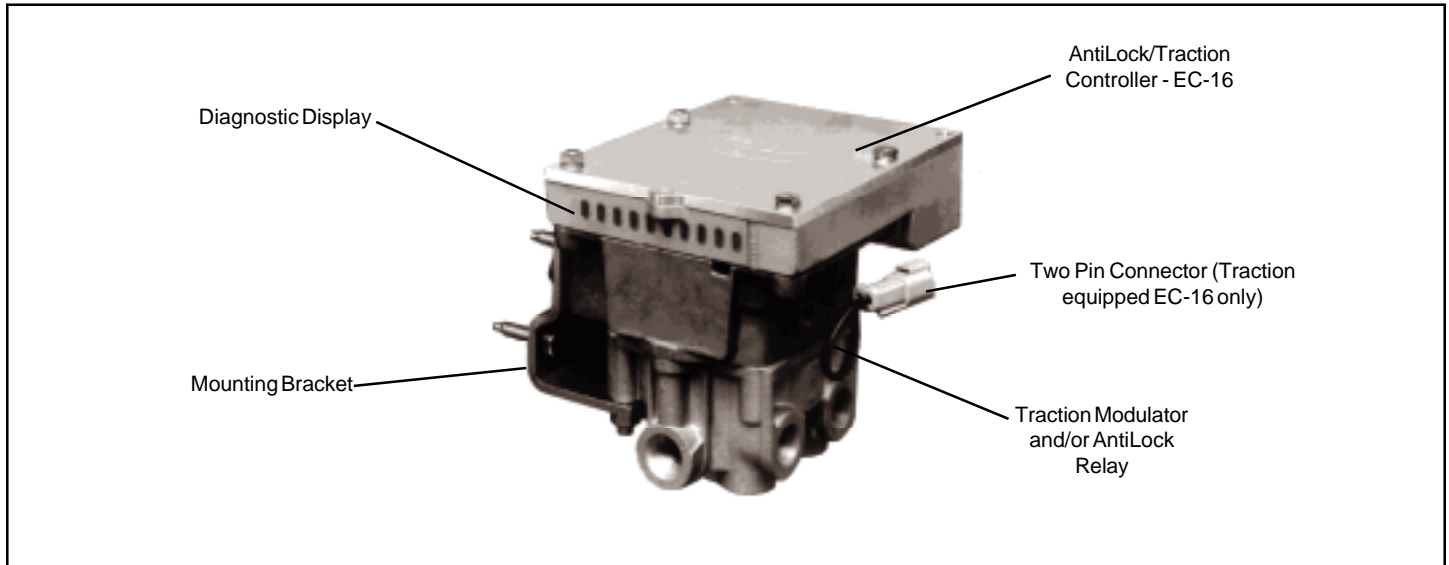




# Installation Instructions

## EC-16 ANTILOCK/TRACTION CONTROLLER



### DIAGNOSING AND LOCATING A SYSTEM PROBLEM

#### GENERAL

The EC-16 contains self test and diagnostic circuitry that continuously checks for proper operation of the entire AntiLock/Traction system including wiring continuity. The EC-16 is programmed at the factory to accommodate the needs of the vehicle and the desires of the customer. All EC-16 AntiLock/Traction controllers are not programmed with the Traction control feature in which case AntiLock only will be active. A vehicle equipped with the Traction Control feature can be identified by the presence of a dash mounted condition lamp for the Traction Control system. Separate dash lamps, controlled by the EC-16, advise the driver of the condition of the entire AntiLock/Traction system. The condition of specific AntiLock/Traction components is provided to the mechanic by a series of labeled, Light Emitting Diodes (LED's) displayed in the EC-16 housing. No special tools or equipment are needed to read or interpret the EC-16 diagnostics display. It should be noted that the EC-16 diagnostics display is separate from the AntiLock and Traction condition lamps on the dash. With this separation, the driver is aware of any problems that occur but is not confused by the diagnostic information. A special feature of the EC-16 controller is the failure latching and diagnostic system. Intermittent problems, particularly in the wheel speed sensing area can be difficult to diagnose. When the controller senses an erroneous condition, whether in the controller electronics, the modulator or wheel speed sensing areas, it stores the condition in non-volatile memory, disables the antilock or traction function, illuminates the dash mounted condition lamp and the appropriate diagnostic LEDs on the EC-16. The failure condition is truly stored and is not cleared by loss of power to the EC-16.

The LEDs will re-light when power is restored and remain illuminated until the failure is corrected. After the actual problem is corrected, maintenance personnel can clear or reset the EC-16 diagnostics by holding a small magnet over the RESET point in the diagnostics display.

#### DIAGNOSTIC LEDs

There are ten LEDs plus a magnetically actuated reset switch in the EC-16 diagnostic display. The first six LEDs locate a problem to a specific area of the vehicle while the next three indicate the problem component or its wiring. The LEDs are software driven and are either ON or OFF depending upon their monitor function. (Note: Right and left, front and rear are determined from the driver's seat.)

- LED oFRT Red LED
- LED oMID Red LED (See Note)
- LED oRER Red LED
- LED oRHT Red LED
- LED oLFT Red LED
- LED oTRC Red LED
- LED oMOD Red LED
- LED oSEN Red LED
- LED oECU Red LED
- LED oVLT Green LED
- RESET + No LED

**NOTE:** The MID LED is used in conjunction with 6x4 Traction equipped vehicles. On other vehicles this LED is not used in the diagnostic process. It will however, light when a magnet is placed on the RESET switch in the diagnostic display.

#### **“FRT” (Front) LED**

This Red LED illuminates and latches ON in order to indicate the location of a problem component or its wiring. It will light in conjunction with either the RIGHT or LEFT LED and the MOD or SENS LED.

#### **“MID” (Mid Axle) LED**

This Red LED is not used in all installations. Only 6x4 vehicles with the Traction Control feature will make use of this LED. On those vehicles this Red LED illuminates and latches ON to indicate the location of a problem speed sensor or its wiring. The "MID" LED should not illuminate with the "MOD" LED.

#### **“RER” (Rear) LED**

This Red LED illuminates and latches ON in order to indicate the location of a problem component or its wiring. It will light in conjunction with either the RIGHT or LEFT LED and the MOD or SENS LED.

#### **“RHT” (Right) LED**

This Red LED illuminates and latches ON in order to indicate the location of a problem component or its wiring. It will light in conjunction with either the FRONT or REAR LED and the MOD or SENS LED.

#### **“LFT” (Left) LED**

This Red LED illuminates and latches ON in order to indicate the location of a problem component or its wiring. It will light in conjunction with either the FRONT or REAR LED and the MOD or SENS LED.

#### **"TRC" (Traction) LED**

This Red LED illuminates and latches ON to indicate a permanent or intermittent problem in the Traction Control system. It may be illuminated with the MOD LED or may illuminate by itself.

#### **“MOD” (Modulator) LED**

This Red LED illuminates and latches ON to indicate a permanent or intermittent open or short circuit in the solenoids of one of the four M-21 modulators or the wiring connecting them to the system. When indicating a problem with a M-21 this LED will be illuminated with two positioning LEDs (RHT/LFT + FRT/RER). NOTE: The MID positioning LED should not be illuminated with this LED. This LED is also used to indicate a problem with an ATR-1 or 2, AntiLock Traction Relay, solenoid. When illuminated for a traction system problem the TRC LED will also be on.

#### **“SEN” (Speed Sensor) LED**

This Red LED illuminates and latches ON to indicate permanent or intermittent failure. The failures indicated are; open or shorted wheel speed sensor, open or shorted wheel speed sensor wiring, wheel speed signal not present or does not conform to design criteria. The "SEN" LED will be illuminated with two positioning LEDs (RHT/LFT + FRT/MID/RER)

#### **“ECU” (Electronic Control Unit) LED**

This Red LED, when illuminated, indicates that the controller itself has failed. It is latched ON for all EC-16 failures except low voltage. For voltages less than 9VDC, the LED illuminates to indicate the controller is inoperative, however when the voltage again exceeds 9VDC the LED will go OUT by itself.

#### **“VLT” LED**

This Green LED illuminates and remains ON during vehicle operation to indicate that vehicle power is reaching the controller. If vehicle power is out of range for proper operation (below 11 vdc or above 17 vdc) this LED will flash until power is brought into range.

#### **“RESET”**

Beneath the RESET area of the display is a magnetically sensitive switch that is used to reset the diagnostic system. The device will respond to a magnet which has strength sufficient to lift a three (3) ounce weight. Holding a magnet against the RESET will cause **ALL** LEDs to light during the time the magnet is against it.

## **TROUBLESHOOTING**

### **GENERAL**

While the EC-16 diagnostic display locates a specific problem area, it is still necessary to confirm whether the problem resides in the component itself or the wiring. Basically the trouble shooting procedure that follows is devoted to narrowing the problem to either the wiring or a specific AntiLock or Traction component. It should be noted however that **ALL TROUBLE SHOOTING BEGINS BY OBSERVING THE ANTILOCK AND TRACTION CONDITION LAMPS ON THE DASH**. All trouble shooting should begin by first performing the "Initial Start-up Procedure" and following the directions contained in it.

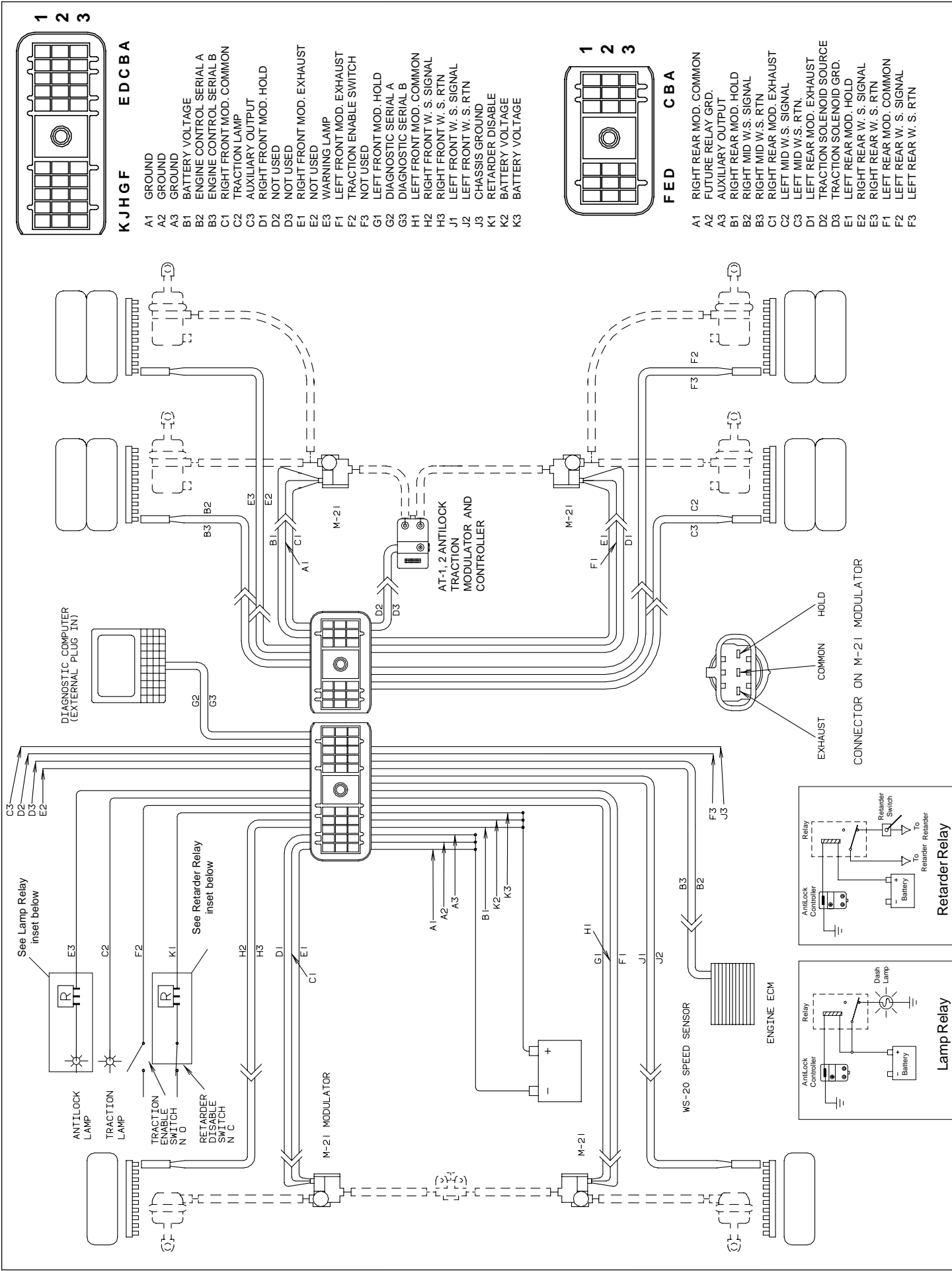
### **IMPORTANT**

Before beginning the TROUBLESHOOTING process:

1. Determine if the vehicle is equipped with Traction Control. The presence of a Traction condition lamp on the dash can be used.
2. Some vehicles are equipped with a Traction Control "disabling switch" if so equipped **ENABLE THE TRACTION SYSTEM BEFORE BEGINNING THE TROUBLESHOOTING**.
3. If the vehicle is equipped with Traction Control and is a tandem axle unit, note the number of drive axles. The "MID" diagnostic LED is used only on 6x4 vehicles.

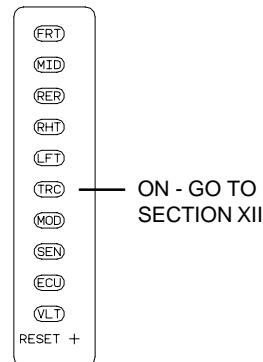
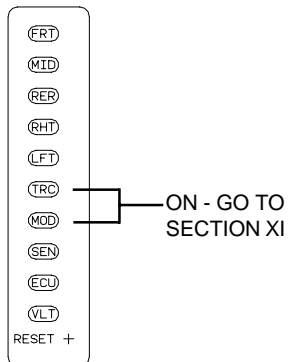
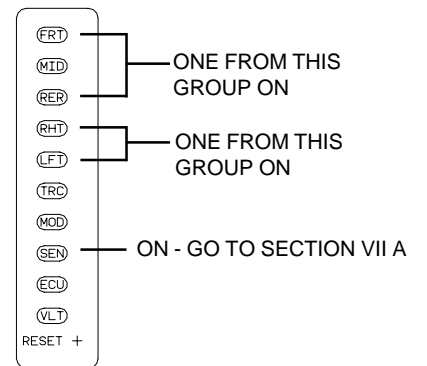
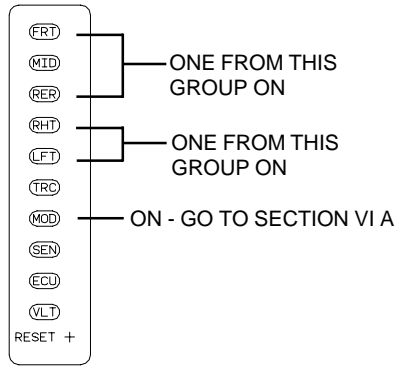
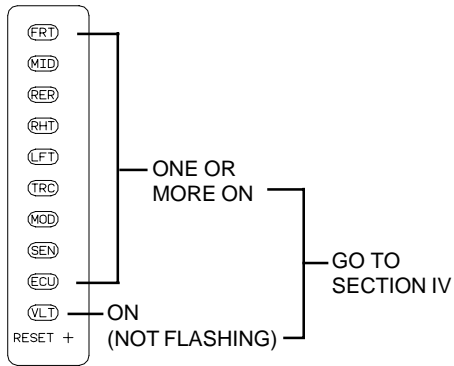
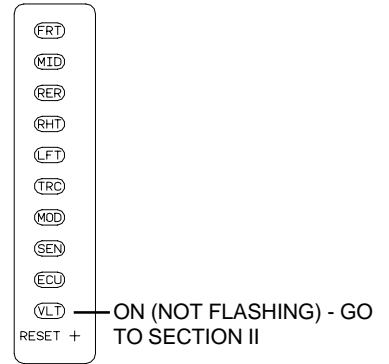
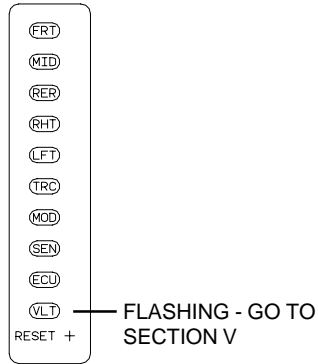
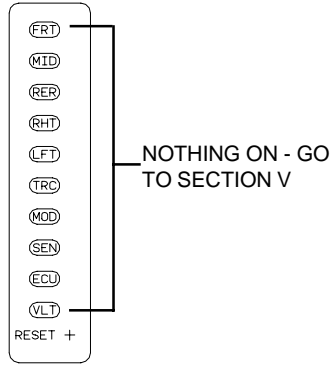
### **TROUBLESHOOTING TIPS**

1. Begin the troubleshooting process by observing the dash condition lamp(s) and performing the "Initial Start-Up Procedure".
2. The troubleshooting technician should record all findings and the action taken during the troubleshooting process.
3. No voltage or resistance tests are performed into the EC-16. All voltage and resistance tests are performed by beginning at the wire harness half of the connector and moving AWAY from the EC-16 toward an AntiLock/ Traction system component (Modulator, Wheel Speed Sensor, etc.)

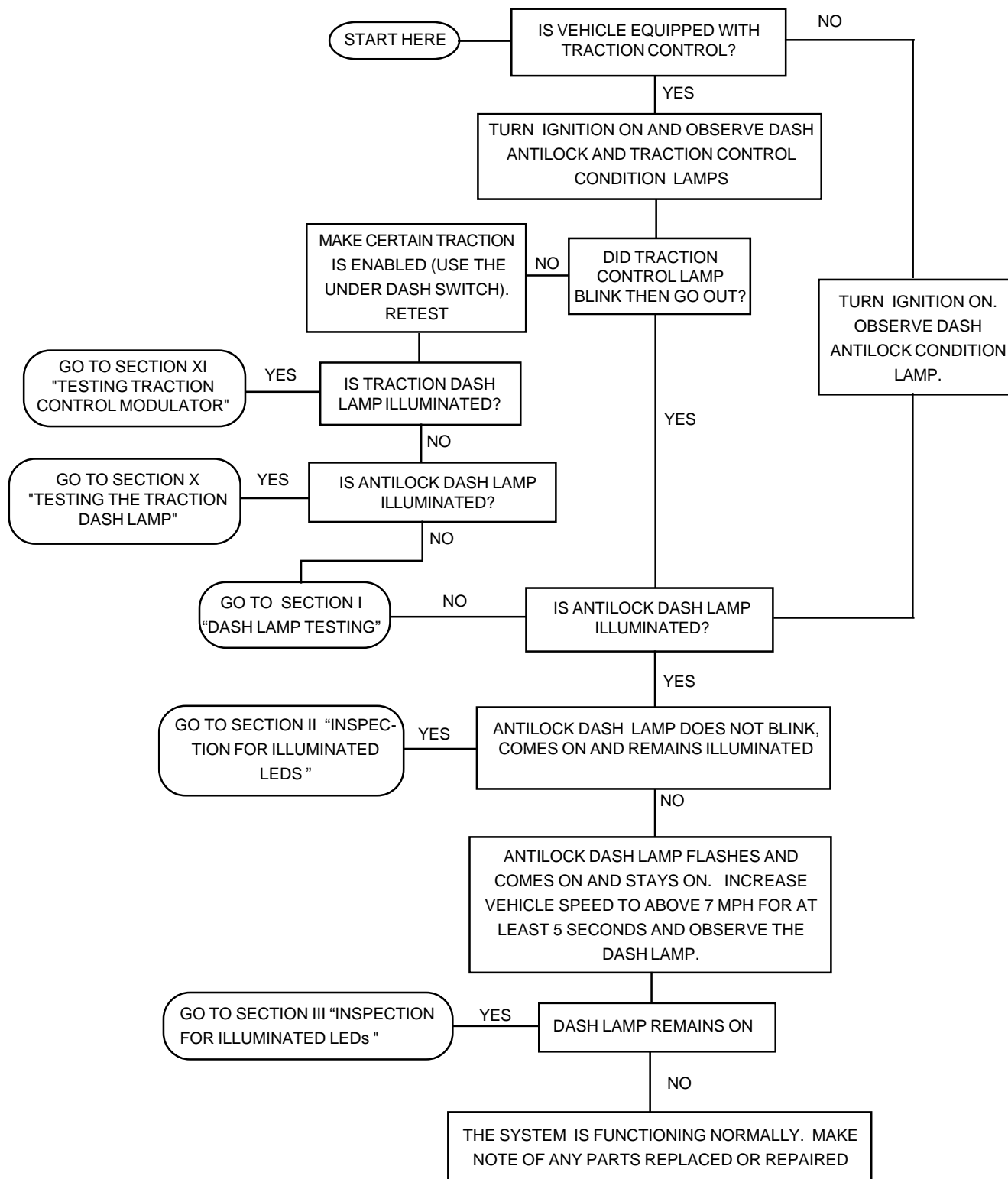


# DIAGNOSTIC DISPLAY QUICK REFERENCE

This index is presented for the benefit of personnel experienced in troubleshooting Bendix full-vehicle wheel control AntiLock with traction control. It provides a quick reference to specific sections that provide testing procedures and values.

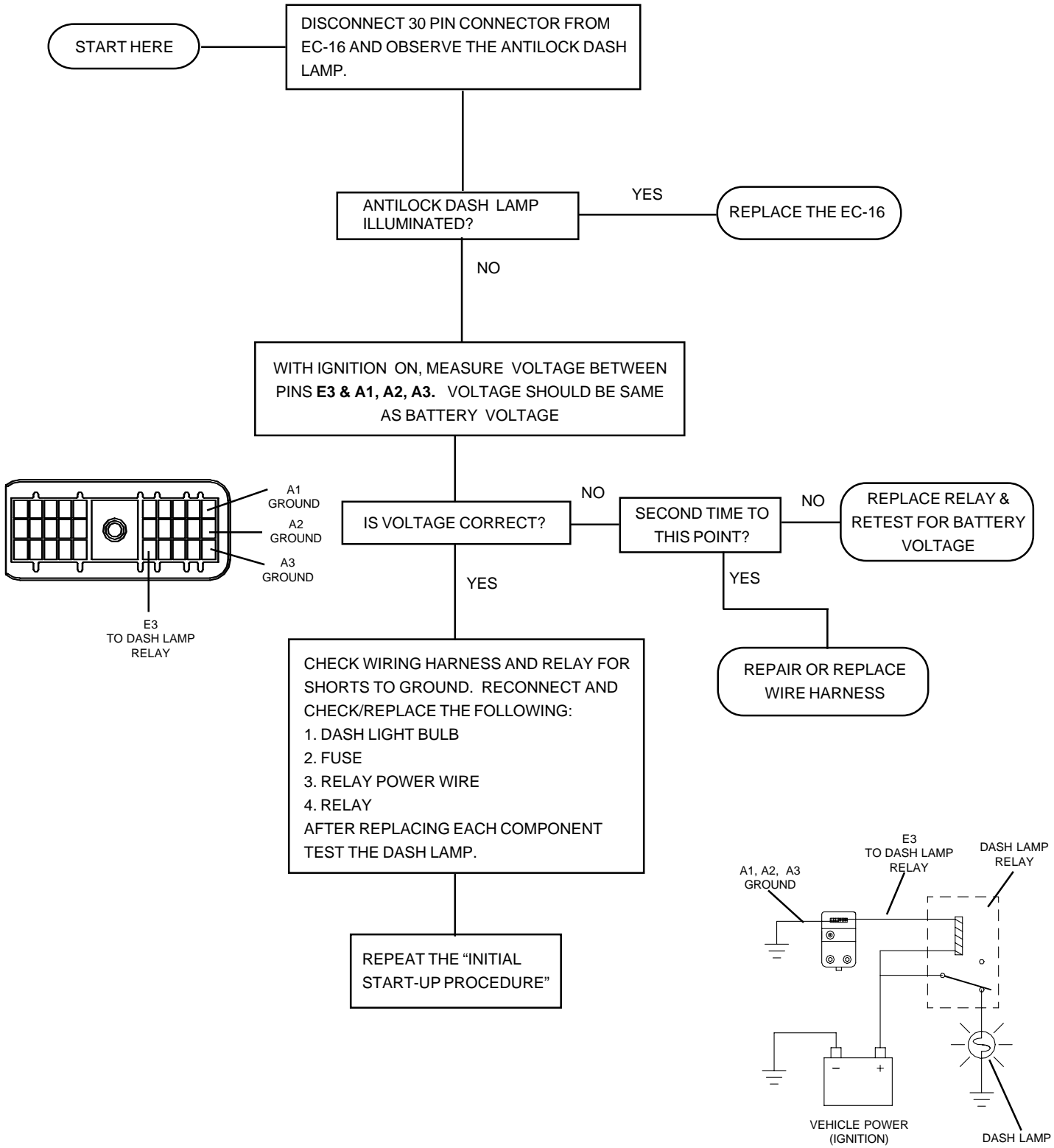


# INITIAL START-UP PROCEDURE

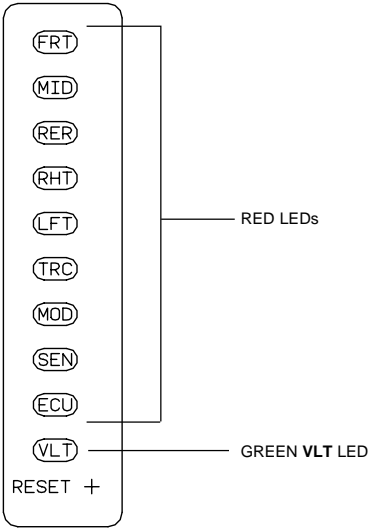
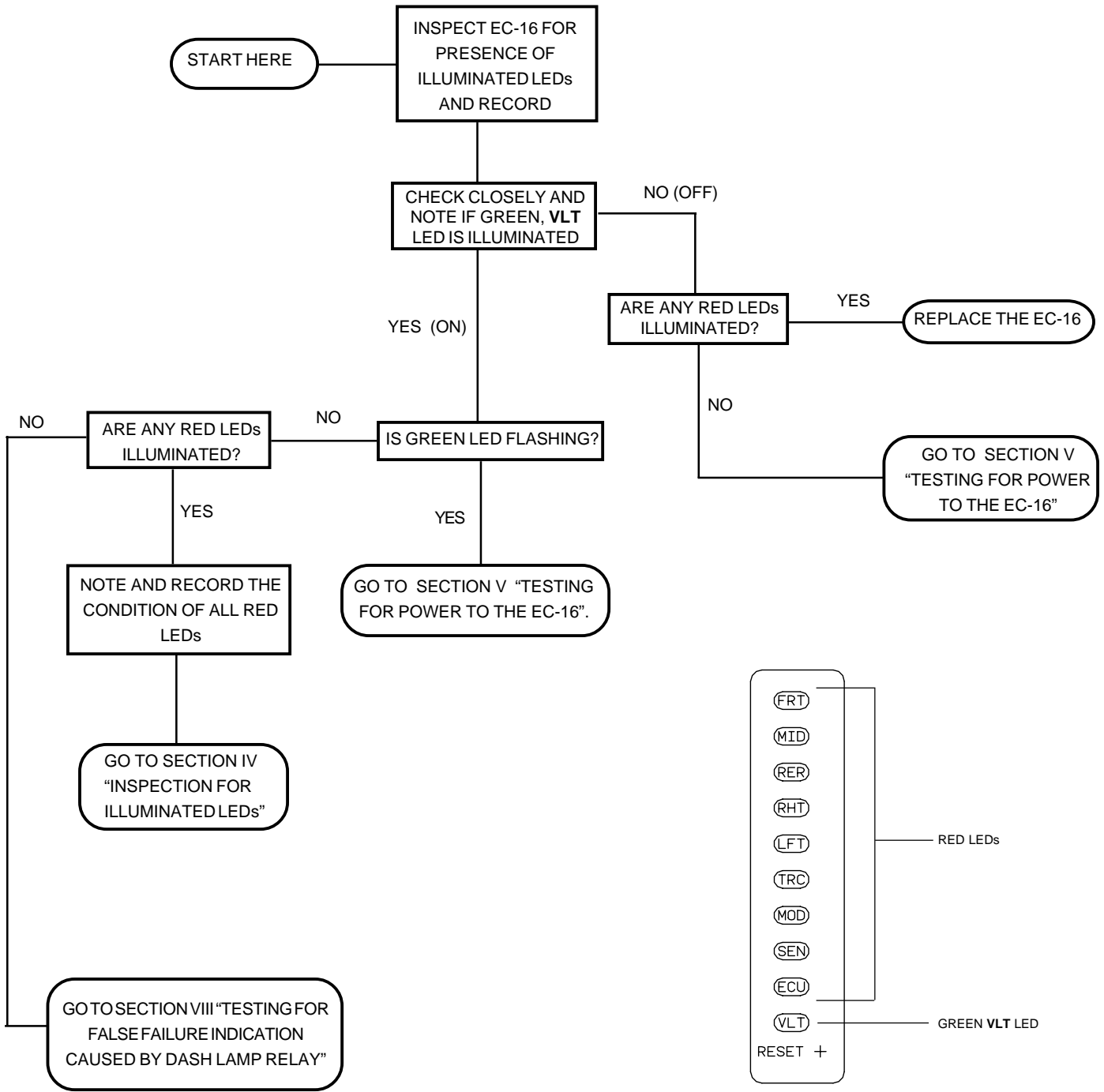


If the EC-16 controller has been recently replaced, determine if it is a self configuring model (refer to service data section entitled "EC-16 CONTROLLER CONFIGURATION") and make certain it is configured properly for the vehicle. If traction control is part of the configuration, the "enable - disable" switch must be placed in the enabled position (traction control operable).

# SECTION I - ANTILOCK DASH LAMP TESTING

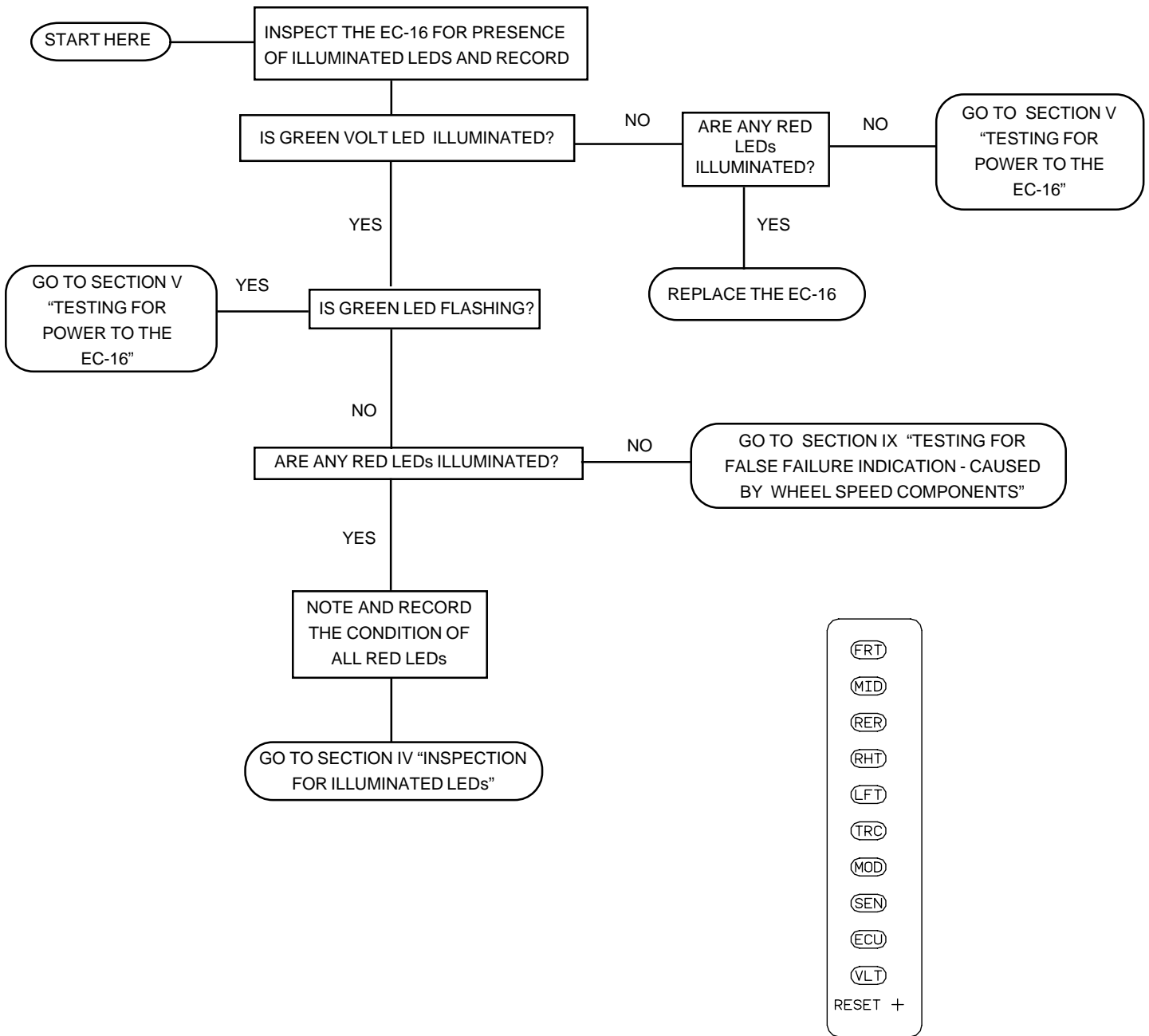


## SECTION II - INSPECTION FOR ILLUMINATED LEDs



**EC-16 DIAGNOSTIC DISPLAY**

## SECTION III - INSPECTION FOR ILLUMINATED LEDs

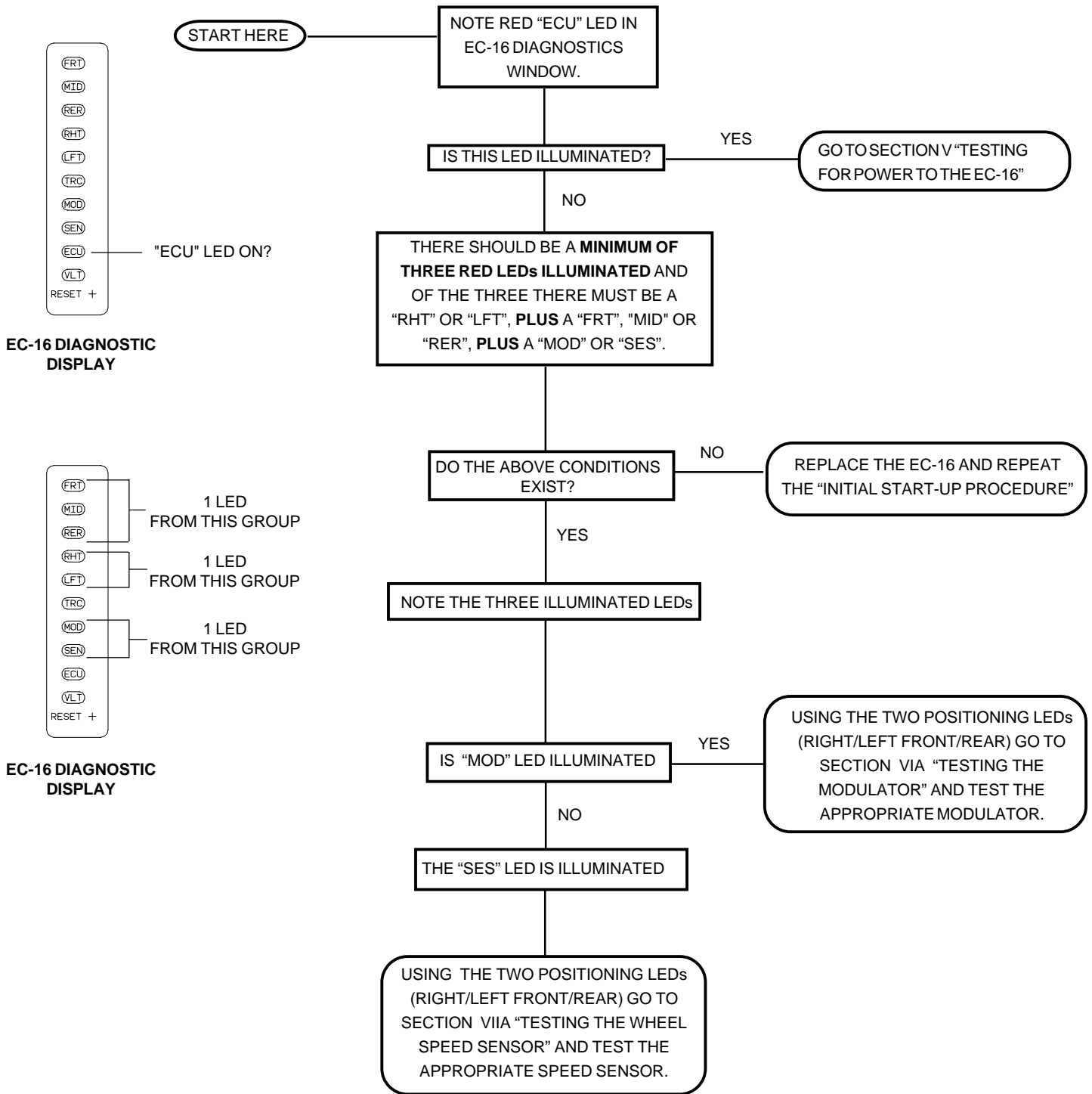


- (FRT)
- (MID)
- (RER)
- (RHT)
- (LFT)
- (TRC)
- (MOD)
- (SEN)
- (ECU)
- (VLT)
- RESET +

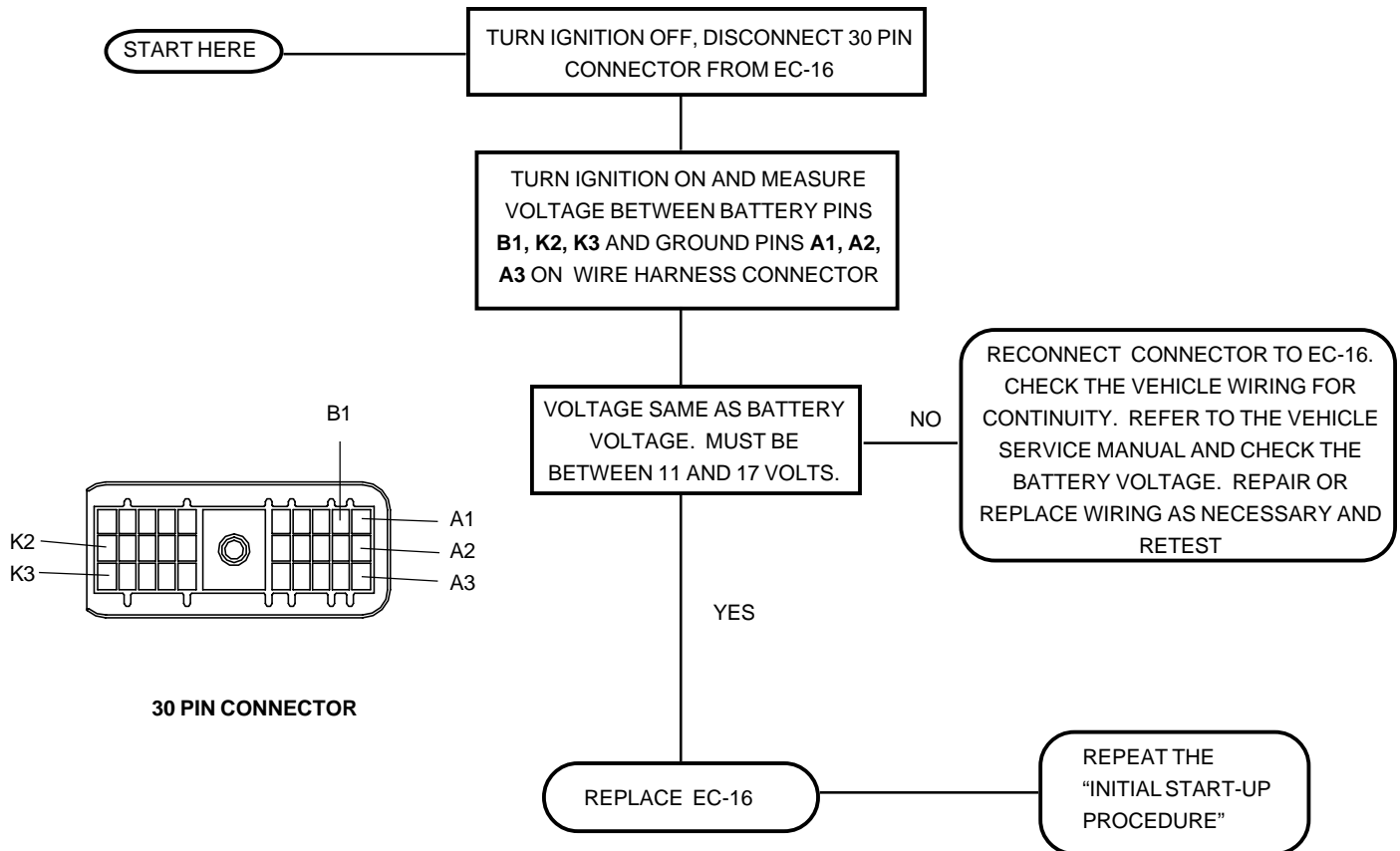
**EC-16 DIAGNOSTIC DISPLAY**



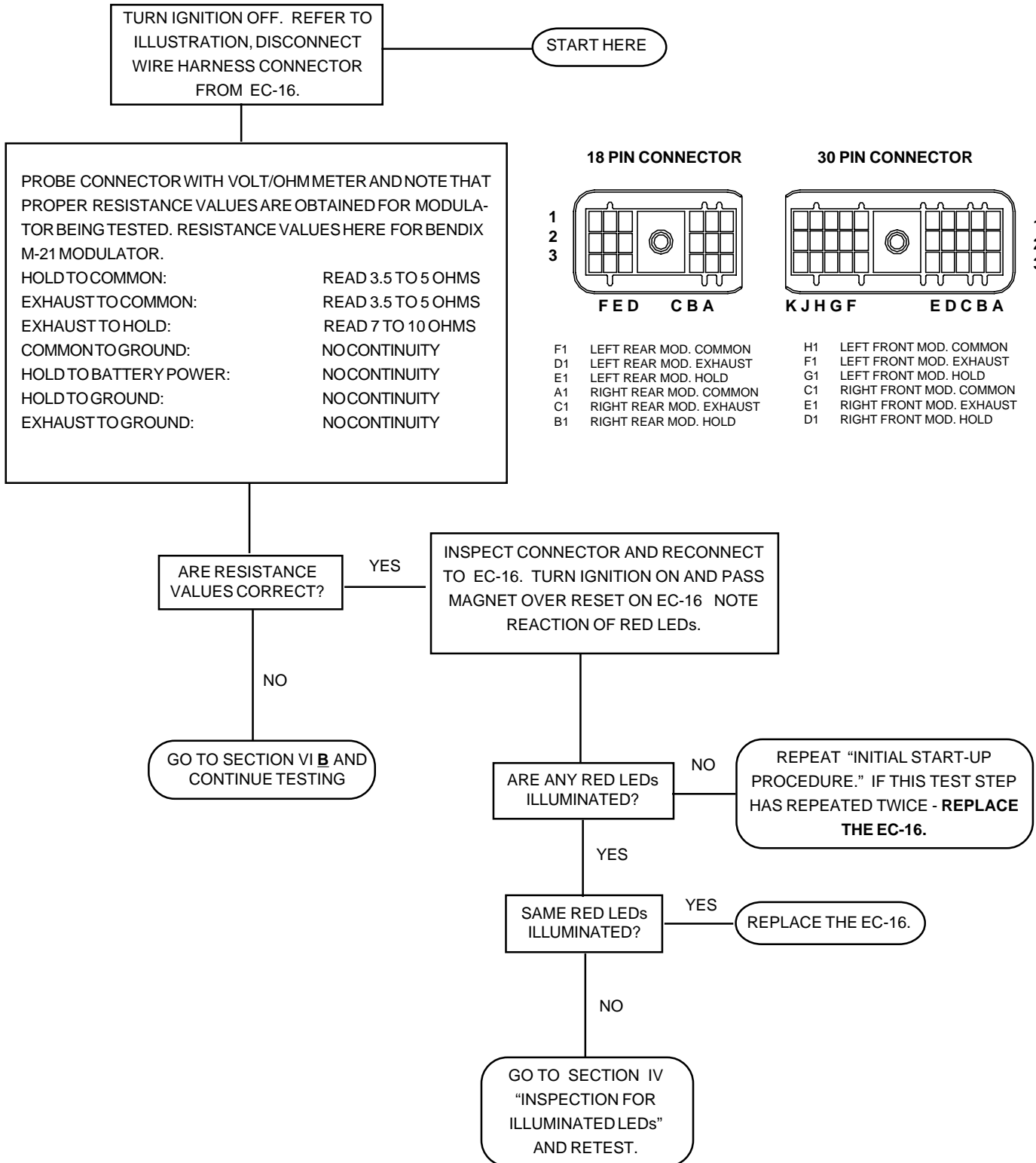
## SECTION IV - INSPECTION FOR ILLUMINATED LEDs



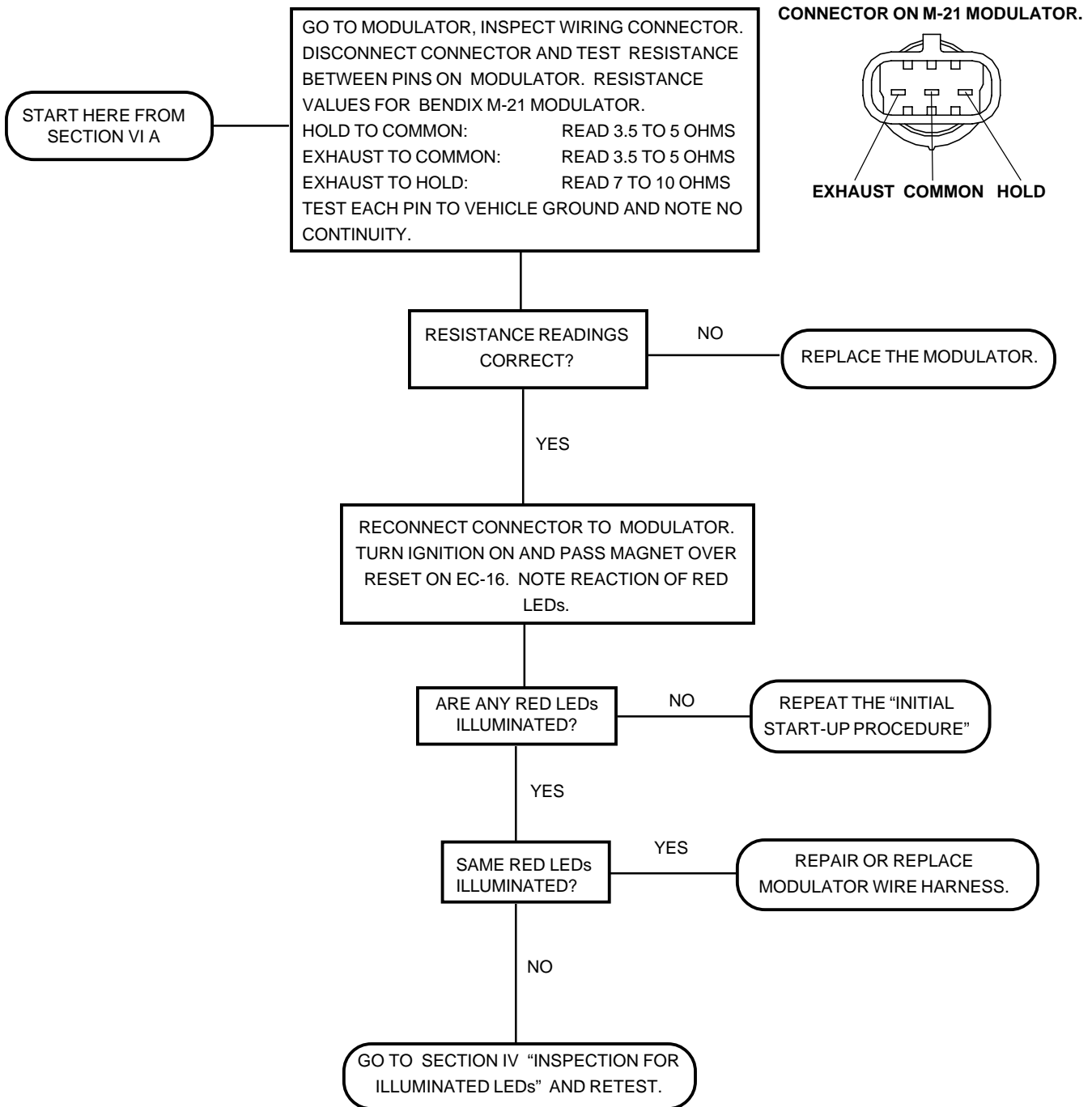
## SECTION V - TESTING FOR POWER TO THE EC-16



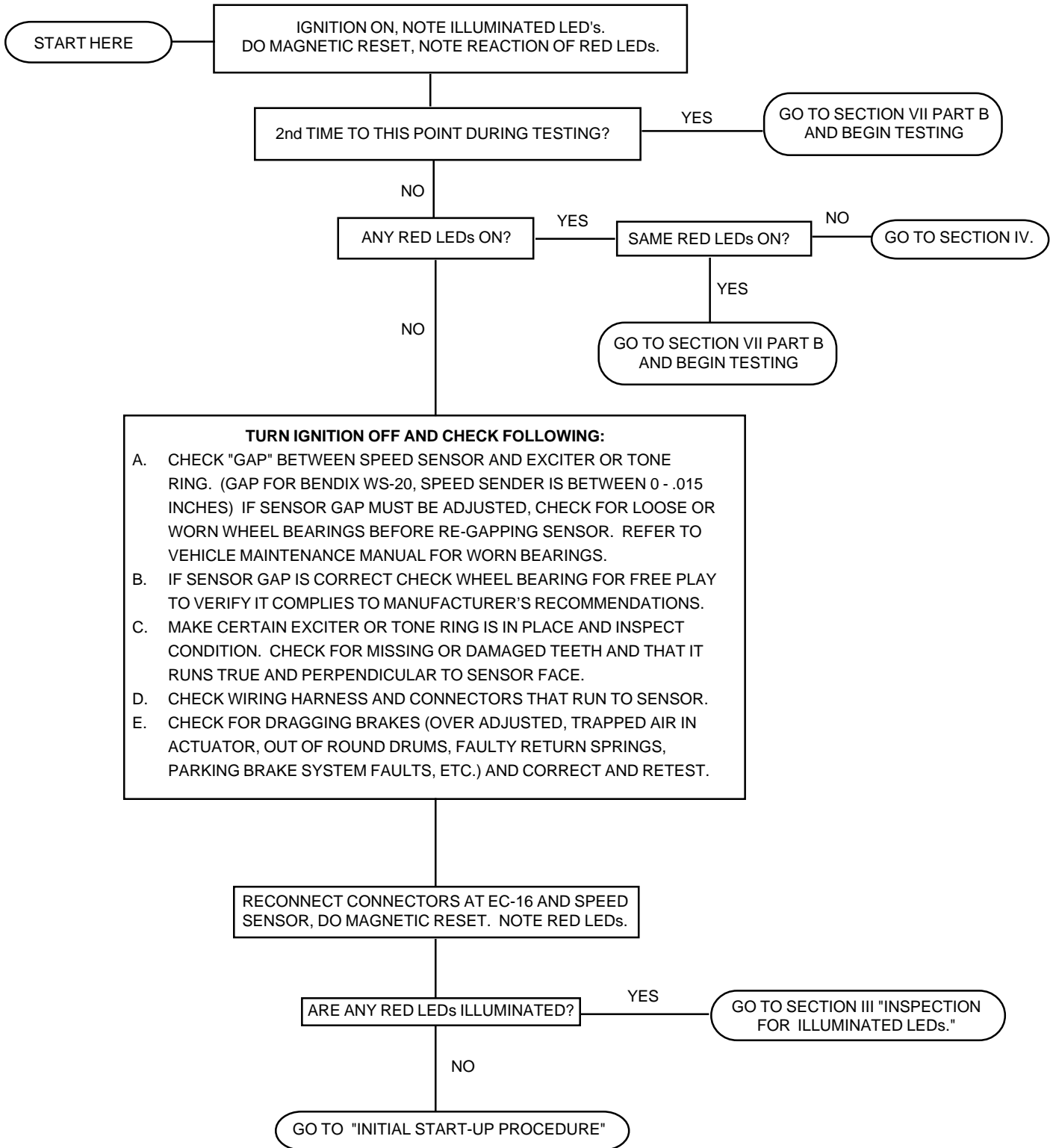
## SECTION VI A - TESTING THE MODULATOR



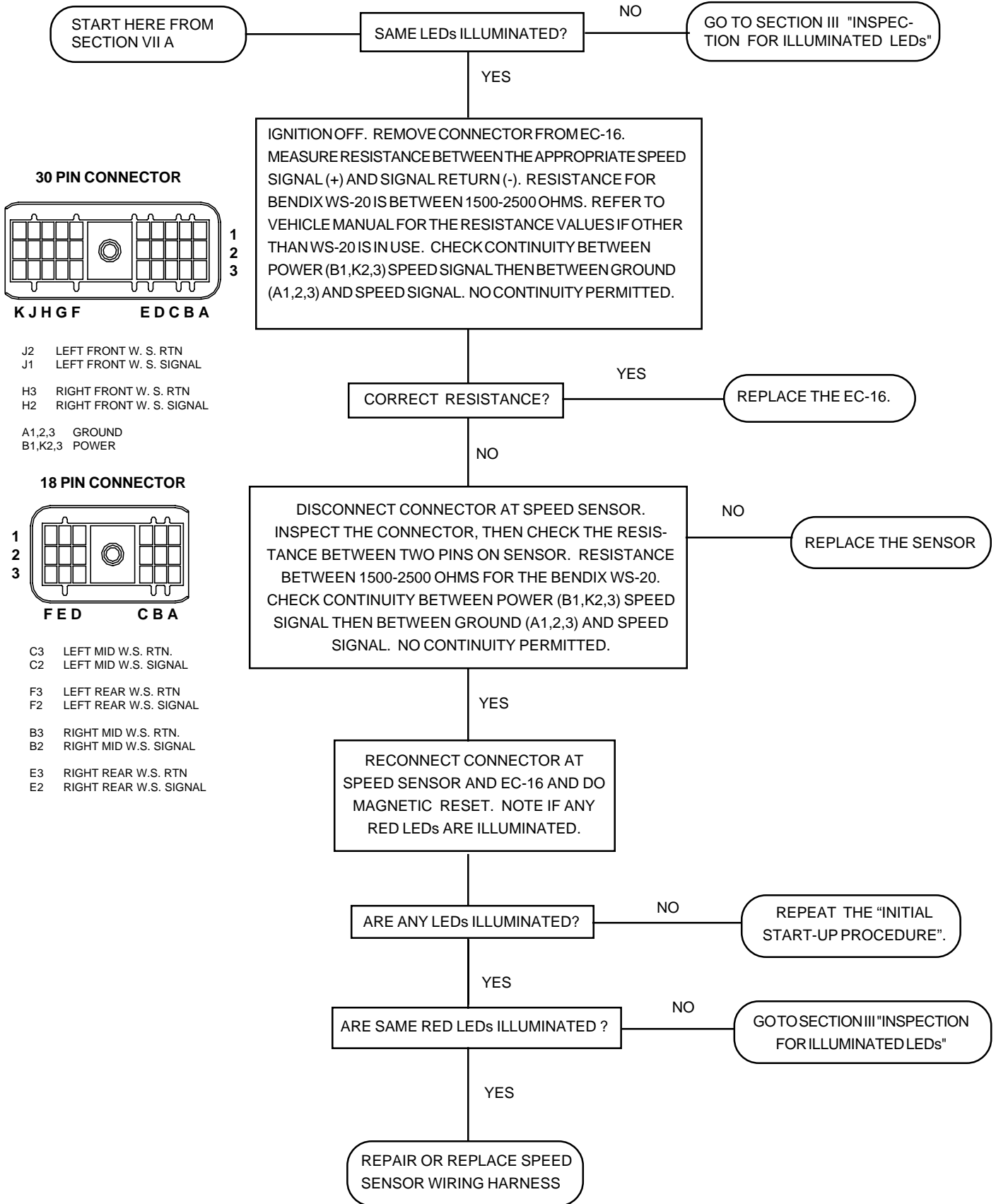
## SECTION VI B - TESTING THE MODULATOR



## SECTION VII A - TESTING THE WHEEL SPEED SENSOR



## SECTION VII B - TESTING THE WHEEL SPEED SENSOR



# SECTION VIII - TESTING FOR FALSE INDICATION CAUSED BY DASH LIGHT RELAY

START HERE

WITH IGNITION ON, HOLD MAGNET ON EC-16 RESET AND NOTE ALL LEDs ILLUMINATED.

ARE ALL LEDs ILLUMINATED?

NO

REPLACE THE EC-16

YES

REMOVE MAGNET FROM EC-16, TURN IGNITION OFF AND DISCONNECT THE 30 PIN CONNECTOR FROM EC-16. CHECK CONTINUITY OF WARNING LAMP WIRE BETWEEN PIN E3, ON THE 30 PIN CONNECTOR AND THE TERMINAL ON THE LAMP RELAY

IS CONTINUITY DETECTED?

NO

REPAIR OR REPLACE WIRE HARNESS, RECONNECT EC-16 WIRE HARNESS AND REPEAT THE "INITIAL START-UP PROCEDURE"

YES

RECONNECT THE 30 PIN CONNECTOR TO THE EC-16, TURN IGNITION ON AND CHECK FOR VEHICLE POWER AT THE LAMP RELAY COIL.

IS POWER DETECTED?

NO

CHECK DASH WIRING AND CONNECTORS, AND CONSULT THE VEHICLE MANUAL FOR TROUBLE SHOOTING INFORMATION. REPAIR OR REPLACE AS NECESSARY AND REPEAT THE "INITIAL START-UP PROCEDURE"

YES

CONNECT THE OPPOSITE END OF RELAY COIL TO VEHICLE GROUND AND NOTE REACTION OF DASH LAMP.

IS DASH LAMP ON?

NO

SECOND TIME TO THIS POINT?

NO

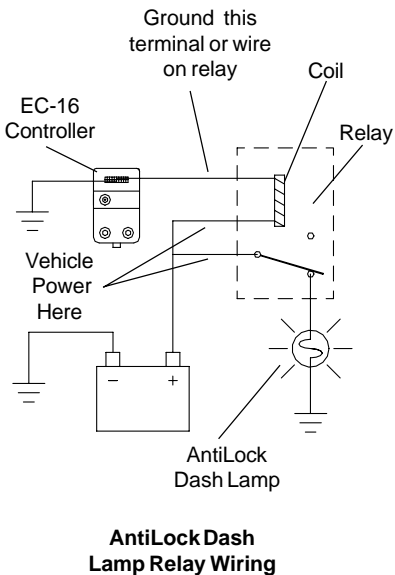
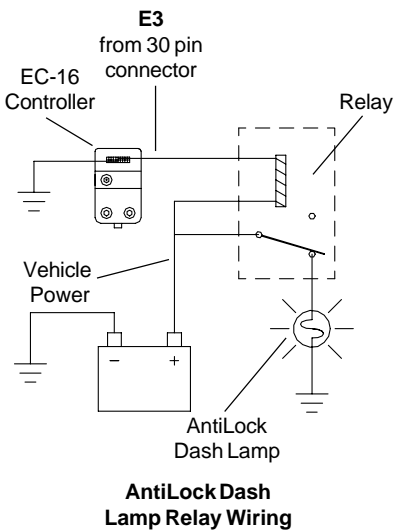
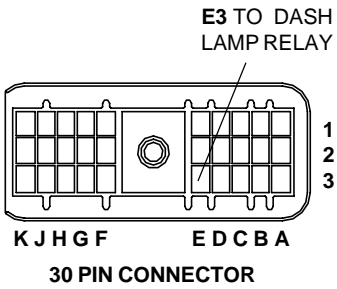
REPEAT "INITIAL START-UP PROCEDURE"

YES

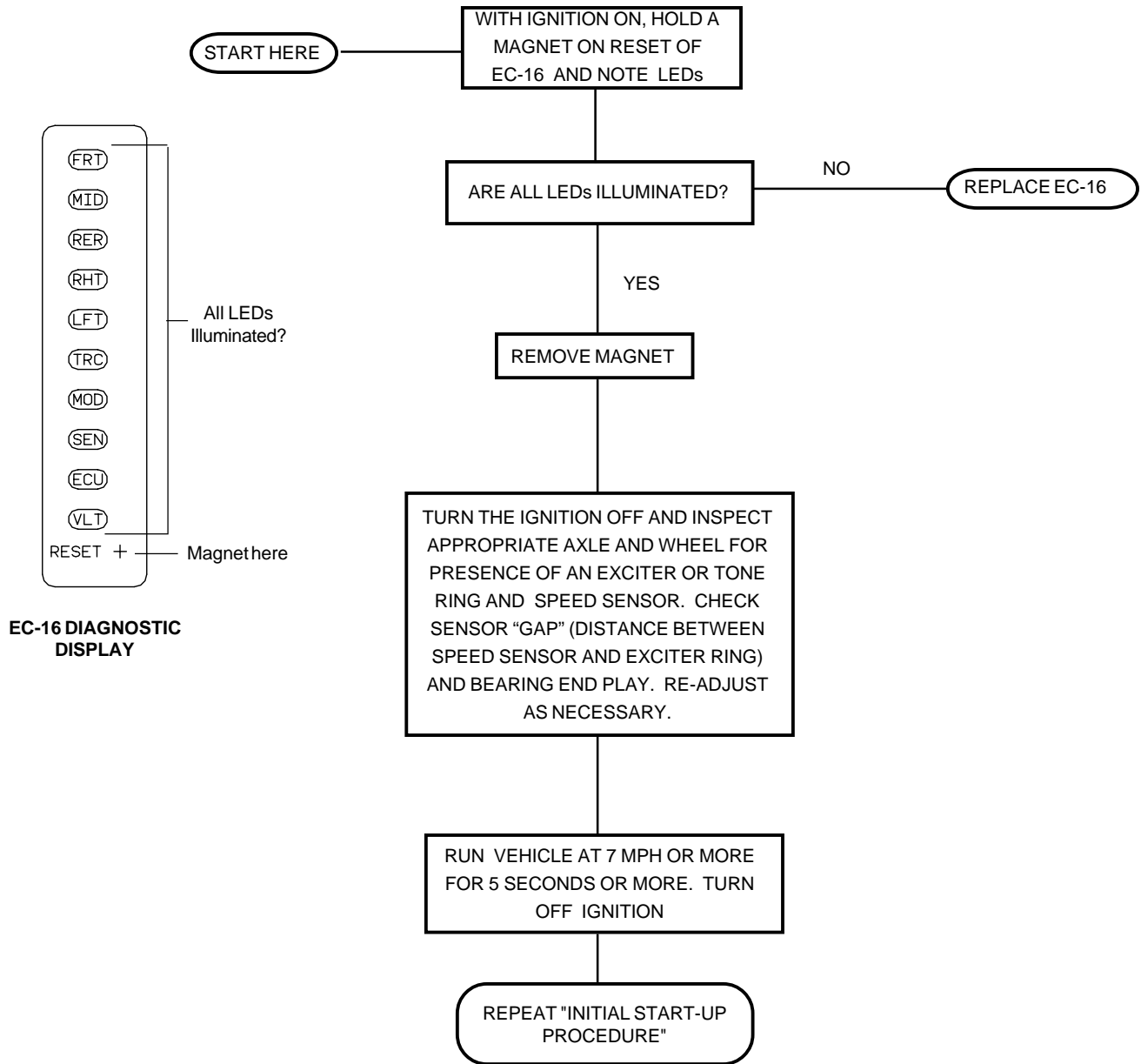
REPLACE THE RELAY AND REPEAT "INITIAL START-UP PROCEDURE"

YES

REPLACE THE EC-16 AND RETEST.

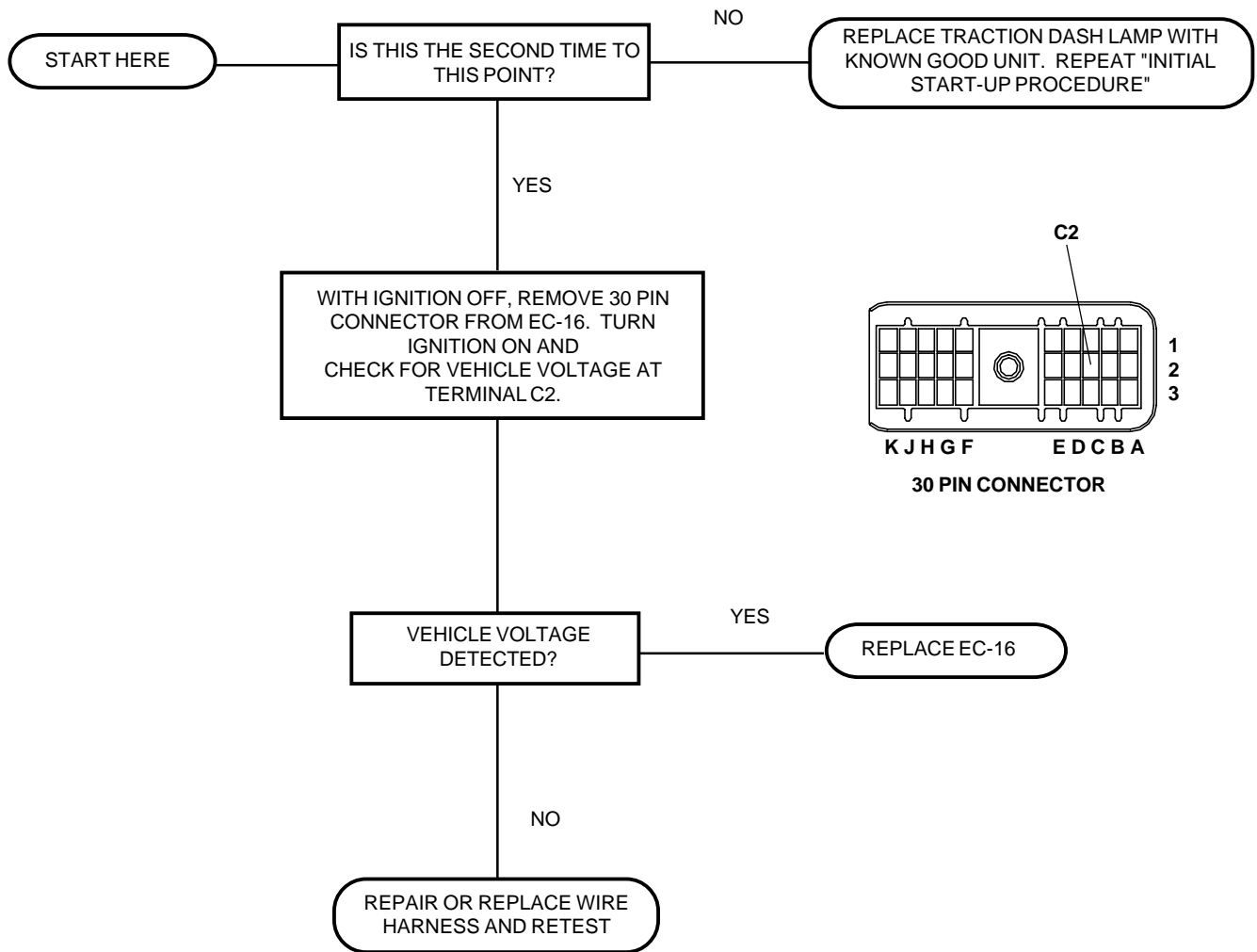


# SECTION IX - TESTING FOR FALSE INDICATION CAUSED BY WHEEL SPEED COMPONENTS

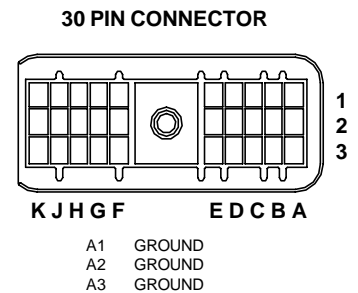
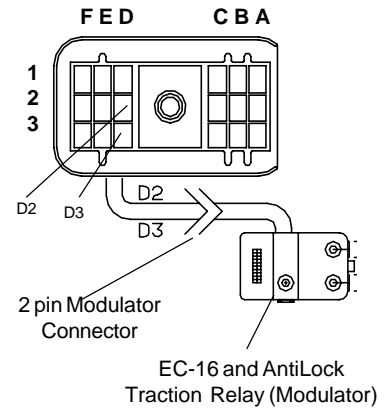
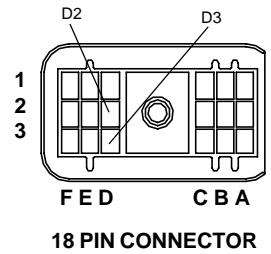
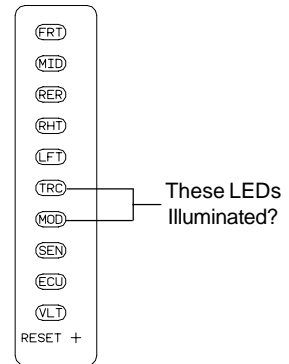
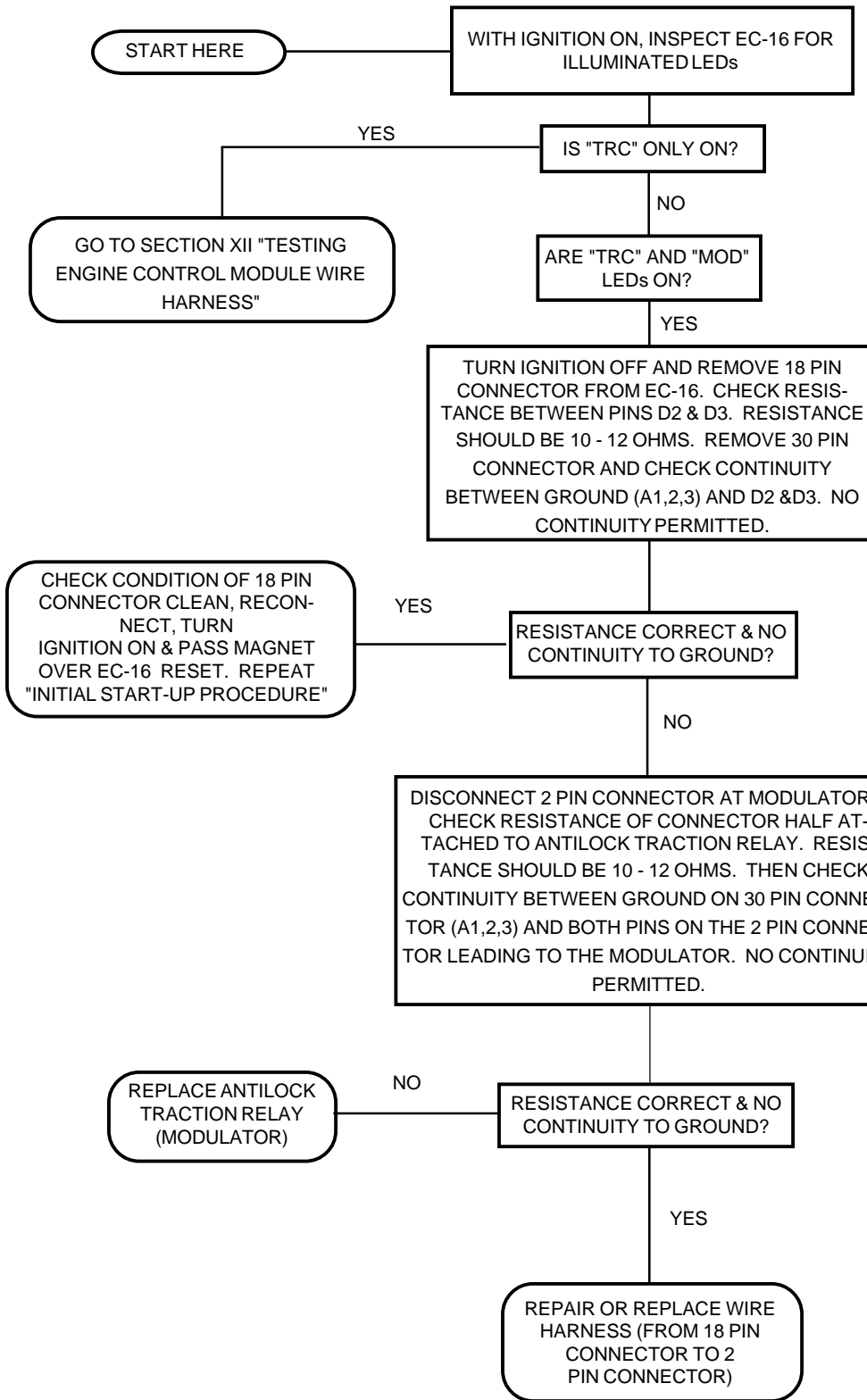




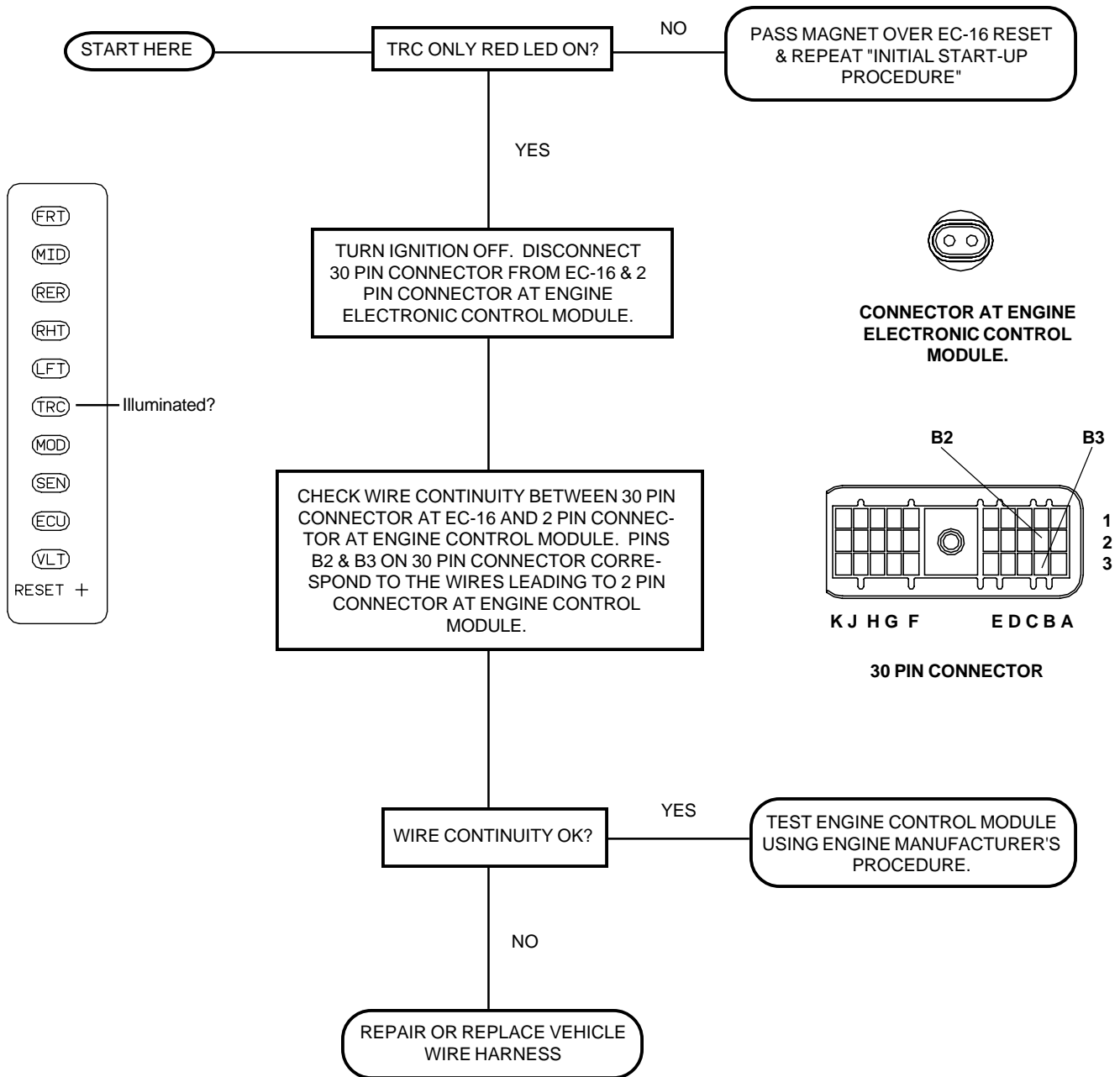
# SECTION X - TESTING TRACTION CONTROL DASH LAMP



# SECTION XI - TESTING TRACTION CONTROL MODULATOR



## SECTION XII- TESTING ENGINE CONTROL MODULE WIRE HARNESS



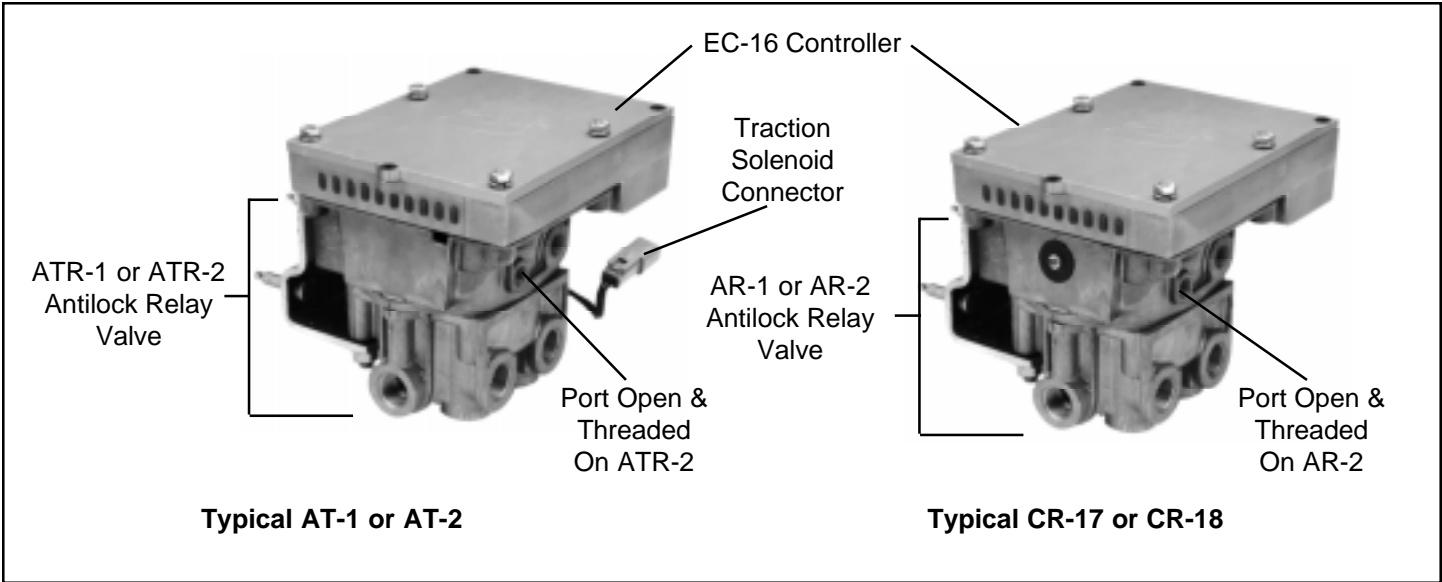


Figure 3 EC-16 and Antilock Valves