IMS LANTIME M1000

Product Highlights

- Maximum flexibility so that you always have exactly the input and output synchronization signals you need for your application—boosting your efficiency.
- Hot-swappable modules allow you to adapt to changing needs on the fly with practically no disruption to your processes, allowing operation as anything from an IRIG-B generator to a PTP grandmaster.
- A compact 1U chassis designed for installation in a standard 19” rack for excellent space economy.
- Web Interface enables easy and secure management of all modules.

A Powerful Rack-Mounted Synchronization Solution

Constructed to be installed in a standard 19” rack, the LANTIME M1000 represents the most compact rackmounted form of the modular IMS platform while still offering flexibility to adapt easily to changing needs.

The LANTIME M1000 already offers superior NTP server performance out of the box with just a power module, clock module, and CPU module—and modules can be added or swapped out to meet temporary or changing needs. For example, a single PTP module provides best-in-class performance as a PTP grandmaster or slave clock, while two PTP modules (IEEE 1588) can be integrated to allow the LANTIME M1000 to operate as a PTP boundary clock.

Meinberg’s custom Linux-based LANTIME Operating System (LTOS), a slim & secure OS developed specially for the needs of a time server, powers the LANTIME M1000 under the hood, providing access to all the security, network, and monitoring features that you could ever need from an enterprise-grade synchronization appliance.

The powerful Web UI enables you to quickly and easily configure and monitor your LANTIME device, while the CLI provides power users with unparalleled flexibility and efficiency. The comprehensive LTOS REST API provides a complete toolset for your network orchestration and automation needs, and SNMP support allows you to integrate your Meinberg systems into your existing network management system.

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Intelligent Modular Synchronization

Meinberg's **Intelligent Modular Synchronization** platform—also simply known as **IMS**—offers the potential to connect a diversity of power sources, input sources, and output receivers and to swap inputs and outputs in and out as and when you require them—or don't need them anymore. It also provides access to the latest synchronization technology upgrades without having to replace your basic server. Almost every module can be hot-swapped while the system is up and running with minimal-to-no disruption to your wider synchronization infrastructure.

Every IMS system supports an extensive selection of plug-in modules designed to meet a variety of industrial timing requirements, including power generation, audio & video content production, telecommunications, data centers, finance, production monitoring, traffic control, and more.

A basic IMS system consists of a CPU module to provide the basic server and configuration interface functionality, power supply modules to provide the requisite power source, and a reference clock with an integrated oscillator and external receiver to allow your server to synchronize to the reference signal of your choice. A basic configuration such as is can itself operate as a fully functional, highly powerful NTP server or time string generator.

For specific applications, modules are also available to allow each IMS unit to receive and output external reference sources such as pulse-per-second or 10 MHz signals, measure signal accuracy, and also process or generate industry-specific signals such as broadcasting and telecom line synchronization signals. Special industry-specific solutions also exist, for example to monitor and analyze mains power line frequencies or timestamp externally generated signals.

And of course, IMS LANTIME systems meet the standard requirement for redundancy at multiple levels. Options are available for power supply redundancy, for example to allow the server to continue operating on a DC battery source if the primary AC source fails, or to fall back to a secondary reference clock and source if the primary clock loses synchronization or can no longer trust its reference source. Network redundancy standards such as the Parallel Redundancy Protocol (PRP) are also supported.

Meinberg offers a plethora of modules for almost every conceivable application, and the sky is the limit when it comes to the flexibility that IMS provides. If you need support for a specific type of clock or time signal that isn't listed in this data sheet, reach out to us and we'll almost certainly be able to find a solution, or may even have already developed one! Meinberg never stops innovating, and the range of available IMS modules continues to grow.

LANTIME M1000 General Information

Electrical specifications such as power draw are exclusively dependent on the combination of modules installed. Please refer to the module data sheets for more information on the electrical specifications of each module, or reach out to your Meinberg Sales Representative if you require the electrical specifications of a complete LANTIME M1000 configuration.

Operating Specifications

Acoustic Noise Emissions	43.3 dB(A)
Operating Temperature	0 °C to 50 °C (32 °F to 122 °F)
Storage Temperature	-20 °C to 70 °C (-4 °F to 158 °F)
Relative Humidity	Max. 95 % at 40 °C (104 °F), non-condensing
Operating Altitude	Max. 4,000 m / 13,123 ft (above sea level)

Chassis Specifications

Form Factor	1U rackmounted chassis for installation in 19" rack
Dimensions (Only Chassis) [W x H x D]	483 mm x 44 mm x 290 mm (19.02 in x 1.73 in x 11.42 in)
Dimensions (including Connectors & Handles) [W x H x D]	483 mm x 44 mm x 314 mm (19.02 in x 1.73 in x 12.37 in)
Material	Powder-coated steel chassis[1]
IP Rating	IP30

Accessories Included

The specific accessories shipped with your LANTIME M1000 will depend on the modules that you order with it. However, the following will generally be included:

- a reference clock module that relies on a GNSS or long-wave radio signal will typically be shipped as standard with the requisite antenna and cable unless otherwise agreed,
- a two-part power cable (5-pin MSTB to IEC 60320 C14 cable, IEC 60320 C13 cable to local mains plug) is always shipped with an IMS-PWR-AD10 power supply module,
- a printed setup guide explaining the basic setup process and antenna installation is always included.

Support & Compliance

Technical Support	Free lifetime support via telephone and email, including firmware updates
Warranty	Three-year warranty, extendable upon request
Firmware Updates	Firmware is field-upgradable; updates can be installed from a connected USB storage medium, via the Web Interface (upload via a web browser), or via the CLI (download from a server). The LANTIME Operating System Firmware LTOS allows you to install multiple firmware versions onto the device concurrently and select which one should be used when the system starts.
Conformity Declarations	CE, UKCA
RoHS Compliance	The product is fully RoHS-compliant.
WEEE Status	The purchase of this product is considered to be a “B2B” transaction (non-household product) for the purposes of the EU Waste of Electrical and Electronic Equipment Directive; the product falls under Category 6, “Small IT and Telecommunications Equipment”. For disposal, it can be returned to the manufacturer to ensure WEEE compliance. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will cover the costs for the waste disposal itself.

LANTIME M1000 Slot Types

The LANTIME M1000 supports a plethora of modules, encompassing power sources, input sources, and signal outputs.

PWR	**Power Module**	The "**Power**" slots, as the name suggests, host the IMS system's power supply modules that powers every component in the unit, from the CPU core to the signal outputs. No additional power supply is necessary for any individual modules. Meinberg offers both AC and DC power supply solutions, and each module provides up to 50 W of power, depending on the power draw of your configuration. The other power slot is typically used to ensure power redundancy, providing a backup power source should the primary power source fail*.
CLK	**Reference Clock Module**	The "**Clock**" slot hosts the primary timekeeping module underpinning the synchronization functions of the LANTIME M1000. These modules allow IMS systems to operate as "Stratum 1" servers—servers directly synchronized with a Stratum 0 atomic clock source such as a GNSS satellite or long-wave radio signal. Modules are available for synchronization with GPS or other GNSS satellite systems, with various long-wave radio signals, or with an IRIG time code signal.
MRI/ESI/IO	**Combination I/O Slots**	The "**MRI**" and "**ESI**" slots ordinarily host Meinberg's extension input modules for applications where a reference clock other than a GPS/GNSS, DCF77, or IRIG time code source is required. These modules are used to handle incoming pulse-per-second and 10 MHz frequency signals as well as AM or DCLS IRIG time codes. There are also special-purpose input modules used for processing industry-specific signals such as E1 and T1 sync signals employed in telecommunications engineering. Please note that certain input modules are specified only for MRI slots and will therefore only function in an "**MRI**" slot of the LANTIME M1000. Modules specified for ESI slots will function in an "**MRI**" or "**ESI**" slot. The "**IO**" slots are typically used for network expansion modules or for signal output modules that can be used to generate high-accuracy signals such as pulse-per-second, frequency signals, studio clock signals, or E1/T1 clock signals. If the "**MRI**" and "**ESI**" slots are not used for input reference signals, these too can be used for output or network expansion modules.
CPU	**Central Processing Unit**	The **CPU** module is the "brain" of the IMS system. It hosts the IMS unit's processor, memory, basic Ethernet connectivity and flash storage memory, making it essentially the mainboard of the server. Among other things, it provides the Web Interface, FTP, SSH server, logging, monitoring, and configuration management functionality.
ACM	**Active Cooling Module**	This design of the **Active Cooling Module** is specific to the LANTIME M1000 series and provides the system with the requisite active temperature control. The IMS system can be configured to respond to failures of this module in order to prevent heat damage.

* In a small number of application scenarios (for example, the installation of 12 SFP network interfaces), the power draw may exceed the 50 W provided by a single power supply modules and the second slot will therefore be needed to supply the additional power. Redundancy in these cases can no longer be guaranteed. Meinberg recommends the use of a LANTIME M2000S, LANTIME M3000, LANTIME M3000S, or LANTIME M4000 in these cases.

CPU Module

Basic System Specifications

Processor	Intel Atom E3805 dual-core SoM (1.33GHz, 1 MB L2 cache, 3 W TDP)
Operating System	Custom LANTIME Operating System Firmware (LTOS) based on Linux 4.x LTS kernel
Main Memory	2GB DDR3L onboard
Flash Disk	4 GB eMMC Flash

Monitoring & Alarms

Supported Protocols	SNMP v1, SNMP v2, SNMP v3
Notification Channels	Email (SMTP), syslog
Log Access	Logs can be viewed and downloaded in the Web Interface, downloaded via the FTP service, or accessed via the command line interface

NTP Support

NTP Protocols	NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4 (RFC 5905), SNTP v3 (RFC 1769), SNTP v4 (RFC 2030)
Security Features	Symmetric key-based authentication using MD5, SHA-1, or AES-128-CMAC hashes NTP v4 Autokey (private/public key pairs) NTS encryption (RFC 8915) for NTP v4 in unicast client mode
Performance	Up to 25,000 NTP requests per second

Network Connectivity

Port “LAN0”	RJ45 Female Connector 10/100/1000BASE-T Ethernet
Port “LAN1”	SFP Connector Supports copper and fiber-optic SFP transceivers for Gigabit Ethernet

Management Interfaces

All management interfaces (except the serial terminal interface) can be disabled or enabled as required.

Remote Management	Web Interface (HTTP/HTTPS TLS v1.3) SSH v2 (command line interface) Telnet (command line interface) REST API (HTTP/HTTPS TLS v1.3)
Local Management	8P8C (“RJ45-like”) connector for serial console access

USB Interface

This USB interface can be used for:

- saving a backup of the LTOS configuration to an external storage medium (such as a USB flash drive) and restoring this backup (or copying a standard configuration between multiple LANTIME servers)
- creating a backup of log files (such as SyncMon logs)
- loading and saving cryptographic certificates
- creating a physical USB “security key” that can be used to enable and disable the local function keys on the device

Reference Clock Modules

Reference clocks with GNSS or other radio signal receivers are shipped as standard with the requisite antenna. Please reach out to your Meinberg Sales Representative if you require more information about a specific module—detailed data sheets for each type are available.

Available Clock Module Types

IMS-GPS	12-channel L1 C/A code receiver for reception of signals from the GPS satellite constellation. Requires a Meinberg GPSANTv2 antenna.
IMS-GNS-UC	72-channel receiver for reception of signals from the GPS (L1 C/A code) and Galileo (E1 B/C) satellite constellations. Requires a Meinberg GPSANTv2 antenna.
IMS-GNS	72-channel multi-GNSS receiver for reception of signals from the GPS (L1), Galileo (E1 B/C), BeiDou (B1I), and GLONASS (L1OF) satellite constellations. Requires a supported L1 antenna.
IMS-GNM	184-channel multi-band, multi-GNSS receiver for reception of signals from the GPS (L1 C/A and L2 bands), Galileo (E1-B/C and E5b bands), BeiDou (B1I and B2I bands), and GLONASS (L1OF and L2OF bands) constellations. Requires a Meinberg GNSS Multi-Band Antenna.
IMS-GXL	448-channel multi-band, multi-GNSS receiver for reception of signals from the GPS (L1 C/A, L2 C/A, L2 P(Y)), Galileo (E1-B/C, E5a, and E5b), BeiDou (B1I, B2I, and B3I) and GLONASS (L1OF and L2OF bands) constellations. Provides advanced anti-spoofing technology with support for the Fugro AtomiChron® service as well as the Galileo OSNMA service*. Requires a Meinberg GNSS Multi-Band Antenna.
IMS-TCR	Time code receiver for reception of DC level shift (pulse-width modulated) or AM (amplitude-modulated) time code signals in a wide variety of standardized formats.
IMS-PZF	Long-wave receiver with quadrature demodulator for reception of signals from the DCF77 long-wave transmitter in Mainflingen, Germany. Requires a Meinberg AW02 or AI01 antenna.
IMS-MSF	Long-wave receiver for reception of signals from the MSF long-wave-transmitter in Anthorn, UK. Requires a Meinberg AW02-60 antenna.

* At the time of publication, the OSNMA service was not yet fully operational and was still subject to change. Upon finalization of the service specifications by the Galileo operator, a free firmware update will be rolled out for all IMS-GXL modules.

Oscillator Options

Each IMS clock module is shipped as standard with a "**OCXO SQ**" type oscillator (oven-controlled crystal oscillator), which provides excellent holdover performance if your server loses synchronization with its upstream reference for any reason. The IMS clock module may also be shipped on request with a more powerful holdover solution; the options available and their performance metrics are listed below:

Type	Holdover Performance (1 Day)*	Holdover Performance (1 Year)*
OCXO SQ	± 65 µs	± 4.7 s
OCXO HQ	± 10 µs	± 788 ms
OCXO DHQ	± 4.5 µs	± 158 ms

* Full holdover performance requires the system to have been synchronized for 24 hours previously

Extended Synchronization Input (ESI) Modules

Available Module Types

IMS-ESI	PPS Input (BNC, female) Sine-Wave or TTL Frequency Input (1 kHz – 20 MHz, BNC, female) Unframed Frequency Input (1 kHz – 20 MHz, 8P8C) E1/T1 Framed Clock Input (8P8C)
IMS-ESI-4PPS	4x PPS Input (BNC, Female)
IMS-ESI-4PPS Extended	4x PPS Input (BNC, Female) Sine-Wave or TTL Frequency Input (1 kHz – 20 MHz, BNC, female) Unframed Frequency Input (1 kHz – 20 MHz, 8P8C) E1/T1 Framed Clock Input (8P8C)
IMS-VSI	Black Burst Input (BNC, female) LTC Input (BNC, female) Word Clock Input (BNC, female) PPS Input (BNC, female)

Multi-Reference Input (MRI) Modules

Available Module Types

IMS-MRI	AM Time Code Input (BNC, female) DCLS Time Code Input (BNC, female) 10 MHz Frequency Input (BNC, female) PPS Input (BNC, female)
IMS-MRI-FO	AM Time Code Input (ST fiber-optic connector, multi-mode) DCLS Time Code Input (ST fiber-optic connector, multi-mode) 10 MHz Frequency Input (ST fiber-optic connector, multi-mode) PPS Input (ST fiber-optic connector, multi-mode)
IMS-MRI-FO-T	AM Time Code Input (ST fiber-optic connector, multi-mode) DCLS Time Code Input (ST fiber-optic connector, multi-mode) 10 MHz Frequency Input (BNC, female) PPS Input (BNC, female)

PTP (IEEE 1588) Modules

Meinberg's PTP modules are fully compliant with all versions of the IEEE 1588 standard (PTPv1/IEEE 1588-2002*, PTPv2/IEEE 1588-2008, PTPv2.1/IEEE 1588-2019) and also offer support for Synchronous Ethernet ("SyncE", ITU-T Rec. G.8261, G.8262 G.8264) and hardware-level NTP.

These PTP modules can be used in any MRI, ESI, or IO slot of an IMS LANTIME system.

Available Module Types

IMS-HPS100	- Combination Gigabit Ethernet interface (SFP or direct RJ45 copper) - Synchronous Ethernet - Hardware-level NTP - 2x signal outputs (SMA, female; PPS, 10 MHz, 2,048 kHz)
IMS-PSX210	- Two discrete 10 Gigabit Ethernet interfaces - Synchronous Ethernet - Hardware-level NTP

PTP Support

Network Modes	- Multicast Slave - Multicast Master - Unicast Slave - Unicast Master - Multicast Auto - Unicast Master + Multicast Master - Hybrid Mode
Clock Modes	- One-Step - Two-Step

IEEE 1588-2009 Profile Support

The functionality for all IEEE 1588-2009 profiles supported by the IMS LANTIME PTP modules includes support for their respective profile-specific extensions.

- Default IEEE1588-2008 Profiles (E2E and P2P)
- IEC 61850-9-3 Utility Profile
- IEEE C37.238-2011 Power Profile
- IEEE C37.238-2017 Power Profile
- ITU-T G.8265.1 Telecom Profile
- ITU-T G.8275.1 Telecom Profile
- ITU-T G.8275.2 Telecom Profile
- SMPTE 2059-2 Profile
- AES67/RAVENNA Profile
- IEEE 802.1AS Profile
- DOCSIS 3.1 Profile

* PTP v1 support only available with Performance Level C license or above. Please reach out to your Meinberg Sales Representative for more information on Performance Level licensing of the IEEE 1588 PTP modules.

Power Supply Modules

A power supply module supplies 50 W of power for the operation for your LANTIME M1000 system—more than plenty for any conceivable application or combination of IMS modules.

IMS-PWR-AD10

Connector Type	5-pin MSTB, female, 5-pin
Nominal Voltage Range (U_N)	100 V – 240 V AC / 100 V – 200 V DC
Rated Voltage Range (U_{MAX})	90 V – 265 V AC / 90 V – 250 V DC
Nominal Current (I_N)	1.0 A (AC) / 0.6 A (DC)
Nominal AC Frequencies (f_N)	50 Hz – 60 Hz
Rated AC Frequency Range (f_{MAX})	47 Hz – 63 Hz
Max. Heat Emission	180 kJ/h (170.61 BTU/h)
Rated Power Output	50 W

IMS-PWR-DC20

Connector Type	5-pin MSTB, female
Nominal Voltage Range (U_N)	24 V – 48 V DC
Rated Voltage Range (U_{MAX})	20 V – 60 V DC
Nominal Current (I_N)	2.1 A
Max. Heat Emission	180 kJ/h (170.61 BTU/h)
Rated Power Output	50 W

IMS-PWR-DC10

Connector Type	5-pin MSTB, female
Nominal Voltage Range (U_N)	10 V – 36 V DC
Rated Voltage (U_{MAX})	24 V DC
Nominal Current (I_N)	2.5 A
Max. Heat Emission	180 kJ/h (170.61 BTU/h)
Rated Power Output	50 W

Other Modules

Programmable Input/Output Module (IMS-PIO)

The Programmable Input/Output (IMS-PIO) module is designed to operate as a monitoring solution for testing the consistency and integrity of external PPS and 10 MHz signals, but can also otherwise be configured as a PPS and 10 MHz output module.

Capture Input Module (IMS-CPE-1002)

The capture input module can be used to monitor an incoming coaxial line and log timestamped events whenever the rising edge of a pulse signal is detected. These events can in turn be output as a special time string via the DSUB-9 Capture Interface.

Network Connectivity Extension Module (IMS-LNE)

The LNE modules for Meinberg's IMS LANTIME systems are used to expand the network connectivity, for example to serve additional subnets or provide additional network redundancy.

These network modules can be used in any MRI, ESI, or IO slot of an IMS LANTIME system.

Error Relay Module (IMS-REL)

The Error Relay (IMS-REL) module provides three 3-pin MSTB relay connectors that are switched when certain defined conditions are met. These can include loss of synchronization of the reference clock, loss of 10 MHz output, or loss of PPS output.

Available IMS-LNE Module Types

IMS-LNE	4x RJ45 Gigabit Ethernet copper interfaces
IMS-LNE-SFP	4x SFP Ethernet interfaces for use with copper or fiber-optic transceivers

Other Modules

Frequency Deviation Monitor Module (IMS-FDM)

The Frequency Deviation Monitor (IMS-FDM) module is connected to a single-phase AC source with a nominal frequency of 50 or 60 Hz. It continuously measures the power line wave frequency and records even slight deviations.

These readings can be output via the module's DFMC connector to trigger automated mechanisms such as alarms or automated correction systems.

Available IMS-FDM Module Types

IMS-FDM	3-pin MSTB input, 70 V – 270 V AC
IMS-FDM-LVI	D-SUB 9 input, 3 V – 9 V AC

Low-Phase Noise Output Module (IMS-LNO)

The LNO modules are used to generate 10 MHz sine wave signals with low phase noise. These modules are fitted with a dedicated oscillator (Type SQ as standard, Type HQ available for even greater phase noise reductions).

Available IMS-LNO Module Types

IMS-LNO-5dBm	5 dBm output level
IMS-LNO-8dBm	8 dBm output level
IMS-LNO-12dBm	12 dBm output level

General Output Modules

Meinberg's range of general output modules for the IMS LANTIME systems is too extensive to fully list here, and so this data sheet simply presents the output possibilities provided by the range of over 100 different I/O module options.

Please reach out to your Meinberg Sales Representative with your signal needs—they will find the specific module solution that fits your needs and provide you with the relevant documentation on request.

The table below lists the signal options available.

	Signal Options (Connector Types)
Pulse-per-Second (PPS)	TTL (2.5 V_p with 50 Ω load) (standard BNC, insulated BNC) 10 V_p with 50 Ω load (BNC) RS-422 (8P8C) RS-422 insulated (16-pin DFMC) Fiber-Optic Single-Mode (ST) Fiber-Optic Multi-Mode (ST)
10 MHz Frequency (Pulses)	TTL (2.5 V_p with 50 Ω load) (standard BNC, insulated BNC) Fiber-Optic Single-Mode (ST) Fiber-Optic Multi-Mode (ST)
1 MHz Frequency (Sine Wave)	Standard (BNC)
2048 kHz (2.048 MHz) Clock Frequency (E1)	TTL (2.5 V_p with 50 Ω load) (standard BNC, insulated BNC) ITU G.703-15 with 75 Ω, unbalanced (BNC, DIN 1.0/2.3) ITU G.703-15 with 120 Ω, balanced (8P8C, DSUB-9) Fiber-Optic Single-Mode (ST) Fiber-Optic Multi-Mode (ST)
2048 kHz Frequency (Sine Wave)	50 Ω unbalanced (BNC) 120 Ω balanced (DSUB-9)
2048 kBit/s Framed Signal (E1)	ITU G.703-11 with 75 Ω, unbalanced (BNC) ITU G.703-11 with 120 Ω, balanced (8P8C, DSUB-9, DIN1.0/2.3)
1544 kHz (1.544 MHz) Clock Frequency (T1)	TTL (2.5 V_p with 50 Ω load) (standard BNC, insulated BNC) 75 Ω, unbalanced (BNC) 120 Ω, balanced (8P8C, DSUB-9)
1544 kBit/s Framed Signal (T1)	75 Ω, unbalanced (BNC) 120 Ω, balanced (8P8C, DSUB-9, DIN 1.0/2.3)

	Signal Options (Connector Types)
Serial Time String	RS-232 (DSUB-9) RS-422 (DSUB-9) RS-485 (DSUB-9) Fiber-Optic Multi-Mode (ST)
AM Time Code	3 V_{pp} with 50 Ω load (BNC)
DCLS Time Code	TTL (2.5 V_p) with 50 Ω load (BNC) 5 V_p / Max. 250 mA (BNC) RS-422 insulated (16-pin DFMC) RS-422 (DSUB-9, 8P8C) Optocoupler (2-pin MSTB) Fiber-Optic Single-Mode (ST) Fiber-Optic Multi-Mode (ST)
Black Burst	75 Ω unbalanced (BNC)
Word Clock	75 Ω unbalanced (BNC, DSUB-15)
DARS	75 Ω unbalanced (BNC, DSUB-15) 110 Ω balanced (DSUB-15, DSUB-25)
Linear Time Code (LTC)	75 Ω unbalanced (BNC, DSUB-15) 600 Ω balanced (DSUB-15)
Programmable Pulses*	TTL (2.5 V_p) with 50 Ω load (BNC, DSUB-9) 10 V_p with 50 Ω load (BNC) RS-422 (DSUB-9, 8P8C) RS-422 insulated (16-pin DFMC) RS-485 (DSUB-9) PhotoMOS (2-pin MSTB) Optocoupler (2-pin MSTB) Fiber-Optic Single-Mode (ST) Fiber-Optic Multi-Mode (ST)
DCF77 Marks (Simulated DCF77 AM Signal)	–62 dBm (BNC) –50 dBm (BNC)
Capture Events	Meinberg Capture String with RS-232 signaling (DSUB-9) Meinberg Capture String with RS-422 signaling (DSUB-9)
Error Relay	Error signaling, programmable notifications (3-pin MSTB)

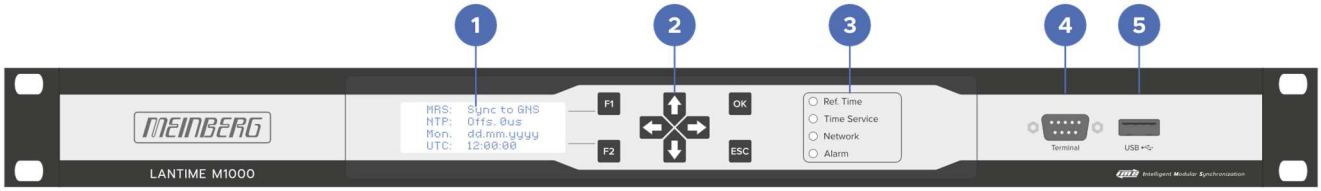
⋆ Please refer to the section "**Programmable Pulses**" for more information.

Programmable Pulses

All IMS LANTIME reference clocks, when paired with a suitable output module with support for programmable pulses, are capable of generating a variety of pulse types. These TTL pulse signals can be configured from the LANTIME OS Web Interface and are either of a set periodicity or frequency, bound to a certain time of day, follow a certain encoding structure, or are conditional (for example, in order to relay certain operating states of the IMS LANTIME system or components of it):

Idle	Any programmable pulse output set to “Idle” is essentially disabled.
Timer	The output generates a voltage signal with a fixed daily schedule. It is possible to define up three times in a day when the output is switched on, and three times in a day when the output is switched off.
Single Shot	A single pulse of defined length is generated once a day at a set time of day.
Cyclic Pulse	A regular pulse is generated at defined intervals starting at midnight local time of each day.
Pulse-per-Second	A regular pulse of defined length is generated once a second.
Pulse-per-Minute	A regular pulse of defined length is generated once a minute.
Pulse-per-Hour	A regular pulse of defined length is generated once an hour.
DCF77 Marks	A simulated time string is output that follows the structure of the signal transmitted by the German DCF77 time code transmitter.
DCF77-like M59	A 500 ms pulse is generated at the 59-second mark of each minute.
Time Sync	A voltage is passed through the output while the reference clock is synchronized.
Position OK	A voltage is passed through the output while the GNSS receiver is receiving enough satellites to determine its position.
All Sync	A voltage is passed through the output while both the “**Time Sync**” and “**Position OK**” states described above are both true.
DCLS Time Code	Generates DCLS Time Code in accordance with the configured IRIG or other time code standard.
1 MHz Frequency	Generates a fixed TTL frequency signal of 1 MHz.
5 MHz Frequency	Generates a fixed TTL frequency signal of 5 MHz.
10 MHz Frequency	Generates a fixed TTL frequency signal of 10 MHz.
Synthesizer Frequency	Generates a custom frequency.
PTTI 1PPS	A pulse-per-second signal with a pulse width of 20 µs is generated.

LANTIME M1000 Display View



1 LCD Panel

- 4 x 16 character backlit display for clarity even in low-light conditions.
- Status display (as shown on right) indicates the status of the receiver clock, the current date and time of the clock, and the current offset of the NTP server.
- Provides status readouts and allows basic configuration processes to be performed using the front-panel function keys.
- Shows alarms and alerts requiring user intervention.

2 Function Keys

"**F1**", "**F2**", "**OK**", "**ESC**", and arrow keys allow for local navigation of configuration menus and status readouts to enable many configuration processes to be performed directly from the device during installation.

3 Status LEDs

Ref. Time (R)	Indicates whether the reference clock is providing a valid timebase.
Time Service (T)	If lit, the internal NTP service of the server is synchronized with the reference clock.
Network (N)	Shows whether there is a valid link-up on the network interface.
Alarm (A)	Advises of a general system fault that requires attention.

4 Serial Console Port (Terminal Access)

The serial console port is a standard RS-232 interface with a D-Sub 9 male connector that can be used to establish a direct serial connection (38400 baud, 8N1 framing) between the LANTIME and any device running suitable terminal software (e.g., a laptop) for direct command line access. The connection can be established using any suitable RS-232 cable or adapter (e.g., RJ45 to D-Sub 9, Yost wiring standard).

It is functionally identical to the serial terminal interface provided on the CPU module.

5 USB Interface

This USB interface can be used for:

- saving a backup of the LTOS configuration to an external storage medium (such as a USB flash drive) and restoring this backup (or copying a standard configuration between multiple LANTIME servers)
- creating a backup of log files (such as SyncMon logs)
- loading and saving cryptographic certificates
- creating a physical USB "security key" that can be used to enable and disable the local function keys on the device

Another USB interface is provided on the CPU module.