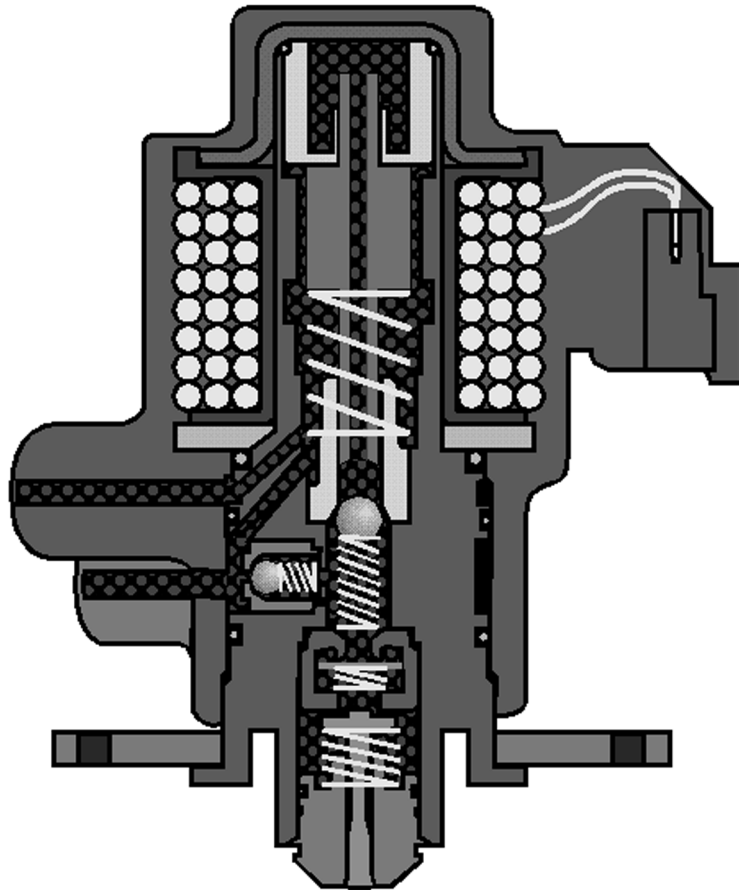




Kawasaki Jet Ski[®] Watercraft

Direct Injection



DIAGNOSTIC SOFTWARE MANUAL

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Introduction

Kawasaki's *FFI*[™] Diagnostic (KADIAG) Software is intended to be used with a service manual for the Direct Injection (D.I.) model to aid a technician in solving D.I. service problems. This software allows a technician to:

1. Retrieve and clear stored service codes.
2. Actuate individual fuel injectors.
3. Check spark on individual cylinders.
4. Run the electric fuel pump.
5. Perform cylinder drop tests.
6. Display accumulated engine hours and EMM information.
7. Display recorded engine hours within nine operational rpm ranges.
8. Display real-time sensor values and system voltages.
9. Display switch conditions.
10. Print and save service report.
11. Display Injector serial numbers.
12. Install service replacement EMM.
13. Adjust fuel map.

The following pages cover these features and functions in more detail.

Preparation

Hardware Requirements:

WARNING

This software is intended to be used on a battery-powered laptop computer.

To minimize electric shock hazard, DO NOT connect an A.C. powered computer to the Jet Ski watercraft.

Kawasaki's Diagnostic Software will operate on a wide range of laptop computers. It has been tested on laptops using 286, 386, 486, and *Pentium* processors. At least 400 kilobytes (K) of DOS memory must be available for the program to run. The screen fonts and colors will display well on monochromatic or color displays.

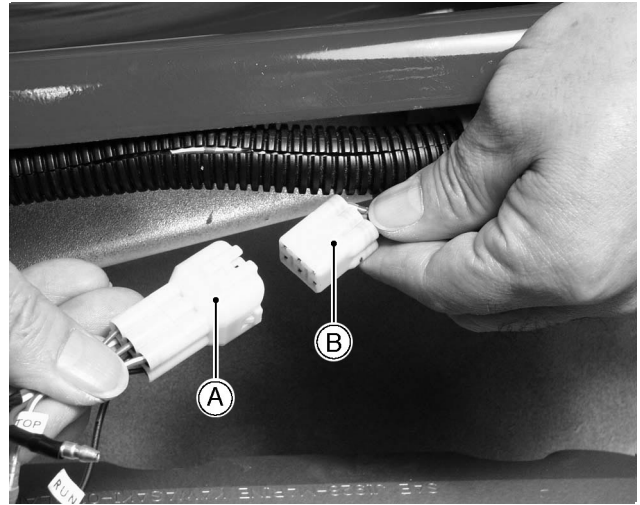
The program is provided on a single 1.44 Meg 3¹/₂ inch floppy disk. This disk can be accessed by most newer IBM compatible laptop computers.

Cable Connections:

- Locate the diagnostic port on the engine wiring harness.
It is positioned at the mid right side under the seat. The port has a cover to keep the connections clean.
- Remove the cover to access the port.
- Connect the yellow end of the communication cable [A] to the diagnostic port [B] on the wiring harness.

A: Communication cable

B: Diagnostic port of wiring harness



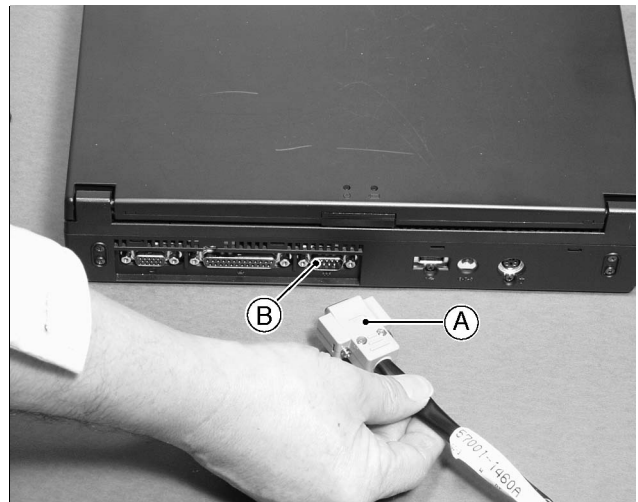
NOTE

- *When you are finished with all testing, make sure you protect the diagnostic port by reinstalling the cover. Do not disconnect or cut off the wire of the cover.*

- Connect the other end of the communication cable [A] to the serial port [B] on the laptop computer.

A: Communication cable

B: Serial port of laptop computer



Special Tool:

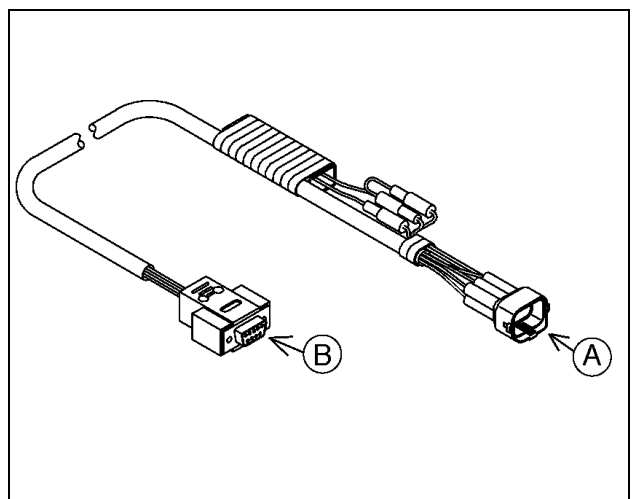
57001-1460 Communication Cable

A : To diagnostic port of wiring harness

B : To serial port of laptop computer

Special Tool:

57001-1461 KADIAG Software



Running software from floppy disk:

- ### Installing software onto laptop's hard drive:

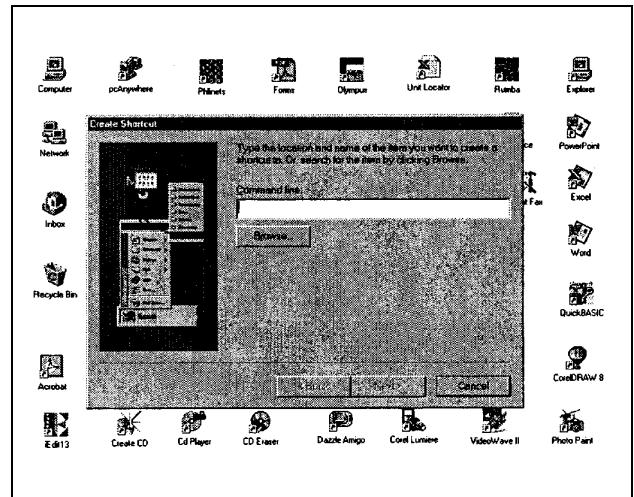
- Insert the floppy disk into the laptop's floppy disk drive.
- Open the "A" drive from **EXPLORER** screen.
- Click **INSTALL.bat**, then press the **ENTER** key.
- If the program will not run from the C drive, restart the computer with the disk in drive A.

Install a **KADIAG** shortcut icon on the windows desktop.

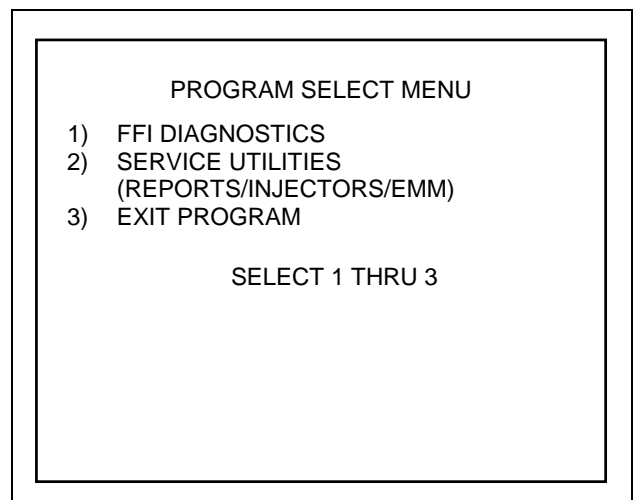
- With the cursor not pointing to an icon, click the right mouse button.
- Select **NEW**, then **SHORTCUT**.



- Choose **BROWSE** on the Create Shortcut Screen.
 - Choose the **KADIAG** folder.
 - Click on **KADIAG.bat** file.
 - Choose open.
 - Choose **NEXT**, then **NEXT**, then **FINISH**.
The **KADIAG.bat** icon will then appear on the desktop screen.



- Start the program by clicking **KADIAG.bat** icon then press the **ENTER** key or by double-clicking it. When the program starts, you will see the **Program Select Menu**.



Setting up the Program:

The first time you run the program, it may need to be configured.

- Press “1” to start the Diagnostic Program.
- When the **Title** screen appears, press the “F3” key to display the **Select Com Port** screen.

PROGRAM SELECT MENU

- 1) FFI DIAGNOSTICS
- 2) SERVICE UTILITIES
(REPORTS/INJECTORS/EMM)
- 3) EXIT PROGRAM

SELECT 1 THRU 3

KAWASAKI
FFI WATERCRAFT
DIAGNOSTICS SUPPORT

VERSION 1.20
FOR FFI WATERCRAFTS 2000

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PRESS ANY KEY TO CONTINUE

Changing a Com Port:

The program can be configured to use any com port. The initial default is com 1. Consult the documentation for your computer to determine which port you have plugged the diagnostic communication cable into. Set the diagnostic program to use the same port.

- To change the default com port, press the “F3” key from the **Title** screen or the **Main Menu** to display the **Select Com Port** screen. The **Select Com Port** screen displays a numbered list of com ports.
- Type the com port number. When you exit the **Select Com Port** the **Title** screen appears.

SELECT COM PORT

- 1) COM 1
- 2) COM 2
- 3) COM 3
- 4) COM 4
- X) EXIT

Current Configuration uses
Com Port 1

SELECT 1 THRU 3 OR X

Selecting a Display Mode:

By default, the program starts with a monochrome display. This ensures compatibility with the widest array of available laptop computers.

- If you are using a color display, press “F2” key to switch to the color mode.

NOTE

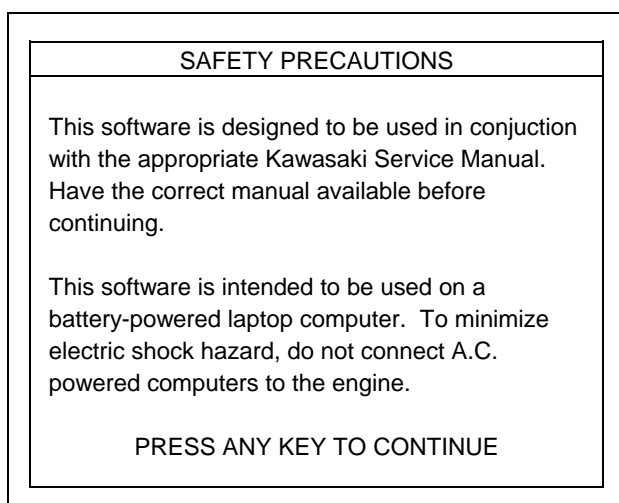
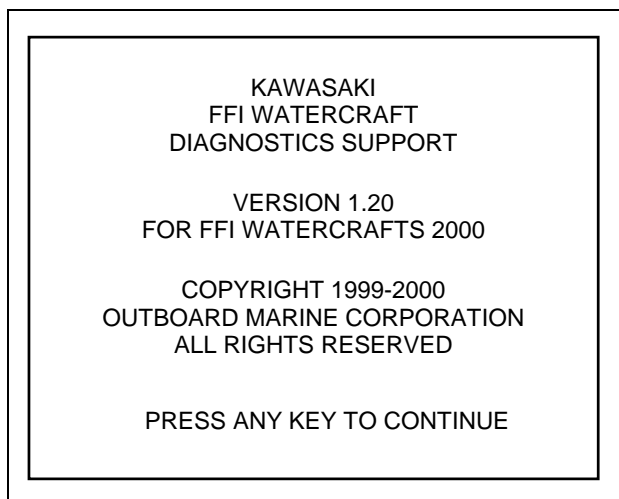
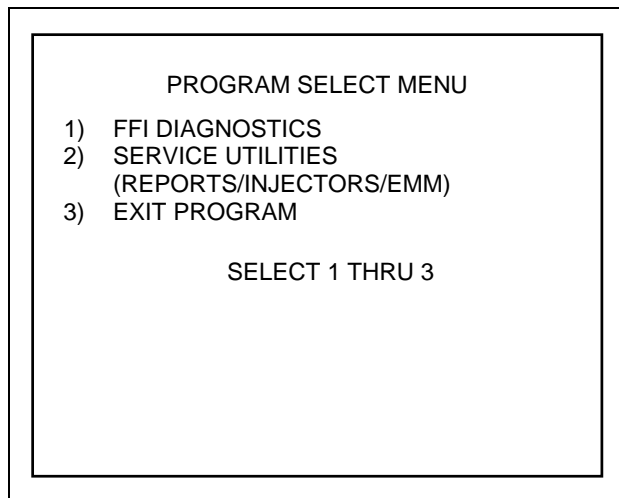
- *The com port and screen mode (color or monochrome) that is being used, when the program is shut down, will automatically be used the next time you start the program.*

Diagnostic Program

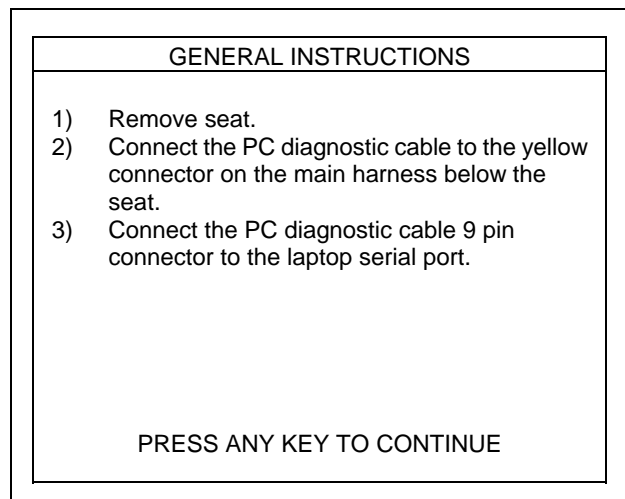
Running the Diagnostic Program

Once you have installed and configured the program, start the program.

- Double-clicking **KADIAG.bat** icon on the Windows desktop. The **Program Select Menu** will immediately display.
- Press the "1" key to start the Diagnostic Program. The **Diagnostic Title** screen will immediately display.
- Press any key to change to the next screen.
- The next screen is the **Safety Precautions** screen. You get to this screen by pressing any key at the **Title** screen.
- Read, understand, and follow the directions on the **Safety Precautions** screen.
- Press any key to advance to the next screen. At this point, **the computer is still not attempting to communicate with the EMM.**



- This is the **General Instructions** screen. You get to this screen by pressing any key at the **Safety Precautions** screen. This screen provides general instructions on connecting the laptop computer to the Jet Ski Watercraft with the communication cable. Make sure you:
 1. Connect the main harness to the laptop computer with the communication cable.
 2. Turn the key switch ON.
 3. Install the lanyard key.
- When you press any key at this screen, the laptop computer will now attempt to communicate with the EMM.

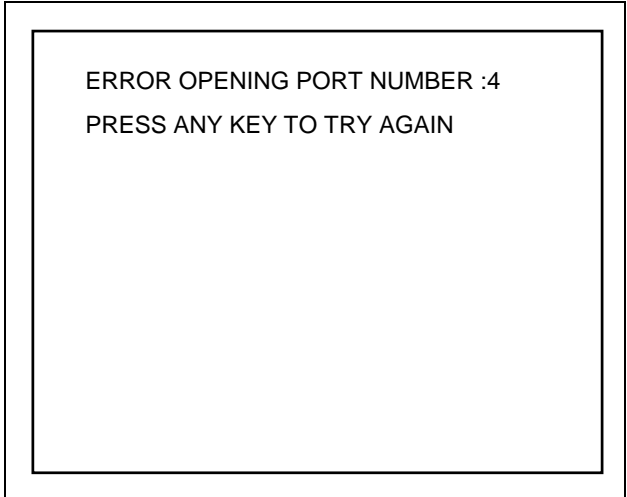


Error Messages

If the program doesn't start, an error message will appear explaining the problem. If the program doesn't start, AND doesn't display an error message, the problem is most likely insufficient computer memory.

COM Port Error:

This error message indicates that the communication port will not open. When you see this error message, press the "ENTER" key to try the same port again. If the program cannot locate and open the default port, the **Select Com Port** will be displayed. This message is usually caused by the following problems.



ERROR OPENING PORT NUMBER :4
PRESS ANY KEY TO TRY AGAIN

The selected com port does not exist on your computer:

- Make sure you selected the correct com port. Most computers have at least two com ports. The ports are normally labeled "COM1" and "COM2".
- Consult the documentation for your computer to determine the name of the port you have plugged the diagnostic communication cable into.
- Make sure the diagnostic program is setup to use the same port.
- See the section titled **Changing a Com Port** (page. 5) in this booklet.

Some computers have the ability to enable and disable the com ports.

- Consult the documentation that came with your computer.
- Make sure the com port is enabled.

Something is already using the com port:

This is usually caused by a mouse driver that is loaded in the **CONFIG.sys** file or **AUTOEXEC.bat** file. If you are using DOS 6 or newer, you can bypass the **CONFIG.sys** and **AUTOEXEC.bat** files by restarting your computer and pressing the "F5" key when you see the **STARTING MS DOS** message. If you are using an older version of DOS, you will have to remove the command that loads the mouse driver by editing the **CONFIG.sys** or **AUTOEXEC.bat** file.

Data Base Error:

If the laptop displays this error screen, there are three possible causes:

Not enough DOS memory available:

- To correct this, press the ESC key to end the program.
- Check computer memory by typing MEM and pressing the ENTER key at the DOS prompt. The largest executable program size must be more than 400KB. If not, reconfigure the computer to make more memory available.

Attempting to start the program outside of the KADIAG directory:

- Change to the **KADIAG** directory before starting the program.

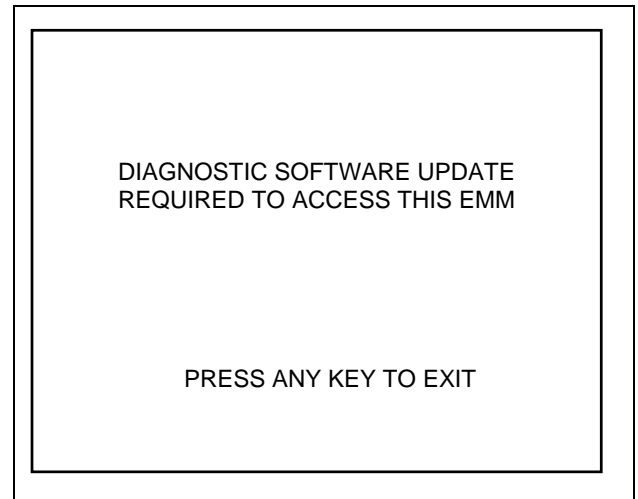
Damaged or erased program file:

- Reinstall the program.
- See the section titled **Installing and Starting the Program** in this booklet.

```
C:\KADIAG>KADIAG
40
DATABASE ERROR – RESTART PROGRAM
IF ERROR OCCURS AGAIN, REINSTALL
PROGRAM FROM THE DISKETTE
```

Software Version:

If the laptop displays this error screen, the EMM program part number is not being recognized by the diagnostic software program. This is most likely caused by using old diagnostic software on a new engine. Always use the newest diagnostic software.



Communication Problems

The EMM must be powered-up for communication to occur. This means the battery must be charged and connected. The key switch must be ON. The **Main Menu** screen will be displayed when the laptop and EMM establish communication.

If the program locates and opens the selected com port but cannot communicate with the EMM for any reason, it will display this screen. The software will not advance beyond this screen until communication can be established between the laptop computer and the EMM.

If you see this screen, make sure the:

1. Key switch is on.
2. Main battery selector switch is on.
(There is not main battery selector switch on JT1100-C1.)
3. Battery cable connections are clean and tight.
4. Battery is charged.
5. All fuses and relays are good.
6. EMM electrical connections are clean and tight.
7. Communication cable connections are clean and tight.
8. Communication cable is attached to the laptop and to the diagnostic connector on the engine wiring harness.
9. Com port with the number you entered, when starting or configuring the program, is connected to the communication cable.
10. Engine stop lanyard is attached to the stop button.

This screen will also be displayed if the laptop momentarily loses communication with the EMM. If this happens, allow a few seconds for the communication to reestablish.

The computer is having trouble communicating with the engine EMM.

Please check the following :

- Key switch is on.
- Main battery selector switch is on.
- Battery cable connections are clean and tight.
- Battery is charged.
- All fuses and relays are good.
- EMM electrical connections are clean and tight.
- Communication cable connections are clean and tight.

COMPUTER WILL CONTINUE COMMUNICATING
WHEN CONNECTION IS CORRECTED

FFI Diagnostics

Main Menu Selections

This screen is the **Main Menu**. It's displayed as soon as the laptop computer establishes communication with the EMM, and it offers a number of choices.

Option 1, Diagnostic Session:

Allows you to retrieve stored service codes from the EMM. Helps you diagnose the problems generating the service codes. Allows you to clear stored service codes.

Option 2, Static Tests:

For testing purposes, allows you to:

1. activate any fuel injector
2. fire any ignition coil
3. turn the fuel pump on

Option 3, Cylinder Drop Test:

Helps isolate a cylinder that's not operating properly by allowing you to momentarily shut off fuel to any cylinder while the engine is running.

Option 4, Not Used:

Option 5, Not Used:

Option 6, EMM Information:

Provides information on engine model and serial number, EMM serial number, software version, program change number, and total engine hours.

Option 7, RPM Profile:

Displays a graph of nine rpm fields in 1,000 rpm increments. Shows percent of time engine has been operated in each range. Also shows total engine hours.

All menu selections will return back to the **Main Menu** when completed.

MAIN MENU	
1)	DIAGNOSTIC SESSION
2)	STATIC TESTS
3)	CYLINDER DROP TEST
4)	NOT USED
5)	NOT USED
6)	EMM INFORMATION SCREEN
7)	RPM PROFILE
X)	EXIT PROGRAM
SELECT 1 THRU 7 OR X	

Service Code Review Screen:

This is the **Service Code Review** screen. It appears after pressing "1" at the **Main Menu**, and provides an overview of all the service codes stored in the EMM. Two types of service codes are displayed. Within each category, the codes are displayed in the order they should be diagnosed.

1. **Hard Codes:**
Are displayed first. A hard code means the problem that created the code exists now.
2. **Intermittent Codes:**
Are displayed second. An intermittent code means the problem that created the code is not occurring at this time.
3. **Repaired Codes:**
Are displayed last. A repaired code means that a problem that was causing a hard code at the beginning of the session is no longer occurring.

From this screen you have two options: press any key for information on the first service code, or press the "ESC" key to return to the **Main Menu**.

SERVICE CODE REVIEW
1 HARD – 13
1 INTERMITTENT – 43
PRESS ANY KEY FOR FIRST CODE PRESS < ESC > TO CANCEL

Service Code Screens:

This is a **Service Code** screen. Code screens are displayed in the same sequence as presented on the **Service Code Review** screen. You get to them by pressing any key at the **Service Code Review** screen. They display the following information:

Code #:

An identifying number given to each code.

1. **Class:**

Hard, intermittent, or repaired.

2. **# of Events:**

Indicates how many times this code has been stored. This field can only increase by one each time the engine is run. This means that if a code occurs several times during a run, it will only increase this counter by one.

3. **Last Event at Hrs.:**

Indicates the number of operating hours on the engine when this code was last present. This field will update during a run (during a single power-up cycle). For instance, if a code occurs at 50 hours, and is still occurring at 51, 52, and 53 hours, the counter will advance to 53 hours. This, however, is not a live data screen. The counter is read only when you begin a diagnostic session.

NOTE

- *You must exit the diagnostic session, return to the **Main Menu**, then begin a new diagnostic session to see the counter change value.*

CODE # 13	CLASS	INTERMITTENT
# OF EVENTS 1	LAST EVENT AT	13HRS
#3 OF 3 CODES	TOTAL ENGINE HRS	13

CODE ANALYSIS: Throttle position sensor below expected range.

CODE DESCRIPTION: The EMM is detecting a Throttle position sensor value that is lower than expected. This can be caused by mechanical damage to the sensor or linkage that increases the sensor travel toward the idle position. Damage to the sensor leads, or sensor electrical connectors that are loose, corroded, or unplugged can also cause this code. See Diagnostic Manual.

PRESS ANY KEY FOR FIRST CODE

4. **# _ of _ Codes:**
How many codes are present, and which code you are presently viewing.
5. **Total Engine Hours:**
Current number of operating hours on the engine. Compare this number to the LAST EVENT AT ___ HRS. number to determine how long since the code was last set.

Retest and Static Test Options:

Some hard codes have a **Retest** and/or an associated **Static Test** option. If these tests are available, "Press **S** for **Static Test**" and/or "Press **R** to **Retest**" is displayed at the bottom of the **Service Code** screen.

Service codes that have a static test option are: the fuel injector and the ignition system. The static test allows you to instruct the EMM to momentarily activate a component that is causing the code so you can verify its operation.

In the retest mode, the computer constantly scans the EMM to see if the present service code is still being set. You can use Retest to diagnose and verify some repairs. For example; Service Code #43 will be set if an open connection occurs in the water temperature sensor circuit.

NOTE

- *When service code 39 appears, perform the static test and inspect the fuel pump according to the service manual.*

CODE #43	CLASS	INTERMITTENT
# OF EVENTS 1	LAST EVENT AT	13 HRS
#2 OF 3 CODES	TOTAL ENGINE HRS	13
CODE ANALYSIS: Water temperature sensor above expected range.		
CODE DESCRIPTION: If this is a hard fault, STOP THE ENGINE to prevent serious damage. Check engine temperature, if overheating, troubleshoot cooling system. Check cooling fittings and hoses for blockage. If engine is not overheating, check for damaged temperature sensor or sensor leads in wiring harness. See Diagnostic Manual.		
PRESS R TO RETEST THIS FAILURE PRESS ANY KEY FOR NEXT CODE		

The **Service Code** screen for Service Code #43 has the Retest feature. If you press "R" key, the **Retest** screen will be displayed. If you wiggle the water temperature sensor connector and it momentarily improves contact, the computer will "beep" when the connection is good. The computer will then display a message that the code appears to be repaired.

NOTE

- *You need set the computer to beep when the signal directs.*

The problem causing this service code is still detected. Conduct a visual inspection, test and clean connections, and test components. The computer will beep and the screen will change when the problem is repaired.

PRESS ANY KEY TO STOP

REPAIRED

PRESS ANY KEY TO EXIT

If the connection breaks, the computer will beep again and display the **Retest** screen. When you exit the **Retest** feature, you will automatically return to the **Service Code** screen. The **CLASS** field will reflect the status of the service code; either Hard or Repaired.

When you are finished with a **Service Code** screen, you have two options: press any key to see the next **Service Code** screen, or press the "ESC" key to return to the **Main Menu**.

Session Completion/Code Clearing:

The **Session Completion** screen is displayed after you have seen the last **Service Code** screen. The **Session Completion** screen provides three options:

SESSION COMPLETION
Please choose one of the following options to complete this diagnostics session before testing engine.
1 - Clear all service codes
2 - Review current service codes without clearing codes.
X - End Session return to main menu without clearing service codes
SELECT 1, 2 or X

- If you type "1", the computer will display a message asking if you are sure you want to clear the codes.
- Press "ESC" key if you do not want to clear the service codes. Pressing any other key will clear the codes. A screen will then appear telling you service codes were successfully cleared.
- If you type "2", the computer will display the **Service Code Review** screen, then page through the **Service Code** screens again.
- You can end the session and return to the **Main Menu** without clearing the service codes by typing "X".

DO YOU REALLY WANT TO CLEAR SERVICE CODES?
PRESS <ESC> TO CANCEL OR ANY OTHER KEY TO CLEAR CODES

NOTE

- *It is important to recheck for codes after clearing codes. If hard codes are still present they will reappear. Clearing codes only removes intermittent codes.*

SERVICE CODES SUCCESSFULLY CLEARED
PRESS ANY KEY FOR MAIN MENU

Menu Option 2 - Static Tests

This is the **Static Testing Menu**. You get to this screen by pressing "2" key at the **Main Menu**. It allows you to select and test one of three engine functions.

NOTE

- *Before selecting a static test, make sure the engine is not running.*

STATIC TESTING MENU	
1)	TEST FUEL INJECTORS
2)	TEST IGNITION FIRING
3)	TEST FUEL PUMP
X)	EXIT STATIC TESTING
SELECT 1 THRU 3 OR X	

If the engine is running, a warning screen will be displayed and the software will not advance to the **Static Test Menu**. If this happens, you must press the "ESC" key to return to the **Main Menu**, or shut the engine off using the engine stop switch. When the engine stops, the **Static Test Menu** will be displayed.

NOTE !!! CANNOT RUN TEST WITH ENGINE RUNNING	
PRESS < ESC > TO CANCEL OR ANY OTHER KEY TO TRY AGAIN	

Testing Fuel Injectors:

NOTE

- *Do not start the engine during any static test. Doing so will cause erratic operation until you shut off the engine.*
- Type "1" to test the fuel injectors. The computer will display a screen prompting you to enter the number of the injector you want to fire.
- Type the number of the injector you want to fire.

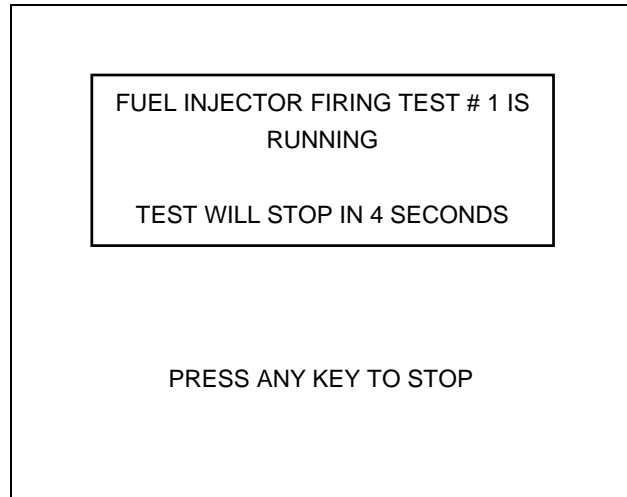
ENTER FUEL INJECTOR TO FIRE	
1)	FIRE FUEL INJECTOR #1
2)	FIRE FUEL INJECTOR #2
3)	FIRE FUEL INJECTOR #3
X)	EXIT FUEL INJECTOR TEST
SELECT 1 THRU 3 OR X	

The computer will display a screen telling you which injector is firing and how long it will continue to fire. The injector will fire approximately once a second for 5 seconds. The screen counts down the amount of time to the end of the test. If you press any key, the injector will stop firing immediately. The screen changes back to the previous screen when the injector stops firing.

The fuel injector will make an audible clicking sound each time it's activated. This sound indicates the injector is being activated by the EMM and that the injector armature is moving. You can also use a timing light connected to either (but not both) injector leads to see if the injector is being triggered by the EMM.

If the timing light flashes and the injector clicks, the injector is most likely functioning as designed. If the light flashes but the injector does not click, the injector is probably damaged. If the timing light does not flash, the problem is probably not in the injector but in the fuses, wiring, or EMM.

When you are finished testing the injectors, type "X" or press the "ESC" key to return to the **Static Test Menu**.



Testing Ignition System:

NOTE

- *Do not start the engine during any static test. Doing so will cause erratic operation until you shut off the engine.*
- Type "2" and press the "ENTER" key to test the ignition system. The computer will now prompt you to install a spark checker onto the high tension leads.
- After installing the spark checker, press any key to advance to the next screen.

Remove all spark plug leads and connect them to a spark tester.
Set At air gap specified in the service manual.

PRESS ANY KEY TO CONTINUE

The computer will next display a screen that allows you to enter the number of the cylinder you want to fire.

- Type the number of the ignition you want to fire.
- The next screen tells you which cylinder is firing and how long it will continue to fire. The ignition will fire approximately once a second for 5 seconds.
- Use the spark checker to observe the spark. The screen counts down the amount of time to the end of the test.
- If you press any key, the ignition will stop firing immediately. The screen changes back to the previous screen when the ignition stops firing.

ENTER IGNITION # TO FIRE

- 1) FIRE IGNITION # 1
- 2) FIRE IGNITION # 2
- 3) FIRE IGNITION # 3
- X) EXIT IGNITION TEST

SELECT 1 THRU 3 OR X

When you are finished testing the ignition, press the "X" or "ESC" key to return to the **Static Test Menu**.

IGNITION FIRING #1 TEST IS
RUNNING

TEST WILL STOP IN 4 SECONDS

PRESS ANY KEY TO STOP

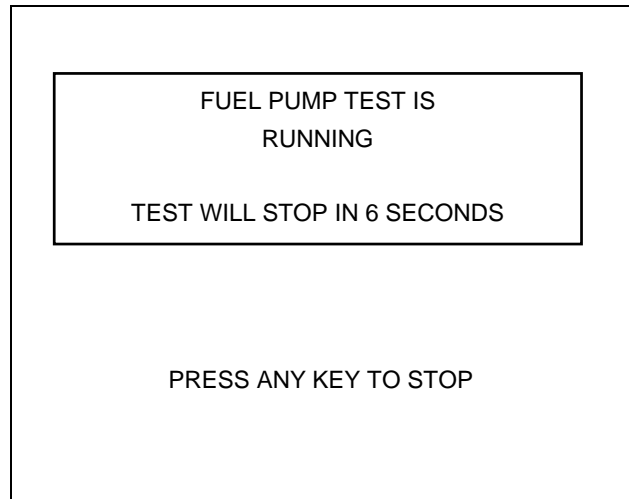
Testing Electric Fuel Pump

NOTE

- *Do not start the engine during any static test. Doing so will cause erratic operation until you shut off the engine.*
- Type "3" to turn the electric fuel pump on. The computer will display a screen telling you the fuel pump is running. The fuel pump will run continuously for approximately 7 seconds. The screen counts down the amount of time to the end of the test.
- If you press any key, the test will stop immediately and return to the **Static Test Menu**.

The fuel pump motor makes an audible whining sound while running. If you hear the fuel pump running, the pump is probably okay. You can also use this procedure to turn the fuel pump on to perform the pressure and volume test outlined in the service manual.

When you are finished with the **Static Test Menu**, press the "ESC" key to return to the **Main Menu**.



Menu Option 3 - Cylinder Drop Test

The cylinder drop test is a highly useful diagnostic tool. It allows you to momentarily shut off **fuel** to any one cylinder while the engine is running. To use the cylinder drop test, you must run the engine with the laptop attached.

- To start the cylinder drop test, type "3" at the **Main Menu**. The computer will display the **Cylinder Drop Test** information screen.
- Read and understand the screen before continuing.
- Press any key to advance to the next screen.

CYLINDER DROP TEST
<ul style="list-style-type: none">• Extract all EMM service codes and make the repairs indicated before using the Cylinder Drop Test.• This test will help you diagnose an engine problem when the systems or cylinders are not known.• This test allows you to drop any cylinder as you run the engine at the RPM where the problem exists.• If the problem is power loss, engine RPM will not change when the cylinder is dropped. If the problem is a misfire, the misfire will stop when the cylinder is dropped.
PRESS ANY KEY TO CONTINUE

The engine must be running above 500 rpm. If the engine is not running, or is below 500 rpm, a warning screen will be displayed and the software will not advance to the **Cylinder Drop Testing Menu**. If this happens, start the engine, or press "ESC" key to return to the **Main Menu**.

NOTE !!!
RPM SHOULD BE ABOVE 500 FOR TEST TO BE EFFECTIVE
PRESS ANY KEY TO TRY AGAIN

When the engine is running above 500 rpm, the **Cylinder Drop Testing Menu** will be displayed. The screen will also show engine rpm so it can be noted before conducting a drop test.

CYLINDER DROP TESTING MENU	
1)	CYLINDER DROP TEST CYL. # 1
2)	CYLINDER DROP TEST CYL. # 2
3)	CYLINDER DROP TEST CYL. # 3
X)	EXIT CYLINDER DROP TEST
RPM: 550	
SELECT 1 THRU 3 OR X	

- Type the number of the cylinder you want to drop. The computer will display a screen telling you which cylinder is dropped and how long it will continue. Engine RPM will again be displayed so you can note if a change occurs. The screen counts down the amount of time to the end of the test.
- If you press any key, the test will end immediately. When the test ends, the screen changes back to the **Cylinder Drop Testing Menu**.

CYLINDER # 1 DROP TEST IS RUNNING	
TEST WILL STOP IN 19 SECONDS	
CURRENT RPM IS: 800	
PRESS ANY KEY TO STOP	

Diagnosing a Misfire:

- Run the engine under the conditions that cause the misfire to occur and drop each cylinder.
- When you drop the cylinder that is misfiring, the misfire will stop. You can focus on that cylinder.

Diagnosing Low Performance or Rough Running:

- Run the engine under a load (in a test tank) and drop each cylinder.
- Watch the RPM on the screen or on the tachometer. The RPM drop will be substantially less on a cylinder that is weak. If you drop a cylinder and the engine RPM does not change, that cylinder has a problem.

- When you are finished with the **Cylinder Drop Testing Menu**, type "X" or press the "ESC" key to return to the **Main Menu**.

Menu Option 4 – Not Used

Menu Option 5 – Not Used

Menu Option 6 - EMM Information

This is the **EMM Information** screen. You get to this screen by pressing "6" at the **Main Menu**. This screen provides information on:

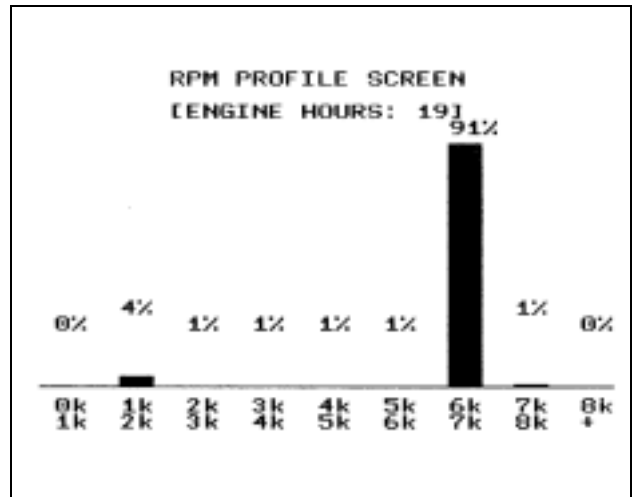
1. **ENGINE MODEL and SERIAL:**
Information in this field should match the numbers on the engine.
2. **EMM SERIAL:**
Displays EMM serial number.
3. **SOFTWARE VERSION:**
Shows part number and version of the EMM software. Can be used to confirm engine/software compatibility.
4. **MAP VERSION:**
Indicates the Program Change Number (level of change) of the present software version.
5. **ENGINE HOURS:**
This is the total time the engine has been operated. Key-on/Engine-off does not accumulate time on this counter.

This field is not live data. Hours will not change while on this screen. You must exit the screen, return to the **Main Menu**, then select Menu Item 6 again to see new values.

EMM INFORMATION SCREEN	
ENGINE MODEL:	1100STX DI
ENGINE SERIAL:	jtt10ce000047
EMM SERIAL:	1295
SOFTWARE VERSION:	3030076
MAP VERSION :	CCC
ENGINE HOURS:	0
PRESS ANY KEY TO CONTINUE	

Menu Option 7 - RPM Profile

This is the **RPM Profile** screen. You get to this screen by pressing "7" at the **Main Menu**. It displays a graph of nine rpm fields in 1000 rpm increments. It shows percent of time the engine has been operated in each range, and it also shows total engine hours.



Service Utilities Program

Running the Service Utilities Program

The **Service Utilities** functions will use the same configuration (e.g. com port selection, color or monoscreen) as the *FFI* Diagnostic functions. Before attempting to run the **Service Utilities** function, you must install and configure the Kawasaki's *FFI* Diagnostic program.

Once you have installed and configured the program, double-click the **KADIAG.bat** icon to start. The **Program Select Menu** will come up.

PROGRAM SELECT MENU

- 1) FFI DIAGNOSTICS
- 2) SERVICE UTILITIES
(REPORTS/INJECTORS/EMM)
- 3) EXIT PROGRAM

SELECT 1 THRU 3

Service Utilities Menu

Press the "2" key to start the service utilities program. The **Service Utilities Menu** will come up. This menu offers five choices:

Option 1, Service Reports:

This option creates a text file of all information that is unique to a specific engine, such as engine hours, RPM profile, current service codes, and current sensor values. The file can be printed immediately or saved to the hard drive for printing or viewing later.

SERVICE UTILITIES MENU

- 1) SERVICE REPORTS
- 2) INJECTOR INFORMATION
- 3) SERVICE EMM
- 4) ENGINE MONITORING
- 5) ADJUST FUEL MAP
- 6) RETURN TO PROGRAM SELECT MENU

SELECT 1 THRU 6

Option 2, Injector Information:

This option displays the original fuel injector serial numbers and identifies their cylinder locations on the engine.

Option 3, Service EMM:

This option allows you to copy the engine model number, serial number, operating hours, RPM profile, and other engine specific information from the original EMM into a service replacement EMM.

Option 4, Engine Monitoring:

This option displays the following live data from the EMM:

1. Sensor values (throttle position sensor, water temperature sensor, etc.)
2. System voltages (battery voltage or alternator voltage.)
3. Engine speed

Option 5, Adjust Fuel Map:

This option allows you to increase or decrease the calibrated fuel amount by +5% or –5%.

Option 6, Return to Program Select Menu:

This option displays the **Program Select Menu**.

Menu Option 1 - Service Report

This is the **Service Report Menu**. You get to this screen by typing "1" at the **Service Utilities Menu**. The purpose of the **Service Report Menu** is to provide a method of creating and printing a service report.

SERVICE REPORT MENU	
1)	VIEW CURRENT EMM REPORT
2)	SAVE CURRENT EMM REPORT
3)	PRINT CURRENT EMM REPORT
4)	VIEW SAVED REPORT
5)	PRINT SAVED REPORT
6)	RETURN TO SERVICE UTILITIES MENU
SELECT 1 THRU 6	

View Current EMM Report:

- Type "1" from the **Service Report Menu** to view a report about the engine you are connected to. The figure (right) shows page one of a typical report file. The figure (right lower) shows the second page.
- Use the "Page-up" and "Page-down" keys or the "Up/Down arrow" keys to view the report.
- Use "ESC" key to return to **Service Report Menu** for other options.

Engine Model No.	1100STX DI
Engine Serial number	jtt10ce000047
EMM Serial	1295
Software Version	3030076
EMM On Time	0:31
Engine Run Time	0:0
Hard Service Codes	51, 52, 53
Intermittent Codes	39
Engine Speed	0
TPS Calibrated	0%
Fuel Timing	xxxxx
Fuel Command	xxxxx
Spark Timing	xxxxx
Spark Duration	xxxxx
Engine Sync	No
Overheat Active	No
S.L.O.W. Active	No
TPS Actual	0.22 V
PDS Voltage	12.20 V

Air Temp	21 C
Engine Temp	20 C
EMM Temp	21 C
Baro Pressure	29.61 in HG
Max EMM Temp	23 C
Max Engine Temp	22 C
Max Engine Speed	
0 - 1000 RPM	100%
1000 - 2000 RPM	0%
2000 - 3000 RPM	0%
3000 - 4000 RPM	0%
4000 - 5000 RPM	0%
5000 - 6000 RPM	0%
6000 - 7000 RPM	0%
7000 - 8000 RPM	0%
8000+ RPM	0%
Injector #1 S/N	99250075990526
Injector #2 S/N	99251076445526
Injector #3 S/N	99251076435527

Save Current EMM Report:

- Type "2" from the **Service Report Menu** to save a report about the engine you are connected to. You will be asked to enter a file name or select a file name from a list.
- To use an existing file name, use the "arrow" keys to move through the list of files.
- When you have the desired file highlighted, press the "ENTER" key to save the file using the highlighted name.
- If you want to create a new file, enter the name you want the report file saved as. Remember to use the standard DOS file naming conventions; no more than eight characters and no special characters.
- After typing the file name, press the "ENTER" key.
- The file can also be saved to the A drive by typing A: and the file name.

FILE NAME:

586430
99175EV
1150FLEE
JOE SMIT

You will be asked to enter a customer name. This name will print at the top of the service report. You can use any name you wish as long as the total number of characters will fit in the area provided. You can also press the "ENTER" key to leave this field blank. After typing the customer name, press the "ENTER" key. The file will be saved in the **C:\KADIAGDATA** directory on your computer hard drive or floppy drive.

ENTER CUSTOMER NAME:
John Doe

Print Current EMM Report:

- Type "3" from the **Service Report Menu** to print a report about the engine you are connected to. You will be asked to enter a customer name.
- After typing the customer name, press the "ENTER" key. This will copy the report to the computer parallel port. Some printers (daisy wheel and dot matrix) will begin printing right away. Other printers will require you to push the form feed button.

View Saved Report:

- Type "4" from the **Service Report Menu** to view a previously saved report.
- You will be asked to enter a file name or select a file name from a list. Use the "arrow" keys to move through the list of files.
- When you have the desired file highlighted, press the "ENTER" key to view that file.
- If the file was saved to the floppy drive, type A: and the "Enter".
- Use this option to review information on an engine that is not connected to your computer.
- Use "ESC" key to return to **Service Report Menu** for other options.

FILE NAME:

586430
99175EV
1150FLEE
JOE SMIT

Print Saved Report:

Use this option to print information on an engine that is not connected to your computer.

- Type "5" from the **Service Report Menu** to print a previously saved report.
- You will be asked to enter a file name or select a file name from a list.

Return to Service Utilities Menu:

- Type "6" from the **Service Report Menu** to return to the **Service Utilities Menu**.

Menu Option 2 - Injector Information

This is the **Injector Information** screen. You get to this screen by typing "2" at the **Service Utilities Menu**. The purpose of this screen is to display the serial numbers of the injectors that were originally installed on the engine during production.

Important:

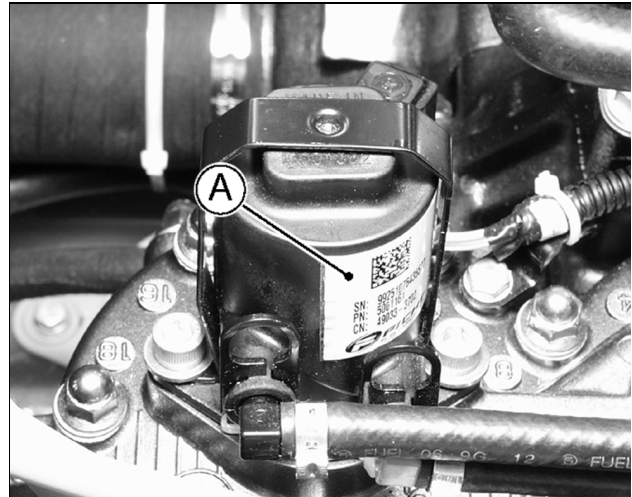
Each fuel injector's serial number and flow characteristics are loaded into the EMM during production. This means that there is a unique relationship between the engine's EMM and its fuel injectors. The result is optimum fuel delivery to each cylinder based on the flow characteristics of that cylinder's fuel injector.

You must use **Kawasaki's FFI Diagnostic Software, Version 1.20** when you perform either of the following service procedures on an engine that has this capability:

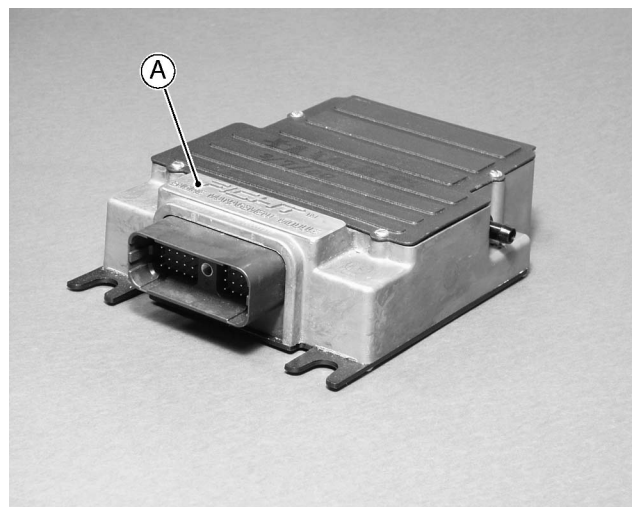
- Replacing an EMM

INJECTOR INFORMATION
CYLINDER #1 : 99250075990526 CYLINDER #2 : 99251076445526 CYLINDER #3 : 99251076435527
FOLLOW INSTRUCTION SUPPLIED WITH THE REPLACEMENT INJECTOR KIT WHEN REPLACING AN ORIGINAL INJECTOR.
PRESS ANY KEY FOR MAIN MENU

Each injector has a white label [A] with the injector's unique serial number.



Each EMM has a unique serial number [A].



The **Injector Information** screen displays the serial numbers of the original injectors. The screen indicates which injector serial number belongs in each cylinder. When servicing a D.I. engine, you should verify that each injector is in the correct cylinder. **Compare the serial number tag on each original fuel injector to the serial number shown on the Injector Information screen.**

INJECTOR INFORMATION
CYLINDER #1 : 99250075990526 CYLINDER #2 : 99251076445526 CYLINDER #3 : 99251076435527
FOLLOW INSTRUCTION SUPPLIED WITH THE REPLACEMENT INJECTOR KIT WHEN REPLACING AN ORIGINAL INJECTOR.
PRESS ANY KEY FOR MAIN MENU

Replacing Injectors:

CAUTION

If you need to replace an injector, you must order a Replacement Injector. **DO NOT** take an injector from another engine or cylinder. Moving an injector to another engine or cylinder will affect air/fuel mixture on that cylinder. This could affect exhaust emissions, cause the engine to run poorly, and cause engine damage.

Each Replacement Injector has one floppy disk in which the flow characteristic are stored and one software instruction sheet.

You can replace an injector following the software instruction sheet independently from the KADIAG software.

- Follow the instructions in this Diagnostic Software Manual to connect the communication cable to the laptop computer.
- Insert the Replacement Fuel Injectors floppy disk into the laptop's floppy disk drive after starting the laptop computer.

Running the Program from Dos

- Type the drive letter followed by a semi colon (usually **A:**), then press the "Enter" key.
- Start the program by typing the word **GO** and pressing the "Enter" key. Follow instructions on the screen.

INJECTOR INFORMATION

CYLINDER #1 : 99250075990526

CYLINDER #2 : 99251076445526

CYLINDER #3 : 99251076435527

FOLLOW INSTRUCTIONS SUPPLIED WITH THE REPLACEMENT INJECTOR KIT WHEN REPLACING AN ORIGINAL INJECTOR.

PRESS ANY KEY FOR MAIN MENU

Running the Program from Windows

- From the Desktop view, double click on the My Computer icon.
- From the My Computer screen, double click on the floppy drive.
- Now double click on the **GO** icon. Follow the instructions on the screen.
- This screen displays the serial numbers of the injector installed on the engine.
- Type the cylinder number for injector you want to replace.

Injector Serial Number and Compensation Type

Cylinder #1	Compensated 99250075990526
Cylinder #2	Compensated 99251076445526
Cylinder #3	Compensated 99251076435527

Type cylinder number for injector you want to replace
(Enter to continue – (ESC) to cancel)

This screen appears after typing a number and pressing the “Enter” key. (In this case, “1” is typed.)

- Verify that serial number on the screen matches the replacement injector serial number.

Injector Serial Number and Compensation Type

Cylinder #1	Compensated 00168093905524
Cylinder #2	Compensated 99251076445526
Cylinder #3	Compensated 99251076435527

Please verify that serial number on the screen matches the replacement injector serial number
(press any key to continue)

This screen appears after pressing the “Enter” key.

Injector Serial Number and Compensation Type	
Cylinder #1	Compensated 00168093905524
Cylinder #2	Compensated 99251076445526
Cylinder #3	Compensated 99251076435527
Install the replacement injector on cylinder #1 (press any key to continue)	

Installing Injector

- Turn off the main switch.
- Disconnect the battery.
- Follow instructions in Service Manual to replace fuel injector.
- Reconnect battery.
- Turn on the main switch.

This screen appears after pressing the “Enter” key.

The program is finished loading the replacement injector information into the EMM.

- Press any key to exit.

Injector Serial Number and Compensation Type	
Cylinder #1	Compensated 00168093905524
Cylinder #2	Compensated 99251076445526
Cylinder #3	Compensated 99251076435527
Write the engine serial number and the original injector serial number on the floppy disk label (press any key to exit)	

When the program is finished, remove the floppy disk and write the engine serial number and the original injector serial number on the floppy disk label.

Restoring Previous Injector

If you accidentally type the wrong injector number, restart the Program.

This screen appears after starting the Program. If you want to restore the previous injector, press the "Enter" key.

Injector Serial Number and Compensation Type

Cylinder #1

Compensated
00168093905524

Cylinder #2

Compensated
99251076445526

Cylinder #3

Compensated
99251076435527

THE INJECTOR HAS REPLACED ON CYLINDER
#1
Tue Jun 27 10:57:43 2000
Do you want to restore the previous injector?
Enter to restore Exit to cancel

This screen appears next.

- Verify that the serial number on the screen matches the original injector serial number.

Injector Serial Number and Compensation Type

Cylinder #1

Compensated
99250075990526

Cylinder #2

Compensated
99251076445526

Cylinder #3

Compensated
99251076435527

matches the original injector serial number
(press any key to continue)

This screen appears after pressing the "Enter" key.

- Press any key to exit.
- Install the original injector on the cylinder.

NOTE

- *Store the replacement injector and floppy disk. You can use this injector as a replacement injector.*

Injector Serial Number and Compensation Type

Cylinder #1

Compensated
99250075990526

Cylinder #2

Compensated
99251076445526

Cylinder #3

Compensated
99251076435527

On cylinder #1
(press any key to continue)

Menu Option 3 - Service EMM

Important:

Each fuel injector's serial number and flow characteristics are loaded into the EMM during production. This means that there is a unique relationship between the engine's EMM and its fuel injectors. The result is optimum fuel delivery to each cylinder based on the flow characteristics of that cylinder's fuel injector.

You must use **Kawasaki's FFI Diagnostic Software, Version 1.20** when you perform either of the following service procedures on an engine that has this capability:

1. Replacing an EMM

This is the **Service EMM** screen. You get to this screen by typing "3" at the **Service Utilities Menu**. The purpose of this screen is to provide a simple method of loading engine specific information into a service replacement EMM.

- Before beginning this procedure, you must have a service replacement EMM. The damaged EMM you are going to replace should still be installed.
- When you see this screen, press any key to copy the engine specific information from the damaged EMM into your computer.

When the information is successfully copied into your computer, the computer will display the next screen. **DO NOT SHUT OFF YOUR COMPUTER.**

- Turn the main switch to the OFF position.
- Install the service replacement EMM.
- Once the service replacement EMM has been installed, turn the main switch to the ON position.
- Press any key to load the engine specific information from your computer into the service replacement EMM. This will take a few seconds.

When the program is finished loading into the service replacement EMM, the screen will display this message.

- Press any key to return to the **Service Utilities Menu**.

BEFORE STARTING THIS PROCEDURE,
MAKE SURE THAT

- * THE DAMAGED EMM IS ON THE ENGINE
- * THE SERVICE REPLACEMENT EMM IS ON HAND
- * THE EMM IS POWERED

PRESS ANY KEY TO COPY INFORMATION
FROM THE DAMAGED EMM, <ESC> TO CANCEL

INFORMATION COPIED SUCCESSFULLY !

- * REMOVE POWER FROM DAMAGED EMM
- * INSTALL SERVICE REPLACEMENT EMM
- * PROVIDE POWER TO THE NEW EMM

PRESS ANY KEY TO COPY INFORMATION
TO NEW EMM, < ESC> TO CANCEL

REPLACEMENT EMM HAS BEEN SUCCESSFULLY
INITIALIZED!

PRESS ANY KEY TO RETURN TO MAIN MENU

Menu Option 4 - Engine Monitoring

The following is the **Engine Monitoring** screen. You get to it by pressing "4" at the **Main Menu**. This screen is a highly useful diagnostic tool. It allows you to see engine conditions as they are occurring. In most cases, you can artificially change or influence the data readings by manipulating an engine component. This will help verify proper operation of a device or circuit, and will determine if follow-up voltage or resistance tests are necessary to confirm a circuit or component failure.

This screen displays the following information:

Run Time : 0:00:00					ENGINE MONITORING					EMM On Time : 0: 0:46				
Sensors						Results								
	Volts	Deg F	Deg C	% Open		Engine Speed		0	RPM					
Air	1.86	70	21	-		Spark Timing		*****						
Water	1.51	68	20	-		Spark Duration		*****						
EMM	1.01	70	21	-		Fuel Timing		*****						
Tps Cal.	-	-	-	0		Fuel Command		*****						
Tps Act.	0.2	-	-	-										
Switches						VOLTAGES								
Engine Sync		NO				ALT.Voltage		14.9						
Overheat		NO				Baro Pressure		29.61 in. HG						
In S.L.O.W.		NO												
Press any key to exit														

1. **Run Time:**

This field displays the total time the engine has been operated in hours, minutes, and seconds. Key-on/Engine-off does not accumulate time on this counter.

2. **EMM On Time:**

This field displays a count in hours, minutes, and seconds. It's reset to zero each time the EMM is "powered-up". The EMM "powers-up" when the key is turned ON, starting the counter.

3. **Air:**
Displays intake air temperature at the throttle body in volts, degrees Fahrenheit, and degrees Celsius. Unplug the sensor to see this value go to maximum high. Jump the sensor leads together to see the value go to maximum low. When operating correctly, voltage and temperature increase or decrease together.

NOTE

- *Voltage values for the sensors reflect the voltage at the analog-to-digital converter inside the EMM. Voltages measured at the sensor will be substantially different.*
4. **Water:**
Displays engine water temperature in volts, degrees Fahrenheit, and degrees Celsius. Unplug sensor to see this value go to maximum high. Jump sensor leads together to see the value go to maximum low. When operating correctly, voltage and temperature increase or decrease together. Use this data to verify S.L.O.W. or overheat warnings.
5. **EMM:**
Displays temperature of injector driver circuits inside the EMM in volts, degrees Fahrenheit, and degrees Celsius. You cannot manually alter this sensor reading.
6. **Tps Cal:**
Shows sensor value in percent of throttle valve opening. Slowly move the throttle lever and watch this value change. Value should progressively increase and decrease from 0% (idle) to 100% (WOT), without gaps (large jumps) or plateaus (flat spots).
7. **Tps Act:**
Shows sensor voltage in relation to throttle plate opening. Slowly move the throttle lever and watch this value change. Value should progressively increase and decrease.

8. **Engine Speed:**
Engine RPM when running or cranking. Use this data to verify the crankshaft position sensor operation.
9. **Spark Timing:**
This value is not shown.
10. **Spark Duration:**
This value is not shown.
11. **Fuel Timing:**
This value is not shown.
12. **Fuel Command:**
This value is not shown.
13. **Engine Sync:**
"Yes" means crank position sensor is detecting the engine revolution correctly.
14. **Overheat: YES or NO**
"YES" means water temperature sensor is indicating an overheat. The temperature sensor reading can verify this condition. Ground the water temperature sensor lead and watch this value change.
15. **In S.L.O.W.TM:YES or NO:**
"Yes" means engine is in S.L.O.W. mode. The water temperature sensor reading can verify this condition. Ground the water temperature sensor lead and watch this value change when engine goes into S.L.O.W.
16. **Alt. Voltage:**
Indicates battery voltage when engine is not running. Indicates voltage available to power the ignition and injectors when engine is running. Use these readings to verify regulator and charging system operation.
17. **Barometric Pressure:**
Indicated in Inches of Hg. This data allows EMM altitude compensation.

NOTE

- *Most sensors, switches, and voltages will have associated service codes. Refer to the **Service Code Chart** attached this service manual for a description of the failure.*

Menu Option 5 – Adjust Fuel Map

This is the **Fuel Map Adjust Menu** screen. You get to this screen by typing “5” at the Service Utilities Menu. The purpose of this screen is to adjust the fuel amount.

- To adjust the fuel amount, you can increase +5% by pressing the “+” key or decrease –5% by pressing the “-” key.

You can adjust the fuel amount by three conditions +5%, 0%, or –5%.

- When you are finished with the **Fuel Map Adjust Menu**, press “ESC” to return to the **Service Utilities Menu**.

FUEL MAP ADJUST MENU	
–	CURRENT ADJUSTMENT IS 0% OF CALIBRATED FUEL AMOUNT
–	PRESS THE + KEY TO INCREASE OR THE – KEY TO DECREASE THE FUEL ADJUSTMENT
PRESS “ESC” TO RETURN TO MENU	

Menu Option 6 – Return to Program Select Menu

- When you are finished with the **Service Utilities**, press “6” to return to the **Program Select Menu**.

SERVICE UTILITIES MENU	
1)	SERVICE REPORTS
2)	INJECTOR INFORMATION
3)	SERVICE EMM
4)	ENGINE MONITORING
5)	ADJUST FUEL MAP
6)	RETURN TO PROGRAM SELECT MENU
SELECT 1 THRU 6	

Appendix

Service Code Chart

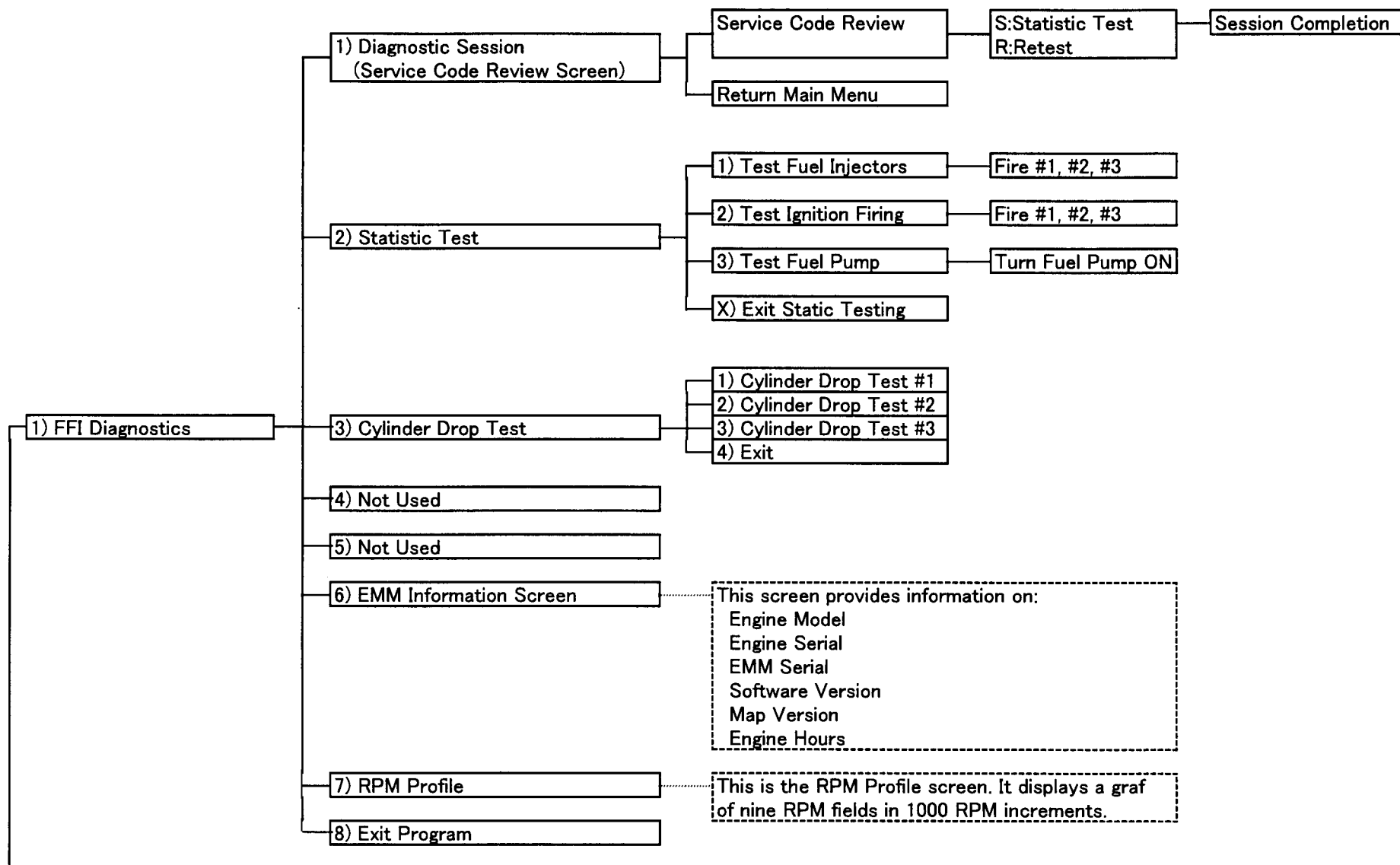
Service codes are identified as either Priority Level A, B, or C. Solve all Priority Level A problems before going on to those identified as Level B or C. In some instances, an "A" level code may set a "B" or "C" level codes. Fixing an "A" level code may eliminate a "B" or "C" level code, thus saving troubleshooting time and effort.

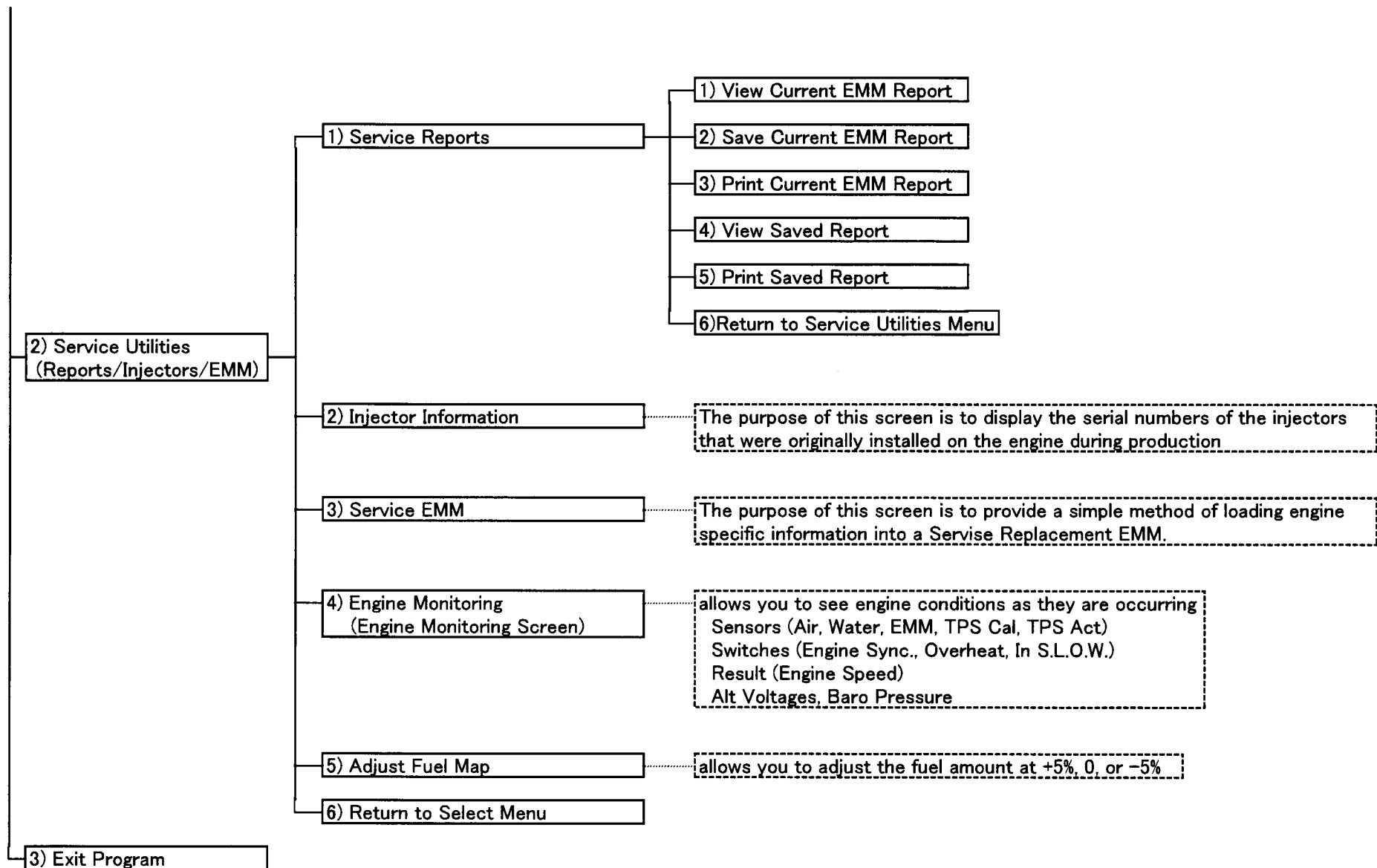
	Code Number	Fault	Initiates S.L.O.W.	Instrument Warning Light
Priority Level A	12	TP sensor circuit malfunction	-	Check Eng.
	13	TP sensor below expected range	-	-
	14	TP sensor above expected range	-	Check Eng.
	15	ROM check sum error	-	Check Eng.
	16	Crank sensor circuit malfunction	-	Check Eng.
	17	Alternator voltage below expected range	-	Check Eng.
	18	Alternator voltage above expected range	YES	Check Eng.
	23	EMM temperature sensor circuit malfunction	-	-
	24	EMM temperature below expected range	-	-
	25	EMM temperature above expected range	YES	Check Eng.
	35	Low oil level	YES	Engine Oil
	39	Fuel pump open load	-	Check Eng.
	59	Fuel pump driver overheat	-	Check Eng.
Priority Level B	41	WT sensor circuit malfunction	-	Check Eng.
	42	WT sensor below expected range	-	Check Eng.
	43	WT sensor above expected range	YES	Water Temp., Check Engine
	44	BP sensor circuit malfunction	-	Check Eng.
	45	BP sensor below expected range	-	Check Eng.
	46	BP sensor above expected range	-	Check Eng.
	51	Fuel Injector #1 open load	-	Check Eng.
	52	Fuel Injector #2 open load	-	Check Eng.
	53	Fuel Injector #3 open load	-	Check Eng.
Priority Level C	47	AT sensor circuit malfunction	-	Check Eng.
	48	AT sensor below expected range	-	Check Eng.
	49	AT sensor above expected range	YES	Check Eng.
	81	Ignition coil #1 primary open load	-	Check Eng.
	82	Ignition coil #2 primary open load	-	Check Eng.
	83	Ignition coil #3 primary open load	-	Check Eng.

Abbreviation: TP = Throttle Position
 WT = Water Temperature
 BP = Barometric Pressure
 AT = Air Temperature

Note: When "NO STORED CODE" is displayed, the D.I. System has no fault.

KADIAG Software Main Menu Chart







KAWASAKI HEAVY INDUSTRIES, LTD.
Consumer Products & Machinery Company

Part No. 99929-1412-01