

Warranty

The obligation of SilverLeaf Electronics, Inc. under this warranty shall be limited to repair or replacement (at our option) during the warranty period of any part which proves defective in material or workmanship under normal installation, use, and service, provided the product is returned to SilverLeaf Electronics, Inc.. The warranty period shall be one year from date of purchase of the VMS™, or purchase of the finished coach with the VMS™ installed.

This warranty shall be invalid if the product is damaged as a result of defacement, misuse, abuse, neglect, accident, destruction, alteration, improper electrical voltages or currents, repair or maintenance by any party other than SilverLeaf Electronics Inc. or an authorized service facility, or any use violative of instructions furnished by us.

This one-year warranty is in lieu of all other expressed warranties, obligations, or liabilities. Any implied warranties, obligations, or liabilities, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, shall be limited in duration to the one-year duration of this written limited warranty.

In no event shall SilverLeaf Electronics, Inc. be liable for any special, incidental, or consequential damages for breach of this or any other warranty, expressed or implied, whatsoever.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.



VMS 200 EL™

Owner's Manual

RV Version 3.0

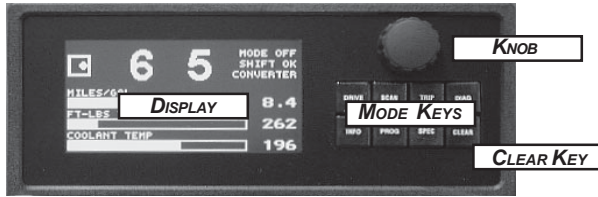


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Quick Start Guide



To Start a Trip

Press TRIP. The Trip Screen should appear. Press CLEAR to reset all values to zero. The VMS will now automatically begin accumulating trip information. The previous trip will be stored in the Trip History. (See Page 7).

To Set Your Destination "Miles-To-Go"

Press TRIP. The Trip Screen should appear.

Turn the KNOB. The Miles To Go number near the bottom should adjust up or down accordingly. Press the KNOB to add 100 miles.

To Read Diagnostic Information

If the Check Engine indicator on the dash lights up, press DIAG. The Engine Diagnostics Screen should appear, showing the cause of the problem. Press DIAG again to see the historical log.

To Set the Time

Press PROG twice. The Clock Set Screen should appear. Turn the KNOB to highlight the word "Time". Press the KNOB. Turn the KNOB to adjust the hours, and press the KNOB. Turn the KNOB to adjust the minutes, and press the KNOB. Turn the KNOB to adjust the AM/PM indicator, and press the KNOB. The clock is now set.

To Scan Multiple Gauges

Press SCAN. The Scan Screen should appear, and every several seconds the gauge should change. The arrow in the upper right corner indicates that the unit is "scanning". Pressing SCAN will set the unit in Watch mode, and the arrow will turn to a stop sign. Pressing SCAN again will return it to Scan mode. To change the list of gauges the unit scans, see Page 12.

To Watch a Particular Gauge

Press SCAN. Then turn the KNOB until the desired gauges appears.

To Adjust the Brightness of the Display

With either Drive Screen showing, turn the KNOB.

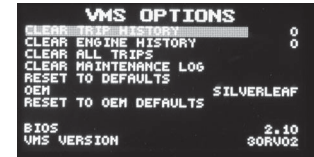
To Select the Gauges on the Drive Screen

Press PROG. Then turn the KNOB to the second page of configuration items. Highlight Gauge 1, press the KNOB, turn the knob to choose the desired gauge, and press the KNOB again. Do the same for Gauge 2 and 3.

Hidden Screens

In addition to all the features already described, the VMS 200 also has a set of hidden screens that provide diagnostic information on the VMS and data bus, and allow further settings to be adjusted. Usually these screens are useful only in the installation of the VMS. But in certain situations they may prove useful, so some brief mention is made here.

The most important hidden screen is accessed by pressing TRIP and SPEC simultaneously and holding them for three seconds. The VMS Options Screen will appear. There are several items on this screen, which you can scroll through using the KNOB.



Clear Trip History

Highlight this and press the KNOB to clear all the trips in the Trip History Screen. The current number of trip in the history is provided. The maximum capacity is 4096.

Clear Engine History

Highlight this and press the KNOB to clear all the diagnostic codes in the Engine History. The current number of events in the history is provided. The maximum capacity is 4096.

Clear All Trips

Highlight this and press the KNOB to reset the trip information in the Main Trip and Alternate Trip Screens. Those screens will show the current trip as having started when the engine was built.

Clear Maintenance Log

Highlight this and press the KNOB to clear the Maintenance Manager.

Reset To Defaults

Select this to reset all VMS settings to their factory default values.

OEM

This determines the logo presented at startup.

Simulated Meters

Some older engines do not include an hourmeter, odometer, and/or fuel meter. The VMS can compensate for these omissions through the use of "simulated" meters. If your engine is lacking any of these features, simply activate the appropriate meter on this screen.

Accessories

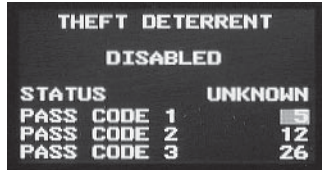
A variety of accessories are available for the VMS. These settings determine whether the VMS will activate the accessory.

Special Screens

Press **SPEC** to activate any special features that may be present on your VMS 200. If no special features are available, the Clock Drive Screen will appear.

Theft Deterrent (Cat Engines Only)

Cat engines are equipped with a unique theft deterrent that allows the VMS to lock the engine electronically. Once locked the engine cannot be started until unlocked by the VMS or a professional mechanic's service tool.



Before locking the engine, be sure to select a code that you will remember. The code consists of three numbers, each from zero to ninety-nine. If you forget your code, it is possible to unlock your engine, but not without the assistance of a Cat mechanic or a call to the SilverLeaf Electronics hot line.

This feature is disabled by default. Near the top of the screen will appear a message "Disabled" or "VMS OK". If it's disabled, go to the VMS Preferences Screen and change the Antitheft setting.

The engine status will be shown near the middle of the display. It should normally read "Locked" or "Unlocked". The procedure for locking and unlocking are exactly the same, except you may enter any numbers to lock the engine. You must enter the exact same numbers to unlock it again.

Turn the **KNOB** to dial in the first code number. Press the **KNOB**.

Turn the **KNOB** to dial in the second code number. Press the **KNOB**.

Turn the **KNOB** to dial in the third code number. Press the **KNOB**. The VMS should beep, and within a moment the engine status will change.

The theft deterrent will not work when the vehicle is moving. On some engines the engine may be running, in which case the engine will shut down upon being locked. On other engines, however, the engine cannot be running when you lock it. The engine will simply ignore the VMS and remain unlocked.

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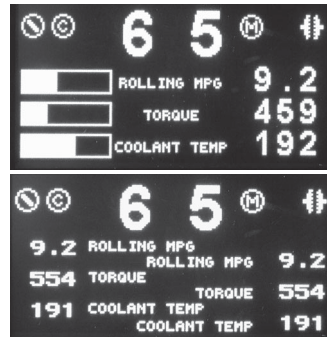
Drive Screens

Pressing **DRIVE** brings up one of the Drive Screens. There are two variations - a Three gauge and a Six gauge version. Pressing the key again selects the next version.

On either Drive Screen, you can turn the **Knob** to adjust the brightness of the display. Both Drive Screens display transmission and cruise control information in the top portion of the screen. The moving icon in the top left corner indicates that the VMS is successfully communicating with the chassis. The (C) icon will disappear when the Cruise Control is off. It will turn solid when the Cruise is active.

The two large numbers at the top center indicate the Gear Selected and Gear Attained by the transmission. You should see these update as the transmission shifts. To the right, the VMS displays the Transmission Mode, Operating Error, and Torque Converter Status. The Mode indicates the aggressiveness of the transmission; on most coaches Mode On indicates less aggressive shifting for better fuel economy. The Error icon (an exclamation mark) will appear to indicate problems. The Torque Converter icon will usually be closed, indicating the converter is locked. At lower gears the converter opens for starting and shifting.

All three gauges in the first Drive Screen version are selectable from the VMS Programming screen, described in a later section of this manual. The six-gauge version has three gauges permanently programmed with the most popular selections - Rolling MPG, Torque, and Coolant Temp. The other three gauges are selectable.



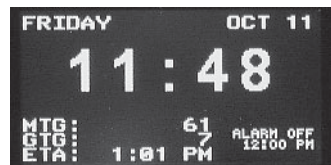
Clock Drive Screen

Clock, Calendar and Alarm Clock

The clock, calendar, and alarm clock can be set using the Clock Set Screen, activated by pressing **PROG** twice.

Trip Status

On the lower left, the VMS displays the Miles-To-Go (MTG), Gallons-To-Go (GTG), and Estimated-Time-of-Arrival (ETA). The MTG is set on the primary Trip Screen (see the Quick Start page), and will slowly count down as you drive. The GTG and ETA are constantly being recalculated based on your fuel economy and speed. In the first miles of each trip it will fluctuate before settling in on its best estimate, which will change as conditions warrant. These can be set to read in Metric using the VMS Settings Screen.



Special Features

The VMS has certain special features that monitor “behind the scenes” and change the display according to the demands of the situation. These features work automatically, and require no user effort. They can be turned on or off via the “hidden” configuration screen described in the last section of this manual.

Cruise Monitor

The VMS watches for any activity on the Cruise Control switches (set, accelerate, resume, coast), and automatically switches the display to the Scan Screen and shows Cruise Set Speed. The screen will stay on that item until the driver lets off the cruise switches. After a few seconds, the VMS will return to displaying whatever screen it was on before.

Trouble Monitor

The VMS watches for any of a number of possible problems, and automatically switches the display to the appropriate screen and gauge. High Coolant or Transmission Temperature, or Low Battery Volts will switch the display to the appropriate Scan Screen gauge. A Check Engine condition will switch the display to the Engine Diagnostics screen. The unit will stay on that screen until the user presses a key. It will then function normally and will not automatically return to that gauge or screen unless another problem occurs.

AntiTheft

This setting allows you to disable the Theft Deterrent feature, available with Caterpillar engines. Disabling this feature prevents inattentive people from accidentally locking the engine and forgetting the code.

Chassis

This selection is required for the Maintenance Tracking screens. If your chassis is not in the list, select "OTHER" to get a fairly representative set of maintenance intervals.

Trip Units

This determines whether trip information is displayed in Metric or Standard units.

Gauge 1,2,3

These determine the gauges shown on the Drive Screen.

Scan Preferences Screen

Press PROG a third time to activate the Scan Preferences Screen. A list of gauges available in the Scan Screen will appear, with their settings for the Watch and Scan modes. Each gauge may be set to Watch or Hide, and Scan or Skip. A gauge set to Hide will not appear in the Watch mode at all, while if it set to Watch it will be accessible in the Watch mode by turning the knob. A gauge set to Scan will appear periodically in the Scan mode. Typically most gauges should be set to Watch, but only the most important should be set to Scan.

SCAN PREFERENCES			
ACCEL POS	HIDE	SKIP	ENGLISH
INLET TEMP	HIDE	SKIP	ENGLISH
12V SYSTEM	WATCH	SKIP	ENGLISH
CRUISE SPEED	WATCH	SKIP	ENGLISH
DST TO EMPTY	HIDE	SKIP	ENGLISH
COOLANT TEMP	WATCH	SCAN	ENGLISH
ENGINE LOAD	WATCH	SKIP	ENGLISH
DELIVR PRSSR	HIDE	SKIP	ENGLISH
INJCTN PRSSR	WATCH	SKIP	ENGLISH

The third column allows you to select English or Metric units. Each gauge can be set independently of the others.

Turn the KNOB to select a particular item - there are more than can fit on the screen at one time. Press the KNOB to change the values.

Automatic Sensor Detection

No engine supports all the gauge functions the VMS is capable of displaying. The VMS is capable of querying the engine to determine its capabilities, and it can automatically set the unsupported gauges to "Hide". To activate the sensor detector, let the VMS run for at least ten seconds while this screen is activated, and press CLEAR. All features supported by the engine should be set to Watch and Scan, while others are set to Hide and Skip.

Scan Screen

The Scan Screen provides the equivalent of over a dozen gauges in one package. The specific gauges depend on the engine model and configuration, and additional items may be available if additional sensors are installed.

Press SCAN to activate the Scan Screen. Near the top right corner is an icon that indicates the screen "mode", Scan or Watch. An arrow icon indicates Scan, a stop sign indicates Watch.

Note: For the Scan Screen to work properly, the correct engine must be selected. The engine type is set in the VMS Preferences Screen, described on page 11.

Scan Mode

In Scan Mode, the VMS will cycle from gauge to gauge, displaying each one for a set amount of time. You can program the gauges provided in this mode, and the amount of time spent showing each one, using the VMS and Scan Preference Screens. (See those sections for details.)

Each gauge can be displayed in two ways. The Graphic gauge shows the gauge value and two graphs. At the bottom of the screen is a simple bar graph indicating the current value. To the right is a histogram which shows how the value has fluctuated over the last minute. A flat graph indicates that the value is stable, and is not changing significantly.

The Numeric gauge displays just the value as a large number. This gauge is easier to read than the Graphic gauge, but it doesn't provide the histogram showing fluctuations.

Press the KNOB to change a particular gauge from Graphic to Numeric or back. Each gauge may be set independently, and the VMS keeps the setting in its permanent memory.

Press SCAN to enter Watch Mode. The VMS will stop scanning, and stay on the current gauge.

Turn the KNOB to dial in a particular gauge. The unit will automatically enter Watch Mode.

Individual gauges may be set to display metric values using the Scan Program screen described in a later section.

Watch Mode

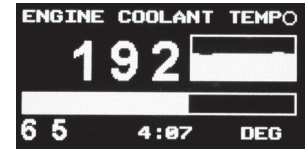
In Watch Mode, the gauge will not change. This is useful when you are keenly interested in one particular gauge - such as the Coolant Temperature during a very hot day. You can change the gauge by dialing with the KNOB. The gauges are arranged in alphabetical order.

Press SCAN to resume Scan Mode.

Press the KNOB to change the gauge from Graphic to Numeric or back.

Gauge Items

All gauge items are obtained directly from the engine and transmission, and are



digitally accurate. In general, the VMS is much more reliable and accurate than the conventional dash gauges.

Most gauges are self-explanatory. Some, such as Accelerator Position, are useful only in certain troubleshooting situations. Some duplicate the dash gauges, but are more accurate and precise than the conventional gauge. Others are truly unique.

Engine Coolant Temperature

When driving in hot weather and working the engine hard, we recommend using this gauge in Graphic Mode. Most engine experts agree that you should start “managing” your temperature when it reaches about 210 degrees. From that point on your goal should be to stabilize the temperature before it reaches 225 or higher. In Graphic mode, a flat histogram indicates the temperature is stable. (Engines models vary somewhat in their tolerance for heat. Check your engine manual for details on your engine.)

Horsepower and Torque

These gauges show the calculated engine output. The VMS cannot compensate for fans, belts, and other parasitic loads on the engine, and this value may be thrown off by a malfunction in the engine. But it does provide an effective indicator of engine performance. Of the two, Torque is more indicative of motive force and efficiency. When working the engine, try to maximize your torque output.

At very low RPMS these values cannot be accurately calculated. Under these conditions both of these gauges will read zero.

Rolling MPG, Instantaneous MPG, and Power Factor

Instantaneous MPG indicates the fuel economy calculated on a moment-by-moment basis. It generally fluctuates too rapidly to be useful for guiding your driving, so the VMS calculates a Rolling MPG. Rolling MPG considers fuel consumption over roughly a one minute time interval, while ignoring very low speed driving and idling. It provides a very good indication of your current fuel economy, and is a useful tool for adjusting your driving to get the best fuel economy. Power Factor indicates the efficiency with which the engine is converting fuel to power. Although it is a good indicator of pure engine efficiency, it is generally not correlated to overall vehicle efficiency, since it does not consider air resistance, rolling resistance, and parasitic loads.

Unsupported Gauges and Zero Readings

Not all engines support all gauges, and some gauges require additional sensors or accessories that may be available as aftermarket installations. These gauges will show a reading of Zero all the time. These gauges can be removed by using the Scan Preference Screen described in a later section, and setting them to “Hide”.

Rarely a bug in the engine ECM may cause a zero reading in an important gauge such as Turbo Boost Pressure. This can generally be fixed by an engine technician. Consult your engine manufacturer or SilverLeaf Electronics if you have any questions about whether your engine supports a particular gauge.

Programming Screens

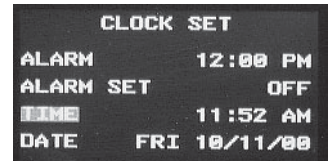
Clock Set Screen

Press **PROG** to activate the Clock Set Screen. This screen allows you to set the date and time, and set and activate the alarm clock.

To set the time, turn the **KNOB** until “**TIME**” is highlighted. Press the **KNOB**, then turn the **KNOB** to adjust the hour. Press the **KNOB**, then turn it to adjust the minute. Then press it and turn it to adjust the AM/PM value. Press the **KNOB** a final time to return to the “**TIME**” position.

Setting the date follows exactly the same process, as does setting the alarm clock. To use the alarm clock you must set the alarm time and also set the “**ALARM SET**” value to “**SET**”.

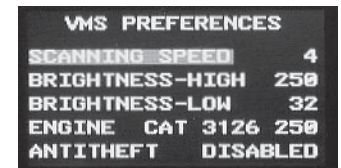
The alarm clock will sound at the appropriate time, but obviously the VMS must be on at that moment. If the VMS is turned off and on again, the alarm clock will remember its status and will sound at its appointed time. The alarm will sound until any key is pressed on the VMS. After sounding, the Alarm Set value will return to OFF.



VMS Preferences Screen

Press **PROG** again to activate the VMS Preferences Screen. Here is where a variety of parameters can be adjusted to match your coach configuration and personal preferences.

Use the **KNOB** to adjust each item. Turn the knob to highlight the parameter name, press the **KNOB**, and turn the **KNOB** again to adjust the value. Press the **KNOB** again to return to the parameter name.



Scanning Speed

This is the number of seconds that the Scan Screen will spend on each gauge when in Scan Mode. A lower number will make it scan faster.

Brightness - High and Low

This is the display luminance, on a scale from zero to 255. The High value indicates the brightness when the headlights are *off* - presumably during the day. The Low brightness indicates the brightness with the headlights *on*. By default the Low brightness is set much lower than the High value, thus the VMS will dim itself when the headlights are turned on. If you drive with the light on during the day, you may want to adjust the Low value higher.

Engine

This indicates the engine make and model. This must be set correctly to allow all features to function properly.

Warning: Chassis service items and intervals can change. We attempt to make this service information thorough and accurate, but the VMS is not a replacement for your manuals. Please consult your engine, transmission, chassis, and other manuals for up-to-date information on your vehicle.

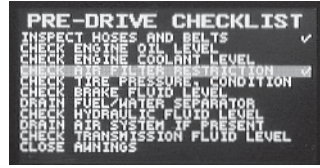
Pre-Drive Checklist

Press INFO again to activate the Pre-Drive Checklist. This screen shows a long list of items that are occasionally forgotten by drivers before moving the coach. It can be used like a pilot's "pre-flight" checklist.

Turn the KNOB to scroll through the list. The initial list contains over thirty items.

Press the KNOB to indicate that the item has been performed. The VMS put a checkmark by the item. If you leave this screen and return, the checkmark will still be there. But if you turn the VMS off, the checkmark will disappear.

Press CLEAR to remove an item from the list. The item will remain off the list even after the VMS has been turned off. This allows you to edit the list to your personal liking. The only way to bring the item back onto the list is to clear every item off the list. The VMS will then put every item back on the list, returning the list to its original condition.

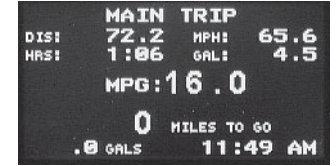


Trip Screens

Press TRIP to activate the Main Trip Screen. Press TRIP again to activate the Alternate Trip Screen. Press TRIP a third time to activate the Trip History Screen. You can convert these screens to metric units using the VMS Settings Screen.

Main Trip Screen

The top portion of the screen show the Distance travelled during this "trip", the number of hours and minutes the engine was running, the average speed, and the gallons of fuel used. The hours and MPH values are based on engine run time, not the total elapsed time. Sitting and idling the engine will affect these values, but sitting with the engine off will not.



The center of the screen shows the Miles Per Gallon achieved on this trip.

Trip Planning

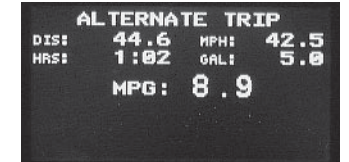
The bottom portion of the screen is dedicated to the Trip Planning feature. Use the knob to set the expected number of miles you plan to travel today. The VMS will slowly count down as you drive, and calculate the gallons of fuel required to reach your destination, and the estimated time of arrival. These will constantly be recalculated as you drive, and are based on your average fuel economy and speed for this particular trip.

Press CLEAR to start a new "trip". All values on the screen will reset to zero. The information on previous trip will be stored and is available on the Trip History Screen. (Trips of less than .2 miles are not saved.)

Turn the KNOB to adjust the Miles-To-Go. Press the KNOB to add 100 to the Miles-To-Go.

Alternate Trip Screen

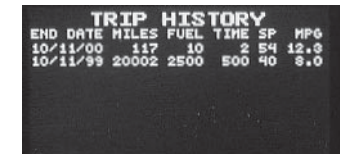
The Alternate Trip Screen is identical to the Main Trip Screen, with two differences. First, there is no Miles-To-Go feature on this screen. Second, trips on this screen are *not* saved in the Trip History. This screen can be used to provide a "grand total", or for a tank-by-tank tracking of fuel. Clearing this trip has no effect on the Main Trip.



Press CLEAR to start a new "trip". All values on the screen will reset to zero.

Trip History

The VMS stores up to over 4000 trips as they are cleared from the Main Trip Screen. They can be viewed on this screen. The screen displays the date the trip *ended*, the miles travelled, fuel used, engine running time, average speed, and fuel economy (MPG). The most recent trip will be on the top, with previous trips following, sorted by date.



Turn the KNOB to scroll through the history.

Diagnostic Screens

Whenever the engine detects a problem, it activates the Check Engine light on the dashboard. At the same time it transmits a series of codes which a mechanic can pick up using his "scan tool". The VMS also picks up those codes, stores them, and translates them for you to read. You can display this information whenever the Check Engine light comes on by pressing **DIAG** and activating the Engine Diagnostics Screen.

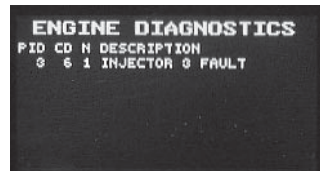
Note that the VMS can only report what the engine transmits. Problems that are external to the engine may not show up, or may show up in an indirect form. For example, a bad alternator will likely not be immediately detected. But eventually a low voltage condition will probably be detected and displayed. Internal engine problems are much easier to detect, and are generally very precise.

Press **DIAG** to activate the Engine Diagnostic Screen, which shows current engine problems. Press **DIAG** again to activate the Engine History Screen, which displays a history of engine problems.

Engine Diagnostic Screen

This screen shows any diagnostic messages received since the VMS was turned on. The "scan code" is displayed, along with a plain language interpretation of the code. The VMS does not have to be on this screen to receive and store diagnostic messages. You can activate this screen at any time to see all codes that have been generated since the VMS was turned on. The unit can store up to six codes at a time.

Press **CLEAR** to clear out the list of codes. If a problem is still occurring, it should reappear in a few moments.



Engine History

This screen shows every diagnostic message ever received by the VMS. It also shows the date, odometer reading, engine rpms, engine load, and temperature at the time the fault first occurred. The VMS only stores the first occurrence of each message, unless the codes were cleared on the Engine Diagnostic Screen. The code will be recorded each time the problem reoccurs after having been cleared on that screen.

The list will display the most recent messages at the top. The history can be cleared using a hidden screen. See the appendix.

Use the **Knob** to scroll through the history.

Information Screens

Engine Status

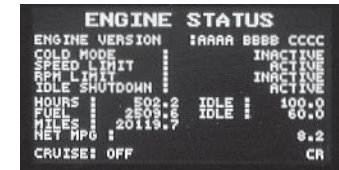
Pressing **INFO** activates the Engine Status screen. This screen may vary slightly depending on the engine installed. The Caterpillar screen is shown here.

For Cummins engines, the top portion of the screen will indicate whether certain engine parameters have reached a yellow or red condition. Items in these zones are highlighted. If none of these are out of their normal range, the "OK" at top center will be highlighted.

Included on this screen is data on the engine hours, fuel, miles, and idle time. These values are from the engine's internal memory, and are accurate from the moment the engine was built, regardless of when the engine or VMS was installed. The miles value does meet the requirements as an odometer for reporting purposes when selling the vehicle.

The Net MPG value is calculated from the total engine miles and hours, less idle hours. Note that young engines generally perform less efficiently - a diesel engine typically takes about 10,000 miles to "break in".

The Cruise Control Status indicator at the bottom of the screen shows the status of the various inputs into the cruise control system. It is useful for troubleshooting.



Maintenance Manager

Pressing **INFO** a second time activates the Maintenance Manager. The VMS has been programmed with maintenance information on a wide variety of chassis. The maintenance items have been organized into about ten groups, such as Radiator Service, Annual Lube/Filter, and Key Inspections.

You can use the VMS to indicate when you have each of these groups performed, and the VMS will calculate when each group is due again.

Turn the **Knob** to select a particular service group. The items in the group will be displayed, along with the date and odometer reading from the last time the service was performed, and when the service is due to be performed again. A face will show whether the item is due.

Press **CLEAR** to indicate that the displayed service group has been performed. The display should update to show the current date and odometer reading.

Press the **Knob** to manually adjust the date and odometer reading. You can use the **Knob** to adjust the month, date, year, and odometer reading for each item. Thus if you fail to press **CLEAR** at the time of service, you can enter the information later.

This feature is not intended to replace your service records. It is always a good idea to keep your service receipts for the protection of your warranties and for the benefit of future owners should you sell your coach.

