



MSS-DEBUG User Manual

The MSS-DEBUG is a handheld diagnostic tool intended for debugging and testing devices compatible with the Modular Signal System (<http://modularsignalsystem.info/>).

Features

- Diagnostic LEDs indicate status of all six MSS signal lines
 - Local Block Occupancy
 - Approach Occupancy In (to node)
 - Advance Approach Occupancy In (to node)
 - Advance Occupancy Out (from node)
 - Advance Approach Occupancy Out (from node)
 - Diverging Approach In/Out (to/from node)
- Switches allow user to toggle each signal line to test module response
- Provides +12V bus pull-up bias voltage from 3x AAA batteries for testing bus segments without pull-ups (such as the MSS-CROSSOVER module)
- Compliant with the MSS v2.0.1 specification

Usage

Install 3x AAA batteries in the back battery holder. Turn on the power switch (lower left corner, up is on). The green power LED should light. If it does not, the batteries are either dead or the MSS-DEBUG's power supply is defective.

One or both of the bus connections should be connected. Which ones you connect will depend on the problem you're trying to solve.

In order to test a node without being connected to a larger MSS network, connect the right side MSS bus connector marked "To Node" to the MSS node you wish to monitor/control. The MSS-DEBUG should be connected to the node with a "straight through / normal" ethernet cable. A short 1' cable is provided for this purpose.

In order to see the signals being received at a node, connect the left side MSS bus connector (marked "To Bus") to the crossover cable where the node would normally plug in. (You may then optionally connect through to the node with a straight-through cable to see both sides.) This is useful for debugging what signals a node is receiving, and why it may be misbehaving.

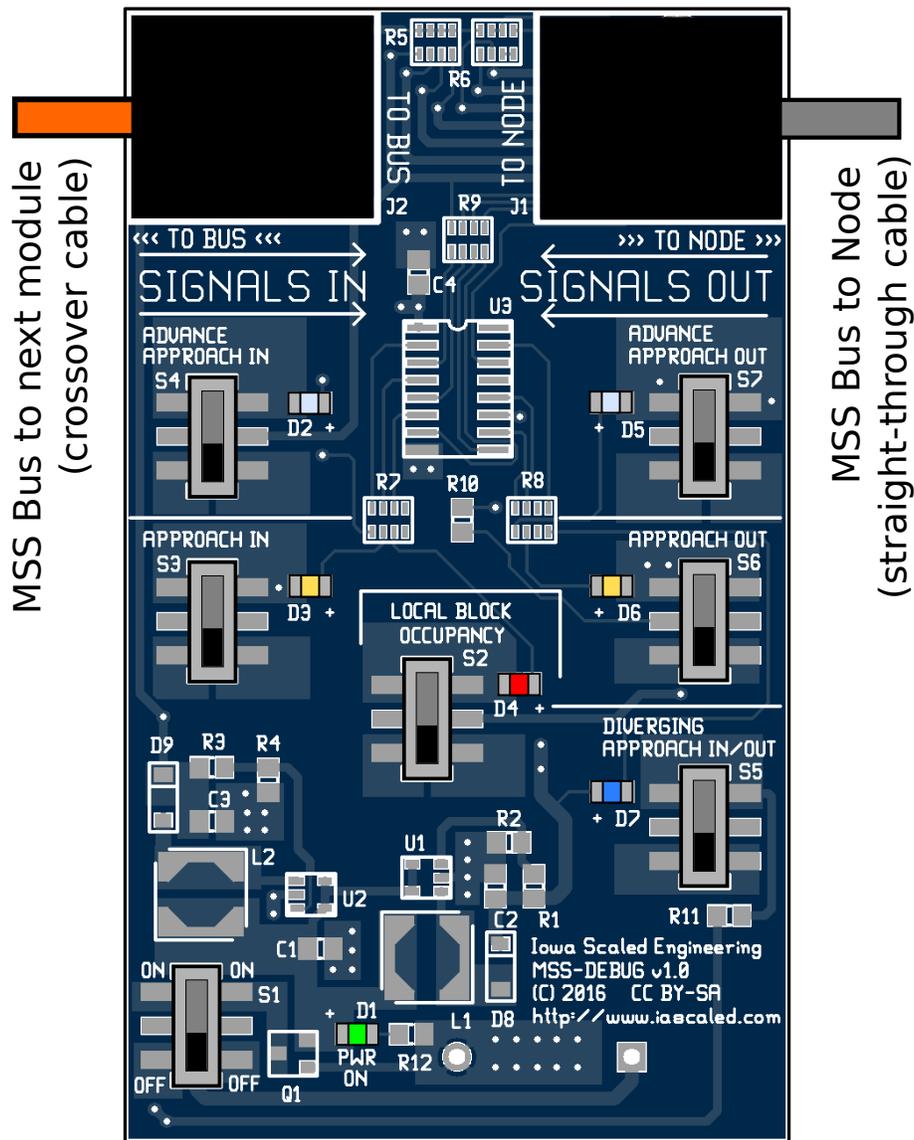


Figure 1 - The MSS-DEBUG board, showing switches, LED indicators, and connections to the bus and node under test.

Lights and Switches

For the following table, left and right are defined in reference to the MSS-DEBUG module picture in Figure 1, where the MSS node under test is to the right and the next block is to the left.

MSS Bus Signal LED Name / Color	If Indicator is On	If Switch is Set
<i>Local Block Occupancy</i> ● Red (D4)	Current track block is showing occupancy	Simulate occupancy in current track block
<i>Approach In</i> ● Yellow (D3)	The node to the left is sending an approach signal to the node on the right. Typically this means that the next block down the line to the left is occupied.	Simulate occupancy in the adjoining block one to the left.
<i>Advance Approach In</i> ● Cool White (D2)	The node to the left is sending an advance approach signal to the node on the right. Typically this means that the second block down the line to the left is occupied.	Simulate occupancy in the adjoining block two to the left.
<i>Diverging Approach In/Out</i> ● Blue (D7)	Connected complex cascade module is indicating the switch is set to the diverging route. In all spec-compliant implementations, the “Approach In” LED should also be lit.	Simulate a diverging route set at the next node to the left. The “Approach In” or “Approach Out” - as appropriate - switch should also be set except when testing invalid bus signal combinations.
<i>Approach Out</i> ● Yellow (D6)	The node to the right is sending an approach signal to the node to the left. This typically means that the next block down the line to the right is occupied.	Simulate occupancy in the next block to the right.
<i>Advance Approach Out</i> ● Cool White (D5)	The node to the right is sending an advance approach signal to the node to the left. This typically means that the second block down the line to the right is occupied.	Simulate occupancy in the second block down the line to the right.
<i>Power</i> ● Green (D1)	12V Power is on	Powers up the board, allowing display of indications and proper pull-up biasing of signal lines.

Modular Signal System Bus

The Modular Signal System bus is constructed out of commodity network cables. An odd number of crossover elements – either crossover modules like this one or crossover Cat5 network cables – must exist between cascade elements.

Note: Only use “Cat5” or “Cat5e” type crossover cables. These only cross over two pair of the four within the cable. “Cat6” or “Cat7” crossover cables cross over all four pair, and will not work with the Modular Signal System.

The wire between J1 – the jack marked “To Node” on the right side of the MSS-DEBUG – should be connected to the node under test with a straight-through (normal) ethernet cable.

For more details on the Modular Signal System, including the specification and other compatible products, see the MSS website:

<http://modularsignalsystem.info/>

Open Design

Iowa Scaled Engineering is committed to creating open designs that users are free to build, modify, adapt, improve, and share with others.

Hardware

The design of the MSS-DEBUG hardware is open source hardware, and is made available under the terms of the Creative Commons Attribution-Share Alike v3.0 license, a copy of which is available from: <http://creativecommons.org/licenses/by-sa/3.0/>

Design files can be found on the Iowa Scaled Engineering's Github site:

<https://github.com/IowaScaledEngineering/mss-debug>

Details on the Modular Signal System standard can be found on the MSS website:

<http://modularsignalsystem.info/>

Firmware

The official Iowa Scaled Engineering firmware for the MSS-CASCADE is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version. A copy of the GNU GPL can be found at: <http://www.gnu.org/licenses/gpl.html>

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