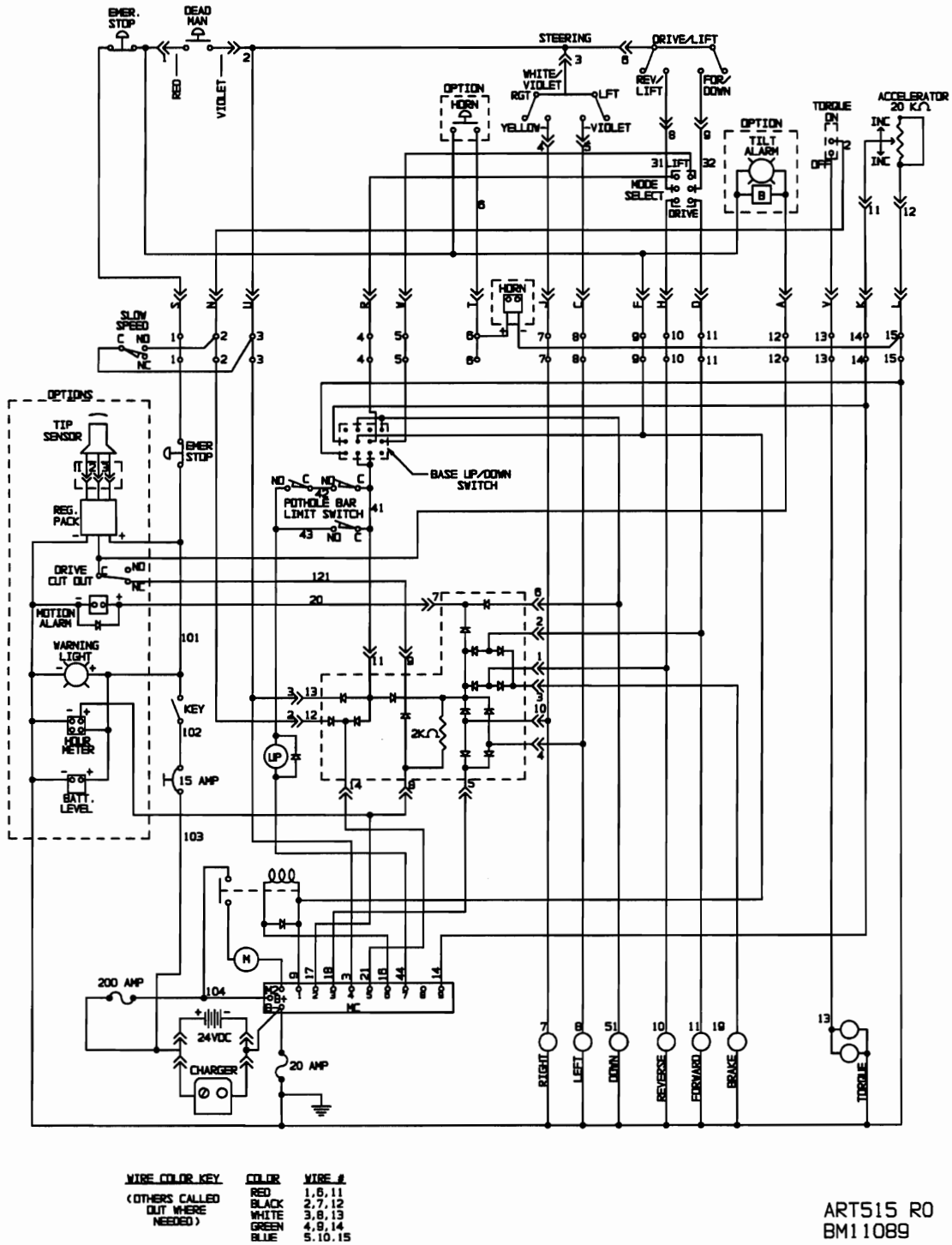
Figure 2C - Electrical Schematic 2033

SERIAL #8600101-#8601536



WIRE COLOR KEY	COLOR	WIRE #
(OTHERS CALLED OUT WHERE NEEDED)	RED	1,6,11
	BLACK	2,7,12
	WHITE	3,8,13
	GREEN	4,9,14
	BLUE	5,10,15

ART515 R0
BM11089

Figure 2D - Electrical Schematic 2033

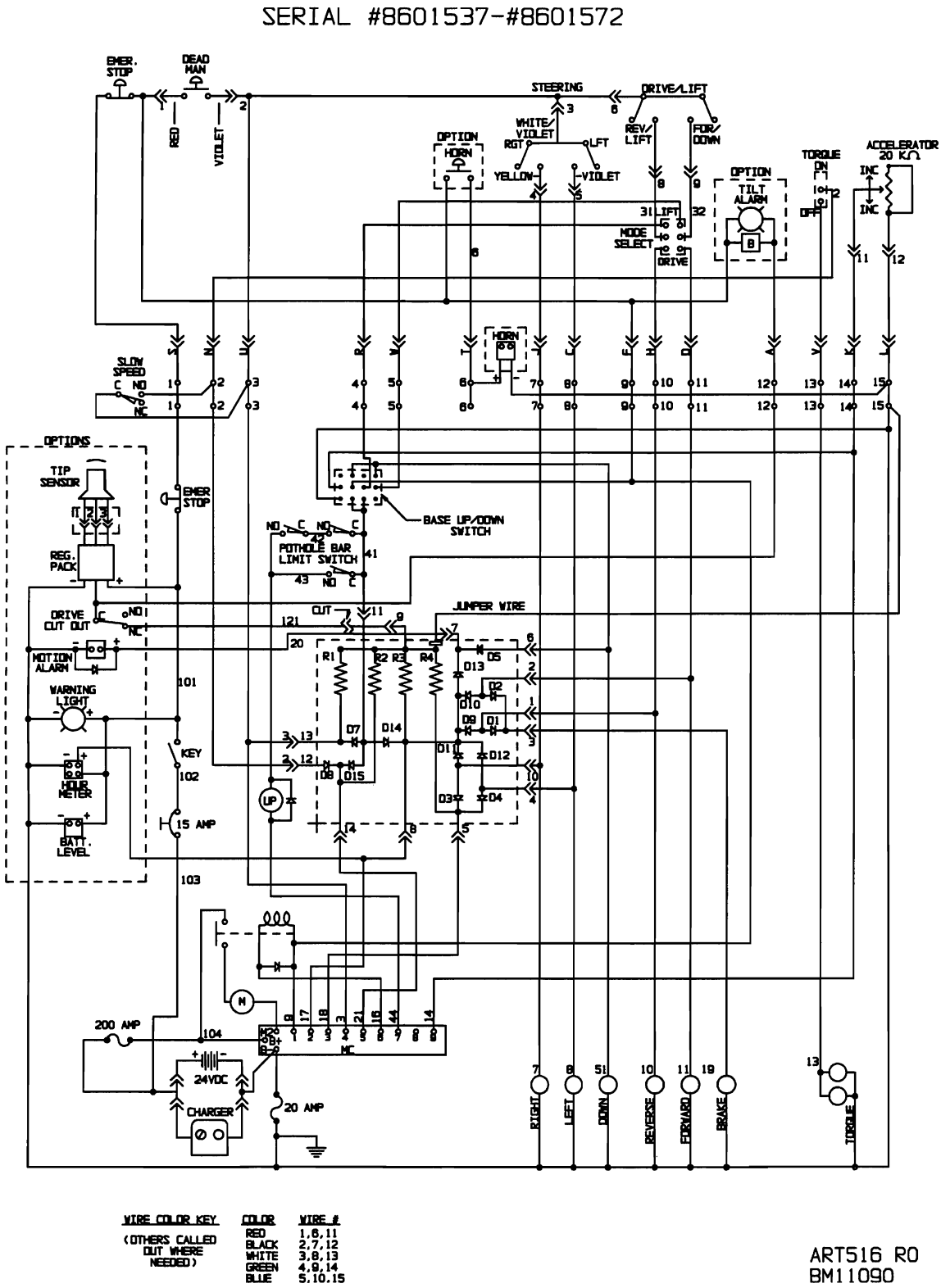
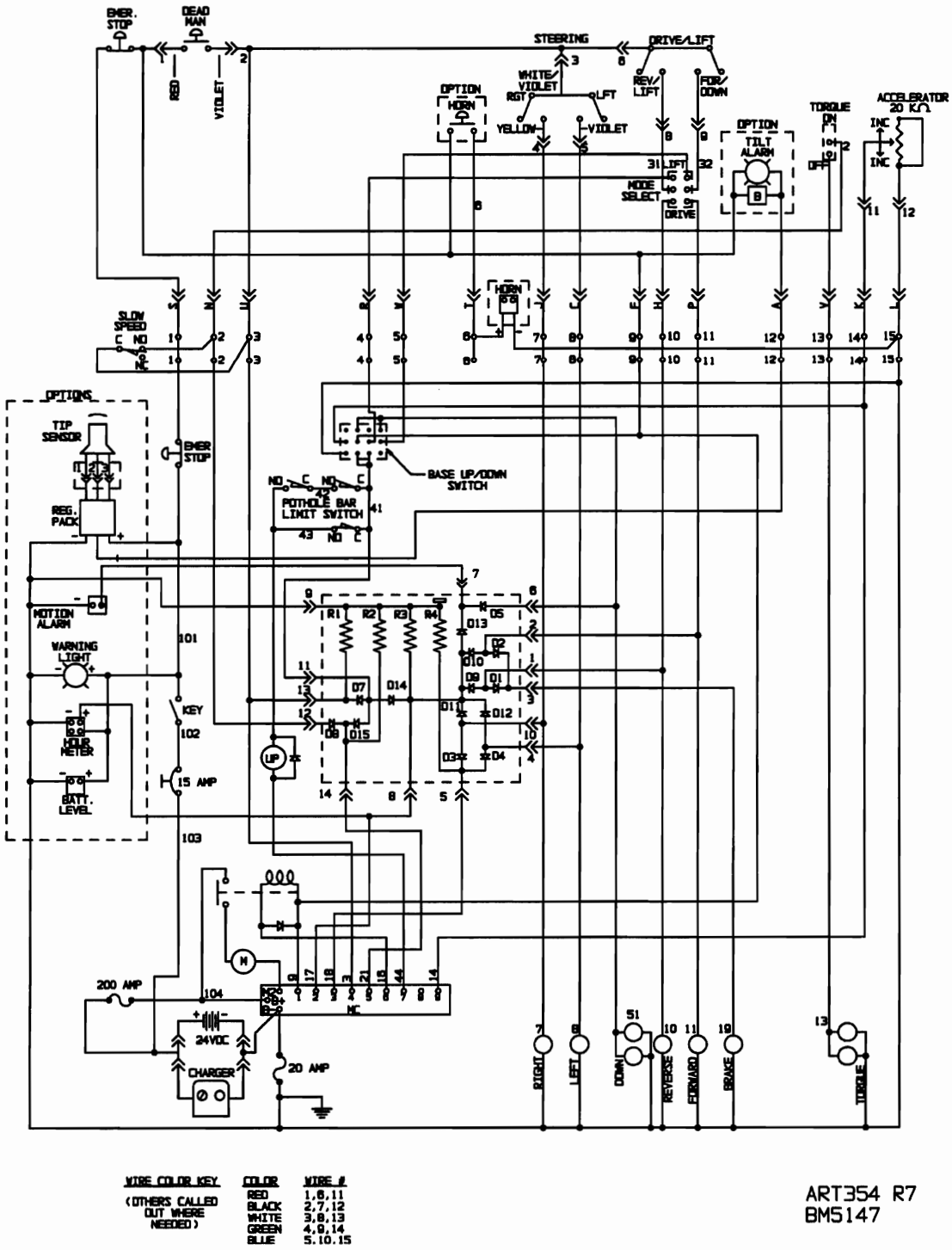


Figure 2E - Electrical Schematic 2033

FOR SERIAL #8601573 THROUGH #8602694

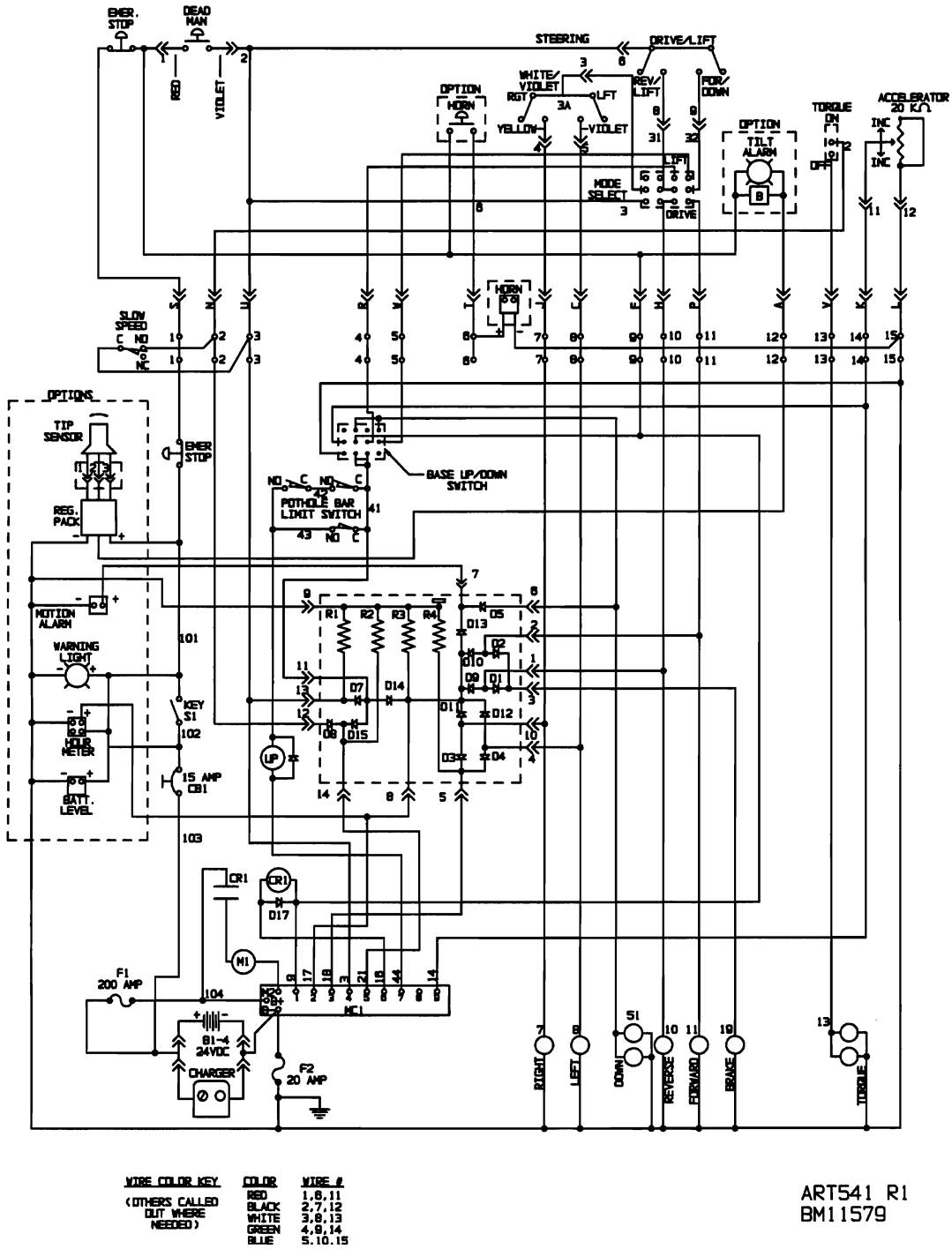


WIRE COLOR KEY (OTHERS CALLED OUT WHERE NEEDED)	COLOR	WIRE #
	RED	1,6,11
	BLACK	2,7,12
	WHITE	3,8,13
	GREEN	4,9,14
	BLUE	5,10,15

ART354 R7
BM5147

Figure 2F - Electrical Schematic 2033

FOR SERIAL #8602695 THROUGH PRESENT



WIRE COLOR KEY (OTHERS CALLED OUT WHERE NEEDED)	COLOR	WIRE #
	RED	1,6,11
	BLACK	2,7,12
	WHITE	3,8,13
	GREEN	4,9,14
	BLUE	5,10,15

ART541 R1
BM11579

Figure 2G - Base Up/Down Switch Diagram 2033RS

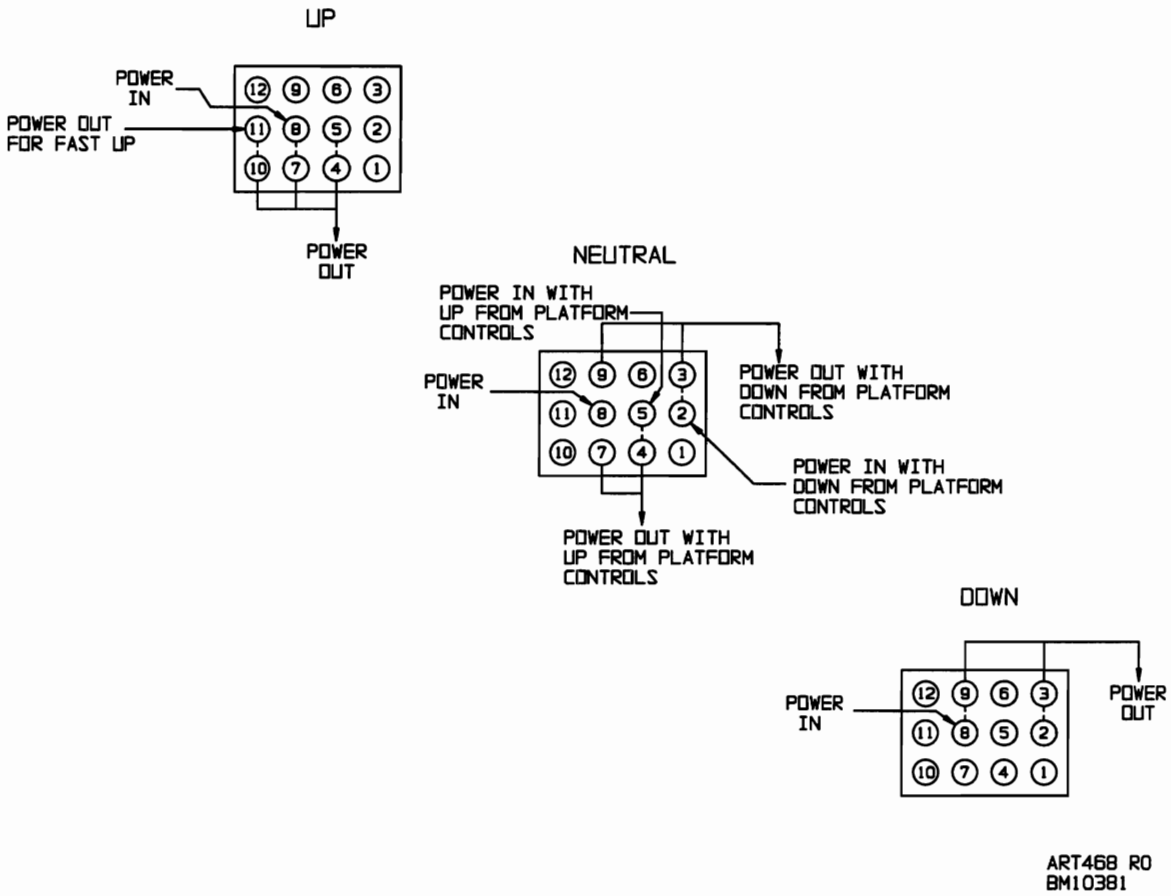


Figure 2H - Electrical Schematic 2033RS Joystick

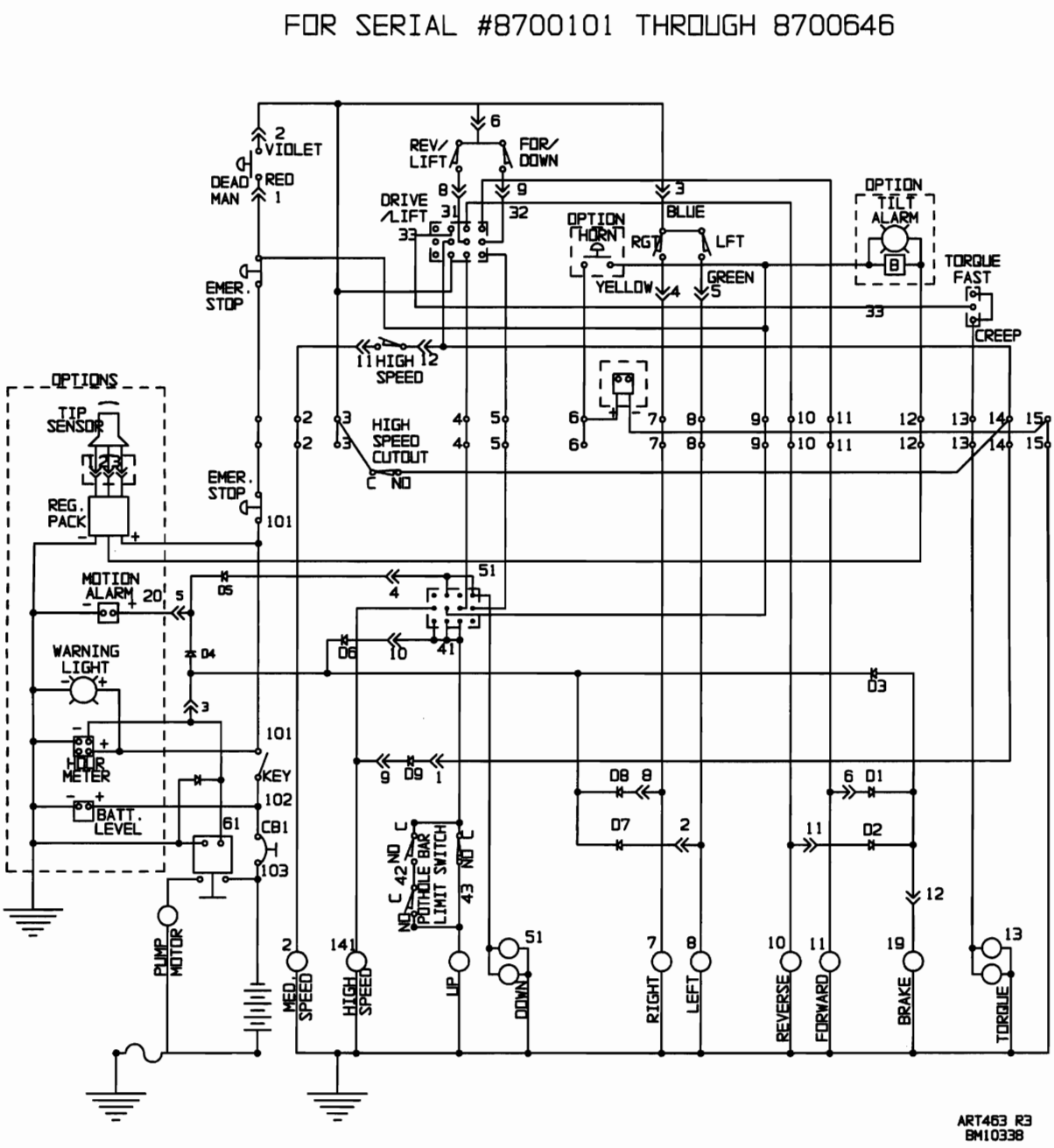


Figure 2I - Electrical Schematic 2033RS Joystick

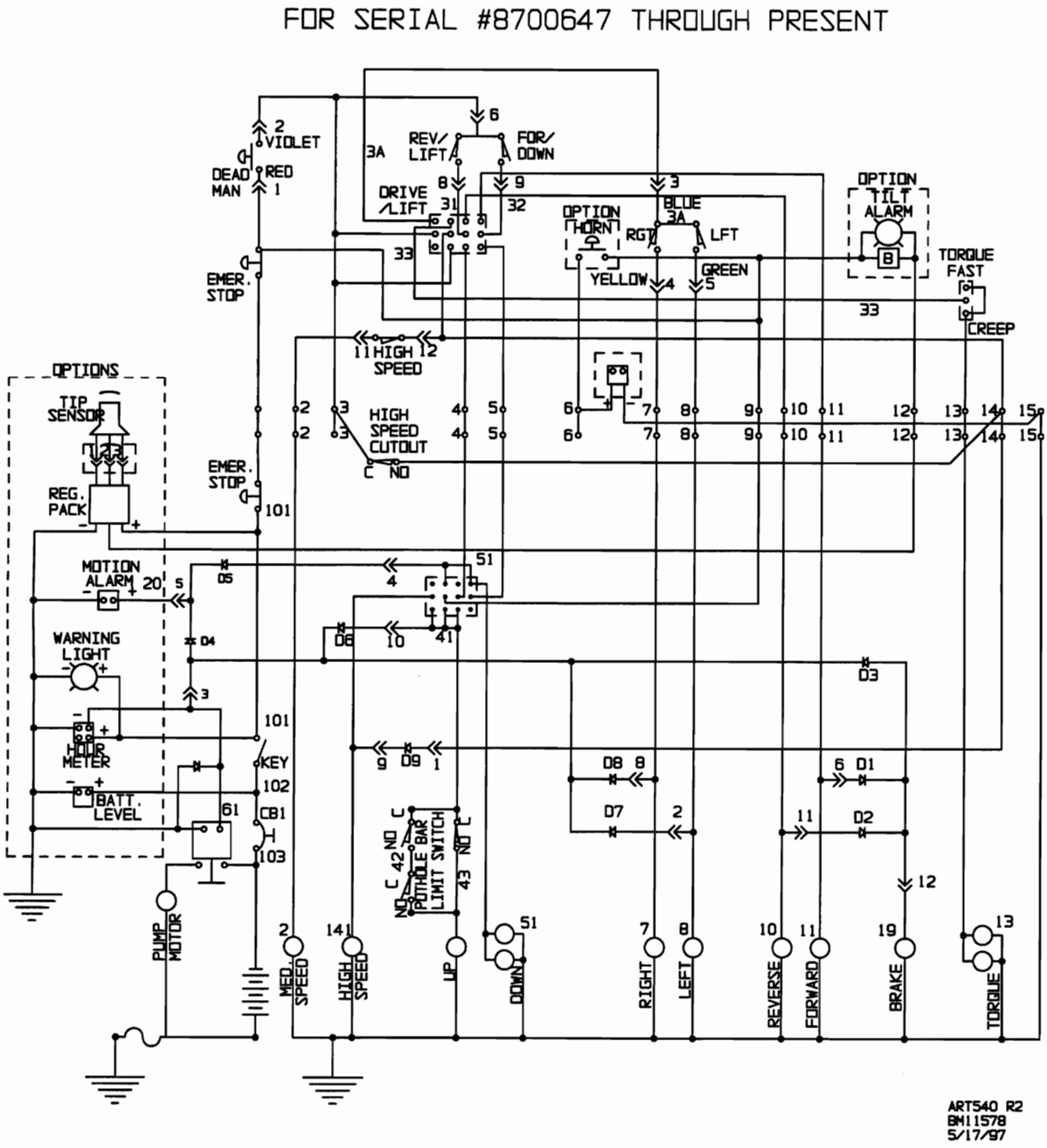


Figure 2J - Electrical Schematic 2033RS Toggle Box

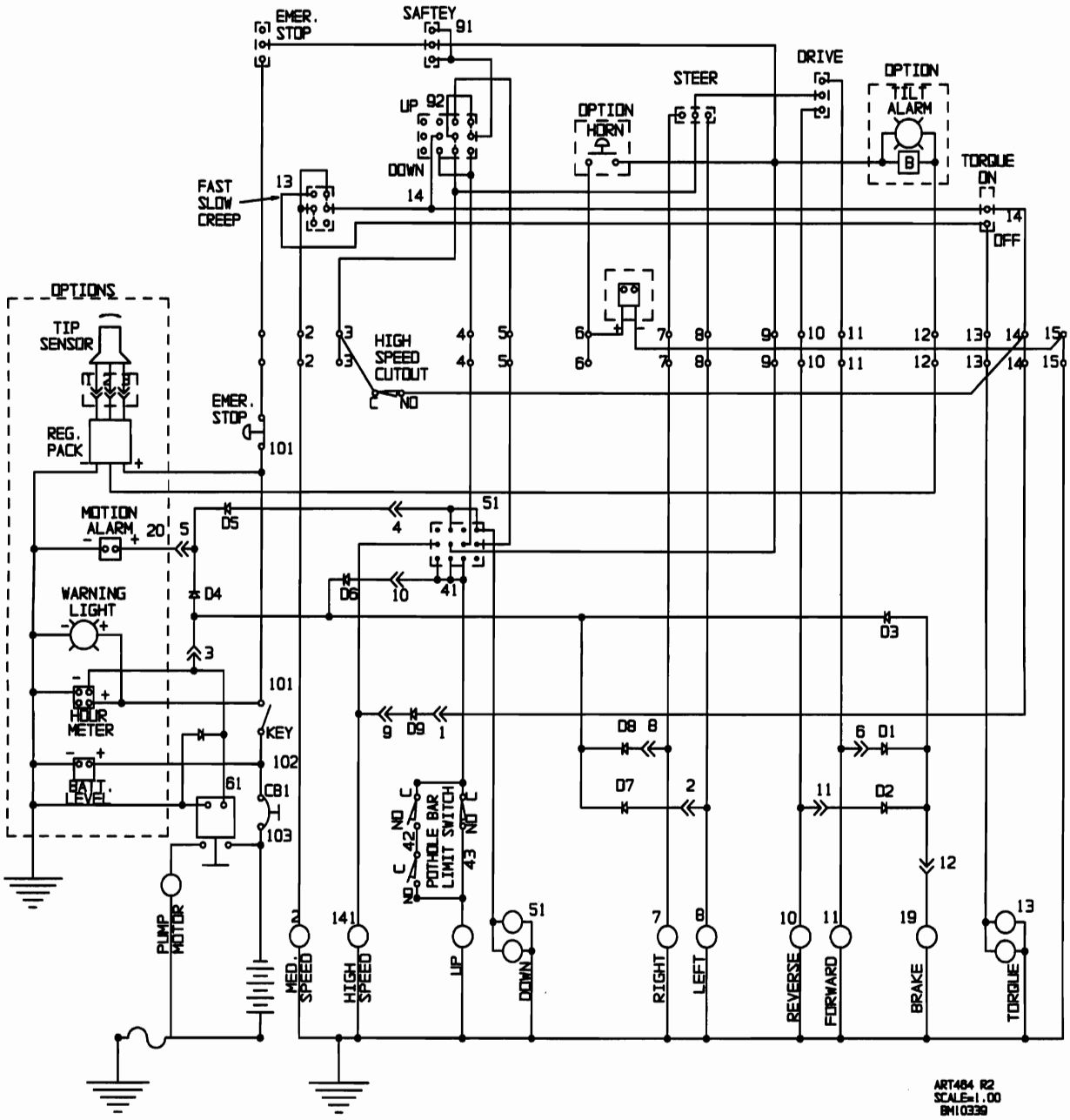
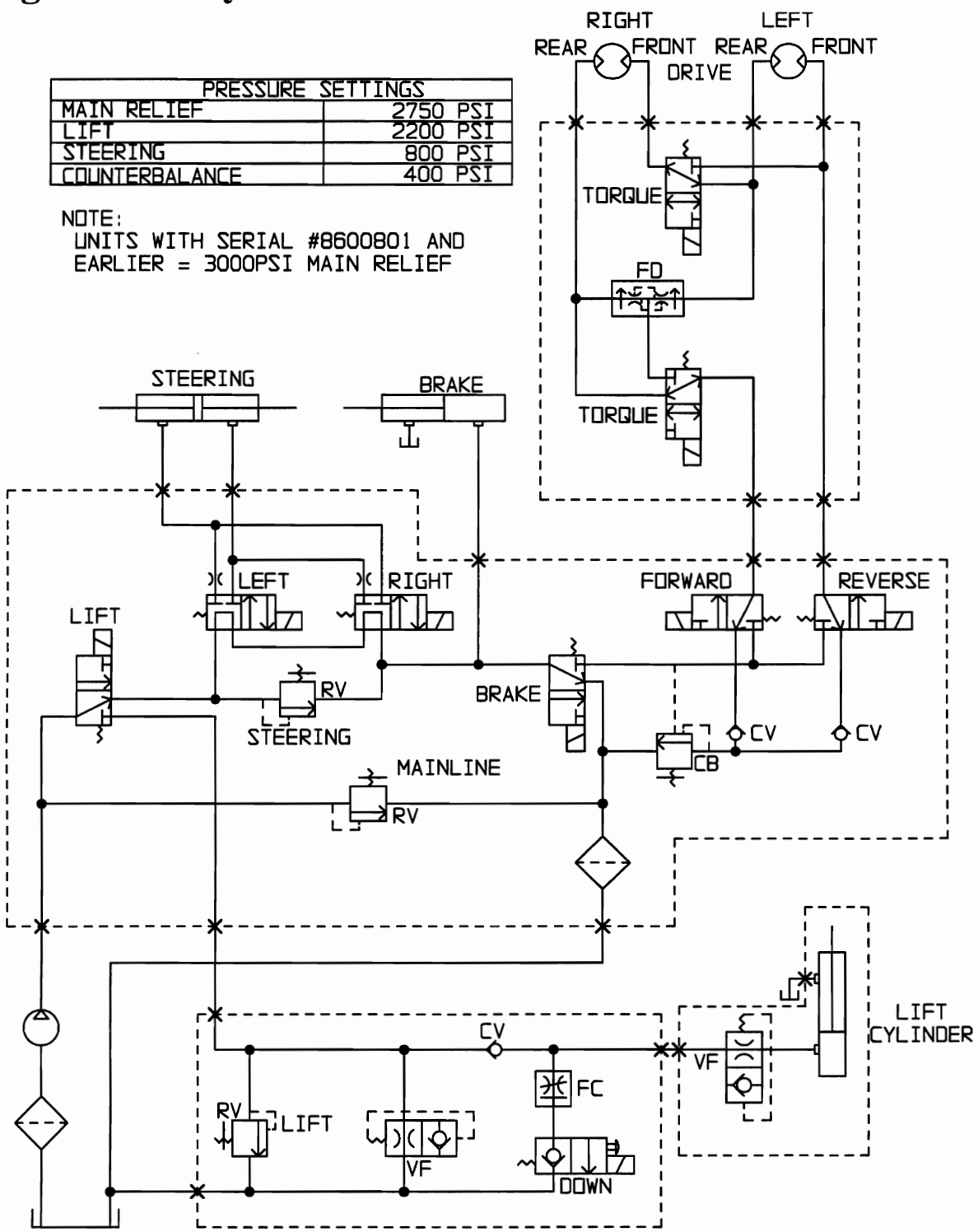


Figure 2K - Hydraulic Schematic 2033

PRESSURE SETTINGS	
MAIN RELIEF	2750 PSI
LIFT	2200 PSI
STEERING	800 PSI
COUNTERBALANCE	400 PSI

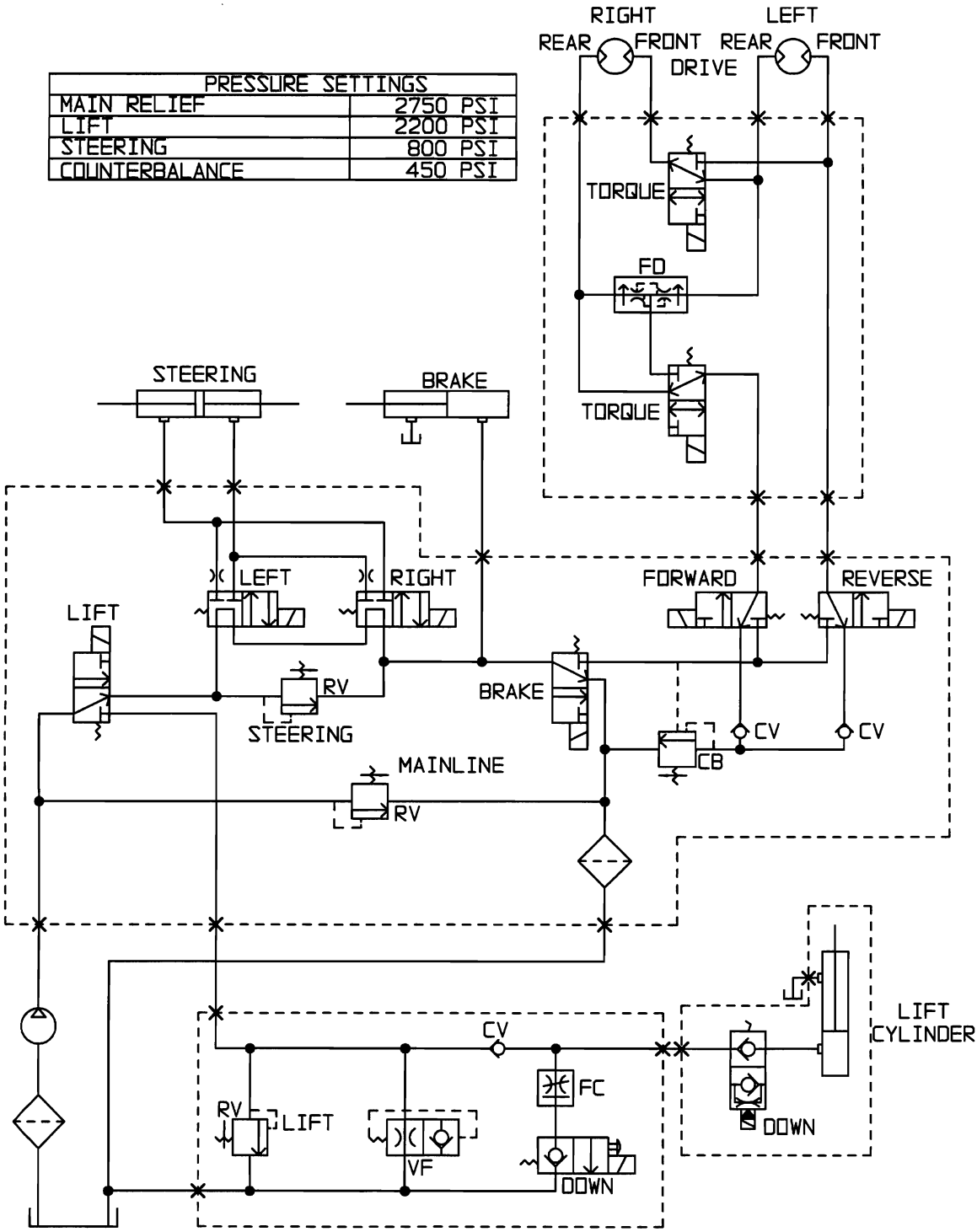
NOTE:
UNITS WITH SERIAL #8600801 AND EARLIER = 3000PSI MAIN RELIEF



ART370-R6
BM5238

Figure 2L - Hydraulic Schematic 2033

PRESSURE SETTINGS	
MAIN RELIEF	2750 PSI
LIFT	2200 PSI
STEERING	800 PSI
COUNTERBALANCE	450 PSI

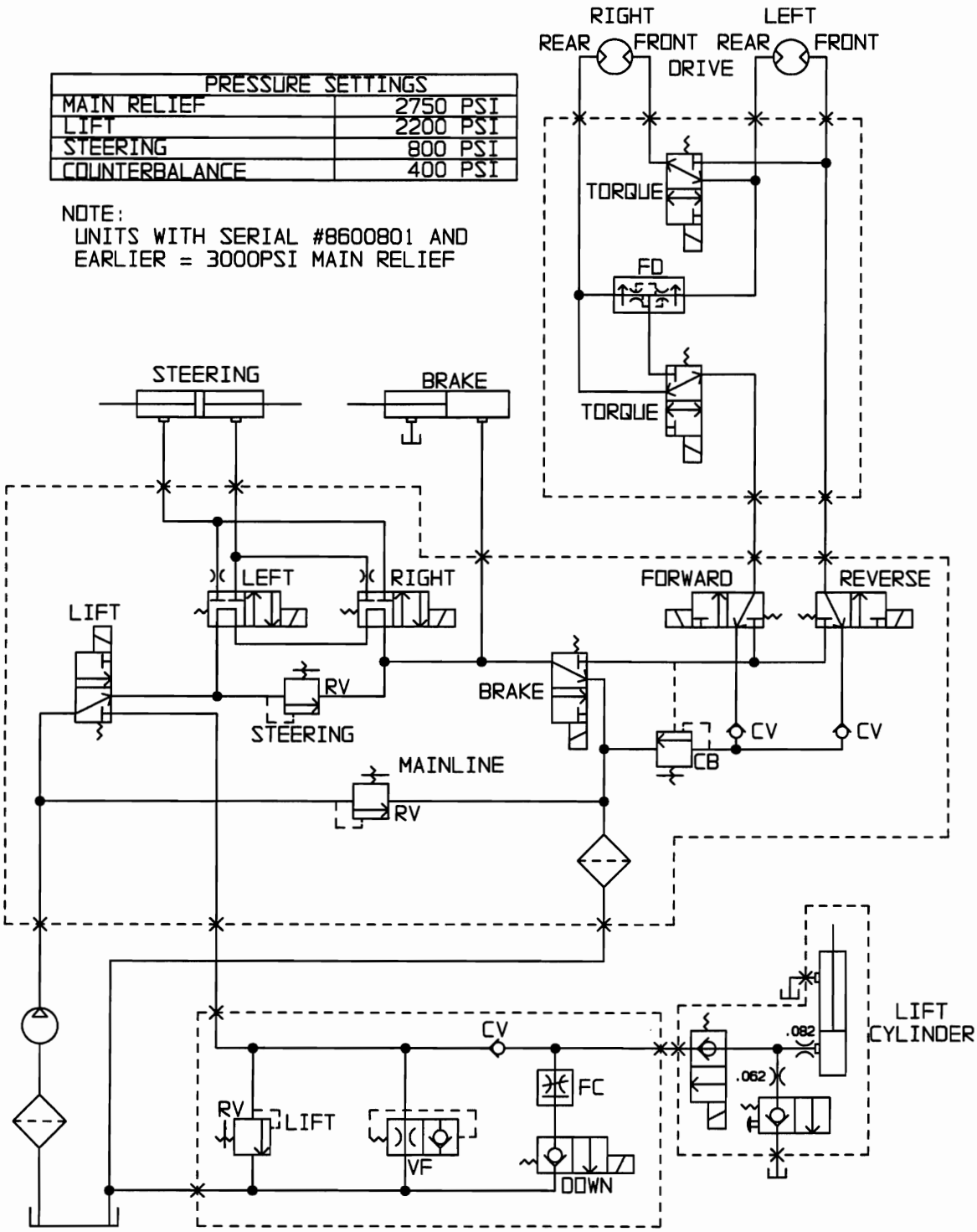


ART475-R1
BM10367

Figure 2M - Hydraulic Schematic 2033 European

PRESSURE SETTINGS	
MAIN RELIEF	2750 PSI
LIFT	2200 PSI
STEERING	800 PSI
COUNTERBALANCE	400 PSI

NOTE:
UNITS WITH SERIAL #8600801 AND EARLIER = 3000PSI MAIN RELIEF



ART477-R2
BM10593

Figure 2N - Hydraulic Schematic 2033RS

PRESSURE SETTINGS	
MAIN RELIEF	2750 PSI
LIFT	2200 PSI
STEERING	800 PSI
COUNTERBALANCE	450 PSI

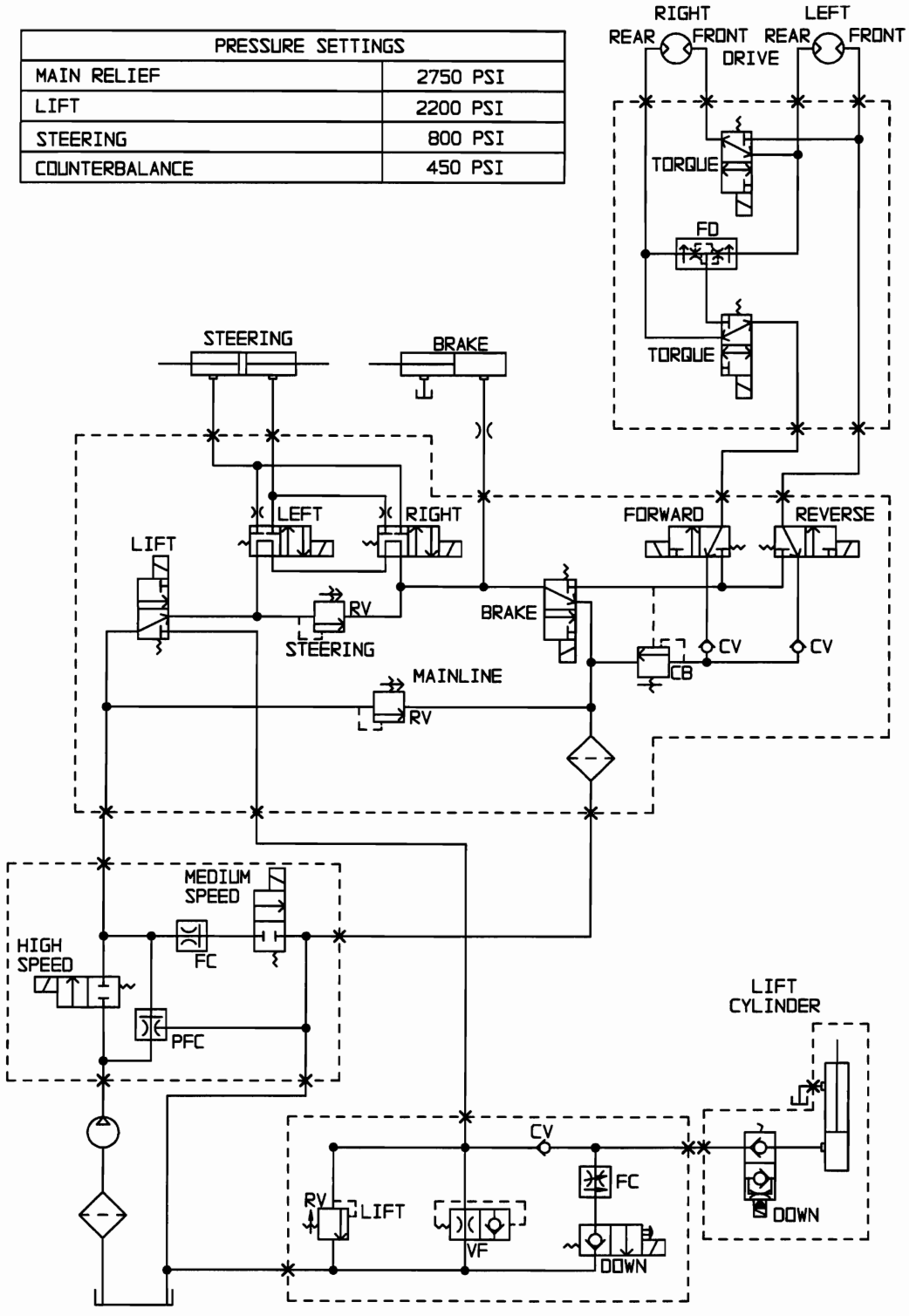
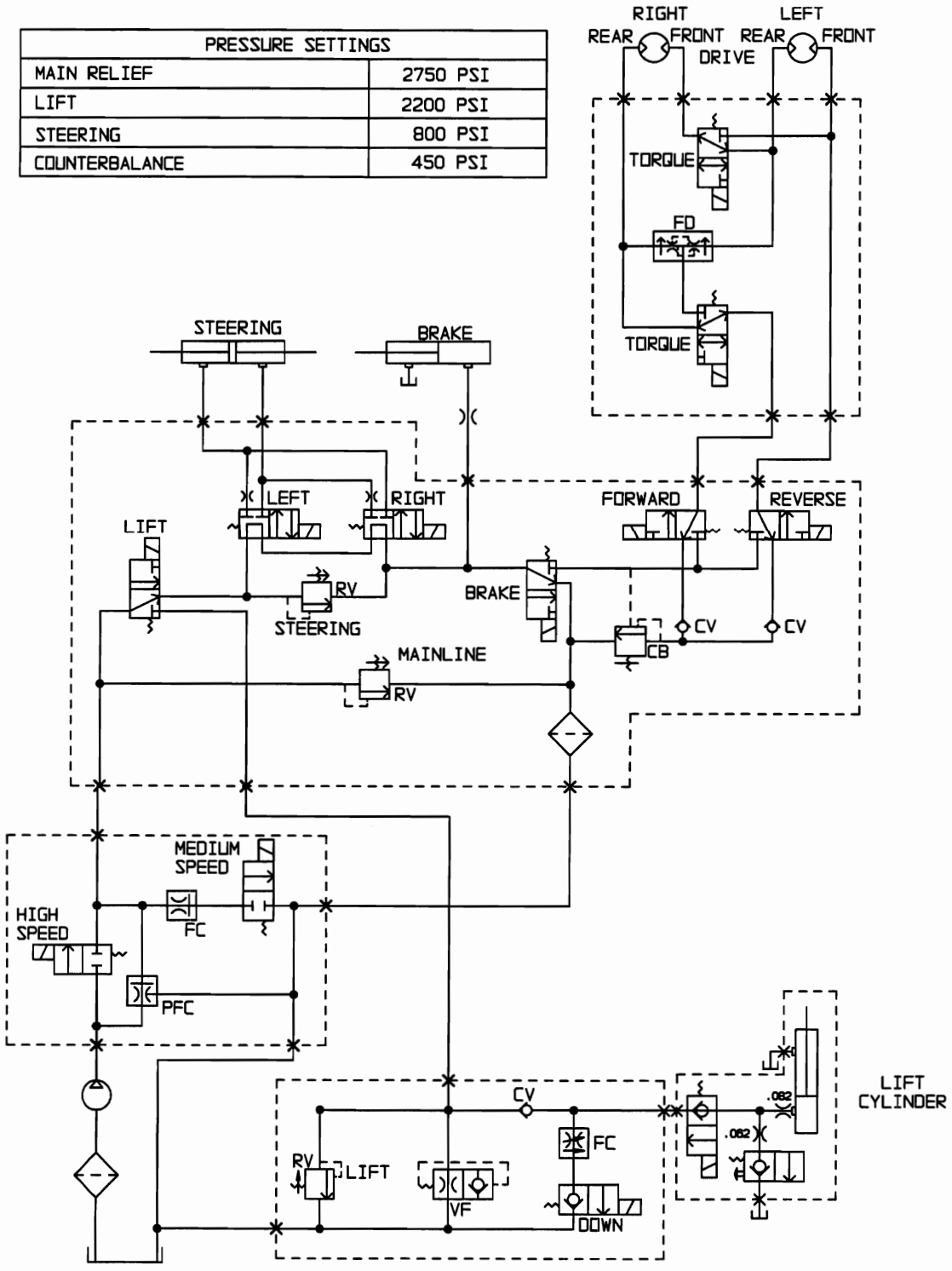


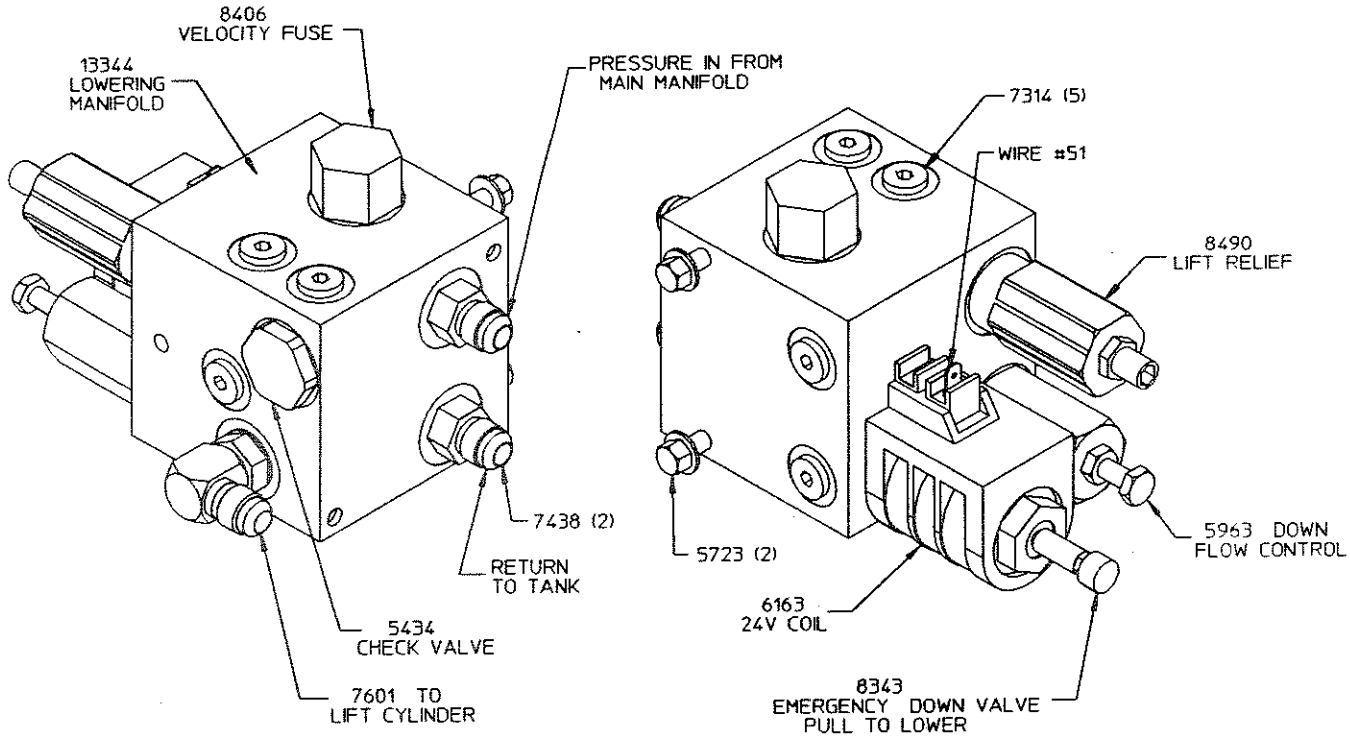
Figure 2O - Hydraulic Schematic 2033RS

PRESSURE SETTINGS	
MAIN RELIEF	2750 PSI
LIFT	2200 PSI
STEERING	800 PSI
COUNTERBALANCE	450 PSI



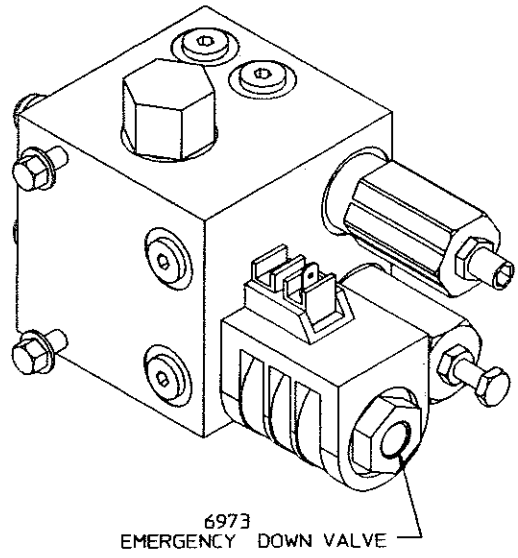
ART517 R1
BM11101
10/22/96

13347 - LOWERING MANIFOLD



STANDARD

13543 - LOWERING MANIFOLD



MANIFOLD ASS'Y IS IDENTICAL TO 13347
EXCEPT FOR EMERGENCY DOWN VALVE.

EUROPEAN

ART327
BM4884

Figure 8-7. 2033/2033RS Lowering Manifold

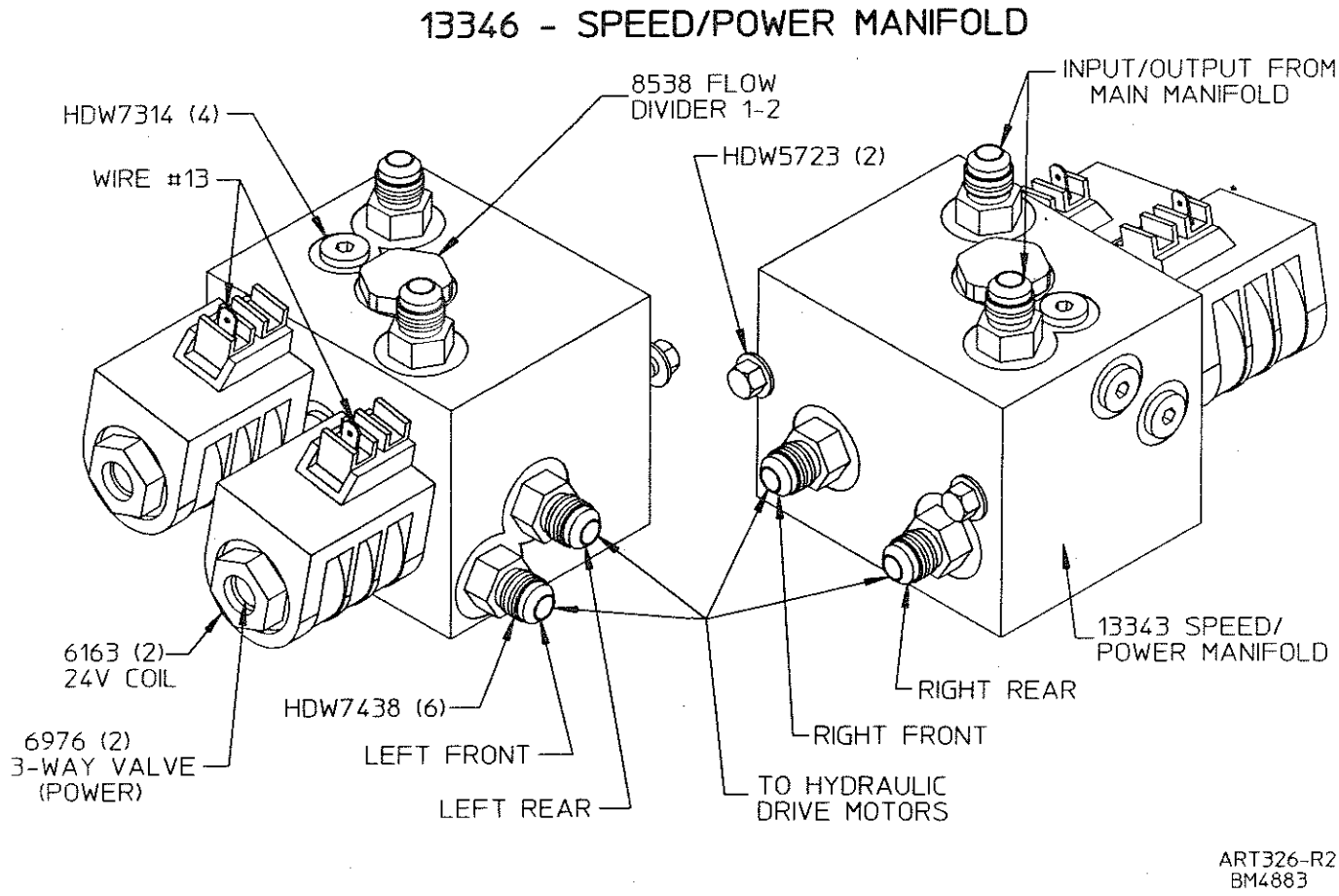
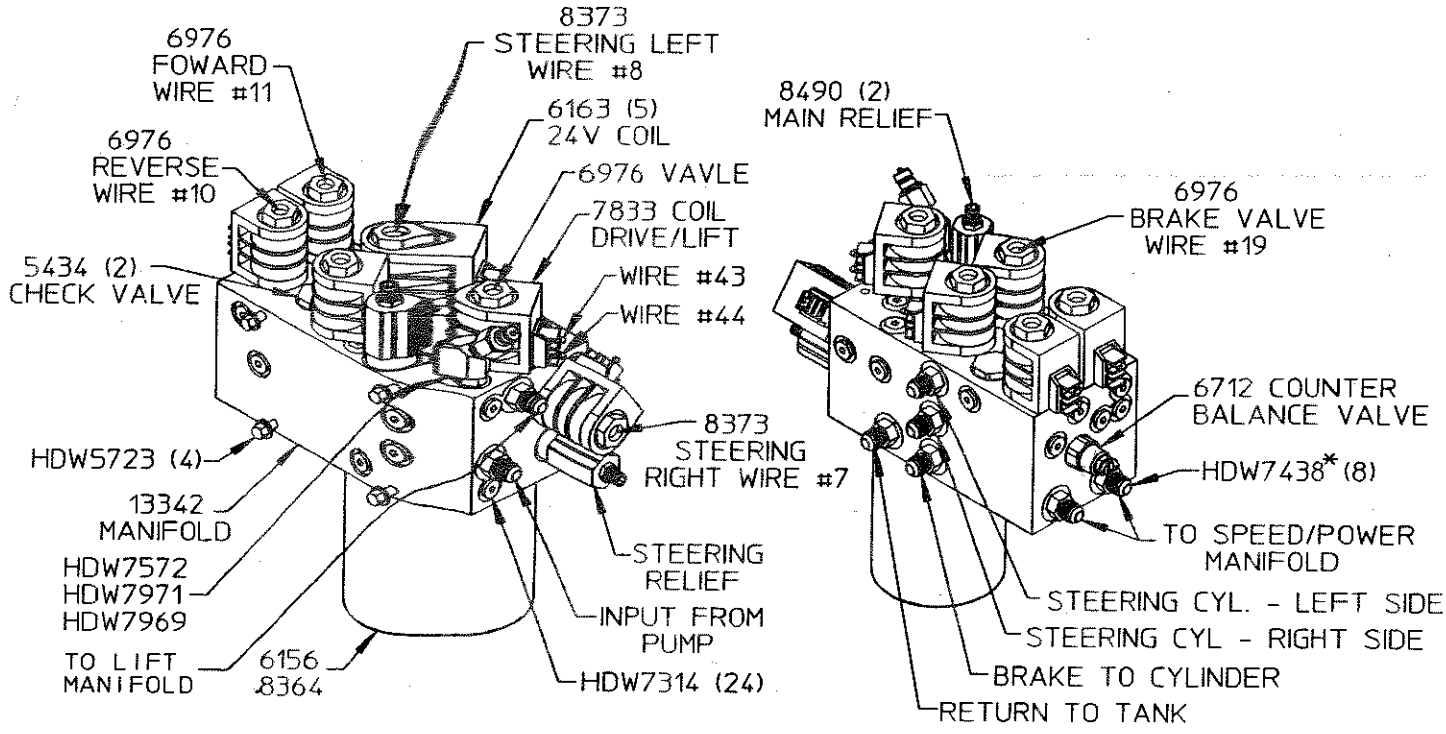


Figure 8-6. 2033/2033RS Speed/Power Manifold

13345 - MAIN MANIFOLD



* SERIAL NUMBER 8601653 - 8601796 USE SPECIAL ORIFICE FITTING P/N ~~13685~~ AT MANIFOLD FOR LEFT STEERING ALL OTHER FITTINGS ARE P/N HDW7438.

HDJ8813 - Fitting
10526 - Orifice

ART328
BM4885

Figure 8-4. 2033 Main Hydraulic Manifold

13648-2033RS SPEED MANIFOLD

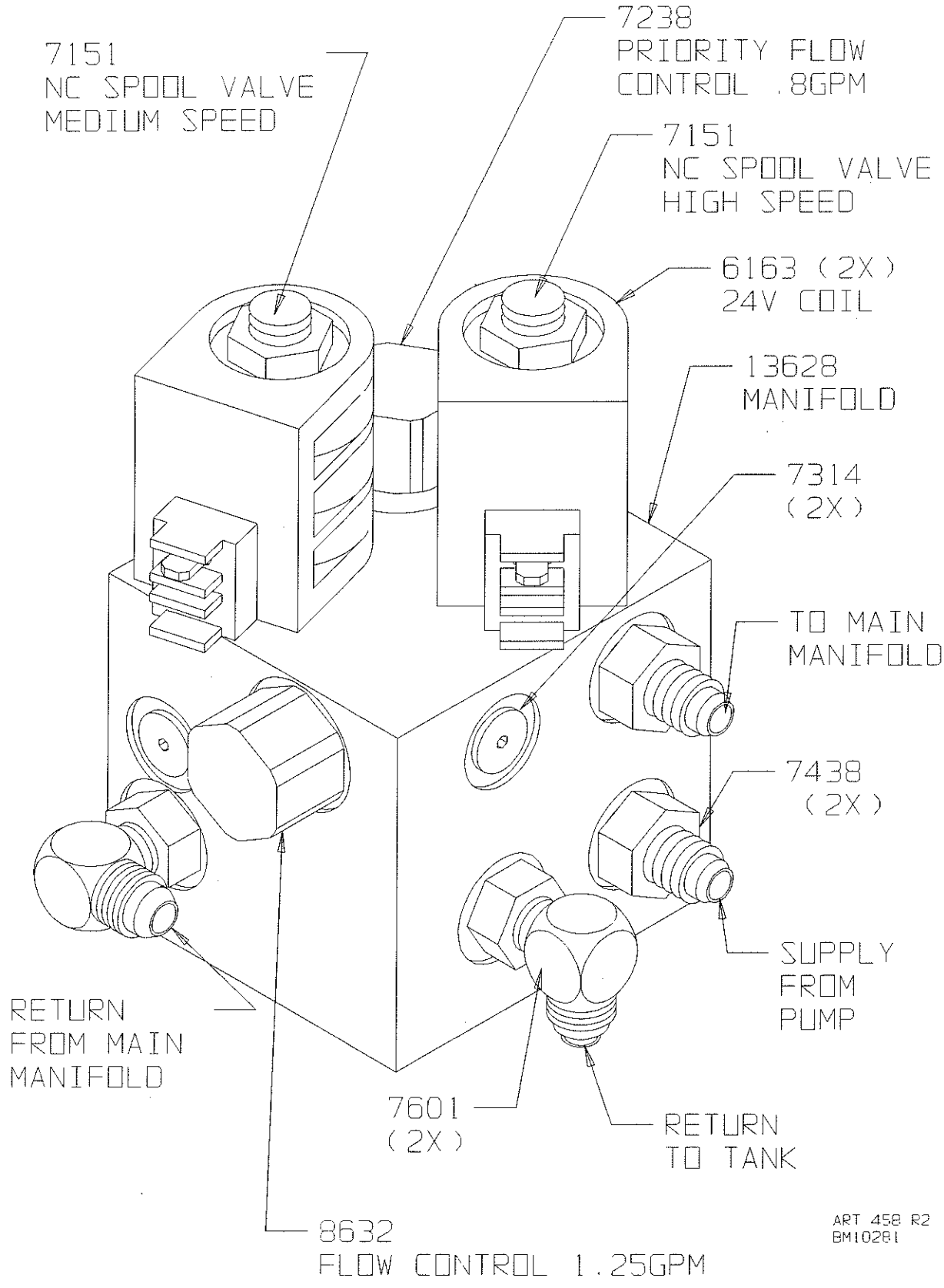


Figure 8-8. 2033RS Speed Manifold

DIODE BOARD

The diode board is located inside the lower control box.

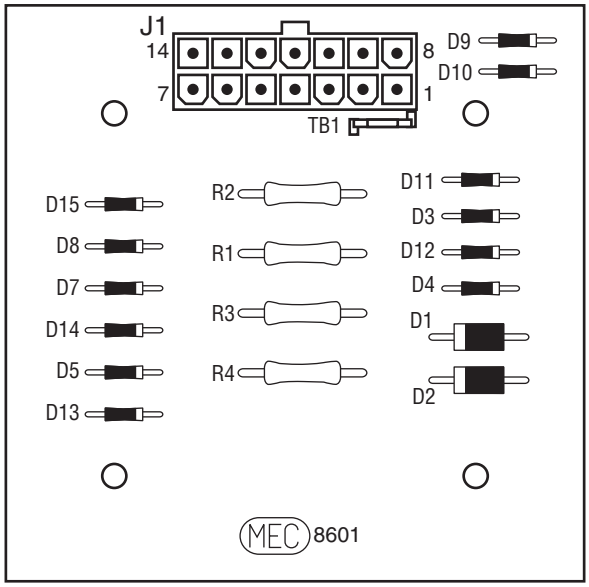


ILLUSTRATION No.
ART_2181

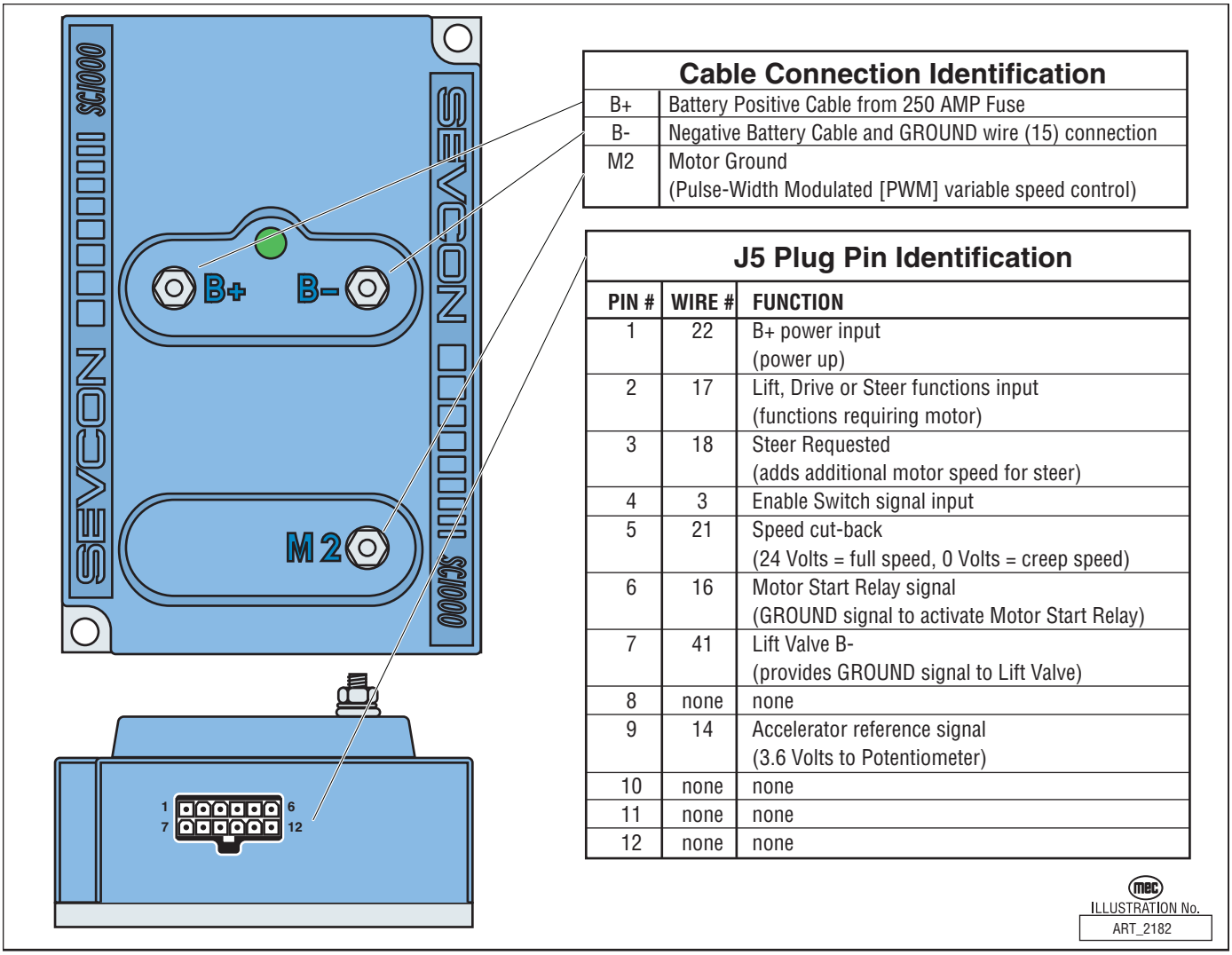
J1 Plug Pin Identification

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)

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.



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)

J5 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	**No power-up** • No power to pin # 1 • No ground to B- post • LED failure or internal controller fault
2 Flashes	**Procedure fault.** • 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	**Motor circuit low.** Set with unit at rest and is the result of the voltage at M-2 dropping to approximately 4 volts or lower. Possible causes: • Short to ground in the motor circuit between the motor contactor and the M-2 terminal
4 Flashes	**Motor circuit high**. Set with the unit at rest and is the result of the voltage at M-2 terminal rising above 21 volts. Possible causes: • Motor contactor points are welded shut
5 Flashes	**Motor contactor circuit open**. Set when a function is requested but no current can flow through the motor circuit to the M-2 terminal. Possible causes: • Blown 200 amp fuse • Malfunctioning motor contactor • Worn motor brushes • Incomplete circuit to the Sevcon pin #6 If the motor and contactor circuits are diagnosed as working properly: • Sevcon internal fault

continued...

LED READING	DIAGNOSIS
6 Flashes	**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. **Measure voltage at terminals 14 and 15 on the platform terminal strip or at the potentiometer plug connection.** • 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	**Battery voltage fault.** • This includes battery voltage below 12 volts or above 45 volts as measured on pin #1 • This code will disable all functions
8 Flashes	**Thermal cutback.** • Sevcon internal temperatures above 176 degrees F • Will limit motor speed in comparison with over temperature • Resets when cooled
9 Flashes	**Battery voltage at or below 18 volts** • As measured on pin #1 • This code will interrupt or prevent lift function but will allow drive and steer functions When lift is interrupted due to a 9 flash, the electric motor will still run.

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** • 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** • 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** • 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**. • 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**. • Speed cut-back is the elevated drive speed

FUNCTION	VOLTAGE READING
PIN 6 – WIRE 16	
Motor Start Relay ground signal	Idle: **24 V DC** When function requested: **0 V DC** • 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	**0 volts** No ground presence until lift is requested • 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)	From **3.5 V DC** with joystick in the neutral to **0 V DC** at full stroke • 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	Full battery voltage • No real diagnostic value
POST B–	
Battery positive cable from 200 amp fuse	Battery ground cable connection Ground path for motor operation • 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	Idle: **12 V DC – 13 V DC** During operation, between **5 V DC & 24 V DC** • 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