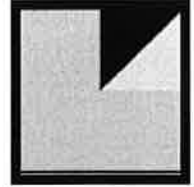




SERCO

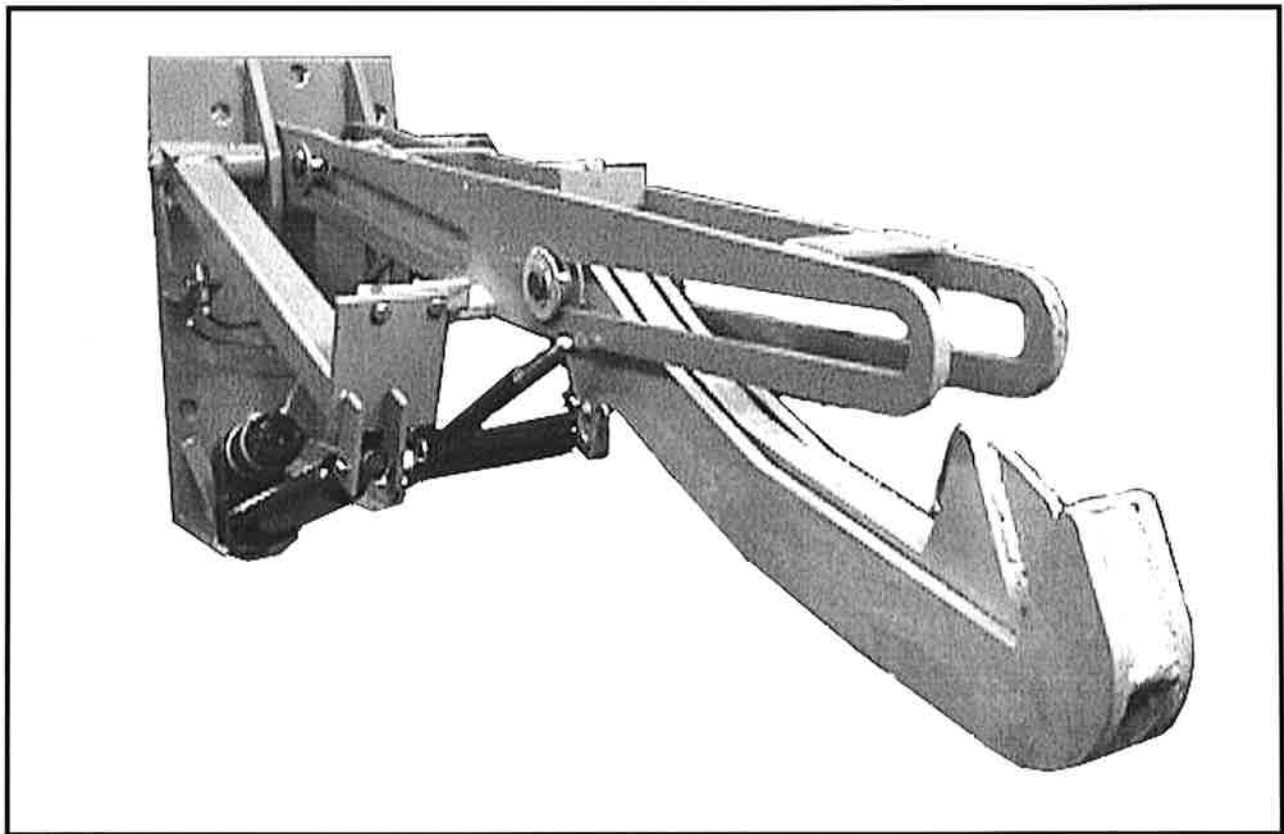
A United Dominion Company



Vehicle Restraints

Safety Loc Series™

SLP 2000



User's Manual

Operations, Maintenance, Parts

SercO Part No. 824-137A

Troubleshooting Guide, continued

Use the Troubleshooting Guide if ever the vehicle restraint fails to perform properly. Find the condition that most closely matches your situation, and make the recommended adjustments.

Problem	Possible Cause	Solution
1 a. Restraint does not operate. No inside lights or PLC LED lights.	a) No power to control panel. b) Circuit breaker tripped.	a) Check for 120 v at terminal RL b) Reset circuit breaker.
1 b. Restraint does not operate. No inside lights. Some PLC LED output lights on.	a) F2 Fuse faulty. b) Transformer faulty.	a) Check for outside light "short", and replace fuse F2 if required. b) Check for 24 VAC across secondary terminals. Replace if faulty.
1 c. Restraint does not operate. No inside lights. Some PLC LED input lights on. No PLC LED output lights on.	a) Memory Cartridge faulty.	a) Replace cartridge. CAUTION: Turn Control Panel "OFF" before removing or inserting the cartridge.
2 a. Restraint hooks will not extend or lower. Circuit breaker trips continually.	a) Circuit breaker faulty. b) Rectifier faulty.	Disconnect red 24 VAC wire to rectifier and reset breaker. a) If breaker trips, check for "short" in 24 VAC wiring, or replace breaker. b) If breaker does not trip, replace rectifier and check for "short" in 24 VDC wiring to restraint.
2 b. All inside lights and PLC LED indicator lights correct. Relays CR, M1 & M2 do not switch.	a) Relay or wiring faulty. b) PLC faulty.	Check for voltage at PLC terminal output 5 when LED 5 is on, terminal output 6 when LED 6 is on. a) If voltage is present, check wiring or replace relay. b) If no voltage, replace PLC.
2 c. All lights and PLC LED indicator lights correct. Relays CR, M1 & M2 switch.	a) Rectifier faulty. b) Wiring faulty. c) Motor faulty.	Check for 25 VDC across terminals RT1 and RT2 when relay M1 or M2 is switched. Check for 25 VDC across terminals RT3 and RT4 when relay CR is switched. a) If no voltage, test rectifier. Replace if required. b) If voltage is present, check wiring to restraint. c) If voltage present at motor, replace appropriate actuator.

Troubleshooting Guide, continued

Use the Troubleshooting Guide if ever the vehicle restraint fails to perform properly. Find the condition that most closely matches your situation, and make the recommended adjustments.

Problem	Possible Cause	Solution
3. Restraint hook will not raise or retract properly. Restraint fully lowered with hooks extended. Input 4 PLC LED on. Inside red light on and inside amber light flashing.	a) Secondary hook depressed.	a) Check secondary hook counter balance adjustment and adjust LS4 switch if required.
4. Restraint extends and makes ratcheting sound. Inside red light on and inside amber light flashing.	a) Restraint obstructed preventing extension. b) No signal from proximity switch LS6, causing clutch to skip.	a) Check for obstruction preventing restraint from extending. b) Check if PLC LED indicator light 8 is on when LS6 is switched. Check if LED on LS6 is indicating. Check wiring to LS6 also to terminal 8 on PLC. Adjust LS6 if required.
5. Restraint fully lowers with hooks extended as soon as it reaches the raised position.	a) No signal from proximity switch LS4.	a) Check if PLC LED indicator light input 4 is on when pivoting hook is depressed. Check wiring to LS4 and adjust as required.
6. Restraint raises, makes ratcheting sound, then restores.	a) No signal from proximity switch LS2, causes clutch to skip.	a) Check if PLC LED indicator light input 2 is on when LS2 is switched. Check if LS2 LED is on. Check wiring to LS2 and to terminal 2 on PLC. Adjust LS2 if required.
7. Restraint raised. Inside red light on and inside amber light flashing.	a) Proximity switch LS1 is stuck on. b) Wiring is faulty.	a) Check if LED's on LS1 & LS2 are on. Adjust sensors if necessary. b) Check wires for "shorts".
8. Restraint lowers and makes ratcheting sound. Inside red light on and inside amber light flashing.	a) Obstruction prevents lowering. b) No signal from proximity switch LS1.	a) Check for obstruction preventing restraint from lowering. b) Check if the LED on LS1 indicates. Check wiring to LS1 and PLC terminal 1. Adjust LS1 if necessary.

Troubleshooting Guide, continued

Use the Troubleshooting Guide if ever the vehicle restraint fails to perform properly. Find the condition that most closely matches your situation, and make the recommended adjustments.

Problem	Possible Cause	Solution
9. Restraint stops: too close to ground level. too far from ground level.	a) Proximity switch LS1 indicates too late. b) Proximity switch LS1 indicates too soon.	a) Adjust proximity switch LS1 as required. b) Adjust proximity switch LS1 as required.
10. Restraint retracts and makes ratcheting sound. Inside red light on and amber light flashing.	a) Obstruction prevents retracting. b) No signal from proximity switch LS5.	a) Check for obstruction preventing restraint from retracting. b) Check if the LED on LS5 indicates. Check wiring to LS5 and PLC terminal 7 and adjust LS5 if required.

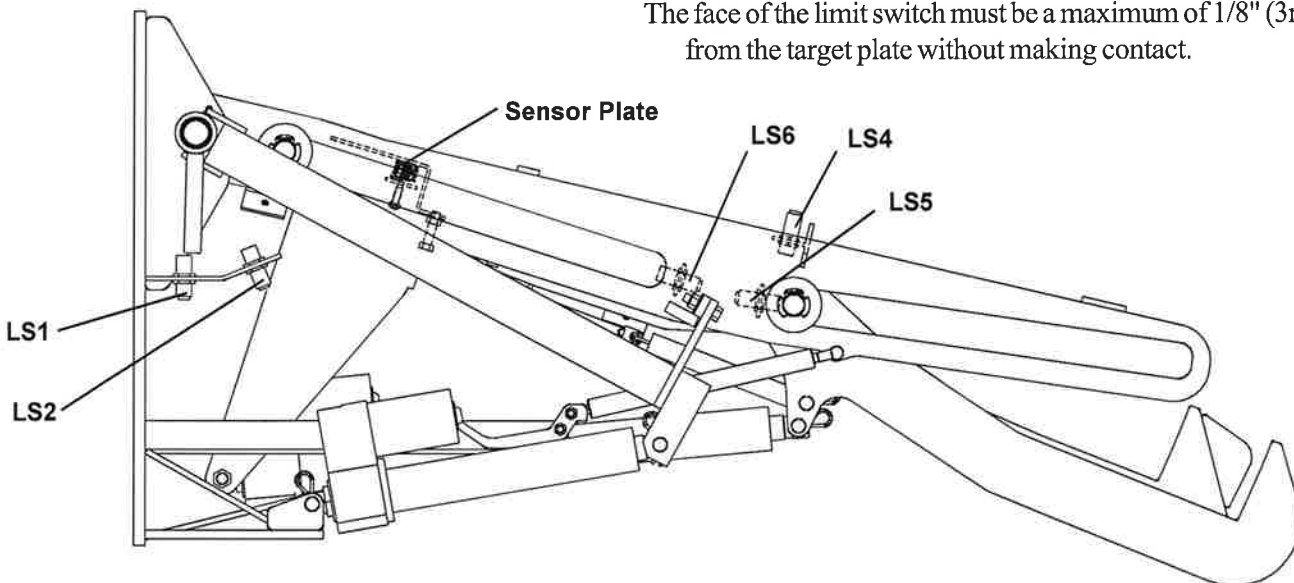
Adjustments

Use these instructions to adjust the vehicle restraint.

Limit Switch Locations

Five limit switches are used to sense the various positions of the vehicle restraint. The switches are solid state proximity switches which close when they sense the presence of a conductive material. The locations of these switches are shown below. The switches are located within slotted holes for variable positioning. Adjust the position of the limit switches using two 15/16" (24mm) open end wrenches to loosen the holding nuts. Then slide the limit switch towards the front or back of the slot and gently tighten the nuts to 11 ft/lbs (15 Nm) to secure the switch.

The face of the limit switch must be a maximum of 1/8" (3mm) from the target plate without making contact.



Adjustments, continued

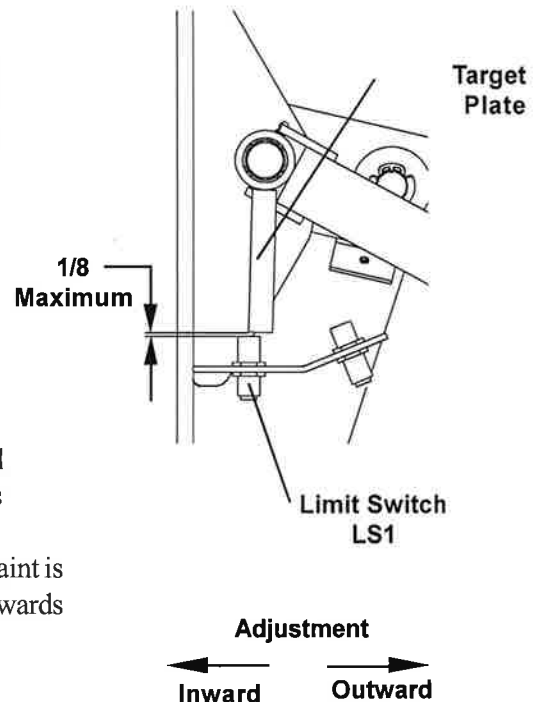
Use these instructions to adjust the vehicle restraint.

Restraint Lowered Switch - LS1

Limit switch LS1 controls the lowered position of the restraining hook by stopping the motor when the restraint is lowered. The correct stored position is when the hook bottom is 1-3 inches above grade level. To adjust limit switch LS1:

- 1.) Raise and extend the restraint and turn the power OFF to the control panel.
- 2.) Loosen nuts holding LS1.
- 3.) Move limit switch inward in the slot to lower the stored position.
- 4.) Move limit switch outward in the slot to raise the stored position.
- 5.) Tighten nuts.
- 6.) Turn the power ON to the control panel, and the restraint will automatically lower. If the stored position is not correct, repeat steps 1 thru 6.

If the actuator clutch slips and makes a ratcheting sound when the restraint is lowered, the limit switch LS1 is not closing. Move the switch slightly towards the target plate and check the operation again.

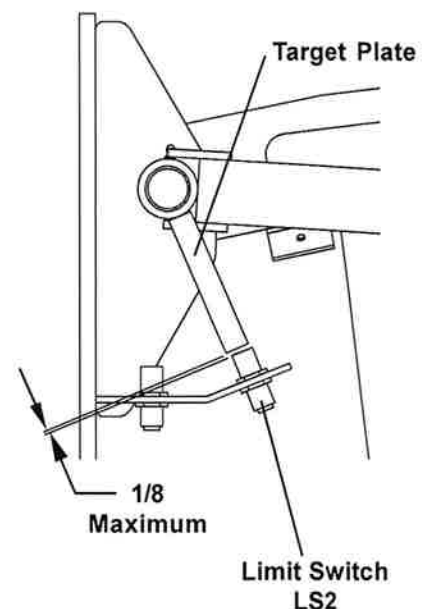


Restraint Raised Switch - LS2

Limit switch LS2 shuts off the motor when the mechanism is fully raised, and controls the ability of the restraint to "float". To check the proper setting, raise the restraint but stop it below the full raised position by pressing on the pivoting hook to activate the sensor plate. When the motor has stopped, push the restraining mechanism down as far as it will travel. The switch is correctly positioned when the bottom of the hook is less than 9" off grade level. To adjust the limit switch LS2:

- 1.) Lower the restraint.
- 2.) Loosen nuts holding LS2.
- 3.) Move limit switch outward in the slot to increase the distance from grade level to bottom of hook.
- 4.) Move limit switch inward in the slot to decrease the distance from grade level to bottom of hook.
- 5.) Tighten nuts.
- 6.) Raise the restraint and check the setting. Repeat steps 1 thru 6 if required.

If the actuator clutch slips and makes a ratcheting sound when the restraint is raised, the limit switch LS2 is not closing. Slide the switch towards the target plate slightly and check the operation again.



Adjustments, continued

Use these instructions to adjust the vehicle restraint.

ICC Bar Contact Switch - LS4

Limit switch LS4 senses when the restraining hook has contacted an ICC bar. The sensor plate is held in place and adjusted by hex nut "A". Sensitivity is adjusted by adjusting bolt "B". The proper setting of LS4 is when the flashing amber light turns OFF when the pivoting hook is depressed 1/16". All adjustments must be made with the hooks raised and extended.

- 1.) Raise and extend the hooks and press down on the secondary hook to activate the sensor plate before the motor stops. The restraint will remain raised.
- 2.) Check the counterbalance spring tension by depressing and then releasing the secondary hook. The secondary hook must contact the stop plate with a positive upward force. Tighten adjusting nut "C" to increase tension - initial position should be 2 1/4" from the end of the threaded rod. (See Fig. 1)
- 3.) Sensor plate and LS4 adjustment:
 - a) Tighten hex nut "A" until it is flush with the end of the bolt. (See Fig. 2)
 - b) Depress the secondary hook and hold in this position. Move LS4 downwards until the face is 1/32" away from the sensor plate surface.
 - c) Release the secondary hook and tighten the LS4 lock nuts.
 - d) Adjust ICC bar sensitivity with adjusting bolt "B". (Fig.3) Note: the actual bolt position will vary. The proper setting is when the flashing amber light on the control panel turns OFF when the secondary hook is depressed 1/16". To increase sensitivity, loosen (turn CW) adjusting bolt "B". To decrease sensitivity, tighten (turn CCW) adjusting bolt "B".

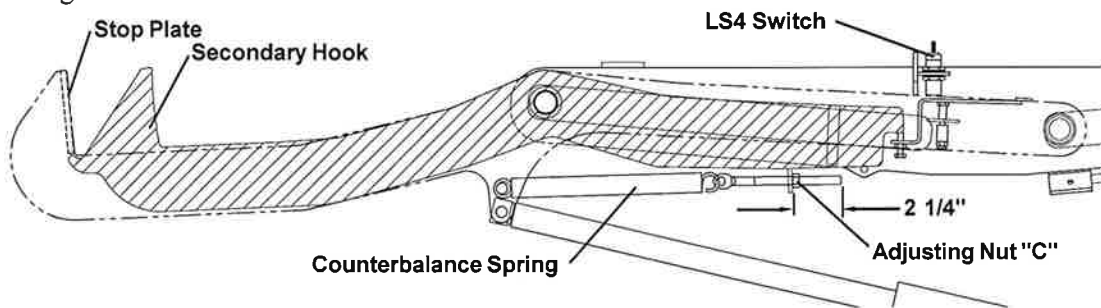


Fig 1. Counterbalance Spring Adjustment

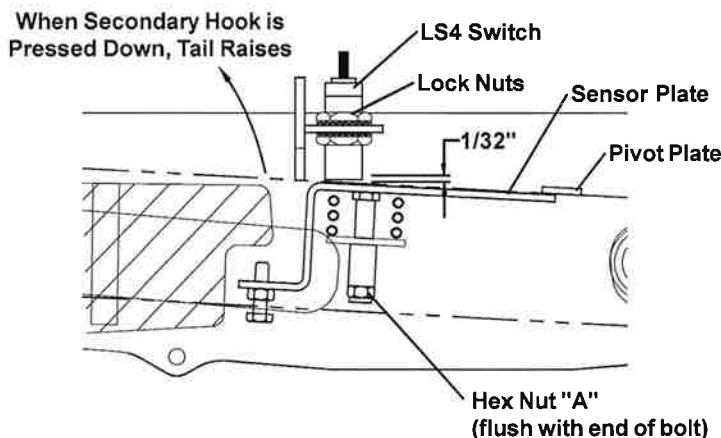


Fig 2. Sensor Plate Adjustment

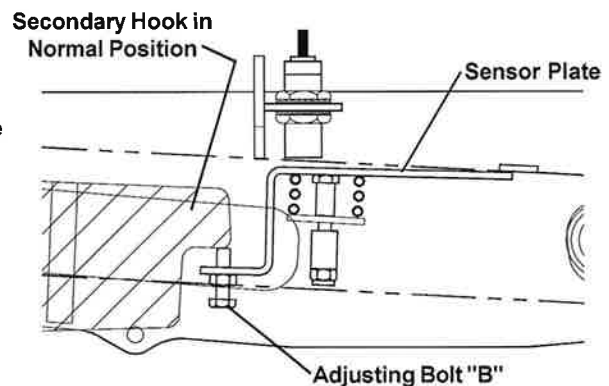


Fig 3. LS4 Adjustments

Adjustments, continued

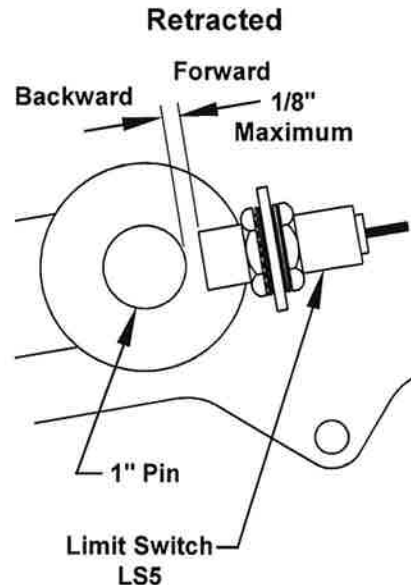
Use these instructions to adjust the vehicle restraint.

Restraint Retracted Switch - LS5

Limit switch LS5 shuts off the motor when the restraint is fully retracted. The switch is correctly positioned when the 1" diameter pin is within 1/8" from the switch face. To adjust limit switch LS5:

- 1.) Lower the restraint and ensure that the hooks are fully retracted.
- 2.) Loosen nuts holding LS5.
- 3.) Move limit switch towards the 1" diameter pin until the switch LED light turns on.
- 4.) Tighten nuts.
- 5.) Check the setting by raising the restraint (**do NOT** engage an ICC bar), and allow it to restore automatically. Repeat steps 1 to 5 if required.

If the actuator clutch slips and makes a ratcheting sound when the restraint is lowered, the limit switch LS5 is not closing. Move the switch towards the pin slightly and check the operation again.



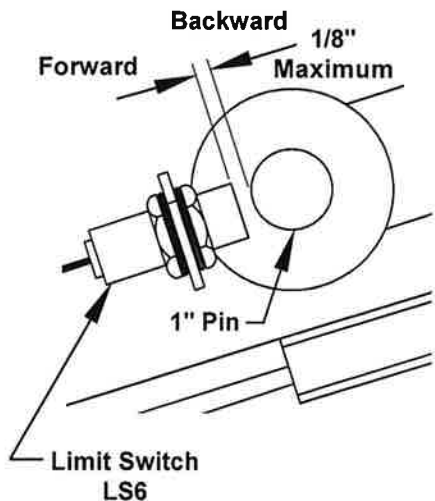
Restraint Extended Switch - LS6

Limit switch LS6 shuts off the motor when the restraint is fully extended. The switch is correctly positioned when the 1" diameter pin is within 1/8" from the switch face. To adjust limit switch LS6:

- 1.) Raise the restraint, ensuring that the hooks are fully extended and depress the pivoting hook. Restraint will stay raised.
- 2.) Loosen nuts holding LS6.
- 3.) Move limit switch towards the 1" diameter pin until the switch LED light turns on.
- 4.) Tighten nuts.
- 5.) Check the setting by raising the restraint and depressing the pivoting hook to keep the restraint raised. Repeat steps 1 thru 5 if required.

If the actuator clutch slips and makes a ratcheting sound when the restraint is raising, the limit switch LS6 is not closing. Move the switch towards the pin slightly and check the operation again.

Shown with Hooks Extended



PLC Diagnostics

Control Panel - PLC LED Display

The VRP-250 vehicle restraint is controlled by a solid-state programmable logic controller (PLC) which reads input signals from the push buttons and limit switches, and closes the appropriate output relays to the motor and to the warning lights.

Input Signals

- 0 - Selector switch ON (not LIGHTS ONLY)
- 1 - Lowered limit switch (LS1 LED indicated)
- 2 - Raised limit switch (LS2 LED indicated)
- 3 - *Not used*
- 4 - ICC bar limit switch (LS4 LED indicated)
- 5 - ENGAGE button depressed
- 6 - RELEASE button depressed
- 7 - Hooks retracted limit switch (LS5 LED indicated)
- 8 - Hooks extended limit switch (LS6 LED indicated)

Output Functions

- 0 - Interlock enabled
- 1 - Inside Red light on
- 2 - Inside Amber light on
- 3 - Inside Green light on
- 4 - Outside Green light on
- 5 - Motor raising
- 6 - Motor lowering
- 7 - Control relay (extend/raise)

The face of the PLC has LED indicator lights which show the status of each input and output.

0	1	2	3	4	5	6	7			MD	OUTPUTS	
0	1	2	3	4	5	6	7	8	9	10	11	INPUTS

The charts on page 15 show the LED indicator lights and traffic lights for both Diagnostic and Operating Modes. If the restraint does not operate correctly, first check the LED indicators on the PLC and match them to these charts.

- If the LED light "MD" is on then refer to **LED Display - Diagnostics Mode**.
- If the LED input lights are correct, but any output lights do not match, consult your dealer.
- If the LED lights are correct, use the **Trouble Shooting Guide** to determine the cause of the problem.

LED Display - Diagnostics Mode

When the "MD" light is on, the PLC is in Diagnostic Mode.

This is caused by an obvious system error that halts the proper function of the vehicle restraint and could be potentially dangerous. When this happens the first four output indicator lights are set to display a coded description of the problem that has occurred. Match the PLC LED display with the chart on page 15 to determine the error that has occurred and check the corresponding equipment for problems.

When the PLC is in Diagnostic Mode the lock will extend, raise, lower or retract only while the ENGAGE or RELEASE button is held and will stop when the button is released. Use this to position the restraint but turn the selector switch to OFF before attempting to make any adjustments.

PLC Diagnostics, continued

LED Display - Diagnostics Mode, continued

Note: Restraint will not engage while in this Mode.

Error Mode Description	Indicator Lights	Traffic Lights																						
Fully raised and lowered limit switches are both on at the same time.	<p style="text-align: center;">0</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td>2</td><td></td><td></td><td></td><td></td><td>8</td><td></td><td></td><td></td></tr> </table>	0										MD	0	1	2					8				<p>When in error mode: Inside Red Inside Amber Flashing Outside Red</p>
0										MD														
0	1	2					8																	
ICC bar sensor is on when the lock is fully lowered.	<p style="text-align: center;">1</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td>8</td><td></td><td></td></tr> </table>		1									MD	0	1			4				8			
	1									MD														
0	1			4				8																
The fully raised limit switch is not being registered 10 seconds after the hook is fully extended.	<p style="text-align: center;">2</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>			2								MD	0	1			4							
		2								MD														
0	1			4																				
The fully lowered limit switch is not being registered 10 seconds after the RELEASE button was pressed.	<p style="text-align: center;">3</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>8</td><td></td><td></td></tr> </table>				3							MD	0								8			
			3							MD														
0								8																
Fully extended and retracted limit switches are both on at the same time.	<p style="text-align: center;">4</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>7</td><td>8</td><td></td><td></td></tr> </table>					4						MD	0	1						7	8			
				4						MD														
0	1						7	8																
ICC bar sensor is on when the hook is retracting.	<p style="text-align: center;">5</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td></td><td></td><td></td><td>5</td><td></td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td>4</td><td></td><td></td><td>7</td><td></td><td></td><td></td></tr> </table>						5					MD	0	1			4			7				
					5					MD														
0	1			4			7																	
The fully extended limit switch is not being registered 10 seconds after the ENGAGE button was pushed.	<p style="text-align: center;">6</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td>6</td><td></td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>							6				MD	0	1										
						6				MD														
0	1																							
The fully retracted limit switch is not being registered 10 seconds after fully lowered.	<p style="text-align: center;">7</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>7</td><td></td><td></td><td style="text-align: right;">MD</td></tr> <tr><td>0</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>								7			MD	0	1										
							7			MD														
0	1																							

! WARNING

Keep hands and feet away from the restraint when in Diagnostics mode. Operation may return to automatic as soon as the fault is cleared. Failure to keep clear may cause serious personal injury.

PLC Diagnostics, continued

LED Display - Operating Mode

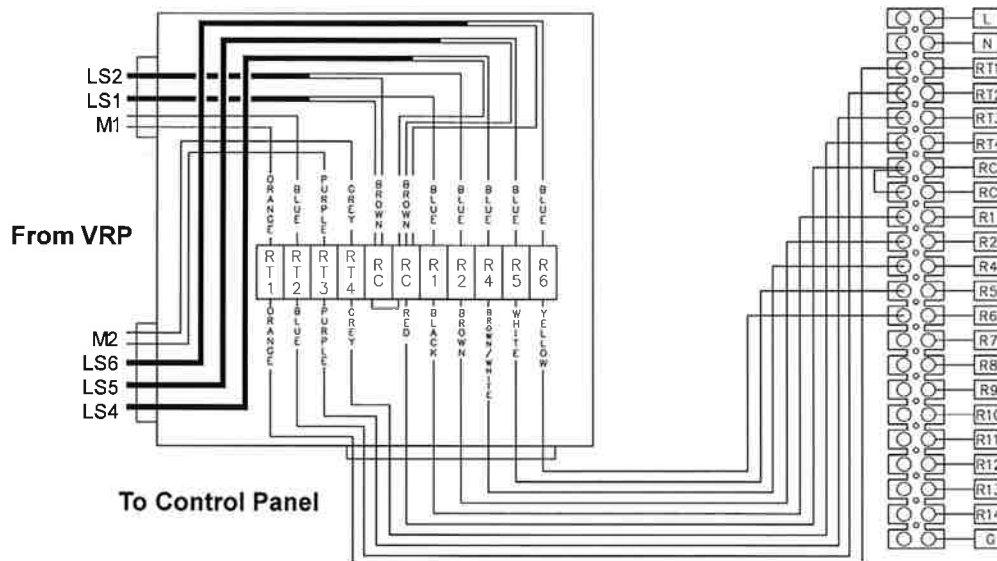
Normal Restraint Positions	Indicator Lights	OUTPUTS INPUTS	Traffic Lights
Restraint stored.		OUTPUTS INPUTS	Inside Red, Outside Green
Restraint raising, fully extended. (before contacting ICC bar)		OUTPUTS INPUTS	Inside Red, Outside Red
Restraint raising, fully extended. (after contacting ICC bar)		OUTPUTS INPUTS	Inside Red, Outside Red
Restraint fully raised and extended. (ICC bar contacted)		OUTPUTS INPUTS	Inside Green, Outside Red
Restraint lowering.		OUTPUTS INPUTS	Inside Red, Outside Red
LIGHTS ONLY. (restraint stored)		OUTPUTS INPUTS	Inside Amber & Green, Outside Red
LIGHTS ONLY. (restraint raised)		OUTPUTS INPUTS	Inside Amber & Green, Outside Red

Electrical Restraint Connections

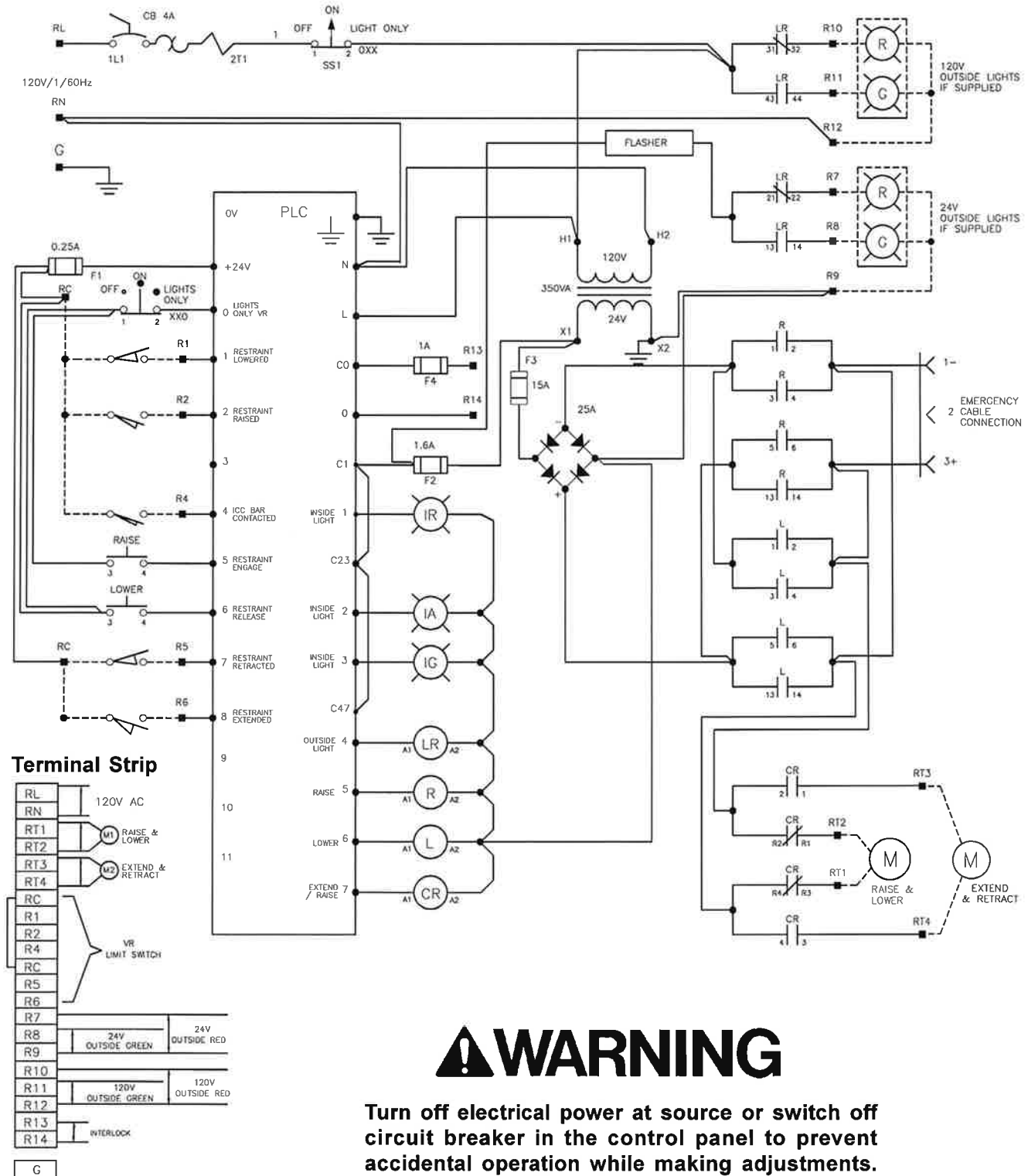
Limit Switches & Linear Actuators

Restraint Connections at Junction Box

Control Panel Connections



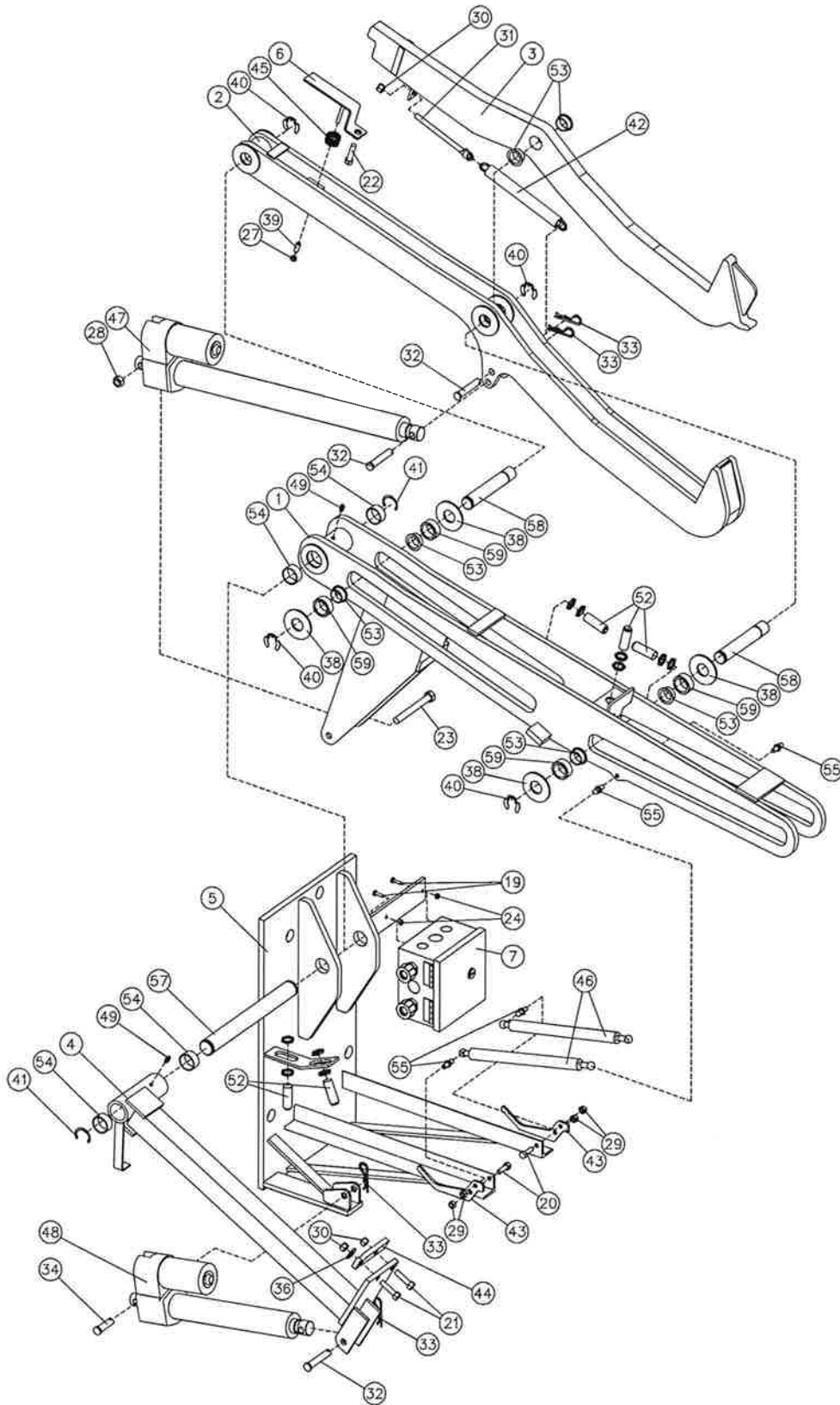
Electrical Schematic - 110 Volt, Single Phase



! WARNING

Turn off electrical power at source or switch off circuit breaker in the control panel to prevent accidental operation while making adjustments.

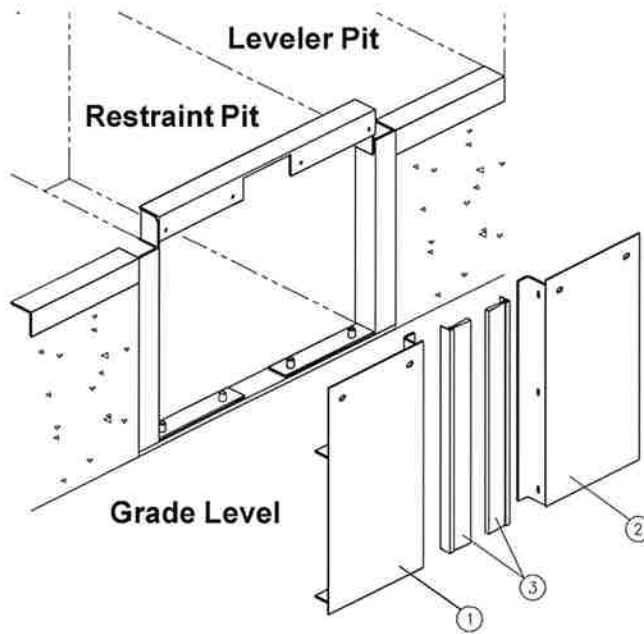
Parts List - Vehicle Restraint



Parts List - Vehicle Restraint, continued

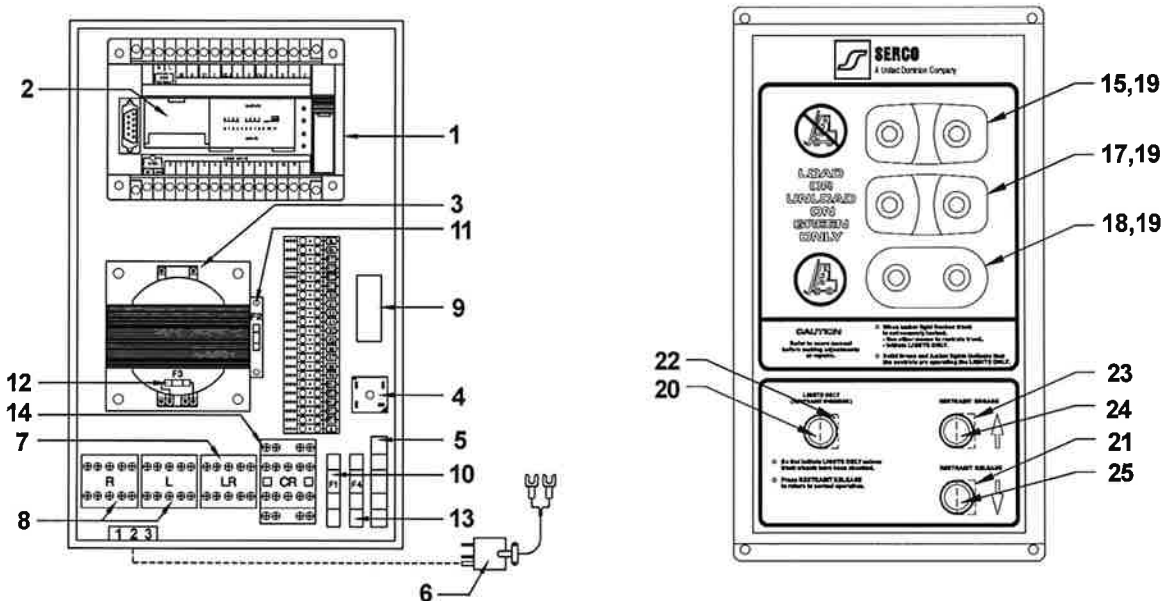
Item	Quantity	Part Description	Part Number
1	1	Main Link Assembly	8-9979
2	1	Primary Hook Assembly	8-9980
3	1	Secondary Hook Assembly	8-9981
4	1	Float Bar Assembly	8-9982
5	1	Back Plate Assembly	8-9983
6	1	LS4 Contact Switch Assembly	8-9984
7	1	Junction Box Assembly	9-9015
19	2	Hex Bolt #10-32 x 3/4 Long	211-824
20	2	Hex Bolt Ø5/16-18 x 1 Long	212-054
21	2	Hex Bolt Ø3/8-16 x 1 1/2 Long	212-105
22	2	Hex Bolt Ø3/8-16 x 1 3/4 Long	212-106
23	1	Hex Bolt Ø1/2-13 x 4 1/2 Long	212-231
24	2	Lock Nut #10-32	214-123
25	2	Hex Nut Ø3/8-16	214-201
26	1	Hex Nut Ø5/8-11	214-282
27	1	Lock Nut Ø1/4-20	214-502
28	1	Lock Nut Ø1/2-13	214-505
29	4	Lock Nut/Washer Ø5/16-18	214-523
30	3	Nylock Nut Ø3/8-16	214-538
31	1	Link Rod	216-257
32	3	Clevis Pin Ø1/2 x 2 3/4	231-502
33	4	Hitch Pin	231-503
34	1	Clevis Pin Ø1/2 x 1 25/32	231-505
35	2	Washer Ø1/4 Nom.	234-081
36	1	Washer Ø3/8 Nom.	234-101
38	4	Washer Ø1 Nom.	234-161
39	1	Spacer Ø 1/4 x 3/4 Long	234-830
40	4	Retaining Clip Ø1	234-114
41	2	Retaining Clip Ø1 1/4	236-123
42	1	Extension Spring	333-021
43	2	Spring Release Lever	328-580
44	1	Shear Plate	328-582
45	1	Comp. Spring C0360-029-1750	332-068
46	2	Gas Spring	338-008
47	1	Linear Actuator 18" Stroke	341-006
48	1	Linear Actuator 8" Stroke	341-027
49	2	Grease Fitting	417-113
52	5	DC Proximity Switch	625-036
53	6	DU Bushing 16FDU08	821-033
54	4	DU Bushing 20DU10	821-035
55	4	Ball Stud	821-037
57	1	Frame Pin Ø1 1/4	485-0056
58	2	Hook Pin Ø1	485-0129
59	4	Roller	485-0130

Parts List - Vehicle Restraint Pit



Item	Quantity	Part Description	Part Number
1	1	Panel Assembly - Left	8-9987
2	1	Panel Assembly - Right	8-9988
3	2	Brush Weather Seal	152-328

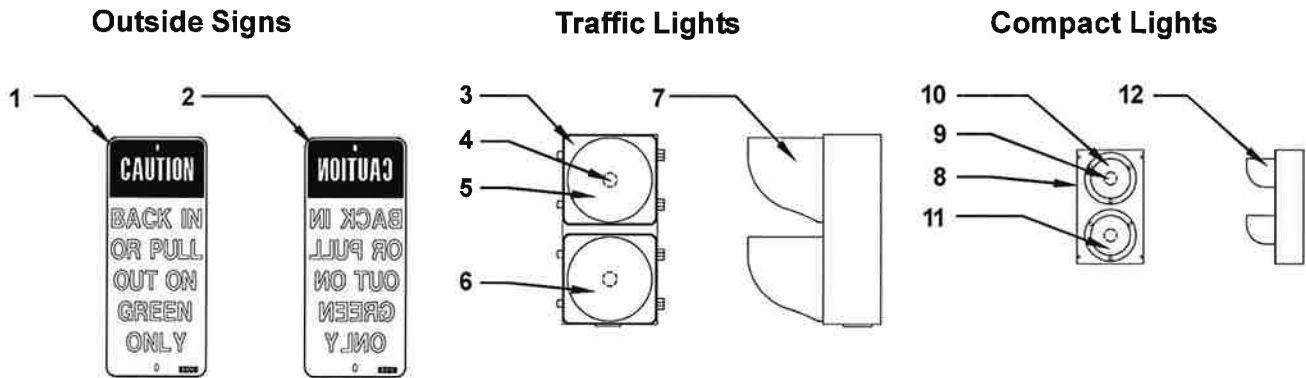
Parts List - Control Panel



Parts List - Control Panel, continued

Item	Quantity	Part Description	Part Number
	1	Complete Control Panel Assembly	629-952
1	1	Programmable Controller (PLC)	637-111
2	1	Memory Cartridge	102-091
3	1	Transformer	622-013
4	1	Rectifier	629-025
5	1	Circuit Breaker	629-024
6	1	Auxiliary Plug & Cable	823-206
7	1	Control Relay	626-020
8	2	Motor Relay (R & L)	629-023
9	1	Flasher	626-022
10	1	Fuse F1 (.25 amp)	-
11	1	Fuse F2 (1.6 amp)	-
12	1	Fuse F3 (20.0 amp)	-
13	1	Fuse F4 (1.0 amp)	-
14	1	Control Relay (CR)	101-800
15	3	Base, Light	823-107
16	1	Lens - Red	823-100
17	1	Lens - Amber	823-102
18	1	Lens - Green	823-101
19	6	Light Bulb - 24V (# 657)	823-098
20	1	Selector Switch	823-076
21	2	Switch Contactor (N/O)	632-129
22	2	Switch Contactor (N/C)	632-134
23	3	Switch Mounting Base	632-106
24	1	Push Button - Green	823-016
25	1	Push Button - Red	832-015

Parts List - Exterior Signs & Lights



Item	Quantity	Part Description	Part Number
1	1	Outside Sign - Normal Lettering	824-005
2	1	Outside Sign - Reverse Lettering	824-006
3	1	Light Assembly - Complete (Traffic Lights)	8-9519
4	2	Light Bulb 120V, 69 Watt	823-072
5	1	Lens - Red	823-043
6	1	Lens - Green	823-044
7	2	Visor	823-042
8	1	Light Assembly - Complete (Compact Lights)	823-103
9	2	Light Bulb 24V (#2233)	823-105
10	1	Lens - Red	823-096
11	1	Lens - Green	823-097
12	2	Visor (Optional)	823-104