

Troubleshooting

312D2, 312D2 GC, 313D2 and 313D2 GC Excavators Machine System

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Connector Contact Description

SMCS - 1408-CY; 7553-WW

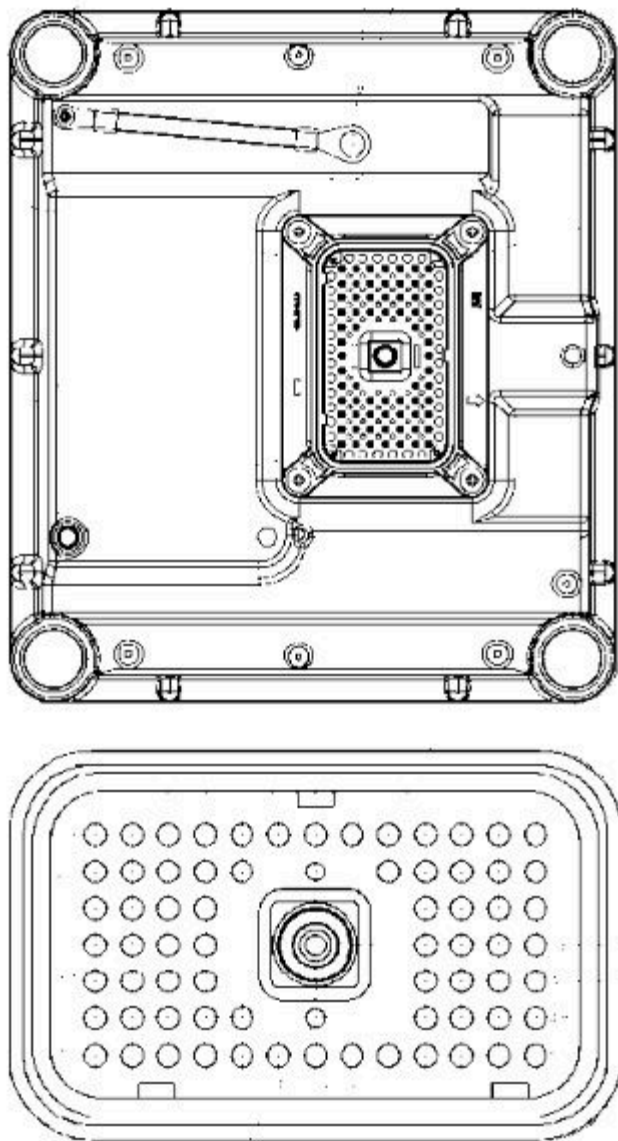


Illustration 1

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The Machine ECM determines outputs based on input data. Programming parameters have been flashed to the memory of the ECM creating tolerances for the data received. After the ECM receives the input information, the ECM programming determines the correct response, sending an output signal to the appropriate component. The internal input circuits and the internal output circuits of the ECM are connected to the machine wiring harness by one 70-pin connector. The remaining machine functions are connected to the Switch Panel. The Switch Panel sends input and acts on Machine ECM output via the CAN Data Link.

Note: The ECM is not serviceable. If the ECM is damaged, the ECM must be replaced. The failure rate for the ECM is low. If the ECM failure is suspected, contact the Technical Communicator at a local dealership for possible consultation with Caterpillar® before replacing the ECM. Replace the ECM only after all of the other possible causes of a particular problem have been investigated.

ECM Pull Up Voltage

For diagnostics of switch and sensor electrical circuits, controlled by the ECM, an internal "pull up voltage" is connected to the ECM. An above normal voltage is internally connected to the ECM signal input circuit through a resistor.

During normal operation, the switch or sensor signal holds the circuit low or at a certain signal amplitude. However, circuit conditions will allow the circuit to be pulled high by the ECM pull up voltage, such as the examples listed below:

- A loss of power to the component
- A disconnection
- An open circuit

The pull up voltage results in an above normal voltage condition at the ECM contact. As a result, the ECM will activate an FMI 3 (voltage above normal) diagnostic code for the affected circuit.

The types of ECM input circuits that have pull up voltage present are:

- Pulse Width Modulated (PWM) sensor input circuits
- Switch-to-ground input circuits
- Active analog (voltage) input signal circuits
- Passive analog (resistance) input signal circuits

ECM Pull Down Voltage

To aid in diagnostics of electrical circuits controlled by the ECM, an internal "pull down voltage" is connected to switch-to-battery type input circuits.

During normal operation, the switch contacts for the connection to a voltage source will hold the circuit high. When power is lost to the switch, the switch circuit is disconnected or an open switch circuit occurs. The resulting loss in power pulls the ECM circuit voltage low. The pull down voltage results in a below normal voltage condition at the ECM contact. As a result, the ECM activates an FMI 4 (voltage below normal) diagnostic code for the affected circuit.

Inputs

The machine has several different types of input devices, including the CAN Data Link connection to the Switch Panel. The Machine ECM receives machine status information from the input devices. The Machine ECM determines the correct output action needed to control machine operations based on memory and software parameters. The machine utilizes the following types of inputs: switch type and sensor type.

Switches provide signals to the switch inputs of the ECM. The possible outputs of a switch are listed: an open signal, a grounded signal and + battery signal.

Sensors provide an electrical signal to the ECM that constantly changes. The sensor input to the ECM can be

one of several different types of electrical signals such as: pulse width modulated (PWM) signals, voltage signals and frequency input signals. Each possible input to the Machine ECM is listed in the table for the 70-pin connector and Switch Panel.

Outputs

The ECM sends electrical signals through the outputs. The outputs can create an action or the outputs can provide information to the ECM. The ECM sends output signals to the system components in one of several different electrical signal types such as: driver outputs, sinking driver outputs, sensor power supply outputs and data link outputs. The possible outputs for the Machine ECM are listed in the table for the 70-pin connector and Switch Panel.

Input/Output

Communication between the Machine ECM and the other control modules on the machine is conducted over data link circuits. The data link circuits allow the sharing of information with other electronic control modules. The data link circuits are bidirectional. The data link circuit allows the ECM to send information and to receive information.

The ECM supports two types of data link systems.

- SAE J1939 Data Link (CAN 1)
- CAN Data Link 2

The data links are the main structure for communication between all of the control modules on the machine. Dedicated CAN Data Link circuits can be used for communication between specific controls on the machine.

Communication between the Machine ECM and the Switch Panel on the machine are conducted over the CAN Data Link circuit . The modules transmit over the CAN Data Link to communicate with the Cat[®] Electronic Technician (ET) Service Tool.

A module identifier (MID) is assigned to each ECM on a machine. The MID for the Machine ECM is 299.

Note: All diagnostic codes for the components in the machine control system are activated by the Machine ECM (MID 299).

Note: The following tables list every possible connection for the Machine ECM. Depending on the attachments that are installed on your machine, some of the listed circuits may not be present.

Table 1

Machine ECM Connector J1 (MID 299) Contact Descriptions⁽¹⁾	
No.	Function
1	+B
2	Ground
3	Key Switch