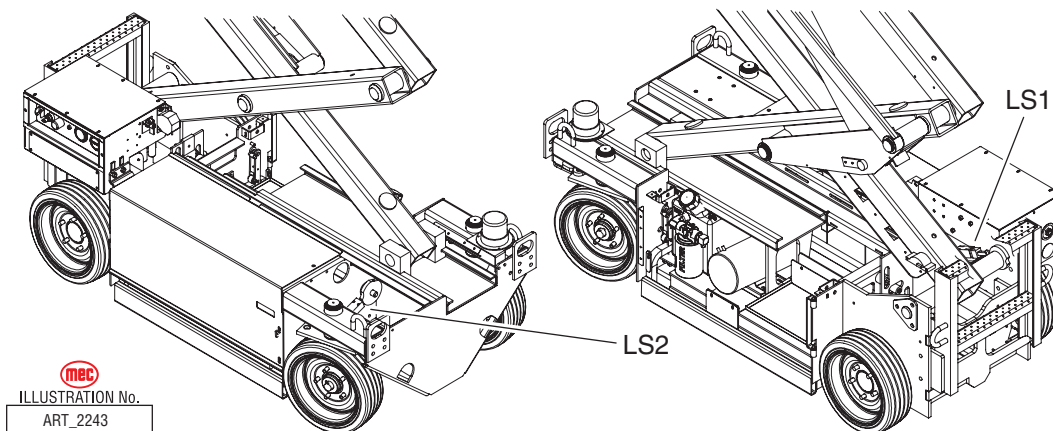
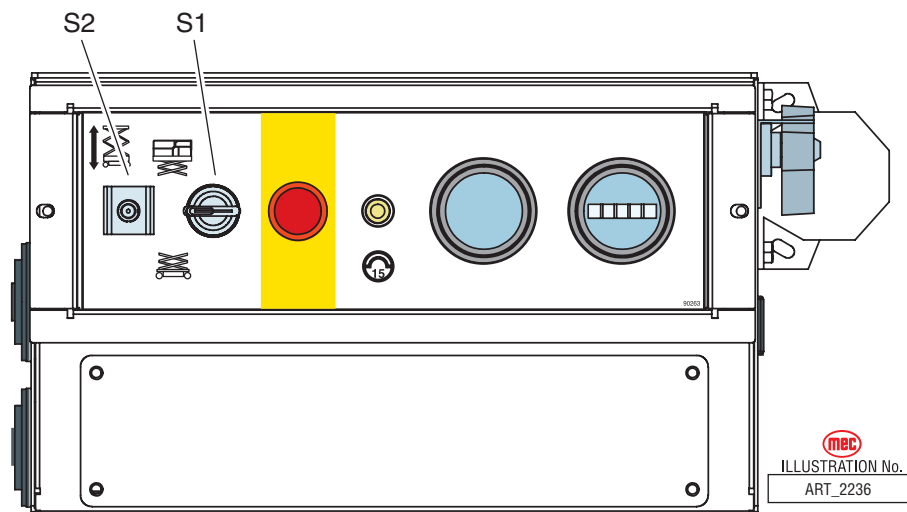
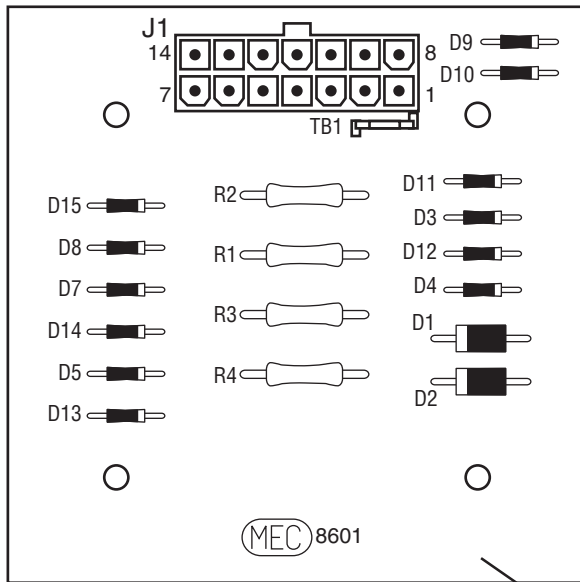


ELECTRIC SCHEMATICS

NOTES: (Unless otherwise specified)

1. Switch **S1 BASE/PLATFORM** makes contact from the CENTER to the LEFT position when placed in **BASE**.
2. Switch **S2 UP/DOWN** makes contact from the CENTER to the LEFT position when the switch is held in the CONTACT position and automatically returns to the CENTER position when released.
3. Switch **LS1** opens the N/C set of contacts and closes the N/O set of contacts when the platform reaches approximately 7 feet.
4. Switch **LS2** closes the N/C set of contacts when the Pothole Bars are down and locked in place.

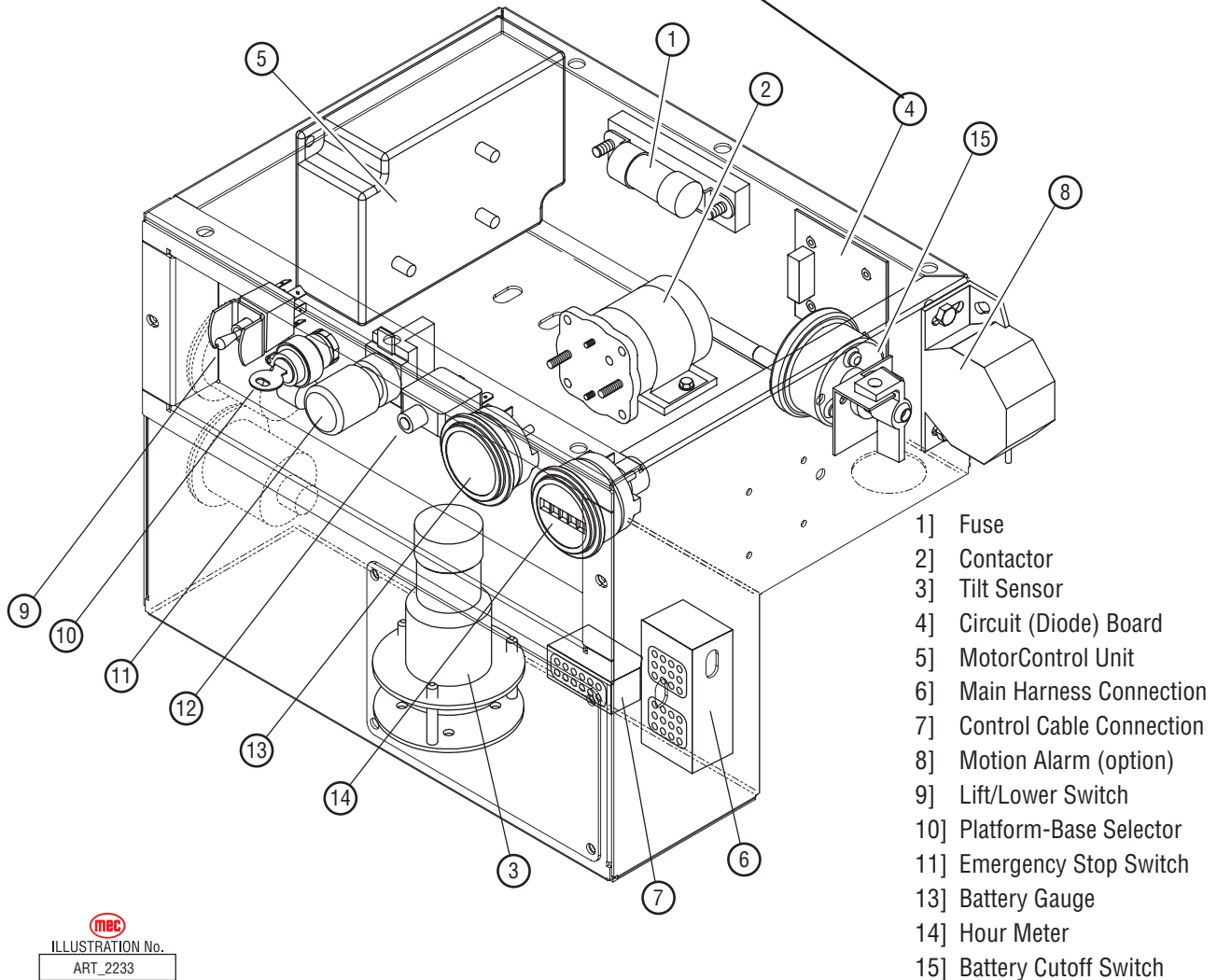




J1 Plug Pin Identification

PIN #	WIRE #	SIGNAL	FUNCTION
1	10	INPUT	Drive Reverse
2	11	INPUT	Drive Forward
3	19	OUTPUT	Brake, Decel Valve signal
4	8	INPUT	Steer Left
5	18	OUTPUT	Steer signal to Sevcon
6	5	INPUT	Down signal
7	20	OUTPUT	Signal to Motion Alarm(s) (optional)
8	17	OUTPUT	Sevcon & Hour Meter (motor function requested)
9	15	INPUT	Battery Negative
10	7	INPUT	Steer Right
11	4	INPUT	Lift Up
12	2	INPUT	Limit Switch (24V = platform down)
13	3	OUTPUT	Enable, from lower Lift switch
14	21	OUTPUT	To Sevcon (for speed cutback)

MEC
ILLUSTRATION No.
ART_2181



MEC
ILLUSTRATION No.
ART_2233



SEVCON MOTOR SPEED CONTROLLER


The Sevcon Motor Speed Controller (MC-1) is a microprocessor designed with the express purpose of operating the D/C electric motor at varying speeds. The controller uses Pulse-Width Modulation (PWM) technology on the Ground side of the motor to control motor speed. Out of concern for operator safety and to prevent short-circuiting, the Controller monitors certain circuits for potential abnormalities. When the controller senses a problem it errs to the side of safety and stops all motor operation. The green LED will flash a code indicating the reason for the shutdown.

Refer to the *LED Diagnostics Definitions* and *Sevcon Motor Speed Controller - Connections* on the following pages.

The diagram shows the Sevcon Motor Speed Controller (MC-1) with its terminal block and a plug. The terminal block has three terminals labeled B+, B-, and M2. The plug has 12 pins, with pins 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, and 12 labeled. A green LED is located on the top of the controller. The plug is shown inserted into the terminal block.

Cable Connection Identification	
B+	Battery Positive Cable from 250 AMP Fuse
B-	Negative Battery Cable and GROUND wire (15) connection
M2	Motor Ground (Pulse-Width Modulated [PWM] variable speed control)

MC-1 Plug Pin Identification		
PIN #	WIRE #	FUNCTION
1	22	B+ power input (power up)
2	17	Lift, Drive or Steer functions input (functions requiring motor)
3	18	Steer Requested (adds additional motor speed for steer)
4	3	Enable Switch signal input
5	21	Speed cut-back (24 Volts = full speed, 0 Volts = creep speed)
6	16	Motor Start Relay signal (GROUND signal to activate Motor Start Relay)
7	41	Lift Valve B- (provides GROUND signal to Lift Valve)
8	none	none
9	14	Accelerator reference signal (3.6 Volts to Potentiometer)
10	none	none
11	none	none
12	none	none


 ILLUSTRATION No.
 ART_2182

LED Diagnostics Definitions (Flash Codes)

LED READING	DIAGNOSIS
LED Steady On	Controller is operational and detects no irregularities on monitored circuits.
LED Off	<p>No power-up</p> <ul style="list-style-type: none"> • No power to pin # 1 • No ground to B- post • LED failure or internal controller fault
2 Flashes	<p>Procedure fault.</p> <ul style="list-style-type: none"> • Enable depressed at power up • Enable depressed for more then 15 seconds without function request • No signal on wire 17 pin # 2 when function requested • No B- to diode board • Failed diode/s • Damaged wire harness • Internal controller fault
3 Flashes	<p>Motor circuit low.</p> <p>Set with unit at rest and is the result of the voltage at M-2 dropping to approximately 4 volts or lower. Possible causes:</p> <ul style="list-style-type: none"> • Short to ground in the motor circuit between the motor contactor and the M-2 terminal
4 Flashes	<p>Motor circuit high.</p> <p>Set with the unit at rest and is the result of the voltage at M-2 terminal rising above 21 volts. Possible causes:</p> <ul style="list-style-type: none"> • Motor contactor points are welded shut
5 Flashes	<p>Motor contactor circuit open.</p> <p>Set when a function is requested but no current can flow through the motor circuit to the M-2 terminal. Possible causes:</p> <ul style="list-style-type: none"> • Blown 200 amp fuse • Malfunctioning motor contactor • Worn motor brushes • Incomplete circuit to the Sevcon pin #6 <p>If the motor and contactor circuits are diagnosed as working properly:</p> <ul style="list-style-type: none"> • Sevcon internal fault

continued...

LED Diagnostics Definitions (continued)

LED READING	DIAGNOSIS
6 Flashes	<p>Accelerator fault. Set with unit at rest, a 6 flash will result in an 80% cutback of motor speed. The Accelerator is the proportional control circuitry for the Sevcon. It works in conjunction with the potentiometer located in the upper control box, which is connected to the joystick handle through a gear arrangement.</p> <p>Measure voltage at terminals 14 and 15 on the platform terminal strip or at the potentiometer plug connection.</p> <ul style="list-style-type: none">• With the joystick handle in neutral, 3.6 volts should be measured on the accelerator circuit (wire #14)• Voltage proportionally decreases with the travel of the joystick, with 0 volts at full stroke• With the joystick centered, voltages lower than 3.1 or higher than 3.9 will trigger a (6 flash) code
7 Flashes	<p>Battery voltage fault.</p> <ul style="list-style-type: none">• This includes battery voltage below 12 volts or above 45 volts as measured on pin #1• This code will disable all functions
8 Flashes	<p>Thermal cutback.</p> <ul style="list-style-type: none">• Sevcon internal temperatures above 176 degrees F• Will limit motor speed in comparison with over temperature• Resets when cooled
9 Flashes	<p>Battery voltage at or below 18 volts</p> <ul style="list-style-type: none">• As measured on pin #1• This code will interrupt or prevent lift function but will allow drive and steer functions <p>When lift is interrupted due to a 9 flash, the electric motor will still run.</p>

Sevcon Motor Speed Controller - Connections

The following two pages describe the connections to the Sevcon Motor Speed Controller with a brief description of their function and the voltage measurements under normal conditions.

Important: Batteries must be fully charged before troubleshooting!

A fully charged battery set on a 24 V DC system will have a nominal voltage of 25.6 V DC

FUNCTION	VOLTAGE READING
PIN 1 – WIRE 22 (WIRE 9 ON EARLY UNITS)	
Battery Positive Input	Switched 5% less than battery voltage <ul style="list-style-type: none"> • Controller power-up and reference point for battery state-of-charge • Green LED indicates controller power-up • Power travels through the upper emergency-stop switch with upper controls selected • 7-Flash code and 9-flash code indicate low voltage at this terminal
Pin 2 Wire 17	
Lift, Drive or Steer functions requested	Motorized function is requested 15%-18% less than battery voltage <ul style="list-style-type: none"> • Controller begins the motor run sequence with this signal but still requires a signal on pin 4 and a change on pin 9 before the motor will operate
Pin 3 Wire 18	
Steer Function Requested	When steering is operated 15%-18% less than battery voltage <ul style="list-style-type: none"> • Adds motor speed to compensate for addition of steer requirement during drive operation • Provides a minimum motor speed for steer requirement when only steer is operated
Pin 4 Wire 3	
Enable signal input	When joystick trigger pulled 5% less than battery voltage. <ul style="list-style-type: none"> • Motor will not start without this input • A signal here longer then 15 seconds without a signal on pin-2 or pin-3 will result in a 2-flash code failure
Pin 5 Wire 21	
Speed cut-back signal from limit switch or Lift circuit	Full speed: 24 V DC Creep speed: 0 V DC. <ul style="list-style-type: none"> • Speed cut-back is the elevated drive speed



Sevcon Motor Speed Controller - Connections (continued)

FUNCTION	VOLTAGE READING
PIN 6 – WIRE 16	
Motor Start Relay ground signal	<p>Idle: 24 V DC</p> <p>When function requested: 0 V DC</p> <ul style="list-style-type: none"> • This is how the Controller maintains control over the motor circuit • Sevcon controls the Motor Start Relay function ground signal • Will not operate the motor start relay when 2, 3, 4 & 7 flash codes occur
PIN 7 – WIRE 41	
Ground signal to Lift solenoid valve	<p>0 volts</p> <p>No ground presence until lift is requested</p> <ul style="list-style-type: none"> • By providing the ground signal, lift function can be prevented anytime battery voltage falls below 18 volts. This will result in a 9 flash code
PIN 9 – WIRE 14	
Accelerator reference signal to the potentiometer (upper control box)	<p>From 3.5 V DC with joystick in the neutral to 0 V DC at full stroke</p> <ul style="list-style-type: none"> • Controller uses this circuit to monitor joystick input after pins 2 & 4 energize • Controls motor speed in reference to the voltage on this circuit • Voltages above 4.0 V DC or below 3.0 V DC will result in a 6 flash code
POST B+	
Battery positive cable from 200 amp fuse	<p>Full battery voltage</p> <ul style="list-style-type: none"> • No real diagnostic value
POST B–	
Battery positive cable from 200 amp fuse	<p>Battery ground cable connection</p> <p>Ground path for motor operation</p> <ul style="list-style-type: none"> • All system ground wires (wire #s 15 & 15A) terminate here • Best place to connect ground lead from multi-meter while troubleshooting
POST M-2	
PWM controlled motor ground	<p>Idle: 12 V DC – 13 V DC</p> <p>During operation, between 5 V DC & 24 V DC</p> <ul style="list-style-type: none"> • 12 – 13 volts is reference voltage used by the controller to monitor motor circuit irregularities at idle • 0 volts at idle = 3 flash code • Above 20 volts at idle = 4 flash code • No voltage change after Motor Start Relay signal = 5 flash code

1532ES, S/N 9000500 - 9001099

1932ES, S/N 9104000 - 9104999

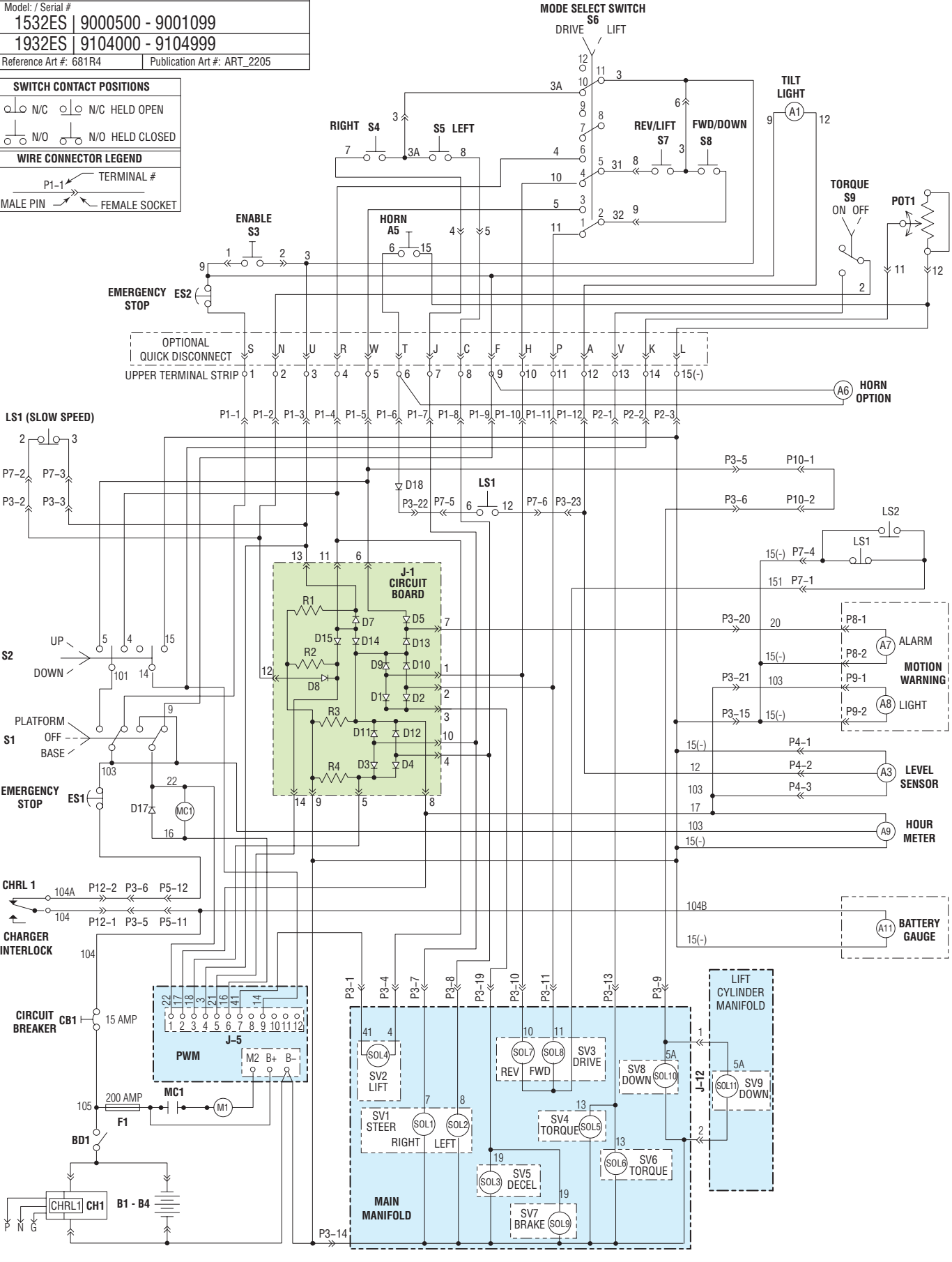
ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Tilt Light, 28V	Warn when Machine is Tilted	Upper Control Box
A3	Level Sensor	Activates Tilt Light	In Lower Control Box
A5	Push-Button Switch	Activates Horn	On Upper Control Box
A6	Horn, 12V - 48V (option)	Activated by Operator	Under Platform
A7	Overload/Motion Alarm (option)	Warn of Movement	Outside Lower Control Box
A8	Motion Light (option)	Warn of Movement	Front Left Corner of Machine
A9	Hour Meter	Record Machine Usage Time	Lower Control Panel
A11	Battery Indicator	Show Battery Status	Lower Control Panel
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
BD1	Battery Disconnect Switch	Disconnect All Electrical Power	Lower Control Box
CB1	Circuit Breaker, 15AMP Manual	Control Circuit Protection	Lower Control Panel
CH1	Battery Charger	Recharges 24-VDC Battery Pack	Machine Base, Rear
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
D18	Diode	Optional "Out of Level" Alarm	Main Harness
ES1	Switch, Emergency Stop	Shutdown All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shutdown All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
LS1	Limit Switch, Double Pole	Enable Drive and High Speed	Right Rear Corner of Machine
LS2	Limit Switch, Single Pole	Drive Enable if Pothole Deployed	On pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Inside Pump Compartment
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
R1 - R4	Circuit Board Resistors		Inside Lower Control Box
S1	Key Switch, N/O Contact Block	Select Base or Platform Controls	Lower Control Panel
S2	Switch, Toggle	Lift/Lower at Lower Controls	Lower Control Panel
S3	Switch, Push Button	Enable Other Functions at Platform	Upper Control Box Handle
S4	Switch, Micro	Right Turn Switch	Upper Control Box Handle
S5	Switch, Micro	Left Turn Switch	Upper Control Box Handle
S6	Switch, Toggle	Select LIFT or DRIVE	Upper Control Box
S7	Switch, Micro	Reverse or Lift Switch	Upper Control Box
S8	Switch, Micro	Forward or Down Switch	Upper Control Box
S9	Switch, Toggle	TORQUE Switch	Upper Control Box
SOL1	Coil, Turn Right Solenoid	Activate Turn Right Valve (SV1)	Main Manifold
SOL2	Coil, Turn Left Solenoid	Activate Turn Left Valve (SV1)	Main Manifold
SOL3	Coil, Decel Solenoid	Activate Decel Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5-6	Coil, Torque Solenoid	Activate Torque Valves (SV4) (SV6)	Main Manifold
SOL7	Coil, Reverse Solenoid	Activate Reverse Valve (SV3)	Main Manifold
SOL8	Coil, Forward Solenoid	Activate Forward Valve (SV3)	Main Manifold
SOL9	Coil, Brake Solenoid	Activate Brake Valve (SV7)	Main Manifold
SOL10	Coil, Down Solenoid	Activate Down Valve (SV8)	Main Manifold
SOL11	Coil, Down Solenoid	Activate Down Valve (SV9)	Lift Cylinder Manifold



MEC ELECTRIC SCHEMATIC

Model / Serial #
 1532ES | 9000500 - 9001099
 1932ES | 9104000 - 9104999
 Reference Art #: 681R4 | Publication Art #: ART_2205

SWITCH CONTACT POSITIONS	
	N/C N/C HELD OPEN
	N/O N/O HELD CLOSED
WIRE CONNECTOR LEGEND	
	TERMINAL #
	MALE PIN
	FEMALE SOCKET



1532ES, S/N 9002000 - Current**1932ES, S/N 9105000 - Current**

ITEM	DESCRIPTION	FUNCTION	LOCATION
A1	Tilt Light, 28V	Warn when Machine is Tilted	Upper Control Box
A3	Level Sensor	Activates Tilt Light	Inside Lower Control Box
A5	Push-Button Switch	Activates Horn	Upper Control Box
A6	Horn, 12V - 48V (option)	Activated by Operator	Under Platform
A7	Overload/Motion Alarm (option)	Warn of Movement	Outside Lower Control Box
A8	Motion Light (option)	Warn of Movement	Front Left Corner of Machine
A9	Hour Meter	Record Machine Usage Time	Lower Control Panel
A11	Battery Indicator	Show Battery Status	Lower Control Panel
B1-4	6-V Deep Cycle Battery	Power for Motor And Control Circuit	Inside Battery Compartment
BD1	Battery Disconnect Switch	Disconnect All Electrical Power	Lower Control Box
CB1	Circuit Breaker, 15AMP Manual	Control Circuit Protection	Lower Control Panel
CH1	Battery Charger	Recharges 24-VDC Battery Pack	Machine Base, Rear
CHRL1	Charger Relay	Disconnect Electric when Charger ON	Inside Charger
MC1	24-V Contactor	Connects Battery (+) to Motor	Inside Lower Control Box
D1 - D15	Circuit Board Diodes	Directs Signal to Proper Location	Inside Lower Control Box
R1 - R4	Circuit Board Resistors		Inside Lower Control Box
D17	Diode w/Ring Terminals	Suppression Diode	Across Contactor Coil
ES1	Switch, Emergency Stop	Shutdown All Moving Functions	Lower Control Panel
ES2	Switch, Emergency Stop	Shutdown All Platform Functions	Upper Control Box
F1	Fuse, 200AMP	Main Line Fuse	Inside Lower Control Box
LS1	Limit Switch, Double Pole	Enable Drive and High Speed	Right Rear Corner of Machine
LS2	Limit Switch, Single Pole	Drive Enable if Pothole Deployed	On pothole Linkage
M1	Motor, 24V, 2HP	Turn the Hydraulic Pump	Pump Compartment
PWM	Controller, DC 250AMP	Changes the Motor Speed	Inside Lower Control Box
POT1	Potentiometer, 20K Ohms	Senses Operator Input	Upper Control Box
S1	Key Switch, N/O Contact Block	Select Base or Platform Controls	Lower Control Panel
S2	Switch, Toggle	Lift/Lower at Lower Controls	Lower Control Panel
S3	Switch, Push Button	Enable Other Functions at Platform	Upper Control Box Handle
S4	Switch, Micro	Right Turn Switch	Upper Control Box Handle
S5	Switch, Micro	Left Turn Switch	Upper Control Box Handle
S6	Switch, Toggle	Select LIFT or DRIVE	Upper Control Box
S7	Switch, Micro	Reverse or Lift Switch	Upper Control Box
S8	Switch, Micro	Forward or Down Switch	Upper Control Box
S9	Switch, Toggle	TORQUE Switch	Upper Control Box
SOL1	Coil, Turn Right Solenoid	Activate Turn Right Valve (SV1)	Main Manifold
SOL2	Coil, Turn Left Solenoid	Activate Turn Left Valve (SV1)	Main Manifold
SOL3	Coil, Decel/Brake Solenoid	Activate Decel/Brake Valve (SV5)	Main Manifold
SOL4	Coil, Lift Solenoid	Activate Lift Valve (SV2)	Main Manifold
SOL5-6	Coil, Torque Solenoid	Activate Torque Valves (SV5)(SV6)	Main Manifold
SOL7	Coil, Reverse Solenoid	Activate Reverse Valve (SV3)	Main Manifold
SOL8	Coil, Forward Solenoid	Activate Forward Valve (SV3)	Main Manifold
SOL11	Coil, Down Solenoid	Activate Down Valve (SV9)	Lift Cylinder

MEC ELECTRIC SCHEMATIC

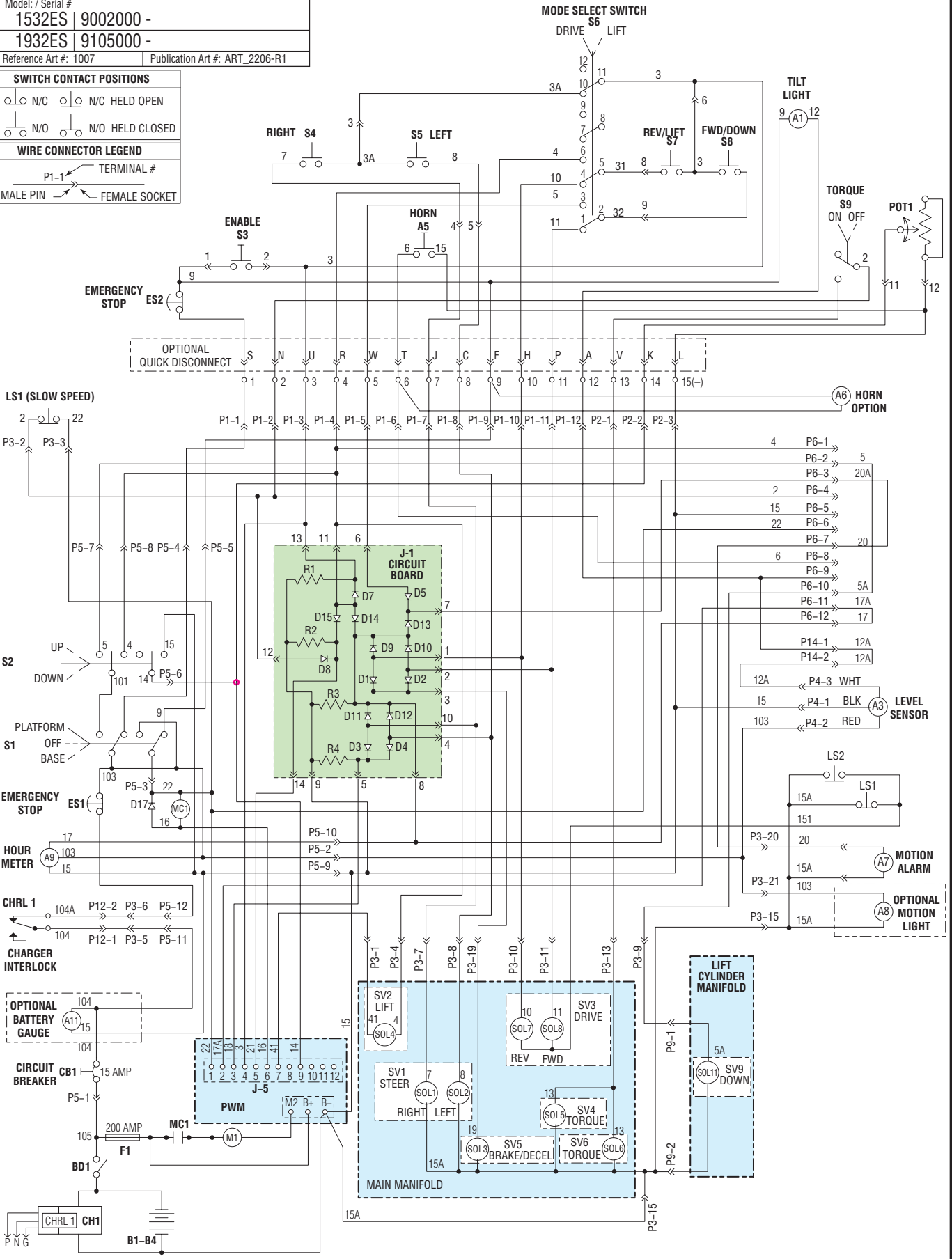
Model: / Serial #
1532ES | 9002000 -
1932ES | 9105000 -
Reference Art #: 1007 Publication Art #: ART_2206-R1

SWITCH CONTACT POSITIONS

	N/C		N/O HELD OPEN
	N/O		N/O HELD CLOSED

WIRE CONNECTOR LEGEND

	TERMINAL #
	MALE PIN
	FEMALE SOCKET



Component Locations

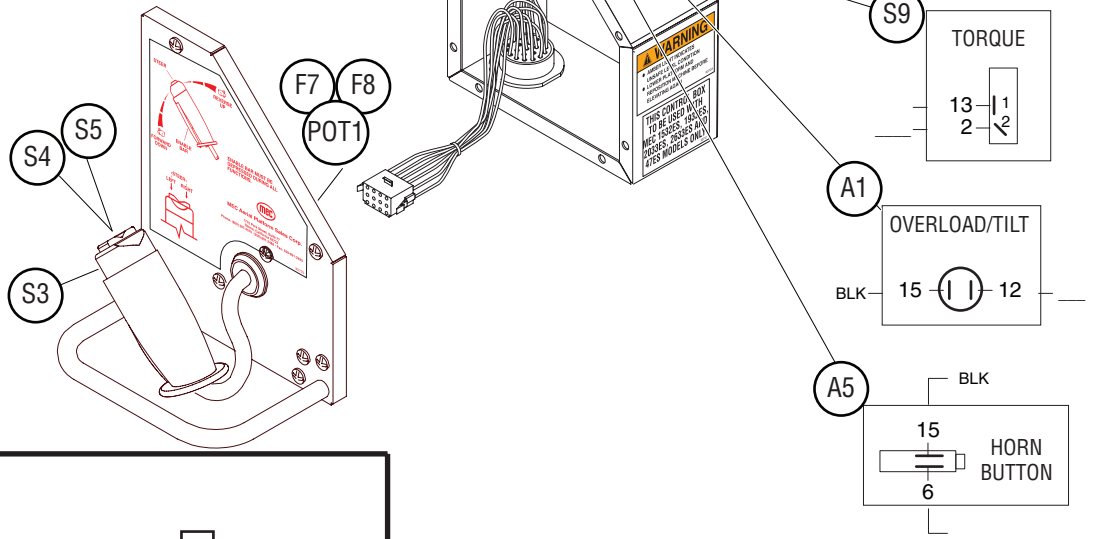
Model: / Serial #

ES Models: all

Reference Art #: none

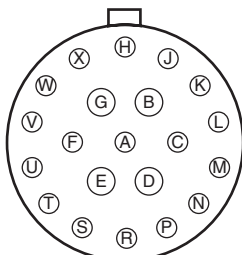
Publication Art #: 2211

**REFER TO
ELECTRIC SCHEMATIC**

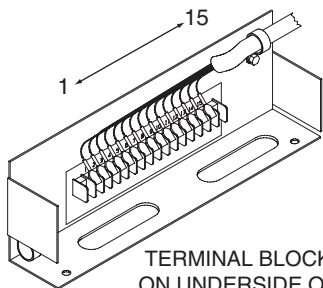


**REMOVABLE
CONTROL
HARNESS**

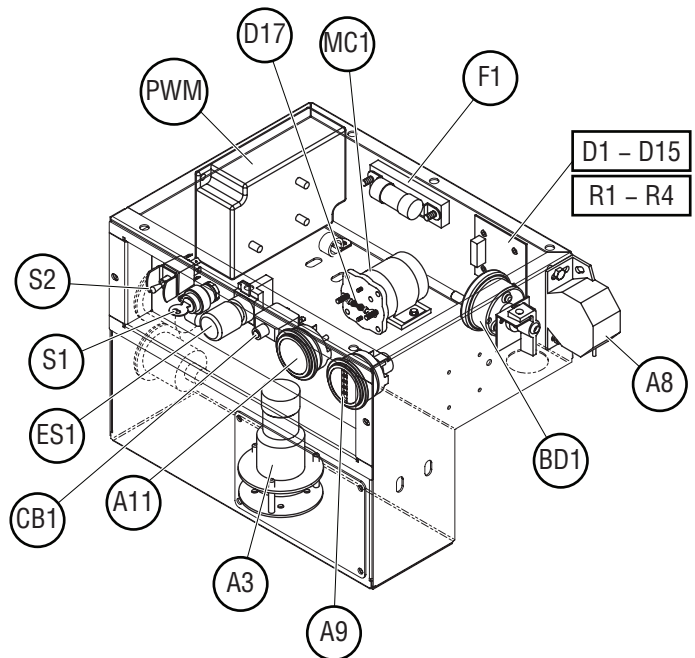
PIN #	WIRE #
S	1
F	9
W	5
R	4
V	13
A	12
H	10
P	11
U	3
T	6
J	7
N	2
C	8
K	14
M	16 (GND)
L	15



END VIEW OF
REMOVABLE
CONTROL HARNESS
(OPTIONAL
QUICK
DISCONNECT)



TERMINAL BLOCK
ON UNDERSIDE OF
PLATFORM DECK

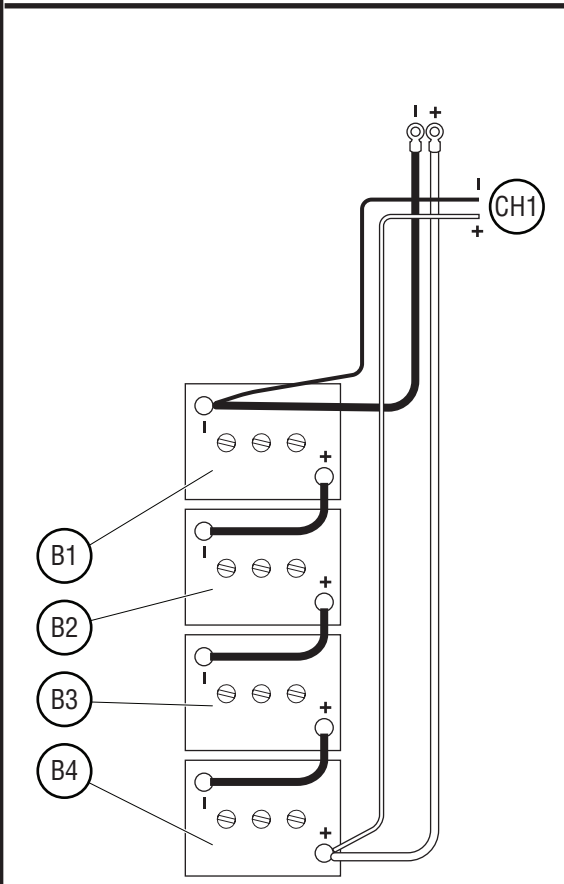
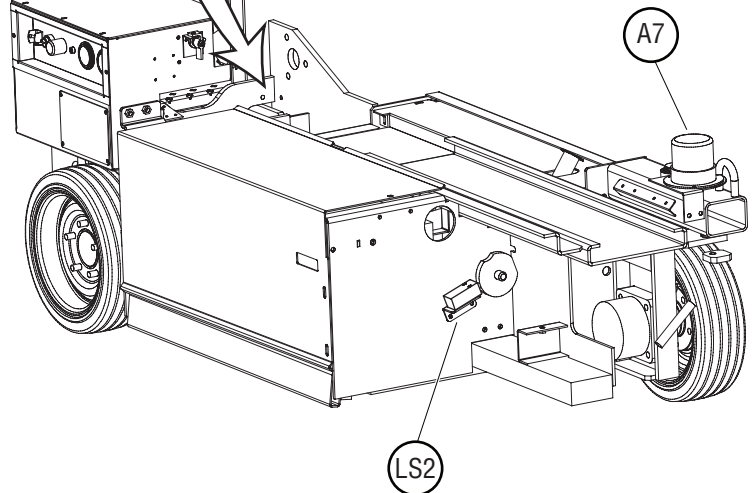
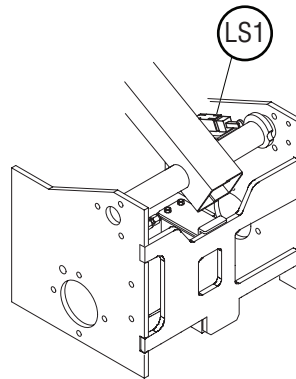
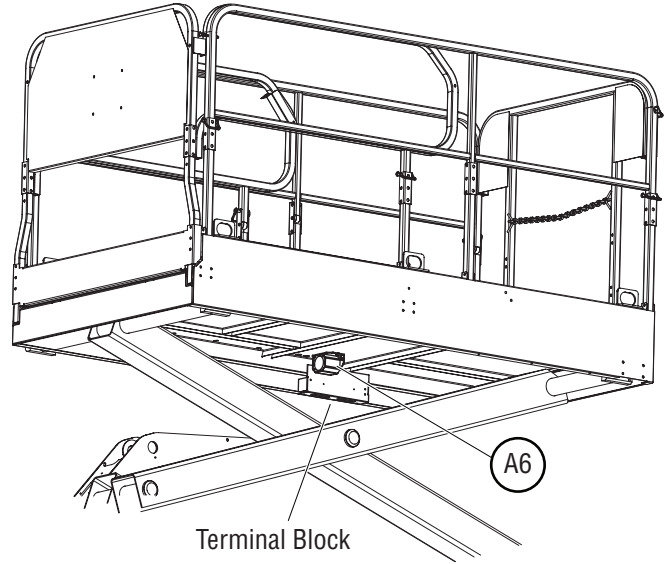


mec Component Locations

Model: / Serial #
1532ES - 1932ES: all

Reference Art #: none Publication Art #: ART_2212

**REFER TO
ELECTRIC SCHEMATIC**



MEC Component Locations

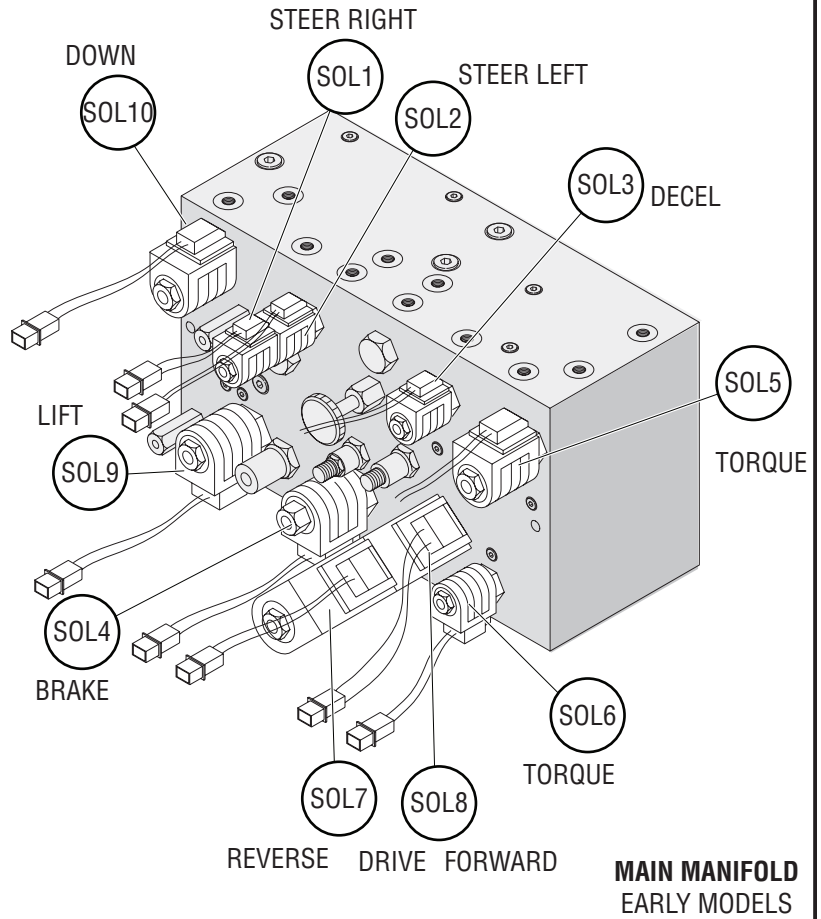
Model: / Serial #

ES Models: all

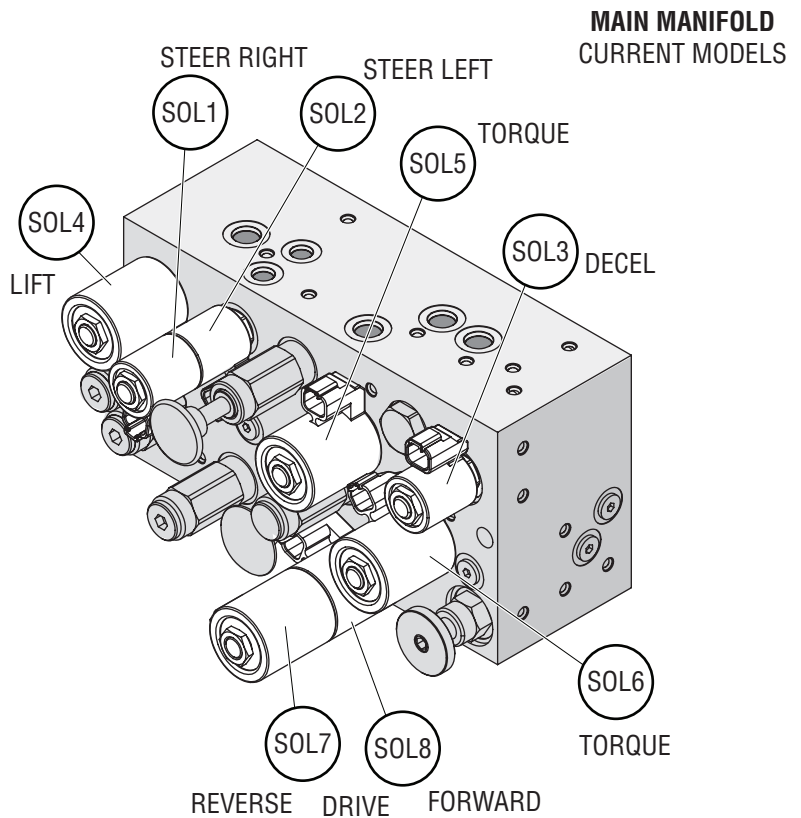
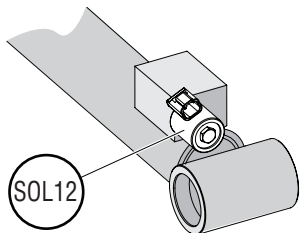
Reference Art #: none

Publication Art #: ART_2213

**REFER TO
ELECTRIC SCHEMATIC**



LIFT CYLINDER



MEC Plug Pin Identification	
Model: / Serial #	
ES Models : all	
Reference Art #: none	Publication Art #: 2217

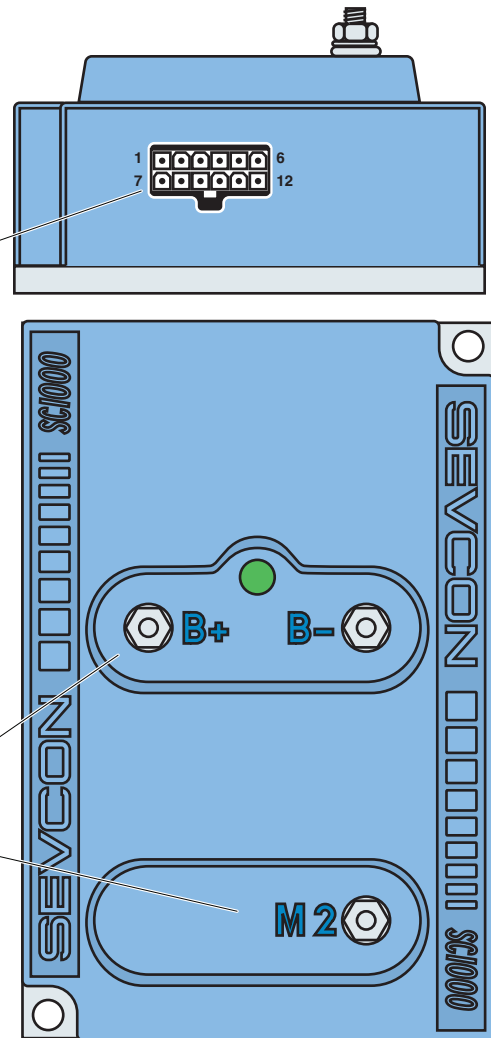
**REFER TO
ELECTRIC SCHEMATIC**

PWM

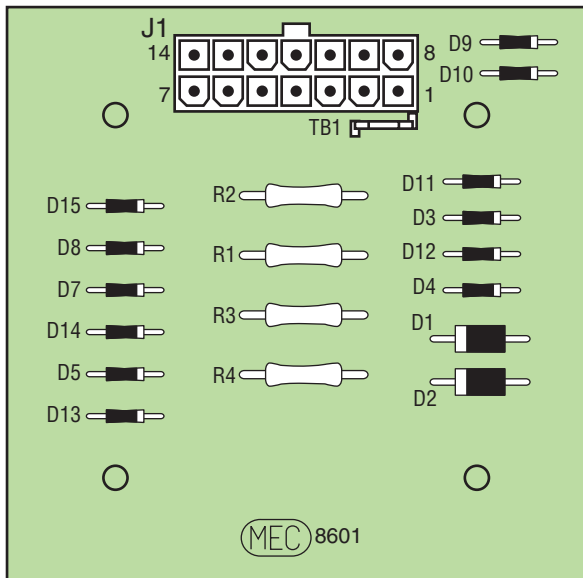
J5 Pin Identification		
PIN #	WIRE #	FUNCTION
1	22	B+ power input (power up)
2	17	Lift, Drive or Steer functions requested (functions requiring motor)
3	18	Steer Requested (adds additional motor speed for steer)
4	3	Enable signal input
5	21	Speed cut-back (24 Volts = full speed, 0 Volts = creep speed)
6	16	Motor Start Relay signal (GROUND signal to activate Motor Start Relay)
7	41	Lift Valve B- (provides GROUND signal to Lift Valve)
8	none	none
9	14	Accelerator reference signal (3.6 Volts to Potentiometer)
10	none	none
11	none	none
12	none	none

Terminal Identification	
POST	FUNCTION
B+	Battery Positive Cable from 200 AMP Fuse
B-	Negative Battery Cable and GROUND wire (15) connection
M2	Motor Ground (Pulse-Width Modulated [PWM] variable speed control)

J5



Circuit Board



J1 Plug Pin Identification

PIN #	WIRE #	SIGNAL	FUNCTION
1	10	INPUT	Drive Reverse
2	11	INPUT	Drive Forward
3	19	OUTPUT	Brake, Decel Valve signal
4	8	INPUT	Steer Left
5	18	OUTPUT	Steer signal to Sevcon
6	5	INPUT	Down signal
7	20	OUTPUT	Signal to Motion Alarm(s) (optional)
8	17	OUTPUT	Sevcon & Hour Meter (motor function requested)
9	15	INPUT	Battery Negative
10	7	INPUT	Steer Right
11	4	INPUT	Lift Up
12	2	INPUT	Limit Switch (24V = platform down)
13	3	OUTPUT	Enable, from lower Lift switch
14	21	OUTPUT	To Sevcon (for speed cutback)

