

Pilot's Guide

Engine Data Management

EDM-900

Experimental and TSO

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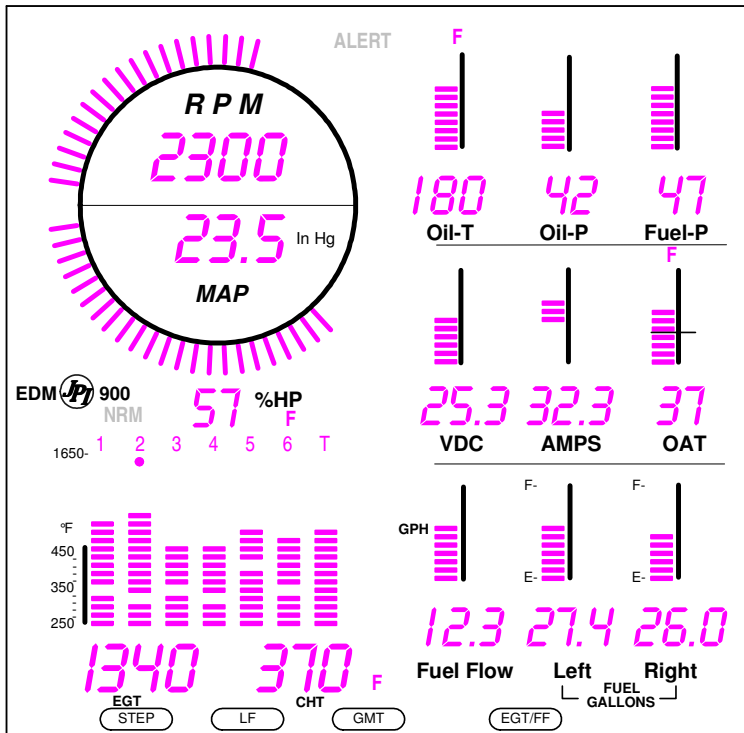
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Product Features Chart

Hands-free, automatic scanning
LeanFind™ finds the first and last cylinder to peak with true peak detect—
eliminates false peaks
Displays both leaned temperature below peak and peak
Battery voltage with alarm
Amperes (load or charge/discharge meter)
Programmable alarm limits
Exhaust Gas Temperatures (EGTs) to stable 1°F resolution
DIF low to high EGT with alarm
Shock cooling monitored on *every* cylinder
User selectable scan indexing rate
Fast response probes
Non-volatile long term memory
 Records and stores data up to 30 hours
 Post-flight data retrieval
 Data retrieval software
Oil pressure
Oil temperature
Turbine inlet temperature (optional)
Outside air temperature
Compressor discharge temperature (optional)
Carburetor temperature or induction temperature (optional)
Fuel pressure (optional)
Fuel level
Fuel Flow
 Solid-state rotor fuel flow transducer
 Fuel quantity in gallons, kilograms, liters, or pounds
 Low fuel quantity alarm
 Low fuel time alarm
 GPS interface
 Instantaneous fuel flow rate
 Total amount of fuel consumed
 Total fuel remaining
 Time to empty at the current fuel flow rate
RPM and manifold pressure
Automatically calculates percent horsepower
History of extreme values during previous flight
Hobbs® timer
Optional remote auxiliary display (RAD)

Section 1 - Getting Started

This is a summary of the basic operation. The last two pages of this manual are a Quick Reference Guide describing how to perform the most commonly used functions. Detailed descriptions of all operations appear later in this Pilot's Guide.

To change the factory settings of your EDM-900 for first time use, see Section 9 - First Time Setup and Customization on page 29 and Section 10 - Custom Programming on page 35. You will want to do this to change the fuel tank capacity, K-factor, alarm limits, display indexing rate, or other custom settings.

The word *tap* is used to denote pressing a button *momentarily*. The word *hold* is used to denote pressing and *holding a button for five seconds or longer*.

Buttons

Buttons, Front Panel

Four operating buttons control all functions of the EDM.



The term *tap* is used to denote pressing a button momentarily. The term *hold* is used to denote pressing and holding a button for five seconds or longer.

STEP Button

- In the Automatic mode, *tapping* the STEP button will stop and change to the Manual mode. Then each *tap* of the STEP button will display the next measurement in the sequence. Holding the STEP button will continuously sequence in reverse order.
- In the LeanFind mode *tapping* the STEP button will terminate the LeanFind mode and change to the Automatic mode.

- In the Program mode *tapping* the STEP button will advance to the next item.

LF Button

- In Automatic or Manual modes, *tapping* the LF button will change to the LeanFind mode.
- In the LF mode *holding* the LF button after peak EGT is found will display peak EGT.

STEP and LF Buttons

- Holding both the STEP and LF buttons simultaneously for five seconds will enter the pilot programming mode.
- Holding both the STEP and LF buttons simultaneously for five seconds after entering LeanFind mode but before beginning to lean will toggle between leaning “rich of peak” and “lean of peak.”
- Tapping both the STEP and LF buttons simultaneously in Manual mode toggles to *include* or *exclude* the displayed measurement from the Automatic mode (except USED). No measurements are excluded from the Manual mode.

DIM Button

- The DIM button lets you fine tune the automatic brightness sensor.
- Holding the DIM button maximizes display brightness.
- Tapping the DIM button reduces the brightness in five total steps.

EGT/FF Button

- In the automatic scan, selects displaying temperatures, fuel flow measurements or both.

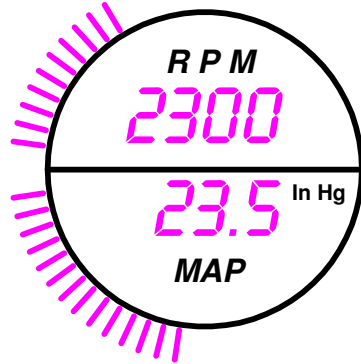
Fueling the Aircraft

1. At power up you will see *FILLPN*. Tap the LF button to see *FILL 75* (or whatever the capacity of your tanks or tabs are).
2. With auxiliary tanks, tap LF again to see *FILL 100* (or whatever the capacity of your tanks-plus-auxiliary or full tanks are).
3. Tap the STEP button to accept the displayed value and exit.

See page 24 for a more detailed description.

Display Screen

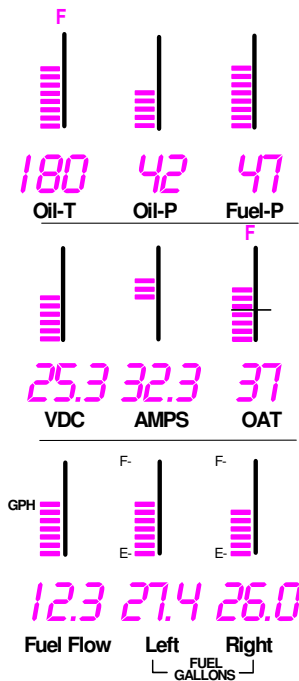
The display screen is arranged into three sections. The top left is the *RPM* and *MAP* section. The bottom left is the *Scanner®* section. And the right side is the *Bar Graphs* section.



RPM and MAP Section Display

The upper semicircular bar graph shows the RPM (Revolutions per Minute) and the lower semicircular bar graph shows the MAP (Manifold Pressure). These are shown both graphically and digitally. Power settings entering red line are displayed by flashing the ALERT icon and flashing a message on the bottom left *Scanner®* section of the screen.

Percent horsepower is displayed digitally underneath the MAP arc.



Bar Graphs Section Display

The Bar Graphs section contains nine dedicated 12 segment bar graphs with digital display. Full scale is red line.

The default displays are (left to right, top to bottom):

- Oil temperature
- Oil pressure
- Fuel pressure
- Bus voltage
- Amps load or charge/discharge
- Outside air temperature (or owner selectable *)
- Fuel flow, units per hour
- Left fuel quantity (default is USD or owner selectable *)
- Right fuel quantity (default is CLD or owner selectable *)

* An interchangeable screen overlay is provided with no labels for where the OAT and left and right fuel levels are. These 3 graphs can be customized. See Customizing the Bar Graph Display on page 39.

Basic Scanner® Operation

The EDM-900 Scanner® section is on the lower left side of the screen. It will go into Automatic scan mode a few minutes after power up. You don't have to touch any buttons.

To get into Manual scan mode, tap STEP.

To get into Automatic scan mode, tap LF and then tap STEP.

The EDM-900 will display the following measurements in the Scanner® section—in the order top to bottom—depending on the options installed on your instrument.



Display Discription

Display	Discription
1340 376	EGT left, CHT right
1370 TIT	Turbine Inlet Temperature
-30 CLD	Rate of shock cooling
80 DIF	Difference between hottest and coldest EGT
300 CDT	Compressor discharge option
125 IAT	Induction air option
132 C-1	Compressor minus induction difference

<i>-22 CRB</i>	Carburetor option
<i>37.2 REM</i>	Fuel remaining
<i>25.9 REQ</i>	Fuel required to wpt (GPS connected)
<i>11.3 RES</i>	Fuel reserve at wpt (GPS connected)
<i>13.0 MPG</i>	Miles per gallon (GPS connected)
<i>02.45 H.M</i>	Fuel time to empty
<i>38 USD</i>	Fuel used since fill or reset

EGT

EGT is shown on the first four or six Scanner® bar graph columns. These are labeled 1 through 4 or 1 through 6 above the columns. The lower limit of the graph range represents half of the TIT alarm red line (default is 825°F) and the top of the range represents alarm red line (default 1650°F). The numerical value of the EGT is shown on the left side of the digital display for each cylinder when there is a dot under one of the cylinder numbers above the column—cylinder 2 in the example.

CHT

The Cylinder Head Temperature—CHT—is represented by a missing segment in the Scanner® bar graph column. If the EGT is too low for there to be a missing segment, the CHT is represented by a lone segment in that column. The scale is shown to the left side of the columns. The numerical value of the CHT is shown on the right side of the digital display for each cylinder when there is a dot under one of the cylinder numbers above the column.

TIT display

If you have TIT, it will be shown on the right-most Scanner® bar graph column and will be labeled with a T above it.

LeanFind

Simply pre-lean, tap the LF button and begin leaning. The EDM-900 will assist you in finding the first cylinder to peak. See page 11 for a more detailed description of leaning.

1. Establish cruise at approximately 65 to 75% power.
2. Pre-lean the mixture to 50°F estimated rich of peak EGT on any cylinder.

3. Wait about 30 to 60 seconds.
4. Tap the LF button.
5. Lean the mixture aggressively—approx. 10°/second *without stopping*—while observing the display. When there is a 15°F rise in EGT, LeanFind mode becomes active, indicated by the dot flashing above the hottest EGT column.
6. Stop leaning when a column begins flashing. You will see *LEANEST* for two seconds, followed by—for example—*1520 13.8*. The left number is the current temperature of the first EGT to peak and the right number is the current fuel flow.
7. If you hold LF, peak EGT will be displayed while the LF button is held down. Release the button for the next step.
8. Slowly enrich the mixture. The temperature will increase, returning to peak. Stop enriching at the desired EGT.

Section 2 - Interpreting Data

Operation for each Phase of Flight



Engine Run-Up (you can add this to your run-up checklist.)

Suggested setup:

Set engine to runup RPM

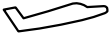
Manual mode

Verify:

- uniform rise of about 50°F in all EGTs in single magneto operation.
- uniform rise of EGTs with application of the mixture control.

Be alert for:

- unusually low voltage (less than nominal battery voltage)
- cold OIL and normal oil pressure
- abnormally high CHT
- large drop in EGT on one cylinder in single magneto operation—may be fouled spark plug.



Take-Off, Climb, and Full Throttle Operations

Suggested setup:

- Automatic mode

Verify:

- EGTs and CHTs consistent with past climbs. EGTs should be in the 1100 to 1300°F range (100° to 300°F cooler than cruise) due to fuel cooling.

Be alert for:

- high EGT in one cylinder, 300°F above the others may indicate plugged injector or leaking manifold gasket on a carbureted engine.

At high density altitude an overly rich mixture can significantly reduce engine power.



Cruise

After the engine is warmed up, use LeanFind to lean the mixture.

Suggested setup:

- Automatic mode

Be alert for:

- uneven EGTs (injected engines). Make fine adjustments to throttle, then RPM, then mixture to level the display columns.
- abnormal patterns of EGTs and CHT. (see “Engine Diagnosis Chart” on page 9).



Descent

Suggested setup:

- Manual mode

Be alert for:

- CLD: shock cooling alarm is set to -60°F. Average cool rates of -40°F/minute to -60°F/minute are normal, depending on the engine size.

Typical Normal Measurements

The following chart lists typical *normal* measurement values that you will observe for most general aircraft engines. Your particular engine's ranges may not fall within these values.








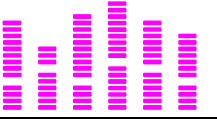

<i>Measurement</i>	<i>Normal range</i>	<i>Comments</i>
EGTs in Cruise	1350°F 1550°F	<ul style="list-style-type: none"> • under 200 HP engines • high performance engines • (EGT should drop 200°F when full throttle is applied)
EGT span (DIF)	70 to 90°F 120 to 150°F	<ul style="list-style-type: none"> • fuel injected engines • carbureted engines
TIT	1600°F average	<ul style="list-style-type: none"> • 100° higher than EGT
CHTs	350°F (OAT 60°F) 410°F	<ul style="list-style-type: none"> • normally aspirated engines • Turbocharged engines
CHT span	50 to 70°F	<ul style="list-style-type: none"> • 100° with gasket probes
OIL T	200°F	<ul style="list-style-type: none"> • oil cooler thermostat opens at 180°F
OIL P	30 to 60 psi	<ul style="list-style-type: none"> • varies with aircraft type
FUEL P	1 to 18 psi	<ul style="list-style-type: none"> • varies with aircraft type
Shock cooling*	-40°/minute -55°/minute -200°/minute	<ul style="list-style-type: none"> • tightly cowled engines • Bonanza • helicopter

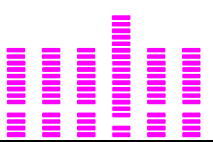


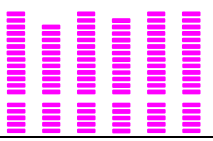

* Maintain a cooling rate magnitude of less than -60°/minute. You will find that the cylinder with the greatest shock cooling will shift from front cylinders (during climb out) to the rear cylinders (during descent).


If one CHT is reading 20° to 50° above or below the others, this may be due to that cylinder having a spark plug gasket probe instead of a bayonet probe. This is necessary because the aircraft's factory original CHT probe is occupying the socket in the cylinder head rather than the EDM. This is normal. If the discrepancy is greater, be sure the spark plug gasket probe is mounted on the *top* spark plug. An adapter probe is available to occupy the same socket as the factory original probe. Contact your dealer.

Engine Diagnosis Chart

The following chart will help you diagnose engine problems in your aircraft.

<i>Display</i>	<i>Symptom</i>	<i>Probable Cause</i>	<i>Recommended Action</i>
	TIT ~100° higher than EGTs	This is normal	
	75° to 100° EGT rise for one cylinder during flight	Spark plug not firing due to fouling, faulty plug, wire or distributor.	Enrich mixture to return EGT to normal. Have plugs checked.
	EGT Increase or decrease after ignition system maintenance	Improper timing: high EGT → retarded ignition; low EGT → advanced ignition.	Check EGT for each magneto to determine any uneven timing.
	No EGT for one cylinder. Engine rough	Stuck valve. Other cylinders are okay.	Have valve train checked.
	No EGT for one cylinder; <i>no digital EGT</i>	Failed probe or failed wire harness.	Swap probes to determine if probe or wire harness is bad.
	Decrease in EGT for one cylinder	Intake valve not opening fully; faulty valve lifter.	Have valve lifter or rocker arm checked.
	Increase in DIF at low RPM	Low compression (blow by) in cylinder	Check compression.
	EGT and CHT not uniform	Dirty fuel injectors or fouled plugs. Normal for carbureted engines	Check injectors, plugs.
	Decrease in EGT for all cylinders	Decrease in airflow into the induction system. Carb or induction ice.	Check for change in manifold pressure.

<i>Display</i>	<i>Symptom</i>	<i>Probable Cause</i>	<i>Recommended Action</i>
	Slow rise in EGT. Low CHT	Burned exhaust valve. CHT is low due to low power output.	Have compression checked.
	High CHT on cylinders on one side of engine	Obstruction under cowling.	Check for improper installed baffling, cowl flap misalignment or bird nests.
	Rapid rise in CHT of one cylinder	Detonation.	Reduce power.
	Sudden off scale rise for any or all cylinders	Pre-ignition or failed probe	Full rich and reduce power. Check probe
(no picture)	Loss of peak EGT	Poor ignition or vapor in fuel injection system.	Have magneto tested.
	Decrease in peak or flat EGT response to leaning process	Detonation. Usually the result of 80 Octane fuel in 100 Octane engine.	Enrich mixture, reduce power and relean mixture. Repeat to find power setting where normal peak is obtained or run rich.
	Below 10,000 ft. full throttle causes EGTs to rise	Weak or defective mechanical fuel pump.	Apply booster pump. If EGTs drop, replace fuel pump.

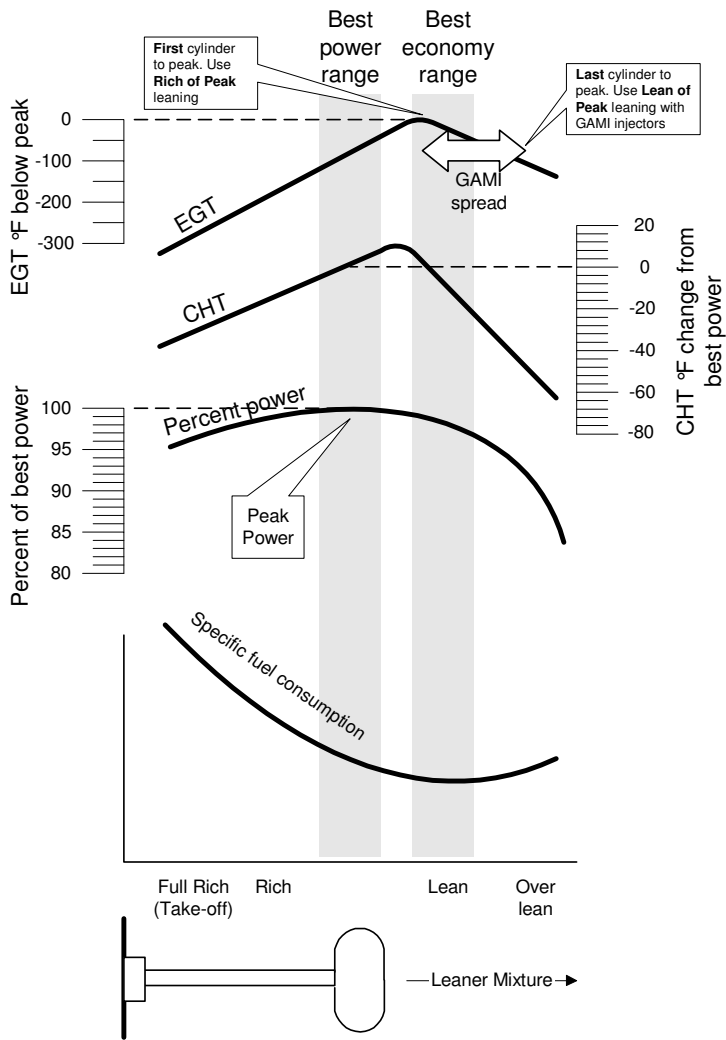
<i>Display</i>	<i>Symptom</i>	<i>Probable Cause</i>	<i>Recommended Action</i>
	CHT more than 500°, EGT normal. Adjacent EGT may be low	Leaking exhaust gasket blowing on CHT probe.	Look for white powder around cylinder to determine leak area.
	Large DIF at low RPM	Blow by in cylinder rings	Check compression

Section 3 - LeanFind

JPI's EDM-900 provides two methods of leaning: lean rich of peak (*LEAN R*) or lean of peak (*LEAN L*). The standard method is to lean about 20° rich of peak. With the advent of GAMI injectors it is now possible to set the mixture lean of peak—saving fuel and running the engine cooler. This manual primarily describes the rich of peak method, and provides the procedure for the lean of peak method. The **default** method is set to **rich of peak**. These two methods are described and depicted in the following pages.

LeanFind Mode—Leaning "Rich of Peak" Method

Simply pre-lean, tap the **LF** button and begin leaning. Upon reaching cruise configuration, you will use the LeanFind mode to identify the first cylinder to reach peak EGT.



LeanFind Procedure—Step-by-Step

	Procedure	Example	Comments
1	Establish cruise at approx. 65 to 75% power.		
2	Pre-lean the mixture to 50°F estimated rich of peak EGT on any cylinder: _____ °	<i>1490 37.0</i>	*For your <i>first flight</i> with the EDM, use the method shown below.
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	<i>LEAN R</i>	Start LeanFind. (Optionally, after starting Leanfind, to change to “lean of peak” method, hold both STEP and LF simultaneously.)
5	Lean the mixture aggressively—approximately 10°/second <i>without pausing</i> —while observing the display. When there is a 15°F rise in EGT, LeanFind mode becomes active.	<i>1520 13.8</i>	Flashing cylinder DOT indicates hottest cylinder and that LeanFind mode is active.
6	Stop leaning when a column begins flashing. You will see <i>LEANEST</i> for two seconds, followed by:	<i>1545 12.4</i>	Flashing cylinder dot & column indicates leanest cylinder. Due to thermal inertia this will usually be about -15°F lean of peak.
7	If you hold LF, peak EGT will be displayed while the LF button is held down.	<i>1560 PK</i>	Captured peak EGT value is displayed.
8	Slowly enrich the mixture. The temperature will increase, returning to peak. Stop enriching at the desired EGT. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">Best economy Best power</div> <div style="text-align: center;"> <i>1560 13.8</i> <i>1460 14.2</i> </div> </div>	<ul style="list-style-type: none"> • Peak EGT for best economy • 100° rich of peak for best power 	
9	If you have chosen the Lean of Peak method, at step 5 continue leaning until the last cylinder has peaked. See page 16 for Lean of Peak.	<i>-15 12.3</i>	Only for GAMI injected engines. When each cylinder reaches peak, the cylinder number will begin flashing.

***Determining the pre-lean value:** while in cruise at under 65 percent power, choose any cylinder and lean that cylinder to peak EGT in the

Manual mode or to engine roughness, whichever occurs first. Note the peak, subtract 50° and write the resulting number in the space provided in step 2.

LeanFind Procedure—Detailed Explanation

Lycoming and Continental engines have established specific restrictions on leaning that must be followed, such as percentage of power, climb leaning, and TIT limits. Lycoming recommends operation at peak EGT for power settings of 75% or lower, while Continental recommends operation at peak EGT for power settings of 65% or lower. This guide is not meant to supersede any specific recommendations of the engine manufacturer or airframe manufacturer.

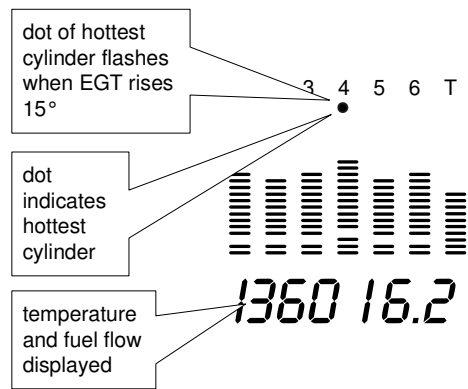
It is your responsibility to know your aircraft's limitations.

Pre-lean the mixture to about 50° below peak. After pre-leaning, wait for one minute for the temperatures to stabilize. Next, begin the leaning process by tapping the LF button. This tells the EDM-900 to begin looking for a 15° rise in EGT for any cylinder. Begin leaning the mixture aggressively *without pausing*. When a 15° rise occurs, eliminating false peaks, the LeanFind mode becomes activated shown when the cylinder dot above the column of the hottest cylinder begins flashing. **The LeanFind mode is not active until a cylinder dot is blinking.**

You will see numerical fuel flow rate during the leaning process on the right side of the Scanner® digital display, for example *12.4*. This allows you to observe the EGT rise and at the same time watch the fuel flow rate decrease.

To show the progress of the leaning process, the EDM-900 selects the hottest cylinder for reference in the digital display. In the example below, the *1360* is the current temperature of the hottest cylinder.

When LF is activated:



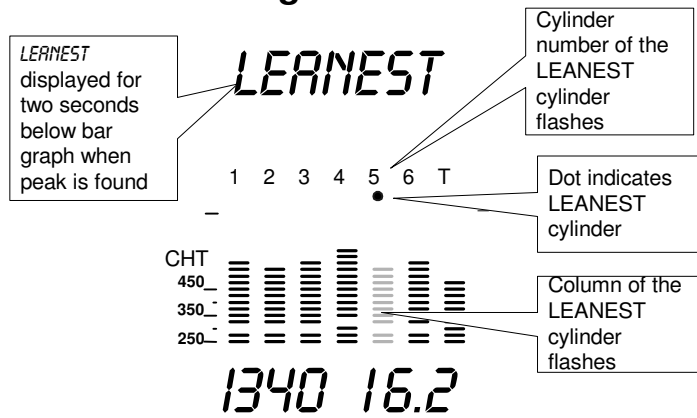
Continue leaning smoothly *without stopping*. With a vernier mixture control, turn the knob about a quarter turn every second. With a non-vernier or quadrant mixture control, lean slowly and smoothly about 1/16 inch every five seconds. Eventually, one cylinder will reach peak before any of the other cylinders. The EDM-900 will determine this automatically. *Notice that this cylinder is not necessarily the hottest.*

The EDM-900 will indicate success in finding a peak by displaying the words *LEANEST* for two seconds, followed by flashing the column and displaying the value of the EGT of the cylinder that peaked first. The current fuel flow rate will be displayed on the right side of the digital display. The flashing cylinder will be locked—or set—into the digital display during the remainder of the LeanFind procedure to allow you to set the final mixture. The peak EGT value is remembered by the EDM-900 and will be displayed as long as you hold the LF button.

You may now enrichen the mixture to operate at peak or continue enriching to 100° rich of peak, or a value of your choice, consistent with the procedures defined in your aircraft engine manual. If you tap the LF button, the digital display will toggle to show the EGT spread (delta EGT).

If you lean too much, the EGT will drop and the engine will be operating lean of peak.

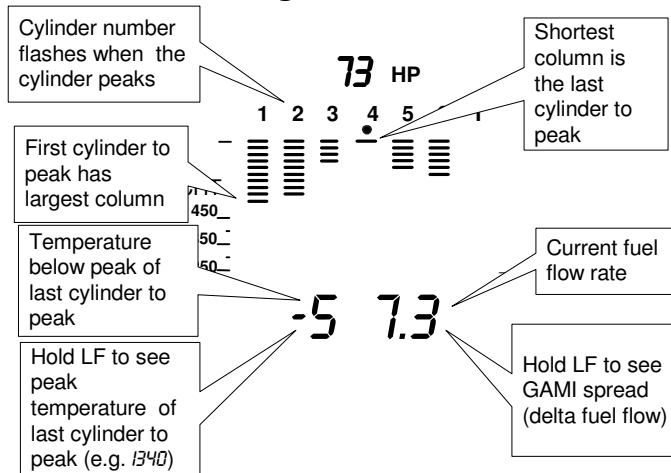
Leaning Rich of Peak



Lean Find Mode—"Lean of Peak" Method, GAMI injectors

To use the "lean of peak" method, tap LF and then immediately hold both STEP and LF until you see *LEAN L*. You may toggle back to *LEAN R* by holding both buttons again. Once you begin leaning (flashing dot) you cannot change leaning method. Upon power up, the EDM-900 always defaults to Rich of Peak mode.

Leaning Lean of Peak



In the “lean of peak” method the columns will **invert** with the first to peak progressing down from the top of the display. The inverted column scale is **5° per segment** below peak. As you continue to lean past peak the dot of the each successive cylinder will flash as it peaks. The peaks will be shown as an **inverted** Scanner® bar graph column; when the last cylinder peaks its column will flash. The analog display is an inverted bar graph showing where each cylinder peaked. When the LF button is held the display will show the delta fuel flow between the first and last to peak (GAMI Spread), as well as the richest peak EGT.

If you tap STEP, scanning will resume. Tapping LF will return to the inverted bar graph, which can be used for fine tuning. To begin the LeanFind procedure anew, tap LF a second time.

Turbocharged Engines

The leaning process for turbocharged engines is by reference to the first cylinder or TIT to reach peak. However, the TIT *factory red line* may limit the leaning process. TIT red line is generally 1650°F, and up to 1750°F in some installations. In the LeanFind mode the T column—TIT—is included in the procedure. If during leaning the TIT exceeds red line by less than 100° for less than one minute, the LeanFind procedure will continue to operate, allowing you to complete the leaning process. Otherwise the digital display will show, for example, *1650 TIT* and *TIT* will flash. You may notice that in some cases the TIT reads **100°F hotter than the hottest EGT**.

JPI Hastaloy-X probes produces faster response with long life and are more accurate than the massive factory installed probe. Therefore **JPI** probes may read as much as 100°F higher than the factory installed TIT probe. However, note that the engine was certified with the factory-installed TIT probe and gauge, and this gauge reading is the limiting factor when adjusting your engine.

Section 4 - Alarms

The EDM-900 has programmable alarms. When a measurement falls outside of its normal limits, the **ALERT** icon will flash and the digital display will flash with the value and abbreviation of the alarming item. If the condition triggering the alarm returns to within normal limits, the **ALERT** icon and the display will stop flashing.

If a remote auxiliary display is installed, it too will show the alarm condition and the label will flash:

77 REM

The pressure alarms become armed when any EGT exceeds 500°F or the RPM exceeds the Hobbs RPM enable value.

The DIF measurement is the difference between the hottest and coolest EGTs. DIF—or span—is the important measurement—and associated alarm—for monitoring the EGTs. See “Factory Set Default Limits” on page 35 for a list of the alarms and their factory default settings.

To disable alarm for 10 minutes: when an alarm is displayed, *tapping* the STEP button will temporarily disable the alarm digital indication for the next ten minutes.

To disable alarm for the remainder of the flight: when an alarm is displayed, *holding* the STEP button until the word *OFF* appears will disable that alarm digital indication for the remainder of the flight, or until the unit is turned off and on again..

Alarm Priority

If multiple alarms occur simultaneously, the higher priority alarm will temporarily “mask” the lower priority alarm(s). When an alarm occurs, note the cause of the alarm and tap the STEP button to clear the alarm indication so that you will be notified of any other alarm that might have occurred. The alarm priorities are as follows:

Highest priority	CHT	High CHT
	O-T	High OIL temperature
	O-P	Low oil pressure
	F-P	Low fuel pressure
	TIT	High TIT
	TK-LOW	Fuel tank low
	AIR	Low fuel endurance remaining
	REN	Low fuel quantity remaining
	F-P	High fuel pressure
	EGT	High EGT
	MAP	Overboost Manifold pressure
	DIF	Excessive EGT span
	CLD	Excessive CHT cooling rate
	RPM	RPM over redline
	O-T	Low oil temperature
	BUS	High battery voltage

Lowest priority

BUS	Low battery voltage
O-P	High oil pressure
AMP	Amps discharge
BAL	Fuel level out of balance

Pre-Ignition and Detonation

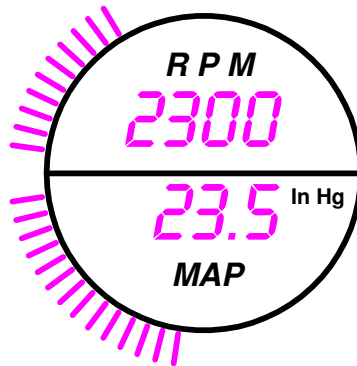
Combustion that is too rapid leads to detonation and possibly pre-ignition. *Detonation* is abnormally rapid combustion where the fuel-air mixture explodes instead of burning uniformly. It causes the EGT to decrease and the CHT to increase, and can appear during the leaning process. It occurs under high compression from fuel with too low an octane rating, or from avgas contaminated by jet fuel. Fuel additives, such as lead, boost the octane rating and slow down the combustion process, producing an even pressure to the piston.

Pre-ignition is caused by hot spots in the cylinder. Ignition occurs prior to the spark plug firing. The EDM-900 depicts pre-ignition as a sudden red line of the EGT on the analog display. This may occur in one or more cylinders. The affected cylinder column(s) will flash while the digital display will show an EGT higher than 2000°F. **At this temperature pre-ignition will destroy your engine in less than a minute unless you take immediate corrective action.**

Section 5 - Displays and Controls

The EDM-900 monitors engine temperatures and voltages, assists in adjusting the fuel/air mixture, and helps diagnose engine malfunctions. There are multiple components of the user interface:

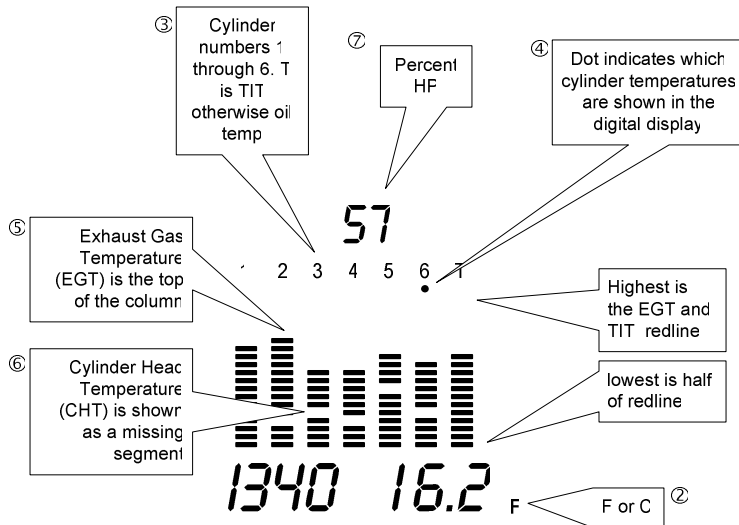
- RPM and MAP display in the upper left corner of the display
- Scanner® analog display including cylinder number and index dot in the lower left corner of the display
- Scanner® digital display for numeric readouts and messages at the bottom left
- Bar graph displays on the right half of the display
- Four front panel operating buttons below the bottom of the display.



RPM and MAP Displays

The upper left side of the display shows RPM above the MAP. The arcs represent the analog values. Below the arcs is shown the percent horsepower. The full scale RPM will be set to RPM redline and the lowest RPM scale will be 1600 RPM less than redline.

Scanner® Displays



Scanner® Analog Display

The lower left side of the display is the Scanner® with %HP above it.

The following is a description of the Scanner® analog display, from top to bottom. Numbers 2 through 7 in circles refer to features in the above diagram.

⓪Temperature Units (°F or °C)

- °F temperatures in the digital display are in Fahrenheit degrees.
- °C temperatures in the digital display are in Celsius degrees.

The bar graph scale remains the same. To change the display of engine temperatures see “Custom Program” on page 35.

ⓈⓈCylinder Numbers and Dot Index

A row of numbers 1 through 6 are the column labels for the analog display. The 1 through 6 are the cylinder numbers. If the TIT function is installed, it will be displayed in the last column under the letter T. A round dot under the numbers 1 through 6 indicates that particular column is shown numerically in the EGT and CHT digital display.

ⓈⓈ Scanner® Bar Graph EGT and CHT

Each bar in the Scanner® bar graph is composed of a column of segments. The total height of each column represents the **EGT** and the missing segment in the column represents the **CHT**.

- The EGT and TIT temperature resolutions depend on the programmed red line limits.
- CHT is displayed by a missing segment and should be interpreted as follows: a missing segment corresponds to the CHT in 25 F° increments, starting at 250°F at the bottom. In the example shown here, the CHT is 350°F. If the EGT Scanner® bar column is lower than the missing CHT segment, then the CHT will be indicated by a single isolated lighted segment.



The CHT missing segment display is the not affected by mode or view.

ⓈPercent HP

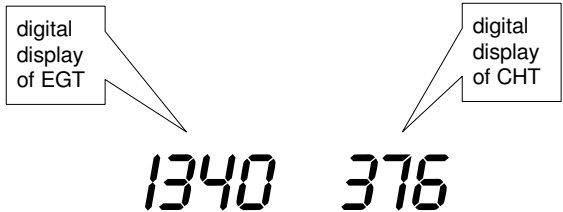
Displays percent of rated HP.

Scanner® Digital Display

Beneath the Scanner® bar graph is the alphanumeric display.

EGT and CHT

When the index dot is beneath a cylinder number, 1 through 6, the digital display shows the EGT on the left (four digits) and the CHT on the right (three digits).



Display Dimming

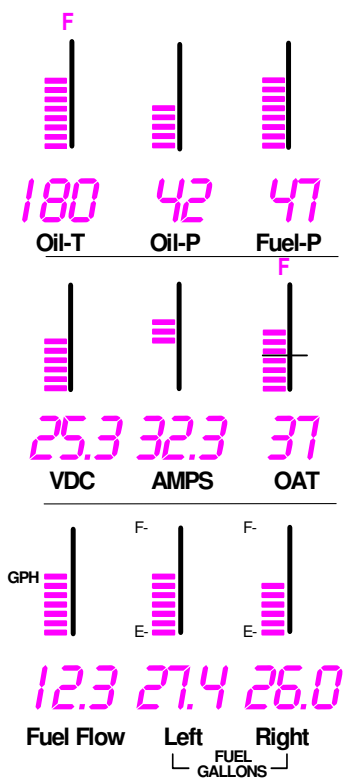
The entire display panel features automatic dimming. Allow ten seconds for the display to adjust to ambient lighting conditions.

Bar Graph Displays

There are nine bar graphs shown on the right side of the display. The default measurements displayed are (left to right, top to bottom):

- Oil temperature,
- Oil pressure,
- Fuel pressure,
- Bus voltage,
- Amps load or charge/discharge,
- OAT *,
- Fuel flow,
- Left tank fuel level *, and
- Right tank fuel level *.

* A interchangeable screen overlay is provided with no labels for where the OAT and left and right fuel levels are. These 3 graphs can be customized. See Customizing the Bar Graph Display on page 39.



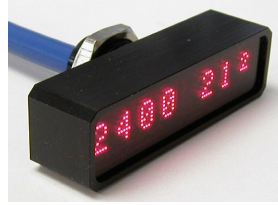
The top of the bar is redline and the bottom of the bar is zero for O-T, O-P, F-P, amps load. For amps charge/discharge the center of the bar is zero and the top and bottom is maximum charge and discharge, respectively, with discharge flashing. For volts the top of the bar is high

redline and the bottom of the bar is low redline. The top of the bar for FLW is 32 GPH. The white horizontal line indicates freezing for OAT (32° F or 0° C).

The ranges and alarm values are user settable and are described later in section Section 9 - First Time Setup and Customization on page 29.

Remote Auxiliary Display Option

The remote auxiliary display option is available for redundancy and to allow positioning a smaller display directly in front of the pilot. This auxiliary display will normally show RPM and MAP, but will display a flashing alarm message, duplicating the alarm indication of the Scanner® digital display, for example:



?? REM

Section 6 - Operation

Modes

The EDM-900 has four different operating modes: *Automatic*, *Manual*, *Program* and *LeanFind*. When you first turn on the power the EDM-900 starts in the Manual mode, but will enter the Automatic mode after a few minutes. The Automatic mode provides you with engine monitoring information for the majority of flight conditions. To adjust the mixture, use the LeanFind mode. And to display specific measurements, use the Manual mode. In both the Automatic and Manual modes the analog display shows a Scanner® bar graph of EGT and CHT for each cylinder and the TIT.

Automatic Mode

Just tap the LF button, then tap the STEP button. In the Automatic mode the EDM-900 displays the measurement sequence at a user-selected rate.

Individual measurements can be excluded from the *Automatic mode*: tap STEP to enter the Manual mode. Tap STEP repeatedly to index to the

measurement you want to exclude. Then tap both the STEP and LF buttons simultaneously. Excluded measurements display a decimal point before the measurement name. For example:

Included: *1540 CDT*

Excluded: *1540 .CDT*

Tapping the STEP and LF buttons simultaneously will toggle back and forth between *include* and *exclude*.

- Every time you turn on the EDM, all measurements are reset to be *included*.
- All installed measurements are always displayed in the Manual mode. Exclusion only applies to the Automatic mode.
- All measurements are checked for alarm conditions every second *regardless of their included or excluded status*.

Manual Mode

Just tap the STEP button. Use the Manual mode when you want to monitor one specific measurement such as shock cooling during descent, or a particular cylinder temperature during climbs. To change to the Manual mode, tap the STEP button once. Subsequent taps will index the digital display through the measurement sequence. To exit the Manual mode and return to the Automatic mode, tap the LF button and then tap the STEP button. You may disable the Automatic mode by setting “0” for scan rate.

LeanFind Mode

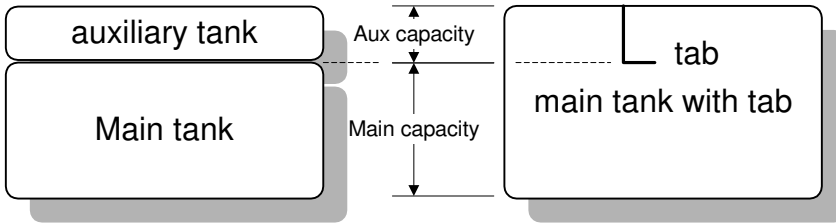
This was described in Section 3 - LeanFind, beginning on page 11.

Section 7 - Fuel Flow Features

Start Up Fuel

After initial self-test, you will be asked to inform the EDM-900 of start up fuel. The EDM-900 will display *FUEL* for one second, and then flash *FILLPN*. If your aircraft has tank fill tabs and no auxiliary tanks, you can use the auxiliary tank feature to select either filling to the tank tabs or topping the tank. The EDM-900 does not differentiate fuel flow between

the main and auxiliary tanks; it considers only *total* fuel in the aircraft. **During flight you may also inform the EDM-900 of startup fuel using the pilot program mode display if you forgot to do so at startup.** The EDM-900 will retroactively calculate the fuel consumed.



Refer to the column in the chart below corresponding to your fuel tank configuration. Tap the LF button to select one of the four following fueling choices on the left column of the chart.

LF to choose ↓ *Main tanks only, no tabs* *Main tanks with tabs* *Main & Auxiliary tanks*

<i>FILL?N</i>	Did not add any fuel since last shutdown.		
<i>FILL 75*</i>	Topped the main tanks.	Filled only to the tabs.	Topped the main tanks. If some additional fuel is added to the auxiliary tanks, you will input this next when <i>.0GAL</i> is displayed
<i>FILL 120*</i>	(not available)	Topped the main tanks.	Topped both the main and auxiliary tanks.
<i>FILL +</i>	Did not top, but added additional fuel to the aircraft, or removed fuel from the aircraft.		

* These values are customize for your aircraft.

Then tap the **STEP** button to complete the entry and advance to the Manual mode.

Adding Fuel and Auxiliary Tanks

If you added less than full fuel to only the main tanks then select **FILL +** and the next display will ask you how much you added: *.0 GAL* (or selected units). Hold the LF button to count up, tap the LF button to count down. The count up will stop at full tanks, since you cannot add more fuel than would top the tanks. If you added fuel to only the main

tanks, then input how much you added. If you topped the main tanks, but have some fuel remaining in the auxiliary tanks, input how much is now in the auxiliary tanks. You can “add” a negative amount of fuel if you remove fuel from the aircraft or wish to correct the total quantity of fuel on board.

Accumulate Total—Trip Total

You may either display total fuel *used* since the last time you informed the EDM-900 that the aircraft was refueled, or for an extended trip with multiple fuel stops. This selection affects only the *USD* measurement.

Resetting “USED”

Every time you inform the EDM-900 that the aircraft is refueled, the amount of fuel *used* is set to zero, unless the instrument is programmed to accumulate or you are in flight. The display of fuel *used* pertains only to the fuel used since the last time you informed the EDM-900 that the aircraft was refueled. **To reset to zero the amount of fuel used** at any point in time, manually STEP to display *USD* and hold both STEP and LF buttons for five seconds until the display shows *.0 USD*.

Fuel Management

For fuel calculations to be accurate, it is imperative that you inform the EDM-900 of the correct amount of fuel aboard the aircraft. Do not rely on fuel flow instruments to determine fuel levels in tanks. Refer to original fuel flow instrumentation for primary information

The EDM-900 Fuel Flow monitor uses a small, turbine transducer that measures the fuel flowing into the engine. Higher fuel flow causes the transducer turbine to rotate faster which generates a faster pulse rate. Because the transducer turbine generates thousands of pulses per gallon of fuel, it can measure the amount of fuel that flows into the engine with high resolution. Prior to engine start you inform the EDM-900 Fuel Flow monitor of the known quantity of fuel aboard, and it will keep track of all fuel delivered to the engine. **During flight you may also inform the EDM-900 of startup fuel using the pilot program mode display if you forgot to do so at start up.**

Measurement Scan

Listed below is the sequence, measurement description and example of the digital display.

<i>Measurement Description</i>	<i>Example</i>	<i>Comments</i>
EGT, CHT	<i>1340 376</i>	EGT, left, CHT, right. Dot indicates cylinder
TIT, Turbine Inlet Temperature	<i>1370 TIT</i>	Turbine #1
Shock Cooling	<i>-30 CLD</i>	Dot indicates fastest cooling cylinder
Compressor Discharge Temperature	<i>300 CDT</i>	Into intercooler
Induction Air Temperature	<i>125 IAT</i>	Out of intercooler
CDT-IAT	<i>132C-1</i>	Difference of CDT and IAT
Carburetor Temperature	<i>-22 CRB</i>	Not available when CDT is installed
Difference between hottest and coldest EGT	<i>80 DIF</i>	Dot indicates most widely deviating cylinder
Fuel Remaining	<i>37.2 REM</i>	In gallons, liters or pounds or kilograms
Fuel required to next GPS WPT or Destination	<i>25.9 REQ</i>	Present with GPS interface Valid signal and way point
Fuel Reserve at next GPS WPT or Destination	<i>11.3 RES</i>	Present with GPS interface Valid signal and way point
Nautical Miles per Gal	<i>13.0 MPG</i>	Present with GPS interface and valid signal or MPK, MPL, MPP
Time to Empty	<i>02.45 H.M.</i>	Hours.Minutes Remaining at current fuel burn
Total Fuel Used	<i>38 USD</i>	Since last refueling or trip total.

Section 8 - Memory and Data Download

The EDM-900 Long Term Data Memory will record and store **all** displayed measurements once every **six seconds** (or at the programmed interval of between 2 to 500 seconds). At a later time it will transfer them directly to a laptop PC.

When you retrieve recorded data to your laptop PC you can choose to retrieve *all* the data in stored in the EDM, or only the *new* data recorded since your last retrieval. In either case, no data in the EDM-900 is erased. The retrieved data will be saved in the PC in a file in a compressed format. The supplied PC program will decompress the data for display and use by other programs, such as MS Excel.

The amount of total data that the EDM-900 can store will vary depending on how rapidly the measurements change. The typical storage is 20 hours at a 6 second intervals (1666 hours at 500 second intervals), but may vary depending on which options are installed. When the memory becomes full, the oldest data will be discarded to make room for the newest. You may place a mark at the next data record by tapping the UTC button. You will see the word *SNAP* at the next record snapshot, indicating a data record has been marked. Recording begins when EGT's are greater than 500°F or "snap" is requested.

All data are time-stamped. You may also program an *aircraft id* that will appear in the output data file. The aircraft id can be your aircraft registration number or your name. Initially the *aircraft ID* is set to *FACTORY*.

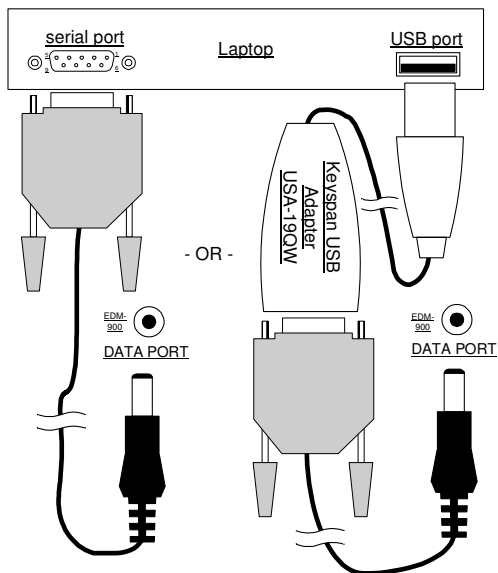
You may change the record interval from 2 to 500 seconds, even in flight. When you change the interval in flight, the current flight file is closed, and a new flight file is created with the new record interval.

Transferring Data from the EDM-900 to a Laptop PC

Install EzPlot™ on your laptop PC, following the instructions included with the EzPlot. Connect to the computer serial port using the supplied serial cable or to the USB port using an optional Keyspan USB Serial Adapter (available from JPI; install the serial adapter driver). Insert the small round plug into the data connector on the EDM-900, and the other end into the computer serial port or to the USB port using the Keyspan adapter. Both types of connections are shown below.

On the Windows desktop double click EzPlot icon. Click on the Download and Archive Data from Your EDM button.

Follow the instructions on the screen. After the data is downloaded *DONE* will be displayed. EzPlot program will decompress the data file that was downloaded, and produce individual Flight files.



Section 9 - First Time Setup and Customization

Pilot Programming Using EzConfig

JPI provides a configuration program that runs on an MSWindows PC, called EzConfig. See the www.jp instruments.com web site to download. Follow the instructions in the EzConfig documentation to change these assignments.

Pilot Programming without EzConfig

To start the Pilot Program procedure, simultaneously hold the STEP and LF buttons for five seconds. You will see the word *PROGRAM* for two seconds and then the sequence shown in the chart below.

Tap the STEP button to advance to the next item in the list. Hold the STEP button to step back to the previous item. Tap the LF button to

select alternate values of that item. Simultaneously hold both STEP and LF to exit.

<i>STEP advances next item</i>	<i>LF sequences through these values</i>	<i>Comments</i>
<i>PROGRAM</i>		Stays on for two seconds.
<i>FUEL N</i>	<i>FILL P N</i>	Tap LF to change fuel status. See page 24 → Exits program mode when done.
<i>RATE 4</i>	<i>0... 9</i>	Index rate (pause time in seconds) in the Automatic Mode. 0 disables the Automatic Mode.
<i>OAT F</i>	<i>OAT F ↔ OAT C</i>	To calibrate the OAT ±10°, hold both the STEP and LF buttons simultaneously for five seconds, which will proceed to the next step. Otherwise the next step will be skipped.
<i>OAT+0</i>	<i>OAT-10... OAT+10</i>	This step will be normally be skipped. Adjust the indicated temperature up or down by up to 10°. For example, <i>OAT+3</i> adjust the OAT 3° higher.
<i>EGT 1P N</i>	<i>EGT 1P N ↔ EGT 1P Y</i>	Y—Yes—sets the digital display to one-degree resolution; N—No—sets 10°. (10° resolution is easier to interpret the EGTs.)
<i>HPC= 125</i>	<i>70^{HP} HPC= 125</i>	%HP display will change when HP constant is adjusted. Hold STEP and LF for 5 seconds until you see ADJUST to set the HP calibration. Tap STEP to continue to the next step. See page 31 → To adjust the MAP, hold both the STEP and LF buttons simultaneously for five seconds, which will proceed to the next step. Otherwise the next step will be skipped.
<i>MAP 29.9</i>	<i>MAP 20 → 32</i>	Adjust the MAP. See page 31 →
<i>KP 29.90</i>		Adjust the instrument's K-factor to match the fuel flow transducer K-factor. See page 31 →

<i>TRIP? N</i>	<i>TRIP? N</i> ↔ <i>TRIP? Y</i>	N—No—Upon informing the EDM that you refueled the aircraft, reset total fuel used to 0. Y—Yes—accumulate total fuel used rather than reset to 0 at each refueling. See page 31 →
<i>HOBBS VRL</i>	<i>2424 ENG</i> ↔ <i>25 EDM</i> ↔ <i>3567 FRM</i>	Displays the engine hours and airframe hours.
<i>END? Y</i>	<i>END? Y</i>	STEP exits the pilot programming mode. LF reenters pilot programming mode.

Programming the Horsepower Constant

You must adjust the HP Constant once for your aircraft. You must perform this adjustment in the air while the aircraft is in flight between 5,000 and 8,000 feet MSL.

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.
2. Tap STEP repeatedly until you see—for example—*HPC = 125*. Then hold both the STEP and LF buttons display until you see *ADJUST*, followed by *HPC = 125*. The adjustment range for the HP Constant is 45 to 180.
3. Set the MP and RPM per your POH to 70 percent power. Let conditions stabilize.
4. Change the HP reading on the EDM-900 to 70 percent by adjusting the HP constant in the lower display by holding or tapping the LF button. Percent HP should be close to 100 percent during takeoff at sea level.
5. Tap the STEP button to proceed to the next step.

Programming the MAP

Sets the manifold pressure calibration (an sets the oil pressure and fuel pressure zero points).

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.

2. Tap **STEP** repeatedly until you see—for example— *HPC = 125*. Then hold both the **STEP** and **LF** buttons display until you see *ADJUST*, followed by *HPC = 125*.
3. Then hold both the **STEP** and **LF** buttons display until you see *MAP 29.9*

Do this one time and only if the MAP on your manifold pressure gauge doesn't match the MAP shown on the EDM-900

You **must** do this on the ground with the engine turned **off**.

Use **one** of the following two methods to calibrate the MAP.

- A. Easy calibration: set the EDM-900 MAP to the same value as shown on your aircraft's manifold pressure gauge. Tap or hold the **LF** button to change the MAP value.

Or

- B. Absolute calibration: the table below shows the MAP for a given field elevation (down the left side of the table) and altimeter setting (along top row of the table). Find the entry in the table most closely matching your field elevation and current altimeter setting. Interpolate if necessary.

Alt setting-> field elev.	29.0	29.2	29.4	29.6	29.8	29.9	30.0	30.2	30.4	30.6	30.8	31.0
0	29.0	29.2	29.4	29.6	29.8	29.9	30.0	30.2	30.4	30.6	30.8	31.0
1000	28.0	28.2	28.4	28.5	28.7	28.8	28.9	29.1	29.3	29.5	29.7	29.9
2000	27.0	27.1	27.3	27.5	27.7	27.8	27.9	28.1	28.3	28.5	28.6	28.8
3000	26.0	26.2	26.3	26.5	26.7	26.8	26.9	27.1	27.2	27.4	27.6	27.8
4000	25.0	25.2	25.4	25.6	25.7	25.8	25.9	26.1	26.3	26.4	26.6	26.8
5000	24.1	24.3	24.5	24.6	24.8	24.9	25.0	25.1	25.3	25.5	25.6	25.8
6000	23.2	23.4	23.6	23.7	23.9	24.0	24.0	24.2	24.4	24.5	24.7	24.8
7000	22.4	22.5	22.7	22.8	23.0	23.1	23.1	23.3	23.5	23.6	23.8	23.9

Unless your airfield is close to sea level, do not set MAP to the local altimeter setting since that setting is the pressure corrected to sea level, and is not the same as your field elevation pressure.

Tap or hold the **LF** button to change the MAP value.

Tap the **STEP** button to proceed to the next item.

K factor

The K factor is shown on the fuel flow transducer as a four-digit number, which is the number of pulses generated per gallon of fuel flow.

Before installing the transducer, write down the K factor here

_____. To enter the number, move the decimal point three places to the left. For example if the K factor on the fuel flow transducer is 29,123, enter 29.12 in the K factor parameter.

If the K factor is increased, the indicated fuel flow will decrease, and vice-versa. *When the K factor is changed during a trip, calculations of fuel used, fuel remaining and time to empty are not retroactively recalculated.*

Fine Tuning the K factor

The K factor shown on the fuel flow transducer does not take into account your aircraft's particular installation. Fuel hose diameters and lengths, elbows, fittings and routing can cause the true K factor to be different from that shown on the fuel flow transducer.

You must use the following procedure to fine tune the K factor.

1. Make at least three flights of about two to three hours each. Note the actual fuel used (as determined by topping the tanks) and the EDM-900 calculation of the fuel used for each flight USD.

Flight	Fuel USED shown by EDM (total tank - REM)	Actual fuel used by topping tanks
1		
2		
3		
Total	①	②

2. Total ① the EDM-900 calculated fuel used and ② the actual fuel used.
3. Record the current K factor here ③ _____ and in the table below.
4. Calculate the New K factor as follows:

$$\text{New K factor} = \frac{\text{① EDM fuel used}}{\text{② Actual fuel used}} \times \text{③ Current K factor}$$

(**2** actual fuel used)

$$\text{New K factor} = \frac{(\mathbf{1}) \quad \quad \quad (\mathbf{3})}{(\mathbf{2}) \quad \quad \quad (\mathbf{2})} \times (\mathbf{3})$$

Every time you fine tune the K factor, change it by only half of the amount calculated above, and record the measurements here:

<i>Date</i>	1 EDM <i>fuel used</i>	2 actual <i>fuel used</i>	3 Current <i>K factor</i>	<i>New K factor</i> = 1 x 3 / 2	<i>Pilot's</i> <i>initials</i>

Programming the K factor

This procedure is different than for setting other parameters.

1. If you haven't already done so, start the Pilot Program procedure, by simultaneously hold the STEP and LF buttons for five seconds. You will see the word *PROGRAM*, followed by *FUEL N*.
2. Again, simultaneously hold the STEP and LF buttons for five seconds. You will see the word *FACTORY*, followed by *RESET? N*.
3. Tap STEP button to advance to the *FFLW? N* screen.
4. Tap LF to enter the fuel flow submenu.
5. Tap STEP repeatedly until you see *KF = 29.90* (for example)
6. Hold both the STEP and LF buttons simultaneously for five seconds. The first digit flashes (shown here as a larger digit only for illustration purposes): *29.90*
7. Tap or hold the LF button to change flashing digit: *19.90*
8. Tap STEP button for next digit (hold STEP for previous digit): *19.90*
9. Tap or hold the LF button to change flashing digit: *18.90*
10. Tap STEP button for next digit (hold STEP for previous digit): *18.90*
11. Repeat items 9 and 10 for the remaining two digits.
12. Hold STEP and LF buttons simultaneously for five seconds to exit the K factor parameter setup.
13. Tap STEP repeatedly until you see *END? Y*, then Tap STEP once more to exit the factory setup mode.

Programming Accumulate Trip Total

Accumulate—default is OFF: resets the fuel *used* to 0 every time you inform the EDM-900 that the aircraft was refueled. With accumulate ON fuel *used* will not be reset to 0 when you inform the EDM-900 that the aircraft was refueled.

Select “No” if you wish to display total fuel used since the last time you informed the EDM-900 that the aircraft was refueled. Select “Yes” to display total fuel used for an extended trip with multiple fuel stops. This selection affects only the *USD* measurement.

During normal operation, to reset the accumulated fuel used display at any time, tap **STEP** until you see *USD*. Hold both **STEP** and **LF** until the display shows *.0 USD*.

Section 10 - Custom Programming

JPI provides a configuration program that runs on an MSWindows PC, called EzConfig. Follow the instructions in the EzConfig documentation to change these assignments.

Factory Set Default Limits

JPI conservatively sets the default alarm limits below Lycoming and Continental recommendations.

<i>Measurement</i>	<i>Default Low Limit</i>	<i>Default High Limit</i>	<i>Alarm Example</i>
CHT		450 °F 230 °C	465 CHT
OIL T	90 °F 32 °C	230 °F 110 °C	280 OIL T
OIL P	15 psi	100 psi	120 OIL P
TIT		1650 °F* 900 °C	1720 TIT
CLD		-60 °F/min. -33 °C/min.	-65 CLD
EGT DIF		500 °F 280 °C	525 DIF
BUS, 24 V	24V	36V	22.4 BUS
BUS, 12 V	12V	18V	17.6 BUS
AMPS			40 AMP
MAP		40 inHg	46.3 MAP
LO FUEL	45 min		00.20 H.F
LO TIME	10 gal, kg, ltr, lbs		7.2 REM`
FP	15 psi	60 psi	7.2 FP
RPM RL		2700	2500

REM
H . M

10 gal
45 minutes

10 REM
45 H . M

If you change the display between Fahrenheit and Celsius, alarm limits will automatically change also. The bar graph scale will remain the same.

When an alarm is displayed, tapping the STEP button will temporarily ignore that alarm from the sequence for the next ten minutes. Or holding the STEP button until the word OFF appears will ignore that alarm for the remainder of the flight.

Section 11 - Determining Fuel Level Calibration Points

The EDM-900 supports fuel level sensors for directly reading the fuel level in aircraft fuel tanks. The EDM-900 contains a fuel table which contains calibration values to convert sensor readings into fuel quantity in the graphs section display. **Note: The owner of the aircraft is responsible for assuring the correct contents of the fuel tables.**

The most accurate way to enter calibration values into the fuel table is to completely drain the aircraft fuel tanks and record readings while filling each tank from empty to full in incremental steps. This is a laborious task. To simplify the calibration procedure, JPI has developed an auto calibration method.

Auto Calibration Method

Using this method, you can immediately use the EDM-900 while the EDM-900 is learning the fuel level readings in the aircraft. This method relies on the EDM-900 *taking the lowest fuel levels ever measured from initial installation to the present time and using this as the empty value.*

With this method there will always be a margin of error in the automatically detected values: the displayed empty values will always be on the conservative side of safe; the EDM-900 will always report *less* fuel than is actually in the aircraft at any given time. If you desire to calibrate to the true value of empty, the manual method—described below—can always be used.

Once you are satisfied that the fuel table is correct and accurate, you can use EzConfig and the **Accept** button to record the unverified fuel table into the EDM-900 configuration table.

First determine how many fuel level calibration points you wish to use. If your tanks or fuel senders are non-linear, use more points. Otherwise use just 2. Select the row in the table below to determine how to calibrate your fuel level indicator.

Number of calibration points	L1 & R1	L2 & R2	L3 & R3	L4 & R4	L5 & R5
2	unusable	Full	Not used	Not used	Not used
3	unusable	1/2 tank	Full	Not used	Not used
4	unusable	1/3 tank	2/3 tank	Full	Not used
5	unusable	1/4 tank	1/2 tank	3/4 Tank	Full

Refer to FAR §23.959 to determine how to establish the unusable fuel level.

The following is the procedure to initially calibrate your fuel senders. You should only have to do this once. You will determine the 2 to 5 fuel level calibration points for one tank and write them in the chart below. You may use these values for the other tank also. If the calibration for the two tanks differ too much, then measure the calibration points for the other tank separately.

Left fuel level calibration point			Right fuel level calibration point		
	Left Cal	Left Fuel		Right Cal	Right Fuel
L1	[][][][][][]	[0][0]. [0]*	R1	[][][][][][]	[0][0]. [0]*
L2	[][][][][][]	[][][]. []	R2	[][][][][][]	[][][]. []
L3	[][][][][][]	[][][]. []	R3	[][][][][][]	[][][]. []
L4	[][][][][][]	[][][]. []	R4	[][][][][][]	[][][]. []
L5	[][][][][][]	[][][]. []	R5	[][][][][][]	[][][]. []

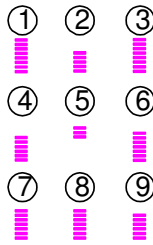
* unusable fuel level is entered as 00.0

NEVER add or remove fuel from the aircraft when the master switch is turned on.

Turn OFF the aircraft master switch	
	Empty left and right tanks and fill each to the unusable level (first fuel level calibration point)
Hold the right-most button while turning ON master switch, see <i>FUELDSP</i>	
	With the left and right tanks empty, write down the displayed calibration values (L1 is on top, R1 is on the bottom). This is the empty (0) fuel level.
Turn OFF the aircraft master switch	
	Add fuel to the left and right tanks and bring it up to the second fuel level calibration point level (or full for a two point calibration)
Hold the right-most button while turning ON master switch, see <i>FUELDSP</i>	
	With the left and right tanks at the second calibration point, write down the displayed calibration values (L2 is on top, R2 is on the bottom) and the amount of fuel now in each tank. For a 2 point calibration, stop here.
Turn OFF the aircraft master switch	
	Add fuel to the left and right tanks and bring it up to the third fuel level calibration point level (or full for a three point calibration)
Hold the right-most button while turning ON master switch, see <i>FUELDSP</i>	
	With the left and right tanks at the third calibration point, write down the displayed calibration values (L3 is on top, R3 is on the bottom) and the amount of fuel now in each tank. For a 3 point calibration, stop here.
Turn OFF the aircraft master switch	
	Add fuel to the left and right tanks and bring it up to the fourth fuel level calibration point level (or full for a four point calibration)
Hold the right-most button while turning ON master switch, see <i>FUELDSP</i>	
	With the left and right tanks at the fourth calibration point, write down the displayed calibration values (L4 is on top, R4 is on the bottom) and the amount of fuel now in each tank. For a 4 point calibration, stop here.
Turn OFF the aircraft master switch	
	Add fuel to the left and right tanks and bring it up to full for the fifth fuel level point calibration point level.
Hold the right-most button while turning ON master switch, see <i>FUELDSP</i>	
	With the left and right tanks at the fifth calibration point, write down the displayed calibration values (L5 is on top, R5 is on the bottom) and the amount of fuel now in each tank (fuel tanks).

Section 12 - Customizing the Bar Graph Display

The bar graph display has 9 stations, 3 of which can be reconfigured to display any of the measurements that can appear in the Scanner® section. Stations 6, 8 and 9 can be reconfigured. Factory defaults are: station 6 OAT, station 8 USD and station 9 CLD. JPI provides a configuration program that runs on an MSWindows PC, called EzConfig. Follow the instructions in the EzConfig documentation to change these assignments.



Section 13 - Troubleshooting the EDM

Common Misapplications

Some of the more common misapplications made by first-time EDM-900 users are presented here in an attempt to help you avoid similar problems.

<i>Problem</i>	<i>Situation</i>	<i>Correction</i>
LeanFind finds a “peak” too soon.	Failure to pre-lean before performing LeanFind or pausing while leaning.	Continue to lean without pausing.
	Leaning too slowly.	Lean more aggressively.
Peak not found	Lean Find not activated or stopping while leaning	Lean at the speed of approximately 10°F per second.
No display of %HP, only RPM displayed	Fuel flow not reading, OAT not reading	Fuel Flow reading and OAT is required for HP.
RPM reads 2/3 of correct value	4 cylinder engine but set to 6 cylinder.	In Pilot Program change 6 to 4 cylinder.
First cylinder to peak is not the hottest	This is normal. The first to cylinder peak is not necessarily the hottest.	
EGTs rise during single magneto check	This is normal, due to incomplete combustion persisting longer.	

EGTs not uniform during low power operation

This is normal. Fuel and air distribution is not optimal at low power settings.

Diagnostic Testing on Startup and During Flight

When your EDM-900 is first turned on, all digits light up for a few seconds, permitting you to check for non-functional segments. Then each column is self-tested in sequence while the EDM-900 tests internal components, calibration and integrity of the probes.

During flight, probes are constantly checked for inconsistent or intermittent signals. A faulty channel or probe encountered during start-up or during flight will be deleted from the sequence, producing a missing column or blank digital data.

Diagnostic Messages

Startup and Operational Diagnostics

The following displays indicate a malfunction in the probes, wiring or instrument:

<i>ENG ON</i>	Indicates that the engine is running while trying to calibrate the MAP. Turn off engine and try again.
<i>MEM ON</i>	Not an error. Memory on. Recording is enabled when EGT exceeds 500°F or the RPM exceeds the Hobbs RPM enable value.
<i>HOBBS ON</i>	Not an error. Hobbs on. RPM exceeds the Hobbs RPM enable value.
<i>TESTING</i>	LF tapped during self test. Tap LF again later.
<i>0.0 GPH</i>	Zero's indicate Fuel flow is too low to register
<i>--- GPH</i>	Dashes indicate No fuel flow transducer signals
<i>--- H.M</i>	Dashes indicate No fuel flow transducer signals
<i>OPEN PRB</i>	Open probe. Wiring to probe is open circuit. Check wiring and crimps. Swap probes to troubleshoot.
<i>BAD-PRB</i>	Bad probe. Erratic reading. May be poor electrical connection. Swap probes to troubleshoot.
<i>HI XX</i>	High. Measurement over range.

<i>LO XX</i>	Low. Measurement under range.
<i>CAL ERR</i>	Calibration error. Return unit to factory.
<i>DSP XXX</i>	Internal communication error. Return unit to factory.
<i>COMM ERR</i>	Internal communication error. Return unit to factory.
<i>NO 15MV</i>	Calibration error. Return unit to factory.
<i>NO 50MV</i>	Calibration error. Return unit to factory.
<i>NO 2.5V</i>	Calibration error. Return unit to factory.
<i>PWRDWN</i>	Power down the instrument and power up again.
<i>WARNCAL, WARNCFG</i>	Transient warning messages. If they persistently occur, return the unit to JPI for repair.
<i>HOBSERR</i>	The time of the most recent flight may not be reflected in the HOBS meter.
<i>HOBSBAD</i>	The HOBS data has been corrupted. The HOBS meter will be cleared.
<i>HANGCFG, HANGCAL</i>	catastrophic errors. The only option the user has is to power the unit off and return it to JPI for repair

GPS Interface Diagnostics

Measurements <i>REQ</i> , <i>RES</i> , & <i>MPG</i> are all missing from the scan.	No communications from GPS receiver to EDM. Possibly no connection or aircraft GPS is off.
<i>NO-COM</i> message and measurements <i>REQ</i> , <i>RES</i> , & <i>MPG</i> are missing.	Communications are received by EDM-900 and the Auto-Protocol setup is in process. Verify correct output format setup in GPS receiver; check GPS connections.
<i>NO-SIG</i> message and measurements <i>REQ</i> , <i>RES</i> , & <i>MPG</i> are missing.	GPS receiver has insufficient signal for valid data.
<i>NO-WPT</i> message and measurements <i>REQ</i> & <i>RES</i> , are missing.	No waypoints are programmed into the aircraft GPS receiver.
<i>---REQ</i> or <i>---RES</i> message	Your ground track is more than $\pm 70^\circ$ from your course to the next GPS waypoint.

History Display

Upon power up you can see the history of extreme values during previous flight. To do this, hold the **STEP** button during initial power up of the EDM-900. The bar graph section of the display will show the extreme value of each measurement for a minute or until you tap the **STEP** button. History cannot be displayed other than at power up. It will remain in the display until RPM exceeds Hobbs On RPM value or the EGT is above 500°F.

Section 14 - Appendices

Features and Benefits

The EDM-900 Engine Data Management system is the most advanced and accurate piston engine-monitoring instrument on the market. Using the latest microprocessor technology, the EDM-900 will monitor up to twenty-four critical measurements in your engine, four times a second, **with a linearized thermocouple accuracy of better than 0.1 percent or 2 F°.**

As your built-in flight engineer, the EDM-900 is constantly “red line” checking: all critical measurements are automatically checked four times a second, regardless of the current display status. Leaning is accomplished quickly and automatically using the LeanFind™ procedure. With the EDM-900 it is now possible to have substantially more diagnostic information available to you in a timely and usable manner.

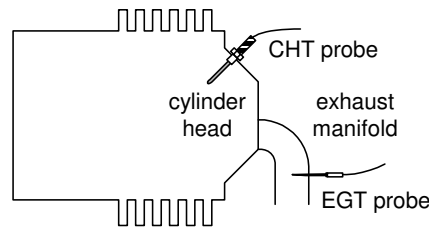
The real-time serial data port—a standard feature—permits you to externally record scanned measurements in real-time using a laptop PC. The built-in data recording will continue to operate.

Benefits of Proper Mixture Control

- Improved engine efficiency
- Greater fuel economy
- Smoother engine operation
- Longer spark plug life
- Reduced maintenance costs
- Reduced operating costs
- Proper engine temperatures
- Reduced engine vibration

JPI Probes

Temperature information processed by the EDM-900 is captured by **fast response**, grounded **JPI** temperature probes, that accurately measure the small temperature changes—as small as 1°F—that occur during mixture adjustment.



Temperature and Mixture

In a piston engine only a small portion of the energy from combustion produces movement of the piston during the power stroke. The majority of energy passes into the exhaust pipe as hot gasses. By monitoring the temperature of these exhaust gasses you will have an indication of the quality of the combustion process. Low compression, non-uniform fuel distribution, faulty ignition, and clogged injectors diminish the efficiency of the combustion process that generates power.

From the cockpit you can adjust the fuel/air ratio by a process called *leaning*. Retarding the mixture control changes the fuel/air ratio and hence the resulting Exhaust Gas Temperature (EGT).

The following figure depicts the mixture and temperature relationship.

As the mixture is leaned, EGT rises to a peak temperature, and then drops as the mixture is further leaned. Peak *power* occurs at a mixture using more fuel than at peak EGT. Best *economy* occurs at peak EGT. Accurate leaning yields optimal engine temperatures. By being able to precisely adjust the mixture, your engine can produce either the best fuel economy or maximum power, whichever you choose.

Shock Cooling

Cooling the cylinders too fast can result in cracking and eventual failure. Lycoming Service Instruction 1094D (March 25, 1994) on ***Fuel Mixture Leaning Procedures states:***

“At all times, caution must be taken not to shock cool the cylinders. The maximum recommended temperature change should not exceed 50°F per minute.”

JPI checks shock cooling on all cylinders displaying the highest reading cylinder.

Navigation Data Formats

Output of GPS; input to EDM. The EDM-900 automatically configures itself for one of three industry standard data formats:

<i>Format</i>	<i>Baud rate</i>	
NMEA-183 (Marine Nav Data Format)	4,800	This is the format for most handheld GPS receivers. Loran must have sentences RMA & RMB. GPS must have sentences RMB & RMC.
Aviation Data Format	9,600	“Output sentence type 1” Required sentences are: A, B, C, D, E, I and L first character identifier byte. Sentence terminator may be either <CR><LF> or <CR> alone.
Northstar (Northstar binary)	1,200	M1 setup select “NO EXTENDED”, “NAV ONLY”

Connector Pin Assignments

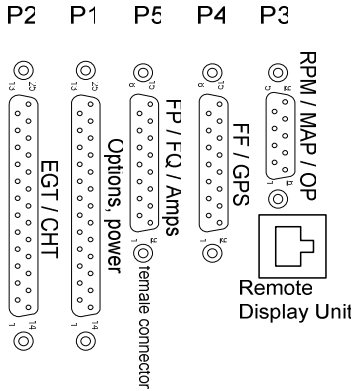
P1 Options 25-pin connector			P3 MAP-RPM 9-pin connector		P4 Fuel Flow 15-pin 25-pin connector		
<i>Pin no.</i>	<i>Pin no.</i>	<i>Probe function</i>	<i>Pin no.</i>	<i>Function/sensor pin</i>	<i>Pin no.</i>		<i>Function</i>
yel 1	red 2	OIL	grn 1	RPM sig /1	1	1	out to GPS
yel 3	red 4	IND	blk 2	RPM grd /2	2	2	in from GPS
yel 5	red 6	CARB*	red 3	RPM pwr /3	3	3	(nc)
y 14	red 15	OAT	red 4	MAP pwr /3	wht 4	4	FF signal
y 16	red 17	TIT-1	blk 5	MAP grd /1	red 5	5	FF power
y 18	red 19	TIT-2	6	OIL P VDO sig	blk 6	6	FF ground
	gry 12	Remote alert T,V	7	OIL P VDO grd		9	red OP
	red 13	+ Power	wht 8	MAP sig+ /2		10	blk OP
	wht 11	data in	grn 8	Kavlico sig		11	grn OP
	wht 24	data out	grn 9	MAP sig- /4		12	wht OP (grn Kavlico)
	blk 25	Engine ground	(nc)	Kavlico	10	15	R fuel lo sw
					wht 12	17	FF2 signal
					13	18	L fuel lo sw
					gry 14	19	AMPS 2 +
					Wht 15	20	AMPS 2 -

*Displays as CRB if IAT probe is not present; displays as CDT is IAT if present.

P2 EGT CHT 25-pin connector			P5 FP/FQ/AMP 15-pin connector	
<i>Pin no.</i>	<i>Pin no.</i>	<i>Probe or function</i>	<i>Pin no.</i>	<i>Function</i>
yel 1	red 2	CHT 1	1	FQ 1 (res)
yel 3	red 4	CHT 2	2	FQ 2 (res)
yel 5	red 6	CHT 3	3	FQ return (res)
yel 7	red 8	CHT 4	wht 4	FP Sig+
yel 9	red 10	CHT 5	grn 5	FP Sig-
yel 11	red 12	CHT 6	red 6	FP pwr
yel 14	red 15	EGT 1	blk 7	FP grd
yel 16	red 17	EGT 2	8	
yel 18	red 19	EGT 3	9	FQ1 sig (cap)
yel 20	red 21	EGT 4	10	FQ2 sig (cap)
yel 22	red 23	EGT 5	11	FQ1 pwr (cap)

yel 24	red 25	EGT 6	12	FQ2 pwr (cap)
			13	Volts 2 sense
			14	AMPS +
			15	AMPS -

View facing rear of instrument



Interface connections to selected GPS models

GPS Model	P4 conn Pin 1	P4 conn Pin 2
EDM-900	P4 conn Pin 1	P4 conn Pin 2
Arnav 5000	Pin 4	Pin 5
Garmin 195	(nc)	Pin 4
Garmin 430 / 430	Pin 57	Pin 56
Northstar M3P	(nc)	Pin 6 (leave pin 11 open)
UPS GX50 / 60	Pin 4	Pin 5

Navigation Data Ports for GPS Comm

(These ports are completely independent of the EDM-900 serial data output port.)

Navigation Data (output from GPS; input to EDM)

Compatible with RS-232, TTL, RS-423, RS-422 SDA.

Serial data format: 8 data, 1 start, no parity. Baud rates: 1,200, 4,800, or 9,600 depending on the GPS data output format. The EDM-900 automatically detects the GPS data output format and is independent of the GPS-C setting.

Fuel Data (input to GPS; output from EDM)

RS-232. Serial data format: 8 data, 1 start, no parity. Baud rate: 9,600.

Output format is determined by the GPS-C setting, but may be overridden by the GPS navigation format: If the EDM-900 senses Northstar or NMEA-183 navigation data input, there will be no fuel data output.

Section 15 - Technical Support

JPI offers both e-mail and telephone technical support. Have your model and serial number ready when you call. Call **JPI** for a return authorization number before returning any equipment.

J.P. INSTRUMENTS Inc.

3185 B Airway

Costa Mesa, CA 92626

800 345-4574 www.jp instruments.com

jpitech@pacbell.net

Section 16 - Limited Warranty

J.P. Instruments Inc. (JPI) warrants all parts in your new EDM-900 to be free from defects in material and workmanship under normal use. Our obligation under this warranty is limited to repair or exchange of any defective part of this unit if the part is returned, shipping prepaid, within two years for electronics and one year for probes from the date of original purchase. Installation labor is the responsibility of the aircraft owner. Homebuilt aircraft warranty starts when the aircraft is certified for flight. Replacement parts carry a warranty for the balance of the warranty period.

Under this warranty, JPI is not responsible for any service charges, including removal, installation, nor any other consequential damages. JPI incurs no obligation under this warranty unless a Warranty Registration Certificate describing the warranted product has been completed and mailed to JPI with all information requested.

This warranty is void on any product which has been subject to misuse, accident, damage caused by negligence, damage in transit, handling or modification which, in the opinion of JPI, has altered or repaired the product in any way that effects the reliability or detracts from the performance of the product, or any product whereon the serial number has been altered, defaced, effaced or destroyed.

This warranty is in lieu of all other warranties expressed or implied and other obligations of liability on JPI's part, and it neither assumes nor authorizes any other person to assume for JPI any other liability in connection with the sale of JPI products.

To initiate this warranty, the aircraft owner must submit a completed Data Logging Worksheet to JPI. Upon receiving a completed worksheet, JPI will initiate the warranty from the date of original purchase. Any replacement parts carry a warranty that extends for the balance of the period of the

original warranty. For homebuilt aircraft the warranty starts when the aircraft is certificated for flight and noted on the warranty card.

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Quick Reference Guide

Automatic Scan

1. Tap LF.
2. Tap STEP.

Exclude Measurement in Automatic Scan (toggle)

1. Tap STEP to index to the measurement to exclude.
2. Tap both STEP and LF.
3. See decimal point before measurement name to exclude.

Change Indexing Rate

1. Hold both STEP and LF until the display shows *PROGRAM*, followed by *FUEL N*.
2. Tap STEP, see *RATE Y*.
3. Tap LF to change the number: 1 through 9 is the pause time during automatic indexing. 0 sets to never index.
4. Tap STEP until you see *END Y*, then tap STEP to exit

Reset Fuel Used

1. Tap STEP and see *USD*.
2. Hold both STEP and LF until the display shows *.0USD*

Transfer Data in Memory

1. Connect your PC to the EDM-900 serial port.
2. On the PC run EZPlot.
3. On EZPlot click on the Download and Archive Data from Your EDM button.

Totalize Fuel Used

1. Hold both STEP and LF until the display shows *PROGRAM*, followed by *FUEL N*.
2. Tap STEP a few times until you see *TRIP ? N*.
3. If you want accumulate the fuel used, tap LF and see *TRIP ? Y*.
4. Tap STEP until you see *END Y* and tap STEP once more to exit.

Filled Tanks

In flight, do this first (on power up, skip to step 3):

1. Hold both **STEP** and **LF** until the display shows *PROGRAM*, followed by *FUEL N*.
2. Tap **LF** to see *FILL* followed by *FUEL P N*.
3. Tap **LF** to see *FILL 75**
4. With aux tanks or tabs, tap **LF** again to see *FILL 120**
5. Tap **STEP** to exit.

Added or Removed Fuel

In flight, do this first (on power up, skip to step 4):

1. Hold both **STEP** and **LF** until the display shows *PROGRAM*, followed by *FUEL N*.
2. Tap **LF** 2 or 3 times to see *FILL +*.
3. Tap **STEP** and see *0 GAL*.
4. Hold **LF** to increase or tap **LF** to decrease the amount of fuel displayed.
5. Tap **STEP** to exit.

Reset Alarm

- **Temporary reset** (next 10 minutes): tap **STEP**.
- **Reset for remainder of flight:** hold **STEP** until the word *OFF* appears.

Leaning Rich of Peak

1. Pre-lean mixture and wait 1 minute.

2. Tap **LF** and see *LEARNR*.
3. Lean mixture until you see a column flash and the words *LEARNEST* followed by (e.g.,) *1545 135**
4. Hold **LF** and see *LEARNEST* followed by *1560 13.5**, the peak EGT of the first cylinder to peak and fuel flow.
5. Enrich mixture to set desired temperature.

Leaning Lean of Peak

1. Pre-lean mixture and wait 1 minute.
2. Tap **LF** and see *LEARNR*.
3. Hold both **STEP** and **LF** until you see *LEARNL*
4. Lean mixture until inverted columns.
5. Continue leaning until you see a column flash. You will see the temperature below peak of the last cylinder to peak and the fuel flow.
6. Hold **LF** to see *RICHEST* followed by (e.g.) *1560 1.0** to see peak EGT of the first cylinder to peak and the delta fuel flow (GAMI spread).
7. Enrich mixture to set desired temperature.

* Values will vary depending on your individual installation.