SERVICE BULLETIN

PLAINTIFF'S EXHIBIT

MAC-77

FEBRUARY 22, 1978 **No.** Q94 **under** BRAKES

FOR BRANCHES, DISTRIBUTORS AND CUSTOMERS.

CHASSIS AFFECTED ALLENTOWN☑ HAYWARD☐ OAKVILLE☑

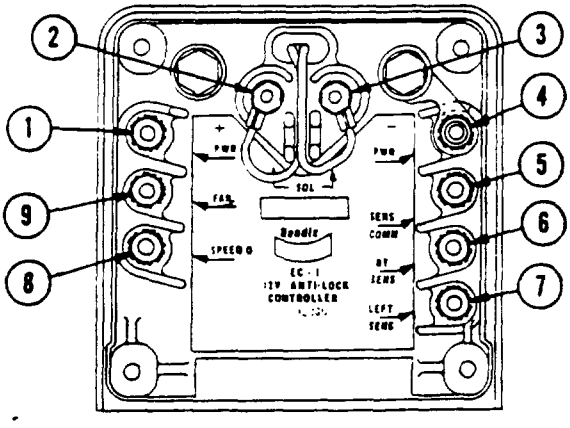
ANTI-WHEEL LOCK SYSTEM
Trouble Shooting Procedure
(Bendix MC-1 and MC-2 Systems)

PURPOSE To provide service personnel with trouble shooting procedures for this new anti-wheel lock system.

RECOMMENDATION Make the information contained in this bulletin available to all who are responsible for brake system service.

INFORMATION The Bendix anti-wheel lock system is similar to others in use on Mack vehicles. It consists of an electronic controller with integral warning unit, that modulates a control valve and a wheel speed sensor system. Two systems are available, MC-1 and MC-2. The MC-1 system utilizes one controller for each axle, whereas the MC-2 system has a single controller to monitor two axles.

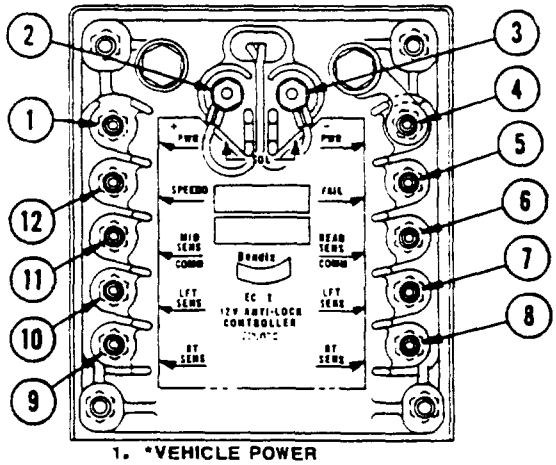
The following trouble shooting guide is offered to facilitate diagnosis and correction of any problems that may develop. See Figure 1 and 2.



1. *VEHICLE POWER
2. SOLENOID
3. SOLENOID
4. *VEHICLE GROUND
5. SENSOR COMMON
6. RIGHT WHEEL SENSOR
7. LEFT WHEEL SENSOR
8. ELECTRONIC SPEEDO (OPT.)
9. INDICATOR LAMP

*REVERSED IN A POSITIVE GROUND SYSTEM

FIGURE 1
EC-1 CONTROLLER TERMINAL CONNECTIONS



1. *VEHICLE POWER
2. SOLENOID
3. SOLENOID
4. *VEHICLE GROUND
5. INDICATOR LAMP
6. LEFT & RIGHT WHEEL SENSOR
7. LEFT WHEEL SENSOR
8. RIGHT WHEEL SENSOR
9. RIGHT WHEEL SENSOR
10. LEFT WHEEL SENSOR
11. LEFT AND RIGHT WHEEL SENSOR
12. ELECTRONIC SPEEDO (OPT.)

*REVERSED IN A POSITIVE GROUND SYSTEM

FIGURE 2
EC-2 CONTROLLER TERMINAL CONNECTIONS

CIRCULATE

- Service Manager
- Shop Foreman
- Night Foreman
- Night Foreman
- Inspector Leadman
- Inspector Leadman
- Inspector Leadman
- Unit Overhaul Room
- Shop Office

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BENDIX ANTI-LOCK BRAKING SYSTEM
MC-1 and MC-2
TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	TEST AND REMEDIAL PROCEDURE
Indicator Lamp Does Not Light	1. Defective Indicator Lamp bulb	1. Replace bulb; retest, if problem not corrected, proceed with probable cause #2.
	2. Bad Ground	*1. Remove controller cover. Inspect controller ground. Connect test lamp to (+ PWR and - PWR) power terminals. Lamp should light. If light does not light, make sure modulator body is properly grounded. Retest, if problem not corrected proceed with probable cause #3.
	3. Broken wire from Indicator Lamp to "FAIL" terminal of controller.	*1. Short the "FAIL" terminal to -PWR terminal, if Indicator light comes on, proceed to step 4. If light does not come on, wire between the fail terminal and Indicator light or wiring between light and vehicle fuse is open (wire broken, poor connection, etc.).
	4. Defective controller	1. While highly unlikely, a defective controller may cause the problem. If source of problem is not discovered elsewhere, replace the controller.
Indicator lamp stays on after 2 seconds.	1. Open or shorted speed sensor or sensor wiring.	1. Inspect sensor wires from controller to sensor for damage (frayed or broken wires etc.). Repair as necessary. Repeat self-check. *2. Remove controller cover. Connect test lamp or voltmeter to +PWR and - PWR terminals. If test lamp does not light or there is less than 9 volts, check fuse and power wires to the controller. *3. Connect a 12-volt test light or volt meter between the terminals listed for the system you are testing. MC-1 from #4 (SOL) to #6 (-PWR) MC-2 from #6 (SOL) to #8 (-PWR) 4. If test lamp lights or voltage is more then 9 volts, proceed to 5, if test lamp fails to light, go to probable cause #4. 5. Test sensors as follows. (Note: This procedure must be followed for all sensors). A. Disconnect sensor wires B. Connect volt/ohmeter leads across wires for one sensor.

* Test with keyswitch on.

(Continued)		C. If ohm reading is between 250 and 10,000 ohms, sensor wiring is o.k. If ohm reading is less than 250, sensor or sensor wiring is shorted. If ohm reading is more than 10,000, sensor or sensor wiring is open. Sensor wiring and/or sensor must be replaced. Repeat for each sensor. D. Attach leads of volt/ohmeter to one sensor lead and chassis. Resistance should be 100,000 ohms or greater. If not sensor or sensor wire is shorted to chassis. Repair/replace as necessary. E. If all sensors and wires check o.k., reconnect all wires. Repeat self-check and proceed to probable cause #2.
	2. Faulty lamp relay (Optional on some negative ground vehicles and all positive ground. If there is no relay proceed to the next probable cause #3).	* 1. Check voltage across relay coil. Voltage must be within two (2) volts of battery voltage. If voltage is not satisfactory wire from relay to the -PWR terminal of controller or the relay ground is defective. Repair or replace as necessary. If the voltage is satisfactory proceed to probable cause #3.
	3. Fail wire shorted to chassis.	* 1. Remove fail wire from FAIL terminal. If the light does not go out, the relay is defective and should be replaced. If the light goes out, the controller is probably defective. Replace wires and repeat self-check. If the light does not go out, replace the controller.
	4. Defective solenoid (Continued Over)	1. Visually inspect solenoid wires for possible open or shorts; repair or replace as necessary. If solenoid wires appear to be o.k. proceed to next step. 2. Remove solenoid wires from solenoid terminals, check solenoid with volt/ohmeter as follows: A. Solenoid resistance should be 3-5 ohms. (If not, replace solenoid). B. Attach one lead of volt/ohmeter to one solenoid wire and one lead of volt/ohmeter to controller case; resistance should be greater than 100,000 ohms. (If not, replace solenoid). If correct, go to probable cause #5.

SYMPTOM	PROBABLE CAUSE	TEST AND REMEDIAL PROCEDURE
(Continued)	5. Defective controller	1. Replace sensor wires and/or solenoid wires and perform "self-check" procedure with ignition switch. If light fails to go out after 2 seconds and no air bursts are heard at solenoid exhaust, controller should be replaced.
Indicator lamp is intermittent	1. Intermittent power	1. Loose connection or defective wiring between controller +PWR terminal and vehicle fuse box. 2. Intermittent or poor ground between controller and chassis 3. Loose connection or shorted wire from fail lamp to "FAIL" terminal of controller.
	2. Lamp relay (optional on some negative ground vehicles and all positive ground).	1. Loose connection or defective wire between controller PWR terminal and lamp relay. Repair as necessary.
	3. Defective lamp relay	1. With 12v across relay the contacts should be open and the indicator lamp off. If different from this, replace relay.
	4. Defective Controller	1. While highly unlikely, a defective controller may cause the problem. If source of problem is not discovered elsewhere, replace controller.