

# Pilot's Guide

Engine Data Management

## EDM-900

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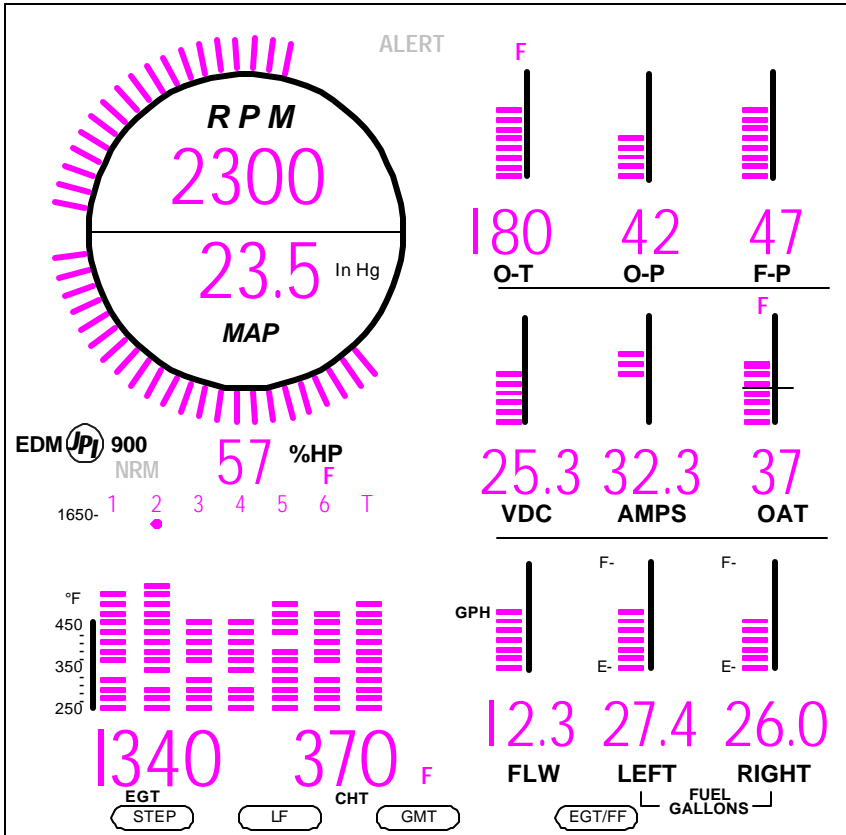
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## Section 1 - Introduction

### Product Features Chart

- Hands-free, automatic scanning
- All programming done from the Front Panel
- 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
- Normalize view
- 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
  - Download to Palm™ Computer
  - 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

## Section 2 - 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 10 - First Time Setup and Customization on page 36. 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*.

### Fueling the Aircraft

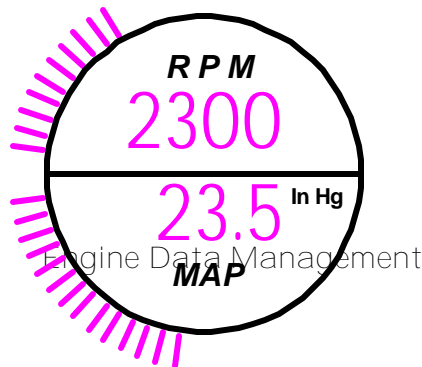
1. At power up you will see FILL?N. Tap LF to see FILL 75 (or whatever the capacity of your tanks or tabs are).
2. With auxiliary tanks or tabs, tap LF again to see FILL 120 (or whatever the capacity of your tanks-plus-auxiliary or full tanks are).
3. Tap STEP to accept the displayed value and exit.

See page 28 for a more detailed description.

The EGT/FF button selects which measurements are displayed during scan: EGT (temperatures, voltage), ALL measurements, or FF (fuel flow related).

### 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

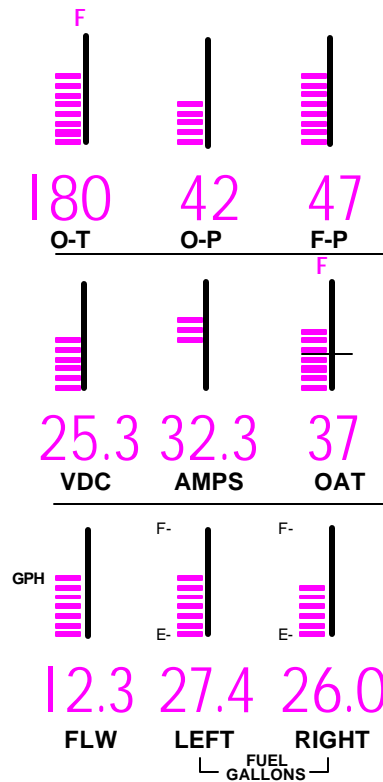
The upper semicircular bar graph shows the RPM (Revolutions per Minute) and the lower semicircular bar graph shows the MAP (Manifold Pressure). These are shown both graphically and digitally. Power settings entering red line are displayed by flashing the ALERT icon and flashing a message on the bottom 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. 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 (or owner selectable \*)
- Right fuel quantity (or owner selectable \*)



\* 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 51.

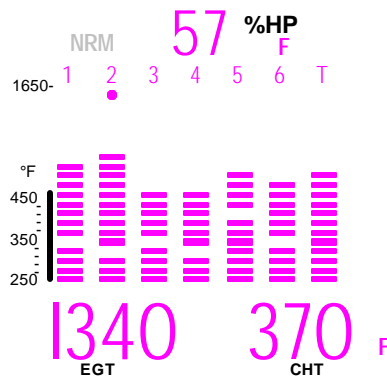
## Basic Scanner Operation

The EDM-900 Scanner section is on the lower left side of the screen. It will go into Automatic scan mode 10 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 and the setting of the EGT ALL FF setting.



EGT	ALL	FF	Display	Discription
x	x		l340 376	EGT left, CHT right
x	x		l370 TIT	Turbine Inlet Temperature
x	x		-30 CLD	Rate of shock cooling
x	x		l4.2 BAT	Avionics bus voltage
x	x		81 OAT	Outside air temperature option
x	x		300 CDT	Compressor discharge option
x	x		l25 IAT	Induction air option
x	x		l32 C-I	Compressor minus induction difference
x	x		-22 CRB	Carburetor option
x	x		80 DIF	Difference between hottest and coldest EGT
	x	x	37.2 REM	Fuel remaining
	x	x	25.9 REQ	Fuel required to wpt (GPS connected)
	x	x	l1.3 RES	Fuel reserve at wpt (GPS connected)
	x	x	l3.0 MPG	Miles per gallon (GPS connected)
	x	x	02.45 H.M	Fuel time to empty
	x	x	l3.5 GPH	Gallons per hour
	x	x	38 USD	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 this example.

There are two views: Normalize view levels the EGT columns and increases the sensitivity of the Scanner bar graph columns to 10° per segment. To enter the Normalize view, hold the **LeanFind** button for three seconds. The **NRM** icon will be displayed above the Scanner section. Hold the **LeanFind** button for three seconds to return to the Percentage view. See page 21 for a more detailed description.

## 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 12 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 25°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 3 - Interpreting Data**

### **Operation for each Phase of Flight**



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

***Suggested setup:***

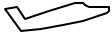
- Set engine to runup RPM
- *Normalize* view
- *Manual mode*

***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:*

- Percentage view
- Automatic mode

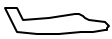
### *Verify:*

- 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.
- If all EGT columns go off scale to the top of the column, be sure you are not in Normalize view, as indicated by the symbol NRM to the left of the horsepower display.

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:*

- Normalize view
- 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 10).



## Descent

### *Suggested setup:*

- Percentage view
- 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.

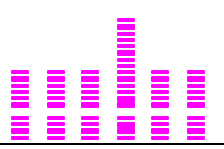
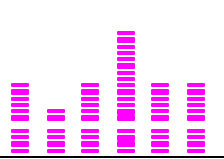

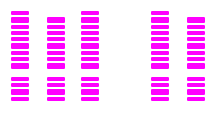



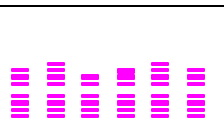
<i>Measurement</i>	<i>Normal range</i>	<i>Comments</i>
EGTs in Cruise	1350°F	<ul style="list-style-type: none"> <li>• under 200 HP engines</li> <li>• high performance engines</li> <li>• (EGT should drop 200°F when full throttle is applied)</li> </ul>
	1550°F	
EGT span (DIF)	70 to 90°F	<ul style="list-style-type: none"> <li>• fuel injected engines</li> <li>• carbureted engines</li> </ul>
	120 to 150°F	
TIT	1600°F average	• 100° higher than EGT
CHTs	350°F (OAT 60°F)	<ul style="list-style-type: none"> <li>• normally aspirated engines</li> <li>• Turbocharged engines</li> </ul>
	410°F	
CHT span	50 to 70°F	• 100° with gasket probes
OIL T	200°F	• oil cooler thermostat opens at 180°F
OIL P	30 to 60 psi	• varies with aircraft type
FUEL P	4 to 18 psi	• varies with aircraft type
Shock cooling*	-40°/minute	<ul style="list-style-type: none"> <li>• tightly cowled engines</li> <li>• Bonanza</li> <li>• helicopter</li> </ul>
	-55°/minute	
	-200°/minute	




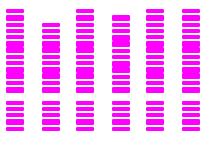
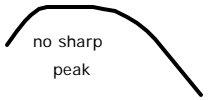
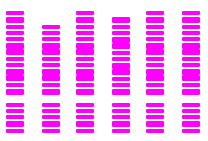
\* Maintain a cooling rate magnitude of less than -60°/minute. You will find that the cylinder with the greatest shock cooling will shift from front cylinders (during climb out) to the rear cylinders (during descent ).


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. Views are Percentage views.

<i>Display</i>	<i>Symptom</i>	<i>Probable Cause</i>	<i>Recommended Action</i>
	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.
	Loss of EGT for one cylinder. Engine rough	Stuck valve. Other cylinders are okay.	Have valve train checked.
	Loss of 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.	Check injectors and plugs. Non-uniformity is normal for carbureted engines
	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 Normalize view. or failed probe	Full rich and reduce power. Change to Percentage view. 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.

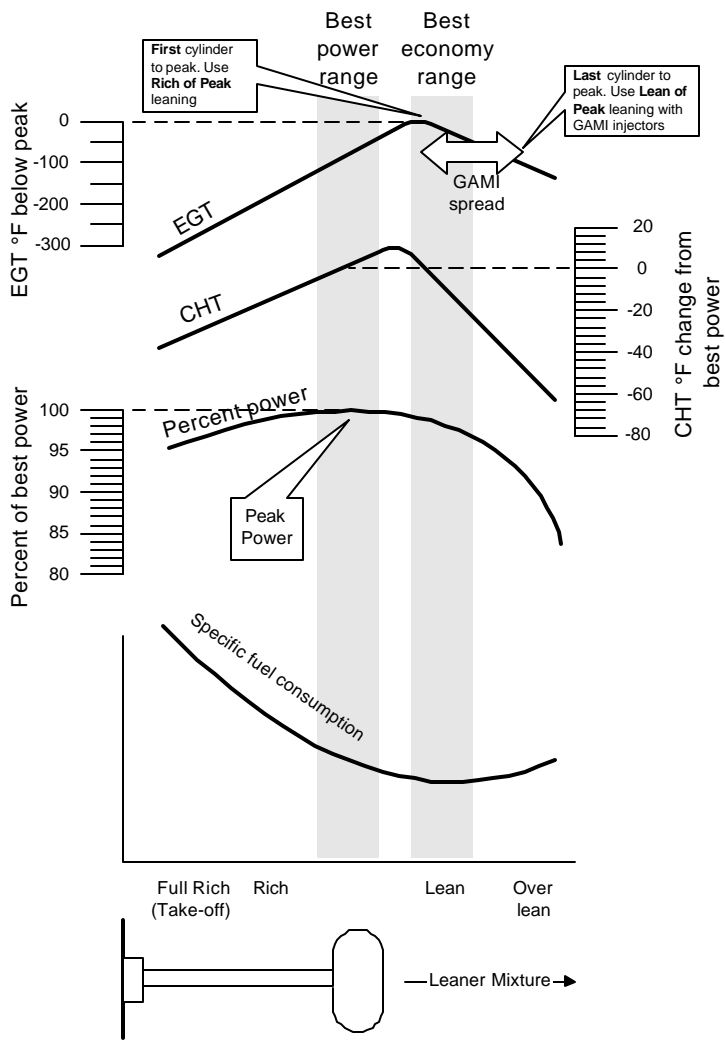
<i>Display</i>	<i>Symptom</i>	<i>Probable Cause</i>	<i>Recommended Action</i>
	CHT more than 500°, EGT normal. Adjacent EGT may be low	Leaking exhaust gasket blowing on CHT probe.	Look for white powder around cylinder to determine leak area.
	Large DIF at low RPM	Blow by in cylinder rings	Check compression

## Section 4 - 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. Teledyne Continental recommends lean of peak for the Malibu. 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: _____°	1490 370	*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	LEAN R	Start LeanFind. (Optionally, after starting Leanfind, to change to "lean of peak" method, hold both STEP and LF simultaneously.)
5	Lean the mixture—approx. 10°/second <i>without pausing</i> —while observing the display. When there is a 15°F rise in EGT, LeanFind mode becomes active.	1520 13.8	Flashing cylinder DOT indicates hottest cylinder and that LeanFind mode is active.
6	Stop leaning when a column begins flashing. You will see LEANEST for two seconds, followed by:	1545 12.4	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.	1560 12.4	Captured peak EGT value is displayed.
8	Slowly enrich the mixture. The temperature will increase, returning to peak. Stop enriching at the desired EGT.  Best economy Best power	1560 13.8 1460 14.2	<ul style="list-style-type: none"> <li>• Peak EGT for best economy</li> <li>• 100° rich of peak for best power</li> </ul>
9	If you have chosen the Lean of Peak method, at step 5 continue leaning until the last cylinder has peaked. See page 17 for Lean of Peak.	-15 12.3	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.

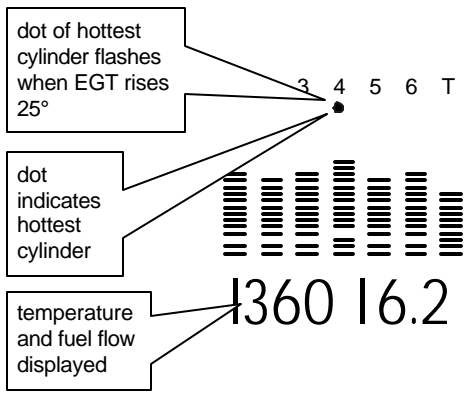
**It is your responsibility to know your aircraft's limitations.**

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 *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 1340 is the current temperature of the hottest cylinder.

## When LF is activated:



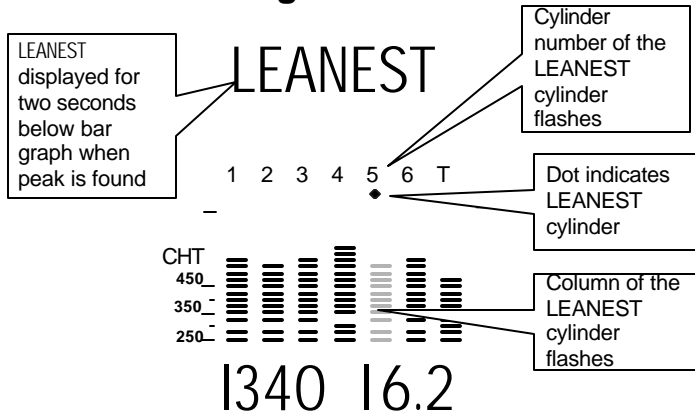
Continue leaning slowly *without stopping*. With a vernier mixture control, turn the knob about a quarter turn every second. With a non-vernier or quadrant mixture control, lean slowly and smoothly about 1/16 inch every five seconds. Eventually, one cylinder will reach peak before any of the other cylinders. 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 lean too much, the EGT will drop and the engine will be operating lean of peak.

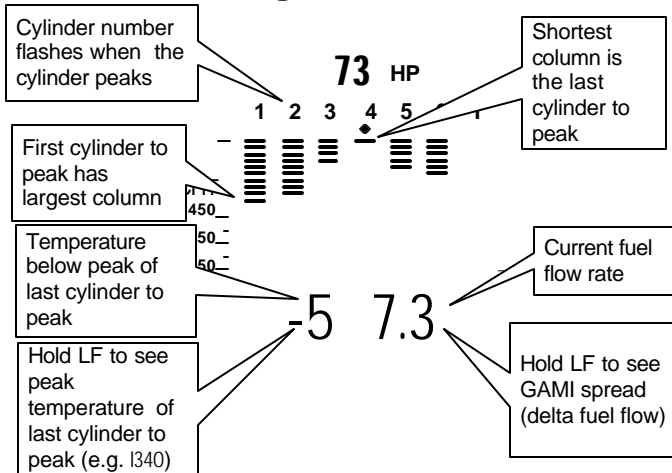
## Leaning Rich of Peak



## 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.

## **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**. This is caused by unburned fuel in the exhaust and igniting.

**JPI Hastaloy-X-tip probes produces faster response** 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 probe. However, note that the engine was certified with the factory-installed probe and gauge, and this gauge reading is the limiting factor when adjusting your engine.

## **Section 5 - 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. The pressure alarms

become enabled 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 51 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. See “Alarm Limits” on page 51.

## 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	<b>CHT</b>	High CHT
	<b>OIL</b>	High OIL temperature
	<b>TIT</b>	High TIT
	<b>OIL</b>	Low OIL temperature
	<b>O-P</b>	Low oil pressure
	<b>O-P</b>	High oil pressure
	<b>CLD</b>	Excessive CHT cooling rate
	<b>DIF</b>	Excessive EGT span
	<b>BAT</b>	High battery voltage
	<b>BAT</b>	Low battery voltage
	<b>MAP</b>	Overboost Manifold pressure
	<b>LO</b>	Low fuel quantity remaining
	<b>FUEL</b>	
Lowest priority	<b>LO</b>	Low fuel endurance remaining
	<b>TIME</b>	

## 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.**

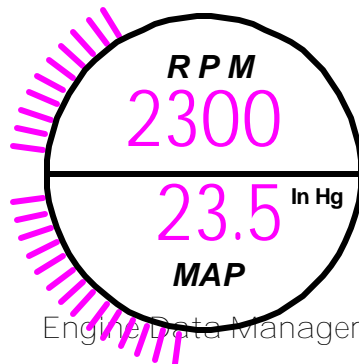
## Section 6 - Displays and Controls

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.

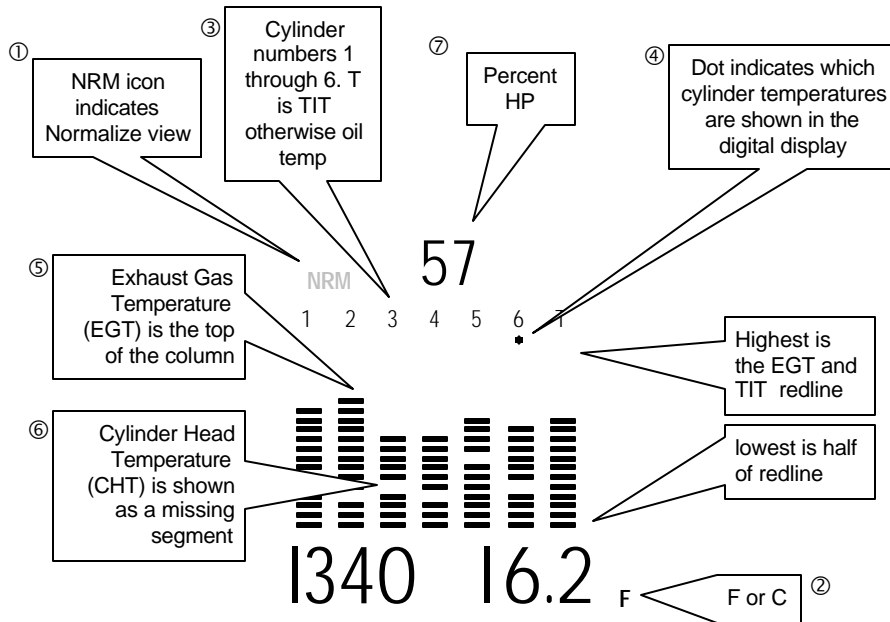
### RPM and MAP Displays

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.

## 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 in circles refer to features in the above diagram.

### ① Normalize View Indicator

- Percentage view (when the NRM icon is *not* lighted): the columns indicate percent of EGT red line. Each column is composed of a stack of segments. A maximum height column depicts 100 % of red line and a one segment-high column depicts 50 % of red line. For example, if the red line is 1650°F, a maximum height column represents 1650°F and a one segment-

high column represents half that value, or 825°F. The *Percentage view* permits comparison of EGTs *across all* cylinders. Hotter cylinders display higher columns than cooler cylinders.

- Normalize view (when the NRM icon is lighted): the EGT columns are displayed normalized. When you change to the Normalize view, all columns are initially set to the same half-height level for trend analysis. Any changes are shown as an increase or decrease in column height. **A one-segment change in column height represents a 10°F change.** The Normalize view permits rapid visualization of EGT *trends*, rather than a percentage of red line. You can use normalize in level cruise and run-up.

**To toggle between Percentage and the Normalize views, hold the LF button for three seconds until the NRM icon toggles.** The analog display becomes half height and the display changes to the Normalize view. Selecting the Normalize view does not affect the digital display nor alter the measurement sequence. The scale of the CHT display—described later—is not affected by the Normalize or Percentage view.

You may select the Normalize view in either the Manual or Automatic mode. Normalize view is most helpful for engine trend monitoring of each cylinder's operation during cruise. When using the Normalize view during engine run-up, a fouled spark plug will appear as a higher column.

A common misapplication is to be in the Normalize view and then change your power setting, causing all columns to go off scale, high or low. Select the Percentage view before adding or reducing power. Always select Percentage View when beginning your descent.

### **Ⓢ Temperature 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 “Factory Program Submenus” on page 39.

### ③④ **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.

### ⑤⑥ **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**.

- In the Percentage view, 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.

### ⑦ **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).

digital display of EGT

1340 376

digital display of CHT

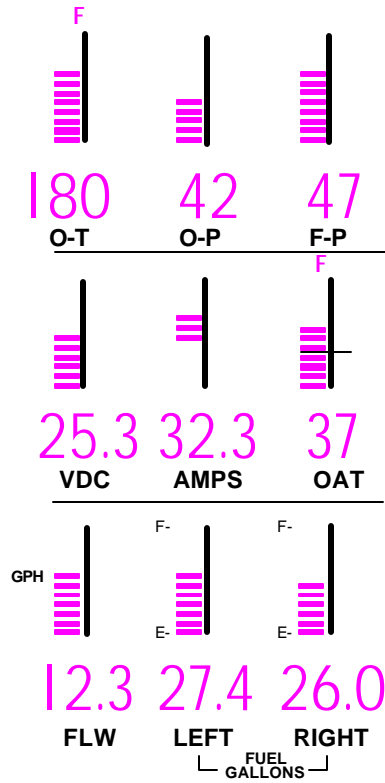
### Display Dimming

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 51.

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 redline charge and discharge, respectively.

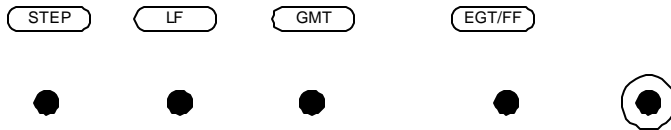
For volts the top of the bar is high redline and the bottom of the bar is low redline. The top of the bar for FLW is set by the MAXFF parameter. The white horizontal line indicates freezing for OAT.

The ranges and alarm values are user settable and are described later in section Section 10 - First Time Setup and Customization on page 36.

## 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 (NRM) Button

- In Automatic or Manual modes, *tapping* the LF button will change to the LeanFind mode.

- In Automatic or Manual modes *holding* the LF button for three seconds will toggle between Percentage and Normalize (NRM) views.
- 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 and other modes.
- 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). It has no affect on the displayed measurements in the Manual mode.

### **EGT/FF Button**

In the Automatic or Manual modes, this button affects the Scanner display and selects what measurements are viewed during scan. See page 4 for detailed description of which measurements are shown.

- In the **FF** selection only fuel flow measurements are displayed.
- In the **ALL** selection, both installed temperature and fuel flow measurements are displayed.
- In the **EGT** selection only the installed temperature (and battery voltage) measurements are displayed.

Any alarm warning will appear regardless of the scan select setting. Selected scan measurements are displayed in the digital display in either the Automatic or Manual modes.

## Section 7 - 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** 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 TIT

Excluded: 1540 .TIT

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, either tap the LF button and then tap the STEP button or wait 5 minutes. You may disable the Automatic mode by setting “0” for scan rate.

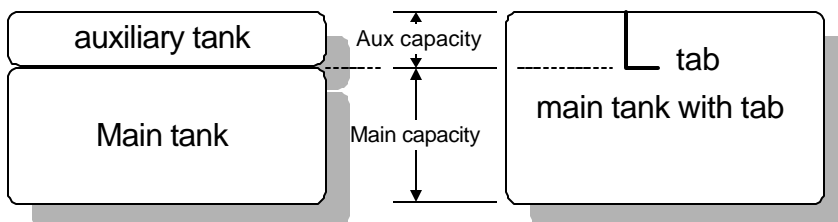
## LeanFind Mode

This was described in Section 4 - LeanFind, beginning on page 12.

## Section 8 - 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 FILL? N until any button is pressed. 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. See page 41 to program the EDM-900 for this feature. 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 start up.** 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.

<i>LF to choose</i> <b>B</b>	<i>Main tanks only, no tabs</i>	<i>Main tanks with tabs</i>	<i>Main &amp; Auxiliary tanks</i>
FILL?N	Did not add any fuel since last shutdown.		
FILL 75	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 .OGAL is displayed
FILL 120	(not available)	Topped the main tanks.	Topped both the main and auxiliary tanks.
FILL +	Did not top, but added additional fuel to the aircraft, or removed fuel from the aircraft.		

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

### **Adding Fuel and Auxiliary Tanks**

If you either

- a) added less than full fuel to only the main tanks, or
- b) topped the main tanks but have some fuel remaining in the auxiliary tanks,

then select **FILL +** and the next display will ask you how much you added: .OGAL (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.

SELECT FF/EGT	<i>Measureme nt Description</i>	<i>Example</i>	<i>Comments</i>
E, A	<b>Voltage, System Bus</b>	14.2 BAT	Battery voltage

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

## Section 9 - 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 to a PC using a Palm™ handheld as an intermediate courier, or directly to a laptop PC.

When you retrieve recorded data to your handheld or 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 Palm handheld or PC in a file in a compressed format. The PC program supplied with the Long Term Data Memory 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 0.1 minute interval (1600 hours at 8 minute interval), 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 **TIME** button twice. You will see the word **SNAP** at the next record snapshot, indicating a data record has been marked. Tap the **STEP** button to return to the Automatic mode. Recording begins when EGTs are greater than 500°F or “snap” is requested.

All data are time-stamped. The EDM-900 Long Term Data Memory contains a real-time clock that may be reset to local time when you initially program your instrument. 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 the EDM's serial number.

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.

At power on, the EDM-900 will execute its self test and then display the date (e.g., 11.12.01), the time (13.26), the percentage of memory filled since the last save (FULL 24), and the Aircraft ID.

### **Downloading data to the Palm handheld**

The examples shown here are specifically for the Palm™ handheld and a PC running Windows® 98. J. P. Instruments provides an optional cable to interface to the Palm cradle cable or travel cable. J. P. Instruments has a downloadable data transfer application program for the Palm series called EzPalm™.

## Downloading the EzPalm Program from the Internet

Go to our web page [www.jp instruments.com](http://www.jp instruments.com), go to the *downloads* page. Double click on EZPALM2.ZIP. When the *File Download* window appears select *Save this file to disk*. Save the file to folder C:\EZSAVE. If it doesn't exist, create it.

Using Windows Explorer, go to the folder C:\EZSAVE and double click on the file name EZPALM2.ZIP. In the new Windows Explorer window that opened, double-click on EZSAVEP.EXE. Select *Extract All*. Accept the default directory C:\EZSAVE and select *Next*. Answer *Yes* and select *Finish*.

## Installing EzPalm on the Palm handheld

Using Windows Explorer, go to directory C:\EZSAVE and double-click on EzPalm.prc. Click Done, Click OK.

HotSync® your Palm handheld. The EzPalm icon should now appear on your applications screen.

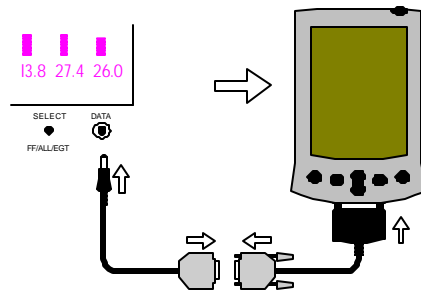
## Memory Data Capture & Import

With the Palm handheld you can transfer memory data into a file and then later HotSync the data into your PC and import it into EzSaveP™. Here are the steps used to perform these two operations.

## Transferring Data from the EDM-900 to the Palm Handheld

To transfer recorded data to your Palm handheld, proceed as follows:


1. Connect the Palm handheld cradle or travel cable option (available from Palm Computing) to the JPI Palm Download cable (gray). Insert the small round plug of the JPI cable into the data connector on your aircraft instrument panel, and the cradle or travel cable to the Palm handheld.



2. Simultaneously hold the **STEP** and **LF** buttons for five seconds. You will see the word **PROGRAM** for two seconds. Tap the **STEP** button until you see the question **DUMP? N**. Tap **LF** to select **DUMP NEW** or **DUMP ALL**.

3. On the Palm handheld, tap the EzPalm icon.



4. Tap the EzCapture™ button. The Palm handheld will wait a few seconds for you. 
5. Tap the **STEP** button to begin the transfer process. The display shows the percentage of memory remaining to be transferred. When this number reaches zero, the transfer is complete. If you want to terminate the transfer before it is complete, simultaneously hold the **STEP** and **LF** buttons for five seconds. You will see **ABORT**.
6. The Palm handheld will close the file named with today's date. Tap **Exit** to end EzPalm or tap **Explorer** to view the file list.

### **Transferring Data from the Palm handheld to your PC in Excel compatible format**

1. Place the Palm handheld in the cradle and begin a HotSync. Your file will be placed in the folder **C:\Palm\YourName\Backup** where **YourName** is the folder corresponding to your Palm handheld user name. The file will have a name similar to **P010318a.PDB** corresponding in this example to the date 2001, March 18.
2. Using MS Explorer, move the file **P010318a.PDB** to the folder containing the **EzSAVEP.exe** application—such as **C:\EZSAVE**.
3. To run **EzSAVEP** on the PC, go to directory **C:\EZSAVE** and run **EXSAVEP.EXE**. From the main menu use the up and down arrow keys to select **De-Compress Palm Pilot Data**. Use the up and down arrow keys to select the file to decompress. Press the **<Enter>** key.

EzSAVEP will create one or more files, each of which corresponds to one flight.

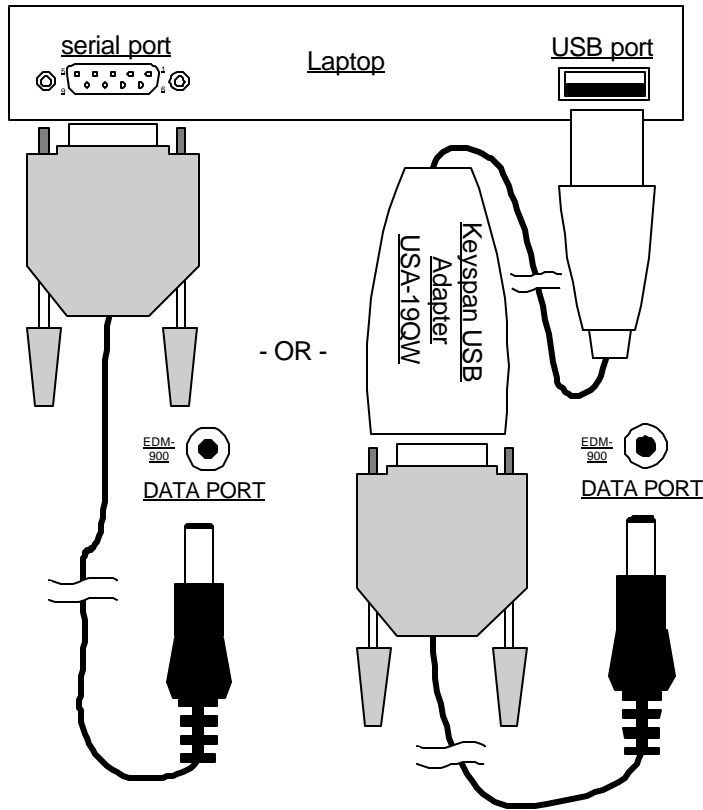
## Transferring Data from the EDM-900 to a Laptop PC

Go to our web page [www.jp instruments.com](http://www.jp instruments.com), go to the *downloads* page. Double click on EZSAVE.ZIP. When the *File Download* window appears select *Save this file to disk*. Save the file to folder C:\EZSAVE. If it doesn't exist, create it.

Install EzSave™ on your laptop PC, following the instructions included with the EzSave program or download EXSAVE.pdf. 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 EzSave icon. Click on the **Download and decompress data** button. You may also tab to the desired button and press the spacebar to select a menu item.

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



## Section 10 - First Time Setup and Customization

### Pilot Program

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.

STEP <i>advances next item</i>	LF <i>sequences through these values</i>	<i>Comments</i>
PROGRAM		Stays on for two seconds.
FUEL N	FILL ? N	Tap LF to change fuel status. See page 28 → Exits program mode when done.
DUMP? N	DUMP? N → DUMP NEW → DUMP ALL	Dump data to a Palm or laptop computer. See page 31 →
RATE 4	0 ... 9	Index rate (pause time in seconds) in the Automatic Mode. 0 disables the Automatic Mode.
OAT F	OAT F ↔ OAT C	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.
OAT+0	OAT-10 ... OAT+10	This step will be normally be skipped. Adjust the indicated temperature up or down by up to 10°. For example, OAT+3 adjust the OAT 3° higher.
EGT I?N	EGT I?N ↔ EGT I?Y	Y—Yes—sets the digital display to one-degree resolution; N—No—sets 10°. (10° resolution is easier to interpret the EGTs.)
HPC= 125	70 <sup>HP</sup>  HPC= 125	%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 38 →
TRIP? N	TRIP? N ↔ TRIP? Y	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 38 →

HOBS VAL	2424 ENG↔ 25 EDM↔ 3567 FRM	Displays the engine hours and airframe hours.
END? Y	END? Y	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

1. At full take off power at sea level, view the reading in the %HP display and see how close it is to 100 percent. If the value in the display is not 100 percent, then go to the next steps.
2. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.
3. Tap STEP repeatedly until you see—for example— HPC = 125. Then hold both the STEP and LF buttons until you see ADJUST, followed by HPC = 125. The adjustment range for the HP Constant is 45 to 180.
4. Change the HP reading by adjusting the HP constant in the lower display by holding or tapping the LF button..
5. Keep adjusting the HP constant until the HP window displays 100 as the current engine percent HP.
6. Tap the STEP button to proceed to the next step.

### 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**.

## Factory Program Submenus

A Windows based program called **EzCfg** is as an alternative to the steps shown below. See the [www.jp instruments.com](http://www.jp instruments.com) web site to download.

To enter the factory programming submenus:

- Simultaneously hold the **STEP** and **LF** buttons for five seconds. You will see **FUEL N**.
- Again, release and simultaneously hold the **STEP** and **LF** buttons for five seconds. You will see **FACTORY** followed by **RESET? N**.

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 **LF** to enter the desired submenu. When you exit the last item on a submenu the display will show **++++ +** for a second and then display the next item. To immediately exit the Factory Program mode, hold the **STEP** and **LF** buttons for five seconds.

The name of the submenu that you are currently stepping through is displayed on the upper left side of the screen. Initially the display will be **FAC MENU**.

## Submenus

**STEP**      **LF** enters this submenu

<b>RESET? N</b>	Tap <b>STEP</b> to skip this step. <b>Warning: tapping LF at this point will reset all programming to the factory defaults.</b>
<b>TEMP ? N</b>	Sets the engine temperature units, calibrates TIT and thermocouple type. See page 40→
<b>ALRM ? N</b>	Sets the alarm limits for battery voltages, engine temperatures, fuel and other parameters. See page 40→
<b>FFLW? N</b>	Sets the tank capacities and other constants for the fuel flow transducer system. See page 41→
<b>RPM ? N</b>	Sets the number of cylinders for the RPM sensor and the Hobbs enable

	RPM. See page 45→
<b>RECD? N</b>	Sets the data recording time interval. See page 45→
<b>MAP? N</b>	Sets the manifold pressure calibration. See page 45→
<b>FLVL ? N</b>	Sets the fuel level parameters. See page 47→
<b>USER IDN</b>	Sets the aircraft ID, registrations number, or owner into the EDM for initial startup and for use in reports. See page 50→
<b>TIME ? N</b>	Sets the time and date. See page 50→
<b>END ? Y</b>	STEP exits the Factory Limit mode. LF reenters factory programming mode.

Tap LF to enter the desired submenu. Within each submenu there are a number of choices. Choose an item within a submenu by tapping the STEP button to step through the list. Tap or hold LF to choose a value for that item. Use the STEP button to advance to the next item.

## TEMP MENU

Sets the engine temperature units, calibrates TIT and thermocouple type

STEP	LF	
EGT - CHT	ENG F ↔ ENG C	Select F or C degrees for all engine temperatures. Same bar graph scale.
ORIG TIT	ORIG T N ↔ ORIG T Y	Original TIT, Y will enter TIT calibration mode, next step
	TIT -975 ↔ 975	For example, if the EDM reads 100 less than the aircraft's TIT gauge, set the display to read TIT +100
TYPE K	TYPE K ↔ TYPE J	Toggles CHT between thermocouple type K and type J (type K is JPI standard)

## ALRM MENU

Sets the alarm limits for battery voltages, engine temperatures, fuel and other measurements.

STEP	LF	
BATTERY	HBAT 10.0 → 35.0	High battery voltage limit (volts)
	LBAT 8.5 → 30.0	Low battery voltage limit (volts)
EGT DIF	DIF 30 → 990	EGT difference limit (°F or °C)
CHT HI	HCHT 90 → 500	High CHT limit (°F or °C)
COOL CHT	CLD 5 → 200	Shock cooling limit (°F or °C)
TIT HI	TIT 650 → 2000	TIT and EGT limits (°F or °C)
OIL TMP	HO-T 40 → 500	High oil temperature limit (°F or °C)
	LO-T 10 → 250	Low oil temperature limit (°F or °C)
OIL PRS	HO-P 0 → 150	High oil pressure limit (psi)
	LO-P 0 → 100	Low oil pressure limit (psi)
MAP HI	MAP 25.0 → 60.0	High manifold pressure limit (in Hg)
LO FUEL	REM = 0 → 200	Low fuel amount remaining limit (gal)
LO TIME	MIN = 0 → 60	Low time fuel alarm limit (minutes)
FUEL PRS	HF - P 0 → 100	High fuel pressure limit (psi)
	LF - P 0 → 100	Low fuel pressure limit (psi)
MAX RPM	RPM 2000 → 3600	High RPM limit (rev. per minute)
MAX AMP	AMP = 0 → 300	High amp load limit
MAX AMP2	AMP2 = 0 → 300	High amp load limit for second amps (set to 0 to disable)
TBO HRS	TBO 0 → 2000	TBO limit (hours)

## FFLW MENU

Sets the tank capacities and other constants for the fuel flow transducer system.

STEP	LF	
UNITS	FUEL GAL → KGS → LTR → LBS	Units for all fuel related measurements
MAIN TK	MAIN 0 → 999	Main tank capacity. See below →
AUX	AUX 0 → 250	Auxiliary tank capacity. See below →
CARB? N	CARB? N ↔ Y CARB? Y	Y—Yes—carbureted engine, enables smoothing filter (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.

<i>Flight</i>	<i>Fuel USED shown by EDM (total tank - REM)</i>	<i>Actual fuel used by topping tanks</i>
1		
2		
3		
Total	❶	❷

2. Total ❶ the EDM-900 calculated fuel used and ❷ 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:

$$\text{New K factor} = \frac{(\textcircled{1}\text{EDM fuel used}) \times (\textcircled{3}\text{Current K factor})}{(\textcircled{2}\text{actual fuel used})}$$

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

Every time you fine tune the K factor, record the measurements here:

<i>Date</i>	<i>①EDM fuel used</i>	<i>②actual fuel used</i>	<i>③Current K factor</i>	<i>New K factor = ①x③/②</i>	<i>Pilot's 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: |9.90
8. Tap STEP button for next digit (hold STEP for previous digit): |9.90
9. Tap or hold the LF button to change flashing digit: |8.90
10. Tap STEP button for next digit (hold STEP for previous digit): |8.90
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.

## RPM MENU

Sets the number of cylinders for the RPM sensor and the Hobbs enable RPM.

STEP	LF	
RF = 6	RF = 4 → 12	RPM Factor = number of pulses per revolution
HOBS ON	RPM 800 → 1500	Minimum RPM to enable to Hobbs counter

### **RPM Factor (RF)**

Set the RPM Factor, RF = 4 or 6, depending on your engine. Exceptions:

- 4 cylinder engine with dual (all-in-one) magnetos set to RF = 8.
- 4 cylinder Laser ignition set to RF = 8.
- 6 cylinder Laser ignition set to RF = 12.

## RECD MENU

Sets the data recording time interval.

STEP	LF	
RATE	RATE 2 → 5 10	Record time interval, in seconds

## MAP MENU

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

STEP	LF	
MAP	MAP 20 → 32	Manifold pressure calibration

**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.

## FLVL MENU

Use this to initially calibrate the fuel level senders. The JPI EzFuel program can be used to simplify this procedure. Visit [www.jp instruments.com](http://www.jp instruments.com) to download.

STEP	LF	
TYP ?N	TYP ?N → TYP ?F → TYP ?L	N – none, F – fuel flow REM and USD, L – Fuel level, proceeds to next step.
PTS? 5	PTS? 2 → PTS? 5	Number of fuel level calibration points from 2 to 5.
0000 000 L 		See <i>Entering the Fuel Level Calibration Points</i> on page 49 below →

### TYP

Type selects what the last two graphs in the bar graphs section display. N will leave them blank, F will display fuel flow derived REM and USD, and L will display fuel levels, left and right.

### Determining Calibration Points

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 number of fuel level calibration points	L1 & R1	L2 & R2	L3 & R3	L4 & R4	L5 & R5
2	unusable	Full	Not used	Not used	Not used
3	unusable	½ tank	Full	Not used	Not used
4	unusable	1/3 tank	2/3 tank	Full	Not used
5	unusable	¼ tank	½ tank	¾ 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 each tank and write them in the chart below. These values will be entered using the procedure, *Entering the Fuel Level Calibration Points*, in the next subsection.

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

You may choose to do this procedure totally on one tank, then the other tank, rather than moving the fuel hose back and forth between the left and right tanks.

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

<b>Turn OFF the aircraft master switch</b>	
	Empty left and right tanks and fill each to the <b>unusable</b> level ( <b>first fuel level calibration point</b> )
<b>Hold EGT/FF button while turning ON master switch, see FUEL DSP</b>	
	With the left and right tanks empty, <b>write down</b> the displayed calibration values (L1 is on top, R1 is on the bottom). This is the empty (0) fuel level.
<b>Turn OFF the aircraft master switch</b>	
	Add fuel to the left and right tanks and bring it up to the <b>second fuel level calibration point</b> level (or full for a two point calibration)
<b>Hold EGT/FF button while turning ON master switch, see FUEL DSP</b>	

	With the left and right tanks at the second calibration point, <b>write down</b> the displayed calibration values (L2 is on top, R2 is on the bottom) <b>and</b> the amount of fuel now in each tank. For a 2 point calibration, stop here.
<b>Turn OFF the aircraft master switch</b>	
	Add fuel to the left and right tanks and bring it up to the <b>third fuel level calibration point</b> level (or full for a three point calibration)
<b>Hold EGT/FF button while turning ON master switch, see FUEL DSP</b>	
	With the left and right tanks at the third calibration point, <b>write down</b> the displayed calibration values (L3 is on top, R3 is on the bottom) <b>and</b> the amount of fuel now in each tank. For a 3 point calibration, stop here.
<b>Turn OFF the aircraft master switch</b>	
	Add fuel to the left and right tanks and bring it up to the <b>fourth fuel level calibration point</b> level (or full for a four point calibration)
<b>Hold EGT/FF button while turning ON master switch, see FUEL DSP</b>	
	With the left and right tanks at the fourth calibration point, <b>write down</b> the displayed calibration values (L4 is on top, R4 is on the bottom) <b>and</b> the amount of fuel now in each tank. For a 4 point calibration, stop here.
<b>Turn OFF the aircraft master switch</b>	
	Add fuel to the left and right tanks and bring it up to full for the <b>fifth fuel level point calibration point</b> level.
<b>Hold EGT/FF button while turning ON master switch, see FUEL DSP</b>	
	With the left and right tanks at the fifth calibration point, <b>write down</b> the displayed calibration values (L5 is on top, R5 is on the bottom) <b>and</b> the amount of fuel now in each tank (fuel tanks).
Proceed to the next step below to enter the fuel level calibration points.	

### Entering the Fuel Level Calibration Points

This procedure is used to enter the fuel level calibration points (2 to 5 points for each tank) into the EDM-900. **This procedure assumes that you have determined the calibration points from the procedure described in the *Determining Calibration Points* section, above.**

Each fuel level calibration point is a seven digit number: the left four digits are the internal EDM-900 calibration constant, and the right three digits

are the corresponding fuel level in fuel units (gallons, kilograms, liters, or pounds).

In the **FLVL MENU**, first select the number of fuel calibration points: 2 through 5, using **LF**, then tap **STEP**. You will see the first point as 0000 00.0 or some other number if calibration points have been previously entered. To the right of this display you will see the point number (L 1 thru L5, R 1 thru R5). To change each fuel level calibration point, hold both **STEP** and **LF** for five seconds until the first digit flashes. Tap or hold **LF** to set the first digit. Tap **STEP** to advance to the next digit (hold **STEP** to go back to the previous digit). Hold both **STEP** and **LF** when you are finished entering this fuel level calibration point. The digit will stop flashing.

Tap **STEP** to advance to the next fuel level calibration point. Repeat the steps in the preceding paragraph for each fuel level calibration point. For 2 point calibration there will be a total of 4 constants, up to a 5 point calibration of 10 constants.

Tap **STEP** to exit the procedure.

## ID MENU

Sets the aircraft ID, registrations number, or owner into the EDM for initial startup and for use in reports.

	00000 → ZZZZZ (1 <sup>st</sup> char flashes)	Current aircraft ID. To change aircraft ID, hold both <b>STEP</b> and <b>LF</b> until the first character flashes.
	00000 → ZZZZZ (2 <sup>nd</sup> char flashes, etc.)	<b>LF</b> the character, <b>STEP</b> moves to the next character. To save, hold both <b>STEP</b> and <b>LF</b> .

## TIME MENU

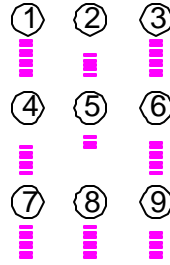
Sets the time and date.

	STEP	LF	
DATE	MONTH 1 → 12		Month
	DAY 1 → 31		Day
	YEAR 01 → 99		Year

TIME	HOUR 00 → 23	Time of day, hours, 24-hour time
	MIN 00 → 59	

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



### Programming Alarm Limits

#### Factory Set Default Limits—Non-Primary

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

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 - 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>
<b>LeanFind finds a “peak” too soon.</b>	Failure to pre-lean before performing LeanFind or pausing while leaning.	Continue to lean without pausing. False peak will be reset and LeanFind will continue.
	Leaning too slowly.	Lean more quickly.
<b>Peak not found</b>	Lean Find not activated or stopping while leaning	Lean at the speed of approximately 10°F per second.
<b>Off-scale EGT columns, too high or low</b>	You forgot that you set the EDM-900 in the Normalize view and later observe off-scale EGT column readings.	The higher sensitivity (10° per segment) of the Normalize view can quickly go too high or low off-scale with only small changes in EGT.
<b>No display of %HP</b>	Fuel flow not reading, OAT not reading	Fuel Flow reading and OAT is required for HP.
<b>RPM reads 2/3 of correct value</b>	4 cylinder engine but set to 6 cylinder.	In Pilot Program change 6 to 4 cylinder.
<b>First cylinder to peak is not the hottest</b>	This is normal. The first to cylinder peak is not necessarily the hottest.	
<b>EGTs rise during single magneto check</b>	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.

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## 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 the startup sequence, the following will be seen on the scanner digital display: EDM-900, MM.DD.YY, HH.MM GMT, USD MEM, XX PCT, aircraft registration number (defaults to FACTORY if new or reset), VER X.XX, BLD XXX.

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:

MEM ON	Not an error. Memory on. Recording is enabled when EGT exceeds 500°F or the RPM exceeds the Hobbs RPM enable value.
HOBS ON	Not an error. Hobbs on. RPM exceeds the Hobbs RPM enable value.
TEST ING	LF tapped during self test. Tap LF again later.
0.0 GPH	Zero's indicate Fuel flow is too low to register
--- GPH	Dashes indicate No fuel flow transducer signals
--- H.M	Dashes indicate No fuel flow transducer signals
OPEN PRB	Open probe. Wiring to probe is open circuit. Check

	wiring and crimps. Swap probes to troubleshoot.
BAD-PRB	Bad probe. Erratic reading. May be poor electrical connection. Swap probes to troubleshoot.
H I XX	High. Measurement over range.
LO XX	Low. Measurement under range.
CAL ERR	Calibration error. Return unit to factory.
DSP XXX	Internal communication error. Return unit to factory.
COMM ERR	Internal communication error. Return unit to factory.
NO XX V	Calibration error. Return unit to factory.

### GPS Interface Diagnostics

Measurements REQ, RES, & MPG are all missing from the scan.	No communications from GPS receiver to EDM. Possibly no connection or aircraft GPS is off.
NO - COM message and measurements REQ, RES, & MPG 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.
NO - SIG message and measurements REQ, RES, & MPG are missing.	GPS receiver has insufficient signal for valid data.
NO - WPT message and measurements REQ & RES, are missing.	No waypoints are programmed into the aircraft GPS receiver.
---REQ or ---RES 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 30 seconds 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 12 - 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.

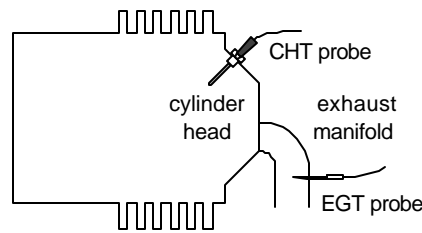
The real-time serial data port—a standard feature—permits you to externally record scanned measurements in real-time using a user-supplied Palm™ handheld or laptop PC. The built-in data recording will continue to operate.

### 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.



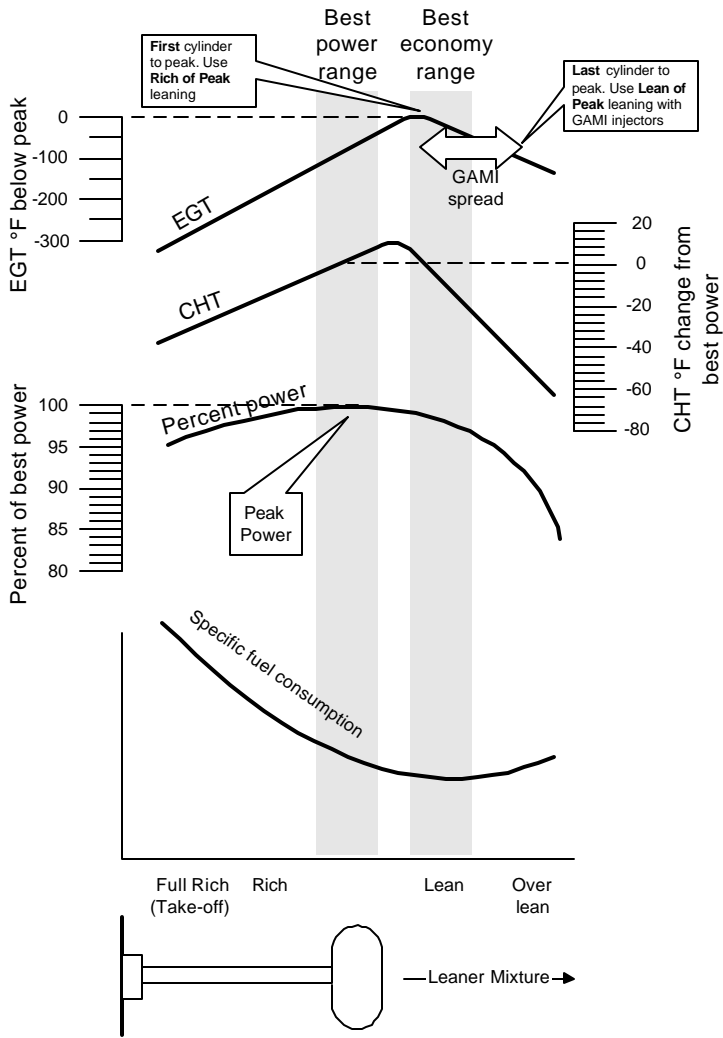
## Temperature and Mixture

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.



A single EGT gauge merely gives you an average of each cylinder's temperature: some cylinders can be too rich, while others too lean. Variations produced by differences in fuel distribution, ignition, and compression will cause each cylinder to follow its own mixture and temperature relationship such that one cylinder will reach peak before another.

## 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:

*Format*            *Baud*  
                              *rate*

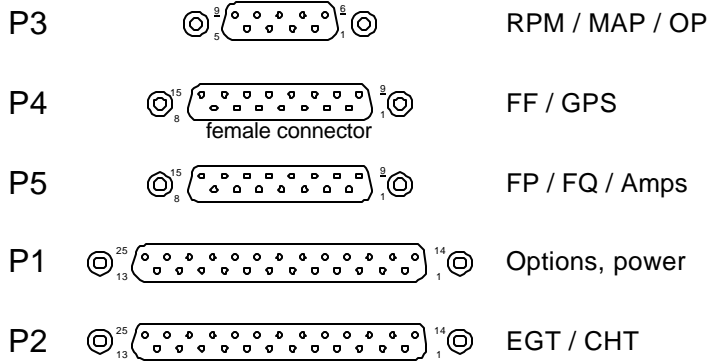
<i>Format</i>	<i>Baud rate</i>	
NMEA-183 (Marine Nav Data Format)	4,800	This is the format for most handheld GPS receivers. Loran must have sentences RMA & RMB. GPS must have sentences RMB & RMC.
Aviation Data Format	9,600	“Output sentence type 1” Required sentences are: A, B, C, D, E, I and L first 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 connector	
<i>Pin no.</i>	<i>Pin no.</i>	<i>Probe or 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	data out to GPS
yel 3	red 4	IND	blk 2	RPM grd /2	2	data in from GPS
yel 5	red 6	CARB (or CDT)*	red 3	RPM pwr /3	3	
yel 14	red 15	OAT	red 4	MAP pwr /3	wht 4	FF signal
yel 16	red 17	TIT-1	blk 5	MAP grd /1	red 5	FF power
yel 18	red 19	TIT-2 (2 <sup>nd</sup> TIT)	6	OIL P sig	blk 6	FF ground
	gry 12	Remote alert T,V	7	OIL P grd	11	remote FF alarm
	red 13	+ Power	wht 8	MAP sig+ /2	wht 12	FF2 signal
	wht 11	data in	grn 9	MAP sig- /4	red 13	FF2 power
	wht 24	data out			14	AMPS 2 +
	blk 25	Engine ground			15	AMPS 2 -

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

### View facing rear of instrument



P2 EGT CHT 25-pin connector		
<i>Pin no.</i>	<i>Pin no.</i>	<i>Probe or function</i>
yel 1	red 2	CHT 1
yel 3	red 4	CHT 2
yel 5	red 6	CHT 3
yel 7	red 8	CHT 4
yel 9	red 10	CHT 5
yel 11	red 12	CHT 6
yel 14	red 15	EGT 1
yel 16	red 17	EGT 2
yel 18	red 19	EGT 3
yel 20	red 21	EGT 4
yel 22	red 23	EGT 5
yel 24	red 25	EGT 6

P5 FP/FQ/AMP 15-pin connector	
<i>Pin no.</i>	<i>Function</i>
1	FQ 1 (res)
2	FQ 2 (res)
3	FQ grd
4	FP Sig+
5	FP Sig-
6	FP pwr
7	FP grd
8	
9	FQ1 sig (cap)
10	FQ2 sig (cap)
11	FQ1 pwr (cap)
12	FQ2 pwr (cap)
13	Volts 2 sense
14	AMPS +
15	AMPS -

### 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 13 - 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](http://www.jp instruments.com)

jpitech@pacbell.net

## 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

### Normalize View

- Hold LF for three seconds.

### Percentage View

- Hold LF for three seconds.

### 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 4.
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 Palm Computer to the EDM-900 serial port.
2. Hold both STEP and LF until the display shows PROGRAM, followed by FUEL N.
3. Tap STEP a few times until you see DUMP?N.
4. Tap LF until you see DUMP NEW or DUMP ALL.
5. On the Palm Computer tap EzPalm, then tap EzCapture.
6. On the EDM-900 tap STEP to transfer. (to abort hold STEP and LF for 5 seconds).
7. On the Palm Computer close the file with today's date.
8. Tap STEP to exit.

### 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 F ILL followed by FUEL ? N.
3. Tap **LF** to see F ILL 75\*
4. With aux tanks or tabs, tap **LF** again to see F ILL 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 F ILL +.
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 LEANR.
3. Lean mixture until you see a column flash and the words LEANEST followed by (e.g.,) 1545 135\*
4. Hold **LF** and see LEANEST 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 LEANR.
3. Hold both **STEP** and **LF** until you see LEANL
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.