AFP–30/35 Installation/Operation Manual

General:

The AFP-30/35 Air-Data, Fuel, Performance Computer performs three main functions:

- An Air Data Computer providing: Altitude, Vertical Speed, Density Altitude, Indicated Airspeed True Airspeed, Mach number, Winds Aloft information, Total Air Temperature and Static Air temperature.
- An Engine Performance Indicator providing: Percent Horsepower, Manifold Pressure, Engine RPM.
- A Fuel Computer providing: Fuel Flow, Fuel Used, Fuel Remaining, Endurance, Range, Economy and Arrival Fuel.

The AFP Computer is designed to supplement the information already available in an aircraft. It is not designed for or intended to replace the instrumentation required by regulation. The unit is not approved for installation in certified aircraft.

Advice:

While installing the AFP-30/35 is relatively straightforward, it does present certain challenges. READ THE ENTIRE MANUAL BEFORE BEGINNING. If you have doubts as to whether you want to do the installation yourself, any capable avionics shop can do the installation.

Revision 2.1 11/3/03

Installation:

Mechanical

Chassis

AFP-30 - Mount the computer's sleeve into standard 6.25" radio rack rails with four 6-32 countersunk screws using locking nuts. Drill and countersink the sleeve to your radio rack rails. The front of the sleeve should be flush with the instrument panel. If the sleeve is narrower than the mounting rails, add washers between the sleeve and the rails. Be sure the holes in the sleeve will match the holes in the computer once it is installed.

The computer is secured to the sleeve by installing one #4-40 screw through the sleeve into the computer box. Slots are provided on three sides of the computer sleeve for easy access, only one screw is required. **The screws must not protrude more than 1/4" into the chassis.**

AFP-35 - Use four 6X32 screws to attach the unit to the instrument panel. The screws should be no longer than 3/4".

Static and Pitot

Attach the unit to the pitot and static system using the 1/8" Female NPT fittings on the rear of the unit. A wrench MUST used to hold the fittings when tightening or loosening, failure to do so will result in damage to the fittings.

Manifold Pressure

Attach as above.

Fuel Flow Transducer(s)

The fuel flow transducer should be installed in a long straight section of your fuel line, twelve inches is desirable (6 straight inches on each side of the transducer). The wires should come out of the top of the transducer. It is desirable, but not required to have the transducer upstream of fuel pumps and down stream of a fuel filter. The transducer has 1/4" NPT threads. When assembling fittings into the inlet and outlet ports do not exceed a **torque value of 15 ft.-lbs. or two full turns past hand tight**, which occurs first.

See Example installation picture on following page.

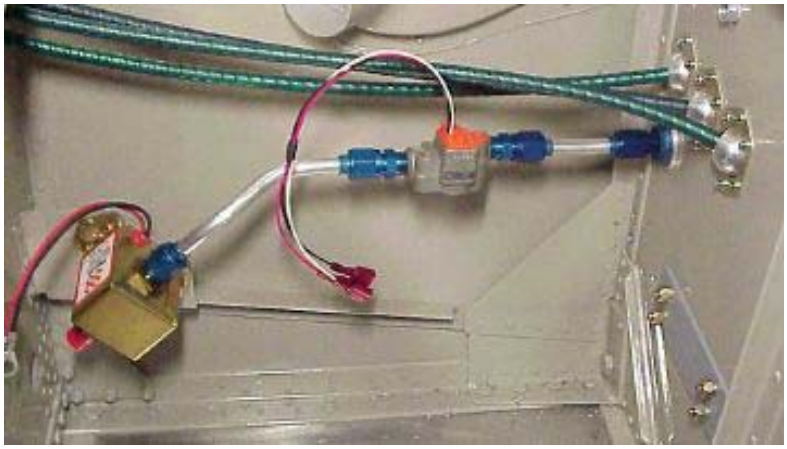
External Temperature Probe

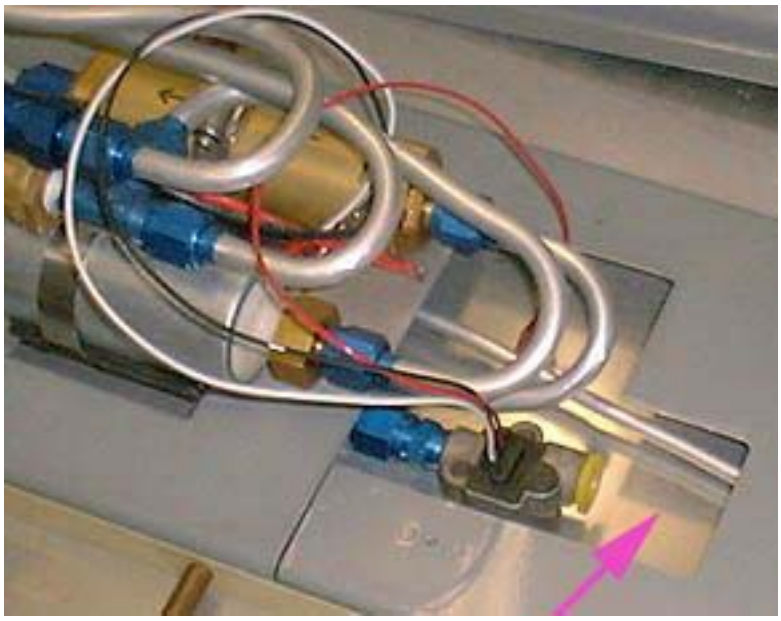
Mount the temperature sensor in any 1/4" hole ahead of heat sources. As much of the probe as possible should be outside of the plane for accurate readings. Use an appropriate glue or sealant to secure the probe in the hole. The wires on the temperature probe may be trimmed to any desired length.

Suggested temperature probe locations:

- RV 7,8,9,10 - If you have a heated pitot tube use the unused hole for the standard pitot tube.
- In an outboard inspection panel on the bottom of the wing outside the arc of the propeller.
- In a NACA Duct.


Possible temperature probe installation location


Vans RV-8


Vans RV-7 fuel injected

Electrical

Assembling the wiring harness

Crimping and Soldering the Pins

All Molex pins should be crimped **AND** soldered for proper contact and mechanical integrity. Care should be taken to neatly crimp and solder the pins. Be sure not to use too much solder or the pin will not snap into the connector properly.

Picture 1: Properly crimped pins.

Crimping Tool

It is suggested that a proper crimping tool be used. One source of this tool is B&C Specialty Products:
http://www.aeroelectric.com/Catalog/tools/tools.html#bct-1
and http://www.aeroelectric.com/Catalog/BCcatalog.html

B&C Specialty Products
P.O. Box B
Newton, KS 67114
Phone: 316-283-8000 Fax: 316-283-7400

Connector Pin Assignments

1 - Power in (+12-14 volts)*
2 - Airframe Ground*
3 – Display Dimming (Nav/Panel lights +12-14 volts)
4 – RS-232 - TX (serial out, data out, transmit) - White
5 – Factory use only
6 – Remote Screen Select (ground to advance display page)
7 – Reserved
8 – Reserved
9 - **Return** Fuel Flow Signal Input (from fuel flow **return** transducer) – White
10- **Main** Fuel Flow Signal Input (from fuel flow transducer) - White
11- RPM Signal Input (from P-Lead or electronic ignition)
12- External Temperature Probe Power (+5 volts to probe)
13- External Temperature Probe Ground
14– Power in (+12-14 volts)*
15- Airframe Ground*
16- RS-232 – Ground (serial ground) - Black
17- RS-232 - RX (serial in, data in, receive) - Red

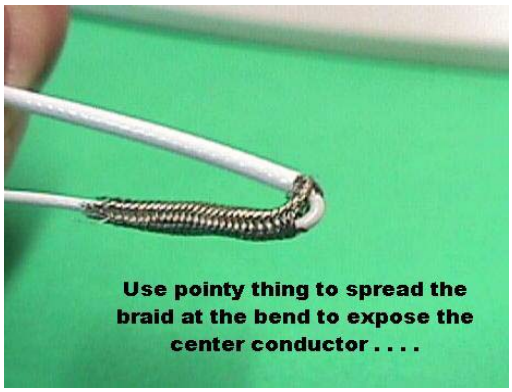
18- Factory use only
19- Factory use only
20- Reserved
21- Factory use only
22- Fuel Flow Transducer Power (+12-14 volts to transducer)
23- Fuel Flow Transducer(s) Ground
24- RPM Ground (from electronic ignition if applicable)
25- External Temperature Signal Input (from probe)

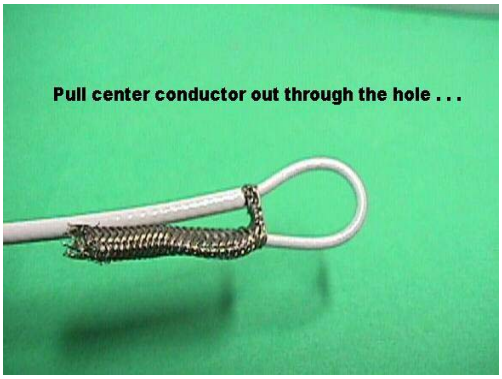
**The power connections are duplicated on two sets of pins, pins 2 and 15 for ground, and pins 1 and 14 for positive. Only one pin (either) for each need be used.*

Please study **FIGURE I** to get an idea of what the complete wiring harness looks like. It will give you a good idea of the connections involved.

Prepare all the wires by cutting to the appropriate length. Verify that the wires are not excessively long before cutting to avoid running short of any particular wire type. After stripping away the outer insulation, leave 1.5" of the shielding.

Prepare the single conductor shielded wire (for the RPM, panel light connection, and remote screen select) by stripping 1.5" of the outer insulation and pulling back the shielding. (see below) Strip 1/8" of insulation and crimp and solder a pin onto the center conductor.





Prepare the three-conductor cable (fuel flow, temperature, and GPS serial) by stripping 1.5" of the outer insulation, remove the foil shielding but NOT the non-insulated shield wire. Be careful not to cut the insulation of the red, white or black wire when removing the outer insulation or the foil. Strip 1/8" of insulation from each wire and crimp and solder on the pins. See picture 1.

Fuel Return Sensing Only – The fuel flow transducers must share ground and power pins in the connector. To accomplish this, take the three conductor shielded cables for the two fuel flow transducers crimp and solder the red wires together with a single pin. Do the same procedure for the black wires from these two cables.

Now we have three *(Fuel Return Sensing has Four)* lengths of three-conductor cable (plus shield) and three lengths of single conductor shielded wire, all with pins crimped and soldered in place. This will vary if you choose not to implement certain features such as remote screen select. Now, cut two lengths of the single-conductor,

non-shielded, wires. These are the power and ground wires. Strip 1/8” from one end of each and crimp and solder a pin on each.

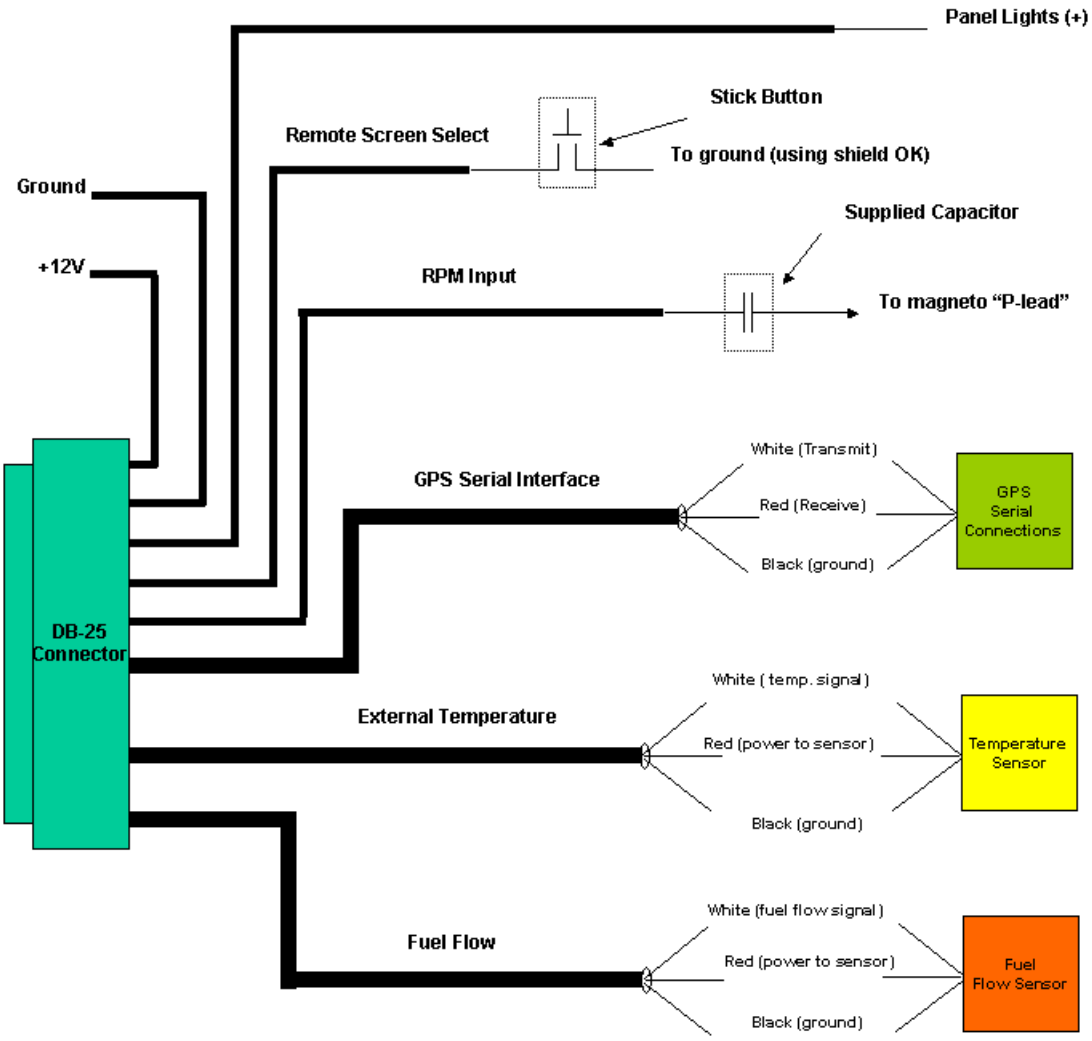


FIGURE I

Note 1: The supplied three pin Molex connectors are to be put in the fuel flow sensor line(s) and the temperature sensor line.

Note 2: A second fuel flow sensor required for fuel return sensing is not shown in the above diagram.

Assembling the Connector

FIGURE II Illustrates the proper way to insert the pins into the DB-25 connector. The Connector Pin Assignments list above also describes the pin functions of the connector. Verify that you are inserting the pins into the correct holes as removing them is difficult and often destroys the pin or connector. After inserting all the pins, twist the shields together.

Fuel Return Sensing Only –The fuel flow RETURN white wire pin goes in hole number 9. Holes number 22 and 23 will have two wires each for the two fuel flow transducers. (Not depicted below)

Lightspeed Electronic Ignition Only – Use the shield of the RPM Input wire into hole number 24 for ground. (Not depicted below)

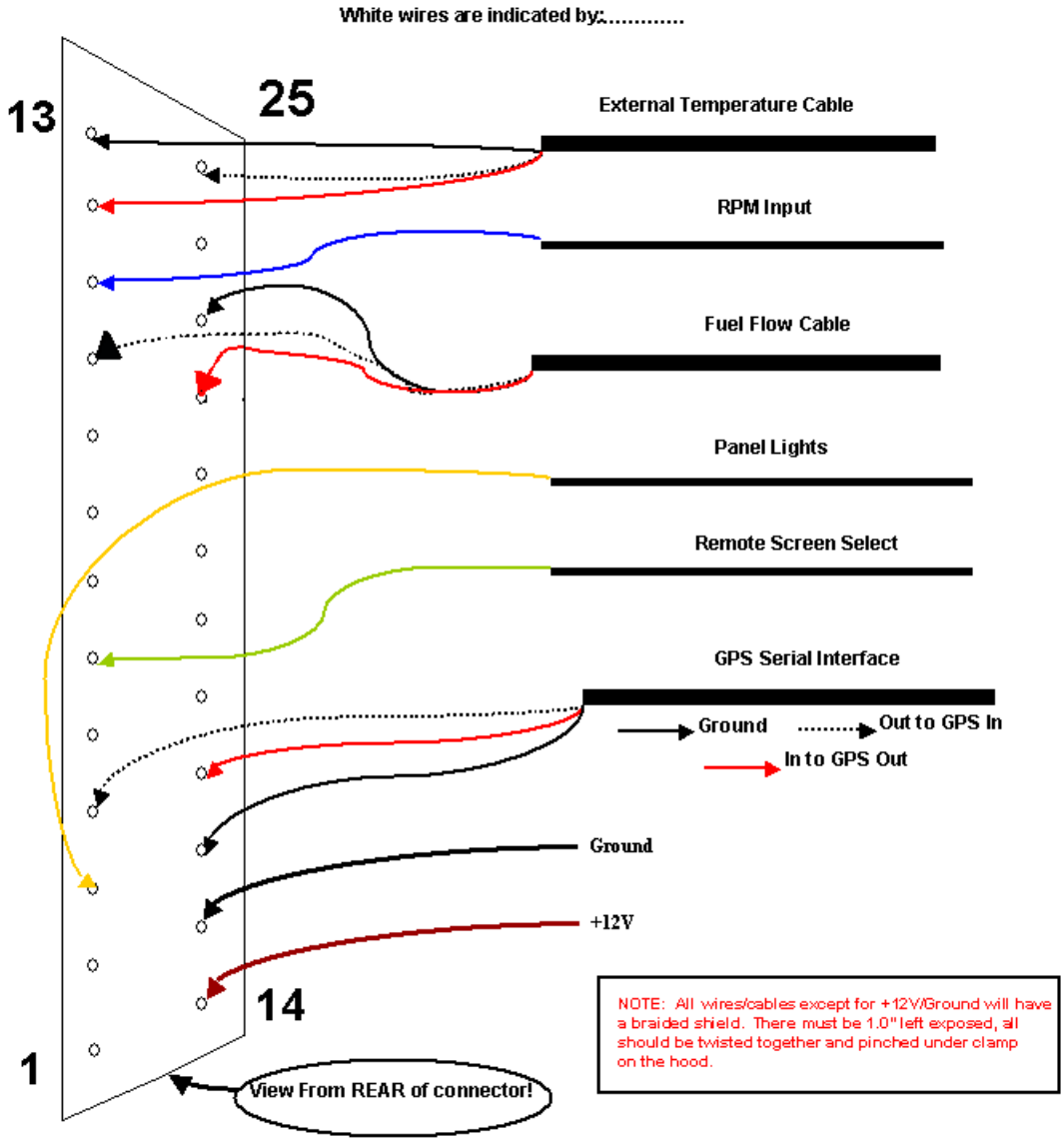
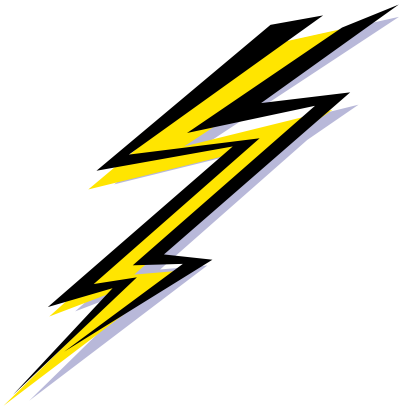


FIGURE II

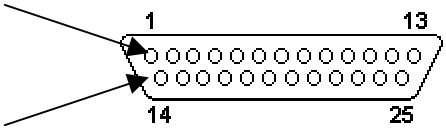


WARNING!

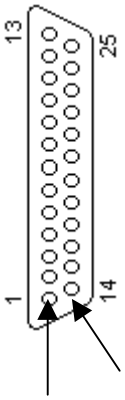
Connecting the 12V power to any other pins than ONE or FOURTEEN will damage the unit. (Even if the voltage is applied for a fraction of a second)

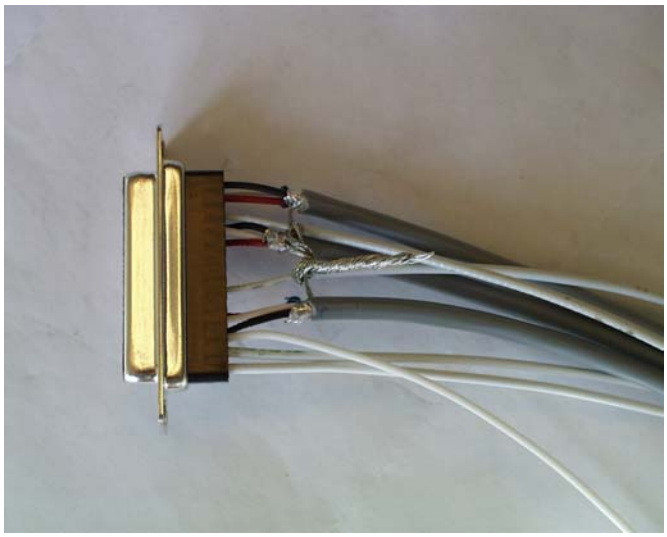
Make sure that the 12V you supply to the female connector mates with either pin 1 or 14 in the male connector of the unit.
(SHOWN BELOW)

VIEW FROM BACK OF UNIT (Radio Stack Mount)



VIEW FROM BACK OF UNIT (3 1/8 Gauge style Mount)





(Note: the panel light wire shown here has no shield)

Before installing the hood, be sure to label the wires.

Install the metal hood so that all the braided shields are pinched under the clamp. Wrapping the cables in electrical tape improves the pinch and protects the wires from the clamp.

Connecting the Harness

Power
+12-14V. Attach this wire to the avionics power bus with a 2-3 amp circuit breaker or fuse. If no avionics master is installed a switch may be put in the power line.

Ground
Ground the unit to the avionics ground on the aircraft.

Tachometer

Magnetos: Solder the capacitor to the center conductor of the shielded cable where it will be attached to the P-lead or Magneto P-lead stud. Use Heat shrink tubing to cover the capacitor. The capacitor must be attached at the switch or magneto. The

capacitor prevents the magneto from grounding should the wire to the computer become grounded by abrasion.

LASAR Electronic Ignition: Attach the center conductor of the shielded wire to the *brown* tachometer output wire in the LASAR harness. The capacitor is not installed for electronic ignition installations.

Dual Lightspeed Electronic Ignition: (Use this method only if you have no magnetos. If you have one magneto, use it to drive the RPM input rather than the Lightspeed system). Attach the center conductor of the shielded wire to the Lightspeed ignition's harness tachometer output wire. Use the shield for the ground connection. The capacitor is not installed for electronic ignition installations.

Temperature Probe
Cut the three conductor shielded cable on the temperature probe to the desired length. Crimp AND solder the **Molex** pins (not the DB-25 connector pins) to the three wires in the cable from the AFP-30/35 and the wires from the temp sensor. Trim the shield wires away. Insert the wires into the Molex connector halves. RED is the power input, BLACK is Ground and WHITE is the Signal wire, make sure that each color mates to the same on the other side of the connector

Fuel Flow Transducer(s)
Cut the three conductor shielded cable to the desired length. Crimp AND solder the **Molex** pins (not the DB-25 connector pins) to the three wires in the cable from the AFP-30/35 and the fuel flow sender. Trim the shield wire away. Insert the wires into the Molex connector halves. RED is the power input, BLACK is Ground and WHITE is the Signal wire, make sure that each color mates to the same on the other side of the connector

GPS
Cut the three conductor shielded cable to the desired length. Trim the shield wire away. Crimp and solder the appropriate pins for your GPS to the wires.

Reference your GPS installation and/or operation manual to determine which pins on your GPS send and receive serial data. There are various names for this GPS connection such as "I/O, Data in/out, RS-232, TX and RX, Serial". See the table below to connect the three wires.

AFP-30/35		GPS
Data out (pin 4, White)	----------→	Data in, RS-232 RX, Serial Receive
Data in (pin 17, Red)	←----------	Data out, RS-232 TX, Serial Transmit
Serial Ground (pin 16, Black)	------	Data ground, RS-232 Ground, Serial Ground

If your GPS does not have a specific Serial Ground pin connect the AFP-30/35 Black Serial Ground wire to your GPS's mounting tray.

Display Dimming
When 12-14 volts is applied to this wire the display will dim for night operation. Connect this wire to the navigation or panel light circuit.

Remote Display Page Advance
Control stick button – When this wire is grounded the display is advanced to the next display page. This is handy to put on a control stick button, if available.

Operation:

Setting up the AFP-30/35

Push and hold the Knob to get to the user preference pages. Push the knob to progress through the setup pages. Rotate the knob to adjust the settings.

The following items are available in the Setup Pages:

- **Fuel Units – Gallons or Liters**
- **K – Factor – Calibrate fuel flow**
- **Temperature Units – Celsius or Fahrenheit**
- **Distance/Speed units – Nautical or Statute Miles**
- **GPS Type – No GPS, Panel Mount GPS, or Handheld (NMEA) GPS**
- **Fuel Capacity – Enter useable fuel**
- **Custom – Choose any four data items to have on the user page(s)**
- **Engine Type – Choose your engine type from the list**
- **Pressure Units – Inches Mercury or Millibars (hPa)**

K-Factor - K-Factor is a parameter that is adjusted to calibrate the AFP-30/35 to the fuel flow sensor. To set the K-Factor, compare the actual fuel used to the calculated fuel used on the AFP-30/35. 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.

K-Factor % = 100 X (actual fuel used – computer fuel used) / actual fuel used

Example 1:

Actual fuel Used = 18.3 Gallons
AFP Computer fuel used = 19.1 Gallons

K-Factor = (18.3-19.1)/18.3 = -.044 = -4%
Thus, K-Factor needs to be reduced by 4%

Example 2:

Actual fuel Used = 26.7 Gallons
AFP Computer fuel used = 24.9 Gallons

K-Factor = (26.7-24.9)/24.9 = .067 = 7%
Thus, K-Factor needs to be increased by 7%

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. Select "FADC" or "Shadin FADC" 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 AFP-30/35 does not output information to handheld GPS receivers. If Baud rate is adjustable, choose 4800 baud.

Normal Operation

Rotate the Knob to select from the different display pages.

Push the Knob to enable adjustment of user adjustable items. User adjustable items are displayed with an **asterisk (*)** to their left. Pushing the knob will cause the **asterisk to flash**, which indicates the item may be adjusted by rotating the knob. Pushing the knob a second time disables adjustment mode. When the asterisk is not flashing rotating the knob changes display pages.

There are three user modifiable items:

- Barometric Pressure (Local)
- Heading (Magnetic)
- Fuel Remaining (Set after Fueling)

Extras

If you forget to reset Fuel Remaining after topping your tanks, it is not a problem. Use the knob to increase fuel remaining to full fuel. The fuel remaining will then automatically decrease back to your actual fuel remaining since engine start.

Display Items

• Air Data -

Altitude -
Alt: Indicated Altitude above seal level (Feet)
Baro: Local Barometric Pressure (inches of mercury)
ROC: Rate of Climb (Feet/Minute)
Dalt: Density altitude (Feet)

Speed -
IAS: Indicated Airspeed (Knots or Miles Per Hour)
TAS: True Airspeed (Knots or Miles Per Hour)
Mach: Mach Number (% speed of sound)

Temperature -
TAT: Total Air Temperature (Celsius or Fahrenheit)
OAT: Static Air temperature (Celsius or Fahrenheit)
Note: The AFP-30/35 **must** be connected to a GPS to compute wind information.

Wind -
Hdng: Magnetic Heading (Degrees)
HWnd or TWnd: Headwind or Tailwind Component (Knots or MPH)
Wind: XXX/XX Direction/Speed (magnetic/knots or MPH)
XWnd: Crosswind Component **R**ight or **L**eft (Knots or MPH)

- **Performance –**

  MaPr: Manifold Pressure (inches of mercury)
  RPM: Engine Revolutions per Minute
  %HP: Percent of Engine Rated Horsepower (Percent)

- **Fuel** –

  GPH/LPH: Current Fuel Consumption (Gallons or Liters/Hour)
  Used: Fuel used since Power turned on (Gallons or Liters)
  Edur: Fuel Endurance until Empty (Hours and Minutes)
  Rmng: Fuel remaining (Gallons or Liters)

  With GPS -
  (N)MPG/(N)MPL: Efficiency (Nautical or Statute Miles per Gallon or Liter)
  Range: Distance to empty tanks (Nautical or Statue Miles)
  Fuel at XXXXX: Fuel remaining at waypoint XXXXX (Gallons or Liters)

- **Custom** –

  Choose four items while in the user setup mode to display on the custom page(s)

Specifications

Sensor Limits –
Altitude: –1200 to 44,000 feet
Indicated Airspeed: 20 to 250 Knots
Total Air Temperature: -40 to 85 Degrees Celsius
Manifold Pressure: 4.4 to 33.9 Inches Hg
Fuel Flow: .6 to 60 GPH

Input Voltage: 12 to 14 Volts DC
Operating Temperature: -20 to +50 degrees Celsius

Plumbing

The following is a list of suggested hardware to attach the AFP computer to your aircraft systems. This list is a suggestion only. There are many variations in aircraft systems and many other functional alternatives.

Pitot/Static – 2 each, Nylo-Seal 268-N 04 x 02 Male Connectors
2 each, Nylo-Seal 271 or 272-N 04 X 02 Tee connectors to tee from existing pitot and static instruments
4 feet, 1/4" Nylo-Seal tubing

Manifold Pressure – 1 each , AN816-2D nipple, AN818-2D nut, AN819-2D sleeve - at computer
1 each, AN4022-1 discharge fitting, AN800-2 union cone, AN805-2 union nut - at intake manifold. Using this primer fitting will eliminate pulses in the line.
6 feet, 1/8" flexible copper tubing and firewall pass through hardware as appropriate.

Fuel Flow Transducer(s) - 2 each, AN816-6D nipple, AN818-6D nut, AN819-6D sleeve. This will allow splicing of the transducer into 3/8" fuel line.

Need Help? → **support@fdatasystems.com**
or call (831) 325-3131