

TECHNICAL BULLETIN

Engine Start Module (ESM) Functional Test

Maxwell Technologies, Inc.
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It is important to read and fully understand the procedure outlined in this bulletin before beginning the functional test.

Summary

This bulletin outlines a functional test to determine the operational state of the Maxwell Technologies Engine Start Module (ESM). This test is very similar to the final functional test performed at our manufacturing facility.

Tools and Equipment

The minimum tools and equipment (see Figure 1) necessary to perform the functional test are:

- A digital multi-meter (DMM)
- A pair of jumper cables
- A fully charged battery (preferably a Group 31 lead-acid battery)
- Maxwell's ESM

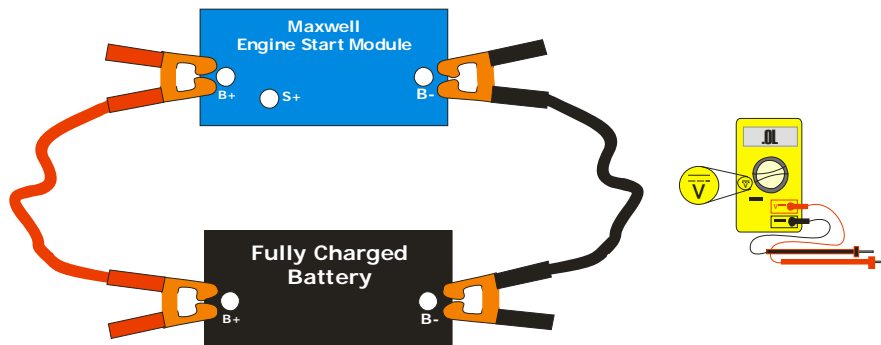


Figure 1

Alternative Test Equipment

The equipment list below is an alternative that can be used by technician level personnel at the customer's discretion.

- Power Supply: Must be capable of supplying constant current of 25 amps and a voltage setting of no less than 12 volts (preferably 12.5 volts). This power supply would replace the fully charged battery.
- 10 Gauge wire (see Figure 2) for connections between your power supply and ESM. Use red wire for POSITIVE and black for GROUND.

Vehicle Wire



- Flexible
- Temperature Range: -10° to 175° F
- Insulation: PVC

Use this low-voltage stranded wire in trucks, boats, trailers, and other vehicles. Also known as primary wire or GPT, it meets SAE J1128. Rated 25 volts AC and 60 volts DC.

Small Spools					100-ft. Spools		
Wire Ga.	OD	Amps @ 86° F	Lg. ft.	Choose a Color	Each	Choose a Color	Each
10	0.18"	51	8	Black, Red, White	6659T18 \$5.13	Black, Red, White	6659T14 \$33.18

Figure 2

- A set of copper clamps equivalent to a McMaster Carr PN 7236K63 (See Figure 3).



Figure 3

- All associated ring terminals and screws.

All connections at the connection side must be covered with heat shrink or equivalent electrical tape. This alternative test station can now be used along with the DMM to perform a functional test on the ESM.

WARNING

HIGH CURRENT HAZARD!

Power terminals pose an extreme arcing hazard when the ESM is fully charged or even partially charged. Make sure to properly insulate exposed terminals while conducting these tests to avoid personal injury.

Ensuring the Battery is Charged

If you are using a battery to perform the functional test, make sure that the battery is fully charged before you begin the test. To ensure the battery is fully charged, connect the battery to a battery charger as shown in Figure 4.

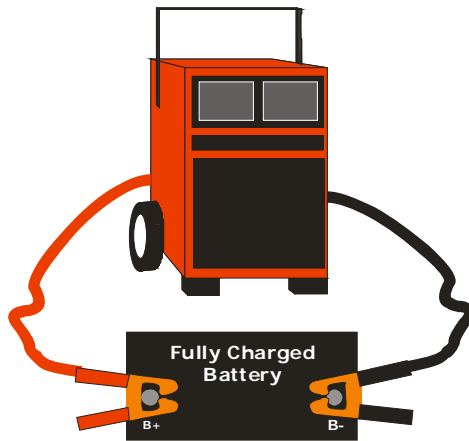


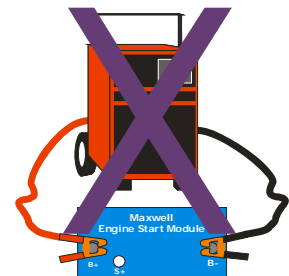
Figure 4

Charging the ESM

NOTICE

DO NOT USE A BATTERY CHARGER TO CHARGE THE ESM

While performing these tests, do not attach the ESM to a battery charger. Battery chargers do not have ripple-free DC voltage and will cause the ESM to experience a low voltage error and not charge properly.



Once the battery and ESM are connected as shown in Figure 5, use the DMM (set to DC volts) to monitor the voltage (Red lead to S+ and Black lead to B-). The ESM should immediately begin to charge and voltage readings should start to increase on the DMM.

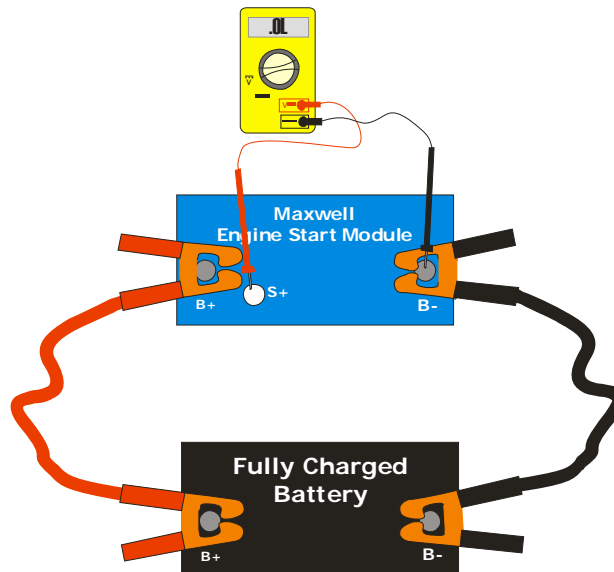


Figure 5

At this point, it is recommended to reset the ESM to remove all faults. To reset the ESM, hold down the Test Button until all lights stop flashing (this usually takes 10-12 seconds). Wait for 30 seconds and then push the Test Button for 1 second. Refer to Table 1 to note which lights are solid and/or flashing:

Status Lights		
Green Light	Red Light	Meaning
● Lit Solid	○ Not Lit	Ready to crank
⊗ Flashing	○ Not Lit	Charging: WAIT 15 minutes
○ Not Lit	⊗ Flashing	Stuck push button
○ Not Lit	● Lit Solid	Internal error – push Test Button for 10 seconds
⊗ Flashing	● Lit Solid	Call Technical Support (888) 890-3337

Table 1

After you have performed the reset, the ESM will still show the voltage is increasing. Push the Test Button for 1 second; a flashing green light will appear to indicate that the ESM is accepting a charge (see Figure 6). The rate of charge is 0.6 volts per minute, and can take anywhere from 5 to 25 minutes. The ending voltage can range from 14.7 V to 16.2 V, depending on the ambient temperature.

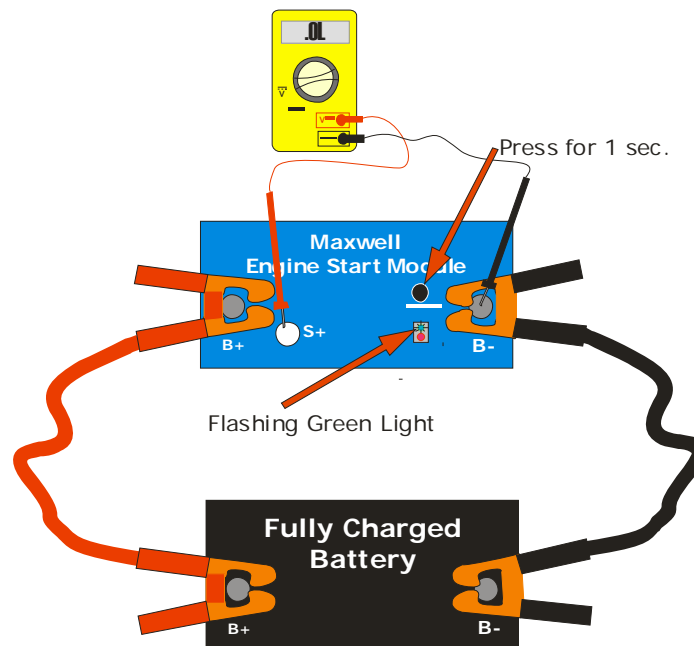


Figure 6

Once the ESM stops charging, push the Test Button for 1 second; a solid green light will appear, indicating the ESM is fully charged. Record the ending voltage. It is highly recommended you record this data for follow-up discussions with your customer or the Maxwell Technologies technical support team.

In the event the ESM stops charging:

1. Check all cables and connections to ensure good working order and contacts are secure.
2. Check the battery voltage to ensure that it's fully charged.

Once the cables, connections and voltage are confirmed, record the ending voltage and push the Test Button for 1 second. The status lights will indicate the ESM status; see Table 1 on page 5 for status lights definitions.

If you have made it successfully to this point with no problems and the ESM performed as described above, you have a fully functional ESM that may be installed and used in a diesel truck. There is no need to contact Maxwell for additional technical assistance.

If, however, you experience any problems during this test, please contact Maxwell Technologies Technical Support Line at (888) 890-3337. When calling the Technical Support Line, please have the following information available:

1. ESM Serial Number (located on the white label just under the barcode on top of the ESM)
2. Starting Voltage
3. Ending Voltage (voltage at the time it stopped charging)
4. Status Lights (what lights were flashing/solid?)
5. What was the complaint from the customer?

Discharging the ESM

WARNING



HIGH CURRENT HAZARD!

Power terminals pose an extreme arcing hazard when the ESM is fully or even partially charged. Make sure to properly insulate exposed terminals while conducting these tests as injuries can occur.

It is important to discharge the ESM after this test. To discharge the ESM, attach any 12 volt load to the ESM, such as a headlight or 12 volt motor. The positive lead from the 12 volt load is attached to the ESM's S+ terminal and the ground lead is attached to the ESM's B- terminal. Monitor the decreasing voltage until it reads ZERO. Once completed, attach a grounding wire between the S+ terminal and B- to ensure the ESM voltage remains at ZERO.

For questions or assistance, please contact Maxwell Technologies Technical Support Line at (888) 890-3337.

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