

INVALID LOAD - CHECK SENSORS

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

LOAD NOT CALIBRATED

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

NO LAST CALDATE!

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

P3-4 SHORT TO 0V?

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

P3-4 SHORT TO SUPPLY?

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

TESTING HWFS

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

TOO HIGH - DRIVE PREVENTED

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

TOO HIGH - LIFT UP PREVENTED

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

UP/DOWN SELECT INPUTS ACTIVE TOGETHER!

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

VEHICLE OVERLOADED

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

VEHICLE TILTED

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

WAITING FOR B+ ON P2-12

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

WAITING FOR NEUTRAL

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

GP102 LED Flash Codes

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

LED ON STEADY

This indicates no fault with the **GP102**

LED OFF ALWAYS

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

LED FLASH CODE 1

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

LED FLASH CODE 2

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

LED FLASH CODE 3

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

LED FLASH CODE 4

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

LED FLASH CODE 5

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

LED FLASH CODE 6

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

LED FLASH CODE 7

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

LED FLASH CODE 8

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

LED FLASH CODE 9

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

LED FLASH CODE 10

This indicates the **GP102** is carrying out startup tests.

LED FLASH CODE 15

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

CALIBRATION

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

TILT SENSOR CALIBRATION

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

a. Drive machine to level ground.
b. Plug **EZcal** into connector P1 on load sense control module.
   • Display reads HELP: PRESS ENTER.
c. Press right arrow to ACCESS LEVEL 3, Press Enter.
   • Display reads CODE 0000.
d. Press up and right arrow to enter code 1775, Press Enter.
   • Display reads ACCESS LEVEL 2.
e. Right arrow to SETUPS, Press Enter.
   • Display reads CHANGE DEFAULTS.
f. Right arrow to TILT SETUPS, Press Enter.
   • Display reads CALIBRATE LEVEL.
g. Press Enter.
   • Display reads CALIBRATE LEVEL: YES:ENTER,NO:ESC.
h. Press Enter.
   • Display reads TILT 0.0',0.0' i. Press ESC, ESC, ESC j. Disconnect **EZcal** from the load sense module.

PLATFORM LOAD CALIBRATION

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

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

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

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

a. Drive machine to level ground, in area where it can reach full elevation.
b. Place rated load in platform.
c. Turn selector switch to Base controls.
d. Remove top cover off of lower control station box, and plug **EZcal** into connector P1 on load sense control module.

EZcal display reads HELP: PRESS ENTER

e. Press right arrow to ACCESS LEVEL 3, Press Enter.
   • Display reads CODE 0000
f. Press up and right arrow to enter code 1775, Press Enter.
   • Display reads ACCESS LEVEL 2.
g. Press Right Arrow to SETUPS, Press Enter.
   • Display reads CHANGE DEFAULTS
h. Press Enter to verify machine type. Press up and down arrows to change if necessary.
   • Display reads 1=1532, 2=1932, 3=2033 …etc. Select appropriate model.
i. Press Enter. Press Esc. Press Right Arrow to LOAD SETUPS. Press Enter.
   • Display reads CALIBRATE LOAD
j. Press Enter.
   • Display reads PLATFORM DOWN? Verify that platform is fully lowered.
k. Press Enter.
   • Display reads PLATFORM LOADED? Verify that rated load is in platform.
l. Press Enter.
   • Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch.
   • Display reads PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position. Release switch. Display reads PLATFORM LOADED?
m. Press Enter.
   • Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch.

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

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

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

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

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

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

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

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

o. Enter current date using Up, Down and Right Arrows.
   - Display reads FINISHED.

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

HEIGHT CALIBRATION

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

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

b. Turn selector switch to Base controls.

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

d. Press right arrow to ACCESS LEVEL 3, Press Enter.
   - Display reads CODE 0000

e. Press Up and Right Arrow to enter code 1775, Press Enter.
   - Display reads ACCESS LEVEL 2.

f. Press Right Arrow to SETUPS, Press Enter.
   - Display reads CHANGE DEFAULTS

g. Press Right Arrow to HEIGHT SETUPS, Press Enter.
   - Display reads CALIBRATE HEIGHT

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

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

CALIBRATION TROUBLESHOOTING

FAILURE MESSAGES

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

F01:CHECK HWFS

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

Check HELP message for more information.

F02:NOT GROUND MODE

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

F03:NOT STOPPED

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

F04:TILTED

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

F05:BAD HEIGHT

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

F06:CHECK ELEV

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

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

F08:CHECK ELEV

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

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

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

F09:BAD HEIGHT

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

F10:BAD HEIGHT

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

F11:NOT UP

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

F12:TOO MANY

This message occurs if the DYNAMIC lift takes too long.

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

F13:LOW HEIGHT RANGE

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

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

F14:BAD HEIGHT

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

F15:CHECK ELEV

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

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

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

F16:LOW ELEV.OPEN

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

F17:HIGH ELEV.OPEN

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

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

F18:LOW ELEV.CLOSE

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

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

F19:HIGH ELEV.CLOSE

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

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

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

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

Check DIAGOSTICS / SYSTEM to check the height.

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

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

F24:TOO MANY

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

F25:CHECK ELEV
F26:CHECK ELEV

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

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

F27:BAD HEIGHT

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

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

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

F30:BAD HEIGHTS

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

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

F31:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F32:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F33:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F34:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F40:REJECT DELTA

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

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

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

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

F42:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F43:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F44:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F45:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F46:CHECK ELEV

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

F47:CHECK ELEV

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

F48:BAD PRESSURE

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

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

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

INFORMATION MESSAGES

During calibration the following messages may be displayed:

BUILDING TABLES

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

CALDATE:

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

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

Press LEFT & RIGHT to select the flashing digits.

Press UP & DOWN to change the flashing digits.

Press ENTER when the entry is complete.

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

FINISHED

This message confirms that calibration is complete and successful.

GO DOWN MORE!

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

GO UP MORE!

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

LIFT EMPTY

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

LIFT LOADED

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

LIFTING

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

LOWER EMPTY

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

LOWER LOADED

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

LOWERING

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

MEASURING

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

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

MUST GO DOWN!

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

MUST GO UP!

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

PLATFORM DOWN?

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

Press ENTER to confirm when the platform is fully lowered.

PLATFORM EMPTY?

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

Press ENTER to confirm when the platform is empty.

PLATFORM LOADED?

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

Press ENTER to confirm when the platform is loaded.

PLEASE LIFT ...

This message is prompting for the platform to be raised.

The UP switch should be closed.

PLEASE LOWER ...

This message is prompting for the platform to be lowered.

The DOWN switch should be closed.

PLEASE WAIT

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

REDO DYNAMIC:

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

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

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

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

REDO EMPTY:

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

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

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

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

REDO LOADED:

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

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

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

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

TOTAL DATA:

This message is displayed at the end of each phase, to confirm the number of measurements recorded by the .

Section 4

MECHANICAL COMPONENTS

CONTENTS — PAGE

FIGURES PAGE

Mechanical Components

This section describes the major components of the machine and the steps required to service them.

Base

CAUTION

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 turn in their mounting , which will 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.

DANGER

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

NOTE: Replace tires with the correct tires to maintain the rating of the equipment.

Changing Tires

Lift and support the machine – Refer to *Introduction* section for instructions and safety precautions.

WARNING

FOAM FILLED TIRES ARE EXTREMELY HEAVY. CARE MUST BE TAKEN TO AVOID PERSONAL INJURY.

CAUTION

Always block the wheels before lifting the machine.

1. Chock tires on the opposite end of machine.
2. Before lifting the machine, break loose the lug nuts and leave them tight.
3. Lift and support the end of machine requiring a wheel change.
4. Remove lug nuts and pull the wheel off.
5. Install the replacement wheel, install lug nuts and tighten.
6. Lower the machine.
7. Tighten lug nuts to proper torque (Refer to machine specifications).
8. Remove the chocks.

Drive Motors

Refer to *Section 1* for repair information.

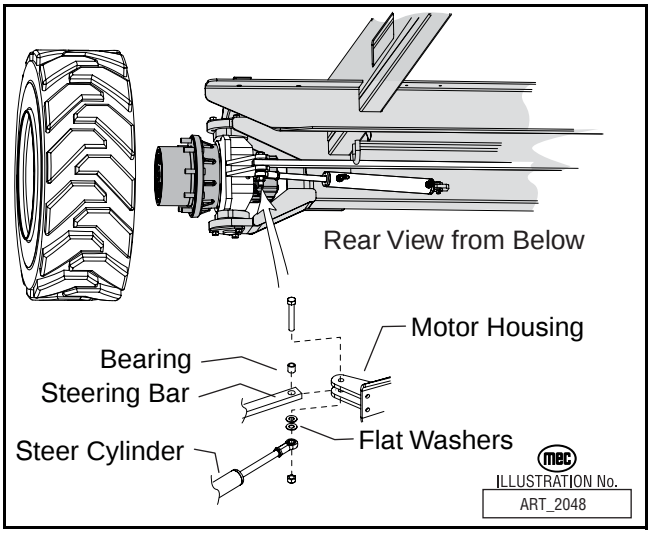
There are two (2) hydraulic drive motors on the front axle and two (2) hydraulic drive motors on the rear drive axle. These can be damaged or leaks may occur; repair or replace as necessary.

CAUTION

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

Front Drive Motors

Figure 4-1: Front Drive Motor



Remove Front Drive Motor

1. Lift and support the front end of machine.
2. Disconnect the cylinder end and tie-rod from the motor housing.
3. Turn the motor housing to gain access to the motor and hose assemblies.
4. Disconnect hose assemblies from drive motor.
5. Remove the cap screws and remove the drive motor.
6. Be careful not to damage or misplace O-ring.

Replace

Installation is reverse of removal.

REAR DRIVE MOTOR

Remove Rear Drive Motor

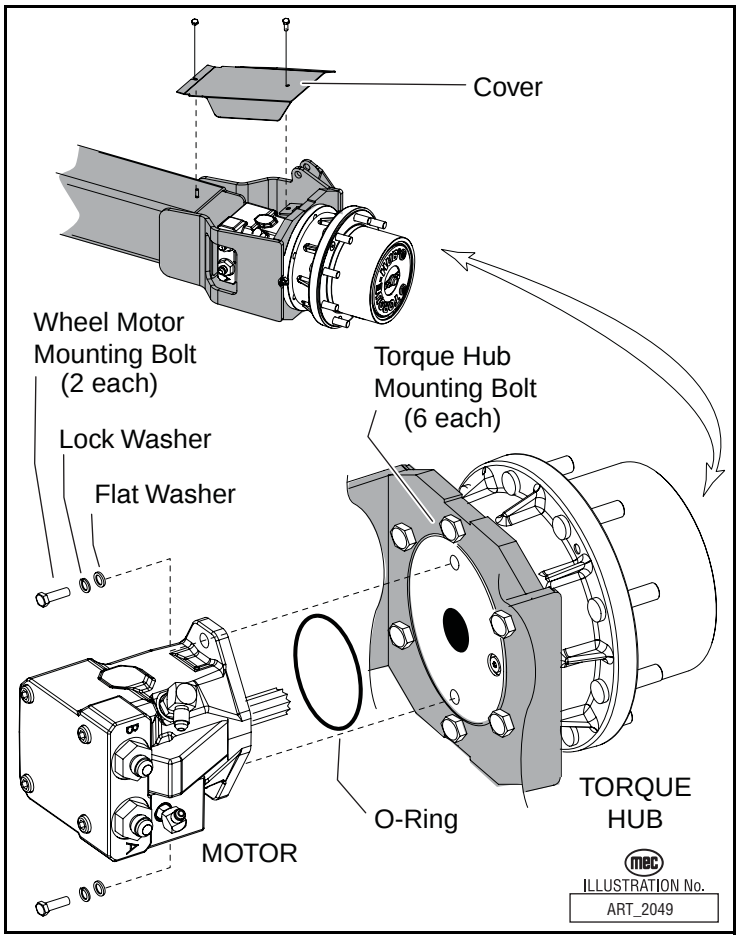
1. Lift and support the rear end of machine.
2. Remove the wheel and remove cover on top of axle.
3. Disconnect hose assemblies from drive motor.
4. Remove the mounting bolts.
5. Rotate the motor until parts face up. Remove the motor.
6. Be careful not to damage or misplace O-ring.

Replace

Installation is reverse of removal.

NOTE: Use Loctite® on mounting bolts.

Figure 4-2: Rear Drive Motor

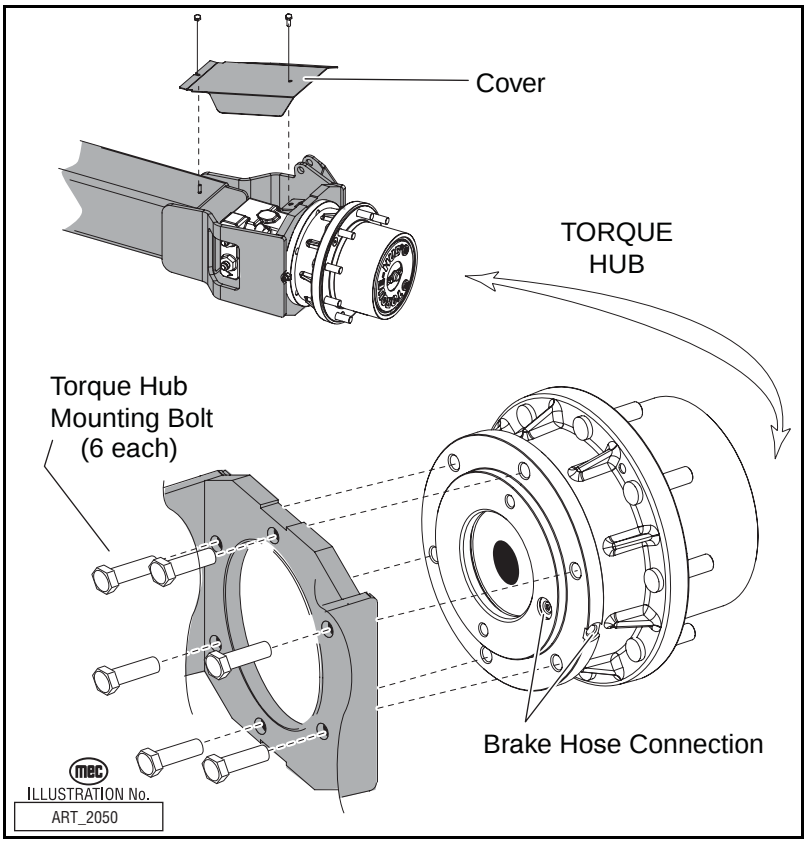


Gear Reduction Torque Hubs

There are two (2) gear reduction hubs on the front axle and two (2) gear reduction hubs with brakes on the rear axle.

Bleed Brake On Machine

Figure 4-3: Brake Bleed



1. Loosen the brake hose approximately one (1) turn.
2. Start the machine and operate drive very slowly until all air is purged from the hose.
3. Tighten the hose fitting and check for leaks.
4. Repeat on opposite side.

Torque Hub Repair

Remove torque hubs from machine and move to a clean work surface.

Remove

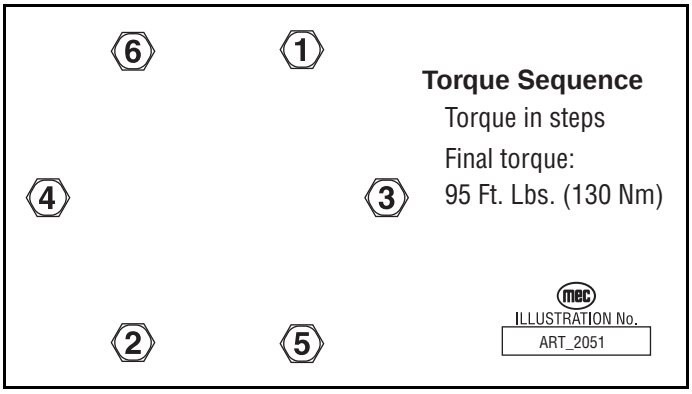
1. Remove the drive motor (see *Drive Motors* earlier in this section).
2. Support the torque hub and remove the six (6) mounting bolts.

Replace

Installation is reverse of removal. Use Loctite® on mounting bolts. Torque in steps.

1. Hand tighten mounting bolts in sequence.
2. Apply torque in sequence: 20 Ft. Lbs. (81 Nm).
3. Apply torque in sequence: 60 Ft. Lbs. (81 Nm).
4. Apply final torque in sequence: 95 Ft. Lbs. (130 Nm).

Figure 4-4: Torque Hub Torque Sequence



Bench Test Torque Hubs

Torque Hubs should be roll and leak tested before and after repair to ensure that the gears, bearings and seals are working properly.

NOTE: Release brake before performing the roll test.

Release Brake

Brake can be released with hydraulic pressure or by compression.

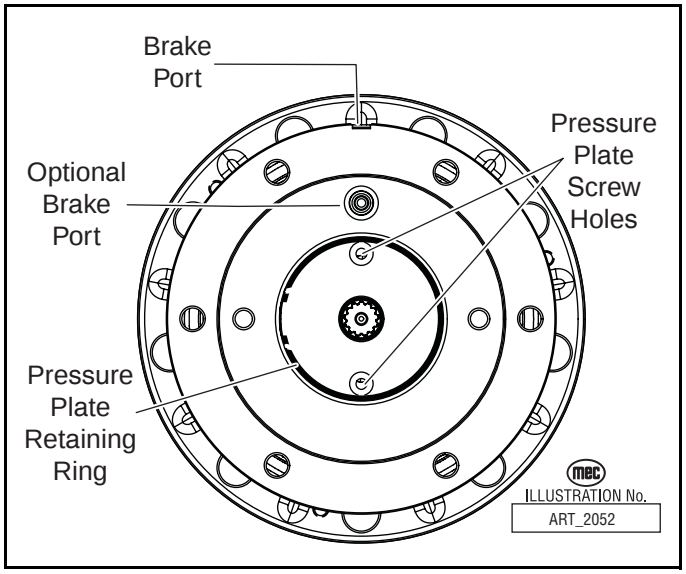
Hydraulic Release

NOTE: Refer to *Brake Test* later in this section.

Compression Release

1. Install two (2) ¼–20 × 5/8" flat head cap screws through the pressure plate and into the piston.
2. Tighten one screw, then the other, a little at a time. Alternate screws until the springs compress and there is no pressure on the retaining ring.

Figure 4-5: Torque Hub Brake



NOTE: Remove bolts before performing brake release test.

Roll Test

1. Release brake as previously described.
2. Apply constant force to roll the gears and check for smooth operation.

NOTE: It may be difficult to roll the motor. This is acceptable as long as operation is smooth and consistent.

3. If inconsistency or drag is detected, the gears are not rolling freely and should be examined.

Leak Test

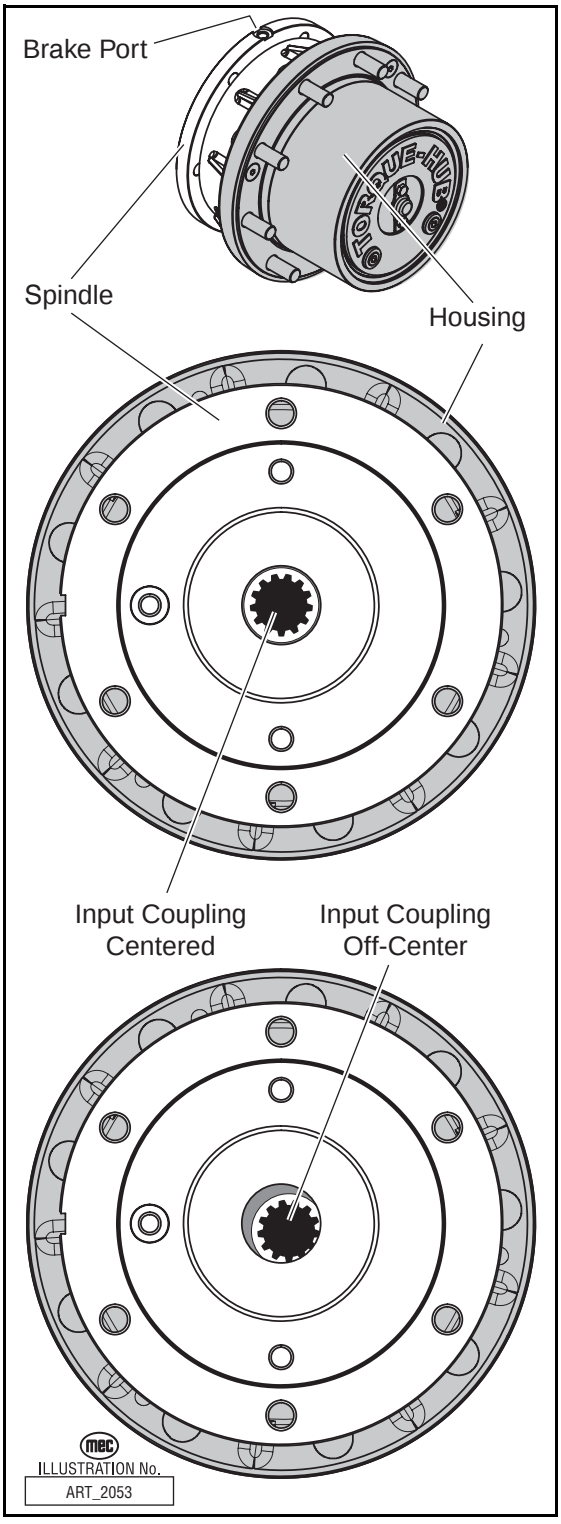
The unit must be air tight. Leaks usually occur at pipe plugs, the main seal, or around O-rings.

1. Attach an air pressure gauge at the brake port.
2. Pressurize the unit to 10 psi (.69 bar) and allow it to equalize. Let it stand for 20 minutes. If the pressure drops a leak is present.
3. With the unit pressurized, brush a soap and water solution around fittings, O-rings and seals and watch for bubbles.
4. Replace faulty components.

Brake Test

1. Connect hydraulic line from a hand pump to the brake port.
2. Ensure that the brake is set by trying to rotate the input shaft It should not rotate.
   - To rotate the input shaft, insert a splined shaft or other tool that will engage the splines of the input coupling.
3. Bleed Brake.
   - Gradually increase hydraulic pressure while trying to rotate the input shaft (tire/housing) until the brake just starts to release. The pressure should be from 200 to 260 psi (13.8 to 17.9 bar).
   - Full release should occur at 280 psi (19.3 bar).
4. Check for leaks
   - Increase and maintain pressure to 1,000 psi (69 bar) for 30 seconds.
   - Leaks must be repaired.
5. Center the input coupling in the spindle, then release pressure.
   - This will make it possible to install the motor without releasing the brake.
6. Ensure that brake engages when pressure is released.

Figure 4-6: Torque Hub Brake Test



Brake Repair

Only the rear hubs have brakes. Remove torque hub and move to a clean work surface.

CAUTION

Wear eye protection.

Disassembly

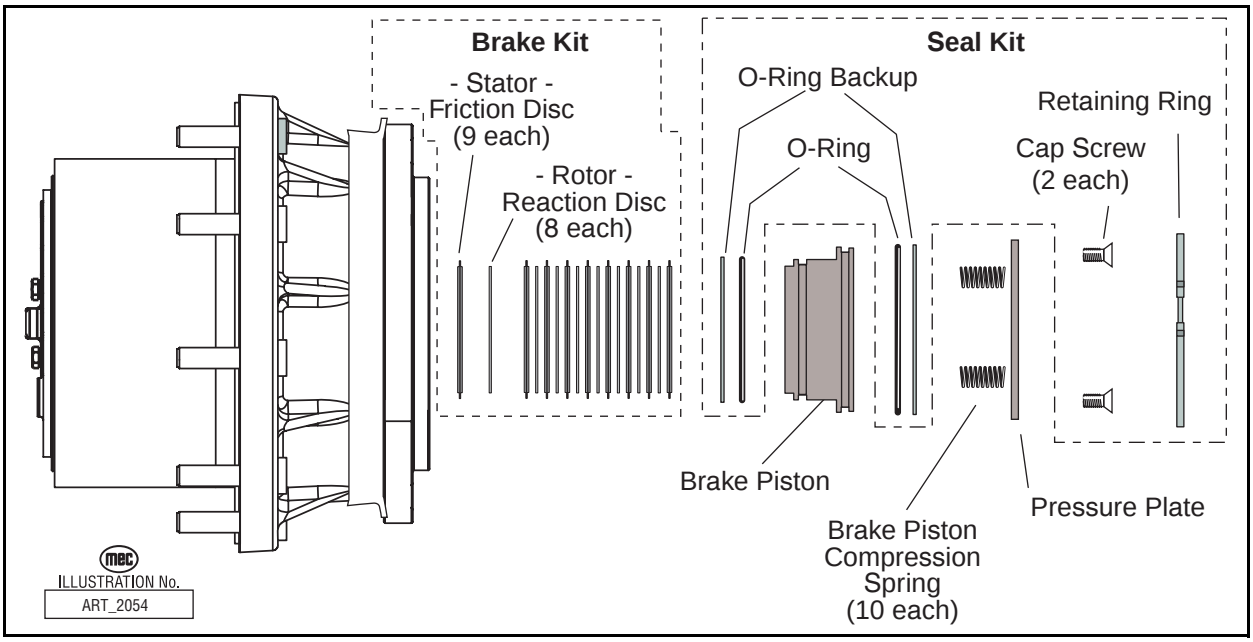
NOTE: Refer to Figure 4-5: "Torque Hub Brake," on page 4-7

1. Compress the brake piston compression springs;
   - Install two (2) ¼–20 × 5/8" flat head cap screws (provided in brake kit) through the pressure plate and into the piston.
   - Tighten one screw, then the other, a little at a time. Alternate screws until the springs compress and there is no pressure on the retaining ring.
2. Use retaining ring pliers to remove the retaining ring.
3. Remove pressure plate;
   - Loosen one screw, then the other, a little at a time.
   - Alternate screws until the springs are loose.
   - Remove the cap screws and pressure plate.
   - Remove the compression springs.
4. Use air pressure to remove the brake piston;
   - Using an air hose, slowly and carefully pressurize the brake port until the piston is partially out of the piston bore.
   - Pull the piston the rest of the way out by hand.
5. Remove the backup rings and O-rings from the grooves in the piston.
6. Remove the reaction discs (rotors) and the friction discs (stators) from the brake cavity.

Assembly

1. Install brake kit;
   - Place a stator (friction disc) then a rotor (reaction disc) into the brake cavity, until there are nine (9) stators and eight (8) rotors (refer to illustration).
2. Install the brake piston seals;
   - Place the piston on a clean surface with the small opening facing upward.
   - Apply grease to the O-rings and backup rings.
   - Install the large diameter backup ring into the large diameter grove on the piston.
   - Install the large diameter O-ring on top of the backup ring.
   - Install and fully seat the small diameter O-ring into the small diameter groove on the piston.
   - Install the small diameter backup ring on top of the O-ring.
3. Insert the piston into the piston bore until it contacts the stator (friction disc).
4. Place the ten (10) springs into the piston.
5. Place the pressure plate on top of the springs and compress the springs (see *Step 1* of *Disassembly*).
6. Install the retaining ring, making sure it is fully seated.
7. Remove the two (2) cap screws or the brake will not function.

Figure 4-7: Torque Hub Brake and Seal Kit



End Cover

Disassembly

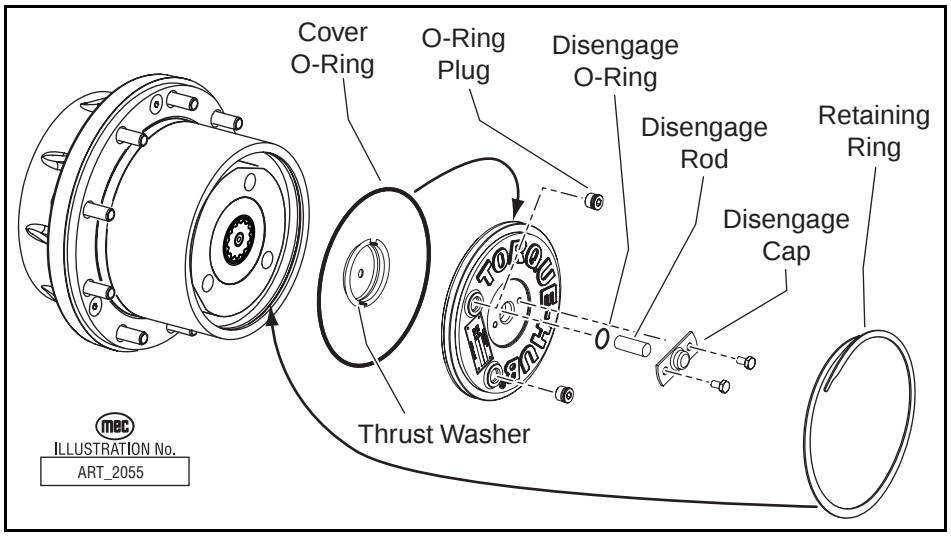
Remove torque hub and move to a clean work surface.

CAUTION

Wear eye protection.

1. Drain fluid from torque hub. Note the condition and volume of the fluid.
2. Remove the retaining ring.
   - Pry the open end of the retaining ring out of the groove with a screwdriver.
   - Use pliers to pull the retaining ring completely out of the groove.
3. Remove the cover subassembly.
   - The unit can be carefully pressurized with air to pop the cover out of the unit.
4. Remove the large diameter O-ring from the groove in the cover.
5. Remove the two (2) bolts from the disengage cap and remove the disengage cap.
6. Pull the disengage rod out from the cover.
7. Use appropriate tool to remove the disengage O-ring from the internal grove in the cover.
8. Remove the O-ring plugs from the cover.

Figure 4-8: Torque Hub End Cover



Assembly

1. Grease the disengage O-ring and insert into the internal groove in the cover.
2. Install the disengage cap and torque bolts to 70–80 in. lbs (8–9 Nm).
3. Insert the disengage rod, either end first, into the hole in the cover until it touches the disengage cover.
4. Grease the face of the thrust washer and place in the cover making sure the tangs on the washer seat into the pockets on the cover.
5. Install the O-ring plugs into the cover. Hand tighten only.
6. Grease the cover O-ring and insert it into the grove in the cover.
7. Install the cover and the retaining ring, making sure that the retaining ring is fully seated.

Replace Bearings

Disassembly

Remove torque hub and move to a clean work surface.

CAUTION

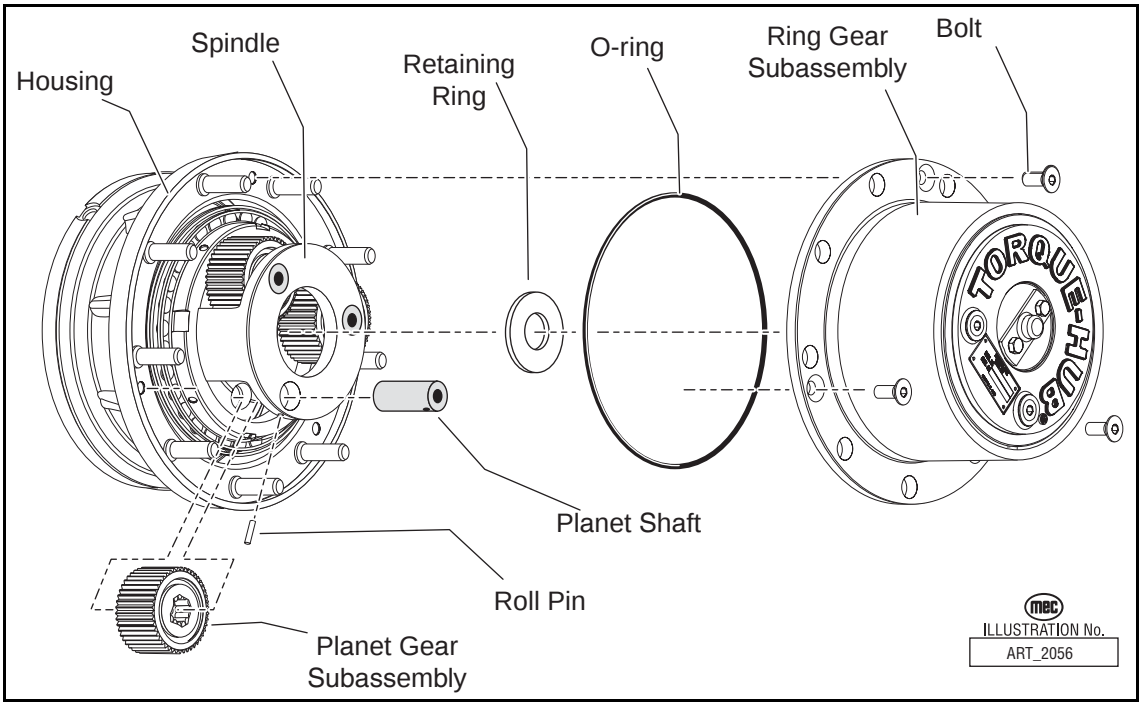
Wear eye protection.

1. Remove the Ring Gear Subassembly;
   - Remove the three (3) flathead bolts that secure the ring gear subassembly to the housing.
   - Lift the ring gear subassembly off of the housing.
   - Remove the O-ring from between the housing and ring gear subassembly.
2. Remove the planet gears;
   - Use a 1/8” diameter punch to drive the roll pin into the planet shaft until it bottoms against the spindle.
   - Using needle nosed pliers of a hooked tool, reach into the end of the planet shaft to grasp the roll pin and pull the planet shaft out of the spindle.
   - Drive the roll pin out of the planet shaft.

NOTE: Use new roll pins when reassembling the unit.

- Slide the planet gear subassembly out of the spindle being careful not to drop the needle bearings.
- Repeat for the two (2) remaining planet gears.

Figure 4-9: Torque Hub Disassembly



3. Remove the bearing nut;
    - Place the housing and spindle assembly on a clean surface with the spindle end down.
    - Remove the two (2) set screws and the bearing nut.

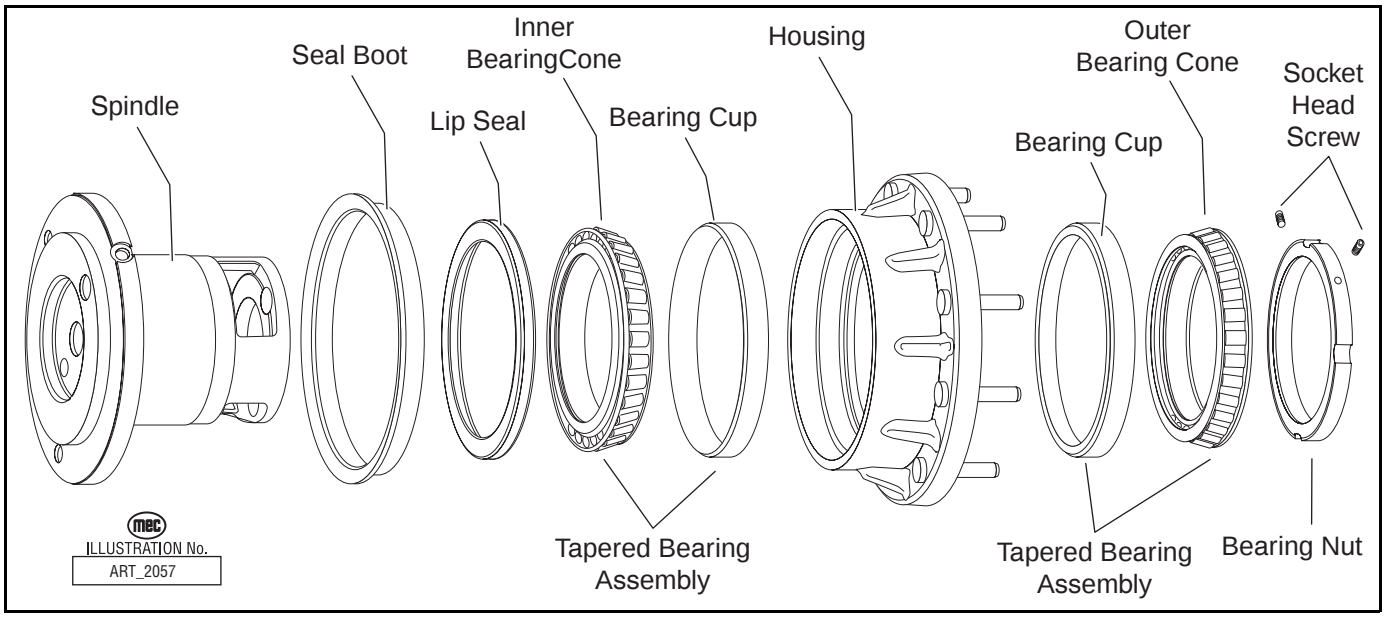
NOTE: The set screw holes in the bearing nut were staked to prevent the set screws from backing out. It will be necessary to clean up the holes prior to removing the set screws.

4. Remove the bearing cones;
    - Remove the outer bearing cone.
    - Turn the unit on its side and press the spindle out of the housing.
    - Remove the inner bearing cone.
5. Remove the seal boot.
6. Remove the lip seal from the housing.

NOTE: Use a new seal when reassembling.

7. Remove the bearing cones;
    - Use a soft steel rod to knock both bearing cones out of the housing.

Figure 4-10: Torque Hub Bearings



Assembly

NOTE: Spray a light film of oil on all component parts during assembly. Spray a generous amount of oil on bearings during installation.

1. Use a pressing tool to press both bearing cups into the housing.
2. Place the inner bearing cone into the inner bearing cup.
3. Grease the seal lip and use an appropriate tool to press the seal into the housing until it is flush with the end of the housing.
4. Place the spindle on the work surface, flange side down, and install the seal boot.
5. Lower the housing onto the spindle.
6. Place the outer bearing cone into the outer bearing cup.
7. Install the bearing nut;
   - Apply Loctite 243 on bearing nut thread and install the bearing nut.
   - Leave .003–.005 inches (.076–.127mm) end play to check the initial rolling torque with the unit tied down.
   - Torque the bearing nut until the rolling torque is 40–50 In. Lbs. (4–5 Nm) greater than initial rolling torque.

NOTE: Final torque is initial rolling torque plus 40–50 in. lbs. (4–5 Nm). E.g., if the initial rolling torque is 30 in. lbs. (3.5 Nm), the final rolling torque is 70–80 in. lbs. (8–9 Nm). Be sure the torque wrench is tangent to the housing OD.

8. Install the set screws into the bearing nut threaded holes.
   - Make sure set screw is driven into the spindle thread.
   - Tighten the set screws to damage the thread.
   - Stake the edge of the nut around the set screws so the nut will not loosen.
9. Place thrust washer into the counter-bore of the spindle.
10. Install planet gear subassemblies;
    - Place a planet gear subassembly into the spindle and align the planet gear bore with a planet shaft hole.
    - Insert a planet shaft (roll pin hole *up)* into the planet shaft hole and through the planet gear subassembly with.
    - Use a punch or similar tool to align the roll pin holes on the shaft and spindle.
    - Being careful not to strike the planet gears, drive the roll pin into the roll pin holes until the pin is flush with the OD of the spindle.
    - Repeat for the remaining planet gear subassemblies.
11. Grease the O-ring and place it into the groove on the housing.
12. Place the ring gear subassembly onto the housing and spindle assembly.
    - Align the three (3) cap screw holes.
    - Install the cap screws and torque to 15–20 ft. lbs. (20–27 Nm).

Steer Cylinder

There are two (2) double acting type steer cylinders on this machine. During operation, cylinder(s) should not leak, but a slight damping at the rod seal is acceptable. The pins should be checked for wear.

To replace steer cylinder:

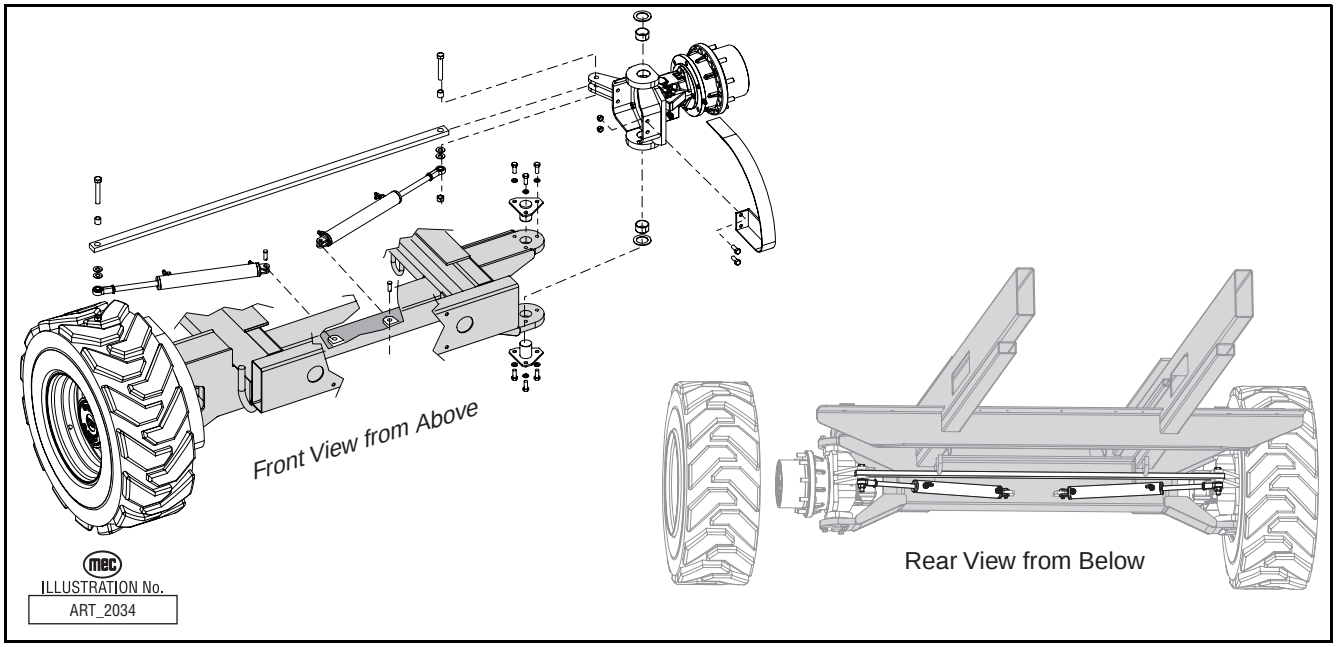
CAUTION

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

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

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

Figure 4-11: Steering Cylinder Installation



Floating Axle Lock Cylinder

There are two Floating Axle Lock Cylinders located at the rear of the machine.

Remove

1. Raise and support the front end of machine.
2. Remove the bolt that secures the long clevis pin to the frame and remove the clevis pin.
3. Remove the bolt that secures the short clevis pin to the floating axle and remove the clevis pin.

Replace

Installation is reverse of removal. Apply one (1) drop of Loctite® to the bolts that secure clevis pins.

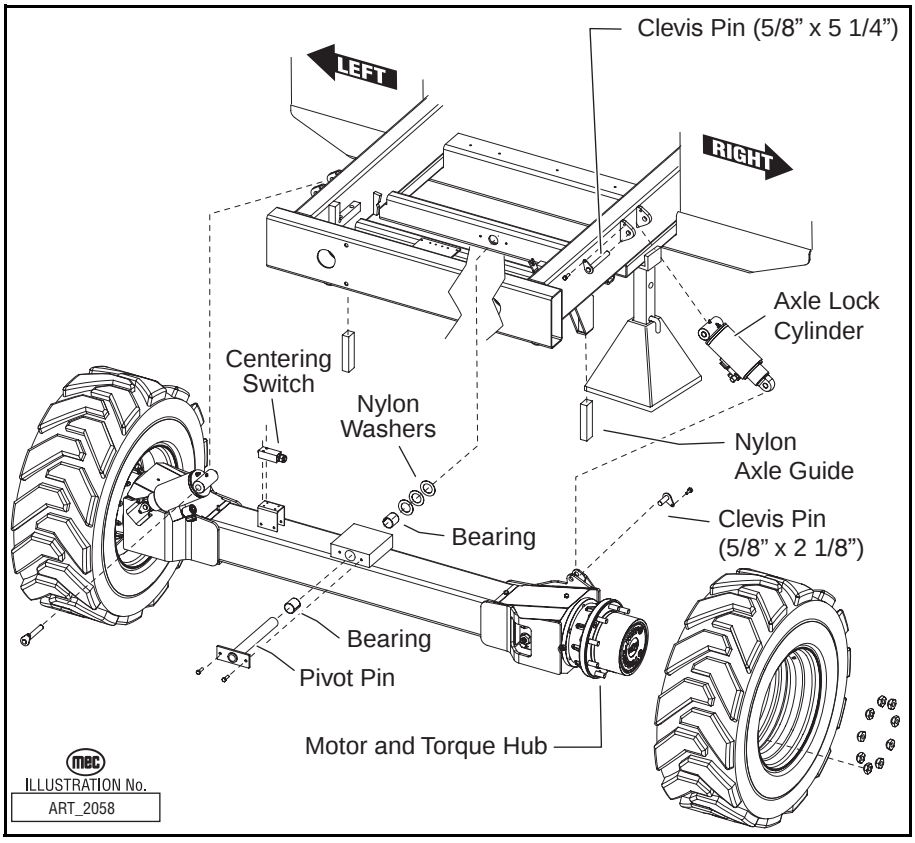
Bleed Procedure

1. Relocate the upper control box from the platform to a ground access point.
2. Loosen the bleed valve located on the top of the cylinder.
3. Operate drive very slowly while watching air escape from valve.
   - Once a steady stream of fluid runs from the valve, release drive and tighten the valve.
4. Repeat on opposite side.

Test Locking and Center Position

1. Place a block approximately 4 inches (10 cm) high behind one of the rear tires.
2. Elevate the platform to 10 feet (3 m).
3. Slowly drive the tire onto the block.
   - The axle lock cylinders should be locked (no movement).
   - The opposite tire should be off the ground.
4. Lower the platform.
   - The axle lock cylinders should release.
   - The suspended tire should lower to the ground.

Figure 4-12: Floating Axle Lock Cylinder



Hoses and Cables

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

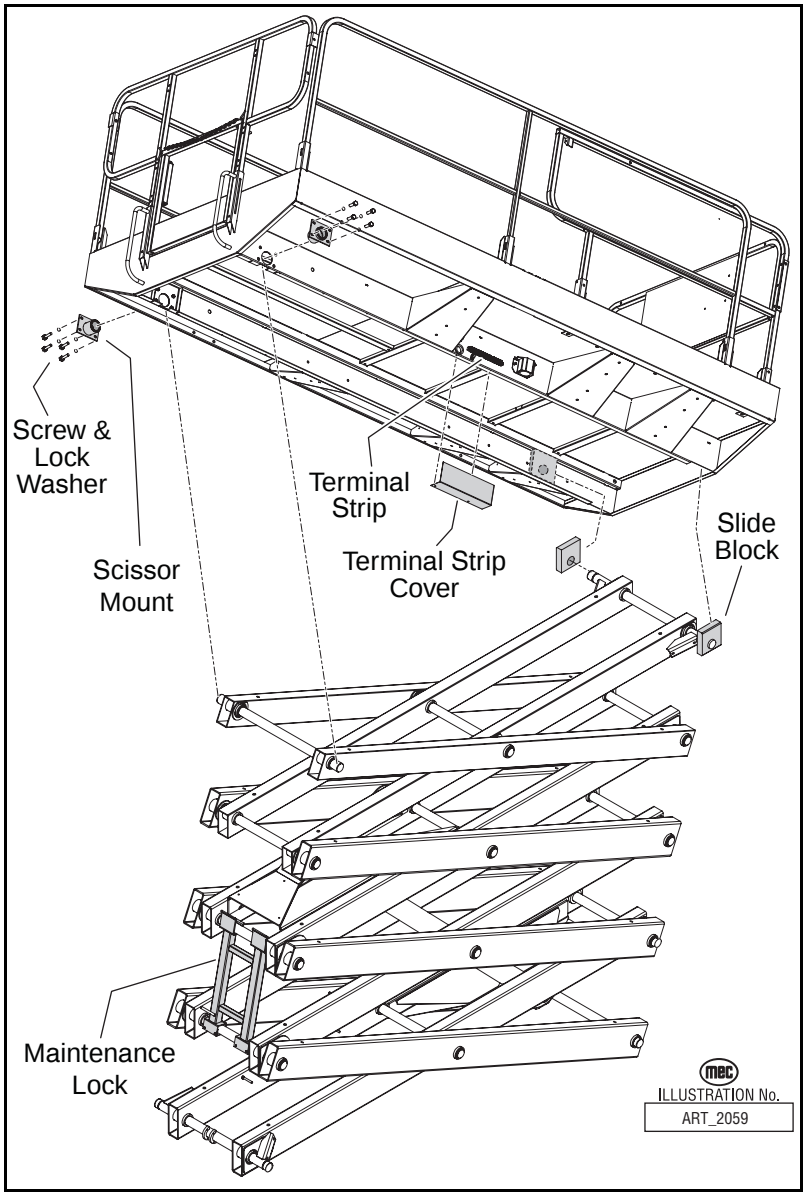
Inspect all hoses and electrical cables for security and damage. Hoses and cables should be examined for rubbing and chafing.

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

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

Platform Removal

Figure 4-13: Platform Removal



1. Raise platform and set the maintenance lock.
2. Connect overhead crane by appropriate lifting device to platform.
3. Disconnect all platform wires.
4. Remove the bolts from both platform scissor mounts at the rear of the machine, and remove the scissor mounts.
5. Slide platform and roll out deck off the machine.

Installation is reverse of removal.

NOTE: Apply one (1) drop of Loctite® to all bolts.

Lift Cylinder Removal and Installation

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

CAUTION:

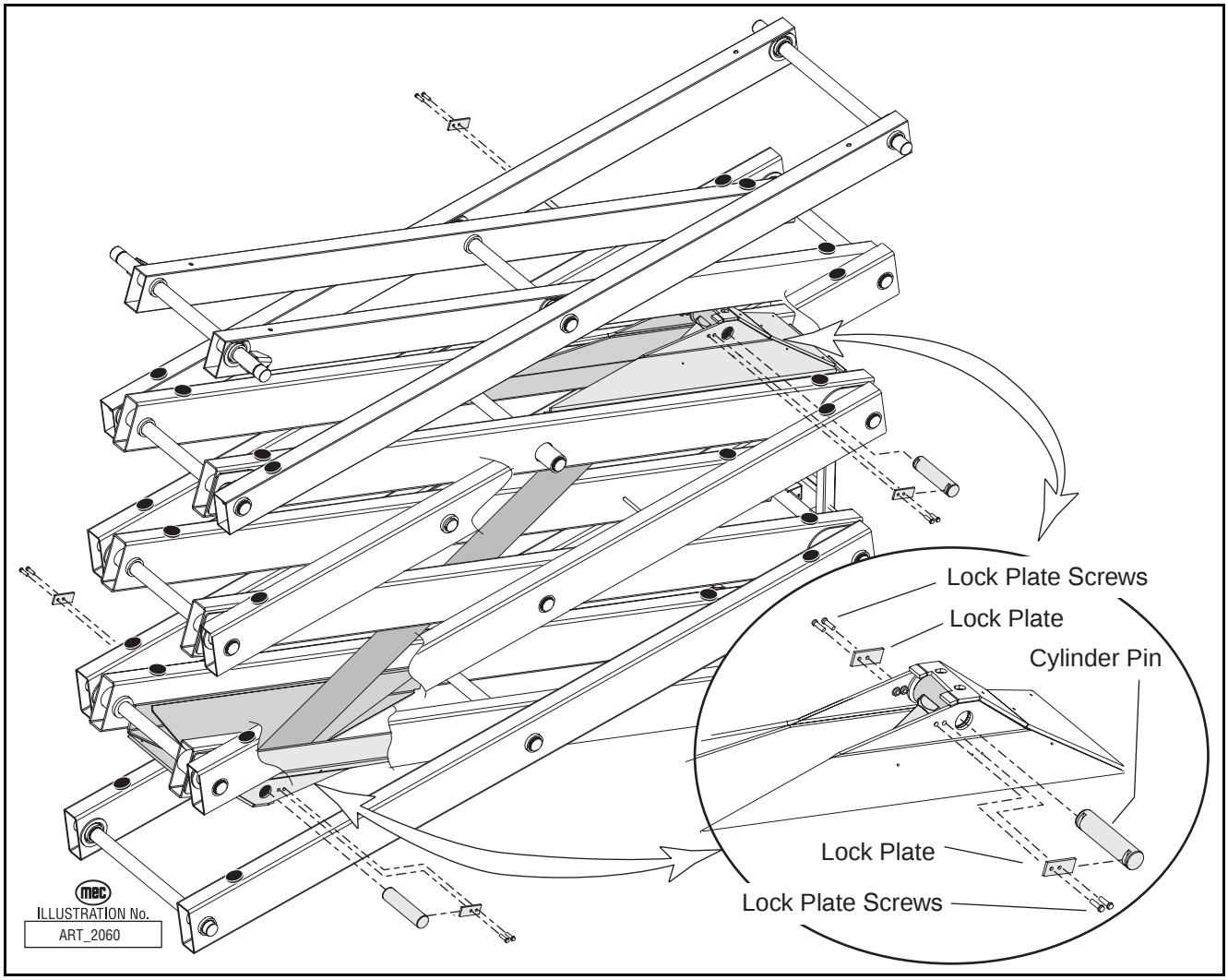
- Clean all fittings before disconnecting hoses.
- Tag hoses for proper reassembly.
- Plug all openings to prevent contamination.
- **Cylinders are heavy.** Provide proper support ***before*** removing pins.
- **Attach the lifting device to the cylinder body.**
  Lifting by either end will cause the cylinder to extend.

1. Raise the scissor arm assembly and support using the maintenance lock.
2. Disconnect hoses and wires and cables to the lift cylinder(s).
3. Use a suitable device to support the lift cylinder.
4. Remove lock plates and cylinder pins.
5. Guide the cylinder through the end of the scissor assembly and lift by the body using a suitable lifting device.

Installation is reverse of removal.

NOTE: Apply one (1) drop of Loctite® to all bolts.

Figure 4-14: Lift Cylinder Removal



Scissor Beam Assembly

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

Clean the beams once a year or as necessary and inspect along the beam's surface, especially welds and brackets.

Scissor Beam Removal

1. Remove the platform and lift cylinder(s).
2. Attach a suitable lifting device to the scissor assembly.
3. Remove the Limit Switch cover and Limit Switch.
4. Remove the bolts from both fixed blocks at the rear of the machine.
5. Slide and lift the scissor assembly

Installation is reverse of removal.

NOTE: Apply one (1) drop of Loctite® to all bolts.

Figure 4-15: Scissor Assembly Removal

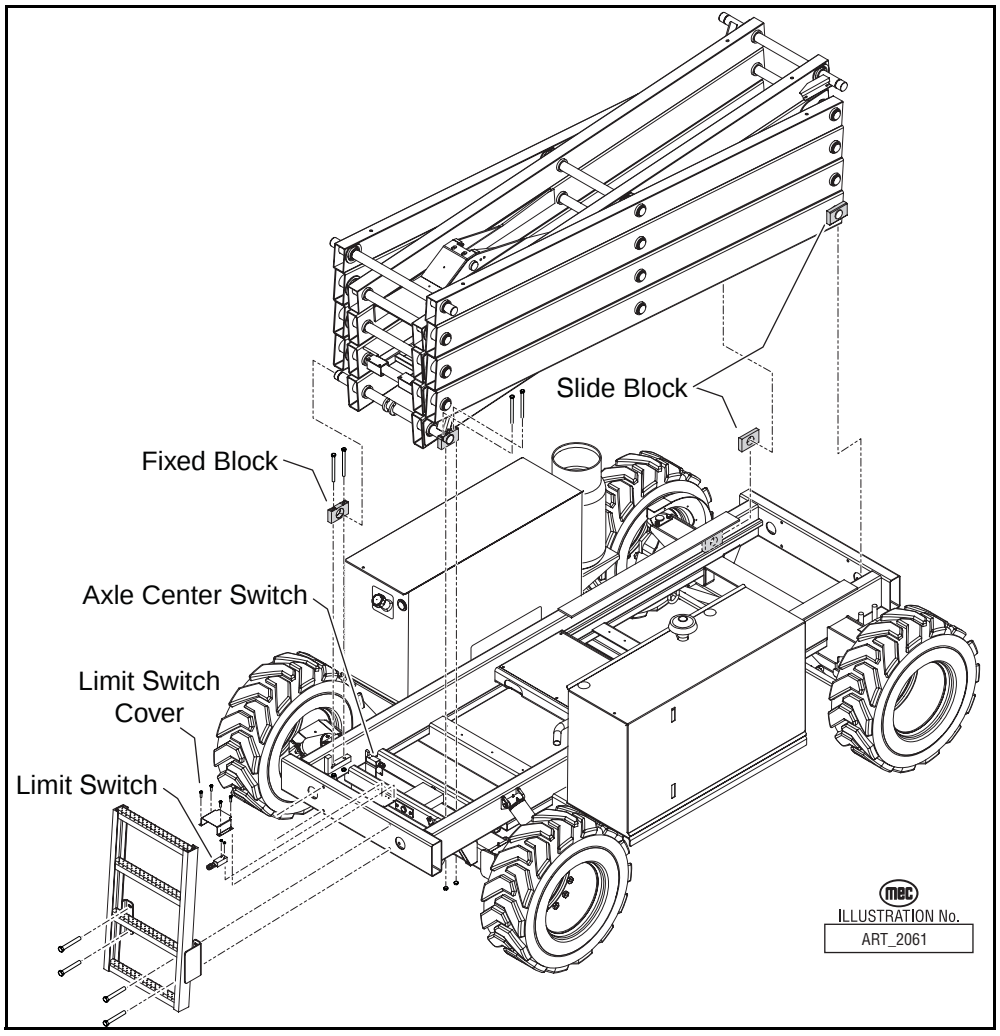
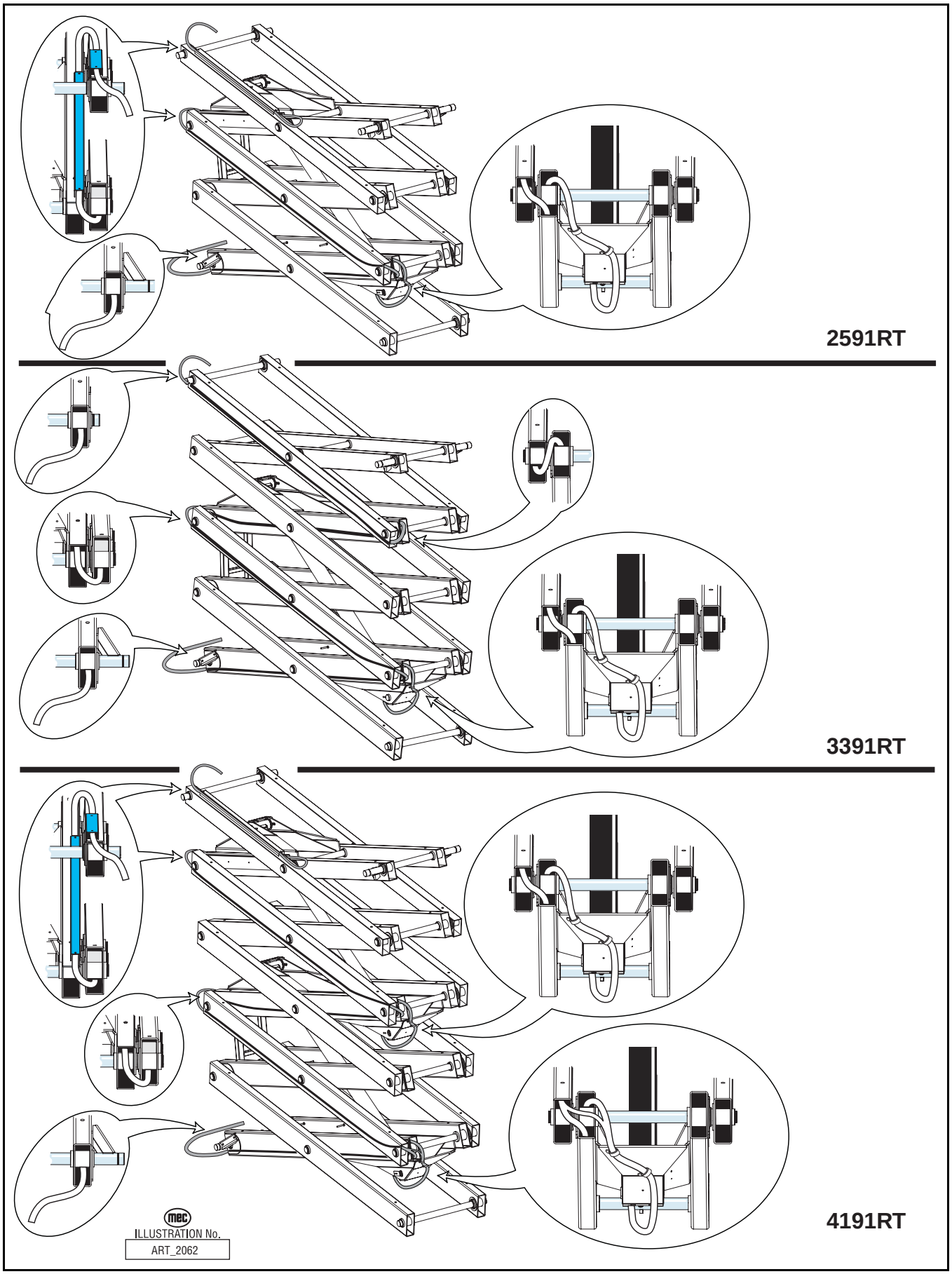


Figure 4-16: Cable Routing

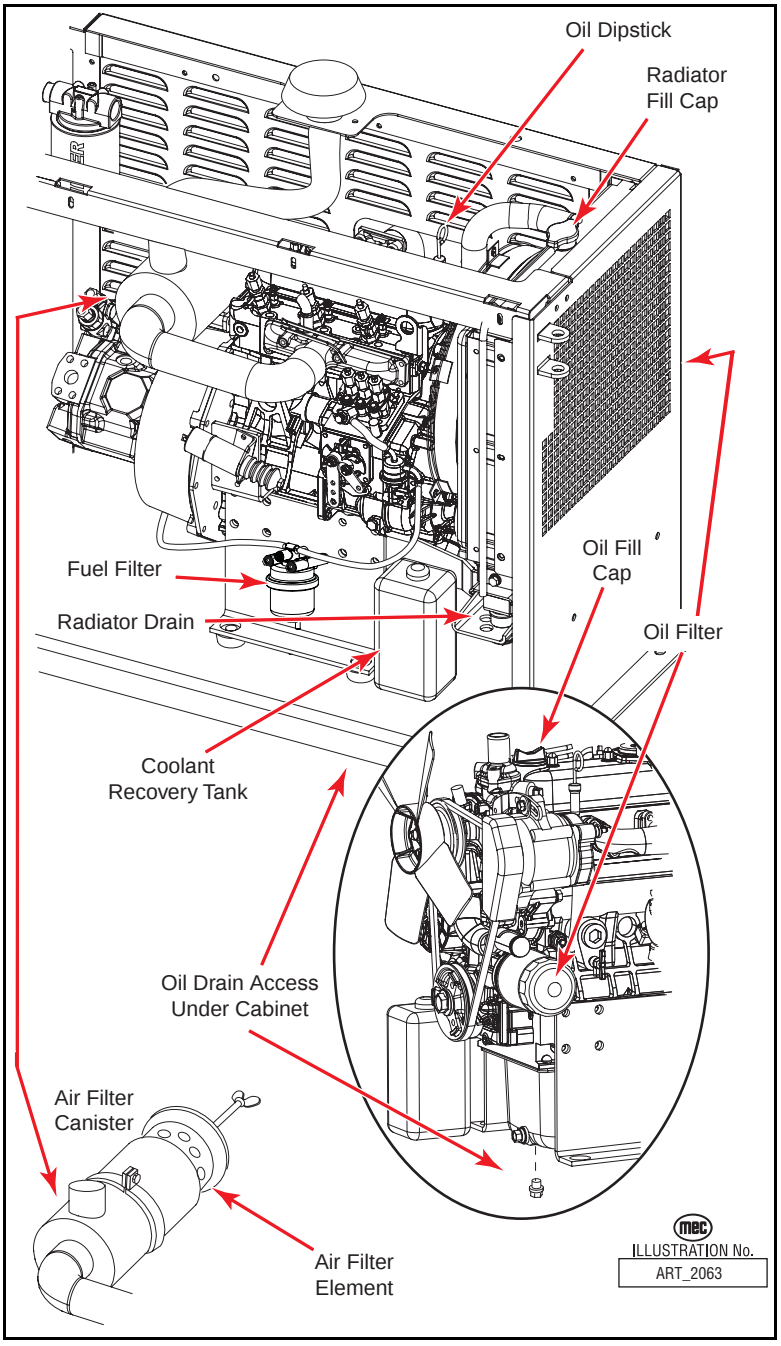


CAUTION

Always wear protective eye-wear when working with fuel and oil.
Engine should be OFF when replacing filter elements.

For complete service information consult the engine manual that came with the machine.

Figure 4-17: Diesel Engine – Oil Filter and Air Filter



OIL AND OIL FILTER

Dispose of used oil and filters properly.

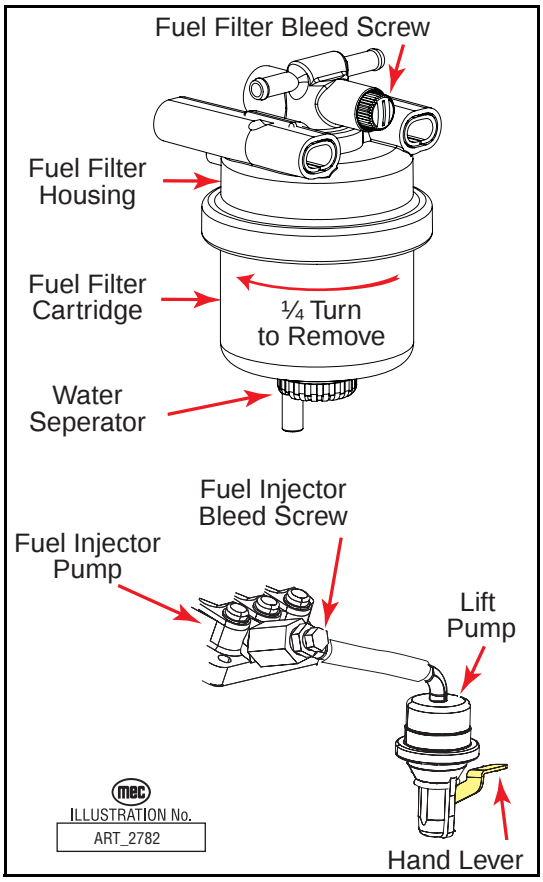
1. Use a suitable container to catch drained oil. Remove the drain plug. After oil has drained, replace the drain plug.
2. Remove the old filter and wipe the filter seal contact surface with a clean towel. Coat the seal on the new filter with clean oil, then install and tighten by hand.
3. Fill engine with 10w-30 motor oil until the dipstick indicates FULL. Capacity is 5.4 US quarts (5,1 l).
4. Recheck dipstick after running engine. Fill as necessary.

AIR FILTER ELEMENT

1. Remove the hoses from the canister.
2. Loosen the bracket and remove the canister.
3. Remove the wing-bolt, remove old filter and replace with a new filter. Replace and tighten the wing-bolt. ***Do not run the engine with the air filter element removed.***
4. Replace the canister and attach the hoses. Tighten the canister bracket and hose clamps.

Fuel Filter

Figure 4-18: Fuel Filter



1. Turn OFF valve on bottom of fuel tank.
2. Place a suitable container beneath the fuel filter assembly to catch spilled fuel. Clean the filter area.
3. Turn filter cartridge ¼ counterclockwise remove. Wipe the filter seal contact surface with a clean towel and install a new filter.
4. Open valve at fuel tank and check for leaks.
5. Purge the air from the fuel system as follows;
   - Fill fuel tank to the fullest extent. Open valve on bottom of fuel tank.
   - Loosen bleed screw on top of fuel filter housing a few turns.
   - Close the bleed screw when there are no more bubbles.
   - Open the bleed screw on the fuel injector pump. Use the lift pump hand lever to pump fuel to the injectors. Close the bleed screw when there are no more bubbles.

NOTE: Do not attempt to start the engine until Step 5 has been performed.

6. If fuel becomes contaminated with water, use the Water Separator Valve at the bottom of the fuel cartridge to drain water.

Idle Speed Adjustment

1. Bring engine to operating temperature.
2. Slow engine to complete idle.
3. Adjust the Idle Stop Screw until the RPM is 950. Adjust slightly up or down to avoid vibrations.
4. Hold the Idle Stop Screw while tightening the jam nut to prevent change in adjustment.

High Speed Adjustment

IMPORTANT: **–** In order to prevent electrical system damage, check the Throttle Solenoid Adjustment after this procedure.

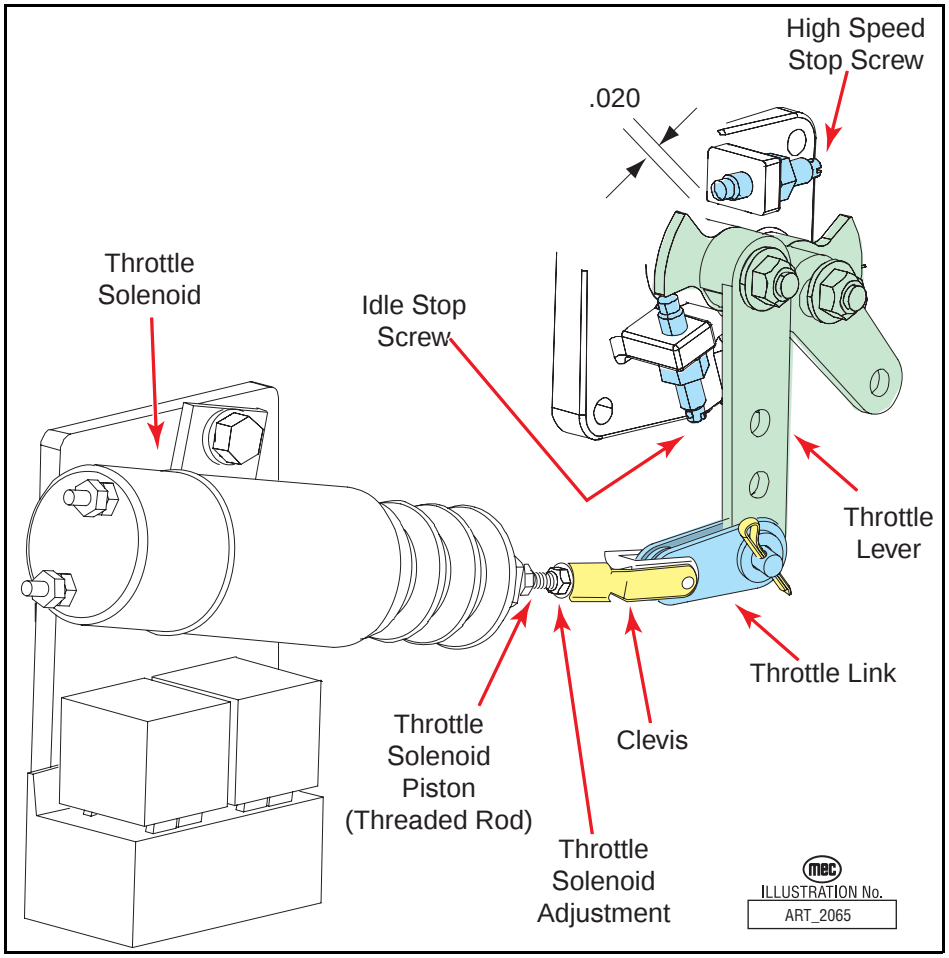
1. Bring engine to operating temperature.
2. Disconnect the Throttle Solenoid linkage at the clevis.
3. Manually pull the Throttle Lever until it contacts the High Speed Stop Screw.
4. Adjust the High Speed Stop Screw until the RPM is 3200 with the Throttle Lever against the High Speed Stop Screw.
5. Turn off the engine and reconnect the Throttle Solenoid linkage at the clevis.
6. Hold the High Speed Stop Screw while tightening the jam nut to prevent change in adjustment.

Throttle Solenoid Adjustment

IMPORTANT: – This final adjustment must be made after all other throttle speed adjustments. The solenoid must be free to retract fully in order to turn OFF the High Amperage Pull Circuit. Improper adjustment will result in solenoid failure and may damage the electrical system.

1. With the engine OFF, manually retract the solenoid by grasping the piston, just ahead of the boot, and pull to the fully retracted position.
2. With the solenoid piston fully retracted measure the distance between the High Speed Stop Screw and the Throttle linkage using a .020 feeler gauge.
3. Adjust clearance at the Throttle Solenoid linkage only.
   Do not adjust the High Speed Stop Screw.
   - Disconnect the linkage at the clevis and turn the clevis to lengthen or shorten as necessary.
   - Reconnect the clevis and measure again. Repeat until the measurement is correct.

Figure 4-19: Throttle Adjustments



Outrigger Function

The outriggers on the RT series MEC Scissor Lifts are a One-Touch Activation system. To deploy the outriggers, simply push the outrigger toggle switch down until the outriggers level the unit and the engine returns to idle. You are now ready to lift the platform. The outrigger control module is a “smart” unit, which will level the unit in all but extreme terrain so you don’t have to attempt to level it yourself.

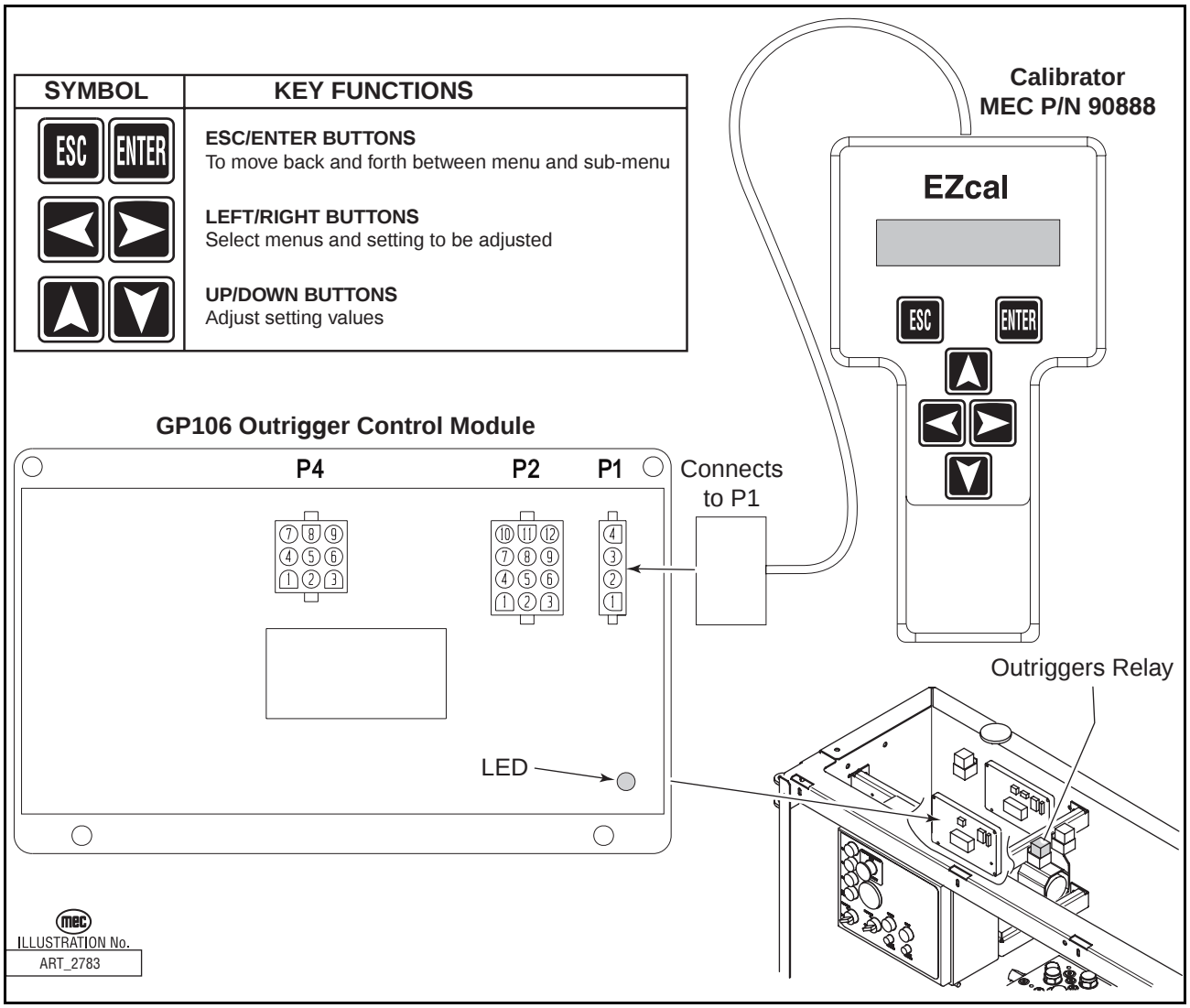
Operational Characteristics

- To deploy the outriggers, push the Outrigger Switch down and hold until the engine returns to idle. The unit will self-level.
- The outrigger legs can not be operated individually.
- The outriggers system will not operate when the platform is elevated above approximately 10 feet (3 m).
- Travel is locked out when the outriggers are deployed. A Drive Indicator Light, above the outrigger switch, will illuminate when the outriggers are fully retracted.
- The engine will not return to idle when the outriggers are fully retracted. The drive indicator light is your signal that the outriggers are fully retracted.
- If the slope of the terrain is in excess of the outrigger’s leveling capabilities, the outrigger control system will continue to attempt to level and the engine will not return to idle. In this case, if the platform remains outside of the pre-described tilt sensor parameters, the unit will not elevate above 6 feet 2 m) and the alarm will sound, indicating the out-of-level situation.
- The outrigger system uses a Top-out limit switch and a Pressure switch on each leg to monitor their respective positions.
- Each outrigger leg uses a Retract valve and an Extend valve to control cylinder stroke. These are located under the protective cover atop the outrigger leg.
- A 4-way, 3-position valve, on the outrigger hydraulic manifold controls the direction of oil flow to the outrigger legs.
- The GP106 Outrigger Control Module controls all outrigger valve and interlock duties as well as sensing unit level.
- Diagnosis of the GP106 Outrigger Control Module is possible by counting the number of flashes from the red LED and referring to *Outrigger Module GP106 LED Flash Codes* at the end of this section. Diagnosis and calibration of the outrigger module can also be done through the use of the EZ-Cal scan tool MEC part # 90888. (See GP106 troubleshooting in this section)
- If the GP106 Outrigger Control Module is ever replaced or removed or if you suspect that it requires calibration, you must use the EZ-Cal scan tool and the following directions to calibrate the outrigger module.

Outrigger Calibration

Before attempting the calibration procedure, move the machine to an area that is level as measured by a spirit level or other leveling device. An EZ-Cal hand-held device (MEC part # 90888) is required to carry out all calibration procedures on the GP106 Outrigger Control Module.

Figure 4-20: Outrigger Calibration Setup



Outrigger Tilt Sensor Calibration

The integral tilt sensor of the GP106 Outrigger Control Module must be calibrated to compensate for variations due to installation and vehicle construction. This procedure must be done if the control module is ever repositioned or replaced.

a. Drive machine to level ground.
b. Plug EZ-Cal into connector P1 on the control module.
   Dsplay reads HELP: PRESS ENTER.
c. Press right arrow to ACCESS LEVEL 3, Press Enter.
   Display reads CODE 0000.
d. Press up and right arrows to enter code 1775, Press Enter.
   Display reads ACCESS LEVEL 2.
e. Right arrow to MACHINE SETUP, Press Enter.
   Display reads CHANGE DEFAULTS.
f. Right arrow to CALIBRATE LEVEL, Press Enter.
   Display reads CALIBRATE LEVEL: YES:ENTER,NO:ESC.
g. Press Enter.Display reads TILT 0.0',0.0'
h. Press ESC, ESC
i. Disconnect EZ-Cal from the outrigger control module.

Outrigger calibration is now complete.

GP106 Outrigger Control Module Troubleshooting

When the **EZ-Cal** hand-held device is connected to the **GP106** control module, the first menu available is “HELP” – just press the **ENTER** button to see a message describing the current status of the **GP106**; this can be very helpful in diagnosing problems with the system.

When an **EZ-Cal** is unavailable, an LED on the **GP106** flashes to provide limited diagnostics

The following messages might be displayed:

EVERYTHING OK

The **GP106** detects no problems.

If problems are being experienced with the system, use the DIAGNOSTICS menus to check for wiring problems.

B+ SUPPLY TOO LOW

The **GP106** is designed for use on 12V and 24V battery powered vehicles; it cannot operate with a supply below about 9V.

The “BATTERY” voltage can be checked in the “SYSTEM” menu (available in the “DIAGNOSTICS” menu).

CANNOT LEVEL: BAD TILT SENSOR

Ensure that the **GP106** is correctly installed – if it is wrongly oriented, its integral tilt sensor will be unable to measure vehicle tilt correctly.

CHECK OUTRIGGERS SUPPLY (P4-9)

An auto-level or auto-retract signal has been detected by the **GP106** (on P2-5 or P2-6) but there is no supply on P4-9 to power the outrigger legs.

OUTRIGGERS MANUALLY CONTROLLED

The outrigger system cannot be manually controlled, but this message may appear. It indicates a wiring problem to terminal P2-2.

OUTRIGGERS CANNOT BE MOVED

The outrigger system will be unable to operate if the machine is on a steep slope greater than ten (10) degrees.

RELEASE OUTRIGGER DEMAND!

The **GP106** is waiting for an active signal on P2-5 or P2-6 to be released (due to activating a switch when power is applied, or in conjunction with manual use of the outriggers, or activating both switches together).

VEHICLE TILTED

Either the “X” or “Y” tilt (measured by the **GP106** integral tilt sensor) exceeds three degrees. This does not affect operation of outriggers.

OUTRIGGER WIRING FAULT

The system has detected voltage on P2-2 but voltage is not present on P2-5 or P2-6. Check wiring to P2-5/6.

Outrigger Module GP106 LED Flash Codes

The **GP106** has a built-in LED to provide simple diagnostics when no **EZ-Cal** is available. Please note that the use of an EZ-Cal provides significantly better diagnostics through the HELP messages listed previously.

LED ON STEADY

This indicates power to, and no fault with, the **GP106**

LED OFF ALWAYS

This indicates no power to the **GP106**

LED FLASH CODE 1

Wiring Fault. Check connection to P2-2.

LED FLASH CODE 2

This indicates a fault with the switch inputs to the **GP106**. Check wiring to connector P2.

LED FLASH CODE 3

This indicates a fault with the “stable” output of the **GP106** – a short to the supply has been detected. Check wiring from pin P2-8

LED FLASH CODE 4

This indicates that the outriggers cannot be operated because the machine is on a slope greater than ten (10) degrees. Move machine to a different location.

LED FLASH CODE 5

This indicates a fault with the “stable” output of the **GP106** – a short to 0V (ground) has been detected. Check wiring from pin P2-8

LED FLASH CODE 6

This indicates a fault with the “auto” inputs of the **GP106** – check the wiring to pins P2-5 & P2-6

LED FLASH CODE 7

This indicates a fault with the supply to the **GP106** – check battery supply at least 8V on pins P2-12 & P4-9

LED FLASH CODE 8

This indicates that the machine is not level. It is not a fault and will not affect operation of outriggers.

LED FLASH CODE 9

This indicates that the **GP106** is performing start-up tests.

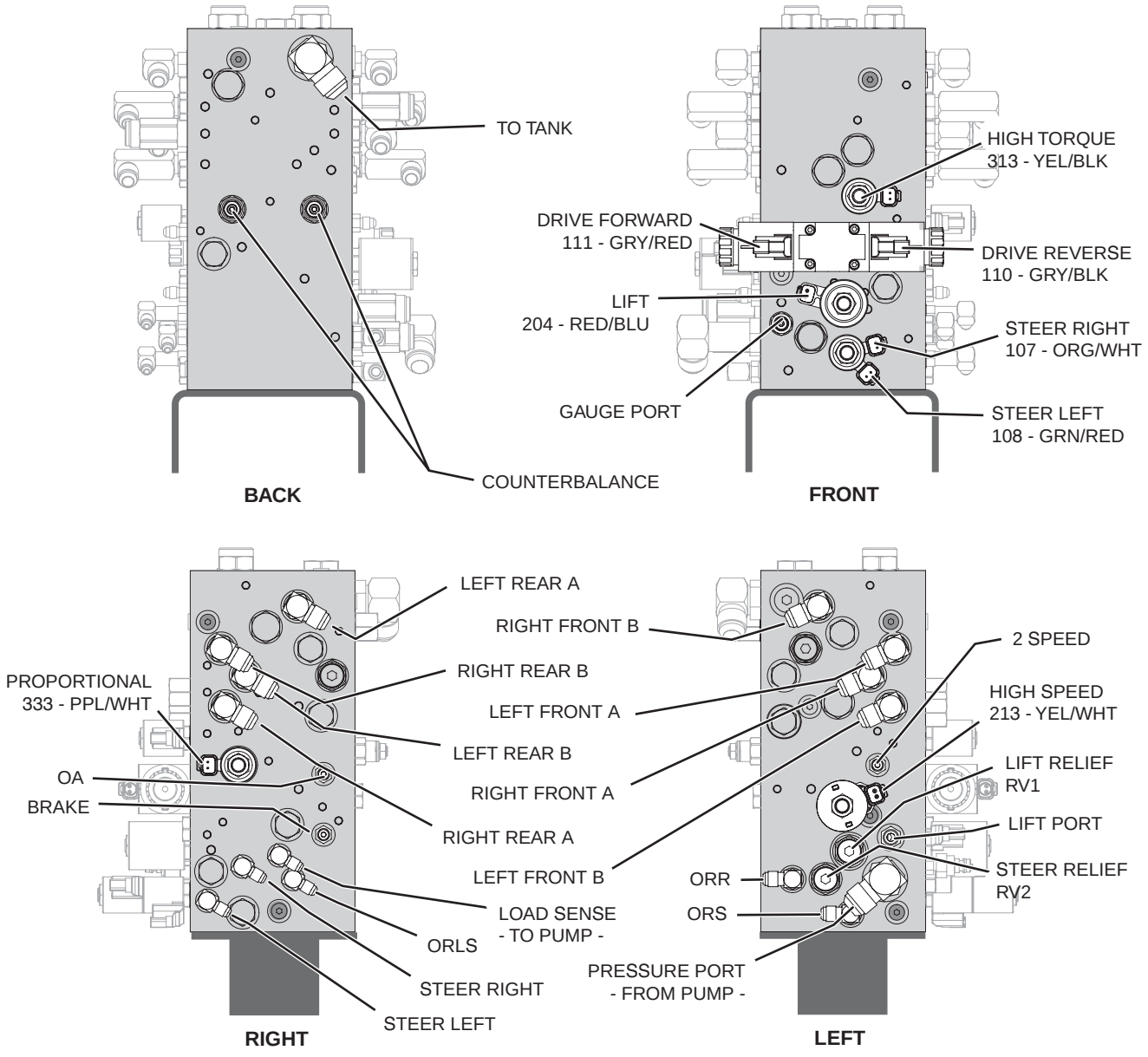
Section 5

TROUBLESHOOTING

CONTENTS — PAGE

FIGURES — PAGE

HYDRAULIC MANIFOLD



DIAGNOSTIC LEDs

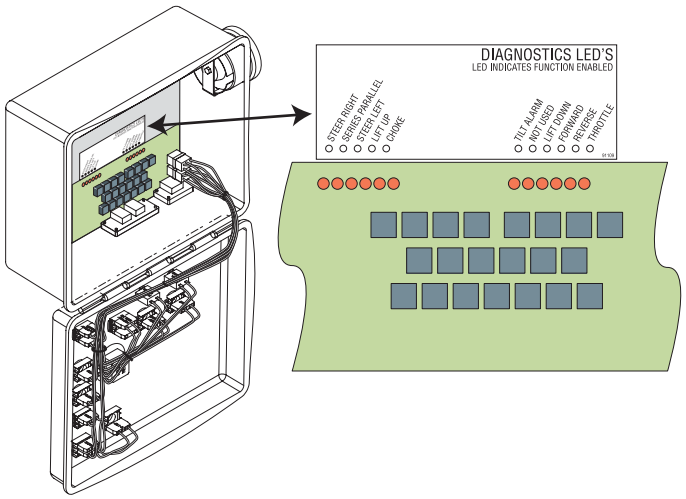


ILLUSTRATION No.
ART_2070

TROUBLESHOOTING

The 2591RT, 3391RT and 4191RT are designed for ease of diagnostics. There is a terminal strip located under the work platform for checking signals to and from Upper Controls. There are also LED's located in the Lower Controls box to indicate outputs from the circuit board.

Diagnostic Example: – if the lift LED does not illuminate when attempting to lift, either the main power is not on, or board is not receiving a signal for lift. If LED is illuminated but machine does not lift, there would be an electrical problem between the Circuit board and the valve, or a hydraulic problem. The main valve block is equipped with a quick disconnect gauge port to help diagnose the hydraulic system.

GENERAL TROUBLESHOOTING TIPS

Before investigating a malfunction, check the following items:

- Check that battery switch is turned on.
- Check that battery connections are secure and battery if fully charged.
- Check that the emergency stop button is released (UP/OUT position).
- Check that the hydraulic fluid is at the correct level.
- Check that the circuit breaker is in the "ON" position (not tripped).

COMMON CAUSES OF HYDRAULIC SYSTEM MALFUNCTIONS

- Incompatible hydraulic fluids mixed, destroying the additives and causing varnish build up, resulting in the valves sticking.
- Water in the hydraulic fluid due to a damp climate.
- Improper hydraulic fluid used. Viscosity too high in cold climates. Viscosity too low in warm climates.
- Hydraulic fluid contaminated with debris - filter change interval neglected.

NOTE: Mobil Fluid 424 Hydraulic Fluid, is a multiple viscosity fluid that is light enough for cold climates and resists thinning in warm climates. Only Mobil Fluid 424 or equivalent must be used. Substituting with a lower grade fluid will result in pump failure.

Following is a step by step basic troubleshooting guide.

NOTE: 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 covered/plugged during maintenance activities.

Table 5-1: Troubleshooting

Problem	Probable Cause	Remedy / Solution
General Power Issue		
No operation from upper or Upper Control station	Main battery switch turned off	Located left of Lower Controls box
	Emergency switch pushed in or Ignition switch turned off	Upper or lower Emergency Stop switch will cut all power as will the Ignition switch in the Platform Controls box
	Dead Battery	Charge battery
	Blown fuse	Sealed unit just below Lower Controls box
	Circuit breaker tripped	Reset - Located in Lower Controls box panel
	Damaged Upper Controls box harness	Inspect from harness plug to terminal strip under platform
	Failed 25 AMP diode	Test/replace. Located inside Lower Controls box
	Failed Power Relay on Circuit board	Replace circuit board in Lower Controls box
Functions from Upper Controls but not from Upper Controls	Faulty relay, located in Upper Controls box	Check power on wire 101 from Key switch Check power on wire 101A from relay to Joystick plug
	Interlock switch (Joystick)	Check power to RED wire (power to switch) and power to PURPLE wire (power out of switch) at Joystick plug
Lift/Lower		
Platform will not Raise	Excessive weight on Platform	Reduce weight to within platform capacity
	Lift Relief valve out of adjustment	Adjust relief valve to rated capacity
	Lift Valve SV-1 not energized	Check lift circuit from Upper Controls box to SV-1 valve
	Lowering valve SV-5 stuck open (located at base of lift cylinder CYL-1)	Check and remove contamination, E-Down cable damaged or replace valve
	Level Sensor out of level (platform elevated above 6 feet)	Reposition machine to firm level surface, Check Level Sensor function
	Main system pressure inadequate	Check pump output pressure (see *Hydraulic Pump Adjustment* in this section)
	Proportional control out of adjustment (High Range Adjustment)	See *Proportional Speed Adjustment* in this section
Platform will not Raise (with outriggers option)	All outrigger feet deployed but not firmly on ground.	Redeploy outriggers by pushing the outrigger switch down.
	Outrigger pressure switch inoperative	Inspect all four outrigger pressure switches located on top of the outrigger legs.
Platform will not lower or lowers slowly	Maintenance Lock in maintenance position	Return Maintenance Lock to the stowed position
	Lowering valve not energized	Check lowering circuit from Upper Controls box to Lowering valve SV-5
	Lowering valve not shifting	Clean debris, replace
	Lowering orifice (ORF-3) plugged	Clean orifice
Lowers but not completely (4191RT only)	Down valve on one cylinder inoperative	Check valve coils
Emergency lowering not working	E-Down cable broken or frayed (2591RT/ 3391RT)	Replace E-Down cable
	Lowering valve not shifting	Clean debris, replace
	Lowering orifice (ORF-3) plugged	Clean orifice
4191RT ONLY	E-Down battery discharged	Charge, check charge diode & connections
	Valve coil failed on either cylinder	Test, replace
Lowers but not completely	Down valve on one cylinder inoperative	Check valve coils, wiring

continued…

Table 5-1: Troubleshooting (Continued)

Problem	Probable Cause	Remedy / Solution
Drive		
No drive function	Valve SVD1 not energizing	Check forward/reverse LEDs lighting up at circuit board inside Lower Controls box Check connections at valve Check voltage at valve Check ground to valve Check valve for proper functioning
	Brakes not releasing	Check OPL5 brake orifice for contamination
	Proportional Control out of adjustment (High Speed adjustment)	See *Proportional Controller Adjustment* in this section
(with outriggers option)	Outriggers lowered	Check Drive Enable light - raise outriggers
	Outrigger Retracted switch/s inoperative	Check enable light on Platform Controls box Check outrigger switches located on top of each outrigger jack for continuity
No drive elevated	Proportional Control out of adjustment (Low Range adjustment)	See *Proportional Controller Adjustment* in this section
	Axle out of center or Axle Center switch inoperative	Lower platform and reposition o level ground. Inspect switch on level ground.
	Unit out of level	Lower and reposition the machine. Check Level Sensor malfunction
(with outriggers option)	Outriggers lowered	Check Drive Enable light - raise outriggers
Slow drive with Platform stowed	High torque enabled	Check Speed/Torque switch in Platform Controls Box
	Limit switch not functioning	Limit switch at rear center of base Check continuity between wire 2 TAN/ORG and wire 20 RED/WHT. Continuity = platform stowed.
	Upper Controls circuit board running in slow speed mode	12 volts to “R” terminal on circuit board in Platform Controls box = High Range
	Proportional Control out of adjustment (Low Range adjustment)	See *Proportional Controller Adjustment* in this section
	Engine not running to full potential	Check engine operation as per engine manufacturer guidelines
	Wheel motor/s not functioning correctly	Inspect wheel motors for excessive bypass
	RV3 or RV4 not adjusted correctly	Check and adjust relief valves
Drive in one direction only	Rev-Up or FWD-Down micro-switch failure	Check micro-switches on Joystick controller for function or adjustment
	Drive valve SVD1 not energizing in one direction	Check 12 volts to appropriate coil, check coil, check valve function
	Counterbalance valve CBV1 or CBV2 not functioning correctly	Swap Counterbalance valves to see if functioning direction changes.
No low speed (high torque mode)	Speed/Torque selector switch inoperative	Check for 12 volts on terminals 2 & 3 of Speed/Torque switch in Platform Controls box with drive enabled
	Valve SV3 not functioning	Check for 12 volts and ground to valve Check for faulty valve spool

continued…

Table 5-1: Troubleshooting (Continued)

Problem	Probable Cause	Remedy / Solution
Drive		
No Mid Speed	SV3 or SV4 powered and/or shifted	These valves should not have 12 volts, in mid-speed, check valve function
	Speed/Torque selector switch malfunction	Should not have power at terminals 1 & 3 of Speed/ Torque switch in Platform Controls box with drive enabled
No High Speed	Speed/Torque selector switch inoperative	Check for 12 volts on **all** terminals of Speed/Torque switch in Platform Controls box with drive enabled
	Faulty diode block DB1	Test DB-1 in Platform Controls box.
	Valve SV4 not functioning	Check voltage and ground to valve. Check for faulty valve spool. Should provide pressure to 2SP Port
Multi-Function		
No drive or Lift function from Upper Controls with steer operational	PWM circuit board in Platform Controls box not functioning correctly	Check battery + and - terminals at board. Check PWM output at A terminal. Check connections between A terminal and Proportional valve.
	Proportional valve malfunction	Check, for 1 AMP at valve during full Joystick stroke. Replace Proportional valve SP-1
	EC1 pressure compensation valve not functioning	Check, replace valve EC1
No steering With Drive operational	SV2 not functioning	Check voltage and ground to valve Check for faulty SV2 valve
	Faulty lift/drive selector switch	Check power on wire #25A on switch
	Faulty steer switch	Check switch in Joystick handle
	Steering Cylinder/s internal leakage	Check for internal leakage - repair
	RV1 steer relief valve not functioning	Check adjustment or replace
Diesel Engine		
Starter inoperative	Battery Cables loose or corroded	Clean, tighten cables
	Key switch not functioning	Check power to wire #20 at Key switch while cranking
	Starter not functioning	Check power to YEL/RED #220 wire at starter, Check ground cable to engine bell housing
	Circuit board relay failed	Check **input** on plug A pin-17, ORG/RED wire #20 on Lower Controls circuit board Check **output** on plug B pin-1, YEL/RED wire #220 on Lower Controls circuit board. *12 volts in - 0 volts out = replace circuit board*
No Engine start: Starter operates	Low diesel fuel level	Fill diesel tank, (see *Section 3* for Fuel Priming instructions)
	Fuel valve closed - located at fuel tank	Open valve
	Air in injector lines	See *Section 4* for Fuel Priming instructions
	Fuel filter clogged	Replace fuel filter
	Run solenoid not activating	Check power at WHT/BLK wire #320 from starter to run solenoid while cranking (WHT/BLK pull in, GRN/WHT hold wire)
	Glow plugs inoperative	See "*Glow Plugs Inoperative*" in this section
Engine starts but dies when starter disengaged	Faulty oil pressure switch	Check switch and wiring
	Faulty Fuel solenoid	Check 12 volts on GRN/WHT wire #116 - Replace Fuel Solenoid
		continued…

Table 5-1: Troubleshooting (Continued)

Problem	Probable Cause	Remedy / Solution
Throttle & Glow Plugs		
Throttle does not operate	Maladjusted Throttle Solenoid (maladjusted throttle solenoid will result in the failure of the solenoid)	Adjust throttle linkage NOTE: throttle linkage adjustment is critical on diesel engine)
	Throttle Solenoid failure	Check + and - to solenoid while operating Throttle
	Throttle Relay (located on side of engine)	Test for 12 volts on RED wire #00 and ORG wire # 225 while throttle is requested *Power on these wires should = 12 volts on ORG/BLK wire 325*
	Failed diode block (Large) located in Upper Controls box	Test and/or replace diode block Check for Throttle LED on Upper Control board
Throttle does not remain energized	Failed Throttle solenoid	Replace Throttle Solenoid
Glow Plugs inoperative	Failed Glow Plug Switch	Try Glow Plug switch on opposite control panel, Check for LED on Lower Controls circuit board.
	Failed Glow Plug Relay - located on side of engine	Test for 12 volts on RED #00 wire and on ORG/WHT wire #124 while operating glow plugs. *Power on these wires should = 12 volts on ORG/BLU wire 224*
	Failed glow plugs	Check for 12 volts at glow plugs while operating glow plugs.
		…end table

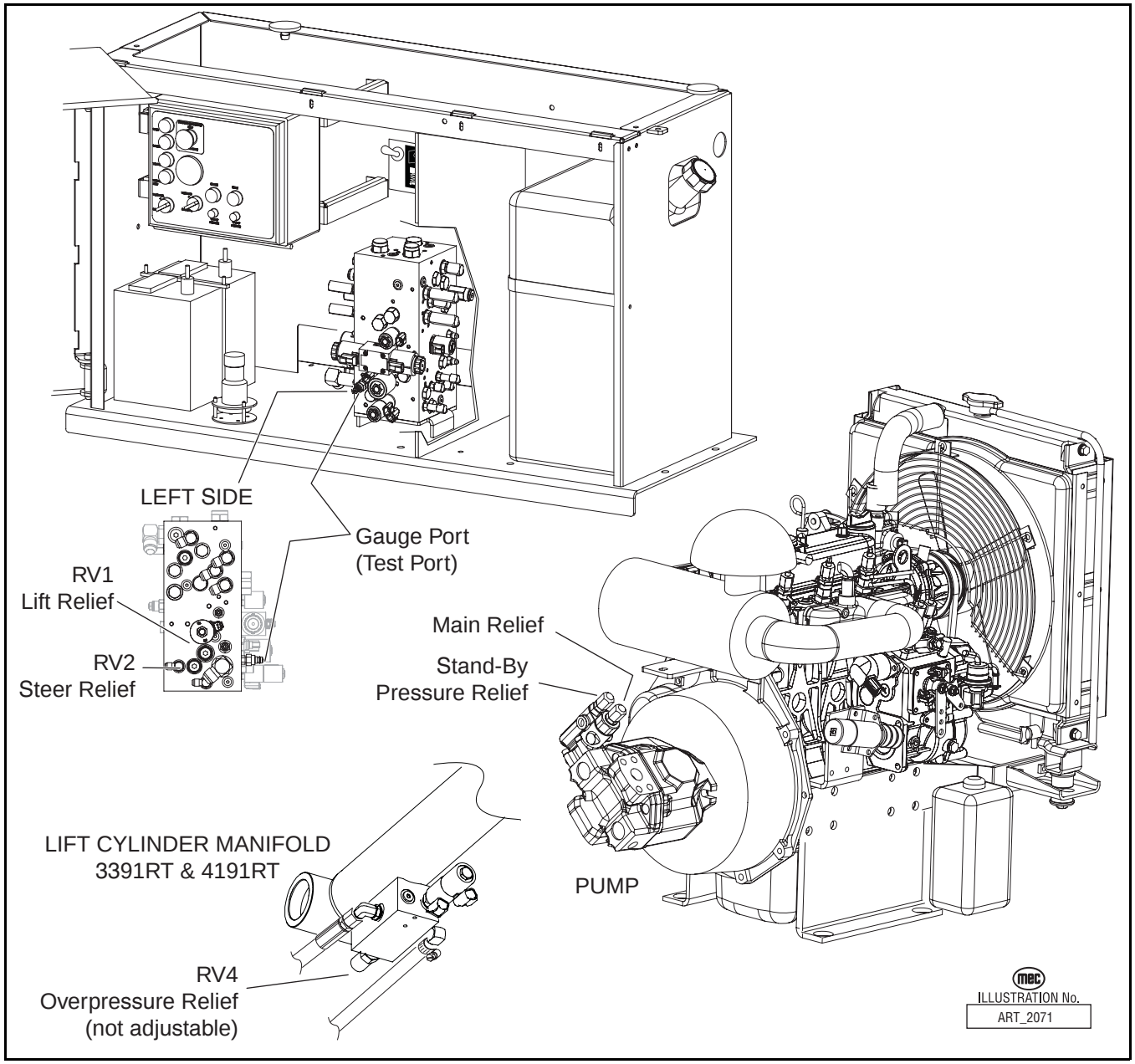
Hydraulic Pressure Adjustment Procedures

- Before attempting to check and/or adjust pressure relief valves, operate the machine for 15 minutes or long enough to sufficiently warm the hydraulic fluid.
- Insert a 0-5000 psi gauge onto the pressure test port on the valve manifold using gauge adapter fitting MEC part no. 8434

Table 5-2: Pressure Adjustment

Model	Main		Lift		Steer		Stand-by	
2591RT	3000 PSI	207 bar	2500 PSI	172 bar	1500 PSI	103 bar	500-550 PSI	35-38 bar
3391RT	3000 PSI	207 bar	2650 PSI	183 bar	1500 PSI	103 bar	500-550 PSI	35-38 bar
4191RT	3000 PSI	207 bar	2500 PSI	172 bar	1500 PSI	103 bar	500-550 PSI	35-38 bar

Figure 5-2: Hydraulic Pressure Adjustment



Pump Adjustment

The Hydraulic Pump used in this model is a Variable Displacement, Pressure Compensated, Piston type pump. Proper adjustment is critical for normal operation of the machine. The following paragraphs will guide you through the various steps however, you must perform all steps, in their listed sequence, in order to achieve proper adjustment and machine performance.

Main Relief and Standby Pressure Adjustments

1. Start engine and operate the unit for 15 minutes or until the hydraulic fluid is warm.
2. Insert a 0 – 5000 PSI (0-345 bar) gauge onto the manifold pressure gauge port.
3. Remove the acorn nut from the Main Relief adjustment screw. Loosen the jam nut and turn the screw counterclockwise 3 turns. Tighten the jam nut and install the acorn nut.
4. Remove the acorn nut from the Standby adjustment screw and loosen the jam nut. Turn the screw clockwise 3 turns or until the needle on the gauge stops climbing. At this point the gauge is reading full main relief pressure.
5. Access the Main Relief screw again and adjust it until the gauge settles at 2800 PSI (193.5 bar). Tighten the jam nut and install the acorn nut.
6. Check the gauge reading again to ensure the setting did not change.
7. Turn the Standby adjustment screw counterclockwise until the gauge reads 550 PSI (38 bar). Tighten the jamb nut and install the acorn nut.
8. Check the gauge reading again to ensure the setting did not change.

Pump Displacement Adjustment

This adjustment is set at the factory and should not be tampered with. The Displacement adjustment controls the maximum amount of fluid flow that the pump will produce per revolution. Excessive flow will result in severe engine loading and stalling. Reduced flow will result in slower functions with no engine loading. If you suspect that the setting is incorrect, please call MEC Product Support at (800) 387-4575 for assistance.

Lift Relief (RV1)

The Lift Relief valve is located on the left-side, center of the valve manifold. It will be necessary to remove the cap from the relief valve if adjustment is necessary. REMOVING THE CAP WHILE THE ENGINE IS RUNNING WILL RESULT IN FLUID LEAKAGE.

To check Lift Relief valve setting, park the machine on a firm level surface free from overhead obstructions. Using the lift switch on the lower panel, elevate the platform to full elevation. While maintaining the lift command, record the reading on the gauge.

Steering Relief (RV2)

The steering Relief valve is located on the left side, lower of the valve manifold. It will be necessary to remove the cap from the relief valve if adjustment is necessary. REMOVING THE CAP WHILE THE ENGINE IS RUNNING WILL RESULT IN FLUID LEAKAGE.

To check Steering Relief valve setting, operate steer in one direction. While maintaining the steer command, record the reading on the gauge.

Lift Cylinder Overpressure Valves (RV4) 4191RT Only

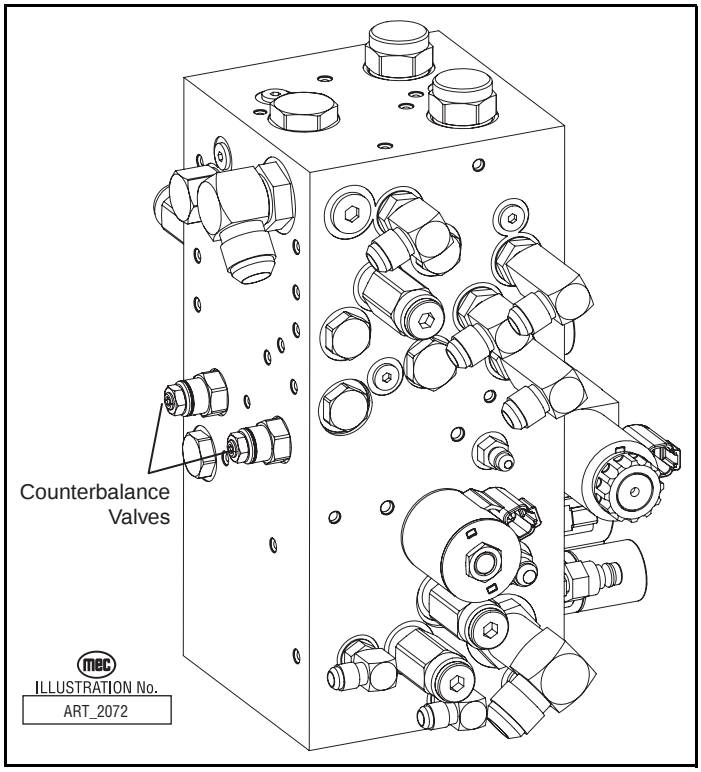
The Lift Cylinder Overpressure valves are located on each of the lift cylinder valve blocks on the 4191RT model only.

Proper valve adjustment is not possible by the consumer. Considering their importance to the safe operation of the machine, they must not be tampered with. If the valve is suspected to be out of adjustment or tampered with, it must be replaced.

Setting Counterbalance Valves

1. Loosen the locknut on one of the valves.
2. Turn the adjustment screw clockwise (to the right) until it reaches the internal stop and the screw will turn no further.
3. Tighten the locknut while holding the adjustment screw in position to prevent it from rotating.
4. Repeat steps 1 through 4 on the other Counterbalance valve.
5. Adjustment is complete.

Figure 5-3: Counterbalance Valves



NOTES:

Proportional Speed Adjustment

CAUTION

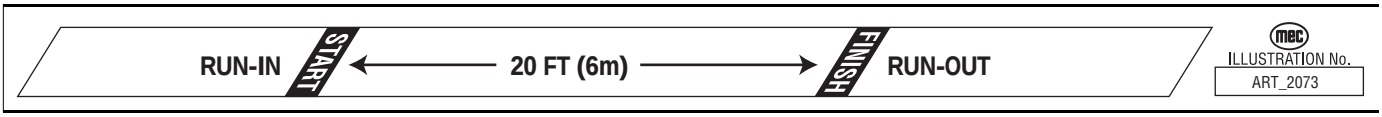
Proportional Circuit Board Adjustment should only be performed after all other components are deemed to be in proper working order.

There are many factors that may contribute to excessively fast or slow drive speeds. Proportional Circuit Board Adjustment should only be performed after all other components are deemed to be in proper working order and not contributing to abnormal driving speeds. Failure to do so may result in incorrect speeds once the offending component has been repaired.

Circuit Board Setting Test Procedure

Before you begin, ensure there are no overhead obstructions preventing lift to full height. Lay out a course measured at 20 feet (6 meters) long. Ensure there are no obstructions preventing a straight travel over the distance of the course including leading up to and away from the course. Try not to steer while driving the timed course.

Figure 5-4: Proportional Speed Adjustment Course



High Speed Drive Test:

With the platform fully lowered, drive the machine over the course, crossing the start line at full speed. Record the time it takes for a (predetermined) point on the machine to cross both lines and compare with the chart below using the ‘High Range’ column figure.

Elevated Speed Drive Test:

Elevate the platform above 12 feet (3.6 meters). Drive the machine over the course, crossing the start line at full speed. Record the time it takes for a (predetermined) point on the machine to cross both lines and compare with the chart below using the ‘Low Range’ column figure.

Table 5-1: Speed Adjustment Table: 20 FT (6 m) Course

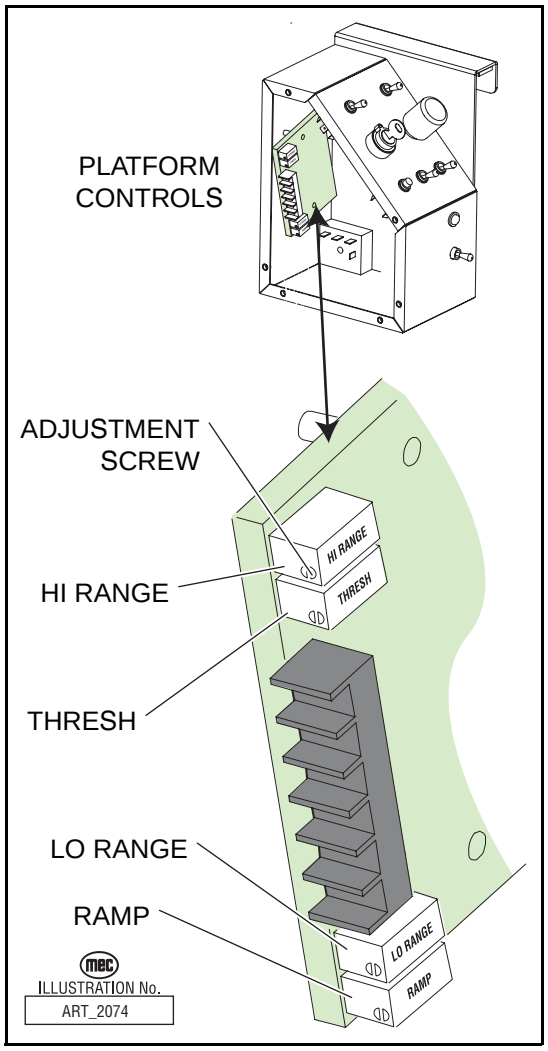
TRIM POT	Travel Time in Seconds
HIGH Range	3.5 to 4.0
LOW Range	27 to 33

NOTE: Proportional Controller adjustments should only be made when the possibility of unauthorized tampering exists or after the Proportioning Valve or Proportional Circuit board was replaced. Though testing the proportional output should be part of routine maintenance, adjustments should not be necessary as a routine maintenance procedure.

The Trim Pots are located in the Platform Controls box (see illustration).

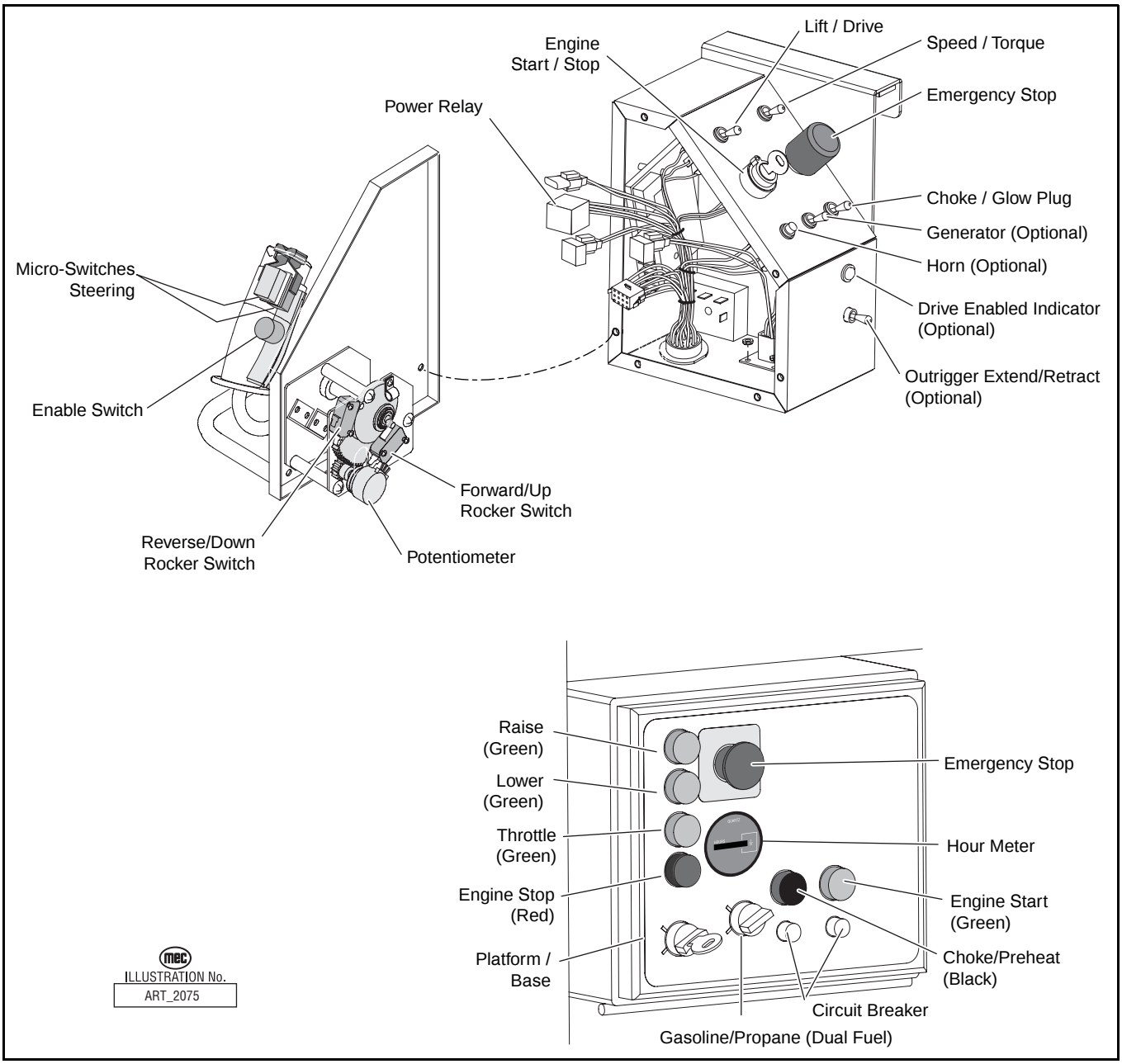
1. Turn the RAMP trim pot counterclockwise until a clicking noise is heard.
2. Ensure there are no overhead obstructions preventing lift to full height. Select LIFT mode, pull the enable and move the Joystick in reverse slowly to the point that the engine accelerates and hold it at that point. While holding the Joystick in that position, adjust the THRESH trim pot until the platform does NOT lift. Once adjusted, slight additional reverse motion of the Joystick should result in very slow and controlled lift action.
   - Counterclockwise trim pot adjustment increases the amount of Joystick travel before platform movement.
   - Clockwise trim pot adjustment will allow platform movement sooner in the Joystick travel.
3. If the machine was slow in the High Speed portion of the test, turn the HI RANGE trim pot clockwise until a clicking noise is heard.

Figure 5-5: Trim Pots



4. If the Elevated Speed Drive Test resulted in speeds other then those listed, turn the LO RANGE trim pot clockwise to increase elevated drive speed or counterclockwise to decrease elevated drive speed to the proper speed. Repeat the Elevated Speed Drive Test.
5. The RAMP trim pot controls the smoothness of the motion start-up and linear ramp-up response. Turn the RAMP trim pot clockwise until the slowest machine start-up can be achieved while maintaining good proportional ramp-up through the travel of the Joystick.

Figure 5-6: Controls and Switches



Section 6

SCHEMATICS

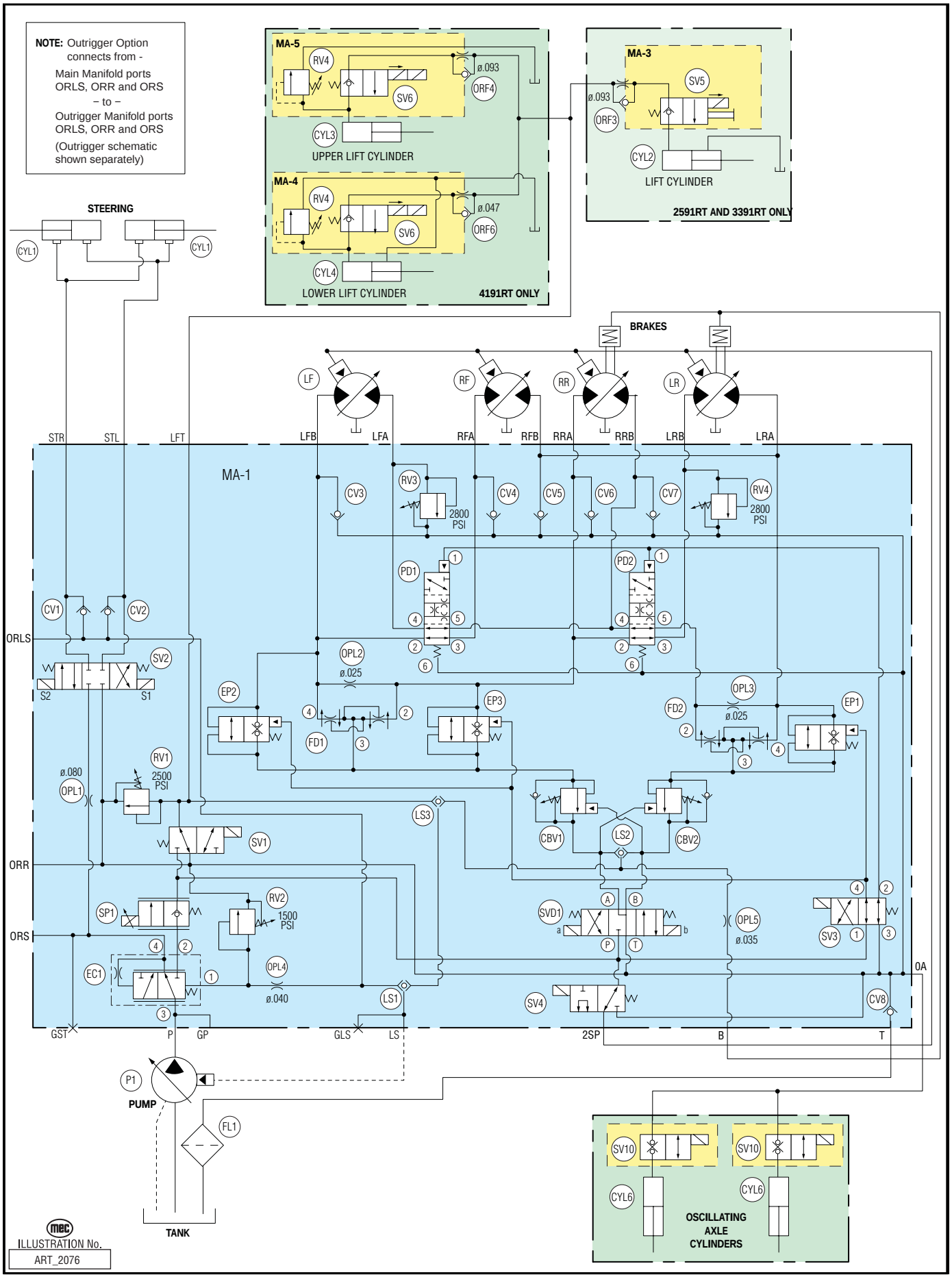
CONTENTS

FIGURES

Hydraulic Schematics

Callout	Description
Lift Cylinder Components (2591RT/3391RT)	
CYL2	Cylinder
MA3	Manifold, Lift Cylinder
SV5	Solenoid Valve - 12V Cable Attach
ORF3	Orifice - 0.093
Lift Cylinder Components (4191RT)	
CYL3	Cylinder, Upper
MA5	Manifold, Lift Cylinder, Upper
SV6	Solenoid Valve - 12V Dual Coil
RV4	Relief Valve - 3200 PSI
ORF4	Orifice - 0.093
CYL4	Cylinder, Lower
MA4	Manifold, Lift Cylinder, Lower
SV6	Solenoid Valve - 12V Dual Coil
RV4	Relief Valve - 3200 PSI
ORF6	Orifice - 0.047
Wheel Motor Components	
LF	Wheel Motor - Dual Displacement (Left Front)
LR	Wheel Motor - Dual Displacement (Left Rear)
RF	Wheel Motor - Dual Displacement (Right Front)
RR	Wheel Motor - Dual Displacement (Right Rear)
P1	Pump - Variable Displacement Pressure Compensated
FL1	Return Filter - 10 Micron
CYL1	Cylinder, Steering
Oscillating Axle Components	
CYL6	Axle Lock Cylinder
SV10	Solenoid Valve, Poppet N.C.
Optional Outriggers Components	
MA6	Manifold, Outriggers
CV1 - CV2	Check Valve
CYL5	Outrigger Cylinder
SV7	Solenoid Valve, Poppet N.C.
SV8	Solenoid Valve, Poppet N.C.
SV9	Spool Valve, 4-way - 3-Position

Callout	Description
Main Manifold Components	
MA1	Manifold, Main Valve Block
SVD1	Spool Valve, Drive, 4 Way - 3 Position
SV1	Spool Valve, Lift, 3 Way
SV2	Spool Valve, Steer, 4 Way - 3 Position
SV3	Spool Valve, Series Parallel, 4 Way - 2 Position
SV4	Spool Valve, High Speed, 3 Way - 2 Position
SV5	Proportional Valve - 12V
SP1	Proportional Valve - 12V
RV1	Relief Valve, Lift - 2500 PSI
RV2	Relief Valve, Steer - 1500 PSI
RV3	Relief Valve, Front Drive Motors - 2800 PSI
RV4	Relief Valve, Rear Drive Motors - 2800 PSI
PD1 - PD2	Piloted Spool Valve, 4 Way - 3 Position
EP1-EP2-EP3	Piloted Poppet Valve, Flow Divider Bypass
LS1-LS2-LS3	Load Sense Shuttle Check Valve
CBV1 - CBV2	Counter Balance Valve
CL1	Coil, Series 8 - 12V
CL2	Coil, Series 10 - 12V
CL3	Coil, Series 10 E-Coil - 12V
FD1 - FD2	Flow Divider / Combiner
EC1	Pressure Compensator
CV1 - CV2	Check Valve, Load Sense
CV3 - CV7	Check Valve, Anti Cavitation
CV8	Check Valve, Tank Return
OPL5	Orifice Plug, Brake - 0.035
OPL1	Orifice Plug, Steer - 0.080
OPL2 - OPL3	Orifice Plug, Flow Divider Bleed - 0.040
OPL4	Orifice Plug, Compensator Bleed - 0.093


NOTE: Outrigger Option connects from - Main Manifold ports ORLS, ORR and ORS – to – Outrigger Manifold ports ORLS, ORR and ORS (Outrigger schematic shown separately)
MA-5
RV4
ø.093
ORF4
SV6
CYL3
UPPER LIFT CYLINDER
MA-4
RV4
ø.047
ORF6
SV6
CYL4
LOWER LIFT CYLINDER
4191RT ONLY
MA-3
SV5
ø.093
ORF3
CYL2
LIFT CYLINDER
2591RT AND 3391RT ONLY
STEERING
CYL1
CYL1
BRAKES
LF
RF
RR
LR
STR
STL
LFT
LFB
LFA
RFA
RFB
RRA
RRB
LRB
LRA
MA-1
CV3
RV3
2800 PSI
CV4
CV5
CV6
CV7
RV4
2800 PSI
PD1
PD2
CV1
CV2
ORLS
SV2
S2
S1
OPL2
ø.025
EP2
EP3
FD1
FD2
OPL3
ø.025
EP1
RV1
2500 PSI
ø.080
OPL1
LS3
SV1
CBV1
LS2
CBV2
ORR
SP1
RV2
1500 PSI
SVD1
OPL5
ø.035
SV3
ORS
EC1
OPL4
ø.040
LS1
SV4
CV8
0A
GST
P
GP
GLS
LS
2SP
B
T
P1
PUMP
FL1
TANK
SV10
SV10
CYL6
CYL6
OSCILLATING AXLE CYLINDERS
ILLUSTRATION No.
ART_2076

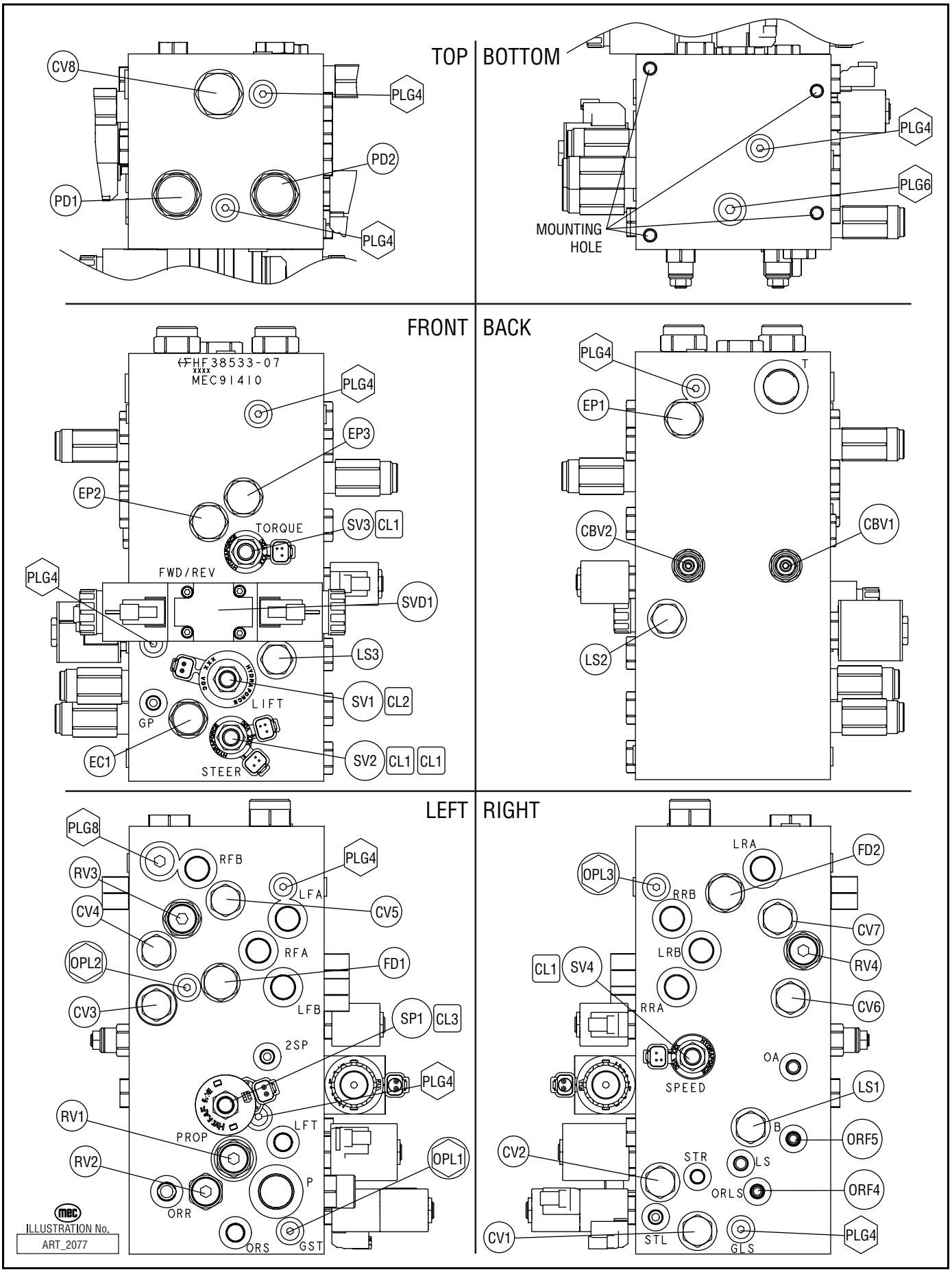
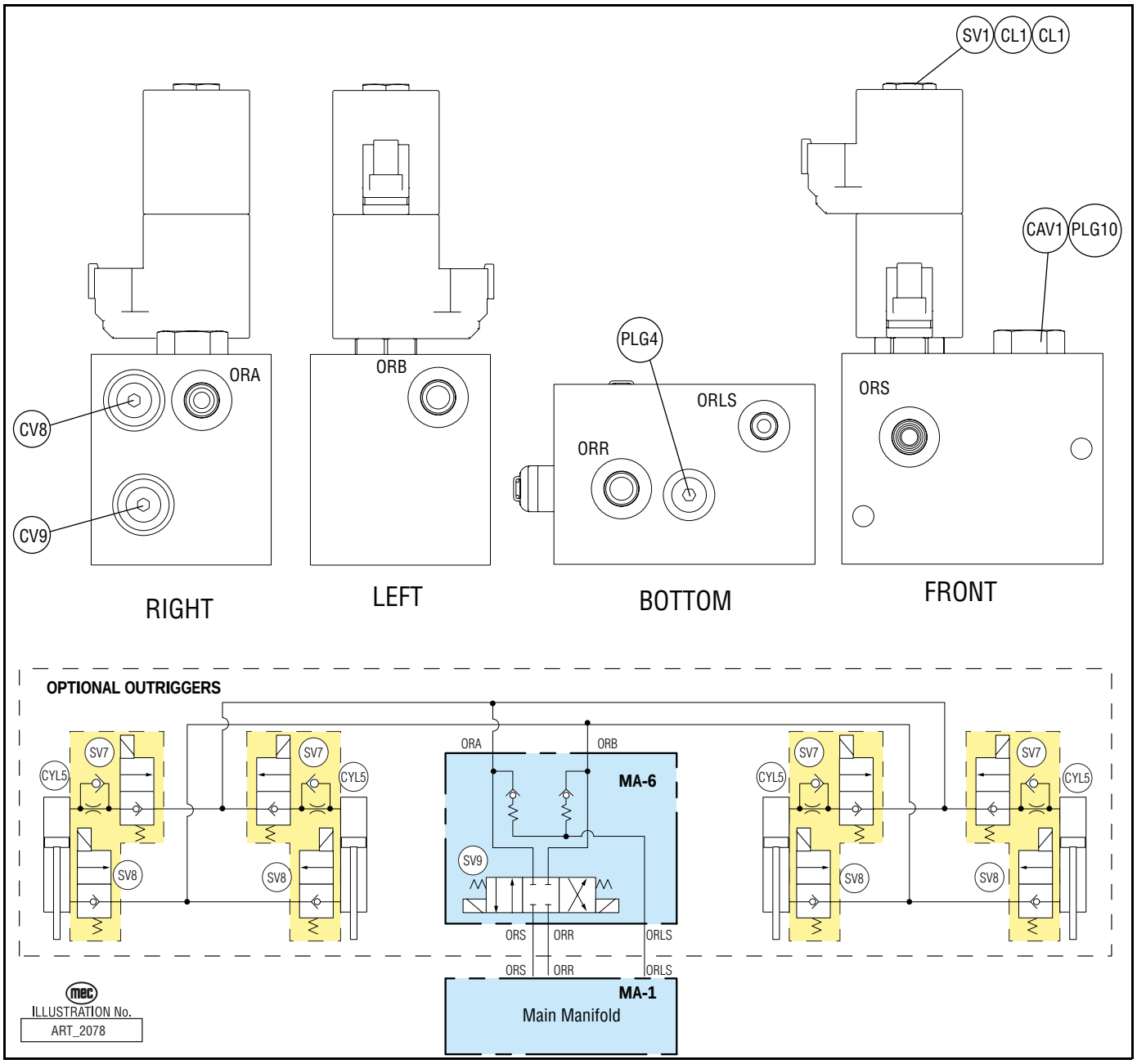

TOP
CV8
PLG4
PD2
PD1
PLG4
BOTTOM
PLG4
PLG6
MOUNTING
HOLE
FRONT
FHF38533-07
xxxx
MEC91410
PLG4
EP3
EP2
TORQUE
SV3
CL1
PLG4
FWD/REV
SVD1
LS3
LIFT
SV1
CL2
GP
EC1
STEER
SV2
CL1
CL1
BACK
PLG4
EP1
T
CBV2
CBV1
LS2
LEFT
PLG8
RFB
PLG4
RV3
LFA
CV4
CV5
RFA
OPL2
FD1
CV3
LFB
SP1
CL3
2SP
PLG4
RV1
PROP
LFT
RV2
P
OPL1
ORR
ORS
GST
ILLUSTRATION No.
ART_2077
RIGHT
LRA
FD2
OPL3
RRB
CV7
LRB
CL1
SV4
RV4
RRA
CV6
OA
SPEED
LS1
B
ORF5
CV2
STR
LS
ORLS
ORF4
CV1
STL
GLS
PLG4

Figure 6-3: Hydraulic Components



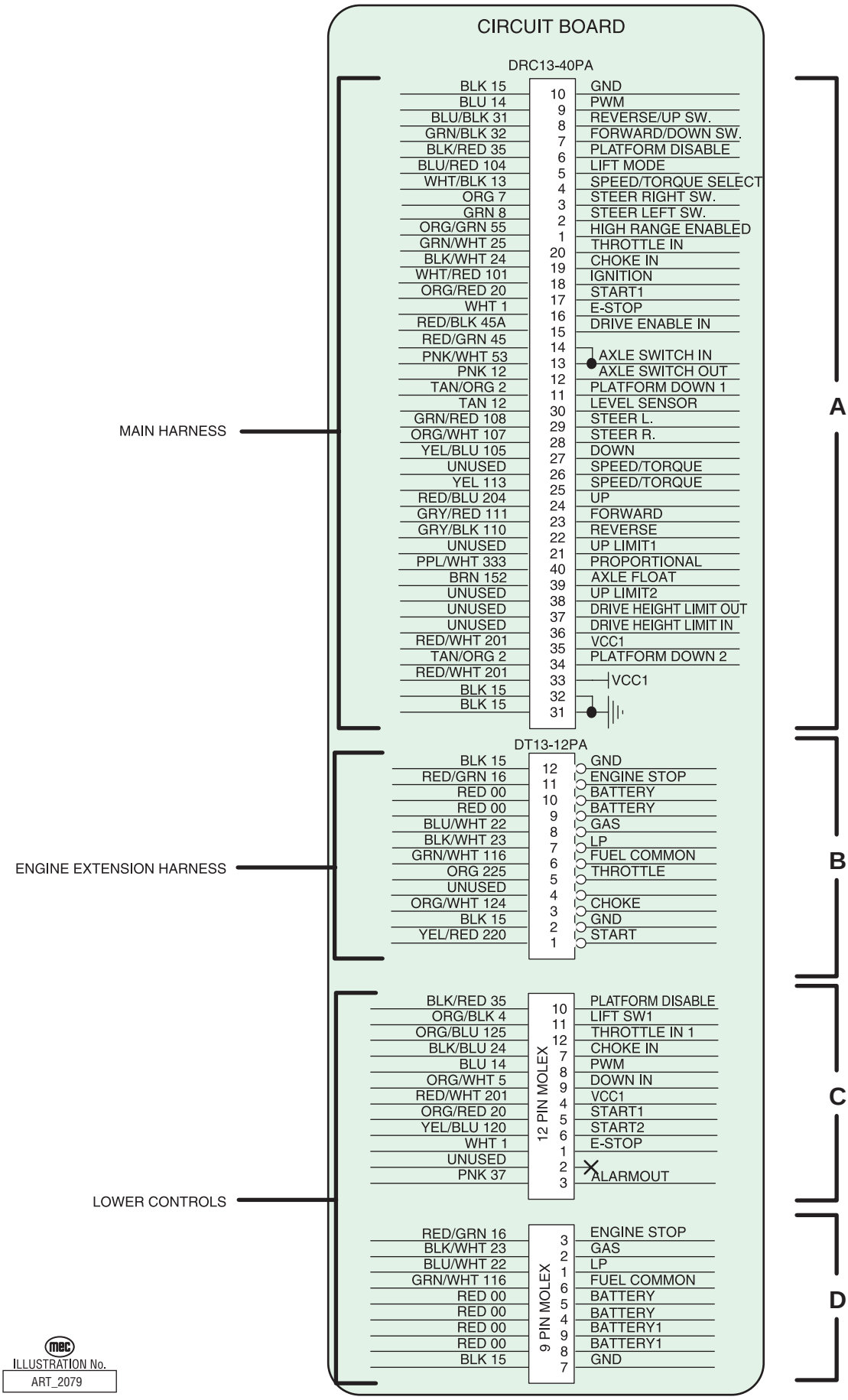
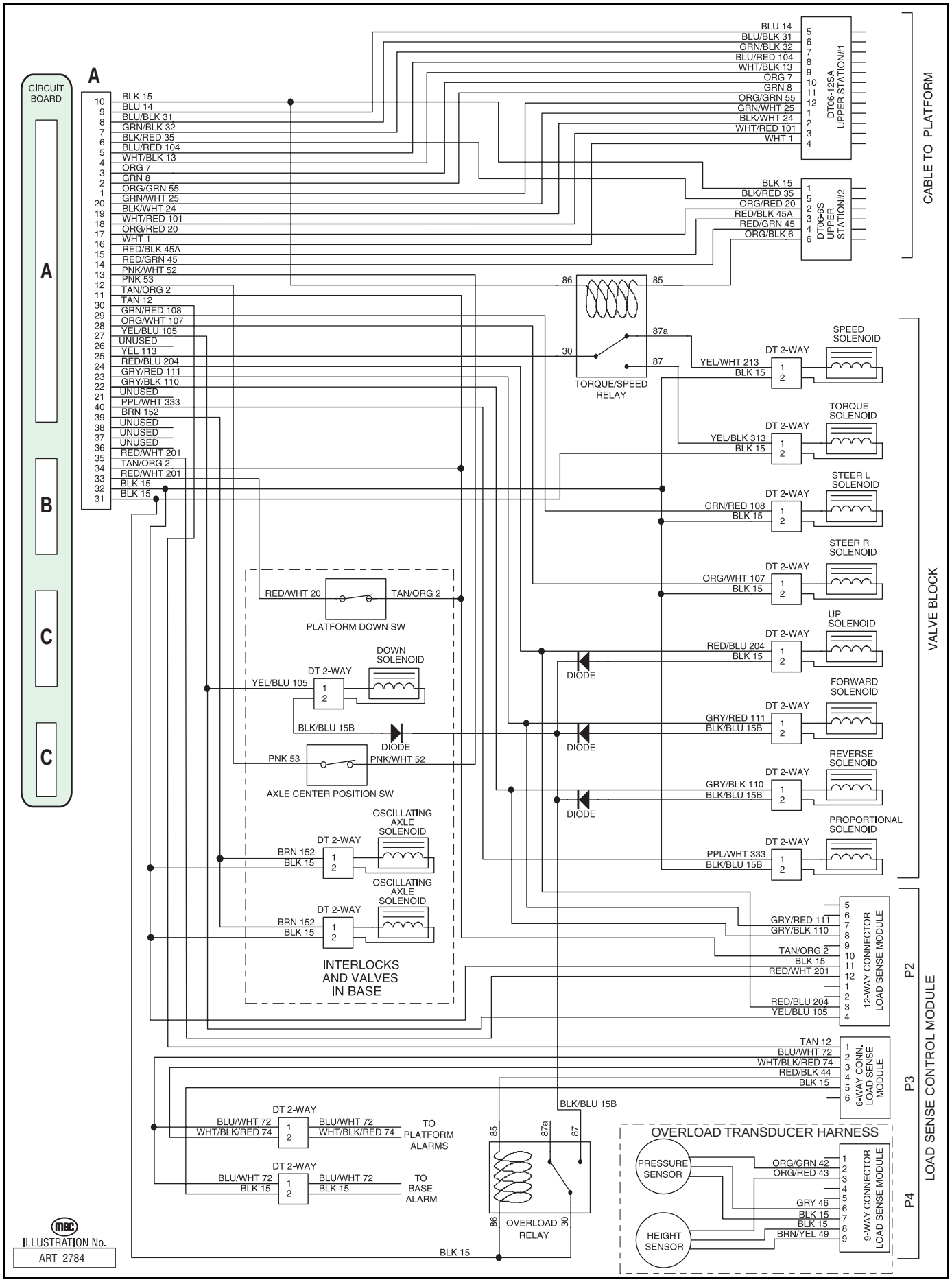


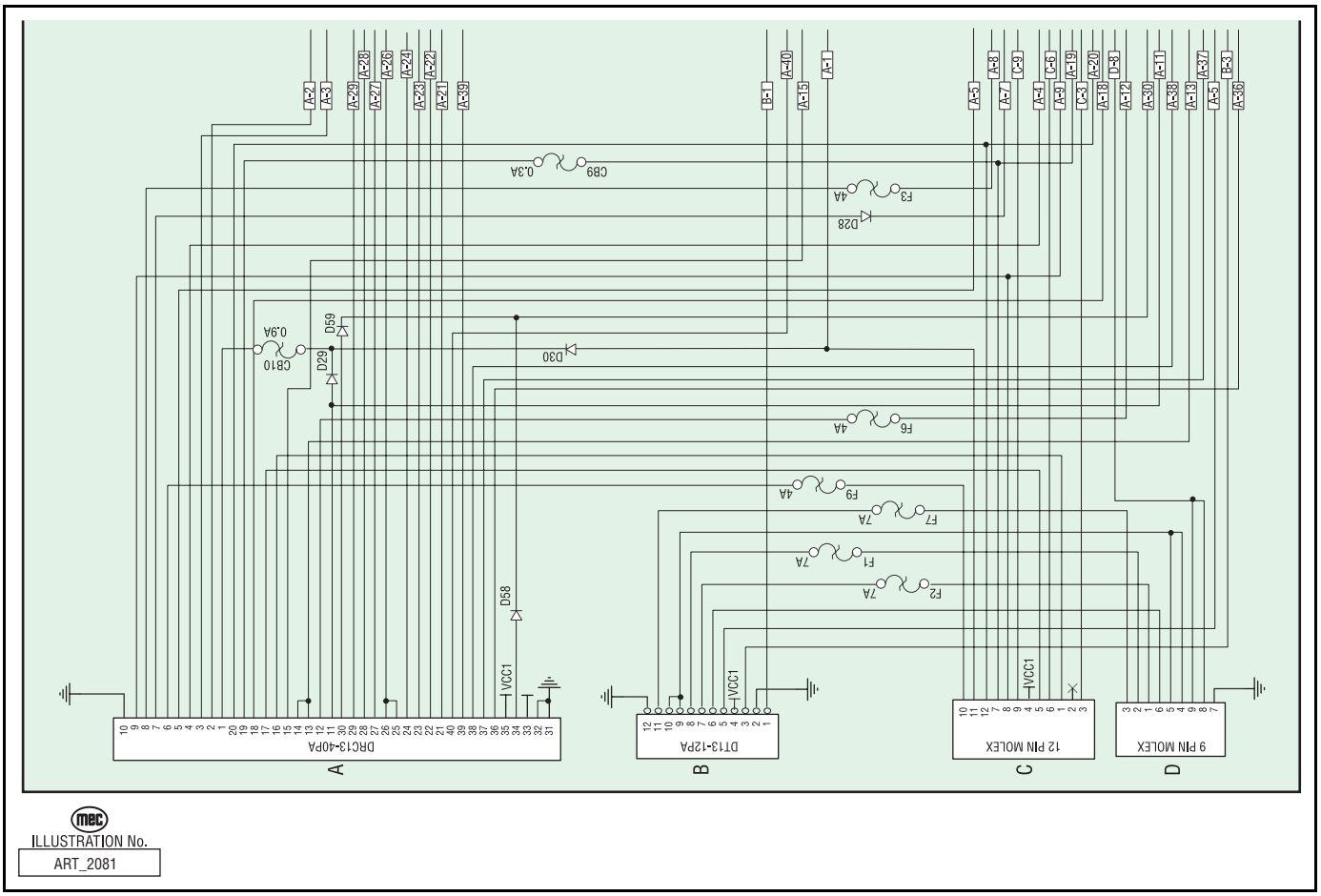
ILLUSTRATION No.
ART_2079

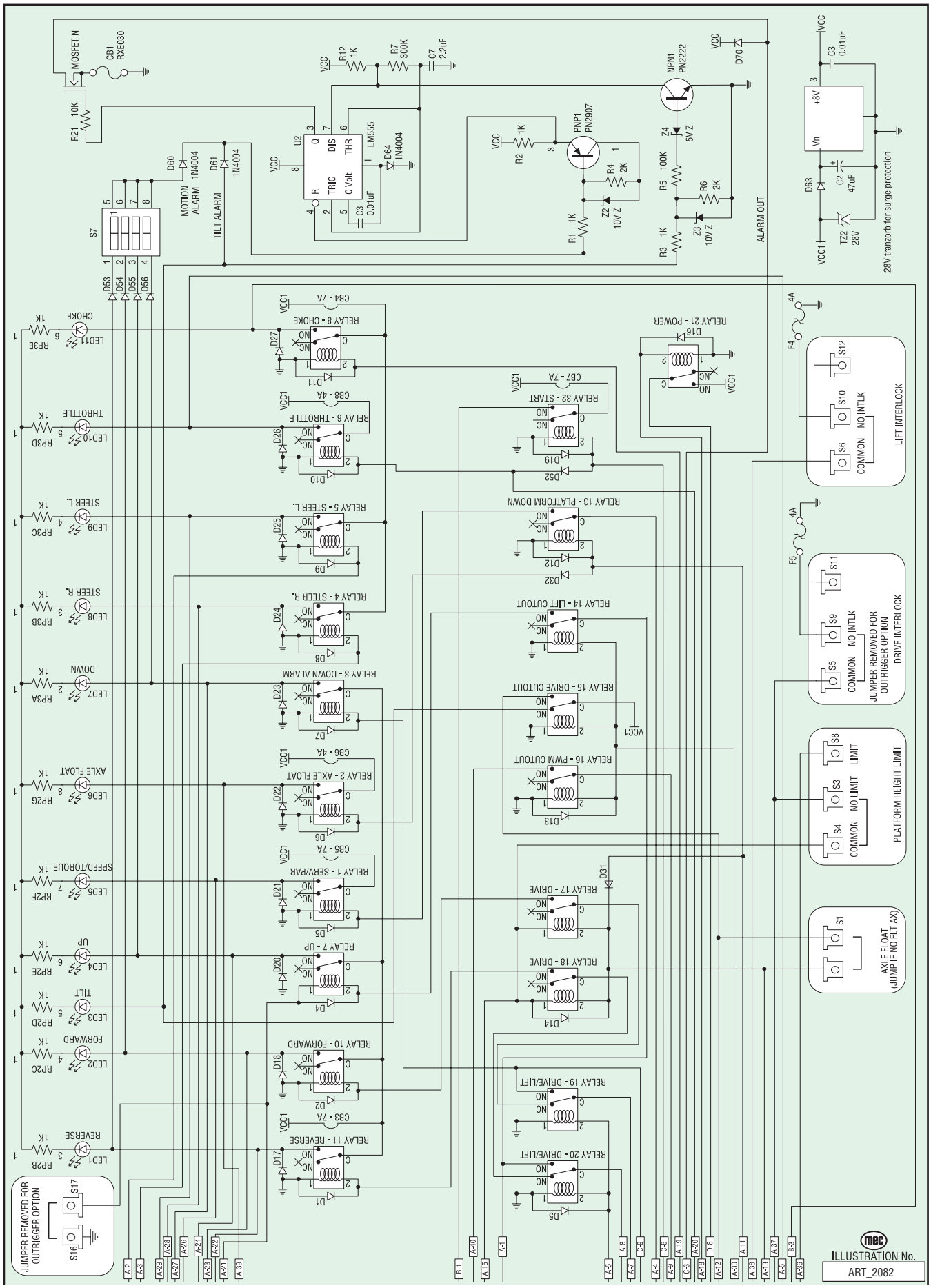

CIRCUIT BOARD
A
B
C
C
A
BLK 15
BLU 14
BLU/BLK 31
GRN/BLK 32
BLK/RED 35
BLU/RED 104
WHT/BLK 13
ORG 7
GRN 8
ORG/GRN 55
GRN/WHT 25
BLK/WHT 24
WHT/RED 101
ORG/RED 20
WHT 1
RED/BLK 45A
RED/GRN 45
PNK/WHT 52
PNK 53
TAN/ORG 2
TAN 12
GRN/RED 108
ORG/WHT 107
YEL/BLU 105
UNUSED
YEL 113
RED/BLU 204
GRY/RED 111
GRY/BLK 110
UNUSED
PPL/WHT 333
BRN 152
UNUSED
UNUSED
UNUSED
RED/WHT 201
TAN/ORG 2
RED/WHT 201
BLK 15
BLK 15
DT06-12SA UPPER STATION#1
DT06-6S UPPER STATION#2
CABLE TO PLATFORM
86
85
87a
30
87
TORQUE/SPEED RELAY
YEL/WHT 213
BLK 15
SPEED SOLENOID
DT 2-WAY
YEL/BLK 313
TORQUE SOLENOID
GRN/RED 108
STEER L SOLENOID
ORG/WHT 107
STEER R SOLENOID
RED/BLU 204
UP SOLENOID
GRY/RED 111
BLK/BLU 15B
FORWARD SOLENOID
GRY/BLK 110
REVERSE SOLENOID
PPL/WHT 333
PROPORTIONAL SOLENOID
DIODE
RED/WHT 20
TAN/ORG 2
PLATFORM DOWN SW
YEL/BLU 105
DOWN SOLENOID
PNK 53
PNK/WHT 52
AXLE CENTER POSITION SW
BRN 152
OSCILLATING AXLE SOLENOID
INTERLOCKS AND VALVES IN BASE
VALVE BLOCK
12-WAY CONNECTOR LOAD SENSE MODULE
6-WAY CONN. LOAD SENSE MODULE
9-WAY CONNECTOR LOAD SENSE MODULE
P2
P3
P4
LOAD SENSE CONTROL MODULE
TAN 12
BLU/WHT 72
WHT/BLK/RED 74
RED/BLK 44
BLK 15
BLU/WHT 72
WHT/BLK/RED 74
TO PLATFORM ALARMS
BLU/WHT 72
BLK 15
TO BASE ALARM
BLK/BLU 15B
OVERLOAD RELAY
OVERLOAD TRANSDUCER HARNESS
PRESSURE SENSOR
ORG/GRN 42
ORG/RED 43
GRY 46
BLK 15
BLK 15
BRN/YEL 49
HEIGHT SENSOR
ILLUSTRATION No.
ART_2784

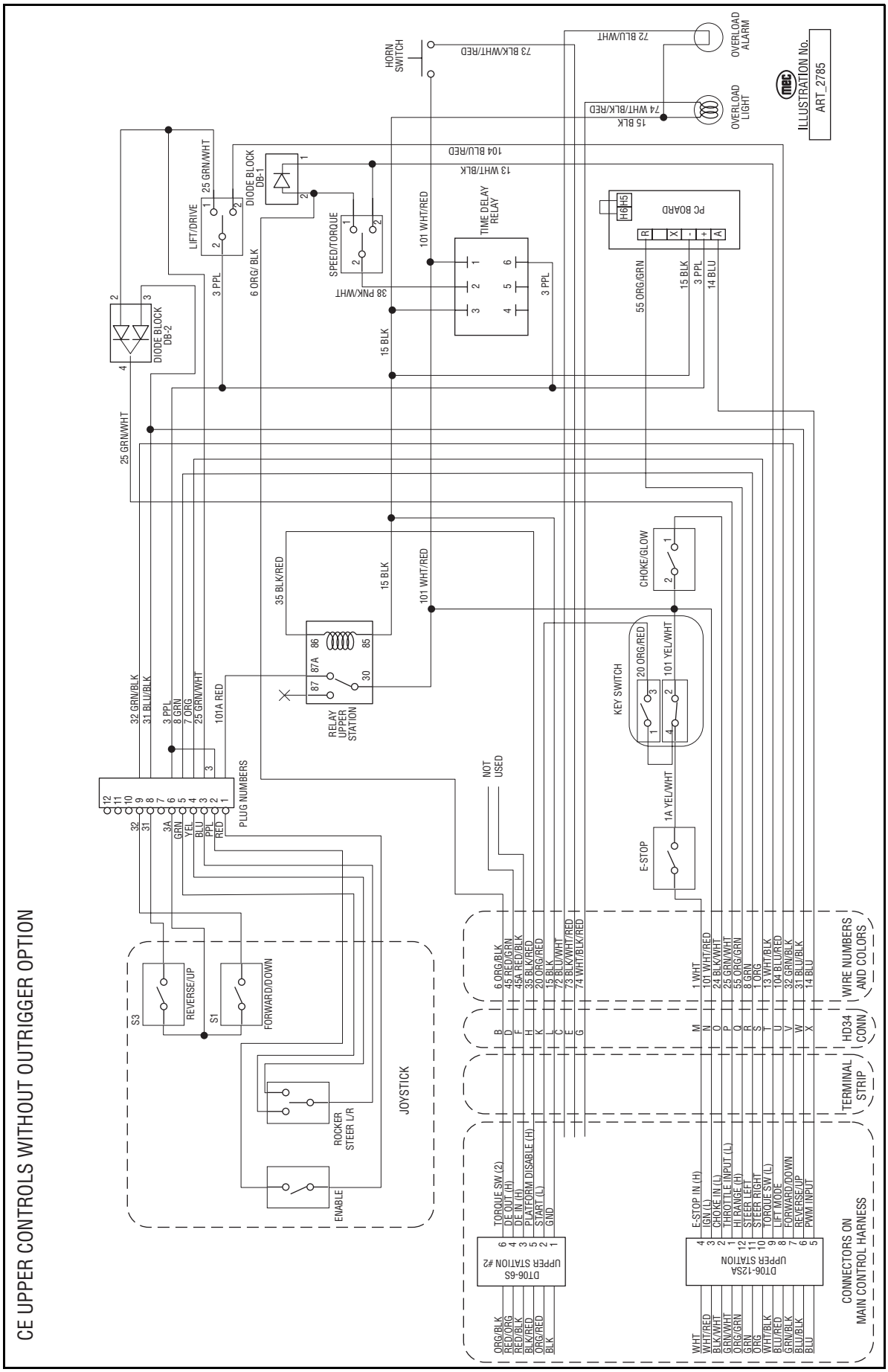
Circuit Board Schematic

The Circuit Board schematic is broken into two pages for clarity. The cable connections are shown on this page. Match the numbers to line-up the traces.

Figure 6-5: Circuit Board Schematic, Part 1




MOSFET N
CB1 RXE030
R21 10K
R12 1K
R7 300K
C7 2.2uF
VCC
U2 LM555
Q DIS THR R TRIG C Volt
C3 0.01uF
D64 1N4004
NPN1 PN2222
PNP1 PN2907
R2 1K
R4 2K
R1 1K
R5 100K
R6 2K
R3 1K
Z4 5V Z
Z2 10V Z
Z3 10V Z
D70
ALARM OUT
+8V Vn
C2 47uF
D63
TZ2 28V
VCC1
28V tranzorb for surge protection
S7
D60 1N4004 MOTION ALARM
D61 1N4004 TILT ALARM
D53 D54 D55 D56
CHOKE
THROTTLE
STEER L.
STEER R.
DOWN
AXLE FLOAT
SPEED/TORQUE
UP
TILT
FORWARD
REVERSE
LED11 LED10 LED9 LED8 LED7 LED6 LED5 LED4 LED3 LED2 LED1
RELAY 8 - CHOKE
RELAY 6 - THROTTLE
RELAY 5 - STEER L.
RELAY 4 - STEER R.
RELAY 3 - DOWN ALARM
RELAY 2 - AXLE FLOAT
RELAY 1 - SERV/PAR
RELAY 7 - UP
RELAY 10 - FORWARD
RELAY 11 - REVERSE
CB4 - 7A
CB8 - 4A
CB7 - 7A
CB6 - 4A
CB5 - 7A
CB3 - 7A
RELAY 21 - POWER
RELAY 32 - START
RELAY 13 - PLATFORM DOWN
RELAY 14 - LIFT CUTOUT
RELAY 15 - DRIVE CUTOUT
RELAY 16 - PWM CUTOUT
RELAY 17 - DRIVE
RELAY 18 - DRIVE
RELAY 19 - DRIVE/LIFT
RELAY 20 - DRIVE/LIFT
F4 4A
F5 4A
S12 S10 S6 COMMON NO INTLK LIFT INTERLOCK
S11 S9 S5 COMMON NO INTLK JUMPER REMOVED FOR OUTRIGGER OPTION DRIVE INTERLOCK
S8 S3 S4 COMMON NO LIMIT LIMIT PLATFORM HEIGHT LIMIT
S1 AXLE FLOAT (JUMP IF NO FLT AX)
S17 S16 JUMPER REMOVED FOR OUTRIGGER OPTION
ILLUSTRATION No. ART_2082


CE UPPER CONTROLS WITHOUT OUTRIGGER OPTION
ILLUSTRATION No.
ART_2785
HORN SWITCH
OVERLOAD ALARM
OVERLOAD LIGHT
LIFT/DRIVE
DIODE BLOCK DB-1
DIODE BLOCK DB-2
SPEED/TORQUE
TIME DELAY RELAY
PC BOARD
CHOKE/GLOW
KEY SWITCH
E-STOP
RELAY UPPER STATION
PLUG NUMBERS
NOT USED
JOYSTICK
REVERSE/UP
FORWARD/DOWN
ROCKER STEER L/R
ENABLE
TERMINAL STRIP
HD34 CONN
WIRE NUMBERS AND COLORS
CONNECTORS ON MAIN CONTROL HARNESS
DT06-12SA UPPER STATION
DT06-6S UPPER STATION #2

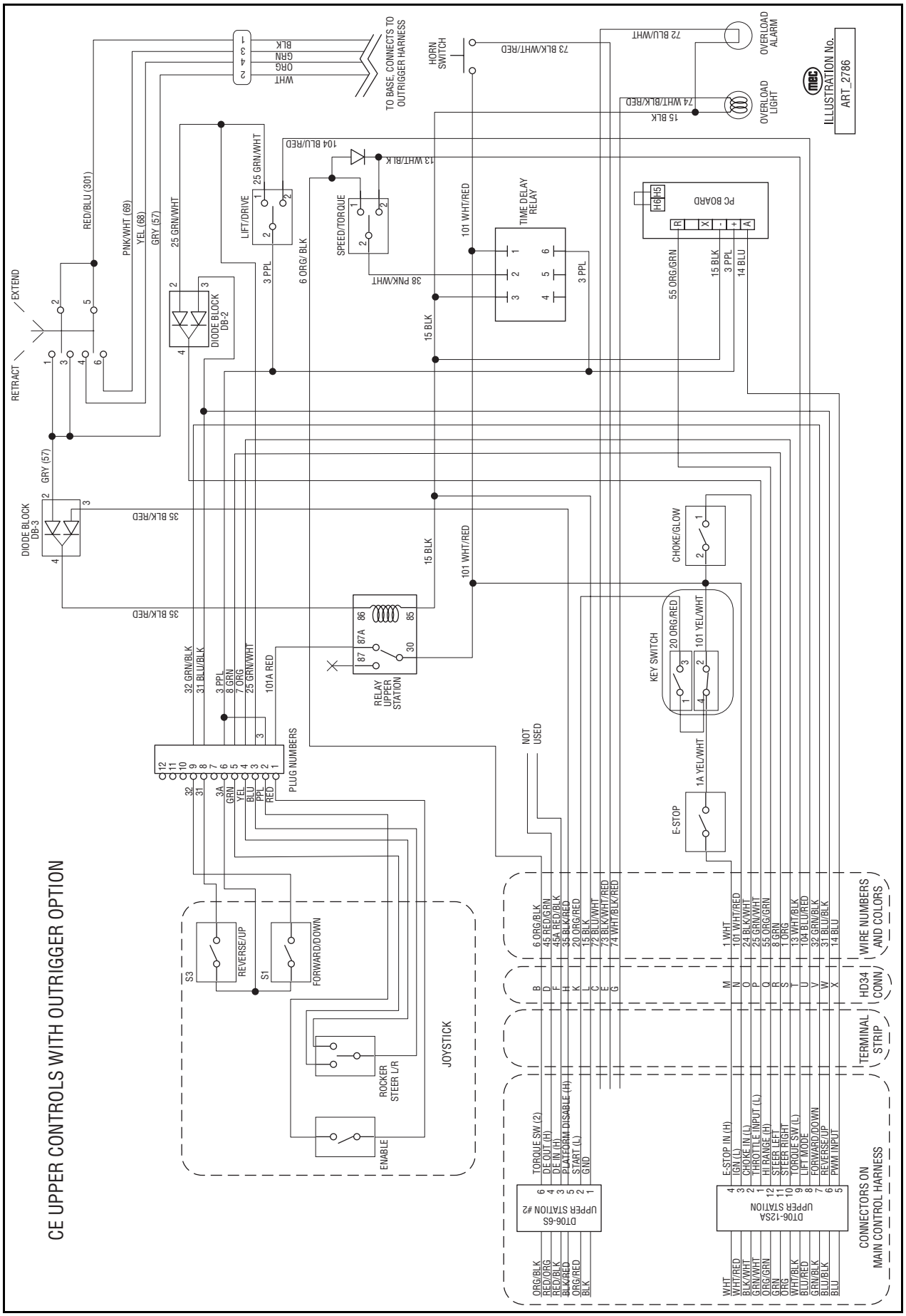
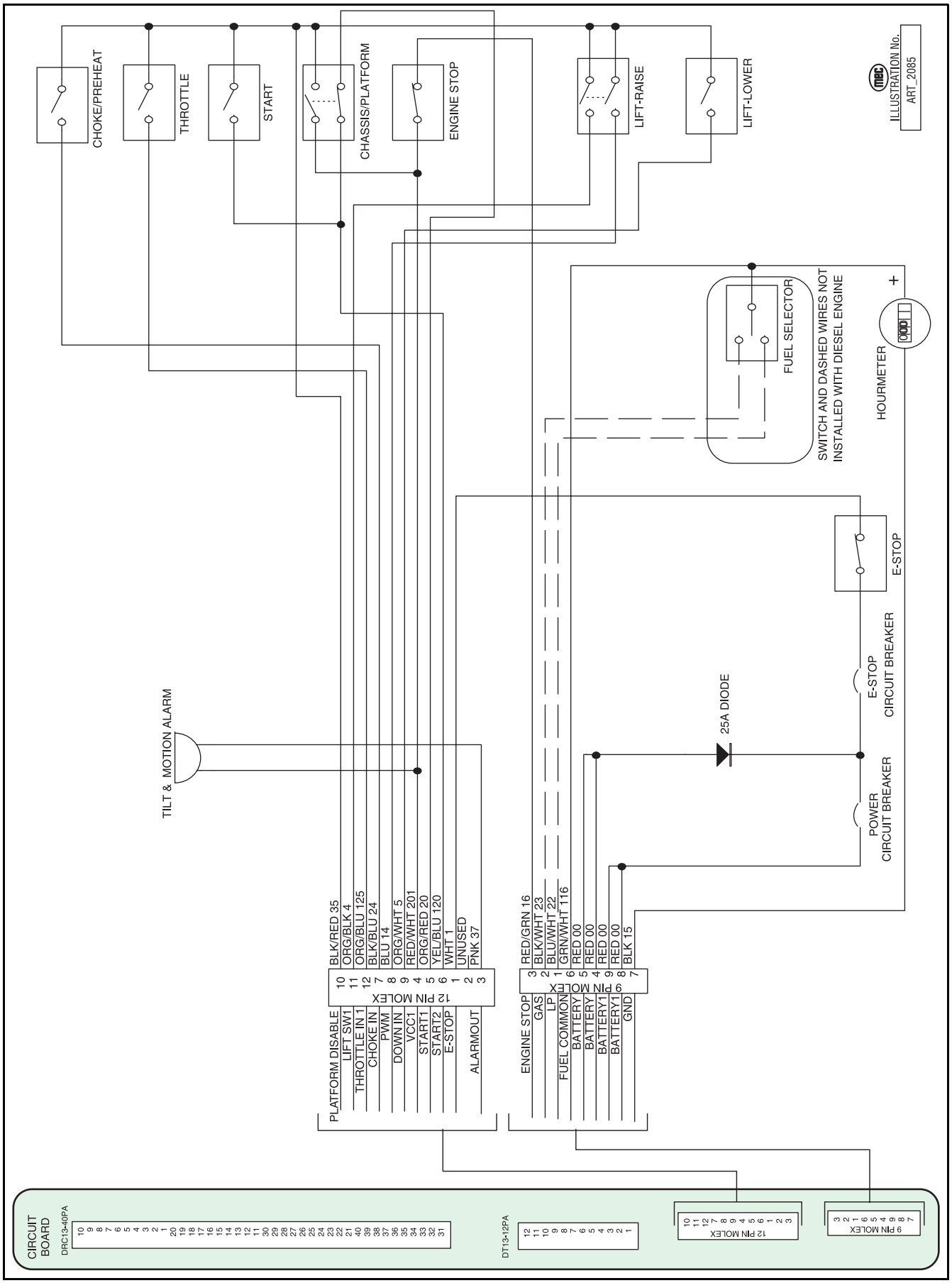

CE UPPER CONTROLS WITH OUTRIGGER OPTION
ILLUSTRATION No.
ART_2786
TO BASE, CONNECTS TO OUTRIGGER HARNESS
HORN SWITCH
OVERLOAD ALARM
OVERLOAD LIGHT
PC BOARD
TIME DELAY RELAY
LIFT/DRIVE
SPEED/TORQUE
DIODE BLOCK DB-2
DIODE BLOCK DB-3
EXTEND
RETRACT
RELAY UPPER STATION
CHOKE/GLOW
KEY SWITCH
E-STOP
PLUG NUMBERS
NOT USED
JOYSTICK
REVERSE/UP
FORWARD/DOWN
ROCKER STEER L/R
ENABLE
S1
S3
TERMINAL STRIP
HD34 CONN
WIRE NUMBERS AND COLORS
CONNECTORS ON MAIN CONTROL HARNESS
DT06-6S UPPER STATION #2
DT06-12SA UPPER STATION

Figure 6-9: Lower Control Box



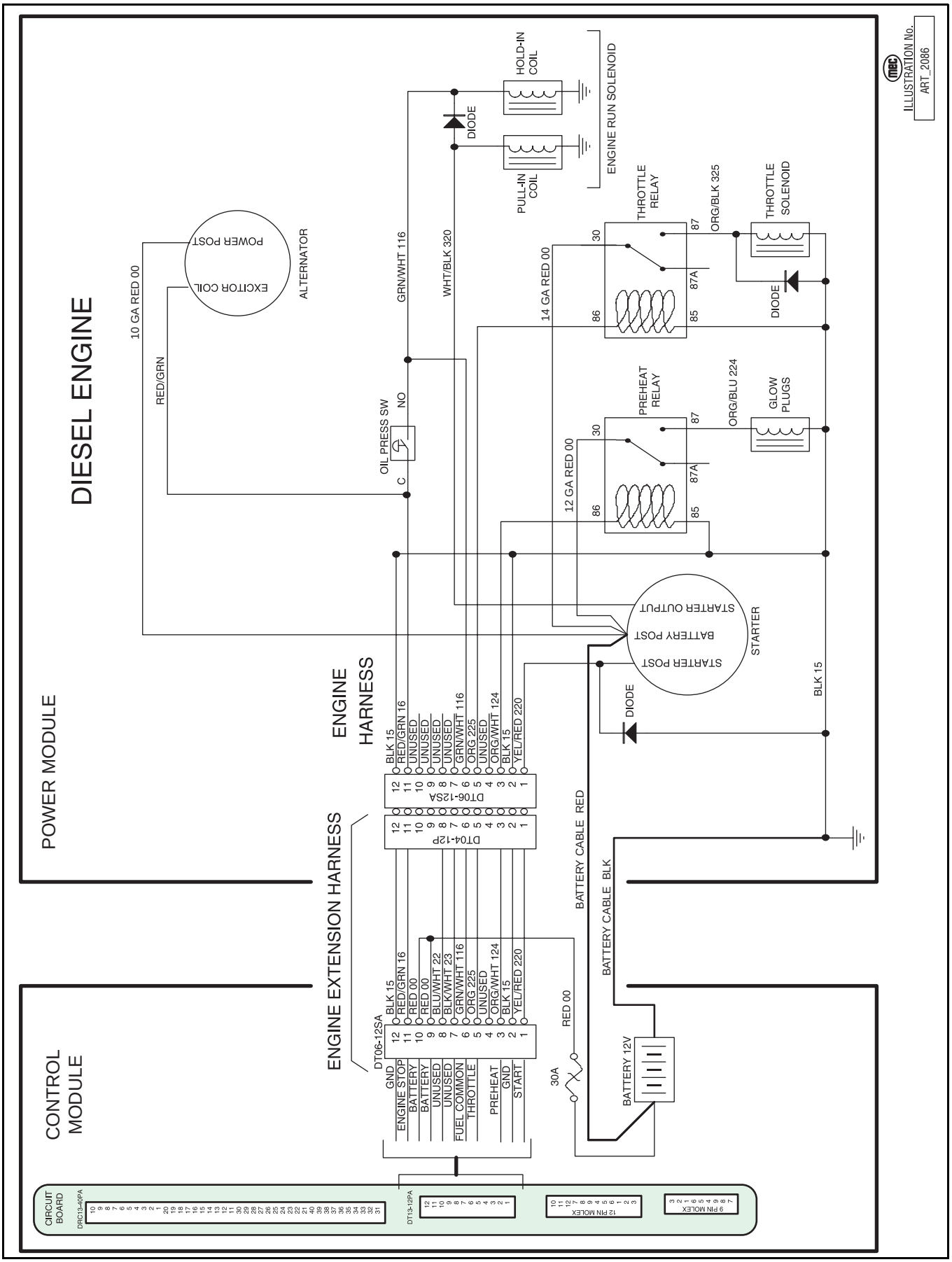


ILLUSTRATION No.
ART_2086
DIESEL ENGINE
POWER MODULE
ENGINE HARNESS
ENGINE EXTENSION HARNESS
CONTROL MODULE
ALTERNATOR
POWER POST
EXCITOR COIL
10 GA RED 00
RED/GRN
GRN/WHT 116
WHT/BLK 320
OIL PRESS SW
NO
C
HOLD-IN COIL
PULL-IN COIL
DIODE
ENGINE RUN SOLENOID
THROTTLE RELAY
ORG/BLK 325
THROTTLE SOLENOID
14 GA RED 00
PREHEAT RELAY
ORG/BLU 224
GLOW PLUGS
12 GA RED 00
STARTER
STARTER POST
BATTERY POST
STARTER OUTPUT
BLK 15
BATTERY CABLE RED
BATTERY CABLE BLK
BATTERY 12V
30A
RED 00
DT06-12SA
DT04-12P
DT06-12SA
BLK 15
RED/GRN 16
UNUSED
GRN/WHT 116
ORG 225
ORG/WHT 124
YEL/RED 220
GND
ENGINE STOP
BATTERY
FUEL COMMON
THROTTLE
PREHEAT
START
BLU/WHT 22
BLK/WHT 23
CIRCUIT BOARD
DRC13-48PA
DT13-12PA
12 PIN MOLEX
9 PIN MOLEX

Figure 6-11: Outriggers Schematic (option)

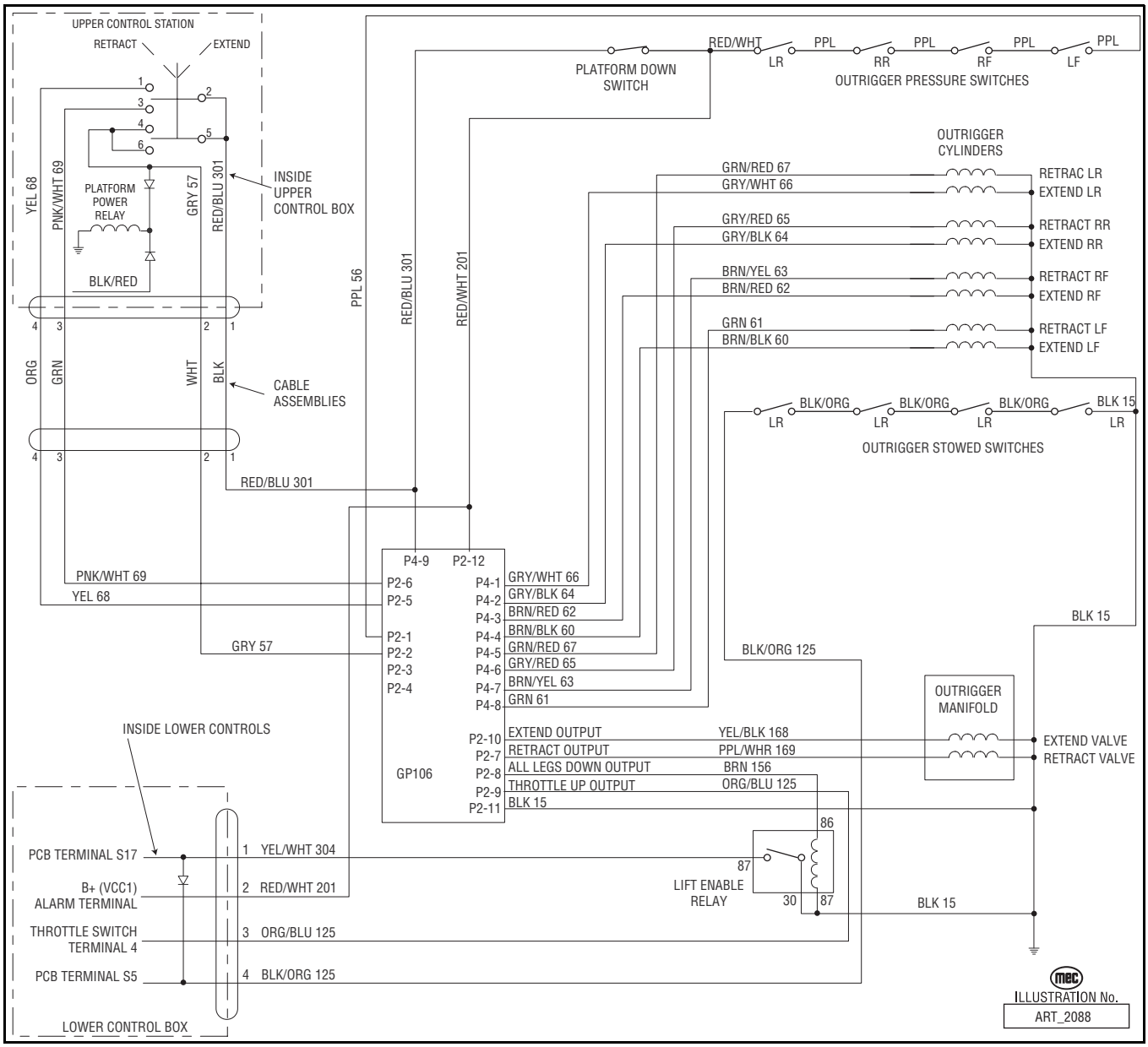
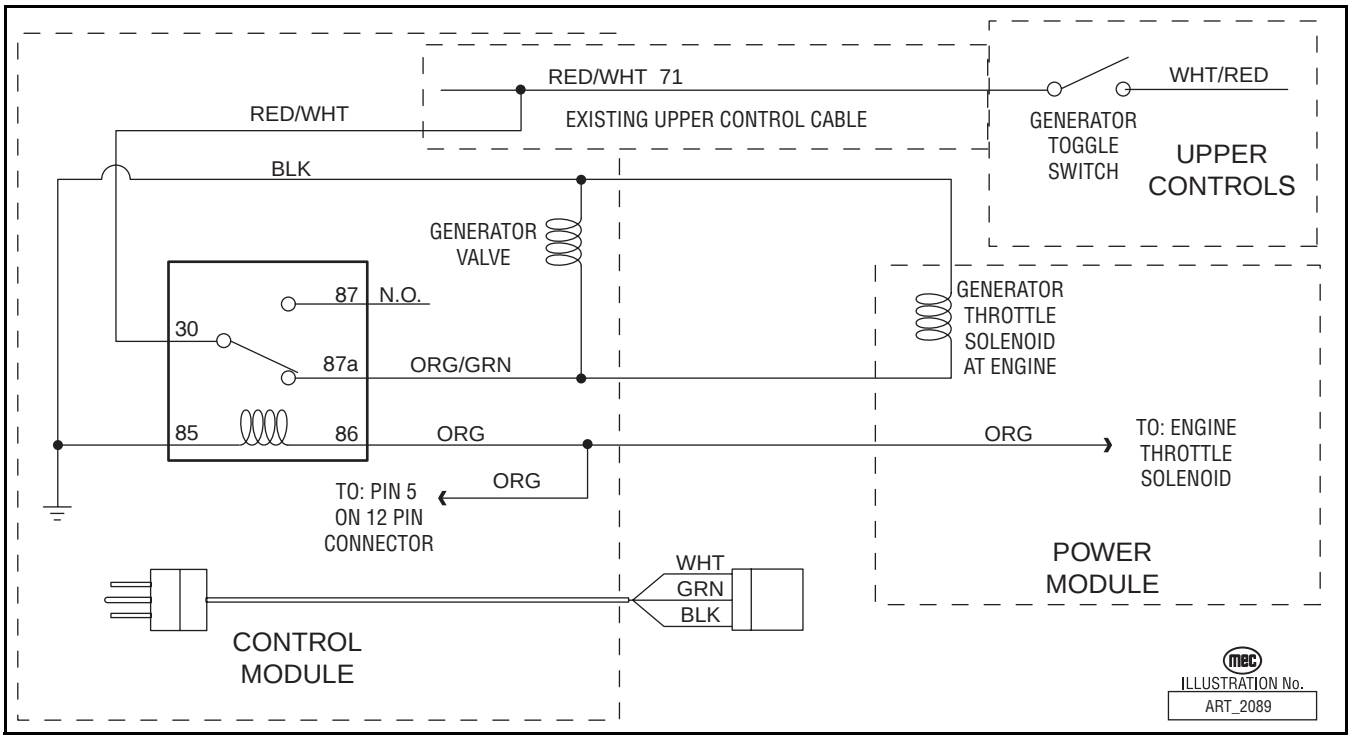


Figure 6-12: Generator Schematic (option)



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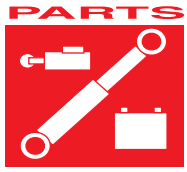


SECTION A

CONTROLS

CONTENTS

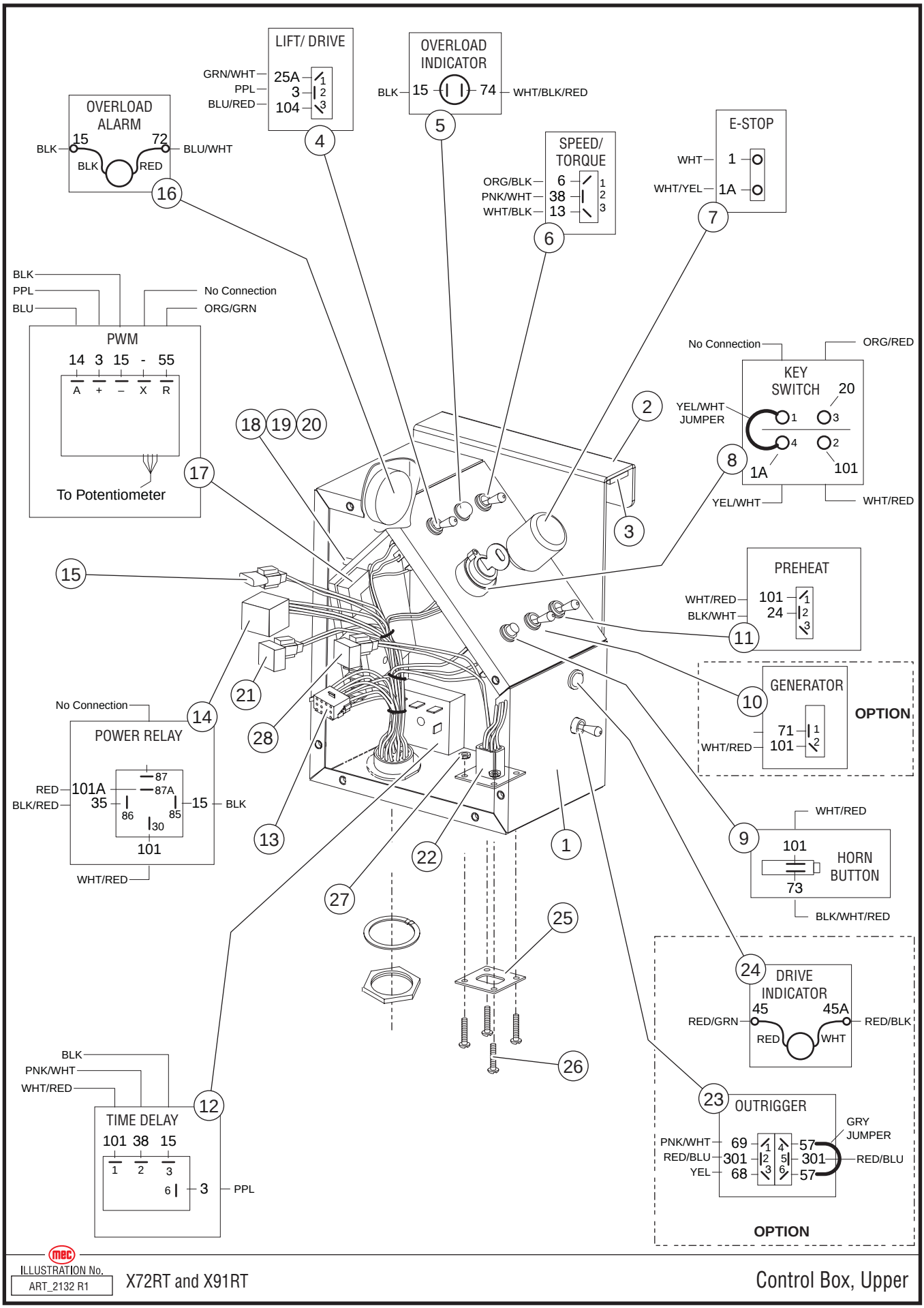


ILLUSTRATION No. ART_2132 R1

X72RT and X91RT

Control Box, Upper

Upper Control Box

ITEM	PART NO.	QTY	DESCRIPTION
	91139		Control Box Assembly, Ce
1	16242	1	Weldment, Control Box
2	13865	1	Bracket, Control Box Holder
3	6350	.5 FT	Tape, Foam
4	6234	1	Switch, Toggle, Lift/drive
5	9183	1	Lens, Red, Overload Indicator
	9188	1	Light, Bayonet, 14 Volt
	9179	1	Socket, Indicator Light
6	6905	1	Switch, Toggle, Speed/torque
7	7800	1	Switch, Emergency Stop
8	91159	1	Keyswitch
	8082	1	Contact Block, No
	8083	1	Contact Block, Nc
9	8044	1	Switch, Horn Button
10	5630	1	Switch, Toggle, Generator (Option)
11	7423	1	Switch, Toggle, Preheat
12	91186	1	Relay, Time Delay
13	91184	1	Wire Harness, Control Box
14	91375	1	Relay, Power
15	91027	1	Diode Block, 2 Position
16	7553	1	Alarm, Overload Warning
17	91107	1	PWM Card
18	90814	2	Spacer
19	90833	2	Screw, 6-32 X 3/4"
20	5364	2	Nut, 6-32
21	91028	1	Diode Block, 4 Position
OUTRIGGER OPTION			
22	91294	1	Harness, Outrigger Control
23	8638	1	Switch, Toggle
24	90789	1	Led, Green, Drive Enabled
25	16312	1	Plate, Mounting, Outrigger Plug
26	90833	2	Screw, 6-32 X 3/4"
27	5364	2	Nut, 6-32
28	91028	1	Diode Block, 4 Position

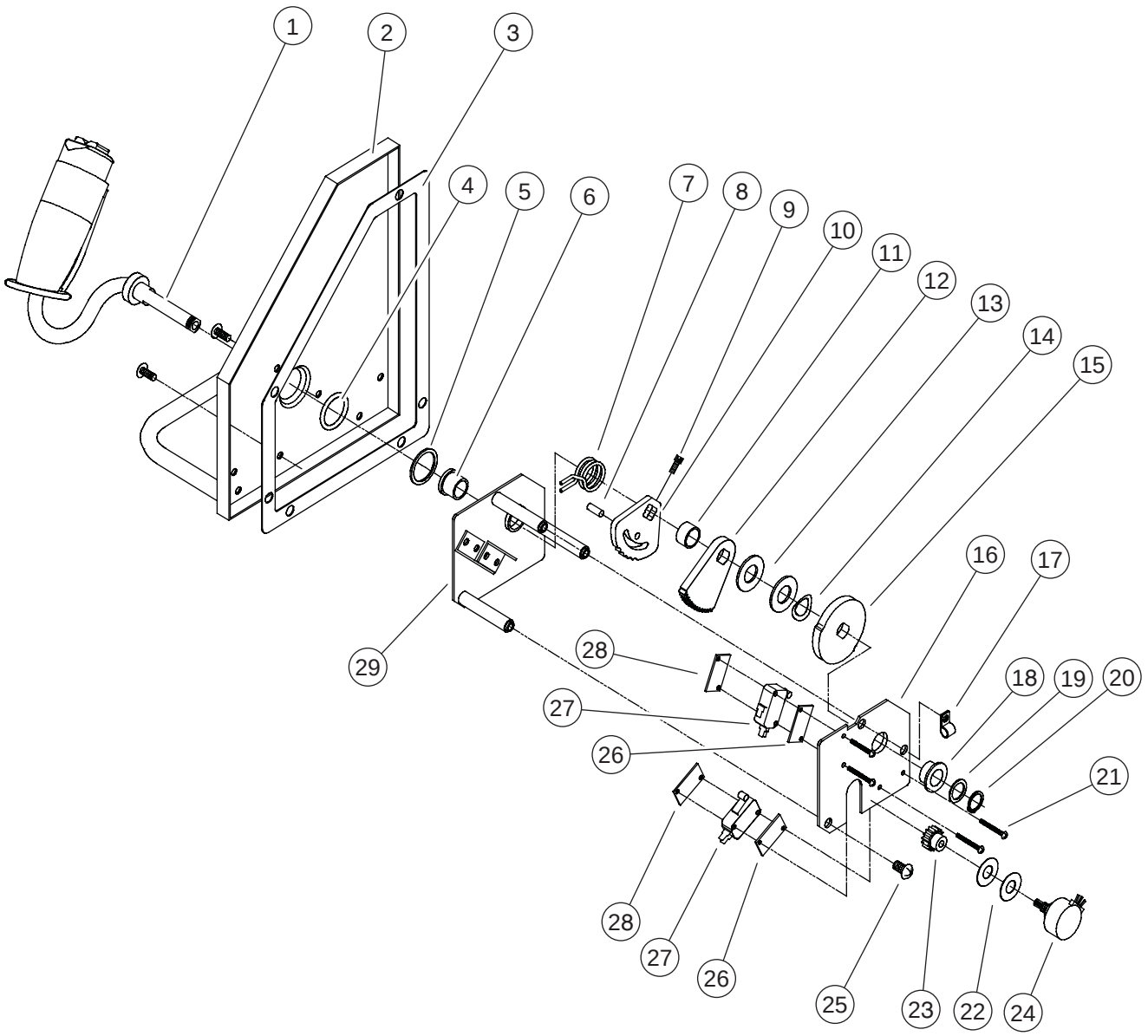


ILLUSTRATION No.
ART_2091 R1

Upper Control Box Cover Assembly

Upper Control Box Cover Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	13647	1	Control Arm Cover
2	3772	1	Cover
3	7875	1	Gasket
4	7882	1	O-ring, 7/8" Id X 1 1/8" Od
5	HDW3768	1	Washer, Flat
6	7819	1	Bearing, Bronze, Flanged
7	8435	1	Spring, Joystick, Centering
8	1008348	1	Pin, Hold Down
9	HDW7887	1	Screw, #6-32, 1/2" Lg
10	13502	1	Bracket, Centering
11	3763	1	Spacer, Step
12	13402	1	Gear, Large
13	HDW8531	2	Washer, Flat
14	HDW7881	1	Washer, Bevel
15	3782	1	Cam. Directional
16	13403	1	Plate, Bottom
17	6917	1	Clamp, Cable 1/4 Inch
18	7818	1	Bearing, Bronze, Flanged
19	HDW3771	1	Washer, Flat
20	5736	1	Ring, Retaining, 1/2 Inch
21	HDW8399	4	Screw, #4 - 40, 5/8 Lg
22	HDW8567	2	Washer, Flat
23	8389	1	Gear, Spur
24	91522	1	Potentiometer
25	HDW7888	12	Screw, #10 - 32, 1/2" Lg
26	3764	2	Plate, Spacer
27	8696	2	Switch, Limit, Micro V7
28	3765	2	Plate, Strap
29	3766	1	Plate, Top

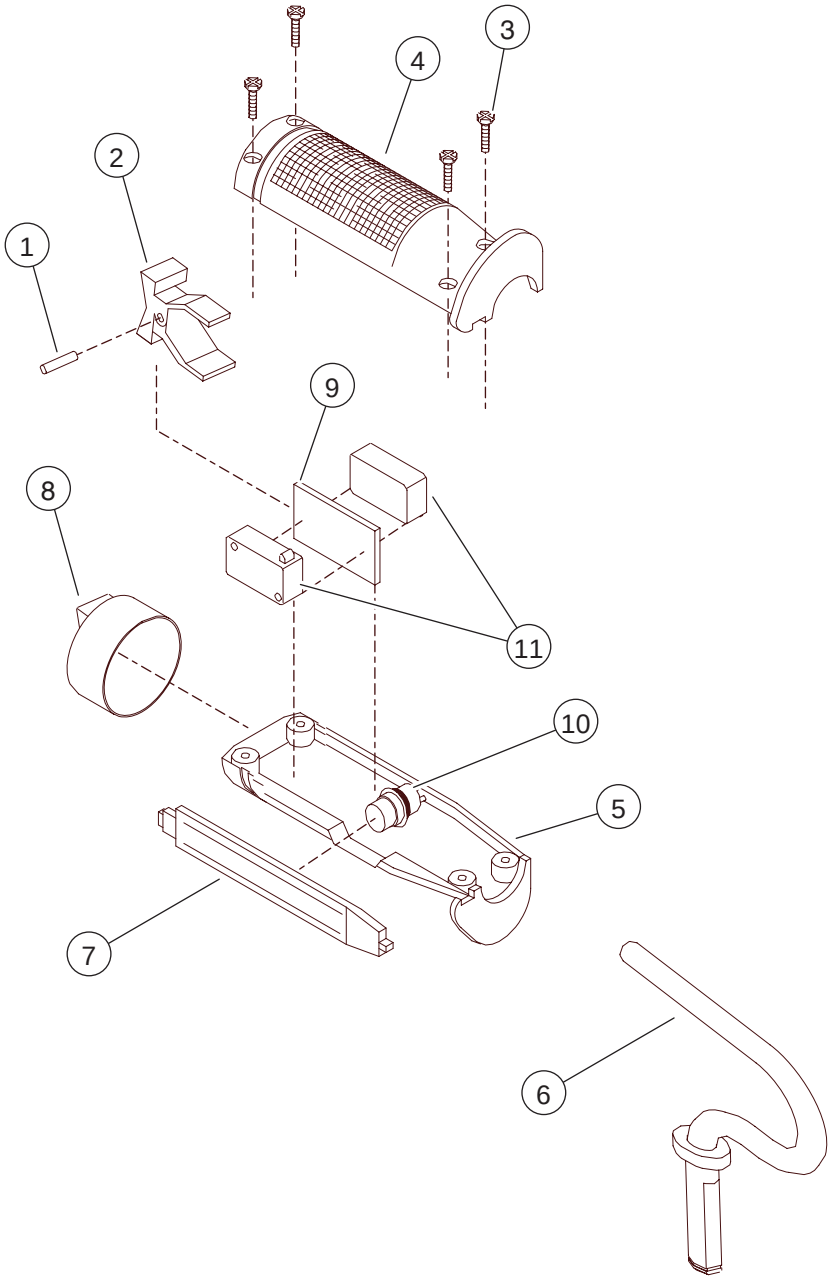
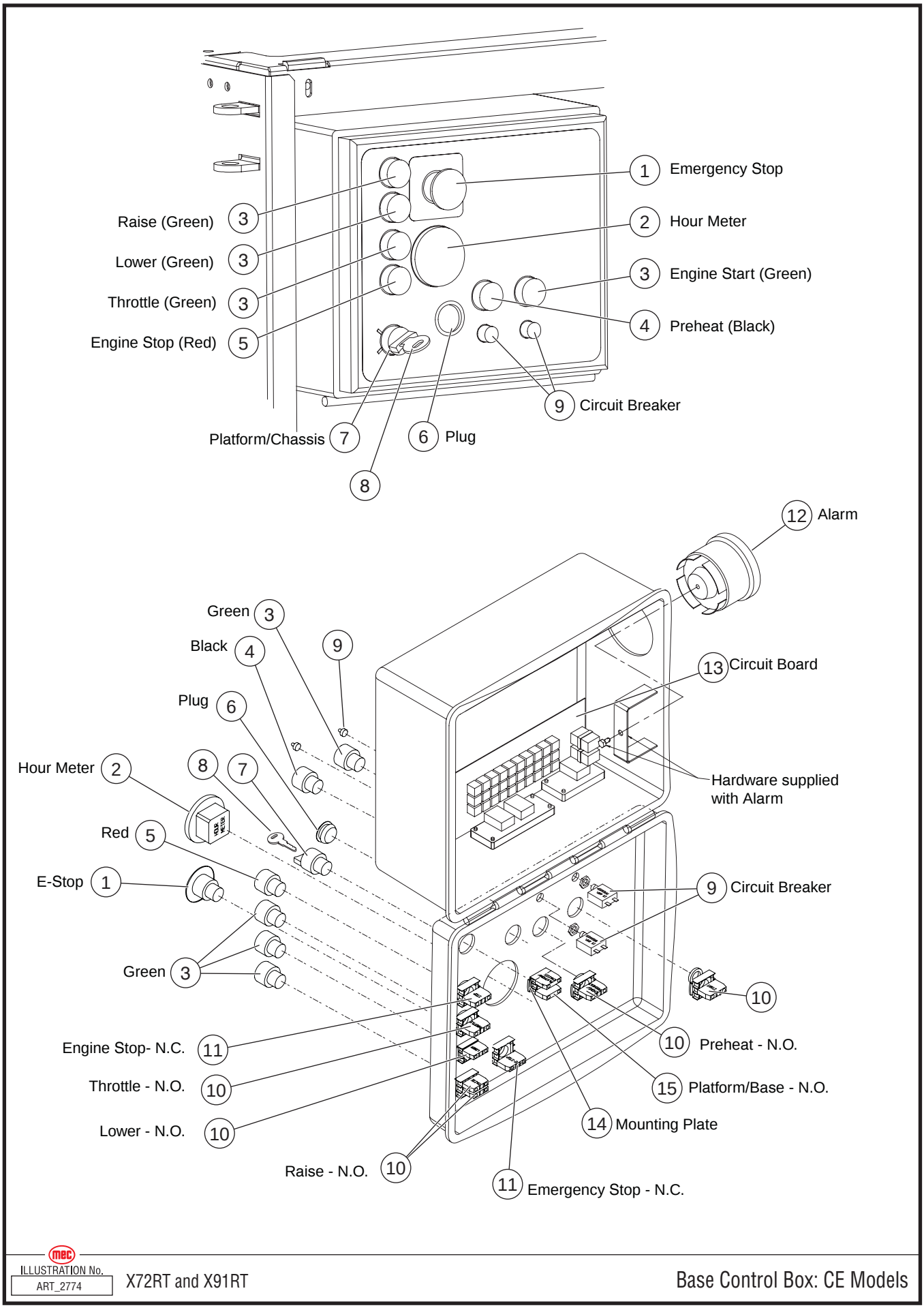


ILLUSTRATION No.
ART_2092 R1

Upper Controls Joystick

Upper Controls Joystick

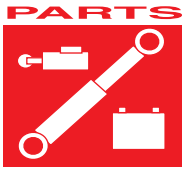
ITEM	PART NO.	QTY	DESCRIPTION
	13647		Control Arm Assembly, Joystick
1	8750	1	Pin (Service Only)
2	8453	1	Switch Actuator (Service Only)
3	HDW8455	4	Screw, 6-1/2" Lg (Service Only)
4	8752	1	Grip-top Half (Service Only)
5	8751	1	Grip-bottom Half (Service Only)
6	13638	1	Control Arm Without Wire
7	8748	1	Trigger (Service Only)
8	8456	1	Rocker Boot (Service Only)
	7476	5	Amp Pins
	8630	1	Handle, Grip
	8761	1	Switch Assembly (Not Shown)
	8089	1 ft	Wire, Blk 18ga 300 V
	7777	2	Terminal, Push On, 3/16"
9	8447	1	Switch Separator (Service Only)
10	8753	1	Motion Switch, On-off (Service Only)
11	8448	2	Switch (Service Only)


1 Emergency Stop
2 Hour Meter
3 Engine Start (Green)
4 Preheat (Black)
9 Circuit Breaker
Raise (Green) 3
Lower (Green) 3
Throttle (Green) 3
Engine Stop (Red) 5
Platform/Chassis 7
6 Plug
8
12 Alarm
13 Circuit Board
Hardware supplied with Alarm
Green 3
Black 4
Plug 6
Hour Meter 2
Red 5
E-Stop 1
Green 3
Engine Stop- N.C. 11
Throttle - N.O. 10
Lower - N.O. 10
Raise - N.O. 10
11 Emergency Stop - N.C.
14 Mounting Plate
15 Platform/Base - N.O.
10 Preheat - N.O.
10
9 Circuit Breaker
ILLUSTRATION No.
ART_2774
X72RT and X91RT
Base Control Box: CE Models

Base Control Box

ITEM	PART NO.	QTY	DESCRIPTION
	91169		Base Control Box Assembly
1	7800	1	Switch, Emergency Stop
2	7909	1	Hour Meter
3	91533	4	Switch, Button, Green
4	91534	1	Switch, Button, Black
5	91535	1	Switch, Button, Red
6	91329	1	Plug
7	91369	1	Keyswitch, 2-position
8		1	Key
9	7235	2	Circuit Breaker, 15 Amp
10	91537	6	Block, Contact, N.O.
11	91538	2	Block, Contact, N.C.
12	91539	1	Alarm, 107dB
13	91370	1	Circuit Board
14	90714	1	Mounting Plate, Keyswitch
15	8082	2	Contact Block, N.O.

NOTES:



SECTION B

PLATFORM AND RAILS

CONTENTS **PAGE**

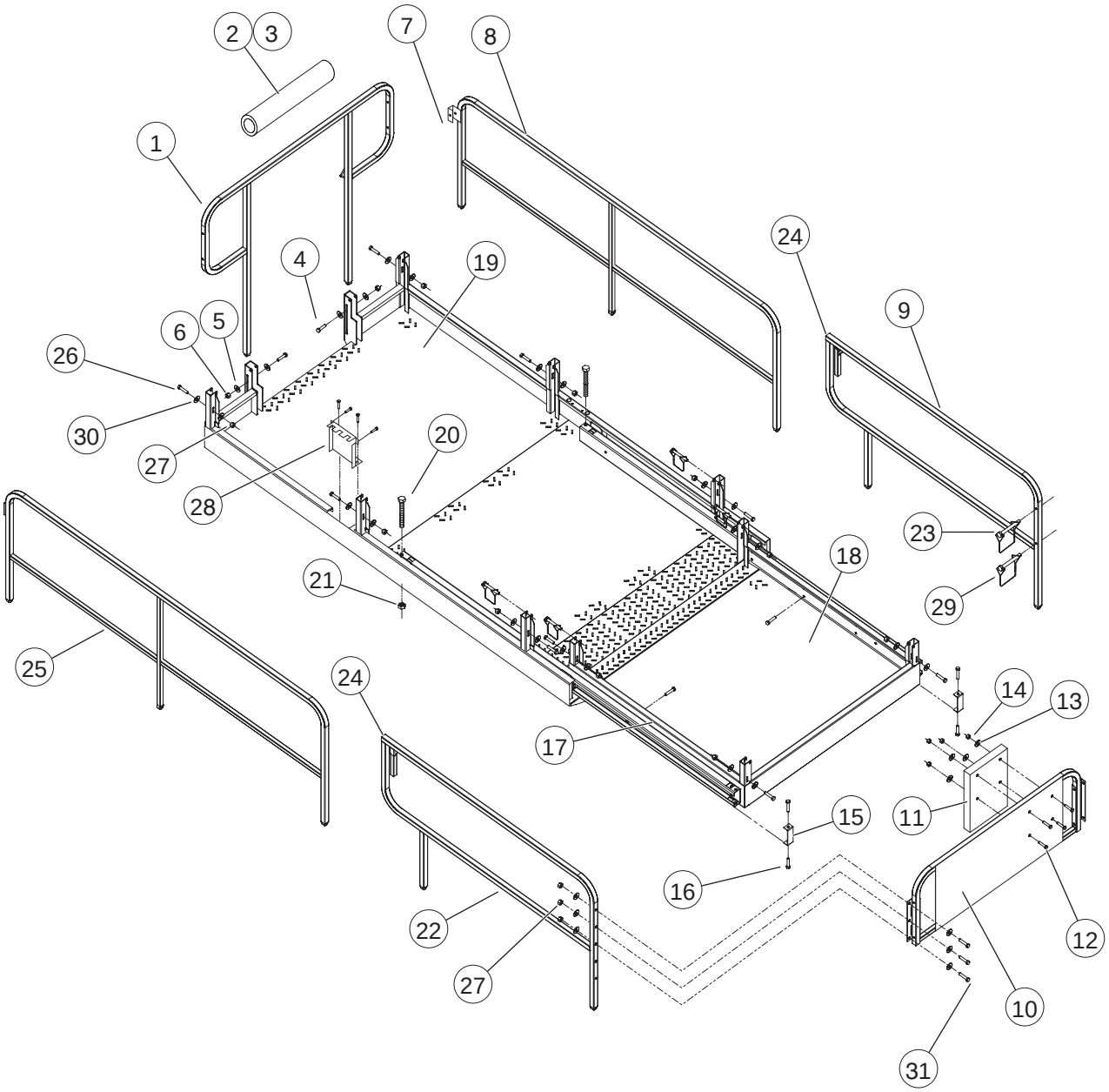


ILLUSTRATION No.
ART_2094

2591RT - 3391RT - 4191RT

Platform and Rails

Platform Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	16436	1	Rear Rail Weldment
2	7805	1	Padding, Rail (Optional)
3	7048	1	Cover, Rail Padding (Optional)
4	HDW7119	2	Screw, 5/16” - 18, 2 ¼” LG, GR 5
5	HDW5217	4	Flat Washer, .343 ID × .688 OD × .063 THK
6	HDW8304	6	Nut, 5/16” - 18
7	HDW7593	6	Pin, Wire Lock, Square, 3/8” × 2 ¼” LG
8	16433	1	Side Rail Weldment, LH
9	14301	1	Side Rail Weldment - Extension
10	16435	1	Front Rail Weldment
11	8909	1	Manual Enclosure
12	HDW5723	8	Screw, ¼” - 20, ½” LG
13	HDW8294	4	Flat Washer, .328 ID × 1.000 OD × .100 THK
14	HDW8267	4	Nut, ¼” - 20
15	14415	2	Bracket, Extension Stop
16	HDW5724	20	Screw, 5/16” - 18, ¾” LG, GR 5
17	14152	2	Channel, Extension
18	16429	1	Extension Platform Weldment
19	16437	1	Main Platform Weldment
20	HDW8856	2	Screw, ½”-13, 5” LG
21	HDW8457	2	Nut, ½” - 13
22	14313	1	Right Side Rail Weldment - Extension
23	HDW8974	1	Pin, Wire Lock, Square, 3/8” × 3” LG
24	6823	2	Cap Plug, 1 ¼"
25	16434	1	Side Rail Weldment, RH
26	HDW8279	10	Screw, 3/8-16, 2½" LG
27	HDW8268	10	Nut, 3/8-16
28	20552	1	Cover, Platform Cord
29	91284	1	Pin Hitch 3/8" × 4
30	HDW5355	20	Washer, Flat, .438 ID×1.00 OD×.078 THK
31	HDW6434	3	Screw, 3/8-16×2" LG

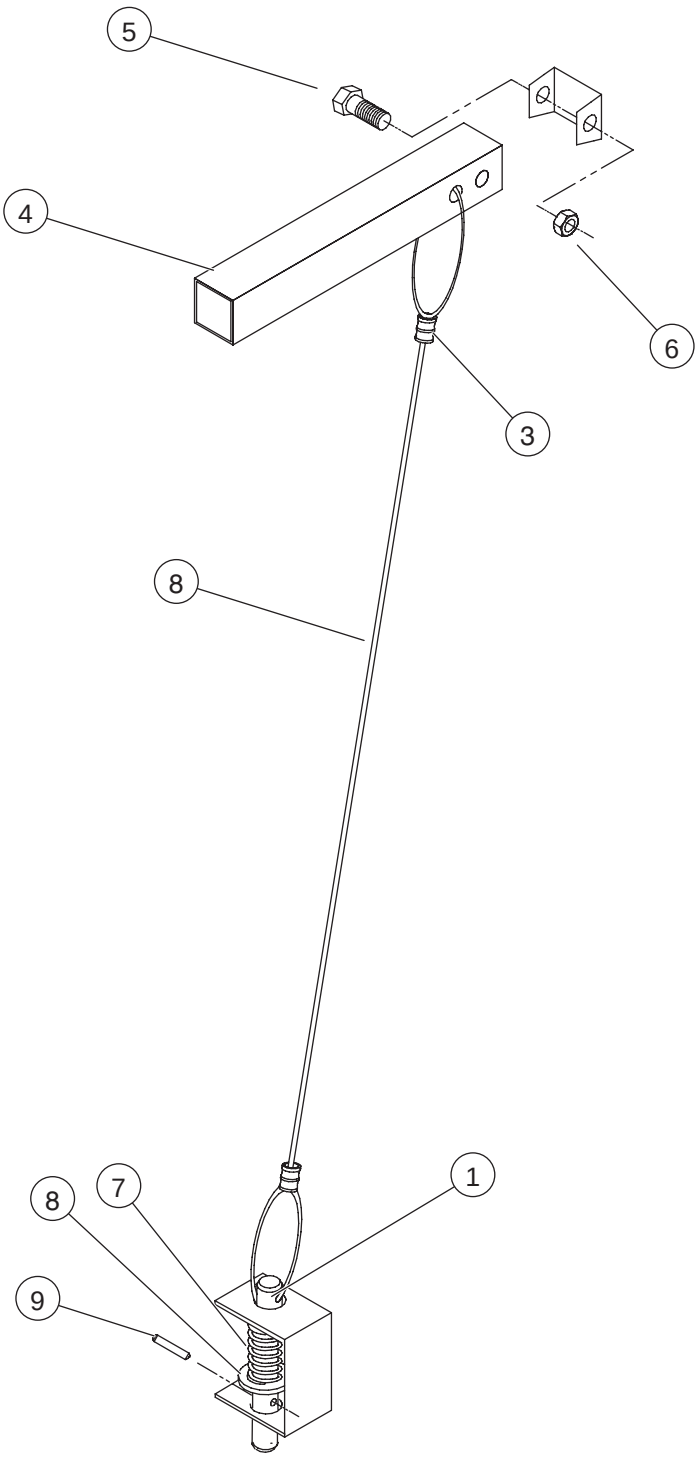


ILLUSTRATION No.
ART_2133

Roll-out Deck Lock Pin Assembly

Roll-out Deck Lock Pin Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	13737	1	Pin, Extension Lock
2	7184	3.7 FT	Cable, Coated and Rolled
3	8814	2	Sleeve, Aluminum Oval
4	20235	1	Handle
5	HDW8303	1	Screw, 5/16” - 18, 2” LG
6	HDW8304	1	Locknut, 5/16” - 18
7	7408	1	Spring, Deck Lock
8	HDW7031	1	Washer, Flat, ½” ID 7/8” OD
9	HDW8513	1	Pin, Spring, 1/8” Dia. ¾” LG

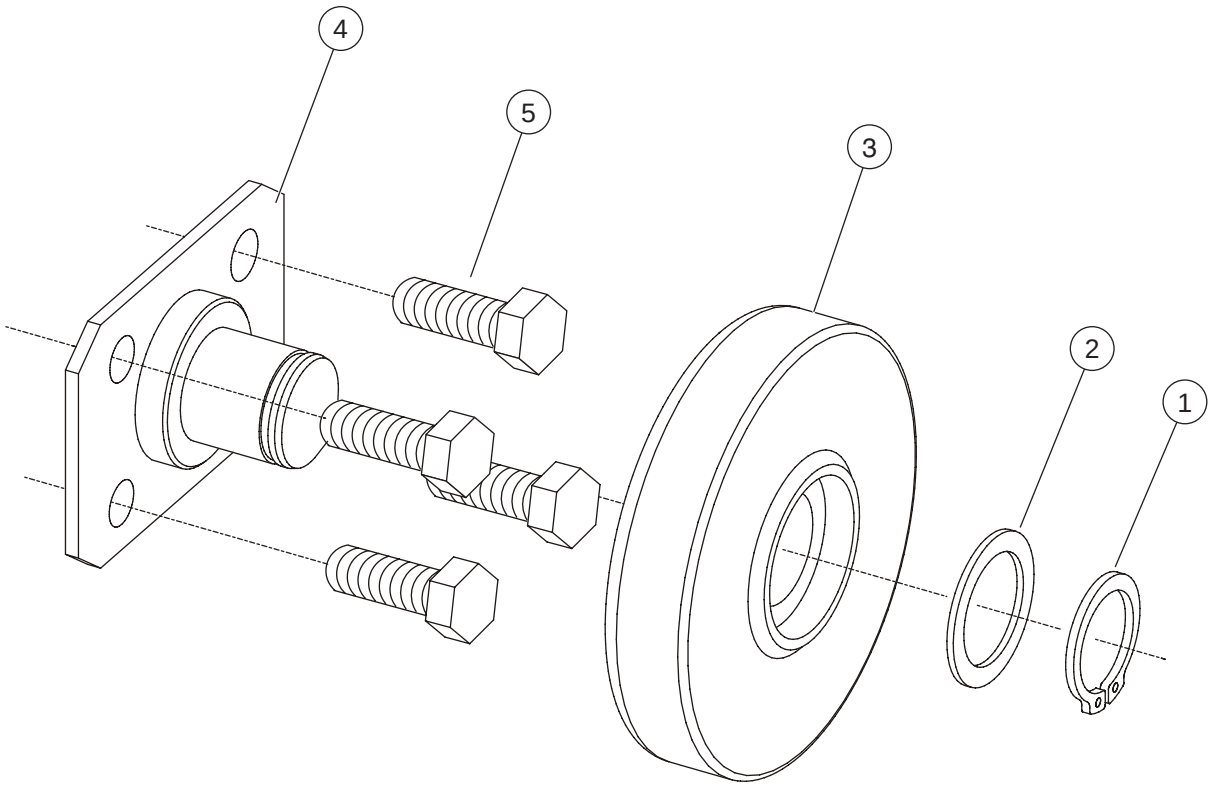


ILLUSTRATION No.
ART_2095

Reference: ART_687

Roll-out Deck Roller

Roll-out Deck Roller Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	5918	1	Retaining Ring, Heavy Duty 1”
2	HDW8370	1	Washer, Flat, 1.015 Id × 1.375 Od × .062 Thk
3	13230	1	Roller
4	14062	1	Roller Plate Weldment
5	HDW5724	4	Screw, 5/16” - 18, ¾” LG

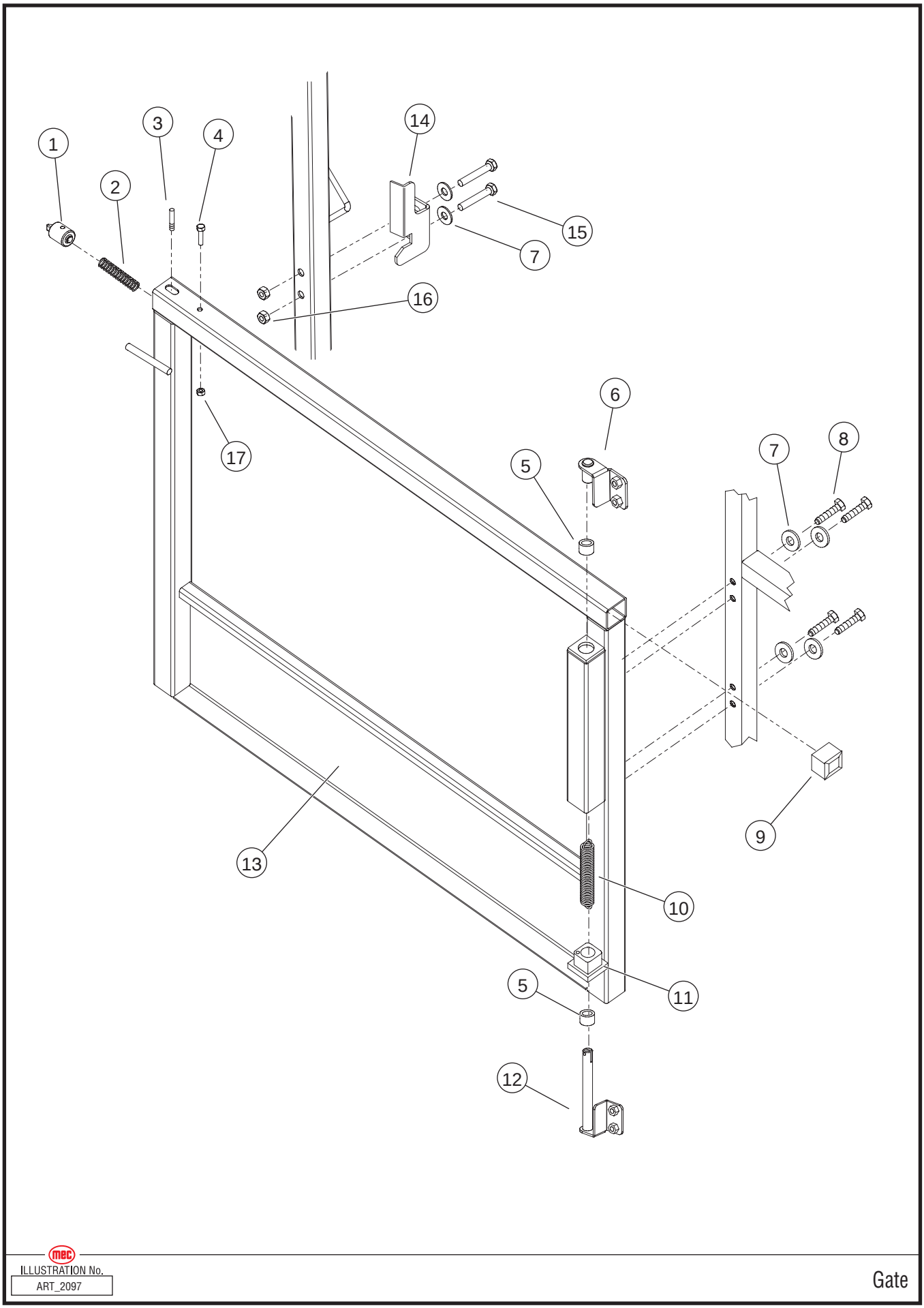


ILLUSTRATION No.
ART_2097

Gate

Entry Gate

ITEM	PART NO.	QTY	DESCRIPTION
1	40003	1	Latch Pin, Rear Gate
2	7055	1	Spring, Latch, .480 DIA. OD × 1.5” LG
3	40006	1	Rod, Latch Lever, Rear Gate
4	HDW6434	1	Screw, 3/8-16 × 2” LG
5	8187	2	Bearing, Nyliner, 5/8” ID × 5/8” LG
6	40014	1	Mounting Bracket, Upper
7	HDW8294	6	Washer, .328” ID × 1” OD × .100” THK
8	HDW8486	4	Screw, 5/16” - 18, 1 7/8” LG, GR 5
9	6823	1	Cap Plug, 1 ¼” Square
10	8300	1	Spring, Torsion, 1” DIA. OD × 4” LG
11	13272	1	Block, Pivot, Rear Gate
12	40015	1	Mounting Bracket, Lower
13	40017	1	Swing Gate Weldment
14	30814	1	Strike Plate
15	HDW8303	2	Screw, 5/6”-18, 2” LG, GR 5
16	HDW7120	2	Nut, 5/16”-18, GR 5
17	HDW8268	1	Nut, 3/8-16

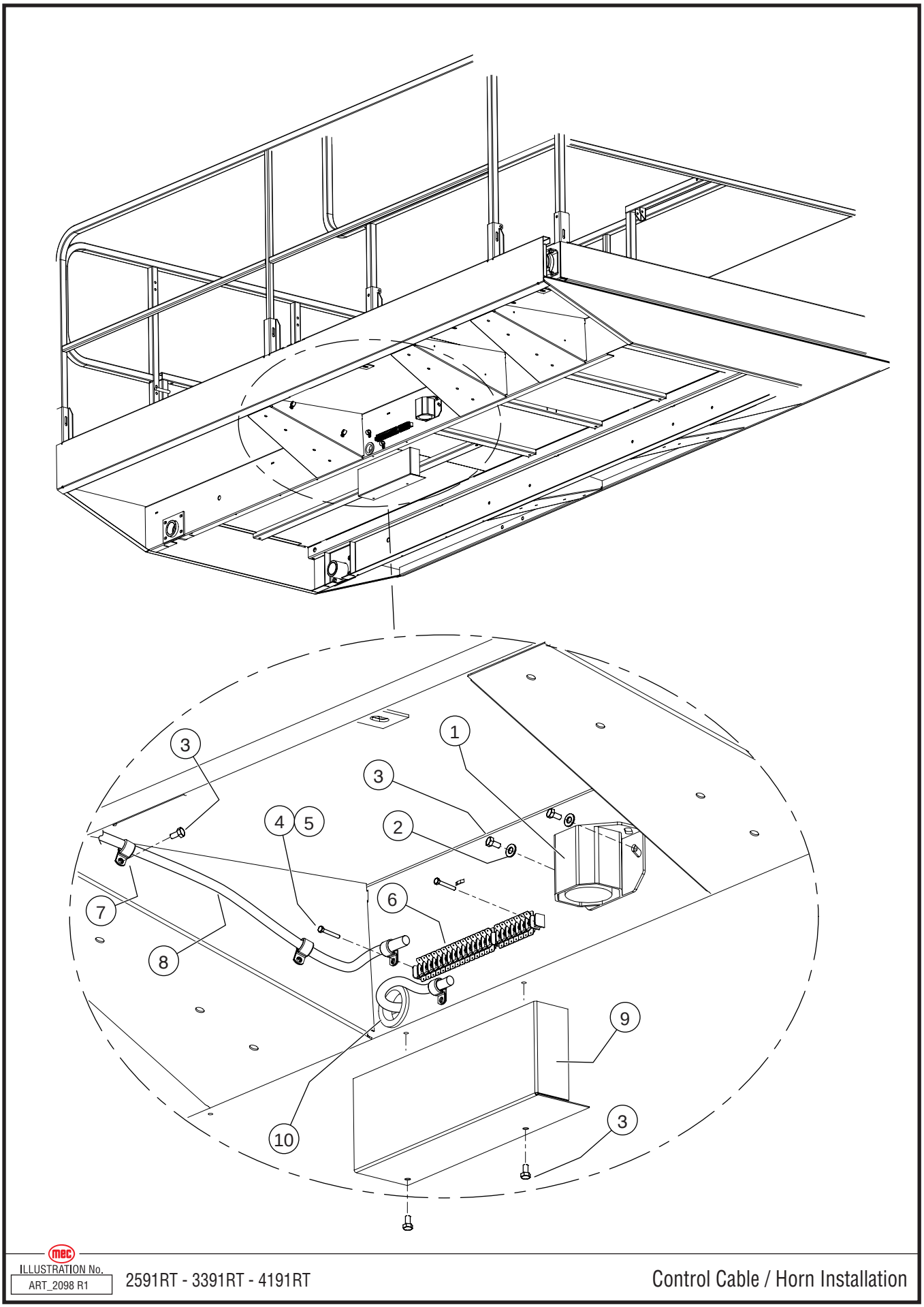


ILLUSTRATION No.
ART_2098 R1

2591RT - 3391RT - 4191RT

Control Cable / Horn Installation

Control Cable and Horn Installation

ITEM	PART NO.	QTY	DESCRIPTION
1	9716	1	Horn, 12-48Vdc
2	HDW5217	2	Washer, Flat, .343 ID × .688 OD × .063 THK
3	HDW6455	5	Screw, ¼”-20, ½” LG, GR 5
4	HDW5363	3	Screw, #6-32, 1” LG, GR 5
5	HDW5364	3	Nut, Keps, #6-32 , GR 5
6	6947	1	Terminal Strip
7	6964	4	Clamp, Cable, 1” DIA.
8	REF		Cable, Upper Control
9	16485	1	Cover, Terminal Strip
0	5863	1	Grommet, 1.5 ID × 1.75 OD × .187 THK

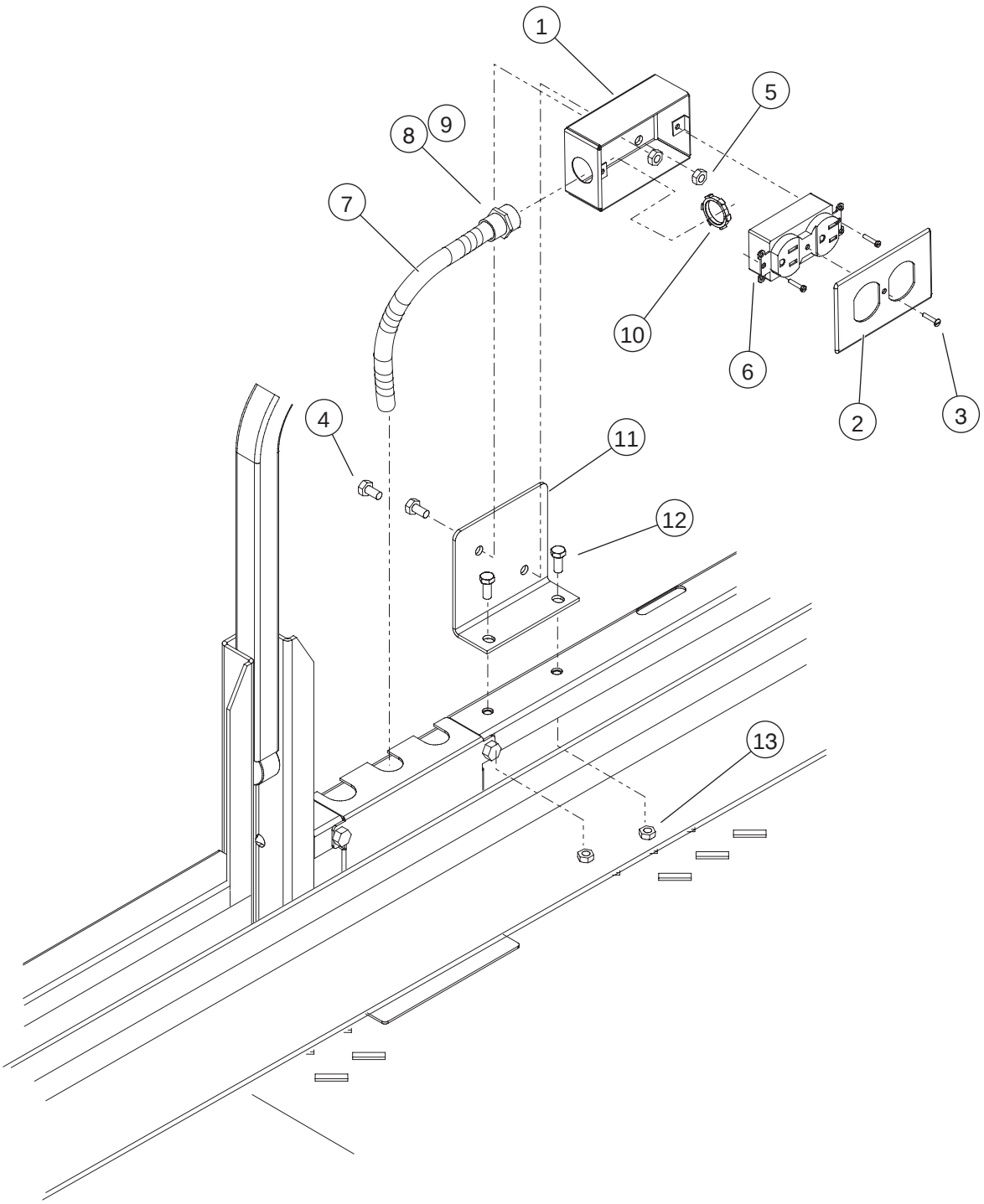


ILLUSTRATION No.
ART_2099

Power to Platform

Power to Platform and Airline to Platform

ITEM	PART NO.	QTY	DESCRIPTION
Power to Platform			
1	90827	1	Box, Receptacle
2	90828	1	Duplex Receptacle Cover
3	HDW5636	1	Screw #6 - 32 × 0.25"
4	HDW6455	2	Screw, ¼" - 20, ½" LG
5	HDW8267	2	Locknut ¼" - 20
6	5381	1	Receptacle, Duplex
7	8208	1	Conduit, 3/8" Flexible
8	8209	1	Ferrule, 3/8"
9	8479	1	Bushing, ¾" ID
10	8833	1	Connector, Outlet Box 3/8" Conduit
11	16221	1	Bracket
12	HDW5724	2	Screw, 5/16–18 × ¾"
13	HDW8304	2	Nut, 5/16–18
	HDW8501	2	Clip, Self Retaining (Not Shown)
	9441	*	Wire, 14 GA (Not Shown) *2591RT = 50 FT. *3391RT = 58 FT. *4191RT = 68 FT.
	HDW5217	2	Flat Washer 11/32" ID (Not Shown)
Airline to Platform (Option) (Not Shown)			
	5351		
	91399	*	Hose, 3/8" Airline *2591RT = 49 FT. *3391RT = 57 FT. *4191RT = 67 FT.
	8559	2	Clamp, Hose
	HDW91500	2	Fitting, ¼" Male, Male Hose Barb
	5882	2	Cable Clamp

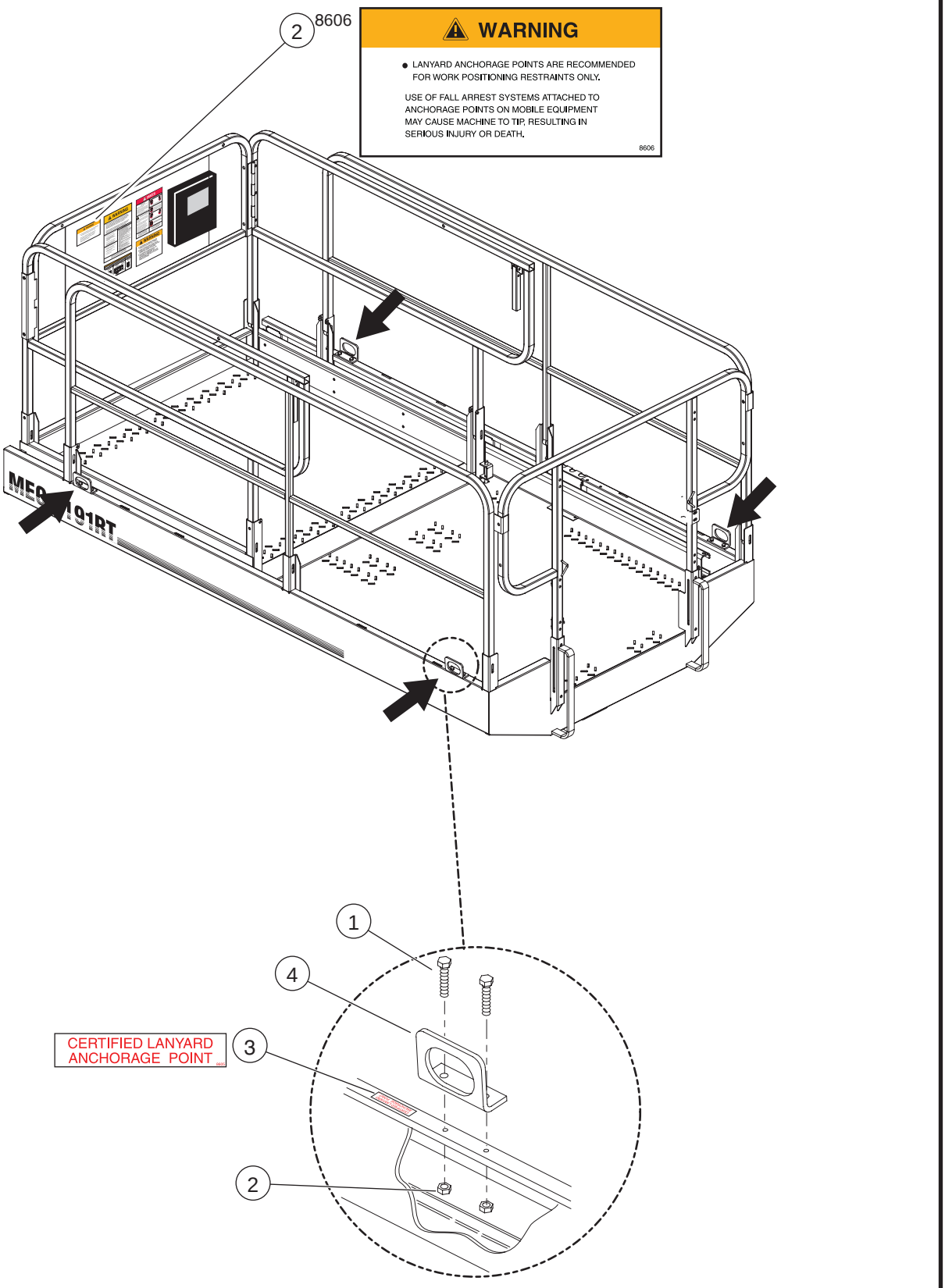


ILLUSTRATION No. ART_2775

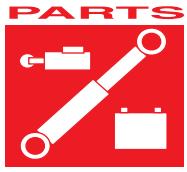
2591RT - 3391RT - 4191RT

Lanyard Anchorage Points

Lanyard Anchorage Points

ITEM	PART NO.	QTY	DESCRIPTION
	14583		Add-on Lanyard Attachment
1	HDW6433	8	Screw, 3/8” - 16, 1” LG, GR 5
2	HDW8268	8	NUT, 3/8” - 16, GR 5
3	8605	4	Decal, Lanyard Attach Point
4	3923	4	Bracket, Attach Point
5	8606	1	Decal, Warning, Pos Restraints

NOTES:



SECTION C

SCISSORS

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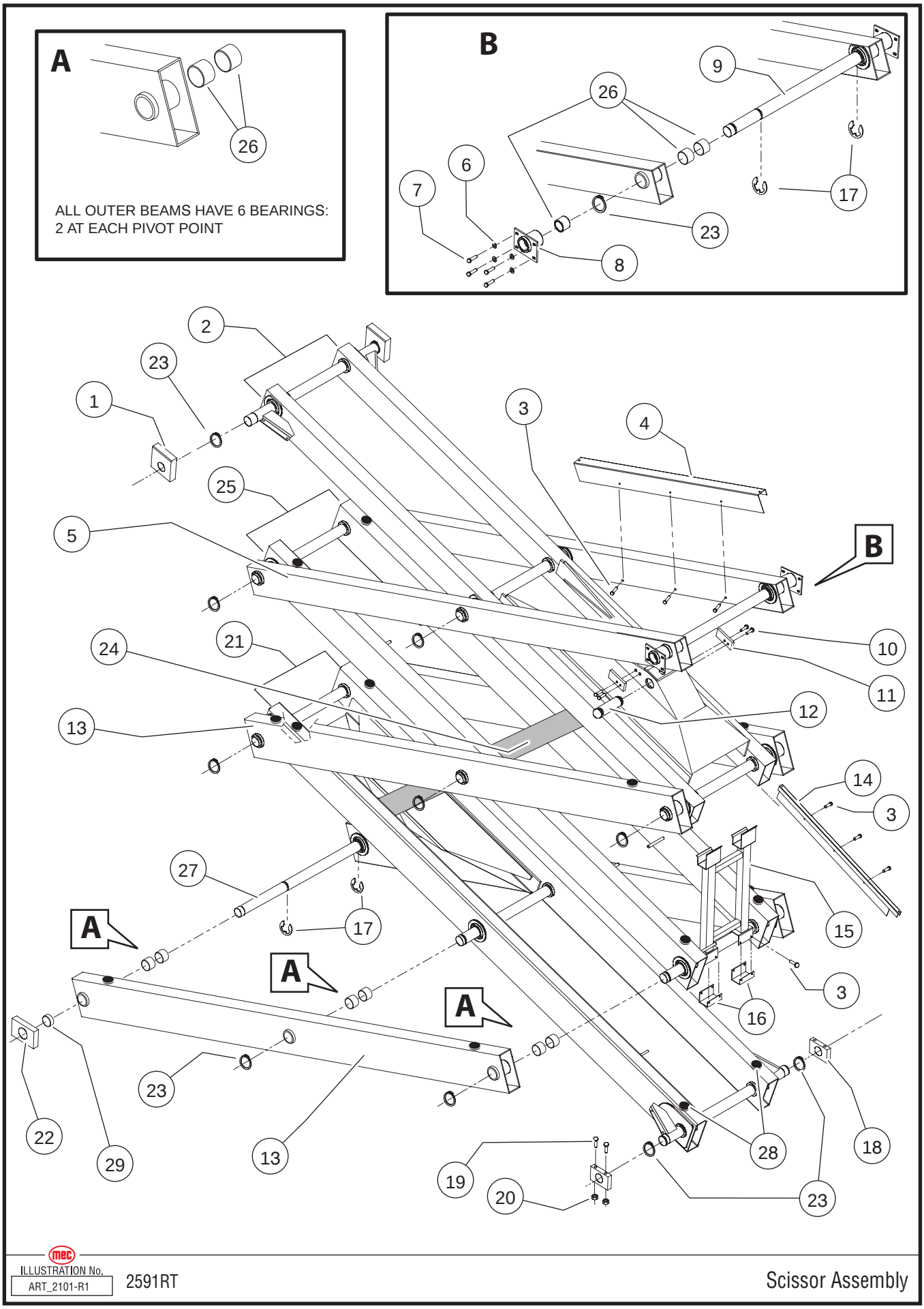
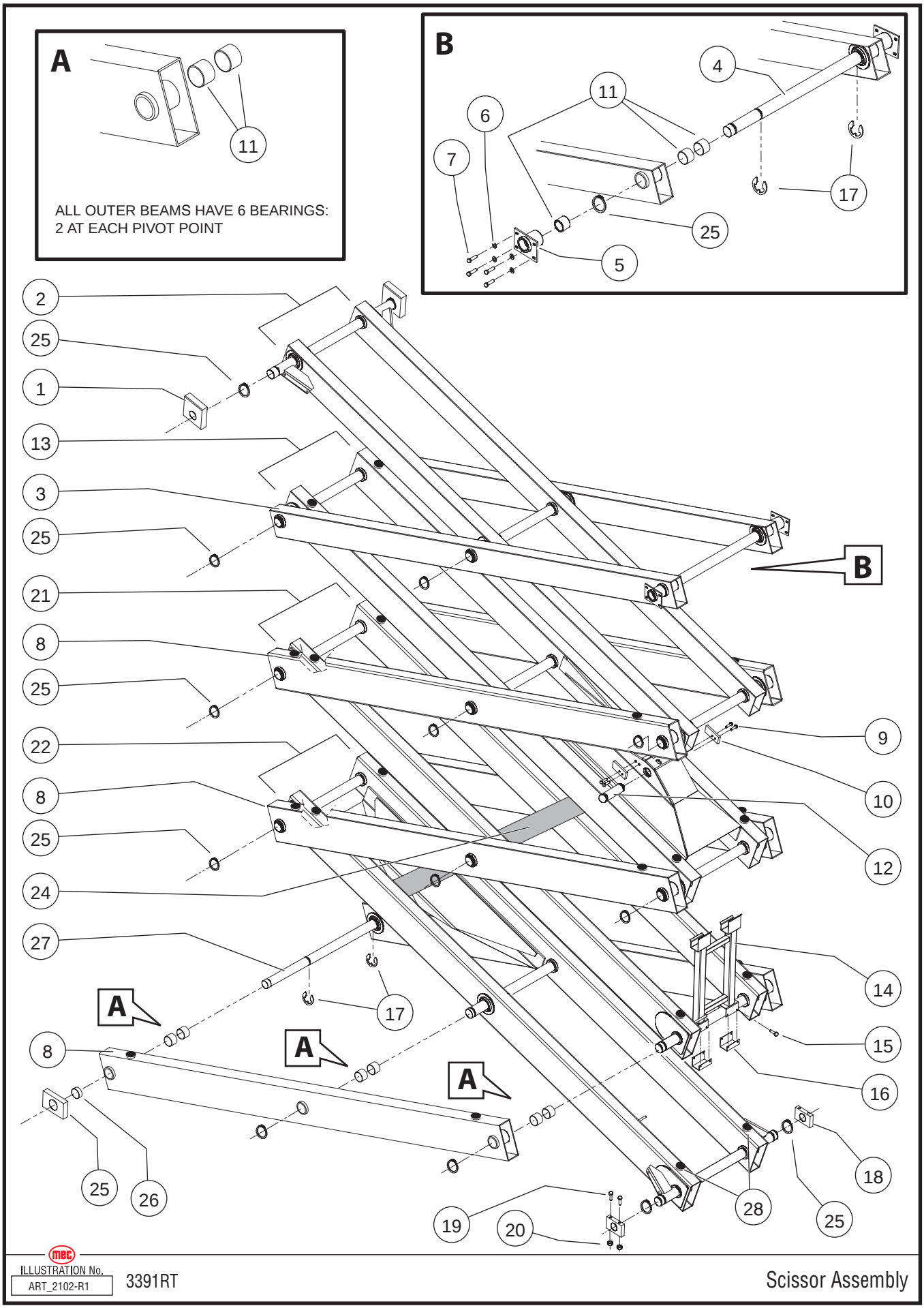


ILLUSTRATION No. ART_2101-R1 2591RT

Scissor Assembly

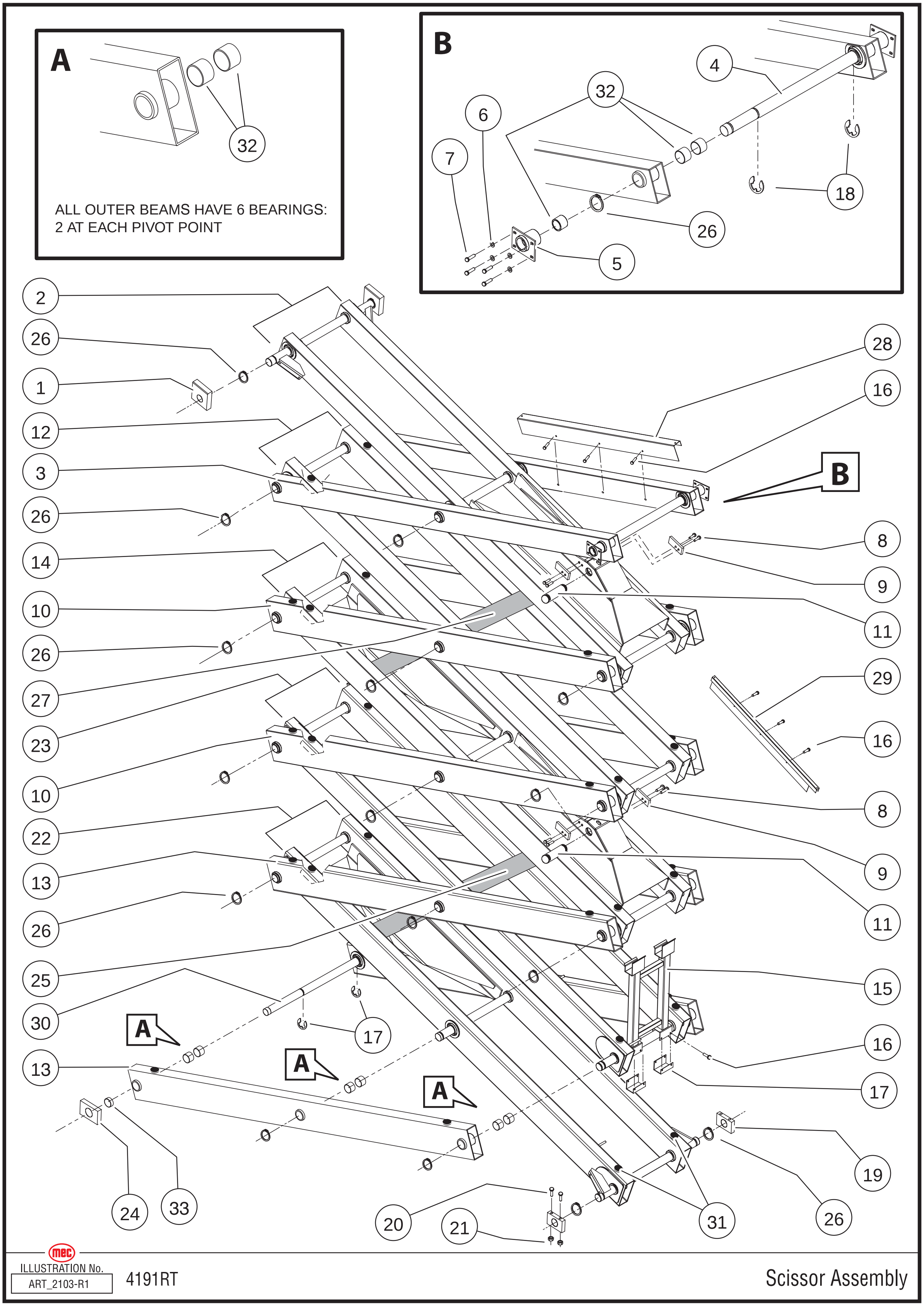
Scissor Assembly, 2591RT

ITEM	PART NO.	QTY	DESCRIPTION
1	20141	2	Block, Slide - Platform
2	16468	1	Beam, Single Cylinder Mount
3	HDW6455	14	Screw, 1/4" - 20,1/2" LG
4	20913	1	Guard, Control Cord, Short
5	20948	2	Beam Weldment, 3 X 6
6	HDW7783	8	Washer, Split, Lock, 3/8"
7	HDW8277	8	Screw, 3/8" - 16, 1 3/4" LG
8	20365	2	Scissors Mount Assembly
9	8340	1	Pin, Roller - Platform
10	HDW5724	8	Screw, 5/16"–18, 3/4" LG
11	20223	4	Plate, Cylinder Pin Lock
12	20224	2	Pin, Cylinder
13	20932	4	Beam, Outer, 3 X 8
14	20839	1	Guard, Control Cord
15	20778	1	Lock, Maintenance
16	21133	2	Bracket, Maintenance Lock
17	6688	4	Clip Ring, 2" Shaft
18	20429	2	Block, Fixed - Base
19	HDW8856	4	Screw, 1/2" -13, 5" LG
20	HDW6463	4	Nut, 1/2" - 13, Nylon
21	16460	1	Beam, Single Cylinder Mount
22	20142	2	Block, Slide - Base
23	6701	18	Ring, Retaining, 2" Shaft
24	91403	1	Cylinder, Lift
25	20937	1	Beam, Inner, Center
26	6669	38	Bearing
27	20413	1	Pin-slide, Base
28	25429	16	Spacer Block
29	6670	2	Bearing


A
11
ALL OUTER BEAMS HAVE 6 BEARINGS:
2 AT EACH PIVOT POINT
B
4
11
6
7
17
25
5
2
25
1
13
3
25
B
21
8
25
22
9
8
10
25
12
24
27
14
A
17
A
8
15
A
16
25
26
18
19
20
28
25
ILLUSTRATION No.
ART_2102-R1
3391RT
Scissor Assembly

Scissor Assembly, 3391RT

ITEM	PART NO.	QTY	DESCRIPTION
1	20141	2	Block, Slide - Platform
2	20957	1	Beam, Inner, 3 X 6
3	20939	2	Beam, Outer, 3 X 6
4	8340	1	Pin, Roller - Platform
5	20365	2	Scissors Mount Assembly
6	HDW7783	8	Washer, Split, Lock, 3/8"
7	HDW8277	8	Screw, 3/8"-16, 1 3/4" LG
8	20932	6	Beam, 3 X 8
9	HDW5724	8	Screw, 5/16"–18, 3/4" LG
10	20223	4	Plate, Cylinder Pin Lock
11	6669	50	Bearing
12	20224	2	Pin, Cylinder
13	16469	1	Beam, Inner, Cylinder Mount
14	20778	1	Lock, Maintenance
15	HDW6455	4	Screw, 1/4"- 20, 1/2" LG
16	21133	2	Bracket, Maintenance Lock
17	6688	4	Clip Ring, 2" Shaft
18	20429	2	Clip Ring, 2" Shaft
19	HDW8856	4	Block, Fixed - Base
20	HDW6463	4	Nut, 1/2" - 13, Nylon
21	20937	1	Beam, Inner, Center
22	16460	1	Beam, Single Cylinder Mount
23	20142	2	Cylinder, Lift
24	91403	1	Ring, Retaining, 2" Shaft
25	6701	24	Ring, Retaining, 2" Shaft
26	6670	2	Bearing
27	20413	1	Pin, Slide, Base
28	25429	24	Spacer Block


A
32
ALL OUTER BEAMS HAVE 6 BEARINGS:
2 AT EACH PIVOT POINT
B
4
32
6
7
18
26
5
2
26
1
12
3
26
14
10
26
27
23
10
22
13
26
25
30
13
A
A
A
24
33
20
21
31
26
19
28
16
B
8
9
11
29
16
8
9
11
15
16
17
17
ILLUSTRATION No.
ART_2103-R1
4191RT
Scissor Assembly

Scissor Assembly, 4191RT

ITEM	PART NO.	QTY	DESCRIPTION
1	20141	2	Block, Slide - Platform
2	20935	1	Beam, Single Cylinder Mount
3	20939	2	Beam, Outer, 3 X 6
4	8340	1	Pin, Roller - Platform
5	20365	2	Scissors Mount Assembly
6	HDW7783	8	Washer, Split, Lock, 3/8"
7	HDW8277	8	Screw, 3/8" - 16, 1 3/4" LG
8	HDW5724	16	Screw, 5/16"–18, 3/4" LG
9	20223	8	Plate, Cylinder Pin Lock
10	20938	4	Beam, Outer, 3 X 8
11	20224	4	Pin, Cylinder
12	16467	1	Beam, Inner, Center
13	20932	4	Beam Weldment
14	20933	1	Beam, Double Cylinder Mount
15	20778	1	Lock, Maintenance
16	HDW6455	14	Screw, 1/4" - 20, 1/2" LG
17	21133	2	Bracket, Maintenance Lock
18	6688	4	Clip Ring, 2" Shaft
19	20429	2	Block, Fixed - Base
20	HDW8856	4	Screw, 1/2" - 13, 5" LG
21	HDW6463	4	Nut, 1/2" - 13, Nylon
22	16460	1	Beam, ¼", Single Cylinder Mount
23	20937	1	Beam Weldment
24	20142	2	Block, Slide - Base
25	91404	1	Cylinder, Lift - Lower
26	6701	30	Ring, Retaining, 2" Shaft
27	91405	1	Cylinder, Lift - Upper
28	20913	1	Guard, Control Cord, Short
29	20839	1	Guard, Control Cord
30	20413	1	Pin, Slide, Base
31	25429	32	Spacer Block
32	6669	62	Bearing
33	6670	2	Bearing

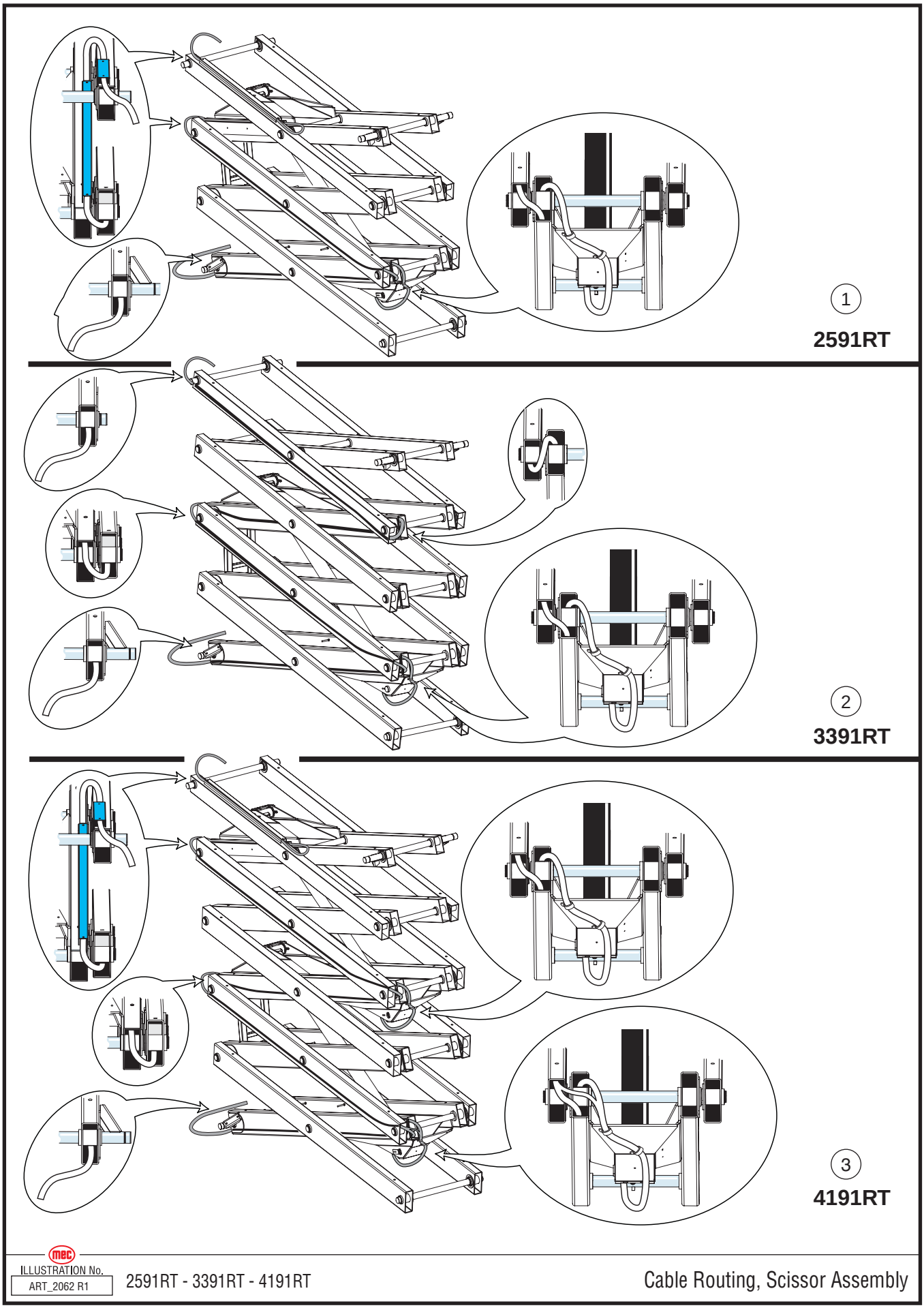


ILLUSTRATION No. ART_2062 R1

2591RT - 3391RT - 4191RT

Cable Routing, Scissor Assembly

Cable Routing, Scissor Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	91185		Control Cable, 2591RT
2	91321		Control Cable, 3391RT
3	91439		Control Cable, 4191Rt

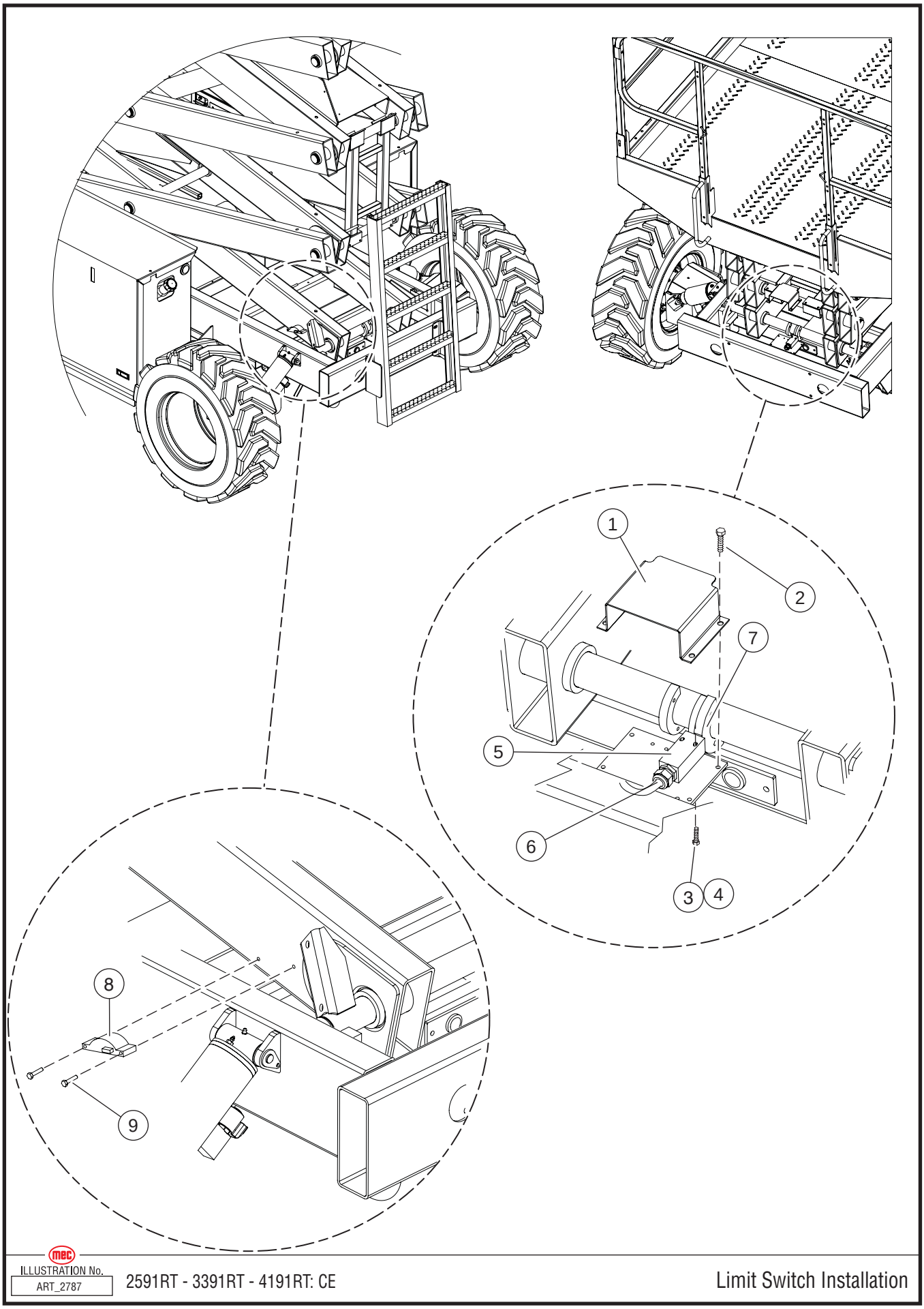


ILLUSTRATION No. ART_2787

2591RT - 3391RT - 4191RT: CE

Limit Switch Installation

Limit Switch Installation

ITEM	PART NO.	QTY	DESCRIPTION
1	20924	1	Cover, Limit Switch
2	HDW6455	4	Screw, 1/4"- 20, 1/2" LG
3	HDW8482	2	Screw, #8-32, 1 1/2" LG
4	HDW5251	2	Nut, #8-32
5	90996	1	Switch, Limit, 3-pole
6	7594	1	Connector, Cord
7	20838	1	Cam, Slow Speed
8	90844	1	Height Sensor
9	HDW6831	2	Screw, ¼”-20, 2” LG

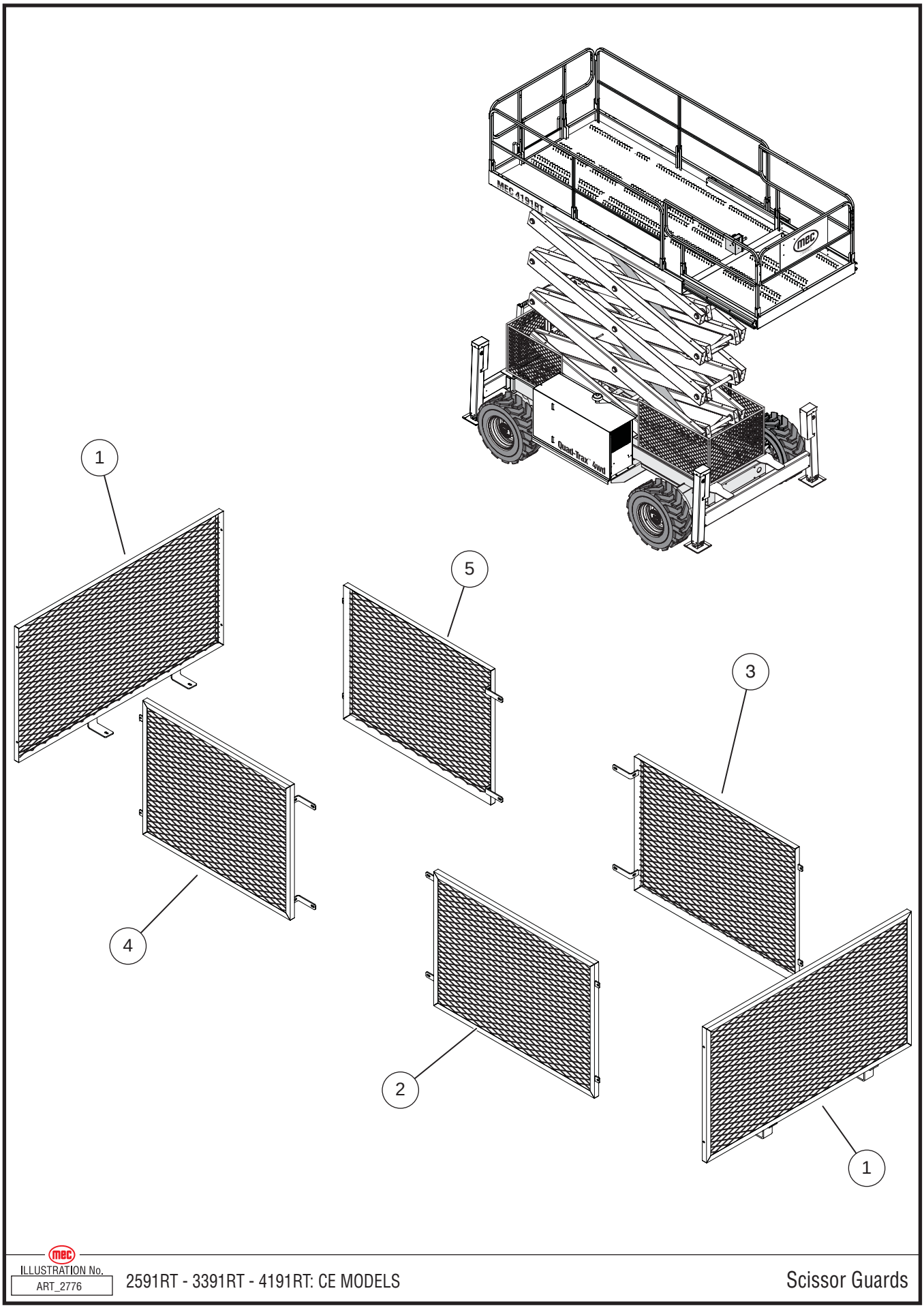


ILLUSTRATION No.
ART_2776

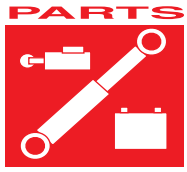
2591RT - 3391RT - 4191RT: CE MODELS

Scissor Guards

Scissor Guards

ITEM	PART NO.	QTY	DESCRIPTION
1	16816	2	Scissor Guard – Front Panel, Rear Panel
2	16817	1	Scissor Guard – Right Front Panel
3	16818	1	Scissor Guard – Left Front Panel
4	16819	1	Scissor Guard – Right Rear Panel
5	16820	1	Scissor Guard – Left Rear Panel

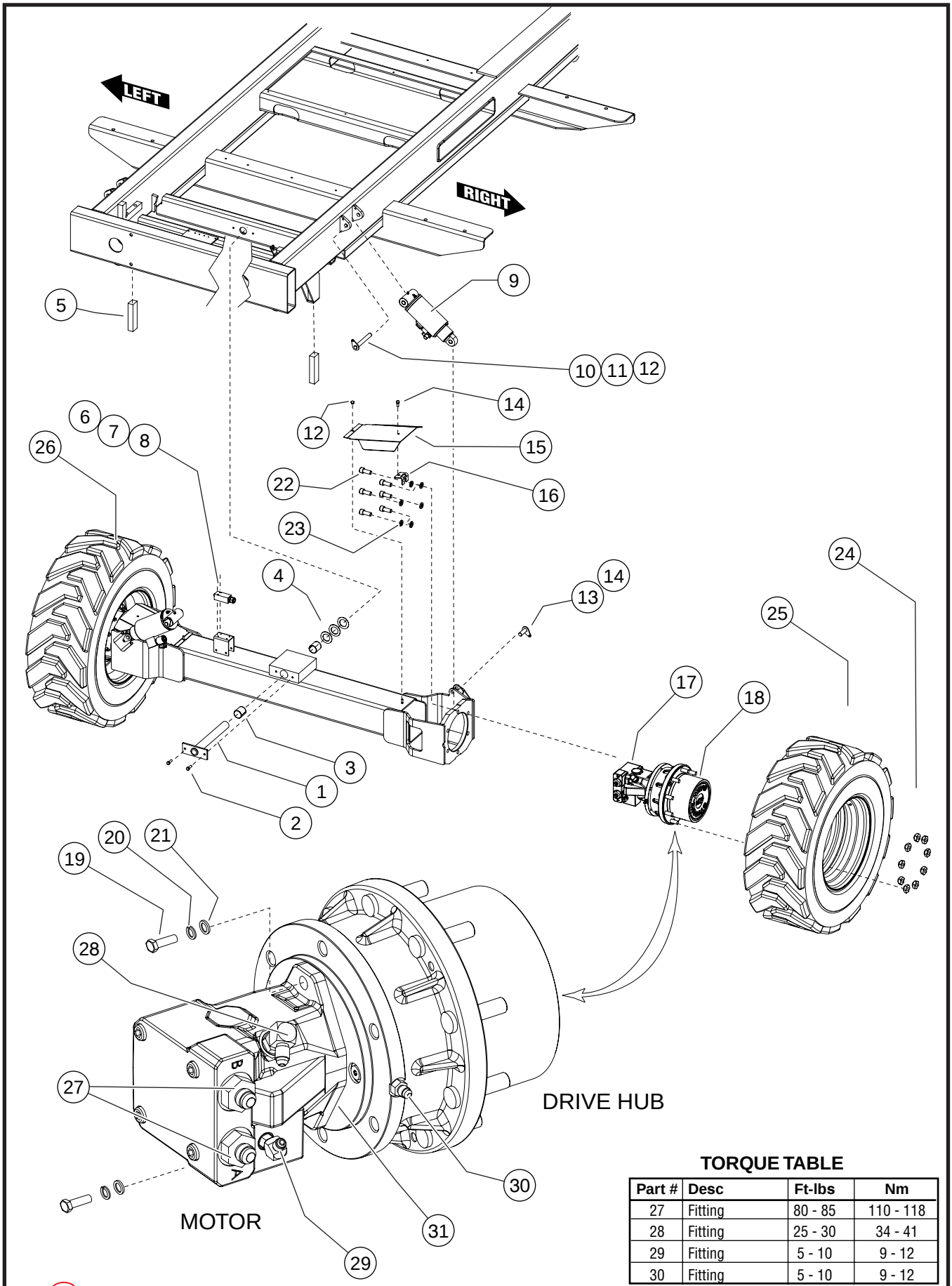
NOTES:



SECTION D

AXLES

CONTENTS PAGE



TORQUE TABLE

Part #	Desc	Ft-lbs	Nm
27	Fitting	80 - 85	110 - 118
28	Fitting	25 - 30	34 - 41
29	Fitting	5 - 10	9 - 12
30	Fitting	5 - 10	9 - 12

ILLUSTRATION No.
ART_2105 R1

2591RT - 3391RT - 4191RT

Rear Axle Assembly

Rear Axle Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	10423	1	Pivot Pin Weldment
2	HDW5204	2	Screw, 5/16-18 × 1"
3	6984	2	Bearing, 1 3/8 × 1 5/8" LG
4	HDW13339	3	Washer, Flat Nylon, 1 3/8 ID × 2¼ OD × .030 THK
5	10424	2	Axle Guide, Nylon
6	90531	1	Limit Switch, Axle Center Position
7	HDW8482	2	Screw, #8-32 × 1.5" LG
8	HDW5251	2	Nut, #8-32
9	91406	2	Axle Lock Cylinder
10	16478	2	Clevis Pin Weldment, 5/8" × 5¼"
11	HDW8273	2	Screw, ¼–20
12	HDW8267	6	Nut, ¼–20
13	16479	2	Clevis Pin Weldment, 5/8" × 2 1/8"
14	HDW5723	2	Screw, ¼–20 × ¾"
15	16482	2	Cover, Rear Axle
16	16484	2	Bracket, Axle Cover
17	91402	2	Motor, Hydraulic Drive
	91560		Seal Kit
18	91400	2	Drive Hub w/Brake
19	HDW8283	4	Screw, ½–13 × 1½" GR8
20	HDW5012	4	Lock Washer, ½"
21	HDW90784	4	Washer, Flat, .531 ID × 1.063 OD × .104 THK
22	HDW91407	12	Screw, 5/8–11 × 1½ Socket Head GR8
23	HDW5994	12	Washer, Lock, 5/8"
24	HDW91420	18	Nut, Lug, 5/8–18
25	91411	1	Wheel Tire Assy, RH, Air Filled
	91413	1	Wheel Tire Assy, RH, Foam Filled Option
	91432	1	Wheel Tire Assy, RH, Non-Marking Air Option
	91445	1	Wheel Tire Assy, RH, Non-Marking Foam Option
26	91412	1	Wheel Tire Assy, LH, Air Filled
	91414	1	Wheel Tire Assy, LH, Foam Filled Option
	91433	1	Wheel Tire Assy, LH, Non-Marking Air Option
	91446	1	Wheel Tire Assy, LH, Non-Marking Foam Option
27	HDW8984	2	Fitting, MB–MJ–12–8
28	HDW8081	1	Fitting, MB–MJ90–8–6
29	HDW91428	1	Fitting, MB–MJ45–4–4
30	HDW8881	1	Fitting, MB–MJ–4–4
31	91419	2	O-Ring (not shown)

TORQUE TABLE

Part #	Desc	Ft-lbs	Nm
27	Fitting	80 - 85	110 - 118
28	Fitting	25 - 30	34 - 41
29	Fitting	5 - 10	9 - 12

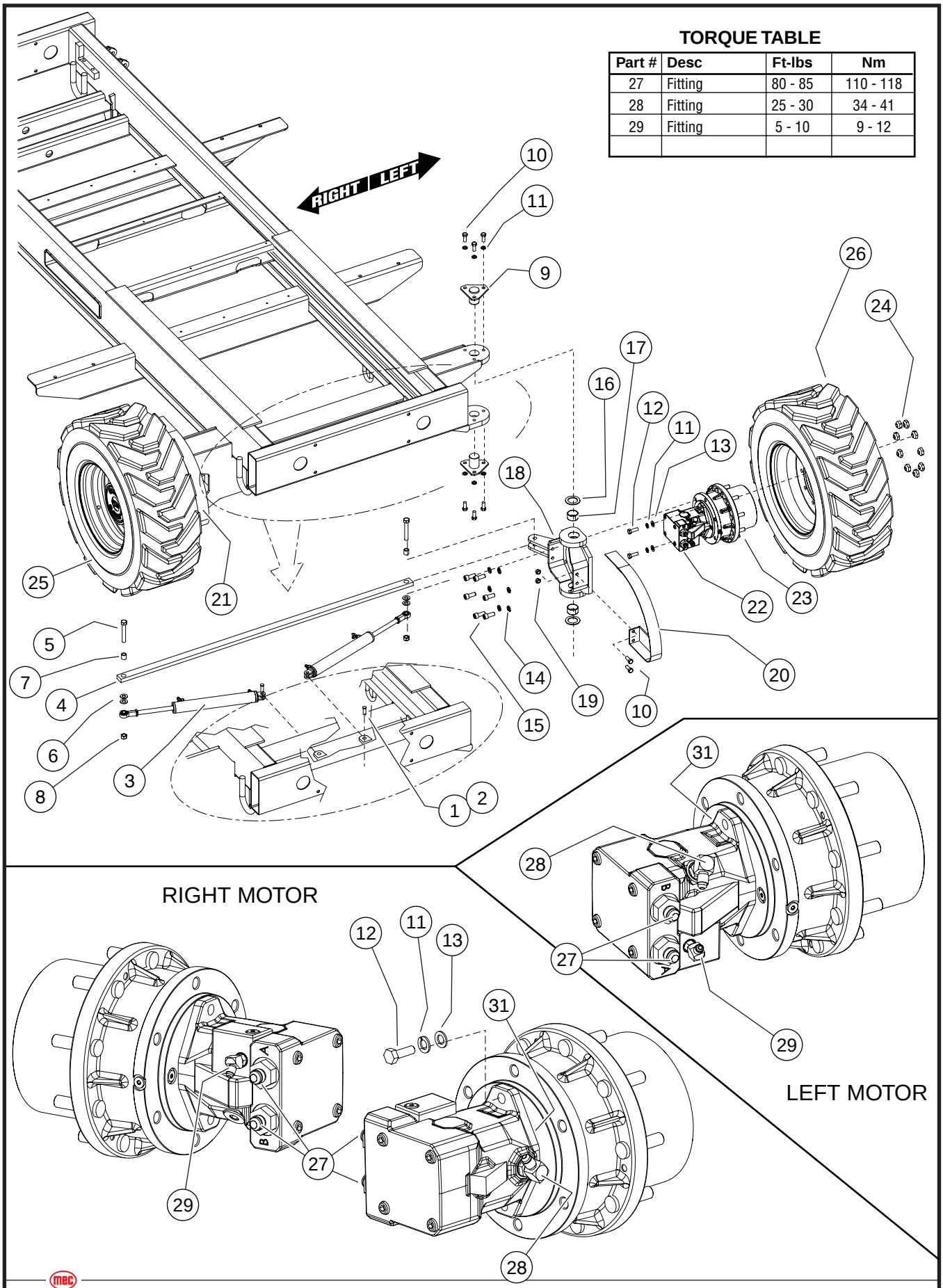


ILLUSTRATION No.
ART_2106 R1

2591RT - 3391RT - 4191RT

Front Axle Assembly

Front Axle Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	HDW5920	2	Pin, Cotter, .12 × 1"
2	HDW90770	2	Pin, Clevis, ½ × 1 3/8"
3	91019	1	Cylinder, Steering
	90990		Seal Kit, Steering Cylinder (not shown)
4	16407	1	Bar, Steering
5	HDW7326	2	Screw, 5/8–11 × 4" GR5
6	HDW9219	4	Washer, .656 ID × 1.312 OD × .093 THK
7	7292	2	Bearing, Bronze
8	HDW6633	2	Nut, 5/8–11 Lock
9	16408	4	King Pin Weldment
10	HDW6211	16	Screw, ½–13 × 1¼" GR5
11	HDW5012	16	Lock Washer, ½"
12	HDW8283	4	Screw, ½–13 × 1½" GR8
13	HDW90784	4	Washer, Flat, .531 ID × 1.063 OD × .104 THK
14	HDW5994	12	Washer, Lock, 5/8
15	HDW91047	12	Screw, 5/8–11 × 1½ Socket Head GR8
16	91408	4	Thrust Bearing, 1¾ ID × 2 5/8 OD × 1/8 THK
17	7896	4	Bearing, 1¾ ID × 1" LG
18	16425	2	Steering Knuckle Weldment
19	HDW8457	4	Lock Nut, ½–13
20	16471	1	Hose Guard Weldment, LH
21	16470	1	Hose Guard Weldment, RH
22	91402	2	Motor, Hydraulic Drive
	91560		Seal Kit
23	91401	2	Drive Hub
24	HDW91420	18	Nut, Lug, 5/8–18
25	91411	1	Wheel Tire Assy, RH, Air Filled
	91413	1	Wheel Tire Assy, RH, Foam Filled Option
	91432	1	Wheel Tire Assy, RH, Non-Marking Air Option
	91445	1	Wheel Tire Assy, RH, Non-Marking Foam Option
26	91412	1	Wheel Tire Assy, LH, Air Filled
	91414	1	Wheel Tire Assy, LH, Foam Filled Option
	91433	1	Wheel Tire Assy, LH, Non-Marking Air Option
	91446	1	Wheel Tire Assy, LH, Non-Marking Foam Option
27	HDW8984	2	Fitting, MB–MJ–12–8
28	HDW8081	1	Fitting, MB–MJ90–8–6
29	HDW91428	1	Fitting, MB–MJ45–4–4
30	91419	2	O-Ring (not shown)

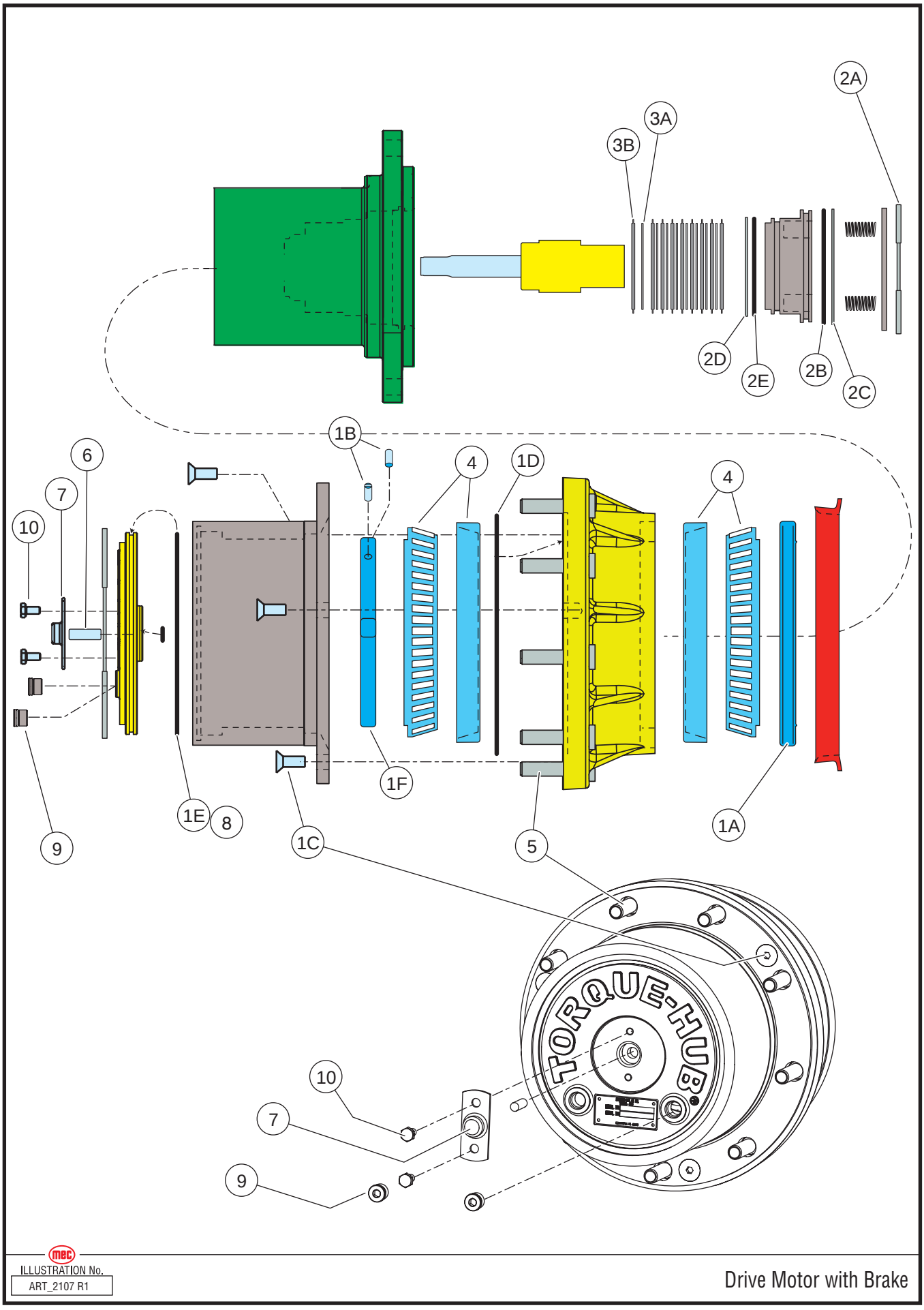


ILLUSTRATION No.
ART_2107 R1

Drive Motor with Brake

Drive Hub with Brake, Rear

ITEM	PART NO.	QTY	DESCRIPTION
	91400		Drive Hub, Rear
1	**91562**		**Seal Kit**
1A	INCL	1	Seal, Lip
1B	INCL	2	Screw, Set-Socket
1C	INCL	3	Bolt, Flat Head - Hex Socket
1D	INCL	1	O–ring
1E	INCL	1	O–ring, End Cover (available separate from kit)
1F	INCL	1	Nut, Bearing
2	**91563**		**Brake Seal Kit**
2A	INCL	1	Retainer, Ring - Internal
2B	INCL	1	O-ring
2C	INCL	1	O-ring, Back-up
2D	INCL	1	O-ring, Back-up
2E	INCL	1	O-ring
3	**91564**		**Brake Lining Kit (Includes Seal Kit 91563)**
3A	INCL	8	Reaction Disc, Brake Rotor
3B	INCL	9	Friction Disc, Brake, Stator
4	91565	2	Bearing Assembly
5	91566	9	Wheel Stud
6	91567	1	Disengage Rod
7	91568	1	Disengage Cap
8	91569	1	End Cover O-ring
9	91571	2	End Cover plug
10	HDW5633	2	Screw ¼–20 × ½" LG

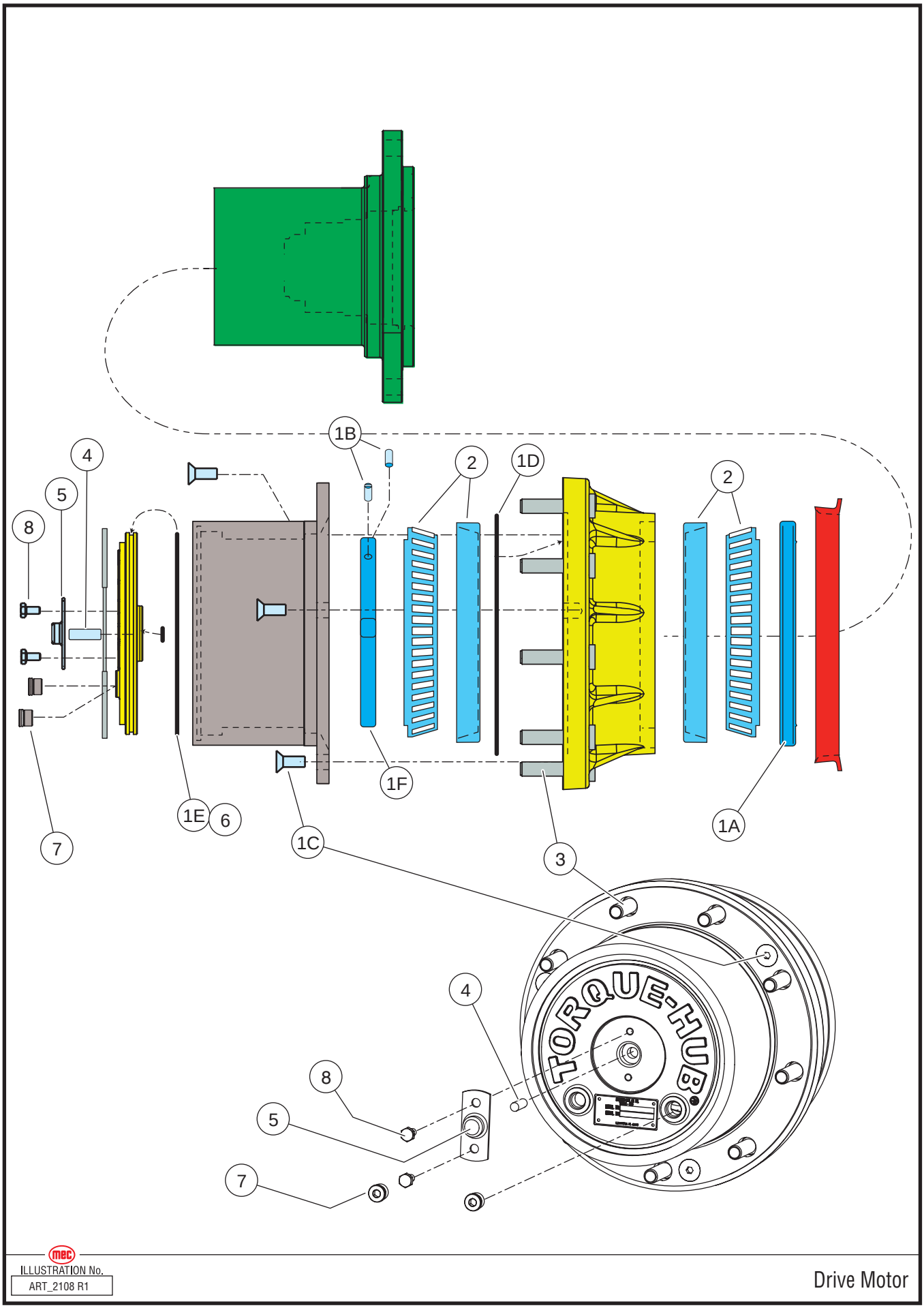


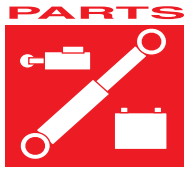
ILLUSTRATION No.
ART_2108 R1

Drive Motor

Drive Hub, Front

ITEM	PART NO.	QTY	DESCRIPTION
	91400		Drive Hub, Rear
1	**91562**		**Seal Kit**
1A	INCL	1	Seal, Lip
1B	INCL	2	Screw, Set-Socket
1C	INCL	3	Bolt, Flat Head - Hex Socket
1D	INCL	1	O–ring
1E	INCL	1	O–ring, End Cover (available separate from kit)
1F	INCL	1	Nut, Bearing
2	91565	2	Bearing Assembly
3	91566	9	Wheel Stud
4	91567	1	Disengage Rod
5	91568	1	Disengage Cap
6	91569	1	End Cover O-ring
7	91571	2	End Cover plug
8	HDW5633	2	Screw ¼–20 × ½" LG

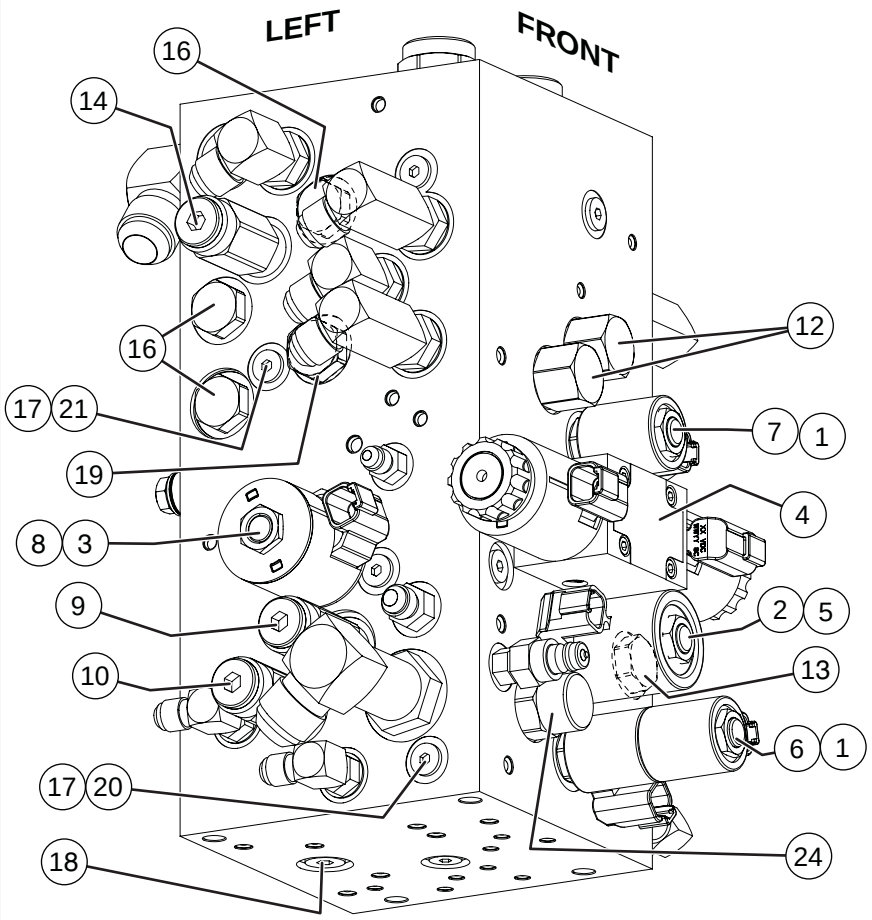
NOTES:



SECTION E

HYDRAULICS

CONTENTS



TORQUE TABLE

Part #	Desc	Ft-lbs	Nm
1	Coil, SV08	4-5	4.5-6.8
2	Coil, SV10	5-7	6.8-9.5
3	E-Coil, SV10	7-10	9.5-13.6
4	Valve, SVD03	6-8	8.5-10.5
5	Valve, SV10	25-27	34.0-36.7
6	Valve, SV08	18-20	24.5-27.2
7	Valve, SV08	18-20	24.5-27.2
8	Valve, SP10	25-27	34.0-36.7
9	Valve, RV08	18-20	24.5-27.2
10	Valve, RV08	18-20	24.5-27.2
11	Valve, PD12	33-37	44.9-50.3
12	Valve, EP10	25-27	34.0-36.7
13	Valve, LS08	18-20	24.5-27.2
14	Valve, RV08	18-20	24.5-27.2
15	Valve, Counterbalance	18-20	24.5-27.2
16	Valve, CV08	12-14	16.3-19.0
17	Plug	10-20	13.5-27.2
18	Plug	10-20	13.5-27.2
19	Flow Div, FD10	25-27	34.0-36.7
20	Orifice	—	—
21	Orifice	—	—
22	Orifice	—	—
23	Orifice	—	—
24	Comp, EC10	25-27	34.0-36.7
25	Valve, SV07	18-20	24.5-27.2
26	Valve, CV12	33-37	44.9-50.3

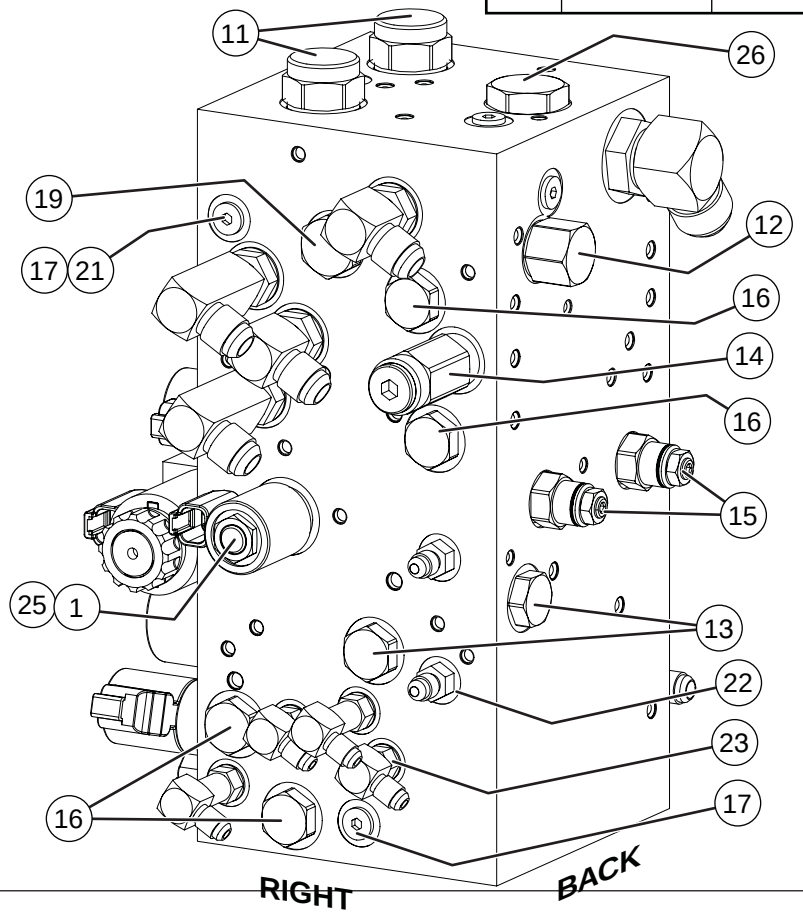


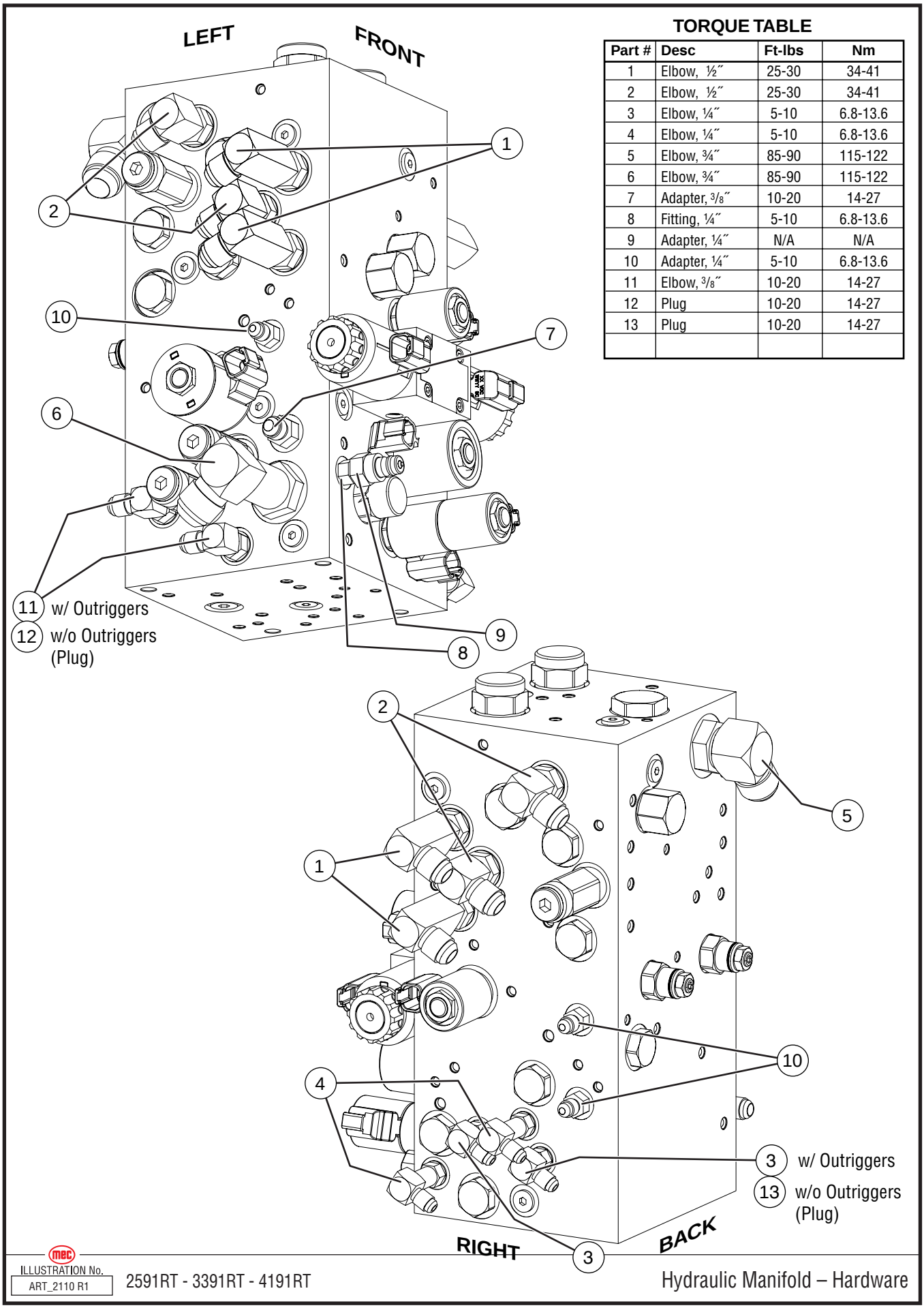
ILLUSTRATION No.
ART_2109 R1

2591RT - 3391RT - 4191RT

Hydraulic Manifold

Manifold Assembly

ITEM	PART NO.	QTY	DESCRIPTION
	91410		**Manifold Assembly**
1	91141	4	Coil, Series 8, 12V
2	91142	1	Coil, Series 10, 12V
3	91143	1	Coil, Series 10 E-coil, 12V
4	91144	1	Valve, Drive, 4 way 3 Position
5	91145	1	Valve, Lift Spool, 3 Way 2 Position
6	91146	1	Valve, Steer, 4 Way 3 Position
7	91147	1	Valve, Torque, Spool, 4 Way 2 Position
8	91148	1	Valve, Proportional, 12 V
9	91149	1	Valve, Relief, Lift
10	91150	1	Valve, Relief, Steer
11	91151	2	Valve, Piloted Spool 4 Way 3 Position
12	91152	3	Valve, Piloted Poppet
13	91153	3	Valve, Load Shuttle Check
14	91476	2	Valve, Relief, Drive
15	91350	2	Valve, Counterbalance
16	91477	7	Valve, Check
17	HDW7314	12	Port Plug M ¼", O-Ring, RBG-4
18	7484	2	Port Plug M 0.38" O-Ring, RBG-6
19	91351	2	Flow Divider / Combiner
20	91355	1	Orifice Plug, Steer
21	91356	2	Orifice Plug, Flow Divider Bleed
22	91474	1	Orifice Plug, Brake
23	91475	1	Orifice Plug, Compensator
24	91352	1	Pressure Compensator
25	91472	1	Valve, Speed Spool 3 Way 2 Position
26	91473	1	Check Valve, Tank Return



TORQUE TABLE

Part #	Desc	Ft-lbs	Nm
1	Elbow, ½″	25-30	34-41
2	Elbow, ½″	25-30	34-41
3	Elbow, ¼″	5-10	6.8-13.6
4	Elbow, ¼″	5-10	6.8-13.6
5	Elbow, ¾″	85-90	115-122
6	Elbow, ¾″	85-90	115-122
7	Adapter, 3/8″	10-20	14-27
8	Fitting, ¼″	5-10	6.8-13.6
9	Adapter, ¼″	N/A	N/A
10	Adapter, ¼″	5-10	6.8-13.6
11	Elbow, 3/8″	10-20	14-27
12	Plug	10-20	14-27
13	Plug	10-20	14-27

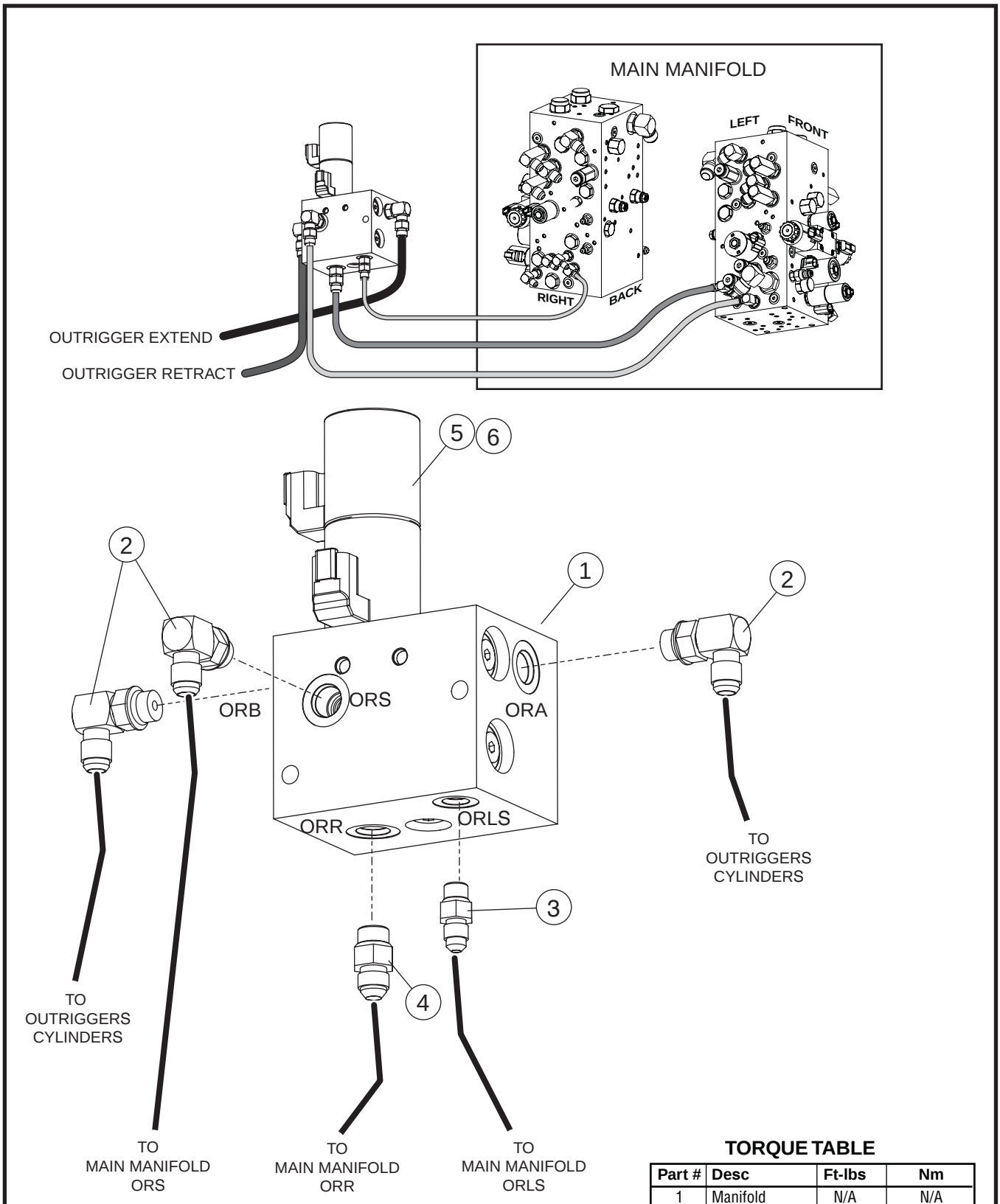
ILLUSTRATION No. ART_2110 R1

2591RT - 3391RT - 4191RT

Hydraulic Manifold – Hardware

Manifold Assembly – Hardware

ITEM	PART NO.	QTY	DESCRIPTION
	91410		**Manifold Assembly**
1	HDW91248	4	Elbow, 90°, Male, ½", O-Ring, Male, ½", MB-MJ90LL-8-8
2	HDW90764	4	Elbow, 90°, Male, ½", O-Ring, Male, ½", MB-MJ90-8-8
3	HDW8877	2	ELBOW, 90°, MALE ¼" O-RING, MALE ¼", MB-MJ90-4-4
4	HDW91081	1	ELBOW, 90°, MALE ¼" O-RING, MALE ¼", MB-MJ90LL-4-4
5	HDW91244	1	ELBOW, 90°, MALE ¾" O-RING, MALE ¾", MB-MJ90-12-12
6	HDW91245	1	ELBOW, 90°, M ¾" O-RING, M ¾",MB-MJ90LL-12-12
7	HDW7438	1	Adapter, Male 3/8 O-ring, Male 3/8 JIC, MB-MJ-6-6
8	HDW7971	1	Fitting, Male Disconnect, ¼" NPT
9	HDW91243	1	adapter Male ¼" orng M ¼" NTP, MP-MB-4-4
10	HDW8881	3	ADAPTER, MALE ¼", O-RING, MALE ¼" 37° MB-MJ-4-4
11	HDW7601	2	Elbow, 90°, Male 3/8 O-ring, Male 3/8 JIC, MB-MJ90-6-6
12	7484	2	Plug (without outrigger option)
13	HDW7314	1	Plug (without outrigger option)



TORQUE TABLE

Part #	Desc	Ft-lbs	Nm
1	Manifold	N/A	N/A
2	Elbow, 3/8″	10-20	14-27
3	Adapter, 1/4″	5-10	6.8-14
4	Adapter, 3/8″	10-20	14-27
5	Coil, SV10	5-7	6.8-9.5
6	Valve, SV10	25-27	34.0-36.7

ILLUSTRATION No.
ART_2111 R1

2591RT - 3391RT - 4191RT

Outrigger Manifold

Manifold – Outrigger Option

ITEM	PART NO.	QTY	DESCRIPTION
1	**91268**	**1**	**Outrigger Manifold Assembly**
2	HDW7601	3	Elbow 90° Male 3/8" O-ring - Male 3/8" JIC
3	HDW8881	1	Adapter Male ¼" O-ring - Male ¼" Jic
4	HDW7438	1	Adapter Male 3/8" O-ring - Male 3/8" JIC
5	91142	2	Coil
6	91008	1	Valve Spool 4-way 3-position

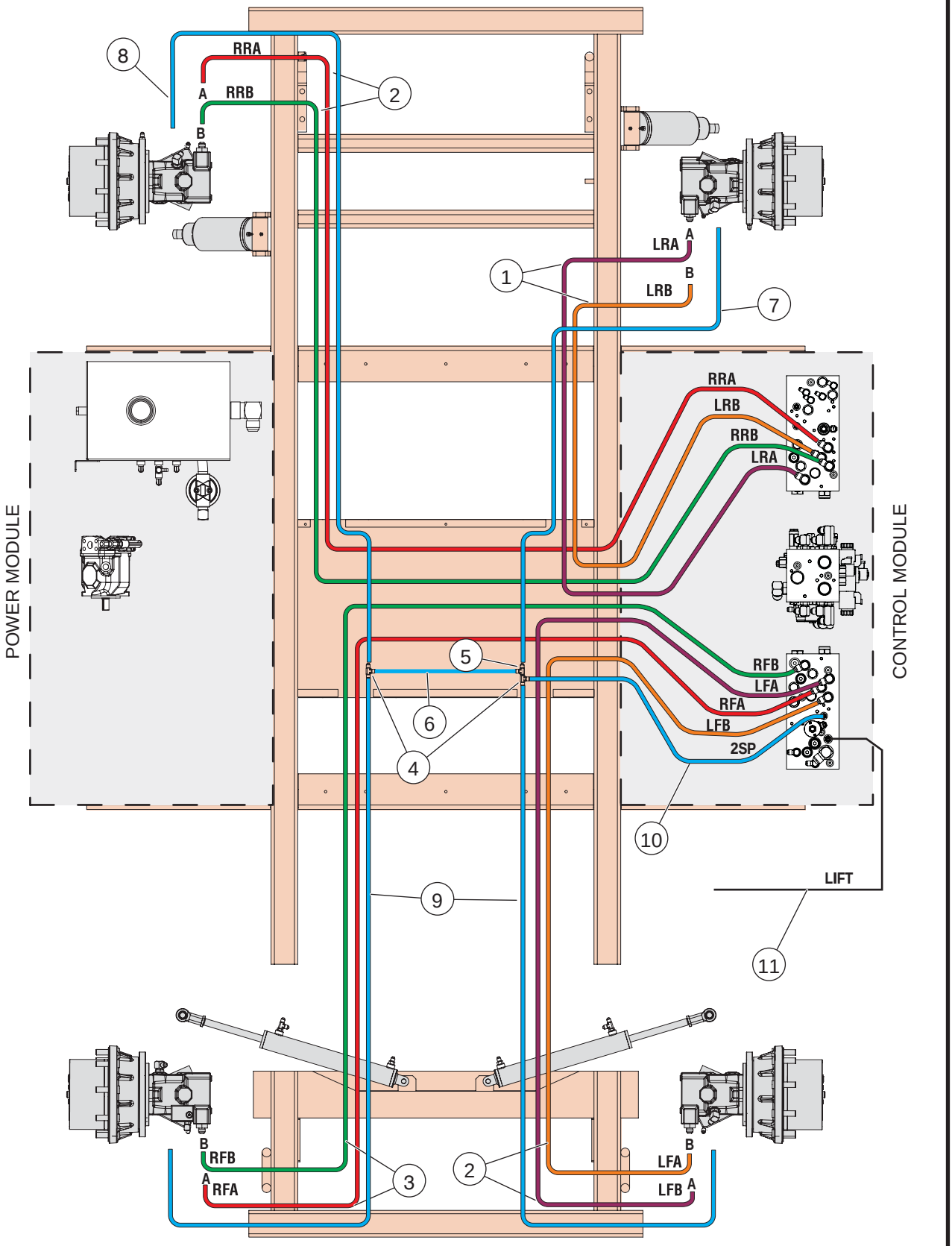


ILLUSTRATION No. ART_2112 R1

2591RT - 3391RT - 4191RT

Hydraulic Hose Routing – Drive – Lift

Hydraulic Hoses – Drive – Lift

ITEM	PART NO.	QTY	DESCRIPTION
Drive			
1	91425	2	Hose Assy, ½"×74", 8M3K-8FJX-8FJX45-74"
2	91426	4	Hose Assy, ½"×116", 8M3K-8FJX-8FJX45-116"
3	91427	2	Hose Assy, ½"×148", 8M3K-8FJX-8FJX45-148"
4	HDW9557	4	TEE, Male ¼ JIC m ¼ JIC
5	HDW90332	1	TEE, Female ¼ JIC × Male ¼ JIC
6	90275	1	Hose Assy, ¼" × 17", 4G1-4FJX-4FJX-17
7	9393	1	Hose Assy, ¼" × 48", 4G1-4FJX-4FJX-48
8	9847	2	Hose Assy, ¼" × 76", 4G1-4FJX-4FJX
9	8884	3	Hose Assy, ¼" × 106", 4G1-4FJX-4FJX-106
10	91256	3	Hose Assy, ¼"×42", 4G1-4FJX-4FJX90S
Lift			
11	REF	–	See appropriate Lift Cylinder art for Hose number

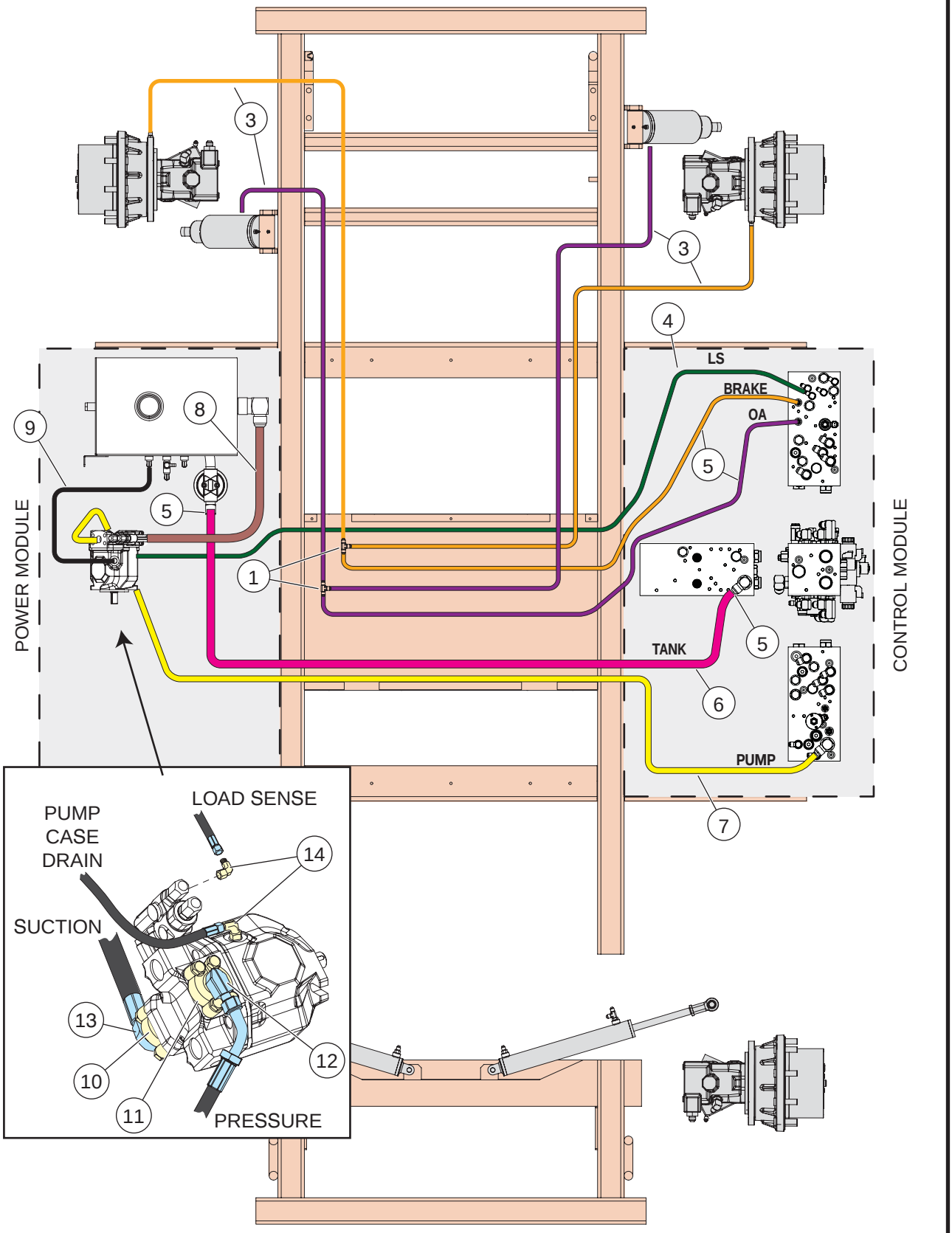


ILLUSTRATION No. ART_2113 R1

2591RT - 3391RT - 4191RT Hydraulic Hose Routing – Brakes – Oscillating Axle – Pump and Tank Return

Hydraulic Hoses – Brake and Oscillating Axle – Pump and Tank Return

ITEM	PART NO.	QTY	DESCRIPTION
Brake and Oscillating Axle			
1	HDW9557	4	TEE, M ¼ JIC m ¼ JIC
2	91256	3	Hose Assy, ¼"×42", 4G1-4FJX-4FJX90S
3	9227	4	Hose Assy, ¼"×83", 4G1-4FJX-4FJX90S
Pump and Tank Return			
4	9847	2	Hose Assy, ¼" × 76", 4G1-4FJX-4FJX
5	HDW91246	2	Fitting Female ¾" JIC Male ¾" Hose Barb
6	91247	8 FT	Hose Assy, ¾", 12LOLA bulk
7	91423	1	Hose Assy, ¾" × 82", 12M3K-12FJX-12FJX45
8	91265	1	Hose Assy, 1" × 22", 16GMV-16FJX-16FJX-22"
9	90276	1	Hose Assy, ¼"×24", 4G1-4FJX-6FJX-24
10	91161	1	Flange Kit #16
11	91162	1	Flange Kit #12
12	91163	1	Adapter ¾" Flange, Male ¾" JIC 90°
13	HDW91176	1	Adapter 1" Flange, Male 1" JIC
14	HDW8877	2	Elbow, 90°, Male ¼" O-Ring, Male ¼" JIC

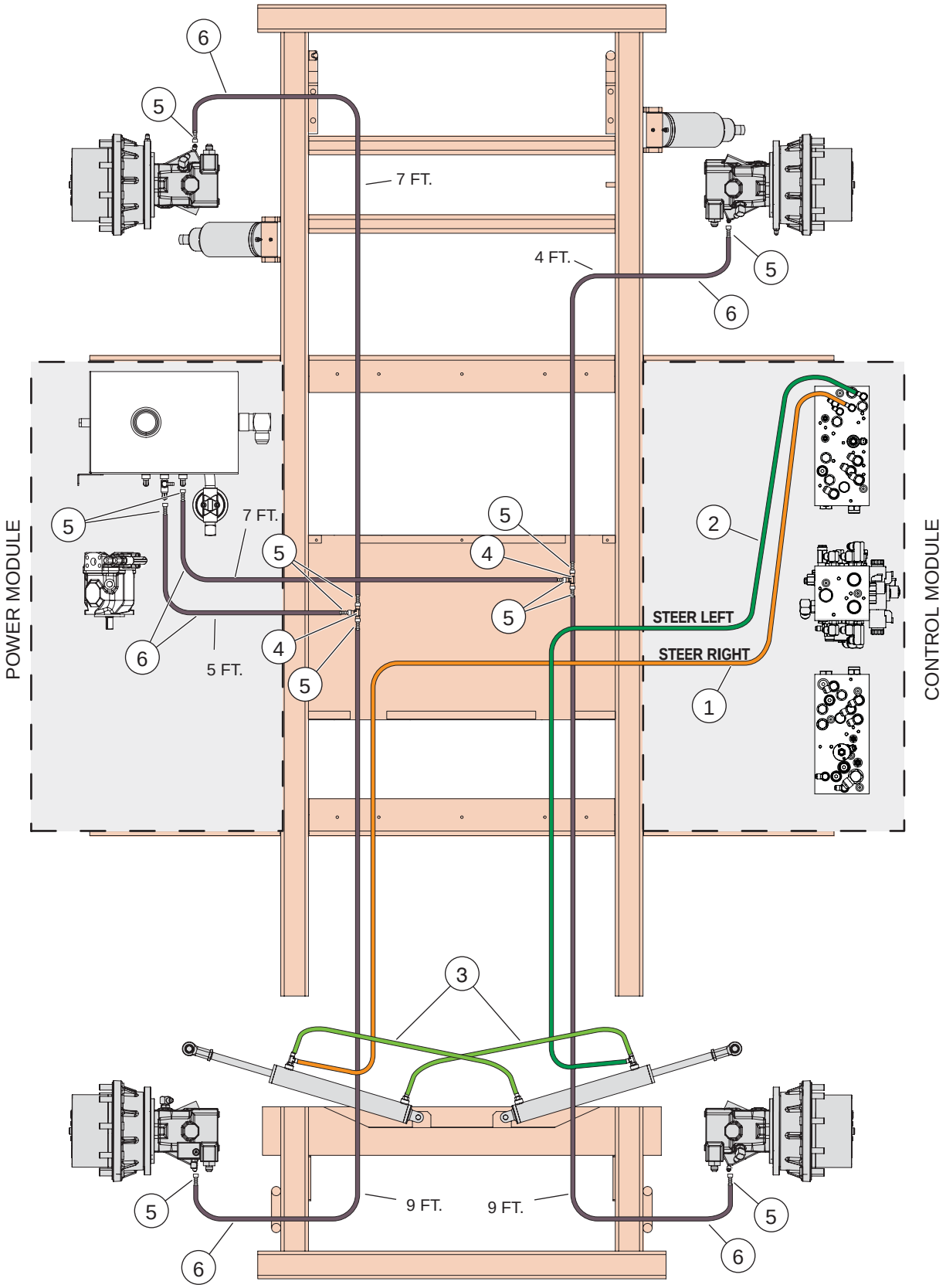


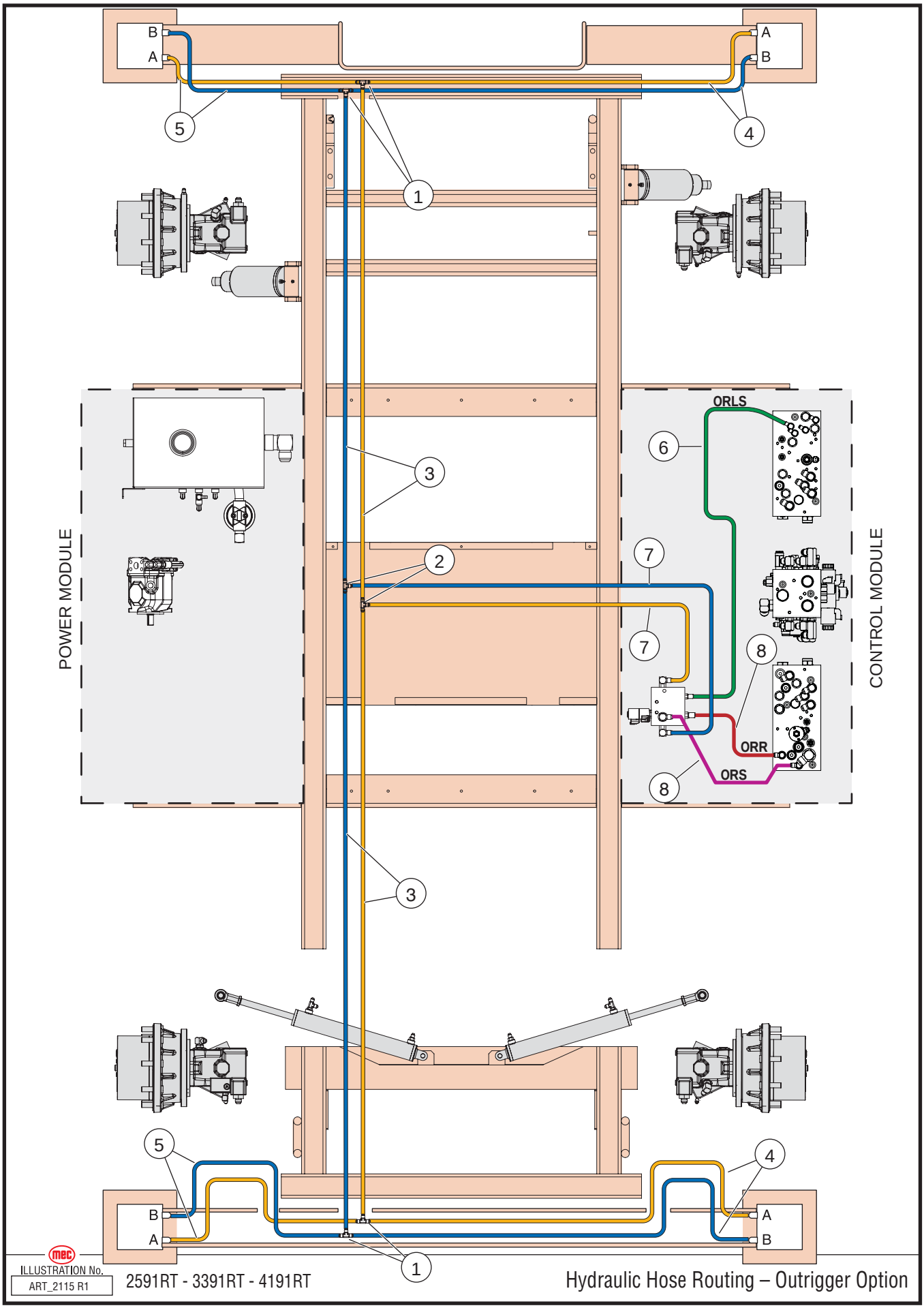
ILLUSTRATION No. ART_2114 R1

2591RT - 3391RT - 4191RT

Hydraulic Hose Routing – Steering – Wheel Motor Case Drain

Hydraulic Hoses – Steering –Wheek Motor Case Drain

ITEM	PART NO.	QTY	DESCRIPTION
Steering			
1	8884	3	Hose Assy, ¼" × 106", 4G1-4FJX-4FJX-106
2	9755	1	Hose Assy, ¼" × 84", 4G1-4FJX-4FJX-84
3	91421	2	Hose Assy, ¼" × 25", 4G1-4FJX90S-4FJX90S-25
Wheel Motor Case Drain			
4	HDW7391	2	TEE, male 3/8 JIC
5	HDW91436	12	Adapter, Female 3/8 JIC × Male 3/8 Hose Barb
6	91435	41 FT	Hose, Case Drain 3/8"


B
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4
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ORLS
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POWER MODULE
CONTROL MODULE
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A
B
1
ILLUSTRATION No.
ART_2115 R1
2591RT - 3391RT - 4191RT
Hydraulic Hose Routing – Outrigger Option

Hydraulic Hoses – Outrigger Option

ITEM	PART NO.	QTY	DESCRIPTION
1	HDW9557	4	Tee, Male ¼" JIC
2	HDW7391	2	Tee, Male 3/8" jic
3	91422	4	Hose Assy, ¼"×74", 4G1-4FJX-6FJX
4	91459	4	Hose Assy, ¼"×44", 4G1-4FJX-4FJX90 S
5	90281	4	Hose Assy, ¼"×73", 4G1-4FJX-4FJX90 S
6	91424	1	Hose Assy, ¼"×26", 4G1-4FJX-4FJX
7	9038	2	Hose Assy, 3/8"×46", 6M3K-6FJX-6FJX
8	8318	2	Hose Assy 3/8"×24", 6M3K-6FJX-6FJX90

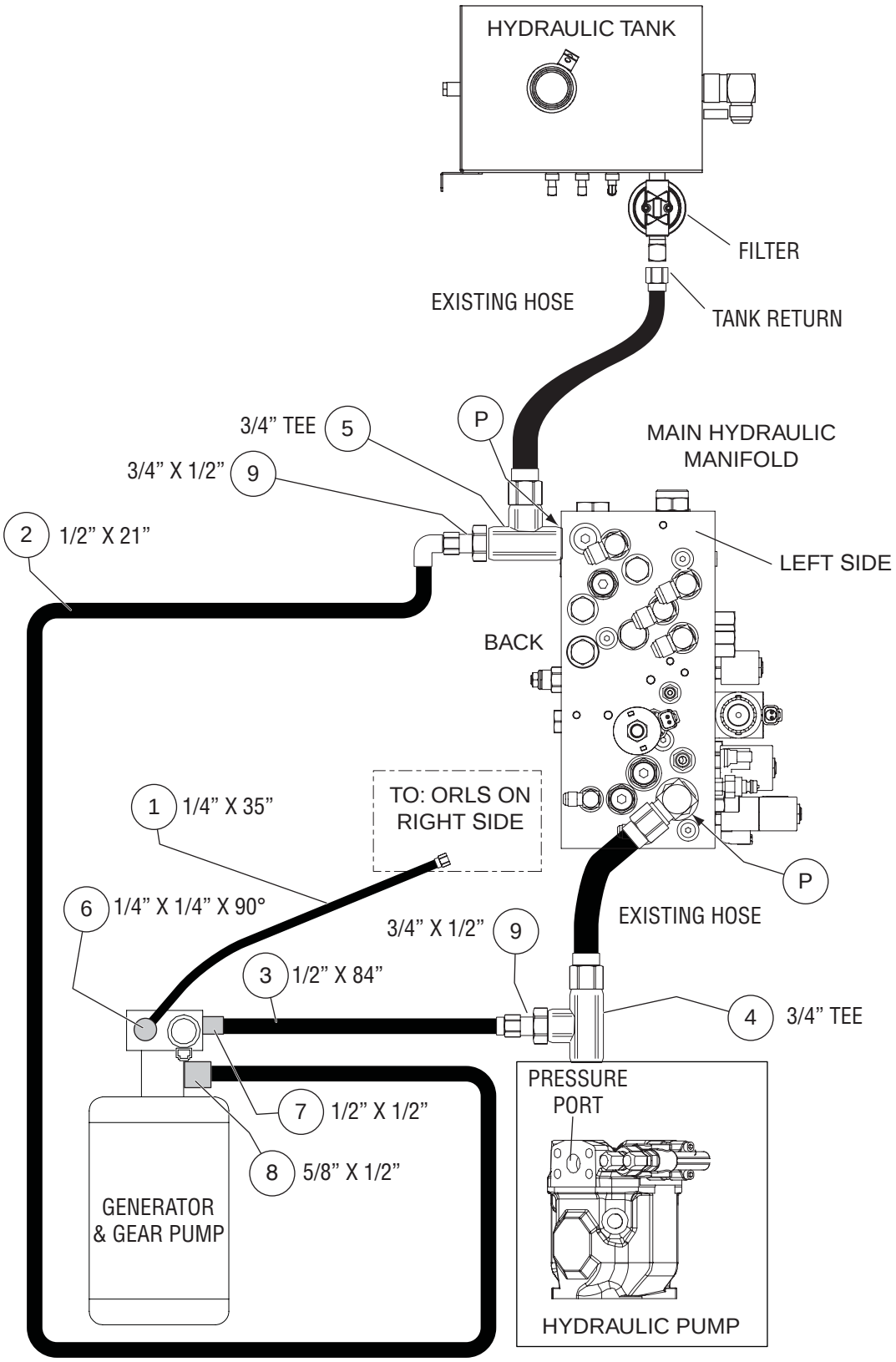

ILLUSTRATION No. ART_2116 R1

2591RT - 3391RT - 4191RT

Hydraulic Hoses – Generator Option

Hydraulic Hoses – Generator Option

ITEM	PART NO.	QTY	DESCRIPTION
1	91346	1	Hose Assy, ¼" × 35", 4GI–4FJX–4FJX90S
2	90315	1	Hose Assy, ½" × 21", 8M3K–8FJX–8FJX90S
3	91259	1	Hose Assy, ½" × 84", 8M3K–8FJX–8FJX45
4	HDW91467	1	Adapter, TEE, ¾" W/Swivel Female
5	HDW91466	1	Adapter, TEE, ¾" Male O-ring, ¾" Male JIC
6	HDW8877	1	Adapter, Male ¼" O-ring, Male ¼" JIC 90°
7	HDW90764	1	Adapter, Male ½" O-ring, Male ½" JIC 90°
8	HDW90967	1	Adapter, Male 5/8" O-ring, Male ¼" JIC 90°
9	HDW91468	2	Adapter, FEMale ¾" JIC, Male ½" JIC

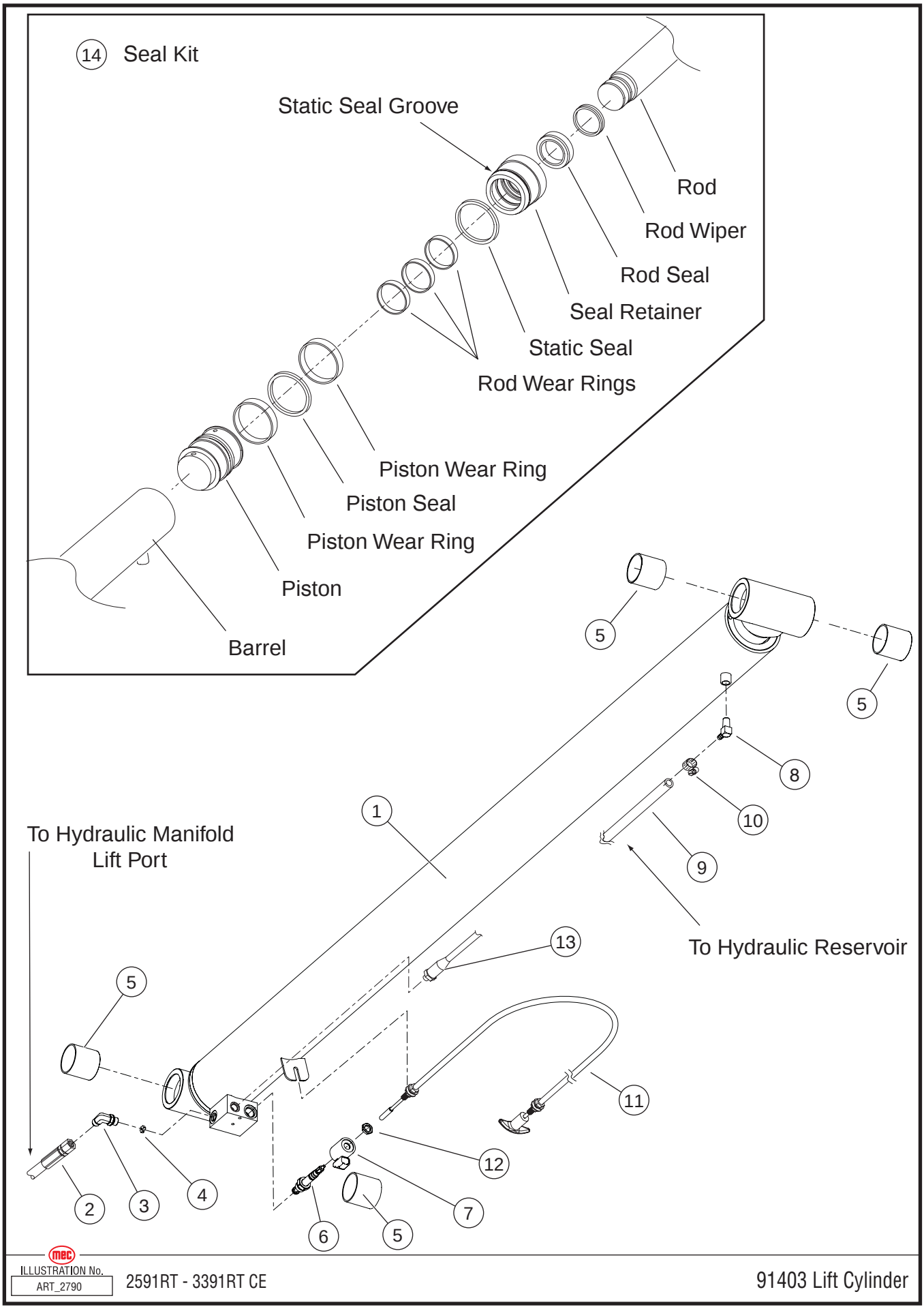
14 Seal Kit
Static Seal Groove
Rod
Rod Wiper
Rod Seal
Seal Retainer
Static Seal
Rod Wear Rings
Piston Wear Ring
Piston Seal
Piston Wear Ring
Piston
Barrel
5
5
8
10
9
1
To Hydraulic Manifold
Lift Port
To Hydraulic Reservoir
13
5
11
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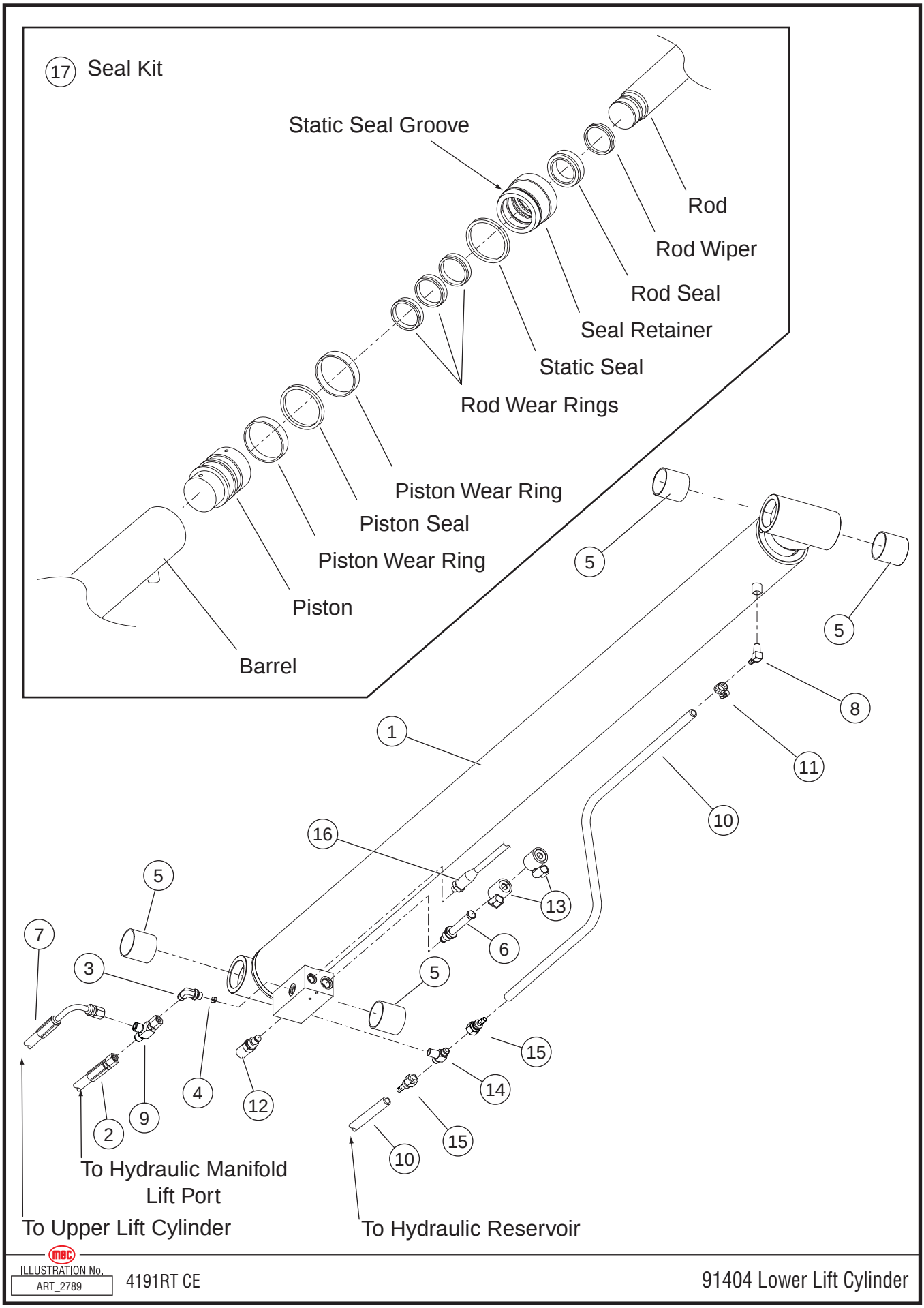
ILLUSTRATION No.
ART_2790
2591RT - 3391RT CE
91403 Lift Cylinder

Cylinder, Lift – 2591RT and 3391RT

ITEM	PART NO.	QTY	DESCRIPTION
1	91403	1	Cylinder, Lift
2	91437	1	Hose Assembly, 3/8"× 320"
3	HDW7601	1	Fitting, Elbow Adaptor
4	91732	1	Orifice
5	6669	4	Bearing
6	91051	1	Valve, 2 Way, N.C. Cable Attach
7	91141	1	Coil, 12 Volt, Deutsch
8	HDW6727	1	Fitting, Pipe 90°, Male Barb
9	6458	21 FT	Hose, Return Line
10	7788	1	Clamp, Hose
11	91442	1	Cable, E-Down
12	HDW91240	1	Nut, Coupling 10-32 × ¾"
13	90845	1	Pressure Sensor
14	91461	–	Kit, Seal-Lift Cylinder (service)
REF	91448	1	Harness, Wire Down, Valve (Not Shown)


17 Seal Kit
Static Seal Groove
Rod
Rod Wiper
Rod Seal
Seal Retainer
Static Seal
Rod Wear Rings
Piston Wear Ring
Piston Seal
Piston Wear Ring
Piston
Barrel
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To Hydraulic Manifold
Lift Port
To Upper Lift Cylinder
To Hydraulic Reservoir
ILLUSTRATION No.
ART_2789
4191RT CE
91404 Lower Lift Cylinder

Cylinder, Lift – 4191RT (Lower)

ITEM	PART NO.	QTY	DESCRIPTION
1	91404	1	Cylinder, Lower lift
2	91437	1	Hose Assembly, Lift Cylinder 3/8"×320"
3	HDW7601	1	Fitting, Elbow 90° Adaptor
4	91732	1	Orifice
5	6669	4	Bearing, 2" ID × 2" LG
6	91462	1	Valve, 2 Way, N.C. Poppet Dual Coil
7	91438	1	Hose Assembly, 3/8"×352"
8	HDW6727	1	Fitting, Pipe 90°, Male Barb
9	HDW8699	1	Fitting, TEE 3/8" JIC
10	6458	21 FT	Hose, Return Line
11	7788	1	Clamp, Hose
12	90969	1	Relief Valve
13	91141	2	Coil, 12 Volt, Deutsch Connector W/diode
14	HDW90943	1	Fitting, TEE Adaptor
15	HDW90945	2	Fitting, Female Swivel
16	90845	1	Pressure Sensor
17	91449	–	Kit, Seal-lift Cylinder - Lower (Service)
REF	91440	1	Harness, Wire Down, Valve (Not Shown)

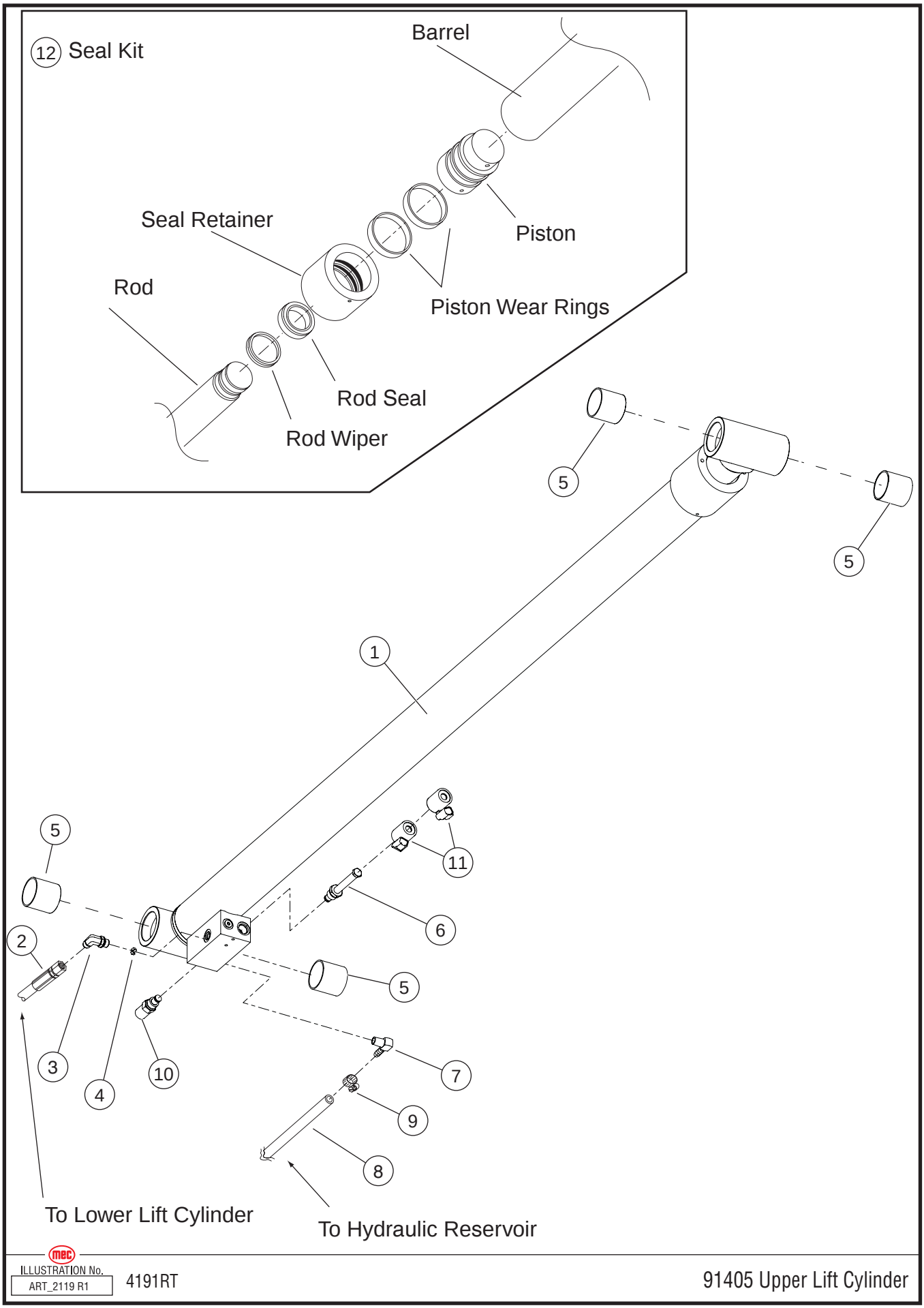


ILLUSTRATION No. ART_2119 R1 4191RT

91405 Upper Lift Cylinder

Cylinder, Lift – 4191RT (Upper)

ITEM	PART NO.	QTY	DESCRIPTION
1	91405	1	Cylinder, Upper Lift
2	91438	1	Hose Assembly, Lift Cylinder 3/8" × 352"
3	HDW7601	1	Fitting, Elbow Adaptor
4	91733	1	Orifice
5	6669	4	Bearing, 2" ID × 2" LG
6	91462	1	Valve, 2 Way, N.C. Dual Coil
7	HDW6727	1	Fitting, Pipe 90°, Male Barb
8	6458	40 FT	Hose, 5/16", Return Line
9	7788	1	Clamp, Hose
10	90969	1	Relief Valve
11	91141	2	Coil, 12 Volt, Deutsch Connector W/diode
12	91450	–	Kit, Seal-lift Cylinder (Service)
REF	91441	1	Harness, Wire Down, Valve (Not Shown)

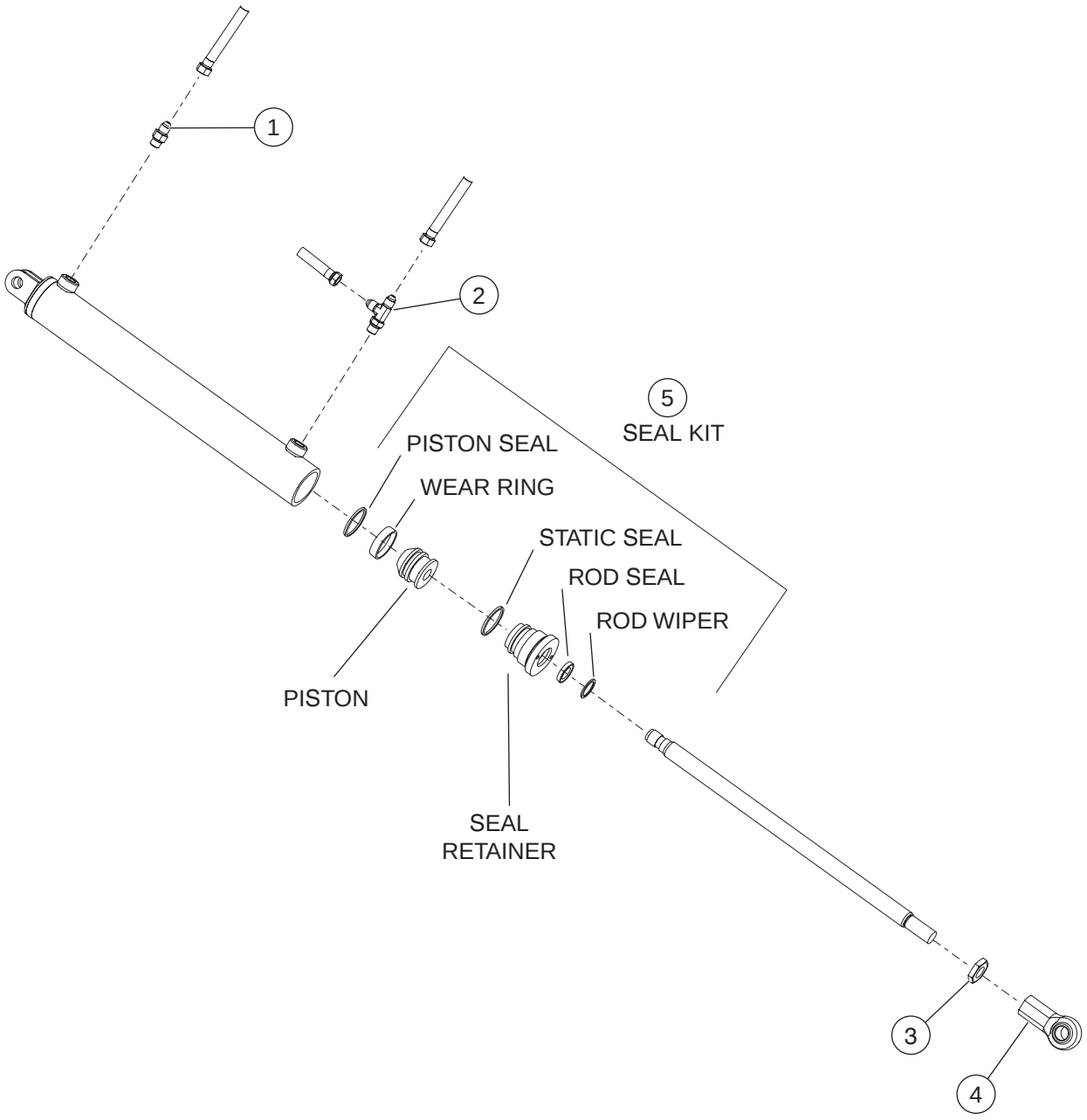


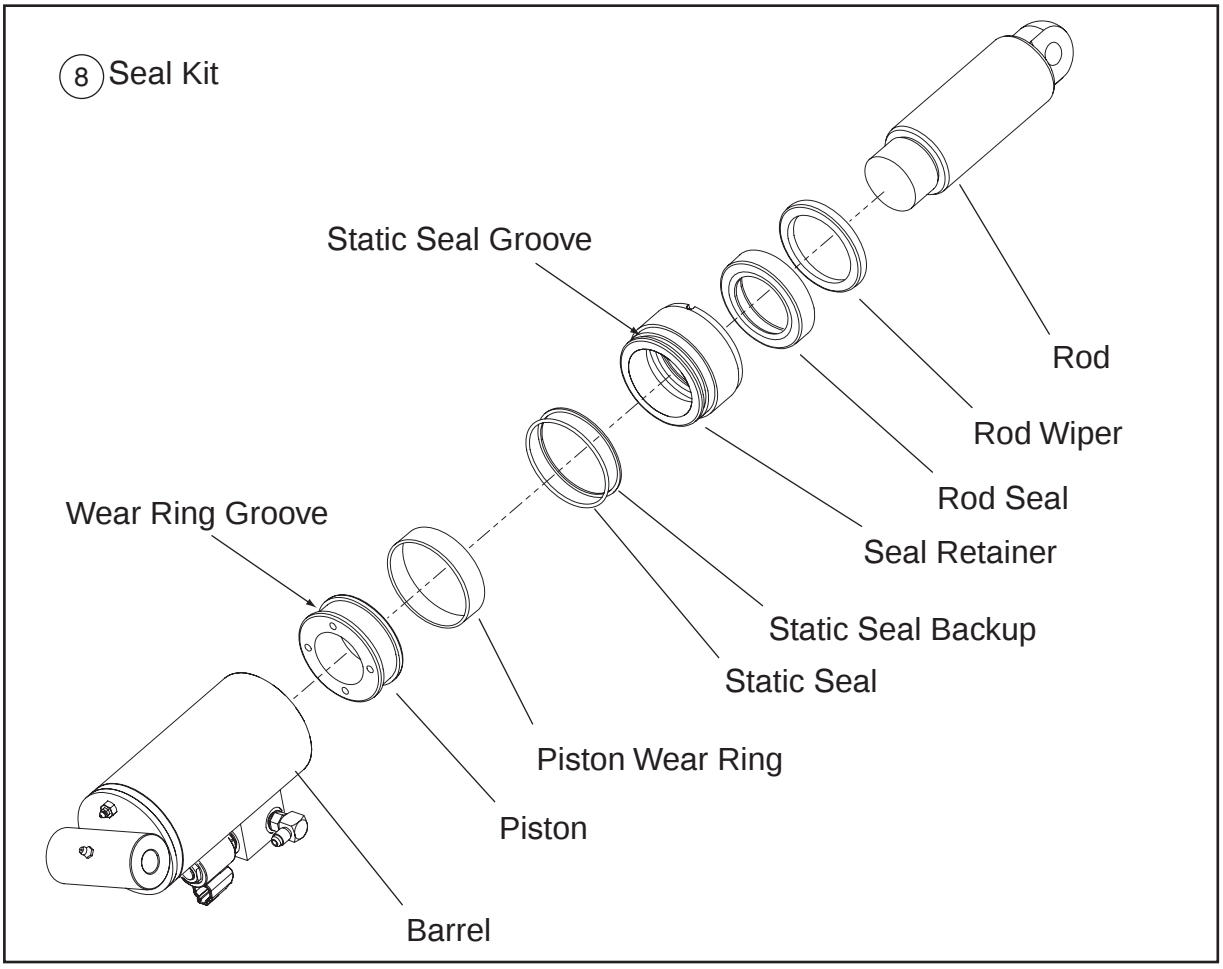
ILLUSTRATION No.
ART_2120 R1

2591RT - 3391RT - 4191RT

91019 Steering Cylinder

Cylinder, Steering

ITEM	PART NO.	QTY	DESCRIPTION
	91019	2	Steering Cylinder
1	HDW8881	1	Adapter Male ¼" O-Ring-Male ¼" JIC
2	HDW8876	1	Adapter Male ¼ O-Ring-Male ¼" JIC TEE
3	HDW5925	1	Jamnut 5/8-18
4	7293	1	Rod End
5	90990	–	Seal Kit (Service)



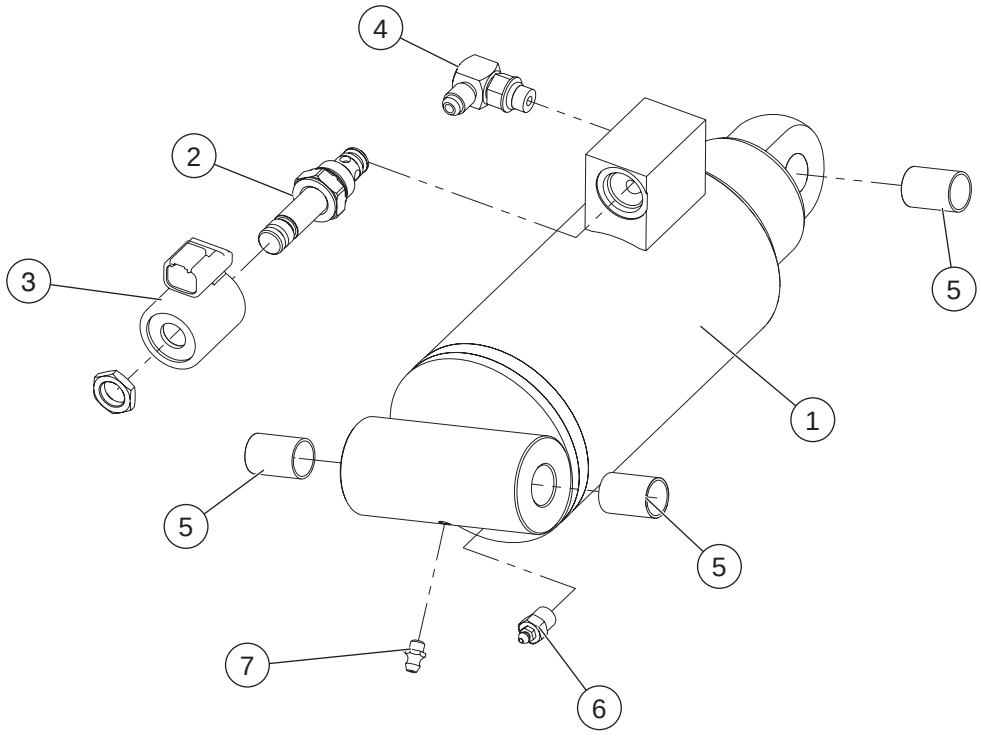


ILLUSTRATION No. ART_2121 R1

2591RT - 3391RT - 4191RT

91406 Axle Lock Cylinder

Cylinder, Floating Axle Lock

ITEM	PART NO.	QTY	DESCRIPTION
1	91406	2	Axle Lock Cylinder
2	91499	1	Valve, Poppet
3	91142	1	Coil, 12V
4	HDW8877	1	Fitting, Elbow Adaptor
5	91498	3	Bearing, 5/8 x 1
6	91497	1	Bleeder Fitting
7	91105	1	Grease Fitting
8	91496	–	Seal Kit (Service)

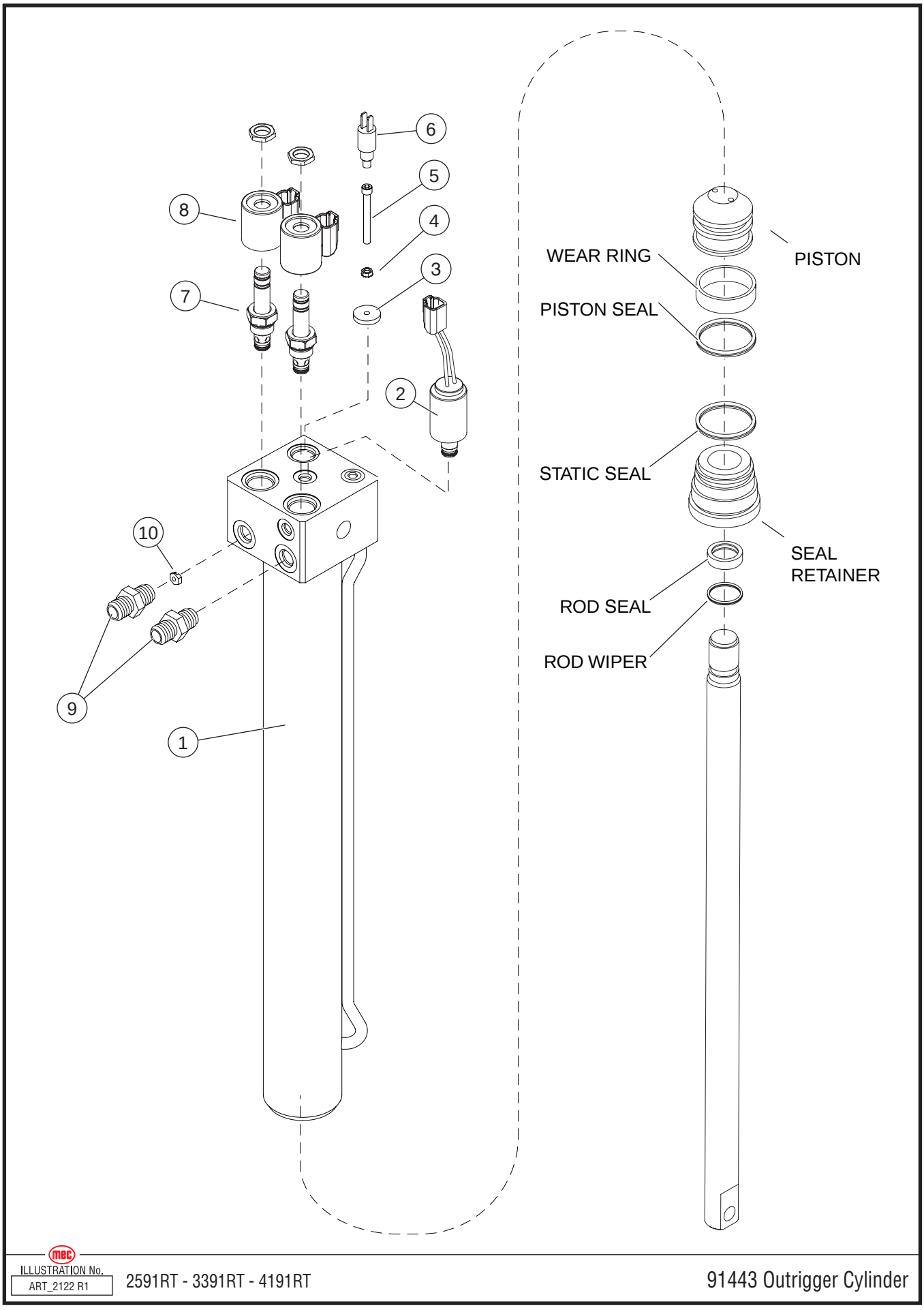


ILLUSTRATION No. ART_2122 R1

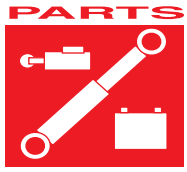
2591RT - 3391RT - 4191RT

91443 Outrigger Cylinder

Cylinder, Outrigger (option)

ITEM	PART NO.	QTY	DESCRIPTION
1	91443	4	Cylinder, Outtrigger
2	91281	1	Switch, Outrigger Pressure N.O.
3	10907	1	Washer Actuator
4	HDW8476	1	Nut Jam ¼-20
5	HDW9761	1	Screw, Socket Head ¼-20 × 2½
6	91277	1	Switch, Outrigger Retract Limit N.O.
7	91464	2	Valve N.C. Poppet
8	91141	2	Coil 12V Deutsch
9	HDW91465	2	Adapter 3/8 Male O-Ring, ¼ Male JIC
10	90439	1	Orifice
11	91451	–	Seal Kit

NOTES:



SECTION F

BASE

CONTENTS PAGE

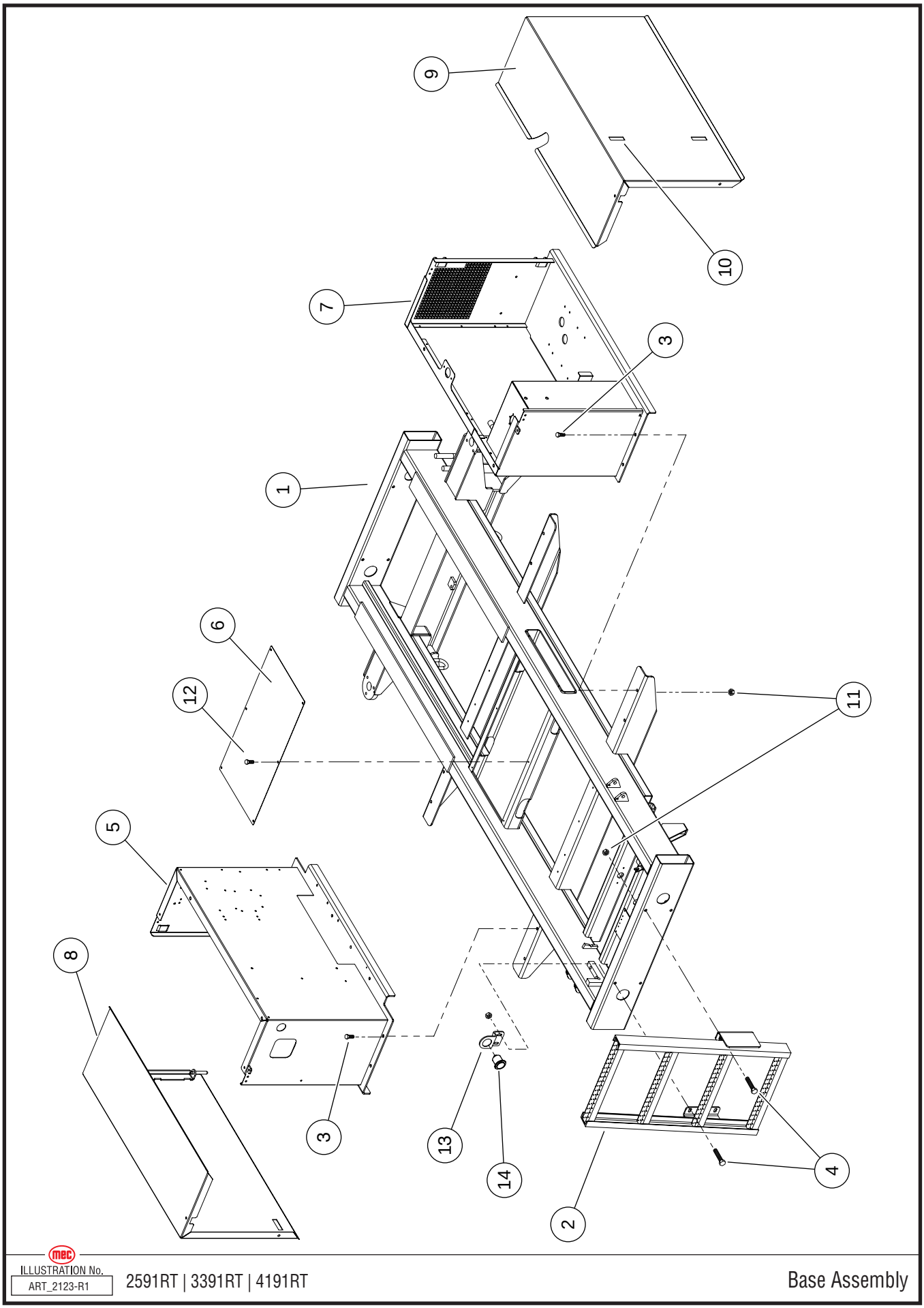


ILLUSTRATION No. ART_2123-R1

2591RT | 3391RT | 4191RT

Base Assembly

Base Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	16410	1	Base Weldment
2	16455	1	Ladder Weldment, 2591RT
	16454	1	Ladder Weldment, 3391RT
	16453	1	Ladder Weldment, 4191RT
3	HDW6211	8	Screw, ½-13, 1 ¼" LG, GR5
4	HDW8498	4	Screw, ¼-13, 4" LG GR5
5	16153	1	Module Weldment, Control Module
6	16480	1	Cover, Hose Tray
7	16213	1	Module Weldment, Power Module
8	16156	1	Door Weldment, Control Module
9	16220	1	Door Weldment, Power Module
10	8386	4	Catch Trigger
11	HDW8457	12	Nut, ½" - 13, GR 5
12	HDW5723	6	Screw, ¼–20 × ¾"
13	16834	1	Bracket, Power to Platform
14	90749	1	Receptical, Power to Platform

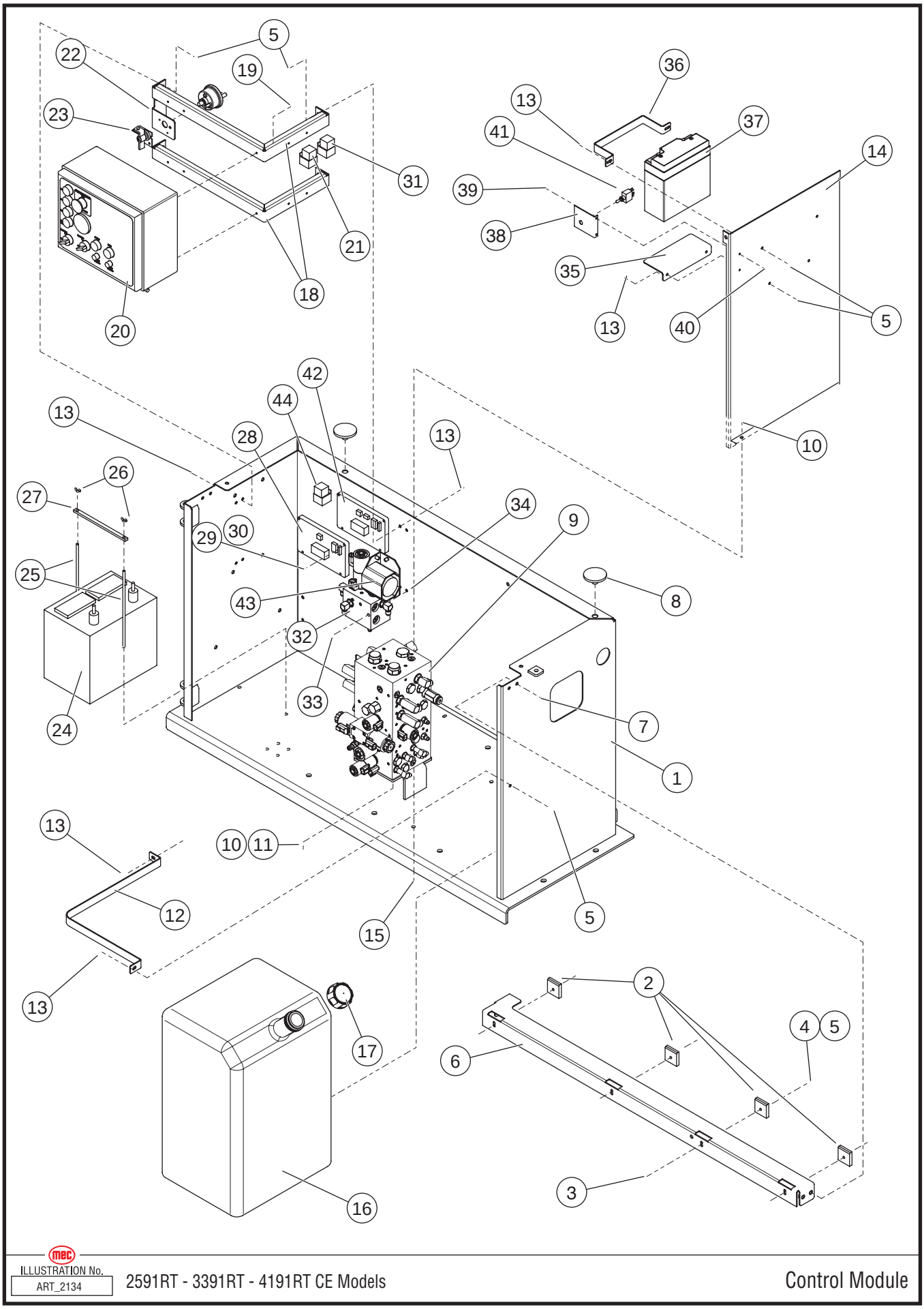


ILLUSTRATION No.
ART_2134
2591RT - 3391RT - 4191RT CE Models
Control Module

Control Module

ITEM	PART NO.	QTY	DESCRIPTION
1	16153	1	Control Module Weldment
2	14896	4	Block, Slide, Door
3	HDW8273	4	Screw, ¼–20, 1" LG
4	HDW5217	4	Washer, .343 ID × .680 OD × .063 THK
5	HDW8267	18	Nut, ¼–20, GR 5
6	16154	1	Bracket, Cross Support
7	HDW5724	4	Screw, 5/16–18, ¾" LG, GR 5
8	25429	2	Pad
9	91140	1	Hydraulic Manifold
10	HDW6433	4	Screw, 3/8 × 1"
11	HDW7783	4	Lock Washer, 3/8
12	16225	1	Bracket, Fuel Tank
13	HDW5723	18	Screw, ¼-20 × ¾"
14	16152	1	Bulkhead
15	HDW8268	5	Nut, 3/8
16	91023	1	Fuel Tank, Plastic
17	91091	1	Fuel Tank Cap
	6919	1	Fuel Shutoff (not shown)
	HDW91279	1	Adapter, Male 1/8 Npt, 5/16 Hose Barb (not shown)
	7788	1	Clamp (not shown)
	6458	72 FT	Hose, Fuel Line (not shown)
	HDW91320	1	Adapter (not shown)
18	16226	2	Bracket, Control Box
19	HDW7888	4	Screw, 10-32 × ½"
20	91169	1	Lower Control Box
21	91375	1	Relay, Speed/torque, Drive
22	16229	1	Battery Disconnect Bracket
23	8841	1	Battery Disconnect
24	6854	1	Battery, 12vdc
25	2987	1	Hold Down Rod
26	HDW6110	2	Wing Nut
27	3436	1	Hold Down Bar
28	91280	1	Control Module – *Outrigger Option*
29	HDW90880	8	Screw, 10-32 × 1" – *Outrigger Option*
30	HDW90803	8	Nut, 10-32 Nylock – *Outrigger Option*
31	91375	1	Relay – *Outrigger Option*
32	91268	1	Outrigger Manifold – *Outrigger Option*
33	HDW91332	2	Screw, 5/16-18 × 3½" – *Outrigger Option*
34	HDW8304	2	Nut, 5/15-18 – *Outrigger Option*
35	16620	1	Battery Shelf – *Emergency Lowering: 4191RT*
36	16619	1	Battery Bracket – *Emergency Lowering: 4191RT*
37	90898	1	Battery, 12vdc – *Emergency Lowering: 4191RT*
38	25480	1	Bracket, Emergency Down Switch – *Emergency Lowering: 4191RT*
39	HDW90833	2	Screw, 6–32 × ¾" Lg – *Emergency Lowering*
40	HDW5364	2	Nut, 6 –32 – *Emergency Lowering*
41	7423	1	Switch, Toggle, 1 Pole 2 Pos – *Emergency Lowering*
42	90843	1	Load Sense Module – *Overload Alarm*
43	9716	1	Alarm – *Overload Alarm*
44	91375	1	Relay – *Overload Alarm*

• as req: as required • INCL: Included with assembly • NS: Not a Stock item • REF: Reference only

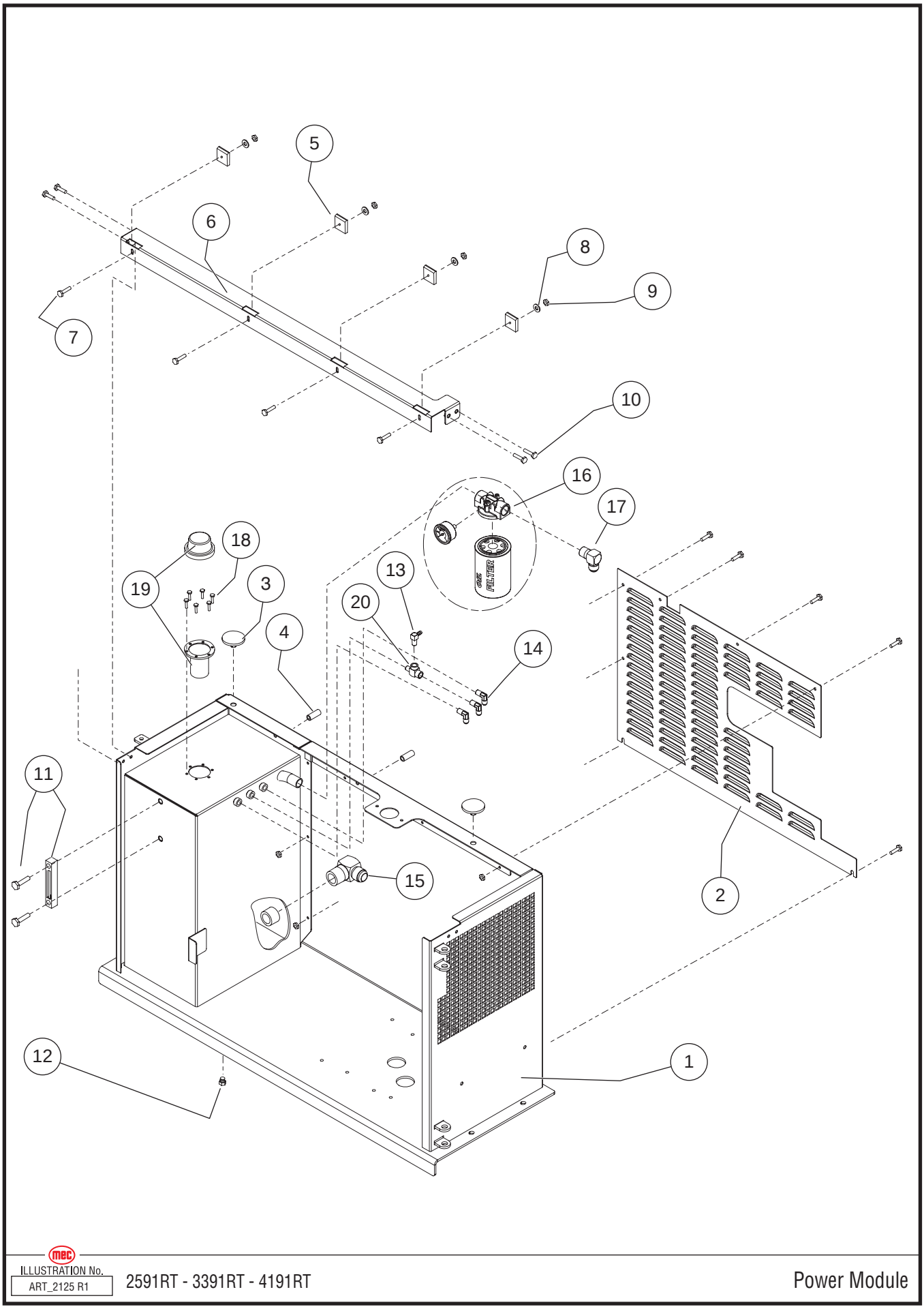


ILLUSTRATION No.
ART_2125 R1

2591RT - 3391RT - 4191RT

Power Module

Power Module

ITEM	PART NO.	QTY	DESCRIPTION
1	16213	REF	Weldment, Power Module
2	16247	1	Guard, Engine Module
3	25429	2	Pad
4	40620	2	Spacer, Insulator, 1.59" LG
5	14896	4	Block, Slide, Door
6	14826	1	Bracket, Cross Support
7	HDW8273	4	Screw, ¼–20, 1" LG
8	HDW5217	4	Washer, .343 id × .680 od × .063 thk
9	HDW8267	4	Nut, ¼–20, GR 5
10	HDW5724	4	Screw, 5/16–18, ¾" LG, GR 5
Hydraulic tank Installation			
11	9370	1	Level Gauge
12	HDW9200	1	Plug, ¼ NPT
13	HDW6727	1	Elbow, 90° ¼ NPT – 5/16 Barb
14	HDW7500	3	Elbow, 90° ¼ NPT – 3/8 JIC
15	91164	1	Elbow, 90° 1 1/8 NPT – 1 JIC
16	91417	1	Filter Assembly
INCL	91418	1	Filter Cartridge
INCL	91570	1	Filter Pressure Gauge
17	HDW9268	1	Elbow, 90° ¾ NPT – ¾ JIC
18	HDW9268	6	Bolt, 32 × 1.57
19	9367	1	Filler/Strainer
20	6655	1	TEE, ¼ NPT

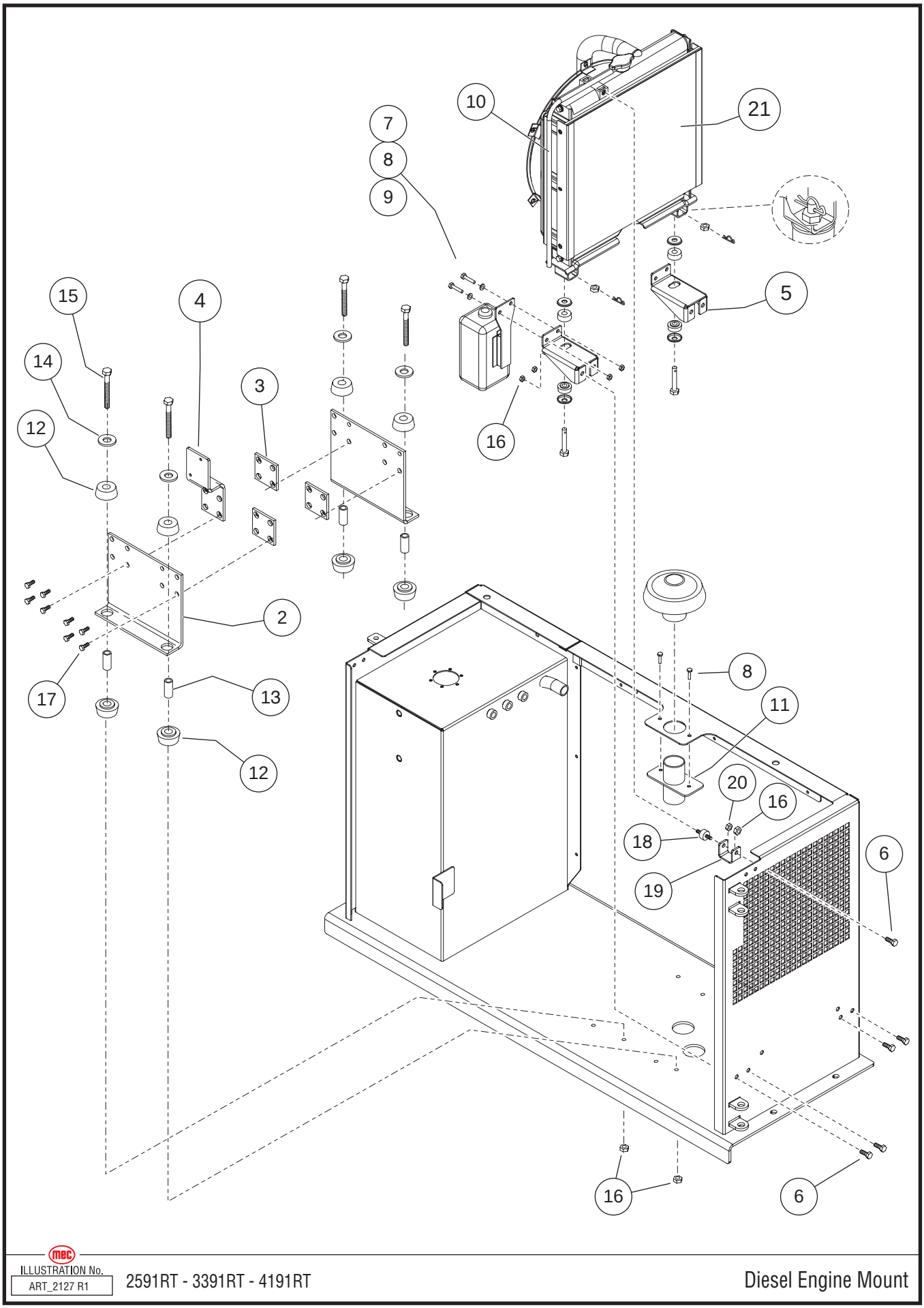


ILLUSTRATION No. ART_2127 R1

2591RT - 3391RT - 4191RT

Diesel Engine Mount

Power Module: Engine Mount

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	–	Power Module
2	16209	2	Engine Mount, Diesel
3	16210	3	Spacer
4	16207	1	Bracket, Solenoid Mount
5	16345	2	Radiator Mount Bracket
6	HDW6432	5	Screw, 3/8 - 18 × ¾
7	91127	1	Coolant Overflow Tank
8	HDW5723	4	Screw, ¼-20 × ¾
9	HDW8267	2	Nut, ¼-20
10	6458	3 FT	Hose
11	16295	1	Air Intake Weldment
12	7736	8	Insulator Rubber
13	40620	4	Spacer Isolator
14	HDW8567	4	Washer, 3/8 Flat
15	HDW8279	4	Screw, 3/8-16 × 2 ½ gr8
16	HDW8268	9	Nut, 3/8-16
17	HDW91234	12	Screw, M10-1.25 × 25 8.8
18	91591	1	Vibration Isolator
19	16346	1	Radiator Brace
20	945407	1	Nut, M6 × 1
21	REF	–	Radiator Kit, See Engine

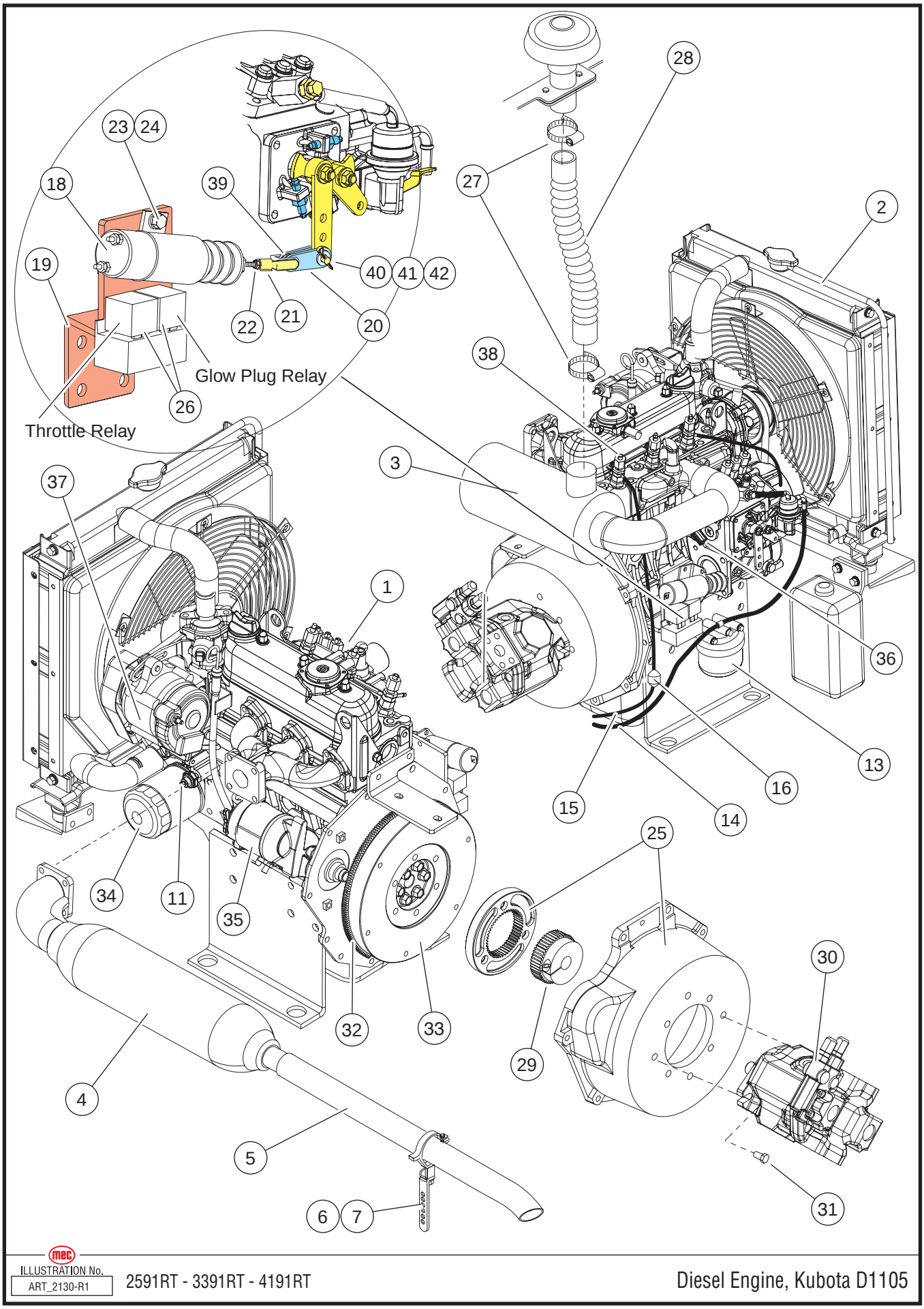


ILLUSTRATION No. ART_2130-R1

2591RT - 3391RT - 4191RT

Diesel Engine, Kubota D1105

Diesel Engine

ITEM	PART NO.	QTY	DESCRIPTION
	84036		Engine Subassembly, Diesel
1	91429		Engine Kit, D1105
2	91113		Radiator Kit
INCL	9831		Radiator
3	91111		Air Cleaner kit
INCL	8667		Air Filter Element
4	91115		Muffler Kit
INCL	9830		Muffler
5	91118		Exhaust Pipe
6	9696		Muffler Hanger
7	9868		Muffler Clamp
8	40620		Spacer
9	HDW8279		Screw, 3/8–16 × 2 ½"
10	HDW8268		Nut, 3/8–16
11	91175		Oil Pressure Switch
12	HDW91187		Fitting, 1/8 NPT, m–F
13	91116		Fuel Filter Assembly
INCL	91123		Fuel Filter Element
14	6458		Hose, Fuel, 5/16
15	91199		Hose, Fuel, 3/16
16	91114		Valve, Check
17	7788		Hose Clamp
18	91589		Solenoid, Throttle
19	16207		Bracket, Solenoid
20	16347	2	Throttle Link
21	91117		Yoke
22	HDW91231		Jamnut, ¼–28
23	HDW5723		Screw, ¼–20 × ¾"
24	HDW8267		Nut, ¼–20
25	91112		KTR housing Kit, D905
26	91375	2	Relay
27	7545	2	Hose Clamp
28	91340	1	Hose, 2.00" I.D. Flex
29	91130	1	Hub
30	91160	1	Hydraulic Pump
31	HDW6433	2	Screw, 3/8-16 × 1"
32	91765	1	Ring Gear
33	91766	1	Flywheel
34	8665	–	Oil Filter
35	8413	–	Starter
36	8001	–	Fuel Solenoid
37	90227	–	Alternator
38	9832	–	Glow Plugs
39	91588	1	Washer, ¼" Rubber
40	HDW5217	1	Washer, Flat, 5/16"
41	HDW91590	1	Clevis Pin, 5/16 × 1"
42	HDW5290	1	Cotter Pin, 1/8" × 1"

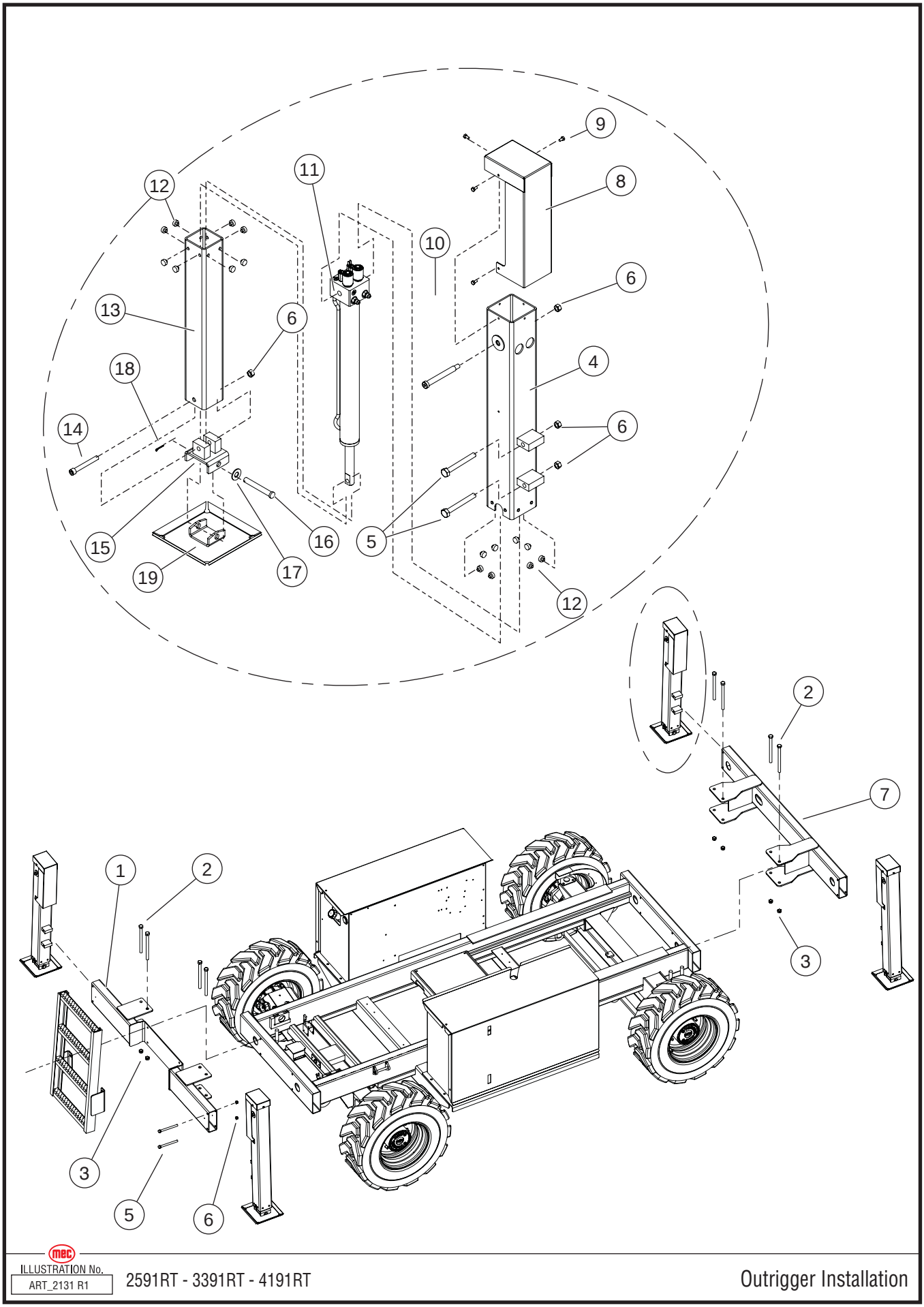


ILLUSTRATION No. ART_2131 R1

2591RT - 3391RT - 4191RT

Outrigger Installation

Outrigger Installation (option)

ITEM	PART NO.	QTY	DESCRIPTION
1	16490	1	Weldment, Outrigger Mount, Rear
2	HDW91457	8	Screw, ¾–10 × 10" LG
3	HDW91458	8	Locknut, ¾–10
4	16451	4	Weldment, Outer Outrigger
5	HDW7052	8	Screw, ½–13 × 3 ½" LG
6	HDW8457	16	Nut, ½–13
7	16491	1	Weldment, Outrigger Mount, Front
8	21170	4	Cover, Outrigger Cylinder
9	HDW6455	20	Screw, ¼–20 × ½"
10	HDW91328	4	Shoulder Screw, 5/8 × 4.75"
11	91443	4	Cylinder, Outrigger
12	90663	64	Spacer
13	16448	4	Tube, Inner Outrigger
14	HDW5916	4	Screw, ½–13 × 4.0"
15	20998	4	Bracket Pivot
16	HDW91395	4	Clevis Pin, 5/8 × 5.0"
17	HDW9219	4	Washer, Flat
18	HDW5920	4	Pin, Cotter, 1/8 × 1"
19	21002	4	Pad Weldment

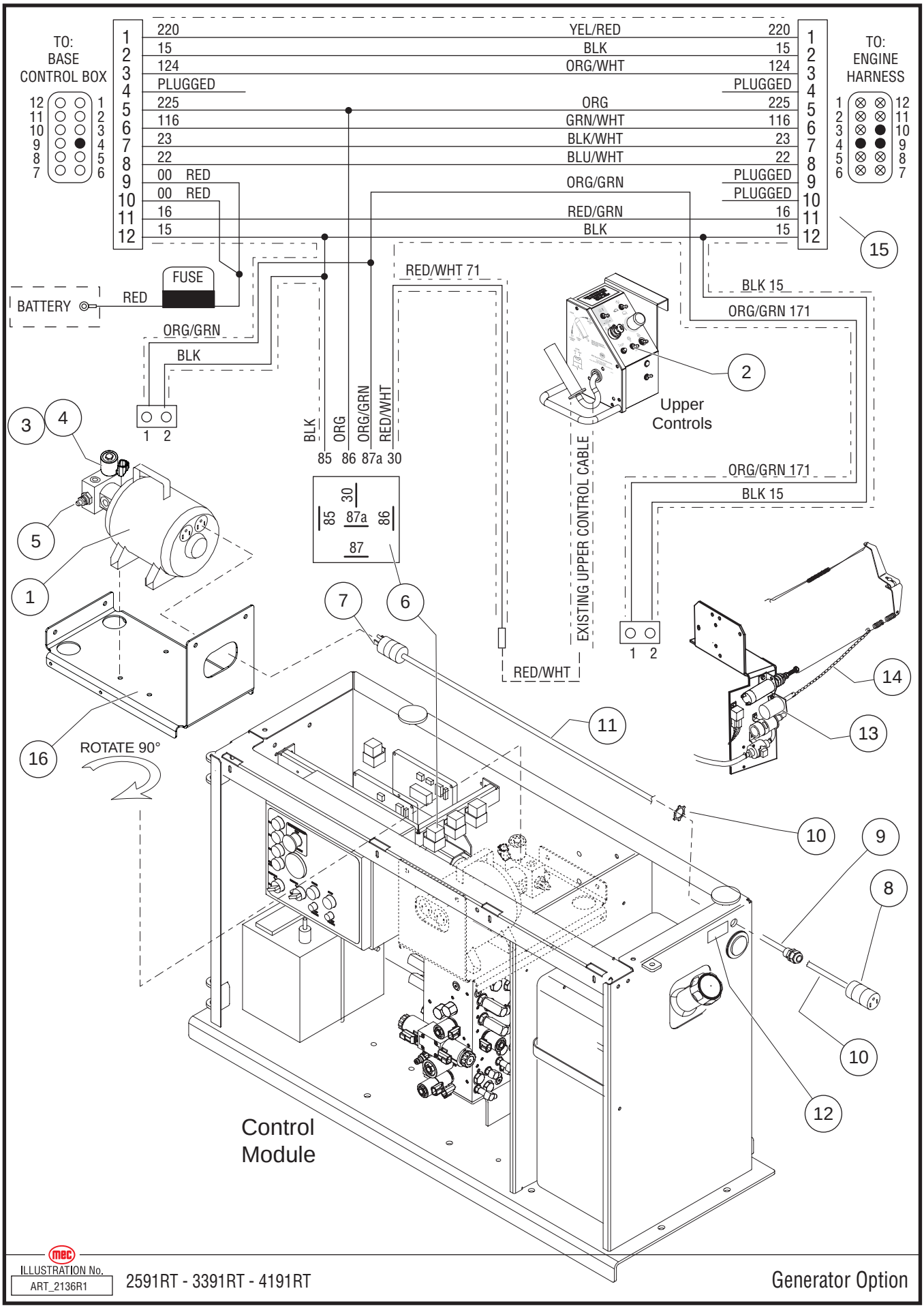


ILLUSTRATION No. ART_2136R1

2591RT - 3391RT - 4191RT

Generator Option

Generator (option)

ITEM	PART NO.	QTY	DESCRIPTION
1	91550	1	Generator, 2000 Watt
2	5630	1	Switch, Toggle
3	91551	1	Valve, Solenoid, 2-way, n.c.
4	91002	1	coil, 12V 10 Series
5	91546	1	Needle Valve
6	91375	1	Relay, SPDT
7	91544	1	Plug, Male, 3 Prong
8	91545	2	Receptacle, Female
9	7594	1	Strain Relief
10	INCL	1	Locknut, ½" NPT
11	7617	6 FT	Wire, 14GA, 3 conductor
12	91556	1	Label, AC Generator
13	91119	1	Solenoid, Generator-Throttle, Diesel Engine
14	91469	2 FT	Chain, Sash #8
15	91543	1	Harness, Engine Intermediate, Generator Option
16	16369	1	Bracket, Generator Mount

NOTES:

Wire Harness

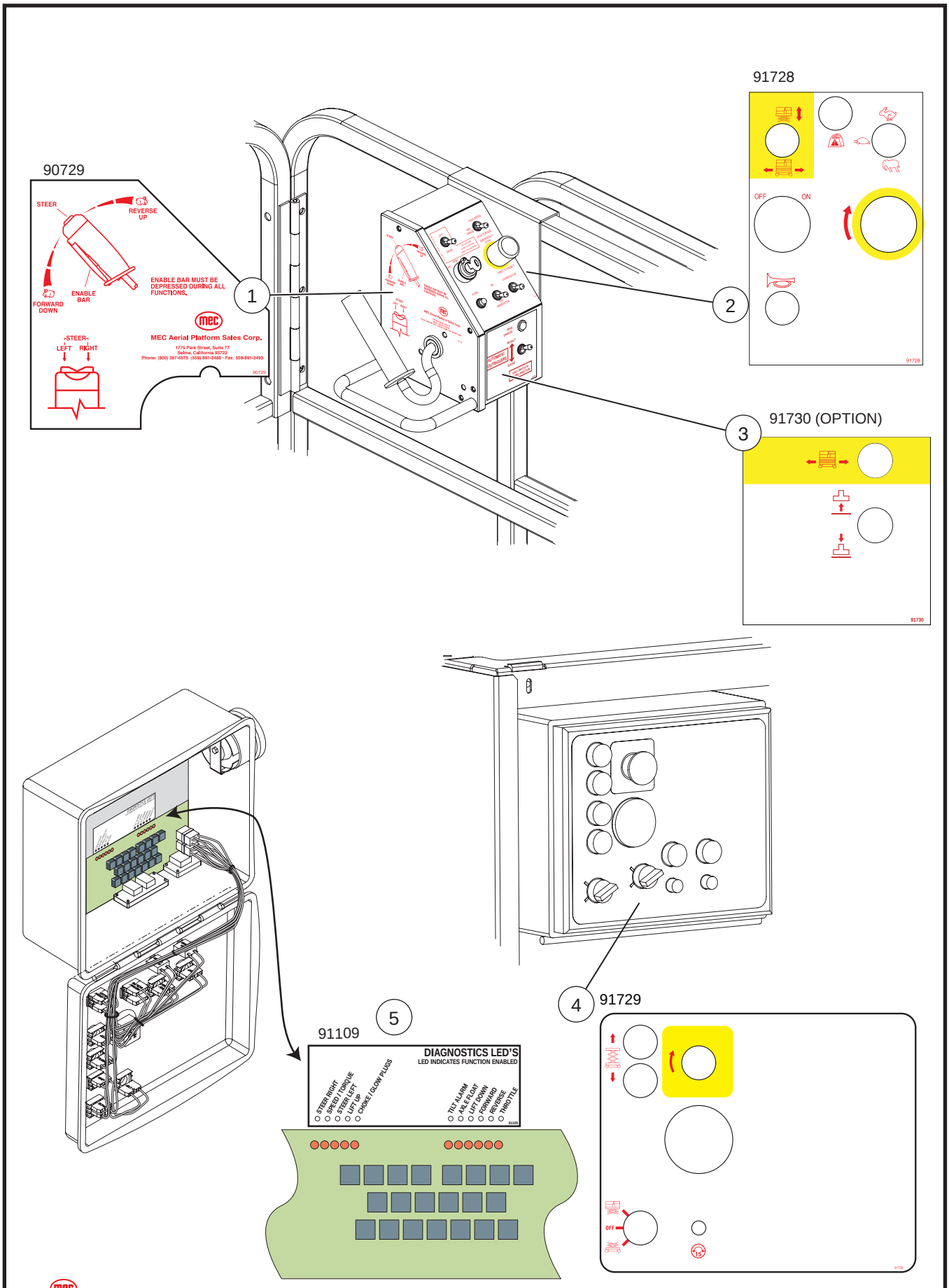
ITEM	PART NO.	QTY	DESCRIPTION
–	91430	–	Harness, Main *[Control Module - Base & Valves]*
–	91185	–	Control Cable, 2591RT *[Control Module to Deck through scissor beams]*
–	91321	–	Control Cable, 3391RT *[Control Module to Deck through scissor beams]*
–	91439	–	Control Cable, 4191RT *[Control Module to Deck through scissor beams]*
–	91184	–	Harness, Control Box (upper) *[Inside Upper Control Box]*
–	91294	–	Cable, Outrigger Option, Upper Controls *[Inside Upper Control Box]*
–	91295	–	Cable, Outrigger Option, Control, Platform *[Deck to Upper Control Box]*
–	91296	–	Cable, Outrigger Option, Control, 2591RT *[Control Module to Deck through scissor beams]*
–	91121	–	Cable, Outrigger Option, Control, 3391RT *[Control Module to Deck through scissor beams]*
–	91447	–	Cable, Outrigger Option, Control, 4191RT *[Control Module to Deck through scissor beams]*
–	91444	–	Harness, Outrigger Option *[Control Module to Outriggers]*
–	91448	–	Harness, Lift Cylinder Down Valve, 2591RT, 3391RT *[Control Module to Lift Cylinder]*
–	91440	–	Harness, Lower Lift Cylinder Down Valve, 4191RT *[Control Module To Lift Cylinder]*
–	91441	–	Harness, Upper Lift Cylinder Down Valve , 4191RT *[Control Module to Lift Cylinder]*
–	91379	–	Harness, E-Down with Diode, 4191RT
–	91378	–	Harness, E-Down to Batteries, 4191RT
–	91171	–	Harness, Engine, Intermediate *[Control Module to Engine Module]*
–	91543	–	Harness, Engine Intermediate, Generator Option *[Control Module to Engine Module]*
–	91172	–	Harness, Engine, Dual Fuel *[Engine Module]*
–	91173	–	Harness, Engine, Diesel *[Engine Module]*
–	91189	–	Cable, Upper Controls, Removable
–	91557	–	Cable, Upper Controls, Fixed
–	91595	–	Harness, Lower Controls *[Inside Lower Control Box]*
–	9438	–	Battery Cable, Red, 15 Inch Long *[Control Module: Battery to Battery Disconnect Switch]*
–	9012	–	Battery Cable, Red, 72 Inch Long *[Control Module to Engine Module]*
–	9013	–	Battery Cable, Black, 72 Inch Long *[Control Module to Engine Module]*
–	7172	–	Boot, Black *[Control Module: Battery Terminal]*
–	7173	–	Boot, Red *[Control Module: Battery Terminal]*
–		–	

NOTES:

SECTION G

DECALS

CONTENTS


90729
STEER
REVERSE UP
FORWARD DOWN
ENABLE BAR
ENABLE BAR MUST BE DEPRESSED DURING ALL FUNCTIONS.
-STEER-
LEFT
RIGHT
MEC Aerial Platform Sales Corp.
1
91728
OFF
ON
2
91730 (OPTION)
3
4
91729
OFF
5
91109
DIAGNOSTICS LED'S
LED INDICATES FUNCTION ENABLED
STEER RIGHT
SPEED / TORQUE
STEER LEFT
LIFT UP
CHOKE / GLOW PLUGS
TILT ALARM
AXLE FLIGHT
LIFT DOWN
FORWARD
REVERSE
THROTTLE

Decals, Controls

ITEM	PART NO.	QTY	DESCRIPTION
1	90729	1	Decal, Upper Control, Joystick Operation
2	91728	1	Decal, Upper Control Panel
3	91730	1	Decal, Outrigger Panel
4	91729	1	Decal, Lower Control Panel
5	91109	1	Decal, Diagnostic LEDs

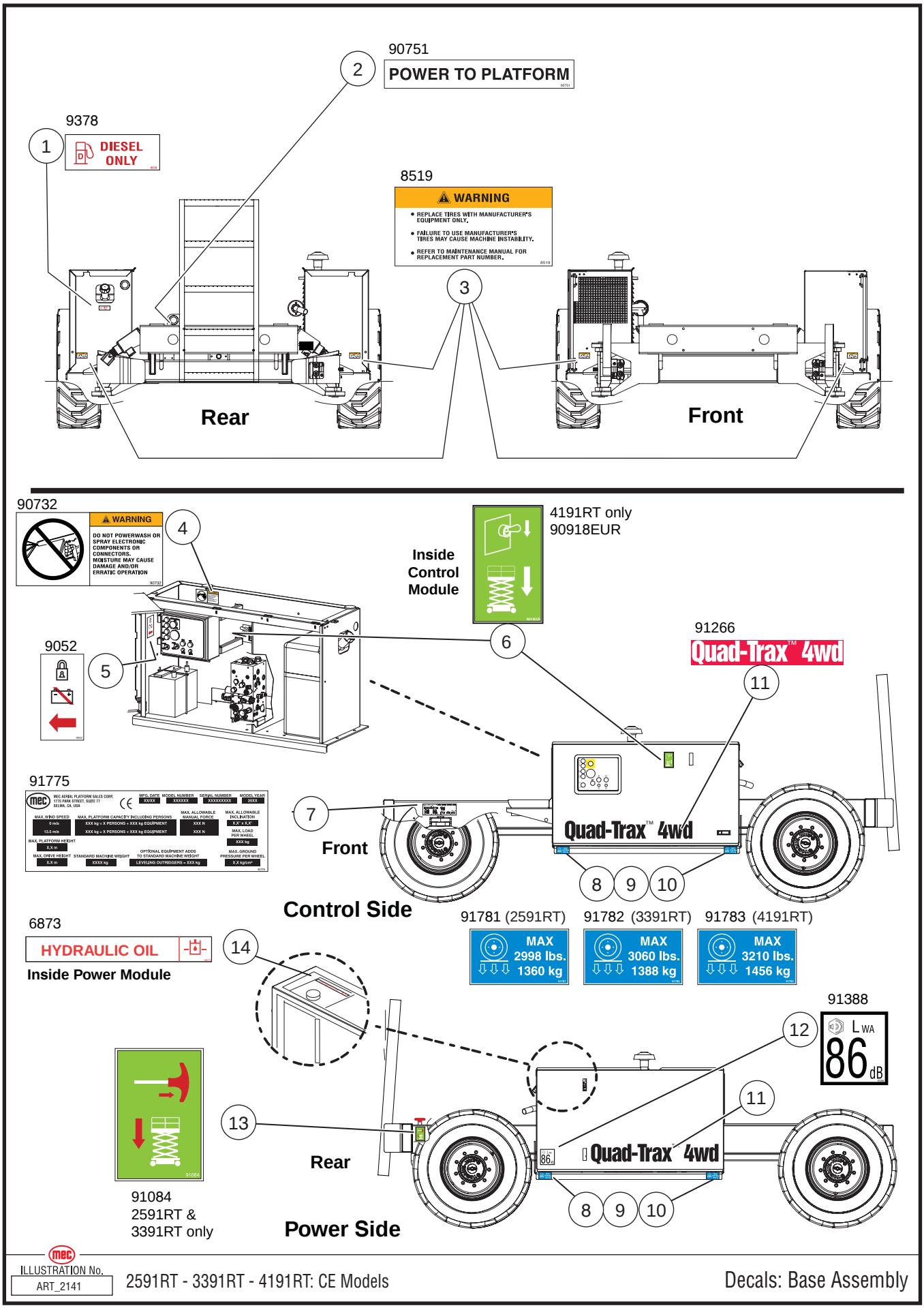


ILLUSTRATION No. ART_2141

2591RT - 3391RT - 4191RT: CE Models

Decals: Base Assembly

Decals, Base

ITEM	PART NO.	QTY	DESCRIPTION
1	9378	1	Decal, Diesel Only
2	90751	1	Decal, Power To Platform
3	8519	4	Decal, Warning: Tire Replacement
4	90732	1	Decal, Warning: Steam Cleaning
5	9052	1	Decal, Battery Disconnect
6	90918EUR	2	Decal, Emergency Lowering, 4191RT Only
7	91776	1	Serial Plate
8	91781	4	Decal, Max Wheel Load, 2591RT
9	91782	4	Decal, Max Wheel Load, 3391RT
10	91783	4	Decal, Max Wheel Load, 4191RT
11	91266	1	Decal, Quad-Trax 4WD
12	91388	1	Decal, 86 dB
13	91094	1	Decal, Emergency Lowering, 2591RT and 3391RT
14	6973	1	Decal, Hydraulic Oil

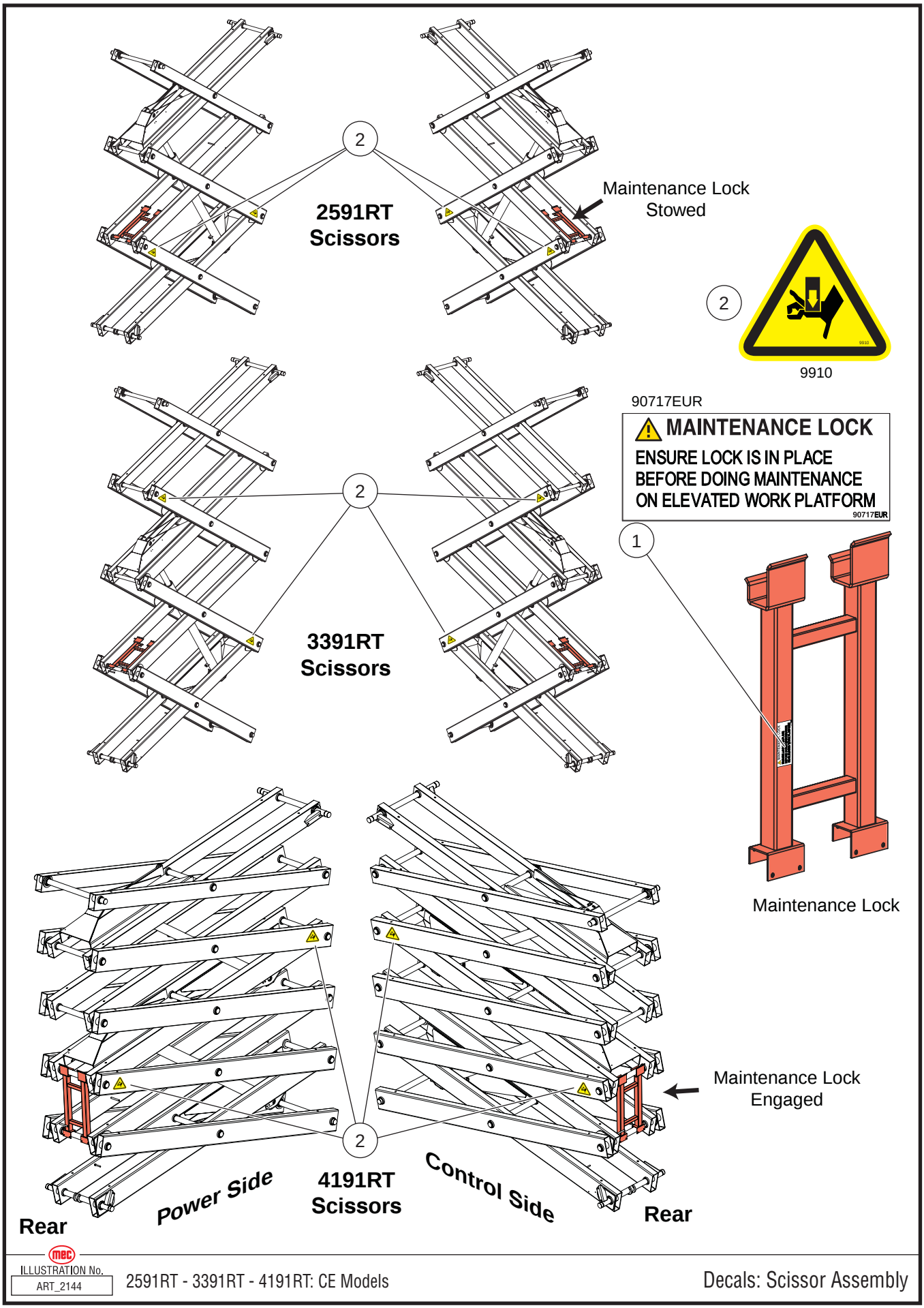


ILLUSTRATION No. ART_2144

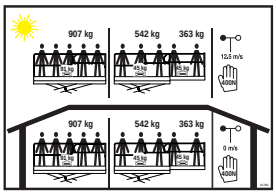
2591RT - 3391RT - 4191RT: CE Models

Decals: Scissor Assembly

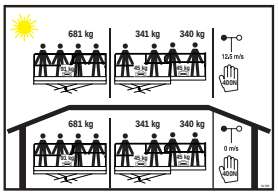
Decals, Scissor Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	90717EUR	1	Decal, Maintenance Lock
2	9910	4	Decal, Hand Crush Hazard

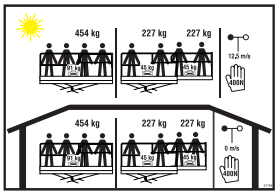
5 2591RT 91786



6 3391RT 91785



7 4191RT 91784



1 91456

WARNING

INSPECT MACHINE AND MAKE SURE THAT IT IS OPERATING PROPERLY. THAT ALL NAME PLATE AND SAFETY AND CONTROL DECALS ARE IN PLACE AND LEGIBLE, AND THAT THE MACHINE IS IN ACCORDANCE WITH THE MANUFACTURER'S MAINTENANCE REQUIREMENTS CONTAINED IN THE OPERATION AND MAINTENANCE MANUAL AND THE DAILY SAFETY CHECKLIST.

OPERATE MACHINE WITH EXTREME CAUTION, WATCH FOR OBSTRUCTIONS WHICH MAY STRIKE PLATFORM, PERSONNEL, CONTROLS, OR MACHINE. OPERATE CONTROLS SLOWLY FOR SMOOTH PLATFORM MOTION.

FOR DRIVING ON ANY GRADE OR SIDE SLOPE:

- PLATFORM MUST BE FULLY LOWERED.
- DO NOT EXCEED MAXIMUM PLATFORM OR EXTENSION LOAD CAPACITY. LOAD TO BE UNIFORMLY DISTRIBUTED, PLACE LOAD NEAR CENTER OF PLATFORM WHEN POSSIBLE.
- DO NOT DRIVE ON SIDE SLOPE IF OVER 25% (14°).
- DO NOT DRIVE UP OR DOWN A GRADE THAT IS GREATER THAN THE DRIVING GRADE SPECIFICATIONS FOR THIS MACHINE. SEE OPERATOR MANUAL FOR SPECIFICATIONS.

FOR DRIVING WITH PLATFORM ELEVATED:

- DRIVE ONLY ON A SMOOTH, FIRM, AND LEVEL SURFACE FREE OF OBSTRUCTIONS.
- DO NOT EXCEED MAXIMUM PLATFORM OR EXTENSION LOAD CAPACITY.
- LOAD MUST BE UNIFORMLY DISTRIBUTED.
- USE EXTREME CAUTION.

OTHER HAZARDS

1. DO NOT OVERLOAD PLATFORM LOAD CAPACITY.
2. DO NOT EXCEED MAXIMUM SIDE FORCE AND MAXIMUM NUMBER OF OCCUPANTS.
3. DO NOT USE WITHOUT GUARD RAILS IN PLACE AND ENTRY GATE PROPERLY SECURED.
4. DO NOT USE IF ANY PART IS MISSING, NOT WORKING PROPERLY OR IF ANY PART IS DAMAGED OR WORN.
5. DO NOT USE NEAR MOVING VEHICLES OR CRANES.
6. DO NOT STAND OR SIT ON GUARDRAILS.
7. ALL PERSONNEL SHALL ALWAYS MAINTAIN FIRM FOOTING ON PLATFORM FLOOR.
8. DO NOT USE WHILE UNDER THE INFLUENCE OF ALCOHOL OR DRUGS.
9. DO NOT OVERRIDE SAFETY DEVICES.
10. DO NOT LEAVE MACHINE UNATTENDED WITH KEY IN "ON" POSITION.
11. DO NOT RAISE PLATFORM WHILE MACHINED IS ON A TRUCK, FORKLIFT, OR OTHER DEVICE OR VEHICLE.
12. DO NOT USE LADDER, SCAFFOLDING, OR OTHER DEVICE ON PLATFORM TO INCREASE SIZE OR WORKING HEIGHT OF PLATFORM.
13. DO NOT ENTER OR EXIT PLATFORM WHILE IN MOTION.
14. DO NOT RECHARGE BATTERIES NEAR OPEN FLAME, SMOKING OR OPEN FLAME, BATTERIES EMIT HIGHLY EXPLOSIVE HYDROGEN GAS.
15. DO NOT PERFORM SERVICE ON THE MACHINE WITHOUT PROPERLY BLOCKING ELEVATING MECHANISM.
16. DO NOT ATTACH OVERHANGING LOADS OR OVERHEAD PLATFORM RAILS.

IMPROPER OPERATION OF THIS MACHINE COULD CAUSE DEATH OR SERIOUS INJURY.

2 90721

DANGER

YOU MUST NOT OPERATE THIS MACHINE	TIP-OVER HAZARDS
UNLESS YOU HAVE BEEN TRAINED IN THE SAFE OPERATION OF THIS MACHINE. TRAINING INCLUDES COMPLETE KNOWLEDGE OF THE SAFETY AND OPERATING INSTRUCTIONS CONTAINED IN THE MANUFACTURERS MANUAL, YOUR EMPLOYER'S WORK RULES AND APPLICABLE GOVERNMENTAL REGULATIONS. AN UNTRAINED OPERATOR SUBJECTS HIMSELF AND OTHERS TO DEATH OR SERIOUS INJURY.	DO NOT DRIVE NEAR DROP-OFF, HOLES OPEN ELEVATOR SHAFTS, AND LOADING DOCKS.
ELECTROCUTION HAZARD THIS MACHINE IS NOT INSULATED. MAINTAIN SAFE CLEARANCE FROM ELECTRICAL LINES AND APPARATUS. YOU MUST ALLOW FOR MACHINE AND LOAD SWAY OR SAG AND ELECTRICAL LINES WARNING. THIS MACHINE DOES NOT PROVIDE PROTECTION FROM CONTACT WITH OR PROXIMITY TO AN ELECTRICALLY CHARGED CONDUCTOR. YOU MUST MAINTAIN A CLEARANCE OF AT LEAST TEN (10) FEET BETWEEN ANY PART OF THIS MACHINE OR ITS LOAD AND ANY ELECTRICAL LINE OR APPARATUS CARRYING UP TO 50,000 VOLTS. ONE FOOT OF ADDITIONAL CLEARANCE IS REQUIRED FOR EVERY ADDITIONAL 30,000 VOLTS OR LESS.	DO NOT ELEVATE PLATFORM ON UNEVEN OR SOFT SURFACES. DO NOT DRIVE ONTO UNEVEN OR SOFT SURFACES WHEN ELEVATED.
	DO NOT RAISE PLATFORM ON SLOPE, OR DRIVE ONTO SLOPE WHEN ELEVATED.
	DO NOT RAISE PLATFORM IN WINDY OR GUSTY CONDITIONS
DEATH OR SERIOUS INJURY WILL RESULT FROM CONTACT OR INADEQUATE CLEARANCE	**DEATH OR SERIOUS INJURY WILL RESULT FROM IMPROPER USE OF THIS EQUIPMENT**

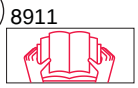
3 90730

WARNING

- PLATFORM EXTENSION MUST BE LOCKED IN PLACE AT ALL TIMES.
- SHEET LOADING GATE MUST BE IN LOWERED LOCKED POSITION BEFORE OPERATING FROM PLATFORM.
- PLATFORM ENTRANCE MUST BE PROPERLY CLOSED AND ALL GUARDRAILS PROPERLY IN PLACE AND SECURED BEFORE OPERATING FROM PLATFORM.

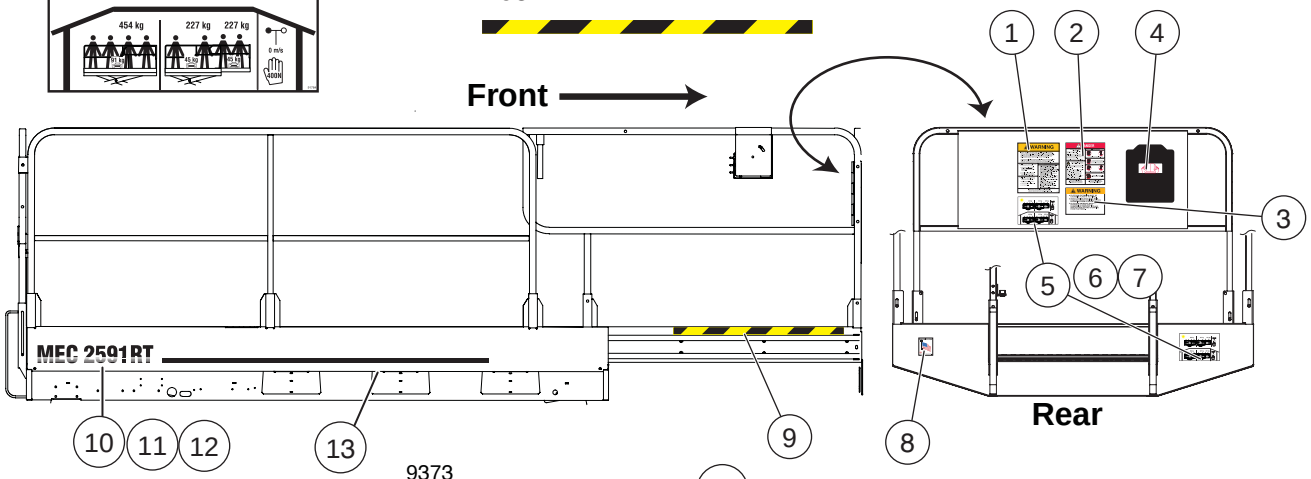
FAILURE TO FOLLOW INSTRUCTIONS COULD CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE

4 8911



8 90739

9 7982



10 9373 MEC 2591RT

13 8402

11 9372 MEC 3391RT

12 9371 MEC 4191RT

90719

14

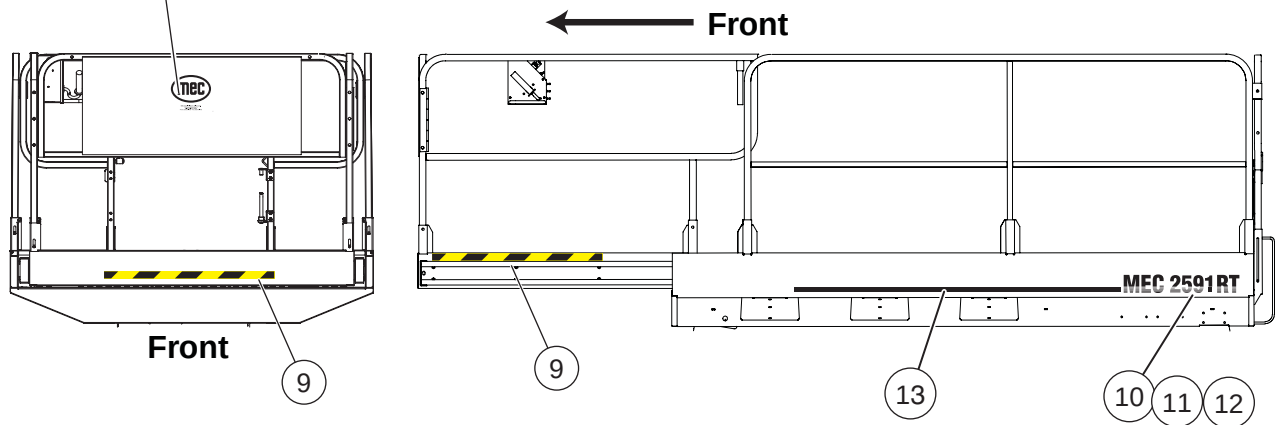


ILLUSTRATION No. ART_2147

2591RT - 3391RT - 4191RT: CE Models

Decals: Platform

Decals, Platform

ITEM	PART NO.	QTY	DESCRIPTION
1	91456	1	Decal, Warning Panel
2	90721	1	Decal, Danger Panel
3	90730	1	Decal, Warning, Sheet Loading
4	8911	1	Decal, Manual Case
5	91786	2	Decal, Wind Rating, 2591RT
6	91785	2	Decal, Wind Rating, 3391RT
7	91784	2	Decal, Wind Rating, 4191RT
8	90739	1	Decal, Made in USA
9	7982	3	Decal, Safety Stripe
10	9373	2	Decal, Model, 2591RT
11	9372	2	Decal, Model, 3391RT
12	9371	2	Decal, Model, 4191RT
13	8402	2	Decal, Rail Stripe
14	90719	1	Decal, MEC Oval

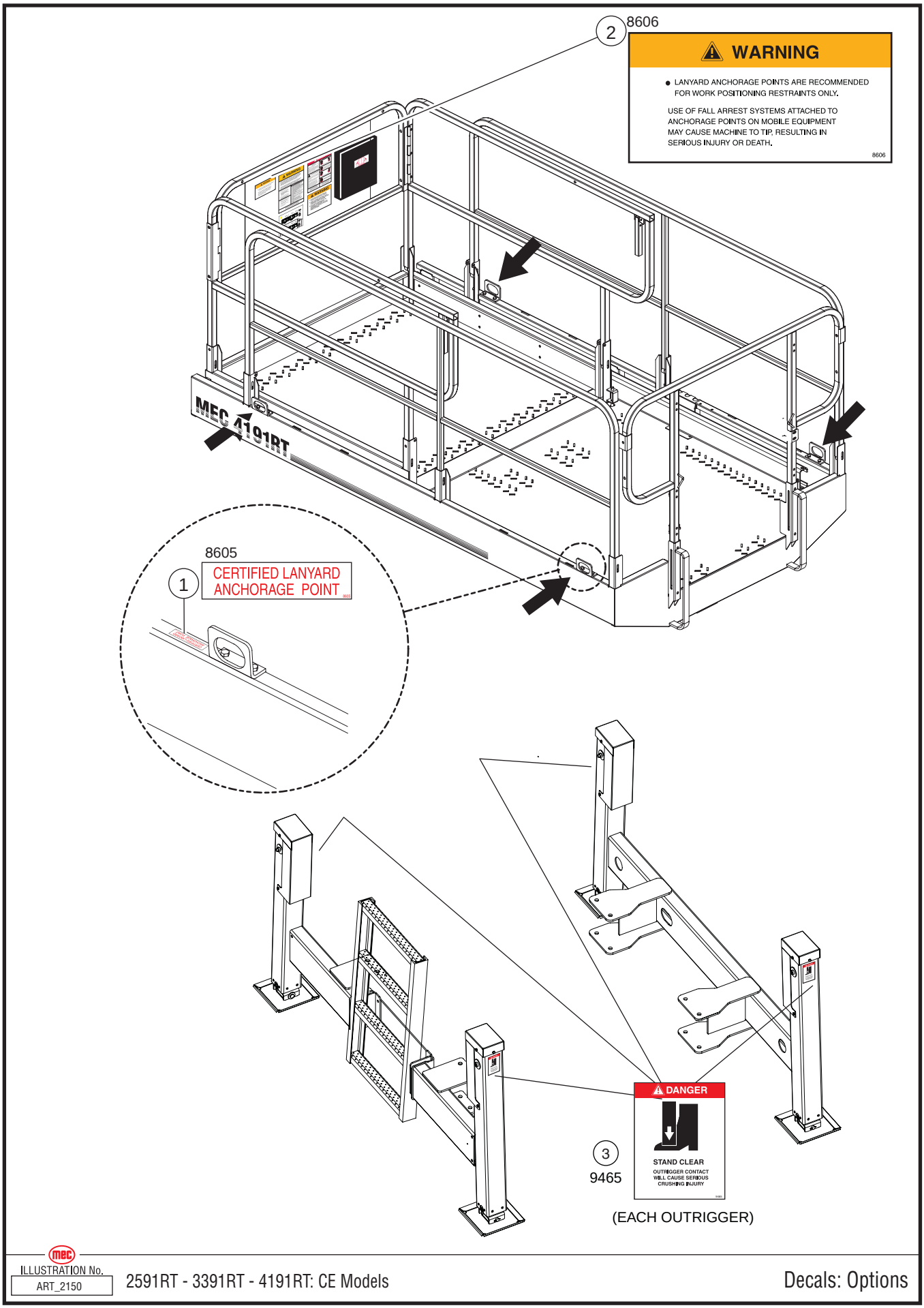


ILLUSTRATION No.
ART_2150

2591RT - 3391RT - 4191RT: CE Models

Decals: Options

Decals, Options

ITEM	PART NO.	QTY	DESCRIPTION
1	8605	4	Decal, Anchorage Point
2	8606	1	Decal, Warning, Lanyard
3	9465	4	Decal, Crush Hazard

NOTES:

Part Number Index

Part Number Index

Part Number Index

Part Number Index

H

Part Number Index

Part Number Index

Service Parts Order Form
Fax to 559-263-9631

Please fill out completely

Date: _____ Ordered By: _____

Account: _____ Your Fax No.: _____

Bill to: _____ Ship to: _____

_____ _____

_____ _____

_____ _____

Purchase Order Number _____ **Ship VIA**_____

**All orders MUST have a Purchase Order Number

**Fed Ex shipments require Fed Ex account number

Part Number	Description	Quantity	Price

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

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

_____

NOTES:

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.

1775 Park Street, Suite 77 • Selma, CA 93662 USA
Ph: 1-800-387-4575 • 559-891-2488 • Fax: 559-891-2448
E-mail:info@mecawp.com • Web:www.mecawp.com