MANUAL

IMS-ESI Setup Guide

Hot-Plug Module

April 1, 2022

Meinberg Funkuhren GmbH & Co. KG

Table of Contents

1 Imprint

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9, 31812 Bad Pyrmont, Germany

Phone: + 49 (0) 52 81 / 93 09 – 0
Fax: + 49 (0) 52 81 / 93 09 – 230

Website: https://www.meinbergglobal.com
Email: info@meinberg.de

Date: April 1, 2022

2 Important Safety Information

Please ensure that IMS modules designed for "hot-plugging" (modules that are removable and insertable while a system is in operation) are always handled with the utmost care.

Before performing any maintenance work on the system:

- We recommend making a backup of any stored configurations (e.g. using a USB flash drive or from the Web UI)
- Take note of the chapter "Prevention of ESD Damage".
- Take note of the chapter "Power Supply".

2.1 Product Documentation

Detailed product documentation is provided on a USB flash drive delivered with the Meinbeg system. The manuals can also be downloaded from the Meinberg website at https://www.meinbergglobal.com, where you can enter your system name into the search box at the top of the page to find the relevant manual. Alternatively, contact Meinberg Support for further assistance.

The "Docs & Support" menu on the Web Interface also provides user manuals for time server administrators.

This manual contains important safety instructions for the installation and operation of the device. Please read this manual thoroughly before using the device.

This device may only be used for the purpose described in this manual. In particular, the specified operating limits of the device must be heeded. The person setting up the device is responsible for safety matters in relation to any larger system in which the device is installed!

Failure to observe these instructions may have an adverse impact on device safety!

Please keep this manual in a safe place.

Target audience

This manual is only intended to be used by qualified electricians, or by persons who have been appropriately instructed by a qualified electrician and who are familiar with applicable national standards and with safety rules & regulations. This device may only be installed, set up, and operated by qualified personnel.

2.2 Prevention of ESD Damage

ATTENTION!

An ESDS device (electrostatic discharge-sensitive device) is any device at risk of damage or malfunction due to electrostatic discharges (ESD) and thus requires special measures to prevent such damage or malfunction. Systems and modules with ESDS devices usually bear the following symbol:

Symbol Indicating Devices with ESDS Components

The following measures will help to protect ESDS components from damage and malfunction.

When preparing to dismantle or install devices:
Ground your body (for example, by touching a grounded object) before touching sensitive devices.

Ensure that you wear a grounding strap on your wrist when handling such devices. These straps must in turn be attached to an uncoated, non-conductive metal part of the system.

Use only tools and devices that are free of static electricity.

When transporting devices:
Devices must only be touched or held by the edges. Never touch any pins or conductors on the device.

When dismantling or installing devices:
Avoid coming into contact with persons who are not grounded. Such contact may compromise your connection with the earth conductor and thus also compromise the device's protection from any static charges you may be carrying.

When storing devices:
Always store devices in ESD-proof ("antistatic") bags. These bags must not be damaged in any way. ESD-proof bags that are crumpled or have holes cannot provide effective protection against electrostatic discharges.

ESD-proof bags must have a sufficient electrical resistance and must not be made of conductive metals if the device has a lithium battery fitted on it.

2.3 Power Supply

WARNING!

The IMS system in which the module is used is operated at a dangerous voltage. Please refer to your IMS Manual for more information about safety.

When removing a hot-pluggable power supply unit, always disconnect its power cable before removing it from the IMS system.

Never open a power supply unit—there may still be hazardous residual voltages present even after disconnection from the mains supply. In the event that a power supply unit is no longer working (e.g. defective), please return it to Meinberg for repair.

Failure to observe these safety instructions may result in serious injury and/or property damage. The IMS system must only be installed, set up, and operated by qualified personnel.

2.4 Cabling

WARNING!
Danger of death from electric shock! Never work on the system while the power is live! Always disconnect the cables from the devices at **both** ends before working on the plugs and terminals of connected cables!

3 Replacement or Installation of a Hot-pluggable IMS Module

If the system is supplied with an antenna and antenna cable, it is advisable to first mount the antenna in a suitable location (see chapter Antenna Mounting) and lay the antenna cable.

Please use a Torx screwdriver (T8 x 60) for removal and installation of the module.

1. Follow the safety instructions at the beginning of this manual!

2. Remove the two marked Torx screws from the module holder plate or the cover plate of the empty slot.

3. **Note when removing!**
    Pull the module carefully out of the guide rail. Note that the module is firmly anchored in the connector block of the housing. You need a certain amount of force to release the module from this link. Once the connection to the connector block of the system's backplane is loosened, the module can be easily pulled out.
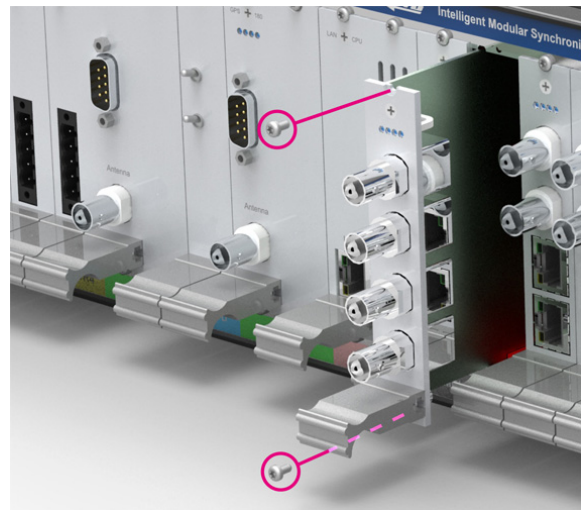
4. **Note during installation!**
    Please ensure that the module is correctly inserted into the two guide rails of the system housing as otherwise damage to the module and the housing could be caused. Make sure that the module is securely locked into the connector block before you fasten the two screws.

5. Now you can put the installed module into operation.

Attachment points of an 1U IMS system

3.1 Important Information Regarding Hot-Pluggable IMS Modules

The following information should be strictly observed when replacing IMS modules during operation. Not all IMS modules are fully hot-pluggable. For example, it is naturally not possible to replace a power supply unit in a system without PSU redundancy without first having installed a second power supply unit while the system is in operation.

The following rules apply for the individual IMS slots:

PWR Slot: "Hot-Swappable" If you operate your system with only one power supply unit, a second power supply unit must be installed before removing or replacing it in order to keep your system on.

I/O, ESI and MRI Slots: "Hot-Pluggable".

CLK1/CLK2 Slots: "Hot-Pluggable" When a clock module is replaced or installed, it is important to rescan the reference clocks ("Rescan Refclocks") in the "System" menu of the Web Interface.

RSC/SPT Slots: "Hot-Pluggable" It will not be possible for your IMS system to switch between signal generators while the RSC/SPT is not installed.

_____

CPU Slot: "<u>Not</u> Hot-Pluggable" Before the CPU is removed, the IMS system must be powered down.

Please note that after powering on and rebooting the LANTIME Operating System, the configuration of some IMS modules may be reset to factory defaults!

ⓘ The NTP service and access to the web interface will be unavailable while the CPU is not installed. Management and monitoring functions will also be disabled.

4 ESI – Telecom Synchronisation References

Enhanced Synchronisation Inputs

Reference Inputs:	PPS and variable frequencies unframed, 1 kHz – 20 MHz	
	2,048 Mbit/s / 1,544 Mbit/s – E1/T1 framed	

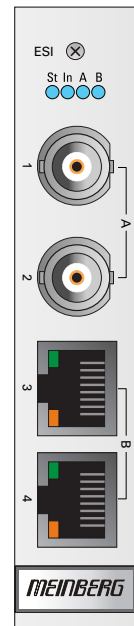|		
	Input 1	1PPS (BNC female connector) TTL, pulse duration $\geq 5\mu$s, active high
	Input 2	1 kHz – 20 MHz (BNC female connector) sine (400 mV$_{pp}$ – 5 V$_{pp}$) or TTL
	Input 3	1 kHz – 20 MHz (RJ-45) 400 mV$_{pp}$ – 5 V$_{pp}$ into 120 Ω, TTL
	Input 4	E1 or T1 framed G.703 (RJ-45) max. attenuation –12 dB (referred to the signal level) into 120 Ω

Power Requirements: 5 V, +–5%, 250 mA

Status Indicators

	LED St:	ESI status
	LED In:	Status of the backplane's reference signals
	LED A	Status of the input signals (1 & 2) at the board
	LED B:	Status of the input signals (1 & 2) at the board

Operation conditions:

Initialisation:	**LED St**	blue until configuration is done
	LED In	off until configuration is done
	LED A	off until configuration is done
	LED B	off until configuration is done
expiration LEDs:	**ALL LEDs**	0,5 sec. red → 0,5 sec. yellow → 0,5 sec. green → 0,5 sec. off
Normal Operation:	**LED St**	green
	LED In	green
	LED A	green, if PPS and Frequency flashing green, if only Frequency flashing yellow, if only PPS off, if no signal
	LED B	green, if Clock and Framed available flashing green, if only Clock available flashing yellow, if only Framed available off, if no signal

Pin assignment of the RJ-45 jacks (input 3 + 4)

Input 3	Input 4
1kHz - 10MHz (2048kHz default)	2048 kBit/s - 120 Ohm
Pin 1: Signal + , Pin 2: Signal —	**Pin 1: RRING , Pin 2: RTIP**
3 1 2	4 1 2
	symm. / *balanced*
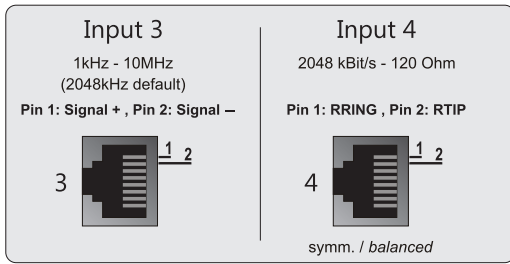
4.1 IMS-ESI (Extended Synchronization Interface)

The ESI (External Synchronization Input) card is capable of adding additional synchronization sources to an IMS system. It accepts E1 or T1 signals, both as framed signals (2.048MBit/s/1.544MBit/s, supporting SSM/BOC) or clock inputs.

The clock inputs are configurable (1 kHz – 20 MHz). Furthermore a 1PPS input is provided as well.

An ESI card is, as the MRI card, dedicated to one specific clock module (depending on the slot it is installed in) and can be installed in both ESI as well as MRI slots.

Extended reference input signals
– 1PPS, BNC
– var. frequencies (1 kHz – 20 MHz) unframed, BNC
– var. frequencies (1 kHz – 20 MHz) unframed, RJ45
– BITS E1/T1 framed, RJ45

Hint:
If the specified frequency range is exceeded, an error message is displayed in the web interface and the entered value is not accepted in this case.

Input 1: The input 1 is dedicated to 1PPS pulse synchronization.

Signal Type – PPS in

ITU Quality Settings
(settings can be made individually for inputs 1 to 4)

ITU Mask.
Predefined masks can be selected, in which quality requirements regarding jitter and wander of the input signals are defined. If the default values are exceeded, the affected input port is switched off.

Hysteresis.
To avoid that signal inputs are continuously switched off and back on when exceeding the ITU mask, a hysteresis for switching on again can be defined. The signal input port is only reactivated when all the selected mask points are below the defined percentage value's limits.

Discard input signal if selected ITU mask violated.
Only if this box is selected, the input signal is switched off when exceeding an ITU mask.

Input 2: The input 2 accepts as input either 2048/1544 kHz frequency or configurable frequency in range between 1 kHz and 20 MHz, also 1.544kHz if required.

**Type:**   Frequency input

Frequency: 1 kHz – 20 MHz of input signal, 10 MHz is set as default.

Maximum Slip: A discontinuity of an integer number of cycles in the measured carrier phase resulting from a remporary loss of input signal. The maximum slip number can be selected in range between 0.5 – 3 cycles, with 1.5 as a default value.

Input 3:
See Input 2, but with RJ45 Connector and as default Frequency input 2048 kHz.

Input 4: As fixed frequency you can choose between E1 framed and T1 framed.
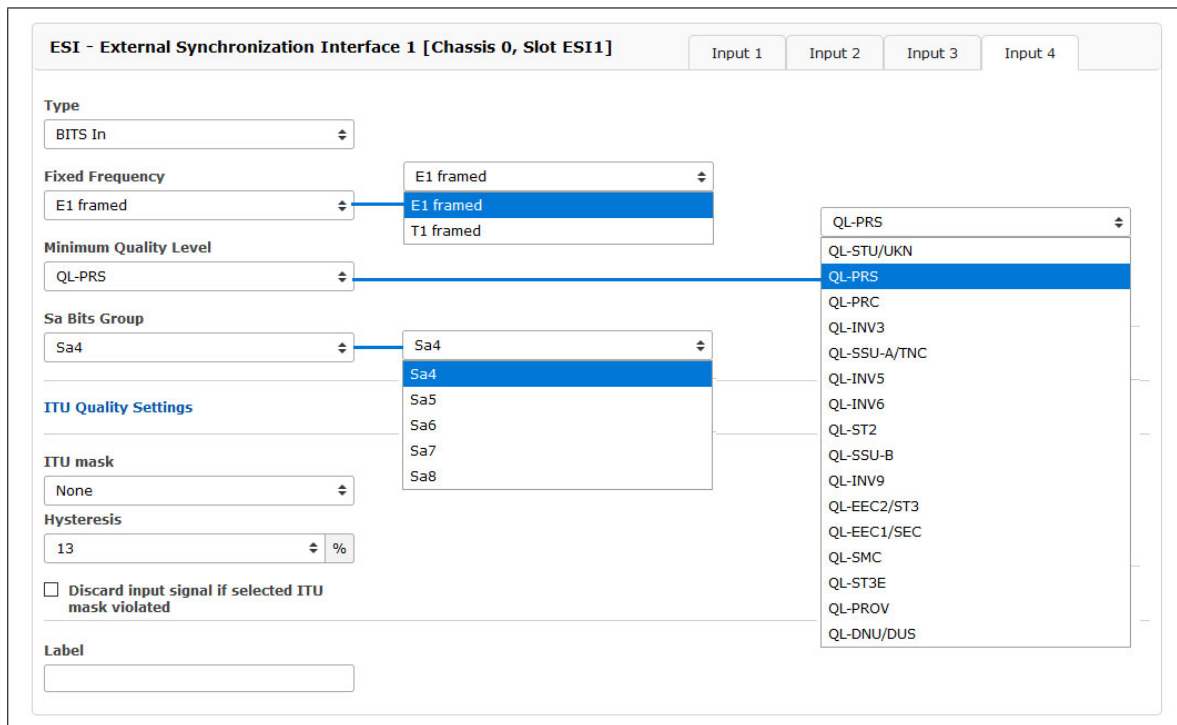
Type: BITS in.

Fixed Frequency: E1 framed (2.048 MHz), T1 framed (1.544 MHz).

Quality: Synchronization Status Messages (SSM), Bit-Oriented Code (BOC).

Sa Bits Group: Location of transmitted SSM/BOC

Quality Maximum SSM / Maximum BOC (quality levels for T1 framed signal)
Synchronization Status Message (SSM) in accordance with ITU G.704-1998 standard includes 4 bit long SSM quality messages received via incoming E1 framed signal. The lower is the bit sequence the higher is quality of the source clock. The clock source quality levels according to G.704-1998 are as follows:

0000	QL-STU/UKN:	Quality unknown
0001	QL-PRS:	Primary Reference Source
0010	QL-PRC:	Primary Reference Clock
0011	QL-INV3:	not used
0100	QL-SSU-A/TNC:	Synchronization Supply Unit A or Transit Node Clock
0101	QL-INV5:	not used
0110	QL-INV6:	not used
0111	QL-ST2:	Stratum 2 Clock
1000	QL-SSU-B:	Synchronization Supply Unit B
1001	QL-INV9:	not used
1010	QL-EEC2/ST3:	Ethernet Equipment Clock 2
1011	QL-EEC1/SEC:	Ethernet Equipment Clock 1 / SDH Equipment Clock
1100	QL-SMC:	SONET Minimum Clock
1101	QL-ST3E:	Stratum 3E Clock
1110	QL-PROV:	Provisionable by the Network Operator
1111	QL-DNU/DUS:	Do not use for synchronization

With the Quality Selection box, you can select the Minimum SSM level of the incoming signal that is still acceptable as input signal. If clock reports a lower quality level than the configured minimum SSM level the system will not use it for synchronization.

Example:
User configured QL-SSU-B as Minimum QL for his system. An E1 input signal reporting either QL-SSU-A or QL-PRC will be allowed for synchronization, whereas a signal with quality level QL-EEC1/SEC will not be accepted.

Sa Bits Group
Here you can select between the Sa4 to Sa8 bit group to choose the location for SSM quality bits.

IMS-ESI_QSG_010422