

## GROUP 9 SELF-DIAGNOSTIC SYSTEM

### 1. OUTLINE

When any abnormality occurs in the NEW CAPO system caused by electric parts malfunction and by open or short circuit, the CPU controller diagnoses the problem and sends the error codes to the cluster and also stores them in the memory.

The current or recorded error codes are displayed at the error display mode selected by touching **SELECT** switch 2 times while pressing **BUZZER STOP** switch.

### 2. CURRENT ERROR DISPLAY

Cluster displays **Co : Er** and makes buzzer sound itself to warn the communication error when communication problem caused by wire-cut or malfunction of the CPU controller occurs.

Cluster displays real time error codes received from CPU controller through communication. In case of no problem it displays **CHECK Er : 00**.

If there are more than 2 error codes, each one can be displayed by pressing ▲ and ▼ switch respectively.

#### Examples :

1) Communication Error

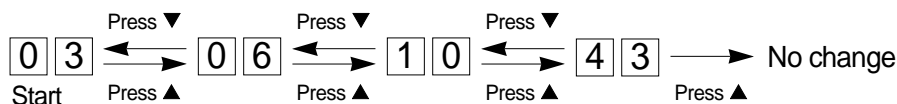
Co : Er & Buzzer sound

2) No problem

CHECK Er : 00

3) 4 Error codes(03, 06, 10, 43) display

CHECK Er : 03

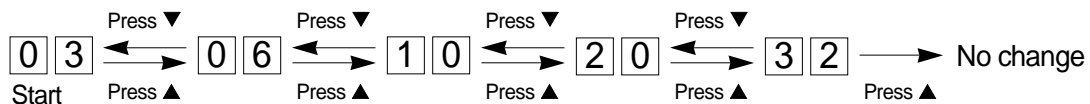


### 3. RECORDED ERROR DISPLAY



The recorded error can be displayed only when the key switch is at ON position.

**Examples :** 5 Recorded error codes(03, 06, 10, 20, 32) display

TIME Er : 03



### 4. DELETE ALL RECORDED ERROR CODES

Select recorded error(TIME Er) display and press engine  and select switch  at the same time for 2 seconds or more. Cluster display changes to **TIME Er : 00**, which shows that CPU controller deleted all the recorded error codes in the memory.

### 5. ECM ERROR CODES DISPLAY

If any fault code is received from ECM, cluster turns on the "Engine check" and sound the buzzer.

The fault codes are displayed on the cluster as the same as current error display.

ex) Check Er : 143

## 5. ERROR CODES TABLE

Error code No.	Description
1	Short circuit in accel actuator system
2	Potentiometer circuit is shorted to Vcc(5V) or battery +
3	Short circuit in pump EPPR valve system
4	Short circuit in boom down EPPR valve system
5	Short circuit in travel speed solenoid system
6	Short circuit in power boost solenoid system
7	Short circuit in max flow solenoid system
10	Short circuit in hour-meter system
11	Accel dial circuit is shorted to Vcc(5V) or battery +
12	P1 pressure sensor circuit is shorted to power supply(24V) line
13	P2 pressure sensor circuit is shorted to power supply(24V) line
14	P3 pressure sensor circuit is shorted to power supply(24V) line
15	Boom down pressure circuit is shorted to power supply(24V) line
16	Accel actuator circuit is open or shorted to ground
17	Potentiometer circuit is open or shorted to ground
18	Pump EPPR valve circuit is open or shorted to ground
19	Boom down EPPR valve circuit is open or shorted to ground
20	Travel speed solenoid circuit is open or shorted to ground
21	Power boost solenoid circuit is open or shorted to ground
22	Max flow solenoid circuit is open or shorted to ground
25	Hour-meter circuit is open or shorted to ground
26	Accel dial circuit is open or shorted to ground
27	P1 pressure sensor circuit is open or shorted to ground
28	P2 pressure sensor circuit is open or shorted to ground
29	P3 pressure sensor circuit is open or shorted to ground
30	Boom down pressure sensor circuit is open or shorted to ground
31	Engine preheater circuit is open or shorted to ground
32	Travel alarm buzzer circuit is open or shorted to ground
33	Alternator circuit is open or shorted to ground
34	Controller input voltage is below 18V
35	Controller input voltage is over 38V
36	Communication error with cluster
37	Engine speed sensor circuit is open or shorted to ground
38	Anti-restart relay circuit is open or shorted to ground
39	Accel actuator does not stop at a target position
40	There is more than 500rpm difference between target speed and actual speed

Error code No.	Description
41	Hydraulic oil temperature sensor circuit is shorted to ground
42	Fuel level sensor circuit is shorted to ground
43	Coolant temperature sensor circuit is shorted to ground
44	Boom up pressure sensor circuit is shorted to power supply(24V) line
45	Hydraulic oil temperature sensor circuit is open or shorted to battery +
46	Fuel level sensor circuit is open or shorted to battery +
47	Coolant temperature sensor circuit is open or shorted to battery +
48	Boom up pressure sensor circuit is open or shorted to ground
49	Engine preheater circuit is shorted to battery +
51	Boom priority solenoid circuit is open or shorted to ground
56	Travel alarm buzzer circuit is shorted to battery +
58	Boom priority solenoid circuit is shorted to battery +

## 6. ENGINE FAULT CODE INFORMATION

Fault code No.	Description	Description
111	ECM internal hardware error.	Possible no effect or engine may run rough or not start.
115	No engine speed or position signal detected at pin 17 of the engine harness.	Engine power derate. Possible white smoke.
121	No engine speed or position signal detected at pin 9 of the engine harness	No engine speed and position backup for main speed/position sensor.
122	High voltage detected at the boost pressure sensor signal pin 45 of the engine harness.	Engine will derate to no-boost fueling.
123	Low voltage detected at boost pressure sensor signal pin 45 of the engine harness.	Engine will derate to no-boost fueling.
131	High voltage detected at throttle position signal pin 30 of the machine harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when the idle validation switch indicates off-idle.
132	Low voltage detected at throttle position signal pin 30 of the machine harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when the idle validation switch indicates off-idle.
133	High voltage detected at remote throttle position signal pin 9 of the machine harness.	Engine will <b>not</b> respond to remote throttle input.
134	Low voltage detected at remote throttle position signal pin 9 of the machine harness.	Engine will <b>not</b> respond to remote throttle input.
135	High voltage detected at oil pressure signal pin 33 of the engine harness.	Default value used for oil pressure. No engine protection for oil pressure.
141	Low voltage detected at oil pressure signal pin 33 of the engine harness.	Default value used for oil pressure. No engine protection for oil pressure.
143	Oil pressure signal indicates oil pressure below the low engine protection limit.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
144	High voltage detected at coolant temperature signal pin 23 of the engine harness.	Default value used for coolant temperature. No engine protection for coolant temperature.
145	Low voltage detected at coolant temperature signal pin 23 of the engine harness.	Default value used for coolant temperature. No engine protection for coolant temperature.
146	Coolant temperature signal indicates coolant temperature has exceeded the minimum engine protection limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
147	A frequency below a calibrated value has been detected at the frequency throttle signal pin 4 of the engine harness.	Engine will <b>not</b> respond to changes in frequency throttle. Engine will go to low idle.
148	A frequency below a calibrated value has been detected at the frequency throttle signal pin 4 of the engine harness.	Engine will <b>not</b> respond to changes in frequency throttle. Engine will go to low idle.
151	Coolant temperature signal indicates coolant temperature has exceeded the maximum engine protection limit.	Speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
153	High voltage detected at intake manifold temperature signal pin 34 of the engine harness.	Default value used for intake manifold temperature. No engine protection for intake manifold temperature.
154	Low voltage detected at intake manifold temperature signal pin 34 of the engine harness.	Default value used for intake manifold temperature. No engine protection for intake manifold temperature.
155	Intake manifold air temperature signal indicates intake manifold air temperature is above the maximum engine protection limit.	Speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
191	Air conditioner clutch driver signal indicates a short to ground when commanded on.	Air conditioner clutch will <b>not</b> operate.
211	Machine specific fault code has occurred.	No effect on engine performance.
221	High voltage detected at ambient air pressure signal pin 32 of the engine harness.	Engine power derate.

Fault code No.	Description	Description
222	Low voltage detected at ambient air pressure signal pin 32 of the engine harness.	Engine power derate.
234	Engine speed signal indicates engine speed has exceeded the overspeed limit.	Fuel to injectors disabled until engine speed falls below the overspeed limit.
235	Coolant level signal at pin 37 of the engine harness indicates coolant level is low.	Power and/or speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
241	Vehicle speed signal on pins 8 and 18 of the machine harness has been lost.	Engine speed limited to "Max. Engine Speed without VSS". Cruise control, gear-down protection and the road speed governor will <b>not</b> work. Trip information data that is based on mileage will be incorrect.
242	Possible tampering has been detected on the vehicle speed circuit pins 8 and 18 of the machine harness	Engine speed limited to " Max. Engine Speed without VSS". Cruise control, gear-down protection and the road speed governor will <b>not</b> work. Trip information data that is based on mileage will be incorrect.
243	Error detected in the exhaust brake relay enable circuit at pin 42 of the engine harness.	Exhaust brake will <b>not</b> work.
245	Error detected in fan clutch relay enable circuit at pin 41 of the engine harness.	Electronic control; module(ECM) can <b>not</b> control the engine cooling fan. Fan will remain on or off.
263	High voltage detected at the fuel temperature sensor signal pin 35 of the engine harness.	Default value used for fuel temperature. Possible low power.
265	Low voltage detected at the fuel temperature sensor signal pin 35 of the engine harness.	Default value used for fuel temperature. Possible low power.
268	Fuel pressure in the accumulator is <b>not</b> changing with engine operating conditions.	Power derate. Engine may run rough.
271	Low or no current detected on front pumping control valve return pin 21. (Set only during control valve click test)	Low power or poor performance.
272	High current detected on front pumping control valve return pin 21.	Low power or poor performance. Possible damage to the ECM.
273	Low or no current detected on rear pumping control valve return pin 15. (Set only during control valve click test)	Low power or poor performance.
274	High current detected on rear pumping control valve return pin 15.	Low power or poor performance. Possible damage to the ECM.
275	Engine ECM has detected a failure in the front pumping element.	Low power or poor performance.
276	High current detected on injection control valve return pin 7.	Injection Control Valve is shutdown and engine will <b>not</b> run. Possible ECM damage.
277	Engine ECM has detected a failure in the injection control valve.	Low power. Engine may <b>not</b> run.
278	Error detected in lift pump circuit at pin 11 of the engine harness.	Possible low power, engine may die, run rough or be difficult to start.
279	Low or no current detected on injection control valve return pin 7. (Set only during control valve click test)	Low power. Engine may <b>not</b> run.
281	Engine ECM has detected a failure in the front pumping element.	Possible no effect or engine power derate.
282	Engine ECM has detected a failure in the rear pumping element.	Possible no effect or engine power derate.
283	High voltage detected at main engine speed/position sensor voltage supply pin 8 of the engine harness.	ECM will use the engine position signal as a backup. Possible white smoke and power loss.

Fault code No.	Description	Description
284	Low voltage detected at main engine speed/ position sensor voltage supply pin 8 of the engine harness.	ECM will use the engine position signal as a backup. Possible white smoke and power loss.
297	High voltage detected at machine pressure signal pin 48 of the machine harness.	Default value used for machine pressure. Lose ability to control machine pressure.
298	Low voltage detected at machine pressure signal pin 48 of the machine harness.	Default value used for machine pressure. Lose ability to control machine pressure.
319	Power to the real time clock has been interrupted and its setting is no longer valid.	Time stamp in ECM powerdown data will be incorrect.
328	Engine ECM has detected a failure in the rear pumping element.	Low power. Engine may <b>not</b> run.
329	Engine ECM has detected an overpumping failure in the CAPS pump.	Engine power derate, engine may die.
349	Auxiliary speed signal frequency indicates the frequency is above a calibrated threshold value.	Engine will go to idle and lose ability to control speed of the auxiliary device.
352	Low voltage detected at engine position sensor +5 VDC supply, pin 10 of the engine harness.	Default value used for sensors connected to this +5 VDC supply. Engine will derate to no-boost fueling and loss of engine protection for oil pressure, intake manifold pressure, and ambient air pressure.
381	Error detected in cold start aid relay 1 enable circuit at pin 41 of the machine harness.	Intake air heater can not be fully energized by the ECM. Possible white smoke and/or hard starting.
382	Error detected in cold start aid relay 2 enable circuit at pin 31 of the machine harness.	Intake air heater can <b>not</b> be fully energized by the ECM. Possible white smoke and/or hard starting.
385	High voltage detected at machine harness sensor +5 VDC supply pin 10 of the machine harness.	Sensors connected to this +5 VDC supply(i.e. remote throttle position sensor) will <b>not</b> function.
386	High voltage detected at the engine harness sensor +5 VDC supply pin 10 of the engine harness.	Default value used for sensors connected to this +5 volts supply. Engine will derate to no-boost fueling and loss of engine protection for oil pressure, intake manifold temperature, and coolant temperature.
387	High voltage detected at the throttle position sensor +5 VDC supply pin 29 of the machine harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when idle validation switch indicates off-idle.
415	Oil pressure signal indicates oil pressure below the very low engine protection limit.	Speed derate and possible engine shutdown if engine protection shutdown feature is enabled.
418	Water-in-fuel signal indicates the water in the fuel filter needs to be drained.	Excessive water in the fuel can lead to severe fuel system damage.
422	Voltage detected simultaneously on both the coolant level high and low signal pins 27 and 37 of the engine harness...OR...no voltage detected on either pin.(Fault is active for switch type coolant level sensors only)	No engine protection for coolant level.
429	Low voltage detected at water-in-fuel signal pin 40 of the machine harness.	No water-in-fuel protection.
431	Idle validation signals on pins 25 and 26 of the machine harness indicate voltage detected simultaneously on both pins...OR...no voltage detected on either pin.	No effect on performance, but loss of idle validation.

Fault code No.	Description	Description
432	Idle validation signal at pin 26 of the machine harness indicates the throttle is at the idle position when the throttle position signal at pin 30 of the machine harness indicates the throttle is <b>not</b> at the idle position...OR...idle validation signal at pin 26 of the machine harness indicates the throttle is <b>not</b> at the idle position when the throttle position signal at pin 30 of the machine harness indicates the throttle is at the idle position.	Engine will only idle.
433	Boost pressure signal indicates boost pressure is high when other engine parameters(i.e. speed and load) indicate boost pressure should be low...OR...boost pressure is low when other engine parameters indicate it should be high.	Possible overfueling during acceleration. Increase in black smoke.
434	All data gathered by the ECM since the last key on(i.e.faults, trip information data. etc.)was <b>not</b> stored to permanent memory at the last key off.	None on performance. Fault code table, trip information data, maintenance monitor data, trending data and user activated datalogger data may be inaccurate.
441	Voltage detected at ECM power supply pins 38, 39, 40 and 50 of the engine harness indicates the ECM supply voltage fell below 6 VDC.	Engine will die or run rough.
442	Voltage detected at ECM power supply pins 38, 39, 40 and 50 of the engine harness indicates the ECM supply voltage is above the maximum system voltage level.	None on performance.
443	Low voltage detected at throttle position sensor +5 VDC supply pin 29 of the machine harness.	Engine idles when idle validation switch indicates idle and ramps up to a default set speed when idle validation switch indicates off-idle.
444	Low voltage detected at machine harness sensor +5 VDC supply pin 10 of the machine harness.	Sensors connected to this +5 VDC supply (i.e. remote throttle position sensor) will <b>not</b> function.
449	Fuel pressure signal indicates that fuel pressure has exceeded the maximum limit for the given engine rating.	Fuel pumping is stopped until pressure returns to normal. Possible fuel pump damage may result.
451	High voltage detected at fuel pressure sensor signal pin 46 of the engine harness.	Low power, reduced performance.
452	Low voltage detected at fuel pressure sensor signal pin 46 of the engine harness.	Low power, reduced performance.
488	Intake manifold temperature signal indicates intake manifold temperature is above the minimum engine protection limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
489	Auxiliary speed signal frequency indicates the frequency is below a calibrated threshold value.	Engine will go to idle and lose ability to control speed of the auxiliary device.
493	ECM has detected a circuit failure on the injection control valve certifier circuit.	Slight loss of performance.
515	High voltage detected at the auxiliary +5 VDC sensor supply voltage pin 49 of the engine harness.	Auxiliary device will <b>not</b> function.
516	Low voltage detected at the auxiliary +5 VDC sensor supply voltage pin 49 of the engine harness.	Auxiliary device will not function.
524	Error detected on the high speed governor droop selection switch in put pin 24 of the engine harness.	Operator can not select alternate high speed governor droop. Normal droop is used.

Fault code No.	Description	Description
527	Error detected in the dual output driver "A" circuit pin 5 of the machine harness.	The device being controlled by the dual output driver "A" signal will <b>not</b> function properly.
528	Error detected on the torque curve selection switch input pin 39 of the machine harness.	Operator can not select alternate torque curves. Normal torque curve is used.
529	Error detected in the dual output driver "B" circuit pin 1 of the engine harness.	The device being controlled by the dual output driver "B" signal will <b>not</b> function properly.
539	Open circuit failure of the injection control valve transorb pin 6 of the engine harness.	Low power, possible ECM damage.
551	Idle validation signals on pins 25 and 26 of the machine harness indicate voltage detected simultaneously on both pins.	Engine will only idle.
599	Software has initiated an engine shutdown based on machine sensor inputs	Engine will shutdown.
611	ECM detected the engine has initiated a protection shutdown or has been keyed off while above a specified load limit.	No effect.
768	Error detected in the output device driver(VGT or transmission shift modulation signal) signal pin 21 of the machine harness.	Can not control the VGT or transmission, depending on application.

Some fault codes are not applied to this machine.