

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

This system monitors the electronic components of the EMS (engine management system), iBR, the multifunction gauge, and other components of the electrical system to detect if they are faulty or defective. The monitoring system becomes active when the START button is pressed.

NOTE: Some components require the engine to be running to be monitored (fuel injectors for example).

The following components or functions are monitored.

EMS MONITORING
Battery voltage
EMS sensors (TAS, TPS, CPS, CAPS, MAPTS, CTS, OPS, EGTS, knock sensor). Throttle actuator, ignition coils and fuel injectors
ECM
Engine RPM
CAN
Engine starter solenoid (STS)
Fuel pump (FP)
O.T.A.S.
Multifunction gauge
iBR module

iBR MONITORING
iBR module and motor
BRLS
Engine RPM
Vehicle speed
iBR gate position
CAN
Information center
ECM

MULTIFUNCTION GAUGE MONITORING
Multifunction gauge
Sport mode activation
MODE switch
CAN
Fuel level sensor
ECM
Depth sounder (if so equipped)
iBR module

When a malfunction is currently detected, the related electronic module:

- Sets an active fault code.
- Adapts the proper protection strategy according to the failure.
- Sends out warning signals to the multifunction gauge which provides beeper codes, fault indicators and fault messages to inform the rider of a particular condition.

When a minor or transient fault occurs, the fault and beeper will cease automatically if the condition that caused the fault no longer exists.

If a minor fault is active, the engine will operate without a noticeable loss of performance.

Releasing the throttle and letting the engine return to idle speed may allow normal operation to resume. If this does not work, try the following:

- Remove tether cord from the engine cut-off switch.
- Wait 3 minutes to allow the ECM to shut down.
- Start engine.
- Check if the fault code is still active.

The electronic system will react differently depending on the fault type. If a severe failure occurs, the engine may not be allowed to be started. In other cases, the engine may operate in limp home mode (reduced RPM) or not be affected at all.

These strategies are used to protect the engine system from damage and to maintain safe operation of the vehicle.

Limp Home Mode

When a major component of the EMS or major functionality of the iBR is not operating properly, limp home mode will be set. Engine speed (RPM) will be limited and therefore vehicle speed.

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This mode allows the rider to return to shore which would otherwise not be possible without this advanced system.

When this mode is active, the CHECK ENGINE indicator will come on and a LIMP HOME message will be displayed in the multifunction gauge.

Major Fault and Vehicle Reaction

The following EMS conditions will trigger a limp home mode.

ENGINE PROBLEM	MAX ALLOWED RPM
High engine temperature (from 100°C (212°F))	3800
High exhaust temperature (from 95°C (203°F))	3800
Low oil pressure (below 150 kPa ± 20 kPa (21.76 PSI ± 2.9 PSI))	4500

The following conditions will trigger limp home mode.

iBR PROBLEM	SYSTEM BEHAVIOR
Major fault code related to the iBR that prevents its proper operation	iBR gate will be moved and locked in forward position (if possible)
	Engine will be set in limp home mode (reduced speed)

Indicator Lights and Message Display Information

The fault indicators and messages displayed in the information center will inform you of a particular condition or if an anomaly occurs.

PILOT LAMPS (ON)	MESSAGE DISPLAY	DESCRIPTION
	HI ENGINE TEMPERATURE	Engine overheating
	HI EXHAUST TEMPERATURE	Exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LO OIL	Low oil pressure
	LOW FUEL level indicator, NO message	Low fuel level warning, approx. 12 L (3.2 U.S. gal.) remaining, or fuel level sensor disconnected.
	MAINTENANCE REQUIRED	Engine or vehicle maintenance required.
SPORT	SPORT MODE	Sport mode is active.
TOURING	TOURING MODE	Touring mode is active
	–	Blinking indicated a major fault (iBR system deactivated)
	–	Confirm that GPS is activated and ready to give speed.

FAULT MESSAGES	
LO OIL	Engine low oil pressure detected
HI EXHAUST TEMPERATURE	High exhaust temperature detected
HI ENGINE TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine management system malfunction or maintenance required
HI BATTERY VOLTAGE	High battery voltage detected
LO BATTERY VOLTAGE	Low battery voltage detected
LIMP HOME	Major fault detected, engine power limited
FUEL SENSOR DEFECTIVE	Fuel level sensor fault
UNSYNC GPS	GPS signal synchronization with navigation satellites not acquired
CALIBRATION CHECKSUM ERROR	Information center programming corrupted

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FAULT MESSAGES	
MAINTENANCE REQUIRED	Watercraft maintenance required
FUNCTION CANNOT BE ACTIVATED	Message when a function is not or cannot be properly activated
O.T.A.S. FAILURE	O.T.A.S. sensor failure (or not detected), or O.T.A.S. system failure

Beeper Signals

When one of the following conditions occurs, the monitoring system emits the associated beep signal.

BEEPER CODES	DESCRIPTION
A 2 second beep every 15 minute interval	Engine management system fault. Major iBR fault.
A 2 second beep every 5 minute interval	Low fuel level. Refill fuel tank. If problem persists, check sensor and circuit. Refer to <i>FUEL TANK AND FUEL PUMP</i> subsection.
	Fuel tank level sensor or circuit malfunction. Check sensor and circuit. Refer to <i>FUEL TANK AND FUEL PUMP</i> subsection.
Continuously beeps	High engine coolant temperature. Refer to <i>COOLING SYSTEM</i> subsection.
	High exhaust temperature. Refer to <i>ELECTRONIC FUEL INJECTION (EFI)</i> subsection.
	Low oil pressure. Turn off engine as soon as possible. Check oil level and refill. Refer to <i>LUBRICATION</i> subsection.

FAULT CODES

A fault code is an indication that a malfunction has been detected by the monitoring system of the vehicle.

Fault Code Categories

A fault code consists of an alphanumeric designator followed by a hexadecimal number of 3 digits. The alphanumeric designator defines the category of the fault code while the hexadecimal number refers to a unique fault.

FAULT CODE CATEGORIES		
ALPHANUMERIC DESIGNATOR	MODULE/SYSTEM	EXAMPLE OF FAULT CODE
From B0 to B3	Body (include multifunction gauge and switch faults)	B2230
From C0 to C3	iBR	C2102
From P0 to P3	Power train and related system faults (includes ECM)	P0520
From U0 to U3	Communication between modules and sensors	U16A9

RELATED MODULE AND FAULTS	
MODULE	FAULT CODE CATEGORY
ECM (engine control module)	Stores mainly "P" codes and some "U" codes
iBR (intelligent brake and reverse)	Stores mainly "C" codes and a few "U" codes
Multifunction gauge	Stores mainly "C" codes and a few "U" codes

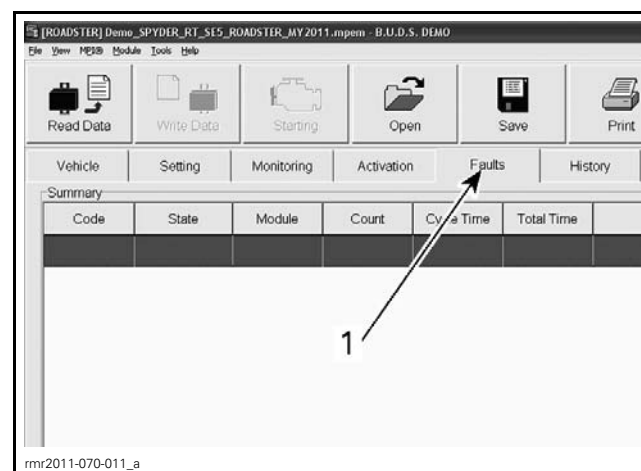
Reading Fault Codes Using the Multifunction Gauge

Fault codes cannot be displayed in this multifunction gauge.

Reading Fault Codes Using B.U.D.S. Software

NOTE: All fault code types can be read with B.U.D.S.

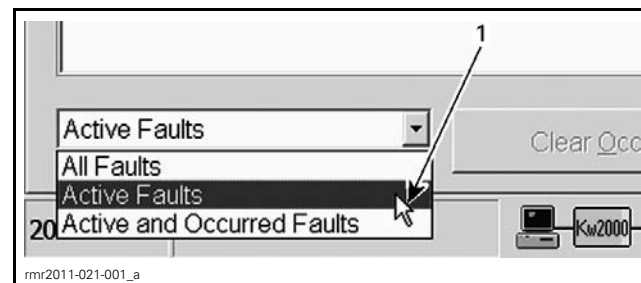
1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Click on the **Read Data** button.
3. Click on the **Faults** tab.



TYPICAL

1. Fault tab

4. Click on the drop-down list on the LH lower corner.
5. Choose the fault state to display.

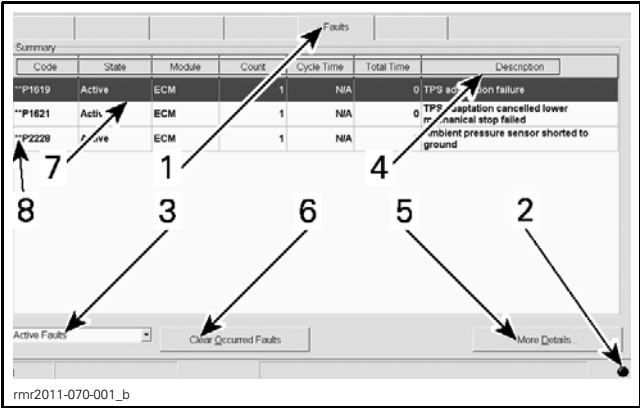


TYPICAL

1. Drop down list

FAULT STATE	INFORMATION
All faults	Display all possible faults regardless of state
Active faults	Display only faults matching this state. Empty area if there is no active fault
Active and occurred faults	Display only faults that have either state. Empty area if there is neither active nor occurred fault

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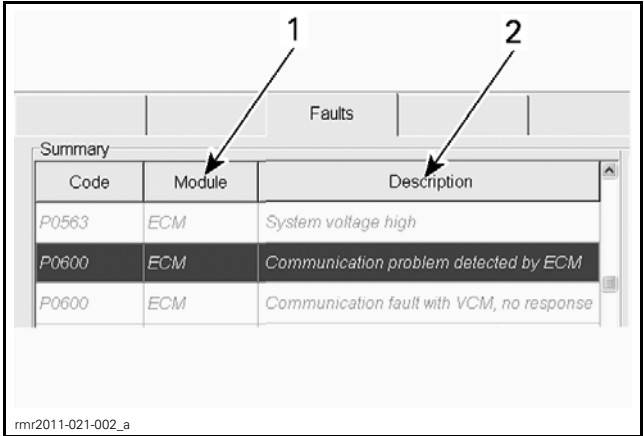
TYPICAL FAULT PAGE
1. Fault tab
2. Fault indicator light
3. Fault code state drop box
4. Fault nomenclature
5. More details button
6. Clear occurred faults button
7. Selected fault
8. More information indicator

FAULT PAGE DESCRIPTION	
ITEM	INFORMATION
Fault tab	Click tab to display the fault page
Fault indicator light	When flashing, it indicates there is an active fault(s)
Fault code state drop box	Click drop box to select the type of faults to display
Fault nomenclature	Display specific information and statistics related to the fault
More details button	To display possible causes and service actions related to the selected fault
Clear occurred faults button	To clear all occurred faults in related ECU(s)
Selected fault	When a fault is selected, additional information pertaining to that fault will be displayed when clicking the "More details" button. To select a fault, click on the fault with the mouse or use the cursor up or down to scroll to the desired fault

FAULT NOMENCLATURE	
COLUMN	INFORMATION
Code	Fault code number. When 2 stars (**) precedes the code, detailed conditions when the fault occurred, can be displayed by clicking the "More details" button
State	Display the fault state (active, occurred, inactive)
Module	Displays the module that reports the fault code. This is the module that detects or has received a message of an anomaly and reports it. List of modules: Multifunction gauge ECM (engine control module) iBR (intelligent brake and reverse).
Count	Number of times this fault occurred within the driving cycle Value: From 0 to 255
Cycle time	Not to be used Value: From 0 to 255 minutes
Total time	Not to be used Value: From 0 to 64 255 minutes
Description	Provides a short description of the fault

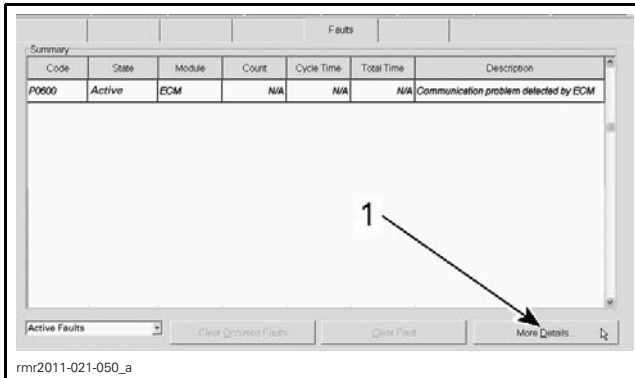
When reading a fault code in B.U.D.S., pay particular attention to which module reports a fault. It is indicated in the **Module** column.

The **Description** column gives a short description of the fault.

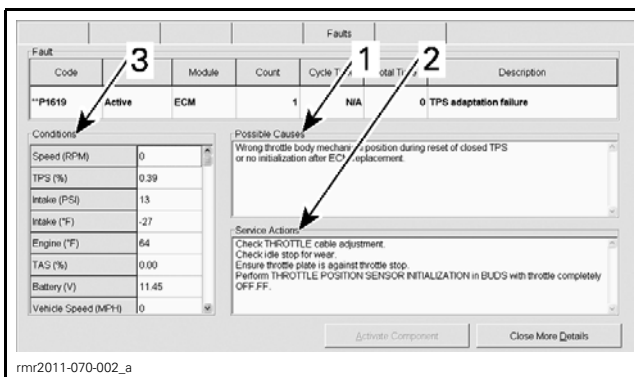


SOME COLUMNS REMOVED FOR CLARITY
1. Module that reports a fault
2. Fault description

Click on the **More Details** button, on the RH lower corner, to display the "Possible Causes" and the "Service Actions" to step further in the diagnosis.



TYPICAL
1. Click here



TYPICAL — MORE DETAILS PAGE
1. Possible causes related to the selected fault
2. Service actions
3. Operating conditions when fault occurred

MORE DETAILS PAGE DESCRIPTION	
ITEM	INFORMATION
Possible causes	List the possible causes that triggered the fault
Service actions	List the possible actions to perform to solve the fault
Conditions when fault occurred	List the operating conditions of the engine and/or vehicle when the fault was triggered

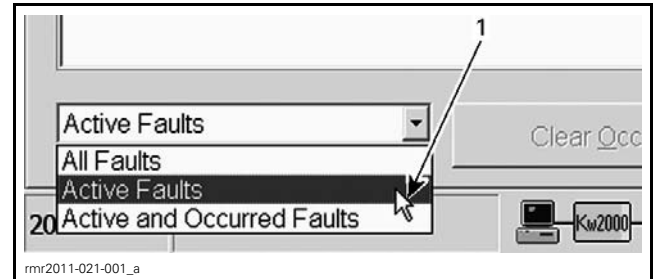
Fault Code States

The various electronic control units (ECUs) used in the vehicle can generate a variety of fault codes depending on the level of monitoring they are capable of. Fault codes have 3 possible states:

- Active
- Occurred
- Inactive.

Click the **Fault** tab then click on the drop-down list on the LH lower corner.

Choose the fault code state you want to display.



TYPICAL
1. Drop down list

FAULT STATE	INFORMATION
All faults	Display all possible faults regardless of state
Active faults	Display only faults matching this state. Empty area if there is no active fault
Active and occurred faults	Display only faults that have either state. Empty area if there is neither active nor occurred fault

Active Fault Codes

An active fault code is an indication of a fault that is **currently triggered**.

The active fault may or may not compromise normal operation of the related system(s). Service action in B.U.D.S. should be used to correct the problem that caused the fault code.

Once the fault condition(s) of the active fault is no longer present, its state will change to "occurred".

Occurred Fault Codes

An occurred fault code indicates a fault that was active, but **no longer** is.

The occurred fault does not presently affect system or component operation but is retained as a history of the faults that were detected.

Inactive Fault Codes

An inactive fault code represents a fault code that is neither active, nor occurred. It is simply part of a list of all possible faults which may be monitored by the various ECUs, which may become active or occurred if the monitoring system detects an applicable fault.

How to Clear Fault Codes Using B.U.D.S.

Connect vehicle to the latest applicable B.U.D.S. software version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

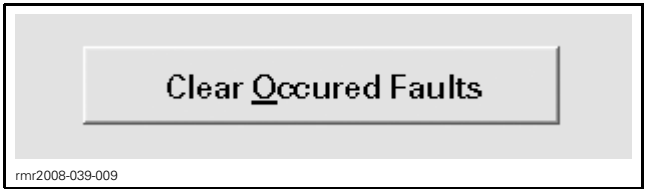
Click on the **Read Data** button.

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Click on the **Faults** tab.

NOTE: Only the **Occurred** state faults can be cleared.

Click the "Clear Occurred Faults" button.



CLEAR OCCURRED FAULTS

This will reset the appropriate counter(s) and will also record that the problem has been fixed in the related module memory.

Observe the "Occurred" fault(s). They should all disappear. Otherwise, follow this procedure.

- Remove tether cord cap from engine cut-off switch.
- Wait 3 minutes.
- Repeat procedure to clear faults again.

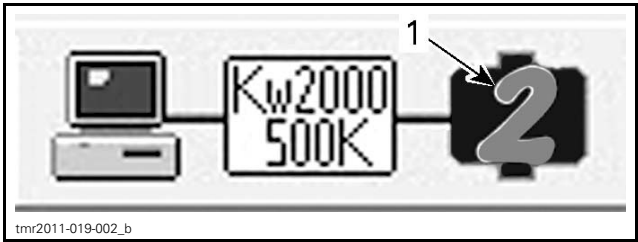
FAULT CODE DIAGNOSTIC

Missing Module

If a module is missing, several fault codes will appear.

The number of modules read by B.U.D.S. can be seen in the status bar at the bottom right hand corner of the B.U.D.S. screen.

MODEL	NUMBER OF MODULE
SPARK	2
SPARK with iBR	3



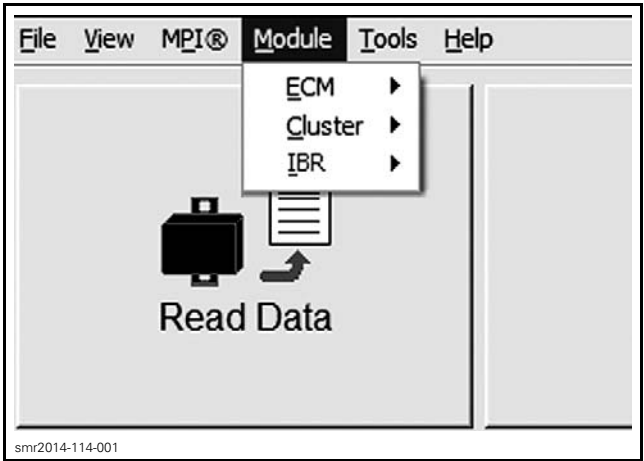
TYPICAL - STATUS BAR
1. Number of modules

To quickly find which module is missing, perform the following:

1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Click on the **Read Data** button.
3. Click **Module** in the menu bar.

4. Look at the list of modules.

5. If a module is not visible, then it is not communicating through the CAN bus (controller area network).



TYPICAL — MODULE SUBMENU LIST

6. Refer to the following table to find the appropriate subsection in this manual to diagnose the missing module.

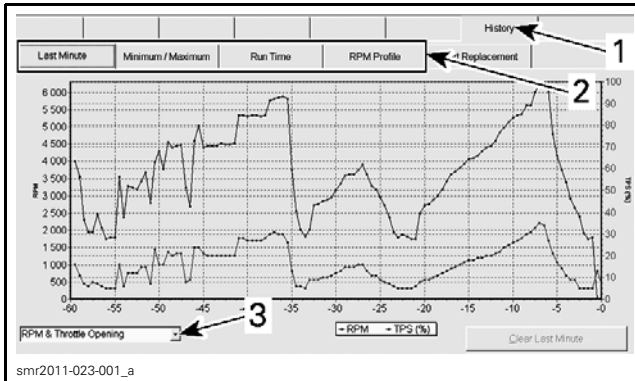
MISSING MODULE	SECTION TO REFER TO
ECM	<i>ELECTRONIC FUEL INJECTION (EFI)</i>
Cluster	<i>MULTIFUNCTION GAUGE</i>
iBR	<i>iBR SYSTEM</i>

Diagnostic Tips Using B.U.D.S.

History Page

HISTORY PAGE DESCRIPTION	
ITEM	INFORMATION
Last minute	Displays several parameters recorded in the last minute of engine operation
Minimum/Maximum	Display the minimum and maximum values encountered. Click "Clear Min/Max" to reset the values
Run time	Display the time proportion in what mode the engine was running in
RPM profile	Display the RPM range proportion in which the engine was running in

To see the last minute of operating conditions, click on the **History** tab in B.U.D.S.

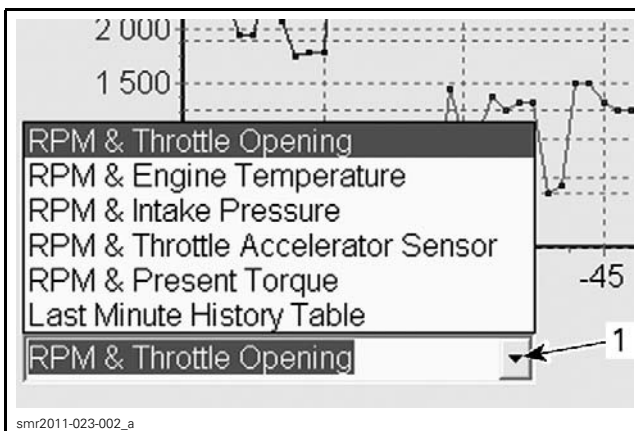


1. History tab
2. Additional history pages
3. Drop-down list in Last Minute page

Last Minute Drop-Down List:

From the **Last Minute** page, click on the drop-down list on the LH lower corner.

Choose the values to display.



TYPICAL

1. Drop down list

Subsection XX (DIAGNOSTIC AND FAULT CODES)

Troubleshooting Guidelines Using Fault Codes

CONDITION	ACTION
Troubleshooting vehicle	Use B.U.D.S. to: Read fault codes. Display "Active" faults to see components currently not operating normally. Display "Occurred" faults to troubleshoot intermittent problems. Monitor system(s), sensor(s), switches and actual conditions. Activate component(s) for troubleshooting. Set components etc. Know the last minute of operating conditions by using the "History" page. Know the operating conditions, if available, when a fault code occurred by using the "More details" button in the fault page.
New fault(s) appear after a vehicle maintenance or repair	Check sensor connections for solidity or for mixed up connections. Before vehicle maintenance: Read the electronic modules with B.U.D.S. Save and print the B.U.D.S. file (keep faults option only). After vehicle maintenance: Read the electronic modules with B.U.D.S. Compare the fault code(s) before and after the maintenance using the printed copy and the current B.U.D.S. reading. Investigate only the newly fault codes. Clear all occurred faults in B.U.D.S.
Communication faults displayed as "Occurred" after module flashing	Normal behavior when flashing a module. Clear all occurred faults and check again.
Sensor "Active" fault	Read the fault description in B.U.D.S. Click on the "More Details" button. Look at the "Conditions" when available. Read the "Possible Causes". Apply the "Service Actions".
Several fault codes active at the same time	Likely to be caused by burnt fuse(s) or bad bus bar connection(s).
Low system voltage on one module Power problem on sensor(s)	Check related fuse(s) and relay. Check related power and ground wires. Check for common power supply to several sensors/modules (refer to <i>POWER DISTRIBUTION AND GROUNDS</i>). NOTE: Some sensors are supplied by the battery while others are supplied by a module.
Low system voltage on several modules (several communication faults will also appear)	Check battery condition and connections. Check related fuse(s) and relay. Check voltage regulator/rectifier.
High system voltage on several modules	A battery charger has likely been used to substitute the vehicle battery. Clear all occurred faults and check again. Check voltage regulator/rectifier.
When all modules report that a module is missing	Check the module that is reported as missing. Check related fuse(s) and relay. Check related power and ground wires.
When several modules are in fault	Search for a common problem such as a faulty sensor.

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CONDITION	ACTION
CAN bus failure, CAN buss OFF	When several modules and sensors report that a module is missing. The missing module may report CAN bus failure, CAN bus off. Check related CAN wires (continuity, short to ground, short between CAN low and high). Check module pins and wiring terminals. Then, the other modules should stop reporting that module is missing.
Occurred fault(s)	May have been generated due to a system or component that was momentarily operating outside normal parameters.
	May be generated when disconnecting and reconnecting a component, replacing a burnt fuse, or may be due to a momentary high or low voltage.
	Before being "Occurred", a fault has always been "Active" for a certain time, indicating that an unexpected condition or problem has been present during the driving cycle. A frequent momentarily fault or an intermittent fault may never be seen as "Active" in B.U.D.S. while there is still a pending problem. This type of malfunctions can be discovered by looking at the "Occurred" faults and then by evaluating the fault count. As long as a fault is present, it is displayed as "Active".
Fault count (0 - 255)	Low value: Suggests handling problems (connections, terminal contact/shape etc.). High value: Suggests a frequent and unsolved problem. The problem should be investigated.
Fault conditions (More details button)	Look for abnormal, excessive values.
Hard to find problems	When the basic troubleshooting has been done and the fault code(s) persists, often the problem is related to the wiring harness, connections or electromechanical components. Short to ground, to battery or between wires. Wire splices, chafing, terminal problems (pulled out, bent, out of shape, corroded etc.). Bad contacts in switch or relay.

GUIDELINES TO SOLVE SPECIFIC FAULT CODES

Several Fault Codes Are Active Simultaneously

- If this occurs, check the following:
- Check connections common to more than one system.
 - Check diagnostic connector for the presence of water or corrosion.
 - Check CAN wires.
 - Check wire junctions or splices (JT xx).

Fault Code C2100

iBR sensors calibration is corrupted If the fault comes active when the iBR is activated and stays active, verify if a software update is available.

Fault Code C2120

iBR application calibration is corrupted If the fault comes active when the iBR is activated and stays active, verify if a software update is available.

Fault Code C2121, C2221

iBR application parameters corrupted (backup no. 1 or no. 2). This fault happens when power to the module is shut off before the module has time to complete its shutdown. Normal operation is not affected. If it occurs often, check supply voltage to module.

Fault Code C2150, C2233, C2250

iBR motor or system current software breaker. Motor or module current too high. This fault may occasionally appear as occurred. Normal operation is not affected. If the count is high, check the moving mechanism of the system if it is stiffer than normal to operate.

Fault Code P0562

Battery voltage too low. It occurs when both battery voltage and engine RPM conditions are met. See following chart. Refer to *CHARGING SYSTEM* subsection.

BATTERY VOLTAGE	ENGINE SPEED
Lower than 11.5 Vdc	Greater than 1200 RPM

Fault Code P0563

Battery voltage too high. It occurs when battery voltage is above 16 Vdc when engine is running. Refer to *CHARGING SYSTEM*.

Fault Code P0171

Multiplicative mixture adaptation exceeds upper limit--> mixture too lean. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P0172

Multiplicative mixture adaptation below lower limit--> mixture too rich. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P1171

Additive mixture adaptation exceeds upper limit--> mixture too lean. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P1172

Additive mixture adaptation below lower limit --> mixture too rich. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code U0129

CAN communication error between iBR module or iBR CAN message time-out or validity. Normal operation is affected by a limp home of the engine. If the count is high, check the related components. Ensure connector is plugged.

Fault Code U0300

Incorrect ECM or multifunction gauge for the engine. Installed part is not appropriate for the vehicle. Using BUDS, check if the security coding of the cluster is matched with the ECM security coding. **Engine will crank but will not start.** Refer to *PARTS CATALOGS* for proper part according to vehicle.

HOW TO FIND FAULT CODE DESCRIPTIONS

For the latest fault code table, use the **Info Center** submenu in BOSSWeb and enter the following search criteria:

- Enclose the search within quotes " "
- Enter: "2014 Sea-Doo PWC DTC Table".