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USERS' MANUAL

# FORCE FEEDBACK DIGITAL ACCELEROMETER

## MODEL EADA-350F

*Made by Encardio-rite in India under license from Gaiacode, UK*

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# Contents

# 1 HOW TO USE THIS MANUAL

This users' manual is organised into sections with each section dealing with a specific topic.

Background material and technical explanations are found in the later sections, while practical instructions are described in the earlier sections. A list of figures and tables is included following the table of contents and specifications can be found in the appendices.

Each section of the users' manual is self-contained and free-standing so that the sections can be read in any order. General cross-references are provided where necessary, but complicated notation of the sections and paragraphs is avoided.

A brief description of each of the sections of the users' manual are given below, the contents page provides the titles and location of each section and subsection.

- **INTRODUCTION:** A summary of the features of the model EADA-350F seismometer.
- **QUICK START:** Instructions for unpacking, installing, and operating the EADA-350F seismometer. The user may use this section for quick deployment and operation of the instrument.
- **OPERATION:** Operational instructions for the seismometer.
- **APPENDICES:** This section provides the specification, details of the connectors and supplementary information to assist in the installation and the operation of the equipment

**Figure 1: The Digital Sigma TSDG4-ACC**

**NOTE:** Installation personnel must have a background of good installation practices and knowledge of the fundamentals of geotechnics and seismographs. Novices may find it very difficult to carry on the installation work. The intricacies involved in installation are such that even if a single essential but apparently minor requirement is ignored or overlooked, the most reliable of instruments will be rendered useless.

A lot of effort has gone in preparing this instruction manual. However the best of instruction manuals cannot provide for each and every condition in the field, which may affect performance of the instrument. Also, blindly following the instruction manual will not guarantee success. Sometimes, depending upon field conditions, the installation personnel will have to consciously depart from the written text and use their knowledge and common sense to find the solution to a particular problem.

The seismometer is normally used to monitor site conditions and will record any change, even though minor that may affect behaviour of the structure/ground being monitored. Some of these factors amongst others, are, seasonal weather changes, temperature, earthquakes,

nearby landslides, traffic, construction activity around site including blasting, tides near sea coasts, fill levels, excavation, sequence of construction and changes in personnel etc. These factors must always be observed and recorded as they help in correlating data later on and also may give an early warning of potential danger or problems

### 1.1 Conventions used in this manual

**WARNING!** Warning messages calls attention to a procedure or practice that if not properly followed could possibly cause personal injury.

**CAUTION**: Caution messages calls attention to a procedure or practice that if not properly followed may result in loss of data or damage to equipment

**NOTE**: Note contains important information and is set off from regular text to draw the users' attention.

## 2 INTRODUCTION

Encardio-rite model EADA-350F Strong [1] Motion accelerometer is an integration of model EAA-350F Analog Accelerometer, which contains a three-axis strong motion force feedback accelerometer, and a Digitizer contained in a robust sealed aluminium case. The sensor mechanical system is designed to be truly rectilinear with an in-line magnet to virtually eliminate cross axis signals. The sensor frequency response under feedback control extends up to 350 Hz. The unit is manufactured by Encardio-rite in India under license from Gaiacode, UK.

The 8-channel digitiser has a maximum sample rate up to 1000 samples per channel per second and is dynamically configurable by the operator via an internet browser.

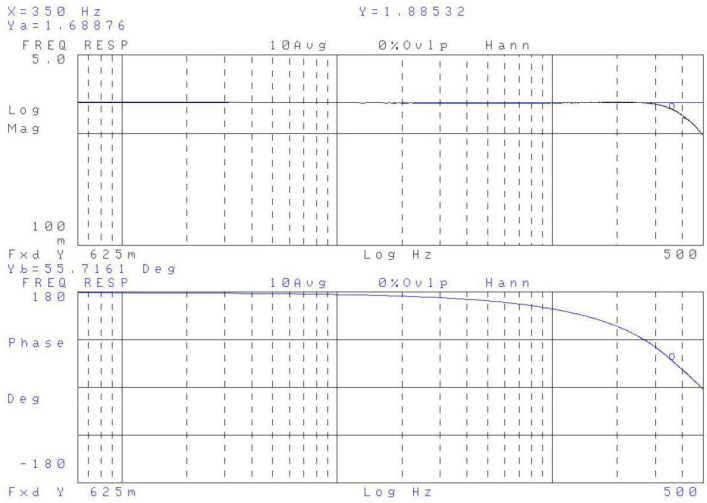



**Figure 2: EADA-350F - Typical Frequency Response to Input Calibration**

Model EADA-350F digital accelerometer is a self-contained system except for the power source and optional external GPS Receiver. An internal dc-dc converter ensures isolated operation with a voltage source of between 9 to 36 Volts DC.

The analogue outputs are all differential with an output impedance of 47 ohms and are internally connected to the digitizer. A single signal ground line is provided as a return line in between the accelerometer electronics and the internal digitiser.

The casing of the sensor is isolated from the input power supply 0 Volts and also from the internal signal ground of the system.

Each EADA-350F digital accelerometer is delivered with a factory calibration certificate for reference.

[1]Strong, refers to sensors that are capable of detecting ground acceleration signals up to 4 g without saturation, (clipping of the output signal).

# 3 PREPARATION

## 3.1 Site Preparation

## 3.2 Unpacking and Inspecting the Unit

On receipt of the equipment the shipping carton should be examined for any obvious damage and, if damage is found, it should be brought to the notice of the freight carrier, recorded on the delivery note, please also record the damage photographically. These photographs will be invaluable if a subsequent claim for repair and or reshipment is necessary.

The EADA-350F digital accelerometer is delivered in a single cardboard box with moulded foam rubber lining. The packaging is specifically designed for this sensor and should be retained for re-use in the event of a later shipment. It should be carefully opened at the top so that it can be re-used. Carefully pull the unit and the inserts from the box. The unit should have no signs of external damage. The unit is now ready for testing and installation

## 3.3 Operating Environment

The EADA-350F digital accelerometer should be installed in a location that provides the following environmental conditions:

### *3.3.1 Temperature*

The EADA-350F digital accelerometer and internal GPS unit may be operated over a –20°C to +80°C ambient temperature range without degradation of performance. The unit should not be placed where it is exposed to direct sunlight.

### *3.3.2 Humidity*

The case of the EADA-350F digital accelerometer is designed to meet the requirements of IP68[3]. The units can operate in humidity levels of up to 100% and withstand occasional temporary immersion in water up to 1.5 metres in depth. The units should not be continuously immersed for longer than 30 minutes as galvanic corrosion of the connectors will occur, potentially destroying the system.

### *3.3.3 Altitude*

The EADA-350F digital accelerometer can operate at altitudes from -300 to +10,000 metres. The enclosure should NOT be opened at altitudes above +3000m to retain residual air pressure

### *3.3.4 2.3.4 Electrical Ratings*

The EADA-350F digital accelerometer requires a DC supply of 9-36 VDC, capable of supplying ~1.5 W average power with a sampling rate of 1000 s/s and a TCP/IP connection, <1 W without communications. This equates to an average current at 12 VDC of ~125 mA. The DC power supply does need to be sized for the total operating load and the initial inrush current. As a rule of thumb designing the power system to support a current of three times the steady state current for will provide an adequate reserve power.

However, as noted in detail in the Appendix X, the electronic loads presented by the EADA-350F digital accelerometer, and other equipment such as modems, radios, Ethernet devices, and so on, are complex

[3] The IP Code, or Ingress Protection Code, IEC standard 60529, sometimes interpreted as International Protection Code, classifies and rates the degree of protection provided by mechanical casings and electrical enclosures against intrusion, dust, accidental contact, and water. It is published by the International Electrotechnical Commission (IEC). The equivalent European standard is EN 60529.

Source: https://en.wikipedia.org/wiki/IP_Code taken 10th June 2020.

and may have peak demands much higher than the 3 times the average for very short periods. Many electronic power supplies cannot operate with such a load unless a smoothing filter is used.

The power requirements for the digital accelerometer, and other electronic systems, must be thoroughly understood in designing a power supply to provide power in field installations. An incompatible power supply characteristic may result in frequent reboots, data loss, corruption of sensor outputs, and in some cases, damage. Read and thoroughly understand the power requirements of the EADA-350F digital seismometer, and the supply you plan to use.

## 3.4 Equipment and supplies

### *3.4.1 Phase One – Laboratory - USB*

For the first phase of the installation (laboratory), concerning setting, or confirming, the Internet Protocol (IP) of the EADA-350F connected only to a Windows PC, you will need:

- An EADA-350F.
- A Windows PC.
- P/N XXXXX Power and USB cable to connect power and the PC to the EADA-350F, one is included in the cable pack that came with the EADA-350F.
- Terminal Emulation Software such as Realterm.
- A 9 – 36V DC power supply (customer supplied)
- IP address allocation for the EADA-350F. This should be planned, particularly where multiple EADA-350Fs may be networked simultaneously in a lab environment. The section below "IP Resource Planning" may help explain the various address and port requirements. The best approach is to create a private subnet, separated by a router from your office LAN, to minimize potential for conflicts and maximize efficiency.

### *3.4.2 Phase Two – Laboratory – TCP/IP*

For the second phase of the installation (laboratory), concerning establishing a TCP/IP connection to the EADA-350F, you will need:

- The EADA-350F.
- A Windows PC.
- P/N XXXXX Power and USB cable to connect power and the PC to the EADA-350F, one is included in the cable pack that came with the EADA-350F.
- P/N XXXXX Cat 5 Ethernet patch cable.
- Connection to an Ethernet hub or switch with RJ45 for connection of the EADA-350F and the PC.
- An Internet Browser such as Firefox or Chrome
- Gaiacode Bootload software, a copy of which is included in the documentation pack that came with the EADA-350F.
- A 9 – 36 V DC power supply (customer supplied)
- The IP address that has been set or confirmed in the first phase of the installation.

### *3.4.3 Final Phase – Site Installation*

For the final phase of installing the equipment in the field additional equipment and supplies will be required depending on the installation requirements. The following list of tools and supplied may be useful to you in the field (we assume that all infrastructure such as vaults, AC wiring, masts and grounding rods have already been installed):

To permanently mount the units:

- A drill capable of drilling into the attachment surface.
- Appropriate 8mm drill bits for the attachment surface.
- Suitable tools to install the M8 screw/anchor into the attachment surface.

To complete the configuration of the unit and test the installation:

- A laptop computer running Windows, Linux, or other suitable operating System and an Internet Browser.
- Cables to connect equipment to configure it and those cables that will be part of the installation.
- A portable printer, to print tests, configurations, and other commissioning data
- A camera, to photograph the completed installation

### 3.5 Wiring & Cabling

Wiring and cabling should be carefully checked prior to installation to ensure correct wiring. It is strongly recommended that you purchase completed cable assemblies whenever possible, if this is not possible it is recommended that you complete and test the cables in a laboratory environment, and only as a last resort complete cable construction in the field. All cables you have fabricated should be continuity and shorts to confirm they are electrically correct before connecting to the equipment. When connecting telecom, LAN, WAN, and antenna cables follow the cautions below:

**WARNING!** Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) volts of DC and the ring signal at ninety (90) VAC can deliver an uncomfortable shock. Power over Ethernet Cabling can carry DC voltages of up to 56VDC. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Most LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

### 3.6 Serial number

The EADA-350F digital accelerometer's serial number is printed on a label contained in the documentation delivered inside the packaging, together with the calibration information and production history.

# 4 INSTALLATION

The EADA-350F should be installed on a hard, clean, and stable surface such as a concrete base or for temporarily configuration and testing purposes on a stable tabletop

1. The base anchoring point of the DIGITAL SIGMA is shown in Figure 3, an M8 bolt (with a maximum diameter of 8mm) should be used if the unit is to be permanently fixed to a solid surface. The M8 bolt should be screwed into the solid surface leaving sufficient of the shaft and the head proud so that the lip of the anchoring point fits snuggly under the head of the bolt (5mm).

   Engraved on the sensor base are North and South pointer tabs with "N" engraved on the North indicator tab and "S" engraved on the South Indicator tab.

2. The accelerometer should be mounted in the correct orientation, the "N" tab pointing towards magnetic North and the "S" tab pointing towards magnetic South.

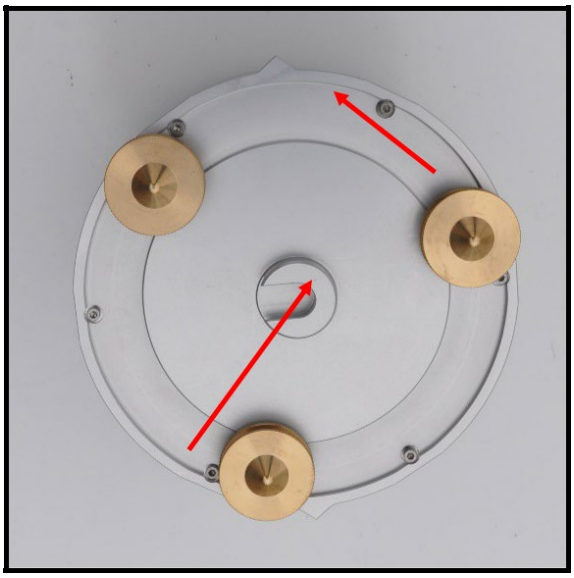


**Figure 3: EADA-350F base, with anchoring point and N/S orientation tabs**

   The accelerometer has three levelling feet attached to the sensor base.

3. Having anchored the sensor base and oriented the sensor, the three feet can be rotated to lock and also horizontally level the sensor, the integral bubble level on the top of the EADA-350F digital accelerometer should be observed during the rotation of the feet, the appropriate foot being rotated clockwise for upward movement and counter clockwise for downward movement until the bubble level is centred as shown in Figure 4.

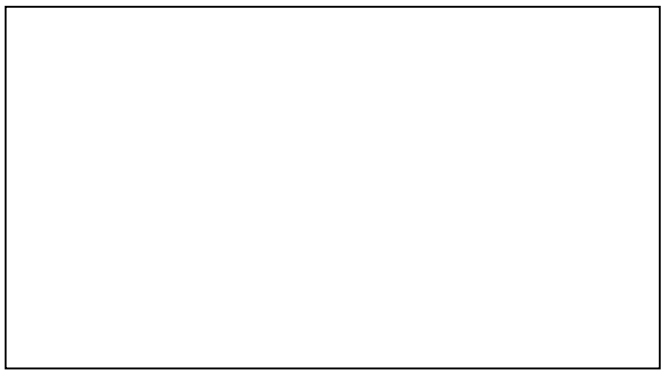


**Figure 4: Rotate levelling feed until bubble is centred.**

### 4.1 Power Supply Considerations

The EADA-350F digital accelerometer operates from a single DC source with a voltage input range of +9 Volts DC to +36 Volts DC. Any voltage drops over a long power cable must be taken into consideration, so the supply voltage may need to be higher. An isolated dc-dc converter installed inside the sensor housing forms the internal power supply and has diode protection from reversed polarity and over voltage misconnections and transient suppression.

In normal operation the sensor will be level and stable, probably recording a low seismic signal, after the sensor has settled for at least 30 minutes and the unit is not serially connected, the power consumption is approximately 2.5W (195 mA with a 12 volts dc supply), powering both the analogue section of the SIGMA sensor and the internal board level TAU digitiser. On switch on, the peak power surge may be up to XXW briefly. Power consumption above the normal quiescent consumption after the initial power on surge is approximately proportional to the output signal. If the sensor has not settled the accelerometer signals to the digitizer will be at a maximum and power consumption may approach xxW. For a settled sensor, a seismic signal that approaches the sensor's maximum voltage clip level the power consumption may approach xW. As a rule of thumb designing the power system to support a current of three times the steady state current for will provide an adequate reserve power. Voltage values of the power supplies are provided as part of the status information shown on the LCD and are also available via operator interrogation.

The resistive load imposed by long power cables needs to be taken into consideration when sourcing a power supply for the sensor. For example, 25m of 24 A.W.G wire has a resistance of 2.1Ω in both directions. Therefore, the voltage drop due to the peak power surge at 9V would be xxV, and the power source therefore must be able to supply xxV. The power supply should also be able to sustain a xxW peak output at a voltage that ensures the sensor receives at least 9V. In the 25m cable example. The peak current would be xmA at 12V and the voltage drop over the cable would be xV, so the source supply must be able to provide xmA at xV to power the sensor for maximum seismic signals.

### 4.2 Control and Data connections

The EADA-350F digital accelerometer has three external connection ports:

- A TCP/IP Ethernet connection, via a 10-way Mil Spec connector, or RJ45 connector, see XXXXX. This connection provides the user with a configuration, control, and data interface to the EADA-350F via a standard Web browser. See XXXXXX for detailed instructions for the use of this interface, and XXXXXX for connector pinout,
- A USB 3.0 port via a 10 pin MIL DTL 26482 (female) connector. This connection provides the user with a simple USB 3.0 interface to the EADA-350F for initial Internet Protocol (IP) configuration. The far, user, end of the USB section of the cable is terminated in a USB 3.0 Type A connector for insertion in one of the USB ports on the user's computer. This connector also carries the input power connection providing +9V – 36 V DC to the EADA-350F. See XXXXXX for detailed instructions for the use of this interface and XXXXX for connector pinout.
- A serial RS232 Port, via 10 pin MIL DTL 26482 (female) connector. This connection is intended for the connection of an external GPS receiver for timing information. See XXXXX for connector pinout

These ports enable the EADA-350F digital accelerometer to be controlled, configured, and interrogated according to user requirements.

### 4.3 Installation Phase 1: Setting IP Address via USB port.

The USB connection to the EADA-350F digital accelerometer is intended for the examination and/or modification of the Internet Protocol (IP) address of the unit so it will be accessible by an Internet Browser.

1. Ensure that the power source used to power the EADA-350F digital accelerometer is switched off prior to connecting the supplied (P/N XXXXX) power and USB cable to the EADA-350F.

2. Connect the USB and power cable provided in the installation pack, P/N XXXXXX, to the USB connector on the user's computer and the user's source of power (9V – 36V DC).
3. The power source supplying power to the EADA-350F may now be switched on, once the EADA-350F has completed its boot cycle the user's computer may give an audible and/or visible indication that a USB device has been connected and that the appropriate driver has been loaded.
4. On the user's computer determine which COM port has been allocated to the EADA-350F using the Windows Device Manager. See Section XXXXXX for detailed instructions how to do this.

Serial communication via a USB port can be achieved using commonly available terminal emulation software, such as Realterm[4]. Encardio-rite have tested Realterm extensively and recommend its use. Instructions in this section of the users' manual are illustrated with examples using Realterm. It is believed other commercially available terminal emulators will also work satisfactorily with the EADA-350F.

Alternately, if the EADA-350F has been pre-set to DHCP the Gaiacode Bootload programme can be used to determine the unit's IP address, please follow the instructions in

### *4.3.1 Realterm Installation*

- Download and run the Realtime installer. Realterm should be installed with a user profile that has Administrator privileges. Active X, required by Realterm, should install, and register automatically.

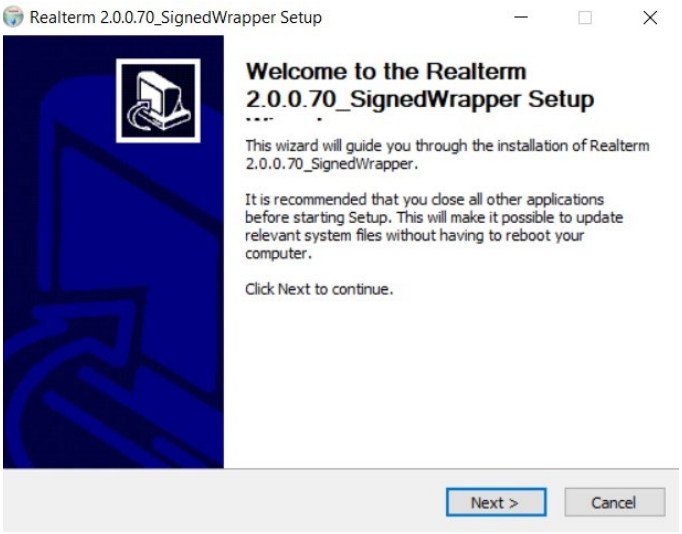



**Figure 5: Installing Realterm**

- If you have not already done so, connect the USB and power cable which was supplied with your EADA-350F to your EADA-350F and the 9V – 36 V DC source and insert the USB Type A connector into a USB port on your computer. The EADA-350F will take a few seconds to initialise on power up before any audible or visual indication that Windows has loaded the appropriate standard Windows drivers to support the EADA-350F.
- Following the on-screen instructions install the Realterm programme on your laptop or PC.
- Identify the COM port being used by the EADA-350F unit. The COM port attached to the EADA-350F may be static or dynamic, as requested by the user, and may be identified by using the procedure detailed in Appendix ??
- When the installation process is complete open the Realterm program.

[4] Realterm, terminal emulation software designed for engineers, operates under the Microsoft Windows® operating system, and its installer may be downloaded from https://sourceforge.net/projects/realterm/files/

- Select the Display window, by clicking on the Display tab in the middle left hand side of the screen, left hand side.
- Select ASCII, note this is the lower occurrence of ASCII in the list, selecting the first ASCII or not selecting the lower ASCII will cause the display window to display control characters, such as carriage return line feed, in the form of representations of control characters, control characters such as Carriage Return (CR) or Line Feed (LF) will appear in the display as CR/LF if included in the echoed keystrokes or output from the EADA-350F digital accelerometer.

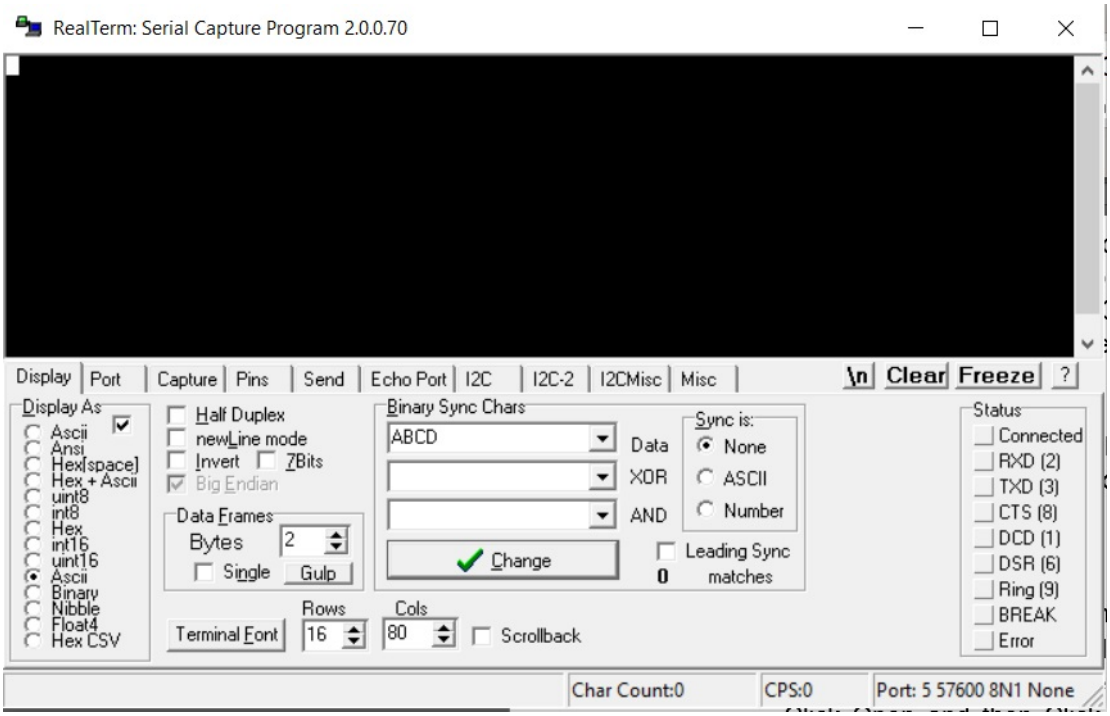



**Figure 6: Realterm Installation Setup**

- Select the Port window by clicking on the Port tab next right to the Display Tab.
- Baud: this setting is immaterial as the USB driver takes care of this.
- Port: Select the COM port identified above from the Port drop down box, the port required will have the identifier X = \USBSER000 where X is the COM port attached to the EADA-350F.
- The Realterm window should now be as shown in Figure 7. In Figure 7 the port selected is Port 5, this may be different in your installation.
- Click Open and then Click Change, this will action the new parameter setting selected above.

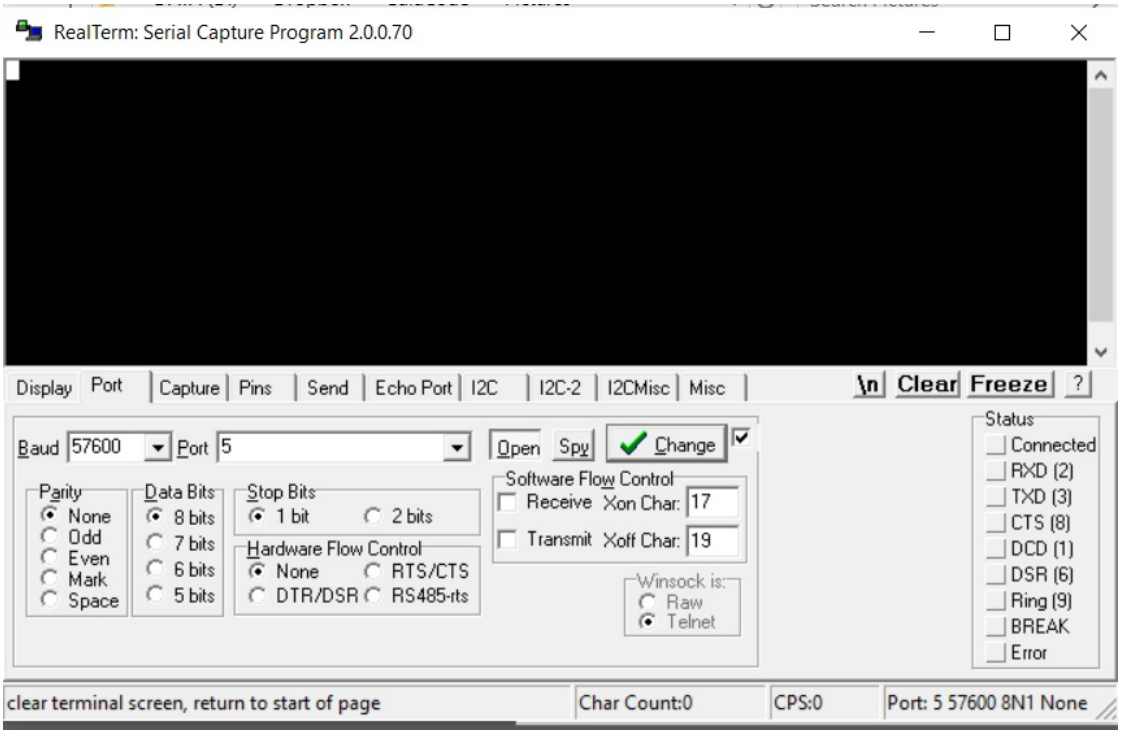



**Figure 7: Realterm Port Window**

- Press the enter key to enable and display the IP configuration menu. The screen should now appear as in Figure 8.

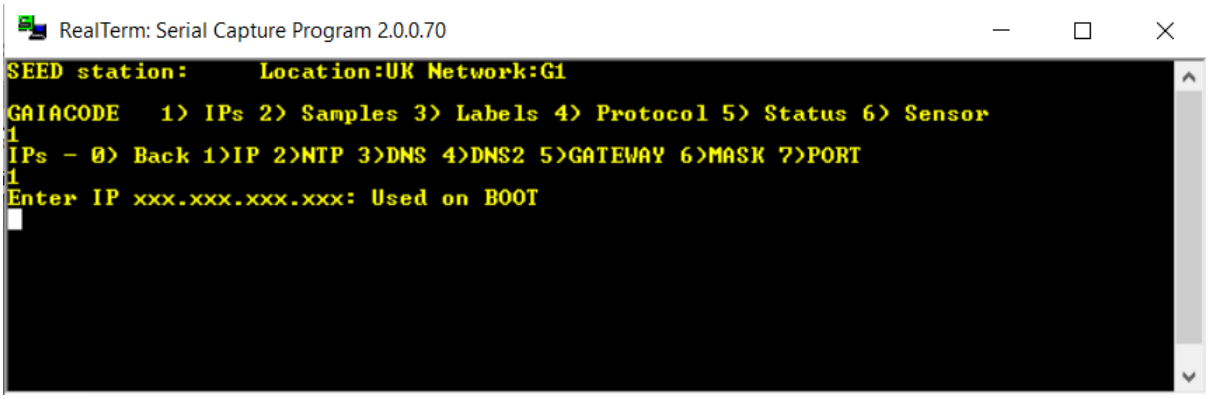



**Figure 8: Internet Protocol Address, View and Change**

The EADA-350F digital accelerometer is now connected to Realtime, use the following instructions to examine or change its IP Address.

This screen will display the current IP Address (if previously specified at order time or subsequently) or prompt the user (xxx.xxx.xxx.xxx) for the IP Address to be used by the User to communicate with the EADA-350F:

For clarity, the lower half, parameter section, of the Realterm screen will not be shown in the illustrative figures from this point onwards, the parameters do not change once communications has been established with the EADA-350F.

The IP address being viewed or changed is the hardware Internet Protocol Address that will be implemented at power up and boot, this address should appear in the display box of the Bootload programme (see Section 19.7) and should be used as the web address in an internet browser for accessing the EADA-350F.

The address should comply with the proper specifications of an IPv4 Internet Protocol Address, nnn.nnn.nnn.nnn, NOTE the required full stop or period (.) between the four, three numerical digit clauses of the address. Leading zeros do not need to be input.

Confirm that the EADA-350F digital accelerometer has the IP Address you require, if you wish to change it simply type the new address, including the period separators, pressing return implements the change, if the new address is not in the correct format, or if no new IP Address has been typed when the return is pressed, the EADA-350F will redisplay the current address and prompt the user for a new address.

## 4.4 Installation Phase 2: Ethernet connection

Ethernet (TCP/IP4 is the intended operational connection for communicating with the EADA-350F digital accelerometer.

The data protocol used to communicate with the Sigma is the SEED Protocol[5], this is handled by the web browser used and is mentioned only for completeness. No user action is required.

The instructions in this Users' manual assume that Windows 10 is being used, previous versions of Windows, or other Operating System may be used but the procedures and appearance of the setup may be different. Essentially you need to be able to inform your browser of the internet address of the EADA-350F.

Unless specified the EADA-350F will ship in DHCP[6] configuration, if you have asked for it to be shipped in a static IP address configuration, probably requested by your Network Administrator whom should supply a static IPv4 address compatible with your network, and you may wish to do some testing before installing on the destination network you may need to setup your PC/Network for the use of static IP Addresses, use the following instructions:

### *4.4.1 Static Internet Protocol (V4) Address Windows' Setup*

- Select the Windows icon on the bottom left corner of your PC screen or press the Windows button on your keyboard.
- Start typing Settings, the Settings App will appear, probably identified as "Best Match" on your screen, left hand side.
- Select on the Settings App Icon, the Settings menu will appear.
- Select the Network and Internet icon, probably the fourth one along on the top row
- Select Ethernet and then click on the ethernet icon for the network connection you wish to use for communicating with the EADA-350F
- Click on the IP Settings, Edit button on the left-hand side of the window.
- Select Manual from the Edit IP Settings drop down list box.
- Click on the IPv4 Off button, changing it too On and bringing up the Address input screen as shown in Figure 9

[5] https://www.seed-protocol.com/

[6] The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on Internet Protocol networks whereby a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on a network so they can communicate with other IP networks. Source: https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol, taken 10th June 2020,

- Fill in the parameters you wish to change to match your network setting and as indicated by your network manager, he minimum of these necessary for communication with your EADA-350F will be the IP address which will be the static IPv4 address requested.

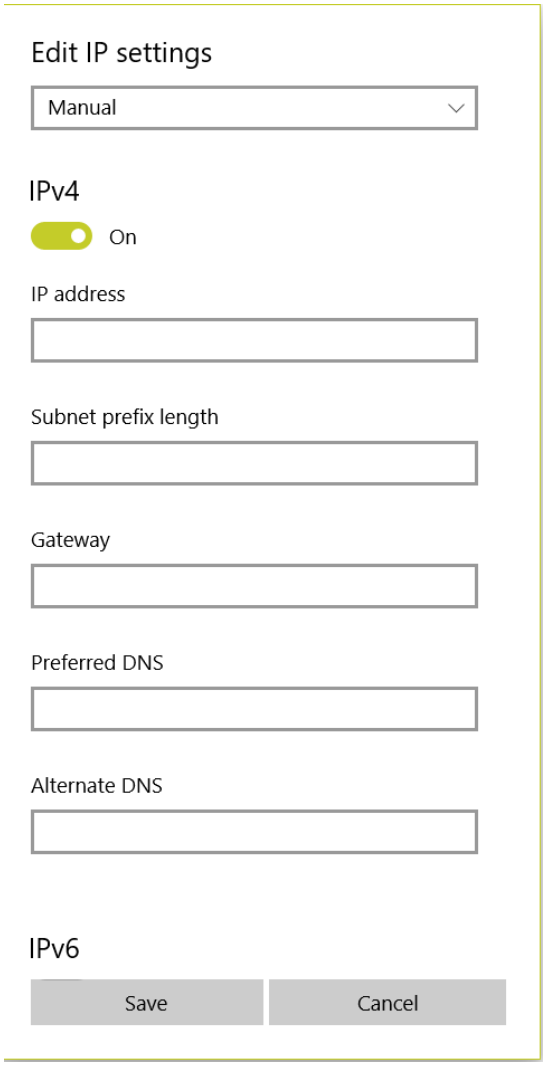



**Figure 9: Windows IPv4 Address Input Screen**

- Click Save when you have completed input, the static IP address will be in the form of a 4-clause number, each clause comprising 3 numerical digits, separated by a full stop or period (.). Windows will notify any syntactical errors, in which case repeat the process.

### 4.4.2 *General* Web Browser Interface (dynamically allocated IPv4 address)

In the case of a dynamic IPv4 address, a standard web browser, such as Firefox or Chrome may be used to access the EADA-350F digital accelerometer. Use the IP address identified in Phase 1 of the installation,

For the purposes of this Users' manual and for the illustrative examples Firefox has been used.


**Figure 10: Gaiacode Internet Address (Example)**

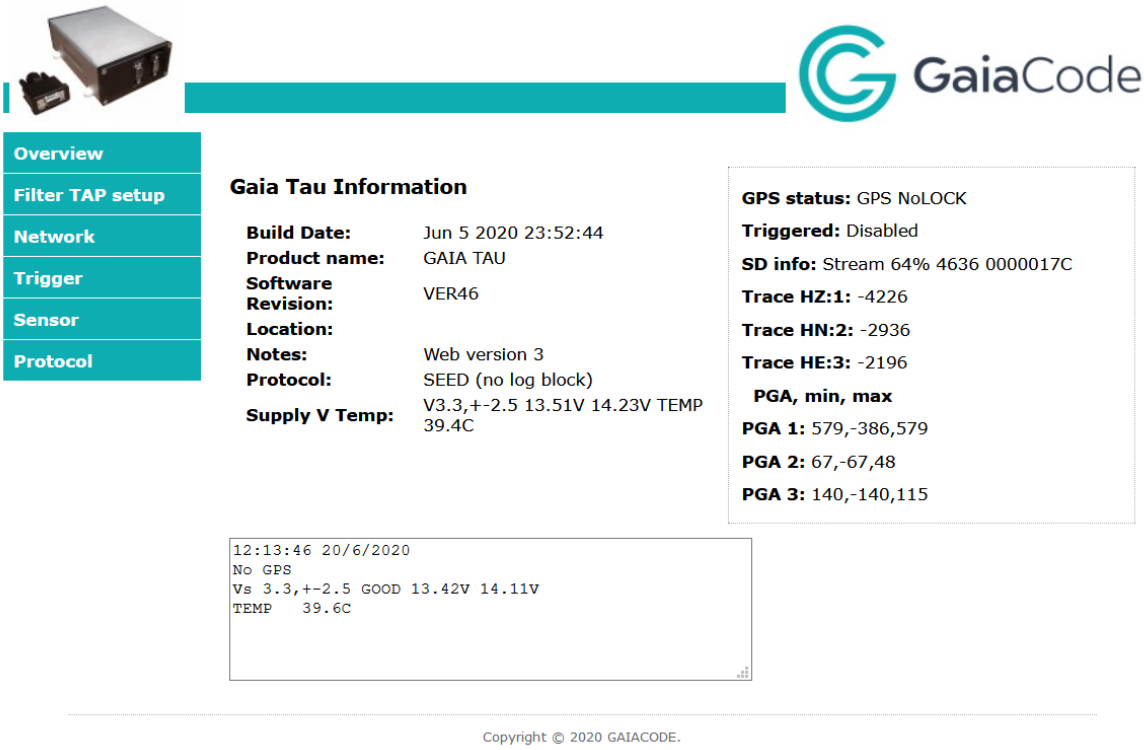
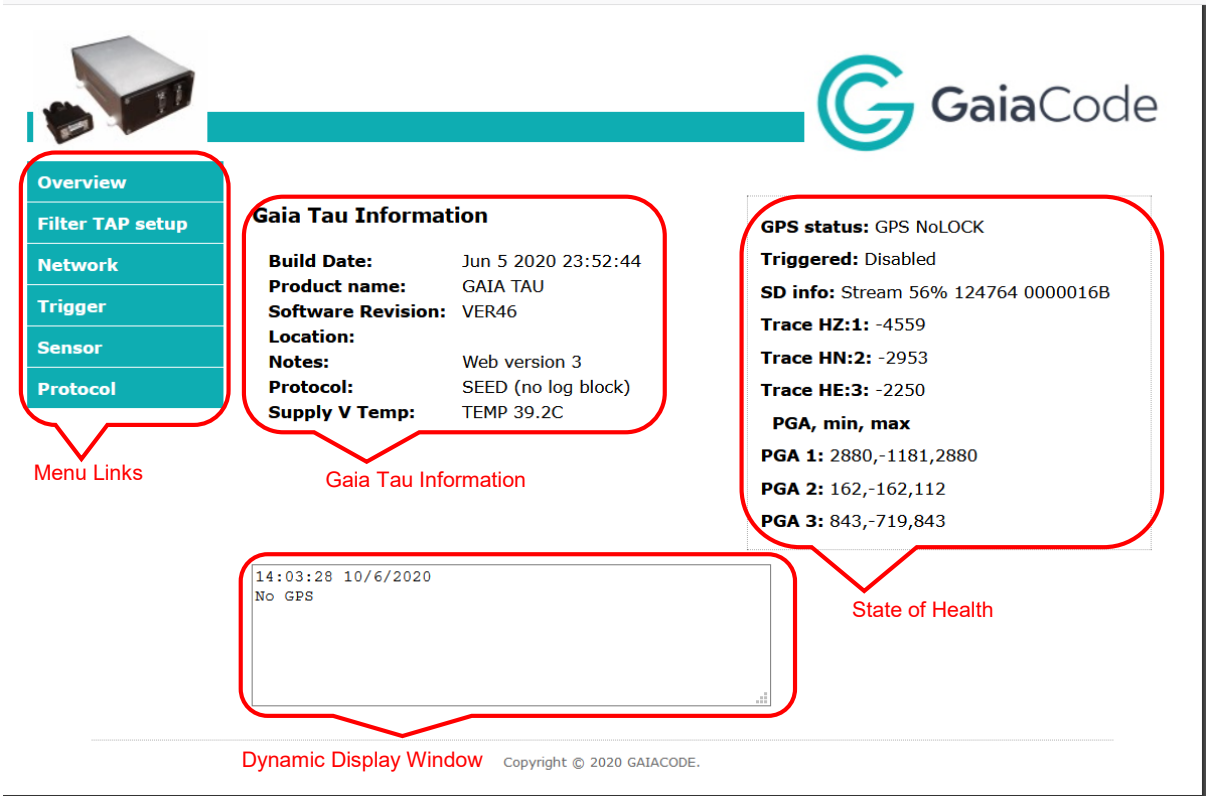



**Figure 11: Gaiacode Internet Interface**

# 5 ACCESSING THE EADA-350F

- Open a web browser page on your computer as normal, note: the home page initially loaded by your browser may not be identical to that shown which the home page for the Firefox browser.
- Type in the TCP/IPv4 address in the top address box of the browser as shown in Figure 6, using the standard IPv4 address presentation, four clauses of three numerical digits, each separated by a full stop or period (.) nnn.nnn.nnn.nnn. and press return.
- In Figure 6 the IP address "192.168.1.206" has been used for illustration, the user should input either the static IPv4 address used in the instructions for setting Static Internet Protocol address on page 10, or the dynamic Ipv4 address obtained in the instructions for Setting the IP Address using the USB Interface on page 6:
- The EADA-350F digital accelerometer Overview Page should now appear, similar to that shown in Figure 12, for purposes of clarity only the EADA-350F window, not the full browser page will be show in illustrative figures.



## 5.1 Overview Web Page

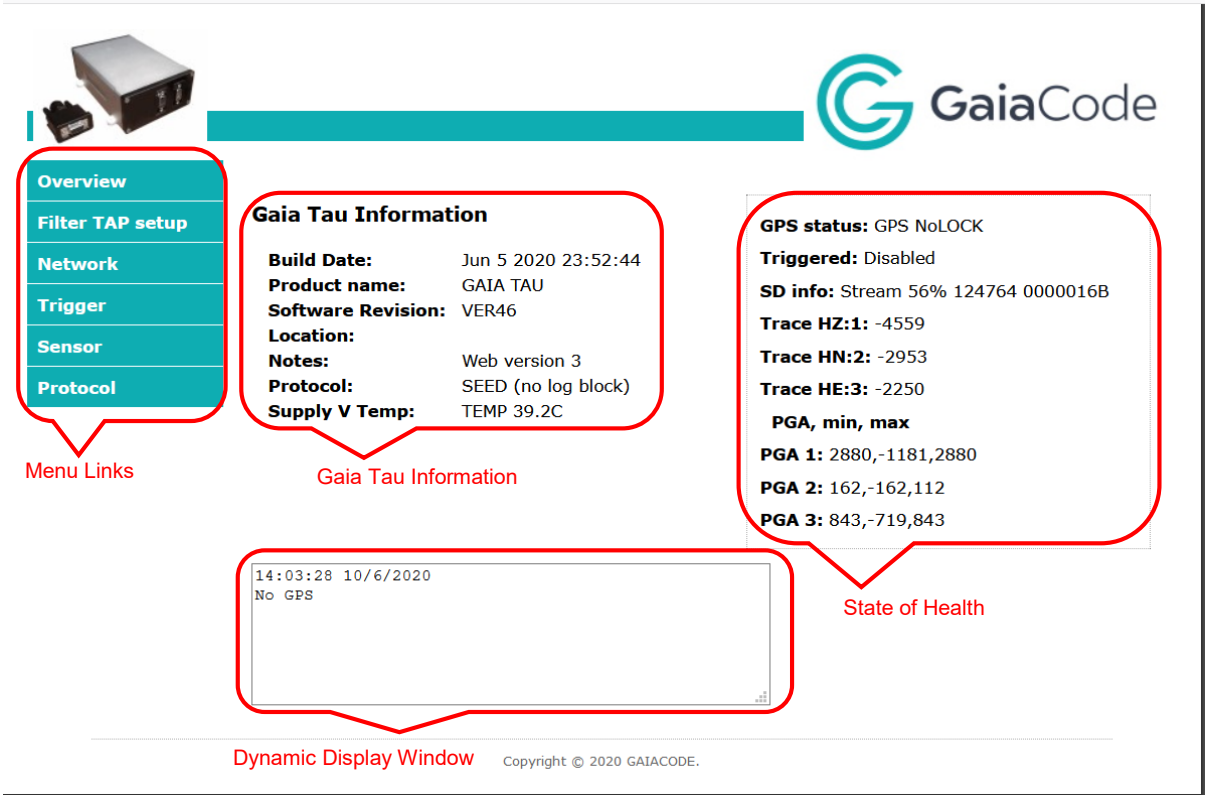
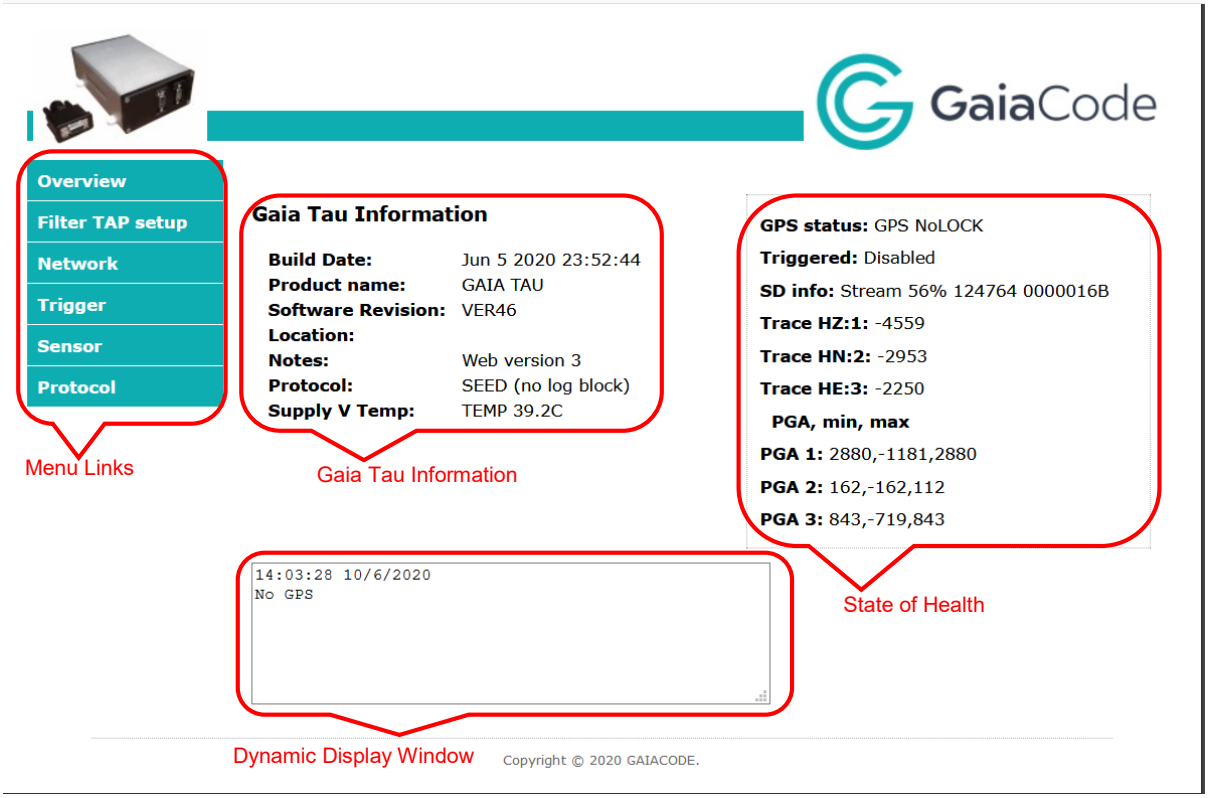
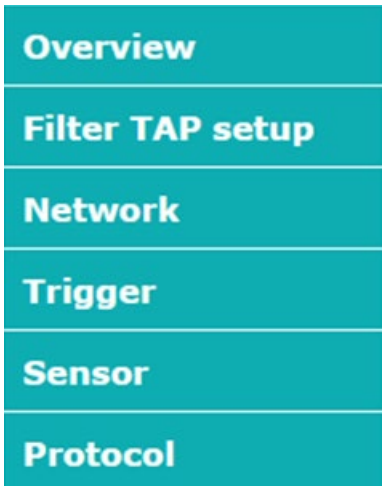



**Figure 12: Gaiacode Overview Page**

An example of the Overview Page is shown in Figure 12, it is split into 4 sections:




- **Menu links,** this section, on the left-hand side of the page, is repeated on each of the other pages in the menu, selecting a menu link tab will take the user to the internet page for that tab:




See Page 17
See Page 18
See Page 19
See Page 21
See Page 22

**Figure 13: Menu Links**

- **State of Health,** this section, on the right-hand side of the page, is repeated on each of the pages in the menu. The section displays dynamic information from the EADA-350F digital accelerometer reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only:
  - **GPS status:** *NoLOCK* signifies that the EADA-350F is not receiving or has yet to receive a stable GPS signal. *LOCK* signifies that the EADA-350F is receiving or has received a stable GPS signal and has been able to lock on it.
  - **Triggered:** *disabled* signifies that the Triggering Algorithm has been disabled and *enabled* signifies that the Triggering Algorithm has been enabled. The Triggering Algorithm may be enabled or disabled using the command TRIGGER on the command line available on the Filter TAP Setup Window, see Page 17.
  - **SD Info:** The EADA-350F records a log file during operation, see page 46 for further details of the log file content. Stream signifies that the SD card, accessible on the nose of the EADA-350F is in Stream mode, *56%* signifies that the SD card is 56% full, *124764* signifies the number of sample packets written to the SD card, *0000016C* signifies the xxxxxxxxxxxxx. The SD card will not become totally full as the operational software will replace the oldest log files with the latest log file.
  - **Trace HZ:1**:
  - **Trace HN:2:**
  - **Trace HE:3**:
  - **PGA 1:** The first number, 2880 in this case, signifies the **absolute value** of Peak Ground Acceleration in the last second from the channel/s allocated to PGA 1, the second number, -1181 in this case, signifies the **minimum value** of Peak Ground Acceleration in the last second from the channel/s allocated to PGA 1, and the third number, 2880 in this case signifies the **maximum value** of Peak Ground Acceleration in the last second for the channel/s allocated to PGA 1. The PGA numbers are in ADU[7]. The allocation of channel to the PGA reports, 1, 2 and 3 may be made using the command GPAMASK on the command line available on the Filter Tap setup Window, see section XXXXXX for further details.
  - **PGA 2:** As described above for PGA 1: but replacing the phrase PGA:1 with PGA:2.

[7] The digital number output by the ADC; the units in which raw values are measured are called ADU (analogue-to-digital units) or DN (data numbers).

- **PGA 3:** As described above for PGA 1: but replacing the phrase PGA:1 with PGA:3.

- **Gaia Tau Information,** this section, situated in the middle of the page, is unique to the Overview page. This section displays information about the firmware that is running on the TGD4, what protocol the EADA-350F digital accelerometer is using and the current temperature inside the EADA-350F, in the vicinity of the power supply. Only the Location and Protocol are operator changeable
  - **Build Date:** This field is the date on which the firmware that is operational on the EADA-350F was last generated and released for commercial use. The date is in mmm dd yyyy hh:mm:ss format and may be required if Encardio-rite is contacted for technical support.
  - **Product Name**: This field is the name given to the EADA-350F by Encardio-rite.
  - **Software Revision:** This field is the revision number of the firmware, that was built on the date given above and may be required if Encardio-rite is contacted for technical support
  - **Location:** This field is the geographical location obtained from the GPS receiver, and is in the format Latitude, N, Longitude, W. for example 51.4533094" N, 0.9684175" W (Reading).
  - **Notes:** This is a free format field containing information programmed by Encardio-rite, currently it indicates the version number of the internet software interface contained within the EADA-350F digital accelerometer firmware, it is anticipated further information, such as the gain of the accelerometer will be included here.
  - **Protocol**, This field displays the Protocol that has been selected to be used by the EADA-350F, the type of Protocol may be selected using the command GCF, see page X to select GCF protocol, the command GAIA, see page Y to select the GAIA protocol, and the command SEED see page Z to select the SEED protocol.
  - **Supply V Temp:** This field displays the temperature of the power supply electronics within the EADA-350F. The temperature is expressed in °C and should not exceed 80°C. If the temperature exceeds 80° please call Encardio-rite or your first line of maintenance support.

- **Gaia Tau Information Dynamic Display Window**, this section, unique to the Overview Web page, is used to dynamically display status messages including boot messages and GPS information, and operational parameters such as Trigger Status, Tap Configuration and IP Configuration, as selected by the operator. The operational parameters to be displayed may be selected using the STATUSMODE command, see page Z for further information.

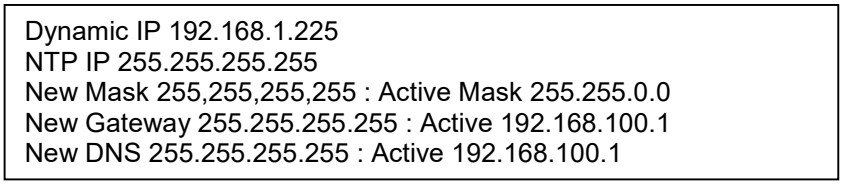



**Figure 14: Example EADA-350F Overview Status Window IP Configuration**

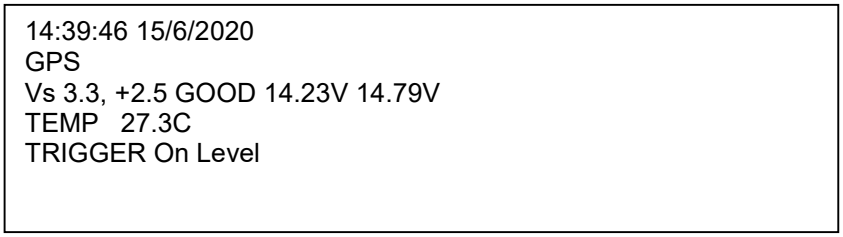



**Figure 15: Example EADA-350F Overview Status Window, Environment**

## 5.2 Filter TAP setup Internet Page

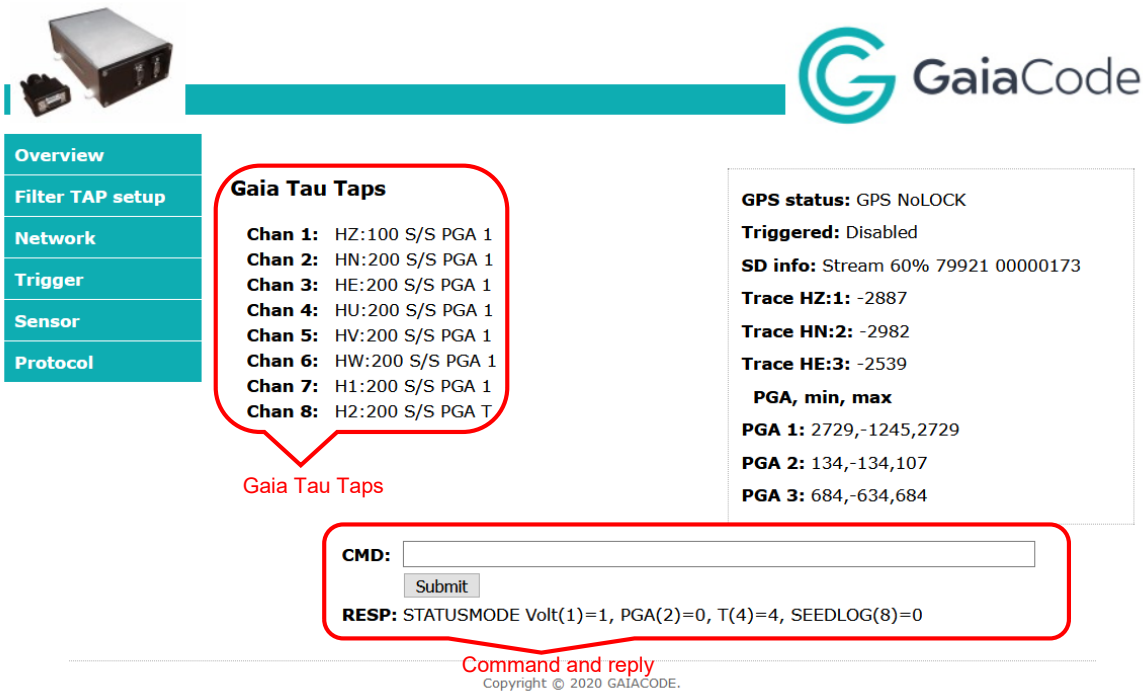



**Figure 16: Filter TAP setup page**

An example of the Filter TAP setup page is shown in Figure 16.

The Filter TAP setup page, displays the sampling parameters of each of the eight accelerometer channels and one of its four sections allows the user to input commands and view responses to those commands:

- **Menu links,** this section, on the left-hand side of the page, is identical to that displayed on the Overview page; see users' manual page 14, selecting a menu link tab will take the user to the internet page for that tab.
- **State of Health,** this section, on the right-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 15. The section displays dynamic information from the EADA-350F reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only.
- **Gaia Tau Taps,** this section, situated in the middle of the page, is unique to the Gaia Tau Taps page, it displays, for each of the eight accelerometer channels, current setup information. The information fields, for each individual channel are described in Figure 17 and Figure 18.

| | |
|---|---|
| ChanN: | Where N = channel number |
| HZ: | The SEED stream ID for channel N, set by the user using the SET-SCHAR command, see XXXXXX |
| nnn S/S | Where nnn = samples per second for this channel, set by the user using the CH command, see XXXXXX |
| PGA N | Peak Ground Acceleration detected on channel N, set by the user using the PGAMASK command, see XXXXXXX |

**Figure 17: Gaia Tau Taps, Display Format**

| | |
|---|---|
| Chan3 | Channel 3 |
| HE | SEED stream ID HE used for Channel 3 |
| 1000 200 100 20 S/S | 4 Sampling rates are set on the Channel, 1000 S/S, 200 S/S, 100 S/S and 20 S/S. |
| PGA 1 | Peak Ground Acceleration??? |

**Figure 18: Gaia Tau Taps, Example**

- **CMD**, the command input field, situated at the bottom middle of the page, with its Submit button and RESP, the response field, are used to input command to the EADA-350F, it is unique to the Filter TAP setup page. The commands are summarised by topic in Table YYYY and individually detailed in Section XXXXXX. An alphabetic list, by command name, is included in Appendix XXXXX. Clicking on the Submit button will send the command input into the CMD field, any elicited response, again detailed in Section XXXXX will be displayed in the RESP: output box.

### 5.3 Network Internet Page

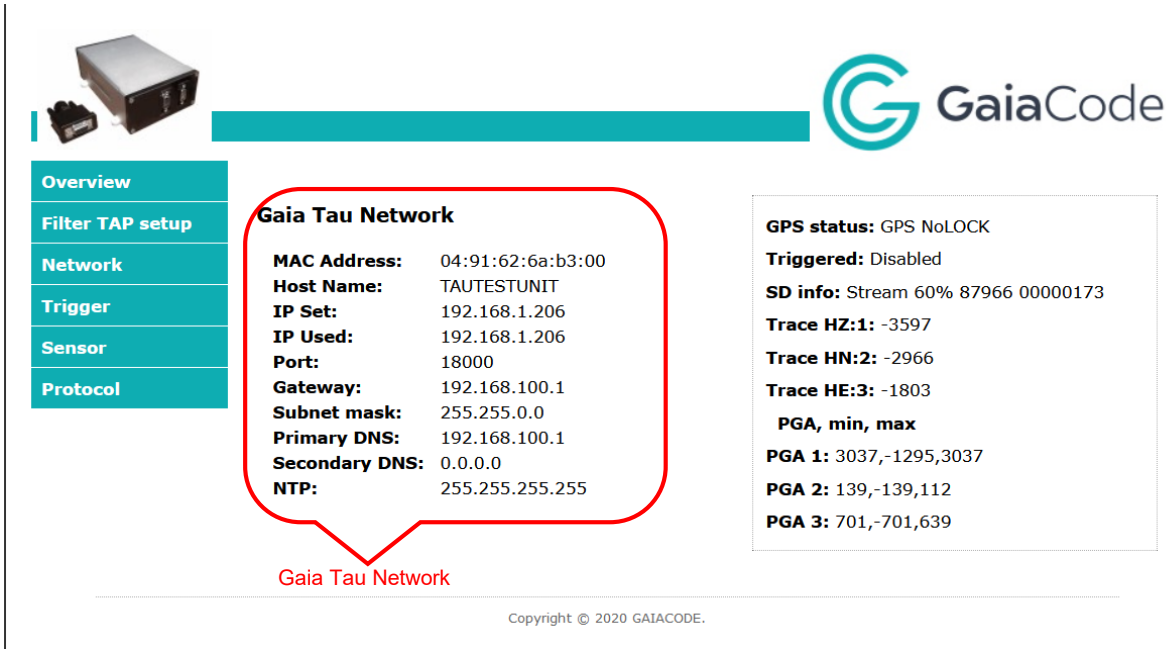



**Figure 19: Network**

An example of the Network page is shown in Figure 19.

The Network page, displays network address and associated parameters of the internet network connection used to control and interrogate the EADA-350F, the page has three sections:

- **Menu links,** this section, on the left-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 14, selecting a menu link tab will take the user to the internet page for that tab.
- **State of Health**, this section, on the right-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 15. The section displays dynamic information from the EADA-350F reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only.
- **Gaia Tau Network,** this section, situated in the middle of the page, is unique to the Gaia Tau Network page, it displays network address and associated parameters for the internet network connection used to control and interrogate the EADA-350F:

- **MAC Address:** this field displays the media access control address assigned to the EADA-350F, the numbers in this field may not be changed the user.
- **Host Name**: this field displays the host name assigned to the EADA-350F and is set by the user using the HOST command, see XXXXX.
- **IP Set**: this field displays the IP Address assigned to the EADA-350F by the user, the EADA-350F may have a fixed IP address, or an address assigned to it by the network. To view and/or change the IP address via RS232 interface see XXXXX, to view and/or change the IP address via the Web interface use the IP command see xxxxxx or Appendix X Bootload.exe.
- **IP User**: ????
- **Port**: this field displays the port number used by the EADA-350F for internet communications, the value in this field may not be changed by the user.
- **Gateway**: this field displays the default gateway address assigned to the EADA-350F by the user, this field may be changed by the user with the GATEWAY command, see XXXXXXXX.
- **Subnet mask**: this field displays the network subnet mask assigned to the EADA-350F by the user, this field may be changed by the user with the MASK command, see VVVVVVVV
- **Primary DNS**: this field displays the primary network DNS address assigned to the EADA-350F by the user, this field may be changed by the user with the DNS command, see CCCCCCC
- **Secondary DNS**: this field displays the secondary network DNS address assigned to the EADA-350F by the user, this field may be changed by the user with the DNS2 command, see DDDDDDD
- **NTP**: this field displays the network NTP address, if assigned to the EADA-350F by the user. If an external GPS receiver is not connected to the EADA-350F the EADA-350F will seek to obtain synchronising signals and time information from the assigned NTP server address, this fied may be changed by the user with the NTP command, see EEEEEEE

## 5.4 Trigger Internet Page

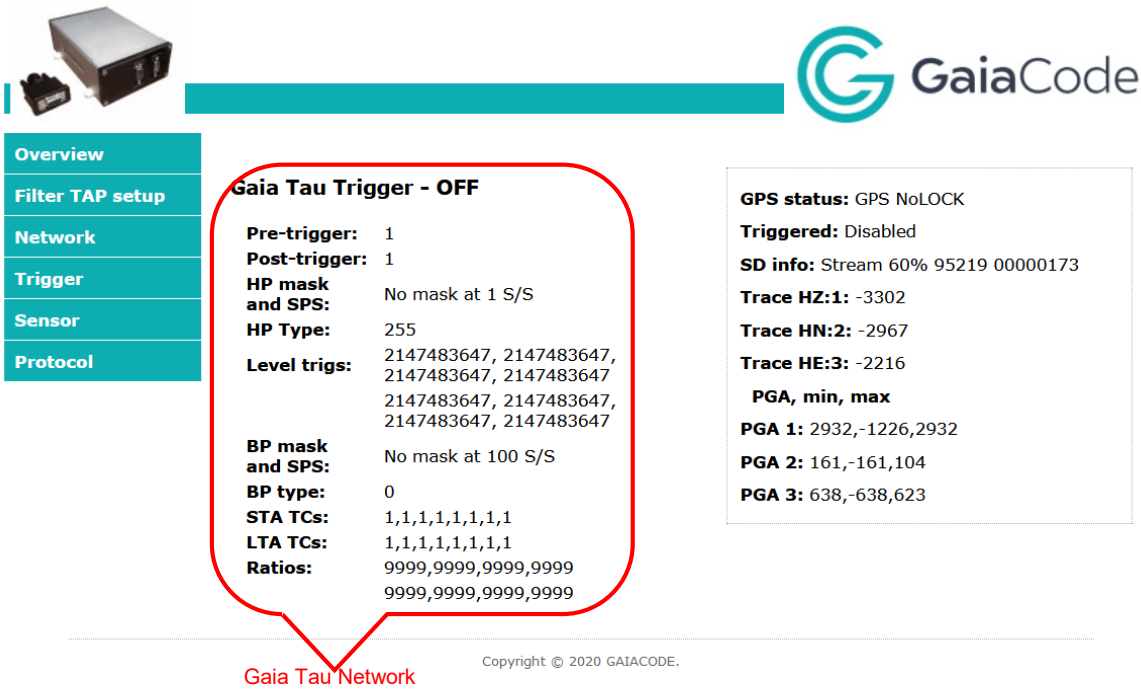



**Figure 20: Trigger**

An example of the Trigger page is shown in Figure 20

The Trigger page, used to give operational details of the triggers that have been configured in the EADA-350F, has three sections:

- **Menu links,** this section, on the left-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 14, selecting a menu link tab will take the user to the internet page for that tab.
- **State of Health**, this section, on the right-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 15. The section displays dynamic information from the EADA-350F digital accelerometer reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only.
- **Gaia Tau Trigger:** this section, situated in the middle of the page, is unique to the Trigger page, it displays parameters associated with the triggers, selected by the user which determine the output of the EADA-350F, the commands used to modify these parameters are detailed below:
    - **Gaia Tau Trigger - OFF:** this field displays ON, if triggers have been enabled with the 1 TRIGGER command, see page XXXXXXX and OFF if triggers have been disabled with the 0 TRIGGER command, see XXXXXX for full details of the TRIGGER command.
    - **Pre-trigger**, this field displays the value in seconds of the pre-trigger specified by the operator using the PRE-TRIG command, see xxxxxx for full details of the PRE-TRIG command.
    - **Post-trigger**, this field displays the value in seconds of the post-trigger specified by the operator using the POST-TRIG command, see page xxxxxx for full details of the POST-TRIG command,
    - **HP mask and SPS,** this field displays which channels have been selected for high pass filtering, and at what samples per second rate they have been set to, see page xxxxxx for full details of the HPMASK and page xxxxx for full details of the HPSYS commands.
    - **HP Type,** this field displays the high pass filter time constant, see page xxxxxx for full details of the HPTYPE command.
    - **Level trigs**, this field displays the high pass trigger levels, in µg (microg) that have been specified by the operator using the MICROG command, see page xxxxxx for full details of the MICROG command.
    - **BP mask and SPS,** this field displays which channels have been selected for band pass filtering, and at what sample per second rate they have been set to.
    - **BP type,** this field displays the band pass filter time constant, as a proportion of the ……. To the ……, that have been specified by the operator using the BPTYPE command, see page ccccc for full details of the BPMASK command and page dddddd for full details of the BP-TYPE command.
    - **STA TCs**, this field displays the time constant value that has been assigned to each channel by the operator using the STA command, see page xxxxx for full details of the STA command. The format is TC1,TC2,TC3,TC4,TC5,TC6,TC7,TC8 STA where TCn is the time constant assigned to channel n.
    - **LTA TCs**, this field displays the time constant value that has been assigned to each channel by the operator using the LTA command, see page xxxxx for full details of the LTA command.
    - **Ratios**, this field displays the trigger ratios of all channels although only the ones defined with the command BP-MASK are used, See page xxxxx for full details of the RATIOS command, and page XXXxx for full details of the BP-MASK command.

## 5.5 Sensor Internet Page

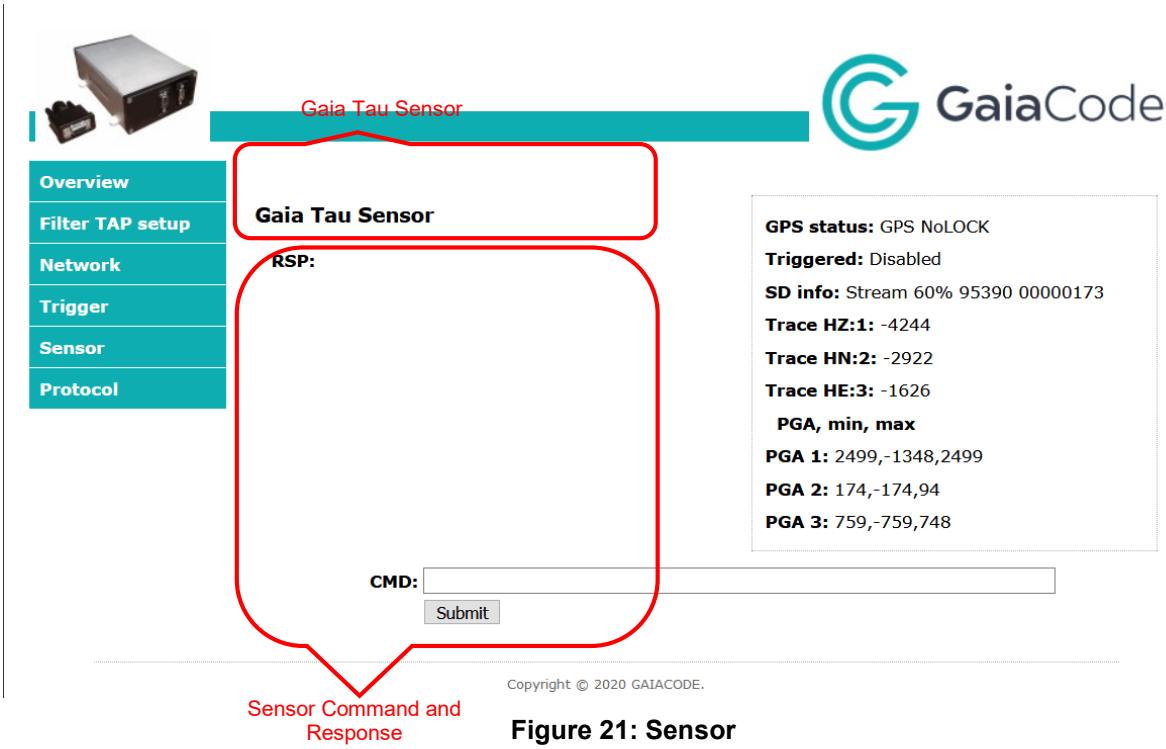



**Figure 21: Sensor**

An example of the Sensor page is shown in Figure 21: Sensor.

The Sensor page, used to display operational parameters directly from the Accelerometers internal to the EADA-350F digital accelerometer, the page also has a command line allowing Accelerometer parameters to be examined and changed, and space to display any response, elicited by the command input, the page has four sections:

- **Menu links,** this section, on the left-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 14, selecting a menu link tab will take the user to the internet page for that tab.
- **State of Health,** this section, on the right-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 15. This section displays dynamic information from the EADA-350F reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only.
- **Sensor**: this section, situated in the middle of the page, is unique to the Sensor page, it displays parameters associated with the internal accelerometers of the EADA-350F, as specified by the user, the commands used to modify these parameters are detailed below:
- **CMD**, the sensor command input field, situated at the bottom middle of the page, with its Submit button and RESP, the response field, are used to input commands through the digitizer to the accelerometer, in order that the user can finely adjust and tune the accelerometer to suit the demands of the operator's application, this section is unique to the Sensor page. Responses to the sensor input commands, one the return key has been pressed or the submit button clicked, will be displayed in the RESP box  The commands are summarised within the Accelerometer Section in Table YYYY and individually detailed in Section XXXXXX. An alphabetic list, by command name, is included in Appendix XXXXX.

## 5.6 Protocol Internet Page

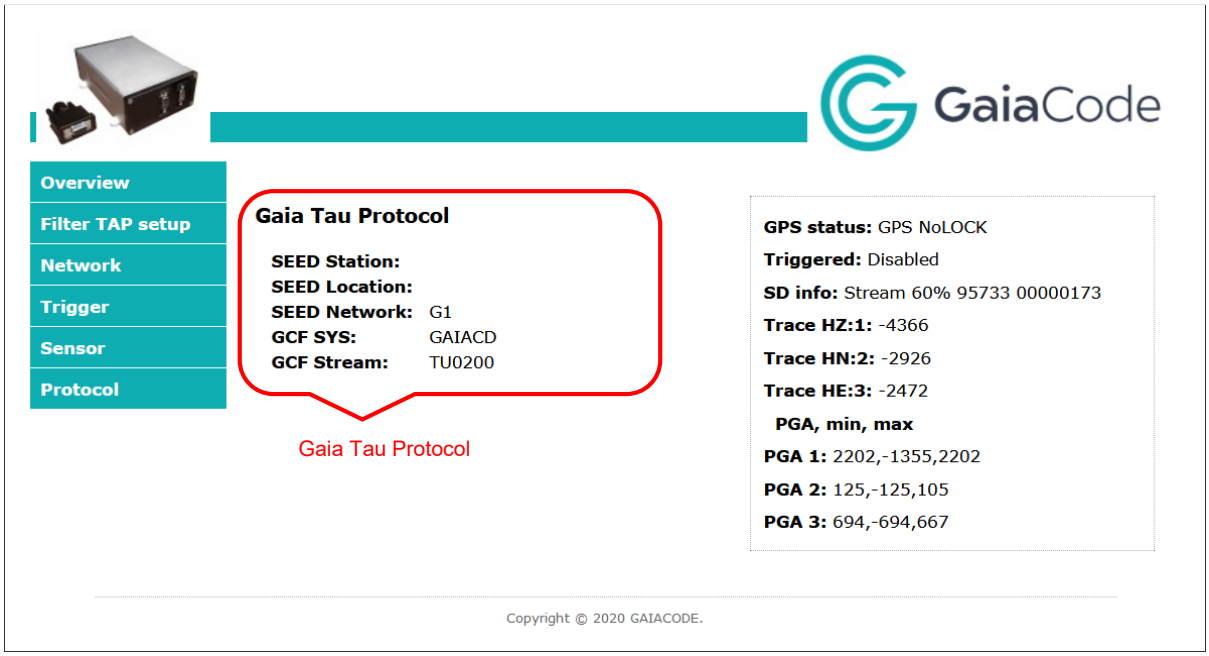



**Figure 22: Protocol**

An example of the Protocol page is shown in Figure 22.

The Protocol page, the page has three sections:

- **Menu links**: This section, on the left-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 14, selecting a menu link tab will take the user to the internet page for that tab.
- **State of Health:** This section, on the right-hand side of the page, is identical to that displayed on the Overview page, see users' manual page 15. The section displays dynamic information from the EADA-350F digital accelerometer reflecting its current activities and status, there are no user directly changeable fields in this section, it is for informational and monitoring purposes only.
- **Gaia Tau Protocol:** This section, situated in the middle of the page, is unique to the Protocol page, it displays parameters associated with the protocol that has been selected using the GCF (Guralp Compressed Format), GAIA (Gaiacode internal format) or SEED (MiniSEED) commands, as specified by the user. For full details of the GCF command see Page xxxxx, for full details of the GAIA command see Page xxxxxx, for full details of the SEED command see Page vvvvvv. The commands used to modify these parameters are detailed below:
  - **SEED Station:** this field displays the SEED station name, as specified by the user using the SET-SEEDSTA command, for full details of the SET-SEEDSTA command see page ccccc.
  - **SEED Location:** this field displays the SEED location, as specified by the user using the SET-SEEDLOC command, for full details of the SET-SEEDLOC command see page ccccc.
  - **SEED Network:** this field displays the SEED network name, as specified by the user using the SET-SEEDNET command, for full details of the SET-SEEDNET command see page ccccc.
  - **GCF SYS:** this field displays the GCF system name, as specified by the user using the SET-SYS command, for full details of the SET-SYS command see page ccccc.
  - **GCF Stream**: this field displays the GCF stream, as specified by the user using the SET-STREAM command, for full details of the SET-STREAM command see page ccccc.

## 6 TOPICAL COMMAND SYNTAX, SUMMARY TABLE FORMAT

For ease of reference the following tables summarise, and present in tabulated form all the commands available on the EADA-350F digital accelerometer

**Table 1: Accelerometer Commands, Page 1**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Accelerometer Sensor | CALON | Sets the calibration line to the Accelerometer to low | CALON | none | | 41 |
| | CALOFF | Sets the calibration line to the Accelerometer to high | CALOFF | none | | 41 |
| | M | Masses, Display the position of the Masses | M | none | | 41 |
| | D | Datalines | D | none | | 41 |
| | 99I | Invert | 99I | none | | 41 |
| | 199I | Revert | 199I | none | | |
| | 49I | Enable Auto Centre | 49I | none | | |
| | 149I | Disable Auto Centre | 149I | none | | |
| | = | Save ADC offsets | = | none | | |

**Table 2: Accelerometer Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| ADC | AMP | Set the gain of the Programmable Gain Amplifier | M N AMP | N = Channel Number, M = Gain Required | Reboot | 41 |

**Table 3: ADC Commands**

| Commands | | | | | | |
|---|---|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Syntax** | **Variable Definitions** | **Contingent Upon** | **Page Number** |
| Accelerometer Sensor | SINE | Set the period of Sinusoidal wave | N SINE | N = 16000/Hz Required, N = 0 for continuous SINE cycles | | **Error! Bookmark not defined.** |
| | PULSE | Set the period of Square (Pulse) wave | N PULSE | N = 16000/Hz Required, N = 0 for continuous PULSE cycles | | 40 |
| | STEP | Output one STEP transition. This transition happens after N/16000 of a second. | N STEP | N = delay in seconds before a single step transition. N = delay (s) * 16000. | | 40 |
| | RAND | Sets the update rate of a random signal | N RAND | N = 16000/Update Rate Required | | 40 |
| | NODA | Switch off the Digital to Analogue Converter | NODA | none | | 40 |
| | DACAMP | Set the amplitude of the Digital to Analogue Converter | N DACAMP | N = ? | | 41 |
| | CYCLES | Set the number of cycles of Sine, Pulse or Rand waves to perform or Set to continuous | N CYCLES | N = Cycles, N = 0 for continuous | | 41 |
| | GAIN | Set the Accelerometer gain, use the CENT command to centre the Accelerometer mass after each change. | N GAIN | N = desired gain value, 0 = ±0.5g, 1 = ±1g, 2 = ±2g, 3 = ±4g | | 41 |
| | CENT | Centre the Accelerometers, it is recommended to execute this command once a PGA change has been made to the sensor | CENT | none | | 41 |

**Table 4: Protocol Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Protocol | GCF | Set the output protocol to GCF | GCF | none | | 42 |
| | GAIA | Set the output protocol to GAIA | GAIA | none | | 42 |
| | SEED | Set the output protocol to MiniSEED | SEED | none | | 42 |
| | SET-SYS | Set GCF system | "A" SET-SYS | A = 6 Alpha (Uppercase) or numeric (0-9) characters | | 42 |
| | SET-STREAM | Set GCF stream | "A" SET-STREAM | A = 4 Alpha (Uppercase) or Numeric (0-9) characters | | 42 |
| | SET-CHAR | Set all GCF channel's last character to specified | "AAAAAAAA" SET-CHAR | AAAAAAAA = 8 Alpha (Uppercase) or numeric (0-9) characters, one per channel, left to right | | 42 |
| | SET-ACHAR | Set an individual GCF channel's last character to specified. | "A" N SET-ACHAR | A = 1 Alpha (Uppercase) or numeric (0-9) character, N = character position or channel | | 42 |
| | SET-SCHAR | Change the MiniSEED ID | "AA" N SET-SCHAR | "AA" = stream identifier, N is the TDG4 channel number (1 - 8) | | 42 |
| | SET-SEEDLOC | Set the MiniSEED location | "AA" SET-SEEDLOC | AA = location | | 42 |
| | SET-SEEDNET | Set the MiniSEED network | "AA" SET-SEEDNET | AA = network | | 42 |
| | SET-SEEDSTA | Set the MiniSEED Station Name | "AA" SET-SEEDSTA | AA = station name | | 43 |

**Table 5: TCP/IP Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| TCP/IP | IP | Set the IP Address | nnn.nnn.nnn.nnn IP | nnn.nnn.nnn.nnn is the fixed or automatic IP Address Required | | 43 |
| | NTP | Set the address of that of a remote NTP Server | nnn.nnn.nnn.nnn NTP | nnn.nnn.nnn.nnn is the fixed or set to hunt mode | | 43 |
| | MASK | Set the subnet MASK | nnn.nnn.nnn.nnn MASK | nnn.nnn.nnn.nnn is the subnet mask | | 43 |
| | GATEWAY | Set the network Gateway Address | nnn.nnn.nnn.nnn GATEWAY | nnn.nnn.nnn.nnn is the network Gateway Address | | 43 |
| | DNS | Set the network DNS | nnn.nnn.nnn.nnn DNS | nnn.nnn.nnn.nnn is the DNS address | | 43 |
| | DNS2 | Set the network Secondary DNS | nnn.nnn.nnn.nnn DNS2 | nnn.nnn.nnn.nnn is the secondary DNS address | | 44 |
| | HOST | Assigns a user defined name to the Host | "A" HOST | "A" is the new name of the Host, or "" to reset | | 44 |
| | FTPNAME | Assigns a user define name to the FTP Server | "A" FTPNAME | "A" is the new name of the FTP Server, or "" to reset | | 44 |
| | FTPPASS | Set the password to be used when the TDG4 logs onto the FTP Server | "A" FTPPASS | "A" is the password to logon to the FTP Server, or "" to reset | | 44 |

**Table 6: Filter Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Filters | CH | Sets the filters for specified channels | SPST SPST SPST N CH | SPS is the sample rate required for the N channel, if SPS is negative then the filter is causal, otherwise non-causal, if T is present stream will output only if triggered | | 44 |
| | SET-CLOCK | Reset the time to that specified, if there is no GPS or NTP signal | yyyy mm dd hh mm ss SET-CLOCK | yyyy = year, mm = month number, dd = date, hh = hour, mm = minute, ss = second | | 44 |

**Table 7: Display Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Display | VER | Display the Version number of the Operational firmware | VER | none | | 47 |
| | STATUSMODE | Enable or Disable the display of the indicated status in the box in the middle of the Overview Page | ^VPTKSM1M2M3 STATUSMODE | V = Y to output the supply voltage, V = N to stop the output, P = Y to output the PGA, P = N to stop the output, T = Y to output the temperature, T = N to stop the output, L = Y to output the Speedlog, L = N to stop the output, S = Y to output of the MEMS sensor, S = N to stop the output,M1 = Y to output the position of Mass 1, M1 = N to stop the output, M2 = Y to output the position of Mass 2, M2 = N to stop the output, M3 = Y to output the position of Mass 3, M3 = N to stop the output | | 47 |

**Table 8: Trigger Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Trigger | BPTYPE | Set the time constant for the Band Pass Filter | N BPTYPE | N = teacher frequency, N = 0 = off, N = 1 = 5%, N = 2 = 10% and N = 5 = 25% of teacher frequency | | 44 |
| | BPMASK | Set which channels are used for the LTA filter | ^C,C,C BPMASK | C = channel number | | 45 |
| | BPSPS | Set the SPS value used for the LTA filter | ^SPS BPSPS | SPS = the SPS value used for the LTA filter, which must be in the filter train. Value must not be 1000, use positive + values for a non-causal trigger, negative - values for a causal trigger. | | 45 |
| | HPTYPE | Set the time constant for the High Pass Filter (used for absolute level trigger) | N HPTYPE | N = 1, 2, or 3 time constant | | 45 |
| | HPMASK | Set which channels are used for the High Pass filter | ^C,C,C HPMASK | C = channel number | | 45 |
| | HPSPS | Set the SPS value used for the high pass filter | ^SPS HPSPS | SPS = the SPS value used for the HP filter, which must be in the filter train. Value must not be 1000, use positive + values for a non-causal trigger, negative - values for a causal trigger. | | 45 |

**Table 9: Page 2 Trigger Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Trigger | STA | Configure the Short Term Average | c0 c1 c2 c3 c4 c5 c6 c7 STA | c# = time constant of channel #, note all channels must be define when this command is used, only those defined with the command BP-MASK will be used. | | 45 |
| | LTA | Configure the Long Term Average | c0 c1 c2 c3 c4 c5 c6 c7 LTA | c# = time constant of channel #, note all channels must be define when this command is used, only those defined with the command HP-MASK will be used. | | 45 |
| | RATIOS | Configure the Short Term and Long Term Ratios. Trigger is fired if the ratio of the short term average (STA) to the long term average (LTA) is greater than the set amount. | c0 c1 c2 c3 c4 c5 c6 c7 RATIOS | c# = LTA to STA ratio of channel #, note all channels must be define when this command is used, only those defined with the command BP-MASK will be used. | | 46 |
| | MICROG | Sets the absolute trigger in ADC counts | N MICROG | N = ADC counts after a BP filter | | 46 |
| | PRE-TRIG | Sets the number of seconds pre-trigger | N PRE-TRIG | N = number of seconds pre-trigger | | 46 |
| | POST-TRIG | Sets the number of seconds post-trigger | N POST-TRIG | N = number of seconds post-trigger | | 46 |
| | TRIG | Fire a trigger | TRIG | none | | 46 |
| | TRIGGER | Enable or Disable Trigger functions | N TRIGGER | N = 0 to disable trigger functions, N = 1 to enable trigger functions | | 46 |

**Table 10: Logging Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| LOGGING | PGAMASK | Set the gain of the Programmable Gain Amplifier for a specified channel | ? | | | 46 |
| | TRACE | Define which channels are displayed in the SOH display on the Web page and are saved to SD Drive | X N TRACE | X = Channel number MASK, N = Trace number MASK on the SOH Display | | 46 |
| | SDMODE | Set which channels are displayed in the SOH panel on the State of Health display on the Web Interface. | N SDMODE | N = 0 = save streams at less than 500 SPS<br>N = 1 = save 3 specified channels (see TRACE) at 1000 SPS | | 46 |
| | LOGRATE | Set the frequency of log update | N LOGRATE | N = number of seconds between log updates | | 47 |

**Table 11: LCD and Reboot Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| LCD | AUX | Sets what happens on the Auxiliary Serial Port | N AUX | N = 0 = nothing, N = 1 = LCD | | 47 |
| CMD | REBOOT | Restart the processor of the Digitizer | RE-BOOT | none | Automatic | 47 |

**Table 12: Display Commands**

| Topic | Command | Description | Syntax | Variable Definitions | Contingent Upon | Page Number |
|---|---|---|---|---|---|---|
| Display | VER | Display the Version number of the Operational firmware | VER | none | | 47 |
| | STATUSMODE | Enable or Disable the display of the indicated status in the box in the middle of the Overview Page | ^M1M2M3SLTPV STATUSMODE | V = Y to output the supply voltage, V = N to stop the output, P = Y to output the PGA, P = N to stop the output, T = Y to output the temperature, T = N to stop the output, L = Y to output the Speedlog, L = N to stop the output, S = Y to output of the MEMS sensor, S = N to stop the output,M1 = Y to output the position of Mass 1, M1 = N to stop the output, M2 = Y to output the position of Mass 2, M2 = N to stop the output, M3 = Y to output the position of Mass 3, M3 = N to stop the output | | 47 |

### 6.1 Topical Command Syntax with Examples. Summary Table Format

For ease of reference the following tables summarise, and present in tabulated form all the commands available on the TSD4G=ACC

**Table 13: Accelerometer Command Examples, Page 1**

| Commands | | | Examples | |
|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Requirement** | **Command** |
| Accelerometer Sensor | SINE | Set the period of Sinusoidal wave | for 1Hz Sine wave, N = 16000 | 16000 SINE |
| | | | for 4Hz Sine wave, N = 4000 | 4000 SINE |
| | PULSE | Set the period of Square (Pulse) wave | for 1Hz Square (Pulse) wave, N = 16000 | 16000 PULSE |
| | | | for 4Hz Square (Pulse) wave, N = 4000 | 4000 PULSE |
| | STEP | Output one STEP transition. This transition happens after N/16000 of a second. | Output a step transition after 1 second, N = 16000 | 16000 STEP |
| | | | Output a step transition after 4 seconds, N = 64000 | 64000 STEP |
| | RAND | Sets the update rate of a random signal | for an update every second, N = 16000 | 16000 RAND |
| | | | for an update every 1/4 second, N = 4000 | 4000 RAND |
| | NODA | Switch off the Digital to Analogue Converter | Switch off the Digital to Analogue Converter | NODA |
| | DACAMP | Set the amplitude of the Digital to Analogue Converter | ? | ? |
| | CYCLES | Set the number of cycles of Sine, Pulse or Rand waves to perform or Set to continuous | for 10 cycles of Sine, Pulse or Step, N = 10 | 10 CYCLES |
| | | | Set continuous cycles of Sine, Pulse, or Step, N = 0 | 0 CYCLES |

| Commands | | | Examples | |
|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Requirement** | **Command** |
| | GAIN | Set the Accelerometer gain, use the CENT command to centre the Accelerometer mass after each change. | Set the accelerometer gain to be 0.5g | 0 GAIN |
| | OPEN | | | |
| | CLOSED | | | |

**Table 14: Accelerometer Command Examples**

| Commands | | | Examples | |
|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Requirement** | **Command** |
| Accelerometer Sensor | CENT | Centre the Accelerometers, it is recommended to execute this command once a PGA change has been made to the sensor | To centre the accelerometers | CENT |
| | CALON | Sets the calibration line to the Accelerometer to low | To set the calibration line low | CALON |
| | CALOFF | Sets the calibration line to the Accelerometer to high | To set the calibration line high | CALOFF |
| | M | Masses, display positions. | Display the current position of the masses | M |
| | D | Datalines | | D |
| | 99I | Invert | Invert the output of the Accelerometer | 99I |

| Commands | | | Examples | |
|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Requirement** | **Command** |
| | 199I | Revert | Revert the output of the Accelerometer | 199I |
| | 49I | Enable Auto Centre | Enable the Accelerometer to auto centre | 49I |
| | 149I | Disable Auto Centre | Disable autocentre | 149I |
| | = | Save ADC offsets | Save the ADC offsets | = |

**Table 15: ADC Command Examples**

| Commands | | | Examples | |
|---|---|---|---|---|
| **Topic** | **Command** | **Description** | **Requirement** | **Command** |
| ADC | AMP | Set the gain of the Programmable Gain Amplifier | to set the 4th channel to a PGA gain of 8, M = 8, N = 4 | 8 4 AMP |
| | | | to set the 1st channel to a PGA gain of 1, M = 1, N = 1 | 1 1 AMP |

**Table 16: Protocol Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| Protocol | GCF | Set the output protocol to GCF | to set the output protocol to GCF | GCF |
| | GAIA | Set the output protocol to GAIA | to set the output protocol to GAIA | GAIA |
| | SEED | Set the output protocol to MiniSEED | to set the output protocol to Miniseed | SEED |
| | SET-SYS | Set GCF system | Set GCF system to GAIA81 | "GAIA81" SET-SYS |
| | SET-STREAM | Set GCF stream | Set GCF stream to GAIA | "GAIA" SET-STREAM |

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| | SET-CHAR | Set all GCF channel's last character to specified | Set GCF channel's last character to ABCDEFGH | "ABCDEFGH" SET-CHAR |
| | SET-ACHAR | Set an individual GCF channel's last character to specified. | Set GCF channel 5 to G | "G" 5 SET-CHAN |
| | SET-SCHAR | Change the MiniSEED ID | Set the MiniSEED ID to be "HZ" for TDG4 channel 1 | "HZ" 1 SET-SCHAR |
| | | | Reset the MiniSEED ID for TDG4 channel 1 | "" 1 SET-SCHAR |
| | SET-SEEDLOC | Set the MiniSEED location | Set the MiniSEED location to 00 | "00" SET-SEEDLOC |
| | SET-SEEDNET | Set the MiniSEED network | Set the MiniSEED network to MX | "MX" SET-SEEDNET |
| | SET-SEEDSTA | Set the MiniSEED Station Name | Set the MiniSEED station name to GAIA | "GAIA" SET-SEEDSTA |

**Table 17: TCP/IP Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| TCP/IP | IP | Set the IP Address | To set to automatic mode | 255.255.255.255 IP |
| | | | To set to a fixed IP Address to 192.168.50.123 | 192.168.50.123 IP |
| | NTP | Set the address of that of a remote NTP Server | to set to hunt mode | 255.255.255.255 NTP |
| | | | To set to a fixed NTP Address to 19.18.22.123 | 19.18.22.123 NTP |
| | MASK | Set the subnet MASK | To set the subnet MASK to 255.255.255.0 | 255.255.255.0 MASK |
| | GATEWAY | Set the network Gateway Address | To set the network Gateway address to 192.168.1.1 | 192.168.1.1 GATEWAY |
| | DNS | Set the network DNS | To set the network DNS to 93.184.216.34 | 93.184.216.34 DNS |
| | DNS2 | Set the network Secondary DNS | To set the network secondary DNS address to 93.184.216.44 | 93.184.216.44 DNS2 |

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| | HOST | Assigns a user defined name to the Host | Set the Host name to Fred | "FRED" HOST |
| | | | Delete the current Host name | "" HOST |
| | FTPNAME | Assigns a user define name to the FTP Server | Set the FTP Server's name to FTPSERVER | "FTPSERVER" FTPNAME |
| | | | Reset the FTP Server's name | "" FTPNAME |
| | FTPPASS | Set the password to be used when the TDG4 logs onto the FTP Server | Set the password used to logon to the FTP Server to "ABCDEFG" | "ABCDEFG" FTPPASS |
| | | | Rest the password used to logon to the FTP Server | "" FTPPASS |

**Table 18: Filter Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| Filters | CH | Sets the filters for specified channels | To have output streams of 1000, 100 and 50 samples per second on channel 2 | 1000 100 50 2 CH |
| | | | To have a causal stream of 20 samples per second on channel 3 only | -20 3 CH |
| | | | To have channel 4 stream at 100 samples per second only if triggered. | 100T 4 CH |
| | SET-CLOCK | Reset the time to that specified, if there is no GPS or NTP signal | No GPS or NTP, set the time and date to 22:38:00 on 31st July 2018 | 2018 7 31 22 58 00 SET-CLOCK |

**Table 19: Trigger Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | **Requirement** | **Command** |
| Trigger | BPTYPE | Set the time constant for the Band Pass Filter | Set the time constant of the bandpass filter to 5% of teacher frequency. | 1 BPTYPE |
| | BPMASK | Set which channels are used for the LTA filter | Select channels 5 and 7 to be used for the LTA type trigger | #5,7 BPMASK |
| | BPSPS | Set the SPS value used for the LTA filter | Set a non-causal value of 100 for the SPS of the LTA | #100 BPSPS |
| | | | Set a causal value of 50 for the SPS of the LTA | #-50 BPSYS |
| | HPTYPE | Set the time constant for the High Pass Filter (used for absolute level trigger) | Set the High pass filter to be type 2. | 2 HPTYPE |
| | HPMASK | Set which channels are used for the High Pass filter | Select channels 3 and 8 to use for the high pass filter. | ^3,8 HPMASK |
| | HPSYS | Set the SPS value used for the high pass filter | Set a non=causal value of 200 for the SPS of the HP | ^200 HPSYS |
| | | | Set a causal value of 100 for the SPS of the HPF | ^-100 HPSYS |
| | STA | Configure the Short Term Average | Set the time constants of channel 0 = 1, channel 1 = 2, channel 2 = 1, channel 3 = 3, channel 4 = 2, channel 5 = 2, channel 6 = 2 and channel 7 = 1. | 1 2 1 3 2 2 2 1 STA |
| | LTA | Configure the Long Term Average | Set the time constants of channel 0 = 10, channel 1 = 20, channel 2 = 10, channel 3 = 30, channel 4 = 20, channel 5 = 20, channel 6 = 20 and channel 7 = 10. | 10 20 10 30 20 20 20 10 LTA |

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | Requirement | Command |
| | RATIOS | Configure the Short Term and Long Term Ratios. Trigger is fired if the ratio of the short term average (STA) to the long term average (LTA) is greater than the set amount. | Set the LTA to STA ratio of channel 0 = 1, channel 1 = 2, channel 2 = 3, channel 3 = 3, channel 4 = 2, channel 5 = 2, channel 6 = 2 and channel 7 = 2. | 1 2 3 3 2 2 2 2 RATIOS |

**Table 20: Page 2: Trigger Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | Requirement | Command |
| Trigger | MICROG | Sets the absolute trigger in ADC counts | Set the absolute trigger, after a Band Pass Filter, to be 1000. | 1000 MICROG |
| | PRE-TRIG | Sets the number of seconds pre-trigger | Set the number of pre-trigger seconds to 2. | 2 PRE-TRIG |
| | POST-TRIG | Sets the number of seconds post-trigger | Set the number of pre-trigger seconds to 10. | 10 POST-TRIG |
| | TRIG | Force a trigger | Force a trigger from the keyboard | TRIG |
| | TRIGGER | Enable or Disable Trigger functions | Enable Trigger functions | 1 TRIGGER |

**Table 21: LOG Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | Requirement | Command |
| LOGGING | PGAMASK | Set the gain of the Programmable Gain Amplifier for a specified channel | | |

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | Requirement | Command |
| | TRACE | Define which channels are displayed in the SOH display on the Web page and are saved to SD Drive | Select channel 1 for display as Trace 1 and save on SD Card, Select channel 4 for display as Trace 2 and save on SD card, Select channel 6 for display as Trace 3 and save on SD card. | ? |
| | SDMODE | Set which channels are displayed in the SOH panel on the State of Health display on the Web Interface. | Display and save to SD Card the channels defined by the TRACE command at <500 SPS | 0 SDMODE |
| | | | Display and save to SD Card the channels defined by the TRACE command at 1000 SPS | 1 SDMODE |
| | LOGRATE | Set the frequency of log update | Set the time between Log update to 5 seconds | 5 LOGRATE |

**Table 22: Display, LCD and Reboot Command Examples**

| Topic | Command | Description | Examples | |
|---|---|---|---|---|
| | | | Requirement | Command |
| Display | VER | Display the Version number of the Operational firmware | Determine the current version of software | VER |
| | STATUSMODE | Enable or Disable the display of the indicated status in the box in the middle of the Overview Page | Select the output of Mass 3, the output of the MEMS sensor, stop the output of the Speedlog, output the temperature, stop the output of the Peak Ground Acceleration, output voltages. | ^YNYNYYNNY STATUSMODE |
| LCD | AUX | Sets what happens on the Auxiliary Serial Port | Connect the LCD to the Auxiliary Serial Port | 1 AUX |
| CMD | REBOOT | Restart the processor of the Digitizer | Reboot theTDG4 | RE-BOOT |

# 7 COMMANDS VIA THE EADA-350F INTERNET INTERFACE

## 7.1 Accelerometer Commands

| Command | Description |
|---|---|
| **SINE**<br>Select a sine wave for the calibration signal. | Use the N SINE command to set the frequency of the sine wave as the calibration input, If N = 0 the output are continuous sine cycles, otherwise N = frequency, in Hertz, of the signal required, where frequency = N/16000, or N = f/16000.<br>This command is used with the CALON command, which starts the calibration process and the CALOFF command, which terminates the calibration process. See Calibration on page XXXXXXX |
| **PULSE**<br>Select a pulse wave for the calibration signal. | Use the N PULSE command to set the frequency of the pulse waveform as the calibration input. If N = 0 the output are continuous pulse cycles, otherwise N = frequency, in Hertz, of the signal required, where frequency = N/16000, or N = f/16000.<br>The waveform will have a positive pulse width of 25% of the cycle width, followed by a zero pulse width of 25% of the cycle width, followed by a negative pulse width of 25% of the cycle time, followed by a zero pulse width of 25% of the cycle time. For example, if frequency = 1, N = 16000, the positive, zero and negative pulse widths will be 0.25 seconds. This command is used with the CALON command, which starts the calibration process and the CALOFF command, which terminates the calibration process. See Calibration on page XXXXXXX |
| **STEP**<br>Select a step wave form for the calibration signal. | Use the N STEP command to set the frequency of the step wave as the calibration input. If N = 0 the output is a continuous step wave, otherwise N = frequency, in Hertz, of the signal required, where frequency = N/16000, or N = f/16000.<br>This command is used with the CALON command, which starts the calibration process and the CALOFF command, which terminates the calibration process. See Calibration on page XXXXXXX |
| **RAND**<br>Select a random wave form for the calibration signal. | Use the N RAND command to set the frequency of the random wave form as the calibration input. If N = 0 the output are continuous random waveforms, otherwise N = frequency, in Hertz, of the signal required, frequency = N/16000, or N = f/16000. This command is used with the CALON command, which starts the calibration process and the CALOFF command, which terminates the calibration process, see Calibration on page XXXXXXX |
| **NODA**<br>Switch off the digital to analogue converter | Use the NODA command to temporarily break the connection between the accelerometer sensors and the digitizer. |

| | Command | Description |
|---|---|---|
| | **DACAMP**<br>Set the amplitude of the digital to analogue output of the digitizer | Use the N DACAMP command to set the gain of the digital to analogue converter on the output of the digitizer. N is the peak to peak amplitude required, where N = amplitude/1000, a 1Vpp amplitude would be N = 10000. This command is used in the calibration process, see Calibration on page xXXXXXX |
| | **CYCLES**<br>Set the number of cycles of sine, pulse, step or random waveforms to perform. | Use the N CYCLES command to set the number of cycles of sine, pulse, step or random waveforms to perform when the CALON command is used. N is the whole number of cycles to perform. This command is used in the calibration process, see Calibration on page xxxxxxx. |
| **GAIN**<br>Set the peak ground acceleration represented by full scale output. | Use the N GAIN command to set the value of peak ground acceleration to achieve full scale output. N = 0 = ±0.5g, N = 1 = ±1g, N = 2 = ±2g and 3 = ±4g. The CENT command should be executed after each GAIN change. | |
| **CENT**<br>Centre the masses of the sensor | Use the CENT command to centre the mass of the Sensor. This command should be used after the N GAIN command has changed any of its parameter values. For more information about Mass Centring please see page xxxx. | |
| **CALON**<br>Switch Calibration On | Use the CALON command to start the calibration process. For more information about the Calibration process see page xxxxx. | |
| **CALOFF**<br>Switch Calibration Off | Use the CALOFF command to terminate the calibration process. For more information about the Calibration process see page xxxxx. | |
| M<br>Display the position of the masses | Use the M command to display the position of the masses. | |
| D | Use the D command to | |
| I | Use the N I command to , where N = XXXX | |
| | = | Use the = command to save the analogue to digital converter offsets |
| | **AMP**<br>Set the gain of the programmable gain amplifier in the analogue to digital converter when connects the output of the sensor to the digitizer. | Use the G C AMP command to set the programmable gain, on a channel by channel basis, of the ADC connecting the output of the sensor to the digitizer. C represents the channel number (1 – 8) and G the required gain, 1, 2, 4, 8 or 12 |

### 7.2 Protocol Commands

| Command | Description |
|---|---|
| **GCF**<br>Set the streaming output protocol to GCF | Use the GCF command to set the streaming output protocol to GCF. For more information about the GCF protocol see page xxxxxx. |
| **GAIA**<br>Set the streaming output protocol to GAIA | Use the GAIA command to set the streaming output protocol to GAIA. For more information about the GAIA protocol see page xxxxxx. |
| **SEED**<br>Set the streaming output protocol to SEED | Use the SEED command to set the streaming output protocol to SEED. For more information about the SEED protocol see page xxxxxx. |
| **SET- SYS**<br>Set the user defined GCF name. | Use the "AAAAAA" SET-SYS command to set the user defined GCF protocol name to A, where A is up to 6 alpha (uppercase A-Z) or numeric (0 – 9) characters. For more information about the GCF protocol see page XXXXX. |
| **SET- STREAM**<br>Set the user defined GCF Stream name. | Use the "AA" SET-STREAM command to set the user defined GCF protocol stream name to A, where AA are two alpha (uppercase A-Z) or numeric (0 – 9) characters. For more information about the GCF protocol see page XXXXX. |
| **SET- CHAR**<br>Set the last character of all the GCF channels to the same character. | Use the "CCCCCCCC" SET-CHAR command to set the last character of all the GCF channel identifiers to C, where C is a single alpha (uppercase A-Z) or numeric (0 – 9) character. For more information about the GCF protocol see page XXXXX. |
| **SET-ACHAR**<br>Set the last character of individual GCF channels. | Use the "A1A2A3A4A5A6A7A8" SET-ACHAR command to set the last character of individual GCF channel identifiers to A1, where A1 is a single alpha (uppercase A-Z) or numeric (0 – 9) character. A1 represents the intended last character for channel 1, A2 represents the intended last character for channel 2 etc. A1 through A8 must all be defined in the command line. For more information about the GCF protocol see page XXXXX. |
| **SET-SCHAR**<br>Set the MiniSEED stream Identifier | Use the "AA" C SET-SCHAR command to set a channels MiniSEED stream identifier to AA, C is the channel number (1 – 8) and AA is the requested stream identifier. AA is up to 2 alpha (uppercase A-Z) or numeric (0 – 9) characters. For more information about the MiniSEED protocol see page XXXXX. |
| **SET-SEEDLOC**<br>Set the MiniSEED location | Use the "AA" SET-SEEDLOC command to set the user defined location of the unit. AA is up to 2 alpha (uppercase A-Z) or numeric (0 – 9) characters. For more information about the MiniSEED protocol see page XXXXX. |
| **SET-SEEDNET**<br>Set the MiniSEED network | Use the "AA" SET-SEEDNET command to set the user defined SEED network to AA, where A is up to 2 alpha (uppercase A-Z) or numeric (0 – 9) characters. For more information about the MiniSEED protocol see page XXXXX. |

| Command | Description |
|---|---|
| **SET-SEEDSTA**<br>Set the MiniSEED station name | Use the "A" SET-SEEDSTA command to set the user defined MiniSEED station name to A, where A is up to 6 alpha (uppercase A-B) or numeric (0 – 9) characters. For more information about the GCF protocol see page XXXXX. |

### 7.3 Internet Protocol Commands

| Command | Description |
|---|---|
| **IP**<br>Set the IP Address of the Unit | Use the pppp nnn.nnn.nnn.nnn IP command to set the Port number and IP address to be used by the user's browser to connect with the EADA-350F.<br>pppp is the port number and nnn.nnn.nnn.nnn is the IP4 IP address, where nnn.nnn.nnn.nnn consists of four 3 character numeric clauses, separated by a period or ".", pppp is the port address used for communications between the web browser used by the user and the unit. The unit may be supplied with a customer defined STATIC IP address, which should be supplied by the Network Manager of the network to which the unit will be attached, otherwise the unit will acquire and certify its own address. The pppp nnn.nnn.nnn.nnn IP command may be used both to examine and set the IP address. See page xxxxx for further details of the Internet Protocol |
| **NTP**<br>Set the NTP Address to be used by the unit | Use the nnn.nnn.nnn.nnn NTP command to set the address of the NTP server which will be used to supply timing signals in the absence of a GPS Receiver being connected to the Unit. nnn.nnn.nnn.nnn is the NTP address, where nnn.nnn.nnn.nnn consists of four 3 character numeric clauses, separated by a period or "." used for communications between the web browser used by the user and the unit. The nnn.nnn.nnn.nnn NTP command may be used both to examine and set the NTP address. See page xxxxx for further details of the Internet Protocol |
| **MASK**<br>Set the subnet Mask of the unit | Use the nnn.nnn.nnn.nnn MASK command to set the subnet mask of the unit. The nnn.nnn.nnn.nnn is the subnet mask, consisting of four 3 digit numeric clauses, separated by a period or ".", and is used for communications between the web browser used by the user and the unit. The nnn.nnn.nnn.nnn MASK command may be used both to examine and set the subnet MASK address. See page xxxxx for further details of the Internet Protocol |
| **GATEWAY**<br>Set the Gateway address to be used by the unit | Use the nnn.nnn.nnn.nnn GATEWAY command to set the gateway address that should be used by the unit. The nnn.nnn.nnn.nnn is the Gateway address consisting of four 3-digit numeric clauses, separated by a period or ".", and is used for communications between the web browser used by the user and the unit. The nnn.nnn.nnn.nnn GATEWAY command may be used both to examine and set the Gateway address. See page xxxxx for further details of the Internet Protocol |
| **DNS**<br>Set the address of the Primary DNS server on | Use the nnn.nnn.nnn.nnn DNS command to set the DNS address that should be used by the unit. The nnn.nnn.nnn.nnn is the DNS address consisting of four 3-digit numeric clauses, separated by a period or ".", and is used for communications between the web browser used by the user and the unit. The nnn.nnn.nnn.nnn DNS command may be used both to |

| Command | Description |
|---|---|
| the network being used by the unit. | examine and set the DNS address. See page xxxxx for further details of the Internet Protocol. |
| **DNS2**<br>Set the address of the Secondary DNS server on the network being used by the unit. | Use the nnn.nnn.nnn.nnn DNS2 command to set the DNS2 address that should be used by the unit. The nnn.nnn.nnn.nnn is the DNS2 address consisting of four 3-digit numeric clauses, separated by a period or ".", and is used for communications between the web browser used by the user and the unit. The nnn.nnn.nnn.nnn DNS2 command may be used both to examine and set the DNS address. See page xxxxx for further details of the Internet Protocol. |
| **HOST**<br>Assign a name to the Network Host. | Use the "A" HOST command to assign a new user defined name to the network Host, where "A" is the new host consisting of up to 8 mixed alpha characters (A – Z) or numeric digits (0 – 9). See page xxxxx for further details of the Internet Protocol. |
| **FTPNAME**<br>Assign a name to the File Transfer Protocol (FTP) server | Use the "A" FTPNAME command to assign a user defined name to the FTP server used to retrieve data files from the unit. "A" is the name of the FTP Server. See page xxx for further details of FTP transfers. |
| **FTPPASS**<br>Set the FTP password. | Use the "A" FTPPASS command to inform the unit the password to be used, together with the FTPNAME, to logon to the FTP server. See page xxx for further details of FTP transfers. |

### 7.4 Filters

| Command | Description |
|---|---|
| **CH**<br>Set the filters for a specified channel | Use the SPS SPS SPS C CH command to set the filter samples per second (SPS) for a specified channel, where SPS is either 1, 10, 20, 40, 50, 100, 250, 500 or 1000 and C is the channel number (1 – 8) on which the filters are to apply. Up to three filters may be applied to each channel. See page xxxxx for more information on filters |
| **SET-CLOCK**<br>Set the unit date and time of day | Use the yyyy mm dd hh mm ss SET-CLOCK command if the unit is not connected to a GPS receiver or has not been assigned an NTP server and is therefore not able to source a date or time automatically. In this command yyyy is year (made up of 4 numerical digits 0 – 9), mm is month (made up of 2 numerical digits, 1 -12), dd is the date (made up of 2 numerical digits, 1 – 31), hh is the hour (made up of 2 numerical digits, 1 – 23), mm is the minute (made up of 2 numerical digits 1 – 59) and ss is the second (made up of 2 numerical digits 1 – 59). |

### 7.5 Trigger

| Command | Description |
|---|---|
| **BPTYPE**<br>Set up the time constant for a band pass filter | Use the N BPTYPE command to specify the number of samples per second for the LTA filter, where N is <1000. If N is <0 a casual filter is |

| Command | Description |
|---|---|
| using the Short-Term Average (STA) / Long - Term Average (LTA) ratio | selected if N>>0 and <1000 a non-casual filter is selected. See Filters on page xxxx for further information. |
| **BPMASK**<br>Select which channels are used for the LTA filter. | Use the ^C,C,C, BPMASK command to specify the channels that are to make up the LTA filter, where C = channel number. See Triggers on page xxxx for further information. |
| **BPSPS**<br>Set the samples per second value for the LTA filter | Use the ^SPS BPSPS command to set the number of samples per second for the LTA filter, where SPS = the SPS value used for the LTA filter, which must be in the filter train. The value must not exceed 1000, if >0 and <1000 a non-causal is created, if <0 a causal filter is created. See Filters on page xxxx, and Triggers on page xxxx for further information. |
| **HPTYPE**<br>Set the time constant for a high pass filter, used for absolute level trigger. | Use the N HPTYPE command to specify the number of samples per second for the high pass filter, where N = 1 = 100 seconds, 2 = 200 seconds or 3 = 1000 seconds. See Triggers on page xx for further information. |
| **HPMASK** | Use the ^C,C,C HPMASK command to select which channels are used for the High Pass filter, where C = channel number. |
| **HPSPS**<br>Set the samples per second value used for level trigger (must be in filter train) | Use the ^SPS HPSPS command to set the number of samples per second for the high pass filter and must be in the filter train. The value must not be >1000, if >0 and <1000 a non-causal is created, if <0 a causal filter is created. See Filters on page xxxx, and Triggers on page xxxx for further information. |
| **STA**<br>Configure the Short-Term Average (STA) trigger. | Use the C0 C1 C2 C3 C4 C5 C6 C7 STA command to specify the samples per second (SPS) value to assign to the STA trigger, where C# are the time constants to be assigned to channel #. Although all channels must be defined in this command, the channels that are to be used will be those defined using the BP-MASK command. Note: after setting the parameters for a trigger you must reboot the unit. It is necessary to wait at least 5 minutes after reboot before the trigger algorithm becomes active. This is because the trigger algorithm has to settle down as there my be long time constants that have to resolve into their steady state. For more information on Triggers see page xxxx. |
| **LTA**<br>Configure the Long-Term Average (LTA) trigger. | Use the C0 C1 C2 C3 C4 C5 C6 C7 LTA command to specify the samples per second (SPS) value to assign to the LTA trigger, where C# are the time constants to be assigned to channel #. Although all channels must be defined in this command, the channels that are to be used will be those defined using the HP-MASK command. Note: after setting the parameters for a trigger you must reboot the unit. It is necessary to wait at least 5 minutes after reboot before the trigger algorithm becomes active. This is because the trigger algorithm has to settle down as there |

| Command | Description |
|---|---|
| | my be long time constants that have to resolve into their steady state. For more information on Triggers see page xxxx. |
| **RATIOS**<br>Set the Short-Term/Long-Term Average ratio | Use the C0 C1 C2 C3 C4 C5 C6 C7 RATIOS command to specify the ratio triggers of STA to LTA, where C# are the ratios of STA trigger to LTA trigger to assign to channel #, typically these values are <1. Although all channels must be defined in this command, the channels that are to be used will be those defined using the BP-MASK command. |
| **MICROG**<br>Set an absolute trigger in ADU[8] | Use the N MICROG command to set an absolute trigger in ADU (ADC counts), where N is XXXXXXX |
| **PRE-TRIG**<br>Specify the number of seconds for the pre-trigger period. | Use the N PRE-TRIG command to specify the pre-trigger period, where N is in seconds. The unit will include in its output N seconds of output recorded prior to detecting a trigger event. For more information on Triggers see page xxxx. |
| **POST-TRIG**<br>Specify the number of seconds for the post-trigger period. | Use the N POST-TRIGGER command to specify the post-trigger period, where N is in seconds. The unit will include in its output N seconds of output recorded after detecting a trigger event. For more information on Triggers see page XXXX. |
| **TRIG**<br>Fire a trigger event manually. | Use the TRIG command to manually fire a trigger event. For more information on Triggers see page xxxx. |
| **TRIGGER**<br>Enable or Disable the Triggering Algorithm | Use the N TRIGGER command to enable or disable the triggering algorithm, where N = 0 to disable, or turn triggering off, and N = 1 to enable, or turn triggering on. For more information on Triggers see page xxxxx. |

### 7.6 Log

| Command | Description |
|---|---|
| **PGAMASK**<br>Specify which channels have their Peak Ground Acceleration included in the Log. | Use the ^N,N,N,N,N,N,N,N PGAMASK command to specify which of the channels (1 – 8) have their PGA included in the log output file, where N are the channel numbers (1-8). See Peak Ground Acceleration on page xxxx for further details. |
| **TRACE**<br>Select which channels are output within the SEED protocol | Use the N N N TRACE command to specify which combination of the 3-output channels are registered within the SEED protocol, where N = 1 and/or 2 and/or 3. |
| **SDMODE** | Use the N SDMODE command to set the save stream mode, where if N = 0 in SEED mode (See protocols on page xxx) save streams <500sps, |

[8] ADU – Analogue/Digital units or ADC Counts

| Command | Description |
|---|---|
| Set the save stream mode. | if N = 1 save the 3 channels specified in the TRACE command, see TRACE on page xxxxx, at 1000 sps. |
| **LOGRATE**<br>Set how long between log updates. | Use the N LOGRATE command to set the number of seconds between log updates, where N = seconds. The items output to the log are specified in the STATUSMODE command, see page xxxx |

### 7.7 Display

| Command | Description |
|---|---|
| **VER**<br>Show the version number of the EADA-350F firmware running. | Use VER to show the version number of the EADA-350F firmware running. |
| **STATUSMODE**<br>Set which parameters are output to the log .and the status window on the Overview Page on the web site. | Use the ^VPTLSM1M2M3 STATUSMODE command to set which parameters are output to the log and the status window on the Overview Page on the web site, where M1 = Y to output the position of the mass of accelerometer 1 (N/S), M2 = Y to output the position of the mass of accelerometer 2 (E/W) and M3 = Y to output the position of mass of accelerometer 3 (Z). S = Y to output the signal from the MEMS[9] sensor. L = Y to output the Speedlog (See Speedlog information on page XXXXX), T = Y to output the internal temperature of the unit. P = Y to output the Peek Ground Acceleration and V = Y to output the supply voltages. Setting any parameter to N stops the output of the respective parameter. |

### 7.8 LCD

| Command | Description |
|---|---|
| **AUX**<br>Set where the data from the Auxiliary Serial Port is routed to. | Use N AUX to set where the data from the Auxiliary Serial Port is routed to, where N = 0 = nothing and N = 1 = LCD. See LCD on page xxxxx for further information. |

### 9.1 System Command

| Command | Description |
|---|---|
| **REBOOT**<br>Restart the EADA-350F | A REBOOT command informs the unit to restart the firmware of the EADA-350F digital accelerometer, essentially it is a firmware power off then power on. Use the REBOOT command in the following circumstances:<br>When trigger parameters have been changed using any of the Trigger related command, such as TRIGGER, BPTYPE, BPMASK, BPSYS, |

[9] MEMS - Microelectromechanical systems (MEMS), also written as micro-electro-mechanical systems (or microelectronic and microelectromechanical systems)

| | |
|---|---|
| | HPTYPE, HPMASK, HPSYS, STA, LTA, RATIOS, MICROG, CH, SET_CLOCK<br><br>If, during a training or maintenance session you are instructed to do so. |

# 8 CALIBRATION

Calibration inputs are provided to allow for relative calibration of the sensor across frequency, waveform and over time. The calibration process injects known waveforms into the sensor's feedback loop.

The calibration waveforms are controlled by several parameters as listed below:

- AMP – set the peak to peak amplitude of the calibration signal
- SINE – select a sine wave calibration signal at a specified frequency.
- PULSE – select a pulse wave calibration signal at a specified frequency and shape.
- STEP- select a step pulse calibration signal at a specified frequency
- RAND – select a random waveform calibration signal, from the 3 types listed above, at a specified frequency.
- CYCLES – select the number of cycles of signal to input, or continuous input.
- CALON – switches calibration on.
- CALOFF – switches calibration off.

The calibration signal is digitised at the highest rate.

# 9 STATE-OF-HEALTH

Each web interface, see page 14, contains a State-of-Health (SoH) display to enable the user to monitor the performance and outputs of the EADA-350F digital accelerometer. The displayed figures represent the state of the horizontal (N/S) and (E/W) and vertical (Z) outputs.

## 10 MASS CENTRING

The mass positions are zeroed at the factory at room temperature, with the unit perfectly level, they may be centred using the CENT command see page xxxxxxx.

# 11 TAPS

The digitizer section of the EADA-350F digital accelerometer converts the analogue signal of each of its eight inputs (the analogue outputs of the sensor) to separate digital data outputs initially at a high sample rate (1000sps), this digital data is then sampled at reducing sample rates, this is called decimation, each output stage of the reduced digital data is called a tap.

The highest data sample rate is 1000 samples per second, obtained by setting the SPS to 1000 using the SPS command, other rates are available, the SPS command supports sample rates of 1000, 500, 250, 200, 100, 50, 40, 20, 10 and 1, for further details of the SPS command see page xxxxxxxxxxxx

# 12 TRIGGERING

The EADA-350F digital accelerometer will, in normal operation, output continuous data at a sample rate specified by the user. The EADA-350F can be requested to apply a triggering algorithm on acquired data. Triggering will allow the user to normally record data continuously at a low data rate, thereby saving bandwidth and analysis time, but record data at a much higher sampling rate during the time certain criteria, called triggers, are active or have been "triggered" or "fired". The parameters controlling the triggering algorithm, and controlling the data output when triggered, are selectable by the user.

<example>

he digitizer can be set to examine any tap, including those the user has not selected to output, the chosen taps will depend on the sensitivity of the data you are monitoring.

There are three types of trigger:

1 An absolute or level trigger which is triggered, or fires, when the absolute sampled values exceed a configured value. The commands HPTYPE, HPMASK, HPSPS, TRIGGER and MICROG control the parameters associated with the absolute or level trigger.
   - HPTYPE: Specifies the time constant used by the High Pass filter used to detect level triggers.
   - HPMASK: Specifies which channels are used for the High Pass filter or level trigger
   - HPSYS: Specifies the samples per second (SPS) used for the High Pass or level trigger.
   - TRIGGER: Enables or disables trigger functions.
   - MICROG: Specifies the Analogue to Digital Converter count (in ADU units) after the Band Pass Filter, exceed this count fires the trigger.

2 Short-Term Average (STA) and Long-Term Average Triggers (LTA), which occur when the ratio of the STA to the LTA exceeds a user dictated value. The commands STA, LTA, RATIOS, BPTYPE, BPMASK, BPSYS, and TRIGGER control the parameters associated with the STA and LTA trigger.
   - STA: Specifies the short-term time constant for each channel.
   - LTA: Specifies the long-term time constant for each channel.
   - RATIOS: Specifies at which ratio level, of the STA to the LTA, fires the trigger.
   - BPTYPE: Specifies the time constant used by the Band Pass filter used to detect STA and LTA triggers.
   - BPMASK: Specifies which channels are used for the Band Pass filter used to detect STA and LTA triggers.
   - BPSYS: Specifies the samples per second (SPS) used for the Band Pass filter used to detect STA and LTA triggers.
   - TRIGGER: Enables or disables trigger functions.

3 A manually controlled forced trigger. The command TRIG allows the user to manually fire a trigger using the command interface.

# 13 STREAMS

# 14 PROTOCOLS

The current version of the EADA-350F digital accelerometer supports three communication protocols:

1 miniSEED[10],a subset of the SEED standard that is used for time series data. See section xxxxx for more information about the miniSEED protocol.

2 Güralp Compressed Format

3 Gaia Protocol

## 14.1 miniSEED Protocol

Time series are stored as generally independent, fixed length data records which each contain a small segment of contiguous series values. A reader of miniSEED is required to reconstruct longer, contiguous time series from the data record segments. Common record lengths are 512-byte (for real time streams) and 4096-byte (for archiving), other record lengths are used for special scenarios.

A "file" or "stream" of miniSEED is simply a concatenation of data records. Depending on the capabilities of the intended reader the data records for multiple channels of data may be multiplexed together,

The download of miniSEED data from DIGITAL SIGMA can be done via Ethernet, USB & direct connection to the SD card.

## 14.2 Güralp Compressed Format (GCF)

## 14.3 Gaiacode Format (PCF)

[10] http://ds.iris.edu/ds/nodes/dmc/data/formats/miniseed/ taken 16th June 2020.

# 15 DOWNLOADING EADA-350F DATA FILES VIA FTP VIA ETHERNET

- Connect your EADA-350F digital accelerometer equipment to a power source.
- Connect the Ethernet cable.
- Run FTP_SD_2_PC.exe and select the IP of the unit you wish to download from and press the index button.
- < picture>
- If you have changed the FTP name and/or FTP password using the FTPNAME and/or FTPPASS, enter the new entries into the User ID & Password fields.
- <picture>
- When the index is complete select the download folder and the data time/date range.
- <picture>
- Press the download button and when the program auto-closes the transfer is complete

# 16 READING EADA-350F SD MEMORY CARDS

USB/Physical SD :

- Connect the EADA-350F digital accelerometer to a power source.
- Connect the Ethernet cable.
- Run COPY_SD_2_PC.exe and select the drive letter assigned to the device by windows.
  <picture>
- Click Build
  <picture>
- Select download destination and filename.
  <picture>
- Select data time/date range.
  <picture>
- Click download.
- When the download is complete you can review the data with any miniSeed compatible application.

# 17 APPENDICES

## 17.1 Electrical Considerations

## 17.2 Connectors

**Mil-Spec Tau External Connectors**

RJF series Mil Spec (TCP/IP) **Mfr. Part No.RJF22N00**

10-Way Male (Power/USB) **Mfr. Part No.62GB-12E12-10PN**

10-Way Female (GPS) **Mfr. Part No.62GB-12E12-10SN**

### *17.2.1 Power and Communication Connector*

Suitable male connector: 10-Way Male (Power/USB) **Mfr. Part No.62GB-12E12-10PN,** conforming to MIL DTL 26482.


| Pin | Function |
|---|---|
| A | USB Vcc |
| B | USBD- |
| C | USBD+ |
| D | USB GND |
| E | Power Ground |
| F | Power |
| G | |
| H | |
| I | |
| J | |
| K | |

**Figure 23: Power and Communications Connector**

### *17.2.2 Pinout of the Ethernet cable*

Amphenol RJField-series 8P8C. It consists of an ISO 8877 8P8C standard and a modular RJ45 socket.

| Pin | Function |
|---|---|
| 1 | Transmit Data + |
| 2 | Transmit Data - |
| 3 | Receive Data + |
| 4 | NC |
| 5 | NC |
| 6 | Receive Data - |
| 7 | NC |
| 8 | NC |

**Figure 24: Pinout of Ethernet Connector**

### *17.2.3 GPS cable pinout:*

- 10-way female Mil-spec connector.

| Pin | Function |
|---|---|
| A | +V |
| B | 1 PPS |
| C | RS232 RX |
| D | RS232 TX |
| E | 0V loop to pin F |
| F | 0V loop to pin F |
| G | +Volts |
| H | -Volts |

**Figure 25: GPS Connector**

### *17.2.4 Top View of EADA-350F digital accelerometer, Showing LCD and Levelling Bubble*

**Figure 26: Top View of EADA-350F, showing LCD and Levelling Bubble**

### *17.2.5* Bottom *View* of *EADA-350F* Base, showing Levelling Feet and Fixing Point

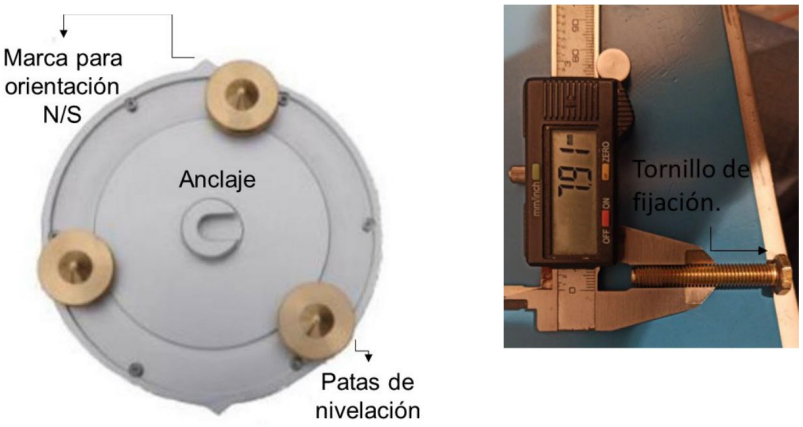



**Figure 27: Base of the EADA-350F, showing Levelling Feet and Fixing Point**

## 17.3 Bootload.exe

Bootload is a firmware update and IP Address discovery tool, used to update the firmware (re-flashing) of the EADA-350F digital accelerometer over the network, or to discover or define the TCP/IP address of the EADA-350F.

From time to time Encardio-rite may release the latest version of the firmware for the EADA-350F, the intention of the update will be to resolve issues (bugs) with previous version of the firmware or to release compatible new functionality. Unless expressly stated the latest level of firmware will be backwards compatible and therefore all previous functionality and the output data format will remain compatible.

It may be possible, through the selection of an incorrect combination of operating parameters, to lose communications with the EADA-350F digital accelerometer, such as having selecting a data output protocol for the USB interface, then attempting to use the USB interface for discovering or defining the TCP/IP address (this should be done in the reverse order: selecting the TCP/IP address first and then changing the USB protocol to the required protocol). In such cases it will be necessary to use the Bootload to upload a new copy of the firmware.

The decision to upgrade the EADA-350F digital accelerometer will be taken and executed by the customer unless a maintenance contract is in place, Encardio-rite recommends that customers should attain to use the latest version of firmware.

### *17.3.1 Downloading the Bootload Programme*

The Bootload programme file may be downloaded from the Gaiacode web site, using an internet browser navigate to www.gaiacode.com\Support\Download page and select the model number (EADA-350F digital accelerometer) from the drop down list box, and then select Bootload", the download should start immediately. The downloaded Bootload installation file, when fully downloaded, will appear in your Download directory. Please move the file to a your Gaiacode directory, or your directory of choice and then select the downloaded file and run it using Administrator privileges, (right-hand click file name and select "run as administrator").

### *17.3.2 Downloading the latest version of EADA-350F Firmware*

The latest (and previous) version of firmware for the EADA-350F digital accelerometer may be downloaded from the Gaiacode web site, using an internet browser navigate to www.gaiacode.com\Support\Download page and select the model number (EADA-350F), and then select "Latest Firmware", the download should start immediately. The downloaded firmware file, when fully downloaded, will appear in your Download directory. Please move the file to your Gaiacode directory, or your directory of choice.

### *17.3.3 Discovering the IP Address of the EADA-350F.*

- Ensure the EADA-350F digital accelerometer is powered and connected to the network.
- Run the Bootload programme as an Administrator
- The programme will automatically scan the connected network for Encardio-rite products and display the corresponding TCP/IP address of any device found.


**Figure 28: Bootload TCP/IP Address Discovery Window**

- Please note the TCP/IP Address for use in communicating with the EADA-350F digital accelerometer using an internet web browser.
- You may now terminate the Bootload programme.

### *17.3.4 Re-flashing the firmware of the EADA-350F*

- Disconnect power from the EADA-350F digital accelerometer. This process works ONLY when the EADA-350F is switched off.
- Ensure the EADA-350F is connected to the Ethernet using the P/N 109476 or equivalent cable.
- Run the *Bootload.exe* program in Administrator mode. The program will appear as below:

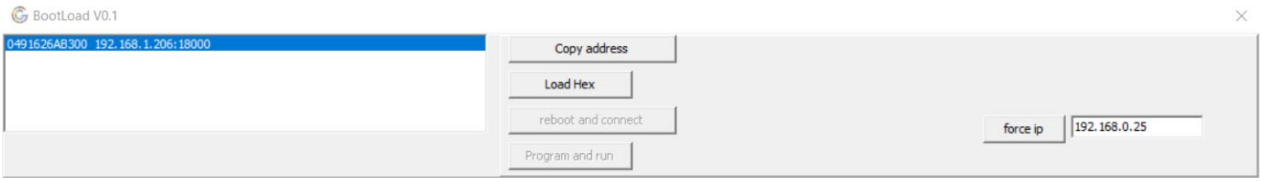



**Figure 29: Bootloader – Re-flashing the Firmware of the EADA-350F**

- Select the EADA-350F you are using, if the TSD4G-AC-C you are using does not appear follow the instructions in Appendix X.
- Select "Load Hex". The program will ask you to locate the update .hex file obtained from the Gaiacode Support web site, see 19.7.1.
- The reboot and connect button in the Bootload window should now display clearly.
- Select the "reboot and connect button".
- Wait for the EADA-350F digital accelerometer to reboot, if you have the USB cable connecting the EADA-350F and the PC you may hear the Window's ping pong twice, indicating that Windows has detected the disappearance of a USB device and then discovered it again as a USB device. The TCP/IP address should re-appear in the Bootload window.
- Close the Bootload programme and proceed.

**NOTE:** The Bootload programme installs the .hex file that contains the operational code for the TAU digitizer.

# 18 GLOSSARY

| | |
|---|---|
| Causal | Used to describe an IIR filter, where the output changes with less pure time delay than a non-causal filter (FIR). |
| FIR | Finite Impulse Response |
| IIR | Infinite Impulse Response |
| PGA | Programmable Gain Amplifier |
| PGA | Peak Ground Acceleration |
| STREAM | |
| TAP | |