SERVICE BULLETIN

Original Issue Date: **5/05**
Model: **30 kW (3.0 L) and 80–125 kW (8.1 L) GM Engines**
Market: **Industrial**
Subject: **Diagnostic Test Light for GM ECM Engines**

Introduction

This bulletin details the fabrication and connection of a diagnostic test light allowing the technician to access the engine control module (ECM) fault codes when performing engine troubleshooting and repairs.

If you do not have access to a laptop PC, it is still possible to retrieve the Diagnostic Trouble Codes (DTC) stored in the memory of the ECM system using a jumper wire and a diagnostic test light. The diagnostic test light is a simplified alternate to using the available diagnostic software and a laptop PC.

The diagnostic test light accesses the three-digit fault code. The user must use the Engine ECM Service Manual to identify the fault codes:

- TP-6215 30 kW (3.0 L) and 80–125 kW (8.1 L) Engine ECM Service Manual

See Diagnostic Trouble Codes (DTC) Summary located at the end of this document for a listing of the fault codes.

Read the entire procedure before connecting the diagnostic test light. Perform the steps in the order shown.

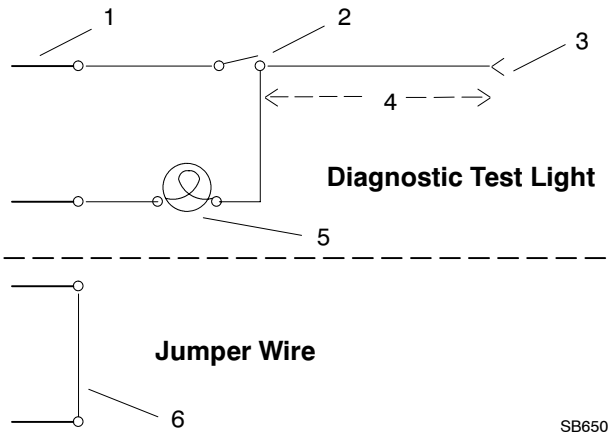
Diagnostic Test Light Assembly

Build the diagnostic test light and jumper wire as shown in Figure 1. The wire length between the switch and battery alligator clip should be at least 3 m (10 ft.) so that the diagnostic test light can reach the engine starting batteries. A lead extension will be needed if the engine starting batteries are further than 3 m (10 ft.) from the engine harnesses J30 and comm link.

Solder all connections and use electrical tape and/or heat shrink tubing to insulate the exposed connections as needed. The user can install the switch and lamp/socket in a suitable box, if desired. Label the switch's closed position as ON.

Diagnostic test light components:

- SPST toggle switch (P/N 268015 or equivalent)
- Battery alligator clip (P/N 291338 or equivalent)
- Lamp, 12 volt, 2 W, T–2, #12 PSB (P/N 295324 or equivalent)
- Lamp socket (P/N 295325 or equivalent)
- Lamp socket lens, white (P/N 295326 or equivalent)
- Male terminals for 10-pin connector, qty. 2, (P/N 361471, Packard Electric P/N 12045773, or equivalent)
- Female terminals for 4-pin connector, qty. 2, (P/N GM13698, Packard Electric P/N 12089188, or equivalent)
- 18-gauge stranded insulated wire (approx. 4.5 m [15 ft.])
- Electrical tape and/or heat shrink tubing as needed
- Electrical terminals as needed



1. Male terminals (qty. 2) for connecting to 10-pin connector
2. SPST toggle (diagnostic) switch
3. Battery alligator clip
4. Wire, 18-gauge, approx. 3 m (10 ft.)
5. Lamp, 12 volt
6. Female terminals (qty. 2) for connecting to 4-pin connector

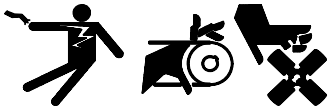
Figure 1 Diagnostic Test Light Components

Routing	Service Manager	Sales Manager	Parts Manager	Technician No. 1	Technician No. 2	Technician No. 3	Return This to
Initial Here							

Safety Precautions

Observe the following safety precautions while troubleshooting the generator set. Follow all safety precautions given in the engine literature when performing engine troubleshooting and repairs.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

⚠ WARNING

Hazardous voltage. Moving rotor.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Installation Procedure

1. Connect the diagnostic test light.

1.1 Place the generator set master switch in the OFF/ RESET position.

1.2 Locate the 10-pin inline connectors J30 and P30. Separate the inline plugs. See Figure 2 and Figure 3.

1.3 Place the diagnostic test switch in the OFF (open) position. See Figure 3.

1.4 Connect the diagnostic test light to J30 pins A and F as shown in Figure 3.

1.5 Locate 4-pin comm link TWR connector.

1.6 Connect the jumper wire to the comm link TWR connector pins A and D as shown in Figure 3.

1.7 Attach the diagnostic test light alligator clip to the generator set battery positive (+) terminal.

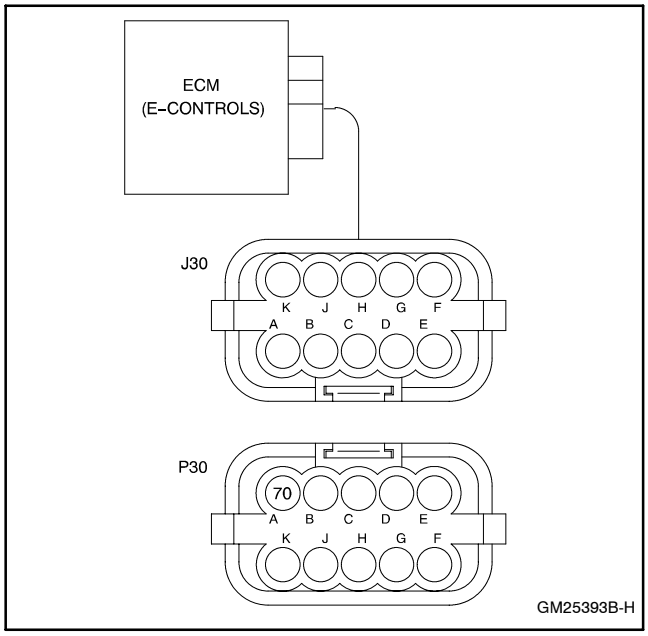
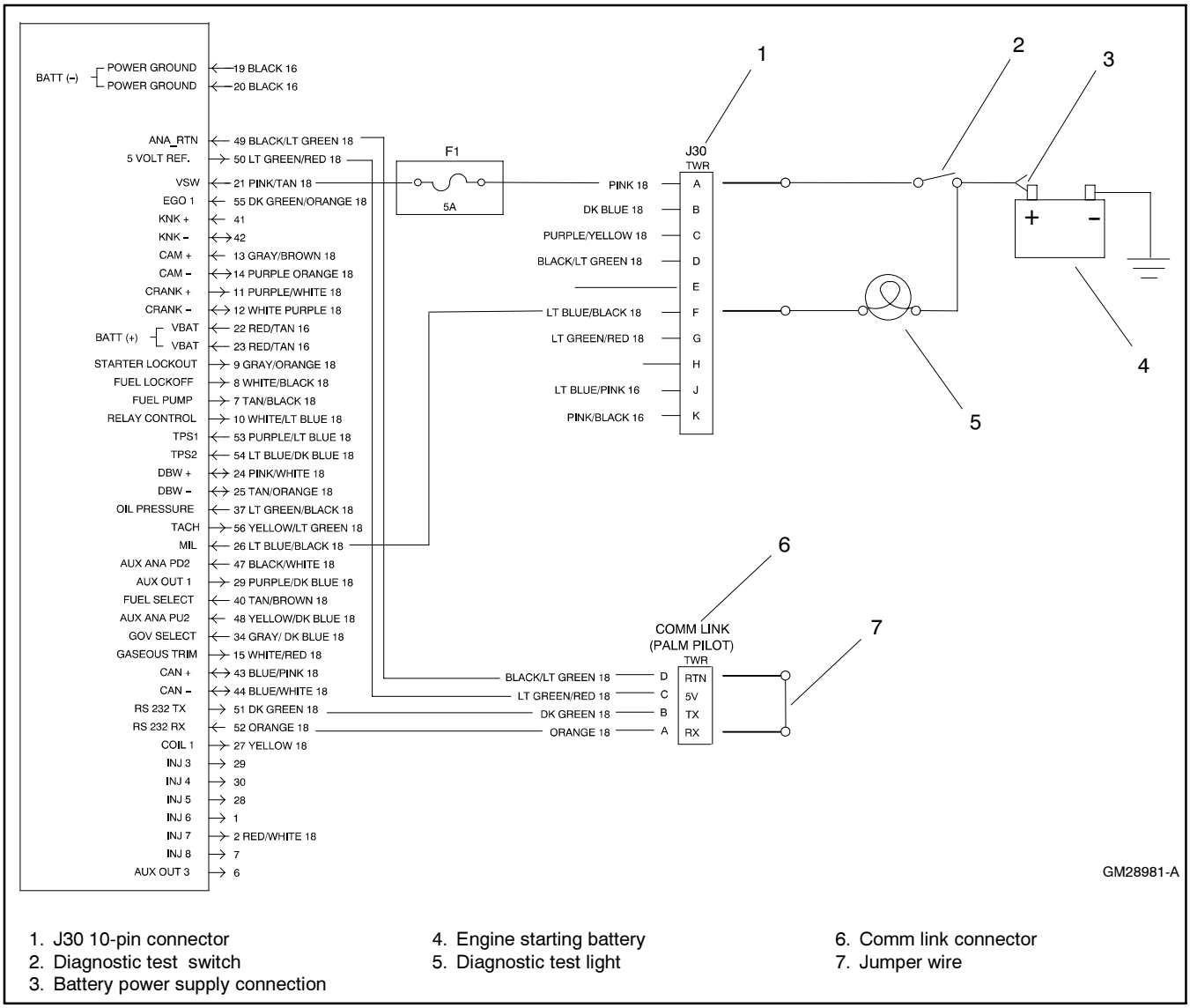


Figure 2 J30 Connector



1. J30 10-pin connector
2. Diagnostic test switch
3. Battery power supply connection
4. Engine starting battery
5. Diagnostic test light
6. Comm link connector
7. Jumper wire

Figure 3 Diagnostic Test Light Connections

2. Access the DTC codes of the engine ECM.

2.1 Place the diagnostic test switch in the ON position to close the switch contacts.

2.2 The diagnostic test light displays three digit codes by flashing the first digit, pausing, then flashing the second digit, pausing, and then flashing the third digit.

For example, a DTC 143 code would be 1 flash followed by 4 flashes followed by 3 flashes.

There will be a longer pause between codes. The ECM will repeat the same DTC code three times. All DTC codes are stored as historical events until they are cleared.

The diagnostic test light will first display DTC 123 code three times indicating the ECM diagnostics are functioning correctly. Then any DTC codes stored in memory will display three times each. After all of the DTC codes are displayed, the diagnostic test light will display all of the codes over again. This will continue until the light is disconnected using the diagnostic test switch, the unit is started, or the DTC codes are cleared from the memory.

Write down each DTC code for identification in the next step.

Note: If the generator set is started during the retrieval of DTC codes, the diagnostic test light will flash rapidly.

2.3 Refer to the respective ECM service manual for DTC code definitions and correct each fault using the information in the ECM service manual. Follow all safety precautions given in the engine literature.

In the circumstance of multiple DTC codes, always begin with the lowest number DTC. Diagnose and correct each problem before going to the next DTC unless directed to do otherwise by the DTC chart. The DTCs are numbered in order of importance.

Displaying codes DTC 112 and DTC 122, both concerning the oxygen sensor, is possible. By correcting DTC 112 first, the problem causing DTC 112 may also be corrected. The ECM will continue to run the self-test unless the DTC is an oxygen sensor lean, oxygen sensor rich, or an internal ECM related DTC. If the system continues to fail this test, the diagnostic test light will stay illuminated and the DTC is current (ACTIVE). While a DTC is current for a sensor, the ECM may assign a default limp-home value and use that value in its control algorithms. All of the system diagnostic self-tests run continuously during normal generator set operation.

Note: The Engine ECM service manual will refer to the diagnostic test light as the Malfunction Indicator Lamp (MIL).

2.4 Place the diagnostic test switch in the OFF position.

3. Clear the DTC codes.

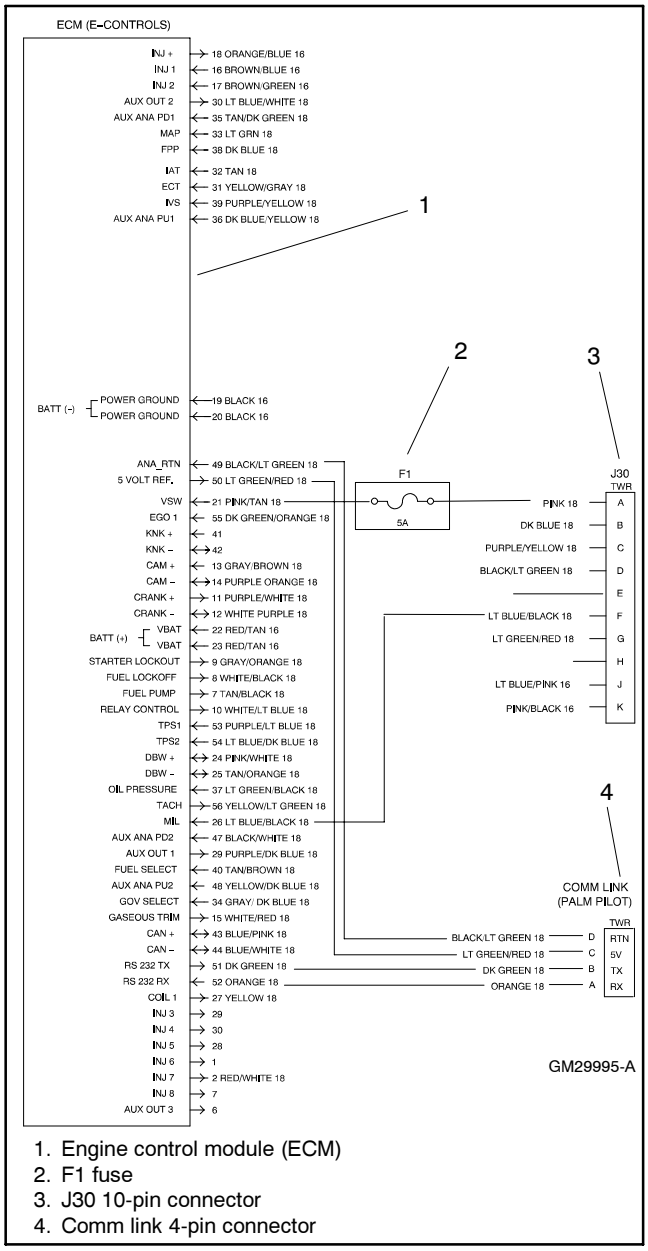
Clearing the codes from the ECM memory includes the clearing the adaptive learn feature. The adaptive learn feature will initiate again when the generator set is restarted.

All DTC codes except the ECM related DTCs will automatically clear from memory if the DTC does not reset within 50 consecutive engine run cycles.

3.1 Place the generator set master switch in the OFF/RESET position.

3.2 Remove the F1 (5 amp) fuse located between J30 connector (pink wire) and the engine ECM wire 21 (pink/tan wire) for at least 15 seconds. See Figure 4.

3.3 Replace the F1 fuse.



1. Engine control module (ECM)
2. F1 fuse
3. J30 10-pin connector
4. Comm link 4-pin connector

Figure 4 F1 Fuse

4. Disconnect the diagnostic test light.

4.1 Place the diagnostic test switch in the OFF (open) position.

4.2 Disconnect the diagnostic test light alligator clip from the generator set battery positive (+) terminal.

4.3 Disconnect the jumper wire from comm link TWR connector pins A and D.

4.4 Disconnect the diagnostic test light from J30 pins A and F.

4.5 Reconnect the 10-pin inline connectors J30 and P30.

Diagnostic Trouble Codes (DTC) Summary

111	Intake Air Temperature (IAT) High Voltage
112	Intake Air Temperature (IAT) Low Voltage
113	Intake Air Temp. (IAT) Higher Than Expected 1
114	Intake Air Temp. (IAT) Higher Than Expected 2
115	Oil Pressure Low
121	Cylinder Head Temperature (CHT)/Engine Coolant Temperature (ECT) High Voltage
122	Cylinder Head Temperature (CHT)/Engine Coolant Temperature (ECT) Low Voltage
123	Engine Coolant Temperature (ECT) Higher Than Expected 1
124	Engine Coolant Temperature (ECT) Higher Than Expected 2
131	Manifold Air Pressure (MAP) High Pressure
132	Manifold Air Pressure (MAP) Low Voltage
133	Barometric Pressure (BP) High Pressure
134	Barometric Pressure (BP) Low Pressure
136	Throttle Inlet Pressure (TIP) Voltage High
137	Throttle Inlet Pressure (TIP) Voltage Low
142	Crank Sync Noise
143	Never Crank Synced at Start
144	Camshaft Sensor Loss
145	Camshaft Sensor Noise
211	Closed Loop Multiplier High (LPG fuel)
212	Heated Oxygen Sensor (HO2S) Open/Inactive
221	Closed Loop Multiplier High (gasoline fuel)
222	Closed Loop Multiplier Low (gasoline fuel)
224	Closed Loop Multiplier Low (LPG fuel)
225	Closed Loop Multiplier High (natural gas fuel)
226	Closed Loop Multiplier Low (natural gas fuel)
241	Adaptive Lean Fault (High Limit-gasoline fuel)
242	Adaptive Rich Fault (Low Limit-gasoline fuel)
243	Adaptive Learn High (LPG fuel)
244	Adaptive Learn Low (LPG fuel)
245	Adaptive Learn High (natural gas fuel)
246	Adaptive Learn Low (natural gas fuel)
261	System Voltage Low
262	System Voltage High
311	Coil Driver #1 Open
312	Coil Driver #1 Shorted
313	Coil Driver #2 Open
314	Coil Driver #2 Shorted
315	Coil Driver #3 Open
316	Coil Driver #3 Shorted
321	Coil Driver #4 Open
322	Coil Driver #4 Shorted
323	Coil Driver #5 Open
324	Coil Driver #5 Shorted
325	Coil Driver #6 Open
326	Coil Driver #6 Shorted
331	Coil Driver #7 Open
332	Coil Driver #7 Shorted
333	Coil Driver #8 Open
334	Coil Driver #8 Shorted
411	Injector Driver #1 Open
412	Injector Driver #1 Shorted
413	Injector Driver #2 Open
414	Injector Driver #2 Shorted
415	Injector Driver #3 Open
416	Injector Driver #3 Shorted
421	Injector Driver #4 Open
422	Injector Driver #4 Shorted
423	Injector Driver #5 Open
424	Injector Driver #5 Shorted
425	Injector Driver #6 Open
426	Injector Driver #6 Shorted
431	Injector Driver #7 Open
432	Injector Driver #7 Shorted
433	Injector Driver #8 Open
434	Injector Driver #8 Shorted
511	COP Failure
512	Invalid Interrupt
513	Adaptive Disabled (A/D) Loss
514	RTI 1 Loss
515	Flash Checksum Invalid
516	Random Access Memory (RAM) Failure
521	CAN Communication Error
531	External 5 V Reference Lower than Expected
532	External 5 V Reference Higher than Expected
555	RTI 2 Loss
556	RTI 3 Loss
611	Foot Pedal Position (FPP) High Voltage
612	Foot Pedal Position (FPP) Low Voltage
613	Foot Pedal Position (FPP) Higher than Idle Validation Switch (IVS) Limit
614	Foot Pedal Position (FPP) Lower than Idle Validation Switch (IVS) Limit
631	Throttle Position Sensor (TPS) 1 (Signal Voltage) High
632	Throttle Position Sensor (TPS) 1 (Signal Voltage) Low
633	Throttle Position Sensor (TPS) 2 (Signal Voltage) High
634	Throttle Position Sensor (TPS) 2 (Signal Voltage) Low
635	Throttle Position Sensor (TPS) 1 Higher than Throttle Position Sensor (TPS) 2
636	Throttle Position Sensor (TPS) 1 Lower than Throttle Position Sensor (TPS) 2
637	Throttle Unable to Open
638	Throttle Unable to Close
651	Maximum Governor Speed Override
652	Fuel Rev Limit
653	Spark Rev Limit