REMY POWER PRODUCTS

April 2017

REMY TECHNICAL SERVICE BULLETIN

Batteries are perishable devices that eventually wear out as they deteriorate and become incapable of performing their job. In addition, new and/or good batteries may become discharged for various reasons. Because of this, a battery check should be the starting point for diagnosing all electrical system problems.

HONDA/ACURA DUAL MODE CHARGING SYSTEM

Operation, Diagnostic and Troubleshooting Procedures: Honda/Acura Model Years 1990-2012

Honda/Acura Dual Mode System Operation (Normal and Low)

For many years, Honda and Acura have utilized a dual mode charging system to increase fuel efficiency and to decrease the drag on the engine when starting.

The two modes can accomplish as much as a10% load reduction on the engine by allowing the Powertrain Control Module (PCM) to determine charging rates based on information gathered from the Electrical Load Detector (ELD) unit as well as other sensors. During heavy electrical or mechanical loads, the PCM will set the charging voltage to 13.5 -14.9V (normal output mode). During startup and light electrical load conditions, the PCM will set the charging voltage to 12.4 -12.9V (low output mode). In the case of the latter, this anomaly may cause a technician to incorrectly diagnose a low charge problem, even though it is normal to have 12.4 -12.9V charging voltage when the parameters are met. With the battery at a high state of charge, the pressure (voltage) does not have to exceed the battery voltage to push amperage into it. However, amperage will flow from the alternator to maintain this state of charge and supply the vehicle's electrical needs.

Normal Mode

When the key is turned to the on position, the alternator receives 12V over the Ignition (IG) circuit to turn on the alternator.

The alternator looks at the Computer (C) circuit voltage to determine the charge rate and begins to build the magnetic field. The PCM supplies a 5V reference over the Monitor (FR) wire. The regulator toggles the FR to ground, creating a variable duty cycle and indicating a charging system load. The regulator determines there is a no charge condition (the vehicle isn't running yet), and grounds the Lamp (L) wire to indicate to the PCM of the no charge condition.

In response, the PCM commands the Gauge Control Module (GCM) to turn on the battery lamp over the Controller Area Network (CAN). When the vehicle is started, the regulator sees the rise in voltage and releases the ground on the L circuit. The PCM commands the GCM to turn off the battery lamp over the CAN. The alternator then supplies the current to support the loads of the vehicle and recharge the battery, if needed. Normal mode voltage set point is 13.5-14.9V.

Note: Starting in 2003, the PCM commands the battery lamp. Prior to 2003, the battery lamp was controlled by the alternator regulator.

Low Mode

The PCM monitors the FR circuit, ELD unit and vehicle conditions. When the vehicle amperage demands are low, the ELD indicates this and the PCM grounds the C wire. This causes the regulator to enter low mode and adjust the set point to 12.4 - 12.9V. When the vehicle amperage demand rises, the PCM releases the "C" terminal and returns the set point to normal mode.

REMEMBER:

- **Always retrieve charging system codes before beginning diagnosis.**
- **Always clear charging system codes after completing diagnosis.**
- **Refer to wiring schematic for year, make and model.**

HONDA/ACURA DUAL MODE SYSTEM DIAGNOSIS AND TROUBLESHOOTING

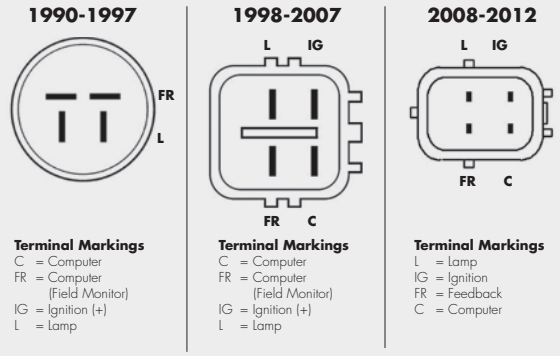
Charging System DTCs

A. P16BB Alternator B+ Circuit Low Voltage
(Failed Alternator, Open B+, Loose Connections)

B. P16BC Alternator FR/IG Circuit Low Voltage
(Open IG circuit, Open or Grounded FR, Failed Alternator, Failed PCM)

C. P0562 Charging System Low Voltage
(Loose Connections, Failed Alternator)

Alternator Regulator Connectors



Follow these steps to ensure proper diagnostics of the charging system

1. Test the battery. Ensure battery is fully charged and passes capacity and/or load testing.
2. Perform a visual inspection under the hood. Verify all electrical connections, main cables and plugs are clean, tight and in good repair. Next, check belt and tensioner condition. Finally, verify the clutch pulley condition (if equipped) and that the alternator is mounted properly.
3. Verify alternator B+ voltage. Key off voltage should be near battery voltage. (If not, repair B+ cable and/or ground circuit). Fig. 1
4. Alternator not turning on: Back probe the "IG" terminal (This is the "Turn On" signal to the alternator).
   - Key off voltage should be 0 (If not, circuit short to voltage, faulty ignition switch)
   - Key On Engine Off (KOEO) voltage should be near battery voltage Fig. 2
   - Key On Engine Running (KOER) should be near system voltage (If not, circuit open, short to ground, faulty ignition switch) Fig. 3
5. Lamp circuit malfunction: Back probe the "L" terminal (Depending on the model year, this is alternator communication to the instrument cluster or PCM concerning alternator operation).

Figure 1
Alt B + V Reading

Figure 2 IG Connector, Bat V

Figure 3 IG Connector, Sys V

- KOEO voltage should be less than 1V and the charge lamp should be illuminated (If not, bulb burned out, circuit short to "V", faulty PCM, alternator or Gauge Control Module) Fig. 4
- KOER voltage should be near system voltage and the lamp should be off (If not, circuit open, short to ground, faulty alternator, PCM, or Gauge Control Module) Fig. 5

6. Alternator not charging: Back probe the "C" terminal (This is the Command wire that is grounded by the PCM to command Normal and/or Low Mode).
   - Normal mode KOER with 7V reference versions: Voltage will be equal to or greater than 7V (For 5V reference versions, voltage will be equal to or greater than 5V) Fig. 6
     - System voltage will be above 13.5V in normal mode (If not, circuit open, to ground, ELD, or PCM)
   - Low mode KOER voltage should be less than 1V (while still back probing the C terminal) Fig. 7
     - System voltage should be between 12.4-12.9V in low mode (If not, circuit short to voltage, faulty ELD, or PCM)
7. Alternator communication failure: Back probe the "FR" terminal (This is the "Monitor" wire the alternator toggles to ground to indicate charging system load).
   - KOEO voltage should be less than 1V. (If not, circuit short to voltage, harness or faulty alternator) Fig. 8
   - Normal mode KOER with high electrical loads: Voltage should decrease. (If voltage is below .27V, check for open or short to ground, faulty alternator or PCM) Fig. 9
   - Low mode KOER with low electrical load: Voltage should be approximately 3.4-4.56V (If voltage is above 5V short to voltage, faulty alternator or PCM) Fig. 10

Tip to remember: Best practice is to perform a charging system voltage drop test before and after replacing the battery and/or alternator. (For voltage drop procedures, refer to the December 2015 Remy Technical Service Bulletin.)

Electrical Load Detector (ELD) Unit Operation

The Electrical Load Detector (ELD) unit monitors the amount of amperage demand the vehicle is pulling from the battery. This amount varies depending on vehicle electrical loads. The PCM supplies a 5V reference to the ELD. The ELD will output .27 - 4.56V to the PCM. This reference voltage is what tells the PCM to increase or decrease the field strength in the alternator, which in turn increases or decreases the output of the alternator.

The ELD pulls the voltage down as current to the vehicle increases. If the voltage on the reference is less than.27V or greater than 4.56V, the PCM detects a fault and sets a DTC.

Note: The ELD will not detect loads that are attached directly to the battery. Any accessories must be integrated into the vehicle's electrical system. Added accessories could overload the stock alternator.

Figure 4 L Connector, less than 1V

Figure 5 L Connector, Sys V

Figure 6 C Connector, greater than 7V

Figure 7 C Connector, less than 1V

Figure 8 FR Connector, less than 1V

Figure 9 FR Connector, V decrease

Figure 10 FR Connector, 3.4 - 4.56V

Figure 11 ELD top fuse box

Figure 12 ELD bottom fuse box

ELD Location

The ELD is located in the underhood fuse box. The electrical connector will either plug into it from the top (Fig. 11) or plug into it from the bottom of the fuse box (Fig. 12). If the electrical connector plugs into the ELD from the bottom, the fuse box mounting screws will have to be removed, the fuse box lifted up and the cover removed to gain access to the connector.

REMEMBER:

- **Always retrieve charging system codes before beginning diagnosis.**
- **Always clear charging system codes after completing diagnosis.**
- **Retrieve proper wiring schematic for diagnostics.**

ELD DIAGNOSIS

ELD DTCs

A. P1297: Electrical Load Detector (ELD) Circuit Low Voltage
(Short to Ground, ELD Failure, PCM Failure)

B. P1298: Electrical Load Detector (ELD) Circuit High Voltage
(Open Power to ELD, Open ELD Ground, Open to PCM, Failed ELD)

Follow these steps for proper diagnostics of the ELD:

1. Back probe the ELD connector's "B+" wire.
   - Key off voltage should be near battery voltage (If not, circuit open, short to ground) Fig. 13
2. Back probe the ELD connector's "Ground" wire.
   - Back probe the ELD ground wire. Connect the voltmeter positive lead to the battery positive. Connect the negative lead to the back probe pin. Voltage reading should be near battery voltage. (If not, circuit open) Fig. 14
3. Back probe the ELD connector's "PCM" reference wire.
   - Normal mode KOER voltage should decrease as load is added (If voltage is below .27V short to ground, ELD failure, PCM failure) Fig. 15
   - Low mode KOER voltage should be approximately 3.4-4.56V (If voltage is above 4.56V, open power to ELD, open ELD ground, open to PCM, ELD failure) Fig. 16

Figure 13
ELD B+ conn

Figure 14
ELD grnd conn

Figure 15
ELD PCM V decrease

Figure 16
ELD PCM 3.4-4.56