



Section 3

OVERLOAD SENSING SYSTEM

CONTENTS	PAGE
General Description	3-2
Troubleshooting	3-4
GP102 - EZcal Help Messages	3-4
GP102 LED Flash Codes	3-7
Calibration	3-8
Calibration Troubleshooting	3-11
Failure Messages	3-11
Information Messages	3-16

FIGURES	PAGE
Figure 3-1: EZcal Connection	3-2



GENERAL DESCRIPTION

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



WARNING

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

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

Figure 3-1: EZcal Connection

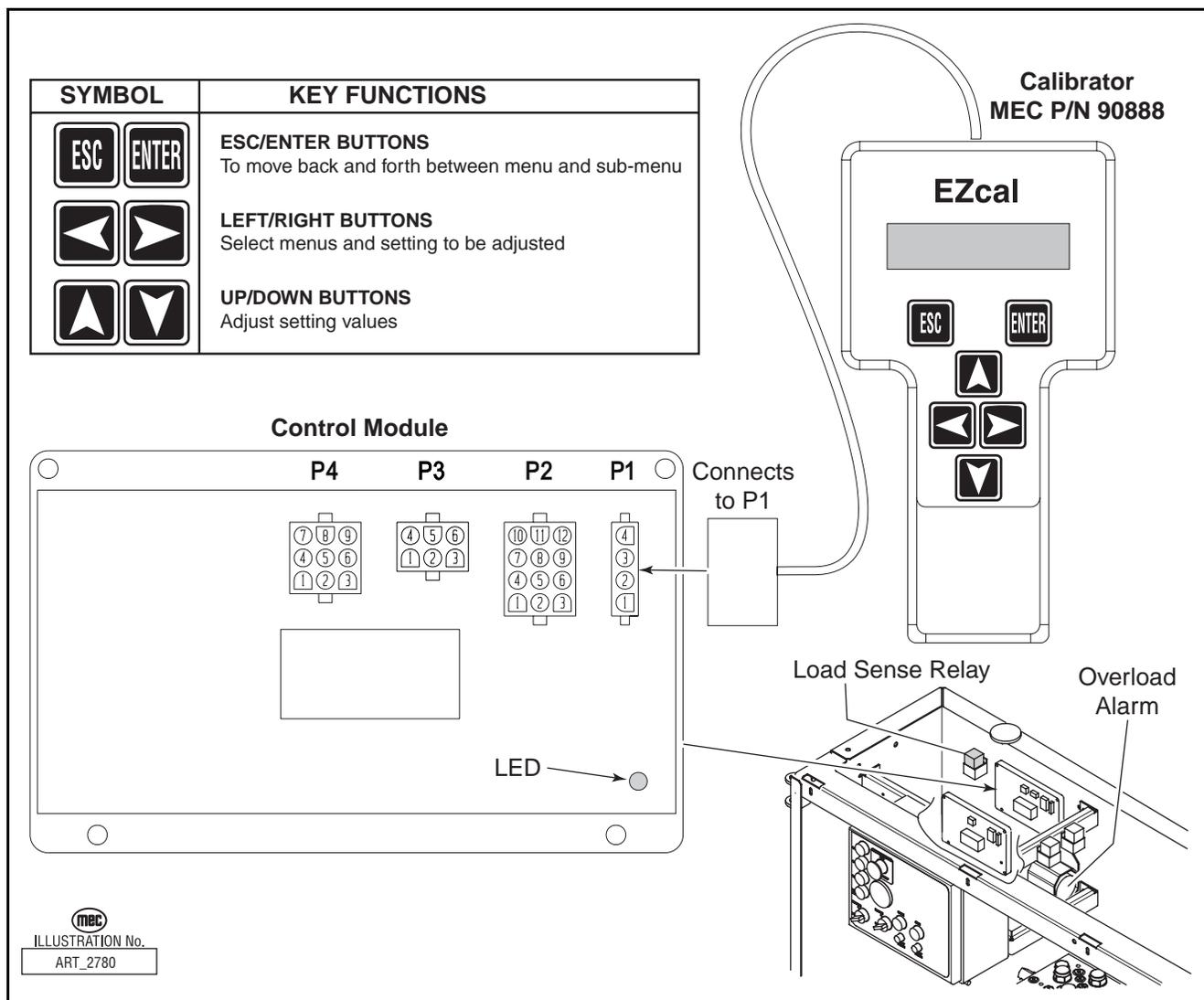


Table 3-1: Electrical Connections

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

TROUBLESHOOTING

GP102 - EZCAL HELP MESSAGES

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

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

The following messages may be displayed on the Ezcal display.

EVERYTHING OK

The **GP102** detects no problems.

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

ARMGUARD ACTIVE!

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

B+ SUPPLY TOO LOW

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

DRIVE/LIFT SELECT INPUTS FAULTY!

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

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

ELEVATION SWITCH SHIFTED?

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

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

ELEVATION SWITCH STUCK?

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

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

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

FACTORY OVERRIDE

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

FAULT: BAD TILT SENSOR

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

HEIGHT NOT CALIBRATED

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

IDLE TIMEOUT ACTIVE!

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

INVALID HEIGHT - CHECK SENSORS

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

INVALID LOAD - CHECK SENSORS

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

LOAD NOT CALIBRATED

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

NO LAST CALDATE!

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

P3-4 SHORT TO 0V?

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

P3-4 SHORT TO SUPPLY?

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

TESTING HWFS

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

TOO HIGH - DRIVE PREVENTED

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

TOO HIGH - LIFT UP PREVENTED

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

UP/DOWN SELECT INPUTS ACTIVE TOGETHER!

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

VEHICLE OVERLOADED

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

VEHICLE TILTED

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

WAITING FOR B+ ON P2-12

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

WAITING FOR NEUTRAL

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

GP102 LED FLASH CODES

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

LED ON STEADY

This indicates no fault with the **GP102**

LED OFF ALWAYS

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

LED FLASH CODE 1

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

LED FLASH CODE 2

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

LED FLASH CODE 3

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

LED FLASH CODE 4

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

LED FLASH CODE 5

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

LED FLASH CODE 6

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

LED FLASH CODE 7

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

LED FLASH CODE 8

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

LED FLASH CODE 9

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

LED FLASH CODE 10

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

LED FLASH CODE 15

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

CALIBRATION

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

TILT SENSOR CALIBRATION

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

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

PLATFORM LOAD CALIBRATION

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

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

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

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

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

EZcal display reads HELP: PRESS ENTER

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

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

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

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

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



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

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

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

- Display reads TOTAL DATA #XX, then BUILDING TABLES, then CALDATE mm/dd/yy.
- o. Enter current date using Up, Down and Right Arrows.
- Display reads FINISHED.
- p. Disconnect **EZcal** from the load sense control module. The Platform Overload Sensing System is now calibrated.

HEIGHT CALIBRATION

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

- a. Drive machine to level ground, in area where it can reach full elevation.
- b. Turn selector switch to Base controls.
- c. Remove top cover off of lower control station box, and plug **EZcal** into connector P1 on load sense control module. **EZcal** display reads HELP: PRESS ENTER
- d. Press right arrow to ACCESS LEVEL 3, Press Enter.
 - Display reads CODE 0000
- e. Press Up and Right Arrow to enter code 1775, Press Enter.
 - Display reads ACCESS LEVEL 2.
- f. Press Right Arrow to SETUPS, Press Enter.
 - Display reads CHANGE DEFAULTS
- g. Press Right Arrow to HEIGHT SETUPS, Press Enter.
 - Display reads CALIBRATE HEIGHT
- h. Press Enter.
 - Display reads PLATFORM DOWN? Verify that platform is fully lowered.
- i. Press Enter.
 - Display reads PLEASE LIFT. Hold lower controls switch in the up position until machine is fully elevated, then release switch. Display reads PLEASE LOWER. Hold switch in down position until platform is in the fully lowered position. Release switch. Display reads FINISHED.

CALIBRATION TROUBLESHOOTING

FAILURE MESSAGES

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

F01:CHECK HWFS

This message is given if the startup tests have not completed.
Check HELP message for more information.

F02:NOT GROUND MODE

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

F03:NOT STOPPED

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

F04:TILTED

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

F05:BAD HEIGHT

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

F06:CHECK ELEV

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

F08:CHECK ELEV

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

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

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

F09:BAD HEIGHT

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

F10:BAD HEIGHT

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

F11:NOT UP

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

F12:TOO MANY

This message occurs if the DYNAMIC lift takes too long.

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

F13:LOW HEIGHT RANGE

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

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

F14:BAD HEIGHT

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

F15:CHECK ELEV

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

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

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

F16:LOW ELEV.OPEN

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

F17:HIGH ELEV.OPEN

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

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

F18:LOW ELEV.CLOSE

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

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

F19:HIGH ELEV.CLOSE

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

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

F20:HEIGHT<>0%

F21:HEIGHT<>0%

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

Check DIAGNOSTICS / SYSTEM to check the height.

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

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

F24:TOO MANY

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

F25:CHECK ELEV
F26:CHECK ELEV

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

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

F27:BAD HEIGHT

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

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

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

F30:BAD HEIGHTS

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

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

F31:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F32:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F33:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F34:REJECT CURVE

The DYNAMIC pressure curve is unacceptable.

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

Check the pressure sensor and lift cylinder hydraulics.

F40:REJECT DELTA

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

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

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

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

F42:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F43:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F44:LOW PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F45:HIGH PRESSURE

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

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

Check DIAGNOSTICS / SENSORS to check the pressure.

F46:CHECK ELEV

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

F47:CHECK ELEV

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

F48:BAD PRESSURE

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

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

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

INFORMATION MESSAGES

During calibration the following messages may be displayed:

BUILDING TABLES

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

CALDATE:

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

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

Press LEFT & RIGHT to select the flashing digits.

Press UP & DOWN to change the flashing digits.

Press ENTER when the entry is complete.

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

FINISHED

This message confirms that calibration is complete and successful.

GO DOWN MORE!

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

GO UP MORE!

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

LIFT EMPTY

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

LIFT LOADED

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

LIFTING

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

LOWER EMPTY

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

LOWER LOADED

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

LOWERING

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

MEASURING #

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

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

MUST GO DOWN!

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

MUST GO UP!

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

PLATFORM DOWN?

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

Press ENTER to confirm when the platform is fully lowered.

PLATFORM EMPTY?

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

Press ENTER to confirm when the platform is empty.

PLATFORM LOADED?

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

Press ENTER to confirm when the platform is loaded.

PLEASE LIFT ...

This message is prompting for the platform to be raised.

The UP switch should be closed.

PLEASE LOWER ...

This message is prompting for the platform to be lowered.

The DOWN switch should be closed.

PLEASE WAIT

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

REDO DYNAMIC:

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

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

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

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

REDO EMPTY:

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

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

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

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

REDO LOADED:

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

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

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

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

TOTAL DATA:

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

OUTRIGGER FUNCTION

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

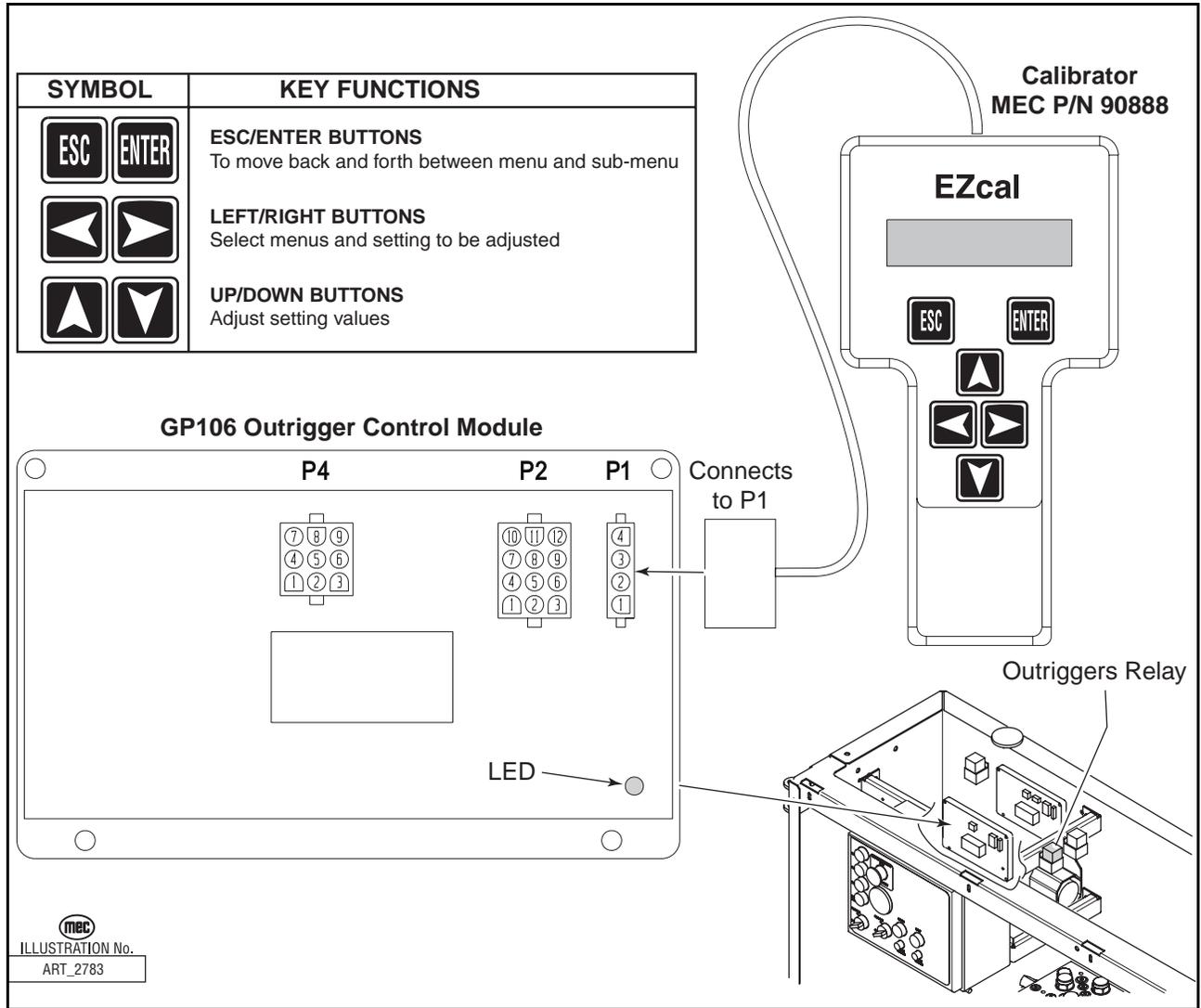
OPERATIONAL CHARACTERISTICS

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

OUTRIGGER CALIBRATION

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

Figure 4-20: Outrigger Calibration Setup



OUTRIGGER TILT SENSOR CALIBRATION

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

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

OUTRIGGER CALIBRATION IS NOW COMPLETE.

GP106 OUTRIGGER CONTROL MODULE TROUBLESHOOTING

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

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

The following messages might be displayed:

EVERYTHING OK

The **GP106** detects no problems.

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

B+ SUPPLY TOO LOW

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

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

CANNOT LEVEL: BAD TILT SENSOR

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

CHECK OUTRIGGERS SUPPLY (P4-9)

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

OUTRIGGERS MANUALLY CONTROLLED

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

OUTRIGGERS CANNOT BE MOVED

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

RELEASE OUTRIGGER DEMAND!

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

VEHICLE TILTED

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

OUTRIGGER WIRING FAULT

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

OUTRIGGER MODULE GP106 LED FLASH CODES

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

LED ON STEADY

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

LED OFF ALWAYS

This indicates no power to the **GP106**

LED FLASH CODE 1

Wiring Fault. Check connection to P2-2.

LED FLASH CODE 2

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

LED FLASH CODE 3

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

LED FLASH CODE 4

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

LED FLASH CODE 5

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

LED FLASH CODE 6

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

LED FLASH CODE 7

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

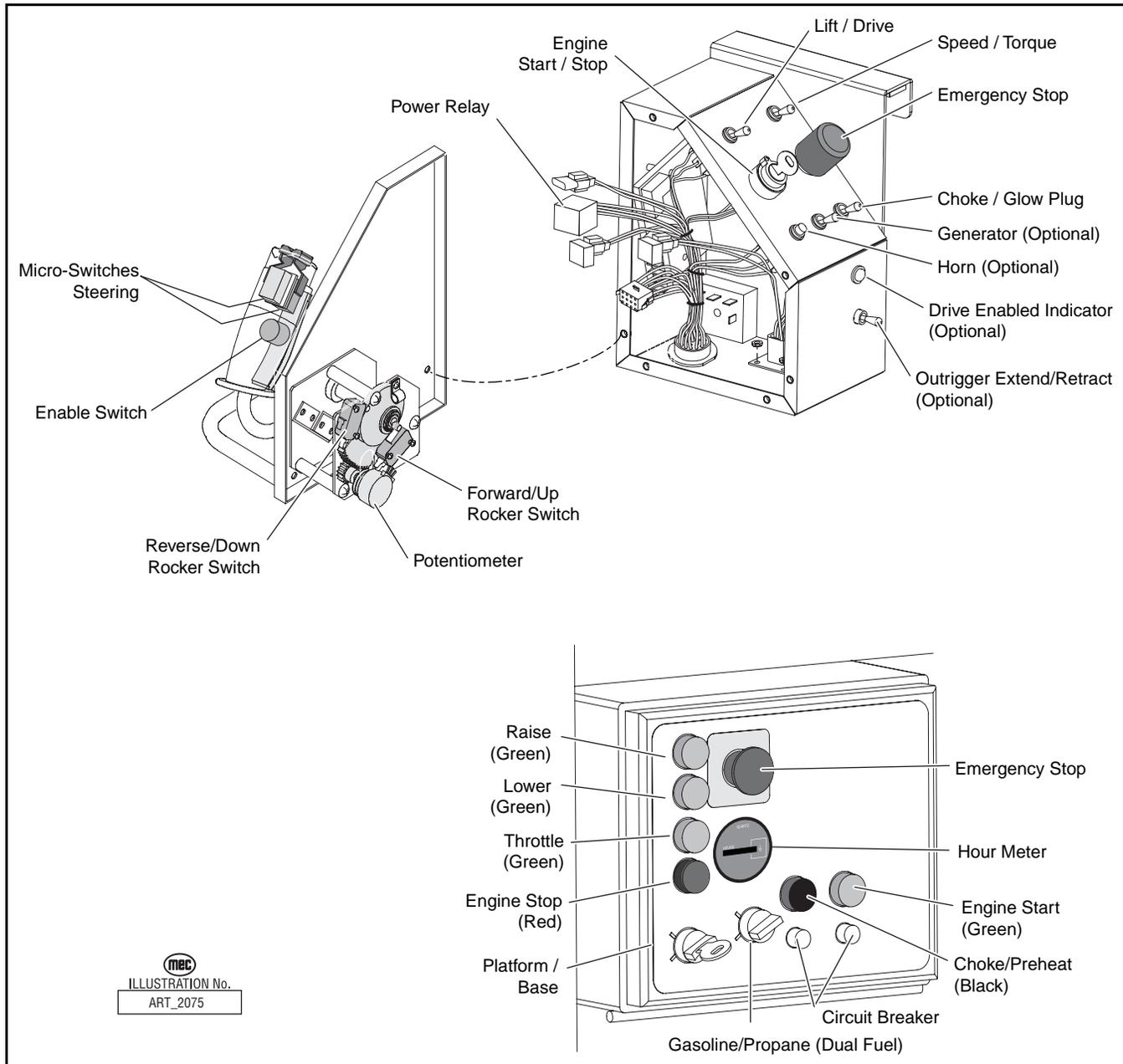
LED FLASH CODE 8

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

LED FLASH CODE 9

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

Figure 5-6: Controls and Switches



mec
ILLUSTRATION No.
ART_2075



Section 6

SCHEMATICS

CONTENTS	PAGE
Hydraulic Schematics	6-2
Electric Schematics	6-6

FIGURES	PAGE
Figure 6-1: Hydraulic Schematic	6-3
Figure 6-2: Hydraulic Manifold	6-4
Figure 6-3: Hydraulic Components	6-5
Figure 6-4: Main Wiring Harness	6-7
Figure 6-5: Circuit Board Schematic, Part 1	6-8
Figure 6-6: Circuit Board Schematic, Part 2	6-9
Figure 6-7: Upper Control Box Schematic	6-10
Figure 6-8: Upper Control Box with Outrigger Controls	6-11
Figure 6-9: Lower Control Box	6-12
Figure 6-10: Engine Schematic	6-13
Figure 6-11: Outriggers Schematic (option)	6-14
Figure 6-12: Generator Schematic (option)	6-15



HYDRAULIC SCHEMATICS

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

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

Figure 6-1: Hydraulic Schematic

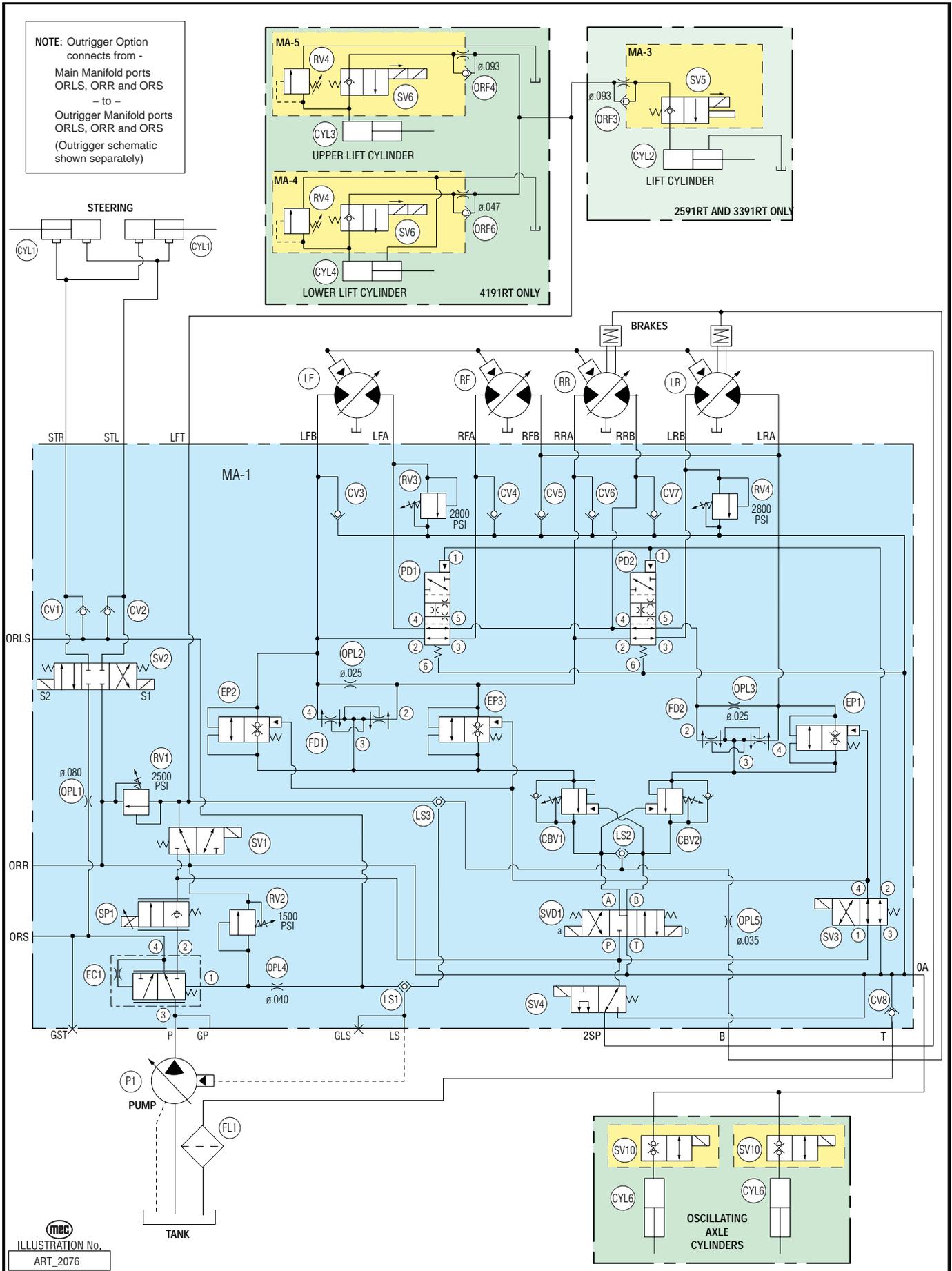


Figure 6-2: Hydraulic Manifold

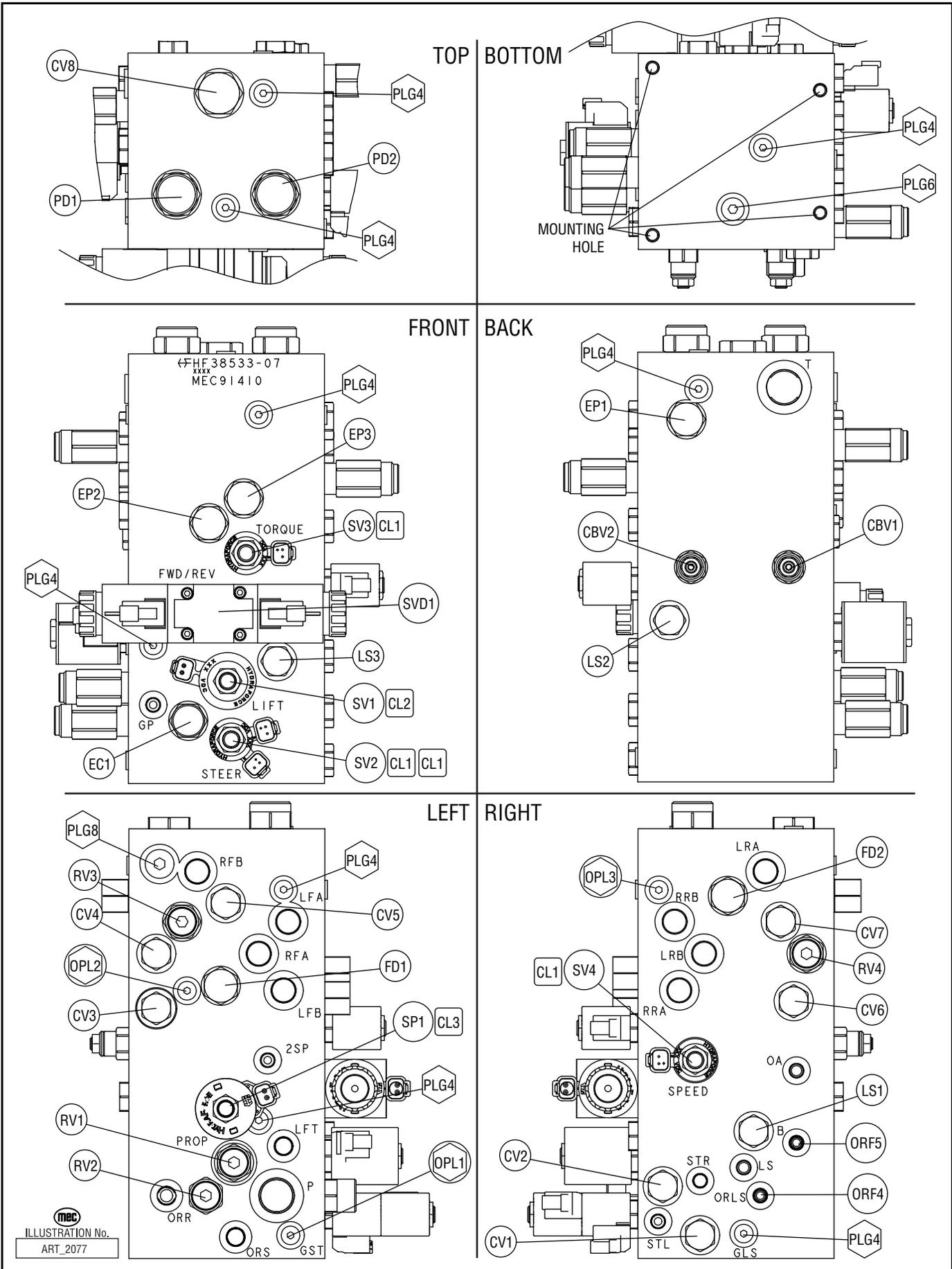
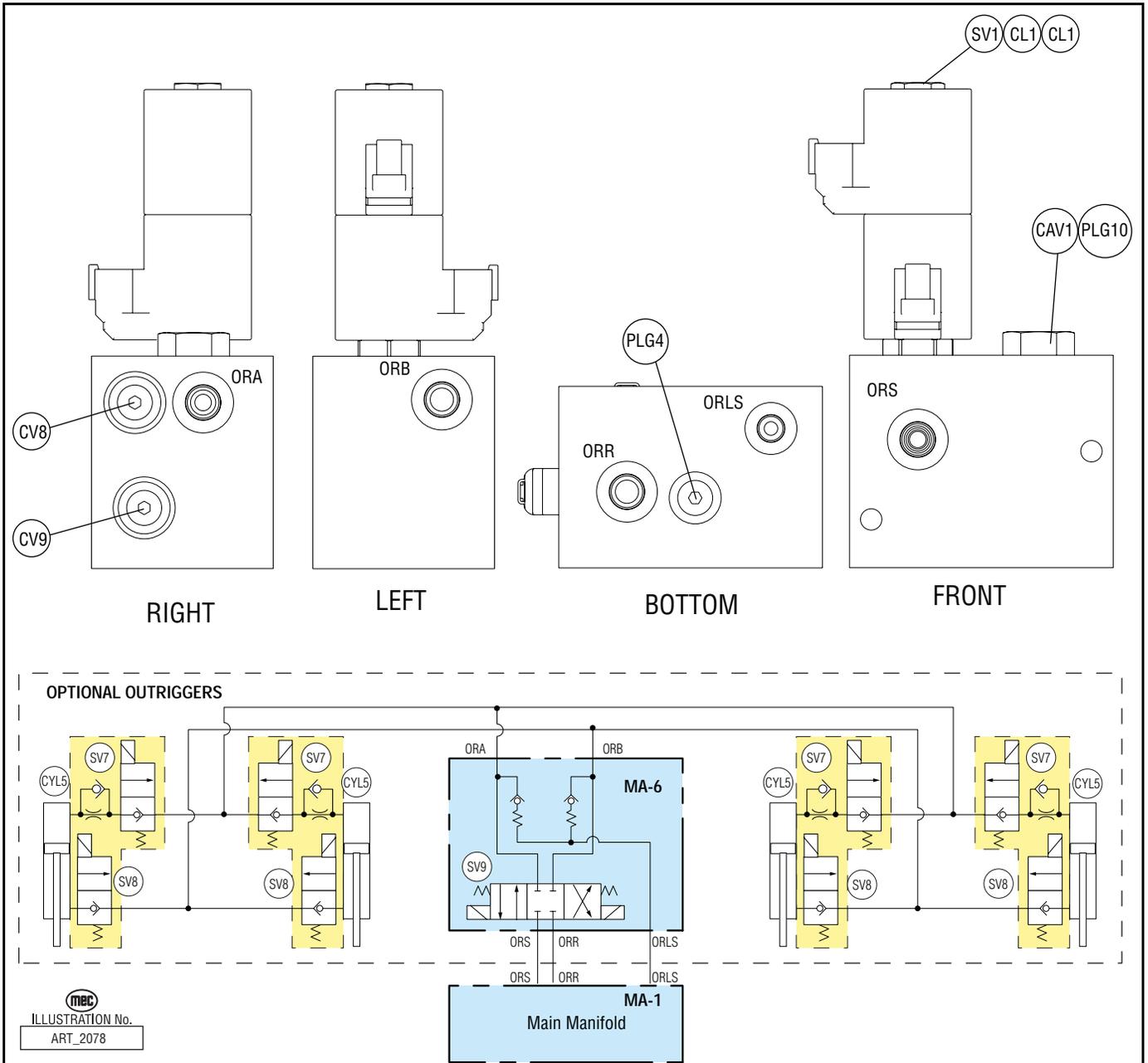


Figure 6-3: Hydraulic Components



ELECTRIC SCHEMATICS

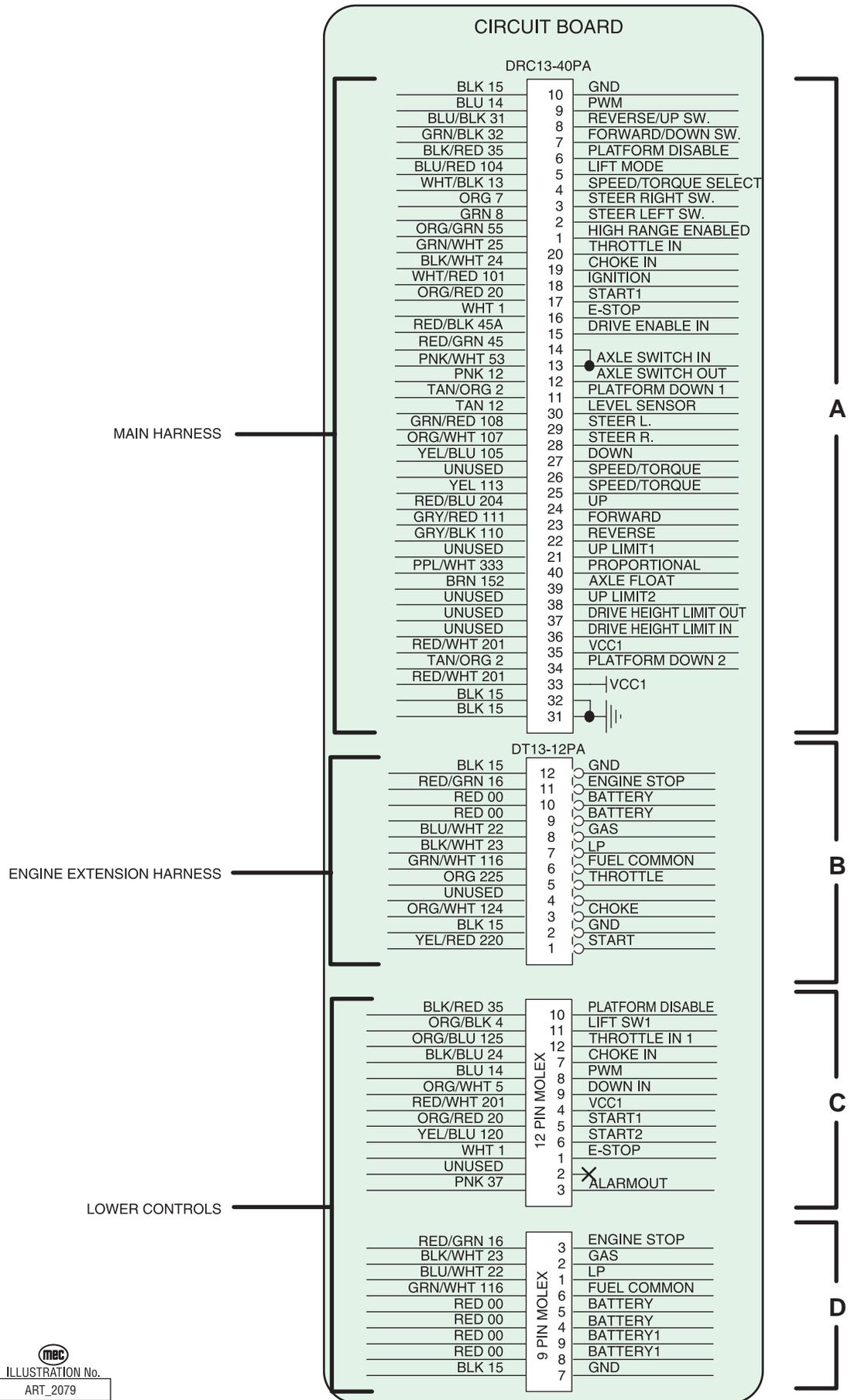



 ILLUSTRATION No.
 ART_2079

Figure 6-4: Main Wiring Harness

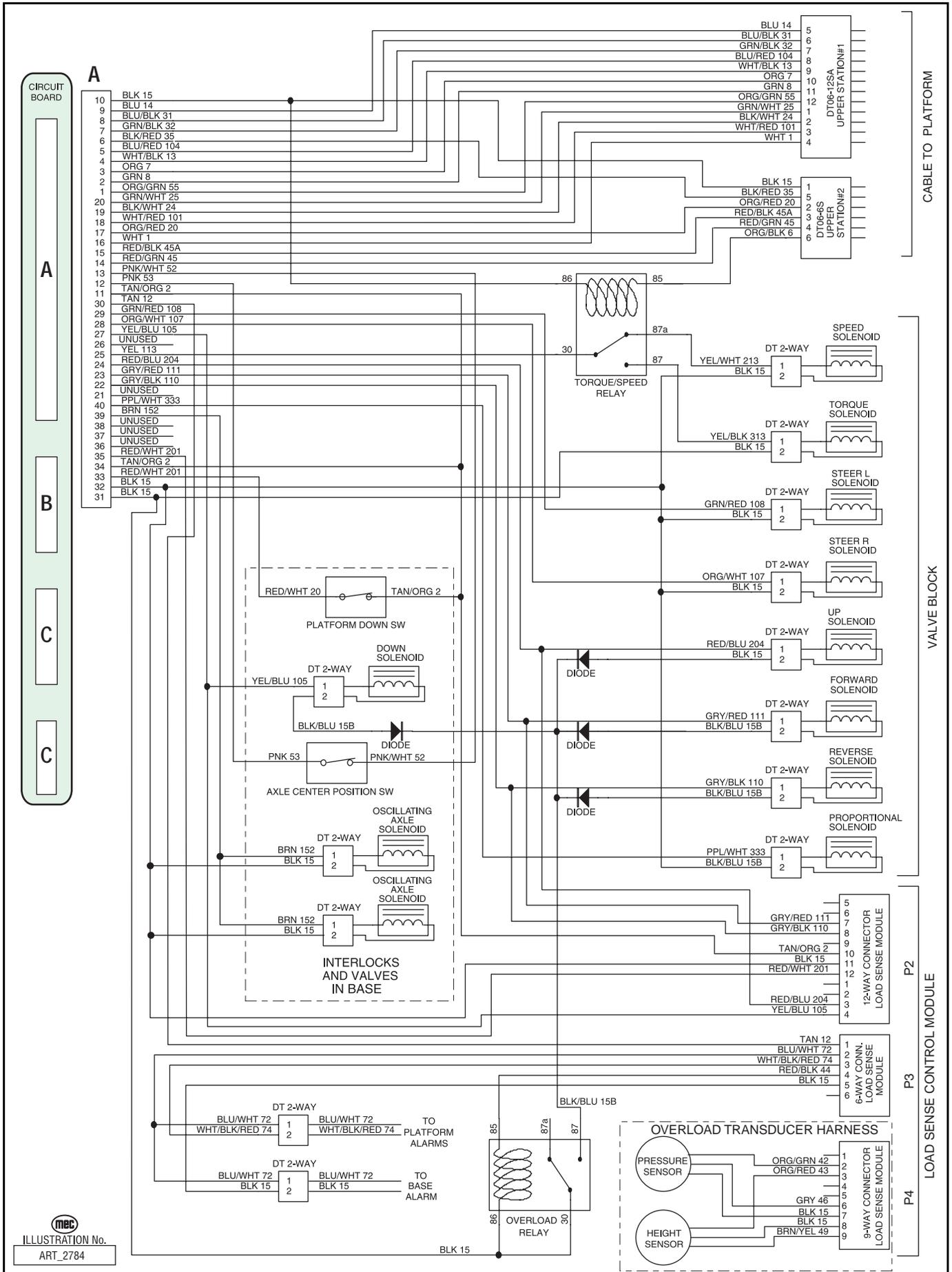


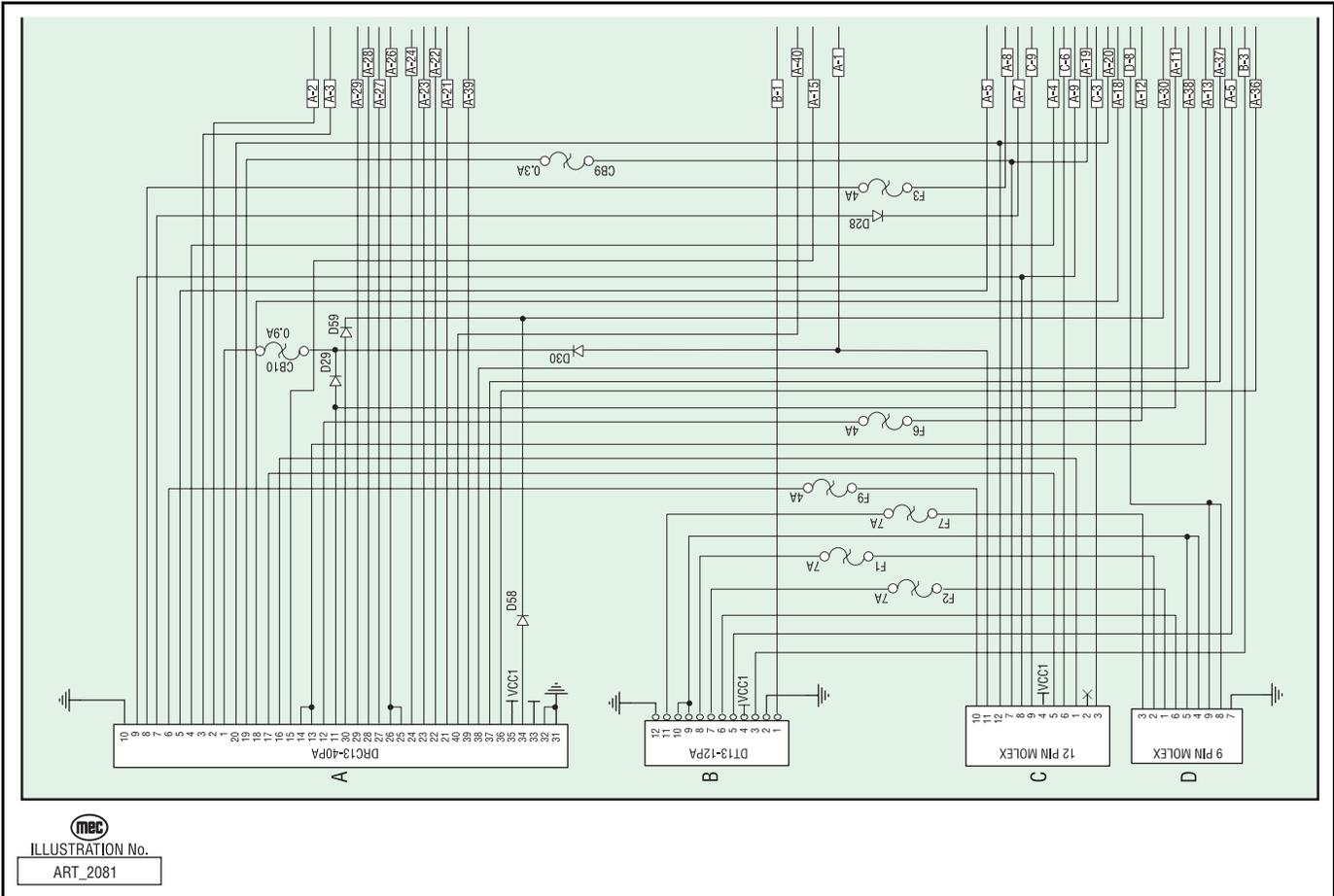
ILLUSTRATION No. ART_2784



CIRCUIT BOARD SCHEMATIC

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

Figure 6-5: Circuit Board Schematic, Part 1



mec
ILLUSTRATION No.
ART_2081

Figure 6-6: Circuit Board Schematic, Part 2

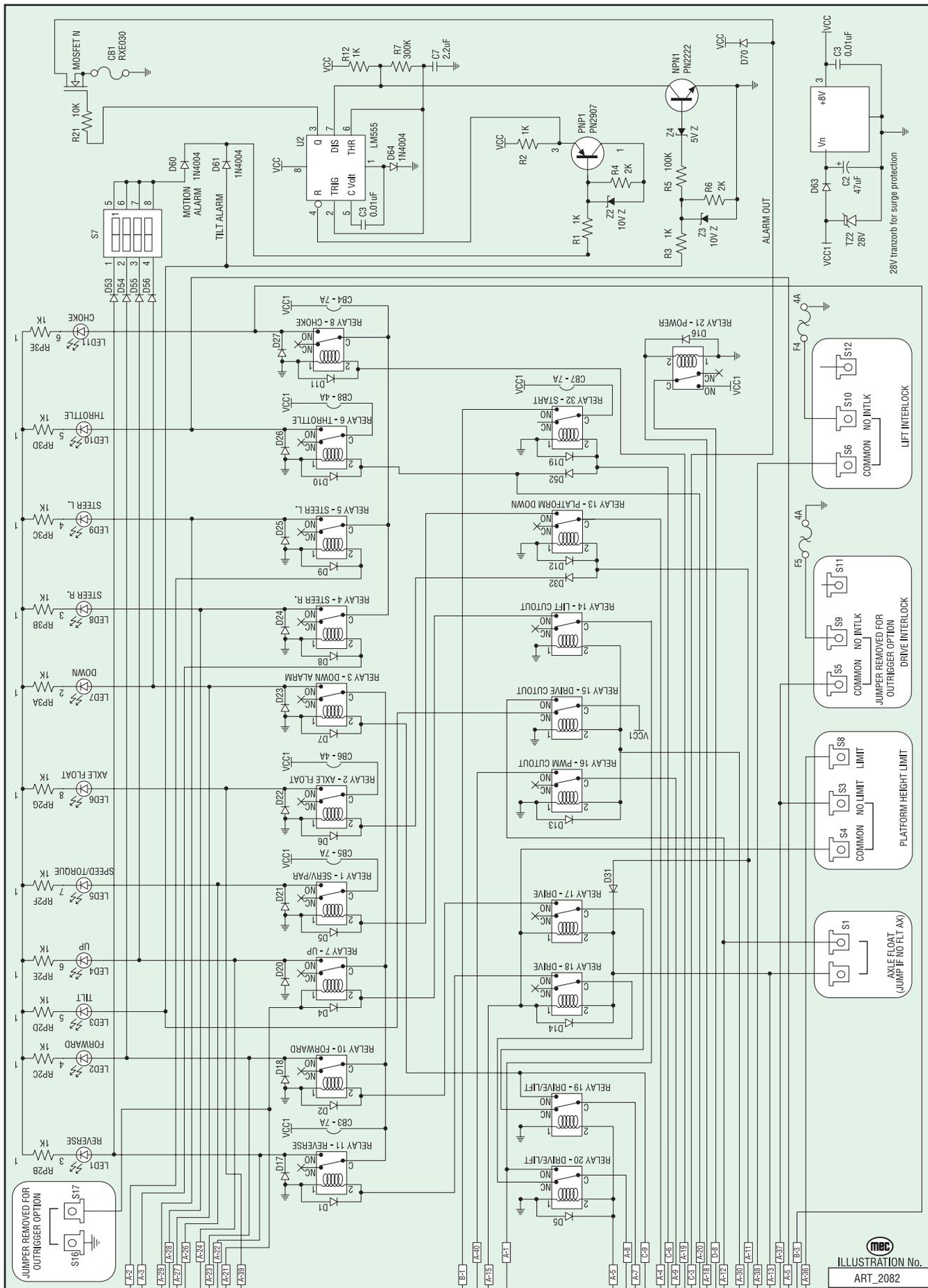
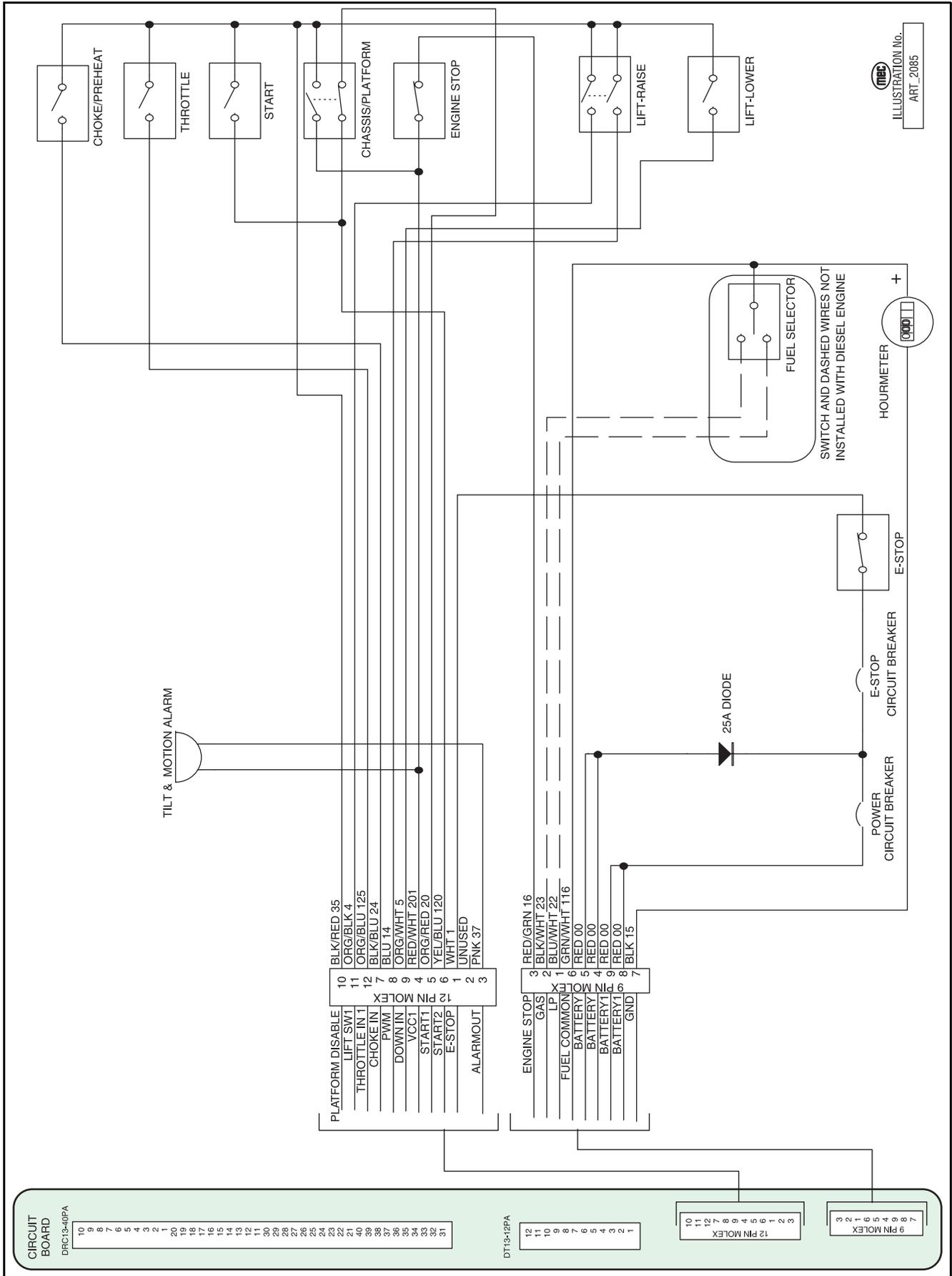


ILLUSTRATION No.
ART_2082

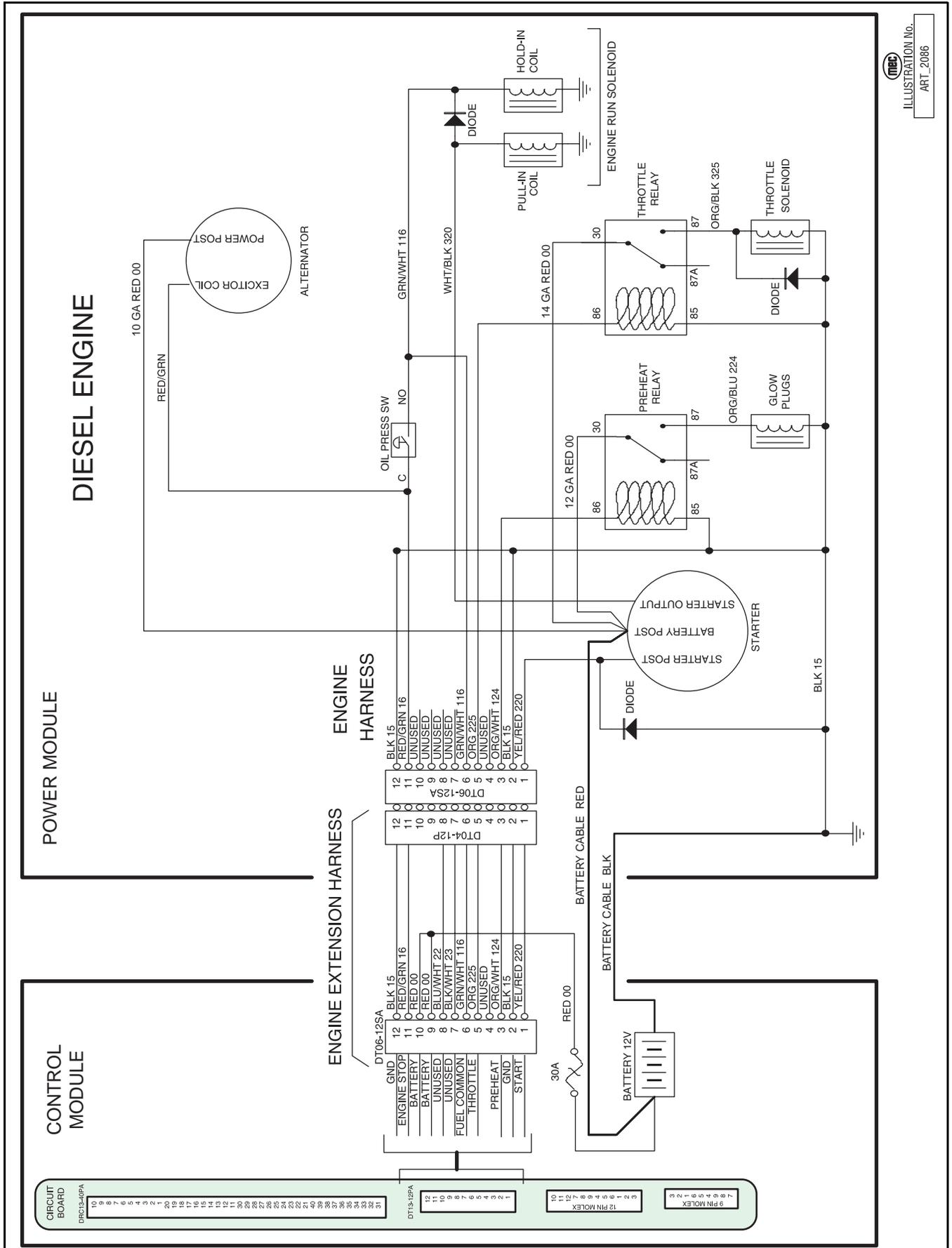
Figure 6-9: Lower Control Box



MEC
ILLUSTRATION No.
ART_2085



Figure 6-10: Engine Schematic



MEC
ILLUSTRATION No.
ART_2086



