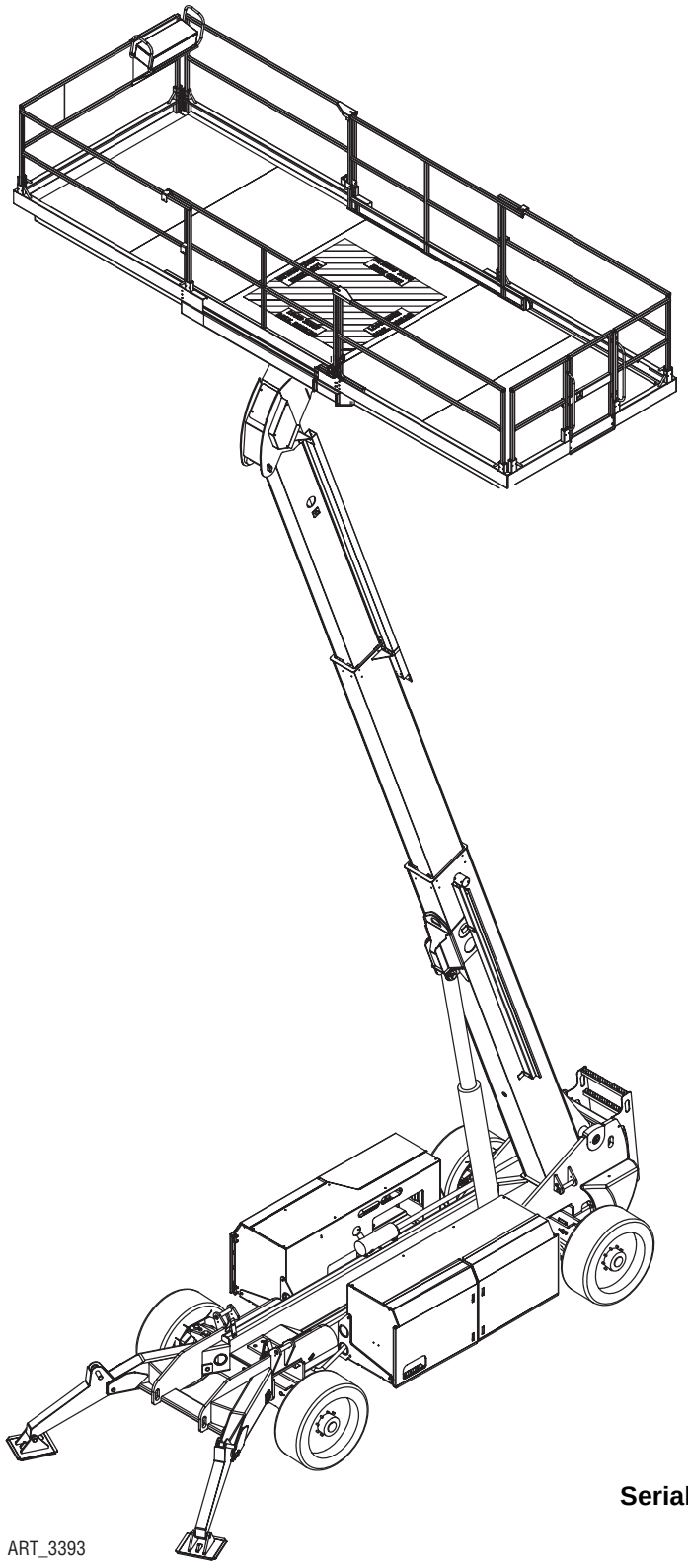
SERVICE AND PARTS MANUAL

Titan Boom 40-S



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INTRODUCTION

This manual consists of Service and Illustrated Parts sections.

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

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

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

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

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Machine Specifications - Titan Boom 40-S

TITAN Boom™ 40-S			
Working Height*		46 ft	14.2 m
Platform Height		40 ft	12.2 m
Maximum Drive Height		30 ft	9.1 m
Maximum Forward Reach w/ Stabilizers		26 ft 6 in	8 m
Machine Weight** (Unloaded)		24400 lb	11065 kg
Lift Capacity	Total	4000 lb	1810 kg
	Load Zone	3000 lb	1360 kg
	Personnel & Tools Evenly Distributed	1000 lb	450 kg
Maximum Occupants		4	
Stowed Height	Rails Up	118 in	3 m
	Rails Folded Down	84 in	2.13 m
Overall Length		22 ft 6 in	6.9 m
Overall Width		96 in	2.44 m
Wheel Base		152 in	3.85 m
Wheel Track		82 in	2.08 m
Platform Dimensions	Length	22 ft	6.7 m
	Platform Width	90 in	2.28 m
	Loading Height	72 in	1.83 m
Turning Radius, (4 Wheel Steer)	Inside	8 ft	2.4 m
	Outside	19 ft	5.8 m
Ground Clearance		18 in	46 cm
Lift/Lower Speeds		50 sec/ 50 sec	
Extend/Retract Speeds		30 sec/ 30 sec	
Platform Translation Speed		15 sec	
Drive Speed (Proportional)	Stowed	0-4 mph	0-6.4 km/h
	Raised or extended	0-.5 mph	0-.8 km/h
Gradeability	Stowed, downhill	40%/22°	
	Stowed, uphill	40%/22°	
Approach Angle		38%/21°	
Breakover Angle		40%/22°	
Platform Rotation		180° (+90°, -90°)	
Frame Level		10° each side	
Maximum Operating Wind Speed		28 mph	12.5 m/sec (45 km/h)
Ground Pressure/Wheel (Maximum)		160 psi	11.2 kg/cm^2
Maximum Wheel Load		9600 lbs	4350 kg
Tire Size		37 in. od	.94 m od
Wheel Lug Nut Torque		150 ft/lb	203 Nm
Hydraulic Pressure	Drive System	4350 psi	300 bar
	Main System	3000 psi	207 bar
Hydraulic Fluid Capacity		40 gal	150 liter

Engine	Kubota V2403-T
Fuel Type	Diesel
Fuel Capacity	32 gal 120 liter
Alternator	40 amp
Batteries	Two 1000 CCA 12V Group 31
Noise Level	86 dB(A) @ work station
Control System	12V DC
Brakes	4 wheel multi disc
Maximum Vibration	does not exceed 2.5 m/sec^2 at operator's position
Ambient Operating Range	-40° F (-40° C) minimum; 122° F (50° C) maximum

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

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 Aerial Work Platform has been designed, built, and tested to provide many years of safe, dependable service. Only trained, authorized personnel should be allowed to operate or service the machine.

MEC, As Manufacturer, Has No Direct Control Over Machine Application And Operation. Proper Safety Practices Are The Responsibility Of The User And All Operating Personnel.

If there is any question regarding application and/or operation contact:

MEC Aerial Work Platform

1401 S. Madera Avenue

Kerman, CA 93630 USA

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www.mecAWP.com

Safety Symbols

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

"DANGER" INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

THIS SIGNAL WORD IS LIMITED TO THE MOST EXTREME SITUATIONS.

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

"CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

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

General Safety Tips

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

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

Maintenance Tips

- 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.

Setting The Maintenance Chock

WARNING

NEVER PERFORM WORK OR INSPECTION ON THE MACHINE WITH THE PLATFORM ELEVATED WITHOUT FIRST BLOCKING THE BOOM ASSEMBLY WITH THE MAINTENANCE CHOCK.

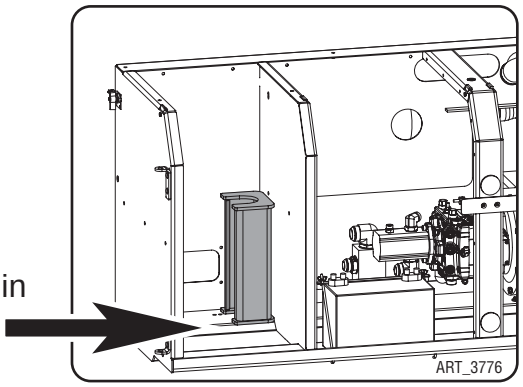
THE MAINTENANCE CHOCK IS HEAVY. HOLD IT SECURELY DURING THE INSTALLATION AND REMOVAL PROCESS.

THE MAINTENANCE CHOCK MAY ROTATE AROUND THE CYLINDER ROD DURING MACHINE MOVEMENT AND MAY FALL IF IT IS NOT HELD SECURELY IN PLACE DURING INSTALLATION AND REMOVAL.

The Maintenance Chock fits over the lift cylinder rod, between the rod end and the end of the cylinder barrel.

Installation

Figure 1-1: Maintenance Chock Stowage

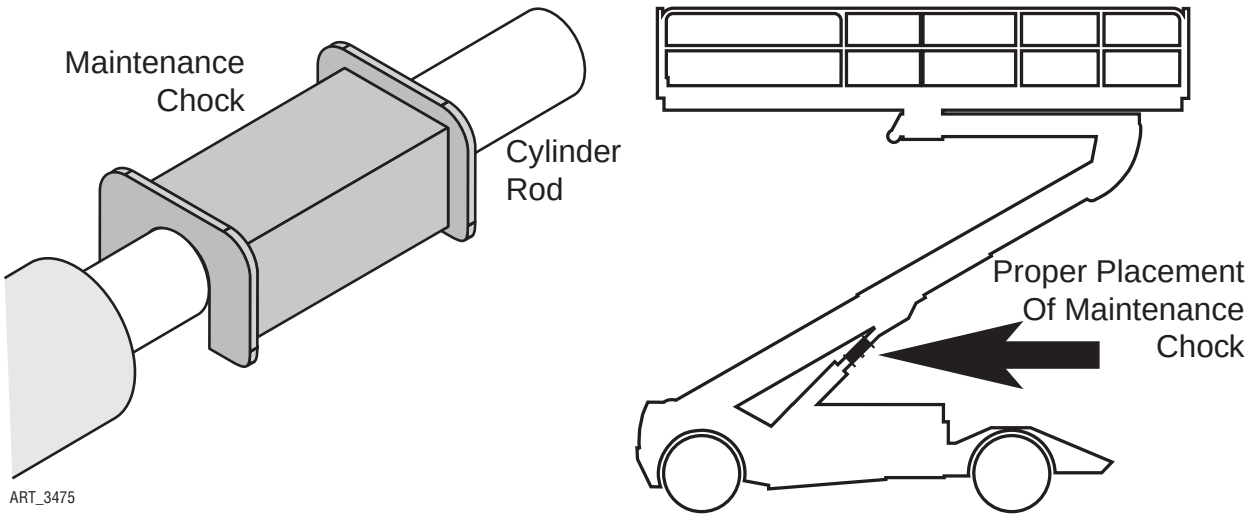


- Remove the Maintenance Chock from the tool storage compartment of the Engine Module.
- Using the Boom Lift/Lower function, raise the platform to approximately 13 feet (4 m).
- Place the Maintenance Chock over the cylinder rod above the cylinder barrel.
- Using the Boom Lift/Lower function, slowly lower the boom until the Maintenance Chock is secure between the cylinder rod end and the cylinder barrel.

Removal

- Using the Boom Lift/Lower function, raise the platform to approximately 13 feet (4 m) until the Maintenance Chock moves freely.
- Remove the Maintenance Chock from the cylinder rod.
- Store the Maintenance Chock in the tool storage compartment of the Engine Module.

Figure 1-2: Maintenance Chock Installation



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

To prevent damage to battery and/or electrical system:
• Always disconnect the negative battery cable first.
• Always connect the positive battery cable first.

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

TOTAL SYSTEM

WARNING

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 MAY CAUSE SEVERE SCALDING.

CAUTION

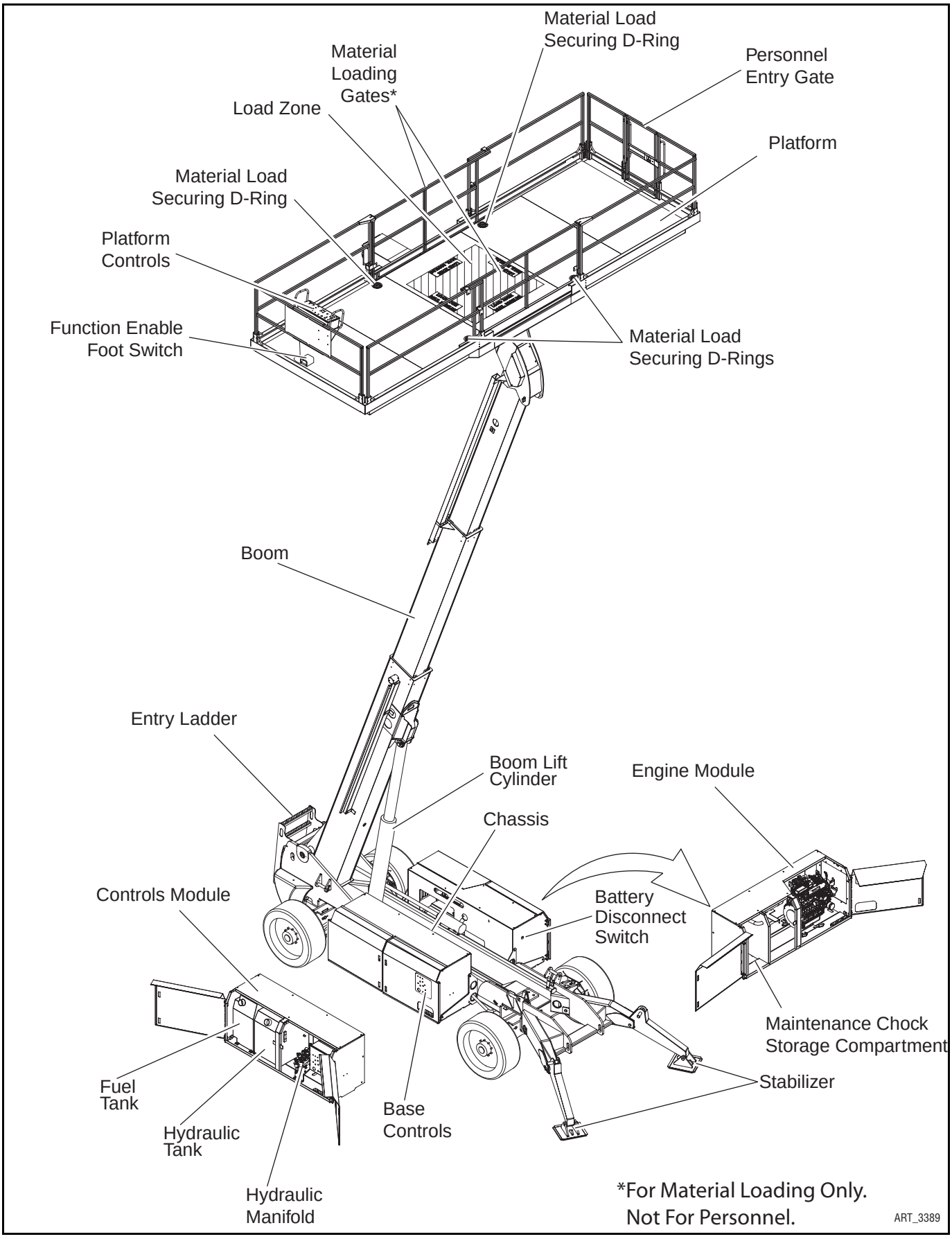
Failure to perform preventive maintenance at recommended intervals may result in the unit being operated with a defect that could result in injury or death of the operator.

Immediately report to your supervisor any defect or malfunction. Any defect shall be repaired prior to continued use of the aerial work platform.

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

Primary Machine Components

Figure 1-3: Component Locations



Torque Specifications

Fasteners

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

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

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

Torque values apply to 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 ELEVATING ASSEMBLY.

EMERGENCY STOP

Figure 1-4: Emergency Stop Switch

ART_3353

The machine is equipped with an EMERGENCY STOP switch on both control panels.

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

SELECTOR SWITCH SET TO PLATFORM

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

SELECTOR SWITCH IS SET TO BASE

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

EMERGENCY LOWERING

WARNING

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

DO NOT CLIMB DOWN THE BOOM ASSEMBLY OR EXIT THE PLATFORM.

The Emergency Lowering System is used to lower the platform in case of power failure. To lower the platform, activate the Emergency Power Switch to run the Emergency Down auxiliary hydraulic pump.

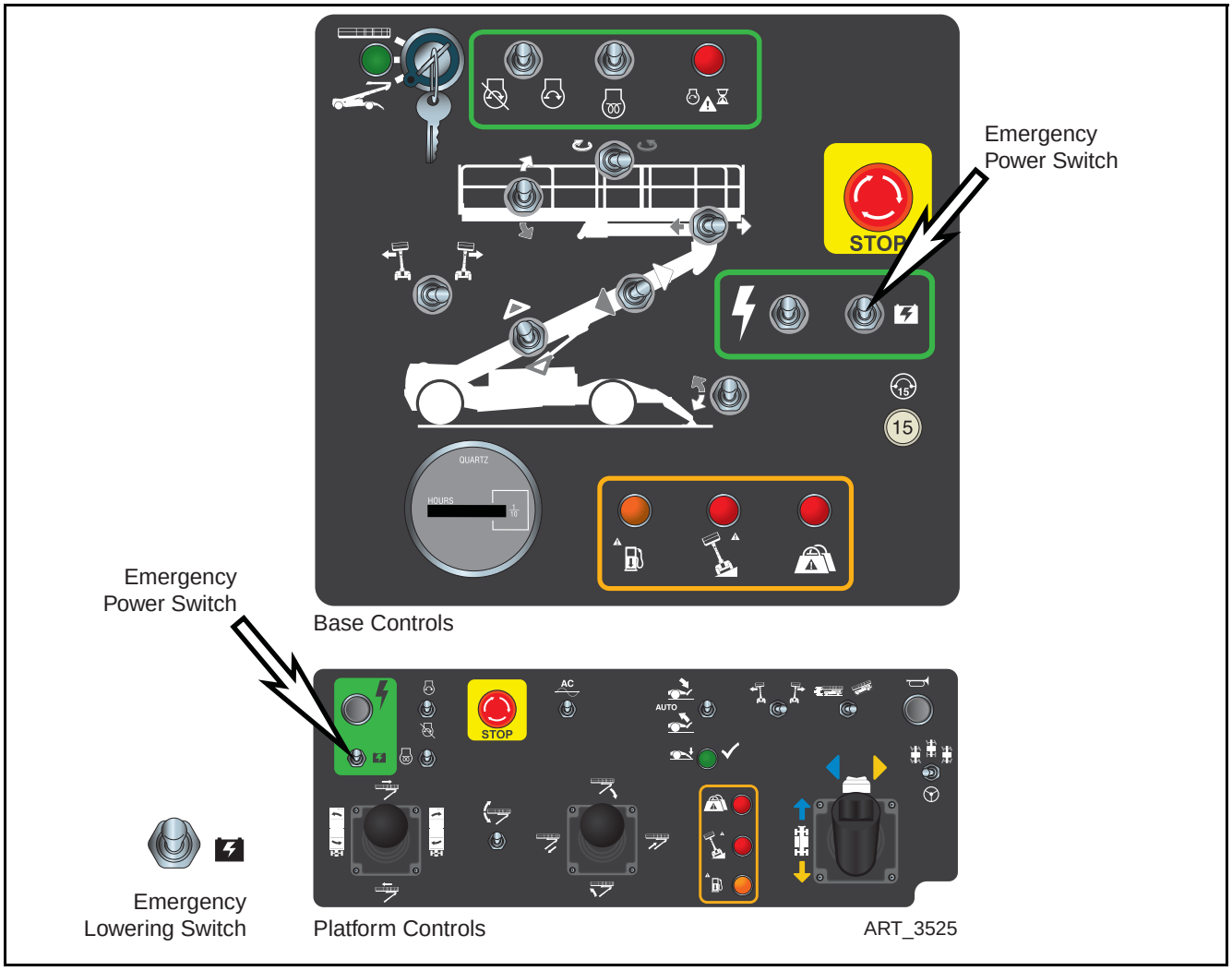
This function uses battery power from the auxiliary battery to lower the platform.

- Push and hold the Emergency Power Switch, then use the Boom Extend/Retract function to retract the boom.
- Continue to hold the Emergency Power Switch, then use the Boom Lift/Lower function to lower the boom.

NOTE: The Emergency Lowering System overrides the engine function. The engine will shut off when the Emergency Power Switch is engaged.

The Emergency Power Switch serves as an enable switch. It is not necessary to use the primary function enable switch.

Figure 1-5: Emergency Power Switch



Free-wheel configuration for Winching or Towing

The machine can be winched or moved short distances in case of power failure at speeds not to exceed 5 MPH (8.05 km/h). Before towing or winching the machine, it is necessary to release the brake. Reset the brakes after winching or towing.

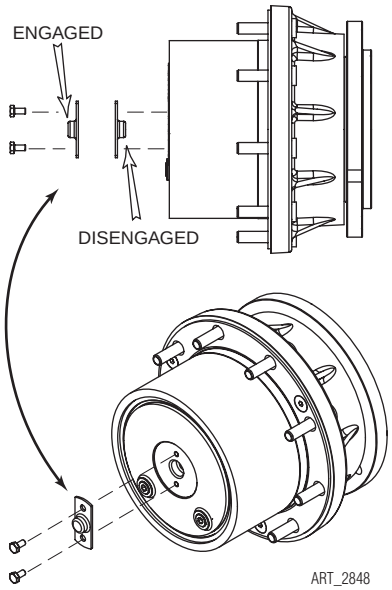
DANGER

RUNAWAY HAZARD!

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

ALWAYS CHOCK THE WHEELS BEFORE MANUALLY RELEASING THE BRAKES.

Figure 1-6: Brake Release



Disengage Brakes Before Towing or Winching

- Chock the wheels.
- Remove the Brake Engage Cap and reinstall with the bump facing inward on all four (4) hubs.

Engage Brakes Before Driving

- Remove the Brake Engage Cap and reinstall with the bump facing outward on all four (4) hubs.

Lift and Support the Machine

DANGER

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

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

- a jack with a lifting capacity of seven (7) tons or more.
- jack stands with a rating of seven (7) tons or more.

To raise the machine

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

To lower the machine

1. Tighten lug nuts to hold the wheel snug to the hub. Do not torque the lug nuts at this time.
2. Raise machine slightly and remove jack stands.
3. Lower the machine and remove the jack.
4. Tighten lug nuts to proper torque (refer to machine specifications).
5. Remove chocks.

Transporting the Machine

Safety Information

WARNING

THIS INFORMATION IS PROVIDED FOR REFERENCE AND DOES NOT SUPERSEDE ANY GOVERNMENT OR COMPANY POLICY REGARDING THE LOADING, TRANSPORT OR LIFTING OF MEC MACHINERY.

DRIVERS ARE RESPONSIBLE FOR LOADING AND SECURING MACHINES, AND SHOULD BE PROPERLY TRAINED AND AUTHORIZED TO OPERATE MEC MACHINERY.

DRIVERS ARE ALSO RESPONSIBLE FOR SELECTING THE CORRECT AND APPROPRIATE TRAILER ACCORDING TO GOVERNMENT REGULATIONS AND COMPANY POLICY.

DRIVERS MUST ENSURE THAT THE VEHICLE AND CHAINS ARE STRONG ENOUGH TO HOLD THE WEIGHT OF THE MACHINE (SEE THE SERIAL NUMBER PLATE FOR MACHINE WEIGHT).

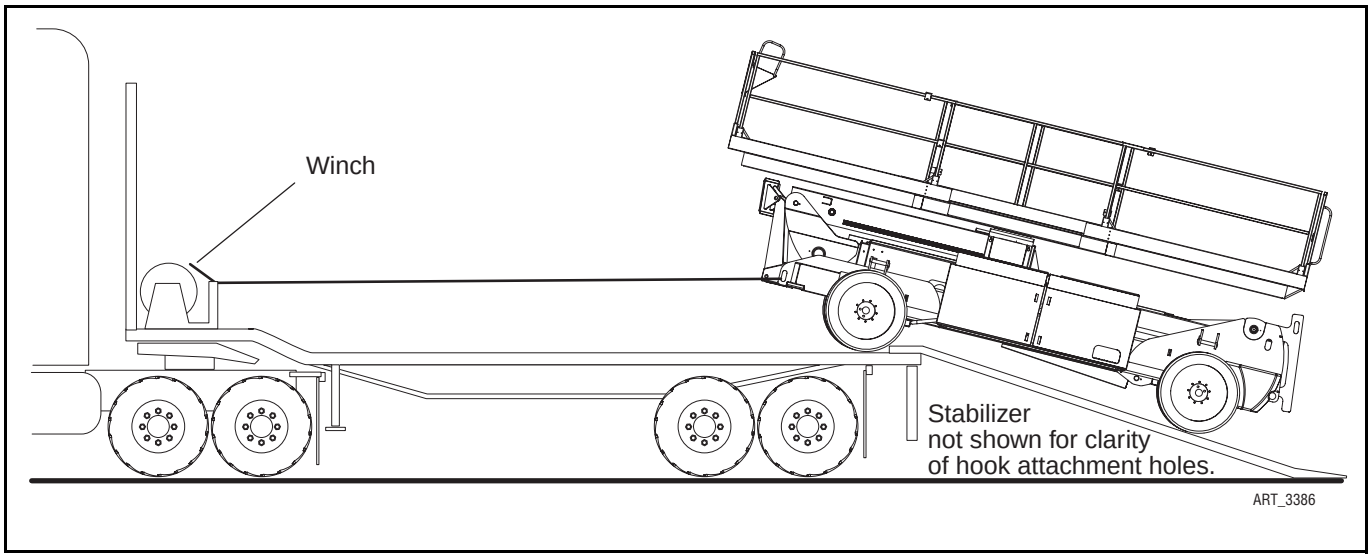
Driving or Winching onto or off of a Transport Vehicle

WARNING

MEC DOES NOT RECOMMEND UNASSISTED LOADING OR UNLOADING. ALWAYS ATTACH THE MACHINE TO A WINCH WHEN LOADING OR UNLOADING FROM A TRUCK OR TRAILER BY DRIVING.

Refer to the Operator's Manual for loading, unloading, driving and operating instructions.

Figure 1-7: Loading the Machine



SERVICE

Section 1

HYDRAULIC SYSTEM

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FIGURES PAGE

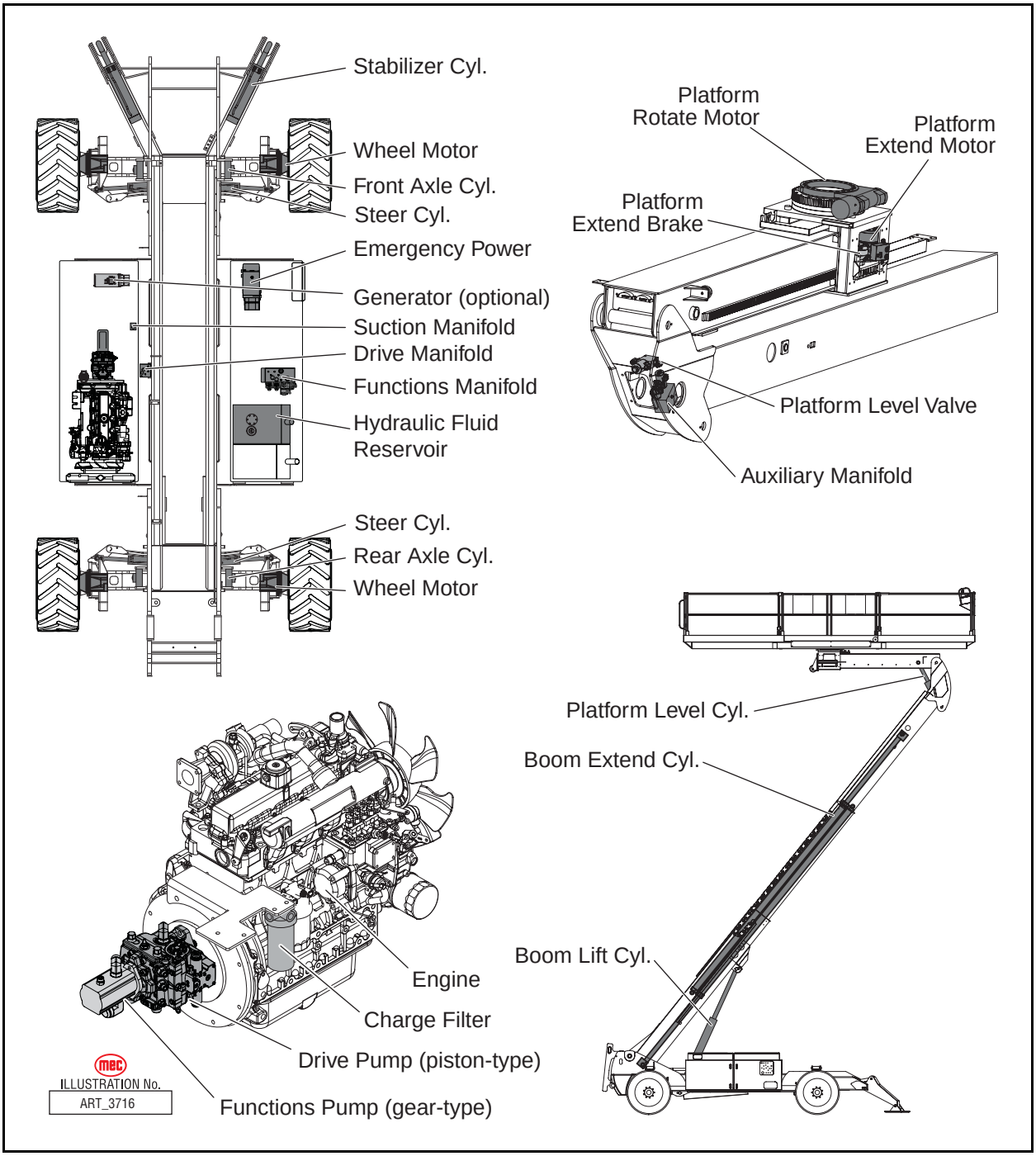
HYDRAULIC SYSTEM – GENERAL

The hydraulic integrated system is designed to control all or part of machine functions by integrating various hydraulic cartridge valves into three manifolds to provide directional, pressure, flow, and load control.

The hydraulic system is a feedback, load-sensing type. Hydraulic fluid is provided by a variable displacement, axial piston-type Drive Pump which is directly coupled to the engine, and by a fixed displacement gear-type Functions Pump mounted to the back of the piston pump. As the engine turns, the hydraulic pumps draw fluid from the reservoir and pump this fluid to the valve manifolds.

Each function has a maximum pressure control limit set by pressure relief valves.

Figure 1-1: Hydraulic System



HYDRAULIC ROADMAP

HYDRAULIC RESERVOIR

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

SUCTION MANIFOLD

The Suction Manifold takes fluid in from the Hydraulic Tank and sends it out the Drive Pump and Function Pump

DRIVE PUMP

The piston-type Drive Pump with infinitely variable proportional control delivers hydraulic fluid under pressure to the Drive Manifold.

FUNCTIONS PUMP

The tandem gear-type Functions Pump delivers hydraulic fluid under pressure to the Functions Manifold.

DRIVE MANIFOLD

The Drive Manifold directs hydraulic fluid to the Wheel Motors and contains valve circuitry that improves performance on slippery surfaces.

AUXILIARY MANIFOLD

The Auxiliary Manifold provides hydraulic fluid pressure to the Platform Level, Rotate and Slide functions.

FUNCTIONS MANIFOLD

The Functions Manifold directs the hydraulic fluid to the Boom Lift, Boom Extend, Stabilizer, Axle and Steering Cylinders through the use of electronically-operated solenoid valves.

WHEEL MOTORS

There are four 2-speed hydraulic wheel motors to provide power to all four wheels. The wheel motors turn gear hubs with integral spring-applied, hydraulically-released brakes. The brakes are released by hydraulic pressure from the Functions Manifold. The drive system is hydrostatic; deceleration is provided by the drive motor.

AXLE CYLINDERS

Four hydraulic cylinders control angle of the axles relative to the frame. The front axle cylinders move freely and allow the front axle to float when driving over rough terrain when the platform is stowed. When platform is elevated, the front axle cylinders lock in place to increase machine stability. The rear axle cylinders are used to level the frame before elevating. Each cylinder has an integral counterbalance valves for load-holding.

STEERING SYSTEM

This machine has three steering modes: 2-wheel, 4-wheel and Crab steer. Rear-wheel steering is not self-centering, and the rear wheels must be centered before selecting 2-wheel mode.

If the front and rear wheels become out of phase, place the machine in Crab steering mode, then press and hold the steering button until all four wheels are turned fully in one direction. Return the wheels to center before switching to 2-wheel or 4-wheel mode.

STABILIZER SYSTEM

Two hydraulic cylinders stabilize the machine in the fore-and-aft plane.

BOOM LIFT CYLINDER
One hydraulic lift cylinder raises and lowers the boom.

BOOM EXTEND CYLINDERS
Two cylinders mounted tandem are used to extend and retract the boom. No sequencing cables or chains are used.

PLATFORM LEVEL VALVE
This valve controls the flow of hydraulic fluid to the Platform Level Cylinder.

PLATFORM LEVEL CYLINDER
One hydraulic cylinder levels the platform as needed as the boom is raised and lowered.

PLATFORM ROTATE MOTOR
One hydraulic motor turns a worm gear to rotate the position of the platform relative to the chassis.

PLATFORM EXTEND MOTOR
One hydraulic motor slides the platform fore-and-aft along the platform beam using a spur gear and rack drive system.

PLATFORM EXTEND BRAKE
This brake unit prevents the platform from moving when the Platform Extend Motor is not in use.

EMERGENCY POWER UNIT
The Emergency Power Unit provides hydraulic fluid power to lower the platform in the event of engine failure or emergency.

GENERATOR SYSTEM -- OPTIONAL
If equipped, the generator is driven by a hydraulic motor which receives hydraulic fluid directly from the pressure port of the Functions 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. SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

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

FLUID LEAKS UNDER PRESSURE MAY NOT ALWAYS BE VISIBLE.

FLUID RECOMMENDATIONS

MEC recommends only the use of the **Mobile Fluid** hydraulic fluids listed in the chart below, and each only in the operating temperatures listed in the chart. Do not substitute other fluids as pump damage may result, and use only the fluid appropriate to the ambient operating temperature.

Table 1-1: Hydraulic Fluid

Recommended Hydraulic Fluid	
> 30° F (0° C)	Chevron 1000THF
0° F (-18° C) ~ 30° F (0° C)	Chevron Rando Premium MV
< 0° F (-18° C)	Chevron Rando Premium MV

SYSTEM FLUSHING PROCEDURE

1. With boom fully lowered and retracted, 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 filter elements.
4. Flush the hoses with clean hydraulic fluid.
5. Discard old filter elements 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. Use only the appropriate hydraulic fluid as recommended in "Fluid Recommendations" on page 1-7.
9. Loosen the output hose fittings at the Functions Pump to flood with hydraulic fluid. Tighten fittings.
10. Perform the "Drive Pump Start-Up Procedure" on page 1-11.

CAUTION

DO NOT operate the Drive Pump until you have completed the "Drive Pump Start-Up Procedure" on page 1-11. Severe damage will occur.

11. Start up the machine. Briefly operate all functions. Two or three complete cycles may be necessary to purge all air from Boom Lift and Boom Extend cylinder(s).
12. When the above procedures have been completed, lower the platform to the stowed position, completely retract the stabilizers, then fill hydraulic reservoir to the full mark on sight gauge.
13. Check for leaks and correct as necessary. Machine is now ready to be placed into operation.

HYDRAULIC FLUID RESERVOIR

The Hydraulic Fluid Reservoir Assembly consists of the reservoir, a lockable 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 weekly.

HYDRAULIC FILTERS

The Hydraulic Fluid Reservoir contains a filter. Additionally, all machines have a Charge Filter Assembly attached to the engine.

When the filter is clogged, hydraulic flow bypasses the filter element.

Replace all filter elements every six (6) months or 500 hours. Extremely dirty conditions may require that the filter be replaced more often.

WARNING

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

HYDRAULIC PUMPS

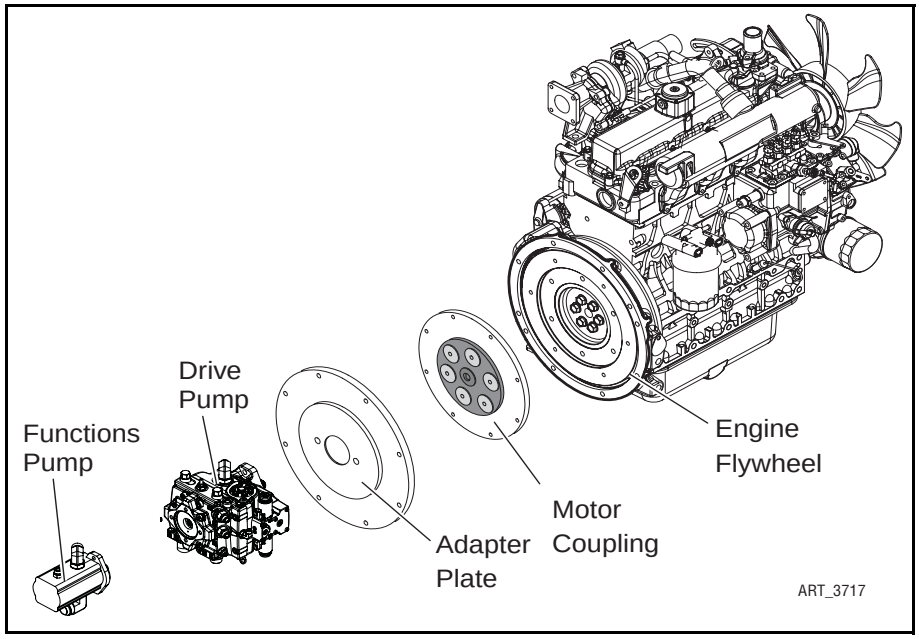
NOTE: Refer to *Parts Section E*.

An internal combustion engine drives the Drive Pump and the Functions Pump.

The Drive Pump is a variable displacement axial piston pump that provides hydraulic power to the Drive Motors. This is a hydrostatic drive system.

The Functions Pump is a gear pump that provides hydraulic power to the Functions Manifold.

Figure 1-2: Engine & Hydraulic Pumps



REMOVE

1. Turn the Battery Disconnect Switch (inside Control Module) to the OFF position.
2. Place a large container under the engine and pump to catch fluid that will be lost during pump replacement. Dispose of used fluid properly.
3. Close the ball valve on the Hydraulic Tank to prevent fluid loss when the hoses are removed.
4. Tag and disconnect hydraulic hoses, and IMMEDIATELY cap or cover the openings to prevent contamination.
5. Remove the two (2) bolts that hold the Functions Pump to the Drive Pump. Remove the gear pump.
6. Remove the two (2) bolts that hold the Drive Pump to the housing. Remove the piston pump.
7. Installation is reverse of removal. Apply one (1) drop of Loctite® 242 or equivalent to each mounting bolt.
8. Open the ball valve on the Hydraulic Tank.

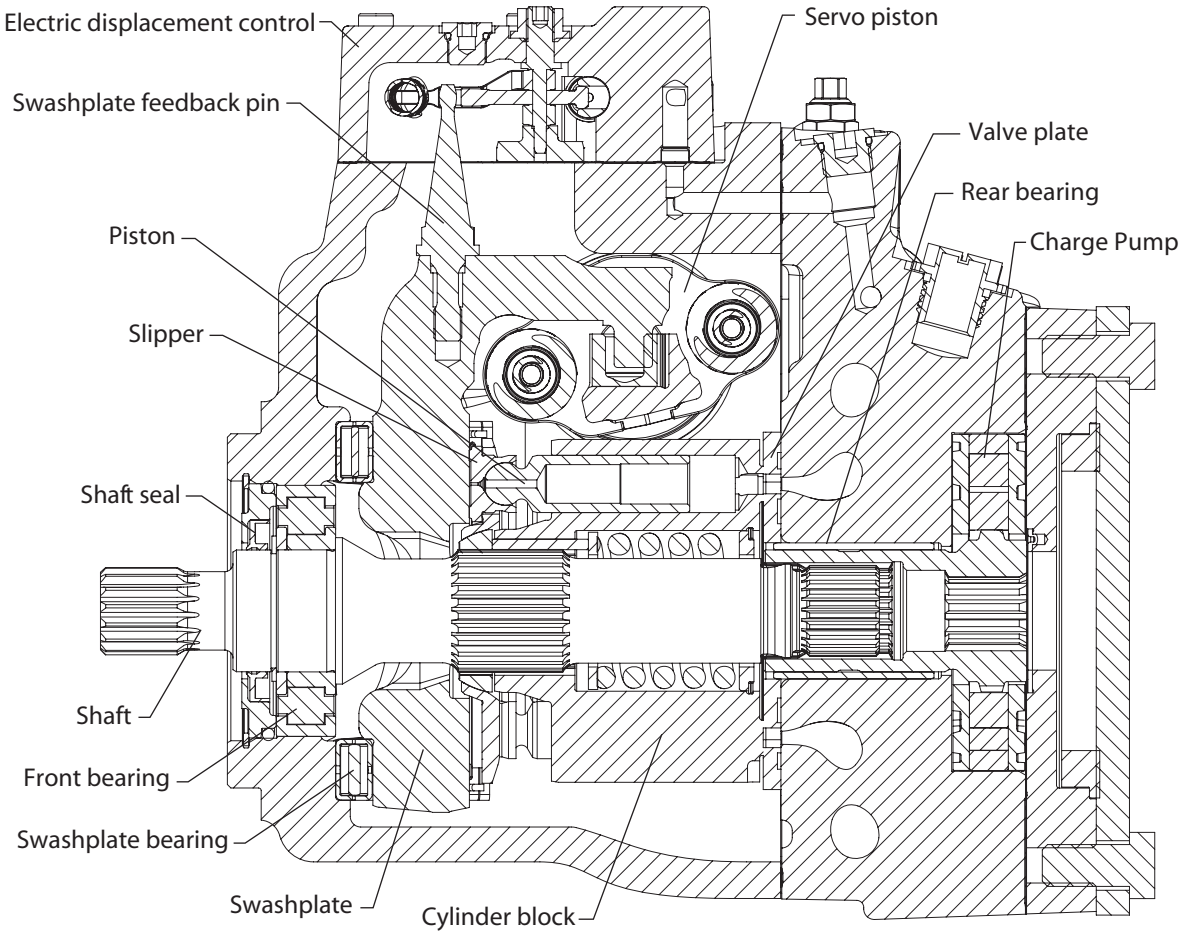
CAUTION

Failure to open the ball valve on the Hydraulic Tank will result in damage to the pumps.

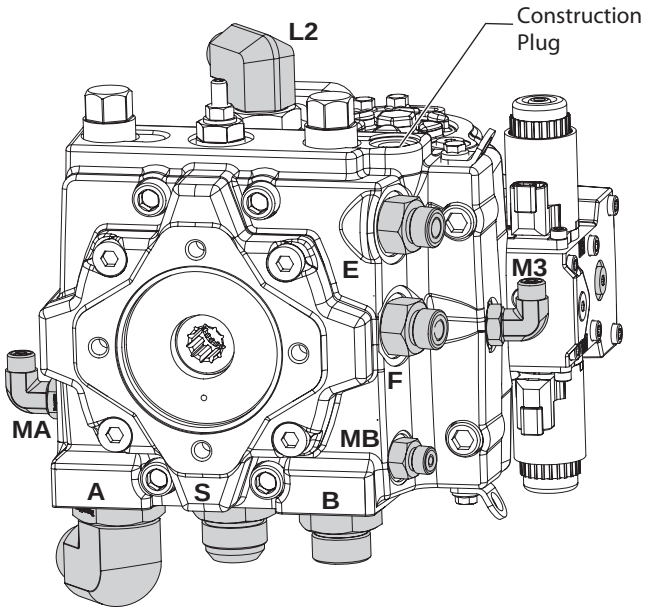
DO NOT operate the Drive Pump until you have completed the "Drive Pump Start-Up Procedure" on page 1-11. Severe damage will occur.

DRIVE PUMP

Figure 1-3: Drive Pump



Pump Port	Connection
A	out to Drive Manifold A
B	out to Drive Manifold B
S	in from Suction Manifold
E	in from Charge Filter
F	out to Charge Filter
MA	out to Functions Manifold DA
MB	out to Functions Manifold DB
M3	out to Functions Manifold CP
L2	Case drain -- out to Tank



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DRIVE PUMP START-UP PROCEDURE

Follow this procedure when restarting a machine on which the Drive Pump has been:

- Removed and re-installed, or
- Drained of fluid for any reason.

WARNING

UNINTENDED MOVEMENT OF THE MACHINE OR MECHANISM MAY CAUSE INJURY. CHOCK THE WHEELS SECURELY BEFORE PERFORMING THIS PROCEDURE.

Inspect the pump for damage prior to installation. Use only the appropriate hydraulic fluid as recommended in "Fluid Recommendations" on page 1-7.

1. Ensure that the machine's hydraulic oil and system components (reservoir, hoses, valves, fittings, and heat exchanger) are clean and free of any foreign material.
2. Install new system filter element(s) if necessary. Check that inlet line fittings are properly tightened and that there are no air leaks.
3. Install the pump. Do not yet connect the hose between port L2 and the hydraulic fluid tank.
4. Install a 1000 psi (50 bar) gauge in the pressure gauge port GCP on the Functions Manifold.
5. Fill the housing by adding filtered hydraulic fluid in port L2. Open the Construction Plug to assist in air bleed.
6. Fill the reservoir with hydraulic fluid. Use a 10-micron filler filter. Fill the inlet line from reservoir to pump.
7. Fill the hydraulic hoses that connect ports E and F to the charge filter.
8. Connect the hose between port L2 to the hydraulic fluid tank. Close the Construction Plug removed in step 4.

CAUTION

After start-up the fluid level in the reservoir may drop due to system components filling. Damage to hydraulic components may occur if the fluid supply runs out. Ensure reservoir remains full of fluid during start-up.

Air entrapment in oil under high pressure may damage hydraulic components. Check carefully for inlet line leaks.

Do not run at maximum pressure until system is free of air and fluid has been thoroughly filtered.

9. Disable the engine to prevent it from starting by disconnecting the fuel shutoff solenoid. Crank the starter for several seconds. Do not to exceed the engine manufacturer's recommendation. Wait 30 seconds and then crank the engine a second time as stated above. This operation helps remove air from the system lines. Refill the reservoir to recommended full oil level.
10. When the gauge begins to register charge pressure, reconnect the fuel shutoff solenoid, then start engine. Let the engine run at low idle for a minimum of 30 seconds to allow the remaining air to work itself out of the system. Check for leaks at all line connections and listen for cavitation. Check for proper fluid level in reservoir.

11. When charge pressure rises above 160 psi (11 bar), increase engine speed to normal operating rpm to further purge residual air from the system.
12. Shut off the engine. Connect the pump control signal wires. Start the engine, checking to be certain pump remains in neutral. Run the engine at normal operating speed and carefully check for forward and reverse control operation.
13. Continue to cycle between forward and reverse for at least five minutes to bleed all air and to flush system contaminants out of loop.

NOTE: Normal charge pressure fluctuation will occur during forward and reverse operation.

14. Check that the reservoir is full. Remove the pressure gauge.
15. The pump is now ready for operation.

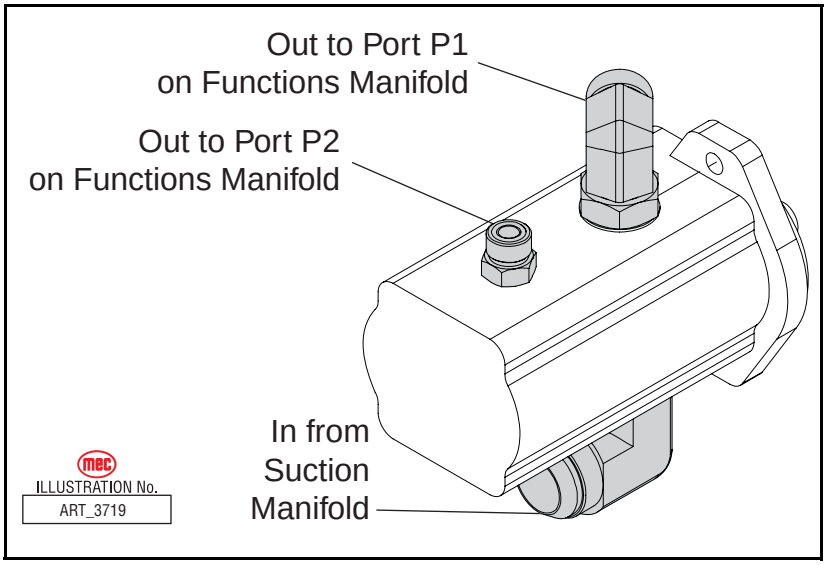
DRIVE PUMP SERVICE

MEC does not recommend end-user maintenance or repair of the Sauer Danfoss hydraulic pump. Contact MEC or Sauer Danfoss for the nearest service provider.

FUNCTIONS PUMP

The Functions Pump is a fixed-displacement gear pump. Power to functions is controlled by the proportional valves, and unused pressure is returned to the tank by the Flow Regulator (EPFR1).

Figure 1-4: Functions Pump



HYDRAULIC MANIFOLDS

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

This machine has three hydraulic manifolds: the Functions Manifold, the Auxiliary Manifold and the Drive Manifold.

CAUTION

- **Clean all fittings before disconnecting hoses.**
- **Tag all hoses and wiring for proper reassembly.**
- **Plug all openings immediately to prevent contamination.**
- **Replace any O-rings and inspect all hoses for crack and damage before reassembly.**

REMOVAL

1. Disconnect the negative battery terminal.
2. Close the ball valve on the Hydraulic Tank to prevent fluid loss when the hoses are removed.
3. Tag and disconnect the solenoid valve electrical leads.
4. Tag and disconnect hydraulic hoses. Immediately cap the openings to prevent contamination.
5. Remove the bolts that hold the manifold to the mounting bracket.
6. Remove the manifold block.

DISASSEMBLY

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

CLEANING AND INSPECTION

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

ASSEMBLY

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

1. Install fittings, plugs, springs, balls, and orifices. Use one drop of Loctite 242 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. Open the ball valve on the Hydraulic Tank.

CAUTION

Failure to open the ball valve on the Hydraulic Tank will result in damage to the pumps.

5. Connect the battery.
6. Operate each hydraulic function and check for leaks and for proper operation.
7. Adjust valve pressures.

Figure 1-5: Functions Manifold, Components

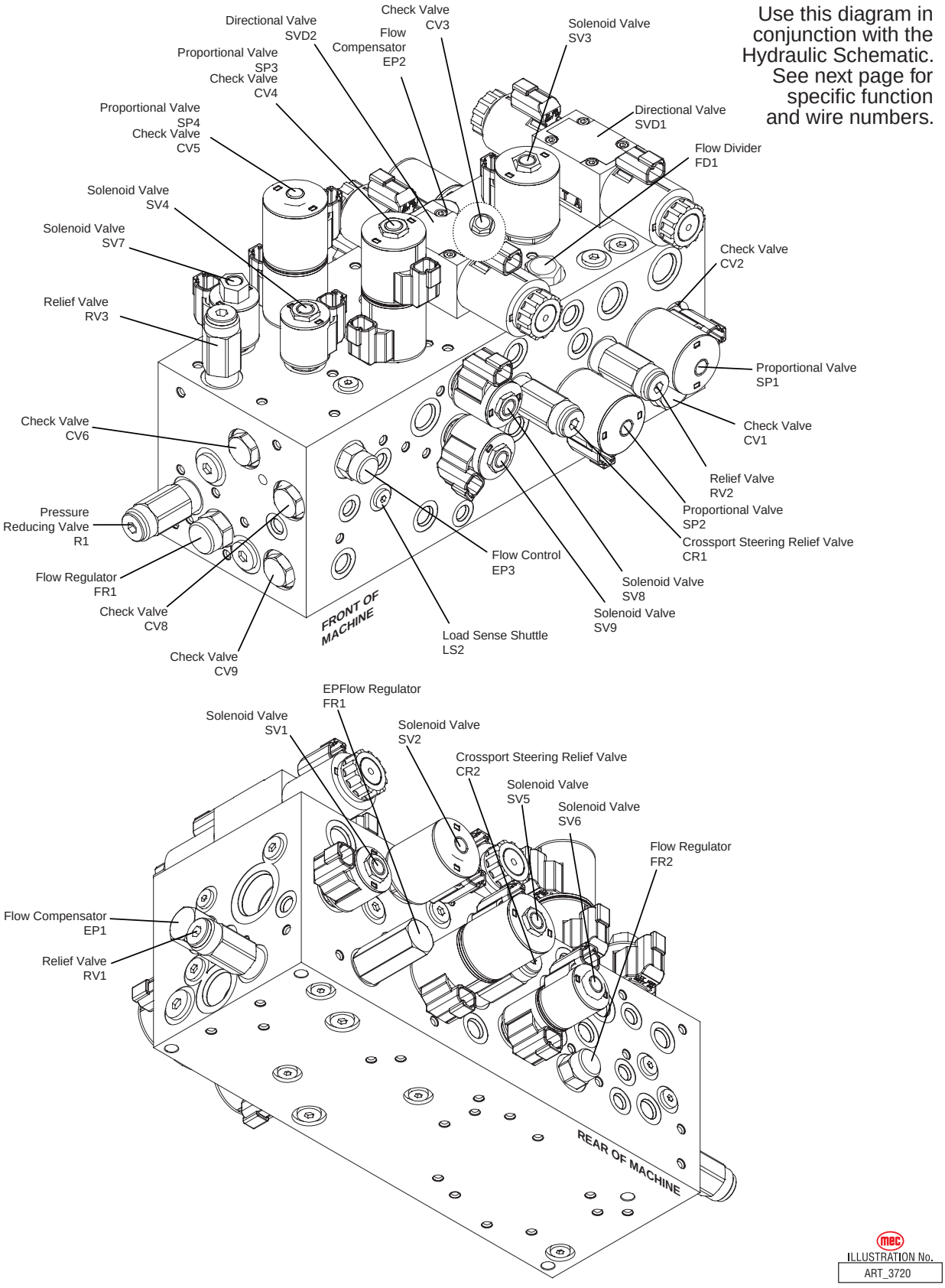


Figure 1-6: Functions Manifold, Wiring Harness Connections

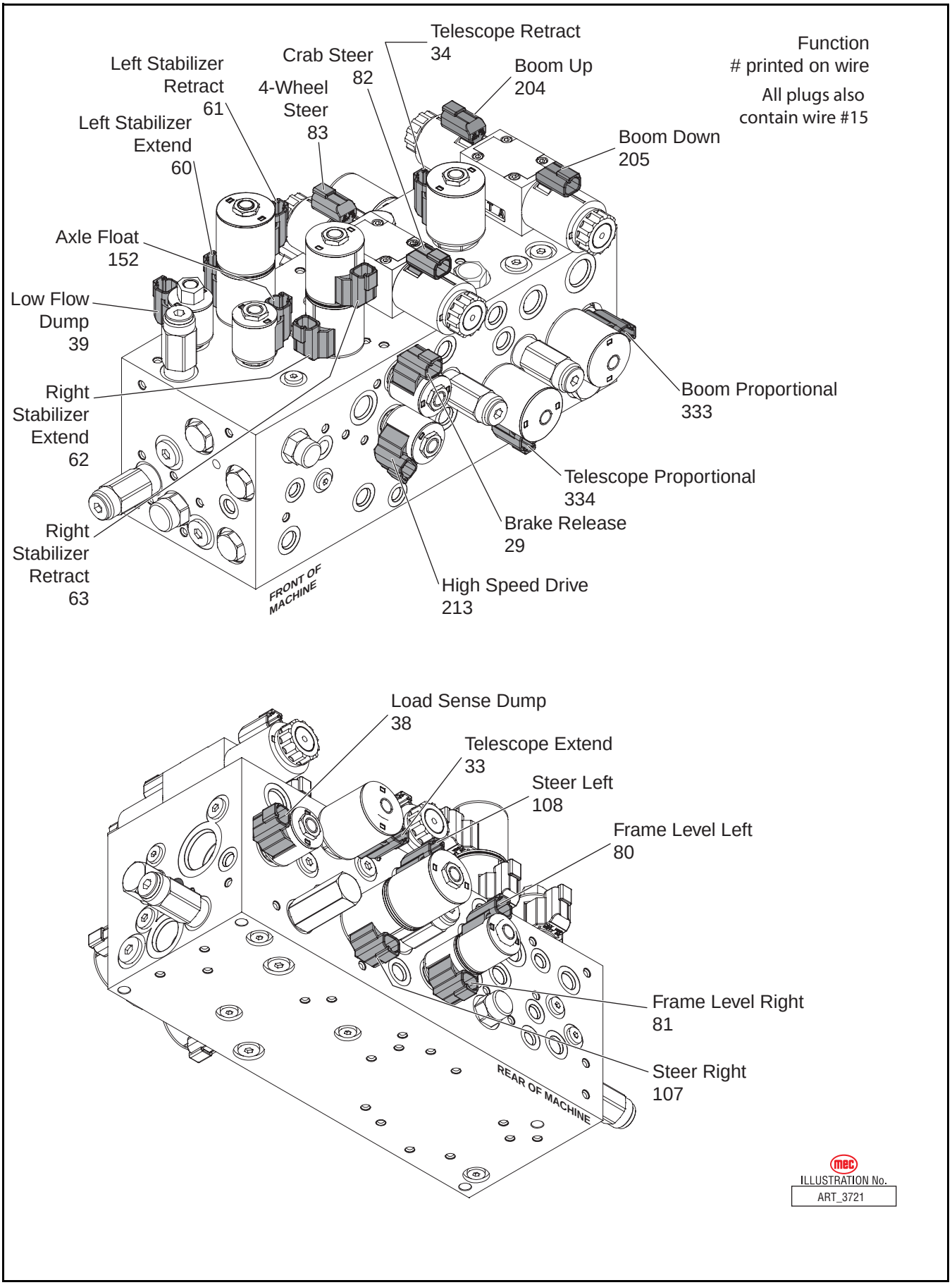


Figure 1-7: Functions Manifold, Fitting Orientation

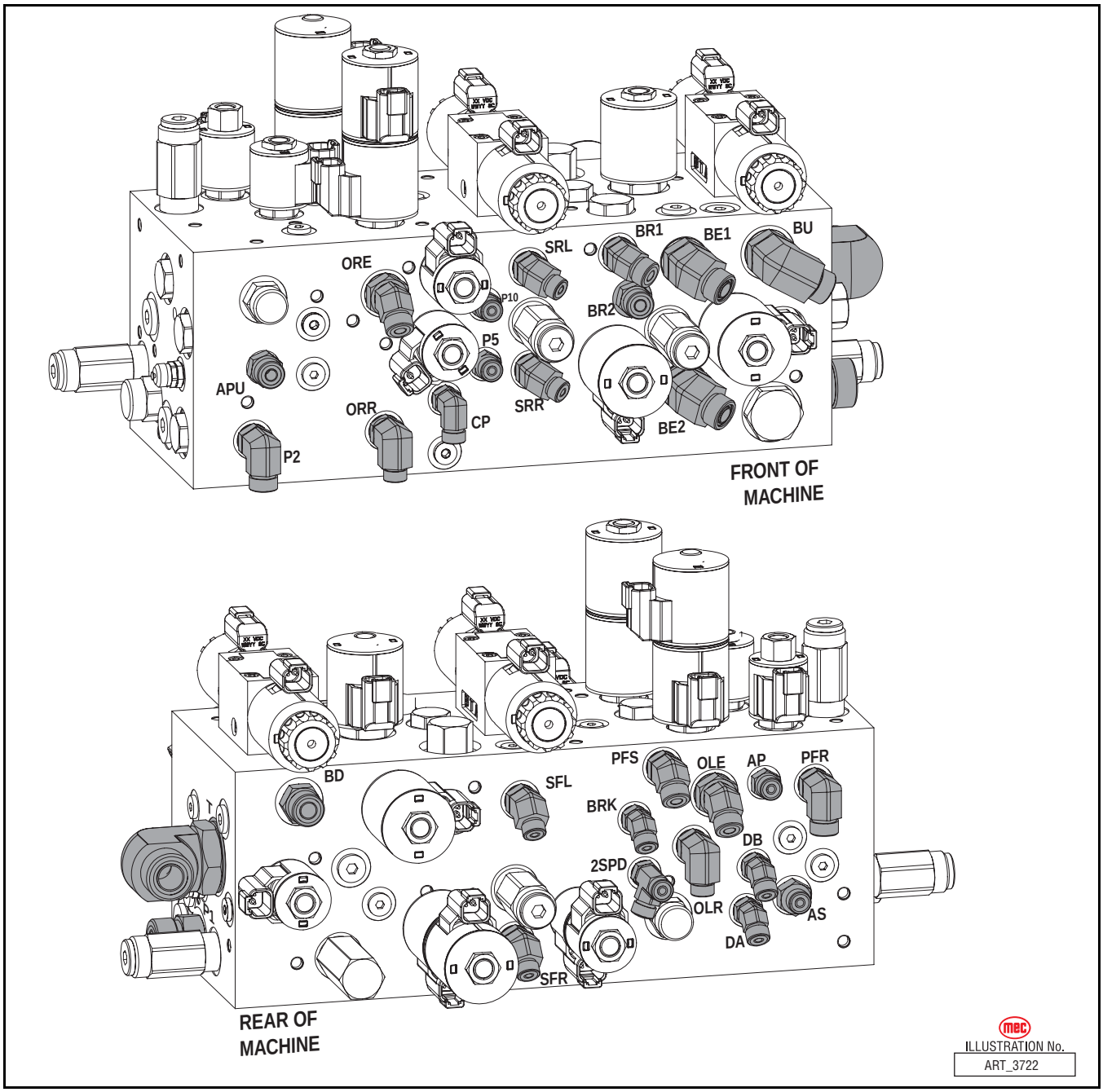


Figure 1-8: Auxiliary Manifold

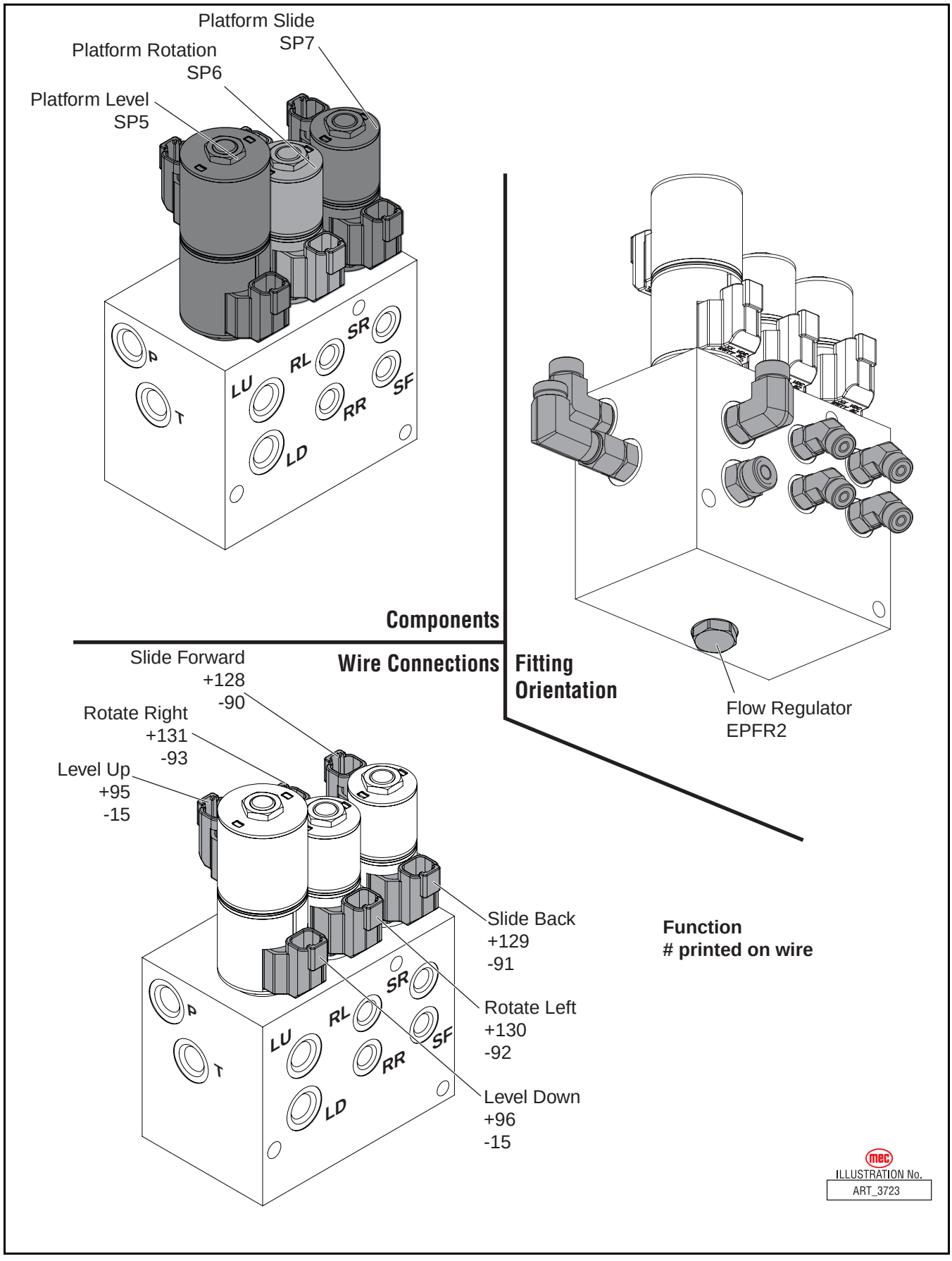
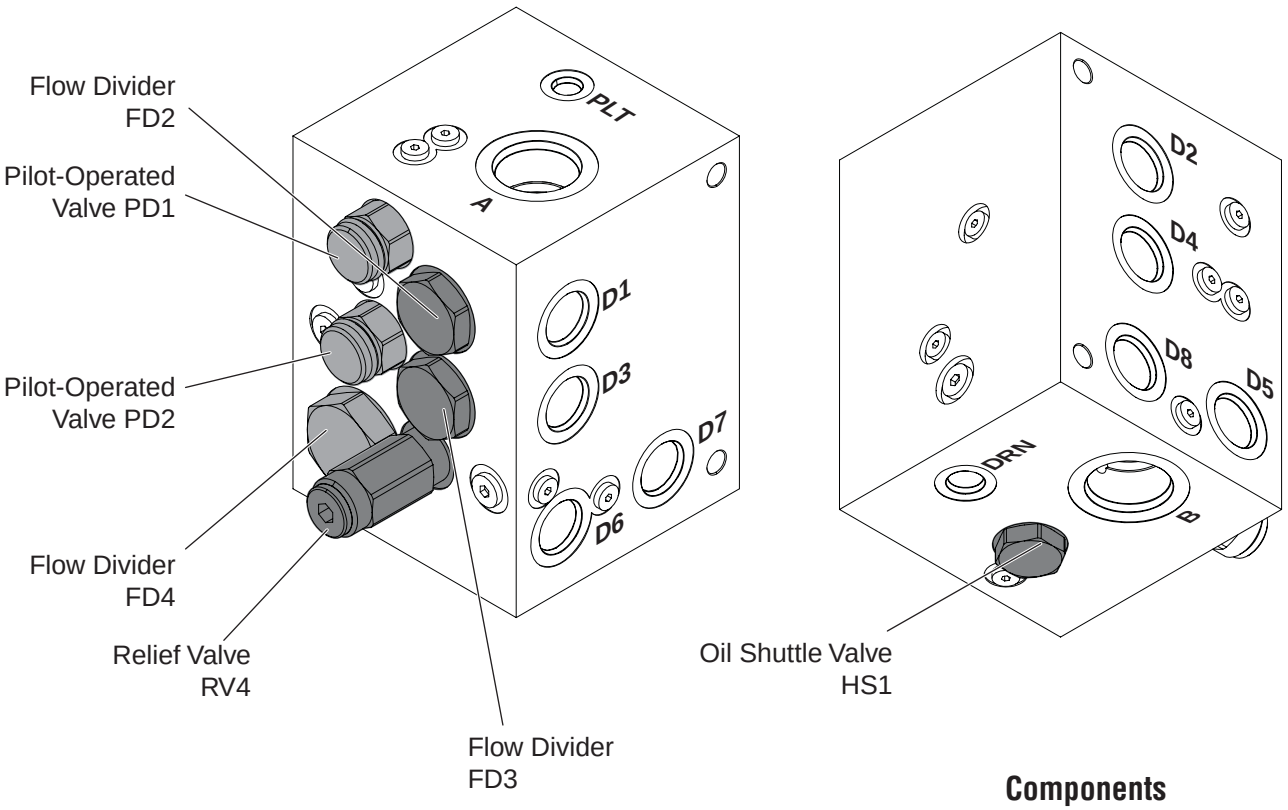
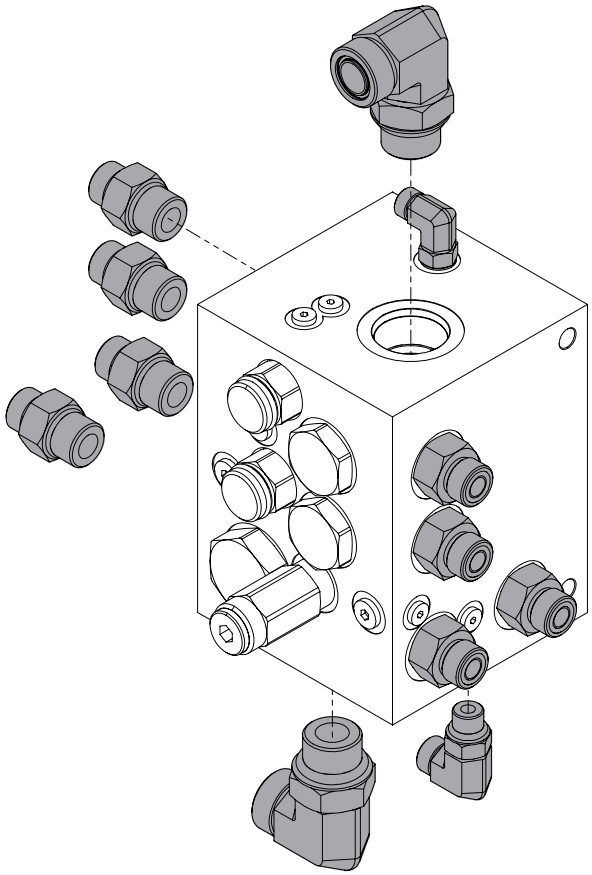


Figure 1-9: Drive Manifold



Components

Fitting Orientation



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HYDRAULIC PRESSURE ADJUSTMENT

- 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 appropriate pressure test port using gauge adapter fitting MEC part no. 50974
- When checking pressure at Ports GD, GLS and GCP, it is necessary to connect a test hose directly to the manifold after removing the existing cap. No test adapter is provided at these ports.

Table 1-2: Hydraulic Pressure Settings

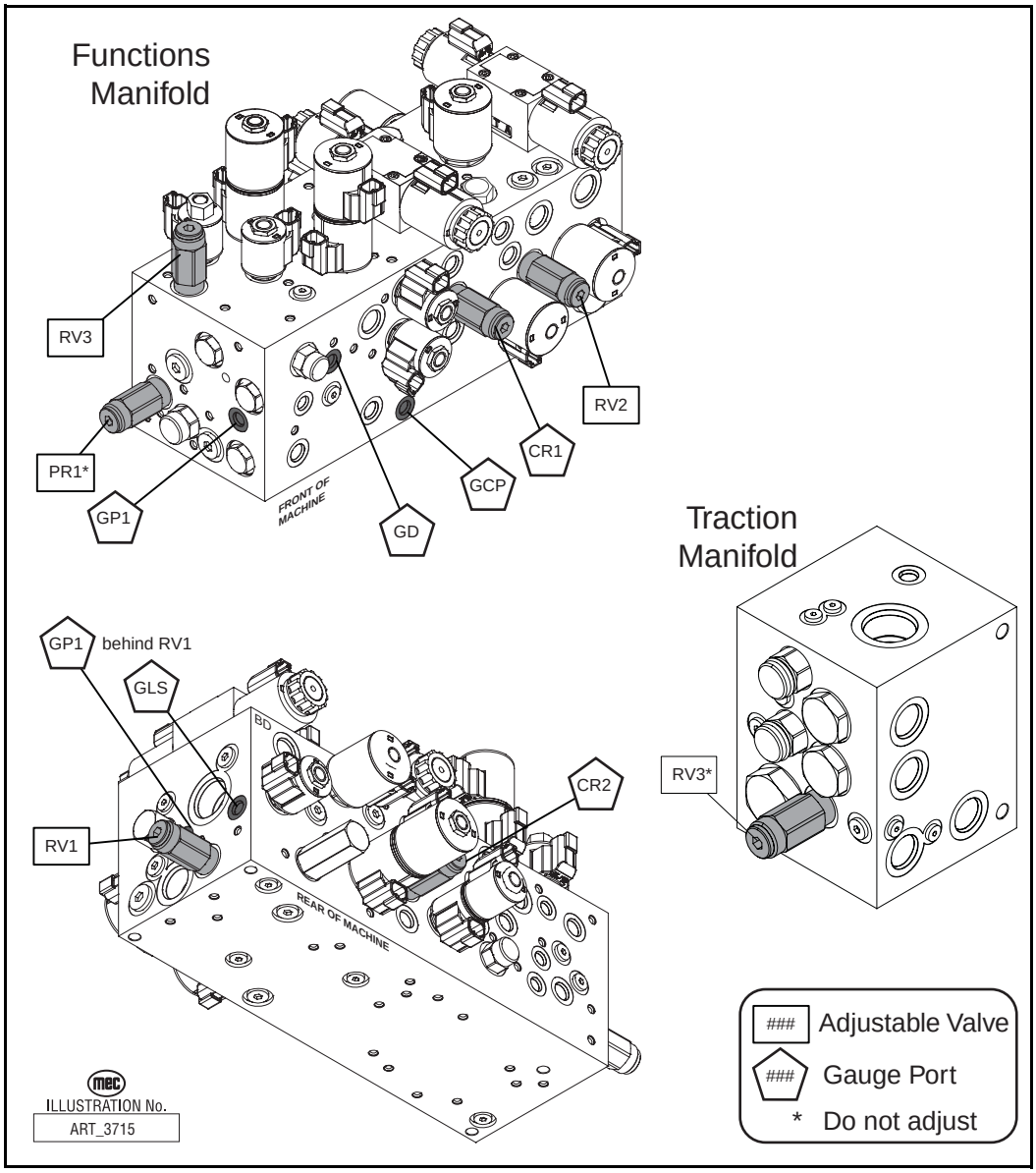
MODEL		Drive System		Charge Pressure	
Titan Boom 40-S		4500 PSI	310 bar	348 PSI	24 bar
		Port GD of Functions Manifold		Port GCP of Functions Manifold	
Boom Lift/Stabilizer -- RV1		**Boom Extend -- RV2**		**Steer/Level/ Upper Manifold -- RV3**	
3000 PSI	207 bar	2000 PSI	138 bar	3200 PSI	221 bar
Port GP1		Port GLS		Port GP2	
Steering Cross-Port Relief--CR1, CR2		**Traction Manifold Oil Supply -- RV4**		**Axle Float-- PR1**	
1500 PSI	103 bar	Do not adjust		Do not adjust	
Port GP2					

ADJUSTING RELIEF VALVES

CAUTION

Do not operate pump with tamper proof cap removed. Fluid will emit under pressure.

Figure 1-10: Adjustable Valves Location



ADJUSTMENTS

COUNTERBALANCE VALVES

The counterbalance valves located on many of the cylinders of the Titan Boom are set by the manufacturer and should not be adjusted for any reason.

Replace any counterbalance valve that shows evidence of adjustment or tampering.

BOOM LIFT/STABILIZER RELIEF (RV1)

The Boom Lift/Stabilizer Relief Valve (RV1) should be checked during routine maintenance to ensure proper lift capacity. 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 Boom Lift/Stabilizer Relief Valve setting, park the machine on a firm level surface free from overhead obstructions.

The Boom Lift/Stabilizer Relief Valve (RV1) should be set to 3000 psi (207 bar).

- Insert a 0-5000 psi gauge into the port GP1 of the Functions Manifold.
- **With no load on platform,** use the Boom Lower function to lower the boom completely.
- Press and hold the Boom Lower switch for 10 seconds to get an accurate reading on the pressure gauge.
- If pressure is LOW, adjust lift relief valve ¼ turn clockwise and recheck.
- If pressure is HIGH, adjust lift relief valve ¼ turn counterclockwise and recheck.
- Repeat until correct.

BOOM EXTEND RELIEF (RV2)

The Boom Extend Relief Valve (RV2) should be checked during routine maintenance to ensure proper steering function. It is 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 the Boom Extend Relief Valve setting, park the machine on a firm level surface free from overhead and forward obstructions.

The Boom Extend Relief Valve (RV2) should be set to 2000 psi (138 bar).

- Insert a 0-5000 psi gauge into the port GLS of the Functions Manifold.
- **With no load on platform,** use the Boom Extend function to extend the boom completely.
- Press and hold the Boom Extend switch for 10 seconds to get an accurate reading on the pressure gauge.
- If pressure is LOW, adjust steering relief valve ¼ turn clockwise and recheck.
- If pressure is HIGH, adjust steering relief valve ¼ turn counterclockwise and recheck.
- Repeat until correct.

STEER/FRAME LEVEL/UPPER MANIFOLD RELIEF (RV3)

The Steer/Frame Level/Upper Manifold Relief Valve (RV3) should be checked during routine maintenance to ensure proper machine function. It is 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.

The Steer/Frame Level/Upper Manifold Relief Valve (RV3) should be set to 3200 psi (221 bar).

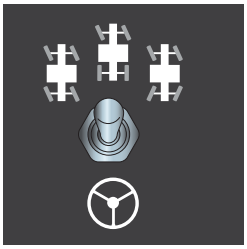
- Insert a 0-5000 psi gauge into the port GP2 of the Functions Manifold.
- Lower and retract the boom completely. Remove everything from the platform
- Energize the Frame Level switch to full left.
- Press and hold the Frame Level switch for 10 seconds to get an accurate reading on the pressure gauge.
- If pressure is LOW, adjust Valve RV3 ¼ turn clockwise and recheck.
- If pressure is HIGH, adjust Valve RV3 ¼ turn counterclockwise and recheck.
- Repeat until correct.

STEERING CROSS PORT RELIEF VALVES (CR1, CR2)

The Steering Cross Port Relief Valves (CR1 & CR2) should be checked during routine maintenance to ensure proper steering function. It is 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.

The Steering Cross Port Relief Valves (CR1 & CR2) should be set to 1500 psi (103 bar).

- Insert a 0-5000 psi gauge into the port GP2 of the Functions Manifold.
- Use the steering function to center all wheels.
- Place the machine in 2-WHEEL steer mode (center position).
- Steer the wheels fully left. Hold the switch for 10 seconds. This is the reading for CR2.
- If pressure is LOW, adjust Valve CR2 ¼ turn clockwise and recheck.
- If pressure is HIGH, adjust Valve CR2 ¼ turn counterclockwise and recheck.



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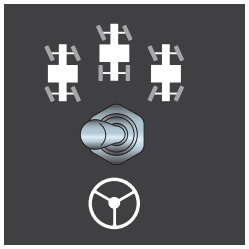
- With the front wheels fully left, place the machine in CRAB steer mode (left position). Steer the machine fully left. The front wheels won't move, as they are already turned fully left.
- The rear wheels should turn until they are pointed fully left. If the rear wheels do not turn, Valve CR1 is set below the setting of Valve CR2
  - Adjust Valve CR1 1/8 turn clockwise and retry. Continue until wheels just begin to steer left.



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- Steer the wheels fully left. Hold the switch 10 seconds. This is the reading for CR1.
- If pressure is HIGH, adjust Valve CR2 1/8 turn counterclockwise and recheck.

DRIVE PUMP

Refer to *Section 3* for Remove and Install instructions.
Refer to *Parts Section E*.

DRIVE PUMP ADJUSTMENTS

This section offers instruction on inspection and adjustment of pump components. Read through the entire topic before beginning a service activity.

CAUTION

Contamination can damage internal components and void your warranty. Take precautions to ensure system cleanliness when removing and reinstalling system lines.

Standard Procedures

1. With the engine off, thoroughly clean the outside of the pump.
2. If removing the pump, tag each hydraulic line. When you disconnect hydraulic lines, immediately cap them and plug each open port to prevent contamination.
3. Ensure the surrounding area is clean and free of contaminants like dirt and grime.
4. Inspect the system for contamination.
5. Check the hydraulic fluid for signs of contamination: oil discoloration, foam in the oil, sludge, or metal particles.
6. If there are signs of contamination in the hydraulic fluid, replace all filters and drain the hydraulic system. Flush the lines and refill the reservoir with the correct filtered hydraulic fluid.
7. Before re-installing the pump, test for leaks.
8. See "Drive Pump Start-Up Procedure" on page 1-11 for start-up instructions

Charge Pressure Relief Valve Adjustment

This procedure explains how to check and adjust the charge pressure relief valve.

1. Install a 1000 psi (50 bar) pressure gauge in charge pressure gauge port GCP on the Functions Manifold. This gauge shows charge pressure.
2. Install a 100 psi (10 bar) gauge at case pressure port L1, L2, or L3. This gauge shows case pressure.
3. Operate the system with the pump in neutral (zero displacement) when measuring charge pressure.

NOTE: Ensure charge pressure is properly set before checking pressure limiter. See Section 1.

4. The charge pressure relief valve setting for this pump is 348 psi (24 bar). This pressures assumes 1800 rpm pump speed, charge flow of 7 gal/min. (26.5 l/min.), and reservoir temperature of 120°F (50°C). The charge pressure references case pressure.

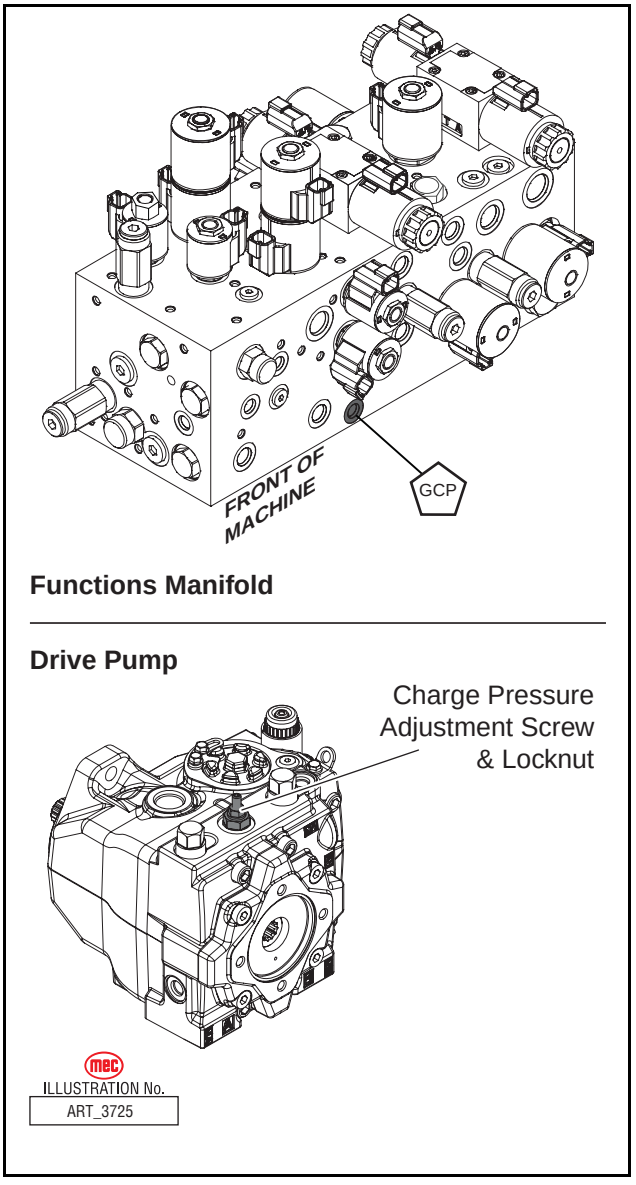
NOTE: At higher pump speeds or higher charge flows the charge pressure will rise over the rated setting.

5. Rotate the adjusting screw clockwise to increase pressure, counter clockwise to decrease pressure.
   Subtract the case pressure reading from the charge pressure reading to compute the actual charge pressure.

NOTE: Pressure change per turn is dependant on charge flow entering pump.

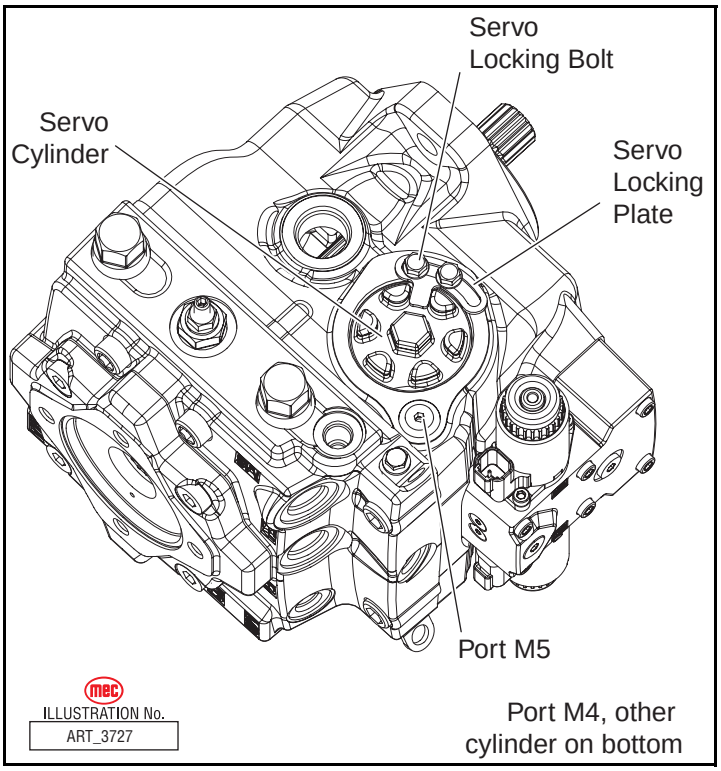
6. Hold the adjusting screw stationary while tightening the locknut to 13 lb-ft. (17 Nm).
7. When you achieve the desired charge pressure setting, remove the gauges and plug the ports.

Figure 1-11: Charge Pressure Adjustment



SERVO ADJUSTMENT

Figure 1-12: Servo Adjustment, top view



Servo adjustment should not be performed unless the pump is confirmed to be out of adjustment. Check all other possibilities before performing this procedure. Refer to Chapter 4 -- Troubleshooting.

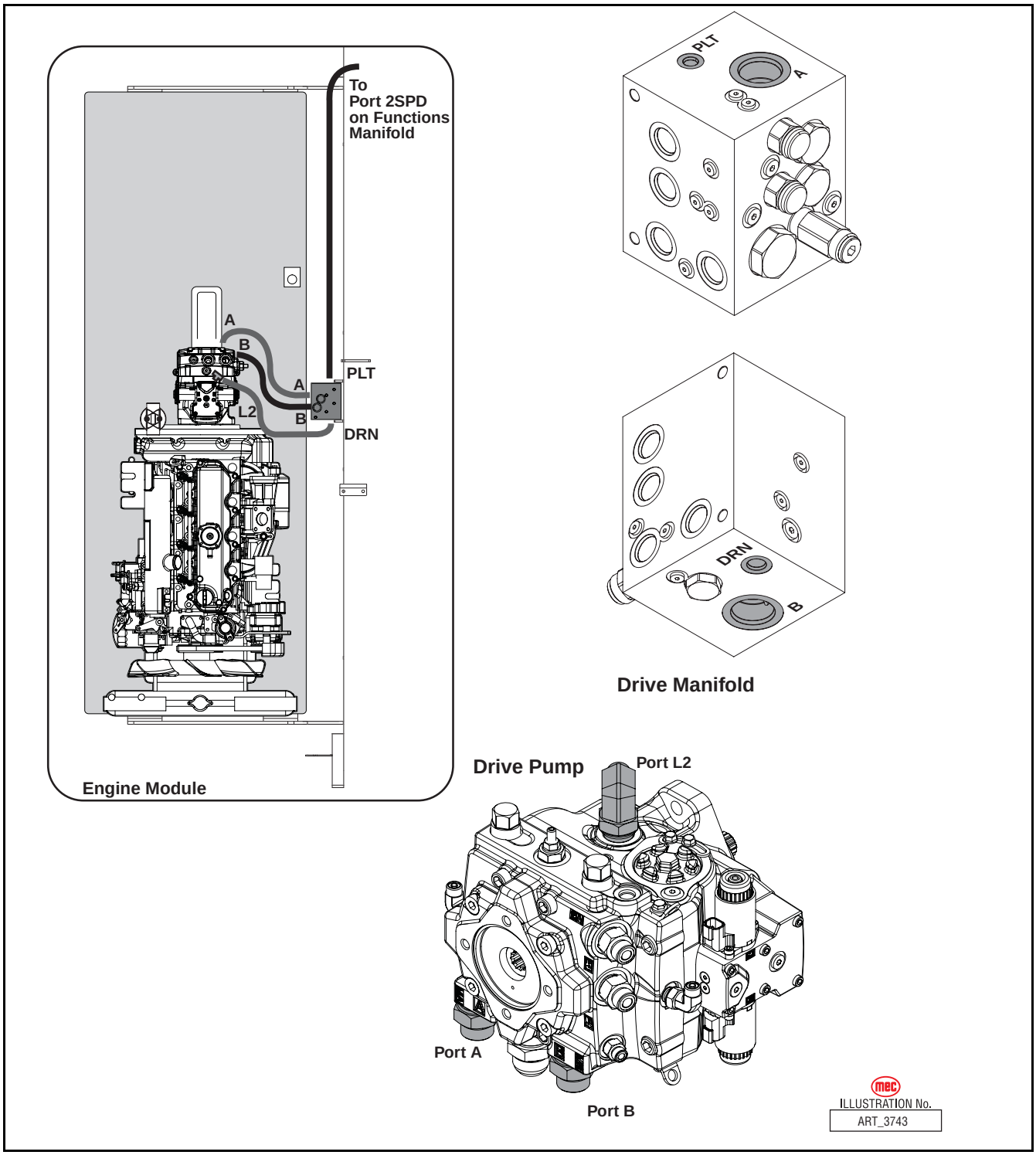
1. Install a 1000 psi (50 bar) gauge in each of the two servo gauge ports (M4 and M5). Disconnect the external control input (electrical connections) from the control solenoids. Start the engine and operate at idle speed.
2. Run engine at 1800 rpm.
3. Check the servo pressure gauges. Ensure the differential between M4 and M5 is less than 22 psi (1.5 bar).
4. Using a 3/4 in hex deep socket, unthread both servo cylinders 2-3 turns. This step ensures the servo cylinders have no contact with the servo piston.
5. Stroke the pump by supplying current to solenoid C1, until the servo pressure at port M4 is 14–29 psi (1 to 2 bar) greater than at port M5 and the system pressure gauges indicate displacement. Pressure should be greater at port MB. This also indicates the servo piston is in contact with the servo cylinder on side M5.
6. Slowly thread the servo cylinder on the M5 side in until the system pressure differential starts to decrease. Maintain servo pressure differential between 14–29 psi (1 to 2 bar) during this step. Continue turning the servo cylinder in until the system pressure differential (between ports MA/MB) is less than 22 psi (1.5 bar). This procedure sets the servo and swash plate to mechanical neutral on the M5 side.
7. Repeat steps 1-5 but stroke the pump in the opposite direction by turning the eccentric screw in the opposite direction, or by supplying current to solenoid C2. Reverse gauge locations (M4 for M5, MB for MA) from those stated above since the pump is now stroking the other direction.
8. Remove all gauges and replace gauge port plugs.

DRIVE PUMP/DRIVE MANIFOLD CONNECTIONS

Hydraulic hoses from Port A and Port B on the Drive Pump connect respectively to Ports A and B on the Drive Manifold and provide directional power to the wheel motors.

Port L2 on the Drive Pump connects by a T-fitting to Port DRN on the Drive Manifold. Port PLT on the Drive Manifold connects to a T-fitting at Port 2SPD of the Functions Manifold. These hoses allow fresh oil to pass into and out of the drive system.

Figure 1-13: Drive Pump/Drive Manifold Connections

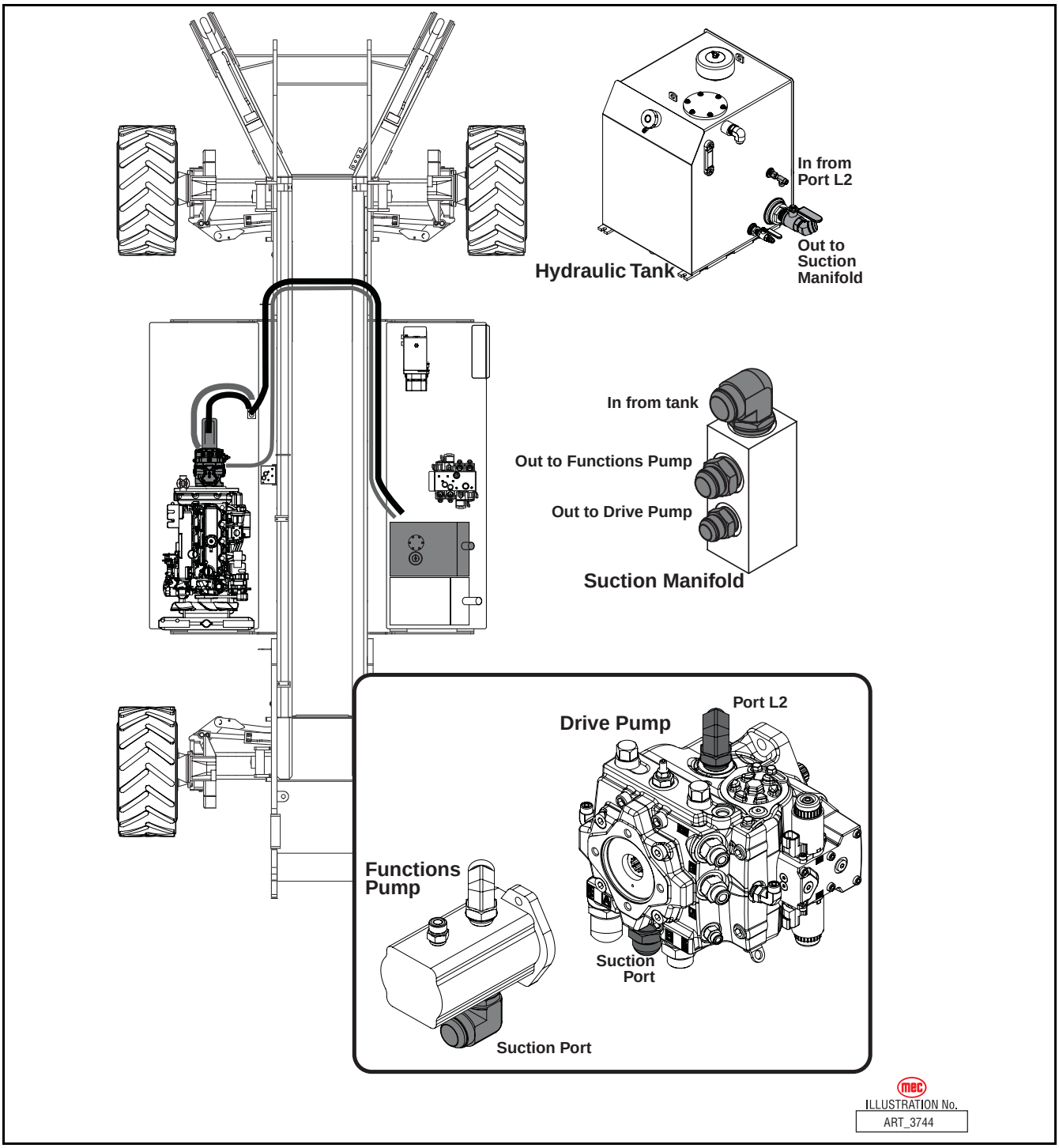


SUCTION & CASE DRAIN CONNECTIONS

The main suction line from the Hydraulic Tank connects to the top port of the Suction Manifold. The upper side port of the Suction Manifold then connects to the Suction Port of the Functions Pump. The lower side port of the Suction Manifold connects to the suction port of the Drive Pump.

Port L2 on the Drive Pump connects to the lower return port of the Hydraulic Tank.

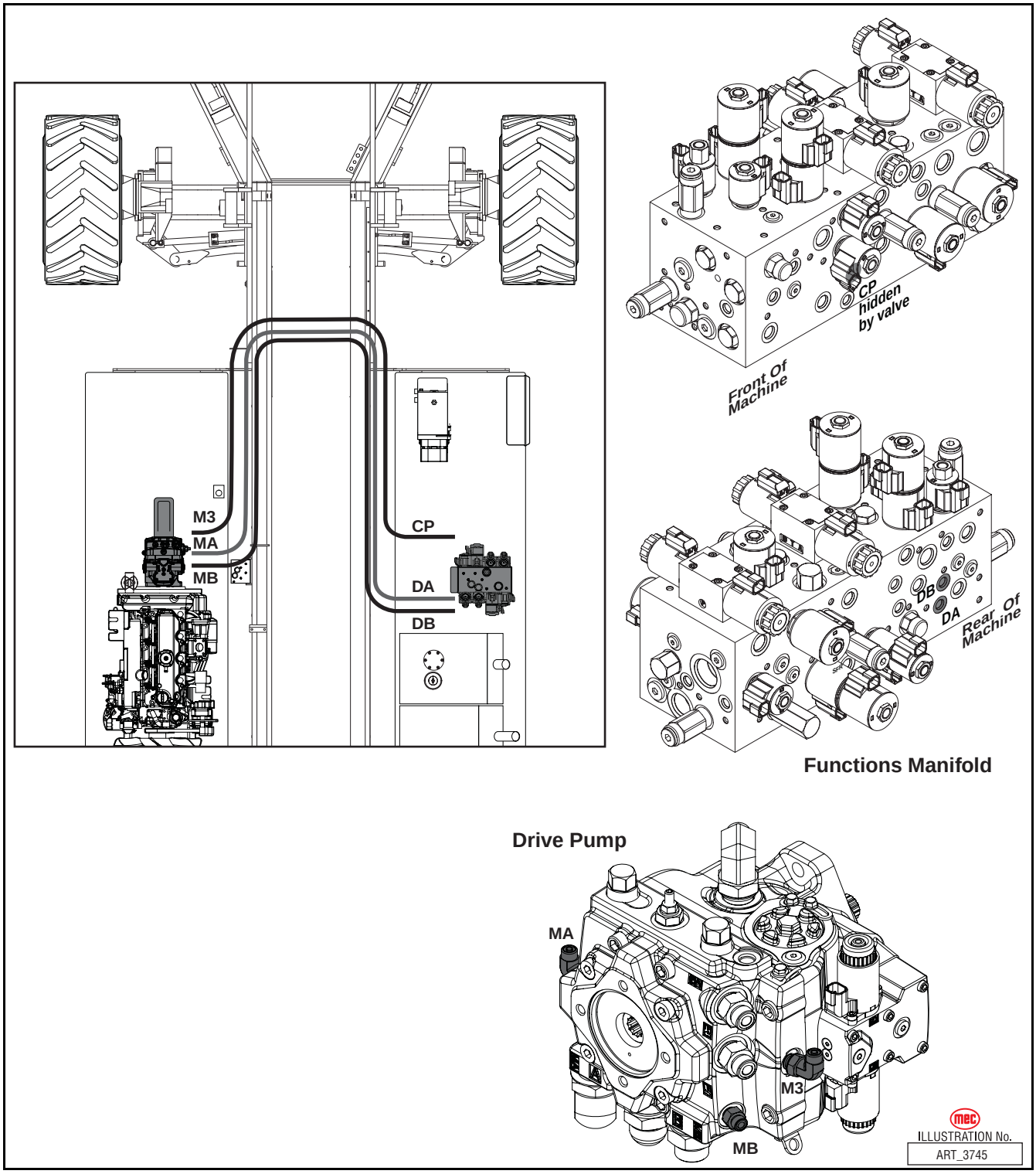
Figure 1-14: Drive Pump/Drive Manifold Connections



DRIVE PUMP/FUNCTION MANIFOLD CONNECTIONS

Three hoses connect the Drive Pump to the Functions Manifold.
Port M3 on the Drive Pump connects to Port CP on the Functions Manifold.
Port MA on the Drive Pump connects to Port DA on the Functions Manifold.
Port MB on the Drive Pump connects to Port DB on the Functions Manifold.

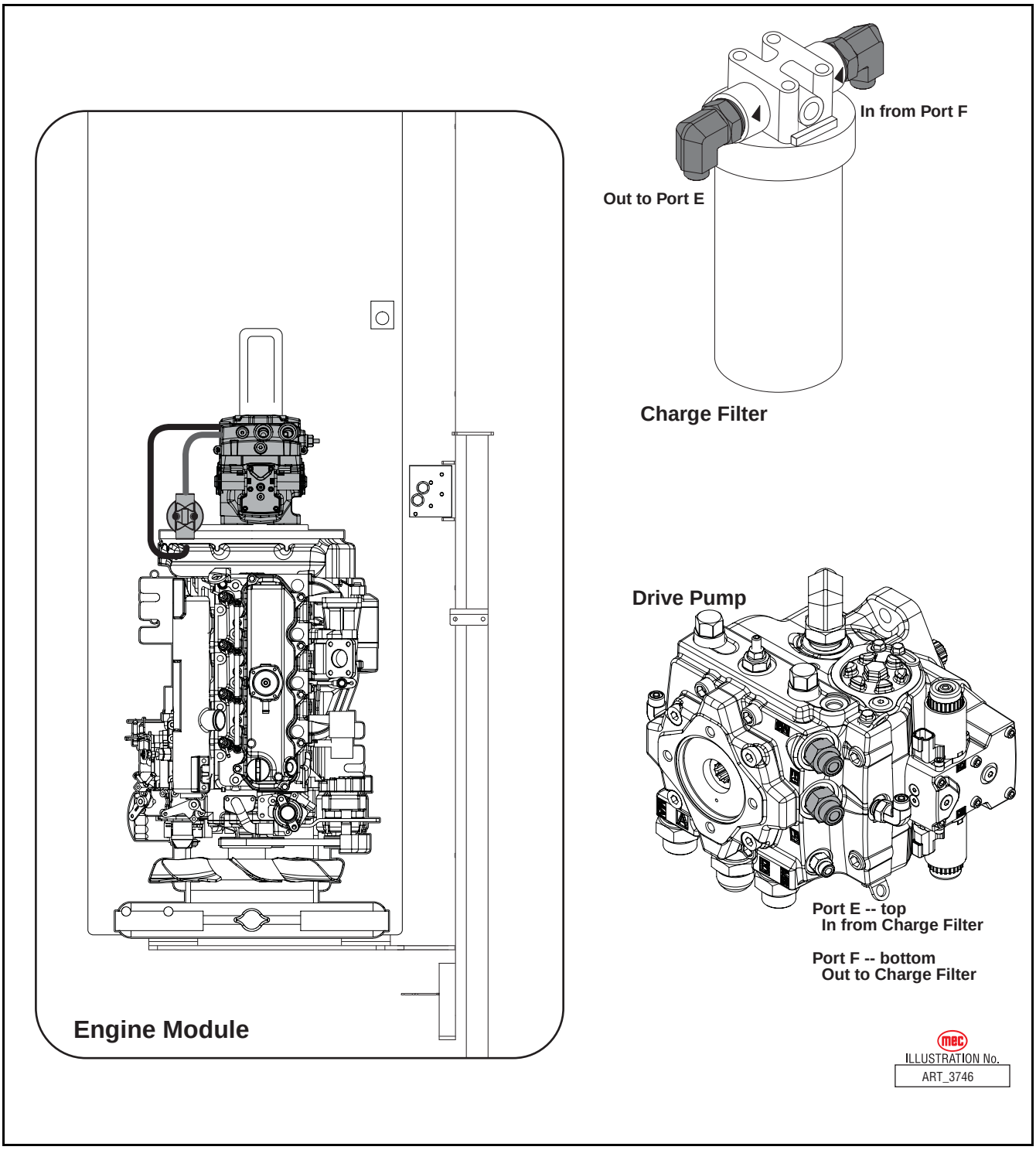
Figure 1-15: Drive Pump/Function Manifold Connections



CHARGE FILTER CIRCUIT

The Charge Filter provides make-up fluid supply to the Drive Pump. Fluid travels from Port F on the Drive Pump to the filter and re-enters the Drive Pump at Port E.

Figure 1-16: Charge Filter Circuit

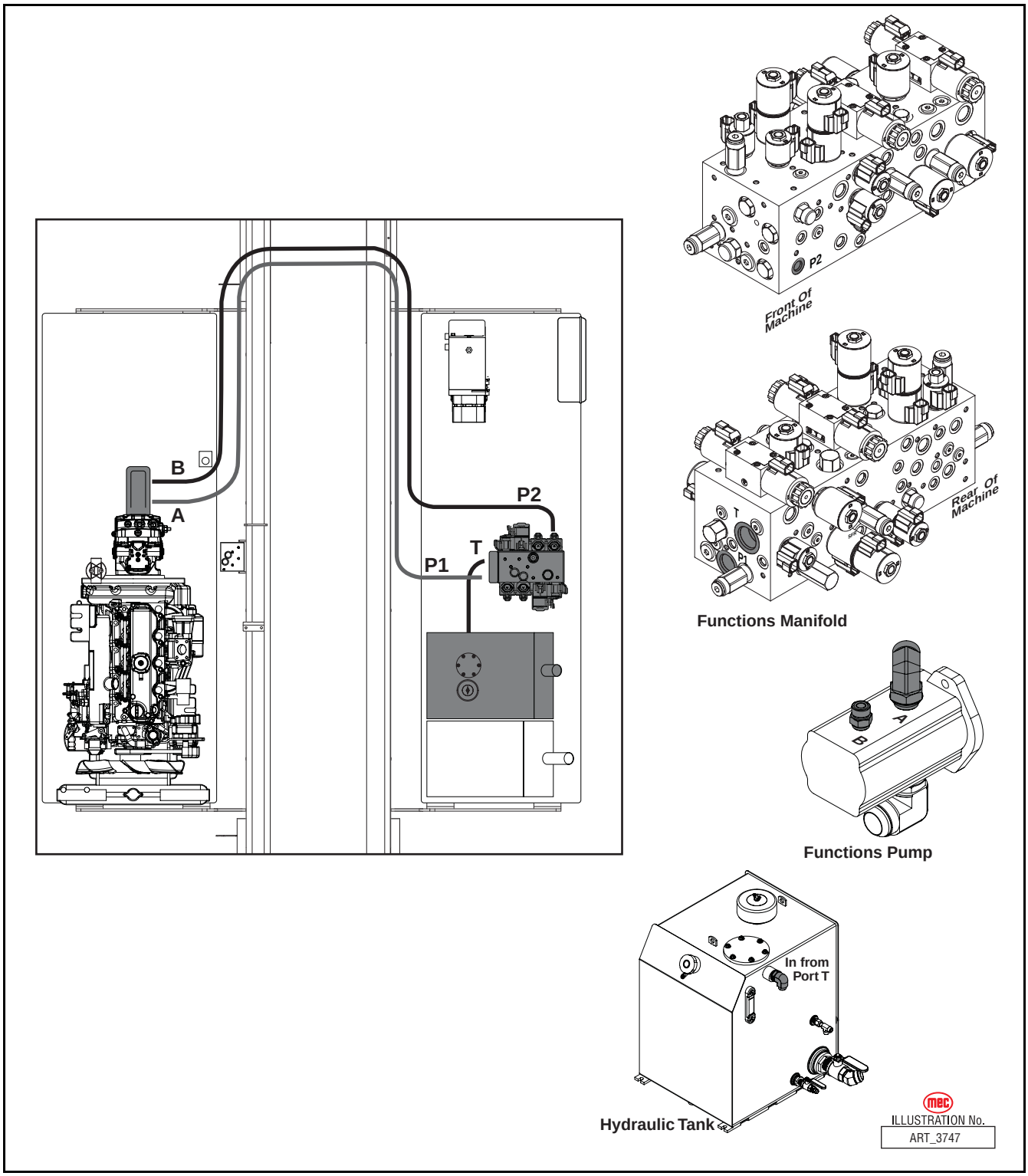


FUNCTIONS PUMP/FUNCTIONS MANIFOLD CONNECTIONS

The Functions Pump connects to the Functions Manifold through two hoses. Port A of the pump connects to Port P1 of the manifold. Port B of the pump connects to Port P2 of the manifold.

Port T of the Functions Manifold moves return oil to the Hydraulic Tank.

Figure 1-17: Drive Circuit



HYDRAULIC FUNCTIONS

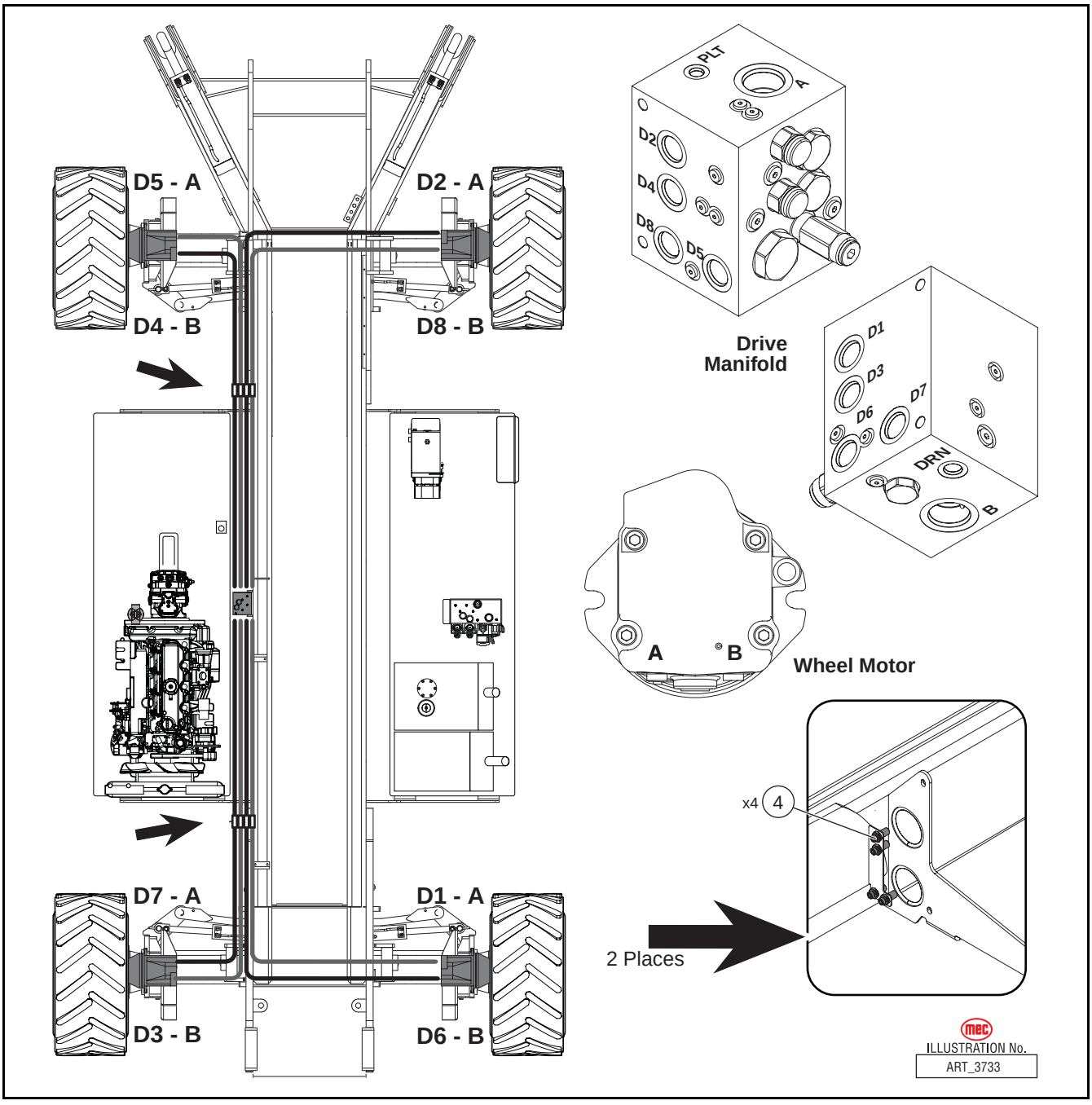
Refer to *Section 3* for Remove and Install instructions.
Refer to *Parts Section E*.

DRIVE FUNCTION

There are four (4) variable-displacement hydraulic Drive Wheel motors that provide power to all four wheels. Hydraulic fluid from the Drive Pump is delivered to the Drive Manifold. From the Drive Manifold, two hoses go to each wheel via bulkhead fittings.

This drive system is hydrostatic; the oil circulates from the pump to the drive motors and back to the pump in a loop. Traction is enhanced through the use of three flow divider valves located in the Drive Manifold. Approximately 10% of the drive system oil is circulated back to the hydraulic tank for cooling purposes.

Figure 1-18: Drive Circuit

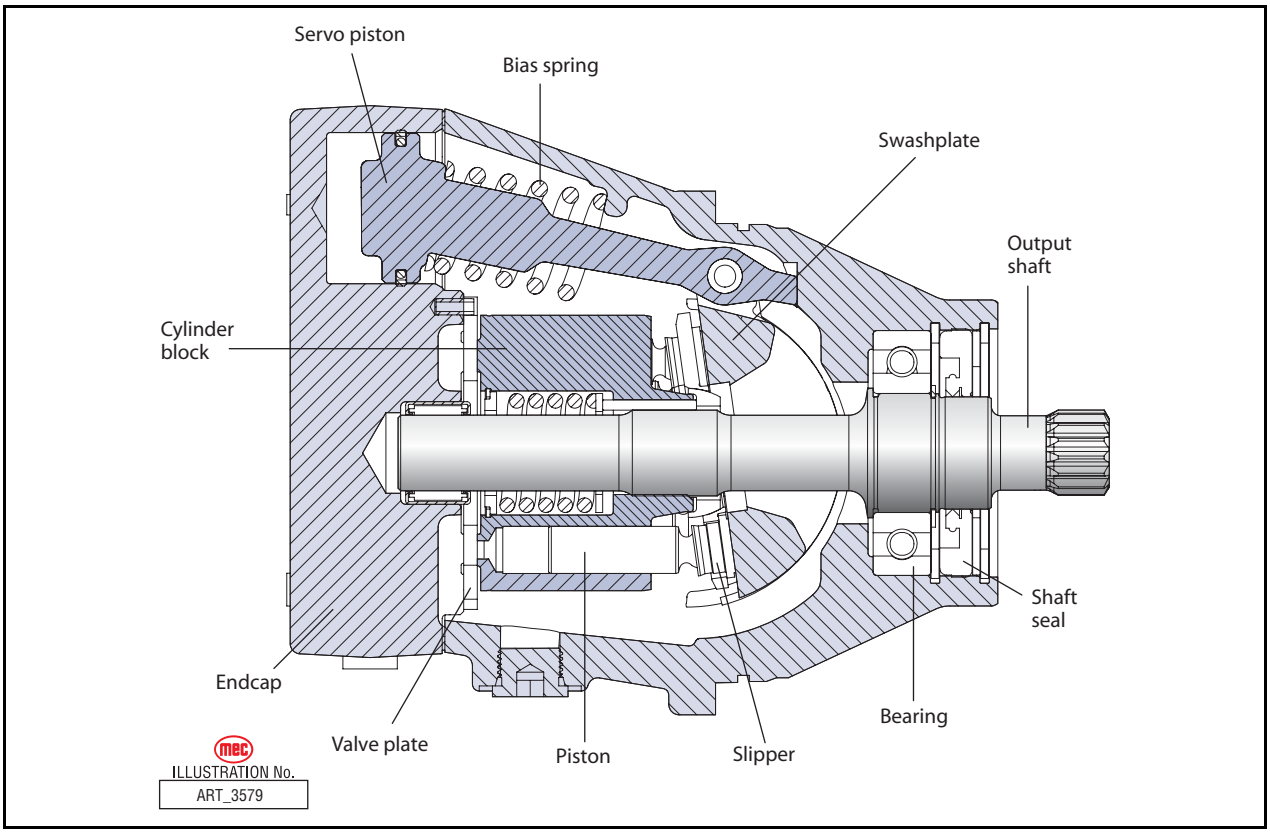


WHEEL MOTOR STARTUP PROCEDURE

Follow this procedure when restarting a machine on which the Drive Motors have been:

- Removed and re-installed, or
- Drained of fluid for any reason.

Figure 1-19: Drive Motor



WARNING

UNINTENDED MOVEMENT OF THE MACHINE OR MECHANISM MAY CAUSE INJURY. SECURE THE MACHINE BEFORE PERFORMING THIS PROCEDURE.

CAUTION

If oil has drained from the Drive Pump, DO NOT operate the Drive Pump until you have completed the "Drive Pump Start-Up Procedure" on page 1-11. Severe damage will occur.

Inspect each Drive Motor for damage prior to installation. Use only the appropriate hydraulic fluid as recommended in "Fluid Recommendations" on page 1-7.

1. Fill the reservoir with the appropriate hydraulic fluid as recommended in "Fluid Recommendations" on page 1-7. Always filter fluid through a 10 micron filter when pouring into the reservoir. Never reuse hydraulic fluid.
2. Fill the inlet line leading from the pump to the reservoir. Check the inlet line for properly tightened fittings and be certain it is free of restrictions and air leaks.
3. Fill the pump and motor housing with clean hydraulic fluid. Pour filtered oil directly into the upper most case drain port.
4. To ensure the pump and motor stay filled with oil, install case drain lines into the upper-most case drain ports.
5. Install a 0 to 35 bar [0 to 500 psi] gauge in the pressure gauge port (M3) of the pump to monitor system pressure during start up.
6. Follow recommendations in the machine operator's manual for engine start up procedures.
7. While watching the pressure gauge, jog the engine or run at the lowest possible speed until system pressure builds to normal levels (minimum 11 bar [160 psi]). Once system pressure is established, increase to full operating speed. If system pressure is not maintained, shut down the engine, determine cause, and take corrective action.
8. Operate the hydraulic system for at least fifteen minutes under light load conditions.
9. Check and adjust pump control settings as necessary after installation.
10. Shut down the engine and remove the pressure gauge. Replace hose and fitting at the pressure gauge port.
11. Check the fluid level in the reservoir; add clean filtered fluid if necessary.
12. The motor is now ready for operation.

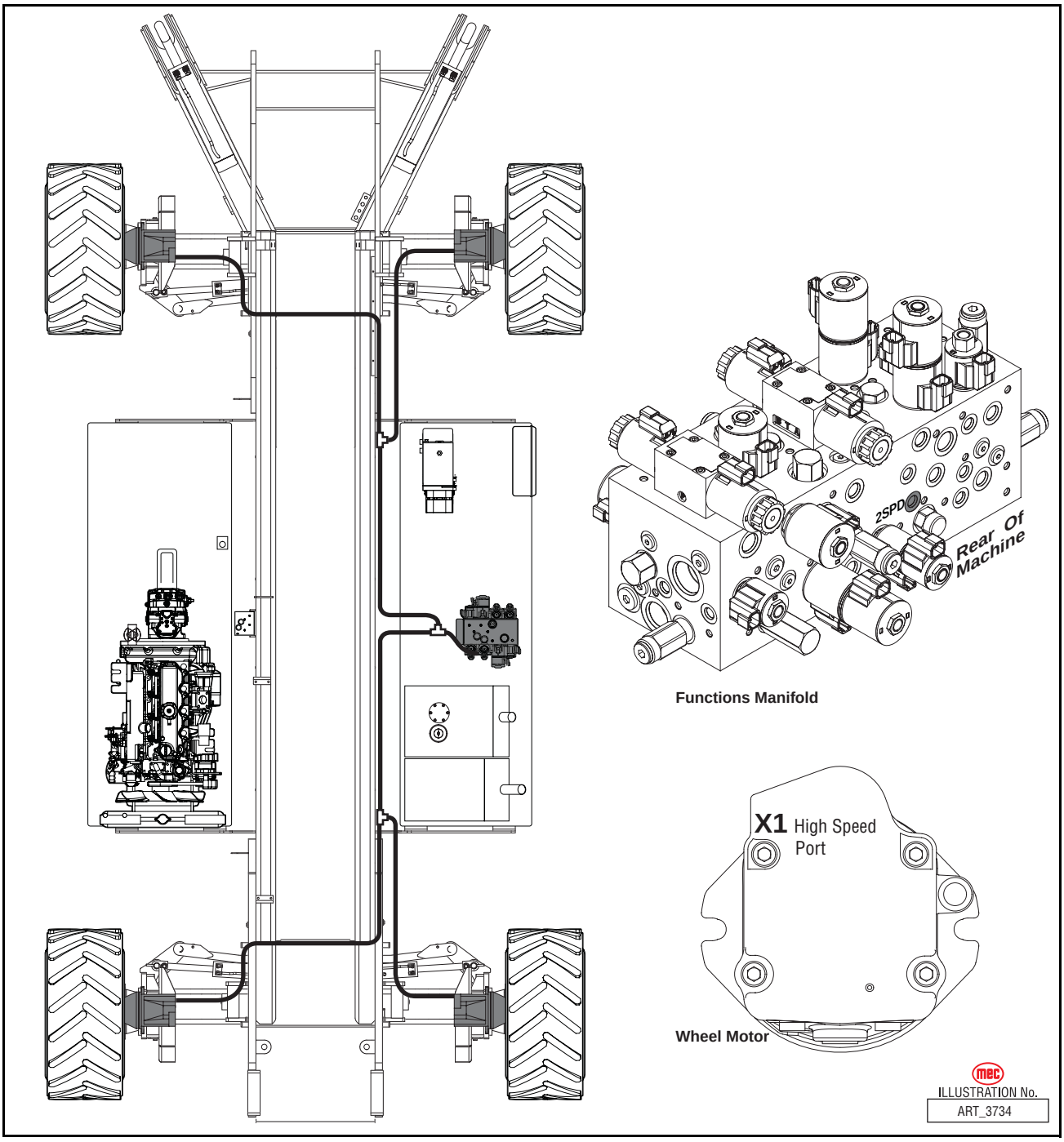
REPAIR

MEC does not recommend end-user maintenance or repair of the Sauer Danfoss drive motors. Contact MEC or Sauer Danfoss for the nearest service provider.

HIGH SPEED FUNCTION

High Speed Drive is activated by hydraulic pressure from Port 2SPD on the Functions Manual. Hoses routed from this port carry fluid to Port X1 on each wheel motor, providing pressure to push the servo piston, which in turn moves the swash plate to a less severe angle and decreases the wheel motor displacement. Smaller displacement means the wheel motor requires less flow per rotation. See Figure 1-19, page 33.

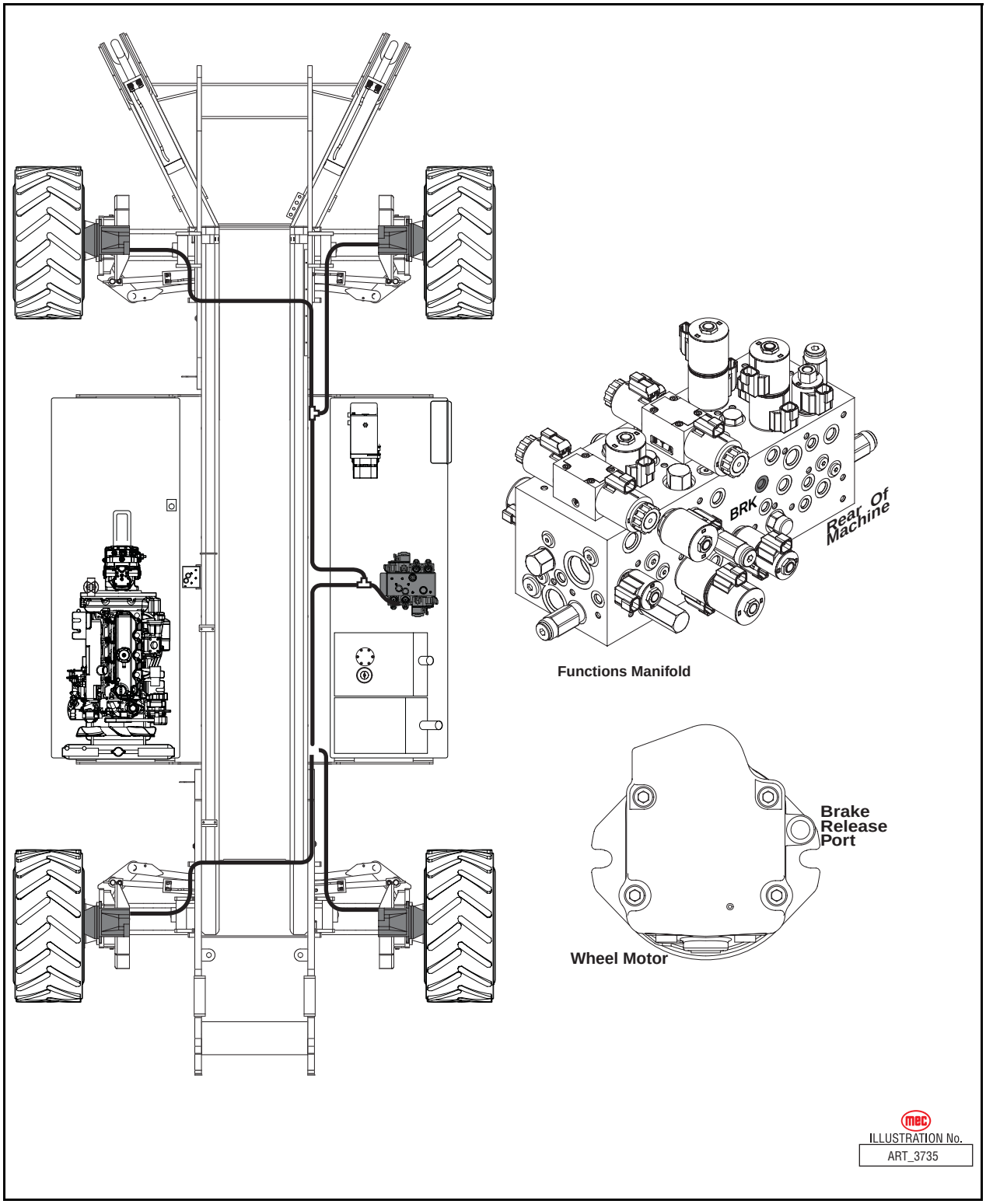
Figure 1-20: High Speed Hose Routing



BRAKE RELEASE FUNCTION

The Brake Release function is activated by hydraulic pressure from Port BRK on the Functions Manual. Hoses routed from this port carry fluid to Brake Release Port on each wheel motor. Fluid passes through the Wheel Motor to the Gear Hub to release the brakes.

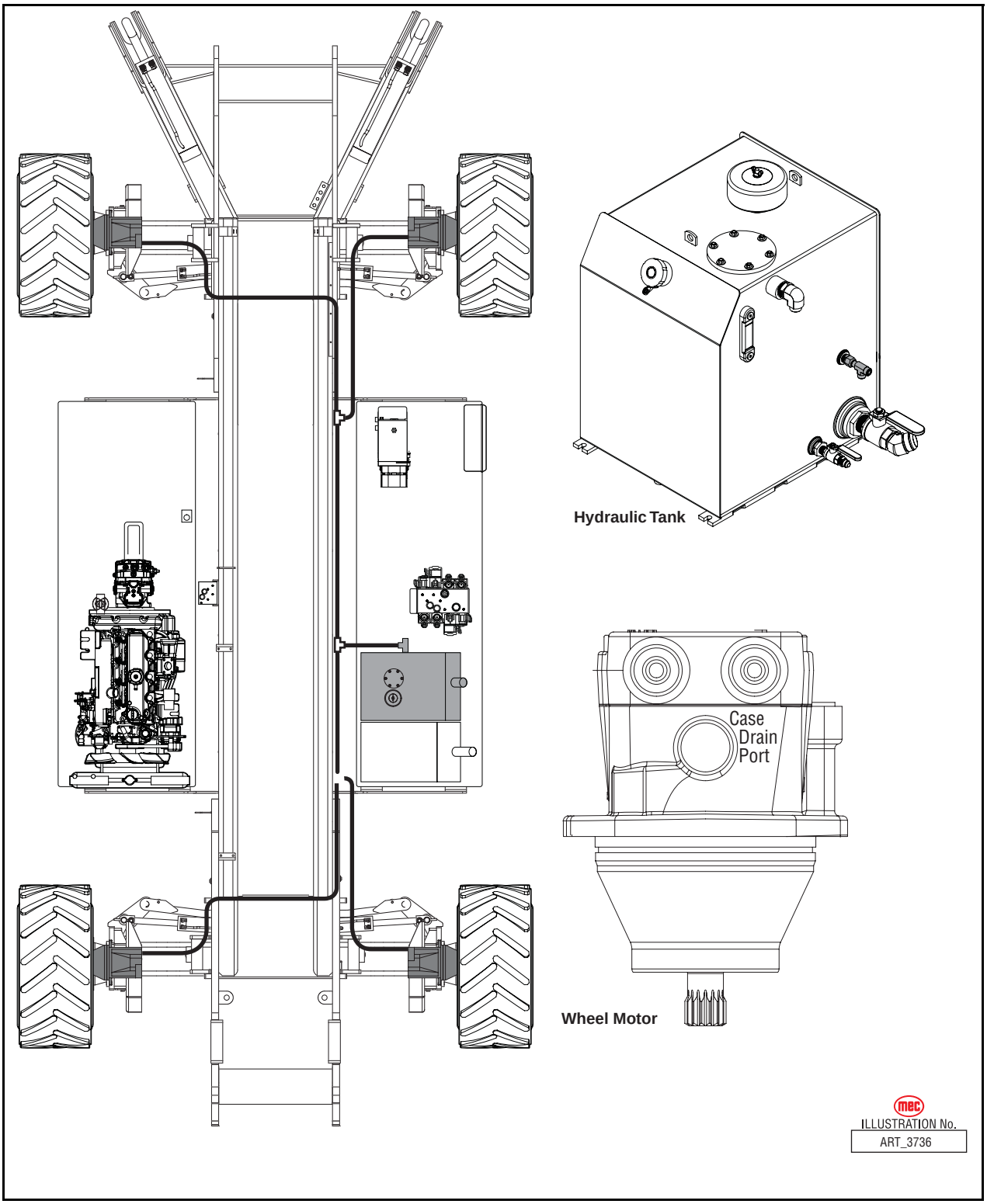
Figure 1-21: Brake Release Hose Routing



DRIVE CASE DRAIN FUNCTION

The Drive Motor Case Drain hoses lead from the Case Drain Port on each wheel motor to the Hydraulic Tank located in the Controls Module.

Figure 1-22: Drive Case Drain Hose Routing



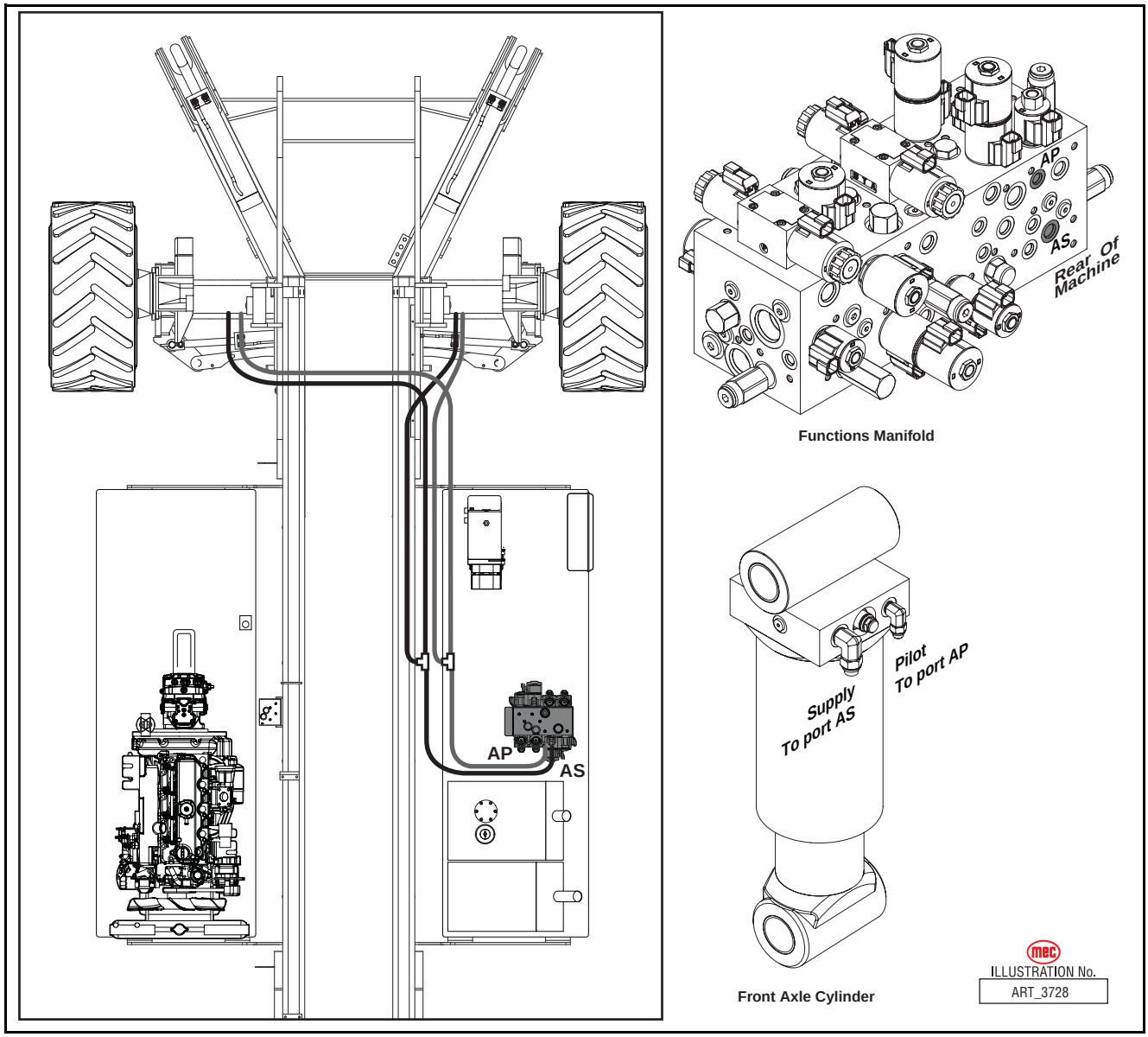
AXLE LOCK FUNCTION

The Axle Lock System allows the front axle oscillate over rough terrain when the platform is in the stowed position.The axle locks in position when the platform is elevated to enhance machine stability.

There are two (2) cylinders in the Axle Lock System. Pressure from Port AP on the Functions Manifold opens the counterbalance valve on each cylinder and allows fluid to freely flow in and out through Port AS while driving over rough terrain, provided that the platform is in the stowed position. The hoses connecting Port AS on the Functions Manifold to the Supply Port on each cylinder are pressurized to 100 psi (7 bar) to prevent cavitation in the cylinder, which can cause air to enter the system.

When the platform is elevated, the electrically-operated valve in the manifold closes, removing the pilot signal to the counterbalance valve, thereby locking the cylinders and preventing fluid flow.

Figure 1-23: Axle Lock Cylinders



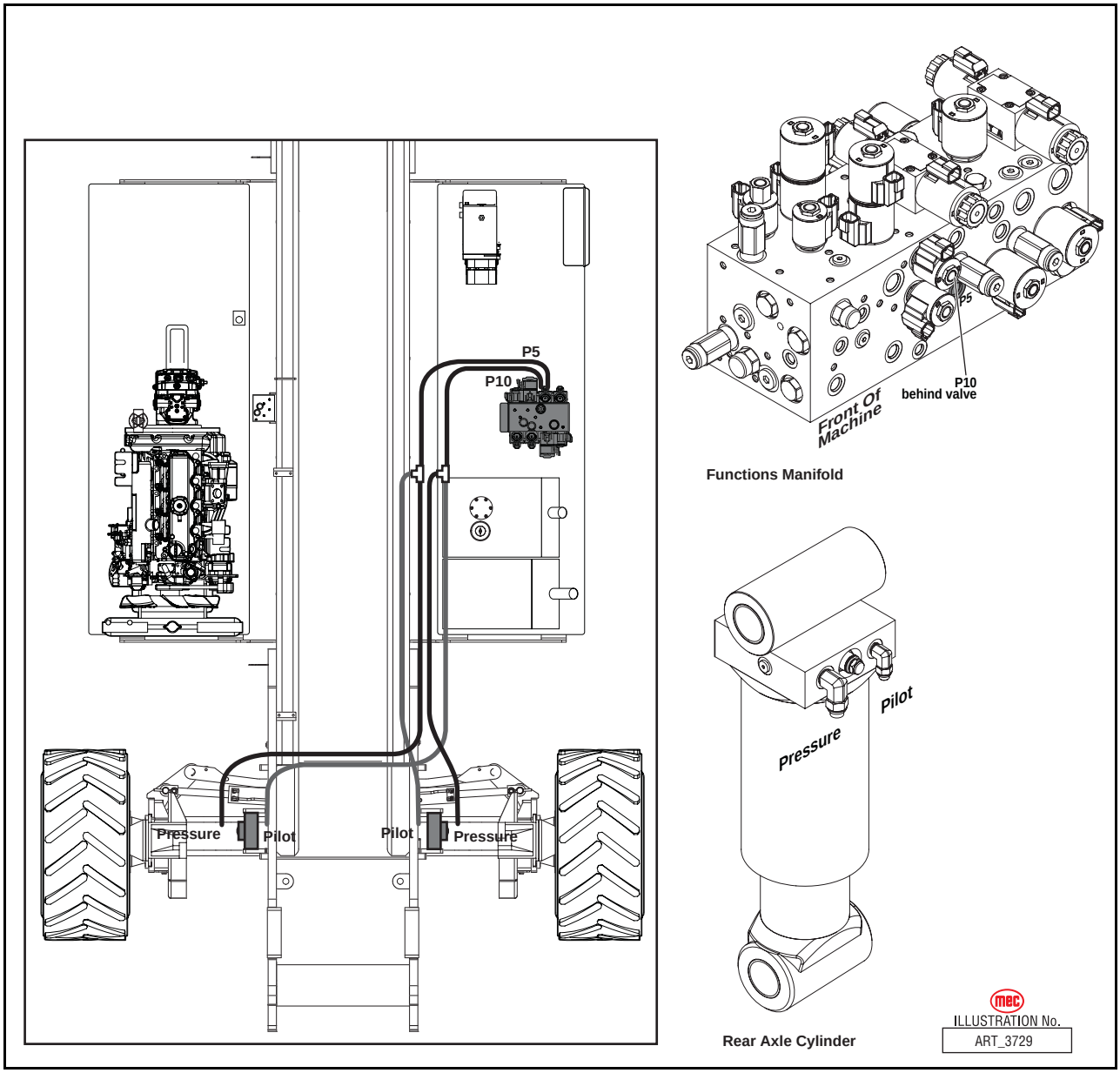
FRAME LEVEL FUNCTION

The Frame Level System allows the rear axle to move relative to the frame when auto-leveling on stabilizer deployment or when manually operated by the controls. This system allows side-to-side leveling of the machine.

There are two (2) single-acting cylinders in the Frame Level System. Pressure from Ports P5 and P10 provide power to the system. Pressure from Port P5 causes the left-side cylinder to extend while releasing the counterbalance valve of the right-side cylinder, causing the frame to tilt to the right. Pressure from Port P10 causes the right-side cylinder to extend while releasing the counterbalance valve of the left-side cylinder, causing the frame to tilt to the left.

The rear axle is locked in place when the Frame Level Function is not in use.

Figure 1-24: Frame Level Cylinders



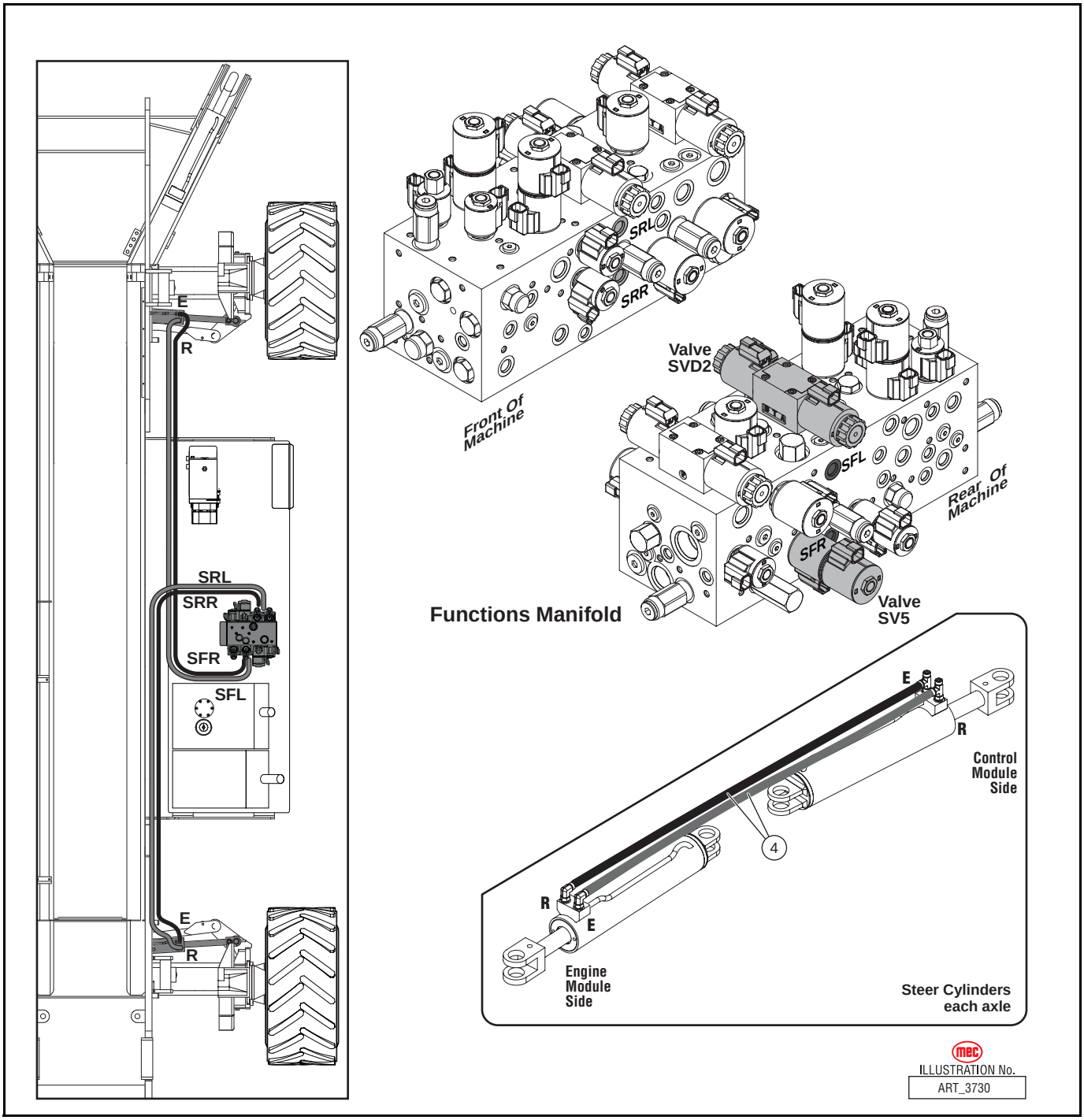
STEERING FUNCTION

The Steering System allows the operator to steer the machine in the following modes:

- 2-wheel -- front wheels only
- 4-wheel -- front and back wheels turn opposite directions
- Crab -- all wheels turn the same direction

Pressure from ports SFL, SFR, SRL and SRR supply the cylinders. Flow is controlled by Valve SV5 for right/left operation of the front steering cylinders. Valve SVD2 provides directional control of the rear steering cylinders, and works in conjunction with Valve SV5.

Figure 1-25: Steering Circuit



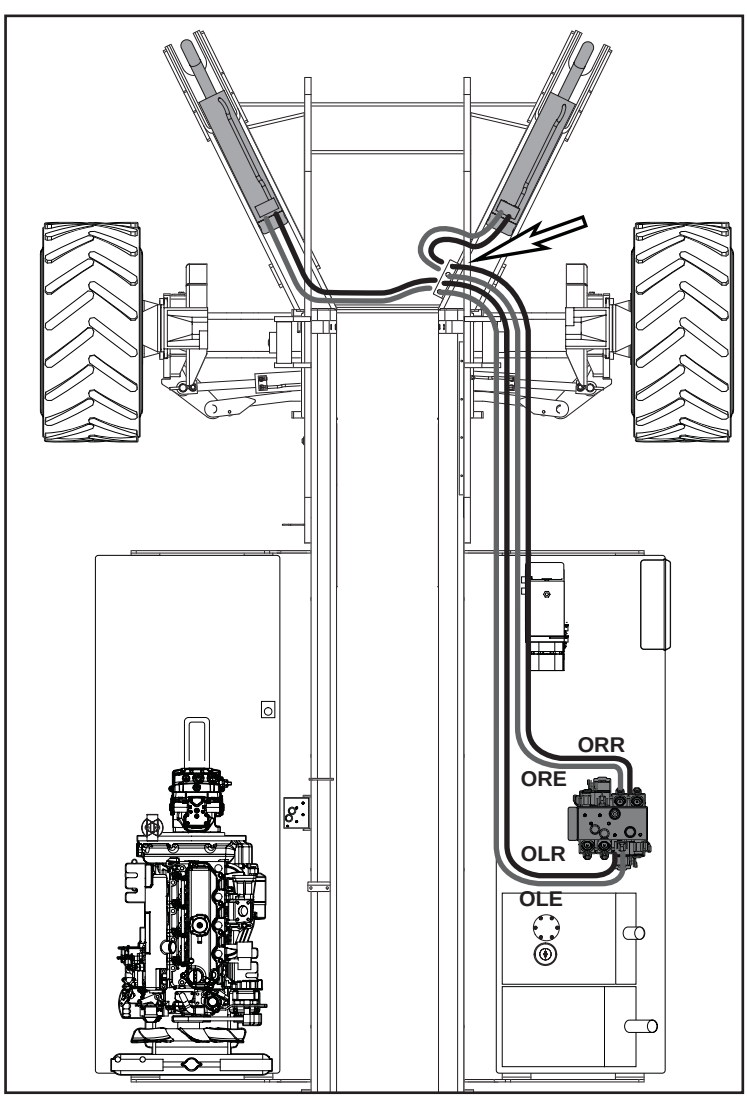
STABILIZER SYSTEM

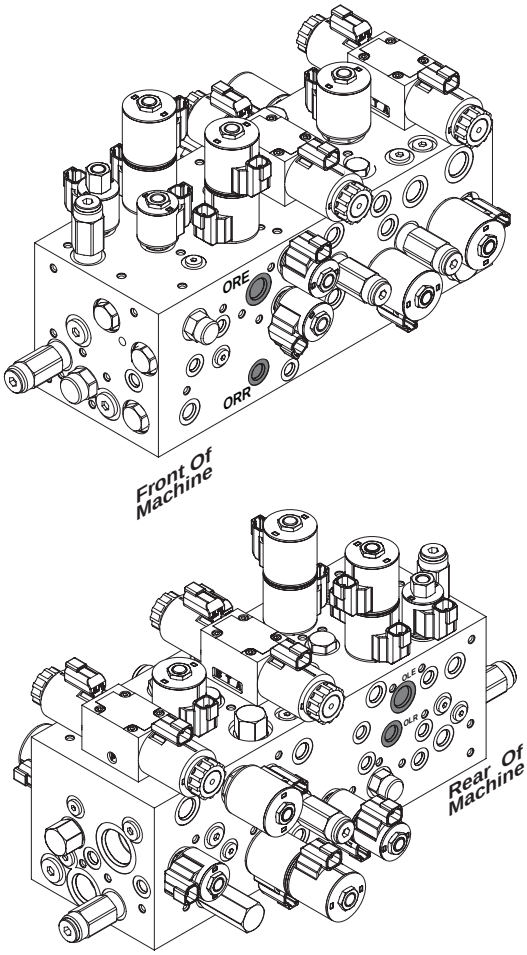
There are two (2) Stabilizer Cylinders located at the front end of the machine. These cylinders provide stability to the machine when the boom is extended. Frame leveling is controlled automatically by the GP400 module.

Pressure from ports ORE and OLE extend the cylinders, while ports ORR and OLR control retraction. Hoses run from the Functions Manifold to bulkhead fittings at the base of the right stabilizer tube, and from there to the cylinders.

A pressure transducer mounted to each cylinder provides stabilizer pressure information to the GP400 Processor.

Figure 1-26: Stabilizer Cylinders





Functions Manifold

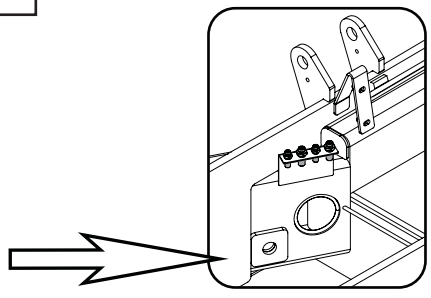
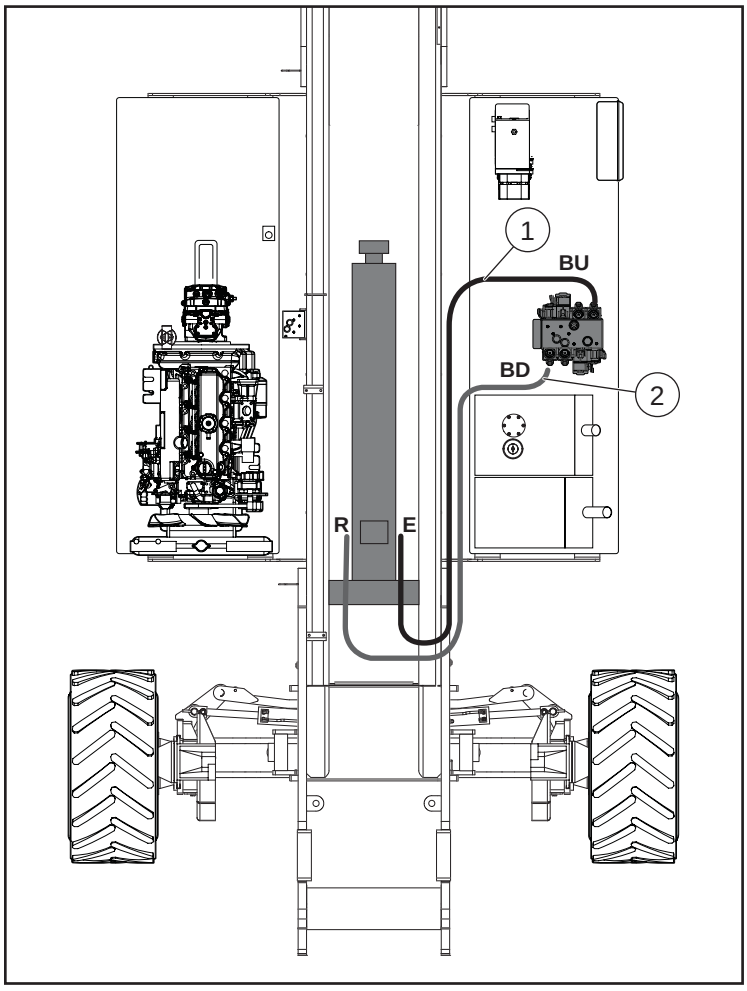


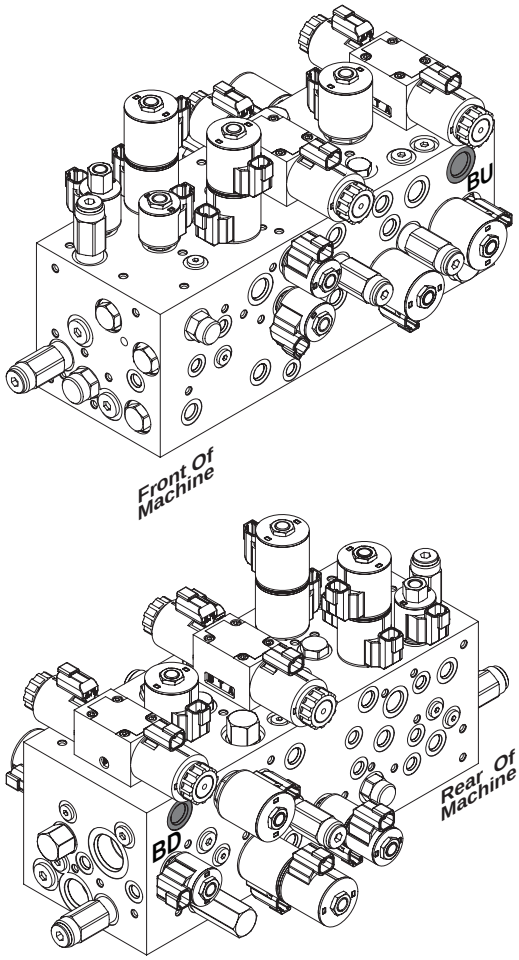
ILLUSTRATION No.
ART_3731

BOOM LIFT SYSTEM

The Boom Lift System uses one (1) double-acting hydraulic cylinder to lift and lower the boom. The counterbalance 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 1-27: Boom Lift Circuit





Functions Manifold

ILLUSTRATION No.
ART_3732

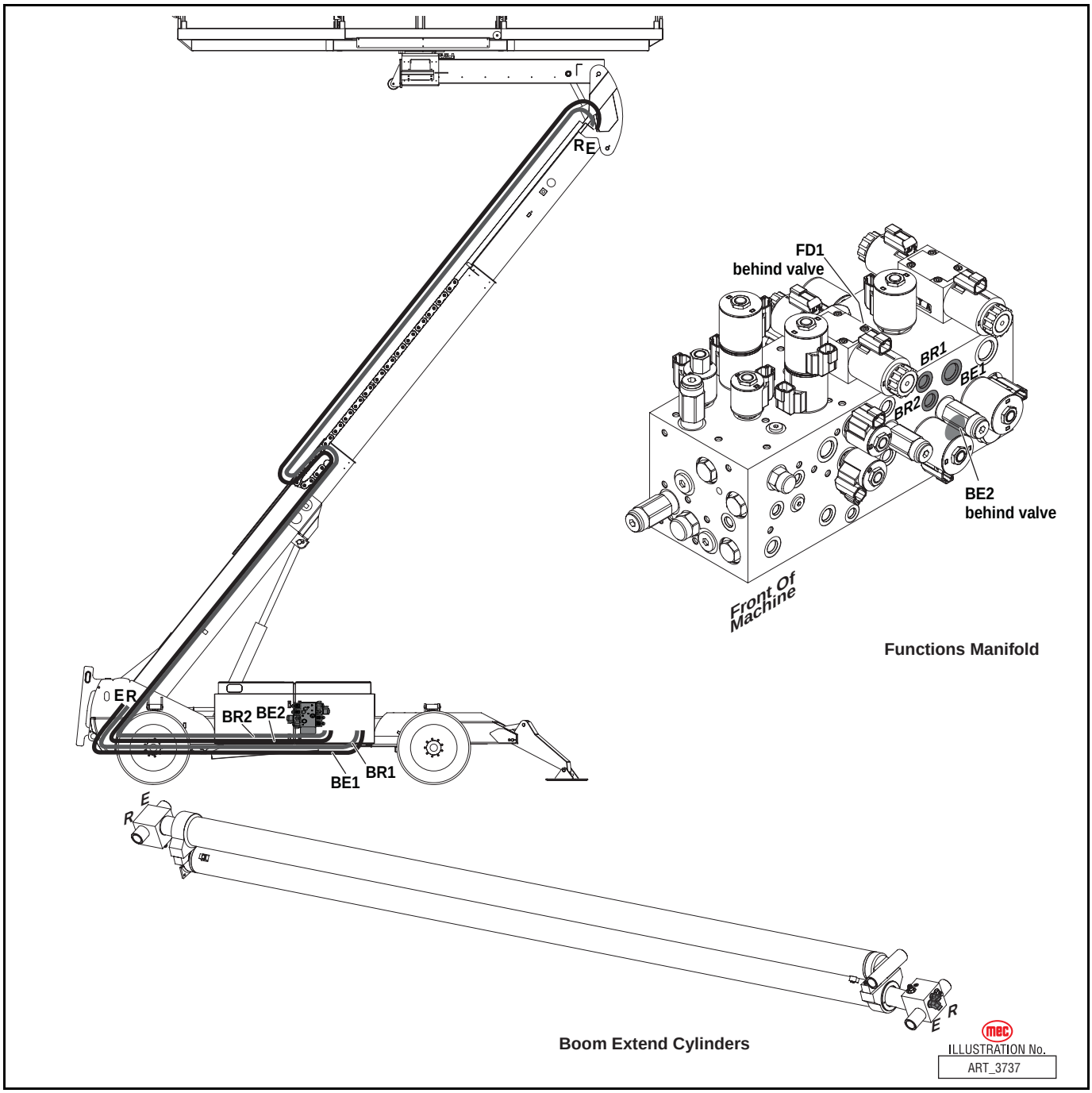
BOOM EXTEND SYSTEM

The boom extend system uses two (2) double acting hydraulic cylinders mounted back-to-back to extend each of the boom sections.

No sequencing chains or cable are used with this system. Extend and retract sequencing is achieved through the use of a flow divider valve (FD1) located in the main manifold.

Boom extend speed is enhanced by using a regenerative flow system which routes the return flow from the rod-end of the cylinder to combine with flow to the extend circuit. Counterbalance valves prevent the extension and retraction of the cylinder rods should a hydraulic line rupture or a leak develop between the cylinders and its related control valves.

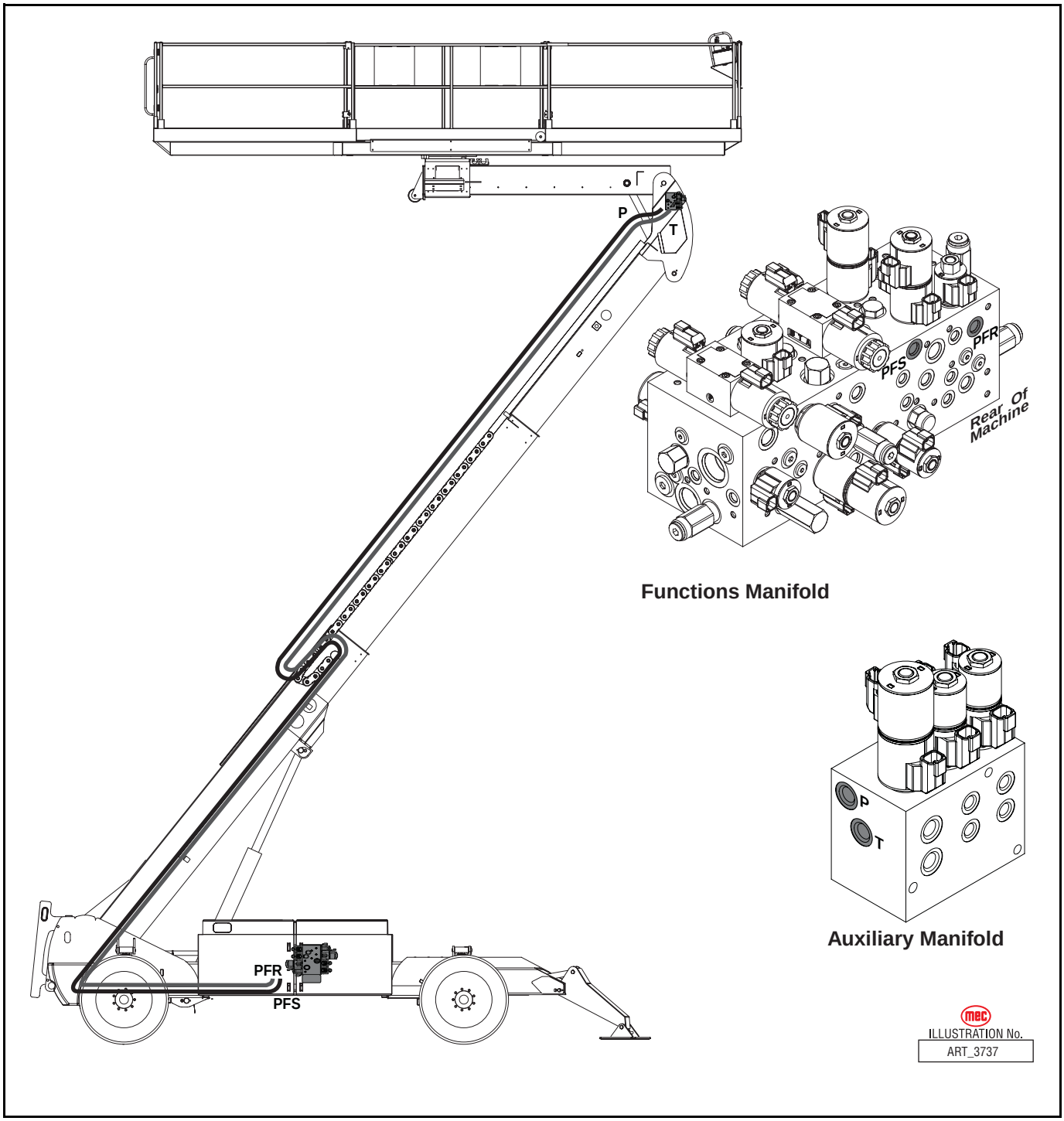
Figure 1-28: Boom Extend Circuit



AUXILIARY MANIFOLD SUPPLY

The Auxiliary Manifold provides hydraulic power for the Platform Level, Platform Rotate and Platform Slide functions, and is supplied by hoses from the PFS and PFR ports of the Functions Manifold.

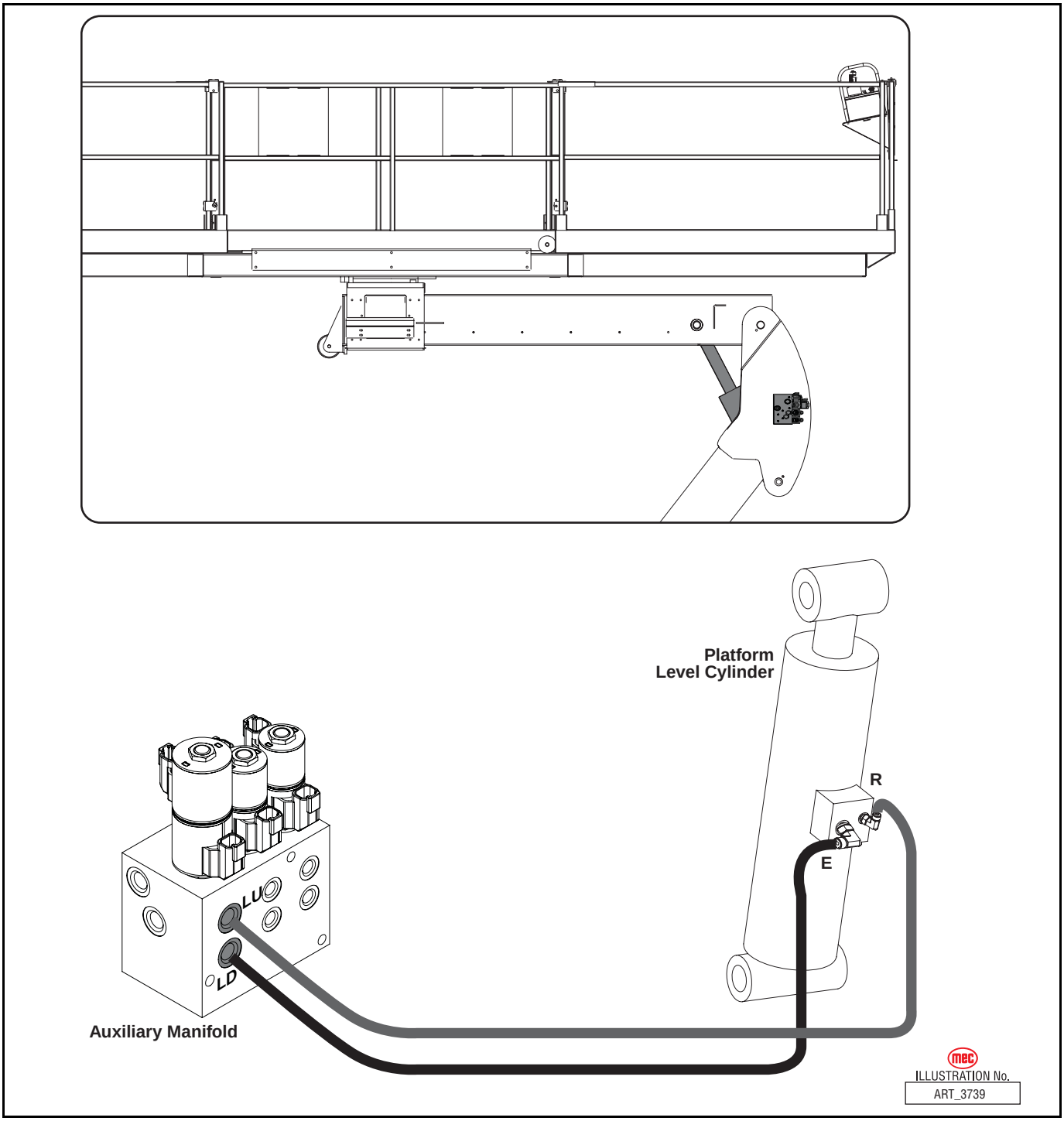
Figure 1-29: Auxiliary Manifold Supply Circuit



PLATFORM LEVEL FUNCTION

The Platform Level Function uses one (1) double-acting cylinder to control the leveling of the platform. Fluid from Port LD of the Auxiliary Manifold flows through the Platform Level Control Valve to the extend port of the cylinder. Fluid from Port LU flows to the retract port of the cylinder. The Auxiliary Manifold provides directional control, while the Platform Level Control Valve provides proportional control.

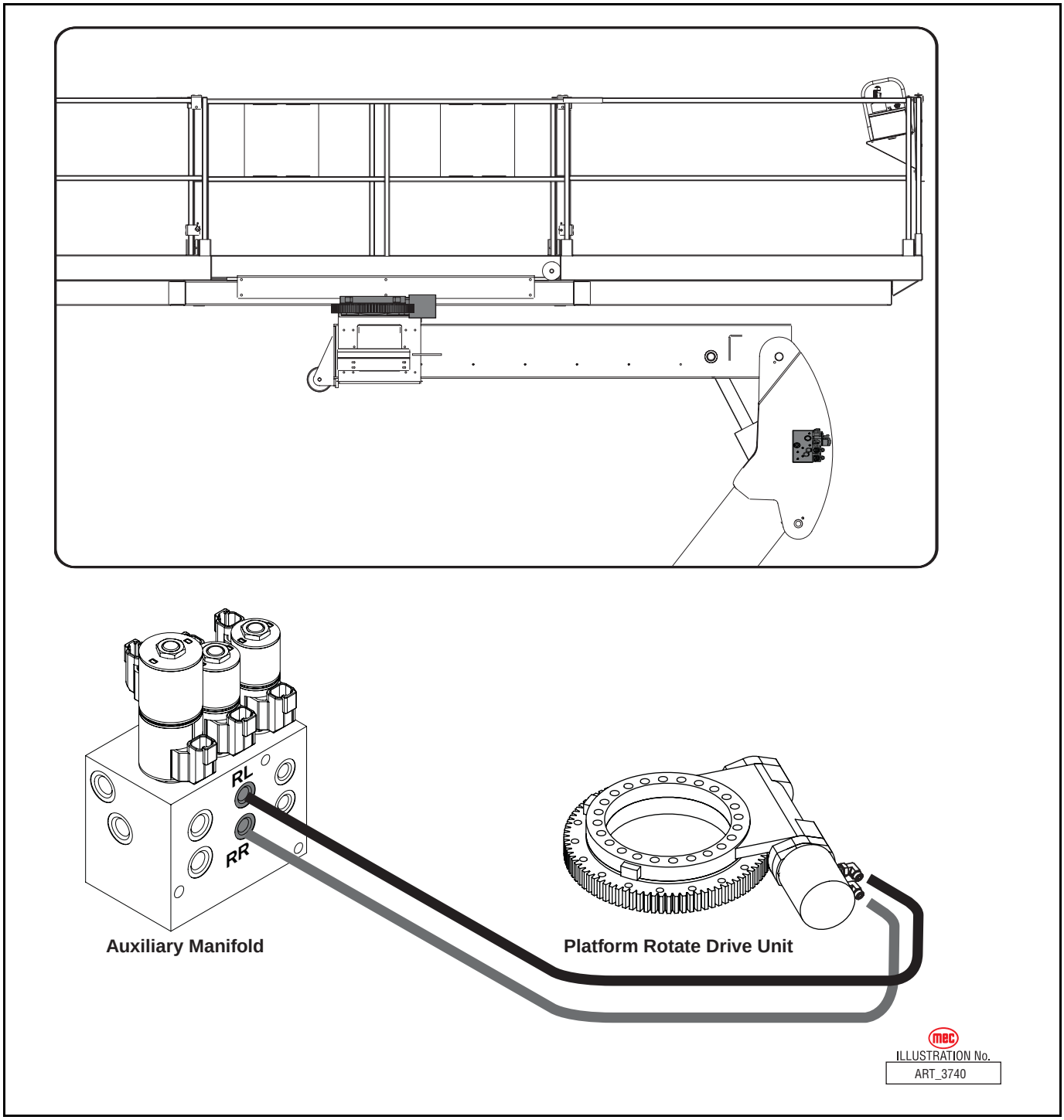
Figure 1-30: Platform Level Circuit



PLATFORM ROTATE FUNCTION

The Platform Rotate Function uses one (1) hydraulic motor and worm gear to control the rotation of the platform. Fluid from Port RL and Port RR of the Auxiliary Manifold flows to the Platform Rotate Drive Unit to the rotate the platform. The Auxiliary Manifold valve provides directional control.

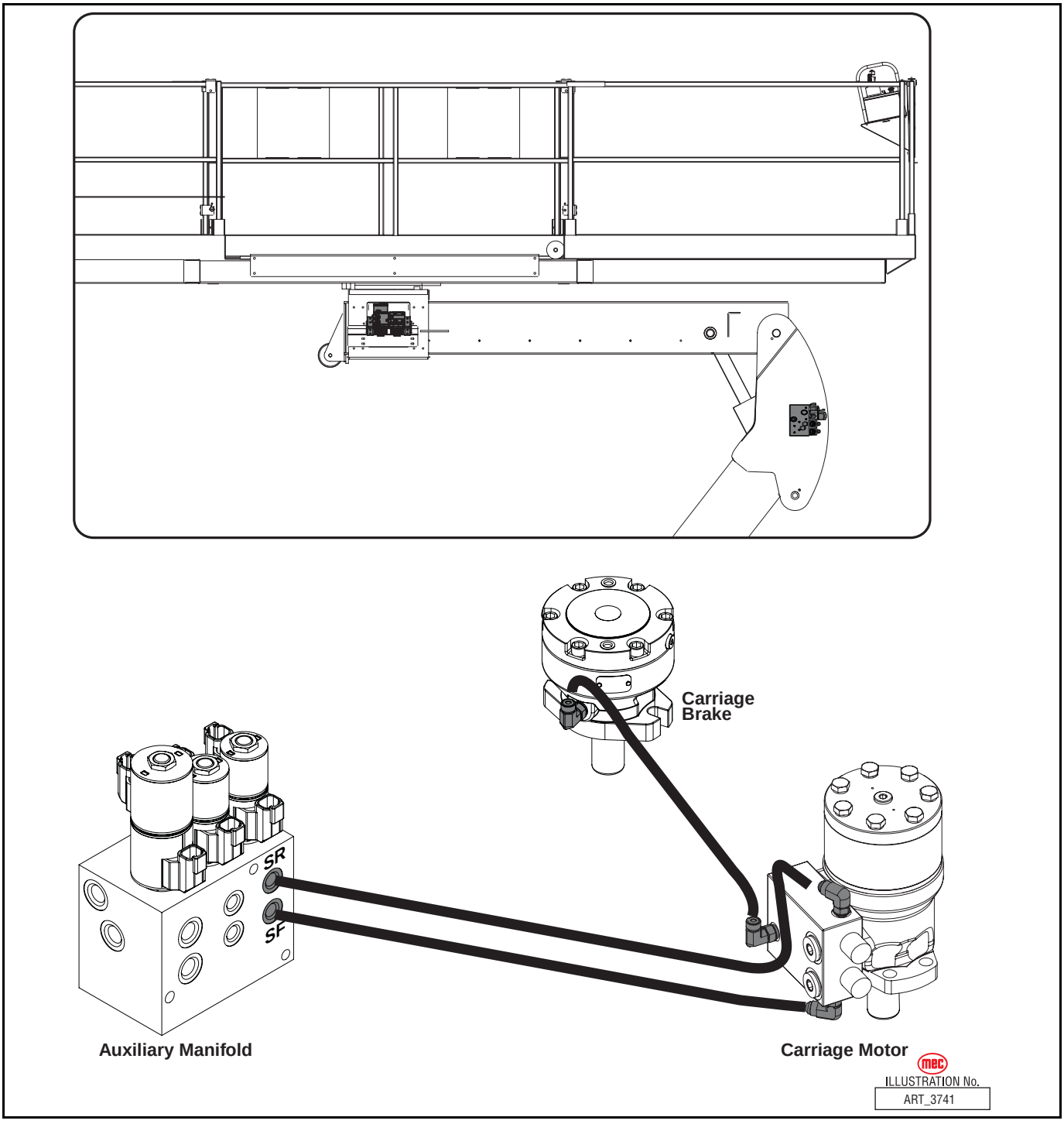
Figure 1-31: Platform Rotate Circuit



PLATFORM SLIDE FUNCTION

The Platform Slide Function uses one (1) hydraulic motor and gear rack to control the fore-and-aft motion of the platform. Fluid from Port SR and Port SF of the Auxiliary Manifold flows to the Carriage Motor to the slide the platform. Pressure from the Carriage Motor's check valve circuit releases the Carriage Brake while the carriage is in motion.

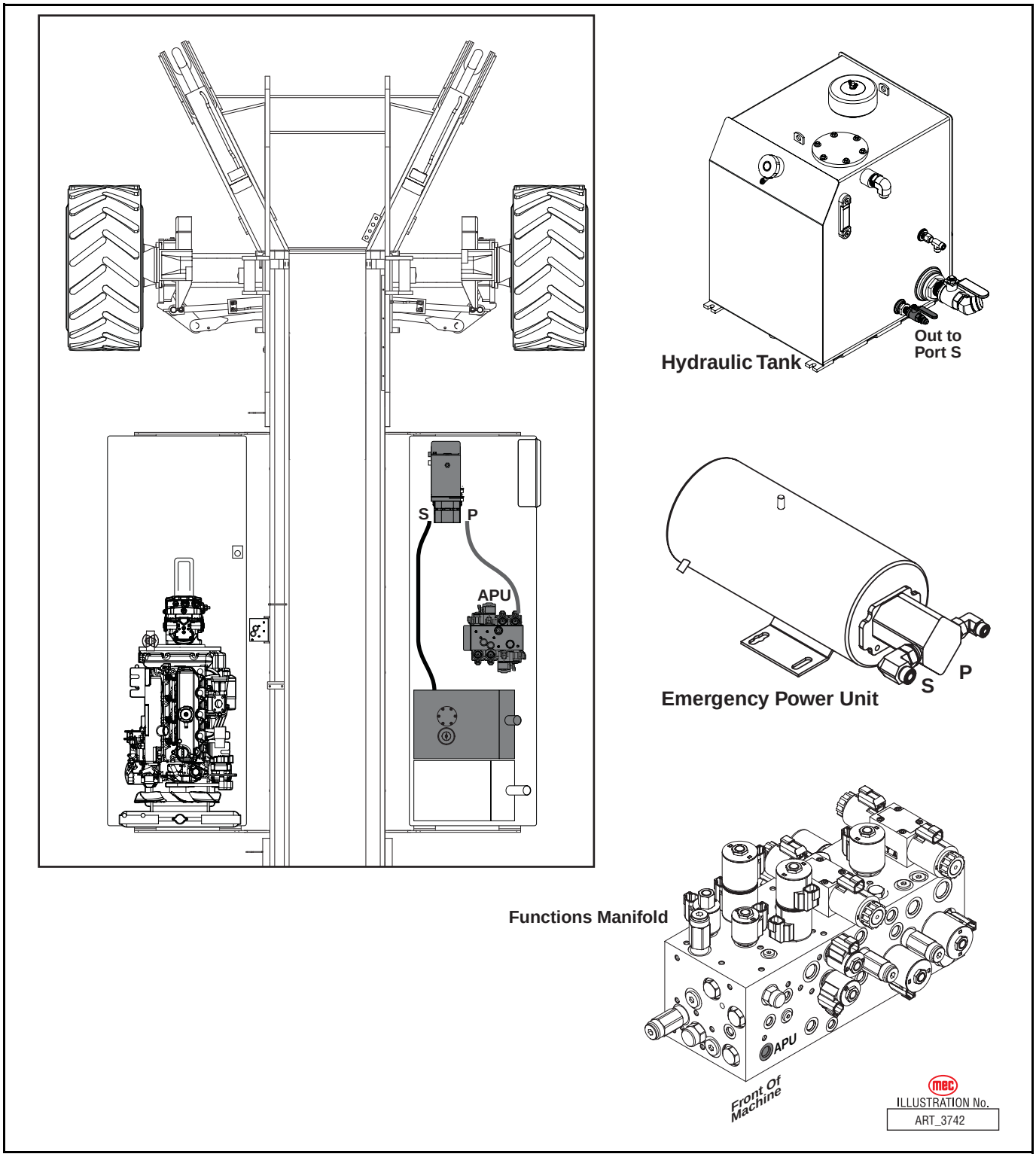
Figure 1-32: Platform Rotate Circuit



EMERGENCY POWER FUNCTION

The Emergency Power Function provides hydraulic power to lower the platform in the event of an emergency or failure of the engine. The Emergency Power Unit is activated electrically using battery power and provides pressure to lower and retract the boom.

Figure 1-33: Emergency Power Circuit



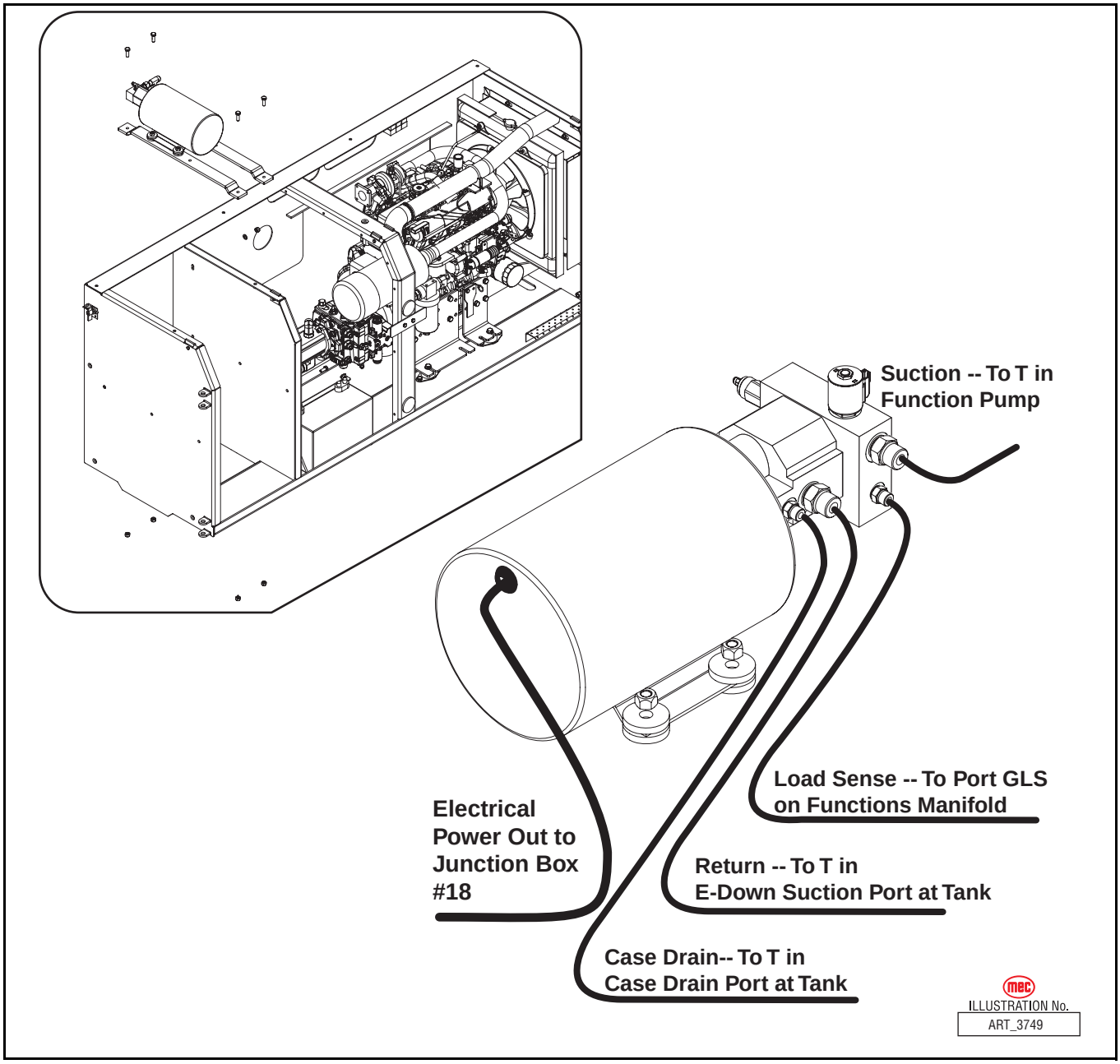
GENERATOR OPTION

The optional generator is driven by hydraulic pressure that takes pressure from the larger port of the Functions Pump. The return line connects to a T at the Emergency Power suction port of the Hydraulic Tank. A third line connects the top port of the Generator's motor to Port GLS on the Functions Manifold.

An electrically-operated solenoid valve located on the generator valve body turns the Generator on and off.

A short cord connects the generator to a junction box beside the Generator. From this box, another cord with a twist-loc end plugs into the Power To Platform connection at the front of the Control Module to provide electrical power to the platform.

Figure 1-34: Optional Generator

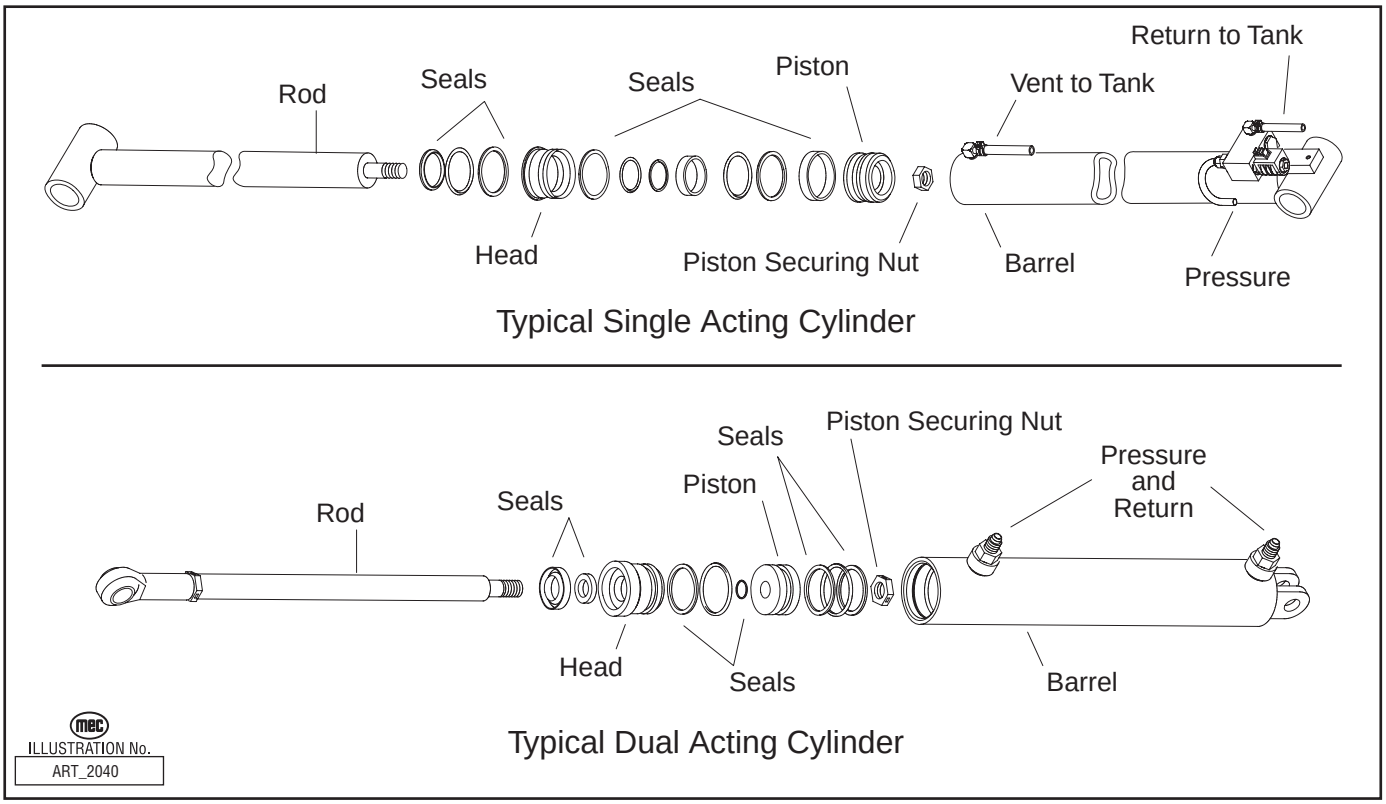


GENERAL CYLINDER REPAIR

WARNING

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

Figure 1-35: 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 precautions to protect the rod surface. Guard against dirt or other foreign objects entering system.

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

CAUTION

DO NOT overtighten the vise. Overtightening may damage the cylinder.

CYLINDER DISASSEMBLY

1. Remove solenoid valves or counterbalance valves, if the cylinder is equipped with them.
2. Remove the head from the cylinder body.
3. Remove the shaft assembly from the barrel, pulling in a straight line, so as not to scar the internal parts.
4. 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.
5. Remove nut at the end of the shaft and pull head and piston off of the rod.
6. Remove all seals from the head and piston using a non-sharp seal tool. These tools are available from various seal suppliers.
7. Clean all fluid and debris off of the head, piston, shaft, collar and barrel using solvent, rags, and an air hose.
8. 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 ensure a quality repair, cylinder parts must be thoroughly cleaned, dry, and free of solvents, and assembly must be performed in a clean area free of dust and contamination.
- Do not use sharp edged tools during seal replacement. After installing seals wait at least one hour before assembling the cylinder to allow the seals to return to their original shape.
- Torque all hardware according to the Hydraulic Components Torque Table unless otherwise specified.

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

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

EXTEND CYLINDER DISASSEMBLY & ASSEMBLY

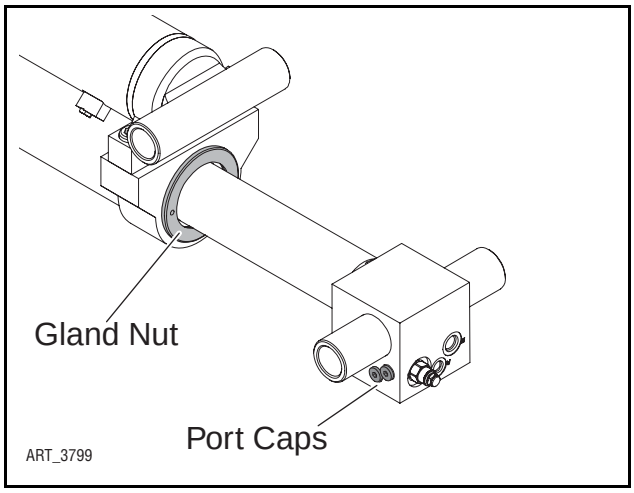
The Extend Cylinder Assembly used on the Titan Boom uses cylinders that pass hydraulic fluid down the center of the cylinder rod, with manifold connections at each rod end and blind cylinder barrels.

It is not necessary to separate the cylinder pair assembly when servicing one or both cylinders.

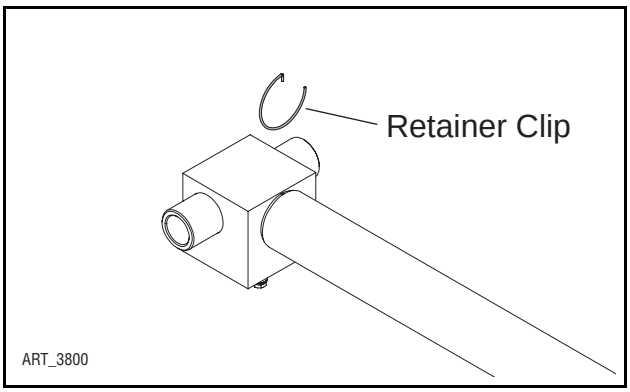
DISASSEMBLY

1. Place cylinder assembly on a bench or rack that will support the cylinder on both ends and in the middle.
2. Clean the cylinder assembly of all dirt, oil and debris before disassembly.
3. Place an oil drip pan under the end of the cylinder to be serviced to catch the oil upon disassembly of the cylinder. Approximately 3 gallons per cylinder will be lost.

IMPORTANT! Each cylinder is equipped with counterbalance valves that prevent cylinder extension/retraction except by hydraulic pressure. Remove the port plugs - located on the side of the cylinder manifold - on the cylinder to be serviced to allow cylinder rod extraction. It is not advised to remove counterbalance valves.



4. Remove cylinder gland nut from the cylinder using the appropriate spanner tool and extract the rod from the cylinder.
5. Place the cylinder rod on a flat surface, protecting it from damage and bending.
6. Remove the Retainer Clip located at the end of the rod (at the base of the cylinder manifold) by carefully lifting it out of the hole, then twisting it off the rod.
7. Using a strap wrench, hold the cylinder rod and unscrew the manifold from the rod end.



NOTE: The manifold is connected to a long tube that extends into the center of the cylinder rod. Use caution when removing the manifold from the cylinder, so as not to bend or damage this tube.

ASSEMBLY

1. Replace seals on piston and inside the gland nut, taking care not to damage the seals.
2. Coat the piston seals and bearings liberally with hydraulic assembly lubricant or clean hydraulic oil.
3. Install cylinder manifold (with tube) into the cylinder, ensuring that the tube fits into the o-ring port in the center of the piston at the far end of the rod.

NOTE: Alignment of the tube with the o-ring port can be assisted through the use of a clean, smooth bar approximately 18" long and 7/16" diameter maximum.
Feed the bar into o-ring port from outside the piston end of the rod. With assistance from a helper, guide the tube into the cylinder rod, fit the bar into the end of the tube and guide it into the o-ring port.

4. Thread the manifold onto the cylinder rod completely using a small amount of anti seize compound on the threads.
5. Locate both sides of the Retainer Clip hole (one side in the rod and the other side in the manifold) and align them by unthreading the manifold slightly. Once the holes are aligned, install the pin retainer.
6. Insert the rod into the cylinder. Take care not to damage the seals as they pass over the sharp edges at the cylinder opening.
7. Install the cylinder gland nut using a small amount of anti seize compound on the threads. Tighten sufficiently.

Repeat procedure on other cylinder if necessary.

Section 2

Electrical System

Contents

FIGURES PAGE

ELECTRICAL SYSTEM – GENERAL

The electrical control system consists of lower controls located on the machine base and upper controls located on the machine platform. Emergency lowering controls are also located on the machine base.

LOWER CONTROLS

The lower controls will operate all functions except the steer and drive functions.

UPPER CONTROLS

The upper controls will operate all machine functions. A momentary bi-directional rocker switch on the drive control handle provides the steering function. The control system for operation of drive, steer, lift, and lower is electric-over-hydraulic type. The lift, extend, rotate, slide and drive system is a proportional and is controlled by position and direction of the upper controls joysticks.

EMERGENCY STOP

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

When both Emergency Stop switches are “set”, the controls have electrical power and the machine will operate.

Figure 2-1: Emergency Stop Switch

ART_3353

NOTE: Both switches must be set or the machine will not operate. The electric Emergency Lowering switch will continue to function when the Emergency Stop switches are depressed.

EMERGENCY LOWERING

The Emergency Lowering System is used to lower the platform in case of power failure. To lower the platform, activate the Emergency Power Switch to run the Emergency Down auxiliary hydraulic pump.

This function uses battery power from the auxiliary battery to lower the platform.

- Push and hold the Auxiliary Power switch, then use the Boom Extend/Retract function to retract the boom.
- Continue to hold the Auxiliary Power switch, then use the Boom Lift/Lower function to lower the boom.

NOTE: The Emergency Lowering System is disabled when the engine is running.

NOTE: The Emergency Power switch serves as an enable switch. It is not necessary to use the primary function enable switch.

DIAGNOSTIC LED & ONBOARD EZ-CAL DIAGNOSTIC TOOL

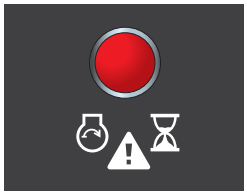
If the machine fails to operate, check the onboard EZ-Cal diagnostic tool located inside the Lower Controls Box. Also, check the diagnostic LED of the GP400 Module, located inside the control box. The LED on the module should be *ON*.

If the EZ-Cal has an error message, or if the LED is *OFF* or FLASHING, see Section 4 of this manual for assistance in troubleshooting.

STARTER CIRCUIT CUTOUT

To protect the starter motor, power will cut off to the starter circuit when the starter motor has run continuously for 10 seconds without starting the engine. The Starter Circuit Cutout indicator light on the Lower Controls Box will turn on during this time. Power to the starter circuit will reengage after 30 seconds.

Figure 2-2: Master Disconnect Switch

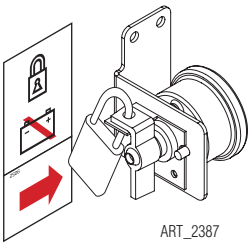


ART_3342

BATTERY DISCONNECT SWITCH

All electrical power is routed through the Master Disconnect switch located in the Control Module. The switch can be locked in the OFF position with a padlock to prevent unauthorized use.

Figure 2-3: Master Disconnect Switch



ART_2387

BATTERIES

CAUTION

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

WARNING

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

ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH BATTERIES.

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

REPLACE ONLY WITH MANUFACTURER-APPROVED BATTERIES.

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

Two (2) battery (12 Volts DC) -- one supplies the electrical power required to start the engine and to operate the electrical circuits, while a second battery provides power for the Emergency Down power unit.

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 CHARGED (100%) AT 80°F (26.6°C)

- drops to 65% at 32°F (0°C)
- drops to 40% at 0°F (-32°C)

Table 2-1: Recommended Battery Charge Intervals

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

BATTERY MAINTENANCE (IN USE)

Check 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:

During quarterly maintenance (after battery has been charged), 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	6V Battery	12V Battery
Fully Charged	1.280	2.10	6.30	12.60
Fully Discharged	1.130	1.75	5.19	10.50

BATTERY REPLACEMENT

WARNING

TURN OFF THE BATTERY DISCONNECT SWITCH BEFORE REMOVING ANY BATTERY FROM THE MACHINE.

CAUTION

Prevent damage to the battery and/or electrical system;

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

TO REMOVE A BATTERY:

1. Turn the Battery Disconnect switch to OFF.
2. Disconnect the battery cables and remove battery hold-down hardware.
3. Lift the battery from the compartment, put the battery aside and dispose of properly.

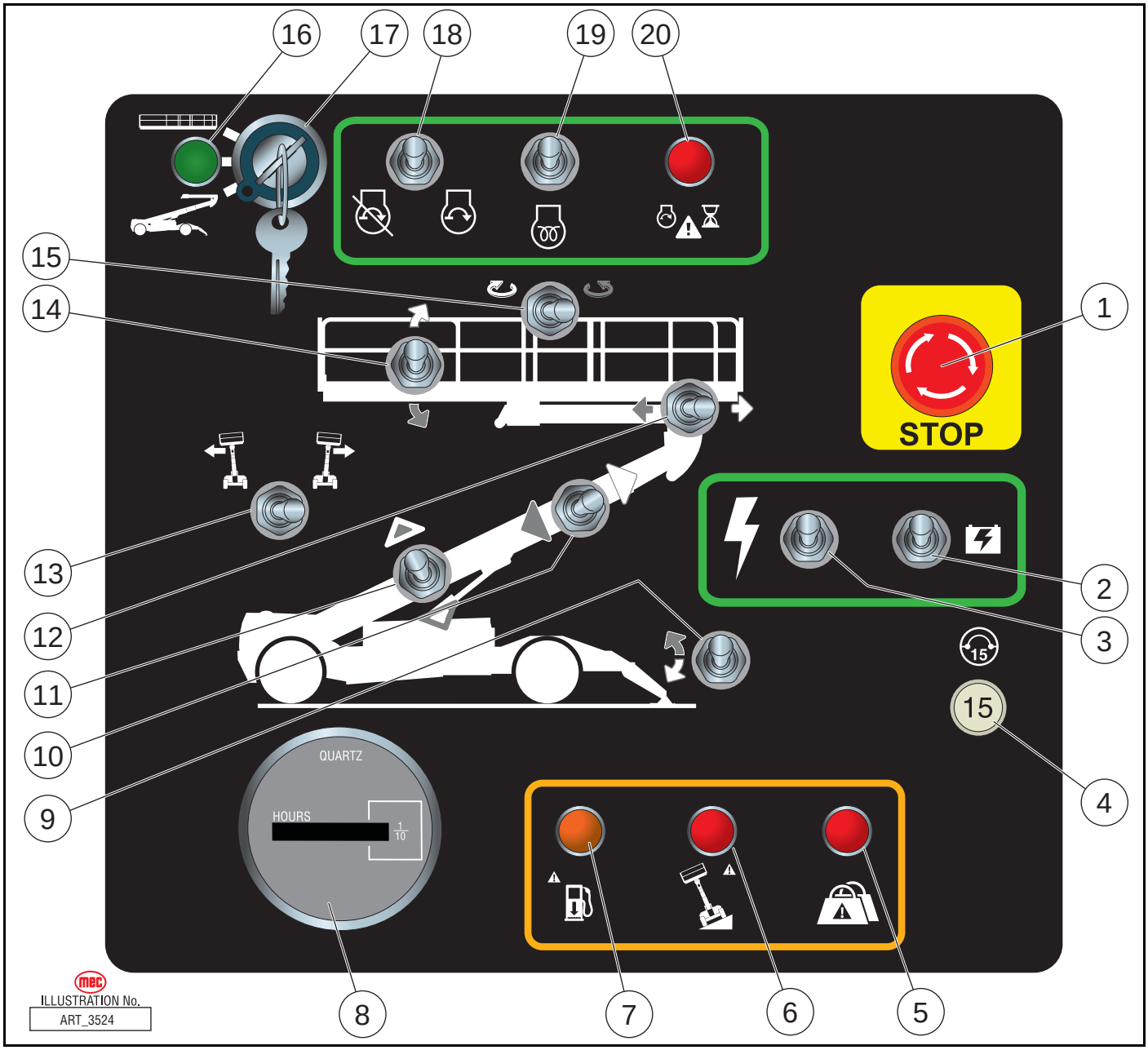
TO INSTALL A BATTERY:

1. Position the battery in the compartment and secure with hold-down hardware.
2. Connect battery cables.

CONTROLS

LOWER CONTROLS

Figure 2-4: Lower Controls

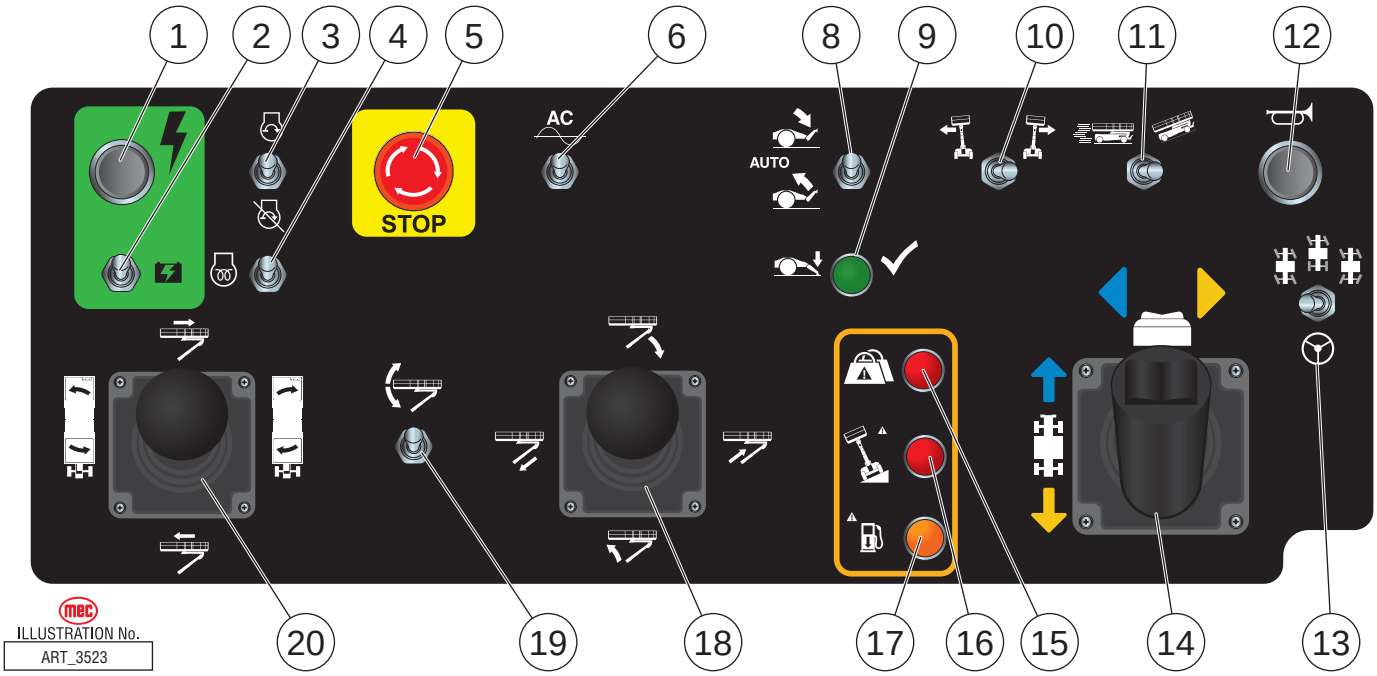


WARNING

ALWAYS BE AWARE OF THE MACHINE'S POSITION AND OF YOUR SURROUNDINGS BEFORE ACTIVATING ANY CONTROL FUNCTION.

	CONTROL	DESCRIPTION	
1	Emergency Stop Switch	Press the EMERGENCY STOP switch at any time to stop all machine functions. Turn switch *clockwise* to reset	
2	Emergency Power Switch	If normal power fails, press and hold while using boom retract and boom lower functions.	
3	Function Enable Switch	Press and hold this switch to enable boom, platform, frame level and stabilizer operations. Press down to operate the controls at slow speed. Press up to operate the controls at higher speed.	
4	Circuit Breaker	Trips when there is excessive electrical load. Push to reset.	
5	Overload Indicator Light (option)	Light ON indicates too much weight on the platform. An audible alarm will sound and all machine function will stop. Remove weight from the platform to restore function and continue.	
6	Tilt Indicator Light	When this red light is illuminated, the machine is not level. Carefully retract the boom, then lower the boom, before leveling the machine, or move the machine to a firm, level surface.	
7	Low Fuel Indicator Light	When this amber light is illuminated, the fuel level is low. Refuel soon.	
8	Hour Meter	Indicates total elapsed time of machine operation.	
9	Stabilizer Switch	Move and hold down until automatic stabilizer deployment stops automatically. Move and hold up to retract stabilizers.	
10	Boom Extend/ Retract	Move this switch right to extend the boom. Move this switch left to retract the boom.	
11	Boom Lift/Lower	Move this switch up to lift the boom. Move this switch down to lower the boom.	
12	Platform Slide Forward/Rearward	Move this switch right to move the platform forward along the platform support beam. Move this switch left to move the platform rearward along the platform support beam.	
13	Frame Level Switch	Move this switch left to manually adjust the level position of the frame to the left. Move this switch right to manually adjust the level position of the frame to the right.	
14	Platform Level Switch	Move this switch up to manually level the rear of the platform upward. Move this switch down to manually level the rear of the platform downward.	
15	Platform Rotate Switch	Move this switch left to rotate the platform clockwise. Move this switch right to rotate the platform counterclockwise. The Platform Rotate function will stop when the platform reaches its detent center position. To continue to rotate the platform, return the switch to the neutral position, then push the switch to rotate the platform in the desired direction.	
16	Power On Indicator Light	When this green light is illuminated, the Selector Switch (#17) is set to either platform or chassis. This light is not illuminated when the key is turned to the center (off) position or when an Emergency Stop Switch in pushed in.	
17	Selector Switch	PLATFORM	Select to operate from the platform control panel.
		BASE	Select to operate from the base control panel.
		OFF	Select to stop operation from either control panel.
18	Start/Stop Switch	Push switch up to start engine. Push switch down to stop engine.	
19	Glow Switch	Press this switch up to activate glow plugs prior to starting.	
20	Starter Time-out Indicator	When this red light is illuminated, the starter circuit is temporarily disabled. The starter circuit times out if the starter is run continuously for 10 seconds without the engine starting. The starter functions resets after 30 seconds.	

PLATFORM CONTROLS



WARNING

ALWAYS BE AWARE OF THE MACHINE'S POSITION AND OF YOUR SURROUNDINGS BEFORE ACTIVATING ANY CONTROL FUNCTION.

	CONTROL	DESCRIPTION
1	Function Enable Button	Press and hold this button to enable platform level, frame level and stabilizer operations.
2	Emergency Power Switch	If normal power fails, press and hold while using boom retract and boom lower functions.
3	Start/Stop Switch	Move this switch up to start engine. Press this switch down to stop engine.
4	Glow Switch	Move this switch up to activate glow plugs prior to cold starting the engine.
5	Emergency Stop Switch	Press the EMERGENCY STOP switch at any time to stop all machine functions. Turn switch *clockwise* to reset
6	Generator Switch (Optional Equipment)	Turn switch ON to engage optional AC generator. Generator switches off in any other function is enabled.
7	--	--
8	Stabilizer Switch	Move and hold this switch up until stabilizer deployment stops automatically. Move and hold this switch down to retract stabilizers.
9	Stabilizers Set Indicator Light	Green light illuminates when the stabilizers are fully deployed and the full range of boom functions are enabled.
10	Frame Level Switch	Move this switch left or right to manually adjust the level position of the frame.
11	Speed/Torque Switch	Move this switch to the left for high speed drive. Push this switch to the right for high torque drive.
12	Horn Button	Press to sound warning horn.

	CONTROL	DESCRIPTION	
13	Steering Mode Switch	Use this switch to set the steering mode: Left position: Crab Steer -- All four wheel turn in the same direction. Center position: 2-Wheel Steer -- Only the front two wheels steer. Right position: 4-Wheel Steer -- The front and rear wheels steer in opposite directions.	
14	Drive/Steer Control Lever	Depending on the placement of the control box and the orientation of the platform, the machine may move in unexpected directions when the Drive and Steer functions are activated. The color- and shape-coded arrows on the joystick decal correspond to similar arrow decals on the machine. Be sure to check the arrows on the machine before using the Drive or Steer functions.	
		Drive Function	Push the control lever forward to go in the direction of the blue arrows on the machine, or backward to go in the direction of the yellow arrows on the machine.
		Steer Function	Press the thumb switch on top of the control lever left to steer in the direction of the blue arrow on the machine, or right to steer in the direction of the yellow arrow on the machine.
15	Overload Indicator Light (option)	Light ON indicates too much weight on the platform. An audible alarm will sound and all machine function will stop. Remove weight from the platform to restore function and continue.	
16	Tilt Indicator Light	If this red light is illuminated, the machine is not level. Carefully retract the boom, then lower the boom, before leveling the machine, or move the machine to a firm, level surface.	
17	Low Fuel Indicator Light	If this amber light is illuminated, the fuel level is low. Refuel soon.	
18	Boom Function Control Lever	Boom Lift/ Lower Function	Depress the enable button on top of the control lever, then pull the joystick backward to lift the boom. Depress the enable button on top of the control lever, then push the joystick forward to lower the boom.
		Boom Extend/ Retract Function	Depress the enable button on top of the control lever, then push the control lever right to extend the boom. Depress the enable button on top of the control lever, then push the control lever left to retract the boom.
19	Platform Level Switch	Press this switch up to manually level the rear of the platform upward. Press this switch down to manually level the rear of the platform downward.	
20	Platform Function Control Lever	Platform Slide Forward/ Rearward Function	Press the enable button on top of the control lever, then push the control lever forward to slide the platform forward along the platform support beam. Press the enable button on top of the control lever, then pull the control lever backward to slide the platform rearward along the platform support beam.
		Platform Rotate Function	Press the enable button on top of the control lever, then push the control lever left to rotate the platform counterclockwise. Press the enable button on top of the control lever, then push the control lever right to rotate the platform clockwise. The Platform Rotate function will stop when the platform reaches its detent center position. To continue to rotate the platform, return the joystick to the neutral position, then push the joystick to rotate the platform in the desired direction.

SENSORS, RELAYS & ALARMS

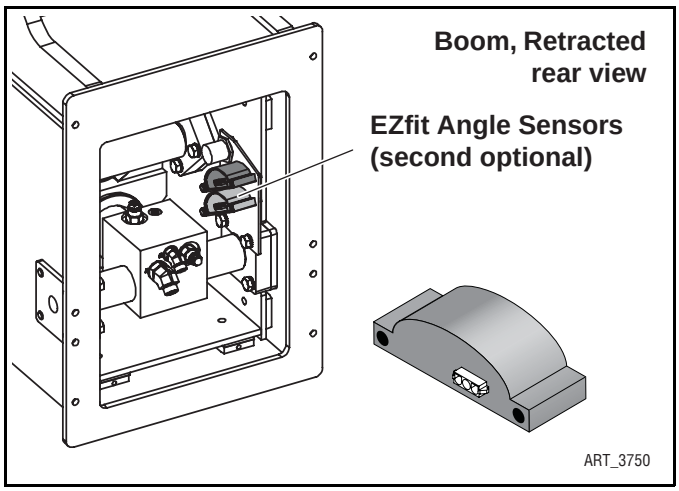
SENSORS

EZFIT ANGLE SENSOR

There is one EZfit Angle Sensor located at the base of the boom. A second redundant EZfit Angle Sensor will be present on machines equipped with the optional Overload Sensing System.

The EZfit Angle Sensor measures the absolute angle of the boom and compensates for the fore-and-aft angle of the chassis.

Figure 2-5: EZfit Angle Sensor



CAN-TILT ANGLE TRANSDUCERS

There are four (4) CAN-Tilt Angle Transducers on this machine. CAN-Tilt Angle Transducers **are not** interchangeable. Each is identified by number for communication with the GP400 Module. If removed, be sure that each returns to its original location. If replaced, be sure that the replacement has the same number as the original.

Two CAN-Tilt Angle Transducers are located side-by-side at the front of the the Platform Beam. These measure the angle of the beam both fore-and aft and side-to-side.

Figure 2-6: Platform Beam CAN-Tilts

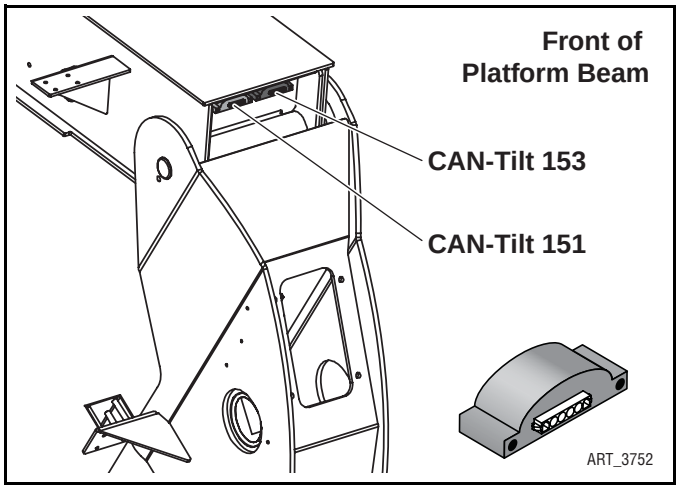
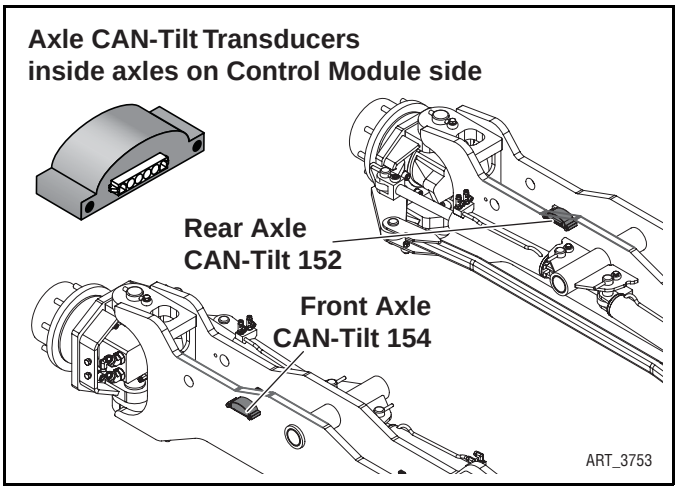


Figure 2-7: Axle CAN-Tilts

Each axle has a CAN-Tilt Angle Transducers mounted on the Control Module side. These measure the angle of their respective axle relative each other and to the GP400 module in the Base Controls Box.



PRESSURE TRANSDUCERS

Figure 2-8: Boom Lift Pressure Transducer

The Boom Lift Cylinder is equipped with one 5000 psi Pressure Transducer on machines equipped with the optional Overload Sensing System.

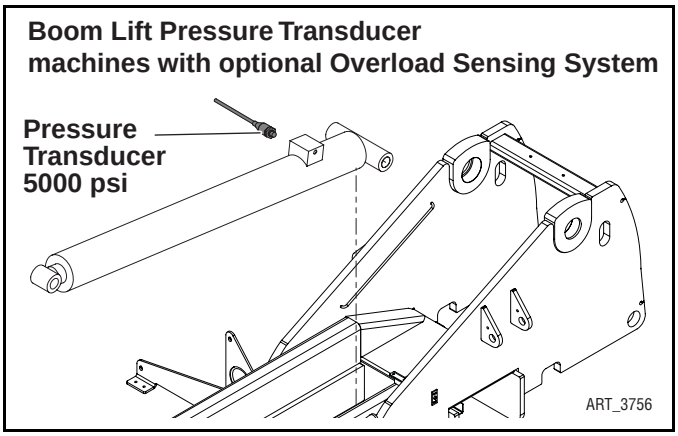


Figure 2-9: Platform Level Pressure Transducer

The Platform Level Cylinder is equipped with one 5000 psi Pressure Transducer on machines equipped with the optional Overload Sensing System.

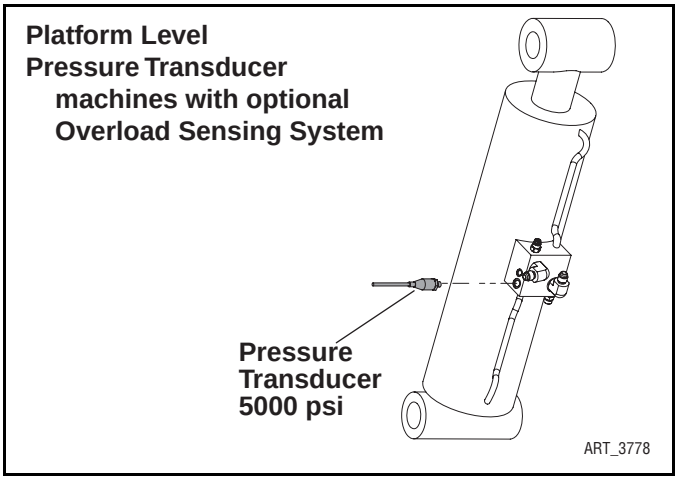
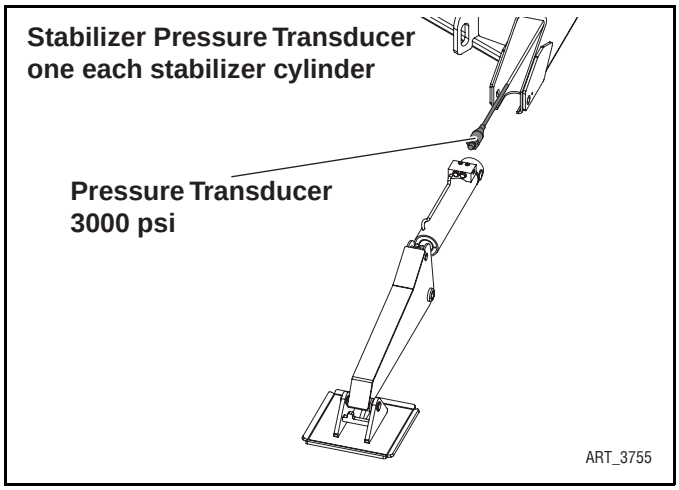


Figure 2-10: Stabilizer Pressure Transducers

Each Stabilizer Cylinder is equipped with one 3000 psi Pressure Transducer. These measure pressure in the Stabilizer Cylinders to ensure that they are supporting the machine.



PROXIMITY SENSORS

There are three (3) Proximity Sensors on this machine.

Figure 2-11: Boom Retract Proximity Sensor

The Boom Retract Proximity Sensor senses boom position to restrict drive speed and disable stabilizer operation when the boom is extended beyond approximately 4 inches (10 cm).

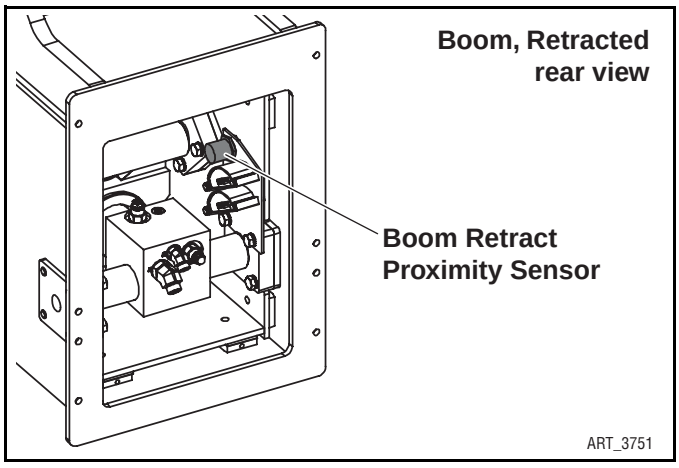
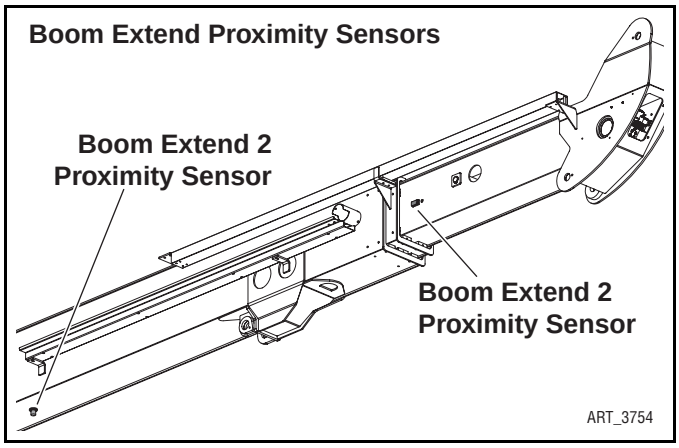


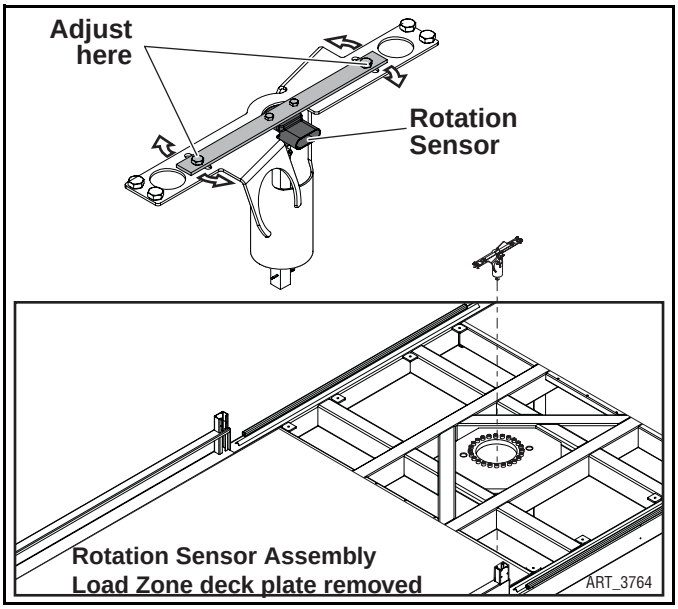
Figure 2-12: Boom Extend Proximity Sensors

The Boom Extend 1 and Boom Extend 2 Proximity Sensors sense boom position to stop motion when the stabilizers are not set. The boom must be retracted to re-enable operation.



ROTATION SENSOR

Figure 2-13: Rotation Sensor



The Rotation Sensor tracks the platform's position relative to centered, and cuts out Frame Level and Stabilizer functions when the platform is more than 10° out of centered position.

When rotating towards the centered position, the Rotation Sensor slows the platform as it approaches center, then stops rotation as the platform reaches center. Release the control handle, then re-engage it again to continue rotation.

Rotation Sensor Adjustment

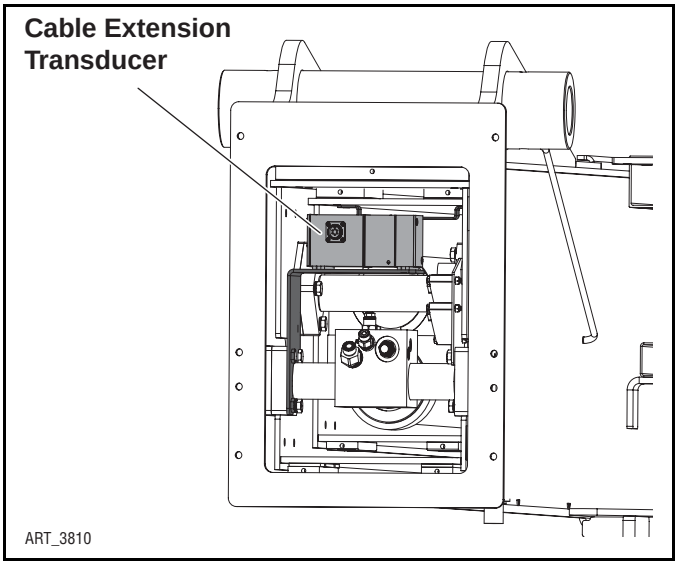
1. Center the platform manually over the boom and platform beam so that the platform entrance aligns directly with the personnel ladder.
2. Remove the Load Zone Deck Plate.
3. Access the onboard EZ-Cal Diagnostic Tool mounted inside the Lower Control Box and proceed to DIAGNOSTICS>ANALOGS>GP440 ANALOGS>P8-1.

NOTE: See Section 4 of this manual for EZ-Cal navigation instructions.

4. With the platform centered, the reading on P8-1 should read 2.51V. If the reading is not 2.51V, adjust the Rotation Sensor Assembly by loosening the adjustment bolts and turning the assembly until it reads correctly. Tighten the adjustment bolts.
5. Rotate 90° in each direction, then return the platform to the centered position. The platform should automatically stop at the centered position.

CABLE EXTENSION TRANSDUCER

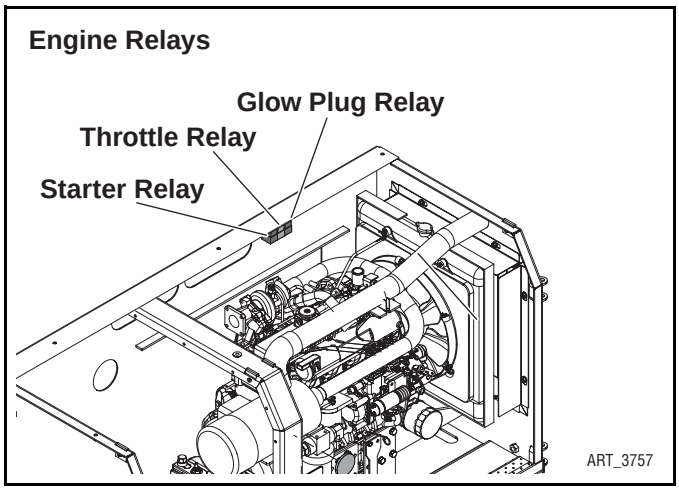
Figure 2-14: Cable Extension Transducer



The Cable Extension Transducer measures boom extension on machines equipped with the optional Overload Sensing System.

RELAYS

Figure 2-15: Engine Relays



ENGINE RELAYS

The Engine Relays are located beside the engine on the rear wall of the Engine Module. These relays reduce the current flow supplied by the GP400 Control Module. Refer to the Section 5 for relay functions and interconnect.

Start Relay

Provides power to the starter solenoid.

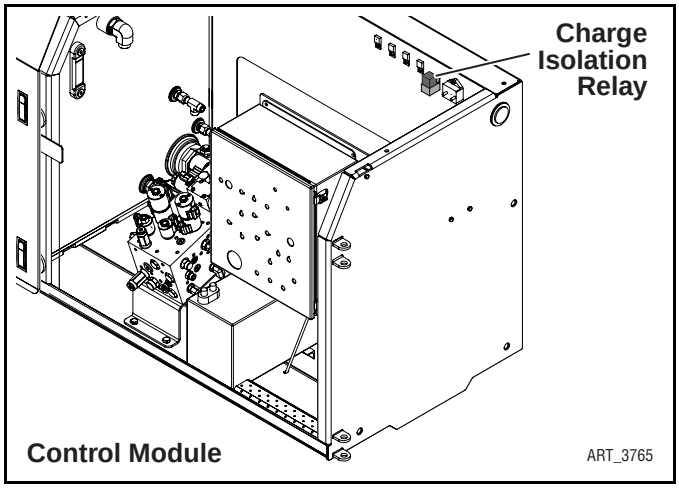
Throttle Relay

Provides power to the electric throttle solenoid.

Glow/Preheat Relay

Provides power to the diesel engine glow plugs.

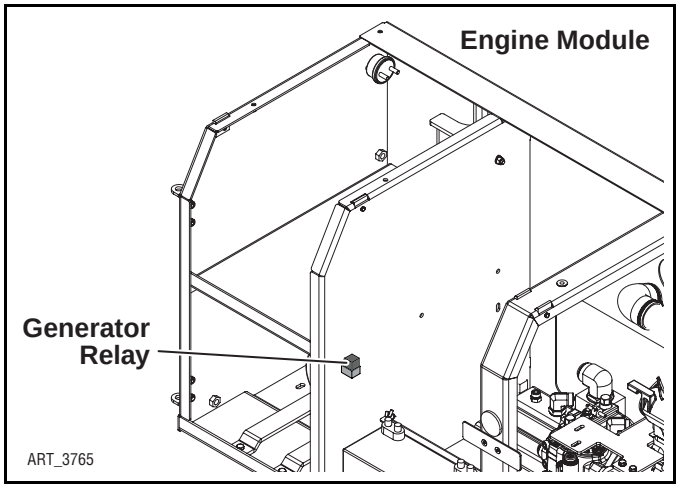
Figure 2-16: Charge Isolation Relay



CHARGE ISOLATION RELAY

The Charge Isolation Relay allows the alternator to charge the Emergency Power Battery while the engine is running and prevent the battery from discharging when the engine is off.

Figure 2-17: Generator Relay



GENERATOR RELAY

On machines equipped with the optional 3kVA Generator, this relay controls the solenoid valve that turns the generator on and off. It also provides power to the exciter for the generator.

ALARMS

TILT ALARM

The Tilt Alarm is a dual-tone alarm that sounds at the Base Controls Box when the angle of the platform is outside of acceptable levels of operation (as measured by the two CAN-Tilt Angle Transducers mounted at the front of the platform beam).

To Correct: – Use the Platform Level control switch to level the platform fore-and-aft. If the alarm continues to sound, the platform may be out of level side-to-side. If this is the case, center the platform, then retract and lower the boom until the platform is in the stowed position. Make sure the stabilizer pad is supported by a firm surface, then re-deploy the stabilizers before repositioning the platform.

OVERLOAD ALARM

The Overload Alarm is a dual-tone alarm that sounds at the Base Controls Box when the control system senses an overload situation. The Overload Alarm is installed on machines equipped with the optional Overload Sensing System.

To Correct: – Remove weight from the platform before operation can continue.

STABILIZER ALARM

The Stabilizer Alarm is a single-tone alarm that sounds at the Upper Controls Station when the Pressure Transducers on the stabilizer cylinders sense a drop in pressure when the boom is elevated and/or extended. When this alarm is sounding, movement is restricted to centering the platform, boom retraction, platform slide and lift 5% above current position. The boom will lower once it is fully retracted.

To Correct: – First retract and then lower the boom and move the platform as necessary to bring the platform to the stowed position. Reset the stabilizers and/or reposition the machine until the green Stabilizers Set indicator illuminates at the Upper Controls Station.

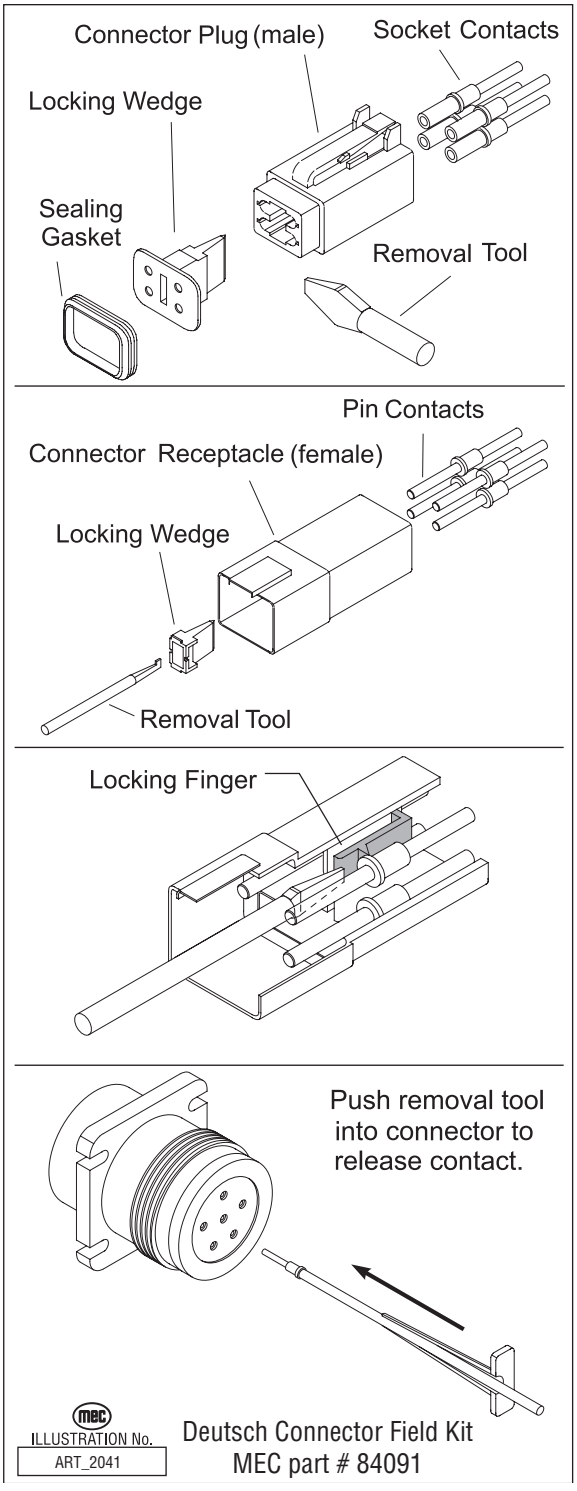
ALERT SOUNDS

- The Platform Descent Alarm is optional but may be required in certain areas of operation. This alarm sounds from the Base Controls Box.
- The All-Motion Alarm is optional and sounds at the Base Controls Box.
- The Horn is activated by button from the Upper Controls Station and sounds from the Base Controls Box.

DEUTSCH CONNECTORS

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

Figure 2-18: Deutsch Connectors



MALE PLUG CONNECTOR

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

FEMALE RECEPTACLE CONNECTOR

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

LOCKING FINGERS

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

HEAVY DUTY PLUG

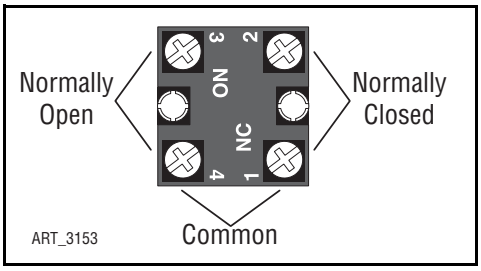
- Slide the removal tool along the wire to be replaced and push into the connector to release the contact.
- Pull the wire and contact out of the plug.

CRIMPING

- Strip 1/4 in. (6 mm) insulation from the wire.
- Insert the contact into the crimping tool and insert the stripped wire into the contact making sure no wires are outside the contact barrel.
- Close the handles of the crimping tool, then release the handles to remove the crimped contact.

CONTINUITY CHECKS

Figure 2-19: Selector Switch

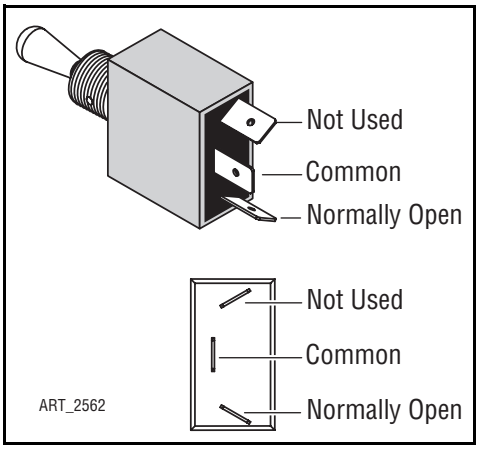


SELECTOR SWITCH – ON-OFF

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

TOGGLE SWITCH – ON-OFF

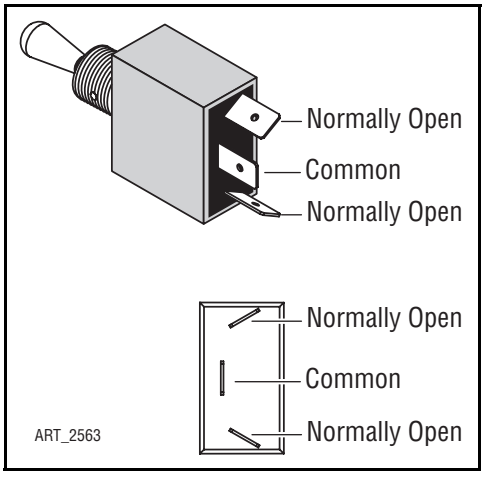
Figure 2-20: Toggle Switch, ON-OFF



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

TOGGLE SWITCH – 1-POLE 2-POSITION

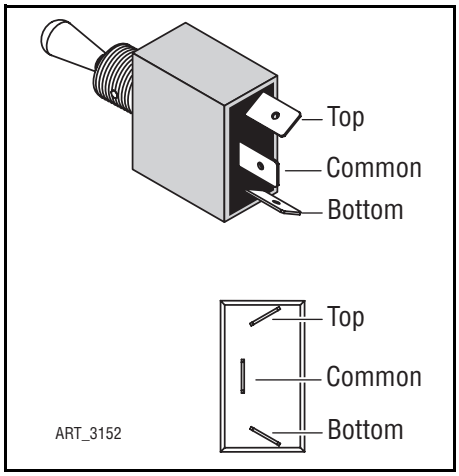
Figure 2-21: Toggle Switch, 1-Pole 2-Position



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

TOGGLE SWITCH – 1-POLE 3-POSITION

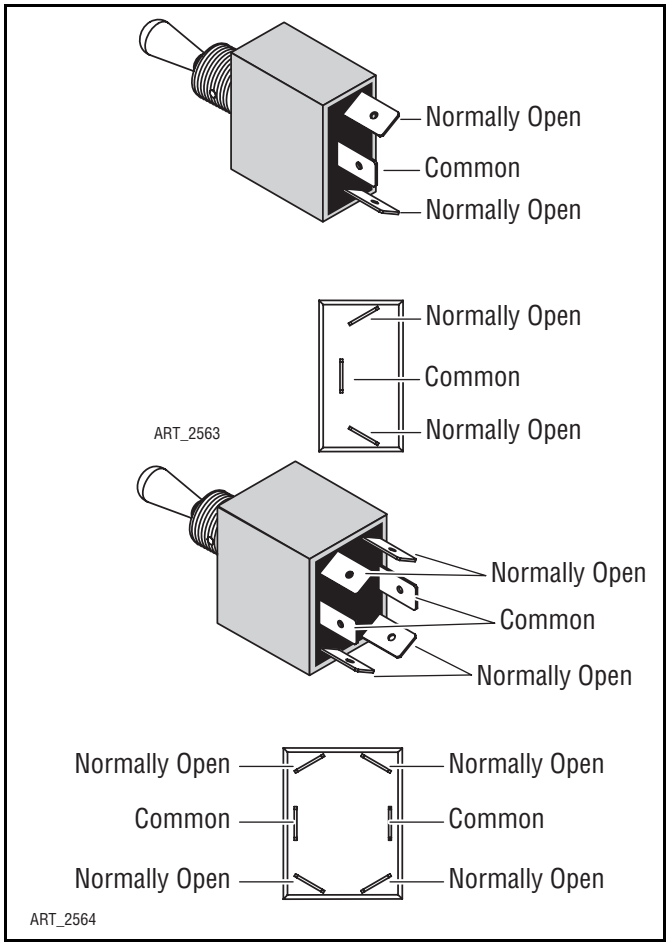
Figure 2-22: Toggle Switch, 1-Pole 3-Position



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

TOGGLE MOMENTARY SWITCH

Figure 2-23: Toggle Switch, Momentary



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

Test top position

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

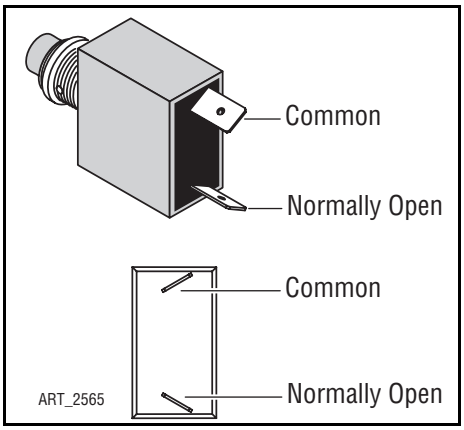
Test bottom position

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

MOMENTARY BUTTON SWITCH

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

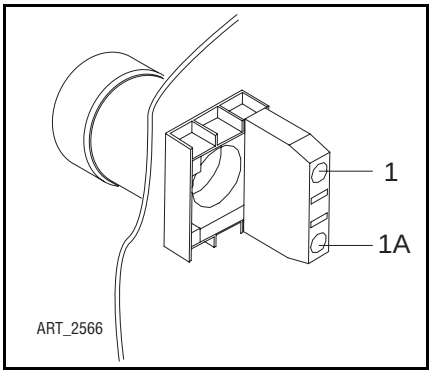
Figure 2-24: Button Switch, Momentary



EMERGENCY STOP BUTTON

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

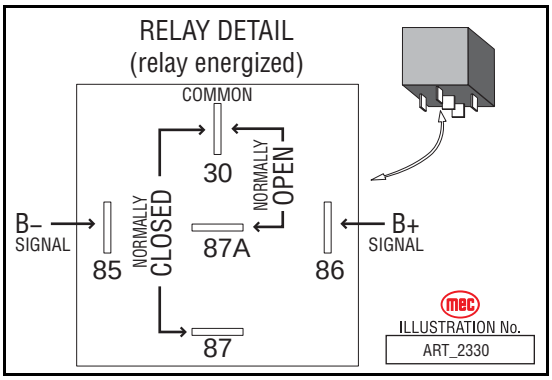
Figure 2-25: Emergency Stop Switch



RELAY

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

Figure 2-26: Relay Operation



CONTROL SYSTEM

The GP400 Control System uses a variety of components and sensors to maintain proper and safe operation of the machine. This machine may be sold into many different countries that require a variety of monitoring equipment.

COMPONENTS & LOCATIONS

- GP400 Control Module processor -- Lower Controls Box
- GP440 Module -- Upper Controls Box
- Valve Current Control Module (VCCM) -- Inside forward end of boom
- Matrix Module (optional Overload Sensing System only) -- inside front cover of Lower Controls Box

Diagnostic information can be found in *Section 4: Troubleshooting.*
Wiring information can be found in *Section 5: Schematics*.

Figure 2-27: GP400 Control Module Location

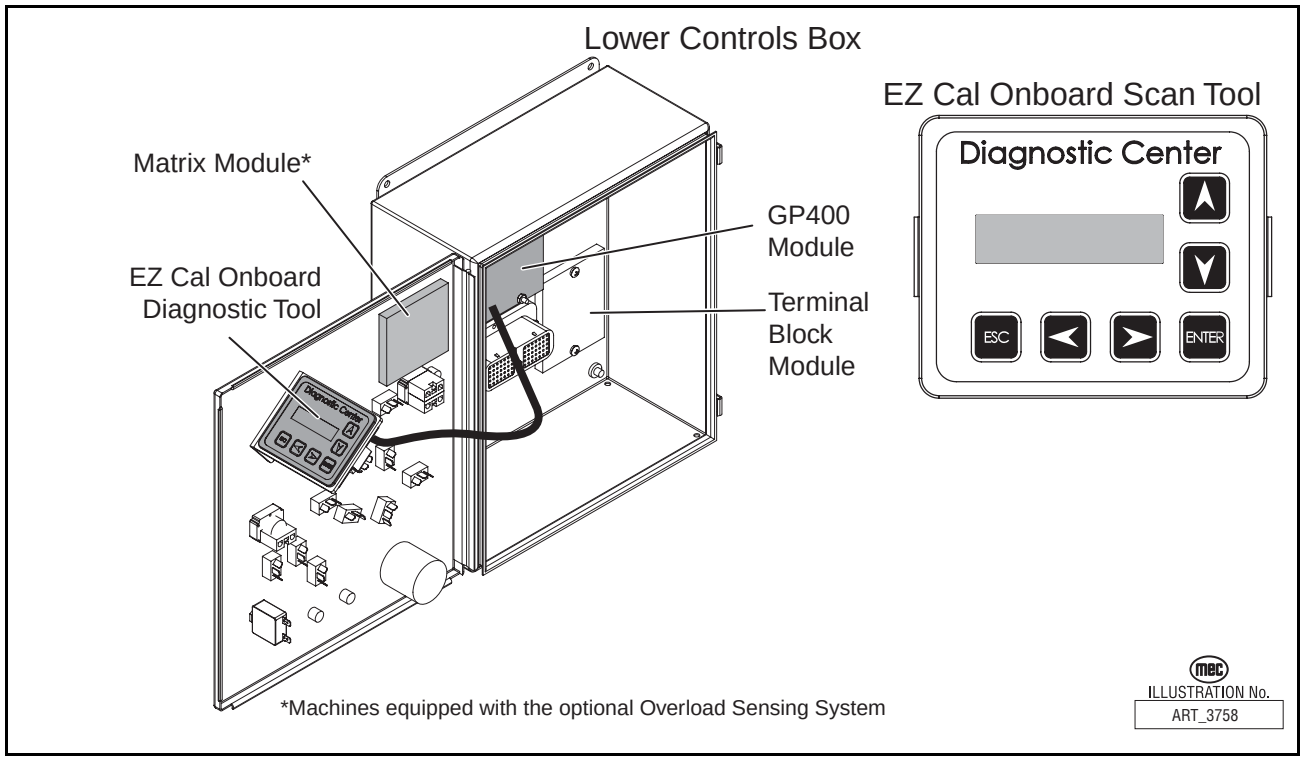
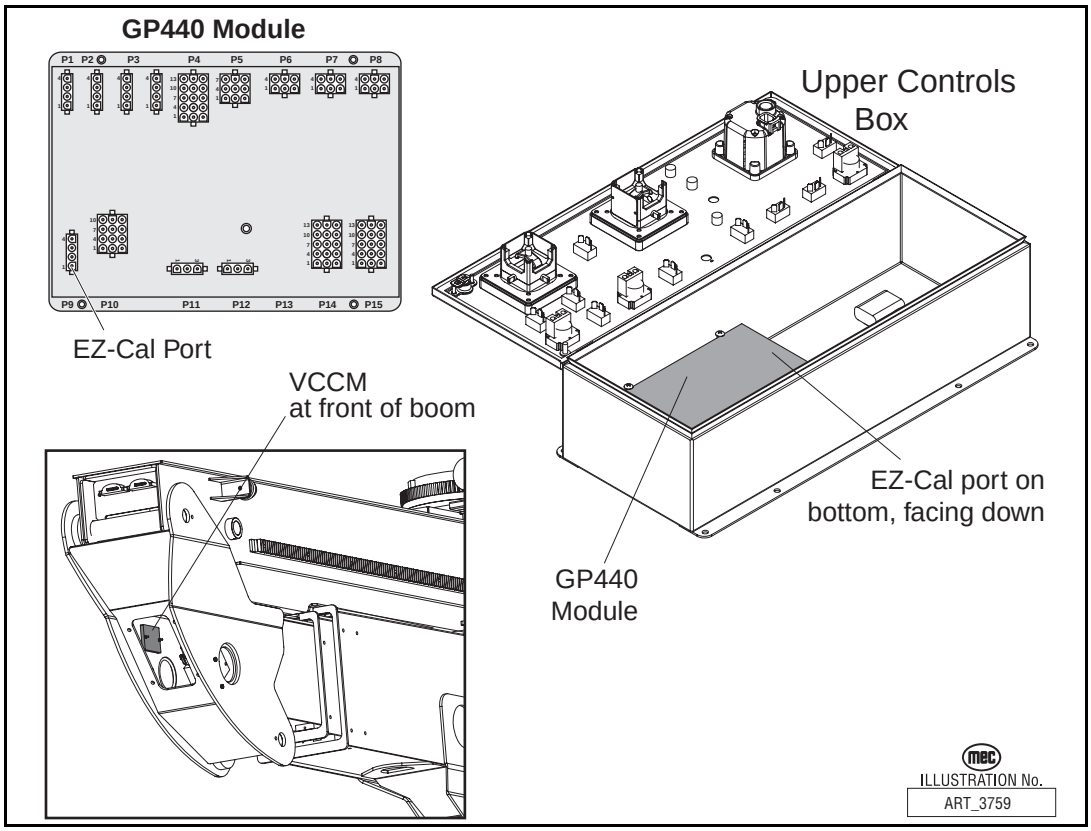


Figure 2-28: GP440 Module & VCCM Locations



GP400 CALIBRATION

This machine has an onboard EZ-Cal Diagnostic Tool mounted inside the Lower Controls Box. Use this to access the GP400 for troubleshooting and calibration.

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

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

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

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

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

GP400 CALIBRATION PROCEDURE

DANGER

IMPROPER CALIBRATION OF THE TITAN CONTROL SYSTEM CAN RESULT IN MACHINE INSTABILITY LEADING TO DEATH OR SERIOUS PERSONAL INJURY. THE FOLLOWING OPERATION MUST BE PERFORMED IN ITS ENTIRETY AS DESCRIBED HEREIN TO PREVENT IMPROPER MACHINE OPERATION.

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.

In the event of a GP400 replacement, the GP400 must be calibrated before it will operate properly. Calibration is the process by which the GP400 receives points of reference of all the machine sensors or how it becomes acquainted with the machine.

Two calibrations must be performed for all models:

1. Level Sensor Calibration
2. Height Sensor Calibration

Machines equipped with the optional Overload Sensing System must perform two additional calibrations:

3. Extension Sensor Calibration
4. Load Calibration

These and other procedures require the use of the onboard EZ-Cal Diagnostic Tool located inside the Lower Controls Box. If the EZ-Cal is missing please contact MEC Aerials parts department to purchase one.

PRE-CALIBRATION SETUP

Park the machine on an absolute flat and level surface free from overhead obstructions that will prevent full boom elevation. Lower the boom completely into its cradle.

Level Sensors calibration must be performed first. When calibrating the level sensors, be aware that the following sensors are all calibrated simultaneously:

- GP400 Control Module's Integral Level Sensor that measures chassis angles
- Two dual-axis CAN-Tilt Angle Transducers that measure platform angle; both mounted at the front of the Platform Beam.
- Two single-axis CAN-Tilt Angle Transducers measuring axle position relative to the chassis; one on each of the axles.

Therefore, before calibration can begin:

- Park the machine on a flat level surface to allow the axles to be parallel with each other and square to the chassis.
- The PLATFORM must be leveled both fore-and-aft and side-to-side through the use of a framers or spirit level placed on the top or bottom side of the platform toe boards.
  Use the Platform Level toggle function to level the platform fore-and-aft.
  Use the Frame Level function to level the platform side-to-side.

After the platform has been confirmed to be absolutely level, proceed to the Level Sensors Calibration instructions.

The sensors used on the Titan are very sensitive and can detect even the slightest movement of the parts that they monitor. Therefore it is it is absolutely mandatory that the previous steps be performed with utmost care and precision before calibration.

LEVEL SENSORS CALIBRATION

1. Park machine on flat level surface and ensure that the chassis and platform are level, as described in Pre-Calibration Setup. Turn the engine off using the Start/Stop toggle switch.
2. Open the control module door, then open the lower control box door to access the Onboard EZ-Cal.
3. Power up the Titan control system by turning the Key Switch on the lower controls to Base. The EZ-cal display will read HELP PRESS ENTER.
4. Press the right arrow twice until the display reads, "ACCESS LEVEL 3". Press ENTER
5. Using the up arrow and right arrow, enter the numbers 1775, then press ENTER. The display should now read "ACCESS LEVEL 2"
6. Press the right arrow twice until the display reads "SETUPS". Press ENTER.
7. Press the right arrow once until the display reads "TILT SETUPS". Press ENTER.
8. The display will read "CALIBRATE LEVEL YES: ENTER NO: ESC"
9. Press ENTER, then press ENTER again. The State-of-Level indicator should now read 0.0 - 0.0 or within .1 degrees.

Level calibration is complete. Proceed to Height Calibration.

HEIGHT SENSOR CALIBRATION

1. If not already done, perform Pre-Calibration Set-up as described in the beginning of these instructions and the Level Sensors Calibration before proceeding.
2. With the EZ-cal menu remaining in the Level Calibration, press ESC once until the display reads" TILT SETUPS" or to start from the beginning follow steps 1 - 6 above of the Level Sensors Calibration procedure.
3. Press the right arrow until the display reads "HEIGHT SETUPS" and press ENTER.
4. Press the right arrow once until the display reads "CALIBRATE HEIGHT". Press ENTER. You will be asked it the boom is fully lowered. Press ENTER when it is.
5. Follow the instructions on the display exactly and operate lift and lower only when the display instructs to do so. DO NOT interrupt lifting or lowering during calibration, as doing so will result in a bad calibration or possible fault.
   You will be instructed to operate Boom Up to full elevation then back down to fully stowed position. When the boom reaches full elevation and stops you must release the toggle switch before the calibration instructions can continue. This is also true when the boom reaches full stowed position. You will not be instructed to release the toggle switch.
6. After following the EZ-cal instructions and Height Calibration is complete, you will be prompted to enter the calibration date. Use the up arrow and right arrow to enter the day's date.
7. Once the CAL DATE has been entered, calibration is complete. Press ESC 3 times and/or turn off the machine.

The following two calibration procedures must and should only be performed on machines equipped with the optional Overload Sensing System.

Perform the previous calibration procedures before performing these.

EXTENSION SENSOR CALIBRATION

1. If not already done, perform Pre-Calibration Set-up as described in the beginning of these instructions and the Level Sensors and Height Sensor Calibrations before proceeding with Extension Sensor Calibration.
2. Access the EZ-cal by opening the Control Module door, then opening the Lower Control Box door. Attached to the Lower Control Box Door is an EZ-Cal interface display which will be used to perform the calibration.
3. Power the Titan system up. The EZ-cal display will read HELP PRESS ENTER.
4. Press the right arrow twice until the display reads, "ACCESS LEVEL 3".
5. Using the up arrow and right arrow, enter the numbers 1775 then press ENTER. The display should now read "ACCESS LEVEL 2"
6. Press the right arrow twice until the display reads "SETUPS". Press ENTER.
7. Press the right arrow three times until the display reads "EXTENSION SETUPS". Press ENTER.
8. Follow the instructions on the display exactly and operate extend and retract only when the display instructs to do so. You will be instructed to operate Boom Extend to full extension then back to the fully retracted position. When the boom reaches full extension and stops you must release the toggle switch before the calibration instructions can continue. This is also true when the boom reaches the fully retracted position. You will not be instructed to release the toggle switch.
9. After following the EZ-cal instructions and Extension Calibration is complete, you will be prompted to enter the calibration date. Use the up arrow and right arrow to enter the day's date. Once the CAL DATE has been entered, calibration is complete, press ESC 3 times and/or turn off the machine.

LOAD CALIBRATION

Weight required for Load Calibration:

(1) 1810 kg (4000 lbs)

1. If not already done, perform Pre-Calibration Set-up as described in the beginning of these instructions and the Level Sensors, Height and Extension Sensor Calibrations before proceeding with Load Calibration.
2. Place the machine on firm level ground, with the stabilizers deployed (green Stabilizers Set light will illuminate at Upper Controls box).
3. Load the 1810 kg (4000 lbs) weight in the center of the Load Zone and secure it from movement using the 4 tie-down points located in the platform floor.
4. Extend the boom horizontally to maximum outreach, then use the Platform Slide function to slide the platform fully forward. Do not elevate the boom.
5. Access the EZ-cal by opening the Control Module door, then opening the Lower Control Box door. Attached to the Lower Control Box Door is an EZ-Cal interface display which will be used to perform the calibration.
6. Power the Titan system up. The EZ-cal display will read HELP PRESS ENTER.

7. Press the right arrow twice until the display reads, "ACCESS LEVEL 3". Press ENTER.
8. Using the up arrow and right arrow, enter the numbers 1775 then press ENTER. The display should now read "ACCESS LEVEL 2"
9. Press the right arrow twice until the display reads "SETUPS". Press ENTER.
10. Press the right arrow until the display reads "LOAD SETUPS". Press ENTER.
11. Press the right arrow until the display reads "CALIBRATE LOAD". Press ENTER.
12. Follow the instructions on the EZ-cal display through a series of lift lower cycles. At the end of each lift and lower the switch must be released for procedure to continue.
13. The first calibration is the DYNAMIC calibration which is one complete lift and lower cycle.
14. After the DYNAMIC calibration is complete, the next calibration is the LOADED calibration. During this procedure the platform will lift to full elevation but will stop at various points along the lift and lower cycle to take static measurements.
15. After the LOADED calibration is complete, **DO NOT** do the EMPTY calibration. Escape out of the calibration. You will see an error message stating the calibration is not complete.
16. Retract the boom to the stowed position. Leave the platform in the forward-most position (platform at the front of the platform beam). Then retract the stabilizers so the machine is resting back on all four tires.
17. Go back into the SETUPS -> LOAD SETUPS -> CALIBRATE LOAD menu. The system will ask if you want to rerun the DYNAMIC and LOADED calibration, press ENTER until the display reads "REDO EMPTY?". Select YES (ENTER). Calibration will go through another lift and lower cycle, stopping at various points to take static measurements.
18. Once the calibration is complete, a screen should appear to enter the date. Enter the date that the machine was successfully calibrated and hit ENTER. You should now see "FINISHED!" appear on the screen. The machine is now calibrated and ready to be used.

CALIBRATION PROBLEMS

FAILURE MESSAGES

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

F01:CANNOT RUN

There is a shut-down fault on the controller. “EVERYTHING OK” *does not* show up when you try to calibrate.

Check HELP message for more information.

F02:NOT GROUND MODE

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

F03:NOT STOPPED

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

F04:TILTED

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

F05:BAD HEIGHT

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

F06:CHECK ELEV

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

(The Titan does not have an elevation switch)

F07:BAD HEIGHTS

The two Height Sensors are not in agreement at the end of Height Calibration (only on machines equipped with the optional Overload Sensing System).

F08:CHECK ELEV

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

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

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

F09:BAD HEIGHT1
F09:BAD HEIGHT2

This message is given if the height sensor output (P8-2) 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 / SYSTEM (2a-7) to see the output. This is usually due to a wiring problem.

F10:BAD HEIGHT1
F10:BAD HEIGHT2

This message is given if the height sensor output (P8-2) 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
F11:NOT DOWN

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

F12:TOO MANY

This message occurs if the DYNAMIC lift takes too long.

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

F13:LOW HEIGHT RANGE

This message occurs at the end of the DYNAMIC lift if the height sensor output did not change sufficiently to give a reasonably accurate platform height estimate. DIAGNOSTICS / ANALOGS can be used to check the height sensor output (P8-2) 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 HEIGHT1

This message occurs if EZfit#1 output is out of range during the DYNAMIC lift. The height sensor output must be between 1.0V and 4.0V. Check DIAGNOSTICS / SENSORS to see the output. A reading of 0V or 5V is probably due to a wiring problem.

F15:CHECK ELEV

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

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

If the platform is fully lowered, check the elevation switch. (The Titan has no elevation switch; check that the boom is fully retracted)

F16:LOW ELEV.OPEN

This message is given if the elevation switch (P7-5) opened during lift at too low of a height (below 5%). Check CALIBRATIONS / HEIGHT CALS. The “ElevUp” value shows the recorded height where the switch opened. (The Titan has no elevation switch; check that the boom is fully retracted)

F17:HIGH ELEV.OPEN

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

Check CALIBRATIONS / HEIGHT CALS; the “ElevUp” value shows the recorded height where the switch opened. (The Titan has no elevation switch; check that the boom is fully retracted)

F18:LOW ELEV.CLOSE

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

Check CALIBRATIONS / HEIGHT CALS; the “ElevDown” value shows the recorded height where the switch opened. (The Titan has no elevation switch; check that the boom is fully retracted)

F19:HIGH ELEV.CLOSE

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

Check CALIBRATIONS / HEIGHT CALS; the “ElevUp” value shows the recorded height where the switch opened. (The Titan has no elevation switch; check that the boom is fully retracted)

F20:HEIGHT1<>0%
F20:HEIGHT2<>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:HEIGHT1<>100%
F22:HEIGHT2<>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.

F27:BAD HEIGHT

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

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

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

F30:BAD HEIGHTS

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

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

F34:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

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

F40:REJECT DELTA DOWN @
F40:REJECT DELTA UP @

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

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

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

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

F42:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F43:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F44:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F45:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F46:CHECK ELEV

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

F47:CHECK ELEV

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

F48:BAD PRESSURE

This message is given if the pressure sensor output is out of range at the start of calibration.

The 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.

F49:TOO FEW

The minimum number of static calibration points was not achieved.

F52:NOT CALIBRATED

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

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

F60:BAD EXTENSION

Extension has not been calibrated or is faulty at the start of Load Calibration.

F61:BAD EXTENSION

Extension is out of range at the start of Extension Calibration.

F62:BAD EXTENSION

Extension is out of range at the start of Extension Calibration.

F63:BAD EXTENSION

Extension is out of range at the end of Extension Calibration.

F64:BAD EXTENSION

Problem at the end of Extension Calibration -- not enough difference between start and end points

F65:BAD EXTENSION

Use Boom Extend function to calibrate extension.

INFORMATION MESSAGES

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

BUILDING TABLES

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

CALDATE:

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

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

Press LEFT & RIGHT to select the flashing digits.

Press UP & DOWN to change the flashing digits.

Press ENTER when the entry is complete.

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

FINISHED

This message confirms that calibration is complete and successful.

GO DOWN MORE!

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

GO UP MORE!

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

LIFT EMPTY

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

LIFT LOADED

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

LIFTING

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

LOWER EMPTY

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

LOWER LOADED

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

LOWERING

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

MEASURING #

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

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

MUST GO DOWN!

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

MUST GO UP!

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

PLATFORM DOWN?

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

Press ENTER to confirm when the platform is fully lowered.

PLATFORM EMPTY?

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

Press ENTER to confirm when the platform is empty.

PLATFORM LOADED?

This message is prompting for confirmation that the platform is loaded to rated load: For the Titan Boom 40-S, this is 3000 lbs (1360 kg) in the Load Zone, and 1000 lb (450kg) at the front of the platform (100% of the load rating listed on the serial plate).

Press ENTER to confirm when the platform is loaded.

PLEASE LIFT ...

This message is prompting for the platform to be raised.

The UP switch should be operated.

PLEASE LOWER ...

This message is prompting for the platform to be lowered.

The DOWN switch should be operated.

PLEASE WAIT

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

REDO DYNAMIC:

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

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

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

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

REDO EMPTY:

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

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

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

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

REDO LOADED:

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

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

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

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

TOTAL DATA:

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

Section 3

Mechanical Components

Contents

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 or pressure washing the base/undercarriage, cover electrical components to prevent water penetration.

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

TIRES & 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.

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

FOAM FILLED TIRES WERE FITTED AS ORIGINAL EQUIPMENT ON THIS MACHINE. TIRES MUST BE REPLACED WITH EQUIVALENT SPECIFICATION TIRES AND FOAM-FILL WEIGHT. CONTACT MEC SERVICE.

CHANGING TIRES

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

CAUTION

Always block the wheels before lifting the machine.

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

DRIVE MOTORS & GEAR HUBS

NOTE: See Section D & Section E of the Parts portion of this manual for parts lists.
See Section 1: Hydraulics for proper hose connection.

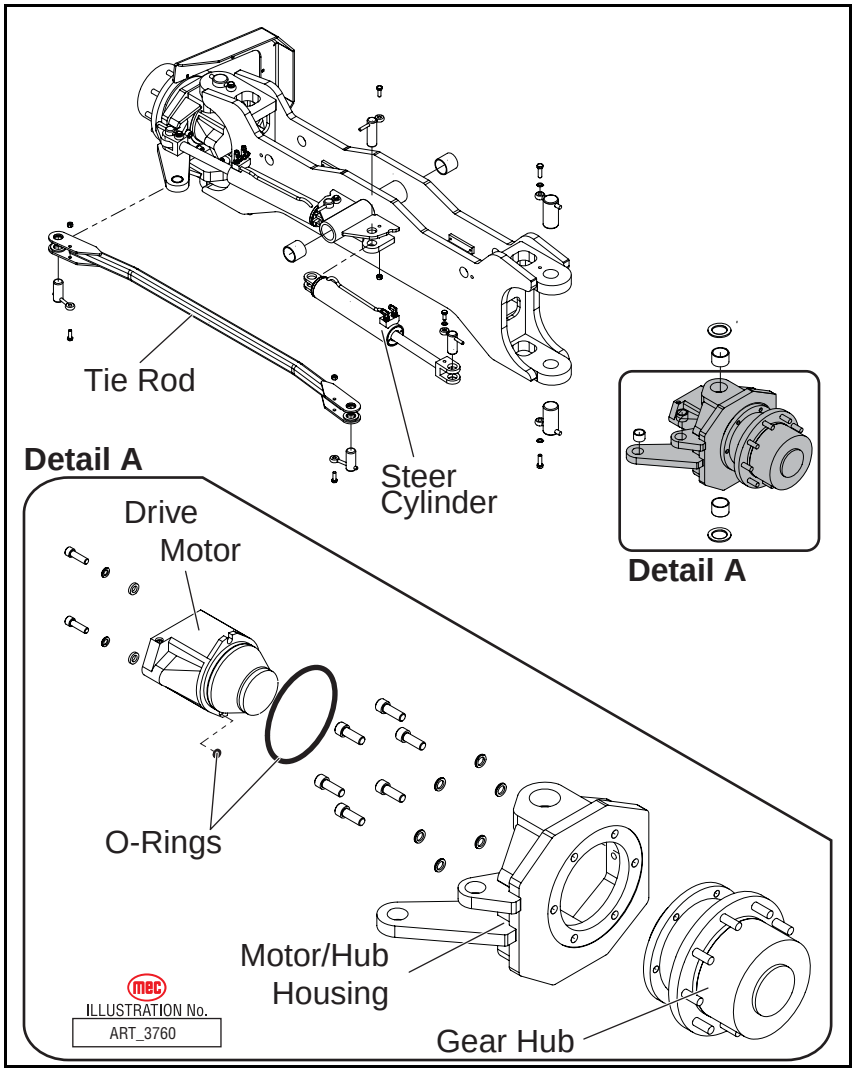
There is one hydraulic drive wheel motor and one gear hub located at each wheel.

CAUTION

- **Clean all fittings before disconnecting hoses.**
- **Tag hoses for proper reassembly.**
- **Immediately plug and cap all openings to prevent contamination.**
- **Replace any O-rings and inspect all hoses for crack and damage before reassembly.**

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

Figure 3-1: Front Drive Motor



REMOVAL

1. Raise and support the front end of machine.
2. Remove the wheel and tire assembly.
3. Remove the retaining pins that secure the steer cylinder and the tie rod to the motor/hub housing. Rotate the housing to access the drive motor.
4. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
5. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.
6. Support the drive motor, then remove the two bolts connecting the drive motor to the gear hub. Remove the motor.
7. Support the gear hub, then remove the six bolts holding the gear hub to the motor/hub housing. Carefully remove the gear hub.

8. Installation is reverse of removal. Apply one (1) drop of Loctite® 242 or equivalent to mounting bolts. Replace the O-ring on the brake release port of the gear hub. Take great care that this O-ring is installed correctly. Use grease to hold the O-ring in place during
installation.

DRIVE MOTORS

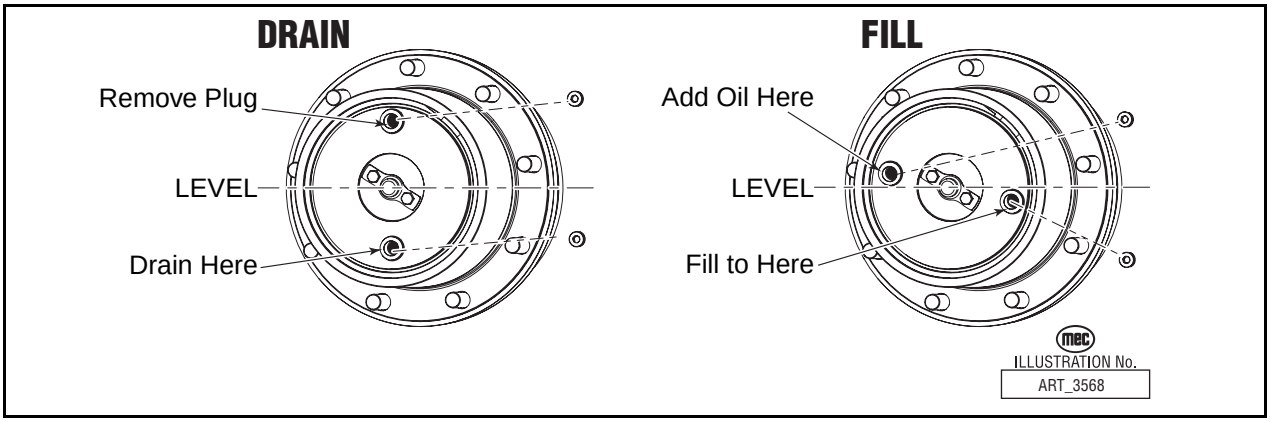
MEC does not recommend end-user maintenance or repair of the Sauer Danfoss drive motors. Contact MEC or Sauer Danfoss for the nearest service provider.

GEAR HUBS

Lubrication

- Change the oil after the first 100 hours of operation
- Change the oil every 2500 hours or every 12 months thereafter.
- Use SAE 90 Multipurpose Hypoid Gear Oil, API Service Classification GL5

Figure 3-2: Gear Hub Oil Change



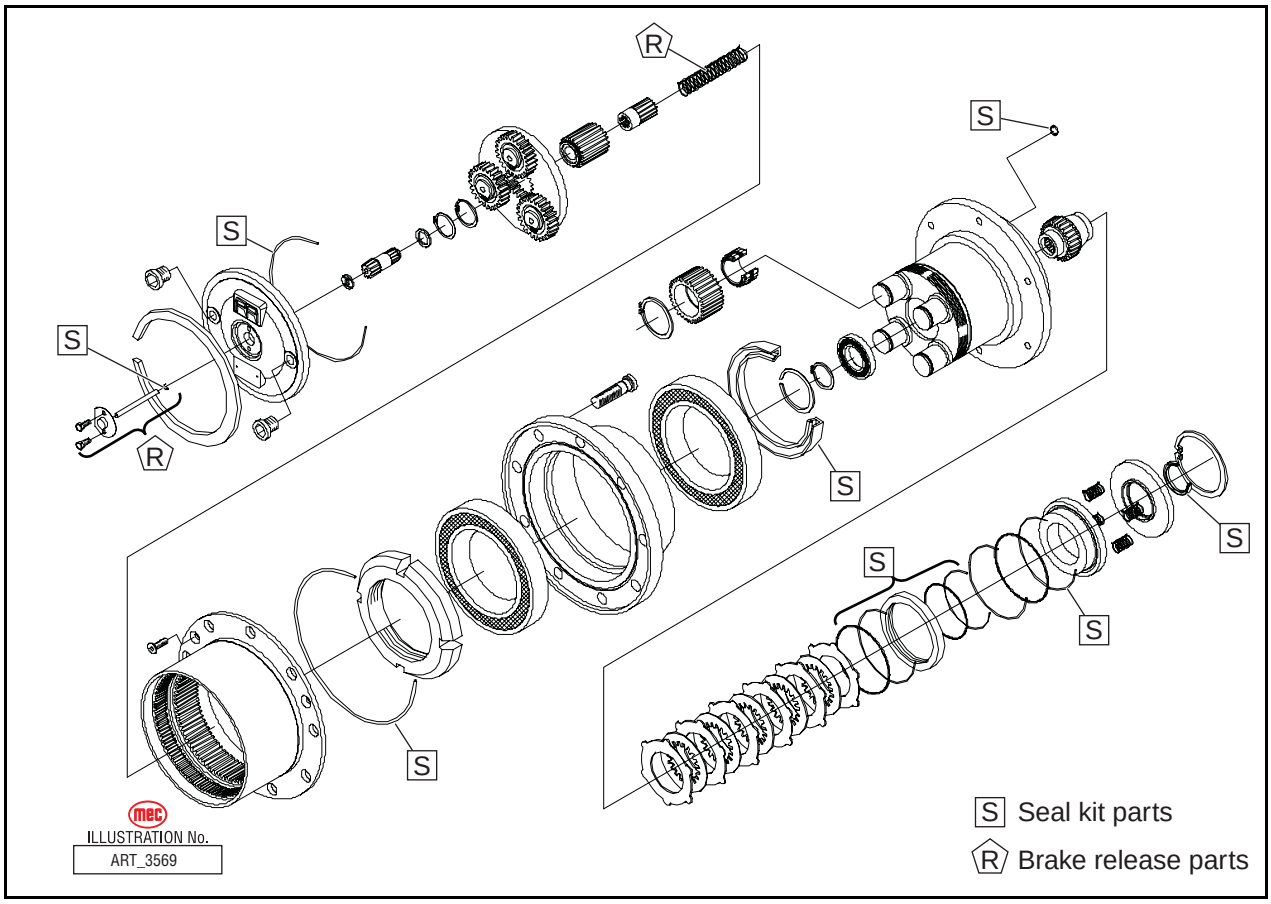
To change the oil in the gear hub:

1. Position the gear hub as shown at left.
2. Loosen and remove the both plugs and allow oil to drain.
3. Position the gear hub as shown at right.
4. Fill with oil until the level reaches the lower drain hole.
5. Replace the plugs, using new seals.

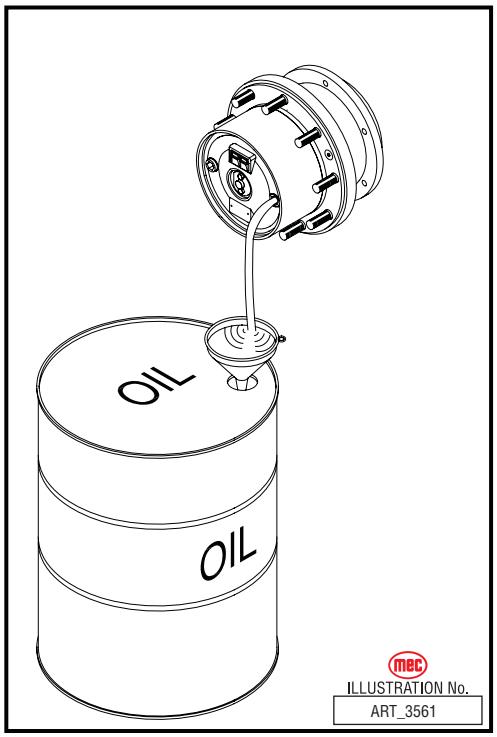
Disassembly

Disassembly may be necessary to replace the seals or repair the brake release mechanism.

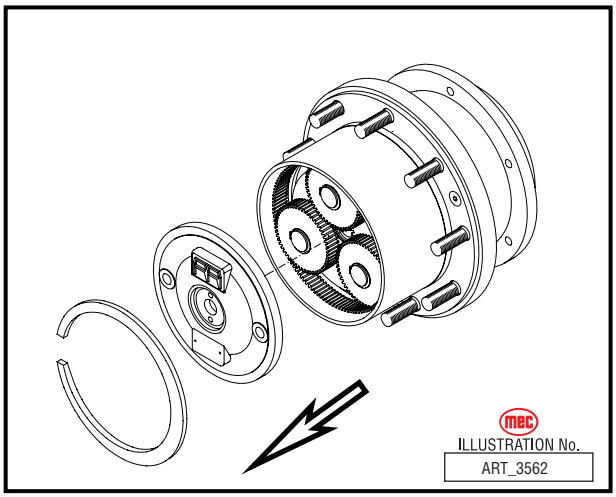
Figure 3-3: Gear Hub, Exploded View



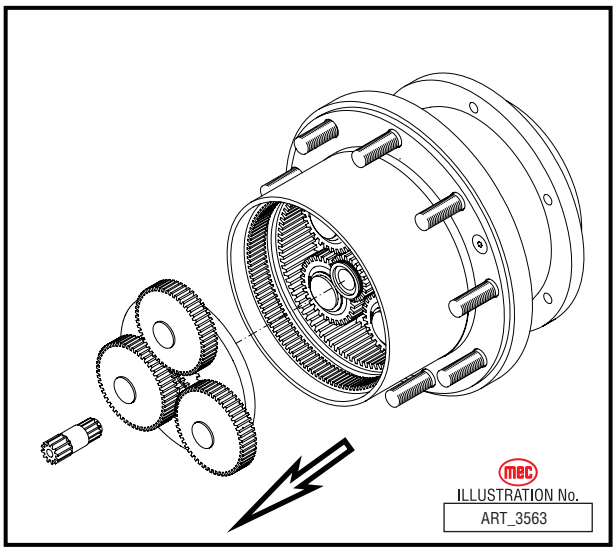
1. Unscrew the plug and drain the oil into a container. Dispose of used oil properly.



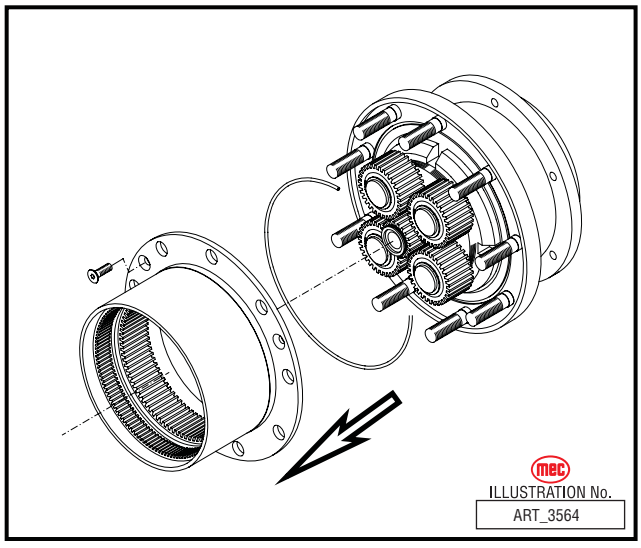
2. Remove the snap ring and cover.



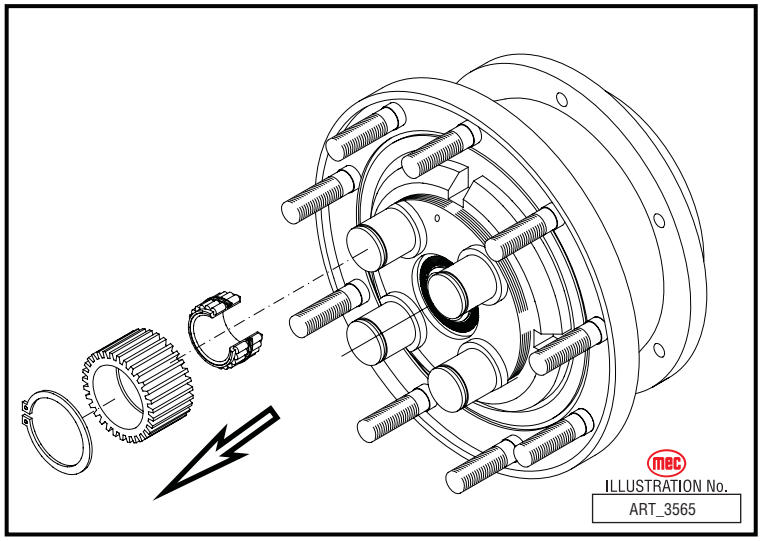
3. Pull out the pinion and the first stage reduction unit.



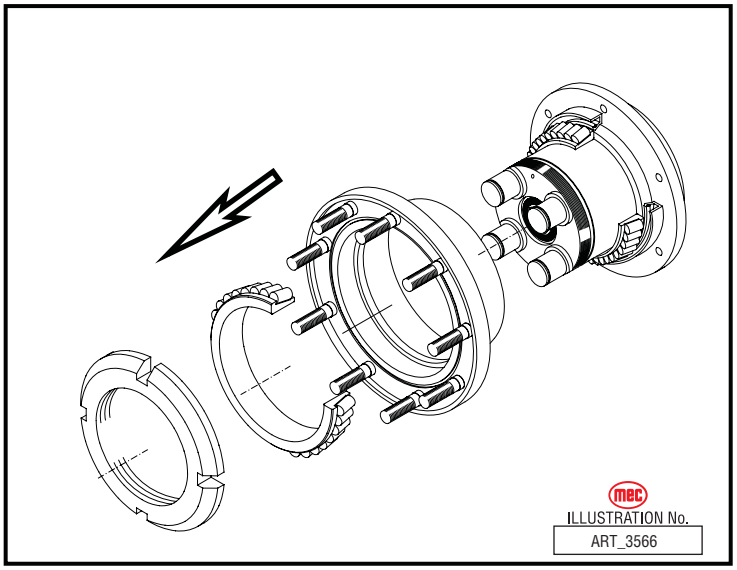
4. Remove the securing screws and remove the planetary ring.



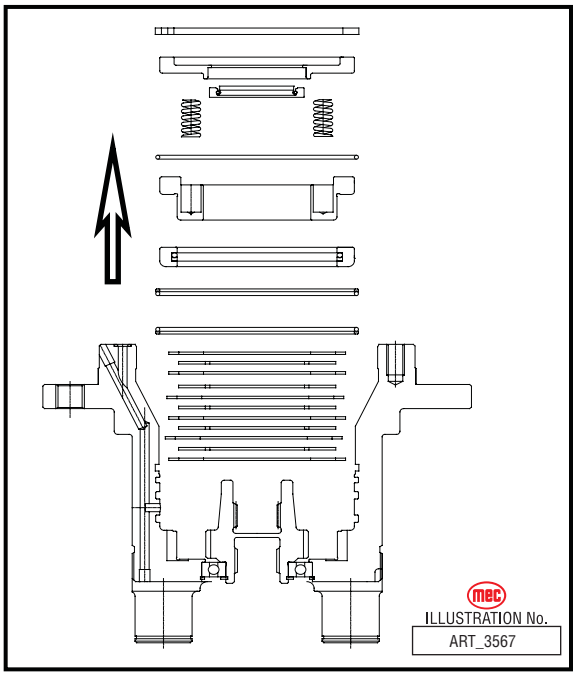
5. Remove the pinion and satellites of the second reduction unit stage.



6. Unscrew the locking ring and remove the spindle from the hub support.



7. Turn the spindle upside down and remove the brake unit.
8. Reassemble in reverse order, replacing seal kit and/or brake release kit components as you go. Use a light petroleum-based oil to lubricate parts and seals during reassembly.



HOSES & CABLES

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

CAUTION

- **Clean all fittings before disconnecting hoses.**
- **Tag hoses for proper reassembly.**
- **Immediately plug and cap all openings to prevent contamination.**
- **Replace any O-rings and inspect all hoses for crack and damage before reassembly.**

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

Check all ties and clamps that keep hoses secure.

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

1. Tag hoses for proper reassembly.
2. Disconnect hydraulic hoses. Immediately cap and plug all openings to prevent contamination.
3. Torque hose fittings according to the Hydraulic Torque Specification Table located in the Introduction section of this manual.

STEER CYLINDERS

See Section D & Section E of the Parts portion of this manual for parts lists.
See Section 1: Hydraulics for proper hose routing.

There are two (2) double acting type steer cylinders on each axle of this machine (four per machine). During operation, cylinder(s) should not leak, but a slight damping at the rod seal is acceptable.

Check the pins periodically for wear.

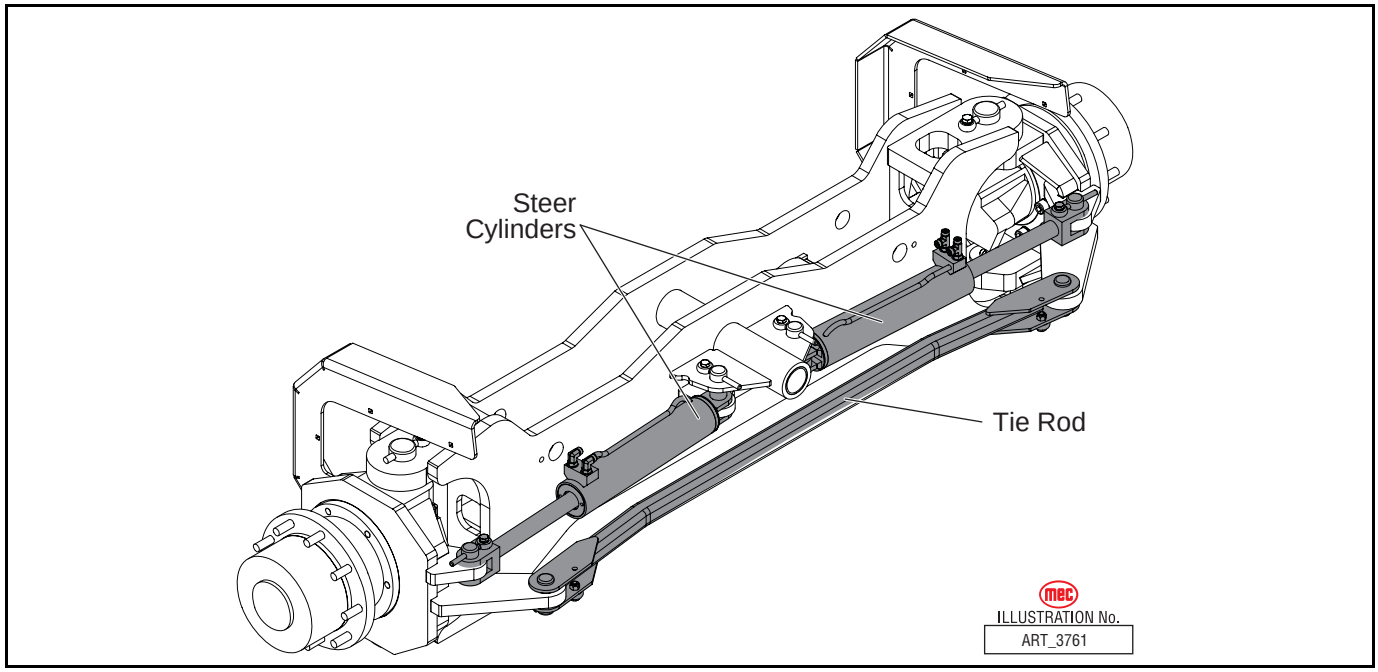
Refer to *"Lift and Support The Machine"* in the *Introduction* section for instructions and safety precautions.

CAUTION

- **Clean all fittings before disconnecting hoses.**
- **Tag hoses for proper reassembly.**
- **Immediately plug and cap all openings to prevent contamination.**
- **Replace any O-rings and inspect all hoses for crack and damage before reassembly.**

1. Raise and support the front end of machine.
2. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
3. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.
4. Remove the pin retainer and pivot pin holding the steer cylinder to the motor/hub housing.
5. Remove the pin retainer and pivot pin holding the steer cylinder to the front axle.
6. Carefully lift off the steer cylinder.
7. Installation is reverse of removal.
8. To purge air from cylinder, cycle the steering system fully left and right 5-6 times.

Figure 3-4: Steering Cylinder Installation



AXLE CYLINDERS

There are four Axle Cylinders on this machine.

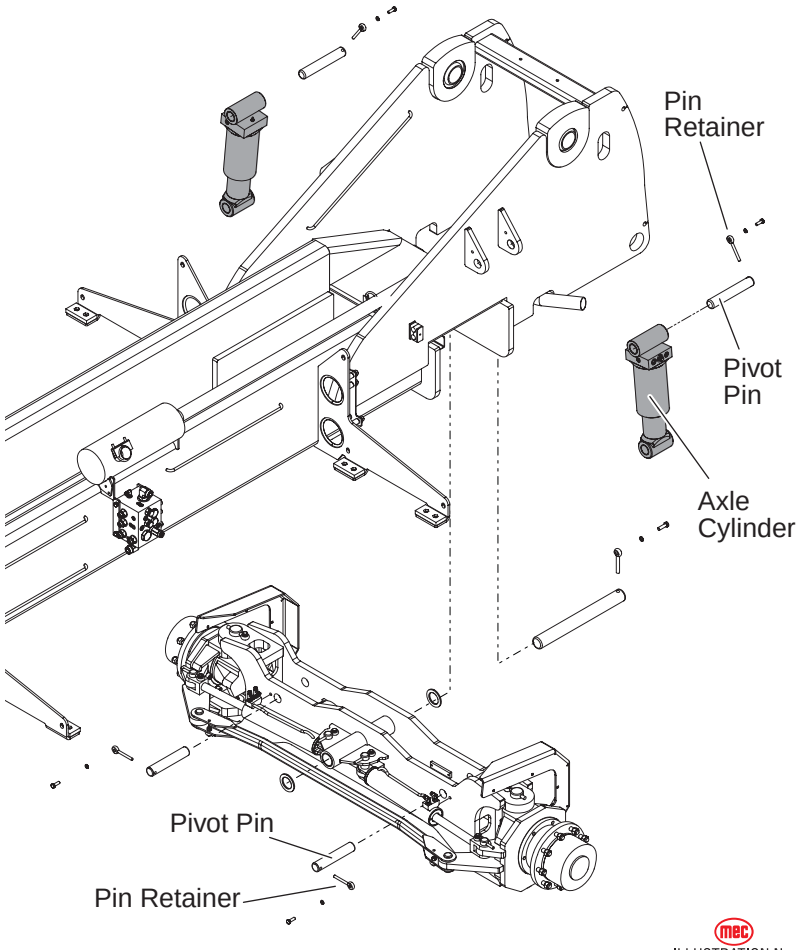
The two Axle Cylinders on the front axle control the floating axle function, which allows the axle to pivot as the machine drives over uneven terrain when the platform is stowed, and locks the axle in place when the platform is elevated.

The two Axle Cylinders on the rear axle control the frame level function and allow the operator or the control system to level the chassis in the side-to-side direction when the platform is stowed.

Figure 3-5: Axle Cylinders

REMOVE

1. Raise and support the rear end of machine.
2. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
3. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.
4. Remove the bolt and pin retainer that secures the pivot pin to the chassis. Remove the pivot pin.
5. Remove the bolt and pin retainer that secures the pivot pin to the axle. Support the cylinder, then remove the pivot pin.
6. Carefully remove the cylinder.
7. Installation is reverse of removal. Apply one (1) drop of Loctite® 242 or equivalent to the bolts that secure the pin retainers.



Rear Axle shown; front axle similar.

FRONT AXLE CYLINDER BLEED PROCEDURE

This operation must be performed whenever the Axle Lock or the Frame Tilt Cylinders have been removed or when the hoses are replaced.

Not bleeding or improper bleeding of entrapped air from the Axle Lock Cylinders or the Frame Tilt Cylinders will result in machine instability.

The following procedure explains the process for each Front Axle Cylinder.

1. If hoses were not replaced go to step 2. Loosen both hoses and operate frame tilt in both directions until all air is expelled from hoses. Tighten hoses.
2. Remove the plug located on the top of the cylinder. Fabricate and install a drain hose to direct emerging oil into a drain pan. The cylinder is prepared for a #4 O-Ring Boss (ORB) fitting.
3. Operate frame tilt in both directions, running the cylinder through it complete stroke in each direction until the emerging oil contains no air bubbles.
4. Remove the drain hose and install plug. See the Introduction section of this manual for proper torque specifications.
5. Repeat on next cylinder if required.

TESTING THE AXLE LOCK FUNCTION

This test is for the Floating Front Axle function only.

1. Place a block approximately 4 inches (10 cm) high behind one of the rear tires.
2. Elevate the platform to 10-11 feet (3-3.4 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.

REAR AXLE CYLINDER BLEED PROCEDURE

This operation must be performed whenever the Frame Tilt Cylinders have been removed or when the hoses are replaced.

Not bleeding or improper bleeding of entrapped air from the Frame Tilt Cylinders will result in machine instability.

The following procedure explains the process for each Rear Axle Cylinder. Each cylinder is bled from a fitting on the back of the cylinder approximately halfway up the barrel. Catch fluid with a pan under the cylinder, or with a shop rag beneath the bleed fitting.

WARNING

DO NOT PLACE ANY PART OF YOUR HAND BETWEEN THE CYLINDER AND THE FRAME DURING THIS PROCEDURE. SERIOUS INJURY MAY OCCUR.

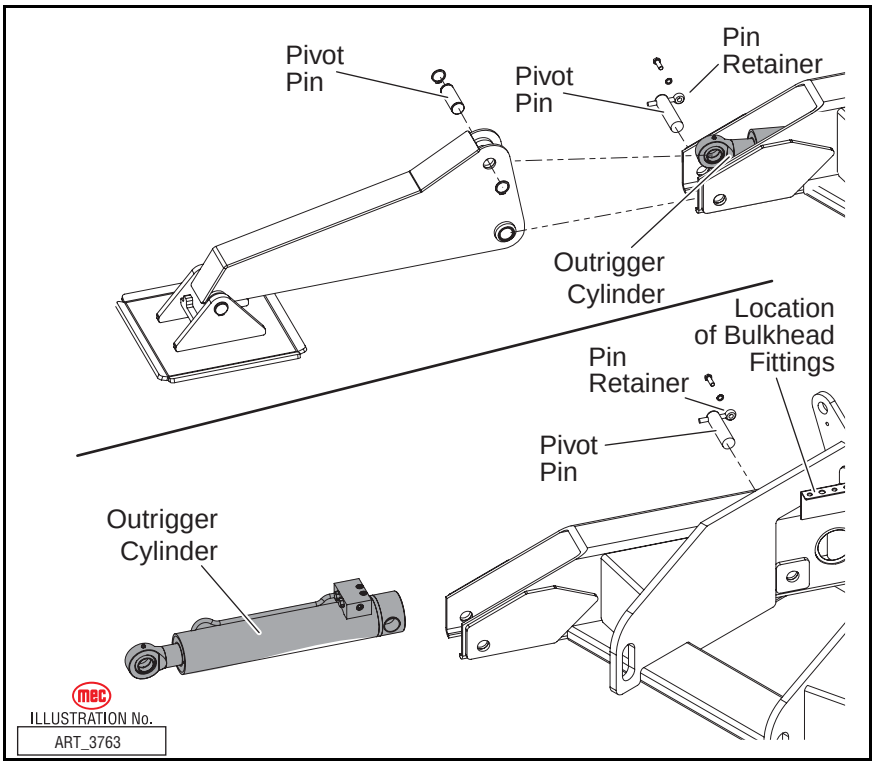
1. Start the engine.
2. Operate the Frame Tilt function and crack open the bleed fitting when the cylinder is retracting. Fluid will escape.

3. Close the fitting before the cylinder completes the retract stroke.
4. Repeat Step 2 and Step 3 until the fluid escaping the cylinder is clear and without any bubbles or froth.
5. Repeat on next cylinder if required.

STABILIZER CYLINDERS

There are two Stabilizer Cylinders, one located at each of the front corners of the machine.

Figure 3-6: Outrigger Cylinders



REMOVAL

1. Park the machine on a firm, level surface.
2. With the boom fully retracted, elevate the boom and install Maintenance Chock (see decal on Lift Cylinder for Maintenance Chock instructions). DO NOT extend the boom.

NOTE: The Maintenance Chock is located inside the storage cabinet of the Engine Module.

3. Lower both stabilizers until the stabilizer pads are ¼" (6mm) off the ground.
4. Remove the pin that connects the Stabilizer Arm to the rod end of the Stabilizer Cylinder to be removed.
5. Slide a small block of wood (approximately 2" x 4" x 8" or 38mm x 100mm x 200mm) under the barrel of the right stabilizer cylinder. This will be used as a fulcrum to aid in removing rear stabilizer cylinder pin.
6. Remove pin retainer and rear pivot pin that retains the barrel-end of the Stabilizer Cylinder. The cylinder is now loose but not ready for removal.
7. Remove both stabilizer hoses from the bulk-head fittings located just above and to the rear of the right stabilizer. Immediately plug and cap all openings to prevent contamination.

NOTE: On units not equipped with a bulkhead fittings as shown on the previous page, it will be necessary to remove the hoses from the valve manifold inside the Control Module.

8. Unplug the electrical connection for the right Stabilizer Pressure Sensor.
9. Carefully remove stabilizer cylinder from chassis. Ensure that the hoses and sensor plug clear the access opening and will be extracted with the cylinder.

10. Note the position of the hoses on the cylinder and remove the hoses and Sensor from the Stabilizer cylinder. Immediately plug and cap all openings to prevent contamination.

INSTALLATION

Apply one (1) drop of Loctite® 242 or equivalent to the bolts that secure the pin retainers.

1. Carefully insert the cylinder into the chassis. Ensure that the hoses and sensor wire remain to the rear of the cylinder and do not fold back under the cylinder as it slides back. Reach into the access hole at the rear of the cylinder tube and pull hoses and sensor plug from the chassis before allowing cylinder to move fully into its place.
2. Lift the cylinder and place the block of wood under it approximately in the middle. Using the wood as a fulcrum, push down on the cylinder rod to raise the rear of the cylinder enough to align the rear cylinder pivot hole with the pin hole in the chassis. Install rear cylinder pin and pin retainer. Torque Pin Retainer Fastener to 65 lb-ft. Remove the wood block.
3. Connect the hoses to the bulkhead fittings and connect Sensor plug to the wiring harness.
4. Start the engine and operate Stabilizer Extend function while watching the stabilizer cylinder extent toward the stabilizer arm connection point. Once the rod-end pin boss can be aligned with the stabilizer arm pin boss, install the rod-end pivot pin and snap rings.
5. Turn engine off.

Repeat if necessary for the other Stabilizer Cylinder.

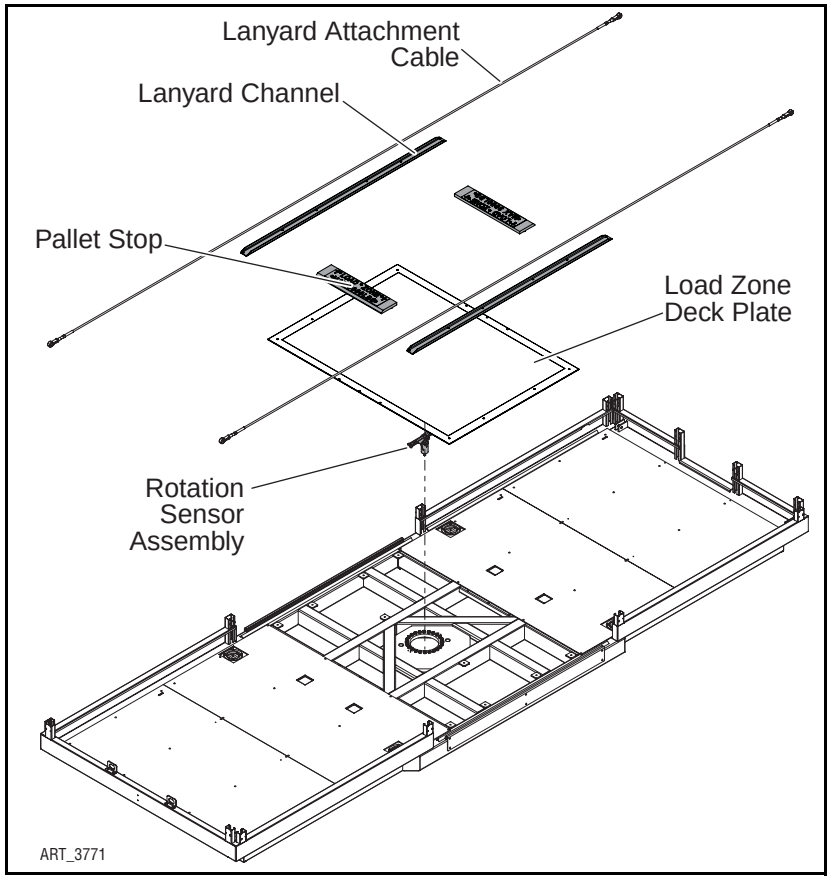
Once finished, operate both stabilizers through 4-5 complete cycles to ensure all air is bled out of the cylinders and that there are no leaks. Remove and stow the Maintenance Chock.

PLATFORM REMOVAL & INSTALLATION

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

Figure 3-7: Platform Removal

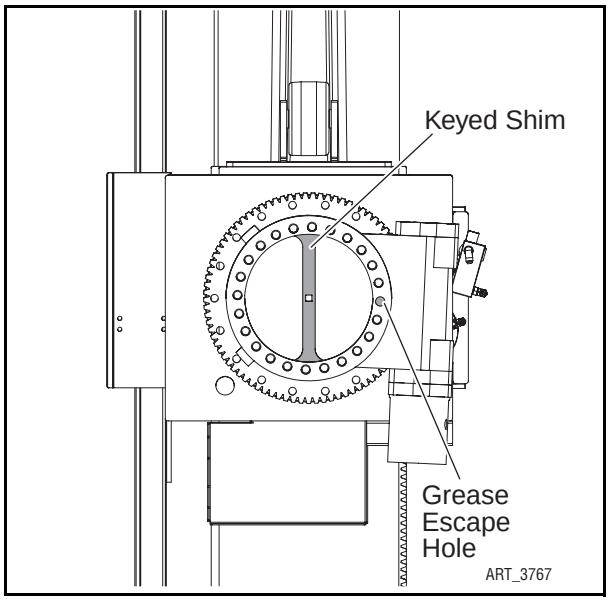


REMOVAL

1. Remove all guard rails and gates.
2. Remove the Lanyard Attachment Cables, the Lanyard Channels and the Pallet Stops.
3. Remove the Load Zone Deck Plate.
4. Unplug the cable connecting to the Rotation Sensor Assembly, the remove the Rotation Sensor Assembly.
5. Connect an overhead crane or appropriate lifting device to the platform. Do not lift at this time.
6. Tag all cables that connect the platform to the boom for proper reassembly, then disconnect the cables.
7. Break loose but do not remove the socket-head cap screws that secure the platform to the carriage.
8. Apply slight lifting pressure.
9. Remove the socket-head bolts that secure the platform to the carriage.
10. Carefully lift the platform away from the Platform Rotate Drive Unit assembly.

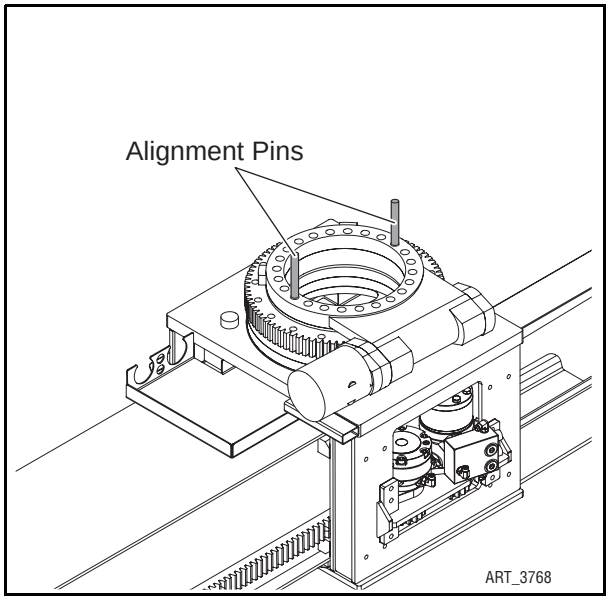
INSTALLATION

Figure 3-8: Keyed Shim Orientation



1. If the Platform Rotate Drive Unit was removed from the carriage, be sure that the Keyed Shim was installed parallel to the Boom and Platform Beam. Make sure the Drive Unit is correctly positioned relative to the Boom.

Figure 3-9: Alignment Pins



2. Thread in two Alignment Pins into the holes aligned with the Keyed Shim.

NOTE: Alignment pins may be made by cutting the heads off two M16-2.0 x 150 bolts.
DO NOT remove the Alignment pins until instructed to do so.

3. Carefully lower the Platform onto the Alignment Pins. Be sure the Platform is in line with the Boom.
4. Use Loctite® 242 or equivalent on all socket-head cap screws. Hand-thread the M16-2.0 x 110 socket-head cap screws and M16 hardened washers into all open holes except for the Grease Escape Hole, shown in Figure 3-8.

WARNING

DO NOT USE STANDARD WASHERS.

5. Snug the bolts with a wrench, then remove the alignment pins and replace them with M16-2.0 x 110 socket-head cap screws and M16 hardened washers.
6. Using a rotating criss-cross pattern, torque all socket-head cap screws to 285 lb/ft. (387 Nm).
7. Install the Rotation Sensor Assembly. Be sure that the square tip fits into the key hole on the Keyed Shim. DO NOT replace the Load Zone Deck Plate at this time.
8. Re-install all cables that connect the platform to the boom.
9. Start the machine and perform the adjustment procedure for the Rotation Sensor (see Section 2 of this manual).

10. Replace the Load Zone Deck Plate and all other platform components. Tighten all fasteners to proper torque.

PLATFORM ROTATE DRIVE UNIT

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

The Platform Rotate Drive Unit is located between the Platform and the Platform Carriage.

The Platform Rotate Drive Unit is normally removed only for repair or replacement.

A overhead hoist or fork lift is needed for this procedure. Two slings capable of lifting 1500 lbs (681 kg) are also needed.

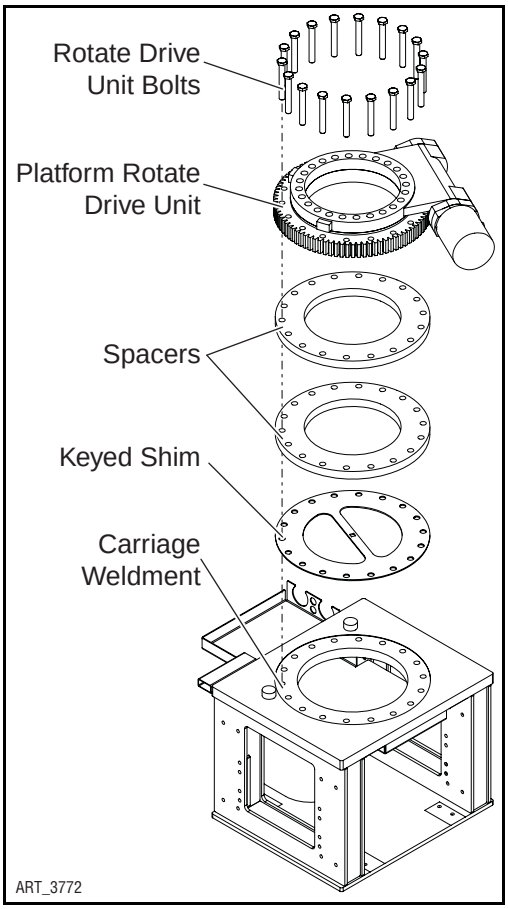
REMOVAL

Park the machine on a firm level surface.

Remove the Platform (see “Platform Removal & Installation” on Page 3-15).

1. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
2. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.
3. Remove the Rotate Drive Unit Bolts.
4. Lift the Platform Rotate Drive Unit by threading two M16-2.0 eyebolts into the threaded holes around the inner ring.

NOTE: Unit is heavy--use a lifting device of adequate capacity to move.

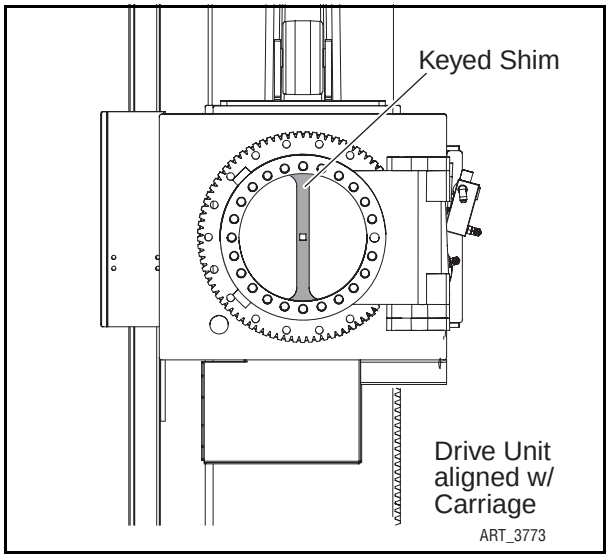


INSTALLATION

Installation is the reverse of the Removal procedure above, with the following items of note:

- Apply one (1) drop of Loctite 242 or equivalent to mounting bolts.
- Torque the Rotate Drive Unit Bolts to 285 lb/ft. (387 Nm).
- Make sure the Keyed Shim is oriented as shown in Figure 3-10.
- Set the Platform Rotate Drive Unit so that the edge of the hydraulic motor is aligned with and parallel to the side of the Carriage.

Figure 3-10: Keyed Shim Orientation



PLATFORM CARRIAGE

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

The Platform Carriage is located between the Platform and the Platform Beam. Its purpose is to move the Platform forwards and backwards in line with the Boom.

It is not necessary to remove the Platform Rotate Drive Unit.

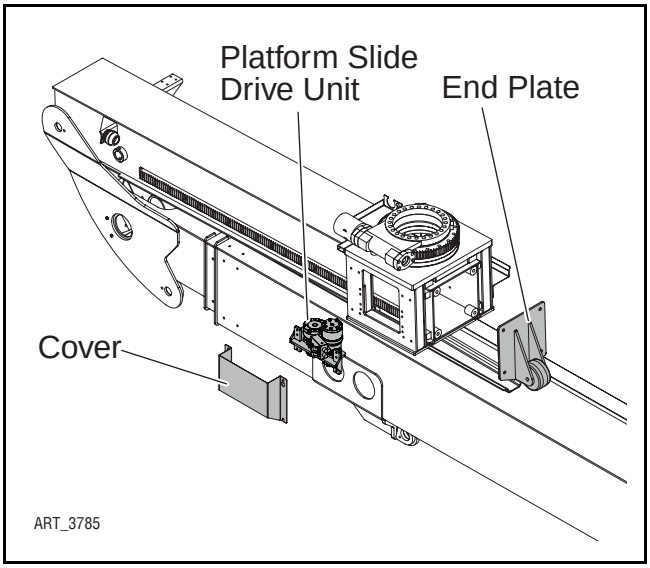
REMOVAL

Park the machine on a firm level surface.

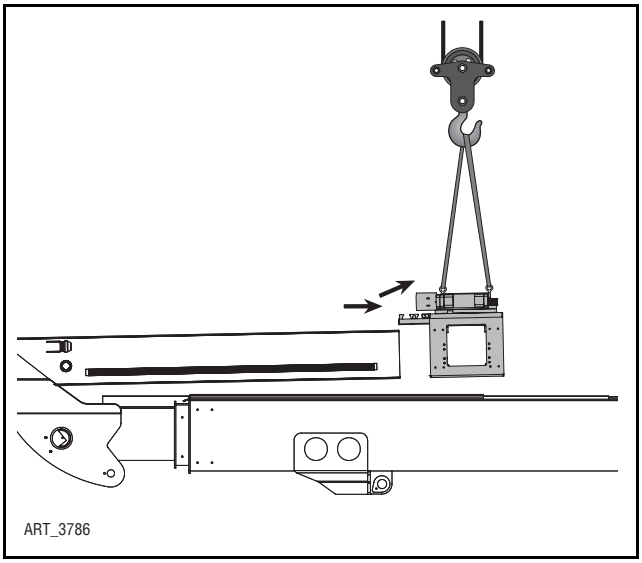
Remove the Platform (see “Platform Removal & Installation” on Page 3-15).

1. Start the machine and use the Platform Slide function to slide the carriage all the way to the rear of the Platform Beam.
2. Use the Platform Level function to lift the rear end of the Platform Beam until the roller no longer touches the boom.
3. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
4. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.

5. Remove the platform beam end plate.
6. Thread two M16-2.0 eyebolts into the threaded holes around the inner ring of the Platform Rotate Drive Unit. Attach lifting slings to these eyebolts.



7. Position an overhead hoist over the carriage and attach the slings. Apply just enough lifting force to tighten the slings.
8. Remove the Platform Slide Drive Unit and cover.



WARNING

BE SURE THAT SUFFICIENT LIFT FORCE EXERTED BY THE CRANE TO PREVENT THE CARRIAGE FROM SLIDING. THE PLATFORM SLIDE DRIVE UNIT CONTAINS THE BRAKE, WHICH PREVENTS THE CARRIAGE FROM SLIDING FREELY. REMOVING THIS UNIT WILL REMOVE THE BRAKE.

9. Move the overhead hoist towards the read of the machine until the carriage is free of the beam.
10. Installation is reverse of removal. Apply one (1) drop of Loctite 242 or equivalent to mounting bolts. See the Introduction section of this manual for proper torque specifications.

IMPORTANT! Perform the following Shim Procedure before returning the machine to service.

PLATFORM CARRIAGE/PLATFORM SLIDE DRIVE UNIT SHIM PROCEDURES

Before adjusting the slide carriage, it is necessary to locate the point on the Platform Beam where the wear pads are the tightest. To do so, operate the Platform Slide function in 3-4 inch (7-10 cm) increments and inspect the clearance between the side wear pads and side of the beam, and between the bottom wear pads and the bottom of the beam. Once the location of tightest clearance is identified, make note of the location(s) by marking the beam.

Carriage

1. Using regular machine controls, move the Carriage to the location where the SIDE wear pads are the tightest.
2. Remove the Platform Slide Drive Unit cover to gain access to the motor and brake assembly.
3. Loosen the mounting bolts that retain the Platform Slide Drive Unit to the carriage. This will prevent the motor or the brake from interfering with lateral shim adjustment.
4. Measure the clearance between the wear pads and the beam and record the measurements.
5. Add or remove shims to acquire a total clearance (both measurements added together) of .030" to .050" (.76-1.25 mm) space between the wear pads and the beam.

Carriage Shims -- Side	
22188	Shim, .060
22194	Shim, .030

6. Loosen the wear pad mounting bolts enough to slide the shim between the wear pad and the Carriage. Apply one (1) drop of Loctite 242 or equivalent to mounting bolts. See the Introduction section of this manual for proper torque specifications.
7. Perform Motor/Brake Pinion Depth Adjustment immediately following this section.
8. Using regular machine controls, move the Carriage to the location where the BOTTOM wear pads are the tightest.
9. Add or remove shims to acquire a .030" to .050" space between the wear pad and the beam.

Carriage Shims -- Lower	
18235	Shim, .060
18236	Shim, .030

10. Loosen the wear pad mounting bolts enough to slide the shim between the wear pad and the Carriage. Apply one (1) drop of Loctite 242 or equivalent to mounting bolts. See the Introduction section of this manual for proper torque specifications.

Motor/Brake Pinion Depth Adjustment

1. Turn Engine off and turn the Battery Disconnect Switch off.
2. Remove the Platform Slide Drive Unit cover.

3. Loosen the four bolts that retain the Carriage Slide Motor/Brake and remove all but one shim on each side. Re-tighten all four bolts to proper torque.
4. Attempt to manually rotate the gears on both the motor and the brake. They should move a small amount freely. If the small amount of free play is observed on both the motor and the brake unit, adjustment is complete; skip to Step 6.
5. If no free play is observed, loosen all four bolts and add one more shim **(MEC part #22195)** on each side. Tighten all four bolts to proper torque and attempt to manually rotate the gears on both the motor and the brake. They should move a small amount freely. If the small amount of free play is observed on both the motor and the brake unit, adjustment is complete, move on to Step 6. If no free play is observed, repeat Step 5 until there is a small amount of free play in both the motor and the brake.
6. Apply one (1) drop of Loctite 242 or equivalent to mounting bolts. See the Introduction section of this manual for proper torque specifications.
7. Operate the Platform Slide function repeatedly in both direction to ensure proper slide action without slowing or sticking.
8. Install the Platform Slide Drive Unit cover.

PLATFORM BEAM & PLATFORM LEVEL CYLINDER

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

REMOVAL

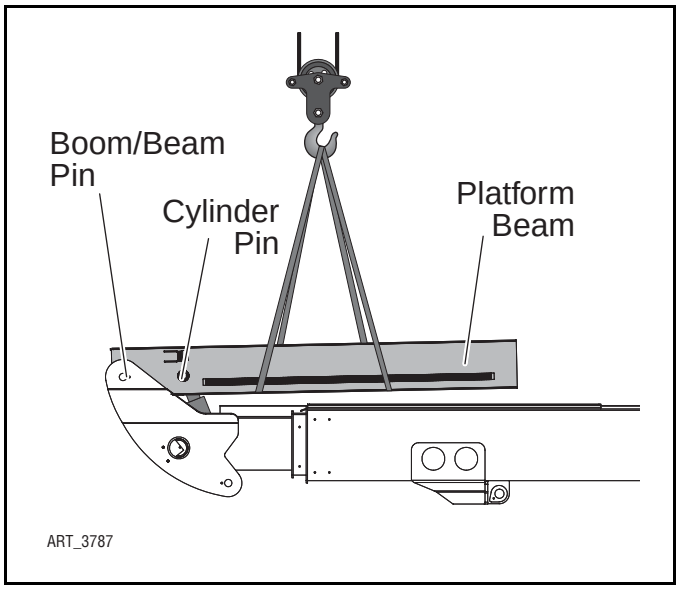
Park the machine on a firm level surface.

Remove the Platform (see “Platform Removal & Installation” on Page 3-15).

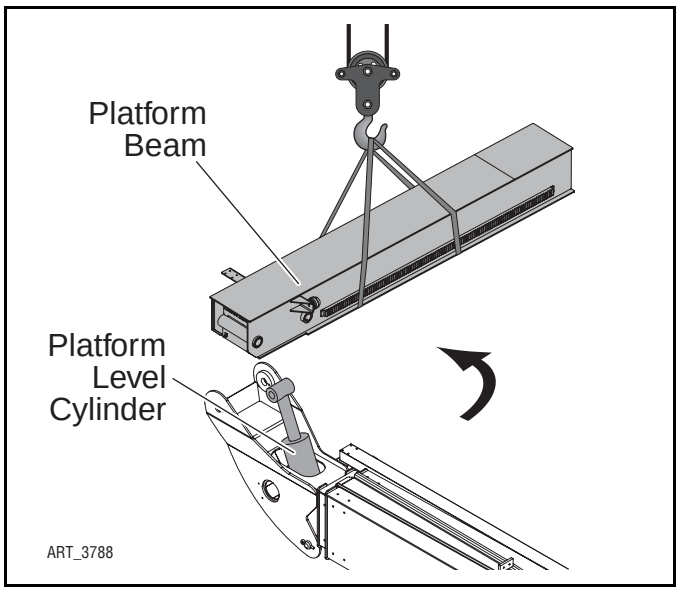
Remove the Platform Carriage (see “Platform Carriage” on Page 3-18)

A overhead hoist or fork lift is needed for this procedure. Two slings 16 feet (5 m) long capable of lifting 1500 lbs (681 kg) are also needed.

1. Position an overhead hoist over the carriage and attach the slings. Apply slight lifting pressure.
2. Clean all hydraulic fittings, then tag all hoses for proper reassembly.
3. Disconnect all hydraulic hoses. Immediately plug and cap all openings to prevent contamination.
4. Upper Platform Level Cylinder pin: remove the cylinder pin retainer, then remove the pin.
5. Boom/Platform Beam pivot pin: remove the cylinder pin retainer, then remove the pin.



6. It is necessary to turn the beam for the rod-end pin boss of the cylinder to clear the hole in the bottom of the Platform Beam. Carefully lift and turn the Platform beam while moving the overhead hoist forward and to the side of the machine.
7. When turned sufficiently, lift the beam off of the cylinder head.
8. Position the overhead hoist over the Platform lift cylinder and securely attach the sling. Apply slight lifting pressure.



9. Lower Platform Level Cylinder pin: remove the cylinder pin retainer, then remove the pin.
10. Carefully lift the Platform Level Cylinder out of the boom. It may be necessary to turn the cylinder slightly to allow the lower pin boss to fit through the hole in the boom.
11. Installation is reverse of removal. Apply one (1) drop of Loctite® 242 or equivalent to bolts securing the pin retainers. See the Introduction section of this manual for proper torque specifications.

EXTEND CYLINDER

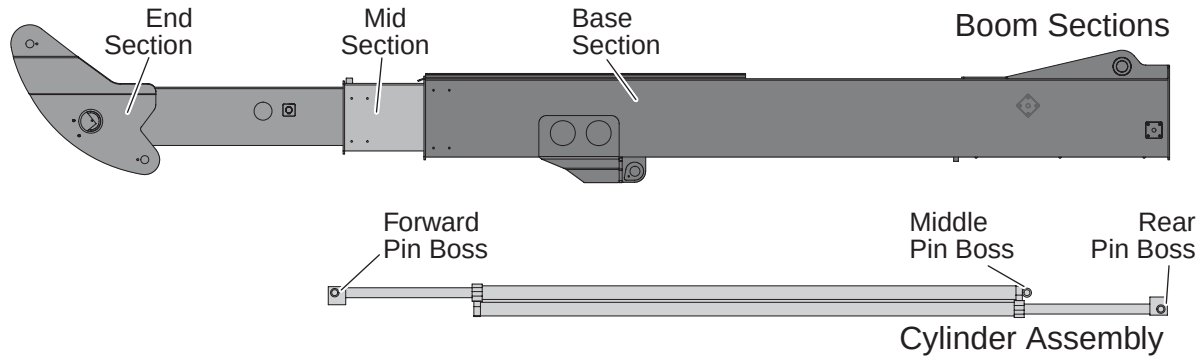
WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

The Extend Cylinder assembly consists of 2 identical cylinders mounted together that extend in opposite directions.

REMOVAL

Park the machine on a firm level surface. Two overhead hoists or fork lifts are necessary to perform this procedure, as the cylinder assembly weight is 750 lbs (341 kg). A sling of 6 feet (2 m) approximate length capable of lifting 2000 lbs (908 kg) is also necessary.



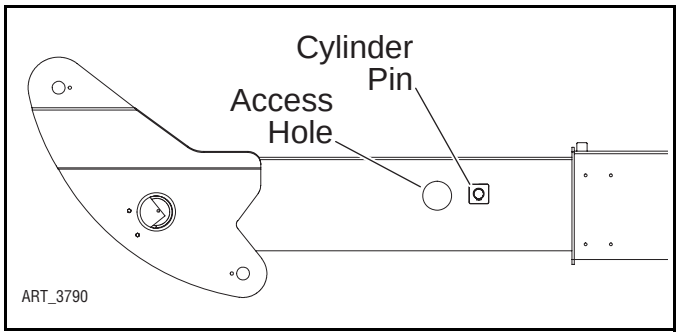
ART_3789

WARNING

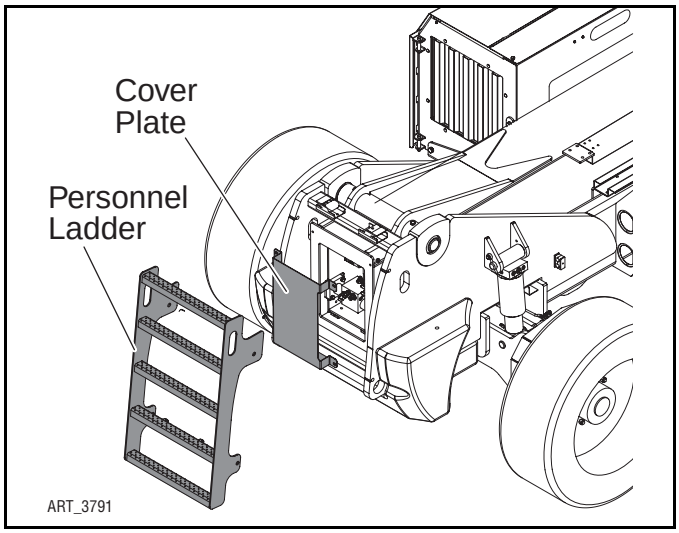
BEFORE PERFORMING WORK ON THE EXTEND CYLINDER ASSEMBLY, EXTEND THE BOOM FAR ENOUGH THAT THE ACCESS HOLE IN THE END SECTION OF THE BOOM IS AT LEAST 18 INCHES (46 CM) FROM THE FRONT EDGE OF THE BOOM'S MID SECTION. SERIOUS INJURY MAY OCCUR IF THE ACCESS HOLE IS TOO CLOSE TO THE MID SECTION OF THE BOOM.

1. From the Lower Control Station, operate the Stabilizer Deploy function until the stabilizers are deployed (the legs will stop moving when fully deployed).

2. Extend the boom enough to expose the cylinder pin in the End Section.
3. Elevate the boom approximately 3 feet and place a boom support apparatus for the tip of the boom to rest on. Choose a boom support that is capable of holding the weight of the boom (approximately 8000 lbs [3628 kg]). Lower the boom gently onto the support and continue lowering slightly until the weight of the boom is no longer on the boom lift cylinder.

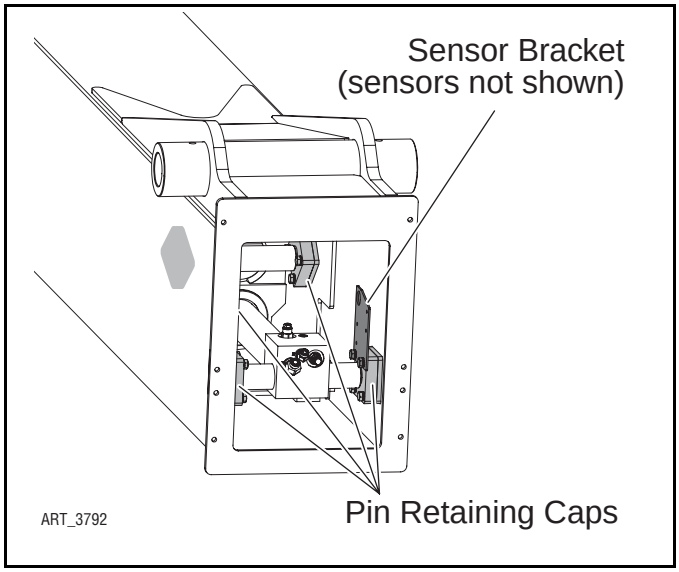


4. Remove the personnel ladder from the rear of the machine.
5. Remove the cover plate from the rear of the boom to provide access to the inside of the boom.
6. Remove hydraulic hoses from the Forward Cylinder. Access is gained through the round hole in the End Section just ahead of the pin boss. Immediately plug and cap all openings to prevent contamination.
7. Remove the snap rings from the cylinder pin, then remove the cylinder pin from the End Section.



8. Remove the hoses from the Mid Section extension cylinder. Access these hoses from the rear of the boom. Immediately plug and cap all openings to prevent contamination.

9. Remove the pin retaining caps that secure the Extend Cylinder to the Base Section of the boom.



IMPORTANT! The cylinder retaining bolts also retain the sensor bracket containing fragile sensors. Carefully stow the sensor bracket to the side, out of the way of the cylinder extraction.

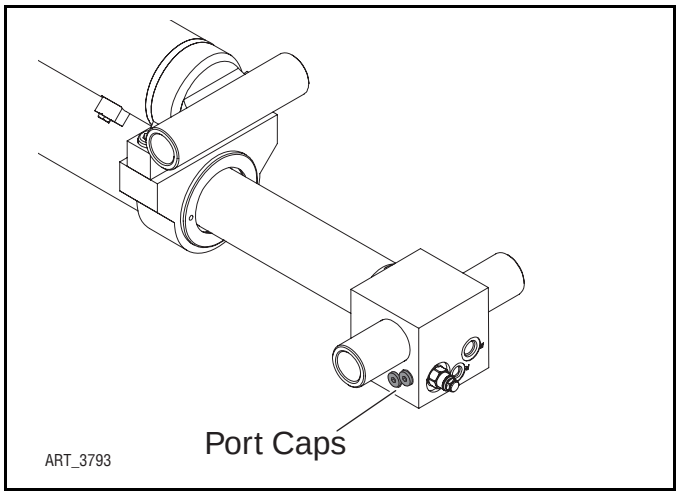
10. Remove the pin retaining caps that secure the Extend Cylinder to the Mid Section of the boom.
11. Secure a sling around the Rear Pin Boss and attach it to the hoist or fork lift.
12. Extract the Extend Cylinder Assembly from the rear of the boom by carefully pulling and lifting with the hoist or forklift. Once the Extend Cylinder has been extracted approximately 90%, use a second hoist or fork lift to support the end of the Extend Cylinder Assembly that remains inside the boom.
13. Carefully extract the cylinder completely.
14. Measure the distance that the cylinder rods protrude from each of the Extension Cylinders and record that number for installation preparation

INSTALLATION

Before beginning installation procedure, refer to the measurements taken in Step 14 of the removal instructions and be sure the cylinders are extended the same length.

Each cylinder is equipped with counterbalance valves that will prevent the cylinders from extend and retracting without hydraulic pressure. Therefore if the cylinder rods require extension or retraction it will be necessary to remove port caps located on the side of the cylinder manifold block to allow movement of the cylinder rod.

Once the proper measurement is achieved, replace caps and torque to proper specification. See the Introduction section of this manual for proper torque specifications.



1. Stage the cylinder assembly at the rear of the boom. Use a fork lift or hoist to support the tip end at a height consistent with insertion into the End Section. Rest the rear of the cylinder on a support of similar height.
2. Secure a sling around the Rear Pin Boss and attach it to a second forklift or hoist with a short lead (1-2 foot [25-50 cm]). Remove the support.

3. Install the cylinder pins and pin retaining caps at the Middle Pin Boss and the Rear Pin Boss. Secure them with tape to hold them in position during installation.
4. Insert the forward end of the cylinder assembly into the boom tubes, ensuring that it enters the End Section section without catching on the lower edge.
5. Once the Forward Pin Boss aligns with the End Section pin hole, install the pin and snap rings.
6. Re-connect the hydraulic hoses to the extension cylinder in the End Section.
7. Lower the hoist to allow the cylinder to lay on the boom tube and remove sling.
8. Connect hoses to the rear-most cylinder.

   Final alignment of the 2 rear pins to the boom sections may require hydraulic activation of the extension cylinders.

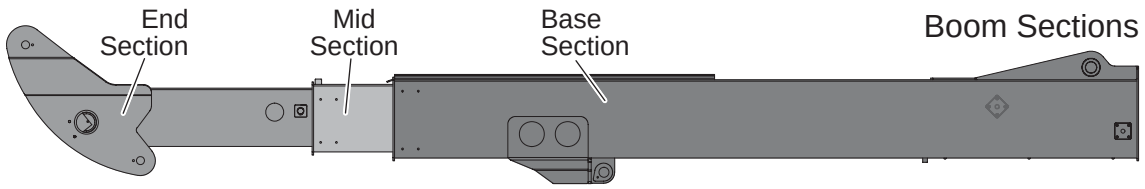
   Use the Emergency Power pump and the Boom Extend/retract toggle switch to make final alignment adjustments, as this function will allow better control of cylinder movement.
9. Once the Middle Pin Boss of the extension cylinder is aligned with the Mid Section mounting holes, remove the tape and install the pin retaining caps. Apply one (1) drop of Loctite 242 or equivalent to each of the mounting bolts. See the Introduction section of this manual for proper torque specifications.
10. Align the Rear Pin Boss of the extension cylinder with the mounting holes in the Base Section of the boom. Apply Loctite 242 or equivalent to the bolts and loosely install mounting bolts to the left-side mounting block.
11. Align the sensor bracket with mounting block holes and install the right side mounting bolts, using Loctite 242 or equivalent on the threads.
12. Tighten all mounting bolts. See the Introduction section of this manual for proper torque specifications.
13. Install rear cover and personnel ladder to the rear of the boom.
14. Raise boom slightly and remove boom support apparatus from the End Section.
15. Operate boom extend and retract through 5 complete cycles to purge air from the system.
16. Inspect for leaks and loose fasteners.

BOOM

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

DISASSEMBLY



ART_3794

Park the machine on a firm level surface.

Two overhead hoists or fork lifts are necessary to perform this procedure. Two slings sling 16 feet (5 m) long capable of lifting 1500 lbs (681 kg) are also necessary.

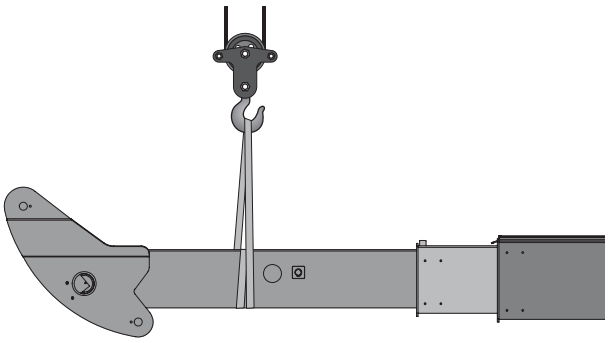
Remove the Platform (see “Platform Removal & Installation” on Page 3-15).

Remove the Platform Carriage (see “Platform Carriage” on Page 3-18).

Remove the Platform Beam and Platform Level Cylinder (see “Platform Beam & Platform Level Cylinder” on Page 3-22).

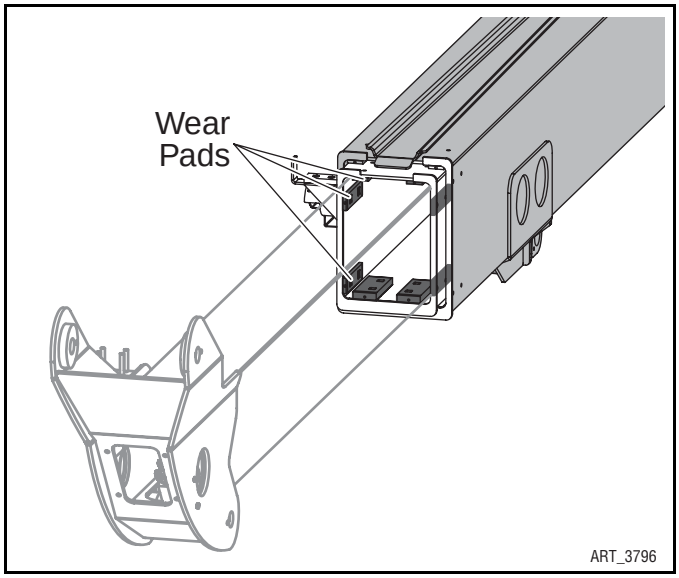
Remove the Extend Cylinder (see “Extend Cylinder” on Page 3-23).

1. Remove the cable track and associated machine parts from the boom. Lay all cable and hoses out of the way to avoid damage.
2. Slide the End Section of the boom out approximately 6 feet (2 m). Position an overhead hoist over the End Section and attach a sling.

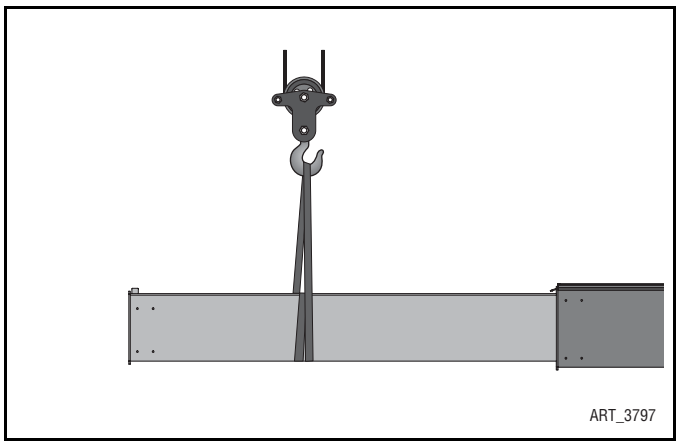


ART_3795

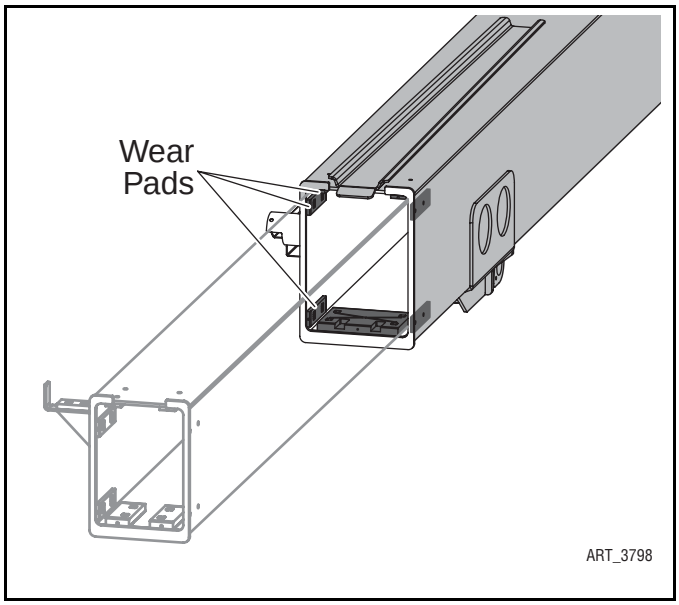
3. Remove the side and the top inner wear pads and shims from the front of the boom's Mid Section.
4. Apply slight lifting pressure.
5. Remove the bottom inner wear pads and shims from the front of the boom's Mid Section.
6. Extract the End Section from the front of the boom by carefully pulling and lifting with the hoist or forklift. Once the End Section has been extracted approximately 90%, use a second hoist or fork lift to support the end of the End Section that remains inside the boom.



7. Carefully extract the boom End Section completely.
8. Slide the Mid Section of the boom out approximately 6 feet (2 m). Position an overhead hoist over the Mid Section and attach a sling.



9. Remove the side and the top inner wear pads and shims from the front of the boom's Base Section.
10. Apply slight lifting pressure.
11. Remove the bottom inner wear pad and shim from the front of the boom's Base Section.
12. Extract the Mid Section from the front of the boom by carefully pulling and lifting with the hoist or forklift. Once the Mid Section has been extracted approximately 90%, use a second hoist or fork lift to support the end of the Mid Section that remains inside the boom.
13. Carefully extract the boom Mid Section completely.



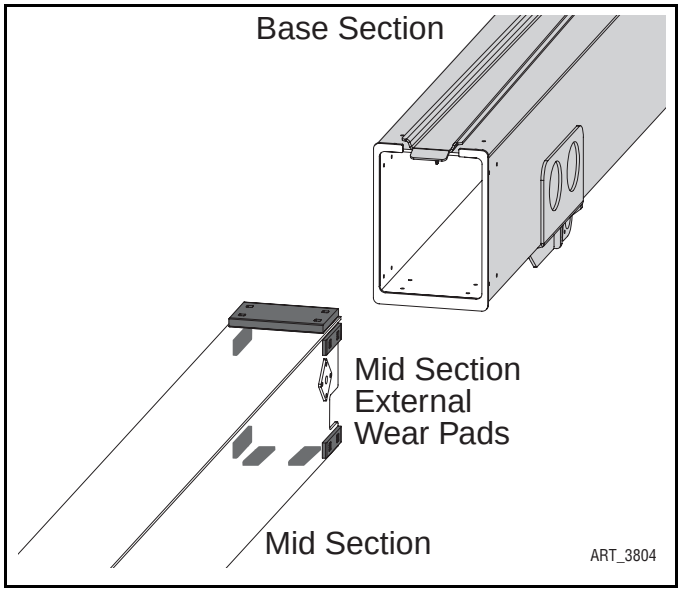
ASSEMBLY

The boom must be properly shimmed to function correctly. Each boom section must be shimmed to a clearance no greater than .030" (.762mm) at its tightest point of travel. It may be necessary to run each boom section in and out several times to properly identify the tightest point of travel, and to adjust the number of shims.

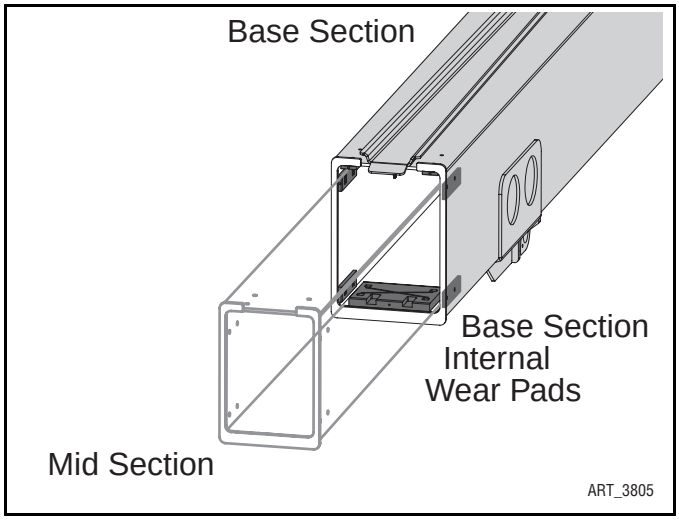
After the proper number of shims has been determined, tighten the mounting bolts for that set of wear pads before moving on to the next step. Apply one (1) drop of Loctite® 242 or equivalent to bolts securing wear pads and shims. See the Introduction section of this manual for proper torque specifications.

Standard Shims -- Use unless otherwise noted		Shims for Specific Location	
22224	Shim, .020" (.5 mm)	22572	**Base Section Internal--** Bottom Wide Wearpad Shim; **Mid Section External--** Top Wide Wearpad Shim
11861977	Shim, .040" (1mm)		
11861981	Shim, .120" (3mm)		
11861982	Shim, .200" (5mm)	22574	**Mid Section Internal--** Bottom Offset Wearpad Shim **End Section External--** Top Offset Wearpad Shim
11861983	Shim, .400" (10mm)		

1. Use an overhead hoist of forklift to position the Mid Section of the boom in front of the Base Section.
2. With wearpads and shims in place, insert the Mid Section into the Base Section of the boom.
3. Keeping the sections as parallel as possible, slide the Mid Section into and out of the Base Section. Shim the Mid Section External Wearpads as needed to achieve proper clearance.
4. Tighten the wearpad mounting bolts. Apply one (1) drop of Loctite® 242 or equivalent per bolt. See the Introduction section of this manual for proper torque specifications. Insert the Mid Section into the Base Section of the boom.



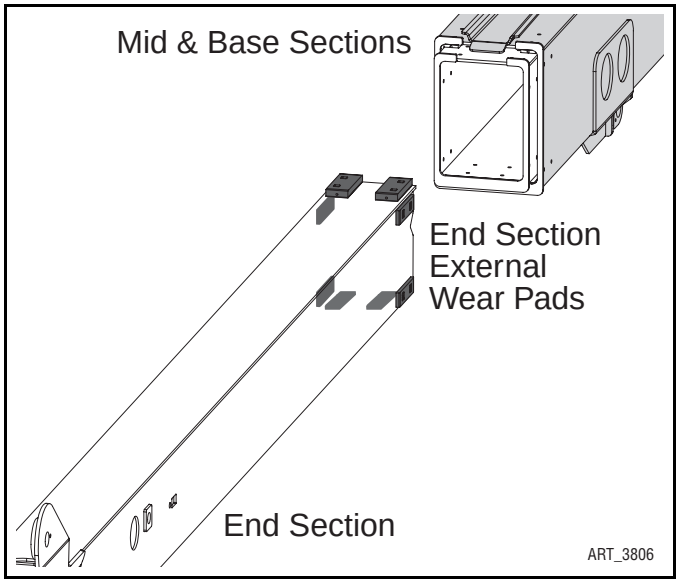
5. With the hoist still attached to the boom Mid Section, install the Base Section Internal Wear pads and shims. Use the hoist to position the Mid Section to provide clearance.



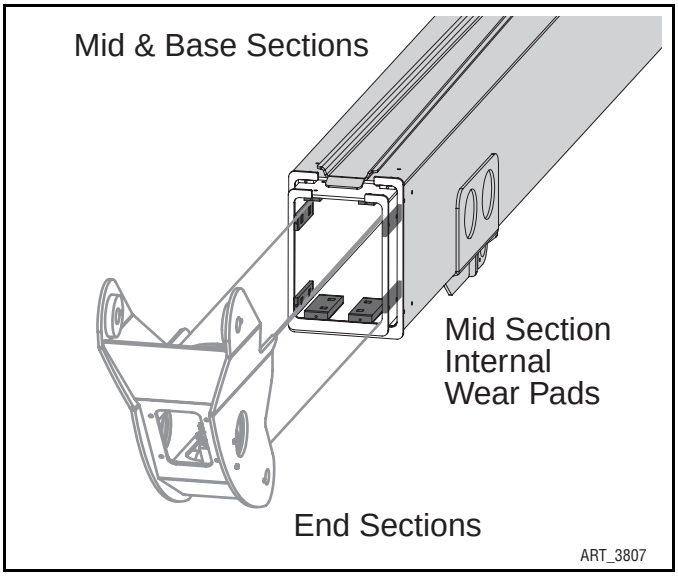
WARNING

DO NOT PLACE ANY PART OF YOUR BODY BETWEEN THE BOOM SECTIONS. USE TOOLS TO POSITION SHIMS AND WEARPADS.

6. Keeping the sections as parallel as possible, slide the Mid Section into and out of the Base Section. Shim the Base Section Internal Wearpads as needed to achieve proper clearance.
7. Tighten the wearpad mounting bolts. Apply one (1) drop of Loctite® 242 or equivalent per bolt. See the Introduction section of this manual for proper torque specifications. Push the Mid Section into the Base Section of the boom.
8. Use an overhead hoist of forklift to position the End Section of the boom in front of the Mid Section.
9. With wearpads and shims in place, insert the End Section into the Mid Section of the boom.
10. Keeping the sections as parallel as possible, slide the End Section into and out of the Mid Section. Shim the End Section External Wearpads as needed to achieve proper clearance.
11. Tighten the wearpad mounting bolts. Apply one (1) drop of Loctite® 242 or equivalent per bolt. See the Introduction section of this manual for proper torque specifications. Insert the Mid Section into the Base Section of the boom.



12. With the hoist still attached to the boom End Section, install the Mid Section Internal Wear pads and shims. Use the hoist to position the Mid Section to provide clearance.



WARNING

DO NOT PLACE ANY PART OF YOUR BODY BETWEEN THE BOOM SECTIONS. USE TOOLS TO POSITION SHIMS AND WEARPADS.

13. Keeping the sections as parallel as possible, slide the End Section into and out of the Mid Section. Shim the Mid Section Internal Wearpads as needed to achieve proper clearance.
14. Tighten the wearpad mounting bolts. Apply one (1) drop of Loctite® 242 or equivalent per bolt. See the Introduction section of this manual for proper torque specifications. Push the End Section into the Mid Section of the boom.

Install the Extend Cylinder.

Install the Platform Beam and Platform Level Cylinder.

Install the Platform Carriage.

Install the Platform.

BOOM LIFT CYLINDER

WARNING

THIS PROCESS REQUIRES SPECIFIC REPAIR SKILLS AND EXPERIENCE, APPROPRIATE LIFTING EQUIPMENT AND A PROPER WORKPLACE. DEATH, SERIOUS INJURY OR SIGNIFICANT MACHINE DAMAGE COULD OCCUR IF YOU ATTEMPT THIS PROCESS WITHOUT THE APPROPRIATE SKILLS AND EQUIPMENT.

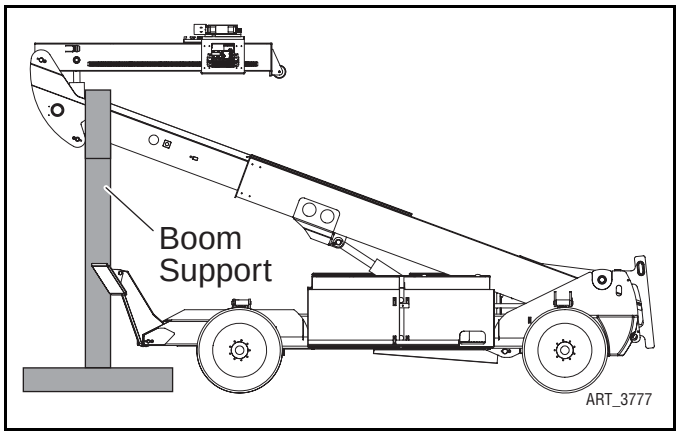
REMOVAL

Park the machine on a firm level surface.

Remove the Platform (see “Platform Removal & Installation” on Page 3-15).

A overhead hoist or fork lift is needed for this procedure, as the cylinder weight is 750 lbs (341 kg). A sling 16 feet (5 m) long capable of lifting 1500 lbs (681 kg) and two wood blocks approximately 3" x 3" x 8" (8 x 8 x 20 cm) are also needed.

1. Raise the boom high enough to access the upper pin of the Boom Lift Cylinder (approximately 6 feet (2 m)).
2. Extend the boom enough to allow clearance for a boom support apparatus for the tip of the boom to rest. Choose a boom support that is capable of holding the weight of the boom (approximately 8000 lbs [3628 kg]). Lower the boom gently onto the support and continue lowering slightly until the weight of the boom is no longer on the Boom Lift Cylinder.

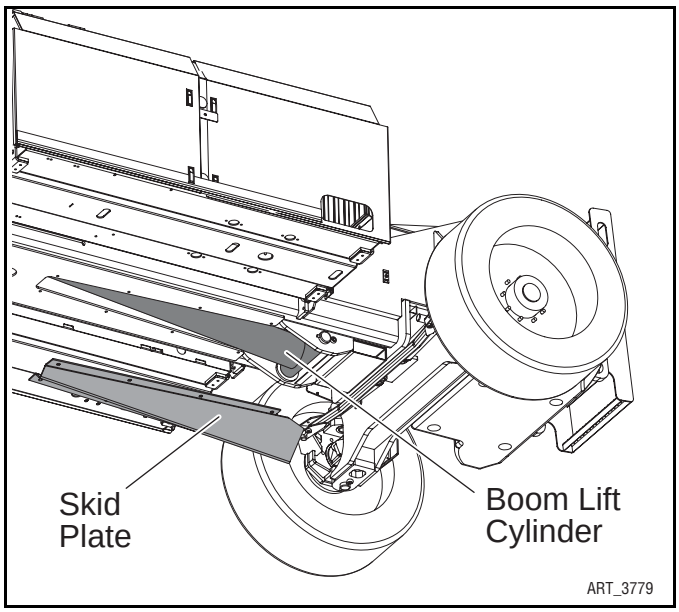


3. Remove skid plate from the bottom of the chassis to expose the lower portion of the Boom Lift Cylinder.

WARNING

THE SKID PLATE IS HEAVY. PROPERLY SUPPORT THE SKID PLATE BEFORE REMOVING THE FASTENERS.

4. Place a drain pan under the cylinder and slowly remove each counterbalance valve (one at a time) just enough to release the pressure behind it. Retighten the counterbalance valves once the oil flow slows to just a drip.

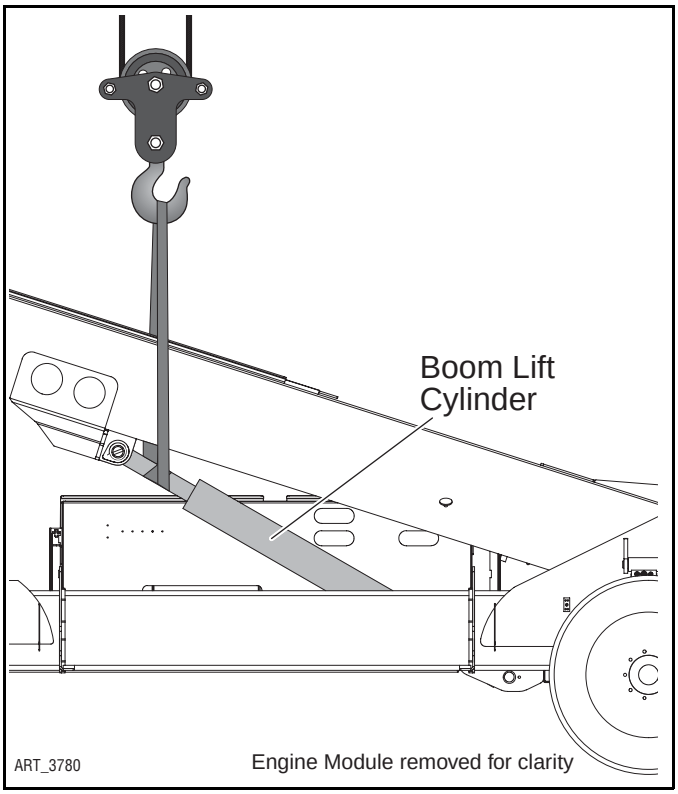


5. Clean all hydraulic fittings, then tag all hoses for proper reassembly
6. Remove both hoses. Immediately plug and cap all openings to prevent contamination. Wipe up any residual oil and remove the drain pan. Dispose of used oil properly.

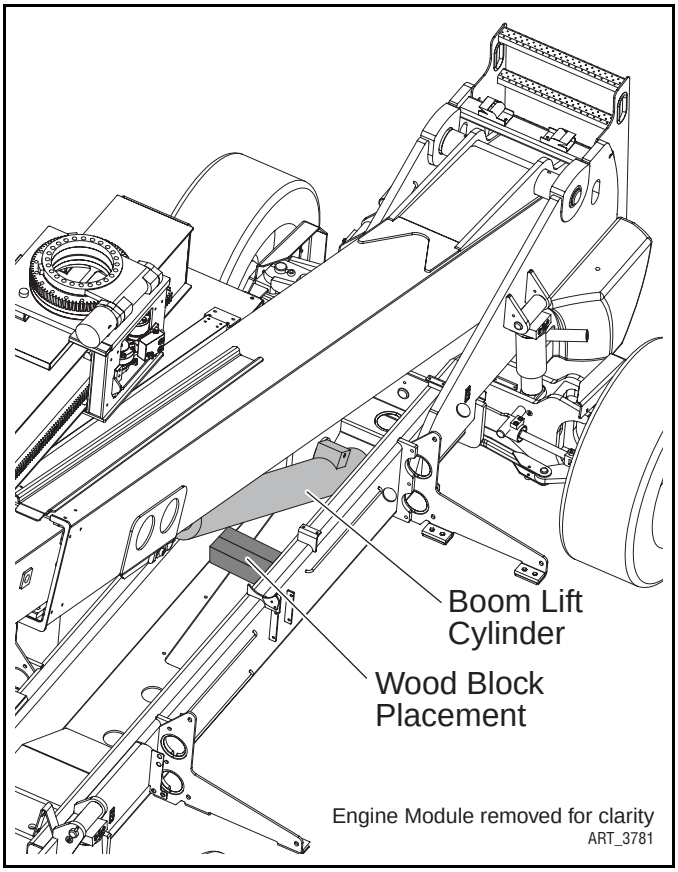
7. Position an overhead hoist or forklift over the boom, just above the Boom Lift Cylinder. Wrap a sling around the rod of the lift cylinder just under the pin boss and lift the hoist enough to remove any slack in the sling.
8. Remove the pin retainer, then drive the upper pin out of the Boom Lift Cylinder.

WARNING

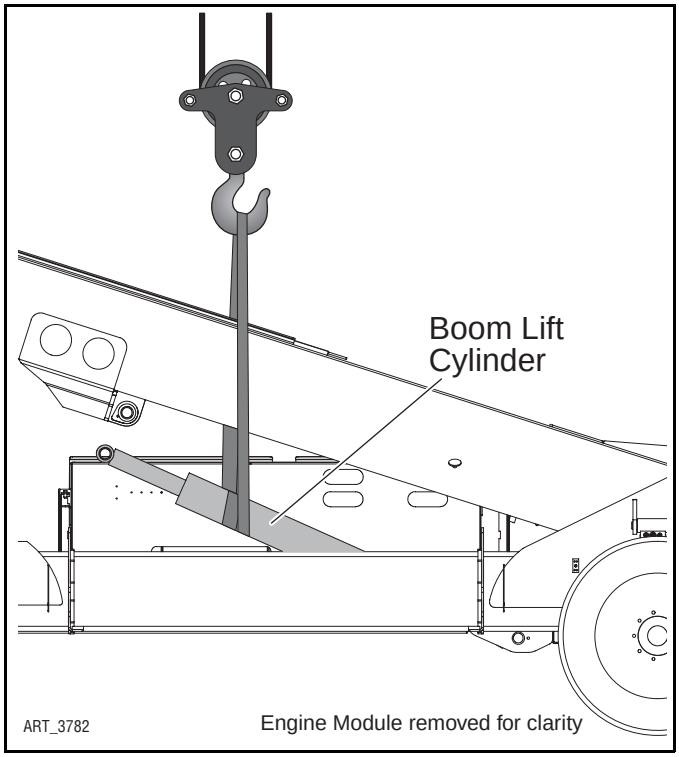
BE CAREFUL TO PREVENT THE LIFT CYLINDER FROM SHIFTING DURING PIN REMOVAL.



9. Place the wood blocks under the mid section of the cylinder barrel and across the frame. Carefully lower the hoist and lift cylinder onto the blocks.
10. Remove the sling from the rod portion of the Boom Lift Cylinder and wrap it around the cylinder barrel, just above the wood blocks. Wrap the sling twice around the barrel, leaving the ends of the sling available to hook onto the hoist.



11. Place a suitable floor jack under the lower pin boss of the Boom Lift Cylinder and place a slight amount of upward pressure on the pin boss.
12. Raise the hoist enough to lift the Boom Lift Cylinder close to its original position on the boom. Examine the sling arrangement periodically during this lift to be sure it remains in place without sliding excessively up the cylinder barrel.
    Carefully remove the wood blocks.
13. Remove the lower pin retainer, then remove the lower lift cylinder pin.

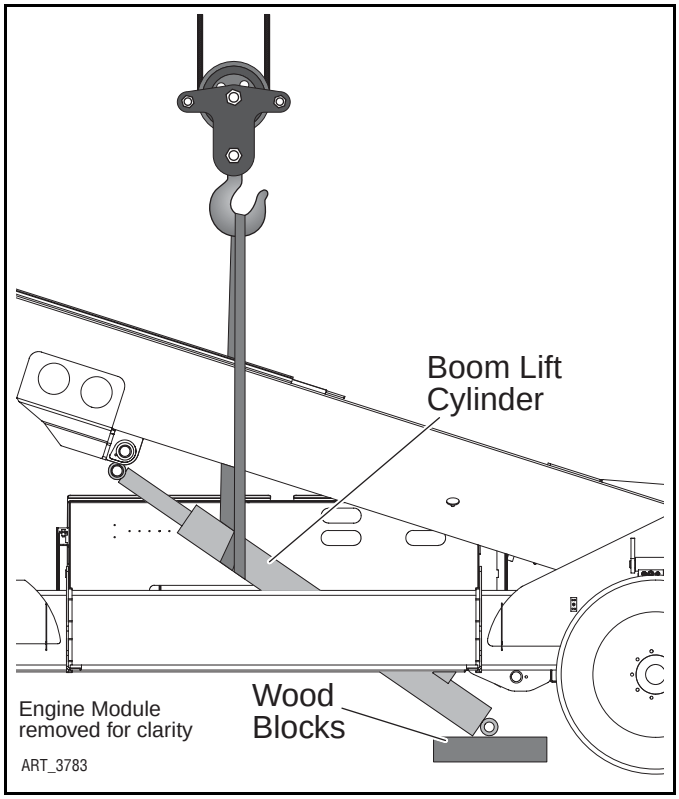


WARNING

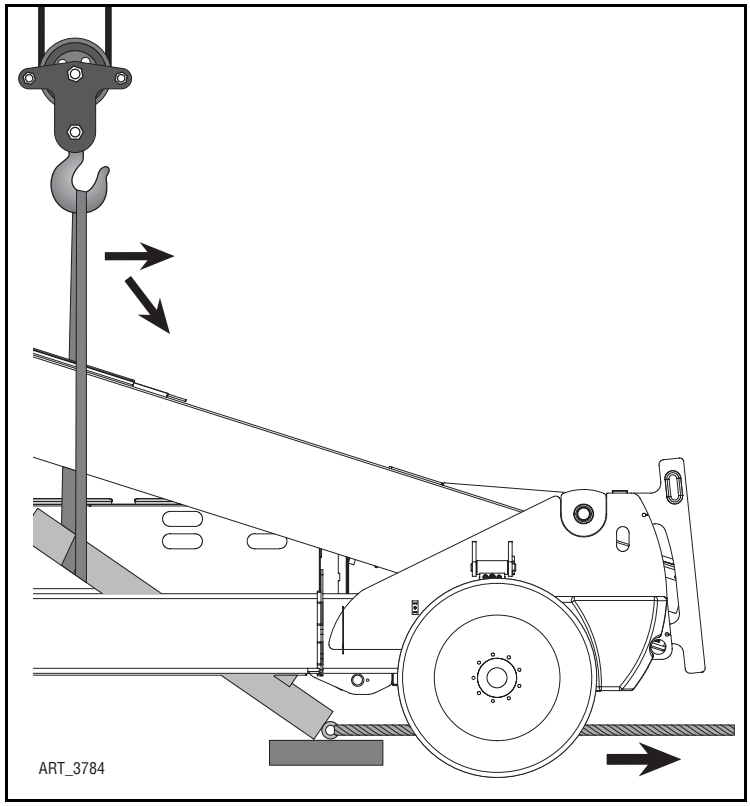
PERSONNEL MUST STAY CLEAR OF THE AREA BELOW AND TO THE REAR OF THE CYLINDER WHEN THE LOWER PIN IS RELEASED.

ENSURE THAT THE BOOM LIFT CYLINDER DOES NOT SHIFT OFF THE FLOOR JACK.

14. Place the wood blocks on the floor beneath the barrel end of the cylinder. Slowly lower the floor jack until the Boom Lift Cylinder rests on the wood blocks. Ensure that the sling remains in place.
15. Once the floor jack is released from the Boom Lift Cylinder, place a sling or heavy rope through the lower pin boss and route to the rear of the machine in preparation for pulling the cylinder from the rear of the machine.



16. Slowly and carefully lower the hoist and lift cylinder to the ground while pulling the cylinder to the rear of the machine.
17. Once the lift cylinder is completely lying on the ground, remove the sling from the barrel. Use the floor jack under the rod end pin boss to lift the cylinder off of the sling.
18. Pull the lift cylinder out from the rear of the machine.



INSTALLATION

1. Lay the Boom Lift Cylinder on the floor behind the chassis with the rod end pointing toward the front of the machine.
2. Tie a heavy rope or sling through the rod end pin boss and pull the cylinder under the machine until the rod end pin boss is below the boom tube pin boss.
3. Using a floor jack placed under the rod-end pin boss, lift the rod-end of the Boom Lift Cylinder and wrap the sling twice around the barrel, leaving the ends of the sling available to hook onto the hoist.
4. Carefully lift the lift cylinder up into its general location with the rod-end pin boss close to the its assembled location at the boom tube pin boss.
5. Place a floor jack under the barrel-end pin boss. Carefully lift and move it into position.
6. Using alignment tools, align the lower pin bosses and install the lower pivot pin. Install the pin retainer, using a drop of Loctite 242 or equivalent on the threads of the bolt. See the Introduction section of this manual for proper torque specifications.
7. Install both hydraulic hoses onto the Boom Lift Cylinder.
8. From the Lower Control station, start the engine and operate Boom Lift Function to extend or retract the Boom Lift Cylinder to align the rod end pin boss with the boom tube pin boss. Move the hoist as necessary to assist in this alignment.
9. Using alignment tools, align the upper pin bosses and install the upper pivot pin. Install the pin retainer, using a drop of Loctite 242 or equivalent on the threads of the bolt. See the Introduction section of this manual for proper torque specifications.
10. From the Lower Control station, lift the boom slightly and remove the boom support.
11. Operate the Boom Lift Function up and down through 3-4 cycles to purge air from the system.
12. Check for leaks and wipe up any residual oil.

13. Install the skid plate. Using a drop of Loctite 242 or equivalent on the threads of each bolt. See the Introduction section of this manual for proper torque specifications.
14. With the boom stowed, fill the hydraulic tank to the proper level using the clean filtered hydraulic oil of the type specified in Section 1 of this manual.

ENGINE MAINTENANCE

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

CAUTION

Always wear protective eye-wear when working with fuel and oil.
Engine should be OFF when replacing filter elements.
Do not run the engine with the air filter element removed.

OIL AND OIL FILTER

Dispose of used oil and filters properly.

Use only oil with lubrication classifications CF, CF-4, CG-4, CH-4 and CI-4.

Oil used with this engine must have proper API and SAE Engine Oil classification according to ambient temperatures as shown below:

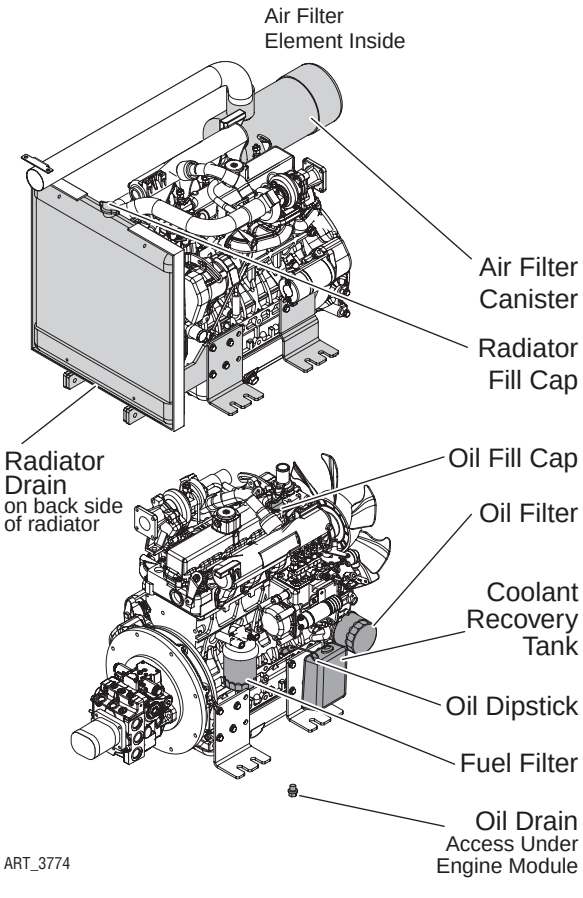
Above 77° F (25° C)	SAE30, SAE10W-30 or SAE15-40
32° ~ 77° F (0 ~ 25° C)	SAE20, SAE10W-30 or SAE15-40
Below 32° F (0° C)	SAE10W, SAE10W-30 or SAE15-40

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.
3. Coat the seal on the new filter with clean oil, then install and tighten by hand.
4. Fill engine with 10w-30 motor oil until the dipstick indicates FULL. Capacity is 10 US quarts (9,5 l).
5. Recheck dipstick after running engine. Fill as necessary.

AIR FILTER ELEMENT

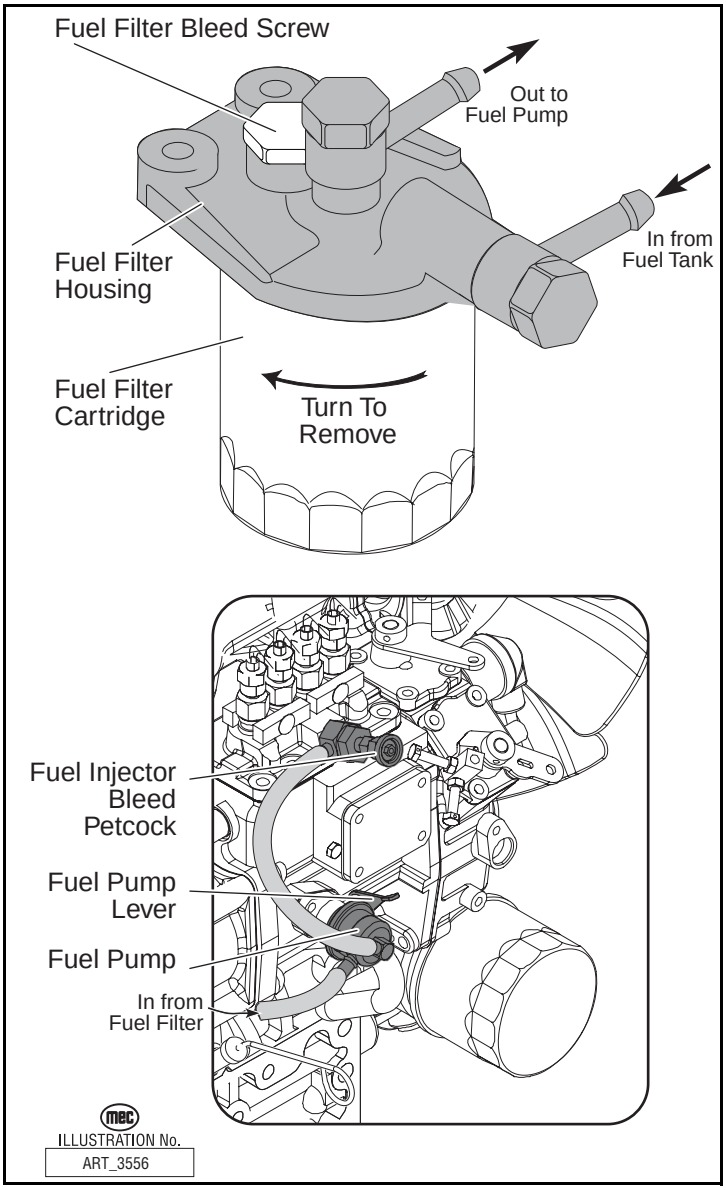
1. Clean the air filter canister before opening.
2. Remove the cap to the air filter canister.
3. Remove old filter and replace with a new filter.
4. Replace the cap to the air filter canister.

Figure 3-11: Engine Maintenance



FUEL FILTER

Figure 3-12: Fuel Filter & Fuel Pump

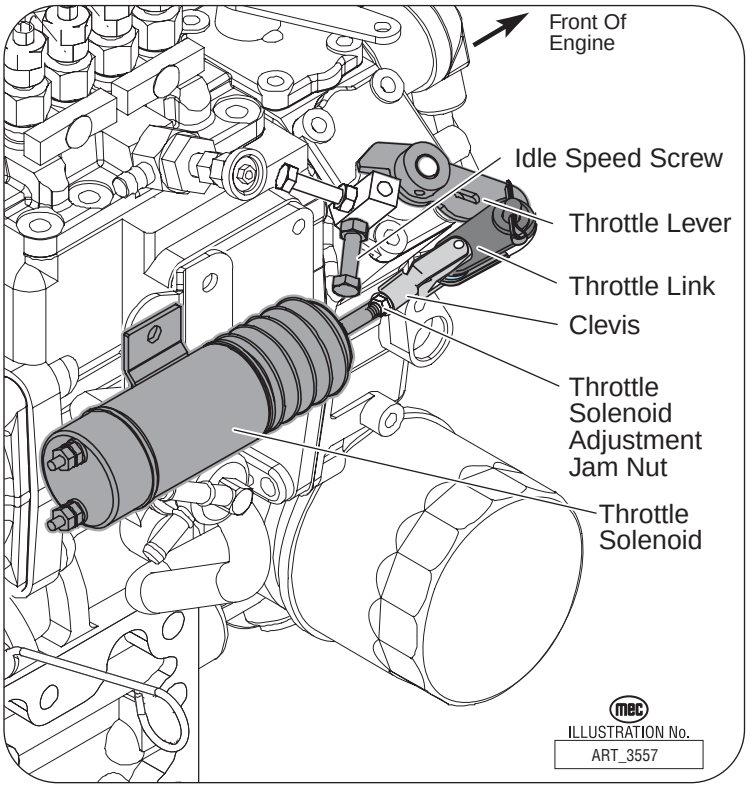


1. Turn OFF valve on bottom of fuel tank and clean the filter area before removing the filter.
2. Place a suitable container beneath the fuel filter assembly to catch spilled fuel.
3. Turn filter cartridge counter-clockwise to remove. Wipe the filter seal contact surface with a clean towel
4. Coat the seal on the new filter with clean oil, then install and tighten by hand.
5. Open valve at fuel tank and check for leaks.
6. Purge the air from the fuel system as follows;
   - Fill fuel tank to the fullest extent. Open valve on bottom of fuel tank.
   - Loosen Fuel Filter Bleed Screw on top of fuel filter housing a few turns. Close the bleed screw when fuel flows steadily and there are no more bubbles.
   - Open the Fuel Injector Bleed Petcock on the fuel injector pump.
   - Crank the engine for about 10 seconds, then stop it, **or** move the fuel feed pump lever by hand.
   - Start the engine. Close the Fuel Injector Bleed Petcock when the engine idles smoothly.

NOTE: The engine will crank for up to 10 seconds before the starter is cut out for a mandatory 30-second starter cool-down cycle. A red light will illuminate on the Base Control Station during the cool-down cycle.

THROTTLE ADJUSTMENT

Figure 3-13: Throttle Linkage



IDLE SPEED ADJUSTMENT

1. Bring engine to operating temperature.
2. Slow engine to complete idle.
3. Adjust the Idle Speed Screw until the RPM is 950. Adjust slightly up or down to avoid vibrations.
4. Hold the Idle Speed 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.

NOTE: The solenoid must retract and extend smoothly. If movement is impaired it may be necessary to reposition the solenoid to improvement alignment.

2. With the solenoid piston fully retracted measure the distance between the High Speed Stop Screw and the Throttle linkage using a .020 inch (.5 mm) 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.

LUBRICATION POINTS

BOOM WEAR PADS

Lower the stabilizers and extend the boom completely. Spread a thin, even coat of lithium-based grease on the areas where the wear pads rub -- top, bottom and sides of the End Section and Mid Section of the boom.

PLATFORM SLIDE CARRIAGE WEAR PADS

Spread a thin even coat of with lithium-based grease on the areas where the slide pads rub -- top, bottom and sides of Platform Beam.

PLATFORM ROTATE DRIVE UNIT

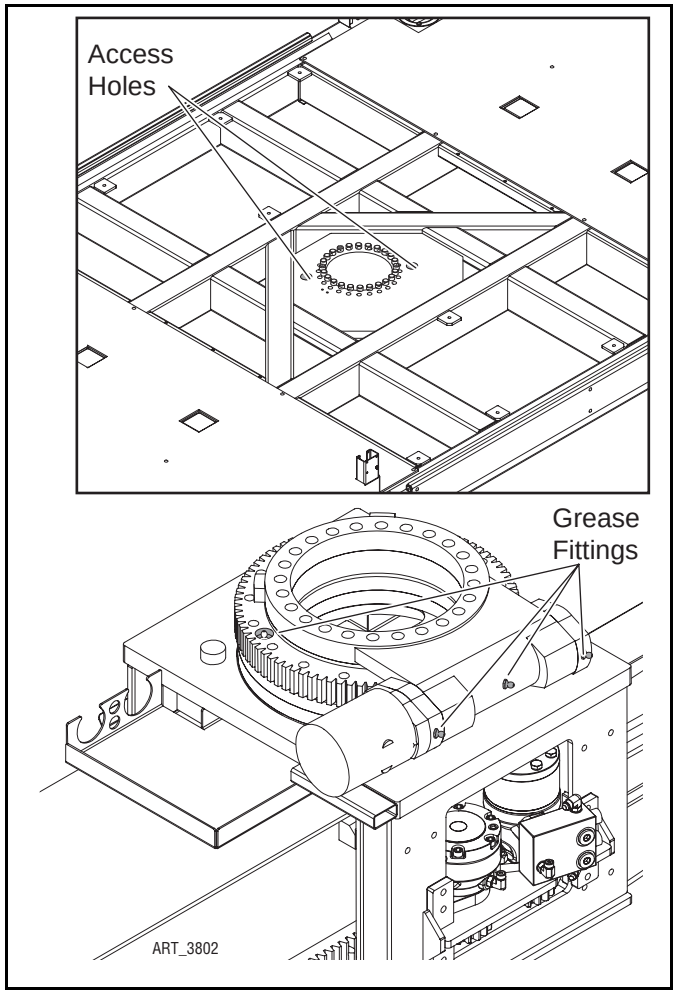
- Apply small amounts of lithium-based grease to approximately every 3rd tooth of the ring gear.
- Apply grease to 3 fittings located on the side of the Platform Rotate Drive Unit.
- Ring Gear Bearing: Remove the Load Zone Deck Plate. Rotate the platform until the access hole aligns with the grease fitting in the ring gear.

CABINET LATCHES AND HINGES

Apply spray lubricant to latches and hinges. Wipe off excess lubricant.

ENGINE

Apply spray lubricant to throttle solenoid linkage pivot points. See Figure 3-13 on page 3-39.



SERVICE

Section 4

TROUBLESHOOTING

CONTENTS

FIGURES

TABLES PAGE

GENERAL TROUBLESHOOTING TIPS

HYDRAULIC FLUID PUMP

The Hydraulic Drive Pump used in this model is a variable displacement, axial piston type pump. Proper adjustment is critical for normal operation of the machine. Refer to Section 1 of this manual.

The Functions/Lift pump is a tandem fixed-displacement gear-type pump attached to the rear of the Drive Pump.

Common Causes of Electrical System Malfunctions:

- Battery switch is turned OFF (located at the front of the engine module).
- Battery connections are loose or corroded
- Battery is not fully charged.
- Emergency Stop buttons are pushed (OFF position).
- Circuit breaker is tripped (OFF position).

Common Causes of Hydraulic System Malfunctions:

- Hydraulic fluid level is too low.
- 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: MEC uses a multiple viscosity fluid that is light enough for cold climates and resists thinning in warm climates. Use only the recommended hydraulic fluid. Substituting a lower grade fluid will cause the machine to operate incorrectly and may lead to pump and drive motor failure. Refer to "Lubrication" in Section 1 of this manual.

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. Make sure all ports and cavities of the manifold and cylinders are properly covered/plugged during maintenance activities.

ELECTRICAL SYSTEM TROUBLESHOOTING

The electronic control system used on this machine was designed for low maintenance and long, trouble-free operation. The system consists of two microprocessor based modules: the GP440 Module in the upper controls box and the GP400 Processor, located in the lower controls box. They communicate through a low voltage digital signal called CAN-Bus communication.

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

WARNING

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

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

GP400 MODULE

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

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

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

Figure 4-1: GP400 Module, Standard Configuration

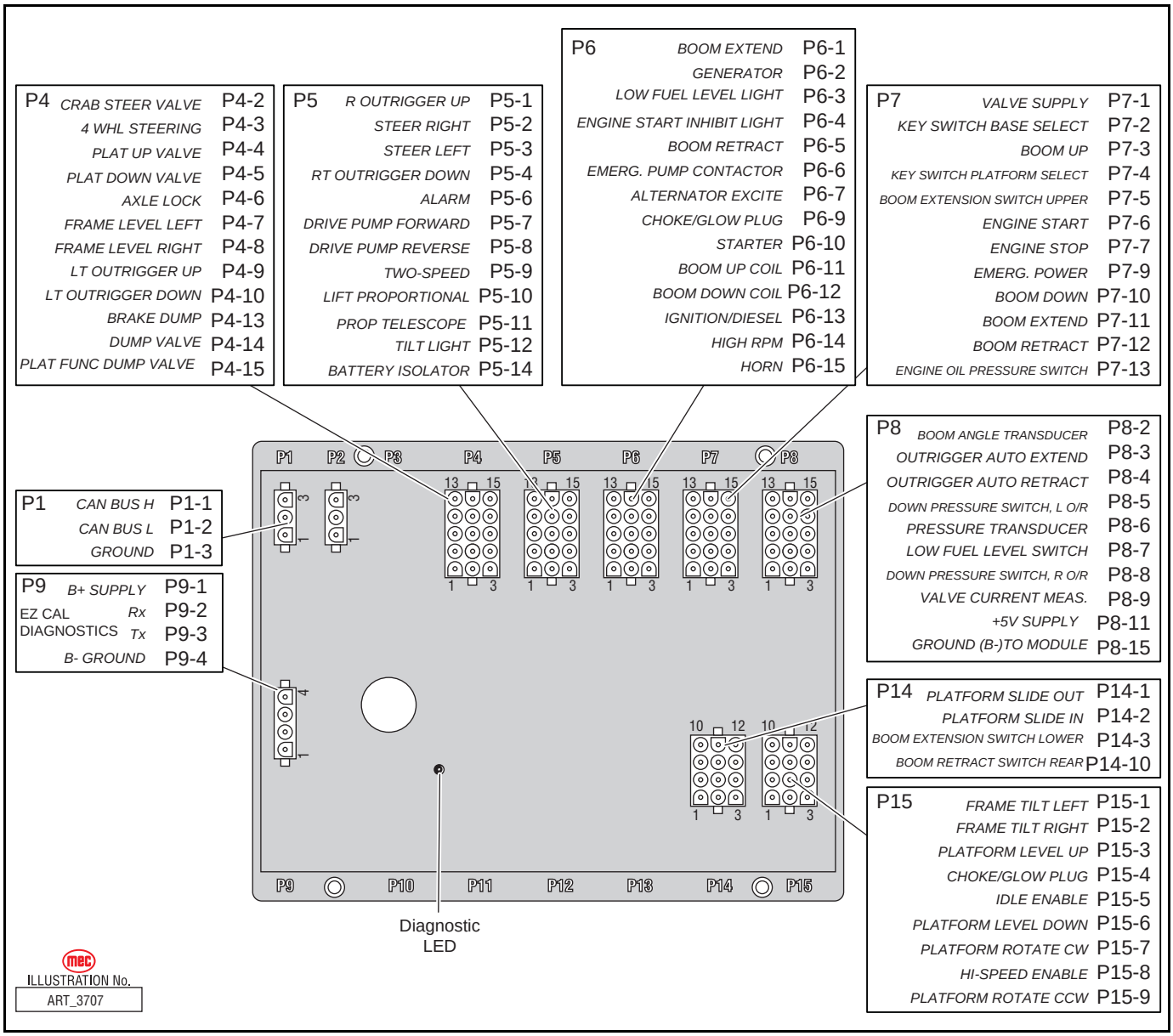
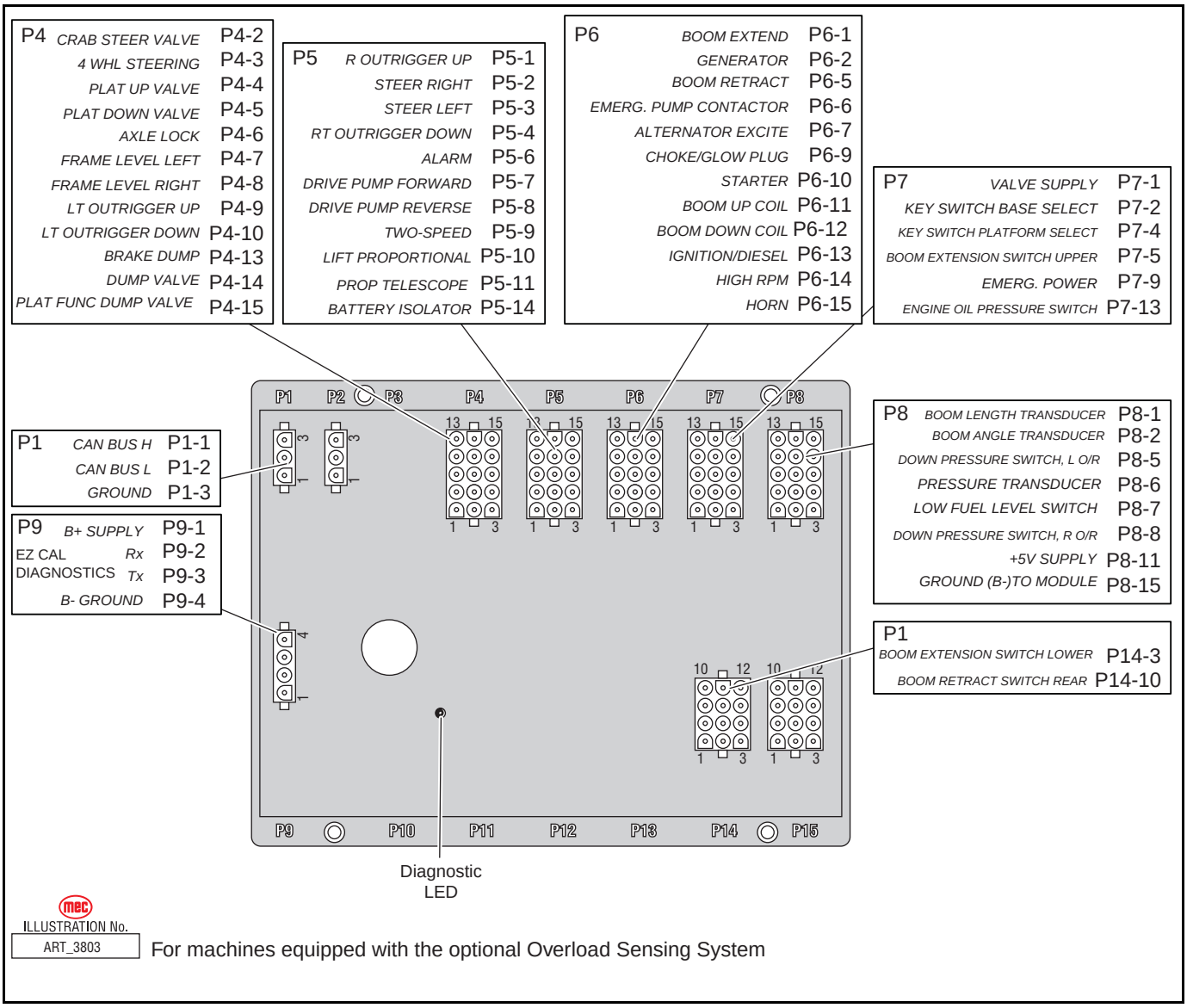


Figure 4-2: GP400 Module, Optional Overload Sensing System Configuration

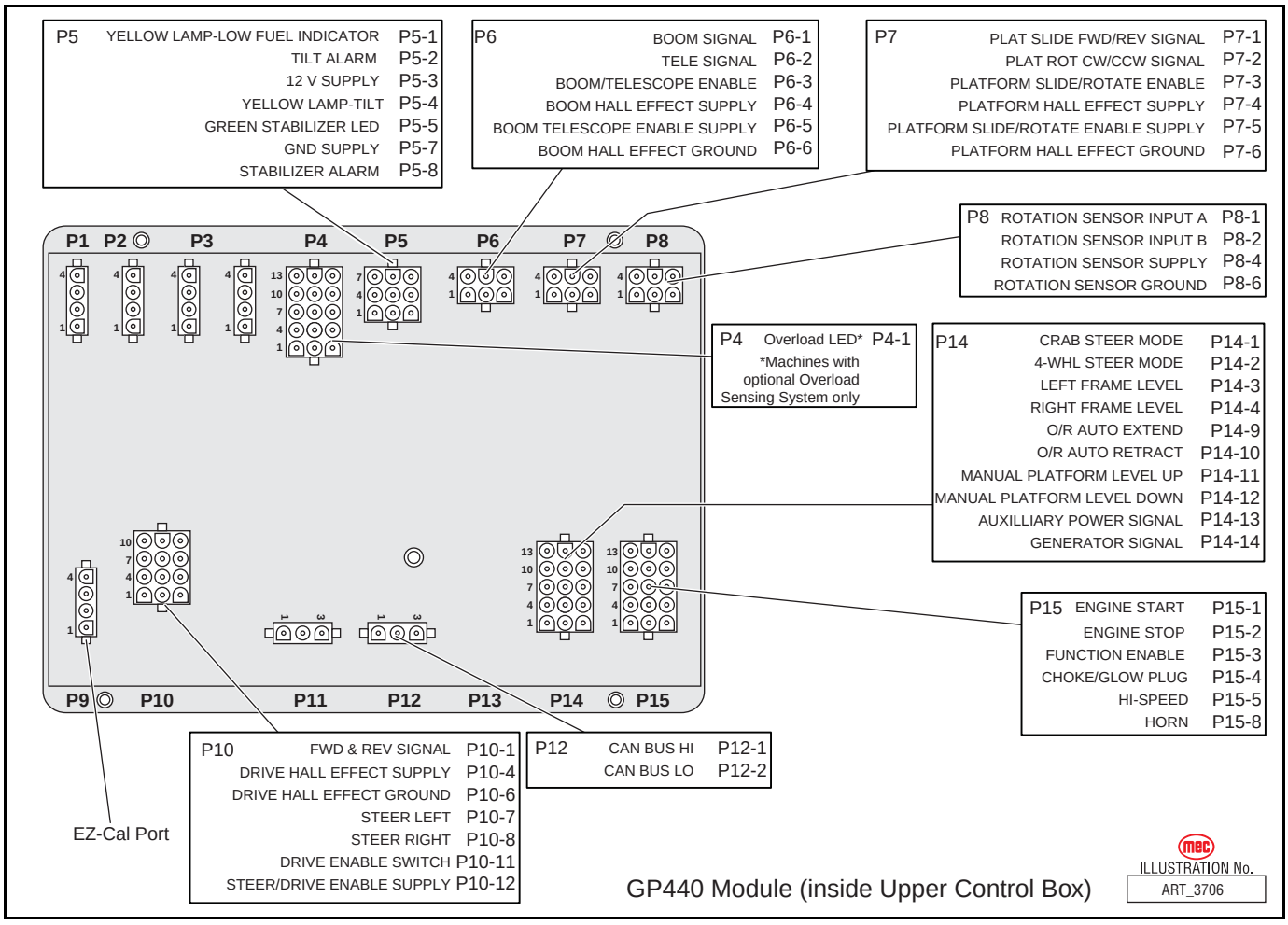


For machines equipped with the optional Overload Sensing System

GP440 MODULE

The GP440 Module is the remote module located inside the upper control box. It received inputs from the operator and relays them to the GP400.

Figure 4-3: GP440 Module

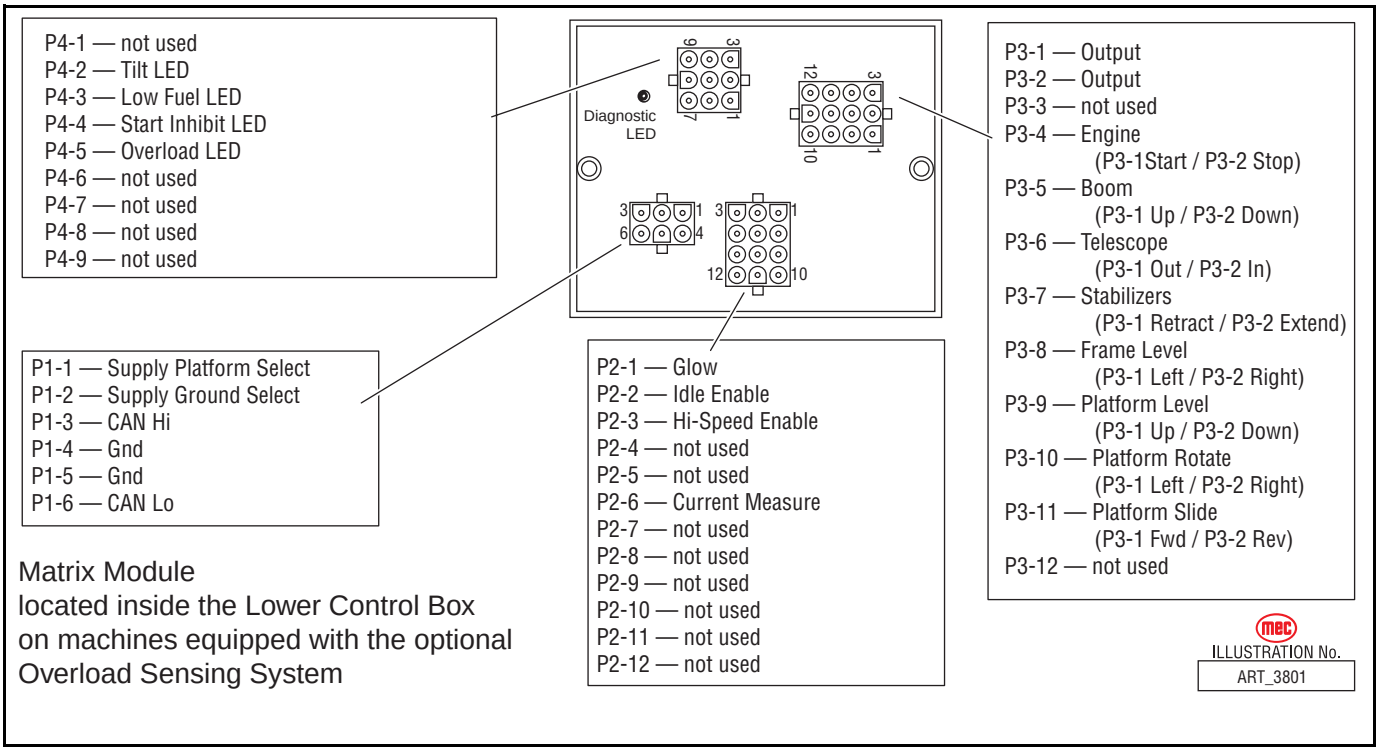


GP440 Module (inside Upper Control Box)

MATRIX MODULE

The Matrix Module is an auxiliary module located inside the lower control box on machines equipped with the optional Overload Sensing System. It received inputs from the operator and relays them to the GP400.

Figure 4-4: Matrix Module

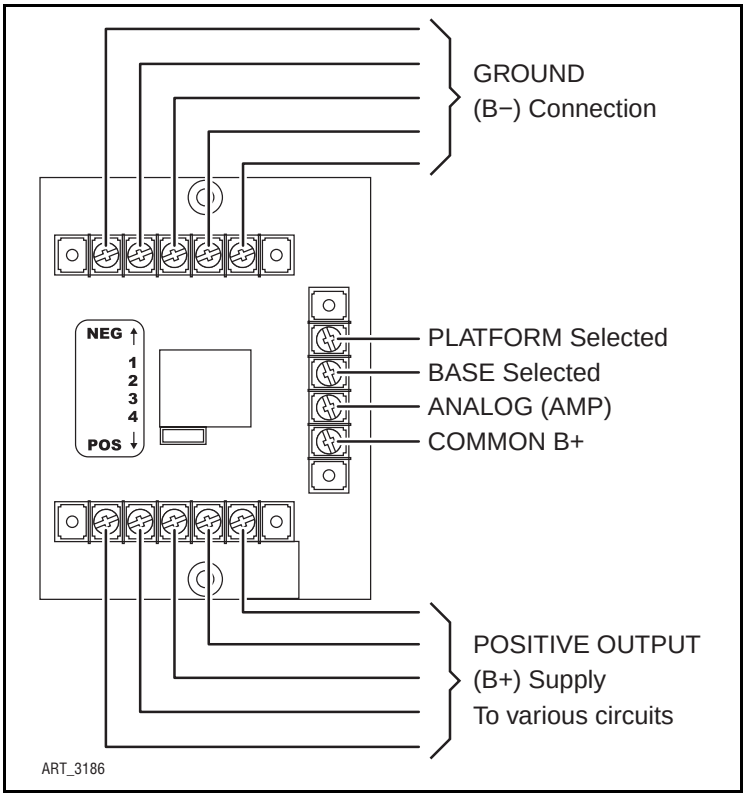


Matrix Module
located inside the Lower Control Box
on machines equipped with the optional
Overload Sensing System

TERMINAL BLOCK MODULE (TBM)

Figure 4-5: Terminal Block Module (TBM)

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



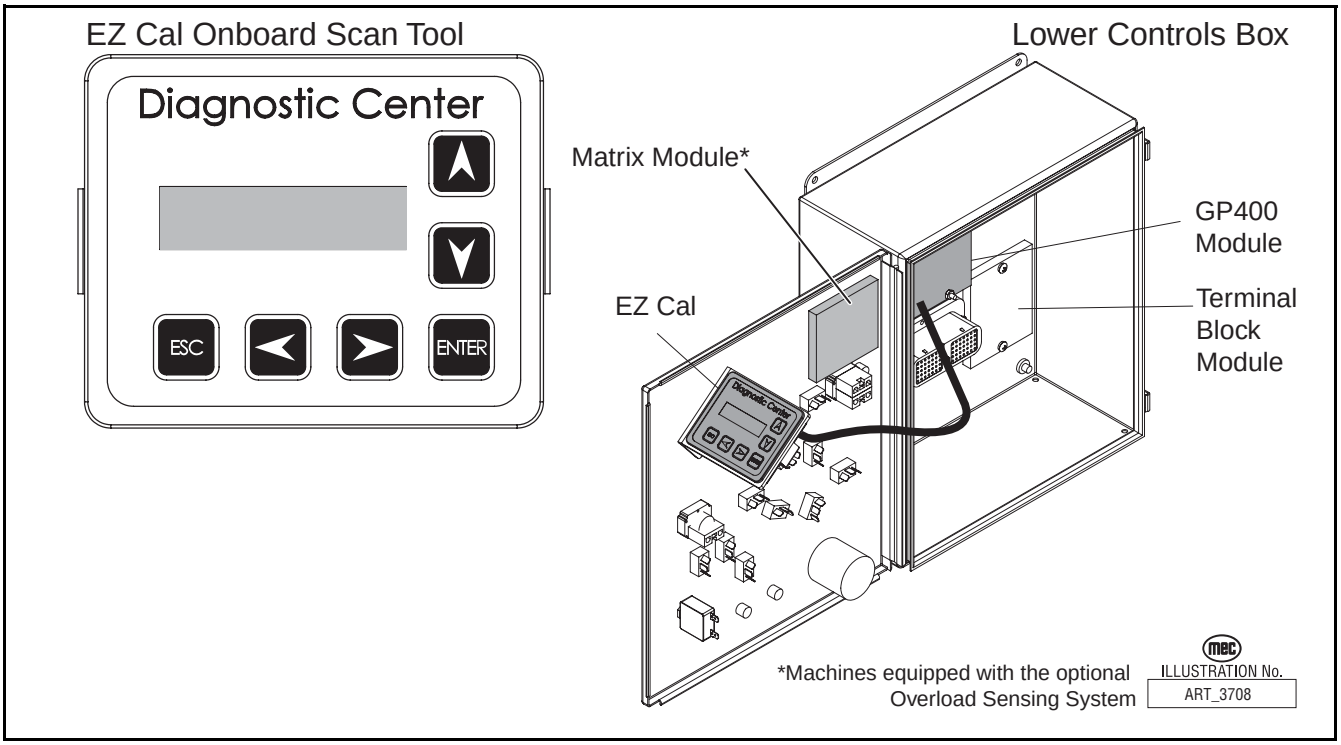
EZ-CAL SCAN TOOLS

The EZ-Cal Scan Tools interface with the machine's control system to provide system information and to allow adjustment. The EZ-Cal receives its power from the GP400 or GP440. The system must be powered up by closing the battery disconnect switch and pulling out both Emergency Stop Switches. You must also select Base or Platform depending on the station from which you will operate.

ONBOARD EZ-CAL -- LOWER CONTROLS BOX

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

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



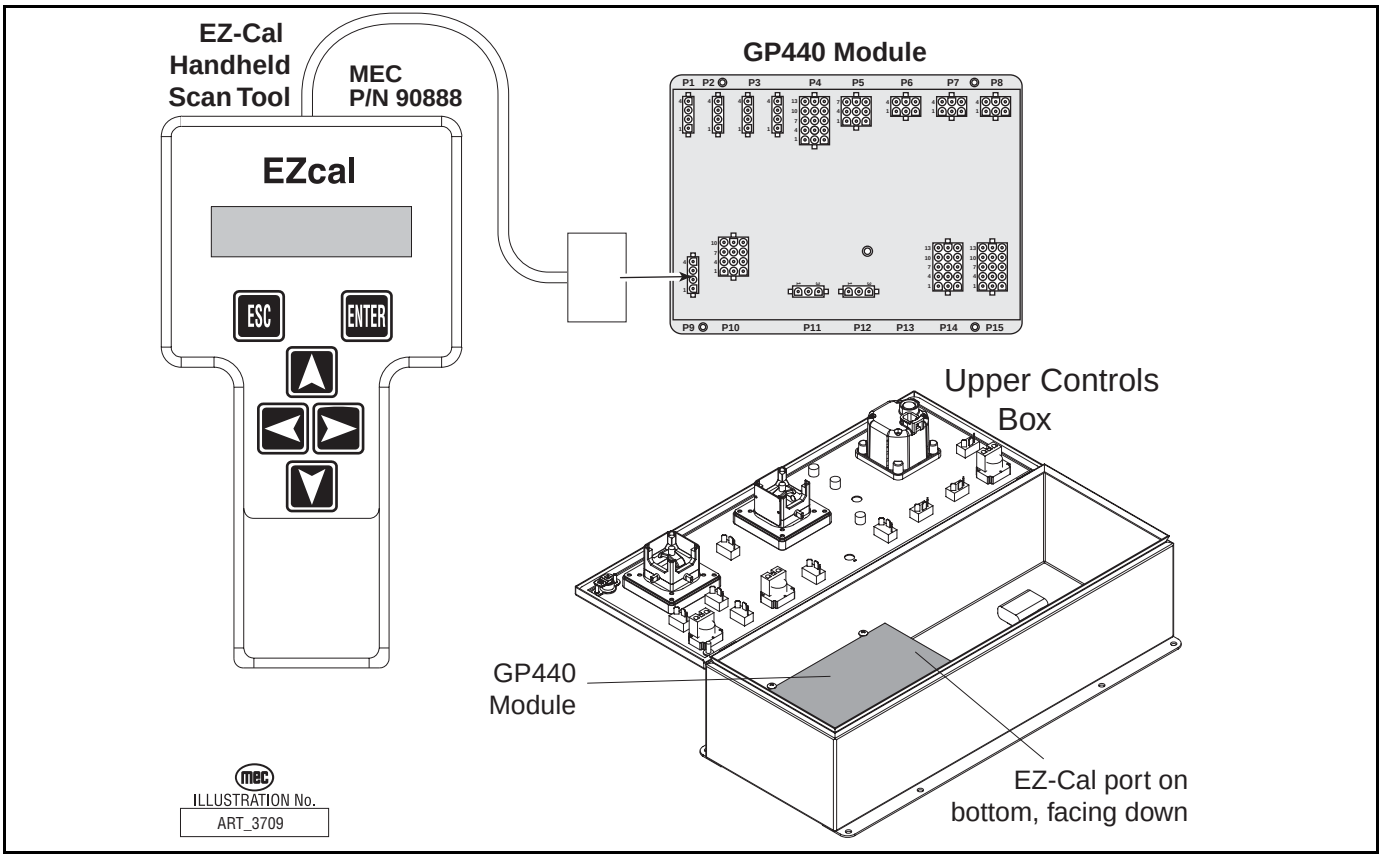
HANDHELD EZ-CAL -- UPPER CONTROLS BOX

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

To use and operate the handheld EZ-Cal at the upper controls station:

- Set the Base/Platform Key Switch to Platform
- Open the lid to the Upper Controls Box
- Plug the EZ-Cal into port P9 of the GP440 module. This plug is on the right side of the module, facing down.

Figure 4-7: Handheld EZ-Cal Tool & GP440



USING THE EZ-CAL SCAN TOOL

Figure 4-8: EZ-Cal Buttons

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

ART_3710

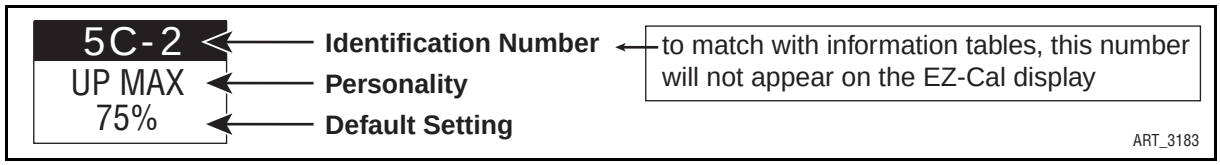
- Once, powered up, the EZ-Cal display will illuminate and read “HELP: PRESS ENTER”. From this point, use the right and left arrows to scroll through the base menus.
- Once the desired base menu is obtained (i.e. *ADJUSTMENTS*) press Enter to access sub menus.
- Use the right and left arrows to scroll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

Press ESC to back up one level.

USING THE EZ-CAL WITH THE FLOW CHARTS

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

Figure 4-9: EZ-Cal Display Example



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

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

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

WARNING

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

ERROR MESSAGES

To obtain error messages from the EZ-Cal, access the EZ-Cal as mentioned above. The display will read, “HELP:PRESS ENTER”. Press Enter to display the current error message. If an error message is present, use the following list of error messages to better understand the fault. If an error message is not present, the display will show the last operation performed.

Pressing Enter twice will provide a log of previous errors and operations that may have occurred within recent operation. The first message will be the most recent.

FLASH CODES

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

Figure 4-10: EZ-Cal Flow Chart: Adjustments and Setup, Standard Machines

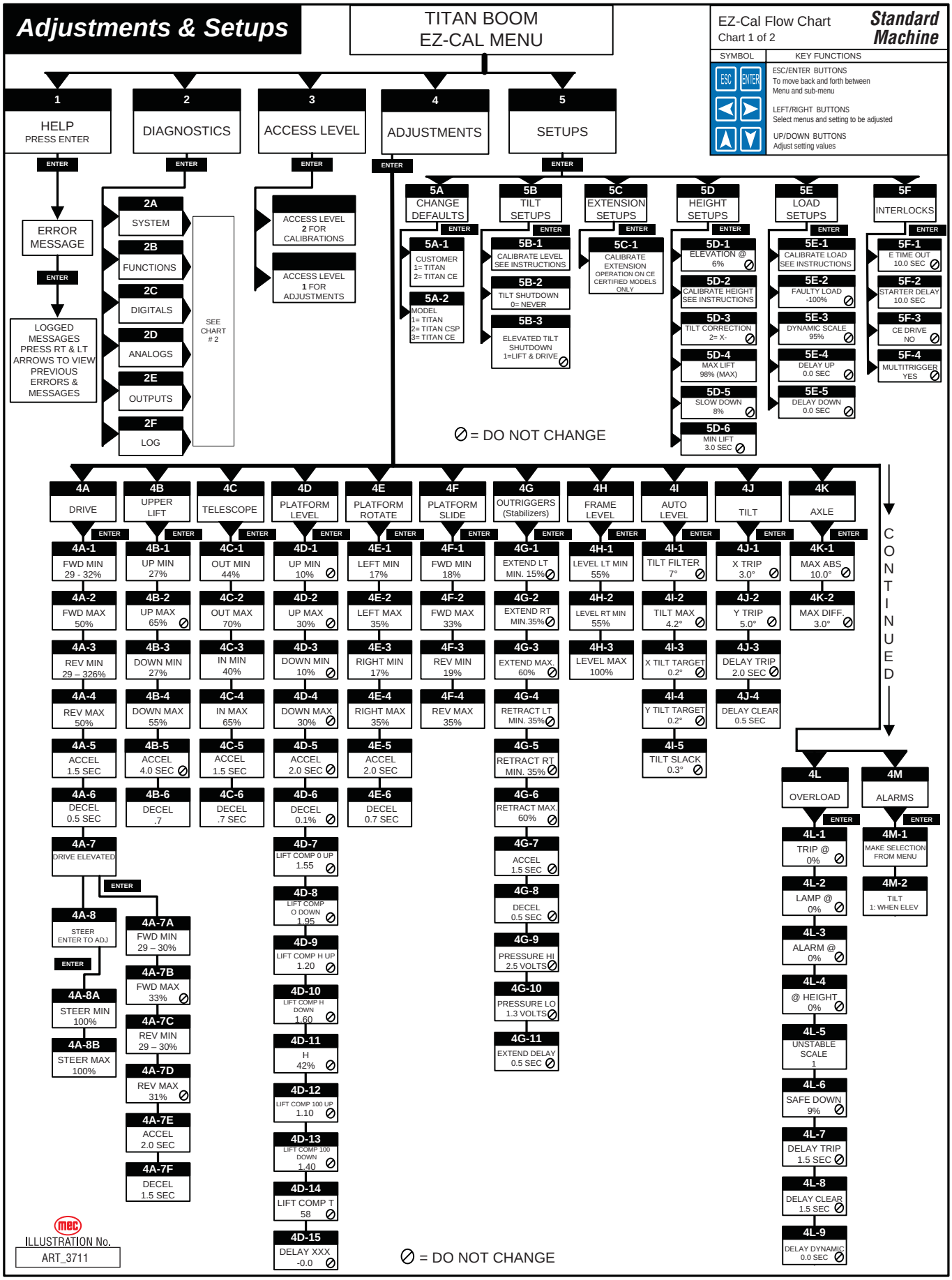


Figure 4-11: EZ-Cal Flow Chart: Diagnostic, Standard Machines

DIAGNOSTIC

Use in conjunction with diagnostic tables for thorough explanation of readout and values

TITAN BOOM EZ-CAL MENU

2 DIAGNOSTICS

ENTER

EZ-Cal Flow Chart
Chart 2 of 2
Standard Machine

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

2A SYSTEM

ENTER

- 2A-1 DRIVE ENABLE NO/YES
- 2A-2 BOOM ENABLE NO/YES
- 2A-3 B+ SUPPLY ACTUAL INPUT VOLTAGE
- 2A-4 TILT STATE OF LEVEL IN DEGREES
- 2A-4A PLATFORM ACTUAL IN DEGREES LEVEL
- 2A-4B GP400 ACTUAL IN DEGREES LEVEL
- 2A-4C CAN TILT 151 ACTUAL IN DEGREES LEVEL
- 2A-4D CAN TILT 152 ACTUAL IN DEGREES LEVEL
- 2A-4E CAN TILT 151 ACTUAL IN DEGREES LEVEL
- 2A-4F CAN TILT 154 ACTUAL IN DEGREES LEVEL
- 2A-5 AXLE AXLE LEVEL INFORMATION
- 2A-5A ANGLES ACTUAL IN DEG.
- 2A-5B AXLE LEVEL/ OFF LEVEL
- 2A-6 TILTED YES or NO
- 2A-7 HEIGHT ACTUAL IN %
- 2A-7A HEIGHT 1 ACTUAL IN %
- 2A-7B HEIGHT 2 (CE) ACTUAL IN %
- 2A-7C HEIGHT no comp ACTUAL IN %
- 2A-7D LIFT COMP NO USER INFO
- 2A-7E LIFT COMP T NO USER INFO
- 2A-7F UD NO USER VALUE
- 2A-7G Fabandon YES or NO
- 2A-7F Last Stable ACTUAL IN %
- 2A-8 EXTENSION ACTUAL IN %
- 2A-9 LOAD ACTUAL IN %
- 2A-10 LOAD level ACTUAL IN %
- 2A-11 LOAD extention ACTUAL IN %
- 2A-12 OVERLOADED YES or NO
- 2A-12A UNDERLOADED YES or NO
- 2A-12B CAUSE # 2 YES or NO
- 2A-13 LAST MOVED UP or DOWN
- 2A-14 ELEVATED YES or NO
- 2A-15 EXTENDED YES or NO
- 2A-16 RETRACTED YES or NO
- 2A-17 STABLE YES or NO
- 2A-18 ENGINE RPM NOT USED

2B FUNCTIONS

ENTER

- 2B-1 DRIVE ACTUAL
- 2B-2 STEER ACTUAL
- 2B-3 UL(upper lift) ACTUAL
- 2B-4 PLTud (Platform up/down) ACTUAL
- 2B-5 PLTlr (Platform L/R) ACTUAL
- 2B-6 PLTfr (paltform F/R) ACTUAL
- 2B-7 TELE ACTUAL
- 2B-8 FRAME ACTUAL
- 2B-9 O/R (stablzrs) ON or OFF

ENTER

- 2B-9A O/R (stablzrs) O/R left Direction and %
- 2B-9-B O/R (stablzers) O/R right Direction and %
- 2B-9C O/R (stablzrs) Tleft Time before stable
- 2B-9D O/R (stablzrs) Tright Time before stable
- 2B-9E AUTORETRACT Autoretract Time
- 2B-10 AUTO PLTud ACTUAL
- 2B-11 AUTO FRAME ACTUAL
- 2B-12 INTERLOCK INFORMATION

2C DIGITALS

ENTER

- 2C-1 GP400 DIGITALS Lower control box INPUTS

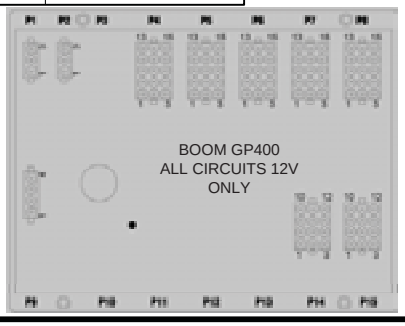
ENTER

P7-1	POWER INPUT
P7-2	KEY SWITCH BASE SELECTED
P7-3	BOOM UP
P7-4	KEY SWITCH PLATFORM SEL
P7-5	BOOM EXT PROX SWITCH UPPER
P7-6	ENGINE START
P7-7	ENGINE STOP
P7-9	EMERGENCY BATTERY POWER
P7-10	BOOM DOWN
P7-11	BOOM EXTEND
P7-12	BOOM RETRACT
P7-13	ENG OIL PRESS SWITCH
P14-1	PLATFORM SLIDE OUT
P14-2	PLATFORM SLIDE IN
P14-3	BOOM EXT PROX SWITCH LOWER
P14-10	BOOM RET PROX SWITCH REAR
P15-1	FRAME TILT LEFT
P15-2	FRAME TILT RIGHT
P15-3	PLATFORM LEVEL UP
P15-4	CHOKE OR GLOW PLUG
P15-5	IDLE ENABLE
P15-6	PLATFORM LEVEL DOWN
P15-7	PLATFORM ROTATE CW
P15-8	HIGH SPEED ENABLE
P15-9	PLATFORM ROTATE CCW

- 2C-2 GP440 Upper control box INPUTS

ENTER

P10-7	STEER LEFT
P10-8	STEER RIGHT
P10-11	DRIVE ENABLE SWITCH
P14-1	CRAB STEER MODE
P14-2	4-WHEEL STEER MODE
P14-3	LEFT FRAME LEVEL
P14-4	RIGHT FRAME LEVEL
P14-9	STABILIZER AUTO EXTEND
P14-10	STABILIZER AUTO RETRACT
P14-11	MANUAL PLAT LEVEL UP
P14-12	MANUAL PLAT LEVEL DOWN
P14-13	EMERG POWER SWITCH
P14-14	A/C GENERATOR SWITCH
P15-1	ENGINE START
P15-3	BOOM ENABLE
P15-4	CHOKE OR GLOW PLUG
P15-5	DRIVE HIGH SPEED
P15-6	DRIVING LIGHTS
P15-8	HORN



2D ANALOGS

ENTER

- 2D-1 GP400 ANALOGS Lower control box INPUTS

ENTER

P8-2	BOOM ANGLE TRNSDCR
P8-3	STBLZER AUTO EXT SW
P8-4	STBLZER AUTO RET SW
P8-5	LT STBLZER PRESS SW
P8-7	LOW FUEL LEVEL SW
P8-8	RT STBLZER PRESS SW
P8-9	VALVE CURRENT MEAS

- 2D-2 GP440 Upper control box analog inputs

ENTER

P6-1	BOOM UP/DWN JSTK
P6-2	TELE IN/OUT JSTK
P6-3	BOOM/TELE ENABLE
P7-1	PLAT SLIDE IN/OUT JSTK
P7-2	PLAT ROTATE JSTK
P7-3	PLAT SLIDE/ROT ENABLE
P8-1	ROTATE SENSOR SIG A
P8-2	ROTATE SENSOR SIG B
P10-1	DRIVE FWD/REV JSTK

NOTE:
When viewing Proportional valve outputs: P5-7 thu P5-11 press ENTER for actual %

2E OUTPUTS

ENTER

- 2E-1 GP400 OUTPUTS Lower control box OUTPUTS

ENTER

P4-1	AUX HYD TO PLATFORM
P4-2	CRAB STEER VALVE
P4-3	4-WHEEL STEER VALVE
P4-4	PLATFORM UP VALVE
P4-5	PLATFORM DOWN VALVE
P4-6	AXLE LOCK VALVES
P4-7	FRAME LEVEL LEFT VALVE
P4-8	FRAME LEVEL RIGHT VALVE
P4-9	STABILIZER LEFT UP VALVE
P4-10	STABILIZER LEFT DOWN VALVE
P4-13	BRAKE DUMP VALVE
P4-14	DUMP VALVE (NOT PLATFORM)
P4-15	DUMP VALVE PLATFORM
P5-1	STABILIZER RIGHT UP VALVE
P5-2	STEER RIGHT VALVE
P5-3	STEER LEFT VALVE
P5-4	STABLZER RIGHT DOWN VALVE
P5-5	DRIVING LIGHTS
P5-6	ALARM
P5-7	DRIVE PUMP FWD VALVE
P5-8	DRIVE PUMP REV VALVE
P5-9	2-SPEED VALVE
P5-10	LIFT PROPORTIONAL VALVE
P5-11	TELE PROPORTIONAL VALVE
P5-12	TILT LIGHT
P5-14	BATTERY ISOLATER RELAY
P6-1	BOOM EXTEND VALVE
P6-2	A/C GENERATOR (OPTIONAL)
P6-3	LOW FUEL LEVEL LIGHT
P6-4	ENGINE STSRT INHIBET LIGHT
P6-5	BOOM RETRACT VALVE
P6-6	EMERGENCY PUMP MOTOR
P6-7	ALTERNATOR EXCITE
P6-8	GAS/PROPANE
P6-9	CHOKE/GLOW PLUG
P6-10	START - ENGINE
P6-11	BOOM UP VALVE
P6-12	BOOM DOWN VALVE
P6-13	FUEL SOLENOID (DIESEL) IGN
P6-14	THROTTLE
P6-15	HORN

- 2E-2 GP440 OUTPUTS Upper control box OUTPUTS

ENTER

P5-1	LOW FUEL INDICATOR LAMP
P5-2	TILT (OVERLOAD CE MODELS)
P5-3	12 VOLT SUPPLY
P5-4	TILT INDICATOR LAMP
P5-5	STABILIZER DOWN LAMP
P5-8	STABILIZER LOW PRESS ALARM

2F LOG

ENTER

- 2F-1 CALDATE DATE OF CALIBRATION
- 2F-2 SOFTWARE SOFT WARE VERSION NUMBER
- 2F-3 MAX BATTERY HIGHEST BATT VOLTAGE

ILLUSTRATION No.
ART_3712

Figure 4-12: EZ-Cal Flow Chart: Adjustments and Setup, Machines w/ Optional Overload Sensing System

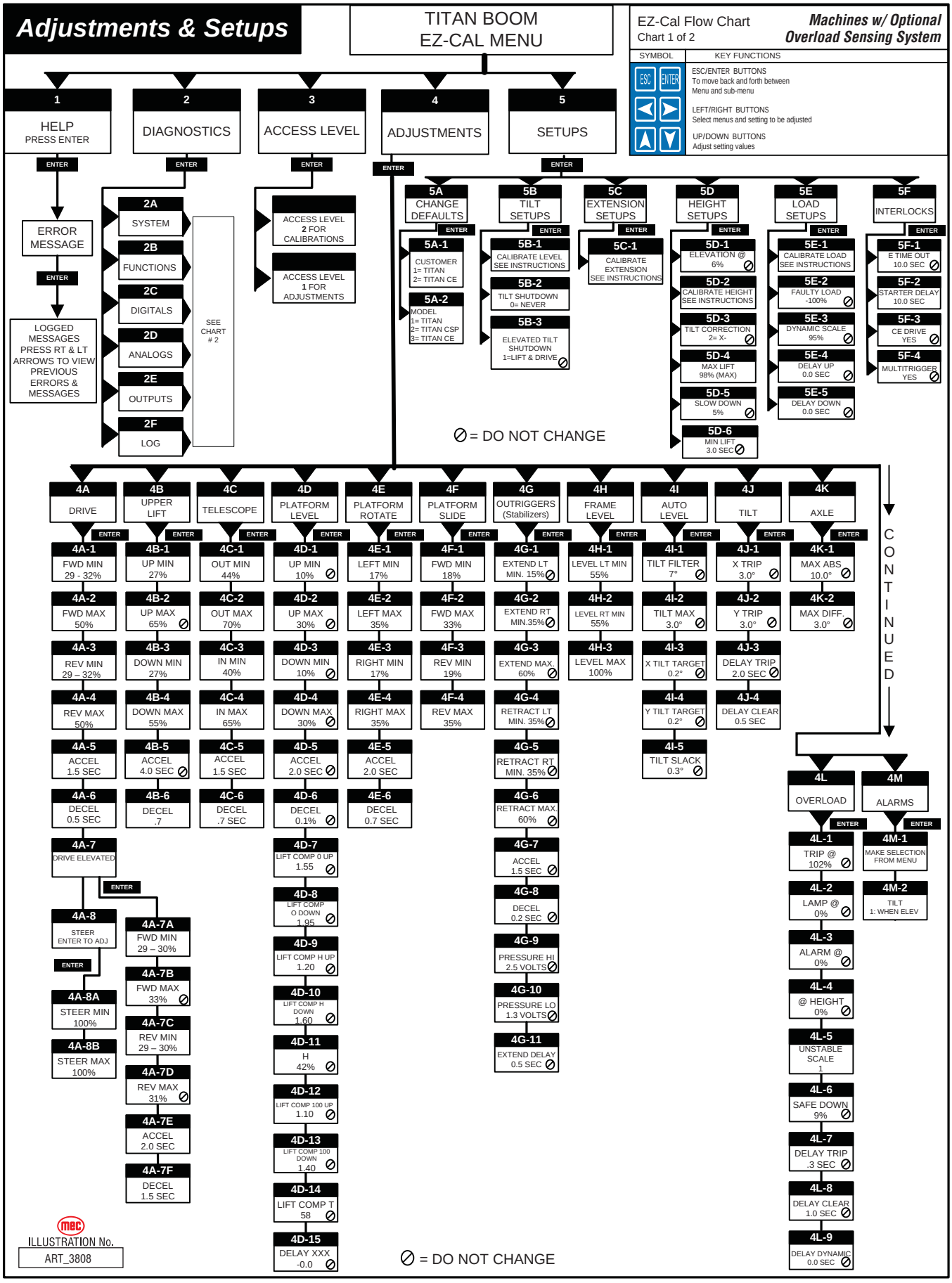
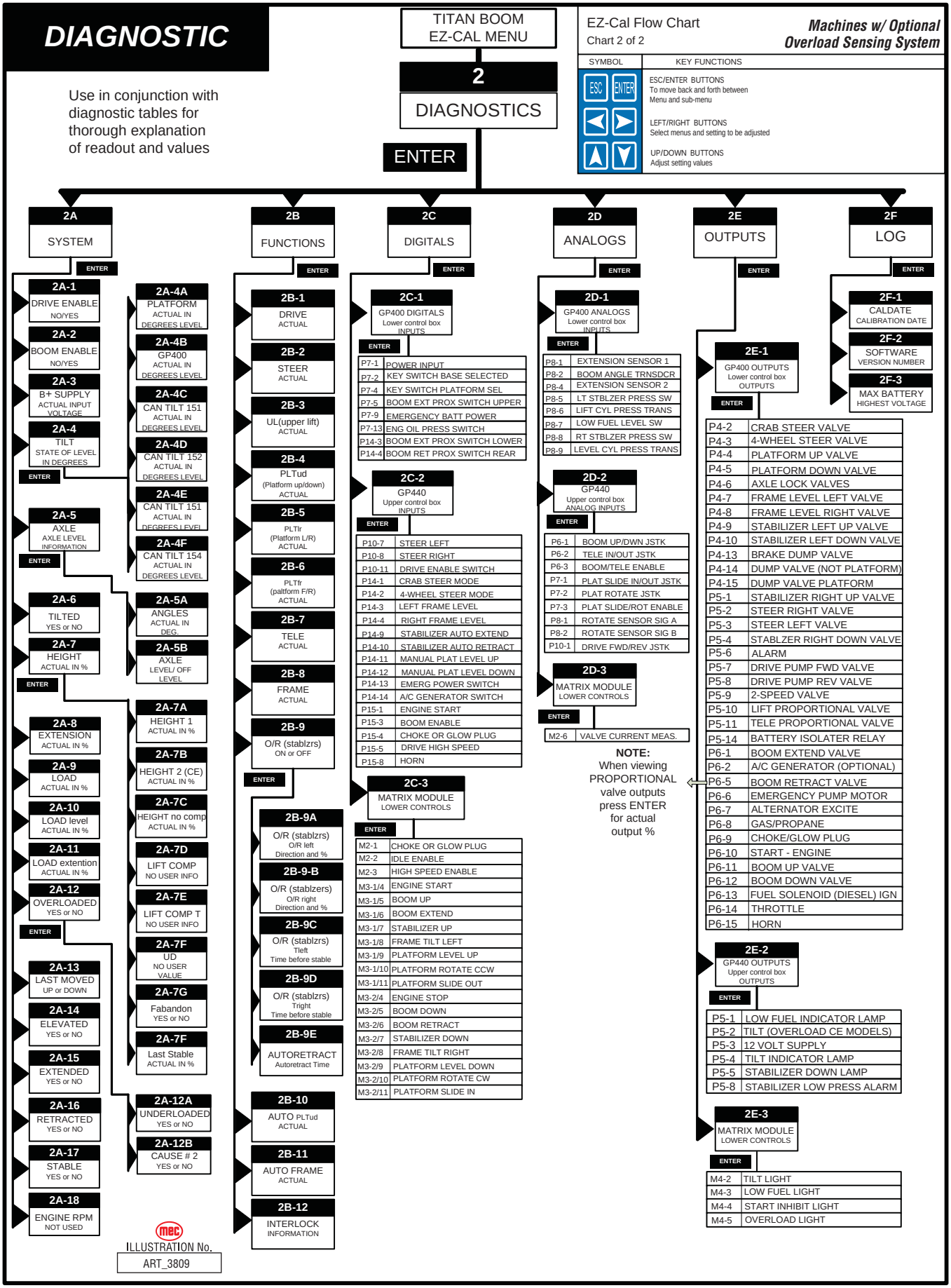


Figure 4-13: EZ-Cal Flow Chart: Diagnostic, Machines w/ Optional Overload Sensing System



EZ-CAL ADJUSTMENT

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

Adjustments are possible in Access Level 1 Only.

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

To reach ADJUSTMENTS, first access Level 1, then press --> for ADJUSTMENTS. Press Enter, then press --> to scroll through the sub-menus.

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

Table 4-1: EZ-Cal Adjustment Table

OPERATION	ID	PERSONALITY	Factory Setting	Explanation
4A DRIVE (platform Stowed)	4A1	Fwd Min	29 - 32%	Slowest speed threshold
	4A2	Fwd Max	55%	Maximum speed setting
	4A3	Rev Min	29 - 32%	Slowest speed possible
	4A4	Rev Max	55%	Maximum speed potential
	4A5	Accel	1.5 sec.	Ramp up time to maximum
	4A6	Decel	.2 sec.	Ramp down to time stop
	4A7	DRIVE ELEVATED	Sub Menu	Press ENTER to access elev. drive settings
	4A7a	Fwd Min	29 - 30%	Slowest speed threshold
	4A7b	Fwd Max	33%	DO NOT CHANGE
	4A7c	Rev Min	29 - 30%	Slowest speed possible
	4A7d	Rev Max	32%	DO NOT CHANGE
	4A7e	Accel	2.0 sec.	Ramp up time to maximum
	4A7f	Decel	1.5 sec.	Ramp down to time stop
	4A8	STEER	Sub Menu	Press ENTER to access steer settings
	4A8a	Steer Min	100%	Steering speed adjustment
	4A8b	Steer Max	100%	Steering speed adjustment
4B UPPER LIFT	4B1	Up Min	24%	Slowest speed threshold
	4B2	Up Max	65%	DO NOT CHANGE
	4B3	Down Min	30%	Slowest speed threshold
	4B4	Down Max	60%	DO NOT CHANGE
	4B5	Accel	4.0 sec.	DO NOT CHANGE
	4B6	Decel	0.7 sec.	Ramp down time to stop
4C TELESCOPE	4C1	Out Min	44%	Slowest speed threshold
	4C2	Out Max	70%	Maximum speed setting
	4C3	In Min	40%	Slowest speed threshold
	4C4	In Max	65%	Maximum speed setting
	4C5	Accel	1.5 sec.	Ramp up time to maximum
	4C6	Decel	0.7 sec.	Ramp down time to stop

OPERATION	ID	PERSONALITY	Factory Setting	Explanation
4D PLATFORM LEVEL	4D1	Up Min	11%	DO NOT CHANGE
	4D2	Up Max	30%	DO NOT CHANGE
	4D3	Down Min	11%	DO NOT CHANGE
	4D4	Down Max	30%	DO NOT CHANGE
	4D5	Accel	2.0 sec.	DO NOT CHANGE
	4D6	Decel	0.1 sec.	DO NOT CHANGE
	4D7	Lift Comp 0 up	1.65	DO NOT CHANGE
	4D8	Lift Comp 0 Down	1.95	DO NOT CHANGE
	4D9	Lift Comp H Up	1.20	DO NOT CHANGE
	4D10	Lift Comp H Down	1.60	DO NOT CHANGE
	4D11	H	42%	DO NOT CHANGE
	4D12	Lift Comp 100 Up	1.10	DO NOT CHANGE
	4D13	Lift Comp 100 Down	1.40	DO NOT CHANGE
	4D14	Lift Comp T	58	DO NOT CHANGE
	4D15	Delay XXX	0	DO NOT CHANGE
4E PLATFORM ROTATE	4E1	Left Min	17	Slowest speed threshold
	4E2	Left Max	35	Maximum speed setting
	4E3	Right Min	17	Slowest speed threshold
	4E4	Right Max	35	Maximum speed setting
	4E5	Accel	2.0 sec.	Ramp up time to maximum
	4E6	Decel	0.7 sec.	Ramp down time to stop
4F PLATFORM SLIDE	4F1	Fwd Min	18%	Slowest speed threshold
	4F2	Fwd Max	33%	Maximum speed setting
	4F3	Rev Min	18%	Slowest speed threshold
	4F4	Rev Max	35%	Maximum speed setting
4G OUTRIGGERS (STABILIZERS)	4G1	Extend Left Min	36%	DO NOT CHANGE
	4G2	Extend Right Min	36%	DO NOT CHANGE
	4G3	Extend Max	60%	DO NOT CHANGE
	4G4	Extend Left Min	35%	DO NOT CHANGE
	4G5	Extend Right Min	35%	DO NOT CHANGE
	4G6	Retract Max	60%	DO NOT CHANGE
	4G7	Accel	1.5 s	DO NOT CHANGE
	4G8	Decel	0.2 s	DO NOT CHANGE
	4G9	Pressure Hi	2.5 volts	DO NOT CHANGE
	4G10	Pressure Lo	1.3 Volts	DO NOT CHANGE
	4G11	Extend Delay	0.5 Seconds	DO NOT CHANGE
4H FRAME LEVEL	4H1	Level Min	55%	Slowest speed threshold
	4H2	Level Left Max	55%	Maximum speed setting
	4H3	Level Right Max	100%	Maximum speed setting
4I AUTO-LEVEL	4I1	Tilt Filter	7 deg	DO NOT CHANGE
	4I2	Tilt Max	4.2 deg	DO NOT CHANGE
	4I3	X Tilt Target	.2 deg	DO NOT CHANGE
	4I4	Y Tilt Target	.2 deg	DO NOT CHANGE
	4I5	Tilt Slack	.3 deg	DO NOT CHANGE
4J TILT	4J1	X Trip	3.0 deg	DO NOT CHANGE
	4J2	Y Trip	3.0 deg	DO NOT CHANGE
	4J3	Delay Trip	2.0 sec.	DO NOT CHANGE
	4J4	Delay Clear	0.5 sec	Time before clear out-of-level shutdown

OPERATION	ID	PERSONALITY	Factory Setting	Explanation
4K AXLE	4K1	MAX ABS	10.0 deg	DO NOT CHANGE
	4K2	Max Differential	3.0 deg	DO NOT CHANGE
4L OVERLOAD ANSI/ CE option	4L1	Trip @	0%	**Standard machine** DO NOT CHANGE
			102%	**Machine with optional Overload Sensing System** DO NOT CHANGE
	4L2	Lamp @	0%	DO NOT CHANGE
	4L3	Alarm@	0%	DO NOT CHANGE
	4L4	@ Height	0%	DO NOT CHANGE
	4L5	Load Level Scale	1.20	DO NOT CHANGE
	4L6	Safe Down	9%	DO NOT CHANGE
	4L7	Delay Trip	1.5 sec.	DO NOT CHANGE
	4L8	Delay Clear	1.5 sec.	DO NOT CHANGE
	4L9	Delay Dynamic	0.0 sec.	DO NOT CHANGE
4M ALARMS	4M1	Motion	0=NO	Select alarm setting to indiv. requirement
	4M2	Tilt Alarm	1: When Elevated	selects when tilt alarm sounds

EZ-CAL SETUP

Changes to Setups are possible in Access Level 1 only. Calibrations are possible in access level 2.

WARNING

SEE "CALIBRATION INSTRUCTIONS" BEFORE ATTEMPTING CALIBRATIONS. INCORRECT CALIBRATION CAN CAUSE MACHINE INSTABILITY.

NOTE: Changing CUSTOMER (5a1) or MODEL (5a2) will return all settings and Adjustments to their default value possibly causing the machine to operate differently than desired (see Adjustment Flow Charts for default values)

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

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

Table 4-2: EZ-Cal Setup Menu

OPERATION	ID	FUNCTION	Factory Setting	Explanation
5a CHANGE DEFAULTS	5a1	Customer	1=TITAN 2=TITAN CE	Identifies Base Model - Must be set when GP400 is Replaced. CE denotes Overload Sensing option.
	5a2	Model	1=TITAN 2=TITAN CSP 3=TITAN CE	Select from these choices. Titan CSP = Cold Start or Arctic option, CE = Overload Sensing Option
5b TILT SETUPS	5b1	Calibrate Level? Y=ENTER, N=ESCAPE		Pressing enter twice will calibrate all level sensors
		WARNING! Refer to Tilt Sensor Calibration instructions before attempting calibration		
	5b2	Tilt Shutdown	0 = never	Function disabled when tilted (stowed)
	5b3	Elevated Tilt Shutdown	1 = Lift and Drive	DO NOT CHANGE
5c HEIGHT SETUP	5c1	Calibrate Extension? Y=ENTER N=ESCAPE		ENTER to begin calibration of Extension sensor.
		WARNING! Refer to Extension Calibration instructions before attempting calibration		
5d HEIGHT SETUP	5d1	Elevation @	6%	DO NOT CHANGE
	5d2	Calibrate Height? Y=ENTER, N=ESCAPE		ENTER to begin calibration of height sensors
		WARNING! Refer to Height Calibration instructions before attempting calibration		
	5d3	Tilt Correction	2=X-	DO NOT CHANGE
	5d4	Max Lift	98%	DO NOT SET ABOVE 98%
	5d5	Slow down	8%	DO NOT CHANGE
	5d6	Min Lift	3.0 sec	DO NOT CHANGE
5e LOAD SETUPS (optional Overload Sensing System only)	5e1	Calibrate Load? Y=ENTER N=ESCAPE		ENTER to begin calibration of Overload Sensing System
		WARNING! Refer to Load Calibration instructions before attempting calibration		
	5e2	Faulty Load	-100%	DO NOT CHANGE
	5e3	Dynamic Scale	95%	DO NOT CHANGE
	5e4	Delay Up	0.0 sec	DO NOT CHANGE
	5e5	Delay Down	0.0 sec	DO NOT CHANGE
5f INTERLOCKS	5f1	E Time Out	10 Seconds	DO NOT CHANGE
	5f2	Starter Delay	10 Seconds	Amount of time starter will operate before 30 sec cool down
	5f3	CE Drive	YES	DO NOT CHANGE
	5f4	MultiTrigger	YES	Allows use of all enable triggers for any function

EZ-CAL DIAGNOSTICS

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

To reach DIAGNOSTICS menu from HELP;

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

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

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

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

Table 4-3: EZ-Cal Diagnostics Menu

SELECTION	ID #	EZ-cal Readout	Explanation
2A SYSTEM	2A1	Drive Enable Y or N	Drive enable switch open or closed
	2A2	Boom Enable Y or N	Boom enable switch open or closed
	2A3	B+ Supply (actual)	Supply voltage at GP200
	2A4	Tilt (actual in degrees)	Platform tilt angle as read by 4-way can tilt
Sub Menu Press ENTER	2A4a	Platform (actual in degrees)	Platform tilt angle as read by 4-way can tilt
	2A4b	GP400 (actual in degrees)	Chassis tilt angle as read by GP400
	2A4c	CAN TILT 151	Reading from Can Tilt in front of boom (Left)
	2A4d	CAN TILT 152	Reading from Can Tilt on Front axle
	2A4e	CAN TILT 153	Reading from Can Tilt in front of boom (Right)
	2A4f	CAN TILT 154	Reading from Can Tilt on Rear axle
	2A5	AXLE	Axle level information
Sub Menu Press ENTER	2A5A	Angle - in degrees	Axle angle compared to GP400 angle
	2A5b	Axle level/off level	State of axle angles
	2A6	Tilted Y or N	Tilted beyond trip angles
	2A7	Height (actual in deg)	As measured by rear angle transducer
Sub Menu Press ENTER	2A7a	Height 1	As measured by rear angle transducer #1
	2A7b	Height 2 (optional Overload Sensing System only)	As measured by rear angle transducer #2
	2A7c	Height No Comp	Height measurement not compensated for chassis angle
	2A7d	Lift Comp	Formula used for controlling platform auto-level
	2A7e	Lift Comp T	Formula used for controlling platform auto-level
	2A7f	Platform UD	Actual output controlling auto-level
	2A7g	F Abandon	Platform angle point when auto-level is abandoned
	2A7h	Last Stable	Last recorded height when stabilizers were set.

Table 4-3: EZ-Cal Diagnostics Menu

SELECTION	ID #	EZ-cal Readout	Explanation
	2A8	Extension (optional Overload Sensing System only)	As measured by Cable Extension Transducer (boom ext)
	2A9	Load (actual in %0	State of load on platform (optional Overload Sensing System only)
	2A10	Load Level	Load calculation based on level cylinder pressure
	2A11	Load Extension	Load calculation based on ext & lift cylinder pressures
	2A12	Overloaded Y or N	Y when excessive weight in platform (optional Overload Sensing System only)
Sub Menu Press ENTER	2A12a	Underloaded Y or N	Y when lift cyl pressure is below minimum
	2A12b	Cause #2 Y or N	Level cylinder tripped overload
	2A13	Last Moved U or D	Operation working when overload tripped
	2A14	Elevated Y or N	Y when elevated above elevation @ setting
	2A15	Extended Y or N	Y when extended beyond 8 feet (2.6m)
	2A16	Retracted Y or N	Y when boom fully retracted
	2A17	Stable Y or N	Y when Stabilizers down and set
	2A18	Engine RPM	NOT USED
2B FUNCTIONS	2B1	DRIVE	Actual state, direction and %
	2B2	STEER	Actual state, direction and %
	2B3	UL (upper Lift)	Actual state, direction and % main lift
	2B4	PLT ud (platform level)	Actual state, direction and %
	2B5	PLT lr	Actual state, direction and % platform rotate
	2B6	PLT fr	Actual state, direction and % platform slide
	2B7	TELE	Actual state, direction and % telescope
	2B8	FRAME	Actual state, direction and % frame level
	2B9	O/R (Stabilizers)	Actual state, direction and % stabilizers
Sub Menu Press ENTER	2B9a	O/R O/R left	Actual state, direction and % left stabilizer
	2B9b	O/R O/R right	Actual state, direction and % right stabilizer
	2B9c	O/R T left	Time before stable
	2B9d	O/R T right	Time before stabile
	2B9e	Auto Retract	Time that stabilizers auto-retract during initial drive.
	2B10	AUTO PLT ud	NOT USED
	2B11	AUTO FRAME	Actual state, direction and % frame level when Auto-leveling
	2B12	INTERLOCK	Information on interlocks (shut downs)

Table 4-3: EZ-Cal Diagnostics Menu

SELECTION	ID #	EZ-cal Readout	Explanation
2C DIGITALS	2C1	GP400 DIGITAL INPUTS	Enter to view switch Inputs from lower controls
		Individual input not displayed separately	Display change from OFF to On when operations are selected
	2C2	GP440 DIGITAL INPUTS	Enter to view switch Inputs from upper controls
		Individual input not displayed separately	Display change from OFF to On when operations are selected
	2C3	MATRIX DIGITAL INPUTS (optional Overload Sensing System only)	Enter to view switch Inputs from lower controls
		Individual input not displayed separately	Display change from OFF to On when operations are selected
2D ANALOGS	2D1	GP400 ANALOG INPUTS	Enter to view inputs from chassis sensors and switches
	2D1a	P8-2 Boom Angle Transducer	Actual position of boom elevation in %
Sub Menu Press ENTER	2D1b	P8-3 Stabilizer Auto-Extend Switch	Battery voltage when switch selected
	2D1c	P8-4 Stabilizer Auto-Retract Switch	Battery voltage when switch selected
	2D1d	P8-5 Left Stabilizer Down Press Sensor	Actual pressure indicated between 1.5 and 4.5 volts
	2D1e	P8-7 Low Fuel Level Sensor	On - off output from fuel tank sensor
	2D1f	P8-8 Right Stabilizer Down Press Sensor	Actual pressure indicated between 1.5 and 4.5 volts
	2D1g	P8-9 Valve Current Measurement	NOT USED

Table 4-3: EZ-Cal Diagnostics Menu

SELECTION	ID #	EZ-cal Readout	Explanation
	2D2	GP440 ANALOG INPUTS	Enter to view analog inputs from upper controls
Sub Menu Press ENTER	2D2a	P6-1 Boom Up/ Down variable input	Actual position of Boom joystick between 1 and 5 volts
	2D2b	P6-2 Tele in/out variable input	Actual position of Telescope joystick between 1 and 5 volts
	2D2c	P6-3 Boom/Tele enable input	On - off output from Boom/Telescope joystick button
	2D2d	P7-1 Platform Slide in/out variable input	Actual position of Plat Slide joystick between 1 and 5 volts
	2D2e	P7-2 Platform Rotate variable input	Actual position of Rotate joystick between 1 and 5 volts
	2D2f	P7-3 Platform Slide/Rot enable input	On - off output from Slide/Rotate joystick button
	2D2g	P8-1 Rotation Sensor A input	States position of platform rotation in voltage ~2.5v = centered
	2D2h	P8-2 Rotation Sensor B Input	States position of platform rotation in voltage ~2.5v = centered
	2D2i	P10-1 Drive fwd/ Rev variable input	Actual position of Drive joystick between 1 and 5 volts
	2D3	MATRIX ANALOG INPUTS (optional Overload Sensing System only)	Enter to view inputs from chassis sensors and switches
	M2-6	Valve Current Measurement	Currently not available
2E OUTPUTS	2E1	GP400 OUTPUTS	Enter to view outputs from Lower control module
		Individual input not displayed separately	Display changes from OFF to On when power signal is sent
	2E2	GP440 OUTPUTS	Enter to view outputs from Upper control module
		Individual input not displayed separately	Display changes from OFF to On when power signal is sent
	2E3	MATRIX OUTPUTS (optional Overload Sensing System only)	Enter to view outputs from Lower control module
		Individual input not displayed separately	Display changes from OFF to On when power signal is sent
2F LOG	2F1	Cal Date	Date entered after last calibration completed
	2F2	Software	Software revision number
	2F3	Max Battery	Maximum battery voltage recorded.

EZ-CAL MESSAGES

"Help Messages" will appear on the EZ-Cal scan tool as a means of explaining operating and non-operating function(s) and system errors or interruptions that are accompanied by flash codes. It can also be used for verifying system operation. On Titan models, the EZ-Cal is conveniently located inside the lower control box. Refer to the EZ-Cal Instruction page for additional help with EZ-Cal operation.

To access messages, power the system up, (it is not necessary to have the engine running) the EZ-Cal display will illuminate and read "HELP - PRESS ENTER". Press ENTER to view current message. Press ENTER a second time then use right and left arrow buttons to access up 30 logged messages from the memory. Many messages simply detail operations being performed by the GP400; other messages detail occurrences that also take place during operation either normal or may be symptomatic of a malfunction.

OPERATIONAL MESSAGES

The following messages appear as result of normal operation and usually do not represent a problem.

EVERYTHING OK ***Flash Code: None***

- All circuits performing properly, no current operation performed.

GROUND MODE ACTIVE ***Flash Code: None***

- Base/Platform selector switch set to base control station.

STARTUP ***Flash Code: None***

- GP400 performing start up procedure, normally a short sequence.

MOVING FRAME ***Flash Code: None***

- Chassis level in progress.

MOVING PLATFORM ***Flash Code: None***

- Platform level in progress

TELESCOPING ***Flash Code: None***

- Boom extend/retract (telescope) in progress

LIFTING ***Flash Code: None***

- Boom lift up in progress

LOWERING ***Flash Code: None***

- Boom Lower down in progress

DRIVING ***Flash Code: None***

- Drive forward or reverse in progress

VEHICLE TILTED ***Flash Code: None***

- Chassis is tilted beyond pre-set maximum. Use auto-level feature to level chassis or re-position the machine.

CAN BUS RELATED MESSAGES

CAN bus communication system is the network by which the control modules and CAN Tilt modules communicate with the GP400.

NO DATA FROM CAN TILT #1_____ Flash Code: None

- CAN Tilt module mounted to front of main boom (located behind panel, Left Module) has malfunctioned or wiring is damaged.

NO DATA FROM CAN TILT #2_____ Flash Code: None

- CAN Tilt module mounted to Front axle has malfunctioned or wiring is damaged.

NO DATA FROM CAN TILT #3_____ Flash Code: None

- CAN Tilt module mounted to front of main boom (located behind panel, Right Module) has malfunctioned or wiring is damaged.

NO DATA FROM CAN TILT #4_____ Flash Code: None

- CAN Tilt module mounted to Rear axle has malfunctioned or wiring is damaged.

FAULT: CAN BUS!_____ Flash Code: 6/6

- The CAN bus cable may be damaged or disconnected from one or more of the modules. All modules must be connected to the CAN bus for machine operation.

CALIBRATION RELATED MESSAGES

The following messages appear when the GP400 microprocessor has not been calibrated or was improperly calibrated.

FACTORY OVERRIDE_____ FAST FLASH

- GP400 is shipped in this condition to allow temporary operation of the machine without interruption from the safety system so that calibration procedures can be performed. The GP400 must be prepared for the machine to which it will be installed, including calibration and Customer/model selection. See "GP400 Setup" for instructions. Once Calibrated, Factory Override is gone forever.

WARNING

ALL SAFETY SETTINGS ARE INACTIVE WHEN THE GP400 IS IN FACTORY OVERRIDE, NEVER OPERATE MACHINE IN FACTORY OVERRIDE EXCEPT TO CALIBRATE THE GP400.

NOT CALIBRATED_____ Flash Code: 1/1

- The GP 400 microprocessor has not been calibrated. Operation will be restricted until calibration is completed. Refer to "Set up procedures" in this section for calibration information and instructions.

HEIGHT NOT CALIBRATED_____ Flash Code: 1/1

- The Height portion of the calibration has not been completed. Operation will be restricted until calibration is completed. Refer to "Set up procedures" in this section for calibration information and instructions.

FUNCTIONS LOCKED - NOT CALIBRATED_____ Flash Code: 1/1

- The GP 400 microprocessor has not been calibrated. Operation will be restricted until calibration is completed. Refer to "Set up procedures" in this section for calibration instructions.

FAULT: CUSTOMER_____ Flash Code: 1/1

- Customer vs. Model settings not correct. Using the EZ-Cal, go to SETUPS/CHANGE DEFAULTS/CUSTOMER to correct. Changing customer or model will require access level 1 code. NOTE: all adjustments and settings return to default value when Customer or Model is changed, ensure proper settings and adjustments after changing Customer or Model.

INTERLOCK MESSAGES

The following messages appear as result of perceived improper operation, machine positioning, or other incorrect operation. Interlock messages may be the result of a part failure if the part in question provides incorrect information to the GP400.

FUNCTIONS LOCKED - LIMIT REACHED_____ Flash Code: 2/2

- Rotating platform not centered; Certain operations require centered platform

Rotating platform at extreme CW or CCW; no further rotation possible in that direction

FUNCTIONS LOCKED - TEST MODE SELECTED_____ Flash Code: 2/2

- Calibration in progress or internal test mode active. Cycle EMS to clear.

FUNCTIONS LOCKED - OUTRIGGERS_____ Flash Code: 2/2

- Stabilizers must be set before operation is allowed.

FUNCTIONS LOCKED - OVERLOADED_____ Flash Code: 2/2

- Platform overloaded - reduce weight in platform until alarms stop (Overload option only)

FUNCTIONS LOCKED - UNDERLOADED_____ Flash Code: 2/2

- Overload system detects less then normal lift cylinder pressure. Platform resting atop a fixed object, possible pressure switch failure or not calibrated correctly.

FUNCTIONS LOCKED - TILTED_____ Flash Code: 2/2

- Platform sensors indicate platform out of level; level platform or chassis until alarm stops or re-position machine

FUNCTIONS LOCKED - AUTO PLATFORM LEVEL_____ Flash Code: 2/2

- Auto Platform Level operation running, wait until completed to operate other functions.

FUNCTIONS LOCKED - TOO HIGH_____ Flash Code: 2/2

- Elevation sensor indicating elevation beyond 98%. Height Calibration performed incorrectly; Angle Transducer loose or remounted incorrectly or extend proximity switch/s failure. Use EZ-Cal in conjunction with EZ-Cal Flow Charts to identify GP400 or GP440 for sensor's inputs to check sensor readings.

FUNCTIONS LOCKED - EXTERNAL SHUTDOWN_____ Flash Code: 2/2

- Boom not retracted or axle/s off level. Boom must be retracted to allow frame level, drive or outrigger operation. Axles must be centered before drive is allowed when the platform is elevated. Also, drive will be interrupted if Stabilizer pressure sensor output is below 0.2 volts (possible sensor failure or sensor wiring issue).

CHECK DRIVE/STEER SWITCHES_____ Flash Code: 2/2

- Drive joystick output without enable or during power up. Check drive joystick analog output and steer switch digital output using the EZ-Cal.

CHECK LIFT SWITCHES_____ Flash Code: 2/2

- Lift joystick or toggle switch movement without enable or during power up. Check joystick analog output using the EZ-Cal.

CHECK PLATFORM SWITCHES_____ Flash Code 2/2

- Platform Rotate/slide joystick or toggle switch movement without enable or during power up. Check joystick analog output and switch digital outputs using the EZ-Cal.

CHECK TELE SWITCHES_____ Flash Code 2/2

- Telescope joystick or toggle switch movement without enable or during power up. Check joystick analog output and switch digital output using the EZ-Cal.

RELEASE ENABLE SWITCH_____ Flash Code 2/2

- One or more enable switches activated for extended period of time without corresponding function or during start up. Check enable switches digital outputs using the EZ-Cal.

OTHER MESSAGES

The following messages are the result of various possible failures or occurrences which may result in machine interruption.

FUNCTIONS LOCKED - NO VALVE SUPPLY!_____ Flash Code 2/3

- GP400 detects no power on P7-1 of the GP400. Check wiring to plug connection; possible GP400 internal failure.

FAULT: ENERGIZED VALVE_____ Flash Code: 3/2

- Power on valve output wire at GP400 plugs P4, P5 or P6. Unplug these connectors and cycle e-stop switch to clear code. Plug in one-at-a-time until code reappears then isolate the circuit (with voltage) within that plug. If code does not clear, possible GP400 failure. EZ-Cal not useful for this procedure.

FAULT: VALVE FEEDBACK HIGH!_____ Flash Code: 3/2

- On start-up GP400 p-5 pin voltage incorrect, check P5-X wiring for voltage feed back. Possible GP400 internal fault

FAULT: BAD INTERNAL SAFETY SWITCH!_____ Flash Code: 3/4

- At startup, internal feedback of output incorrect, possibly failed output driver; check wiring to P6-12/13/14/15; possible GP400 internal failure

FAULT: LOW OIL PRESSURE!_____ Flash Code: 4/1

- Oil pressure switch opened during operation or time out. Check oil pressure, pressure switch, wiring. Message will appear if engine stops running for reasons other then normal shut down.

FAULT: BAD INTERNAL SLAVE!_____ Flash Code: 4/2

- Malfunction within the GP400 possibly caused by a short circuit in the wiring or high voltage surge. replace GP400

FAULT: BAD INTERNAL 5 VOLTS!_____ Flash Code: 4/2

- 5 volt circuit that provides voltage to sensors had failed. Possible short in the wiring or high voltage surge on supply.

FAULT: BATTERY VOLTAGE TOO LOW!_____ Flash Code: 4/4

- Charge battery and battery connections, check charging system and voltage source connections.

FAULT: BATTERY VOLTAGE TOO HIGH!_____ Flash Code: 4/4

- GP400 input voltage should be 12 volts. Check battery and battery connections, alternator output.

FAULT: CHECK HEIGHT 2 SENSOR!_____ Flash Code 6/1

- Height 2 sensor output over 4.5 volts or under .5 volts. Check height 2 sensor output using the EZ-Cal (height 2 sensor on CE option only). Possible sensor failure or wire connection failure.

FAULT: CHECK HEIGHT 1 SENSOR!_____ Flash Code 6/1

- Height 1 sensor output over 4.5 volts or under .5 volts. Check height 1 sensor output using the EZ-Cal. Possible sensor failure or wire connection failure.

FAULT: CHECK HEIGHT SENSORS!_____ Flash Code 6/1

- Voltage from Height sensors out of range, should be .5 volts to 4.5 volts

FAULT: CHECK PRESSURE SENSOR!_____ Flash Code 6/2

- Voltage from Pressure sensor out of range, should be .5 to 4.5 volts (Overload option only).

FAULT: CHECK ELEVATION SWITCH!_____ Flash Code 6/3

- This message should not occur on Titan models; check for incorrect GP 400 part.

FAULT: SOME BIG BAD PROBLEM!_____ Flash Code 9/9

A failure happened that has no message associated with it. This should never occur.

TROUBLESHOOTING CHART

The following chart describes the possible causes for inoperation of the different functions of the Titan 40-S. The *Causes* and *Solutions* columns list various points of references that can be found in the Hydraulic, Electrical, Schematics and Troubleshooting sections of this manual.

The majority of electrical troubleshooting on this model will require the use of the on-board EZ-Cal scan tool, located inside the lower control box door. Please refer to "EZ-Cal Scan Tools" on page 4-9 for further instructions on the use of the EZ-Cal scan tool.

Perform a full assessment of machine operations prior to troubleshooting this model and using this chart. This model is operated by a Microprocessor Control System equipped with a variety of built-in safety interlocks to prevent continued operation in the event of a failure or misoperation. Some interlocks may only be detected through the use of the EZ-Cal.

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
General Power Issue		
No operation from upper or lower control station	Main battery switch turned off	Located left of lower control box
	Emergency stop switch pushed in; Ignition switch turned off; Faulty switches	Upper or lower e-stop switch or ignition switch will cut all power as will the ignition switch in the platform control box
	Battery discharged or faulty cables	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge battery - repair cables
	Circuit breaker tripped	Located in lower control box. Look for short circuit and/or damage in wiring or high amperage draw at valve coils or engine actuators.
	Damaged upper control box harness-- Should be able to operate from Lower Controls Box	Inspect the harnesses and harness plugs for damage or broken wires - May receive 6-6 flash code on GP-400 (CAN-bus) or no power at all
	Blown supply fuse	Locate source of short circuit. Inspect/replace fuse located just below Main Battery Switch.
	Other fault in system monitored by GP400	Check Help message on EZ-Cal or check flash code for error
Operates from lower controls but not from upper controls	Base/Platform select switch not set to Platform position or switch malfunction	Ensure that the switch is in the Platform position; Check switch function.
	Interlock switch (joystick)	Check power to red wire (power to switch) and power to purple wire (power out of switch) at joystick plug
	Damaged upper control box harness	Inspect the harnesses and harness plugs for damage or broken wires.
	Malfunctioning Matrix Module-- machines with optional Overload Sensing System only	Check help messages using the EZ-Cal tool. Also check for joystick inputs (see 2b1 - 2b7 in diagnostic chart)
	System interlock	Check EZ-Cal HELP messages for interlock

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
ENGINE RELATED ISSUES		
Starter will not crank from upper or lower stations	Battery discharged or faulty cables	Will receive 4-4 or 7-7 flash on GP400. Clean, service and charge battery; repair cables.
	Malfunctioning start relay or fuse	Test/replace relay located on left hand side of engine and fuse located near starter.
	Malfunctioning starter	Test/replace starter.
	Faulty start switch either location	Test; replace as necessary.
	Oil pressure switch failure	Check that oil pressure switch is not shorted, closed.
	Starter interrupt system initiated	Check for red "Start Disable" light on lower panel Starter may be operated for 10 seconds before a 30 second "cool down" is initiated. See "Starter cranks but engine will not start" below.
	Poor ground on GP400	Check wiring and connections; replace
Starter cranks but engine will not start	Low fuel	Check/fill fuel reservoir.
	Air trapped in the fuel system	Purge air from the fuel system (see section 3 of this manual for instructions).
	Restriction in the fuel system	Replace Fuel Filter; Check fuel supply hoses .
	Malfunctioning fuel solenoid	Check/replace fuel solenoid located on the front of the engine, accessed from right hand side.
	Malfunctioning Glow plugs (cold climates)	Test/replace glow plug relay, fuse and glow plugs.
	Obstructed air filter	Clean/replace air filter.
	Contaminated fuel	Test/replace fuel.
	Other engine issues	See engine manufacturers troubleshooting guide.
No high throttle	Malfunctioning Throttle Relay, Solenoid or blown fuse	Test/replace throttle relay and/or throttle solenoid and fuse.
	Restriction in the fuel system	Replace Fuel Filter; Check fuel supply hoses .
	Obstructed air filter	Clean/replace air filter.
	Other engine issues	See engine manufacturers troubleshooting guide.

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
BOOM LIFT/LOWER		
Platform will not raise	Excessive weight on platform	Reduce weight to specified platform capacity
	Boom extended excessively with stabilizers not deployed	Retract boom until boom up/down operates.
	Main Relief Valve out of adjustment	Adjust Main Relief Valve to rated platform capacity located on function manifold - see hydraulic section.
	Lift Valve SVD1 not energized	Check wiring to lift valve, Check for EZ-Cal message or flash code.
	Lift Valve SVD1 not shifting	Clean debris, Check for damage, replace.
	Proportional valve SP1 not energizing	Check wiring to lift valve, Check for EZ-Cal message or flash code.
	Proportional valve SP1 not shifting	Clean debris; Check for damage; Replace.
	Solenoid Valve SV1 (load sense dump) not energized	Check wiring to valve; Check EZ-Cal ref. P4-14 for output.
	Solenoid Valve SV1 (load sense dump) not shifting	Clean debris; Check for damage; Replace.
	Level sensor out of level (platform elevated above 10 ft. (3m))	Reposition or level platform using platform level toggle. Check level sensor signal using EZ-Cal ID#s 2a6 and 2a4.
	Main system pressure is inadequate	Check pump output flow and pressure.
	Lift/Lower joystick inoperative	Check joystick output using EZ-Cal ref. 2d-2, P6-1 for analog output signal.
	Battery discharged/No charge output	Check battery voltage, alternator output (14.5 volts). Check GP400 for 4-4 flash code.
	System interlock	Check EZ-Cal HELP messages for interlock.
Platform will not lower or lowers slowly	Maintenance lock in maintenance position	Return maintenance lock to the stowed position.
	Boom extended excessively with stabilizers not deployed	Retract boom until boom up/down operates .
	Lowering valve SVD1 not energized	Check wiring to lowering valve located inside control module - see Section 1 of this manual for exact location.
	Lowering valve SVD1 not shifting	Clean debris; Check for damage; Replace.
	System interlock	Check EZ-Cal HELP messages for interlock.
Emergency Lowering not working	Emergency Battery discharged/not charging	Check/charge battery; Check charge Isolator relay and fuse; Check alternator output (14.5 volts).
	Auxiliary power unit malfunction	Check Auxiliary power unit, located below lower control box.
	Emergency Down switch failure	Check/replace switch.
	Lowering valve not shifting	Clean debris; Check for damage; Replace.
	Battery discharged/No charge output	Check battery voltage, alternator output (14.5 volts); Clean, service and charge battery.

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
BOOM EXTEND/ RETRACT		
No Boom Extension	Excessive weight on Platform	Reduce weight to specified platform capacity.
	Boom extended too far without stabilizer deployment (Boom extension beyond approximately 8 ft.* (3m)* requires deployment) *7 ft (2.1 m) on machines equipped with optional Overload Sensing System.	Return boom to fully stowed position and deploy stabilizers before attempting to extend boom further.
	Level sensor out of level (platform elevated above 10 ft. (2.45 m)	Reposition or level platform using platform level toggle. Check level sensor signal using EZ-Cal ID#s 2a7 and 2a4.
	Extend Relief Valve RV2 out of adjustment	Adjust Extend relief valve (see Section 1 - Hydraulics) located on function manifold.
	Proportional Valve SP2 not energized	Check wiring to lift valve, Check for EZ-Cal message or flash code.
	Solenoid Valve SV1 (load sense dump) not energized	Check wiring to valve, Check EZ-Cal ref.P4-14 for output.
	Proportional Valve SP2 not shifting	Clean debris; Check for damage; Replace.
	Ext/Retract joystick inoperative	Check Joystick output using EZ-Cal ref. 2d-2, P6-2 for upper control analog output signal.
	Battery discharged/No charge output	Check battery voltage, alternator output (14.5 volts) Check GP400 for 4-4 flash code.
	System interlock	Check EZ-Cal HELP messages for interlock.
Boom extends/retracts slowly	Excessive weight on Platform	Reduce weight to specified platform capacity.
	Extend Relief Valve RV2 out of adjustment	Adjust Extend Relief Valve (see hydraulics section) located on function manifold.
	Proportional Valve SP2 not shifting completely	Clean debris; Check for damage; Replace.
	Flow Control Valve EP2 not shifting completely	Clean debris; Check for damage; Replace.
	Joystick output restricted	Check Joystick output using EZ-Cal ref. 2d-2, P6-2 for upper control analog output signal.
No Boom Retract	Proportional Valve SP2 not energized	Check wiring to lift valve; Check for EZ-Cal message or flash code.
	Proportional valve SP2 not shifting	Clean debris; Check for damage; Replace.
	Solenoid Valve SV1 (load sense dump) not energized	Check wiring to valve; Check EZ-Cal ref. P4-14 for output.
	Solenoid Valve SV1 (load sense dump) not shifting	Clean debris; Check for damage; Replace.
	Ext/Retract joystick inoperative	Check Joystick output using EZ-Cal ref. 2d-2, P6-2 for upper control analog output signal.
	Battery discharged/No charge output	Check battery voltage, alternator output (14.5 volts) Check GP400 for 4-4 flash code.
	System interlock	Check EZ-Cal HELP messages for interlock.

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
PLATFORM AUTO-LEVEL		
Platform will not remain level while elevating or lowering platform (level cylinder not moving at all)	Platform Level solenoid valve not energized	Check wiring to valve, Check EZ-Cal ref. 2e1, P4-4 (up) and P4-5 (down) for output.
	Platform Level solenoid valve not shifting	Clean debris; Check for damage; Replace.
	Platform Level proportional valve SV10 not energized	Check wiring to valve from Valve Constant Current Module (VCCM).
	Platform Level proportional valve SV10 not shifting	Clean debris; Check for damage; Replace.
	Counterbalance valve CBV15 or CBV16 faulty	CBV15 (extend) CBV16 (retract) must not be adjusted, replace if suspected.
	Flow Compensator valve EP4 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Flow Regulator valve EPFR2 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Obstruction in Platform Level Valve	Clean debris; Check for damage; Replace.
	Platform Level Valve not energized	Check wiring to valve.
	Platform in excess of 7° out of level	Use the Manual Platform Level function to return the platform to level.
Platform will not remain level while elevating or lowering platform (level cylinder moving slowly)	Excessive weight on platform	Reduce weight to specified platform capacity.
	Low Flow Relief Valve RV3 out of adjustment	Adjust low flow relief valve (see Section of this manual) located on function manifold.
	Platform Level solenoid valve SP5 not shifting completely	Clean debris; Check for damage; Replace.
	Platform Level proportional valve SV10 not shifting completely	Clean debris; Check for damage; Replace.
	Flow Compensator valve EP4 not shifting completely	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Flow regulator valve EPFR2 not shifting completely	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Pump P2 faulty	Test; replace pump.
	Obstruction in Platform Level Valve	Clean debris; Check for damage; Replace.
	Platform Level Valve not energized	Check wiring to valve.
	Platform in excess of 7° out of level	Use the Manual Platform Level function to return the platform to level.
PLATFORM MANUAL LEVEL		
Platform level operates automatically but not manually	Platform Level toggle switch inoperative	Check output from toggle using EZ-Cal --Lower Controls -- see I.D. #2c-1, P15-3 (up) or 2c-1, P15-6 (down) --Upper Controls -- see I.D. #2c-2, P14-11 (up) or 2c2, P14-12 (down)
	System Interlock	Check EZ-Cal HELP message for interlock .
PLATFORM ROTATE		

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
Platform will not rotate either direction	Rotate Valve SP6 not energizing	Check wiring to valve from Valve Constant Current Module (VCCM).
	Rotate Valve SP6 not shifting	Clean debris; Check for damage; Replace.
	Mechanical interference in rotator	Inspect, clean or repair.
	Flow Compensator valve EP4 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Flow Regulator valve EPFR2 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	System interlock	Check EZ-Cal HELP messages for interlock.
Platform will rotate in one direction only	Rotate Valve SP6 not energizing	Check wiring to valve from Valve Constant Current Module (VCCM).
	Rotate Valve SP6 not shifting	Clean debris; Check for damage; Replace.
	Mechanical interference in rotator	Inspect, clean or repair.
	System interlock	Check EZ-Cal HELP messages for interlock.
PLATFORM SLIDE		
Platform will not slide either direction	Excessive weight in platform or weight not distributed correctly	Reduce weight or redistribute weight in platform, not to exceed 3000 lbs in the load zone and 1000 lbs distributed evenly outside the load zone.
	Slide Valve SP7 not energizing	Check wiring to valve from Valve Constant Current Module (VCCM)
	Slide Valve SP7 not shifting	Clean debris; Check for damage; Replace.
	Mechanical interference on slide path	Inspect, clean or repair.
	Slide Brake BR5 not releasing	Check for hydraulic pressure to brake; Check brake unit for mechanical issue
	Flow Compensator valve EP4 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	Flow regulator valve EPFR2 not shifting	Clean debris; Check for damage; Replace. Use GLS port on secondary manifold to test valve signal pressure.
	System interlock	Check EZ-Cal HELP messages for interlock
	Shims too tight	Check shim clearance of Platform Carriage; should be .030" (.762 mm) total clearance top-to-bottom and side-to-side
Platform will slide in one direction only	Excessive weight in platform or weight not distributed correctly	reduce weight or redistribute weight in platform not to exceed 3000 lbs in the load zone and 1000 lbs distributed evenly
	Slide Valve SP7 not energizing	Check wiring to valve from Valve Constant Current Module (VCCM)
	Slide valve SP7 not shifting	Clean debris; Check for damage; Replace.
	Mechanical interference in slide path	Inspect, clean or repair
	System interlock	Check EZ-Cal HELP messages for interlock
	Shims too tight	Check shim clearance of Platform Carriage; should be .030" (.762 mm) total clearance top-to-bottom and side-to-side

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
DRIVE		
No drive operation	Stabilizers not raised off of ground	Return Boom to stowed position and raise stabilizers
Titan is drivable at full boom elevation and extended up to 8 ft. (2.45 m)*. Drive is disabled when the stabilizers are deployed. *7 ft. (2.13 m) on machines equipped with optional Overload Sensing System.	Stabilizer pressure sensor/s inoperative	Check Stabilizer pressure sensors using EZ-Cal (see EZ-Cal I.D.# 2d1, P8-5 and 2d1, P8-8. Should should read 0.0 volts each.
	Planetary hub bypass engaged	Check bypass plates located in the center of each planetary hub, should be convex - turn over.
	Drive Valve (on drive pump) not shifting	Check drive output from GP400 (see EZ-Cal chart ID#s 2e1, P5-7 and P5-8). Check connections at valve located on top of drive pump. Check drive valve for contamination.
	Brakes not releasing	Check brake valve and brake pressure (see hydraulic diagram for location).
	Drive joystick output failure	Check drive joystick output from GP400 (see 2d2, P10-1) check joystick enable trigger operation, Check wire connections.
	System interlock	Check EZ-Cal HELP messages for interlock.
	Low pump stand-by pressure	Check at main manifold port GCP, (See Hydraulics section of this manual). Should be 300 PSI (21 bar) - Adjust stand-by pressure.
	Incorrectly adjusted or worn hydraulic drive pump	See Hydraulics section of this manual for pump adjustment, inspect or replace pump.
No drive with platform elevated NOTE: Maximum elevated drive is 35 feet (10.7 m)*. *34 ft. (10.4 m) on machines equipped with optional Overload Sensing System.	Unit out of level	Lower boom and operate on more level surfaces.
	Outriggers deployed	Lower platform and retract outriggers.
	Low pump stand-by pressure	Check at main manifold port GCP, (See Hydraulics section of this manual). Should be 300 PSI (21 bar) - Adjust stand-by pressure.
	System interlock	Check EZ-Cal HELP messages for interlock.
Slow drive with Platform in stowed position	Slow speed enabled	Check speed switch in platform box; check 2-speed valve located on the main manifold (see Schematics section of this manual).
	Low pump stand-by pressure	Check at main manifold port GCP, (see Hydraulics section of this manual). Should be 300 PSI (21 bar) - Adjust stand-by pressure.
	FWD MAX, REV MAX setting incorrect	Reset drive speeds using EZ-Cal.
	Wheel motor not functioning correctly	Inspect wheel motors for damage or wear.
Poor Gradeability or Drive performance	High Speed enabled	Check Speed Switch.
	Wheel motor not functioning correctly	Inspect wheel motors for excessive bypass.
	Planetary hub bypass engaged	Check bypass plates located in the center of each planetary hub, should be convex - turn over.
	Low pump stand-by pressure	Check at main manifold port GCP, (see Hydraulics section of this manual). Should be 300 PSI (21 bar) - Adjust stand-by pressure.
	Incorrectly adjusted or worn hydraulic drive pump	See Hydraulics section of this manual for pump adjustment; inspect or replace pump.
Drive in one direction only	Drive valve not energizing in one direction	Check 12 volts to coil, check coil, check valve function (located on top of drive pump).
	No output from GP400	Check switch position output from GP400 (see EZ-Cal ID# 2e1, P5-7 and P5-8).

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
No High Speed	Speed selector switch inoperative	Check continuity through Speed Select switch with wires disconnected.
	2-speed valve SV9 not functioning	Check for 12 volts and ground to valve; check for faulty valve spool; check switch position output from GP400 (See EZ-Cal ID# 2e1, P5-9).
Variable elevated speed	Variable hydraulic oil temperature	Out of the stowed position, each machine is set to drive 10m (33 ft) in 30 seconds with the hydraulic oil at 50° C (122° F), at a speed of .33 m/s (.74 mph). Through testing, this setting causes the speed to increase to 10m in 25 seconds [.40 m/s (.9 mph)] at an oil temperature of 20° C (68° F), and 10m in 18 seconds [.55 m/s (1.23 mph)] at an oil temperature of 0° C (32° F). Although colder ambient temperatures are likely, once the engine has started and hydraulic oil has been circulating, it very quickly reaches 0° C (32° F) and therefore the elevated driving speed should not exceed .7 m/s (1.57 mph).
STEER		
No steer in either direction (2-wheel steer mode)	Stabilizers not raised off of ground	Return Boom to stowed position and raise stabilizers.
	Joystick rocker switch inoperative	Check continuity through micro-switch inside joystick handle using wires outside the handle.
	Steering valve inoperative	Check steering valve for power. Check for damage and contamination. check output from GP400 (see EZ-Cal ID # 2e1, P5-2 and P5-3).
	Hoses connected incorrectly	See Chapter 1 -- Hydraulics for correct connection.
	Steer Cross-Port Relief valve/s CR1 and CR2 set too low	Set steer relief valves to 1500 PSI (103 bar) (see hydraulic diagram for relief valves location.
	Low-flow system dump valve SV3 inoperative	Test; clean; replace.
	System interlock	Check EZ-Cal HELP messages for interlock.
Steer in one direction only	Steering Valve inoperative or stuck	Inspect and/or replace Steering Valve.
	No power to steering coil	Check for power and ground in both directions; repair wiring; check output from GP400 (see EZ-Cal I.D. #S. 2f-11 right & 2f-12 left).
	System interlock	Check EZ-Cal HELP messages for interlock.
Will steer but not fully, or slow steering	Failure of one or both steering cylinder internal seals	Check steering cylinder seals, replace.
	Steer Cross-Port Relief valve(s) set too low	Set steer relief valves to 1500 PSI (103 bar) (see hydraulic diagram for relief valves location.
	King pin(s) seizing in the bore	Disassemble and inspect, replace bushings.
	4-wheel steer valve SVD2 not energizing	Check wiring to valve. Check EZ-Cal ref. 2e1, P4-2 and P4-3 for output.
	4-wheel steer valve SVD2 not shifting	Clean debris; Check for damage; Replace.
	Steer Cross-Port Relief valve CR1 defect	Check, adjust, replace.
	Rear axle steer cylinders damaged or internal seals leaking	Check cylinders, repair, replace.
Rear Wheel Steer operates uncommanded	Steer select toggle switch failure	Check toggle switch.
	4-Wheel Steer Valve SVD2 not shifting	Clean debris. Check for damage, replace.

Table 4-4: Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	REMEDY/SOLUTION
Stabilizers, Frame Leveling		
No Stabilizer operation Note: Stabilizer operation is disabled when the boom is elevated above 6% and when boom is extended more then 1' (300mm).	System senses boom elevated to an angle above 6%	Return the boom to stowed position and try again. Check elevation status using the EZ-Cal (see I.D. # 2a10). Recalibration of Height may be necessary (see Calibration section for instruction). Also see EZ-Cal I.D # 2a7 for analog input from height sensor in %.
	System senses boom is extended beyond 12" (300mm)	Retract boom completely and try again. Check Boom Retract status using the EZ-Cal (see I.D.# 2A-12). Also see # 2C-1 GP400 digitals--go to P14-4 for Retract Sensor output information.
	Unit on too extreme an angle side-to-side (chassis level must complete level cycle before stabilizers deploy)	EZ-Cal Help message will read "LEVELING". Relocate machine to a more level surface.
	Stabilizer/Auto-level switch inoperative	Check outrigger switch output (in the LOWER control box) using EZ-Cal; scan GP400 for switch inputs (see EZ-Cal I.D.# 2d1)--go to P8-3 and P8-4. Check outrigger switch in the UPPER control box using EZ-Cal, scan GP440 for switch inputs (see EZ-Cal I.D.# 2C-2 go to P14-9 & P14-10).
	Stabilizer Valve SP3 or SP4 not energizing	Check wiring to stabilizer valve. Check for EZ-Cal message or flash code.
	Stabilizer Valve SP3 or SP4 not shifting	Clean debris; Check for damage; Replace.
	Frame Level Valve not functioning (chassis level must complete level cycle before stabilizers deploy)	Located on function manifold. Inspect valve for power, inspect for damage, check output from GP400 (see EZ-Cal GP400 Outputs P4-7 (left) and P4-8 (right).
Frame level operates but frame is not level when cycle is complete	Unit located on too extreme an angle side-to-side	Relocate unit to more level ground.
	Lower control box loose	Tighten four (4) lower control box mounting screws.
	Level sensor not properly calibrated (located inside the GP400).	See Calibration section for level sensor Calibration instructions.

NOTES:

Section 5

SCHEMATICS

CONTENTS PAGE

FIGURES PAGE

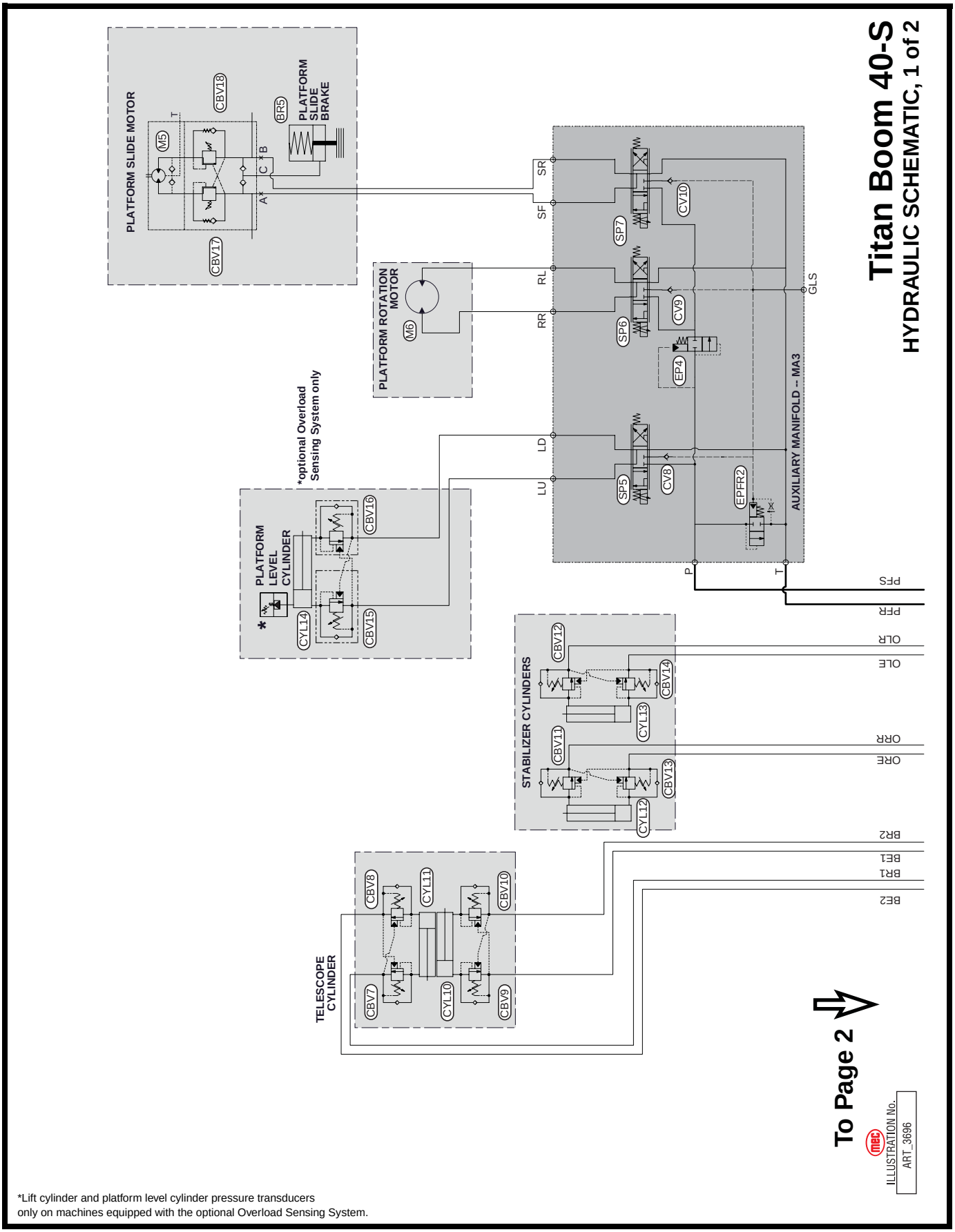
NOTES:

HYDRAULIC SCHEMATICS

The following table applies to Figure 5-1 through Figure 5-5.

Callout	Description	Callout	Description
BR1-BR4	Wheel Brakes (located in gear hubs)	ORF1	Orifice -- Brake Apply .040
BR5	Platform Slide Brake	ORF2	Orifice -- Traction Manifold .052
CBV1-CBV18	Counterbalance Valves	ORF3	Orifice -- Traction Manifold .052
CR1-CR2	Cross-Port Relief Valve	ORF4	Orifice -- Traction Manifold .040
CV1	Check Valve, P1	ORF5	Orifice -- Traction Manifold .090
CV2	Check Valve -- Load Sense	ORF6	Orifice -- Generator Option .030
CV3	Check Valve -- Load Sense	PD1	Pilot-Operated Valve
CV4	Check Valve -- Load Sense	PD2	Pilot-Operated Valve
CV5	Check Valve -- Load Sense	PFC1	Priority Flow Control--5 gpm
CV6	Check Valve -- Low to High Flow	PR1	Pressure Reducing Valve
CV7	Check Valve -- Auxiliary Manifold Supply	RV1	Relief Valve -- High Flow
CV8	Check Valve -- Platform Level	RV2	Relief Valve -- Telescope
CV9	Check Valve -- Platform Rotate	RV3	Relief Valve -- Low Flow
CV10	Check Valve -- Platform Slide	RV4	Relief Valve -- Traction Manifold 300 psi
CYL1	Boom Lift Cylinder	SP1	Proportional Valve -- Boom
CYL2-CYL5	Steer Cylinders	SP2	Proportional Valve -- Telescope
CYL6-CYL9	Axle Cylinders	SP3	Proportional Valve -- Stabilizer
CYL10-CYL11	Boom Extend Cylinders	SP4	Proportional Valve -- Stabilizer
CYL12-CYL13	Stabilizer Cylinders	SP5	Proportional Valve -- Platform Level
CYL 14	Platform Level Cylinder	SP6	Proportional Valve -- Platform Rotate
EP1	Flow Compensator -- Boom	SP7	Proportional Valve -- Platform Slide
EP2	Flow Compensator -- Telescope	SVD1	Directional Valve -- Boom
EP3	Flow Control -- Auxiliary Pump	SVD2	Directional Valve -- Steer Select
EP4	Flow Control -- Auxiliary Manifold	SV1	Solenoid Valve -- L/S Dump Hi-Flow
EPFR1	Flow Regulator	SV2	Solenoid Valve -- Re-Gen, Tele Extend
EPFR2	Flow Regulator	SV3	Solenoid Valve -- Re-Gen, Tele Retract
F1	Return Filter	SV4	Solenoid Valve -- Axle Float
F2, F3	Pressure Filter (OPTION)	SV5	Solenoid Valve -- Steer Direction
FD1	Flow Divider -- Telescope	SV6	Solenoid Valve -- Frame Level
FD2	Flow Divider -- Traction Manifold	SV7	Solenoid Valve -- Low Flow Dump
FD3	Flow Divider -- Traction Manifold	SV8	Solenoid Valve -- Brake
FD4	Flow Divider -- Traction Manifold	SV9	Solenoid Valve -- 2-Speed Drive
FR1	Flow Regulator -- Steer		
FR2	Flow Regulator -- Auxiliary Manifold		
HS1	Oil Shuttle Valve		
LS2	Load Sense Shuttle		
LS3	Load Sense Shuttle		
M1-M4	Motor -- Wheels	Gauge Ports	
M5	Motor -- Platform Slide	GP1	Gauge Port -- High Flow
M6	Motor -- Platform Rotate	GP2	Gauge Port -- Low Flow
MA1	Functions Manifold	GCP	Gauge Port -- Charge Pressure
MA2	Traction Manifold	GD	Gauge Port -- Drive Pressure
MA3	Auxiliary Manifold		

Figure 5-1: Hydraulic Schematic, 1 of 2



*Lift cylinder and platform level cylinder pressure transducers only on machines equipped with the optional Overload Sensing System.

Figure 5-2: Hydraulic Schematic, 2 of 2

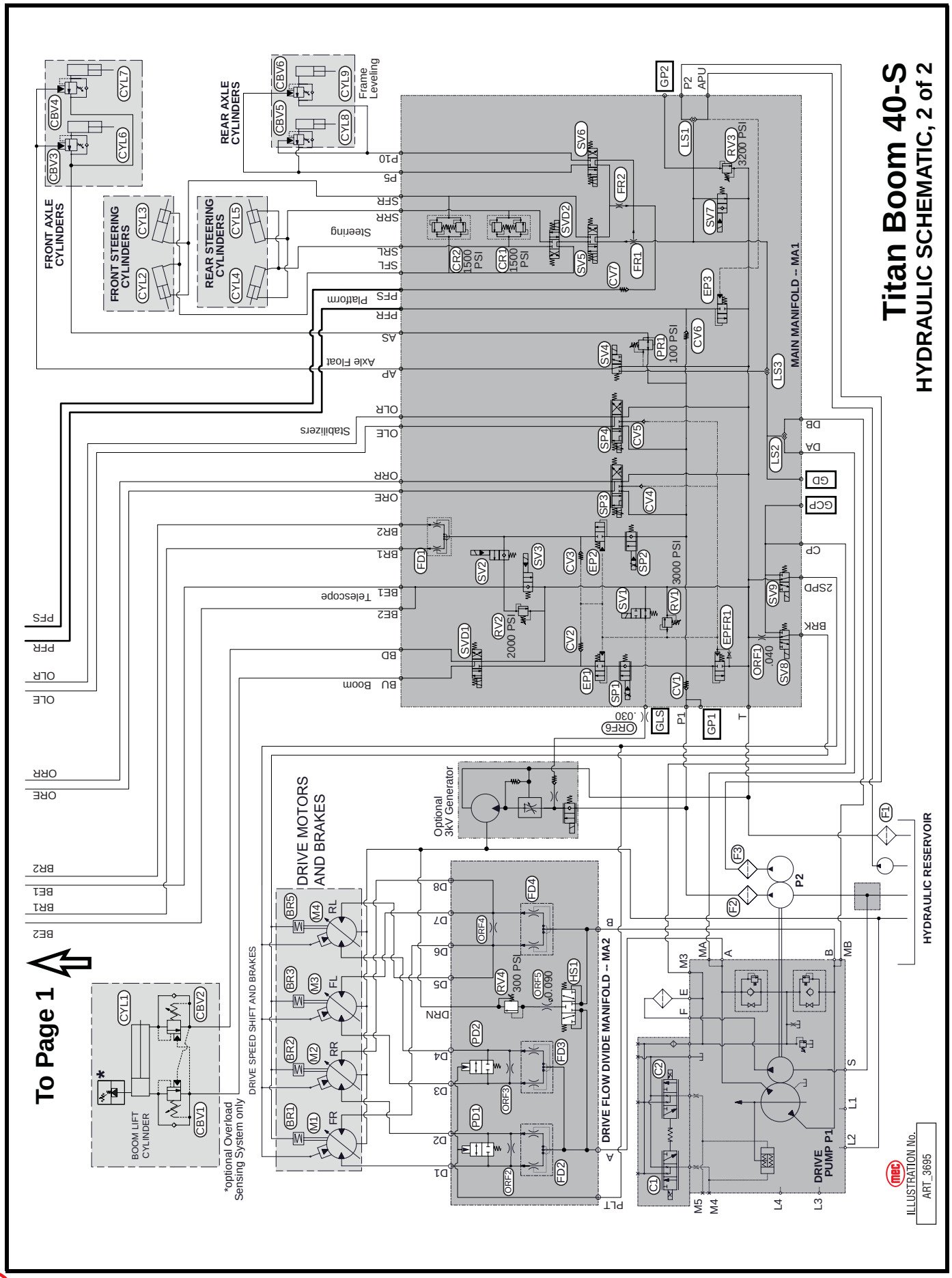
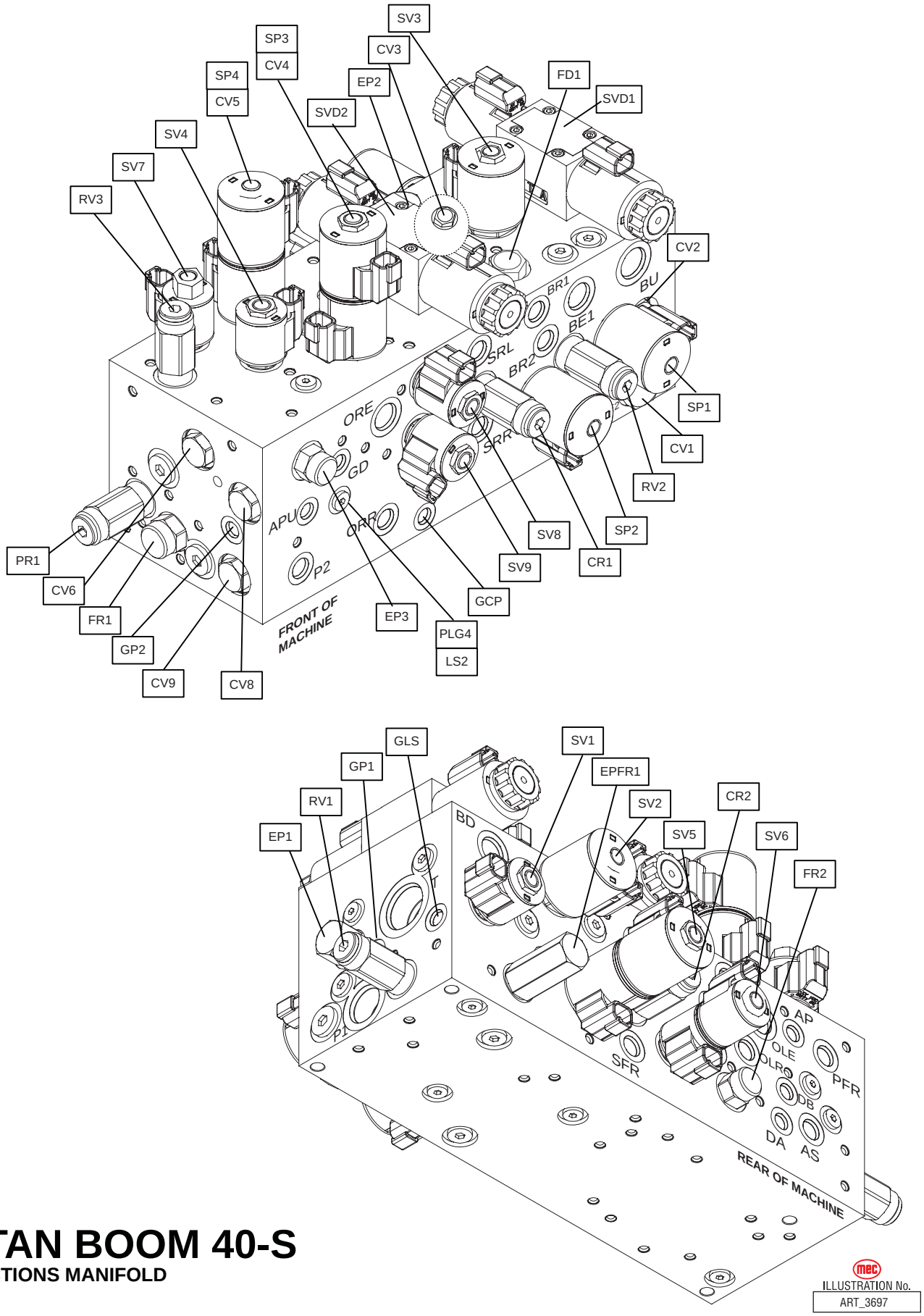


Figure 5-3: Function Manifold, MA1



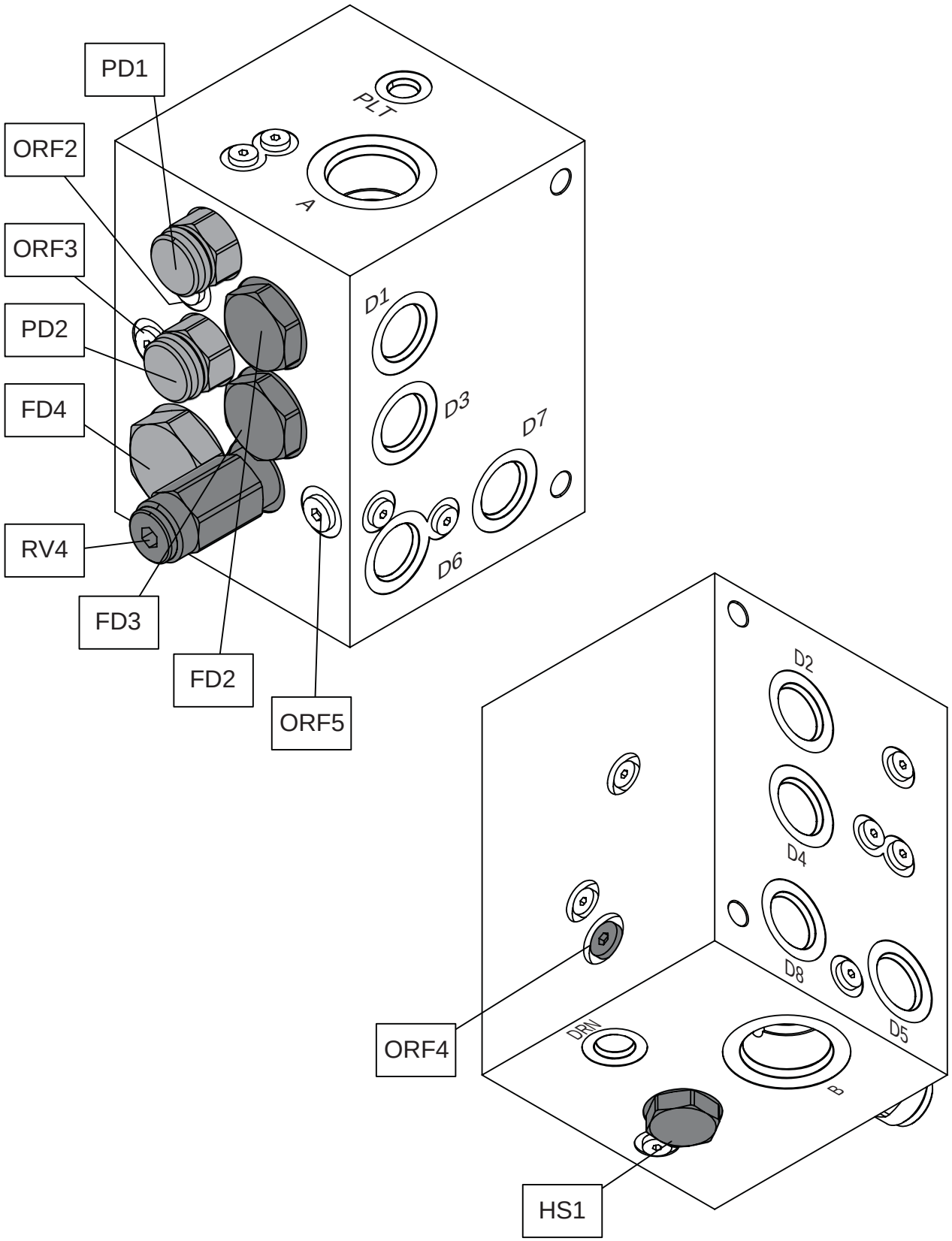
TITAN BOOM 40-S

FUNCTIONS MANIFOLD

MA1

ILLUSTRATION No.
ART_3697

Figure 5-4: Drive Manifold, MA2

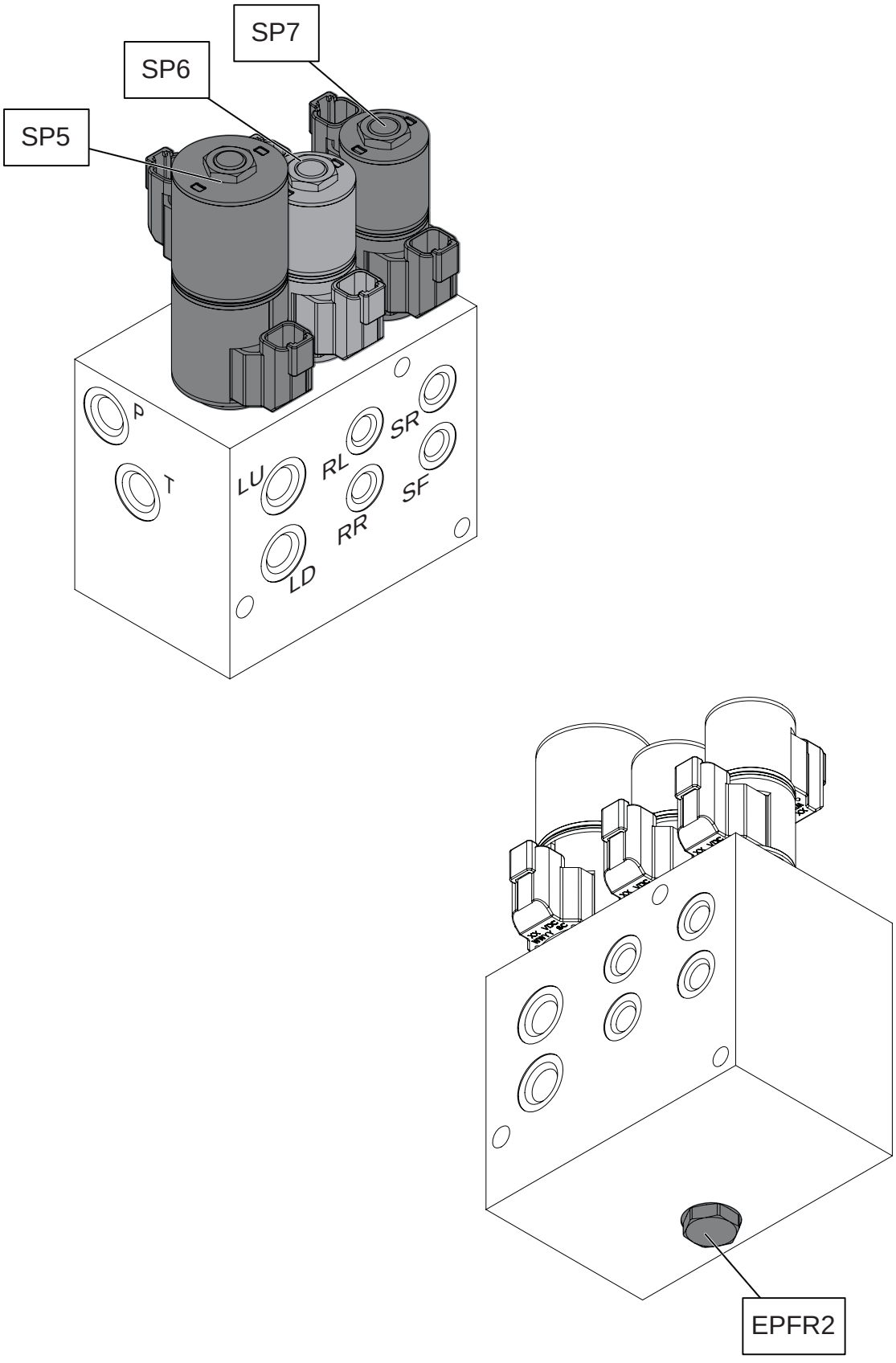


Titan Bom 40-S

DRIVE MANIFOLD
MA2

ILLUSTRATION No.
ART_3698

Figure 5-5: Auxiliary Manifold, MA3



Titan Boom 40-S

AUXILLARY MANIFOLD
MA3

ILLUSTRATION No.
ART_3699

ELECTRICAL SCHEMATICS - STANDARD MACHINE

Figure 5-6: Electric Schematic, Lower Control Box, **Standard Machines**

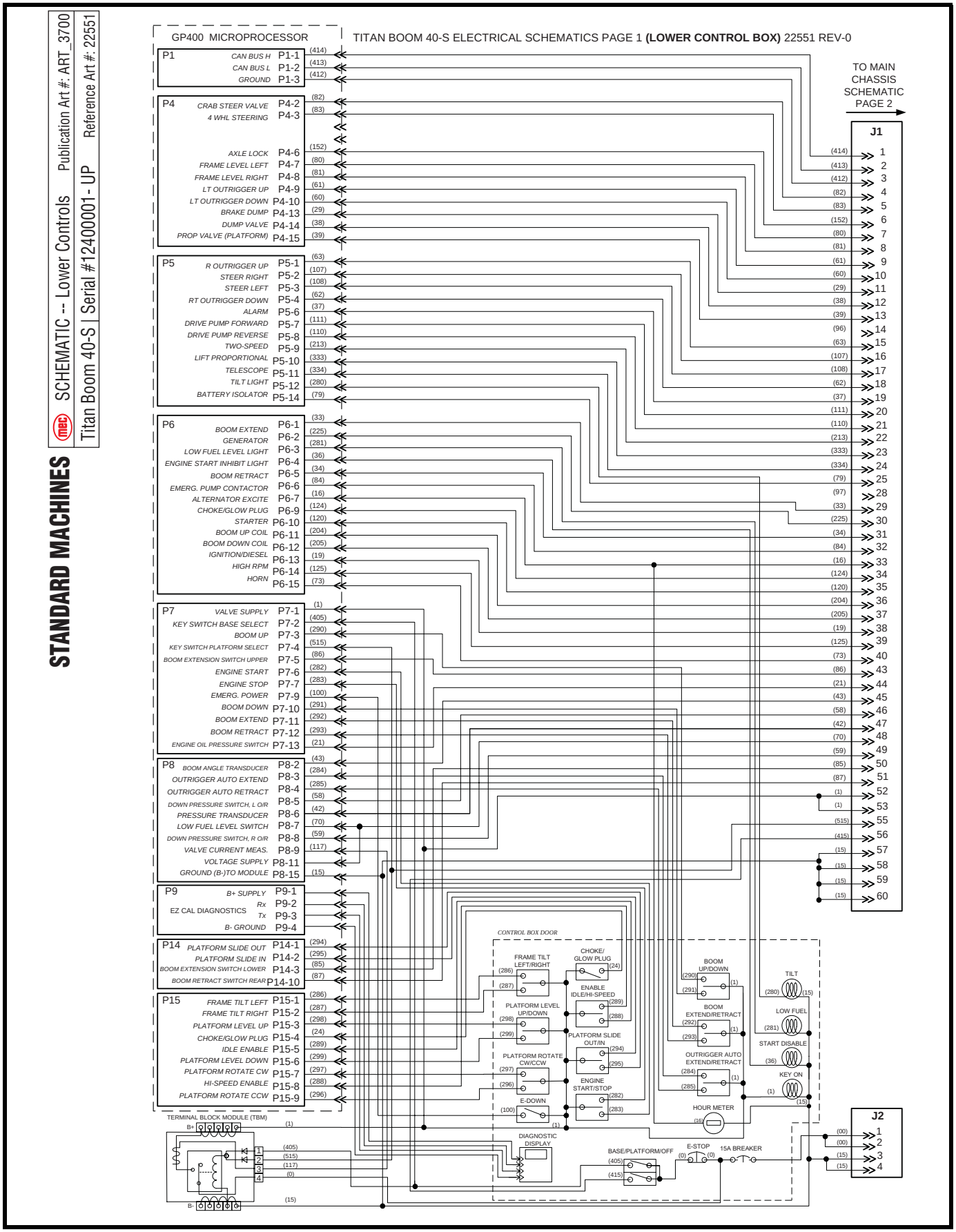


Figure 5-7: Electric Schematic, Chassis, **Standard Machines**

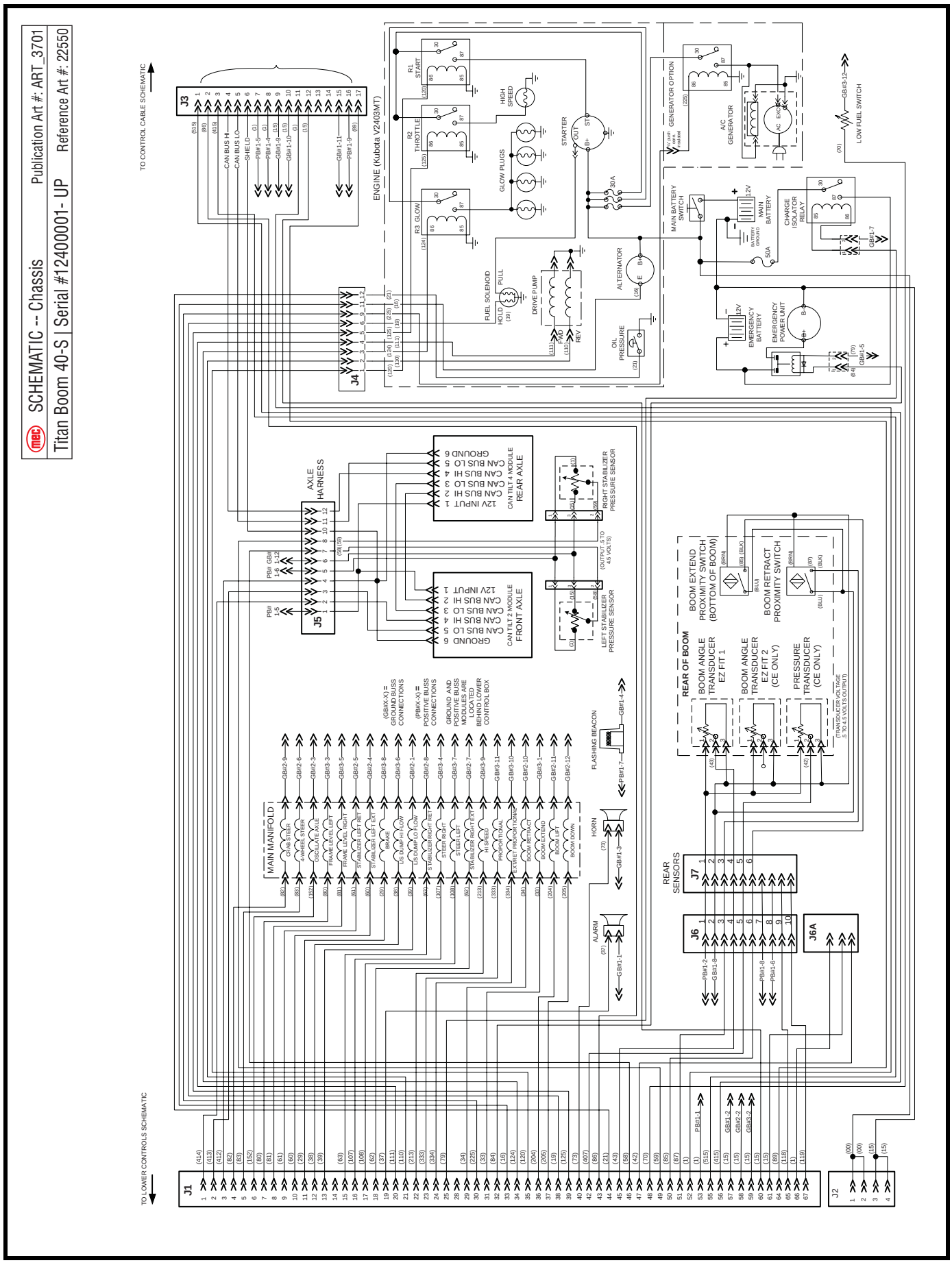


Figure 5-8: Electric Schematic, Control Cable, **Standard Machines**

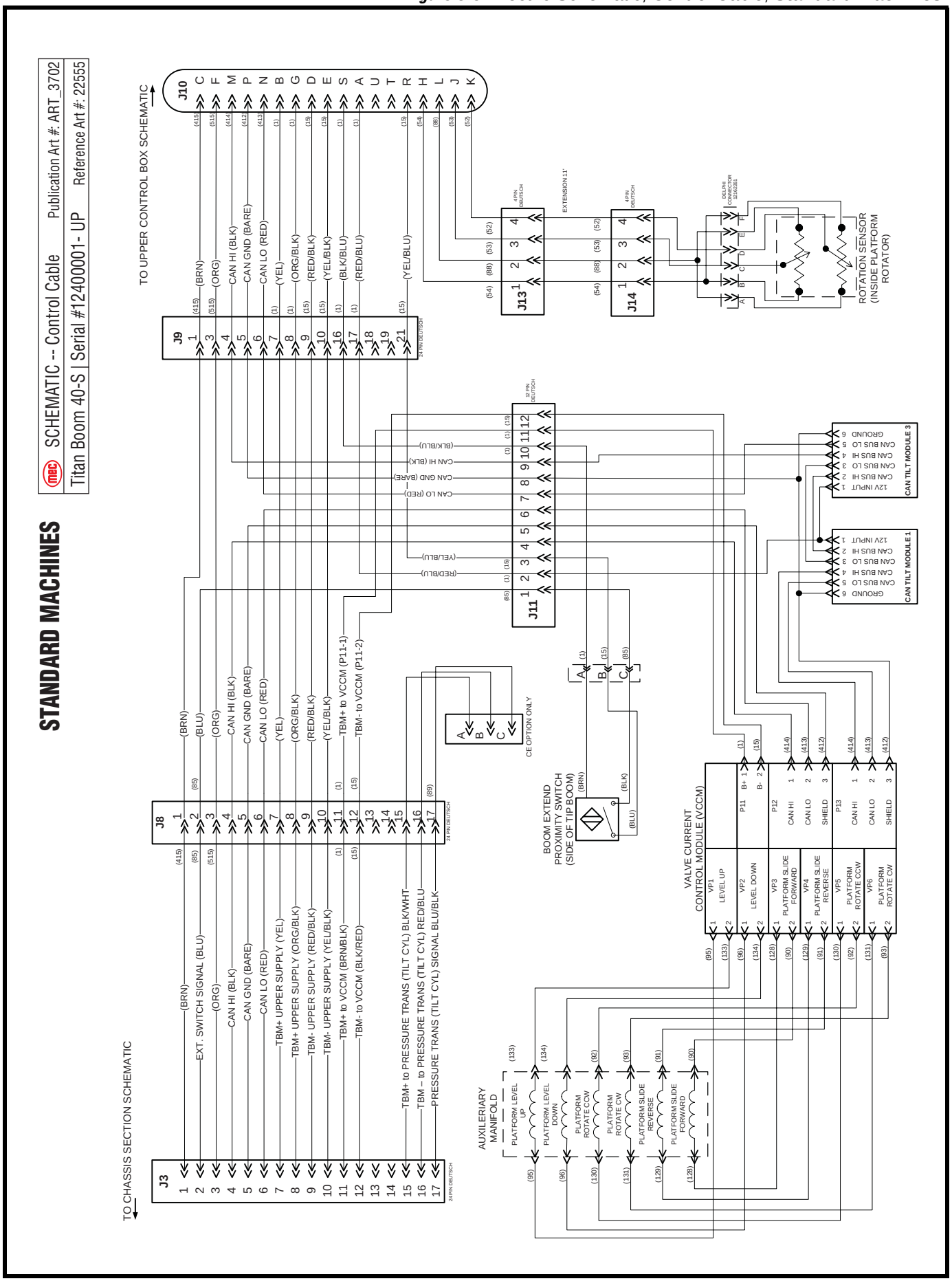
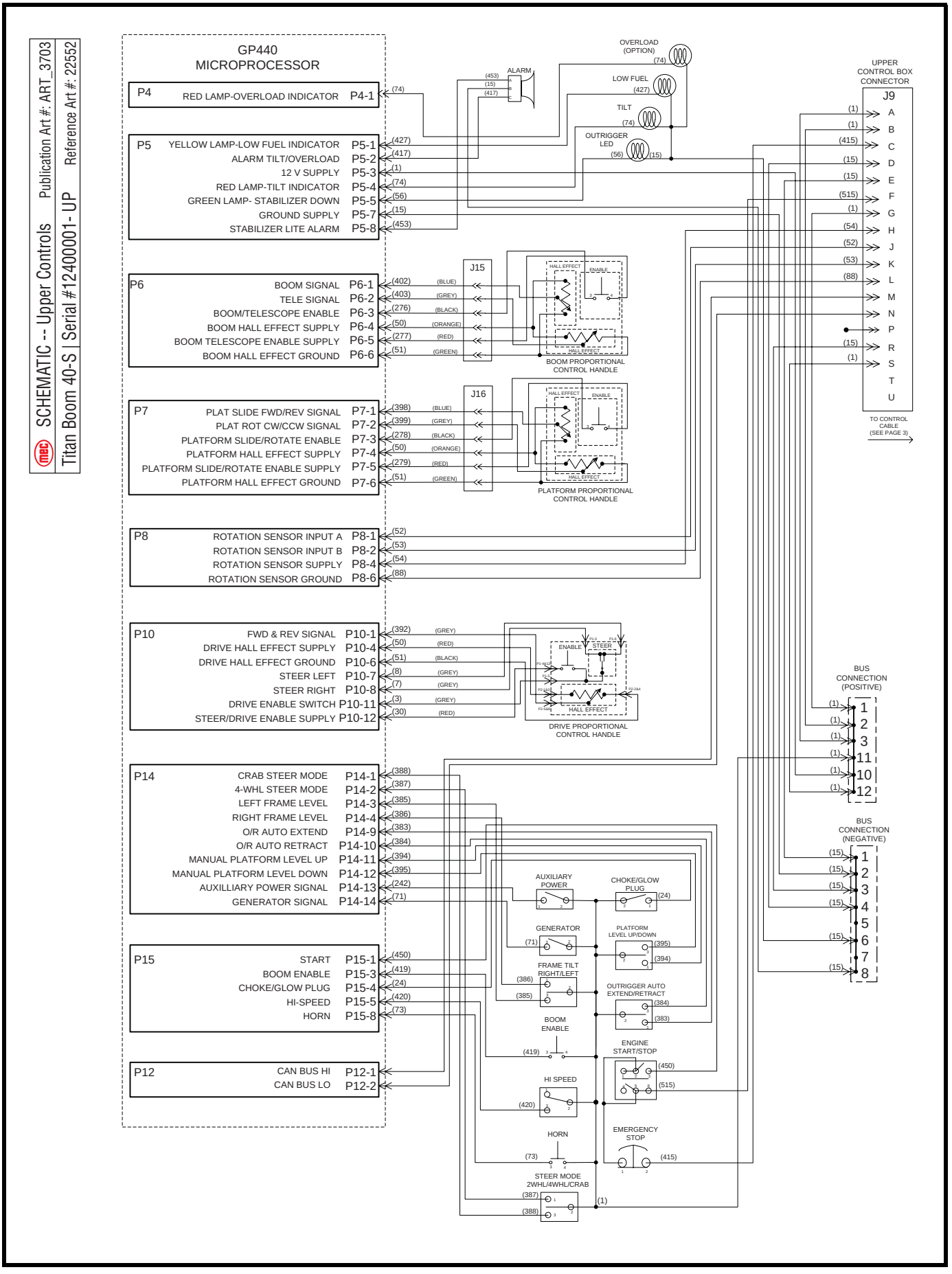


Figure 5-9: Electric Schematic, Upper Control Box, **All Machines**



ELECTRICAL SCHEMATICS - OPTIONAL OVERLOAD SENSING SYSTEM

Figure 5-10: Electric Schematic, Lower Control Box, **Optional Overload Sensing System**

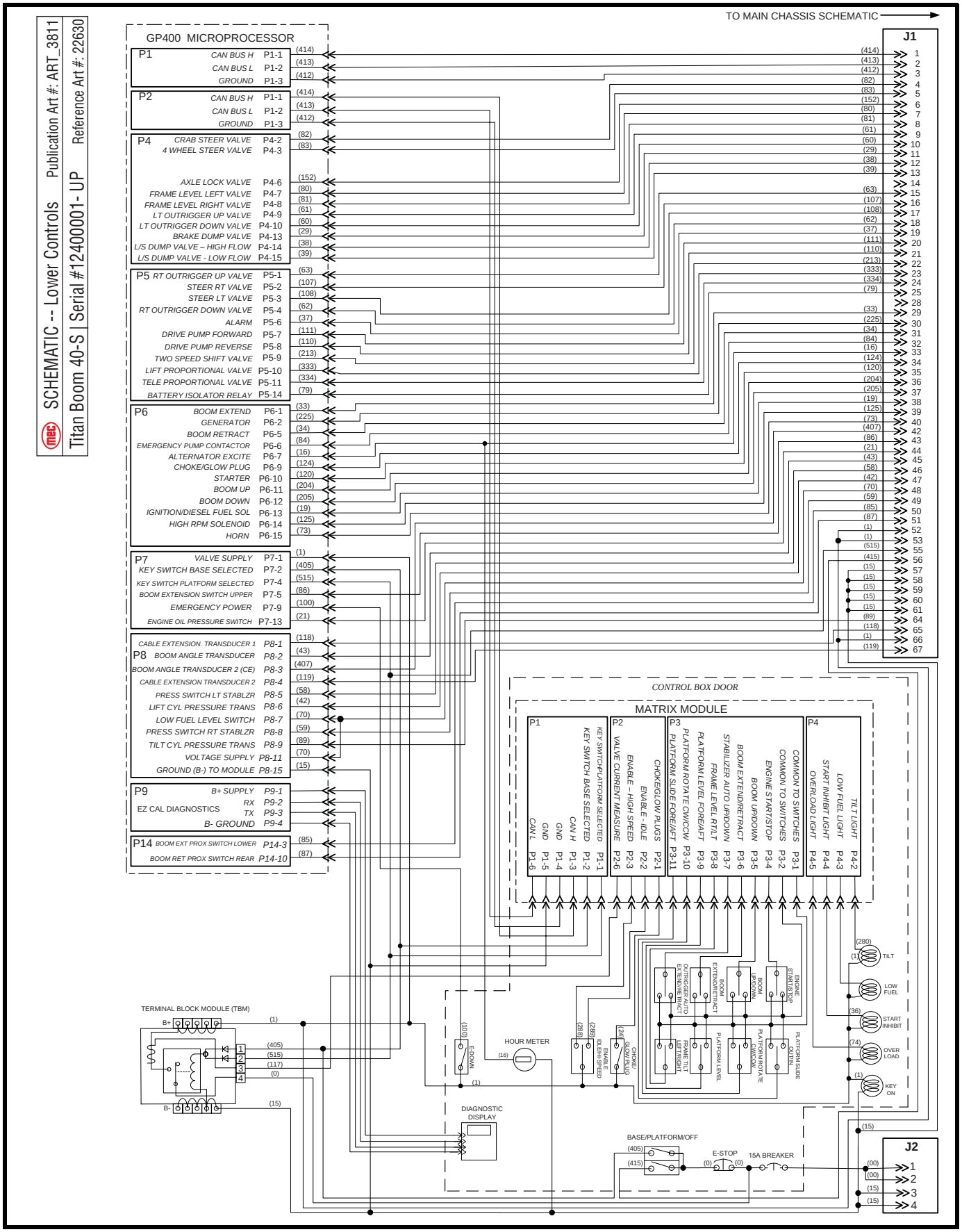


Figure 5-11: Electric Schematic, Chassis, **Optional Overload Sensing System**

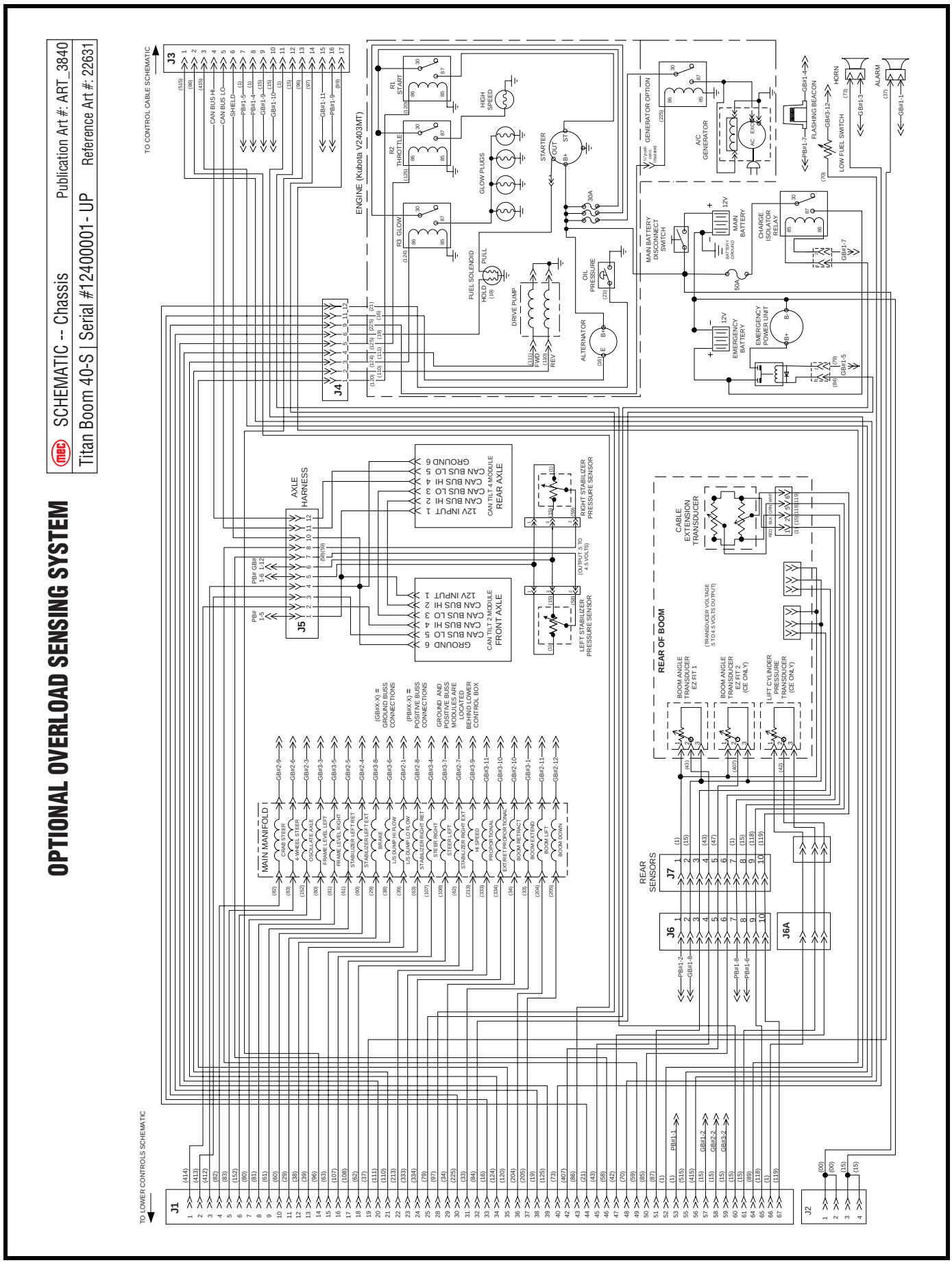


Figure 5-12: Electric Schematic, Control Cable, **Optional Overload Sensing System**

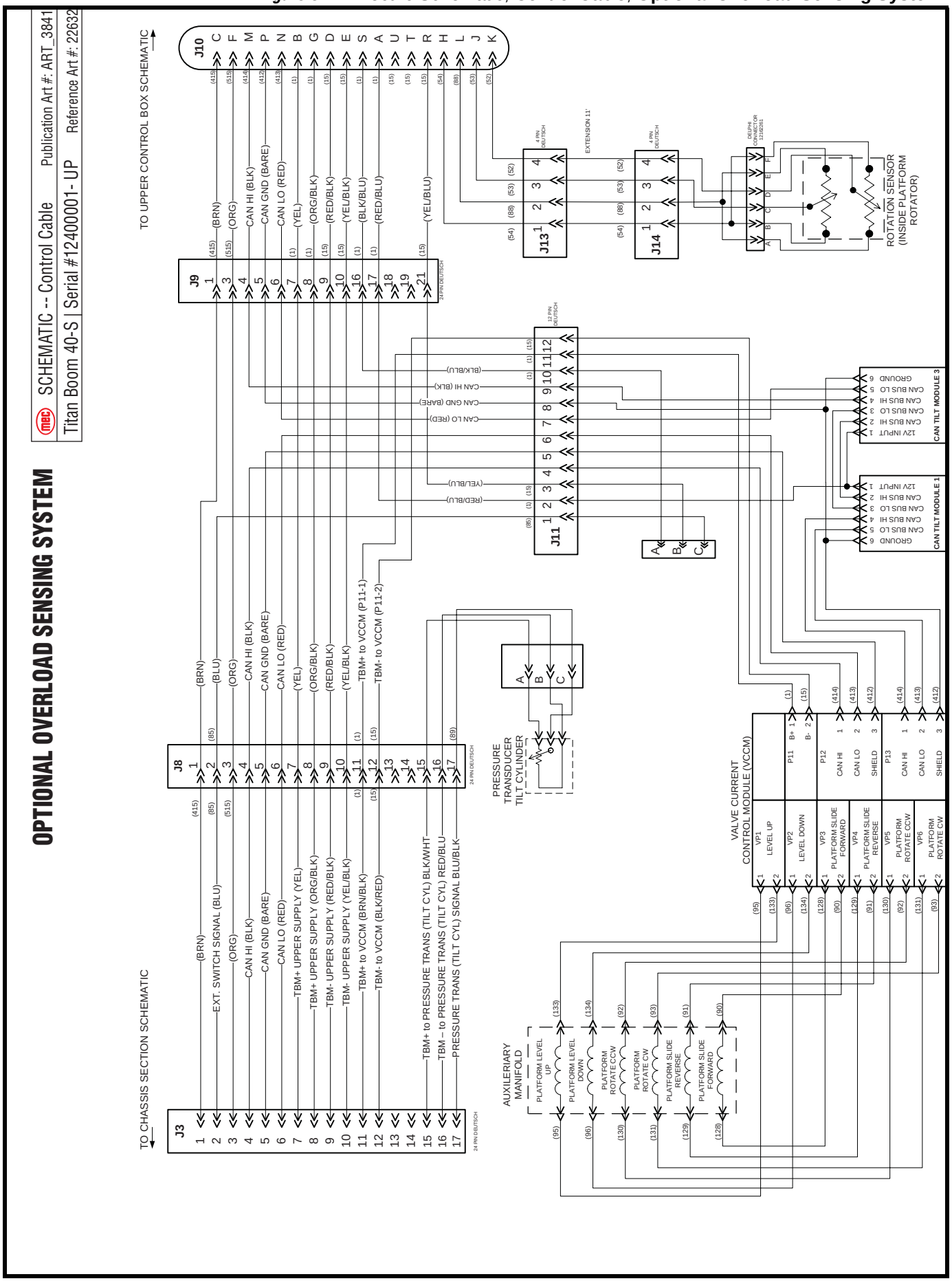


Figure 5-13: Electric Schematic, Upper Control Box, **All Machines**

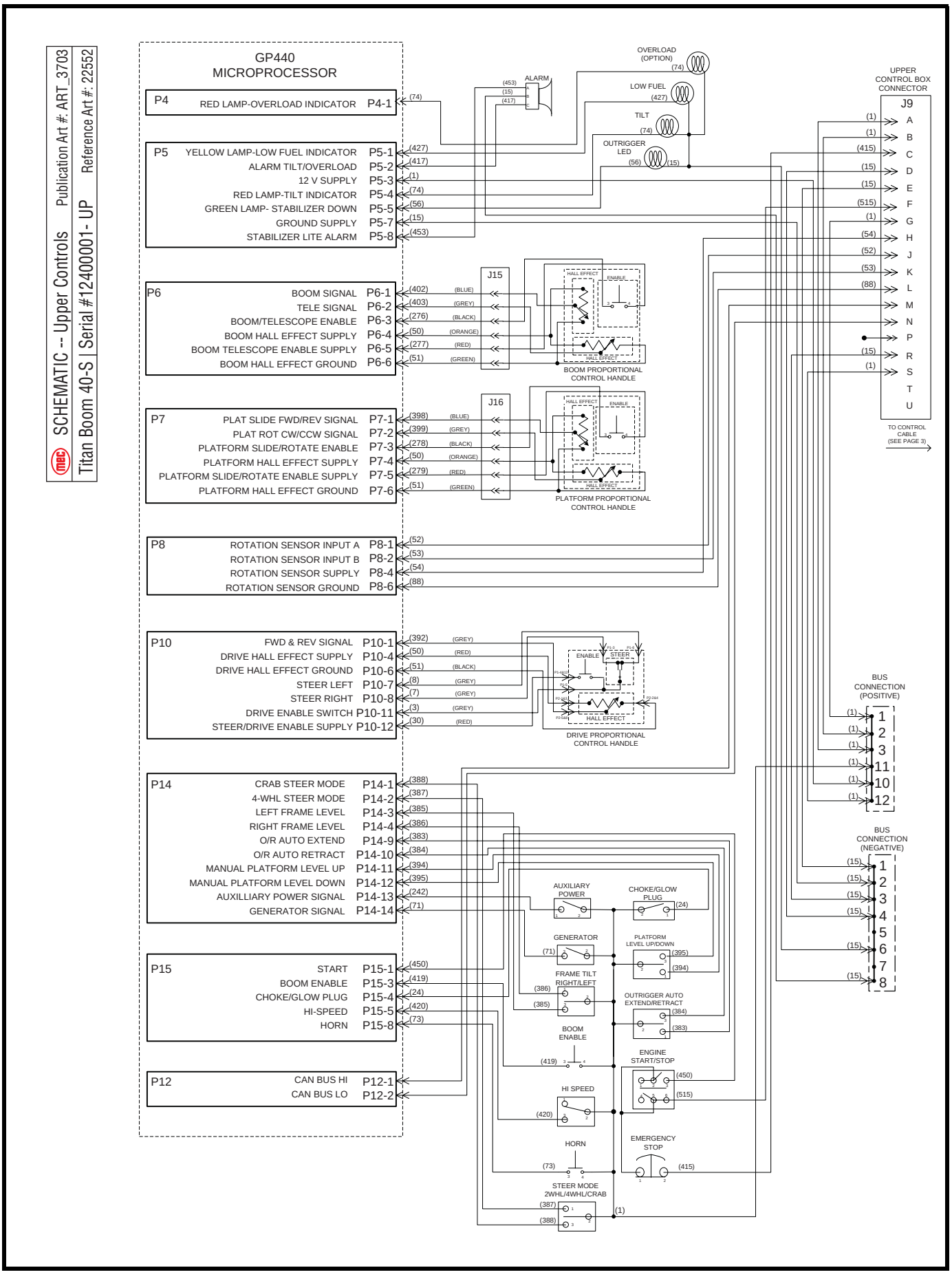
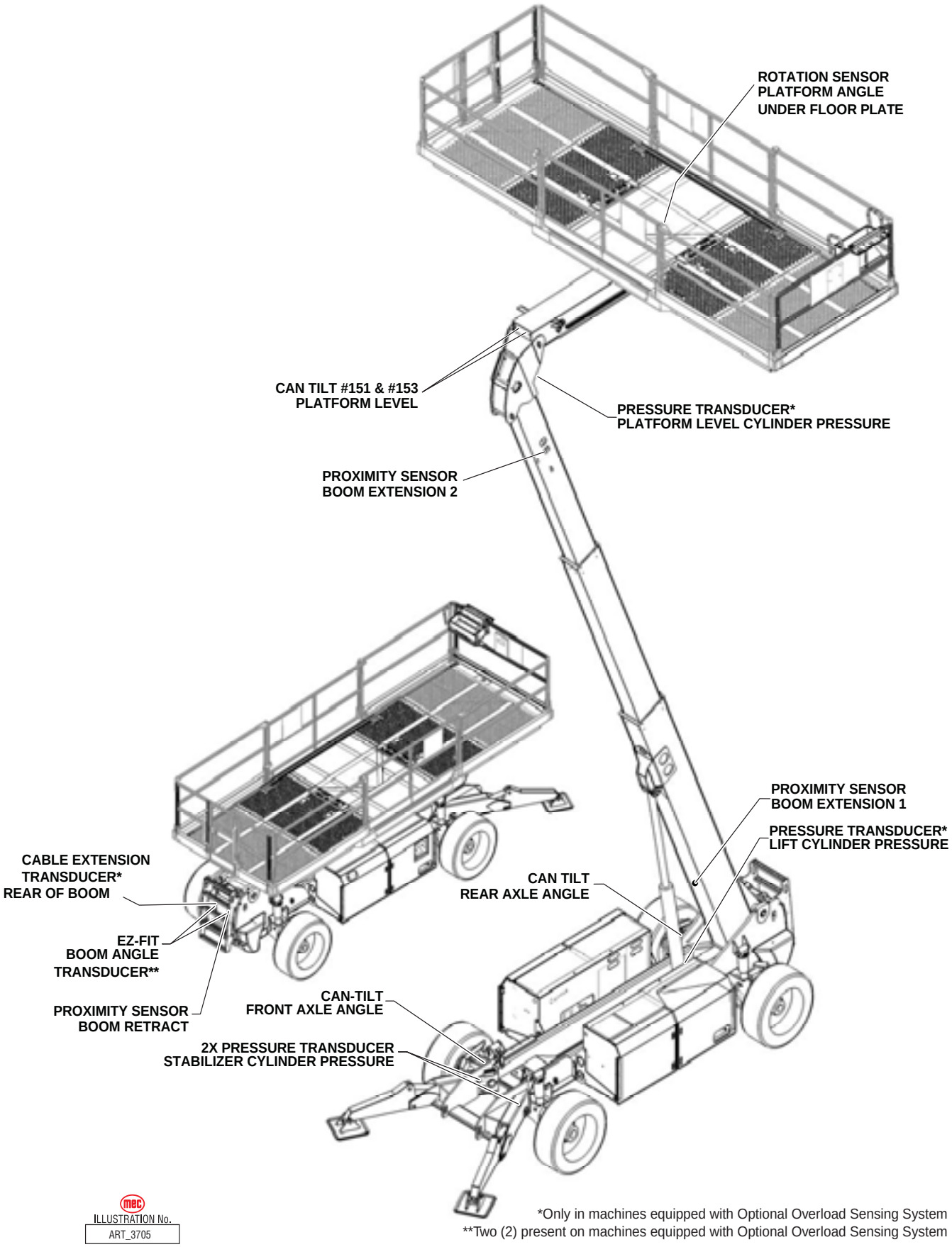


Figure 5-14: Sensor Locations



*Only in machines equipped with Optional Overload Sensing System
**Two (2) present on machines equipped with Optional Overload Sensing System

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Parts Table of Contents

Parts Table of Contents

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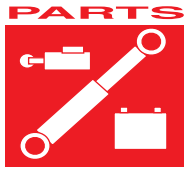

SECTION A

CONTROLS

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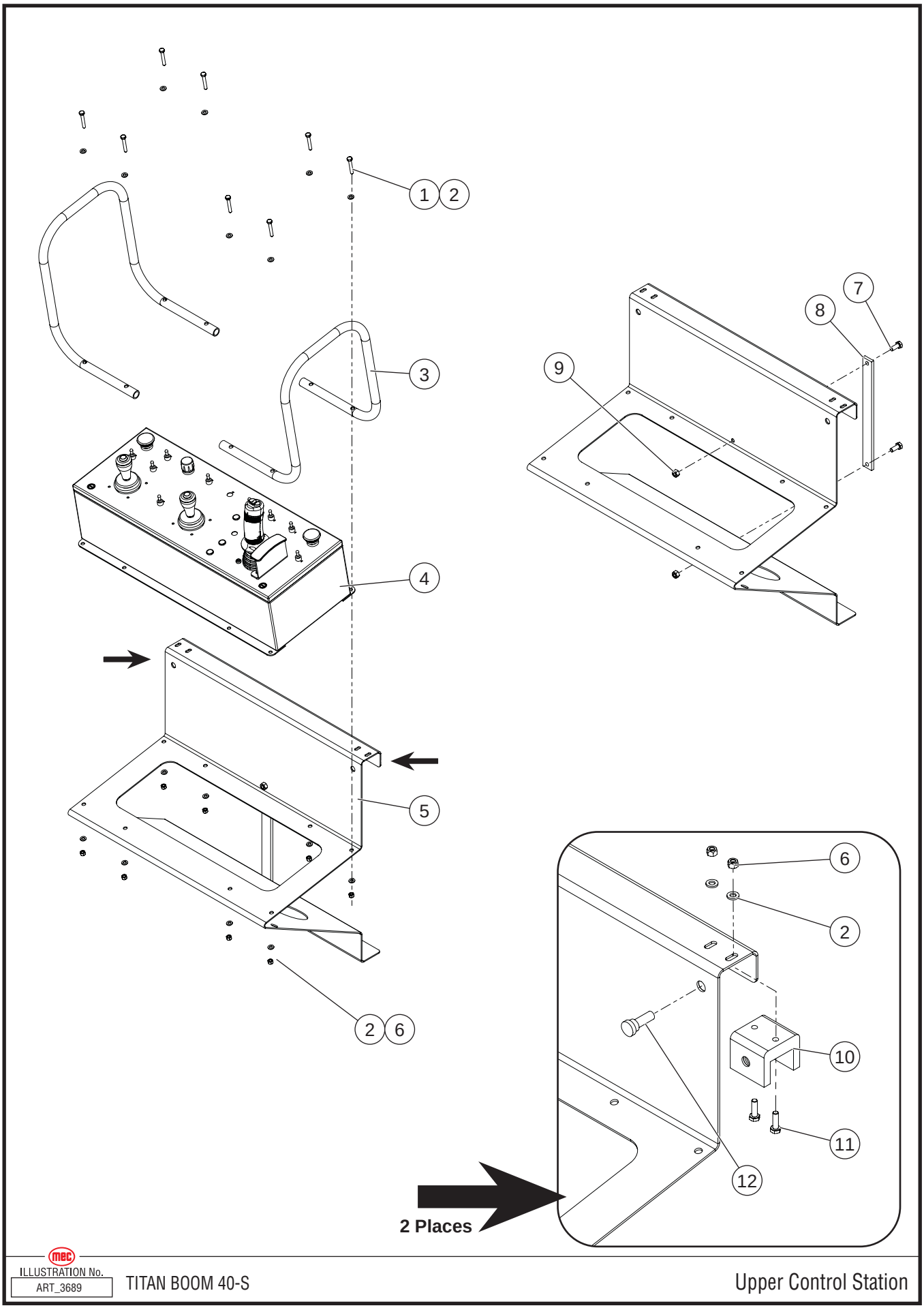

ILLUSTRATION No. ART_3689

TITAN BOOM 40-S

Upper Control Station

Upper Controls Station

ITEM	PART NO.	QTY	DESCRIPTION
1	50289	8	Bolt, HHCS M6 x 40
2	50000	20	Washer, M6 Std
3	22228	2	Rail, Upper Control Box
4	84184	1	Upper Control Box Assembly
5	22227	1	Bracket, Upper Control Box
6	50047	8	Nut, M6 Nylock
7	50030	2	Bolt, HHCS M8 x 20
8	22384	1	Brace
9	50048	2	Nut, M8 Nylock
10	22397	2	Rail Pad
11	50028	4	Bolt, HHCS M6 x 20
12	92125	2	Thumbscrew, Nylon

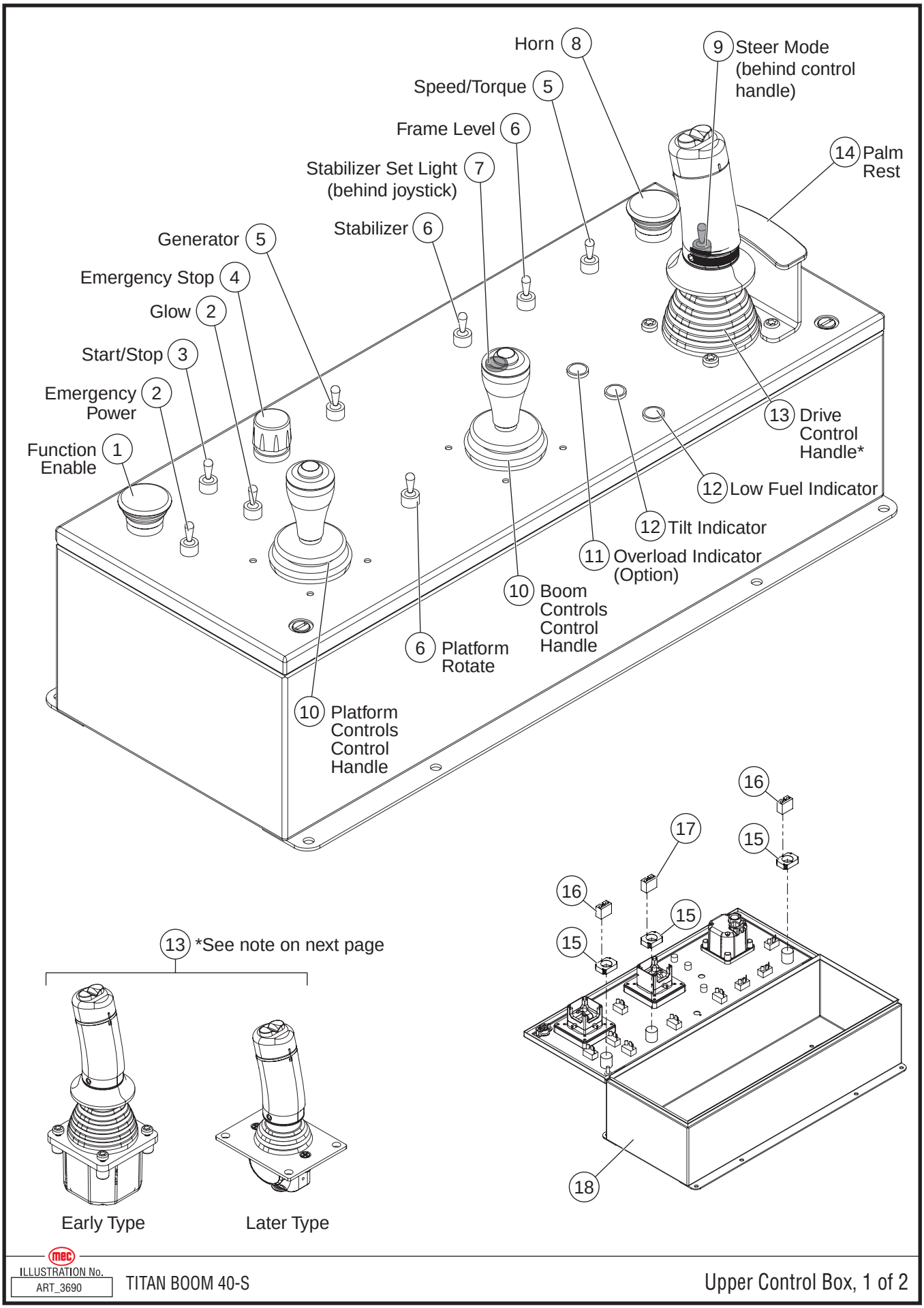

ILLUSTRATION No. ART_3690

TITAN BOOM 40-S

Upper Control Box, 1 of 2

Upper Controls Box, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
--	84184	--	Upper Controls Box Assembly
1	92422	1	Button, Green
2	7423	2	Switch, Toggle, On--Momentary
3	92427	3	Switch, Toggle, Off--On--Momentary
4	7800	1	Emergency Stop Button
5	6234	2	Switch, Toggle, On--On
6	91954	2	Switch, Toggle, Momentary--Off--Momentary
7	92255	1	Indicator Light, Green
8	92421	1	Button, Black
9	6905	1	Switch, Toggle, On--Off--On
10	92165	2	Control Handle
11	92254	1	Indicator Light, Red (Option)
12	92253	2	Indicator Light, Orange
13	92786*	1	Drive Control Handle
--	22237	--	Adapter Plate, Drive Control Handle, New Style
14	18494	1	Palm Rest
15	90714	3	Switch/Button Mount
16	8082	2	Contact Block, N.O
17	8083	1	Contact Block, N.C
18	22208	1	Upper Control Box

*Early type Drive Control Handles are no longer available. See the drawing at left to determine if your machine is equipped with the early or later type control handle.

If your machine is equipped with an early type control handle, you must replace it with the later type control handle (Item #13). You must also replace the Palm Rest (Item #14), as early versions of this item are not compatible with later control handles.

If your machine is equipped with a later type control handle, replace only the control handle (Item #13).

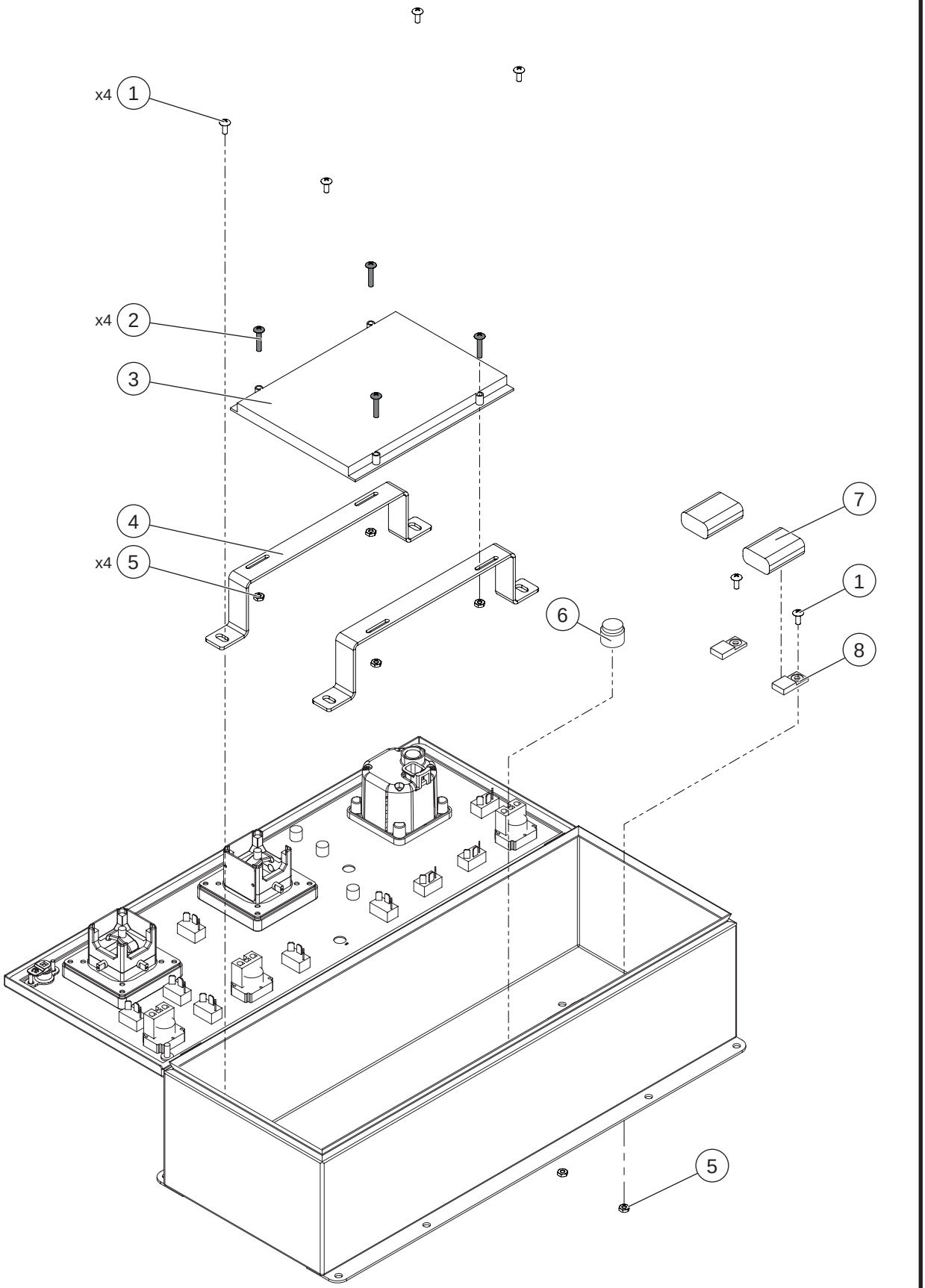

ILLUSTRATION No. ART_3691

TITAN BOOM 40-S

Upper Control Box, 2 of 2

Upper Controls Box, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	50191	6	Screw, THMS #10-32 x .5
2	50330	4	Screw, THMS #10-32 x 1
3	92027	1	GP440 Module
4	22429	2	Mount, GP440
5	50238	6	Nut, #10-32 Nylock
6	7553	1	Alarm
7	92033	2	Buss
8	91881	2	Relay/Buss Mount

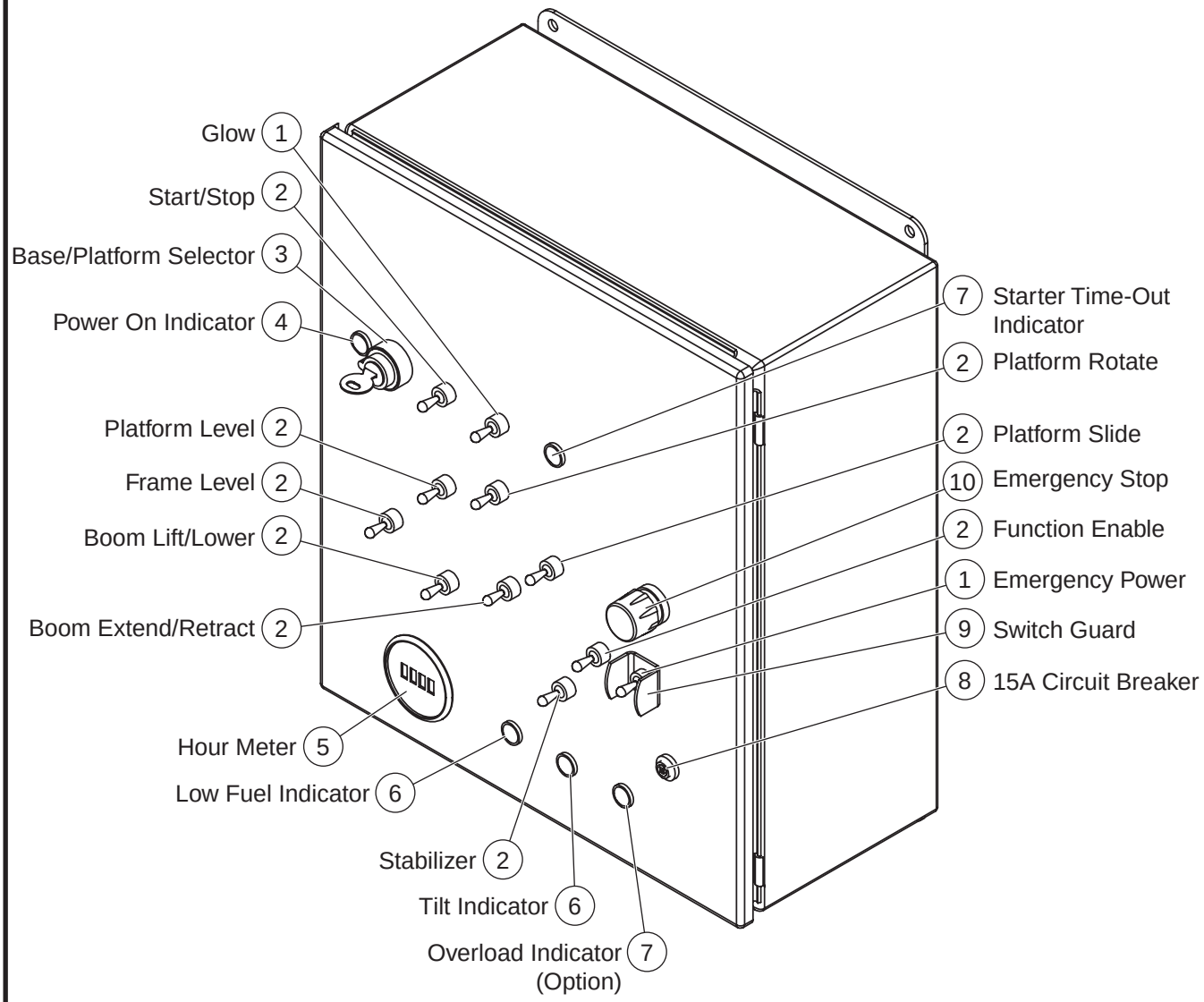

ILLUSTRATION No.
ART_3692

TITAN BOOM 40-S

Lower Control Box, 1 of 2

Lower Controls Box, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
--	84181	--	Lower Controls Assembly
1	7423	2	Switch, Toggle, On--Momentary
2	91954	9	Switch, Toggle, Momentary--Off--Momentary
3	9549	1	Switch, Keyed Selector
4	92255	1	Indicator Light, Green
5	91704	1	Hour Meter
6	92253	2	Indicator Light, Orange
7	92254	1	Indicator Light, Red
		2	Indicator Light, Red (Option)
8	7235	1	Circuit Breaker, 15 Amp
9	1313	1	Switch Guard
10	7800	1	Emergency Stop Button

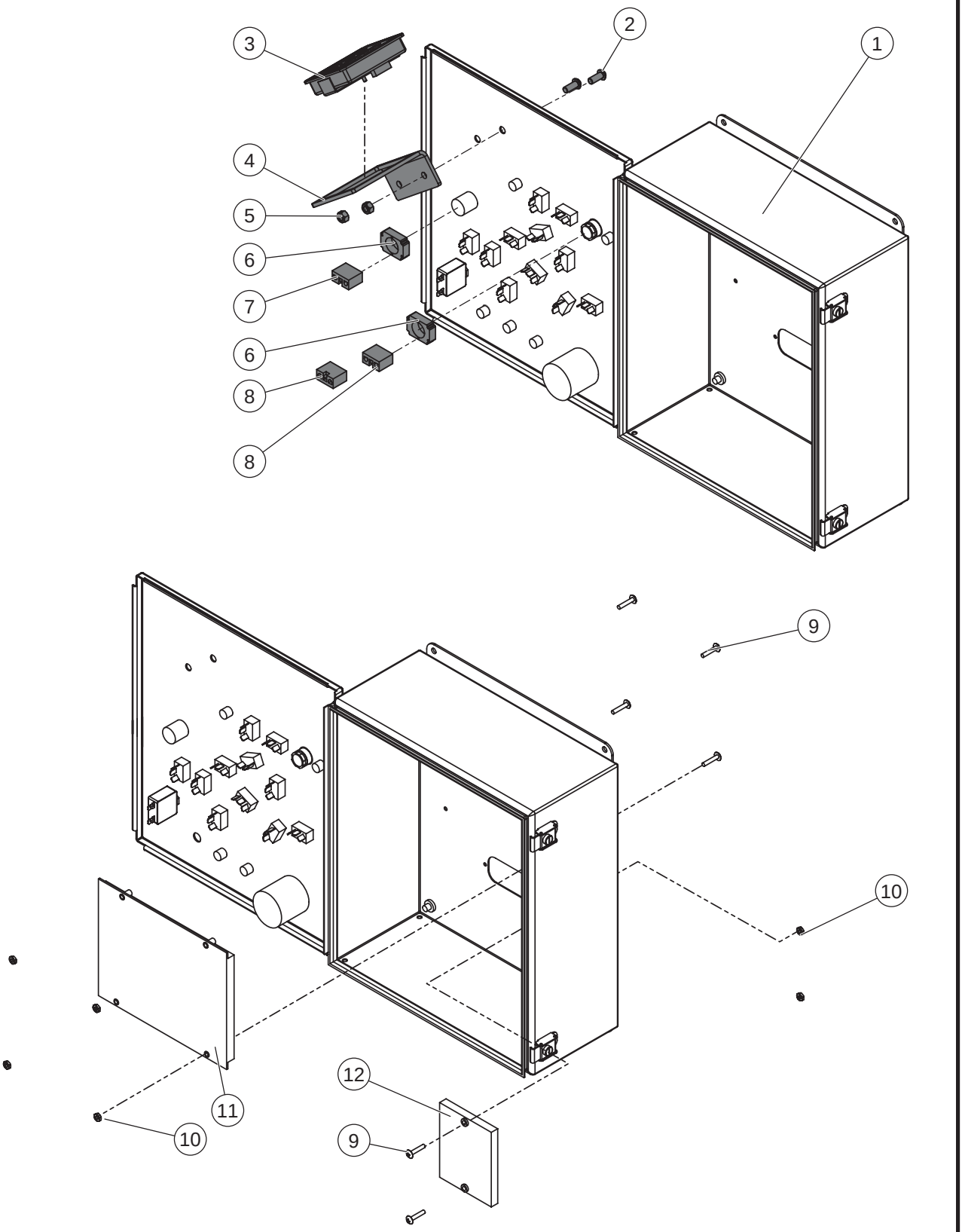

ILLUSTRATION No.
ART_3693

TITAN BOOM 40-S

Lower Control Box, 2 of 2

Lower Controls Box, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	22252	1	Lower Control Box
2	50124	2	Screw, BHCS M8 x 20
3	92003	1	EZ Cal Diagnostic, Normal type
--	92741	--	EZ Cal Diagnostic, Arctic type
4	22405	1	Bracket, EZ Cal
5	50048	2	Nut, M8 Nylock
6	90714	2	Switch/Button Mount
7	8083	1	Contact Block, N.C.
8	8082	2	Contact Block, N.O.
9	50330	6	Screw, THMS #10-32 x 1
10	50238	6	Nut, #10-32 Nylock
11	92028	1	GP400 Module
12	92838	1	Terminal Block Module

NOTES:

SECTION C

ELEVATING ASSEMBLY

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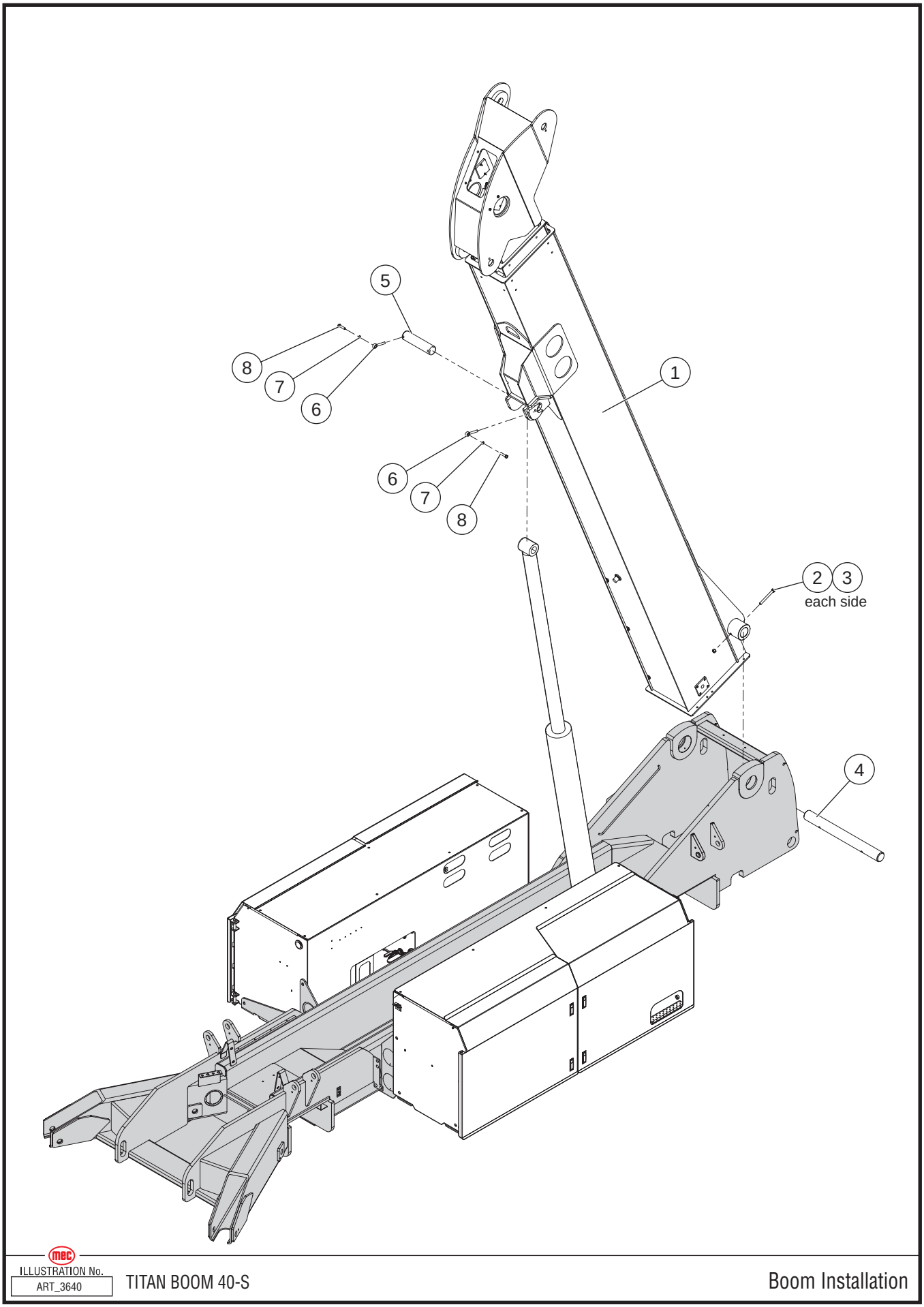


ILLUSTRATION No.
ART_3640

TITAN BOOM 40-S

Boom Installation

Boom Installation

ITEM	PART NO.	QTY	DESCRIPTION
1	84176	1	Boom Assembly
2	50302	2	Bolt, HHCS M14 x 130
3	50303	2	Nut, M14 Nylock
4	22450	1	Boom Pivot Pin
5	22196	1	Boom/Lift Cylinder Pin
6	18152	2	Pin Retainer
7	50007	2	Washer, M12 Nordlock
8	50250	2	Bolt, HHCS M12 x 50

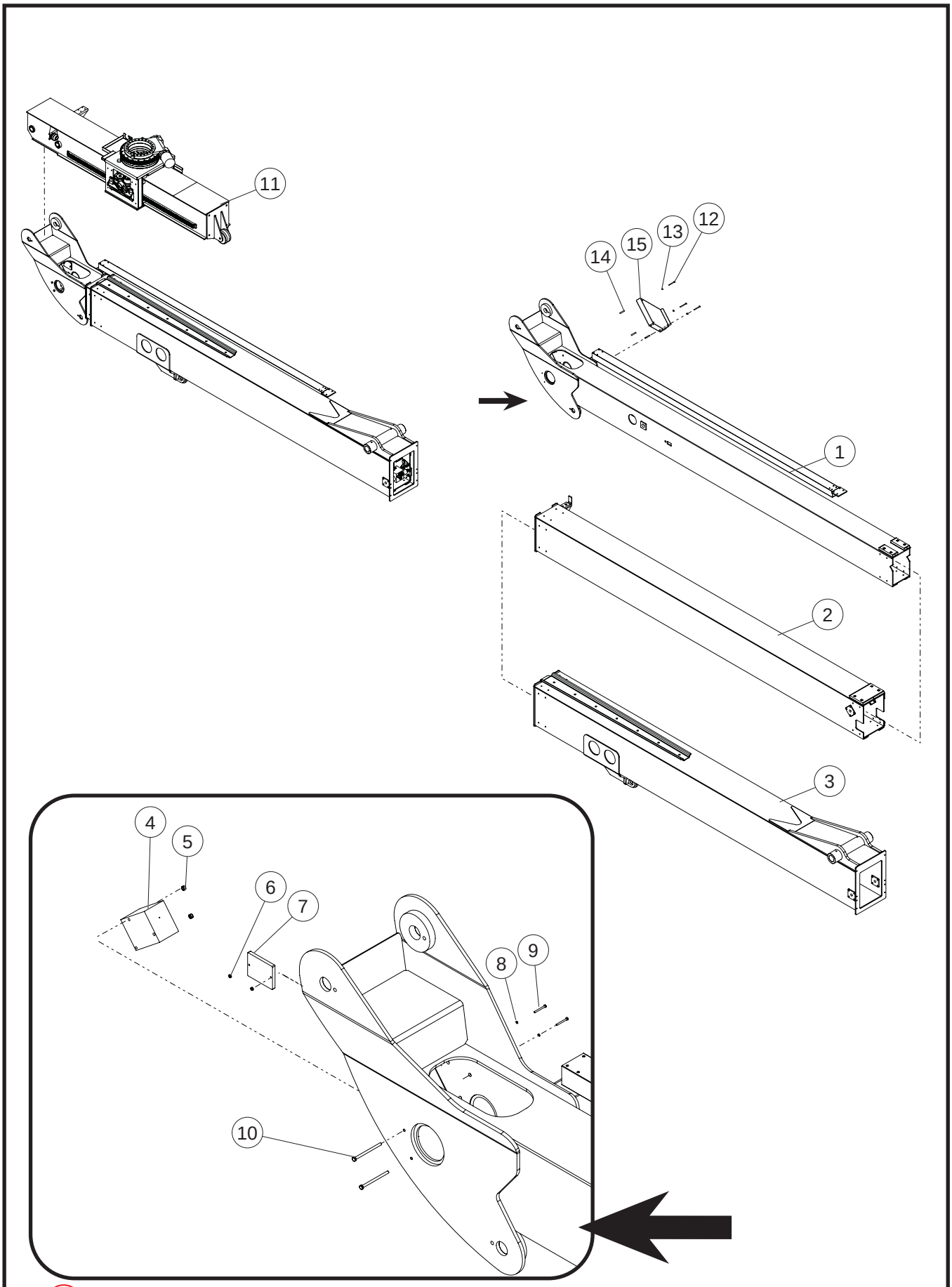


ILLUSTRATION No. ART_3614

TITAN BOOM 40-S

Boom Assembly, 1 of 2

Boom Assembly, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
--	84176	--	Boom Assembly
1	84166	1	End Boom Assembly
2	84167	1	Mid Boom Assembly
3	84168	1	Base Boom Assembly
4	92082	1	Manifold, Platform Level
5	50048	2	Nut, M08x1.25 08 Zp Nylock
6	50238	2	Nut, #10-32 05 Nylock
7	91950	1	Valve Current Control Module (VCCM)
8	50280	2	Washer, #10-32 Zp Standard Lock
9	50298	2	Bolt, HHCS #10-32x02.00 05 Z
10	50268	2	Bolt, HHCS M08-1.25x120 08 Zp P
11	REF	--	Cantilever Assembly -- see page C-17
12	50237	3	Bolt, HHCS M8 x 100
13	50200	3	Washer, M8 Nordlock
14	22385	3	Spacer
15	22321	1	Hose Cover

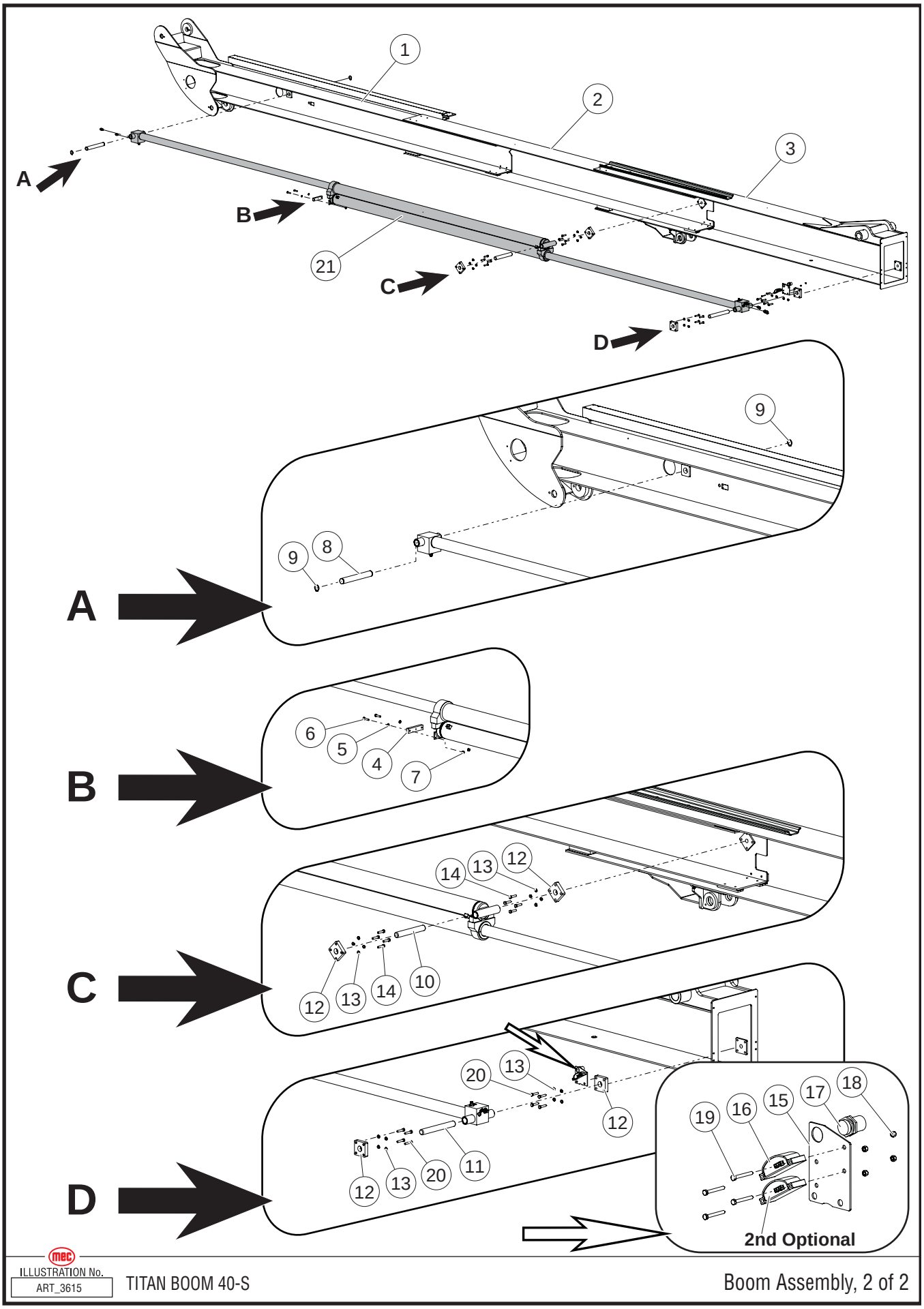


ILLUSTRATION No. ART_3615

TITAN BOOM 40-S

Boom Assembly, 2 of 2

Boom Assembly, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
--	84176	--	Boom Assembly
1	84166	1	End Boom Assembly
2	84167	1	Mid Boom Assembly
3	84168	1	Base Boom Assembly
4	22219	1	Slide Block
5	50002	2	Washer, M10 Zp Standard Flat
6	50035	2	Bolt, HHCS M10-1.50x040 08 Zp F
7	50049	2	Nut, M10 Nylock
8	22206	1	Pin, 1.500 X 11.063
9	92243	2	Snap Ring, 1.50” X .109” Thick External
10	22205	1	Pin, 1.500 X 10.50
11	22204	1	Pin, 1.500 X 12.375
12	22211	4	Pin Keeper
13	50007	16	Washer, M12 Zp Nordlock
14	50250	8	Bolt, HHCS M12-1.75x050
15	22222	1	Mounting Bracket
	Standard Machine	Machine w/optional Overload Sensing System	
16	90844	1 | 2	Ez Fit Angle Sensor
17	92032	1 | 2	Proximity Switch, 30mm
18	50047	2 | 4	Nut M06 Nylock
19	50262	2 | 4	Bolt, HHCS M06-1.00x050
20	50301	8	Bolt, HHCS M12-1.75x055
21	REF	1	Cylinder, Boom Extend -- See Section E

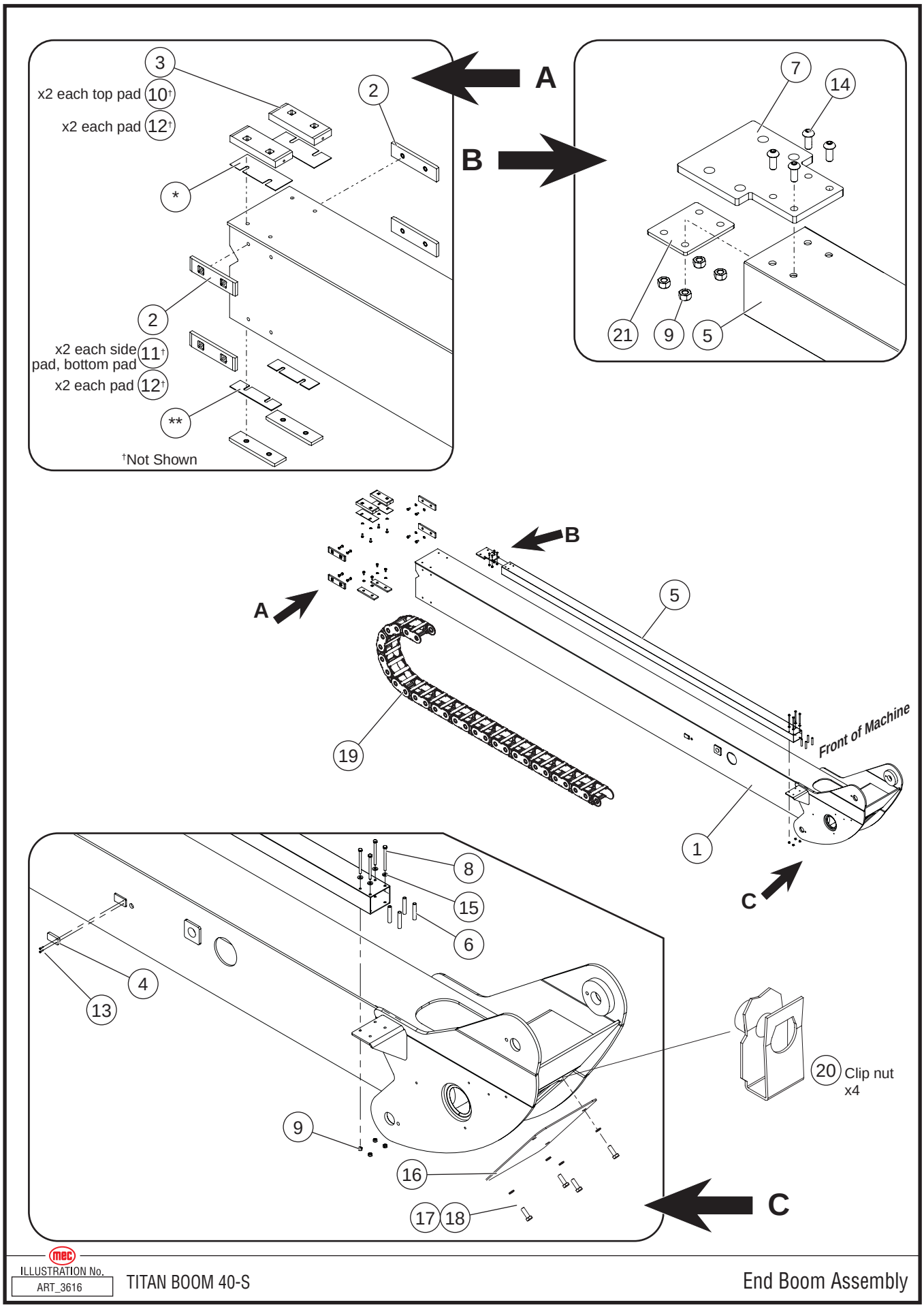


ILLUSTRATION No. ART_3616

TITAN BOOM 40-S

End Boom Assembly

End Boom Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84166	--	End Boom Assembly
1	22048	1	Inner Boom
2	11861979	6	Std. Wearpad
3	22573	2	Offset Wearpad
4	92097	1	Inner Boom Extension Sensor
5	22264	1	Cable Tube
6	22386	4	Hose Tube Support Tube
7	22337	1	Cable Track Mount Plate
8	50237	4	Bolt, HHCS M08-1.25x100 08 Zp P
9	50048	8	Nut, M08x1.25 08 Zp Nylock
10	50033	4	Bolt, HHCS M10-1.50x025 08 Zp F
11	50215	12	Bolt, HHCS M10-1.50x020 08 Zp F
12	50006	16	Washer, M10 Zp Nordlock
13	50155	2	Bolt, SHCS #06-32x00.50 08 Zp
14	50124	4	M8 X 1.25 X 20 Button Cap Screw
15	50001	4	Washer, M08 Zp Standard Flat
16	22309	1	Cover Plate
17	50033	4	Bolt, HHCS M10-1.5 x 25
18	50006	4	Washer, M10 Nordlock
19	92675†	1	Assembly, Cable Track, Metal†
20	92098	4	Clip Nut, M10-1.5
21	22769	1	Backing Plate
Boom sections must be shimmed to a total clearance of .030 inch (.762mm) in both side-to-side and top-to-bottom directions when the boom is in the tightest section. *Use with the Offset Wearpads (#3) only			
--	22574	2	Offset Wearpad Shim
**Use with the Std. Wearpads (#2) only			
--	22224	as req.	Wearpad Shim (0.02)
--	11861977	as req.	Wearpad Shim (1mm)
--	11861981	as req.	Wearpad Shim (3mm)
--	11861982	as req.	Wearpad Shim (5mm)
--	11861983	as req.	Wearpad Shim (10mm)
†Early machines were equipped with plastic cable tracks. If replacing the entire cable track, Items #19, #21 and #7 must be ordered together. Plastic cable track service parts:			
--	92327	--	4-ft Replacement Section, Cable Track, Plastic
--	92328	--	Replacement Cross Bar, Plastic, Cable Track, Plastic
--	92329	--	Hub/Cover Kit, Cable Track, Plastic

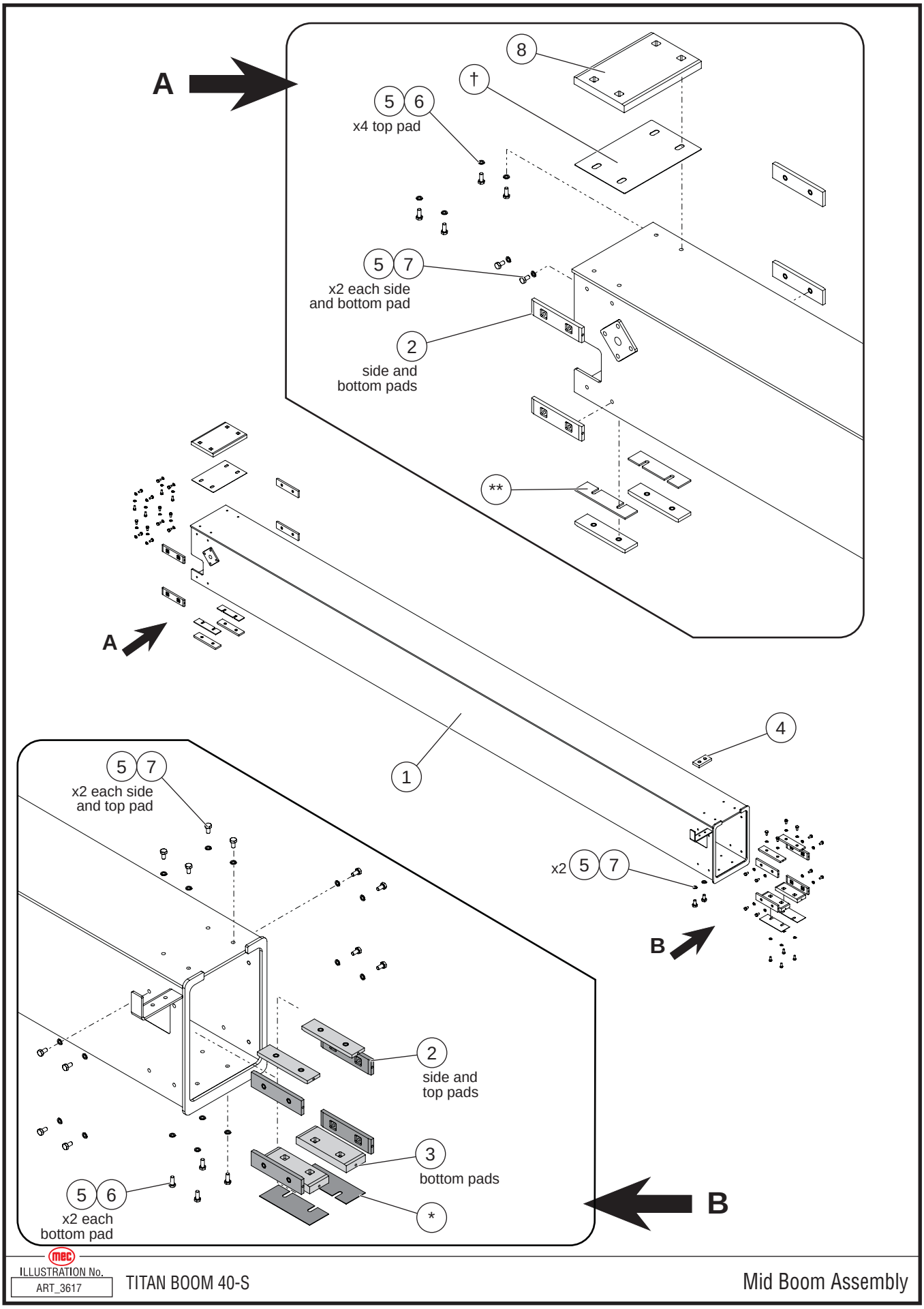


ILLUSTRATION No. ART_3617

TITAN BOOM 40-S

Mid Boom Assembly

Mid Boom Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84167	--	Mid Boom Assembly
1	22042	1	Mid Boom
2	11861979	12	Std. Wearpad
3	22573	2	Offset Wearpad
4	22425	1	Slide Block
5	50006	34	Washer, M10 Zp Nordlock
6	50033	8	Bolt, HHCS M10-1.50x025 08 Zp F
7	50215	26	Bolt, HHCS M10-1.50x020 08 Zp F
8	22571	1	Rear Wide Wearpad
Boom sections must be shimmed to a total clearance of .030 inch (.762mm) in both side-to-side and top-to-bottom directions when the boom is in its tightest section. †Use with the Rear Wide Wearpad (#8) only			
--	22572	1	Wide Wearpad Shim
*Use with the Offset Wearpad (#3) only			
--	22574	2	Offset Wearpad Shim
**Use with the Std. Wearpads (#2) only			
--	22224	as req.	Wearpad Shim (.02)
--	11861977	as req.	Wearpad Shim (1mm)
--	11861981	as req.	Wearpad Shim (3mm)
--	11861982	as req.	Wearpad Shim (5mm)
--	11861983	as req.	Wearpad Shim (10mm)

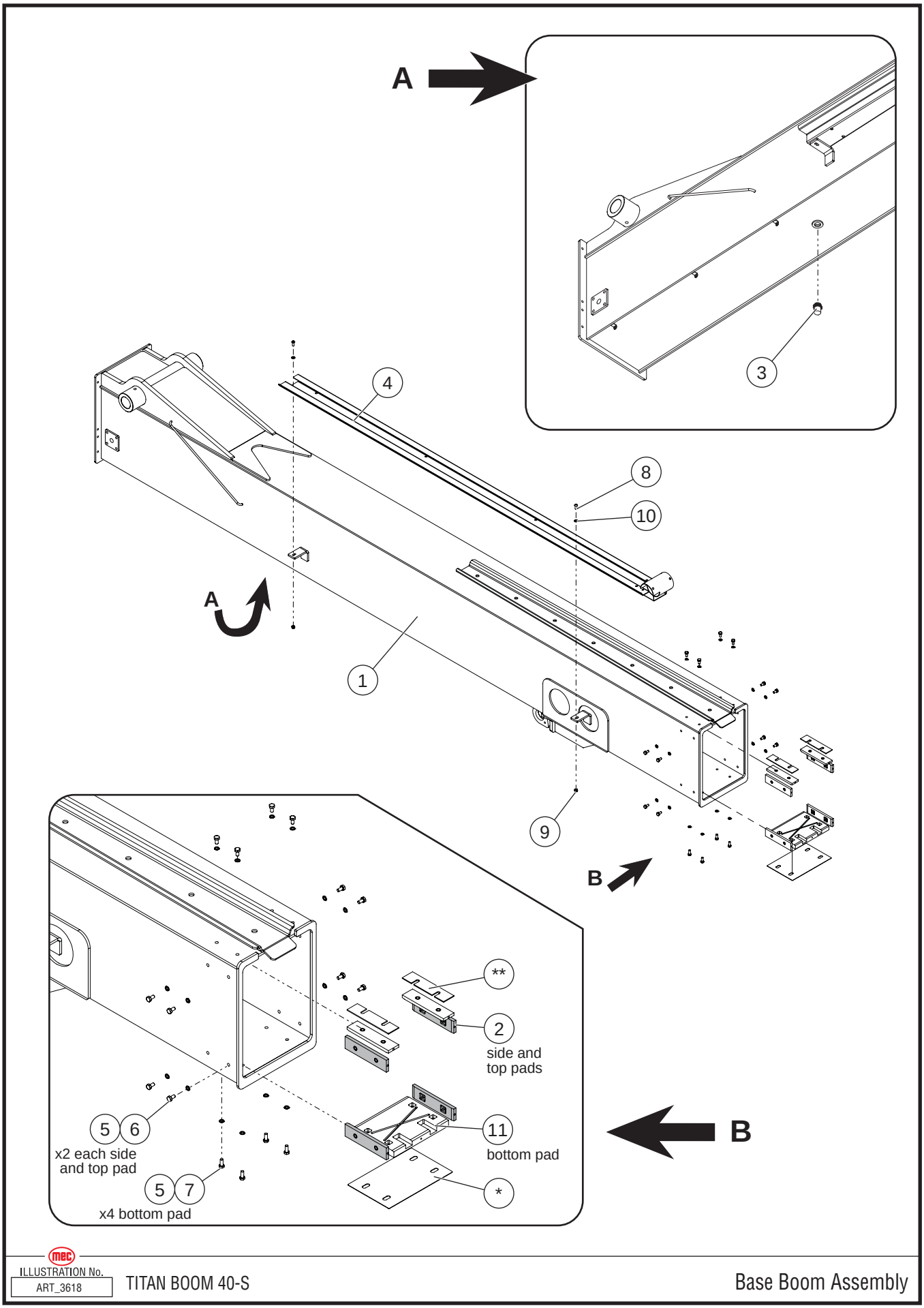


ILLUSTRATION No. ART_3618

TITAN BOOM 40-S

Base Boom Assembly

Base Boom Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84168	--	Base Boom Assembly
1	22024	1	Base Boom
2	11861979	6	Top/Side Wearpad
3	92032	1	Boom Extend Proximity Switch
4	22149	1	Cable Track Carrier Weldment
5	50006	16	Washer, M10 Zp Nordlock
6	50215	12	Bolt, HHCS M10 x 20
7	50033	4	Bolt, HHCS M10-1.50x25
8	50297	2	Bolt, BHCS M10-1.5x25
9	50049	2	Nut, M10x1.50 Nylock
10	50002	2	Washer, M10 Std
11	22570	1	Wide Front Wearpad
Boom sections must be shimmed to a total clearance of .030 inch (.762mm) in both side-to-side and top-to-bottom directions when the boom is in its tightest section. *Use with the Rear Wide Wearpad (#8) only			
*	22572	1	Wide Wearpad Shim
**Use with the Std. Wearpads (#2) only			
--	22224	as req.	Wearpad Shim (0.02)
--	11861977	as req.	Wearpad Shim (1mm)
--	11861981	as req.	Wearpad Shim (3mm)
--	11861982	as req.	Wearpad Shim (5mm)
--	11861983	as req.	Wearpad Shim (10mm)

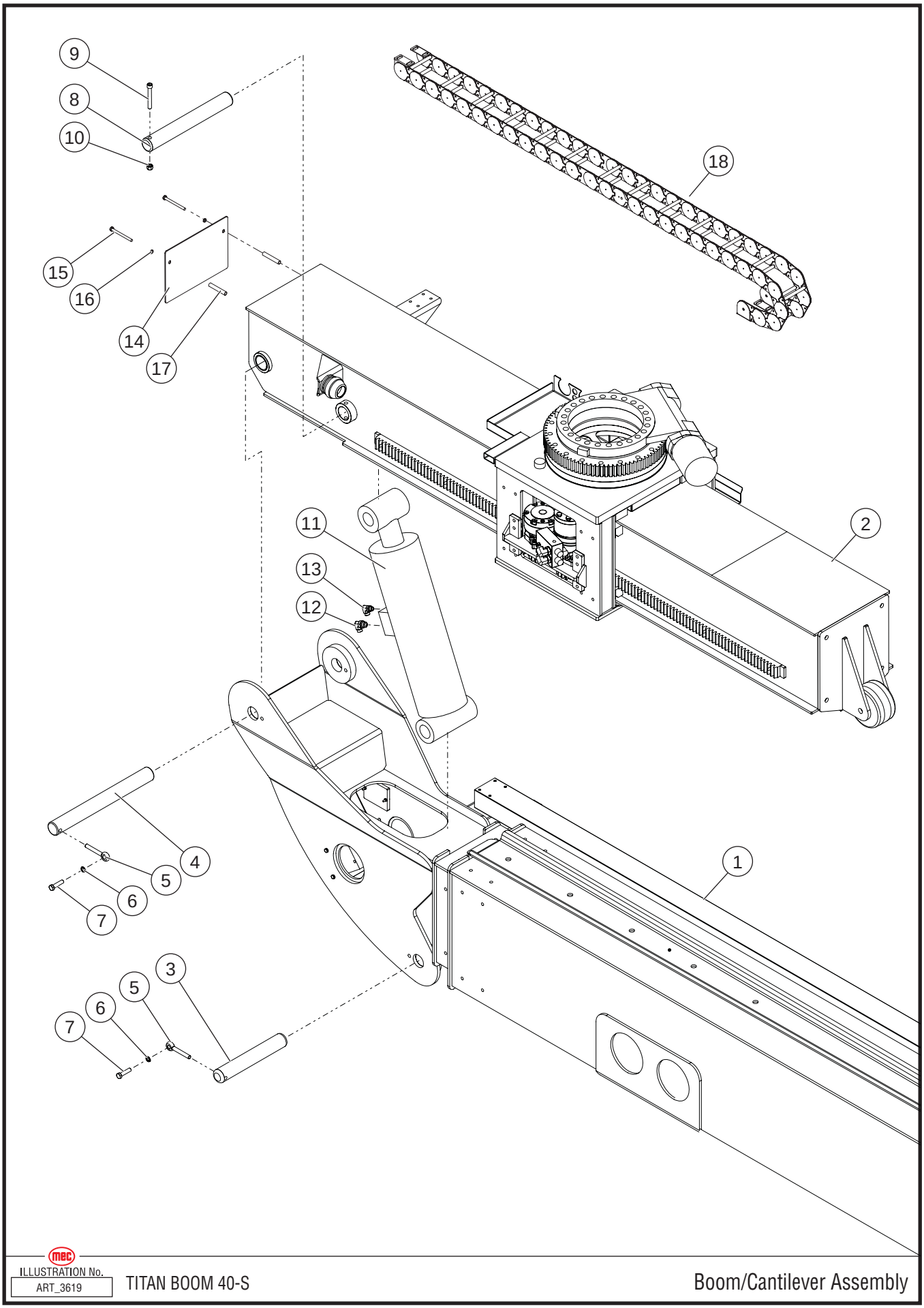


ILLUSTRATION No. ART_3619

TITAN BOOM 40-S

Boom/Cantilever Assembly

Boom/Cantilever Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84182	--	Boom/Cantilever Assembly
1	84176	1	Boom Assembly
2	84170	1	Cantilever Assembly
3	19121	1	Pin, 2.000 X 12.63
4	22200	1	Pin, 2.000 X 18.75
5	18152	2	Keeper Pin
6	50007	2	Washer, M12 Zp Nordlock
7	50250	2	Bolt, HHCS M12-1.75x050 10 Zp P
8	22199	1	Pin, 2.000 X 15.875
9	50105	1	Bolt, SHCS M12-1.75x090 08 Zp P
10	50050	1	Nut, M12x1.75 08 Zp Nylock
11	22153	1	Leveling Cylinder
12	50847	1	Fitting, MFFOR-MB90-6-8
13	50674	1	Fitting, MFFOR-MB90-06-06
14	22077	1	Cover Plate
15	50237	2	Bolt, HHCS M8 x 100
16	50200	2	Washer, M8 Nordlock
17	22385	2	Spacer
18	92030	1	Cable Track
--	92330	--	Crossbar Repair Kit for 92030 Cable Track

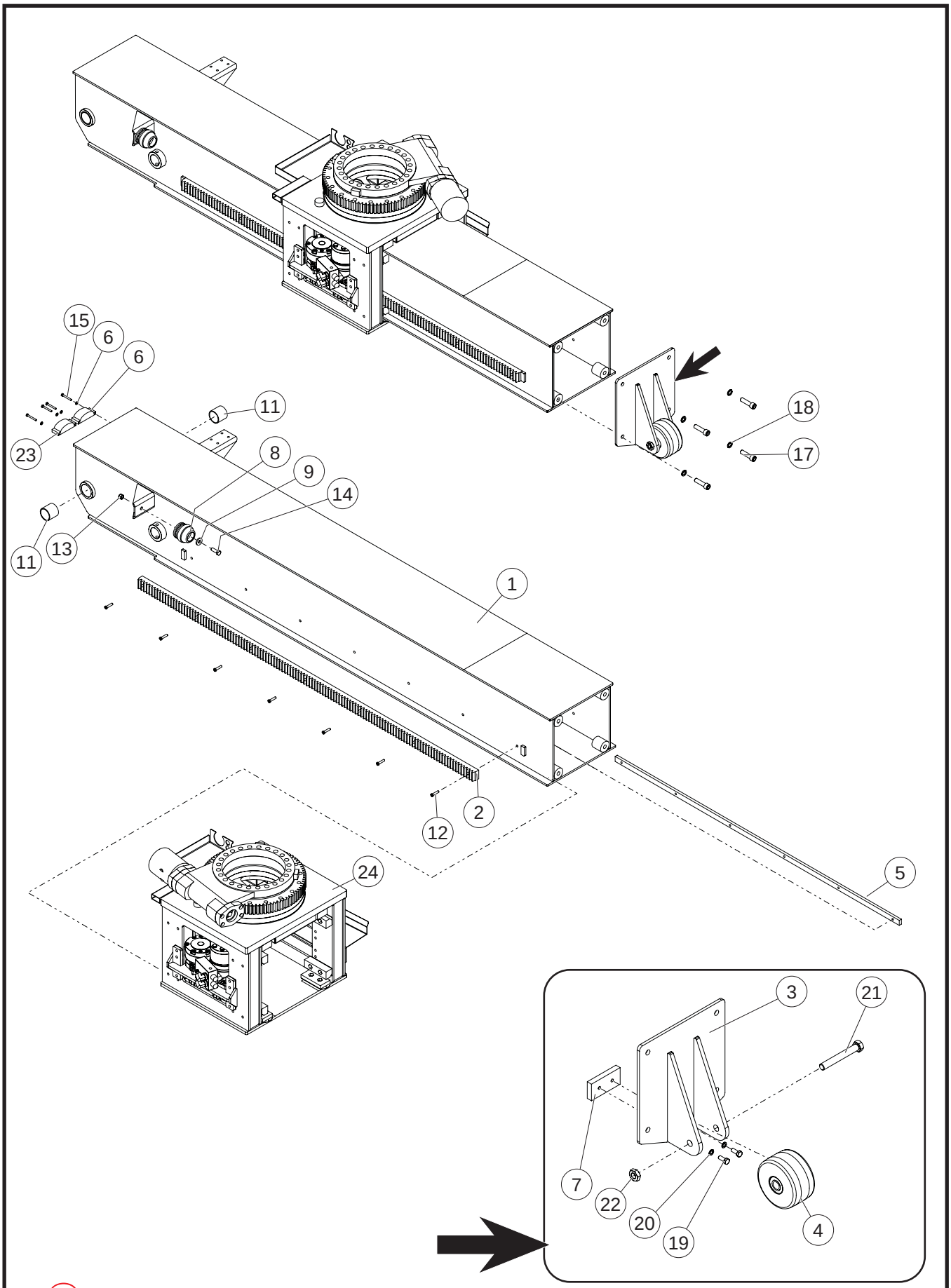


ILLUSTRATION No. ART_3620

TITAN BOOM 40-S

Cantilever Assembly

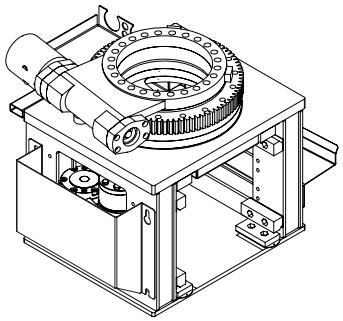
Cantilever Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84170	--	Cantilever Assembly
1	22494*	1	Cantilever Beam
2	22140	1	Rack Gear
3	22506	1	Carriage Stop Weldment
4	19047	1	Roller Wheel
5	22286	1	Rack Bolt Plate
6	92009	1	**SERIAL # ~12400101 --** Can Tilt 151
	92201	1	**SERIAL # 12400102~ --** Can Tilt 161 w/ Deutsch Connector
7	22425	1	Slide Block
8	92096	1	Bumper
9	22473	1	Bumper Washer
10	--	--	--
11	92110	2	Bearing
12	50260	7	Bolt, SHCS M08-1.25x035 10 Zp P Low Head
13	50050	1	Nut, M12x1.75 08 Zp Nylock
14	50040	1	Bolt, HHCS M12-1.75x035
15	50262	4	Bolt, HHCS M06-1.00x050
16	50000	4	Washer, M06 Zp Standard Flat
17	50011	4	Bolt, SHCS M16-2.00x060
18	50249	4	Washer, M16 Zp Nordlock 5/8
19	50033	2	Bolt, HHCS M10-1.50x025
20	50006	2	Washer, M10 Zp Nordlock
21	50059	1	Bolt, HHCS 03/04-10x05.50
22	50118	1	Nut, 03/04-10
23	91960	1	**SERIAL # ~12400101 --** Can Tilt 153
	92203	1	**SERIAL # 12400102~ --** Can Tilt 163 w/ Deutsch Connector
24	84171	1	Carriage Assembly

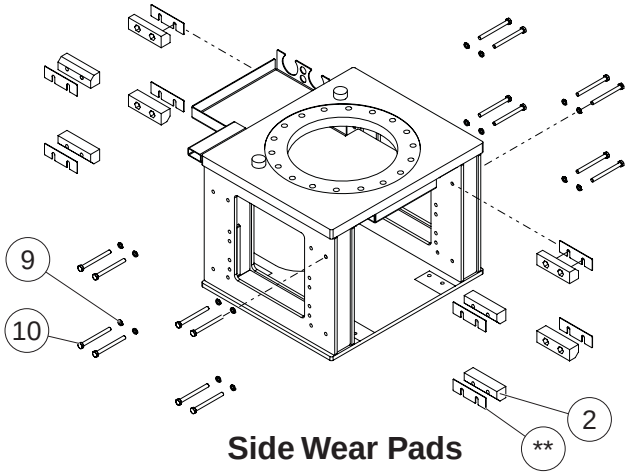
*Serial numbers up to 12400033:

When replacing Part #22494 Cantilever Beam, you must also replace:

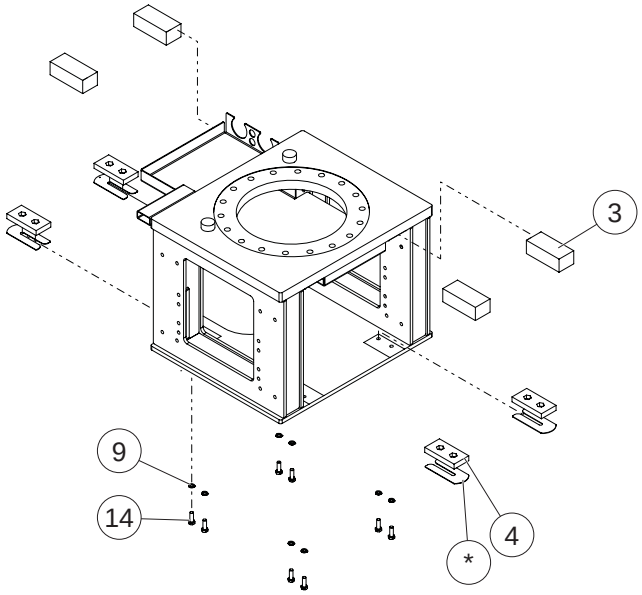
- #22495 Carriage Weldment (qty 1)
- #22506 End Plate (qty 1)
- #22504 Top Carriage Wear Pad (qty 4)
- #50299 Bolt, Platform Rotate Ring (qty 18)



Assembled



Side Wear Pads



Top & Bottom Wear Pads

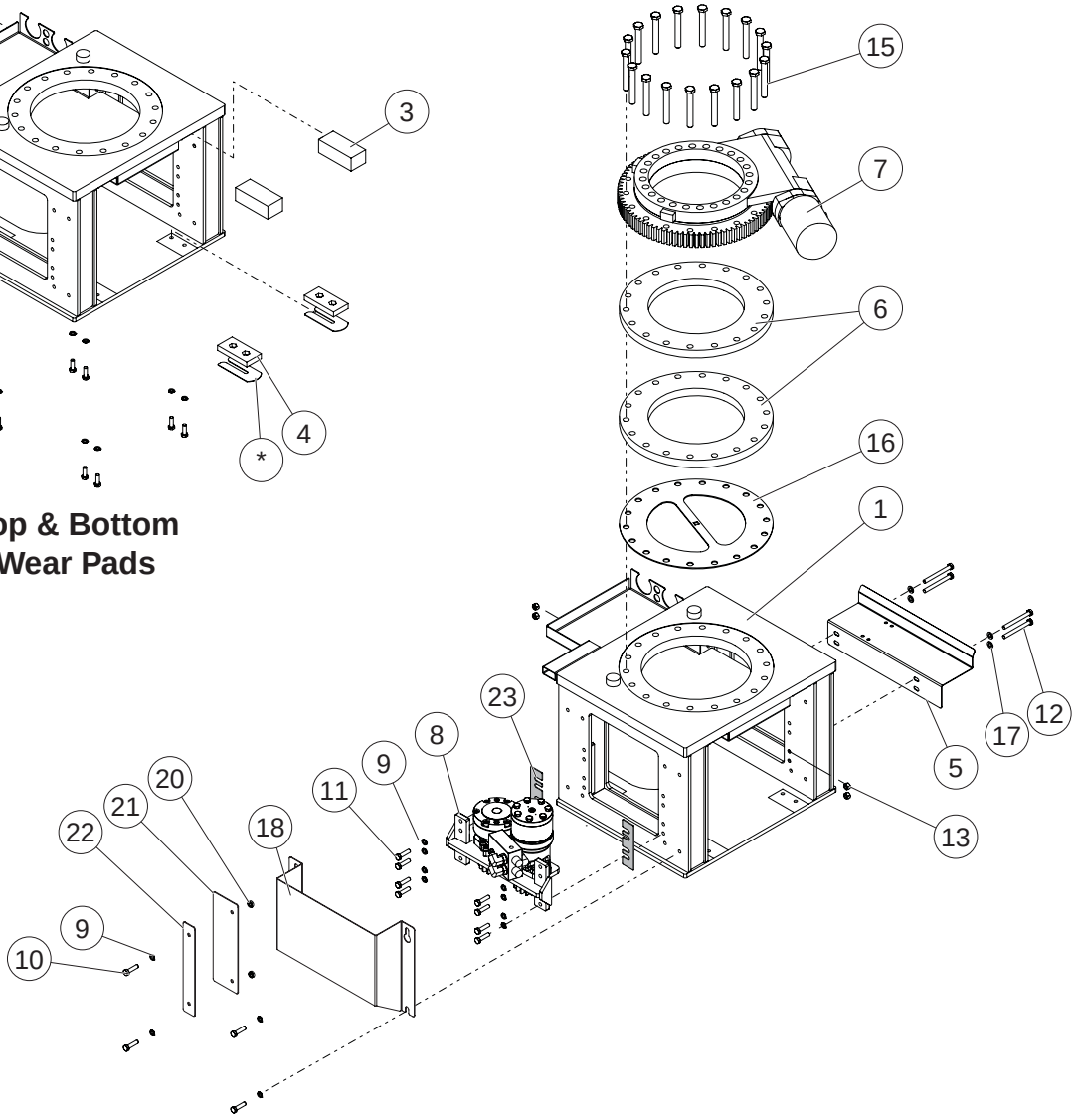


ILLUSTRATION No. ART_3621

TITAN BOOM 40-S

Carriage Assembly

Carriage Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84171	--	Carriage Assembly
1	22495†	1	Carriage Weldment
2	22248	8	Carriage Side Wearpad
3	22504	4	Carriage Top Wearpad
4	18138	4	Carriage Lower Wearpad
5	22138	1	Carriage Track Mount
6	22289	2	Slew Drive Spacer
7	REF	1	Slew Drive -- See Section E
8	84173	1	Carriage Motor Assembly
9	50006	36	Washer, M10 Zp Nordlock
10	50257	20	Bolt, HHCS M10-1.50x110 08 Zp P
11	50035	8	Bolt, HHCS M10-1.50x040 08 Zp F
12	50209	4	Bolt, HHCS M10-1.50x100 08 Zp P
13	50049	4	Nut, M10x1.50
14	50034	8	Bolt, HHCS M10-1.50x030 08 Zp F
15	50299	18	Outer Swing Bearing Bolt --
16	22539	1	Platform Rotation Keyed Shim Plate
17	50002	4	Washer, M10 Zp Standard Flat
18	22326	1	Carriage Motor Cover
19	--	--	--
20	22620	2	Spacer
21	22618	1	Carriage Guard Flap-- CE option package only
22	22619	1	Bracket, Carriage Guard Flap-- CE option package only
23	22195	As needed	Carriage Drive Shim -- Shim as needed so that the end of the gear teeth do not contact bottom of the teeth on the Cantilever Beam Rack Gear (Item #2 on previous page)
Carriage must be shimmed to a total clearance of .030 inch (.762mm) in both side-to-side and top-to-bottom directions when the carriage is in the tightest section of the platform beam. *Use with the Carriage Lower Wearpad (#4) only			
--	18235	-	Small Wear Pad Shim (0.06)
--	18236	-	Small Wearpad Shim (0.03)
**Use with the Carriage Side Wearpads (#2) only			
--	22188	-	Carriage Wearpad Shim (0.06)
--	22194	-	Carriage Wearpad Shim (0.03)

†Serial numbers up to 12400033:

When replacing Part #22495 Carriage Weldment, you must also replace:

- #22494 Cantilever Beam (qty 1)
- #22506 End Plate (qty 1)
- #22504 Top Carriage Wear Pad (qty 4)
- #50299 Bolt, Platform Rotate Ring (qty 18)

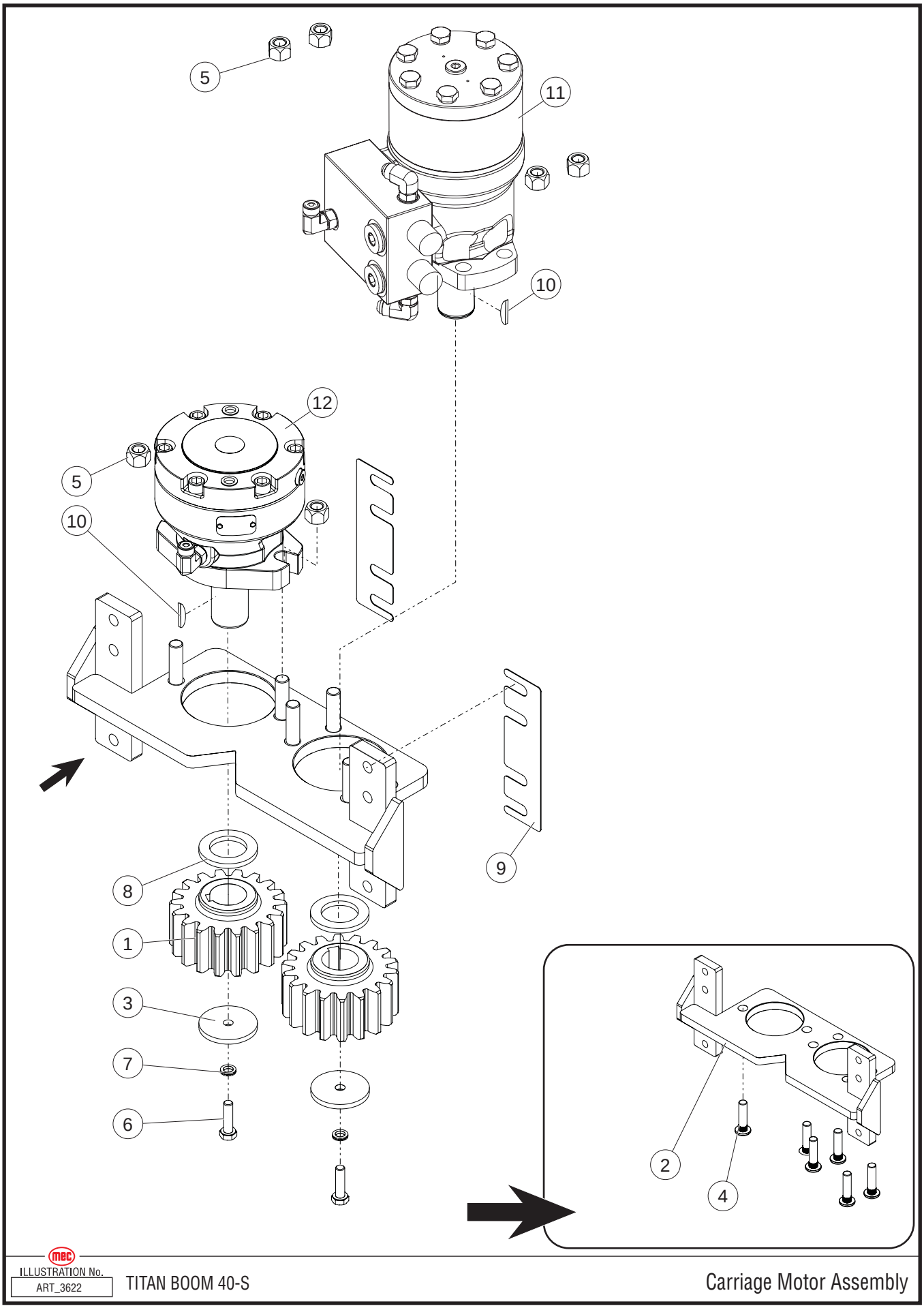


ILLUSTRATION No.
ART_3622

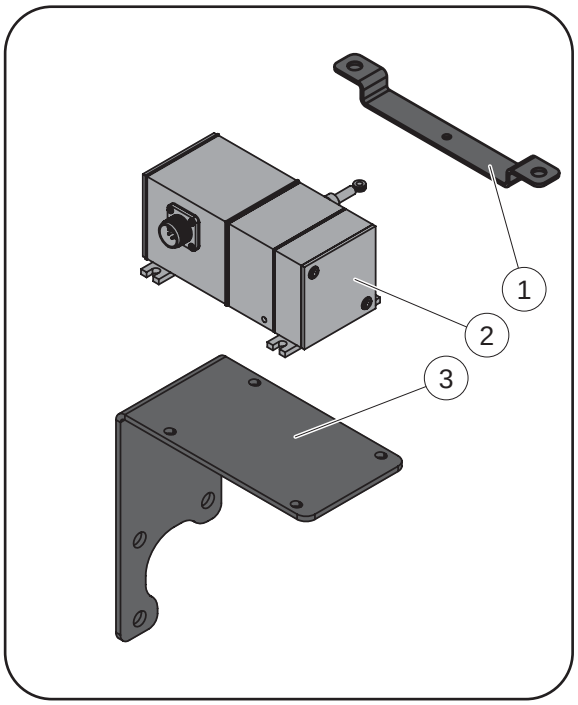
TITAN BOOM 40-S

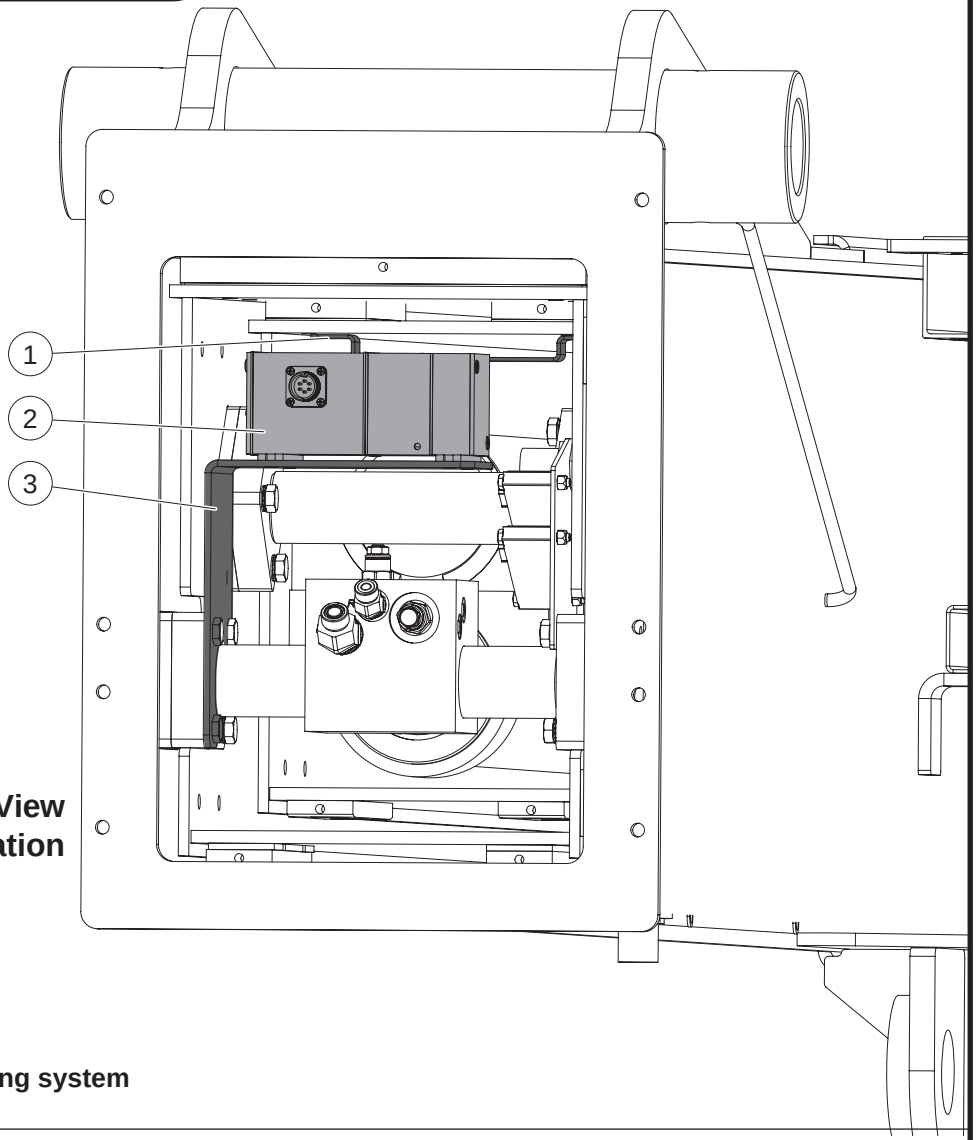
Carriage Motor Assembly

Carriage Motor Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84173	--	Carriage Motor Assembly
1	22141	2	Pinion Gear
2	22086	1	Carriage Drive Mounting Plate
3	22320	2	Pinion Retaining Washer
4	92407	6	M12-1.5x045 Wheel Stud
5	50305	6	Nut, M12x1.50 08 Zp Nylock
6	50032	2	Bolt, HHCS M08-1.25x030 08 Zp F
7	50200	2	Washer M08 Zp Nordlock
8	22322	2	Pinion Spacer
9	22195	As needed	Carriage Drive Shim -- Shim as needed so that the end of the gear teeth do not contact bottom of the teeth on the Cantilever Beam Rack Gear (Item #2 on page C-17)
10	92658	2	Shaft Key
11	REF	1	Carriage Motor -- See Section E
12	REF	1	Carriage Brake -- See Section E

Exploded View





Boom -- Rear View showing installation

These parts are used only on machines equipped with the optional Overload Sensing system

ILLUSTRATION No. ART_3775

TITAN BOOM 40-S

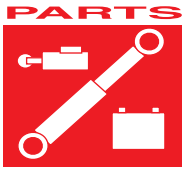
Cable Extension Transducer Components

Cable Extension Transducer Components

ITEM	PART NO.	QTY	DESCRIPTION
1	22239	1	Bracket, Cable Extension Target
2	92634	1	Cable Extension Transducer
3	22238	1	Bracket, Cable Extension Mounting

These parts are used only on machines equipped with the optional Overload Sensing System.

NOTES:



SECTION B

PLATFORM AND RAILS

CONTENTS

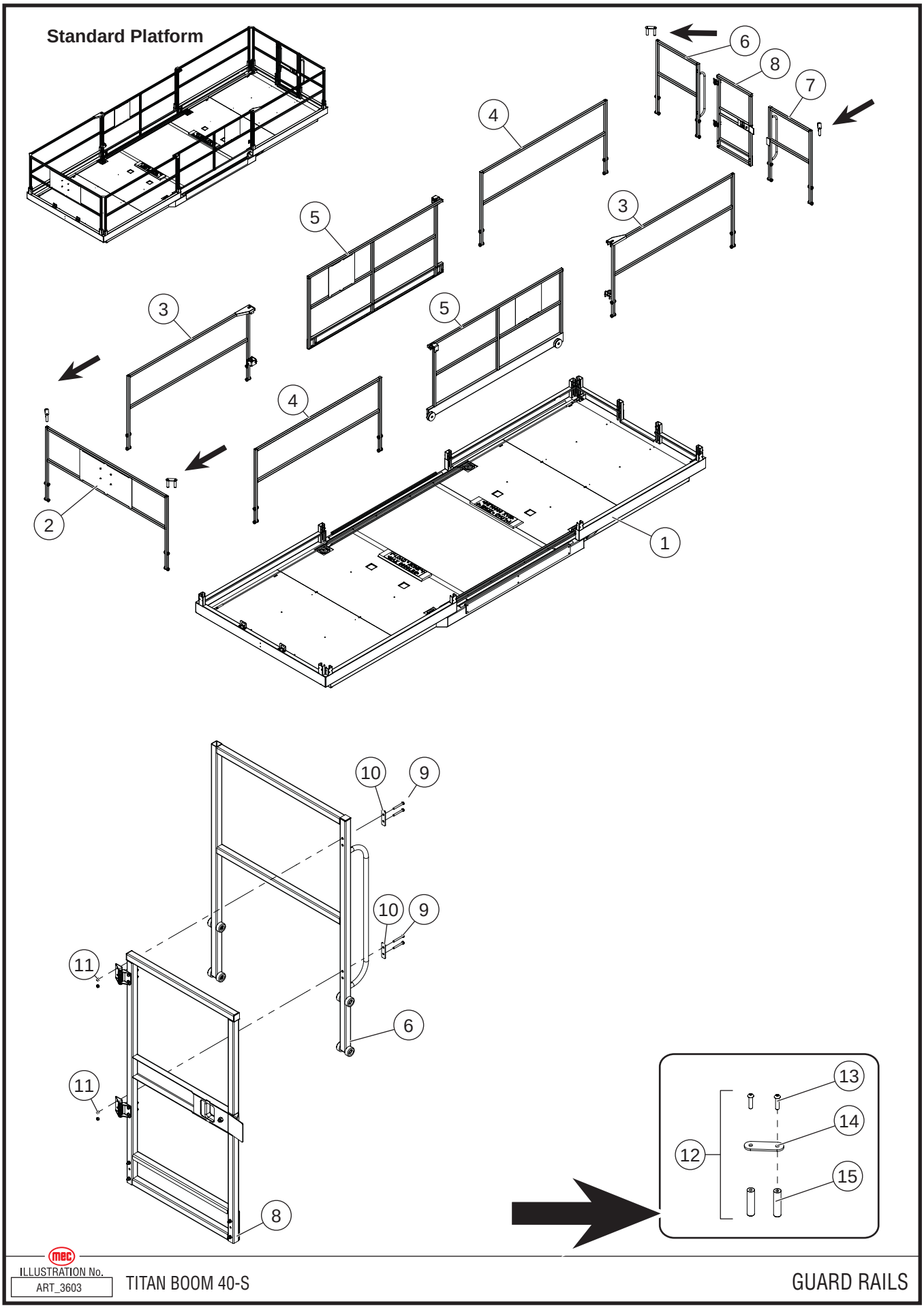


ILLUSTRATION No. ART_3603

TITAN BOOM 40-S

GUARD RAILS

Standard Platform, Guardrails

ITEM	PART NO.	QTY	DESCRIPTION
--	84158	1	Platform/Guardrail Assembly
1	REF	1	Platform
2	84159	1	Front Rail Assembly
3	84160	2	Right Side Rail Assembly
4	84161	2	Left Side Rail Assembly
5	84162	2	Sliding Gate Assembly
6	84164	1	Right Rear Rail Assembly
7	84165	1	Left Rear Rail Assembly
8	84163	1	Personnel Entry Gate Assembly
9	50262	4	Bolt, HHCS M06-1.00 x 050
10	19239	2	Hinge Spacer
11	50047	18	Nut, M06x1.00 08 Zp Nylock
12	84148	4	Rail Corner Reinforcement
13	50286	8	Bolt, BHCS M12-1.75 x 50
14	22458	8	Rail Cap
15	22459	4	Rail Corner

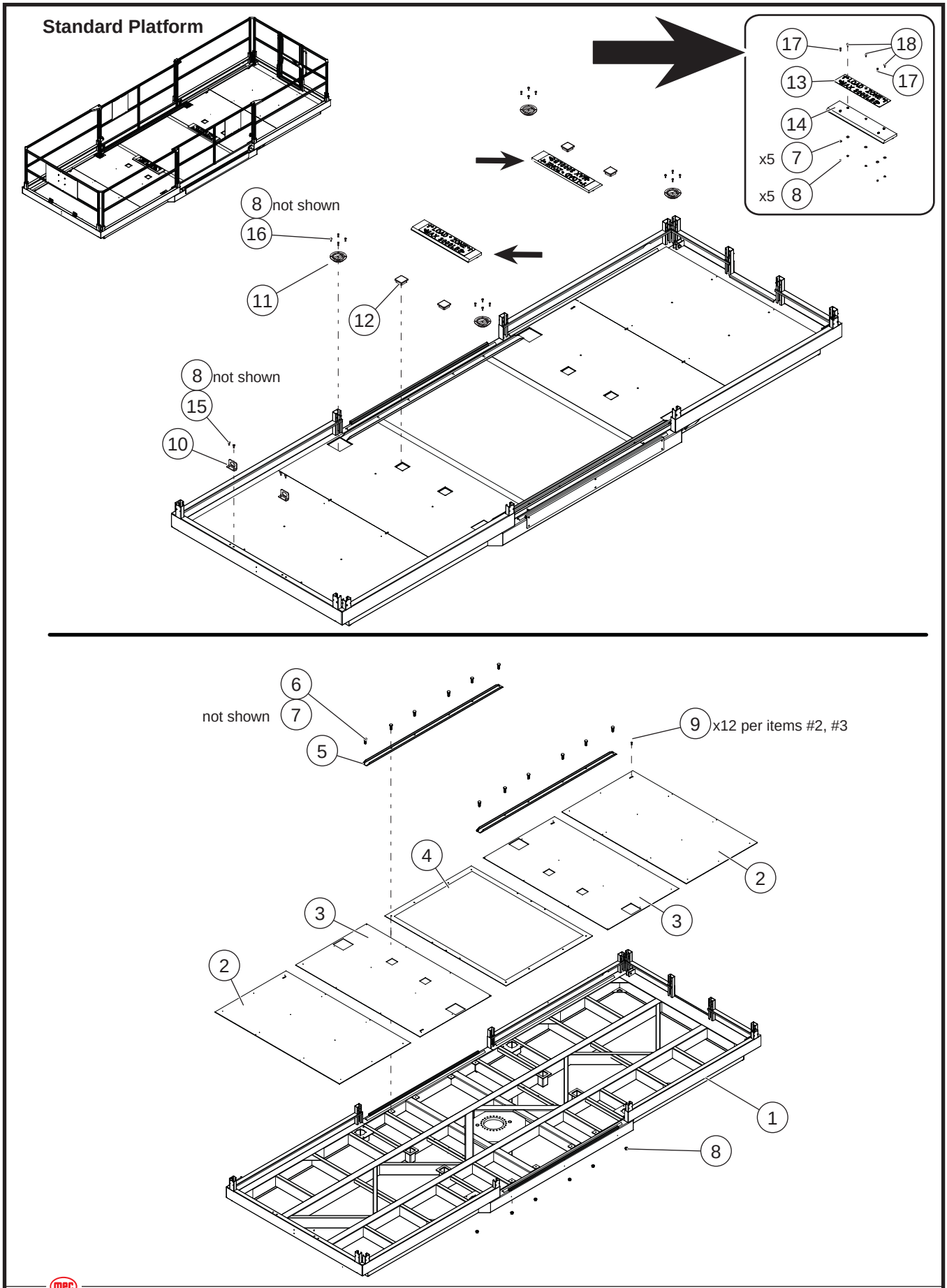


ILLUSTRATION No. ART_3604

TITAN BOOM 40-S

Deck Components, 1 of 2

Standard Platform, Deck Components, 1 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	22095	1	Platform Weldment
2	22420	2	Deck Plate, Outer
3	22419	2	Deck Plate, Inner
4	22281	1	Deck Plate, Load Zone
5	22463	2	Channel, Lanyard
6	50309	12	Screw, BHCS M10 x 40
7	50002	17	Washer, M10 Std
8	50049	37	Nut, M10 Nylock
9	92251	48	Rivet, SSB8-8S
10	3923	2	Bracket, Lanyard
11	92090	4	D-Ring, Swivel
12	92454	4	Socket Cap
13	22484	2	Plate, Load Zone
14	22426	2	Stop Block, Load Zone
15	50033	4	Bolt, HHCS M10 x 25
16	50031	16	Bolt, HHCS M8 x 25
17	50036	6	Bolt, HHCS M10 x 50
18	50209	4	Bolt, HHCS M10 x 100

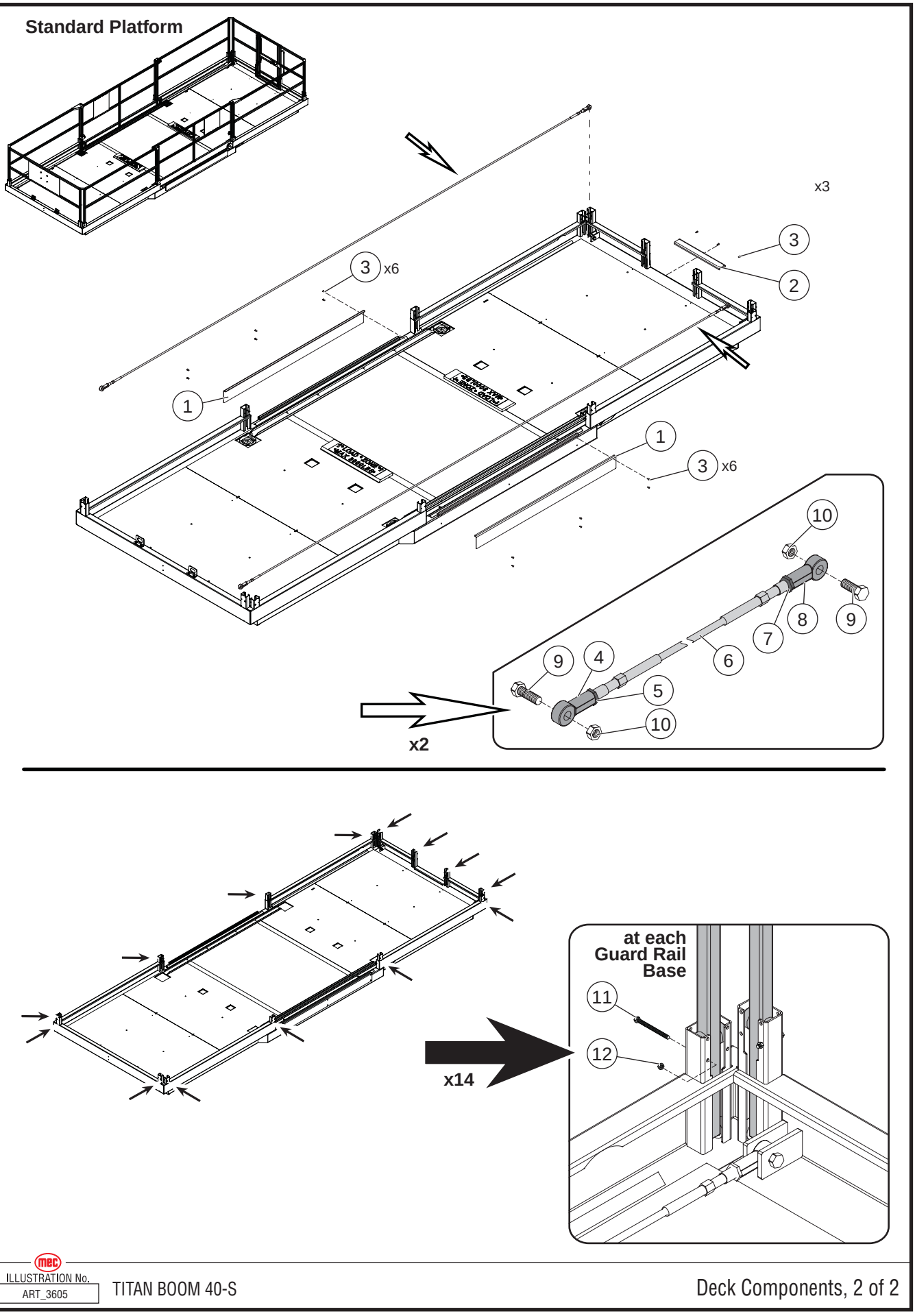


ILLUSTRATION No. ART_3605

TITAN BOOM 40-S

Deck Components, 2 of 2

Standard Platform, Deck Components, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	22379	2	Trim, Loading Gate
2	22545	1	Raised Entry
3	92251	15	Rivet, SSB8-8S
4	92091	2	Heim Joint, 3/4" Right-Hand
5	92094	2	Jam nut, 3/4" Right-Hand
6	92093	2	Cable, Lanyard Attachment
7	92095	2	Jam nut, 3/4" Left-Hand
8	92092	2	Heim Joint, 3/4" Left-Hand
9	50304	4	Bolt, HHCS 3/4" x 2.5"
10	50118	4	Nut, 3/4" Nylock
11	50125	14	Bolt, HHCS M6 x 55
12	50047	14	Nut, M6 Nylock

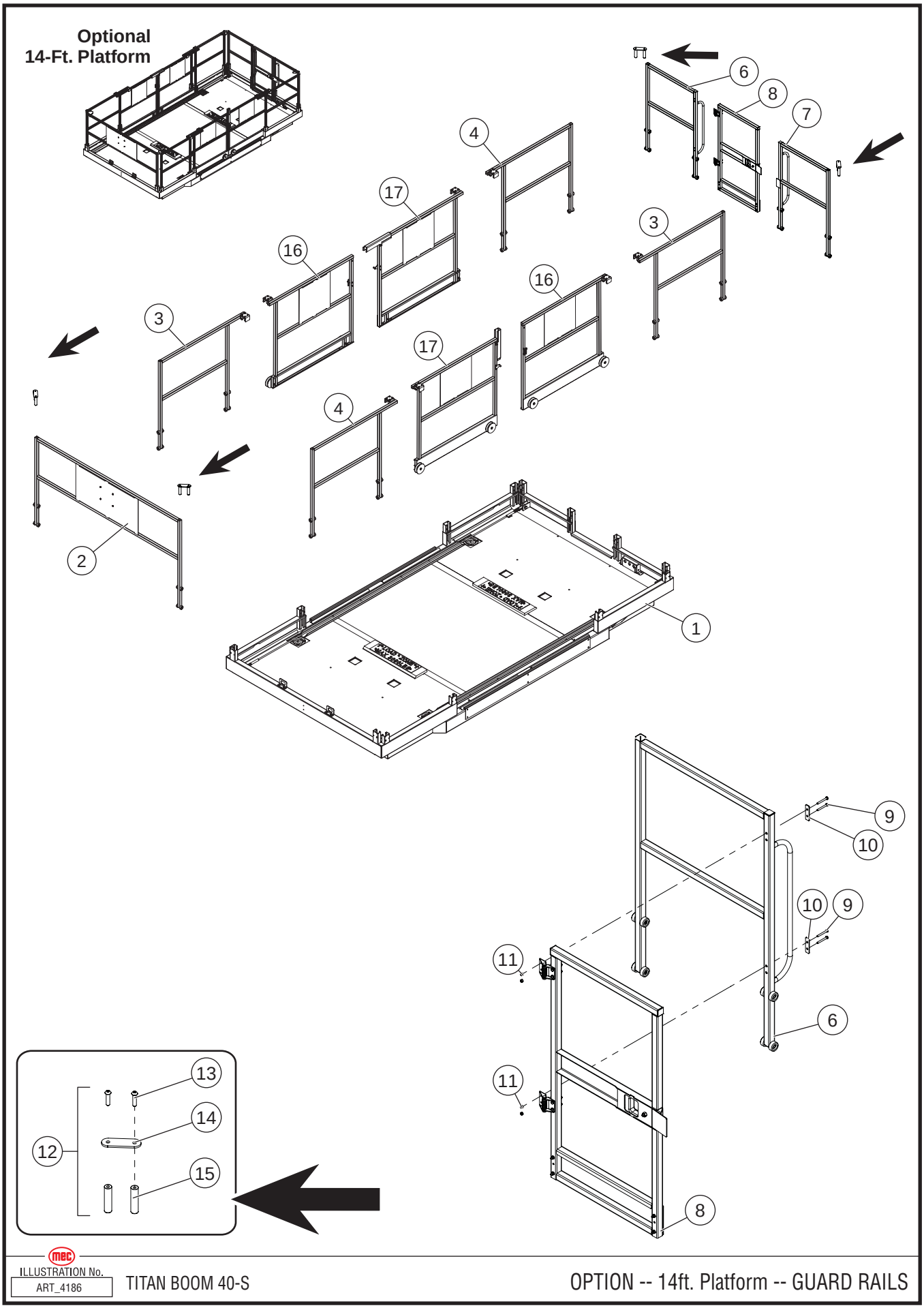


ILLUSTRATION No. ART_4186

TITAN BOOM 40-S

OPTION -- 14ft. Platform -- GUARD RAILS

OPTION -- 14Ft. Platform, Guardrails

ITEM	PART NO.	QTY	DESCRIPTION
--	84224	1	14-Ft. Platform/Guardrail Assembly
1	REF	1	Platform
2	84159	1	Front Rail Assembly
3	84226	2	Right Side Rail Assembly
4	84229	2	Left Side Rail Assembly
5	--	--	--
6	84164	1	Right Rear Rail Assembly
7	84165	1	Left Rear Rail Assembly
8	84163	1	Personnel Entry Gate Assembly
9	50262	4	Bolt, HHCS M06-1.00 x 050
10	19239	2	Hinge Spacer
11	50047	18	Nut, M06x1.00 08 Zp Nylock
12	84148	4	Rail Corner Reinforcement
13	50286	8	Bolt, BHCS M12-1.75 x 50
14	22458	8	Rail Cap
15	22459	4	Rail Corner
16	84227	2	Left Side Gate Assembly
17	84228	2	Right Side Gate Assembly

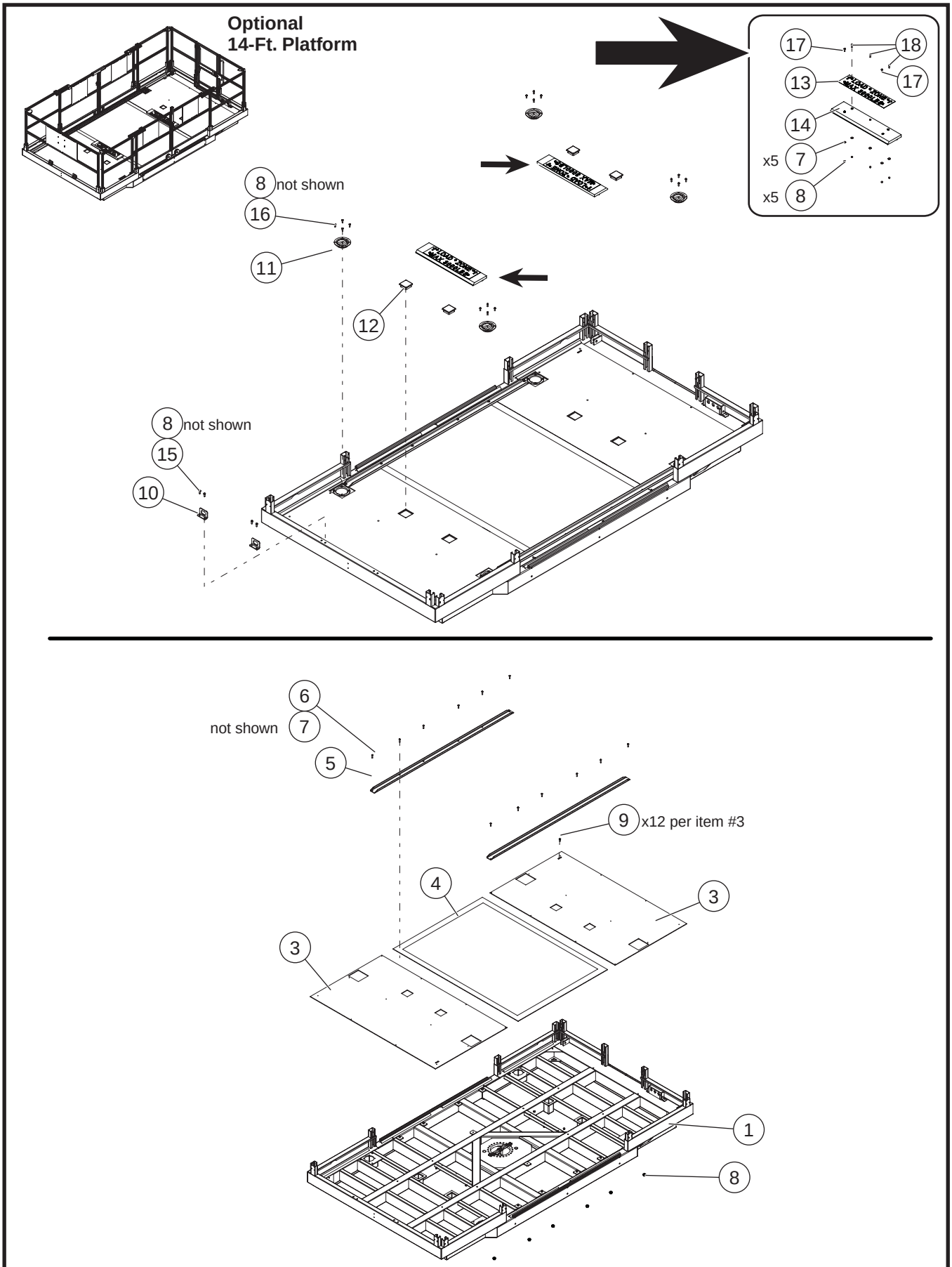


ILLUSTRATION No. ART_4187

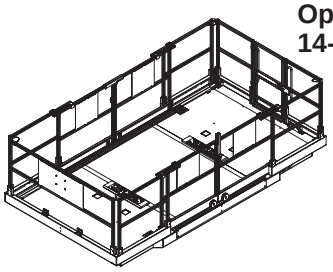
TITAN BOOM 40-S

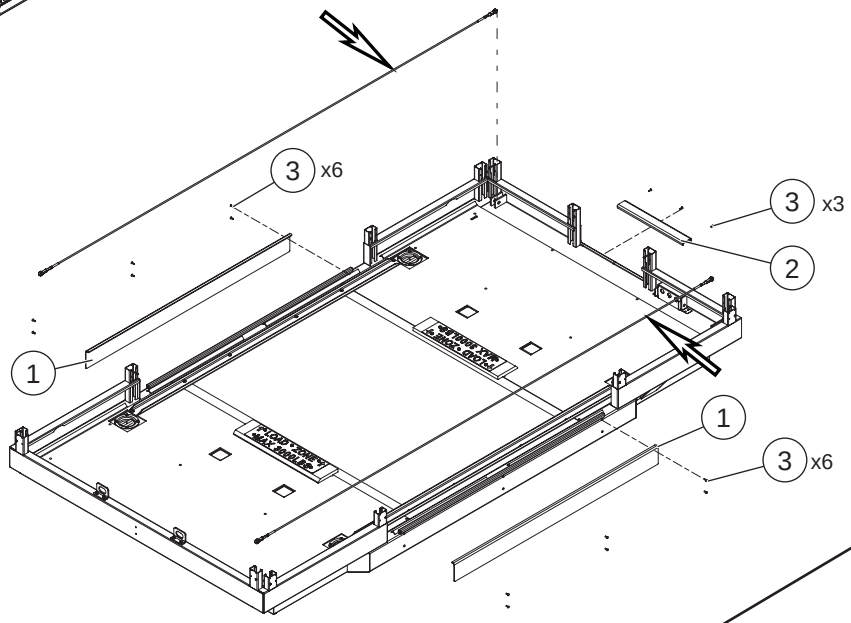
OPTION -- 14ft. Platform -- Deck Components, 1 of 2

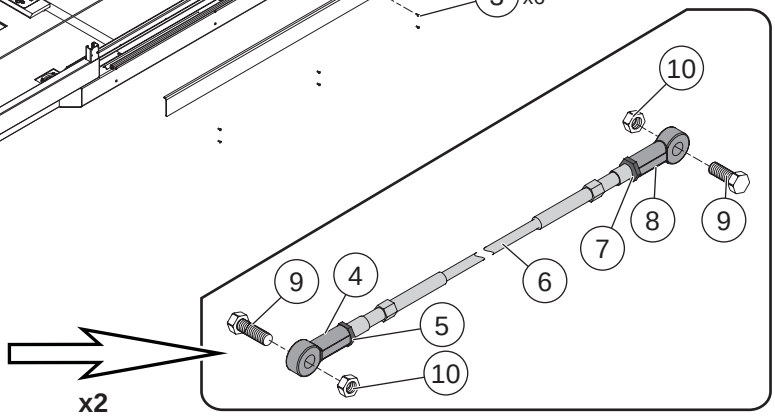
OPTION -- 14Ft. Platform, Deck Components, 1 of 2

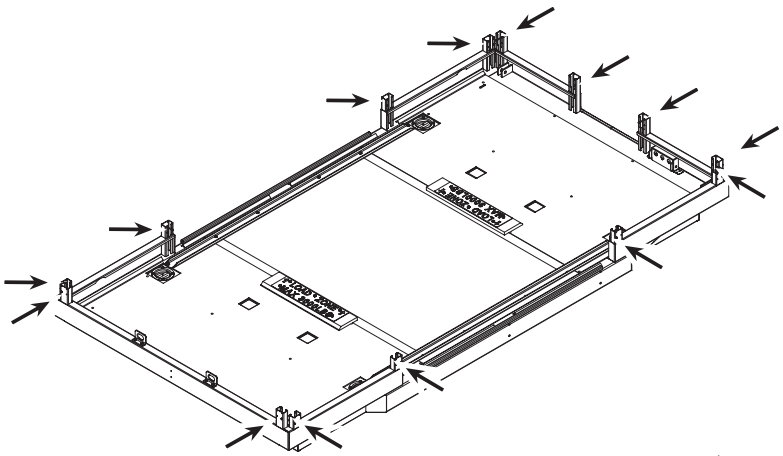
ITEM	PART NO.	QTY	DESCRIPTION
1	22701	1	Platform Weldment
2	--	--	--
3	22419	2	Deck Plate
4	22281	1	Deck Plate, Load Zone
5	22463	2	Channel, Lanyard
6	50309	12	Screw, BHCS M10 x 40
7	50002	17	Washer, M10 Std
8	50049	37	Nut, M10 Nylock
9	92251	24	Rivet, SSB8-8S
10	3923	2	Bracket, Lanyard
11	92090	4	D-Ring, Swivel
12	92454	4	Socket Cap
13	22484	2	Plate, Load Zone
14	22426	2	Stop Block, Load Zone
15	50033	4	Bolt, HHCS M10 x 25
16	50031	16	Bolt, HHCS M8 x 25
17	50036	6	Bolt, HHCS M10 x 50
18	50209	4	Bolt, HHCS M10 x 100

Optional
14-Ft. Platform









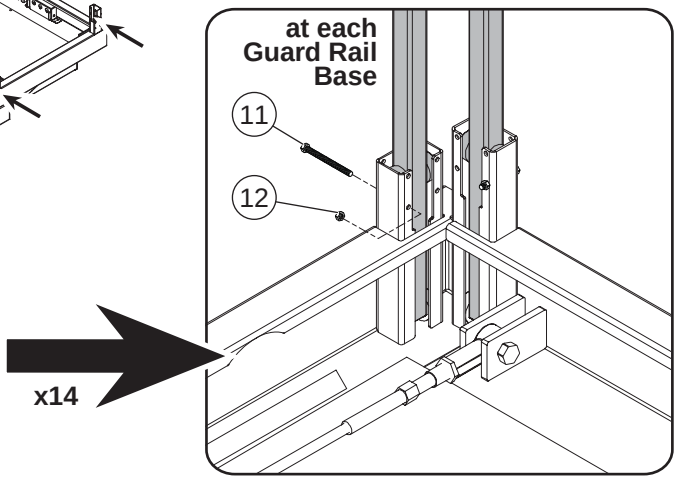


ILLUSTRATION No. ART_4188

TITAN BOOM 40-S

OPTION -- 14ft. Platform -- Deck Components, 2 of 2

OPTION -- 14Ft. Platform, Deck Components, 2 of 2

ITEM	PART NO.	QTY	DESCRIPTION
1	22379	2	Trim, Loading Gate
2	22545	1	Raised Entry
3	92251	15	Rivet, SSB8-8S
4	92091	2	Heim Joint, 3/4" Right-Hand
5	92094	2	Jam nut, 3/4" Right-Hand
6	92862	2	Cable, Lanyard Attachment
7	92095	2	Jam nut, 3/4" Left-Hand
8	92092	2	Heim Joint, 3/4" Left-Hand
9	50304	4	Bolt, HHCS 3/4" x 2.5"
10	50118	4	Nut, 3/4" Nylock
11	50125	14	Bolt, HHCS M6 x 55
12	50047	14	Nut, M6 Nylock

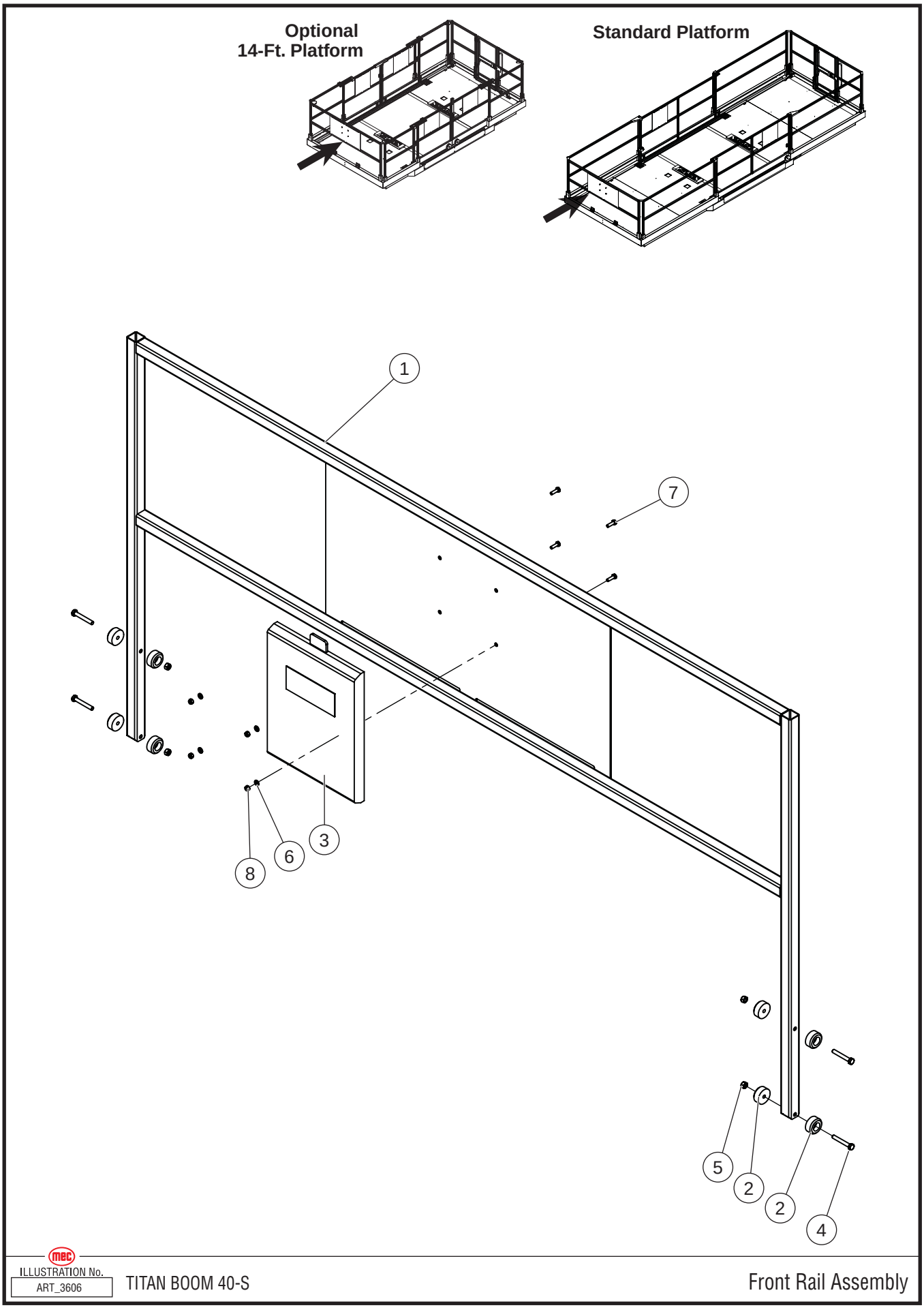


ILLUSTRATION No.
ART_3606

TITAN BOOM 40-S

Front Rail Assembly

Front Rail Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
--	84159	--	Front Rail Assembly
1	22363	1	Front Rail Weldment
2	19131	8	Puck
3	8909	1	Enclosure Service Manual
4	50016	4	Bolt, HHCS M08-1.25X055
5	50048	4	Nut, M08X1.25 Nylock
6	50000	8	Washer, M06 Std
7	50028	4	Bolt, HHCS M06-1.00X020
8	50047	4	Nut, M06X1.00 Nylock

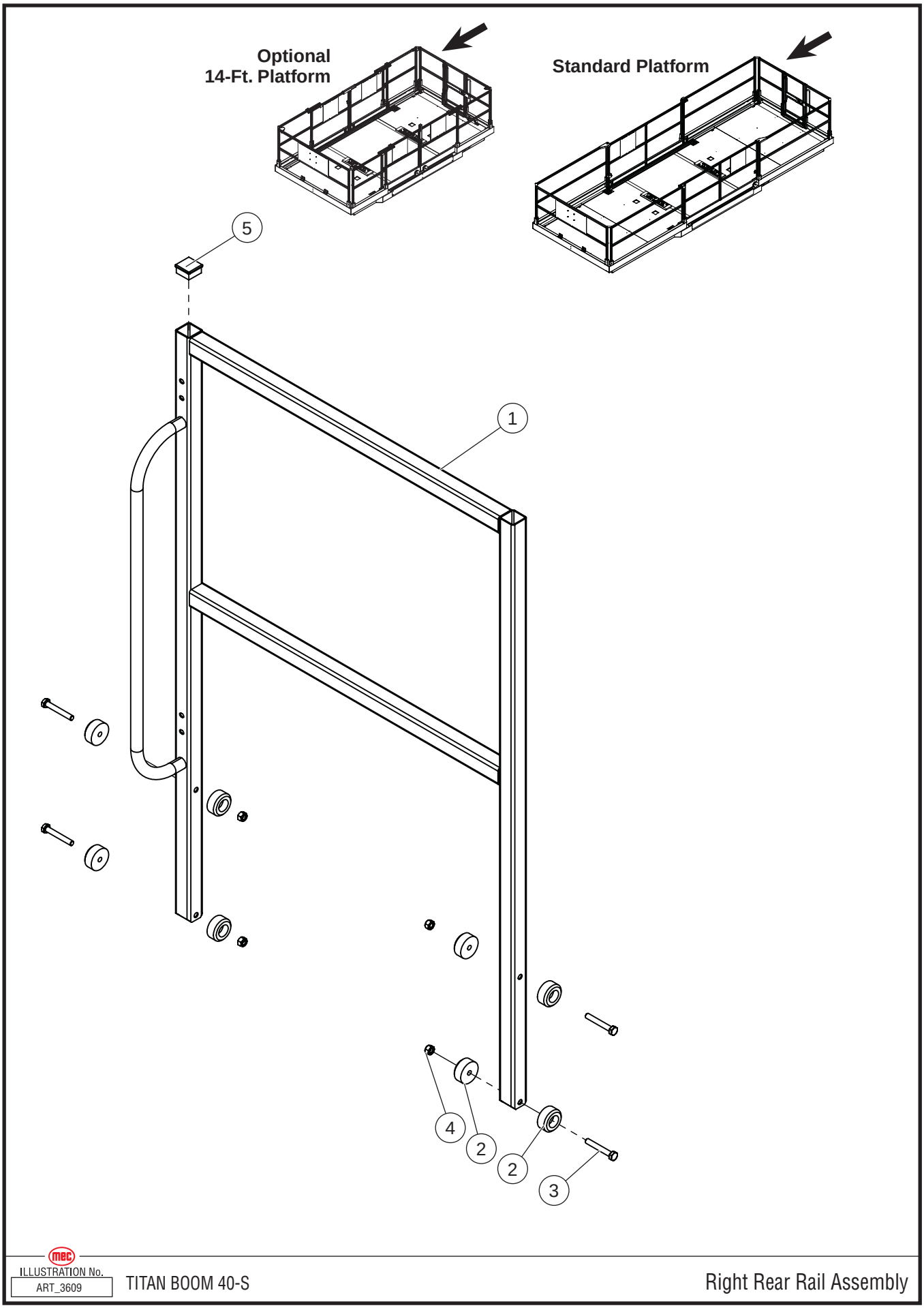


ILLUSTRATION No. ART_3609

TITAN BOOM 40-S

Right Rear Rail Assembly

Right Rear Rail Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
--	84164	--	Right Rear Rail Assembly
1	22361	1	Right Rear Rail Weldment
2	19131	8	Puck
3	50016	4	Bolt, HHCS M08-1.25x055 08 Zp P
4	50048	4	Nut, M08x1.25 08 Zp Nylock
5	6823	1	Cap Plug 1-1/4” Sq. Tube

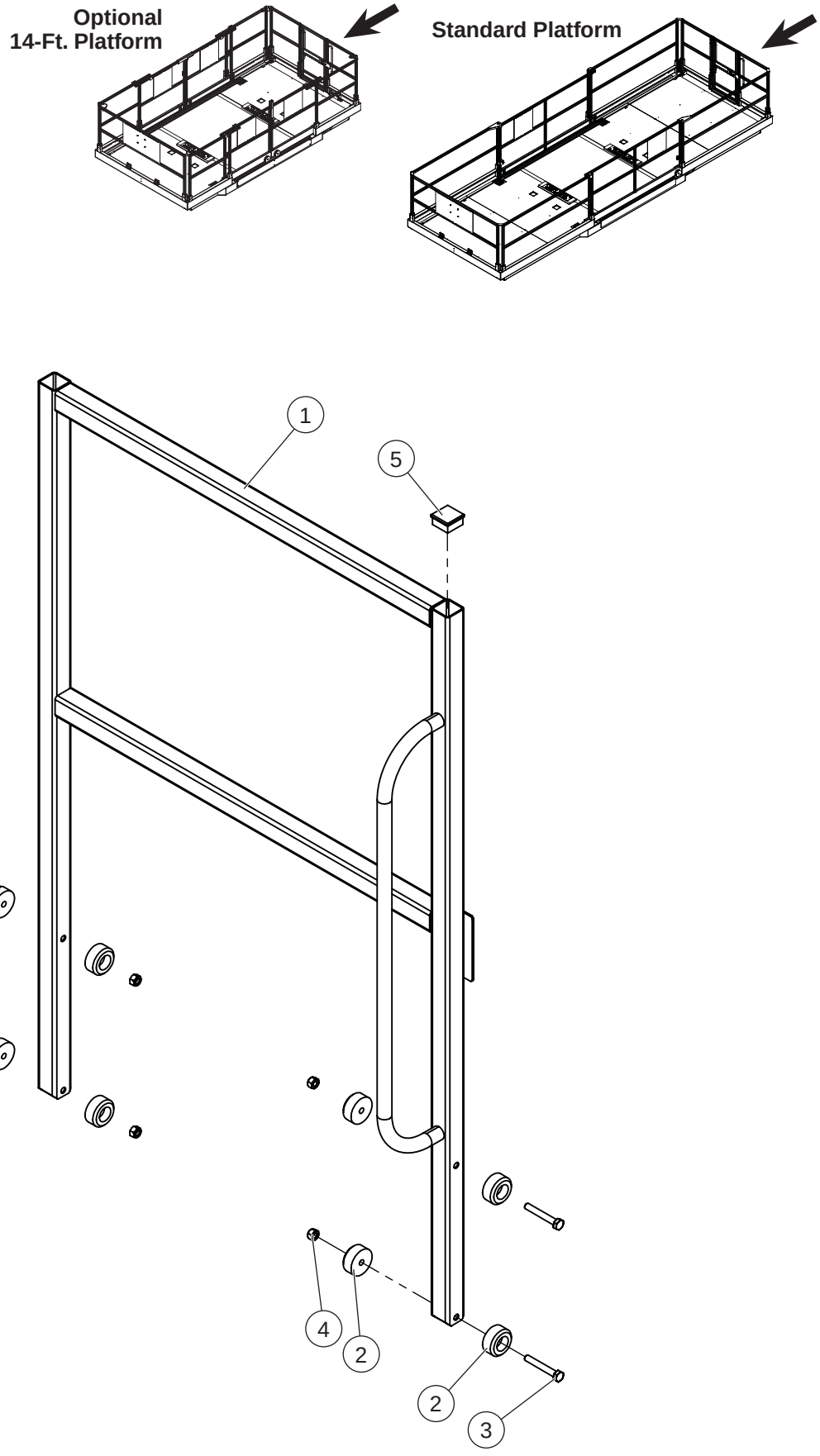


ILLUSTRATION No.
ART_3610

TITAN BOOM 40-S

Left Rear Rail Assembly

Left Rear Rail Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
--	84165	--	Left Rear Rail Assembly
1	22355	1	Left Rear Rail Weldment
2	19131	8	Puck
3	50016	4	Bolt, HHCS M08-1.25x055 08 Zp P
4	50048	4	Nut, M08x1.25 08 Zp Nylock
5	6823	1	Cap Plug 1-1/4” Sq. Tube

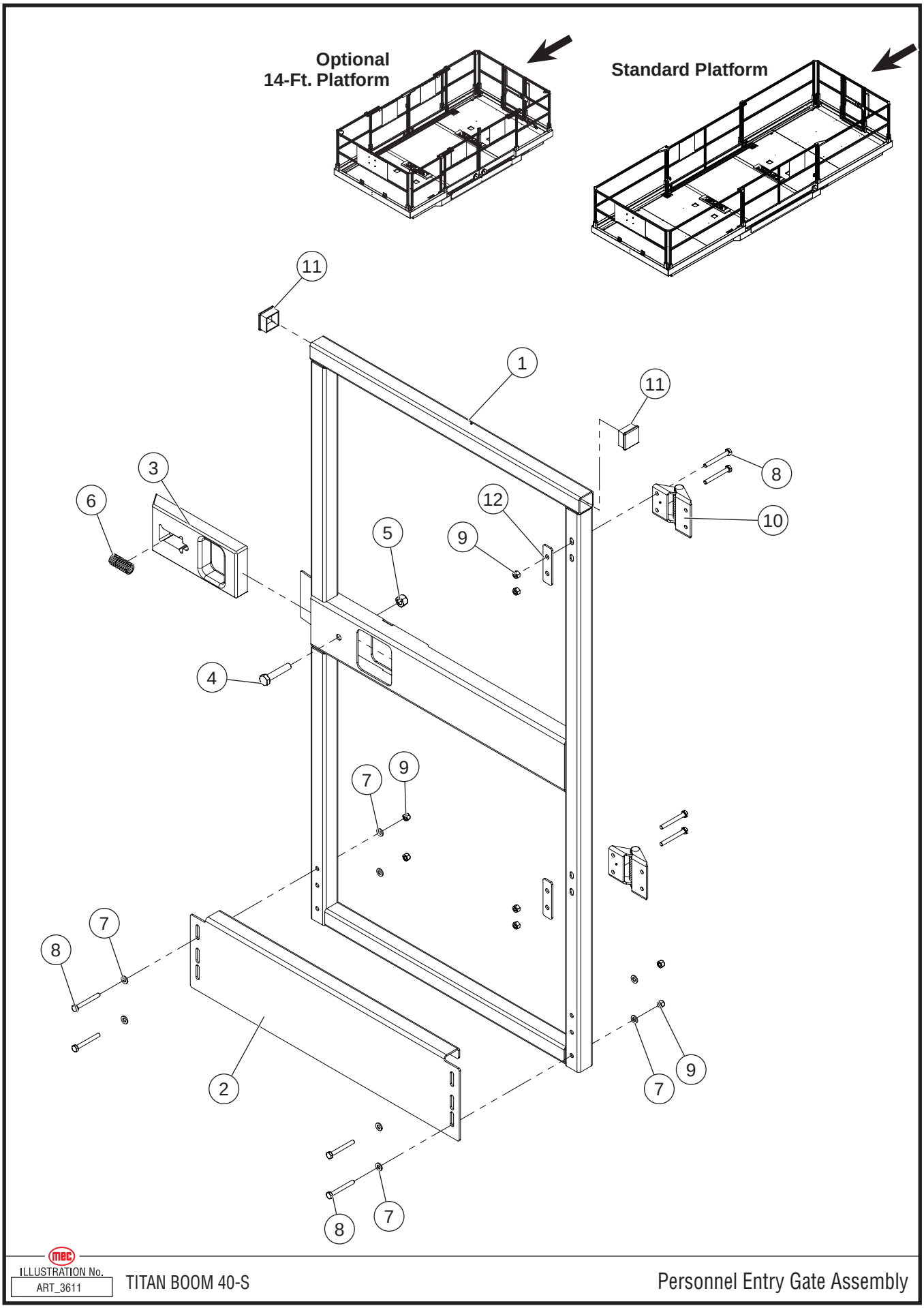


ILLUSTRATION No. ART_3611

TITAN BOOM 40-S

Personnel Entry Gate Assembly

Personnel Entry Gate Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
--	84163	--	Entry Gate Assembly
1	22366	1	Weldment, Entry
2	22372	1	Formed, Entry
3	16799	1	Gate Latch
4	50036	1	Bolt, HHCS M10-1.50x050 08 Zp F
5	50049	1	Nut, M10x1.50 08 Zp Nylock
6	7408	1	Spring
7	50000	8	Washer M06 Zp Standard Flat
8	50262	8	Bolt, HHCS M06-1.00x050 08 Zp F
9	50047	8	Nut, M06x1.00 08 Zp Nylock
10	91629	2	Gate Hinge
11	6823	2	Cap Plug 1-1/4” Sq. Tube
12	19239	2	Hinge Spacer

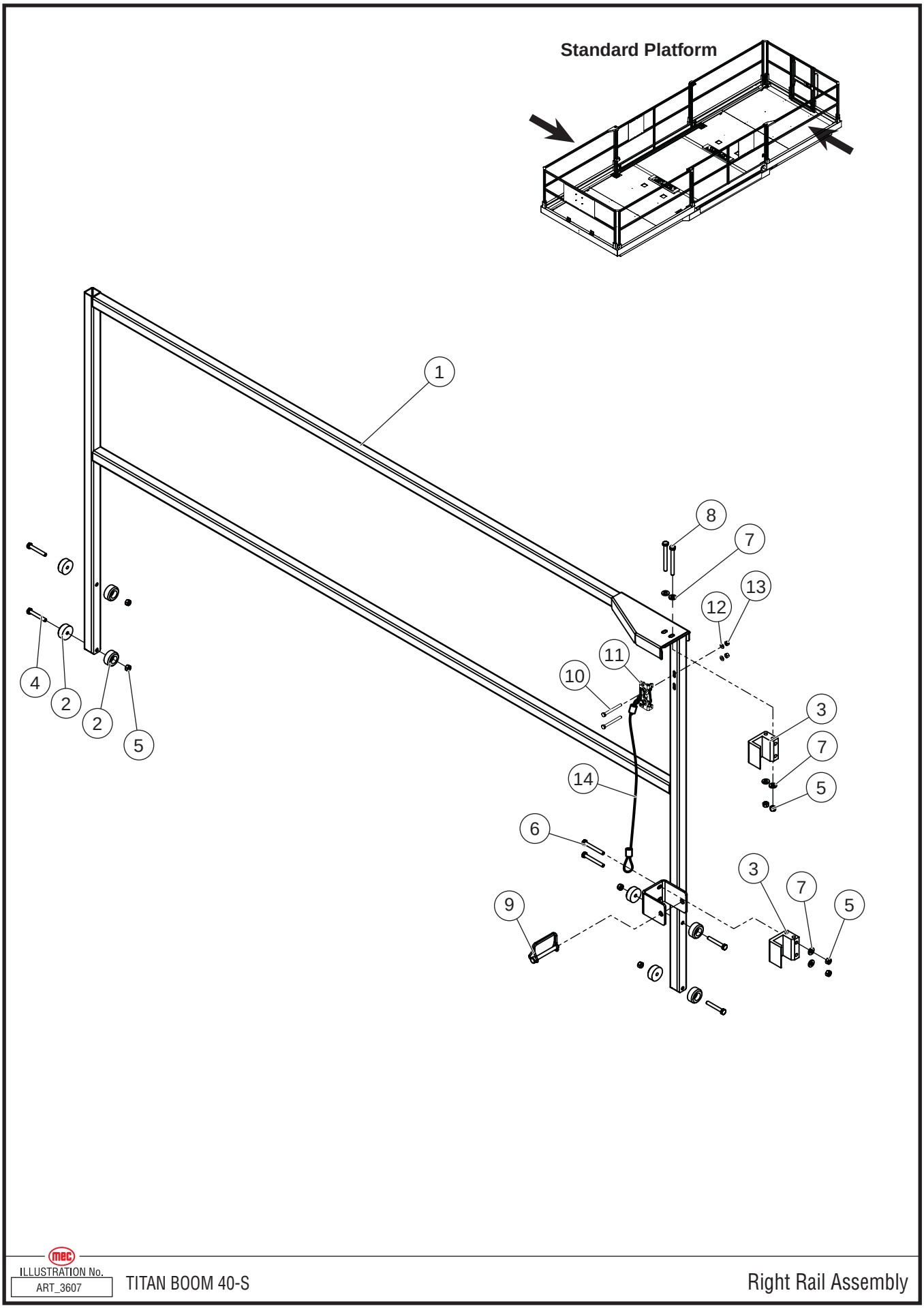


ILLUSTRATION No. ART_3607

TITAN BOOM 40-S

Right Rail Assembly

Right Side Rail Assembly, Standard Platform

ITEM	PART NO.	QTY	DESCRIPTION
--	84160	--	Right Side Rail Assembly
1	22354	1	Right Side Rail Weldment
2	19131	8	Puck
3	22318	2	Load Gate Guide
4	50016	4	Bolt, HHCS M08-1.25X055
5	50048	8	Nut, M08x1.25 Nylock
6	50251	2	Bolt, HHCS M08-1.25x065
7	50001	8	Washer, M08 Std
8	50018	2	Bolt, HHCS M08-1.25x080 08
Machines will have either Item #9 or Items #10-#14			
9	50186	1	Pin Wire Lock 0.375 X 3.25
10	50125	2	Bolt, BHCS M6 x 55
11	92302	1	Door Catch
12	50000	2	Washer, M6 Std
13	50047	2	Nut, M6 Nylock
14	22628	1	Cable

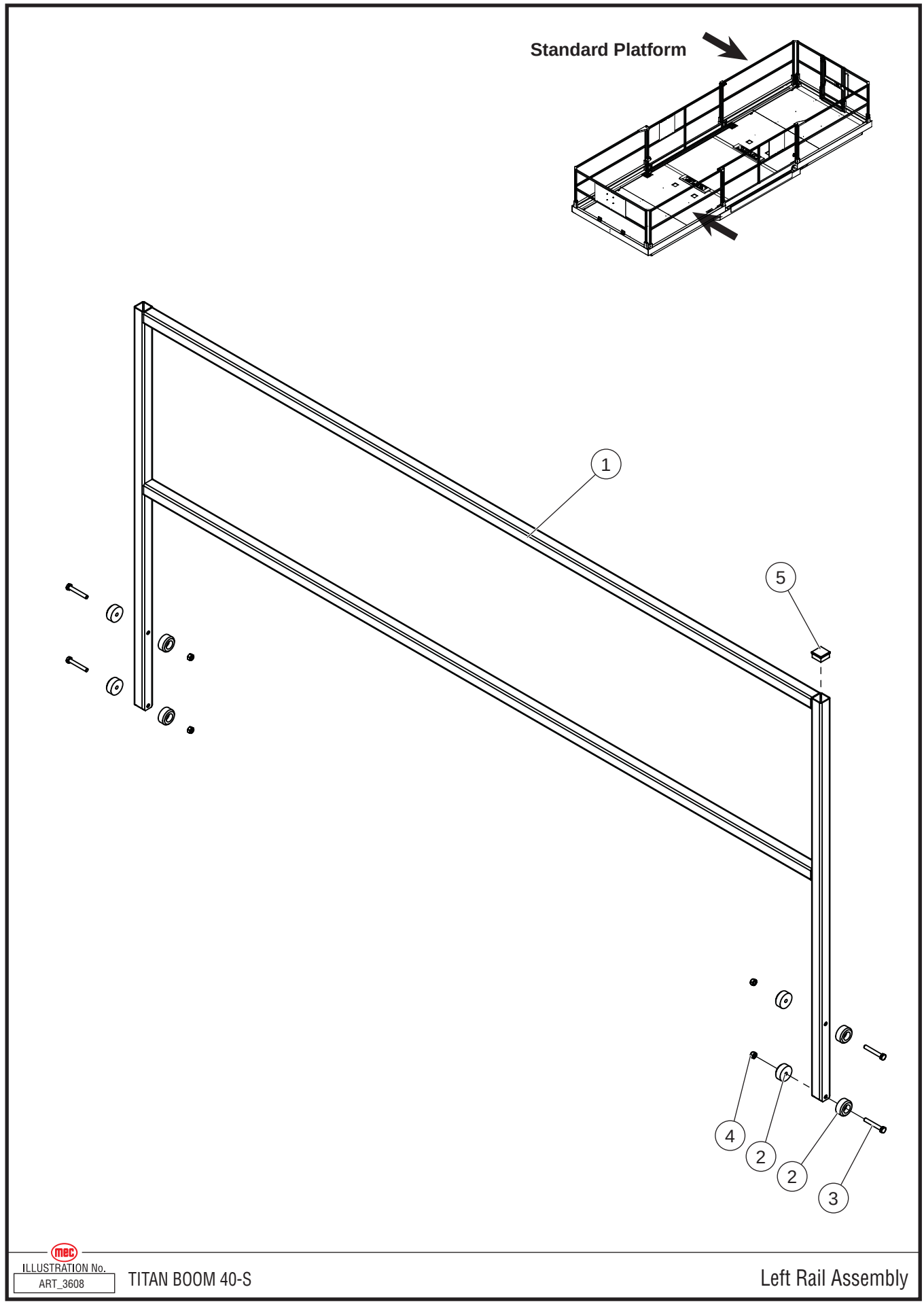


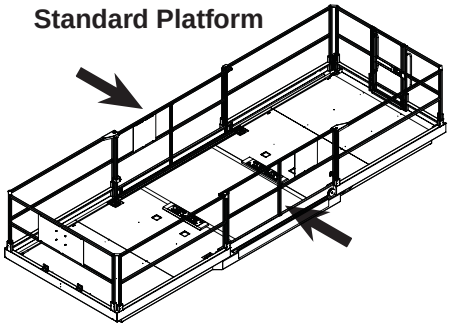
ILLUSTRATION No.
ART_3608

TITAN BOOM 40-S

Left Rail Assembly

Left Side Rail Assembly, Standard Platform

ITEM	PART NO.	QTY	DESCRIPTION
--	84161	--	Left Side Rail Assembly
1	22350	1	Weldment, Side
2	19131	8	Puck
3	50016	4	Bolt, HHCS M08-1.25x055 08
4	50048	4	Nut, M08x1.25 08 Zp Nylock
5	6823	1	Cap Plug 1-1/4” Sq. Tube



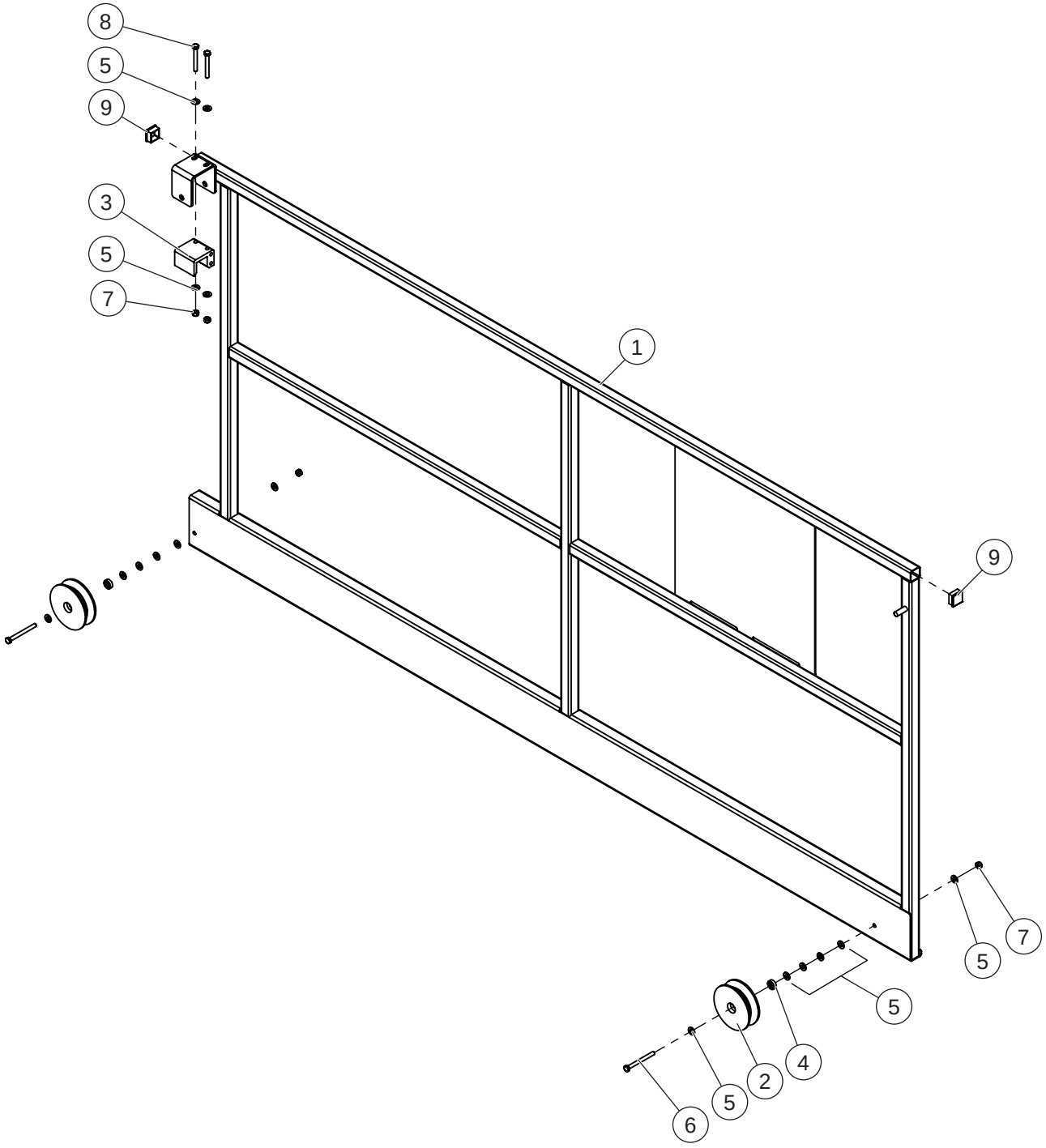


ILLUSTRATION No.
ART_3612

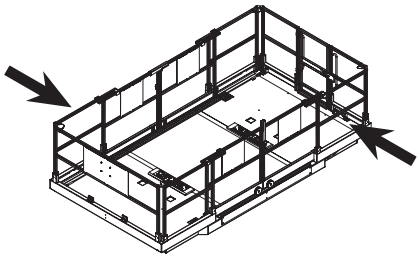
TITAN BOOM 40-S

Sliding Gate Assembly

Sliding Gate Assembly, Standard Platform

ITEM	PART NO.	QTY	DESCRIPTION
--	84162	--	Sliding Gate Assembly
1	22115	1	Sliding Gate
2	22325	2	Gate Guide
3	22318	1	Load Gate Guide
4	92250	2	Bearing
5	50001	16	Washer, M08 Zp Standard Flat
6	50019	2	Bolt, HHCS M08-1.25x085 08 Zp P
7	50048	4	Nut, M08x1.25 08 Zp Nylock
8	50251	2	Bolt, HHCS M08-1.25x065 08 Zp P
9	6823	2	Cap Plug 1-1/4” Sq. Tube

Optional
14-Ft. Platform



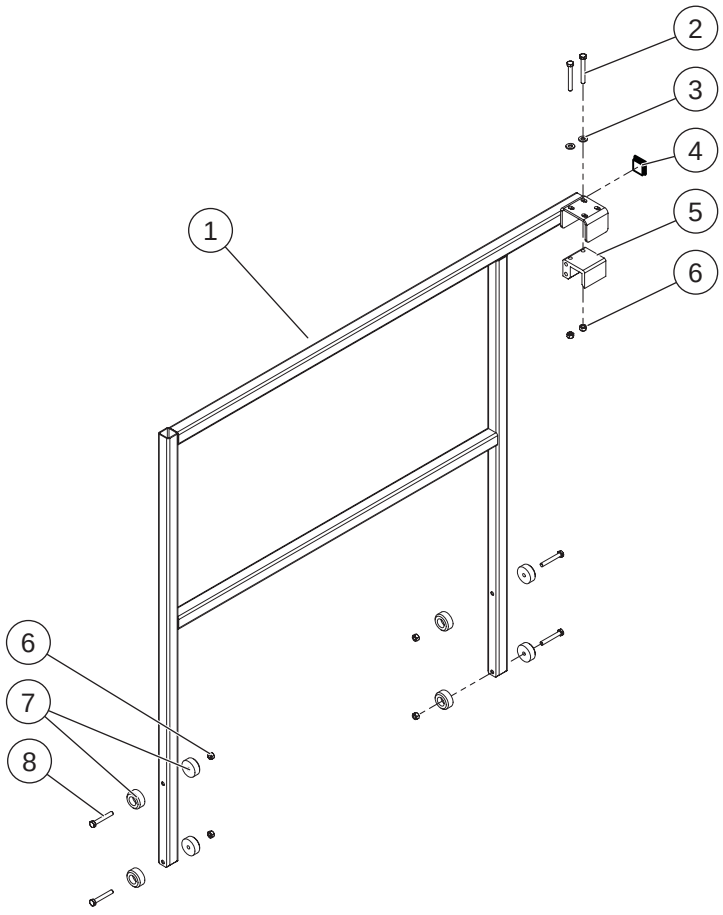


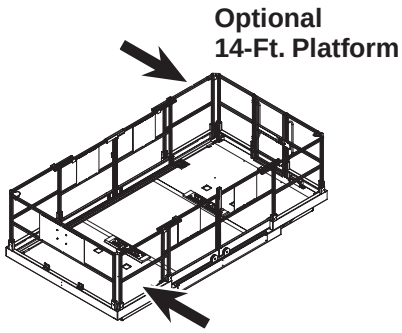
ILLUSTRATION No. ART_4189

TITAN BOOM 40-S

Right Side Rail Assembly, Optional 14ft. Platform

Right Side Rail Assembly, Optional 14-Ft. Platform

ITEM	PART NO.	QTY	QTY PER MACH	DESCRIPTION
--	84226	1	2	Right Side Rail Assembly
1	22711	1	2	Right Side Rail Weldment
2	50251	2	4	Bolt, HHCS M8 x 65
3	50001	2	4	Washer, M8 Std.
4	6823	1	2	Cap, 1.25” square
5	22318	1	2	Guide, Load Gate
6	50048	6	12	Nut, M8 Nylock
7	19131	4	8	Puck
8	50016	4	8	Bolt, HHCS M8 x 55



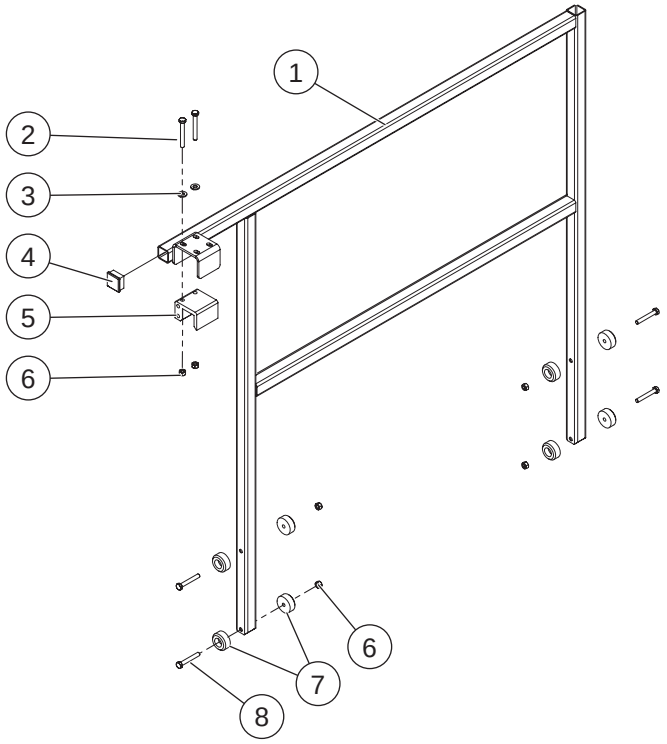


ILLUSTRATION No.
ART_4190

TITAN BOOM 40-S

Left Side Rail Assembly, Optional 14ft. Platform

Left Side Rail Assembly, Optional 14-Ft. Platform

ITEM	PART NO.	QTY	QTY PER MACH	DESCRIPTION
--	84229	1	2	Left Side Rail Assembly
1	22700	1	2	Left Side Rail Weldment
2	50251	2	4	Bolt, HHCS M8 x 65
3	50001	2	4	Washer, M8 Std.
4	6823	1	2	Cap, 1.25” square
5	22318	1	2	Guide, Load Gate
6	50048	6	12	Nut, M8 Nylock
7	19131	4	8	Puck
8	50016	4	8	Bolt, HHCS M8 x 55

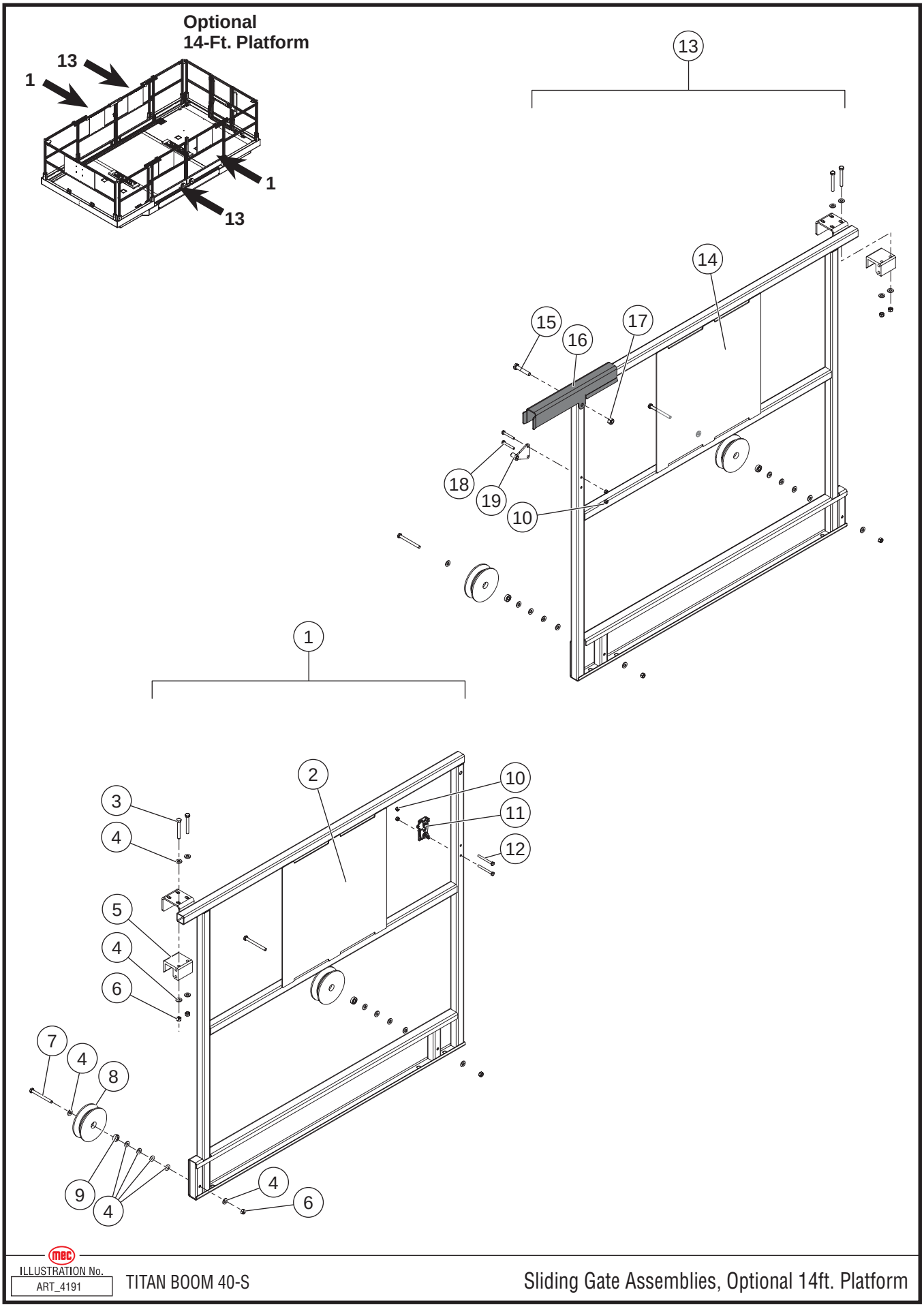


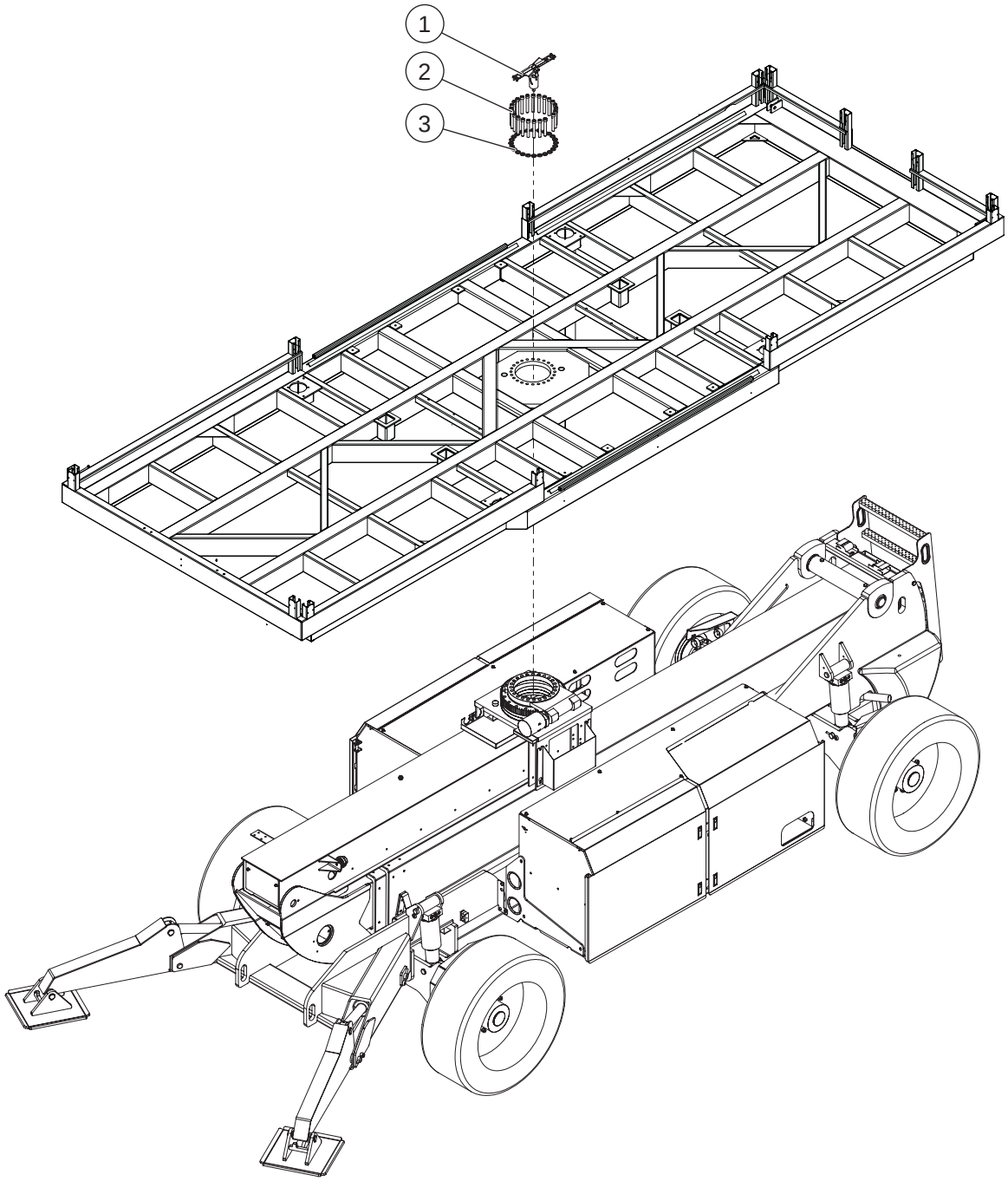
ILLUSTRATION No. ART_4191

TITAN BOOM 40-S

Sliding Gate Assemblies, Optional 14ft. Platform

Sliding Gate Assemblies, Optional 14-Ft Platform

ITEM	PART NO.	QTY	QTY PER MACH	DESCRIPTION
1	84227	1	2	Left Side Gate Assembly
2	22712	1	2	Left Side Gate Weldment
3	50251	4	8	Bolt, HHCS M8 x 65
4	50001	32	64	Washer, M8 Std
5	22318	2	4	Load Gate Guide
6	50048	8	16	Nut, M8 Nylock
7	50019	4	8	Bolt, HHCS M8 x 85
8	22325	4	8	Guide Roller
9	92250	4	8	Bearing
10	50047	4	8	Nut, M6 Nylock
11	92302	1	2	Gate Latch
12	50028	2	4	Bolt, HHCS M6 x 20
13	84228	1	2	Right Side Gate Assembly
14	22722	1	2	Right Side Gate Weldment
15	50021	1	2	Bolt, HHCS M10 x 55
16	22724	1	2	Gate Support
17	50049	1	2	Nut, M10 Nylock
18	50294	2	4	Bolt, HHCS M6 x 45
19	22719	1	2	Gate Striker



Deck components removed for clarity.
It is only necessary to remove the central
Load Zone plate to access these parts.

ILLUSTRATION No.
ART_3627

TITAN BOOM 40-S

Platform/Cantilever Assembly

Platform/Cantilever Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	1	Rotation Sensor Assembly -- See page 37
2	50263	23	Bolt, SHCS M16-2.00 x 110
3	50261	23	Washer, M16 Hardened

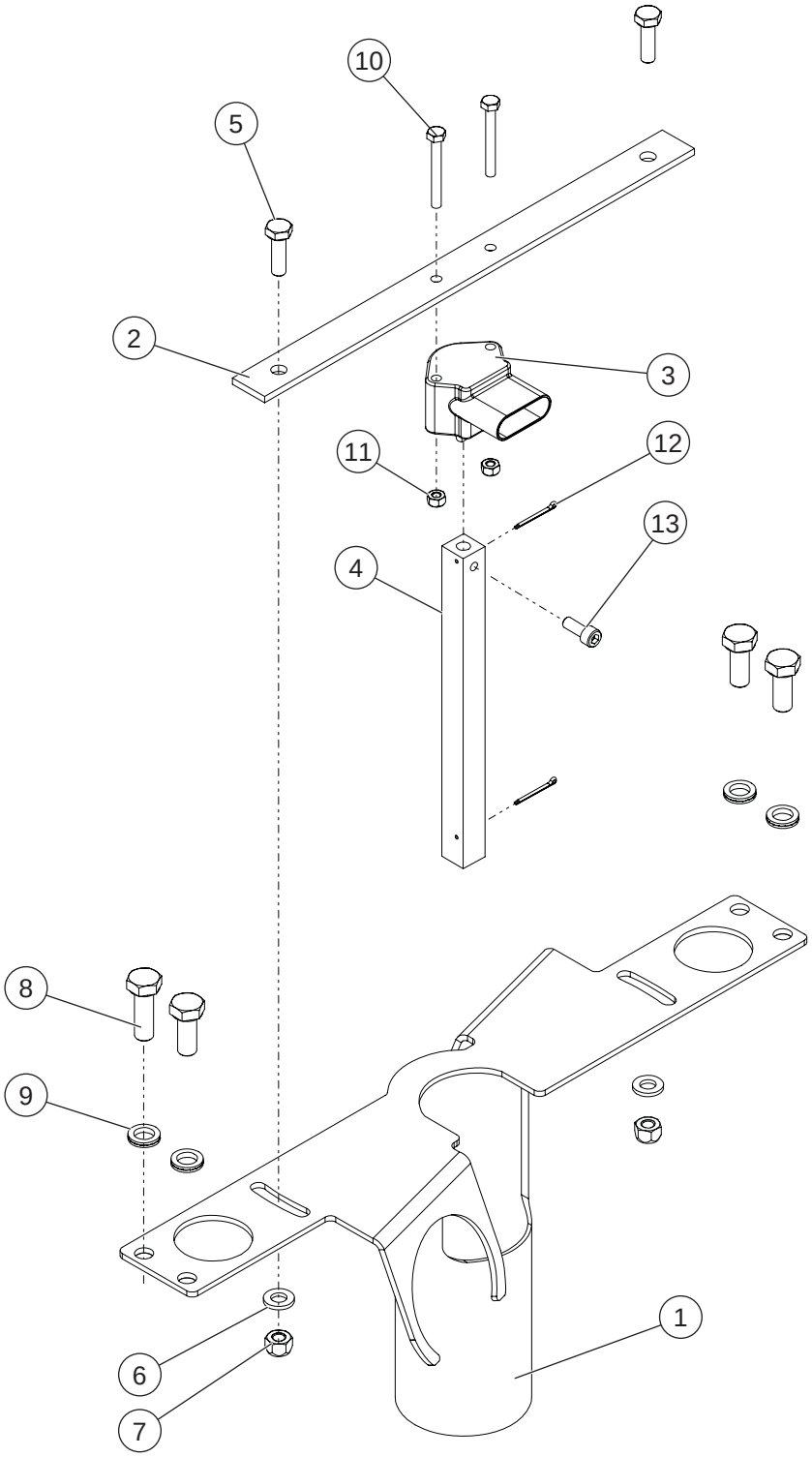


ILLUSTRATION No. ART_3613

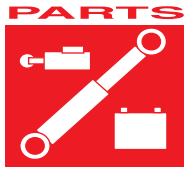
TITAN BOOM 40-S

Rotational Sensor Assembly

Rotation Sensor Assembly, All Machines

ITEM	PART NO.	QTY	DESCRIPTION
1	22533	1	Rotation Wire Guide Weldment
2	22536	1	Rotation Sensor Mount
3	92220	1	Rotation Position Sensor
4	22537	1	Rotation Shaft
5	50028	8	Bolt, HHCS M06-1.00x020
6	50000	26	Washer, M06 Zp Standard Flat
7	50047	16	Nut, M06x1.00 Nylock
8	50030	5	Bolt, HHCS M8-1.25 X 20
9	50200	9	Washer, M08 Zp Nordlock
10	50307	2	Bolt, HHCS M04-0.70x035
11	50285	2	Nut, M04x0.70 08 Zp Nylock
12	92276	2	Cotter Pin, 1/16” x 0.75”
13	50326	1	Bolt, SHCS #10-32 X 0.5”

NOTES:



SECTION D

AXLES

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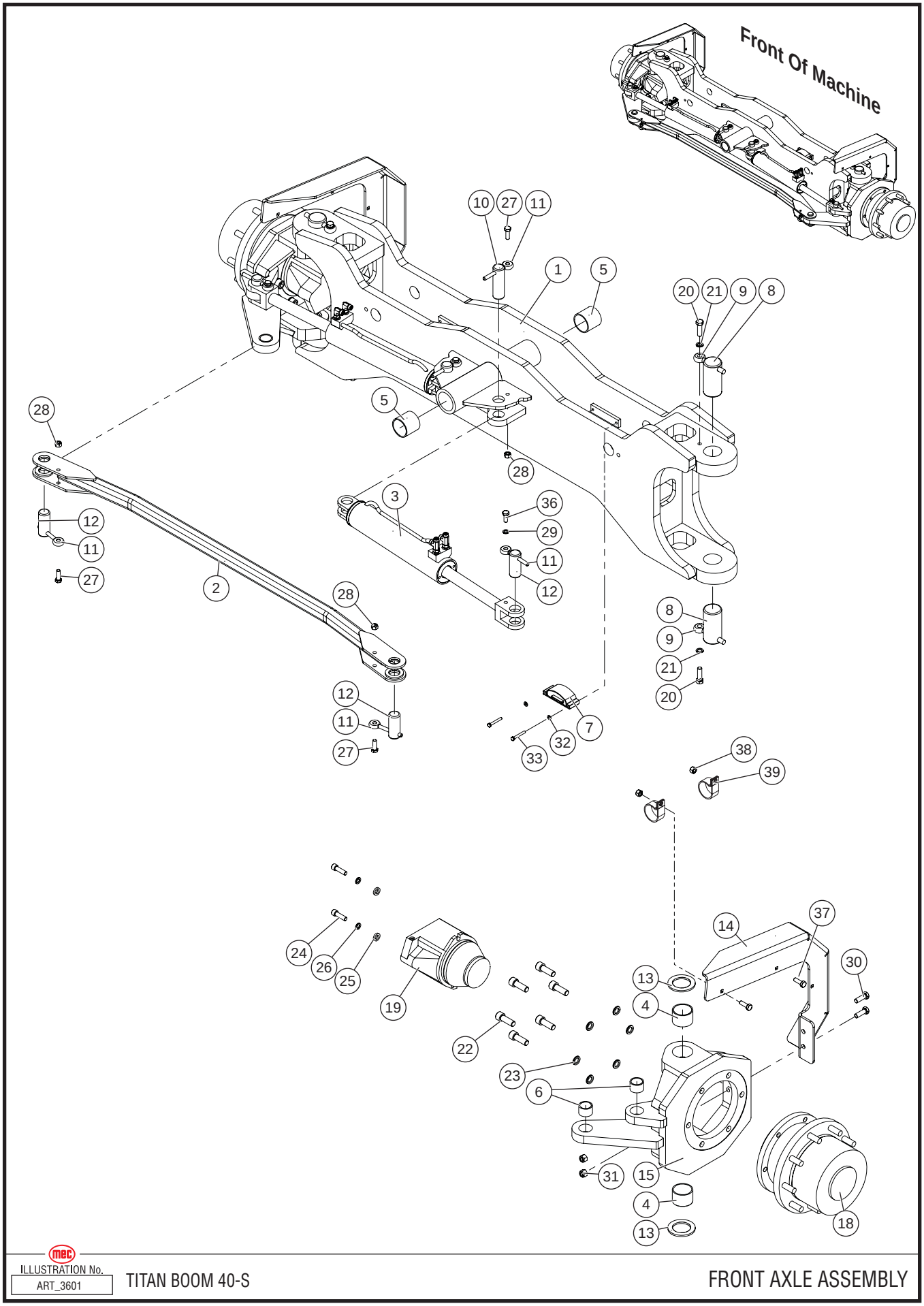


ILLUSTRATION No. ART_3601

TITAN BOOM 40-S

FRONT AXLE ASSEMBLY

Front Axle Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84152	1	Front Axle Assembly
1	18022	1	Front Axle
2	18028	1	Tie Rod
3	REF	2	Steering Cylinder -- See SECTION E
4	92108	4	Sleeve Bearing
5	92110	2	Sleeve Bearing
6	92109	4	Sleeve Bearing
7	91961	1	**SERIAL # ~12400101 --** Can Tilt 154
	92204	1	**SERIAL # 12400102~ --** Can Tilt 164 w/ Deutsch Connector
8	18055	4	Pin
9	18152	4	Keeper Pin
10	18051	2	Pin
11	18151	6	Keeper Pin
12	22215	4	Pin
13	92039	4	Thrust Washer
14	22209	1	Hose Guard
15	18038	1	Yoke, Right
16	18031	1	Yoke, Left
17	22210	1	Hose Guard
18	17958	2	Planetary Hub
--	92528	--	Seal Kit
--	92529	--	Brake Release Parts Kit
19	REF	2	Drive Motor -- See SECTION E
20	50236	4	HHCS M12-1.75X040 10 ZP F
21	50007	4	WSHR M12 ZP NORDLOCK
22	50057	12	SHCS 05/08-11X01.75 08 ZP F
23	50249	12	WSHR M16 ZP NORDLOCK 5/8
24	50055	4	SHCS 07/16-14X01.50 08 ZP F
25	11176	4	DRIVE MOTOR WASHERS
26	50273	4	WSHR M11 ZP NORDLOCK 7/16
27	50034	4	HHCS M10-1.50X030 08 ZP F
28	50049	4	NNYL M10X1.50 08 ZP NYLON INSE
29	50006	2	WSHR M10 ZP NORDLOCK
30	50040	4	HHCS M12-1.75X035 08 ZP F
31	50050	4	NNYL M12X1.75 08 ZP NYLON INSE
32	50000	2	HHCS M12-1.75X035 08 ZP F
33	50294	2	HHCS M06-1.00X45 08 ZP P
34	--	--	--
35	--	--	--
36	50033	2	HHCS M10-1.50X025 08 ZP F
37	50225	2	Bolt, CARB M8 x 20
38	50048	2	Nut, M8 Nylock
39	91953	2	P-Clip

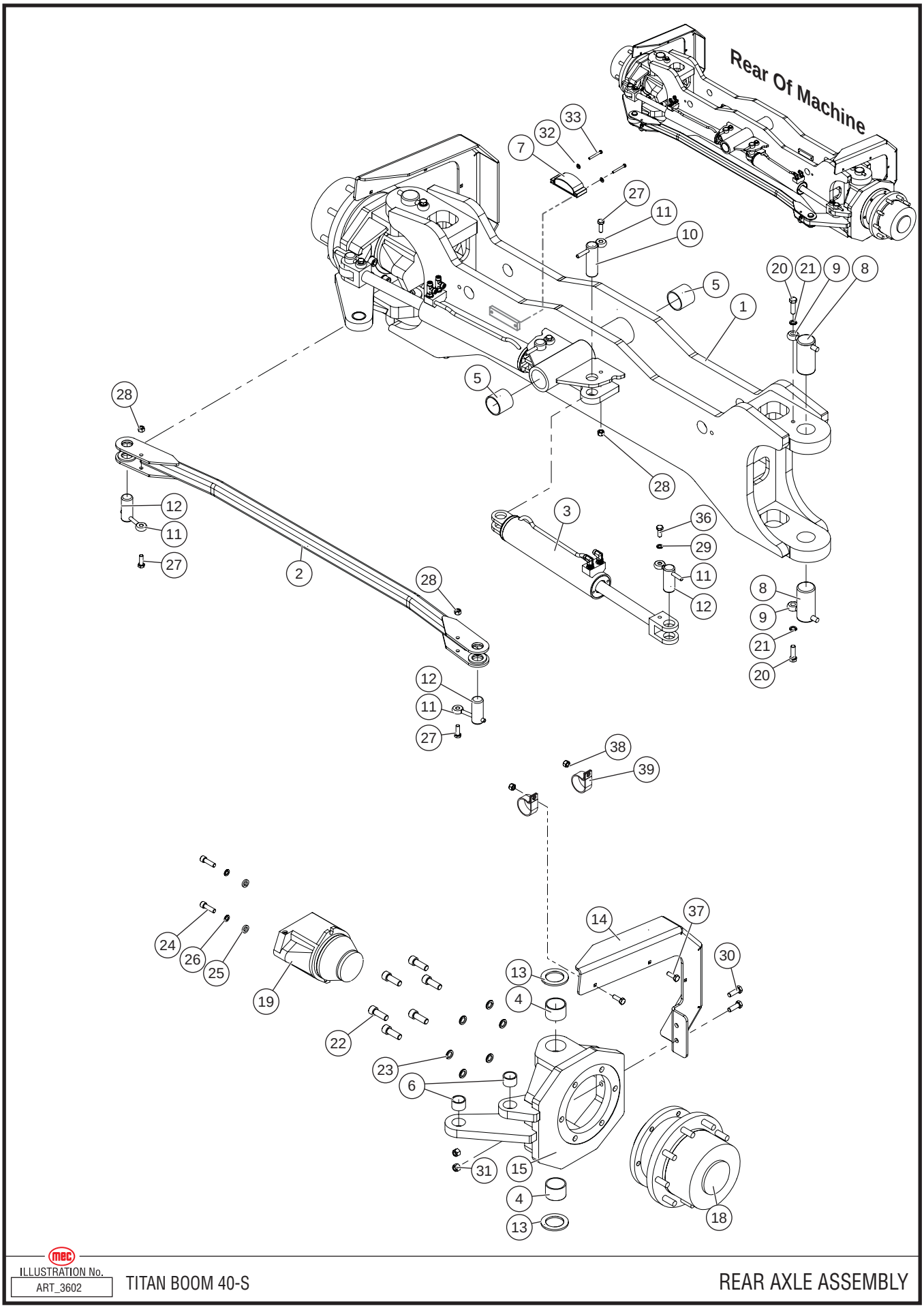


ILLUSTRATION No. ART_3602

TITAN BOOM 40-S

REAR AXLE ASSEMBLY

Rear Axle Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84172	1	Rear Axle Assembly
1	18022	1	Front Axle
2	18028	1	Tie Rod
3	REF	2	Steering Cylinder -- See Section E
4	92108	4	Sleeve Bearing
5	92110	2	Sleeve Bearing
6	92109	4	Sleeve Bearing
7	92010	1	CAN TILT 152
7	92010	1	**SERIAL # ~12400101 --** Can Tilt 152
	92202	1	**SERIAL # 12400102~ --** Can Tilt 162 w/ Deutsch Connector
8	18055	4	Pin
9	18152	4	Keeper Pin
10	18051	2	Pin
11	18151	6	Keeper Pin
12	22215	4	Pin
13	92039	4	Thrust Washer
14	22209	1	Hose Guard
15	18038	1	Yoke, Right
16	18031	1	Yoke, Left
17	22210	1	Hose Guard
18	17958	2	Planetary Hub
--	92528	--	Seal Kit
--	92529	--	Brake Release Parts Kit
19	REF	2	Drive Motor -- See SECTION E
20	50236	4	HHCS M12-1.75X040 10 ZP F
21	50007	4	WSHR M12 ZP NORDLOCK
22	50057	12	SHCS 05/08-11X01.75 08 ZP F
23	50249	12	WSHR M16 ZP NORDLOCK 5/8
24	50055	4	SHCS 07/16-14X01.50 08 ZP F
25	11176	4	DRIVE MOTOR WASHERS
26	50273	4	WSHR M11 ZP NORDLOCK 7/16
27	50034	4	HHCS M10-1.50X030 08 ZP F
28	50049	4	NNYL M10X1.50 08 ZP NYLON INSE
29	50006	2	WSHR M10 ZP NORDLOCK
30	50040	4	HHCS M12-1.75X035 08 ZP F
31	50050	4	NNYL M12X1.75 08 ZP NYLON INSE
32	50000	2	HHCS M12-1.75X035 08 ZP F
33	50294	2	HHCS M06-1.00X45 08 ZP P
34	--	--	--
35	--	--	--
36	50033	2	HHCS M10-1.50X025 08 ZP F
37	50225	2	Bolt, CARB M8 x 20
38	50048	2	Nut, M8 Nylock
39	91953	2	P-Clip

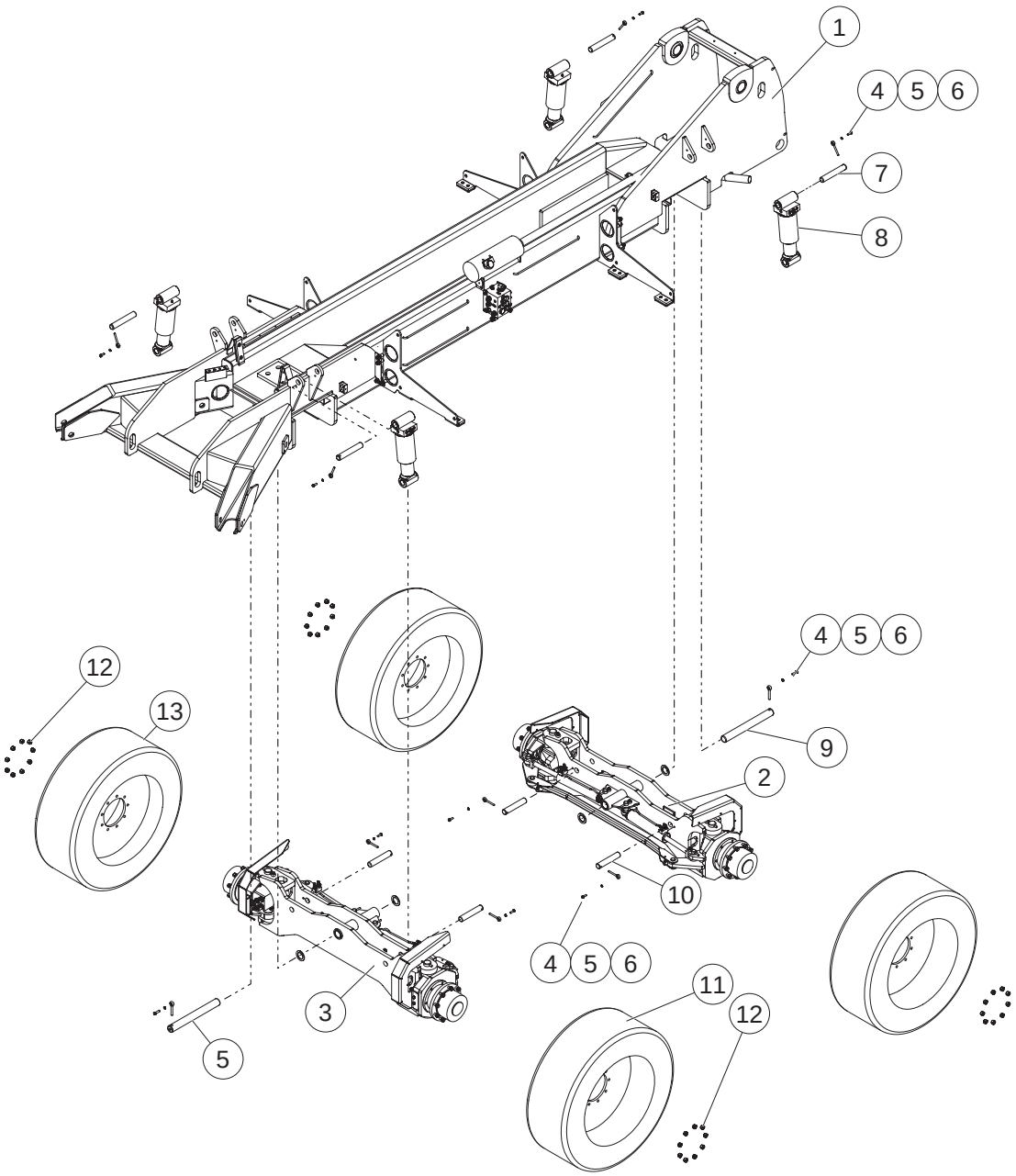


ILLUSTRATION No.
ART_3623

TITAN BOOM 40-S

Axle/Chassis Assembly

Axle/Chassis Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	--	Chassis
2	REF	--	Rear Axle Assembly
3	REF	--	Front Axle Assembly
4	50034	10	Bolt, HHCS M10 x 30
5	50006	10	Washer, M10 Nordlock
6	18151	10	Pin Retainer
7	22198	4	Pin
8	REF	4	Axle Lock Cylinder -- See Section E
9	18045	2	Pin
10	18075	4	Pin
11	91899	2	Tire/Wheel Assembly, Foam Filled, Left Hand
12	50266	36	Lug nut, 5/8-18
13	91898	2	Tire/Wheel Assembly, Foam Filled, Right Hand

NOTES:

SECTION E

HYDRAULICS

CONTENTS

NOTES:

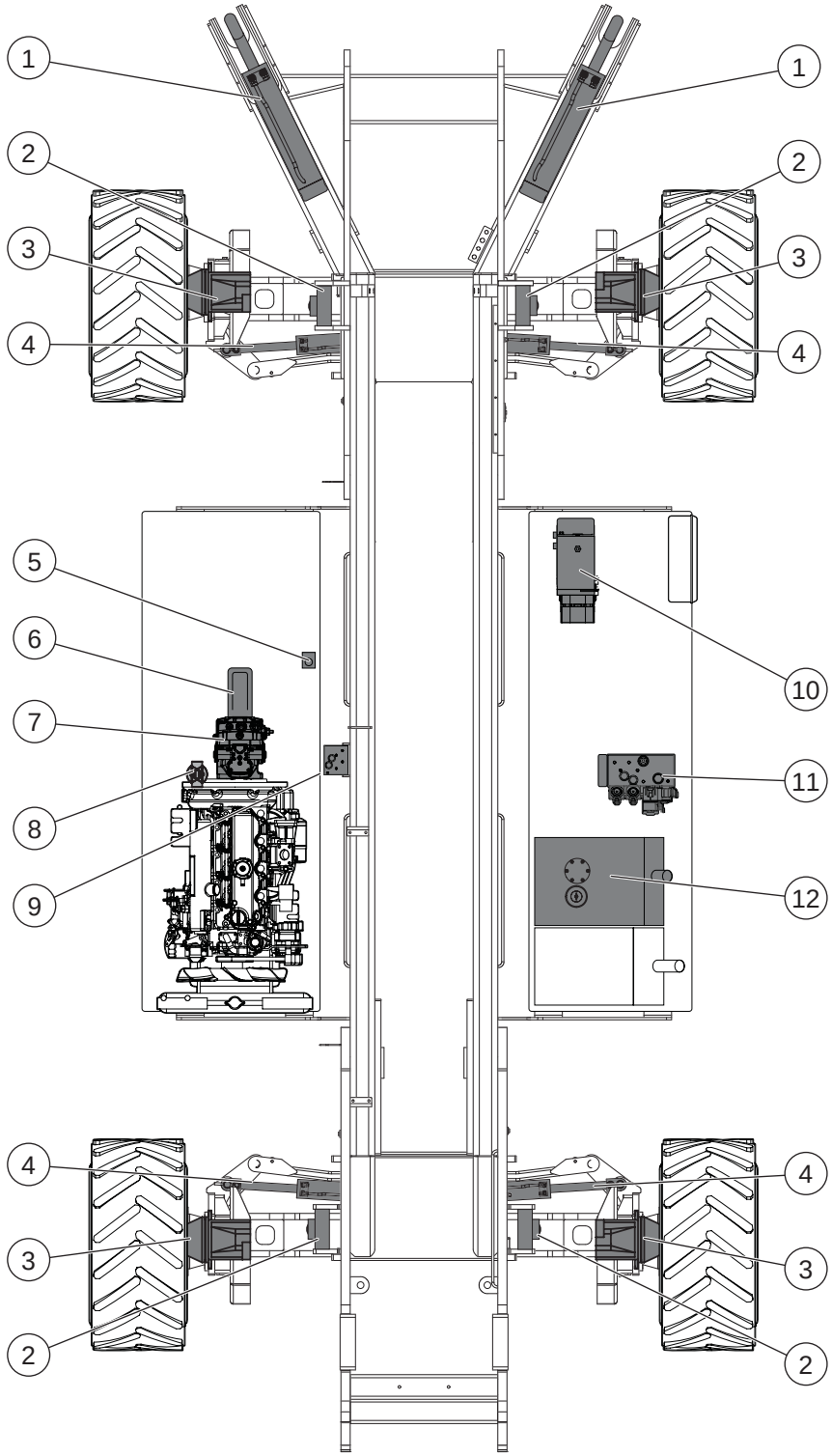


ILLUSTRATION No.
ART_3650

TITAN BOOM 40-S

Hydraulic Components -- Chassis

Hydraulic Components -- Chassis

ITEM	PART NO.	QTY	DESCRIPTION
1	22241	2	Stabilizer Cylinder
2	22315	4	Axle Lock Cylinder
3	17961	4	Wheel Motor
4	18070	4	Steering Cylinder
5	92037	1	Suction Manifold
6	84175	1	Tandem Gear Pump
7	84174	1	Piston Pump
8	92072	1	Charge Filter
9	84177	1	Traction Manifold
10	90970	1	Emergency Down Unit
11	84178	1	Functions Manifold
12	22440	1	Hydraulic Fluid Tank

Component Fittings not show or listed on this page.

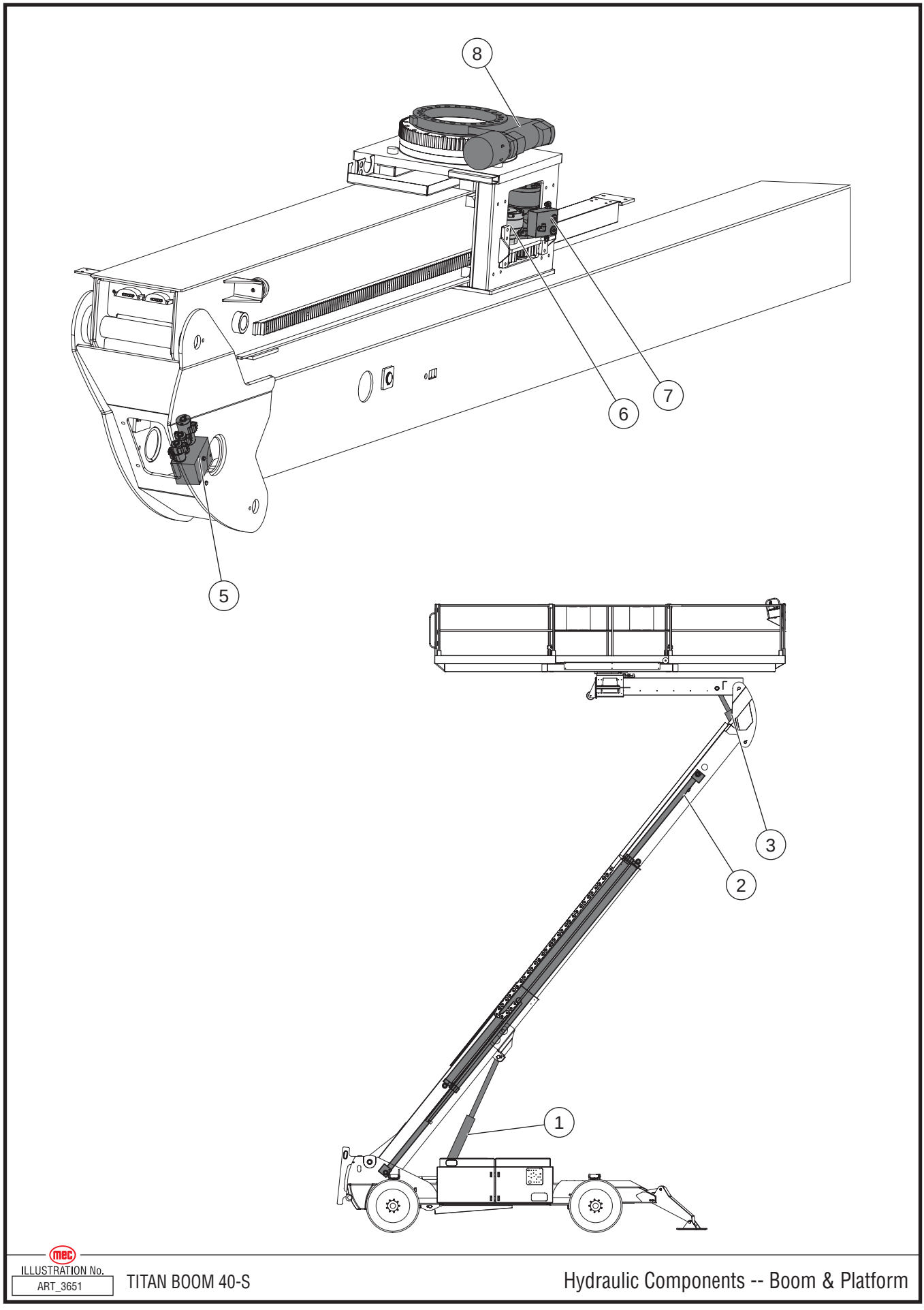


ILLUSTRATION No.
ART_3651

TITAN BOOM 40-S

Hydraulic Components -- Boom & Platform

Hydraulic Components -- Boom & Platform

ITEM	PART NO.	QTY	DESCRIPTION
1	22151	1	Lift Cylinder
2	22152	1	Extend Cylinder
3	22153	1	Platform Level Cylinder
4	--	--	--
5	84189	1	Auxiliary Manifold
6	91894	1	Carriage Brake
7	REF	1	Carriage Slide Motor (see “Carriage Motor & Brake” on Page E-43)
8	92018	1	Platform Rotate Drive Unit

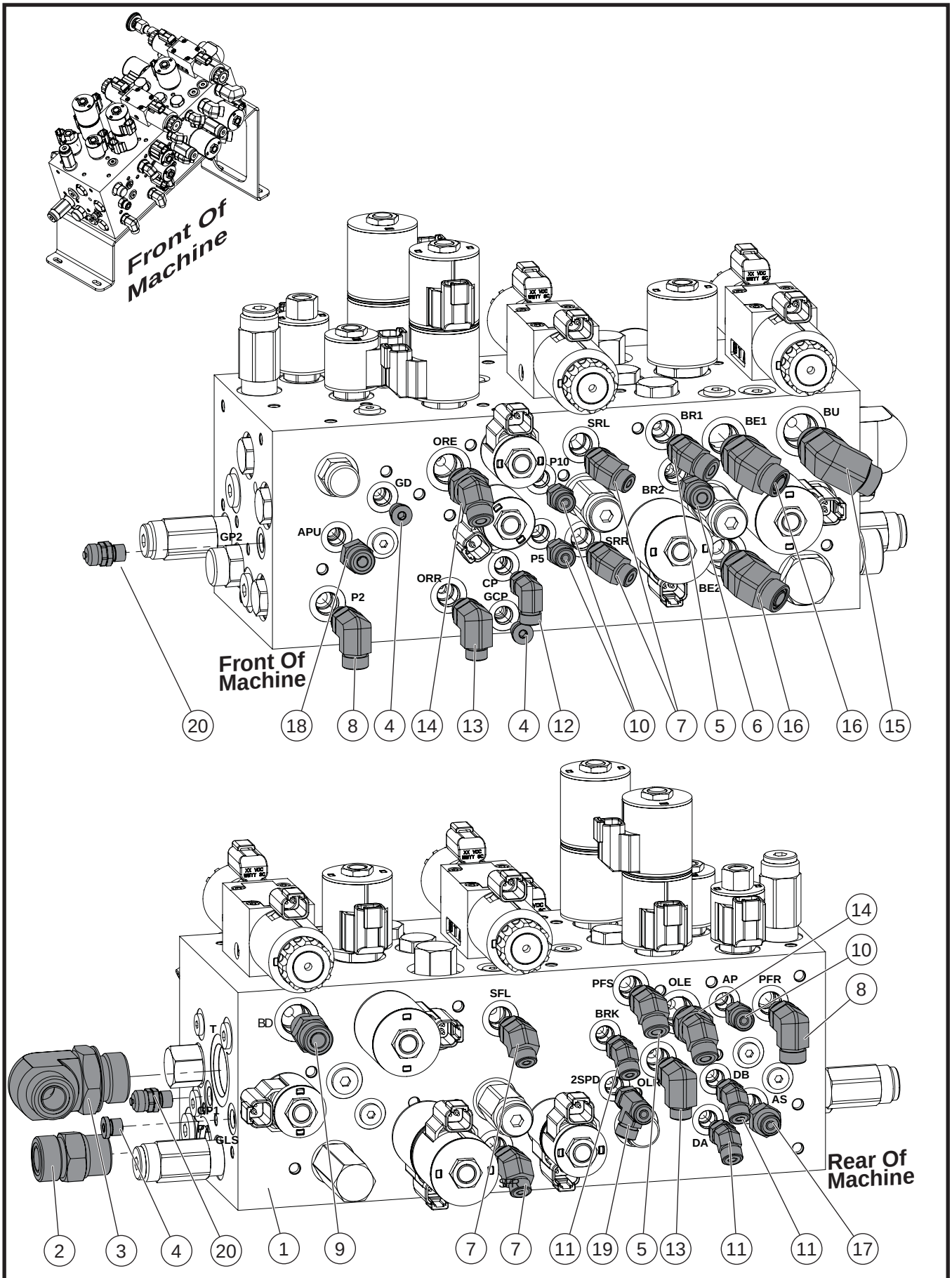


ILLUSTRATION No. ART_3638

TITAN BOOM 40-S

Functions Manifold Fittings

Functions Manifold Assembly -- Fittings

ITEM	PART NO.	QTY	DESCRIPTION
--	84178	--	Functions Manifold Assembly, Complete
1	92083	1	Functions Manifold, no fittings
2	50826	1	Fitting, MFFOR-MB-12-12
3	50844	1	Fitting, MFFOR-MB90-12-16
4	50748	3	Fitting, 4MFFOR-plug
5	50676	2	Fitting, MFFOR-MB45-06-06
6	50835	1	Fitting, MFFOR-MB-6-6
7	50815	4	Fitting, MFFOR-MB45-4-6
8	50674	2	Fitting, MFFOR-MB90-06-06
9	50836	1	Fitting, MFFOR-MB-6-8
10	50831	3	Fitting, MFFOR-MB-4-4
11	50675	3	Fitting, MFFOR-MB45-04-04
12	50673	1	Fitting, MMFOR-mb90 4-4
13	50656	2	Fitting, MFFOR-MB90-04-06
14	50816	2	Fitting, MFFOR-MB45-6-8
15	50848	1	Fitting, MFFOR-MB90-8-10
16	50819	2	Fitting, MFFOR-MB45-8-8
17	50832	1	Fitting, MFFOR-MB-4-6
18	50820	1	Fitting, MFFOR-MB-6-4
19	50858	1	Fitting, MFFOR-MB-MFFORT-4
20	50974	2	Fitting, Test Port, TPO-4

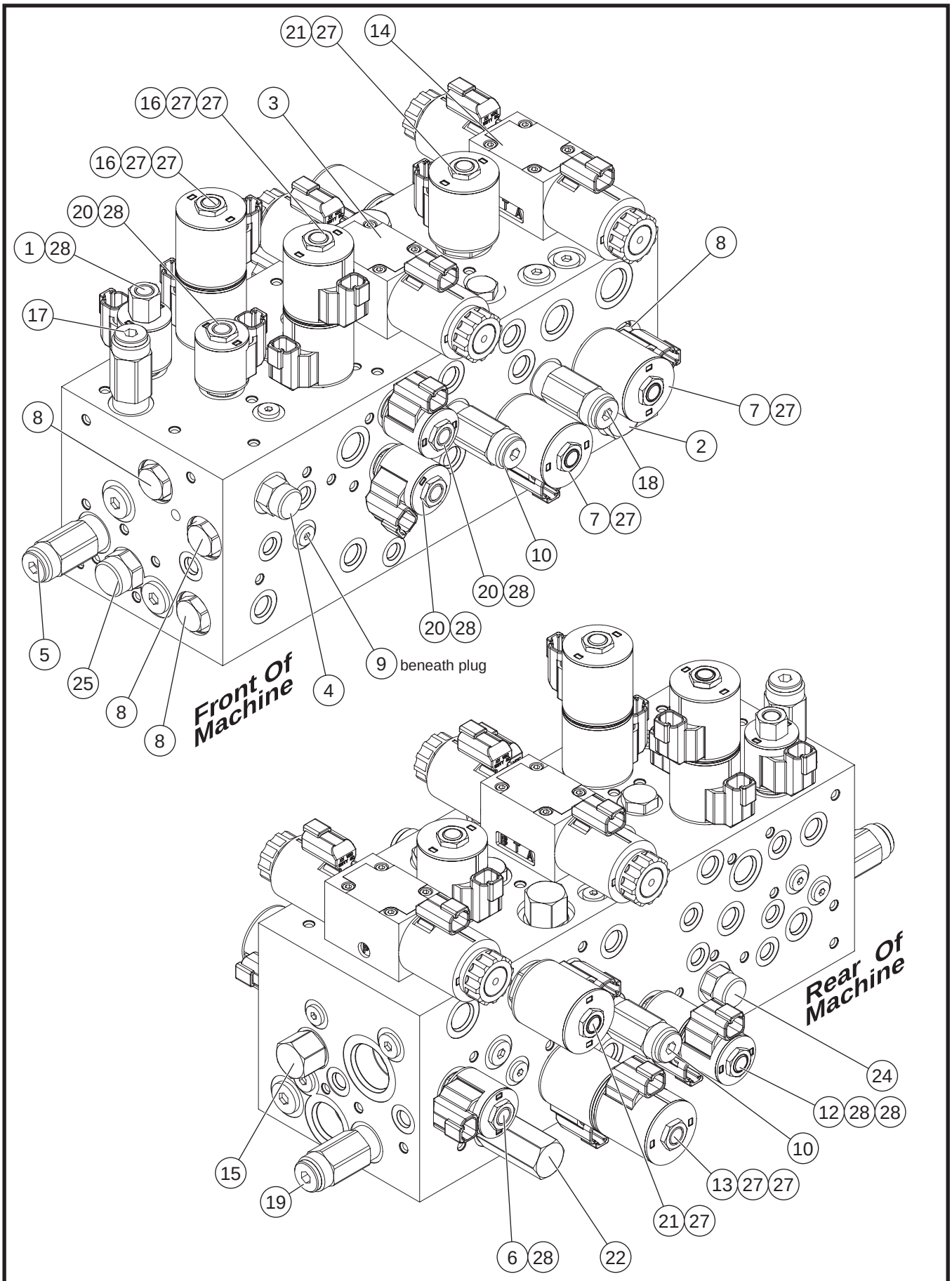


ILLUSTRATION No. ART_3639

TITAN BOOM 40-S

Functions Manifold Valves & Coils

Functions Manifold Assembly -- Valves

ITEM	PART NO.	QTY	DESCRIPTION
--	92083	--	Functions Manifold, without fittings
1	92572	1	Valve, Solenoid
2	91473	1	Valve, Check
3	92573	1	Valve, Spool
4	92574	1	Valve, Pilot
5	92575	1	Valve, Pressure-Reducing
6	90120	1	Valve, Solenoid
7	91148	2	Valve, Solenoid Proportional
8	91477	5	Valve, Check
9	91154	2	Valve, Load Shuttle Check
10	92576	2	Valve, Cross-Port Relief
11	92577	1	Flow Divider
12	92578	1	Valve, Solenoid
13	92579	1	Valve, Solenoid
14	91144	1	Valve, Spool
15	92580	2	Valve, Pilot
16	92581	2	Valve, Proportional
17	92582	1	Valve, Relief
18	92583	1	Valve, Relief
19	92584	1	Valve, Relief
20	90119	3	Valve, Solenoid
21	92585	2	Valve, Solenoid
22	92586	1	Valve, Flow-Reducing
23	--	--	--
24	92587	1	Valve, Flow-Reducing
25	92588	1	Valve, Flow-Reducing
26	92475	1	Orifice
27	91143	10	Coil
28	92589	7	Coil

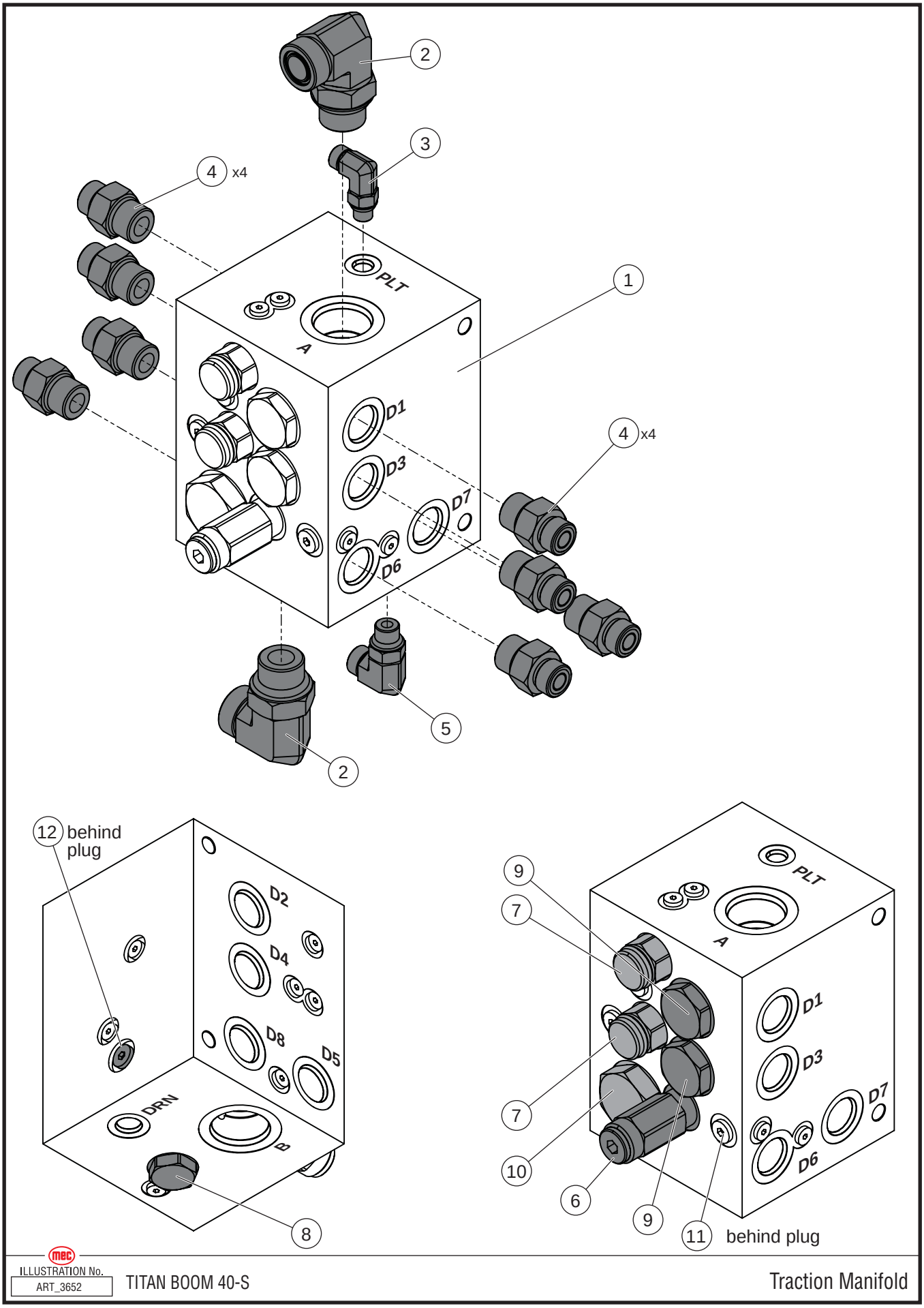


ILLUSTRATION No. ART_3652

TITAN BOOM 40-S

Traction Manifold

Traction Manifold Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84177	--	Traction Manifold Assembly
1	92167	1	Traction Manifold Block, without fittings
2	50843	2	Fitting, MFFOR-MB90-12-12
3	50673	1	Fitting, MFFOR-MB90 4-4
4	50837	8	Fitting, MFFOR-MB-8-10
5	50674	1	Fitting, MFFOR-MB90-06-06
6	92602	1	Valve, Relief
7	92603	2	Valve, Piloted
8	92604	1	Valve, Oil Shuttle
9	92605	2	Flow Divider
10	92606	1	Flow Divider
11	92607	1	Orifice Plug, .090"
12	91017	1	Orifice Plug, .040"
13	92608	2	Orifice Plug, .052"

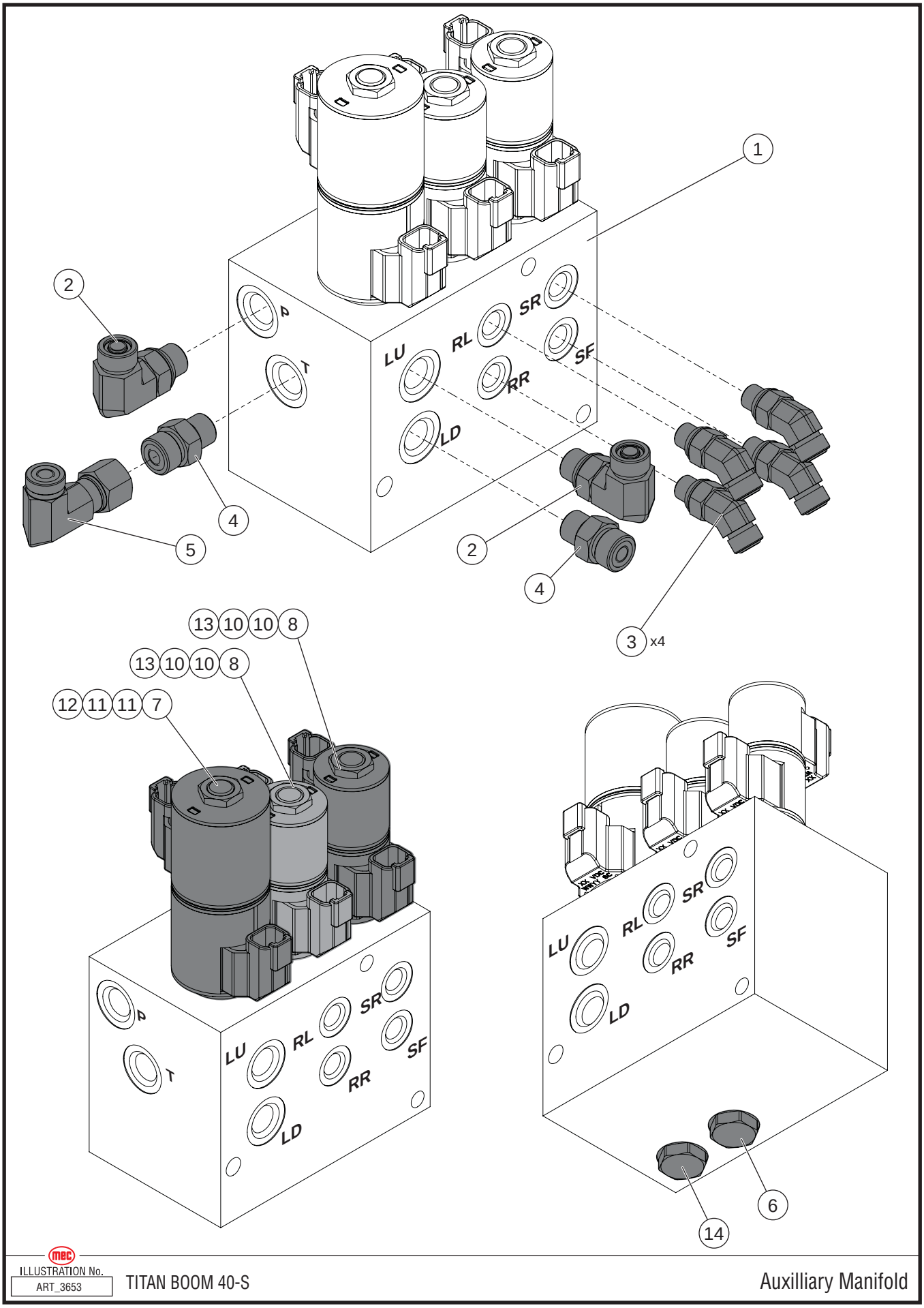


ILLUSTRATION No. ART_3653

TITAN BOOM 40-S

Auxilliary Manifold

Auxiliary Manifold Assembly

ITEM	PART NO.	QTY	DESCRIPTION
--	84189	1	Auxiliary Manifold Assembly
1	92082	1	Platform Function Manifold
2	50674	2	Fitting, MFFOR-MB90-06-06
3	50675	4	Fitting, MFFOR-MB45-04-04
4	50835	2	Fitting, MFFOR-MB-6-6
5	50672	1	Fitting, MFFOR-FFORX90-06-06
6	92864	1	Valve, Piloted
7	92581	1	Valve, Solenoid
8	92600	2	Valve, Solenoid
9	--	--	--
10	92173	4	Coil
11	91143	2	Coil
12	92398	1	Check Valve Disk
13	92399	2	Check Valve Disk
14	92669	1	Valve Flow Regulator

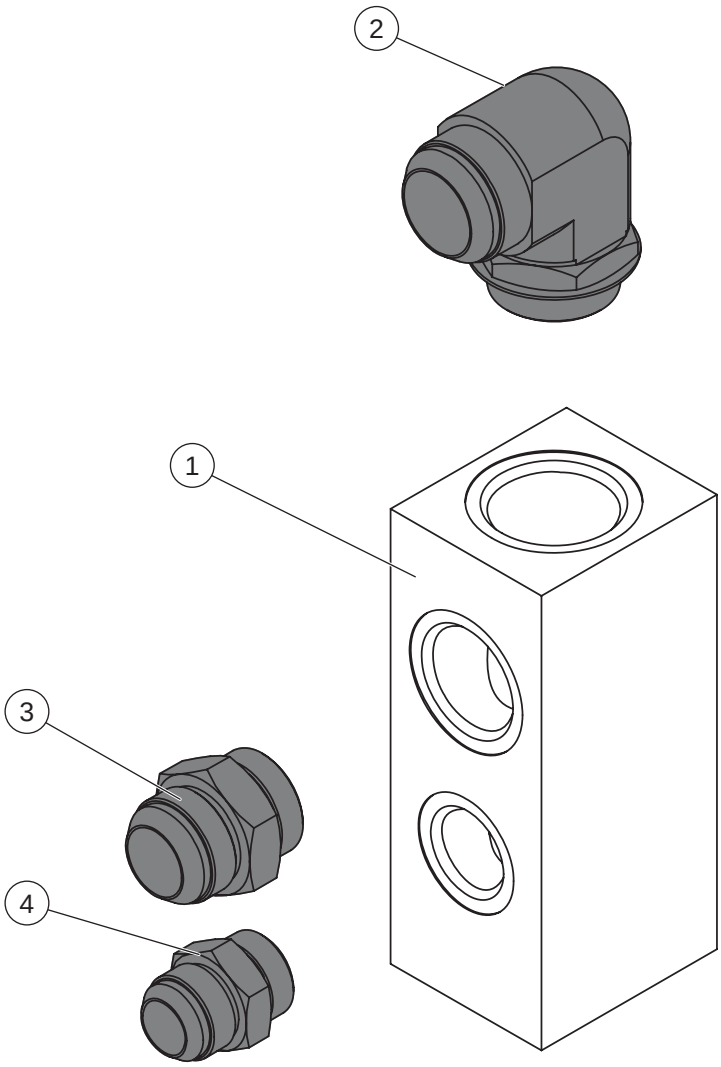


ILLUSTRATION No.
ART_3655

TITAN BOOM 40-S

Suction Manifold

Suction Manifold

ITEM	PART NO.	QTY	DESCRIPTION
1	92037	1	Suction Manifold
2	50966	1	Fitting, MB-MJ90-24-24
3	50967	1	Fitting, MB-MJ-20-20
4	50765	1	Fitting, MB-MJ-16-16

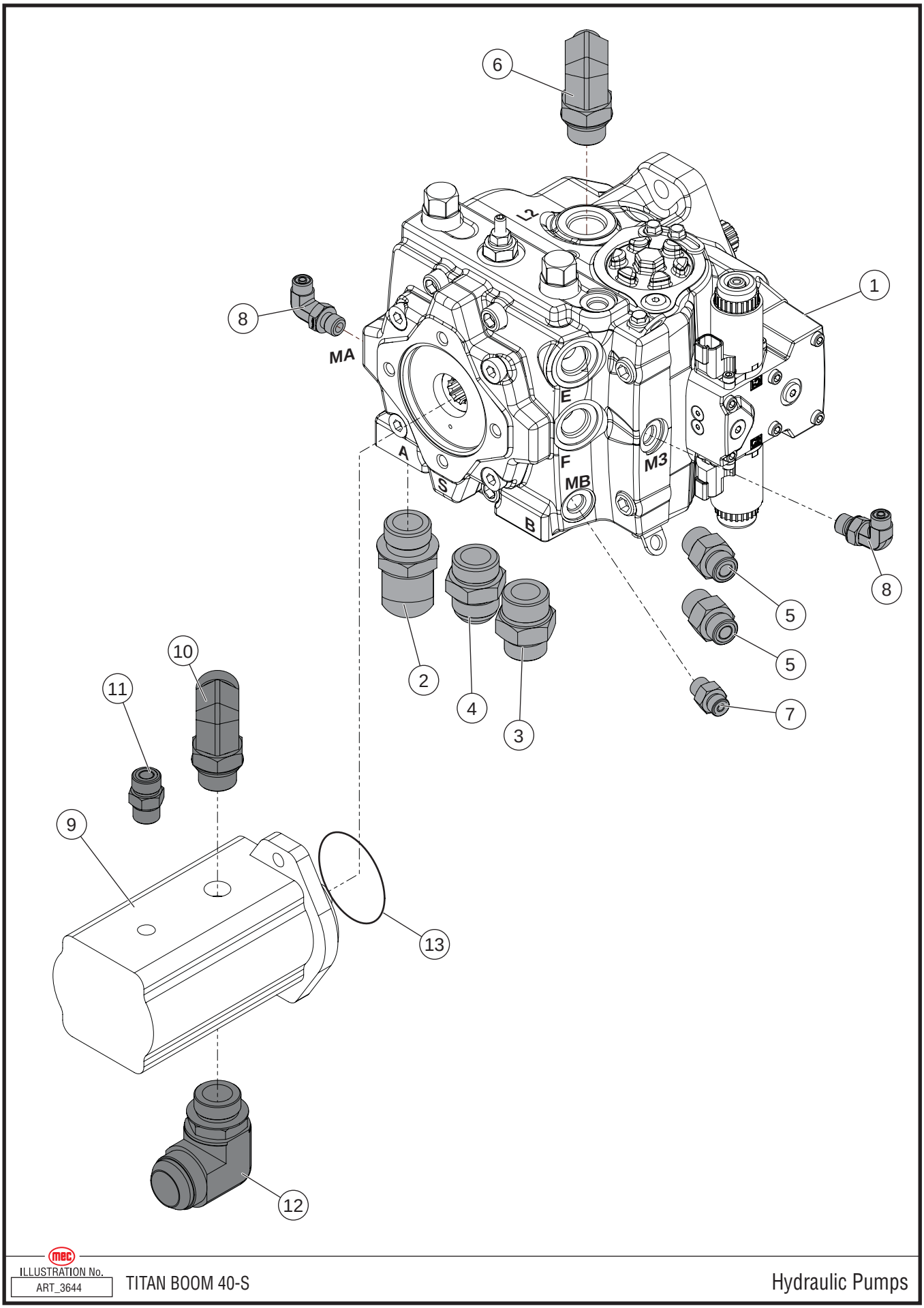


ILLUSTRATION No.
ART_3644

TITAN BOOM 40-S

Hydraulic Pumps

Hydraulic Pumps

ITEM	PART NO.	QTY	DESCRIPTION
--	84174	--	Piston Pump Assembly
--	84175	--	Tandem Gear Pump Assembly
1	91893	1	Piston Pump, without fittings
2	50844	1	Fitting, MFFOR-MB90-12-16
3	50827	1	Fitting, MFFOR-MB-12-16
4	50765	1	Fitting, MB-MJ-16-16
5	50837	2	Fitting, MFFOR-MB-8-10
6	50849	1	Fitting, MFFOR-MB90-8-12
7	50832	1	Fitting, MFFOR-MB-4-6
8	50846	2	Fitting, MFFOR-MB90-4-6
9	92698	1	Tandem Gear Pump, without fittings
10	50843	1	Fitting, MFFOR-MB90-12-12
11	50841	1	Fitting, MFFOR-MB-8-8
12	50787	1	Fitting, MB-MJ90-16-20
13	17971	1	O-Ring

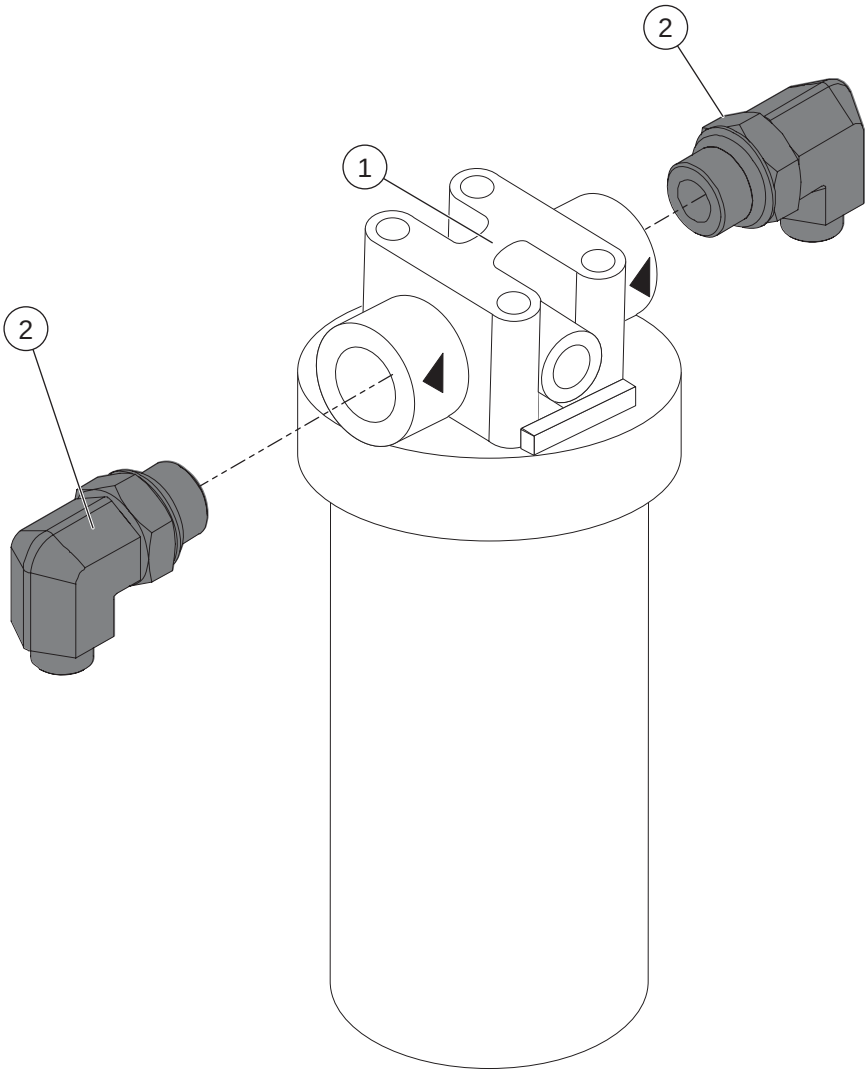


ILLUSTRATION No.
ART_3656

TITAN BOOM 40-S

Charge Filter Assembly

Charge Filter Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	92072	1	Charge Filter Assembly, , without fittings
--	92169	--	Filter Element
2	50849	1	Fitting, MFFOR-MB90-8-12

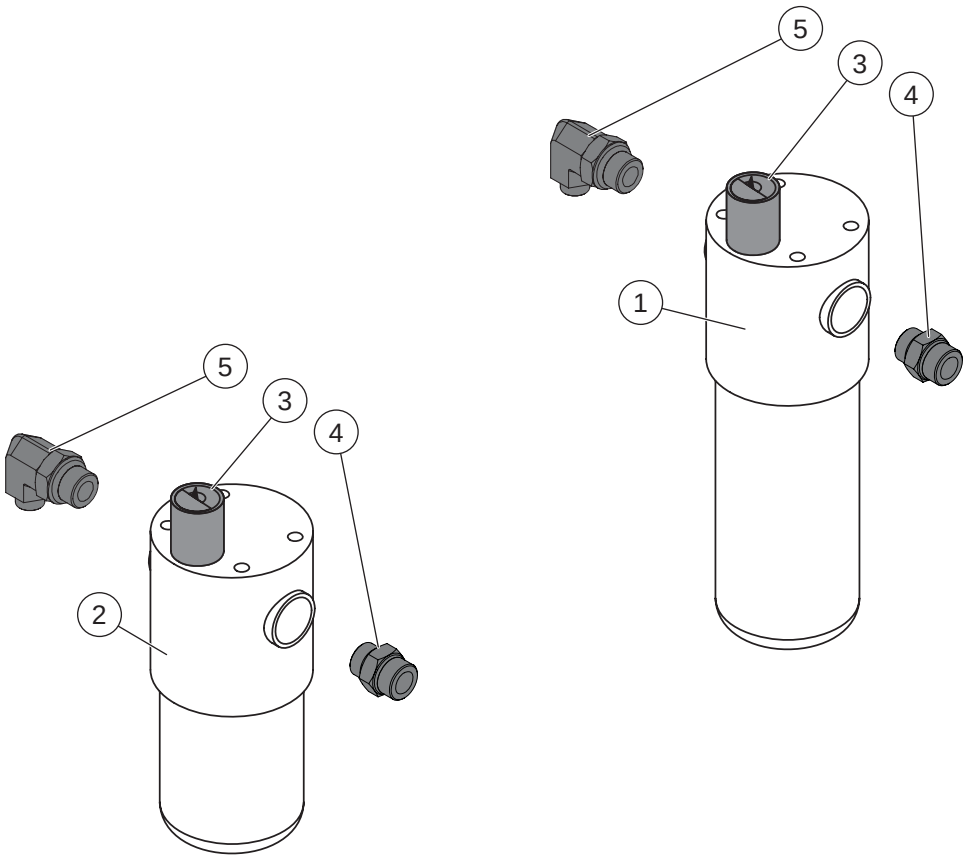


ILLUSTRATION No.
ART_4192

TITAN BOOM 40-S

OPTION -- High Pressure Filters

OPTION -- High Pressure Filter Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	92674	1	Filter Assembly, Long, 20GPM
--	92831	--	Filter Element, Long, 20GPM
2	92785	1	Filter Assembly, Short, 10GPM
--	92830	--	Filter Element, Short, 10GPM
3	92832	1	Guage, Filter Minder
4	50838	2	Fitting, MB-MFFOR-12-8
5	50849	2	Fitting, MB-MFFOR90-12-8

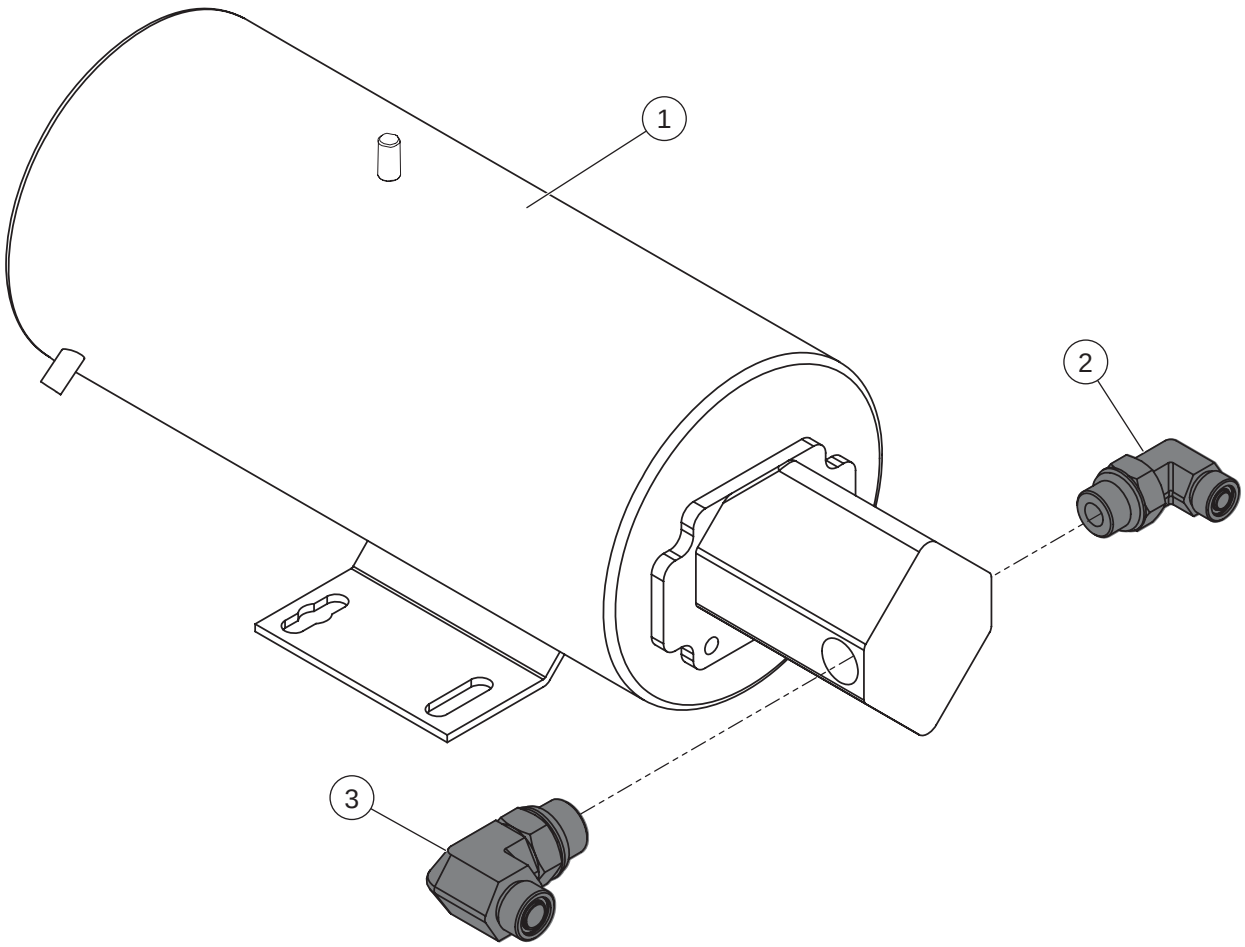


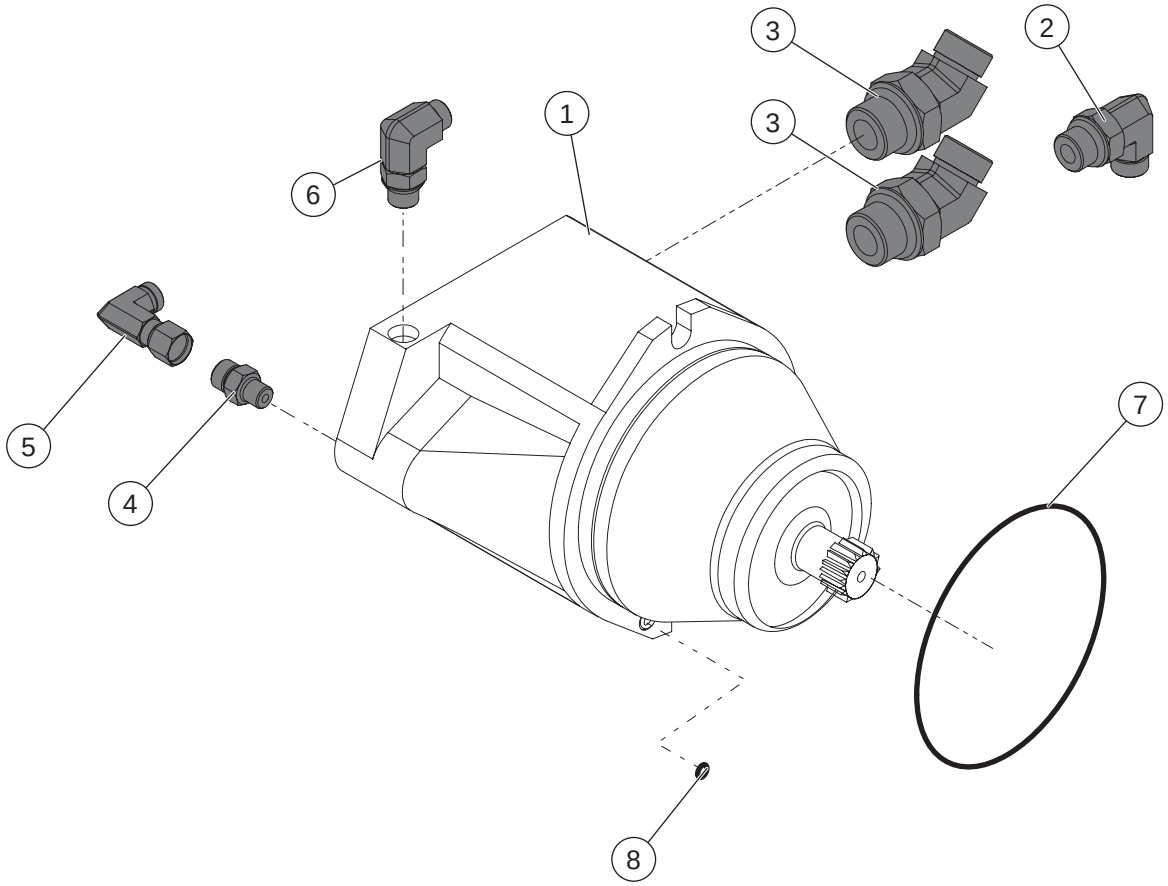
ILLUSTRATION No.
ART_3657

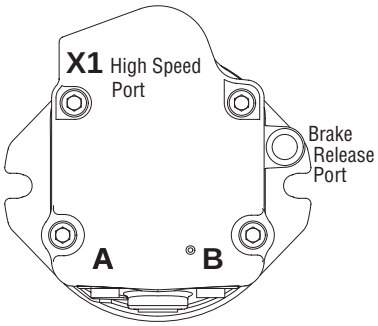
TITAN BOOM 40-S

Emergency Power Unit Assembly

Emergency Power Unit Assembly

ITEM	PART NO.	QTY	DESCRIPTION
1	90970	1	Emergency Power Unit
--	90997	--	Motor
--	90998	--	Pump
2	50847	1	Fitting, MFFOR-MB90-6-8
3	50848	1	Fitting, MFFOR-MB90-8-10





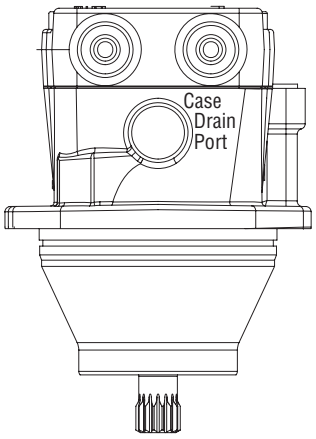


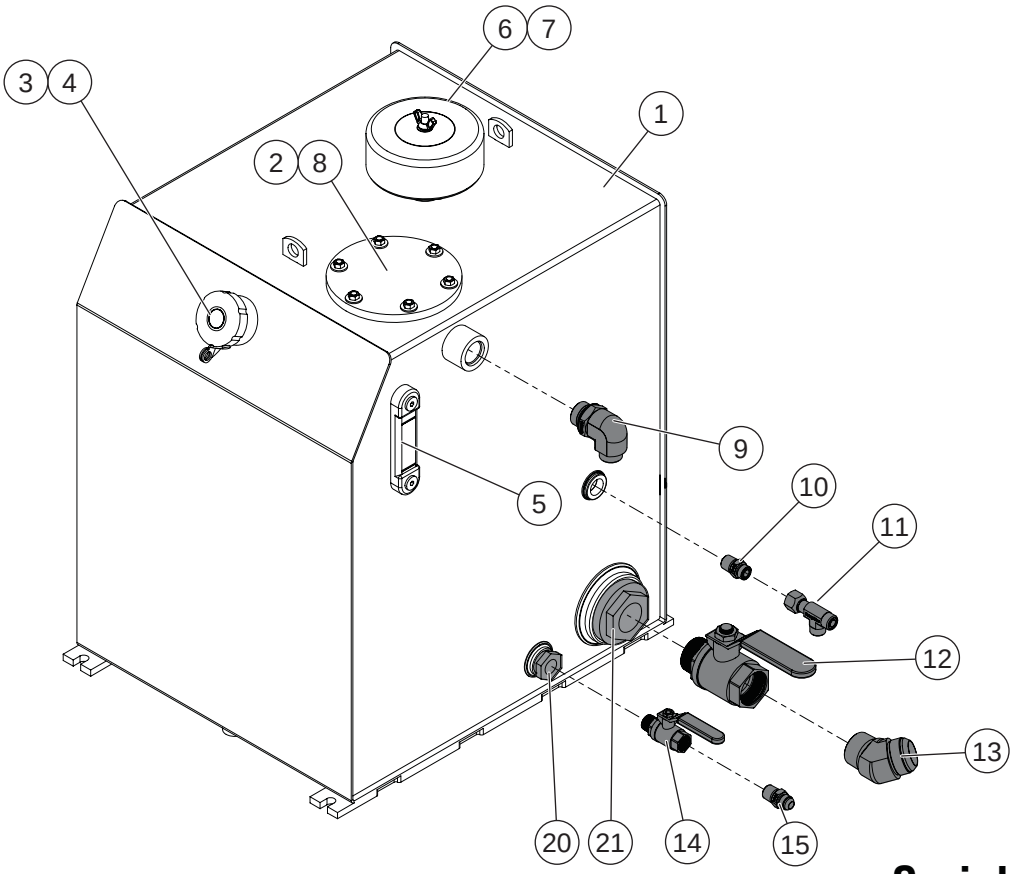
ILLUSTRATION No. ART_3658

TITAN BOOM 40-S

Wheel Motor Assembly

Wheel Motor Assembly

ITEM	PART NO.	QTY PER WHEEL	QTY PER MACHINE	DESCRIPTION
1	91882	1	4	Wheel Motor, without fittings
2	50847	1	4	Fitting, MFFOR-MB90-6-8
3	50957	2	8	Fitting, MFFOR-MB45-10-12
4	50831	1	4	Fitting, MFFOR-MB-4-4
5	50671	1	4	Fitting, MFFOR-FFORX90-04-04
6	50656	1	4	Fitting, MFFOR-MB90-04-06
7	92166	1	4	O-Ring
8	92042	1	4	O-Ring



Serial ~ #12400061

Serial #12400062 ~

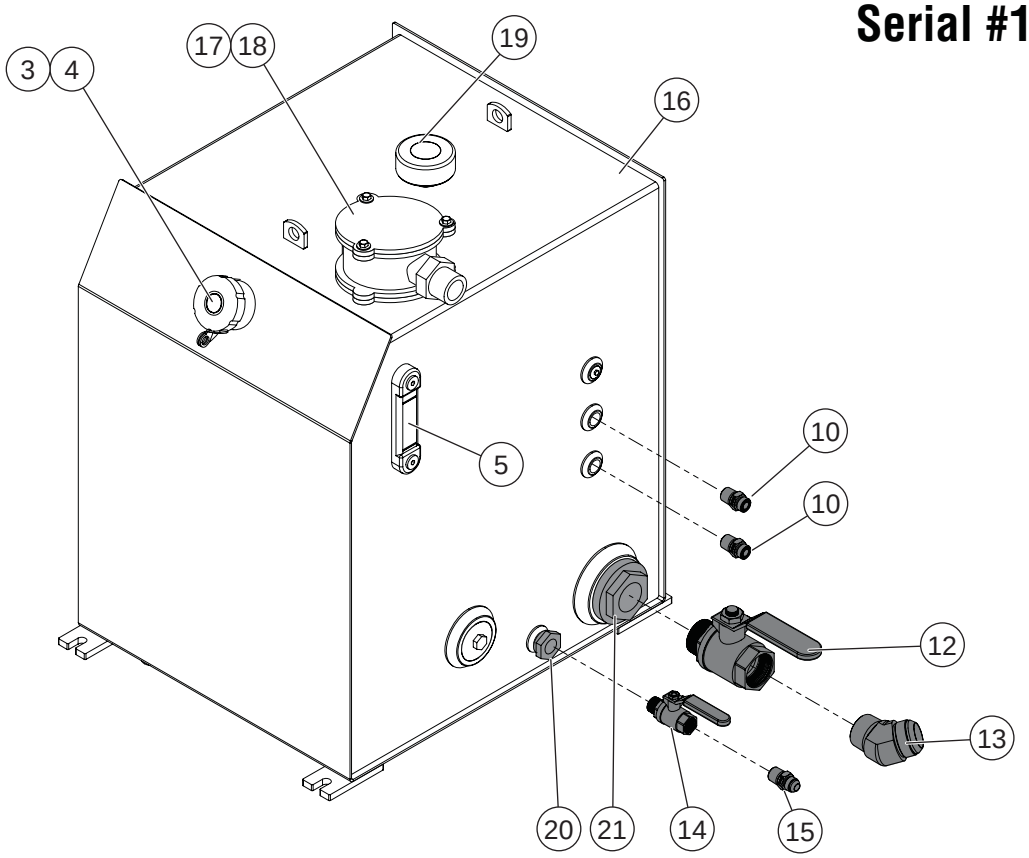


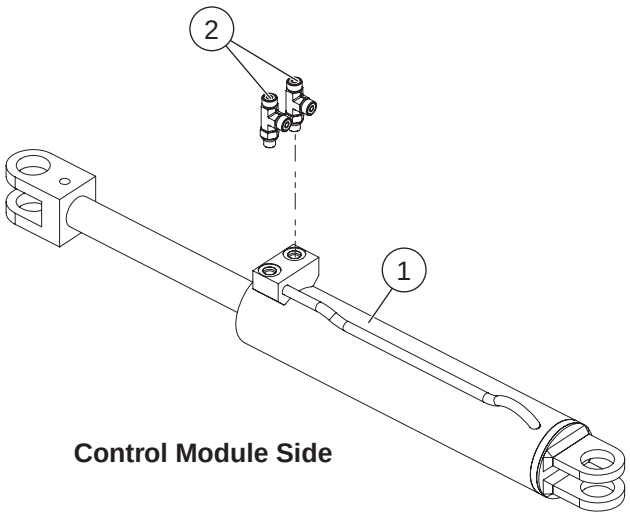
ILLUSTRATION No. ART_3671

TITAN BOOM 40-S

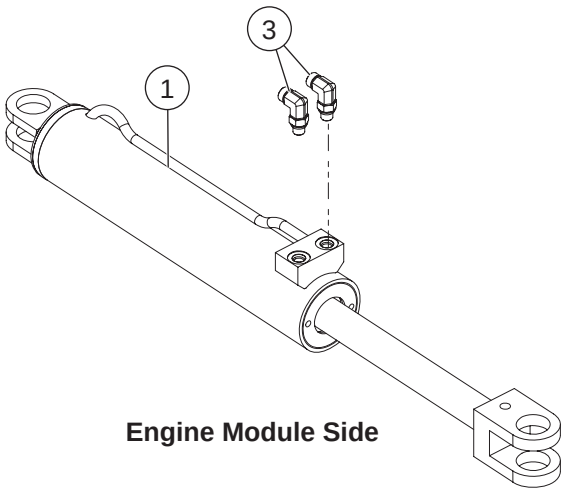
Hydraulic Tank Assembly

Hydraulic Tank Assembly

ITEM	PART NO.	QTY Serial ~ #12400061	QTY Serial #12400062~	DESCRIPTION
--	84180	--	--	Hydraulic Tank Assembly
1	18407	1	--	Hydraulic Tank
2	92482	1	--	Filter Element
3	92478	1	1	Filler Cap
4	92484	1	1	Filler Strainer
5	92479	1	1	Sight Gauge
6	92481	1	--	Breather Assembly
7	92485	1	--	Breather Element
8	92483	1	--	Gasket, Filter Cover
9	50844	1	--	Fitting, MFFOR-MB90-12-16
10	50876	1	3	Fitting, MFFOR-MP-8-8
11	50811	1	--	Fitting, MFFOR-FFORX-MMFOR-8
12	92111	1	1	Valve, Ball, 1.5"
13	50969	1	1	Fitting, MJ-MP-45-24-24
14	92122	1	1	Valve, Ball, .5"
15	50981	1	1	Fitting, MJ-MP-8-8
16	22633	--	1	Hydraulic Tank
17	92366	--	1	Filter Assembly
18	92397	--	1	Filter Element
19	92357	--	1	Breather Assembly
20	92355	1	1	Suction Strainer, .5” NPT
21	92356	1	1	Suction Strainer, 1.5” NPT



Control Module Side



Engine Module Side

Same each axle

ILLUSTRATION No.
ART_3659

TITAN BOOM 40-S

Steer Cylinders

Steer Cylinder

ITEM	PART NO.	QTY PER AXLE	QTY PER MACHINE	DESCRIPTION
1	18070	2	4	Steer Cylinder, without fittings
--	92616	2	4	Seal Kit
2	50858	2	4	Fitting, MFFOR-MB-MFFORT-4
3	50673	2	4	Fitting, MFFOR-MB90-04-04

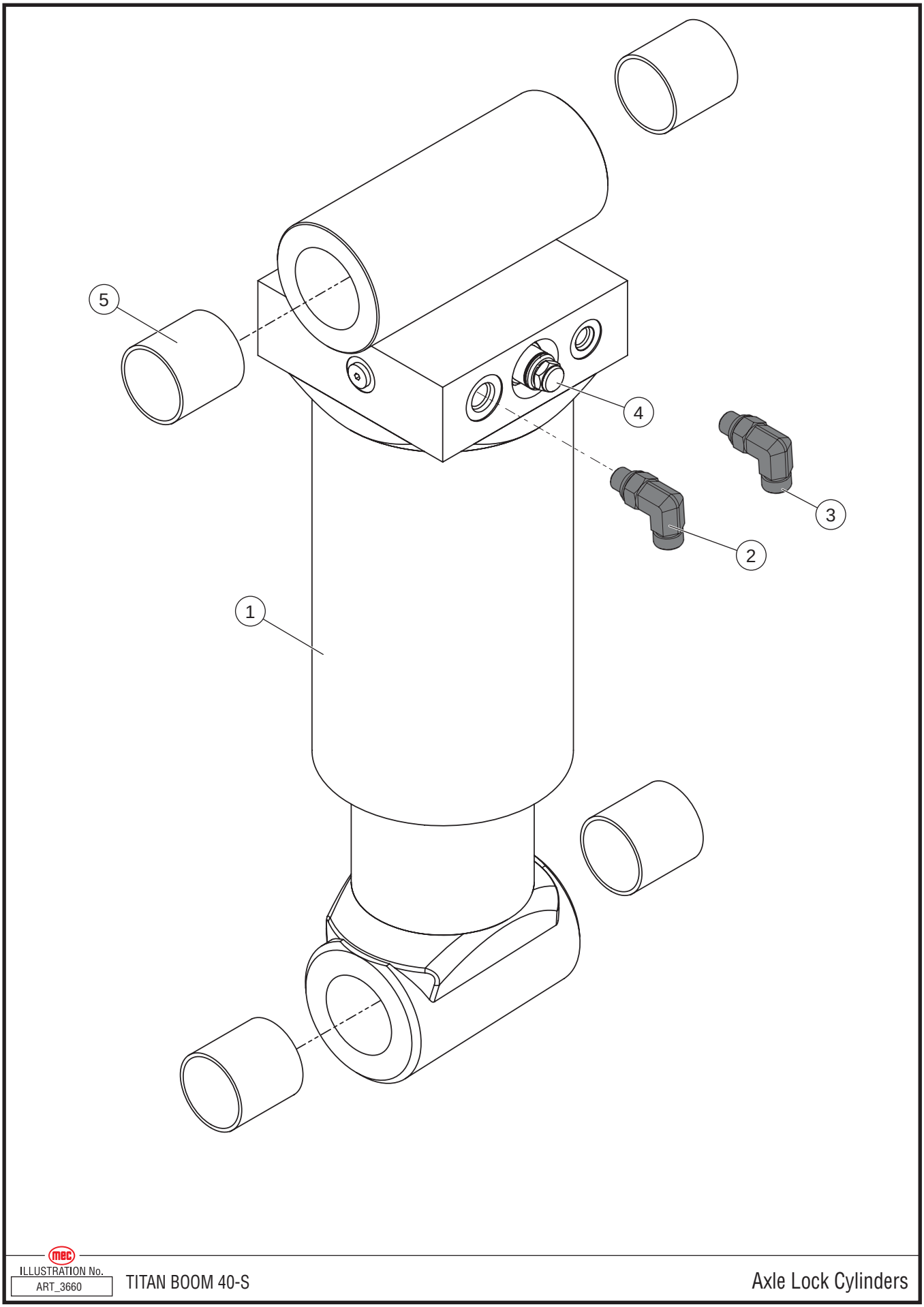


ILLUSTRATION No.
ART_3660

TITAN BOOM 40-S

Axle Lock Cylinders

Axle Lock Cylinder

ITEM	PART NO.	QTY PER ASSEMBLY	QTY PER MACHINE	DESCRIPTION
1	22315	1	4	Assembly, Axle Lock Cylinder, without fittings
--	92617	--	--	Seal Kit
2	50846	1	4	Fitting, MFFOR-MB90-4-6
3	50673	1	4	Fitting, MFFOR-MB90-4-4
4	92622	1	4	Valve, Counterbalance
5	7217	4	16	Bearing

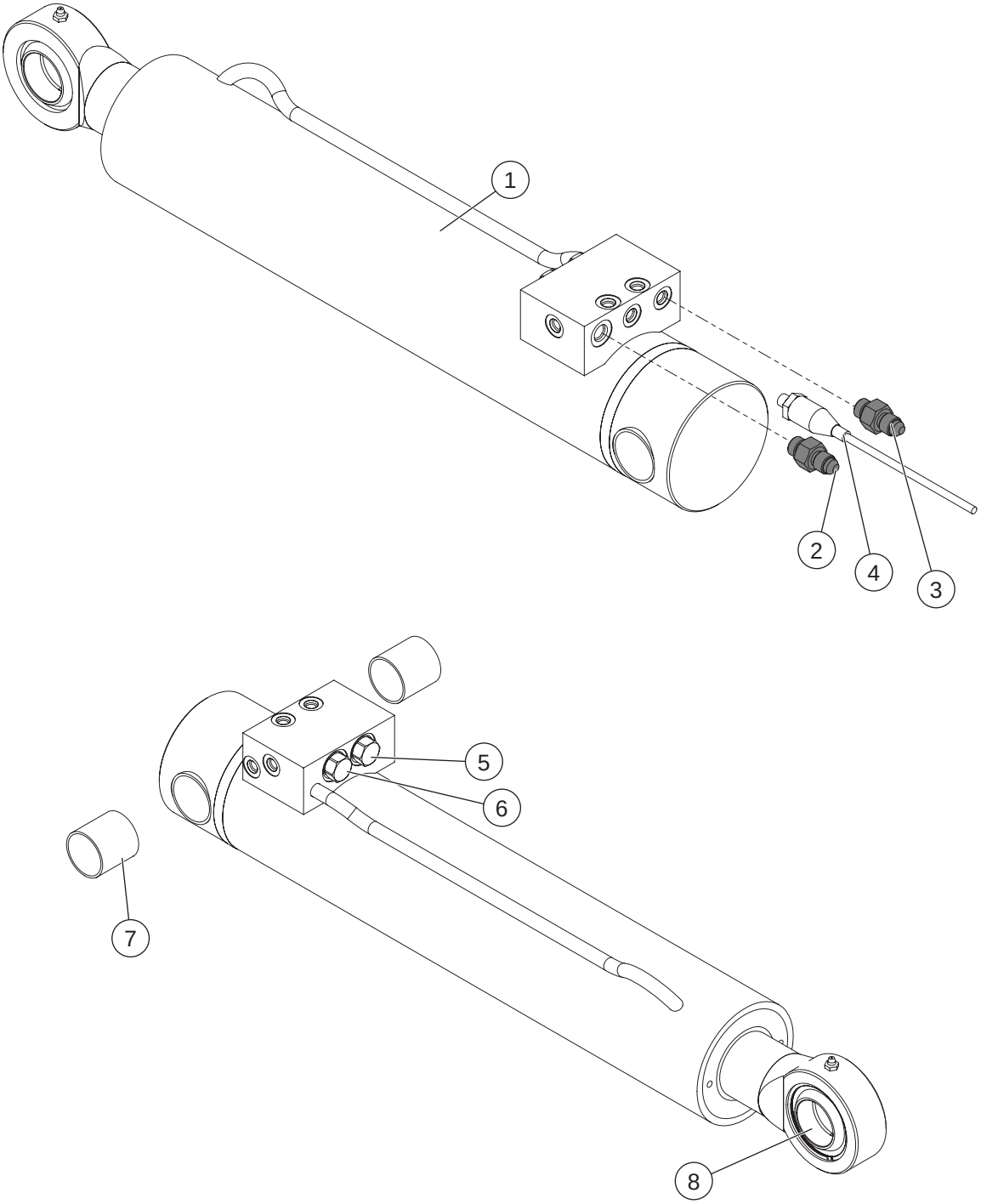


ILLUSTRATION No.
ART_3661

TITAN BOOM 40-S

Stabilizer Cylinders

Stabilizer Cylinder

ITEM	PART NO.	QTY PER ASSEMBLY	QTY PER MACHINE	DESCRIPTION
1	22241	1	2	Stabilizer Cylinder, without fittings
--	92618	--	--	Seal Kit
2	50832	1	2	Fitting, MFFOR-MB-4-6
3	50831	1	2	Fitting, MFFOR-MB-4-4
4	90845	1	2	Pressure Sensor
5	92623	1	2	Valve, Counterbalance, 3600 psi
6	92019	1	2	Valve, Counterbalance, 1000 psi
7	7217	2	4	Bearing
8	92629	1	2	Bearing, Spherical

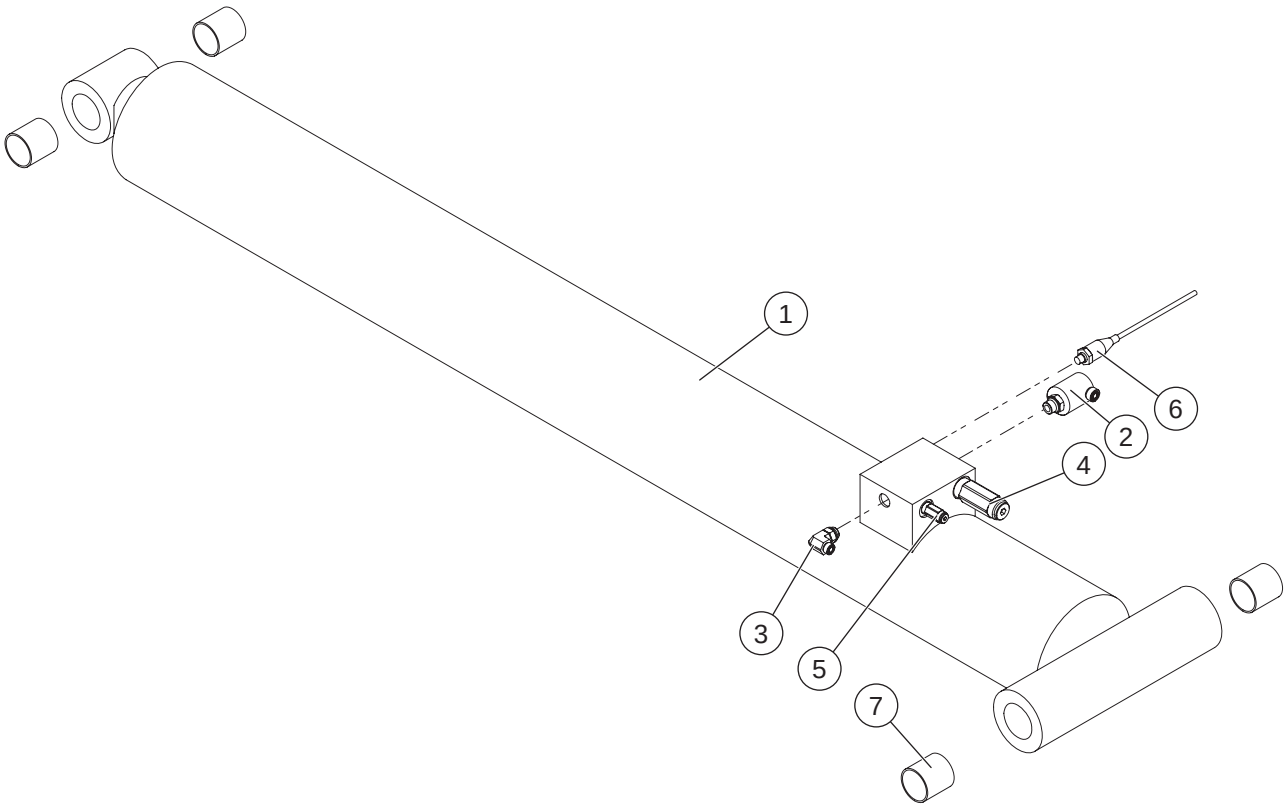


ILLUSTRATION No.
ART_3662

TITAN BOOM 40-S

Lift Cylinder

Lift Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
1	22151	--	Lift Cylinder Assembly, without fittings
--	92619	--	Seal Kit
2	50982	1	Fitting, MFFOR-MB-08-10 Swivel
3	50847	1	Fitting, MFFOR-MB90-6-8
4	92624	1	Valve, Load Reactive
5	92623	1	Valve, Counterbalance
6	92646	1	Pressure Transducer -- Optional Overload Sensing System Only
7	92630	4	Bearing

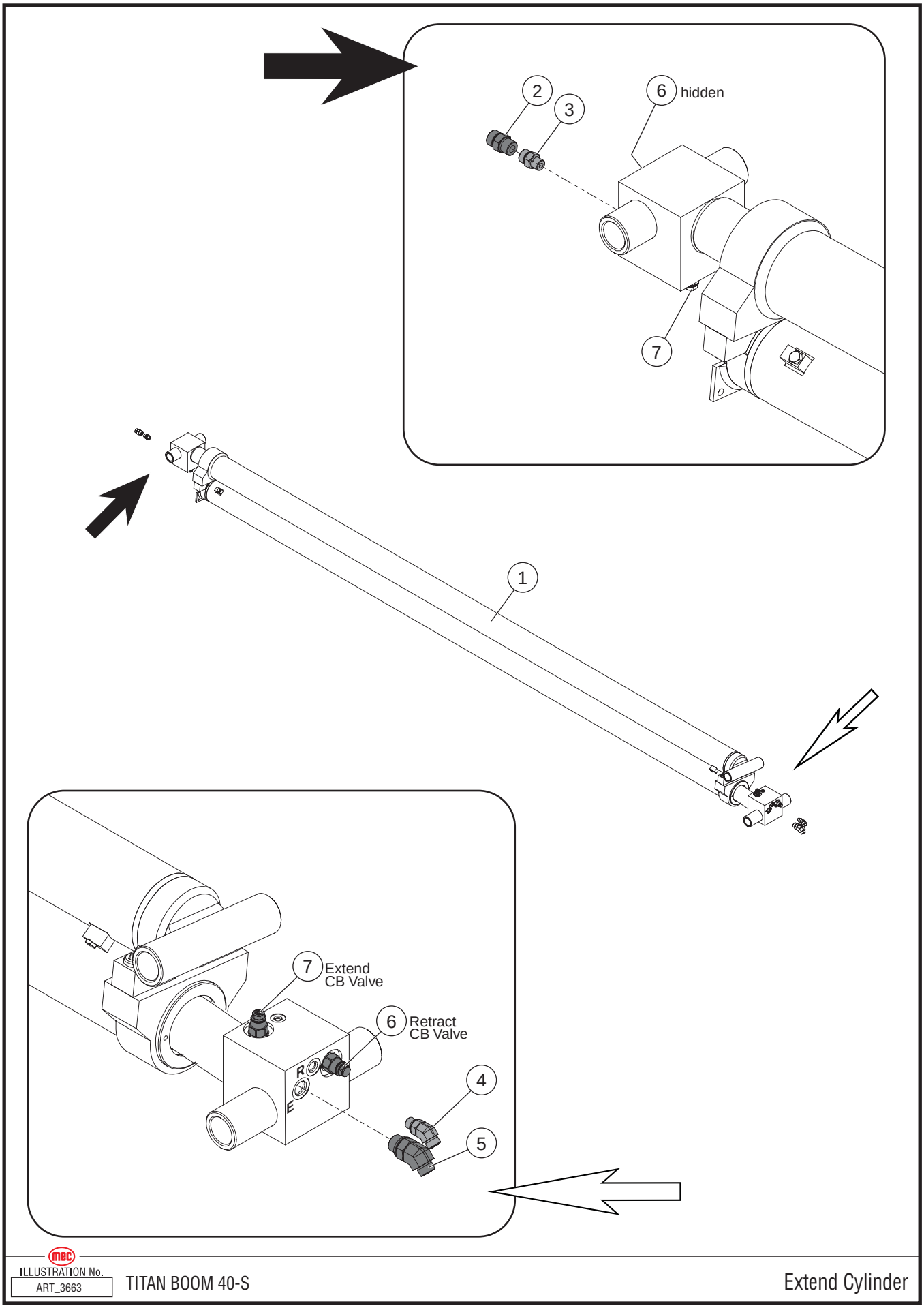


ILLUSTRATION No. ART_3663

TITAN BOOM 40-S

Extend Cylinder

Extend Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
1	22152	1	Boom Extend Cylinder Assembly, without fittings
--	92620	--	Seal Kit
2	50841	1	Fitting, MFFOR-MB-8-8
3	50835	1	Fitting, MFFOR-MB-6-6
4	50676	1	Fitting, MFFOR-MB45-06-06
5	50819	1	Fitting, MFFOR-MB45-8-8
6	92625	2	Valve, Counterbalance
7	92626	2	Valve, Counterbalance

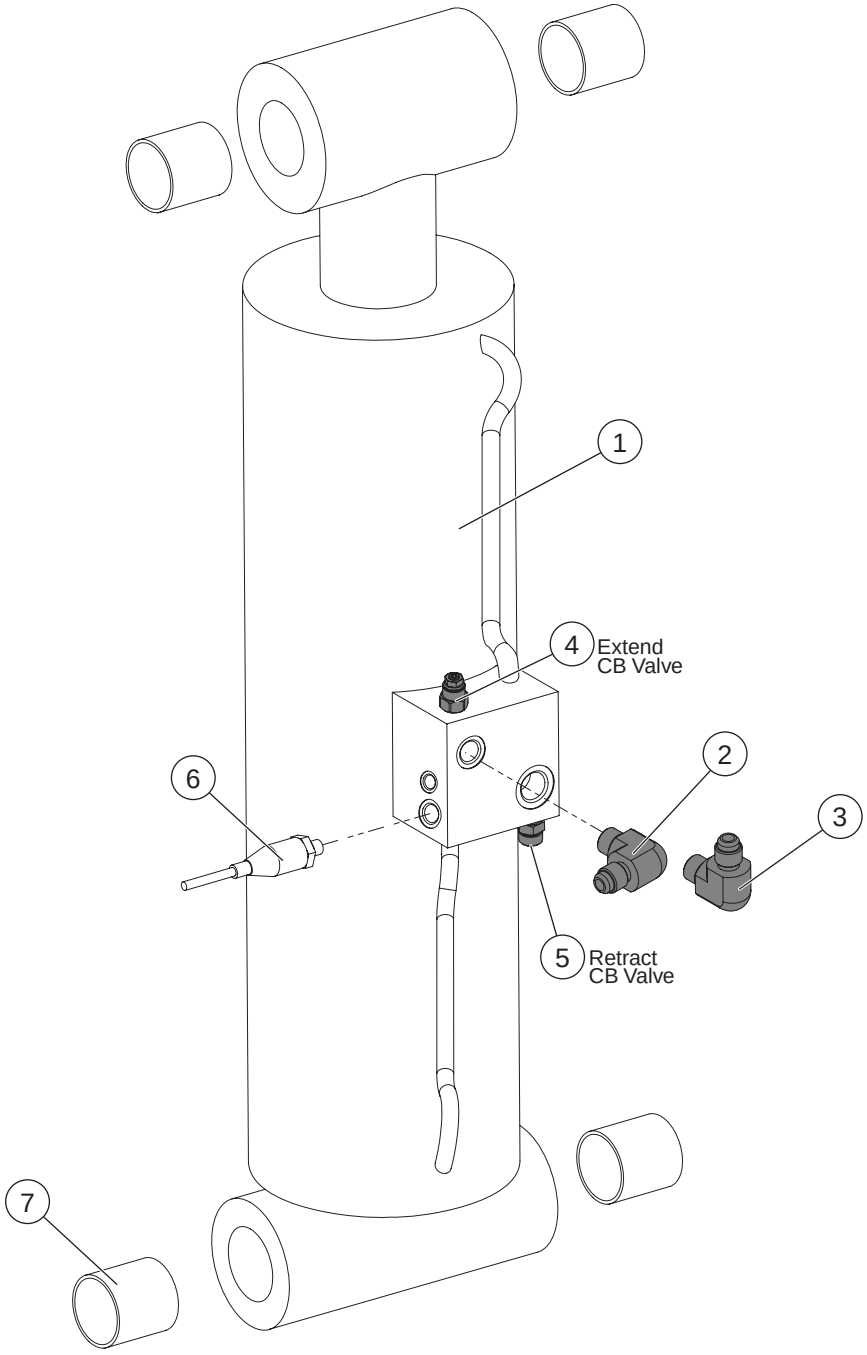


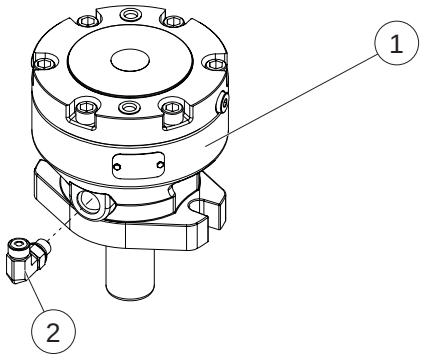
ILLUSTRATION No.
ART_3664

TITAN BOOM 40-S

Platform Level Cylinder

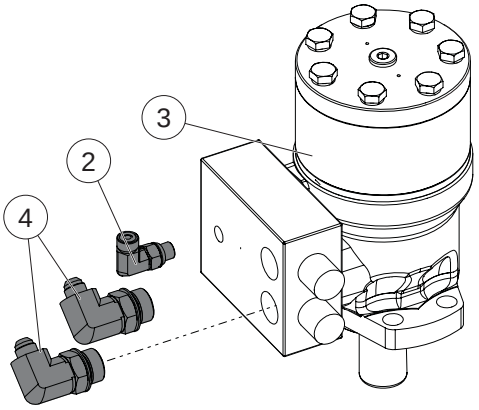
Platform Level Cylinder

ITEM	PART NO.	QTY	DESCRIPTION
1	22153	1	Platform Level Cylinder, without fittings
--	92621	--	Seal Kit
2	50674	1	Fitting, MFFOR-MB90-6-6
3	50847	1	Fitting, MFFOR-MB90-6-8
4	92627	1	Valve, Counterbalance
5	92628	1	Valve, Counterbalance
6	92646	1	Pressure Transducer -- Optional Overload Sensing System Only
7	92631	4	Bearing

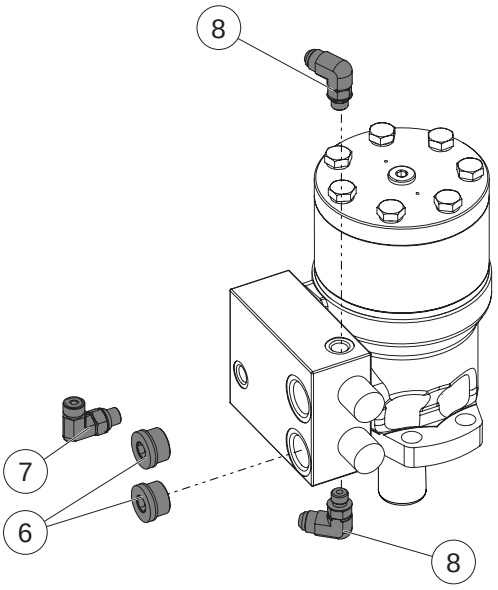


Carriage Brake

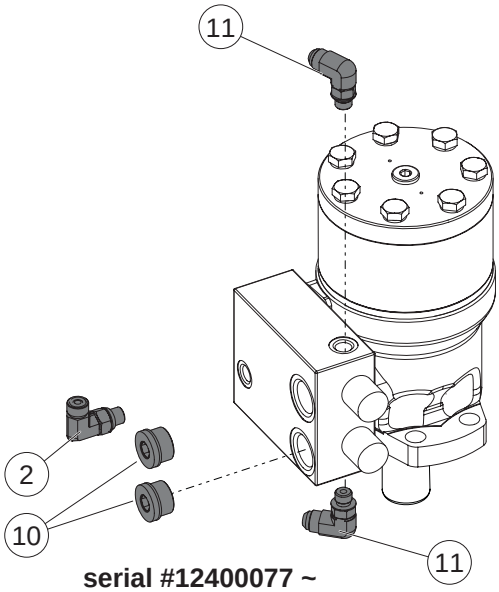
Carriage Motor



~ serial #12400044



serial #12400045 ~ #12400076



serial #12400077 ~

Carriage Motor & Brake

ITEM	PART NO.	QTY	DESCRIPTION
1	91894	1	Brake
2	50673	2	**Serial ~ #12400044, #12400077~** Fitting, MFFOR-MB90 4-4
		1	**Serial #124000045-#12400076** Fitting, MFFOR-MB90 4-4
3	92005	1	Hydraulic Motor
--	92657	--	Motor only; no block
--	92658	--	Shaft Key
4	50780	2	Fitting, MB-MJ90-10-6
5	--	--	--
6	50987	2	Fitting, 1/2‟ BSPP Plug
7	50800	1	Fitting, MBSPPOR-MJ-4-4
8	50986	2	Fitting, MB-MJ90-04-06
9	--	--	--
10	HDW90952	2	Fitting, MB-10 Plug
11	50986	2	Fitting, MB-MJ90-04-06

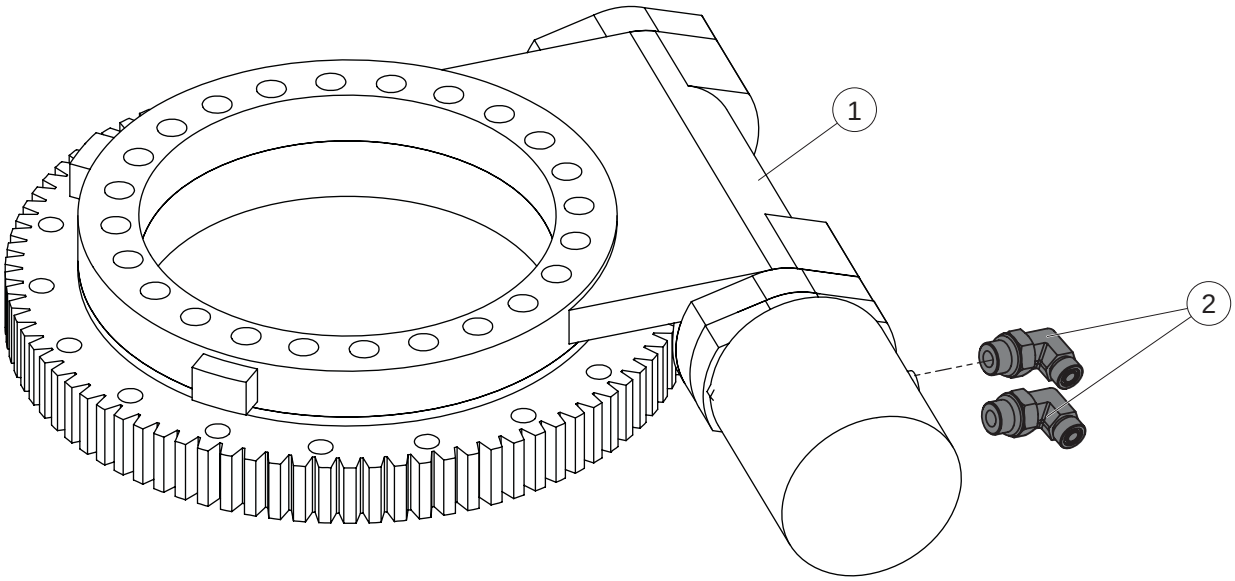


ILLUSTRATION No.
ART_3666

TITAN BOOM 40-S

Platform Rotate Drive Unit

Platform Rotate Drive Unit

ITEM	PART NO.	QTY	DESCRIPTION
1	92018	1	Platform Rotate motor, without fittings
2	50665	2	Fitting, MB-MJ90-04-04

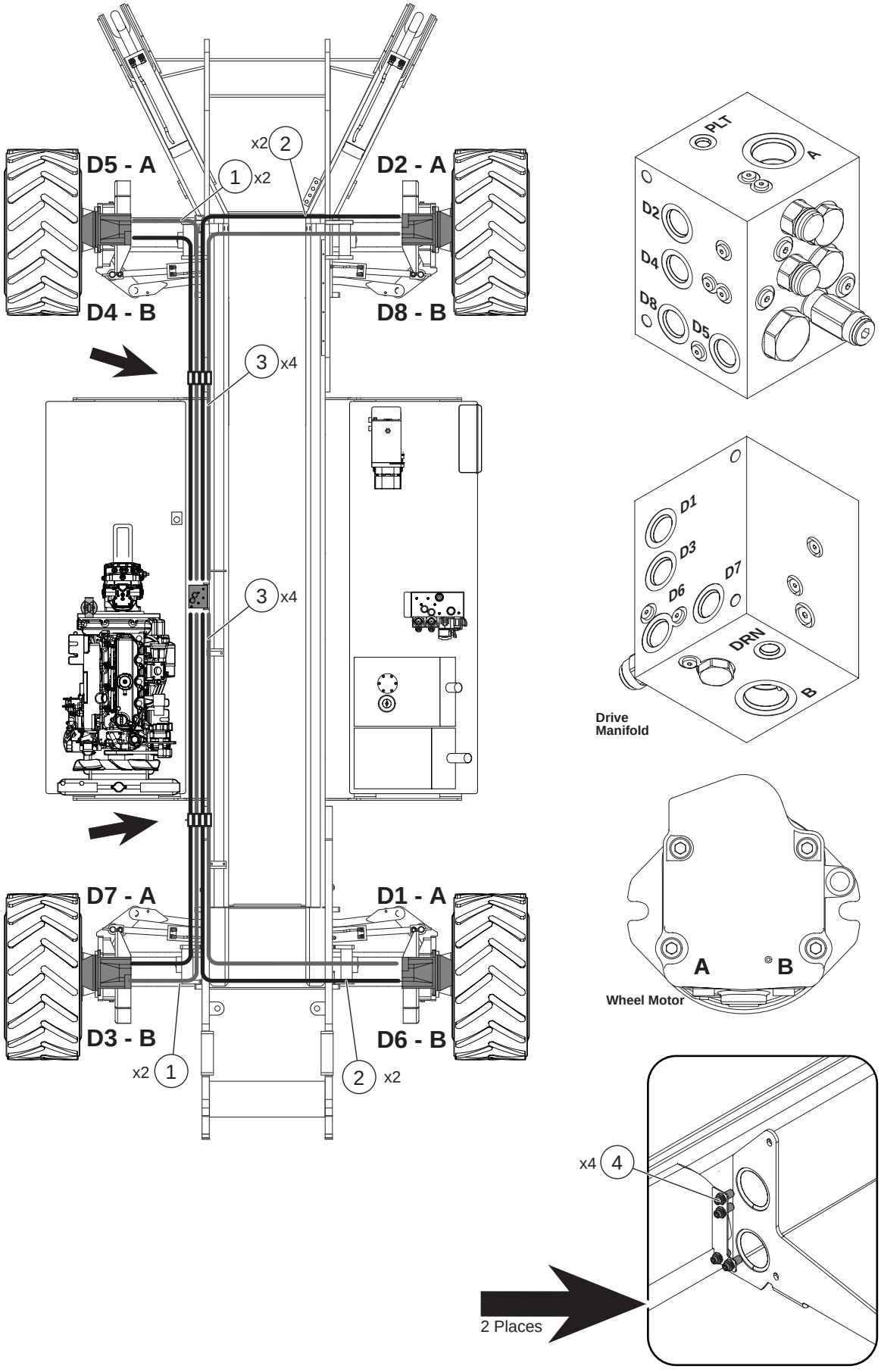


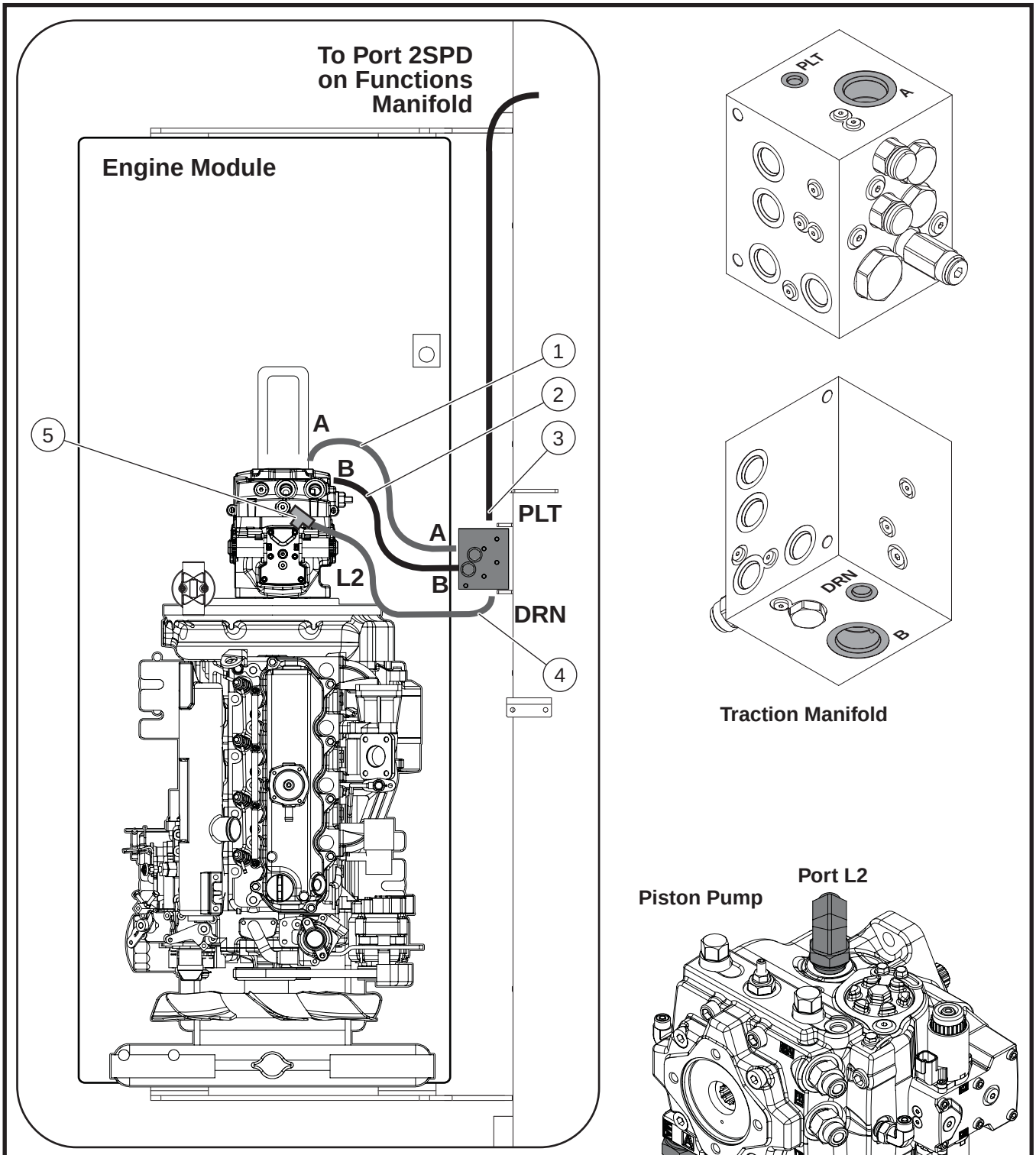
ILLUSTRATION No. ART_3667

TITAN BOOM 40-S

Drive Circuit

Drive Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52021	4	Hose Assy, 1/2" x 65", 8G-10FFORX-8G8FFORX
2	52020	4	Hose Assy, 1/2" x 101", 8G-10FFORX-8G8FFORX
3	52022	8	Hose Assy, 1/2" x 43.5", 8G-10FFORX-8G8FFORX
4	50867	8	Fitting, MMFOR-MMFORH-8 Bulkhead Adapter



Traction Manifold

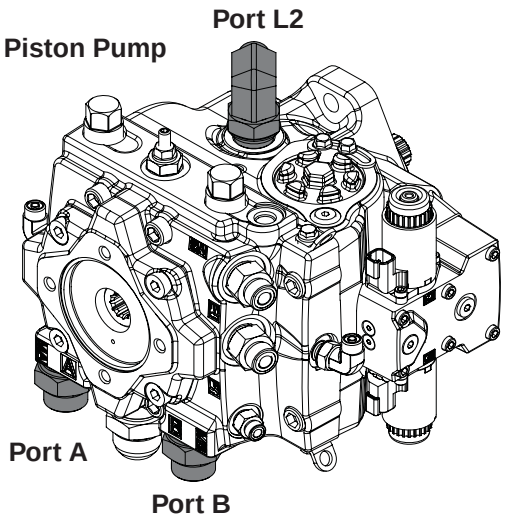


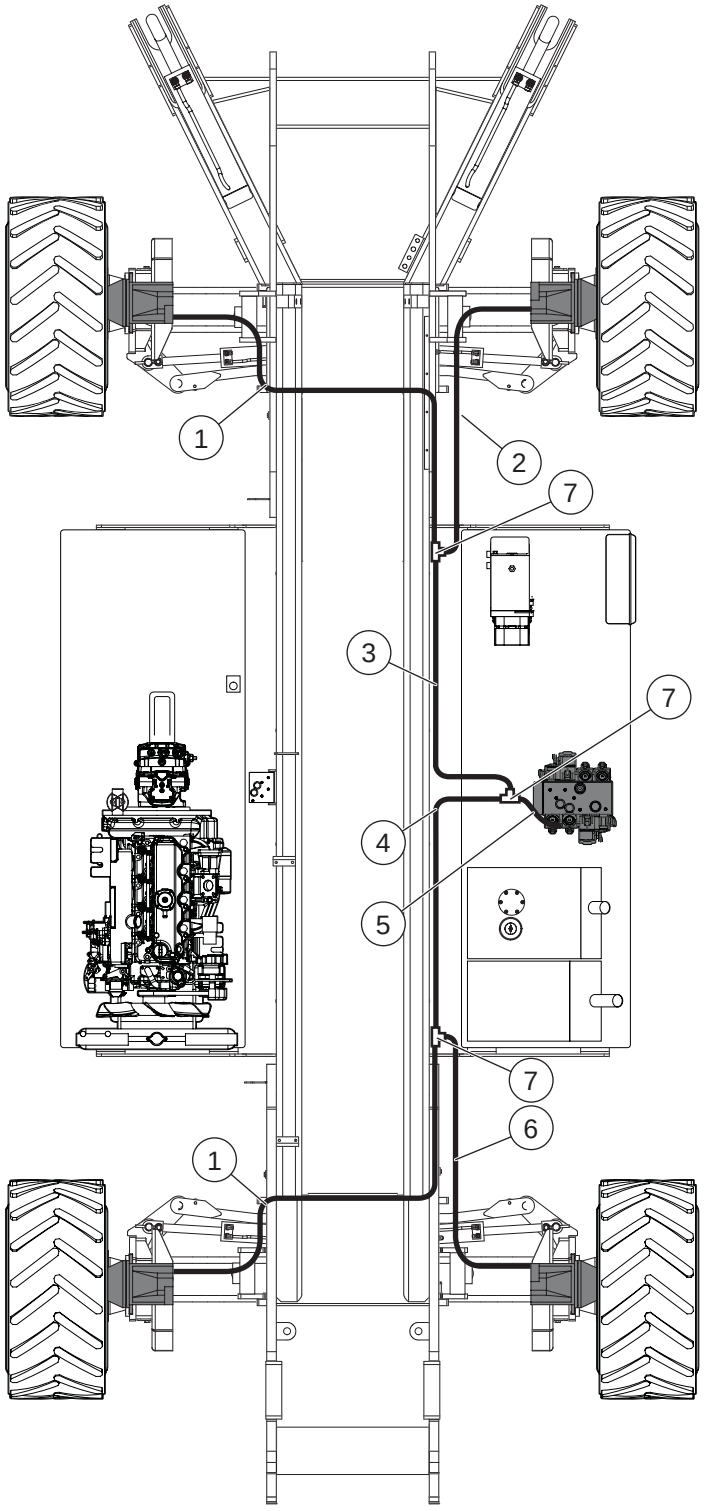
ILLUSTRATION No. ART_3678

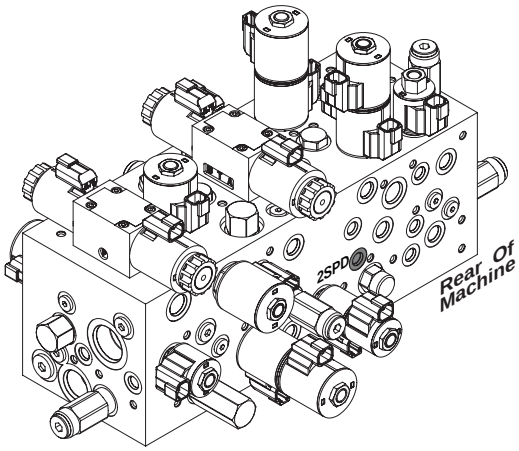
TITAN BOOM 40-S

Drive Pump/Drive Manifold Circuit

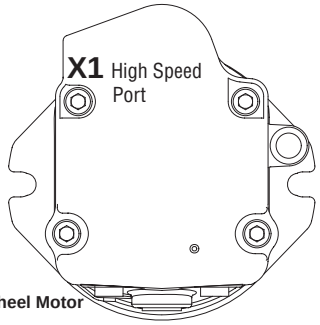
Drive Pump/Traction Manifold Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52027	1	Hose Assy, Port B to Port B, 3/4" x 26 12G12FFORX x 12G12FFORX90
2	52028	1	Hose Assy, Port A to Port A, 3/4" x 18 12G12FFORX45 x 12G12FFORX45
3	52119	1	Hose Assy, Port PLT to Port 2SPD
4	52120	1	Hose Assy, Port DRN to Port L2 on Drive Pump
5	50975	1	Fitting, MFFOR-MFFOR-FFORX-08





Functions Manifold



Wheel Motor

ILLUSTRATION No.
ART_3668

TITAN BOOM 40-S

High Speed Circuit

High Speed Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52047	2	Hose Assy, 1/4" x 112", 4G4FFORX-4G4FFORX
2	52002	1	Hose Assy, 1/4" x 87", 4G4FFORX-4G4FFORX
3	52026	1	Hose Assy, 1/4" x 38", 4G4FFORX-4G4FFORX
4	52050	1	Hose Assy, 1/4" x 64", 4G4FFORX-4G4FFORX
5	52052	1	Hose Assy, 1/4" x 18", 4G4FFORX-4G4FFORX90L
6	52048	1	Hose Assy, 1/4" x 90", 4G4FFORX-4G4FFORX
7	50878	3	Fitting, MFFORT-4

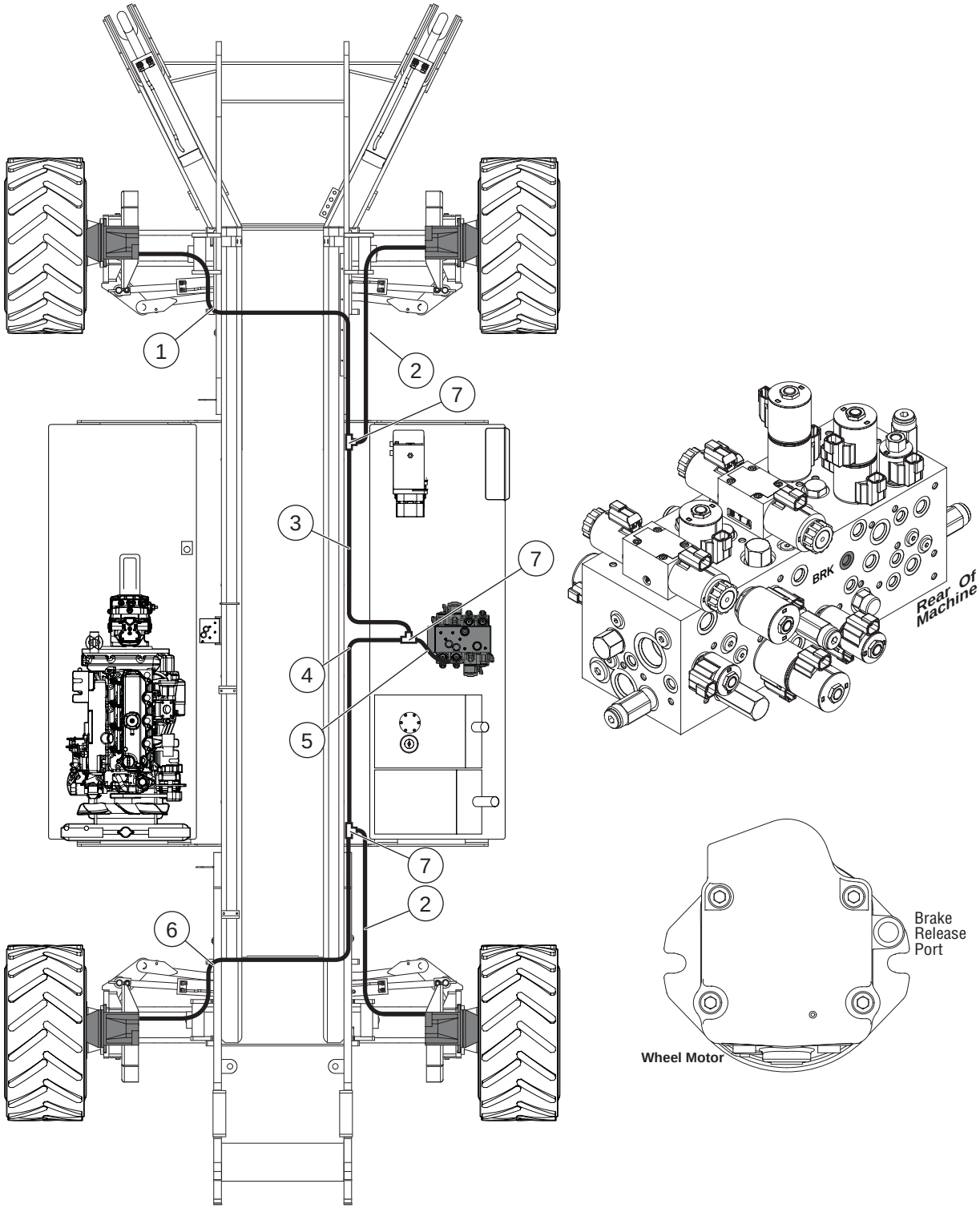


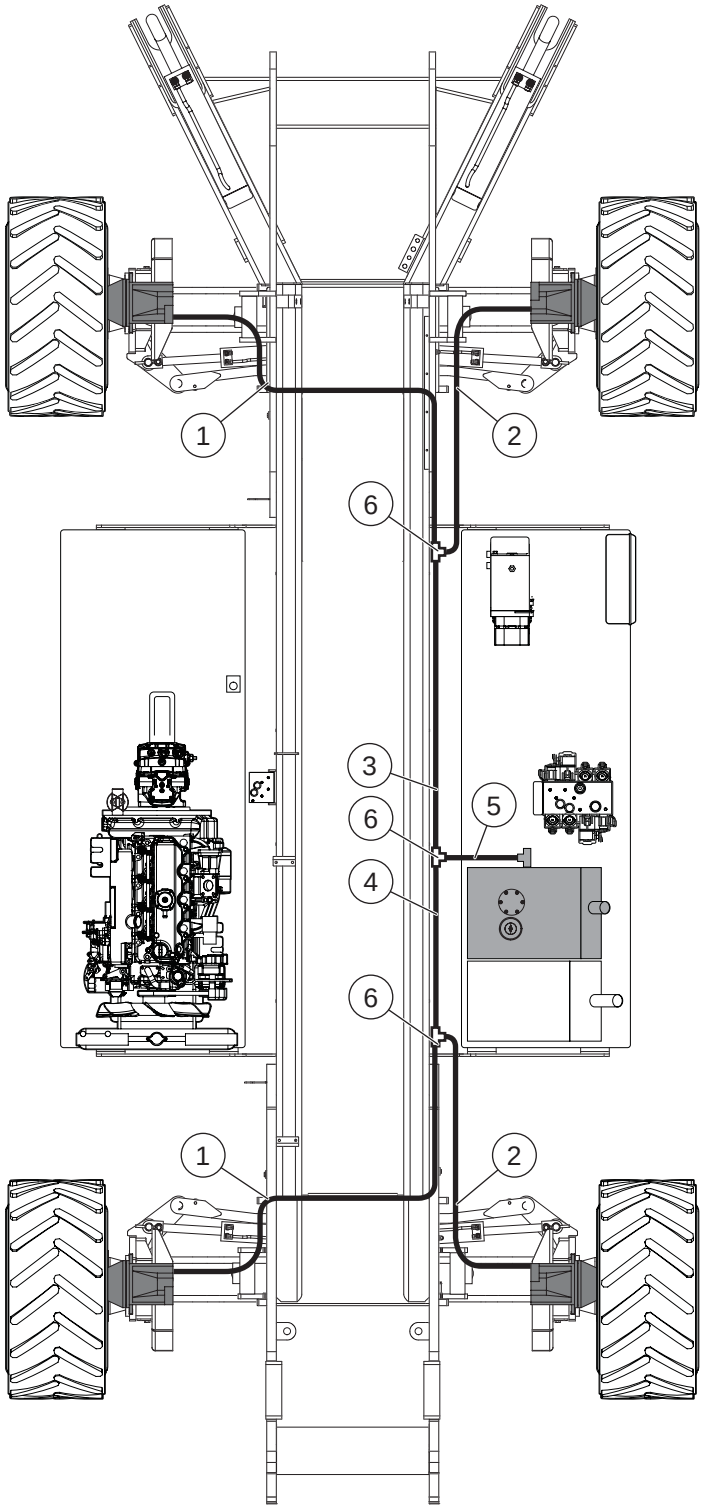
ILLUSTRATION No. ART_3669

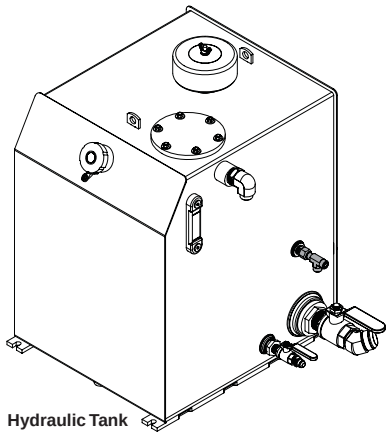
TITAN BOOM 40-S

Brake Circuit

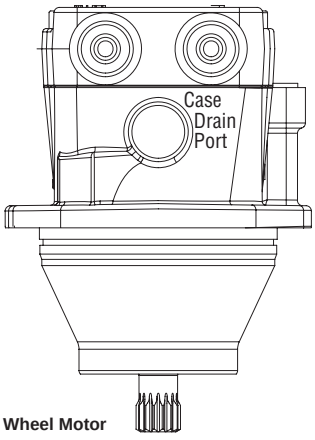
Brake Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52046	1	Hose Assy, 1/4" x 103", 4G4FFORX-4G4FFORX
2	52002	2	Hose Assy, 1/4" x 87", 4G4FFORX-4G4FFORX
3	52026	1	Hose Assy, 1/4" x 38", 4G4FFORX-4G4FFORX
4	52050	1	Hose Assy, 1/4" x 64", 4G4FFORX-4G4FFORX
5	52010	1	Hose Assy, 1/4" x 17", 4G4FFORX-4G4FFORX
6	52047	2	Hose Assy, 1/4" x 112", 4G4FFORX-4G4FFORX
7	50878	3	Fitting, MFFORT-4





Hydraulic Tank



Wheel Motor

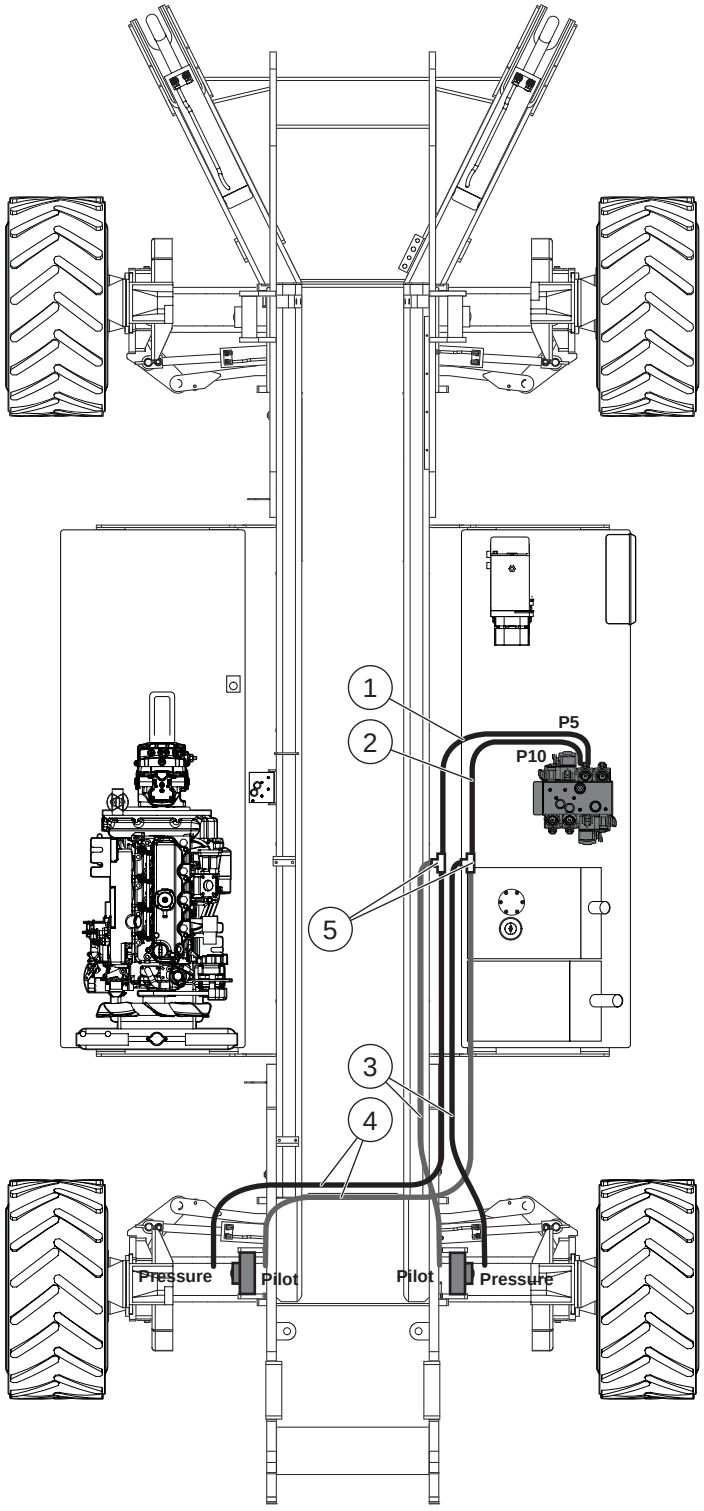
ILLUSTRATION No.
ART_3670

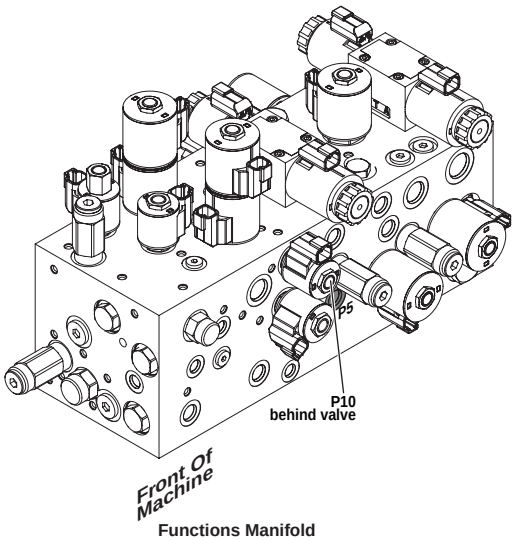
TITAN BOOM 40-S

Drive Case Drain Circuit

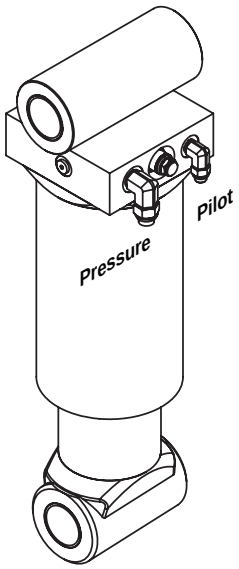
Drive Case Drain Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52045	2	Hose Assy, 3/8" x 109", 6G6FJX-6G6FJX90S
2	52044	2	Hose Assy, 3/8" x 84", 6G6FJX-6G6FJX90S
3	52051	1	Hose Assy, 3/8" x 64", 6G6FJX-6G6FJX
4	52049	1	Hose Assy, 3/8" x 38", 6G6FJX-6G6FJX
5	52053	1	Hose Assy, 3/8" x 42", 6G6FJX-6G8FJX90
6	50879	3	Fitting, MFFORT-6





Functions Manifold



Rear Axle Cylinder

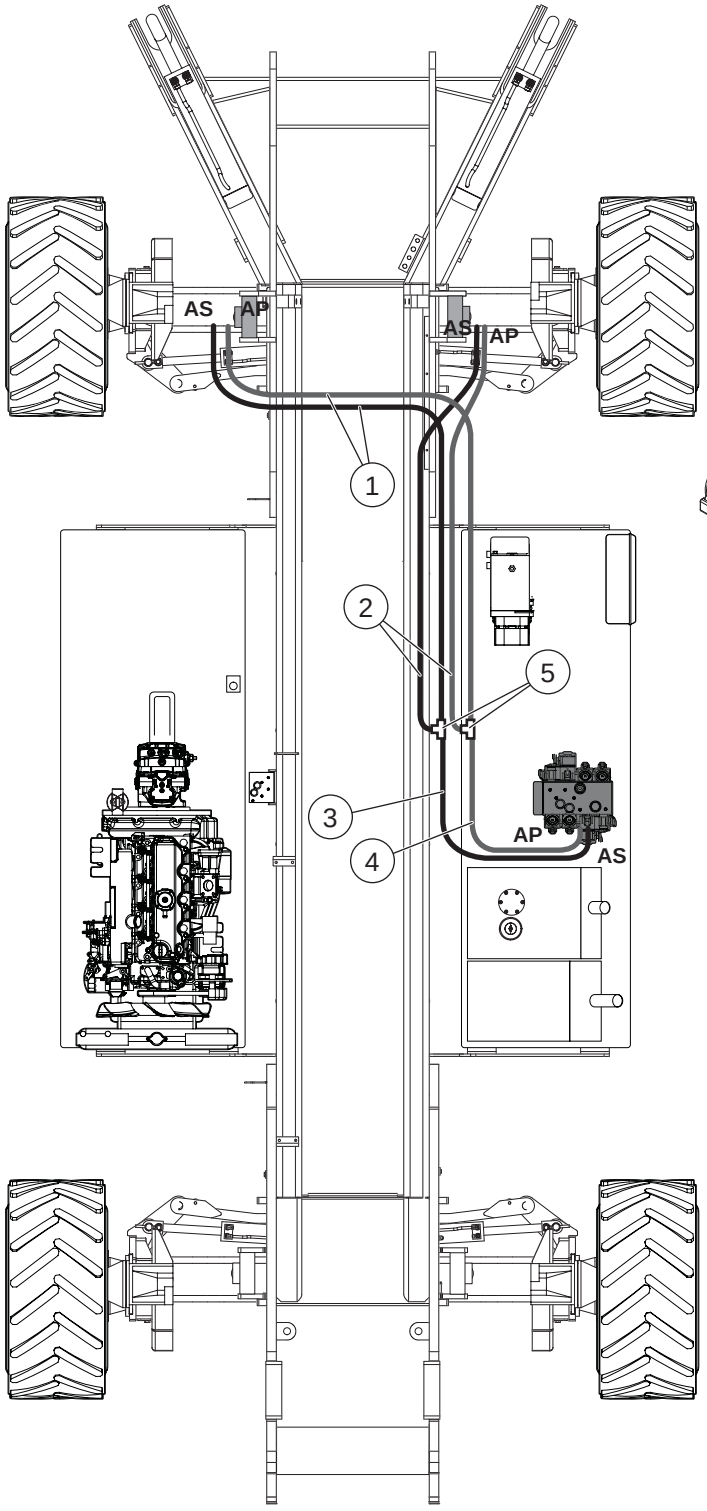
ILLUSTRATION No.
ART_3672

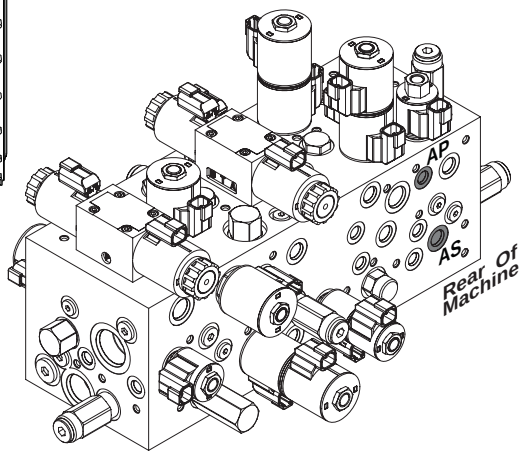
TITAN BOOM 40-S

Rear Axle Cylinder Circuit

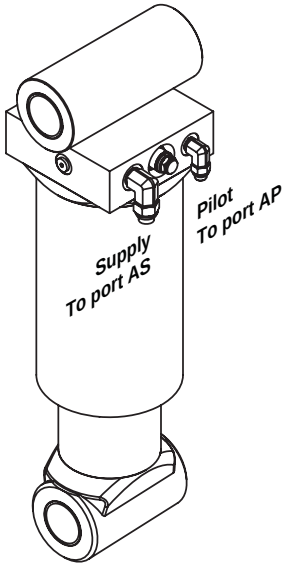
Rear Axle Cylinder Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52006	1	Hose Assy, 1/4" x 25", 4G4FFORX-4G4FFORX90S
2	52004	1	Hose Assy, 1/4" x 29", 4G4FFORX-4G4FFORX90L
3	52003	2	Hose Assy, 1/4" x 119", 4G4FFORX-4G4FFORX
4	52002	2	Hose Assy, 1/4" x 87", 4G4FFORX-4G4FFORX
5	50878	2	Fitting, MFFORT-4





Functions Manifold



Front Axle Cylinder

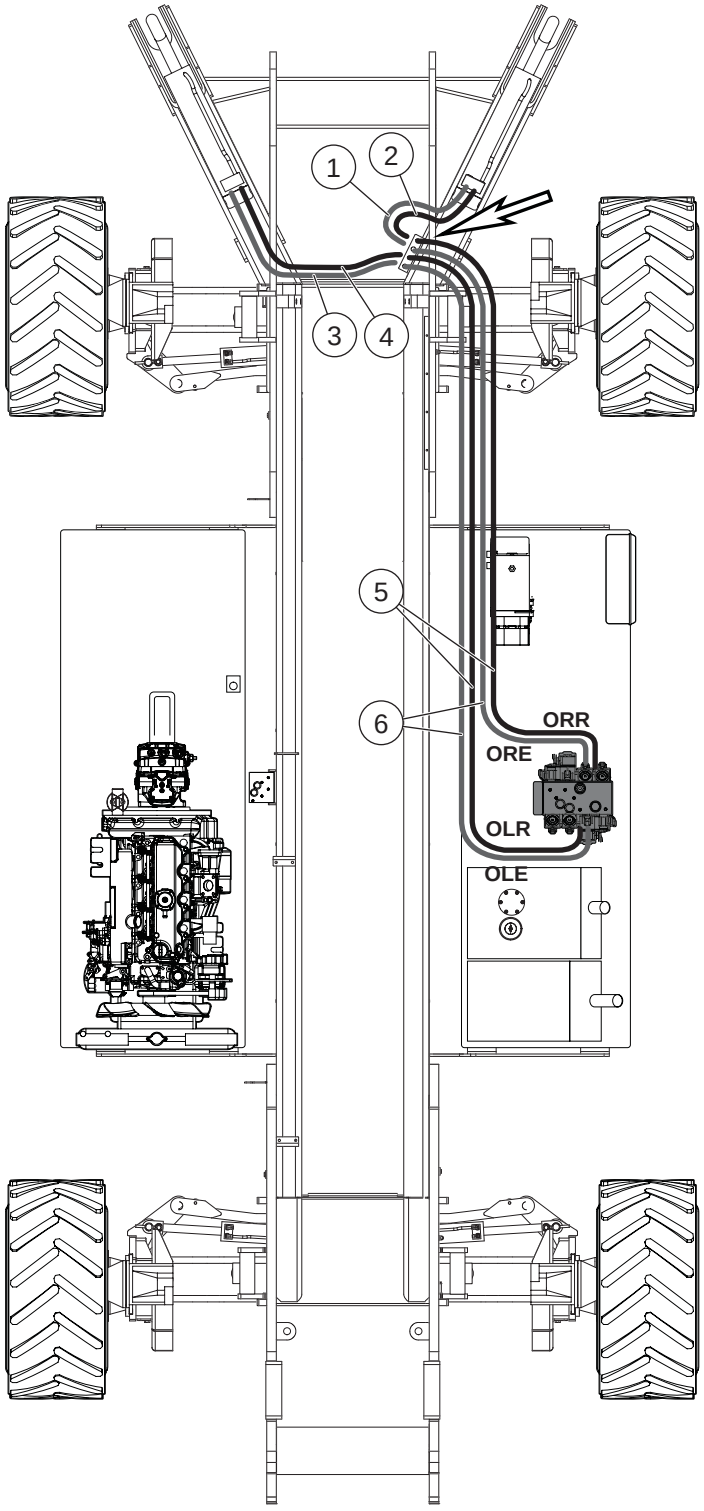
ILLUSTRATION No.
ART_3673

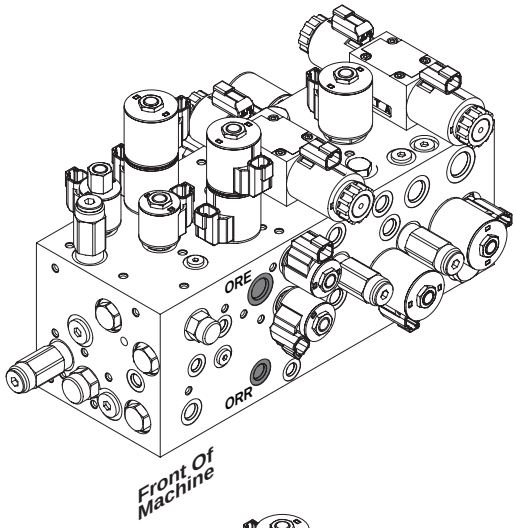
TITAN BOOM 40-S

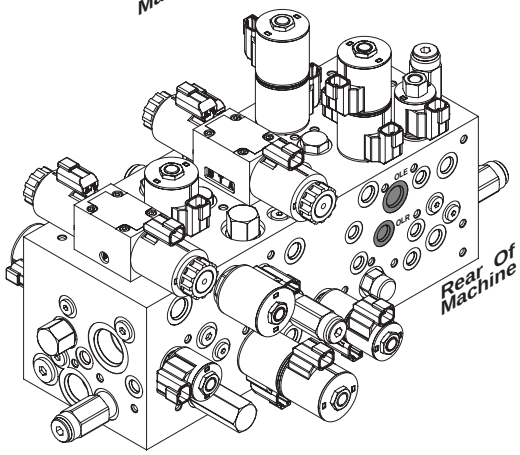
Front Axle Cylinder Circuit

Front Axle Cylinder Circuit

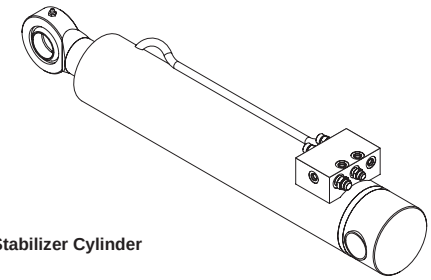
ITEM	PART NO.	QTY	DESCRIPTION
1	52001	2	Hose Assy, 1/4" x 96", 4G4FFORX-4G4FFORX
2	52000	2	Hose Assy, 1/4" x 62", 4G4FFORX-4G4FFORX90S
3	52005	1	Hose Assy, 1/4" x 31", 4G4FFORX-4G4FFORX90S
4	52004	1	Hose Assy, 1/4" x 29", 4G4FFORX-4G4FFORX90L
5	50878	2	Fitting, MFFORT-4







Functions Manifold



Stabilizer Cylinder

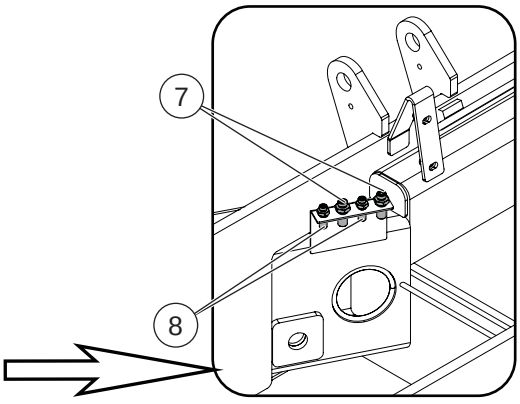


ILLUSTRATION No. ART_3674

TITAN BOOM 40-S

Stabilizer Circuit

Stabilizer Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52009	1	Hose Assy, 3/8" x 14", 6G6FFORX-6G6FFORX
2	52010	1	Hose Assy, 1/4" x 17", 4G4FFORX-4G4FFORX
3	52011	1	Hose Assy, 3/8" x 34", 6G6FFORX-6G6FFORX
4	52012	1	Hose Assy, 1/4" x 35", 4G4FFORX-4G4FFORX
5	52007	2	Hose Assy, 1/4" x 99", 4G4FFORX-4G4FFORX90
6	52008	2	Hose Assy, 3/8" x 94", 6G6FFORX-6G6FFORX90
7	50964	2	Fitting, MMFOR-MMFORH90-6 Bulkhead Adapter
8	50963	2	Fitting, MMFOR-MMFORH90-4 Bulkhead Adapter

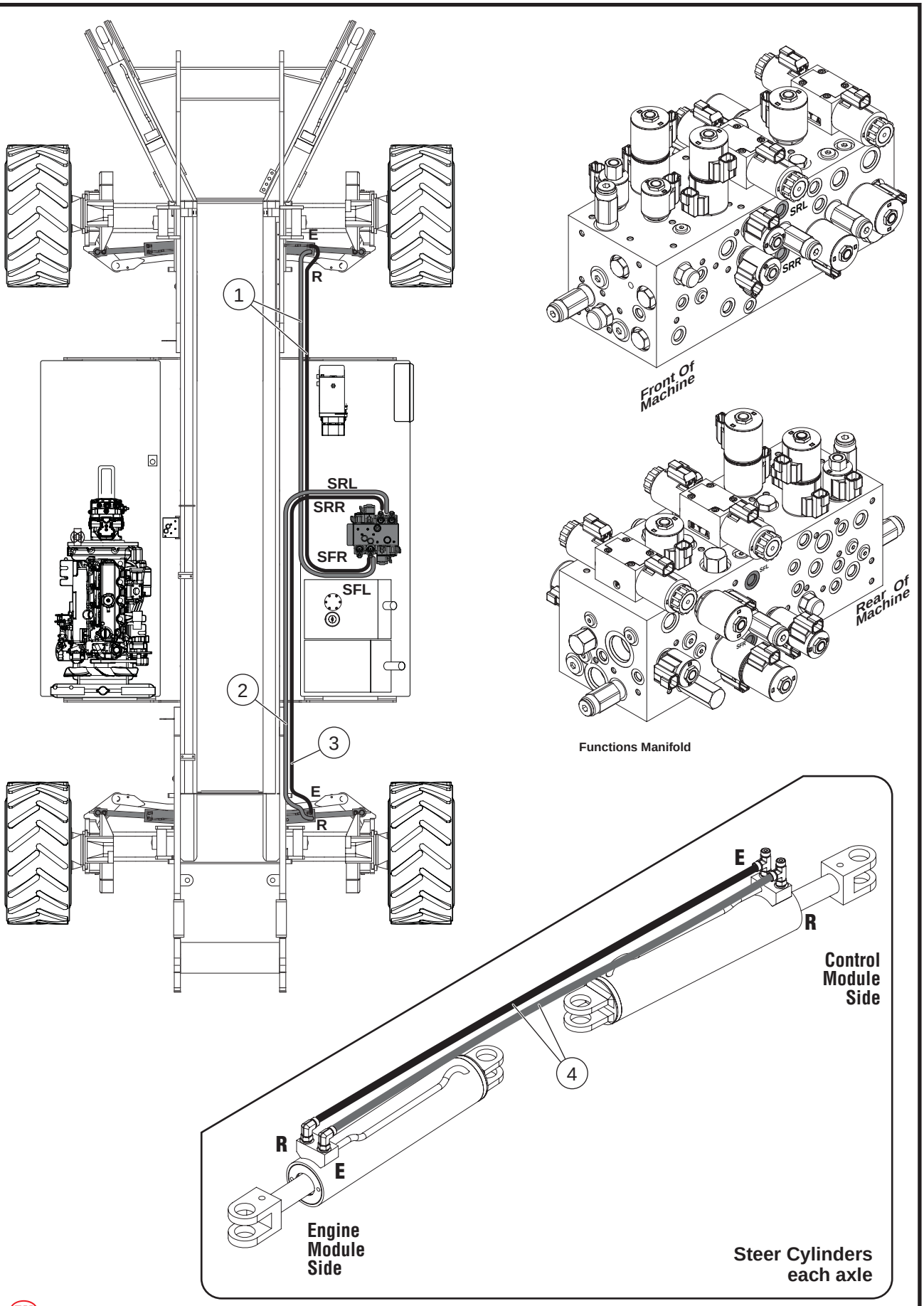


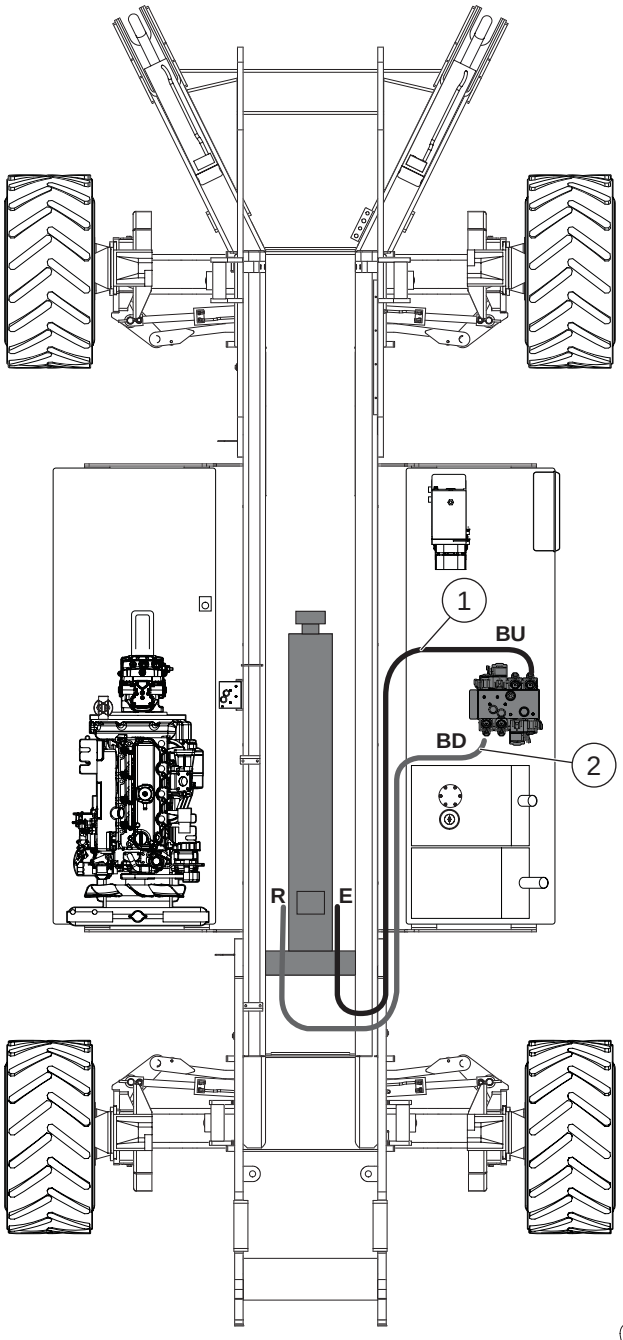
ILLUSTRATION No. ART_3675

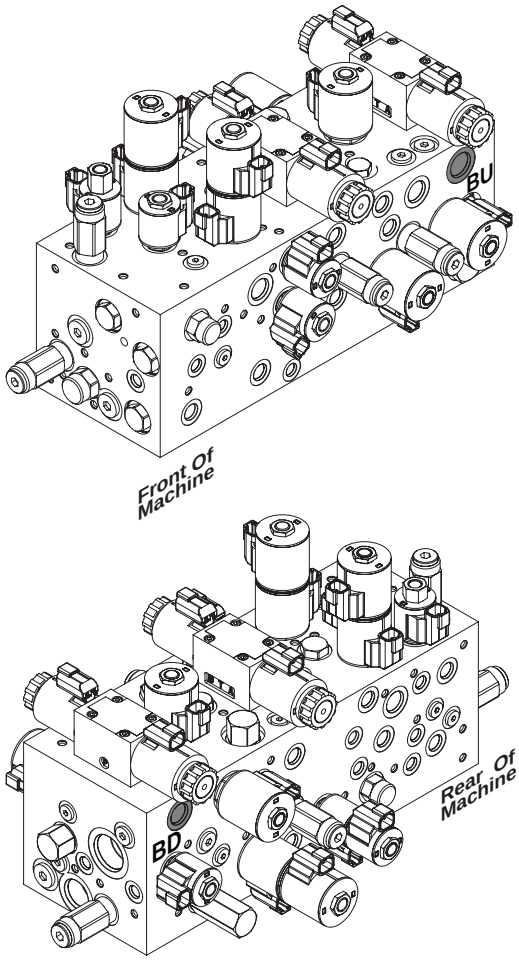
TITAN BOOM 40-S

Steer Circuit

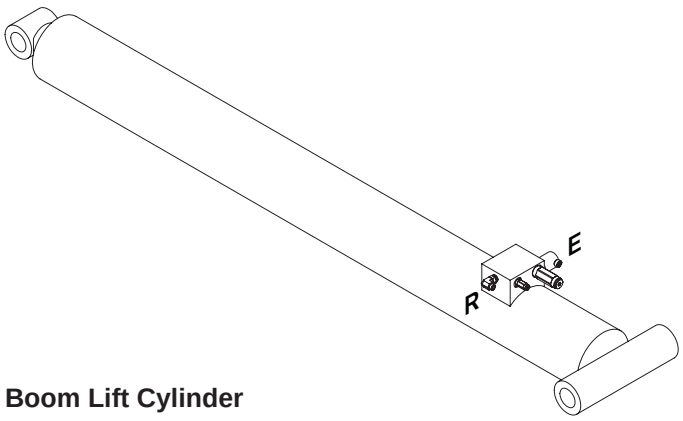
Steer Cylinder Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52023	2	Hose Assy, 1/4" x 118", 4G4FFORX-4G4FFORX45
2	52024	1	Hose Assy, 1/4" x 85", 4G4FFORX-4G4FFORX45
3	52025	1	Hose Assy, 1/4" x 90", 4G4FFORX-4G4FFORX45
4	52026	4	Hose Assy, 1/4" x 38", 4G4FFORX-4G4FFORX





Functions Manifold



Boom Lift Cylinder

ILLUSTRATION No. ART_3683

TITAN BOOM 40-S

Lift Circuit

Lift Cylinder Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52018	1	Hose Assy, 3/8" x 120" 6G6FFORX-6G6FFORX90
2	52017	1	Hose Assy, 1/2" x 120" 8G8FFORX-8G8FFORX45

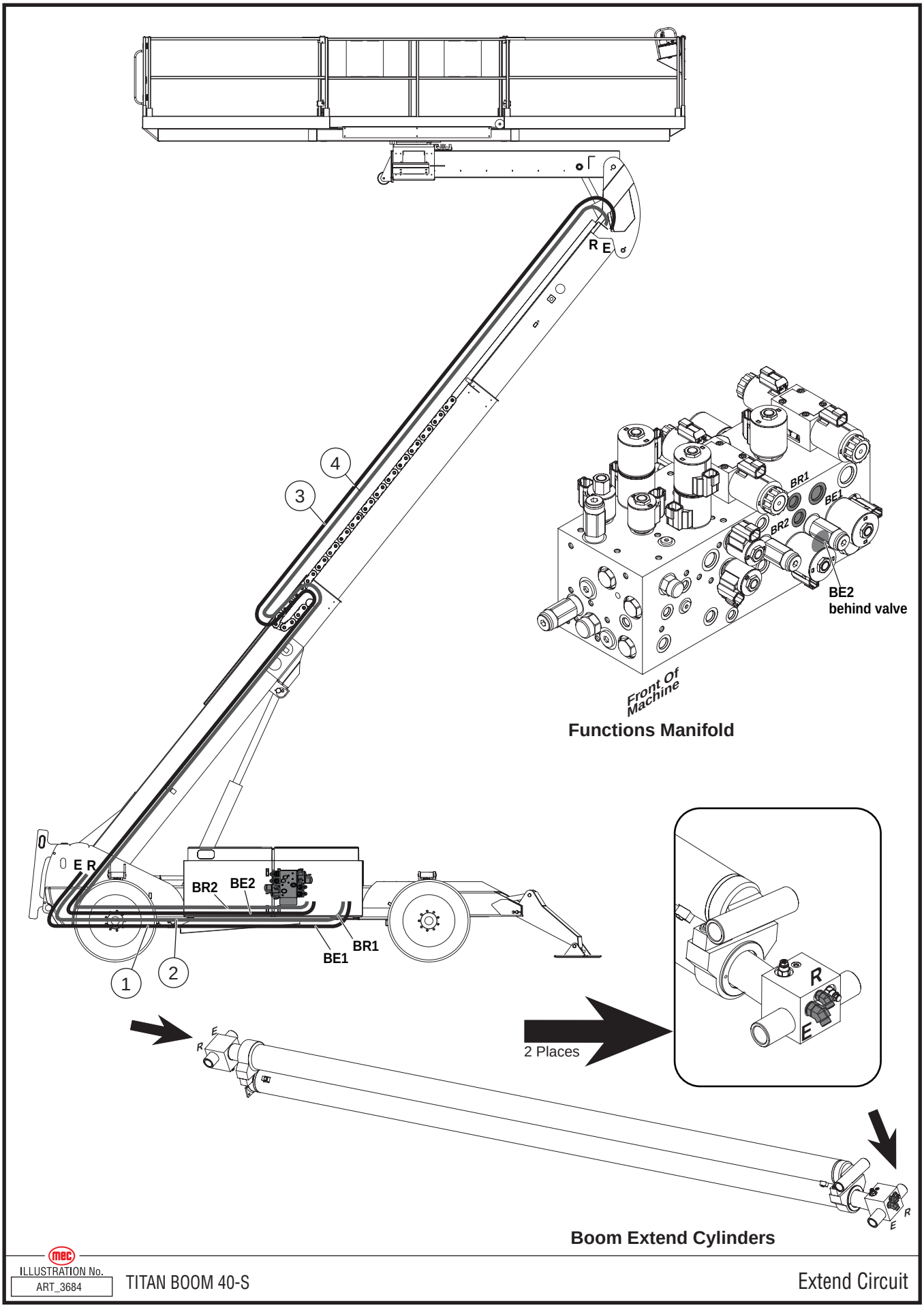


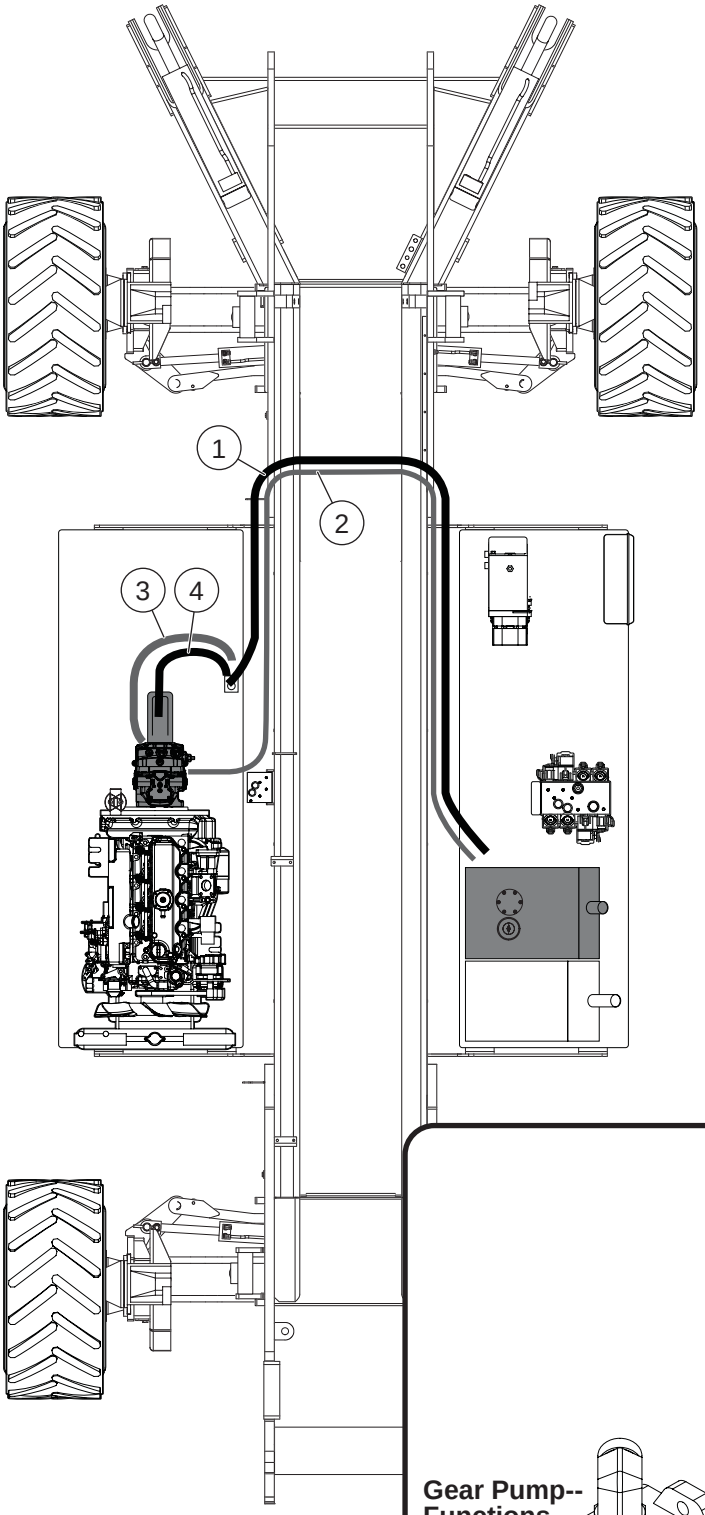
ILLUSTRATION No.
ART_3684

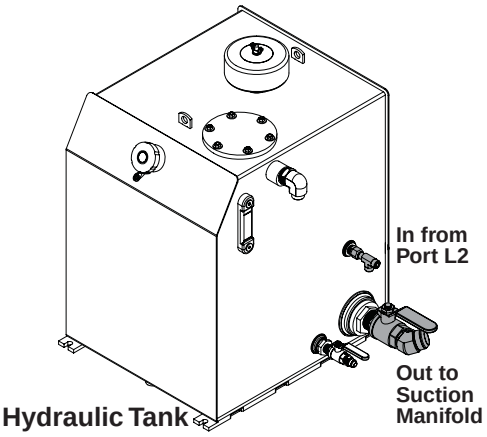
TITAN BOOM 40-S

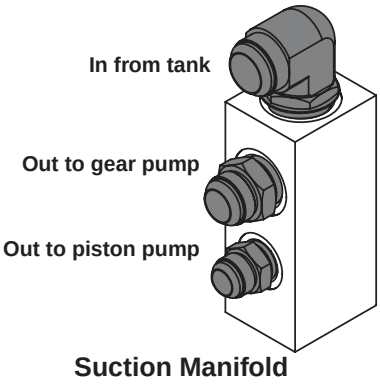
Extend Circuit

Extend Cylinder Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52013	1	Hose Assy, 1/2" x 152" 8G8FFORX45-8G8FFORX45
2	52014	1	Hose Assy, 3/8" x 152" 6G6FFORX45-6G6FFORX45
3	52015	1	Hose Assy, 1/2" x 684" 8G8FFORX-8G8FFORX45
4	52016	1	Hose Assy, 3/8" x 684" 6G6FFORX-6G6FFORX90







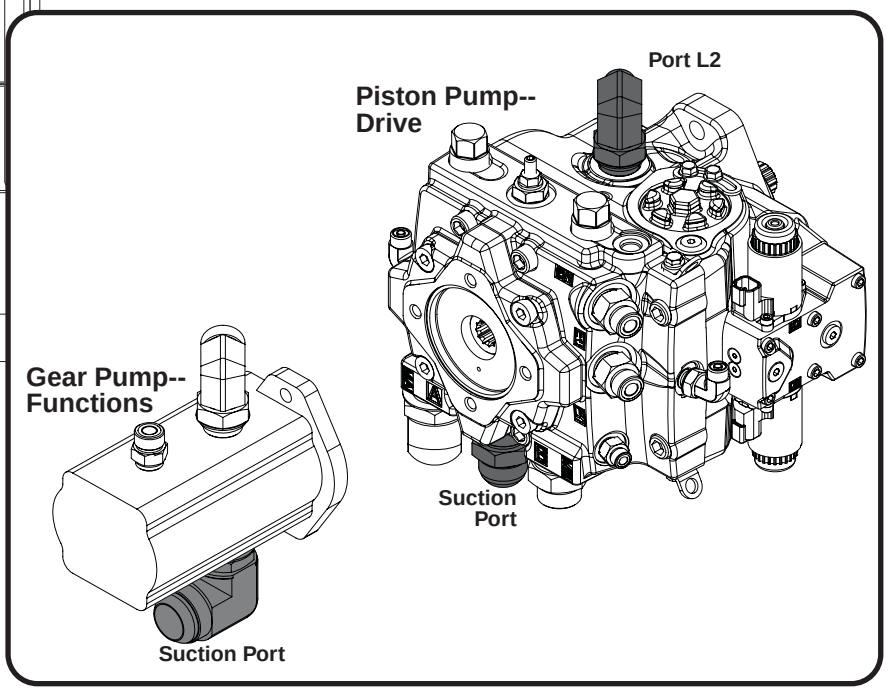


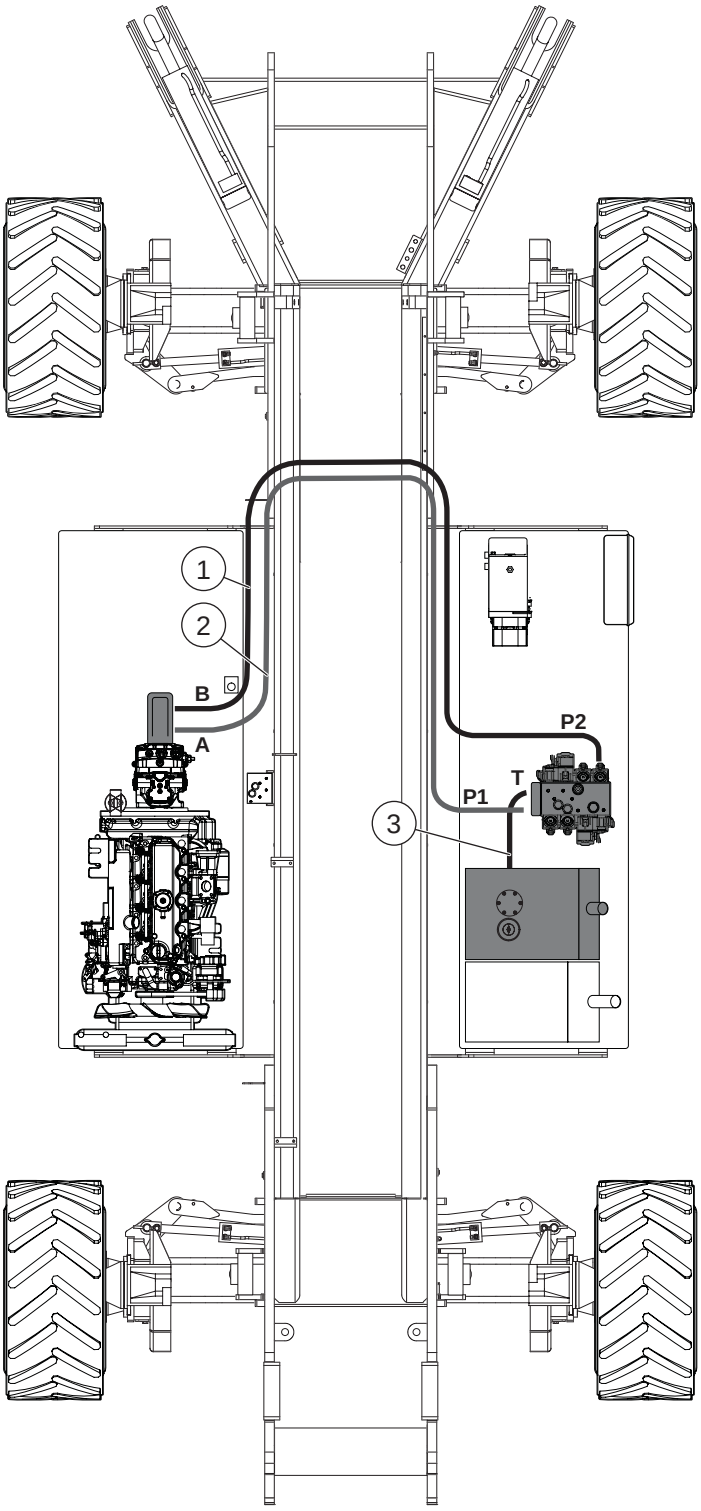
ILLUSTRATION No. ART_3677

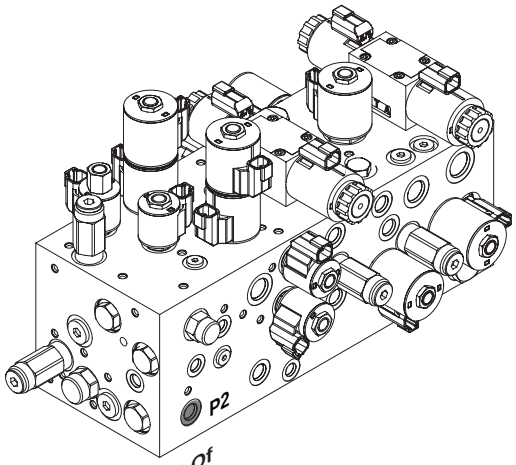
TITAN BOOM 40-S

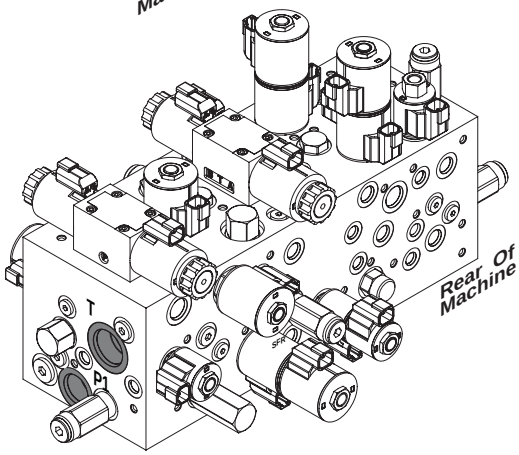
Suction/Piston Pump Case Drain Circuit

Suction/ Piston Pump Case Drain Circuit

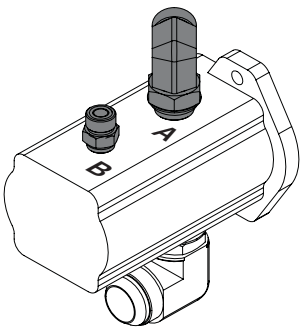
ITEM	PART NO.	QTY	DESCRIPTION
1	52043	1	Hose Assy, 1.5" x 124" 24G24FJX-24G24FJX
2	52031	1	Hose, Assy, 1/2" x 158" 8G8FFORX-8G8FFORX90
3	52033	1	Hose Assy, 1" x 35" 16GS16FJX-16GS16FJX
4	52036	1	Hose Assy, 1.25" x 31" 20G20FJX-20G20FJX



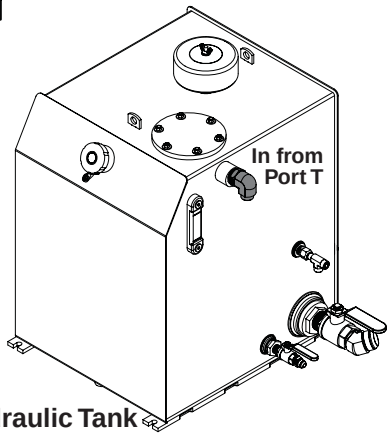




Functions Manifold



Gear Pump



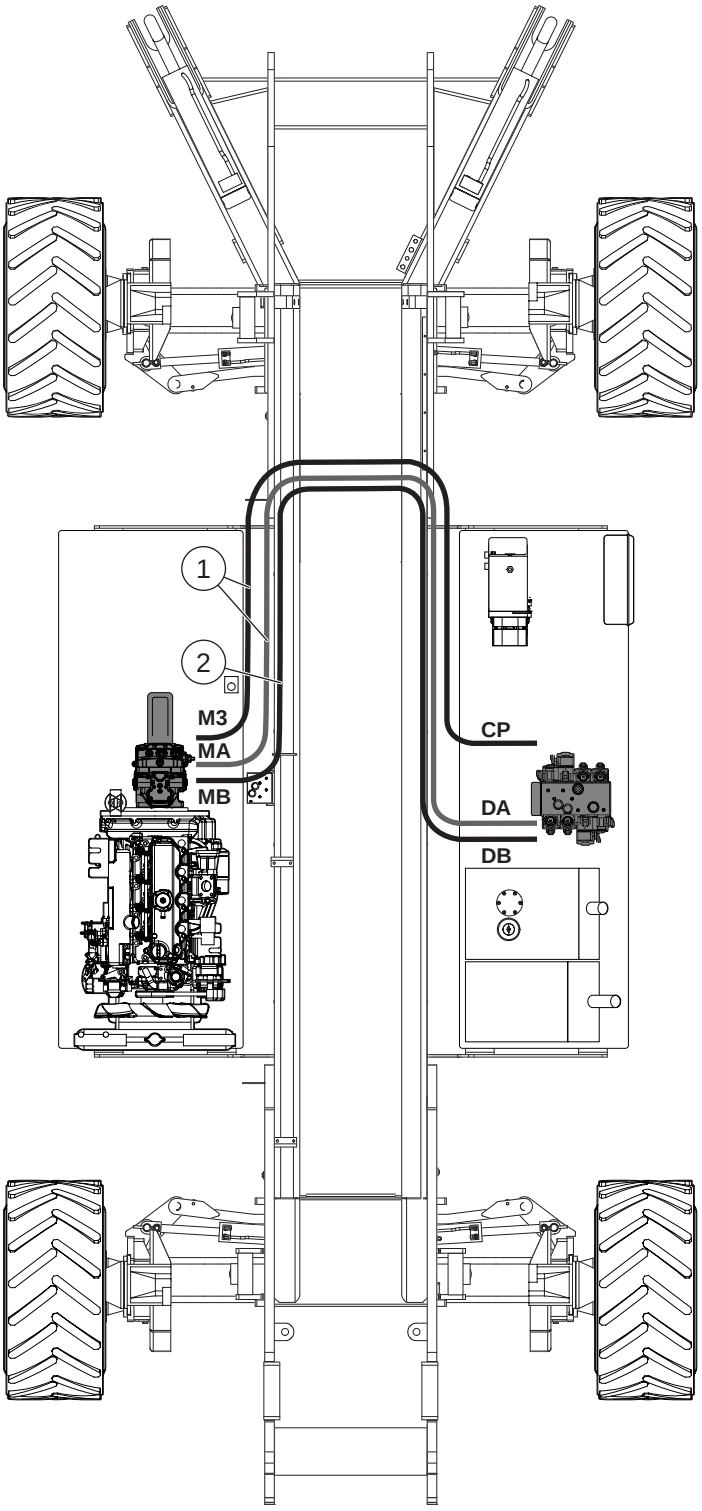
Hydraulic Tank

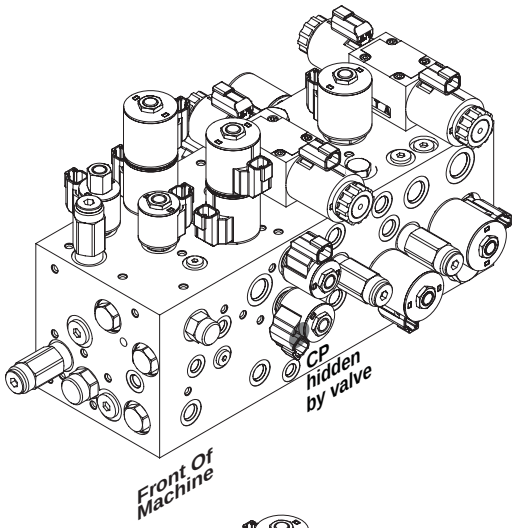
ILLUSTRATION No. ART_3681 TITAN BOOM 40-S

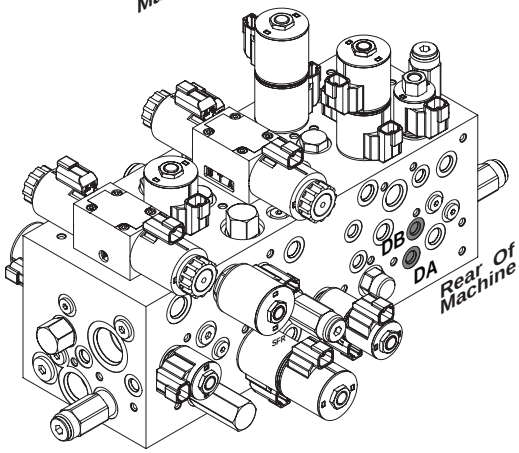
Gear Pump/Functions Manifold & Functions Manifold Return Hoses

Gear Pump to Functions Manifold Pressure & Functions Manifold Return Hoses

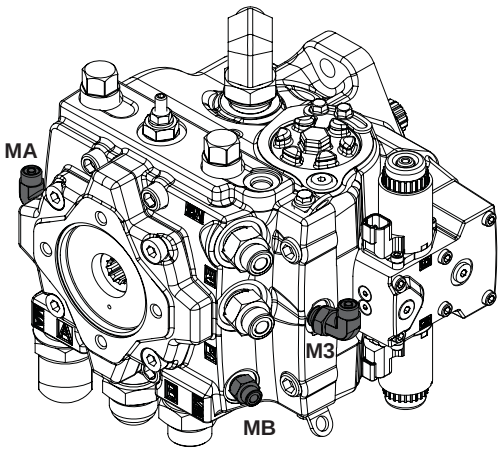
ITEM	PART NO.	QTY	DESCRIPTION
1	52034	1	Hose Assy, 3/4" x 171" 12G12FFORX-12G12FFORX45
2	52034	1	Hose Assy, 3/8" x 185" 6G6FFORX-6G8FFORX
3	52054	1	Hose Assy, 3/4" x 24", 12G12FFORX-12G12FFORX







Functions Manifold



Piston Pump

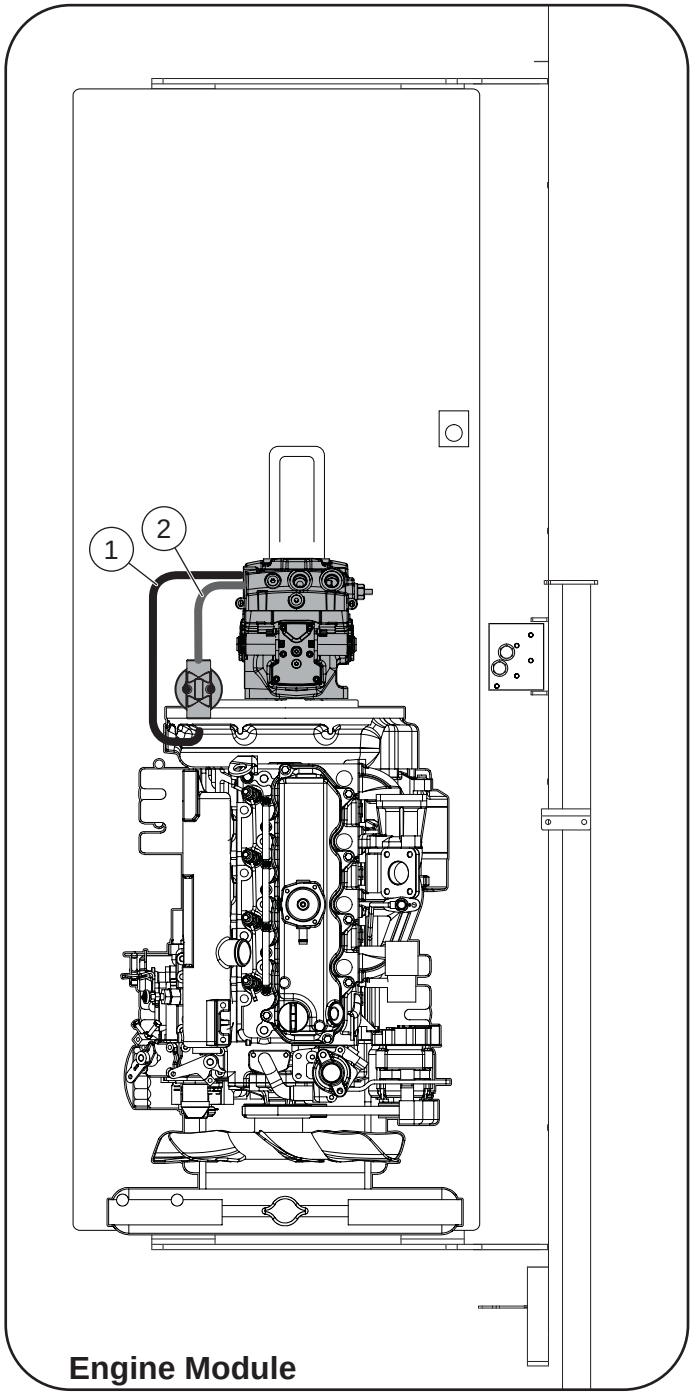
ILLUSTRATION No.
ART_3680

TITAN BOOM 40-S

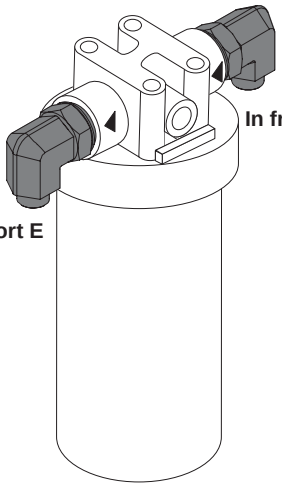
Charge Pressure Circuit

Charge Pressure & Drive Signal Hoses

ITEM	PART NO.	QTY	DESCRIPTION
1	52029	2	Hose Assy, 1/4" x 185" 4G4FFORX-4G4FFORX
2	52030	1	Hose Assy, 1/4" x 195" 4G4FFORX-4G4FFORX90L

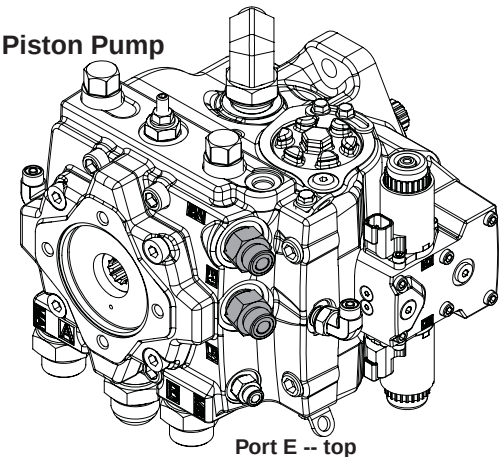


Engine Module



Charge Filter

Piston Pump

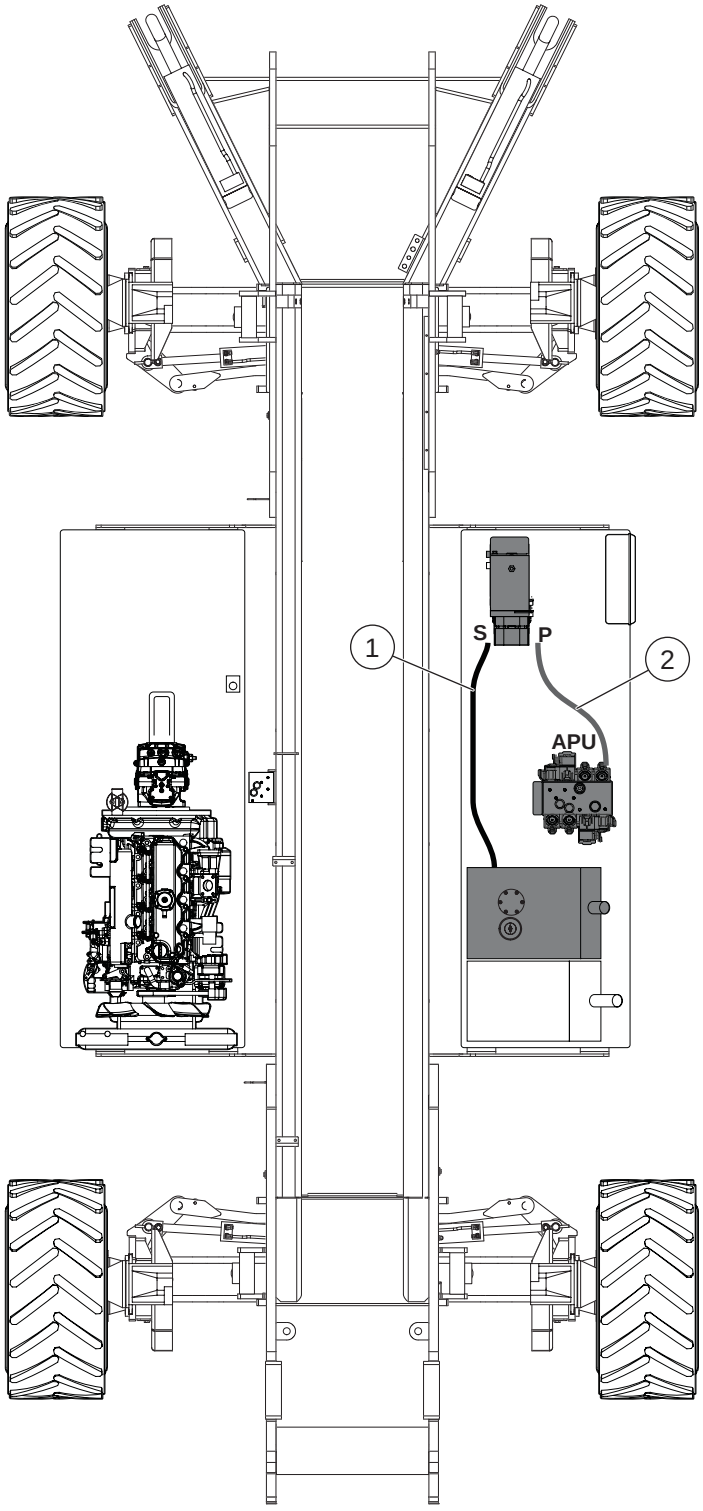


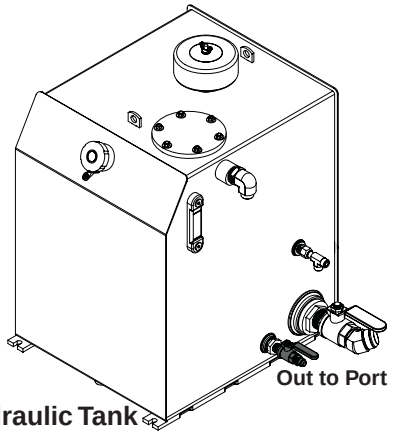
Port E -- top
In from Charge Filter

Port F -- bottom
Out to Charge Filter

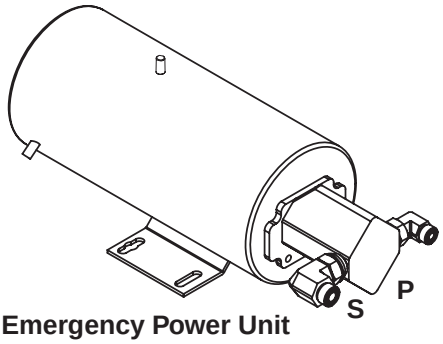
Charge Filter Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52032	2	Hose Assy, 1/2" x 35", 8G8FJX-8G8FJX90

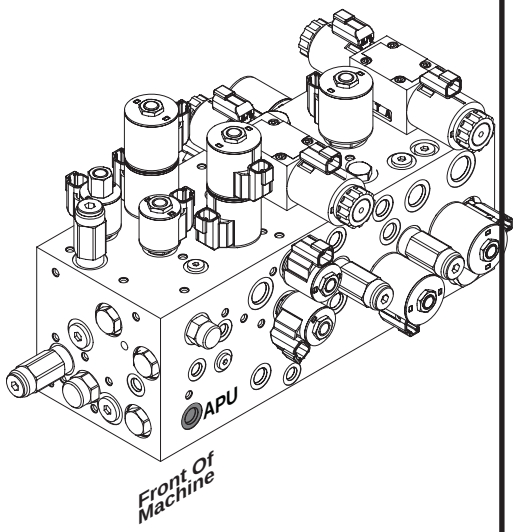




Hydraulic Tank



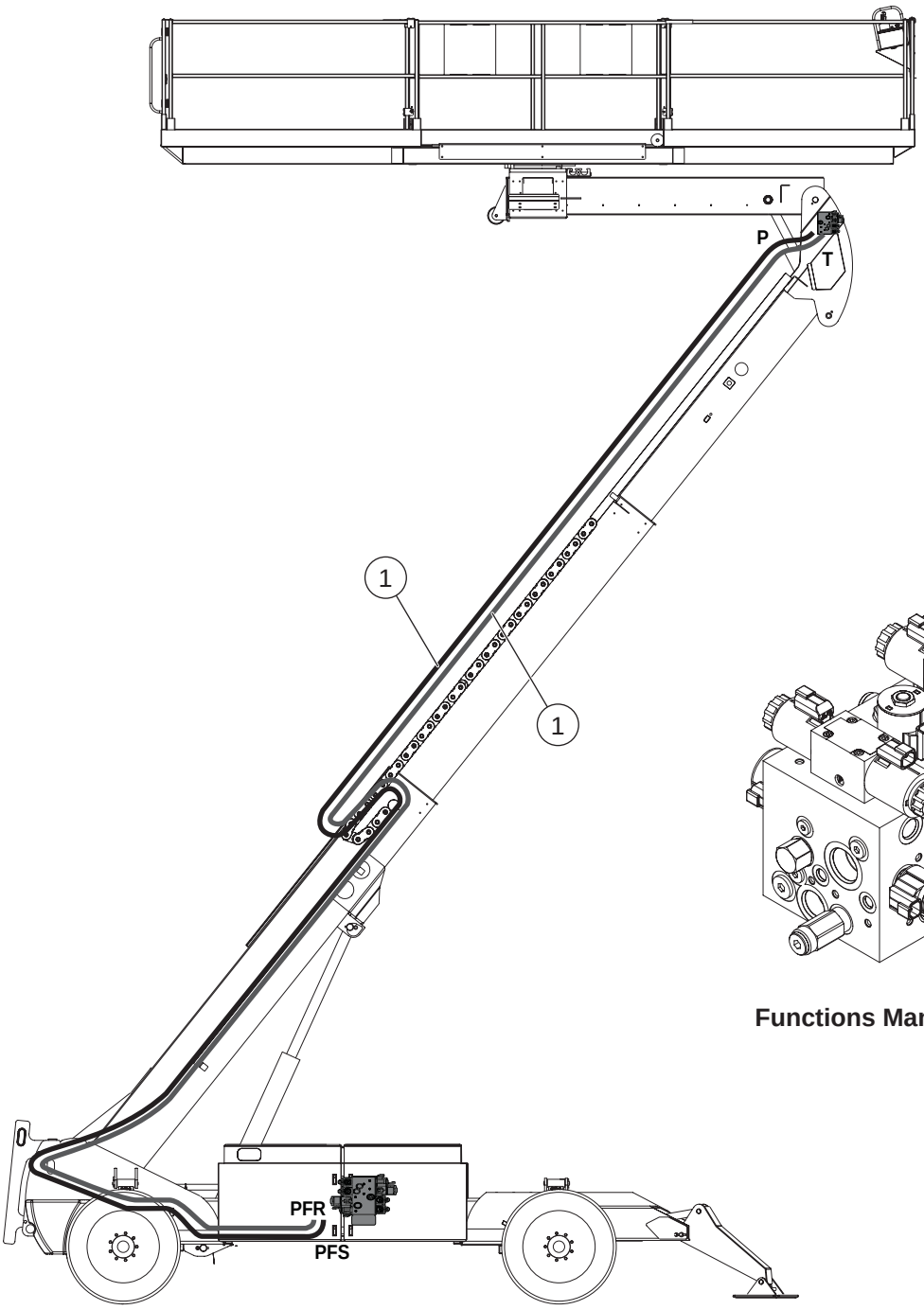
Emergency Power Unit

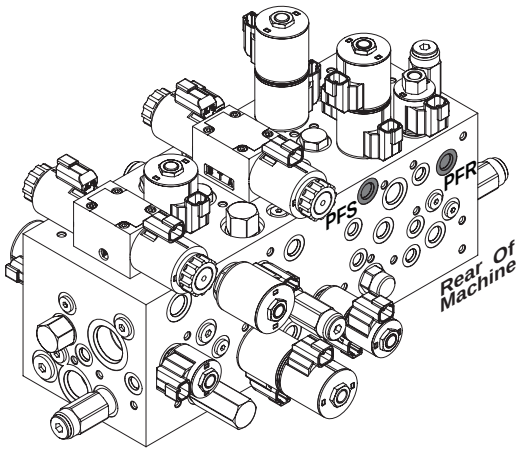


Functions Manifold

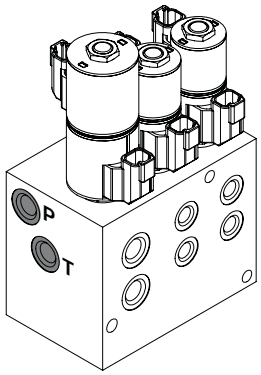
Emergency Power Unit Hoses

ITEM	PART NO.	QTY	DESCRIPTION
1	52037	1	Hose Assy, 1/2" x 28", 8G8FJX-8G8FFORX
2	52038	1	Hose Assy, 3/8" x 26", 6G6FFORX-6G6FFORX





Functions Manifold



Auxiliary Manifold

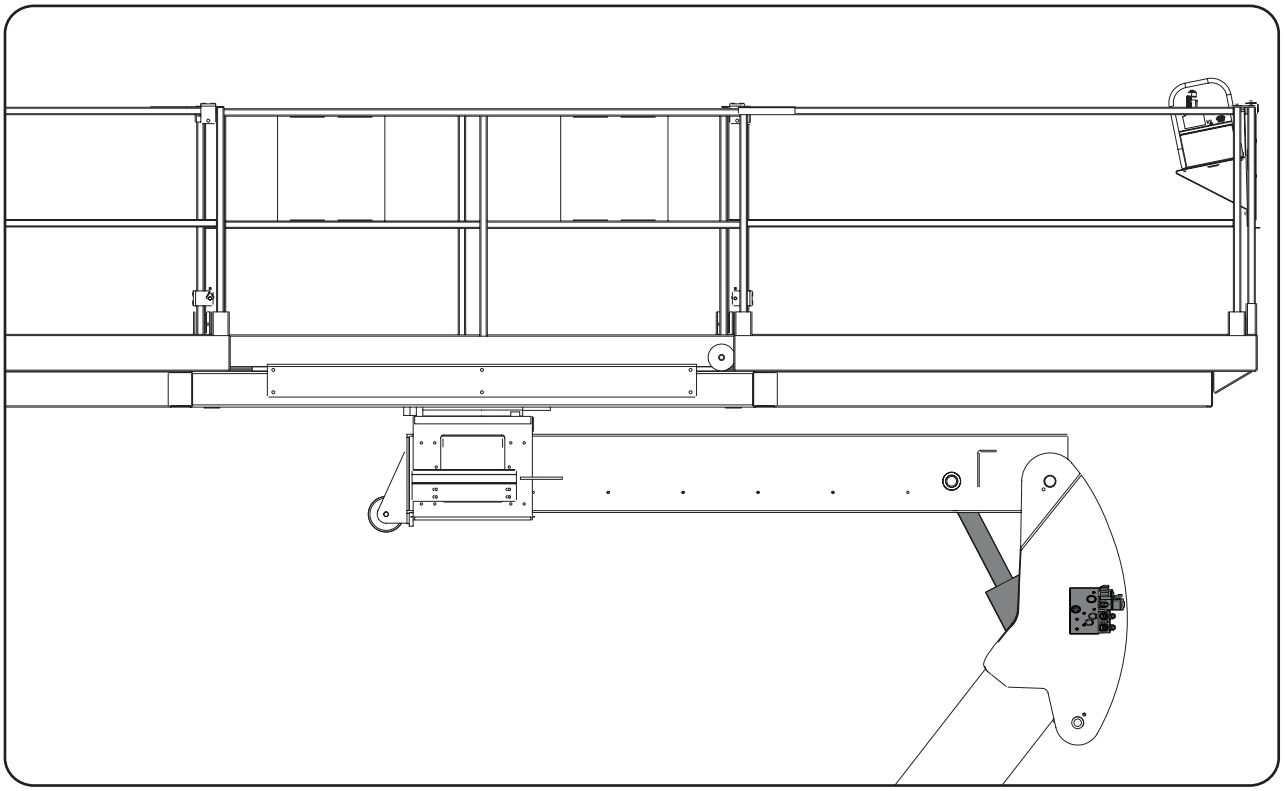
ILLUSTRATION No. ART_3685

TITAN BOOM 40-S

Functions Manifold/Auxilary Manifold Hoses

Functions Manifold/Auxiliary Manifold Hoses

ITEM	PART NO.	QTY	DESCRIPTION
1	52019	2	Hose Assy, 3/8" x 666", 6G6FFORX-6G6FFORX



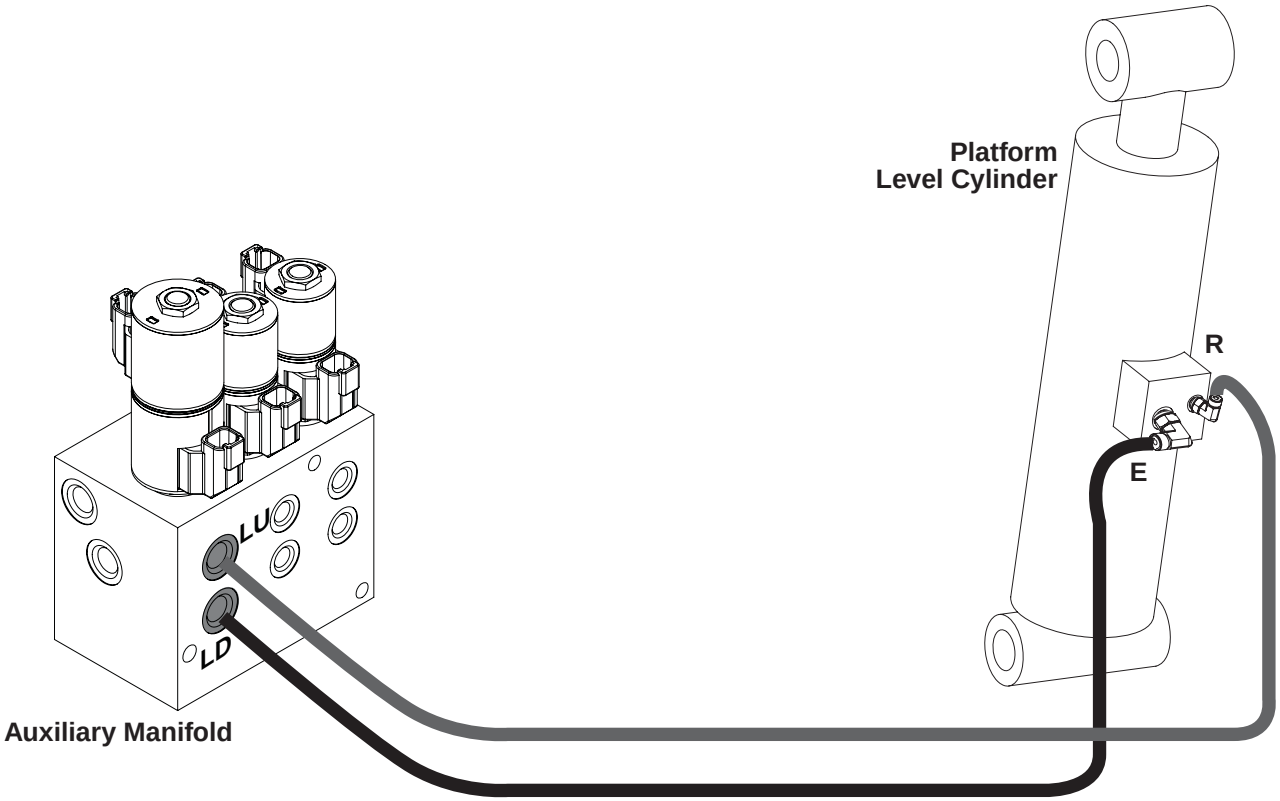


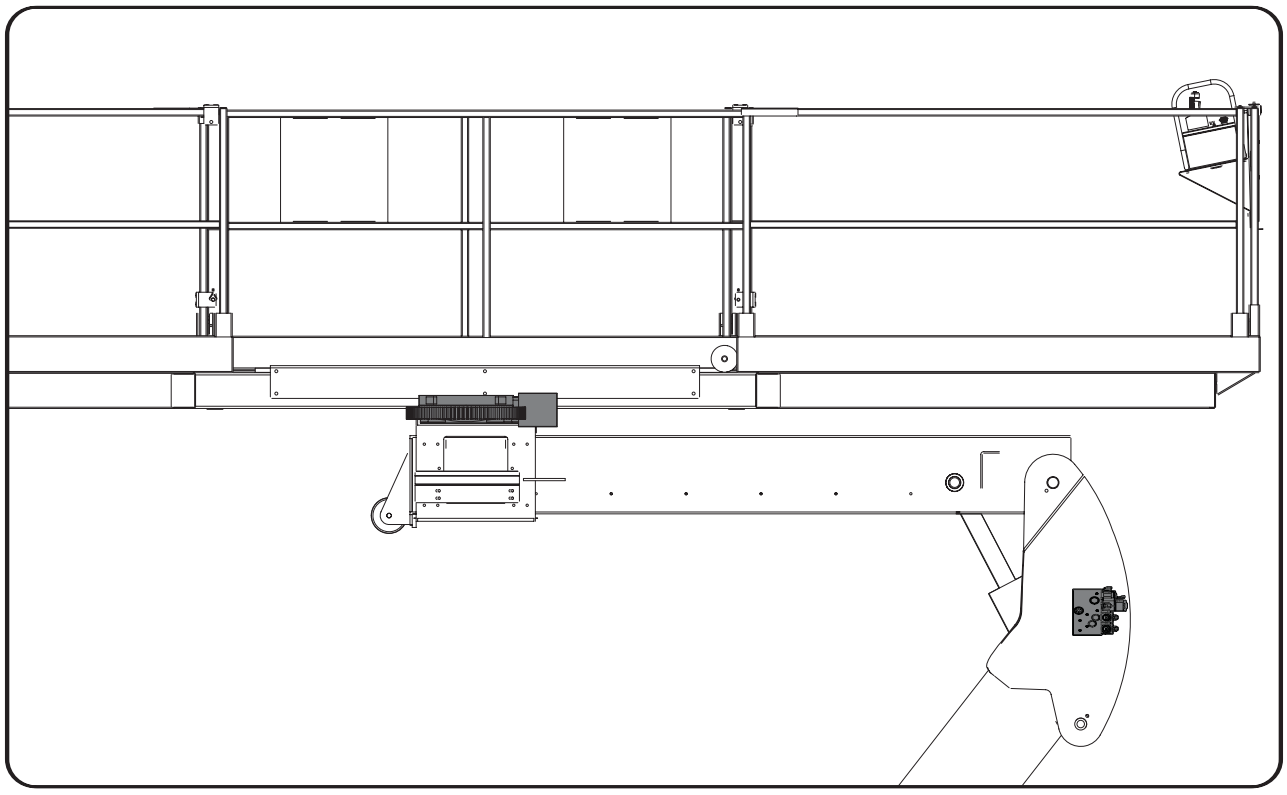
ILLUSTRATION No. ART_3686

TITAN BOOM 40-S

Platform Level Circuit

Platform Level Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52041	1	Hose Assy, 3/8" x 12", 6G6FFORX-6G6FFORX
2	52042	1	Hose Assy, 3/8" x 26", 6G6FFORX-6G6FFORX90S



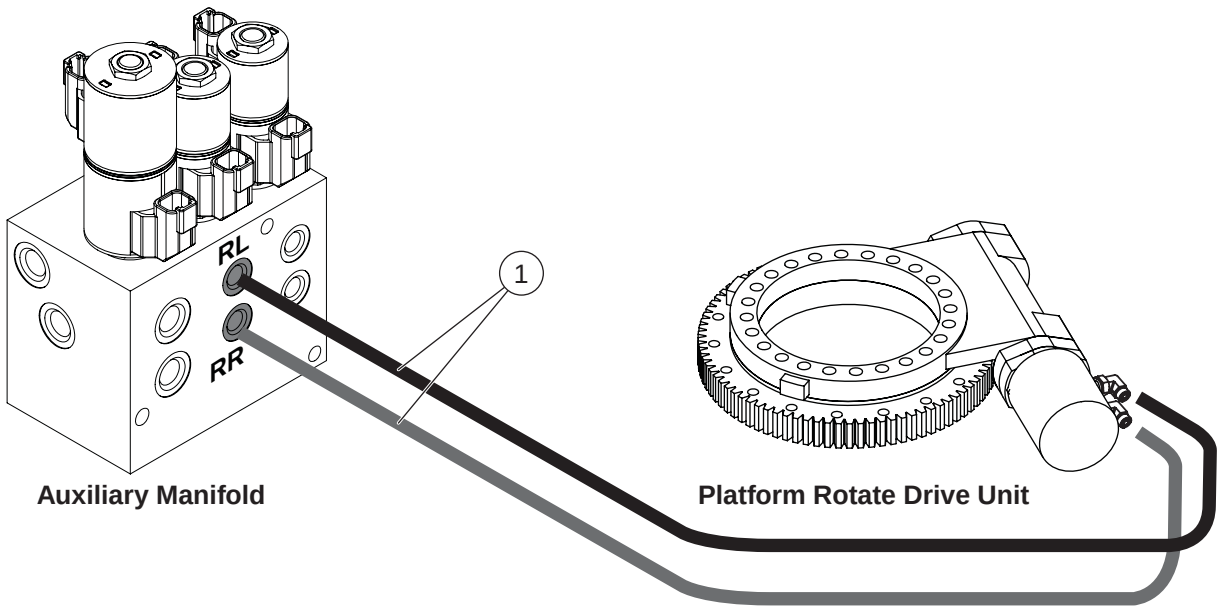


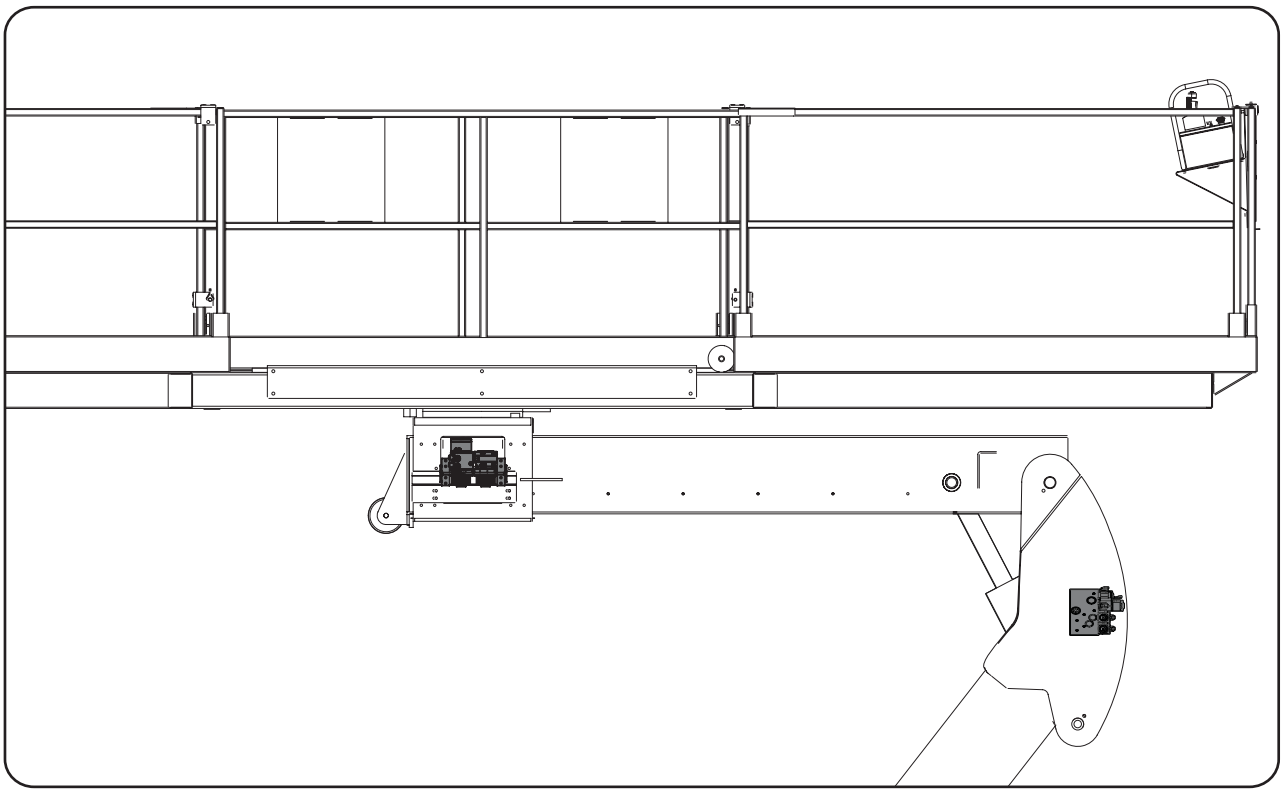
ILLUSTRATION No. ART_3687

TITAN BOOM 40-S

Platform Rotate Circuit

Platform Rotate Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52039	2	Hose Assy,1/4" x 257", 4G4FFORX-4G6FJX



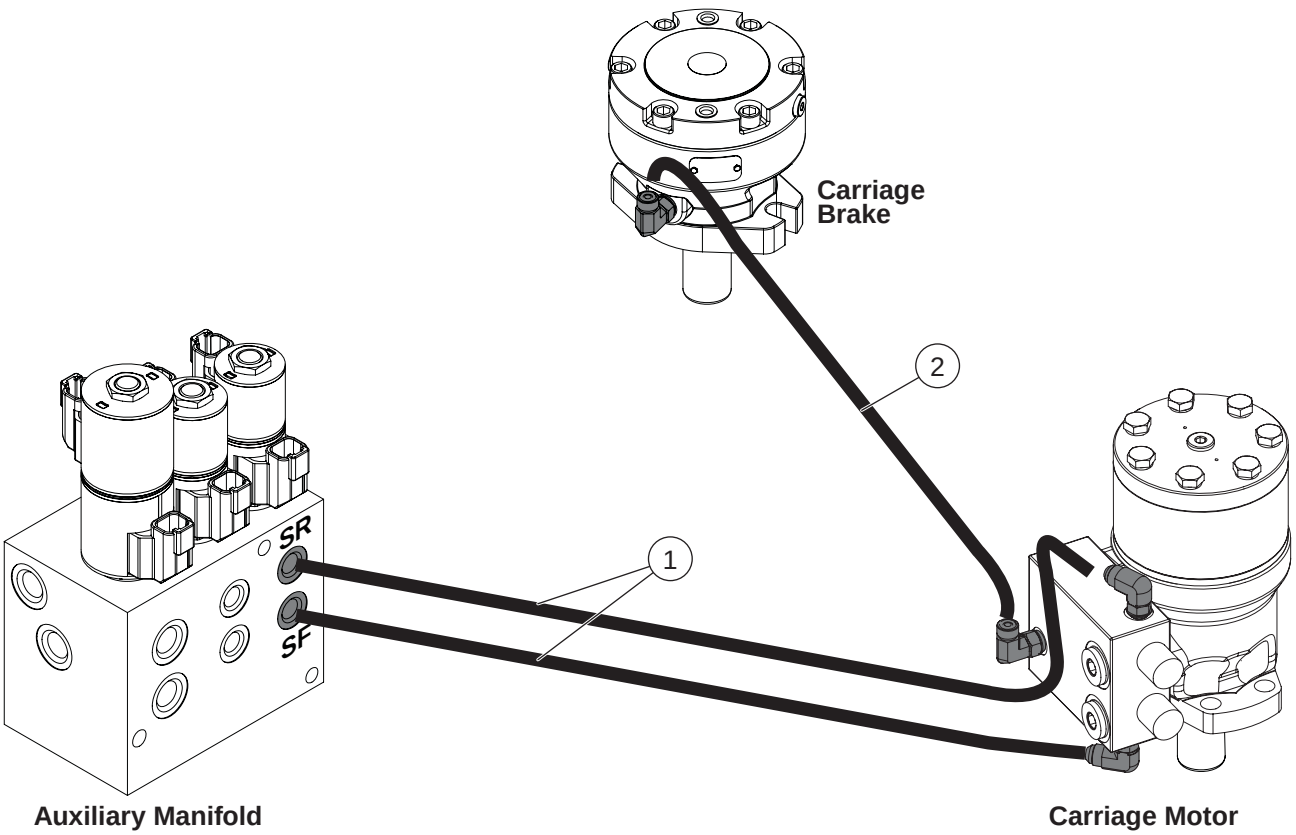


ILLUSTRATION No.
ART_3688

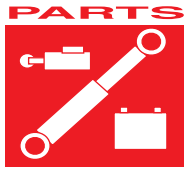
TITAN BOOM 40-S

Carriage Slide Circuit

Platform Circuit

ITEM	PART NO.	QTY	DESCRIPTION
1	52040	2	Hose Assy,1/4" x 216", 4G4FFORX-4G6FJX
2	50667	1	**Serial ~ #12400044, #12400060~** Hose Assy, 1/4" x 13", 4G4FFORX-4G4FFORX
	50607	1	**Serial #124000045-#12400059** Hose Assy, 1/4" x 13", 4G4FJX-4G4FJX

NOTES:



SECTION F

BASE

CONTENTS PAGE

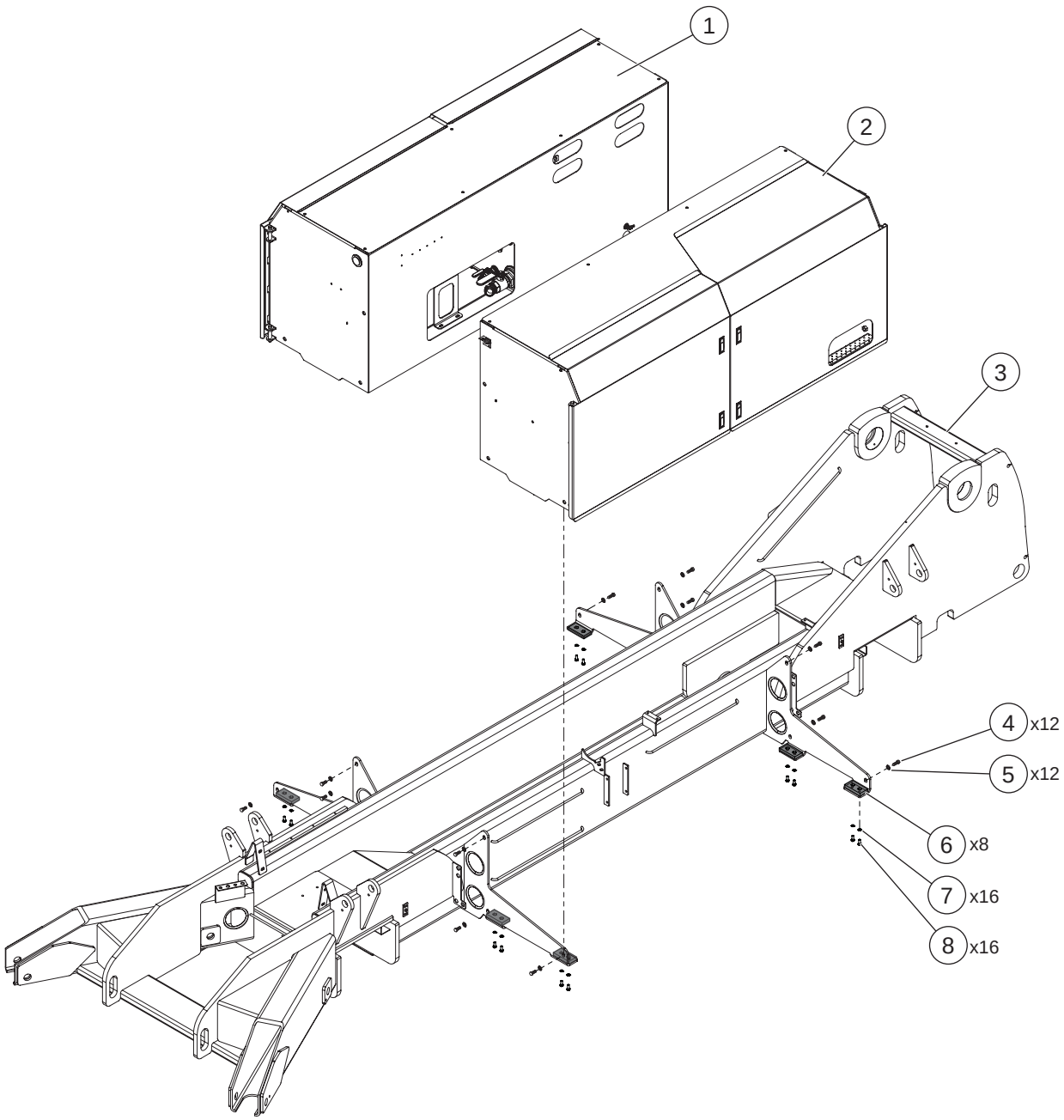


ILLUSTRATION No.
ART_3633

TITAN BOOM 40-S

Module Installation

Module Installation

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	1	Control Module
2	REF	1	Engine Module
3	22001	1	Chassis Weldment
4	50043	12	Bolt, HHCS M16 x 40
5	50249	12	Washer, M16 Nordlock
6	22425	8	Block
7	50006	16	Washer, M10 Nordlock
8	50033	16	Bolt, HHCS M10 x 25

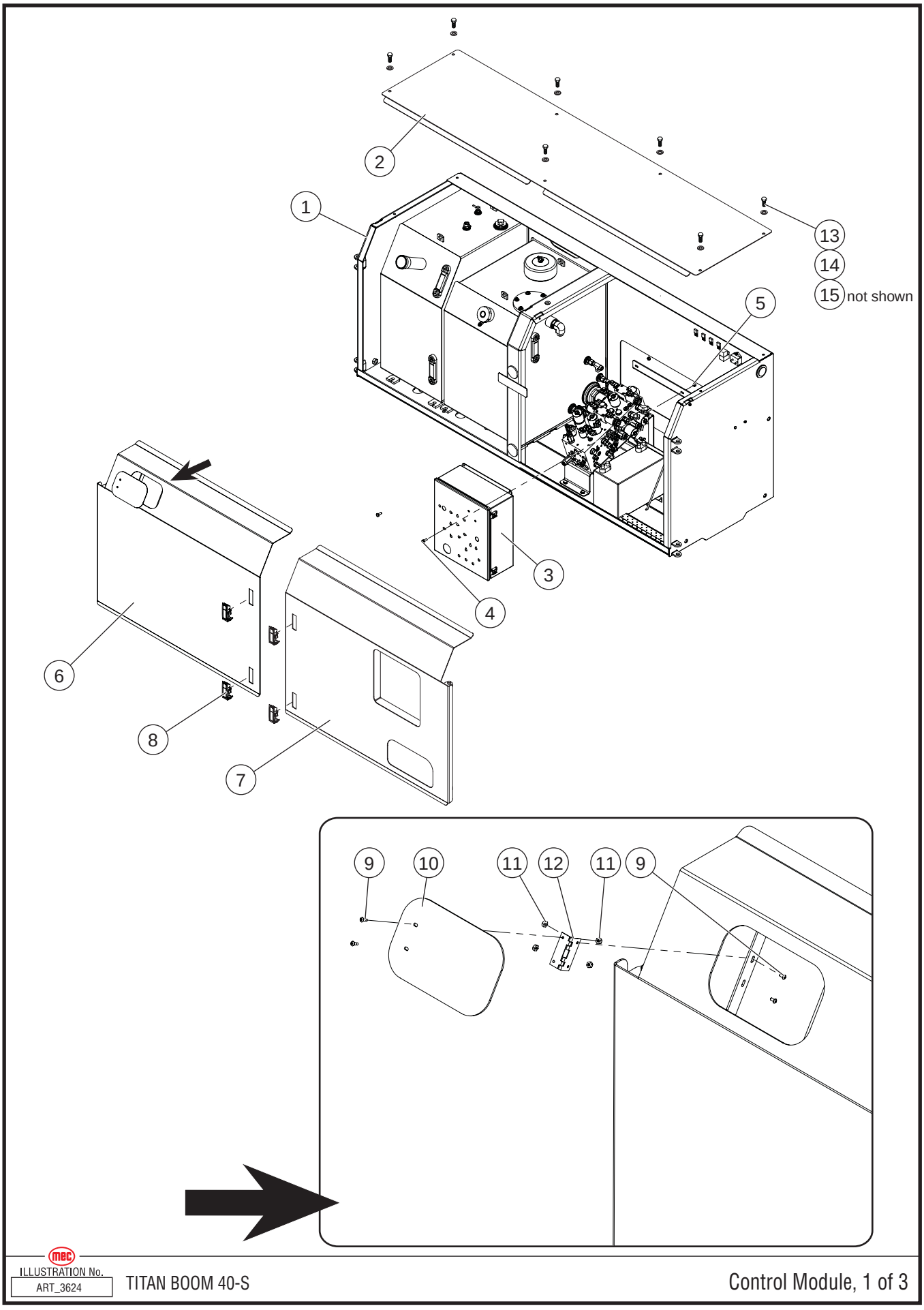


ILLUSTRATION No. ART_3624

TITAN BOOM 40-S

Control Module, 1 of 3

Control Module, Drawing 1 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	--	Control Module
2	22253	1	Top Cover, Control Module
3	REF	--	Lower Controls Box -- See Section A
4	50030	2	Bolt, HHCS M8 x 20
5	50048	2	Nut, M8 Nylock
6	22452	1	Left-Hand Door, Control Module
7	22182	1	Right-Hand Door, Control Module
8	8386	4	Door Latch
	92690	--	Door Latch, Locking (option)
	92691	--	Key, Locking Door Latch (option)
9	50328	4	Bolt, BHCS 6-32 x 3/8
10	22400	1	Fuel Door
11	50329	4	Nut, 6-32 Nylock
12	92213	1	Hinge
13	50215	7	Bolt, HHCS M10 x 20
14	50006	7	Washer, M10 Nordlock
15	50049	7	Nut, M10 Nylock

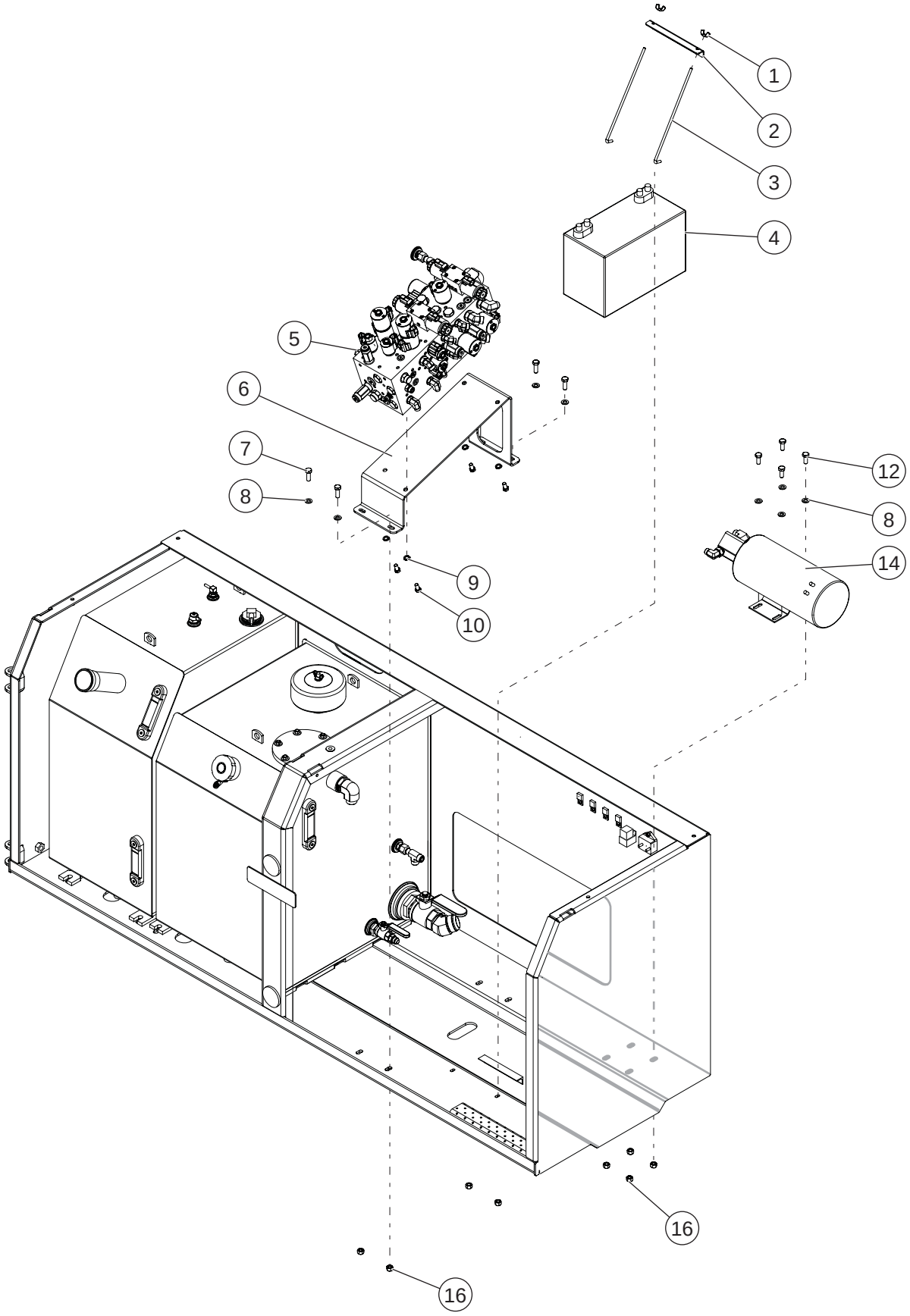


ILLUSTRATION No. ART_3625

TITAN BOOM 40-S

Control Module, 2 of 3

Control Module, Drawing 2 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	HDW6110	2	Wing Nut 1/4-20
2	22421	1	Battery Bracket
3	22563	2	J-Bolts, Battery Hold-Down
4	17966	1	Battery, Group 31-stud, 950 CCA
5	84178	1	Functions Manifold
6	22269	1	Mount, Functions Manifold
7	50034	4	Bolt, HHCS M10 x 30
8	50002	8	Washer, M10 Std.
9	50006	4	Washer, M10 Nordlock
10	50219	4	Bolt, HHCS 3/8 x .75
11	--	--	--
12	50033	4	Bolt, HHCS M10 x 25
13	--	--	--
14	REF	1	Emergency Power Unit -- See Section E
15	--	--	--
16	50049	8	Nut, M10 Nylock

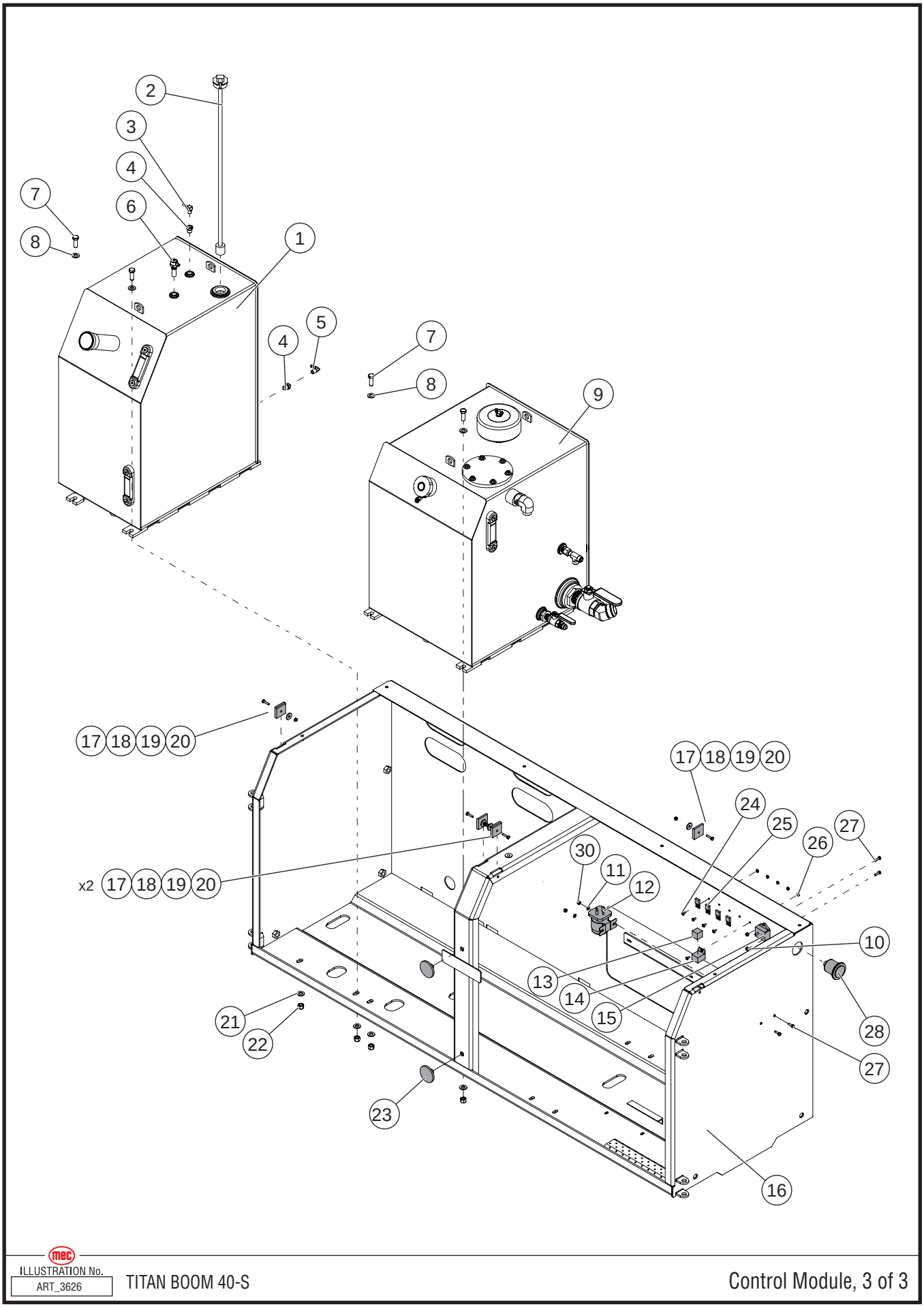


ILLUSTRATION No. ART_3626

TITAN BOOM 40-S

Control Module, 3 of 3

Control Module, Drawing 3 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	22647	1	Fuel Tank Weldment
--	92480	--	Filler Cap
--	92479	--	Sight Gauge
2	92069	1	Fuel Sending Unit
3	92488	1	Fitting, 1/4 NPT-3/16 hose-90
4	50941	2	Fitting, MP-FP-6-4 *Not used on later tanks
5	HDW6727	1	Fitting, 1/4 NPT-5/16 hose-90
6	92699	1	1/4 NPT Roll-Over Vent
7	50040	4	Bolt, HHCS M12 x 35
8	50003	4	Washer, M10 Std.
9	REF	--	Hydraulic Tank Assembly -- See Section E
10	50047	4	Nut, M6 Nylock
11	50000	2	Washer, M6 Std.
12	91745	1	Contactor, 48V Contacts, 12V Coil
13	92400	1	Relay
14	92103	1	Relay Base
--	92104	2	Terminal, Relay Base, 14-16 gauge
--	92105	2	Terminal, Relay Base, 10-12 gauge
15	92403	1	Auto Reset, 50 Amp
16	22175	1	Control Module Weldment
17	50117	4	Bolt, HHCS M6 x 25
18	14896	4	Slide Block, Door
19	50068	4	Washer, M6 Fender
20	50047	4	Nut, M6 Nylock
21	50003	4	Washer, M12 Std.
22	50050	4	Nut, M12 Nylock
23	25429	2	Spacer, Rubber
24	50191	5	Bolt, THCS 10-32 x .5"
25	91881	4	Buss Holder
26	50238	5	Nut, 10-32 Nylock
27	50028	4	Bolt, HHCS M6 x 20
28	90749	1	Plug
29	92033	4	Buss, 12-Terminal

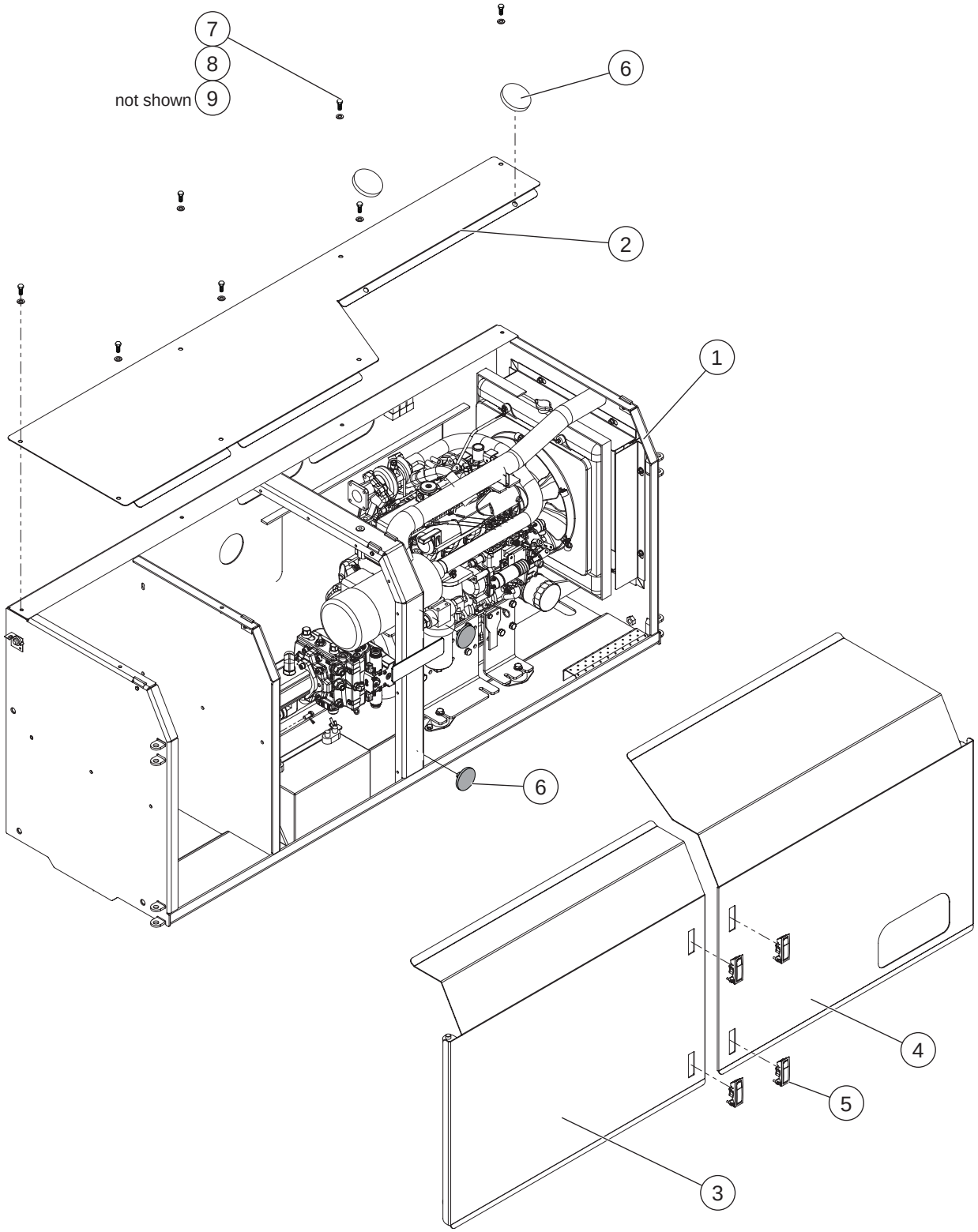


ILLUSTRATION No. ART_3628

TITAN BOOM 40-S

Engine Module, 1 of 4

Engine Module, Drawing 1 of 4

ITEM	PART NO.	QTY	DESCRIPTION
1	22155	1	Engine Module Weldment
2	22249	1	Top Cover, Engine Module
3	22180	1	Left-Hand Door, Engine Module
4	22161	1	Right-Hand Door, Engine Module
5	8386	4	Door Latch
	92690	--	Door Latch, Locking (option)
	92691	--	Key, Locking Door Latch (option)
6	25429	2	Spacer, Rubber
7	50215	7	Bolt, HHCS M10 x 20
8	50006	7	Washer, M10 Nordlock
9	50049	7	Nut, M10 Nylock

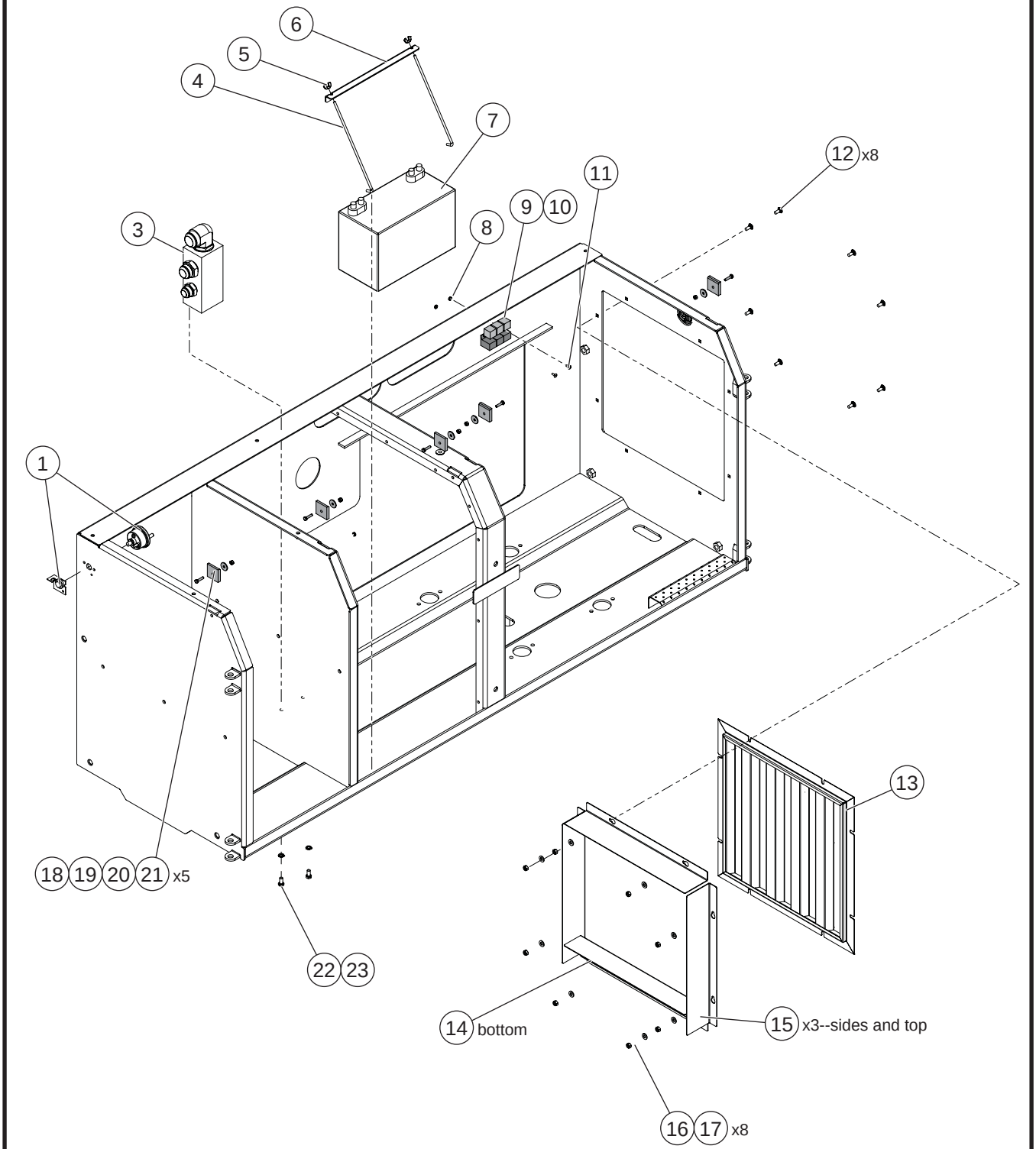


ILLUSTRATION No. ART_3629

TITAN BOOM 40-S

Engine Module, 2 of 4

Engine Module, Drawing 2 of 4

ITEM	PART NO.	QTY	DESCRIPTION
1	8841	1	Switch, Master Disconnect
2	--	--	--
3	REF	1	Suction Manifold -- See Section E
4	22563	2	Battery J-Bolt
5	HDW6110	2	Wing Nut, 1/4-20
6	17475	1	Bracket, Battery
7	17966	1	Battery, Group 31-stud, 950 CCA
8	50238	2	Nut, 10-32 Nylock
9	91375	3	Relay
10	92103	3	Relay Base
--	92104	2	Terminal, Relay Base, 14-16 gauge
--	92105	2	Terminal, Relay Base, 10-12 gauge
11	50191	2	Screw, THMS 10-32 x 1.5
12	50225	8	Bolt, Carriage, M8 x 20
13	17680	1	Radiator Grill
14	22464	1	Bracket, Radiator, Bottom
15	22462	3	Bracket, Radiator, Top/Sides
16	50048	8	Nut, M8 Nylock
17	50001	8	Washer, M8 Std.
18	50117	4	Bolt, HHCS M6 x 25
19	14896	4	Slide Block, Door
20	50068	4	Washer, M6 Fender
21	50047	4	Nut, M6 Nylock
22	50219	2	Bolt, HHCS 3/8-16 x .75
23	50006	2	Washer, M10 Nordlock

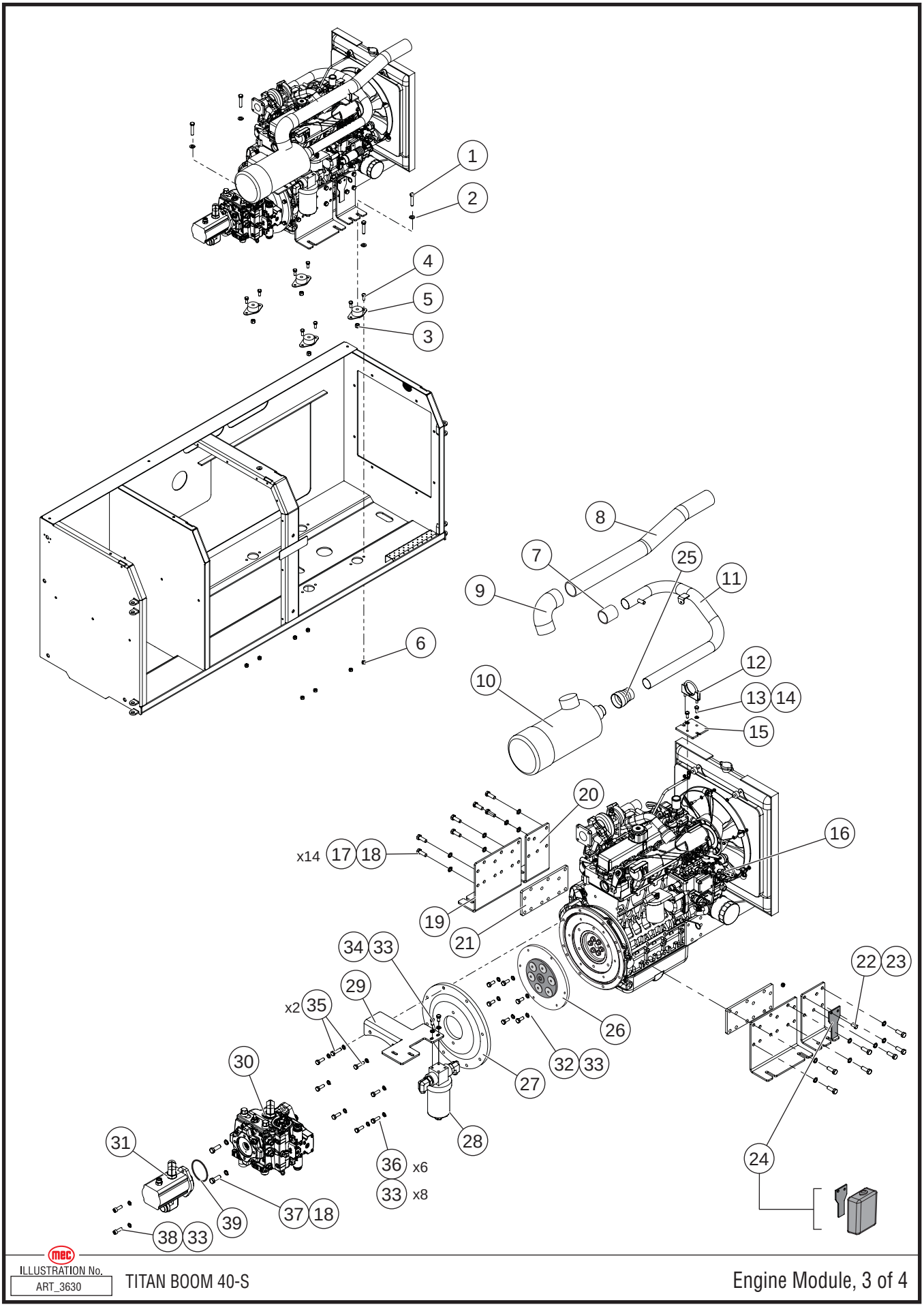


ILLUSTRATION No. ART_3630

TITAN BOOM 40-S

Engine Module, 3 of 4

Engine Module, Drawing 3 of 4

ITEM	PART NO.	QTY	DESCRIPTION
1	50265	4	Bolt, HHCS M12 x 60
2	50003	4	Washer, M12 St.d
3	50050	4	Nut, M12 Nylock
4	50116	8	Bolt, HHCS M10 x 25
5	17969	4	Motor Mount
6	50049	8	Nut, M10 Nylock
7	92396	1	Connector, Turbo to Intake Tube
8	22287	1	Intake Tube
9	92021	1	Connector, 90°
10	92475	1	Air Filter Assembly
--	92181	--	Filter Element, Air
11	22548	1	Turbo Intake Tube
12	91883	1	Clamp, U-Bolt 2.5"
13	50030	2	Bolt, HHCS
14	50200	2	Washer, M8 Nordlock
15	22329	1	Intake Mount
16	17964	1	Engine, Kubota V2403-MT
17	50133	14	Bolt, HHCS M12 x 35
18	50007	16	Washer, M12 Nordlock
19	18228	2	Mounting Bracket, Rear Engine
20	18227	2	Mounting Bracket, Front Engine
21	18271	2	Spacer
22	50030	1	Bolt, HHCS M8 x 20
23	50048	1	Nut, M8 Nylock
24	91127	1	Coolant Overflow Tank Assembly
25	17676	1	Intake Adapter
26	92473	1	Motor Coupler
27	92498	1	Adapter Plate
28	REF	1	Charge Filter Assembly-- See Section E
29	17467	1	Filter Mounting Bracket
30	REF	1	Drive Pump Assembly -- See Section E
31	REF	1	Functions Pump Assembly-- See Section E
32	50033	6	Bolt, HHCS M10 x 25
33	50006	19	Washer, M10 Nordlock
34	50219	2	Bolt, HHCS 3/8 x .75”
35	50035	2	Bolt, HHCS M10 x 40
36	50034	6	Bolt, HHCS M10 x 35
37	50069	2	Bolt, HHCS 1/2 x 1.5”
38	50127	2	Bolt, SHCS M10 x 30
39	17971	1	O-Ring

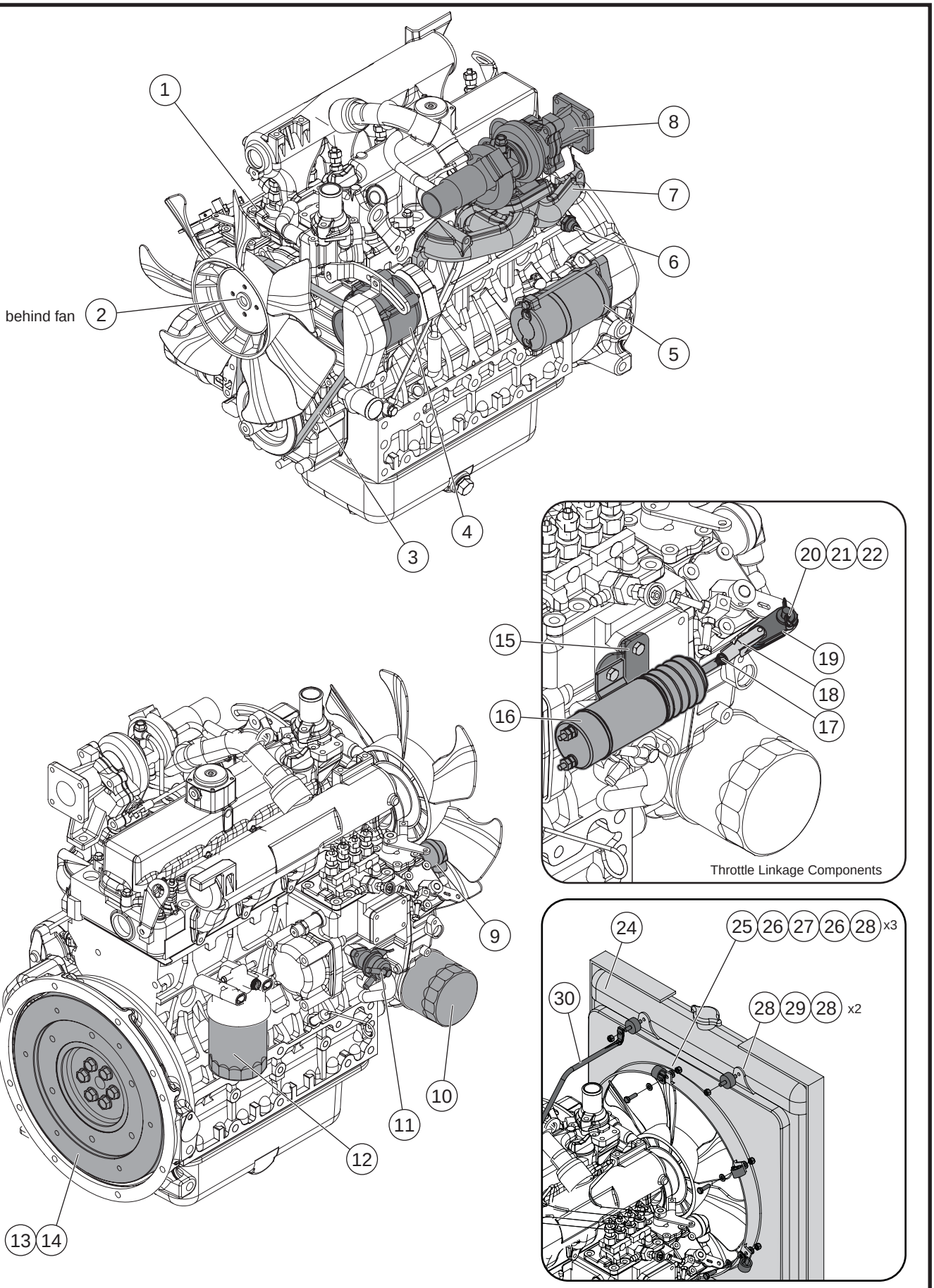


ILLUSTRATION No. ART_3631

TITAN BOOM 40-S

Engine Module, 4 of 4

Engine Module, Drawing 4 of 4

ITEM	PART NO.	QTY	DESCRIPTION
1	17964	--	Engine, Kubota V2403-T
2	92471	1	Water Pump
3	92472	1	Fan Belt
4	92178	1	Alternator
5	92177	1	Starter
6	91175	1	Oil Pressure Switch
7	92184	1	Exhaust Manifold
--	92185	--	Gasket, Exhaust Manifold
8	92470	1	Turbo Charger Assy
9	92179	1	Solenoid, Fuel Shutoff
10	92180	1	Oil Filter
11	92176	1	Fuel Pump
12	92182	1	Fuel Filter
13	92183	1	Flywheel Assy -- Includes Item #58
14	92175	1	Ring Gear, Flywheel
15	17638	1	Bracket, Throttle Solenoid
16	91589	1	Throttle Solenoid
--	50028	2	Bolt, M6 x 20
--	50000	4	Washer, M6 Std
--	50047	2	Nut, M6 Nylock
17	50164	1	Jam Nut, 1/4-28
18	91117	1	Yoke
19	16347	2	Throttle Link
20	HDW5217	1	Washer, 5/16 Flat
21	HDW91590	1	Pin, Clevis, 5/16 x 1
22	50177	1	Pin, Cotter, 1/8 x 1
23	--	--	--
24	92186	1	Radiator Assembly
--	92468	1	Upper Radiator Hose
--	92469	1	Lower Radiator Hose
25	50028	3	Bolt, HHCS M6 X 20
26	50000	3	Washer, M6 Std
27	5882	3	P Clamp
28	50047	3	Nut, M6 Nylock
29	91591	2	Hose Mount
30	18257	1	Bar, Radiator Mount

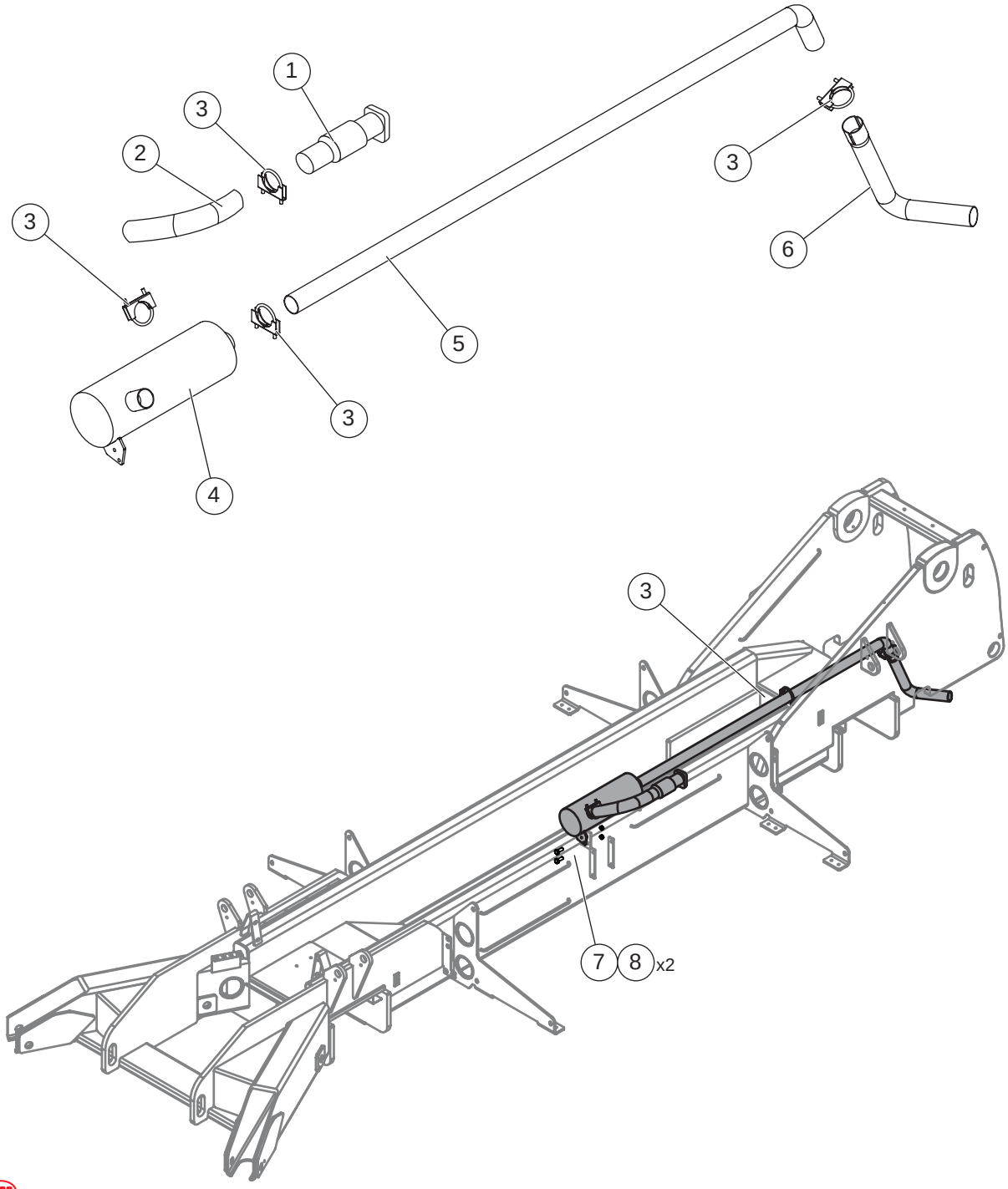


ILLUSTRATION No.
ART_3632

TITAN BOOM 40-S

Exhaust Components

Exhaust Components

ITEM	PART NO.	QTY	DESCRIPTION
1	22586	1	Flexible Coupling
2	22543	1	Exhaust Pipe
3	17637	4	Clamp, U-Bolt, 2-1/8"
4	22435	1	Muffler
	92517	1	OPTION -- Exhaust Purifier/Muffler
5	22328	1	Exhaust Pipe
6	22396	1	Exhaust Pipe
7	50031	2	Bolt, HHCS M8 x 25
8	50048	2	Nut, M8 Nylock

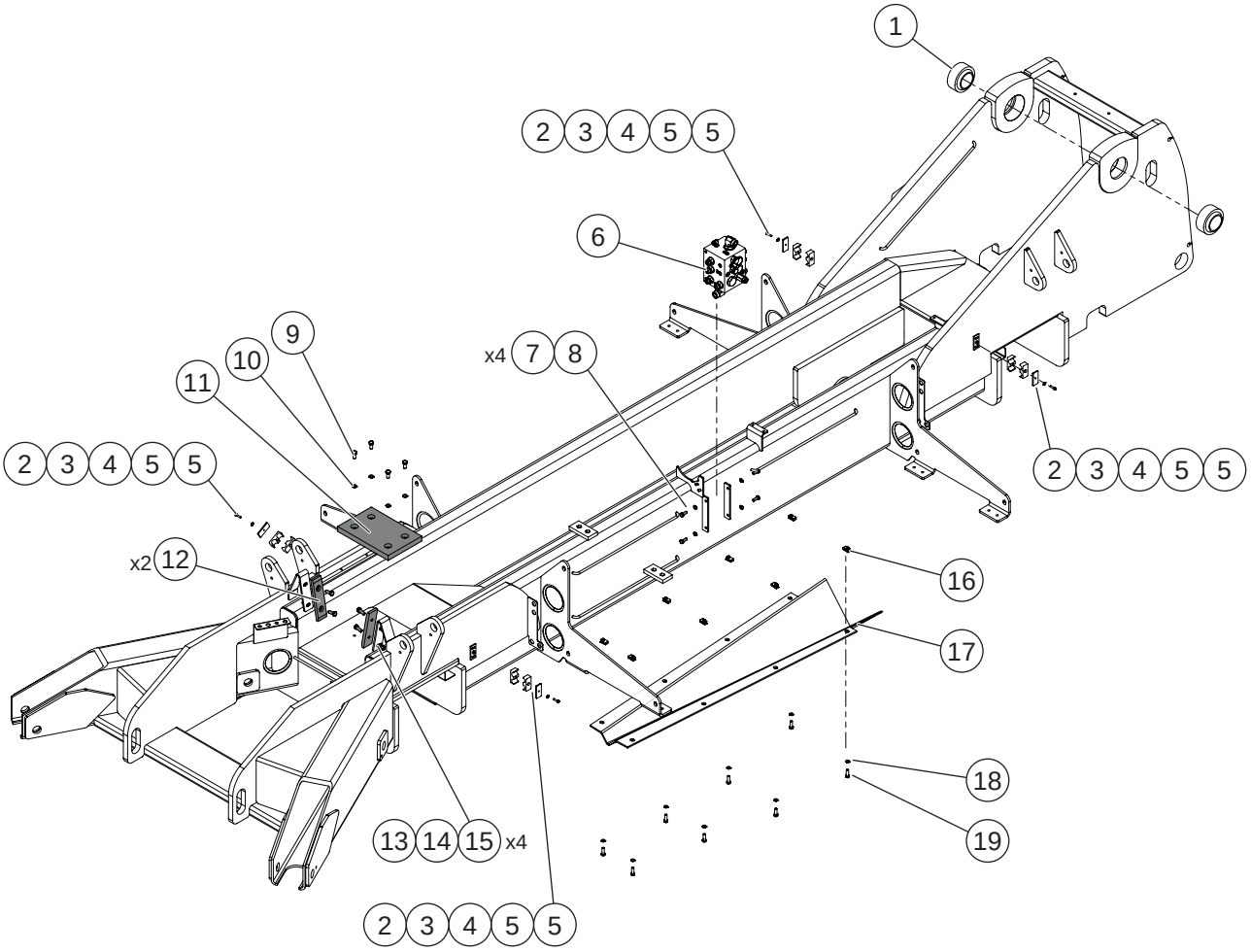


ILLUSTRATION No. ART_3634

TITAN BOOM 40-S

Chassis Components, 1 of 3

Chassis Components, Drawing 1 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	92099	2	Bearing
2	50015	4	Bolt, HHCS M6 x 25
3	50200	4	Washer, M6 Std
4	92487	4	Cover Plate
5	92499	8	Clamp Plate
6	REF	--	Traction Manifold -- See Section E
7	50033	4	Bolt, HHCS M10 x 25
8	50006	4	Washer, M10 Nordlock
9	50038	4	Bolt, HHCS M12 x 25
10	50007	4	Washer, M12 Nordlock
11	22270	1	Boom Pad
12	11861980	2	Bearing Pad
13	50137	4	Bolt, HHCS M12 x 30
14	50003	4	Washer, M12 Std.
15	50050	4	Nut, M12 Nylock
16	92098	8	Nut Clip M10
17	22041	1	Bottom Pan
18	50006	8	Washer, M10 Nordlock
19	50034	8	Bolt, HHCS M10 x 30

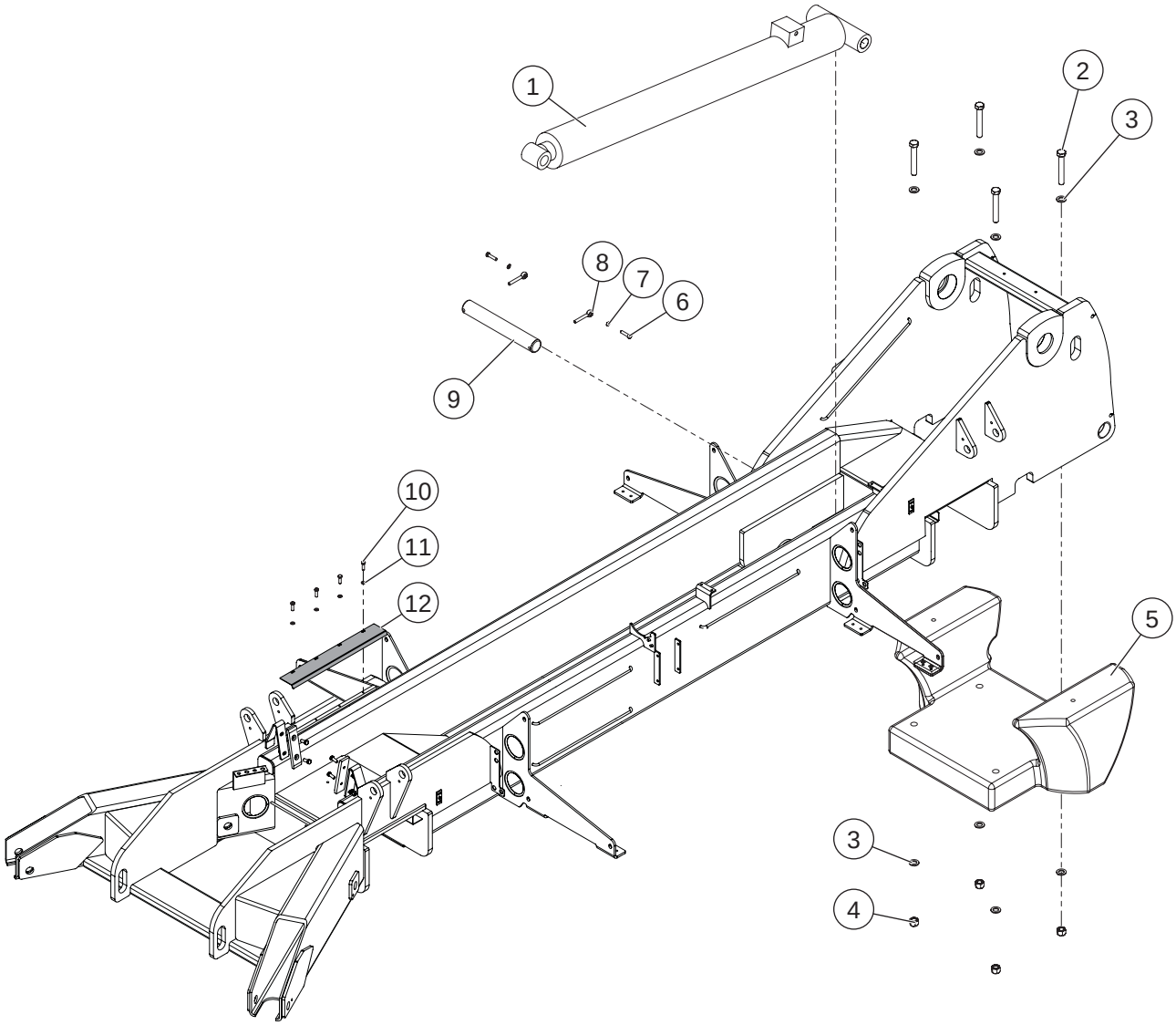


ILLUSTRATION No.
ART_3635

TITAN BOOM 40-S

Chassis Components, 2 of 3

Chassis Components, Drawing 2 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	REF	--	Lift Cylinder -- See Section E
2	50254	4	Bolt, HHCS M24 x 160
3	50255	8	Washer, M24
4	50256	4	Nut, M24 Nylock
5	11870311	1	Counterweight
6	50250	2	Bolt, HHCS M12 x 50
7	50007	2	Washer, M12 Nordlick
8	18152	2	Pin Retainer
9	22197	1	Pin, Chassis/Lift Cylinder
10	50295	4	Bolt, HHCS M8 x 15
11	50001	4	Washer, M8 Std.
12	22512	1	Hose Guard

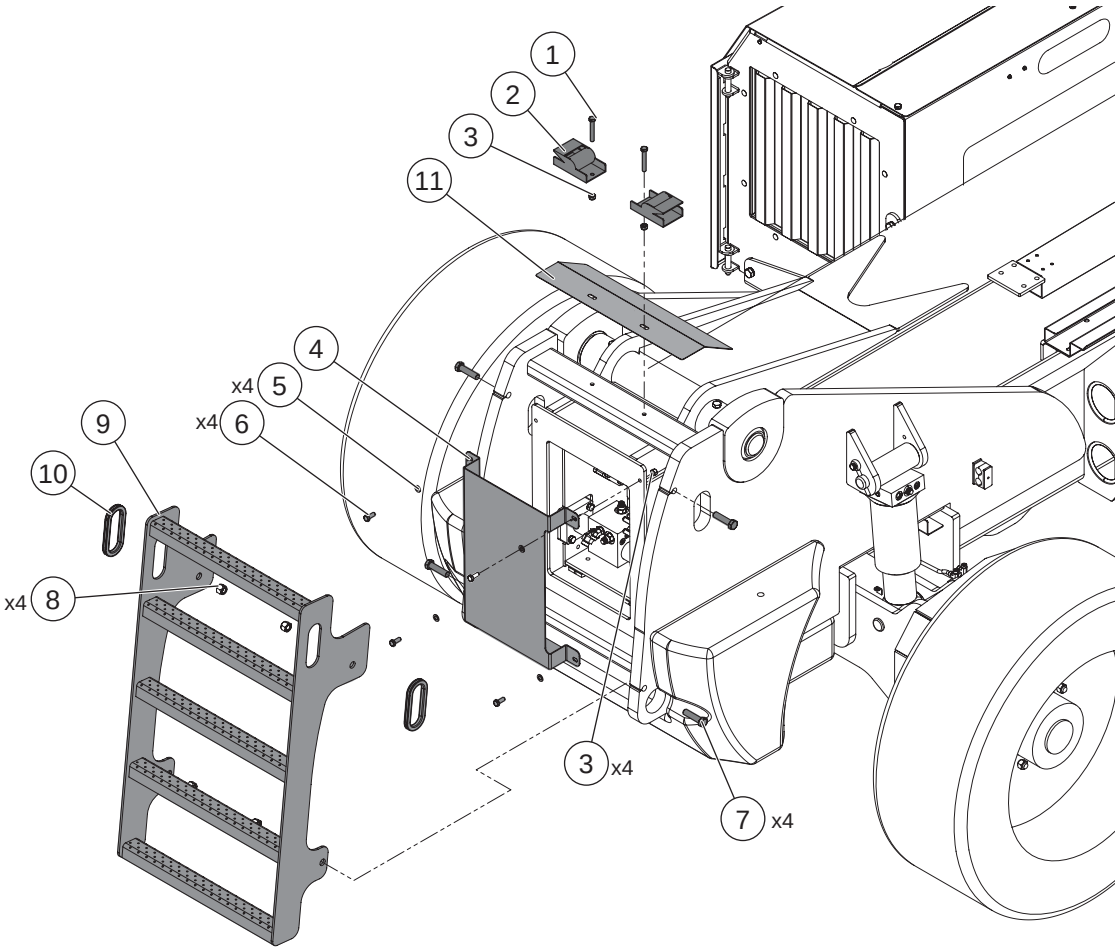


ILLUSTRATION No.
ART_3636

TITAN BOOM 40-S

Chassis Components, 3 of 3

Chassis Components, Drawing 3 of 3

ITEM	PART NO.	QTY	DESCRIPTION
1	50022	2	Bolt, HHCS M10 x 70
2	92076	2	Platform Retention Strap
3	50049	2	Nut, M10 Nylock
4	22268	1	Rear Cover
5	50002	4	Washer, M10 Std.
6	50033	4	Bolt, HHCS M10 x 25
7	50044	4	Bolt, HHCS M16 x 65
8	50051	4	Nut, M16 Nylock
9	22244	1	Ladder Weldment
10	92535	2	Trim Lock
11	22615	1	Pivot Guard -- CE option package only

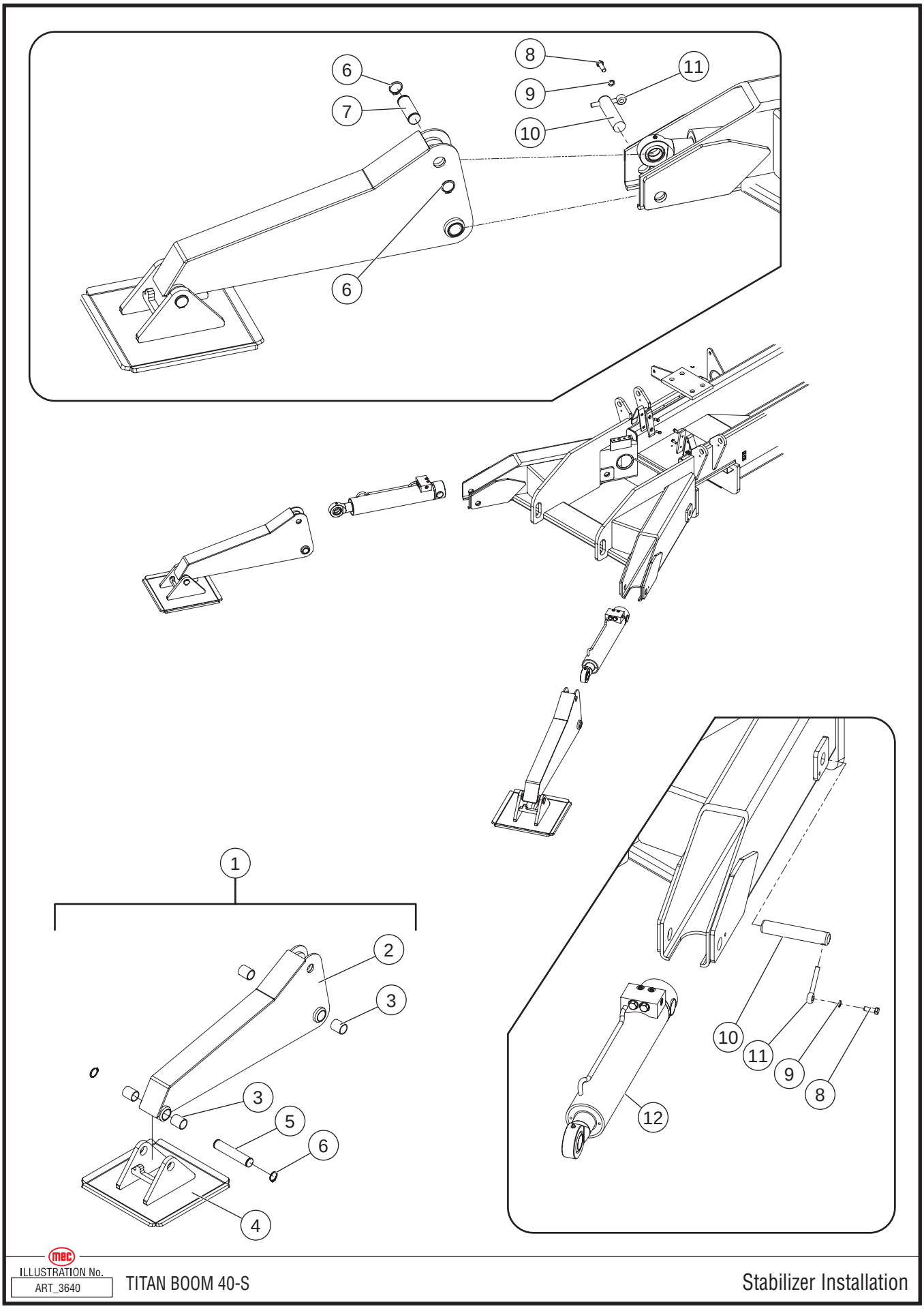


ILLUSTRATION No.
ART_3640

TITAN BOOM 40-S

Stabilizer Installation

Stabilizer Components

ITEM	PART NO.	QTY	DESCRIPTION
1	84169	2	Stabilizer Assembly
2	22300	2	Stabilizer Arm
3	92214	8	Bearing
4	22233	2	Stabilizer Pad
5	22342	2	Pin
6	92243	8	Snap Ring
7	22335	2	Pin
8	50040	4	Botl, HHCS M12 x 35
9	50007	4	Washer, M12 Nordlock
10	22207	4	Pin
11	18152	4	Pin Retainer
12	REF	2	Stabilizer Cylinder -- See Section E

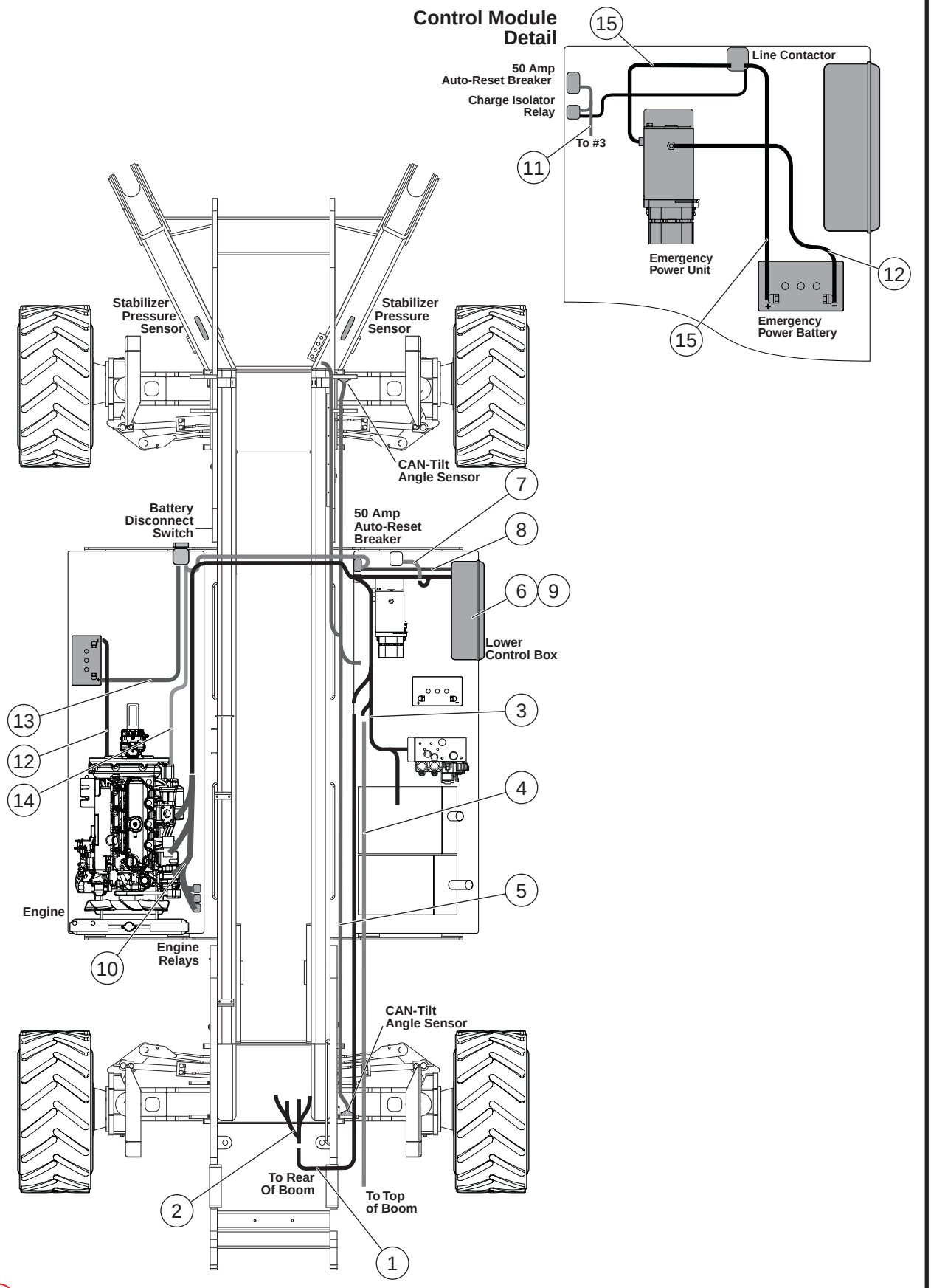


ILLUSTRATION No. ART_3641

TITAN BOOM 40-S

Wiring Harness -- Chassis

Wiring Harness -- Chassis

ITEM	PART NO.	QTY	DESCRIPTION
1	22604	1	Harness, Transducer Extension (J6, J7)
2	22605	1	Harness, Transducer (J7, Sensors at rear of boom)
3	22606	1	Harness, Chassis Complete (J1, J2, J3, J4, J5, J6)
4	22609	1	Harness, Control Cable, Lower (J3, J8)
5	22612	1	Harness, Axle Can-tilt (J5, Axle CAN-Tilt Modules, Stabilizer Pressure Sensors)
6	22613	1	Harness, Lower Control Box Complete (J1, Interior of Lower Control Box)
7	22624	1	Harness, Line Contactor to Main Harness Adaptor
8	22625	1	Harness, Lower Control Box Power Harness
9	22626	1	Harness, Internal Ez Cal
10	92433	1	Harness, Engine (J4, Engine)
11	22553	1	Harness, Charge Isolator Relay
12	55001	2	Cable, Black 2-Gauge, 30”
13	55002	1	Cable, Red 2-Gauge, 103”
14	55003	1	Cable, Red 2-Gauge, 130”
15	55004	2	Cable, Red 2-Gauge, 30”

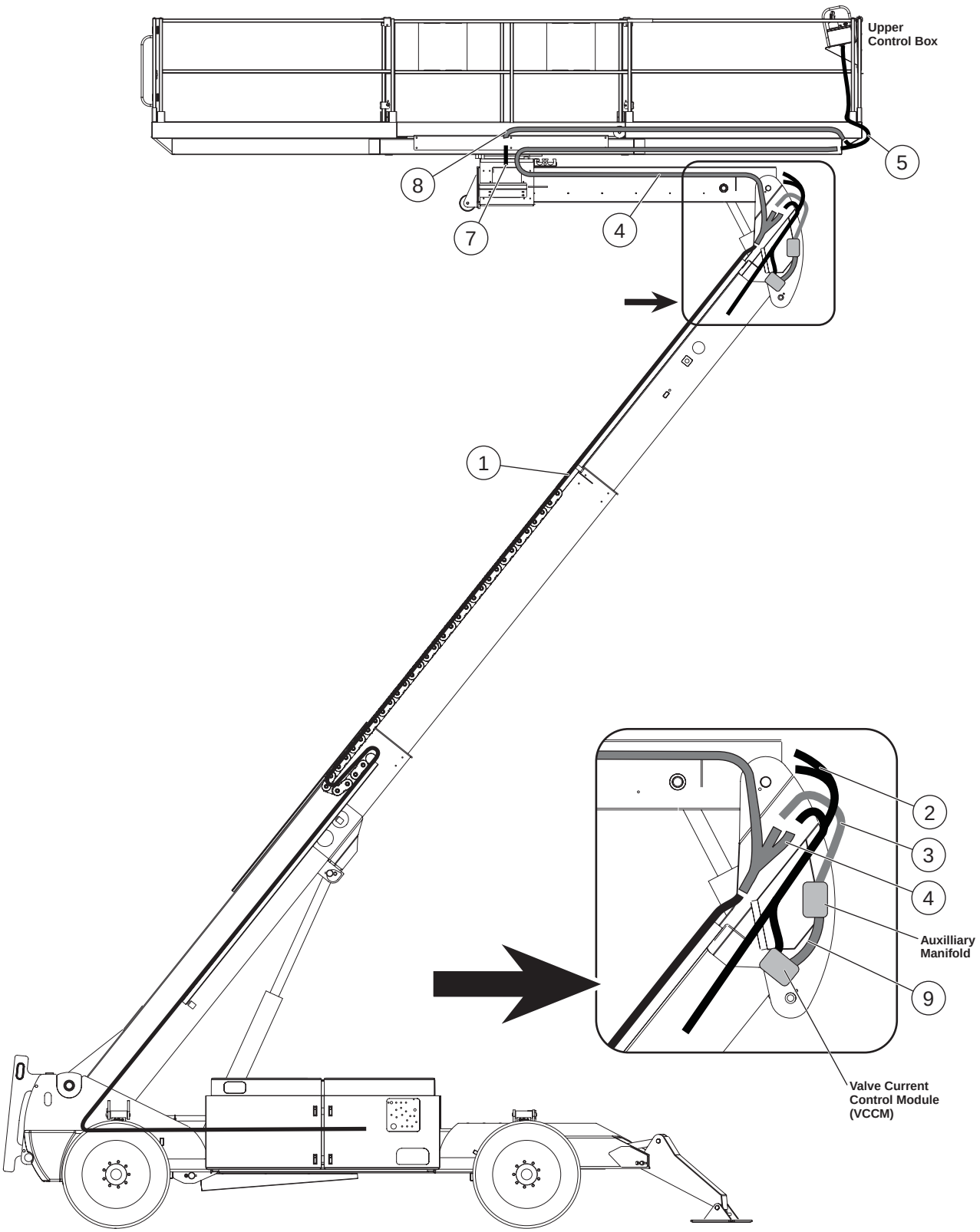


ILLUSTRATION No.
ART_3642

TITAN BOOM 40-S

Wiring Harness -- Boom & Platform

Wiring Harness -- Boom & Platform

ITEM	PART NO.	QTY	DESCRIPTION
1	22609	1	Harness, Control Cable, Lower (J3, J8)
2	22607	1	Harness, End Boom (J11, CAN-Tilt, VCCM, Prox. Switch)
3	22608	1	Harness, Platform Level Valve (J12, Aux. Manifold)
4	22610	1	Harness Control Cable, Intermediate (J8, J9, J11, J12)
5	22611	1	Harness, Control Cable, Upper (J8, J10, J13)
6	22614	1	Harness, Upper Control Box, Complete (J10, interior of control box)
7	22622	1	Harness, Rotational Sensor (J14, Rotation Sensor)
8	22627	1	Harness, Rotational Sensor Extension Harness (J13, J14)
9	22554	1	Harness, VCCM/Aux Manifold (VCCM, Aux. Manifold)
10	9441	85 ft.	Cable, Power To Platform (not shown; follows path similar to Item #1)

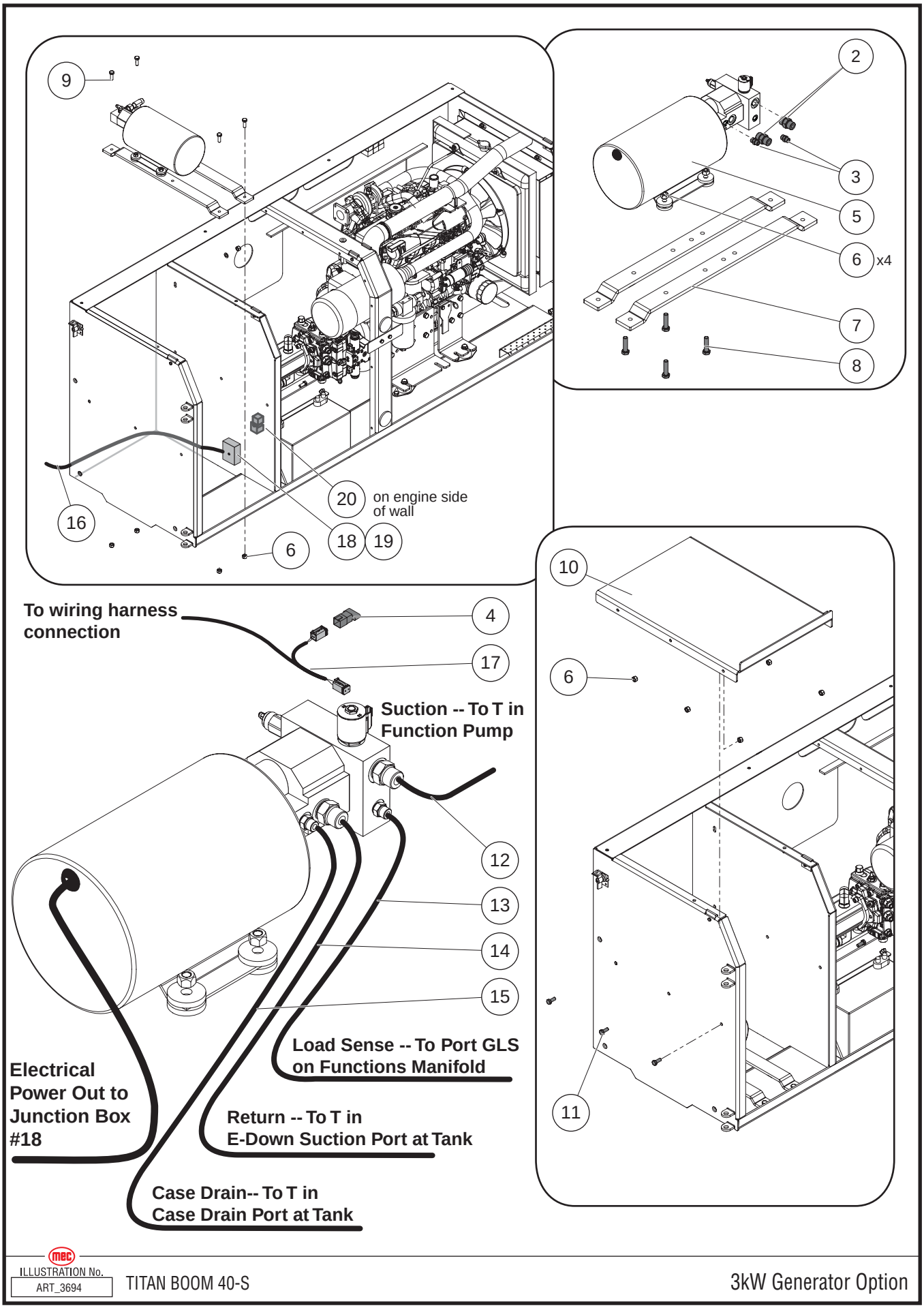


ILLUSTRATION No. ART_3694 | TITAN BOOM 40-S | 3kW Generator Option

OPTION -- 3kVA Generator

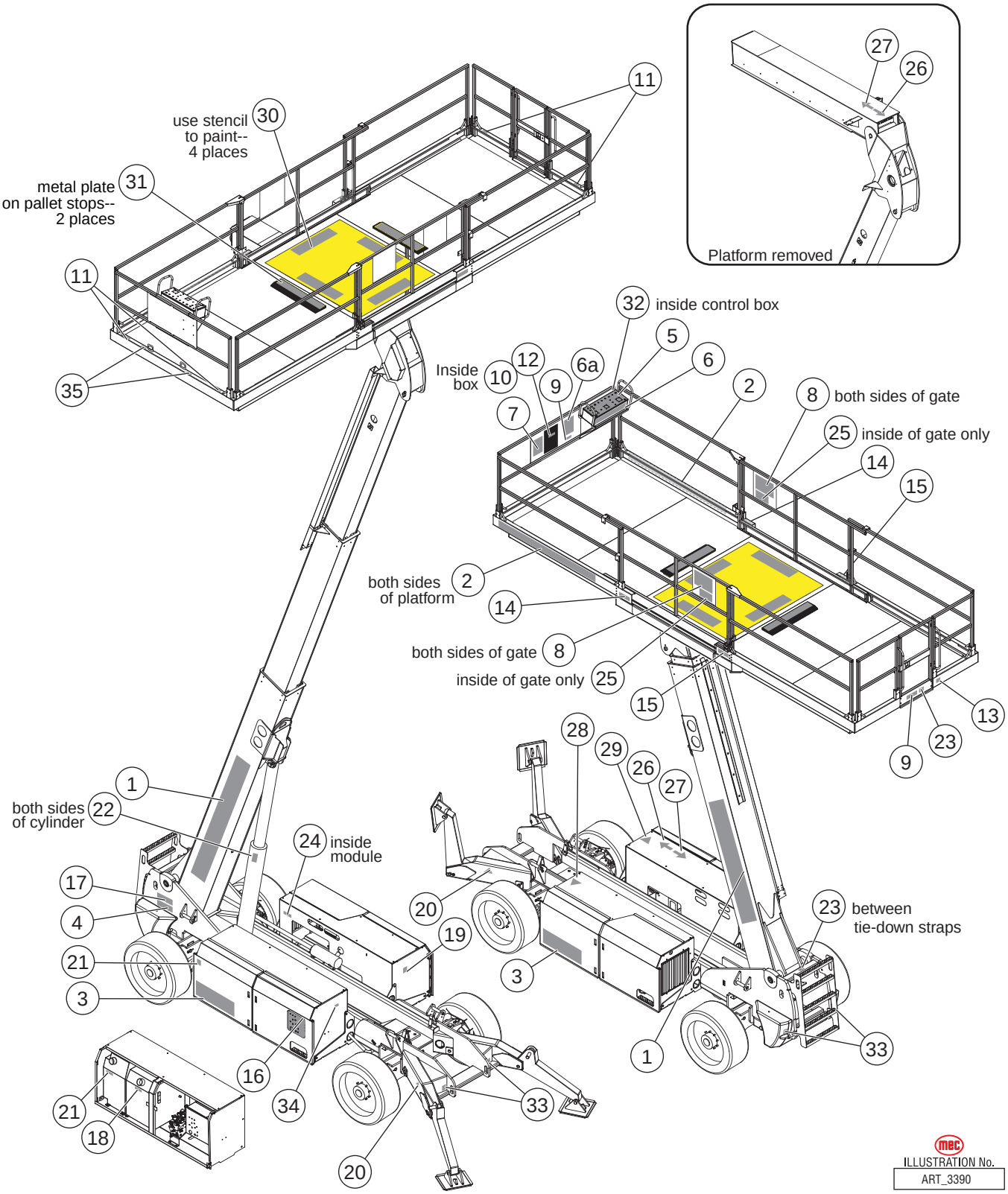
ITEM	PART NO.	QTY	DESCRIPTION
1	--	--	--
2	50841	2	Fitting, MFFOR-MB-8-8
3	50831	2	Fitting, MFFOR-MJ-4-4
4	91027	1	Diode, 2-pin
5	92515	1	Generator, 3kVA
6	50049	14	Nut, M10 Nylock
7	22532	2	Mounting Bracket
8	50035	4	Bolt, HHCS M10 x 40
9	50034	4	Bolt, HHCS, M10 x 30
10	22531	1	Utility Shelf, Generator Option
11	50033	6	Bolt, HHCS M10 x 25
12	52056	1	Hose Assy, Pressure, 1/2" x 39", 8G8FFORX-8G8FFORX
13	19349	1	Hose Assy, Load Sense, 1/4" x 120", 4G4FJX-4G4FJX
14	52057	1	Hose Assy, Return, 1/2" x 125", 8G8FFORX90L-8G8FFORX
15	52177	1	Hose, Assy, Case Drain, 1/4" x 125", 4G4FFORX-4G4FJX
16	91375	7 ft	Cable, Generator to Power To Platform connection
17	22554	1	Harness, Engine Intermediate, Generator Option
18	92495	1	Junction Box
19	92493	1	Circuit Breaker, 30 Amp
20	91375	1	Relay, Generator Power
--	92496	1	Plug, 30A 110V Female (not shown; attached to #16 and plugs into Power To Platform connection)

NOTES:

SECTION G

DECALS, ANSI

CONTENTS


27
26
Platform removed
11
use stencil
to paint--
4 places
30
metal plate
on pallet stops--
2 places
31
11
35
32
inside control box
5
6
2
8
both sides of gate
25
inside of gate only
14
15
Inside
box
10
12
9
6a
7
both sides
of platform
2
14
both sides of gate
8
inside of gate only
25
15
13
23
9
28
29
26
27
1
both sides
of cylinder
22
24
inside
module
17
4
21
3
20
19
3
23
between
tie-down straps
1
33
16
34
33
21
18
20
ILLUSTRATION No.
ART_3390

Decals, Titan Boom 40-S ANSI

ITEM	PART NO.	QTY	DESCRIPTION
1	92050	2	Decal, MEC TITAN BOOM, Boom
2	92049	2	Decal, MEC TITAN BOOM, Toeboard
3	92051	2	Decal, MEC TITAN BOOM, Module
4	92054	1	Decal, Patents Pending
5	92044	1	Decal, Platform Controls
6	92056	1	Decal, Instructions
6a	92233	1	Decal, Instructions
7	92055	1	Decal, Danger
8	92115	4	Decal, Load Zone
9	92057	2	Decal, Personnel
10	90718	1	Decal, Inspection
11	92116	4	Decal, Lanyard Cable
12	8911	1	Decal, Manuals Case
13	90739	1	Decal, Made In USA
14	92059	2	Decal, Load Zone Capacity
15	92058	2	Decal, Material Gates
16	92060	1	Decal, Base Controls
17	92230	1	Decal, Serial Number ANSI
	92230	1	Decal, Serial Number CSA
18	92117	1	Decal, Hydraulic Fluid Range
19	9052	1	Decal, Master Disconnect
20	91850	2	Decal, Crush Hazard
21	91975	2	Decal, Diesel Fuel
22	92118	2	Decal, Maintenance Chock
23	92120	2	Decal, Tie-Down Straps
24	92119	1	Decal, Relays
25	92114	2	Decal, Material Loading Gates
26	91971	1	Decal, Arrow, Forward
27	91972	1	Decal, Arrow, Reverse
28	91981	1	Decal, Arrow, Left
29	91982	1	Decal, Arrow, Right
30	22474	4	Stencil, Load Zone
31	22484	2	Plate, Load Zone
32	92236	1	Decal, EZ Cal Port
33	11026730	4	Decal, Tie-Down Point
34	90751	1	Decal, Power To Platform
35	92542	1	Decal, Lanyard Point

1 92050 2 Places

mec TITAN BOOM™ 40-S

2 92049 2 Places

mec TITAN BOOM™ 40-S

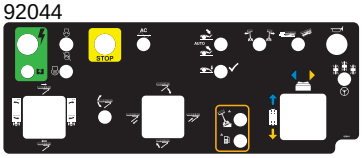
3 92051 2 Places

mec TITAN BOOM™ 40-S

4 92054

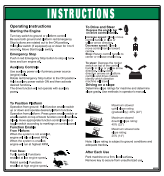
Multiple Patents Pending

5 92044



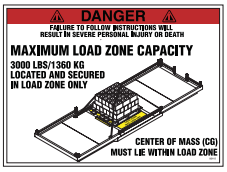
6 92056

6a 92233

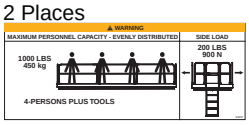


7 92055

8 92115
4 Places



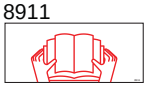
9 92057
2 Places



10 90718

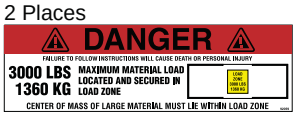
11 92116
4 Places

12 8911



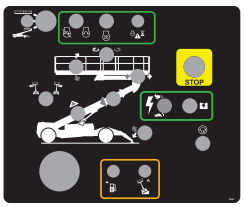
13 90739

14 92059
2 Places



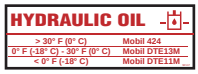
15 92058
2 Places

16 92060



17 92334 -- ANSI
92230 -- CSA

18 92117

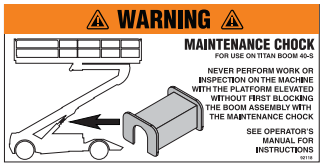


19 9052

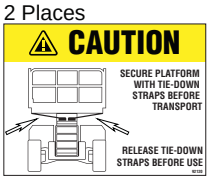
20 91850
2 Places

21 91975
2 Places

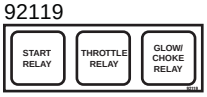
22 92118
2 Places



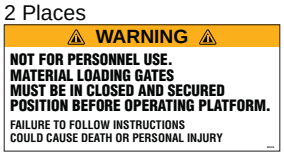
23 92120
2 Places



24 92119



25 92114
2 Places



26 91971
2 places

27 91972
2 places

28 91981

29 91982

30 22474 -- Paint Stencil for Load Zone
4 places - not a decal

LOAD ZONE
MAX. 3000LBS

31 22484 -- Metal Plates on Pallet Stops
2 places

32 92236

33 11026730
4 Places

34 90751

POWER TO PLATFORM

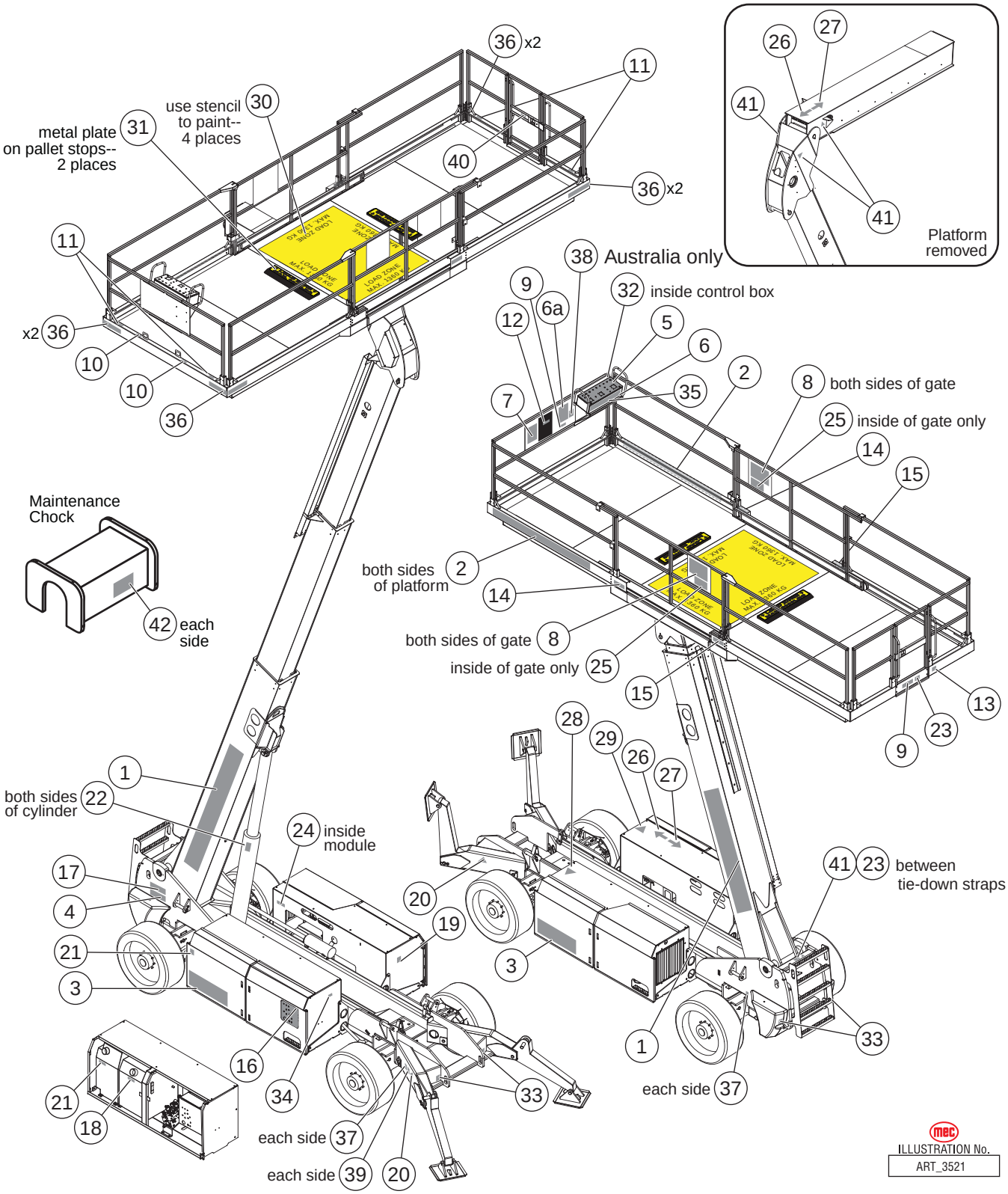
35 92542

mec
ILLUSTRATION No.
ART_3391

SECTION H

DECALS, CE

CONTENTS


36 x2
11
use stencil to paint-- 4 places
30
metal plate on pallet stops-- 2 places
31
40
36 x2
11
x2 36
10
10
36
38 Australia only
9
6a
12
32 inside control box
5
6
35
2
8 both sides of gate
7
25 inside of gate only
14
15
Maintenance Chock
42 each side
both sides of platform 2
14
both sides of gate 8
inside of gate only 25
15
13
23
9
28
29
26
27
1
both sides of cylinder 22
24 inside module
17
4
21
3
20
19
3
41 23 between tie-down straps
1
33
16
34
33
each side 37
21
18
each side 37
each side 39
20
each side 37
26
27
41
41
Platform removed
mec
ILLUSTRATION No.
ART_3521

Decals, Titan Boom 40-S CE

ITEM	PART NO.	QTY	DESCRIPTION
1	92050	2	Decal, MEC TITAN BOOM, Boom
2	92049	2	Decal, MEC TITAN BOOM, Toeboard
3	92051	2	Decal, MEC TITAN BOOM, Module
4	92054	1	Decal, Patents Pending
5	92044	1	Decal, Platform Controls
6	92056	1	Decal, Instructions
6a	92233	1	Decal, Instructions
7	92411	1	Decal, Danger
8	92297	4	Decal, Load Zone
9	92298	2	Decal, Personnel
10	92542	1	Decal, Lanyard Point
11	92116	4	Decal, Lanyard Cable
12	8911	1	Decal, Manuals Case
13	90739	1	Decal, Made In USA
14	92410	2	Decal, Load Zone Capacity
15	92058	2	Decal, Material Gates
16	92294	1	Decal, Base Controls
17	92235	1	Decal, Serial Number
18	92117	1	Decal, Hydraulic Fluid Range
19	9052	1	Decal, Master Disconnect
20	91850	2	Decal, Crush Hazard
21	91975	2	Decal, Diesel Fuel
22	92118	2	Decal, Maintenance Chock
23	92120	2	Decal, Tie-Down Straps
24	92119	1	Decal, Relays
25	92114	2	Decal, Material Loading Gates
26	91971	1	Decal, Arrow, Forward
27	91972	1	Decal, Arrow, Reverse
28	91981	1	Decal, Arrow, Left
29	91982	1	Decal, Arrow, Right
30	22474	4	Stencil, Load Zone
31	22484	2	Plate, Load Zone
32	92236	1	Decal, EZ Cal Port
33	11026730	4	Decal, Tie-Down Point
34	90751	1	Decal, Power To Platform
35	91388	1	Decal, 86 dB
36	7982	4	Decal, Safety Tape
37	92299	4	Decal, Wheel Load
38	91325	1	Decal, Electrical Clearance (Australia only)
39	92548	2	Decal, Stabilizer Load
40	92549	1	Decal, Personnel Entry Gate
41	9910	4	Decal, Pinch Point
42	90717EUR	2	Decal, Maintenance Block

1 92050 2 Places

mec TITAN BOOM™ 40-S

2 92049 2 Places

mec TITAN BOOM™ 40-S

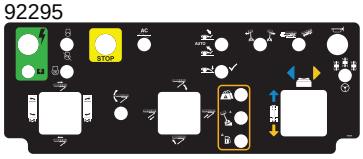
3 92051 2 Places

mec TITAN BOOM™ 40-S

4 92054

Multiple Patents Pending

5 92295

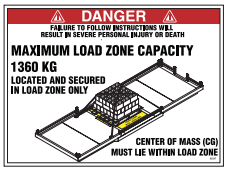


6 92056

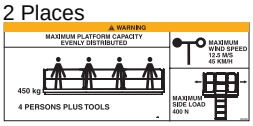
6a 92233

7 92411

8 92297
4 Places



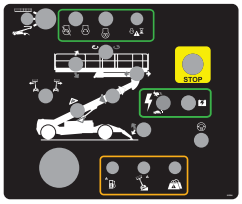
9 92298
2 Places



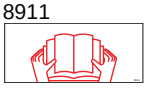
10 92542
2 Places

11 92116
4 Places

16 92294

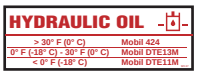


12 8911



14 92410
2 Places

18 92117



19 9052

13 90739

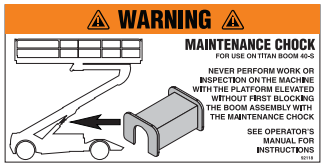
15 92058
2 Places

17 92235

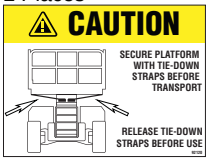
20 91850
2 Places

21 91975
2 Places

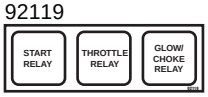
22 92118
2 Places



23 92120
2 Places



24 92119



25 92114
2 Places

26 91971
2 places

27 91972
2 places

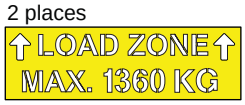
28 91981

29 91982

30 22623 -- Paint Stencil for Load Zone
4 places - not a decal

LOAD ZONE
MAX. 1360 KG

31 22558 -- Metal Plates on Pallet Stops
2 places



32 92236

33 11026730
4 Places

34 90751

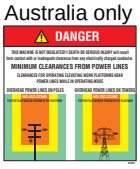
POWER TO PLATFORM

35 91388

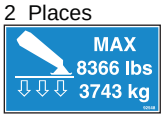
37 92299
4 Places

36 7982
8 Places -- 2 each corner

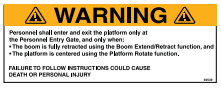
38 91325
Australia only



39 92548
2 Places



40 92549



41 9910
4 Places

42 90717EUR
2 Places

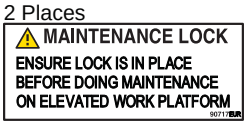


ILLUSTRATION No.
ART_3520

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 _____

**All orders MUST have a Purchase Order Number

Ship VIA_____

**Fed Ex shipments require Fed Ex account number

Part Number	Description	Quantity	Price

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

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

_____

NOTES:

Limited Owner Warranty

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

Aerial Platform Sales Corp.

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