WAITERS FLIGHT DATA RECORDER

LIST OF FIGURES

Waiters Flight Data Recorder

TERMS OF USE

You are free to use and distribute this program. You can give it away, but please don't sell it.

THE PROGRAM

This program is designed to perform three main functions;

1) Record flight data for later analysis.

2) Playback and convert raw Dynon captured (EFIS or EMS) data.

3) Provide Remote EFIS and Engine Monitor displays.

The display screens are sized in a fixed 640 x 480 format. This is the display size used by most small (5 – 8 inch) LCD VGA monitors. On large screens, you can display up to four of the screens simultaneously.

New to version 3.3.6, the Display screens can now be updated at variable rates. This will allow fully functional usage even with slow CPU speeds.

RECORD DATA

One of the major problems I have when test flying new hardware or airframe changes, is documenting the flight parameters. I get caught up in "flying the plane" and forget to note key parameters.

With this software program, attached to a GPS, an EFIS, and an Engine Monitoring system (EMS), I can now focus my full attention on the test card and not have to worry about documenting flight parameters.

Just start the program before engine start, and go fly the plane.

Waiters Flight Data Recorder is designed to run on a laptop, or other IBM compatible computer that may be installed in the aircraft.

The Recorder accepts serial inputs from any, or all;

1) GPS receiver that transmits NEMA 0183, OR, the Garmin Proprietary NMEA 0183 Sentence Serial Data at 4,800 bps,

2) Dynon EFIS D10, D10A, or D100 transmitting serial data at 115,200 bps.

3) Dynon EMS 10 Engine Monitor, transmitting serial data at 115,200 bps.

4) Grand Rapids 2000, transmitting serial data at 9,600 bps.

5) Grand Rapids 4000/6000, transmitting serial data at 9,600 bps.

The "Recorder" can record data in either (or both) of two ways;

It can capture the raw serial data and place it into a file for later review, OR,

it can record parsed and corrected data in a text file that can be imported into Excel or read by Notebook.

The Recorder separates the data and displays it on the user screen.

The displayed data is then recorded at a user selectable interval from 63 times per second (if EFIS is installed), or as slow as once every 30 seconds.

Typically, the recorder is operated at once per second.

Toshiba Laptop Test Computer

THE NEED FOR SPEED

Slower Machine:

Keep in mind that the EFIS Serial Data is the main consumer of CPU time.

When operating in the "Real Time" mode, and attempting to record all three items (EFIS, EMS and GPS), my older Toshiba Satellite 1555, 350mhz AMD-K6 processor (shown above) running Windows ME could not keep up, and would crash after a few seconds.

When I turned off the EMS, it would record the EFIS and GPS in the REAL TIME mode.

It would keep up at the "1/4 Second" interval.

NOTE – I no longer own this computer so I couldn't test it with the New Version 3.3.6. However, I suspect that this computer would have no problems displaying the data, even the new EFIS Instrument screen as long as I selected a slower screen update speed.

ALSO

Version 3.3.6 added variable speed for screen updates. I used a Dell GX150 (1 ghz Pentium III for testing. If I ran the Data and EFIS screens at the "Real Time" setting, I would get the dreaded "Stack Overflow" error after about 30 seconds. Even if I was operating with the EFIS only. A check of Task Manager revealed a fully loaded (100%) CPU when the EFIS screen was displayed on the monitor.

However, When I decreased the DATA and EFIS update rates to 75ms (about 15 times per second). The CPU loading never went above 85%, even when all the screens were being displayed.
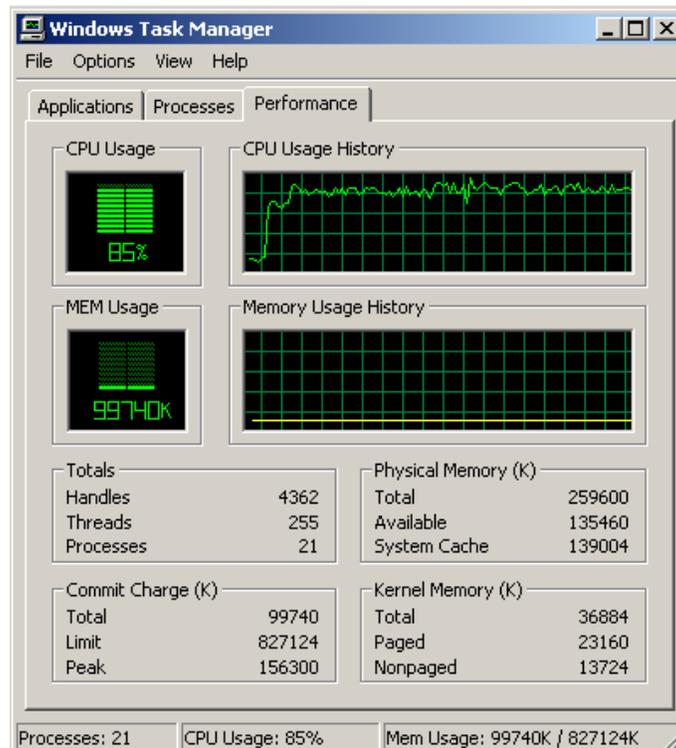
Windows XP Task Manager

ALSO – If you need to record data at full speed (65 times a second) , you may want to select the "CAPTURE" mode rather RECORD mode. You can then reload and convert the data after the flight.

Captured data doesn't get parsed, its recorded as it comes in the serial port so this would be a much faster method.

Faster Machine:

A no name computer running WinXP with an AMD Duron processor at 1.3 Ghz. Using one serial port, and two SER-to-USB adapters was able to record all three items (EFIS, EMS and GPS) in the "Real Time" mode. This is a LOT of data being stored, so make sure there's plenty of room on the hard drive.

NOTE: if your computer is crashing, remove the EFIS or EMS serial plug, then reboot, run Waiters Flight Data Recorder, and select a slower speed or disable one of the high-speed unit. Save the configuration before attempting to reconnect the serial cable.

PLAYBACK CAPTURED DATA

Captured Serial Data can be played back and / or converted . Played back data is displayed and can be run at variable speeds, from one frame at a time to near real time.

ALSO – Dynon has added the ability for their EMS to log data internally. This file can be downloaded to a laptop using Dynon's utilities. This file can then be read and converted using this program.

DISPLAY DATA and INSTRUMENTS

ALSO – Introduced into version 3.3.6, the Data and EFIS screens can now be set to update from "Real Time" to once per second. The Dynon EFIS sends out a high speed data stream up to 65 times per second. When the Real Time is selected, the screens are updated after each stream is received. This is a significant load on the CPU and will choke all but the fastest CPUs.

Slower update times can be selected for both the MAIN screen and the EFIS HIS screen. A setting of 75 Milliseconds allows for flicker free screens, yet significantly eases the CPU loading.

SETUP AND RUN

Run the SETUP file to install the Waiters Flight Data Recorder. This will install three files in the application folder, WAITERS FLIGHT DATA RECORDER.EXE and WAITERS FLIGHT DATA RECORDER.XML, and WAITERS FLIGHT DATA RECORDER.PDF. Windows normally places these in the C:\Program Files\ folder

The final resting place for these files will most likely be in the following folder:

       C:\Program Files\WAITERS FLIGHT DATA RECORDER.exe

Once installed, run Waiters Flight Data Recorder like any other Windows program. To run Waiters Flight Data Recorder, click on the "WAITERS FLIGHT DATA RECORDER" icon on the desktop, or in the START- PROGRAMS – Waiters Flight Data Recorder

RECORDER DATA FILES

The default folder for the recorded data files is "C:\FLIGHT RECORDER".
You can change this on the COM SETUP screen.

Whenever the Recorder is started, it looks to see if a data file already exists for today's date. If it doesn't, a new file is created. The file name will be in the form of WFDRmmddyy.TXT. Example: WFDR072505.TXT

Regardless if the file exists or not, the Recorder will always write a header line to the file. The header line is tab delimited that provides the names for the data fields. For a brief description of the headers, look below under Header Fields.

If the recorder is stopped and started several times during a day, you'll see a new header line in the file every time the recorder was restarted.

SERIAL INPUTS

The Dynon EFIS D10, D10A, and D100 output a serial stream of data over 60 times a second. This rapid stream is excellent for detailed resolution, but may be "to much" data for viewing on an Excel spreadsheet.
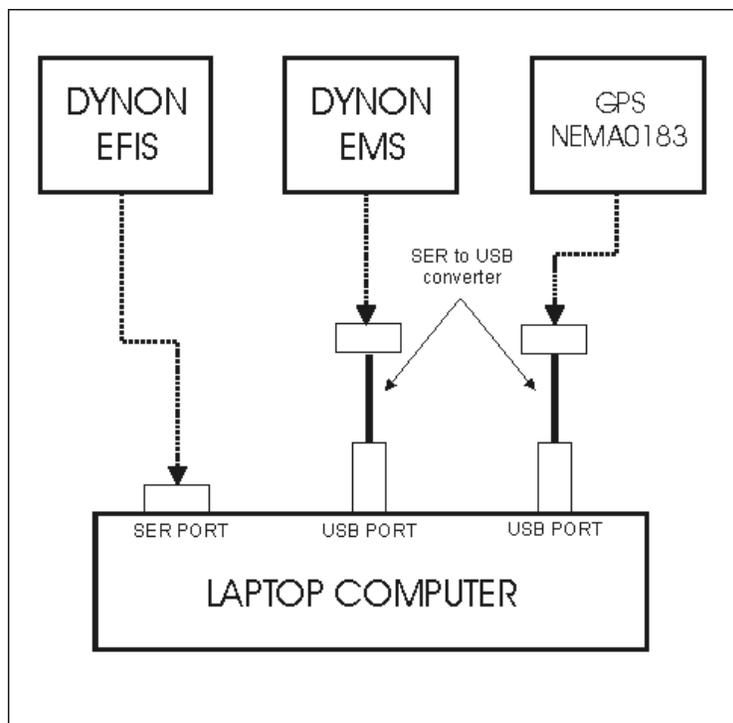
Recorder Block Diagram

HOW IT WORKS

The EFIS data stream is decoded and displayed it real time. The Displayed data is then "captured" at the interval selected, from "real time" to once every 30 seconds and stored in a tab delimited text file.

The EFIS data on the MAIN screen and the EFIS Instrument Screen are updated at the interval selected (default 75 Milliseconds, 15 times per second).

The EMS and GPS screens are updated real time as new data is received (1/4 second for EMS and 1 sec for GPS)

An input is also available for GPS data. Most modern GPS units transmit a NEMA 0183 serial output. Waiters Flight Data Recorder looks for four particular "Sentences" from the NEMA 0183 data.

> $GPGGA
> $GPRMC
> $GPVTG
> $GPGSV

Most of the new Garmin receivers output Garmin's Proprietary NMEA 0183 Sentences. Garmins sentences provide data that isn't available in the Standard NMEA 0183 sentenances.

> $PGRMP

$PGRMH
$PGRMB
$PGRMM
$PGRMV
$PGRMZ
$PGRME

If Your Garmin allows you to select the sentence's to be transmitted, Select all the above PLUS the $GPGSV and $GPVTG. These two provide the Satellite in view information ($GPGSV), and a Magnetic heading information ($GPVTG)

By utilizing both EFIS and GPS data, a complete three-dimensional data set, along with exact location, can be save to the recorders data files.

PLUS, a Serial input from the EMS records engine parameters in conjunction with the positioning data. This makes performance evaluations a snap, as all the data is correlated in time, and recorded in one file. i.e. CHT and Oil Temperature rise during climb. Fuel burn for climb, cruise, or descent. ALL THIS IS recorded and documented.

When recording a DYNON EFIS, If the Computer has a 9 pin serial connector, use this for the EFIS rather than a USB to Serial connector. This will improve the computers performance for the EFIS high speed data stream.

Waiters Flight Data Recorder will record EFIS, GPS, and ENGINE data at the interval selected. If you don't have a GPS but would like to take advantage of this recorder, you may want to look at

www.deluoelectronics.com

They offer some very inexpensive standalone USB and Serial port GPS receivers.

GPS Receiver   **USB Adapter**

The left photo shows a Deluo Stand Alone GPS receiver (Price $69.00). This receiver measures about 1 inch square. It receives its power from the USB or Mouse connector on the computer. It

outputs standard NEMA0183 serial data at 4800 baud. The Sentences transmitted by the receiver are:

> $GPGGA
> $GPRMC
> $GPGSV

Most Laptops only have one Serial port connection. I've used both "Blue Tooth", and a "USB to Serial" converters, to give me another serial port, both with excellent results.

The photo on the right shows two SER-to-USB converters that I use. My old Toshiba laptop has only one mode 1.0 USB port (slow), so I also use a USB powered USB HUB (shown with the converters. With the drivers provided, the computer treats these USB converter ports like standard serial ports.

Remember, Waiters Flight Data Recorder will record EFIS OR GPS OR ENGINE, OR any combination. If you record only with EFIS, the GPS fields will be blank. If you record only with GPS, the EFIS and EMS fields will be blank. For easy viewing, the ENGINE data is displayed on is own separate page.

Waiters Flight Data Recorder Main Page

FLIGHT DATA

Main Screen

Flight data displayed on the main page is captured from two sources, an EFIS and/or a GPS. (EMS data is displayed on its own page)

The EFIS data source can be either a Dynon EFIS D10, D10A, or D100. This source transmits EFIS data out its serial port at 115,200. Note that the EFIS data fields have blue colored text.

The GPS data source can be any GPS that transmits a NEMA 0183 "$GPGGA", "$GPRMC", and "$GPVTG" sentence. Note that the GPS data fields have brown colored text.

Data and windows shown on the Main Screen change depending on the configuration.

TIME

The Display shows three times, The Computer time, GPS Time, and the EFIS time. All three times are recorded.

When the GPS receiver is tracking a valid position, the "FIX MODE" indicator will change to a bright green color. Note also that the "SET" button becomes active with a valid GPS fix. Pressing the SET button will update the computers date and time to match the GPS date and time. The time set feature will take into account the "Time Zone" that is set in the computer.

SPEED – ALTITUDE - COURSE

Note that the GPS and the EFIS can both supply this information. This window allows you to see what the difference is.

The data presented in this window is corrected to the Units that are set up on the Configuration page.

NOTE – The "GPS" caption on the left will change to "Garmin" depending on which item is selected for the source (GPS Instrument Setup Screen)

If the Standard NMEA 0183 is selected, display information is derived from the;

> $GPGGA
> $GPRMC
> $GPVTG
> $GPGSV

If the Garmin NMEA 0183 is selected, display information is derived from the;

> $PGRMP
> $PGRMH
> $PGRMB
> $PGRMM
> $PGRMV
> $PGRMZ
> $PGRME
>
> NOTE: $GPVTG supplies Magnetic heading, There is no counterpart in the Garmin
>
> NOTE: $GPGSV supplies Satellite information, There is no counterpart in the Garmin

There are three data blocks under the course heading, these are;

> GPS True course. Aircraft is tracking this course across the ground.
>
> GPS Magnetic Course** . Aircraft is tracking this course across the ground.
>
> EFIS Heading. Aircraft is pointing in this direction (magnetic)

** Some GPS receivers don't transmit the "$GPVTG" sentence, Waiters Flight Data Recorder uses this sentence ONLY for the magnetic heading. True heading is derived from the more popular "$GPRMC" sentence.

ENGINE MONITOR

Clicking this button will select the engine monitor screen. There are currently two (2) Engine Monitors supported; (Grand Rapids, and Dynon)

EFIS INSTRUMENTS

Clicking this button calls up the EFIS Screen. This screen is designed to emulate a Dynon D10A display. It shows only the basic flight data. The airspeed portion can be customized for individual installations

ENGINE INSTRUMENTS

Clicking this button calls up the Engine Monitor Screen. This screen is designed to emulate a Dynon EMS 10 display. It shows most of the parameters that are displayed on the Dynon. The instruments can be customized for each particular aircraft installation.

When a Grand Rapids instrument is selected as the Engine monitor. This display shows several aircraft style gauges and the Dynon style engine gauges.

GPS INSTRUMENTS

Clicking this button calls up the GPS Screen. This screen displays GPS data on aircraft style instrument gauges. It also displays position data, and GPS satellite data.

The airspeed instrument can be customized for individual installations.

COMM PORTS

The Com ports show what ports are being used, and their settings. The three indicators show the com port being used, a light that shows the validity of the data being received, and the current comm. Port settings.

Clicking on the COMM port window will take you to the Serial Display window, were you can see tha actual data as its received by the serial port.

Clicking on the Settings window will take you to the configuration screen.

The configuration of the serial ports can be changed by clicking the "CONFIG SERIAL" button near the bottom of the screen. This will call up the "EFIS GPS COM PORT SETTINGS" screen.

Real time serial data can be displayed at any time by clicking on any of the data display windows for the GPS or the EFIS.

NOTE: If the EFIS or GPS Comm ports are set to "NONE", their corresponding data displays are darkened and disabled.

The small green indicators beside each Port Number text box will turn bright green when recognizable data is being received and decoded on the port.

One very important feature added to 3.3.6 was the ability to "Capture" the serial port data. The captured data is then written to a file and can be reviewed or analyzed later

If a Serial port is set up to Capture, a small blue "C" will be displayed next to the COMM window.

Comm Port Window

GPS COMM PORT

Review your GPS manual for description of NEMA 0183 sentence descriptions. Although the NEMA 0183 is a standard, there may be minor variations in the sentence structure. I've tested the software with numerous vendors of GPS receivers and the code works OK .

Goggle NEMA 0183

A GPS will normally send out 3 – 6 data Sentences once per second.

GPS is normally 4800 baud, 8 bits, 1 stop, no parity, no flow control.

These fields are created and recorded if the GPS COM port is set to anything except "NONE";

    GPS COMM
    GPS TIME
    GPS MAG
    GPS TRUE
    GPS GND SPEED
    GPS ALTITUDE
    GPS LATATUDE
    GPS LONGITUDE
    GPS MODE
    GPS SATS USED

EFIS COMM PORT

These fields are created and recorded if the EFIS COM port is set to anything except "NONE"; Currently the Dynon D10, D10A, and D100 are the only three EFIS systems supported.

The EFIS sends out 65 data sentences per second.

EFIS is normally 115,200 baud, 8 bits, 1 stop, no parity, no flow control.

DYNON EFIS D10, D10A, and D100 data

Review the Dynon EFIS manual for detailed description of EFIS data:

http://www.dynondevelopment.com/

EFIS COMM
EFIS TIME
EFIS PITCH
EFIS ROLL
EFIS YAW
EFIS AIRSPEED
EFIS ALTITUDE
EFIS TURN RATE
EFIS LAT G's
EFIS VERT G's
EFIS AOA

EMS COMM PORT

These fields are created and recorded if the ENGINE COM port is set to anything except "NONE"; Either the DYNON EMS or the GRAND RAPIDS will be recorded, depending on the setup.

DYNON EMS 10 DATA

The EMS sends out 4data sentences per second.

EMS is normally 115,200 baud, 8 bits, 1 stop, no parity, no flow control.

Review the Dynon EMS manual for detailed description of EMS engine data:

http://www.dynondevelopment.com/

RPM
MANIFOLD PRES
OIL TEMP
OIL PRES
VOLTS
AMPS
EGT 1
EGT 2
EGT 3
EGT 4
EGT 5
EGT 6
CHT 1
CHT 2
CHT 3
CHT 4
CHT 5
CHT 6
FUEL PRES
FUEL FLOW
QUANTITY 1
QUANTITY 2
FUEL REMAINING
GP 1
GP 2
GP 3
THERMOCOUPLE

GRAND RAPIDS GR-2000

NOTE: Waiters Recorder doesn't perform any unit conversion with the Grand Rapids 2000, because there is no way for the recorder to know what units are being output by the GR2000, i.e. knots vs. mph, or Deg C vs. Deg F. The units recorded are the units displayed on the GR2000.

EMS COMM
HEADER
FLIGHT TIMER
HOUR METER
OIL TEMP
OIL PRES
CARB TEMP
COOLANT TEMP
RPM1
VOLTS
EGT1
EGT2
CHT1
CHT2
FUEL
FLOW
TIME REMAIN
AIRSPEED
ALTITUDE
ROC
BARO
OAT
INT TEMP
AUX1
AUX2

GRAND RAPIDS 4000 / 6000

Depending on the software version of the Grand Rapids 4000/6000, it may output one of two different styles of information (headers). Waiters Flight Data Recorder will automatically detect which header style is being transmitted, and parse the serial stream data correctly.

NOTE: Waiters Recorder doesn't perform any unit conversion with the Grand Rapids 4000/6000, because there is no way for the recorder to know what units are being output by the GR4000/6000, i.e. knots vs. mph, or Deg C vs. Deg F. The units recorded are the units displayed on the GR4000/6000.

EMS COMM
HEADER
FLIGHT TIMER
HOUR METER
OIL TEMP
OIL PRES
CARB TEMP
COOLANT TEMP
RPM1
RPM2
VOLTS
EGT1
EGT2
EGT3
EGT4
EGT5
EGT6
CHT1
CHT2
CHT3
CHT4
CHT5
CHT6
FUEL
FLOW
TIME REMAIN
AIRSPEED
ALTITUDE
ROC
BARO
OAT
INT TEMP
AUX1
AUX2
AUX3
AUX4
AUX5
AUX6

CONFIGURATION BUTTON – Calls up the Serial Port / Recorder configuration screen

RECORDER

There are Two possible sub windows available, depending on the configuration setting.
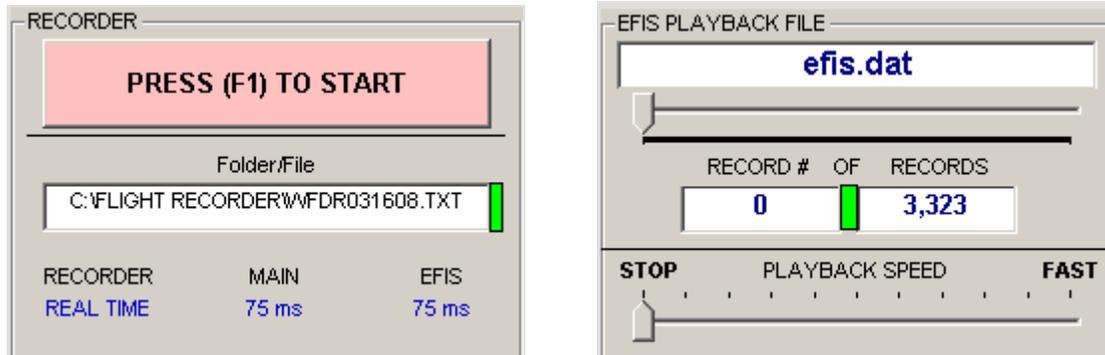
Recorder / EFIS Playback Windows

The Window on the left is displayed on the main screen if the "Show RECORDER START-STOP Button" is selected on the **EFIS or GPS Com Port Settings** screen. The recorder can be started and stopped by either clicking on the PRESS (F1) TO START, or by using the F1 hot key. When the recorder is ON, the button will blink colors, alternating between dark green and gray.

The window on the right is displayed if the "Show RECORDER START-STOP Button" is NOT selected. In this case, the recorder runs whenever the program is running.

NOTE: Whenever the recorder is started, OR, whenever any of the setup parameters are changed, a new header line is inserted into the data file.

The Folder where the recorded file is stored has a default setting of "C:\EFIS". This can be changed in the Setup Page by clicking the CONFIGURATION button.

DATA FILE NAME

The record data File name is created automatically, based on the computers date. The file name will be EFISmmddyy.TXT. The Record file is a tab delimited file and can read by any text editor or spreadsheet program. Keep in mind that Microsoft Excel is limited to 65,000 lines.

Whenever Waiters Flight Data Recorder is started, it will always write a new line that contains the field headers. The headers are tab delimited, just like the data, and make it easy to identify the fields when loaded into a spreadsheet program.

Header fields are only included for the item being recorder, EFIS, GPS, or ENGINE. Header fields are enabled by selecting a valid COM port. If a COM port is anything other than "NONE", then

fields are created, and the corresponding data is recorded. If the COM port is "NONE" than the fields are NOT created, and the data is NOT recorded.

These two fields will Always be created, and are always the first two fields in each record.

COMPUTER TIME
UNITS

The following fields are also created if their corresponding COMM PORT is selected to record data.

UPDATE TIMES

RECORDER - Recording in "Real Time" will require a significant amount of disk space (65 data records per second). Unless its absolutely necessary to capture this high of a resolution, I recommend ¼ sec or even 1 second intervals.

NOTE - When REAL TIME is selected for the recorder sample rate on the SETUP screen. This enables the F8 key

Pressing F8 will toggle between REAL TIME (F8) and 1 SEC (F8) . This allows the recorder operator to change the recording speed on the fly without the need to goto the SETUP screen.

Remember, F8 ONLY works when REAL TIME is selected.

MAIN and EFIS. This is the update rate of the Main WFDR screen and the EFIS Instrument screen. If your computer will not handle the high rates of 65 updates per second, I recommend setting the update to 75 milliseconds. This will significantly improve the computers performance, with a negligible impact on the data displayed to the operator/pilot.

EFIS PLAYBACK FILE

EFIS Playback Window

When a file is selected for playback, the data from each record is displayed on both the MAIN screen and the EFIS instrument screen

FILE NAME WIINDOW - This sub window is displayed when "FILE" is selected for the EFIS device.

The File window shows the name of the file selected. If you place the mouse over this window, a small text window pops up and displays the entire path for the play back file.

The slider allows the user to move through the file and select different record for display.

The RECORD window shows the record that is currently display.

The status light shows if the record was correctly parsed (GREEN = OK)

The Total number of records in the file is displayed in the RECORDS window

PLAYBACK SPEED

The Playback slider allows the operator to playback the records at different speeds by moving the slider between STOP and FAST.

STOP – Clicking on the STOP label will stop the playback at the current record.

PLAYBACK SPEED – Clicking here will set the playback speed at the medium level.

FAST – Clicking here will set the playback speed at the fastest speed.

DYNON EMS 10 ENGINE DATA SCREEN

Dynon EMS Data Screen

Review the Dynon EMS 10 manual for the meaning/applicability of the data.

Click on any of the fields to view the raw serial stream.

NOTE – Hobbs Time, Tach Time, and the six contacts are only available using the *CSV file read feature. These items are NOT part of the live EMS serial data stream transmitted out the serial port.

FILES

Playback of EMS files is identical to that discussed in the EFIS section.

ALSO – See the

GRAND RAPIDS 4000/6000 ENGINE DATA SCREEN

GRAND RAPIDS 4000/6000 ENGINE DATA SCREEN

NOTE

No Unit conversion is performed. The units recorded in the data file, and the units displayed on this screen are the same as the units displayed on the Grand Rapids screen.

The HEADER box (MISC) displays the header version being received by the recorder. Currently, only two headers are supported, $FE-$FF-$FE and , $FE-$FE-$FE .

The small green box to the right of the HEADER will turn bright green when one of these two headers has been received and decoded.

COMM PORT AND CONFIGURATION SETTINGS
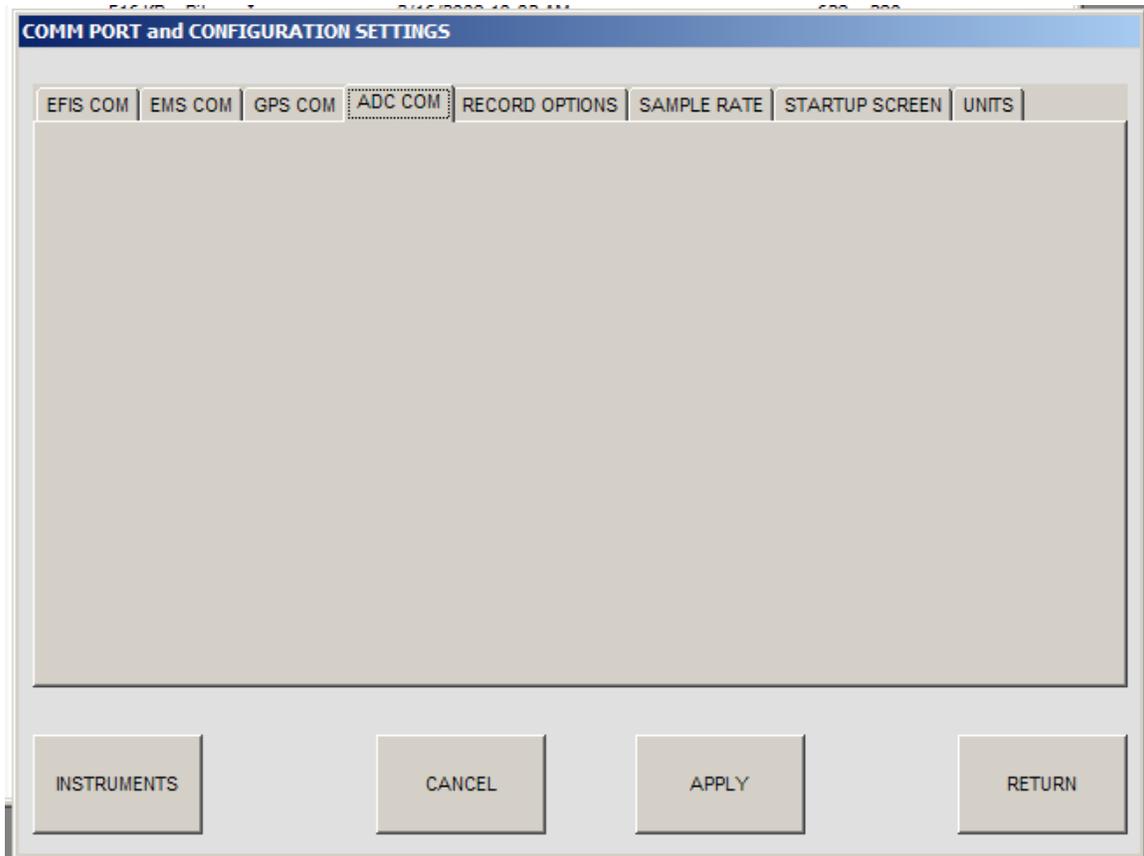
COMM PORT AND CONFIGURATION SETTINGS

NOTE – The ADC tab is for future incorporation of Air Data Computer information. It is currently not used.

The Configuration screen allows the user to customize all of the program parameters for their particular needs.

Select the item of interest from the top tab.

INSTRUMENTS

Calls up the Configuration screen for the EFIS and Engine monitor instruments.

CANCEL

The CANCEL button will cause any UNACCEPTED changes to flip back to the original settings. Once the ACCEPT button has been pressed, the CANCEL has no effect.

APPLY

Accepts and saves the changes that have been made. The screen does not change (See RETURN)

RETURN

The RETURN button will accept all changes made, then return to the MAIN screen.

EFIS / GPS / EMS   COM PORT SETTINGS TAB

The three Serial Comm Port tabs all look identical, but there are a couple minor differences.

1) READ COMM / READ FILE is only supported on the EFIS and Engine monitor. The GPS doe not support READ FILE.

2) There are currently three styles of EMS supported. Dynon, GR2000, and GR4000/6000.

EFIS, GPS, and EMS Port Settings

The Com port settings portion of the screen allows you to change com port settings, and reassign the folder where the recorded data will be written.

This portion of the screen is identical to all three, EFIS, EMS, and GPS.

Clicking on any of the parameters will cause the corresponding "ACCEPT" button to turn red. This serves as a reminder that you may have made changes to the port settings. You MUST click the ACCEPT button to activate any changes.

The ACCEPT button causes some rudimentary error checking to occur. If the port settings are legal, the ACCEPT button will turn back to a gray color, the settings will be saved as the default settings, and the port will become active with the new settings.

COM1 thru COM12 are supported. Most standard rates up to 115,200 are supported.

The DISPLAY COMM button calls up the Raw Serial data screen to display any received data from the selected port.

The small green indicators to the right of the COMM PORT windows are used to display the current status of the Comm ports. These will turn bright green when data is being received and decoded on the corresponding port.

READ COMM   READ FILE

The two option buttons determine if we are reading data from the comm. Or reading data from a file.

The EFIS and EMS Playback windows are similar, The EFIS playback window is located on the MAIN screen, but ONLY when "READ FILE is selected.

The EMS Playback window is located on the EMS DATA screen, but ONLY when READ FILE is selected.

Currently, only the DYNON EFIS and DYNON EMS portions support the ability to read in a data file.

See READING / CONVERTING DATA FILES below.

GPS COM and Position Source Information

The Position Information source selects what GPS sentence to use for information. If you have a Garmin, use it. Otherwise select the Standard sentence.

RECORD TIME / UNITS TAB

COMM PORT and CONFIGURATION SETTINGS

EFIS COM | EMS COM | GPS COM | ADC COM | RECORD OPTIONS | SAMPLE RATE | STARTUP SCREEN | UNITS

RECORDER OPTIONS

Data Folder : C:\FLIGHT RECORDER

START-STOP METHOD
- ⦿ START-STOP Button   ○ RECORD Continously

1   SAVE Newest X GIG of WFDR Record Data files (1 to 100)

1   SAVE Newest X GIG of EFIS Capture files (1 to 100)

10   SAVE Newest X MEG of EMS and GPS Capture files (1 to 100)

FILE MAINTENANCE

INSTRUMENTS   CANCEL   APPLY   RETURN

RECORD TIME / UNITS TAB

RECORDER OPTIONS

Data Folder

This is the default folder where the recorded data file will be stored

START STOP METHOD

START-STOP Button You must manually start/stop the recorder or

RECORD CONTINOUSLY – The recorder starts immediately when this program starts.

SAVE NEWEST FILES

These three windows select the maximum disk space to be used for captured and recorded files.

When the program first starts, it looks at the captured and recorded files to determine how much space they occupy. If the occupied space is greater than the amount specified, the program will delete the oldest files until the newer files occupy less space than specified.

NOTE - The EFIS CAPTURE and the RECORD DATA space is specified in Gigabytes

The GPS and EMS is specified in Megabytes

FILE MAINTENANCE

Calls up the File Maintenance screen. Files can be deleted individually, or a purge can be performed. The Purge is the same process that happens when the program starts, deleting older files to ensure disk space.

SAMPLE INTERVAL TAB

RECORDER SAMPLE INTERVAL

This is the time interval between recorded entries. Keep in mind that some slower computers may not be able to keep up with the fast speeds of the serial port, or the fast write times that will be required if the recorder is operated in the "Real Time" mode.

Real Time – makes a recording entry every time the EFIS sends a complete field. This recording is done up to 63 entries per second.   If for some reason the EFIS serial port becomes disconnected, data will be recorded at a default rate of once per second.

Although Excel will be able to handle about 18 hours of data at this speed, the file will become very large and cumbersome. Try it.

¼ - 30 seconds – These intervals make a recording entry as indicated. The ¼ will make 4 entries per second, the 30 will make one entry every thirty seconds.

If you change the times, you can save the new setting by clicking on the "APPLY" button.

NOTE: If the EFIS is not used or not selected, the "REAL TIME" and "1/4 Second" record times are disabled. Normally GPS updates at once per second, so recording any faster than this is a waste of disk space.

NOTE – This selection does NOT effect the sample rate when recording in the SERIAL CAPTURE mode.

MAIN SCREEN and EFIS SCREEN UPDATE

Sets the screen update rates to the speed selected. Depending on how Waiters Flight Data Recorder is to be used, the operator/Pilot can set the speed to allow even a slow computer to be used.

A good compromise setting would be 1/4 second recording interval , 250ms MAIN screen update, and 70ms EFIS update.

NOTE – Sample does NOT affect SERIAL CAPTURE speeds. Capture happens real time, regardless.

STARTUP / UNITS TAB

EFIS COMM	EMS COMM	GPS COMM	RECORD / TIME	STARTUP /UNITS	EFIS / AIRSPEED	ENGINE MARKING

STARTUP SCREEN
- ⦿ MAIN
- ○ EMS-10 DATA
- ○ GR 4000 / GR 6000
- ○ EFIS FLIGHT INSTRUMENT
- ○ GPS FLIGHT INSTRUMENT
- ○ ENGINE FLIGHT INSTRUMENT

UNITS

	SPEED	DISTANCE	TEMPERATURE	VERT SPEED
○	Meter/Sec	Meters	Celcious	Meter/Sec
○	KiloMeter/Hour	Meters	Celcious	Meter/Sec
○	Miles / Hour	Feet	Fahrenheit	Feet / Minute
⦿	Knots	Feet	Fahrenheit	Feet / Minute

STARTUP / UNITS TAB

STARTUP SCREEN

This is great for remote display installations (i.e. in the back seat)

When the program starts, what screen should be displayed.

UNITs

The GPS and EFIS outputs data in the Metric and/or English system. The Waiters Flight Data Recorder will convert, display, and record the data in the units selected by the operator. To avoid confusion, a field in the recorded data indicates what units are being used., KPH, MPS, KNOTS, or MILES.

KPH :   Speed > Kilometers per Hour,   Altitude > Meters
MPS :   Speed > Meters per Second,   Altitude > Meters
KNOTS : Speed > Nautical Miles per Hour, Altitude > Feet
MILES : Speed > Statute Miles per Hour,   Altitude > Feet

Unit conversion can be selected real time., and takes effect immediately.

If you wish to save the changes made to the UNITS or the RECORDER time, simply press the "SAVE CONFIG" button. The settings are now saved in the INI file.

The Dynon serial output units are the same, regardless of the display units. This allows the Dynon serial data to be converted to any other units.

IMPORTANT - The units output by the Grand Rapids serial data mimics their display. Therefore this program does not do unit conversion on Grand Rapids data, as it has no way of knowing what the units the current data is in.

AIRSPEED MARKINGS TAB

COMM PORT and CONFIGURATION SETTINGS

| EFIS / AIRSPEED | ENGINE MARKING |

EFIS / AIRSPEED

If Airspeed > XXX, then display this color

Indicator Maximum	240	
Vne	210	
Vno	140	
Vfe	80	
Vs1	60	
Start color		

VERT SPEED

MIN / MAX   2000

G METER

MAX   5

AOA Angle of Attack

MAX SCALE	40
RED Start	30
YEL Start	22
MIN SCALE	15

COMM RECORDER   CANCEL   APPLY   RETURN

AIRSPEED MARKINGS TAB

The Airspeed markings will be applied to three airspeed indicators:

EFIS Airspeed Tape on the EFIS Instrument Screen

GPS Airspeed indicator on the GPS Instrument Screen

Grand Rapids Airspeed indicator on the Grand Rapids Engine screen.

NOTE – If the Indicator Maximum is set to ZERO, the Airspeed indicator will not be displayed.

ENGINE MARKINGS TAB

				Oil Temp	Oil Pres	Voltage	AMPS	FuelPres	FuelFlow	Fuel Left	Fuel Right
EFIS COMM	EMS COMM	GPS COMM	RECORD / TIME	STARTUP /UNITS		AIRSPEED MARKING		ENGINE MARKING			

ENGINE MONITOR

	Oil Temp	Oil Pres	Voltage	AMPS	FuelPres	FuelFlow	Fuel Left	Fuel Right
MAX SCALE	300	100	20	60	10	15	25	25
RED (HIGH)	260	80	17	50	9	14		
YELLOW	240	70	16	40	9	14		
YELLOW	140	25	12	1	3	2	8	8
RED (LOW)	100	15	10	-1	2	1	4	4

	RPM		CHT	EGT	MAN PRES
MAX SCALE	3000	MAX SCALE	550	1600	30
RED Start	2700	RED (HIGH)	450	1500	29
YEL Start	2650	YELLOW	425	1400	28
YEL Stop	2300	MIN SCALE	150	800	0
YEL Start	2200	DISPLAY CYLINDERS	☑ ☑ ☑ ☑ ☑ ☑		

ENGINE MARKINGS FOR DYNON EMS

EFIS COMM	EMS COMM	GPS COMM	RECORD / TIME	STARTUP /UNITS	EFIS / AIRSPEED	ENGINE MARKING

ENGINE MONITOR

	Oil Temp	Oil Pres	Voltage	FuelFlow	Quantity
MAX SCALE	300	100	20	15	25
RED (HIGH)	260	80	17	14	
YELLOW	240	70	16	14	
YELLOW	140	25	12	2	8
RED (LOW)	100	15	10	1	4

	RPM		CHT	EGT
MAX SCALE	3000	MAX SCALE	550	1600
RED Start	2700	RED (HIGH)	450	1500
YEL Start	2650	YELLOW	425	1400
YEL Stop	2300	MIN SCALE	150	800
YEL Start	2200	DISPLAY CYLINDERS	☑ ☑ ☑ ☑ ☑ ☑	

ENGINE MARKINGS FOR GRAND RAPIDS EMS

ENGINE MARKINGS

The Engine markings can display to different sets of markings, depending if it's a Dynon or a Grand Rapids.

In both cases, setting the MAX SCALE to ZERO will remove that particular item from the display.

SPECIAL CONSIDERATION

AMP gauge – The AMPS gauge reads PLUS to MINUS, So, The MAX SCALE setting is also applied to the minimum scale. In the example above, the AMP scale will be from –60 to +60 amps.

CHT / EGT

These two gauges share the same gauge, but display with different pointers. The scales do not have the temperature markings but are used as a reference to each other.

If you keep both scales with spans of 400, this will make for a pleasing display.

i.e.   CHT MAX = 600   CHT MIN = 200   (600-400=200)

EGT MAX = 1500   EGT MIN = 700   (1500-700=800) (800 is a multiple of 400)

GPS SETUP TAB
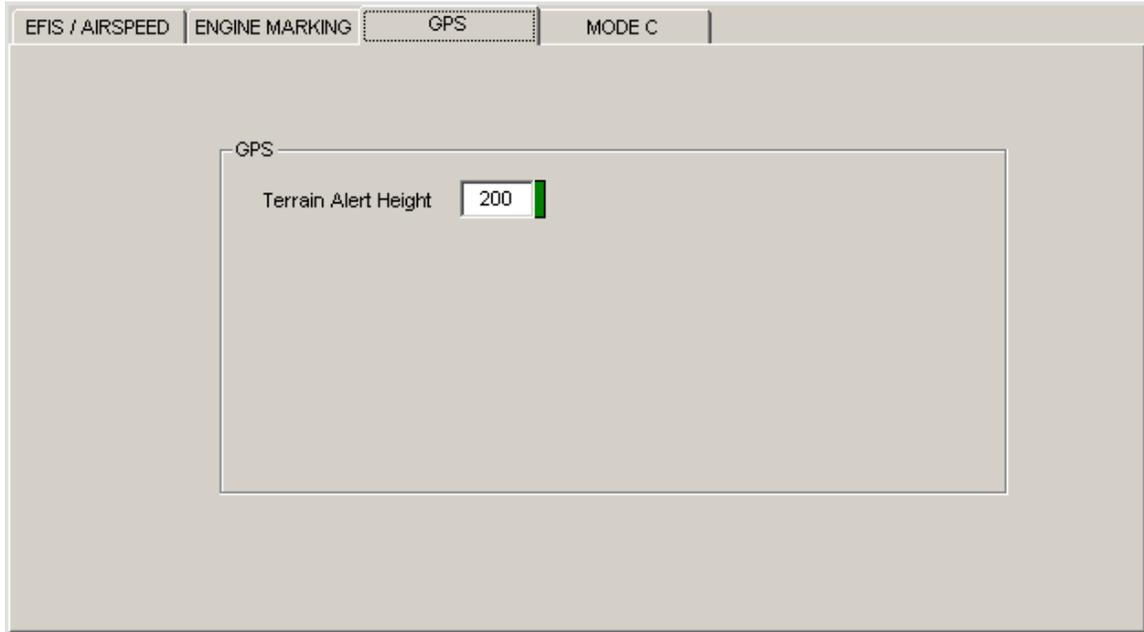
| EFIS / AIRSPEED | ENGINE MARKING | GPS | MODE C |

GPS

Terrain Alert Height   200

GPS SETUP TAB

Terrain Alert Height – 0 to 5000 ft. You can set at 0 (zero) to disable this feature.

WARNING – This alert is based the "Approximate" altitude above the terrain that is reported by the Garmin GPS Sentence.

If this sentence is NOT used, or is NOT available then the CHECK ALTITUDE will NOT be available to you.

MODE C SETUP TAB
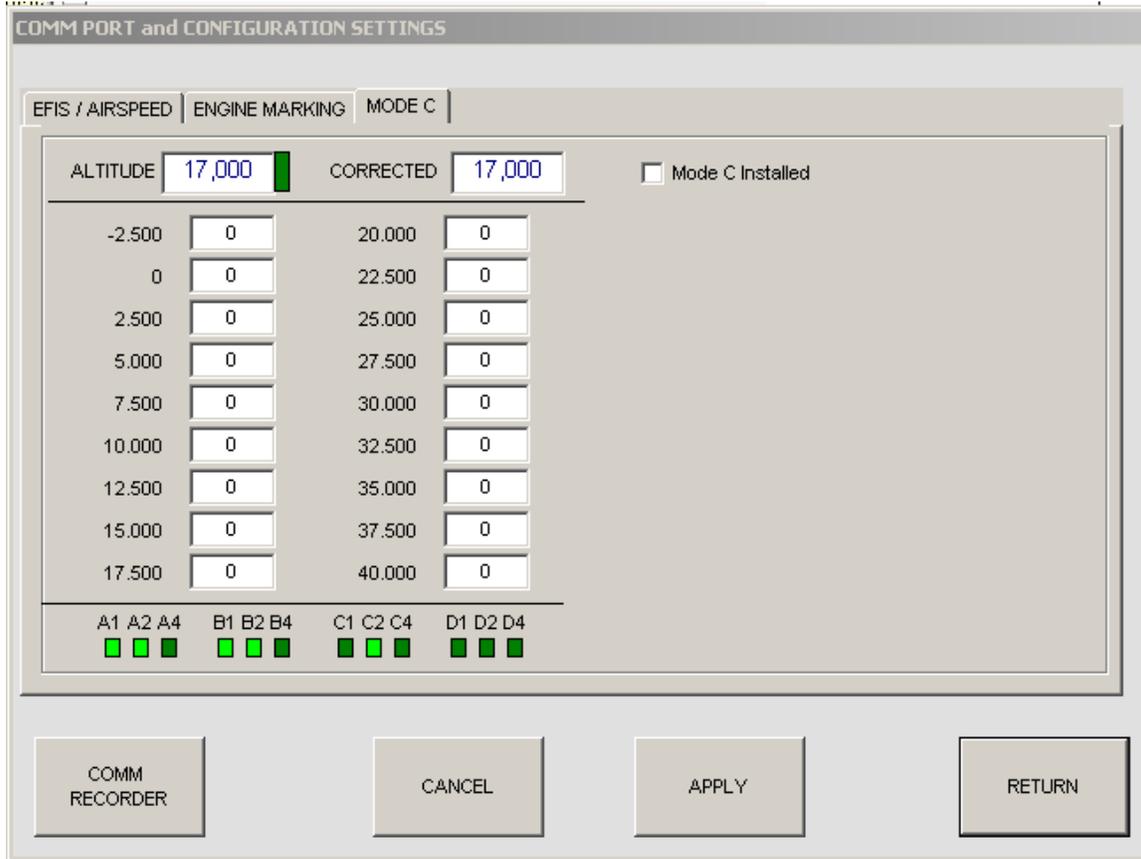
Mode C SETUP TAB

This screen is used to setup and display Mode C output data. If the supported hardware is connected, this program can supply the correct Mode C "Gray code" to a mode C transponder.

You MUST have a Dynon EFIS (it supplies the Pressure Altitude) to use this feature.

ALTITUDE

Shows the currently reported Pressure Altitude (based on 29.92, regardless of altimeter setting)

CORRECTED

The correction data from the table is applied to the ALTITUDE. This will be the altitude that the Gray Code is based on.

CORRECTIONS WINDOWS

The corrections are accumulative.

Example; If your at 4500 ft, the –2500, 0 and 2500 correction will be applied.

If your at FL180, All the corrections up to 17,500 are applied.

Mode C Installed

Indicates that the Hardware is connected to the computer to output gray code to the transponder

NOTE - This will be added in the near future.

A1 – D4 DATA INDICATORS

 These indicators show what the current Gray Code outputs will be for the current altitude.

GPS / GARMIN Information

GPS STANDARD NMEA SENTENCE

$GPGGA - Essential Fix Data Sentence

Fix Time (UTC)	Sats Tracked	Fix	Horizontal Dilution	Altitude (Meters)	Geoid Height
1102:26	5	1	5.3	119.1	51.2

Latitude	Longitude
N 41:36.5877	W 083:28.3961

$GPRMC - Essential Fix Data Sentence

Fix Date	Fix Time	STAT	Speed	Track	Mag Var
15/04/08	1102:25	A	000.0	000.0	

Latitude	Longitude
N 41:36.5877	W 083:28.3961

$GPGSA - DOP and Active Satellites

SV # Used	Sel	Fix	PDOP	HDOP	VDOP

Still working on this page

$GPGSV - Vehicle Status

Sent: 3
Sats: 10

○ SNR #
○ SAT #

> 35
> 10
< 10

$GPVTG - Velocity Made Good

True	Magnetic	Knots	kph

$GPBOD - Bearing - Origin to Destination

True	Magnetic	Start WPT	Dest WPT

GARMIN SENTENCE | GPS INSTRUMENTS | RETURN

Garmin Information Screen

Each window contains the data that is supplied for that particular NMEA-0183 Sentence.

Note in the upper right corner of the window is an indicator light. This turns bright green when the particular sentence has been detected and decoded.

The Tool Text Tip over each entry supplies a little more detail. Move your mouse over the text and a small window will pop up.

NOTE – Units on this page are NOT corrected to the Units selected on the setup screen. These are the Units that are reported by the individual sentences.

VEHICLE STATUS – 0,30,60 are degrees above the horizon(Center is straight up or 90 degrees) Move your mouse over each of the SV icons to see more information.

Garmin Information Screen

Each window contains the data that is supplied for that particular Garmin Sentence.

Note in the upper right corner of the window is an indicator light. This turns bright green when the particular sentence has been detected and decoded.

Note the window in the lower right corner, Standard NMEA-0183, These light indicate the reception and decoding of data in the standard NMEA 0183 sentences.

The Tool Text Tip over each entry supplies a little more detail Move your mouse over the text and a small window will pop up.

NOTE – Units on this page are NOT corrected to the Units selected on the setup screen. These

FILE MAINTENANCE

FILENAME	TYPE	CREATED	SIZE	
WFDR_EFIS_031708.DAT	EFIS	3/17/2008 1:16:54 PM	602667	
WFDR_EMS_031708.DAT	EMS	3/17/2008 2:41:31 PM	130321	
WFDR_GPS_031708.DAT	GPS	3/17/2008 2:45:52 PM	43758	
WFDR_031707.TXT	TXT	3/17/2008 3:24:53 PM	357	
WFDR_031708.TXT	TXT	3/17/2008 3:24:53 PM	119243	

File Maintenance

	EFIS			EMS			GPS			RECORDER		
FILES	SIZE (Gig)	MAX	FILES	SIZE (Meg)	MAX	FILES	SIZE (Meg)	MAX	FILES	SIZE (Gig)	MAX
1	0.001	1	1	0.130	10	1	0.044	10	2	0.000	1

PURGE FILES   DELETE FILE   RETURN

FILE MAINTENANCE SCREEN

Serial Captured files will be of TYPE EFIS, EMS or GPS. Recorder files will be of type TXT.

A new Capture file is started at the top of the hour. The file name includes the date and hour.

The status windows at the bottom of the page show the current number of files, the current total disk space occupied, and the MAX space that was specified on the Recorder Options screen.

PURGE   will cycle through and delete the older files if the MAX space is exceeded.

DELETE will delete the file that selected in the list. The user is prompted with a "Are you Sure" message box.

READING / CONVERTING DATA FILES

The READ FILE option is available for the DYNON EFIS and DYNON EMS devices only.
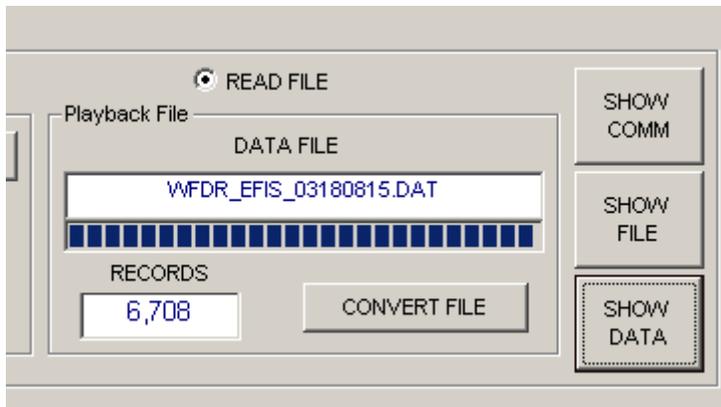
READ FILE SUB WINDOW

To read, playback and convert a file , select the READ FILE option.

Doing this will enable the Playback File sub window and disable the COMM sub window.

HOW IT WORKS

There are currently two file types that can be recalled for EFIS or EMS playback (*.DAT and *.CSV). Playback for the EFIS only supports *.DAT files.

*.DAT Files

Raw serial data from either the Dynon EFIS or EMS can be saved with this program, a serial capture device, or a terminal program, like Hyperterm. When you name the file, use a *.DAT extension.

NOTE – Waiters Flight Data Recorder will automatically save the serial captured as :

      "WFDR_XXXX_mmddyy_hh.DAT"

            XXXX = EFIS, EMS, or GPS
            Mmddyy = Month, Day, Year
            Hh = hour (24 hour format)

Example: WFDR_GPS_031908_08.DAT

*.CSV Files

EMS ONLY - As part of the latest release from Dynon, The EMS devices –EMS D10, EMS D120, and the DEK D180 can now internally record EMS parameters. These parameters can then be downloaded from the EMS device and saved to a *.CVS file. You can download the PC utility from the Dynon web site that performs this function.

READING A FILE

Click on the DATA FILE window. This will call up a standard OPEN Dialog box.

If the file is a *.DAT (EFIS or EMS) type file, it is read in and placed on the Data Display screen.

If the file is a CSV file (EMS ONLY), the "EMS raw data" field is parsed out and placed in the Data Display screen.
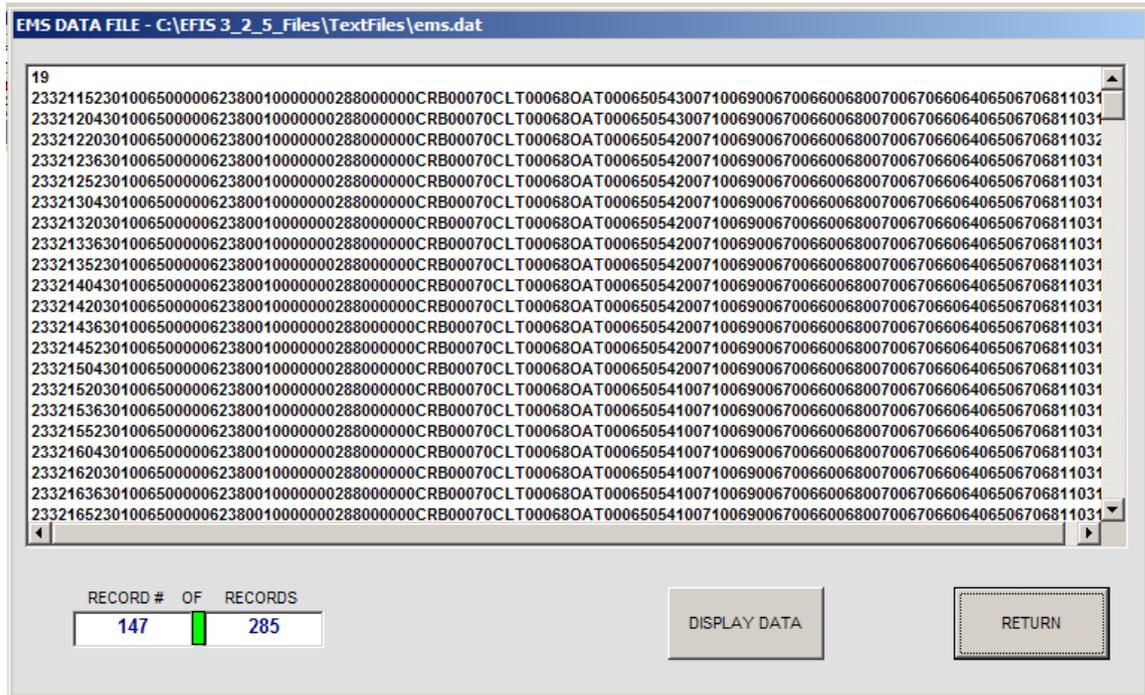
DATA FILE DISPLAY SCREEN (EMS DATA)

Clicking on the DISPLAY DATA button will take you to the MAIN screen (EFIS DATA DISPLAY) or the DYNOEMS Screen (Dynon EMS data display)

Both of the screens have a FILES Window that's used to scroll through the records.

File Playback Window

When a file is selected for playback, the data from each record is displayed on both the MAIN screen and the EFIS instrument screen

FILE NAME WIINDOW

This sub window is displayed when "FILE" is selected for the EFIS device.

The File window shows the name of the file selected. If you place the mouse over this window, a small text window pops up and displays the entire path for the play back file.

The slider allows the user to move through the file and select different record for display.

The RECORD window shows the record that is currently display.

The status light shows if the record was correctly parsed (GREEN = OK)

The Total number of records in the file is displayed in the RECORDS window

PLAYBACK SPEED

The Playback slider allows the operator to playback the records at different speeds by moving the slider between STOP and FAST.

STOP – Clicking on the STOP label will stop the playback at the current record.

PLAYBACK SPEED – Clicking here will set the playback speed at the medium level.

FAST – Clicking here will set the playback speed at the fastest speed.

PLAYBACK WARNING

Data from the Playback file is parsed and displayed on the data screen and the Instrument screen.

Example – If playing back an EFIS file, View the MAIN screen to look at the data, You can also look at the EFIS Flight Instruments to see the data displayed on the flight instruments.

When Playback is selected for the EFIS or EMS , a warning bar blinks at the bottom of the EFIS and EMS instrument screens.
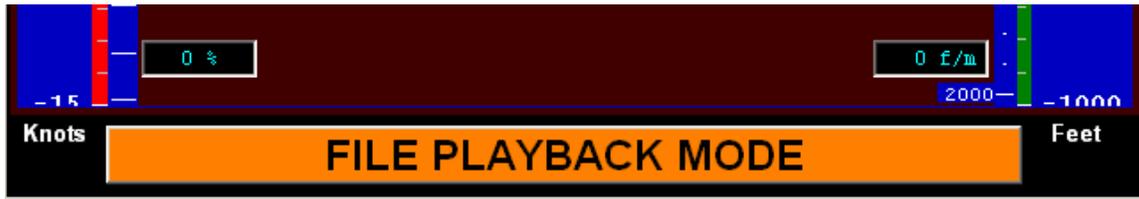
PLAYBACK WARNING BAR

CONVERT

Convert a serial capture data file to a text file capable of being read by Excel.

With a file selected for conversion, you will be asked where to save the file. The default location will be the folder where the capture file came from (C:\FLIGHT RECORDER)

When the conversion process begins, a Status bar will display just below the file name window. This will show the current file conversion status.

You can hit CANCEL at any time to abort the conversion process.
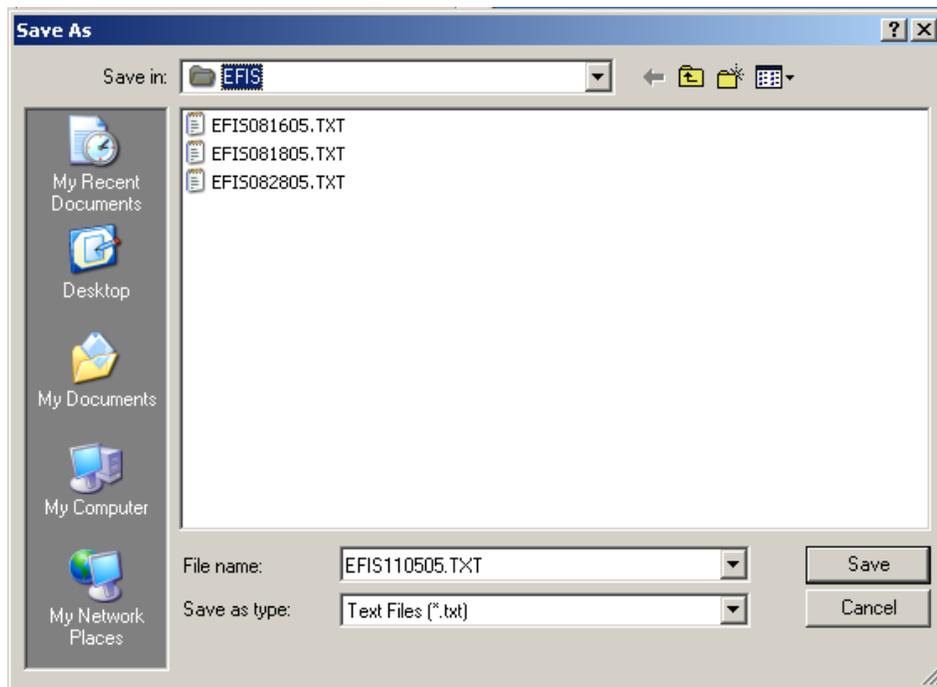
File Save As Dialog Box

COM PORT RAW DATA

The COMM Port Raw Data screen displays data as its received from the Serial Port. Clicking on any of the Main or Engine data screen windows will call up this screen.

Below are sample of data that will be displayed when called up from the EFIS or Engine screens.
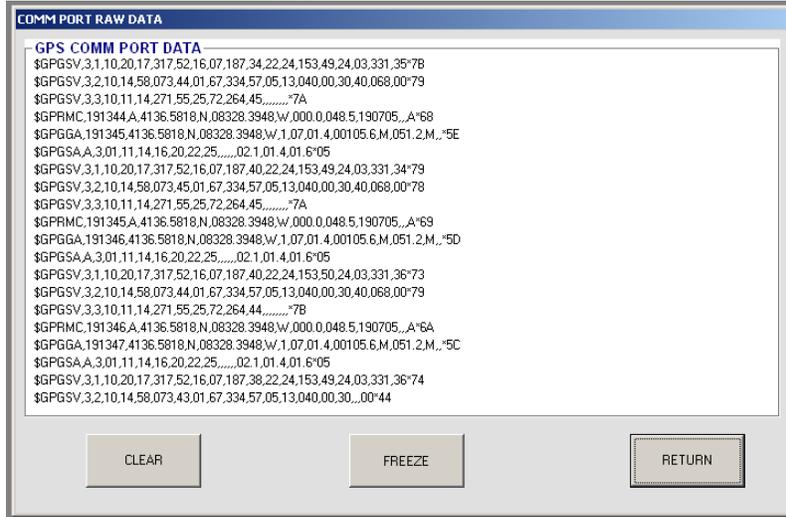
SAMPLE – GPS DATA
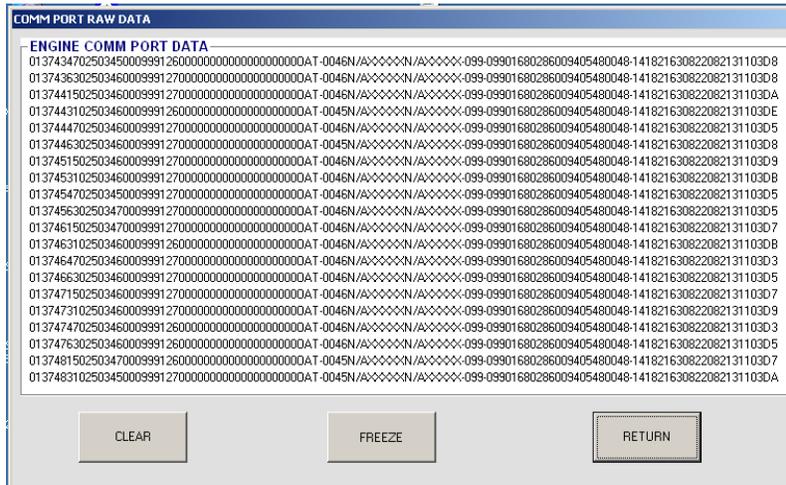
SAMPLE – DYNON EMS ENGINE DATA

COMM PORT RAW DATA

ENGINE COMM PORT DATA

```
$FE $FE $FE $00 $00 $00 $45 $00 $45 $00    $45 $00 $45 $00 $48 $00 $48 $00 $43 $00    $43 $00 $43 $00 $43 $00 $49 $00 $48 $FF
 $FF $00 $00 $00 $00 $00 $00 $00 $78 $00    $00 $53 $4D $00 $7F $00 $51 $13 $00 $04    $00 $0C $00 $00 $01 $2E $00 $3B $00 $00
 $01 $7C $0B $10 $08 $00 $00 $00 $00 $00    $00 $00 $00 $00 $00 $6C $62

$FE $FE $FE $00 $00 $00 $45 $00 $45 $00    $45 $00 $45 $00 $48 $00 $48 $00 $43 $00    $43 $00 $43 $00 $43 $00 $49 $00 $48 $FF
 $FF $00 $00 $00 $00 $00 $00 $00 $78 $00    $00 $53 $4D $00 $7F $00 $51 $13 $00 $04    $00 $0C $00 $00 $01 $2E $00 $3B $00 $00
 $01 $7C $0B $10 $08 $00 $00 $00 $00 $00    $00 $00 $00 $00 $00 $6C $62

$FE $FE $FE $00 $00 $00 $45 $00 $45 $00    $45 $00 $45 $00 $48 $00 $48 $00 $43 $00    $43 $00 $43 $00 $43 $00 $49 $00 $48 $FF
 $FF $00 $00 $00 $00 $00 $00 $00 $78 $00    $00 $53 $4D $00 $7F $00 $51 $13 $00 $04    $00 $0C $00 $00 $01 $2E $00 $3B $00 $00
 $01 $7C $0B $10 $08 $00 $00 $00 $00 $00    $00 $00 $00 $00 $00 $6C $62

$FE $FE $FE $00 $00 $00 $45 $00 $45 $00    $45 $00 $45 $00 $48 $00 $48 $00 $43 $00    $43 $00 $43 $00 $43 $00 $49 $00 $48 $FF
 $FF $00 $00 $00 $00 $00 $00 $00 $78 $00    $00 $53 $4D $00 $7F $00 $51 $13 $00 $04    $00 $0C $00 $00 $01 $2E $00 $3B $00 $00
 $01 $7C $0B $10 $08 $00 $00 $00 $00 $00    $00 $00 $00 $00 $00 $6C $62

$FE $FE $FE $00 $00 $00 $45 $00 $45 $00    $45 $00 $45 $00 $48 $00 $48 $00 $43 $00    $43 $00 $43 $00 $43 $00 $49 $00 $48 $FF
 $FF $00 $00 $00 $00 $00 $00 $00 $78 $00    $00 $53 $4D $00 $7F $00 $51 $13 $00 $04    $00 $0C $00 $00 $01 $2E $00 $3B $00 $00
 $01 $7C $0B $10 $08 $00 $00 $00 $00 $00    $00 $00 $00 $00 $00 $6C $62
```

CLEAR   FREEZE   RETURN

SAMPLE – ENGINE GRAND RAPIDS DATA

Shown above are three samples , GPS data and the Dynon and Grand Rapids Engine data.

This screen shows the last 20 lines of data received from either the EFIS, GPS, or EMS com ports. The newest line comes in at the bottom, and scrolls up. Displays 20 lines only, cannot be scrolled.

NOTE: Due to the type of encoding used by the Grand Rapids EMS, The Serial data stream is converted to a HEX for display purposes. The fields are then placed in groups of 10, 3 groups per line. In the example above, there are 77 data fields display over the three lines of GR data.

NOTE: The GR2000 will display data in a similar fashion, HOWEVER, it only contains 48 bytes of data. (The GR4000/6000 contain 77 bytes)

CLEAR

Clears the 20 lines of scrolling text.

FREEZE

Toggles ON / OFF - Freezes the display. When the display is frozen, the button turns red. Freezing does NOT effect the received data coming into the com port, or the recorder itself.

Freezing the screen keeps it from being updated by received data. This is useful for examining data that is scrolling by fast.

RETURN

Return to the previous display

ANALYSIS

This feature will be available soon

FUEL FLOW

Display selection EGTs, CHT, fuel flow, airspeed, altitude, RPM

Graph EGT (select 0 – 6)

Graph CHT (select 0 – 6)

Graph Fuel Flow

Graph RPM

Select DYNON, GR

RATE OF CLIMB

Graph Altitude

Graph Airspeed

Graph ROC

Display Altitude, Airspeed, ROC

Select from DYNON, GR, GPS, filter

SAVE DATA POINT

EFIS DISPLAY
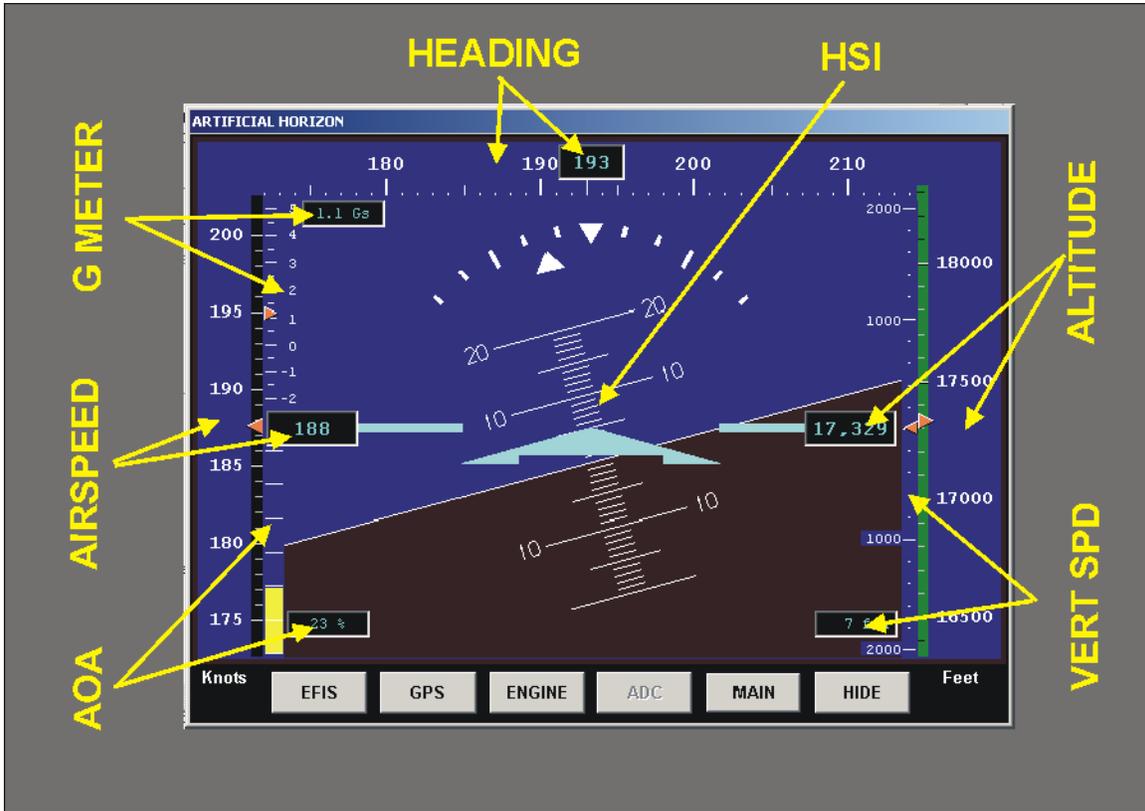
EFIS DISPLAY

Screen display. This uses the Serial Data from the Dynon EFIS. Markings for the airspeed tape ar
taken from the IRSPEED MARKINGS configuration. The Units are converted as per the UNITS
CONVERSION configuration.

This display will show Real time serial data OR file playback.

If Communications is lost, the legends blink RED
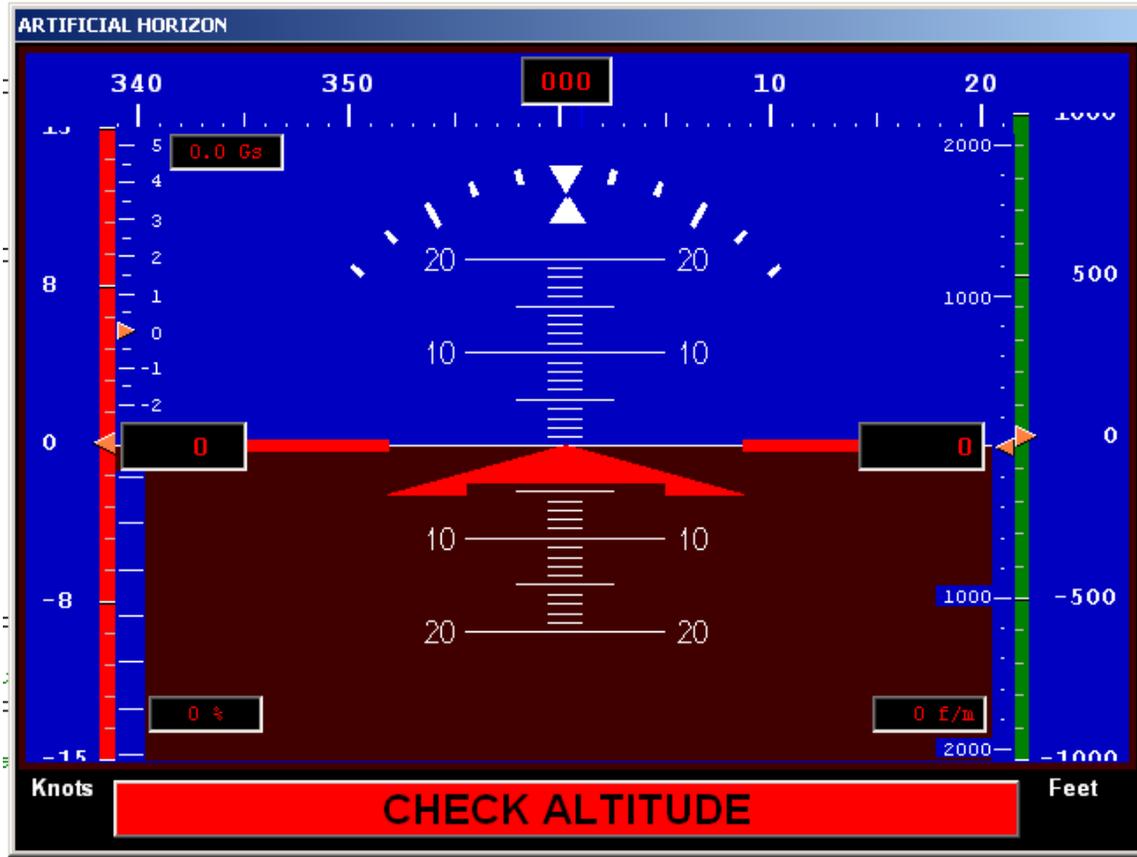
EFIS CHECK ALTITUDE alert

If the Altitude Alert is enable (GPS Instrument Setup Screen) the bottom of the screen will blink.

WARNING – This alert is based the "Approximate" altitude above the terrain that is reported by the Garmin GPS Sentence.

If this sentence is NOT used, or is NOT available then the CHECK ALTITUDE will NOT be available to you.

DYNON ENGINE MONITOR DISPLAY
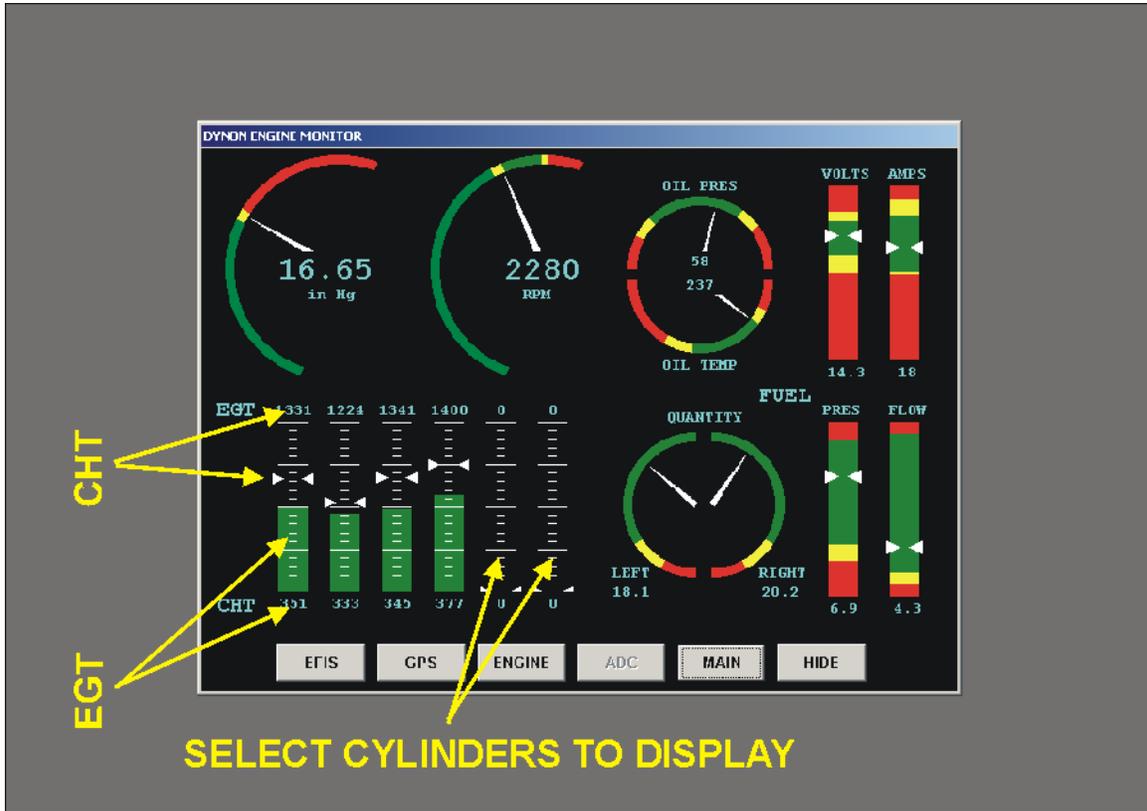
Dynon Engine Monitor Display

Markings are taken from the ENGIN MARKINGS screen.

This display will show Real time serial data OR file playback.

If Communications is lost, the legends blink RED

GRAND RAPIDS INSTRUMENTS
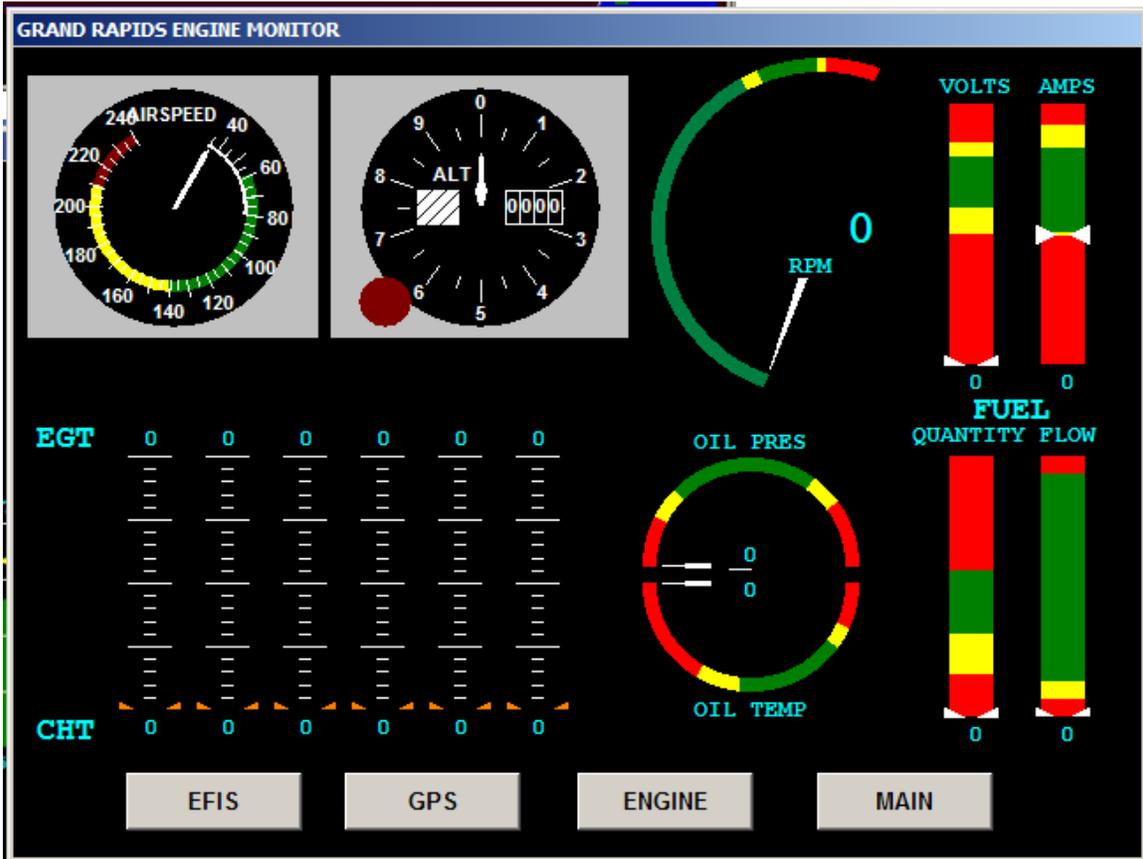
Grand Rapids Engine Monitor Display

This display will show Real time serial data OR file playback.

If Communications is lost, the legends blink RED

GPS INSTRUMENT DISPLAY
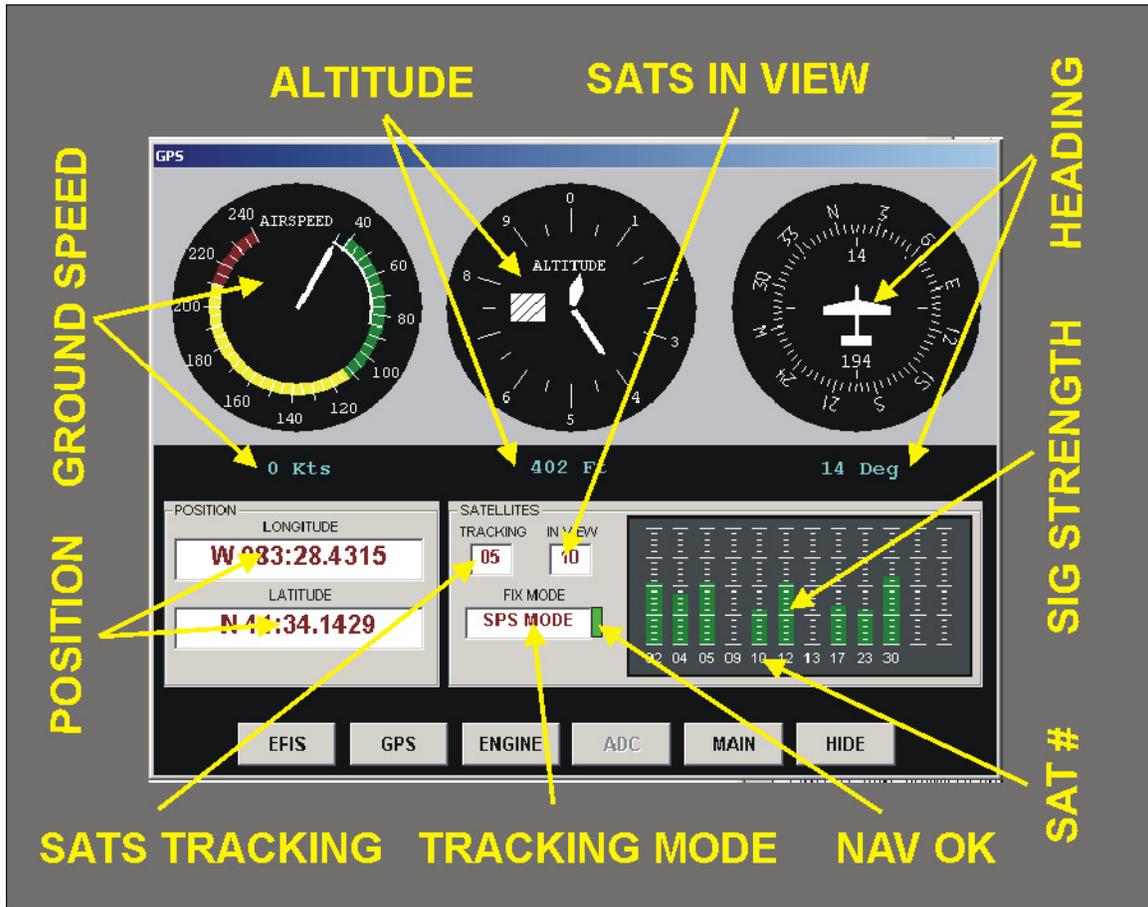
GPS Instrument Display

This display will show Real time serial data OR file playback.

If Communications is lost, the legends blink RED

KNOWN ISSUES

Setting Computer Time / Date - There are some minor variations in the GPS sentence that provides date/time. Although the software has been tested on many computers and GPS devices, I've seen one instance were the correct time was set, but the wrong date. This may have been corrected in the later versions, but keep an eye on this if you SET your date/time.

Out of Stack space – you will most likely encounter this if your running an older / slower computer, AND your attempting to record EFIS, EMS, and GPS, in the "REAL TIME" mode. If you must record real time, then turn off the EMS and GPS serial ports (select NONE.). Slow down to at least 1 second if you are recording all three items.

Set the MAIN and EFIS screen update rates to the next slower value (recommend start at 75ms)

Use the computers built in Comm ports for all high speed data (Dynon EFIS), if possible.

Grand Rapids Data – There seems to be an issue with how GR sends out the data for AUX1 through AUX6. AUX1 through AUX6 are reported as having a high and low bytes, but seems to be sent as 2's complement.

DYNON EFIS seconds don't start at ZERO – Dynon EFIS seconds are broken into 64 parts, 00 – 63. A "00" doesn't start a new second, there seems to be a slight delay, and new second start at about 05 or 06.. Look at the EFSI clock that was recorded in "Real Time";

> 15:04:29.62
> 15:04:29.63
> 15:04:29.00
> 15:04:29.01
> 15:04:29.02
> 15:04:29.03
> 15:04:29.04
> 15:04:29.05
> 15:04:30.06
> 15:04:30.07
> 15:04:30.08
> 15:04:30.09

To correct for this, the recorder software ignores the Dynon milliseconds, and assigns its own milliseconds. When the recorder sees that the seconds value has changed, it resets an internal counter to zero. This will be the first data point for a new second. As each data point is received, the counter is incremented, and the value is assigned as the New Dynon millisecond. With this correction, the recorded datapoints are now in correct chronological order, and may be sorted correctly by EFIS time.

Note that the Dynon EFSI normally sends a maximum of 64 serial data streams per second (0 – 63), BUT, NOT ALWAYS. Occasionally, the Dynon data stream will dip to as low as 59 streams per second. This is normal, as per conversation with Dynon.

COMMENTS, SUGGESTIONS, BUGS, ETC

Please contact me via e-mail:

waiter@iflyez.com

<u>APPENDIX A</u>

<u>VERSION INFORMATION</u>

3.3.16	20 Oct 2008	Correct Spelling errors in windows and documentation
3.3.15	17 Jun 2008	Fix Dynon record length error that prevented display of cvs file on instruments
3.3.14	11 May 2008	Fix Dynon EMS to display according to UNITS Fix UNITS labels on Dynon EFIS Disable Display filter when viewing Pre-Recorded data
3.3.13	2 May 2008	Fix Dynon ROC to display according to UNITS Add F8 to toggle Record sample speed
3.3.12	14 Apr 2008	Add System Tray to program
3.3.11	8 Apr 2008	Adding NMEA and Garmin data pages
3.3.10	3 Apr 2008	Add Garmin NMEA sentence parsing and display Add Low Altitude Alert (must use Garmin GPS) Alt Alert indicator on setup page GPS Setup displays all the time, not just when Garmin selected
3.3.9	2 Apr 2008	Fix Dynon csv file parsing Add Instrument display filter to Dynon EMS and EFIS
3.3.8	22 Mar 2008	Fix Index Out Of Bounds when booting for new install Fix Error 76 path not found on startup
3.3.7	20 Mar 2008	Add Ability to output Mode C Graycode
3.3.6	16 Mar 2008	Add variable update times for display and DataC Significantly improve performance for slower machines. Allow variable speed playback Serial onfig now will allow easier expansion (ADC, ARINC 429)
3.3.5	9 Mar 2008	Add CSV files to Dynon EMS display For Dynon internally recorded files
3.3.4	8 Mar 2008	Combine parsing for live and files. Makes maintenance easier
3.3.3	7 Mar 2008	Fix GR ROC parse, Parse GR file screen Add Vertical Speed, Gs, and AOA to EFIS
3.3.2	6 Mar 2008	Blink GR Monitor if Ser Lost GR-2000 included in display and parsing Fix GR Altitude and Airspeed gauges
3.3.1	5 Mar 2008	Fix F1 Recorder Crash Moved Units to Form2

3.3.0	26 Feb 2008	Add Displays
		Add XML Setup File
		Resize displays to 640x480
		Fix Dynon EFIS Status bit parsing
3.2.8	24 Nov 2007	Add File Read capability
3.2.7	18 Nov 2007	Correct GR6000 File Parse (no MAG HDG)
3.2.6	17 Nov 2007	Correct GR6000 File Parse (no MAG HDG)
3.2.5	16 Nov 2007	Correct White text backgrounds for Windows Vista
3.2.4	15 May 2007	Correct Header info on GR2000
3.2.3	12 May 2007	Add GR2000 support to the Engine Monitor
3.2.2	15 Nov	Correct GR OAT decoding scheme
3.2.1	12 Nov	Add Millisecond correction to Dynon EFIS time. Millisecond is now
		Correct the TACH2 data from GR4000/6000 (two header styles)
		Upgrade COM ActiveX to increase performance
		Upgrade COMM DISPLAY for GR to display ALL data fields
3.0.0	8 Nov	Rename to update usage from original program
		Optimize switch for CPU speed
2.4.2	5 Nov	Verify Dynon D100 compatibility
2.4.1	4 Nov	Fix GR 4000/6000 OAT decoding
		Fix Data Folder Selection bug
2.4.0	3 Sep	Clean up serial ports. Verify OPS with WinXP
		Convert GR data to HEX for display purposes
2.3.1	28 Aug	Add GR Header info display
'		Added COMM Status to GR screen
'		Added COMM status lights on main and Comm screens
		Added Comm Status to recorded Serial data
2.3.0	27 Aug	Release for GR data
2.2.4	22 Aug	Rework GR EMS data detection
2.2.3	17 Aug	Use the F1 key to toggle the recorder ON/OFF
2.2.2	16 Aug	Recorder can start/stop
'		different time format
2.2.1	15 Aug	Data file now saved in binary instead of text
'		Fixed some misspells
2.2.0	13 Aug	Add support for Grand Rapids 4000/6000

'2.1.2   6 AUG Fix EMS serial port doesn't initialize properly

'2.1.1   31 JUL Fix stack overflow problem in Receive events
'   Add EMS to recorder

'2.0.3   28 Jul Add Magnetic heading from VTG sentence

'2.0.2   27 Jul Add Kilometers per hour to scales
'   Fix minor display errors

'2.0.1   25 Jul NEW RELEASE

'1.0.7   25 Jul Enable/Disable buttons according to com ports selected
'   parse and record GPS data
'   Set computer time to GPS time

'1.0.6   23 Jul Fix com port startup error lockup
'   Clean up time displays , more user friendly
'   shut down ports when closing
'   close open files when closing

'1.0.5   22 Jul Fix Freeze button color problem when using CLEAR

'1.0.4   19 Jul Display and record Three time clocks, Computer, GPS, EFIS

'1.0.3   19 Jul Fix ACCEPT button colors They now go back to gray if everything oK
'   Added a CANCEL button on Serial Setup Screen
'   Add Serial ports display screen

'1.0.2   18 Jul Add Serial port page

'1.0.1   18 Jul Add 1/4 second time record

'1.0.0   15 Jul Orig Release

APPENDIX B

SAFEGUARDING your data

Now that you have the data file, you need to take great care to ensure that the file isn't altered or worst, accidentally deleted. I normally give my files a "READ ONLY" attribute to prevent accidental damage.

To change a files attribute to "READ ONLY", do the following;

1) Using Windows explorer, browse to the drive and folder that contains your data files.

2) Select "Edit / Select All" from the top tool bar.

3) Move your mouse onto any of the highlight files, and do a right click.
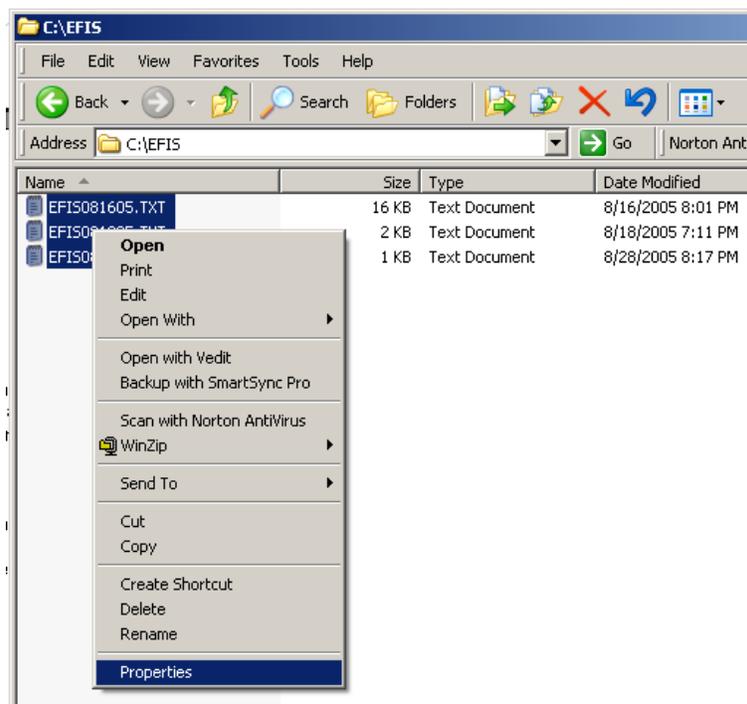
6) Scroll down to the "Properties" item, and click it, The following Screen will be displayed;
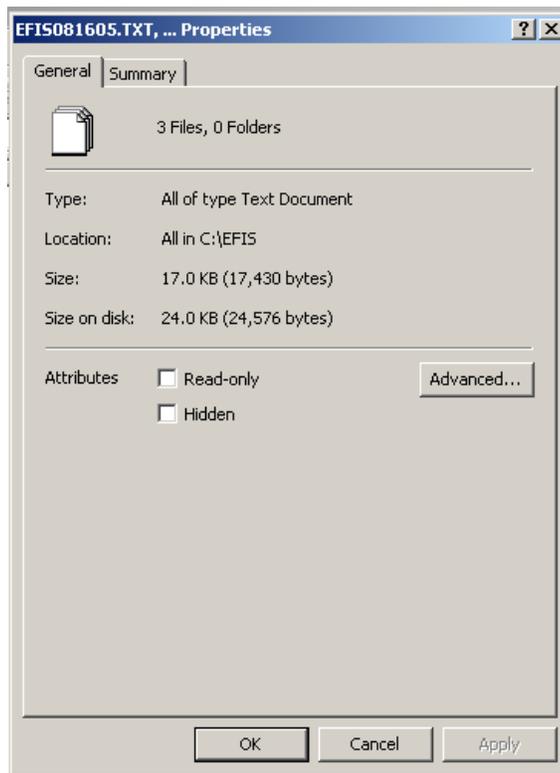
7) put a checkmark in the "Read-only" box, then hit OK. When a file is Read Only, you will be prompted with a warning before the file is deleted or overwritten.

Make ALL your data file READ ONLY,. ALSO, Make copies of the files and place them in a safe place.

APPENDIX C

Reading Data file into Microsoft Excel

1) Start Excel from the **START / PROGRAMS** button.

2) After Excel start, select **FILE / OPEN**.

3) In the OPEN dialog box near the bottom, "Files of Type" select "ALL *.*"

4) Still in the OPEN Dialog box, browse to the drive/folder of your particular data file.

5) When you find the file, click on it and the following Excel screen will open.
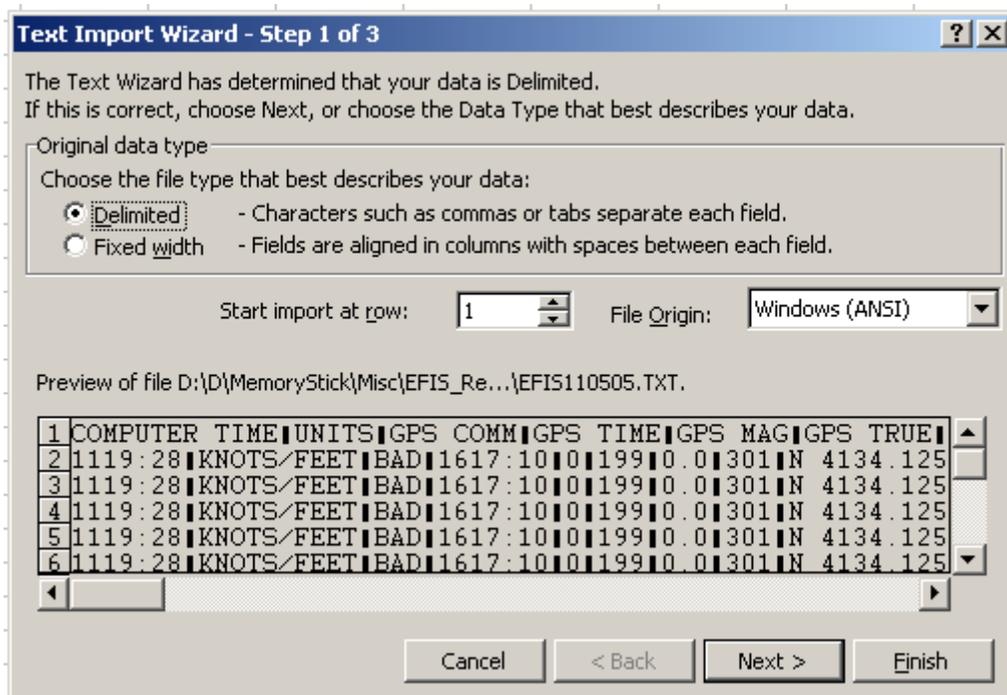
6) Make sure "Delimited" is checked, then hit "Next". The following screen will open.

7) **Make sure the "Tab" is selected for Delimiters, and "Text Qualifier", needs to be changed to "None".   Click Next and the following screen will open.**

8) **Change the "Column Data Format" to "Text". When you click "Finish", all your data will be placed in their proper column.**

9) **Before starting any analysis, you may want to "Save As" the data, so you won't have to go through this loading process again for this particular file.**

10) **Select "Files / Save As" from the main Excel screen, this will display the following screen;**
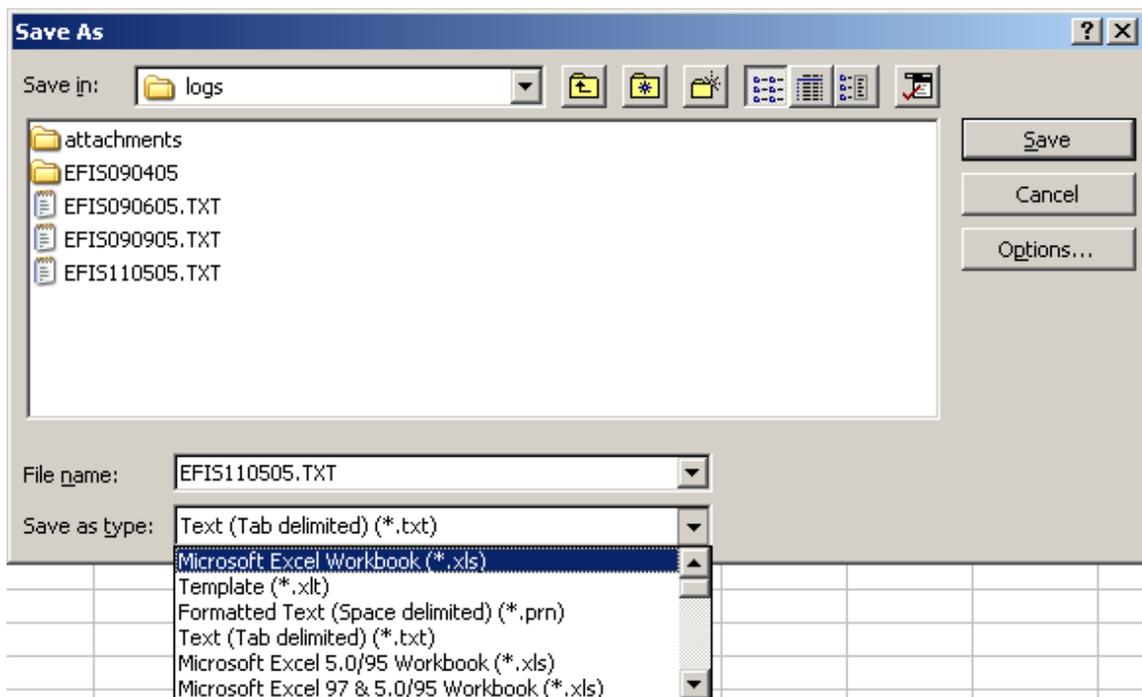
11) **In the Save as Type, select the "Microsoft Excel Workbook" as the type. When you click the Save button, your file will be saved under the same file name, but as an Excel file.**

   IMPORTANT – Doing an immediate Save As will keep you from accidentally altering or deleting your flight data. You did make them READ ONLY, Didn't you?