STEERING CONTROL SYSTEM TROUBLESHOOTING GUIDE

This section outlines a strategy that can be used to solve problems in the control system. A common technique used in problem solving is exchanging components. However, a very important element necessary to the timely and successful conclusion of this activity is the correct selection of the malfunctioning component. A thorough understanding of the entire system and an elimination process leading to the malfunctioning component is absolutely necessary before starting the exchange activity.

Reduce the random exchange of components by carefully analyzing the symptoms and then conducting tests to determine which of the elements in the system is likely to be the problem. The technician should use the flow chart below as a guide to locate the problem.

Since it is new, the electronic controller is often the first component targeted for exchange. However, the malfunction of an electronic controller is extremely rare and, therefore, it should be the last component considered for replacement. In fact, the electronic controller has an internal ability to diagnose itself and the connections attached to it. This information can be very helpful in finding the problem area. If the electronic controller is responding to commands and not giving diagnostics that indicate an internal problem, the likelihood that the problem is internal to the electronic controller is remote.

FAULT CODES

When the controller detects a fault condition, it signals the specific fault using the red Status LED. Under normal conditions with no error present, the red LED is off and the yellow LED blinks at a 0.5 Hz rate. If no application code is loaded in the controller, the red LED is off and the yellow LED blinks at a 10 Hz rate. All other errors (those specific to the application) are decoded by observing "blink codes" generated by the red LED.

FAULT CODE CHART

Yellow LED (Mode)	Red LED (Status)	System Status:
10 Hz blink rate	Off	No application loaded
0.5 Hz blink rate	Off	Application loaded and no error
0.5 Hz blink rate	4 bit blink code to describe fault	Application loaded and error

Description of Blink Code Algorithm

If the yellow LED blinks at an unvarying 0.5 Hz rate and the red LED is blinking, the cause of the fault can be decoded from the red LED alone as follows: the red LED will flash a four bit sequence, followed by a pause, followed by the four bit sequence, the pause, and so on. The long flash, symbolized by a "-", lasts approximately one second. The short flash, symbolized by a ".", lasts approximately one-half second. The pause between the four-bit sequence lasts approximately 3.5 seconds. If more than one fault exists, each fault will be displayed in sequence before being repeated.

BLINK CODE TRANSLATION

Fault Code	Flash Bit Sequence	Device at Fault	Cause of Fault	Machine Response
1	_···	Speed pot, unidirectional command Input	Voltage signal is out of range or input is uncalibrated.	No output from the speed pot will cause machine to stop.
2	·_··	Max speed pot, unidirectional command Input	Voltage signal is out of range or input is uncalibrated.	No output from the max speed pot. Machine will stop.
3	_ _··	FNR pot Bi-directional command input	Voltage signal is out of range or input is uncalibrated.	FNR command will return to neutral and machine will stop.
4	··_·	Steer pot Bi-directional command input	Voltage signal is out of range or input is uncalibrated.	Machine will steer straight. at any handle setting.
5	_·_·	FNR Object	RPM below 200, or no RPM at all.	Machine will revert to neutral causing the machine to stop.
7	_ _ _·	Left Valve	Uncalibrated.	Machine will revert to neutral causing the machine to stop.
8	···_	Right Valve	Uncalibrated.	Machine will revert to neutral causing the machine to stop.
9	_··_	Right Valve Forward Coil	Open or Short.	Machine will revert to neutral causing the machine to stop.
10	·_·_	Right Valve Reverse Coil	Open or Short.	Machine will revert to neutral causing the machine to stop.
11	_ _·_	Left Valve Forward Coil	Open or Short.	Machine will revert to neutral causing the machine to stop.
12	··_ _	Left Valve Reverse Coil	Open or Short.	Machine will revert to neutral causing the machine to stop.

"·" = short flash = 0 "_" = long flash = 1

STEERING SYSTEM WIRING

Wiring Guidelines

1. Protect all wires from mechanical abuse. Wire can be run in flexible metal or plastic conduits.
2. Use 85°C wire with abrasion resistant insulation. 105°C wire should be considered near hot surfaces.
3. Use #18 gauge wire or greater. #14 or #16 wire is preferred.
4. Separate high current wires such as solenoids, lights, alternators, or fuel pumps from control wires.
5. Run wires along the inside of, or close to, metal machine frame surfaces where possible. This simulates a shield, which will minimize the effects of EMI/RFI radiation.
6. Do not run the wires near sharp metal corners. Consider running the wire through a grommet when rounding a corner.
7. Do not run wires near hot machine members.

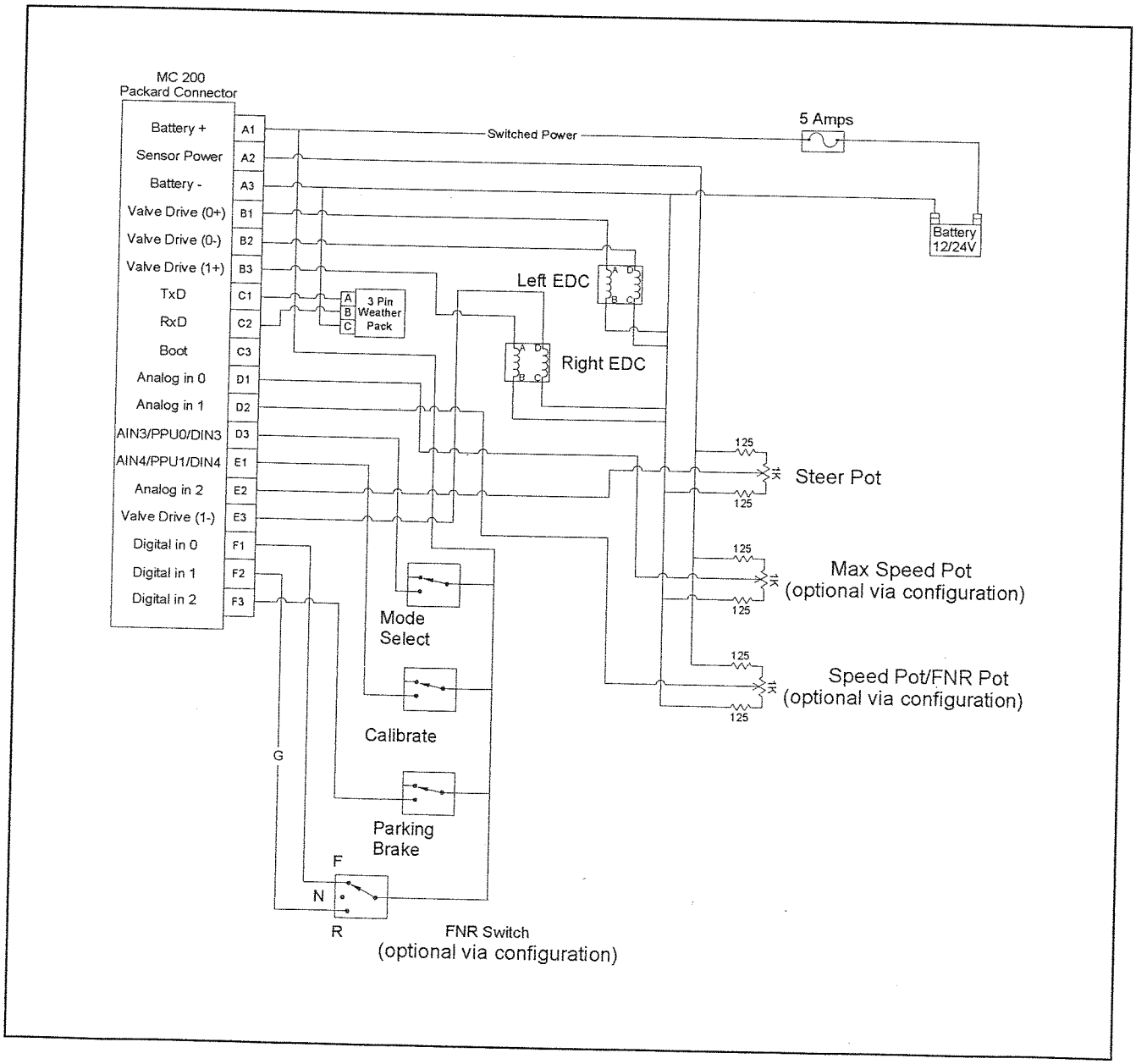

FIGURE 4-19. STEERING WIRING DIAGRAM

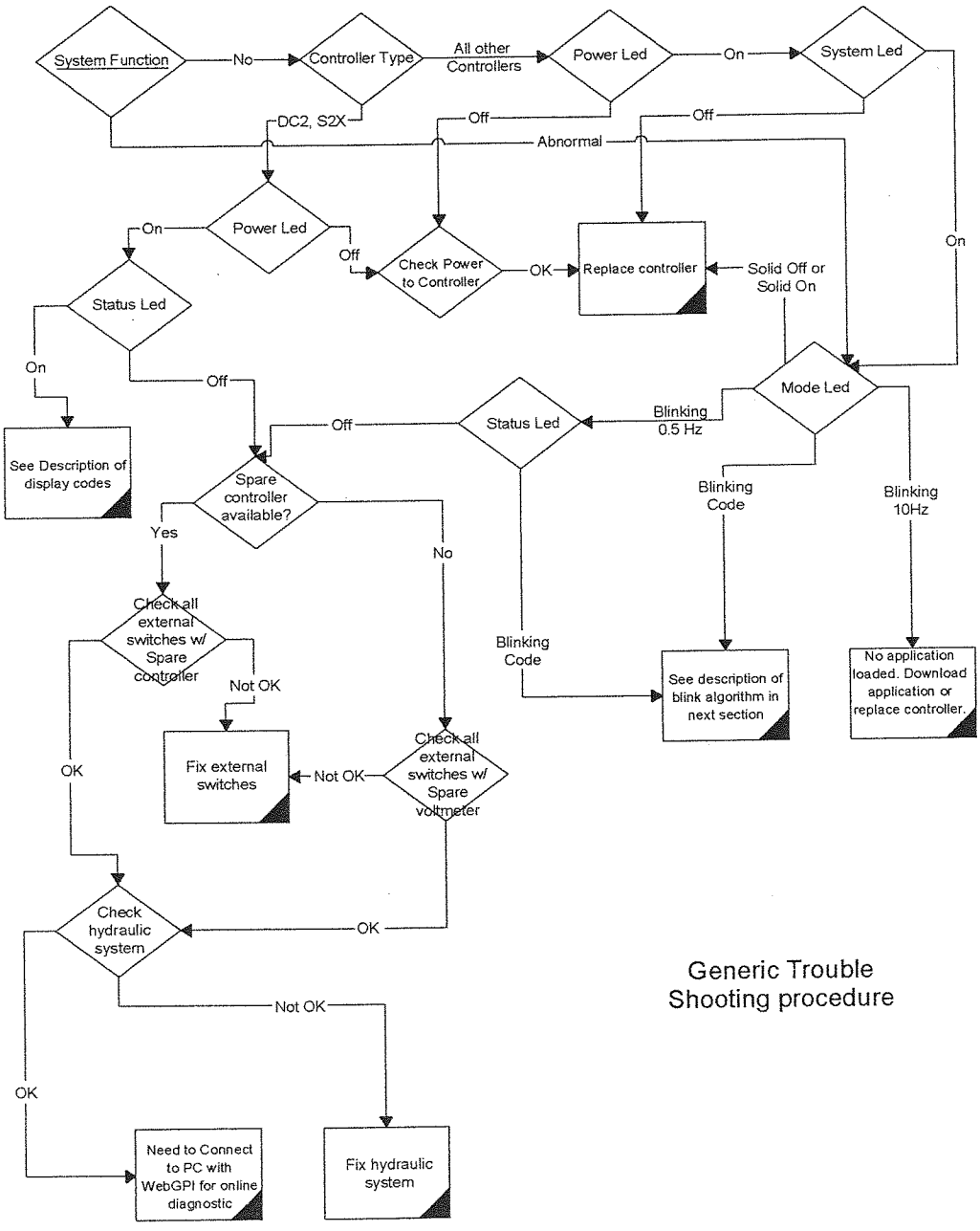

FIGURE 4-20. STEERING TROUBLESHOOTING GUIDE