All text, photographs, and illustrations in this handbook are based on the most current product information available at the time of publication. Product improvements or other changes may result in differences between this handbook and the motorcycle. Excelsior-Henderson reserves the right to make production changes at any time, without notice and without incurring any obligation to make the same or similar changes to motorcycles previously built.

EXCELSIOR-HENDERSON MOTORCYCLE MANUFACTURING COMPANY
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CONTENTS

ABOUT THIS HANDBOOK

This handbook describes the use of the equipment found in the Examinator™ Diagnostic Tool Kit. It also includes warranty information for the kit.

This handbook focuses on the use of the Examinator diagnostic tool and breakout box. It does not attempt to describe the diagnosis and repair of malfunctions in the fuel injection system. Refer to the *Excelsior-Henderson™ Service Handbook* for detailed information about the fuel injection system, its components, and operation.

Overview

Here is an overview of what you will find in this handbook.

- Chapter 1 Description presents the components of the Examinator Diagnostic Tool Kit and describes their purpose. It also includes a part number list.
- Chapter 2 Using the Examinator describes the operation of the Examinator diagnostic tool and how to perform diagnostic tasks.
- Chapter 3 Using the Breakout Box describes how to connect and operate the breakout box.

Symbols And Terms

The hazard symbol indicates a potential hazard to yourself, others, or the motorcycle. Pay special attention to information that begins with this symbol.

The following term has special meaning. Be certain you understand the meaning of this term, as it communicates important information about the motorcycle, its operation, and maintenance.

⚠ Caution

- **Indicates a potential hazard that could damage the diagnostic tool or the motorcycle.**

Technical Support

If you experience difficulty using your Examinator diagnostic tool, you can call Excelsior-Henderson technical support at 1-800-873-4957 Monday through Friday, 8:00 AM to 5:00 PM, Central Time.

Warranty

Excelsior-Henderson Motorcycle Manufacturing Company warrants this product to be free from defects in materials and workmanship. Should the product fail due to a defect in material and/or workmanship after normal use, Excelsior-Henderson Motorcycle Manufacturing Company will, at its option, repair or replace the product at no charge for a period of twelve (12) months from the date of purchase.

The following items are excluded from this warranty:

- All cables
- Test probes
- Case

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1. DESCRIPTION

The Examinator Diagnostic Tool Kit consists of the Examinator diagnostic tool and breakout box. The Examinator diagnostic tool assists you in identifying and correcting engine management system malfunctions. By disconnecting the harness from the Engine Control Module (ECM) and reconnecting the harness to the breakout box, the breakout box provides convenient access to the circuitry of the engine management system. Multimeter test probes can be inserted into the contact points of the breakout box to test for continuity, measure resistance, or measure voltage.

The following table lists the Examinator Diagnostic Tool Kit components.

ITEM	PART NUMBER
Examinator Diagnostic Tool Kit	6999-0088
Examinator Case	
Examinator Handbook	
Examinator Diagnostic Tool	
Examinator Cable	
Memory Card	
Test Probe Set	
Breakout Box	
Pin Adapter	
Breakout Box Overlay	
Breakout Box Cable	
Y-Cable	

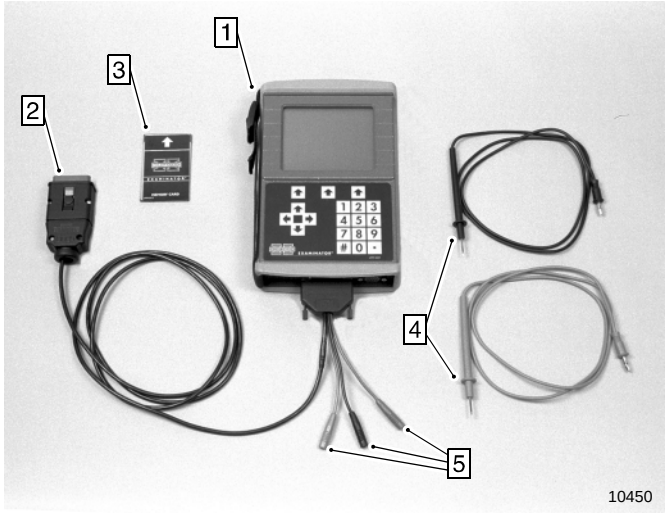
Examinator Diagnostic Tool

The Examinator diagnostic tool is equipped with the following:

- A 160 by 128 pixel display with adjustable contrast
- A keypad to select and perform diagnostic tasks
- A cable to connect to the motorcycle wiring harness
- Multimeter connectors for continuity tests, resistance measurements, and voltage measurements
- Test probes
- A memory card containing the Examinator software and engine tunes.

The Examinator diagnostic tool enables you to do the following:

- Read and clear fault codes that are stored in the ECM
- Identify and correct engine management system malfunctions.
- Display output from the sensors
- Display engine performance information
- Set the short term idle fuel trim
- Reset the long term idle fuel trim
- Reset the closed throttle position
- Reset the idle air control (IAC) valve adaption
- Load engine tunes into the ECM



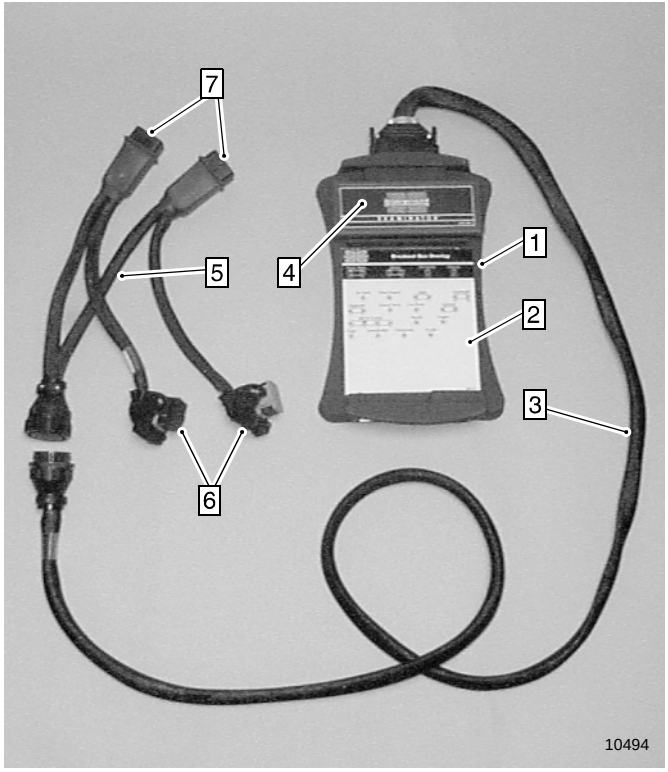
1. EXAMINATOR
2. EXAMINATOR CABLE
3. MEMORY CARD
4. TEST PROBES
5. MULTIMETER CONNECTORS

Breakout Box

The breakout box is equipped with the following:

- A pin adapter that routes the connections from the wiring harness ECM connectors to the contact points on the breakout box board.
- An overlay that labels the contact points on the breakout box board.
- A breakout box cable and a Y-cable that attach the breakout box to the wiring harness and ECM.

Using the multimeter built in to the Examinator diagnostic tool, you can test individual circuits of the engine management system.



1. BREAKOUT BOX
2. BREAKOUT BOX OVERLAY
3. BREAKOUT BOX CABLE
4. PIN ADAPTER
5. Y-CABLE
6. Y-CABLE FEMALE CONNECTORS
7. Y-CABLE MALE CONNECTORS

Handling and Care

The Examinator diagnostic tool and breakout box are designed for the shop environment. However, like other electrical equipment, they should be handled with care to ensure a long service life. We recommend the following:

- Keep the Examinator diagnostic tool clean and dry.
- Clean with a clean, damp cloth and mild detergent.
- Avoid dropping the Examinator diagnostic tool.
- Store the Examinator diagnostic tool in the case when not in use.
- Do not expose the Examinator diagnostic tool to temperatures below 32° or above 130° F.
- To protect the liquid crystal display, do not expose the Examinator diagnostic tool to direct sunlight for extended periods.

Handle memory cards with care also.

- Keep memory cards clean and dry
- To protect the stored data, avoid exposing memory cards to direct sunlight or to magnetic fields.
- Avoid exposing memory cards to temperatures below 32° or above 130° F.

2. USING THE EXAMINATOR

This chapter describes how to use the Examinator diagnostic tool. The first section describes the basic operation. The Diagnostics section describes how to perform diagnostic tasks.

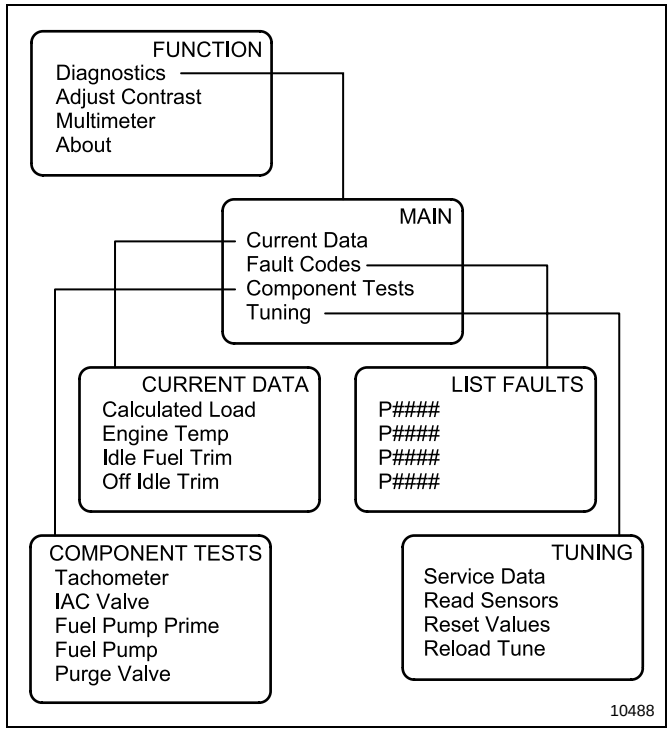
Basic Operation

Basic operation includes the following:

- *Using the Menus*
- *Using the Keypad*
- *Getting Help*
- *Connecting to the ECM*
- *Adjusting Screen Contrast*
- *Using the Multimeter*
- *Removing and Installing the Memory Card*

Using the Menus

The following diagram illustrates the major Examinator menus.



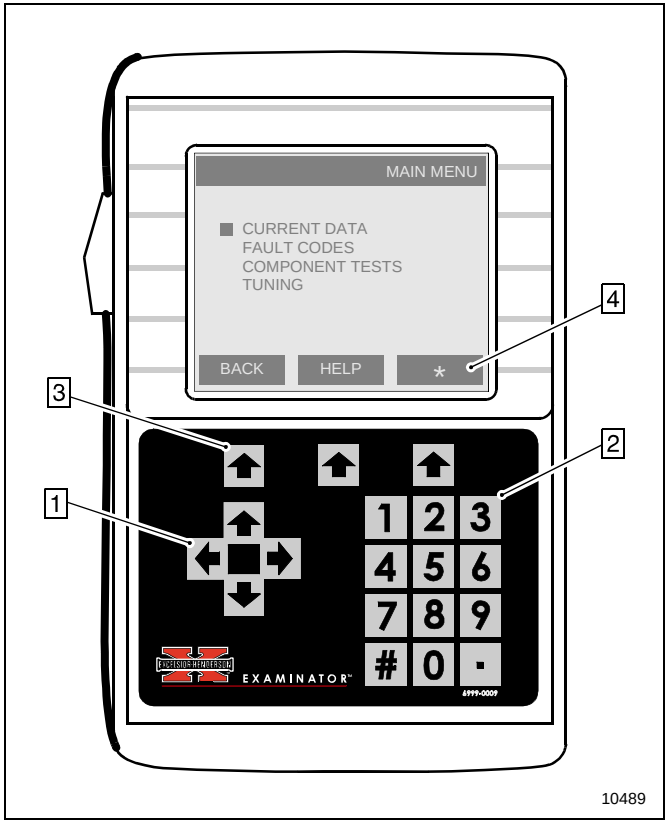
Using the Keypad

The key pad has three types of keys: cursor keys, data keys, and function keys. Cursor keys are used to move the cursor up and down through the list of menu items. Data keys are used to enter information such as the date of service.

Function keys are used to initiate selected menu items, complete tasks, or to navigate through the menu system. Function key labels appear on each screen identifying the purpose of each function key.

The following function key labels are used:

- **OK** - Complete an operation.
- ∗ - Initiate a menu selection
- **HELP** - Display help for the screen or selected menu item.
- **BACK** - Return to the previous screen.
- **QUIT** - Cancel the operation and return to the previous menu.
- **MORE/LESS** - Increase or decrease something, such as screen contrast.
- **MAIN** - Return to the Main menu.
- **NEXT** - Advance to the next screen.
- **FIX** - Resolve the selected fault code.
- **DATA** - Display history data for the selected fault code.
- **LIST** - Return to the list of fault codes



1. CURSOR KEYS
2. DATA KEYS
3. FUNCTION KEYS
4. FUNCTION KEY LABELS

Getting Help

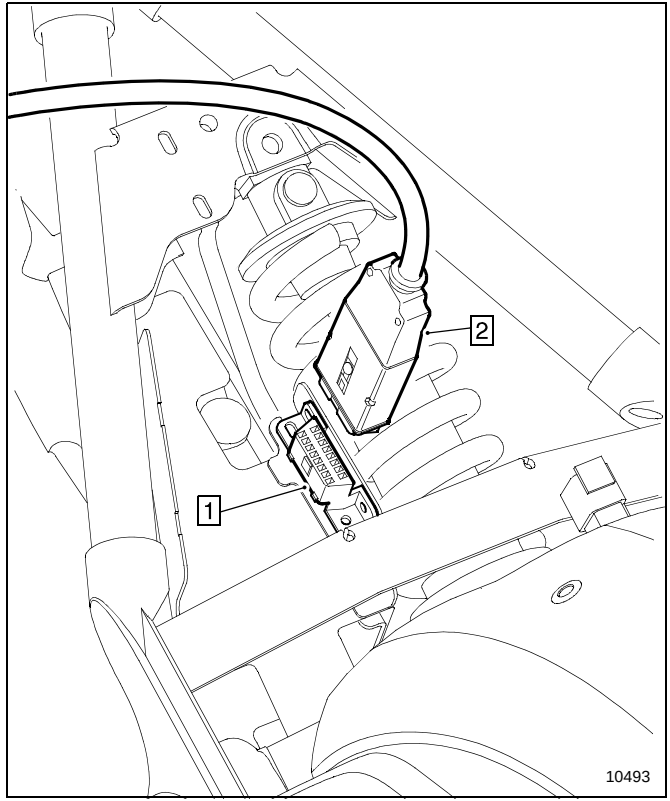
To display help information for a screen or a selected menu item, press the **HELP** function key. For help with a particular menu item, move the cursor to that item and press the **HELP** function key.

Connecting to the ECM

The Examinator diagnostic tool connects to the ECM by means of a diagnostic cable. This cable has a 25-socket connector that attaches to the Examinator diagnostic tool and a 16-pin connector that attaches to the diagnostic connector on the motorcycle wiring harness. This connector provides power to the Examinator diagnostic tool and access to the ECM. The Examinator diagnostic tool requires a minimum of 8 volts. Do the following:

1. Connect the diagnostic cable to the Examinator diagnostic tool and ensure that a memory card is installed. *See Removing and Installing the Memory Card on page 2-5*.
2. Connect the Examinator diagnostic tool to the diagnostic connector on the motorcycle wiring harness.
3. Remove the Lights fuse to minimize battery drain.
4. Move the main switch to the **On** position to energize the Examinator diagnostic tool.
5. Move the engine Stop/Run switch to the **Run** position to energize the ECM.

The Examinator diagnostic tool performs a self-test and checks for the presence of a memory card. When this is complete, the Excelsior-Henderson logo appears momentarily followed by the Function menu.



1. DIAGNOSTIC CONNECTOR 2. EXAMINATOR CABLE

Adjusting Screen Contrast

Select SCREEN CONTRAST from the Function menu and press ∗. In the next screen, press **MORE** to increase the contrast, **LESS** to decrease.

Using the Multimeter

The Examinator diagnostic tool has three mulitimeter connectors:

- Red for voltage measurements relative to motorcycle ground
- Black for resistance measurements and continuity tests relative to motorcycle ground
- Green for voltage measurements, resistance measurements, and continuity tests relative to the Examinator diagnostic tool ground.

⚠ Caution

- **Applying a voltage to a test probe attached to the green multimeter connector while the Examinator diagnostic tool is connected to the motorcycle could damage the Examinator diagnostic tool.**
- **Applying a voltage to a test probe attached to the black multimeter connector could damage the Examinator diagnostic tool.**

The Examinator diagnostic tool connects to the motorcycle ground through the diagnostic connector. Therefore, measurements relative to that ground require only one test probe. For example, to measure motorcycle battery voltage, do the following:

1. Select MULTIMETER from the Function menu and press ∗.
2. Select VOLTAGE and press ∗.
3. Connect the red test probe to the red multimeter connector.
4. Apply the red test probe to the positive battery post and read the result.

To test for a ground short, do the following:

1. Select MULTIMETER from the Function menu and press ∗.
2. Select RESISTANCE or CONTINUITY and press ∗.
3. Connect the black test probe to the black multimeter connector.
4. Apply the black test probe to the circuit and observe the result.

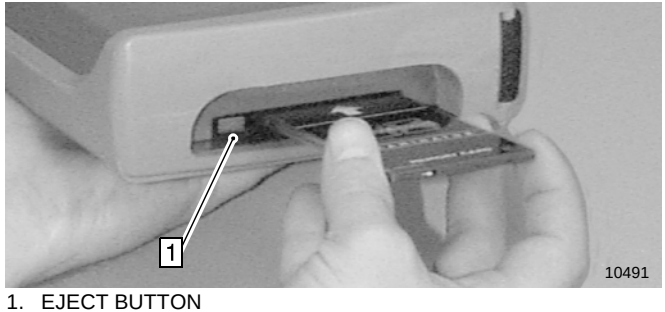
Measuring voltages or resistances on components that are electrically isolated from the motorcycle require two test probes. For voltage measurements, attach test probes to the red (positive) and green (negative) multimeter connectors. For resistance measurements and continuity tests, attach test probes to the black and green multimeter connectors. For example, to measure the resistance of an air temperature sensor, do the following:

1. Select MULTIMETER from the Function menu and press ∗.
2. Select RESISTANCE and press ∗.
3. Attach the black test probe to the black multimeter connector and the red test probe to the green multimeter connector.
4. Apply the test probes to the terminals of the sensor and read the result.

Removing and Installing the Memory Card

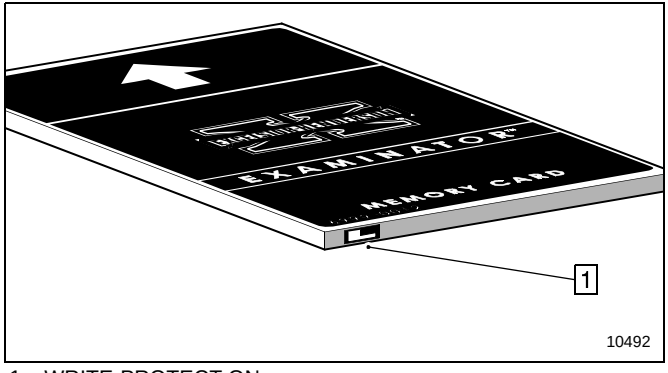
The memory card contains the menu software for the Examinator diagnostic tool and engine tune programs for the ECM. There will be periodic updates to this software; so it will be necessary to install memory cards.

To remove the memory card, press the eject button and remove the memory card. To install the memory card, insert the card into the slot with the label up and the arrow pointing into the slot.



1. EJECT BUTTON

The memory card has a write-protect switch that is normally set to **On**. This switch must be in the On position for the Examinator diagnostic tool to work.



1. WRITE-PROTECT ON

Diagnostics

This section describes how to use the Examinator diagnostic tool to perform the following diagnostic tasks:

- *Entering Service Data*
- *Displaying Engine Data*
- *Displaying Fault Codes*
- *Clearing Fault Codes*
- *Diagnosing Fault Codes*
- *Testing Components*
- *Adjusting Short Term Idle Fuel Trim*
- *Resetting the Long Term Idle Fuel Trim*
- *Resetting the Closed Throttle Position*
- *Resetting the IAC Valve Adaption*
- *Loading Engine Tunes*

To perform diagnostic tasks, the engine Stop/Run switch must be set to **Run** to provide power to the ECM. Select DIAGNOSTICS from the Function menu and press ∗.

Entering Service Data

After you select DIAGNOSTICS for the first time, the Service Data screen prompts you for service information. Do the following:

1. Enter the month, day, and year of service using the data keys. Press **OK** after each entry.
2. Enter your dealer number and press **OK**. This is a six-digit field. Enter enough zeros plus your dealer number to fill six digits. For example, if you are dealer number 34, enter 000034.This creates a service history for the motorcycle. The Main menu now appears.

To display the date of the most recent service and the corresponding number of the dealer performing that service, do the following:

1. Select TUNING from the Main menu and press ∗.
2. Select SERVICE DATA from the Tuning menu and press ∗.

Displaying Engine Data

Engine data consists of readings from the various sensors and engine performance data calculated by the ECM. The Examinator diagnostic tool presents this information as current data and fault history data. Current describes current engine conditions. Fault history data is attached to a specific fault code providing engine data at the time the fault occurred. *See Displaying Fault Codes on page 2-7* for more information about fault codes.

The following data is available:

CALCULATED DATA	SENSOR DATA
Calculated engine load	Air temperature
Fuel system status	Air temperature sensor voltage
Short term fuel trim	Engine temperature
Long term fuel trim	Engine temperature sensor voltage
Injector pulse time	Throttle position
Engine speed	Throttle position sensor voltage
Road speed	Purge valve duty cycle
Idle reference speed	Oxygen sensor voltage
Ignition timing	Air pressure
Target dwell time	IAC valve position
IAC valve adaption	Battery voltage
	Sensor reference voltage
	Main switch status
	Neutral switch status

To display current data, do the following:

1. Select CURRENT DATA from the Main menu and press ∗.
2. Start the engine as prompted by the next screen and press **OK**.
3. The Current Data screen displays the engine data. Press **NEXT** to display the next page. To display help text for a data item, press **HELP** to suspend the display, then move the cursor to the chosen item and press **HELP** again.

To display fault history data, do the following:

1. Select FAULT CODES from the Main menu and press ∗.
2. Select LIST FAULTS from the Fault Codes screen, and press ∗. Fault history data is stored only for the first fault code on the list. The word DATA appears opposite the fault code for which fault history data is available.
3. Press **DATA** in the Fault Detail screen.

Sensor data is also available from the Tuning menu. Select TUNING from the Main menu, then select READ SENSORS.

Displaying Fault Codes

A fault code is a 5-character code, such as P0351, that identifies a malfunction. The letter identifies the functional area: P-power train, C-chassis, B-body. The first digit is 0 or 1 indicating a generic or a specific code. A generic code indicates a malfunction; a specific code provides some information about the nature of the malfunction. For example, P0351 indicates a malfunction with the number one ignition coil, where P1351 indicates an open circuit or short to ground condition on the number one ignition coil. A specific fault code will always be accompanied by the corresponding general code.

The second digit identifies one of the following systems:

1 - Fuel and air metering
2 - Injectors
3 - Ignition system
4 - Auxiliary emissions controls
5 - Vehicle speed or Idle controls
6 - ECM output circuit
7 - Transmission
8 - Transmission

The last two digits identify the specific component. From the example, 51 identifies the number one ignition coil. In this case, P0351 identifies a general malfunction affecting ignition coil 1. See the *Excelsior-Henderson Service Handbook* for a complete listing of fault codes.

To display fault codes, do the following:

1. Select FAULT CODES from the Main menu and press ∗.
2. Select LIST FAULTS from the Fault Codes screen, and press ∗.
3. The List Faults screen displays the current fault codes. To display an explanation of the code, select a fault code on the List Fault screen, and press ∗.

Clearing Fault Codes

To clear fault codes and fault history data from the ECM memory, do the following:

1. Select FAULT CODES from the Main menu and press ∗.
2. Select ERASE FAULTS from the Fault Codes screen and press ∗.
3. In the Erase Faults screen, press **OK**.

Diagnosing Fault Codes

The Examinator diagnostic tool contains a set of diagnostic procedures to help you identify the condition behind a specific fault code. To diagnose a fault code, do the following:

1. Select FAULT CODES from the Main menu and press ∗.
2. From the Fault Codes screen, select LIST FAULTS and press ∗.
3. Select a fault code on the List Fault screen, and press ∗.
4. From the Fault Details screen, press **FIX** and follow the instructions. A complete description of the diagnostic procedures can also be found in the *Excelsior-Henderson Service Handbook*.

Testing Components

The Examinator diagnostic tool enables you to isolate the following engine management system components and perform operational tests:

- Tachometer
- IAC valve
- Fuel pump
- Fuel pump prime
- Purge valve

To test one of these components, do the following:

1. Select COMPONENT TESTS from the Main menu and press ∗.
2. Select the component you want to test from the Component Test menu and press ∗. If there are any fault codes present, you will be prompted to erase them before performing the component test.
3. Perform the test and observe the results.

The tachometer, idle air control valve, and purge valve tests prompt you to observe the tachometer or listen for valve operation. If a fault occurs during the test, a failure notice will be displayed.

There are two types of a fuel pump tests. The first is a continuous test (FUEL PUMP TEST) that runs the fuel pump until you press QUIT.

⚠ Caution

- **Running the fuel pump test on an empty tank could damage the fuel pump.**

The second test is a fuel pump prime test. This test operates the fuel pump for a few seconds and then stops automatically.

Adjusting Short Term Idle Fuel Trim

The short term idle fuel trim controls fueling at idle during open loop conditions. After making repairs to the fuel injection system, you may need to adjust the short term idle fuel trim to obtain a smooth idle.

To adjust the short term idle fuel trim, do the following:

1. Start the motorcycle and allow it to warm up.
2. Select TUNING from the Main menu and press ∗.
3. Select RESET VALUES from the Tuning menu and press ∗.
4. Select SHORT IDLE TRIM from the Reset Values menu and press ∗. The short term idle fuel trim must be adjusted on a warm engine. Therefore, if the engine temperature is too low, the Examinator diagnostic tool will pause until the temperature comes up to the minimum.
5. When prompted to adjust the trim, press MORE to increase the idle fuel trim, LESS to decrease. Observe the calculated load and engine speed as you change the trim.

Resetting the Long Term Idle Fuel Trim

The long term idle fuel trim is a fueling correction factor that is calculated at idle and stored in memory. The ECM continuously adjusts this factor within certain limits to optimize engine performance under closed loop conditions. After making repairs to the fuel injection system,

reset the long term idle fuel trim to enable the system to find a new optimal value more quickly.

To reset the long term idle fuel trim, do the following:

1. Select TUNING from the Main menu and press ∗.
2. Select RESET VALUES from the Tuning menu and press ∗.
3. Select LONG IDLE TRIM from the Reset Values menu and press ∗.

Resetting the Closed Throttle Position

The ECM calculates how much air flows into the throttle body based on the data from the throttle position sensor. The closed throttle position may vary slightly as parts wear and seat together. Therefore it is necessary to periodically recalibrate the closed throttle position to the throttle position sensor, particularly after repairs.

To reset the closed throttle position, do the following:

1. Select TUNING from the Main menu and press ∗.
2. Select RESET VALUES from the Tuning menu and press ∗.
3. Select CLOSED THROTTLE from the Reset Values menu and press ∗.

Resetting the IAC Valve Adaption

The IAC valve adaption is an air flow correction factor that is calculated at idle and stored in memory. The ECM continuously adjusts this factor and applies it to the IAC valve position to produce the target idle engine speed for the current conditions. After making repairs to the fuel injection system, reset the IAC valve adaption to enable the system to find a new optimal value more quickly.

To reset the IAC valve adaption, do the following:

1. Select TUNING from the Main menu and press ∗.
2. Select RESET VALUES from the Tuning menu and press ∗.
3. Select IACV ADAPTION from the Reset Values menu and press ∗.

Loading Engine Tunes

An engine tune is the set of instructions that the ECM uses to govern engine performance. As an engine evolves through design changes or the addition of accessories, new engine tunes will be provided.

NOTE

- This part of the Examinator menu system is protected by the following 8-digit password: **13789440**. Consider your security needs when distributing this password.

To load a new engine tune into the ECM, do the following:

1. Select TUNING from the Main menu and press ∗.
2. Select RELOAD TUNE from the Tuning menu and press ∗.

3. Enter the 8-digit Examinator password and press **OK**.
4. Select a new engine tune from the list of available tunes and press ∗.
5. Confirm the selected engine tune by pressing **OK**. The Examinator will report progress and successful loading or failure. If the load fails, turn the main switch to **Off** then **On** and try again.

NOTES

3. USING THE BREAKOUT BOX

With the breakout box, you can test engine management system circuits by inserting multimeter probes in the appropriate contact points. For example, to test the throttle position sensor circuit for a ground short, using the black multimeter connector on the Examinator diagnostic tool, insert the black test probe into the **Throttle** contact point.

This chapter describes how to prepare the breakout box to test circuits of the engine management system. This involves the following:

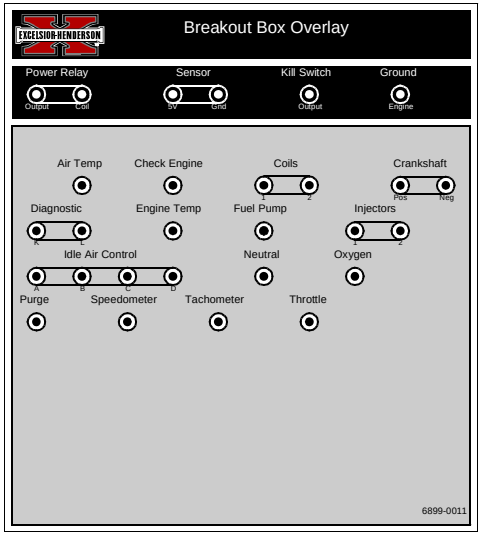
- Installing the Pin Adapter
- Using the Breakout Box Overlay
- Connecting the Breakout Box

Installing the Pin Adapter

The pin adapter distributes the ECM connections from the wiring harness (or the ECM) to the contact points on the breakout box board. To install the adapter, press the adapter firmly into to its receptacles on the breakout box.

Using the Breakout Box Overlay

The breakout box overlay labels the contact points on the board identifying the corresponding circuits. The following sections explain the contact point labels. See the wiring diagram in the *Excelsior-Henderson Service Handbook* for more information about these circuits.



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Power Relay: Output/Coil

This is the power latch relay which provides power to the ECM. **Output** is the power circuit to the ECM. **Coil** is the energizing circuit for the relay.

Sensor: 5V/Gnd

This is the power circuit for some of the sensors. **5V** is the 5 volt power supply. **Gnd** is the ground connection.

Kill Switch: Output

This is the output side of the Engine Stop/Run switch circuit.

Ground: Engine

This is the engine and chassis ground circuit.

Air Temp

This is the signal line of the air temperature sensor circuit.

Check Engine

This is the signal line of the check engine lamp circuit.

Coils: 1/2

These are the return lines of the number 1 and 2 ignition coil circuits.

Crankshaft: Pos/Neg

These are the positive and negative lines of the crankshaft position sensor circuit.

Diagnostic: K/L

These are the K and L lines of the diagnostic circuit.

Engine Temp

This is the signal line of the engine temperature sensor circuit.

Fuel Pump

This is the return line for the fuel pump circuit.

Injectors 1/2

These are the return lines of the number 1 and 2 injector circuits.

Idle Air Control: A/B/C/D

These are the signal lines of the idle air control valve stepper motor circuit.

Neutral

This is the power line of the neutral switch circuit.

Oxygen

This is the output line of the oxygen sensor circuit.

Purge

This is the return line of the purge valve circuit.

Speedometer

This is the output line of the road speed sensor circuit.

Tachometer

This is the signal line that drives the tachometer.

Throttle

This is the signal line of the throttle position sensor circuit.

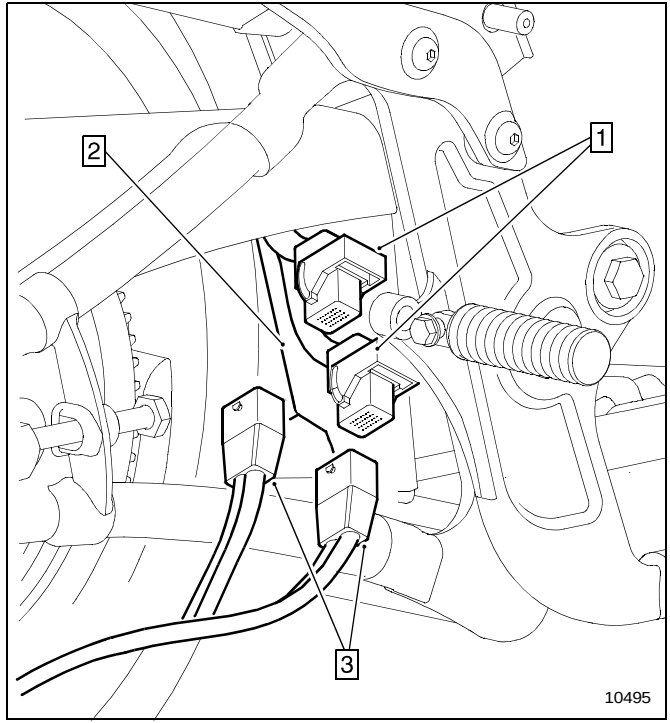
Connecting the Breakout Box

There are two ways to connect the breakout box. The first way is to connect the breakout box to the motorcycle wiring harness. This configuration provides access to the wiring harness circuits for resistance measurements and continuity tests. To connect the breakout box in this way, do the following:

1. Connect the breakout box cable to the top of the breakout box.
2. Connect the Y-cable to the breakout box cable.
3. Turn the main switch to the **Off** position.
4. Disconnect the motorcycle harness ECM connectors from the ECM. See the *Excelsior-Henderson Service Handbook* for service access to the ECM.
5. Attach the harness connectors to the Y-cable male connectors. These connectors are color coded (gray and black) and keyed so that they are not interchangeable.

The second way to connect the breakout box is in series between the wiring harness and the ECM. This configuration maintains power to the ECM and is used for measuring circuit voltages. To connect the breakout box in this way, do the following:

1. Connect the breakout box to the harness as described previously.
2. Connect the Y-cable female connectors to the ECM.
3. Move the main switch to the **On** position.
4. Move the engine Stop/Run switch to the **Run** position to energize the ECM.



1. ECM CONNECTORS
2. ECM
3. Y-CABLE MALE CONNECTORS