

400 Series Professional Work Station

tion and Maintenance Instructions

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400 Series Professional Work Station Operation & Maintenance Instructions

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Chapter 1

Introduction

The 400 Series Professional Work Station is a PC-based testing system that incorporates specially designed "smart modules" and custom software to aid in the service and repair of motor vehicles.

The 400 Series software is very intelligent. It automatically checks a customer test record for option information, including the Flow Charts and On-Board Computer options, and enables these modules in preparation for testing the vehicle.

Accurate performance and time-saving features make the 400 Series Professional Work Station a leader in its class.

Safety Precautions

Personal Safety

Read all service procedures and precautions, installation instructions and equipment operating manuals thoroughly. Failure to observe these precautions, or the improper use of equipment, could result in property damage, serious injury or death. Never allow improperly trained personnel to perform these procedures or operate equipment.

- To prevent electrical shock, avoid wet floors when plugging the analyzer into an electrical outlet.
- DO NOT install fuses of a higher ampere rating than specified.
- Read the operating instructions before attempting to operate the analyzer. Keep this manual with the analyzer at all times.

Ventilation

Provide ventilation through an exhaust gas removal system, ventilation fans or large doors. Inhalation of carbon monoxide gas, which is odorless and colorless, can cause serious illness, injury or death.

Fuel Systems

- Wear Safety Goggles!
- Keep lighted cigarettes, sparks, flames or other ignition sources away from fuel systems at all times.
- Minimize skin contact with any vehicle fuel. Do not swallow fuel.
- Make sure there is an ABC-type fire extinguisher nearby at all times. Know how to operate and maintain ABC-type fire extinguishers.
- NEVER pour gasoline down the carburetor to start the engine.
- To reduce the risk of fire and personal injury, release fuel system pressure before servicing any fuel system components.
- When testing fuel injection systems, wrap any fuel rail taps with a towel to control any leakage.
- When bleeding fuel injection systems, carefully pour the excess fuel into a container designed for gasoline storage and transportation.

Batteries

Automotive batteries contain sulfuric acid and produce explosive gases. To avoid battery explosion and serious injury or death, follow these important safety precautions whenever servicing batteries or performing tune-up procedures:

- Wear Safety Goggles!
- Keep lighted cigarettes, sparks, flames or other ignition sources away from battery at all times.
- DO NOT lay tools or equipment on battery. Accidentally grounding the "hot" battery terminal can cause shock, burns, and damage to wiring, battery, tools or tester.
- DO NOT wear jewelry, rings, watches or metal belt buckles when working on or around batteries.
- Cover battery vents with damp cloth to suppress explosive gases before load testing or charging.
- NEVER lean over battery during testing or charging.
- When connecting battery test leads, avoid sparks which could cause the battery to explode.
- Avoid spilling or splashing electrolyte on skin, eyes or clothing. Electrolyte contains sulfuric acid, is poisonous and causes severe burns.
- Be sure work area is well ventilated and has access to water should flushing be required.

Personal Safety

Protect Face, Hands and Feet From Burns and Other Injury:

- NEVER smoke or light a match when working on a vehicle. Gasoline vapor and battery gases are highly flammable and explosive.
- Make sure all electrical connections are tight. An improperly grounded condenser can cause engine backfire. NEVER look directly into the carburetor throat while the engine is cranking or running, since backfire can cause severe burns and injury.
- NEVER remove radiator pressure cap when system is under pressure or before the engine has cooled. Steam or hot coolant can cause burns if cap is removed before pressure is allowed to escape or while engine is hot.
- Avoid contact with hot surfaces such as spark plugs, exhaust manifolds and pipes, mufflers, catalytic converter, resonator, radiator and hoses, etc.
- When engine is running, DO NOT touch spark plug ignition cable wires, ignition coil or distributor cap.
- Turn off ignition key before installing, working on or adjusting contact sets, condensers, or other ignition parts.
- Use safety lights carefully. Route the cord safely outside or above engine compartment.
- Use proper tools and extensions carefully to avoid cuts and bruises on sharp engine parts when installing spark plugs into hard-to-get-at cylinders.

- Wear safety goggles to protect eyes from gasoline, dust and dirt flying off moving engine parts.
 - When working under the hood, make sure fan blades, belts, pulleys, etc. are in good condition. Any fan blade can break, especially when it has been bent.
 - Keep out of a direct line with fan blades, especially when testing timing advance with a timing light.
 - Keep hands, hair and clothes clear from any moving parts, including throttle and transmission linkages.
 - NEVER wear neckties, loose clothing, wrist watches, rings or other jewelry when working on a vehicle. They could catch on moving parts or cause an electrical short circuit resulting in severe electrical shock and burns.
 - Remove tools from vehicle before starting engine. Tools can fall into moving components and be propelled into the air, which could result in property damage or injury.
 - Avoid bringing hook-up leads over engine fan, pump and belt areas. Whenever possible, route leads outside of the engine compartment.
 - Electric fans are activated by a coolant temperature sensing switch. Disconnect a fan lead whenever working on a hot engine with an electric fan because the fan can start when the engine is "OFF."
 - Exercise caution when working in the engine compartment while the ignition key is turned ON; electrical shock and/or engine start hazards are present.
 - Avoid entanglement with fan blades, belts and pulleys when working around moving engine parts. Do not wear ties, loose clothing or dangling jewelry. When conducting engine running tests ventilate the area by using the building exhaust gas removal system, or by opening garage doors.
- Make Sure the Vehicle Cannot Move During Testing and Tune-Up!***
- Before testing vehicles, place the automatic transmission shift lever in the PARK position, or place manual transmission in NEUTRAL.
 - Securely set the parking or emergency brake on test vehicles. If there is any possibility the vehicle will roll, block the wheels.
 - Some vehicles have an automatic release on the parking brake when the vehicle is put in gear. Disconnect and plug automatic release vacuum hose before performing any tests while vehicle is in DRIVE. If there is any possibility that the vehicle might move, block the wheels.
 - Make sure motor mounts are in good condition. Broken motor mounts can cause an engine to jump into gear, or the throttle to stick when the engine is accelerated.
 - Take the vehicle out of gear after setting the carburetor. DO NOT rev the engine when the transmission is in "DRIVE."



Be sure to reconnect the fan lead before starting the vehicle to avoid overheating and damaging the engine!

About the Manual...

Figure 1-1 details page features that allow the reader to quickly find and easily understand information.

1 Chapter Heading - Allows the reader to locate main section headings while "thumbing through" the manual.

2 Topic Headings - Identifies major topics within the chapter.

3 Topic Sub-Headings - Calls attention to important concepts.

4 Illustrations - Explain important ideas or procedures.

5 Important Reader Messages:



When this symbol appears, the potential exists for serious injury and/or damage to the analyzer. **READ AND FOLLOW THE INSTRUCTIONS IN THIS TYPE OF NOTE CAREFULLY!**



Information in this type of note is extremely important and may affect analyzer operation and test result quality. **READ THESE NOTES CAREFULLY!**



Notes contain helpful hints and tips to make operating the analyzer easier.

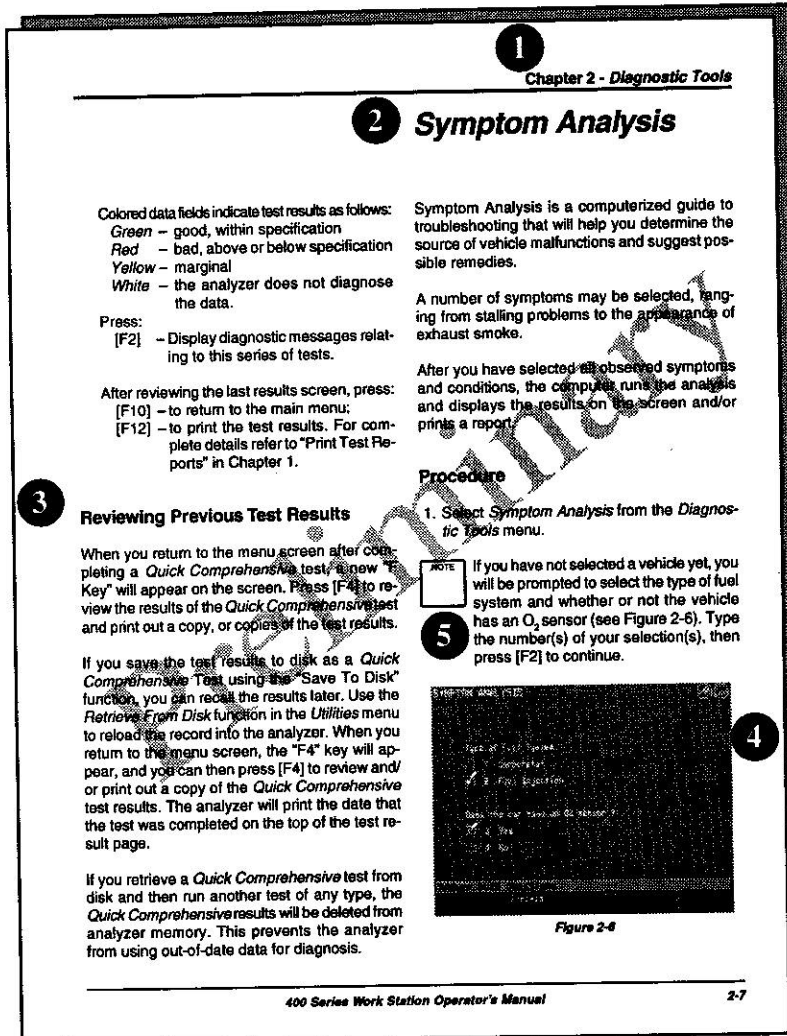


Figure 1-1

Conventions and Definitions

This manual uses the following written conventions, procedures and definitions:

Enter a Number, Letter or Command

Text that instructs the user to enter a number, letter or command, appears in brackets.

Example: "Select [1] from the Main Menu and press [ENTER]." This instruction is to press the number "1" key on the keyboard followed by the "Enter" key on the keyboard.

Cursor

The cursor is the point of action on the display screen. It is represented by a lighted dot or a reverse video bar that is moved around on the display screen by using the Arrow or Tab Keys on the keyboard.

[F10] "Previous Menu Key"

The [F10] "Previous Menu Key" returns the user to the menu screen that came directly before the current screen shown on the display.

Major Components

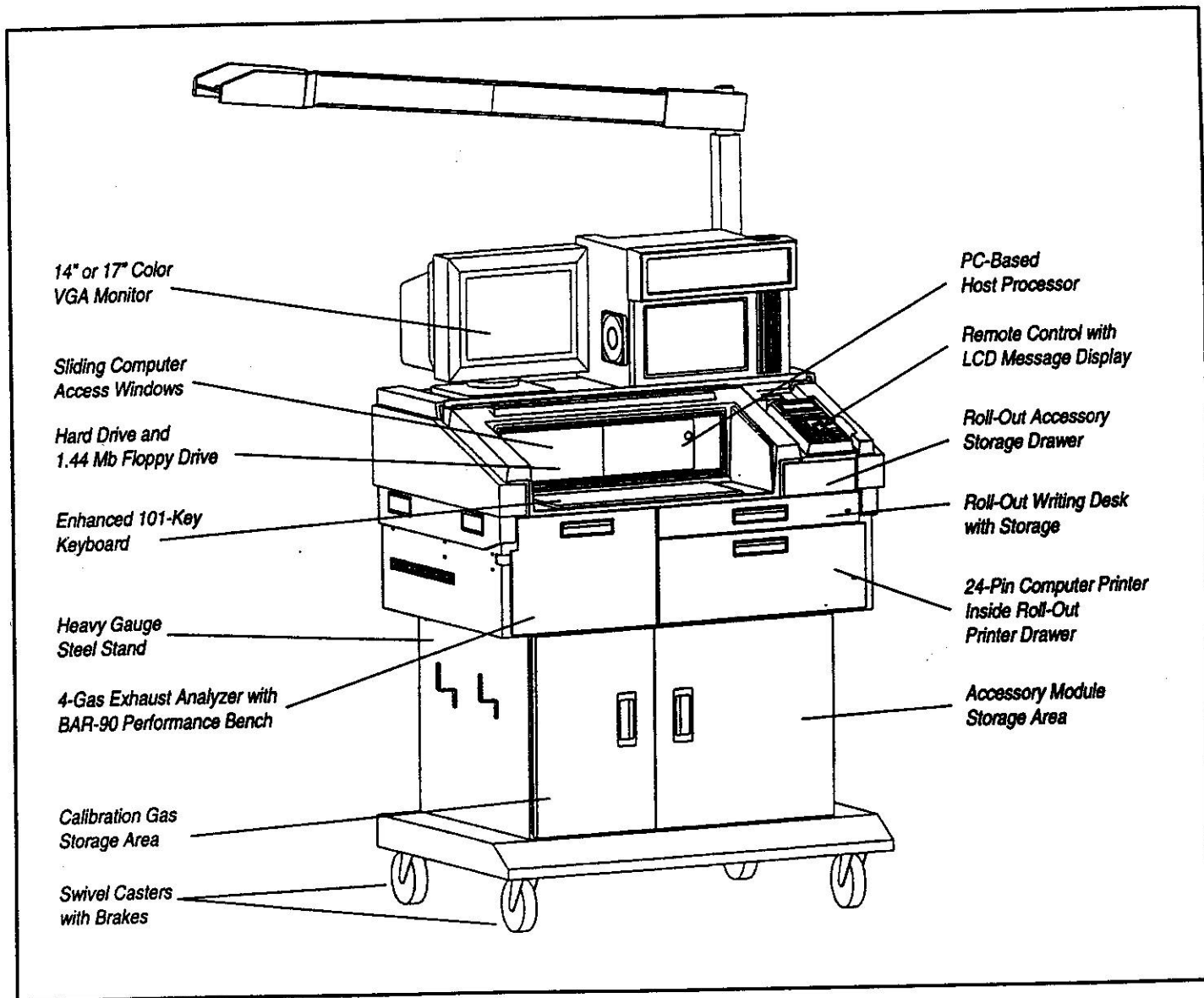


Figure 1-2

Test Leads and Accessories

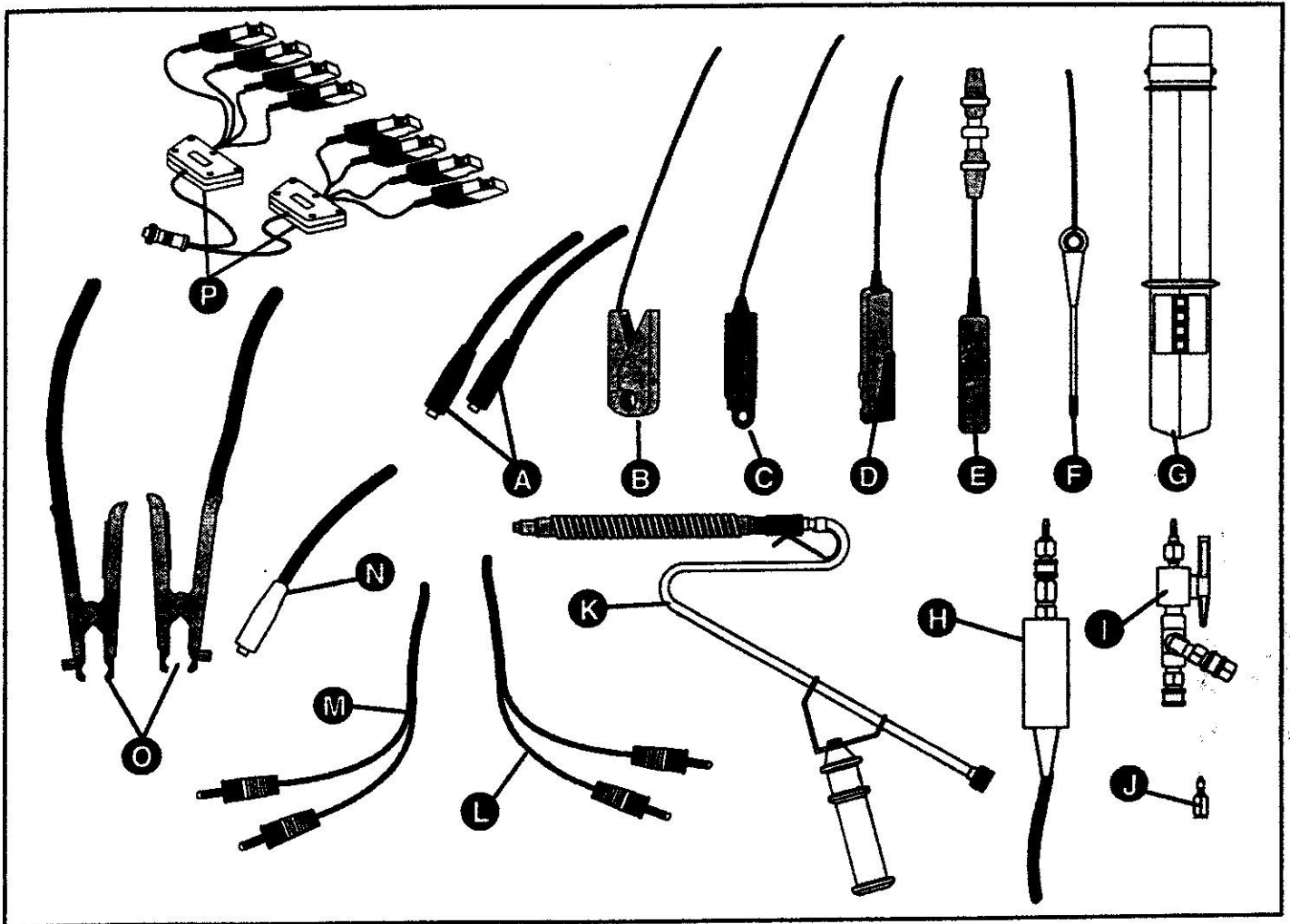


Figure 1-3

- | | |
|--|--|
| A - Coil Pos. (Yellow) and Coil Neg. (Blue) Leads | I - Vacuum/Pressure Transducer Bleed Adapter |
| B - Amp Probe | J - Fuel Rail Adapter—to connect bleed adapter and vacuum/pressure transducer to fuel rail |
| C - Low Current Probe | K - Exhaust Gas Analyzer Lead |
| D - Green #1 Lead | L - Multi-Meter Lead |
| E - Conventional Secondary Lead with Standard, HEI and Universal HT Adapters | M - Multi-Scope Lead |
| F - Temperature Lead | N - System Ground Lead |
| G - Timing Light | O - Battery Load Leads |
| H - Vacuum/Pressure Transducer | P - DIS Secondary Leads |

Optional Ignition Adapters

The 43-243 Adapter Kit includes the following standard primary ignition adapters for many domestic and import vehicles:

- Ford and GM electronic ignitions (including HEI)
- GM External Coil
- Ford E-Core, Thick Film Ignition (TFI) systems
- GM Micropak Coil
- Acura and Honda with Hitachi ignition system
- Toyota, Suzuki, Subaru, Isuzu, Mitsubishi and GM imports with Nippondenso ignition system
- Nissan with Hitachi ignition system
- AMC, Renault, Peugeot, and Jeep with Renix/Ducellier ignition system

Optional Accessories

- 43-285 CD ROM Kit
- Mitchell\Expertec CD software
- 43-289 Diagnostic Flowcharts
- 43-258 Phone Modem Kit

Contact an authorized representative for more details on adapter and accessory availability.

Specifications and Ranges

Dimensions

- | | | |
|------------------------|------------|------------|
| • Height: 61" | Width: 39" | Depth: 32" |
| • Net Weight: 575 lbs. | | |
| • Boom Height: 80" | | |
| • Boom Length: 54" | | |

Host Software

- MS DOS
- Host Program

Exhaust Analyzer

- Barometric Pressure Compensated
- Automatic Calibration
- 25 ft. Sample Hose
- Flexible Stainless Steel Probe
- Disposable sample filters
- Meets BAR-90 Accuracy
- Charcoal filter equipped for zero air
- Response Time: Less than 15 seconds to 95% final reading
- Warm-up Time: Less than 15 minutes to stable operation
- Meets or exceeds OIML CLASS I requirements (220V)
- Designed to meet or exceed AU II requirements (220V)

Memory Requirements

For optimum performance, your analyzer requires 590K of available conventional memory. Avoid installing any memory-resident or other programs that decrease the amount of available conventional memory below 590K.

Engine Analyzer Measurements

Reading	Range	Resolution
Battery Voltage	0 to 25 VDC	.01 VDC
High Current	-1000 to + 1000 DC Amps	1.0 Amp
Low Current	-10 to +10 DC	Amps .01 Amp
RPM	0 to 10,000	1 RPM
Cylinders	1 to 12 Cylinders	
Secondary KV	-10 KV to + 40 KV - 2 KV to + 8 KV	1 KV
Dwell	0 - 360 Degrees	.1 Degree
Pressure	-15 to 85 PSI	1 PSI
Vacuum	0 to 30 In Hg	.5 In Hg
Multimeter Voltage ¹	0 to +- 50 VDC 0 to 60 Volts AC RMS	.1 Volt DC .1 VAC
Multimeter Resistance ²	0 to 2 megohms Measurement	.2 ohm
Multi-Trace Lab Scope	0 to +/- 25.0 VDC	.02 VDC
Exhaust Analyzer		
Hydrocarbons	0 to 5000 PPM	1 PPM
Carbon Monoxide	0 to 10 % Vol	.01 %
Carbon Dioxide	0 to 20 % Vol	.01 %
Oxygen	0 to 20 % Vol	.01 %

¹ Electrically Isolated. >10 Megohm Impedance

² Electrically Isolated

Figure 1-4

Remote Control Unit

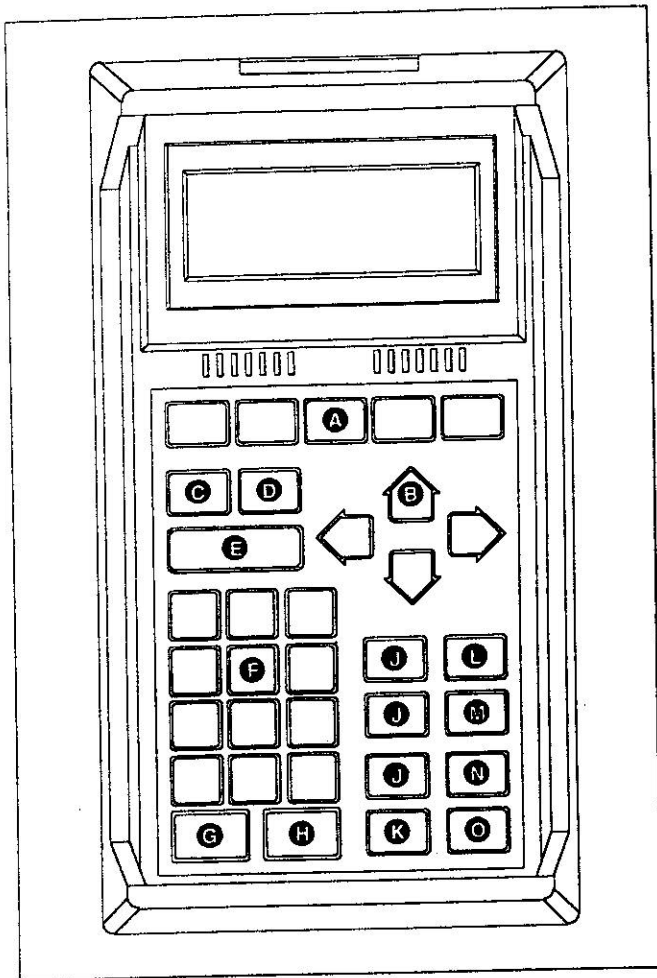


Figure 1-5

Use the remote to control the analyzer when you are seated in the car. All of the main keyboard functions are represented on the keypad.

The backlit LCD display is easy to read in low-light conditions. In addition, the remote is equipped with a speaker to beep when performing drain tests or continuity testing.

NOTE

Refer to "Engine Analyzer Configuration" in Chapter 5 for the proper procedure for adjusting contrast and brightness of the Remote Control Unit's display.

Key Functions

- A - Function Keys** — these keys match the F1 - F5 keys on the main keyboard. These keys perform a variety of functions during a test, and may change often.
- B - Arrow Keys** — these keys match the Arrow Keys on the main keyboard. Use the Arrow Keys to move the cursor, scroll up or down, etc.
- C - Prev Menu Key** — this key is the same as the [F10] key on the keyboard. Press this key to display the previous screen that came directly before the current screen shown on the display.
- D - Help** — this key accesses help information.
- E - Enter Key** — selects the option highlighted on the screen, or use as the enter key.
- F - Numeric and Icon Keys** — enter numbers and use the icon keys to enter decimal and signed (+/-) numbers.
- G - Alpha/Numeric** — use this key to toggle the Alpha-key configuration "ON" and "OFF." When the Alpha-key configuration is turned "ON," you can use the keypad to enter the letters of the alphabet.
- H - Clear Key** — press this key to clear the data in a highlighted field or to clear a graphic display and begin displaying new data.
- J - Memory Keys** — use these keys to store and manipulate memory functions.
- K - Status** — press this key to display the "Trigger Lead Status" screen.
- L - Paper Adv.** — this key matches the "F11" key on the main keyboard. Press this key to form feed the paper from the printer.
- M - Screen Dump** — print an exact copy of the display screen.
- N - Data print** — print the test reports. Matches the "F12" key on the main keyboard.
- O - Kill** — matches the "F8" key on the main keyboard.

Keyboard

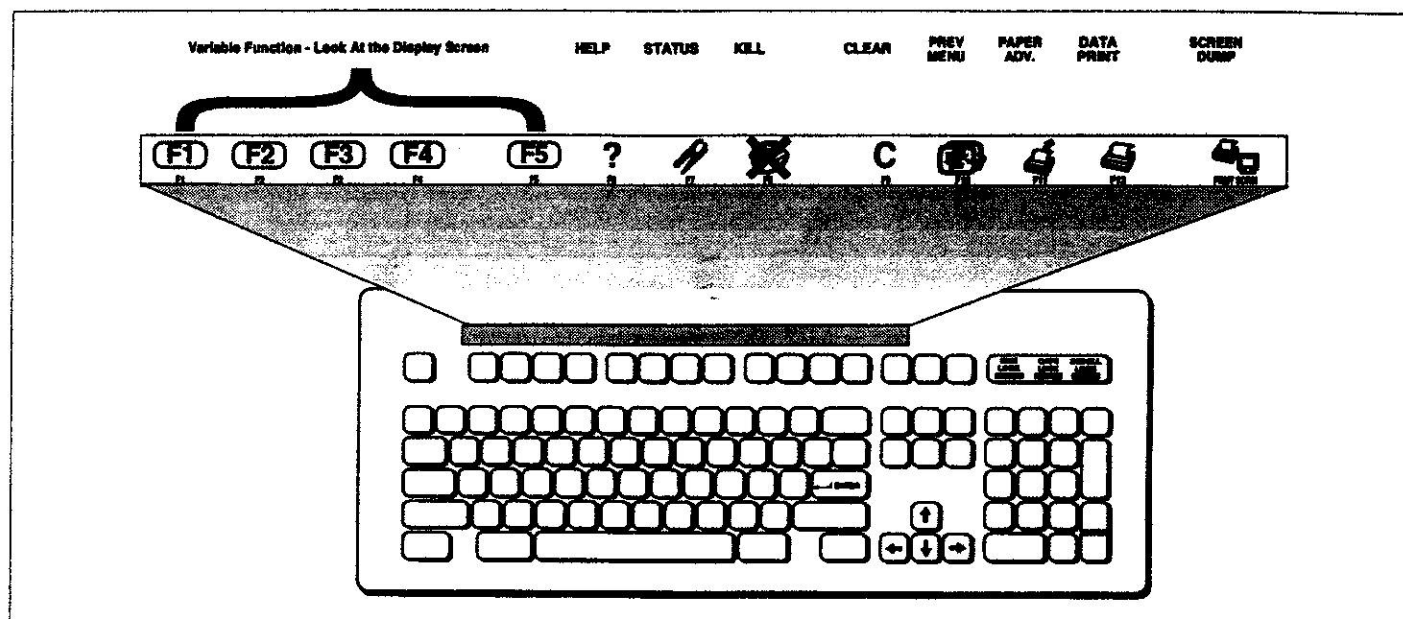


Figure 1-6

[F1]-[F5] – These keys vary according to each test routine. Each variable function is named in the function key buttons across the bottom of each screen.

[F6] (Help) – Press [F6] for a series of help messages that explain the inputs the analyzer is expecting, as well as the information the analyzer is displaying.

[F7] (Trigger Lead Status) – Displays the "Trigger Lead Status" screen.

[F8] (Kill) – Disables the ignition primary to stop the engine if the primary BLUE Lead is connected to the Negative side of the ignition coil and the White Engine Analyzer Ground Lead is connected to the Negative Battery terminal.

[F9] (Clear) – In any information screen, clears the data from the highlighted screen. From any test screen, clears the pattern display and begins displaying new data.

[F10] (Previous Menu) – Aborts the test in progress and returns to the previous menu.

[F11] (Form Feed) – Advances the paper in the report printer one full page.

[F12] (Print Reports) – Prints the data and diagnostic messages after any test has been run. From any menu screen, press [F12] to display the "Print Reports" menu.

[PrtSc] (Print Screen) – Prints a "screen dump" - an exact copy of what appears on the screen.

Computer Controls

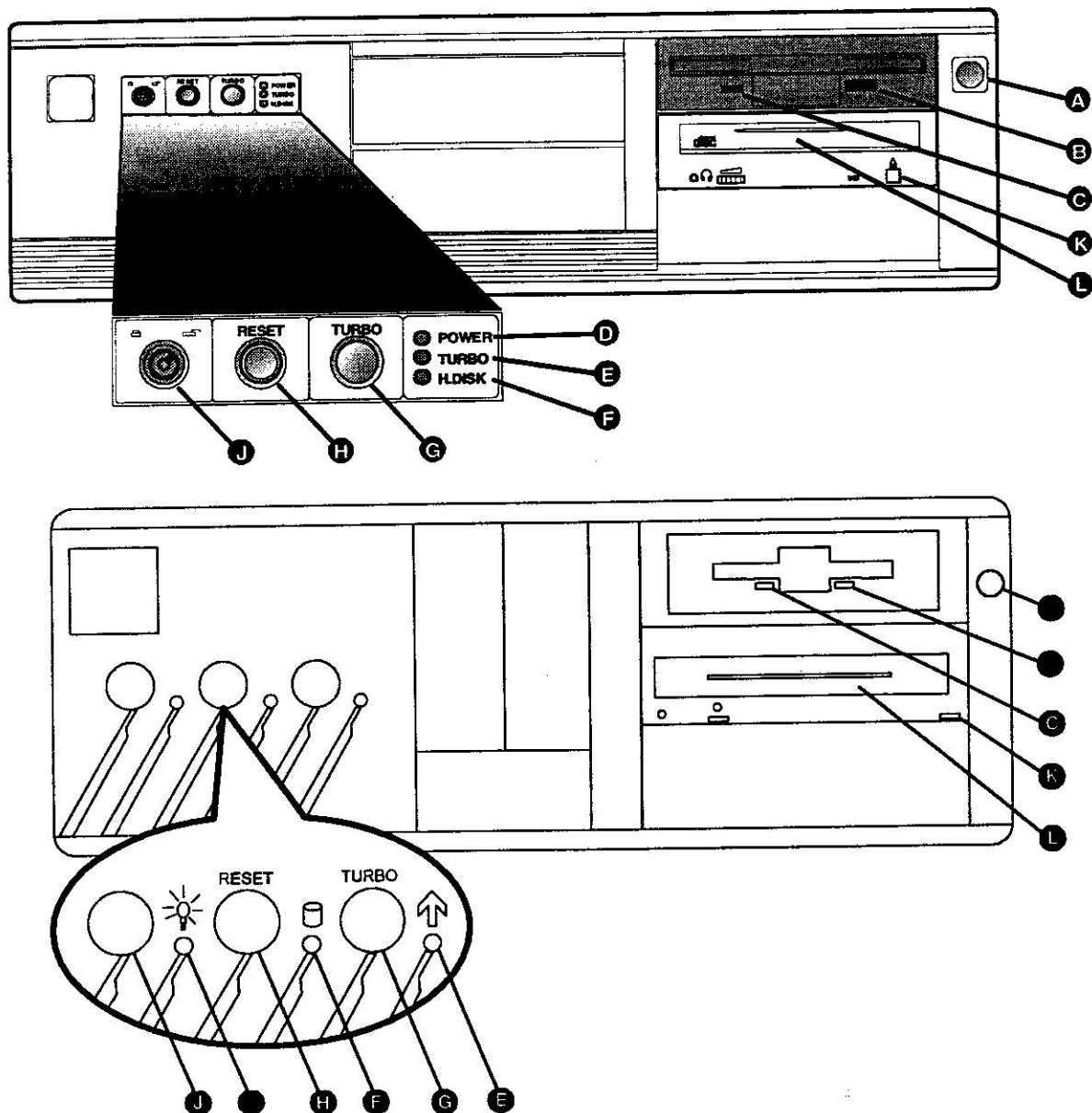


Figure 1-7

- A** - Computer Power ON/OFF
- B** - Floppy Disk Eject Button
- C** - Floppy Disk Drive In Use Light
- D** - Power On Light
- E** - Turbo Mode On Light
- F** - Hard Disk In Use Light
- G** - Turbo Mode ON/OFF Button

- H** - Reset Button — reboot the computer by pushing this button.
- J** - Key Lock — Use the keys provided to lock the computer to prevent unauthorized people from tampering with the computer.
- K** - CD-ROM Eject button
- L** - CD-ROM Access Door

Printer Controls

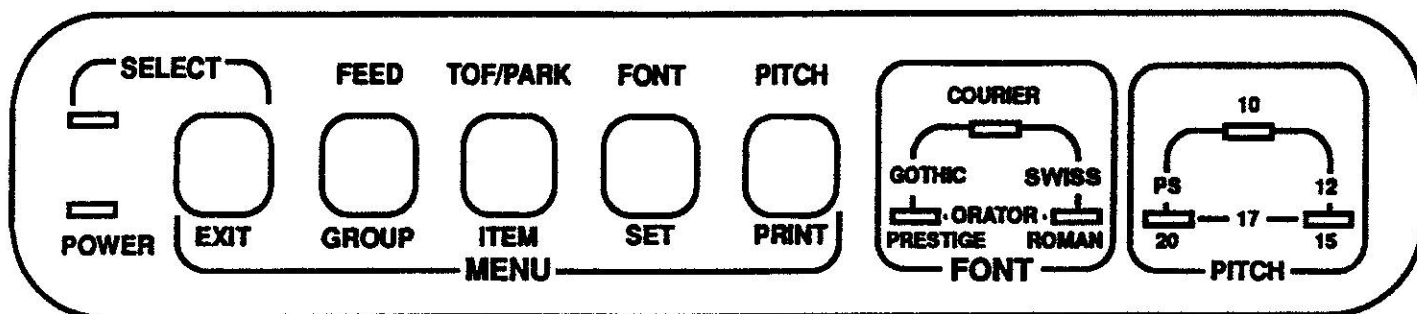


Figure 1-8

NOTE

These instructions apply to the Okidata Microline 380 printer.

Setting Top of Form (TOF)

1. Press "TOF/PARK" button.
2. The paper will retract.
3. Open the bail lever.
4. The paper will feed through and stop.
5. Close the bail lever. The paper will retract, and TOF is now set.

Front Panel Controls

There are five buttons on the control panel (refer to Figure 1-8). The functions represented by the labels at the top of each button are engaged when the printer is in "Print Mode." The functions represented by the labels at the bottom of each button are engaged when the printer is in "Menu Select Mode." In "Menu Select Mode" the operator can change the printer's default settings.

Print Mode

When the printer is turned "ON" it defaults to "Print Mode," ready to receive data or commands from the analyzer.

Lights

Power Light – This light indicates that the printer is turned on.

Select Light – When this light is "ON," the printer is selected and ready to receive data from the computer. When the light is "OFF," the printer is deselected and can't receive data. When the light is flashing, the printer is out of paper or an error (such as a paper jam) has occurred.

Font Lights – These lights indicate which font is engaged. When all font lights are "OFF," the printer is in the "Utility Print Mode."

Pitch Lights – These lights indicate which pitch is engaged.

Control Buttons

Select Button – Push this button to select or deselect the printer (“SELECT” light is “ON” or “OFF”).

To reset the printer to factory default settings, hold down the “SELECT” button and the “FEED” button while turning on the printer. (See Appendix B in the printer manual for more information on the menu factory settings.)

Hold down the “SELECT” button and the “TOF/PARK” button while turning on the printer, to place the printer in the hex dump mode. Refer to the printer manual for more information.

Feed Button – Push and release this button to advance the paper one line. Push the button and hold it for approximately one second, to advance the paper to the first print line of the next page.

Hold down this button while turning on the printer, to engage the “Self Test Mode.” Refer to the printer manual for more information.

TOF/PARK Button – When the printer is selected, push this button to park continuous-form paper. The paper will retract from the front of the printer so the operator can use single sheets without completely removing the continuous forms. Refer to the printer manual for more information.

When the printer is deselected, push this button to set the position of the first print line on the page (“top of form”).

Hold down the “TOF/PARK” button while turning on the printer, to engage the Rolling ASCII test.

Font Button – Push this button (printer selected or deselected) to select the font to use. Refer to the printer manual for more information.

The “FONT” lights to the right of the “FONT” button indicate which font is engaged. If only one light is glowing, then the font associated with it is engaged (Courier, Roman, or Prestige). If two lights are glowing, then the font between them is engaged (Swiss, Orator, or Gothic).



When the printer is placed in the Utility print mode, all of the “FONT” lights stop glowing.



The printer is set to the Utility print mode when the system is set up. For best operation of the analyzer software, the printer should be left in this mode.

Push the “FONT” button while turning on the printer to enter the “Menu Select Mode.”

Pitch Button – Push this button (printer selected or deselected) to select the pitch (character width). Refer to the printer manual.

The “PITCH” lights to the right of the “PITCH” button indicate which pitch is engaged. If only one light is glowing, then the pitch associated with that light is engaged (10, 15, or 20 cpi). If two lights are glowing, then the pitch between them is engaged (12, 17, or PS).

Menu Select Mode

Use this mode to create custom defaults for the printer. When the printer is in the Menu Select Mode, the function of the control panel buttons corresponds to the label below them: "EXIT," "GROUP," "ITEM," "SET," and "PRINT."

For a listing of all the menu selections, refer to the printer manual.

NOTE The operator can override features set on the menu using either the front panel or commands sent from the computer. However, when the printer is turned "OFF," features set by those methods will be cancelled. Features set on the menu will stay in effect, even when the printer is unplugged.

Enter the "Menu Select Mode" either directly from the "Print Mode" or from the power off state.

Enter the "Menu Select Mode" from the "Print Mode:"

1. Make sure the printer has ribbon and paper.
2. Press the "FONT" and "PITCH" buttons simultaneously. The "SELECT" light will go off and "Menu Mode" will print. Make menu changes by using the control panel.
3. To return to the "Print Mode," press the "EXIT" button. The "SELECT" indicator will light.

Enter the Menu Select Mode from the "Power Off" State:

1. Make sure the printer has ribbon and paper, and that it is turned "OFF."

2. Hold down the "FONT" button while turning the printer "ON." The "POWER" light will come on ("SELECT" light remains "OFF") and "Menu Mode" will print. Make menu changes by using the control panel.

3. To switch to the "Print Mode," press the "EXIT" button. The "SELECT" indicator will light.

Control Button Functions in Menu Select Mode

Group Button – Push this button to move to the next Group in the menu.

Item Button – Push this button to move to the next Item within the Group.

Set Button – Push this button to move to the next setting within the Item. Once a setting is changed, it will be stored in the printer's permanent memory, even if the printer is turned "OFF," until the operator presses "SET" with that Group and Item selected.

Print Button – Press this button at any time while in "Menu Select Mode" to print a listing of all the current menu settings. Print out the menu whenever it is changed for reference.

Exit Button – Push this button to exit the "Menu Select Mode" and return the printer to the "Print Mode."

For detailed information on changing printer settings, refer to the printer manual.

Menu Screen Components

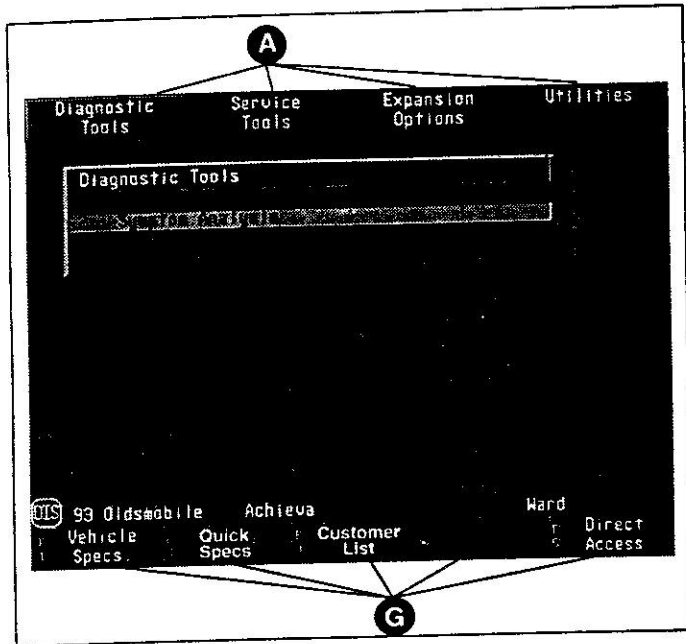


Figure 1-9

A - The Main Menu Bar – (see Figure 1-9) positioned across the top of the screen, contains four pop-down submenus:

Diagnostic Tools – These routines assist in troubleshooting and allow you to test various vehicle systems and use customized test sequences.

Service Tools – Provides a menu of pre-programmed diagnostic screens as well as “live” meter screens to allow you to get an overall view of system performance.

Expansion Options – Provides a menu for selection of powerful optional tools such as Flowcharts, On-Board Computer, etc. This menu also provides a function to allow the operator to add new options from other sources to the analyzer.

Utilities – Allows the operator to set up report headers, to calibrate the test leads, change time and date settings, and more.

B - Menus – Menus list the functions available to the operator. Some menu items point to sub-menus of secondary test routines.

C - Menu Highlight – Move this highlight either by using the Up or Down Arrow Keys or by typing in the menu item number. Press [ENTER] to start the test or access the submenu.

D - Customer Last Name – This appears on screen to indicate that customer information has been entered.

E - Specification – Indicates that specifications for the make, model and year have been entered into analyzer memory. This spec can be changed or edited.

F - DIS Icon – Indicates that the analyzer is configured for DIS testing.

G - Function Keys – Press the “F” key indicated to access the function listed in the box.



The “F” keys shown on the Main Menu pictured in Figure 1-9 appear when no customer is loaded. If a customer is loaded, the “F” keys will be as follows:

F1	-	No Customer
F2	-	Edit Customer
F3	-	Customer List
F5	-	Direct Access

Meter and "Live" Screen Components

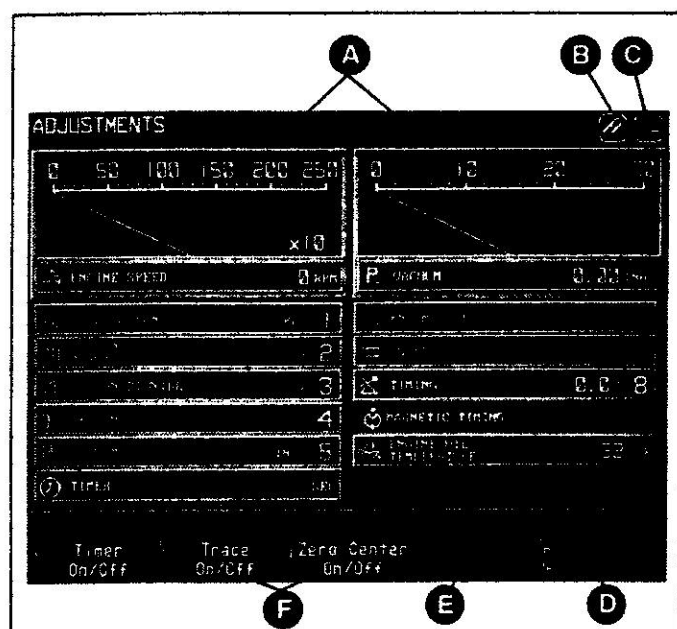


Figure 1-10

Figure 1-10 shows a typical meter and data screen. Most screens will have these common components:

- A - Analog Meters** – Meters are auto ranging (sliding scales) for maximum flexibility. Meters feature a trace function to show trends and also a zero-center function.
- B - Trigger Lead Status Icon** – If this icon flashes, press [F7] to display the "Trigger Lead Status" screen (refer to Figure 1-11). This screen indicates which leads are not functioning correctly.

C - Previous Menu Icon – Whenever this icon appears, press [F10] to return to the previous menu. If you are running a user test, press [F10] to start the next test in the series.

D - Digital Meters – These areas of the screen display all of the meters or optional functions that are available, and/or display the current data readings. Gray options are not available, either because the meter or function is currently in use, or because it does not apply to the particular system being tested. Meters which are labeled with a number can be displayed in the analog meter boxes. Type the number of the meter and it will be displayed in the active analog meter box.

E - Message Center – This box displays test instructions, prompts and informational messages to explain what the analyzer is doing while it is calculating test results, etc.

F - Function Keys – Each box lists the "F" key that will activate a particular function. Usually, pressing [F2] will continue the program along to the next step in a test or will exit the test and return to the Engine Analyzer Main Menu.

Arrows (refer to "Icon Index") – When arrow icons appear on the screen, press the Up, Down, Left or Right Arrow Key on the keyboard to expand or shrink the display scales. This function is available in ignition pattern screens.

Trigger Lead Screen Components

This screen allows you to verify that the analyzer is receiving proper signals from the analyzer leads. Press [F7] from any screen showing the "Lead Status Icon." If the icon is flashing, there is a problem with the trigger leads.

1. Connect the leads to the test vehicle.
2. Press [F7]. The "Leads Status" screen appears (see Figure 1-11).

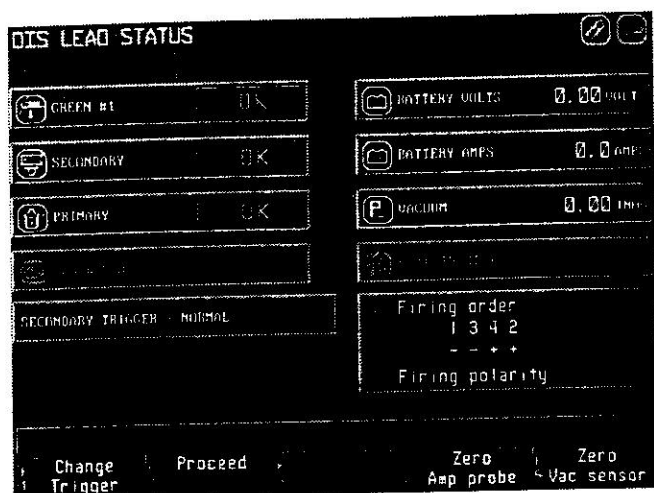


Figure 1-11

Press:

- [F1] – to change the trigger;
- [F2] – to return to the previous screen;
- [F3] – (Kill On/Off - not available for DIS systems) to kill the engine, if the blue Coil Negative lead is connected to the negative coil terminal and the white System Ground lead is connected to the negative battery terminal;
- [F4] – to zero out amp probe;
- [F5] – to zero out vacuum sensor.

3. Start the test vehicle and look at the screen. Correct any problems that are indicated and press [F10] to return to the previous menu.

Changing Trigger

Press [F1]. A menu of trigger choices appears (see Figure 1-12). Use the Up or Down Arrow Keys to choose the trigger that you want to use.

For Conventional Systems:

Primary/Secondary Trigger - Primary or secondary trigger, whichever is available.

Primary Only - Uses the primary trigger only.

For DIS Vehicles:

Secondary Trigger - Normal - Uses the secondary trigger (default).

Secondary Trigger - Special - This trigger is adjusted to compensate for higher trigger voltages caused by open plugs or other problems. Use this trigger to obtain a steady signal only when other triggers will not work.

Primary Trigger - Uses the Low Current Amp Probe clamped around the primary "B+" feed wire of the ignition module.

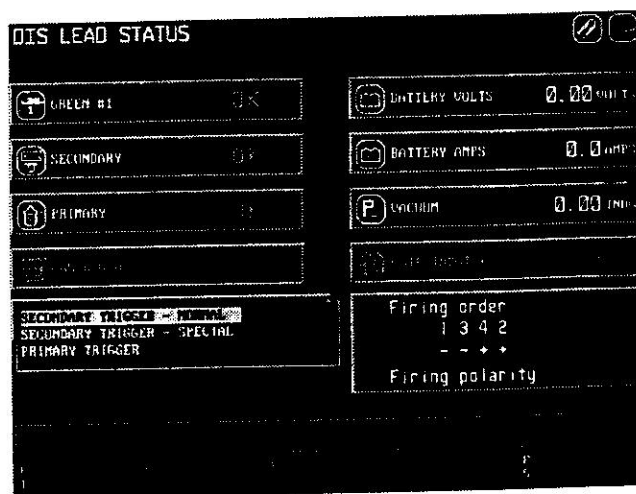






Figure 1-12

Icon Index






Main Icons

-  Trigger Lead Status (press [F7] to display)
-  DIS Specs Loaded (menu screens only)
-  Display Previous Menu (press [F10])
-  Arrow Keys (scroll up/down, change meter scales)








General Engine Data Icons

-  RPM
-  Timing
-  Vacuum
-  Dwell
-  Timing Light (Timing Light is Active)
-  Pressure
-  Magnetic / Stut








Battery System Icons

-  Rated CCA Units
-  Open Volts
-  Load Volts
-  Recovery Volts
-  Available CCA







Primary Ignition Icons

-  Battery Voltage
-  Positive Coil Volts
-  Negative Coil Volts
-  Average Dwell
-  Dwell Variation
-  Dwell On Variation
-  Dwell Off Variation










Secondary Ignition Icons

-  Cylinder Number
-  Average KV
-  Delta KV
-  Burn Time
-  Burn KV
-  Slope KV
-  Coil Oscillations
-  Snap KV
-  Circuit Gap

Gas Analysis Icons

-  HC Hydrocarbons
-  CO₂ Carbon Dioxide
-  CO Carbon Monoxide
-  O₂ Oxygen
-  CO₂ Corrected Carbon Monoxide
-  λ Lambda

Multimeter Screen Icons

-  A Amps
-  Ω Ohms
-  Zero Center Meter
-  V_~ AC Voltage
-  V₋ DC Voltage
-   Continuity
-  T Timer
-  P₂ Pressure/Vacuum

Use and Care

Special Computer Precautions

A computer is a delicate piece of equipment. The following is a list of "Do's and Don'ts" for working with a computer:

- ALWAYS protect the power supply.
 - Make sure the analyzer is properly grounded.
 - Use a high-quality power filter/surge protector.
- ALWAYS protect the analyzer from water, dust, and direct sunlight whenever possible. DO NOT block the ventilation fans - computers can overheat quickly.
- NEVER move the analyzer when either disk drive is operating. In order to read and write huge amounts of data, the magnetic disk inside a drive must spin very rapidly. If the analyzer is moved suddenly or bumped while a disk is spinning, the drive and/or data may be damaged.
- NEVER place sources of magnetic or electrical interference near the computer. These sources include:
 - Magnets (many automotive parts generate a magnetic field)
 - Radios
 - Other electrical appliances
- NEVER place food or beverages on the analyzer. Carbonated sodas are excellent conductors of electricity and an accidental spill could easily short out critical components inside the computer.
- NEVER shut off power or unplug the analyzer while a disk drive is operating. Return to the main menu and wait until the disk drive has stopped operating before interrupting power.

1. The Engine Analyzer must be plugged into a 120V, 60HZ, properly grounded outlet. DO NOT cut off the grounding prong of the AC power cord. DO NOT use a ground adapter. If an extension cord is needed, use a 3-wire type with the grounding circuit in good condition.

NOTE

It is strongly recommended that a dedicated electrical outlet circuit be installed by an authorized electrical contractor, for use with the analyzer. This circuit should be connected to its own circuit breaker and should not share that circuit breaker with any other outlets in the building.

2. Do not operate the analyzer in direct sunlight for extended periods.
3. DO NOT expose the analyzer to rain or moisture, or operate it on a wet floor.
4. Follow the maintenance schedule listed in the Maintenance section of this manual.
5. Make sure that the battery power clamp connections are good. Check the clamps to make sure that they are clean and clean the battery terminals if necessary.
6. Do not drop the test leads.

Gas Analyzer Use and Care

To prevent damage to the sampling system, do not use the analyzer while a vehicle is running on a dynamometer. For further information, contact your sales representative.

1. Check the water trap and filter daily for excessive build-up of dirt or water.
2. Replace the sample system filter at least every other week.
3. Store the gas analyzer exhaust probe off the floor to prevent damage and contamination.
4. Remove exhaust probe from the tailpipe while carburetor or combustion chamber cleaners are being used in the engine. This is particularly important because of the highly corrosive nature of carburetor and combustion chamber cleaners.
5. Do not drop the exhaust probe; this will break the probe and cause leaks.
6. Do not disconnect the exhaust probe from the analyzer.
7. Do not test diesel exhaust; this will contaminate the sample system.

General Test Procedure

The following general procedure describes how you complete a test with the 400 Series Analyzer. Each step in the procedure is explained in more detail in the following sections.

1. Plug the analyzer in and turn it on.
 2. Enter the Customer Information.
 3. Enter the Vehicle Specifications:
 - From a Menu screen;
 - From the Customer Information screen.
 4. Select the test to be performed.
 5. Access the "Help" screens by pressing [F6] for information on leads needed to run tests, as well as recommended procedures, safety notes, definitions and other relevant information.
- NOTE
- Once vehicle specifications are loaded, Task Switching is enabled allowing the operator to access vehicle pictures. See "Task Switching" for more information.
6. Install leads on vehicle engine.
 7. Start the engine and allow the vehicle to warm up to normal operating temperature.
 8. Check the Lead Status Screen by pressing [F7] to make sure that the analyzer is receiving good signals from all test leads.
 9. Follow the prompts to complete the test.
 10. Print out the customer or technical reports required.

Task Switching

The 400 Series Professional Work Station provides Task Switching capability. Task Switching allows you to temporarily "leave" the WorkStation to retrieve data from another software module installed in the 400 unit. There are two methods of Task Switching available:

Expansion Options Menu

This method allows you access to all modules installed on the 400.

1. Exit the test you are performing and return to the Main Menu screen.
2. Select *Expansion Options*.



Most available modules will be accessible through the *Expansion Options* menu. But, some modules may have been installed via the *Other Options Menu*. If so, select *Other Options Menu* from the *Expansion Options* menu to access them.

3. From the list of available software modules, select the desired option.

Help

This method allows you to use FlowCharts software or Mitchell-On-Demand (if Mitchell-On-Demand and Vin-Pass are installed). It is accessible in most menus and tests.

1. Press [F6] Help.
2. Press [F3] Vehicle Information.
3. Select the desired Vehicle Information option.

When you leave FlowCharts and return to the 400, any test you were running resumes at the point it was suspended.

Step 1: Turn the Analyzer on

After turning the analyzer on, the title logo screen appears. Press any key to access the Main Menu screen.

Step 2: Enter Customer Information

Customer information can be retrieved from the Customer List. The customer list contains data for up to ten (10) customers at one time. The information is saved by the analyzer. This allows you to work on multiple jobs at the same time and recall the correct customer and specification information for each job.

NOTE If customer information has been entered, customer and vehicle data, along with diagnostic test data can be saved to diskette. See "Save Test Data to Disk" in Chapter 5 for the correct procedure.

To enter the "Customer List" screen, press [F3] from any menu screen, (see Figure 1-13).

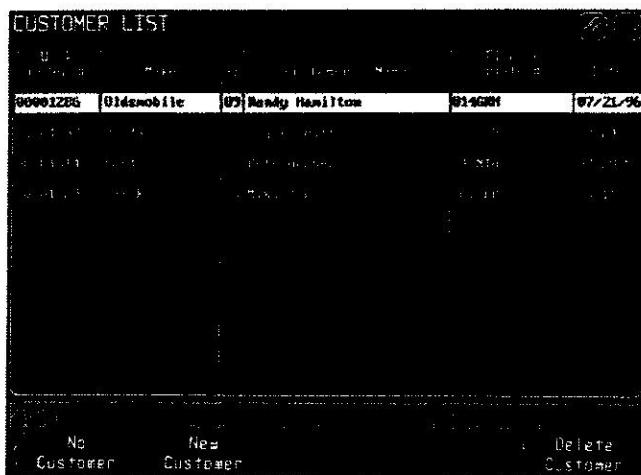


Figure 1-13

Press:

- [F1] – to return to the Main Menu screen without making any changes. If customer information is held in analyzer memory, that information will be deleted, and the customer's last name will no longer appear at the bottom of the menu screen.
- [F2] – to enter a new customer. See "Enter a New Customer."

NOTE The "F2" key will appear only if there are nine (9) or less customers on the list.

- [F5] – to delete a highlighted customer entry from the list. See "Deleting a Customer."

Select an Existing Customer

1. Use the Arrow Keys to move the cursor to an existing customer in the customer list and press [ENTER].
2. The "Customer Information" screen appears (see Figure 1-14).

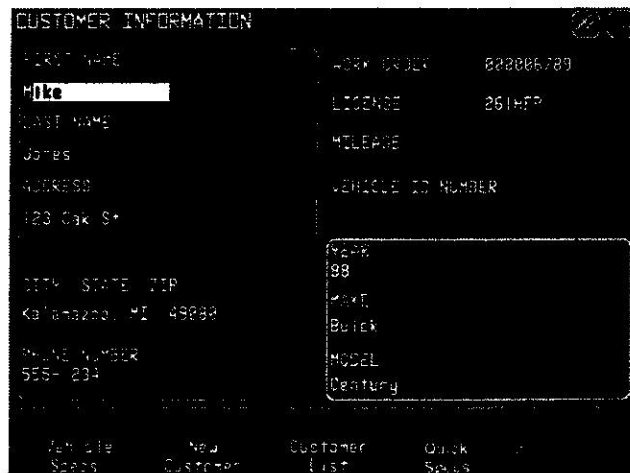


Figure 1-14

3. Use the Arrow or Tab Keys to move around the customer information screen. Update any data. Press:
 - [F1] – to enter vehicle specs (for details, see "Enter Vehicle Specifications" or "Linking Vehicle Specifications to Customer Information" below);
 - [F2] – to enter a new customer;
 - [F3] – to return to the "Customer List" to choose a different customer entry;
 - [F4] – to use the "Quick Spec" entry method to enter the minimum vehicle specs necessary for testing. (see "Quick Spec Entry")

Specification Message

A specification message (see Figure 1-15) appears when a selected customer was last tested using a previous version of the 400 Series Analyzer Software. The system requests that the customer information and vehicle specifications be re-entered into memory.

The screenshot shows a terminal window titled "CUSTOMER INFORMATION". It contains several data fields: FIRST NAME, LAST NAME, ADDRESS, CITY, PHONE NUMBER, WORK ORDER, LICENSE, MILEAGE, and MODEL. A large rectangular box is overlaid on the screen, containing the text "CUSTOMER INFORMATION" and "SPECIFICATION MESSAGE". At the bottom of the screen, there is a status bar with the text "Select Vehicle Specifications to update specification" and three buttons: "Vehicle Specs", "New Customer", and "Customer List".

Figure 1-15

Press any key to clear the message and then press [F1]. The vehicle specification must be completed in order to allow the software to properly enable the expansion modules installed in the system.

Enter a New Customer

1. From the "Customer List" screen, press [F2] or move the cursor to a blank line in the customer list and press [ENTER]. The "Customer Information" screen appears. It is a similar screen to Figure 1-14, except with blank data fields.
2. Type in the information for each data field on the screen. When finished, press [F10] to save information in memory.

Deleting A Customer Entry

When the Customer List contains (10) ten names and a new customer needs to be added, determine an entry that can be deleted and follow the procedure below.

1. Use the Up or Down Arrow Keys to highlight the entry to be deleted.
2. Press [F5] to delete the customer from the list.
3. The analyzer prompts you to press [F5] a second time to confirm that you want to delete the highlighted customer.
4. Press [F10] to return to the previous menu screen.

Replace a Customer with a New Entry in the Customer List

1. Use the Arrow Keys to highlight a customer in the Customer List and press [ENTER].
2. The customer's information appears in the data fields. Press [F2], "New Customer."
3. The customer's information is erased. Input the new customer's information.
4. Press [F10] to save the new customer information in memory.

Step 3: Enter Vehicle Specifications

The analyzer contains a database of vehicle specifications. When you identify the manufacturer, make and model of the vehicle to be tested, the analyzer loads that information into memory and sets up appropriate tests to fit the vehicle.

Enter the Vehicle Specifications screen:

- from a Menu screen;
- from the Customer Information screen.

Load the vehicle specifications into analyzer memory:

- by Year/Make/Model;
- by creating a set of specifications manually.

Loading Vehicle Specifications by Year/Make/Model

1. From any Menu screen, press [F1] to enter a vehicle specifications selection screen (see Figure 1-16). Note that if a vehicle spec is already loaded in memory, or when an existing customer is selected, a full summary screen appears (see Figure 1-20). If the full summary screen appears, press [F3] "New Vehicle," to enter new vehicle specifications.



Figure 1-16

NOTE Press [F2] and a menu of available regional databases will be displayed (see Figure 1-17). Use the cursor keys to highlight the selection of your choice and press [ENTER]. You will be returned to the vehicle specification screen (see Figure 1-16).

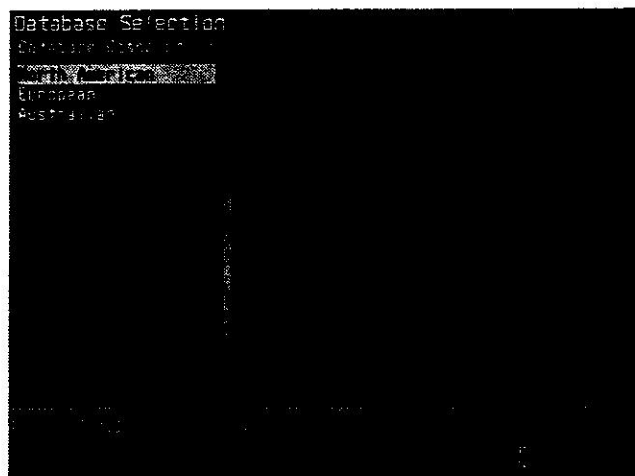


Figure 1-17

2. Use the Up- or Down-Arrow Key to highlight the correct vehicle year and press [ENTER].
3. A list of vehicle manufacturers will now be displayed (see Figure 1-18). Use the Arrow Keys to move through the list. Highlight the correct manufacturer and press [ENTER].

Shortcut: Press the first letter in the manufacturer name. The cursor jumps to the first name in the list that begins with that letter. Press the letter again to scroll through all the names that begin with that letter. Press [ENTER] when the correct manufacturer name is highlighted.

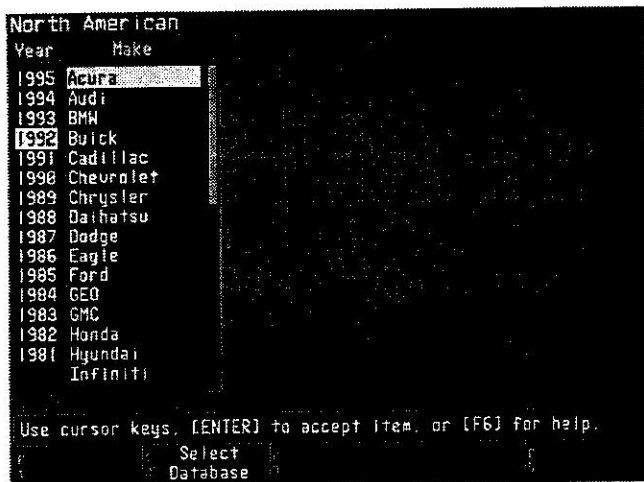


Figure 1-18

4. A list of vehicle models will now pop-up (see Figure 1-19). Use the Arrow Keys to move through the list. Highlight the correct model and press [ENTER].

Shortcut: Press the first letter in the model name. The cursor jumps to the first name in the list that begins with that letter. Press the letter again to scroll through all the names that begin with that letter. Press [ENTER] when the correct model name is highlighted.

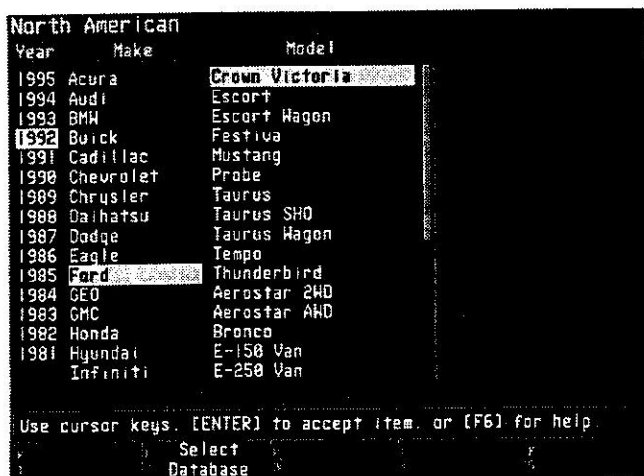


Figure 1-19

NOTE

At this point, you may be prompted to make other selections, such as engine size, transmission type and so forth, depending on the vehicle make/model you have chosen.

5. When you have finished selecting vehicle specifications, the analyzer will display a result screen summarizing the data just entered (see Figure 1-20).

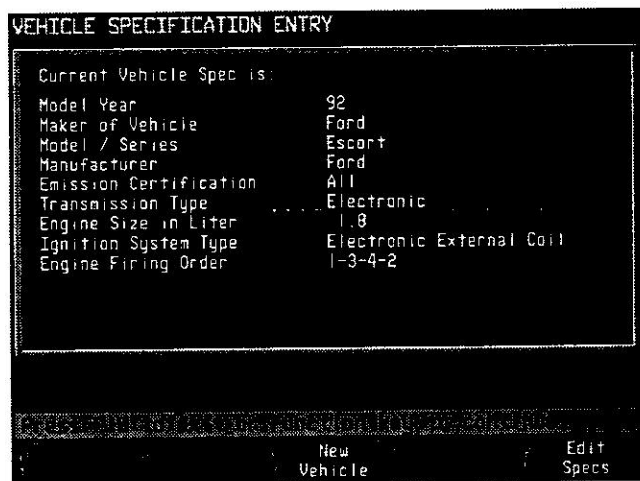


Figure 1-20

Press:

- [F3] – to input new vehicle specifications;
- [F5] – to edit the screen currently in analyzer memory (see the “Editing Specifications” section for complete details).

8. Press [F10] to return to the previous menu screen. The vehicle specifications now appear above the “F-Keys.”

Editing Specifications

There may be occasions when the specifications entered into the computer do not match the equipment or systems installed on the vehicle.

To ensure correct results and appropriate diagnostic messages, you can edit the specifications as needed to gain an exact match to the vehicle.

From the Vehicle Specification summary screen, press [F5]. The first of several specification screens will appear (see Figure 1-21).

Edit Specification	
Make of Vehicle	Ford
Model / Series	Escort
Model Year	92
Transmission Type	Electronic
Engine Size in Liter	1.8
Number of Cylinders	4
Engine Layout	In Line
Engine Type	4 cycle
Ignition System Type	Electronic Ignition
Engine Firing Order	1-3-4-2
Slow Idle Setting	750
Slow Idle Condition	Park

New Vehicle Next

Figure 1-21

Use the Up and Down Arrow Keys to highlight the specification that needs to be changed. For specifications such as *Manufacturer* or *Model Year*, type over the old information. For specifications, such as *Engine Layout* or *Ignition System Type*, press [ENTER] and a dialog box will pop up, providing you with a list of options. Use the up- or down-arrow keys to highlight your choice and press [ENTER].

When you are satisfied with the changes, press:

- [F3] – to select new vehicle specifications;
- [F4] – to display the previous specification screen;
- [F5] – to display the next specification screen;
- [F10] – to save specifications and exit.

Linking Vehicle Specs to Customer Information

If you have forgotten to enter vehicle specifications for a customer, or if you need to change the vehicle specifications attached to any customer, link the Vehicle Specs to the Customer information as follows:

1. From the "Customer Information" screen, press [F1] to enter the "Vehicle Specifications" screen. Note that if a vehicle spec is already loaded in memory, a full summary screen appears. If the full summary screen appears, press [F3] "New Vehicle" to enter the "Vehicle Specifications Entry" screen.
2. Select the vehicle specifications as described previously in *Loading Vehicle Specifications by Year/Make/Model*. When specs are loaded, a result screen similar to Figure 1-20 will appear.
3. At the result screen, press [F10] to return to the "Customer Information" screen again.
4. Press [F10] again to return to the Menu screen. The analyzer will save the information entered in the customer file. The menu screen will display the customer and specifications above the "F" keys.

Quick Spec Entry

Using the Quick Spec Entry method, enter the minimum vehicle specifications needed to test a vehicle.

NOTE

IMPORTANT: Quick Specs will not allow you to run the Quick Comprehensive or Diagnostic Tests, or perform Task Switching. Only Service Tests are available, and no diagnostic messages will be available for these tests.

1. From the Menu Screen, press [F2], "Setup."
2. The "Vehicle Setup/Quick Spec Entry" screen appears, (see Figure 1-22).

Figure 1-22

3. Press the number key which matches the specification that must be changed. A list of options for that number appears (see Figure 1-23).
4. Use the Arrow Keys to highlight the correct option and press [ENTER].

Figure 1-23

NOTE

When you select some of the specifications, such as *Ignition Type* and *Firing Order*, you will be presented with a list of entries to choose from. Other specifications, such as *Number of Cylinders*, will require you to enter a value. For example: To change the number of cylinders, press [2]. The "Cylinders" entry will be highlighted with a flashing cursor. Type the correct number of cylinders and press [ENTER].

There are other options at the Vehicle Setup/Quick Spec Entry screen. Press:

- [F1] – Access the "Vehicle Specs" to change the manufacturer or make entry. When you have finished selecting the vehicle specifications, a Vehicle Specification Entry screen will be displayed (see Figure 1-17). Press [F3] to enter new vehicle specifications, [F5] to edit the existing specifications, or [F10] to return to the Main Menu;