The Synchronization Experts.

SETUP GUIDE

DCF600HS

DCF Clock with Serial Interface

February 24, 2023

Meinberg Funkuhren GmbH & Co. KG

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1 Imprint

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2 Change Log

Version	Date	Revision Notes
1.00	5/31/2011	- Basic version
1.01	8/27/2013	- Configuration using driver software "GPSMON" and "PZFMON"
1.02	1/21/2014	- Time strings updated
1.03	2/5/2015	- ATIS time string added
1.04	7/13/2015	- Configuration using driver software "MBGMON"
1.05	4/21/2016	- Baud rate & framing set to 19200 / 8N1 by default
1.06	6/28/2018	- Configuration using Meinberg Device Manager as optional configuration program, - New illustration and designation of screw terminals - voltage range, housing information
2.00	02/22/2023	- Fundamental revision of the manual structure - Revision history - Chap. 5 restructured, chap. 6 added - Configuration process using Meinberg Device Manager updated

3 Copyright and Liability Exclusion

4 Introduction

This Setup Guide provides you with step-by-step guidance on how to set up your Meinberg product for the first time.

This compact device is integrated in a plastic enclosure that is designed to be mounted on a DIN rail. It features four LEDs that provide status information, for example by signaling demodulation of time signal and indicating the synchronization status of the device.

The DCF600HS radio clock has an RS-232 interface (optionally a RS-485 interface) for communication and configuration, as well as two optocoupler-isolated programmable pulse outputs in the form of screw terminals. These output a pulse per second and pulse per minute signal respectively in their default configuration.

The software "**Meinberg Device Manager**" can be used to output different signals through these outputs. The module is powered by a DC power source via the screw terminals marked VDD and GND.

How It Works

The signal from the DCF77 antenna passes through the antenna connector to a narrowband direct receiver, which in turn transfers the demodulated time markers to the DCF600HS's microcontroller. The microcontroller decodes the time markers provided by the receiver circuit and uses this data to generate accurate date and time information. If the time data is successfully decoded without any errors, the information is also subjected to a plausibility check using two consecutive time strings. If this plausibility check is also successful, the internal software clock is adjusted to the decoded time.

Manual Revisions

Meinberg products are subject to ongoing development even after their market release, with new features and enhancements added on a regular basis via firmware and software updates. Meinberg also revises its product manuals to account for these feature updates.

This version of the manual has been prepared based on the feature set of **Firmware Version dcf600_hsrs.300** of your DCF600HS as well as **Meinberg Device Manager Version 7.1**. When using a different software or firmware version, there may be noticeable differences, for example in the presentation and availability of the status information and options as shown in Chapter **12** ("**Configuration of the DCF600HS**").

5 Presentation Conventions in this Manual

5.1 Conventions for the Presentation of Critical Safety Warnings

Warnings are indicated with the following warning boxes, using the following signal words, colors, and symbols:

Caution!

This signal word indicates a hazard with a **low risk level**. Such a notice refers to a procedure or other action that may result in **minor injury** if not observed or if improperly performed.

Warning!

This signal indicates a hazard with a **medium risk level**. Such a notice refers to a procedure or other action that may result in **serious injury** or even **death** if not observed or if improperly performed.

Danger!

This signal word indicates a hazard with a **high risk level**. Such a notice refers to a procedure or other action that will very likely result in **serious injury** or even **death** if not observed or if improperly performed.

5.2 Secondary Symbols Used in Safety Warnings

Some warning boxes may feature a secondary symbol that emphasizes the defining nature of a hazard or risk.

The presence of an "electrical hazard" symbol is indicative of a risk of electric shock or lightning strike.

The presence of a "fall hazard" symbol is indicative of a risk of falling when performing work at height.

Das Symbol "laser hazard" symbol is indicative of a risk relating to laser radiation.

5.3 Conventions for the Presentation of Other Important Information

Beyond the above safety-related warning boxes, the following warning and information boxes are also used to indicate risks of product damage, data loss, and information security breaches, and also to provide general information for the sake of clarity, convenience, and optimum operation:

Important!

Warnings of risks of product damage, data loss, and also information security risks are indicated with this type of warning box.

Information:

Additional information that may be relevant for improving efficiency or avoiding confusion or misunderstandings is provided in this form.

5.4 Generally Applicable Symbols

The following symbols and pictograms are also used in a broader context in this manual and on the product.

The presence of the "ESD" symbol is indicative of a risk of product damage caused by electrostatic discharge.

Direct current (DC) *(symbol definition IEC 60417-5031)*

Alternating current (AC) *(symbol definition IEC 60417-5032)*

Ground connection *(symbol definition IEC 60417-5017)*

Protective earth connection *(symbol definition IEC 60417-5019)*

6 Important Safety Information

The safety information provided in this chapter as well as specific safety warnings provided at relevant points in this manual must be observed during every installation, set-up, and operation procedure of the device, as well as its removal from service.

Any safety warnings affixed to the device itself must also be observed.

Any failure to observe this safety information, these safety warnings, and other safety-critical operating instructions in the product documentation, or any other improper usage of the device may result in unpredictable behavior from the product, and may result in injury or death.

Depending on your specific device configuration and installed options, some safety information may not be applicable to your device.

Meinberg accepts no responsibility for injury or death arising from a failure to observe the safety information, warnings, and safety-critical instructions provided in the product documentation.

It is the responsibility of the operator to ensure that the product is safely and properly used.

Should you require additional assistance or advice on safety-related matters for your product, Meinberg's Technical Support team will be happy to assist you at any time. Simply send a mail to **techsupport@meinberg.de**.

6.1 Appropriate Usage

The device must only be used appropriately in accordance with the specifications of the product documentation! Appropriate usage is defined exclusively by this manual as well as any other relevant documentation provided directly by Meinberg.

Appropriate usage includes in particular compliance with specified limits! The device's operating parameters must never exceed or fall below these limits!

6.2 Product Documentation

The information in this manual is intended for readers with an appropriate degree of safety awareness. The following are deemed to possess such an appropriate degree of safety awareness:

- skilled persons with a familiarity with relevant national safety standards and regulations,
- instructed persons having received suitable instruction from a skilled person on relevant national safety standards and regulations

If there is any safety information in the product documentation that you do not understand, **do not** continue with the set-up or operation of the device!

Read the product manual carefully and completely before you set the product up for use.

Safety standards and regulations change on a regular basis and Meinberg updates the corresponding safety information and warnings to reflect these changes. It is therefore recommended to visit the Meinberg website at **https://www.meinbergglobal.com** regularly to download up-to-date manuals.

Please keep all product documentation, including this manual, in a safe place in digital or printed format to ensure that it is always easily accessible.

Meinberg's Technical Support team is also always available at **techsupport@meinberg.de** if you require additional assistance or advice on safety aspects of your system.

6.3 Safety when Installing the Device

This rack-mounted device has been designed and tested in accordance with the requirements of the standard IEC 62368-1 (*Audio/Video, Information and Communication Technology Equipment—Part 1: Safety Requirements*). Where the rack-mounted device is to be installed in a larger unit (such as an electrical enclosure), additional requirements in the IEC 62368-1 standard may apply that must be observed and complied with. General requirements regarding the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) and applicable national standards must be observed in particular.

The device has been developed for use in industrial or home environments and may only be used in such environments. In environments at risk of high environmental conductivity ("high pollution degree" according to IEC 60664-1), additional measures such as installation of the device in an air-conditioned electrical cabinet may be necessary.

If the unit has been brought into the usage area from a cold environment, condensation may develop; in this case, wait until the unit has adjusted to the temperature and is completely dry before setting it up.

When unpacking & setting up the equipment, and before operating it, be sure to read the information on installing the hardware and the specifications of the device. These include in particular dimensions, electrical characteristics, and necessary environmental conditions.

Fire safety standards must be upheld with the device in its installed state.

The device with the highest mass should be installed at the lowest position in the rack in order to position the center of gravity of the rack as a whole as low as possible and minimize the risk of the rack tipping over. Further devices should be installed from the bottom, working your way up.

The device must be protected against mechanical & physical stresses such as vibration or shock.

Never drill holes into the device to mount it! If you are experiencing difficulties with rack installation, contact Meinberg's Technical Support team for assistance!

Inspect the device housing before installation. The device housing must be free of any damage when it is installed.

6.4 Electrical Safety

This Meinberg product is operated at a hazardous voltage.

This system may only be set up and connected by a skilled person, or by an instructed person who has received appropriate technical & safety training from a skilled person.

Custom cables may only be assembled by a qualified electrician.

Never work on cables carrying a live current!

Never use cables or connectors that are visibly damaged or known to be defective! Faulty, defective, or improperly connected shielding, connectors, or cables present a risk of injury or death due to electric shock and may also constitute a fire hazard!

Before operating the device, check that all cables are in good order. Ensure in particular that the cables are undamaged (for example, kinks), that they are not wound too tightly around corners, and that no objects are placed on the cables.

Cables must be laid in such a way that they do not present a tripping hazard.

The power supply should be connected using a short, low-inductance cable. Avoid the use of power strips or extension cables if possible. If the use of such a device is unavoidable, ensure that it is expressly rated for the rated currents of all connected devices.

Never connect or disconnect power, data, or signal cables during a thunderstorm! Doing so presents a risk of injury or death, as cables and connectors may conduct very high voltages in the event of a lightning strike!

The device cables must be connected or disconnected in the order specified in the user documentation for the device. Connect all cables only while the device is de-energized before you connect the power supply.

Always pull cable connectors out at both ends before performing work on connectors! Improperly connecting or disconnecting this Meinberg system may result in electric shock, possibly resulting in injury or death!

When pulling out a connector, **never** pull on the cable itself! Pulling on the cable may cause the plug to become detached from the connector or cause damage to the connector itself. This presents a risk of direct contact with live components.

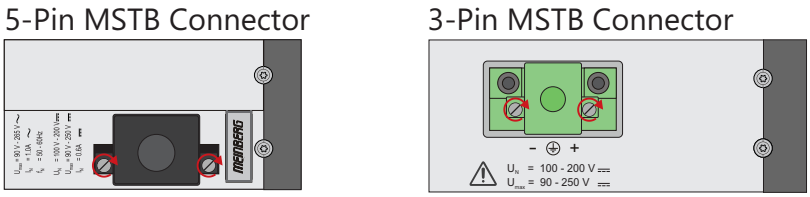


Fig.: Lock screws on an MSTB plug connector; in this case on a LANTIME M320

Ensure that all plug connections are secure. In particular, when using plug connectors with lock screws, ensure that the lock screws are securely tightened. This is especially important for power supply connectors where 3-pin or 5-pin MSTB connectors with lock screws are used (see illustration).

Before the device is connected to the power supply, the device housing must be grounded by connecting a grounding conductor to the grounding terminal of the device.

When installing the device in an electrical enclosure, it must be ensured that adequate clearance is provided, minimum creepage distances to adjacent conductors are maintained, and that there is no risk of short circuits.

Protect the device from the ingress of objects or liquids!

If the device malfunctions or requires servicing (for example, due to damage to the housing, power supply cable, or the ingress of liquids or objects), the power supply may be cut off. In this case, the device must be isolated immediately and physically from all power supplies! Electrical isolation must be performed and confirmed in accordance with the following procedure:

- Pull the power supply plug from the power supply.
- Loosen the locking screws of the MSTB power supply plug on the device and pull it out of the device.
- Contact the person responsible for your electrical infrastructure.
- If your device is connected to one or more uninterruptible power supplies (UPS), the direct power supply connection between the device and the UPS solution must be first be disconnected.

6.4.1 Special Information for Devices with DC Power Supply

In accordance with IEC 62368-1, it must be possible to disconnect the appliance from the supply voltage from a point other than the appliance itself (e.g., from the primary circuit breaker).

The power supply plug may only be fitted or dismantled while the appliance is isolated from the power supply (e.g., disconnected via the primary circuit breaker).

Power supply cables must have adequate fuse protection and have an adequate wire gauge size (1 mm^2 — 2.5 mm^2 / 17 AWG — 13 AWG)

The power supply of the device must have a suitable on-demand disconnection mechanism (i.e., a switch). This disconnection mechanism must be readily accessible in the vicinity of the appliance and marked accordingly as a cut-off mechanism for the appliance.

6.5 Safety when Maintaining and Cleaning the Device

Only use a soft, dry cloth to clean the device.

Never use liquids such as detergents or solvents to clean the device! The ingress of liquids into the device housing may cause short circuits in the electronic circuitry, which in turn can cause a fire or electric shock!

Neither the device nor its individual components may be opened. The device or its components may only be repaired by the manufacturer or by authorized personnel. Improperly performed repairs can put the user at significant risk!

In particular, **never** open a power supply unit or module, as hazardous voltages may be present within the power supply device even after it is isolated from the upstream voltage. If a power supply unit or module is no longer functional (for example due to a defect), it can be returned to Meinberg for repair.

Some components of the device may become very hot during operation. Do not touch these surfaces!

If maintenance work is to be performed on the device and the device housing is still hot, switch off the device beforehand and allow it to cool.

6.6 Battery Safety

The CR2032 lithium battery on the receiver module has a service life of at least 10 years.

Should it be necessary to replace the battery, please note the following:

- The battery may only be replaced by the same type or a comparable type recommended by the manufacturer.
- The battery may only be replaced by the manufacturer or authorized personnel.
- The battery must not be exposed to air pressure levels outside of the limits specified by the manufacturer.

Improper handling of the battery may result in the battery exploding or in leakages of flammable or corrosive liquids or gases.

- Never short-circuit the battery!
- Never attempt to recharge the battery!
- Never throw the battery in a fire or dispose of it in an oven!
- Never dispose of the battery in a mechanical shredder!

7 Important Product Information

7.1 CE Marking

This product bears the CE mark as is required to introduce the product into the EU Single Market.

The use of this mark is a declaration that the product is compliant with all requirements of the EU directives effective and applicable as at the time of manufacture of the product. These directives are listed in the EU Declaration of Conformity, appended to this manual as Chapter 18.

7.2 UKCA Marking

This product bears the British UKCA mark as is required to introduce the product into the United Kingdom (excluding Northern Ireland, where the CE marking remains valid).

The use of this mark is a declaration that the product is in conformity with all requirements of the UK statutory instruments applicable and effect as at the time of manufacture of the product. These statutory instruments are listed in the UK Declaration of Conformity, appended to this manual as Chapter 19.

7.3 Ensuring the Optimum Operation of Your Device

- Ensure that ventilation slots are not obscured or blocked by dust, otherwise heat may build up inside the device. While the system is designed to shut down automatically in the event of temperature limits being exceeded, the risk of malfunctions and product damage following overheating cannot be entirely eliminated.
- The device is only deemed to be appropriately used and EMC limits (electromagnetic compatibility) are only deemed to be complied with while the device housing is fully assembled in order to ensure that requirements pertaining to cooling, fire safety, electrical shielding and (electro)magnetic shielding are upheld.

7.4 Maintenance and Modifications

Important!

Before performing any maintenance work on or authorized modification to your Meinberg system, we recommend making a backup of any stored configuration data (e.g., to a USB flash drive from the Web Interface).

7.4.1 Replacing the Battery

Your device's receiver module is fitted with a lithium battery (type CR2032).

This battery has a life of at least ten years. However, if the device develops the following unexpected behaviors, the voltage of the battery may have dropped below 3 V, and the battery needs to be replaced as a result:

- The reference clock has the wrong date or wrong date when the system is started.
- The reference clock repeatedly starts in Cold Boot mode (i.e., upon starting, the system has no ephemeris data saved whatsoever, resulting in the synchronization process taking a very long time due to the need to rediscover all of the visible satellites).
- Some configuration options relating to the reference clock are lost every time the system is restarted.

In this case you should not replace the battery on your own. Please contact the Meinberg Technical Support team, you will provide you with precise guidance on how to perform the replacement.

7.5 Disposal

Disposal of Packaging Materials

The packaging materials that we use are fully recyclable:

Material	Use for	Disposal
Polystyrene	Packaging frame/filling material (e.g., polystyrene peanuts)	Recycling Depot
PE-LD (Low-density polyethylene)	Accessories packaging, bubble wrap	Recycling Depot
Cardboard	Shipping packaging, accessories packaging	Paper Recycling

For information on the proper disposal of packaging materials in your specific country, please inquire with your local waste disposal company or authority.

Disposal of the Device

This product falls under the labeling obligations of the Waste Electrical and Electronic Equipment Directive 2012/19/EU ("*WEEE Directive*") and thus bears this WEEE symbol. The presence of this symbol indicates that this electronic product may only be disposed of in accordance with the following provisions.

Important!

Do not dispose of the product or batteries via the household waste. Inquire with your local waste disposal company or authority on how to best dispose of the product or battery if necessary.

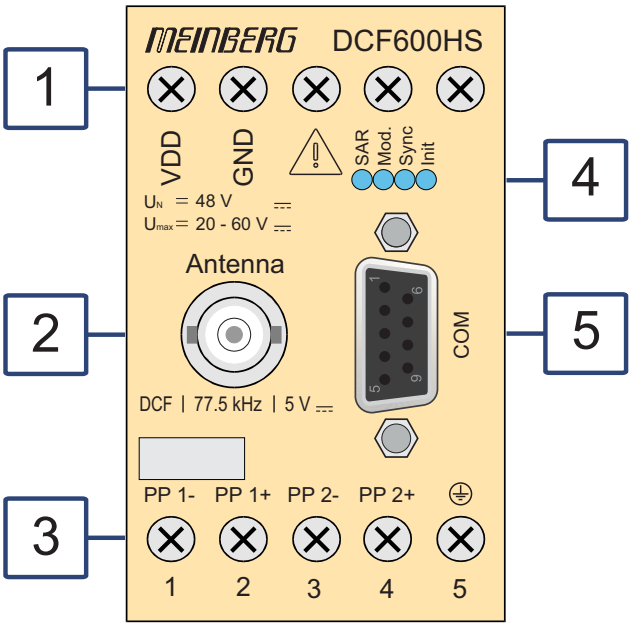
This product is considered to be a "**B2B**" product for the purposes of the WEEE Directive and is also classified as "**IT and Telecommunications Equipment**" in accordance with Annex I of the Directive.

It can be returned to Meinberg for disposal. In this case, the shipping costs are to be borne by the customer, while Meinberg will cover the costs for disposal. If you wish for Meinberg to handle disposal for you, please get in touch with us. Otherwise, please use the return and collection systems provided within your country to ensure that your device is disposed of in a compliant fashion to protect the environment and conserve valuable resources.

Disposal of Batteries

Please consult your local waste disposal regulations for information on the correct disposal of batteries as hazardous waste.

8 DCF600HS Connectors and Indicators



Information:

The numbering above relates to the corresponding subsection in this chapter.

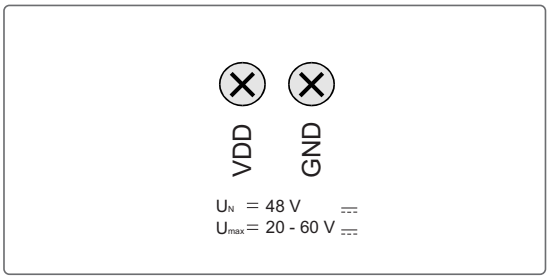
8.1 DC Power Supply Connector

Connector Specifications

Connector Type: Screw terminal

Terminal Functions: VDD
(positive potential of the operating voltage)

GND
(negative potential of the operating voltage)



Power Supply Specifications

Nominal Voltage:	U_N	=	48 V ⎓
Rated Voltage Range:	U_{max}	=	20-60 V ⎓
Rated Current:	I_N	=	20 mA ⎓
Max. Power:	P_{max}	=	2 W

Output Specifications

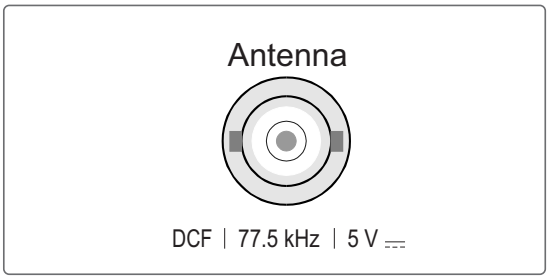
Max. Heat Output:	E_{therm}	= 7.2 kJ/h (6.82 BTU/h)

Further Specifications:

The receiver circuit is galvanically isolated by an internal DC/DC converter; the isolation voltage is 1.5 kV DC.

8.2 Antenna Input - DCF77 Reference Clock

Receiver Type:	Narrowband direct receiver with gain control for optimized processing of the DCF77 signal
Reception Frequency:	77.5 kHz
Bandwidth:	Approx. 40 Hz
Termination:	50 Ohm
Signal Level:	50 μV – 5 mV
Supply Voltage:	3.5 V – 5 V
Connector Type:	BNC Female
Cable Type:	Coaxial Cable, Shielded
Cable Length:	Typically 300 m with RG58 Coaxial Cable



Danger!

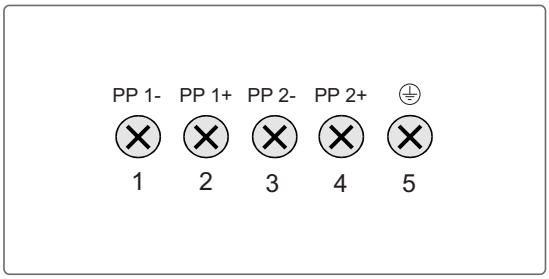
Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

8.3 Programmable Pulse Outputs

Screw Terminal Functions: [1]



Output Signal: Programmable Pulses

Connector Type: Screw Terminal

Cable: Signal Cable
(See Chapter **9.3**, "**Power and Signal Cables**")

Terminal Functions:

1: PP 1- Emitter
2: PP 1+ Collector

3: PP 2- Emitter
4: PP 2+ Collector

5: Ground

Signals: Please refer to Chapter **15.4** "**Description of Programmable Pulse Signal Types**" for a list and explanation of all possible programmable signals.

Important!

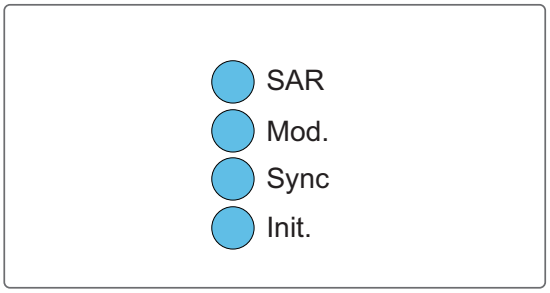
The load on the optocoupler outputs must not exceed 55 V or 50 mA.

[1] Max. tightening torque of terminal block screws 0.8 Nm

8.4 Status LEDs

Status Indicators

LED "SAR":	Synchronized After Reset
LED "Mod":	DCF Signal Reception
LED "Sync":	Synchronization Status
LED "Init":	Initialization Status



The LEDs are used to signal the following status conditions:

LED "SAR" - System Status:

Red:	DCF600HS not yet synchronized following reset (or may not yet have acquired an updated time)
Green:	DCF600HS synchronized following reset

LED "Mod" - DCF Signal Reception Status:

Green, Flashing (Once a Second):	DCF signal reception

LED "Sync" - Synchronization Status:

Green:	DCF600HS is synchronized
Red:	DCF600HS is not synchronized (clock running solely off internal oscillator)

LED "Init" - Initialization Status:

Blue:	During initialization process
Green:	Initialization successful

8.5 COMx Time String: RS-232

Data Transfer: Serial

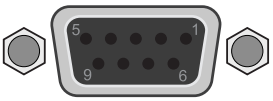
Baud Rate/Framing: 19200 / 8N1 (Default)

Time String: Meinberg Standard (Default)

Assignment:
Pin 2: TxD (Transmit)
Pin 3: RxD (Receive)
Pin 5: GND (Ground)

Connection Type: D-Sub female 9-pin

Cable: RS-232 Null Modem Cable (Shielded)



COM x

9 Before You Start

9.1 Contents of Delivery

The package includes:

1 x DCF600HS

Optional:

---

1 x AW02 antenna with
1 x 10 m antenna cable RG58 (Type-N male / Type-N male)

or

1 x AI01-Antenne with
1 x 5 m antenna cable RG174 (BNC male - BNC male)

Unpack the DCF600HS 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.

Disposal of the Packing Materials

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

Please note the information on disposal in the chapter **7.5** "**Disposal**"

9.2 Meinberg Device Manager

The software **Meinberg Device Manager** is used to configure the DCF600HS and monitor its status.

Meinberg Device Manager for Windows and Linux

The latest version of Meinberg Device Manager is downloadable free of charge for Windows as an executable installer or a portable ZIP file, and is also available for Linux. The software can be downloaded at:

https://www.meinbergglobal.com/english/sw/mbg-devman.htm

Documentation

A complete user manual for **Meinberg Device Manager** is also available to download from our website and contains comprehensive information on all of the configuration and system monitoring options available for the DCF600HS using the software. The manual (as a PDF file) can be downloaded from:

https://www.meinbergglobal.com/download/docs/manuals/english/meinberg-device-manager.pdf

Information:

To avoid problems with the detection, configuration, and status monitoring of the DCF600HS, Version 7.1 or higher of Meinberg Device Manager is required.

9.3 Power and Signal Cables

Before the DCF600HS is connected to a power source, the cables (not included with the product) must be specifically assembled to supply power and transmit the signals.

Tools Required:

1. Wire cutters

2. A crimping tool may also be necessary

Cable Specifications

Please make sure that you select a power supply cable with the recommended core cross-section. We recommend applying a suitable ferrule to the DC power supply cable for the cross-section in order to optimize the electrical connection.

DC Power Supply:

Cable Type:	PVC special single-stranded wire with DIN 46228-1/-2/-3/-4 sleeve
Cross Section:	0.5 mm^2 - 1.5 mm^2 (21 AWG - 16 AWG)
Conductor Insulation to be Stripped:	10 mm
Maximum Current:	25 A

10 Installation of a DCF77 Antenna

Selecting the Antenna Location

The antenna location plays a critical role in determining the quality of reception and thus the signal strength of the DCF77 signal, and should therefore be selected carefully so as to avoid difficulties with synchronization. If the antenna is not precisely aligned, signal reception and timing accuracy will be affected.

The DCF77 antenna must be directed towards Mainflingen, near Frankfurt am Main, in accordance with the installation conditions specified below.

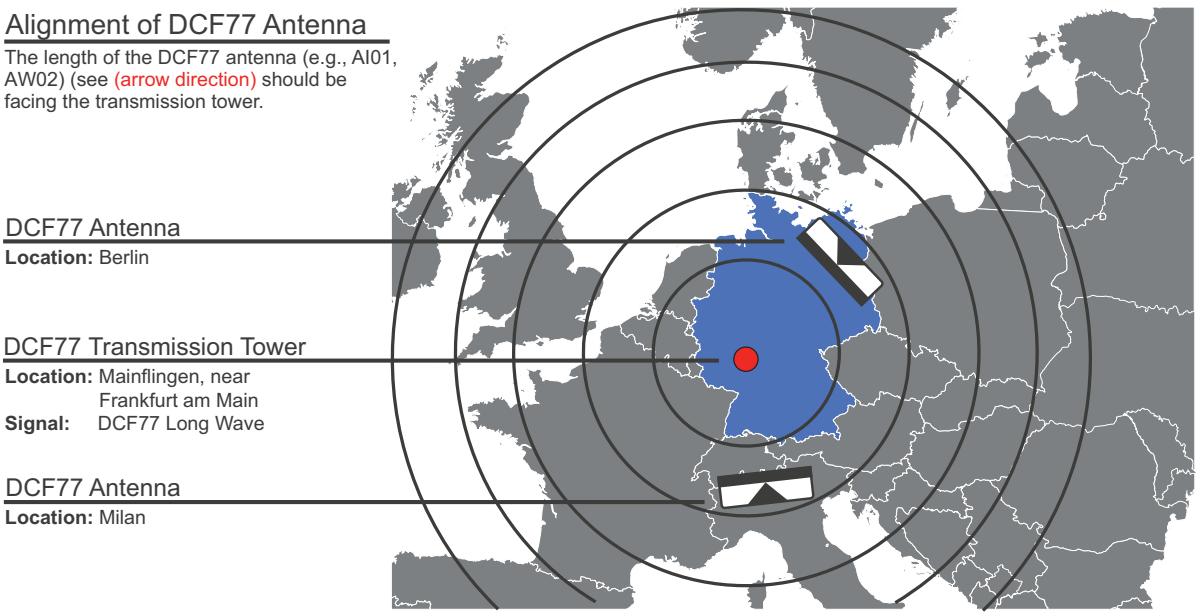


Illustration: Installation of a Meinberg AW02 antenna directed towards the DCF77 transmitter tower in Mainflingen (Frankfurt am Main).

For optimum operation, the following should be noted when installing a DCF77 antenna:

- The antenna should be mounted horizontally.
- The DCF77 antenna should be perpendicular to the direction of the transmission tower with the arrow pointing towards the tower (see illustration on previous page).
- A distance of at least 30 cm should be maintained from any metal objects.

Meinberg recommends installing the antenna in an outdoor location. This is usually preferable because such locations generally provide a suitable distance away from disruptive signals generated by electronic devices in buildings. This in turn allows for more reliable synchronization. While DCF77 reception is possible within buildings, reception quality may be impaired by shielding and other factors causing signal attenuation. The following factors in particular will have an adverse impact on signal reception:

- Installation of the antenna near metallic objects (such as reinforced concrete walls, metallic cladding, heat-insulated windows, etc.)
- Installation of the antenna near televisions or computer monitors
- Installation of the antenna under or near power lines

Important!

If the above installation criteria cannot be met, adequate and consistent signal reception cannot be guaranteed.

Installation

Please read the following safety instructions carefully before mounting the DCF-77 antenna.

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that you work safely when installing antennas!
- Never work without an effective fall arrester!

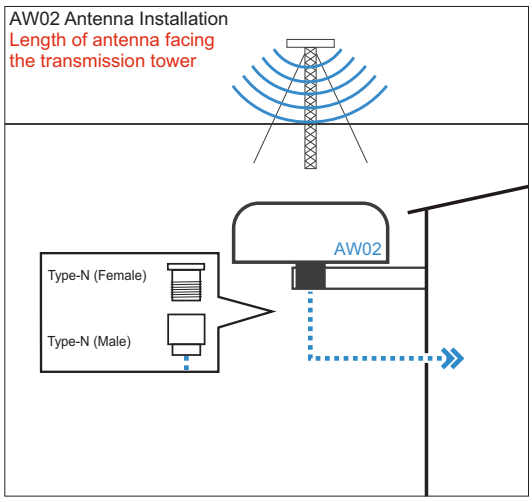
Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

1.
Mount the antenna in a location in accordance with the conditions specified above directly onto a wall using the included mounting kit. Connect the antenna cable to the Type-N connector of the antenna.



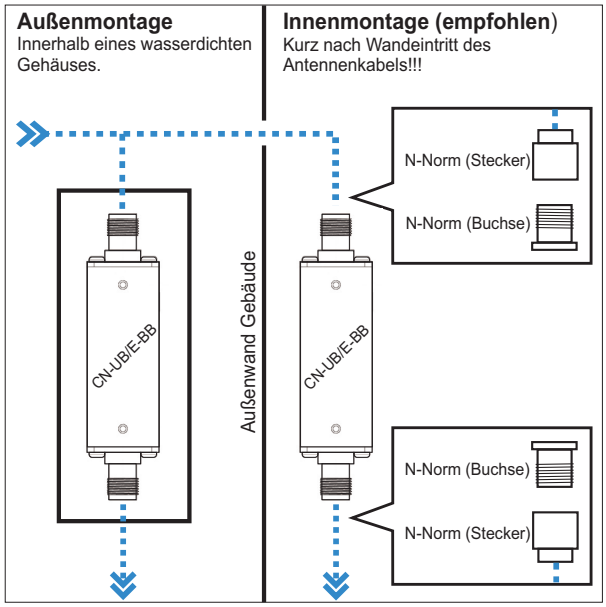
Information:

Ensure that the maximum cable length is not exceeded when laying the antenna cable between the antenna and receiver. Meinberg generally recommends the use of RG58 cable not exceeding 300 m. When using other cable types, the maximum cable length will depend on the type and its attenuation factor.

2.
The antenna cable may act as a conductor for voltage surges (e.g., lightning strike), which may damage your receiver. The receiver can be protected against these transient voltages by using a surge protector with a floating shield (0V potential against ground).

Before installing the surge protector, please ensure that it is also suitable for outdoor use. Meinberg recommends installing the surge protector inside the building, as close as possible to the point where the cable passes through the building exterior, in order to minimize the risk of damage from voltage surges (e.g., lightning strike).

Meinberg recommends using the CN-UB/E-BB surge protector with floating shield for coaxial cable connections from the manufacturer Phoenix Contact.



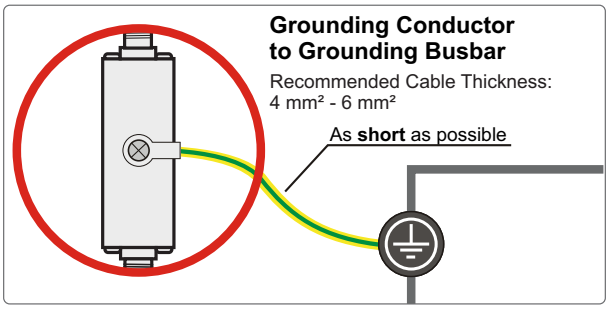
Important!

When using an external antenna to synchronize the DCF600USB radio-controlled clock, please only use a surge protector with a floating shield.

3.

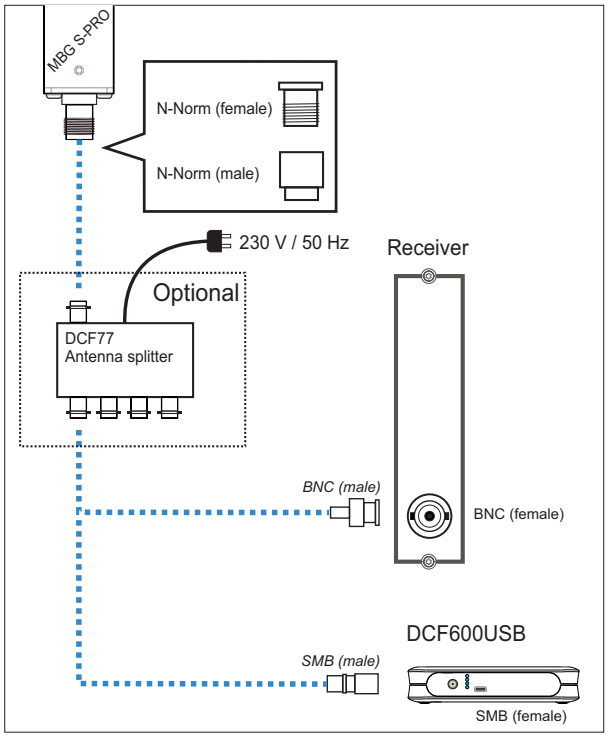
To ground the antenna cable, connect the surge protector to a grounding busbar using a grounding conductor (see illustration).

Once the grounding connection has been established, connect the other end of the antenna cable to the female connector of the surge protector.



4.

Connect the supplied coaxial cable from the surge protector to the receiver.



Procedure for Antenna Alignment

DCF77 Antenna (AW02)
The AW02 antenna itself provides no visual indication of the reception quality of the DCF77 signal while aligning it.

Meinberg Funkuhren therefore recommends that the alignment and signal reception testing be done with the assistance of a second person. An effective method for aligning and testing a long-wave antenna is to have person 1 (who is aligning the antenna) actively communicate with person 2 (who monitors the receiver).

Step 1
Person 1 rotates the antenna until person 2 sees the "Mod" LED flash on the receiver unit (even if it is not yet flashing rhythmically every second). This determines the approximate direction.

Step 2
Person 1 rotates the antenna slowly in an anticlockwise direction until person 2 sees that signal strength is at maximum (in MbgMon) or the "Mod" LED flashes rhymthically once a second without erratic flickering.

If no such signal can be found, the antenna should be turned slowly in a clockwise direction from the approximate direction until person 2 sees that signal strength is at maximum (in MbgMon) or the "Mod" LED flashes rhythmically once a second without erratic flickering.

Please note that a high signal level alone is no guarantee of good reception, as it can also be caused by electrical noise in the associated frequency range.

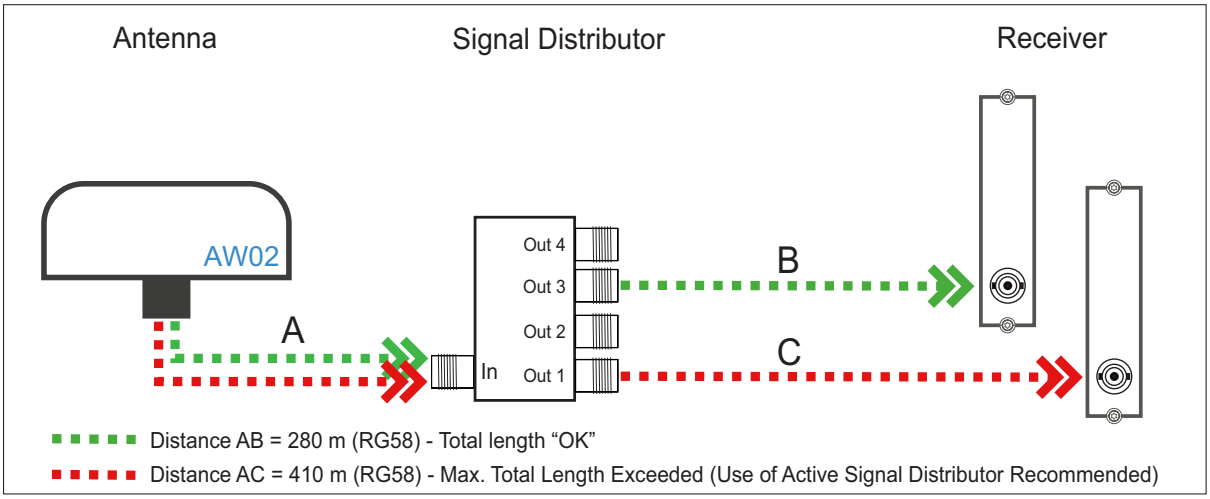
With good reception, the connected DCF reference clock will synchronize within three minutes after initialization.

Successful synchronization is signaled by the "Sync" LED turning from red to green. Reception problems are signaled by the "Sync" LED turning red again. If the clock is running off the oscillator alone for more than 12 hours, the "Sync" LED will begin to flash.

Determining Reception Quality
The DCF600HS reception quality is indicated visually by the modulation LED ("Mod."), regardless of whether the integrated ferrite antenna or an external DCF77 AW02 antenna is used. The modulation indicator is also displayed in the management utility MbgMon (under "Mod."), which also allows a sound signal to be activated so that the signal rhythm is audible.

Optional Use of Antenna Signal Distributor

If the cable length exceeds 300 m, we recommend installing our Meinberg DCF77 AV4 signal distributor between the antenna and the receiver. This not only serves as a signal splitter to allow multiple receivers to be connected to a single antenna, but also (optionally) amplifies the signal. The signal distributor can be installed at any location between the surge protector and the receiver, and requires a 230 V / 50 Hz power supply.



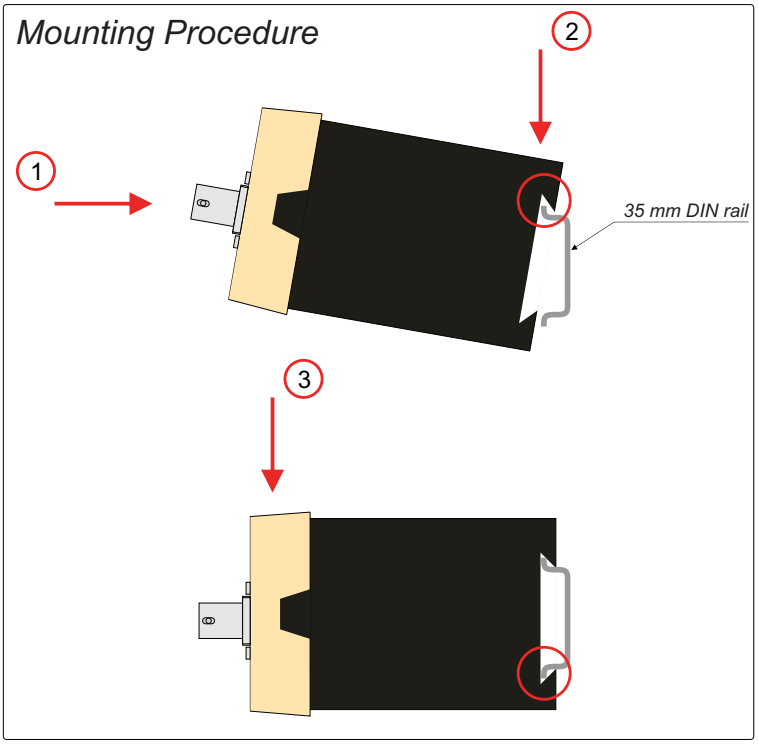
11 Mounting the DCF600HS

Mounting on a DIN Rail

The DCF600HS is designed for mounting on a 35 mm G-type DIN rail (DIN EN 50022)

The product is mounted as follows:

1. Turn the DCF600HS up slightly and place it over the DIN rail (1).
2. Place the enclosure on the DIN rail so that the upper part of the snap-on fixture mechanism locks into place on the rail (2), then apply pressure to the rear of the device from above.
3. While doing this, align the enclosure (3) so that it is horizontal to enable the lower part of the snap-on mechanism to also lock into place.



11.1 Connecting the System

Proceed as follows in order to connect the power and signal cables:

Caution!

Before connecting the cables, ensure that the power supply is switched off.

1. First, insert the ground cable into Terminal 5, then insert each of the signal cables individually into the terminals marked 1–4 (optocouplers), before securing each of the cables one at a time by tightening the screws using a cross-head screwdriver. Take care to apply a torque of no more than 0.8 Nm when tightening.

Terminal Layout:

1: PP 1 - Emitter
2: PP 1 + Collector

3: PP 2 - Emitter
4: PP 2 + Collector

5: Ground

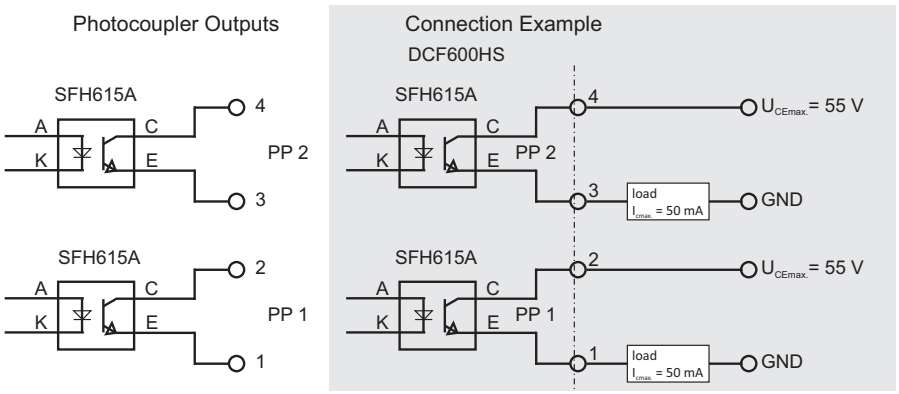


Illustration: Example of how the optocoupler outputs can be connected

2. Connect the power supply cable (see illustration) and tighten the terminal screws, again taking care to not apply a torque exceeding 0.8 Nm.

   Only when the cable is connected should you switch the power supply on. Once the DCF600HS is powered, the initialization phase will commence. The phase is completed once the "Init" LED remains green.

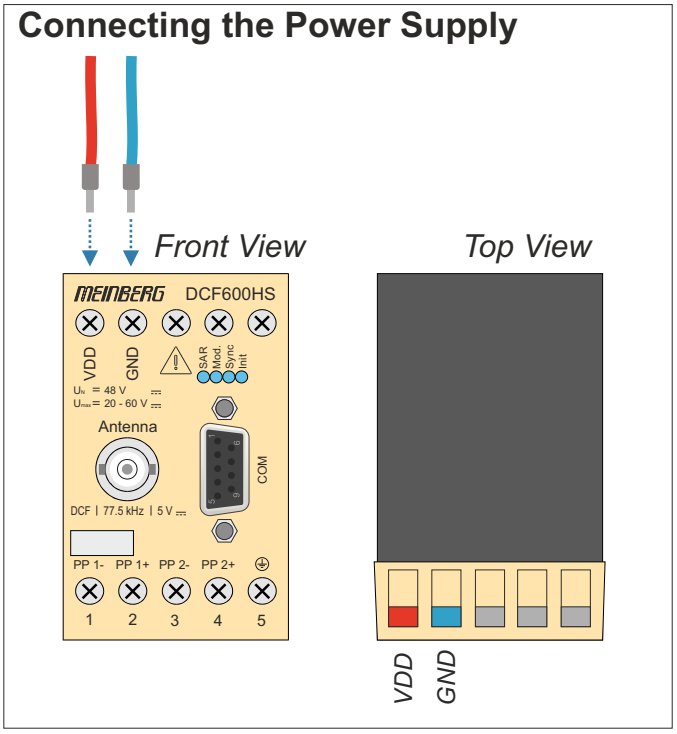


Illustration: DC Power Supply

3. Connect a DCF77 antenna to the antenna input of the DCF600HS.

4. Connect a null modem cable to the COM interface of the DCF600HS and establish a connection to your PC.

This cable connection serves two purposes: as a management interface for configuring the DCF600HS, and for transferring data from the DCF600HS to the corresponding application. Because there is only one COM interface available, it can either be used for configuration or for connection to a productive operation (e.g. NTP-Server, see Example Application).

Example Application:
The diagram below shows a DCF600HS that is synchronized by means of a signal from a DCF77 antenna (AW02)

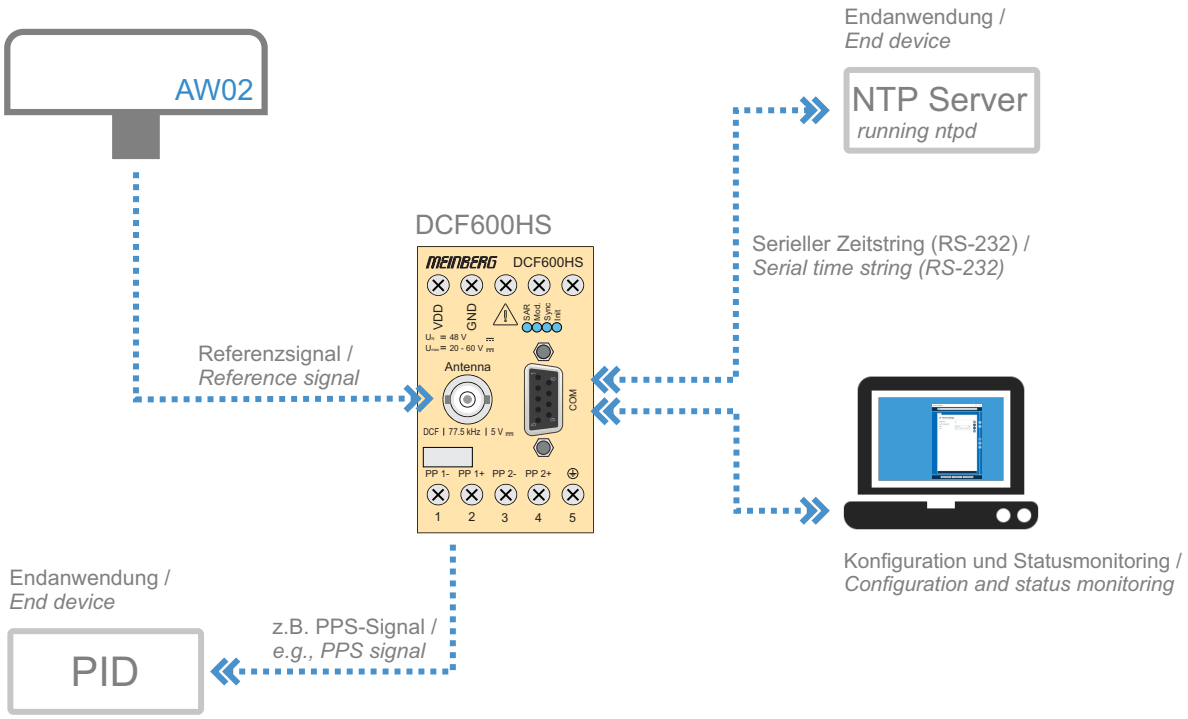


Illustration: Synchronization of the DCF600HS via a signal from an AW02 antenna

Other supported reference sources:

- AI01 antenna
- BPE1060 (4x SIM77 DCF signal)
- DCF77 generator
- GPS165 with DCF77 SIM Out

12 Configuration of the DCF600HS

This chapter addresses the main steps of setting up the DCF600HS using **Meinberg Device Manager** for the first time.

The Meinberg Device Manager User Manual provides a very detailed explanation of all the configuration and monitoring options provided by the software.

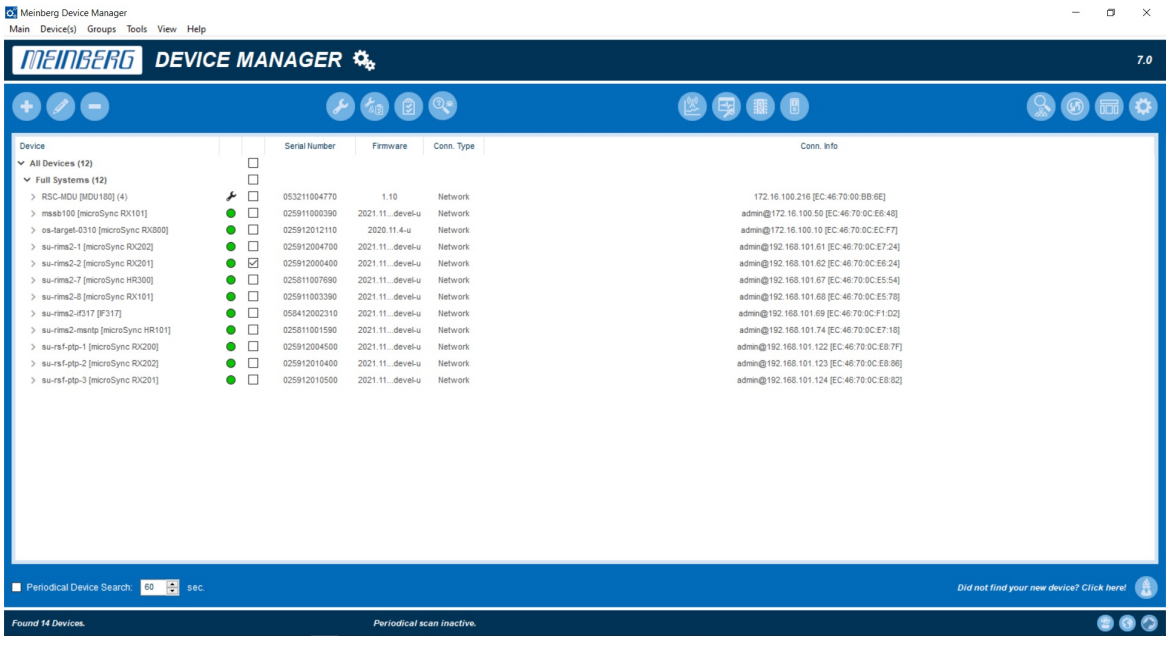
The document can be downloaded (in PDF format) here:
https://www.meinbergglobal.com/download/docs/manuals/english/meinberg-device-manager.pdf

12.1 Installation & First Launch

Once installed, launch the Meinberg Device Manager. Alternatively, if you do not wish to install the software on your PC, you may use the Portable Version of Meinberg Device Manager, which can be launched directly from the USB flash drive: *USB Drive/Software/MbgDevMan/mbgdevman_portable/mbgdevman.exe*.

Meinberg Device Manager for Windows and Linux
The latest version of the Meinberg Device Manager software can be downloaded free of charge from the Meinberg website. The software can be downloaded at the following link:

https://www.meinbergglobal.com/english/sw/mbg-devman.htm



Clicking on the button ***Search for Network and Serial Meinberg Devices*** will trigger a search for all Meinberg modules or devices available over a serial or network connection. These will then be listed in Meinberg Device Manager.

- Systems that have been found are marked with a green dot.

- Modules that cannot be found any more are marked with a red dot.
- Modules whose password (and username) are unknown are marked with a red x.

Select the device that you wish to connect to by marking the corresponding checkbox.

If the connected system cannot be found using the automatic search function, it is possible to add a device manually using the **Add Device** button.

Establishing a Serial Connection

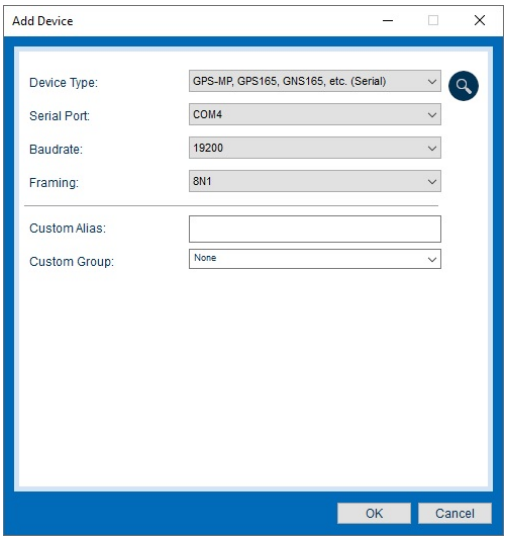
1. First, click on **Device Type**.

The drop-down menu provides a selection of Meinberg products supported by Meinberg Device Manager, and also lists how they are connected (serial, network, others, etc.)

2. Select the Conn. Type **Serial**.

3. Set the serial communication parameters.

4. You can set a user-defined alias for each system or module and assign them to a group.



Information:

Please note that configuration adjustments performed in Meinberg Device Manager always need to be saved using the "Apply Configuration" button. The "Restore Configuration" button resets all of the settings to their respective default values.

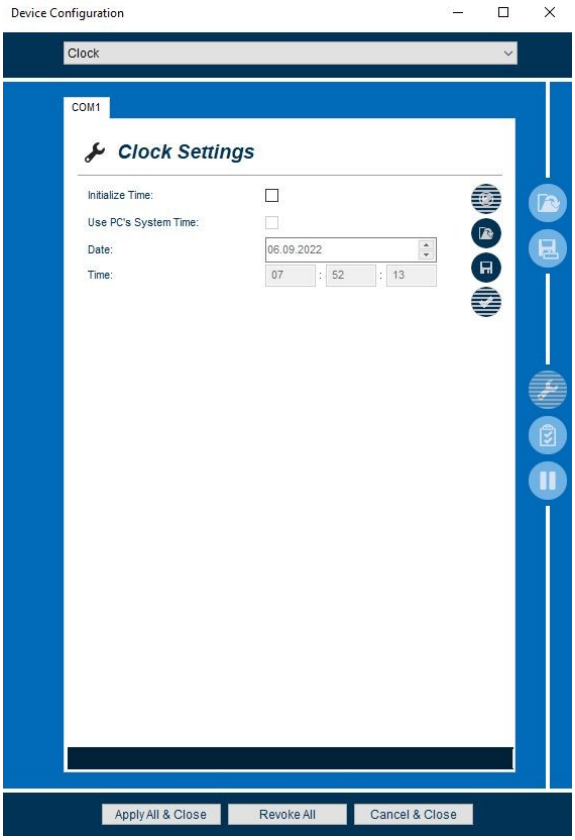
Please refer to the Meinberg Device Manager manual for more information.

12.2 Configuring the Reference Clock

The Clock Settings menu can be used to perform the basic configuration for your device's receiver.

To configure the clock, proceed as follows:

1. Select the DCF600HS.
2. Open the menu **Configure Device(s)**.
3. Select the menu **Clock Settings**.
4. Make the desired changes to the settings.
5. Save the changes by clicking on "Apply Configuration".



Manually Setting the Date and Time

Enabling the option "Initialize Time" allows you to manually enter the system date and time of your receiver module.

Use PC's System Time
The system time of the PC on which Meinberg Device Manager is running can be used to set the time of the device.

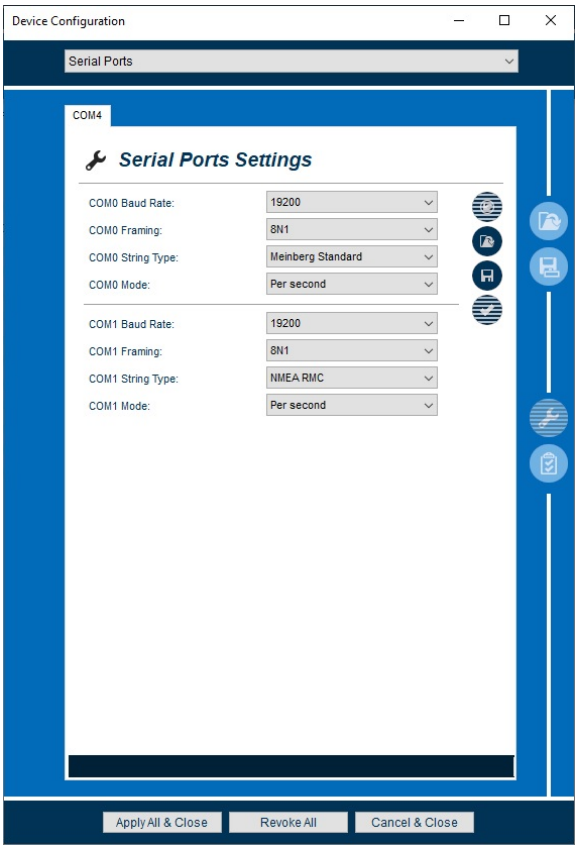
Date / Time
These fields are used to manually set the date and time of the receiver in your device to desired values.

12.3 Serial Settings

The baud rate, framing, and time string format can be configured individually for each of the two interfaces. Both interfaces are able to output a time string once a second, once a minute, or only on demand when prompted with an ASCII "?".

To configure the serial output, proceed as follows:

1. Select the DCF600HS.
2. Select the button **Configure Device(s)**.
3. Select **Serial Ports Settings** from the drop-down menu.
4. Make the desired adjustments.
5. Save the configuration by clicking on "**Apply Configuration**".

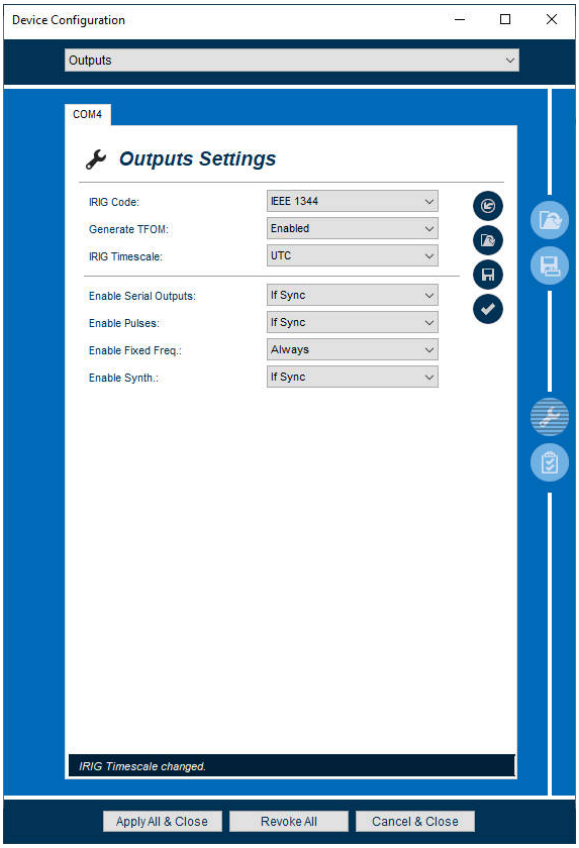


12.4 Output Settings

It is possible to configure each of the following output options so that the signal is output immediately following power-up or only when the receiver has successfully synchronized for the first time.

To adjust the output, proceed as follows:

1. Select the product.
2. Select the button **Configure Device(s)**.
3. Select **Outputs Settings** from the drop-down menu.
4. Made the desired adjustments.
5. Save the changes by clicking on "**Apply Configuration**" ab.



Configuration of Signal Output Conditions

Enable Serial Outputs
The output method for serial time strings can be selected here. These time strings can be configured as described in Chapter 12.3.

Enable Pulses
For the frequency and/or pulse outputs, the signal output method can be configured here.

Enable Fixed Freq.
The output method for the fixed frequency outputs can be configured here.

Enable Synth.
The output method for the frequency synthesizer outputs can be configured here.

12.5 Programmable Outputs

The pulse generator of the DCF600HS is capable of generating a variety of pulse signals and outputting these through two discrete optocoupler-isolated outputs, each of which is configured using Meinberg Device Manager.

Default Settings:

Once the clock is synchronized with the upstream DCF77 signal, a pulse per second signal will be output via Output 1 (PP 1: Terminals 1 & 2), while a pulse per minute signal is output via Output 2 (PP 2: Terminals 3 & 4) with a pulse width of 0.2 seconds. In the event that DCF77 reception is lost, the pulse signal output will continue for another 12 hours before being disabled.

To modify the configuration for the programmable outputs, proceed as follows:

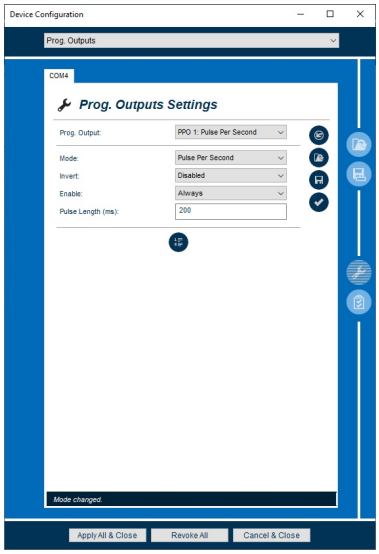
1. Select the DCF600HS.
2. Open the menu **Configure Device(s)**.
3. Select the menu **Prog. Output Settings**.
4. Make the desired changes to the settings.
5. Save the changes by clicking on "**Apply Configuration**".

Information:

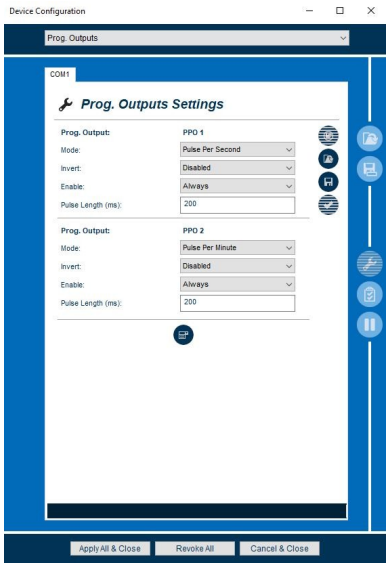
Die DCF600HS is unable to output a defined frequency as a programmable signal.

The programmable outputs can be displayed individually by selecting each from a drop-down menu or displayed together as a list.

 To show the list view, click on this button.



Drop-Down Menu View



List View

Please refer to Chapter **15.4**, "**Description of Programmable Pulse Signal Types**" for a detailed description of the individual programmable signal and pulse types.

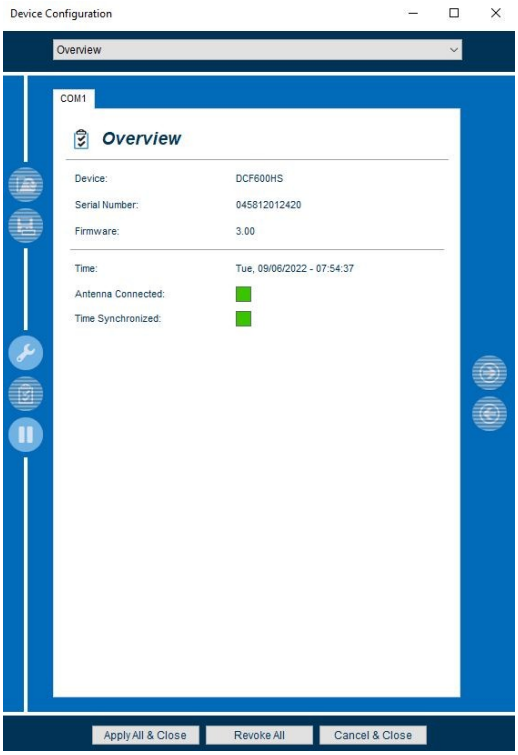
13 DCF600HS Status Monitoring

This chapter addresses the main status monitoring options provided via Meinberg Device Manager for your DCF600HS.

13.1 Status Overview

This window provides you with a general overview of the current status of your DCF600HS.

1. Select the DCF600HS.
2. Open the window **Show Device(s) Status**.
3. Select the option **Overview**.



The main status information items are explained in more detail below for the system in question.

Device: Shows the selected device.

Serial Number: Shows the serial number of the device.

Firmware: Shows the firmware version currently installed.

Time: Displays the time of the previously configured time zone.

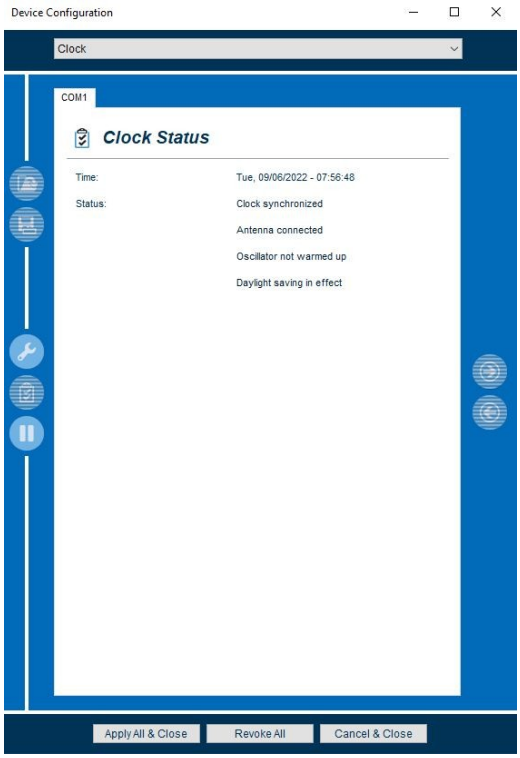
Antenna Connected: Indicates whether the antenna is connected.

Time Synchronized: Displays the synchronization status of the system.

13.2 Clock Status

The Clock Status keeps you up to date with important status messages about your receiver module.

1. Select the DCF600HS.
2. Open the window **Show Device(s) Status**.
3. Select the option **Clock Status**.



Time: Displays the current time of the system.

Status: Displays various status information of the receiver, such as synchronization status, antenna connection and oscillator status.

14 Firmware Update

Important!

The firmware of the DCF600HS should only be updated under the expert guidance of our support team, as an improperly performed update process can severely impair the proper function of your device.

Meinberg will provide you with quick expert assistance on updating the firmware of your DCF600HS. We provide free support for the entire service life of your Meinberg product.

Meinberg Technical Support

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

15 Technical Appendix: DCF600HS

15.1 Technical Specifications: Chassis

Chassis: Dold KO4762 enclosure for installation on a 35 mm DIN rail

Chassis Material: Plastic

Temperature Range

Operation: 0 to 50 °C (32 to 122 °F)

Storage: -20 to 70 °C (-4 to 158 °F)

Relative Humidity

Operation: Max. 93 % (non-condensing) at 40 °C

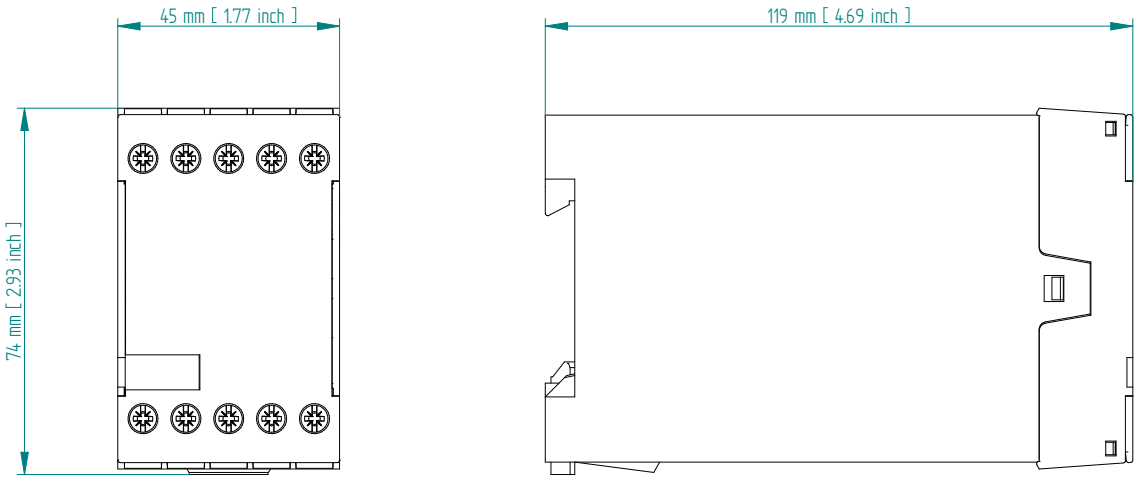
Maximum Altitude

Operation: Max. 2000 m / 6562 ft (above sea level)

Acoustics: 0 dB (A)

IP Rating: Enclosure IP 40, Screw Terminal IP 20

Chassis Dimensions



15.2 General Information about DCF77

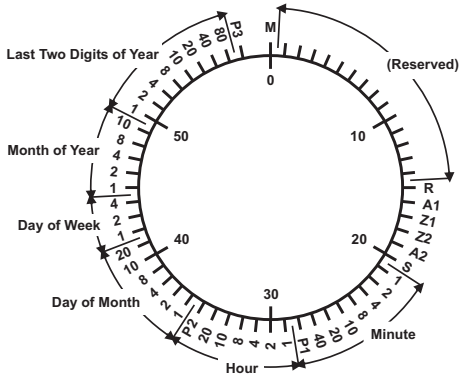
The DCF radio-controlled clocks manufactured by Meinberg receive their signal from the DCF77 long-wave transmitter, which is installed in Mainflingen, near Frankfurt am Main in Germany, and transmits the reference time of the Federal Republic of Germany. This time reference will either be Central European Time (CET) or Central European Summer Time (CEST), depending on the time of year.

The transmitter is controlled by the atomic clocks of the PTB, Germany's national metrology institute located in Braunschweig, and transmits the current time of day, date of the month, and day of the week in coded pulse signals once a second. A complete record of the current time is transmitted once each minute as a 59-bit signal.

This signal is transmitted over the high-precision 77.5 kHz carrier frequency. At the start of each second, the amplitude of the carrier wave is lowered to around 15 % for 0.1 or 0.2 seconds. These amplitude reductions constitute one-per-second markers that contain the binary-coded time information; a marker lasting 0.1 seconds represents a binary "0", while a marker lasting 0.2 seconds represents a binary "1". The information on the time of day and the date as well as a number of parity and status bits are provided in the markers from 17 seconds to 58 seconds in each minute. The absence of the 59-second marker is used to signal the start of a new minute.

The radio-controlled clocks that we produce can receive this high-accuracy time information from anywhere in Germany, and also wholly reliably in Germany's neighboring countries, with reception documented as far afield as Bilbao in Spain or the town of Umeå in northern Sweden. DCF77 clock modules adjust to summertime and wintertime changes (Daylight Saving Time) automatically. The provision of this time signal is a public service that does not require payment of a license fee or registration.

You should generally ensure that the receiver antenna is positioned in such a way as to receive the best possible signal. It should be pointed at a 90 degree angle from the direction of the transmitter (Frankfurt) and be placed at least 1 meter away from your computer and 30 cm away from any steel structures, metal plates, etc.



M	Start of Minute (0.1 s)	
R	RF Transmission via Secondary Antenna	
A1	Announcement of a Change in Daylight Saving Time	
Z1, Z2	Time Zone Identification	
	Z1, Z2 = 0, 1:	Daylight Saving Time Disabled
	Z1, Z2 = 1, 0:	Daylight Saving Time Enabled
A2	Announcement of a Leap Second	
S	Start of Time Code Information	
P1, P2, P3	Even Parity Bits	

15.3 Time Strings

15.3.1 Format of the Meinberg Standard Time String

The Meinberg Standard Time String is a sequence of 32 ASCII characters starting with the **<STX>** (start-of-text) character and ending with the **<ETX>** (end-of-text) character. The format is as follows:

<STX>D:***dd.mm.yy;T:w;U:hh.mm.ss;uvxy***<ETX>

The letters printed in italics are replaced by ASCII-formatted numbers, whereas the other characters are directly part of the time string. The groups of characters as defined below:

<STX> Start-of-Text, ASCII code 02h sent with one-bit accuracy at the change of each second

dd.mm.yy The date:

dd	Day of Month	(01–31)
mm	Month	(01–12)
yy	Year of the Century	(00–99)

w The day of the week (1–7, 1 = Monday)

hh.mm.ss The time:

hh	Hours	(00–23)
mm	Minutes	(00–59)
ss	Seconds	(00–59, or 60 during leap second)

uv Clock status characters (depending on clock type):

u:	'#'	GPS: Clock is in free-run mode (no exact synchronization)
		PZF: Time frame not synchronized
		DCF77: Clock has not synchronized since last reset
	' '	(space, 20h)
		GPS: Clock is synchronized (base accuracy is reached)
		PZF: Time frame is synchronized
		DCF77: Clock has synchronized since last reset
v:	'*'	GPS: Receiver has not checked its position
		PZF/DCF77: Clock currently running off XTAL
	' '	(space, 20h)
		GPS: Receiver has determined its position
		PZF/DCF77: Clock is syncronized with transmitter

x time zone indicator:

'U'	UTC	Universal Time Coordinated, formerly GMT
' '	CET	European Standard Time, daylight saving disabled
	'S'	(CEST) European Summertime, daylight saving enabled

y Announcement of clock jump during last hour before jump enters effect:

'!'	Announcement of start or end of Daylight Saving Time
'A'	Announcement of leap second insertion
' '	(Space, 20h) nothing announced

<ETX> End-of-Text, ASCII code 03h

15.3.2 Format of the SAT Time String

The SAT Time String is a sequence of 29 ASCII characters starting with the **<STX>** (start-of-text) character and ending with the **<ETX>** (end-of-text) character. The format is as follows:

<STX>*dd.mm.yy*/*w*/*hh:mm:ss*xxxx*u*v<ETX>

The letters printed in italics are replaced by ASCII-formatted numbers, whereas the other characters are directly part of the time string. The groups of characters are as defined below:

<STX> Start-of-Text, ASCII code 02h sent with one-bit accuracy at the change of each second

dd.mm.yy The date:

dd	Day of Month	(01–31)
mm	Month	(01–12)
yy	Year of the Century	(00–99)

w The day of the week (1–7, 1 = Monday)

hh:mm:ss The time:

hh	Hours	(00–23)
mm	Minutes	(00–59)
ss	Seconds	(00–59, or 60 during leap second)

xxxx Time zone indicator:

'UTC'	Universal Time Coordinated, formerly GMT
'CET'	European Standard Time, daylight saving disabled
'CEST'	European Summertime, daylight saving enabled

u Clock status characters:

'#'	Clock has not synchronized since last reset
' '	(Space, 20h) Clock has synchronized since last reset

v Announcement of clock jump during last hour before jump enters effect:

'!'	Announcement of start or end of Daylight Saving Time
' '	(Space, 20h) nothing announced

<CR> Carriage Return, ASCII code 0Dh

<LF> Line Feed, ASCII code 0Ah

<ETX> End-of-Text, ASCII code 03h

15.3.3 Format of the Uni Erlangen String (NTP)

The Uni Erlangen String (NTP) of a GPS clock is a sequence of 66 ASCII characters starting with the **<STX>** (start-of-text) character and ending with the **<ETX>** (end-of-text) character. The format is as follows:

<STX>*dd.mm.yy; w; hh:mm:ss; voo:oo; acdfg i;bbb.bbbbn lll.llle hhhhm*<ETX>

The letters printed in italics are replaced by ASCII-formatted numbers, whereas the other characters are directly part of the time string. The groups of characters are as defined below:

<STX> Start-of-Text, ASCII code 02h sent with one-bit accuracy at the change of each second

dd.mm.yy The date:

dd	Day of Month	(01–31)
mm	Month	(01–12)
yy	Year of Century	(00–99)

w Day of the week (1–7, 1 = Monday)

hh.mm.ss The time:

hh	Hours	(00–23)
mm	Minutes	(00–59)
ss	Seconds	(00–59, or 60 during leap second)

v -/+ sign of the offset of local timezone relative to UTC

oo:oo Offset of local time zone relative to UTC in hours and minutes

ac Clock status characters:

a:	'#'	Clock has not synchronized since reset
	' '	(Space, 20h) Clock has synchronized since reset
c:	'*'	GPS receiver has not checked its position
	' '	(Space, 20h) GPS receiver has determined its position

d Time zone indicator:

'S'	CEST	European Summertime, Daylight Saving Time enabled
' '	CET	European Standard Time, Daylight Saving Time disabled

f Announcement of clock jump during last hour before jump enters effect:

'!'	Announcement of start or end of Daylight Saving Time
' '	(Space, 20h) nothing announced

g Announcement of clock jump during last hour before jump enters effect:

'A'	Announcement of leap second insertion
' '	(Space, 20h) nothing announced

i Leap second insertion

'L'	Leap second is currently to be inserted (only active in 60th second)
' '	(Space, 20h) No leap second to be inserted

bbb.bbbb Geographical latitude of receiver position in degrees
Leading characters padded by Space characters (20h)

n	Latitudinal hemisphere, with the following characters possible: 'N' North of Equator 'S' South of Equator
lll.llll	Geographical longitude of receiver position in degrees Leading characters padded by Space characters (20h)
e	Longitudinal hemisphere, with the following characters possible: 'E' East of Greenwich Meridian 'W' West of Greenwich Meridian
hhhh	Altitude above WGS84 ellipsoid in meters Leading characters padded by Space characters (20h)
<ETX>	End-of-Text, ASCII code 03h

15.3.4 Format of the NMEA 0183 String (RMC)

The NMEA 0183 RMC String is a sequence of 65 ASCII characters starting with the string '$GPRMC' and ending with the characters **<CR>** (Carriage Return) and **<LF>** (Line Feed). The format is as follows:

$GPRMC,*hhmmss.ff*,*A*,*bbbb.bb*,*n*,*lllll.ll*,*e*,*0.0*,*0.0*,*ddmmyy*,*0.0*,*a*hh***<CR><LF>

The letters printed in italics are replaced by ASCII-formatted numbers, whereas the other characters are directly part of the time string. The groups of characters are as defined below:

$ — Start character, ASCII code 24h
sent with one-bit accuracy at the change of each second

GP — Talker ID, in this case "GP" for GPS

RMC — Message type ID, in this case "RMC"

hhmmss.ss — The time:

hh	Hours	(00–23)
mm	Minutes	(00–59)
ss	Seconds	(00–59, or 60 while leap second)
ff	Fractions of Seconds	(1/10 ; 1/100)

A — Status (A = Time Data Valid, V = Time Data not Valid)

bbbb.bb — Geographical latitude of receiver position in degrees
Leading characters padded by Space characters (20h)

n — Latitudinal hemisphere, with the following characters possible:

'N'	North of Equator
'S'	South of Equator

lllll.ll — Geographical longitude of receiver position in degrees
Leading characters padded by Space characters (20h)

e — Longitudinal hemisphere, with following characters possible:

'E'	East of Greenwich Meridian
'W'	West of Greenwich Meridian

0.0,0.0 — Speed over the ground in knots and track angle in degrees.
With a Meinberg GPS clock, these values are always 0.0,
With GNS clocks, the values are calculated by the
receiver for mobile applications

ddmmyy — The date:

dd	Day of Month	(01–31)
mm	Month	(01–12)
yy	Year of the Century	(00–99)

a — Magnetic Variation E/W

hh — Checksum (XOR of all characters except '$' and '*')

<CR> — Carriage Return, ASCII code 0Dh

<LF> — Line Feed, ASCII code 0Ah

15.3.5 Format of the ATIS standard Time String

The ATIS standard Time String is a sequence of 23 ASCII characters terminated by a CR (Carriage Return) character. The format is:

<GID><ABS><TSQ><CC><CS><ST>*yymmddhhmmsswcc*<GID><CR>

The letters printed in italics are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<GID>	Address of the receiver		code 7Fh
<ABS>	Originator of message	ASCII '0'	code 30h
<TSQ>	Telegram number	ASCII '0'	code 30h
<CC>	Command code	ASCII 'S' for SET	code 53h
<CS>	Command code	ASCII 'A' for ALL	code 41h
<ST>	Time status	ASCII 'C' for valid time	code 43h
yymmdd	the current date:		
	yy year of the century	(00..99)	
	mm month	(01..12)	
	dd day of month	(01..31)	
hh:mm:ss	the current time:		
	hh hours	(00..23)	
	mm minutes	(00..59)	
	ss seconds	(00..59, or 60 while leap second)	
w	the day of the week	(1..7, 1 = 31h = Monday)	
cc	checksum in hex, built from all characters including GID, ABS, TSQ, CC, ST, ...		
<CR>	Carriage Return, ASCII code 0Dh		

(The standard interface configuration for this string type is 2400 baud, 7E1)

15.4 Description of Programmable Pulse Signal Types

If your Meinberg system has programmable signal and pulse outputs, then depending on the system, more or less of the listed signals will be available. These can be configured separately for each signal output.

Idle
Selecting "Idle" enables that specific output to be disabled.

Timer
In "Timer" mode, the output simulates a timer with a fixed daily schedule. It is possible to configure three switch-on and three switch-off times for each day and each output. In order to set a timer, both the switch-on time ("ON") and the corresponding switch-off time ("OFF") must be set. If the switch-on is later than the switch-off time, the switching scheduler will interpret this to mean that the switch-off time is on the next day, which will keep the signal enabled through midnight.

Thus, if a program was set with a switch-on time of 23:45:00 and a switch-off time of 0:30:00, this would cause the output (e.g., PP 1 Out) to be enabled on day n at 11:45 p.m., and then to be disabled on day n+1 at 12:30 a.m. If any of these three programs are to be left disabled, simply enter the same times into the ON and OFF fields. The "Signal" selector specifies the active state for the timer periods. Selecting "Normal" will put the output in a low state outside of switch-on periods and in a high state during switch-on periods ("active high"). Conversely, selecting "Inverted" will place the output in a high state outside of switch-on periods and in a low state during switch-on periods ("active low").

Time Slots
In this mode, you can select defined time slots. "Number of Time Slots" determines the number and length of the time slots based to one minute. The "Pre-limit buffer" allows to set a premature shutdown. This can be configured in the range between 50ms and 500ms to prevent overlap of time slots.

Example:

- Number of Time Slots = 10
- Pre-limit buffer = 500ms

Time slots 1 and 2 are enabled (0 - 6s and 6 - 12s).
In fact, the outputs triggers from 0 - 11,5s.

Single Shot
"Single Shot" mode generates a single pulse of defined length once per day. The time of day when the pulse is to be generated can be set via the "Time" value. The value "Length" allows the pulse length to be set in 10 msec increments and may be any value in the range of 10 ms to 10 sec.

Cyclic Pulse
"Cyclic Pulse" mode is used to generate cyclically repeating pulses. The time between two pulses is defined, and this value must always be provided in hours, minutes, and seconds. It is important to note that the pulse train is always synchronized with 0:00.00 local time, so that the first pulse on any given day will always be output at midnight, and is repeated at the specified cycle interval henceforth. Thus, if a cycle duration of 2 seconds is specified, this will result in pulses being triggered at 0:00.00, 0:00.02, 0:00.04 and so on. While it is possible to set any cycle time between 0 and 24 hours, these repetitions are usually only useful if the time between pulses is always the same. For example, if a cycle time of 1:45.00 is set, this will output pulses at intervals of 6300 seconds. However, between the last pulse of any given day and the pulse at midnight on the following day, there will be an interval of just 4500 seconds.

Pulses Per Second, Per Min, Per Hour
These modes generate pulses of defined length once per second, once per minute, or once per hour. The configuration options for all three modes are the same. The value "Pulse Length" specifies the length of the pulse and can be between 10 msec and 10 sec.

DCF77 Marks

In "DCF77 Marks" mode the selected output simulates the time string transmitted by the German DCF77 time code transmitter. The pulses output are the 100 ms and 200 ms pulses (logical 0/1) typical for the DCF77 code. The absence of the 59-second mark is used to signal that the next minute will begin with the following second mark.

The 'DCF Suspend After'/'Timeout' field can be used to enter how many minutes the system should wait while in free-run mode before DCF77 simulation is suspended. Entering 0 here will disable the timeout function, so that the DCF77 simulation will continue running perpetually until manually disabled.

Sync Mode

There are three different modes available for outputting the synchronization state of the clock.

Position OK
The "Position OK" mode outputs a signal through the output whenever the GPS receiver is receiving enough satellites to determine its position.

Time Sync
In "Time Sync" mode, a signal is passed through the output while the clock's internal timebase is synchronized to the GPS time.

All Sync
The "All Sync" mode requires both of the above states to be true—sufficient satellites for positioning and synchronization of internal timebase to satellite system for a signal to be passed through the output.

DCLS Time Code
DC level shift time code. The time code output here is configured using the "IRIG Settings" tab in the LANTIME OS Web Interface or the "Outputs Settings" section of Meinberg Device Manager.

10 MHz Frequency
This mode is used to output a fixed frequency of 10 MHz, using a PPS signal as an absolute phase reference (i.e., the falling edge of the 10 MHz signal is synchronized with the rising edge of the PPS signal).

DCF77-like M59
A 500 ms pulse is sent at the 59-second mark.

The 'DCF Suspend After'/'Timeout' field can be used to enter how many minutes the system should wait while in free-run mode before DCF77 simulation is suspended. Entering 0 here will disable the timeout function, so that the DCF77 simulation will continue running perpetually until manually disabled.

Synth. Frequency
This mode is used to output a custom frequency, which is also defined using the "Synthesizer" tab in the LANTIME OS Web Interface or the "Outputs Settings" section of Meinberg Device Manager.

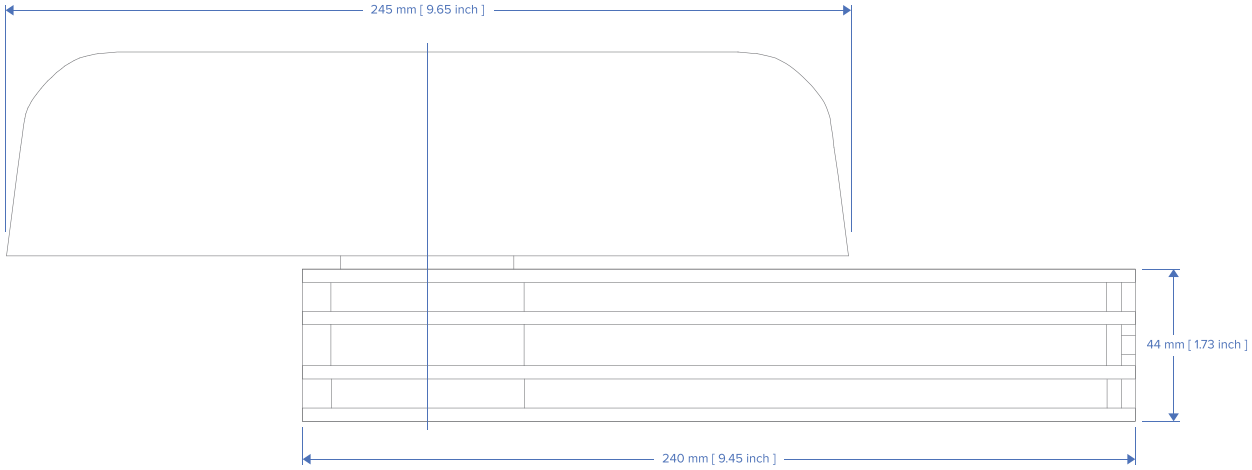
PTTI 1PPS
This mode is used to pass a PPS signal of 20 microseconds length through the output.

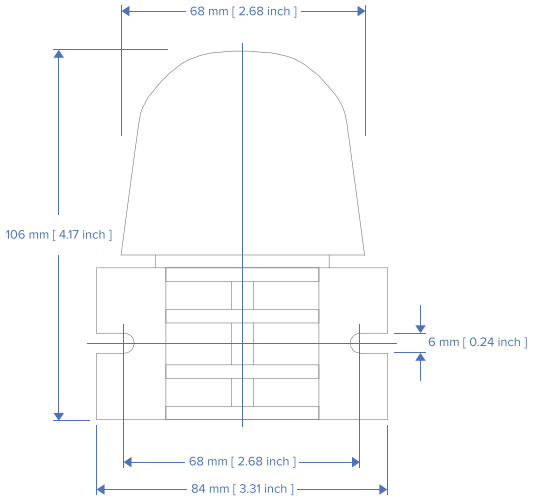
1 MHz Frequency
This mode is used to output a fixed frequency of 1 MHz, using a PPS signal as an absolute phase reference (i.e., the falling edge of the 10 MHz signal is synchronized with the rising edge of the PPS signal).

5 MHz Frequency
This mode is used to output a fixed frequency of 5 MHz, using a PPS signal as an absolute phase reference (i.e., the falling edge of the 10 MHz signal is synchronized with the rising edge of the PPS signal).

16 Technical Specifications AW02 Antenna

Physical Dimensions:





Specifications:

Power Supply:	3.5 V – 5 V
Reception Frequency:	77.5 kHz
Bandwidth:	1 kHz
Signal Level:	50 μV – 5 mV
Connector Type:	Type-N Female
Form Factor:	ABS Plastic Enclosure for Outdoor Installation
IP Rating:	IP 56
Temperature Range:	-25 °C to +65 °C (-13 to 149 °F)
Weight:	0.55 kg (1.2 lbs), Including Mounting Kit

16.1 Technical Specifications: Antenna Cable

The table below shows which coaxial cable types and lengths are supported by Meinberg for each of the receiver types. If you need to purchase a replacement cable at any time, please refer to this table to ensure that you select cable with suitable cutoff frequency and attenuation properties.

Cable Type	Cable Diameter (mm/in)	Attenuation at 100 MHz (db)/100 m/328 ft	Max. Cable Length (m/ft)	Used for Receiver Type
RG58/CU	5/0.2	17	300/984	GPS/GNS-UC/DCF/PZF
RG213	10.3/0.41	7	700/2297	GPS/GNS-UC
H155	5.4/0.21	9.1	70/230	GNM/GNS
H2010 Ultraflex	7.3/0,29	5.8	150/492	GNM/GNS

Please refer to the data sheet of the cable in question for further specifications.

16.2 Technical Specifications: MBG S-PRO Surge Protector

Adapter plug with replaceable gas discharge tube for coaxial signal connections.

Connector Type: Type-N connector female/female. The MBG S-PRO set includes a surge protector (Phoenix CN-UB-280DC-BB), a pre-assembled coaxial cable, and a mounting bracket.

The coaxial cable surge protector must be installed on the antenna line. The shielding is grounded using a conductor that is short as possible. The CN-UB-280DC-BB is equipped with two Type-N female connectors and has no dedicated input/output polarity and no preferred installation orientation.

Phoenix CN-UB-280DC-BB

Features:

- High RF Performance
- Multiple Strike Capability
- 20 kA Surge Protection
- Bidirectional Protection

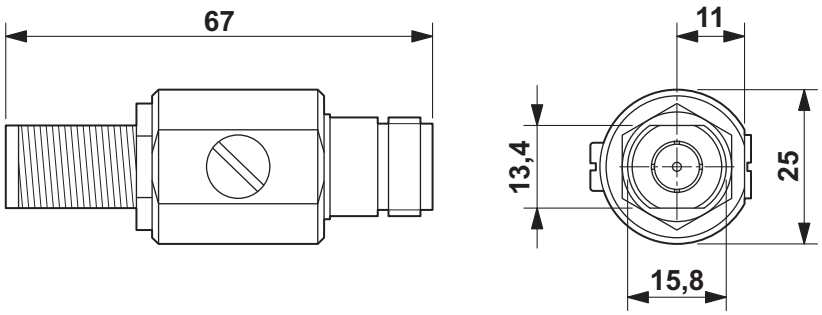
Installation Method:	Connector Type-Specific Adapter Plug	
Direction of Action:	Line Shield/Earth Ground	
Maximum Continuous Operating Voltage:	UC (Wire-Ground) 195 V AC	280 V DC
Rated Current:	I_N	5 A (25 °C)
Effective Operating Current:	IC at UC	$\leq$ 1 μA
Rated Discharge Current:	In (8/20) μs (Core-Earth) In (8/20) μs (Core-Shield)	20 kA 20 kA
Total Surge Current:	(8/20) μs (10/350) μs	20 kA 2.5 kA

Max. Discharge Current:	I_{max} (8/20)μs Maximum (Core-Shield)	20 kA
Rated Pulse Current:	I_{an} (10/1000)μs (Core-Shield)	100 A
Impulse Discharge Current:	(10/350) μs, Peak Value I_{imp}	2.5 kA
Output Voltage Limit:	At 1 kV/μs (Core-Earth) spike At 1 kV/μs (Core-Earth) spike	$\leq$ 900 V $\leq$ 900 V
Response Time:	tA (Core-Earth) tA (Core-GND)	$\leq$ 100 ns $\leq$ 100 ns
Input Attenuation:	aE, asym.	Typically 0.1 dB ($\leq$ 1.2 GHz) Typically 0.2 dB ($\leq$ 2.2 GHz)
Cut-Off Frequency:	fg (3 dB), asym. (Shield) in 50 Ω System > 3 GHz	
Standing Wave Ratio:	VSWR in a 50 Ω System	Typically 1.1 ($\leq$ 2 GHz)
Permissible HF Power:	P_{max} at VSWR = xx (50 Ω System)	700 W (VSWR = 1.1) 200 W (VSWR = ∞)
Capacitance:	(Core-Earth) Asymmetric (Shield)	Typically 1.5 pF Typically 1.5 pF
Surge Current Resistance:	(Core-Earth)	C1 - 1 kV/500 A C2 - 10 kV/5 kA C3 - 100 A D1 - 2.5 kA
Ambient Temperature:	(During Operation)	-40 °C ... 80 °C
Supported Altitude:	$\leq$ 2000 m (above sea level)	
IP Rating:	IP55	
Housing Material:	Nickel-Plated Brass Colored Nickel	
Dimensions:	Height 25 mm, Width 25 mm, Depth 67 mm	
Connection Type:	 IN OUT	Type-N Connector 50 Ω Type-N Connector, Female Type-N Connector, Female
Standards/Regulations:	IEC 61643-21 2000 + A1:2008 EN 61643-21 2001 + A1:2009	

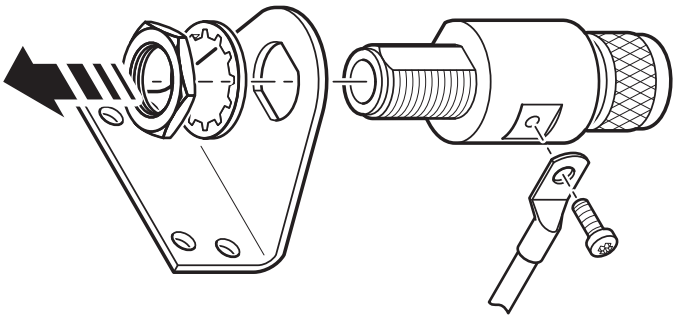
The original product page of the supplier (see link) of the CN-UB-280DC-BB surge protector is the source of the specifications above. Please refer to the manufacturer's product page at the following link for detailed specifications as well as a variety of product-specific documents:

https://www.phoenixcontact.com/online/portal/gb/?uri=pxc-oc-itemdetail:pid=2818850

16.2.1 MBG S-PRO: Physical Dimensions



16.2.2 Installation and Grounding



17 RoHS Conformity

Conformity 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 warrant that our 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.

18 Declaration of Conformity for Operation in the European Union

Konformitätserklärung

Doc ID: -August 24, 2022

Hersteller *Manufacturer*	Meinberg Funkuhren GmbH & Co. KG Lange Wand 9, D-31812 Bad Pyrmont

erklärt in alleiniger Verantwortung, dass das Produkt,
declares under its sole responsibility, that the product

Produktbezeichnung *Product Designation*	**DCF600HS**

auf das sich diese Erklärung bezieht, mit den folgenden Normen und Richtlinien übereinstimmt:
to which this declaration relates is in conformity with the following standards and provisions of the directives:

EMV – Richtlinie *EMC Directive* 2014/30/EU	EN 61000-6-2:2019 EN IEC 61000-6-3:2021 EN 55035:2017/A11:2020 EN 55032:2015 + AC:2016 + A11:2020 + A1:2020
Niederspannungsrichtlinie *Low-voltage Directive* 2014/35/EU	EN IEC 62368-1:2020 + A11:2020
RoHS – Richtlinie *RoHS Directive* 2011/65/EU + 2015/863/EU	EN IEC 63000:2018

Bad Pyrmont, August 24, 2022

S. Meinberg

Stephan Meinberg
Production Manager

19 Declaration of Conformity for Operation in the United Kingdom

UK Declaration of Conformity

Doc ID: -August 24, 2022

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

declares that the product

Product Designation	**DCF600HS**

to which this declaration relates, is in conformity with the following standards and provisions of the following regulations under British law:

Electromagnetic Compatibility Regulations 2016 (as amended) *SI 2016/1091*	EN IEC 61000-6-2:2019 EN IEC 61000-6-3:2021 EN 55035:2017/A11:2020 EN 55032:2015 + AC:2016 + A11:2020 + A1:2020
Electrical Equipment (Safety) Regulations 2016 (as amended) *SI 2016/1101*	EN IEC 62368-1:2020/A11:2020
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended) *SI 2012/3032*	EN IEC 63000:2018

Bad Pyrmont, Germany, dated August 24, 2022

Stephan Meinberg
Production Manager