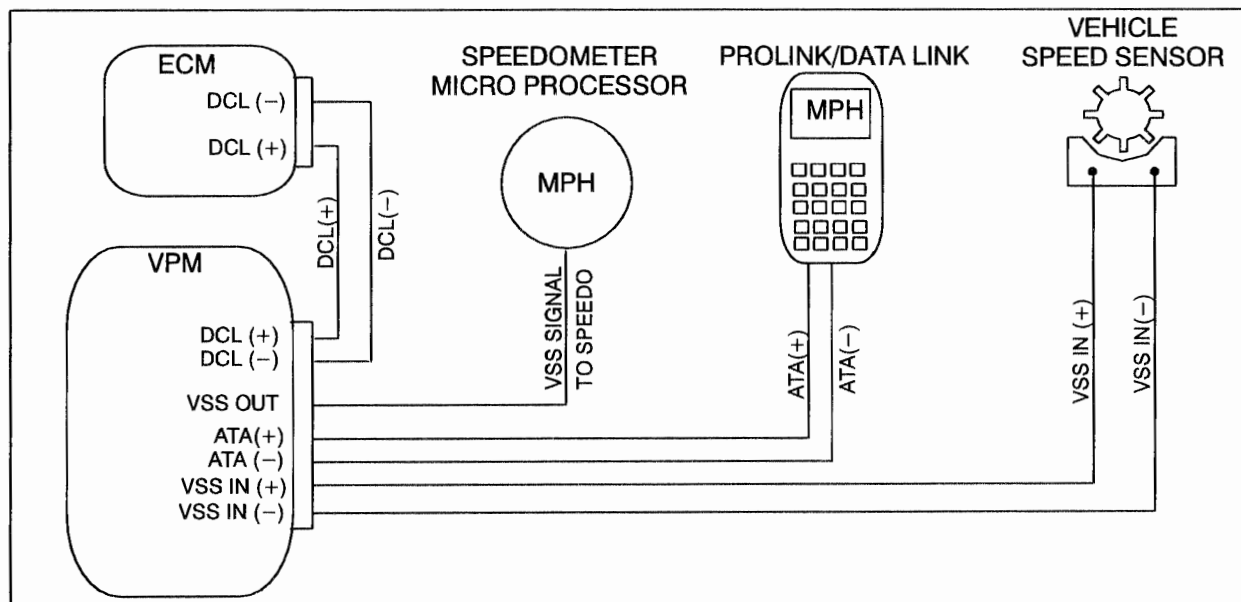


ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

VEHICLE SPEED SIGNAL (VSS)

SPEEDOMETER SIGNAL



SIGNAL FUNCTION

The vehicle speed signal from the speed sensor is input to the VPM. VPM programming includes number of teeth on the sensor wheel, tire size and axle ratios. Using this information, the VPM creates a signal which is sent to the speedometer/tachometer cluster as input for the speedometer function.

The VPM also outputs a DCL formatted vehicle speed signal over the DCL data link circuit to the ECM. The ECM uses the input for controlling vehicle functions including cruise control.

Additionally the VPM outputs an ATA formatted signal over the ATA data link to the diagnostic connector where vehicle speed can be read using the Prolink EST.

FAULT DETECTION MANAGEMENT

The vehicle speed sensor signal is monitored continuously by the VPM to see that the signal is

within certain range. If the VSS signal is out-of-range, the VPM sends an out-of-range high signal to the ECM, telling the ECM that the VPM detected a fault in the VSS.

When the ECM sees the out-of-range high signal, VPM Flash code 141 or 142 is set, but the Engine Warning light is NOT turned on. The ECM disables operation of the Cruise Control or PTO. If Road Speed Limiting is enabled, the ECM will limit engine speed in all gears. Torque level tailoring will use a prescribed torque curve.

FAULT CODES

NOTE: IF THE VEHICLE SPEEDOMETER DOES NOT OPERATE PROPERLY, BUT NO FAULT CODES ARE PRESENT, USE THE PROLINK TO ATTEMPT TO READ VEHICLE SPEED FROM THE ATA DATA LINK CONNECTOR. IF VEHICLE SPEED CAN BE READ USING THE PROLINK, TROUBLESHOOT CIRCUIT 47B AND THE INSTRUMENT CLUSTER.

ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

VEHICLE SPEED SIGNAL (VSS)

EXTENDED DESCRIPTION

The Vehicle Speed Signal (VSS) from the VPM is sent over the DCL data link to the ECM. The VSS information is used by the ECM to control features such as: Cruise Control, PTO, Torque Level Tailoring and Road Speed Limiting.

The VPM also provides VSS input to the vehicle speedometer, tachometer and odometer unit located in the instrument panel.

Refer to the circuit diagram located in this section for the following discussion.

VEHICLE SPEED SENSOR (303)

The Vehicle Speed Sensor (VSS) is located on the transmission and sends an AC signal to the VPM. The VSS sensor contains a permanent magnet which creates a magnetic field. The AC signal is created when the 16-tooth transmission speedometer gear rotates breaking the magnetic field created by the sensor. The VSS signal is sent through the engine and cab harness to the VPM.

With a manual transmission, Navistar installs the speed sensor at the rear of the transmission. With an Allison AT/MT transmission, Allison installs the sensor at the lower right side of the transmission.

VPM (VEHICLE PERSONALITY MODULE)

The VPM (381) receives the AC signal from the vehicle speed sensor. The VPM programming includes the rear axle ratio and tire size. It uses this programmed information and the speed sensor input to create the vehicle speed signal sent to the Speedometer Unit.

From VPM connector (381), terminal 18, an analog AC signal is input on circuit 47B to the vehicle speedometer unit through connector (27). Speedometer ground circuit 47-G from connector (27) is grounded at the cab ground stud.

The VSS signal is also formatted so that it can be sent over the Digital Communications Link (DCL) to the ECM (379).

ECM DIAGNOSTICS

FLASH CODES

During vehicle operation, the vehicle speed signal (VSS) is monitored continuously by the VPM to see that the signal is within certain range. If the VSS signal is out-of-range, the VPM sends an out-of-range high signal to the ECM, telling the ECM that the VPM detected a fault in the VSS.

When the ECM sees the out-of-range high signal, VPM Flash code 141 or 142 is set, but the Engine Warning light is NOT turned on. The ECM disables operation of the Cruise Control or PTO. If Road Speed Limiting is enabled, the ECM will limit engine speed in all gears. Torque level tailoring will use a prescribed torque curve.

FLASH CODE 141

ATA CODE PID 84 FMI 4

VPM: VSS ORL

This code is set when the VPM detects an out-of-range low (ORL) signal from the vehicle speed sensor.

WIRING CAUSE: VSS Sensor circuit between the VPM and Sensor, shorted to ground or open.

If this code is active, perform Testing VPM to Sensor Circuits on page 241.

FLASH 142

ATA CODE PID 84 FMI 3

VPM: VSS ORH

This code is set when the VPM detects an out-of-range high (ORH) signal from the vehicle speed sensor.

WIRING CAUSE: VSS Sensor circuit shorted to VREF or VBAT circuit.

If this code is active, perform Testing VPM to Sensor Circuits on page 241.

SPEEDOMETER DOES NOT FUNCTION PROPERLY

The ECM/VPM diagnostics DO NOT check for VSS sensor adjustment, so it is possible with a miss-adjusted vehicle speed sensor to get a faulty vehicle speed signal **without fault code 141 or 142**. The speedometer and/or odometer will operate erratically or not at all. The odometer may not function correctly.

If Flash code 141 or 142 IS NOT PRESENT, but the speedometer and/or odometer does not function properly, perform Testing Speedometer on page 245.

If Flash code 141 or 142 is present and the speedometer does not function properly, correct the cause of the Flash Codes before troubleshooting the speedometer.

If the speedometer/odometer does not function properly when the Two-Speed Axle is shifted (HIGH or LOW), refer to Two Speed Axle in this section.

VEHICLE SPEED SIGNAL (VSS)

TROUBLESHOOTING

BEFORE TROUBLESHOOTING

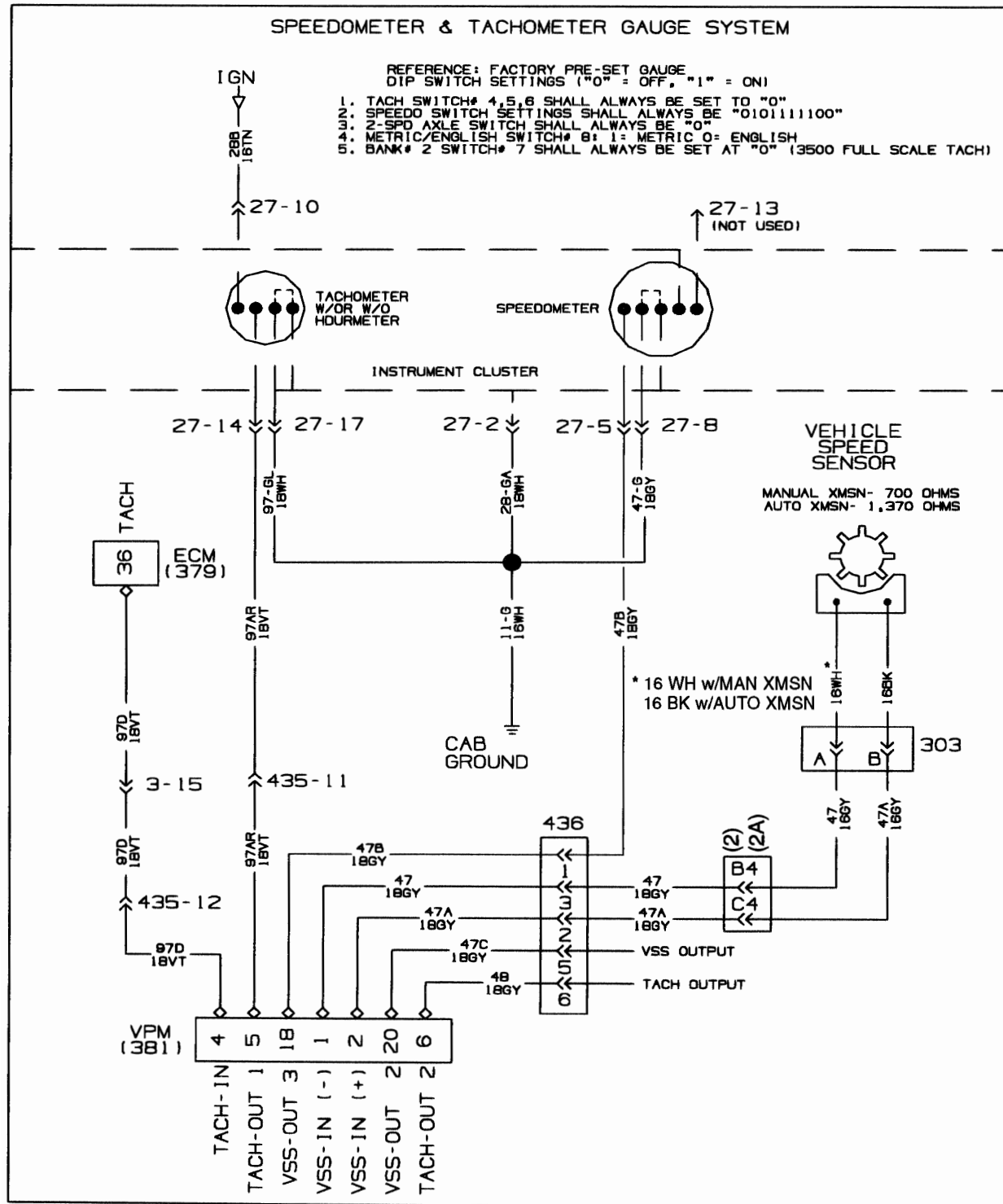
- A. Before troubleshooting, make sure that the batteries are fully charged! Check battery connections and grounds for clean, tight connections free of damage. Voltage tests will give misleading results if the batteries are not fully charged.
- B. Before troubleshooting, inspect circuit connectors for pushed back, loose, or damaged (spread or bent) terminals, or wires with cut strands, etc. Wires and connections must be free of damage or corrosion. When some connectors corrode, a light white residue will be present that must be removed.
- C. Before troubleshooting, inspect suspect circuit grounds for clean, tight connections free of damage.

ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

VEHICLE SPEED SIGNAL (VSS)

CIRCUIT DIAGRAM

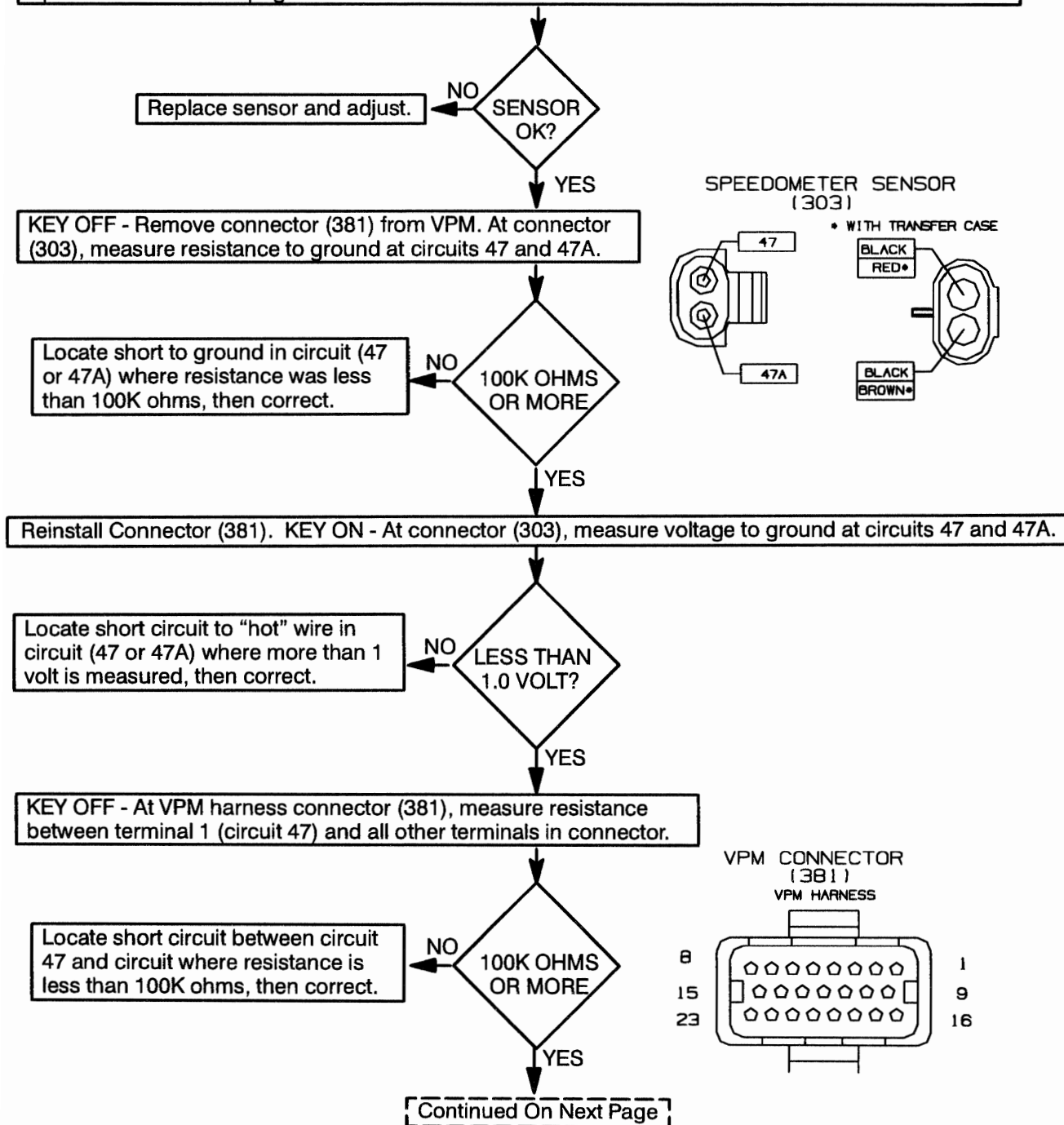
3000 & 4000 Electrical Circuit Diagrams



TESTING VPM TO SENSOR CIRCUITS

Refer to circuit diagram on page 240.

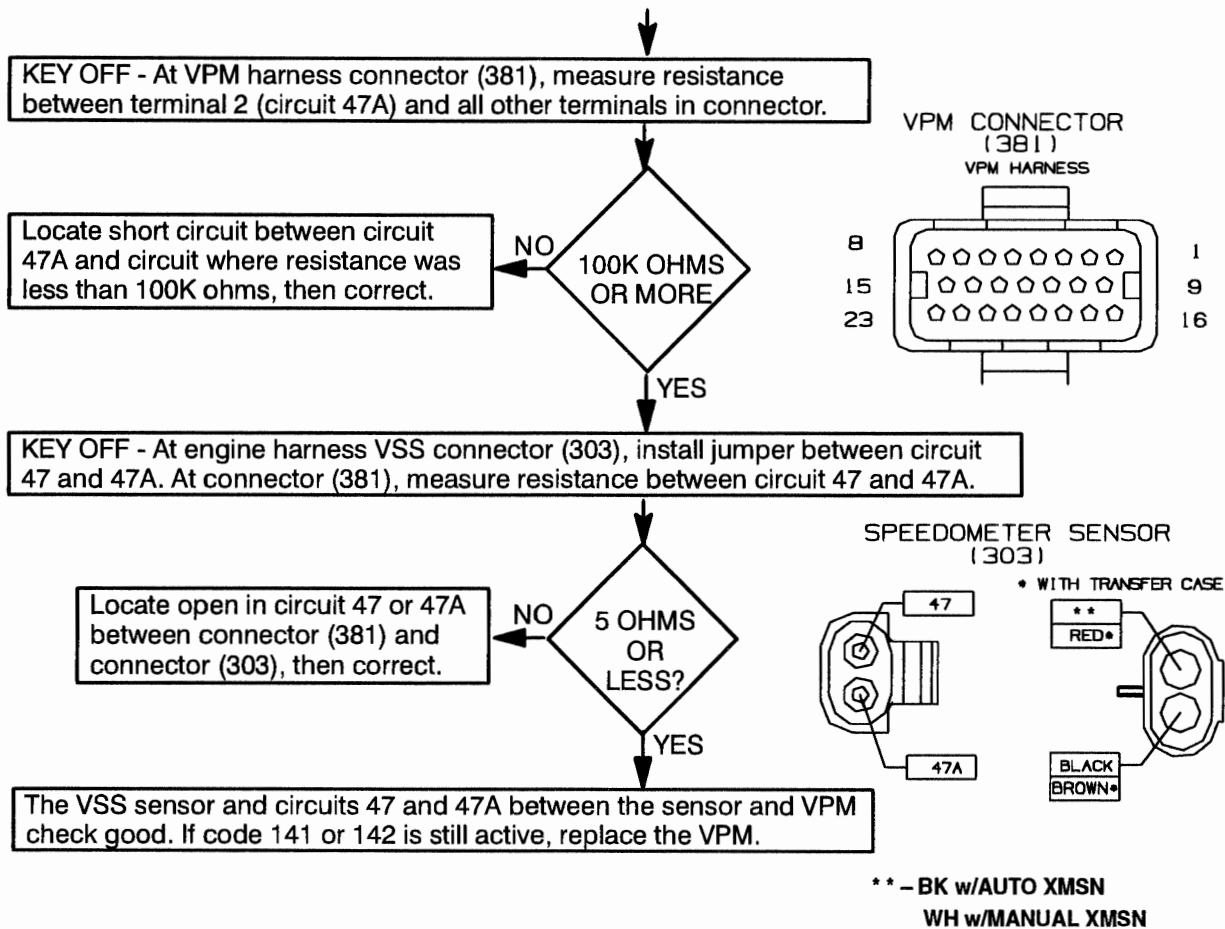
With **Manual XMSN**, perform speed Sensor Test p. 243. With **Allison AT OR MT XMSN**, perform Speed Sensor Test on page 244.



ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

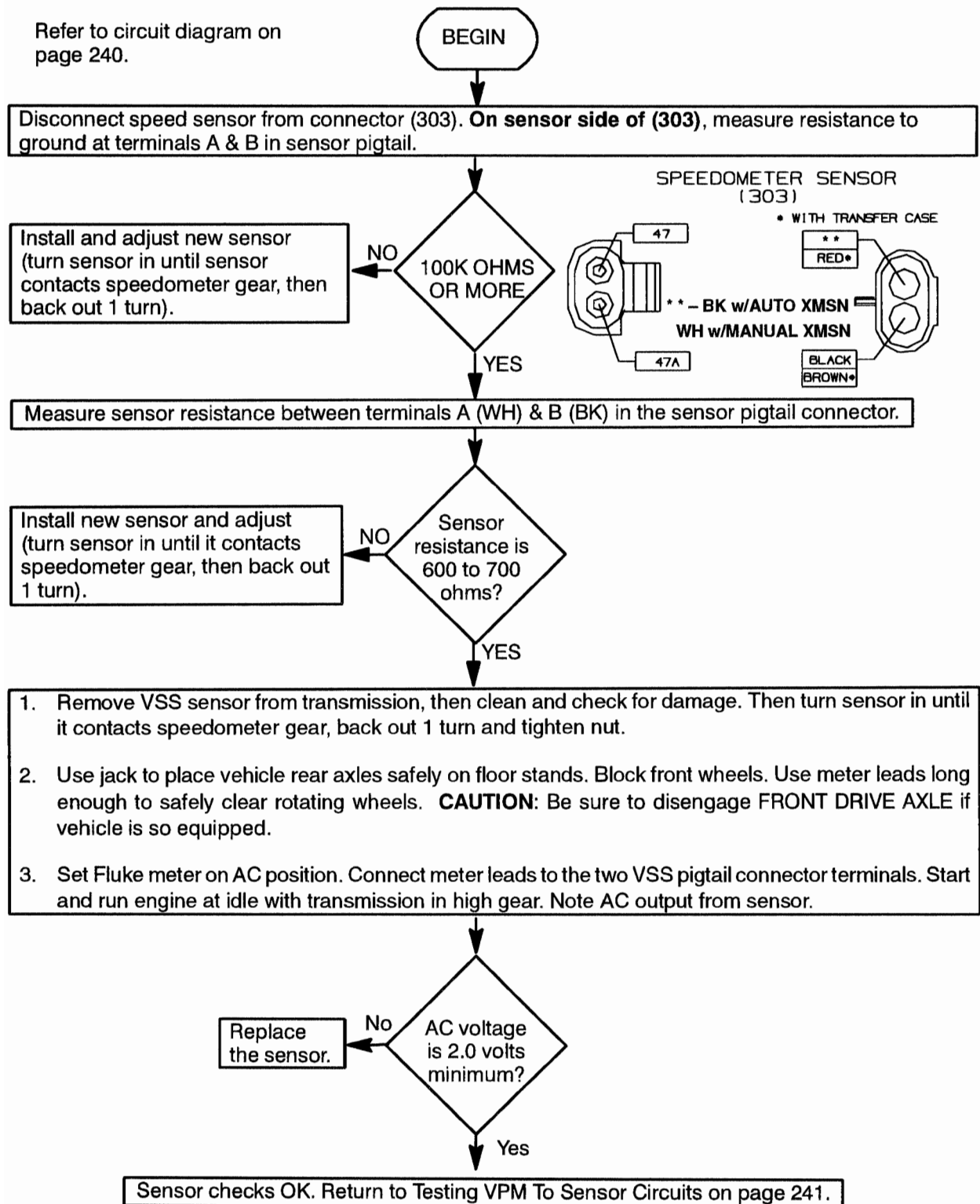
VEHICLE SPEED SIGNAL (VSS)

TESTING VPM TO SENSOR CIRCUITS (Continued)



VEHICLE SPEED SIGNAL (VSS)

VEHICLE SPEED SENSOR TEST WITH MANUAL TRANSMISSION

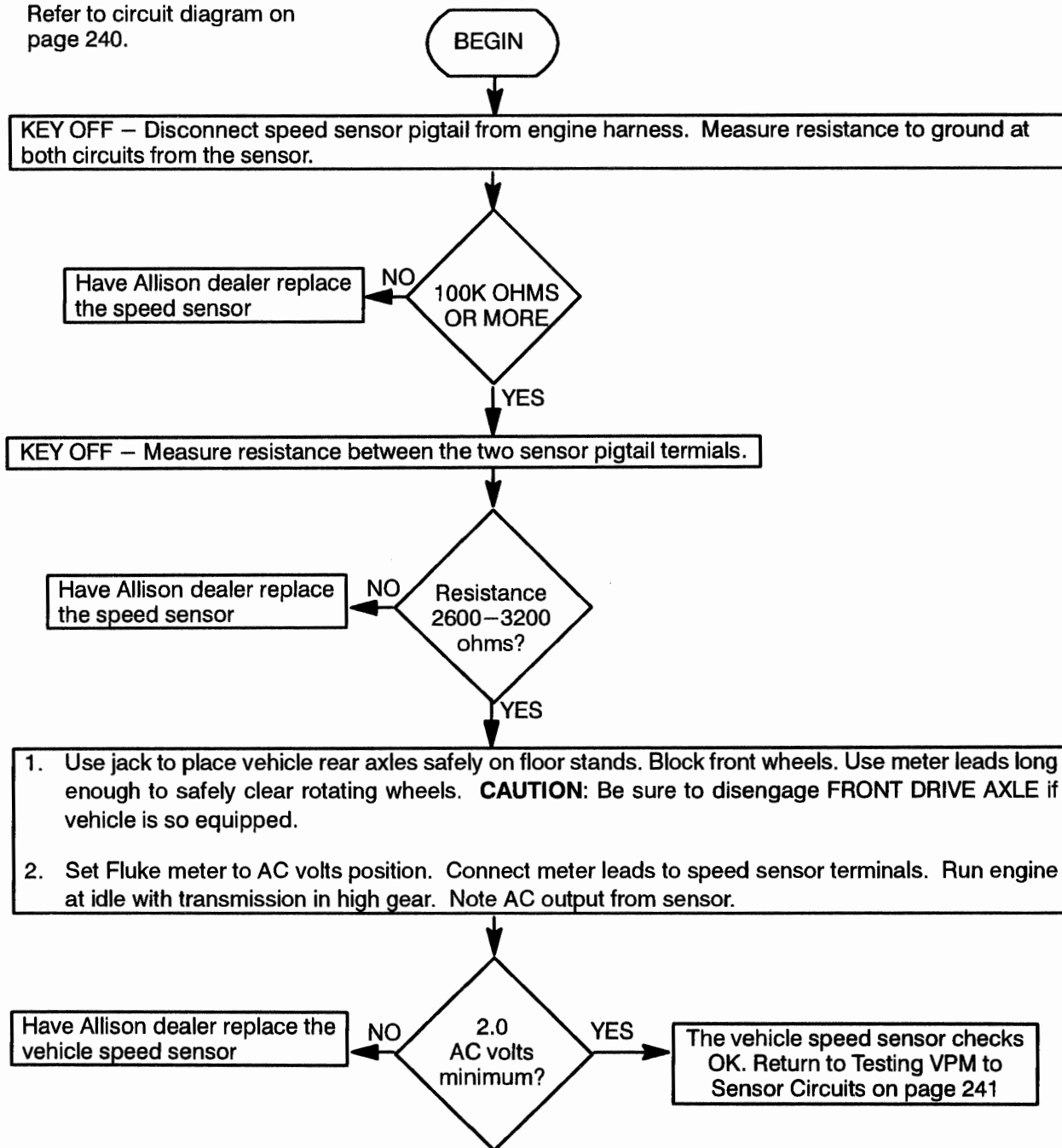


ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

VEHICLE SPEED SIGNAL (VSS)

VEHICLE SPEED SENSOR TEST WITH ALLISON AT OR MT TRANSMISSION

Refer to circuit diagram on
page 240.



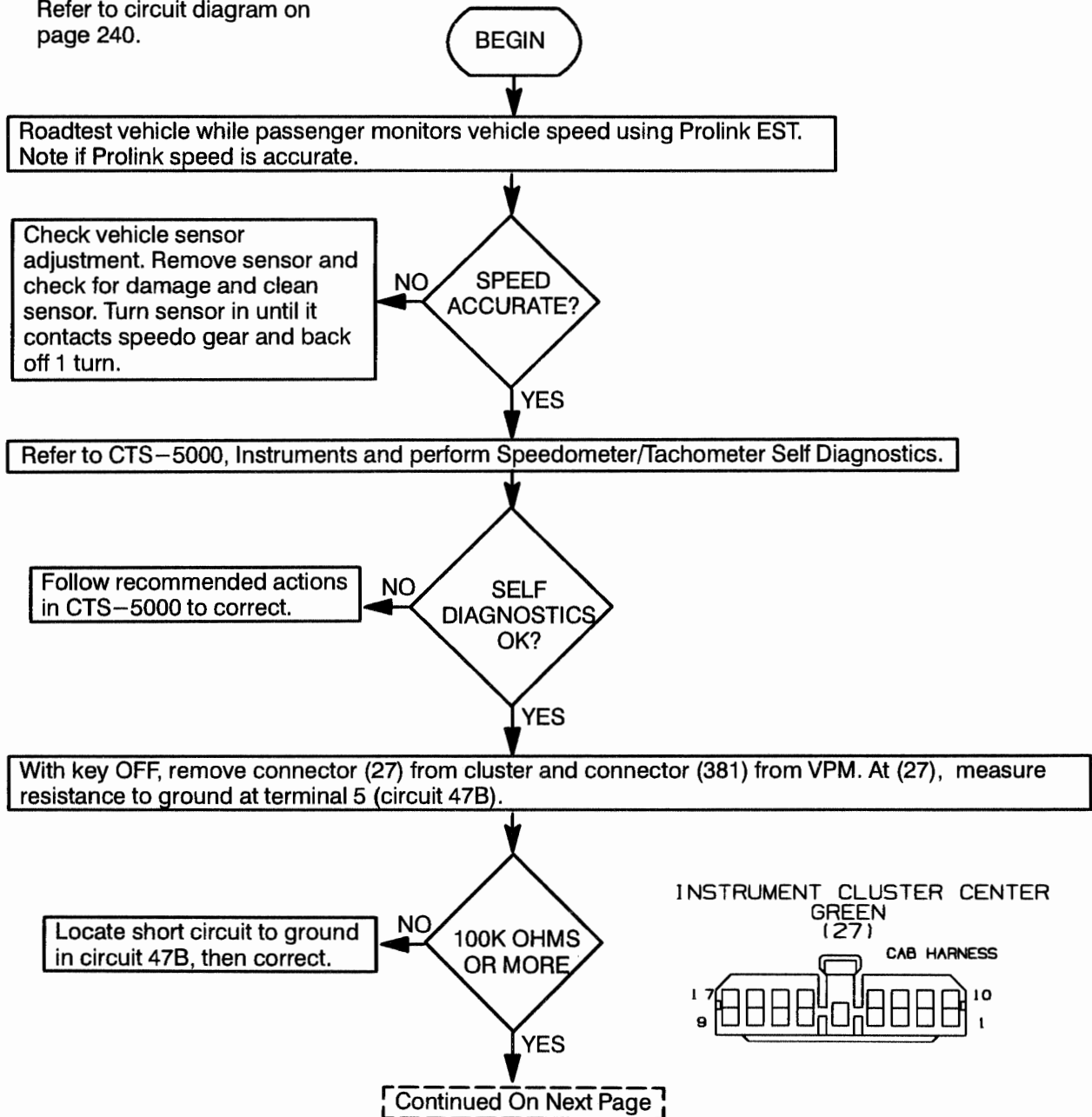
VEHICLE SPEED SIGNAL (VSS)

TESTING SPEEDOMETER

If Flash Codes are not present indicating that a VSS signal problem has been detected by the VPM or

ECM, but the speedometer and/or odometer are not functioning properly, perform this test.

Refer to circuit diagram on page 240.



ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

VEHICLE SPEED SIGNAL (VSS)

TESTING SPEEDOMETER (Continued)

