TimeLink
microsystems

TMS1000

USER MANUAL

Reference :	**MN0482**
Release :	**A3**
Date :	**2017-09-04**

CHANGES IN THE DOCUMENT		
Release	**DATE**	**OBJECT of CHANGE**
A1	2014-11-19	Initial version
A2	2014-12-15	Details concerning system update and manual date setup
A2_EN	2016-10-27	English version provided
A3_EN	2017-09-05	New password associated with LO665A2

	Name-Title	**Date and Signature**
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1. GENERAL DESCRIPTION

The TMS1000 is a GNSS disciplined NTP server.

1.1. FRONT AND BACK PANELS

The front panel of the equipment includes the power supply connector, the GNSS antenna connector as well as the 1 PPS output.
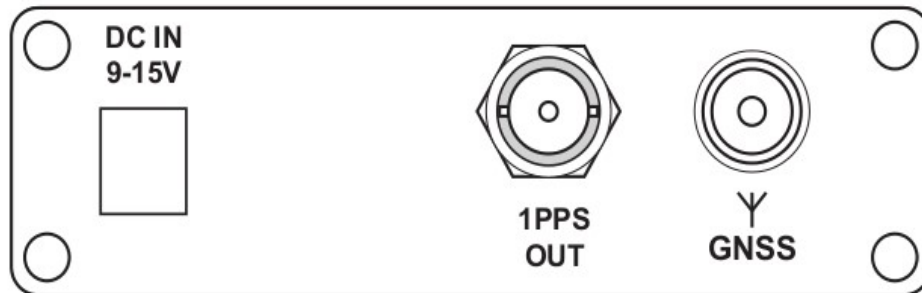

Figure 1 – Front panel

The back panel of the equipment includes the control interfaces (console and SDCARD) and the network RJ45 connector.
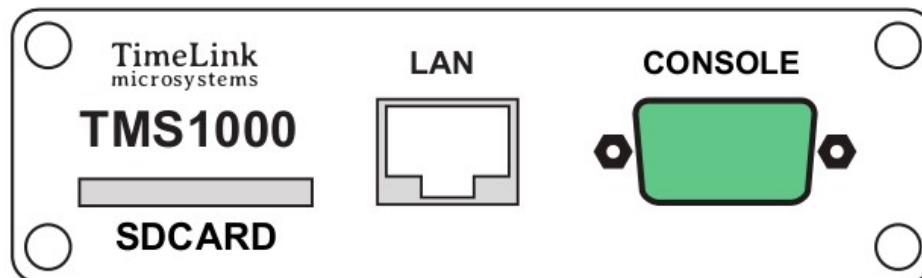

Figure 2 – Back panel

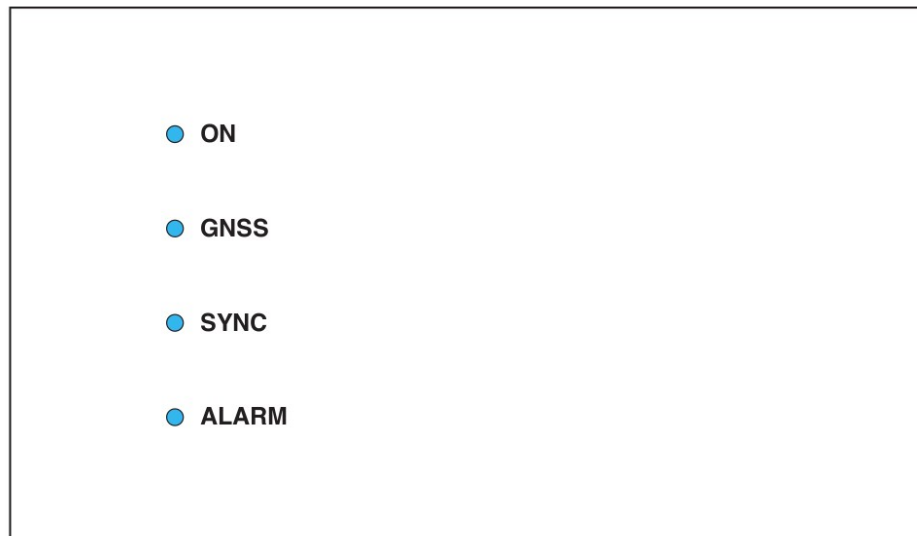The top panel includes four LEDS displaying the equipment status.

○ ON

○ GNSS

○ SYNC

○ ALARM

Figure 3 – Top panel

1.2. FUNCTIONAL CHARACTERISTICS

The table below summarizes the functional characteristics of the equipment.

Characteristics	Types/Values
1PPS output	Level : 0-5V, positive pulse, 50 Ω
	Female BNC connector - Identification: "1PPS OUT"
	Duration: 1ms, Period:1Hz
SDCard	"Push-push" type connector on back panel – identification "SDCARD"
Power supply	12V DC adaptor (provided)
	Consumption : ~3W / 12VDC
LAN/Network	Ethernet 100 Mbps
	RJ45 - Identification "LAN"
NTP service	Port UDP 123, Client/Server mode (unicast)
Console	SubD 9 pins connector, 115200 bauds, 8bits, 1 stop bit
SSH service	Port TCP 22
HTTP service	Port TCP 80
Remote monitoring	UDP connections towards configurable IP/Ports

TMS1000 functional characteristics

1.3. PHYSICAL CHARACTERISTICS

The table below summarizes the physical characteristics of the equipment.

Characteristics	Types/Values
Size	Width 105mm – Height 33mm – depth 167mm
Weight	418g

TMS1000 physical characteristics

2. PREPARATION FOR USE

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

2.1. CONNECTIONS

The following connections must be made:

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

- 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 on the equipment only after all connections has been made.

2.2. CONFIGURATION

Configuration parameters must be setup with consistent values to allow proper use of the equipment. Those settings are in files located within an SDCard inserted in the back of the equipment.

The parameters available to the user are located in the "user.ini" file. This file is within the SDCard directory "TMS1000" when mounted using a PC, and within "/config" when accessed through remote access (console or network).

The following table lists the parameters by functional chapter the same way they are laid out within the configuration file. The procedure to change the settings is described in an appendix to this document.

Important: Please do not modify files other parameters 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.

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2.2.1. TMS1000 SETTINGS

These settings are located in the **'TMS1000/user.ini'** file of the SDCARD.

Section [NETWORK]

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
MAC	MAC address of the equipment	Mandatory	Attributed according to serial number	Any compliant MAC address. Should normally not be modified.
GW	IP V4 address of the default gateway	Optional but recommended	192.168.10.254	Any compliant IP V4 address
BROADCAST	IP V4 broadcast address	Optional	192.168.10.255	Any compliant IP V4 broadcast address
NAMESERVER	IP V4 address of the name server	Optional	8.8.8.8	Any compliant IP V4 address

Section [NTP_SERVER]

Name	Description	Availability	Default value	Accepted values
ENABLE	Activate/deactivate the NTP server	Mandatory	Y	**Y** or **N**
VERSION	NTP protocol version to use in replies	Mandatory	AUTO	**V3**: indicates version 3 packet **V4**: indicates version 4 packet **AUTO**: adapt itself to the requestor
NOTIME	Behavior when unable to get a consistent time	Mandatory	NO_ANSWER	**NO_ANSWER**: do not answer to NTP requests **LEAP**: the NTP packet contains the 'LEAP' flag, indicating the server does not provide a consistent time

Section [GPS]

Name	Description	Availability	Default value	Accepted values
UTC_OFFSET	Offset between GPS and UTC time	Mandatory	18	

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Section [RM]

Name	Description	Availability	Default value	Accepted values
PUSH_TO	IP V4:Port addresses of the UDP frame recipients	Mandatory	192.168.10.191:9000	List of comma-separated 'IP:Port' values

Note: other parameters in the "user.ini" file must not be modified without guidance from Timelink microsystems.

Those parameters are listed right after the following warning:

```
#------------------------------------------------------------------#
#>>>> DO NOT MODIFY PARAMETERS UNDER THIS LINE <<<<
#------------------------------------------------------------------#
```

3. GETTING STARTED

3.1. POWERING UP

The equipment starts when the power is applied to the unit. There is no ON/OFF switch.

Notes:

1. During the boot sequence, the top panel LEDS are switched off during 15 seconds after power is applied.

2. Because of the very low consumption, following power off, one must wait 30 seconds before powering on again. Otherwise a corrupted boot may occur.

3.2. LEDS

3.2.1. LEDS AT STARTUP

During the boot sequence, LEDS displays boot progress or an error code. Below is the summary of the different options.

ON	GNSS	SYNC	ALARM	Description
Yellow	Off	Off	Off	SDCard mounting
Red	Red	Red	Red	SDCard missing or not seen
Green	Yellow	Off	Off	SDCard configuration reading
Red	Off	Off	Red	Network configuration error (IP address not defined)
Off	Red	Off	Red	Network configuration error (subnet mask not defined)
Off	Off	Red	Red	Network configuration error (MAC address not defined)
Green	Green	Yellow	Off	Network services starting
Green	Green	Blue	Off	Network services configuration (first boot only)
Green	Green	Green	Yellow	Application starting
Green	Green	Green	Green	Boot completed
Yellow	Yellow	Yellow	Red	Application did not start

Tableau 1 – LEDS during boot sequence

3.2.2. LEDS DURING OPERATIONS

LED	Color	Description
ON	White	System started
GNSS	Red	No GNSS source
	Yellow	The time source is available but excluded
	Green	The time source is operational and selected as the reference time source
	Off	GNSS source is not activated
SYNC	Red	Not GNSS synchronized
	Green	GNSS synchronized
ALARM	Green	No alarm (Information message may be displayed)
	Yellow	At least one Warning Alarm type
	Red	At least one Error Alarm type

Tableau 2 – LEDS during operations

3.3. INTERFACES

Below interfaces are available:

- 1 PPS signal output
- 1 Ethernet 100Mbits connector
- 1 SDCard Reader
- A 4 LEDS display

Several services are available on the Ethernet interface:

- IP v4 NTP service
- IP v4 SSH
- HTTP server
- UDP v4 server

3.3.1. NTP SERVICE

This service allows synchronizing an NTP client. The generated time is the one calculated by the equipment based on one of the source connected to the equipment.

The NTP server is NTPV3 and V4 compliant; depending on its configuration whenever no reliable time is available it can either not answer or answer with the LEAP flag.

3.3.2. SSH ACCESS

This service allows to remotely connecting to the equipment in secure mode through a network.

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

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The following commands are available:

- 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**'.

3.3.2.1. SYSTEM SOFTWARE UPDATE

The system software update is done using the provided 'update' tool. See the Maintenance section for the procedure.

3.3.2.2. 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 SDCard.

Note:

- The maintenance user password must be by the standard password rules as displayed when requested.

- The root user can bypass the standard password rules.

3.3.2.3. RESTART OR STOP THE EQUIPEMENT

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 a 'poweroff' the equipment can be switched off.

3.3.2.4. CHANGE TO USER 'root'

The command below allows a user to change to user 'root':

Type '`/tools/su`' and enter the 'root' password.

3.3.3. SERIAL CONSOLE ACCESS

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

- 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 the SSH chapter can be issued.

4. MONITORING

The equipment can be monitored through the integrated Web server, SNMP or by receiving a UDP frame containing operation information about the equipment.

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4.1. HTTP Server

The integrated http server uses port 80. The following screenshots give a preview of the pages as they appear in a browser:

Default screen

GNSS screen

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Oscillator screen

Actions screen

Information screen

4.2. MANUAL TIME SETTING

On the "Actions" screen, you can manually set the system time. First, you have to disable all the available time sources by pressing the "Disable" button in front of each source. Once each time source has been disabled, you can enter the current date and time by clicking on the ▦ icon, which opens a dialog allowing you to define the new date:
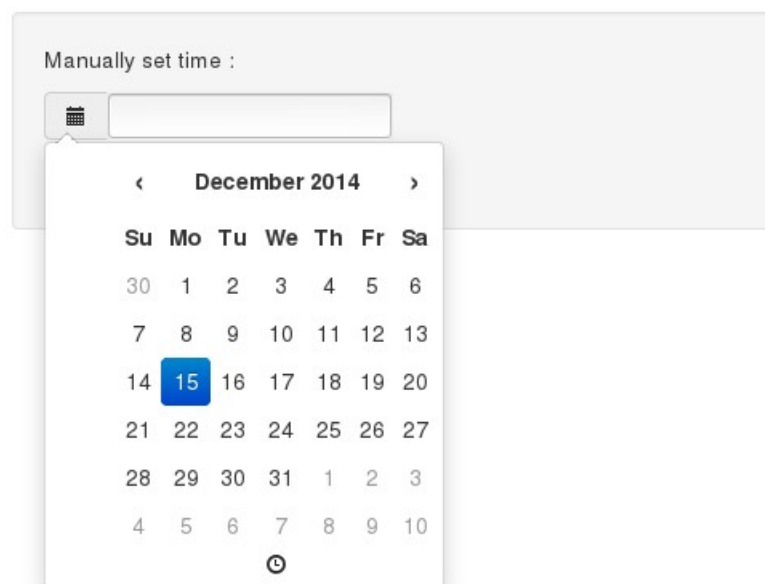
Once the new date has been selected, click on the ⊙ icon, on the bottom of the dialog, to be able to set the time:
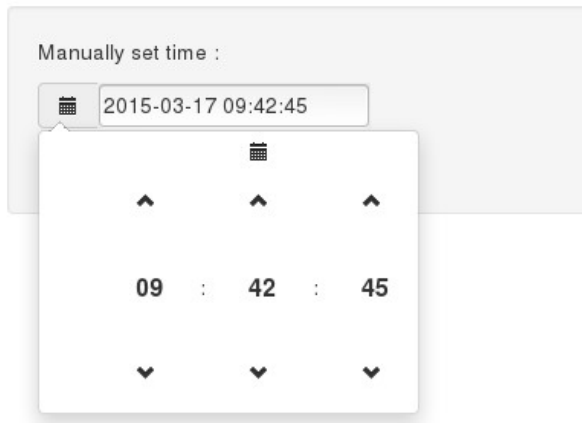
Once the date and time have been selected, close the dialog by clicking outside of it, then press the "Set Time" button to update the system time:
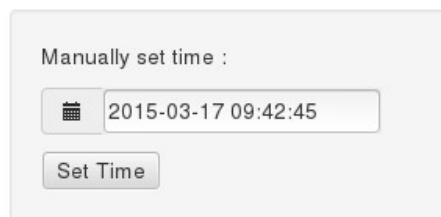
4.3. UDP FRAME

A UDP frame can be automatically sent, each second, to one or several recipient systems. The corresponding configuration is described along with the system's configuration ('[RM]' section).

The frame contains the following fields, separated by ',':

- Frame date and time: 2014-09-15 12:00:00
- Time quality indicator: QT5
- Frequency quality indicator: QF4
- Estimated frequency stability value: -1.230e-11
- Offset between generated PPS and UTC: -007ns
- Current value of the oscillator's DAC: 0412437
- Name of the time source used for synchronizing the equipment: GPS
- GNSS receiver status: C: 000: O
- Count and list of currently active alarms: [0,NONE]

Frame sample:

```
2014-10-09 14:59:34,QT5,QF4,+3.610e-10,+008ns,0669564,GPS,C:100:O,[0,NONE]
```

Notes:

The GNSS receiver status contains 3 fields separated by ':':

- Antenna status: connected ('C'), not connected ('N') or shorted ('S')
- Survey progress: value between 000 to 100 (000 may be a normal value if survey is disabled)

- Decoding status: decoding can be successful ('O') or incorrect ('N')

The alarms list equals 'NONE' when no alarm is active; otherwise, it contains a list of alarm codes separated by ':' (see §6.2 for a full list of alarm codes).

'QF' and 'QT' are followed by a single digit between 0 and 5, see below for the corresponding status:

QT:

Bars	Precision	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	
4	50ns to 100ns	Normal
5	< 50ns	

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

QF :

Bars	Stability	Equipment state
0	> 1e-8	Indicates a problem in steady state. (Normal during startup)
1	1e-8 to 5e-9	
2	5e-9 to 1e-9	
3	1e-9 to 5e-10	Nominal
4	5e-10 to 1e-10	
5	< 1e-10	

5. MAINTENANCE

Maintenance operations are limited to software update.

5.1. SOFTWARE RELOADING

To be able to execute the update procedure you must be logged in as the 'root' user. See the section indicating how to proceed.

Software update is done by using the provided tool: `'/usr/bin/update'`. Use it as follow:

- Copy on the SDCard the file(s) to update.

- Re-insert the SDCard and restart the equipment

- Open a shell by connecting with SSH or the Console

- Execute `'/usr/bin/update'`

5.2. SOFTWARE UPDATE

The software update is made by storing the binary file contained in the 'update' directory of the SDcard in the FLASH memory of the processor module. If a new binary file is provided by Timelink microsystems, please copy it first in the SDCard in the /update directory.

To proceed, type the following command in a command shell.

```
"/usr/bin/update -u /config/update/<filename>"
```

<Filename> is the name of the binary file which contains the new software.

It is **highly recommended** to verify that the update was fully successful. To proceed, type the command

```
"/usr/bin/update -c /config/update/<fichier>"
```

The resulting information will indicate if the updated flash content and the file are identical. If not, try again to make the update.

Note: if the update fails, the flash memory of the processor module may have been damaged. It will be necessary to return the equipment, or only the processor module, to TIMELINK microsystems for investigation. No sensible user data are stored on the processor module so your data will not be visible to the manufacturer.

5.3. GNSS RECEIVER RESET

To reset the GNSS it is necessary to be connected on the console or in Ssh on the equipment. When connected type the following command from a shell:

```
"/usr/bin/coldstart"
```

During the GNSS reset the equipment remains operational but not disciplined to the GNSS. At the end of the GNSS reset the equipment resumes to its nominal behavior.

Note: It is recommended to restart the equipment at the end of a GNSS reset to have better frequency stability estimation because the reset induces abnormal measures that temporarily affect this estimation in a negative way.

6. APPENDIX

6.1. CONFIGURATION FILES EDITION

The only configuration file that can be modified by the user on this equipment id the 'user.ini' files.

Two means are available to modify the file:

- from the equipment itself
- from a PC equipped with a SDCard reader

6.1.1. EDITING FROM THE EQUIPEMENT

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.

1.1.1. EDITING FROM AN EXTERNAL SYSTEM

Before file modification, stop the equipment, remove the SDCard and insert it in the SDCard reader of a PC. Use a text editor to modify the 'user.ini' file. Then remove the SDCard and insert it back in the equipment. Then power on the equipment.

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.

1.1.1. EDITING FROM AN EXTERNAL SYSTEM

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Summary of TMS1000 parameters

Section	Parameter	Default value	Operational value
[NETWORK]	IP	192.168.10.190	
	MASK	255.255.255.0	
	MAC	Depends on equipment serial number	
	GW	192.168.10.254	
	BROADCAST	192.168.10.255	
	NAMESERVER	8.8.8.8	
[NTP_SERVER]	ENABLE	Y	
	VERSION	AUTO	
	NOTIME	NO_ANSWER	
[GPS]	UTC_OFFSET	16	
[RM]	PUSH_TO	192.168.10.191:9000	
Password 'maintenance'		timelink	
Password 'root'		timelink	

*** End of document ***