Product: GENERATOR SET
Model: 3456 GENERATOR SET C4G
Configuration: 3456 Generator Set C4G00001-UP

Troubleshooting
3406E and 3456 Generator Set Engines
Media Number -RENR2227-04 **Publication Date -01/07/2004** **Date Updated -19/07/2004**

i02094984

Emergency Stop Switch Circuit - Test

SMCS - 7332-038

System Operation Description:

The customer's emergency stop switch sends two signals to the Electronic Control Module (ECM). The signals are used to determine if the emergency stop switch is active. The emergency stop switch is active when the switch is in the open state and the two signals are high. The emergency stop switch is inactive when the switch is in the closed state and the two signals are held low.

If the ECM is powering up and one of the signals from the emergency stop switch is in a different state from the other signal, the ECM knows that one of the signals is faulty. If one of the signals from the emergency stop switch is in a different state from the other signal, the ECM will generate a diagnostic code that remains active until power to the ECM is cycled. The ECM will not allow the crank cycle to begin if the signals are opposite of each other.

The ECM monitors the emergency stop signals at all times. If the engine is running and one of the signals from the emergency stop switch changes states, the engine will continue to run. The ECM initiates an emergency stop shutdown only when both signals are high during engine operation.

When a signal from the emergency stop switch is received, the ECM will activate the air shutoff solenoid.

The ECM will not allow the starting sequence to begin when the emergency stop switch is activated. The engine will not be able to restart until the following conditions are met:

- The engine rpm must equal zero.
- The emergency stop inputs must go low.
- The ECM has been reset.

Note: If one of the signals from the emergency stop switch is in a different state from the other signal, the Caterpillar Electronic Technician (ET) will display the warning "Invalid Data".

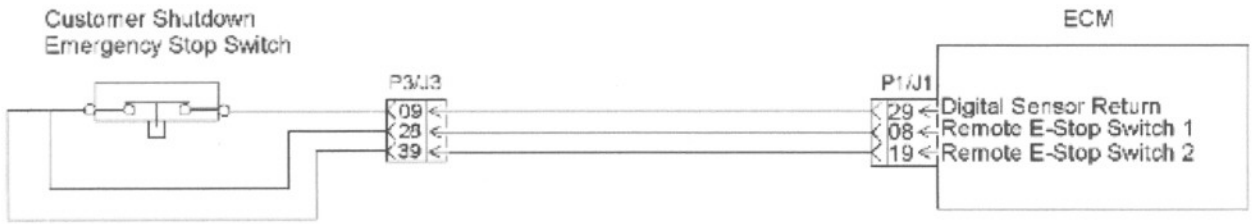

Illustration 1 g01068113
Circuit for the emergency stop switch

Test Step 1. Inspect Electrical Connectors and Wiring

A. Turn the circuit breaker for the battery to the OFF position.

B. Turn the ECS to the OFF/RESET position.

C. Thoroughly inspect the ECM connectors J1/P1 and J3/P3. Inspect all of the other connectors that are associated with the emergency stop switch. Refer to the diagnostic functional test Troubleshooting, "Inspecting Electrical Connectors" for details.

D. Perform a 45 N (10 lb) pull test on each of the wires in the ECM connector that are associated with the circuit.

E. Check the ECM connector (allen head screw) for the proper torque of 6.0 N·m (55 lb in).

F. Check the customer connector (allen head screw) for the proper torque of 2.25 ± 0.25 N·m (20 ± 2 lb in).

G. Check the harness and the wiring for abrasion and for pinch points.

Expected Result:

All connectors, pins, and sockets are completely coupled and/or inserted, and the harness and wiring are free of corrosion, of abrasion and of pinch points.

Results:

- **OK -** The connectors and wiring are okay. Proceed to Test Step 2.
- **Not OK -** The connectors and/or wiring are not okay.

  Repair: Repair the connectors or wiring and/or replace the connectors or wiring.

  Stop.

Test Step 2. Check the ON Status of the Emergency Stop Switch

A. Turn the circuit breaker for the battery to the ON position.

B. Turn the ECS to the STOP position.

C. Activate the emergency stop switch.

D. Connect Cat ET to the service tool.

E. Observe the status of the emergency stop switch on Cat ET.

Expected Result:

The parameter for the emergency stop switch reads "ON".

Results:

- **OK -** The emergency stop switch is working correctly. Proceed to Test Step 3.
- **Not OK -** The parameter for the emergency stop switch does not display "ON". Proceed to Test Step 4.

Test Step 3. Check the OFF Status of the Emergency Stop Switch

A. Deactivate the emergency stop switch.

B. Observe the status of the emergency stop switch on Cat ET.

Expected Result:

The parameter for the emergency stop switch reads "OFF".

Results:

- **OK -** The emergency stop switch is functioning correctly.

  Repair: The problem may be intermittent. If the problem is intermittent, refer to the diagnostic functional test Troubleshooting, "Inspecting Electrical Connectors".

  Stop.

- **Not OK -** The parameter for the emergency stop switch does not display "OFF". Proceed to Test Step 4.

Test Step 4. Test the ECM

A. Turn the ECS to the OFF/RESET position.

B. Disconnect ECM connector P1 from the ECM.

C. Disconnect P1:08 (remote E-Stop switch 1).

D. Disconnect P1:19 (remote E-Stop switch 2).

E. Disconnect P1:29 (digital return).

Note: The digital return will no longer be connected to the other sensors and switches. Additional diagnostic codes will be generated from the ECM. Clear the codes after you complete this test.

F. Reconnect P1 to the ECM.

G. Turn the ECS to the STOP position.

H. Observe the status for the emergency stop on Cat ET.

I. Insert a jumper wire between P1:08, P1:19, and P1:29.

J. Turn the circuit breaker for the battery to the ON position.

K. Turn the ECS to the STOP position.

L. Observe the status for the emergency stop on Cat ET.

M. Turn the ECS to the OFF/RESET position. Remove the wire jumpers and reinstall all wires.

Expected Result:

The parameter for the emergency stop switch displays "OFF" when the jumper is installed. The parameter for the emergency stop switch displays "ON" when the jumper is removed.

Results:

- **OK -** The problem is not with the ECM. Proceed to Test Step 5.
- **Not OK -** The parameter on the ECM is incorrect.

  Repair: Replace the ECM. Refer to the diagnostic procedure Troubleshooting, "Replacing the ECM".

  Stop.

Test Step 5. Check the Emergency Stop Switch and the Wiring

A. Turn the ECS to the OFF/RESET position.

B. Disconnect connector P1 from ECM connector J1.

C. Activate the emergency stop switch.

D. Measure the resistance between P1:29 (digital return) and P1:08 (remote E-Stop switch 1).

E. Measure the resistance between P1:29 (digital return) and P1:19 (remote E-Stop switch 2).

F. Measure the resistance between P1:29 (digital return) and all the pins in P1 ECM connector.

Expected Result:

The resistance is greater than 20,000 Ohms.

Results:

- **OK -** The resistance is greater than 20,000 Ohms. Proceed to Test Step 6.
- **Not OK -** The resistance is less than 20,000 Ohms. There is a short in the circuit.

  Repair: Repair the switch or wiring and/or replace the switch or wiring. Verify that the repair has eliminated the problem.

  Stop.

Test Step 6. Deactivate the Emergency Stop Switch

A. Deactivate the emergency stop switch.

B. Measure the resistance between P1:29 (digital return) and P1:08 (remote E-Stop switch 1).

C. Measure the resistance between P1:29 (digital return) and P1:19 (remote E-Stop switch 2).

Expected Result:

The resistance is less than 10 Ohms.

Results:

- **OK -** The resistance is less than 10 Ohms. The emergency stop switch is okay.

  Repair: The problem may be intermittent. If the problem is intermittent, refer to the diagnostic functional test Troubleshooting, "Inspecting Electrical Connectors".

  Stop.

- **Not OK -** The resistance is greater than 10 Ohms. There is an open circuit in the emergency shutdown switch.

  Repair: Repair the switch or wiring and/or replace the switch or wiring. Verify that the repair has eliminated the problem.

  Stop.
