

# TECHNICAL BULLETIN

## Engine Start Module (ESM) Functional Test Rev 2.

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. The last page includes a worksheet to record test data to send to Maxwell Technologies, Inc.*

## 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) required to perform the functional test are:

- A digital multi-meter (DMM).
- A pair of jumper cables.
- A fully charged and load tested battery 12.6-12.8V (lead-acid, deep cycle or AGM).
- Maxwell's ESM.
- Functional Test worksheet (*last page of this document*) to record results.

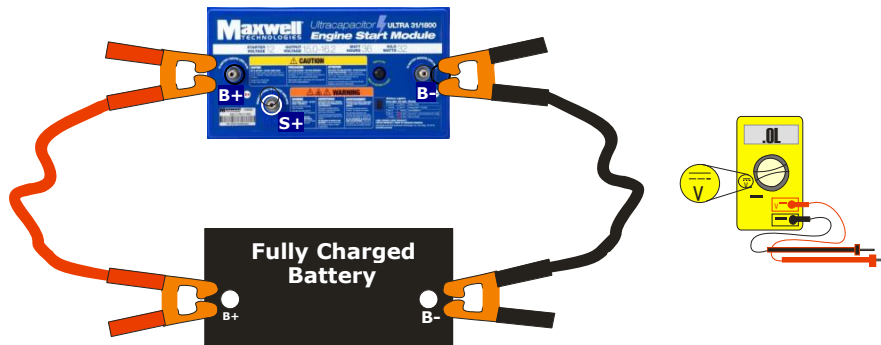


Figure 1

## 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.

### Charging the ESM

Once the battery and ESM are connected as shown in Figure 2, 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. **Note- if the battery is not fully charged this could result in a fault status and a failed test.**

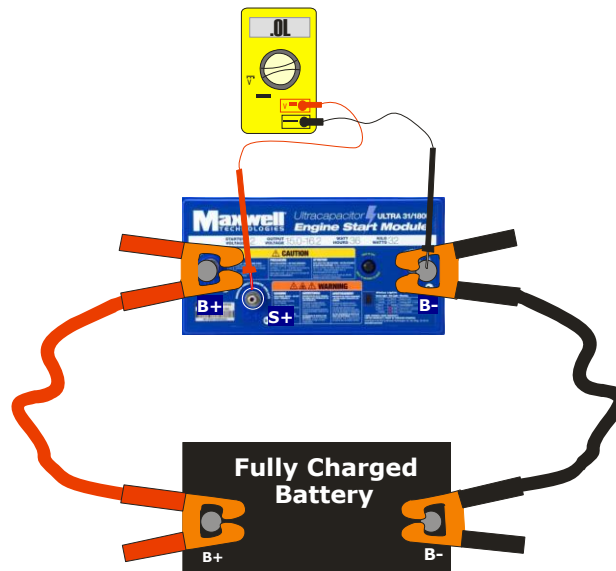


Figure 2

Press the 'Push for 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 and hold test Button for 15 seconds |
| ● Flashing    | ● Lit Solid | Call Technical Support (888) 890-3337                     |

A flashing green light indicates that the ESM is accepting a charge (see Figure 3). The rate of charge should increase 0.6 volts per minute, and can take anywhere from 5 to 25 minutes to reach full charge. ESM voltage can range from 14.7 volts to 16.2 volts, depending on the temperature. The status lights will only illuminate for ten seconds and only when the ESM is connected to a battery.

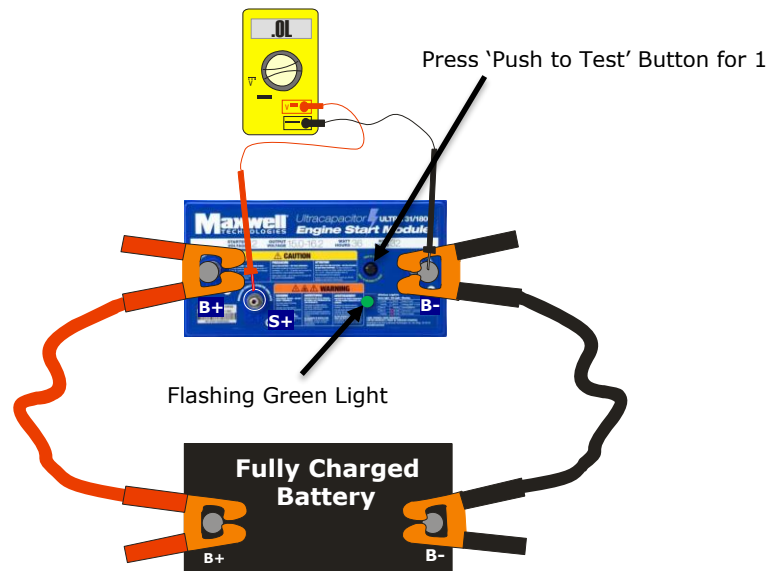


Figure 3

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.

***Immediate ESM failure criteria.***

- 1. LED will not illuminate after pushing test button for 1 second.*
- 2. ESM does not immediately accept a charge.*
- 3. ESM stops charging prior to reaching a minimum of 14.8V.*
- 4. Red LED Fault status will not clear.*

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 any heavy duty commercial vehicle. 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 or [esmsales@Maxwell.com](mailto:esmsales@Maxwell.com).

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**Engine Start Module (ESM) Functional Test Worksheet**

| Contact Information | You | Customer or Fleet |
|---------------------|-----|-------------------|
| Name                |     |                   |
| Address             |     |                   |
| Date                |     |                   |
| Phone               |     |                   |
| Email               |     |                   |



- Record ESM Serial Number \_\_\_\_\_
- Are all 3 Terminals Present?  Yes  No  
 If not, which Terminal(s) are Broken?  Battery +  Battery -  Starter +  
 If there is a broken terminal this test is complete. ESM Terminals are note repairable.  
 Please take a photograph of the broken terminal(s)and submit with this worksheet.
- Before connecting battery record the voltage across the ESM S+ to B- Terminals \_\_\_\_\_VDC
- Connect a 12V battery to the ESM B+ and B- terminals.
- Press the Push to Test Button for one second and record Status Lights (check all that apply)

|                              |  |
|------------------------------|--|
| Flashing Green               |  |
| Solid Green                  |  |
| Flashing Green and Solid Red |  |
| Solid Green and Flashing Red |  |
| Solid Red                    |  |
| No Status Lights             |  |

- Voltage Tests: Measured across the ESM S+ and B- Terminals  
 Measure how long (in Seconds) the ESM takes to charge 1 Volt \_\_\_\_\_ seconds  
 Is the ESM voltage increasing?  Yes  No  
 If not, what is the voltage? \_\_\_\_\_ volts  
 If yes, what is the final voltage of the ESM? \_\_\_\_\_ volts  
 Does the Solid Green light appear when pressing the Push to Test Button?  Yes  No
- If you have any of the following conditions, please contact Maxwell Tech Support:

|                     |                              |                 |                  |
|---------------------|------------------------------|-----------------|------------------|
| No Voltage Increase | Never have Solid Green Light | Solid Red Light | No Status Lights |
|---------------------|------------------------------|-----------------|------------------|

ESM Technical Support: (888) 890-3337 or [esmsales@Maxwell.com](mailto:esmsales@Maxwell.com)