Fuel Flow / Pressure

(FP–5 and FP–5L)

Operating Instructions

OI 0505931

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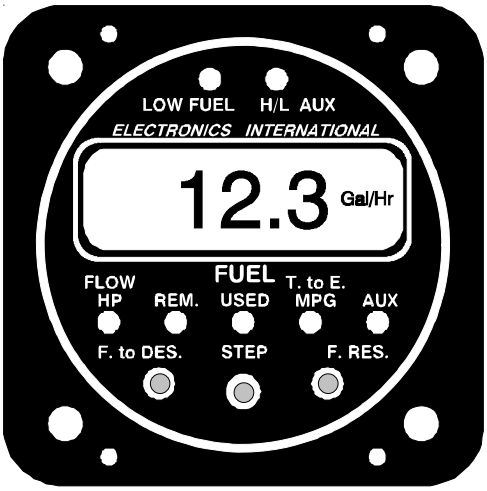
Rev. H: 2/17/05

You must read this manual before installing or operating the instrument. This manual contains warranty and other information that may affect your decision to install this product and/or the safety of your aircraft.



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FP-5 and FP-5L

Important Notice

********** Must Read **********

If you think it is not important to read this manual, you're wrong! This manual contains important information that may affect the safety of your aircraft.

Read the Warranty / Agreement. There is information in the Warranty / Agreement that may alter your decision to install this product. If you do not accept the terms of the Warranty / Agreement, do not install this product. This product may be returned for a refund. Contact Electronics International inc. for details.

The fuel remaining displayed by the FP-5 is not a measurement of the fuel in the tanks. It is an amount calculated from the starting fuel level you programmed into the FP-5, minus the fuel used while the engine was running. When properly calibrated, the FP-5 can accurately measure the fuel used. **It is imperative the pilot verify the calibration of the FP-5 over many tanks of fuel before using the "REM" and/or "USED" Modes as an indication of the fuel in the tanks or fuel used. Even after verifying the calibration of the FP-5 it should never be used as the primary indicator of fuel quantity in the tanks. It is important the pilot visually check/measure the fuel quantity for each tank before takeoff and cross-check these readings against the Fuel Level Gauges and the FP-5.** The FP-5 reminds you to do this by blinking the "REM" LED and displaying the current fuel remaining in the tanks each time the aircraft power is turned on. **Also, it is important the pilot use preflight and flight planning techniques, in accordance with the FAR's, which will help insure the proper amount of fuel for the intended flight is on board the aircraft before takeoff.**

While in flight the FP-5 readings should only be used to crosscheck fuel level gauges, calculations of the fuel onboard from flow rates specified in the specification for your aircraft and calculations of the fuel onboard from flow rates that you measured from previous flights. The use of the FP-5 does not eliminate or reduce the necessity for the pilot to use good flight planning, preflight and in-flight techniques for managing fuel. If you are not familiar with these techniques, contact the FAA to acquire proper training.

Before leaning your engine you must verify your horsepower is correct with engine operation charts from the engine and/or aircraft manufacturer to insure you do not cause detonation and engine damage.

It is possible for any instrument to fail thereby displaying inaccurate high, low or jumpy readings. Therefore, you must be able to recognize an instrument failure and you must be proficient in operating your aircraft safely in spite of an instrument failure. If you do not have this knowledge, contact the FAA or a local flight instructor for training. Also, the ability for this product to detect a problem is directly related to the pilots ability to program proper limits and the pilots interpretation and observation skills.

The pilot must understand the operation of this product before flying the aircraft. Do not allow anyone to operate the aircraft that does not know the operation of this product. A copy of this manual must be kept in the aircraft at all times.

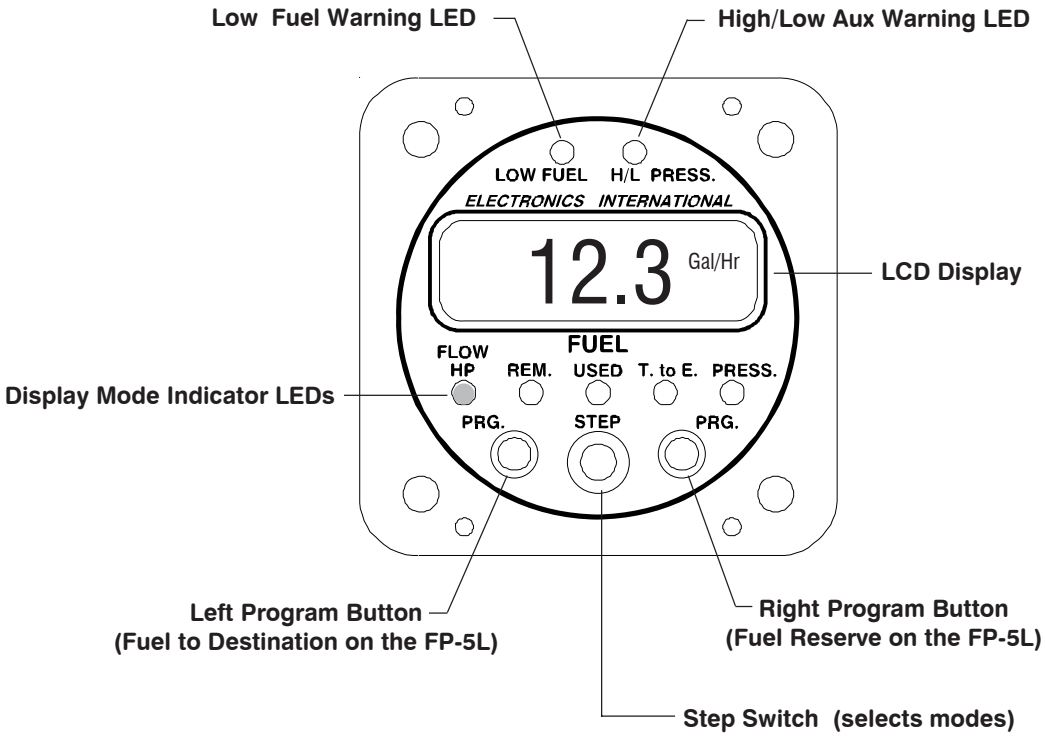
FP-5 and FP-5L
Operating Instructions

System Description:

The FP-5 and FP-5L are models of a fuel flow computer instrument packaged in a 2.5" by 2.5" by 3.65" depth case. Each of the instruments connects to a fuel flow transducer which is mounted in the engine cowling area. A single "AUX" (auxiliary) Channel is optional and may be used to monitor one of the following functions: EGT (provides compensation for Horsepower when leaning), CHT, Oil Temp, OAT, Carb. Temp, Fuel Pressure, Oil Pressure, Manifold Pressure, Gyro Vac, Bus Voltage or Amps. Each function requires a Functional Module (3" x 2" x 1" box) that comes with the appropriate transducers and cables. More than one function may be monitored using a remote switch.

The fuel flow transducer is mounted in the fuel line going to the carburetor (or flow divider on an injected engine). If the rotor in the flow transducer becomes blocked, it will not reduce the flow of fuel to the engine. The FP-5(L) instrument connects to the transducers via a wire harness. The instrument and transducers employ connectors so they may be removed safely and quickly from the aircraft.

The FP-5 and FP-5L each have seven display modes: Fuel Flow, Horsepower, Fuel Remaining, Fuel Used Since Fill Up, Fuel Used for the Flight, Time to Empty, and AUX Channel. The FP-5L has all the features of the FP-5, with four additional display modes: Nautical Miles per Gal, Statute Miles per Gal, Fuel to Destination and Fuel Reserve.



In addition to these seven display modes both units have the following pilot programmable settings (used to set up the display and alarms): Display in Gallons, British (Imperial) Gallons, Pounds or Liters; Fuel Remaining; Auto Calibrate the K Factor; two Low Fuel Alarms; Time to Empty Alarm; Reoccurring Fuel Used Alarm; High and Low AUX Alarm. Also, both units have Power-Up Programmable Settings that are used to configure the instrument for your personal preferences, aircraft and engine. Although the FP-5 and FP-5L are simple to operate, the pilot programmable settings make them very effective and sophisticated fuel management systems.

Note: After the FP-5(L) has been installed in an aircraft it should be programmed initially as described in the "Power-Up Programming" section of this Manual.

Displays , Warning LEDs and Alarms:

1. Digital LCD Display and LED Display Mode Indicators:

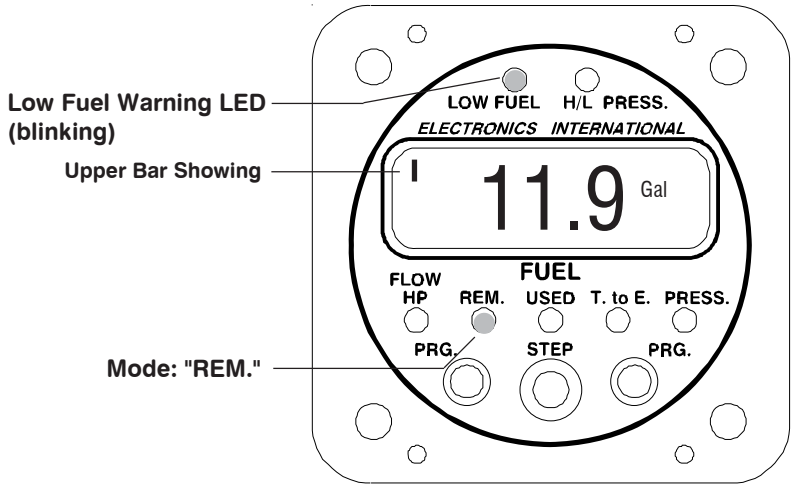
If the digital LCD display backlight has been permanently powered up (as recommended), the display will be easier to see during low ambient light conditions and at night. In direct sunlight the digital LCD display is easy to see.

During night operation the green LED Display Mode Indicators may be too bright. If the LED Dimming Line on the FP-5(L) is connected to your panel light rheostat, turning the rheostat up will dim the LEDs. If the LED Dimming Line is connected to E.I.'s CP-1 (LED Intensity Control Pot), the Pot will control the LED intensity, independent of other instrument lights. The two red Warning LEDs will always be displayed at full intensity.

2. Low Fuel Warning LED:

There are four pilot-programmable alarms that will blink the red Low Fuel Warning LED when violated. The following describes how each alarm affects the Low Fuel Warning LED:

A. First Low Fuel Alarm: This alarm should be set as a reminder (example: 1/3 tank level). When the Alarm Limit is violated the red Low Fuel Warning LED will start to blink. Pushing any button or switch will stop the blinking and turn off the Warning LED. Also, a bar in the upper left corner of the display will be shown when displaying “REM”.



Note: In this example, the First Low Fuel Limit was set to 12.0 Gallons. The blinking Low Fuel Warning LED indicates that the limit was violated.

B. Second Low Fuel Alarm: This alarm should be set as a warning (example: 5 gallons). When the Alarm Limit is violated the red Low Fuel Warning LED will start to blink. Pushing any button or switch will stop the blinking and the LED will go solid red. Also, a bar in the lower left corner of the display will be shown when displaying “REM”.

C. Time to Empty Alarm: This alarm may be set for a time to empty value (example: 1 hour). When the fuel flow and fuel remaining results in less than one hour of fuel on board (as per example) the Alarm Limit is violated and the red Low Fuel Warning LED will start to blink. Pushing any button or switch will stop the blinking and turn off the Warning LED. Also, a bar in the upper left corner of the display will be shown when displaying "T.toE."

D. Reoccurring Fuel Used Alarm: This alarm may be set for a fuel used value (example: 10 Gal). If the alarm was activated with 40 gallons of fuel remaining, there will be an alarm at 30, 20 and 10 gallons of fuel remaining in the tank. This feature reminds you to switch tanks for balancing the wings (based on weight, not time) or it may be used to remind you to check your fuel levels at set intervals. When the Alarm Limit is violated the red Low Fuel Warning LED will start to blink. Pushing any button or switch will stop the blinking and turn off the Warning LED.

Note: See the "Pilot Programmable Modes" section of this manual to set the alarms.

3. H/L AUX Warning LED:

There are pilot programmable High and Low Alarm Limits that will blink the red "H/L AUX Warning LED when violated. Pushing any button or switch will cause the LED to stop blinking and become solid red. If the High Limit is violated, a bar in the upper left corner of the display will be shown when displaying “AUX” If the Low Limit is violated, a bar in the lower left corner of the display will be shown when displaying “AUX” See the "Pilot Programmable Modes" section of this manual to set the alarm limits.

4. Power-Up:

When the aircraft master switch is turned on, the FP-5(L) will perform a self-diagnostics test and flash the red warning LEDs. This allows you to check the Warning LEDs for proper operation.

After power-up, the FP-5(L) will blink the "REM" (Fuel Remaining) LED, and display the fuel remaining in the tank(s). The “REM” LED will continue to blink until any button or switch is pushed. The blinking “REM” LED is intended as a reminder to update the FP-5(L) if you’ve added fuel to the aircraft since your last flight (see “REM” Display Mode).

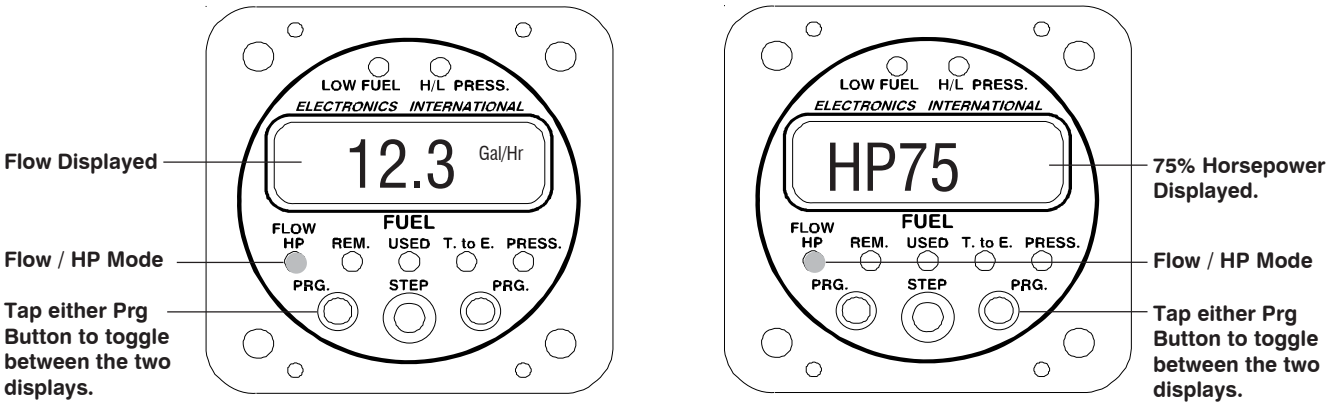
Display Modes and Operating Features:

The following chart is an overview of the Display Modes and Pilot Programmable Settings available.

	Display Mode *(indicated by a green LED)*				
	FLOW HP	**REM**	**USED**	**T. to E. MPG**	**AUX**
Main Display *(select with "STEP" Switch)*	Fuel Flow (17.3 gal/Hr)	Fuel Remaining (23.7 gal)	Fuel Used since Fill Up (16.3 gal)	Time to Empty (1:22)	Displays one of many functions.
Alternate Display *(tap either "PRG" button)*	% Horsepower (HP75)		Fuel Used for the Flight (F 7.2 gal)	**(FP-5L only)** Nautical Miles per Gallon (n 9.3)	
				(FP-5L only) Statute Miles per Gallon (10.7)	
Pilot Programmable Settings *(push both "PRG" buttons)*	Set FP-5(L) to Display in Gal, Br Gal, Lbs or Ltrs.	Add Fuel	Set the First Low Fuel Alarm	Set the Time to Empty Alarm	Set the High Aux Alarm
		Auto Calibrate the K Factor	Set the Second Low Fuel Alarm	Set the Reoccurring Fuel Used Alarm	Set the Low Aux Alarm

1. "FLOW / HP" Display Modes:

By pushing the mode select switch to the right or left, you can select the various display modes. When in the "Flow / HP" mode, tapping either "PRG" button will cause the display to toggle between displaying Fuel Flow and percentage of Horsepower. When displaying Horsepower, "HP" will be shown at the left of the display.



When displaying **Fuel Flow**, the FP-5(L) will operate as follows:

A. When set to display in Gallons the display will read in .1 Gal/Hr increments up to 199.9 Gal/Hr.

B. When set to display in Imperial Gallons the display will read in .1 Gal/Hr increments up to 162.0 Gal/Hr.

C. When set to display in Pounds the display will read in 1 Lb/Hr increments up to 1199 Lbs/Hr.

D. When set to display in Liters the display will read in 1 Ltr/Hr increments up to 749 Ltrs/Hr.

Special algorithms in the microprocessor are used to insure a quick response and a stable display. Also, there are two programmable filter settings that will affect the stability and response of the fuel flow readings (see the "Power-up Programmable Settings" section of this manual).

The accuracy of the displayed fuel flow is affected by the value of the K Factor. The K Factor sets the calibration of the instrument to match the flow transducer and the variations in the installation. The K Factor may be changed by entering the "Power-up Programming Mode" or it can be changed automatically by entering the "Auto Calibration Mode."

What is a K Factor:

Each flow transducer outputs a different number of electical pulses for each gallon of fuel that flows through it. This value is called the K Factor. The FT-60 has a K Factor of approximately 68,000 pulses per gallon. The installation and the type of engine (carbureted or injected) can affect the K Factor.

When displaying **% Horsepower**, the FP-5(L) will operate as follows:

A. Horsepower is calculated from fuel specifics (as is done on engine dyno's) which takes into account manifold pressure, RPM, altitude and OAT. Almost all spark ignition combustion engines have a fuel specific of approximately .10 gallons per H.P. per hour at full rich mixture. The "Power-Up Programming Mode" allows you to calibrate the FP-5(L) to match your engine at a full rich mixture.

B. If the AUX Channel is used to monitor an EGT, the FP-5(L) will compensate the displayed horsepower as your lean your engine. Otherwise, as you lean for max power (100° to 150°F rich of peak EGT) you may see a 5% to 8% *drop* in the displayed horsepower when you should see an approximately 3% *increase* in horsepower. Therefore, only display "HP" when your engine is running at full rich mixture settings.

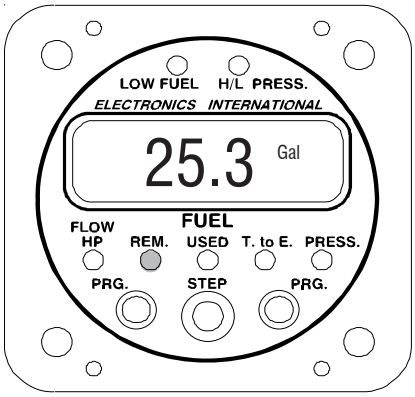
With EGT compensation on the AUX Channel, the FP-5(L) can be calibrated to your engine when leaned (see the "Power-Up Programmable Settings" section in this manual).

C. The FP-5(L) was designed to display in % Horsepower (1% resolution). It is possible to calibrate the FP-5(L) to display in raw horsepower. See the "Power-Up Programming Mode."

Warning: You should never lean your engine with power settings over the factory recommended level (generally 65% to 75% power). Leaning with high power settings can cause detonation. Always verify your power level with engine charts before leaning. As you lean past maximum horsepower (100°F to 150°F rich of peak EGT) your engine will lose power and the FP-5(L) will show this.

2. "REM" (Remaining) Display Mode:

In the "REM" (Fuel Remaining) Display Mode, the FP-5(L) will display the fuel in the aircraft tanks as follows:



A. When set to display in Gallons the display will read in .1 Gal increments up to 99.9 Gals. and 1 Gal increments from 100 to 999 Gals.

B. When set to display in Imperial Gallons the display will read in .1 Gal increments up to 99.9 Gals. and 1 Gal increments from 100 to 811 Gals.

C. When set to display in Pounds the display will read in 1 Lb increments up to 1999 Lbs.

D. When set to display in Liters the display will read in 1 Ltr increments up to 1999 Ltrs.

If the First Low Fuel Limit has been violated, a bar in the upper left corner of the display will be shown when this mode is selected. If the Second Low Fuel Limit has been violated, a bar in the lower left corner of the display will be shown when this mode is selected. See the "Pilot Programmable Settings" section of this manual to set the two Low Fuel Limits.

Warning: **<u>The fuel remaining displayed by the FP-5(L) is not a measurement of the fuel in the tanks.</u>** It is an amount calculated from the starting fuel level you programmed into the FP-5, minus the fuel used while the engine was running. When properly calibrated, the FP-5(L) can accurately measure the fuel used. **It is imperative the pilot verify the calibration of the FP-5(L) over many tanks of fuel before using the "REM" and/or "USED" Modes as an indication of the fuel in the tanks or fuel used. Even after verifying the calibration of the FP-5(L) it should never be used as the primary indicator of fuel quantity in the tanks. It is important the pilot visually check/measure the fuel quantity for each tank before takeoff and cross-check these readings against the fuel level gauges and the FP-5.** The FP-5(L) reminds you to do this by blinking the "REM" LED and displaying the current fuel remaining in the tanks each time the aircraft power is turned on. **Also, it is important the pilot use preflight and flight planning techniques, in accordance with the FARs, which will help insure the proper amount of fuel is on board the aircraft before takeoff.**

While in flight the FP-5(L) readings should only be used to cross-check the fuel level gauges, calculations of the fuel on board from flow rates specified in the specification for your aircraft and calculations of the fuel on board from flow rates that you measured from previous flights. The use of the FP-5(L) does not eliminate or reduce the necessity for the pilot to use good flight planning, preflight and in-flight techniques for managing fuel. If you are not familiar with these techniques, contact the FAA to acquire proper training.

3. Auto Calibrate Mode:

If you find the FP-5(L) is not displaying the Fuel Remaining in the tank(s) or Fuel Used Since Fill Up accurately, you can enter the "Auto Calibrate Mode" and have the FP-5(L) automatically calibrate the K Factor. This should be done when you have used more than 1/2 tank of fuel and you have just filled the tank(s) with fuel.