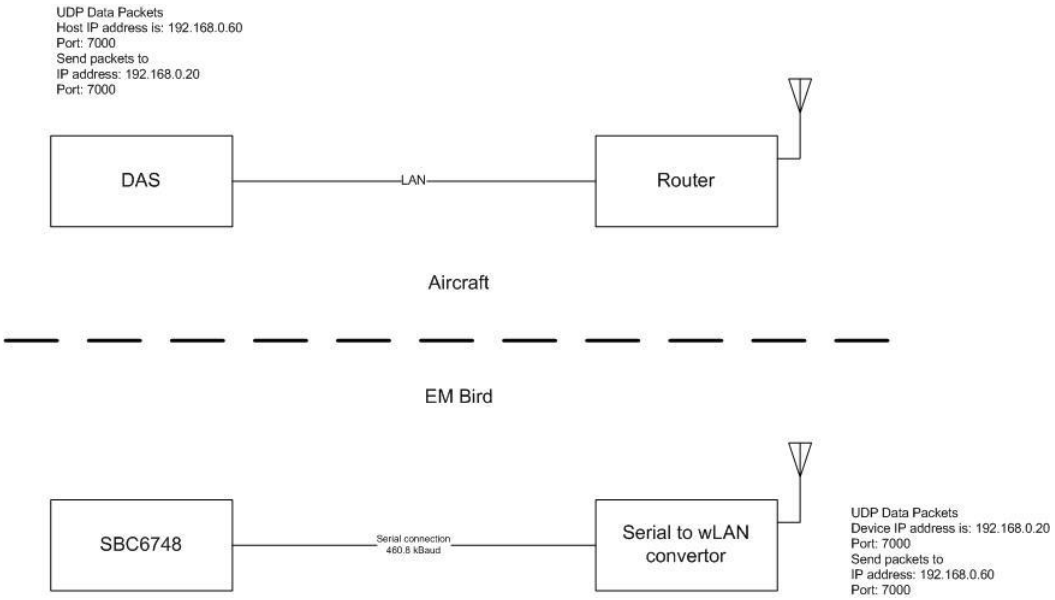
DAS Software Manual

1. Introduction

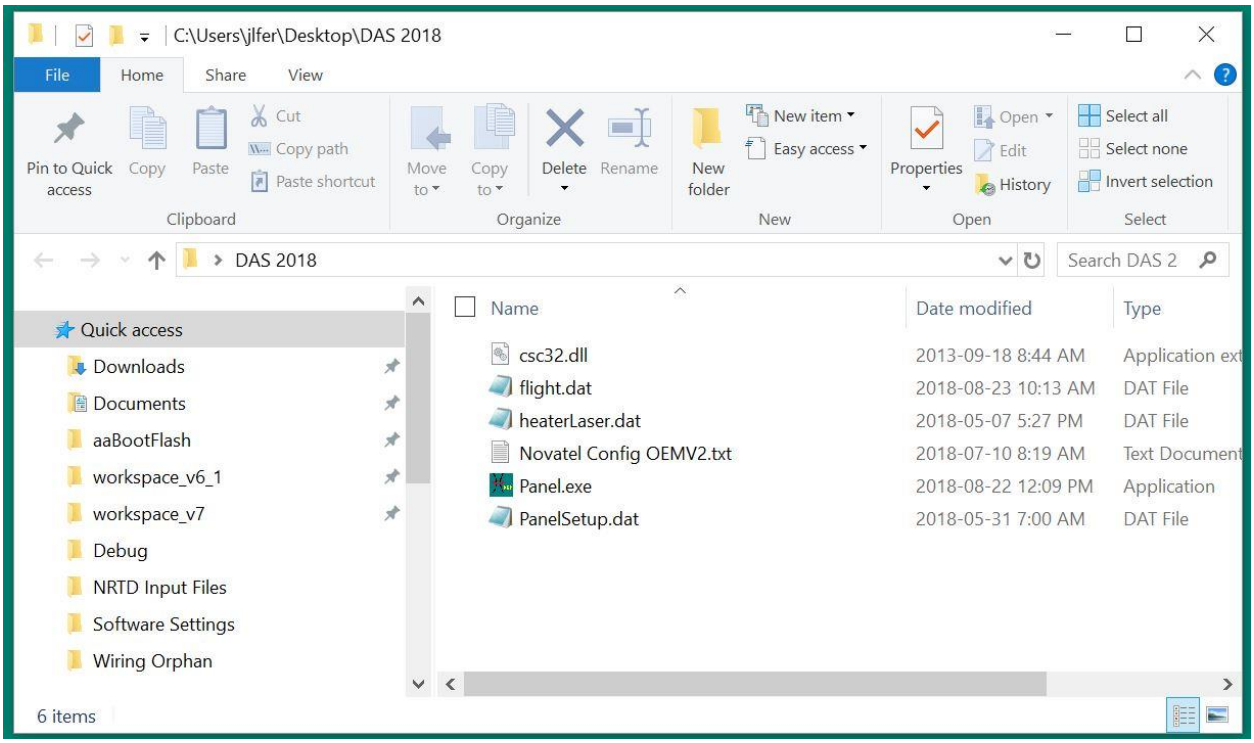
The DAS application is used to display and record the data from the EM Bird that is configured win a SBC6748 processor. It is also used to set various configuration parameters on the SBC6748 hardware in the EM Bird. The DAS application will operate on Windows 7, 8, 8.1 and 10.

The DAS app uses the connectionless UDP method to link to the EM Bird.
The DAS sends requests to the EM Bird by sending a UDP message to IP address 192.168.0.20, or port 7000.
The EM Bird sends data to the DAS app by sending a UDP message to IP address 192.168.0.60, or port 7000.



2. Required Files

The files required for the DAS application are shown below.



All these files should be in the directory where the DAS app will run.

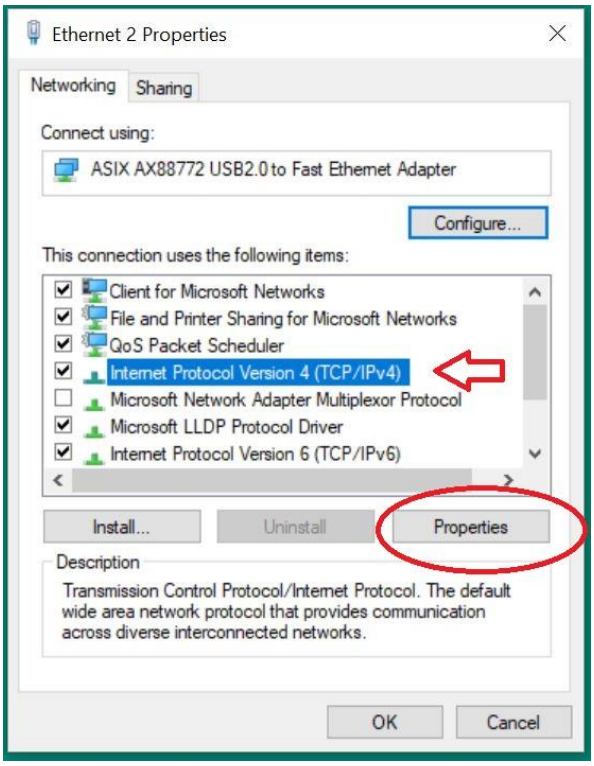
- csc32.dll
- flight.dat (*)
- heaterLaser.dat (*)
- Panel.exe
- PanelSetup.dat (*)

The files marked with (*) will be created if they do not exist. If there a formatting problem with these files they and be deleted and then recreated by the DAS App by using the Exit Save or Save options.

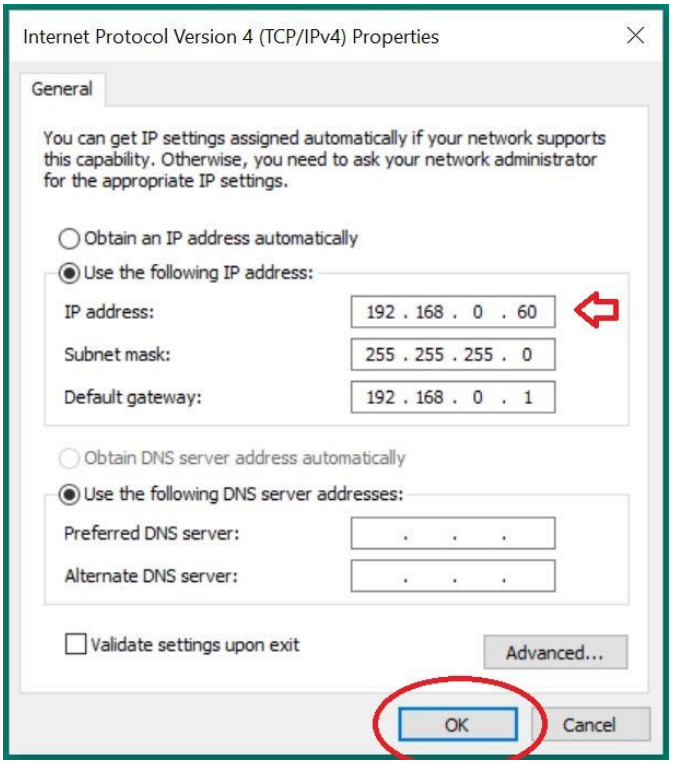
3. Network Setup

The DAS app can operate on a laptop or a PC device using a LAN or Wi-Fi connection to a router with the AP (access point) called “F2”. The EM Bird when it is powered up will automatically connect wirelessly to the same router and access point. The router is installed in the 28v power supply.

The DAS app will require the IPv4 address 192.168.0.60 to operate properly. Use the following steps to set up the LAN or wLan IP address on the PC device. Find the network device icon for the LAN port and open its properties. Then select the Internet Protocol Version 4 (TCP/iPv4) as shown below. Click on the Properties button.



For the iPv4 Protocol enter the IP address as shown in the image below. Press OK to accept the settings that have been entered.



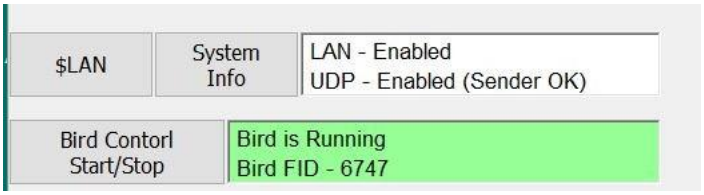
The DAS App will work properly with a wired LAN connection to the router or wLan connection to the router. Only one should be implemented to provide the connection. Note that the wired LAN connection is more stable that the wLan connection. With the wLan connection occasional data dropouts will occur.

4. Application Start up

To use the DAS application, run the app named Panel.exe.

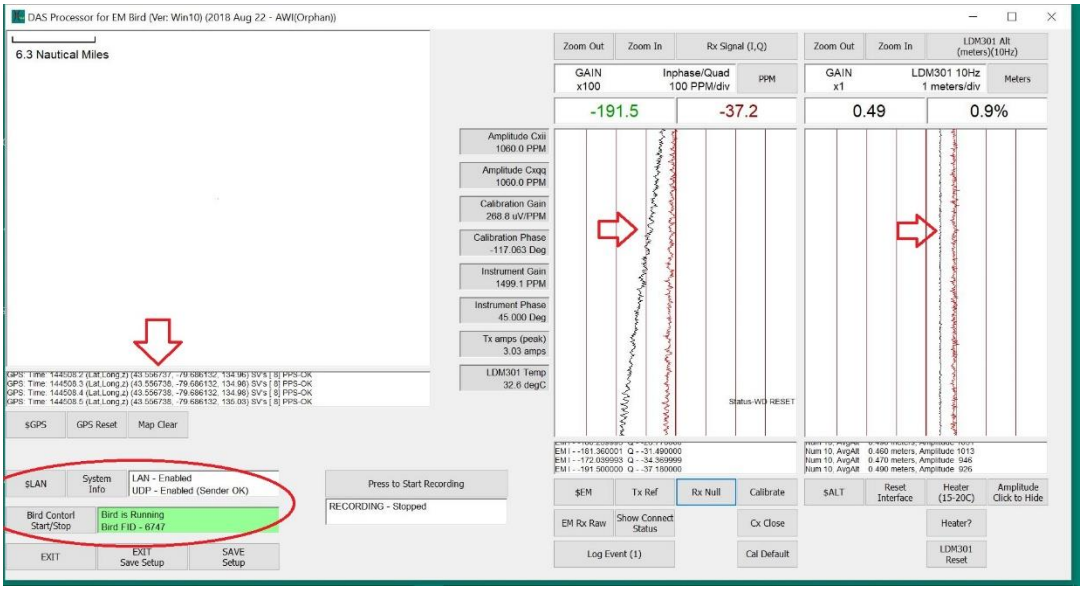
At start up, the DAS app will attempt to connect to the LAN port at the IP address 192.169.0.60 on the local computer. If this specific address is available, and the connection is successful, the LAN status window will show the text;
LAN – Enabled
UDP – Enabled (Sender OK) or Enabled (Bird OFF OK)

The "LAN – Enabled" indicates that the network driver on the computer is working properly.
The UDP status test "Enabled (Sender OK)" indicates that UDP messages are being received from the EM Bird on IP address 192.168.0.60.



4.1.Data presentation

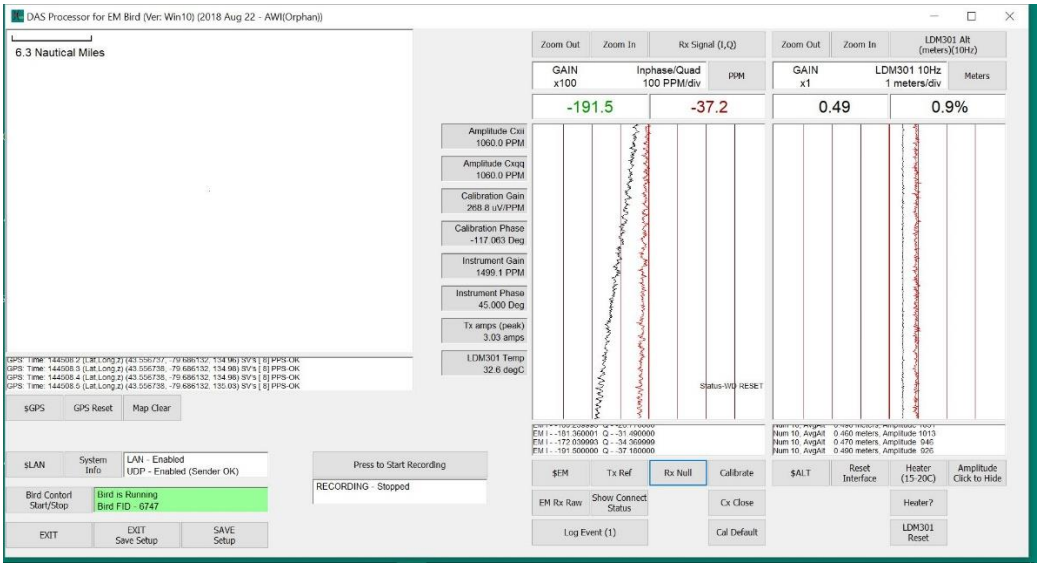
If the IP address connection is successful, and the EM Bird is powered up and sending UDP messages to the DAS computer, the DAS app should appear as shown below.
The EM data is correctly being posted in the graph.
The laser data is correctly being posted in the graph.
The GPS data is correctly being posted.
The LAN connection shows that the UDP connection is valid.



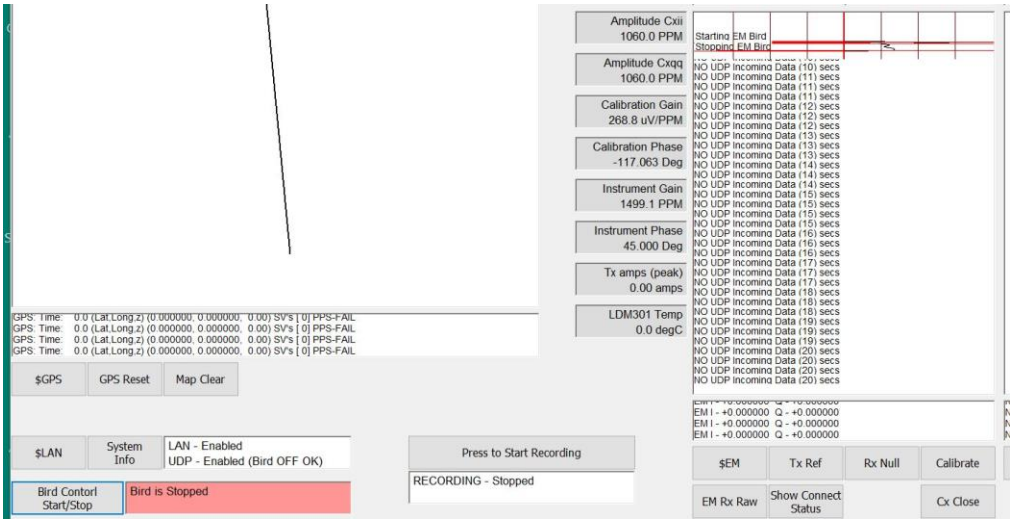
5. Using the DAS application

To use the DAS application, the EM Bird can be powered up, before or after the DAS app is running. If the EM Bird is running and delivering data to the DAS app, via the UDP connection, then all the traces will show activity and progress upward to the top of their respective windows.
All the graphs are updated with new information, 10 times each second.

Shown below is a DAS application with an active connection to the EM Bird.



If there are any errors related to the incoming UDP data, they are posted in the first trace as shown below. When this type of error occurs, new information is not available therefore the graphs are posted with values of 0.0. The graphs will continue to scroll, even with these error conditions.



Refer to the section Error Messages for more detail on the error messages and what they indicate.

While the new data from the EM Bird is being updated, various commands are available to view the incoming data. Refer to the SBC6748 Software Manual for a description of the data produced by the EM Bird.

5.1. GPS Data Presentation

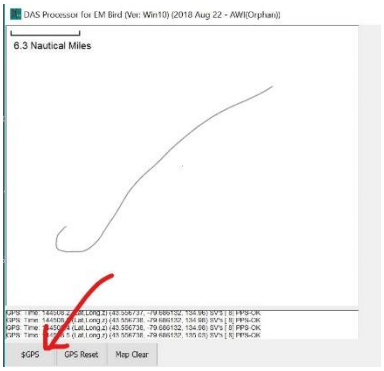
The GPS data is presented as a location map, scaled in units of longitude and latitude. A sample is given below. The flight track inside the GPS graphics window shows a history of the GPS coordinates samples by the GPS device.

The text below the graphics window shows a sample of the GPS data, such as;
“Time:151910.0 Lat:43.556787 Long:-79.686132 Height:138.3600 SV’s:11, Delay:12, PPS:0k”.

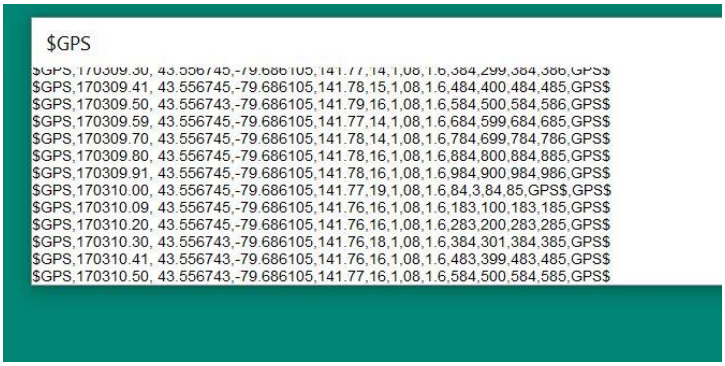
- The Time field is the time stamp of the GPS data and should increment by 0.1 seconds.
- The Lat field is the latitude value of the GPS sample in units of degrees.
- The Long field is the longitude value of the GPS sample in units of degrees.
- The Height field is the elevation above sea level of the GPS sample in units of meters.
- The SV field shows the number of GPS satellites used in the GPS fix.
- The Delay field shows the number of milliseconds between the PPS trigger and the arrival of the data in the SBC6748, EM Bird computer.
    - A delay of 10 to 14 ms indicates that the data was provided correctly, that the GPS fix is valid and the reliability of the data is high.
    - A delay of 90 to 100ms indicates that there is no valid data being provided by the GPS device.
- The PPS field indicates the status of the PPS trigger supplied by the GPS device and monitored by the SBC648 EM Bird computer.
    - A status of “ok” indicates that a PPS trigger was detected for this 100ms interval.
    - For a PPS status of “ok”, the 100ms time base for the SBC6748 EM Bird computer is being provided by the PPS trigger hardware.
    - A status of “fail” indicates that the PPS trigger was not detected for this 100ms interval.
    - For a PPS status of “fail”, the 100ms time base for the SBC6748 EM Bird computer is being provided by the SBC6748 CPU clock.

5.2. $GPS Button

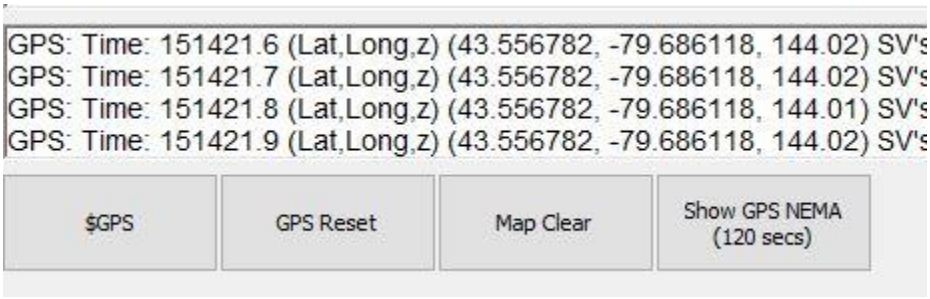
The $GPS button can be used to view more detail in the GPS data that is being sent by the EM Bird. To activate this view press the $GPS button.



The following view will be provided. This shows the contents of all the GPS data sent by the EM Bird computer.

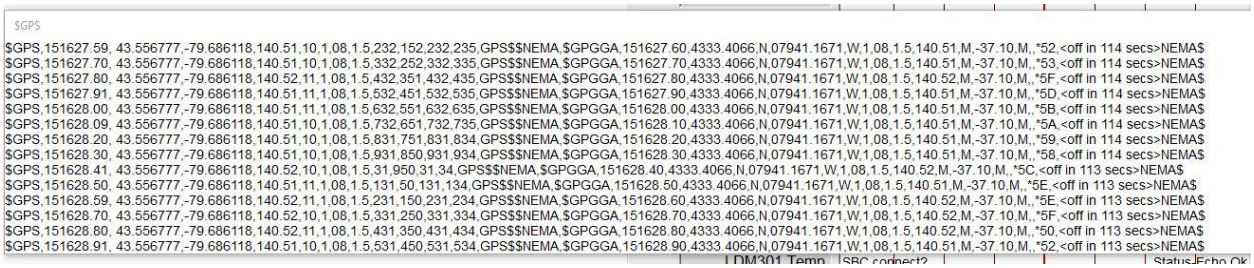


When the $GPS window is displayed an additional button labelled as “Show GPS NEMA” will be display in the GPS button group as shown below.



Press this button to add the NEMA string to the $GPS window as shown below. The NEMA string is the output of the “log GPGGA” data string sent by the GPS device. If the GPS device is off, then this will be indicated in the NEMA message.

As indicated in the button text, the NEMA message string will be shown for 120 seconds and will then be discontinued. Press the “Show GPS NEMA” at any time to set the display time to 120 seconds.



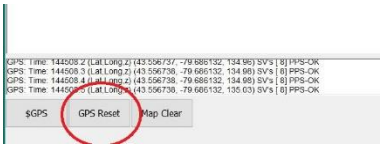
The contents of the data record are described below. For reference the field value for the first line is provided.

Field 1:	152153.70	Time stamp for the GPS data. This time stamp corresponds to the time the PPS trigger is initiated.
Field 2:	43.556800	The calculated longitude position, units in degrees.
Field 3:	-79.686102	The calculated latitude position, units in degrees.
Field 4:	141.97	The calculated height position, units in meters.
Field 5:	12	The length of time between the successful read of the GPS data and the PPS interrupt received from the GPS hardware.
Field 6:	1	The quality of the GPS solution, refer to GPS hardware manual.
Field 7:	15	The number of available GPS satellites in view.
Field 8:	0.8	The hdop, refer to the GPS hardware manual.
Field 9:	916	Time at which the GPS PPS trigger arrived.
Field 10:	830	Time at which the GPS data was loaded into the output buffer.
Field 11:	916	Time at which the GPS data was transferred to the UDP data packet.
Field 12:	918	Time at which the GPS UDP data packet was sent to the DAS.

For the NEMA string refer to the GPGGA log message in the Novatel reference manual.

5.3. Reset Interface Button

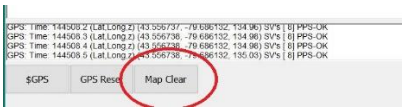
If the GPS data stream is not changing or is not being updated, it is possible to reset the serial link between the EM Bird computer and the GPS hardware. To activate this function, press the “Reset Interface” button. This will reset the RS232 serial interface on the SBC6748 that is directly connected to the Novatel GPS device.



After the button is pressed, there will be a pause in the GPS data flow. If the streaming problem was related to the serial interface connection, the GPS data stream should return to normal. If it does not return to normal, then the reason for the problem is not the serial connection.

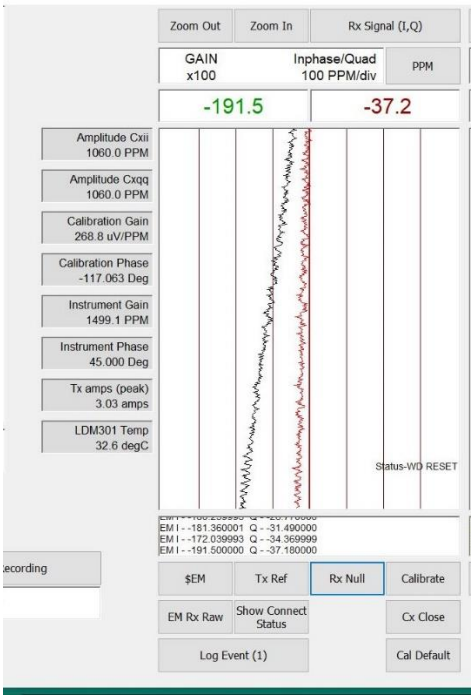
5.4. Map Clear Button

The Map Clear button will clear the GPS track and then start a new track.



6. EM Signal Presentation

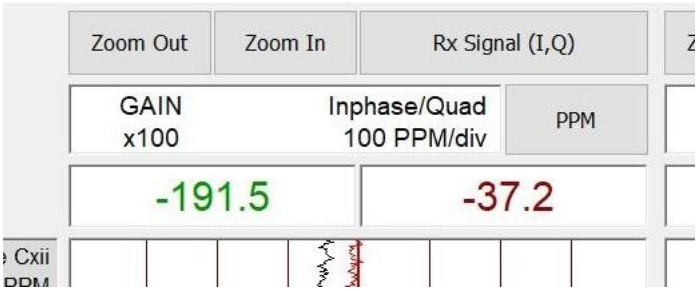
The EM data is posted on the vertical graph as shown below.



The action of the buttons and the information in the info boxes is described below.

6.1. Top Information boxes

The current value of the inphase sample and quadrature sample are posted at a rate of 10 times per second. The inphase value is in green and the quadrature value is in red, as shown below. The unit of the sample is shown in the info box above the inphase window. For this example, the units is 100 PPM/div.



The value posted depends on the units selected with the Units button.

Unit	Contents
PPM Units	Inphase value (green) is PPM's, Q value (red) is PPM's.
AP Units	Inphase value (green) is volts, Q value (red) is degrees.
Volts Units	Inphase value (green) is volts, Q value (red) is volts.

6.2. Top buttons

Zoom buttons
Press the "Zoom Out" button to decrease the scaling on the data being plotted.
Press the "Zoom In" button to increase the scaling on the data being plotted.

Signal type
There are two EM signal inputs for the SBC6748, the Rx coil signal and the Tx coil reference signal. Press the Rx Signal button to change the signal trace to Tx Signal. Press the Tx Signal button to change the signal trace back to Rx Signal.

Units button
In the view above the Rx Signal is being shown in PPM units. Press the PPM button to cycle through the three different units that can be displayed: "Volts", "AP" (amplitude/phase) and "PPM". The units of the inphase and quadrature sample will be changed accordingly.

6.3. Side Info Boxes

The info boxes provide update information that is calculated by the SBC6748.

Amplitude Cxii	Shows the amplitude or offset, in PPM's of the expected EM inphase signal when the Cx coil is closed.
Amplitude Cxqq	Shows the amplitude or offset, in PPM's of the expected EM quadrature signal when the Cx coil is closed.
Calibration Gain	Shows the scaling calculated from the closure of the Cx coil. This scale value is used to convert the volts measured by the system to PPM units.
Calibration Phase	Shows the phase calculated for the conversion of the volts signal to a correctly phased PPM signal. This phase value is used to convert the volts measured by the system at the system phase into PPM values where the inphase and quadrature samples are correctly phased to the EM field generated by the Tx coil.
Instrument Gain	Shows the amplitude of the calibration signal generated by the Cx coil.
Instrument Phase	Shows the phase of the Cx coil.
Tx amps (peak)	Shows the amplitude of the current in the Tx coil. The unit is "amps peak" at 4060 Hz.
LDM301 Temp	Shows the temperature measurement inside the LDM301. This temperature is strongly affected by the laser electronics.

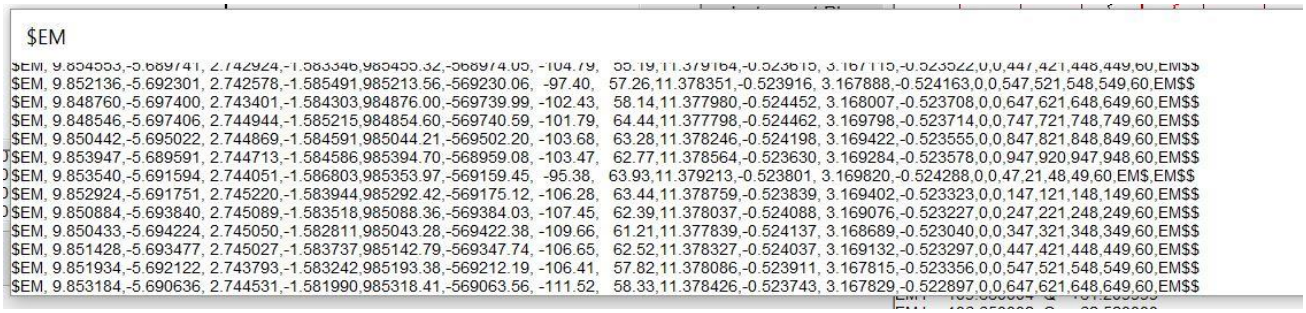
6.4. Bottom Buttons

$EM

This button will show the EM data stream arriving as a UDP message from the EM Bird.
Pressing the button will open a new window that shows a continuous stream of the portion of UDP data that is between the “$EM” and “EM$” string segments in the full UDP message.
Press the button a second time to close the window.

The data fields are in this list are ordered as follows;

Field 1	A/D channel 0, Tx reference, inphase voltage.
Field 2	A/D channel 0, Tx reference, quadrature voltage.
Field 3	A/D channel 1, Rx coil signal, inphase voltage.
Field 4	A/D channel 1, Rx coil signal, quadrature voltage.
Field 5	A/D channel 0, Tx reference, inphase amplitude in PPM’s.
Field 6	A/D channel 0, Tx reference, quadrature amplitude in PPM’s.
Field 7	A/D channel 1, Rx coil signal, inphase amplitude in PPM’s.
Field 8	A/D channel 1, Rx coil signal, quadrature amplitude in PPM’s.
Field 9	A/D channel 0, Tx reference, amplitude voltage.
Field 10	A/D channel 0, Tx reference, phase in radians.
Field 11	A/D channel 1, Rx coil signal, amplitude voltage.
Field 12	A/D channel 1, Rx coil signal, phase in radians.
Field 13	Cx coil switch state, 0-open, 1-closed
Field 14	Cx external coil switch state, 0-open, 1-closed
Field 15	SBC6748 EM task trigger time in ms.
Field 16	SBC6748 EM task data loaded time in ms.
Field 17	SBC6748 EM task data transfer time in ms.
Field 18	SBC6748 EM task data sent time in ms.



Tx Ref

When the Tx Ref button is pressed, a command is sent to the EM Bird to execute the Tx reference function on the SBC6748. This function will compute an average value for the transmitter voltage using the equation

amplitude A_{ref} = sqrt(Vi^2 + Vq^2). The trace values are then calculated from this reference amplitude using the equations;
PPMi = 1E6*Vi/A_{ref}.
PPMq = 1E6*Vq/A_{ref}.
The output for the Tx ref function can only be viewed on the EM graph, when the trace is set to Tx Reference and the units selection is "PPM".

Rx Null

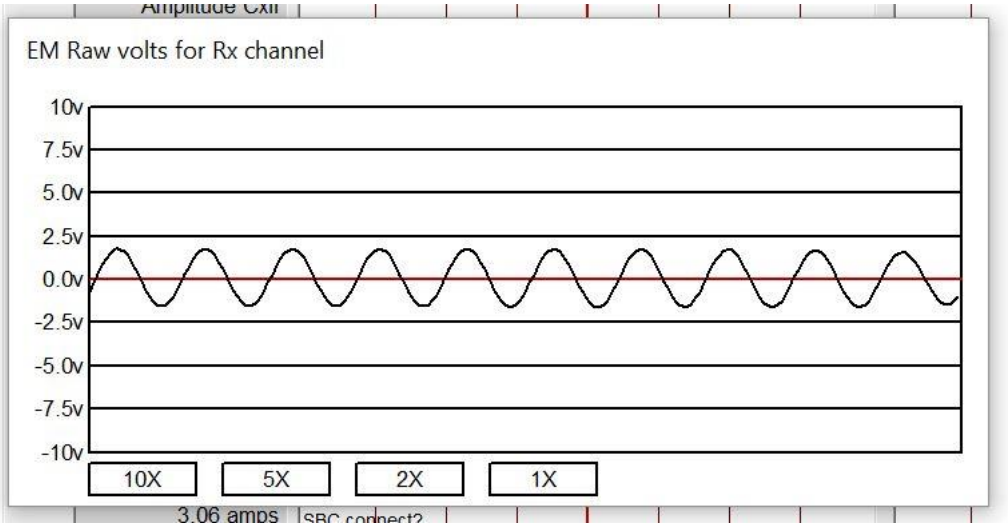
When the Rx Null button is pressed, a command is sent to the EM Bird to execute the average voltage for both the Vi and Vq signals and to compute the two null reference values, Nulli and Nullq. These null reference values are then subtracted from the Vi and Vq voltages.
Ni = Vi – Nulli
Nq = Vq – Nullq
Where Nulli = sum(Vi(n_1,n_2)) / N and Nullq = sum(Vq(n_1,n_2)) / N
The output for the Rx Null function can only be viewed on the EM graph, when the trace is set to "Rx Signal" and the units selection is "PPM".

Calibrate

When the Calibrate Cx button is pressed, a command is sent to the EM Bird to execute a function that calculates the volts-to-PPM conversion factor for the Rx coil voltage signal.
The outcome of the calculation is posted in the Calibration Gain and Calibration Gain info boxes.
After a cold boot of the EM Bird, the volts-to-PPM conversion factor is defaulted to 200uV/PPM.

EM Rx Raw

When the EM Rx Raw button is pressed a window will be opened that shows the raw Rx signal trace in volts. The voltage shown is the first 10 periods of the 4060 Hz voltage that is measured by the A/D convertors on the SBC6748 over a total period of 100ms (406 periods total).

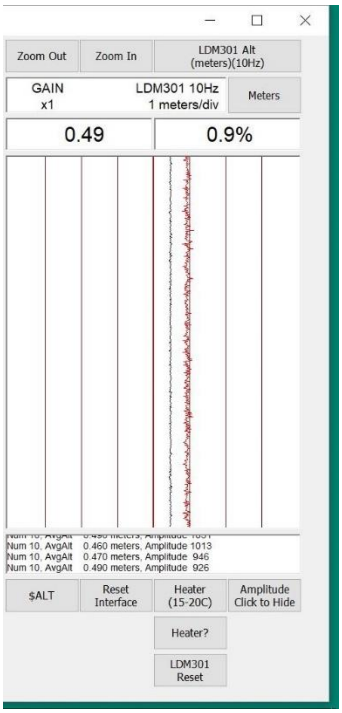


The scale starts off at 1x. Press the 10x, 5x or 2x scale buttons to change the scaling.

	Press the EM Rx Raw button a second time to close this window. To view the Tx raw voltage, change the signal view to Tx Signal by pressing the to left button for the EM trace group, then press the EM Tx Raw button again.
Show Connect Status	In order to maintain the connection between the DAS app and the EM Bird, a status request is sent from the DAS app to the EM Bird. The status request and resulting echo from the bird is posted in the EM trace. To reduce the clutter, press this button to turn the report on the trace to OFF. This does not turn off the request/echo mechanism. Press the button a second time to have the message posting to be displayed again.
Cx Close	The Cx coil can be closed which will show a step in the Rx (I,Q) voltages. The Cx coil will open after 2 seconds. No calculation results from closing the Cx coil with this button. This action can be used to include a Cx coil step in the data file. It also shows that the EM system is working correctly. If the system is calibrated and phased correctly, the Cx inphase and Cx quadrature amplitudes should be the same.
Cal Default	The calibration gain is set to 200uvolts/PPM and the calibration phase is set to 0 degs. These values are posted in the Calibration Gain and Calibration Gain info boxes.

7. Laser Altimeter Presentation

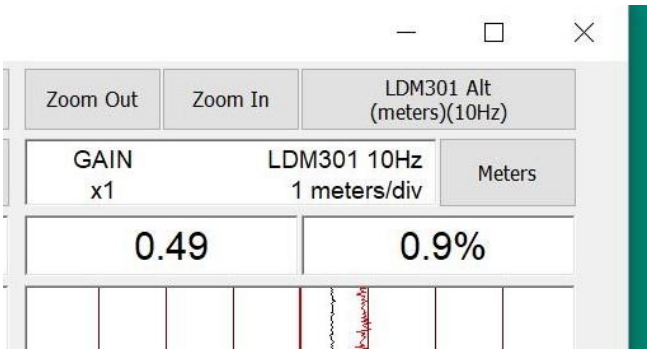
The Laser data is posted on the vertical graph shown below.



The action of the buttons and the information in the info boxes is described below.

7.1. Top Information boxes

The current value of the laser range value and the laser amplitude are posted at a rate of 10 times per second. The range is posted on the left and the amplitude is posted on the right, as shown below.



The value posted depends on the units selected.
When the signal type is “meters” the units are meters and %.
When the signal type is “feet” the units are feet and %.
When the signal type is GPS height the units are meters and %.
When the signal type is GPS(x,y) the units are degrees and degrees.

7.2. Top buttons

Zoom buttons
Press the “Zoom Out” button to decrease the scaling on the data being plotted.
Press the “Zoom In” button to increase the scaling on the data being plotted.

Signal type
In the view above the laser samples from the LDM301 Alt is being shown in the units of meters. The data rate is 10Hz.
Press the Signal Type button to cycle through the following data types.

LDM301 Alt (meters)(10Hz)	Laser samples shown in meters. The 10Hz rate shows an average of 10 samples for each 100ms period.
LDM301 Alt (meters)(100Hz)	Laser samples shown in meters. The 100Hz rate shows an all 100 samples for each 100ms period.
LDM301 Alt (feet)(10Hz)	Laser samples shown in feet. The 10Hz rate shows an average of 10 samples for each 100ms period.
LDM301 Alt (feet)(100Hz)	Laser samples shown in feet. The 100Hz rate shows an all 100 samples for each 100ms period.
GPS Alt (meters)(10Hz)	GPS height samples shown in meters as obtained from the GPS device.
GPS(Lat/Long)	Shows the GPS latitude and longitude samples as provided by the GPS device at a 10 Hz rate.

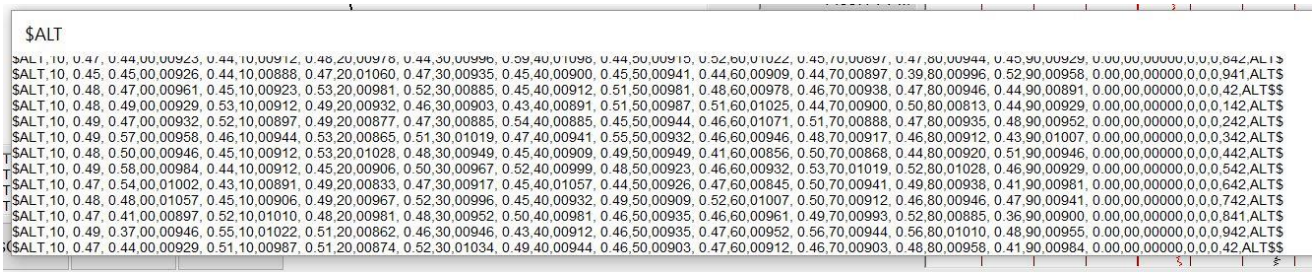
7.3. Bottom Buttons

$ALT

This button will show the laser data stream arriving as a UDP message from the EM Bird.
Pressing the button will open a new window that shows a continuous stream of the portion of UDP data that is between the “$ALT” and “ALT$” string segments in the full UDP message.
Press the button a second time to close the window.
The data fields are in this list are ordered as follows;

Field 1	Number of expected altimeter samples, 10 for example.
Field 2	The calculated average of the N samples altimeter samples.
Field 3	sample 1, range (meters).
Field 4	sample 1, delay time (ms) in 100ms window.
Field 5	sample 1, amplitude (number).
-	
-	
Field 30	sample 10, range (meters).
Field 31	sample 10, delay time (ms) in 100ms window.
Field 32	sample 10, amplitude (number).
Field 15	SBC6748 Laser task trigger time in ms.

Field 16 SBC6748 Laser task data loaded time in ms.
Field 17 SBC6748 Laser task data transfer time in ms.
Field 18 SBC6748 Laser task data sent time in ms.

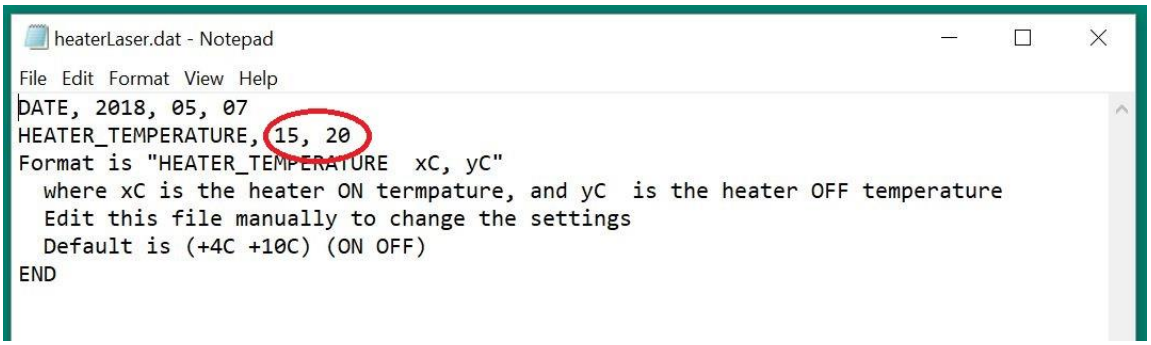


Reset Interface

The communication connection between the SBC6748 and the LDM301 laser is a RS232 link. If the data stream is interrupted and stops, a reset of the Serial 1 interface on the SBC6748 may be necessary.
Pressing this button will request the SBC6748 to carry out this Serial 1 port reset. A request and echo message will be printed in the altimeter graph presentation window.
The request message is “Reset ALT serial”.
The echo message is “Laser serial was RESET”.

Heater (xx-yyC)

The operational spec for the LDM301 is -40C. The LDM uses a heater to achieve this low temperature spec.
The factory default for the heater on/off control is 4C for heater on and 10C for heater off.
Pressing this button will set a user range for the temperature control to xxC for the heater off temperature and yyC for the heater on temperature.
A request and echo message will be printed in the altimeter graph presentation window.
The request message is “LASER heater xxC yyC”.
The echo message is “Heater set (xx yy)”.
When this message is sent to the LDM301 by the SBC6748 there will be an approximate 1 sec data loss of altimeter data.
The values for xx and yy are set by editing the file “heaterLaser.dat”.



The temperature range that is required can be set by editing the line “HEATER_TEMPERATURE, 15, 20” and changing the values of 15 and 20 to 12 and 21 for example.

Heater ?

Pressing this button will obtain the current heater control setting for the LDM301.
A request and echo message will be printed in the altimeter graph presentation window.
The request message is “LASER heater?”.
The echo message can be “Heater set (12 21)”.
When this message is sent to the LDM301 by the SBC6748 there will be an approximate 1 sec data loss of altimeter data.

LDM301 Reset

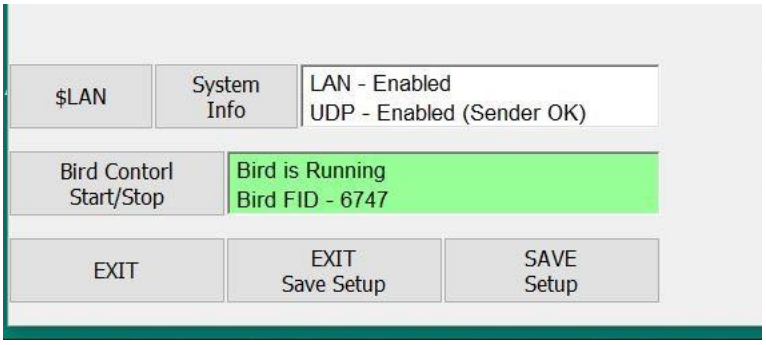
This button will reset the setup for the LDM301. See the SBC6748 Software Manual for the setting parameters for the LDM301 that are used for the EM Bird.
This request will clear all the settings and load in the default settings.
The operational spec for the LDM301 is -40C. The LDM uses a heater to achieve this low temperature spec.
The factory default for the heater on/off control is 4C for heater on and 10C for heater off.
Pressing this button will set the default temperature control to 4C and 10C.
A request and echo message will be printed in the altimeter graph presentation window.
The request message is “LASER Reset”.
The echo message is “Heater Reset Ok”.
When this message is sent to the LDM301 by the SBC6748 there will be an approximate 1 sec data loss of altimeter data.

The SBC6748 sends the following commands to the LDM301 when it receives a “LDM301 Reset” command is sent by the DAS app.
“esc” puts the LDM301 in command mode.
“PR” reset the LDM301 to factory settings.
“MF 1” set measurement frequency to 1 Hz.

	"SD0 3" set output format to decimal with fields of distance, signal strength and temperature. "SA 1" number of individual measurements used in the average measurement is 1. "AS DF" set auto start command to DF – individual measurement with external triggering. "DR" carry out a cold start of the LDM301. All the above settings are applied.
Amplitude Click to Hide	The amplitude of the laser reflection from the target is shown in units of %. If the reflections are changing dramatically, the "%" trace will start to wrap from side to side on the graphical presentation and this could obscure the range trace. Click this button and the "%" trace will not be drawn. After the click, the button will show the text "Amplitude Click to Show". Click the button a second time to have the "%" returned. The % value is calculated from the equation Amplitude = (current amplitude * 100)/100,000.

8. LAN buttons

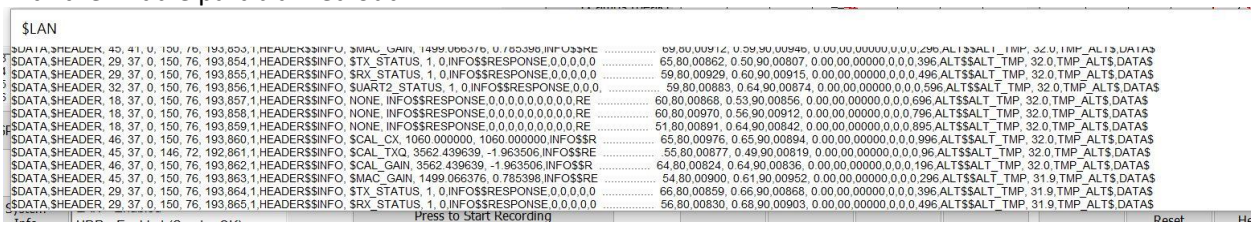
The LAN group of buttons are shown below.
The $LAN button provides a means of viewing the data being streamed from the EM Bird to the DAS application.
The System Info button shows the various IP address settings for the EM Bird and the DAS application computer device.
The status box shows the state of the UDP connection between the EM Bird the DAS application.



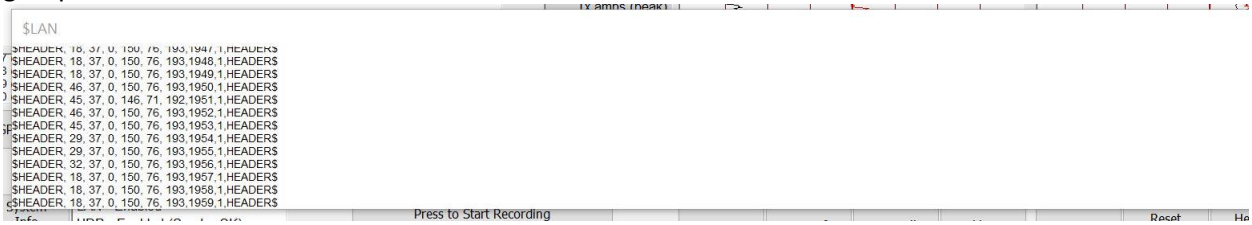
8.1.$LAN

Pressing the $LAN button will show the contents of the data message that is streamed from the EM Bird and has been received by the DAS application.
Clicking the button will cause the display to cycle through 6 different views, which are described below.

$LAN – screen 1, shows a summary of the start of the UDP message packet and the end of the packet, with the middle part blanked out.

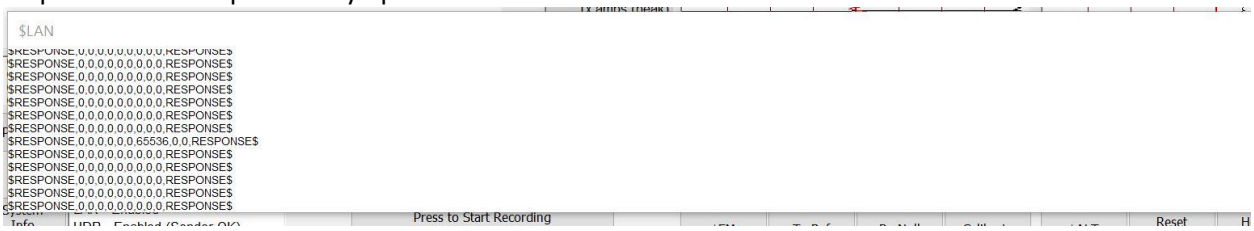


$LAN – screen 2, shows the header block in the UDP message. The header marks the start point of each group.

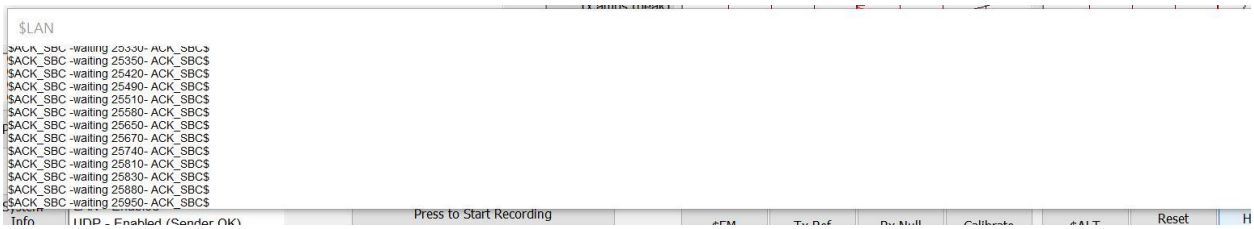


$LAN – screen 3, shows status block. Each field in the status block is loaded at a interval of once each second. Otherwise the field is blank.

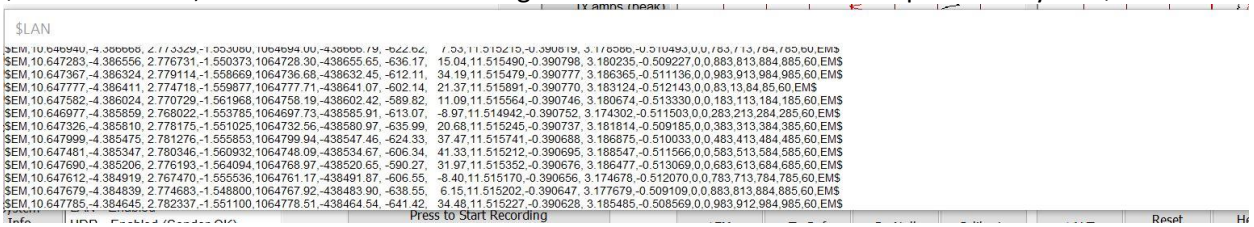
$LAN – screen 4, shows the response from the SBC6748. The DAS application will send a request, and the SBC6748 will respond. The response should be observed in this message list. The request and response can be separated by up to 10 secs in time.



$LAN – screen 5, shows acknowledge request and reply protocol that takes place between the DAS application and the SBC6748 at a time interval of 5 seconds.

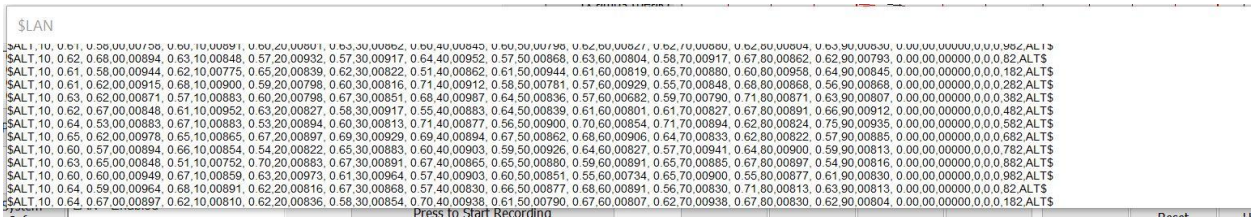


$LAN – screen 6, shows the EM data message block. This is the same list as provided by the $EM button.



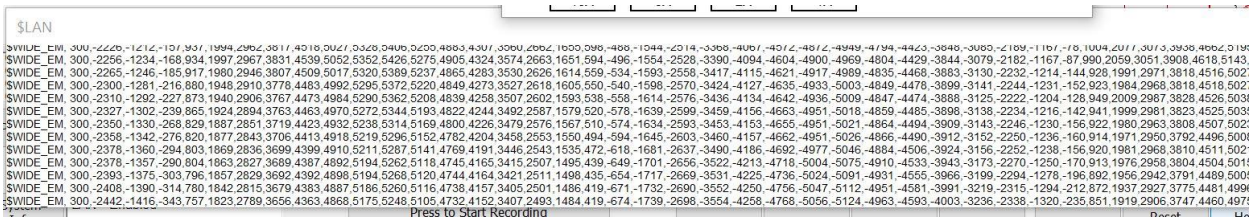
$LAN – screen 7, shows the GPS data message block. This is the same list as provided by the $GPS button.

$LAN – screen 8, shows the laser data message block. This is the same list as provided by the $ALT button.



$LAN – screen 9, shows the temperature data message block which is provided from the LDM301 device.

$LAN – screen 10, shows the EM wide data message block.



8.2.System Info

The System Info button shows various system settings for the DAS application computer and the SBC6748.

(1) The expected IP address settings for the DAS application computer and the SBC6748.
(2) The version number for the SBC6748 binary code.
(3) The screen resolution of the DAS application computer in pixels horizontal and vertical.
(4) The state of the power line filter switch is shown as ON or OFF.

8.3.LAN Information

The text window to the right of the System Info button shows the status of the UDP connection between the DAS app and the EM Bird.

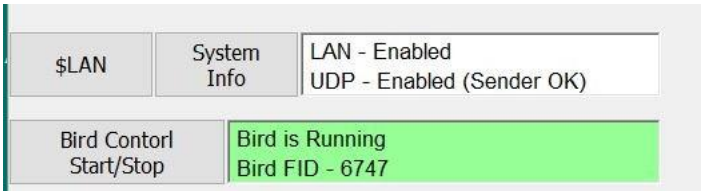
The UDP format uses a connectionless method to send messages between two access points on the wired LAN and/or wireless wLan network. The sending computer uses an IP port address to send the UDP message to another IP address and a specific port number on the destination IP address. The sender will not be aware if the destination IP address is not connected to the network.

For the network connection between the DAS application and the EM Bird to work they should be configured as follows:

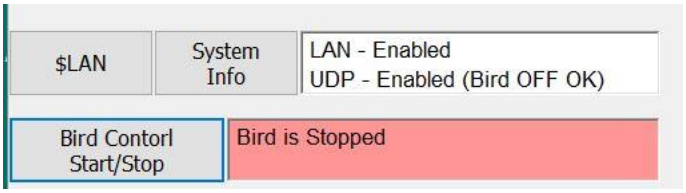
DAS application computer.
IP address 192.168.0.60.
Connected to router with access point “F2”.
Messages are received on port 7000.

EM Bird.
The serial to wLan convertor should be set to
IP Address 192.168.0.20
Connected to router with access point “F2”.
Messages are received on port 7000.

The DAS application uses a DLL library to connect to the network adapter on the computer device.
If the DLL library is working properly, the test “LAN -Enabled” should be shown as indicated below;
If the DLL library is not working properly the text “LAN -Not Enabled” will be shown.
If the DAS application is receiving UDP messages correctly from the EM Bird the second line in the status window will show the text “UDP – Enabled (Sender OK)”.



If the DAS application is receiving status UDP messages and no data UDP messages correctly from the EM Bird the second line in the status window will show the text “UDP – Enabled (Bird OFF OK)”.



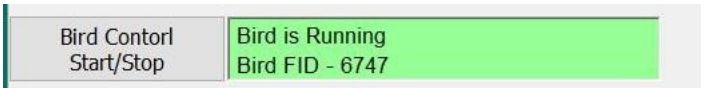
If the DAS application is not receiving status UDP messages and no data UDP messages correctly from the EM Bird the second line in the status window will show the text “UDP – Bird is OFF”.

9. Bird Control

The running and stopped state of the EM Bird can be controlled by the Bird Control Start/Stop button.

From a cold start the EM Bird will default to a run state. It will take 20 to 30 seconds for the run status to be updated in the DAS application after the EM Bird has been powered on. The 30 second wait is required for the EM Bird to stabilize for the Tx coil transmitter system and for the serial to wLan convertor to connect to the access point “F2”.

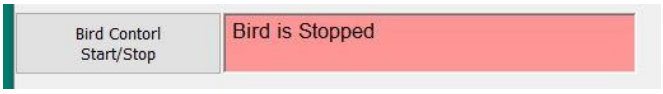
When the EM Bird is properly connected the text window to the right of the Bird Control button will show the text “Bird is Running” and “Bird FID – xxxx”, where “xxxx” is the FID number that is being incremented on the SBC6748.



When the EM Bird has been turned off, by clicking the Bird Control button, status window will show the text “Bird is stopped”.

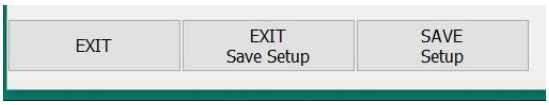
When the EM Bird has been NOT been powered on, status window will show the text “Bird is stopped”.

Note there is no difference been the bird off state and no bird present for this status message.



10. DAS Application Exit

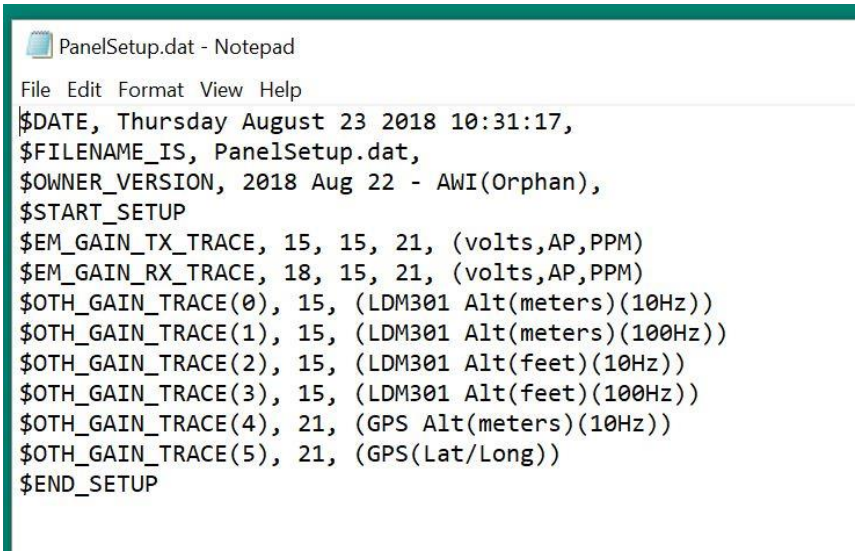
To exit the DAS app, click the Exit button.



To exit the DAS app and to save the setup that is being currently used click the Exit Save Setup button.

On this exit the file “panelsetup.dat” will be updated. If it does not exist it will be created.

The settings that are saved are shown in the image below.

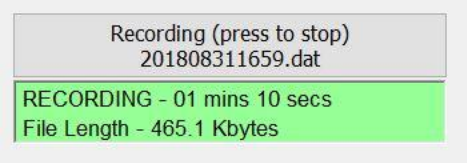


To save the DAS app setup without exiting the application click the Save Setup button. On this exit the file “panelsetup.dat” will be updated. If it does not exist it will be created.

11. Data Recording

The DAS app provides the ability to record the data received from the EM Bird to a data file. To start Data Recording click the “Press to Start Recording” button. The status window below the button indicates that the Recording system is OFF.

When the recording system is running the button and status window will appear as shown below.



The button should be pressed a second time to stop the recording.

The file name is shown on the button.

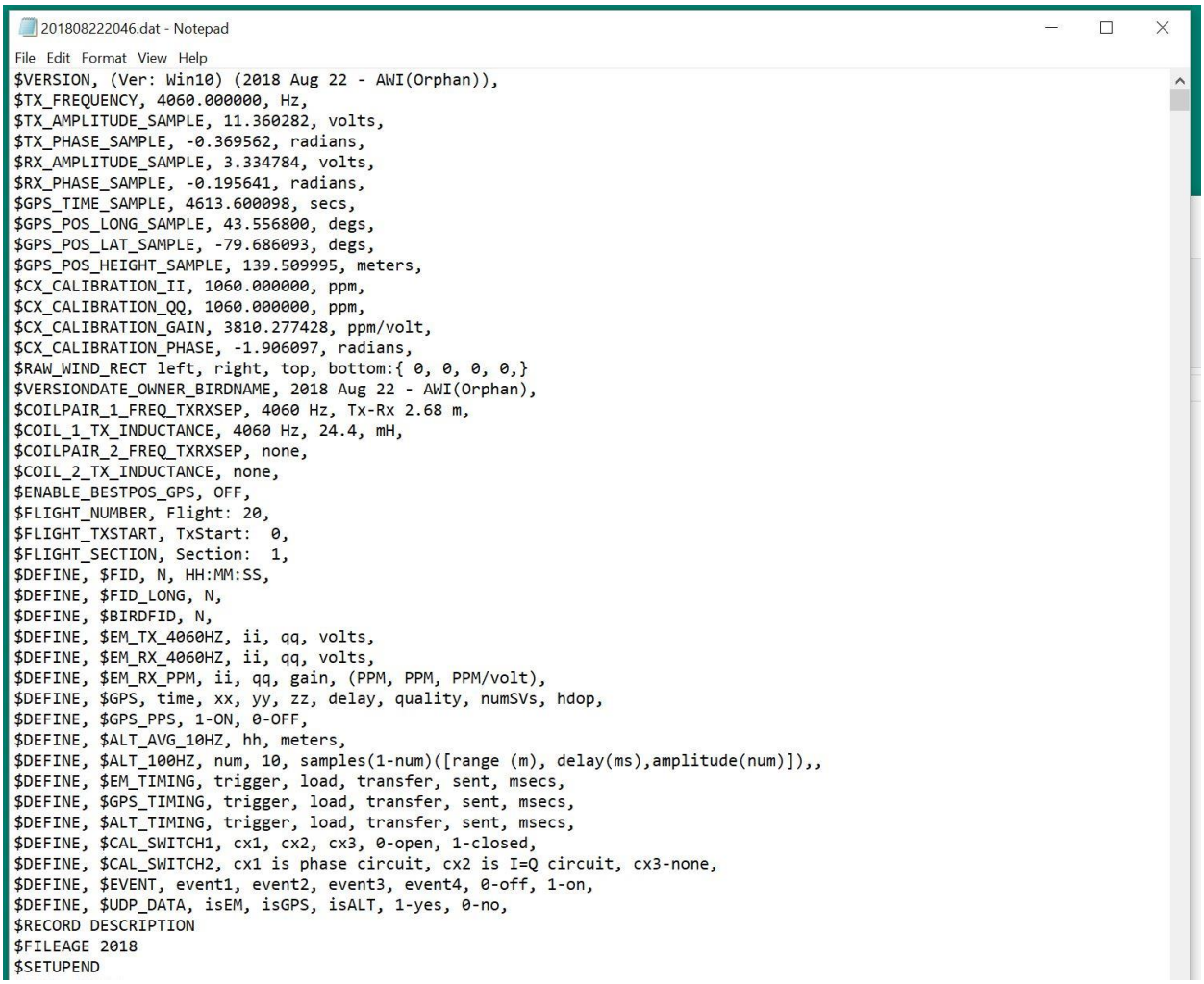
The recording time is updated in real time to show how long the recording has been running.

The size of the file is indicated on the second line of the status window.

Data File

When the Record button is pressed, a new file is created. The file name is based on the year, month, day and the time of day (24hr clock). For example, the file name "201808301830.dat" indicates that the file was created on Aug 30, 2018 at 6:30pm. The file extension is always ".dat".

The top of the file contains header information as shown in the sample file below.


201808222046.dat - Notepad
File Edit Format View Help
$VERSION, (Ver: Win10) (2018 Aug 22 - AWI(Orphan)),
$TX_FREQUENCY, 4060.000000, Hz,
$TX_AMPLITUDE_SAMPLE, 11.360282, volts,
$TX_PHASE_SAMPLE, -0.369562, radians,
$RX_AMPLITUDE_SAMPLE, 3.334784, volts,
$RX_PHASE_SAMPLE, -0.195641, radians,
$GPS_TIME_SAMPLE, 4613.600098, secs,
$GPS_POS_LONG_SAMPLE, 43.556800, degs,
$GPS_POS_LAT_SAMPLE, -79.686093, degs,
$GPS_POS_HEIGHT_SAMPLE, 139.509995, meters,
$CX_CALIBRATION_II, 1060.000000, ppm,
$CX_CALIBRATION_QQ, 1060.000000, ppm,
$CX_CALIBRATION_GAIN, 3810.277428, ppm/volt,
$CX_CALIBRATION_PHASE, -1.906097, radians,
$RAW_WIND_RECT left, right, top, bottom:{ 0, 0, 0, 0,}
$VERSIONDATE_OWNER_BIRDNAME, 2018 Aug 22 - AWI(Orphan),
$COILPAIR_1_FREQ_TXRXSEP, 4060 Hz, Tx-Rx 2.68 m,
$COIL_1_TX_INDUCTANCE, 4060 Hz, 24.4, mH,
$COILPAIR_2_FREQ_TXRXSEP, none,
$COIL_2_TX_INDUCTANCE, none,
$ENABLE_BESTPOS_GPS, OFF,
$FLIGHT_NUMBER, Flight: 20,
$FLIGHT_TXSTART, TxStart: 0,
$FLIGHT_SECTION, Section: 1,
$DEFINE, $FID, N, HH:MM:SS,
$DEFINE, $FID_LONG, N,
$DEFINE, $BIRDFID, N,
$DEFINE, $EM_TX_4060HZ, ii, qq, volts,
$DEFINE, $EM_RX_4060HZ, ii, qq, volts,
$DEFINE, $EM_RX_PPM, ii, qq, gain, (PPM, PPM, PPM/volt),
$DEFINE, $GPS, time, xx, yy, zz, delay, quality, numSVs, hdop,
$DEFINE, $GPS_PPS, 1-ON, 0-OFF,
$DEFINE, $ALT_AVG_10HZ, hh, meters,
$DEFINE, $ALT_100HZ, num, 10, samples(1-num)([range (m), delay(ms),amplitude(num)]),,
$DEFINE, $EM_TIMING, trigger, load, transfer, sent, msecs,
$DEFINE, $GPS_TIMING, trigger, load, transfer, sent, msecs,
$DEFINE, $ALT_TIMING, trigger, load, transfer, sent, msecs,
$DEFINE, $CAL_SWITCH1, cx1, cx2, cx3, 0-open, 1-closed,
$DEFINE, $CAL_SWITCH2, cx1 is phase circuit, cx2 is I=Q circuit, cx3-none,
$DEFINE, $EVENT, event1, event2, event3, event4, 0-off, 1-on,
$DEFINE, $UDP_DATA, isEM, isGPS, isALT, 1-yes, 0-no,
$RECORD DESCRIPTION
$FILEAGE 2018
$SETUPEND

The Descriptors used in the header information are described below.

$BYTES 00002012 Descriptor length (bytes)

$BYTES marks the top of the header record, followed by its length is bytes (2012 bytes).

$DATE, Wednesday August 22 2018 20:46:13,

$DATE shows the recording date of the data file.

$FILENAME_IS, 201808222046.dat,

$FILENAME_IS shows the name of the current data file.

$VERSION, (Ver: Win10) (2018 Aug 22 - AWI(Orphan)),

$VERSION gives the version of the DAS application and the EM Bird it is attached to.

$TX_FREQUENCY, 4060.000000, Hz,

$TX_FREQUENCY shows the operating frequency of the EM Bird.

$TX_AMPLITUDE_SAMPLE, 11.360282, volts,

$TX_AMPLITUDE_SAMPLE provides a sample Tx coil amplitude voltage.

$TX_PHASE_SAMPLE, -0.369562, radians,e

$TX_PHASE_SAMPLE provides a sample Tx coil phase in radians.

$RX_AMPLITUDE_SAMPLE, 3.334784, volts,

$RTX_AMPLITUDE_SAMPLE provides a sample Rx coil amplitude voltage.

$RX_PHASE_SAMPLE, -0.195641, radians,

$RX_PHASE_SAMPLE provides a sample Rx coil phase in radians.

$GPS_TIME_SAMPLE, 4613.600098, secs,

$GPS_TIME_SAMPLE provides a sample of the GPS time stamp in the file.

$GPS_POS_LONG_SAMPLE, 43.556800, degs,

$GPS_POS_LONG_SAMPLE provides a sample of the GPS longitude in the file.

$GPS_POS_LAT_SAMPLE, -79.686093, degs,

$GPS_POS_LAT_SAMPLE provides a sample of the GPS latitude in the file.

$GPS_POS_HEIGHT_SAMPLE, 139.509995, meters,

$GPS_POS_HEIGHT_SAMPLE provides a sample of the GPS height in the file.

$CX_CALIBRATION_II, 1060.000000, ppm,

$CX_CALIBRATION_II shows the calibrated inphase amplitude to be expected when the Cx coil is closed.

$CX_CALIBRATION_QQ, 1060.000000, ppm,

$CX_CALIBRATION_QQ shows the calibrated inphase amplitude to be expected when the Cx coil is closed.

$CX_CALIBRATION_GAIN, 3810.277428, ppm/volt,
$CX_CALIBRATION_GAIN shows the calculated amplitude derived from the closure of the Cx coil. This value is used to convert the measured volts to calibrated PPM values.

$CX_CALIBRATION_PHASE, -1.906097, radians,
$CX_CALIBRATION_PHASE shows the calculated phase derived from the Cx coil closure. This value is used to correct the phase of the voltage measurements.

$RAW_WIND_RECT left, right, top, bottom:{ 0, 0, 0, 0,}
$RAW_WIND_RECT is used by the DAS app only.

$VERSIONDATE_OWNER_BIRDNAME, 2018 Aug 22 - AWI(Orphan),
$VERSIONDATE_OWNER_BIRDNAME shows the version date of the DAS app and the EM Bird that it is attached to.

$COILPAIR_1_FREQ_TXRXSEP, 4060 Hz, Tx-Rx 2.68 m,
$COILPAIR_1_FREQ_TXRXSEP shows the Tx to Rx coil distance in meters.

$COIL_1_TX_INDUCTANCE, 4060 Hz, 24.4, mH,
$COIL_1_TX_INDUCTANCE shows the measured inductance of the Tx coil. This value can be used to calculate the current in the Tx coil.

$COILPAIR_2_FREQ_TXRXSEP, none,
$COILPAIR_2_FREQ_TXRXSEP shows the coil separation of the second coil set. Currently set to none.

$COIL_2_TX_INDUCTANCE, none,
$COIL_2_TX_INDUCTANCE shows the Tx coil inductance of the second coil set. Currently set to none.

$ENABLE_BESTPOS_GPS, OFF,
$ENABLE_BESTPOS_GPS this feature is disabled

$FLIGHT_NUMBER, Flight: 2,
$FLIGHT_NUMBER shows the current flight number.

$FLIGHT_TXSTART, TxStart: 0,
$FLIGHT_TXSTART set to 0 when the DAS application is started and remains at 0.

$FLIGHT_SECTION, Section: 1,
$FLIGHT_SECTION shows the current section number of a given flight. The section number is incremented each time the Record button is pressed.

$DEFINE, $FID, N, HH:MM:SS,
Defines the format of the $FID record in the data file.

$DEFINE, $FID_LONG, N,
Defines the format of the $FID_LONG record in the data file.

$DEFINE, $BIRDFID, N,
Defines the format of the $BIRDFID record in the data file.

$DEFINE, $EM_TX_4060HZ, ii, qq, volts,
Defines the format of the $EM_TX_4060HZ record in the data file.

$DEFINE, $EM_RX_4060HZ, ii, qq, volts,
Defines the format of the $EM_RX_4060HZ record in the data file.

$DEFINE, $EM_RX_PPM, ii, qq, gain, (PPM, PPM, PPM/volt),
Defines the format of the $EM_RX_4060HZ record in the data file.

$DEFINE, $GPS, time, xx, yy, zz, delay, quality, numSVs, hdop,
Defines the format of the $GPS record in the data file.

$DEFINE, $GPS_PPS, 1-ON, 0-OFF,
Defines the format of the $GPS_PPS record in the data file.

$DEFINE, $ALT_AVG_10HZ, hh, meters,
Defines the format of the $ALT_AVG record in the data file.

$DEFINE, $ALT_100HZ, num, 10, samples(1-num)([range (m), delay(ms),amplitude(num)]),,
Defines the format of the $ALT_100HZ record in the data file.

$DEFINE, $EM_TIMING, trigger, load, transfer, sent, msecs,
Defines the format of the $EM_TIMING record in the data file.

$DEFINE, $GPS_TIMING, trigger, load, transfer, sent, msecs,
Defines the format of the $GPS_TIMING record in the data file.

$DEFINE, $ALT_TIMING, trigger, load, transfer, sent, msecs,
Defines the format of the $ALT_TIMING record in the data file.

$DEFINE, $CAL_SWITCH1, cx1, cx2, cx3, 0-open, 1-closed,
Defines the format of the $CAL_SWITCH1 record in the data file.

$DEFINE, $CAL_SWITCH2, cx1 is phase circuit, cx2 is I=Q circuit, cx3-none,
Defines the format of the $CAL_SWITCH2 record in the data file.

$DEFINE, $EVENT, event1, event2, event3, event4, 0-off, 1-on,
Defines the format of the $EVENT record in the data file.

$DEFINE, $UDP_DATA, isEM, isGPS, isALT, 1-yes, 0-no,
Defines the format of the $UDP_DATA record in the data file.

$RECORD DESCRIPTION
Not used.

$FILEAGE 2018
File age indicator which can be used automatically detect the file format.

$SETUPEND
Marks the end of the header record in the data file.

Data record for a 100ms data sample.

At a 100ms interval the DAS application will record the current data samples to the data file. Each new record is appended at the bottom of the data file.

The contents of the data record is described below.

$FID, 3451, 20:46:13
Fid number and the DAS app computer time.

$UDP_DATA, 1,1,1,
Shows that the UDP message contains EM, GPS and Alt data.

$FID_LONG, 1534985142.1
Value of the long fid which is a double integer number.

$BIRDFID, 3708
Value of the fid in the EM Bird.

$EM_TX_4060HZ, 10.5935020, -4.1027160,
The inphase and quadrature voltage as measured on the A/D channel 0, which is attached to the Tx coil reference turn. This value is not scaled or phased.

$EM_RX_4060HZ, 3.2702360, -0.6468360,
The inphase and quadrature voltage as measured on the A/D channel 1, which is attached to the Rx coil amplifier output. This value is not scaled or phased.

$EM_RX_PPM, -370.95, -108.04, 3810.28,
The inphase and quadrature value as measured on the A/D channel 1, which is attached to the Rx coil amplifier output. This value is processed from volts to a calibrated value that is scaled

and phased into PPM units. The accuracy of this value is dependent on the correct calibration of the EM Bird that must be done at the beginning of the data file.

$GPS, 4613.80 , 43.55680000, -79.68609300, 139.49000549, 16,1,5,1.80,

The GPS time, latitude, longitude and height followed by the delay, quality, numSVs, hdop values.

$GPS_PPS, 1

Shows if the GPS PPS is valid or not valid. 1 indicates that it is valid.

$ALT_AVG_10HZ, 0.450,

The 10 laser range samples in a 100ms time window are averages into a single range sample which is posted in this record.

$ALT_100HZ, 10, 10, 0.420, 0, 874, 0.420, 10, 874, 0.400, 20, 978, 0.530, 30, 1010, 0.460, 40, 935, 0.410, 50, 865, 0.410, 60, 880, 0.470, 70, 952, 0.460, 80, 915, 0.460, 90, 941,

Shows that there are 10 expected laser samples and 10 where received.
The range of the first sample is 0.420 meters.
The amplitude of the first sample is 880 units.
The delay time from the start of the 100ms window is 0 ms for the first sample.
The range of the second sample is 0.420 meters.
The amplitude of the second sample is 874 units.
The delay time from the start of the 100ms window is 10 ms for the second sample.

$ALT_TEMP_10HZ, 34.6 ,

Shows the temperature sample obtained from the LDM301 device.

$CAL_SWITCH, 0, 0, 0,

Shows the state of the Cx control switches. 0 indicates open, 1 closed.

$EVENT_FLAG, 0, 0, 0, 0,

Shows the event flag number. The first one is incremented each time the Event button is pressed.

$EM_TIMING, 726, 800, 801, 60,

Shows that the EM data was triggered at 726ms, loaded into the SBC6748 local buffer at 800ms, transferred to a global buffer at 801ms and sent out on UDP message block at 60ms.

$GPS_TIMING, 799, 715, 799, 801,

Shows that the GPS data was triggered at 799ms, loaded into the SBC6748 local buffer at 715ms, transferred to a global buffer at 799ms and sent out on UDP message block at 801ms.

$ALT_TIMING, 880, 0, 70, 952,

Shows that the ALT data was triggered at 880ms, loaded into the SBC6748 local buffer at 0ms, transferred to a global buffer at 70ms and sent out on UDP message block at 952ms.