General Troubleshooting Tips

Hydraulic Fluid Pump

The hydraulic Drive Pump and Primary Functions Pump used in this model are variable displacement, axial piston type pumps. Proper adjustment is critical for normal operation of the machine. Refer to Section 10 - Hydraulic System.

The Secondary Functions pump is a fixed-displacement gear-type pump attached to the rear of the Primary Functions 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 10 - Hydraulic System.

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.

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.

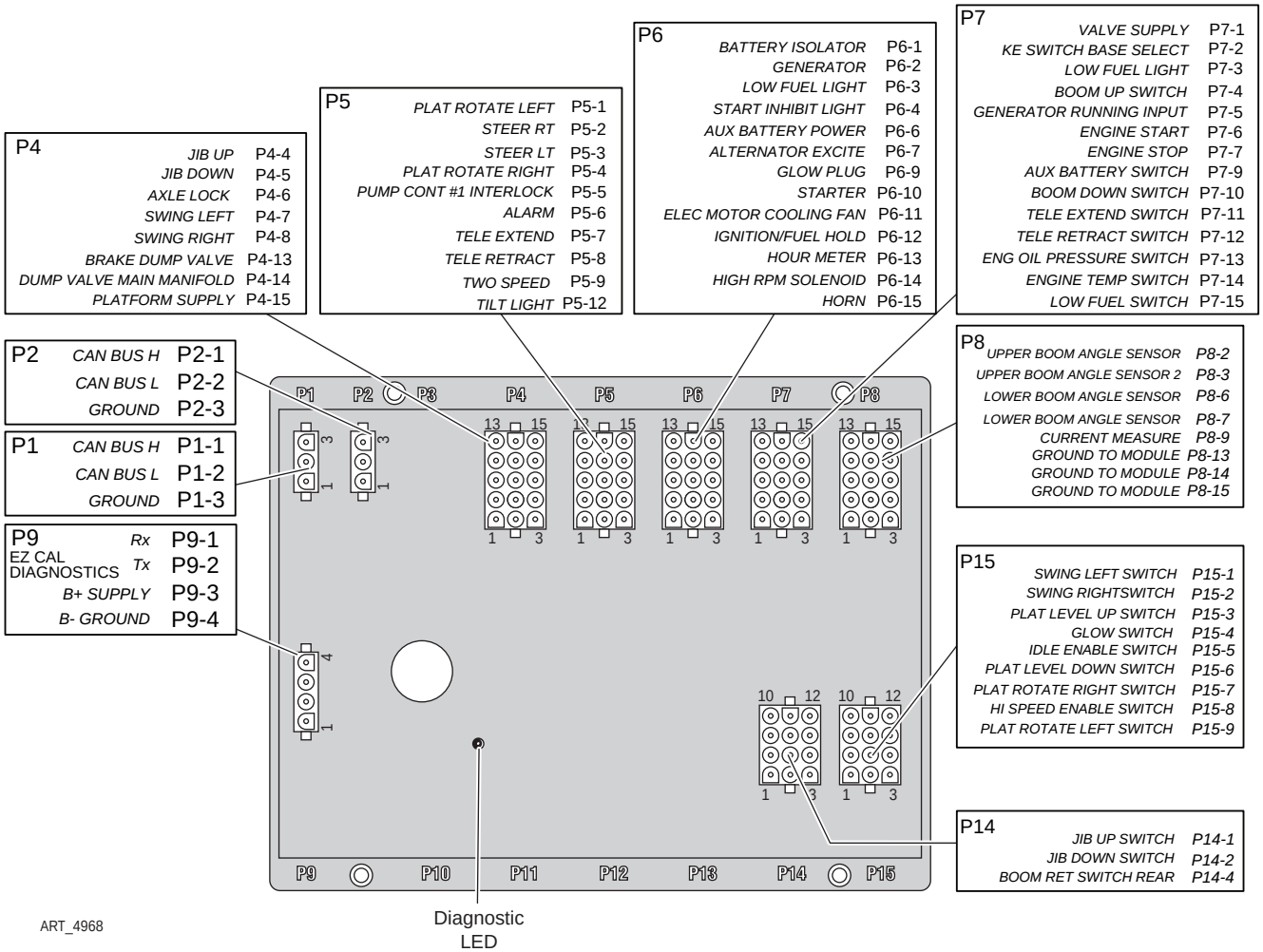
USE OF HIGH PRESSURE WASHING EQUIPMENT DIRECTLY ON THE MODULES CAN FORCE WATER INTO SEALED CONNECTION AND CAN CAUSE A TEMPORARY SYSTEM SHUT-DOWN. HIGH PRESSURE WASHING WITHIN THE VICINITY OF THE MODULES IS HIGHLY DISCOURAGED.

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.

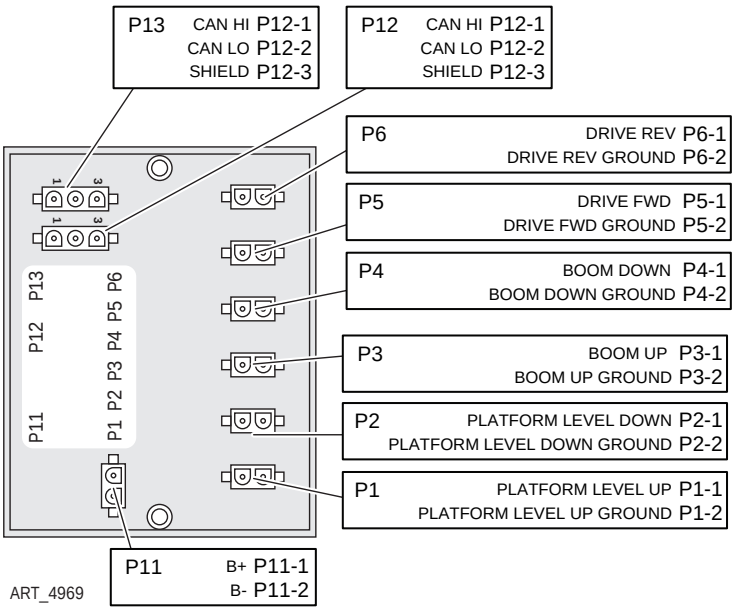
The GP400 operates on 12 volts DC and should never be probed or operated with voltage higher than 14 volts DC.



Valve Constant Current Module and Terminal Block Module

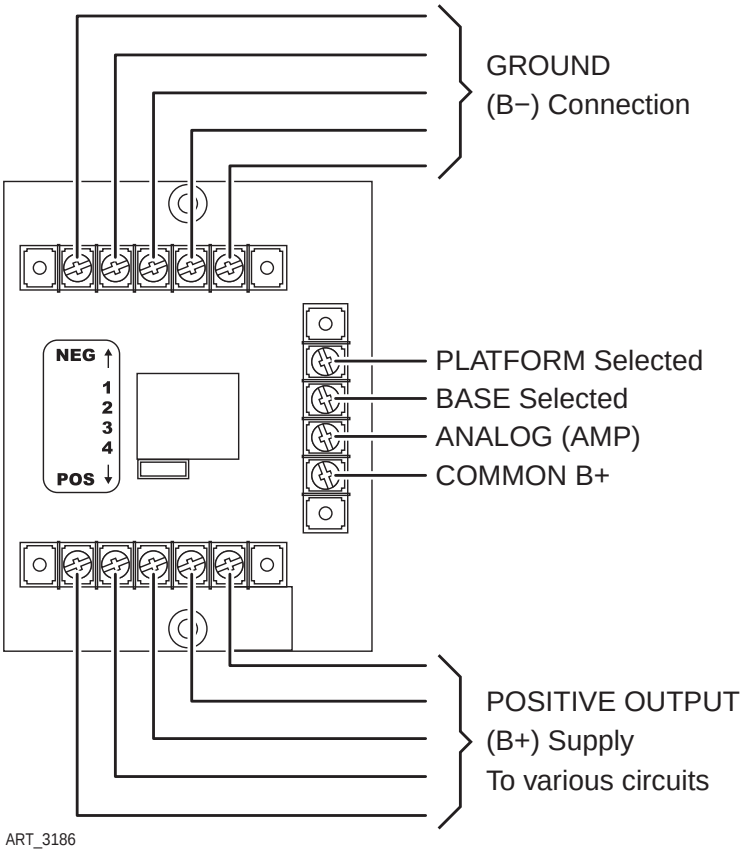
Valve Constant Current Modules (VCCM)

The Valve Constant Current Module is an auxiliary module located inside the lower control box. It controls certain proportional functions of the machine.



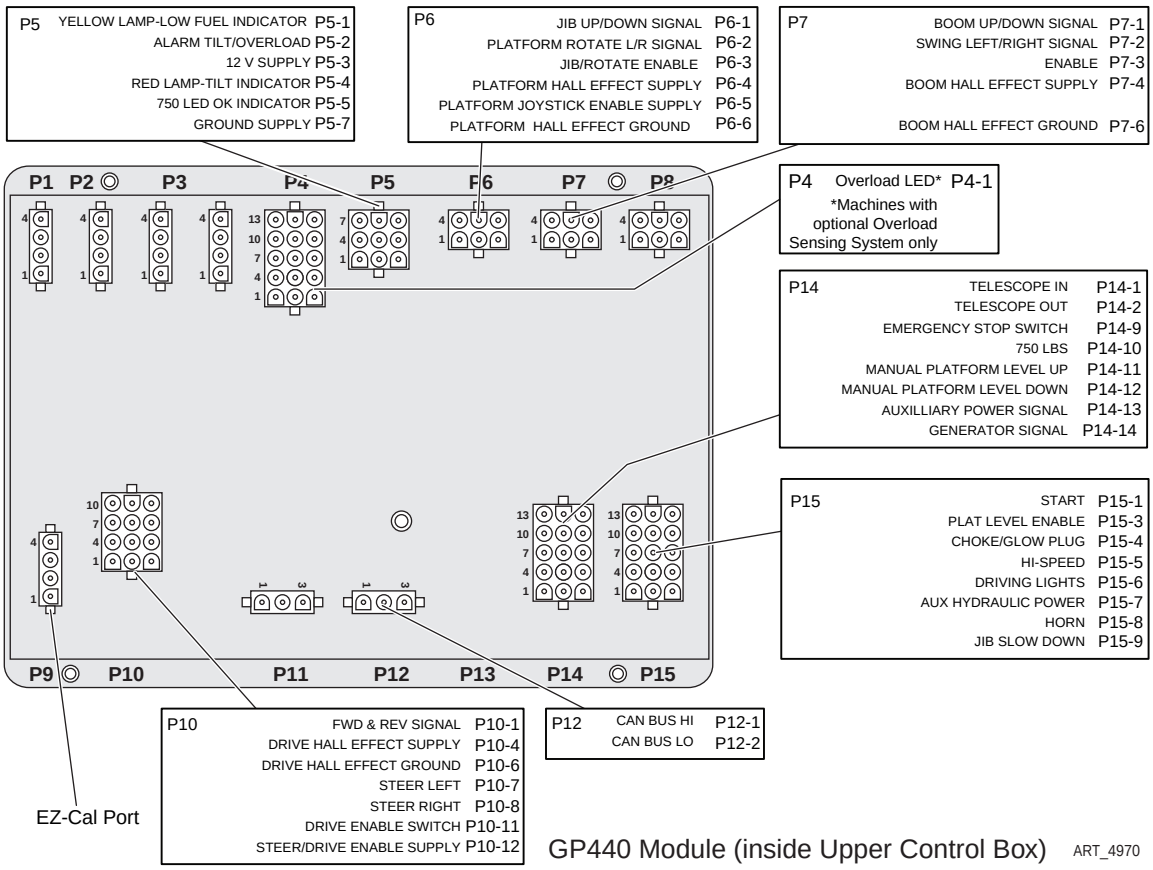
Terminal Block Module (TBM)

The Terminal Block Module (TBM) is a module inside the lower control box that provides terminal point connections for both positive and ground circuits. A signal from the Emergency Stop circuit activates a load-reduction relay within the TBM that provides 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.



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.



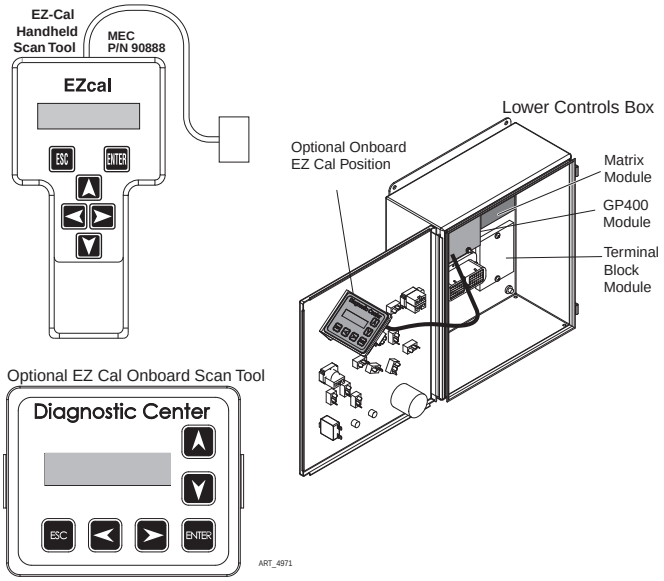
GP440 Module (inside Upper Control Box) ART_4970

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 Option -- 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.

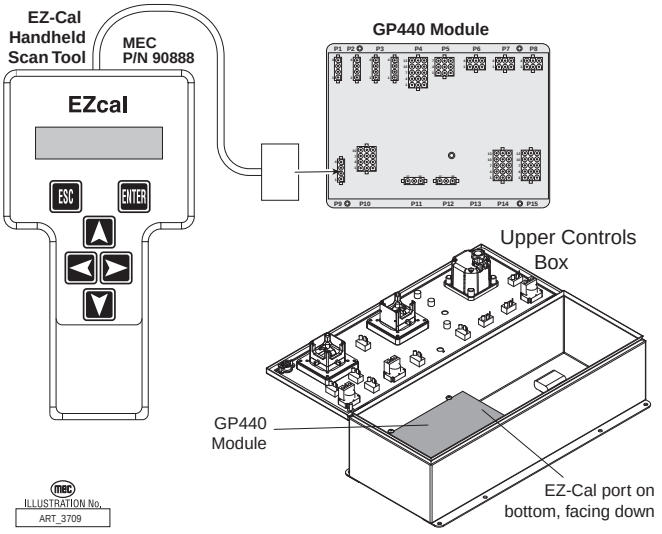


Handheld EZ-Cal -- Upper Controls Box

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.



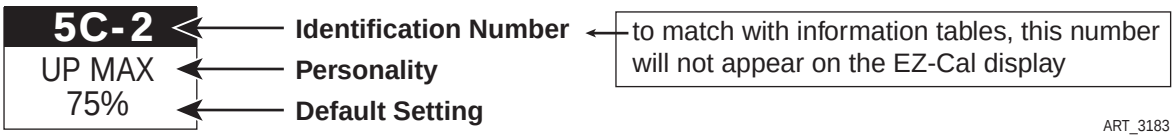
Using The EZ-Cal Scan Tool

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

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

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.



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.

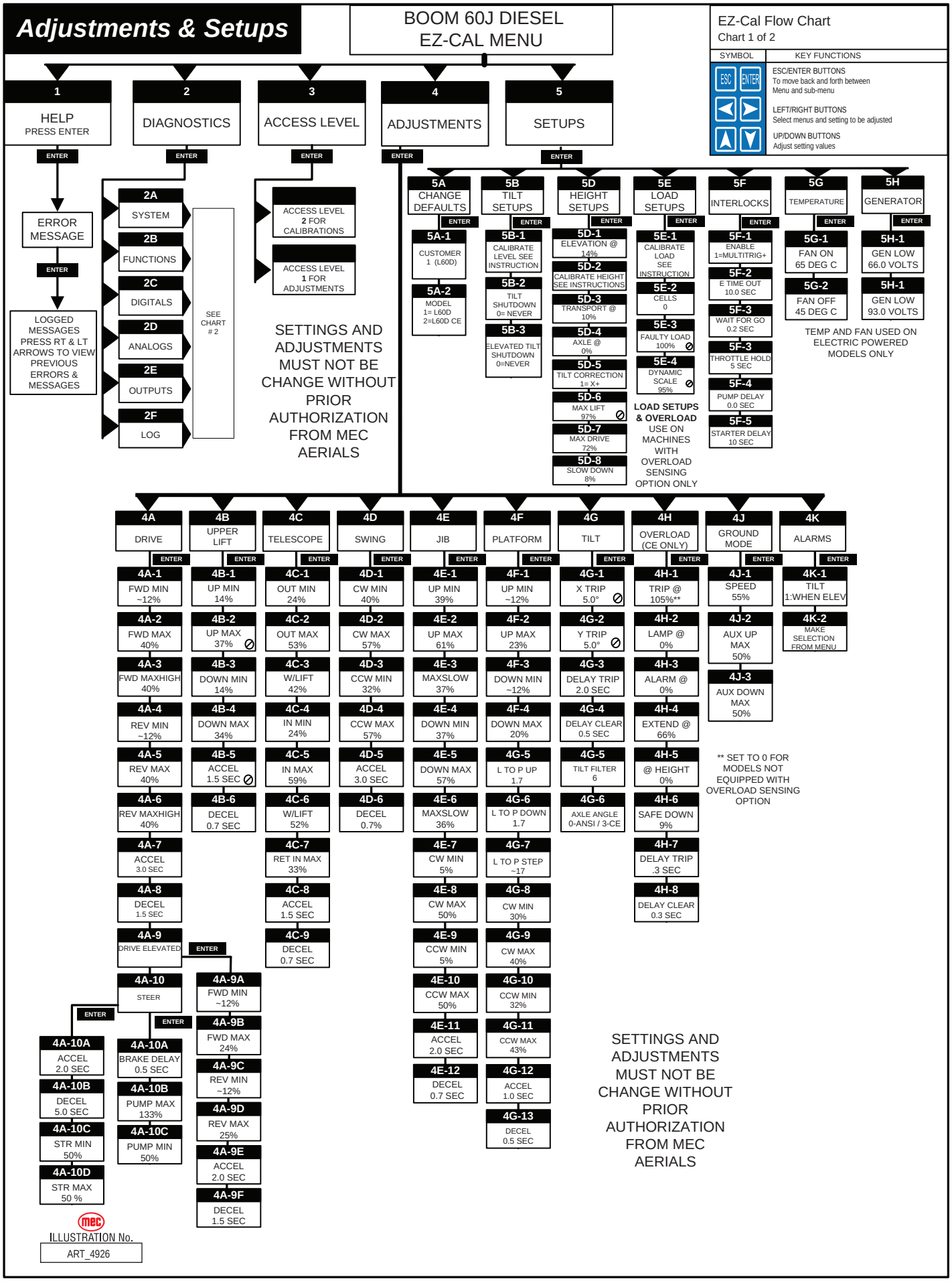
Error Messages

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 104 for flash coded error messages.


Adjustments & Setups
BOOM 60J DIESEL
EZ-CAL MENU
EZ-Cal Flow Chart
Chart 1 of 2
SYMBOL
KEY FUNCTIONS
ESC/ENTER BUTTONS
To move back and forth between Menu and sub-menu
LEFT/RIGHT BUTTONS
Select menus and setting to be adjusted
UP/DOWN BUTTONS
Adjust setting values
1 HELP PRESS ENTER
2 DIAGNOSTICS
3 ACCESS LEVEL
4 ADJUSTMENTS
5 SETUPS
ENTER
ERROR MESSAGE
LOGGED MESSAGES PRESS RT & LT ARROWS TO VIEW PREVIOUS ERRORS & MESSAGES
2A SYSTEM
2B FUNCTIONS
2C DIGITALS
2D ANALOGS
2E OUTPUTS
2F LOG
SEE CHART # 2
ACCESS LEVEL 2 FOR CALIBRATIONS
ACCESS LEVEL 1 FOR ADJUSTMENTS
SETTINGS AND ADJUSTMENTS MUST NOT BE CHANGE WITHOUT PRIOR AUTHORIZATION FROM MEC AERIALS
5A CHANGE DEFAULTS
5A-1 CUSTOMER 1 (L60D)
5A-2 MODEL 1= L60D 2=L60D CE
5B TILT SETUPS
5B-1 CALIBRATE LEVEL SEE INSTRUCTION
5B-2 TILT SHUTDOWN 0= NEVER
5B-3 ELEVATED TILT SHUTDOWN 0=NEVER
5D HEIGHT SETUPS
5D-1 ELEVATION @ 14%
5D-2 CALIBRATE HEIGHT SEE INSTRUCTIONS
5D-3 TRANSPORT @ 10%
5D-4 AXLE @ 0%
5D-5 TILT CORRECTION 1= X+
5D-6 MAX LIFT 97%
5D-7 MAX DRIVE 72%
5D-8 SLOW DOWN 8%
5E LOAD SETUPS
5E-1 CALIBRATE LOAD SEE INSTRUCTION
5E-2 CELLS 0
5E-3 FAULTY LOAD 100%
5E-4 DYNAMIC SCALE 95%
LOAD SETUPS & OVERLOAD USE ON MACHINES WITH OVERLOAD SENSING OPTION ONLY
5F INTERLOCKS
5F-1 ENABLE 1=MULTITRIG+
5F-2 E TIME OUT 10.0 SEC
5F-3 WAIT FOR GO 0.2 SEC
5F-3 THROTTLE HOLD 5 SEC
5F-4 PUMP DELAY 0.0 SEC
5F-5 STARTER DELAY 10 SEC
5G TEMPERATURE
5G-1 FAN ON 65 DEG C
5G-2 FAN OFF 45 DEG C
5H GENERATOR
5H-1 GEN LOW 66.0 VOLTS
5H-1 GEN LOW 93.0 VOLTS
TEMP AND FAN USED ON ELECTRIC POWERED MODELS ONLY
4A DRIVE
4A-1 FWD MIN ~12%
4A-2 FWD MAX 40%
4A-3 FWD MAXHIGH 40%
4A-4 REV MIN ~12%
4A-5 REV MAX 40%
4A-6 REV MAXHIGH 40%
4A-7 ACCEL 3.0 SEC
4A-8 DECEL 1.5 SEC
4A-9 DRIVE ELEVATED
4A-10 STEER
4A-10A ACCEL 2.0 SEC
4A-10B DECEL 5.0 SEC
4A-10C STR MIN 50%
4A-10D STR MAX 50 %
4A-10A BRAKE DELAY 0.5 SEC
4A-10B PUMP MAX 133%
4A-10C PUMP MIN 50%
4A-9A FWD MIN ~12%
4A-9B FWD MAX 24%
4A-9C REV MIN ~12%
4A-9D REV MAX 25%
4A-9E ACCEL 2.0 SEC
4A-9F DECEL 1.5 SEC
4B UPPER LIFT
4B-1 UP MIN 14%
4B-2 UP MAX 37%
4B-3 DOWN MIN 14%
4B-4 DOWN MAX 34%
4B-5 ACCEL 1.5 SEC
4B-6 DECEL 0.7 SEC
4C TELESCOPE
4C-1 OUT MIN 24%
4C-2 OUT MAX 53%
4C-3 W/LIFT 42%
4C-4 IN MIN 24%
4C-5 IN MAX 59%
4C-6 W/LIFT 52%
4C-7 RET IN MAX 33%
4C-8 ACCEL 1.5 SEC
4C-9 DECEL 0.7 SEC
4D SWING
4D-1 CW MIN 40%
4D-2 CW MAX 57%
4D-3 CCW MIN 32%
4D-4 CCW MAX 57%
4D-5 ACCEL 3.0 SEC
4D-6 DECEL 0.7%
4E JIB
4E-1 UP MIN 39%
4E-2 UP MAX 61%
4E-3 MAXSLOW 37%
4E-4 DOWN MIN 37%
4E-5 DOWN MAX 57%
4E-6 MAXSLOW 36%
4E-7 CW MIN 5%
4E-8 CW MAX 50%
4E-9 CCW MIN 5%
4E-10 CCW MAX 50%
4E-11 ACCEL 2.0 SEC
4E-12 DECEL 0.7 SEC
4F PLATFORM
4F-1 UP MIN ~12%
4F-2 UP MAX 23%
4F-3 DOWN MIN ~12%
4F-4 DOWN MAX 20%
4G-5 L TO P UP 1.7
4G-6 L TO P DOWN 1.7
4G-7 L TO P STEP ~17
4G-8 CW MIN 30%
4G-9 CW MAX 40%
4G-10 CCW MIN 32%
4G-11 CCW MAX 43%
4G-12 ACCEL 1.0 SEC
4G-13 DECEL 0.5 SEC
4G TILT
4G-1 X TRIP 5.0°
4G-2 Y TRIP 5.0°
4G-3 DELAY TRIP 2.0 SEC
4G-4 DELAY CLEAR 0.5 SEC
4G-5 TILT FILTER 6
4G-6 AXLE ANGLE 0-ANSI / 3-CE
4H OVERLOAD (CE ONLY)
4H-1 TRIP @ 105%**
4H-2 LAMP @ 0%
4H-3 ALARM @ 0%
4H-4 EXTEND @ 66%
4H-5 @ HEIGHT 0%
4H-6 SAFE DOWN 9%
4H-7 DELAY TRIP .3 SEC
4H-8 DELAY CLEAR 0.3 SEC
4J GROUND MODE
4J-1 SPEED 55%
4J-2 AUX UP MAX 50%
4J-3 AUX DOWN MAX 50%
** SET TO 0 FOR MODELS NOT EQUIPPED WITH OVERLOAD SENSING OPTION
4K ALARMS
4K-1 TILT 1:WHEN ELEV
4K-2 MAKE SELECTION FROM MENU
SETTINGS AND ADJUSTMENTS MUST NOT BE CHANGE WITHOUT PRIOR AUTHORIZATION FROM MEC AERIALS
ILLUSTRATION No.
ART_4926

DIAGNOSTIC

Use in conjunction with Diagnostic tables for Thorough explanation Of readout and values

60JD BOOM EZ-CAL MENU

2 DIAGNOSTICS

ENTER

EZ-Cal Flow Chart
Chart 2 of 2

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** ENABLED NO/YES — ENTER
- **2A-2** B+ SUPPLY ACTUAL INPUT VOLTAGE — ENTER
- **2A-3** TRACTION NOT USED ON DIESEL UNITS — ENTER
- **2A-4** PUMP NOT USED ON DIESEL UNITS — ENTER
- **2A-5** TILT STATE OF LEVEL IN DEGREES — ENTER
- **2A-6** AXLE ANGLE ACTUAL CE UNITS ONLY — ENTER
- **2A-7** TILTED YES or NO
- **2A-8** HEIGHT ACTUAL IN % — ENTER
- **2A-9** LOAD ACTUAL IN %
- **2A-10** OVERLOADED YES or NO — ENTER
- **2A-11** ELEVATED YES or NO
- **2A-12** EXTENDED YES or NO
- **2A-13** EXTENDED #2 YES or NO
- **2A-14** TRANSPORT YES or NO
- **2A-15** CURTIS NOT USED
- **2A-16** GEN STATE NOT USED

- **2A-1A** PLATFORM MODE ON or OFF
- **2A-1B** GROUND MODE ON or OFF
- **2A-1C** VALVE SUPPLY ON or OFF
- **2A-1D** OK to GO YES or NO
- **2A-2A** LOW BATTERY YES or NO
- **2A-2B** 12 VOLT SUPPLY ACTUAL
- **2A-2C** CAPBANK NOT USED
- **2A-5A** PLATFORM ACTUAL IN DEGREES LEVEL
- **2A-5B** GP400 ACTUAL IN DEGREES LEVEL
- **2A-5C** CAN TILT 151 ACTUAL IN DEGREES LEVEL
- **2A-5D** CAN TILT 153 ACTUAL IN DEGREES LEVEL
- **2A-5E** P ADJUST
- **2A-6A** AXLE ANGLE LOCKED YES or NO
- **2A-8A** HEIGHT 1 up ACTUAL IN %
- **2A-8B** HEIGHT 2 low ACTUAL IN %
- **2A-10A** OVERLOADED 0/L EXTEND YES OR NO

2B FUNCTIONS

ENTER

- **2B-1** DRIVE ACTUAL
- **2B-2** STEER ACTUAL
- **2B-3** LL(lower lift) ACTUAL
- **2B-4** UL (upper lift) ACTUAL
- **2B-5** JIB U-D ACTUAL
- **2B-6** JIB L-R ACTUAL
- **2B-7** BASKET U-D ACTUAL
- **2B-8** BASKET L-R ACTUAL
- **2B-9** TELE ACTUAL
- **2B-10** SWING ACTUAL
- **2B-11** INTERLOCK INFORMATION

2C DIGITALS

ENTER

2C-1 GP400 DIGITALS Lower control box INPUTS — ENTER

P7-1	(VALVE SUPPLY) POWER INPUT
P7-2	KEY SWITCH BASE SELECTED
P7-3	BOOM UP SWITCH
P7-4	KEY SWITCH PLATFORM SEL
P7-5	GENERATOR RUNNING (60JE)
P7-6	ENG START SWITCH
P7-7	ENGINE STOP SWITCH (L60E)
P7-9	AUX BATTERY POWER
P7-10	BOOM DOWN SWITCH
P7-11	TELE EXTEND SWITCH
P7-12	TELE RETRACT SWITCH
P7-13	ENGINE OIL PRESSURE SWITCH
P7-14	ENGINE TEMP SWITCH
P7-15	LOW FUEL SWITCH
P14-1	JIB UP SWITCH
P14-2	JIB DOWN SWITCH
P14-10	BOOM RETRACT PROX SWITCH
P15-1	SWING LEFT SWITCH
P15-2	SWING RIGHT SWITCH
P15-3	PLATFORM LEVEL UP SWITCH
P15-4	GLOW PLUG SWITCH
P15-5	IDLE ENABLE SWITCH
P15-6	PLATFORM LEVEL DOWN SWITCH
P15-7	PLATFORM ROT RIGHT SWITCH
P15-8	HIGH SPEED ENABLE SWITCH
P15-9	PLATFORM ROT LEFT SWITCH

2C-2 GP440 Upper control box INPUTS — ENTER

P10-7	STEER LEFT
P10-8	STEER RIGHT
P10-11	DRIVE ENABLE SWITCH
P14-1	TELE OUT SWITCH
P14-2	TELE IN SWITCH
P14-9	EMERGENCY STOP SWITCH
P14-10	750 LBS OPTION
P14-11	PLATFORM LEVEL UP
P14-12	PLATFORM LEVEL DOWN
P14-13	AUXILLIARY POWER SIGNAL
P14-14	GENERATOR SIGNAL
P15-1	START
P15-3	ENABLE, PLATFORM LEVEL
P15-4	GLOW PLUG/CHOKE
P15-5	HIGH SPEED
P15-6	DRIVING LIGHTS
P15-7	AUX HYDRAULIC POWER
P15-8	HORN
P15-9	JIB SLOW DOWN SWITCH

2C-3 MATRIX MODULE LOWER CONTROLS — ENTER

	NO MATRIX DIGITALS

2D ANALOGS

ENTER

2D-1 GP400 ANALOGS Lower control box INPUTS — ENTER

P8-2	UPR BOOM ANGLE TRNS
P8-6	LWR BOOM ANGLE TRNS 1
P8-9	TBM AMPERAGE
P8-13	GROUND TO MODULE
P8-14	GROUND TO MODULE
P8-15	GROUND TO MODULE

2D-2 GP440 Upper control box ANALOG INPUTS — ENTER

P6-1	JIB UP/DWN JSTK
P6-2	PLATFORM ROTATE L/R
P6-3	ENABLE JIB/ROTATE
P7-1	BOOM UP/DOWN
P7-2	TURRET SWING
P7-3	ENABLE BOOM/SWING
P10-1	DRIVE FWD/REV JSTK
P14-1	TELESCOPE OUT
P14-2	TELESCOPE IN

2D-3 MATRIX MODULE LOWER CONTROLS — ENTER

	NO MATRIX ANALOGS

NOTE: When viewing PROPORTIONAL outputs press ENTER for actual output %

2E OUTPUTS

ENTER

2E-1 GP400 OUTPUTS Lower control box OUTPUTS — ENTER

P4-4	JIB UP VALVE
P4-5	JIB DOWN VALVE
P4-6	AXLE LOCK VALVE
P4-7	SWING LEFT VALVE
P4-8	SWING RIGHT VALVE
P4-13	BRAKE DUMP VALVE
P4-14	DUMP VALVE MAIN
P4-15	PLATFORM SUPPLY
P5-1	PLATFORM ROTATE LEFT
P5-2	STEER RIGHT VALVE
P5-3	STEER LEFT VALVE
P5-4	PLATFORM ROTATE RIGHT
P5-5	PUMP CONT #1 INTERLOCK
P5-6	ALARM
P5-7	TELE OUT VALVE
P5-8	TELE IN VALVE
P5-9	2-SPEED VALVE
P5-12	TILT LIGHT
P6-1	BATTERY ISOLATOR
P6-2	GENERATOR
P6-3	LOW FUEL LIGHT
P6-4	START INHIBIT LIGHT
P6-6	AUX BATTERY POWER
P6-7	ALTERNATOR EXCITE
P6-8	GAS/PROPANE (FUTURE MODEL)
P6-9	GLOW PLUG (CHOKE)
P6-10	STARTER
P6-11	MOTOR COOLING FAN
P6-12	DIESEL STOP VALVE (IGN)
P6-13	HOUR METER
P6-14	HIGH RPM SOLENOID HOLD
P6-15	HORN

2E-2 GP440 OUTPUTS Upper control box OUTPUTS — ENTER

P4-1	OVERLOAD LIGHT (CE)
P4-7	BATERY CHARGE GAUGE (60JE)
P5-1	LOW FUEL INDICATOR LT
P5-2	TILT ALARM/OVERLOAD
P5-3	12 VOLT SUPPLY
P5-4	TILT INDICATOR LT
P5-5	750 LBS OK LT
P5-7	GROUND SUPPLY B-

2E-3 MATRIX MODULE LOWER CONTROLS — ENTER

NO MATRIX OUTPUTS

2F LOG

ENTER

- **2F-1** CALDATE CALIBRATION DATE
- **2F-2** SOFTWARE VERSION NUMBER
- **2F-3** MAX BATTERY HIGHEST VOLTAGE

ILLUSTRATION No.
ART_4927

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. 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 EZCal 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

- Check for incorrect GP 400 part.

FAULT: LOW OIL PRESSURE!_____ _ Flash Code 7/7

- Engine Start was pushed but engine did not start or oil pressure switch did not close.
- Engine Oil Pressure is low. Check oil level.

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 this machine. 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 onboard EZ-Cal scan tool, located inside the lower control box door. Please refer to “EZ-Cal Scan Tools” on page 100 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.

Problem	Possible Cause	Remedy/Solution
General Power Issue		
No operation from upper or lower control station. No LEDs on modules.	Emergency stop switch pushed in or ignition switch turned off or faulty switches	Lower e-stop switch and ignition switch will cut all power. Upper e-stop will cut only upper power as will the ignition switch in 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.
	Faulty Terminal Block Module (TBM)	Located inside the lower control box. Initiates all power when signaled by the key switch. Check for loose terminals. Terminal 4 is Common power from Circuit breaker. Terminals 1 and 2 are signals to close the relay.
No operation from upper or lower control station Module LEDs on or flashing	Flash codes are the GP400’s indication of a fault in the system.	Refer to flash code designation in this section of the manual or plug in an EZ-Cal scan for more relevant information relating to the failure. See EZ-Cal Instructions for more information.
	Starter Relay or Starter failure	Test for signal and Common power to Starter Relay. Check fuse for Common power to relay. Test Starter.
Operates from lower controls but not from upper controls. No LEDs when in Upper control position.	Base/Platform select switch not in Platform position or switch malfunction	Ensure that the switch is in the Platform position. Check switch function.
	Damaged or loose harness connections to upper control box	Check for power inside the upper control box on e-stop switch and at Buss Module. Check for presence of ground on the Ground Buss Module. Repair connections.
	Malfunctioning GP440 Module (Module inside the upper control box)	Check help messages using the EZ-Cal tool. Also check for joystick inputs (see 2C2 and 2D2 Diagnostic Chart for inputs from GP440).
	System interlock	Check EZ-Cal HELP messages for interlock

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 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
	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.

7-7 Flash code on GP400	Indicates an attempt to start was sent by the GP400 but the oil pressure switch did not close.	Check all the above
Starter cranks but engine will not start	Low fuel reservoir	Check/fill fuel reservoir. Fuel system requires air purge after loss of fuel.
	Air trapped in the fuel system	Purge air from the fuel system (See Section 18 - Mechanical Components for instructions). Check fuel reservoir level or for leaks in the fuel hoses.
	Restriction in the fuel system	Replace Fuel Filter. Check fuel supply hoses
	Malfunctioning fuel solenoid	Check/replace fuel solenoid located on the top of the injection pump.
	Malfunctioning glow plugs (cold climates)	Test/ replace grid heater relay, fuse and grid heater
	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 controller, solenoid or blown fuse	Test/replace throttle controller 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

Problem	Possible Cause	Remedy/Solution
Boom Lift/Lower		
Platform will not raise	Excessive weight on platform	Reduce weight to within platform capacity
	Machine out of level (platform elevated above 10')	Indicator light will be illuminated and alarm will sound off. Reposition machine to level ground.
	Main relief valve (6) out of adjustment	Adjust Main relief valve (6) to rated platform capacity located on function manifold - see hydraulic section.
	Lift valve (8.1) not energized	Check wiring to lift valve. Check for EZ-Cal message or flash code
	Lift valve (8.1) not shifting	Clean debris. Check for damage/replace.
	Solenoid Valve (18) dump valve not energized	Check wiring to valve. Check EZ-Cal ref. P4-14 for output.
	Solenoid Valve (18) load sense dump not shifting	Clean debris. Check for damage/replace.
	Main system pressure inadequate	Check pump output flow and pressure
	Lift/Lower joystick inoperative	Check Joystick output using EZ-Cal ref. 2D-2
		P7-1 for analog joystick 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	Lowering valve SV3 not energized	Check wiring to lowering valve located inside control module - Section 25 - Hydraulics for location.
	Lowering valve (8.2) not shifting	Clean debris. Check for damage/replace.
	System interlock	Check EZ-Cal HELP messages for interlock
	Main system pressure inadequate	Check pump output flow and pressure
Emergency lowering not working	Battery discharged, not charging	Check/charge battery. Check charge Isolator relay and fuse. Check alternator output (14.5 volts)
	Auxiliary power unit malfunction	Check APU located beside lower control box
	Emergency Down switch failure	Check/replace switch.
	Lowering valve (8.2) not shifting	See "Platform will not lower or lowers slowly"
	Counterbalance Valve (on lift cylinder) not adjusted correctly	Contact Factory Technical Support for instructions for counterbalance valve adjustment
	System interlock	Check EZ-Cal HELP messages for interlock

Problem	Possible Cause	Remedy/Solution
Boom Extend/Retract		
No boom extension	Excessive weight on platform	Reduce weight to within platform capacity
	Level sensor out of level (platform elevated above 10')	Indicator light will be illuminated and alarm will sound off. Reposition machine to level ground
	Main relief valve (6) out of adjustment	Adjust Main relief valve (6) to rated platform capacity located on function manifold - see hydraulic section.
	Solenoid Valve (18) (dump valve) not energized	Check wiring to valve. Check EZ-Cal ref. P4-14 for output
	Ext/Retract valve (8.2) not energized	Check wiring to lift valve. Check for EZ-Cal message or flash code.
	Extend/Retract valve (8.2) not shifting	Clean debris. Check for damage/replace.
	Ext/Retract joystick inoperative	Check Joystick output using EZ-Cal ref. 2D-2, P14-1 & P14-2 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 slow	Excessive weight on Platform	Reduce weight to within platform capacity
	Main relief valve (6) out of adjustment	Adjust Extend relief valve (see hydraulics section) located on function manifold.
	Extend/Retract valve (8.2) not shifting completely	Clean debris. Check for damage/replace.
	Extend Speed adjustment reduced in GP400 Processor	Use the EZ-Cal and check/adjust setting. See ADJUSTMENTS/TELESCOPE OUT MAX
No boom retract	Main relief valve (6) out of adjustment	Adjust Main relief valve (6) to rated platform capacity located on function manifold - see hydraulic section.
	Foreign debris stuck in boom slide pads	Inspect/ clean slide pads.
	Solenoid Valve (18) (dump valve) not energized	Check wiring to valve. Check EZ-Cal ref. P4-14 for output.
	Ext/Retract valve (8.2) not energized	Check wiring to lift valve. Check for EZ-Cal message or flash code.
	Extend/Retract valve (8.2) not shifting	Clean debris. Check for damage/replace.
	Ext/Retract joystick inoperative	Check joystick output using EZ-Cal ref. 2D-2, P14-1 & P14-2 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

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 (19) valve not energized	Check wiring to valve. Check output from VCCM P-1.
	Platform Level solenoid valve (19) sticking	Remove valve and inspect for debris or damage. Replace valve located up on the side of the boom.
	Counterbalance valve faulty	Valve must not be tampered with. Replace valve.
	Flow Compensator valve (20) not shifting	Clean debris. Check for damage/replace.

Platform will not remain level while elevating or lowering platform (level cylinder moving too slow or fast)	Excessive weight on Platform	Reduce weight to within platform capacity
	Main relief valve (16) out of adjustment	Adjust main relief valve (see hydraulics section) located on function manifold.
	Platform Level solenoid valve (19) not shifting completely	Clean debris. Check for damage/replace.
Platform will not remain level while elevating or lowering platform (level cylinder moving too slow or fast)	Flow Compensator valve (22) not shifting completely	Clean debris. Check for damage/replace.
	Adjustments in GP400 incorrect	Refer to Adjustments Flow Chart column 4F for settings that will allow leveling to be close then make slight changes until operating correctly. Contact MEC Technical Support for assistance if needed.
	Pump faulty	Test/replace pump

Problem	Possible Cause	Remedy/Solution
Platform Manual Level		
Platform level operates automatically but not manually	Platform Level toggle switch inoperative	Check output from toggle using EZ-Cal. See I.D.# 2C-1, P15-3 (up) P15-6 (down) for lower control operation or 2c-2, P14-11 (up) or P14-12 (down) from upper controls.
	System Interlock	Check EZ-Cal HELP message for interlock

Problem	Possible Cause	Remedy/Solution
Turntable Rotate		
Turntable will not rotate either direction	Turntable Rotate joystick inoperative	Check joystick output using EZ-Cal. See 2D2 P7-2 for signal.
	Rotate Valve (11) not energizing.	Check wiring to valve Check GP400 output using EZ-Cal. See 2E1 P4-7 (left) and P4-8 (right).
	Rotate valve (11) not shifting.	Clean debris. Check for damage/replace.
	Internal damage or failure of rotator	Inspect/clean/repair
	System interlock	Check EZ-Cal HELP messages for interlock
Turntable will rotate in one direction only	Rotate Valve (11) not energizing	Check wiring to valve
	Rotate valve (11) 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

Problem	Possible Cause	Remedy/Solution
Platform Rotate		
Platform will not rotate either direction	Platform Rotate joystick inoperative	Check joystick output using EZ-Cal. See 2D2 P6-2 for signal.
	Rotate Valve (20-1) not energizing	Check wiring to valve Check GP400 output using EZ-Cal. See 2E1 P5-1 (left) and P5-4 (right)
	Rotate valve (20-1) not shifting	Clean debris. Check for damage/replace.
	Internal damage or failure of rotator	Inspect, clean or repair
	Flow Compensator valve (22) not shifting	Clean debris. Check for damage/replace.
	System interlock	Check EZ-Cal HELP messages for interlock
Platform will rotate in one direction only	Rotate Valve (20-1) not energizing	Check wiring to valve
	Rotate valve (20-1) 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

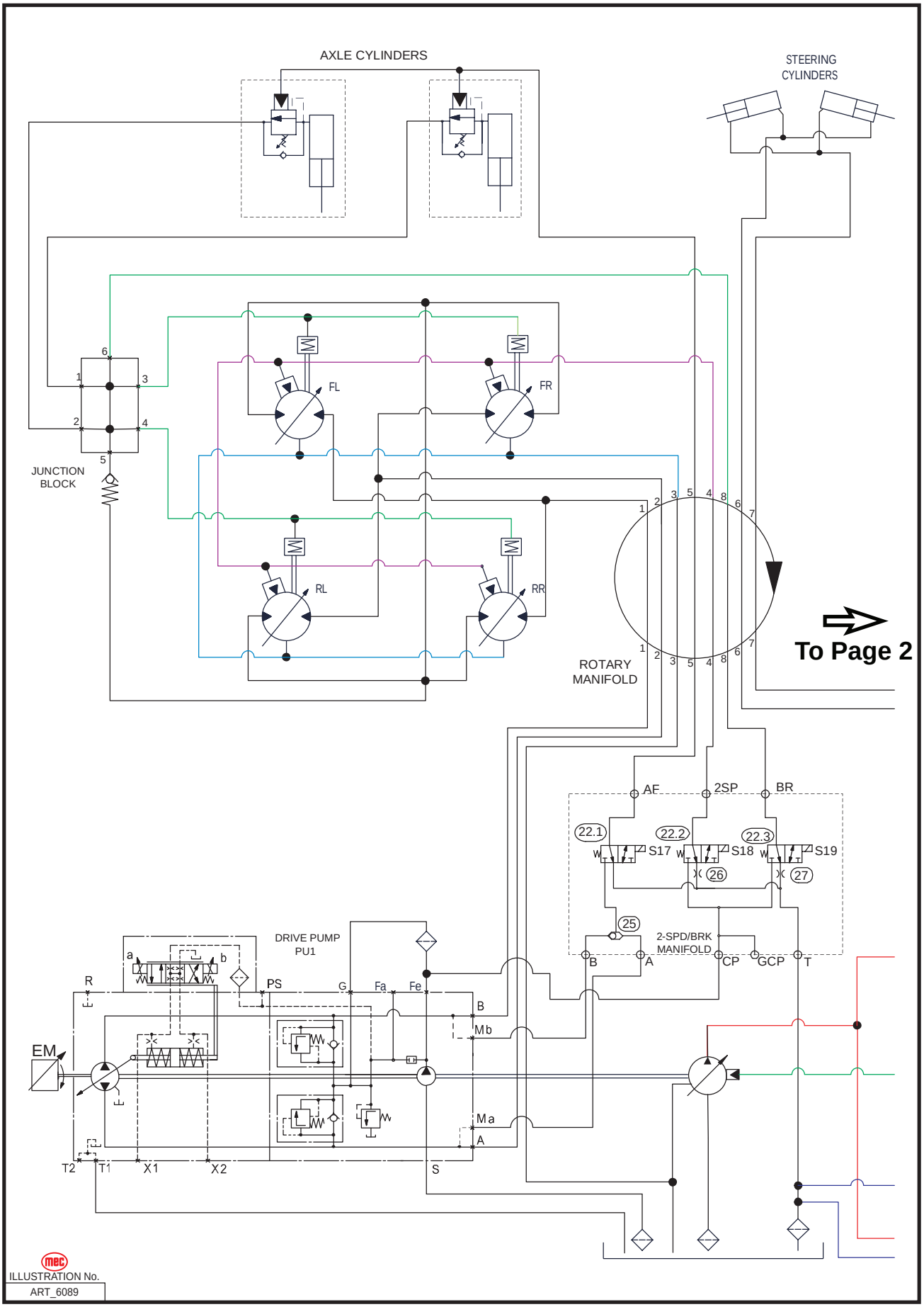
Problem	Possible Cause	Remedy/Solution
Drive		

No drive operation	Planetary hub bypass engaged	Check bypass plates located in the center of each planetary hub. Should be convex. Turn over if not.
	System interlock	Check EZ-Cal HELP messages for interlock
	Hydraulic oil incorrect for severe low temperatures	Use hydraulic tank warmer if equipped. Operate drive continuously until drive begins to operate.
No drive operation	Drive Valve (on drive pump) not energized	Check Drive output from VCCM Module VP5 and VP6. Check for power at valve coils located on top of the drive pump.
	Drive Valve (on drive pump) not shifting	Check drive valve for contamination
	Brakes not releasing (system under pressure when drive attempted)	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.
	Low pump stand-by pressure	Check at main manifold port GCP (see hydraulic Diagram). Adjust stand-by pressure to 300 PSI (21 bar).
	Incorrectly adjusted or worn hydraulic drive pump	See Section 25 - Hydraulics for pump adjustment. Inspect or replace pump.
No drive with platform elevated **CE rated models	Unit out of level	Lower boom and operate on more level surfaces.
	FWD MIN, REV MIN setting incorrect	Reset drive speeds using EZ-Cal
	Hydraulic oil incorrect for severe low temperatures	Use hydraulic tank warmer if equipped. Operate drive continuously until drive begins to operate.
	Low pump stand-by pressure	Check at main manifold port GCP (see hydraulic Diagram). Adjust stand-by pressure to 300 PSI (21 bar).
	System interlock	Check EZ-Cal HELP messages for interlock
	Axles not parallel	Reposition machine on flat ground
Slow drive with platform in stowed position and boom retracted	Slow speed enabled	Check speed switch in platform box. Check 2-speed valve located on the main manifold (see hydraulic diagram).
	Hydraulic oil incorrect for severe low temperatures	Use hydraulic tank warmer if equipped. Operate drive continuously until drive begins to operate.
	Boom Retract proximity switch failure	Check for power ground & signal output to Proximity Switch located inside the rear of boom. Also check EZ-Cal 2C1, P14-10 for input.
	Low pump stand-by pressure	Check at main manifold port GCP (see hydraulic Diagram). Adjust stand-by pressure to 300 PSI (21 bar).
	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 grade-ability or drive performance	High Speed enabled	Check Speed Switch
	Wheel motor not functioning correctly	Inspect wheel motors for excessive bypass or shift not working properly
	Hydraulic oil incorrect for severe low temperatures	Use hydraulic tank warmer if equipped. Operate drive continuously until drive begins to operate.
	Planetary hub bypass engaged	Check bypass plates located in the center of each planetary hub. Should be convex. Turn over if not.
	Low pump stand-by pressure	Check at Brake/Axle manifold, should be 300psi (21 bar). Adjust stand-by pressure to 300 PSI (21 bar).
	Incorrectly adjusted or worn hydraulic drive pump	See Section 25 - Hydraulics 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 VCCM Module	Check output from VCCM VP5 and VP6
	Drive joystick output failure	Check drive joystick output from GP400 (see 2d2, P10-1)

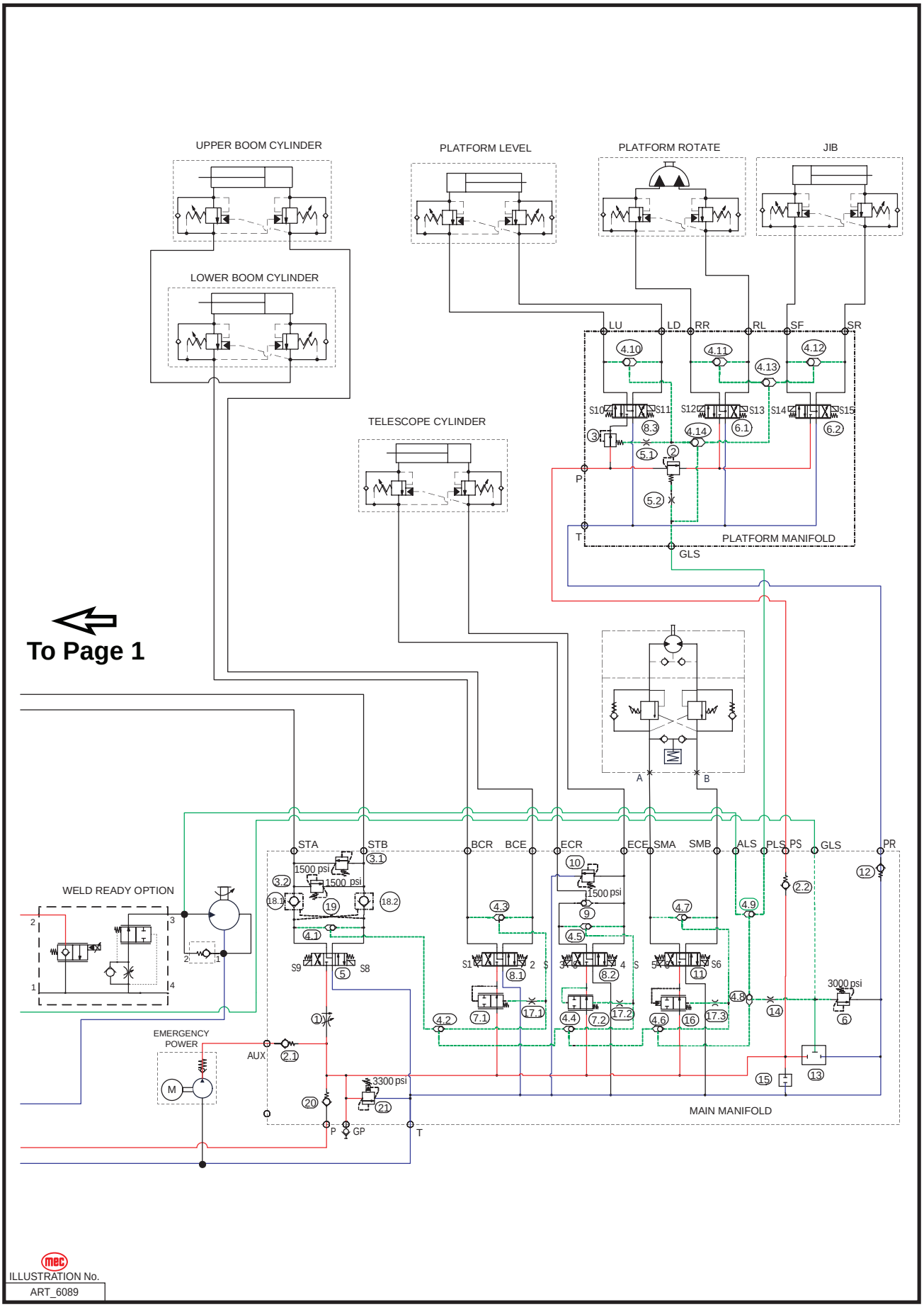
No High Speed	Speed selector switch inoperative	Check continuity through Speed Select switch with wires disconnected
	2-speed valve SV9 not functioning	Check for 12 volts and ground to valve. Check for faulty valve spool. Check switch position output from GP400 (See EZ-Cal ID# 2E1, P5-9).
	Boom Retract proximity switch failure	Check for power ground & signal output to Proximity Switch located inside the rear of boom. Also check EZ-Cal 2C1, P14-10 for input

Problem	Possible Cause	Remedy/Solution
Steer		
No steer in either direction	Joystick rocker switch inoperative	Check continuity through micro-switch inside joystick handle using wires outside the handle. Check output (see EZ-Cal 2C2, P10-7 and P7-8).
	Steering valve 5 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). Inspect/replace steering valve.
	Hoses connected incorrectly	See Section 25 - Hydraulics for correct connection.
	Steer cross-port relief valve(s) 3-1 and 3-2 set too low	Set steer relief valves to 1500 PSI (103 bar). See hydraulic diagram for relief valves location.
	System interlock	Check EZ-Cal HELP messages for interlock
Steer in one direction only	Joystick rocker switch inoperative	Check continuity through micro-switch inside joystick handle using wires outside the handle. Check output (see EZ-Cal 2C2, P10-7 and P7-8).
	Steering valve 5 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). Inspect/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	One or both steering cylinder internal seal failure	Check/replace steering cylinder seals.
	Steer cross-port relief valve(s) 3-1 and 3-2 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.

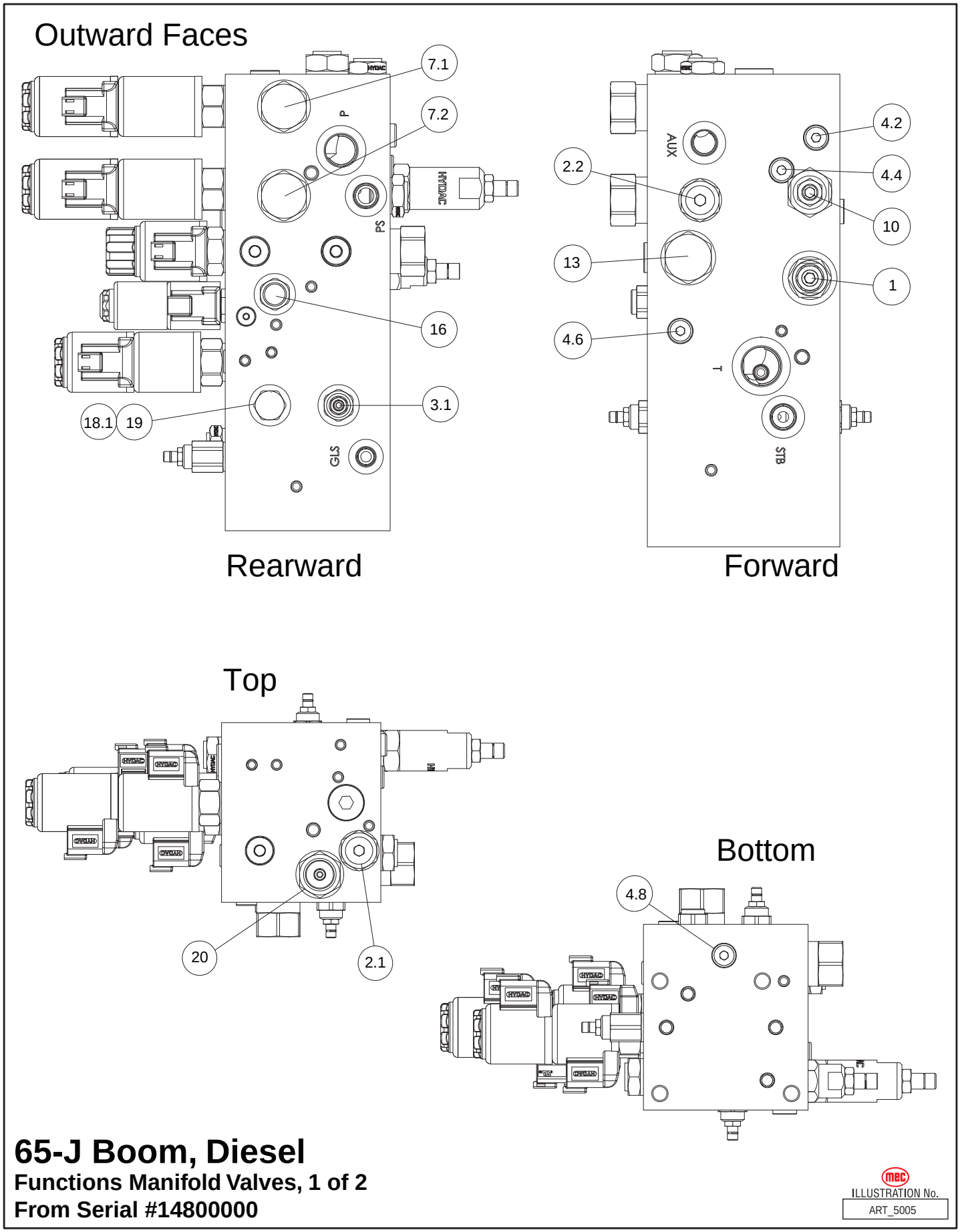
Hydraulic Schematic, Part 1



Hydraulic Schematic, Part 2



Primary Functions Manifold, Part 1



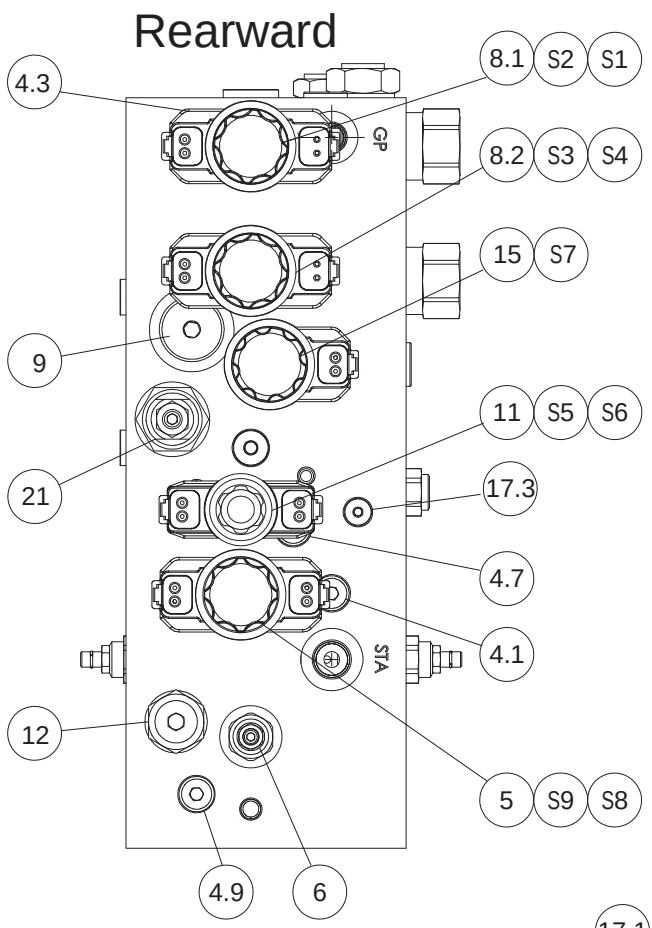
65-J Boom, Diesel

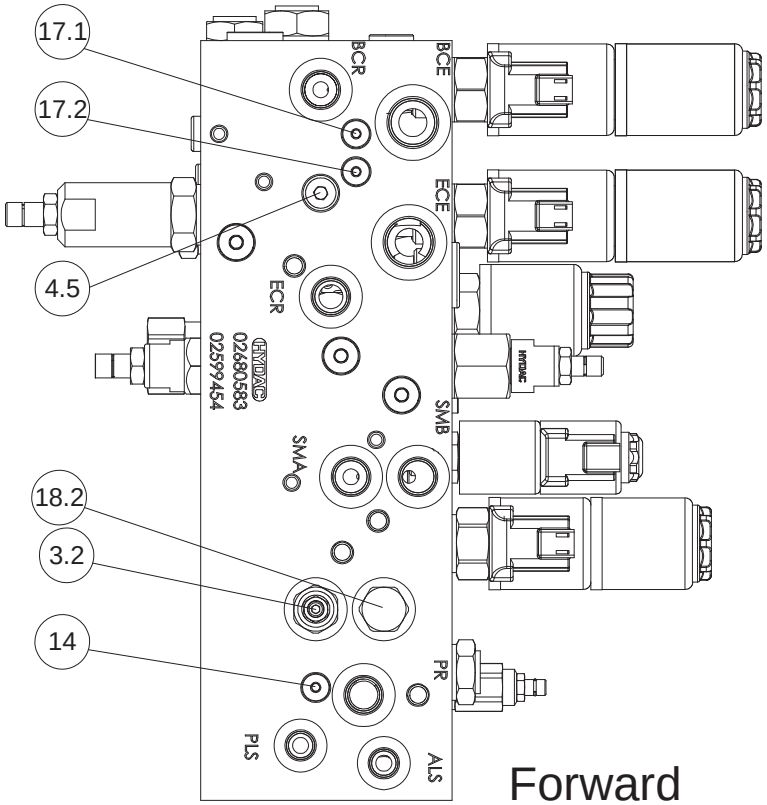
Functions Manifold Valves, 1 of 2

From Serial #14800000

ILLUSTRATION No.
ART_5005

Primary Functions Manifold Mk 1, Part 2





1	PRIORITY VALVE, STEER
2.1	CHECK VALVE, AUX PUMP
3.1 – 3.2	CROSS PORT RELIEF VALVES, STEER
4.1 – 4.9	SHUTTLE VALVE, LOAD SENSE
5	VALVE, 3-POS, 4 WAY, STEER
6	RELIEF VALVE, MAIN
7.1	FLOW SHARE VALVE
7.2	FLOW SHARE VALVE
8.1	3-POS, 4 WAY VALVE, BOOM UP/DOWN
8.2	3-POS, 4 WAY VALVE, BOOM EXT/RET
9	SHUTTLE VALVE, EXTEND REGENERATE
10	RELIEF VALVE, BOOM EXTEND
11	VALVE, 3-POS, 4-WAY, SWING
12	CHECK VALVE, PLATFORM RETURN
13	FLOW COMPENSATOR VALVE
14	ORIFICE, 0.5MM, LOAD SENSE
15	DUMP VALVE, MAIN
16	FLOW SHARE VALVE
17.7 – 17.3	ORIFICE, 0.5MM FLOW SHARE (¼-20 UNC)
18.1 – 18.2	CHECK VALVE, PILOT OPERATED, STEER
19	PILOT PISTON, STEER P/O CHECKS
20	CHECK VALVE, MAIN PUMP INLET
21	RELIEF VALVE, MAIN
S1 – S9	VALVE COILS 12 VOLT

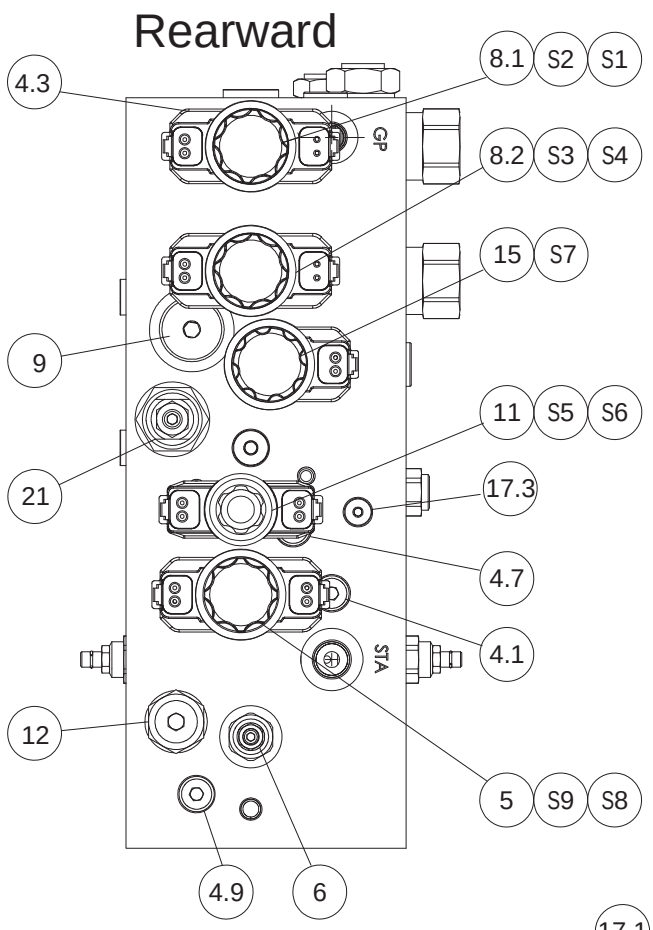
65-J Boom, Diesel

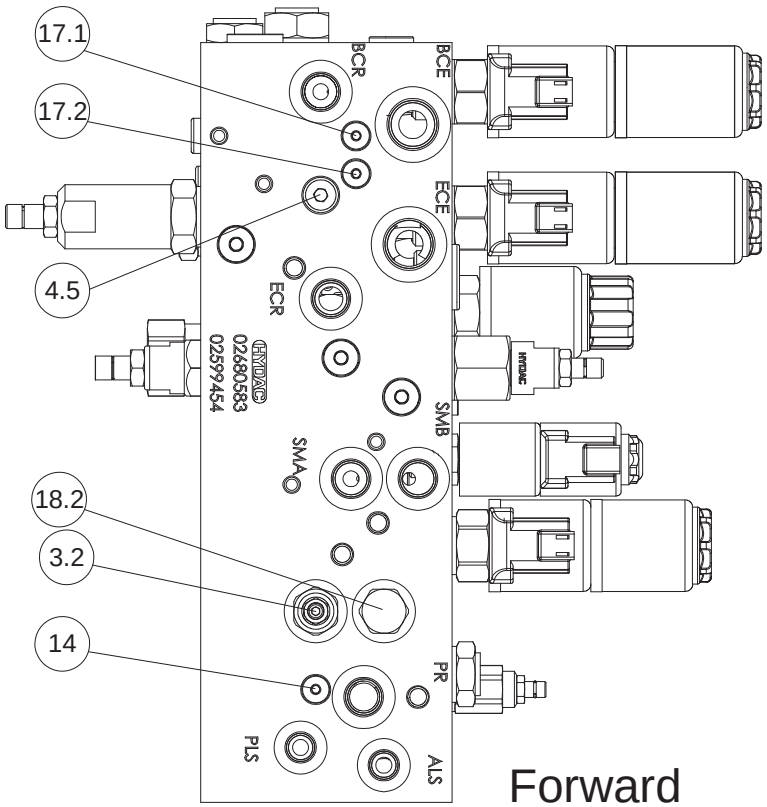
Functions Manifold Valves, 2 of 2

From Serial #14800000

ILLUSTRATION No.
ART_5006

Primary Functions Manifold Mk 2, Part 2





1	PRIORITY VALVE, STEER
2.1	CHECK VALVE, AUX PUMP
3.1 – 3.2	CROSS PORT RELIEF VALVES, STEER
4.1 – 4.9	SHUTTLE VALVE, LOAD SENSE
5	VALVE, 3-POS, 4 WAY, STEER
6	RELIEF VALVE, MAIN
7.1	FLOW SHARE VALVE
7.2	FLOW SHARE VALVE
8.1	3-POS, 4 WAY VALVE, BOOM UP/DOWN
8.2	3-POS, 4 WAY VALVE, BOOM EXT/RET
9	SHUTTLE VALVE, EXTEND REGENERATE
10	RELIEF VALVE, BOOM EXTEND
11	VALVE, 3-POS, 4-WAY, SWING
12	CHECK VALVE, PLATFORM RETURN
13	CAVITY PLUG
14	ORIFICE, 0.5MM, LOAD SENSE
15	CAVITY PLUG
16	FLOW SHARE VALVE
17.7 – 17.3	ORIFICE, 0.5MM FLOW SHARE (¼-20 UNC)
18.1 – 18.2	CHECK VALVE, PILOT OPERATED, STEER
19	PILOT PISTON, STEER P/O CHECKS
20	CHECK VALVE, MAIN PUMP INLET
21	RELIEF VALVE, MAIN
S1 – S9	VALVE COILS 12 VOLT

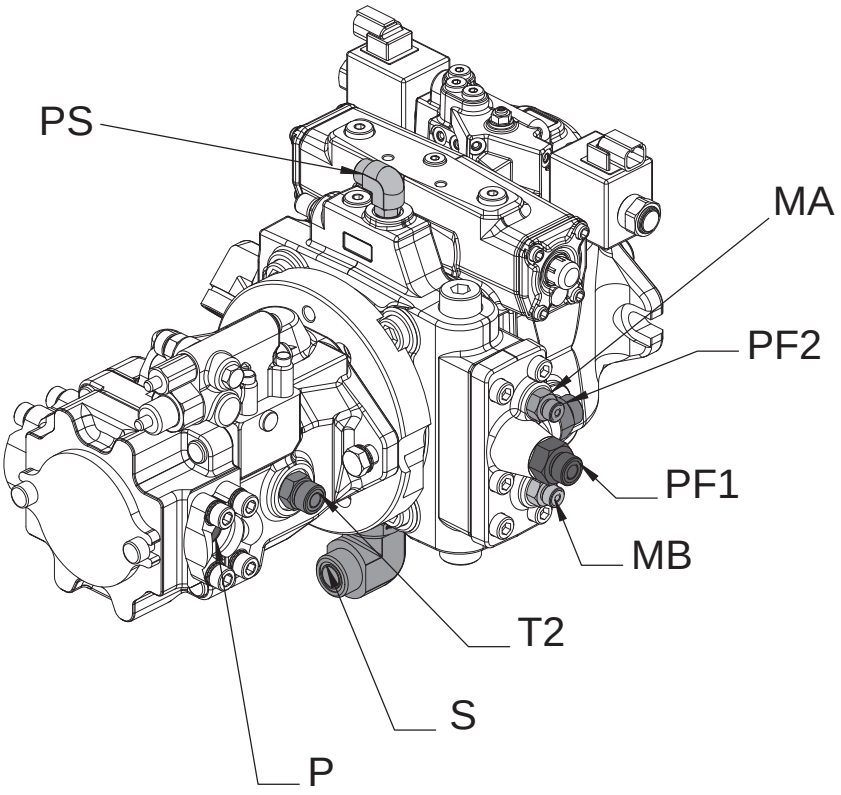
65-J Boom, Diesel

Functions Manifold Valves, 2 of 2

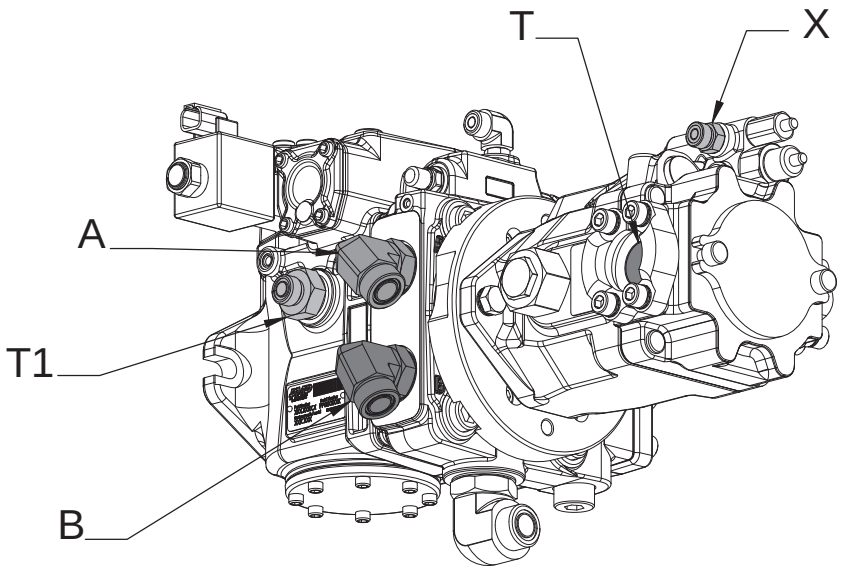
From Serial #14800000

ILLUSTRATION No.
ART_5006

Hydraulic Pump Ports, PMP Ports



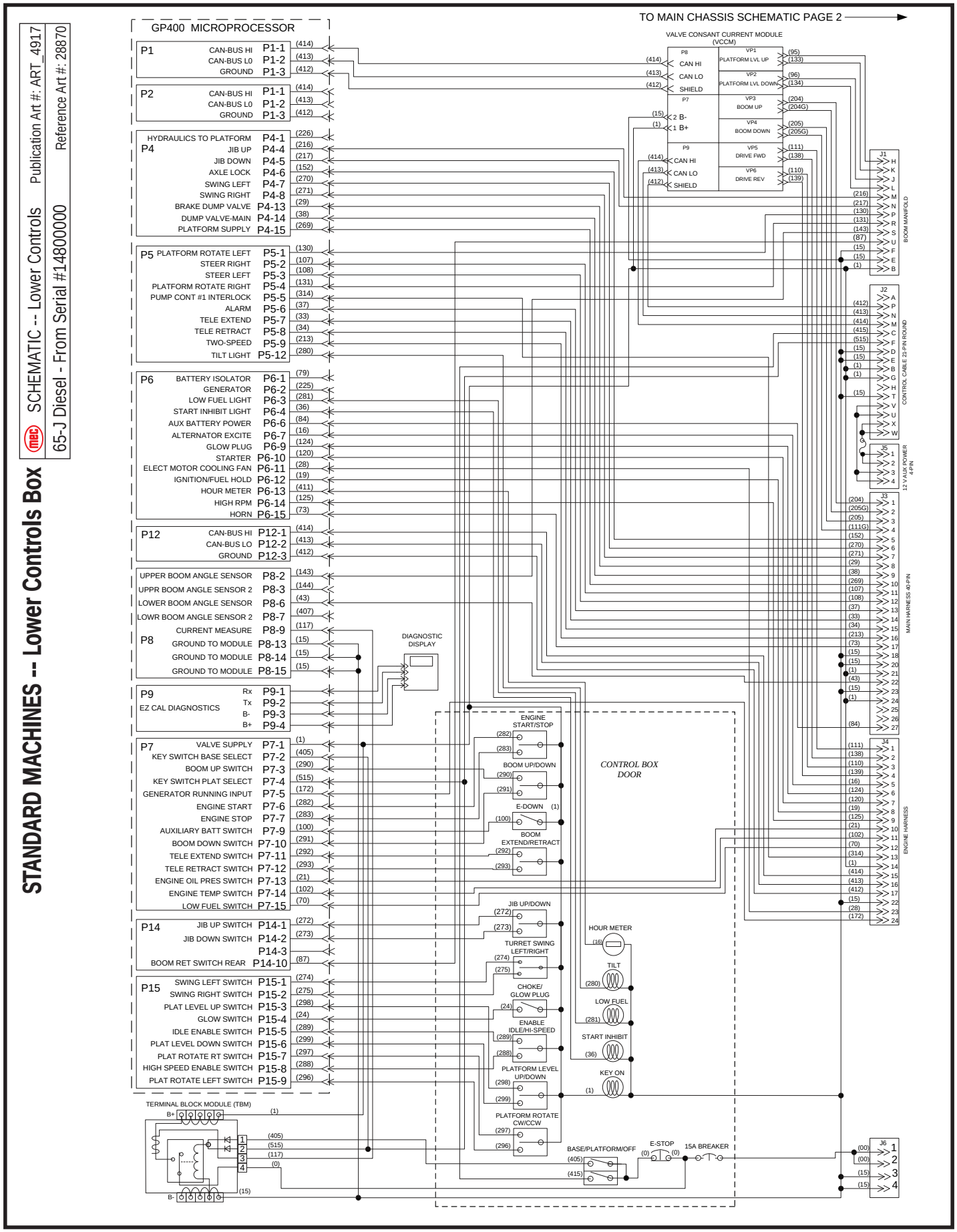
Port	Connection
A	Rotary Manifold
B	Rotary Manifold
T1	Case Drain
PS	2-Spd/Brk Manifold - CP
S	Hydraulic Tank - Suction
MA	2-Spd/Brk Manifold - A
MB	2-Spd/Brk Manifold - B
PF1	Remote Filter - Outlet
PF2	Remote Filter - Return



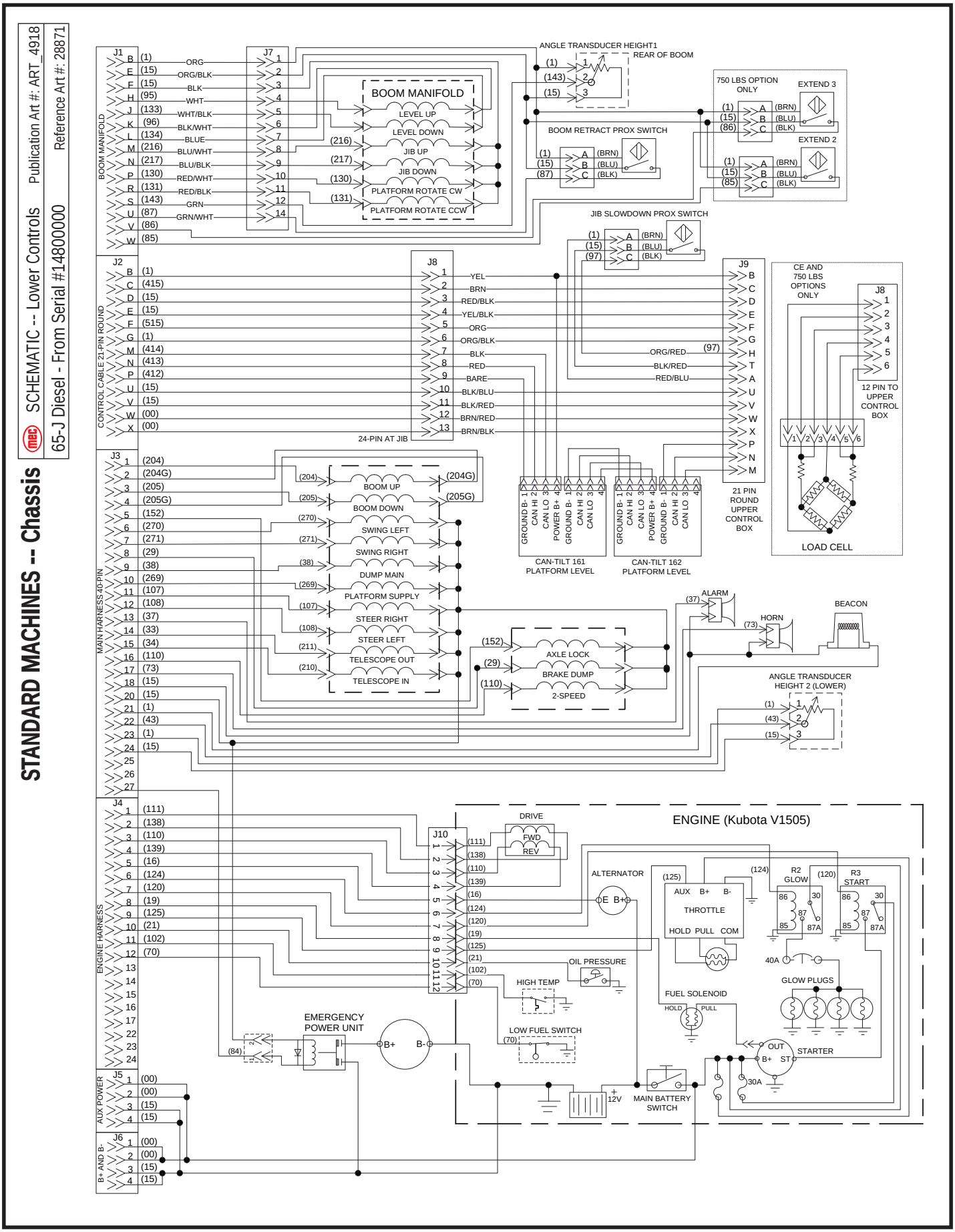
Port	Connection
T	Rotary Manifold
P	Rotary Manifold
T1	Case Drain
PS	2-Spd/Brk Manifold - CP

ILLUSTRATION No. Art_5780 60-J Hydraulic Pump Ports, PMP Pump

Electric Schematic, Lower Control Box, Standard Machines



Electric Schematic, Chassis, Standard Machines



Electric Schematic, Upper Controls Box, All Machines