Time & Frequency Solutions

Timespy Portable Expansion Module

PEM

P/N: 900000159

Revision C

For Time and Frequency Solutions products with the following Part Numbers: 780AA000A

Safety Warnings

WARNING:

The lightning flash with an arrowhead inside of an equilateral triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure. The "dangerous voltage" may be of sufficient magnitude to constitute a risk of electrical shock to people. Do not attempt to repair the unit without first unplugging it.

CAUTION:

The exclamation point inside of an equilateral triangle is intended to alert the user to the presence of important operation and maintenance instructions in the user guide. Only qualified personnel should repair this unit. Several board assemblies contain static sensitive devices. Appropriate procedures must be used when handling these board assemblies.

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Revision History

Revision	Date	Changes
A	21/10/2016	Initial Release
B	26/01/2017	Revised section 2, connecting PEM to TimeSpy. Added definitions to timecode formats
C	10/02/2017	Incorporated colour-coding format to cabling structure and additional comments from customer.

1 Introduction

The Portable Expansion Module (PEM) provides a method of switching various timing signals for monitoring or conditioning by the PCMU TimeSpy Elite (referred to hereafter as TimeSpy). It decodes timecodes and passes time of day and frequency signals to the TimeSpy for analysis. It also receives precise time and stable frequency references from TimeSpy and provides outputs of various time and frequency signals.

2 Connecting PEM to TimeSpy

Refer to TIMESPY REAR PANEL and PEM FRONT PANEL. Use the cables supplied with PEM, as the unit is calibrated to operate with these. The cables supplied with the PEM are colour-coded for easy identification as follows:

Part Number	Qty	Description	Application	Colour coding
002206420	1	0.6m Serial cable	Serial Connection TimeSpy to PEM	White
002206414	1	0.6m DC Power cable	Power Connection TimeSpy to PEM	Black
002206413	3	0.6m BNC cable	10MHz TimeSpy to PEM, 1PPS TimeSpy to PEM, Measurement signal PEM to TimeSpy,	Blue
002206421	2	1.6m BNC cable	Connection from PEM to equipment being measured	Green
002206422	1	Pair of Fibre leads	Connection from PEM to equipment being measured	Orange
002206423	2	1.6m Twinax cable	Connection from PEM to equipment being measured	Red

1. Connect RS232 USER PORT (TIMESPY REAR PANEL) to RS232 (PEM) using the white coded 0.6m serial cable.
2. Connect 10MHz OUTPUT (TIMESPY REAR PANEL) to 10MHz (PEM) using a blue coded 0.6m BNC cable.
3. Connect 1PPS OUTPUT (TIMESPY REAR PANEL) to 1PPS (PEM) using a blue coded 0.6m BNC cable.
4. Connect TTL PULSE (TIMESPY FRONT PANEL) to ON TIME (PEM) using a blue coded 0.6m BNC cable.
5. Connect 24V DC IN (PEM) to 24V DC (TIMESPY REAR PANEL) using the black coded 3-pin 24V power connector. *To avoid the risk of short circuiting the TimeSpy, connect the power cable to the PEM before connecting it to the TimeSpy.*
6. If TimeSpy is turned off, then turn TimeSpy power on, please note that the TimeSpy may have to

re-acquire the current time from its time input source.

PLEASE NOTE: If the PEM is disconnected and then reconnected to the TimeSpy, return the TimeSpy to the top menu.

3 Operation

3.1 About the PEM

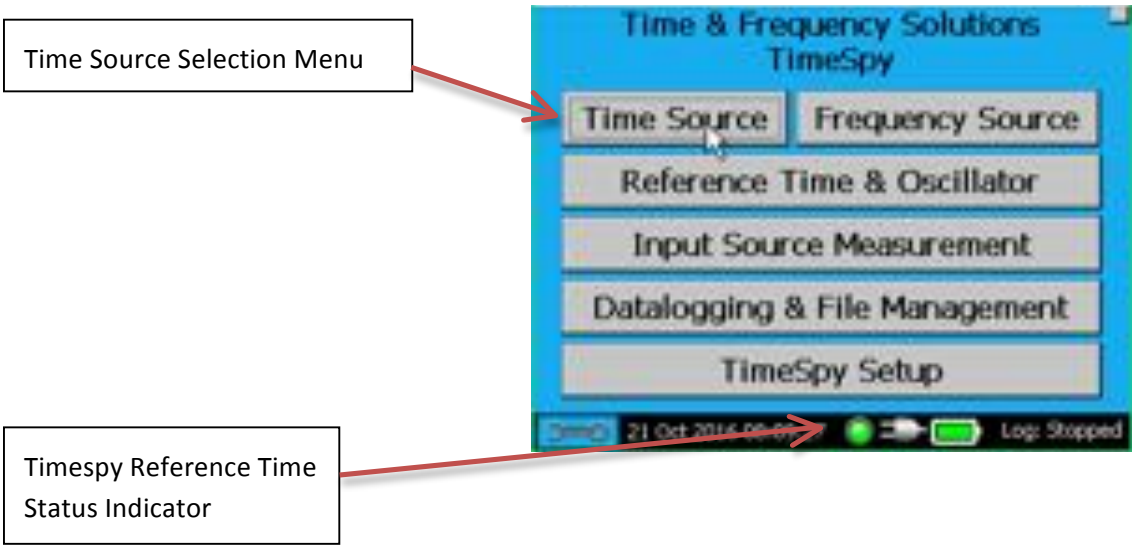
TimeSpy and PEM communicate through the RS232 serial link. Input selection is made from the TimeSpy front panel. Output signals from PEM are enabled whilst the PEM has time from TimeSpy. TimeSpy sends a valid time to PEM when the reference time status indicator on the task bar of the TimeSpy Front panel display is illuminated in orange or green; an orange indicator means that the TimeSpy is sending time but does not have a GPS signal and is in holdover mode, while a green indicator shows that the TimeSpy has valid time and is locked to GPS. For full details of the meanings of this indicator please refer to the TimeSpy user manual. Once the PEM has been connected and is working, connect the time signal input and output connections as required.

3.1.1 Input Signals

To select a particular input for measurement select "TimeSource" on the TimeSpy front panel. Connect the output form the appropriate signals to be measured to the Measurement Inputs section of the PEM, as indicated in this manual. Once a measurement is made its results can be logged to file. Please refer to the TimeSpy manual for the exact details of the logging format.

Balanced input signals are received on BNC Twinax sockets. Optical input signals are received on ST socket connectors. All other input signals are received on BNC sockets.

Figure 1 – TimeSpy Menu



Select **Time Source** from the Timespy Main Menu

Figure 2 – TimeSpy Expander Moduler Selected

Select **Expander** from the screen that follows (presence of this control confirms that the PEM has been detected by the TimeSpy)

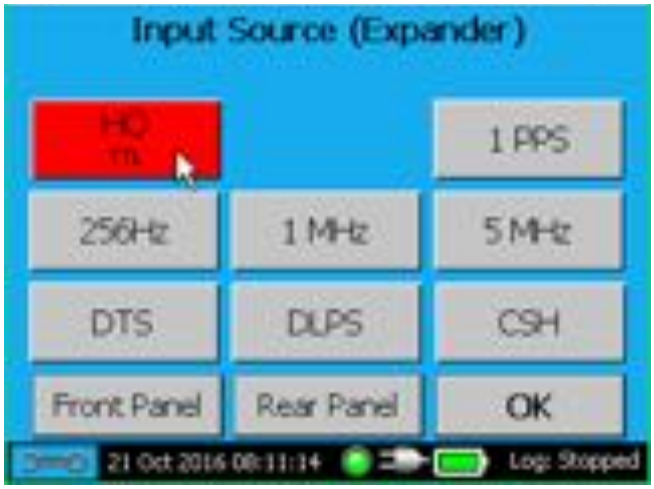


Figure 3 – HaveQuick Source Selected

Make the required selection from the various time signals available

3.1.2 HaveQuick Time Code Measurement

To measure HaveQuick Timecode, the Timespy with PEM is capable of measuring HaveQuick timecode in three different variations: HaveQuick TTL, HaveQuick RS422 and HaveQuick Optical.

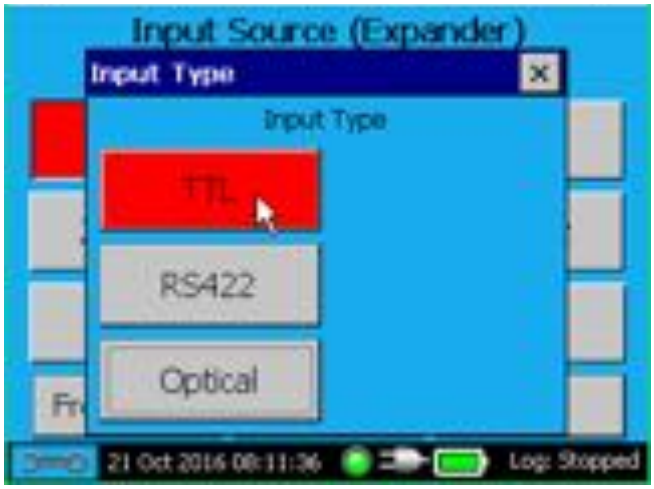


Figure 4 – HaveQuick Input Type Expanded

HQ - TTL. Connect the HaveQuick output signal to be measured to the Measurement Input BNC port labeled HQ-TTL using an appropriate cable. Connect the associated 1PPS signal to the Measurement Input port labeled 1PPS-50ohm using a green coded 1.6m BNC cable.

HQ - RS422. Connect the HaveQuick output signal to be measured to the BNC port labeled HQ-RS422 using an appropriate cable. Connect its associated 1PPS signal to the Measurement Input port labeled 1PPS-RS422 using a red coded 1.6m Twinax cable.

HQ - Optical. Connect the Extended HaveQuick fibreoptic output signal to be measured to the optical port labeled EXT-HQ using an orange fibre cable. Connect its associated 1PPS signal to the Measurement Input optical port labeled 1PPS using the other orange fibre cable.

Selecting the HQ Input Type selection will open the External HaveQuick measurement screen.

Figure 5 – External HaveQuick Measurement Screen

3.1.3 1 PPS Measurement

Selecting the button labeled "1 PPS" will open the PPS measurement options window. From here, select the 1 PPS format to measure. The PEM is capable of measuring up to four different 1PPS formats: 1 PPS 5V, 1 PPS RS422, 1 PPS over optical, and 1 PPS 50ohm.

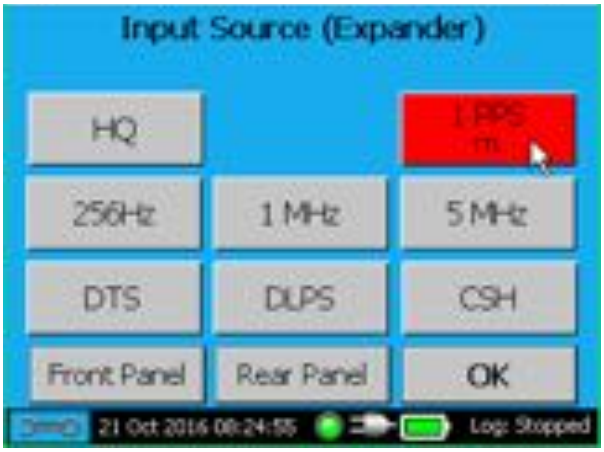


Figure 6 – 1PPS Selected

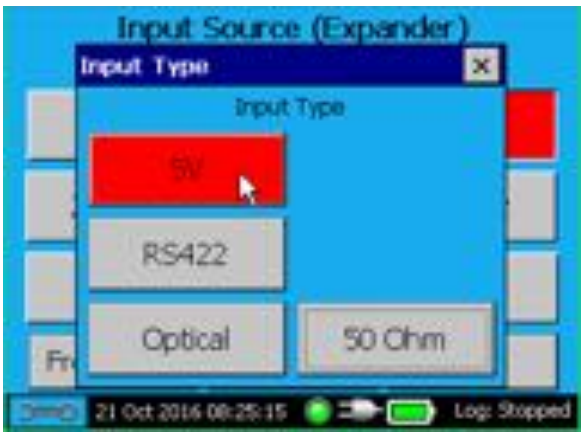


Figure 7 – 1PPS Options Expanded

1 PPS - 5V. Connect the 1 PPS signal to be measured to Measurement Input 1PPS-5V using a green coded 1.6m BNC cable

1 PPS - RS422. Connect the 1 PPS signal to be measured to Measurement Input 1PPS-RS422 using a red coded 1.6m Twinax cable

1 PPS - Optical. Connect the 1 PPS signal to be measured to Measurement Input 1PPS (optical connector) using an orange fibre cable

1 PPS - 50 ohm. Connect the 1 PPS signal to be measured to Measurement Input 1PPS-50ohm using a green coded 1.6m BNC cable

Selecting the PPS Input Type selection will open the External PPS measurement screen.

Figure 8 – 1PPS Measurement Screen

3.1.4 Frequency Measurements

There are five frequency measurements available

1. 256Hz - Connect the 256Hz frequency signal to be measured to the Measurement Input BNC connector labeled CSH-256Hz using a red coded 1.6m Twinax cable

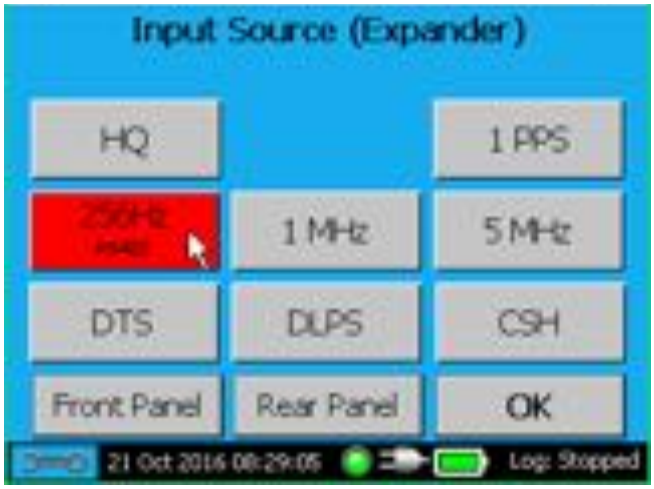


Figure 9 – 256Hz Selected

2. 1MHz 1V - Connect the frequency signal to be measured to Measurement Input 1MHz-1V using a green coded 1.6m BNC cable

3. 1MHz 2V - Connect the frequency signal to be measured to Measurement Input 1MHz - 2V using a green coded 1.6m BNC cable.

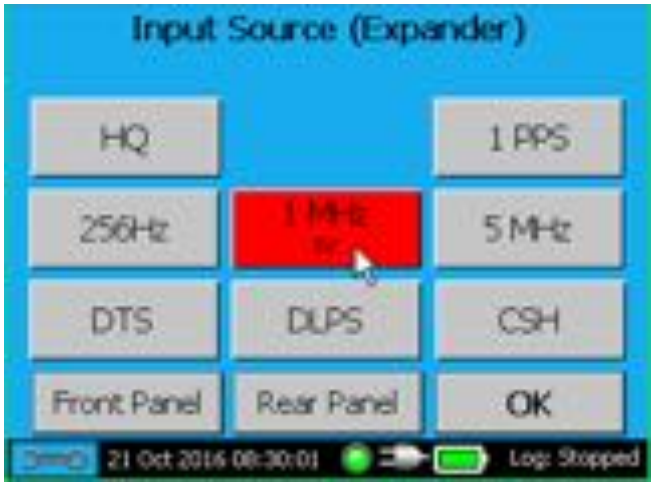


Figure 10 – 1MHz Selected

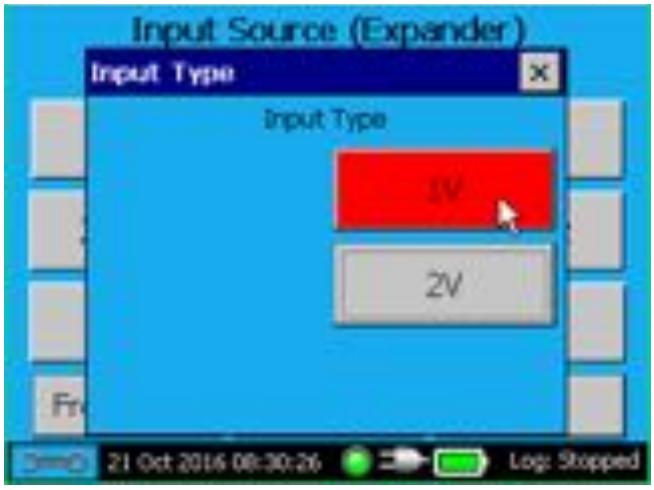


Figure 11 – 1MHz Selection Expanded

4. 5MHz 50 Ohm. Connect the frequency signal to be measured to Measurement Input 5MHz 50 Ohm using a green coded 1.6m BNC cable

5. 5MHz Optical. Connect the frequency signal to be measured to Measurement Input 5MHz (optical connector) using an orange fibre cable

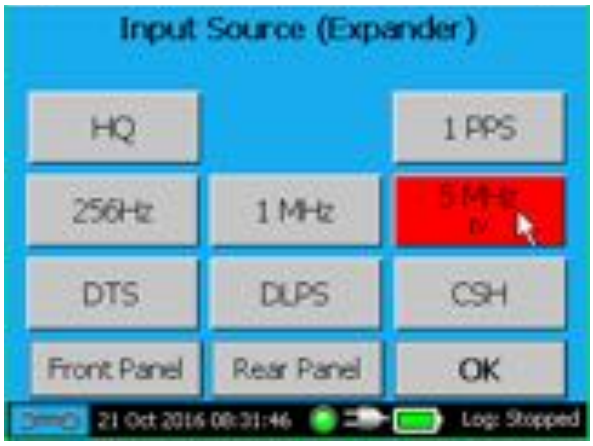


Figure 12 – 5MHz Selected

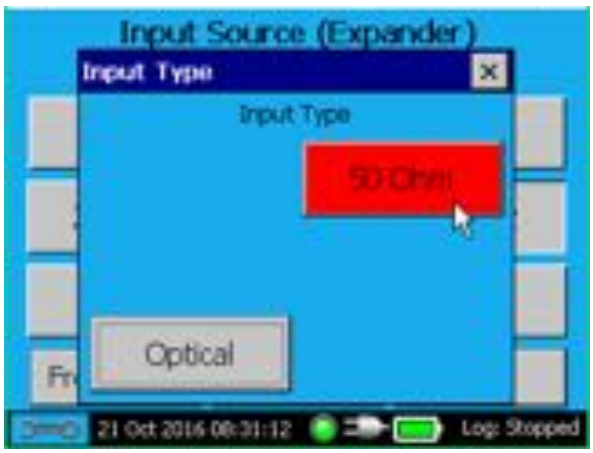


Figure 13 – 5MHz Expanded

Selecting a frequency will open the External Frequency Difference Measurement screen.

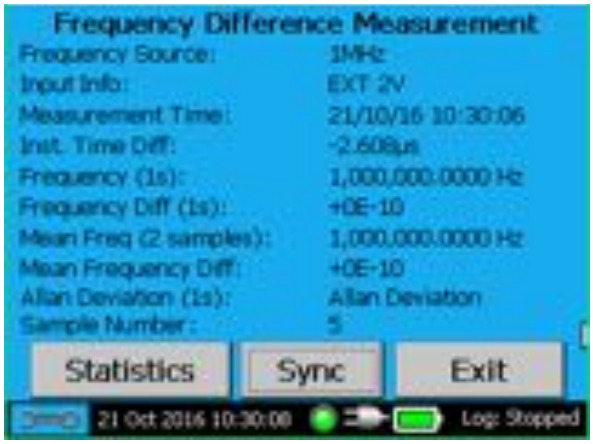


Figure 14 – 1MHz Measurement Screen

3.1.5 DTS

Data Transfer System, or DTS, is an optical time code format. The Timespy is capable of measuring the time of day in this format.

This option is not currently implemented

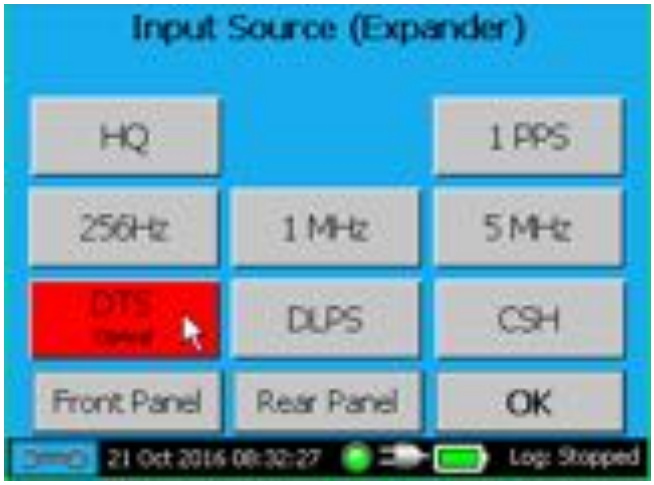


Figure 15 – DTS Selected

3.1.6 DLPS

Data Link Processing System, or DLPS, is a time code format used for shipboard applications. Connect the 1 PPS signal from the equipment to the BNC connector labeled 1PPS-DLPS using a red coded 1.6m Twinax cable.

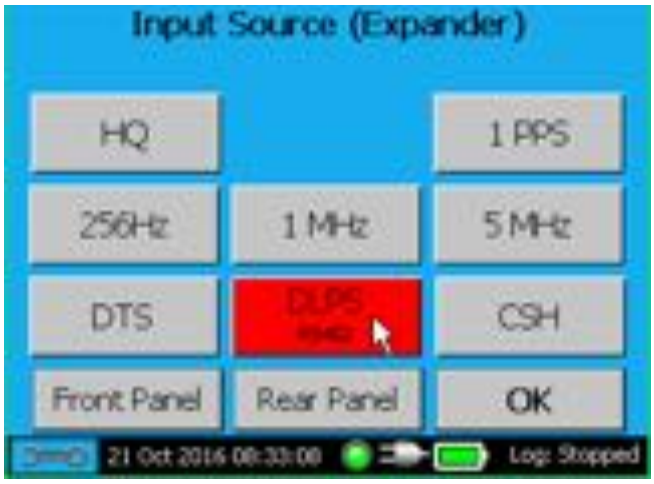


Figure 16 – DLPS Selected

Selecting **DLPS** will open the External Time Difference measurement screen.

Figure 17 – DLPS Measurement Screen

3.1.7 CSH

Combat System Highway, or CSH, is a serial time code format that the TimeSpy is capable of measuring. Connect the CSH time signal to be measured to the Measurement Input CSH-TM using a red coded 1.6m Twinax cable

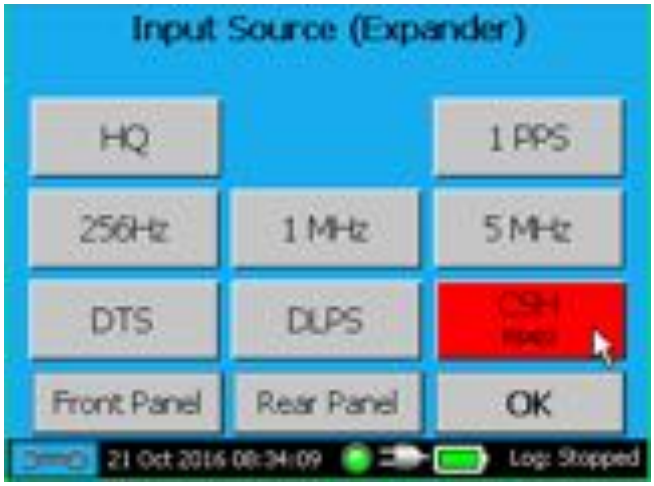


Figure 18 – CSH Selected

Selecting **CSH** will open the External CSH Time Difference measurement screen.

Figure 19 – CSH Measurement Screen

3.2 Output Signals

The following output signals are available from the PEM, with reference to their common specification name. 1PPS's are 20µs long, rising edge. Frequency signals are locked to the reference 10MHz and 1PPS signals from TimeSpy. Frequencies are sinusoidal with harmonic distortion better than -40dB and non-harmonic distortion better than -60dB. Balanced output signals are presented on BNC Twinax sockets. Optical output signals are presented on ST socket connectors. All other output signals are presented on BNC sockets.

Signal	**Description**	**FSF Appendix**	**Cable colour code**
5MHz Optical		(T45)	Orange
1PPS Optical		(T45)	Orange
EXT HQ:	Extended Havequick Optical - associated with 1PPS Optical	(T45)	Orange
DTS Optical:	Not implemented		Orange
HQ-RS422:	Havequick at RS422 levels, associated with 1PPS-RS422	(2QCD)	Red
HQ-TTL:	Havequick at TTL levels, associated with 1PPS-50Ω	(2QCD)	Green
CSH-TM:	A serial timecode, starting within 10ms of the 1PPS -5V	(CSH)	Red
1PPS-RS422:	1PPS at RS422 levels	(2QCD)	Red
1PPS-50ohm:	1PPS at 10V into 50 Ohm load	(2QCD)	Green
CSH-256Hz:	256Hz signal at RS422 levels	(CSH)	Red
1MHz-1V:	1MHz at $1V_{rms}$ levels into 50 Ohm load	(ICS6)	Green
1MHz-2V:	1MHz at $2V_{rms}$ levels into 50 Ohm load	(SCOT)	Green
5MHz-1V:	5MHz at $1V_{rms}$ levels into 50 Ohm load	(2QCD)	Green
1PPS-DLPS:	1PPS at RS485 levels	(DLPS)	Red
1PPS-5V:	1PPS at 5V into 50 Ohm	(JTIDS)	Green

4 Panel Drawings

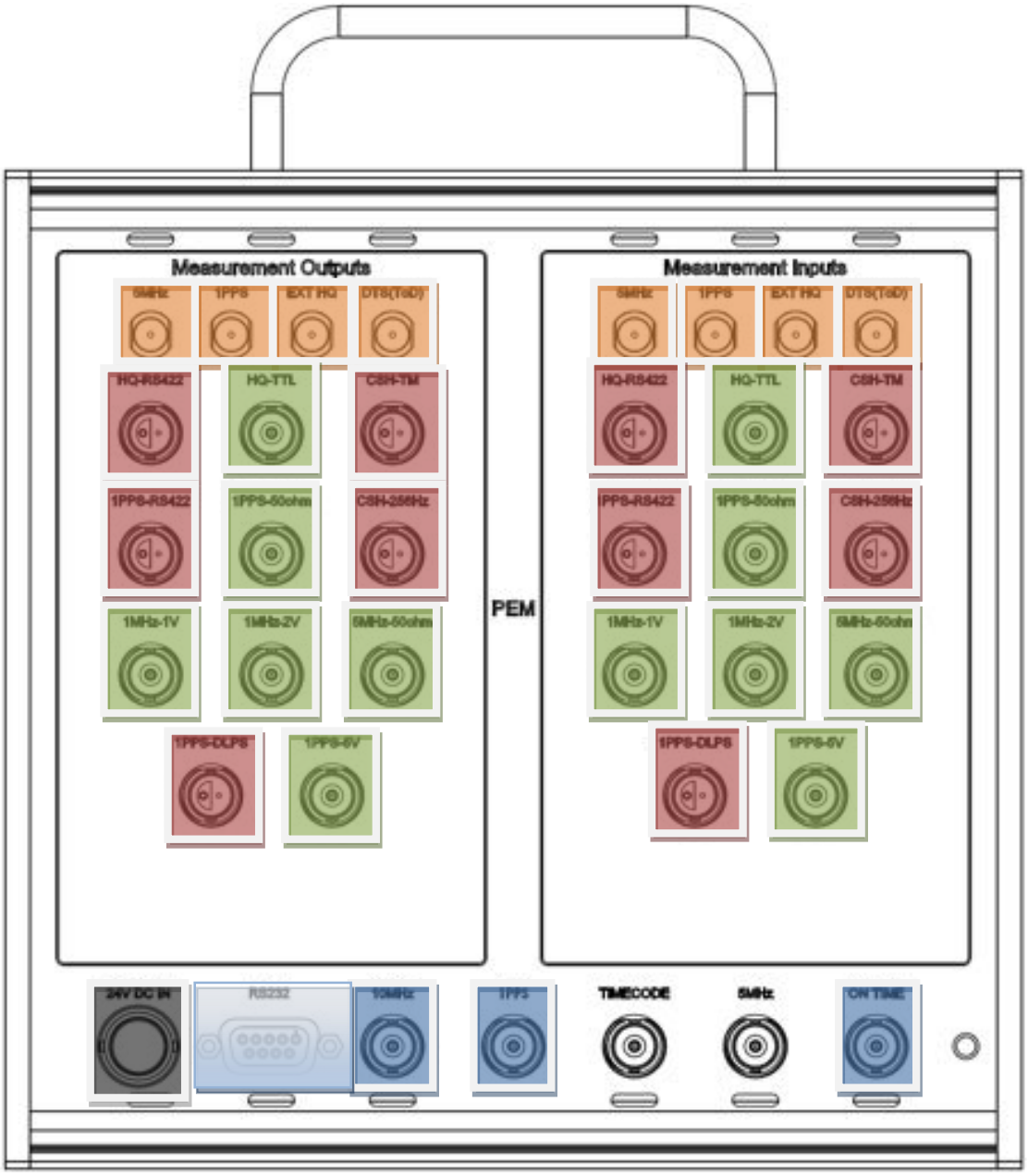


Figure 20 – PEM Front Panel

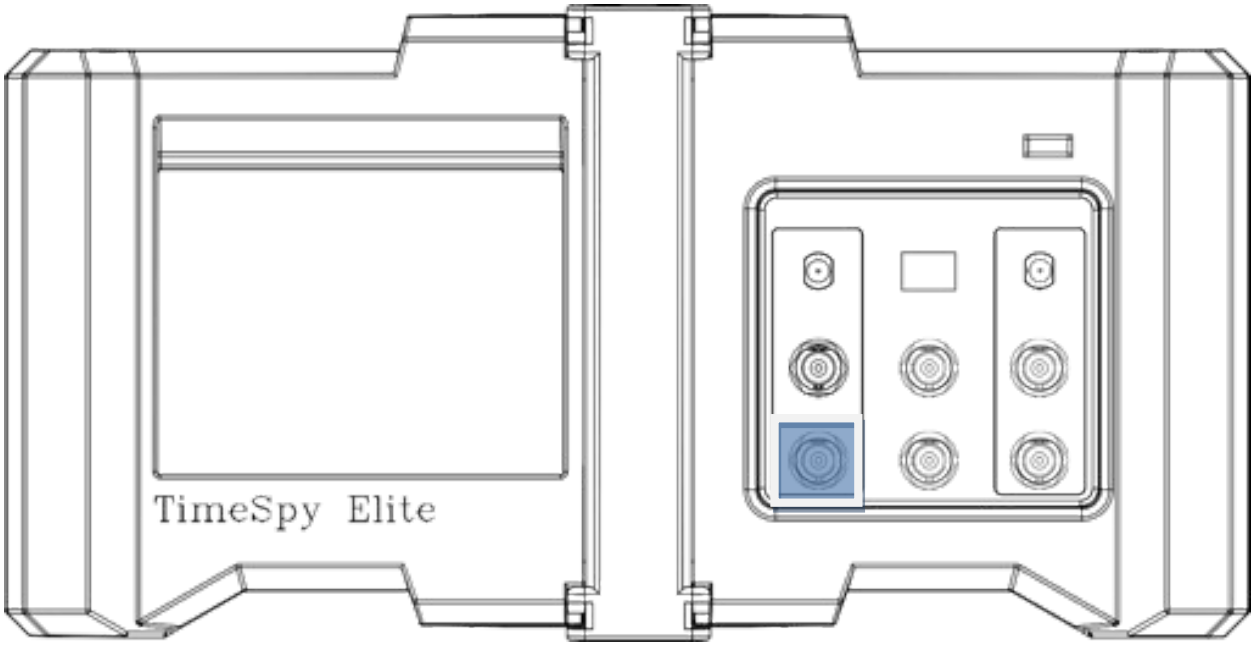


Figure 21– TimeSpy (PCMU) Front Panel

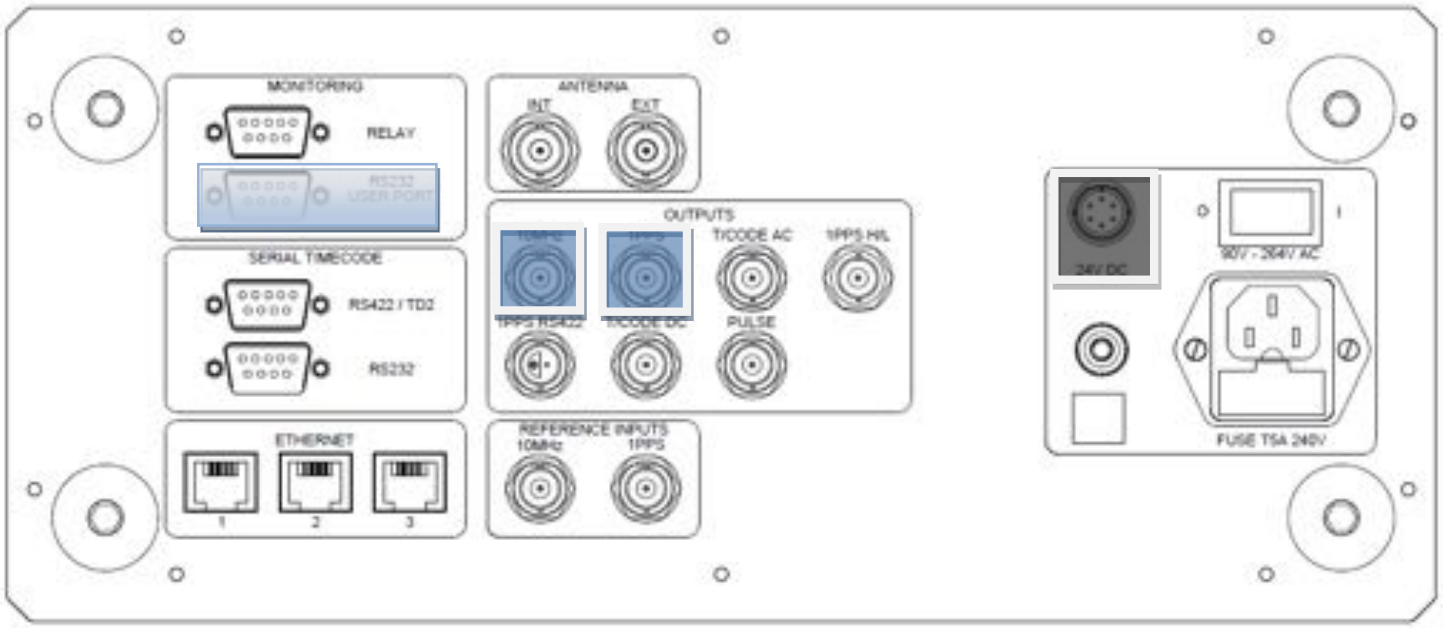


Figure 22 - TimeSpy (PCMU) Rear Panel