The Synchronization Experts.

SETUP GUIDE

IMS-TCR180

Hot-Plug Module

December 17, 2021

Meinberg Funkuhren GmbH & Co. KG

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1 Imprint

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Manual
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2 Change Log

Version	Date	Revision Notes
1.0	06/03/2021	Initial version
1.01	12/17/2021	Addition of change log & troubleshooting chapter, minor corrections

3 Introduction

This Setup Guide is a systematically structured guideline to assist you with the initial set-up of your Meinberg product.

The IMS-TCR180 receiver module is used to decode and generate modulated (AM) and unmodulated (DC level-shift) IRIG-A / B / G, AFNOR, C37.118, and IEEE1344-formatted time codes. Time codes are transmitted by modulating the amplitude of a sinusoidal carrier wave, while unmodulated codes are transferred by modulating the pulse width of a TTL signal.

As standard, the TCR180 clock module is equipped with an OCXO-SQ (Oven-Controlled Xtal Oscillator) which serves as the master oscillator to ensure high accuracy of $\pm$ 1x10^{-8} during holdover mode. An optional OCXO-MQ or OCXO-HQ oscillator is available for higher accuracy.

Functionality:

The automatic gain control within the modulated code receiver circuit allows IRIG-A / B / G, AFNOR, C37.118, or IEEE1344 signals to be decoded with a carrier amplitude of 600 mV_{pp} to 8 V_{pp}.

The input stage is electrically isolated and has an impedance of either 50 Ω, 600 Ω (default) or 5 kΩ, selectable using a jumper (see chapter "Adjusting Input Impedance") on the board.

The DC level-shift input is electrically isolated using an optocoupler with an internal series resistance of 220 Ω.

Features

- IRIG Generator
- 4 Programmable Pulse Outputs
- Frequency Synthesizer

The LANTIME OS Firmware manual provides a complete description of all configuration and status monitoring options for your Meinberg product.

Download LTOS7 Firmware manual:
http://www.mbg.link/doce-fw-ltos

Compatibility

The IMS-TCR180 is an IMS module that is compatible with the following systems in the IMS product family and can be used in the following slots.

System Compatibility - IMS TCR180

IMS System	M500	M1000	M1000 S	M2000 S	M3000	M3000 S	M4000
Compatible	✓	✓	✓	✓	✓	✓	✓

Slot Compatibility - IMS TCR180

IMS Slot	PWR	CLK	CPU	MRI	ESI	I/O
Compatible	✗	✓	✗	✗	✗	✗

4 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, Meinberg recommends:

- backing up stored configurations (e.g., via USB flash drive or Web UI)
- taking note of the chapter "Prevention of ESD damage".
- Please note the chapter "Supply voltage".

4.1 Additional Safety Information

This manual contains important safety information regarding the installation and use of the device. Please read it through fully before setting up the device for use.

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 and accessible place.

Target Readership
This manual is only intended to be used by qualified electricians, or by persons who have been appropriately instructed by qualified electricians and who are familiar with applicable national standards and safety rules & regulations, especially in relation to the installation of low-voltage (< 1000 V) installations.

4.2 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.

4.3 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.

4.4 Handling of Batteries

WARNING!

The lithium battery on the receiver modules has a life of at least ten years. Should it be necessary to replace it, please note the following:

Improper handling of the battery can lead to an explosion or to a leakage of flammable liquids or gases.

- Never short-circuit the battery.
- Never attempt to recharge the battery.
- Never throw the battery into a fire.
- The battery must only be exposed to the barometric pressure range specified by the battery manufacturer.
- The battery must only ever be replaced with one of the same type or a comparable type recommended by the manufacturer. The battery must only be replaced by the manufacturer or an authorized technician.
- Never dispose of the battery in a mechanical crusher or shredder, or in an open fire or furnace.
- Please consult your local waste disposal regulations for information on how to dispose of hazardous waste.

ATTENTION!

The battery is used to power components such as the RAM and the reserve real-time backup clock for the reference clock.

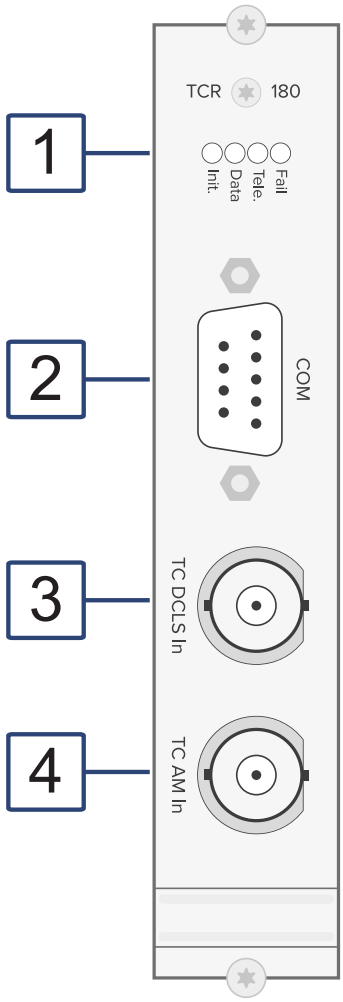
If the battery voltage drops below 3 V DC, Meinberg recommends having the battery replaced. If the battery voltage drops below the specified minimum, the following behavior may be observed in the reference clock:

- The reference clock may have the wrong date or wrong date upon power-up
- The reference clock repeatedly starts in Cold Boot mode
- Some of the configurations saved for the reference clock may be lost

4.5 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!

5 Module Connectors and Indicators IMS-TCR180



The numbering in the drawing above relates to the relevant subsection in this chapter.

5.1 IMS-TCR180 - Status LEDs

The LEDs indicate the following status conditions:.

"Init" LED:

Blue:	Initialization phase of TCR180
Off:	Oscillator not warmed up
Green:	Oscillator warmed up

"Data" LED:
Shows status after initialization

Green:	IRIG receiver has received a valid code at the input
Red:	IRIG receiver has not received a valid code at the input
Yellow:	TCR180 is synchronized against an external source (MRS)
Yellow/green (flashing):	Holdover mode (MRS), IRIG code available
Yellow/red (flashing):	Holdover mode (MRS), IRIG code not available

"Tele" LED:

Green:	Telegram consistent
Red:	Telegram not consistent
Yellow (flashing):	Jitter too high

"Fail" LED:

Red:	Clock is running on oscillator (holdover mode)
Off:	Synchronized by the received IRIG code

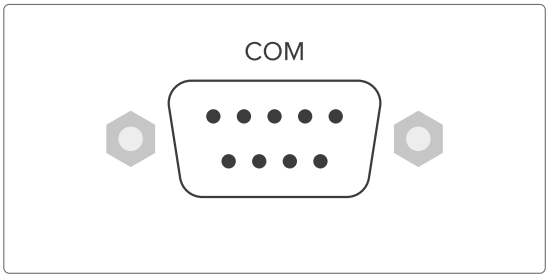
5.2 COMx Timestring - RS-232

Data Transfer Method: Serial

Baud Rate/Framing: 19200 / 8N1 (Default)

Time String Format: Meinberg Standard (Default)

Pin Layout:
Pin 2: RxD (receive)
Pin 3: TxD (transmit)
Pin 5: GND (ground)



Connector Type : D-Sub Male 9-Pin

Cable: Data Cable (Shielded)
PC Connector 1:1

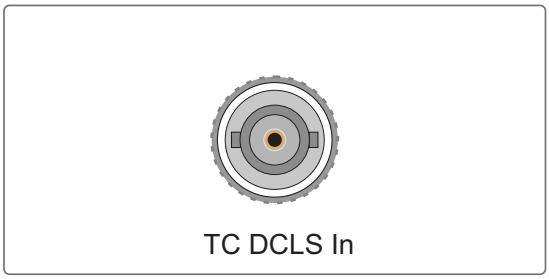
Synchronization using PPS + String:

Pin 1: PPS
Signal Type: TTL
Pulse Length: $\geq$5 μs (Active High).

Pin 2: String
The following time strings can be used:
- NMEA RMC
- NMEA ZDA
- Meinberg Standard
- Uni Erlangen

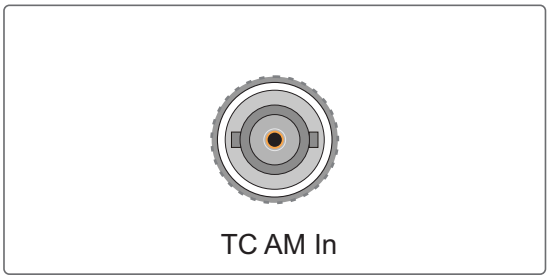
5.3 DCLS Time Code (Unmodulated) Input

Input Signal:	DCLS Time Code, Pulse-Width Modulated (e.g., IRIG-B00x)
Insulation Voltage:	3750 V_{rms}
Typ. Input voltage:	5 V DC
Internal Resistor:	220 Ω
Max. Input Current:	60 mA
Connector Type:	BNC Female, Insulated
Cable:	Coaxial Cable, Shielded



5.4 AM Time Code (Modulated) Input

Input Signal:	Unbalanced Sine Wave Signal
Signal Level:	600 mV_{pp} / 8 V_{pp} (MARK/SPACE) 600 Ω Termination
Insulation Voltage:	3000 V DC
Connector Type:	BNC Female, Insulated
Cable:	Coaxial Cable, Shielded



6 Before you start

6.1 Contents of Delivery

Unpack the IMS-TCR180 carefully and check the contents of the delivery against the enclosed packing list to ensure that no parts are missing. If any of the listed items are missing, please contact our sales department: *sales@meinberg.de*

Check that the product has not been damaged in transit. If the product is damaged or fails to operate upon installation, please contact Meinberg immediately. Only the recipient (the person or company receiving the system) may file claims or complaints against the forwarder for damage caused in transit.

Meinberg recommends that you keep the original packaging materials in case the product needs to be shipped or transported again at a later date.

6.2 Disposal of Packaging Materials

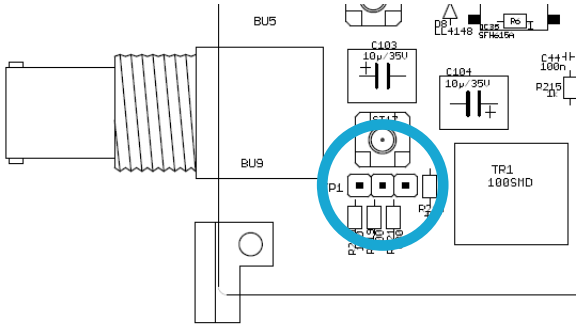
The packaging materials we use are fully recyclable:

Material	Use for	Disposal
Cardboard	Shipping, packaging of accessories	Paper recycling
Plastic Wrapping	Shipping, packaging of accessories	Household waste or recycling depot

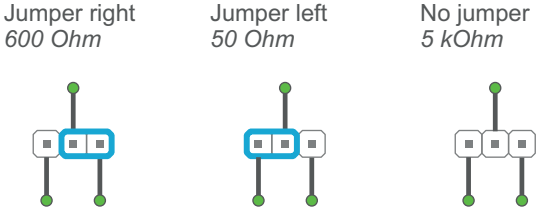
6.3 Adjusting Input Impedance

Time code specifications do not specify values for modulated codes, neither in relation to the output impedance of the transmitter, nor to the input impedance of the time code receiver.

This has resulted in time code component manufacturers selecting arbitrary values, which in turn means that not all devices are compatible with one another. For example, if the time code generator has a large output impedance and the time code receiver has a low input impedance, the signal level at the receiver input may be too low to read. This is why the IMS-TCR180 has been equipped with an input impedance jumper, which can be used to adjust the module to a variety of systems and can be set to one of three impedance values: 50 Ω, 600 Ω oder 5 kΩ.



The image below shows the various possible jumper positions with the corresponding input impedance values:



Note: The IMS-TCR180 is shipped with the jumper set to 600 Ω.

7 System Installation

7.1 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:

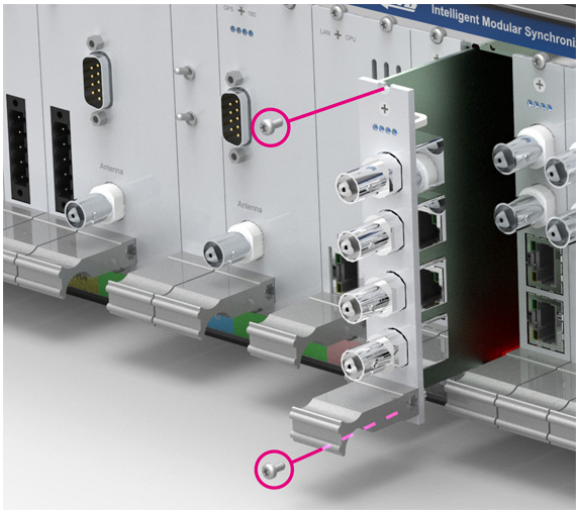
PWR Slot:	"Hot-Swappable"	If you operate your system with only one power supply unit, a second power supply unit must be installed before removing or replacing it in order to keep your system on.
I/O, ESI and MRI Slots:	"Hot-Pluggable".	
CLK1/CLK2 Slots:	"Hot-Pluggable"	When a clock module is replaced 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:	"Not 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.

7.2 Installation of Hot-Pluggable IMS Modules.

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

Please use a Torx screwdriver (T8 x 60) to remove and install IMS modules.



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. **Please note when removing modules:**
   The module must be pulled **carefully** out of the guide rail. Note that the module will be securely seated in the connector block inside the chassis—a certain amount of force must be applied to release the module. Once the module has been detached from the connector block in the system backplane, the module can be easily pulled out.

4. **Please note when installing modules:**
   Ensure that the module is correctly inserted into the two guide rails of the system chassis. Failure to do so may result in damage to the module and chassis. Ensure that the module is securely seated in the connector block inside the chassis before you fasten the two screws.

5. The installed module is now ready for use.

Locations of fixture screws in a 1RU IMS system

7.3 Use of Coaxial Cable as Signal Conductor

The TCR180 module provides two BNC connectors for providing time code signals to synchronize the system.

Your system must be connected to the TCR180 signal inputs using coaxial cable with the proper characteristic impedance and adequate shielding.

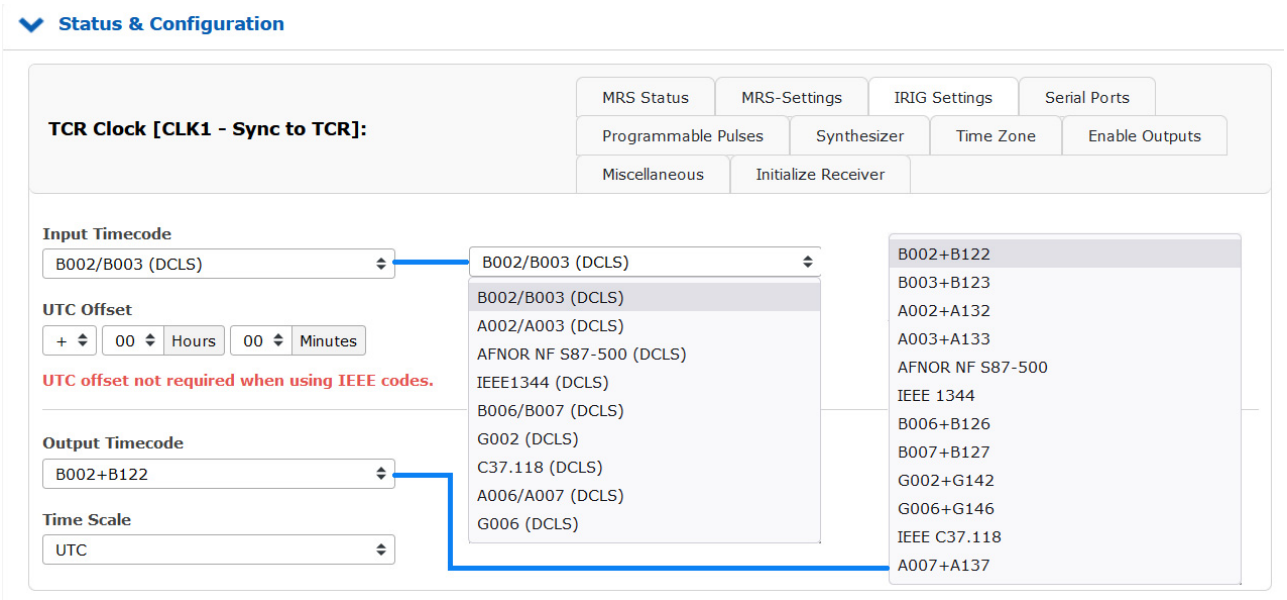
A mismatched cable impedance will result in signal distortion, while poor shielding can cause signal interference.

8 Configuration and Status Monitoring

This chapter explains how to set the IMS-TCR180 up for use via the Web Interface.

8.1 IRIG Settings

In the "Clock" menu of the web interface, both the timecode used to synchronize the IMS-TCR180 and the timecode to be provided via output modules can be set.



Open the "**Clock**" menu, the "**Status & Configuration**" submenu and select the "IRIG Settings" TAB.

Parameters to be configured

Input Code:
Select the input code to which the module should synchronize

UTC Offset:
If the applied timecode is impinged with a constant time offset to UTC, this time offset must be configured here, so that the clock can convert the received time to UTC.

Output code:
If the system has direct TC output options, you can set the parameters in this menu section.

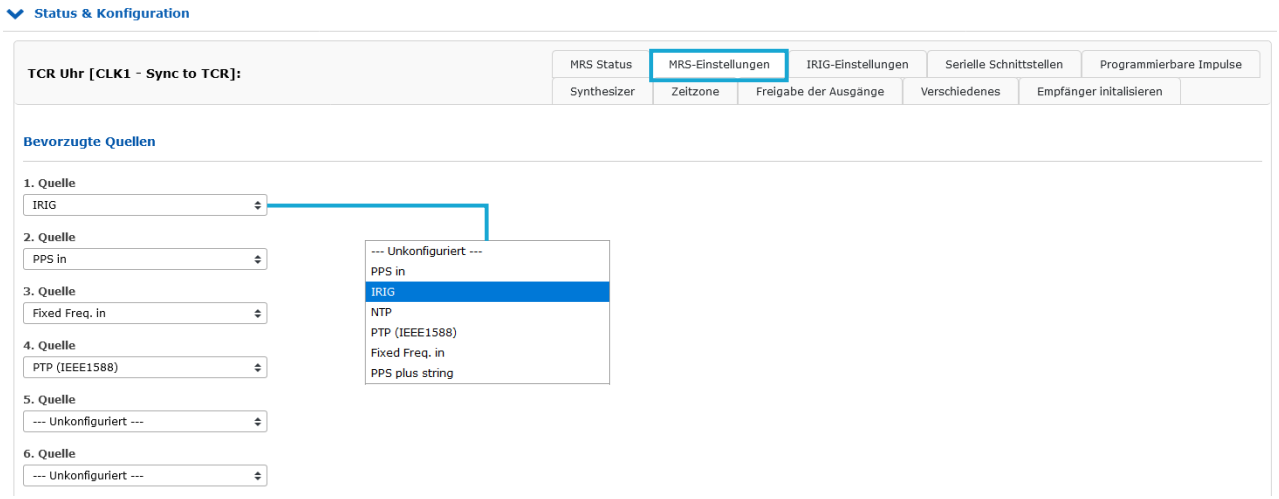
The time code output options can be set via this menu (for redundant receiver configurations via the switchover card menu).

```
The time codes for the signal outputs can be provided, for example, by a
BPE module of the 2000 series, which has time code outputs.
```

Time Scale:
The output of the selected time code can be done with UTC or the local time. When "LOCAL TIME" is used, it refers to the configuration of the menu point "Time zone".

8.2 MRS Settings

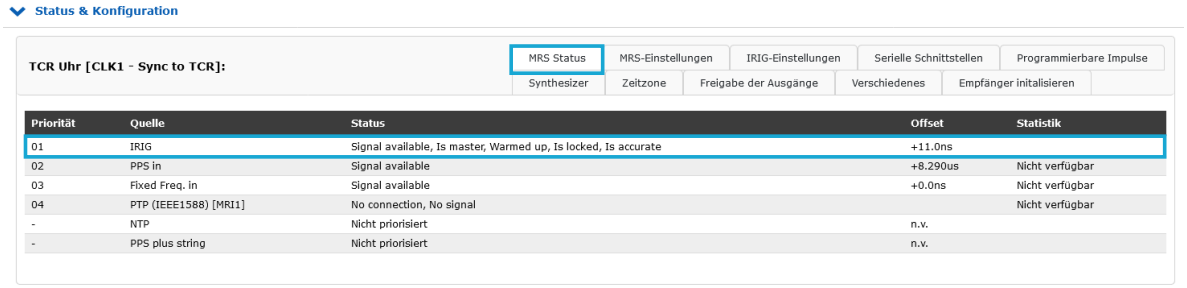
In order to use the timecode signal fed in via the IMS-TCR180 to synchronize the system, it first needs to be selected as a prioritized reference source.



Open the menu "**Clock**" -> "**Status & Configuration**" and select the "MRS Settings" TAB.

Now select IRIG from the drop down menu of the 1st source.

8.3 MRS Status



Open the menu "**Clock**" -> "**Status & Configuration**" and select the "MRS Status" TAB.

The TAB **MRS Status** provides an overview of the most important parameters of all previously configured MRS sources. Among other things, the current status and offset of the reference signal can be read.

9 Troubleshooting

Our Technical Support team will be pleased to help you with any problems that you may be having with your Meinberg IMS-TCR180. However, before you contact our Technical Support team, it is advisable to read this chapter through first to see if your problem might be more quickly resolved with one of the solutions below.

Problem	Possible Causes	Possible Solutions
The module is not detected by the base IMS unit.	The module may not have been properly inserted into the slot.	Ensure that the module is properly aligned with the guide rails inside the IMS unit; the module must lock securely into the socket at the back. The metal plate of the module should be perfectly flush with the metal plates of the other slots and the screws should be straight.
	Your IMS device's firmware may not be up to date.	Using the instructions in the chapter "Firmware Updates" in your IMS device manual, check whether the latest version of the LANTIME OS Firmware is installed, and install the latest version if necessary.
Even though a valid signal is connected, the TCR180 reference clock is unable to synchronize. The "Data" and "Tele." LEDs are red.	The incoming time code signal does not match the time code expected according to the module configuration. The TFOM value is not sufficient. (IEEE 1344 & C37.118 only)	Ensure that the AM and DCLS time code signal cables are connected to the accordingly labeled module connectors. When connecting a DCLS signal (for example), check that TC-DCLS time codes are also configured in the "Clock" menu of the Web Interface.

10 Your Opinion Matters to Us

This user manual is intended to assist you in the preparation, use, and care of your Meinberg product, and provides important information for configuration and status monitoring.

Be a part of the ongoing improvement of the information contained in this manual. Please contact our Technical Support team if you have any suggestions for improvements or technical questions that are relevant to the manual.

Meinberg – Technical Support

Phone: +49 (0) 5281 – 9309- 888
Email: techsupport@meinberg.de

11 RoHS and WEEE

Compliance with EU Directive 2011/65/EU (RoHS)

We hereby declare that this product is compliant with the European Union Directive 2011/65/EU and its delegated directive 2015/863/EU “Restrictions of Hazardous Substances in Electrical and Electronic Equipment”. We ensure that electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), bis(2-ethylhexyl)phthalat (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), or diisobutyl phthalate (DIBP) above the legal limits.

WEEE status of the product

This product is handled as a B2B (Business to Business) category product. To ensure that the product is disposed of in a WEEE-compliant fashion, it must be returned to the manufacturer. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will bear the costs for the waste disposal itself.