TMS6002
USER MANUAL

Reference :	**MN06127**
Issue :	**A1**
Date :	**2019-03-27**

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Version change		
Issue	**Date**	**Description**
A1	2019-03-27	Original issue

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GENERAL DESCRIPTION

TMS6002 is a multi-source (IRIGB or GNSS) disciplined NTP time server. It also generates a PPS output.

The equipment can be used with one source only, it is preferable to disable the unused source in that case in order not to get the corresponding Alarms.

It can also be used with several sources with a priority selection amongst them. The equipment will automatically switch from one to the other source if the current source is not usable anymore.

1.1. FRONT AND BACK PANEL

The front panel of the device has a high contrast LCD display with two lines of 40 characters, three color LED indicators and a simplified 6 buttons keypad for navigation between the different screens.
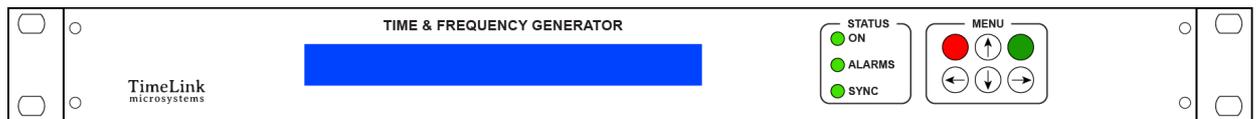

Figure 1 – Front panel

The back panel of the equipment groups all connectors for connections to the environment :

- GNSS TNC type connector
- SD card connector
- RJ45 NTP network
- USB console
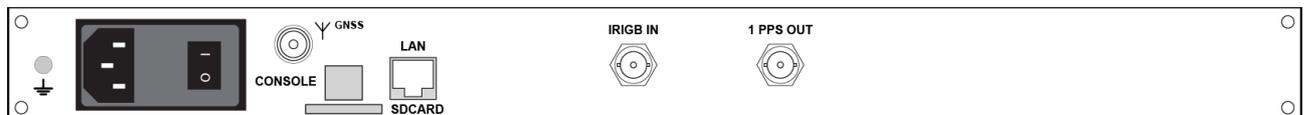- BNC 1 PPS signal
- BNC IRIGB IN connector

Figure 2 – Back panel

1.2. DETAILED CHARACTERISTICS

Characteristics	Types / Value
1PPS output	Level: 0-5V, positive pulse, 50 Ohms
	Female BNC connector – named "1PPS"
	Duration: 20us, 1Hz period, rising edge
IRIG-B	Analog IRIGB (modulation 1:3/1:1, level 0 to 8V peak to peak - 600 Ω)
	Female BNC connector
GNSS	Integrated GNSS (GPS and GLONASS) module
	TNC connector for active antenna - 5V or 3.3V power supplied by the GPS module
SD card	"Push-push" connector on the back of the equipment - Identification "SD CARD"
Power supply input(s)	CEE 2P+E socket with integrated filter and ON/OFF switch
	Integrated back-up power supply
	85 to 265V AV 47-60Hz
	Consumption : <10W at 230VAC/50 Hz
NTP Service	RJ45 connector – named "LAN"
	UDP port 123, request/answer operation (unicast)
	100/1000 Mbps Ethernet
Console	USB connector, speed 115200 bauds, 8 data bits, 1 stop bit
SNMP service	SNMP v2c, V3 protocol

Tableau 1 – functional specifications

1.3. PHYSICAL CHARACTERISTICS

The table below summarizes the physical characteristics of the equipment.

Characteristics	Types/Values
Dimensions	19" rack (483 mm), 1U high (44 mm), 350 mm deep.
Weight	2.7 Kg (3.0 Kg with provided power cord).

Table 2 – Physical specifications

2. TMS6002 SETUP

Before using the equipment, it is necessary to perform the operations described below.

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2.1. PHYSICAL INSTALLATION OF EQUIPMENT

The equipment is intended to be installed into a 19" cabinet. It is recommended to connect the equipment to the protective ground of the cabinet via the ground stud on the left rear of the equipment.

2.2. CONNECTIONS

The following connections must to be made:

- Connect the equipment to the AC power via the supplied AC cord.

- Connect the mechanical chassis ground to the cabinet ground.

- Connect the GNSS antenna cable to the antenna input of the equipment.

- Connect the equipment to the remote management network ("LAN" connector) with a RJ45 network cable.

Important: Power the equipment only after all connections have been made.

2.3. CONFIGURATION

The proper functioning of the equipment requires setting the configuration parameters with consistent values. These settings are located on an SD card inserted in the back of the equipment.

The parameters available to the user are located in the **'user.ini'** file. When inserted into a PC, the **'user.ini'** file is located in the **'TMS6002'** directory of the SD card. On the equipment, this file is located in the **'/config'** directory.

The following table lists the parameters according to their location in the configuration space. The procedure to change the settings is described in the maintenance chapter of this document.

Important: Please do not modify files other than those listed below under penalty of breaking the equipment's operation, except if the support staff of Timelink microsystems invites you to do so.

2.3.1. General settings

These settings are located in the **`'TMS6002/user.ini'`** file of the SDCARD.

Only the parameters listed below can be modified, contact TIMELINK for other needs.

Section [IP_eth0]

Name	Description	Availability	Default value	Accepted values
Ip	IP V4 address of the equipment	Mandatory	192.168.10.190	Any compliant IP V4 address
mask	Subnet mask of the network on which the equipment is connected	Mandatory	255.255.255.0	Any compliant subnet mask
gateway	IP V4 address of the default gateway	Optional but recommended	192.168.10.254	Any compliant IP V4 address
nameserver	IP V4 address of the name server	Optional	8.8.8.8	Any compliant IP V4 address

[SOURCE_PRIORITIES] Section

Name	Description	Availability	Default value	Accepted values
GNSS	Select the priority of the source compare to the others. 1 is highest priority	Mandatory	1	1,2,3
IRIGB_IN	Select the priority of the source compare to the others. 1 is highest priority	Mandatory	2	1,2,3
LOCAL	Select the priority of the source compare to the others. 1 is highest priority	Mandatory	3	1,2,3

[GNSS] Section

Name	Description	Availability	Default value	Accepted values
PRESENCE	Enable/disable the GNSS source.	Mandatory	Y	Y, N
UTC_OFFSET	Offset between GPS and UTC time in second	Mandatory	18	Number
MOBILE	Enable the GNSS mobile receiver mode	Mandatory	Y	**Y** or **N**
LEAP_MODE	Set the way the UTC offset update is managed. LEGACY: the parameter UTC_OFFSET described above is prioritized and when different from the one propagated by GNSS, an alarm is triggered. Manual acknowledgement is then necessary to switch to the GNSS parameter. AUTOMATIC: as soon as available the UTC offset	Mandatory	AUTOMATIC	**LEGACY** or **AUTOMATIC**

Name	Description	Availability	Default value	Accepted values
	propagated by GNSS is used and the value described above is updated accordingly automatically.			
PASSIVE_ANT ENNA	Select active or passive antenna	Mandatory	N	**Y** or **N**
GPS	Enable or disable GPS constellation. Only 2 constellations can be activated.	Mandatory	Y	**Y** or **N**
GALILEO	Enable or disable GALILEO constellation. Only 2 constellations can be activated.	Mandatory	Y	**Y** or **N**
GLONASS	Enable or disable GLONASS constellation. Only 2 constellations can be activated.	Mandatory	N	**Y** or **N**
BEIDOU	Enable or disable BEIDOU constellation. Only 2 constellations can be activated.	Mandatory	N	**Y** or **N**

Note : any change to the default constellation must be followed by a Coldstart and a reboot.

[IRIGB_IN] Section

Name	Description	Availability	Default value	Accepted values
PRESENCE	Enable/disable IRIGB source.	Mandatory	Y	Y, N
YEAR	Default year used when it is not received	Mandatory	2019	Current year
CODE	Type of IRIGB code	Mandatory	B122	B122, B126, 1344

2.3.2. Dedicated NTP settings

NTP authentication is managed using 3 files located on the SD card:

The file "/config/system/etc/ntp/keys" sets the keys to be used. Those keys must be shared with the NTP client so that authentication can take place.

"keys" file example :

```
# Thu Apr 28 16:06:45 2016
 1 MD5 12345678901234567890  # MD5 key
```

```
2 MD5 x$H;9MV>zXL7YEa%+T)x  # MD5 key
3 MD5 $jHdPH(0S3Jm;A7       # MD5 key
```

The file " /config/system/etc/ntp/trustedkeys" activates the keys

Example: within the following file, the 3 keys are activated

```
# Specify the key identifiers from /etc/ntp/keys which are trusted.
trustedkey 1 2 3
```

The file "/config/system/etc/ntp/restrict" define NTP server access rights for a subnet or a machine.

Example:
```
restrict 192.168.10.0 mask 255.255.255.0 #authenticated or not
restrict 192.168.1.0 mask 255.255.255.0 notrust #authenticated
restrict 192.168.1.1 mask 255.255.255.255 notrust #authenticated
```

3. HOW TO GET STARTED

3.1. POWERING-UP

The equipment power-up when the power is applied to the unit and the ON/OFF switch is turned ON.

3.2. LEDS

On the front panel a group of three colored LED indicates the status of the system. These indicators and their meanings are described in the table below.

LED	Color	Description
ON	Off	At system start-up
	Green	Equipment is powered up.
	Blinking Green	Equipment is locked on current screen.
ALARMS	Off	At system start-up
	Red	At least one ERROR criticality alarm is present
	Orange	At least one WARNING and no ERROR is present
	Green	Equipment operates normally. Alarms of type INFO can though be present
SYNC	Red	The internal time has not been set yet
	Orange	The equipment is no more synchronized
	Green	The equipment is synchronized and disciplined on the GNSS source

Tableau 3 – Status LEDs

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3.3. SCREENS

The display is composed of several screens on which the navigation is done by using the up and down arrow keys. The default screen is displayed again after 5 seconds without action on the up or down arrows. Nevertheless, it is possible to lock the display on the current screen by pressing the green button.

No configuration changes can be made from the screens displayed.

The following sections describe the contents of screens.

3.3.1. MAIN SCREEN

This screen is displayed as the default screen. It provides a synthesis of the operation of the equipment.

The displayed information is the following:

- current UTC date and time

- name of the selected time source (GNSS or LOCAL)

- quality of the generated time

- quality of the frequency stability

```
Time      2014-04-25 12:00:00 UTC      Freq
▌▌▌▌▌     Synced to source GPS          ▌▌▌▌
```

Screen sample

The quality indicators are made of 0 to 5 bars.

Time indicator:

Bars	Precision (GNSS)	Equipment state
0	> 10µs	Indicates a problem in steady state. (Normal during startup)
1	1µs to 10µs	
2	500ns to 1µs	
3	100ns to 500ns	Operating
4	50ns to 100ns	
5	< 50ns	

Precision is an image of the phase difference between the internal generated 1PPS and the 1PPS of the time source.

Frequency indicator:

Bars	Equipment state
0	Indicates a problem in steady state. (Normal during startup)
1	
2	
3	Operating
4	
5	

- A press on the green button allows to setup a manual time. Use up and down arrows to change the values and right and left arrows to browse through the menu. Press green button to validate the time (red button to cancel). If no other source is available the setup time will be maintained otherwise it will be changed by the source time.

3.3.2. ALARMS SCREEN

This screen displays the current alarms. The following screen is displayed when there is no alarm.

```
Alarms              NONE

```

Sample screen with no alarm

The following screen gives an example of the presence of an alarm raised when no GNSS antenna is connected.

```
Alarm [ERROR] '1201' x 1            1/1
          GNSS antenna not connected
```

Sample screen with an alarm

When multiple alarms are up, the left and right arrow keys can be used to navigate around them. The number of alarms is shown is the upper right corner with the syntax X/N where X is the Xth alarm out of N total alarms.

It is possible to reset all current alarms by pressing the red key.

Note: if the alarm condition remains active, the alarm will appear again in the list.

3.3.3. SOURCE SCREEN

This screen gives information about the time source.

3.3.3.1. GNSS SCREEN

```
GNSS    Doing fixes(Sat=X)      UTC+18s
Pos: N043.55296 / E001.41670 / +0162m
```

Sample screen for GNSS time source

The first line gives information about the operation of the GNSS receiver. Possible modes are:

- doing fixes: GNSS operates nominally

- antenna not connected: the GNSS antenna is not connected

- antenna shorted: the GNSS antenna is short-circuited or not powered

- UTC Offsets mismatch: UTC offsets differ between configuration and GNNS

- not nominal: the GNSS does not operate nominally

- survey in progress (x%):   the GNSS is establishing its position

The second line shows the position of the antenna connected to the equipment.

Available actions from this screen are:

- A long press on the red button excludes or includes the GNSS source into the list of available time sources.
- A GNSS Coldstart is achieved by pressing successively red button, left arrow, left arrow, right arrow, right arrow, green button. Once a cold start has been done, the equipment must be switched OFF and ON.

3.3.3.1. IRIGB SCREEN

```
IRIG-B  time is not available
Type: standard status : no signal
```

Sample screen for IRIGB time source (no signal in that case)

- A long press on the red button excludes or includes the IRIGB source into the list of available time sources.

3.3.4. OSCILLATOR SCREEN

This screen gives information about

- the measurement of the phase differences between the internal 1PPS and the 1PPS of the time source
- the computed frequency stability estimator

```
Est. Stab.=+1.023e-11          PH/TR
          PPS/GPS = +012ns
```

Sample screen of the oscillator

The first line gives the stability estimator, and the mode (here active PHASING/TRACKING).

The second line indicates the estimation of the phase difference between the internal generated 1PPS and the 1PPS of the reference time source.

```
Est. Stab.=+1.023e-11          HEAT
          PPS/GPS = +012ns      10s
```

Sample screen of the oscillator during the heating period

First line indicates that the oscillator is heating.

Second line indicates the remaining time for the end of heating.

3.3.5. EQUIPMENT INFORMATION SCREEN

It shows the equipment type and the software version running.

MSXXX is the equipment type.

LOXXX and ATXXX are the embedded software versions.

```
www.timelinkmicro.com          TMS6002

MSXXXX          LOXXXX          XLXXXXX
```

<p align="center">Sample screen for equipment information</p>

- A press on the right arrow allow to check the embedded firmware version.

3.4. SSH ACCESS

This service enables access to a remote device in secured mode. The server can be accessed through SSH from the network it is connected to.

Only the '**maintenance**' user is authorized to connect to the equipment. After a successful connection, a shell is opened. The user must take care of its actions as they can result in the equipment no longer being able to serve its primary functions.

The possible actions executable from this shell are the following:

- update the software

- modify the password of a user

- restart or stop the equipment

- connect as 'root'

The default password for both accounts is '**timelink**'.

3.4.1. CHANGE PASSWORD

To change the password for a user, use the command **'passwd <user>'**. The system will ask for the new password and it will be written in encrypted format in a file on the SD card.

Note :   When user **maintenance** changes its password, it must comply with the following rules:

- At least 8 characters long
- Contains at least 3 of the following: a lower case letter (a-z), an upper case letter (A-Z), a digit (0-9), a special character ($,@,…)
- The new password must differ from the current one
- The password must not be the equipment's host name (even with character permutations of different cases).

The password is rejected if it lacks compliance with any of those rules.

For the **root** user, a warning is printed if those rules are not complied with, but the password is changed anyway.

__Note :__ After modifying a password, or any other system or application parameter, the SD card digital signature must be updated (cf. § 6.1) before rebooting the equipment. In case it weren't done, the equipment wouldn't start.

3.4.2. RESTART OR STOP THE EQUIPMENT

These functions allows for securely restart or stop the equipment. The user must first log in as 'root'.

To restart, use the '**reboot**' command; to stop, use '**poweroff**'.

After executing '**poweroff**' the command the equipment can be switched off.

3.4.3. CHANGE TO USER 'root'

This function allows a user to change its identity to '**root**'.

To do this, type '**/tools/su**' and enter the 'root' password.

3.5. SERIAL CONSOLE ACCESS

Access to the system can also be made from the Console port by connecting a terminal emulator software. Use the following parameters:

- baud rate 115200

- 8 bits, 1 stop bit, no parity

After logging in with the login/password used to gain SSH access, a shell is opened. The same commands as those described in 3.4 can be issued.

4. MONITORING

4.1. Http server

The http interface is a remote control of the equipment; The integrated http server uses port 80.

The following screenshots give a preview of the pages as they appear in a browser:
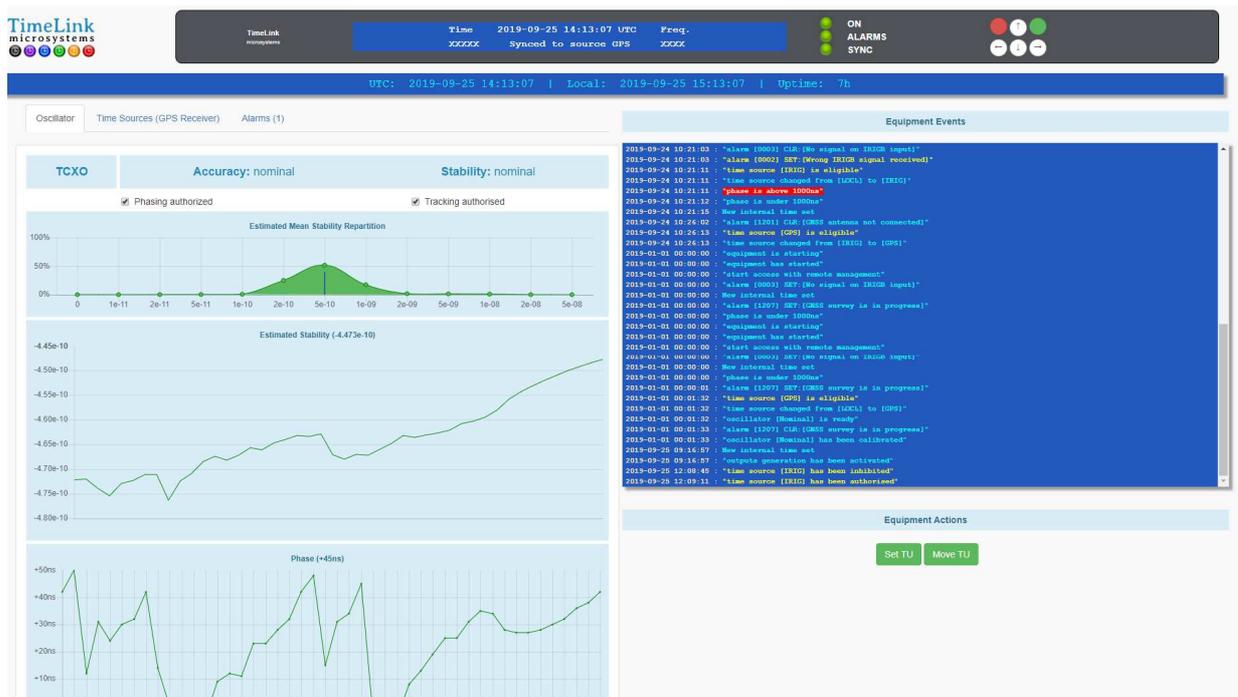
The top section is an active remote management of the front face and allows browsing through the equipment menu remotely.

Display adjusts to arrow selection on the right

Active control
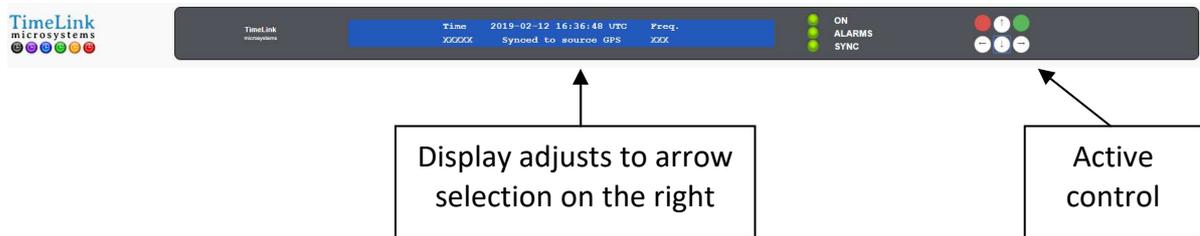
Long press is replaced by "CTRL" and button click.

- The top left part allows checking and controlling the equipment.
- The oscillator section provides information on the stability accuracy.
- The Time sources section provides control over the available time sources as shown below
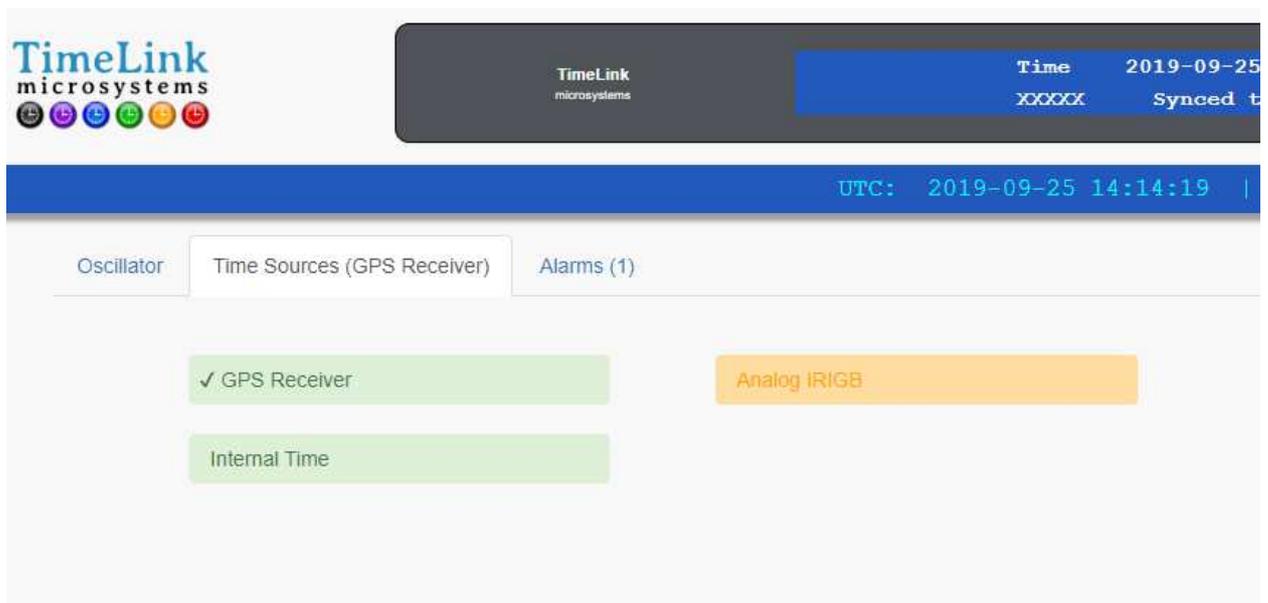
A right click on the source allows excluding or including the selected source.

4.2. SNMP MONITORING

The monitoring of the equipment can be made using the SNMP v2c protocol. See the provided MIB file for complete description of the information that can be monitored.

The community configuration is located in the file **'/config/etc/snmp/snmpd.conf'**. The default name for read-only is **'public'** and read-write is **'private'**.

The MIB root OID is: **1.3.6.1.4.22641.100**.

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5. MAINTENANCE

5.1. SOFTWARE UPDATE

The software update is automatically done by changing the content of the SD card.

5.2. CONFIGURATION FILE UPDATE CONFIGURATION

The configuration files can be modified:

- Either through a remote access

- Or using a PC and a SD card reader.

5.2.1. EDITING USING REMOTE ACCESS

First, log in from a Console or SSH.

Once connected, use the 'vi' editor provided in the equipment.

Type **`vi /config/user.ini`**, modify the values, save the file and exit from the editor.

Once the modification of the file has been done, restart the equipment by typing 'reboot' for the new values to take effect.

5.2.2. EDITING USING A PC

Before file modification, stop the equipment, remove the SD card and insert it in the SD card reader of a PC.

Use a text editor to modify the 'user.ini' file. The SD card can then be located back into the equipment which needs to be powered-on.

Important note:

Depending on the used text editor, verify than the encoding of the end of lines are in the UNIX format (only LF) and not in the WINDOWS format (CR + LF). A bad encoding will lead to an unreadable file in the equipment. Text editor 'Notepad++' is a good choice for updating configuration files

5.3. TROUBLESHOOTING AND ALARMS MESSAGES

The possible alarm codes are the following:

0001: Error decoding IRIGB signal.

0002: Wrong IRIGB signal received. Check that the IRIG-B code received is consistent with the expected code.

0003: No signal on IRIG-N input.

1100: check that the UTC_OFFSET value of the [GPS] section has the same value as the displayed one. If they differ edit the 'user.ini' file to write the new value.

1201: the GNSS antenna is not connected

1202: the GNSS antenna is short-circuited or not powered

1207: GNSS survey is in progress

1208: GNSS leap second is pending

3102:   GNSS time is different from internal

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