

Hodge Flight Services

Cessna 172R N9520D Avionics Manuals

**J.P. INSTRUMENTS
ENGINE DATA MANAGEMENT (EDM) – 900
SYSTEM**

TSO-C43 Temperature
TSO-C44 Fuel Flow
TSO-C45 Manifold Pressure
TSO-C47 Oil/Fuel Pressure
TSO-C49 RPM
TSO-C55 Fuel Level
DO-178 Level C



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Pilot's Guide

EDM-900



EPM-900

N9520D 172R

PRODUCTION TYPE = 790000-C-282

EDM SERIAL # = 05278

INSTALL DATE: 4/5/2016

TACH TIME TRUE @ 2133

ENGINE TACH TIME
AT TIME OF INSTALL

HOBBS 2922.7

TACH 2332.2

EDM LIMITS SET 4/6/2016

RPM HIGH = 2400

MAP HIGH = 30

CHT HIGH = 450

EGT HIGH = 1650

OIL T HIGH = 245°F

OIL P HIGH = 115 PSI

VOLTS HIGH = 30 VOLTS

LOW = 24 VOLTS

CLD HIGH = 60

DIF HIGH = 500

FUEL REMAINING = 10 GAL

Pilot's Guide

Engine Data Management

EDM-900

Primary

TSO/STC

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Rev A

For Your Safe Flight

Page 1

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Product Features

- Hands-free, automatic scanning
- LeanFind™ finds the first and last cylinder to peak with true peak detect—eliminates false peaks
- Displays both leaned temperature below peak and peak
- Battery voltage with alarm
- Amperes (load or charge/discharge meter)
- Programmable alarm limits
- Exhaust Gas Temperatures (EGTs) to stable 1°F resolution
- DIF low to high EGT with alarm
- Shock cooling monitored on every cylinder
- Fast response probes
- Non-volatile long term memory
- Records and stores data up to 30 hours
- Post-flight data retrieval
- Data retrieval software
- Oil pressure
- Oil temperature
- Turbine inlet temperature, if applicable (optional)
- Outside air temperature
- Compressor discharge temperature (optional)
- Carburetor temperature or induction temperature (optional)
- Fuel pressure, if applicable
- Fuel level Voltage, Resistive or Capacitive (frequency)
- 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
- Hobbs® timer
- Remote Auxiliary Display (RAD)

Section-1

Getting Started

This is a summary of basic operation. Detailed descriptions of all operations appear later in this Pilot's Guide.

EDM-900 primary instrument has preset alarm limits and cautionary ranges per the POH (user cannot change them) typically for the following measurements of: oil temperature, oil pressure, fuel pressure, fuel quantity, cylinder head temperature, turbine inlet temperature, manifold pressure, and RPM.

Note: Fuel quantity gauges must be calibrated to the aircraft and will not be functional until the fuel calibration process has been performed.

View Angle

The best view angle for the pilot is in the horizontal mode with the buttons on the bottom. The best Portrait mode is with the buttons on the right.

View angles are per the table below:

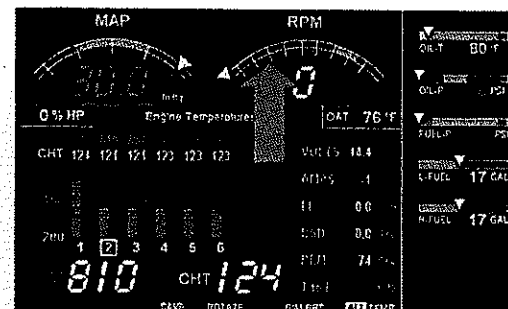
Viewing angle	Horizontal	Left	65 Degrees
		Right	65 Degrees
	Vertical	Up	60 Degrees
		Down	50 Degrees

List of abbreviations and acronyms

Gauge Function	Message Area Alarm Abbreviation
Primary	Primary
Engine rotational speed	RPM xxxx
Engine Manifold Pressure	MAP xx.x in hg
Engine Cylinder Head Temp	CHT2 xxx °F
Engine Oil Temperature	O-T xxx °F
Engine Oil Pressure	O-P xxx °F
Fuel Pressure	F-P xx PSI
Fuel Flow to engine	F-F xx.x GPH
Comp. Discharge Temp.	CDT xxx °F
Turbine inlet Temp. Left side	TIT-L xxxx °F
Turbine Inlet Temp. Right side	TIT-R xxxx °F
Single Turbine Inlet Temp.	TIT xxxx °F
Non-Primary	Non-Primary
Exhaust Gas Temp.	EGT2.xxxx °F
Shock Cooling of CHT	CLD xx °/MIN
Differential Temp. of EGT	DIF xx °F
Bus Voltage	Volts xx.x
Amperage Load	AMPS xx
Outside Air Temp.	OAT xx °F
Estimated Time to Empty	Est. T to E xx:xx H:M
Fuel used to date	USED xx.x GAL
Estimated Remaining fuel	Est. REM xx GAL
Estimated Fuel required to Waypoint	Est. WP REQ xx GAL
Estimated Fuel Remaining at Waypoint	Est. WP RES xx GAL
Nautical Miles per Gallon	ECON xx.x MPG
Brightness, Dim control	DIM/BRT

Rotation

Holding the step button in for 5 seconds, **with the engine OFF**, will produce the gray arrow. This arrow can be rotated to a new up position by tapping the LF button and then the STEP button. If for some reason you chose the one bad angle (Landscape looking up from the buttons), return the instrument to JPI and JPI will rotate the screen.

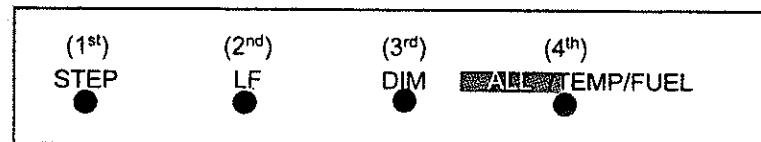


Fuel Flow Computer Basics (independent of fuel quantity)

The fuel flow computer tracks the fuel flowing to the engine and computes various values based on this. At installation, then each time you refuel the aircraft, you must inform the EDM about how much useable fuel is onboard. This is done via the *REFUEL* function. See page 35 for detailed information

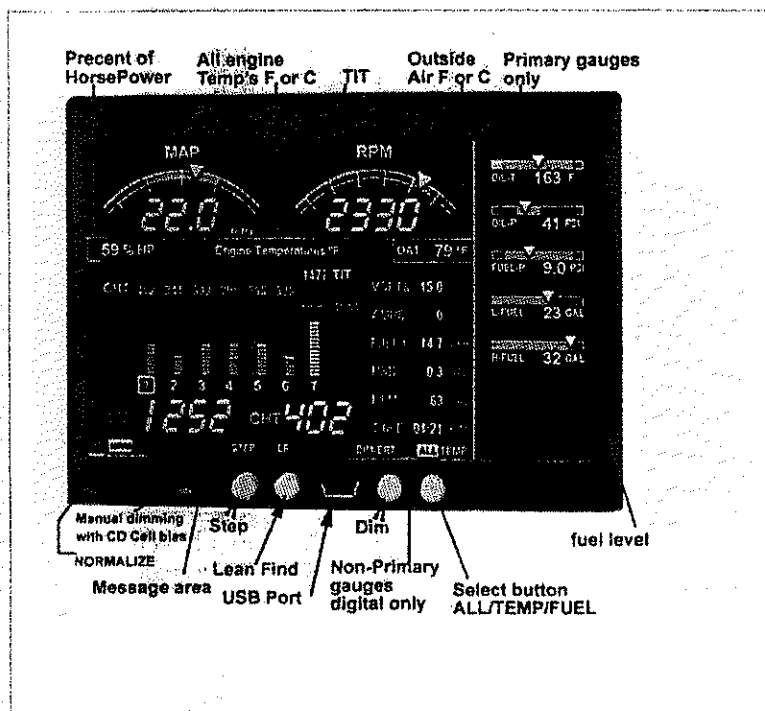
Control Button Basics

Four operating buttons control all functions of the EDM. These buttons change labels depending on the current state of the EDM.

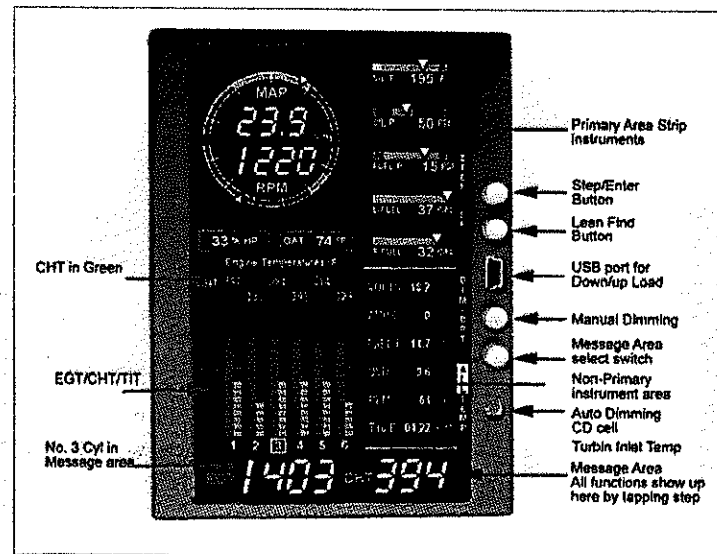


Display Screen Basics

The display screen is arranged into three sections. The top left is the *MAP* and *RPM* section. The bottom left is the *Scanner®* section or message area. On the right side are the horizontal primary strip gauges. Non-Primary gauges have a digital read out only. The instrument ranges and alarm limits are configured to match those of your aircraft POH when the EDM is set up as a Primary instrument. TIT column is to the right of the last EGT/CHT when applicable.



Horizontal Display Mode



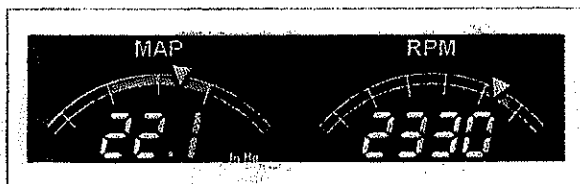
Vertical Display Mode

Remote Annunciate Light Basics

The Remote Annunciator Light 'RAL' provides notification that an alarm is present in the display, for all Primary gauges. Upon power up, the RAL shows Red and yellow indicating it is functional. Before each flight, confirm that it is functional. Non-functioning RAL must be repaired before flight.



Remote Annunciator Light (RAL)



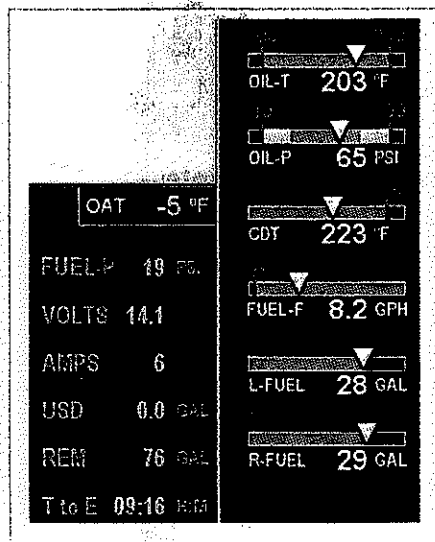
Horizontal mode

RPM and MAP Display Basics

In the vertical mode to the right and the Horizontal mode above MAP (Manifold Pressure) and RPM (Revolutions per Minute) are shown. Operations exceeding red line cause the digital value to turn red or yellow with the RAL coming on and a digital value in the Scanner message area.

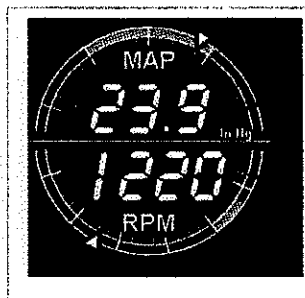
Linear Bar Graph Display Basics

The Bar Graphs section contains dedicated bar graphs with digital display. An example is shown here. Pointers move horizontal left to right showing value changes and digital readouts turn red when primary exceedances occur. Non primary functions flash white.

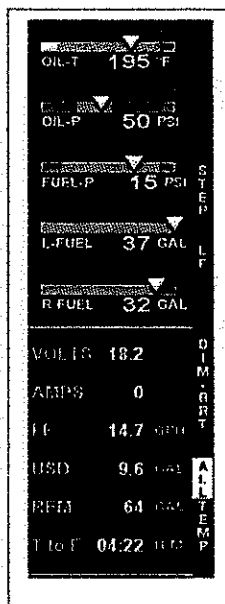


Horizontal mode

Vertical mode



Vertical mode



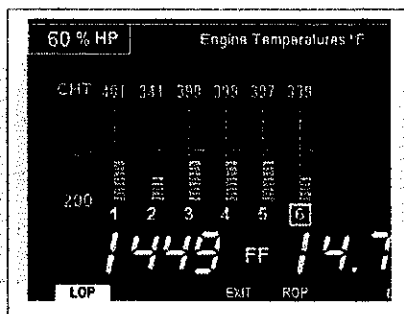
Scanner® Information Area

The Scanner® Information Area provides expanded information in the form of alpha-numeric messages, parameters and calculations. In Auto-Scan, parameters will 'scan by' once every 4 seconds (default). This rate can be changed in Pilot Programming Mode. Tap the STEP button for 'Manual' selection of any parameter. Parameters for the installed options will be displayed. To start the automatic scan tap LF and then STEP.

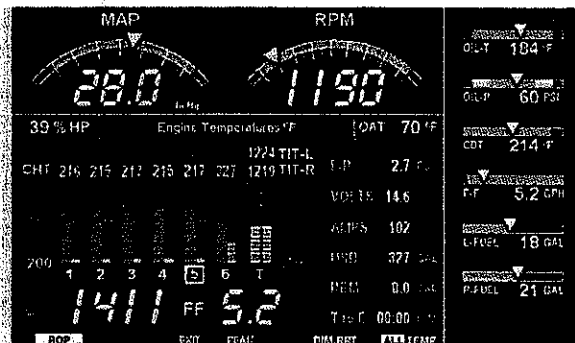
DISPLAY	PARAMETER	DESCRIPTION
EGT 1436 CHT 382	EGT/CHT	Shows successive pairs of EGT & CHT per STEP tap.
TIT 1580 °F	TIT	Single Turbine Inlet Temp.
TIT-L and -R 1490 °F	TIT-L, TIT -R	Two Turbine Inlet Temp. Left and Right engine side
OIL-T 204 °F	OIL TEMP	Oil temperature in degrees F
OIL-P 64 PSI	OIL PRES	Oil pressure in psi
F-P16 PSI	FUEL PRES.	Fuel pressure in psi
F-F 2.7GPH	FUEL FLOW	Fuel flow in GPH
CLD 75 °F	SHOCK COOL	CHT cooling rate (deg/min)
VOLTS 13.9	BATTERY	Battery/Bus voltage
AMPS -6	Amperage	Set up per the specific aircraft
OAT 23 °F	OAT	Outside air temperature F or C
DIF 40 °F	DIF	Hottest minus coldest EGT
CRB 56 °F	CRB	Carburetor Air Temp (only allowed if IAT not present)
CDT 145 °F	CDT	Compressor Discharge Temp (only allowed if CRB not present)
IAT 105 °F	IAT	Induction Air Temp
Est. REM 68.0 GAL	FUEL REMAINING	Calculated fuel remaining on board based on what the pilot put in as maximum.
WP REQ 12.7 GAL	FUEL REQUIRED	Calculated fuel required to reach waypoint or destination (GPS interface must be corrected)
Est. WP REM 63 GAL	FUEL RESERVE	Calculated fuel reserve at waypoint (GPS interface must be correct)
ECON 9.8 MPG	Nautical MILES PER GALLON	Calculated fuel miles per units (GPS interface required)
EST. T to E 04:32 H:M	Estimated Time to Empty	Calculated time remaining to fuel exhaustion in Hours and Minutes at present power.
GPH 15.0 GPH	FUEL FLOW RATE	Actual fuel flow rate in Gallons per hour
USD 7.2 GAL	FUEL USED	Actual fuel used by the engine
FUEL-P 64 PSI	FUEL PRES	Fuel pressure in PSI

LeanFind Basics

Simply pre-lean, tap the **LF** button (Lean Find) and begin leaning. The EDM will assist you in finding the first cylinder to peak. This example is for Rich of Peak, ROP. See page 26 for a more detailed description of leaning. Press **LOP** to exit the ROP mode and enter the LOP mode.



1. Establish cruise at approximately 65 to 75% power and pre-lean the mixture to 50°F estimated rich of peak EGT on any cylinder.
2. Wait about 30 seconds, then tap the **LF** button.
3. Begin leaning the mixture smoothly *without stopping*. Turn a vernier about ¼ turn per second; retract a non-vernier or quadrant lever so that EGT rises about 10°F per second.
4. Stop leaning when you see **LEANEST** for two seconds, followed by—for example—EGT 1449 FF 14.7 The left number is the current temperature of the first EGT to peak and the right number is the current fuel flow.
5. Now tap the **PEAK** button to display the EGT difference from peak which is very useful for setting desired degrees below peak.
6. Slowly enrich the mixture noting that the EGT difference diminishes as EGT climbs back to peak, followed by it going minus again. Stop enriching at the desired EGT difference (such as 'EGT -75').
7. You can also see what the peak EGT was by holding the **PEAK** button.
8. Tap **STEP** to exit the Lean Find Mode.



Section 2 - Interpreting Data

Operation for each Phase of Flight

(Worth adding to your run-up checklist)



Engine Run-Up

Suggested setup:

- Set engine to run-up 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:

- Standard 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. At high density altitude an overly rich mixture can significantly reduce engine power.
- 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 above the Scanner® section.



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 16).



Descent

Suggested setup:

- Standard view
- Manual mode

Be alert for:

- CLD: shock cooling alarm is set to -60°F. Average cool rates of -40°F/minute to -50°F/minute are normal, depending on the engine size.

Typical Normal Measurements



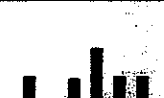






The following chart lists typical *normal* measurement values that you will observe for most general aircraft engines. Your particular engine's ranges may not fall within these values.







Measurement	Normal range	Comments
EGTs in Cruise	1350°F	• under 200 HP engines
	1550°F	• high performance engines • (EGT should drop 200°F when full throttle is applied)
EGT span (DIF)	70 to 90°F	• fuel injected engines
	120 to 150°F	• carbureted engines
TIT	1600°F average	• 100° higher than EGT
CHTs	350°F (OAT 60°F)	• normally aspirated engines
	410°F	• Turbocharged engines
CHT span	50 to 70°F	• 100° with gasket probes
OIL T	200°F	• oil cooler thermostat typically opens at 180°F
OIL P	30 to 60 psi	• varies with aircraft type
FUEL P (injected)	14 to 18 psi	• varies with aircraft type
FUEL P (carbureted)	0.5 to 8 psi	
Shock cooling*	-40°/minute	• tightly cowled engines
	-55°/minute	• Bonanza
	-200°/minute	• helicopter

* Maintain a cooling rate magnitude of less than -50°/minute. You will find that the cylinder with the greatest shock cooling may shift from front cylinders (during climb out) to the rear cylinders (during descent).

Engine Diagnosis Chart

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

Display	Symptom	Probable Cause	Recommended Action
	TIT ~100° higher than EGTs	This is normal	
	75° to 100° EGT rise for one cylinder during flight	Spark plug not firing due to fouling, faulty plug, wire or distributor.	Enrich mixture to return EGT to normal. Have plugs checked.
	EGT increase or decrease after ignition 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; no digital EGT	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	Normal for carbureted engines. Dirty fuel injectors or fouled plugs.	Check injectors and plugs.
	Decrease in EGT for all cylinders	Decrease in airflow into the induction system. Carb or induction ice.	Check for change in manifold pressure.

Display	Symptom	Probable Cause	Recommended Action
	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 cowl.	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 Normalize view or failed probe	Full rich and reduce power. Change to Standard view Check probe
(no picture)	Loss of peak EGT	Poor ignition or vapor in fuel injection system.	Have magneto tested.
(no picture)	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.
	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.

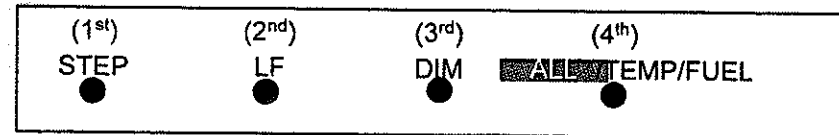
Section 3 - Displays and Controls

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

- Four front panel operating buttons below the bottom of the display.
- RPM and MAP display in the upper left corner of the display
- Scanner analog display including cylinder number and index square 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

Control Buttons

Four operating buttons control all functions of the EDM. These buttons may change labels depending on the current operating mode 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. Button layout is shown below:



1st Button

- In the Automatic mode, *tapping* the **STEP** button stops Scanner auto-sequencing and changes to Manual mode. Each *tap* of the **STEP** button then displays the next measurement in the sequence. Holding the **STEP** button sequences in reverse order.
- In the LeanFind mode tapping the **EXIT** button will terminate the LeanFind mode and change to the Automatic mode.
- In the Program mode tapping the **NEXT** button will advance to the next item.

2nd Button

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

- In the LF mode holding the **LF** button after peak EGT is found will display the peak EGT.
- In Automatic or Manual modes holding the **LF** button for three seconds will toggle between Standard and Normalize (NRM) views.
- In the programming mode, tapping the **PLUS** or **MINUS** button will allow you to edit a parameter value.
- Holding **LF** during power up will display the primary alarm limits after the self-test is complete.

1st and 2nd Buttons

- Holding both the **STEP** and **LF** buttons simultaneously for five seconds will enter the pilot programming mode.
- Just after entering Lean Find Mode (but before any EGT has risen), holding both First and Second buttons for five seconds will toggle between LOP or ROP leaning modes.
- Tapping both the **STEP** and **LF** buttons simultaneously in Manual mode toggles to 'include' or 'exclude' the displayed non-primary measurement from the Automatic mode only. The excluded measurement will show up in the manual mode.

3rd Button

- Tapping **DIM** (brightness decreases) or holding **DIM** (brightness increases) allows decrease or increase brightness respectively.

2nd and 3rd Buttons

- Holding both the **LF** and **DIM** buttons simultaneously will display the Hobbs readings. Tap button labeled **NEXT** to see additional information screens.

4th Button (ALL/TEMP/FUEL)

- Select what is shown during Scanner auto-sequence. Choices are **ALL**, **TEMP** or **FUEL**. Highlighted one is what is active.

Scanner Displays

Scanner EGT and CHT Analog Bar Graph

The height of each column represents a EGT or CHT or TIT (if installed) temperature. Note: when in certain modes, such as leaning or normalize, the EGT resolution will temporarily be finer.

Cylinder Numbers and Index

Just below the bar graph columns are numbers identifying the respective cylinder. If TIT is installed, it is labeled by the letter T underneath. A square 'Cylinder I.D. Index' surrounding a number indicates what cylinder is currently selected and relates to the digital display.

Scanner Digital Display

Located under the Scanner bar graph area is the alphanumeric display. It displays alphanumeric values for different parameters as well as status and alarm messages.

Normalize / Standard View

To toggle between Standard and the Normalize views, hold the **LF** button for three seconds until the **NRM** icon toggles on or off. Note: Normalize cannot be activated while in Lean Find mode.

- **Standard view** (when the **NRM** icon is *not* lit): the EGT top of the columns represent absolute temperature.
- **Normalize view** (when the **NRM** icon is lighted): When you change to the Normalize view, all EGT columns are initially normalized to the mid-point for deviation trend analysis. Any changes are shown as an increase or decrease relative to the mid-point, thus giving an instantaneous indication that an EGT has deviated. You normally use normalize in level cruise, but it is also useful during steady state run-ups. Note: A common misapplication is to be in the Normalize view and then change power setting. This causes all columns to go off scale, high or low. Select Standard view before changing power or altitude.

Temperature Units (°F or °C)

The EDM can display engine temps in either °F or °C (Fahrenheit or Celsius). In Primary configurations, this is set to the same units as the configuration the aircraft was originally certified to.

Linear Bar Graph Displays

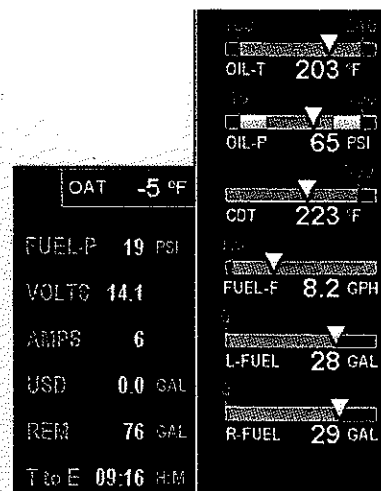
The linear bar graphs are arranged on the right half of the display. A typical layout is depicted here. (Note: your actual configuration may vary). Typical functions that can be displayed are:

Primary gauges

- Oil temperature
- Oil pressure
- Compressor Discharge temp
- Fuel Flow.
- Left tank fuel quantity
- Right tank fuel quantity

Non Primary gauges

- Fuel pressure
- Volts
- Amps
- Fuel USED Estimated
- Fuel REM Estimated
- Time to Empty Estimated
- Outside Air Tem.



Non Primary

Primary

The range of the bar graphs depends on the programming. Range, redlines and/or limits are typically set to match the original aircrafts gauge markings. These are locked for Primary installations, however non-primary gauges can be user modified.

See 'Section 9 - First Time Setup and Customization'.

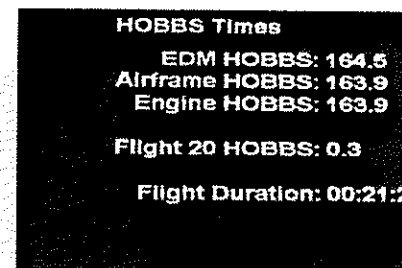
Note: Amps can operate either as a (Amps Charge) charge/discharge or (Amps Load) load meter, depending on programming.

Remote Annunciate Light

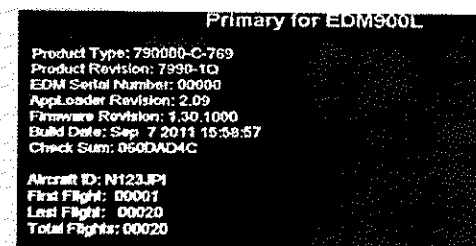
The remote auxiliary 'ALERT LIGHT' provides redundancy. Upon power up the Remote Annunciate Light displays Red and Yellow. If the RAL is not working about the flight. While the EDM's programmed configuration (aircraft make and model and primary status) is shown in the display. Mentally Confirm that it matches your aircraft configuration before using the instrument. If it does not match the aircraft configuration abort the flight.

Additional Displays Hobbs, Revisions, and Alarm Limits

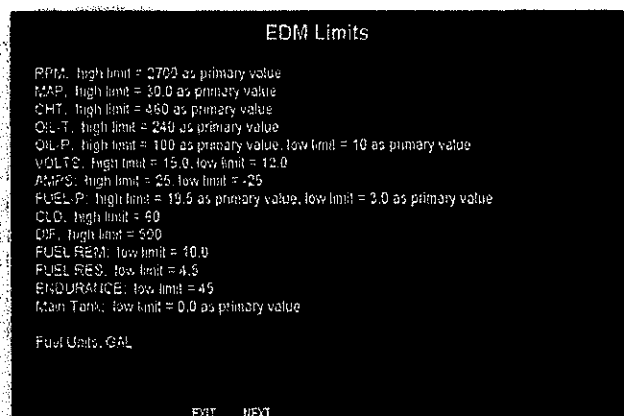
Holding both the LF and DIM buttons simultaneously will display the Hobbs times similar to the example below:



or Revisions



or Programmed Limits in this Instrument.



Dimming the Display

Automatic dimming is provided to the panel display. You can manually adjust brightness by tapping the DIM button. You will see **DIM BRT**. Holding **DIM** lowers brightness or holding **BRT** increase brightness. The percentage of brightness is displayed in the message area.

Section 4 - Operating Modes

The EDM has four basic operating modes: *Automatic*, *Manual*, *Program* and *LeanFind*. LeanFind is described in the next section; Program mode is described on page 40. When you first turn on the power the EDM 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 optimize the mixture, use the LeanFind mode. To display specific parameters, use the Manual mode. In either Automatic or Manual modes, the display always shows the Scanner bar graphs for EGT and CHT for each cylinder and TIT (if so equipped) with the temperatures above the columns except in the vertical mode only the CHT temperatures are shown.

Automatic Mode

To activate Automatic Scanner Mode, just tap the LF button, then tap the STEP button. In the Automatic mode the EDM changes which measurement is displayed every four seconds (factory default is 'Auto Scan Rate 4'), however you can change this rate in the Program Mode. A setting of zero disables auto scanning altogether.

The order of automatic scan if the switch is in the **ALL MODE**: EGT/CHT, TIT, CLD, DIFF, CDT, OIL-T, REM, T to E, GPH, USD, AMP, Volts, OIL-P, and Fuel-P.

Some non-primary measurements can be excluded from the *Automatic mode*: tap STEP to enter the Manual mode. Tap STEP repeatedly to index to the measurement you want to exclude. Then tap both the STEP and LF buttons simultaneously. Excluded measurements display a decimal point before the measurement name. For example:

Included: 1540 CDT Excluded: 1540 •CDT

Tapping the STEP and LF buttons simultaneously will toggle back and forth between *include* and *exclude*. Note: All measurements are always checked for alarm conditions every second.

- 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.

Manual Mode

To activate Manual Mode, just tap the STEP button. Use the Manual mode when you want to lock on one specific measurement such as shock cooling during descent, or your hottest CHT during climbs. To select the desired parameter, tap the STEP button until it appears. To return to the Automatic mode, tap the LF button and then tap the STEP button. You may completely disable the Automatic mode by setting zero for 'Auto Scan Rate 4'. See Pilot Programming.

Scan Sequence Example

Measurement	EXAMPLE	COMMENTS
EGT, CHT	EGT 1354 CHT 335	Square indicates the cylinder being viewed
TIT	1370 TIT	Turbine Inlet Temperature # 1
Shock Cooling	-30 CLD	Square indicates fastest cooling cylinder
Compressor Discharge Temperature	300 CDT	Temperature into intercooler
Induction Air Temperature	125 IAT	Temperature out of the intercooler
Carburetor Temperature	-22 CRB	(Not available when CDT is installed)
Difference between hottest and coldest EGT	80 DIF	Square indicates most widely deviating cylinder

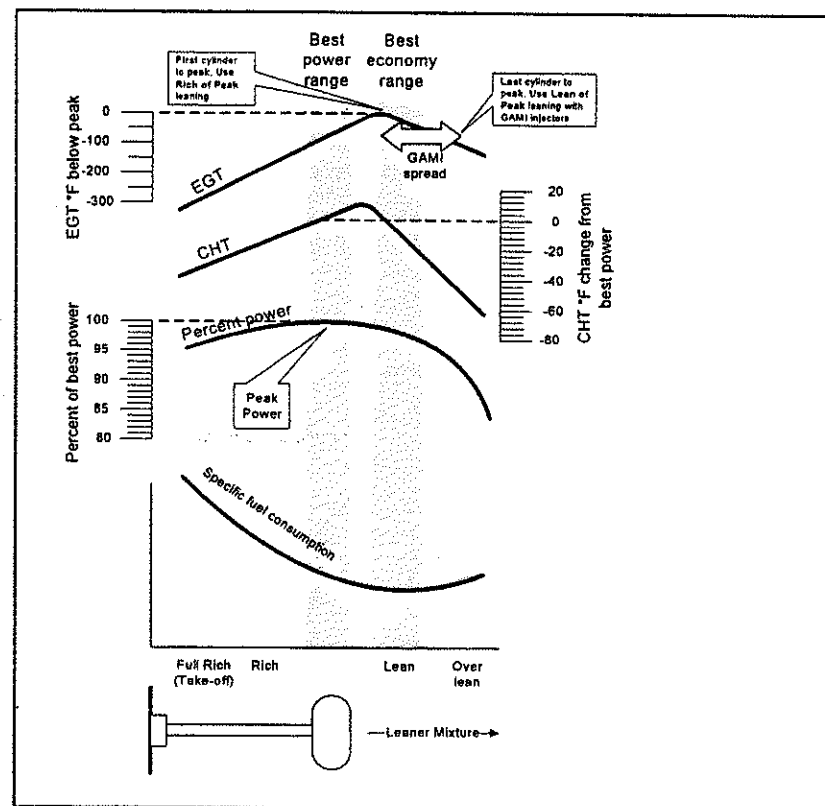
Fuel Remaining	Est. REM XX GAL	In gallons, liters, pounds or kilograms
Fuel required to next GPS WP or Destination at present power	WP REQ XX GAL	Present with GPS interface, valid signal and way point
Fuel Reserve at next GPS WP or Destination	Est. WP REM XX GAL	Present with GPS interface, valid signal and way point
Nautical Miles per Gal	ECON XX.X MPG	Present with GPS interface and valid signal. MPK, MPL, MPP for dif units
Time to Empty	Est. T to E XX:XX H:M	Hours: minutes calculated remaining at current fuel burn.
Total Fuel Used	USD X.X GAL	Since last refueling or trip total.

Section 5 - LeanFind

The EDM supports two methods of leaning; **ROP** (Rich Of Peak) and **LOP** (Lean Of Peak). Note: on power-up, the unit defaults to Rich Of Peak mode, but is easily changed to Lean Of Peak mode. During Rich Of Peak leaning, you'll finalize the mixture to about 20° to 80° rich of peak (depending on engine operating requirements). However, with the advent of closely balanced injectors (such as GAMI), it is possible to set the mixture lean of peak—thus saving fuel and running the engine cooler. Both Rich Of Peak and Lean Of Peak processes are described in detail in this manual.

Upon reaching cruise configuration, use the LeanFind mode to identify the correct cylinder to reach peak EGT (for Rich Of Peak this is the **FIRST** to peak, for Lean Of Peak this is the **LAST** to peak). To change from one method to the other, right after activating LeanFind, hold **STEP** and **LF** and the other method will be momentarily shown: **ROP** (Rich Of Peak) or **LOP** (Lean Of Peak). Release buttons after other method appears.

The following depicts the power, mixture and temperature relationships.



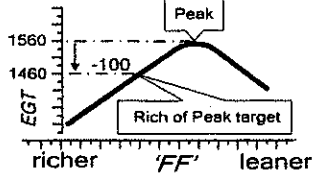
The following pages provide step by step guidelines in leaning your engine, for both rich of peak and lean of peak modes:

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 a few 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 peak at a different temperature. In some cases the coldest cylinder will peak first. TIT will run up to 100 degrees hotter than the hottest EGT.

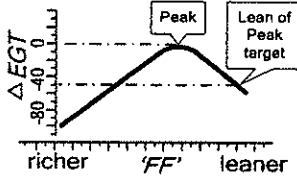
Rich of Peak leaning is as simple as:

- Pre-lean your mixture.
- Tap the LF button (verify *ROP* appears).
- Lean mixture until *LEANEST* flashes (peak found).
- Enrichen to the desired value 'Rich Of Peak'.

R	Procedure	Scanner Example	Comments
1	Establish cruise at 65 to 75% power.		
2	Pre-lean the mixture to 50°F estimated rich of peak on any EGT: _____°F.	EGT 1490 CHT 370	* See 'Pre-leaning'
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	ROP	Start LeanFind (if <i>LOP</i> appears hold STEP & LF until <i>ROP</i> appears)
5	Lean the mixture at approx. 10°/second <i>without</i> pausing.	EGT 1520 FF 13.8	Flashing cylinder I.D. box identifies that EGT increased at least 15°F. EDM is now looking for first EGT to peak.
6	Stop leaning when a column begins flashing. You will see <i>LEANEST</i> for one second, followed by:	EGT 1545 FF 12.4	Flashing cylinder I.D. box AND its column indicates leanest cylinder. Due to thermal inertia this will usually be about -15°F down the lean side of peak.
7	If you hold PEAK, the values of EGT and FF when peak was found are displayed.	EGT ↑ 1560 FF 12.9	Captured peak EGT value and peak FF are displayed.
8	If you tap PEAK, the difference from peak EGT is shown. Tap again to return to the peaked EGT value.	EGTΔ -90 FF 13.4	A useful mode for setting mixture the desired degrees rich of peak - no math required! NOTE: Unit remembers view last used.
9	Slowly enrich the mixture noting that EGT is returning to peak. Stop enriching at the desired EGT. 'Peak': best Econ. 'ROP' target: best power.	EGT 1560 FF 12.9 EGT 1460 FF 13.6 (100° RICH OF PEAK)	

Lean of Peak leaning is as simple as:

- Pre-lean your mixture.
- Tap the LF button (verify *LOP* appears).
- Lean mixture until *RICHEST* flashes (peak found).
- Enrichen to the desired value 'Lean Of Peak'.

L	Procedure	Scanner Example	Comments
1	Establish cruise at 65 to 75% power.		
2	Pre-lean the mixture to 50°F estimated rich of peak on any EGT: _____°F.	EGT 1490 CHT 370	* See 'Pre-leaning'
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	LOP	Start LeanFind (if <i>ROP</i> appears, hold STEP & LF until <i>LOP</i> appears)
5	Lean the mixture at approx. 10°/second <i>without</i> pausing. (cylinder I.D. box flashes when a EGT rises 15°F)	EGT 1520 FF 13.8	Flashing cylinder I.D. box identifies the hottest EGT and that an EGT has increased at least 15°F which arms the EDM to now look for first EGT to peak.
6	After the first EGT peaks, you will see <i>LEANEST</i> for one second and bars coming from the top down. Continue leaning.	EGTΔ -17 FF 12.4	When bars come from the top down, the cylinder I.D. box identifies the first EGT that peaked (leanest). Continue leaning.
7	When <i>RICHEST</i> appears, fine tune the delta EGT to the desired degrees below 'Peak' (Lean of peak).	EGTΔ -45 FF 11.6	
8	If you hold PEAK, the peak EGT recorded will be displayed along with FF spread.	EGT ↑ 1560 FFΔ 0.6	Captured peak EGT value and the FF spread between richest and leanest cylinders.

LeanFind Procedure—General Explanation

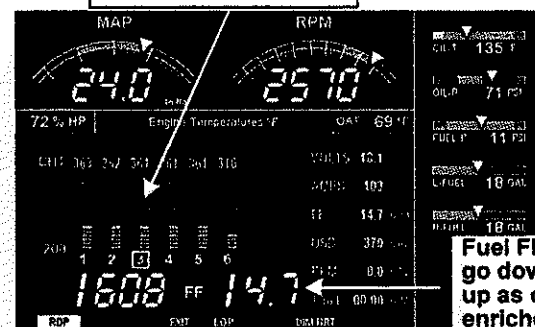
Lycoming and Continental established specific restrictions on leaning that must be followed, such as percent power, climb leaning, and TIT limits. Lycoming recommends operation at peak of EGT at 75% or less power only. Continental recommends operation at peak EGT at 65% or less power only. This guide does not supersede specific recommendations of the engine or airframe manufacturer. **It is your responsibility to know your aircraft's limitations.**

Pre-leaning: The leaning process typically begins with 'pre-leaning' to insure all cylinders are operating rich of peak EGT (note: you can optionally activate 'Normalize' - hold LF until **NRM** appears - making it easier to confirm all EGTs decrease). Now enriched the mixture to achieve a 50° drop on the hottest EGT. Insure that all EGTs decrease. Wait one minute to allow temperatures to stabilize.

Lean Find-Initiation: Initiate the EDM leaning mode by tapping the LF button. Note that the EDM displays its current leaning mode momentarily: 'ROP' for operating Rich of Peak or 'LOP' for operating Lean of Peak. Then the current mode will show up in the message bar white on black, also you will see the alternate mode over the LF button. You have 10 seconds to chose the alternate mode which will disappear indicating your chosen mode white on black. To change, simply exit the mode you are in and re-tap the LF button. The EDM is now waiting for a 15° rise on any EGT (this feature significantly reduces false peaks). Lean the mixture *without pausing* to achieve about a 10 deg per second change. 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 (note: leaning accurately with a quadrant system is difficult due to its mechanical linkage).

Lean Find-Activation: When a 15° EGT rise occurs, LeanFind activates (indicated by a cylinder I.D. box flashing over the number of the hottest EGT). **Remember: The LeanFind mode is not active until a cylinder I.D. box is flashing.** To show the progress of the leaning process, the EDM now displays the hottest EGT in the left side of the digital display and the fuel flow in the right side. This information allows you to observe the EGT behavior throughout the leaning process.

Column of Leanest cylinder flashes indicating the first EGT to peak.



You are leaning to Rich of Peak

If you want to lean Lean of Peak press button.

Fuel Flow will go down then up as one enriches mixture

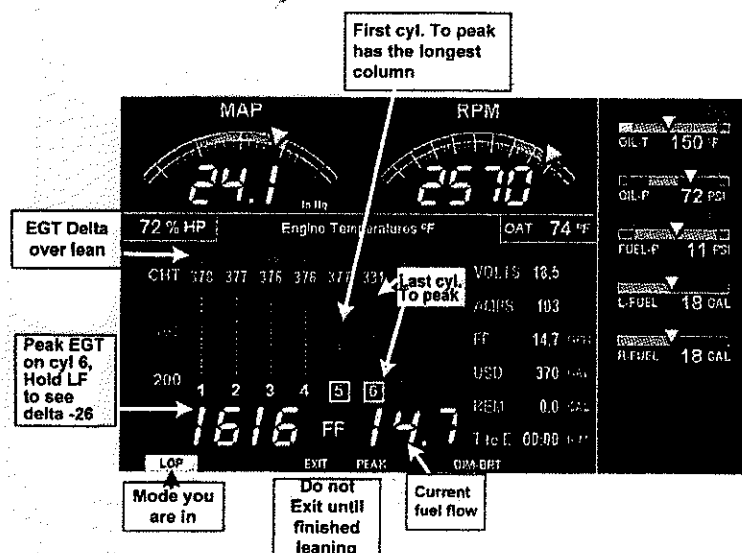
Leaning Rich Of Peak (ROP) Detection: Eventually, one cylinder will reach peak before any of the other cylinders. The EDM will determine this automatically. The EDM will indicate success in finding a peak by displaying the word **LEANEST** for two seconds and flashing its corresponding Cylinder column. The *Scanner®* Information Area will also display the current value for the EGT on the left, and the fuel flow value on the right, for final adjustment of the mixture, do not exit until the leaning process is complete. The peak EGT value and Fuel Flow value encountered during leaning is remembered by the EDM and can be displayed by holding the PEAK button during Lean Find Mode.

Finalizing the Rich Of Peak Mixture: You may now enrichen the mixture to operate at peak or continue enriching to a value of your choice (typically between 50 to 100° rich of peak for best power), consistent with the procedures defined in your aircraft and/or engine manual. Because during the leaning process the mixture control was not stopped at the exact time the column flashed the value shown will be 5 to 10 degrees on the lean side. So as the mixture is enriched the temperature will go up to peak and then down as the mixture is enriched further. Note: tap PEAK to see the current difference from the peak temperature. This is handy for finalizing mixture. Tapping EXIT exits the lean find mode and automatic scanning resumes.

Leaning Lean Of Peak (LOP) Detection: Note: This mode should only be used when your engine is equipped with balanced fuel injectors or you have a DIF value of around 80 degrees. When using the Lean of Peak mode, you lean until *all* EGTs decrease slightly below their respective peaks. The EDM has automatic peak detection and will sequentially indicate leaning progress. When the first EGT peaks, the word **LEANEST** appears and the cylinder I.D. box highlights the cylinder number. Each column successively drops as leaning continues. When the last column drops (last EGT peaks), **RICHEST** appears and its respective column flashes momentarily. The last EGT to peak is the one you will use when setting the final mixture.

Finalizing the Lean Of Peak Mixture: The Scanner® Information Area displays the degrees below peak for the **last** (or richest) EGT to peak, giving you precise information necessary in setting the final mixture. Adjust the mixture to achieve the desired value below peak (using the digital EGT readout) or before engine roughness occurs. Caution: do not lean to the point where the engine runs rough. Note: the peak EGT value encountered during leaning can be recalled by holding the PEAK button. Do not exit until finished or all values will be lost. Tapping STEP exits the lean find mode and automatic scanning resumes.

Peak Detected - Lean Of Peak Mode LOP



Expanded Leaning Procedures

Lean Of Peak, LOP mode: During the 'lean of peak' process, the EDM hunts for the last cylinder to peak. Ultimately, you want to have ALL cylinders operating on the lean side of peak. You will final adjust your mixture to this cylinder. To provide a unique graphical depiction during lean of peak operation, the columns become inverted after the first EGT goes just beyond peak. Each EGT column then originates from the top of the display and drops downward. As each subsequent EGT goes past peak, its column will begin falling. The columns length depicts how far the EGT has dropped below its original peak. In this mode, each segment is 5° F. You will continue to lean until the last EGT peaks (note: never lean to the point where the engine is running rough). When the last EGT peaks, its column will flash and **RICHEST** appears. The digital readout will show the current temperature difference from where peak EGT occurred and the current fuel flow (if so equipped). Note: holding the PEAK button will show the captured peak value of the 'last EGT to peak' and also the difference in fuel flow between the first and last to peak (known as the GAMI Spread). This is a good indication of injector balance (the smaller the FF difference, the better the balance). Tapping STEP exits the lean find mode and automatic scanning resumes.

Leaning Turbocharged Engines: The leaning process for turbocharged engines is by reference to the first EGT or TIT to reach peak. Therefore you should use the Rich Of Peak mode. The factory TIT red line (typically 1650°F to 1750°F) may limit the leaning process, depending on flight conditions. If TIT exceeds red line (but not by more than 99°), the EDM will allow you to continue leaning for one minute before a TIT alarm activates. NOTE: TIT can read approximately 100°F hotter than the hottest EGT due to unburned fuel in the exhaust igniting and is not necessarily abnormal behavior. The reduced size of the JPI Hastaloy-X-tip probes produce faster response and are more accurate than the massive factory installed probes. Therefore a JPI probe may read as much as 100°F higher than a factory installed probe.

Common Misapplications

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

Problem	Situation	Corrective action
LeanFind finds a 'peak' too soon.	Failure to pre-lean before performing LeanFind or you stopped leaning.	<ul style="list-style-type: none"> Follow the pre-lean procedure in 'Error! Reference source not found.' section (pg 26).
	Leaning too slowly.	<ul style="list-style-type: none"> Lean more quickly.
Peak not found	Lean Find not activated or you stopped leaning.	<ul style="list-style-type: none"> Lean at the speed of approximately 10°F per second.
Off-scale EGT bars, too high or low	You forgot that you set the EDM in the Normalize view and later notice that the EGT bars go off-scale.	<ul style="list-style-type: none"> 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.
First cylinder to peak is not the hottest	This is normal. The first cylinder to peak is not necessarily the hottest.	<ul style="list-style-type: none"> None
EGT rises during single magneto check	This is normal, due to incomplete combustion persisting longer.	<ul style="list-style-type: none"> None
EGT not uniform during low power operation	This is normal. Fuel and air distribution is not optimal at low power settings.	<ul style="list-style-type: none"> None
No display of %HP	FF, MAP, RPM, OAT not reading or not equipped	<ul style="list-style-type: none"> FF, RPM, OAT, MAP required for %HP

Section 6 - Fuel Flow Operation

Fuel Management

Without a means of measuring accurate fuel flow, you must rely on the aircraft fuel gauges or total time of flight. Aircraft fuel gauges are notoriously inaccurate (they are only required by the FAA to read accurately when displaying *empty*). Determining fuel consumption by multiplying time of flight by estimated flow rate is, at best, an approximation, and assumes a constant fuel flow rate for each phase of flight. However, the EDM Fuel Flow Option 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 with high resolution the amount of fuel that flows into the engine. Prior to engine start you inform the EDM Fuel Flow Computer system of the known quantity of fuel onboard, it then subsequently tracks all fuel delivered to the engine.

IMPORTANT !

For EDM fuel calculations to be accurate, it is mandatory that you inform the EDM of the correct amount of usable fuel onboard the aircraft and confirm proper operation of the fuel flow transducer prior to and during flight. Do not rely on fuel flow instruments to determine fuel levels in tanks. Refer to original fuel flow instrumentation for primary fuel management information.

Start Up Fuel

On power-up, you will be prompted to enter any fuel you might have added to the aircraft (this process updates the **REM** and **USD** values).

The EDM will flash **REFUEL?**. If you didn't add any fuel, simply tap **NO** to quit, otherwise tap **YES** to pick one of the three quickset choices below:

REFUEL?		T to E 11:42 H:M	
NO	YES		

If you say YES then you will see **Fuel onboard**, if you have **Aux tanks** you will see TWO choices like in the example 76 GAL Main and Main + Aux = 96GAL. You pick the one you want to enter.

FUEL ONBOARD		T to E 11:42 H:M	
CANCEL	76 GAL	96 GAL	ADD/SUB

Upon making a choice you will see your choice as **Initial Fuel**

Initial Fuel		T to E 11:42 H:M	
96.0 GAL			
CANCEL	76 GAL	96 GAL	ADD/SUB

If you tap **ADD SUBTRACT** then you can add say 10 gallons

CHANGE BY		T to E 11:42 H:M	
+ 0.0 GAL			
SAVE	CANCEL	ADD	SUBTRACT

NOTE: If you forgot to perform your EDM **REFUEL** before starting the engine, it can still be performed. The EDM will automatically subtract any burned fuel from the value you choose. Go to Program mode and the first item is **REFUEL**

You are responsible for insuring that your usage of the **REFUEL** feature results in the EDM's **REM** parameter showing the correct amount of usable fuel remaining onboard the aircraft.

Resetting 'USD'

USD is automatically reset whenever you perform **REFUEL** on your EDM (except if TRIP mode = yes).

After filling your tanks and prior to engine start you should inform the EDM that the aircraft has been filled. In this case **USD** is automatically set to zero.

To manually zero the amount of fuel **USD** at any time, manually STEP to display **USD** and then hold both DIM (button 3) and EGT/FF (button 4) until the display shows '**USD 0.0 GAL**' (this normally takes about five seconds).

Trip Mode (Accumulate Trip Totalizer)

Trip mode is typically used if you want to track the total fuel used over a multi-stop cross country. To have the **USD** parameter continuously accumulate total consumed fuel, set **TRIP?** Y. 'Trip Mode' is described in the 'Program Mode section'. Note: typically, **TRIP?** is set to 'N' so that **USD** will be reset every time you fuel the aircraft.

Scanner Fuel Flow Display Select

Button four selects three different Scanner filters - ALL, EGT or Fuel. Tapping this button will select the next choice (shown after the '/' symbol):

- **ALL/TEMP**: all installed parameters are shown in Scanner (and battery voltage).
- **TEMP/Fuel**: only the installed temperature parameters are shown in Scanner.
- **Fuel/ALL**: only fuel flow parameters are shown in Scanner.

Section 7 - Alarms

Whenever a primary measured parameter falls outside of the normal allowed operating limits, i.e. goes beyond redline, the main display will blink an alert icon. This consists of the current digital value and a flashing red label in the Scanner area and the REDRemote Annunciate Light. For example, if CHT 2 is at 480, and redline is 460, the alert would be displayed as *CHT2 480 °F*.

Tapping the CLEAR button extinguishes the alert

Primary alarm limits for each specific aircraft model are set by JPI in accordance with the POH and are not programmable by the pilot.

These typically include some or all of the following measurements: CHT, CDT, Oil-T, Oil-P, Fuel-P, GAL LEFT, GAL RIGHT, MAP, RPM, Fuel Flow, and TIT. To view the alarm limits screen, hold button 2 during power up (or hold both buttons 2 & 3 during normal operation), tap NEXT until the list is displayed.

The primary functions for your installation are shown on the Primary label on the back of the instrument and are identical to those specified in the FAA Approved Airplane Flight Manual/Pilot's Operating Handbook.

Alarm Priority Hierarchy

1.	OILP LO
2.	FP LO
3.	OILT HI
4.	CHT
5.	TIT
6.	FLVL
7.	REM
8.	FP HI
9.	MAP
10.	DIF
11.	CLD
12.	RPM
13.	OILT
14.	BUS
15.	OILP HI
16.	AMPS
17.	CDT
18.	BAL
19.	FUEL END
20.	FUEL RES
21.	EGT
22.	Fuel Flow

Section 8 - Memory and Data Download

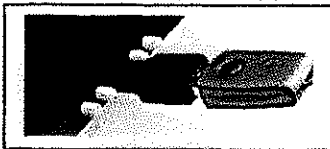
The EDM compresses and records **all** displayed parameters once every **six seconds (default)** in Long Term Data Memory (note: you can change this rate to be 1 to 500 seconds). This data is retrievable by inserting a USB Drive into the jack on the front of the instrument and following the prompts. You can choose to retrieve '**ALL**' the data stored in the EDM, or only the '**NEW**' data recorded since your last retrieval. In either case, the selected data in the EDM is not erased. The data can later be viewed on EZTrends, a PC program available from JPI or over the internet.

RPM is greater than 500. The amount of data that the EDM can store will vary depending on how rapidly parameters change. The typical storage capacity is greater than 300 hours at a 6 second recording interval, but can vary depending on configuration. When the memory becomes full, the oldest data will be discarded to make room for the newest. All data are time-stamped. The EDM contains a real-time clock that may be set when you initially program your instrument. You may change the recording interval from 1 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 started at the new interval).

Downloading Data from the EDM

Downloading is a simple process. Follow the steps below:

- With the EDM powered up, plug the USB flash drive adaptor and flash drive into the EDM USB port.
- Wait for the EDM display to show **DOWNLOAD: NEW**.
- To download only the new data since the last download, tap the STEP button.
- To download all data in the EDM, tap the CHANGE button to see **DOWNLOAD: ALL**, then tap STEP.
- You will see a 'progress indicator' as the data is copied to the USB flash drive. **DO NOT INTERRUPT THIS PROCESS**. When the download is complete the display on the EDM will show **DONE** and then return to normal operation.
- Wait until the process is complete then remove the USB flash drive from the USB connector.



Transferring data from the USB Flash Drive to a PC

To transfer your data from the USB flash drive to your PC, follow these easy steps.

1. On your PC, start the EzTrends program.
 2. Plug in the USB flash drive into an available USB port.
 3. In EzTrends, select the Move and Plot Data from Memory Stick option.
 4. In the displayed list, find the USB flash drive and double click it.
 5. Select the file you wish to plot and then select the flight in that file.
- Refer to the EzTrends manual for details on how to use EzTrends.

Section 9 - First Time Setup and Customization

Your EDM comes with most settings programmed. However some settings you will fine tune to your installation and/or preferences. We recommend you perform the following minimum set up:

1. Pilot Programming Mode:

- Set the GPS Communications format to match your type of GPS.
- Fine tuning of fuel flow K-factor is important as it affects your fuel computer parameter accuracies.
- Set the Engine HP equal to your engines rated horsepower.
- Perform the HP Constants set up for best accuracy of the Percent Horsepower readout.
- Optionally fine tune other parameters such as MAP, OAT.

Pilot Programming Mode

To start Pilot Program Mode, hold both **STEP** and **LF** buttons until you see **PROGRAM** for two seconds. Then tap the **NEXT** button to advance to the desired item in the list. Hold the **NEXT** button to back up in the list. Either tap **NEXT** until you see **END. Yes** and then tap **EXIT** or hold both **NEXT** and **LF** to save changes.

First button advances to NEXT item	Second button selects values	Comments
Program Mode		Stays on for two seconds.
Refuel?		Tap REFUEL to change fuel status. Exits program mode when done.
Auto Scan Rate 4	0 ⇔ 9	Scan rate (seconds between parameters) in the Automatic Mode. 0 disables the Automatic Mode.
Trip Used? No	NO ⇔ YES	NO : When Refuel mode used on EDM, total fuel used is reset to 0. YES : accumulate total fuel used rather than reset to 0 at each refueling. See page 43.
EGT Display in 1's	1's 10's	Tapping 1's sets the digital display to one-degree resolution; tapping 10's sets 10°. (10° resolution is easier to interpret the EGTs.)
OAT Display °F	F ⇔ C	Tap C to display OAT in Celsius, F to display in Fahrenheit. Hold STEP and LF for 5 seconds to ADJUST the OAT calibration.
OAT Adjustment 0	-10 ⇔ +10	Adjust the indicated temperature up or down by up to 10° using PLUS or MINUS . For example, OAT+3 adjust the OAT 3° higher.
HP Constants		Hold NEXT and button 2 for 5 seconds until you see ADJUST rich of peak or lean of peak constants. Tap ROP to proceed to Rich of Peak 'HP Constant' setting. Tap LOP to proceed to Lean of Peak 'Engine Constant' setting.
HP Constant= 125	10 ⇔ 999	Hold NEXT and button 2 until you see ADJUST . Tap PLUS or MINUS to adjust (%HP display will reflect changes). Hold NEXT and button 2 to save changes.
Engine Constant = 14.9	1 ⇔ 99.9	Hold NEXT and button until you see ADJUST . Tap PLUS or MINUS to adjust. Hold NEXT and button 2 to save changes.

Engine HP = 225	10⇔999	Set the nominal horsepower of your engine. This value will be used with FF to calculate LOP %HP. Hold NEXT and button 2 for 5 seconds until you see ADJUST . Use PLUS or MINUS to adjust. Tap SAVE to save changes. Tap NEXT to skip to next item.
Map Adjustment +0.0	-3.0 ⇔ +3.0	Correct the MAP to the altimeter setting at a sea level airport ±3.0 inHg. Hold NEXT and button 2 for 5 seconds until you see ADJUST . Use PLUS or MINUS to adjust. Tap SAVE to save changes. Tap NEXT to skip to next item.
K-Factor 1 29.90	00.10 ⇔ 99.99	Set the instrument's K-factor to match the fuel flow transducer K-factor and performance. Hold DIGIT and button 2 for 5 seconds until you see ADJUST . Use DIGIT , PLUS or MINUS to adjust. Hold NEXT and button 2 to save changes.
GPS Format = 6	0 ⇔ 8	Adjust to set the GPS Communications format. Hold NEXT and button 2 for 5 seconds until you see ADJUST . Use PLUS or MINUS to adjust. Tap SAVE to save changes. Tap NEXT to skip to next item. See page 47.
Time: 18:23:59	00:00:00 ⇔ 23:59:59	Hold NEXT and button 2 for 5 seconds until you see ADJUST . Use Hours , Minutes , Seconds to adjust. Tap SAVE to save changes. Tap NEXT to skip to next item.
Date: 05/14/09	01/01/00 ⇔ 12/31/99	Hold NEXT and button 2 for 5 seconds until you see ADJUST . Use Month , Day , Year to adjust. Tap SAVE to save changes. Tap NEXT to skip to next item.
END? Yes	END? Yes	Yes exits the pilot program mode. No reenters pilot program mode.

Section 10 - Adjusting Manifold Pressure & %HP

Adjusting the HP Constant for Rich of Peak Operation

To fine tune the %HP readout, follow this procedure airborne between 5,000 and 8,000 feet MSL. (note: Verify that the MAP adjustment has been performed prior to this process).

1. Enter the pilot program mode by simultaneously holding the **STEP** and **LF** buttons for five seconds.
2. Tap **STEP** repeatedly until you see **HP Constants**. Hold both **NEXT** and **Button 2** until you see **ROP** and **LOP** appear in status bar. Tap **ROP**. Now **HP Constant 125** should appear. Hold both **NEXT** and **Button 2** until you see **ADJUST** momentarily. Adjustment range for the HP Constant is 45 to 180.
3. Set the MP and RPM per your POH to 70 percent power. Let conditions stabilize.
4. Adjust the HP Constant value **PLUS** or **MINUS** so that the %HP reading on the display equals **'70 %HP'**. Note: this is the percent of maximum horsepower.
5. Hold both **NEXT** and **Button 2** until you see **SET**.

Adjusting the MAP

This procedure allows you to adjust the MAP to the altimeter setting at a sea level airport. **NOTE: If airport is not at sea level, use the correction table to derive corrected sea level altimeter setting).**

1. Enter the pilot program mode by simultaneously holding the **STEP** and **LF** buttons for five seconds.
2. Tap **NEXT** repeatedly until you see **MAP ADJUSTMENT +0.0**. Then hold both the **NEXT** and **Button 2** until you see **ADJUST** momentarily.
3. Adjust the value using the **PLUS** or **MINUS** until the value equals the altimeter setting (sea level airport). The adjustment range for the MAP is ±3.0 inHg.
4. Hold both **NEXT** and **Button 2** until you see **SET**.

Adjusting the HP Value

You must set the nominal horsepower of your engine. This value is used to calculate the percent horsepower display.

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.
2. Tap NEXT repeatedly until you see **Engine HP 200**. Then hold both the NEXT and Button 2 until you see **ADJUST** momentarily.
3. Adjust the value PLUS or MINUS to equal your engines HP.
4. Hold both NEXT and Button 2 until you see **SET**.

Section 11 - Programming the Fuel Flow

Fuel Flow Parameters

Three additional parameters may be set by the pilot when the Fuel Flow Option is installed:

- K Factor—the fuel flow transducer calibration constant.
- Accumulate—default is OFF: resets the fuel *used* to 0 every time you inform the EDM that the aircraft was refueled. With accumulate ON, fuel *used* will continue to accumulate for all subsequent flights.
- GPS Communications fuel data format.

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 tenth gallon of fuel flow.

Before installing the transducer, write down the K factor here

_____. To enter the number into the EDM, place a decimal point two places from the right of the number. For example if the K factor written on the fuel flow transducer is '2912' enter 29.12 in the EDM K factor parameter field.

The K factor can be changed in the pilot programming procedure. *When the K factor is changed during a trip, calculations of fuel used, fuel remaining and time to empty are not retroactively recalculated.*

Fuel Flow K factor

The K factor is shown on the fuel flow transducer as a hand written four-digit number, which represents the number of pulses per tenth gallon of fuel flow. **Before installing the transducer, record its K factor here** _____. The EDM stores the K Factor in the form **29.12**, i.e. if the transducer K factor is 2912, you would enter 29.12 in the EDM's K factor field.

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 calculation of the fuel consumed for each flight = USD.

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

2. Total ① the EDM fuel used and ② the actual fuel used.

3. Record the current K factor here ③ _____ and in the table below.

4. Calculate the New K Factor as follows:

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

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

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

Date	①EDM fuel used	②actual fuel used	③Current K factor	New K factor	Pilot's initials
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Setting the K factor

This procedure differs somewhat from setting other parameters. If you haven't already done so, start the pilot programming procedure by simultaneously holding the STEP and LF buttons for a few seconds until you see the word *PROGRAM* appear.

1. Tap STEP button to advance to the *KF-SET* screen *KF=29.90*.
2. Hold both the STEP and LF buttons for a few seconds until the first digit flashes (shown here as a larger digit for illustration purposes): *29.00*
3. Tap or hold the LF button to change flashing digit: *19.00*
4. Tap STEP button to move to next digit: *19.00*
5. Tap or hold the LF button to change flashing digit: *18.00*
6. Tap STEP button for next digit: *18.00*
7. Repeat items 5 and 6 for the remaining two digits.
8. Hold STEP and LF buttons until the parameter is saved.

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. Fine tuning is accomplished over multiple flights of sufficient duration and repeatable conditions. Use the process below to calculate and correct the K Factor to achieve maximum performance. Note: This process adjusts the K factor only half of the correction. We recommend this because it minimizes 'chasing' a correction target back and forth

Programming Trip Mode

Trip Mode keeps a running total of fuel used (USD) for all flights. If Trip Mode = No, fuel 'USD' is zeroed after updating the EDM's fuel computer via **Refuel** modes. NOTE: to clear the fuel used display at any time, tap STEP until you see USD. Hold both DIM and ALL/EGT/FF buttons until the display shows '.0 USD'.

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.
2. Tap NEXT repeatedly until you see **TRIP Used? No**.
3. Tap YES to select the trip mode or NO to deselect mode.
4. Tap NEXT to accept your choice.

Setting the GPS Com Format

This process allows you to select what GPS communication format the EDM should use when sending fuel flow data to the GPS. See table below with the numeric GPS-C values and their corresponding formats.

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.
2. Tap NEXT repeatedly until you see **GPS FORMAT**.
3. Hold DIGIT and Button 2 until **ADJUST** appears
4. Select desired code value using PLUS or MINUS.
5. Hold both NEXT and Button 2 until you see **SET**.

GPS-C Type of GPS Format

0	No fuel data output
1	Garmin (Shadin Miniflow format)
2	Allied Signal (format B) "To waypoint only"
4	Arnav/EI fuel flow data
4	Allied Signal (format C) *
5	(Not used)
6	Garmin 430/530 GNX-80/GX-60 "To waypoint only"
7	Garmin 430/530 GNX-80/GX-60 "To Destination only"
8	Bendix(B) - DEST

Factory Limits (Hold Step and LF at end of Pilot Program Mode).

Factory	Next	
MAIN = 76	Plus Minus	
Aux = 0.0	Plus Minus	
AMPS ADJ. +0	Plus Minus	Hold Step and LF to enter or exit
FUEL PRESSURE FP=30PSI 2W	Plus Minus	Hold Step and LF to enter or exit
CUSTOMIZE DISPLAY	Plus Minus	Hold Step and LF to enter or exit
END	Yes No	

Troubleshooting the EDM

Diagnostic Testing on Startup and During Flight

When your EDM is first turned on, it tests internal components, calibration and integrity of the probes. Most alarms are disabled until the engine has been started.

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

The following displays indicate malfunctions in the system:

Startup and Operational Diagnostics

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.
Red 'X' drawn through a gauge	Gauge is non functional.
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 15 MV	Calibration error. Return unit to factory.
NO 50MV	Calibration error. Return unit to factory.
NO 2.5V	Calibration error. Return unit to factory.
PWR DWN	Power down the instrument and power up again.
WARNCAL, WARNCFG	Transient warning messages. If they persistently occur, return the unit to JPI for repair.

HOBSEERR	The time of the most recent flight may not be reflected in the HOBBS meter.
HOBSEBAD	The HOBBS data has been corrupted. The HOBBS meter will be cleared.
HANGCFG, HANGCAL	Internal system errors. Return unit to factory.

GPS Interface Diagnostics

Measurements 'xxx REQ', 'xxx RES' and 'xxx 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 'xxx REQ', 'xxx RES' and 'xxx MPG' are all missing from the scan.	Communications are received by EDM and the Auto-Protocol setup is in process. Verify correct output format setup in GPS receiver; check GPS connections.
NO - SIG message and 'xxx REQ', 'xxx RES' and 'xxx MPG' are all missing from the scan.	GPS receiver has insufficient signal for valid data.
NO - WPT message and 'xxx REQ', 'xxx RES' are all missing from the scan.	No waypoints are programmed into the aircraft GPS receiver.

Section 12 - Appendices

Shock Cooling (CLD)

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 from Lycoming should not exceed 50°F per minute cooling rate."

JPI checks shock cooling (CLD) on all cylinders displaying the fastest cooling cylinder in degrees per minute cool rate.

List of ALL messages in EDM-900

Startup Banner Messages ===== EDM900 PRIMARY FOR 182P-SA000152WI 550	'Normal' Scanner Messages ===== EGT 1494 CHT 332 OIL-T 195 °F VOLTS 27.4 T to E 00:04 H:M CLD 0 ° / Min DIF 8 °F Est. REM 74.0 GAL WP REQ 12.5 GAL Est. RES 61.5 GAL ECON 9.9 MPG F-F 14.7 GPH AMPS 0 VOLTS 27.4 FUEL-P 13 PSI	Data Download Messages ===== DOWNLOAD: NEW DOWNLOAD: ALL DOWNLOAD: EXIT
Refuel Messages ===== REFUEL? TOP OFF? MAIN 74.0 GAL CHANGE FUEL QTY? + X.X GAL Adjusted by + 0.5 GAL Initial Fuel 71.6 GAL	LeanFind Messages (ROP) ===== ROP EGT 1494 FF 17.7 NOPEAK EGT 1494 FF 17.7 LEANEST ROP -90 FF 12.5	Pilot Program Messages ===== PROGRAM REFUEL? Auto Scan Rate 4 Trip Used? No Trip Used? Yes EGT Display In 1's EGT Display In 10's OAT Display :F OAT Display :C HP Constants Engine HP 300 MAP ADJUSTMENT +0.0 K-Factor 1 30.45 CARB? No CARB? Yes CARB=2 GPS Format #0: No Output #1: Shadin #2: Bendix(B)-WP #3: Arnav/EI fuel data #4: Bendix(C) #5: No Output #6: GNS 430/530-WP #7: GNS 430/530-DEST #8 Bendix(B)-DEST Time: 13:17:45 Date: 07/11/11 End? Please wait...Saving changes.
LeanFind Messages (LOP) ===== ROP EGT 1494 FF 17.7 NOPEAK LOP EGT 1494 FF 17.7 LEANEST RICHEST LOP -55 FF 11.5	LCD Brightness Messages ===== LCD BRIGHTNESS: 2%	
	Primary Alert Messages (All RED text, channel name flashing) ===== L-FUEL 0 GAL R-FUEL 0 GAL CHT1 476 °F OIL-T 245 °F DIF 1382 °F BAD PROBE CHT5 REM 1.1 GAL RPM 2760 MP 37.7 In. Hg Non-Primary Alert Messages (All WHITE text, channel name flashing) ===== T to E 00:04 H:M CLD 87 ° / Min Est. REM 74.0 GAL BAD PROBE EGT3 VOLTS 21.4 AMPS -5	

Navigation Data Formats

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

Format	Baud	
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"

Navigation Data Ports for GPS Comm

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

Navigation Data (output from GPS; input to EDM)

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

Serial format: 8 data, 1 start, no parity. Baud 1200, 4800, or 9600, depending on the GPS data output format. The EDM 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 format: 8 data, 1 start, no parity. Baud 9600. Output format is determined by the GPS-C setting, but may be over-ridden by the GPS navigation format. If the EDM senses Northstar or NMEA-183 navigation data input, there will be no fuel data output.

Interface connections to selected GPS models

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

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 (RMA) before returning any equipment.

J.P. INSTRUMENTS Inc.

3185 B Airway

Costa Mesa, CA 92626

Call: (800) 345-4574

Web: www.jp instruments.com or www.JPITech.com

Limited Warranty

J.P. Instruments Inc. (JPI) warrants all parts in your new EDM 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.

*

* *Pre-lean procedure*, 28**A**

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