ETM1000

CONFIGURATION & PYTHON GRAPHING / TRENDING
USER MANUAL

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AUTHORS:	John M. Tipton, Jonathan Gunn
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CHANGE LOG

v7.3	- Updated document to support AKV Graphing Version 1.0.1rc21 Software Number S5410 Build ID 152 - Added T53 Cycle Counting - Improved HyperTerminal setup instructions for when cycle counting is enabled Pg.10 - Added missing H – Set LCD timer format Pg. 50 - Various corrections / improvements
v7.4	- Updated Appendix C for better clarity - Added Notes for reference to Appendix C
v7.5	Added changes for **LRU s/n 272 and newer** - New Remote Display P/N ETM004-RD LCD - Load Hook Interface and supporting configurations Appendix D, E & F - Spider X Interface - New cabled serial port dedicated to 3rd party devices - Addition of barometer offset

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1.0 INTRODUCTION

NOTE: This manual (v7.5 and later) incorporates changes made for **LRU S/N 272 and newer**. If your LRU is S/N 001 – 271 there will be configurations that are not available such as the Load Hook (weight), additional cabled RS232 and 3rd party Spider X interface.

The **ETM1000 User Manual** describes the procedures for configuring a company PC to communicate with and modify certain settings on the **ETM1000** via the **HyperTerminal** program, as well as use the supplied **AKV Python Graphing Software**. While the **HyperTerminal** is used to change factory default settings and to calibrate **Tq** and **MGT**, the **Python** graphing software is used to display exceedance information and to trend data over time.

IMPORTANT: The end-user is expected to have a functional knowledge of PC computer use running Windows operating systems. The User will also need to familiarize themselves with this manual.

There are two (2) **ETM1000** system **Configurations** available:

Standard -1	This complete configuration includes both Pushbutton/Annunciators (**Indication**) and Audio (**Alert**) side-tone and available **Options**.
Optional -2	This option does not include either the Pushbutton/Annunciators (**Indication**) or the Audio (**Alert**) side-tone and other options such as cycle counting etc. This Option is provided to operators as a lower, entry-priced system.

It is highly recommended that the User read this manual thoroughly, at least once, before proceeding, and be aware of the following:

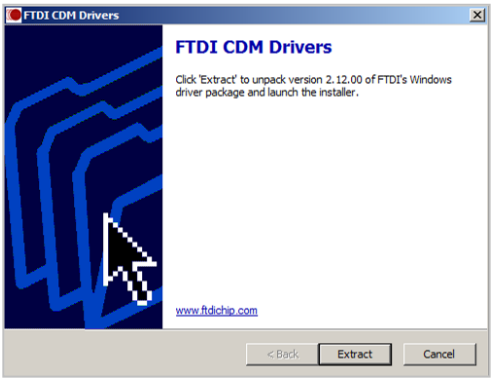
Considerations:

- A Dropbox link supplied via email contains all of the required data and software to install and communicate with the ETM1000. If you cannot locate this link, contact sales@akvinc.com with the request for a replacement link. The system serial number and customer / owner name is required.
- The instructions contained herein refer to using **Windows** only
- This graphing software is not designed to support **Apple MAC** computers. Use only a PC running **Windows Operating Systems**
- Use of Windows 10 or greater and a **64 Bit Operating** system is recommended
- It is recommended to print this document in color, so all color references stand out
- To communicate with the **ETM1000**, the User must set up **HyperTerminal** and configure it as outlined. **HyperTerminal** was a native Windows program that existed in all MS operating systems, except **Windows 7** and later. For these systems, it needs to be purchased separately and downloaded from the web links mentioned in **SECTION 3.4 – RUNNING HYPERTERMINAL**
- If your computer supports a 9-pin Serial port, then you do not need to use the supplied USB adaptor. If a 9-pin serial port is not available, you will need to set up the USB-to-Serial Cable driver, as mentioned in **SECTION 2.0 – USB TO SERIAL CABLE DRIVER INSTALLATION**

2.0 USB TO SERIAL CABLE DRIVER INSTALLATION

All of the instructions outlined below will enable the end-user to install and run the **HyperTerminal** communication tool. The **AKV**-supplied **USB** adapter software is required if your PC does not have a 9-pin serial port available. If your PC supports a 9-pin serial port, you may skip to **SECTION 3.0 – STARTUP OF HYPERTERMINAL.**

a. Boot up the computer to be used (**SECTION 6.0 - GRAPHING**)
b. Locate the **USB to 9-Pin Serial Cable** and set aside for now
c. Locate the supplied Dropbox email link and locate the ***USB FTDI Adaptor*** folder
d. Open the folder and double-click on the file ***DM21228_Setup***, or the latest supplied version →
e. Click on **Extract**
f. When the **Welcome to the Installation Wizard** is displayed, Click **NEXT**
g. Select **Accept** terms
h. When complete, select **FINISH**
i. **Reboot** the computer
j. When reboot is complete, plug in the **USB Adaptor**
k. The **Installing Device Driver** will pop up and then displays **Ready to Use** when it's complete



- Installation errors will be displayed, and may require un-installing and then re-installation of the software to resolve

Alternate Method:

You may obtain the driver from the **FTDI Support** page.

1. Go to http://www.ftdichip.com/Drivers/VCP.htm
2. On the **Drivers** window, scroll down until you see the **Processor Architecture** table as shown below
3. Select the latest Windows driver as "*Setup Executable*", as shown in screenshot

		Processor Architecture							
Operating System	Release Date	x86 (32-bit)	x64 (64-bit)	PPC	ARM	MIPSII	MIPSIV	SH4	Comments
Windows*	2017-08-30	2.12.28	2.12.28	-	-	-	-	-	WHQL Certified. Includes VCP and D2XX. Available as a setup executable Please read the Release Notes and Installation Guides.

4. Under **COMMENTS** double-click **CDM vXX.X WHQL Certified.exe** to install it, and continue
5. Click on **Setup Executable**, and select **Run**

NOTE: You may also select **Save**, to copy the raw file to your **PC**. If downloading and saving this way, you will need to locate the downloaded file to run it.

3.0 STARTUP OF HYPERTERMINAL

If you are using *MS Windows XP*, *2000*, or *Vista*, you will need to set up the **HyperTerminal** software by performing the steps in this section. For *Windows 7 and later end-u*sers, go to **STEP 3.3 - HyperTerminal Installation For Windows 7 and later.**

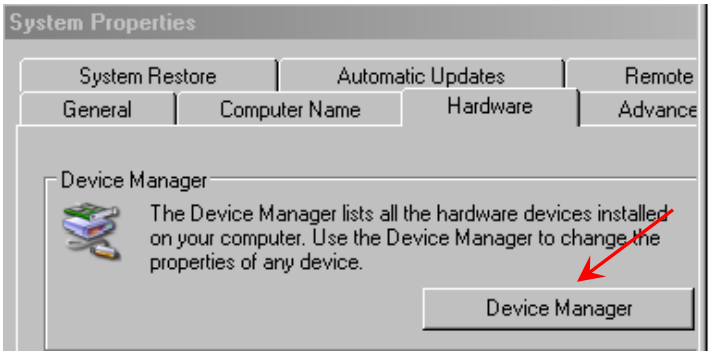
3.1 USB CABLE TEST

a. Plug the **USB cable** into a convenient USB port on your computer
b. Once you are satisfied the **USB** plug has been recognized by your computer, continue

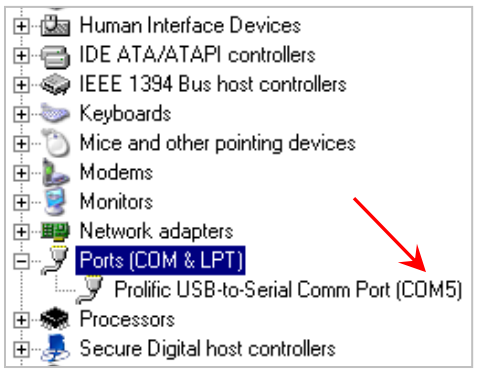
3.2 DEVICE MANAGER

To begin the **HyperTerminal** setup with a **USB** connection, you must know what **COM** port has been assigned to the **USB** port you're plugged into. To accomplish, perform this process:

a. Left-click on **START**, then click on **Control Panel** (from the right-hand side of the pop-up options)
   - For XP machines: Right-click on **START**, select **Settings**, then click on **Control Panel**
b. Click on **System**
   - If using **Windows XP**, **2000**, or **Vista**, continue to **NEXT STEP**
   - If using **Windows 7 and later**, click on **Device Manager** in the left column
c. From the **System Properties** window select the **Hardware Tab**
d. Click on the **Device Manager** button



e. Click on the plus sign next to the **Ports (COM & LPT)** listing to expand the information
f. It should read: *USB Serial Port (COMxx)*
   - Your COM number may be different
g. Write down the **COM** number
h. Close this window and the **System Properties** window
i. Skip to **STEP 3.4**



3.3 HYPERTERMINAL INSTALLATION FOR WINDOWS 7 AND LATER

a. The required HyperTerminal is approximately $70.00 USD per PC.
   - ➢ Access the installation link: http://www.hilgraeve.com/hyperterminal/

b. Select the **HyperTerminal** application you wish to use

c. Follow the **HyperTerminal** application instructions to install it on your system
   - Installation video http://www.hilgraeve.com/hyperterminal-install/

d. Return to **STEP 3.1**

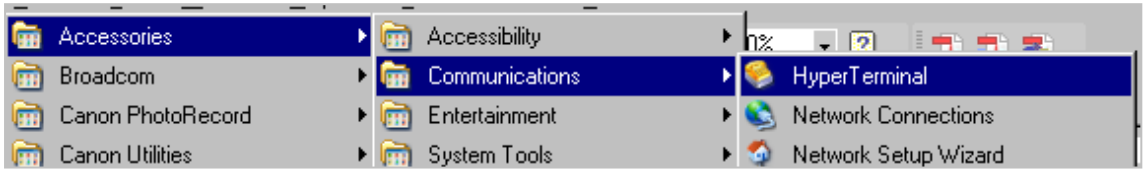
3.4 RUNNING HYPERTERMINAL

If installing **HyperTerminal** on **Windows 7** and later machines has created a desktop shortcut, double-click this icon and proceed to **STEP E**, otherwise, begin with **STEP A**.

a. Left click on the Windows **START** button

b. Click **All Programs** to expand this selection and move the slide bar on the right to show **Accessories** at the top

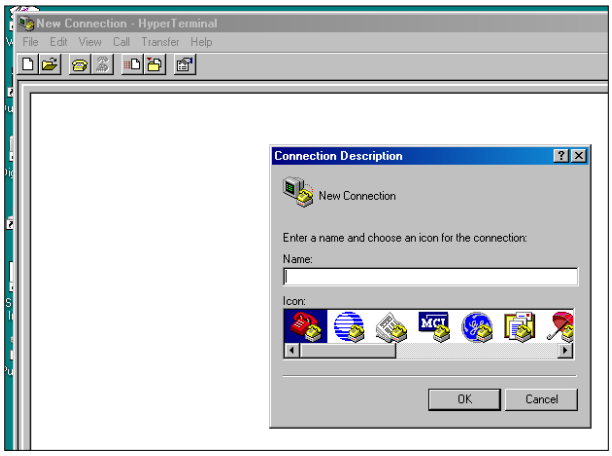
c. Place the pointer over **Accessories** and then over **Communications** then **HyperTerminal**

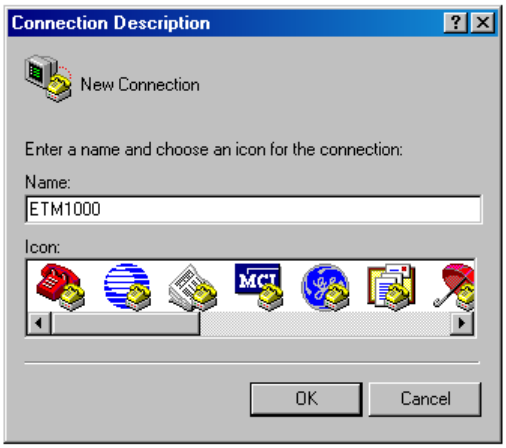


d. Select **HyperTerminal** from the list or double-click the icon

e. The **Connection Description** window appears, as shown below

NOTE: If no USB cable is connected, the screen will appear different from those shown





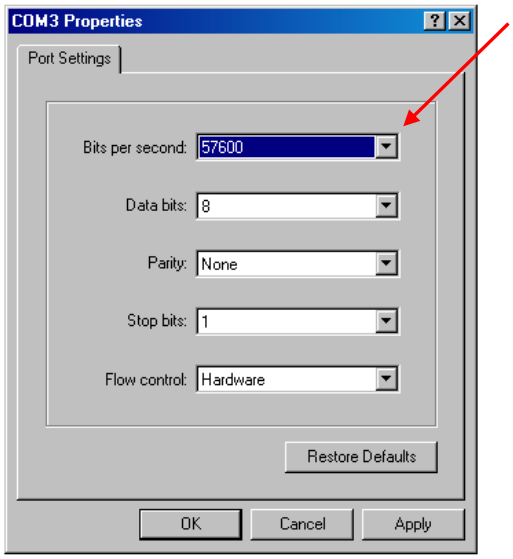
f. Under **Name**, type in **ETM1000**, or select a different Icon if desired

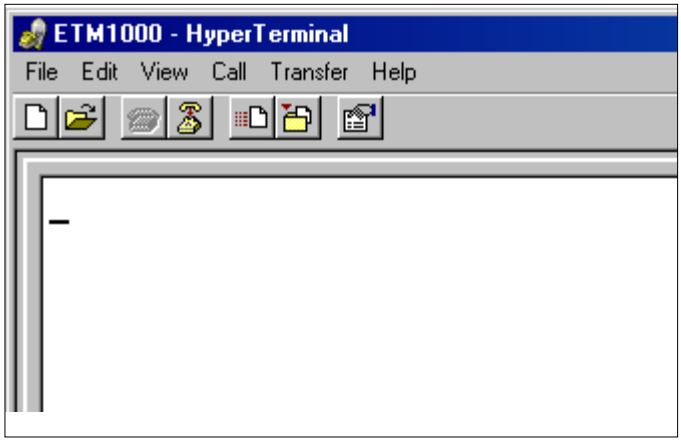
g. Click **OK**

h. The **Connect To** window opens

i. Under the **Connect Using** option, click the dropdown arrow and select the active COM Port discovered earlier in **SECTION 3.2 – DEVICE MANAGER**
   - COM3 and COM4 selections are shown here, but your COM number may be different

j. Click **OK** and the **COM Properties** window opens





k. On the **Port Settings** tab, under *Bits Per Second*, use the drop-down arrow to select **57600**

l. Make sure all other default settings are as shown, and click **OK**

m. The **ETM1000 – HyperTerminal** window now becomes active

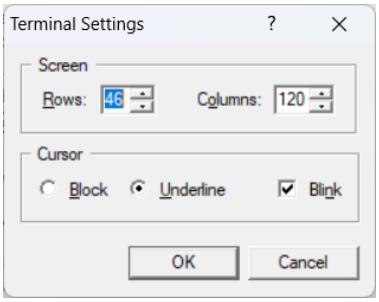
n. Hang up using the telephone key  , or select **Call** and **Disconnect**

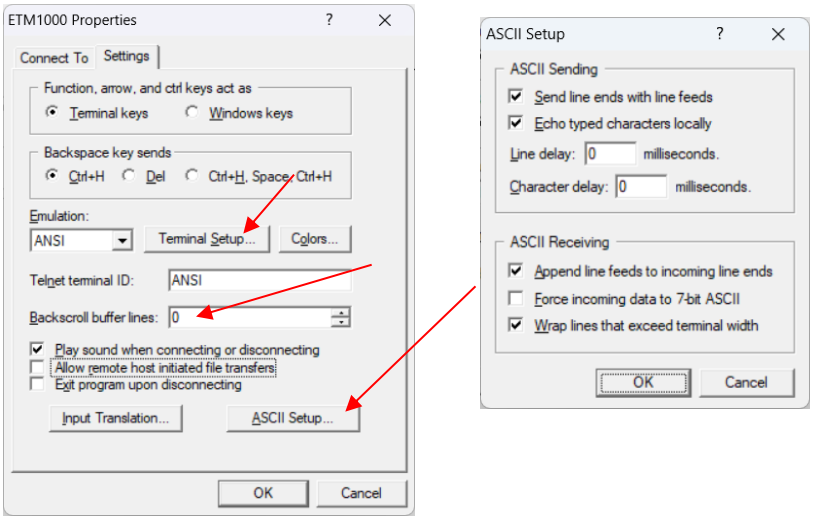
o. Click on the **Properties** key at the top 

p. The **ETM1000 Properties** window opens

q. With reference to the **ETM1000 Properties** displayed below, Select the **Settings** tab:

r. Go to **Emulation**, left side near center:
   1) Select **ANSI** from the drop-down box
   2) Click on the **Terminal Setup** button
   3) To account for displaying premium features such as Cycle Counting, the display **Rows** need to be set to **46** and columns to **120**. This allows sufficient viewable area for Cycle Counting data to be properly displayed without losing the first few lines of the **HT** information when set to small
   4) Set the Backscroll buffer lines to "**0**"





s. Click on the **ASCII Setup…** button
   1) The **ASCII Setup** window opens
   2) Select the **Checkbox** for *Echo typed characters locally*. This allows you to view your own commands as they are entered, otherwise they are invisible
   3) **Select** the remaining check boxes as shown
   4) Click **OK** to close **ASCII** window

t. Click **OK** again to close **PROPERTIES** window

NOTE: Ref **Appendix C** (back of this document) for additional information regarding the required HyperTerminal communication when using BOTH the optional Remote Display P/N ETMRD-004 and Bluetooth Mobile (Remote) Display iOS App module P/N BTM1000.

3.5 CHANGE THE HYPERTERMINAL FONTS

The following are needed changes to modify the **HyperTerminal** display.

a. From the tool bar, select **View** and click on **Font…**

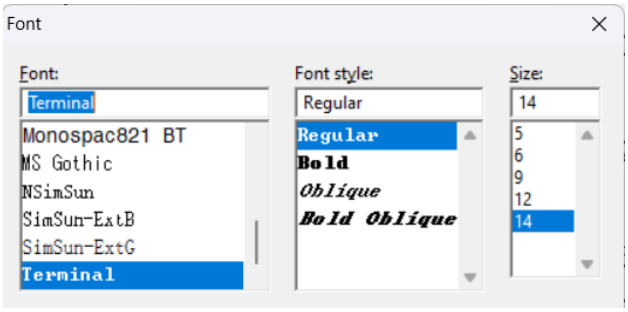
b. Make the following changes:

Font type: *Terminal*

Font style: *Regular*

Size: *14 (best viewing)*

c. Click **OK**



3.6 RESIZING WINDOW USING THE SNAP FUNCTION

If not already displayed as shown below, apply this setting to resize **HyperTerminal** to show only the data area of the ETM1000.

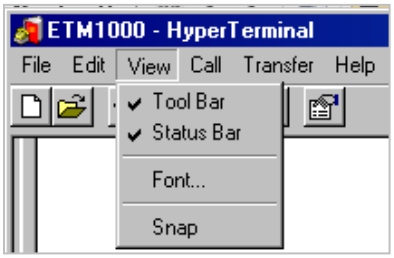
a. Minimize the display by clicking the right hand upper corner square

b. Click on **VIEW** from the tool bar

c. Click on **Snap**

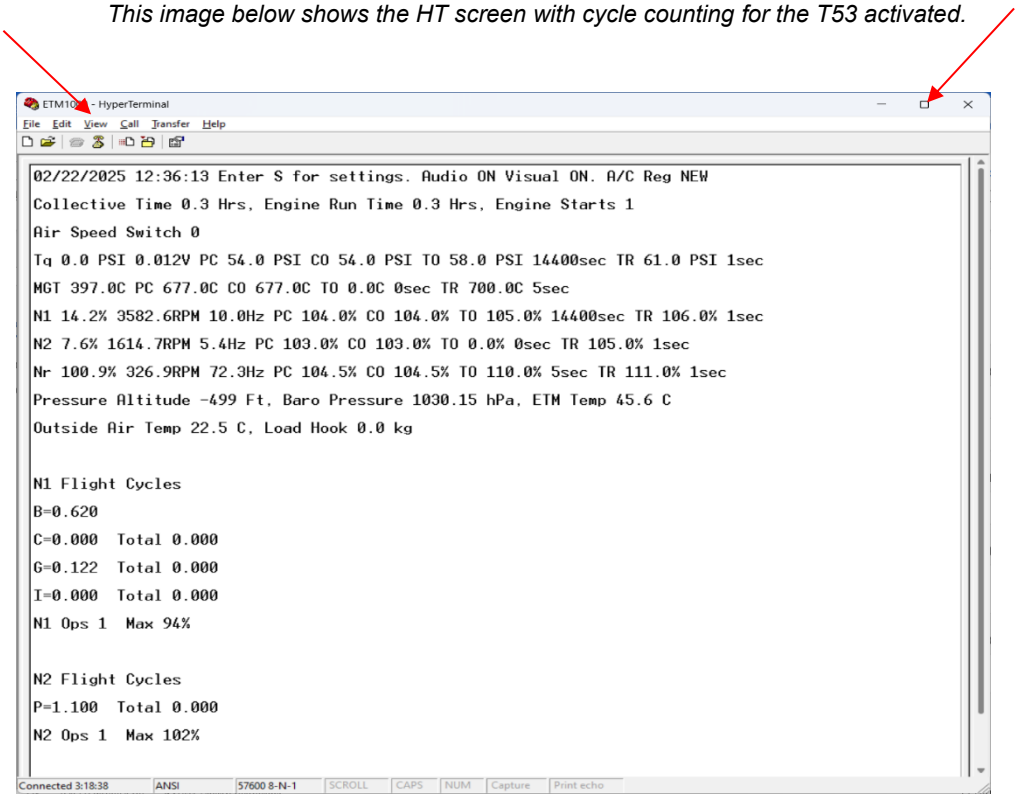
d. The **HyperTerminal** window automatically resizes

e. Return to **Step 3.5** if needed to modify these settings again



f. Click on **File** in the toolbar and select **Save**. This will save your settings under ***ETM1000*** for future use

This image below shows the HT screen with cycle counting for the T53 activated.



4.0 CONNECTING HYPERTERMINAL TO THE ETM1000

This section steps you through the **ETM1000** connection settings using the **HyperTerminal** and provides a definitions list for the displayed data stream information, which is refreshed every second.

4.1 CONNECTING HYPERTERMINAL

a. If **HyperTerminal** is not already running, refer to **STEP 3.4 - RUNNING HYPERTERMINAL**

b. Locate the **AKV**-supplied **9-pin Serial Cable** and connect one end to the **USB** adaptor, if needed, or directly to the 9-pin port on the **PC**

c. Connect the other end of the **9-pin Serial Cable** to the **Config Port** of the *ETM1000* installed in the helicopter

d. Turn on the aircraft battery switch

e. Double Click **OK** on the **ETM1000** icon to open it

f. If scrolling data is not seen immediately, connect to the *ETM1000* by using the telephone key or select **Call,** move down, and click on **Call**

g. **Streaming** data should be displayed (Refreshes values every second)

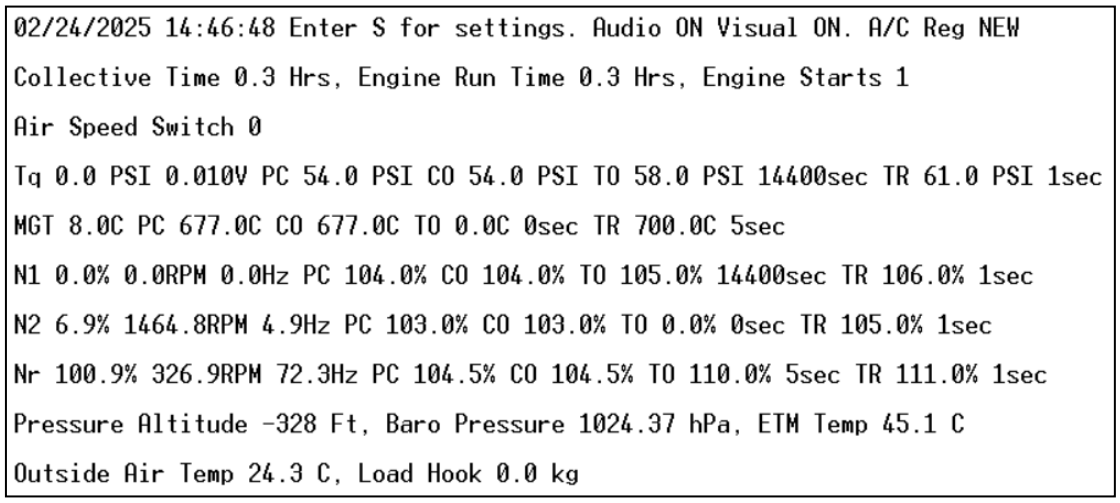
- If the -1 configuration system is installed and any annunciator lights are illuminated, go to **STEP 4.2 - HYPERTERMINAL, SD, AND ERR AMBER INDICATOR LIGHTS**
- Otherwise, skip to **STEP 4.3 – HOW TO INTERPRET HYPERTERMINAL DATA**

4.2 HYPERTERMINAL, SD, AND ERR AMBER INDICATOR LIGHTS

- If an amber **ERR** (**ERROR**) light appears on the annunciator, connect to the **ETM1000** using **HyperTerminal**, which will indicate the error type at the bottom of the screen.
- If the aircraft is running and the **ERR** is associated with a signal connection (i.e. Ng, Nr, etc.), check the wiring for proper connections. Refer to installation wiring diagrams under **ETM1000-MDL** or the **ICA Wiring Diagrams Appendix.**
- If you see a flashing amber **SD** light, there are approximately 8 hours of **SD Data Storage** space left. The data must be backed up to a **PC** for storage as described in **PART 6.0 VIEWING RECORDED SD CARD DATA**.
- A solid amber **SD** light indicates the **SD Card** is missing or not inserted properly.

4.3 HOW TO INTERPRET HYPERTERMINAL DATA

This section provides a line-by-line explanation of the **HyperTerminal** window you will see while using it. The sample data stream screenshot below shows how the screen data appears in **HyperTerminal**.
The left-hand column line reference (numbers) is detailed below.



(1) *11/25/2013 16:06:51 Enter S for settings. Audio ON Visual ON. A/C Reg XXXXXX*

11/25/2013 16:06:51	This is the ETM1000 Date and Time
Enter S for settings	Allows you to change the ETM1000 settings
Audio Enabled	Indicates the pilot's side-tone is active
A/C Reg xxxxx	This is the aircraft's registration number (to be entered)

(2) *Collective Time 0.0 Hrs, Engine Run Time 0.0 Hrs, Engine Start Count 0*

Collective Time	This is the flight time of the helicopter in 1/10th hour increments
Engine Run Time	Indicates the running time of the helicopter in 1/10th hour increments
Engine Start Count	This is a counter for accumulating total engine starts

(3) *Air Speed Switch 0*

Indicates aircraft speed as either **<40** knots (indicated by **0**) or **>40** knots (indicated by **1**)

(4) *Tq 0.0% 0.00V PC 94.0% CO 94.0% TO 100.0% 14400sec TR 107.0% 5sec*

Tq is Torque. It is in % for the AS350, B206, B407 and B214. It is in PSI for the UH-1, 204 & 205

(5) *MGT 9.4C PC 795.0C CO 795.0C TO 845.0C 300sec TR 865.0C 5sec*

MGT is Measured Gas Temperature

(6) *N1 0.0% 0.0RPM 0.0Hz PC 98.0% CO 98.0% TO 100.8% 300sec TR 107.5% 5sec*

N1 is gas producer speed

(7) *N2 0.0% 0.0RPM 0.0Hz PC 106.9% CO 106.9% TO 0.0% 0sec TR 118.7% 5sec*

N2 is free turbine speed

(8) *Nr 0.0% 0.0RPM 0.0Hz PC 105.1% CO 105.1% TO 110.3% 300sec TR 110.3% 1sec*

Nr is main rotor speed

ABBREVIATIONS

Colors used above identify abbreviations used in the line **(4)** though **(8)** reference numbers.

PC (Pre-Caution Value): This is a field-programmable parameter. It may be set to any number equal to, or lower than, the factory setting which is the same as CO

CO (Continuous Operating Limit): This is a limit defined by the RFM and is not user-configurable.

TO (Take-Off Limit): This is a limit defined by the RFM and is not user-configurable.

xxxxSec. –When the time is set to 14,400 seconds, from the factory, there is no defined time limit in the RFM. It is not user-configurable.

TR (Transient Limit): This is a limit defined by the RFM and is not user-configurable.

xxSec. – This time is defined by the RFM and is not user-configurable.

(9) *Pressure Altitude -273 Ft, Baro Pressure 1022.49 hPa, ETM Temp 28.4 C*

Pressure Alt	This is based on a standard atmosphere of 29.92inHg
Baro Pressure	This is the standard atmosphere converted to hectopascals or millibars
ETM Temp	This is the computer board temperature within the ETM1000

(10) *Outside Air Temp 24.3 C*

Outside Air Temp The ambient temperature outside the aircraft, described in Celsius.

Load Hook 0.0 Kg (LRU S/N 272 and newer)

Load Hook Weight The external load weight is received from the Onboard Systems / MSI load analogue interface and recorded in the ETM1000. Default value is Kg but can be changed to Lb in the settings

5.0 SETTING THE ETM1000 USER VALUES VIA HYPERERMINAL

These are the steps and commands required to access the **ETM1000 User Interface**. Within this interface, you will be able to change several of the factory defaults. **HyperTerminal** must be running, and streaming data must be viewable, before continuing. (If it is not, review **SECTIONS 3** & **4**)

5.1 ETM1000 USER INTERFACE

Read this section thoroughly. You will want to make notes on what changes are needed, such as the *password*, *date/times*, and *pre-caution limits*, and write down these values for later reference. When configuring the **ETM1000** from within **HyperTerminal**, **Do Not** use the PC keyboard arrow keys or backspace to move the cursor around. For any errors made in the **System Menu**, simply press **ENTER** and select **N** to retry an entry, or follow on-line prompts. In some instances, pressing **ENTER** will allow you to re-enter the information you attempted.

a. Start up **HyperTerminal**, if not previously done, and turn on the A/C battery switch

b. The system power-up screen temporarily displays the date, time, *Software Version* & *Parameter Version*, and the *Aircraft Model* & *Parameter Version*. Verify the aircraft model and engine type is correct. If not, contact **AKV**

- To view this screen again, you will need to recycle the power

```
Reset 05/31/2022 15:20:15


ETM1000 Software Version        Parameter Version

Aircraft Model: AS350B2 ARRIEL 1D1 Parameter Version
```

c. The aircraft data begins streaming, updating every second

```
02/24/2025 14:46:48 Enter S for settings. Audio ON Visual ON. A/C Reg NEW
Collective Time 0.3 Hrs, Engine Run Time 0.3 Hrs, Engine Starts 1
Air Speed Switch 0
Tq 0.0 PSI 0.010V PC 54.0 PSI CO 54.0 PSI TO 58.0 PSI 14400sec TR 61.0 PSI 1sec
MGT 8.0C PC 677.0C CO 677.0C TO 0.0C 0sec TR 700.0C 5sec
N1 0.0% 0.0RPM 0.0Hz PC 104.0% CO 104.0% TO 105.0% 14400sec TR 106.0% 1sec
N2 6.9% 1464.8RPM 4.9Hz PC 103.0% CO 103.0% TO 0.0% 0sec TR 105.0% 1sec
Nr 100.9% 326.9RPM 72.3Hz PC 104.5% CO 104.5% TO 110.0% 5sec TR 111.0% 1sec
Pressure Altitude -328 Ft, Baro Pressure 1024.37 hPa, ETM Temp 45.1 C
Outside Air Temp 24.3 C, Load Hook 0.0 kg
```

d. The following primary letter **Main Settings Menu** becomes available, once the user accesses the **System Access** for user configuration. Some of these contain sub-menus, as shown in the **HyperTerminal Menu Layers** table, below.

NOTE: The menu screen will differ depending on the software version installed

S+ENTER	to open the System Access Menu, below	See **SECTION 5.2**
R	to Configure Reset Warning Light	See **SECTION 5.3**
D	to Configure Date/Time	See **SECTION 5.4**
N	to Set Aircraft Registration Number	See **SECTION 5.5**
Q	to Configure Torque and MGT Calibrations	See **SECTION 5.6**
H	to Configure Load Hook **(LRU S/N 272 & newer)**	See **SECTION 5.7**
B	to Configure Barometric Pressure Offset **(LRU S/N 272 & newer)**	See **SECTION 5.8**
T	to Configure Collective/Engine Run Time/Engine Start Counter	See **SECTION 5.9**
L	to Configure Limit Override	See **SECTION 5.10**
A	to Configure Audio and Visual Indicators	See **SECTION 5.11**
S	to Enable the N2 Speed Input ***(shown below for Arriel 1 only)***	See **SECTION 5.12**
E	to Enable Premium Features (Cycle Counting / 3rd party Sat tracking systems)	See **SECTION 5.13**
P	to Change Password	See **SECTION 5.14**
X	to Reset all settings to Factory Defaults	See **SECTION 5.15**
F	to Download new ETM Firmware	See **SECTION 5.16**
C	to Cancel/Exit (A universal command within menus and most sub-menus)	All **SECTION** Menus

```
Main Settings Menu:
R to reset WARNING light
D to set date/time
N to set Aircraft Registration Number
Q to Calibrate Torque or MGT
H to Configure Load Hook
B to Configure Barometric Pressure Sensor
T to set Collective Timer, Engine Run Timer, and Engine Start Counter
L to override Pre-Caution limits or restore their factory defaults
A to configure Audio and Visual indicators
S to enable the N2 speed input
E for Premium Features: Cycle Counting, ioNode, DZMx, Spider X...
P to change password
X to reset all settings to Factory Defaults
F to download new ETM firmware
C to exit.
```

SYSTEM NOTES:

- You will be returned to the data stream after canceling a selection, or completing any selection change
- You must re-enter **System Access** with the password to change other values
- The factory-default password is *ETM1000* until changed by the user
- If you make an incorrect entry, you may re-enter it via the displayed screen menus
- There are several layers to the **System Menu**, as outlined below:

ETM HyperTerminal Menu Layers			
DATA STREAM	*SYSTEM ACCESS*	*SYSTEM MENU*	*SYSTEM SUB-MENUS*
Data Streaming	**S** (Access)	**R** (WARNING Reset)	
		D (Date & Time)	**S** (Set Time) **A** (Clock Speed)
		N (Registration Number)	
		Q (Calibrate Torque or MGT)	**T** Torque Calibration **M** MGT Calibration
		H (Load Hook) **NOTE:** S/N 272 & newer	**R** Input Range **S** Scale Factor **O** Offset **E** Source **U** Units
		B (Barometric Pressure Offset) **NOTE:** S/N 272 & newer	
		T (Engine Info)	**C** (Collective) **E** (Eng Run) **S** (Eng Start)
		L (Change Limits)	**PCD** (Restore Pre-Caution Defaults) **TQ** (Torque) **MGT** (Gas Temp) **N1** (Gas Producer) **N2** (Turbine Speed) **Nr** (Rotor Speed)
		A (Configure Audio)	**A** (Audio) **V** (Visual) **L** (Alarm Levels)
		S (Eanble N2 for Arriel 1)	
		E (Premium Features)	**N** (Cycle Counting) **I** (Latitude IONODE) **S** (Spider X) **D** (Flightcell DZMx) **M** (Mobile Display)
		P (Change Password)	
		X (Reset All to Factory Defaults)	
		F (Firmware Download)	

5.2 S (SYSTEM ACCESS)

a. Type **S** and press **ENTER** in quick succession, to access the internal menu system
b. The system prompts you for the password:
   - The first time you enter this section you must use the factory default password (all in caps / uppercase) **ETM1000**. This may be changed by the user
   - See **STEP 5.14 – CHANGE PASSWORD** to change password options

```
Enter password, it is case-sensitive.

You have 10 seconds, then the unit will reset. C to cancel. ETM1000_
```

c. Type in the password and press **ENTER**
d. You are taken to the **Options Menu** screen
e. These commands are used to change **ETM1000** factory defaults, if needed

5.3 R (WARNING LIGHT RESET)

This blue WARING light turns on when there has been an Exceedance. When this occurs, the SD card data needs to be reviewed as described in **Section 8.0**. There are two parts to this:

Perform the following to turn off the ***WARNING*** light and erase all ***Data***:

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options** menu screen opens
d. Type **R** and press **ENTER**
e. **Displays:** "*WARNING light reset. Press any key to continue*."
f. Press any key and **ENTER**
g. The **WARNING** light turns off
h. You are returned to the **System Menu**

WARNING: When the **WARNING Light** is reset, exceedance backup data in **EXCRECOV** flash memory is erased.
Ensure the data has been backed up before proceeding by removing the **SD Card** and copying all the files to a PC. See **Step 6.1 – Suggested Methods To Backup & Store Recorded Data**

NOTE: The pilot can temporarily extinguish the **WARNING** light in-flight by pressing the **MUTE** button for **>3 sec**. The **WARNING** light will re-appear when another exceedance is recorded within the same flight, or when the battery switch is recycled after shutdown.

Perform the following after an exceedance has been recognized:

a. Remove the **SD** card from the **ETM1000** enclosure
b. Copy the **SD** card data to a **PC**
c. Wipe the **SD** card clean after confirming the data has been copied to the **PC** correctly
d. View the **Exceedance** using the graphing software. **Ref Sect. 6.0**
e. Complete any necessary corrective maintenance actions.

5.4 D (SET DATE/TIME) & ADJUST CLOCK SPEED

NOTE: The **ETM1000** system does not compensate for *Daylight Saving Time*. For LRU's S/N 272 and newer, it incorporates an improved "run time clock" for accuracy.

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options** menu screen opens
d. Type **D** and press **ENTER**

```
Enter S to set date/time, A to adjust clock speed, C to cancel.
```

e. You are prompted to select the letter corresponding to what you want to change:

S – SET TIME AND DATE: Go to **STEP 5.4.1**
A – ADJUST CLOCK SPEED: Go to **STEP 5.4.2**

5.4.1 S – CHANGE TIME & DATE

Initial entry will always walk you through both settings, but if you elect to skip one or the other, the system will retain the previous values.

1) Type **S** and press **ENTER** to ***set time***
2) The System prompts you to enter new time as: **HH MM SS**
3) Do one of the following:
   - Type in the new time with spaces indicated (e.g. **09 48 15**)
   - Type **S** and press **ENTER** to skip directly to **Date** (go to **Step 8**)

```
Enter 24-Hr Time as HH MM SS (C to cancel, S to skip to date): _
```

4) Press **ENTER**
5) Type **S** and the System prompts you to enter the ***current time*** using the required format:

```
Enter S to set date/time, A to adjust clock speed, C to cancel. s


Time will be set to 09:48:15.  Is this correct (Y/N)?to date): 09 48 15
```

6) The System queries "Is this correct **Y** or **N** ?"
7) Type **Y** and press **ENTER**
8) The System prompts you to enter the ***current date*** as **MM DD YYYY**

```
Time will be set to 09:48:15.  Is this correct (Y/N)?yo date): 09 48 15


Enter Date as MM DD YYYY (C to cancel date setting): _
```

9) Type in the date and press **ENTER** (e.g. **05 16 2018**)

```
Enter Date as MM DD YYYY (C to cancel date setting): 05 16 2018_
```

10) The System displays your change “Date will be set to 05/16/2018”

11) The System queries “Is this correct **Y** or **N** ?”

```
Date will be set to 05/16/2018.  Is this correct (Y/N)?y16 2018
```

12) Type **Y** and press **ENTER**

13) You are returned to the **System Menu**

14) Read the top of the data stream to double-check that changes are correct

5.4.2 A – CHANGE CLOCK SPEED

The **ETM1000** is provided with an accurate Run Time Clock (RTC). However, the time may need to be adjusted over a long operational period, so a clock speed offset is provided. The System displays the current total adjustment, factory set at **0** seconds per day, as circled below.

If you find that the **ETM1000** clock is off when compared to a real-time clock, perform the following process to modify the factory setting as needed.

1) Log back into **D Set Date/Time** (steps **a** through **e** of **Section 5.4**)

2) Type **A** and press **ENTER** to change ***clock speed***

3) The System displays the current total adjustment in seconds per day

```
Current total adjustment is 0 seconds per day.C to cancel. A

Enter the number of seconds the clock is off in a 24-hour period.
If clock is slow enter a positive number, if fast enter a negative number.
C to cancel. _
```

4) The System prompts you to enter the number of seconds the clock is off as a positive or negative number for adjustment. Perform one of the following to correct:

- If the **ETM1000** is slow, enter a positive number in seconds (e.g. 4 seconds)
  (e.g. The clock at 0 with an offset of +4 would result in a new clock offset of +4)

- If the **ETM1000** is fast, enter a negative time in seconds (e.g. -4 seconds)
  (e.g. The clock at 0 with an offset of -4 would result in a new clock offset of -4)

```
If clock is slow enter a positive number, if fast enter a negative number.
C to cancel. 4
Clock adjustment about to be set to 4 seconds per day.
Do you wish to make the change? Enter Y, N, or C to cancel._
```

5) The System displays your changes
6) The System queries “Do you wish to make the change?” Enter **Y**, **N**, or **C** (cancel)
7) Type **Y** and press **ENTER**
8) The message “Clock adjusted by ***xxx*** seconds per day” is displayed for a second, before automatically returning to the **System Menu**
9) Repeat **STEPS** 1 through **3** above, to verify that the current total ***adjustment change*** has taken place (see red circle in **STEP 3** image, above will show current adjustment)
    - Press **CANCEL** to back out of it, if accurate

5.5 N (AIRCRAFT REGISTRATION NUMBER)

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options Menu** screen opens
d. Type **N** and press **ENTER**

```
Aircraft Registration Number is blank.

Enter the Aircraft Registration Number, C to cancel: _
```

e. Enter the **Aircraft Registration Number** (While this accepts lower-case letters, it is not recommended)
f. Press **ENTER**
g. The System queries “Is this correct?” Enter **Y**, **N**, or **C** (cancel)

```
Current Aircraft Registration Number is N12345

Enter the Aircraft Registration Number, C to cancel: N12345

Aircraft Registration number about to be set to N12345

Is this correct? Enter Y, N, or C to cancel.Y
```

h. Type **Y** and press **ENTER**
i. The message “*Aircraft Registration Number successfully set*.” is displayed for a second, before automatically returning to the **System Menu** where the registration is displayed

5.6 Q (CALIBRATE TORQUE OR MGT)

This option is used to calibrate the **ETM1000 Torque Voltages (Tq)** and **Measured Gas Temperatures (MGT)** readings to match the instrument panel indicators. The calibration will provide < 1% Tq error and < 5 Deg MGT error.

a. Turn the aircraft battery switch **ON**
b. Connect your **PC** to the **ETM**
c. Run **HyperTerminal (HT)** with the streaming data displayed
d. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
e. Type in the password and press **ENTER**
f. The **Main Options Menu** screen opens
g. Type **Q** and press **ENTER**

```
q

Enter T to calibrate torque, M to calibrate MGT, C to cancel:
```

h. You are prompted to select the letter corresponding to what you want to change:

T – CALIBRATE TORQUE:	Go to **STEP 5.6.1**
M – CALIBRATE MGT:	Go to **STEP 5.6.2**
C – CANCEL	Return to the **System Menu**

5.6.1 T – TORQUE CALIBRATION

Install the Tq calibration dead weight test-set to the engine Tq transmitter per the manufacturer's instructions. To obtain better accuracy during calibration with the test-set, use a digital meter rather than an analogue pressure gauge. You will be required to record the current **ETM** torque volt readings at **10%** increments up to **110%** torque on the supplied **Torque Calibration Worksheet** in **APPENDIX A**. Print this appendix from Dropbox email link file before proceeding (*Torque Calibration Worksheet.xls*) or copy from the **APPX. SECTION** of this document.

IMPORTANT: After recording the calibration values on the Torque Calibration Worksheet, save the completed worksheet.

1) From **Main Menu Q** (**Section 5.6**), type **T** and press **ENTER**

```
Enter T to calibrate torque, M to calibrate MGT, C to cancel: t

D to record torque data, E to enter calibration coefficients, C to cancel:_
```

2) The screen displays a new menu, with three options:

D – **RECORD Torque Data**
E – **ENTER Calibration Coefficients**
C – CANCEL Return to the **System Menu**

NOTE: If you need to ***RELOAD*** the original **Factory Default Tq Values** prior to calibration, perform the following before proceeding:

a) **Type D** and press **ENTER**
b) **Type D** again and press **ENTER**
c) **Type E** and press **ENTER**

d) **Type D** and press **ENTER** to restore default values
e) The System queries "Are you sure you want to Restore Torque Defaults?" Enter **Y**, **N**, or **C** (cancel)
f) **Type Y** and press **ENTER**
g) You are returned to the **Data Stream** automatically
h) Return to **Step 2**, above, and continue to **Tq calibration**

3) Type **D** and press **ENTER** to **Record Torque Data**
4) Current Torque voltage will stream in the window

```
D to record torque data, E to enter calibration coefficients, C to cancel:d

Torque Volts 0.023V Press D then Enter when done.

Torque Volts 0.023V Press D then Enter when done.
```

NOTE: The following procedure describes % for the AS350, but the same is accomplished for for the Bell Medium except in 5 PSI increments, which uses the PSI calibration spread sheet.

5) Starting with the test-set providing a zero torque reading on the torque indicator, increase the deadweight test-set to indicate **10% Tq**

NOTE: As it is sometimes difficult to get the Tq indicator to read precisely what you want at each 10% increment, if the Tq indicator value is different, then write down the indicated value. (i.e. With test set at 10% setting, your indicator displays 11%: Write down 11% in place of 10% in the left column under "indicated %" and record the ETM voltage value.

6) Wait **five seconds** for stabilization
7) Record the new **Torque Volts** value on the **Torque Calibration Worksheet**
8) Increment **Tq** by **10%** and repeat **Steps 5)** through **8)** until you reach and record **110%**, then continue to the next step.
9) Decrease the test–set to **0% Tq**

NOTE: On the AS350 VEMD B2s and Bell 407 Torque Indicators, the Exceedance must be reset due to the 110% setting used during calibration. Follow the OEM Tq Indicator reset procedure.

10) Type **D** and press **ENTER** to exit the scrolling data display
11) The **Torque Calibration Coefficients** screen appears, showing current and default values, which will be used later in this procedure
12) Proceed to section below to record the values

ENTERING TORQUE CALIBRATION VALUES ON THE SPREADSHEET

Copy the **Torque Calibration Volt** readings from the worksheet by entering the recorded values at each 10% into the provided **MS Excel** file **Torque Calibration** spreadsheet.

IMPORTANT: When closing the spreadsheet, *DO NOT* save when prompted.

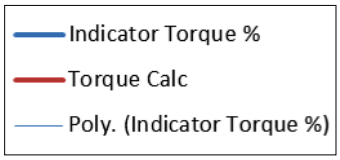
a. Locate and open the **TorqueCalibration.xlsx** file from the Dropbox email link
b. Maximize the window
c. From your worksheet readings, enter the results in the rows for blue **ETM Volts** and yellow **Indicator Torque %** cells for each 10% increment

NOTE: If your **Indicator Torque %** indicator readings were different, change them in the yellow areas beneath each corresponding blue voltage reading.

REMINDER: Do not save this sheet when exiting

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Enter ETM Volts reading in the blue area and Indicator Torque % reading (if different) in the yellow area below. Then enter the T0, T1 & T2 values in the ETM1000 Hyperterminal Torque Calibration Facility.																
2																	
3	ETM Volts	0.015	0.04	0.07	0.101	0.131	0.16	0.191	0.222	0.252	0.284	0.315	0.347	x			
4	Indicator Torque %	0	10	20	30	40	50	60	70	80	90	100	110	y			
5																	
6																	
7																	
8														T0	T1	T2	
9	Torque Calculated	0.684951	9.32715	19.60848	30.13015	40.21336	49.86786	60.08749	70.20309	79.89333	90.12218	99.92567	109.9363	-4.5328E+00	3.4867E+02	-5.4129E+01	
10	Error %	0.684951	-0.67285	-0.39152	0.130153	0.213365	-0.13214	0.087492	0.203092	-0.10667	0.122184	-0.07433	-0.06372	0.684951198	0.240		
11														Max Err %	Avg Err %		

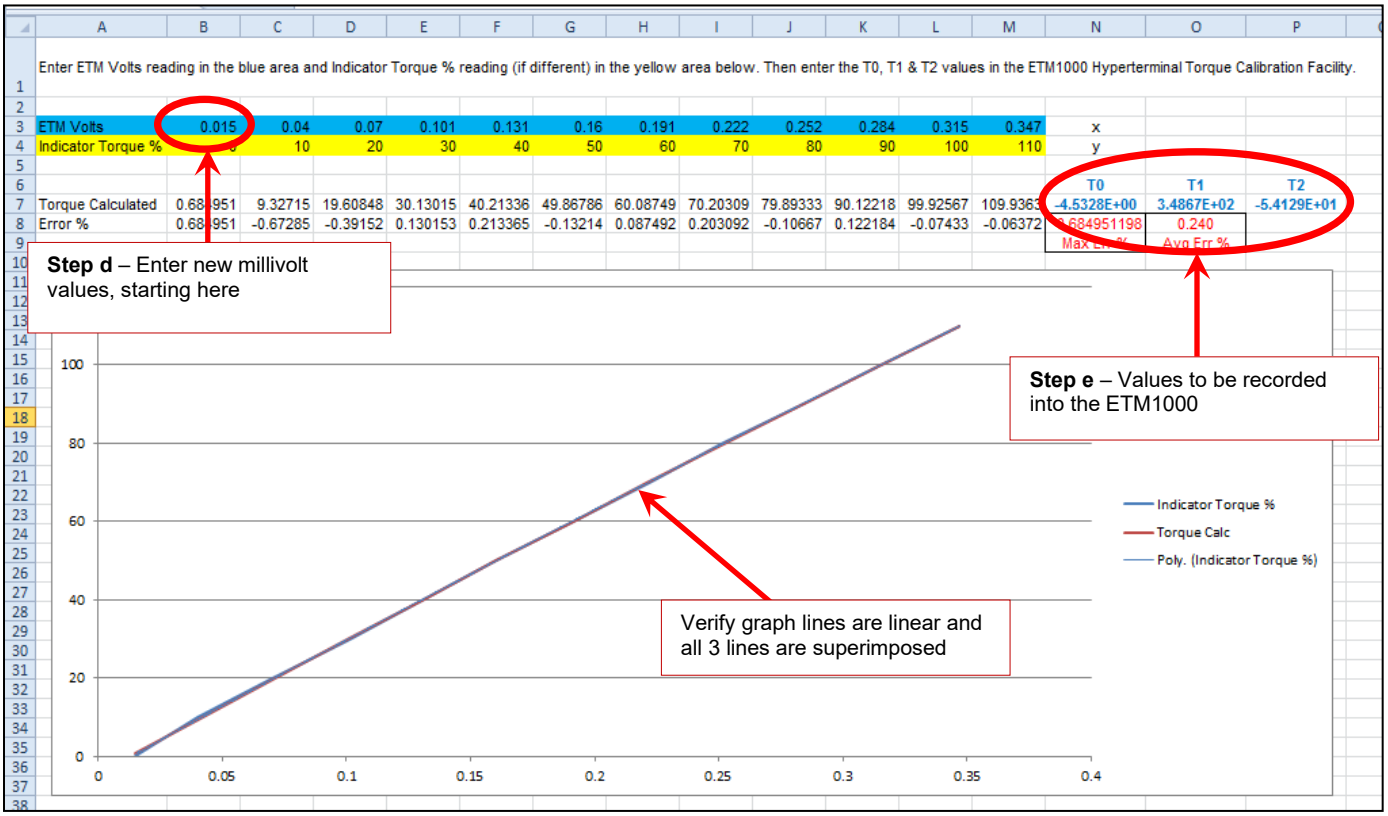
d. Once all volt readings have been entered, verify that all three lines depicted on the graph are linear and superimposed on top of each other, as shown below. You should see very little deviation in the mid-torque to high-torque ranges of 50-110%.



NOTE: If skewed deviations (lines are not linear or superimposed) exist in the graph lines, values may be missing or incorrectly entered. Before proceeding, do the following to verify data is correct:

- Re-check your volt entries for accuracy
- Repeat the **TORQUE CALIBRATION** procedure on the aircraft and check the new figures against what was previously entered on the spreadsheet

e. Record the **T0**, **T1**, and **T2** values (blue) into the **Appendix A – TORQUE CALIBRATION WORKSHEET** under **New TQ Calibration Values**. Pay close attention that you note whether the numbers are ***positive*** (+) or ***negative*** (–)



f. Use these new calibration numbers below for entry into the **ETM1000**

g. When closing the **TorqueCalibration.xlsx**, ***DO NOT*** save the file

ENTERING NEW TORQUE CALIBRATION VALUES INTO THE ETM1000

With the new **T0**, **T1**, and **T2** calibration values recorded in the **Torque Calibration Worksheet**, perform the following:

a. Go to the HyperTerminal **Torque Calibration Coefficients** screen, which should show the current and default values with three options:

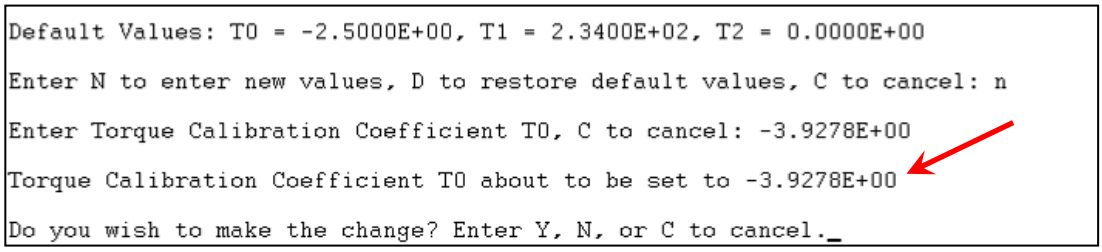
N – Enter New Values
D – Restore Default Values
C – Cancel and return to the **Data Stream**

```
Torque Calibration Coefficients:

Current Values: T0 = -2.5000E+00, T1 = 2.3400E+02, T2 = 0.0000E+00

Default Values: T0 = -2.5000E+00, T1 = 2.3400E+02, T2 = 0.0000E+00

Enter N to enter new values, D to restore default values, C to cancel:
```

b. Type **N** and press **ENTER** to add new values

c. Enter the **Torque Calibration Coefficient T0** number and press **ENTER**

Note: Be aware of the format **–**x.xxxx**E+**xx with variations in **+** and **–** indicators

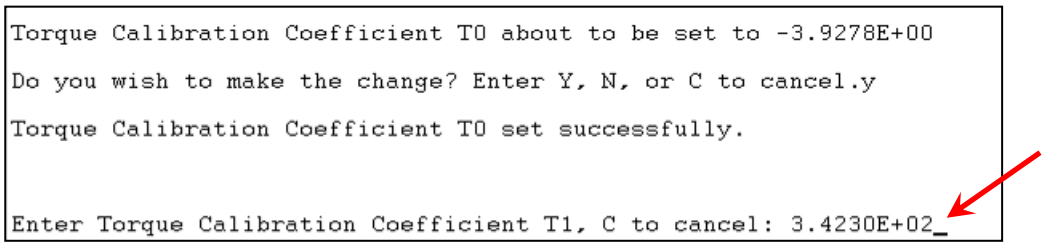


d. The System queries “Do you wish to make the change?” Enter **Y**, **N**, or **C** (cancel)

e. Type **Y** and press **ENTER**

f. The “T0 Set Successfully” message appears and immediately steps to the **T1** entry

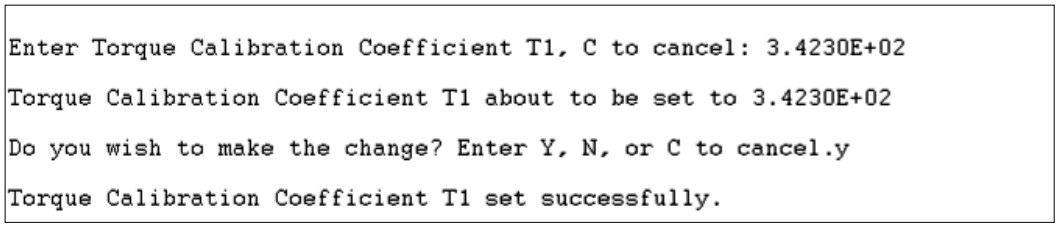
g. Enter the **Torque Calibration Coefficient T1** number and press **ENTER**



h. The System queries “Do you wish to make the change?” Enter **Y**, **N**, or **C** (cancel)

i. Type **Y** and press **ENTER**

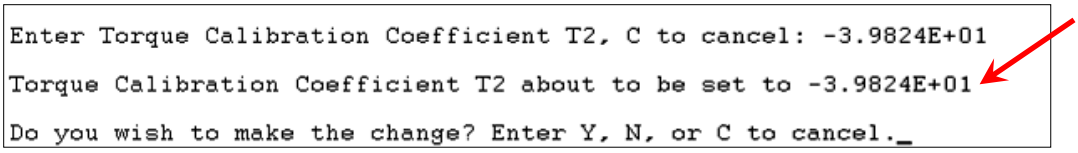
j. The “Torque Calibration Coefficient T1 set successfully” message appears and immediately steps to the **T2** entry



k. Enter the **Torque Calibration Coefficient T2** number and press **ENTER**

l. The System queries “Do you wish to make the change?” Enter **Y**, **N**, or **C** (cancel)

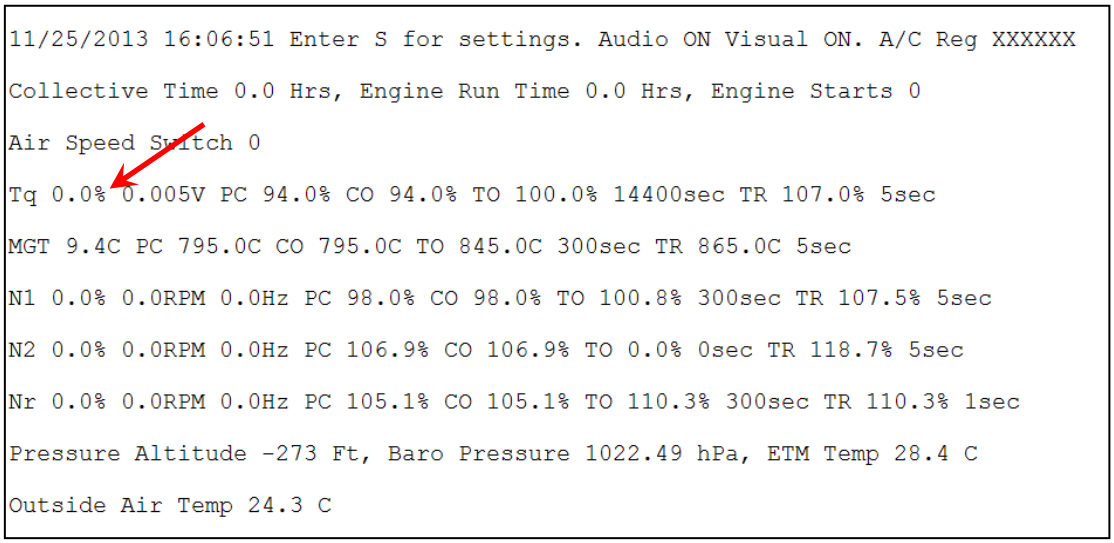
m. Type **Y** and press **ENTER**



n. The “T2 Set Successfully” line appears and returns you to the **Data Stream** automatically

o. Verify the ETM1000 Tq reading matches the Tq indicator by performing the following:

1) Starting with the test-set at zero torque reading on the torque indicator, increase the deadweight test-set to indicate **10% Tq**
2) Wait **five seconds** for stabilization
3) Increment **Tq** by **10%** and compare each time the Tq indicator with the ETM1000 Tq reading until you reach and verify **110%**
4) Decrease the test–set back to **0% Tq**
5) If the ETM1000 Tq value is within 0.5% of the Tq indictor or then you have been successful in calibrating the system if not, then repeat the Tq calibration procedure over until the desired results are obtained.



5.6.2 M – MGT CALIBRATION

Install the MGT (Measured Gas Temperature) calibration test-set per the manufacturer's instructions. You will be required to record the current ETM MGT values at **100 Deg C** temperature value increments up to **1000 Deg C**, on the supplied **MGT Calibration Worksheet** in **Appendix B**. Print this appendix from the Dropbox email link before proceeding (*MGT Calibration Worksheet.xls*) or copy from the APP. SECTION of this document.

IMPORTANT: After recording the calibration values on the MGT Calibration Worksheet, save the completed worksheet.

1) From **Main Menu Q** (**Section 5.6**), Type **M** and press **ENTER**

```
Enter T to calibrate torque, M to calibrate MGT, C to cancel: m

D to record MGT data, E to enter calibration coefficients, C to cancel:_
```

2) The screen displays the **MGT** sub-menu, with three options:

   D – Record MGT Data
   E – Enter Calibration Coefficients
   C – **Cancel** and return to the **System Menu**

   NOTE: If you need to ***RELOAD*** the original **Factory Default MGT Values** prior to calibration, perform the following before proceeding:

   a) **Type E** and press **ENTER**
   b) **Type D** and press **ENTER** to restore default values
   c) The System queries "Are you sure you want to Restore MGT Defaults?" Enter **Y**, **N**, or **C** (cancel)
   d) **Type Y** and press **ENTER**
   e) You are returned to the **Data Stream** automatically
   f) Return to **Step 8**, above, and repeat the steps to continue calibration

3) Type **D** and press **ENTER** to **Record MGT Data**

4) Current temperature will stream in the window

```
D to record MGT data, E to enter calibration coefficients, C to cancel:d

Uncalibrated MGT 69.2C Press D then Enter when done.

Uncalibrated MGT 69.2C Press D then Enter when done.
```

5) Starting with the test-set providing a zero temperature reading on the MGT indicator, increase the test-set to indicate **100 Deg C Temp**

   NOTE: As it is sometimes difficult to get the MGT indicator to read precisely what you want at each 100 Deg increment, If the MGT indicator value is different, then write down the indicated value. (i.e. With test set at 400 Deg, your indicator displays 405 Deg: Write down 405 deg in place of 400 Deg in the left column under "Indicated C" and record the ETM voltage value.

6) Wait five seconds for stabilization

7) Record the new ETM1000 MGT Temp value on the MGT Calibration Worksheet

8) Increment MGT by 100 Deg C and repeat **Steps 6** & **7** until you record 1000 Deg C temp

9) Decrease the test–set to 0 Deg C

10) Type **D** and press **ENTER** to exit the scrolling data display

11) The **MGT Calibration Coefficients** screen appears, showing current and default values, which will be used later in this procedure

```
Current MGT Calibration Coefficients:

 M0            M1            M2            M3            M4            M5

 2.5806E+01    5.8839E-01    4.6741E-03   -1.2737E-05    1.4404E-08   -5.8663E-12


Default MGT Calibration Coefficients:

 M0            M1            M2            M3            M4            M5

 0.0000E+00    1.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
```

ENTERING MGT CALIBRATION VALUES ON THE SPREADSHEET

Use the **MGT Calibration Temperature** readings from the worksheet by entering the recorded values at each 100 Deg C into the provided **MS Excel** file, **MGT Calibration** spreadsheet.

IMPORTANT: After completing use of the spreadsheet, *DO NOT* save when prompted.

a. Locate and open the **MGTCalibration.xlsx** file from the Dropbox email link

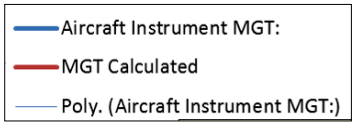
b. Maximize the window

c. Enter the **MGT** results from the worksheet into the blue **ETM MGT** cells, above their 100 Deg C temperature increments

NOTE: If your **Indicator MGT** readings were different, change them in the yellow areas beneath each corresponding blue voltage reading.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Enter Uncalibrated ETM MGT reading in the blue area and Aircraft Instrument MGT reading (if different) in the yellow area below. Then enter the M0 through M5 values in the ETM1000 Hyperterminal MGT Calibration Facility.																
2																	
3	Uncalibrated ETM MGT:	83.2	161.5	238.8	315.8	395	488.5	582	670.5	760.7	853	x					
4	Aircraft Instrument MGT:	100	200	300	400	500	600	700	800	900	1000	y					
5																	
8												M0	M1	M3	M3	M4	M5
9	MGT Calculated	100.4	198.2	301.7	401.5	496.8	600.9	701.5	798.6	900.4	1000.0	2.5806E+01	5.8839E-01	4.6741E-03	-1.2737E-05	1.4404E-08	-5.8663E-12
10	Error %	0.4	-1.8	1.7	1.5	-3.2	0.9	1.5	-1.4	0.4	0.0	3.227508157	1.074				
11												Max Err °C	Avg Err °C				

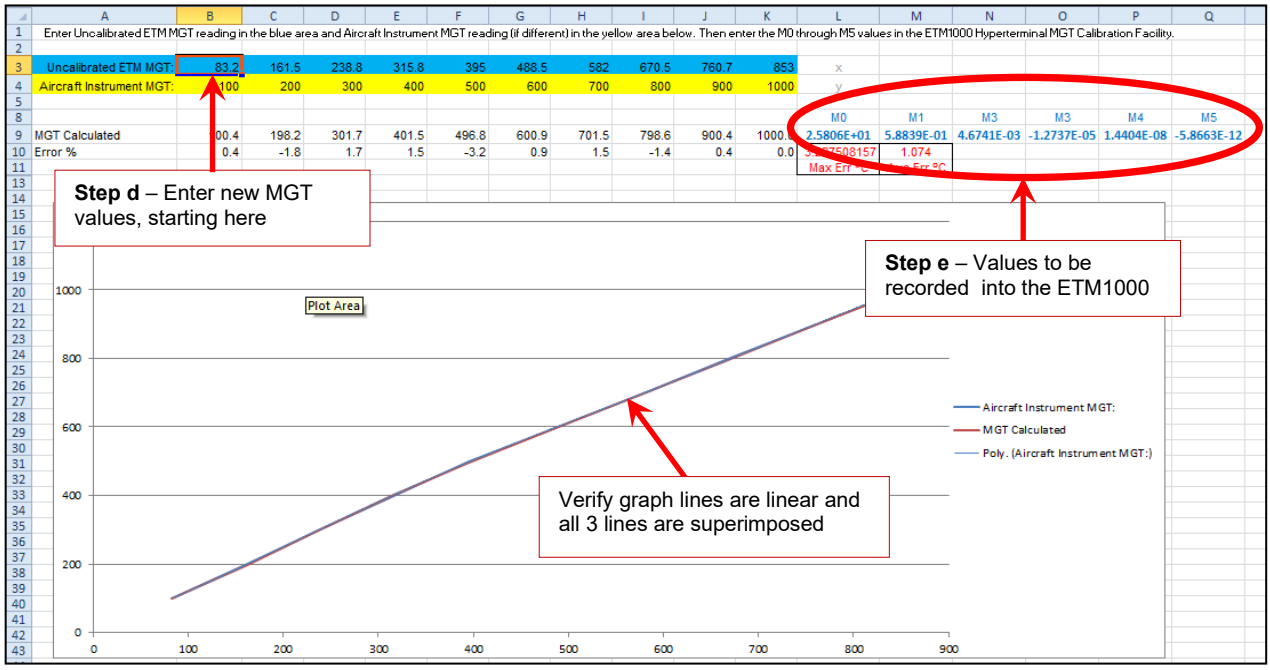
d. Once all MGT readings have been entered, verify that all three lines depicted on the graph are linear and superimposed on top of each other, as shown below. You should see very little deviation in the mid-temp to high-temp ranges (500-1000 C)



NOTE: If skewed deviations (lines are not linear or superimposed) exist in the graph lines, values may be missing or incorrectly entered. Before proceeding, do the following to verify the recorded data is correct:

- Re-check your entries for accuracy
- Repeat the **MGT CALIBRATION** procedure on the aircraft and check the new figures against what was previously entered on the spreadsheet

e. Record the **M0** through **M5** (blue) values into the **Appendix B – MGT Calibration Worksheet** under **New MGT Calibration Values**. Pay close attention that you note whether the numbers are *positive* + or *negative* –



f. Use these new calibration numbers below for entry into the **ETM1000**

g. When closing the **TorqueCalibration.xlsx** *DO NOT* save the file when prompted

ENTERING NEW MGT CALIBRATION VALUES INTO ETM1000

With the new **M0** through **M5** calibration values recorded in the **MGT Calibration Worksheet**, perform the following;

IMPORTANT: When closing the spreadsheet, *DO NOT* save when prompted.

a. Go to the HyperTerminal **MGT Calibration Coefficients** screen, which should show the current and default values with three options:

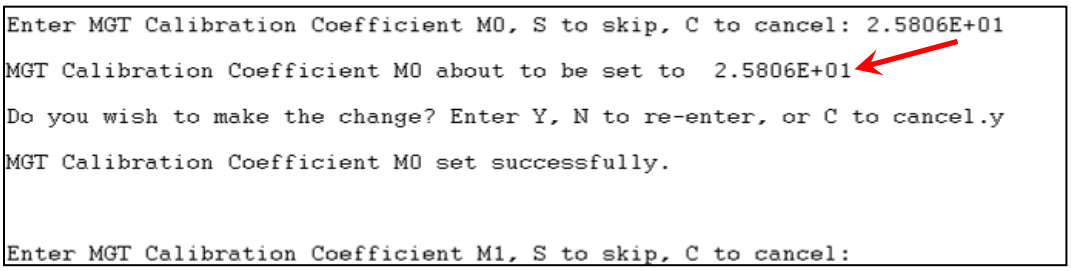
N – Enter New Values
D – Restore Default Values
C – Cancel and return to the **System Menu**

```
Current MGT Calibration Coefficients:

 M0            M1            M2            M3            M4            M5

 0.0000E+00    1.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00


Default MGT Calibration Coefficients:

 M0            M1            M2            M3            M4            M5

 0.0000E+00    1.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
```

b. Select **N** and press **ENTER** to add new values

c. Enter the **MGT Calibration Coefficient M0** number and press **ENTER**

Note: Be aware of the format **–**x.xxxx**E+**xx with variations with **+** and **–** indicators

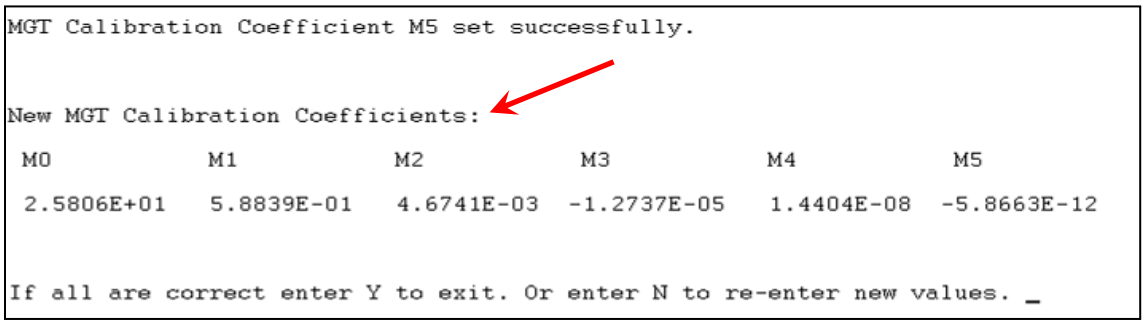


d. The System queries “Do you wish to make the change?” Enter **Y**, **N**, or **C** (cancel)

e. Type **Y** and press **ENTER**

f. The “M0 Set Successfully” message appears and immediately steps to the **M1** entry

g. Enter the **M1, M2, M3, M4,** and **M5** coefficients as above



h. Verify all changes are correct, then type **Y** and press **ENTER** to accept the changes and return to the data stream

i. Verify the **ETM1000 MGT** reading matches the **MGT** indicator by doing the following:

1) Starting with the test-set at zero reading on the MGT indicator, increase the test-set to indicate **100 Deg C**
2) Wait **five seconds** for stabilization
3) Increment **MGT** by **100 Deg C** and compare each time the MGT indicator with the ETM1000 MGT reading until you reach and verify **1000 Deg C.**
4) Decrease the test–set back to **0 Deg C**
5) If the ETM1000 MGT value is within **5 Deg** C of the **MGT Indictor**, then you have been successful in calibrating the system. If not, then repeat the **MGT Calibration Procedure** until the desired results are obtained.

5.7 H (LOAD HOOK) (For LRU **S/N 272** and newer)

NOTE: The use of the AKV Load Calibration Kit P/N LC-100 is recommended for the following procedure. Ref Appendix D (C-39), E (C-40) or F (MSI-150) for the Load Calibration Procedure

a. From the scrolling data stream, type **H** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options Menu** screen opens
d. You are prompted to select the letter corresponding to what is needed to change:
   - R Input Range : (Default is 0-5v)
   - S Scale Factor: (as needed)
   - O Offset: (as needed)
   - E Source: (leave as default – ETM1000)
   - U Units: (Kg or Lb)
   - X – Cancel:

e. Adjust values as prompted and press enter

5.8 B (BAROMETRIC PRESSURE SENSOR) (For LRU **S/N 272** and newer)

This section allows for an offset value to be entered to match the ETM reading with the altimeter

Enter the indicated elevation difference from the aircraft altimeter **Kollsman** window when set at **29.92**.

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options Menu** screen opens
d. Type **N** and press enter
e. Enter the pressure altitude reading

Note: A "**-**" [negative] is added to the value if below sea level i.e. -220

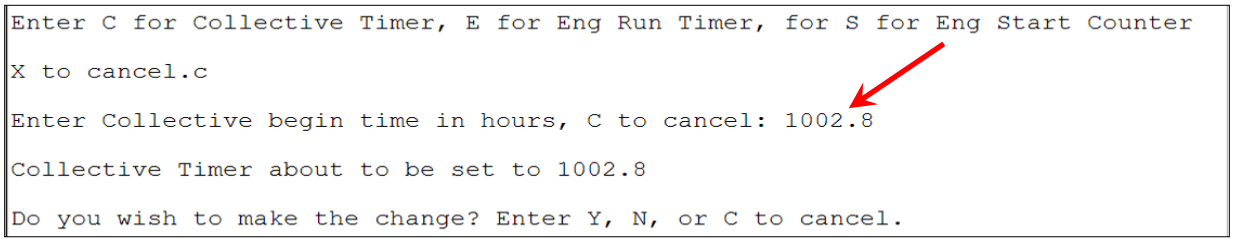
5.9 T (COLLECTIVE/ENGINE RUN TIME/ENGINE START COUNTER)

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. The **Options Menu** screen opens
d. Type **T** and press **ENTER**
e. You are prompted to select the letter corresponding to what is needed to change:

C – Collective Time:	Go to **STEP 5.9.1**
E – Engine Run Time:	Skip to **STEP 5.9.2**
S – Engine Starts Counter:	Skip to **STEP 5.9.3**
X – Cancel:	Return to the **Main Menu**

5.9.1 C – CHANGE COLLECTIVE TIME

a. Type **C** and press **ENTER**
b. You are prompted to enter the new Collective Time
c. Enter the new Collective time and press **ENTER** (e.g. 1002.8)
   NOTE: Entering nothing displays "Collective Timer about to be set to 0.0"
d. Displays two lines:
   "Collective Timer about to be set to 1002.8"
   "Do you wish to make the change? Enter Y, N, or C to cancel"

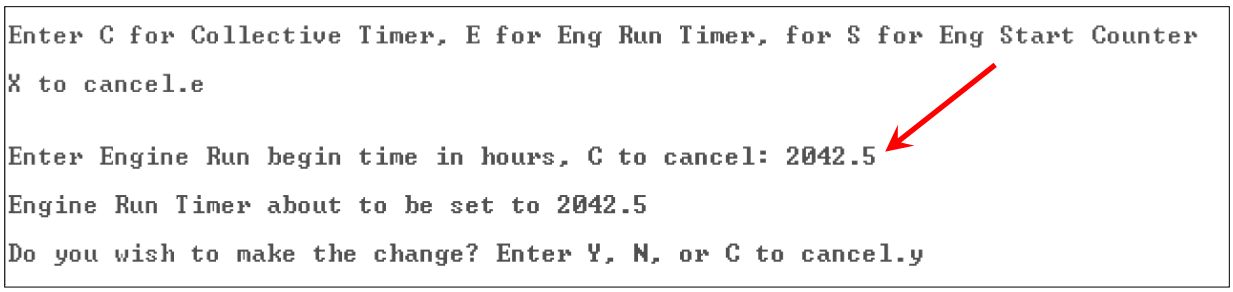


Y – Displays: "Collective begin time set." and returns to **Main Menu**
N – Asks to "Enter collective time in hours, **C** to cancel" and steps through again
C – Cancel returns to **Main Menu**

e. Type **Y** and press **ENTER**
f. You are returned to the **Main Menu**

5.9.2 E – CHANGE ENGINE RUN TIME

a. Type **E** and press **ENTER**
b. You are prompted to enter the new Engine Run Time
c. Enter the new Run time and press **ENTER** (e.g. 2042.5)
   NOTE: Entering nothing displays "Engine Run Timer about to be set to 0.0"
d. Displays two lines:
   "Engine Run Timer about to be set to 2042.5"
   "Do you wish to make the change? Enter Y, N, or C to cancel"

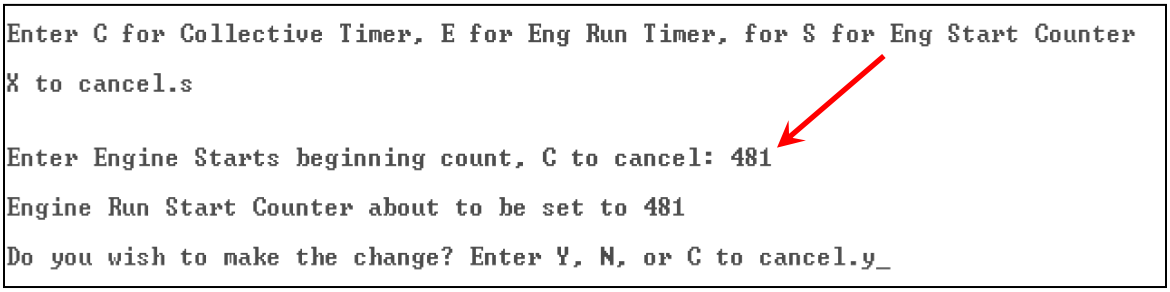


Y – Displays: "Engine Run begin time set." and returns to **Main Menu**
N – Asks to "Enter collective time in hours, **C** to cancel" and steps through again
C – Cancel returns to **Main Menu**

e. Type **Y** and press **ENTER**
f. You are returned to the **Main Menu**

5.9.3 S – CHANGE ENGINE STARTS COUNTER

a. Type **S** and press **ENTER**
b. You are prompted to enter the new Engine Starts Counter
c. Enter the new Start Count and press **ENTER** (e.g. 481)
   NOTE: Entering nothing displays "Engine Run Start Counter about to be set to 0.0"
d. Displays two lines:
   "Engine Run Start Timer about to be set to 481"
   "Do you wish to make the change? Enter Y, N, or C to cancel"



Y – Displays: "Engine Start counter set. and "Returns to **Main Menu**
N – Asks to "Enter Engine Starts beginning count, **C** to cancel" and steps through again
C – Cancel returns to main menu

e. Type **Y** and press **ENTER**
f. You are returned to the **Main Menu**

5.10 L (CHANGE LIMITS – PRE-CAUTION ONLY)

This section is for changing the **Pre-Caution (PC)** settings causes the ETM1000 to provide earlier advanced warning to the pilot, but does not affect the **RFM Continuous Operating Limit** (**CO**).

NOTE: The most effective use of the **Pre-Caution (PC)** is for **TQ**.

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**

b. Type in the password and press **ENTER**

c. The **Options Menu** screen opens

d. Type **L** and press **ENTER** and displays multiple warnings, as shown below:
   - Entered values must be equal to, or less than, Pre-Caution settings (default is equal to **RFM CO**)

```
WARNING: You have entered the Pre-Caution Limit Override Facility. C to cancel.

Limits can be overriden with a lower value only.  Entries are case sensitive.


Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: _
```

e. The **Override Limits Menu** screen opens and prompts you to select the letter set corresponding to the options available within this sub-menu:

f. Select one of the following options:

PCD	**–**	**Restore Pre-Caution Defaults:**	Go to **STEP 5.10.1**
TQ	**–**	**Torque:**	Go to **STEP 5.10.2**
MGT	**–**	**Exhaust Gas Temperature:**	Go to **STEP 5.10.4**
N1	**–**	**Gas Producer Speed:**	Go to **STEP 5.10.5**
N2	**–**	**Free Turbine Speed:**	Go to **STEP 5.10.6**
Nr	**–**	**Main Rotor Speed:**	Go to **STEP 5.10.7**
C	**–**	**Cancel:**	Returns to **Main Menu**

5.10.1 PCD – RESTORE PRE-CAUTION LIMITS TO FACTORY DEFAULT

a. Type **PCD** and press **ENTER** (Entries are case-sensitive)

NOTE: This also resets the Password back to Factory Default.

b. Displays two lines:

"Do you really want to restore Pre-Caution Limits to factory defaults?"
"Enter Y, N, or C to cancel."

```
WARNING: You have entered the Pre-Caution Limit Override Facility. C to cancel.

Limits can be overriden with a lower value only.  Entries are case sensitive.


Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: PCD

Do you really want to restore Pre-Caution Limits to factory defaults?

Enter Y, N, or C to cancel._
```

Y – Displays reset date/time, software version, parameter version, aircraft model and parameter version, then returns to **Main Menu**
N – Asks to "Enter a value between 0 and default to override, C to cancel: " and steps through again
C – Cancel returns to **Main Menu**

c. Type **Y** and press **ENTER** to change

d. The screen will go blank for a few seconds

```
Reset 06/01/2022 09:19:44


ETM1000 Software Version 73.0.3 Parameter Version 40.8

Aircraft Model: AS350B2 ARRIEL 1D1 Parameter Version 8.8
```

e. The reset message (example shown above), appears for two seconds before you are automatically returned to the **Data Stream**

5.10.2 TQ – TORQUE

a. Type **TQ** and press **ENTER**

b. Displays current **Pre-Caution** Limit:
"Torque Pre-Caution Limit is 94.0%, default is 94.0%."
"Enter a value between 0 and default to override, **C** to cancel: "

```
Enter FD to restore all limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: TQ

Torque Pre-Caution Limit is 94.0%, default is 94.0%.

Enter a value between 0 and default to override, C to cancel: 91

Torque Pre-Caution Limit about to be changed from 94.0% to 91.0%.

Do you wish to make the change? Enter Y, N, or C to cancel.
```

c. Type the new value **93** and hit **ENTER** (enter numbers only)

d. The System displays two lines:
"Torque Pre-Caution Limit about to be changed from 94.0% to 93.0%."
"Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

e. Select one of the following:
Y – Resets and returns to **Main Menu**
N – Returns to previous selection menu for **TQ**
C – Cancel (**Main Menu**)

f. Type **Y** and hit **ENTER**

g. You are returned to the **Main Menu**

NOTE: When the **Tq Pre-Caution** is set to a lower value the **CO** (**Continuous Operating**) limit, a tone will be produced only when the airspeed switch is activated.

5.10.3 PR – PRESSURE

NOTE: This feature has been removed and re-purposed as the **LOAD HOOK** (**SECT. 5.7**)

5.10.4 MGT – EXHAUST GAS TEMPERATURE

a. Type **MGT** and press **ENTER**
b. Displays two lines:
   "Temperature Pre-Caution Limit is 795.0C, default is 795.0C."
   "Enter a value between 0 and default to override, **C** to cancel: "
c. Enter **750** and hit **Enter**
d. Displays two lines:
   "Temperature Pre-Caution Limit about to be changed from 795.0C to 750.0C."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: MGT

Temperature Pre-Caution Limit is 795.0C, default is 795.0C.

Enter a value between 0 and default to override, C to cancel:
```

e. Select one of the following:
   Y – Resets and returns to **Main Menu**
   N – Returns to previous selection menu for **MGT**
   C – Cancel (**Main Menu**)
f. Type **Y** and press **ENTER** to change
g. You are returned to the **Main Menu**

5.10.5 N1 – GAS PRODUCER SPEED

a. Type **N1** and press **ENTER**
b. Displays two lines:
   "N1 Speed Pre-Caution Limit is 98.0%, default is 98.0%."
   "Enter a value between 0 and default to override, **C** to cancel: "
c. Enter **95** and hit **ENTER**
d. Displays two lines:
   "N1 Speed Pre-Caution Limit about to be changed from 98.0% to 95.0%."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: N1

N1 Speed Pre-Caution Limit is 95.0%, default is 98.0%.

Enter a value between 0 and default to override, C to cancel:
```

e. Select one of the following:
   Y – Resets and returns to Main Menu
   N – Returns to previous selection menu for **N1**
   C – Cancel (**Main Menu**)

f. Type **Y** and press **ENTER** to change

g. You are returned to the **Main Menu**

5.10.6 N2 – FREE TURBINE SPEED

a. Type **N2** and press **ENTER**

b. Displays two lines:
   "N2 Speed Pre-Caution Limit is 106.9%, default is 106.9%."
   "Enter a value between 0 and default to override, **C** to cancel: "

```
Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: N2

N2 Speed Pre-Caution Limit is 106.9%, default is 106.9%.

Enter a value between 0 and default to override, C to cancel:
```

c. Enter **100** and hit **ENTER**

d. Displays two lines:
   "N2 Speed Pre-Caution Limit about to be changed from 106.9% to 100.0%."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

e. Type **Y** and press **ENTER** to change

f. Select one of the following:
   Y – Resets and returns to Main Menu
   N – Returns to previous selection menu for **N2**
   C – Cancel (**Main Menu**)

g. You are returned to the **Main Menu**

5.10.7 NR – MAIN ROTOR SPEED

a. Type **Nr** and press **ENTER**

b. Displays two lines:
   "Nr Speed Pre-Caution Limit is 105.1%, default is 105.1%."
   "Enter a value between 0 and default to override, C to cancel: "

c. Enter **100** and hit **ENTER**

d. Displays two lines:
   "Nr Speed Pre-Caution Limit about to be changed from 105.1% to 100.0%."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
Enter PCD to restore Pre-Caution Limits to Factory Defaults, C to cancel.

Enter TQ for torque, PR for pressure, MGT for temp, N1, N2, or Nr for speed: Nr

Nr Speed Pre-Caution Limit is 105.1%, default is 105.1%.

Enter a value between 0 and default to override, C to cancel: _
```

e. Type **Y** and press **ENTER** to change

f. Select one of the following:
   Y – Resets and returns to **Main Menu**
   N – Returns to previous selection menu for **Nr**
   C – Cancel (**Main Menu**)

g. You are returned to the **Main Menu**

5.11 A (CONFIGURE AUDIO AND VISUAL INDICATORS) ***FOR THE ETM1000-1 CONFIGURATION ONLY***

There are three selections available for the -1 Configuration: **Audio OFF/ON** (**A**), **Visual OFF/ON** (**V**), and **ALARM LEVELS** (**L**) with six options.

NOTE: If you are using the *-2 Configuration*, skip to **SECTION 5.10**

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**

b. Type in the password and press **ENTER**

c. The **Options Menu** screen opens

d. Type **A** and press **ENTER**

```
a

Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel:
```

e. Displays one line:
   "Enter A to enable/disable all audio, V to enable/disable all visual indicators, L to configure alarm levels, C to cancel:"

f. You are prompted to select the letter corresponding to what is needed to change:

A – Enable/Disable All Audio:	Go to **STEP 5.11.1**
V – Enable/Disable All Visual Indicators:	Skip to **STEP 5.11.2**
L – Configure Alarm Levels:	Skip to **STEP 5.11.3**
C – Cancel:	Return to the **Main Menu**

5.11.1 A - Audio OFF/ON ***FOR THE ETM1000-1 CONFIGURATION ONLY***

This section is based on the default value "ON", and will assume the operator is attempting to *Disable* the Audio. If the Audio is currently "OFF", see further below for *Enabling* Audio.

TO DISABLE (0):

a. Type **A** and press **ENTER**
   - The default value for this is **ON** (**1**), but you may change it to **OFF** (**0**)
   - Operation of the **Caution Indicator** is not affected by turning the **Audio OFF**

b. The screen displays the **Audio's** current setting:
   Default Display: "Audio is currently enabled. Enter **0** to disable. **C** to cancel."

```
Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel: A

Audio is currently enabled. Enter 0 to disable. C to cancel. _
```

c. Select one of the following:
   0 – Disable Audio
   C – Cancel (**Main Menu**)

d. Enter **0** and hit **ENTER**

e. Displays two lines:
   "Audio is about to be disabled."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
a

Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel: a

Audio is currently enabled. Enter 0 to disable. C to cancel. 0

Audio is about to be disabled.

Do you wish to make the change? Enter Y, N, or C to cancel.
```

f. Select one of the following:
   Y – Resets and returns to **Main Menu**
   N – Returns to previous menu for **A**
   C – Cancel (**Main Menu**)

g. Type **Y** and hit **ENTER**

h. You are returned to the **Main Menu**

TO ENABLE (1):

a. Type **A** and press **ENTER**

b. The screen displays the **Audio's** current setting:
   Default Display: "Audio is currently disabled. Enter **1** to enable. **C** to cancel."

c. Select one of the following:
   1 – Enable Audio
   C – Cancel (**Main Menu**)

d. Enter **1** and hit **ENTER**

e. Displays two lines:
   "Audio is about to be enabled."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel: a

Audio is currently disabled. Enter 1 to enable. C to cancel. 1

Audio is about to be enabled.

Do you wish to make the change? Enter Y, N, or C to cancel._
```

f. Select one of the following:
   Y – Resets and returns to **Main Menu**
   N – Returns to previous menu for **A**
   C – Cancel (**Main Menu**)

g. Type **Y** and hit **ENTER**

h. You are returned to the **Main Menu**

5.11.2 V - Visual OFF/ON

FOR THE ETM1000-1 CONFIGURATION ONLY

This section is based on the default value "ON", and will assume the operator is attempting to *Disable* the Visual Indicator. If the Visual Indicator is currently "OFF", see further below for *Enabling* Visual Indicators.

TO DISABLE (0):

a. Type **V** and press **ENTER**
   - The default value for this is **ON** (**1**), but you may change it to **OFF** (**0**)

b. The screen displays the **Visual Indicators** current setting:
   Default Display: "Visual indicators are currently enabled. Enter **0** to disable. **C** to cancel."

```
Enter A to enable/disable all audio, V to enable/disable all visual indicators,
L to configure alarm levels, C to cancel: V
Visual indicators are currently enabled. Enter 0 to disable. C to cancel.
```

c. Select one of the following:
   0 – Disable Visual Indicators
   C – Cancel (**Main Menu**)

d. Enter **0** and hit **ENTER**

e. Displays two lines:
   "Visual Indicators are about to be disabled."
   "Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

f. Select one of the following:
   Y – Resets and returns to **Main Menu**
   N – Returns to previous menu for **V**
   C – Cancel (**Main Menu**)

g. Type **Y** and hit **ENTER**

h. You are returned to the **Main Menu**

TO ENABLE (1):

a. Type **V** and press **ENTER**

b. The screen displays the **Visual Indicators** current setting:
   "Visual indicators are currently disabled. Enter **1** to enable. **C** to cancel."

c. Enter **1** and hit **ENTER**

d. Select one of the following:
   0 – Enable Visual Indicators
   C – Cancel (**Main Menu**)

e. Enter **0** and hit **ENTER**

f. Displays two lines:
"Visual Indicators are about to be enabled."
"Do you wish to make the change? Enter **Y**, **N**, or **C** to cancel."

```
a

Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel: v

Visual indicators are currently disabled. Enter 1 to enable. C to cancel. 1

Visual indicators are about to be enabled.

Do you wish to make the change? Enter Y, N, or C to cancel.
```

g. Select one of the following:
Y – Resets and returns to **Main Menu**
N – Returns to previous menu for **V**
C – Cancel (**Main Menu**)

i. Type **Y** and hit **ENTER**

h. You are returned to the **Main Menu**

5.11.3 L – Configure Alarm Levels ***FOR THE ETM1000-1 CONFIGURATION ONLY***

a. Type S and press ENTER to access the internal menu system
b. Type in the password and press **ENTER**
c. The **Options** menu screen opens

```
Enter A to enable/disable all audio, V to enable/disable all visual indicators,

L to configure alarm levels, C to cancel: L
```

d. Type **A** to **Configure Audio & Caution Indicators** and press **ENTER**
e. Type **L** to **configure Alarm Levels** and press **ENTER**
f. The top line displays the Audio and Caution Light Alarm Level's current setting
   - The default value for this is 0 (ON for all alarm levels), but you may change it to 1, 2, 3, or 4, as shown in the screen shot below
   - When the Pre-Caution (PC) is configured to a value less than the Continuous Operating Limit (CO), disabling any of the alarm levels (1 through 4) does not affect the PC tone or CAUTION LIGHT operation
   - *"Current Audio and Caution light alarm level is set to 0" (red arrow).* This means all alarms are active and is the default.

```
Enter A to enable/disable all audio, V to enable/disable all visual indicators,
L to configure alarm levels, C to cancel: l
Current Audio and Caution light alarm level is set to 0
Enter 0 to enable Audio & Caution for all alarm levels (default)
1 to disable TO alarms. PRETO, TOPRED, and TR alarms still active.
2 to disable TO and PRETO alarms. TOPRED and TR alarms still active.
3 to disable TO, PRETO, and TOPRED alarms. TR alarms still active.
4 to disable all cautionary alarm levels. Warning light/solid tone still active
NOTE: To disable PC alarms, set PC = CO using the L command in the main menu.
C to cancel. _
```

ALARM ABBREVIATIONS

TO (Takeoff limit) – This is the yellow area between the Continuous Operating (CO) limit and takeoff limit. Provides a synchronized Audio and Caution Light (slow **. – . –** beeps and dashes) when operating within the 5 minute takeoff range. Set this to a value of "1" if you want disable the audio and caution light operation when in this range.

PRETO (Pre-Takeoff Limit) – Provides a synchronized Audio and Caution Light (fast **. . . .** beeps) when operating within 2% of the Takeoff (TO) limit. Set this to a value of "2" if you want to disable the audio and caution light operation when in this range.

TOPRED (**Takeoff Alarm Timer**) – Provides a synchronized Audio and Caution Light (fast **. . . .** beeps) when operating 5 seconds before the Takeoff (TO) timer expires. Set this to a value of "3" if you want to disable the audio and caution light operation when in this range.

TR (Transient Limit) – Provides a synchronized Audio and Caution Light (fastest **....** beeps) when operating in the transient range **>** TO (Takeoff limit). Set this to a value of "4" if you want to disable the Audio and Caution Light when in this range. When an exceedance is recorded you will still hear the solid tone and see the blue warning light.

NOTE: Nothing will be seen or heard if both Audio and Visual indicators are turned OFF.

5.12 S (ENABLE N2 SPEED INPUT)

N2 is required to be DISABLED when the **ETM1000** is installed in an **Arriel 1B** (there is no N2 tachometer generator) but is ENABLED by default when installed in the **Arriel 1D1** and when using the cycle counting option.

TO ENABLE N2 SPEED:

a. Type **S** and press **ENTER**
b. Displays: "N2 Speed is currently disabled. Do you wish to enable it (Y/N/C to cancel):"
c. Select one of the following:
   Y – Enables N2 Speed after sensor verification
   C – Cancel (**Main Menu**)
d. Type **Y** and press **ENTER**
e. Displays three lines:
   "N2 disabled. Press any key to continue."
   "The N2 Speed sensor must be installed on the aircraft before it can be enabled."
   "Please confirm that N2 is installed. (Y/N/C to cancel): "

```
N2 Speed is currently disabled. Do you wish to enable it (Y/N/C to cancel): y

The N2 Speed sensor must be installed on the aircraft before it can be enabled.

Please confirm that N2 is installed. (Y/N/C to cancel):
```

f. Select one of the following:
   Y – Enables N2 Speed
   C – Cancel (**Main Menu**)
g. Type **Y** and press **ENTER**
h. Displays: "N2 enabled. Press any key to continue."
i. Pressing **any key + ENTER** or just **ENTER** returns to **Main Menu**

```
The N2 Speed sensor must be installed on the aircraft before it can be enabled.

Please confirm that N2 is installed. (Y/N/C to cancel): y

N2 enabled. Press any key to continue.
```

TO DISABLE N2 SPEED:

a. Type **S** and press **ENTER**
b. Displays: "N2 Speed is currently enabled. Do you wish to disable it (Y/N/C to cancel):"

```
S

N2 Speed is currently enabled. Do you wish to disable it (Y/N/C to cancel): _
```

c. Select one of the following:
   Y – Disables N2 Speed
   C – Cancel (**Main Menu**)
d. Type **Y** and press **ENTER**
e. Displays: "N2 disabled. Press any key to continue."
f. Pressing **any key + ENTER** or just **ENTER** returns to **Main Menu**

5.13 E (PREMIUM FEATURES): (Cycle Counting, 3rd party Sat tracking systems)

NOTE: For **S/N 285** and newer, the wire harness now has a dedicated serial connector for all 3rd party Sat tracking systems which now includes **Spider X**.

The Cycle Counting Remote Display and Mobile Display (iOS App) use the LRU serial ports

To use the following features, a password is required from **AKV** which is then entered into the **ETM1000** PREMIUM FEATURES section. Each of these has its own unique password. If "*disabled*" it will require a password from **AKV** to enable it.

For **AKV** to supply a password, **we require the registration number** entered in the ETM1000 be provided to AKV to receive a custom password for the feature to be turned on.

CYCLE COUNTING REMOTE DISPLAY
(via LRU Data port or moves to the Config port when the Mobile Display is also used)

LATITUDE ION100
(via RS232 connector in the wire harness)

FLIGHTCELL DZMX
(via RS232 connector in the wire harness)

BLUETOOTH MOBILE DISPLAY (iOS App)
(via LRU Data port only)

SPIDER X
(via RS232 connector in the wire harness)

The menu is accessed from the main data screen by:

a. Type "**S"** and hit the **ENTER** key
   1) Enter your password (DEFAULT password is "*ETM1000*", but it is recommended this be changed)
   2) Select **OPTION** desired

b. Type **E** and press **ENTER**

c. You are prompted to select the Sub-Menu corresponding to a Premium Feature:

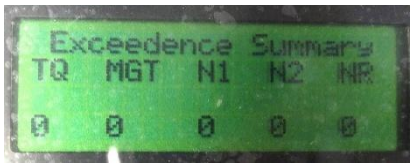
N – Cycle Counting Remote Display:	Go to **STEP 5.13.1**
I – Latitude IONode Interface:	Skip to **STEP 5.13.2**
S – Spider X Interface	Skip to **STEP 5.13.3**
D – Flightcell DZMx Interface:	Skip to **STEP 5.13.4**
M – iOS Mobile Display Interface:	Skip to **STEP 5.13.5**
C – Cancel:	Returns to the **Main Menu**

```
Premium Features Menu:
N for Cycle Counting. Currently enabled.
I for Lattitude ioNode Interface. Currently disabled.
S for Spider X Interface. Currently disabled.
D for Flightcell DZMx Interface. Currently disabled.
M for Mobile Display Interface. Currently enabled.
C to exit.
```

5.13.1 N – CYCLE COUNTING

NOTE: Ref **Appendix C** (back of this document) for additional information regarding the required HyperTerminal communication when using BOTH the optional Remote Display P/N ETMRD-004 and Bluetooth Mobile (Remote) Gauge iOS App module P/N BTM1000.

When the Cycle Counting option is not enabled, the cycle counting remote display P/N ETMRD-004 will show only the Exceedance Summary screen. When an exceedance occurs, the summary screen displays the peak values during the Exceedance along with the type of exceedance identified with a 2 letter abbreviation.



Ref the ETM1000-RFMS and Pg. 16 for additional information

a. Type **N** and press **ENTER**

b. Displays two lines:
   "Cycle Counting requires a password to enable it. Contact AKV if needed."
   "Enter Cycle Counting password, it is case-sensitive. **C** to cancel."

   NOTE: C returns to **E Premium Menu**

```
N

Cycle Counting requires a password to enable it. Contact AKV if needed.

Enter Cycle Counting password, it is case-sensitive. C to cancel. _
```

c. Enter the AKV-supplied Password and press **ENTER** (e.g. *CCxxxx*)
NOTE: Errors allow you to continue trying

d. Displays: "Password successful - Cycle Counting enabled."

e. Displays Cycle Counter Menu with current **N1**, **N2 Totals**:

```
Cycle Counting Menu:

T to set Cycle Count Totals. Current N1 Total = 0.000, N2 Total = 0.000

M to set TU77 Engine Modification status. Current setting is Post-TU77 Mod.

H to set LCD timer format to HHHHH:MM or XXXXX.X

D to disable Cycle Counting.

C to exit.
```

d. You are prompted to select a **Cycle Counter Sub-Menu** option:

T – Set Cycle Count N1, N2 Totals:	Go to STEP **5.13.1.a**
M – Set TU77 Engine Mod. Status (Arriel 1):	Skip to **STEP 5.13.1.b**
H – Set LCD timer format	Skip to Step **5.13.1c**
L – Select LCD Module	Skip to Step **5.13.1d**
D – Disable Cycle Counting:	Skip to **STEP 5.13.1.e**
C – Cancel:	Returns to the **Cycle Counting Menu**

5.13.1.a T – CYCLE COUNTER SUB-MENU

Enable the Cycle Counting starting totals for **N1** (Ng) and **N2** (Np). These values are the current total cycles for the engine. Default values are 0.000.

a. Type **T** and press **ENTER**

b. Displays: "Enter N1 Cycle Count Beginning Total, C to cancel: "

```
Cycle Counting Menu:

T to set Cycle Count Totals. Current N1 Total = 0.000, N2 Total = 0.000

M to set TU77 Engine Modification status. Current setting is Post-TU77 Mod.

D to disable Cycle Counting.

C to exit.

t

Enter N1 Cycle Count Beginning Total, C to cancel:
```

Arriel 1 / LTS101 Shown

```
Cycle Counting Menu:

T to set Cycle Count Totals. Current C Total = 0.000, G Total = 0.000, I Total = 0.000, Pt Total = 0.000

H to set LCD timer format to HHHHH:MM or XXXXX.X

D to disable Cycle Counting.

C to exit.
```

T53 Shown

NOTE: The following procedure is described for entering the Arriel 1 and LTS101 Ng and Np totals. It uses the same data entry format for the T53. However, the additional T53 Cycle Counting entry fields are:

N1:
- C – Compressor Total
- G – Gas Producer Total
- I – Impeller Total

N2:
- Pt – Power Turbine

c. Enter **N1 Beginning Total** & press **ENTER** (e.g. 50)
d. Displays: "N1 Total about to be set to 50.000. Please confirm (Y/N):"
e. Select one of the following:
   Y – Displays: "N1 Total set."
   N – Allows re-entry of **N1**
f. Type **Y** and press **ENTER**
g. Displays: "Enter N2 Cycle Count Beginning Total, C to cancel:"
h. Type **C** to return to **Cycle Counting Menu**

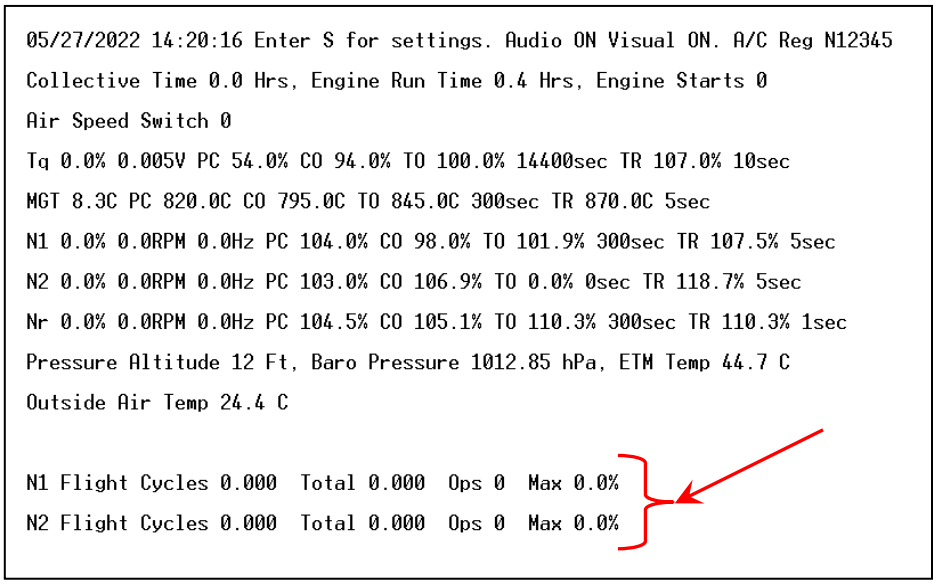
```
t

Enter N1 Cycle Count Beginning Total, C to cancel: 50

N1 Total about to be set to 50.000. Please confirm (Y/N): n

Enter N1 Cycle Count Beginning Total, C to cancel: 50

N1 Total about to be set to 50.000. Please confirm (Y/N): y

N1 Total set.


Enter N2 Cycle Count Beginning Total, C to cancel:
```

i. Enter **N2 Beginning Total** & press **ENTER** (e.g. 60)
j. Displays: "N2 Total about to be set to 60.000. Please confirm (Y/N):"
k. Select one of the following:
   Y – Displays: "N2 Total set."
   N – Allows re-entry of **N2**
l. Type **Y** and press **ENTER**
m. Type **C** to return to **Cycle Counting Menu**

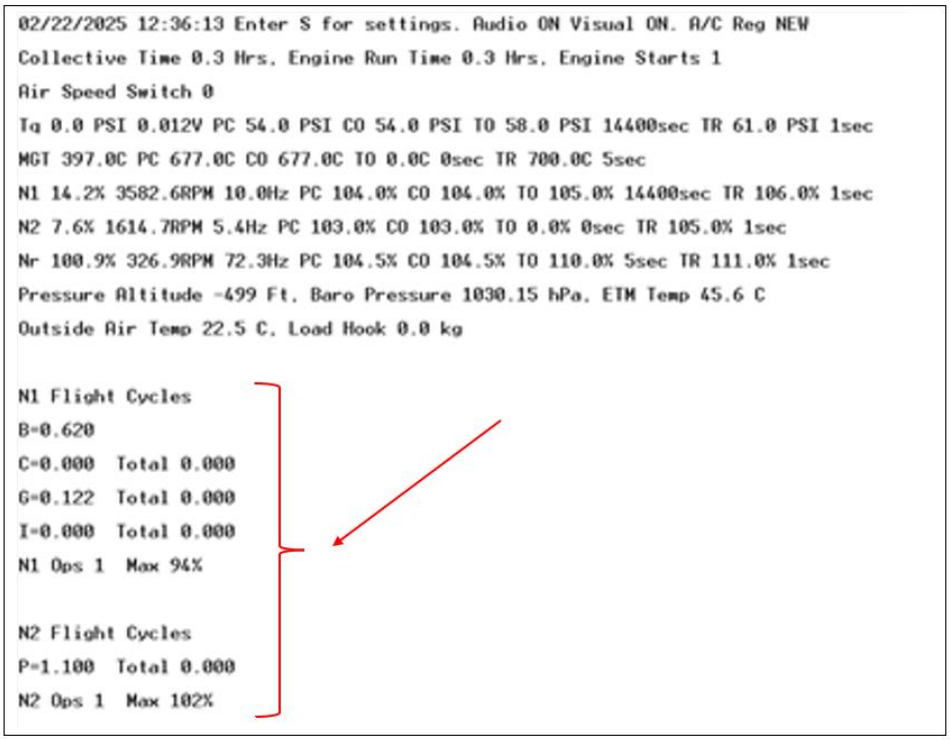
```
Enter N2 Cycle Count Beginning Total, C to cancel: c

Cycle Counting Menu:

T to set Cycle Count Totals. Current N1 Total = 50.000, N2 Total = 0.000

M to set TU77 Engine Modification status. Current setting is Post-TU77 Mod.

D to disable Cycle Counting.

C to exit.

t

Enter N1 Cycle Count Beginning Total, C to cancel:

N1 Total about to be set to 0.000. Please confirm (Y/N): n

Enter N1 Cycle Count Beginning Total, C to cancel: _
```

n. Type **C** again to return to the **System Menu**

o. With **CYCLE COUNTING** enabled, the data will be shown on the main data screen as follows:



Arriel 1 and LTS101 Shown



T53 Cycle Counting Shown

5.13.1.b M – Set TU77 Engine Mod. Status (Arriel 1)

Enable the Cycle Counting Engine Modification setting. You only need to change this setting if the engine has not had the TU77 modification performed. Default setting is engine is Post-TU77 Mod.

a. Type **M** and press **ENTER**
b. Displays: "Has the TU77 engine mod been made on this aircraft? (Y/N/C to cancel)?"
c. Select one of the following toggles:
   Y – Further questions (see **Yes** below)
   N – Further questions (see **No** below)
   C – Returns to **Cycle Counting Menu**

```
m

Has the TU77 engine mod been made on this aircraft? (Y/N/C to cancel)? y

Enter Y to confirm that the TU77 engine mod has been made, C to cancel: y

TU77 modification status set.


Cycle Counting Menu:

T to set Cycle Count Totals. Current N1 Total = 50.000, N2 Total = 40.000

M to set TU77 Engine Modification status. Current setting is Post-TU77 Mod.

D to disable Cycle Counting.

C to exit.

m

Has the TU77 engine mod been made on this aircraft? (Y/N/C to cancel)? n

Enter Y to confirm that the TU77 engine mod has not been made, C to cancel:
```

***YES*:**

a. Type **Y** and press **ENTER**
b. Displays: "Enter Y to confirm that the TU77 engine mod has been made, C to cancel:"
   Y – Confirm TU77 engine mod
   C – Returns to question. Another **C** returns to **E** Menu selection
c. Type **Y** and press **ENTER**
d. Displays "TU77 modification status set." and returns to **Cycle Counting Menu**

***NO*:**

a. Type **N** and press **ENTER**
b. Displays: "Enter Y to confirm that the TU77 engine mod **has not** been made, C to cancel:"
   Y – TU77 modification has not been made
   N – Further questions (see below)
   C – Returns to question. Another **C** returns to **E Menu** selection
c. Type **Y** and press **ENTER**
d. Displays "TU77 modification status set." and returns to **Cycle Counting Menu**

5.13.1.c H – Set LCD Timer Format

- Default setting is XXXX.X – The same format as the Hobbs (hour) Meter
- Selecting HH:MM (hours:minutes) in clock format is useful for timing each leg of a flight if desired, but is reset to zero when the Cycle Counter is reset
- The XXXX.X is not affected when resetting the cycle counter and it will still count engine run and flight time when displayed as HH:MM

5.13.1.d L – Select LCD Module

- For ETM's **S/N 288 and newer,** the Remote Display P/N ETMRD-004 and its new LCD called "Matrix Orbital" is now used due to the previous LCD becoming obsolete. This will be evident on system power up with the LCD indicating a "Matrix Orbital" logo. This requires "Matrix Orbital" to be selected in the menu settings in order for it to read correclty.
- Alternately, older systems that have the Seetron Remote Display P/N ETMRD-004 which must have the menu setting changed to Seetron. If on power up the LCD does not indicate the Matrix Orbital logo, then it is a Seetron display
- If the correct selection is not made for the appropriate LCD, the display will show random, unreadable characters

a. Type **"E"** for Premium Features, then **"N"** for Cycle Counting.
b. Type **"L"** Select LCD Module and confirm or change the LCD setting

```
Cycle Counting Menu:
T to set Cycle Count Totals. Current N1 Total = 0.000, N2 Total = 0.000
M to set TU77 Engine Modification status. Current setting is Post-TU77 Mod.
H to set LCD timer format to HHHHH:MM or XXXXX.X
L to select LCD module. Current module: SEETRON
D to disable Cycle Counting.
C to exit.
L

LCD Module Selection:
M for MATRIX ORBITAL
S for SEETRON
```

5.13.1.e D – Disable Cycle Counting

Enable and Disable Cycle Counting. Default setting is **OFF**.

Type **"D"** to disable Cycle Counting.

a. Type **D** and press **ENTER**
b. Displays two lines:
   "Are you sure you want to disable Cycle Counting?"
   "A special Cycle Counting password is required to re-enable (Y/N/C to cancel)?"

c. Select one of the following:
   Y – Disable Cycle Counting
   C – Cancel (**Cycle Counting Menu**)

d. Type **Y** and press **ENTER**

e. Displays: "Cycle Counting disabled. Press any key to continue."

f. Pressing **ENTER** or **any key + ENTER** returns to **Cycle Counting Menu**

```
d

Are you sure you want to disable Cycle Counting?

A special Cycle Counting password is required to re-enable (Y/N/C to cancel)? y

Cycle Counting disabled. Press any key to continue.s
```

5.13.2 I – LATITUDE IONODE INTERFACE

NOTE: The Latitude iONode uses the Data port only for communication. It cannot be used with any other option such as Flightcell DZMx or Mobile App display

The Latitude iONode interface is for collection of the ETM1000 recorded data and transmission of exceedances. Latitude provides for playback of the recorded data via their Websentinal.

TO ENABLE IONODE INTERFACE:

a. Type **I** and press **ENTER**

b. Displays two lines:
   "IONode Interface requires a password to enable it. Contact AKV if needed."
   "Enter IONode Interface password, it is case-sensitive. C to cancel."

c. Enter AKV-supplied Password and press **ENTER** (e.g. *IOxxxx*)
   - Errors allow you to continue trying
   - **C** returns to **Premium Features Menu**

d. Displays: "Password successful - IONode Interface enabled."

e. Displays: "IONode Interface is currently enabled."

f. You are prompted to select one of the following:
   D – Disable IONode Interface (see below)
   C – Exit (Save changes. Returns to **Premium Features Menu**)

```
i

ioNode Interface requires a password to enable it. Contact AKV if needed.

Enter ioNode Interface password, it is case-sensitive. C to cancel.  xxxxxx

Password successful - ioNode Interface enabled.


ioNode Interface is currently enabled.

D to disable ioNode Interface.

C to exit.
```

g. Type **C** and press **ENTER**
h. Returns to **Premium Features Menu**
i. Type **C** and press **ENTER TO Exit** (Returns to **Premium Features Menu**)
j. Refer to the ***Latitude IONode ION100 User Manual*** for further information

TO DISABLE IONODE INTERFACE:

a. Type **D** and press **ENTER**
b. Displays three lines:
"IONode Interface is currently enabled."
"D to disable IONode Interface."
"C to exit."
c. Type **D** and press **ENTER**
d. Displays two lines:
"Are you sure you want to disable the IONode Interface?"
"A special IONode password is required to re-enable (Y/N/C to cancel)?"

```
C to exit.

d

Are you sure you want to disable the ioNode Interface?

A special ioNode password is required to re-enable (Y/N/C to cancel)? _
```

e. Select one of the following:
Y – Disable Cycle Counting
C – Cancel (**Previous Menu**)
f. Type **Y** and press **ENTER**
g. Displays: "IONode Interface disabled. Press any key to continue."
h. Pressing **ENTER** or **any key + ENTER** returns you to **Premium Features Menu**

5.13.3 S – SPIDER X INTERFACE

a. Type **S** and press **ENTER**
b. Displays two lines:
"Spider X Interface requires a password to enable it. Contact AKV if needed."
"Enter Display Interface password, it is case-sensitive. **C** to cancel."

NOTE: **C** returns to **M Menu**

c. Enter Password and press **ENTER** (e.g. *SPxxxx*)
- Errors allow you to continue trying
- **C** returns to **Premium Menu**

d. Displays: “Password successful – Spider X enabled.”

```
Spider X Interface requires a password to enable it. Contact AKV if needed.

Enter Spider X Interface password, it is case-sensitive. C to cancel. SP6486


Password successful - Spider X Interface enabled.



Spider X Requires UTC time instead of local time. Please enter 24-Hr UTC Time as HH M
M SS (C to cancel, S to skip to date):
```

e. You are prompted to enter **UTC** time, which aligns the **ETM** date and time stamp with **Spider X**. From here, enter the time then date

   NOTE: The **Spider X** updates the ETM time stamp on each initial power up.

f. You are prompted to select one of the following:
   - **D** – Disable Spider X Display
   - **C** – Exit (Save changes. Returns to **Premium Features Menu**)

g. Type **C** and press **ENTER TO Exit** (Returns to **Premium Features Menu**)

h. Refer to the ***Spider X documents*** for further information on the data transmitted from the ETM

TO DISABLE SPIDER X INTERFACE:

a. Type **S** and press **ENTER**

b. Displays three lines:
   “Spider Display is currently enabled.”
   “D to disable Spider X Interface.”
   “C to exit.”

c. Type **D** and press **ENTER**

d. Displays: “Spider X Interface disabled. Press any key to continue.”

e. Pressing **ENTER** or **any key + ENTER** returns you to **Premium Features Menu**

5.13.4 D – FLIGHTCELL DZMX INTERFACE

NOTE: The Flightcell DZMx uses the Data port only for communication. It cannot be used with any other option such as Latitude iOnode or Mobile App display

Interface with the Flightcell DZMx provides for displaying the Cycle Counting data and transmission of exceedances in place of the AKV Remote Display.

TO ENABLE DZMX INTERFACE:

a. Type **D** and press **ENTER**
b. Displays two lines:
   "DZMx Interface requires a password to enable it. Contact AKV if needed."
   "Enter DZMx Interface password, it is case-sensitive. C to cancel."

   NOTE: C returns to **D Menu**

```
d

DZMx Interface requires a password to enable it. Contact AKV if needed.

Enter DZMx Interface password, it is case-sensitive. C to cancel.
```

c. Enter Password and press **ENTER** (e.g. *DZxxxx*)
   - Errors allow you to continue trying
   - **C** returns to **Premium Features Menu**

d. Displays: "Password successful - DZMx Interface enabled."
e. You are prompted to select one of the following:
   D – Disable DZMx Interface (see below)
   C – Exit (Save changes. Returns to **Premium Features Menu**)

```
Enter DZMx Interface password, it is case-sensitive. C to cancel. DZ3805

Password successful - DZMx Interface enabled.


DZMx Interface is currently enabled.

D to disable DZMx Interface.

C to exit.
```

f. Type **C** and press **ENTER TO Exit** (Returns to **Premium Features Menu**)

TO CONFIRM ETM1000 / DZMX CYCLE COUNTING COMMUNICATION

Turn the aircraft battery switch **ON**. After the **DZMx** displays the main screen, confirm the following on the **DZMx**:

1) An * is observed in the very top left corner. This indication confirms the **ETM1000** and **DZMx** are talking to each other
2) Press **MENU**, then use the Down Arrow key (8) to scroll to **Diagnostics Menu** and press **ENTER**
3) Use the Down Arrow key (8) to again scroll down to **ETM1000 Diagnostics** and press **ENTER**
4) On this display, confirm the software installed in the **ETM1000** is correct for the following:
   - Model of helicopter
   - Engine installed, and for the Arriel 1, whether **Pre** or **Post Mod TU77** configuration
   - For the Arriel 1, the "*Linear Ver Rev XX*" is the cycle counting algorithm used in the **ETM1000**
5) Press the BACK ARROW key a few times to return the MAIN MENU
6) Press **MENU** and select the **Cycle Counter Page** by pressing **ENTER**

NOTE: For either the **AKV Remote Display** or **Flightcell DZMx**, further information is found in the following:

- AKV document ***ARRIEL 1 OPERATING SPECIFICATION DOCUMENT REV D*** or later approved revision
- AKV document ***RFMS REV H*** or later approved revision

TO DISABLE DZMX INTERFACE:

a. Type **D** and press **ENTER**

b. Displays three lines:
   "DZMx Interface is currently enabled."
   "D to disable IONode Interface."
   "C to exit."

c. Type **D** and press **ENTER**

d. Displays two lines:
   "Are you sure you want to disable the DZMx Interface?"
   "A special DZMx password is required to re-enable (Y/N/C to cancel)?"

```
d

Are you sure you want to disable the DZMx Interface?

A special DZMx password is required to re-enable (Y/N/C to cancel)? y

DZMx Interface disabled. Press any key to continue.s

Premium Features Menu:
```

e. Select one of the following:
   Y – Disable **DZMx**
   C – Cancel (**Previous Menu**)

f. Type **Y** and press **ENTER**

g. Displays: "DZMx Interface disabled. Press any key to continue."

h. Pressing **ENTER** or **any key + ENTER** returns to **Premium Features Menu**

5.13.5 M – MOBILE DISPLAY – iOS INTERFACE

Reference **Appendix C** (back of this document) for additional information regarding the required HyperTerminal communication when using *BOTH* the optional Remote Display P/N ETMRD-004 and Bluetooth Remote Gauge iOS App module P/N BTM1000.

The iOS Mobile Display App is connected to the ETM1000 via an AKV supplied Bluetooth module connected to either the Data port or Config port and mounted to the side of the ETM1000.

NOTE 1: The Bluetooth and Mobile iOS App display is a **non-STC'd system, for reference only**

NOTE 2: Ref. AKV IOS App User Manual - v1.x, for additional App download and setup instructions

TO ENABLE MOBILE DISPLAY INTERFACE:

i. Type **M** and press **ENTER**

j. Displays two lines:
"Mobile Display Interface requires a password to enable it. Contact AKV if needed."
"Enter Display Interface password, it is case-sensitive. C to cancel."

NOTE: C returns to **M Menu**

k. Enter Password and press **ENTER** (e.g. *MDxxxx*)
- Errors allow you to continue trying
- **C** returns to **Premium Menu**

l. Displays: "Password successful – Mobile Display enabled."

m. You are prompted to select one of the following:
D – Disable Mobile Display
C – Exit (Save changes. Returns to **Premium Features Menu**)

```
Enter Mobile Display password, it is case-sensitive. C to cancel.  xxxxxx

Password successful - Mobile Display enabled.


Mobile Display is now enabled.

D to disable Mobile Display.

C to exit.
```

n. Type **C** and press **ENTER TO Exit** (Returns to **Premium Features Menu**)

o. Refer to the ***iOS Interface User Manual*** for further information

TO DISABLE MOBILE DISPLAY INTERFACE:

f. Type **M** and press **ENTER**

g. Displays three lines:
"MD Display is currently enabled."
"D to disable Mobile Display."
"C to exit."

h. Type **D** and press **ENTER**

i. Displays: "Are you sure you want to disable the Mobile Display? (Y/N/C to cancel)?"
j. Type **Y** and press **ENTER**
k. Displays: "Mobile Display disabled. Press any key to continue."
l. Pressing **ENTER** or **any key + ENTER** returns to **Premium Menu**
m. Type **C** and press **ENTER TO Exit** (Returns to **Premium Features Menu**)

```
D to disable Mobile Display.

C to exit.

d

Are you sure you want to disable the Mobile Display? (Y/N/C to cancel)? y

Mobile Display disabled. Press any key to continue.

Premium Features Menu:
```

5.14 P (CHANGE PASSWORD)

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the (current) password and press **ENTER**
c. The **Options** menu screen opens
d. Type **P** and press **ENTER**
e. The **System** asks for new password of between 4 and 7 characters
   - Passwords are case-sensitive
   - These characters may be any combination of letters, numbers, or special characters
   - DO NOT use the letter "***C***" as the last character in your password, or the system will process this as a **CANCEL**, returning you to the **Main Menu**, and retain the original password
   - Passwords should be highly unique so only authorized personnel perform any changes

```
C to cancel. P

Enter new password, must be between 4 and 7 characters. C to cancel. Fred07_
```

f. Make note of your new password and keep it safe!
   - If you lose your password, contact **AKV, Inc.** for a one-use password to gain access
g. Type in your new password and press **ENTER**
   - Errors will allow you to continue trying
h. You are returned to the **Main Menu**
i. Immediately test your new password

5.15 X (RESET ALL SETTINGS TO FACTORY DEFAULTS)

Reset the ETM1000 to its original factory supplied settings, by performing the following:

a. From the scrolling data stream, type **S** and press **ENTER** to access the **System Menu**
b. Type in the password and press **ENTER**
c. Type **S** and press **ENTER**
d. Displays three lines:

"WARNING: You have entered the Factory Default facility. Use extreme caution."
"This will clear the Collective Timer, Engine Run Timer, Engine Start Counter, Aircraft Registration Number, Premium Features, all Calibrations, etc."
"Enter FD to restore all settings to their factory defaults, C to cancel."

NOTE: Errors allow you to continue trying

```
WARNING: You have entered the Factory Default facility. Use extreme caution.


This will clear the Collective Timer, Engine Run Timer, Engine Start Counter,

Aircraft Registration Number, Premium Features, all Calibrations, etc.


Enter FD to restore all settings to their factory defaults, C to cancel.
```

e. Select one of the following:
FD – Restore Factory Defaults
C – Cancel (**Main Menu**)
f. Type **FD** and press **ENTER** (caps only – Errors allow you to continue trying)
g. Displays three lines:
"Do you really want to restore all settings to their factory defaults?"
"This will clear the Collective Timer, Engine Run Timer, Engine Start Counter, Aircraft Registration Number, Premium Features, all Calibrations, etc."
"Enter Y for Yes any other key to cancel."
h. Select one of the following:
Y – Restore Factory Defaults
C – Cancel (**Main Menu**)
- Clicking **Any Key + ENTER** or just **Enter** Displays: "Operation cancelled. Exiting Factory Default facility." and returns to **Main Menu**

```
Enter FD to restore all settings to their factory defaults, C to cancel. FD

Do you really want to restore all settings to their factory defaults?

This will clear the Collective Timer, Engine Run Timer, Engine Start Counter,

Aircraft Registration Number, Premium Features, all Calibrations, etc.

Enter Y for Yes any other key to cancel._
```

i. Type **Y** and press **ENTER**
j. **Y** – Pauses display while it works

k. Displays three lines:
"Warning: No saved Collective Timer, Engine Run Timer, & Engine Start Counter."
"Must use Settings to initialize them."
"Reset 06/23/2022 11:14:32"

l. **Factory Defaults** are set and you are returned to the **Data Stream** automatically

m. You must now (if necessary), re-enter your previous settings. Refer to **SECTION 5.0**

Note: This change also resets the **Password** back to **Factory Default**.

5.16 F (DOWNLOAD NEW ETM FIRMWARE)

After initiating this procedure, it will be necessary to reset the ETM1000 to its Factory Default (FD) settings, and all current values will be erased.

5.16.1 Record Current Settings

To complete this successfully & smoothly, you should manually record the current settings and values from within HyperTerminal so that they can be re-loaded after the firmware is updated.

a. Connect the **ETM1000** to a properly configured laptop

b. Start **HyperTerminal** and log in

c. Before proceeding, record the following information as it appears on the main screen or from within each of these locations:

- Aircraft Registration (Ref **SECTION 5.5**)
- TQ Calibration Values ***** (Ref **SECTION 5.6.1**)
- MGT Calibration Values ***** (Ref **SECTION 5.6.2**)
- Load Hook (Ref **SECTION 5.7**)
- Barometric Pressure Sensor (Ref **SECTION 5.8**)
- Collective Time (Ref **SECTION 5.9.1**)
- Engine Run Time (Ref **SECTION 5.9.2**)
- Engine Starts (Ref **SECTION 5.9.3**)
- Any Pre-Caution (PC) values previously altered (Ref **SECTION 5.10**)
- Audio/Visual Alarm ****** (for -1 Configuration only) (Ref **SECTION 5.11.3**)
- N2 Speed (Ref **SECTION 5.12**)
- Premium Features (any used) (Ref **SECTION 5.13**)
- Password (Ref **SECTION 5.14**)

***** Obtain the most recent **TQ** & **MGT Calibration Worksheets**. If these are unavailable, collect the information from within **HyperTerminal** by completing these steps:

1) Type **Q** and press **ENTER**
2) Type **T** (or **M**) and press **ENTER**
3) Type **E** and press **ENTER**
4) Manually record the "*Current Values*" for **TQ**, shown as **T0**, **T1**, & **T2**
5) Cancel this operation and **Repeat** the above procedure, substituting **M** for **T**
6) Manually record "*Current Values*" for **MGT**, shown as **M0**, **M1**, **M2**, **M3**, **M4**, & **M5**
7) Press **C** to **Cancel** operation and exit to **Main Menu**

****** Obtain the most recent **Audio/Visual Alarm Level** from within **HyperTerminal** by completing these steps:

1) Type **A** and press **ENTER**
2) Type **L** and press **ENTER**
3) Manually record the "*Current Audio and Caution Light Alarm Level*" value (0-4)
4) Type **C** to **Cancel** operation and exit to **Main Menu**

5.16.2 Firmware Download

If you encounter a power failure or other interruption of the download in progress, perform the steps listed at the end of this section under ***5.16.3 Firmware Download Trouble-Shooting***, to recover and continue.

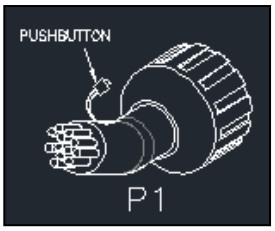
a. Type **S** and press **ENTER** to access the internal menu system
b. Type in the password and press **ENTER**
c. The **Options** menu screen opens
d. Type **F** and press **ENTER**

```
f

Hold the Power Check button and press Enter to start the firmware downloader._
```

e. The message "*Hold the Power Check button and press Enter to start the firmware downloader*" appears. Push and hold the **PWR/CHK** pushbutton and press **ENTER**, then release both

IMPORTANT:

- If your system is a -2 Configuration, locate the **Mini Pushbutton** near the large **J1 Main Connector** strain relief on the **ETM1000** enclosure
- References to flashing **CAUTION** or **DONE** lights on the annunciators do not apply for the -2 configuration



f. The Internal Menu System appears, as shown below. The **CAUTION** light will flash, indicating the system is ready for the firmware download

NOTE: Do Not enter **4**: This is used for AKV Inc. purposes only.

```
F to download new ETM firmware

C to cancel

F

========== ETM IAP Bootloader 1.0 - Main Menu ==========

  Download Program to the STM32F10x Internal Flash ----- 1

  Execute the Program ---------------------------------- 3

  Set Load Address, current value is 0x8000000 --------- 4

==================== IAP at 0x806E000 ====================
```

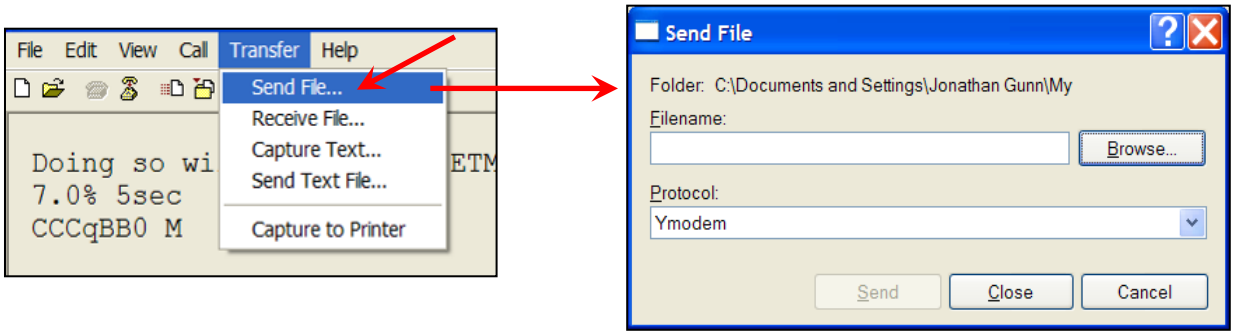
g. Type **1** and the following message appears

NOTE: If you need to abort this process, or exit this menu, cycle power on the ETM1000.

```
1

Waiting for the file to download, press any key to cancel.

From the Hyperterminal Menu, select Transfer, Send File.

Select Ymodem Protocol, Browse to .bin file, Open, Send.
```

h. Go to the menu at the top of **HyperTerminal**

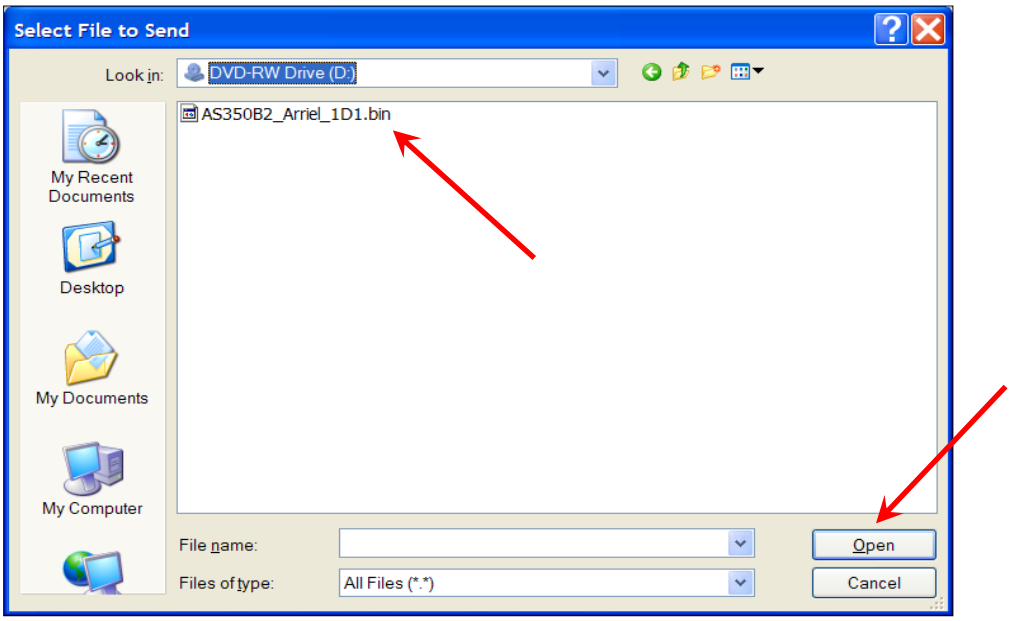
i. Click on **TRANSFER**, then select the **SEND FILE…** option, which opens the **Send File** window



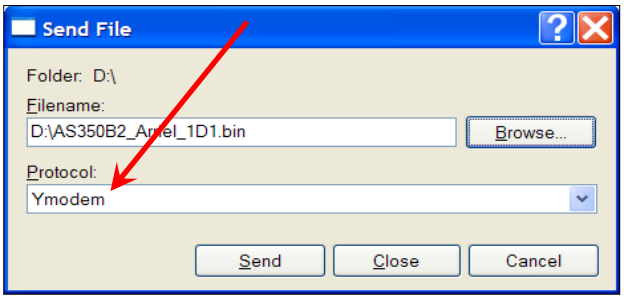
j. Locate the **AKV** supplied ETM1000 Dropbox email link and the ETM1000 Program folder

k. Select the appropriate file by highlighting the specific **.bin** file and click **OPEN**

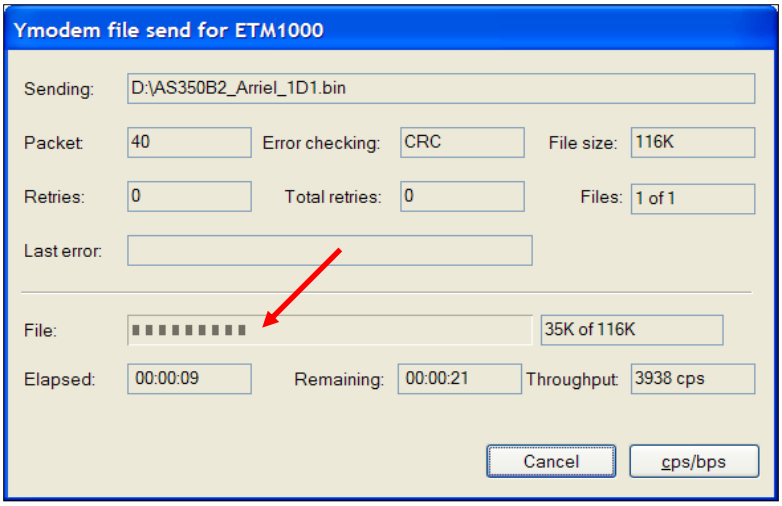
(e.g. **AS350B2_Arriel_1D1.bin**) **NOTE:** Actual file name used depends on airframe/engine type.



l. Select **Ymodem** from the **Protocol** drop-down menu, if not displayed



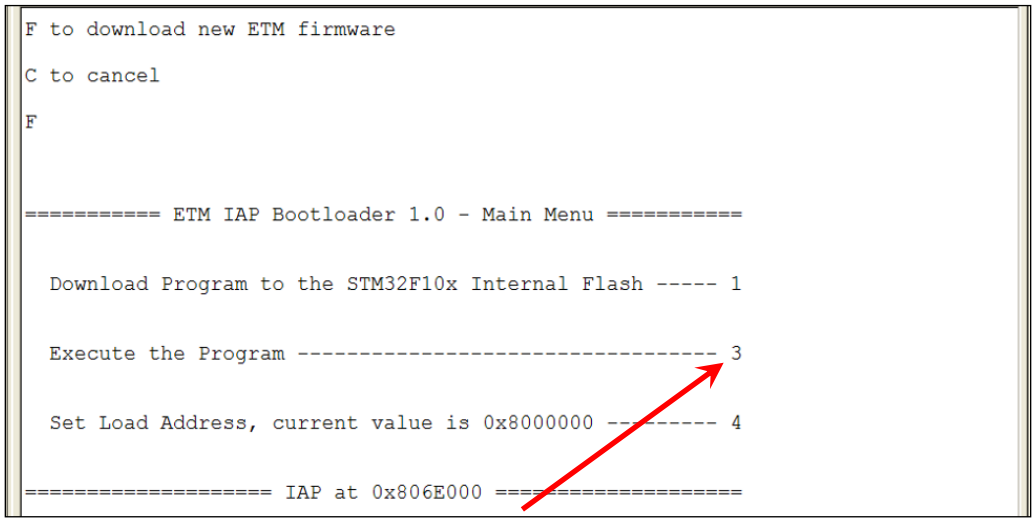
m. Click **SEND** and the firmware download will commence. The USB adaptor's blue LEDs will flash, and the CAUTION light will remain solid until the download is complete (be patient when waiting for the FILE transfer bars to appear)



n. After programming is complete, **HyperTerminal** will revert to the following screen. The *CAUTION* will flash and the *DONE* light will illuminate

o. Type **3** to **Execute The Program**

NOTE: Do Not enter 4: This is used for **AKV Inc.** purposes only.



p. **HyperTerminal** returns to the scrolling data screen as the CAUTION & DONE lights extinguish

```
3

Jumping to Program..
```

q. Cycle the A/C power and and the following will appear for a few seconds

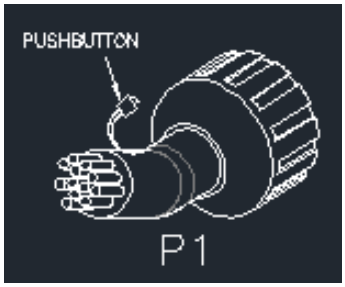
```
Reset 03/16/2013 16:08:27


ETM1000 Software Version XX.X Parameter Version XX.X

Aircraft Model: AS350B2 ARRIEL 1D1 Parameter Version XX.X
```

5.16.3 FIRMWARE DOWNLOAD TROUBLE-SHOOTING

If you encounter an interruption of the download in progress, perform these steps to recover and continue the firmware download:

1) Power off the aircraft
2) Hold the **PWR/CHK** button and power up the aircraft

   IMPORTANT:
   - If your system is a -2 Configuration, locate and use the **Mini Pushbutton** near the large **J1 Main Connector** strain relief on the **ETM1000** enclosure. References to flashing **CAUTION** or **DONE** lights on the annunciators do not apply



3) The **CAUTION** button will begin flashing as the internal (HT) menu is accessed
4) The ***ETM IAP*** *Bootloader Main Menu* opens in HyperTerminal
5) Continue from **Step F**, above

GRAPHING SOFTWARE

6.0 GRAPHING

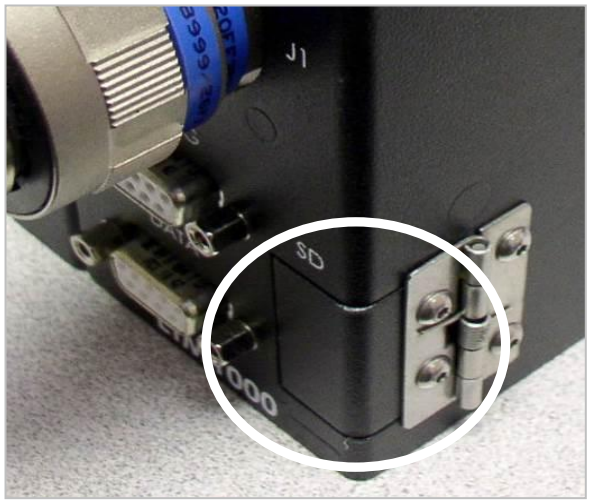
The supplied **"AKV GRAPHING" Python** based program is utilized in order to view any ETM1000 recorded data from the **SD Card**. Python is a graphic-rich platform that provides additional functionality like Pinch Zoom, improved long term trending, and a better overall user experience.

The AKV Python graphing software is used for both the **AKV ETM1000** and **DCS1100** systems. It auto-detects which system data is being loaded and viewed.

In order for flight data to be recorded, an **SD Card** (**Maximum size of 2 GB**) must be inserted into the ETM **SD Card** slot, as indicated below. A missing SD Card will result in a solid amber **SD** warning light when the aircraft battery is turned on. Recommended practice is to be sure that the aircraft is powered down before removing or inserting the **SD Card**. Removal of the **SD Card** is required when an exceedance has occurred and the exceedance needs to be reviewed.

Run Log data is recorded in one-second intervals, but during an actual **Exceedance**, it is recorded up to five–times–per–second for the duration of the exceedance.

Even though the **SD card** is capable of storing up to 5,000 hours of operational information, it is STRONGLY recommended that the **SD Card** be removed, and the data copied and backed up on a company PC, at least every **100 hours** or during any **scheduled maintenance**. This provides a safe means of regular backup of your usage data to a company PC, which limits loss-of-data due to SD card corruption, lost **SD cards**, or other unforeseen issues.



SD Card Port

NOTE: Display of the recorded cycle counts in the Graph requires that the ETM1000 is installed with software **version 73.0.3.** This currently applies to the Arriel 1 only until other engine models are added at a later date

6.1 SUGGESTED METHODS TO BACKUP & STORE RECORDED DATA

a. With reference to the *Fig. 1* below, create a dedicated top level folder named ***ETM1000 Data*** on your **Windows Desktop** screen by performing the following:
   1) **Right-click** in an open area of the screen and select ***New***
   2) Click on the ***Folder*** option
   3) Name the new folder ***ETM1000 Data***

b. Inside the ***ETM1000 Data*** folder, create a new ***Aircraft Registration Folder*** for each aircraft that uses an ETM, with the aircraft's registration number as the folder name

c. Inside of the ***Aircraft Registration Folder*** create a ***Date Folder*** into which the **SD Card** data is downloaded. AKV recommends naming this folder as the *DATE* in which the data was transferred from the ETM to this folder

   (e.g. **100123** for **November 10, 2023**, or whichever variation suits your business)

d. Within each ***Date Folder***, you will copy all data from the **SD Card**

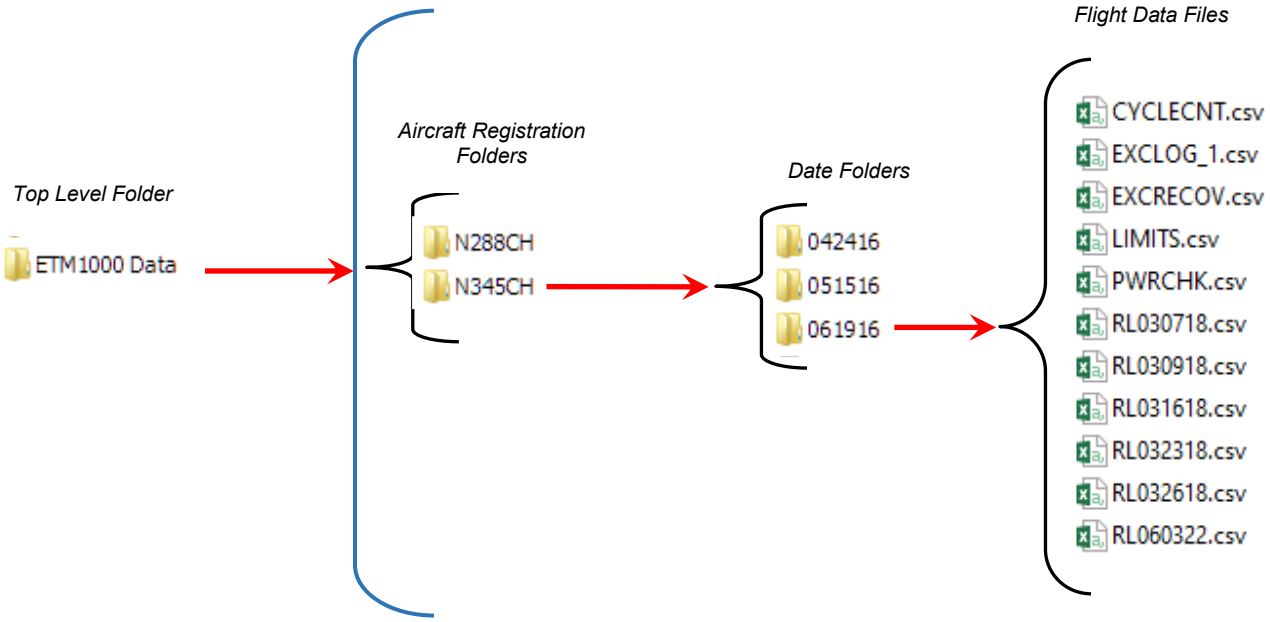


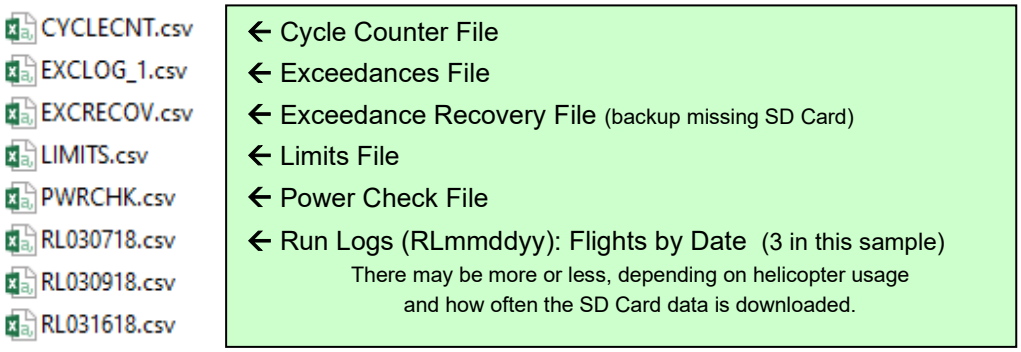
Fig. 1 - Backup File Structure Example

6.2 HOW TO BACK UP RECORDED DATA

NOTE: Perform the following to back a maximum every 100 Hours of Flight Data.

a. Power off the aircraft
b. On the **ETM1000**, open **SD Card Port**
c. Remove the **SD Card** by pushing it in to release
d. Insert the card into a **SD Card Reader** (customer supplied if no SD port available on the PC)
e. Open the **ETM1000 Data** folder from the desktop shortcut (see **SECTION 6.1**)
f. Open the correct aircraft registration named folder
g. Create a new date flight folder:
   1) Right-click inside the folder in a clear area, and select **NEW**
   2) At the top of the pop-up window, select **FOLDER**
   3) Name the folder with the **DATE CONVENTION**; YEARMONTHDAY (e.g. 20180425)
   4) Go back one folder directory
h. Copy all data from the **SD Card** to the newly created *DATE* FOLDER
   1) Copy all data off of the **SD Card** into the new folder

      (Refer to **SECTION 6.1 – SUGGESTED METHODS TO BACKUP & STORE RECORDED DATA**)



This sample shows the typical files moved from the SD Card into the ETM1000 Date Folder

i. When done, double-check and verify that files copied correctly before continuing

WARNING: If you see "**shortcut**" in the file name, you have **NOT** copied the **Data**, and are in danger of losing your data if the **SD Card** is wiped clean. Be absolutely sure you have copied the files correctly.

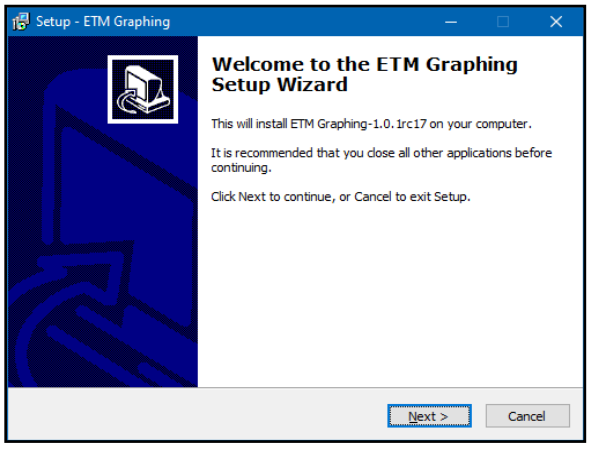
j. Once confirmed the files have copied correctly, you may delete the files from the **SD Card**
k. Return the **SD Card** to the **ETM** and push in until it clicks into place, then release
l. Turn the battery switch on to make sure the **SD light** does not remain illuminated
m. Go to **SECTION 7.1** for running the **PYTHON GRAPHING** if it is already installed

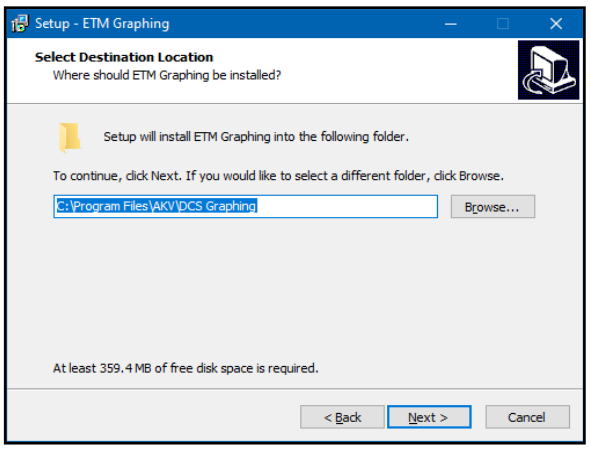
7.0 INSTALLING THE PYTHON GRAPHING PROGRAM

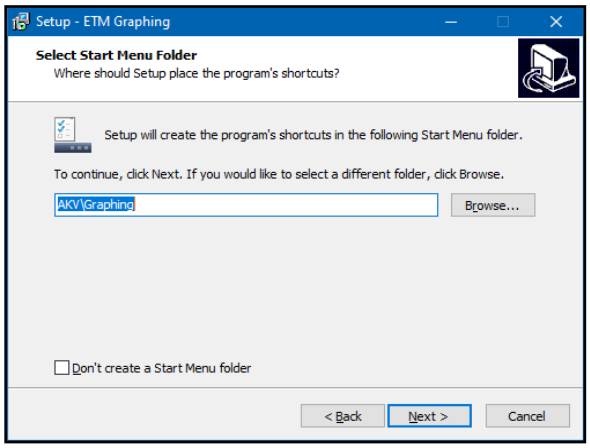
This section explains how to install and run the graphing software and view your data.

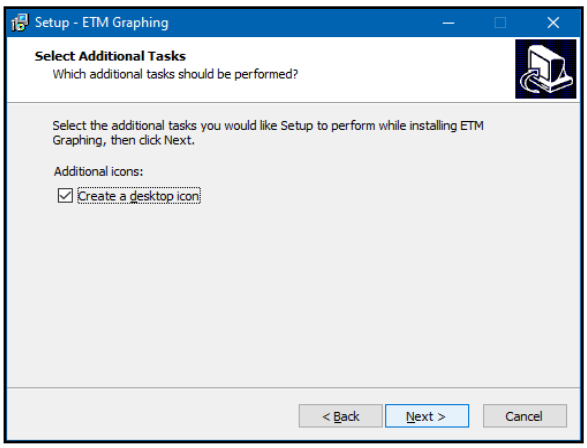
The installation file "*setup_AKV-Graphing-1.0.1rc20.149.exe*" or later version is located on the supplied Dropbox email link

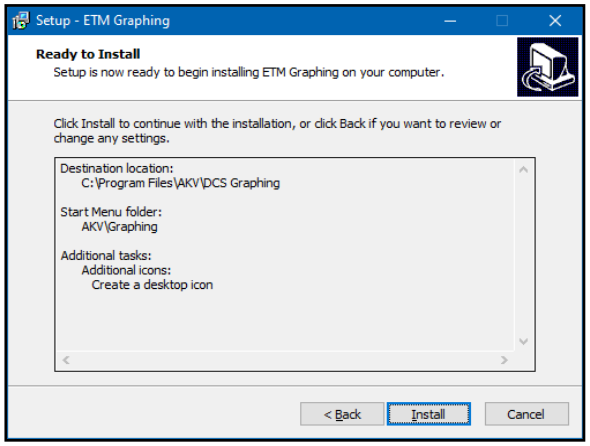
a. Locate and double-click the ***setup_AKV-Graphing-1.0.1rc20.149.exe*** (or latest version)
b. **Install** the program using the defaults presented
c. Click on **NEXT** when displayed and then **INSTALL**
d. Click **FINISH** when installation complete

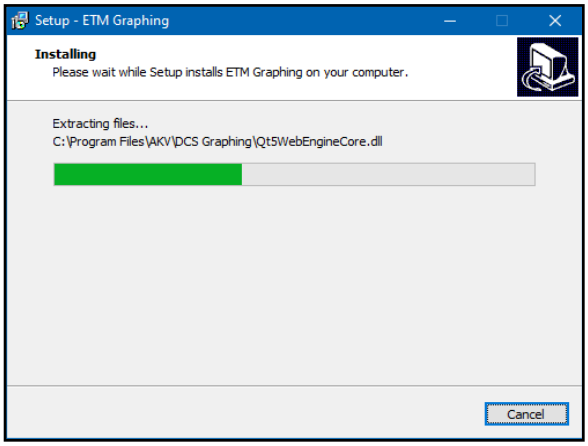








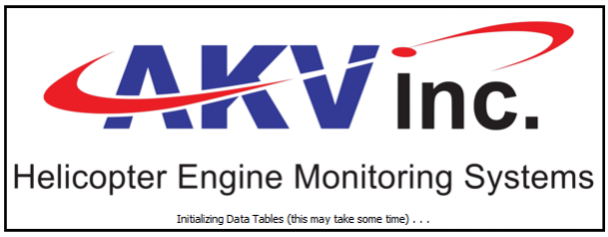




7.1 RUN THE GRAPHING PROGRAM

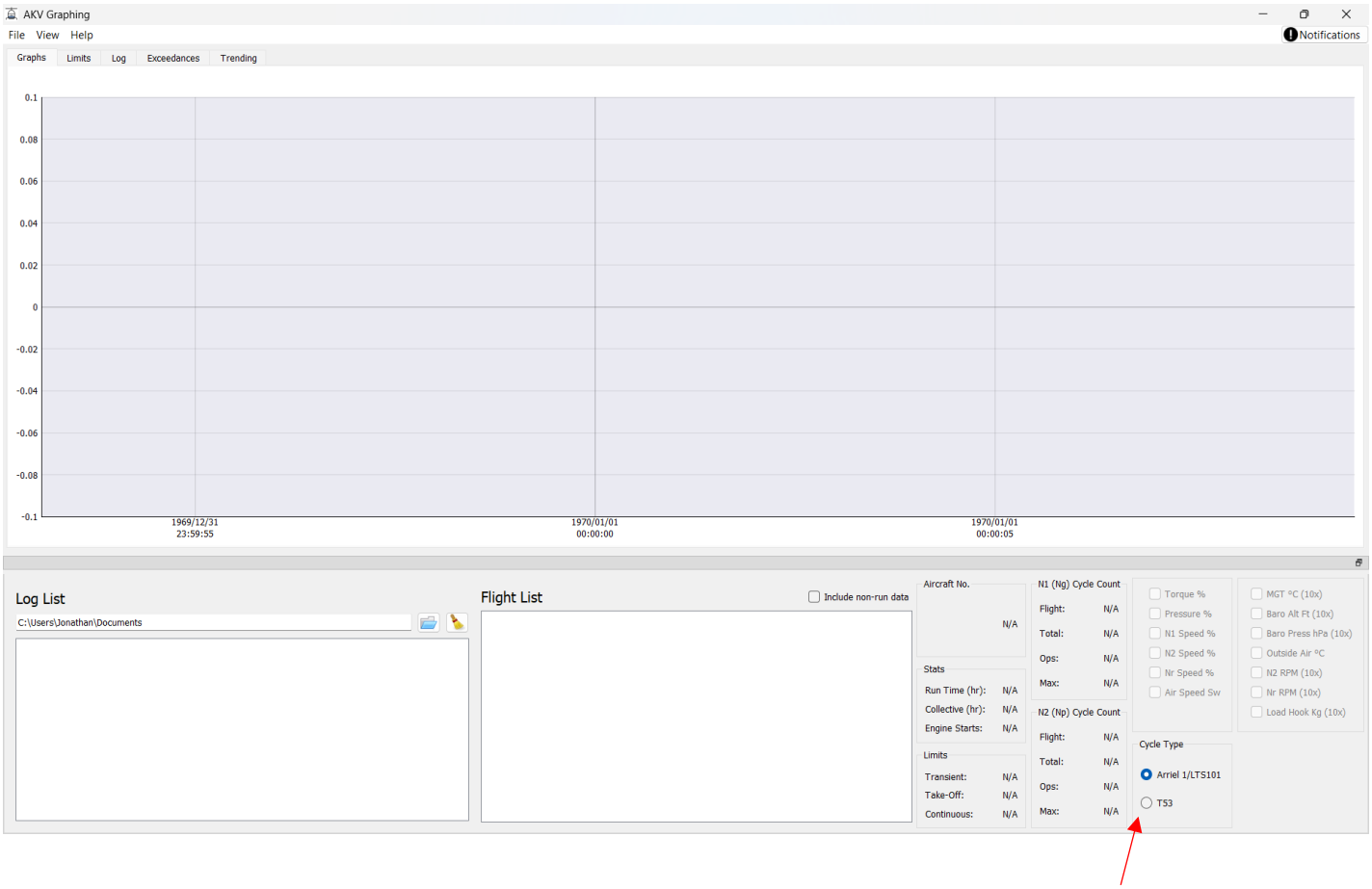
a. **Double-Click** on the **AKV Graphing Icon** from the desktop

b. The **AKV Inc. Splash Screen** appears for a few moments



c. The Main **ETM1000** window will then appear

d. To view your data, refer to **Sections 8.0** and **9.0**



NOTE: AKV Graphing Version: **1.0.1rc21 Software Number: S5410 Build ID: 152** and later includes T53 Cycle Counting. Select the appropriate radio button under “Cycle Type”. Not all graph images depict the addition of the new “Cycle Type” radio button selection as they are for illustration purposes.

8.0 LOADING DATA

This section breaks down the various features of the **Python Graphing Program**.

NOTE: For each instance the aircraft battery switch is turned on, the **ETM1000** creates a **Run Log** file **RLmmddyy** for the day, even if there is no other activity.

8.1 IMPORT AND ACCESS FLIGHT DATA

There are two options for loading **ETM1000** log files:

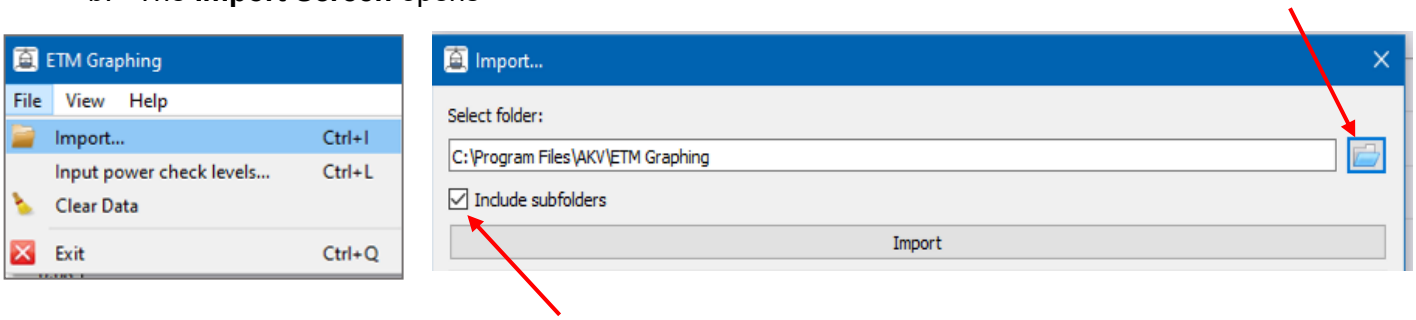
- **METHOD ONE** is used to load large batches of multiple stored data files. This provides a quicker way to view and navigate between large files as it loads all data into the graphing memory and provides for a better experience.
- **METHOD TWO** is used to load smaller file folders one-at-a-time.

METHOD ONE – Import Batch Files

This method is used when large batches of multiple subfolders need to be loaded. It provides for faster loading of data when switching between date folders in the **Log List** as the data is already loaded. It also loads the same files into the trending section.

a. Click on **Tool Bar**, **File**, and then **Import**

b. The **Import Screen** opens



c. Select the **Include Subfolders Checkbox**

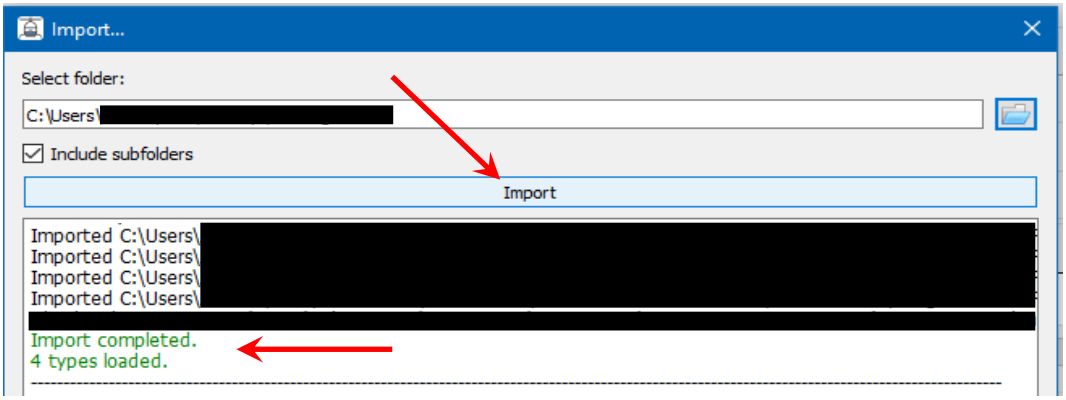
d. Click on the directory folder icon at far right

e. Select the specific “aircraft registration” folder you created where the data is stored (no files will be visible)

f. Click on **Select Folder** at bottom-right

g. The **Import…** Windows opens

h. Click on **Import** button in center



i. The area beneath the import button, shown above, displays what data is loaded and will highlight any errors

j. Close this window by clicking the **X** in the top right

k. The graphing screen will appear, similar to the image below

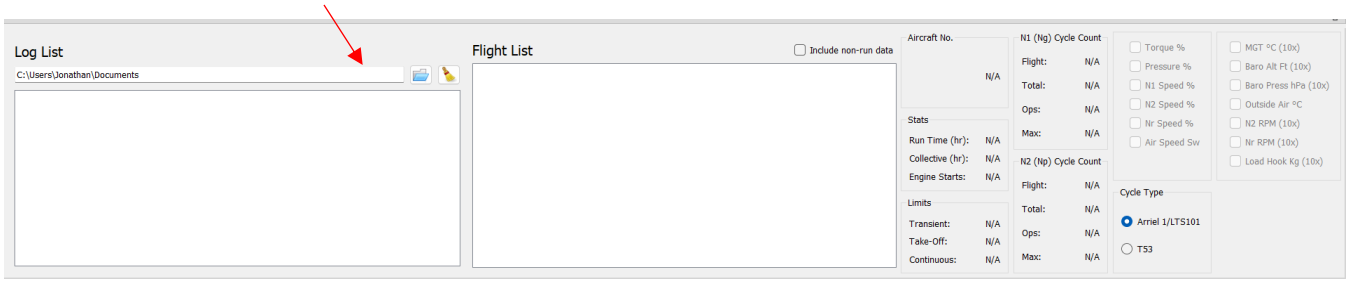
l. Continue to the next **Section 8.2** to select desired files

NOTE: If there are multiple sub-folders that are loaded then you will need to select the particular sub folder by clicking the **Log List** directory folder icon (red arrow) and selecting which of the folders you want loaded in the **Log List** window.

METHOD TWO – LOAD INDIVIDUAL FILES

This method is best used when just one subfolder needs to be loaded.

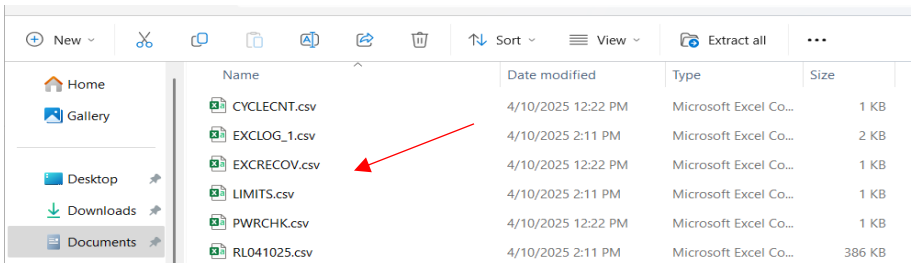
a. Load folders one-at-a-time by using the **Log List** folder directory selection (red arrow)



b. Double-click on any one of the files shown from within a particular folder

c. All files within the selected folder are loaded into the **Log List**

NOTE: Clicking on any file within a folder will automatically load ALL files in that folder.



8.2 ACCESS RUN LOGS AND FLIGHT LISTS

Run Log Format

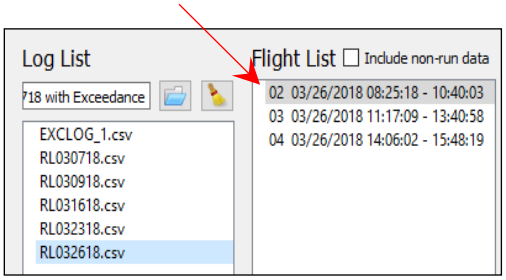
Run Log (**RLmmddyy**) files are displayed in the bottom left-hand **Log List** box. These are always listed after the **EXCLOG_1** file in date/time sequence. For each day the aircraft battery switch was turned on, a new **Run Log** is created for that day.

The **Run Log** file name is displayed as the date the file was generated from the **ETM1000**

i.e. ***RL032618.csv*** *(Run Log, Dated 03-26-2018)*

When you click on a **Run Log** file, all flights associated with that **Run Log** appear in the right-hand box under **Flight List**. They are represented with a sequential numeric file number with the date displayed in standard format, with beginning and ending times.

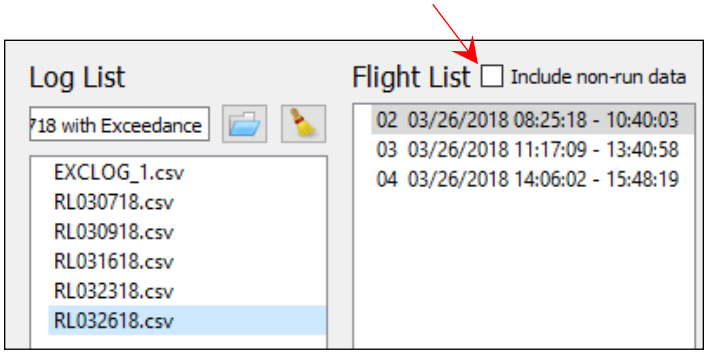
i.e. **02 3/26/2018 8:25:18 AM – 10:40:03 AM**



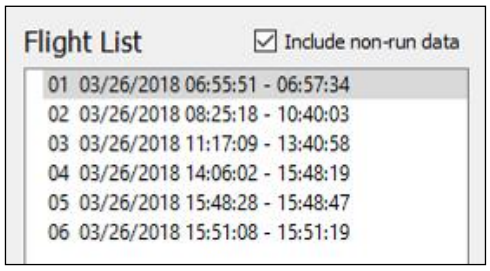
NOTE: By default, the Flight List shows only files with an engine start.

Non-Run Data

The **Include Non-Run Data** CHECKBOX must be selected to view hidden files that do not contain an engine start, as shown below.



By default, only run files are shown



With the Include Non-Run box checked, both run and non-run files are displayed

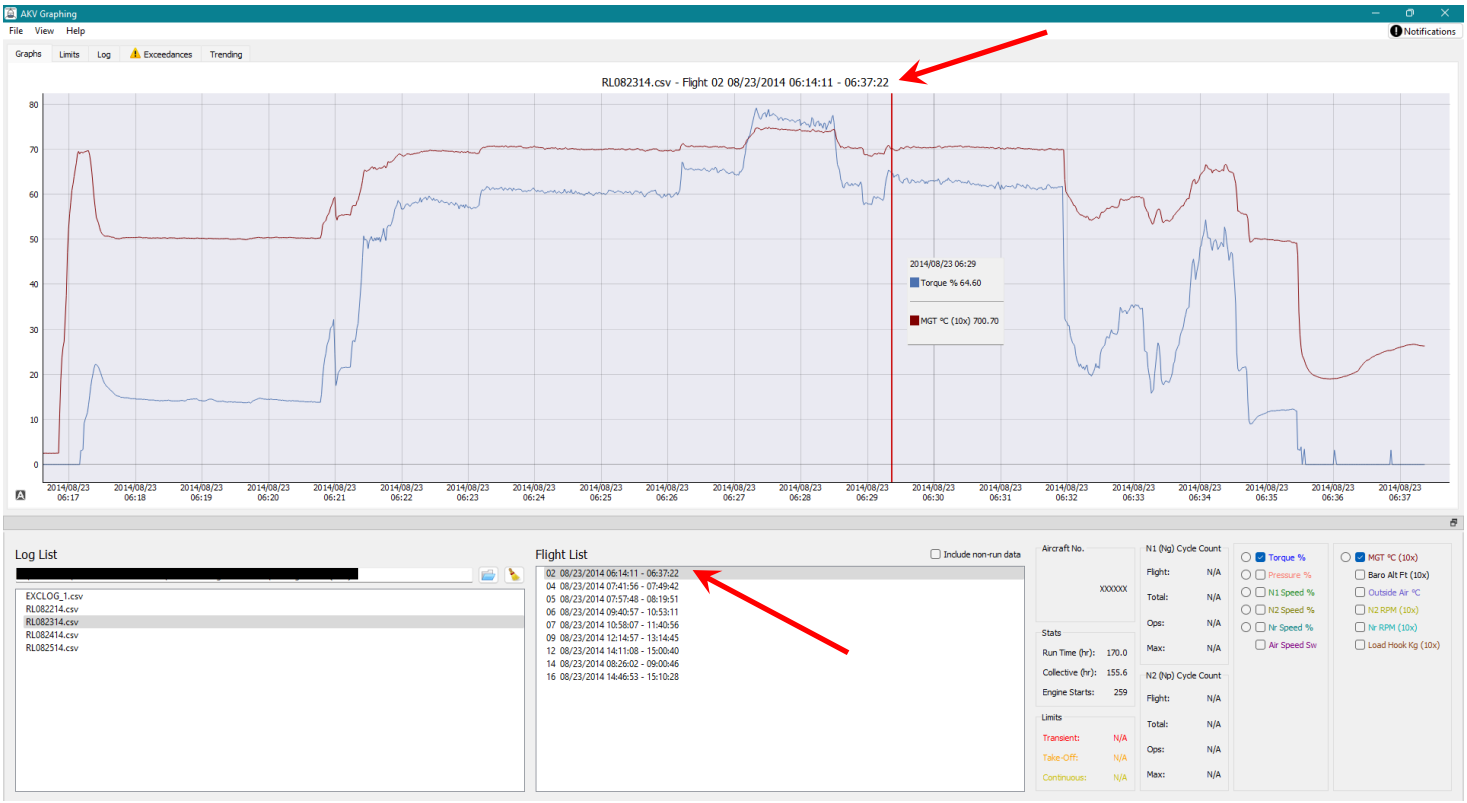
9.0 GRAPHING DATA

This section describes how to view your data.

9.1 SELECT A RUN LOG

a. In the **Log List** box, click on the desired **Run Log (RL)** date file

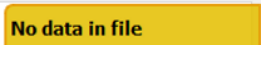
b. The **Flight List** box displays all files that have engine run data . The file you highlight displays across the top of the graph window



c. The **Flight List** files are represented with a sequential flight number and the date in standard format, with beginning and ending times

- Flight File example highlighted above: **08/23/2014 06:14:11 – 06:37:22**

NOTES: When initially importing files the EXCLOG_1 is highlighted by default and if it does not have any recorded exceedance data, a yellow pop-up in the right corner will display for a few seconds



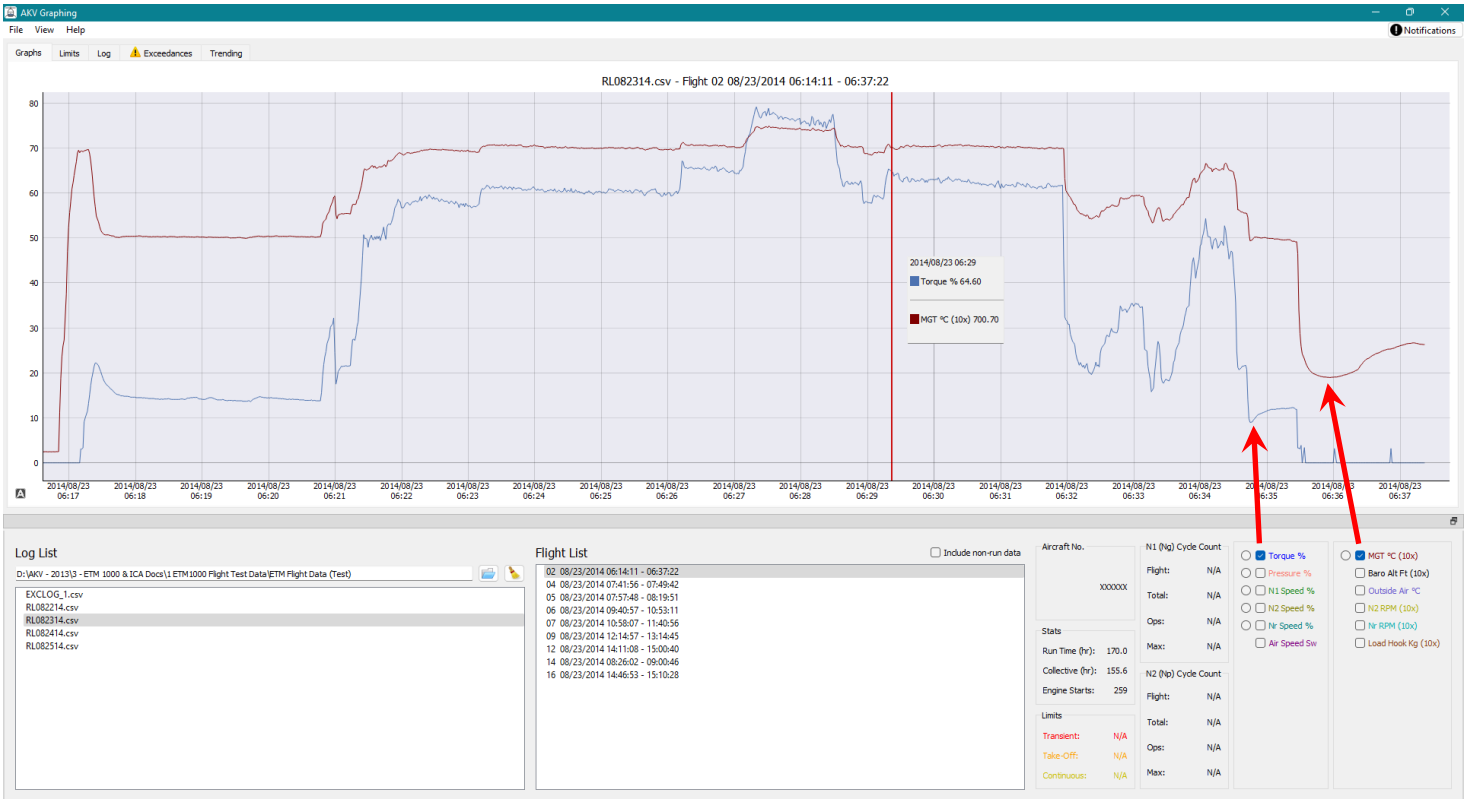
When selecting a RL file and no data exists, a blue flag in the top-right will be displayed for a few seconds

9.2 GRAPHING A RUN LOG (RLMMDDYY.CSV)

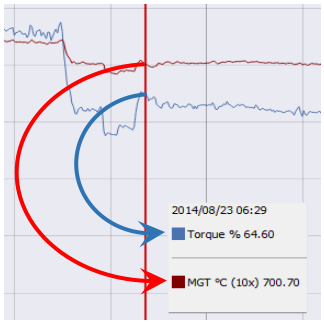
a. Select any parameter **Check Box**(s) you wish to view in the graph

b. The **Y-Axis Vertical Slider**:

- When the mouse is placed in the graphing area, the vertical red line slides left and right. A **Pop-Up Box** shows all selected values where the vertical slider intercepts the parameter. It displays the parameter name and designated color along with the value at the intercept point.



NOTE: A parameter that displays a **10x** multiplier is shown in the **Pop-Up Box** with its true value. For example the **MGT** intercept at **Y-Axis 70.70** indicates the true value of **700.70** shown above.



c. Changing Selection:

- Each time you view a different **Flight Log**, all data from the graph and the **Parameters** will be cleared
- To clear all selections and remove the current **Log Lists** manually, click on the **Reset** button (brush icon).

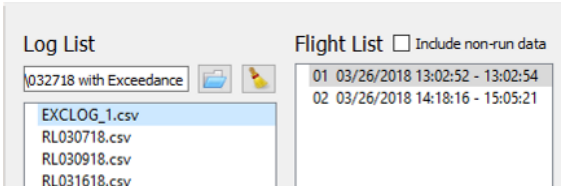
10.0 GRAPHING EXCEEDANCES

The following graphing images are not representative of real-life data and are used here only for instructional guidance.

10.1 VIEWING EXCEEDANCE LISTS

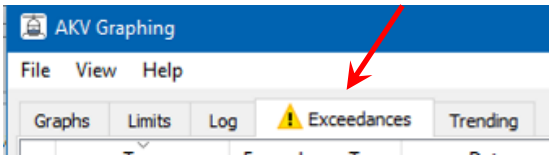
a. When data is initially loaded, the system displays the following:

- The **Exceedance** file is at the top of the left hand **Log List** column, highlighted by default.
- The right hand **Flight List** box displays the exceedances by date and time. Multiple exceedances are listed if they have occurred. The timeframe is based on the start and stop time of the Exceedance. If there are no exceedances, this **Flight List** will be blank

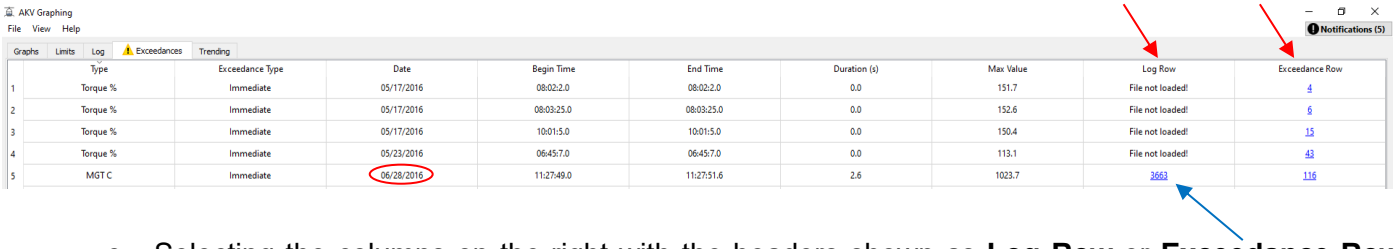


10.2 VIEWING EXCEEDANCE LOG FILES

a. Recorded exceedances can be viewed with the **Exceedances** tab

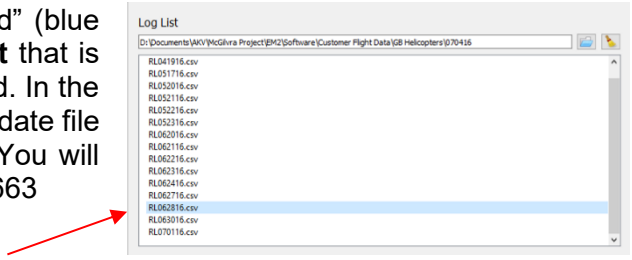


b. Click on the **Exceedances tab** and the Exceedances Log summary window opens. You can view which parameter has been exceeded under **Type** and **Exceedance Type**

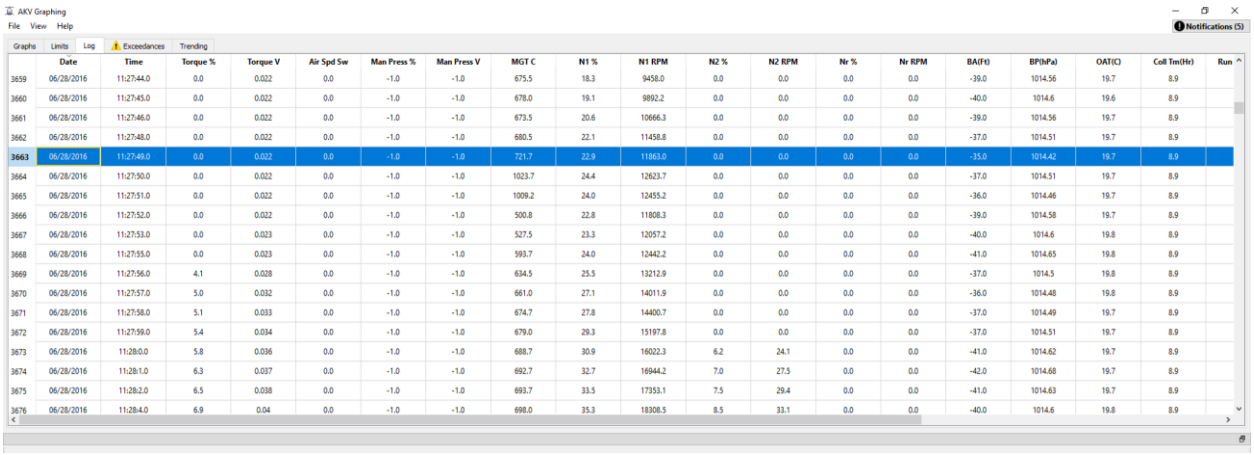


c. Selecting the columns on the right with the headers shown as **Log Row** or **Exceedance Row** and by clicking on the blue number, takes you directly to the starting row of the raw exceedance data. The benefit of viewing the raw data is it provides a direct way to see what the other engine parameters values were at the time of the exceedance

NOTE: Initially, the **Log Row** will indicate “file not loaded” (blue arrow above). This is because the **RL** file in the **Log List** that is associated with the exceedance date needs to be selected. In the example picture above, the date (red circle) and same **RL** date file **RL062816** from the log list file needs to be highlighted. You will then see the **Log Row** number appear, in this case row 3663



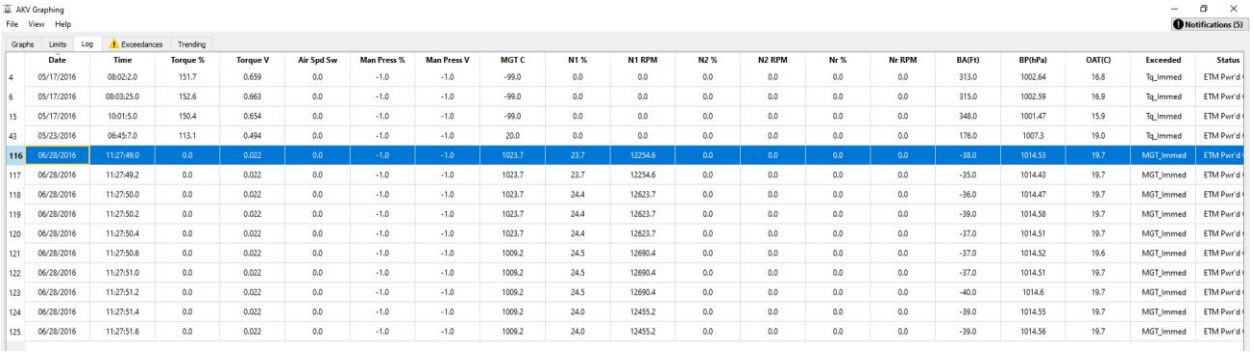
d. Selecting the **Log Row** blue number will take you directly to the raw Log file with the row number highlighted as shown below. This is the exceedance within the **Run Log** file



	Date	Time	Torque %	Torque V	Air Spd Sw	Man Press %	Man Press V	MGT C	N1 %	N1 RPM	N2 %	N2 RPM	Nr %	Nr RPM	BA(Ft)	BP(hPa)	OAT(C)	Coll Tm(Hr)	Run
3659	06/28/2016	11:27:44.0	0.0	0.022	0.0	-1.0	-1.0	675.5	18.3	9458.0	0.0	0.0	0.0	0.0	-39.0	1014.56	19.7	8.9	
3660	06/28/2016	11:27:45.0	0.0	0.022	0.0	-1.0	-1.0	678.0	19.1	9892.2	0.0	0.0	0.0	0.0	-40.0	1014.6	19.6	8.9	
3661	06/28/2016	11:27:46.0	0.0	0.022	0.0	-1.0	-1.0	673.5	20.6	10666.3	0.0	0.0	0.0	0.0	-39.0	1014.56	19.7	8.9	
3662	06/28/2016	11:27:48.0	0.0	0.022	0.0	-1.0	-1.0	680.5	22.1	11458.8	0.0	0.0	0.0	0.0	-37.0	1014.51	19.7	8.9	
3663	06/28/2016	11:27:49.0	0.0	0.022	0.0	-1.0	-1.0	721.7	22.9	11863.0	0.0	0.0	0.0	0.0	-35.0	1014.42	19.7	8.9	
3664	06/28/2016	11:27:50.0	0.0	0.022	0.0	-1.0	-1.0	1023.7	24.4	12623.7	0.0	0.0	0.0	0.0	-37.0	1014.51	19.7	8.9	
3665	06/28/2016	11:27:51.0	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.0	12455.2	0.0	0.0	0.0	0.0	-36.0	1014.46	19.7	8.9	
3666	06/28/2016	11:27:52.0	0.0	0.022	0.0	-1.0	-1.0	500.8	22.8	11808.3	0.0	0.0	0.0	0.0	-39.0	1014.58	19.7	8.9	
3667	06/28/2016	11:27:53.0	0.0	0.023	0.0	-1.0	-1.0	527.5	23.3	12057.2	0.0	0.0	0.0	0.0	-40.0	1014.6	19.8	8.9	
3668	06/28/2016	11:27:55.0	0.0	0.023	0.0	-1.0	-1.0	593.7	24.0	12442.2	0.0	0.0	0.0	0.0	-41.0	1014.65	19.8	8.9	
3669	06/28/2016	11:27:56.0	4.1	0.028	0.0	-1.0	-1.0	634.5	25.5	13212.9	0.0	0.0	0.0	0.0	-37.0	1014.5	19.8	8.9	
3670	06/28/2016	11:27:57.0	5.0	0.032	0.0	-1.0	-1.0	661.0	27.1	14011.9	0.0	0.0	0.0	0.0	-36.0	1014.48	19.8	8.9	
3671	06/28/2016	11:27:58.0	5.1	0.033	0.0	-1.0	-1.0	674.7	27.8	14400.7	0.0	0.0	0.0	0.0	-37.0	1014.49	19.7	8.9	
3672	06/28/2016	11:27:59.0	5.4	0.034	0.0	-1.0	-1.0	679.0	29.3	15197.8	0.0	0.0	0.0	0.0	-37.0	1014.51	19.7	8.9	
3673	06/28/2016	11:28:0.0	5.8	0.036	0.0	-1.0	-1.0	688.7	30.9	16022.3	6.2	24.1	0.0	0.0	-41.0	1014.62	19.7	8.9	
3674	06/28/2016	11:28:1.0	6.3	0.037	0.0	-1.0	-1.0	692.7	32.7	16944.2	7.0	27.5	0.0	0.0	-42.0	1014.68	19.7	8.9	
3675	06/28/2016	11:28:2.0	6.5	0.038	0.0	-1.0	-1.0	693.7	33.5	17353.1	7.5	29.4	0.0	0.0	-41.0	1014.63	19.7	8.9	
3676	06/28/2016	11:28:4.0	6.9	0.04	0.0	-1.0	-1.0	698.0	35.3	18308.5	8.5	33.1	0.0	0.0	-40.0	1014.6	19.8	8.9	

View of the raw exceedance data within the Run Log file

e. Selecting the **Exceedance Row** blue number will take you directly to the raw Log file with the row number highlighted, as shown below. This row is the start of the exceedance within the **Exceedance Log** file. Other exceedances will show before and/or after the exceedance being viewed. Look at the date and time to confirm the exceedance you are looking at is correct



	Date	Time	Torque %	Torque V	Air Spd Sw	Man Press %	Man Press V	MGT C	N1 %	N1 RPM	N2 %	N2 RPM	Nr %	Nr RPM	BA(Ft)	BP(hPa)	OAT(C)	Exceeded	Status
4	05/17/2016	08:02:2.0	151.7	0.659	0.0	-1.0	-1.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	313.0	1002.64	16.8	Tq_Immed	ETM Pwr'd
6	05/17/2016	08:03:25.0	152.6	0.663	0.0	-1.0	-1.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	315.0	1002.59	16.9	Tq_Immed	ETM Pwr'd
15	05/17/2016	10:01:5.0	150.4	0.654	0.0	-1.0	-1.0	-99.0	0.0	0.0	0.0	0.0	0.0	0.0	348.0	1001.47	15.9	Tq_Immed	ETM Pwr'd
43	05/23/2016	06:45:7.0	113.1	0.494	0.0	-1.0	-1.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	176.0	1007.3	19.0	Tq_Immed	ETM Pwr'd
116	06/28/2016	11:27:49.0	0.0	0.022	0.0	-1.0	-1.0	1023.7	23.7	12254.6	0.0	0.0	0.0	0.0	-38.0	1014.53	19.7	MGT_Immed	ETM Pwr'd
117	06/28/2016	11:27:49.2	0.0	0.022	0.0	-1.0	-1.0	1023.7	23.7	12254.6	0.0	0.0	0.0	0.0	-35.0	1014.43	19.7	MGT_Immed	ETM Pwr'd
118	06/28/2016	11:27:50.0	0.0	0.022	0.0	-1.0	-1.0	1023.7	24.4	12623.7	0.0	0.0	0.0	0.0	-36.0	1014.47	19.7	MGT_Immed	ETM Pwr'd
119	06/28/2016	11:27:50.2	0.0	0.022	0.0	-1.0	-1.0	1023.7	24.4	12623.7	0.0	0.0	0.0	0.0	-39.0	1014.58	19.7	MGT_Immed	ETM Pwr'd
120	06/28/2016	11:27:50.4	0.0	0.022	0.0	-1.0	-1.0	1023.7	24.4	12623.7	0.0	0.0	0.0	0.0	-37.0	1014.51	19.7	MGT_Immed	ETM Pwr'd
121	06/28/2016	11:27:50.6	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.5	12690.4	0.0	0.0	0.0	0.0	-37.0	1014.52	19.6	MGT_Immed	ETM Pwr'd
122	06/28/2016	11:27:51.0	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.5	12690.4	0.0	0.0	0.0	0.0	-37.0	1014.51	19.7	MGT_Immed	ETM Pwr'd
123	06/28/2016	11:27:51.2	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.5	12690.4	0.0	0.0	0.0	0.0	-40.0	1014.6	19.7	MGT_Immed	ETM Pwr'd
124	06/28/2016	11:27:51.4	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.0	12455.2	0.0	0.0	0.0	0.0	-39.0	1014.55	19.7	MGT_Immed	ETM Pwr'd
125	06/28/2016	11:27:51.6	0.0	0.022	0.0	-1.0	-1.0	1009.2	24.0	12455.2	0.0	0.0	0.0	0.0	-39.0	1014.56	19.7	MGT_Immed	ETM Pwr'd

View of the raw exceedance data within the Exceedence Log file

10.3 VIEWING EXCEEDANCES AS A GRAPH

The best way to view an exceedance in graphical form is to use the **Run Log** data associated with a particular exceendance date and time. There are three types of Exceedances displayed in the **Exceedance Type** column within the **EXCEEDANCE TAB**, with the following meanings:

TAKEOFF TIMER:	The Takeoff Limit Timer was exceeded (normally 5 min in most helicopters)
IMMEDIATE:	The Tq versus Airspeed or Transient Limit was exceeded
TRANSIENT TIMER:	The Transient Limit Timer was exceeded

a. Once **ETM1000** flight data has been selected, click on the **EXCEEDANCE TAB** to view all Exceedances available

b. Write down the parameter that has been exceeded, the exceedance type, the date, and the beginning and ending time of the exceedance

c. Click on the **GRAPHS TAB** and highlight the **EXLOG_1.csv** log file

d. In the **Log List**, select the date of the exceedance and in the **Flight List** box, select the time the Exceedance falls within. If multiple flights exist, select the flight with the same time range as the exceedance occurred in

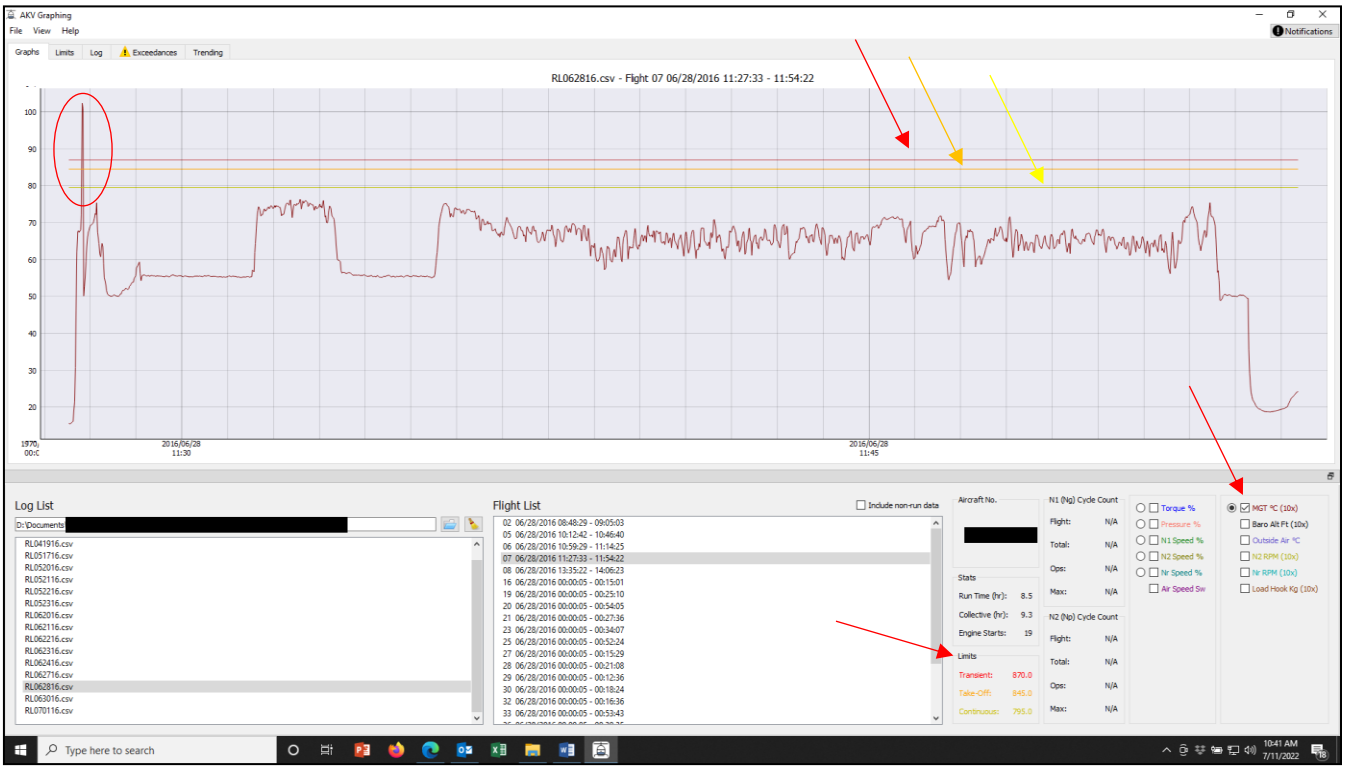
(e.g. For an exceedance beginning at 16:34:05, choose flight *16:25:01 PM –16:49:46 PM*)

e. Select the **Parameter(s)** exceeded

f. Select the appropriate **Parameter check box(es)** associated with the **Exceedance**

g. Select the **Radio Button** beside the parameter check box to be viewed. This will create the limit lines horizontally on the graph for that parameter (shown below)

- The **Continuous Operating Limit** line appears in **Yellow**
- The **Take-Off Limit** line appears in **Orange**
- The **Transient Limit** appears in **Red**



The sample image above indicates a hot start exceedance (red circle)

10.4 CLEARING EXCEEDANCES

AKV recommends that once the data from the **SD Card** is copied to a company **PC**, that the data on the **SD Card** be deleted. This prevents any confusion of prior exceedance data which may have already been acknowledged by Maintenance. In order to clear the blue **WARNING** light from the annunciator, see **STEP 5.3 – R (WARNING Light Reset)**.

10.5 EXCEEDANCE RECOVERY FILE

The **EXCRECOV** located on the SD card is the **Exceedance Recovery File**. Exceedance data is retained in the **ETM1000** flash memory as a separate backup to the SD card.

In the event the SD card is lost or stolen, you can recover the exceedance data by inserting a new SD card into the **ETM1000**, and turning the battery switch on. The exceedance data in memory is then written to the **EXCRECOV** file on the SD card for viewing.

All regular Run Log (RL) flight data is lost if the card is missing. The flash memory only retains raw exceedance data as a limited backup of critical information

CRITICAL NOTE: When the **WARNING Light** is reset, the **EXCRECOV** backup flash memory is ***PERMANENTLY CLEARED***!

SCENARIO: The aircraft battery switch is turned **ON** and…

- The blue **WARNING** light appears on the anunnciator
- The **SD** light appears, indicating the **SD Card** is missing

Immediately perform the following:

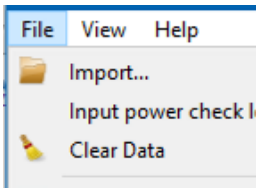
a. Turn the battery switch **OFF**
b. Insert a new blank **SD Card**
c. Turn the battery switch back **ON**
d. At this point, the exceedance data retained in the **ETM1000** flash memory is written to the **EXCRECOV** file on the **SD Card**
e. Turn the battery switch **OFF**
f. Remove the **SD Card** and insert into a **PC**
g. Copy all files into the appropriate **ETM1000 Data** sub-folder (refer to **Section 6.2**)
h. Access the The **EXCRECOV** file via **PYTHON**

NOTE: The **EXCRECOV** file, when recovered this way, can only be viewed as raw data, without the ability to graph it

11.0 GRAPH CONTROL OPTIONS

11.1 TOOLBAR

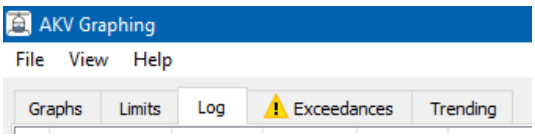
The Toolbar provides access to other features that are available



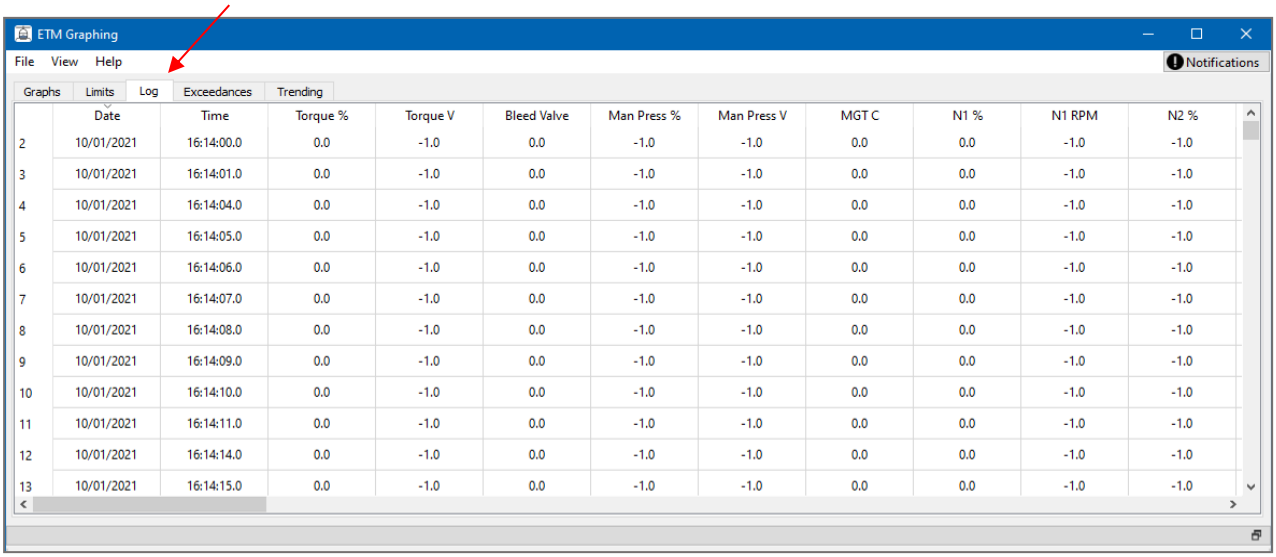
- **IMPORT DATA** – Described in **SECTION 8.1**
- **INPUT POWER CHECK LEVELS** – See **SECTION 0 – TRENDING DATA**
- **CLEAR DATA** – This resets the graph by clearing **Python** of all information, and displaying blank **Log List** and **Flight List** boxes. Data can then be re-loaded

11.2 TABS

The Tabs allow for navigation between the screens.



- **GRAPHS TAB** – To view the graphing screen for the recorded data
  See **Section 10.0 – Graphing Data**
- **Limits TAB** – Displays how each of the parameter limits is configured in the **ETM**. These values are based on the **RFM** limitations and produces the alert tones, caution, and warnings lights
- **LOG TAB** – Displays the raw recorded data for the selected **Run Log** file for which-ever file is highlighted in the **Log List**



	Date	Time	Torque %	Torque V	Bleed Valve	Man Press %	Man Press V	MGT C	N1 %	N1 RPM	N2 %
2	10/01/2021	16:14:00.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
3	10/01/2021	16:14:01.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
4	10/01/2021	16:14:04.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
5	10/01/2021	16:14:05.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
6	10/01/2021	16:14:06.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
7	10/01/2021	16:14:07.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
8	10/01/2021	16:14:08.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
9	10/01/2021	16:14:09.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
10	10/01/2021	16:14:10.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
11	10/01/2021	16:14:11.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
12	10/01/2021	16:14:14.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0
13	10/01/2021	16:14:15.0	0.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0

- **Exceedances Tab** – When selected, this tab takes you to the Exceedance Summary Table, which displays specific exceedance details. See **Section 10.0 – GRAPHING EXCEEDANCES**
- **TRENDING TAB** – Displays the Trending screen, which allows the trending of all recorded data. See **SECTION 0 – TRENDING DATA**

11.3 GRAPH VIEWING CONTROLS

At the screen bottom-right are viewable data and selectable parameters for a specific flight highlighted in the **Flight List**. For description, it has been divided into sections, **A** thru **G.**

A	**– Aircraft No.**	The current file's aircraft registration number
B	**– Stats**	Flight, Engine run times and engine starts
C	**– Limits**	Programmed Limit Values for the parameter selected by the radio button (O) next to each parameter
D	**– N1 (Ng) Cycle Count**	Ending Cycle Counter Values (optional)
E	**– N2 (Np) Cycle Count**	Ending Cycle Counter Values (optional)
F	**– Parameters**	Displayed chart values when selected
G	**– Parameters**	Displayed chart values when selected

NOTES:

- Sections **F** and **G** contain both **N2** and **Nr**. In some B3's these are in **%** and in others RPM
- While **Check Boxes** can be mixed, the **Radio Buttons** can only be selected one at a time and are not available when viewing **Exceedances**
- Display of the recorded cycle counts in **Sections D** and **E** requires that the **ETM1000** is installed with software version **73.0.3**. This currently applies to the **Arriel 1** only, until other engine models are added at a later date

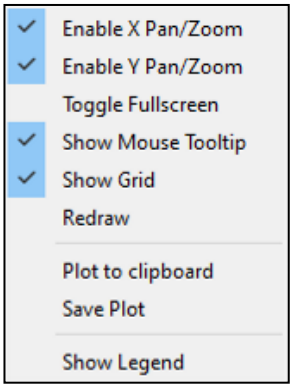
11.4 MOUSE CONTROLS

With graphed data showing, place the mouse cursor over the graph area and:

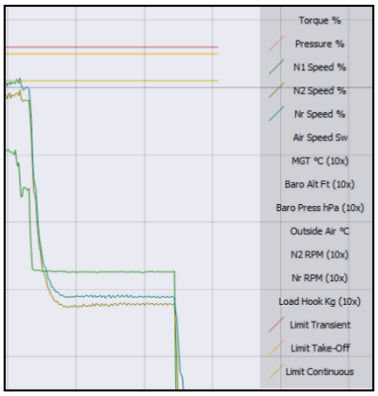
- **Roll up and down** with a scroll wheel type mouse to expand/contract the **Y-Axis** viewing
- **Click and hold left mouse** allows the screen data to be dragged around for viewing
- **Click and hold right mouse** and move the mouse to expand/contract both **X-** & **Y-Axis** viewing resolution, which will automatically re-scale the X-axis time stamp accordingly

Other options are available by right-clicking directly on the graphing chart. You may select or de-select them as needed.

- **Default Selections:** The four selections (Enable Pan/Zoom and Show Mouse Tooltip and Grid) are checked by default
- **To reset the view**, select **Redraw**. This re-scales the graph back to its original layout



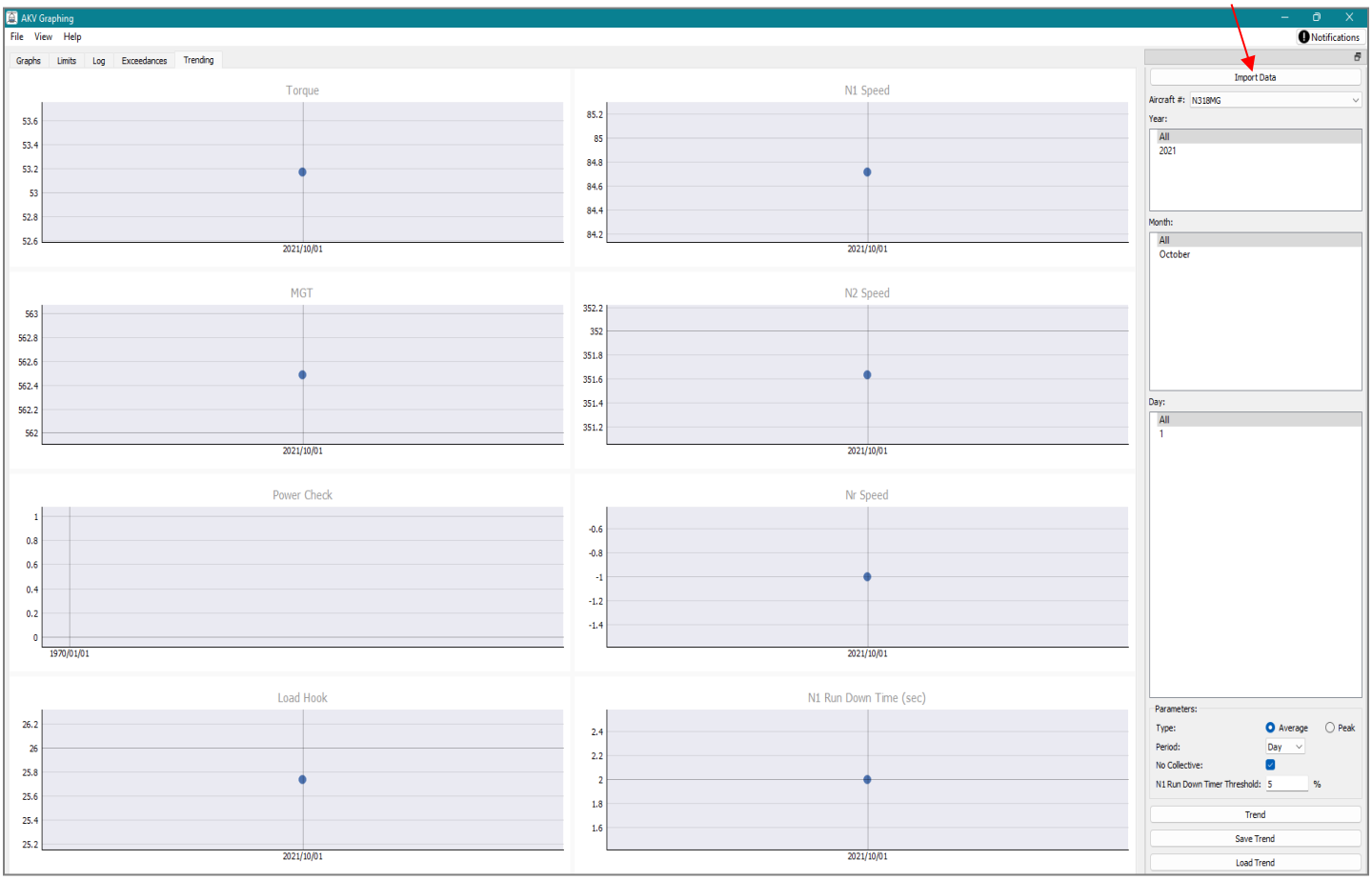
- Select **Toggle *FULLSCREEN*** for full-screen viewing of the graph. Select **Toggle Fullscreen** again to return or click on the **X** upper-right
- **Plot To Clipboard:** This allows you to **Print** the current image by **right-clicking** and selecting **Plot to Clipboard**, then use **CNTL+V** to paste it into a document to print, save, or email
- **Save Plot:** This saves the current image as a **.png** file in a save location you choose
- **Show Legend:** This displays the parameter boxes with their color schemes



12.0 TRENDING DATA

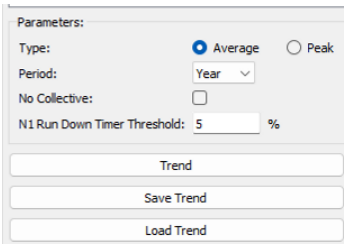
The trending capability of **Python** provides long-term trending of recorded data for each **Aircraft Folder** (helicopter registration number). If you have loaded data in the graphing screen using only the **Log List** directory folder then selected a **Log List** date, it will show only that set of data with the year, month and day in addition to any other selected **Log List** dates from the **Graph** in the right pane window.

If you want to trend additional data, the best method is to import the complete **Aircraft Folder** (helicopter registration number) either from the graphing screen tool bar **File tab** then "**import**" or by importing directly from within the trending screen and selecting "**Import Data**" (red arrow)



12.1 HOW TO TREND DATA

a. Which ever method you use to load data into the trending screen, The Year, Month, and Days will be highlighted as ***ALL*** by default. From here you can also select specific ranged data as needed (date, month, year)

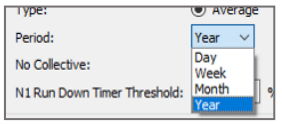


b. In the bottom right **Parameters** section you can Select:

- **AVERAGE** processes a day's worth of data into a single value
- **PEAK** processes a day's worth of data into a single value
- The **NO COLLECTIVE** check box needs to be checked if your aircraft does not use the collective switch interface for flight time. Some aircraft do not have the collective micro switch installed and is the reason this check box may need to be selected. As a default, it is un-checked.

NOTE: Without a collective signal to provide actual flight data, your trended data will be diluted with ground run data. This will affect the averaging of the trended data.

- The **PERIOD** drop-down option at the bottom changes the default range from year to Month, Week, or Day. All parameters will be refreshed after the **Trend** button is selected again



- The **N1 RUN DOWN TIMER THRESHOLD %** is the time it takes from the entered threshold value until zero is reached on shutdown. Detecting a negative trend (short time to zero), may indicate the presence of coaking issues.

c. You may use **All** for YEAR, MONTH, or DAY detail or change as needed

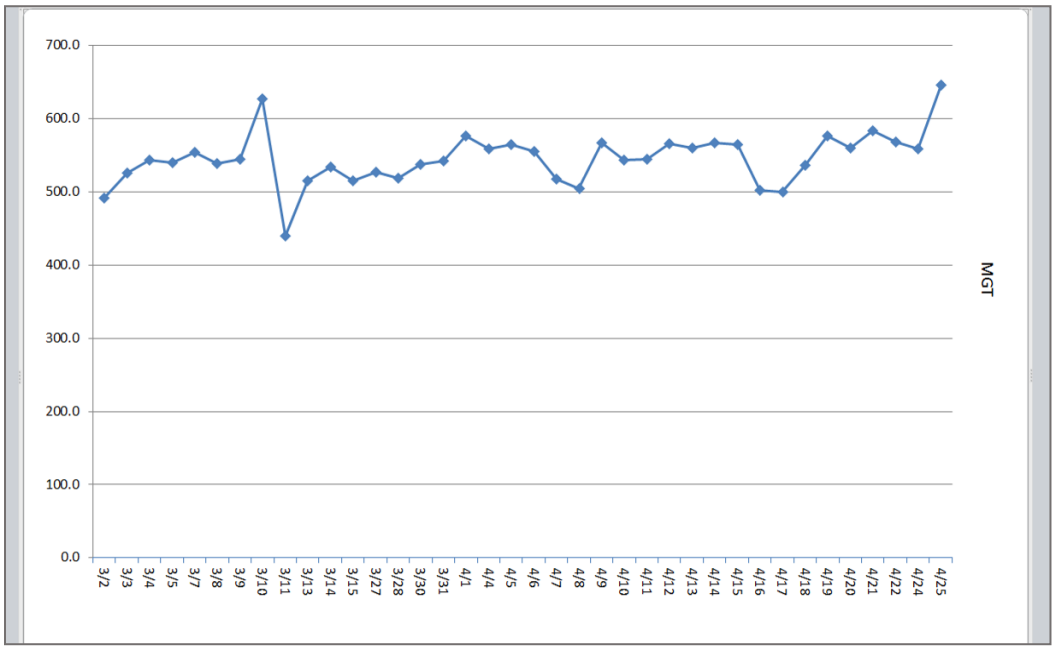
d. Click the **TREND** button at bottom-right. It may take some time if there is a lot of data to be processed, but once data is trended, it is displayed in each parameter window

e. Click the **SAVE TREND** to save the current Trend information. This file will be saved to the **Data Folder** you are currently viewing

> **Note:** Saving will only keep one instance within the **Data Folder** you are currently viewing. Anytime you save, it overwrites the previous file. After saving a Trend, you can continue trending additional data as needed.

f. Click the **LOAD TREND** to load the saved Trend information. This file automatically opens the file saved from the **Data Folder** you are currently viewing. It will also load any parameters that were used to trend the saved file.

g. Each parameter window utilizes the same mouse pop-up control as with the graph. For example, place the mouse pointer over any of the trended parameters, right click then select toggle full screen. The selected graph will be displayed by itself, full screen and will have the same zoom functions as the graphing screen, along with plotting to the clip board for saving and redraw, etc.



h. To return to the trending screen, do one of the following:

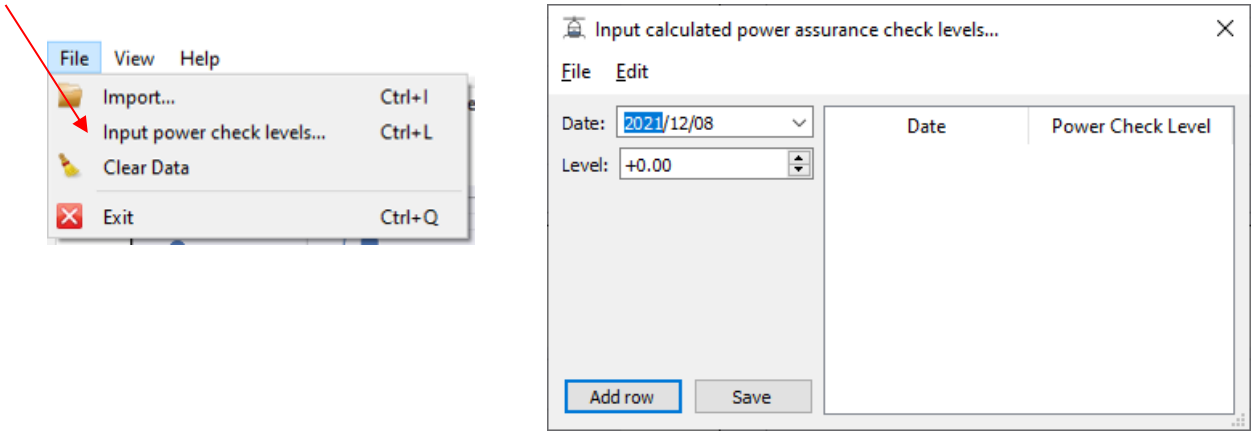
- **Toggle** the **Fullscreen** again
- **Click** on the **X** at upper-right

12.2 ENTER POWER CHECKS FOR TRENDING

This section describes how to enter your power checks.

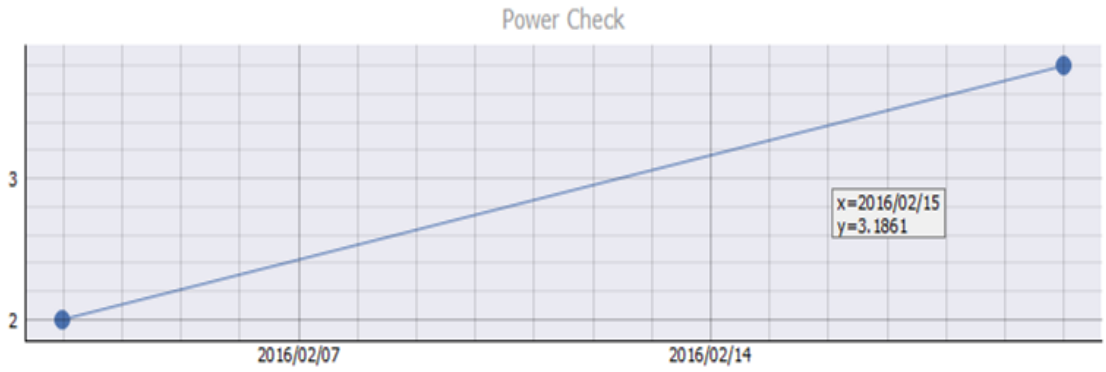
a. **IMPORTANT:** Import data into **Trend** that has the same data range as the power check(s) to be entered
b. Manually enter power checks by clicking on **Tool Bar**, and then **File**
c. Click on the **Input Power Check Levels** option

NOTE: **Power Checks** must have the same date as the imported files.



d. Enter the selected date, power check "level", then click on **ADD ROW**. Multiple entries can be made by clicking **ADD ROW** again
e. When done click **SAVE**
f. After you see the notice the file was successfully saved, close this window
g. Click the **TREND** button to display the **Power Check** entries in the graphing window, and it will update automatically

NOTE: Power checks are saved as **CPWRCHK.csv** in the same file as the imported data.



Two Power Check points plotted

13.0 CONTACT INFORMATION

777 Aviation Drive
Camarillo, CA 93010 USA
Phone (805) 437-1739
FAX (805) 437-1783
Email: sales@akvinc.com
Web: www.akvinc.com

APPENDICES

APPENDIX A – TORQUE CALIBRATION WORKSHEET

This worksheet is for use with **SECTION 5.6.1 TORQUE CALIBRATION**. Copies of this worksheet are also provided on the supplied Dropbox email link for printing purposes.

APPENDIX A

Torque Calibration Worksheet

Indicated %	ETM VDC Test 1	ETM VDC Test 2
0		
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
110		

Aircraft Registration Number

Date of Calibration

New Tq Calibration Values

Torque	Values
TO	
T1	
T2	

APPENDIX B – MGT CALIBRATION WORKSHEET

This worksheet is for use with **SECTION 5.6.2 MGT CALIBRATION**. Copies of this worksheet are also provided on the supplied Dropbox email link for printing purposes.

APPENDIX B

MGT Calibration Worksheet

Indicated C	ETM MGT
100	
200	
300	
400	
500	
600	
700	
800	
900	
1000	

Aircraft Registration Number

_____

Date of Calibration

_____

New MGT Calibration Values

MGT	Values
M0	
M1	
M2	
M3	
M4	
M5	

APPENDIX C

CONFIG. AND DATA PORT BAUD RATES

FOR

REMOTE DISPLAY (CYCLE COUNTING) & MOBILE DISPLAY (iOS APP)

This section explains the requirement for communicating with the ETM1000 via the Config. port when both options for the **Remote Display P/N ETMRD-004** & **Remote Gauge P/N BTM1000** are used.

- The **Config port** is always set in the ETM1000 to a baud rate of 57,600 for HyperTerminal by default
- The **Data Port** is always set to a baud rate of 38,400 by default for either the Cycle Counting Remote Display **P/N ETMRD-004** or the Remote Gauge iOS App Bluetooth Module **P/N BTM1000**

The **RS232** ports are designed to be used as follows:

1. The "Config" port is the only programming port for configuring the ETM1000 via **HyperTerminal**
2. The optional Remote Display **P/N ETMRD-004,** which is used to display cycle counting, is always connected to the **Data Port** when no other options are used as shown on the interface drawing, next page
3. If the optional Bluetooth Module (BLE) **P/N BTM1000** for the Remote Gauge iOS App option is also used, it must however also plug into the **Data Port** as that is the only port it can use
4. In this case, the Cycle Counting **Remote Display** has the ability to use the **Config port** when the Bluetooth Module is occupying the data port

The **ETM1000** will know what is plugged into the **Config Port** when the Cycle Counting **Remote Display** is also needing to use the Config. port since the baud rates are different for **HyperTerminal** (57,600) and the **Remote Display** (38,400).

The following example is for when both the Cycle Counting **Remote Display** is using the Config port and the Bluetooth Module **Remote Gauge iOS App** is using the Data port, and are both turned "ON" via the **HyperTerminal** settings menu.

Do the following:

1. When needing to configure the ETM1000 using **HyperTerminal** such as clearing a blue "WARNING" light, unplug the Cycle Counting **Remote Display** unit from the **Config Port**, and connect **HyperTerminal** to it

2. Run **HyperTerminal** and simply **hit the "enter" key** on your keyboard which will tell the ETM1000 that HyperTerminal is connected. It will then automatically change the baud rate from 38,400 to 57,600. At this point, streaming data on the **HyperTerminal** screen will be displayed

3. When finished using **HyperTerminal**, plug the Cycle Counting **Remote Display** back into the Config. port then press and release the red "Reset" button on the side of the display. This will tell the ETM1000 to switch back the baud rate to 38,400. Cycle Counting data will be displayed

APPENDIX D

ONBOARD SYSTEMS
C-39 LOAD CALIBRATION PROCEDURE

ONBOARD C-39 AND ETM1000 CALIBRATION – ON GROUND PROCEDURE

The following procedure allows for on-ground calibration of the **ETM1000** load hook (sling weight) indication with the **Onboard C-39 Load Indicator**. By following this procedure, there is no need to fly the helicopter to calibrate with a known weight (except for a test flight). With this method of calibration, it provides more time to configure the system and is possible to obtain an accuracy of +/- 5Kg or +/-10Lb or better between the **ETM1000** and the Onboard indicator.

NOTE: For this procedure however, it is required that the RICE LAKE RANGER 5 load cell simulator kit P/N LC-100 is purchased from AKV, sold separately.

Typical operation is to simply tare or zero the indicator when the longline and remote hook are attached. This allows for the pilot to view only the weight carried on the hook. However, pressing the "zero" button on the indicator will NOT zero the analogue output which is needed for the ETM1000 to record weights correctly based on actual weights carried.

The "Installation Zero" routine will enable the indicators analogue 0-5v output (0-7v on some models) to be at 0v when the weight of a longline and remote hook are connected in flight. This is important for the ETM1000 load hook weight to record accurately

NOTE: During calibration of the ETM1000, it is important for the ETM1000 displayed "Load Hook" weight to match the Onboard indicator. Once calibration is complete and if pressing the zero button to tare the longline and hook in flight, **there will be a difference** between the ETM1000 load hook displayed weight and the Onboard indicator equal to the weight of the longline and hook. It will, however, not affect the analogue signal to the ETM1000 after calibration.

Items needed for calibration are:

- Laptop PC using Hypertermianl
- RICE LAKE RANGER 5 load cell simulator kit P/N LC-100 (purchased separately from AKV). **Supplied with interface connector.**
- Reference to the Onboard **C-39 owner's manual 120-039-00**
- Battery cart for the A/C external power
- Your typical longline and remote hook (will also be used for the test flight)

IMPORTANT: It is assumed the Onboard indicator routines have previously been configured correctly and the system is already calibrated. Check the following items for your installation before proceeding. Refer to the Onboard C-39 indicator owner's manual 120-039-00

- CODE = the load cell labeled "CAL CODE" number (typically a four digit code) is entered
- SCAL = the rated load cell capacity value which directly affects the analogue output. For example, a SCAL value of 2000Lb/Kg is entered as 0200 (x10). This means that at 0Lb/Kg the analogue output from the indicator is 0v and at 2000, it is 5v (7v for some models)

Calibration Sample 1:

1. Confirm A/C power is OFF
2. Weigh the longline and remote hook together on a scale, record the weight on paper
3. Disconnect the belly hook load cell connector and connect the “RICE LAKE RANGER 5” load cell simulator to the load cell female cable connector that is routed to the load indicator in the cockpit

4. Set the “RICE LAKE RANGER 5” as follows:
   a. Set the course/fine to “fine” and the multi-turn adjustment pot on the right at zero
   b. Set the mV/V scale knob to zero
5. Connect the external battery cart to the A/C
6. Turn the A/C power ON

Calibration Sample 2:

For the following calibration example, the Onboard indicator is set to display Kg and the weighed line and hook are 40 Kg (88Lb). However, **you will enter the weight of your longline and hook as weighed above during this procedure**.

1. Connect your PC running Hyeperterminal to the ETM1000
2. Run the HyperTerminal interface.

```
02/24/2025 14:46:48 Enter S for settings. Audio ON Visual ON. A/C Reg NEW
Collective Time 0.3 Hrs, Engine Run Time 0.3 Hrs, Engine Starts 1
Air Speed Switch 0
Tq 0.0 PSI 0.010V PC 54.0 PSI CO 54.0 PSI TO 58.0 PSI 14400sec TR 61.0 PSI 1sec
MGT 8.0C PC 677.0C CO 677.0C TO 0.0C 0sec TR 700.0C 5sec
N1 0.0% 0.0RPM 0.0Hz PC 104.0% CO 104.0% TO 105.0% 14400sec TR 106.0% 1sec
N2 6.9% 1464.8RPM 4.9Hz PC 103.0% CO 103.0% TO 0.0% 0sec TR 105.0% 1sec
Nr 100.9% 326.9RPM 72.3Hz PC 104.5% CO 104.5% TO 110.0% 5sec TR 111.0% 1sec
Pressure Altitude -328 Ft, Baro Pressure 1024.37 hPa, ETM Temp 45.1 C
Outside Air Temp 24.3 C, Load Hook 0.0 kg
```

3. Confirm the ETM1000 analog setting voltage range is correct for the C-39
   Ref. 5.7 LOAD HOOK and R - INPUT RANGE then continue
4. Zero the Oboard indicator display using the zero button
5. Adjust the multi-turn Vernier pot until the Onboard indicator displays a 4 (x10) = 40Kg (88Lb). Use your measured weight here
6. Go to the Onboard configuration routine by pressing both buttons simultaneously
   a. With the left button, press twice to display “0 in”
   b. Press the right button, then with the 4 (x10) = 40Kg)) weight value flashing, press any button to exit. This will set the Analogue output to 0v with the 40Kg weight of the longline and hook
   c. Confirm the symbol “Ø” (top middle) is displayed by pressing “un-zero”

7. Turn the Vernier multi-turn pot back to zero and the Onboard indicator will display a (negative value) – 4 (x10) = -40Kg. This is now your "un-zero" Ø weight value on the indicator which is the weight of the line and hook now removed from the load cell

   NOTE: Pressing the zero button will zero the Onboard indicator but not the analogue output. Press the "un-zero" button again to show the un-zero Ø value. Leave it here and do not zero the indicator.

8. Ref the Load Hook weight for the ETM1000. **This value is Kg by default and can be changed to Lb.**
9. Turn up the "RICE LAKE RANGER 5" Vernier multi-turn pot to display a 0 weight value on the Onboard indicator. This is now your 0 weight with the weighed longline and hook weight attached but with the analogue output at zero as well
10. Continue to turn up the "RICE LAKE RANGER 5" Vernier multi-turn pot to display a 45 (x10) =450Kg which is a mid-weight value (992Lb) on the Onboard indicator
11. Observe the ETM1000 weight versus the Onboard indicator weight

    REMINDER: The Onboard indicator weight is x10 whereas the ETM1000 PC interface display is the real weight. An Onboard indicator weight of 45Kg = 450Kg

12. If the ETM1000 sling load weight is indicating higher than the Onboard indicator, then the ETM1000 scale value will need to be lowered and vice-versa
13. On the ETM1000 interface, enter S – Scale Factor to enter a different scale value
14. Adjust the ETM1000 scale factor until you have found the correct scale value that allows the ETM1000 to match the Onboard indicator. The **basic formula** to know the approx. scale value to enter is based on the load cell capacity divided by the typical measured excitation 10v, for example, 2000/10 = 200Lb/Kg per volt. A value of 200 is then a good starting scale number to enter in the ETM1000
15. Exit settings back to the main screen after every entry
16. When the ETM1000 and Onboard indicator match within +/- 5Kg or +/-10Lb, adjust the Vernier multi-turn pot to different displayed weights, including max weight to verify they continue to match. There maybe a need to enter an offset value. If so, then a change to the scale factor might be needed to fine tune
17. When satisfied, record the ETM1000 scale value and offset as backup
18. Turn the "RICE LAKE RANGER 5" Vernier multi-turn pot to zero
19. Turn off the A/C power, disconnect the "RICE LAKE RANGER 5" and re-connect the cable to the Onboard load cell

Complete a test flight with the long line and remote hook that was weighed previously.

A mechanic will need to ride along to observe that the displayed "HOOK" weight corresponds with the Onboard indicator weight.

REMINDER: The Onboard indicator weight is x10 whereas the ETM1000 PC interface display and App weight is the real weight. An Onboard indicator weight of 52Kg = 520Kg

1. Start the A/C
2. Make sure the Onboard Indicator is set to display "un-zero" Ø (top middle). This will display the **–XX** value equal to the weight of the longline and hook used above

   NOTE: If you press the zero button, the displayed indicator weight will not match the analogue output weight, so you will want to always leave it as "un-zero". Pressing either the zero or un-zero will not change your settings

3. Lift to a hover and with the longline clear of the ground. The Onboard indicator should show zero

4. Lift a known weight to confirm the **Onboard Indicator** and **ETM1000** PC interface weight match +/- 5Kg or +/-10Lb
5. The calibration procedure can be repeated if the results are not as expected, or you can contact AKV for assistance

NOTE: If changing to a longer or shorter longline, it may be necessary to **reset** the **Onboard Indicator** "0 in" configuration routine for the weight of the new line and hook.
If you neglect to do this, you may notice the ETM1000 PC interface Load Hook weight will not match the **Onboard Indicator** weight.
Re-calibration is not required, only resetting the "0 in" is required. This is best done in cruise flight if flying without assistance of a copilot or mechanic.
Remember to always leave the display as "un-zero" Ø.

END

ONBOARD C-39 AND ETM1000 CALIBRATION – ON GROUND PROCEDURE

APPENDIX E

ONBOARD SYSTEMS
C-40 LOAD CALIBRATION PROCEDURE

ONBOARD C-40 AND ETM1000 CALIBRATION – ON GROUND PROCEDURE

The following procedure allows for on-ground calibration of the **ETM1000** load hook (sling weight) indication with the **Onboard C-40 Load Indicator**. By following this procedure, there is no need to fly the helicopter to calibrate with a known weight (except for a test flight). With this method of calibration, it provides more time to configure the system and is possible to obtain an accuracy of +/- 5Kg or +/-10Lb or better between the **ETM1000** and the Onboard indicator.

NOTE: For this procedure however, it is required that the RICE LAKE RANGER 5 load cell simulator kit P/N LC-100 is purchased from AKV, sold separately.

Typical operation is to simply tare or zero the indicator when the longline and remote hook are attached. This allows for the pilot to view only the weight carried on the hook. However, pressing the “zero” button on the indicator will NOT zero the analogue output which is needed for the ETM1000 to record weights correctly based on actual weights carried.

The “Installation Zero” routine will enable the indicators analogue 0-5v output (0-7v on some models) to be at 0v when the weight of a longline and remote hook are connected in flight. This is important for the ETM1000 load hook weight to record accurately

NOTE: During calibration of the ETM1000, it is important for the ETM1000 displayed “Load Hook” weight to match the Onboard indicator. Once calibration is complete and if pressing the zero button to tare the longline and hook in flight, **there will be a difference** between the ETM1000 load hook displayed weight and the Onboard indicator equal to the weight of the longline and hook. It will, however, not affect the analogue signal to the ETM1000 after calibration.

Items needed for calibration are:

- Laptop PC installed with PuTTy for interface with the ETM1000 using the supplied RS232 cable
- RICE LAKE RANGER 5 load cell simulator kit P/N LC-100 (purchased separately from AKV). **Supplied with interface connector.**
- Reference to the Onboard **C-40 owner’s manual 120-152-00**
- Battery cart for the A/C external power
- Your typical longline and remote hook (will also be used for the test flight)

IMPORTANT: It is assumed the Onboard indicator routines have previously been configured correctly and the system is calibrated already. Check the following items for your installation before proceeding. Refer to the Onboard C-40 indicator owner’s manual 120-152-00

- CODE = the load cell labeled “CAL CODE” number (typically a four digit code) is entered
- SCAL = the rated load cell capacity value which directly affects the analogue output. For example, a SCAL value of 2000 Lb/Kg means that at 0Lb/Kg the analogue output from the indicator is 0.5v and at 2000 it is 10v

Calibration Sample 1:

1. Confirm A/C power is OFF
2. Weigh the longline and remote hook together on a scale, record the weight on paper
3. Disconnect the belly hook load cell connector and connect the “RICE LAKE RANGER 5” load cell simulator to the load cell female cable connector that is routed to the load indicator in the cockpit
4. Set the “RICE LAKE RANGER 5” as follows:
   a. Set the course/fine to **OFF**
   b. Set multi-turn adjustment pot on the right at zero
   c. Set the mV/V scale knob to zero
5. Connect the external battery cart to the A/C
6. Turn the A/C power ON

Calibration Sample 2:

For the following calibration example, the Onboard indicator is set to display Kg and the weighed line and hook are 40 Kg (88Lb). However, **you will enter the weight of your longline and hook as weighed above during this procedure**.

1. Connect your PC running Hyeperterminal to the ETM1000
2. Run the HyperTerminal interface

```
02/24/2025 14:46:48 Enter S for settings. Audio ON Visual ON. A/C Reg NEW
Collective Time 0.3 Hrs, Engine Run Time 0.3 Hrs, Engine Starts 1
Air Speed Switch 0
Tq 0.0 PSI 0.010V PC 54.0 PSI CO 54.0 PSI TO 58.0 PSI 14400sec TR 61.0 PSI 1sec
MGT 8.0C PC 677.0C CO 677.0C TO 0.0C 0sec TR 700.0C 5sec
N1 0.0% 0.0RPM 0.0Hz PC 104.0% CO 104.0% TO 105.0% 14400sec TR 106.0% 1sec
N2 6.9% 1464.8RPM 4.9Hz PC 103.0% CO 103.0% TO 0.0% 0sec TR 105.0% 1sec
Nr 100.9% 326.9RPM 72.3Hz PC 104.5% CO 104.5% TO 110.0% 5sec TR 111.0% 1sec
Pressure Altitude -328 Ft, Baro Pressure 1024.37 hPa, ETM Temp 45.1 C
Outside Air Temp 24.3 C, Load Hook 0.0 kg
```

3. Confirm the ETM1000 analog setting voltage range is correct for C-40 (0-10v)
   Ref. 5.7 LOAD HOOK and R- INPUT RANGE then continue
4. On the C-40, run “Installation Zero”
5. Go to the Onboard configuration routine by rotating the knob left or right
   a. Push the knob one time
   b. Rotate the knob to highlight “Installation Zero”
   c. Push the knob one time
   d. Rotate the knob to display <YES>
   e. Push the knob to enter and again to select <OK>
   f. Push the knob and hold to exit

6. Verify analog input voltage AI1 is approx. 0.500v (green arrow above)
7. On the RICE LAKE RANGER 5, turn the course/fine to FINE
8. Adjust the multi-turn Vernier pot until the Onboard indicator displays a 40Kg (88Lb). Use your measured weight here
9. Run “Installation Zero” again as above
10. On the RICE LAKE RANGER 5, turn the course/fine to FINE or MEDIUM (your preference)

    NOTE: Pressing the zero button (displays Ø) will zero the Onboard indicator but not the analogue output. Double press to show the un-zero value. Leave it here and do not zero the indicator

11. Ref the Load Hook weight for the ETM1000. **This value is Kg by default and can be changed to Lb.**
12. Turn up the “RICE LAKE RANGER 5” Vernier multi-turn pot to display a 0 weight value on the Onboard indicator. This is now your 0 weight with the weighed longline and hook weight attached but with the analogue output at zero as well
13. Continue to turn up the “RICE LAKE RANGER 5” Vernier multi-turn pot to display a 450Kg which is a mid-weight value (992Lb) on the Onboard indicator
14. Observe the ETM1000 weight versus the Onboard indicator weight
15. If the ETM1000 sling load weight is indicating higher than the Onboard indicator, then the ETM1000 scale value will need to be lowered and vice-versa
16. On the ETM1000 interface, enter S – Scale Factor to enter a different scale value
17. Adjust the ETM1000 scale factor until you have found the correct scale value that allows the ETM1000 to match the Onboard indicator. The **basic formula** to know the approx. scale value to enter is based on the load cell capacity divided by the typical measured excitation 10v, for example, 2000/10 = 200Lb/Kg per volt. A value of 200 is then a good starting scale number to enter in the ETM1000
18. Exit settings back to the main screen after every entry

    NOTE: When exiting the settings and if using the App it will display “No Data” and you will have to re-connect the App each time.

19. When the ETM1000 and Onboard indicator match within +/- 5Kg or +/-10Lb, adjust the Vernier multi-turn pot to different displayed weights, including max weight to verify they continue to match. There maybe a need to enter an offset value. If so, then a change to the scale factor might be needed to fine tune
20. When satisfied, record the ETM1000 scale value and offset as backup
21. Turn the “RICE LAKE RANGER 5” Vernier multi-turn pot to zero
22. Turn off the A/C power, disconnect the “RICE LAKE RANGER 5” and re-connect the cable to the Onboard load cell

Complete a test flight with the long line and remote hook that was weighed previously.

A mechanic will need to ride along to observe that the App displayed “HOOK” weight corresponds with the Onboard indicator weight.

1. Start the A/C.
2. Make sure the Onboard indicator is set to display “un-zero”. This will display the –XX value equal to the weight of the longline and hook used above.

   NOTE: If you press the zero button (indicates Ø), the displayed indicator weight will not match the analogue output weight so you will want to always leave it as “un-zero”. Pressing either the zero or un-zero will not change your settings.

3. Lift to a hover and with the longline clear of the ground. The Onboard indicator should show zero.
4. Lift a known weight to confirm the Onboard indicator and ETM1000 PC interface weight match +/- 5Kg or +/- 10Lb.
5. The calibration procedure can be repeated if the results are not as expected or you can contact AKV for assistance.

NOTE: If changing to a longer or shorter longline, it may be necessary to **reset** the **Onboard Indicator** "Zero Installation" configuration routine for the weight of the new line and hook.
If you neglect to do this, you may notice the ETM1000 PC interface Load Hook weight will not match the **Onboard Indicator** weight.
Re-calibration is not required, only resetting the "0 in" is required. This is best done in cruise flight if flying without assistance of a copilot or mechanic.
Remember to always leave the display as "un-zero" Ø.

END

ONBOARD C-40 AND ETM1000 CALIBRATION – ON GROUND PROCEDURE

APPENDIX F

MSI-150X LOAD CALIBRATION PROCEDURE

MSI-150X AND ETM1000 CALIBRATION – **ON GROUND PROCEDURE**

The following procedure allows for on-ground calibration of the **ETM1000** sling load indication with the **MSI-150X Load Indicator**. By following this procedure, there is no need to fly the helicopter to calibrate with a known weight (except for a test flight). With this method of calibration, it provides more time to configure the system and is possible to obtain an accuracy of +/- 5Kg or +/-10Lb or better between the **ETM1000** and the MSI indicator. An alternate "in-flight" only calibration procedure follows this procedure.

NOTE: For this procedure however, it is required that the RICE LAKE RANGER 5 load cell simulator kit is purchased from AKV, sold separately.

Typical operation is to simply tare or zero the indicator when the longline and remote hook are attached. This allows for the pilot to view only the weight carried on the hook. However, pressing the "zero" button on the indicator will NOT zero the analogue output which is needed for the ETM1000 to record weights correctly based on actual weights carried.

The "un-zero" method will enable the indicators analogue 0-5v output to be at 0v when the weight of a longline and remote hook are connected in flight. This is important for the ETM1000 sling load weight to record accurately.

NOTE: During calibration of the ETM1000, it is important for the ETM1000 and load hook weight to match the MSI indicator. Once calibration is complete and if pressing the zero button to tare the longline and hook in flight, **there will be a difference** between the FLI Repeater App hook weight from the ETM1000 and the MSI indicator equal to the weight of the longline and hook. It will however not affect the analogue signal to the ETM1000 after calibration.

Items needed for calibration are:

- Laptop PC installed with PuTTy for interface with the ETM1000 using the supplied RS232 cable
- RICE LAKE RANGER 5 load cell simulator kit (purchased separately from AKV). **Supplied with interface connector.**
- Reference to the **MSI-150X Sky-Weigh User Guide.**
- Battery cart for the A/C external power.
- Your typical longline and remote hook (will also be used for the test flight)

IMPORTANT: It is assumed the MSI indicator is already calibrated as indicated by the MSI "Calibration" method on Pg. 7 of the **MSI-150X Sky-Weigh User Guide.**

Calibration Sample 1:

1. Confirm A/C power is OFF
2. Weigh the longline and remote hook together on a scale and record the weight on paper
3. Disconnect the belly hook load cell connector and connect the “RICE LAKE RANGER 5” load cell simulator to the load cell female cable connector that is routed to the load indicator in the cockpit
4. Set the “RICE LAKE RANGER 5” as follows:
   a. Vernier to “fine” and the multi-turn adjustment pot on the right at zero
   b. Set the mV/V scale knob to zero
5. Connect the external battery cart to the A/C
6. Turn the A/C power ON

Calibration Sample 2:

For the following calibration example, the MSI indicator is set to display Kg and the weighed line and hook are 40 Kg (88Lb). However, **you will enter the weight of your longline and hook as weighed above during this procedure**.

1. Connect your PC running the HyperTerminal interface to the ETM1000
2. Run the Hypertermianl interface

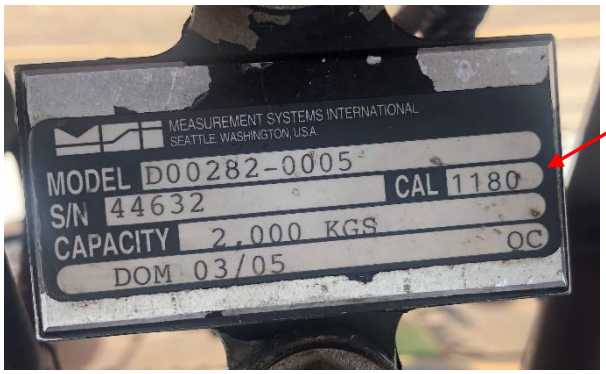
```
02/24/2025 14:46:48 Enter S for settings. Audio ON Visual ON. A/C Reg NEW
Collective Time 0.3 Hrs, Engine Run Time 0.3 Hrs, Engine Starts 1
Air Speed Switch 0
Tq 0.0 PSI 0.010V PC 54.0 PSI CO 54.0 PSI TO 58.0 PSI 14400sec TR 61.0 PSI 1sec
MGT 8.0C PC 677.0C CO 677.0C TO 0.0C 0sec TR 700.0C 5sec
N1 0.0% 0.0RPM 0.0Hz PC 104.0% CO 104.0% TO 105.0% 14400sec TR 106.0% 1sec
N2 6.9% 1464.8RPM 4.9Hz PC 103.0% CO 103.0% TO 0.0% 0sec TR 105.0% 1sec
Nr 100.9% 326.9RPM 72.3Hz PC 104.5% CO 104.5% TO 110.0% 5sec TR 111.0% 1sec
Pressure Altitude -328 Ft, Baro Pressure 1024.37 hPa, ETM Temp 45.1 C
Outside Air Temp 24.3 C, Load Hook 0.0 kg
```

3. Confirm the ETM1000 analog setting voltage range is correct for MXI-150
   Ref. 5.7 LOD HOOK and R – INPUT RANGE then continue
4. The MSI indicator display, if previously adjusted for zero and span correctly, should display zero. If not refer to MSI “Calibration” method on Pg. 7 of the **MSI-150X Sky-Weigh User Guide**
5. Adjust the multi-turn Vernier pot until the MSI indicator displays 40Kg (88Lb). Use your measured weight here
6. Wait 30 sec to allow for the dampening settings of the indicator to stabilize the display

7. On the rear of the MSI indicator, now adjust the “zero” pot to indicate 0 on the display
8. Turn the Vernier multi-turn pot back to zero and the MSI indicator will display a (negative value) – 40Kg. This is the unconnected or “un-zero” weight value on the indicator which is the weight of the line and hook now removed from the load cell

   NOTE: Pressing the zero button will zero the MSI indicator but not the analogue output. Recycle the power to show the unconnected weight of your longline and hook. **Leave it here and do not zero the indicator.**

9. Ref the Load Hook weight for the ETM1000. **This value is in Kg by default and can be changed to Lb.**
10. Turn up the “RICE LAKE RANGER 5” Vernier multi-turn pot to display a 0 weight value on the MSI indicator. This is now your 0 weight with the weighed longline and hook weight attached but with the analogue output at zero as well
11. Continue to turn up the “RICE LAKE RANGER 5” Vernier multi-turn pot to display a 450Kg which is a typical mid-weight value (992Lb) on the onboard indicator
12. Observe the ETM1000 weight versus the MSI indicator weight
13. If the ETM1000 sling load weight is indicating higher than the MSI indicator, then the ETM1000 scale value will need to be lowered and vice-versa
14. On the ETM1000 interface, enter S – Scale Factor to enter a different scale value
15. Adjust the ETM1000 scale factor until you have found the correct scale value that allows the ETM1000 to match the MSI indicator. As a starting scale value, enter the actual A/C labeled load cell CAL *xxxx*



16. Exit settings back to the main screen after every entry
17. When the ETM1000 and MSI indicator match within +/- 5Kg or +/-10Lb, adjust the Vernier multi-turn pot to different displayed weights, including max weight to verify they continue to match

    NOTE: At the lower weight indications, there may be a need to add an offset value + or -. If this needed, **re-check the higher weight indications** to adjust the scale factor to compensate for the added offset.

18. When satisfied, record the ETM1000 scale and offset values as backup
19. Turn the “RICE LAKE RANGER 5” Vernier multi-turn pot to zero
20. Turn off the A/C power, disconnect the “RICE LAKE RANGER 5” and re-connect the cable to the A/C load cell

Complete a test flight with the long line and remote hook that was weighed previously

A mechanic will need to ride along to observe “HOOK” weight corresponds with the MSI indicator weight.

1. Power ON
2. The MSI indicator should still display the –XX value equal to the weight of the longline used above. If not, adjust the rear zero pot to show the negative (-xx) “un-zero” value of the weighed longline and hook

   NOTE: If you press the zero button, the displayed indicator weight will not match the analogue output weight so you will want to always leave it as “un-zero”. You will need to cycle the power to see the “un-zero” value again.

3. Start the A/C and lift to a HOGE with the longline and hook clear of the ground. The MSI indicator should show zero
4. Lift a known weight to confirm the MSI indicator and ETM1000 PC interface weight match +/- 5Kg or +/-10Lb
5. The calibration procedure can be repeated if the results are not as expected or you can contact AKV for assistance

NOTE: If changing to a longer or shorter longline, it may be necessary to **reset** the MSI indicator “un-zero” for the weight of the new line and hook.
If you neglect to do this, you may notice the ETM1000 PC interface and load hook weight will not match the MSI indicator weight.
Re-calibration is not required, only resetting the “un-zero” is required using the rear indicator zero pot. This is best done with the assistance of a copilot or mechanic.
Remember to always leave the display as “un-zero”.

END

MSI-150X AND ETM1000 CALIBRATION – ON GROUD PROCEDURE