AVN-GMC

IEEE1588 PTP Grandmaster Clock
with GPS Receiver

Manufacturers of Audio Products for AV,
Installed Sound, Broadcast Radio & Broadcast TV

SONIFEX

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This handbook is for use with the following product:
IEEE1588 PTP Grandmaster Clock with GPS Receiver
AW10735, Stock Code: 30-294

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SONIFEX

Register Online for an Extended 2 Year Warranty

As standard, Sonifex products are supplied with a 1 year back to base warranty.

If you register the product online, you can increase your product warranty to 2 years and we can also keep you informed of any product design improvements or modifications.

Product: _____

Serial No: _____

To register your product, please go online to www.sonifex.co.uk/register

Product Warranty - 2 Year Extended

As standard, Sonifex products are supplied with a 1 year back to base warranty. In order to register the date of purchase and so that we can keep you informed of any product design improvements or modifications, it is important to complete the warranty registration online. Additionally, if you register the product on the Sonifex website, you can increase your product warranty to 2 years. Go to the Sonifex website at: www.sonifex.co.uk/register to apply for your 2 year warranty.

Note: For your own records the product serial number is recorded on the CE certification page of this handbook.

Sonifex Warranty & Liability Terms & Conditions

1. Definitions

'the Company' means Sonifex Ltd and where relevant includes companies within the same group of companies as Sonifex Limited.

'the Goods' means the goods or any part thereof supplied by the Company and where relevant includes: work carried out by the Company on items supplied by the Purchaser; services supplied by the Company; and software supplied by the Company.

'the Purchaser' means the person or organisation who buys or has agreed to buy the Goods.

'the Price' means the Price of the Goods and any other charges incurred by the Company in the supply of the Goods.

'the Warranty Term' is the length of the product warranty which is usually 12 months from the date of despatch; except when the product has been registered at the Sonifex website when the Warranty Term is 24 months from the date of despatch.

'the Contract' means the quotation, these Conditions of Sale and any other document incorporated in a contract between the Company and the Purchaser.

This is the entire Contract between the parties relating to the subject matter hereof and may not be changed or terminated except in writing in accordance with the provisions of this Contract. A reference to the consent, acknowledgement, authority or agreement of the Company means in writing and only by a director of the Company.

2. Warranty

a. The Company agrees to repair or (at its discretion) replace Goods which are found to be defective (fair wear and tear excepted) and which are returned to the Company within the Warranty Term provided that each of the following are satisfied:

    i. notification of any defect is given to the Company immediately upon its becoming apparent to the Purchaser;

    ii. the Goods have only been operated under normal operating conditions and have only been subject to normal use (and in particular the Goods must have been correctly connected and must not have been subject to high voltage or to ionising radiation and must not have been used contrary to the Company's technical recommendations);

    iii. the Goods are returned to the Company's premises at the Purchaser's expense;

    iv. any Goods or parts of Goods replaced shall become the property of the Company;

    v. no work whatsoever (other than normal and proper maintenance) has been carried out to the Goods or any part of the Goods without the Company's prior written consent;

vi.   the defect has not arisen from a design made, furnished or specified by the Purchaser;

vii.   the Goods have been assembled or incorporated into other goods only in accordance with any instructions issued by the Company;

viii.   the defect has not arisen from a design modified by the Purchaser;

ix.   the defect has not arisen from an item manufactured by a person other than the Company. In respect of any item manufactured by a person other than the Company, the Purchaser shall only be entitled to the benefit of any warranty or guarantee provided by such manufacturer to the Company.

b.   In respect of computer software supplied by the Company the Company does not warrant that the use of the software will be uninterrupted or error free.

c.   The Company accepts liability:

(i)   for death or personal injury to the extent that it results from the negligence of the Company, its employees (whilst in the course of their employment) or its agents (in the course of the agency);

(ii)   for any breach by the Company of any statutory undertaking as to title, quiet possession and freedom from encumbrance.

d.   Subject to conditions (a) and (c) from the time of despatch of the Goods from the Company's premises the Purchaser shall be responsible for any defect in the Goods or loss, damage, nuisance or interference whatsoever consequential economic or otherwise or wastage of material resulting from or caused by or to the Goods. In particular the Company shall not be liable for any loss of profits or other economic losses. The Company accordingly excludes all liability for the same.

e.   At the request and expense of the Purchaser the Company will test the Goods to ascertain performance levels and provide a report of the results of that test. The report will be accurate at the time of the test, to the best of the belief and knowledge of the Company, and the Company accepts no liability in respect of its accuracy beyond that set out in Condition (a).

f.   Subject to Condition (e) no representation, condition, warranty or other term, express or implied (by statute or otherwise) is given by the Company that the Goods are of any particular quality or standard or will enable the Purchaser to attain any particular performance or result, or will be suitable for any particular purpose or use under specific conditions or will provide any particular capacity, notwithstanding that the requirement for such performance, result or capacity or that such particular purpose or conditions may have been known (or ought to have been known) to the Company, its employees or agents.

g.   (i)   To the extent that the Company is held legally liable to the Purchaser for any single breach of contract, tort, representation or other act or default, the Company's liability for the same shall not exceed the price of the Goods.

(ii)   The restriction of liability in Condition (g)(i) shall not apply to any liability accepted by the Seller in Condition (c).

h.   Where the Goods are sold under a consumer transaction (as defined by the Consumer Transactions (Restrictions on Statements) Order 1976) the statutory rights of the Purchaser are not affected by these Conditions of Sale.

Unpacking Your Product

Each product is shipped in protective packaging and should be inspected for damage before use. If there is any transit damage take pictures of the

product packaging and notify the carrier immediately with all the relevant details of the shipment. Packing materials should be kept for inspection and also for if the product needs to be returned.

The product is shipped with the following equipment so please check to ensure that you have all of the items below. If anything is missing, please contact the supplier of your equipment immediately.

Item	Quantity	
Product unit	1	
IEC mains lead fitted with moulded mains plug		1
Handbook and warranty card	1	

If you require a different power lead, please let us know when ordering the product.

Repairs & Returns

Please contact Sonifex or your supplier if you have any problems with your Sonifex product. Email technical.support@sonifex.co.uk for the repair/upgrade/returns procedure, or for support & questions regarding the product operation.

Safety & Installation of Mains Operated Equipment

There are no user serviceable parts inside the equipment. If you should ever need to look inside the unit, always disconnect the mains supply before removing the equipment covers. The cover is connected to earth by means of the fixing screws. It is essential to maintain this earth/ground connection to ensure a safe operating environment and provide electromagnetic shielding.

Voltage Setting Checks

Ensure that the machine operating voltage is correct for your mains power supply by checking the box in which your product was supplied. The voltage is shown on the box label. The available voltage settings are 115V, or 230V. Please note that all products are either switchable between 115V and 230V, or have a universal power supply.

Power Cable & Connection

An IEC power connector is supplied with the product which has a moulded plug attached.

The mains plug or IEC power connector is used as the disconnect device. The mains plug and IEC power connector shall remain readily operable to disconnect the apparatus in case of a fault or emergency.

The mains lead is automatically configured for the country that the product is being sent to, from one of:

Territory	Voltage	IEC Lead Type	Image
UK & Middle East	230V	UK 3 pin to IEC lead	
Europe	230V	European Schuko round 2 pin to IEC lead	
USA, Canada and South America	115V	3 flat pin to IEC lead	
Australia & New Zealand	230V	Australasian 3 flat pin to IEC lead	

Connect the equipment in accordance with the connection details and before applying power to the unit, check that the machine has the correct operating voltage for your mains power supply.

This apparatus is of a class I construction. It must be connected to a mains socket outlet with a protective earthing connection.

Important note: If there is an earth/ground terminal on the rear panel of the product then it must be connected to Earth.

CE and UKCA conformity

The products in this manual comply with the essential requirements of the relevant UK and European health, safety and environmental protection legislation. The technical justification file for this product is held at Sonifex Ltd. Relevant declarations of conformity can be found at: https://www.sonifex.co.uk/declarations

WEEE Directive

Directive 2012/19/EU of the European Parliament and of the Council of 4th July 2012 lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste from electrical and electronic equipment (WEEE).

The policy of Sonifex Ltd is to comply with all applicable laws of all jurisdictions having authority over Sonifex's business, including the WEEE directive. Accordingly, Sonifex has implemented a rigorous program designed to ensure compliance of its products with the WEEE directive. The latest statements can be found at: https://www.sonifex.co.uk/company/recycling

Atmosphere/Environment

This apparatus should be installed in an area that is not subject to excessive temperature variation (<0°C, >50°C), moisture, dust or vibration.

This apparatus shall not be exposed to dripping or splashing, and no objects filled with water, such as vases shall be placed on the apparatus.

1. AVN-GMC IEEE1588 PTP Grandmaster Clock with GPS Receiver

Introduction

Fig 1-1: The AVN-GMC Front Panel

The AVN-GMCS is a PTPv2 grandmaster clock for use with AoIP applications. IEEE1588-2008 PTPv2 (precision time protocol) is used to synchronise all the nodes within a network. To achieve this one of the nodes must become the master clock and distribute time packets to the others. The AVN-GMCS is designed to perform this role simply and accurately, enabling sub micro second synchronisation between all nodes.

The AVN-GMCS supports the Default Profile and in normal operation, the unit has PTPv2 time stamping resolution to 8nsec. The AVN-GMCS uses a combination of a GPS receiver, a PLL (phase lock loop) and a specialist on-board clock device to create the precise, low jitter clock signals required to drive the physical transceiver's time stamping circuitry, also providing holdover if the GPS signal is lost.

The specialist on board clock , which is used to sustain the PTP clock if the GPS signal is lost, is available in three different types:
TCXO, OXCO and **CSAC** (Chip Scale Atomic Clock, Caesium), which vary in both price and accuracy:

AVN-GMCS – TCXO Temperature Compensated Oscillator accurate to 1 part per million (worst case 1 sec gain/loss every 11.5 days). *

AVN-GMCOS – OCXO Oven Controlled Oscillator accurate to 0.1 parts per million (worst case 1 sec gain/loss every 115 days). *

AVN-GMCCS – SAC Quantum Atomic Clock accurate to 0.00050 parts per million (worst case 1 sec gain/loss every 63 years). *

An external sync clock input can act as an alternative reference source to GPS. Clock outputs, driven from the physical transceiver, can be used to provide media clocks for external equipment local to the AVN-GMC when it is in both 'master' and 'slave' states. The clock outputs are available as a single AES-3id output and two outputs which can be selected as either word clock or variable PPS. The wordclock can operate at 32, 44.1, 48, 96, 176.4 and 192kHz. When set as a variable PPS output, the unit can act as a clock master to distribute a reference frequency to test and measurement equipment.

The front panel of the unit shows the PTP timebase as standard, which is always set to International Atomic Time (TAI). It can be reconfigured to display UTC or 'Local Time' instead. Local time allows a fixed time offset from UTC to be applied (useful for time zones) and the accommodation of automatic daylight saving time changes by entering Spring Forward and Fall Back dates.

The built-in webserver, or front panel OLED display, can be used to configure the unit. Front panel LEDs show the synchronisation status, reference lock status and the status of the AC and DC power supply inputs.

The brightness of the OLED display and LED indicators can be adjusted for low or high lighting conditions

4 general purpose outputs indicate critical states for the unit using a 9 way D-type connector mounted on the rear panel. Pull down when active pins are supplied for reference source, reference lock status, AC power present and DC power present.

* This figure represents the holdover accuracy should the GPS signal be lost - this is an approximation based on 1st year stability figures.

The unit has a front panel power button and dual power connectors - an IEC mains input and a 12V DC input, which allows the AVN-GMCS to be used for both studio and mobile installations. Moreover this allows for a secondary power source to reduce the effect of power down events. In any case, the unit monitors the status of both power sources and displays this on the front panel.

The unit can be put into a low-power sleep mode when not in use, with an instant start when power is re-applied. In power off situations, a super capacitor is used to keep the GPS receiver powered in a low power mode for more than 20 hours, enabling the receiver to regain lock immediately rather than having to 'cold' start. A Real-Time Clock (RTC) is fitted to hold the time over power off conditions.

Front Panel Display & Indicators

Front Panel Indicators

Ethernet
An indication of network link status. This LED is green when an Ethernet link is established or red when the link is down.

GPS
If the unit is using GPS as its primary synchronisation source, this LED is illuminated green.

Fig 1-2: Front Panel Indicators

Sync In

If the unit is using the external input as the primary synchronisation source, this LED is illuminated green.

Lock

GPS Mode:

Green - The GPS receiver has locked to 4 or more satellites.
Yellow - The GPS receiver has locked to 3 satellites.
Red - The GPS receiver has locked to 2 or fewer satellites.

Ext Sync Mode:

Green - The input sync clock is valid.
Red - The input sync clock is invalid or disconnected.

Master

Green - This means that the PTP state of the unit is set to   Master.
Yellow - This shows that the unit is in another PTP state other   than Master or Slave.
Red - This means that the PTP state of the unit is set to Slave.

AC PSU & DC PSU

The colour of these LEDs show the state of each power input:

Green - This means that the cable is plugged in and is providing the correct voltage level, within the range   11V to 13V.

Yellow - This means that the cable is plugged in but the voltage level is in a warning state, within the ranges of either 10V to 11V or 13V to 14V.

Red - This means that the cable is unplugged or the voltage level is out of specification (less than 10V or more than 14V).

Display & Spinwheel

Fig 1-3: Display & Spinwheel

The front panel contains an OLED monochrome display which is normally used to show unit statuses and settings . The display is used with the spinwheel and directional buttons to navigate, select and edit parameters & settings via the menu structure.

Fig 1-4: Default Screen Display

From the top, left column:
Device ID
Active PTP profile
Number of Satellites detected
Average Signal Strength – Each bar represents 10dBHz

From the top, right column:
Time displayed in 24 hour, hh:mm:ss format and the selected time base
Date displayed in the selected date format.
External sync input frequency
Selected word clock output frequency
Selected VarPPs output frequency

Power Button

This puts the unit in and out of standby mode.

Standby Mode - Power button is red

Normal Powered Mode - Power button is green

On applying power to the AC mains or DC power inputs, the button is illuminated red, meaning that it is in standby mode. In standby mode, all operation is halted. A momentary press of the power button restarts the unit into normal power mode.

To put the unit into standby mode, press and hold the button for two seconds, then release it. The current mode is remembered through a power cycle and the standby mode can also be disabled through the webserver.

Resetting the unit then holding down the power button puts the unit into boot loader mode.

GPS Operation

The unit will begin collecting GPS information as soon as an antenna is connected. The number of satellites found is displayed on the front panel, along with the average signal strength. More in depth lock information is included on the web server 'Device Info' page. On boot up, the unit can take a few minutes to deliver the first GPS fix. After this, the on-board super capacitor will enable the receiver to store the data required to perform a quick start on power up. The super capacitor will power the receiver's memory for more than 20 hours.

Rear Panel Connectors

Fig 1-5: AVN-GMC Rear Panel

Sync Input

This is a 75Ω input used to connect an external synchronisation source to drive the internal PTP clock. Connect a wordclock to this input and from the menu select Device Settings> Reference Input> External Sync Input to enable it and select the sample rate. This allows the distribution of an existing station wordclock through the network. Supported sample rates are 32, 44.1, 48, 88.2, 96, 176.4, 192kHz and 10MHz.

WC (Wordclock) Output

This is a 50Ω TTL level wordclock output which is synchronised to the onboard PTP clock. The rate is selectable from the front panel menu (Device Settings> Wordclock) or the webserver. Selectable sample rates are 32, 44.1, 48, 88.2, 96, 176.4, and 192kHz.

AES-3id Output

This is a 75Ω AES-3id digital audio signal, with muted audio, that is synchronised to the onboard PTP clock. The rate is selectable from the front panel menu (Device Settings> AES-3id) or the webserver. Selectable sample rates are 32, 44.1, 48, 88.2, 96, 176.4, and 192 kHz.

Variable PPS (Pulse Per Second) Output

This 50Ω output is synchronised to the onboard PTP clock and the rate is selectable through the front panel menu (Device Settings> Variable PPS) and webserver. Selectable rates are 1Hz, 10, 100, 1kHz, 10k, 100k & 1MHz.

Note: The Wordclock and Variable PPS Outputs can both provide either Wordclock or Variable PPS Outputs. This is selected from the front panel or through the webserver.

GPS Antenna

An SMA socket is used for connection to an active or passive GPS antenna.

GPI/O Remote Input/Output Connector

A 9 way D-type female connector contains 4 open-collector outputs and 4 active low inputs. The 4 outputs provide alarms/indicators for:

Pin #	Type	Function	Action
1	Output	GPS or External Sync	Open collector to ground when GPS selected
2	Output	Lock indication	Open collector to ground when selected reference (GPS or External) is locked. (Follows Lock LED).
3	Output	AC Power status	Open collector to ground when AC present
4	Output	DC Power status	Open collector to ground when DC present
5	Ground	Ground reference	
6	Input	Not used	
7	Input	Not used	
8	Input	Not used	
9	Input	Not used	

Ethernet

This is a standard 100BASE-T CAT5 Ethernet RJ45 connector to connect the unit to the network. The connector has two LEDs that indicate data throughput and link status. The unit can be controlled remotely over the Ethernet connection using the built-in webserver.

12V DC Power Input

This 12V power input provides a secondary power source on a KPJX-45 plug. It accepts voltages in the range of 11.5V - 13.2V and must be able to source 500mA. Both mains and DC power sources can be connected at the same time, so the DC input can act as an alternative redundant power supply.

IEC Mains Input

Power is applied via a standard three-pin IEC male socket. Mains voltages between 85V and264V AC and frequencies between 47 and 63Hz are accepted without adjustment. The Earth pin MUST be connected to ensure safety.

Front Panel Menu Navigation
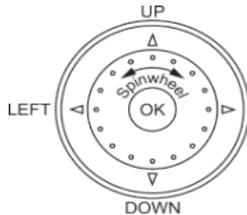
The menu is entered by holding the centre button (the 'OK' button) of the rotational and directional spinwheel.

Use the four UP, DOWN, LEFT and RIGHT directional buttons at the outer edge of spinwheel to move within the menu.

Once entered a number of pages can be chosen by moving the highlight using the directional buttons, or by rotating the spinwheel (Clockwise = DOWN, Anti Clockwise = UP).

Select a Page - Use the OK button, or the RIGHT button

Exit a Page - Use the BACK menu item or the LEFT button.

Exit the Menu Structure - Use the CLOSE menu item, usually at the bottom.

Each dialog page contains a number of options in one of the following control formats:

String Entry/Edit - Move the cursor highlight to the character that you want to edit/alter. Use the spinwheel to cycle through the available characters. A push of the centre OK button changes the character to its default value which is 'A'. To move to the next character press the RIGHT button.

To end the entry, press the DOWN button and then LEFT/RIGHT directional buttons to highlight the 'OK' screen box to confirm or the 'CANCEL' box to ignore the new string and return to the previous one. Press the OK button to action your choice. Please note, the first and last characters cannot be a '-'.

IP Address Edit - Move the highlight to one of the 4 IP numbers using the directional LEFT/RIGHT buttons. These are 3 digit strings which will cycle from 000 to 255 (and back around), using the spinwheel. Once you have entered the 4 numbers, use the DOWN button to move to either the 'OK' or 'CANCEL' screen options and press the OK button.

Number Edit - Use the spinwheel to change the number. The number range is set according to which option has been selected. Once you have finished, move to either the 'OK' or 'CANCEL' screen options and press the OK button.

Scale Edit - Use the spinwheel to change the position of the scale bar. Once you have finished, move to either the 'OK' or 'CANCEL' screen options and press the OK button.

Select List Option - Move the cursor highlight to the desired list item and press the OK button to select it. A tick appears next to the selected option.

AVN-GMC Menu Tree

```
Main Menu
        ├── Device Information -> Info about the device, Serial Number, Firmware Versions, Network Info & Voltages
        ├── Network Settings
        │       ├── Host Name → Dialog to set Bonjour host name
        │       ├── IP Address → Dialog to set Static IP address of system
        │       ├── Subnet Mask → Dialog to set Subnet Mask of system
        │       ├── Gateway → Dialog to set Gateway address of system
        │       └── Network Mode → List selection from Static IP Mode, or Auto IP or DHCP with failover to Static IP Address or to Auto-IP
        ├── PTP Profiles
        │       ├── DSCP → List selection from DSCP method from 22 available
        │       ├── TTL → Dialog to set the PTP TTL value from 1 to 255
        │       ├── Active Profile → List selection from Default , AES media, SMPTE, AES-SMPTE and Custom
        │       ├── Default
        │       │       ├── Delay Mechanism → List selection from E2E or P2P mechanisms
        │       │       ├── Announce Interval → List selection from Interval of 1 to 16 seconds
        │       │       ├── Announce Timeout → Dialog to set Timeout from 2 to 10 announce intervals
        │       │       ├── Sync Interval  → List selection from Interval of $^1/_2$ to 2 seconds
        │       │       ├── Del Req Interval → List selection from Interval of 1 to 32 seconds
        │       │       ├── PDel Req Interval → List selection from Interval of $^1/_2$ to 16 seconds
        │       │       ├── Priority 1 → Dialog to Set Priority 1 level between 0 to 255
        │       │       ├── Priority 2 → Dialog to Set Priority 2 level between 0 to 255
        │       │       ├── Domain → Dialog to set Domain between 0 to 127
        │       │       └── Reset to Defaults
        │       ├── AES Media
        │       │       ├── Delay Mechanism → List selection from E2E or P2P mechanisms
        │       │       ├── Announce Interval → List selection from Interval of 1 to 16 seconds
        │       │       ├── Announce Timeout → Dialog to set Timeout from 2 to 10 announce intervals
        │       │       ├── Sync Interval → List selection from Interval of $^1/_{16}$ to 2 seconds
        │       │       ├── Del Req Interval → List selection from Interval of $^1/_8$ to 32 seconds
        │       │       ├── PDel Req Interval → List selection from Interval of $^1/_2$ to 16 seconds
        │       │       ├── Priority 1 → Dialog to Set Priority 1 level between 0 to 255
        │       │       ├── Priority 2 → Dialog to Set Priority 2 level between 0 to 255
        │       │       ├── Domain → Dialog to set Domain between 0 to 255
        │       │       └── Reset to Defaults
        │       ├── SMPTE
        │       │       ├── Delay Mechanism → List selection from E2E or P2P mechanisms
        │       │       ├── Announce Interval → List selection from Interval of $^1/_8$ to 2 seconds
        │       │       ├── Announce Timeou → Dialog to set Timeout from 2 to 10 announce intervals
        │       │       ├── Sync Interval → List selection from Interval of $^1/_{16}$ to $^1/_2$ second
        │       │       ├── Del Req Interval → List selection from Interval of $^1/_{16}$ to $^1/_2$ second
        │       │       ├── PDel Req Interval → List selection from Interval of $^1/_2$ to 16 seconds
        │       │       ├── Priority 1 → Dialog to Set Priority 1 level between 0 to 255
        │       │       ├── Priority 2 → Dialog to Set Priority 2 level between 0 to 255
        │       │       ├── Domain → Dialog to set Domain between 0 to 127
        │       │       └── Reset to Defaults
```

Main Menu   PTP Profiles

```
              ┌─ AES-SMPTE
              │   ├─ Delay Mechanism → List selection from E2E or P2P mechanisms
              │   ├─ Announce Interval → List selection from Interval of 1 to 2 seconds
              │   ├─ Announce Timeout → Dialog to set Timeout from 2 to 10 announce intervals
              │   ├─ Sync Interval → List selection from Interval of ¹/₂ seconds
              │   ├─ Del Req Interval  → List selection from Interval of 1 to 16 seconds
              │   ├─ PDel Req Interval  → List selection from Interval of ¹/₂ to 16 seconds
              │   ├─ Priority 1 → Dialog to Set Priority 1 level between 0 to 255
              │   ├─ Priority 2 → Dialog to Set Priority 2 level between 0 to 255
              │   ├─ Domain → Dialog to set Domain between 0 to 127
              │   └─ Reset to Defaults
              └─ Custom
                  ├─ Delay Mechanism → List selection from E2E or P2P mechanisms
                  ├─ Announce Interval → List selection from Interval of ¹/₈ to 64 seconds
                  ├─ Announce Timeout → Dialog to set Timeout from 2 to 10 announce intervals
                  ├─ Sync Interval → List selection from Interval of ¹/₁₆ to 64 seconds
                  ├─ Del Req Interval → List selection from Interval of ¹/₁₆ to 64 seconds
                  ├─ PDel Req Interval → List selection from Interval of ¹/₂ to 16 seconds
                  ├─ Priority 1 → Dialog to Set Priority 1 level between 0 to 255
                  ├─ Priority 2 → Dialog to Set Priority 2 level between 0 to 255
                  ├─ Domain → Dialog to set Domain between 0 to 255
                  └─ Reset to Defaults
 ├─ Device Settings
 │   ├─ Device ID → Dialog to enter Unit name for user identification
 │   ├─ Reference Input → Select the time reference Source between GPS and External Sync Input
 │   ├─ WC Out Source → Select Word Clock output from Word Clock and VarPPS
 │   ├─ VarPPS Out Source → Select VarPPS output from Word Clock and VarPPS
 │   ├─ Word Clock → Select the rate of the External Wordclock output from 32 to 192kHz
 │   ├─ Variable PPS → Select the rate of the Variable PPS output from 1Hz to 1MHz
 │   └─ Standby Mode → Select to enable or disable standby button
 ├─ Display Settings
 │   ├─ LED Brightness → Set the brightness of the indicator LEDs and the SONIFEX logo
 │   ├─ Screen Timeout → Set a time in minutes between 1 and 9
 │   ├─ Screen Saver → Set unit's screen saver to a blank screen or a big clock display
 │   └─ Screen Contrast → Set the level of screen contrast to suit different viewing angles and ambient lighting conditions
 └─ Time Settings
     ├─ Display Time → Select the Time displayed between TAI, UTC, or Local time
     ├─ Date Format → Select between D/M/Y, M/D/Y and Y/M/D format
     ├─ Local Offset → Set the local time offset from UTC
     ├─ DST (Daylight saving) Offset → Set DST offset between 0h and 2h:30 in 30 minute increments
     ├─ DST Toggle Time → Set the time of day at which the offset will toggle
     ├─ DST Toggle Date → Set the date on which the offset will toggle
     ├─ DST Toggle → Set whether the toggle is enabled
     ├─ Force Time → Set unit PTP time if running from an external sync input
     └─ Force Date → Set unit PTP date if running from an external sync input
```

Fig 1-6: AVN-GMC Menu Tree (V2.1)

2. Webserver & Unit Discovery

The AVN-GMC uses the Zeroconf networking methodology to allow the unit to be a "plug and play" device. Just simply connect it to the network and use it. The unit is assigned an IP address using a DHCP server, or a self-assigned address using AutoIP when one isn't available.

Once the unit has been connected to the network it will try to obtain an IP address from a DHCP server on the network, if none is found then the unit will use Auto-IP to assign itself an IP address.

If you're using the AVN-GMC for the first time, it is configured with a static IP address of 192.168.0.92 so is accessible by network connecting it to a PC (or similar device) and entering the following IP address in a browser's address bar:

http//:192.168.0.92

The Mozilla Firefox and Google Chrome browsers are preferred.

Bonjour Network Discovery

Using a Bonjour discovery application or browser plug-in, the unit can be discovered and connected to with relative ease. Bonjour is available as standard on MAC OS and as plug-in for Internet Explorer for the Bonjour for windows download. You can also use the discovery application provided by Sonifex and available from the download page on the Sonifex website.

Standard Webpage Layout

Fig 2-1: Standard Webpage Layout
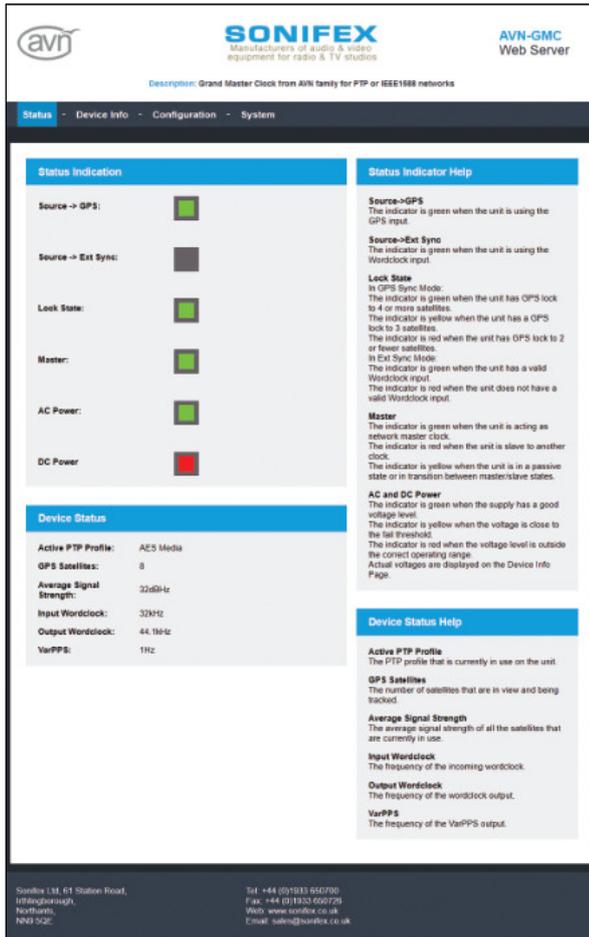
Webpages include a title bar, which includes the company logo, the device family logo, the product name and a brief description of the product.

Under the title bar there is a menu to select which page is displayed. To select a page, hover the mouse pointer over a heading so that it becomes highlighted and click the primary mouse button. If more than one page is associated with a heading (for example, 'configuration'), a drop down menu will appear. The currently displayed page is highlighted blue.

The page display area is divided into two, where the left hand side contains the content and the right hand side contains the help information associated with the content.

The page footer contains the company contact information.

The pages are designed to be resized for tablets and mobile phones. In cases where horizontal space becomes limited, the menu will collapse into a single 'menu' heading, from which all pages can be selected. The help boxes will fall beneath their associated content boxes.

Status Page
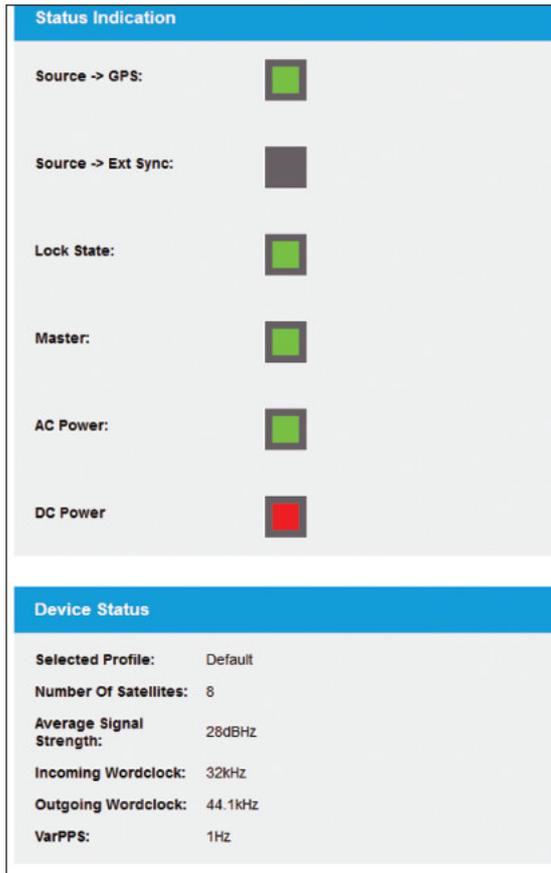
Fig 2-2: AVN-GMC Status Screen

Status Indication

The status indication area shows coloured boxes which mirror the front panel indication LEDs, updated live.

Source->GPS
The indicator is green when the unit is using the GPS input.

Source->Ext Sync
The indicator is green when the unit is using an External Sync input.

Lock
In GPS Sync Mode:
The indicator is green when the unit has GPS lock to 4 or more satellites.
The indicator is yellow when the unit has a GPS lock to 3 satellites.
The indicator is red when the unit has GPS lock to 2 or fewer satellites.

In Ext Sync Mode:
The indicator is green when the unit has a valid Wordclock input.
The indicator is red when the unit does not have a valid Wordclock input.

Master
The indicator is green when the unit is acting as network master clock. The indicator is red when the unit is a slave to another GMC or PTP clock generator.
The indicator is yellow when the unit is in transition between slave and master.

AC and DC Power
The indicator is green when the supplies have a good voltage level.
The indicator is yellow to indicate that the voltages are close to the fail thresholds.
The indicator is red to indicate that the voltage levels are outside the correct operating range.
The indicator is off to show that no voltage is being detected.
Actual voltages are displayed in the Device Info Page.

Device Status

The device status box mirrors the information that is available on the front panel display during normal operation.

Selected Profile

The PTP profile that is currently assigned to the unit.

Number Of Satellites

The number of satellites that are being used to determine the time.

Average Signal Strength

The average signal strength of all the satellites that are currently in use.

Incoming Wordclock

The frequency of the incoming wordclock.

Outgoing Wordclock

The frequency of the outgoing wordclock.

VarPPS

The frequency of VarPPS output.

Webpage Parameter Details - Device Information

Device Information

The device information box contains important information about the unit such as Device ID, Host name, serial number, firmware version numbers, voltage figures, system up time an approximate PTP time reading with time base and fitted oscillator type.

Network Information

The network information box contains the MAC address, actual IP address, actual subnet mask, actual gateway IP and the addressing mode.

GPS Satellite Information

This page displays a snap shot of the satellite data for any detected satellites (up to 16).

Each satellite displays the following parameters:
The identification number of the satellite
Signal Strength (Carrier-to-noise-density ratio)
Elevation Angle
Azimuth angle

Press the Refresh Info button to update the values

Fig 2-3: AVN-GMC Device Information Screen

Network Settings

Accessible by selecting Config > Network Settings on the web page.

Fig 2-4: AVN-GMC Network Settings Screen

Network Settings

IP Address

Enter the static IP address that you wish to assign to this unit. This IP address will be used if DHCP is disabled or if no DHCP server is detected. The default IP address is 192.168.0.92

Subnet Mask

Enter the subnet mask of the network you wish to connect to. The default subnet mask is 255.255.255.0

Gateway IP Address

Enter the gateway IP address of your router. The default gateway is 0.0.0.0

DHCP

Enable DHCP to allow the unit to acquire its IP address automatically from a DHCP server. Disable DHCP to use the static IP address entered on this page. DHCP is initially enabled, the unit will automatically default to static network settings after 45 seconds if no DHCP server is detected.

Auto IP

Enabling Auto IP allows the unit to configure its own IP address without the need of a router in the form 169.254.X.Y, where X and Y are numbers between 0 and 255. Ensure the connecting device has Auto IP enabled. If both DHCP and Auto IP are enabled, DHCP takes precedence.

Changing network details may require a browser refresh and in some cases (IE), a close and reopen. If accessing via IP address rather than host name, an address bar change may be required to reconnect.

HTTP Port

Configures the port which the webserver listens on. This can be set to port 80, or a number between 1024 and 65535. The unit must be restarted for this setting to take effect.

Password

It is possible to setup password access to the unit's webserver.To add a password, simply enter a new password in the New Password entry box and re-type it in the Retype Password entry box. The password should be between 4 and 8 characters in length and contain only letters and numbers.

After submission, the user will be required to enter this password to gain access to the device. The password can be removed by clearing both entry boxes and clicking Submit. The username is always admin.

mDNS (Bonjour)
Enabling mDNS allows the unit to be discovered using the Sonifex Service Discovery application. If this isn't required then it is recommended to disable mDNS to reduce the network traffic going to the unit. The unit must be restarted for this setting to take effect.

Syslog
This setting enables the remote logging of the AVN-GMC with the aid of a remote Syslog server.   Specify the server IP address in the Syslog Server entry box and set the the message filter accordingly.

PTP Profiles

Fig 2-5: AVN-GMC PTP Profile Screen

PTP Profiles

Profile Select

Select from a list of stored profiles including Default, AES Media, SMPTE, AES-SMPTE and Custom. The active profile button is checked if this is the profile is being used by the unit.

Reset to Defaults

Select this checkbox and press submit to reset the current selected profile to the default set for that profile.

Delay Mechanism

Select between E2E and P2P Delay mechanisms.

Announce Interval

The rate at which the Announce message is sent. One per the selected time.

Announce Timeout

Multiple of announce intervals. This is the time the unit will wait for a response to an announce message.

Sync Interval

The rate at which the Sync message is sent. One per the selected time.

Delay Request Interval

The rate at which the master allows Delay Requests - only valid for E2E delay mechanism.

Peer Delay Request Interval

The rate at which the master allows Peer Delay Requests - only valid for P2P delay mechanism.

Priority 1 and 2

Position in an ordered set of clocks, used by Best Master Clock Algorithm.

Priority 2 provides 'fine grain' ordering.

Domain

The PTP domain on which the GMC operates.

As to which ranges are available for each parameter in each profile, please refer to the AVN-GMC menu tree on pages 6 and 7.

DSCP

This is a single parameter for all profiles to set the Diffserv method for outgoing packets.

TTL

This is a single parameter for all profiles to set the TTL value in the outgoing PTP messages.

Device Settings

Fig 2-6: AVN-GMC Device Settings Screen

Device Settings

Device ID
Name used to identify unit. Can be used as a description field.

Reference Selection
Choose between GPS and External sync from which to sync the internal PTP clock.

WC and VarPPS Output Source
The unit's WC (Wordclock) and VarPPS can be routed to each output, or either can be routed to both.

Wordclock
Select the rate of the wordclock output. The rate can be selected as 32, 44.1, 48, 88.2, 96,176.4 or 192 kHz.

Variable PPS
Select the rate of the PPS output. This can be selected as 1, 10, 100, 1000, 10,000, 100,000 or 1,000,000 Hz.

Standby
The front panel power/standby button can be enabled or disabled here.

Time Settings

Fig 2-7: AVN-GMC Time Settings Screen

Time Settings

Display Time
Select whether the display shows TAI, UTC or Local Time. Local time is UTC time +/- Local offset and DST offset.

Date Format
Select the preferred date format for the unit. Choices are D/MY, M/D/Y and Y/M/D.

Display Time Offset
Adjust the display time by a set amount when displaying Local Time, in hours and minutes. Useful for time zones, for example

Daylight Saving
The amount of time to adjust when daylight saving is applied, in hours and minutes.

Apply Daylight Saving
Toggle daylight saving. Clear = off, checked = on

Daylight Saving Toggle Time and Date
Use this feature to set a time at which the daylight saving setting will automatically toggle, in hours and minutes for the time and day. month, year for the date.

Toggle Enabled
Enable or Disable the daylight saving toggle feature. Clear = disabled, checked = enabled

Misc Settings

Fig 2-8: AVN-GMC Misc Settings Screen

Misc Settings

Force Time & Force Date

Force Time & Force Date allows the time and date to be set if the unit is running from an external input, rather than GPS. This setting affects both the PTP timebase and the front panel display. If set to run from GPS, the force time setting is ignored.

Auto Save on Page Exit

Enabling 'Auto Save on Page Exit' enables you to automatically submit and save changes on leaving a webpage.

Factory Defaults

Click the 'Reset Settings' button to return the unit to factory default settings.

Enable 'Network Reset' to reset the network settings as well, otherwise they will remain unchanged.
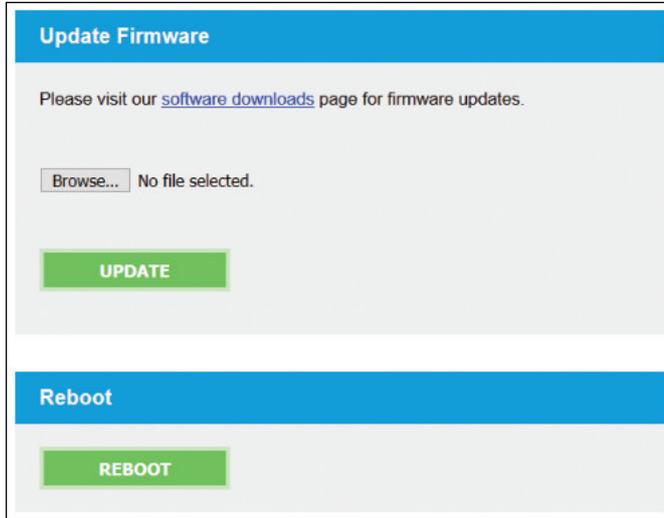
System

Fig 2-9: AVN-GMC System Screen

Update Firmware

This page allows you to update the firmware running on the unit. New versions of the firmware can be found on the appropriate product page on the Sonifex website.

Procedure

Use the 'Choose File' button to open a browse window and navigate to an AVN-GMC firmware file. File selection is protected by a filter which detects correct file name and type. Once selected, click update. The front panel of the unit should display that a file upload is in progress and then whether it succeeded or failed. A webpage will also confirm this.

Once the upload is complete, the unit will reset. If the upload succeeded, the unit will proceed to install the new firmware. This is indicated by a series of green power button flashes (one flash, followed by two flashes, followed by three). Then the unit will boot. It is possible that the front panel code will also be updated. In this case, shortly after the power button LED sequence, a progress bar will be displayed. An error condition in the installation or boot up process is indicated by the power button flashing red and green. In this case, contact Sonifex technical support for advice on how to proceed.

Reboot

Click the reboot button to immediately reboot the unit. This will take approximately 25 seconds during which a status bar will be displayed. Once complete, the status webpage will be displayed.

3. Grandmaster Clocks, AVN, RAVENNA & AES67

Sonifex joined the Ravenna group in 2012 and the AVN product range is the result of our R&D in the area of audio over IP. If a Sonifex product starts with the letters 'AVN', then it's part of the family of products which can send audio to each other over an IP network (AoIP).

RAVENNA (of which AES67 is a subset) allows for the distribution of audio across a network. For this to be possible, each of the nodes needs to be time synchronised with one another. Ravenna uses PTP (Precision Time Protocol, as defined by IEEE1588-2008v2) time stamping to achieve this, which both distributes the network time and also works out the latency involved in the delivery and adjusts the time at each node accordingly. Unit configuration is achieved easily either with the front panel controls or the webserver, including the setup of the PTP profile. A Grandmaster Clock (GMC) is a source of all the networks' time and should be synchronised to GPS.

AVN and other manufacturers RAVENNA products will use the time distributed by the AVN-GMC to create internal audio clocks that are all highly synchronous to one another, so that audio derived from one unit will playout at precisely the same rate when sent to another.

AES67 is a standard released by the Audio Engineering Society to enable interoperability of Audio over IP devices from different manufacturers and there is a specific subset of RAVENNA that will implement the methods and protocols as required.

4. Technical Specification For AVN-GMC

Timing Specification

Profile Support:	Default profile
Timing Protocol:	PTPv2, IEEE1588-2008, TAI timebase
Timing Accuracy:	PTP time stamping resolution 8ns
Holdover Drift: TCXO: OCXO: CSAC: These figures are over 24 hours at constant temperature	 <90ms <900µs <45µs
GPS Performance:	50 channel GPS receiver
GPS Frequency:	1575.42MHz, L1 band

Clock Specification

Word Clock Sync Impedance:	75Ω
Word Clock Output Impedance:	<50Ω
VAR PPS Output Impedance:	<50Ω
AES-3id Output Impedance:	<75Ω
Antenna Impedance:	50Ω

Connections

Clocking Input:	BNC female TTL Wordclocks (32kHz to 192kHz) and 10MHz
Clocking Outputs:	BNC female AES-3id @ 32, 44.1, 48, 96, 176.4 & 192kHz. BNC female Wordclock Out (32kHz to 192kHz) TTL BNC female Variable PPS Out (1Hz to 1MHz) TTL
GPS Input:	SMA socket
GPIO:	9 way D-Type female

Ethernet Port:	RJ45 socket, 100BASE-T
Mains AC Input:	Universal filtered IEC socket, continuously rated 85-264 VAC @47-63Hz, max 10W
DC Input: Maximum Operating Range (DC):	1 x 12V, KPJX-45 socket, positive pins 1 and 3 10.3V to 13.2V DC, 500mA

Equipment Type

AVN-GMCS:	Grandmaster clock for PTP systems, GPS, IP, TCXO, 1ppm, rackmount
AVN-GMCOS:	Grandmaster clock for PTP systems, GPS, IP, OCXO, 0.1ppm, rackmount
AVN-GMCCS:	Grandmaster clock for PTP systems, GPS, IP, CSAC, 0.0005ppm rackmount

Physical Specification

Dimensions: (Raw)	4.4cm (H) x 48.3cm (W) x 17.8cm (D) (1U) 1.8" (H) x 19" (W) x 7" (D) (1U)
Dimensions (Boxed):	6.8cm (H) x 58.8cm (W) x 27cm (D) 2.7" (H) x 23" (W) x 10.6" (D)
Weight:	Nett: 1.5kg Gross: 2.2kg Nett: 3.2lbs Gross: 4.8lbs

Accessories

AVN-DC150:	150W DC power supply with KPJX-4S plug