Primary Fuel Flow/Pressure

FP-5L

Operating Instructions

OI 0505931

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.

S/N:_____

Electronics International Inc.

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1. 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-5L 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-5L, minus the fuel used while the engine was running. When properly calibrated, the FP-5L can accurately measure the fuel used. **It is imperative the pilot verify the calibration of the FP-5L 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-5L 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-5L.** The FP-5L 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-5L 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-5L 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 pilot's ability to program proper limits and the pilot's 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.

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2. Warranty / Agreement

Electronics International Inc. (E.I. Inc.) warrants this instrument and system components to be free from defects in materials and workmanship for a period of one year from the user invoice date. **Fuel Flow and Pressure Transducers are NOT covered under this warranty.** They are covered by the original equipment manufacturer. Electronics International Inc. will repair or replace any item, at its sole discretion, covered under the terms of this Warranty provided the item is returned to the factory prepaid for shipping costs.

1. This Warranty shall not apply to any product that has been repaired or altered by any person other than Electronics International Inc., or that has been subjected to misuse, accident, incorrect wiring, negligence, improper or unprofessional assembly or improper installation by any person. **This warranty does not cover any reimbursement for any person's time for installation, removal, assembly or repair.** Electronics International retains the right to determine the reason or cause for warranty repair.

2. This Warranty does not extend to any machine, vehicle, boat, aircraft or any other device to which the Electronics International Inc. product may be connected, attached, interconnected or used in conjunction with in any way.

3. The obligation assumed by Electronics International Inc. under this Warranty is limited to repair, replacement or refund of the product, at the sole discretion of Electronics International Inc.

4. Electronics International Inc. is not liable for expenses incurred by the customer or installer due to factory updates, modifications, improvements, upgrades, changes, or any other alterations to the product that may affect the form, fit, function or operation of the product.

5. Personal injury or property damage due to misinterpretation or lack of understanding of this product is solely the pilot's responsibility. 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. Keep the Operating Manual in the aircraft at all times.

6. E. I. Inc. is not responsible for shipping charges or damages incurred under this Warranty.

7. No representative is authorized to assume any other liability for Electronics International Inc. in connection with the sale of Electronics International Inc. products.

8. If you do not agree to and accept the terms of this Warranty, you may return the product for a refund.

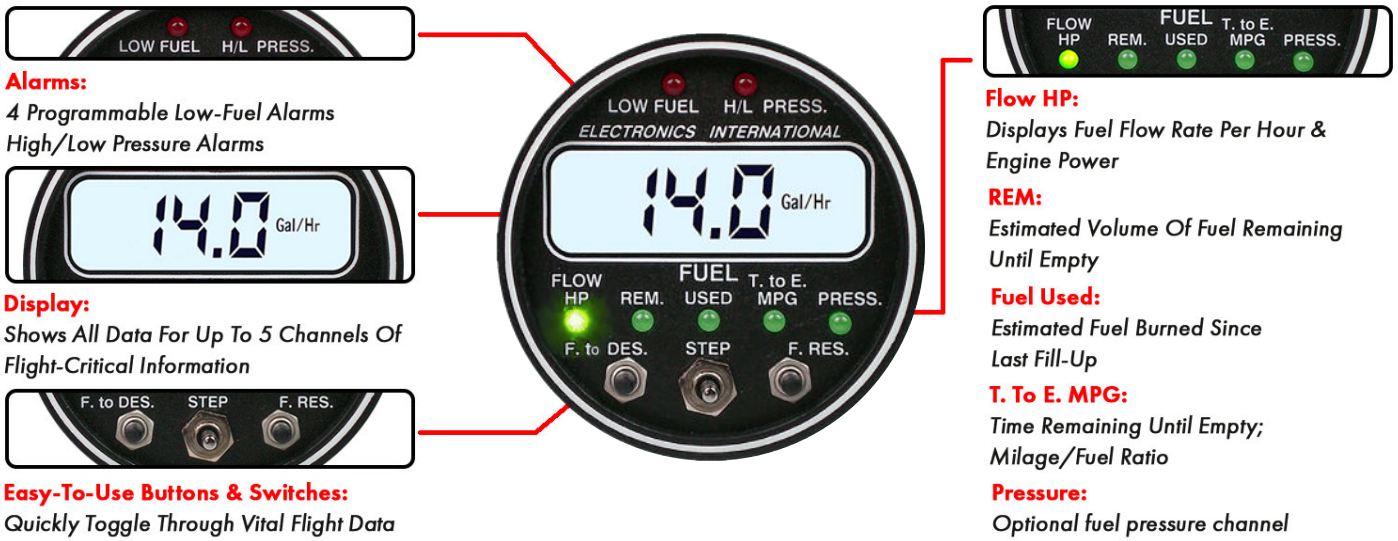
This Warranty is made only to the original user. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS: EXPRESS OR IMPLIED. MANUFACTURER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. PURCHASER AGREES THAT IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS OR LOSS OF USE OR OTHER ECONOMIC LOSS. EXCEPT AS EXPRESSLY PROVIDED HEREIN, MANUFACTURER DISCLAIMS ALL OTHER LIABILITY TO PURCHASER OR ANY OTHER PERSON IN CONNECTION WITH THE USE OR PERFORMANCE OF MANUFACTURER'S PRODUCTS, INCLUDING SPECIFICALLY LIABILITY IN TORT.**

3. System Description

The FP-5L is a fuel flow computer instrument packaged in a 2.5” by 2.5” by 2.7” depth case. The instrument connects to a fuel flow transducer which is mounted in the engine cowling area. A single “PRESS” Channel is optional and may be used to monitor Fuel Pressure.

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-5L 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-5L has eleven display modes: Fuel Flow, Horsepower, Fuel Remaining, Fuel Used Since Fill-Up, Fuel Used for the Flight, Time-to-Empty, Press Channel, Nautical Miles per Gal, Statute Miles per Galllon, Fuel-to-Destination and Fuel Reserve.



In addition to these eleven display modes the FP-5L has 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 Pressure (i.e. PRESS.) Alarm. Also, the FP-5L has Power-Up Programmable Settings that are used to configure the instrument for your personal preferences, aircraft and engine. Although the FP-5L is simple to operate, the pilot-programmable settings makes it a very effective and sophisticated fuel management system.

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

4. Displays, Warning LEDs and Alarms

4.1 Digital LCD Display and LED Display Mode Indicators:

If the digital LCD display backlight has been wired to be on when the instrument is powered on (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 also easy to see.

During night operation the green LED Display Mode Indicators may be too bright. If the LED Dimming Line on the FP-5L 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.

4.2 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. to E."

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.

4.3 H/L Pressue Warning LED:

There are pilot programmable High and Low Alarm Limits that will blink the red H/L Pressure 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 “PRESS.” If the Low Limit is violated, a bar in the lower left corner of the display will be shown when displaying “PRESS.” See the “Pilot Programmable Modes” section of this manual to set the alarm limits.

4.4 Power Up:

When the aircraft master switch is turned on, the FP-5L 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-5L 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-5L if you’ve added fuel to the aircraft since your last flight (see “REM” Display Mode).

5. Display Modes and Operating Features

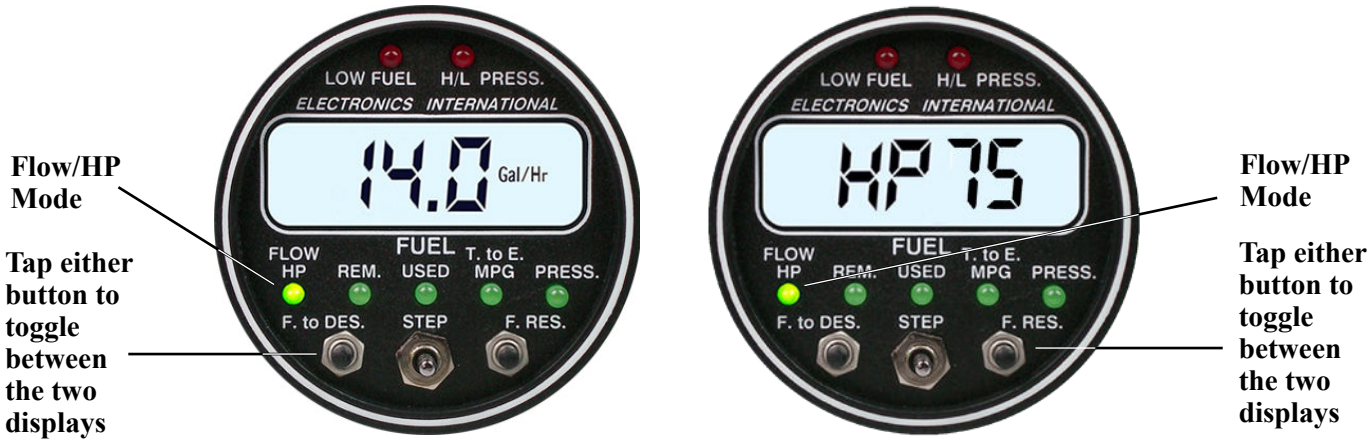
The following chart is an overview of the Display Modes and Pilot Programmable Settings available

	Display Modes (indicated by a green LED)				
	FLOW HP	**REM**	**USED**	**T. to E. MPG**	**PRESS.**
Main Display (select with "STEP" Switch)	Fuel Flow (17.3 gal)	Fuel Remaining (23.7 gal)	Fuel Used since Fill Up (16.3 gal)	Time-to-Empty (1:22)	Fuel Pressure
Alternate Display (tap either "PRG" button)	% Horsepower (HP75)		Fuel Used for the Flight (F 7.2 gal)	Nautical Miles per Gallon (n 9.3)	
				Statute Miles per Gallon (10.7)	
Pilot Programmable Settings (push both "PRG" buttons)	Set FP-5L to Display in: Gal, Br Gal, Lbs or Ltrs	Add Fuel	Set the First Low Fuel Alarm (High Bar)	Set the Time to Empty Alarm (High Bar)	Set the High Pressure Alarm* (High Bar)
		Auto Calibrate the K Factor	Set the Second Low Fuel Alarm (Low Bar)	Set the Reoccurring Fuel Used Alarm (Low Bar)	Set the Low Pressure Alarm* (Low Bar)
	The below data can be viewed at anytime & override any of the above display modes.				
Additional Display Modes (Press & Hold the "F. to DES." & "F. RES." buttons to view respective data)	**F. to DES.**: Computes fuel needed to destination (next waypoint) for current conditions.				
	F. RES.: Computes fuel you will have in your tank once you reach your destination (next waypoint) for current conditions.				

***NOTE:** If your FP-5L is certified as a primary replacement instrument for fuel pressure, the pressure alarm limits cannot be changed, as they have been set at the factory. However, if you are using a non-primary FP-5L, you have the flexibility to customize these limits.

5.1 "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 the "F. to DES." or "F. RES." 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-5L 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. If the fuel flow exceeds 199.9 Gal/Hr, the display will switch and read in 1 Gal/Hr increments to 1999 Gal/Hr.

B. When set to display in Imperial Gallons the display will read in .1 Gal/Hr increments up to 199.9 Gal/Hr. If the fuel flow exceeds 199.9 Gal/Hr, the display will switch and read in 1 Gal/Hr increments to 1660 Gal/Hr.

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

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

What is K Factor

Each flow transducer outputs a different number of electrical 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.

Special algorithms in the microprocessor are used to ensure 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."

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

A. Horsepower is calculated from fuel specifics (as is done on engine dynos) 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-5L to match your engine at a full rich mixture.

B. The FP-5L was designed to display in % Horsepower (1% resolution). It is possible to calibrate the FP-5L 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.

5.2 "REM" (Remaining) Display Mode:

In the "REM" (Fuel Remaining) Display Mode, the FP-5L 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 199.9 Gals. and 1 Gal increments from 200 to 1999 Gals.

B. When set to display in Imperial Gallons the display will read in .1 Gal increments up to 199.9 Gals. and 1 Gal increments from 200 to 1999 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: The fuel remaining displayed by the FP-5L 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-5L, minus the fuel used while the engine was running. When properly calibrated, the FP-5L can accurately measure the fuel used. **It is imperative that the pilot verify the calibration of the FP-5L 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-5L 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 crosscheck these readings against the fuel level gauges and the FP-5L.** The FP-5L 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 ensure the proper amount of fuel is on board the aircraft before takeoff.**

While in flight the FP-5L readings should only be used to crosscheck 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-5L 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.

5.3 Auto Calibrate Mode:

If you find the FP-5L 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-5L 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.

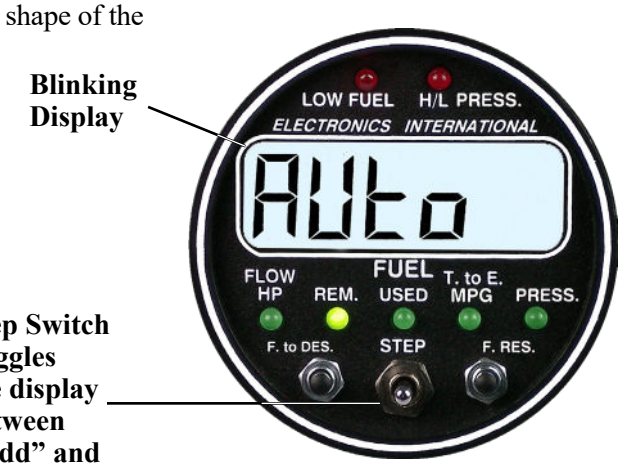
Examples:

* You start your flight with full tank(s) and go fly.
* You land and pull up to the pumps, taking on 30.0 gallons of fuel.
* The FP-5L indicates you used 26.9 gallons since fill up, indicating a 3.1 gallon error.
* You enter the "Auto Calibrate Mode" (see below) & change display from 26.9 to 30.0 (pump reading).
* When you exit the "Auto Calibrate Mode" the New K Factor is displayed for 3 seconds.

Note: If you want the FP-5L to automatically calibrate the K Factor, you must enter the "Auto Calibrate Mode" before entering the "Add Fuel Mode." When you exit the "Add Fuel Mode" the "Fuel Used Since Fill Up" will be cleared and the FP-5L will not be able to calculate the new K Factor.

Note: When calibrating the K Factor it is important to fill the tank(s) to the same level each time (which is not always easy). Some variables are: 1. How level the wings are during refueling. 2. The affects of any crossover tubes. 3. The ability of the line attendant to fill the tank to the same mark. 4. The shape of the tank and the dihedral of the wings.

Normally you will only need to calibrate the K Factor during the first three or four tanks of fuel after the initial installation. The FP-5L uses a progressive algorithm to calibrate the K Factor and to keep the instrument from hunting for the correct K Factor. To enter the "Auto Calibrate Mode", perform the following steps:



A. Select the "REM" display mode.

B. Momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The display will blink "Add."

C. While pushing and holding the "F. to DES" button, push the "STEP" Switch right or left to display "Auto."

D. Tap either one of the buttons and the FP-5L will display the "Fuel Used Since Fill Up" according to its current calibration. The blinking left digit indicates that you may program this digit.

E. Program the display to show the fuel you actually used as indicated by the fuel pump as follows:

a) Select a Digit: The Right and Left "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Advance the Digits Count: Moving the "STEP Switch" to the right will increase the blinking digits count by one and moving the "STEP Switch" to the left will decrease the blinking digits count by one. After the blinking digit reaches 9, it will reset to 0.

c) To Exit: To exit the "Auto Calibration Mode", momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The new K Factor will be displayed for 3 seconds and the display will return to a blinking "Add." Most of the time you will want to enter the "Add Fuel Mode" after you have performed an auto calibration (see "Add Fuel").

Note: After exiting the "Auto Calibrate Mode," the "Fuel Used Since Fill Up," "Fuel Used for the Flight," and the "Fuel Remaining" values will be reset to 0.

5.4 Add Fuel:

If you have added fuel to the aircraft but have not filled the tanks, set the FP-5L "REM" value for the fuel remaining shown on the FP-5L, plus the fuel added to the tank(s) as shown on the fuel pump. If you have filled the tank(s), set the FP-5L "REM" value for the total fuel in the tanks. There are two pre-programmed full fuel levels you may recall automatically. It is important to verify the fuel levels in the tanks before takeoff.

To change the Fuel Remaining shown on the FP-5L, perform the following steps:

A. Select the "REM" display mode (this mode is displayed during power-up).

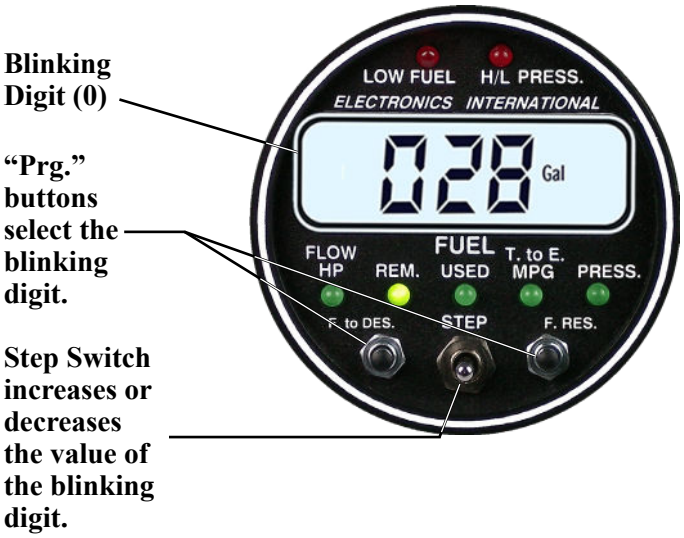
B. Momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The display will blink "Add."

C. Push either one of the buttons. The display will show the current fuel remaining. The blinking left digit indicates that you may program this digit first.

D. Set the Fuel Remaining Level using the following procedure (if you have topped off the tank, see step "**c)**" below):

a) Select a Digit: The "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Increase or Decrease a Digits Count: Moving the "STEP Switch" to the right will increase the blinking digits count and moving it to the left will decrease the blinking digits count.



c) Call up a pre-programmed Fuel Level: If you push and hold the "F. to DES" button, the display will cycle between the two pre-programmed fuel levels (set during Power-Up Programming) and the current fuel level every two seconds.

d) Exit: To exit the "Add Fuel Mode," momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed value will be stored in memory and no internal batteries or external power are required to store this information for life.

Fuel Remaining is one of the most important calculations the FP-5L can provide. The differences between the flow transducers, elbows, fittings, pipe sizes, hoses and routing methods used during installation for any fuel flow instrument can cause the flow transducer to output different electrical pulses per gallon (called K Factor) than when it was tested at the factory. To ensure accuracy, which is essential, the FP-5L provides a pilot-programmable K Factor to correct for these differences. Initially, the FP-5L's K Factor is set to a value which is marked on a tag supplied with the flow transducer. At each fill up the K factor may be changed using the "Auto Calibrate Mode" or the K Factor may be manually changed in the Power-up Programming.

5.5 "USED" Display Mode:

In the "USED" Display Mode, the FP-5L will display the "Fuel Used Since Fill Up." By tapping either "PRG" button, the display will toggle between "Fuel Used Since Fill Up" and "Fuel Used for the Flight" (displayed with a "F" in the front of the value). The Fuel Used for the Flight is measured from the time the aircraft's electrical power was turned on. If the electrical power is turned off, the Fuel Used for the Flight will reset to "000." The "Fuel Used Since Fill Up" is held in permanent memory and reset to "000" when you enter the "Add Fuel" or "Auto Calibrate" modes.

"Fuel Used Since Fill Up" Displayed

"Fuel Used for the Flight" Displayed

The "Fuel Used Since Fill Up" and the "Fuel Used for the Flight" is displayed as follows:

A. When set to display in Gallons the display will read in .1 Gal increments up to 199.9 Gals and 1 Gal increments up to 1999 Gals.

B. When set to display in Imperial Gallons the display will read in .1 Gal increments up to 199.9 Gals and 1 Gal increments up to 1999 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.

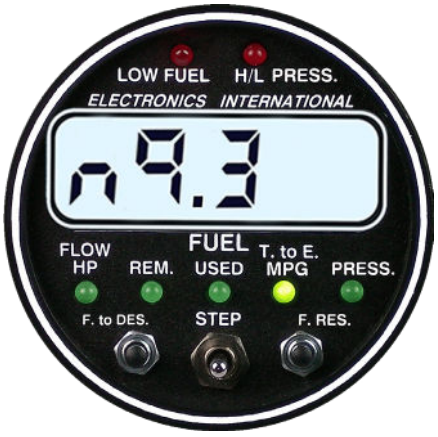
The K Factor programmed into the FP-5L will affect the fuel used. See the "Pilot-Programmable Modes" section in this manual for further details.

5.6 "T. to E. / MPG" (Time-to-Empty / Miles per Gallon) Display Mode:

"Time-to-Empty" is calculated by dividing "Fuel Remaining" by "Fuel Flow." The value is displayed in hours and minutes up to 19 hours and 59 minutes. By tapping either the "F. to DES" or the "F. RES" button, the FP-5L can be toggle between "Time-to-Empty," "Nautical Miles per Gallon" (shown with an "n" in the left of the display) and "Statute Miles per Gallon."

If the programmable Low "T. to E." Limit has been violated (as shown in the left display below), a bar in the upper left corner of the display will be shown when displaying Time-to-Empty. See the "Pilot Programmable Settings" section of this manual to set the Time-to-Empty Limit.

Time-to-Empty Displayed



Nautical Miles per Gallon Displayed

Statute Miles per Gallon Displayed

If the FP-5L is not receiving a digital signal from a GPS, the display will show "OFF." If a digital signal is present but the baud rate is not 4800 or 9600 or there is no distance or speed data, the display will show "On." The FP-5L automatically links to the GPS baud rate and data format.

5.7 "PRESS" (Fuel Pressure Channel) Display Mode:

The "PRESS" channel can monitor Fuel Pressure. If the Fuel Pressure channel is disabled, the display will read "OFF." For details, see "Power-Up Programming Settings" in this manual under section 6, "PRESS Channel Fuel Pressure."

If the High Pressure Limit is violated, a bar will appear in the upper left corner of the LCD display in the "PRESS" mode, and the H/L PRESS Warning LED will blink. If the Low PRESS Limit is violated, a bar will appear in the lower left corner of the LCD display in the "PRESS" mode, and the H/L PRESS Warning LED will blink. See the "Pilot Programmable Settings" section of this manual to set the High and Low PRESS Limits.

5.8 "F. to D. (Fuel to Destination) Display Mode:

When the left button ("F. to DES") is pushed the FP-5L will read the serial data from your GPS unit and compute the Fuel-to-Destination (next waypoint) for the current conditions: Fuel Flow, Fuel Remaining, Ground Speed and Distance-to-Destination. This process will take from one to three seconds depending on the update time of your GPS unit. If the fuel required to reach the waypoint is more than the fuel remaining as shown on the FP-5L, the "Low Fuel Warning" LED will come on.

If the FP-5L is not receiving data from a GPS, the display will show "OFF." If a signal is present but the baud rate is wrong or the ground speed and distance to waypoint is not available, the display will show "ON." The FP-5L sets the baud rate and data format automatically to match the GPS. Once speed and distance data have been received, the Fuel-to-Destination (next waypoint) will be computed instantly and displayed on the FP-5L.

Distance = 180nm
Speed = 150n/hr
Fuel Flow = 12.0 Gal/Hr

5.9 "F. Reserve (Fuel Reserve) Display Mode:

When the right button ("F. RES") is pushed the FP-5L will read the serial data from your GPS unit and compute the Fuel Reserve for the current conditions: Fuel Flow, Fuel Remaining, Ground Speed and Distance-to-Destination. The Fuel Reserve is the fuel you will have in your tank once you reach your destination (next waypoint) programmed on the GPS unit (Fuel Reserve = Fuel Remaining - Fuel-to-Destination). If the fuel required to reach the waypoint is more than the fuel remaining as shown on the FP-5L, the Low Fuel Warning LED will come on and the Fuel Reserve will be displayed as a negative number (e.g., " -3" would mean you are 3 gallons short of reaching your destination).

When the "F. RES" button is pushed it will take from one to two seconds, depending on the update time of your GPS unit, to read and compute the serial data. If the FP-5L is not receiving data from a GPS, the display will show "OFF." If a signal is present but the baud rate is wrong or the ground speed and distance to waypoint is not available, the display will show "ON." The FP-5L sets the baud rate and data format automatically to match the GPS. Once speed and distance data have been received, Fuel Reserve will be computed instantly and displayed on the FP-5L.

Distance = 180nm
Speed = 150n/hr
Fuel Flow = 12.0 Gal/Hr
Fuel Rem. = 18.3

6. Pilot-Programmable Settings

The FP-5L has nine Pilot Programmable Settings. These programmable settings are what make the FP-5L versatile, accurate and so effective at managing fuel. Most of these programmable settings need to be set only once to match your engine and desired warning levels. The following chart is an overview of the Display Modes and Pilot Programmable Settings available.

	Display Modes (indicated by a green LED)				
	FLOW HP	**REM**	**USED**	**T. to E. MPG**	**PRESS.**
Main Display (select with "STEP" Switch)	Fuel Flow (17.3 gal)	Fuel Remaining (23.7 gal)	Fuel Used since Fill Up (16.3 gal)	Time-to-Empty (1:22)	Fuel Pressure
Alternate Display (tap either "PRG" button)	% Horsepower (HP75)		Fuel Used for the Flight (F 7.2 gal)	Nautical Miles per Gallon (n 9.3)	
				Statute Miles per Gallon (10.7)	
Pilot Programmable Settings (push both "PRG" buttons)	Set FP-5L to Display in: Gal, Br Gal, Lbs or Ltrs	Add Fuel	Set the First Low Fuel Alarm (High Bar)	Set the Time to Empty Alarm (High Bar)	Set the High Pressure Alarm* (High Bar)
		Auto Calibrate the K Factor	Set the Second Low Fuel Alarm (Low Bar)	Set the Reoccurring Fuel Used Alarm (Low Bar)	Set the Low Pressure Alarm* (Low Bar)
	The below data can be viewed at anytime & override any of the above display modes.				
Additional Display Modes (Press & Hold the "F. to DES." & "F. RES." buttons to view respective data)	**F. to DES.**: Computes fuel needed to destination (next waypoint) for current conditions.				
	F. RES.: Computes fuel you will have in your tank once you reach your destination (next waypoint) for current conditions.				

***Note: If your FP-5L is certified as a primary replacement instrument for fuel pressure, the pressure alarm limits cannot be changed, as they have been set at the factory.** However, if you are using a non-primary FP-5L, you have the flexibility to customize these limits.

Although programming may be new to some of you, programming the FP-5L is simple. After a few tries, you should have the hang of it. No matter which buttons you push or parameter you set you cannot hurt the FP-5L and any parameter can be reset.

To program the Power-up Programmable Settings, perform the following steps:

A. Turn the aircraft electrical power off, push both the "F. to DES" and "F. RES" buttons, and hold them in.

B. Turn the aircraft electrical power on, wait two seconds, then release both buttons. At this point, the far left digit should be blinking and there should be a bar in the upper left corner of the display. All the green display mode LEDs should be off. If this is not the case, go back to step A. The 1st Full Fuel Level is being displayed and you are now ready to program the Power-up Programmable Setting that were described previously.

a) Select a Digit: The "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Advance a Digits Count: Moving the Mode Select Switch to the right will increase the blinking digits count by one or to the left to decrease a blinking digits count by one. After the blinking digit reaches 9 it will reset to 0.

c) Change Functions: The display will toggle between the Power-up Programmable Settings described above by pushing the right "F. RES" button with the right digit blinking (advances to the next function) or by pushing the left "F. to DES" button with the left digit blinking (returns to the last function). For each function the display will appear as described previously.

d) To Exit: To exit the Power-up Programming Mode, momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

6.1 Setting the display for "Gal," "br Gal," "Lbs," or "Ltr" in the "Flow" Display Mode:

In the "FLOW" Display Mode the FP-5L may be set to display Fuel Flow, Fuel Remaining and Fuel Used in Gallons, British (Imperial) Gallons, Pounds or Liters.

To program the display, perform the following steps:

A. Select the "FLOW" Display Mode.

B. Momentarily push both the "F. to DES" and "F. RES" buttons. Either "Gal," "br Gal," "Lbs," or "Ltr" will be shown in the display. You are ready to program the FP-5L to display in Gallons, British (Imperial) Gallons, Pounds or Liters.

C. Set the Display using the following procedure:

a) To change the display to "Gal," "br Gal," "Lbs," or "Ltr": Moving the Mode Select Switch to the left while pushing the left "F. to DES" button will alternate the display between "Gal," "br Gal," "Lbs," and "Ltr."

b) To Exit: To exit the Pilot Programming Settings for the "FLOW" Display Mode, momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed values will be stored in memory and internal batteries or external power are not required to store this information for life.

6.2 Add Fuel and Auto Calibrate the K Factor:

This procedure was described previously in the "Display Modes and Operating Features" section of this manual.

6.3 Setting the Two Low Fuel Alarms in the "Used" Display Mode:

In the "USED" Display Mode the following alarms may be set:

First Low Fuel Alarm - The First Low Fuel Alarm may be programmed to blink the "Low Fuel Warning" LED when the fuel remaining reaches your programmed set point. Pushing any button or switch will turn off the blinking LED. This limit is intended as a reminder. It may be set to remind you to switch tanks or when a specified amount of fuel remaining in the tanks has been reached. A good point to use in setting this alarm is at the 1/2 fuel remaining level. In the "REM" Display Mode a bar in the upper left corner of the display will be shown when the 1st Low Fuel Alarm Limit has been violated. Programming this alarm to "000" disables the alarm.

Second Low Fuel Alarm - The Second Low Fuel alarm may be programmed to blink the "Low Fuel Warning" LED when the fuel remaining reaches your programmed setpoint. Pushing any button or switch will stop the blinking but the Low Fuel Warning LED will stay on. **This limit is intended as an emergency warning.** It should be set to the lowest acceptable or safe fuel level in the tanks. A good point to use in setting this alarm is 30 minutes' worth of fuel (at cruise) for a VFR pilot or 45 minutes for an IFR pilot. In the "REM" display mode a bar in the lower left corner of the display will be shown when the Second Low Fuel Alarm Limit has been violated. Programming this alarm to "000" disables the alarm.

To program the First and Second Low Fuel Alarm Limits, perform the following steps:

A. Select the "USED" Display Mode.

B. Momentarily push both the "F. to DES" and "F. RES" buttons. A bar will appear in the upper left corner of the display and the left digit will be blinking. You are ready to program the 1st Low Fuel Alarm Limit.

C. Set the 1st and 2nd Low Fuel Alarm Limits using the following procedure:

a) Select a Digit: The right "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Increase or Decrease a Digits Count: Moving the "STEP" Switch to the right will increase the blinking digits count and moving it to the left will decrease the blinking digits count.

c) Change Functions: The display will toggle between the First and Second Low Fuel Alarm Limits by pushing the Right "F. RES" button with the right digit blinking or by pushing the Left "F. to DES" button with the left digit blinking. The First Low Fuel Alarm Limit is always displayed with a bar in the upper left corner of the display and the Second Low Fuel Alarm Limit is always displayed with a bar in the lower left corner of the display.

d) To Exit: To exit the Pilot Programming Settings for the "USED" Display Mode, momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

6.4 Setting the Time-to-Empty Alarm and the Reoccurring Fuel Used Alarm in the "T. to E." Display Mode:

In the "T. to E." display mode the following alarms may be set:

Time-to-Empty Alarm - The Time-to-Empty Alarm may be programmed to blink the Low Fuel Warning LED when the Time-to-Empty calculated by the FP-5L reaches your programmed setpoint. Pushing any button or switch will turn off the blinking LED. This limit may be set to remind you to switch tanks or when a specified Time-to-Empty has been reached. In the "T. to E." Display Mode a bar in the upper left corner of the display will be shown when this limit has been violated. Programming this alarm to "0:00" disables the alarm.

Reoccurring Fuel Used Alarm - The Reoccurring Fuel Used Alarm may be programmed to blink the Low Fuel Warning LED each time the fuel used reaches the programmed limit. Example: You have 40 gallons of fuel on board. You set the Reoccurring Alarm to 5 gallons. You will get an alarm every 5 gallons of fuel used (i.e., when your fuel levels reaches 35, 30, 25, 20, etc. gallons). Pushing any button or switch will turn off the blinking LED. This limit may be set to remind you to switch tanks or to check your fuel levels at specified fuel levels. Programming this alarm to "000" disables the alarm.

To program the Time-to-Empty and Reoccurring Alarms, perform the following steps:

A. Select the "T. to E." Display Mode.

B. Momentarily push both the "F. to DES" and "F. RES" buttons. A bar will appear in the upper left corner of the display and the left digit will be blinking. You are ready to program the Time-to-Empty Alarm limit.

C. Set the Time-to-Empty and Reoccurring Alarm limits using the following procedure:

a) Select a Digit: The "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Increase or Decrease a Digits Count: Moving the "STEP Switch" to the right will increase the blinking digits count and moving it to the left will decrease the blinking digits count.

c) Change Functions: The display will toggle between the Time-to-Empty Alarm limit and the Reoccurring Alarm limit by pushing the right "F. RES" button with the right digit blinking or by pushing the left "F. to DES" button with the left digit blinking. The Time-to-Empty Alarm limit is always displayed with a bar in the upper left corner of the display and the Reoccurring Alarm limit is always displayed with a bar in the lower left corner of the display.

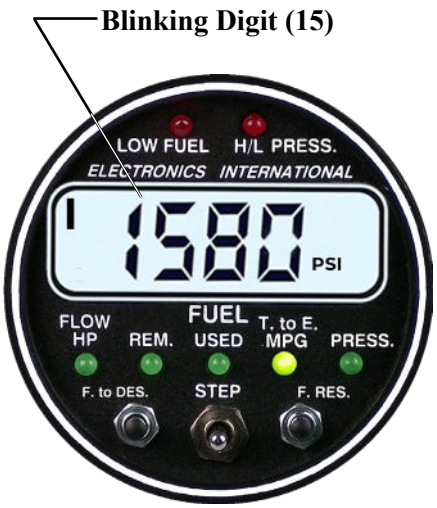
d) To Exit: To exit the Pilot Programming Settings for the "T. to E." Display Mode, momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

6.5 Setting the High and Low Pressure Alarms in the "PRESS" Display Mode:

Important Note: If your FP-5L is certified as a primary replacement instrument for fuel pressure, the pressure alarm limits cannot be changed, as they have been set at the factory. However, if you are using a non-primary FP-5L, you have the flexibility to customize these limits.

In the "PRESS" Display Mode the following alarms may be set:
Note: If fuel pressure is a primary function with factory-set limits, the ability to adjust these limits in the field is locked. Any required changes must be performed by E.I.

High Pressure Alarm: A High Pressure Alarm may be programmed to blink the H/L PRESS Warning LED when the displayed pressure value exceeds your programmed high setpoint. Pushing any button or switch will stop the blinking but the H/L Pressure Warning LED will stay on. This limit is intended as a warning. It should be set to the highest acceptable level for the function measured. In the "PRESS" Display Mode a bar in the upper left corner of the display will be shown when the high limit has been violated. Programming this limit to "000" disables the alarm.



Low Pressure Alarm: A Low Pressure Alarm may be programmed to blink the H/L PRESS Warning LED when the displayed Pressure value exceeds your programmed low setpoint. Pushing any button or switch will stop the blinking but the H/L Pressure Warning LED will stay on. **This limit is intended as a warning.** It should be set to the lowest acceptable level for the function measured. In the "PRESS" Display Mode a bar in the lower left corner of the display will be shown when the low limit has been violated. Programming this limit to "000" disables the alarm.

If the "PRESS" Display Mode is not going to be used, program the High and Low Pressure Alarms to "000." This will cause the display to show "OFF" when the "AUX" Display Mode is selected.

To program the High and Low Pressure Alarms, perform the following steps:

A. Select the "PRESS" Display Mode.

B. Momentarily push both the "F. to DES" and "F. RES" buttons. A bar will appear in the upper left corner of the display and the left digit will be blinking. You are ready to program the High Pressure Alarm limit.

C. Set the High and Low Alarm limits using the following procedure:

a) Select a Digit: The "F. to DES" and "F. RES" buttons move the blinking digit to the right or to the left.

b) Increase or Decrease a Digits Count: Moving the "STEP Switch" to the right will increase the blinking digits count and moving it to the left will decrease the blinking digits count.

c) Change Functions: The display will toggle between the High and Low Alarm limits by pushing the right "F. RES" button with the right digit blinking or by pushing the left "F. to RES" button with the left digit blinking. The High Alarm limit is always displayed with a bar in the upper left corner of the display and the Low Alarm limit is always displayed with a bar in the lower left corner of the display.

d) To Exit: To exit the Pilot-Programmable Settings for the "PRESS" Display Mode, momentarily push both the "F. to DES" and "F. RES" buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

7. Power-Up Programmable Settings:

The FP-5L has eleven Power-Up Programmable Settings. These programmable settings need to be set only once to configure the instrument to your aircraft, engine and personal preference. The following settings are available:

7.1 and 7.2 - First and Second Full Fuel Levels:

There are two Full Fuel Levels that may be set in the FP-5L. When adding fuel to the FP-5L, the First and Second programmed Full Fuel Levels may be retrieved automatically. The First Full Fuel Level will be displayed with a bar in the upper left corner of the display. The Second Full Fuel Level will be displayed with a bar in the lower left corner of the display.

7.3 K Factor:

The K Factor represents the number of electrical pulses per gallon the FP-5L receives from the flow transducer. **Changing the K Factor changes the accuracy of the FP-5L.** Initially, the K Factor should be set to the value listed for the specific flow transducer. If the flow transducer came from the factory as a package, the proper K Factor would have been set in the instrument.

Example: Value listed 68,000 (68,000 pulses per gallon measured on the bench). Set the K Factor on the FP-5L for the first three digits of the K Factor listed (680).

The differences between the elbows, fittings, pipe sizes, hoses and routing methods used during installation and the fuel pressure for your aircraft can, for any fuel flow gauge, cause the flow transducer to output a different number of electrical pulses per gallon (K Factor) than when it was tested on the bench. To correct for any errors in the K Factor, keep track of the Actual Fuel Used (fuel required to bring the tanks back to full) and compare this with the FP-5L Fuel Used (Full Tank Level minus Fuel Remaining as displayed on the FP-5L). If your error is less than 3 gallons for a single tank, you should average the error over 3 tanks of fuel. Use the following formula to correct the K Factor:

$$\text{New K Factor} = \frac{(\text{FP-5L Fuel Used}) \times (\text{Current K Factor})}{\text{Actual Fuel Used}}$$

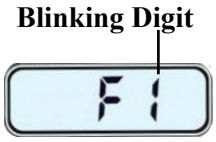
Note: The K Factor can be automatically corrected by using the "Auto Calibrate" Mode (see the Display Modes and Operation Features section of this manual).

Note: When refueling an aircraft fuel tank, it is not easy to fill the tanks to exactly the same level each time. Some variables are: 1. How level the wings are during refueling. 2. The affects of any crossover tubes. 3. The ability of the line attendant to fill the tank to the same mark. Also, the shape of the tank and the dihedral of the wings can aggravate the situation.

Note: K Factor settings below 580 will cause the display resolution to increase above .1 Gal/Hr. when used with a Display Update Time setting of "UP2." K Factors below 180 will cause the display resolution to increase above .1 Gal/Hr. when used with a Display Update Time setting of "UP1." The FT-90 Flow Transducer has a K Factor around 198.

7.4 Filter:

The FP-5L has a filter setting to remove fluctuations or jumping in the fuel flow readings. The filter number is in seconds of filtering. A lower number gives a faster response, and a larger number gives a slower response, but a smoother reading. For fuel injected engines a filter of 1 is recommended. For most carbureted engines, a filter of 2 or 3 is recommended. Filter numbers up to 9 are available.



7.5 Fuel Flow at 75% Power (rich mixture) Setting:

This setting calibrates the % Horsepower Display Mode to your engine. This procedure should be done after you have verified the calibration of the FP-5L. Changing the K Factor on the FP-5L will change the displayed Fuel Flow and the displayed % Horsepower.

Fly your aircraft at cruise altitude (or, if necessary, at lower altitude where you can achieve 75% power) with a rich mixture. Refer to operating charts from your aircraft or engine manufacturer to determine your power setting. Record the fuel flow displayed on the FP-5L at 75% power (rich mixture). For this setting, program the recorded fuel flow into the FP-5L. When displaying the Fuel Flow at 75% Power an "r" will be displayed in the lower left corner of the display.

The FP-5L can be set up to display raw horsepower by using the following procedure:

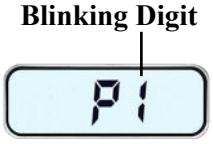
A. Record the Fuel Flow at 75% Power as described above. This value will be designated FF@75% rich.

B. Program the Fuel Flow Setting in the FP-5L using the following formula:

$$\text{Fuel Flow Setting} = \frac{\text{FF@75\% rich} \times 75}{\text{HPmax (max horsepower of your engine)} \times .75}$$

Note: For most spark ignition piston engines this fuel flow setting will be around 7.0 gallons/hr.

7.6 PRESS Channel Setup:



The following settings configures the Pressure Channel:

P0 - Disables the PRESS display.
P1 - Configures the PRESS input for a PT-30GA pressure transducer.
P2 - Configures the PRESS input for a PT-100GA pressure transducer.
P3 - Configures the PRESS input for custom pressure transducer setup by E.I.

7.7 PRESS Channel Snap:

A pressure transducer can have a small offset at zero pressure. This offset can be snapped to zero. If the pressure input drops below this value, the reading will read zero. For example: If the snap value is set to .5, the pressure display will read 0.0 whenever the pressure drops below 0.5 PSI.

7.8 GPS Receive Format:

The FP-5L automatically configures the GPS input based on the data being received.

7.9 GPS Transmit Format:

The GPS Transmit Format configures the FP-5L to transmit data to a GPS. The data transmitted may or may not be used by your GPS (check your GPS Operating Manual). The FP-5L GPS output port will only be enabled when the GPS Receive Format has been set to " In1." For all transmit formats the baud rate is 9600.

The GPS Transmit Format may be set for the following:

Ot0 - Disables the output port. If your GPS is not going to use the FP-5L transmitted data, set the GPS Transmit Format to " Ot0."

Ot1 - Outputs the older Shadin fuel flow data. Works with many older Arnav, King and newer Garmin GPS units.

Ot2 - Outputs the Shadin fuel flow sentence. Works with Garmin and many other units.

Ot3 - Outputs a modified Shadin Fuel/Airdata sentence. Works with many UPS GPS units.

Ot4 - Outputs the Shadin Z format.

Blinking Digit

7.10 Scan Rate:

The Scan Rate (the time the FP-5L takes to switch between display modes) can be set from 0 to 9 seconds. A "0" setting disables the scan feature. When displaying the Scan Rate, "Sn" will be shown on the left of the display.

Blinking Digit

7.11 Pounds per Gallon:

The FP-5L measures in gallons but can display in pounds. To do this correctly for the fuel type you will be using, enter the fuel weight per gallon.

Blinking Digits

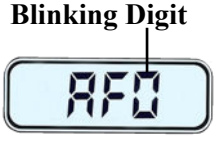
7.12 Add Fuel Resolution:

When adding fuel to the FP-5L, the resolution can be set to 1 or 0.1 gallon increments.

AF0 - Add fuel in 1 gallon increments from 1 to 1999 gallons.

AF1 - Add fuel in 0.1 gallon increments from 0.1 to 199.9 gallons.

Blinking Digit



Note: If you changed the "Add Fuel Resolution," you must read just the "first and second fuel levels" in steps 1 and 2.

8. Specifications and Operating Features

Model:

FP-5L (Fuel Flow/Pressure Instrument)

Case Dimensions:

2.5" x 2.5" x 2.7" depth, 2 1/4" Bezel.

Weight:

Instrument Only: 7 Oz.
Flow Transducer FT-60 or FT-90: 5.3 Oz.

Environmental:

Meets TSO C44a/C47

Power Requirements:

7.5 to 35 Volts, 1/10 Amp.

Green Display Mode Indicator LEDs:

The intensity of these LEDs is controlled by the dimming wire. 12 or 24 volts on this wire will dim the LEDs for night operation.

Red Low Fuel Warning LED:

This LED will blink any time the programmed First or Second Low Fuel limit, Time-to-Empty Limit or Reoccurring Alarm is violated. The Low Fuel Warning LED is always displayed at full intensity and will flash on power-up.

Red H/L PRESS Warning LED:

This LED will blink any time the programmed High or Low Pressure limit is violated. The H/L Pressure Warning LED is always displayed at full intensity and will flash on power-up.

Digital Display:

LCD (viewable in direct sunlight), with 12 and 24 volt backlight control wires for night operation. Displays "8888" on power up.

External Warning Control Line:

Grounds when any Red Warning LED is on or blinking. Current should be limited to 2/10 amp.

Accuracy:

Flow: 2% or better in accordance with TSO C44a.
Pressure Channel: 2% in accordance with TSO.

Resolution:

Fuel Flow:	1 Gal. or 1 Lb. or 1 Ltr.
Fuel Remaining:	1 Gal. up to 199.9 Gal or 1 Lb. or 1 Ltr. (1 to 1999 gal for the AF0 setting)
Fuel Used:	1 Gal. up to 199.9 Gal or 1 Lb. or 1 Ltr. (1 to 1999 gal for the AF0 setting)
Time-to-Empty:	1 minute
Pressure:	1 or .1 (programmable)

Max Displayed Range (Instrument Only):

Fuel Flow:	1999 Gals/Hr or 1999 br Gal/Hr or 1199 Lbs/Hr or 749 Ltr/Hr.
Fuel Remaining:	1999 Gals. or 811 br Gal. or 1999 Lbs. or 1999 Ltr.
Fuel Used:	1999 Gals. or 811 br Gal. or 1999 Lbs. or 1999 Ltr.
Time-to-Empty:	19 hours 59 minutes
Pressue:	+/- 1999

RS-232/422 Input Ports:

Single Line Receive Method:	RS-232C or RS-423
Dual Line Receive Method:	RS-422 or RS-485 (with 120 ohm external resistor)
Protocol:	1 Start bit, 8 Data bits, 1 Stop bit
Baud Rate:	4800 or 9600
Receive Format:	Moving Map or NEMA

RS-232/422 Output Port:

Transmit Method:	RS-232C Single Line
Protocol:	1 Start bit, 8 Data bits, 1 Stop bit
Baud Rate:	9600
Transmit Format:	King KLN88, Garmin, or UPS

Fuel Flow Transducer, FT-60 (Red Cube):

Range:	0.6 to 70+ GPH
Linearity:	1% over an engines normal operating range.
K Factor:	Approx. 68,000
Pressure Drop:	0.5 PSI at 28 GPH 2.0 PSI at 56 GPH
Working Press:	250 PSI
Min. Burst Press:	4,000 PSI
Temp. Range:	-65’C to 125’C
Fuel Ports:	1/4” Female NPT

Fuel Flow Transducer, FT-90 (Gold Cube):

Range:	2 to 125+ GPH
K Factor:	Approx. 33,800
Pressure Drop:	0.5 PSI at 63 GPH 2.0 PSI at 127 GPH
Working Press:	250 PSI
Min. Burst Press:	4,000 PSI
Temp. Range:	-65’C to 125’C
Fuel Ports:	1/4” Female NPT

Fuel Pressure Transducer (PT-100GA):

Range:	0 to 100 PSI
Over Press:	300 PSI without damage.
Min. Burst Press:	500 PSI
Temp. Range:	-40’C to 125’C
Material:	303 Stainless Steel
Press. Port:	1/4” Male NPT

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