Pilot's Guide

Engine Data Management

EDM-730

EDM-830

EDM-740

EXPERIMENTAL

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Effectivity: VER 2005.00
Printed in the United States of America Rev F July, 2018

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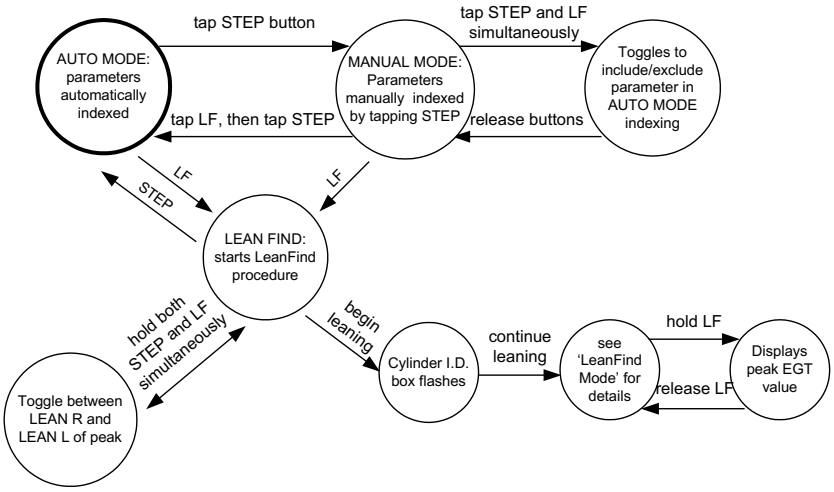
The following is a quick reference of basic operation



Section 1 - Introduction

Product Features

✓ indicates standard feature	730	830
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 a false peaks	✓	✓
Displays both leaned temperature below peak and peak	✓	✓
Battery voltage with alarm	✓	✓
24 Programmable alarm limits	✓	✓
Normalize view	✓	✓
DIF low to high EGT with alarm	✓	✓
EGTs to stable 1°F resolution	✓	✓
Shock cooling monitored on *every* cylinder	✓	✓
User selectable index rate	✓	✓
Fast response probes	✓	✓
Non-volatile long term memory	✓	✓
Records and stores data up to 30 hours	✓	✓
Post-flight data retrieval	✓	✓
Data retrieval software	✓	✓
Alarm and warning light outputs	✓	✓
Oil temperature	opt	opt
Oil pressure	opt	opt
Turbine inlet temperature	opt	opt
Outside air temperature	opt	✓
Compressor discharge temperature	opt	opt
Intercooler temperature	opt	opt
Carburetor temperature	opt	opt
Manifold Pressure (MAP)		✓
Fuel Flow	FF opt	✓
Solid-state rotor fuel flow transducer	FF opt	✓
Fuel quantity in gallons, kilograms, liters, or pounds	FF opt	✓
Low fuel quantity alarm	FF opt	✓
Low fuel time alarm	FF opt	✓
GPS interface	FF opt	✓
Instantaneous fuel flow rate	FF opt	✓
Total amount of fuel consumed	FF opt	✓
Total fuel remaining	FF opt	✓
Time to empty at the current fuel flow rate	FF opt	✓
Displays % horsepower and RPM	RPM opt	✓
Automatically calculates percent horsepower Requires FF, OAT, RPM, and MAP.		✓

Engine Data Management

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

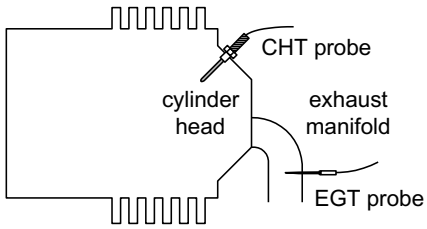
As your built-in flight engineer, the EDM is constantly "red line" checking: all critical parameters are automatically checked four times a second, regardless of the current display status. Leaning is accomplished quickly and automatically using the LeanFind™ procedure. With the EDM, it is now possible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

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

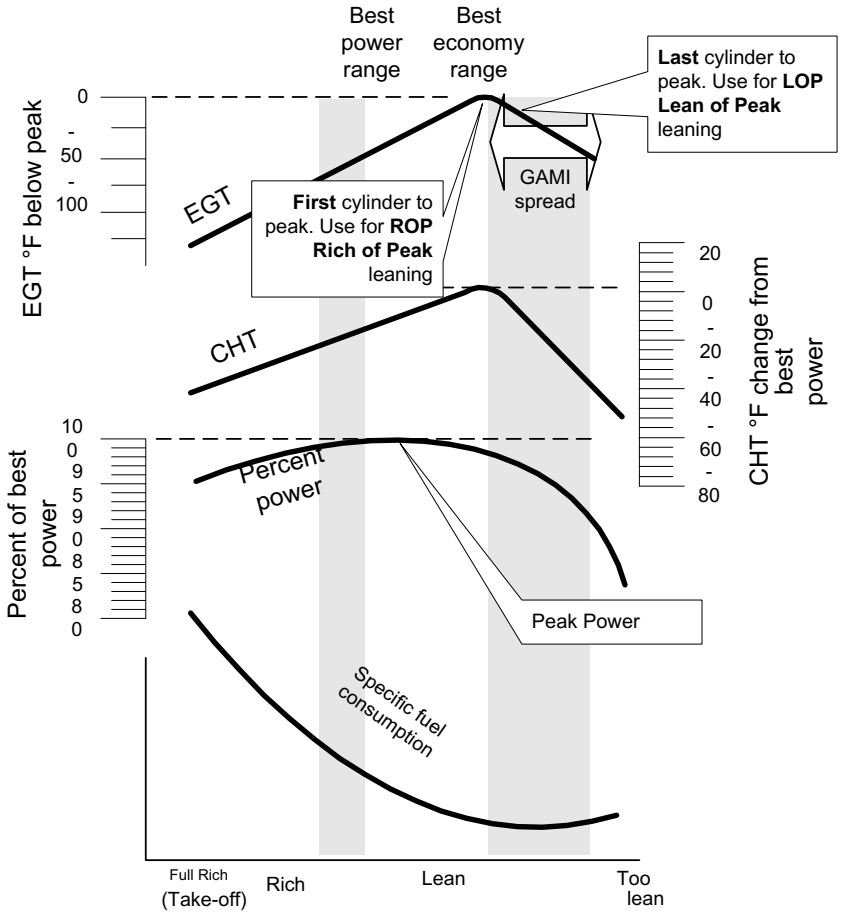
Temperature information processed by the EDM is captured by **fast response** grounded ***JPI*** temperature probes that accurately measure small temperature changes—as small as 1°F—that routinely occur during mixture adjustment.



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 affects the Exhaust Gas Temperature (EGT).

The following depicts the power, mixture and temperature relationships.



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.

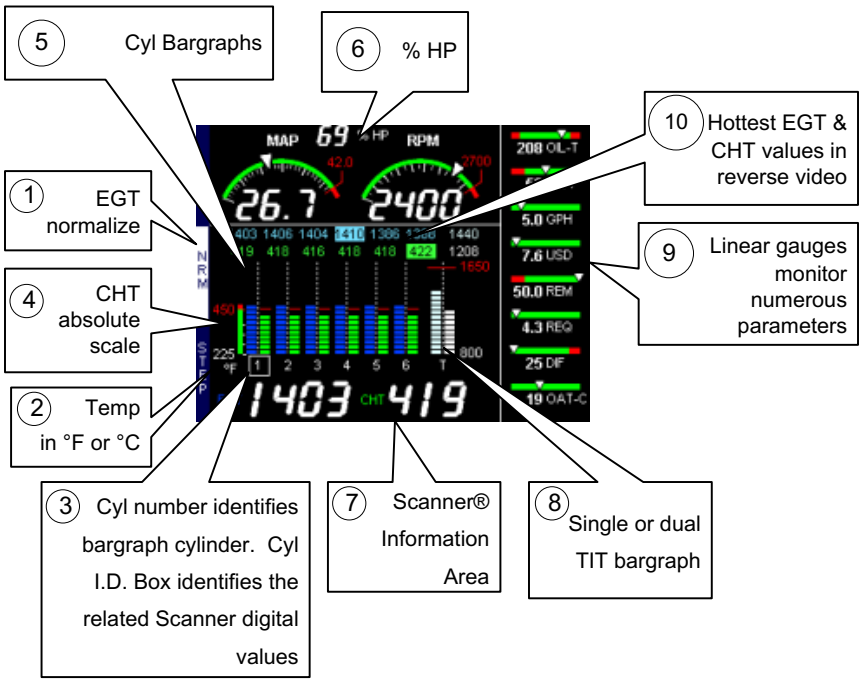
A single EGT gauge merely gives you an average of a few cylinder's temperature: some cylinders can be too rich, while others too lean. Variations produced by differences in fuel distribution, ignition, and compression will cause each cylinder to peak at a different temperature. In some cases the coldest cylinder will peak first. TIT will run up to 100 degrees hotter than the hottest EGT.

Displays and Controls

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

- Analog display including cylinder number and cylinder I.D. box
- Digital display for numeric readouts and messages
- Two front panel operating buttons for simple operation.

Typical EDM-830-6C Cylinder Display



Display Dimming

The display features automatic dimming. Allow ten seconds for the display to adjust to ambient lighting conditions. The dimming baseline can be user adjusted in Pilot Programming Mode.

The following is a description of various display areas. Numbers in circles refer to features in the above diagram.

① Normalize View and Percentage View

- **Percentage View**: when the EGT normalize indicator '**NRM**' **is not lit**, the columns indicate percent of EGT red line. Each column is composed of a stack of segments. A maximum height column (all segments lit) depicts 100 %, or more, 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 normalize indicator '**NRM**' **is lit**, the EGT, TIT & CHT columns are displayed normalized. When you activate Normalize View, all column peaks are 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 should use normalize in level cruise and run-up.

To toggle between Percentage View and Normalize View, hold the LF button until the 'NRM' indicator either comes on or goes off.

Selecting the Normalize view does not affect the digital display nor alter the parameter sequence.

You may select the Normalize view in either the Manual or Automatic modes, but not during Lean Find mode. Normalize view is most helpful for engine trend monitoring of each cylinder's operation. For example using the Normalize view during engine run-up, a fouled spark plug will appear as a higher column.

TIP: A common misapplication is to be in the Normalize view and then change your power setting. This can cause all columns to go off scale, high or low, giving you the impression there is a problem. Turn off '**NRM**' (return to Percentage view) before adding or reducing power and when beginning your descent.

② Temperature Units (°F or °C)

The EDM series engine temps can be set for either degrees Fahrenheit **°F** or degrees Celsius **°C. Note:** OAT units can be set independently of the engine temps. **To change the display of engine temperatures see "Changing the Alarm Limits" on page 56.**

③ Cylinder Numbers and the Cylinder I.D. box

The row of numbers 1 through 6 (cylinder I.D numbers) and the letter 'T' (optional turbine inlet temp) are the column labels for the analog display bargraphs. A square box (cylinder I.D. box), surrounding one or more of the labels, specifies that those particular cylinders relate to the values currently shown in the *Scanner*® information area.

④ CHT absolute scale

The 'CHT absolute scale' allows you to quickly determine the absolute temperature of any CHT by comparing the bargraph height to the scale. This is a quick and useful way to visually determine your CHT temperatures relative to redline**.**

⑤ Bar Graph EGT and CHT

A cylinder 'bargraph set' is composed of a dotted line leading from the cylinder I.D. number vertically to its EGT/CHT digital values. The EGT column is located to the left of the line and the CHT column to the right. Columns are composed of a stack of segments. The maximum height for a column is the top of the dotted line. The CHT redline value is depicted by a horizontal red line approximately half way up and to the right of the dotted line. When any CHT column reaches redline, its column will turn red and an alarm message will commence. The CHT display is not affected by mode or view. The EGT column has three different viewing modes: Percent View, Normalize View and Lean Find.

⑥ Percent HP (EDM-830 only)

Displays %HP (if FF, RPM, OAT, MAP functional).

⑦ Scanner® Information Area

The *Scanner*® Information Area provides expanded information for the various monitored parameters. The *Scanner*® operates automatically or manually.

⑧ **TIT Bargraph**

The EDM provides a bargraph display of the hottest TIT and continuously checks for exceedance of the redline temp. Once redline is reached, the bargraph will change to red and an alert will flash in the *Scanner*® Information Area.

⑨ **Linear Gauges**

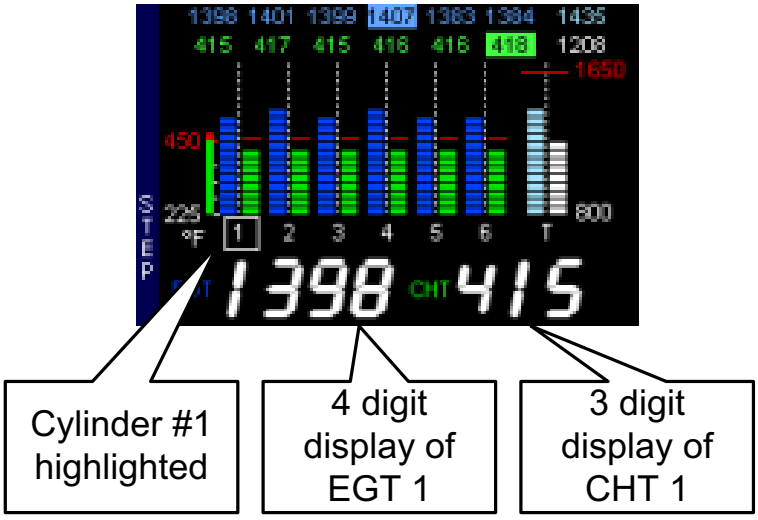
The Linear gauges provide both digital and analog indications for various parameters. The sliding pointer and color range marks give you a quick indication of where you are relative to the operating limits while the digital value provides precise information. See Section 14 - Display Customization for ways you can customize this area. Note: parameters monitored vary by model and options present.

⑩ **Hottest EGT & CHT**

The hottest EGT and CHT values are displayed in reverse video to quickly identify the hottest cylinder and exhaust temperatures.

EGT and CHT operation in *Scanner*® Information Area

When the Cylinder I.D. Box highlights a cylinder number (1 through 6), the *Scanner*® Information Area will show the EGT value on the left (four digits) and the CHT value on the right (three digits). Other parameters are displayed in the digital display as described in the subsection "*Scanner*® Information Area" on page 20.

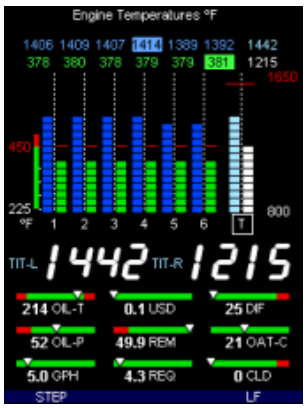


Typical display configurations by model and mounting orientation

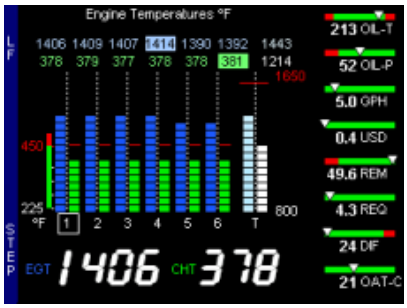
The EDM-730/830 series features the ability to be mounted either in landscape or portrait orientation. Display layouts will differ as a result of configuration differences. Examples of the EDM-830 and EDM-730 are shown below:

EDM-830 6 Cylinder
(landscape orientation)

EDM-830 6 Cylinder
(portrait orientation)



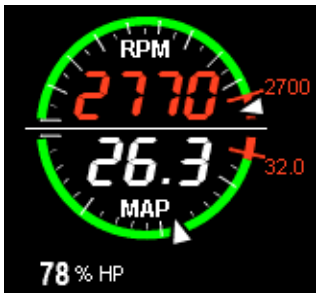
EDM-730 6 Cylinder
(portrait orientation)



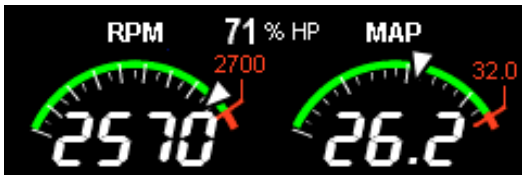
EDM-730 6 Cylinder
(landscape orientation)

EDM-830 RPM and MAP Display

The EDM-830 depicts both RPM and Manifold Pressure graphically and digitally. Examples are shown for both landscape and portrait orientation. When a power setting exceeds redline, the digital value changes to red and a blinking message appears in the *Scanner*® Information Area. Percent horsepower is located in this display area also.



EDM-830 RPM & MAP
(portrait orientation)



EDM-830 RPM & MAP
(landscape orientation)

EDM-730/830 Linear Gauges

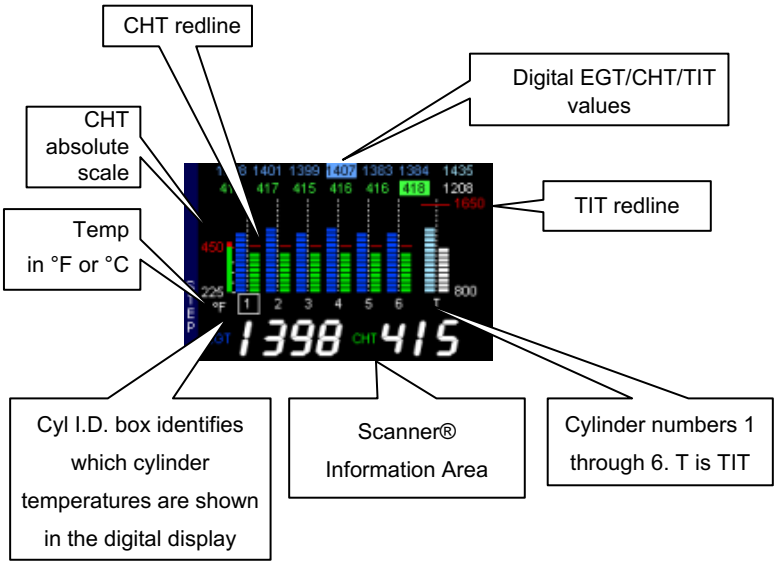
This area contains linear bar graphs with digital displays. When a value exceeds red line, it is displayed in RED. You can customize what appears in each position. Examples of available displays are:

- Voltage (BAT)
- EGT Span (DIF)
- Shock Cooling (CLD)
- Oil temperature (O-T)
- Oil pressure (O-P)
- Outside Air Temperature (OAT)
- Fuel flow, units per hour (GPH)
- Fuel Used (USD)
- Fuel Remaining (REM)
- Fuel Required to waypoint or destination (REQ)

EDM-830
Linear Gauge

EDM-730/830 Basic Scanner® Operation

The EDM-730/830 Scanner section contains graphic representation of EGT, CHT and TIT values as well as containing a general purpose text message area. It will go into Automatic scan mode a few minutes after power up. You don't have to touch any buttons.



EGT: Exhaust Gas Temperatures

Blue segments represent temperature magnitude and are located to the left of the vertical dotted line present in each cylinder bar graph. Cylinder I.D. numbers are located just below the dotted line (one for each cylinder on the engine). A white square around a cylinder I.D. number identifies which cylinder the *Scanner*® digital value relates to (cylinder 3 in the above example). The digital value is always present above the dotted line and is Blue.

CHT: Cylinder Head Temperatures

Green segments represent temperature magnitude and are located to the right of the vertical dotted line present in each cylinder bar graph. Cylinder I.D. numbers are located just below the dotted line (one for each cylinder on the engine). A white square around a cylinder I.D. number identifies which cylinder the *Scanner*® digital value relates to (cylinder 3 in the above example). The digital value is always present above the dotted line and is green. CHT redline is depicted by red horizontal lines half way up the bar graph scale.

TIT: Turbine Inlet Temperature
Light Blue segments represent temperature magnitude (at the same scale as EGT) and are located to the right of the last cylinder bar graph set. A 'T' just below the dotted line identifies this as TIT. When a white square surrounds the 'T', this signifies that the scanner digital values relate to TIT. The digital value is always present above the dotted line and is Light Blue. TIT redline is depicted by a red horizontal line above the majority of the TIT bar graph area.

There are two views: Normalize view levels the EGT columns and increases the sensitivity of the Scanner® bar graph columns. To enter the Normalize view, hold the LeanFind button for three seconds. The NRM icon will be displayed above the Scanner® section and the bars will be blue. Hold the LeanFind button for three seconds to return to the Standard view. See page 9 for a more detailed description.

Hottest EGT and CHT
A single EGT value displayed above the bar graph columns will be displayed as black text on a **Light Blue background,** indicating the cylinder with the hottest EGT value. A single CHT value displayed above the bar graph columns will be displayed with black text on a **Green background,** indicating the cylinder with the hottest CHT value.

Operating Modes

There are three standard operating modes of the EDM: *Automatic, Manual,* and *LeanFind*. These modes will be described in more detail beginning on page 21. When you first turn on the power the EDM starts in the Manual mode, but will enter the Automatic mode after two minutes (most of the time you will operate the EDM in the Automatic mode). The three modes primarily affect the *Scanner*® Information Area.

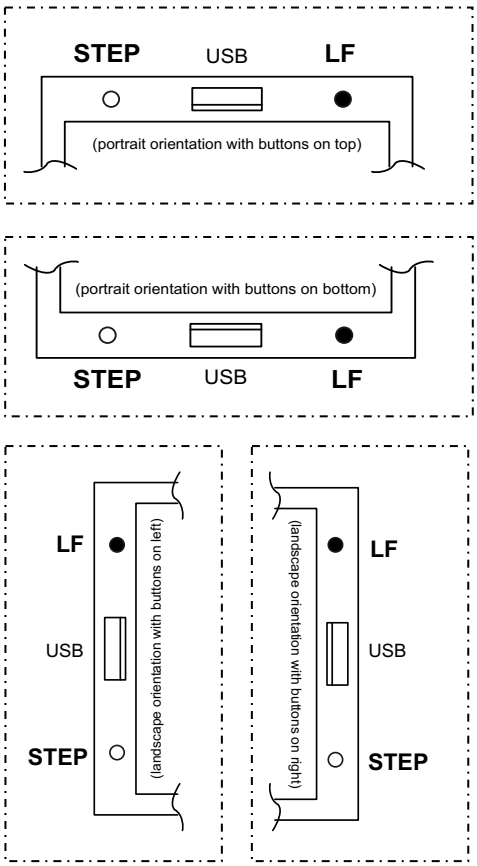
Automatic Mode
Just tap the LF button, then tap the STEP button. No user intervention is required to use this mode. Each cylinder and each parameter value is automatically sequenced and shown in the digital display for a few seconds.

Manual Mode
Just tap the STEP button. This stops Automatic Mode. Each indexed parameter is frozen in the digital display until you manually index to the next parameter by tapping the STEP button.

LeanFind Mode
Simply pre-lean, tap the LF button and begin leaning. The EDM will assist you in finding the correct cylinder to peak to set your mixture to.

Button Location and Display Rotation

The EDM can be mounted in four different positions. After mounting, you may need to remove and relocate the white button to the 'STEP' location. You may also need to rotate the EDM display. Clear any flashing displays and hold STEP (about 6 seconds) until you see the overlayed arrow. This arrow indicates where the top of the display will be. Tap LF until the arrow points to 12 o'clock. Now tap STEP. Your display should now be upright. The button functions are depicted in the four possible orientations as shown below:



The STEP and LF buttons control all functions of the EDM. The term ***tap*** denotes pressing a button momentarily. The term ***hold*** denotes pressing and holding a button for five seconds or longer.

STEP Button - Primary functions

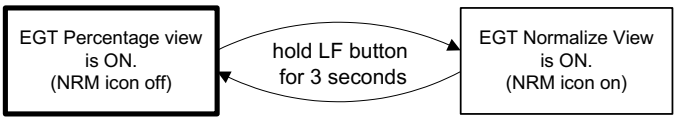
- In the Automatic mode, *tapping* the STEP button will change to the Manual mode. Subsequent *taps* of the STEP button will display the next parameters in the sequence.
- In the LeanFind mode *tapping* the STEP button will terminate the LeanFind mode and change to the Automatic mode.

STEP Button - Secondary functions

- In the Manual mode, *holding* the STEP button will display the previous parameters in the sequence (rapidly backwards).
- In the Pilot Program Mode, *tapping* the STEP button will generally advance to the next item in the list.
- When an alarm is displayed, *tapping* the STEP button will prevent that alarm from appearing for the next ten minutes.
- When an alarm is displayed, *holding* the STEP button until the word OFF appears, prevents that alarm from appearing for the remainder of the flight.

LF Button - Primary functions

- In Automatic or Manual modes, *tapping* the LF button will change to the LeanFind mode.
- In the LeanFind mode, *holding* the LF button after peak EGT is found will display peak EGT.
- In Automatic or Manual modes, *holding* the LF button for three seconds will toggle between Percentage and Normalize views.



LF Button - Secondary functions

- In the pilot programming procedure, *holding* or *tapping* the LF button is used to increment or decrement parameter values and toggle between Yes and No answers to questions.

STEP and LF buttons together

- *Holding* both the STEP and LF buttons simultaneously, for several seconds, changes to the Pilot Programming Mode.
- *Holding* both the STEP and LF buttons simultaneously for several seconds when in a unit programming mode and 'END? Y' is displayed will take you to the next programming mode (if one exists).
- *Holding* both the STEP and LF buttons simultaneously for several 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 parameter from the Automatic mode. It has no affect on the displayed parameters in the Manual 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 - uninstalled parameters will not appear.

DISPLAY	PARAMETER	DESCRIPTION
EGT *1436* CHT *382*	EGT/CHT	Shows successive pairs of EGT & CHT per STEP tap.
TIT *1580* °F	TIT	Turbine Inlet Temp (single)
TIT-L *1490* TIT-R*1580*	TIT 2	Turbine Inlet Temp (2 TITs)
OIL-T *204* °F	OIL TEMP	Oil temperature
OIL-P *64* PSI	OIL PRES	Oil pressure
CLD *75* °/Min	SHOCK COOL	CHT cooling rate (deg/min)
VOLTS *13.9*	BATTERY	Battery/Bus voltage
OAT *23* °C	OAT	Outside air temperature
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	Intercooler Air Temp
C-I *-40* °F	CDT-IAT	Intercooler cooling
GS *140* KTS	GROUND SPEED	GPS reported ground speed
RPM *2460* MAP *23.6*	POWER	RPM & MAP values
HP *70* %	PERCENT HP	Calculated percent of horsepower
Est. REM *68.0* GAL	REM	Calculated fuel remaining
WP REQ *12.7* GAL	FUEL REQUIRED	Calculated fuel required to reach waypoint (GPS interface must be correct)
Est. WP REM *55.2* GAL	FUEL RESERVE	Calculated fuel reserve at waypoint (GPS interface must be correct)
ECON *9.8* MPG	MILES PER GALLON	Calculated fuel miles per units (GPS interface must be correct)
Est. T to E 04:32 H:M	ENDURANCE	Calculated time remaining to fuel exhaustion
FUEL-F *15.0* GPH	FUEL FLOW RATE	Calculated fuel flow rate in units per hour
USD *7.2* GAL	FUEL USED	Calculated fuel used

Built-in Diagnostics: Startup and During Flight

When your EDM is first turned on, the screen begins by showing the unit model number and TSO category. Next, several display patterns are presented allowing you to check for proper screen operation. During this time, the EDM is conducting built-in-tests of certain components, calibration and probes. Any newly installed options are found and logged in at this time. If a probe problem is found, diagnostic indications will be presented on the display. These vary depending on the parameter. For CHT, EGT and TIT, a message appears in the *Scanner*® Information Area. For example, if EGT#2 were open circuit, the message would read '***OPEN PROBE EGT 2***'. For an inoperative horizontal linear gauge function, a red '**X**' is drawn through it and its digital value is dashed out. Probes determined to be faulty during the power up checks are disabled from the *Scanner*® automatic sequence. During flight, probes are periodically checked for inconsistent or intermittent signals and are disabled if deemed unusable in which case an appropriate message will appear.

EDM Modes

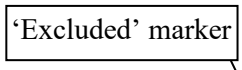
The EDM has three different operating modes: *Automatic*, *Manual* and *LeanFind*. When you first turn on the power the EDM starts in the Manual mode, but will enter the Automatic mode after a few minutes. The Automatic mode provides you with engine monitoring information for the majority of flight conditions. To adjust the mixture, use the LeanFind mode. To display specific parameters, use the Manual mode. In either Automatic or Manual modes, the cylinder bar graphs show a graphic representation of EGT and CHT for each cylinder and TIT (if present).

Automatic Mode

Just tap the LF button, and then tap the STEP button. No other user intervention is required to use this mode. The EDM will begin displaying the parameter sequence at the programmed 'RATE' (see "Personalizing" on page 48).

Individual parameters can be excluded from the Automatic mode: tap STEP to enter the Manual mode. Tap STEP to select the parameter you want to *exclude*. Now tap both STEP and LF buttons simultaneously. Note that tapping the STEP and LF buttons again, toggles back to *include* status.

An excluded parameter displays a decimal point before the parameter name.



For example:

Included: ***VOLTS 14.6*** Excluded: ***.VOLTS 14.6***

- Every time you turn on the EDM, all parameters are set to 'included'.
- *All* installed parameters are always displayed in the Manual mode. Exclusion only applies to the Automatic mode.
- All parameters are checked periodically for alarm conditions regardless of their included or excluded status.
- OIL temperature, EGT, CHT and TIT values cannot be excluded.

Manual Mode

Just tap the STEP button. Use the Manual mode when you want to monitor one specific parameter 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 parameter sequence (see "Scanner® Information Area" on page 20). To exit the Manual mode and return to the Automatic mode, tap the LF button and then tap the STEP button. You may disable the Automatic mode by setting scan rate to '0'.

LeanFind Mode

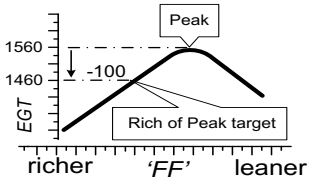
The EDM supports two methods of leaning; **Rich Of Peak** (***ROP***) and **Lean Of Peak** (***LOP*****).** Note: you can set the power-up default to LOP or ROP in the Pilot Program Mode but easily change modes during flight. During traditional Rich Of Peak leaning, you'll finalize the mixture to about 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. Teledyne Continental recommends lean of peak for the Malibu. 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, just after activating LeanFind, hold STEP and LF and the other method will be momentarily shown: ***ROP*** or ***LOP***. Release buttons after other method appears.

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

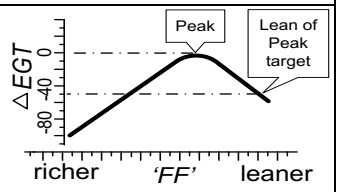
Rich of Peak leaning is as simple as:

A. Pre-lean your mixture.
B. Tap the LF button (verify *ROP* appears).
C. Lean mixture until *LEANEST* flashes *(*peak found).
D. 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 *LOP* appears hold STEP & LF until *ROP appears*)
5	Lean the mixture at approx. 10°/second *without* pausing. (cylinder I.D. box flashes when a EGT rises 15°F)	EGT *1520 LF* (Without FF) - or - EGT *1520* FF *13.8* (With FF)	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	Stop leaning when a column begins flashing. You will see *LEANEST* for one second, followed by:	EGT *1545 SET* (Without FF) - or - EGT *1545* FF *12.4* (With FF)	Flashing cylinder I.D. box *AND* its column indicates leanest cylinder. (SET means Set the mixture.) Due to thermal inertia this will usually be about -15°F down the lean side of peak.
7	If you hold LF, peak EGT will be displayed while the LF button is held down.	EGT *1560 PK* (Without FF) - or - EGT *1560* FF *12.9* (With FF)	Captured peak EGT value (plus peak FF, if FF equipped) is displayed.
8	If you tap LF, the difference from peak EGT is shown. Tap again to return to the peaked EGT value.	EGT *-90 SET* (Without FF) - or - EGT *-90* FF *13.4* (With FF)	A useful mode for enrichening the mixture to desired degrees below peak. Just set to desired value - no math required! NOTE: Unit remembers view last used.
9	Slowly enrich mixture noting that EGT is returns to peak then drops. Stop enriching at the desired EGT. 'Peak': best Econ. 'ROP' target: best power.	EGT *1560 SET* (PEAK) EGT *1460 SET* (100º RICH OF PEAK)	

Lean of Peak leaning is as simple as:

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

L	Procedure	Scanner Example	Comments
1	Establish cruise between 65 to 75% power.		
2	Pre-lean the mixture to 50°F estimated rich of peak on any EGT: _____°F.	EGT *1491* CHT *391*	* See 'Pre-leaning'
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	*LOP*	Start LeanFind (if *ROP* appears, hold STEP & LF until *LOP appears*)
5	Lean the mixture at approx. 10°/second *without* pausing. (cylinder I.D. box flashes when a EGT rises 15°F)	EGT *1520* *LF* (Without FF) - or - EGT *1520* FF *13.8* (With FF)	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 ***LEANEST*** for one second and bars coming from the top down. Continue leaning.	EGT *-17* *LF* (Without FF) - or - EGT *-17* FF *12.4* (With FF)	When bars come from the top down, the steady cylinder I.D. box identifies the first EGT that peaked (leanest). Continue leaning.
7	When ***RICHEST*** appears, fine tune the delta EGT to the desired degrees below 'Peak' (Lean of peak).	EGT *-45* *SET* (Without FF) - or - EGT *-45* FF *11.6* (With FF)	
8	If you hold LF, the peak EGT recorded will be displayed along with FF spread.	EGT *1560* *PK* (Without FF) - or - EGT *1560* FF *0.6* (With FF)	Captured peak EGT value and if FF equipped, the FF spread between richest and leanest cylinders.

LeanFind Procedure—General 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-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 EGT's decrease). Now enrichen the mixture to achieve a 50° drop on the hottest EGT. Insure that all EGT's decrease. Wait one minute to allow temperatures to stabilize.

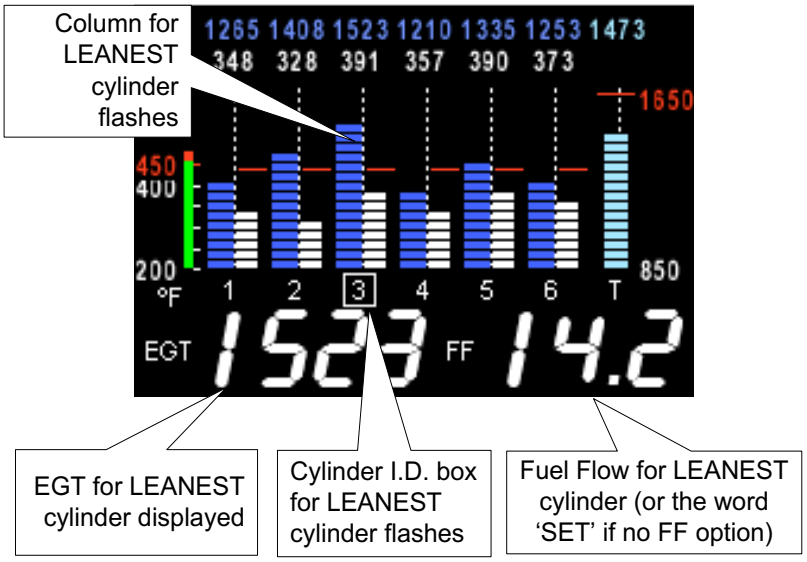
Lean Find-Initiation: Initiate the EDM leaning mode by tapping the LF button. Note that the EDM displays its current leaning mode momentarily: '*ROP'* for operating Rich of Peak or '*LOP'* for operating Lean of Peak. To change, simply hold STEP and LF until the display shows the other mode. The EDM is 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 word '*LF*' in the right side (note: with the Fuel Flow option installed, you will see the fuel flow instead of the word '*LF*'). This information allows you to observe the EGT behavior throughout the leaning process.

Lean Find-Rich Of Peak 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 the peaked EGT column. The *Scanner*® Information Area will also display the current value for the peaked EGT on the left, and the word ***SET*** on the right (or fuel flow value, if so equipped), for final adjustment of the mixture. The peak EGT value encountered during leaning is remembered by the EDM and can be displayed by holding the LF button during Lean Find Mode.

Lean Find-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. Note: tap LF to see the current difference from the peak temperature. This is handy for finalizing mixture. Tapping STEP exits the lean find mode and automatic scanning resumes.

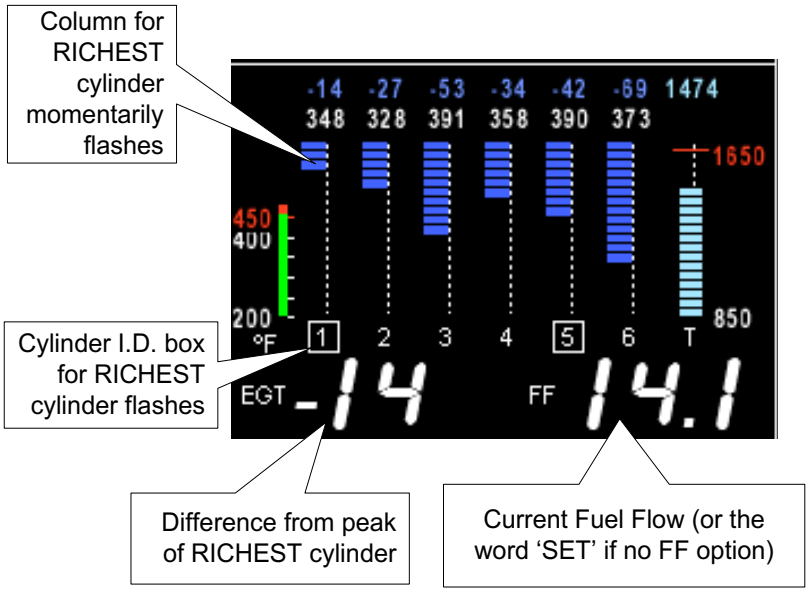
Peak Detected - Rich of Peak mode



Lean Find-Lean Of Peak Detection: Note: This mode should only be used when your engine is equipped with balanced fuel injectors. When using the Lean of Peak mode, you lean until *all* EGT's 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.

Lean Find-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 LF button. Tapping STEP exits the lean find mode and automatic scanning resumes.

Peak Detected - Lean of Peak mode



Expanded Leaning Procedures

Lean Of Peak mode: During the 'lean of peak' process, the EDM hunts for the last cylinder to peak. This is because, 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 below 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 respective column will flash and the word ***RICHEST*** appears. The scanner digital readout will now show the current temperature difference from where peak EGT occurred and also the current fuel flow (if so equipped). Note: if you hold the LF button, the display will show the captured peak value of the 'last EGT to peak' and also the difference in fuel flow (if FF equipped) between the first and last to peak (also known as the GAMI Spread). This can be a good indication of how well your injectors are balanced (the smaller the FF difference, the better the injector 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 may limit the leaning process, depending on flight conditions. TIT red line is generally 1650°F to 1750°F. 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, implying you should enrichen the mixture.**

NOTE: in some cases, TIT can read approximately **100°F hotter than the hottest EGT**. This is because of 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 the factory installed probe. However, the certified factory-installed gauge must be obeyed as the limiting factor when adjusting your engine.

Engine Run Up - while RPM is set to run-up value .

Suggested setup:

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
- abnormally high CHT
- a higher EGT on one cylinder in dual magneto operation—indicates fouled spark plug.

NOTE: Include your EDM on your run-up checklist.

Take-Off, Climb, and Full Throttle Operations .

Suggested setup:

Percentage view
Automatic mode

Verify:

- EGTs and CHTs consistent with past climbs. EGTs should be the 1100 to 1250°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.
- If all EGT bars go off scale to the top of the column, be sure you are not in *Normalize* view.

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

Cruise - engine stabilized & leaned using LeanFind

Suggested setup:	***Be alert for:***
Percentage view *Automatic mode*	• uneven EGTs or CHTs (carbureted engines). Make fine adjustments to throttle, then RPM, then mixture to level the display columns. • abnormal patterns of EGTs and CHT. (see "Diagnosing Engine Problems" on page 33).

Descent .

Suggested setup:	***Be alert for:***
Percentage view *Manual mode*	• CLD: shock cooling alarm default is –60°F. Average cool rates of –40°F/minute to –60°F/minute are normal, depending on the engine size.

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. The EDM automatically displays the cylinder with the highest rate of cooling.

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.	• Follow the pre-lean procedure in 'LeanFind Mode' section (pg 23).
	Leaning too slowly.	• Lean more quickly.
Peak not found	Lean Find not activated or you stopped leaning.	• 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.	• 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.	• None
EGT rises during single magneto check	This is normal, due to incomplete combustion persisting longer.	• None
EGT not uniform during low power operation	This is normal. Fuel and air distribution is not optimal at low power settings.	• None
No display of %HP	FF, MAP, RPM, OAT not reading or not equipped	• FF, RPM, OAT, MAP required for %HP

Section 3 - Diagnosing Engine Problems

This chart lists typical EDM indications for most G.A. engines.

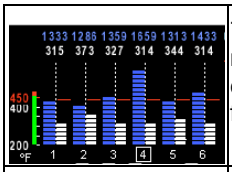
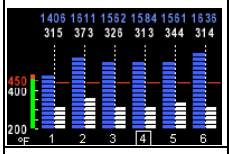
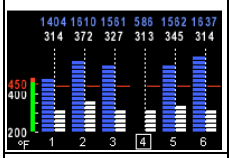
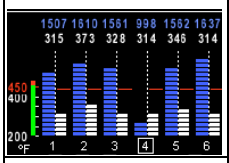
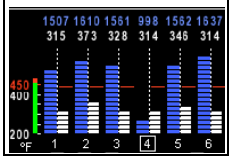
Parameter	*Normal range*	*Comments*
EGT at Takeoff	1200 to 1300°F	• EGT is approximately 200°F lower than cruise when full throttle applied.
EGT in Cruise	1350°F	• under 200 HP
	1550°F	• high performance
EGT span (DIF)	70 to 90°F	• fuel injected
	120 to 150°F	• carbureted
TIT	1600°F average	• 100° higher than EGT
CHT	350°F (OAT 60°F)	• normally aspirated
	410°F	• Turbocharged
CHT span	50 to 70°F	• 100° with gasket probes
OIL	200°F	• oil cooler thermostat opens at 180°F
Shock cooling (CLD)*	-40°/minute	• tightly cowled
	-55°/minute	• Bonanza
	-200°/minute	• helicopter

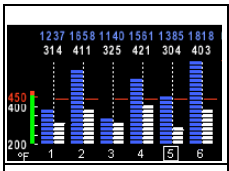
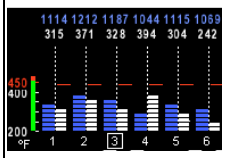
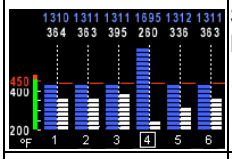
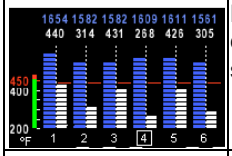
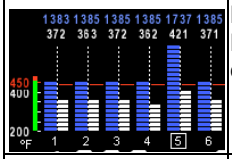
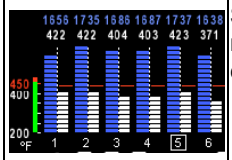
* Maintain a cooling rate of less than -60°/minute. You will find that the cylinder with the greatest shock cooling will shift from front cylinders (during climb out) to the rear cylinders (during descent).

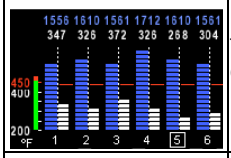
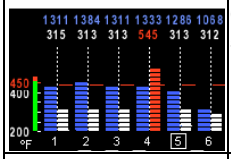
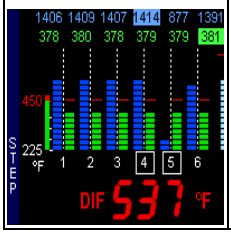
NOTE: If one CHT is reading 20° to 50° above or below the others, this may be due to that cylinder having a spark plug gasket probe instead of a bayonet probe. This is necessary because the aircraft's factory original CHT probe is occupying the socket in the cylinder head rather than the EDM. This is 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 (unit is in 'Percentage View' mode for these pictures).

Display	*Symptom*	*Probable Cause*	*Recommended Action*
	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; *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.
	Decrease in EGT for one cylinder at low RPM	Low compression.	Check compression.

Display	*Symptom*	*Probable Cause*	*Recommended Action*
	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. Engine units set to Celsius	Check for change in manifold pressure. Check that the alarm limits are set to Celsius degrees
	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 EGT/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.

Display	*Symptom*	*Probable Cause*	*Recommended Action*
(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 re-lean 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.
	Large DIF at low RPM	Blow by in cylinder rings	Check compression

Alarms

The EDM has programmable alarms. When a parameter falls outside normal limits, the display flashes its value and acronym. Once the parameter returns to normal limits, the flashing stops. If you've connected lights to the EDM's two enunciator outputs, they too will flash. The 'Remote FF Alarm' output (P4-11) activates when the fuel remaining or endurance falls below your preset limit. The 'Remote Alarm' output (P1-12) activates with all other alarms. Note: Individual EGTs do not have separate alarms because they can assume different values depending on the installation and/or flight configuration—run up, climb, cruise. However, there *is* an important alarm which occurs when the difference between hottest and coolest EGT's exceeds a programmed limit. This is called the 'DIF' alarm. This can quickly warn you when cylinder combustion becomes abnormal.

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

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. See ‘

Factory Limits and GPS' section on page 56 for a list of the alarms and their factory default settings.

Alarm Priority

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

Highest priority	**CHT**	High CHT
	OIL	High OIL temperature
	TIT	High TIT
	OIL	Low OIL temperature
	CLD	Excessive CHT cooling rate
	DIF	Excessive EGT span
	VOLTS	High battery voltage
	VOLTS	Low battery voltage
	MAP	Overboost Manifold pressure
	O-P	Oil pressure
	LO REM	Low fuel quantity remaining
	LO H:M	Low fuel endurance remaining
Lowest priority	**FF**	Low fuel flow

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 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 4 - Fuel Flow Option 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 Option of the known quantity of fuel onboard, it 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 REMaining and USED values). The EDM will flash *REFUEL? N*. If you didn't add any fuel, simply tap STEP to exit, otherwise tap LF and pick one of the three choices below:

Choice 1) *FUEL ONBOARD 66 GAL* : This shortcut sets REMaining to the MAIN tank value (you preset MAIN in Factory Limits setup).

Choice 2) *FUEL ONBOARD 86 GAL*: This shortcut sets REMaining to the sum of MAIN and AUX (you preset AUX in Factory Limits setup).

Choice 3) *ADD/SUBTRACT FUEL ONBOARD?*: This allows you to adjust your REMaining either up or down by holding or tapping LF. Use when adding a partial amount of fuel.

Once you've selected your choice, tap STEP to accept it.

NOTE: If you forgot to update your EDM fuel remaining before starting the engine, you can still perform the REFUEL procedure. The EDM will automatically subtract any burned fuel from the REFUEL value you choose (not applicable to the 'ADD/SUBTRACT FUEL ONBOARD' feature).

The three examples, shown below, depict different aircraft tank configurations and how you can update your EDM after refueling your aircraft. These are meant to be general guidelines. You are responsible for insuring that your usage of the *REFUEL* feature results in the EDM showing the correct amount of usable fuel remaining onboard the aircraft.

<u>Example A</u>: Aircraft has two fuel tanks with internal tabs.

You've preset: *'MAIN = 66'* (33 + 33 usable)

'*AUX = 16'* (8 + 8 usable)

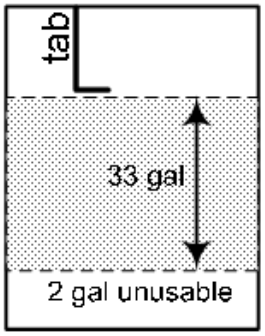
When you refuel:

'FUEL ONBOARD 66 GAL': use this shortcut when <u>filling to the internal tank tabs</u>.

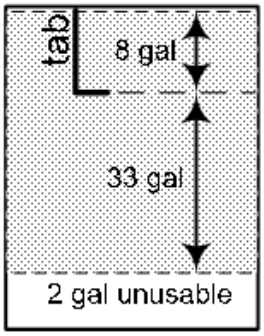
'FUEL ONBOARD 82 GAL': use this shortcut when <u>filling to the caps</u>.

(only one tank is shown in each of the two scenarios)

'FILL 66'



'FILL 82'



<u>Example B</u>: Aircraft has two MAIN and two AUX tanks.

You've preset: *'MAIN = 60'* (30 + 30 usable)

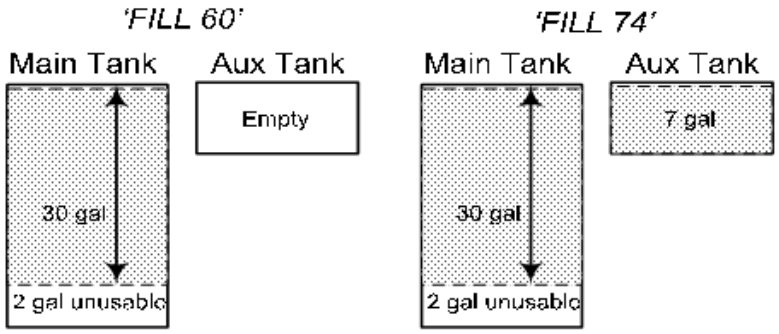
'*AUX = 14'* (7 + 7 usable)

When you refuel:

'FUEL ONBOARD 60 GAL': use this shortcut when <u>filling only MAIN tanks</u> (! AUX tanks must be empty).

'FUEL ONBOARD 74 GAL': use this shortcut when <u>filling MAIN *and* AUX tanks</u>.

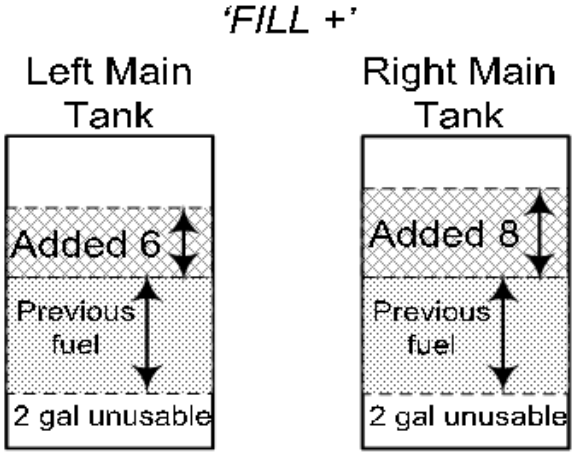
(only one wing shown in each of the two scenarios)



<u>Example C</u>: Aircraft has two MAIN tanks.

When you partially refuel, use:

'ADD/SUBTRACT FUEL ONBOARD': use this to add the <u>amount of fuel you pumped into the aircraft</u> (it doesn't matter which tanks you added to - the EDM totalizes ALL onboard usable fuel). In this example you will add ***'+ 14.0 GAL'***, the same as your fuel slip reads. This will be added to the totalizer REM value.



Resetting '*USD*'

Every time you inform the EDM that the aircraft is refueled, the amount of fuel *USED* is automatically set to zero (unless the instrument is programmed to *TRIP USED? Y*). **To manually zero the amount of fuel *USED* at any time**, manually STEP to display *USD* and then hold both buttons until the display shows 'USD *0 GAL'* (this normally takes about five seconds.

Accumulate — Trip Totalizer

To have the *USED* parameter continuously accumulate total consumed fuel, set ***TRIP USED? Y***. This is typically done if you want to track the total fuel consumed over a multi-stop cross country. 'Accumulate' is described in 'Pilot Programming' beginning on page 48. Note: typically, ***TRIP USED?*** is set to ***'N'*** so that *USED* will be reset every time you fuel the aircraft.

Fuel Flow Display Select Switch

The select switch is a three-position toggle switch mounted on your instrument panel near the display of the EDM. It selects one of three different sets of parameters to be displayed by the Scanner:

- In the **EGT** (**T***emperature)* position only the installed temperature (and battery voltage) parameters are displayed.
- In the **ALL** (**A***ll*) position, the EDM both installed temperature and fuel flow parameters are displayed.
- In the **FF** (**F***uel Flow)* position only fuel flow parameters are displayed.

Alarm warnings appear regardless of the select switch setting. Alarms are displayed in the digital display in either Automatic or Manual Scanner modes. The select switch does not affect the analog display.

Parameter Scan—Systems with Fuel Flow Option

Listed below is the scan sequence, parameter description and an example of the digital display. The first column indicates what position the select switch must be in to display that particular parameter. T=EGT, F=FF and A= ALL.

Scanner Parameter Example Table

Switch	*Parameter*	*Example*	*Comments*
T, A	**Voltage**, System Bus	VOLTS *14.2*	Battery voltage
T, A	**Outside Air** Temp	OAT *81* °F	°F or °C
T, A	**Induction** Air Temp	IAT *125* °F	Out of intercooler
T, A	**Compressor Discharge** Temp	CDT *300* °F	Out of compressor
T, A	**Intercooler efficiency**	C-I *25* °F	Amount of cooling provided by the intercooler (if equipped)
T, A	**Carburetor** Temp	CRB *-22* °F	Not available when CDT is installed
T, A	**Difference** between hottest and coldest EGT	DIF *80* °F	Dot indicates most widely deviating cylinder
T,A,F	**RPM MAP**	RPM *2450* MAP *23.4*	RPM and Manifold pressure
F, A	**Fuel Remaining**	*EST. REM 37.2* GAL	In gallons, liters or pounds or kilograms
F, A	**Fuel required to next GPS WPT or Destination**	EST. WP REQ *25.9* GAL	Present with GPS interface Valid signal and way point
F, A	**Fuel Reserve at next GPS WPT or Destination**	EST. WP REM *11.3* GAL	Present with GPS interface Valid signal and way point
F, A	**Nautical Miles per Gal**	ECON *13.0* MPG	Present with GPS interface and valid signal or *MPK, MPL, MPP*
F, A	**Time to Empty**	EST. T TO E *02:45* H:M	Estimated ***H***ours: ***M***inutes Remaining at current fuel burn
F, A	**Fuel Flow Rate**	FUEL-F *13.5* GPH	Or *KPH, LPH , PPH*
F, A	**Total Fuel Used**	USD *26.5* GAL	Since last refueling or trip total.
T, A	**EGT, CHT**	EGT *1340* CHT *376*	EGT, left, CHT, right. Dot indicates cylinder
T, A	**TIT**, Turbine Inlet Temp 1	*1370 TIT*	Turbine Inlet Temp #1
T, A	**TIT**, Turbine Inlet Temp 2	TIT-L *1340* TIT-R *1340*	Turbine Inlet Temp (2 TIT values)
T, A	**Oil** Temp	OIL-T *178* °F	Oil Temperature
T, A	**Oil** Pressure	OIL-P *52* PSI	Oil Pressure
T, A	**Shock Cooling**	CLD *-30* °/Min	Cyl. I.D. box indicates fastest cooling cylinder

Section 5 - Long Term Data Memory

CAUTION: Do not insert anything but a USB Flash Drive Stick in the USB Port!

The EDM compresses and records **all** displayed parameters once every **six seconds** in Long Term Data Memory (note: you can change this rate to be 2 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.

For EDMs equipped with RPM sensors, recording begins when RPM is greater than800. For EDMs without RPM, recording begins when EGTs are greater than 850°F. The amount of data that the EDM can store will vary depending on how rapidly parameters change. The typical storage capacity is greater than 150 hours at a 6 second recording interval, but can vary depending on which options are installed. 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 also program an *Aircraft ID* that will appear in the output data file. We recommend setting *Aircraft ID* to your aircraft registration number or your name. A*ircraft ID* is initially factory set to the EDM's serial number. You may change the recording 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 started at the new interval). During built-in tests, the EDM displays the Model, Date, Time, Percent Memory filled (since the last download), and the Aircraft ID.

Downloading from Long Term Memory

From either Automatic Scanner or Manual Scanner mode, simply plug a properly formatted USB Drive into the front panel jack (note: you must clear any alarms that are present for downloading to commence).

There are three download choices:

'DUMP NEW' : download all NEW flights since last download.
'DUMP ALL' : download ALL flights in the EDM memory.
'DUMP EXIT' : EXIT the download mode.

Tap the LF button to select a choice, then Tap STEP button to execute. The EDM will show messages and percent complete indicators to keep you apprised of progress. When the download is complete the EDM may

briefly show DONE. Wait a few seconds for the display to return to the normal engine monitoring mode and then remove your USB Drive. This completes the download.

Transferring 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 6 - Personalizing

Pilot Programming

To start the Pilot Programming 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. Tap the LF button to select alternate values of that item. The shaded areas in the example chart below pertain only to the Fuel Flow Option.

Tap STEP to advance to the next item	*Tap LF to sequence through these values*	*Comments*
PROGRAM		Briefly indicates entry into Program Mode.
SOFTWARE INFO?		Displays the SW part number and checksum information.
AIRFRAME HOBBS	*1125.2*	HOBBS timer enabled whenever engine is ON
TACH TIME	*1090.6*	Engine hours (displays as HOBBS time if RPM not enabled) Hold STEP and LF to adjust
REFUEL? N	*N ⇔ Y*	Y—Yes—to change fuel status. See refueling.

AUTO SCAN RATE 4 SEC	*0 … 9*	Index rate (pause time) in the Automatic Mode. 0 disables the Automatic Mode. Tap 'STEP' to accept and go to next mode. Hold STEP and LF to access '*ORIG TIT ? N'*.
ORIG TIT ?N	*N ⇔ Y*	Select Y if original ship TIT is being used. Tap STEP to accept. If Y chosen, then TIT is calibrated below.
CAL TIT TIT +0	*TIT +300 TIT -300*	Adjust TIT to match ships gauge during flight. Tap STEP to accept and exit PPM.
TRIP USED ?N	*N ⇔ Y*	N—No—Selects resetting fuel *USED* to zero after performing EDM *FILL* process (after you filled aircraft). Y—Yes—Selects continuously accumulating total fuel *USED,* rather than resetting to 0 after EDM *FILL* process.
EGT DISPLAY IN 1'S	*N ⇔ Y*	Y—Yes—sets the digital display to one-degree resolution; N—No—sets 10°.
OAT DISPLAY °F	*F ⇔ C*	Select degrees F/C. Tap STEP to accept or hold both STEP and LF buttons for a few seconds to access OAT calibration below.
OAT ADJUSTMENT +0	*OAT+I0 OAT-I0*	Adjust the indicated temperature up or down by up to 10°. For example, *OAT+3* adjusts the OAT 3° higher.
HP CONSTANT 108		%HP display will change when HP constant is adjusted. Hold STEP and LF for a few seconds to access MAP calibration. Tap STEP to exit.
MAP ADJUSTMENT 0.0		Hold STEP and LF for a few seconds until ADJUST shows. Adjust (by ±3.0 in Hg) until MAP gauge equals the altimeter setting on a sea level airport. Tap Step to continue to the next step.
KFACTOR 1	*KF1=29.90*	Hold both STEP and LF buttons a few seconds to access KF-set mode (see below) or tap STEP to skip.
	*KF1=**2**9.90*	***2****9.90* Adjust the flashing digit using LF button. Tap STEP to select next digit. Hold both buttons to save and exit KF-set mode.
KFACTOR 2	*KF2=**2**9.90*	Set using same method as K-FACTOR 1 above (for installations with fuel return transducer)

CARB? N	*N ⇔ Y*	N—No—injected engine. Y—Yes—carbureted engine. Adds additional filtering to smooth out values.
CARB = 2	*1 – 3*	1 – lowest Fuel Flow filter 2 – medium Fuel Flow filter 3 – highest Fuel Flow filter
GPS FORMAT	#6: GNS 430/530-WP	Hold both STEP and LF buttons a few seconds to access GPS Format mode. Tap LF to change selection Hold both STEP and LF buttons a few seconds to save format changes.
TIME:	#6: GNS 430/530-WP	Hold both STEP and LF buttons a few seconds to access GPS Format mode. Tap LF to change selection Hold both STEP and LF buttons a few seconds to save format changes.
Time: 18:23:59	00:00:00 □ 23:59:59	Hold STEP and LF for 5 seconds until you see **ADJUST**. Tap LF to change hours. Tap LF to select minutes. Tap LF again to select seconds. Hold STEP and LF to save changes
DATE: 01/01/15	*01/01/00 – 12/31/99*	Hold STEP and LF for 5 seconds until you see **ADJUST**. Tap LF to change hours. Tap LF to select minutes. Tap LF again to select seconds. Hold STEP and LF to save changes
RECORD TIME: 6 SEC	*1 – 500*	Tap LF button to change data recording interval.
TAIL NO:	*UP TO 8 ALPHA-NUMERIC*	Hold STEP and LF to begin adjust. Hold or tap “CHANGE” to change character/digit. Tap STEP to select next character/digit. Hold STEP and LF to save changes.
DAY LCD ADJUST=50	*-50 – +60*	User brightness preference used in bright light conditions
NIGHT LCD ADJUST=50	*-50 – +60*	User brightness preference used in low light conditions
END? Y	*Y ⇔ N*	Y—Yes to exit; N—No to review list again.

Section 7 - Programming Horsepower Constant

For EDM’s equipped with FF, RPM, OAT and MAP, you will adjust the HP Constant **once for your aircraft** (**NOTE: perform MAP adjustment prior to this process**) Follow the steps below:

1. Prior to takeoff, with the engine running, enter Pilot Program Mode (hold STEP and LF until *‘PROGRAM’* is displayed).
2. Tap STEP until you see *HP CONSTANT 108* (your value may be different). Try changing the constant by tapping/holding the LF

button. Note that the %HP gauge value changes as you change the constant. This adjustment will be performed while airborne.

3. Once airborne, by reference to the Aircraft Flight Manual (AFM), not the EDM , setup a constant power setting of 70% in straight and level flight below 10,000 feet (be sure your mixture is Rich of Peak). If necessary, re-enter the HP constant mode (steps 1 & 2 above). Adjust the HP constant until the EDM's %HP is as close as possible to 70%. **Note: the reading is the *percent of maximum* HP, not actual HP.**
4. Tap the STEP button to save and exit.

Section 8 - Programming Manifold Pressure (MAP)

Note: MAP function is an option and must be enabled in Factory Limits Mode.

Perform calibration if the MAP on your manifold pressure gauge doesn't match the MAP shown on the EDM.

1. Do this on the ground with the **engine turned off.**
2. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for a few seconds.
3. Tap STEP to index to *MAP ADJUSTMENT +0.0*
4. Hold both the STEP and LF buttons*to change MAP adjustment*.
5. You will need to determine and set the absolute air pressure (this is what MAP displays). Depending on your airport elevation, use either method 'A' or 'B' below:

   A. Airport <u>at</u> sea level: adjust the MAP gauge digital display to the airport ATIS altimeter setting **(**or to your altimeter Kollsman window if no ATIS available) by tapping/holding the LF button. The range is +/- 3 in HG.

OR

   B. Airport <u>above</u> sea level: the table below shows MAP for a given field elevation (down the left side of the table) and altimeter setting (along top row of the table). Find the closest entry in the table to your field elevation and current altimeter setting. Interpolate if necessary. Adjust the MAP gauge digital display by tapping/holding LF button. The range is +/- 3 in. HG.

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

For this method, do not set MAP to the local altimeter (Kollsman window) setting since that setting is the pressure at sea level, and is not the same as your field elevation pressure.

6. Tap the STEP button to save.

Section 9 - Programming use of Factory Original TIT Probe

If your aircraft is using the factory original TIT probe and gauge, you should calibrate the EDM for that probe. The factory original TIT probe must be a type K and the leads must be wired red-to-red and yellow-to-yellow. Both the EDM and factory original gauge may be used concurrently. Due to the high input impedance of the EDM instrument, it will not affect the accuracy of the factory installed probe or gauge. In normal cruise flight, record the difference between the factory installed TIT gauge and the EDM TIT reading: TIT gauge _____ EDM _____.

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* for two seconds.

Tap* STEP *to advance to the next item	***Tap the* LF *button to sequence through these values***	***Comments***
PROGRAM		Appears for two seconds.
AUTO SCAN RATE 4		hold STEP and LF buttons simultaneously for several seconds to access the next sequence.
ORIG TIT ?N	*N ⇔ Y*	Y—Yes—selects factory original TIT probe and proceeds to the next step.
TIT +0	*- 975 … + 975*	Tap the LF button to lower the correction; hold the LF button to raise the correction. For example, if the EDM reads 100 less than the aircraft's TIT gauge, set the display to read *TIT + 100*.
		Tap STEP button to exit the procedure.

Section 10 - Programming the Fuel Flow Option

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.*

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	❶	❷

2. Total ❶ the EDM fuel used and ❷ the actual fuel used.

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

4. Calculate the New K Factor as follows:

New K Factor = (❶EDM fuel used) x (❸Current K factor)
(❷actual fuel used)

New K Factor = (❶ _____) x (❸ _____)
(❷ _____)

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

Date	*❶EDM fuel used*	*❷actual fuel used*	*❸Current K factor*	*New K factor = ❶x❸/❷*	*Pilot's initials*

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.

Accumulate Total—Trip Total

Select TRIP USED? from the Pilot Program Mode. Select *'N'* if you wish to display total fuel used since the last time you informed the EDM that the aircraft was refueled. Select *'Y'* to display total fuel used for an extended trip with multiple fuel stops. This selection affects only the *USD* parameter.

GPS-C Comm settings
Select this from the Pilot Program Mode. The GPS-C setting selects the format of the *fuel data* output of the EDM. See page 62.

Section 11 - Programming Long Term Data Memory

If you haven't already done so, start the Pilot Programming Mode by holding the STEP and LF buttons for a few seconds until the word *PROGRAM* appears for two seconds. To change the date, time and user id for the Long Term Data Memory, tap the STEP button until the display shows *TIME*. Then set the data memory parameters as show below:

STEP	**LF**	***Comments***
TIME:	*0 – 23:59:59*	Time of day
DATE:	*01/01/00 – 12/31/99*	Current date
DAY:	*1 …31*	Day
YEAR:	*00 … 99*	Year (note: represents 20**00** through 20**99**)
HOUR:	*00 … 23*	24 hour time. We suggest you use Zulu time
RECORD TIME:	*1 – 500 SECONDS*	Record time interval, in seconds
N-----	***N*** *123456*	Current Aircraft ID. To *change* Aircraft ID, hold both STEP and LF buttons until the first character flashes. LF selects the first character. STEP moves to the next character. To *Save*, hold both STEP and LF for 5 sec.
END? Y		Tap STEP button to exit the procedure.

Factory Set Default Limits—Non-Primary

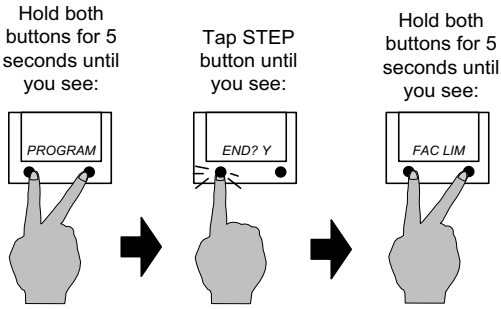
JPI conservatively sets the default alarm limits below Lycoming and Continental recommendations. This is an example of default limits. Your actual aircraft alarm limits may differ from these:

Parameter	*Default Low Limit*	*Default High Limit*	*Alarm Example*
CHT	(n/a)	450°F* 230°C	*465* ***CHT2***
OIL	90°F 32°C	230°F* 110°C	***OIL*** *280*
TIT	(n/a)	1650°F* 900°C	***TIT*** *1720*
CLD	(n/a)	-60°F/min. -33°C/min.	***CLD*** *65*
DIF	(n/a)	500°F 280°C	***DIF*** *525*
BAT, 24 V	24V	32V	***VOLTS*** *22 .4*
BAT, 12 V	12V	16V	***VOLTS*** *17.6*
MAP	(n/a)	32 in. hg.	***MAP*** *46.3*
LO FUEL	45 min	(n/a)	*00.20* ***H.M***
LO TIME	10 gal, kg, ltr, lbs	(n/a)	***REM*** *7.2*

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

Changing the Alarm Limits/Tank Capacity

You may prefer to set your own alarm limits or set up your usable fuel in the main and, optionally, aux tanks. Follow the procedure outlined below to change any of the factory default settings. To start the alarm limit procedure, after power up, wait until the EDM completes its self-test and is in the Automatic or Manual mode. If in doubt, tap the STEP button a few times. Then follow the steps depicted below:



The display will then sequence similar to the example chart below. Tap the STEP button to advance to the next item in the list. Tap the LF button to select values for that item. *Hold* the LF button to increase a

numerical value; *tap* the LF button to decrease a numerical value. The shaded areas in the chart below apply to EDM's equipped with the Fuel Flow Option. Example sequence and procedures for changing the alarm limits or main tank capacity shown below:

Tap* STEP *for next item	**LF *sequences through these value ranges***	***Description***
FACTORY RESET? N	*N ⇔ Y*	Restore factory defaults?
EDM TYPE:	*EDM730 ⇔ EDM830*	Selects EDM730 or EDM830 display layout
RPM SENSOR INSTALLED?	*Y ⇔ N*	RPM option. Y=enable
MAP SENSOR INSTALLED?	*Y ⇔ N*	MAP option. Y=enable
ENGINE TEMPS IN °F	*°F ⇔ °C*	Select F or C degrees for all engine temps. You must also change the alarm limits to °F or °C.
CHANGE ADVISORY LIMITS?		Enters a sub-menu to set limits. See table below.
AVERAGE CRUISE RPM	*75% OF RPM REDLINE ⇔ 100% OF RPM REDLINE*	Average cruise RPM value used to adjust TACH TIME. When RPM is > Average Cruise RPM, TACH TIME accumulates faster than real time. When RPM < Average Cruise RPM, TACH TIME accumulates slower than real time.
LAST FLIGHT NO=	*1⇔ 999999*	Once set, this value can never be set to a lower flight number to ensure that every flight has a unique number.
FUEL UNITS GAL	*GAL⇒* *KGS⇒* *LTR⇒* *LBS⇒*	Selects the units in **all** parameters where fuel quantity or fuel rate is displayed
MAIN TANK SIZE=50	*0 … 999*	Main tank capacity, in units selected
AUX? N	*N ⇔ Y*	Y—Yes—aircraft has auxiliary tanks
AUX TANK SIZE=0	*0 … 999*	Auxiliary tank capacity
R-FACTOR CYL=6	*1 – 99*	Set the number of cylinders. See page 61 for exceptions.

CYL 7,8,9? N	*N ⇔ Y*	N – 4 or 6 cylinders Y – Allow up to 9 cylinders
ENGINE HP 180	*20 … 999*	Set the engine HP
ENGINE CONSTANT 14.90	*1.0 … 99.9*	Set the Engine Constant
CUSTOMIZE DISPLAY?	*NEXT OR YES*	Tapping YES button enters customization mode. See Customize Display Sub-menu below.
REMEMBER CHANNEL EXCLUSIONS	*N ⇔ Y*	Remembers excluded channels next time EDM is powered up. See "Exclude parameters" topic.
LOP DFLT?	*N ⇔ Y*	Set to Y if you want Lean of Peak to be the default LeanFind operation.
FUEL USED REMINDER 0 GAL	0 – 500	Display a message each time the number of GAL, LTRS, etc has been used.
REMINDER TIMEOUT 5 SECONDS	*0 – 60 SECONDS*	0 seconds – no timeout, require a STEP press.
CO GUARDIAN?N	*N ⇔ Y*	Y—Yes—expect COGuardian sensor input
FDR OUTPUT? Y	*Y ⇔ N*	N—no serial output. Y—Output real-time data to serial port.
END? Y	*Y ⇔ N*	Y—Yes to exit; N—No to review list again

*The alarm limits may differ from those shown here, depending on your type of aircraft.

Advisory Limits Sub-menu

HIGH BATTERY 16.0 VOLTS	*10.0 … 35.0*	Battery high voltage limit, set in 0.5 volt increments.
LOW BATTERY 12.0 VOLTS	*10.0 … 35.0*	Battery low voltage limit.
HIGH EGT DIFF 500	*30 … 990°*	EGT difference limit, set in 10° increments.
HIGH CHT TEMP 450°	*90 … 500°*	CHT high limit, set in 5° increments.*
SHOCK COOLING -60	*-5 … -200 °/MIN*	Cooling limit, set in 5°/min. increments.

HIGH TIT TEMP 1650°	*650 … 2000 °*	Also sets the maximum scale of the EGT and TIT bar graph.*
HIGH OIL TEMP 230°	*40 … 500°*	Oil temperature high limit, set in 5° increments.*
LOW OIL TEMP 90°	*10 … 250°*	Oil temperature low limit set in 5° increments
LOW OIL-P 20 PSI	*0 … 99 PSI*	Oil pressure low limit set in 1 pound increments
HIGH RPM 2700	*1000 … 3500*	High RPM alarm (when equipped with RPM)
AVERAGE CRUISE RPM 2400	*75% - 100% OF HIGH RPM LIMIT*	Used for TACH TIME calculation
HIGH MAP 40 INCHES HG	*25 … 90*	MAP overboost alarm when equipped
HIGH CDT TEMP 300°	*40 – 500°*	High CDT limit set in 5° increments
LOW FUEL REMAINING 10 GAL	*0 … 200*	Alarm limit for low fuel quantity in tanks, in units selected
LOW TIME TO EMPTY 45 MINUTES	*0 … 60*	Alarm limit in minutes for low time in tanks
DONE?	*NO / YES*	Tap YES to return to FACTORY prompt menu.

Customize Display Sub-menu

MAP POSITION=	*TOP ⇔ BOTTOM OR LEFT ⇔ RIGHT*	As described.
MAXIMUM LINEAR GAUGES	*5 ⇔ 10*	Allows for wider EGT/CHT bargraph when set to 5
CHANGE LINEAR GAUGES?	*NEXT OR YES*	Y - Select linear gauge preferences (choices vary by options)
RESET ALL TO FACTORY GAUGES	*NO / YES*	Restores linear gauges to original JPI factory default order.
DONE?	*NO / YES*	Tap YES to return to FACTORY prompt menu.

MAP, Fuel Flow Alarm Limits, Units, Fuel Capacity

MAP Overboost Alarm
Enter the redline for overboost on turbocharged engines.

Fuel Flow Units *(shaded area above*)
Selects the units in *all* measurements where fuel quantity or fuel rate is displayed. **If you change this parameter, it does *not* change the numerical value of the fuel tank capacity**. **You must do this manually**. For example if you change from Gal. to Lbs., the tank capacity will be interpreted as 50 Lbs. rather than 50 gallons; the EDM will not automatically convert 50 Gal to equivalent pounds.

Main Tank Capacity
Enter the total usable fuel capacity of the main tanks in the fuel flow units selected.

If you do not have auxiliary tanks or tank tabs, answer "No." If you answer "Yes," you will be asked to input the capacity of the auxiliary tanks in the fuel flow units selected. Another scenario is if you have tank tabs and sometimes fill only to the tabs. In this case you may set the auxiliary tank capacity to the difference between full tank capacity and tab capacity. Note: The EDM does not differentiate fuel flow between the main and auxiliary tanks; it tracks only *total* usable fuel in the aircraft.

Time to Empty Alarm Limit
Select the value of the time remaining, in minutes, that triggers the alarm. Time remaining is determined by dividing the current calculated fuel remaining by the current fuel flow rate.

Low Fuel Alarm Limit
Select the value of the fuel remaining, in the selected fuel flow units, that triggers the alarm. Fuel remaining is a calculated value and is dependent on what you've programmed into the EDM when refueling and the performance of the fuel flow transducer.

Carburetor?
Different **response filters** are used depending on whether your engine is carbureted or fuel injected. The filter for a carbureted engine has a slower response time to reduce sudden fluctuations in readings. The higher the number, the more filtering (the reading is smoother).

Number of Cylinders
This affects only RPM capable EDMs. Set *RPM SENSOR PULSES PER REVOLUTION = 4* or *6* depending on your engine. Exceptions:

- 4 cylinder engine with dual (all-in-one) magnetos set to *8*.
- 4 cylinder Lasar® ignition set to *8*.
- 6 cylinder Lasar® ignition set to *12*.

HP and EC Constant settings
These adjustments set the parameters for the HP calculations in the EDM. Set the Rated HP for your particular aircraft (for example, a 300 horsepower engine: *HP=300*). Set the Engine Constant for normally aspirated or turbo normalized: *EC=14.90* or for turbo boosted: *EC=13.75*. To change the *EC* field value, hold STEP and LF until the digit flashes. The flashing digit can now be edited using the LF button. Tap STEP to advance to the next digit. Hold STEP and LF until the change mode is exited, which will save the value.

Entering the Tank Capacity
To initialize or change the tank capacities, hold the STEP button while turning on the power to the EDM. (Note: these can also be accessed via Pilot Program Mode). The following program steps will be displayed:

Tap STEP to advance	*Tap the LF button to sequence through these values*	*Comments*
MAIN TANK SIZE=50	*0 … 999*	Main tank capacity, in units selected
AUX? N	*N ⇔ Y*	Y—Yes—aircraft has auxiliary tanks
AUX TANK SIZE=0	*0 … 250*	Auxiliary tank capacity

Navigation GPS Data Formats

GPS radios communicate with other equipment in various formats to suite intended usage. You will need to determine what GPS mode is best suited for your installation and set up both your GPS and EDM for compatibility.

For incoming GPS data, the EDM automatically configures itself for one of three industry standard data formats, hence there is no EDM selection necessary for the EDM to receive the incoming data. The table below is for reference only:

Data OUT OF GPS → INTO EDM		
Format	*Baud rate*	*Description*
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 binary	1,200	M1 setup select "NO EXTENDED", "NAV ONLY"

Note: If you connect a handheld, set its to output 'NMEA-183'.

The EDM sends formatted data to the GPS relating to fuel flow. This format must be selected in Pilot Program Mode to match what the GPS expects to receive. The table below depicts the available EDM choices:

GPS-C Fuel Flow Format for GPS Bi-directional Comm

Data OUT OF EDM → INTO GPS	
GPS-C	*Description*
0	No fuel data output
1	Garmin (Shadin Miniflow format)
2	Allied Signal (format B) "To waypoint only"
3	Arnav/EI Signal Format
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	Allied Signal (format B) "To Destination only"

Diagnostic Messages for Fuel Flow and GPS

The following tables depict various messages you may see when a malfunction or signal problem exists:

Fuel Flow Transducer Diagnostics

0.0 GPH	Zeros indicate fuel flow signal is too low to register.
0.0 FF	*'FF'* flashing indicates loss of fuel flow signal.
--:-- H:M	Dashes indicate no fuel flow signal.

GPS Interface Diagnostics

Parameters *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 parameters *REQ, RES, MPG* are missing.	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 parameters *REQ, RES, MPG* are missing.	GPS receiver has insufficient signal for valid data.
NO - WPT message and parameters *REQ, RES* are missing.	No waypoints are programmed into the aircraft GPS receiver.

Navigation Data Ports for GPS Communication

Navigation Data input to the EDM (an output from the GPS)

EDM can accept RS-232, TTL, RS-423, RS-422 SDA.

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

Fuel Data input to GPS (an output from the EDM)

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

EDM Output format is normally fixed by the GPS-C number you chose, but may be over-ridden when the EDM auto-senses certain incoming GPS navigation formats. For example, if the EDM senses Northstar or NMEA-183 navigation data formats coming in, the EDM will not send fuel data to the GPS.

Section 13 - Options Connector Pin Assignments

P1 25-pin connector for 4 or 6 cylinder engines. See installation manual for 7, 8, 9 cylinder instruments

Pin no.	*Pin no.*	*Probe or function*
yel 1	red 2	Oil Temp
yel 3	red 4	IAT
yel 5	red 6	CRB/CDT
yel 14	red 15	OAT
yel 16	red 17	TIT
yel 18	red 19	TIT2
	gry 12	Remote alarm
	red 13	+ Power 14/28 vdc
	wht 24	RS-232 data port
	blk 25	Ground at Engine

P3 MAP-RPM 9-pin connector

Pin no.	*Function/ sensor pin*
grn 1	RPM sig /1
blk 2	RPM grd /2
red 3	RPM pwr /3
red 4	MAP pwr /3
blk 5	MAP grd /1
wht 6	Oil P term
blk 7	Oil P term
wht 8	MAP sig+ /2
grn 9	MAP sig- /4

P4 Fuel Flow Option 15-pin connector

Pin no.	*Function*
1	RS-232 out
2	RS-232 in
wht 4	FF signal
red 5	FF power
blk 6	FF return
7	Switch COM
8	Switch EGT
9	Switch FF
11	Remote FF alarm

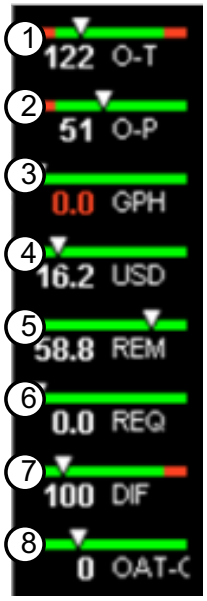
Interface connections to selected GPS models

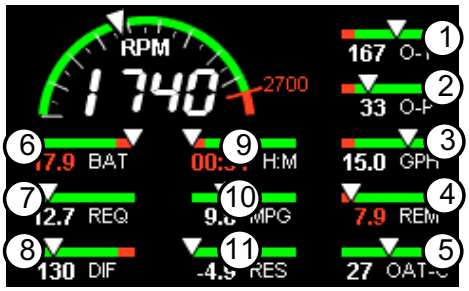
EDM	Fuel flow conn Pin 1	Fuel flow conn Pin 2
Arnav 5000	Pin 4	Pin 5
Garmin 195	(nc)	Pin 4
Garmin 430 / 530	Pin 57	Pin 56
Northstar M3P	(nc)	Pin 6 (leave pin 11 open)
UPS GX50 / 60	Pin 4	Pin 5

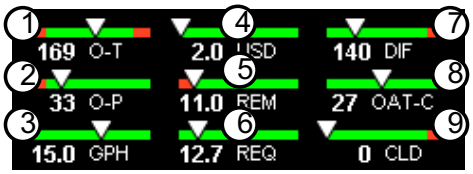
Section 14 - Display Customization

You can customize the linear gauges to your preference. Enter Program Mode, then tap STEP until *'END? Y'* appears. Hold STEP and LF to enter '*FAC LIM'* mode. Tap STEP until you see '*CUSTOMIZE DISPLAY?'.* Tap Y to enter custom display sub-menu. Tap STEP until 'CHANGE LINEAR GAUGES' appears. Tap Y button. '*1=GPH'* appears (*GPH* may differ on your unit). Tap LF to choose a new function for this position. Tap STEP to accept and move to next position. Repeat until you are satisfied with the choices. Hold STEP and LF to save and exit. Now review your custom layout.

Examples of 'Position Numbers' for different layouts:







Section 15 - Reference Reading

You may wish to know more about the effect of engine operations on EGT and CHT. The reading list below provides general overviews as well as original references on topics that may be of interest.

General Overview
These references are readily available to pilots and provide a readable source of general technical information.

- Teledyne Continental Motors, *Engine Operation for Pilots*, from the FAA Accident Prevention Program, FAA-P-8740-13.
- Editors of *Light Plane Maintenance* Magazine, *EGT Systems*, Belvoir Publications Inc., Greenwich, CT 06836. 1989.
- *Lycoming Flyer* Issue 53 dated January 93.

Technical Reviews and Original References
For those pilots who have engineering backgrounds, the references listed below present the original research on the combustion process and represent the source documents for those with technical interests.

- A. Hundere, "Autogas for Avgas," *AOPA Pilot*, October, 1969.
- A. Hundere and J. Bert, "Pre-ignition and Its Deleterious Effects in Aircraft Engines," *SAE Quarterly Transactions*, Vol. 2, No. 4, pages 547-562, October 1948.

Section 16 - Technical Support

JPI offers both e-mail (support@jpitech.com) 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

800 345-4574
714 557 3805
Fax 714-557-9840
www.jpinstruments.com and www.jpitech.com

Section 17 - 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 three 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.

Section 18 - EDM-851 TWIN ENGINE ADDENDUM

The following provides instructions for install / operation of the EDM-851 Twin Engine configuration. Each EDM-830 instrument is installed to its respective engine as if it were a single. One EDM operates as a 'Master', and the other operates as a 'Slave'. This allows each instruments fuel computer values, such as total fuel remaining, total fuel used, hours of endurance and so on, to be combined and displayed on the Master.

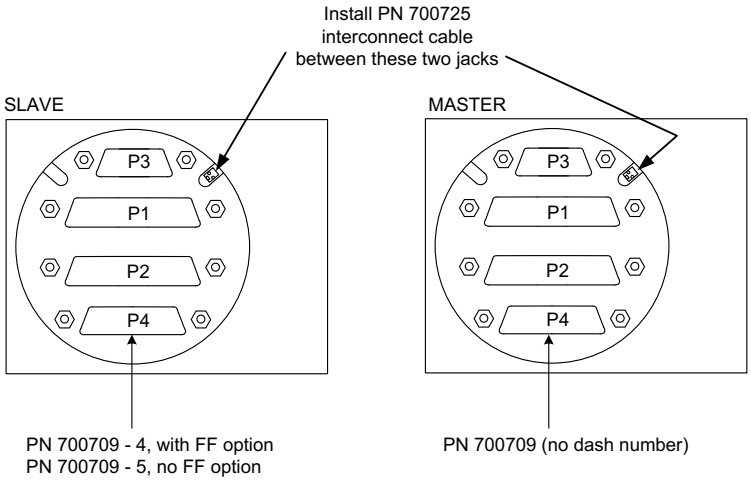
The main differences for the twin installation (versus a single) are:

1. An interconnect cable (JPI PN 700725) is installed between the two instruments, allowing them to cross-communicate. See 'Illustration A' below.
2. The right engine EDM acts as a 'Slave' unit and certain connections must be made as follows:
    a. If you <u>do have</u> the fuel flow option, install the supplied P4 harness (JPI PN 700709-4) to the 'Slave' EDM. Install the *other* P4 harness (JPI PN 700709 no dash number) to the 'Master' EDM. Note: EDM <-> GPS connections are only made between the GPS radio and the 'Master' EDM. None are made to the 'Slave' EDM.
    b. If you do not have the fuel flow option, install the supplied P4 plug (JPI PN 700709-5) to the 'Slave' EDM.

The following are reminders regarding installation requirements that must be followed:

- Each EDM unit shall be powered by a dedicated circuit breaker.
- Each EDM unit shall be grounded directly to the engine that it is monitoring (not the aircraft ground bus).
- Pilot Programming Mode and Factory Limits Mode should be performed on each EDM unit to match them to the installation requirements. NOTE: these parameters are intentionally not synchronized between the units. YOU MUST PROGRAM BOTH EDM's.

Illustration A: Special connections for EDM-851 Twin Configuration



NOTE: Connections for P1, P2 and P3 are per 'Install Manual #103'.

*

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Normalize View

1. Hold LF for three seconds.
2. 'NRM' should appear and EGT, TIT & CHT column heights will center.

Percentage View

1. Hold LF for three seconds.
2. 'NRM' should disappear and EGT columns will return to absolute temp heights.

Automatic Scan

1. Tap LF.
2. Tap STEP.

Exclude a Parameter in Auto-Scan

1. Tap STEP to select the parameter to exclude.
2. Tap both STEP and LF.
3. Decimal point appears before parameter name, indicating it is now excluded.

Change Auto-Scan Indexing Rate

1. Hold both STEP and LF until the display shows *PROGRAM*, followed by *FUEL? N*.
2. Tap STEP to find *RATE 4**.
3. Tap LF to change from 1 to 9 (this is the time, in seconds, between parameters during auto-scanning). Set to 0 to disable auto-scanning.
4. Tap STEP to find *END? Y*, then tap STEP to exit

Reset Fuel Used to zero in flight

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

Transfer Data in Memory

1. Tap STEP to clear any alarms.
2. Insert USB Drive into the EDM data port.
3. *DUMP NEW* should appear.
4. Tap STEP to select the download choice (*NEW, ALL* or *EXIT*).
5. Tap STEP to initiate transfer.
6. Wait for the normal engine monitor display to re-appear.
7. Remove USB Drive.

Initializing Tank Capacity

1. With power off, hold the STEP button in, then turn power on. Hold button in until the first item in table below appears:

MAIN=50	Main tank capacity, in units selected
AUX? N	Y—Yes—aircraft has auxiliary tanks
AUX=0	Auxiliary tank capacity

2. Tap STEP to select the desired item. Tap or hold LF to change its value. Then tap STEP to save.
3. After this initialization, you should now add/subtract fuel in the EDM to make REM equal what is actually in your tanks.

Filled Tanks

Note: if '*FILL? N*' is visible, start at '4.':

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

Added or Removed Fuel

Note: if '*FILL? N*' is visible, start at '4.':

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

Reset an 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 one minute.
2. Tap LF (if you see *LOP,* hold both STEP and LF until you see *ROP)*.
3. Lean mixture until you see a column flash and the words *LEANEST* followed by *1545 SET**
4. To see the peak EGT of the first cylinder to peak and fuel flow :*1560 PK**or *1560 13.5**, hold LF.
5. Enrich mixture to set desired temperature.

Leaning Lean of Peak

1. Pre-lean mixture and wait one minute.
2. Tap LF (if you see *ROP,* hold both STEP and LF until you see *LOP).*
3. Lean mixture until you see inverted columns.
4. Continue leaning until column flashes and the word *RICHEST* appears. Temp dif below peak of the last cylinder to peak and the fuel flow now appear.
5. To see the peak EGT of the first cylinder to peak and the delta fuel flow (GAMI spread), hold LF and see *1560 1.0**.
6. Lean mixture to set desired temperature.

* *Values may vary depending on your installation.*

Pilot's Guide Supplement

Engine Data Management

EDM-740 Experimental Model

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Printed in the United States of America Rev A 07/09/2010

Last printed 12/9/2020 11:33:00 AM

This section describes the added capabilities and operation of the EDM-740 model. The added capabilities are:

Fuel Pressure: Monitors fuel pressure ranges for either carbureted or injected engines. Fuel pressure is displayed in the '*Scanner*' area and optionally as a linear gauge via 'Display Customization'. Sensor type and low and high fuel pressure alarm limits are programmable in the Factory Limits setup area.

Amps: Monitors positive or negative amperage flow at the location of your choice - typically either a bus 'loadmeter' or battery 'charge/discharge' configuration. Amps is displayed in the '*Scanner*' area and optionally as a linear gauge via 'Display Customization'. Low and high amps limits are programmable in the Factory Limits setup area.

Fuel Level: Monitors fuel tank levels (maximum of two). Fuel level is displayed in the '*Scanner*' area and optionally as a linear gauge via 'Display Customization'. Calibration is performed in the aircraft and saved inside the instrument. The most popular resistive, voltage or frequency output level sensors are compatible (not supplied). The calibration data entry and low fuel level alarm values are programmable in the Factory Limits setup area. See 'Factory Limit Program Mode additions' section below. Detailed fuel level calibration instructions can be found in the 'Installation Manual Addendum for EDM-740'.

HOBBS: The hobbs function displays total engine running time. This is visible for several seconds when the instrument is first turned on, after the engine is stopped or via the Pilot Program Mode.

Clock: The clock function is displayed in the Scanner area in 24 hour format (00:00:00 to 23:59:59). This is initially set via the Pilot Program Mode.

Timer: The timer function is displayed in the Scanner area and provides Hours:Minute:Seconds resolution. While displayed, the timer count can be started and stopped, by tapping the LF button. Holding LF resets the timer.

EDM-740 Program Mode additional choices

Pilot Program Mode additions

HOBBS: 1234.9	Displays engine total running hours.

Factory Limit Program Mode additions

LO AMPS=0	Tap/hold LF to change value. Tap STEP to save. Hold both STEP and LF buttons for a few seconds to access AMP calibration choice below.
AMPS ADJ +0	Hold both STEP and LF buttons to enable adjustment. Tap/hold LF to change value. Hold both STEP and LF buttons again to save.
HI AMPS=100	Tap/hold LF to change value. Tap STEP to save.
FUEL PRESSURE	Hold STEP and LF for a few seconds to access sensor selection.
FP=30 PSI 2W *FP=150 PSI 2W* *FP=NONE*	Tap/hold LF to change selection. Tap STEP to save.
LO F-P=1.0	Tap/hold LF to change value. Tap STEP to save.
HI F-P=25.0	Tap/hold LF to change value. Tap STEP to save.
EDIT FUEL LEVELS?	Hold STEP and LF for a few seconds to access Fuel Level Calibration (see section on fuel level calibration).
LO L-TANK=0	Tap/hold STEP to adjust left tank low alarm. Tap STEP to save.
LO R-TANK=0	Tap/hold STEP to adjust right tank low alarm. Tap STEP to save.

EDM-740 Expansion Module pin to sensor assignments

J7 Harness Amps		
Pin / color	**Shunt Sensor/color**	**Hall Effect Sensor/color**
1 (wht)	**(+)**amps	'WHT' (wht)
2 (grn)	**(-)**amps	(N.U.)
3 (blk)	(N.U.)	'BLK' (blk)
4 (red)	(N.U.)	'RED' (red)

(N.U.) means no connection

J8 Harness Fuel Pressure	
Pin / color	**VDO 2W resistive sensor/color**
2 (wht)	Term A (wht) No polarity
3 (grn)	Term B (grn)

J9 & J10 Fuel Level 1 & 2			
Pin / color	**resistive Sensor**	**0 - 5dc voltage Sensor**	**VMS Freq Sensor**
1 (grn)	Term A	Sig	Sig (wht)
2 (blk)	Ground	Gnd	Gnd (blk)
3 (red)	(N.U.)	Pwr	Pwr (red)