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EVO: Electrical System

The REFERENCE section has a listing of - Device Connector Pinouts:

SDB - Serial Data Bus

In 2004, HD implemented the serial data bus (SDB) on all Sportster models. This single wire, digital communications link, provides a means for the Ignition Control Module (ICM), the Turn Signal Module (TSM/TSSM) and Speedometer/Tachometer to intelligently communicate with one another. There is a 4-pin 'port' connector (called a serial data link) to allow external computer connection to the SDB. It is located near the MaxiFuse.

The SDB link allows the ICM to be reprogrammable - That allows the factory and dealer to use one stock-version ICM module and program it for use on either the 883 engines or 1200 engines. There are updates that can be dealer 'flashed' into the ICM when new parameters will resolve known problems.

The ICM, TSM & Speedo/Tach regularly communicate their current status to one another. When all operating parameters on the serial data line are within specifications, a state of health message is sent between the components.

A DTC of U1016 (Diagnostic Code) is set when the ICM can't send that 'state of health message'.
— That code is also set if there was communications, but it stopped at some point.
A DTC of U1097 is set by the Speedo if it can't send the 'state of health message'. — That code is also set if there was communications, but it stopped at some point.
A DTC of U1255 is set when no messages are communicated at power up.

The SDB is designed upon a standard SAE serial communication protocol callded “J1850”. The digital data is transmitted and received on a single wire at around 10.4 Kbps. This protocol was used thru the 2013 model year.

Diagnostic Troubleshooting Codes (DTC) are available to be read on the speedometer. A DTC of U1016 indicates that the ECM is not capable of sending this state of health message. A DTC of U1255 indicates that no messages were present during power up of the current key cycle. A DTC of U1016 indicates that there was communication on the data bus since power up, but communication was lost or interrupted during that key cycle.

While it is possible for more than one fault to occur and set more than one DTC, there are several conditions which may result in one fault setting multiple DTCs. For example, serial data DTCs (DTC U1016, U1064, U1097, U1255, U1300 and U1301) may be accompanied by other DTCs. Always correct

the serial data DTCs before resolving other DTCs.

Checking SDB Link:
With ignition key switch turned ON, engine not running, transmit data should typically create a voltage on the SDB line (LtGreen/Violet Wire) of 0.6-0.8 volts. The range of voltages that might be seen as acceptable during operation is 0v - 7.0 volts, but you won't see that with a multimeter - you may need an O-scope to see those changes.

Writing about this subject could fill many pages - but it is recommended that you purchase (along with a factory service manual) the Sportster Electrical Diagnostic Manual (EDM) for your specific model year if you intend to service your own bike. It is extremely helpful in understanding the electrical intricacies of your bike. The part number for the EDM is 99495-xx, where xx is your model year.

CANbus - Controller Area Network Bus

In 2014, HD implemented the Controller Area Network bus (CANbus), sometimes referred to as the HDLAN bus, on all Sportster models. This system uses a two wire, digital communications link, providing a means for the Engine Control Module (ECM), the Body Control Module (BCM), the Speedometer/Tachometer, the right & left handlebar control switches and the Anti-lock Brake System (ABS) to intelligently communicate with one another. There is a 6-pin 'port' connector (called a DLC - Data Link Connector or SDL - Serial Data Link) to allow external computer connection to the CANbus. It is located near the MaxiFuse.

The CANbus circuit allows the devices to communicate their current status. When all operating parameters on the CANbus are within specifications, a state of health message is sent between the components.

The CANbus DLC allows the ECM/BCM to be reprogrammable for different models and for either 883 engines or 1200 engines. There are updates that can be dealer 'flashed' into the ECM/BCM when new parameters will resolve known problems.

The CANbus link communicates using a set of wires in a twisted pair configuration and is designed upon a standard SAE serial communication protocol. These two wires are designated as CAN low and CAN high circuits, operating with a differential signal at around 500Kbps. Both circuits are connected to the ECM, BCM, instruments, both hand control modules and the ABS module (if equipped). The ECM and the right hand control module contain 120 Ohm terminating resistors. Typical resistance between the two circuits is approximately 60 Ohms.

The CANbus is made up of the White/Red wire for the CANbus high circuit and the White/Black wire for the CANbus low circuit. Each of these circuits show around 2.5V when measured to ground with the IGN ON. A fault on either one of these circuits will cause several modules to set “U” codes and may cause a complete loss of communication between all modules.

The voltage on the CANbus wires operates differentially. Both the CAN High (White/Red Wire) and the CAN Low (White/Black Wire) signal lines use a base voltage of 2.5v. When communicating, both lines change their voltage - the High goes to 3.75v (or more) and the Low goes to 1.25v (or less) - in order to create a differential voltage of at least 2.5v. This creates the binary ones and zeros for digital communications.

Test - CANbus normal voltage:
With the keyswitch on, you can connect a meter (set for 20v readings) between Pin#1 (White/Red), or Pin#3 (White/Black), and ground to test for the 2.5v, which would be a normal reading on these lines. If either line reads lower than 1.25v or higher than 3.75v, you may have a malfunctioning device or a short somewhere.

Test - CANbus shorted together:
You can test the CANbus to see if the two lines are shorted together. With the keyswitch off, place your meter on the ohms scale, and put one probe each on the DLC Pin#1 (White/Red) and DLC Pin#3 (White/Black). You should read 60-ohms between these CANbus High and CANbus Low connections. If the resistance is less than 50-ohms, you will want to disconnect devices on the CANbus, one at a time, to see which is causing the low reading. Devices should be removed in the following order: Speedometer, ECM, LftHandControl, RtHandControl, Tach and BCM.

Test - CANbus High shorted to ground:
You can test to see if the CANbus High signal line, DLC Pin#1 (White/Red) is shorted to ground. With the keyswitch off, place your meter on the ohms scale, and put one probe on the DLC Pin#1 (White/Red) and the other on ground. You should read more than 1000-ohms to ground. If the resistance is less than 1000-ohms, you will want to disconnect devices on the CANbus, one at a time, to see which is causing the low reading. Devices should be removed in the following order: Speedometer, ECM, LftHandControl, RtHandControl, Tach and BCM. If the low reading does not go away, you will need to examine your wiring for the problem.

Test - CANbus Low shorted to power:
You can test to see if the CANbus Low signal line, DLC Pin#3 (White/Black) is shorted to a power line. With the keyswitch off, place your meter on the 20v scale, and put your RED probe on the DLC Pin#3 (White/Black) and the other on ground. You should read 0-volts to ground. If the reading is more than 0-volts, you will want to disconnect devices on the CANbus, one at a time, to see which is causing the voltage reading. Devices should be removed in the following order: Speedometer, ECM, LftHandControl, RtHandControl, Tach and BCM. If the voltage reading does not go away, you will need to examine your wiring for the problem.

Test - CANbus High shorted to power:
With the keyswitch on, you can connect a meter (set for 20v readings) between Pin#1 (White/Red) and ground. If the voltage is higher than 4v on CANbus High, you may have a short to voltage somewhere. By turning the keyswitch off, then removing one component from the CANbus, then turning the keyswitch back on, you can test to see if the voltage on DLC Pin#1 has normalized because you removed a malfunctioning CANbus component.

Be sure to turn the keyswitch off when connecting or disconnecting devices. Devices should be removed in the following order: Speedometer, ECM, LftHandControl, RtHandControl, Tach - If DLC Pin#1 has not

normalized, then, with the keyswitch off, reconnect the ECM & disconnect power to the BCM, then disconnect the main connector from the BCM, then turn the keyswitch on and test the DLC pin again - If now normalized, the BCM is suspect.

Writing about this subject could fill many pages - but it is recommended that you purchase (along with a factory service manual) the Sportster Electrical Diagnostic Manual (EDM) for your specific model year if you intend to service your own bike. It is extremely helpful in understanding the electrical intricacies of your bike. The part number for the EDM is 99495-xx, where xx is your model year.