Pilot's Guide

Engine Data Management

EDM-930

Primary

TSO

Das in der OE-DTA verbaute EDM-930 ist ein "Primary" Go/1/2023

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EDM Config Editor

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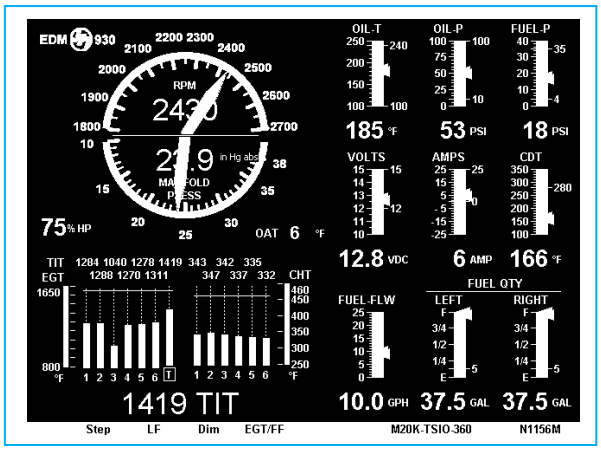
EDM-930 SYSTEM DISPLAYS



EDM-930 Main display

Remote Auxiliary Display

(RAD)

Product Features

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

- Remote Auxiliary Display (RAD)

Section 1 - Getting Started

Important Note!

You ***must*** have the remote auxiliary display—RAD— installed on the instrument panel of your aircraft. This is required for FAA certification of the EDM-930 as a primary instrument. Upon start up, the RAD displays the make and model of your aircraft, which must be verified before you can rely on the EDM-930 for use as the primary engine instrument cluster. The RAD also will continuously notify you of any alarm conditions, regardless of whether you have cleared them on the EDM-930 display.

This is not an option!

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

EDM-930 primary instruments have preset alarm limits and cautionary ranges (user cannot change them) typically for the following measurements: oil temperature, oil pressure, fuel pressure, fuel quantity, cylinder head temperature, turbine inlet temperature, manifold pressure, and RPM. Your EDM-930 contains a custom Key Card. For Primary configurations, the Key Card activates the primary engine instrument abilities of your engine monitor.

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

Display View Angle

The best viewing angle for the pilot is in the horizontal mode with the buttons on the bottom. **Note:** The EDM-930 is to be installed in landscape orientation only and cannot be rotated.

View angles are per the table below:

Viewing angle	Horizontal	Left	65 Degrees
		Right	65 Degrees

List of abbreviations and acronyms

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

Fuel Flow Computer Basics

The fuel flow computer tracks the fuel flowing to the engine and computes various values based on this. At installation, then each time you refuel the aircraft, you must inform the EDM about how much useable fuel is onboard. This is done via the ***REFUEL*** function. There are three 'Quickset' ways to do this:

1. ***Main 74.0 GAL:*** MAIN tanks are filled (no other fuel onboard).

2. ~~***Main + Aux 94.0 GAL:*** MAIN +AUX tanks are filled.~~

3. ***Adjust? 0.0 GAL:*** Partial fuel added to existing quantity.

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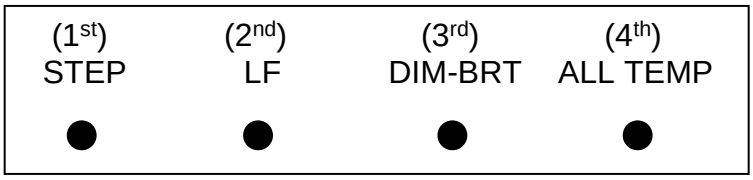
See page 34 for expanded information on the refueling process.

Control Button Basics

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



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

Display Screen Basics

The display screen is arranged into three sections. The top left is the *RPM* and *MAP* section. The bottom left is the *Scanner*® section. And the right side is the *Linear Bar Graphs* section. The instrument ranges and alarm limits are configured to match those of your aircraft when the EDM is set up as a Primary instrument.

Remote Auxiliary Display Basics

The Remote Alarm Display '**RAD'** provides alarm display, RPM and MAP, and is located directly in front of the pilot. Upon power up, the RAD shows the Aircraft model, engine type and declares instrument status: 'Primary' (if applicable). Before each flight, confirm that it matches your aircraft requirements.

RPM and MAP Display Basics

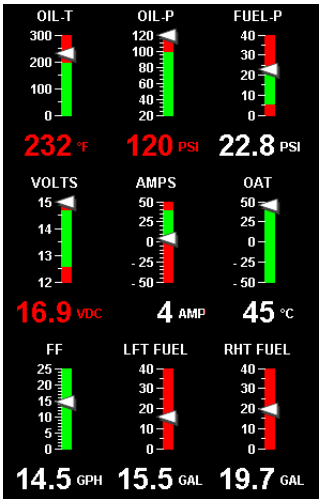
The upper half shows the RPM (Revolutions per Minute) and the lower half shows the MAP (Manifold Pressure). Gauge positions are interchangeable during Pilot Programming. Operations exceeding red line causes the digital value to turn red.

Percent horsepower is displayed digitally below and to the left of these two gauges.

Linear Bar Graph Display Basics

The Bar Graphs section contains nine dedicated bar graphs with digital display organized in a three by three matrix. An example is shown here. Pointers move up and down in response to value changes and digital readouts turn red when exceedances occur.

Note: functions displayed in this example may differ from your EDM.

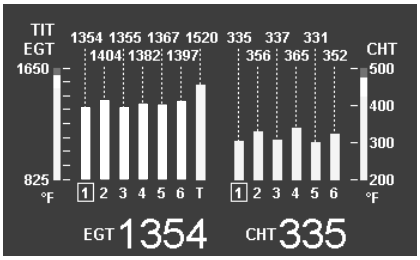


Scanner® Display Basics

The EDM Scanner section is located in the lower left area of the screen. It consists of a graphical display of EGT and CHT (and TIT if so equipped) and a digital display that automatically scans the various parameters. You can select Manual Mode by tapping STEP to lock onto the parameter of interest. To return to Automatic scan mode, tap LF followed by tapping STEP.

Lean Find Basics

Simply pre-lean, then tap the **LF** button (Lean Find) and begin leaning. The EDM will assist you in finding the first cylinder to peak. This example is for Rich of Peak. See page 24 for a more detailed description of leaning.



1. Establish cruise at approximately 65 to 75% power and pre-lean the mixture to 50°F estimated rich of peak EGT on any cylinder.
2. Wait about 30 seconds, then tap the **LF** button.
3. Begin leaning the mixture smoothly *without stopping*. Turn a Vernier about ¼ turn per second; retract a non-Vernier or quadrant lever so that EGT rises about 10°F per second.
4. Stop leaning when you see *LEANEST* for two seconds, followed by—for example— EGT1520 FF13.8. The left number is the current temperature of the first EGT to peak and the right number is the current fuel flow.
5. Now tap the **PEAK** button to display the EGT difference from peak which is very useful for setting desired degrees below peak. *Note: The value for EGT ROP will be a negative value which means you've gone lean of peak by the time you stopped leaning the mixture.*

6. Slowly enrich the mixture noting that the EGT difference diminishes as EGT climbs back to peak, followed by it going positive again. Stop enriching at the desired EGT difference (such as 'EGT *75*'). *Note: Please refer to the engine manufacturer's operating guide for the correct value for EGT difference rich of peak operation at 75% and 65%*
7. You can also see what the peak EGT was by holding the **PEAK** button.
8. Tap **STEP** to exit the Lean Find Mode.

Section 2 - Interpreting Data

Operation for each Phase of Flight

(worth adding to your run-up checklist)

Engine Run-Up

Suggested setup:
- Set engine to run-up RPM

Normalize view:
- Manual mode

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

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

Take-Off, Climb, and Full Throttle Operations

Suggested setup:

- Standard view
- Automatic mode

Verify:

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

Be alert for:

- high EGT in one cylinder, 300°F above the others may indicate plugged injector or leaking manifold gasket on a carbureted engine. At high density altitude an overly rich mixture can significantly reduce engine power.
- If all EGT columns go off scale to the top of the column, be sure you are not in Normalize view, as indicated by the symbol NRM above the Scanner® section.

Cruise

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

Suggested setup:

- Normalize view
- Automatic mode

Be alert for:

- uneven EGTs (injected engines). Make fine adjustments to throttle, then RPM, then mixture to level the display columns.
- abnormal patterns of EGTs and CHT. (see *Engine Diagnosis Chart* on page 11).

Descent

Suggested setup:

- Standard view
- Manual mode

Be alert for:

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

Typical Normal Measurements

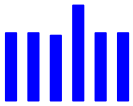
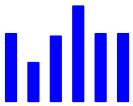
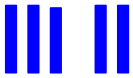
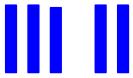
The following chart lists typical *normal* measurement values that you will observe for most general aircraft engines. Your particular engine's ranges may not fall within these values.

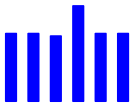
Measurement	*Normal range*	*Comments*
EGTs in Cruise	1350°F 1550°F	• under 200 HP engines • high performance engines • (EGT should drop 200°F when full throttle is applied)
EGT span (DIF)	70 to 90°F 120 to 150°F	• fuel injected engines • carbureted engines
TIT	1600°F average	• 100° higher than EGT
CHTs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

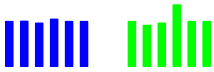
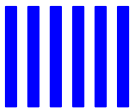
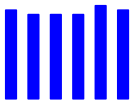
* Maintain a cooling rate magnitude of less than -50°/minute. You will find that the cylinder with the greatest shock cooling may shift from front cylinders (during climb out) to the rear cylinders (during descent).

Engine Diagnosis Chart

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

Display	*Symptom*	*Probable Cause*	*Recommended Action*
	TIT ~100° higher than EGTs	This is normal	
	75° to 100° EGT rise for one cylinder during flight	Spark plug not firing due to fouling, faulty plug, wire or distributor.	Enrich mixture to return EGT to normal. Have plugs checked.
	EGT Increase or decrease after ignition maintenance	Improper timing: high EGT → retarded ignition; low EGT → advanced ignition.	Check EGT for each magneto to determine any uneven timing.
	Loss of EGT for one cylinder. Engine rough	Stuck valve. Other cylinders are okay.	Have valve train checked.
	Loss of EGT for one cylinder; *no digital EGT*	Failed probe or failed wire harness.	Swap probes to determine if probe or wire harness is bad.

	Decrease in EGT for one cylinder	Intake valve not opening fully; faulty valve lifter.	Have valve lifter or rocker arm checked.
	Increase in DIF at low RPM	Low compression (blow by) in cylinder	Check compression.
	EGT and CHT not uniform	Normal for carbureted engines. Dirty fuel injectors or fouled plugs.	Check injectors and plugs.
	Decrease in EGT for all cylinders	Decrease in airflow into the induction system. Carb or induction ice.	Check for change in manifold pressure.

Display	*Symptom*	*Probable Cause*	*Recommended Action*
	Slow rise in EGT. Low CHT	Burned exhaust valve. CHT is low due to low power output.	Have compression checked.
	High CHT on cylinders on one side of engine	Obstruction under cowling.	Check for improper installed baffling, cowl flap misalignment or bird nests.
	Rapid rise in CHT of one cylinder	Detonation.	Reduce power.
	Sudden off scale rise for any or all cylinders	Pre-ignition Normalize view or failed probe	Full rich and reduce power. Change to Standard view Check probe
(no picture)	Loss of peak EGT	Poor ignition or vapor in fuel injection system.	Have magneto tested.
(no picture)	Decrease in peak or flat EGT response to leaning process	Detonation. Usually the result of 80 Octane fuel in 100 Octane engine.	Enrich mixture, reduce power and 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 boost pump. If EGTs drop, replace fuel pump.

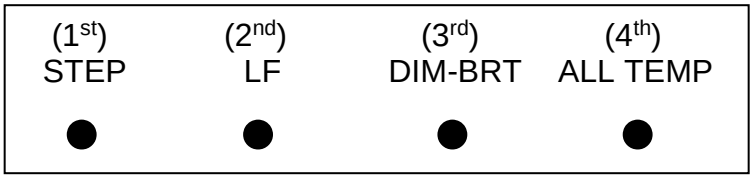
	CHT more than 500°, EGT normal. Adjacent EGT may be low	Leaking exhaust gasket blowing on CHT probe.	Look for white powder around cylinder to determine leak area.

Section 3 - Displays and Controls

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

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

Control Buttons



Four operating buttons control all functions of the EDM. These buttons may change labels depending on the current operating mode of the EDM. The term *tap* is used to denote pressing a button momentarily. The term *hold* is used to denote pressing and holding a button for five seconds or longer. Button layout is shown below:

1st Button

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

2nd Button

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

1st and 2nd Buttons

- Holding both the **STEP** and **LF** buttons simultaneously for five seconds will enter the pilot programming mode.
- ~~Just after entering Lean Find Mode (but before any EGT has risen), holding both First and Second buttons for five seconds will toggle between LOP or ROP leaning modes.~~
- Tapping both the **STEP** and **LF** buttons simultaneously in Manual mode toggles to ‘include’ or ‘exclude’ the displayed non-primary measurement from the Automatic mode. Note: Measurements are never excluded from the Manual mode.

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3rd Button

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

2nd and 3rd Buttons

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

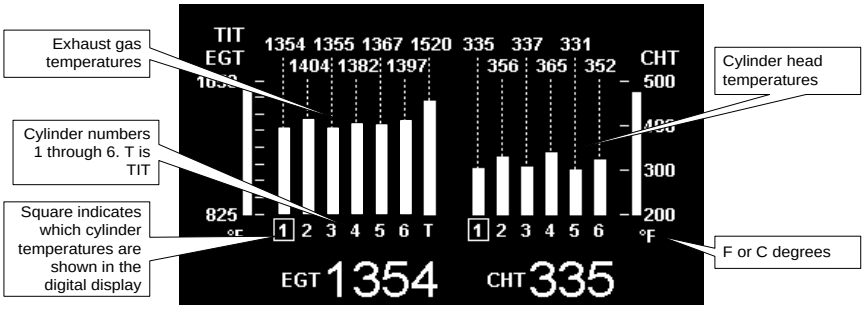
4th Button (ALL, TEMP, FUEL)

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

RPM and MAP Displays

The upper left side of the display shows RPM above the MAP. The arcs represent the analog values. Percent horsepower is shown to the lower left of MAP. Within the FACTORY menu you will be able to swap dial positions for RPM and MAP (see the Quick Reference Guide on page 68).

Scanner Displays



Scanner EGT and CHT Analog Bar Graph

The height of each column represents a EGT or CHT or TIT (if installed) temperature**.** The graph resolution depends on the programmed span between the top and bottom of the range marks. Note: when in certain modes, such as leaning or normalize, the EGT resolution will temporarily be finer.

Cylinder Numbers and Index

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

Scanner Digital Display

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

Normalize / Standard View

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

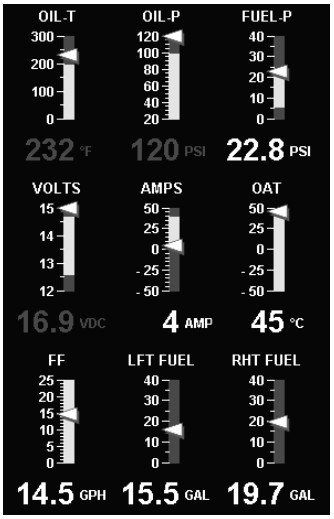
- **Standard view** (when the **NRM** icon is *not* lighted): the EGT represent absolute temperature. The top of the columns indicate absolute temperature relative to the adjacent range mark temperature scale. A maximum height column depicts the temperature at the top of the range mark scale (or more), while no column represents the temperature at bottom of the range mark scale(or less). The *Standard view* permits comparison of EGTs *across all* cylinders.
- **Normalize view** (when the **NRM** icon is lighted): the EGT represent the difference in temperature from the mid-point of the range mark scale. When you change to the Normalize view, all EGT columns are initially normalized to the mid-point for deviation trend analysis. Any changes are shown as an increase or decrease relative to the mid-point, thus giving an instantaneous indication that an EGT has deviated. You normally use normalize in level cruise, but it is also useful during steady state run-ups. Note: A common misapplication is to be in the Normalize view and then change power setting. This causes all columns to go off scale, high or low. Select Standard view before changing power or altitude.

Temperature Units (°F or °C)

The EDM can display engine temps in either **°F** or **°C** (Fahrenheit or Celsius). In Primary configurations where the POH has both **°F** or **°C** the unit can be configured either way.

Linear Bar Graph Displays

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



- Oil temperature
- Oil pressure
- Fuel pressure
- Bus voltage
- Amps (charge/discharge shown)
- OAT
- Fuel flow
- Left tank fuel quantity *
- Right tank fuel quantity *

* The fuel quantity gauges will not be functional until the fuel calibration process has been completed.

The range of the bar graphs depends on the programming. Range, redlines and/or limits are typically set to match the original aircrafts gauge markings. These are locked for Primary installations, however non-primary gauges can be user modified, using 'EDM Config' which is currently available through the front panel buttons. Editing of Gauge Layout requires EDM Software version 1.20.489 or later. Note: Amps can operate either as a charge/discharge or load meter, depending on programming. For charge/discharge, the center of the bar is zero and the top and bottom are maximum charge and discharge, respectively.

Remote Auxiliary Display

See the important note on page 1 regarding the RAD.

The remote auxiliary display '**RAD'** provides redundancy and allows positioning a smaller display directly in front of the pilot. Upon power up the RAD displays the EDM's programmed configuration (aircraft make and model and primary status). Confirm that it matches your aircraft configuration before using the instrument. This auxiliary display will normally show RPM and MAP, but will display a blinking alarm message, duplicating the alarm indication of the EDM. For example, low calculated fuel remaining of 7.7 gallons would show:

Hobbs Display

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

Tach Time is true at 2400 RPM

Tach Time: 317.0

HOBBS: 312.3

Dimming the Display

Automatic dimming is provided to dim both the panel display and the remote alarm display. You can manually adjust brightness by tapping the DIM-BRT button and using DIM to decrease brightness or BRT to increase brightness of the display.

Section 4 - Operating Modes

The EDM has four basic operating modes: *Automatic*, *Manual, Program* and *Lean Find*. Lean Find is described in the next section; Program mode is described on page 449, 'First Time Setup and Customization'. When you first turn on the power the EDM starts in the Manual mode, but will enter the Automatic mode after a few minutes. The Automatic mode provides you with engine monitoring information for the majority of flight conditions. To optimize the mixture, use the Lean Find mode. To display specific parameters, use the Manual mode. In either Automatic or Manual modes, the display always shows the Scanner bar graphs for EGT and CHT for each cylinder and TIT (if so equipped).

Automatic Mode

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

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

Included: 1540 CDT Excluded: 1540 •CDT

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

- Every time you turn on the EDM, all measurements are reset to be *included*.
- *All* installed measurements are always displayed in the Manual mode. Exclusion only applies to the Automatic mode.

Manual Mode

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

Scan Sequence Example

Measurement	*EXAMPLE*	*COMMENTS*
EGT, CHT	EGT 1354 CHT 335	Square indicates the cylinder being viewed
TIT	1370 TIT	Turbine Inlet Temperature # 1
Shock Cooling	-30 CLD	Square indicates fastest cooling cylinder
Compressor Discharge Temperature	300 CDT	Temperature into intercooler
Induction Air Temperature	125 IAT	Temperature out of the intercooler
Carburetor Temperature	-22 CRB	(Not available when CDT is installed)
Difference between hottest and coldest EGT	80 DIF	Square indicates most widely deviating cylinder
Fuel Remaining	Calculated 37.2 REM	In gallons, liters, pounds or kilograms

Fuel required to next GPS WPT or Destination	25.9 REQ	Present with GPS interface, valid signal and way point
Fuel Reserve at next GPS WPT or Destination	Calculated 11.3 RES	Present with GPS interface, valid signal and way point
Nautical Miles per Gal	13.0 MPG	Present with GPS interface and valid signal. MPK, MPL, MPP for dif units
Time to Empty	Calculated 02:45 H:M	Hours: minutes calculated remaining at current fuel burn.
Total Fuel Used	38 USD	Since last refueling or trip total.

Section 5 - Lean Find

The EDM supports two methods of leaning; **ROP** (Rich Of Peak) ~~and **LOP** (Lean Of Peak).~~ Note: on power-up, the unit defaults to Rich Of Peak mode, ~~but is easily changed to Lean Of Peak mode~~. During 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.~~ Both Rich Of Peak and Lean Of Peak processes are described in detail in this manual.

Upon reaching cruise configuration, use the Lean Find mode to identify the correct cylinder to reach peak EGT (for Rich Of Peak this is the FIRST to peak, ~~for Lean Of Peak this is the LAST to peak). To change from one method to the other, right after activating Lean Find, hold **STEP** and **LF** and the other method will be momentarily shown: **ROP** (Rich Of Peak) or **LOP** (Lean Of Peak).~~ Release buttons after the other method appears. Within the FACTORY menu you will be able to default to LOP operation as your lean find mode (see the Quick Reference Guide on page 68).

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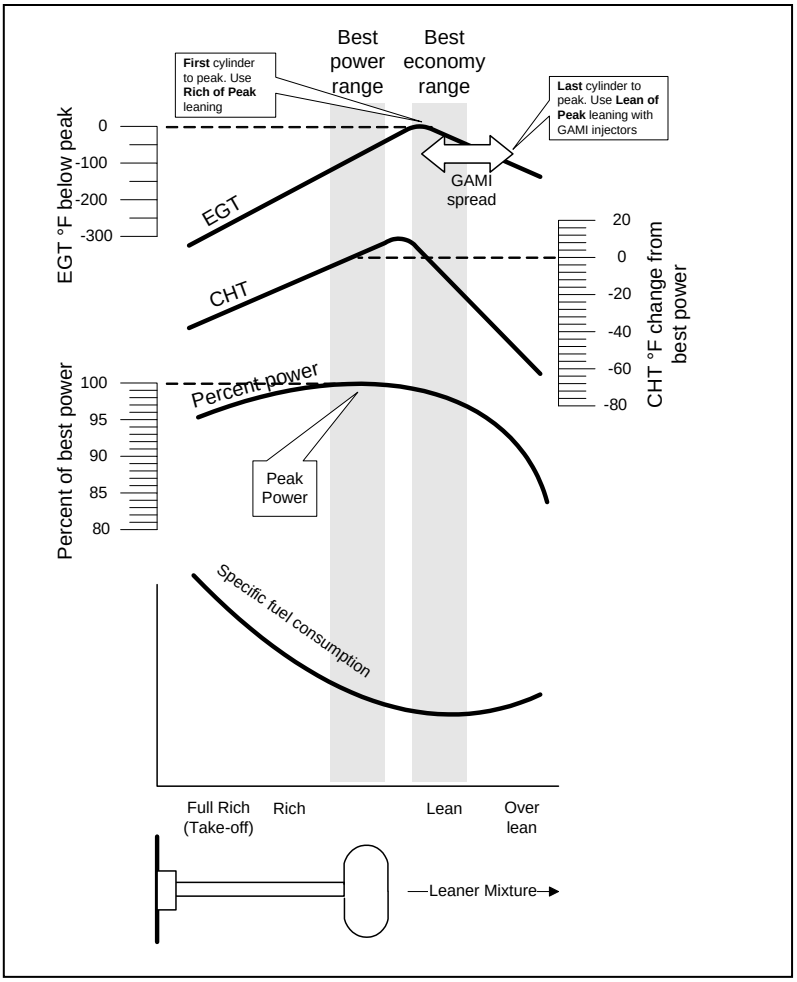
The illustration below shows the various relationships between the mixture, fuel flow and engine power:

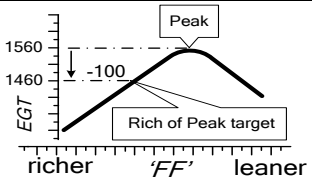


The following pages provide step by step guidelines in leaning your engine, for both rich of peak and lean of peak modes:

Rich of Peak leaning is as simple as:

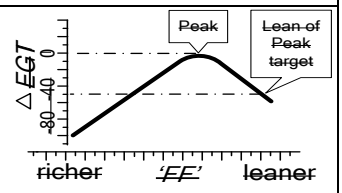
A. Pre-lean your mixture.
B. Tap the LF button (verify *ROP* appears).
C. Lean mixture until *LEANEST* flashes *(*peak found).
D. Enrichen to the desired value 'Rich Of Peak'.

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' page 23.
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	ROP	Start Lean Find (if *LOP* appears hold STEP & LF until *ROP appears*)
5	Lean the mixture at approx. 10°/second *without* pausing.	EGT *1520* FF *13.8*	Flashing cylinder I.D. box identifies that EGT increased at least 15°F. EDM is now looking for first EGT to peak.
6	Stop leaning when a column begins flashing. You will see *LEANEST* for one second, followed by:	EGT *1545* FF *12.4*	Flashing cylinder I.D. box *AND* its column indicates leanest cylinder. Due to thermal inertia this will usually be about -15°F down the lean side of peak.

7	If you hold PEAK, the values of EGT and FF when peak was found are displayed.	EGT ↑*1560* FF *12.9*	Captured peak EGT value and peak FF are displayed.
8	If you tap PEAK, the difference from peak EGT is shown. Tap again to return to the peaked EGT value.	EGTΔ *-90* FF *13.4*	A useful mode for setting mixture the desired degrees rich of peak - no math required! NOTE: Unit remembers view last used.
9	Slowly enrich the mixture noting that EGT is returning to peak. Stop enriching at the desired EGT. 'Peak': best Econ. 'ROP' target: best power.	EGT *1560* FF *12.9* EGT *1460* FF *13.6* (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 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' page 23.
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	LOP	Start Lean Find (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* FF *13.8*	Flashing cylinder I.D. box identifies the hottest EGT and that an EGT has increased at least 15°F which arms the EDM to now look for first EGT to peak.
6	After the first EGT peaks, you will see ***LEANEST*** for one second and bars coming from the top down. Continue leaning.	EGTΔ *-17* FF *12.4*	When bars come from the top down, the cylinder I.D. box identifies the first EGT that peaked (leanest). Continue leaning.
7	When ***RICHEST*** appears, fine tune the delta EGT to the desired degrees below 'Peak' (Lean of peak).	EGTΔ *-45* FF *11.6*	
8	If you hold PEAK, the peak EGT recorded will be displayed along with FF spread.	EGT↑ *1560* FFΔ *0.6*	Captured peak EGT value and the FF spread between richest and leanest cylinders.

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Lean Find Procedure—General Explanation

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

Pre-leaning: The leaning process typically begins with 'pre-leaning' by leaning the mixture until you see the hottest cylinder peak. (note: you can optionally activate 'Normalize' - hold LF until **NRM** appears - making it easier to confirm all EGT's decrease). After finding peak EGT, enrichen the mixture to achieve a 50° drop on the hottest EGT. Ensure that all EGT's decrease. Wait one minute to allow temperatures to stabilize.

Lean Find-Initiation*:* The leaning process typically begins with 'pre-leaning' to insure all cylinders are operating rich of peak EGT. This is accomplished as follows. As you lean the mixture watch the hottest EGT and note when it begins to decrease in temperature. 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. *Note: When the first EGT peaks, you can optionally activate 'Normalize' - hold* **LF** *until NRM appears - making it easier to confirm that all EGT's decrease.*

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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 tap the LF button which should read ROP or LOP depending on which has been set as default.~~ The display will show 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 the Vernier mixture control, turn the knob about a quarter turn every second. With the 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, Lean Find activates (indicated by a cylinder I.D. box flashing over the number of the hottest EGT). **Remember: The Lean Find mode is not active until a cylinder I.D. box is flashing.** To show the progress of the leaning process, the EDM now displays the hottest EGT in the left side of the digital display and the fuel flow in the right side. This information allows you to observe the EGT behavior throughout the leaning process.

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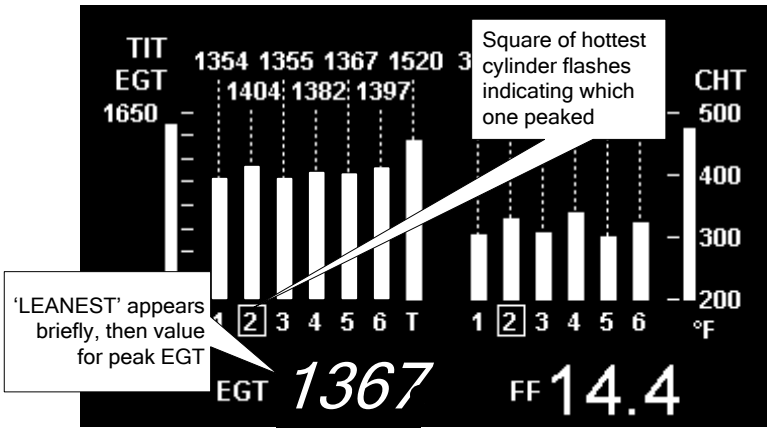
Lean Find-Rich Of Peak Detection: Eventually, one cylinder will reach peak before any of the other cylinders. The EDM will determine this automatically. The EDM will indicate success in finding a peak by displaying the word ***LEANEST*** for two seconds and flashing its corresponding Cylinder I.D. Box. The *Scanner*® Information Area will also display the current value for the peaked EGT on the left, and the fuel flow value on the right, for final adjustment of the mixture. The peak EGT value and FF value encountered during leaning is remembered by the EDM and can be displayed by holding the PEAK button during Lean Find Mode.

Lean Find-Finalizing the Rich Of Peak Mixture: You may now enrich 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 PEAK to see the current difference from the peak temperature. This is handy for finalizing mixture. Tapping EXIT exits the lean find mode and automatic scanning resumes.

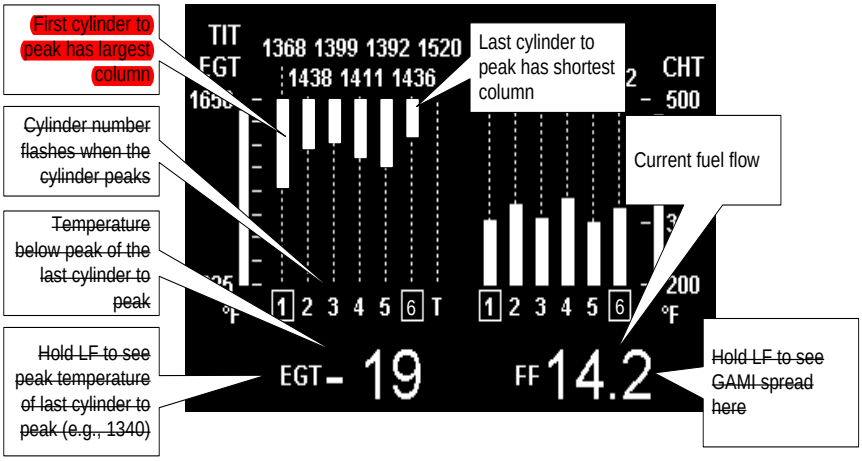
Peak Detected - Rich Of Peak Mode



~~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 PEAK button. Tapping STEP exits the lean find mode and automatic scanning resumes.~~

~~Peak Detected - Lean Of Peak Mode~~



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Expanded Leaning Procedures

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

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

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Section 6 - Fuel Flow Operation

Fuel Management

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

IMPORTANT !

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

Start Up Fuel

On power-up, you will be prompted to enter any fuel you might have added to the aircraft (this process updates the **REM** and **USD** values). The EDM will flash ***REFUEL?*** . If you didn't add any fuel, simply tap EXIT to quit, otherwise tap NEXT to pick one of the three quickset choices below:

Choice 1) *MAIN 66.0 GAL* : Tap SAVE to accept or NEXT for choice #2. This shortcut sets **REM** to the MAIN tank value (66 in this case) you set up in your fuel computer.

~~Choice 2) *MAIN + AUX 82.0 GAL* : Tap SAVE to accept or NEXT for choice #3. This shortcut sets **REM** to the sum of MAIN and AUX you set up in your fuel computer.~~

Choice 3) *Adjust? + 0.0 GAL* : Tap either ADD or REMOVE to adjust **REM**. Use when adding a partial amount of fuel. Tap SAVE to accept adjustment or NEXT to repeat ***REFUEL?***.

NOTE: If you forgot to perform your EDM REFUEL before starting the engine, it can still be performed. The EDM will automatically subtract any burned fuel from the value you choose (not applicable to the 'Adjust? + 0.0' feature)

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

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.

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Example A: **Aircraft has two fuel tanks with internal tabs.**

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

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

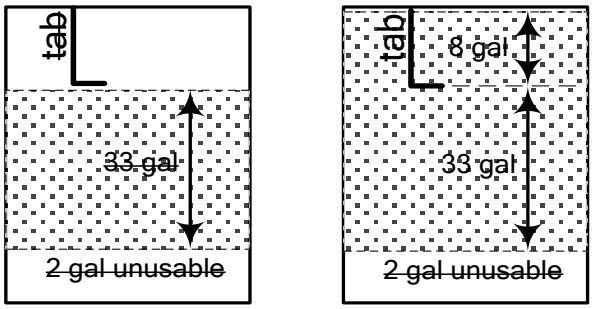
When you refuel:

'MAIN 66.0 GAL': use this shortcut when filling to the internal tank tabs.

'MAIN+AUX 82.0 GAL': use this shortcut when filling to the caps.

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

MAIN 66.0 GAL	***MAIN+AUX 82.0 GAL***
'FILL 66'	*'FILL 82'*



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Example B: Aircraft has two MAIN and two AUX tanks.

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

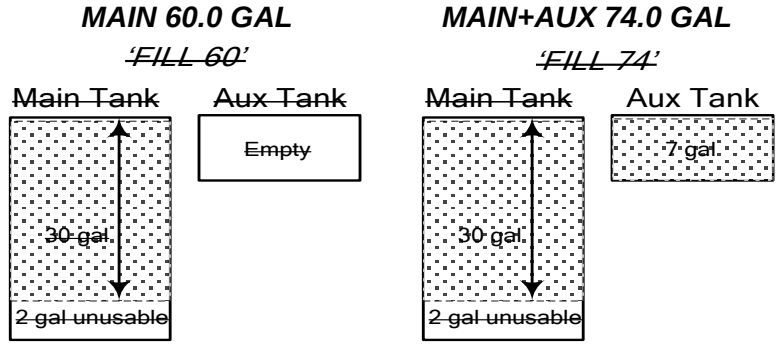
'*AUX = 14*' (7 + 7 usable)

When you refuel:

'MAIN 60 GAL': use this shortcut when filling only MAIN tanks (! AUX tanks must be empty).

'MAIN+AUX 74 GAL': use this shortcut when filling MAIN *and* AUX tanks.

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



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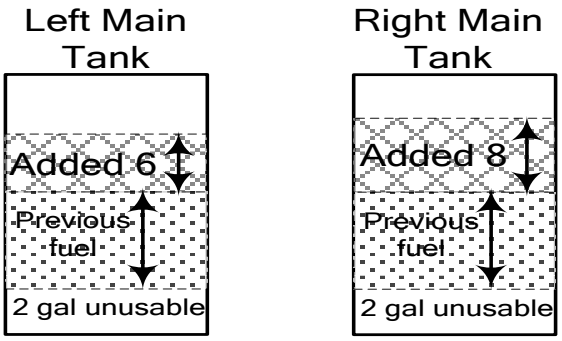
Example C: Aircraft has two MAIN tanks.

When you partially refuel, use:

'Adjust? + 0.0 GAL': use this to add the amount of fuel you pumped into the aircraft (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.

Adiust? + 14.0 GAL
'FILL +'



Resetting 'USD'

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

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

If you forgot and have already started the engine, and then you inform the EDM that tanks have been filled, then some fuel has already been used. Not to worry as the EDM will automatically set ***USD*** to this amount and also subtract it from the ***REM*** value, keeping the two values in balance.

To manually zero the amount of fuel *USD* at any time, manually STEP to display ***USD*** and then hold both DIM (button 3) and ALL TEMP (button 4) until the display shows '***.0 USD***' (this normally takes about five seconds).

Trip Mode (Accumulate Trip Totalizer)

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

Scanner Fuel Flow Display Select

Button four selects three different Scanner filters - ALL, TEMP or FUEL. Tapping this button will select the next choice shown.

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

Note: Scanner filter or mode selection does not affect Alarms or analog displays.

Section 7 - Alarms

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

2780 HI RPM, *15 LO OIL-PSI*, *240 HI OIL-TEMP*.

Tapping the CLEAR button extinguishes the alert for ten minutes whereas holding the CLEAR button turns the alarm off for the remainder of the flight.

Primary alarm *limits* for each specific aircraft model are set by JPI in accordance with the Pilot Operating Handbook and/or TCDS and are not programmable by the pilot. These typically include some or all of the following measurements**:** CHT, CDT, O-T, O-P, F-P, GAL LEFT, GAL RIGHT, MAP, RPM, FF, IAT, CRB, and TIT. To view the alarm limits screen, hold button 2 during power up (or hold both buttons 2 & 3 during normal operation), tap NEXT until the list is displayed.

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

Non-primary Alarm Priority

Primary alarms will always have precedence over non-primary alarms. The typical non-primary alarm priorities are as follows:

Highest .....Lowest

MIN → REM → DIF → CLD → BUS H → BUS L → AMP