

FC-10 Installation/Operation Manual

The FC-10 is not approved for installation in certified aircraft.

Installation:

Mechanical

Mount the FC-10 in any 2-1/4" instrument hole using four 6-32 screws.

For Transducer installation information, see the "FT-60 installation instructions " on page three of this manual.

Electrical

The transducer cable is the light tan **three conductor** shielded cable and the data cable is the grey **two conductor** shielded cable. After cutting these cables to their required length strip away approximately 1.5" of the outer insulation. You may need to obtain pins appropriate to your GPS to make the RS-232 data connections. Strip the internal wires and crimp (and solder) on the pins for your GPS. The transducer's wires may be trimmed to the desired length. They should be attached to the supplied harness either with butt splice, fast-on or Molex connectors (not supplied).

Important Note: Shields: Handheld GPS units must connect the data cable shield wire to the Handheld's RS232 ground connection. For all other installations, the shield wires should not be connected and should be trimmed away.

Pin

- 1) **Red** (Power) 12-28 Volts DC, Connect to the avionics bus via a 1 Amp fuse
- 2) **Black** (Ground) Avionics Ground
- 3) **White with Orange Stripe** (Transducer Power) Connect this wire to the red wire on the fuel flow transducer
- 4) **No Connection**
- 5) **White with Blue Stripe** (Transducer Ground) Connect this wire to the black wire on the fuel flow transducer
- 6) **White** (Data Transmit to GPS) Connect this wire to your Panel Mount GPS. Handheld GPS do not connect this wire. The associated GPS connection will be labeled Data in, RS-232 RX, Serial Receive (Consult your GPS Manual)
- 7) **White** (Left Transducer Signal) Connect this wire to the white wire on the left (single) fuel flow transducer
- 8) **White** (Right Transducer Signal) Connect this wire to the white wire on the right (second) fuel flow transducer (applicable only to dual transducer systems)
- 9) **Black** (Data Receive from GPS) Connect this wire to your GPS. The associated GPS connection will be labeled Data Out, RS-232 TX, Serial Transmit. (Consult your GPS installation manual)

Setup:

After the unit is powered PRESS and HOLD the (Center) **Set** button until "888" is displayed to enter setup mode.

Icons will flash to indicate what is option is being set. Once the desired value is set, press the (Center) **Set** button to move to the next item. Values are changed by pressing the (right) **Action** button to increase and the (left) **Mode** button to decrease the value. Continue setting all options until "888" is displayed again. This indicates the setup process has been completed.

Flashing Icon	Item Being Set	Description
FLOW	Fuel Units	0.0 = Gallons, 1.0 = Liters
RESV	Distance Units	0.0 = Nautical Miles, 1.0 = Statute Miles, 2.0 = Kilometers
L and R ^-Note	Pulses/Gallon/100	Set 680 for the EI FT-60 "Red Cube" and 300 for the Floscan 201B6 Transducer
L	Left K Factor (Single)	Value in percent, See instructions below
R	Right K Factor	Value in percent, See instructions below
USED	Fuel Tank Size	In Gallons
EFCY *-Note	Number of Engines	1.0 = Single Engine, 2.0 = Twin Engine,
GPS	GPS Type	0.0 through 4.0 (see GPS table on following page)
WARN	Low Fuel Warning	In Minutes
REQD #-Note	Flow Response Rate	0.0 = Normal (Recommended), 1.0 = Faster, 2.0 = Faster Still, 3.0 = Fastest

*Note: If you have a single engine installation with a second sender for fuel return to the tank, set "1.0".

#Note: This feature only available on Firmware 1.2 or greater. ^Note: This feature only available on Firmware 1.3 or greater

Fuel Efficiency will be displayed in different units depending on the combination of Fuel Quantity units and Distance units selected. See table:

Fuel Units	Distance Units	Fuel Efficiency Units
Gallons	Nautical Miles	Nautical Miles/Gallon
Gallons	Statute Miles	Statue Miles/Gallon
Gallons	Kilometers	Kilometers/Gallon
Liters	Nautical Miles	Nautical Miles/Liter
Liters	Statute Miles	Statue Miles/Liter
Liters	Kilometers	Liters/100 Kilometers

Setting K-Factor - K-Factor is a parameter that is adjusted to calibrate the fuel flow sensor to your installation. To determine the K-Factor, compare the actual fuel used to the calculated fuel used on the FC-10. It will be necessary to compare fuel consumption for several tanks of fuel to decide by what percentage to adjust the K-Factor. If the actual fuel used is more than the calculated fuel used, increase the K-Factor percentage. Likewise, if the actual fuel used is less than the calculate fuel used, decrease the K-Factor percentage.

The FC-10 K Factor values are in displayed in Percent K-Factor with 100 percent as the baseline. Use the following formula and examples to determine the K-Factor for your installation.

$$\text{K-Factor \%} = 100 \times (\text{actual fuel used} - \text{computer fuel used}) / \text{actual fuel used}$$

Example 1: Actual fuel Used = 18.3 Gallons FC-10 Computer fuel used = 19.1 Gallons $\text{K-Factor} = (18.3-19.1)/18.3 = -.044 = -4\%$ Thus, K-Factor needs to be reduced by 4% from its current value.	Example 2: Actual fuel Used = 26.7 Gallons FC-10 Computer fuel used = 24.9 Gallons $\text{K-Factor} = (26.7-24.9)/26.7 = .067 = 7\%$ Thus, K-Factor needs to be increased by 7% from its current value
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Configuring your GPS –

Consult the GPS Installation/Operation manual to locate "Serial Interface, I/O, RS-232, Serial Data, Data In/Out" setup pages on your GPS. There are several different names for this function.

Panel Mount – Select "Aviation Out" or "Move Map" for the Output format. See table below for the input format. If Baud rate is adjustable, choose 9600 baud.

Handheld – Select "NMEA" or "NMEA 0183" for the Output format at 4800 Baud. Select "OFF" or "NO in" for the Input format. The FC-10 does not output information to handheld GPS receivers. If Baud rate is adjustable, choose 4800 baud.

FC-10 GPS Mode	Input to FC-10	Output from FC-10
0	None	None
1	NMEA - Handheld GPS	None
2	Aviation - Panel Mount GPS	"Shadin Z" – Compatible with UPS/Apollo, Garmin and others (Recommended)
3	Aviation - Panel Mount GPS	"King A" – Compatible with ARNAV, King, Garmin and others
4	Aviation - Panel Mount GPS	"Shadin Generic" – Compatible with Garmin and others

Operation:

Modes: The FC-10 has Seven modes.

PRESS the (Left) **Mode** button the switch between modes.

PRESS and HOLD the (Left) **Mode** button to display the Firmware Version number.

FLOW – Fuel flow Gallons/Hour or Liters/Hour PRESS the Action button to toggle between Left and Right engines on twin engine systems	USED – Fuel used since power up Gallons or Liters PRESS the Action button to toggle between Left and Right engines on twin engine systems
RMNG – Fuel remaining Gallons or Liters PRESS the Set button to change the fuel remaining. The "RMNG" icon will flash. PRESS the Action button to increase the value and the Mode button to decrease the value. To quickly fill the tank press and hold the Action button until the full fuel value is displayed.	WARN – Fuel remaining is less than low fuel level warning quantity GPS – Usable GPS data is being received L – Left Flow Sensor Information R – Right Flow Sensor Information
ENDR – Fuel Endurance Hours:Minutes (or Distance with GPS) If connected to a GPS, the Action button may be pressed to toggle between the endurance distance or endurance in hours and minutes.	RESV – Fuel Reserve at active GPS waypoint (GPS Required) Hours:Minutes or Distance PRESS the Action button to toggle between fuel quantity remaining and flight time remaining at the next waypoint
EFKY – Fuel economy (GPS Required) See Efficiency units table for Units	REQD – Fuel required to active GPS waypoint (GPS required) Gallons or Liters

Specifications:

Input Voltage: 12-28 Volts DC

Current Draw: ~70mA @13.5 Volts

Fuel Flow: 0.6 to 60.0 Gallons per Hour/Engine

Dimensions: Fits a Standard 2-1/4" instrument hole.

Overall Width and Height 2.375"X 2.375", Depth behind panel 0.67 "

Weight: 2.6 oz.



Need Help?

support@fdatasystems.com

or call (831) 325-3131

FT-60 Transducer Installation Instructions

Fuel Flow Transducer Notes

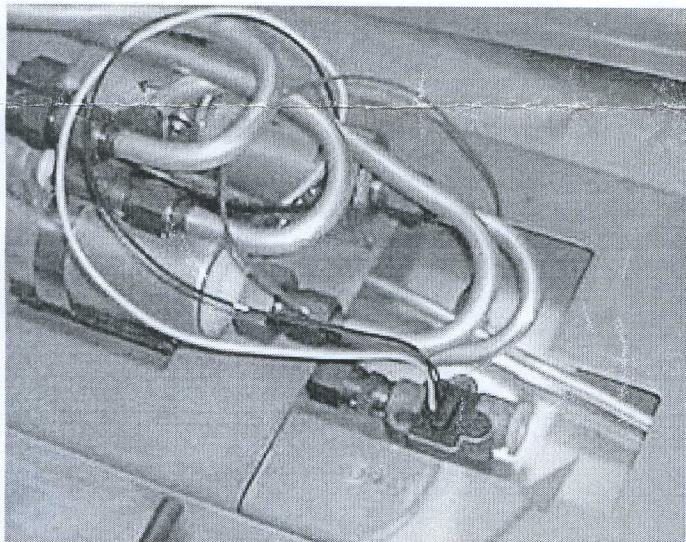
- **NEVER** blow through the transducer. Keep the yellow caps on until it is installed.
- The fuel flow transducer(s) should be installed in a straight section of your fuel line. (6 straight inches on each side is desirable).
- The fuel line should not drop down after exiting the transducer.
- The wires **MUST NOT** come out of the bottom of transducer. Wires pointing up is the best.
- When assembling fittings into the 1/4" NPT inlet and outlet ports do not exceed a **torque value of 25 ft.-lbs.**
- Do not use Teflon tape in an aircraft fuel system. Use "Fuel Lube/Ez Turn Lubricant"
- The transducer should be mounted down stream of a fuel filter.
- Do not attach the transducer directly to the engine to avoid excessive vibration.
- Do not mount the transducer near the exhaust systems or other hot engine components.
- If the transducer is in the engine compartment, it should be covered in fire sleeve to protect it from excessive heat.
- The transducer wires may be trimmed any desired length

Possible Transducer Placement Locations:

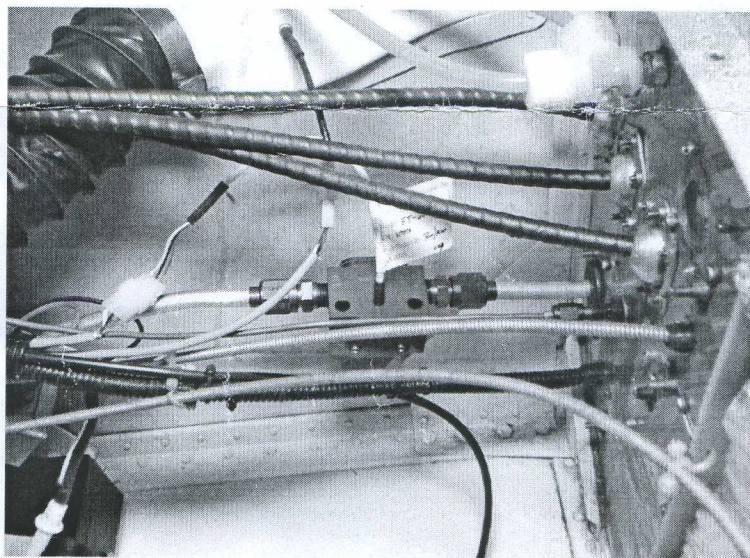
1. Between the auxiliary electric boost pump and the engines mechanical fuel pump.
2. Between fuel injection servo and the distribution block.
3. Between the Engine driven pump and the Carburetor

Note: If your engine is equipped with a fuel return line **from the carburetor or fuel injector manifold** back to the fuel tank you will need to install two flow transducers. One in the feed line from the fuel pump to the carburetor and one in the return line from the carburetor back to the fuel tank. This applies to certain Continental engines and Rotax 912(ULS) and 914 engines.

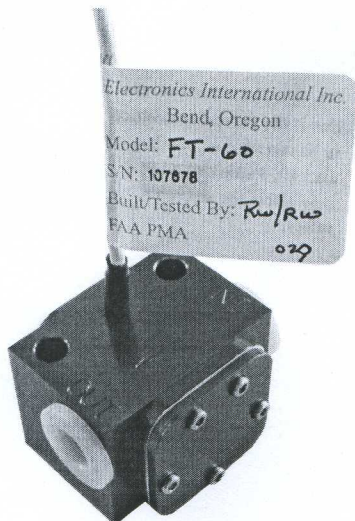
Suggested Installation Hardware: 2 Each, AN816-6D nipple, AN818-6D nut, AN819-6D sleeve. This will allow splicing of the transducer into 3/8" (-6) aluminum fuel line.



RV-7 Fuel Injected



RV-8 Carbureted



EI FT-60 "Red Cube" Specifications:

Flow Range , Gasoline: 0.6 – 70+ GPH,
 Approximate K Factor (Pulses/Gallon):68,000
 Pressure Drop: 0.5 PSI @ 28 GPH, 2.0 PSI @ 56 GPH
 Repeatability +/- 1/4%
 Working Pressure: 100 PSI psi
 Temperature Range: -65° / 125°C
 Bearing Life Expectancy: 10,000 hr. min.
 Electrical Specifications:
 8-30 VDC between RED (+) wire and BLACK (-) wire. @ 14 mA

Fuel Flow Transducer Important Notice

1206042

Rev. A

******* MUST READ *******

This Important Notice contains significant installation information that may affect the safety of your aircraft, delay your installation or affect the operation of your instrument.

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.

If this transducer is not installed under a STC, **you must perform the flow and pressure tests in FAA document A.C. 23-16 (Powerplant Guide for Certification of Part 23 Airplanes) to insure safe and proper operation.**

It is possible for any Fuel Flow Transducer to fail thereby causing inaccurate high, low or jumpy readings. Therefore, you must be able to recognize a Fuel Flow Transducer failure and you must be proficient in operating your aircraft safely in spite of this type of failure. If you do not have this knowledge or skill, contact the FAA or a local flight instructor for training prior to flying the aircraft with this product.

If you are not an Aircraft Mechanic familiar with the issues of installing aircraft Fuel Flow Transducers, Do Not attempt to install this transducer. The installer should use current aircraft standards and practices to install this transducer (refer to AC 43.13).

After installation of the Fuel Flow Transducer, the fuel system **MUST be checked for leaks.** Perform three leak tests before the aircraft is released for normal flight: First Test (Engine Off) - Pressurize the fuel system and check for leaks. Second Test (Engine On) - Ground run the engine long enough to achieve minimum normal operating pressures. Shut down the engine and check all fittings, hoses and the transducer for leaks as soon as possible. Third (Flight Test) - Fly the aircraft around the pattern one time. Land and check all fittings, hoses and the transducer for leaks. Check all components and hardware to be secure and for chaffing.

The Fuel Flow Transducer, hoses and fittings should NOT be installed next to the exhaust system or a turbocharger. Excessive heat can damage fuel system components.

See Reverse Side for Warranty/Agreement

Warranty / Agreement

1206042

Rev. A

Electronics International Inc. (EI) warrants this Fuel Flow Transducer to be free from defects in materials and workmanship for a period of one year from the user invoice date. EI will repair or replace the Fuel Flow Transducer under the terms of this Warranty provided the item is returned to the factory prepaid.

1. If you do not agree to and accept **ALL** the terms of this warranty, **DO NOT Install This Product**. You may return the product for a refund. Contact Electronics International Inc. for details.
2. Electronics International Inc. is not liable or responsible for a pilot's action or any situation that results in personal injury, property damage, missed commitments, lack of use of an aircraft or any expenses incurred due to: product failure, inaccuracy in displayed data, upgrade or customization issues, misinterpretation of the display, calibration problems, installation issues (leaks, mis-wiring, obstructions, damage to aircraft or components, incorrect installation of any parts, wrong parts, part that don't fit, etc.) or any other issues related to the installation or operation of this product. All of the above are solely the pilot's and/or installer's responsibility. The pilot **must** understand the operation and limitations of this product before flying the aircraft. The pilot will not allow anyone to operate the aircraft that does not know the operation of this product.

By installing this product, the aircraft owner/pilot and installer agree to hold Electronics International Inc. harmless and in no way responsible for monetary compensation, including punitive damages for any incident, harm and/or damage associated with this product (including but not limited to the ones listed above). If you do not agree to the above, **DO NOT INSTALL THIS PRODUCT**. The pilot, owner and/or installer may want to obtain an appropriate insurance policy before installing this product.

3. 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.
4. 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.
5. 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.
6. Electronics International Inc. is not liable for expenses incurred by the customer or installer due to factory updates, modifications, improvements, changes, or any other alterations to the product that may affect the form, fit, function or operation of the product.
7. Electronics International is not responsible for shipping charges or damages incurred under this Warranty.
8. No representative is authorized to assume any other liability for Electronics International Inc. in connection with the sale of Electronics International Inc. products.

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.**

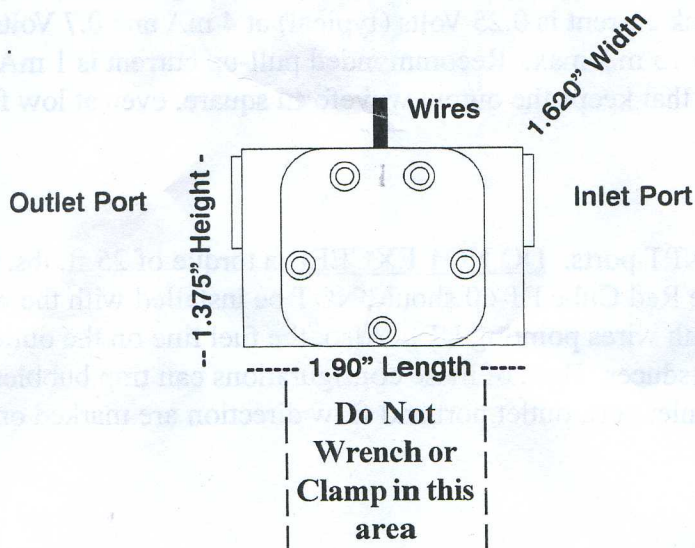
See Reverse Side for Important Notice

Electronics International

1030032

FT-60 Flow Transducer (Red Cube)

10/30/2003
Rev. B: 5/27/09



Warnings:

If the installation of the FT-60 transducer is not covered on an STC, **you must perform the flow and pressure tests in FAA document A.C. 23-16 to insure safe and proper engine operation. Installation must conform to aircraft standards and practices (A.C. 43.13).** DO NOT attempt to remove the screws in this transducer, doing so will cause the screws to break and render the FT-60 unsafe.

General:

The Red Cube FT-60 has considerably less pressure drop than other units on the market and a blocked rotor does not effect pressure drop. Also, the overall accuracy and linearity of the Red Cube FT-60 is superior to most other flow transducers. The Red Cube FT-60's design vacates bubbles and is not nearly as susceptible to debris as other units on the market. Additionally, rotor pin to jewel clearances are matched on every unit resulting in a single K-factor for all units. Note: Installation configuration can effect the K-factor.

The FT-60 is compatible with gasoline, Av gas, diesel, jet A, kerosene and any other fluid with similar optical characteristics.

Identification:

The Red Cube FT-60 can be identified by its red anodized body and cube shape (see above drawing).

Electrical Interface:

The Red Cube FT-60 interfaces with the FP-5(L) and most other fuel flow instruments. The input (red power lead) will operate from 8 to 30 Volts. Typical supply current is 14 mA over the entire operating range.

1030032

FT-60 Continued

The FT-60 incorporates an open collector output (white lead). The output can operate from 0 to 30 Volts. Saturation voltage at a given sink current is 0.25 Volts (typical) at 4 mA and 0.7 Volts (max) at 10 mA. The output should be limited to 15 mA max. Recommended pull-up current is 1 mA. The output incorporates a two stage comparator that keeps the output waveform square, even at low flow rates.

Mechanical Interface:

The Red Cube FT-60 has 1/4" NPT ports. DO NOT EXCEED a torque of 25 ft. lbs. when installing fittings into the transducer. The Red Cube FT-60 should NOT be installed with the wires pointing DOWN (the best situation is with wires pointing UP). Also, the fuel line on the outlet port should not drop down after exiting the transducer. Both of these configurations can trap bubbles in the transducer causing jumpy readings. The inlet port, outlet port and flow direction are marked on the top of the Red Cube FT-60.

Specifications:

Model: FT-60 (Red Cube)

K-Factor: 68000 Pulses/Gal (installation configurations can effect the K-Factor) (use 680 when programming the K-Factor in the FP-5(L)).

Pressure Drop (with 6.0 Lbs/Gal fuel), (blocked or unblocked rotor) : 0.5PSI @ 28 Gal/Hr
2.0PSI @ 56 Gal/Hr

To Calculate Pressure Drop: $P = \frac{(\text{Flow})^2}{9573} \times W_f$

P = Pressure Drop in PSI
Flow = Fuel Flow in Gal/Hr.
Wf = Weight of Fuel in Lbs/Gal

Fuel Flow Range: 0.6 to 70+ Gal/Hr.

Fuel Flow Over Range (with no damage to transducer): Unlimited

Linearity: +/- 1% over an engines normal operating range.

Repeatability: +/- 1/4%

Burst Pressure: 4000 psi minimum

Temperature Range: -65°C to 125°C

Weight: 5.26 Oz.

Life Expectancy: 10,000 Hrs. min.

FAAPMA'd and STC'd

Important Notice

Maximum Working Pressure : 100 psi. (If higher pressure unit is required, contact Electronics International)