The Synchronization Experts.

MANUAL

ANZ141

LED Date & Time Display Unit with Optional DCF77 or NTP/PTP Synchronization

June 21, 2024

Meinberg Funkuhren GmbH & Co. KG

Table of Contents

1 Imprint

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

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

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

Date: June 20, 2024

Manual
Version: 1.0

2 Copyright and Liability Exclusion

3 Change Log

Version	Date	Revision Notes
1.0	1/9/2024	Initial version
1.1	2/5/2024	- Added baud rate and framing information to connectors (Chapter 9) and Meinberg Device Manager chapter (Chapter 14.2) - Added new section on the Meinberg Device Manager Network Connection Wizard (Chapter 14.2.2.3)

4 Presentation Conventions in this Manual

4.1 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 word 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.

4.2 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.

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

4.3 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.

4.4 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)*

Grounding Terminal *(symbol definition IEC 60417-5017)*

Protective Earth Connection *(symbol definition IEC 60417-5019)*

Disconnect All Power Connectors *(symbol definition IEC 60417-6172)*

5 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 information affixed to the product 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 product 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**.

5.1 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!

5.2 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 personnel** with a familiarity with relevant national safety standards and regulations,
- **instructed personnel** having received suitable instruction from skilled personnel on relevant national safety standards and regulations

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

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

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 regularly visit the Meinberg website at **https://www.meinbergglobal.com** or the Meinberg Customer Portal at **https://meinberg.support** to download up-to-date manuals.

Please keep all product documentation, including this manual, in a safe place in a 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.

5.3 Safety during Installation

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 commercial 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 enclosure 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—never block or obstruct ventilation openings and/or the intakes or openings of active cooling solutions.

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.

5.4 Electrical Safety

This Meinberg product is operated at a hazardous voltage.

This system may only be set up and connected by skilled personnel, or by instructed personnel who have received appropriate technical & safety training from skilled personnel.

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.

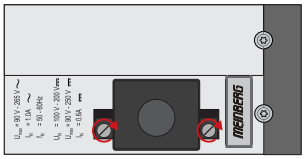
Never connect or disconnect power, data, or signal cables during a thunderstorm! Doing so presents a risk of injury or death, as cables and connectors may conduct very high voltages in the event of a lightning strike!

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 energized components.

5-Pin MSTB Connector



3-Pin MSTB Connector

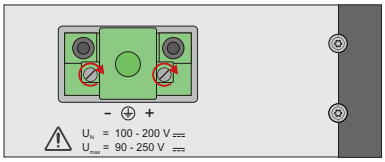


Illustration: Lock screws on an MSTB plug connector; in this case on a LANTIME M320

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 cable 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! The following procedure must be followed in order to correctly and reliably isolate the device:

- Pull the power supply plug out of the power source, then disconnect the cable from 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.

5.4.1 Special Information for Devices with AC Power Supply

This device is a Protection Class 1 device and may only be connected to a grounded outlet (TN system).

For safe operation, the installation must be protected by a fuse rated for currents not exceeding 20 A and equipped with a residual-current circuit breaker in accordance with applicable national standards.

The appliance must only ever be disconnected from the mains power supply via the mains socket and not from the appliance itself.

Make sure that the power connector on the appliance or the mains socket is readily accessible for the user so that the mains cable can be pulled out of the socket in an emergency.

Non-compliant cabling or improperly grounded sockets are an electrical hazard!

Only connect the appliance to a grounded shockproof outlet using a safety-tested mains cable designed for use in the country of operation.

5.4.2 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 disconnection mechanism for the appliance.

5.5 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.

5.6 Battery Safety

The integrated CR2032 lithium battery has a service life of at least ten 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!

6 Important Product Information

6.1 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.

6.2 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 effective 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 18.

6.3 Ensuring the Optimum Operation of Your Device

- Ensure that ventilation slots are not obscured or blocked by dust, or else heat may build up inside the device. While the system is designed to shut down safely and 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.

6.4 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).

6.4.1 Replacing the Battery

Your device may be fitted with a lithium battery (type CR2032) that is used to sustain operation of the integrated real-time clock (RTC).

This battery has a life of at least ten years. However, if the device does not retain the current time when switched off, the voltage of the battery may have dropped below 3 V, and the battery needs to be replaced as a result.

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

6.4.2 Replacing the Fuse

Danger!

This equipment is operated at a hazardous voltage.

Danger of death from electric shock!

- The device must be disconnected from the mains! This is done using the physical power switch.
- Once the power switch is OFF, release the lock screws of the power connector (if applicable) and detach the connector.

Meinberg recommends keeping a spare fuse to hand at all times to ensure that a triggering of the integrated fuse does not disrupt the operation of your system for any longer than absolutely necessary. Ensure that it is of the proper type, and that it has the appropriate current and voltage ratings and blow curve. The rated voltage and current values are marked on the device itself next to the fuse compartment.

Fuses are marked with standardized designations in accordance with IEC 60127 to provide information about their specifications. For example, if a fuse is marked *T 2.5 A H 250 V*, it has the following meaning:

- *T*: The blow curve type, in this case *timelag*
- *2.5 A*: The current rating, in this case *2.5 Ampere*
- *H*: The breaking capacity, in this case *high*
- *250 V*: The voltage rating, in this case *250 Volt*

Ensure that the new fuse meets the following requirements and satisifies the specifications printed on the device itself:

Current Type	Labeling Standard	Cooling Material	Blow Curve Type	Dimensions
AC	IEC 60127-compliant	With/without	T (Timelag)	5 x 20 mm
DC	IEC 60127-compliant	With	T (Timelag)	5 x 20 mm

Replacement Process

1. Cut the power supply to the device before disconnecting all signal, antenna, error relay, and serial interface connections from the device. Check that the device is actually de-energized and ensure that it cannot be switched back on!
2. Remove the fuse bracket from the fuse compartment by rotating it anticlockwise using a slotted screwdriver. Replace the fuse and insert the fuse bracket with the new fuse into the fuse compartment. Push it in with the screwdriver and rotate it clockwise until the fuse bracket is securely seated again.
3. Reconnect all cables in the reverse order to how they were disconnected. The power can now be switched back on if appropriate.

6.5 Disposal

Disposal of Packaging Materials

The packaging materials that we use are fully recyclable:

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

7 Introduction to Your ANZ141 Display Unit

Thank you for purchasing your new Meinberg **ANZ141 Display Unit**.

Meinberg's ANZ141 family of devices are a series of customized time & date display units designed to be installed either in a control panel enclosure or in a dedicated desktop case. Designed for industrial applications, the ANZ141 Display Units provide optimum clarity and contrast with adjustable brightness levels for easy reading of the current time & date from the 14-digit LED display.

The ANZ141 Display Units are available in a variety of models that, depending on the options selected during purchase, can be synchronized to a time string delivered via an RS-232 or RS-422 serial interface, to a long-wave time signal such as the German DCF77 time service, to a remote NTP server (such a GPS-synchronized LANTIME M320 from Meinberg) over an Ethernet interface, or to a PTPv2 or PTPv2.1 master clock (such as a microSync server from Meinberg).

The serial interfaces also allow the ANZ141 Display Units to serve as a 'passthrough' reference source in their own right in order to synchronize other devices over a serial RS-232 or RS-422 connection.

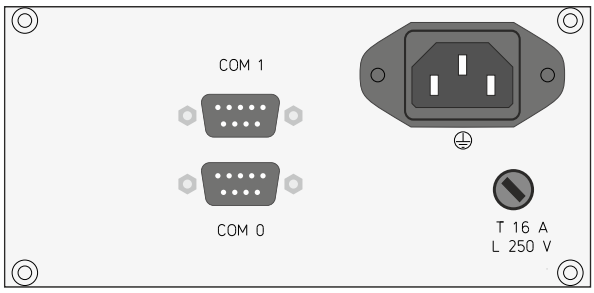
All ANZ141 models feature an integrated real-time clock that continue to provide accurate time even in the absence of the reference signal. This real-time clock features either a backup capacitor to provide at least 150 hours of continued operation (or optionally a lithium battery for up to 10 years continued operation) in the event of loss of power to the clock—more than adequate for any power outage scenario to ensure that the clock continues to provide accurate time immediately when power is restored.

Most of the ANZ141 Display Units can be entirely configured via the integrated menu system using the two buttons on the front of the unit. The sole exceptions here are the ANZ141/NET variants, which may require some configuration over a network or serial connection if they are to be synchronized to a NTP server or PTP master.

This Technical Reference provides guidance on setting up your ANZ141 Display Unit for use. If you should require assistance with synchronizing your ANZ141 device, Meinberg's Technical Support team is also on hand to help where needed.

8 ANZ141 Models

There are three main models of the ANZ141 that vary in terms of the reference signal.



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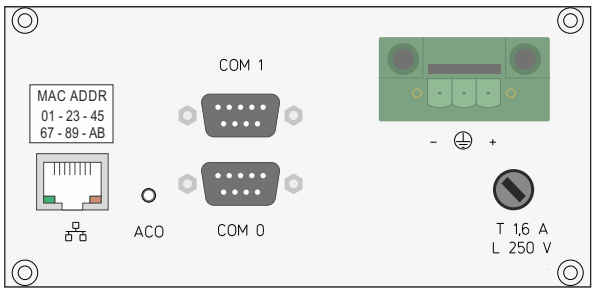

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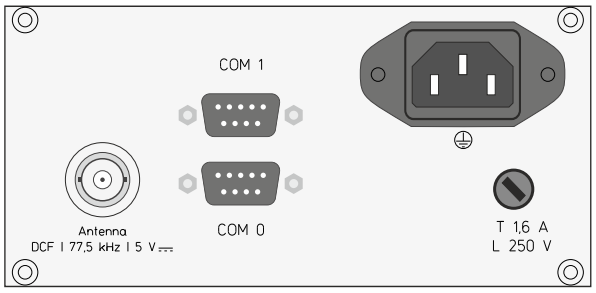

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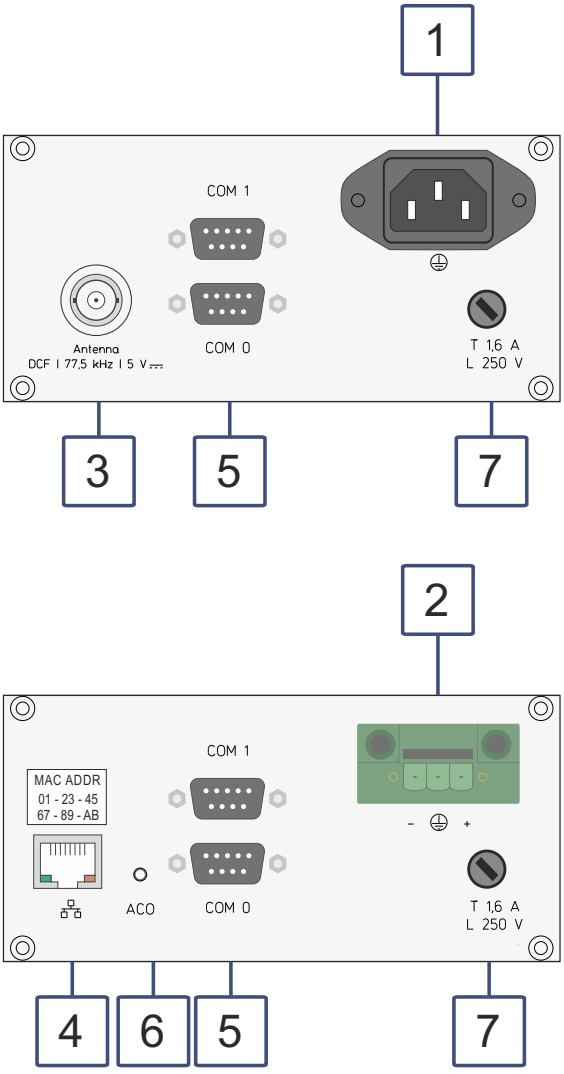
No.	Type	Reference Sources	Power Supply
1	Standard	Time String (RS-232 or RS-422)	AC (IEC 60320 C14) or DC (MSTB 3-pin)
2	NET	NTP Server or Time String (RS-232 or RS-422)	AC (IEC 60320 C14) or DC (MSTB 3-pin)
3	DCF77	DCF77 Long-Wave Signal or Time String (RS-232 or RS-422)	AC (IEC 60320 C14) or DC (MSTB 3-pin)

The above illustrations show a standard model with AC power supply, a NET model with DC power supply, and a DCF77 model with AC power supply by way of example, but any combination of reference source and power supply is possible.

9 ANZ141 Rear Panel



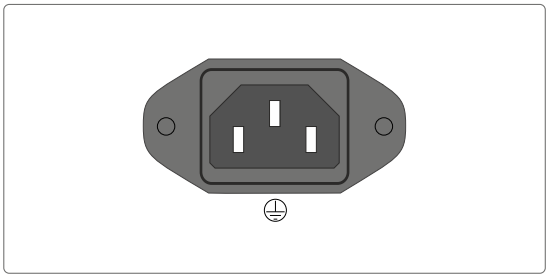
Information:

The numbering of the illustrations above corresponds to the subchapters of this chapter.

The models above are example ANZ141 configurations that illustrate all of the possible connectors and features that may be present on an ANZ141 unit. Other configurations, for example an ANZ141/NET with a network interface and AC power supply, are available.

9.1 Power Connector (AC Power Supply Model)

Connector Type: IEC 60320 C13



Input Specifications

Nominal Voltage Range:	U_N	=	100–240 V~
Rated Voltage Range:	U_{max}	=	85–264 V~
Nominal Current:	I_N	=	0.15 A
Nominal Frequency Range:	f_N	=	50–60 Hz
Rated Frequency Range:	f_{max}	=	47–63 Hz

Output Specifications

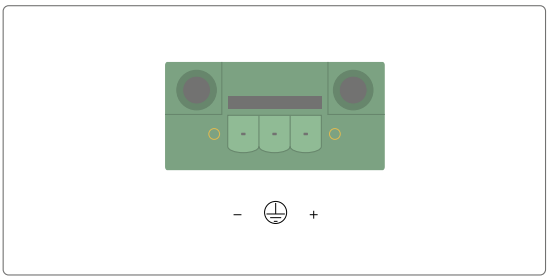
Maximum Power: P_{max} = 15 W

Maximum Heat Output: 54.01 kJ/h (51.19 BTU/h)

9.2 Power Connector (DC Power Supply Model)

Connector Type: 3-Pin MSTB

Pin Assignment:
1: +
2: PE (Protective Earth)
3: -



Input Specifications

Nominal Voltage:	U_N	=	48 V ⎓
Rated Voltage Range	U_{max}	=	20–60 V ⎓
Nominal Current:	I_N	=	0.22 A

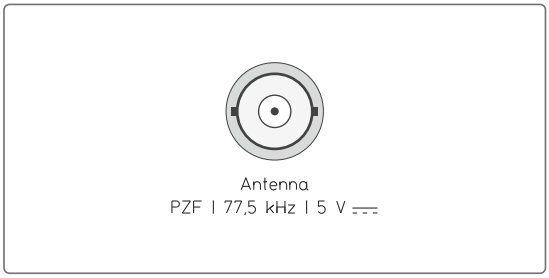
Output Specifications

Max. Power: P_{max} =10 W

Max. Heat Output: 34.13 BTU/h

9.3 DCF77 Antenna Input

Receiver Type:	Receiver for processing of a DCF77 signal
Reception Frequency:	77.5 kHz
Input Impedance:	50 Ω
Signal Level:	1 μV_{rms} – 20 mV_{rms}
Supply Voltage:	5 V, max. 1 mA
Connector Type:	BNC, Female
Cable Type:	Coaxial Cable, Shielded
Cable Length:	Max. 300 m with RG58



Danger!

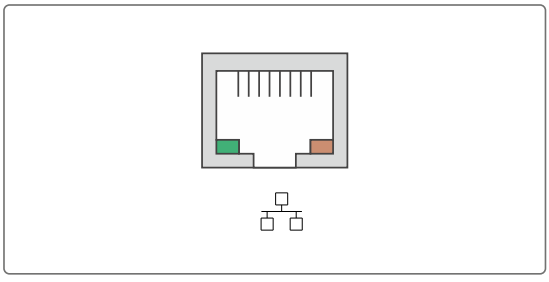
Do not work on the antenna installation during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna installation or the antenna cable if there is a risk of lightning strike.
- Do not perform any work on the antenna installation if it is not possible to maintain the prescribed safety distance from exposed power lines or electrical substations.

9.4 10/100BASE-T Network Interface

Ethernet Standard:	100BASE-T
Data Transmission Rate:	10/100 Mbit/s
Connector Type:	8P8C (RJ45)
Cable Type:	Copper, Twisted Pair
Duplex Modes:	Half/Full/Autonegotiation

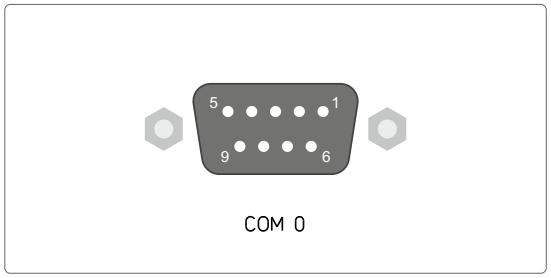


9.5 COM0 Time String I/O (RS-232/RS-422)

Data Transfer Mode: Serial

Baud Rates: 115200 *(Default)*, 57600, 38400, 19200, 9600, 4800, 2400

Framing: 7N2, 7E1, 7E2, 8N1 *(Default)*, 8N2, 8E1



Pin Assignment:
Pin 2: RS-232 TxD (Transmit)
Pin 3: RS-232 RxD (Receive)
Pin 5: GND (Ground)
Pin 7: RS-422 TxD – (Transmit, neg.)
Pin 8: RS-422 TxD + (Transmit, pos.)

Connector Type: DSUB Female, 9-pin

Cable Type: RS-232 Cable (Shielded, Max. 15 m)
Modified RS-422 Cable (Shielded, Max. 1200 m)

Information:

Please note that the pin layout of the device receiving the time string output will dictate whether you require a RS-232 "straight-through" or a null modem cable to connect your system to a time string receiver. A null-modem cable has Pins 2 and 3 'crossed over', so that Pin 2 at one end leads to Pin 3 at the other, and vice versa.

If Pins 2 and 3 have identical assignments on both devices, you will require a null-modem cable. If they are opposite to one another, you will require a "straight-through" cable. Either way, it is important that the transmitter pin (TxD) of each device is connected to the receiver pin (RxD) of the other device.

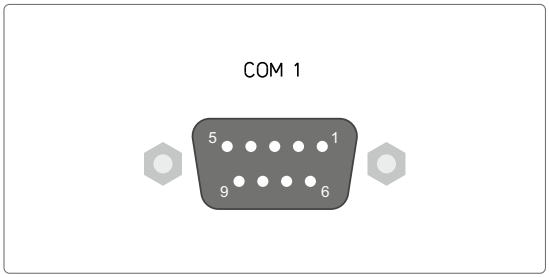
The pin assignment of the RS-422 interface is specific to the ANZ141 and a cable for RS-422 communication will therefore need to be specially assembled.

9.6 COM1 Time String I/O (RS-232/RS-422)

Data Transfer Mode: Serial

Baud Rates: 115200, 57600, 38400, 19200 *(Default)*, 9600, 4800, 2400

Framing: 7N2, 7E1, 7E2, 8N1 *(Default)*, 8N2, 8E1



Pin Assignment:

Pin 2:	RS-232 TxD (Transmit)
Pin 3:	RS-232 RxD (Receive)
Pin 5:	GND (Ground)
Pin 7:	RS-422 RxD – (Receive, neg.)
Pin 8:	RS-422 RxD + (Receive, pos.)

Connector Type: DSUB Female, 9-pin

Cable Type: RS-232 Cable (Shielded, Max. 15 m)
Modified RS-422 Cable (Shielded, Max. 1200 m)

Information:

Please note that the pin layout of the device receiving the time string output will dictate whether you require a RS-232 "straight-through" or a null modem cable to connect your system to a time string receiver. A null-modem cable has Pins 2 and 3 'crossed over', so that Pin 2 at one end leads to Pin 3 at the other, and vice versa.

If Pins 2 and 3 have identical assignments on both devices, you will require a null-modem cable. If they are opposite to one another, you will require a "straight-through" cable. Either way, it is important that the transmitter pin (TxD) of each device is connected to the receiver pin (RxD) of the other device.

The pin assignment of the RS-422 interface is specific to the ANZ141 and a cable for RS-422 communication will therefore need to be specially assembled.

9.7 ACO Button (ANZ141/NET Only)

The **ACO** button (Access Control Override) is used to allow Meinberg Device Manager to log into the ANZ141 over a IP network connection without the use of a password. This can be useful if the password has been changed from its default setting `mbg` and since forgotten.

A pointed implement should be used to press the ACO button. From the time that it is pressed, the password protection will be disabled for 60 seconds. The connection settings in Meinberg Device Manager should be edited so that the password field is left empty. A connection should then be established with the ANZ141 before the 60-second period expires.

Once the connection has been established, the connection will be preserved until the connection is terminated, even after expiry of the 60-second period.

This connection should be used to change the password under the **Config - Network** page by clicking on the **Change Password(s)** button. The **Old Password** field in this case will be disabled and does not need to be completed; simply complete the new password fields with the new password and click on the **OK** button.

Please note that it is not possible to change the password of your ANZ141 over a serial connection.

9.8 Fuse

The fuse provides protection against voltage surges and short circuits and limits the risk of damage to the integrated power supply. The fuse is accessible from the front panel and can be replaced if necessary.

Technical Specifications

Rated Voltage:	250 V
Trigger Delay:	Slow-Blow (Timelag)
Rated Current:	1.6 A (AC and DC Models)

T 1,6 A
L 250 V

Danger!

This equipment is operated at a hazardous voltage.

Danger of death from electric shock!

- The device must be disconnected from the mains! This is done using the physical power switch. Once the power switch is OFF, release the lock screws of the power supply connector and detach the connector.
- Disconnect all signal cables from the device, including antenna, fault message relay contact cables, and serial interfaces.
- Please note the information in Chapter 6.4.2, "**Replacing the Fuse**".

10 Installation and Connection of the Standard Model

Danger!

Proper Assembly and Connection of Power Cable

Danger of death due to electrocution and fire!

A power cable that is improperly assembled, improperly connected, or defective can result in electric shock and represents a significant fire hazard.

- DC power cables may only be assembled by a qualified electrician!
- Power cables must inspected before use! Never use a cable that is visibly damaged, known to be defective, or improperly assembled!
- Always ensure that the power cable is securely inserted into the power supply connector!
- When using a DC power cable (connector type MSTB 5-pin), always tighten the lock screws to secure the connector and minimize the risk of accidental connector movements.

1. Insert the ANZ141 into the enclosure in which it is to be used, be it an electrical cabinet or desktop enclosure.
2. Connect the **COM1** port of the ANZ141 to the desired time string source using a suitable RS-232 or RS-422 cable.

Important!

Please note that the **COM0** port cannot be used to synchronize the ANZ141.

3. If using a DC power supply, ensure that the power supply cable is correctly assembled and not damaged. Before connecting the power cable to the power source, insert the 3-pin MSTB plug into the 3-pin MSTB female power connector of the ANZ141 and tighten the two lock screws in order to secure the power connector.

   If using an AC power supply, ensure that the power supply cable is not damaged. Before connecting the power cable to the power source, insert the C13 plug into the C14 power connector on the ANZ141.

4. If you wish to use the ANZ141 as a time reference to synchronize another device, connect the ANZ141 to the receiver using a suitable RS-232 or RS-422 cable. Please note that an RS-422 output connection must always be connected to the **COM0** port when using the ANZ141 as a reference source. An RS-232 connection is possible on either **COM0** or **COM1**.

5. Switch on the power supply and a startup message showing the software revision and "CC" will appear for around three seconds before the time & date are displayed.

6. Ensure that the correct time string source is selected as a reference by pressing the **Menu** and **Set** buttons together, navigating to the "**Reference Input**" option (**IN**) using the **Menu** button, pressing the **Set** button to select *232* for RS-232 input or *422* for RS-422 input respectively, then pressing the **Menu** to confirm this entry.

   Navigate to the "**Save**" (**Sv**) option using the **Menu** button, select *YES* using the **Set** button, and confirm by pressing the **Menu** button.

If you are not sure whether your ANZ141 is synchronized to your reference clock, you can manually set the clock to the 'wrong' time by pressing the **Menu** and **Set** buttons together, navigating to the "**Set Time**" option (**ST**) using the **Menu** button, pressing the **Set** button to select *YES*, then pressing the **Menu** to confirm this entry. You can now change each digit or the day by holding down the **Set** button or switching to the next digit or day by quickly pressing and releasing the **Set** button. Use this to temporarily set the wrong date or hour, then navigate to the "**Save**" (**Sv**) option using the **Menu** button, select *YES* using the **Set** button, and confirm by pressing the **Menu** button.

If the ANZ141 is correctly synchronized to its reference clock, the displayed date & time should 'jump' to the correct values. The speed of this process depends on how frequently your reference clock sends time strings. For example, if the reference clock is configured to send a time string once a minute, your ANZ141 should re-synchronize within one minute.

11 Installation and Connection of the ANZ141/NET Model

Danger!

Proper Assembly and Connection of Power Cable

Danger of death due to electrocution and fire!

A power cable that is improperly assembled, improperly connected, or defective can result in electric shock and represents a significant fire hazard.

- DC power cables may only be assembled by a qualified electrician!
- Power cables must inspected before use! Never use a cable that is visibly damaged, known to be defective, or improperly assembled!
- Always ensure that the power cable is securely inserted into the power supply connector!
- When using a DC power cable (connector type MSTB 5-pin), always tighten the lock screws to secure the connector and minimize the risk of accidental connector movements.

1. Insert the ANZ141 into the enclosure in which it is to be used, be it an electrical cabinet or desktop enclosure.
2. Connect the network port of the ANZ141/NET to the network via which the ANZ141/NET will access the NTP server or PTP master or via which the ANZ141/NET will be managed over the network.
3. If using a DC power supply, ensure that the power supply cable is correctly assembled and not damaged. Before connecting the power cable to the power source, insert the 3-pin MSTB plug into the 3-pin MSTB female power connector of the ANZ141/NET and tighten the two lock screws in order to secure the power connector.

   If using an AC power supply, ensure that the power supply cable is not damaged. Before connecting the power cable to the power source, insert the C13 plug into the C14 power connector on the ANZ141/NET.

4. If you wish to use the ANZ141/NET as a time reference to synchronize another device, connect the ANZ141/NET to the receiver using a suitable RS-232 or RS-422 cable. Please note that an RS-422 output connection must always be connected to the **COM0** port when using the ANZ141 as a reference source. An RS-232 connection is possible on either **COM0** or **COM1**.
5. Switch on the power supply and a startup message showing the software revision and "CC" will appear for around three seconds before the time & date are displayed.
6. Ensure that the correct reference source is selected as a reference by pressing the **Menu** and **Set** buttons together, navigating to the "**Reference Input**" option (**IN**) using the **Menu** button, pressing the **Set** button to select *LAN* for NTP or PTP input (alternatively *232* or *422* if you wish to synchronize your ANZ141/NET to a time string source), then pressing the **Menu** to confirm this entry. Navigate to the **Save** ("**Sv.**") option using the **Menu** button, select *YES* using the **Set** button, and confirm by pressing the **Menu** button.

12 Installation and Connection of the ANZ141/DCF Model

Danger!

Proper Assembly and Connection of Power Cable

Danger of death due to electrocution and fire!

A power cable that is improperly assembled, improperly connected, or defective can result in electric shock and represents a significant fire hazard.

- DC power cables may only be assembled by a qualified electrician!
- Power cables must inspected before use! Never use a cable that is visibly damaged, known to be defective, or improperly assembled!
- Always ensure that the power cable is securely inserted into the power supply connector!
- When using a DC power cable (connector type MSTB 5-pin), always tighten the lock screws to secure the connector and minimize the risk of accidental connector movements.

1. Insert the ANZ141 into the enclosure in which it is to be used, be it an electrical cabinet or desktop enclosure.
2. Connect the antenna cable leading from the Meinberg AW02 or AI01 antenna to the antenna input of the ANZ141/DCF.
3. If using a DC power supply, ensure that the power supply cable is correctly assembled and not damaged. Before connecting the power cable to the power source, insert the 3-pin MSTB plug into the 3-pin MSTB female power connector of the ANZ141 and tighten the two lock screws in order to secure the power connector.

   If using an AC power supply, ensure that the power supply cable is not damaged. Before connecting the power cable to the power source, insert the C13 plug into the C14 power connector on the ANZ141/DCF.
   #
4. If you wish to use the ANZ141/DCF as a time reference to synchronize another device, connect the ANZ141/DCF to the receiver using a suitable RS-232 or RS-422 cable.

   Please note that an RS-422 output connection must always be connected to the **COM0** port when using the ANZ141 as a reference source. An RS-232 connection is possible on either **COM0** or **COM1**.

5. Switch on the power supply and a startup message showing the software revision and "CC" will appear for around three seconds before the time & date are displayed.

6. Ensure that the correct reference source is selected as a reference by pressing the **Menu** and **Set** buttons together, navigating to the "Reference Input" option (**IN**) using the **Menu** button, pressing the **Set** button to select *DCF* for DCF77 reception (alternatively *232* or *422* if you wish to synchronize your ANZ141/DCF to a time string source), then pressing the **Menu** to confirm this entry.

   Navigate to the "**Save**" (**Sv**) option using the **Menu** button, select *YES* using the **Set** button, and confirm by pressing the **Menu** button.

Your ANZ141/DCF will indicate that it is correctly receiving the DCF77 signal via the flashing LED at the bottom left of the display. Assuming that the signal is sufficiently coherent, the ANZ141/DCF should synchronize within three minutes, upon which the displayed date & time should 'jump' to the correct values.

12.1 Antenna Installation

The ANZ141/DCF supports the use of the Meinberg AW02 or AI01 antenna for reception of the 77.5 kHz DCF77 signal. The AW02 is designed for fixed-location installation in an elevated outdoor location, whereas the AI01 is intended for indoor use.

12.1.1 Geographical Considerations

The antenna location plays a critical role in determining the quality of reception and thus the signal strength of the 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 antenna must be directed towards Mainflingen, Germany, near Frankfurt am Main, in accordance with the installation conditions specified below.

The DCF77 signal has a theoretical range of 2000 km (measured fromm the transmission tower) and enables DCF77 receiver-clocks in not only Germany but also countries such as France, Denmark, Sweden, Austria, and Italy to be synchronized. Depending on the time of day, sensitive receivers can receive a sufficiently strong signal even in the furthermost regions of the reception area.

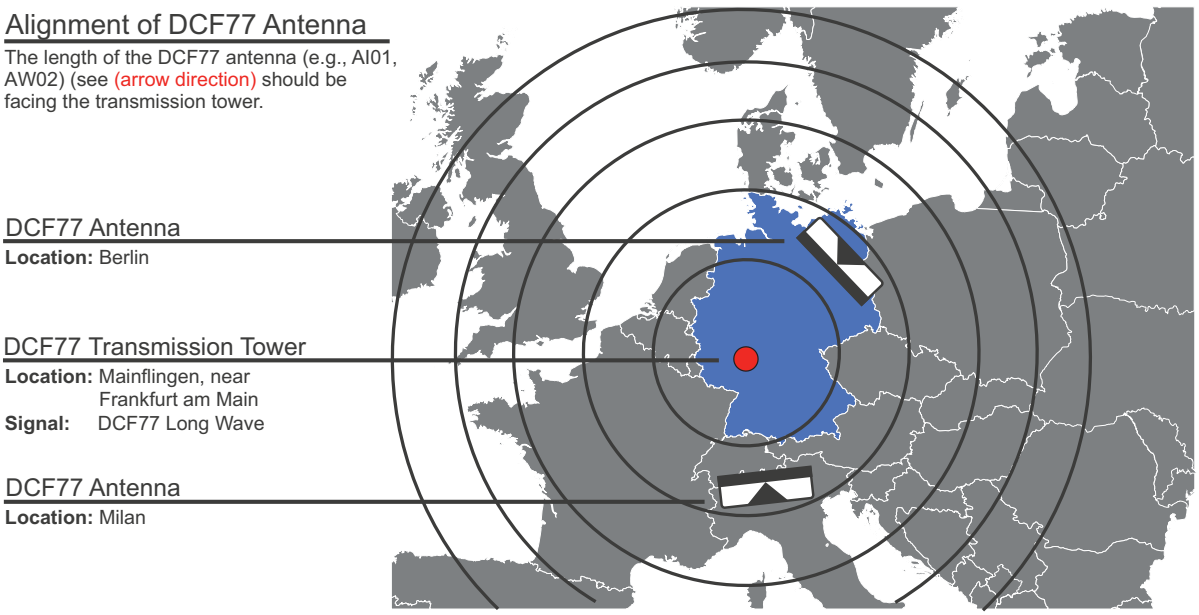


Illustration: Installation of a Meinberg long-wave antenna directed towards the DCF77 transmitter tower in Mainflingen, near Frankfurt-am-Main in Germany.

12.1.2 Meinberg AW02 Antenna

12.1.2.1 Selecting the Antenna Location

There are two ways of mounting the antenna using the mounting kit included in the packaging.

1.Mounting on a pole

2.Mounting on a wall

To ensure that the long wave signal can be reliably received and avoid difficulties with synchronization of your Meinberg product, select a location that allows for an unobstructed view towards Mainflingen, Germany (near Frankfurt am Main).

The line of sight between the antenna and signal source must therefore not be obstructed in any way. The antenna must also not be installed under power lines or other electrical lighting or power circuits.

Other Installation Criteria for Optimum Operation:

- The antenna should be mounted horizontally (see illustration).
- It should be at a distance of at least 30 cm (1 ft) from other antennas.
- The length of the antenna must be facing the transmission tower (see illustration).

Information:

Problems may arise with the synchronization of your Meinberg system if these conditions are not met.

12.1.2.2 Installation of the Antenna

Please read the following safety instructions carefully before installation and be sure to observe them.

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

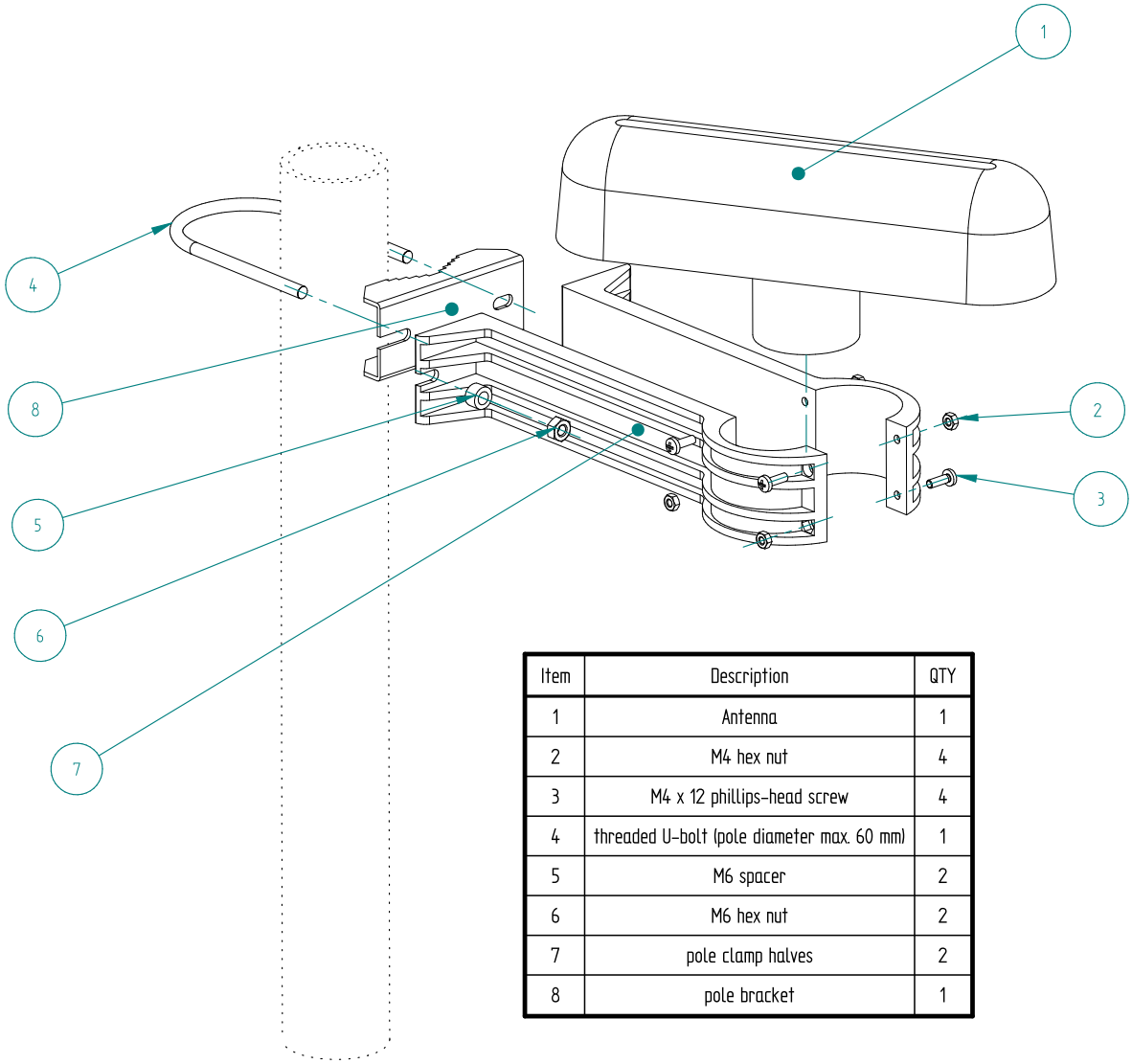
- Ensure that you work safely when installing antennas!
- Never work at height without a suitable and effective fall arrester!

Danger!

Do not work on the antenna installation during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna installation or the antenna cable if there is a risk of lightning strike.
- Do not perform any work on the antenna installation if it is not possible to maintain the prescribed safety distance from exposed power lines or electrical substations.



Item	Description	QTY
1	Antenna	1
2	M4 hex nut	4
3	M4 x 12 phillips-head screw	4
4	threaded U-bolt (pole diameter max. 60 mm)	1
5	M6 spacer	2
6	M6 hex nut	2
7	pole clamp halves	2
8	pole bracket	1

Fig. 3: Mounting a AW02 antenna onto a pole

Mount the long-wave antenna as shown above at a distance of at least 30 cm to other antennas using the mounting kit provided, either onto a vertical pole of no more than 60 mm diameter or directly onto a wall.

The illustration above shows how the antenna is mounted on a pole by way of example. When mounting the antenna directly onto a wall, use the enclosed wall plugs and M6 x 45 screws, which are to be fed directly through the corresponding recesses on the pole clamp halves (Pos. 8).

12.1.2.3 Procedure for Antenna Alignment

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

Step 1: A field strength meter can be used to determine the ideal direction of the installed DCF77 antenna. First, the length of the antenna (using the arrow printed on the antenna) is pointed in the general direction of Frankfurt am Main, in Germany. Finer adjustments are then made to the direction of the antenna until the field strength is in the optimum range of –60 dB to –70 dB.

If no field strength meter is available, Meinberg recommends that two people perform the process of turning the antenna and verifying the reception quality. Person 1 (at the antenna) should remain in communication with Person 2 (at the receiver) to this end.

Step 2: Person 1 rotates the antenna slowly in an **anticlockwise** direction until Person 2 sees that the reception LED on the display is flashing rhythmically once a second.

If the LED does not flash in this way, the antenna should be turned slowly in a **clockwise** direction from the approximate direction until Person 2 sees that the reception LED is flashing rhythmically once a second.

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 should synchronize within three minutes after initialization.

Successful synchronization is signaled by the reception LED to the left of the hour indicator flashing.

12.1.2.4 Surge Protection and Grounding

The greatest risk to an antenna installation and the electronic devices connected to it is exposure to lightning strikes. An indirect lightning strike in the vicinity of the antenna or coaxial cable can induce significant surge voltages in the coaxial cable. This induced surge voltage can then be passed to the antenna and to the building interior, which can damage or even destroy both your antenna and your Meinberg system.

Warning!

Surge protection and lightning protection systems may only be installed by persons with suitable electrical installation expertise.

Surge Protection

VDE 0185-305 (IEC 62305) (relating to buildings with lightning protection systems) and VDE 0855-1 (IEC 60728-11) (addressing bonding strategies and the grounding of antenna installations in buildings with no external lightning protection system) are the lightning protection standards applicable to antenna installations on a building. Antennas must generally be integrated into a building's lightning protection system or bonding infrastructure.

MBG S-PRO Surge Protector

Information:

The surge protector and suitable coaxial cable are not included as standard with a Meinberg GPS Antenna, but can be ordered as an optional accessory.

Construction

The MBG-S-PRO is a surge protector (Phoenix CN-UB-280DC-BB) for coaxial connections. It is patched directly into the antenna line and consists of a replaceable gas discharge tube that redirects the energy from the cable shielding to the ground potential when ignited.

Installation Conditions

To protect the building from possible surge voltages, the MBG-S-PRO is installed at the point of entry of the antenna cable into the building. The MBG-S-PRO must be shielded against water spray and water jets by means of either a suitable enclosure (IP65) or a protected location.

Ideal Installation Conditions:

- Installation at the point where the antenna cable passes through the building wall
- Ground conductor cable from surge protector to bonding bar as short as possible

Installation and Connection

This surge protector has no dedicated input or output polarity and therefore has no preferred installation orientation. It features Type-N female connectors at both ends.

Installation

1.
Fit the surge protector to the supplied mounting bracket as shown in the illustration.

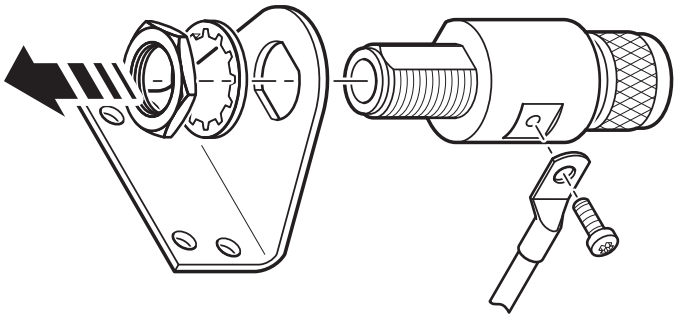


Fig. 7: Installation of the surge protector

2.
Connect the MBG-S-PRO to a bonding bar using a ground conductor cable that is as short as possible. It is also important for the bonding connection of the surge protector to be connected to the same bonding bar as the connected Meinberg system to prevent destructive potential differences.

3.
Connect the coaxial cable from the antenna to one of the surge protector connectors, then connect the other surge protector connector to the coaxial cable leading to the Meinberg reference clock.

Caution!

For safety reasons, the antenna cable must not exceed a certain length if there are no other devices such as a power distributor between the surge protector and the downstream electronic device with integrated surge protection at the mains connector level.

Please refer to the document "**Technical Specifications: MBG-S-PRO Surge Protector**" in the appendix as well as the manufacturer's data sheet for detailed installation instructions and technical specifications for the surge protector.

Data Sheet (Download):
https://www.meinbergglobal.com/download/docs/shortinfo/german/cn-ub-280dc-bb_pc.pdf

12.1.2.5 Optional Antenna Splitter

Up to four Meinberg DCF or PZF receivers can be connected to one antenna using the AV4 antenna splitter. The AV4 is powered via a Type F (CEE 7/4, "Schuko") plug.

The splitter may be installed at any location between the surge protector and the receivers.

12.1.3 Meinberg AI01 Antenna

12.1.3.1 Selecting the Mounting Location

The AI01 antenna is intended for indoor use. To ensure that the DCF77 signal can be reliably received and in order to avoid difficulties with synchronization, select a location that allows for a view towards Mainflingen, Germany (near Frankfurt am Main) that has as few obstructions as possible.

- You should ideally select a room within the building with an unobstructed view towards Mainflingen.
- The line of sight between the antenna and signal source should have as few obstructions as possible. Ideally, it should be placed near a window facing Mainflingen without any nearby buildings.
- The antenna should not be installed under power lines, other electrical lighting, or other power circuits.
- Maintain a distance of at least 30 cm (1 ft) from other antennas.

Information:

Problems may arise if these conditions are not met.

12.1.3.2 Procedure for Antenna Alignment

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

Step 1: A field strength meter can be used to determine the ideal direction of the installed DCF77 antenna. First, the length of the antenna (using the arrow printed on the antenna) is pointed in the general direction of Frankfurt am Main, in Germany. Finer adjustments are then made to the direction of the antenna until the field strength is in the optimum range of –60 dB to –70 dB.

If no field strength meter is available, Meinberg recommends that two people perform the process of turning the antenna and verifying the reception quality. Person 1 (at the antenna) should remain in communication with Person 2 (at the receiver) to this end.

Step 2: Person 1 rotates the antenna slowly in an **anticlockwise** direction until Person 2 sees that the reception LED on the display is flashing rhythmically once a second.

If the LED does not flash in this way, the antenna should be turned slowly in a **clockwise** direction from the approximate direction until Person 2 sees that the reception LED is flashing rhythmically once a second.

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 should synchronize within three minutes after initialization.

Successful synchronization is signaled by the reception LED to the left of the hour indicator flashing.

12.1.4 Antenna Cable

Selecting the Appropriate Cable

Meinberg provides suitable cable types with its antennas and these are ordered together with the antenna to match the length you need from your antenna to your Meinberg reference clock. The route to be covered for your antenna installation should be determined and the appropriate cable type selected accordingly before confirming your order.

The cable is shipped with both ends fitted with the appropriate connectors as standard, although the cable can also be shipped without any pre-fitted connectors if so requested.

Important!

Please avoid using mixed types of coaxial cable in your antenna installation (for example, RG58 and RG174 together in a single installation). This should also be noted when purchasing cable, for example to expand an existing installation.

The table below shows the specifications of the supported cable types for the transmission of the 77 kHz long-wave frequency:

Cable Type	RG58C/U	RG174U
Signal Propagation Time at 77.5 kHz	527.72	557.60
Attenuation at 77.5 kHz (dB/100 m)	0.57	3.35
DC Resistance (Ohm/100 m)	5.3	33.8
Cable Diameter (mm)	5	2.8
Max. Cable Length	300	700

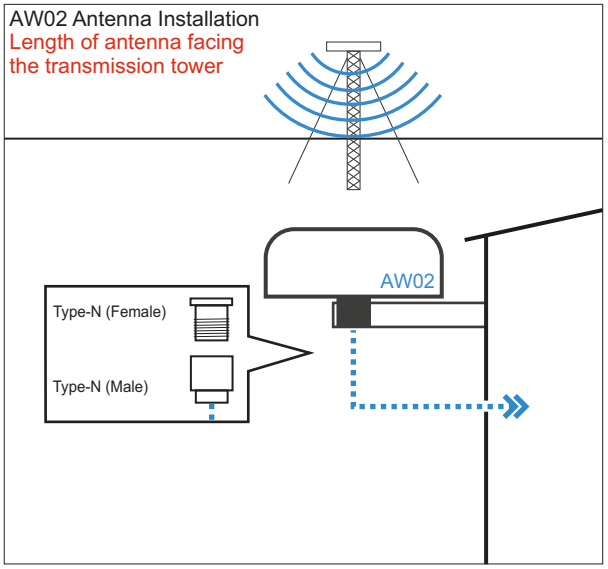
Table 1: Specifications of Cable Types Recommended by Meinberg

** The propagation times are specified on the basis of 100 m cable; these values can be used as a reference to calculate the propagation time of any other arbitrary length of cable.*

Laying the Antenna Cable

When laying the antenna cable, ensure that the specified maximum cable length is not exceeded. This length will depend on the selected cable type and its attenuation factor. If the specified maximum length is exceeded, correct transmission of the synchronization data and thus proper synchronization of the reference clock can no longer be guaranteed.

The antenna cable should then be connected to the Type-N connector of the antenna. Feed the other end of the cable into the building through the wall.



Caution!

When laying the antenna cable, ensure that sufficient distance is maintained from live cables (such as high-voltage power lines), as these can cause severe interference and compromise the quality of the antenna signal significantly. Surges in power lines (caused, for example, by lightning strike) can generate induced voltages in a nearby antenna cable and damage your system.

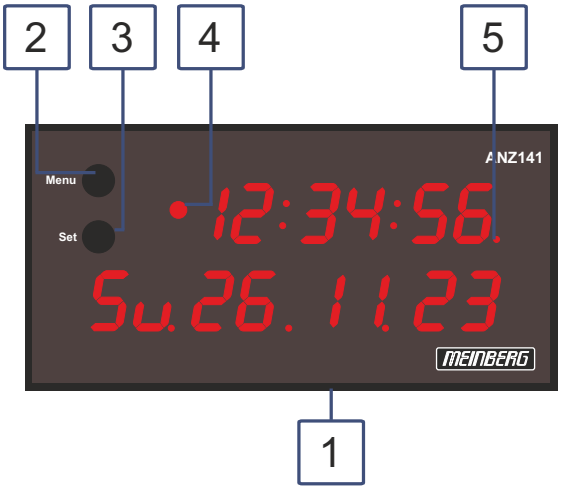
Further Points to Consider when Laying Antenna Cable:

- The minimum bend radius of the cable must be observed.[1]
- Any kinking, crushing, or other damage to the external insulation must be avoided.
- Any damage or contamination of the coaxial connectors must be avoided.

[1] *The bend radius is the radius at which a cable can be bent without sustaining damage (including kinks).*

The next chapter "**Surge Protection and Grounding**" explains how to implement effective surge protection for an antenna installation.

13 ANZ141 Front Panel



Once the power supply to the ANZ141 is switched on, the LED display should appear as shown above:

1. The LED display is a 14-character, two-line display used to not only show the date & time but also allow navigation through the Configuration Menu.
2. The **Menu** button is used:

   - in conjunction with the **Set** button, to access the Configuration Menu from the date & time display,
   - to navigate through the Configuration Menu itself,
   - to return to the full date & time display from the millisecond display.

3. The **Set** button is used:

   - in conjunction with the **Menu** button, to access the Configuration Menu from the date & time display,
   - to cycle through the options for each setting in the Configuration Menu,
   - to access the millisecond display (additionally showing the time with milliseconds) from the date & time display,

4. The modulation LED indicator is present on the ANZ141/DCF model only and indicates that data from the DCF77 long-wave signal is being successfully received and decoded.
5. The **error indicator** after the second digits on the display appears as a period symbol, indicating that there is an unresolved error in the system.

14 Configuring the ANZ141

14.1 Configuration Directly via the ANZ141 Front Panel

Most configuration operations for the ANZ141 can be performed directly from the unit itself. The front panel of the ANZ141 features two push buttons: **Menu** and **Set**. Pressing both buttons simultaneously will open the configuration menu, as shown in the illustration above.

The **Enter** button is used to navigate to the next configuration menu item, while the **Set** button cycles through to the next option for that menu item or opens the corresponding submenu.

14.1.1 Enter [En.]

The **Enter** ("**En**") item is the first item viewed when opening the configuration menu.

The **Menu** button can be used to exit the configuration menu without making any changes here.

The **Set** button is pressed to navigate to the next item in the configuration menu.

14.1.2 Brightness [Br.]

The **Brightness** "**Br**" item is used to set the brightness of the display to one of ten levels (*0*–*9*), whereby *0* is the lowest (dimmest) setting and *9* is the highest (brightest) setting.

The **Set** button is used to cycle to the next brightness level and back to *0* from *9*. The brightness of the display is adjusted dynamically to provide an indication of the brightness.

The **Menu** button is used to navigate to the next item in the configuration menu. The brightness level set here is retained while the configuration menu is active; if the configuration is not saved, the former brightness level will be restored when the configuration menu is exited.

14.1.3 Time Zone [TZ]

The **Time Zone** "**TZ**" item is used to set the time zone of the display in relation to the time received from the DCF77 long-wave service, from an NTP server, from a PTP master, or when the clock is operating in free-run mode (without synchronization).

The **Set** button is used to cycle through the available options: *UTC*, *CET* (Central European Time, UTC+1), *EET* (Eastern European Time, UTC+2), or *LOC* (local time).

Please note that this option has no effect on time received from a time string source, which is expected to deliver the appropriate local time.

Information:

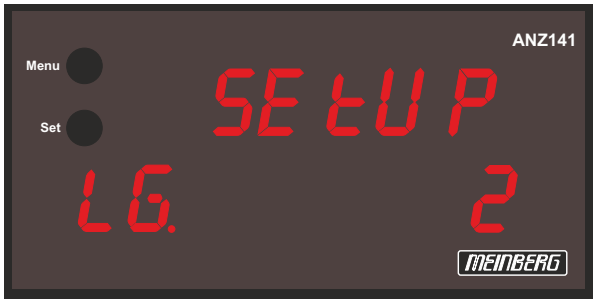
If you wish to configure a time zone other than those listed above, the ANZ141 must be configured using Meinberg Device Manager.

Refer to Chapter 14.2.3.8, "**Config - Time Zone**" for more information.

Daylight Saving Time adjustments are accounted for automatically—selecting CET during summertime, for example, will automatically apply CEST.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.4 Language [Lg.]



The **Language** "**LG**" item is used to set the language of the abbreviated day of the week displayed on the left of the unit. The **Set** button is used to cycle through the available options:

1. English
2. German
3. French
4. Spanish
5. Finnish
6. Slovenian
7. Russian

Please note that this does not affect the display of any other information; all other text, including the configuration menu, is displayed in English only.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.5 Baud Rate COM0 [Bd. 0]

The **Baud Rate COM0** ("**Bd.0**") item is used to set the baud rate for serial communication on the serial port **COM0**.

The **Set** button is used to cycle through the available options: *240* (2400 Baud), *480* (4800 Baud), *960* (9600 Baud), *1920* (19200 Baud), *3840* (38400 Baud), *5760* (57600 Baud), *11520* (115200 Baud).

COM0 is used to receive time string data from a reference source via RS-232 or RS-422, as the management communication interface for Meinberg Device Manager, and to output time string data to an external receiver via RS-232.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.6 Framing COM0 [Fr.0]

The **Framing COM0** ("**Fr.0**") item is used to set the framing for serial communication on the serial port **COM0**.

The **Set** button is used to cycle through the available options: *7N2*, *7E1*, *7E2*, *8N1*, *8N2*, *8E1*.

COM0 is used to receive time string data from a reference source via RS-232 or RS-422, as the management communication interface for Meinberg Device Manager, and to output time string data to an external receiver via RS-232.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.7 Serial Output Transmission Frequency COM0 [SM.0]

The **Serial Output Transmission Frequency COM0** ("**SM.0**") item is used to set the frequency at which time strings are output via the serial port **COM0**.

The **Set** button is used to cycle through the available options: *SEC* (once per second), *60 S* (once per minute), *ON R* (on request).

Setting *on request* means that the ANZ141 will only output a time string when it receives a ? (ASCII code 0x3Fh) on the TxD pin(s) from the prospective receiver.

This option only affects **COM0**, and so only relates to RS-232 time string output.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.8 Time String Out COM0 [TS.0]

The **Time String Out COM0** ("**TS.0**") item is used to set the format of the time strings output via the serial port **COM0**.

The Set button is used to cycle through the available options:

1. Meinberg Standard
2. Uni Erlangen[1]
3. ATIS
4. SYSPLEX 1[2]
5. SAT
6. SPA
7. Computime
8. NMEA 0183 RMC GGA[1] *(NMEA 0183 RMC followed by NMEA 0183 GGA)*
9. NMEA 0183 RMC[1]
10. RACAL
11. Meinberg GPS
12. NMEA 0183 GGA[1]
13. NMEA 0183 ZDA
14. ION Blanked
15. IRIG-J
16. 6021
17. Freelance

This option relates to both RS-232 and RS-422 time string output.

The **Menu** button is used to navigate to the next item in the configuration menu.

1 These string formats normally contain GPS location data, but longitude, latitude, and altitude values are all output as zero by the ANZ141.

2 A C (ASCII code 0x43h) must be sent by the receiver once to initiate string transmission. Not supported in RS-422 mode.

14.1.9 Baud Rate COM1 [Bd.1]

The **Baud Rate COM1** ("**Bd. 1**") item is used to set the baud rate for serial communication on the serial port **COM1**.

The **Set** button is used to cycle through the available options: *240* (2400 Baud), *480* (4800 Baud), *960* (9600 Baud), *1920* (19200 Baud), *3840* (38400 Baud), *5760* (57600 Baud), *11520* (115200 Baud).

COM1 is used to receive time string data from a reference source via RS-232 and to output time string data to an external receiver via RS-232 or RS-422.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.10 Framing COM1 [Fr.1]

The **Framing COM1** ("**Fr.1**") item is used to set the framing for serial communication on the serial port **COM1**.

The **Set** button is used to cycle through the available options: *7N2*, *7E1*, *7E2*, *8N1*, *8N2*, *8E1*.

COM1 is used to receive time string data from a reference source via RS-232 and to output time string data to an external receiver via RS-232 or RS-422.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.11 Serial Output Transmission Frequency COM1 [SM. 1]

The **Serial Output Transmission Frequency COM1** ("**SM. 1**") item is used to set the frequency at which time strings are output via the serial port **COM1**.

The **Set** button is used to cycle through the available options: *SEC* (once per second), *60 S* (once per minute), *ON R* (on request).

Setting *on request* means that the ANZ141 will only output a time string when it receives a ? (ASCII code 0x3Fh) on the TxD pin from the prospective receiver over RS-232.

This option relates to both RS-232 and RS-422 time string output; please note, however, that transmission *on request* will not work with RS-422 signaling, as the port **COM1** has no RxD pin pair to accept the ? transmission.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.12 Time String Out COM1 [TS.1]

The **Time String Out COM1** ("**TS.1**") item is used to set the format of the time strings output via the serial port **COM1**.

The **Set** button is used to cycle through the available options:

1. Meinberg Standard
2. Uni Erlangen[1]
3. ATIS
4. SYSPLEX 1[2]
5. SAT
6. SPA
7. Computime
8. NMEA 0183 RMC GGA[1] *(NMEA 0183 RMC followed by NMEA 0183 GGA)*
9. NMEA 0183 RMC[1]
10. RACAL
11. Meinberg GPS
12. NMEA 0183 GGA[1]
13. NMEA 0183 ZDA
14. ION Blanked
15. IRIG-J
16. 6021
17. Freelance

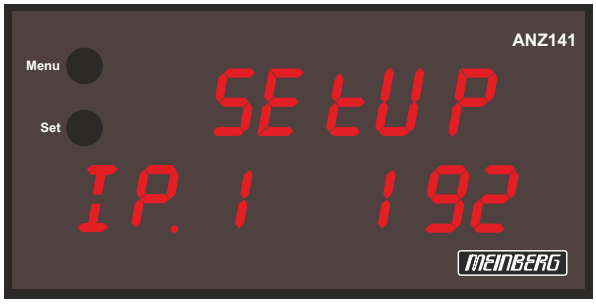
This option only affects **COM1**, and so only relates to RS-232 time string output.

The **Menu** button is used to navigate to the next item in the configuration menu.

1 These string formats normally contain GPS location data, but longitude, latitude, and altitude values are all output as zero by the ANZ141.

2 A C (ASCII code 0x43h) must be sent by the receiver once to initiate string transmission.

14.1.13 IP Address [IP] (ANZ141/NET Only)



The **IP Address** ("**IP**") item is used to display the current IPv4 address of the network interface integrated into the ANZ141.

The **Set** button is used to cycle through each of the octets of the address.

Important!

Please note that it is not possible to modify the IP address or network configuration from the front panel of the ANZ141/NET; this can only be done using the Meinberg Device Manager tool. This front-panel option is solely provided to allow the IP address to be read (for example, to identify which address has been assigned by the DHCP server).

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.14 Sync Input [In]

The **Sync Input** ("**In**") item is used to set the reference source used to synchronize the ANZ141.

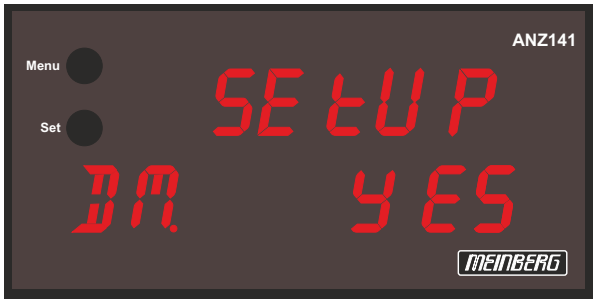
The **Set** button is used to cycle through the available options: *DCF* (DCF77 signal, ANZ141/DCF only), *232* (RS-232 serial), *422* (RS-422 serial), *LAN* (NTP server/PTP master, ANZ141/NET only), *NON* (none; clock operates entirely in free-run mode).

Important!

A connection with Meinberg Device Manager is required to configure an ANZ141/NET's NTP client or PTP slave functionality.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.15 Debug Mode [DM] (ANZ14/NET Only)



The **Set** button is used to alternate between *YES* and *NO*.

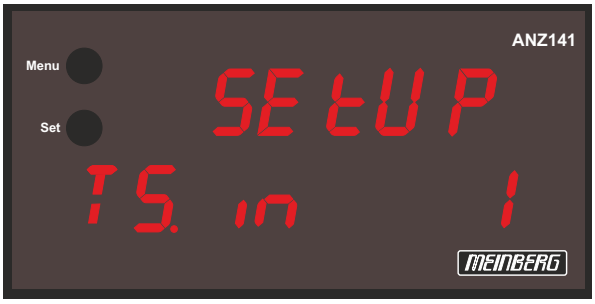
The **Menu** button is used to navigate to the next item in the configuration menu.

If Debug Mode is enabled (*YES*), error messages are displayed on the second line of the ANZ14/NET display instead of the date:

FREE: Clock is in free-run mode (no synchronization)
Error 00: Internal error
Error 01: No response from NTP server
Error 02: NTP not synchronized
Error 03: NTP server stratum is greater than stratum of ANZ141

Errors are also indicated by a period after the second counter on the first line of the display, regardless of whether Debug Mode is enabled or not (see illustration above).

14.1.16 Time String Input [TS.In]



The **Time String Input** ("**TS.In**") item is used to set the format of the time strings input via the serial ports **COM0** (RS-232 only) and **COM1** (RS-232 and RS-422).

The **Set** button is used to cycle through the available options:

1. Meinberg Standard
2. Uni Erlangen[1]
3. ATIS
5. SAT
8. Computime

This option relates to both RS-232 and RS-422 time string input.

The **Menu** button is used to navigate to the next item in the configuration menu.

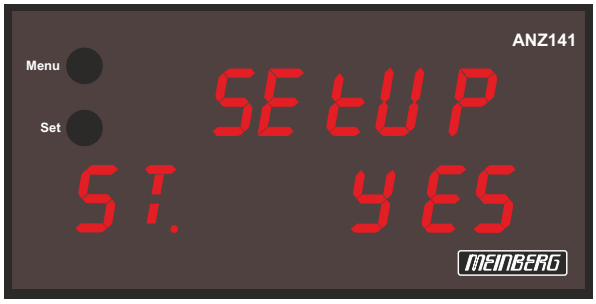
14.1.17 Serial Number [SN]

The **Serial Number** ("**SN**") item is used to display the 16-digit serial number of your ANZ141.

The serial number is displayed in blocks of four digits **SN. 1**, **SN. 2**, **SN. 3**, and **SN. 4**, and the **Set** button is used to cycle through the four blocks.

The **Menu** button is used to navigate to the next item in the configuration menu.

14.1.18 Set Time [ST.]



The **Set Time** ("**ST.**") item is used to manually set the date and time of the ANZ141.

Please note that any changes made here will be overwritten almost immediately if the ANZ141 is receiving time from another reference source. It is therefore generally only useful if you wish to operate the ANZ141 as a non-synchronized ("free running") clock, or for verifying if the clock is synchronizing to the reference source by setting the time & date to an implausible value and observing if the clock automatically synchronizes back to the correct time.

The **Set** button is used to alternative between the options *YES* and *NO*.

If *NO* is selected, pressing the **Menu** button here will navigate to the next item in the configuration menu.

If *YES* is selected, pressing the **Menu** button here will display the current time & date of the clock; the first digit of the hour will be flashing.

To adjust each digit of the time & date, the **Set** button should be **held down** until the correct value is reached and then **released**.

To select the next digit, the **Set** button should be **pressed and released immediately** (i.e., for less than a second).

Once the time & date have been set, press the **Menu** button; this will navigate to the next item in the configuration menu. Please note that the time & date set here will only be applied once the item **Save** ("**Sv.**") is set to *YES*.

14.1.19 Factory Defaults [FD.]

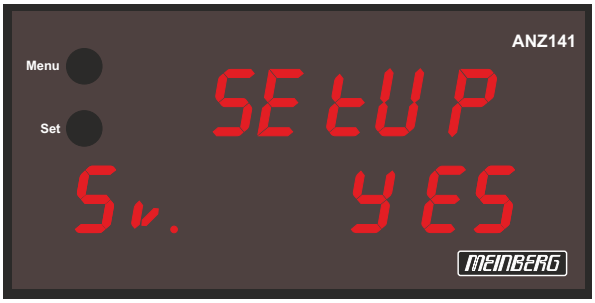
The **Factory Defaults** ("**FD.**") item is used to reset the ANZ141 to its factory default settings. Please note that this only relates to the settings in this Configuration Menu and does not affect the current time & date of the ANZ141 clock.

The **Set** button is used to alternate between *YES* and *NO*.

The **Menu** button is used to navigate to the next item in the configuration menu.

If *YES* is selected, the ANZ141 will only be reset to its factory default settings once the item **Save** ("**Sv.**") is set to *YES*.

14.1.20 Save [Sv.]



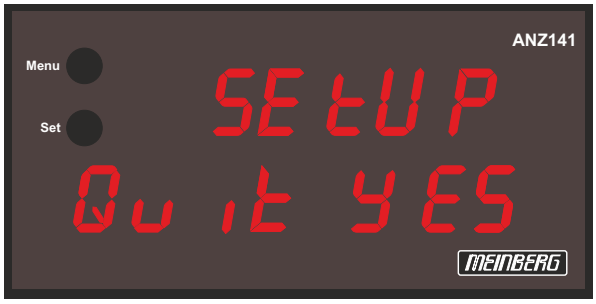
The **Save** ("**Sv.**") item is used to save any changes made in the Configuration Menu in the EEPROM of the ANZ141 (unless *YES* has been selected for the **Factory Defaults** ("**FD.**") item, in which case all configuration options will be reset to their factory default settings, regardless of any other changes applied).

The **Set** button is used to alternate between *YES* and *NO*.

If *YES* is selected, the **Menu** button closes the Configuration Menu, saves the changes (or restores the factory default settings), and returns to the time & date display.

If *NO* is selected, the **Menu** button will navigate to the next item in the configuration menu.

14.1.21 Quit



The **Quit** item is used to quit the configuration menu and reject any changes made in the Configuration Menu.

The **Set** button is used to alternate between *YES* and *NO* and must be pressed at least once to display the options. The **Menu** button will have no function until one of the options is selected.

If *YES* is selected, the **Menu** button closes the Configuration Menu, rejects the changes, and returns to the time & date display.

If *NO* is selected, the **Menu** button will navigate back to the first item in the configuration menu with all changes made so far still pending.

14.2 Configuration of the ANZ141 using Meinberg Device Manager

14.2.1 Introduction to Meinberg Device Manager

The software **Meinberg Device Manager** can be used to configure the ANZ141 and monitor its status. While most configuration processes can be performed directly from the front panel of the ANZ141, Meinberg Device Manager allows these processes to be performed more conveniently and enables multiple Meinberg devices to be managed remotely from a single workstation. There are also a number of processes that can only be performed via Meinberg Device Manager, specifically:

- Configuration of NTP servers as a reference source
- Configuration of PTP masters as a reference source
- Updating the firmware of the ANZ141

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 a variety of Linux distributions.

Version 7.3 or higher of Meinberg Device Manager is required for the ANZ141 to be correctly detected, configured, and monitored.

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 ANZ141 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

14.2.2 Establishing a Connection with Meinberg Device Manager

There are three ways that a connection with Meinberg Device Manager can be established:

- The ANZ141/NET can establish a connection to Meinberg Device Manager over an IP network connection. If the IP network has a DHCP server, it will by default acquire an IP address, configure itself automatically, and establish the connection. Refer to Chapter 14.2.2.1, "**Network Connection (ANZ141/NET Only)**" for more information.
- All ANZ141 models can also establish a connection over a serial interface, for which a suitable RS-232 cable is required. Please note that RS-422 communication is not supported for management. Refer to Chapter 14.2.2.2, "**Serial Connection**" for more information.
- A connection to Meinberg Device Manager can also be established over a direct Ethernet connection using the Network Configuration Wizard. This is generally only advised for direct connections with the PC and is generally not suitable for connections established through routers or switches. Refer to Chapter 14.2.2.3, "**Network Configuration Wizard**" for more information.

Your choice of connection method will depend on your access to the device in its installed state, the availability of suitable cables, and your network's IP addressing configuration:

Method	Direct Access to Device Required	Separate RJ45 Cable Required	RS-232 Cable Required	DHCP Server Required
IP Network Connection	No	No	No	Yes
Serial Connection	Yes	No	Yes	No
Network Connection Wizard	Yes	Yes	No	No

14.2.2.1 Network Connection (ANZ141/NET Only)

Important!

Configuration over a network is only possible with an ANZ141/NET.

Please note that a DHCP server is required to establish an initial connection over an IP network. If your network has no DHCP server, you should first use a direct serial connection (see Chapter 14.2.2.2, "**Serial Connection**" to set up your ANZ141/NET network configuration beforehand.

1. If not already done, open Meinberg Device Manager (v7.3 or better).
2. Click on the "**Add Device**" icon at the top left to open the "**Add Device**" window.
3. Select "*Other...*" as the device type. The window will adapt accordingly.
4. Select the following options:

   Connection Type: Network
   Authentication: Password only
   IP Address: *(The IP address as provided by DHCP and displayed via the front panel or set via serial connection)*
   Password: `mbg` (*default password*)

   You may set a custom alias and group if you wish to organize multiple Meinberg devices in your Meinberg Device Manager installation.
5. Click on OK at the bottom of the window. A connection should be established automatically with the ANZ141.

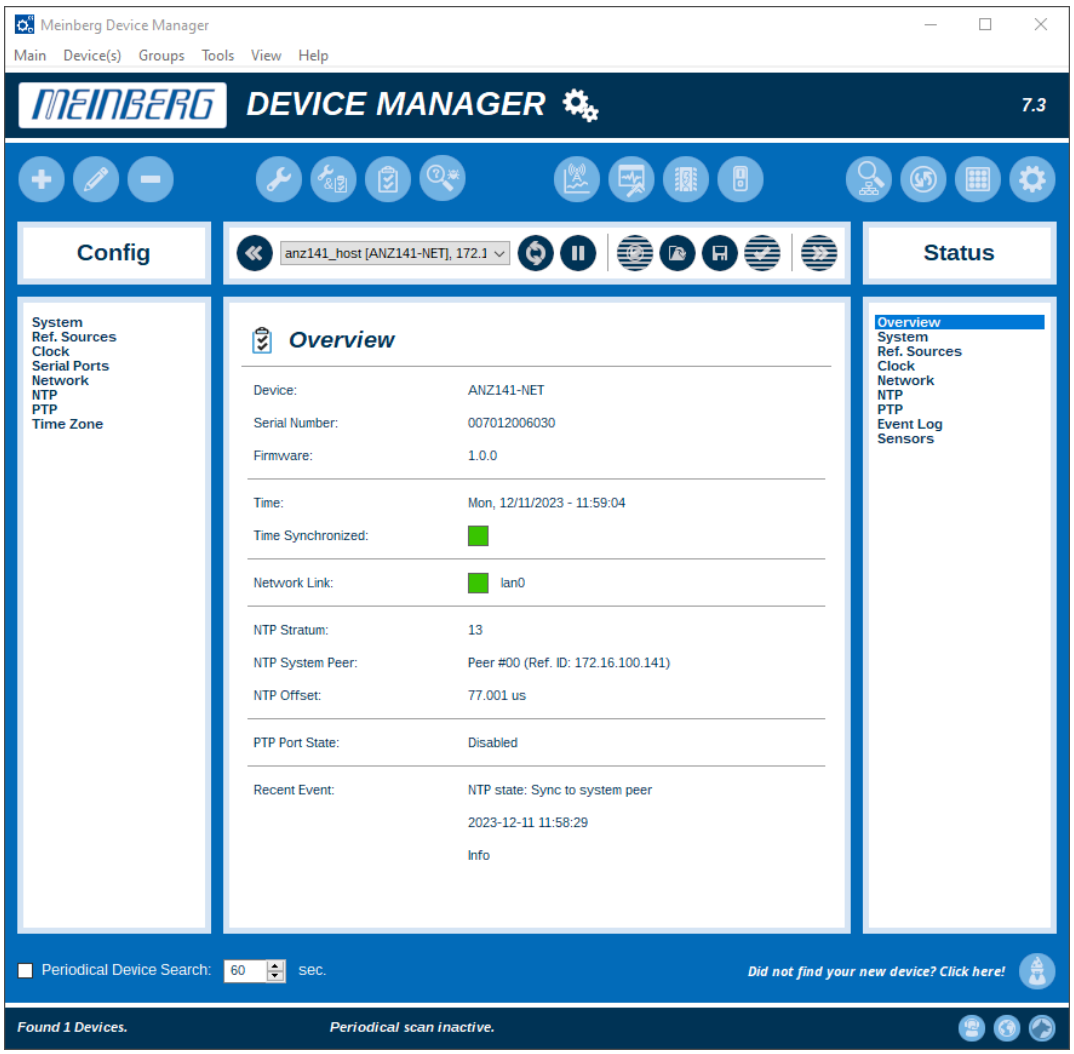


Illustration: The Meinberg Device Manager Dashboard

Once you have a connection established to your ANZ141 in Meinberg Device Manager via a network connection, you will see the Dashboard as shown in the screenshot above.

This guide simply explains the ANZ141-specific configuration and monitoring options and does not go into explain the use of Meinberg Device Manager in detail. For more information on Meinberg Device Manager, please refer to the Meinberg Device Manager user manual.

14.2.2.2 Serial Connection

A serial connection between a PC running Meinberg Device Manager and the ANZ141 itself requires a suitable RS-232 serial cable with a DSUB9 connector at one end. This may be a DSUB-9-to-DSUB-9 null-modem cable (connected either directly to a corresponding DSUB or RJ45 serial interface on the PC or via a standard USB-to-serial adapter) or a DSUB-9-to-USB Type-A RS-232 cable (with integrated USB-to-serial adapter).

1. Connect the DSUB-9 connector of the serial cable to the port **COM0** of the ANZ141.
2. Connect the other end of the serial cable to a suitable serial interface (e.g. RS-232, USB) on your PC.
3. Identify which COM interface is associated with your serial cable. If using a serial-to-USB cable or adapter, you may need to use the Windows Device Manager or review the output of *dmesg* under Linux to identify the port.
4. If not already done, install and open Meinberg Device Manager (v7.3 or better). If you are installing Meinberg Device Manager for the first time, the Setup Wizard will guide you through the process of setting up the software and detecting your ANZ141. In this case, you can skip the steps below.
5. If your ANZ141 is not automatically detected by Meinberg Device Manager, click on the "**Add Device**" icon at the top left to open the "**Add Device**" window.
6. Select "*Other...*" as the device type. The window will adapt accordingly.
7. Select the following options:

   Connection Type: Serial
   Serial Port: *(The serial port identified above)*
   Baudrate: *(The baud rate set for* **COM0***; default is 115200)*
   Framing: *(The framing set for* **COM0***; default is 8N1)*

   You may set a custom alias and group if you wish to organize multiple Meinberg devices in your Meinberg Device Manager installation.
8. Click on OK at the bottom of the window. A connection should be established automatically with the ANZ141.

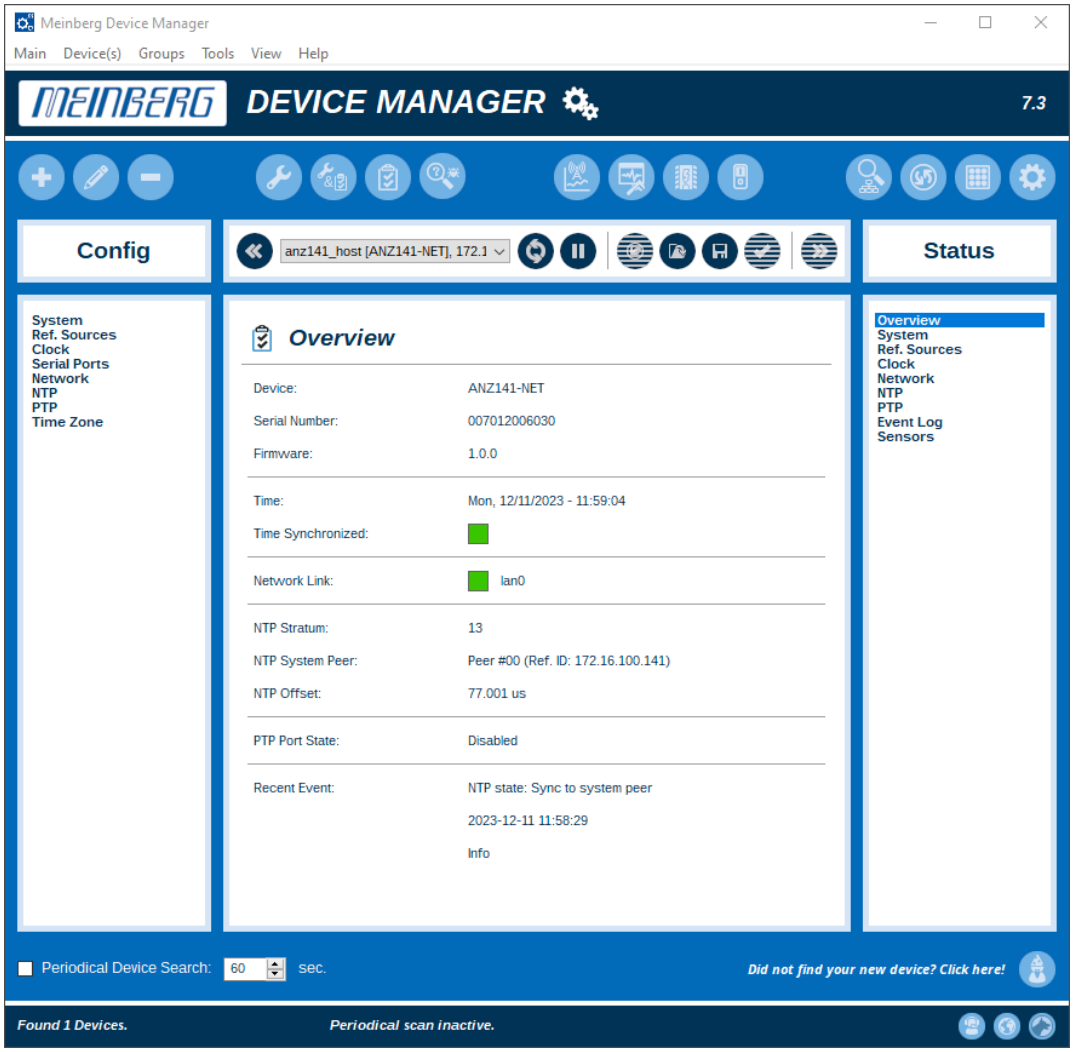


Illustration: The Meinberg Device Manager Dashboard

Once you have a connection established to your ANZ141 in Meinberg Device Manager via a serial connection, you will see the Dashboard as shown in the screenshot above.

This guide only explains the ANZ141-specific configuration and monitoring options and does not go into the use of Meinberg Device Manager in detail. For more information on Meinberg Device Manager, please refer to the Meinberg Device Manager user manual.

14.2.2.3 Network Configuration Wizard

In addition to a serial connection, the ANZ141/NET also allows you to establish a direct Ethernet connection between a PC running Meinberg Device Manager and the ANZ141/NET itself using a standard Ethernet cable.

Important!

The Network Configuration Wizard relies on MAC-addressed UDP broadcast messages that are often blocked by enterprise-grade routers and switches in order to prevent broadcast storms. Therefore, it is **strongly** recommended that the Network Configuration Wizard be run using a direct Ethernet cable connection between the PC running Meinberg Device Manager and the ANZ141.

Illustration: MAC address printed above the network port

1. Connect the network cable to the network port of the ANZ141/NET. Make a note of the MAC address printed above the network port (see illustration above) while doing this.
2. Connect the other end of the network cable to a network interface on your PC.
3. If not already done, install and open Meinberg Device Manager (v7.3 or better).

Illustration: Network Configuration Wizard button in Meinberg Device Manager

4. Click on the button to open the Network Configuration Wizard as shown above.
5. You will be prompted to enter the MAC address of your device, as printed above the network port on your ANZ141/NET. Click on the **Next** button to continue.
6. You will be prompted to enter an optional hostname for your device. Leaving this field blank will force Meinberg Device Manager to use the default hostname provided by the device. Click on the **Next** button to continue.

7. You must now specify if you wish to acquire IP address information via DHCP or set a static IP address. Once you have selected the appropriate option, click on the **Next** button.
8. If you have opted for a static IP address, you will be prompted to specify the desired IP address, the subnet mask, the default gateway, and one or two DNS servers.
9. You will now be prompted to confirm your configuration. If you have selected DHCP, no address will be displayed at this time. Click on the **Next** button to continue.
10. Finally, you will be prompted to press the **ACO Button** (see Chapter 9.7, for which you will require a pointed implement. Once you have pressed the ACO Button, click on **Apply** to complete the configuration process.

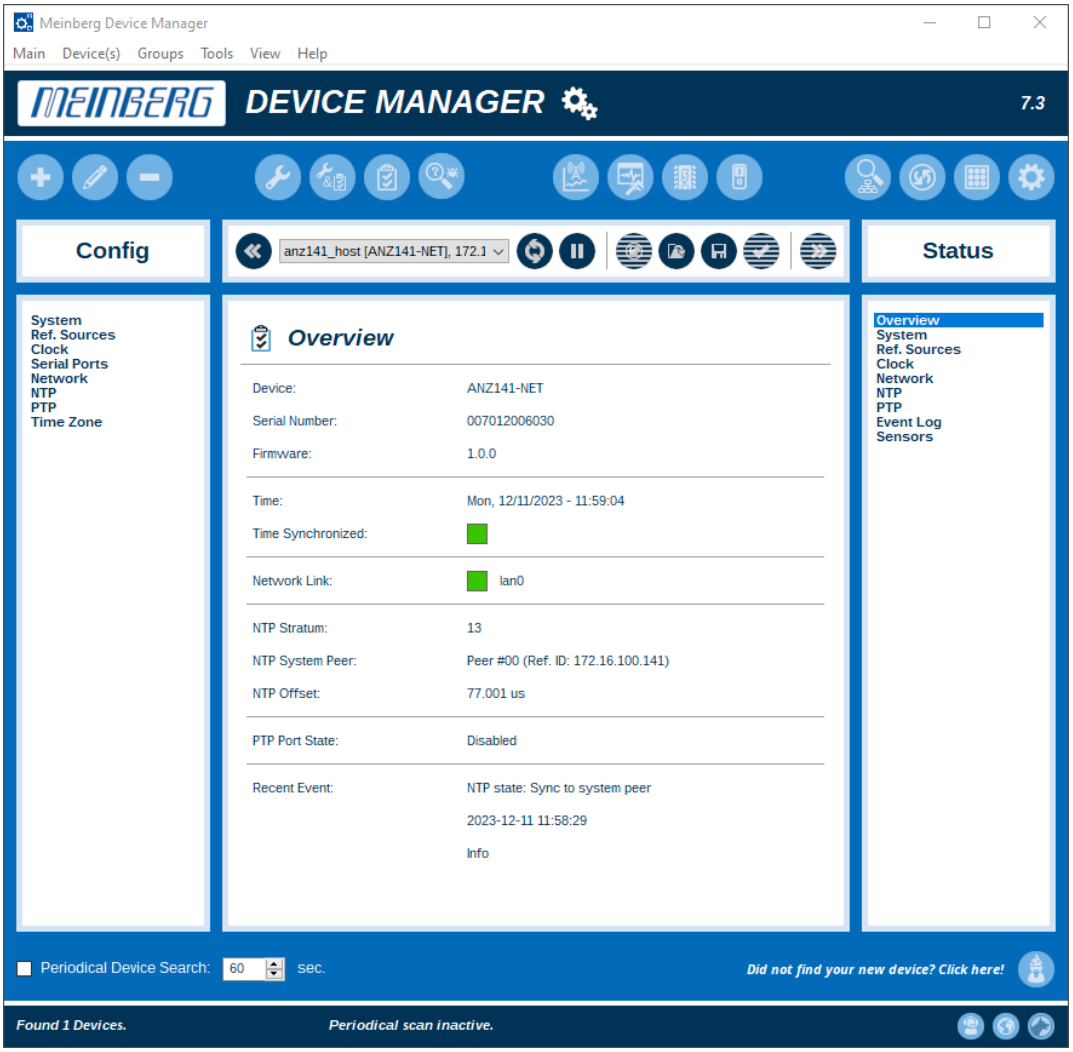


Illustration: The Meinberg Device Manager Dashboard

Once you have a connection established to your ANZ141 in Meinberg Device Manager via a serial connection, you will see the Dashboard as shown in the screenshot above.

This guide only explains the ANZ141-specific configuration and monitoring options and does not go into the use of Meinberg Device Manager in detail. For more information on Meinberg Device Manager, please refer to the Meinberg Device Manager user manual.

14.2.3 Configuration Options in Meinberg Device Manager

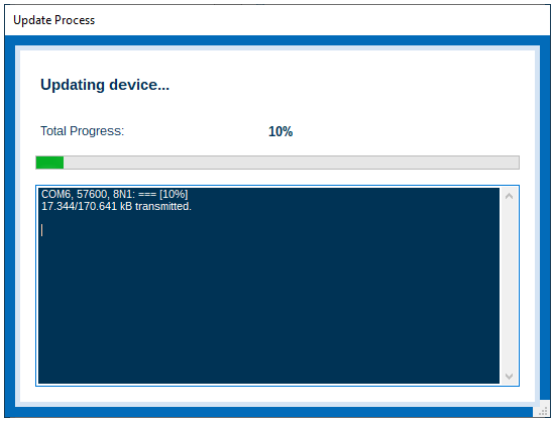
14.2.3.1 Configuration - System

The **System** page under the **Config** column on the left of the Meinberg Device Manager Dashboard provides the ability to update the firmware of your ANZ141. It also allows you to create a 'snapshot' file, containing a variety of information about your device, which can help the Meinberg Technical Support team to diagnose any issues you may have.

Update Device Firmware

Selecting this will bring up a file selection prompt in which you should select the firmware update file (`.ufu` file) provided by Meinberg.

Once the file is selected, the firmware update process will begin immediately.



Important!

Users of a ANZ141/NET with network capability are strongly advised to update over a network connection for a more stable update experience.

Do not disconnect your ANZ141 from the serial interface or network and do not remove the power cable from your ANZ141 at any time during the installation process, as doing so may render your ANZ141 inoperable.

Create Snapshot

Selecting this will bring up a location selection prompt in which you should select where to save the snapshot file. This snapshot file contains information that is useful for diagnosis, optimization, and troubleshooting and should be sent to Meinberg's Technical Support team when you contact them for support.

14.2.3.2 Configuration - Reference Sources

The **Ref. Sources** page under the **Config** column on the left of the Meinberg Device Manager Dashboard allows you to set which reference source should be used to synchronize your ANZ141.

None	The ANZ141 is operated without any synchronization (i.e., the clock operates in free-run mode).
NTP	The ANZ141 is synchronized to an external NTP server. Further configuration is required on the **NTP** configuration page. Refer to Chapter 14.2.3.6, "**Config - NTP**" for more information (ANZ141/NET Only).
PTP	The ANZ141 is synchronized to an external PTP master. Refer to Chapter 14.2.3.7, "**Config - PTP**" for more information (ANZ141/NET Only).
String (only)	The ANZ141 is synchronized to an external time telegram. Further settings are required via the configuration of the **Serial Port**. Refer to Chapter 14.2.3.4, "**Config - Serial Ports**" for more information.

Ensure that you click on the **Apply Configuration** button to apply the new reference source.

14.2.3.3 Config - Clock

The **Clock** page under the **Config** column on the left of the Meinberg Device Manager Dashboard allows you to manually set the time of your ANZ141 or synchronize your ANZ141 once to your PC's system time.

Synchronizing your ANZ141 to Your PC's System Time

Click on the "**Initialize Time**" checkbox to enable it, then enable the checkbox **Use PC's System Time**.

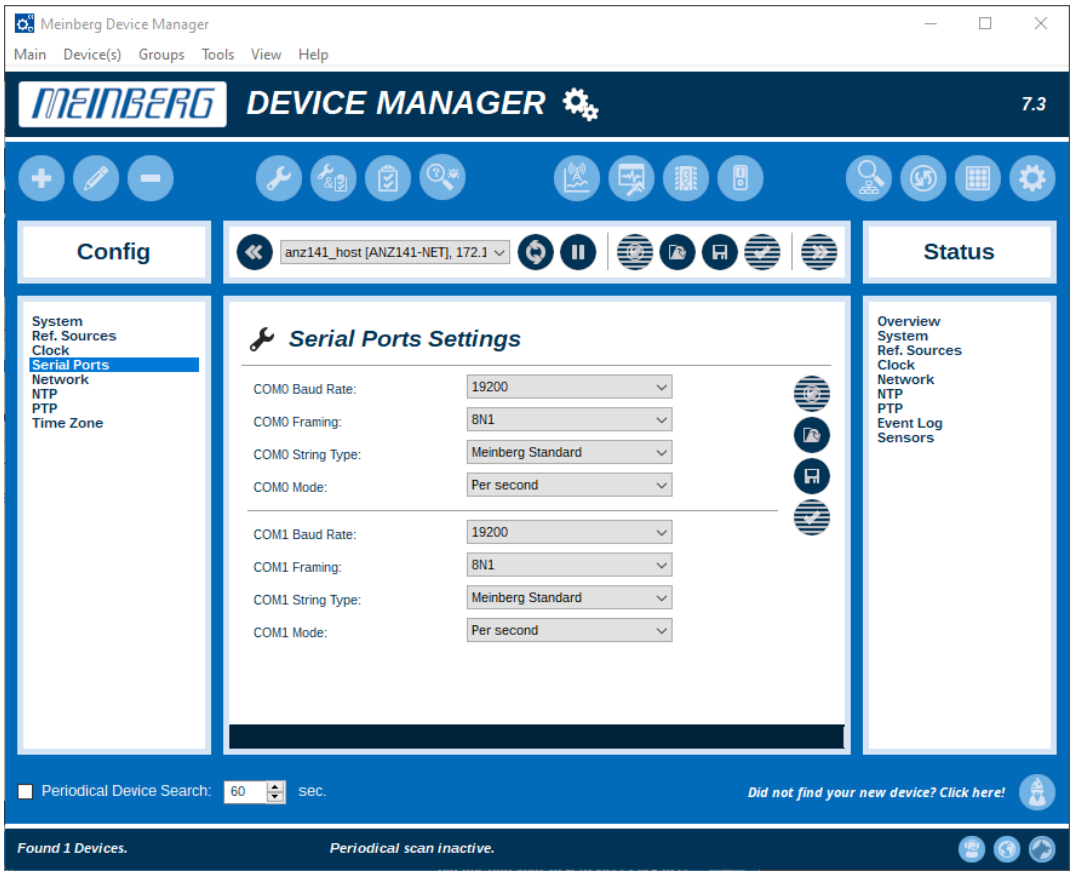
Click on the **Apply Configuration** button to apply the new time.

Manually Setting the Time of Your ANZ141

Click on the "**Initialize Time**" checkbox to enable it, then enter the desired time and date in the **Date** and **Time** fields.

Click on the **Apply Configuration** button to apply the new time.

14.2.3.4 Config - Serial Ports



The **Serial Ports** page under the **Config** column on the left of the Meinberg Device Manager Dashboard is used to set the communication parameters for serial communication with the ANZ141; this affects both time string input and output in both RS-232 and RS-422 mode as well as communication with Meinberg Device Manager.

Ensure that you click on the **Apply Configuration** button to apply the new serial port configuration.

COM0

The **COM0** port can be used for time string output in both RS-232 and RS-422 mode.

COM0 Baud Rate: The baud rate for serial communication on the **COM0** interface. Refer to Chapter 9.5, "COM0 Time String I/O (RS-232/RS-422)" for more information on the baud rate options.

COM0 Framing: The framing for serial communication on the **COM0** interface. Refer to Chapter 9.5, "COM0 Time String I/O (RS-232/RS-422)" for more information on the framing options.

COM0 String Type: The string format to be output via the **COM0** interface. Please note that Sysplex 1 output is not possible in RS-422 mode as the port lacks RxD pins to receive the trigger signal needed to initiate transmission. Refer to Chapter 16.5, "Serial Time Strings" for more information on time string formats.

COM0 Mode: The transmission mode for the **COM0** interface: *per second*, *per minute* or *on request only (?)*. Transmission on request only requires a ? (ASCII code 0x3Fh) to be sent to the RxD pin of the **COM0** port of the ANZ141 to trigger transmission of a single time string. Please note that transmission *on request only* is not possible in RS-422 mode as the port lacks RS-422 RxD pins to receive the request code.

COM1

The **COM1** port can be used for time string output in RS-232 mode only. Please note that while the **COM1** port is used to receive external time strings for synchronization, these settings have no bearing on incoming time strings.

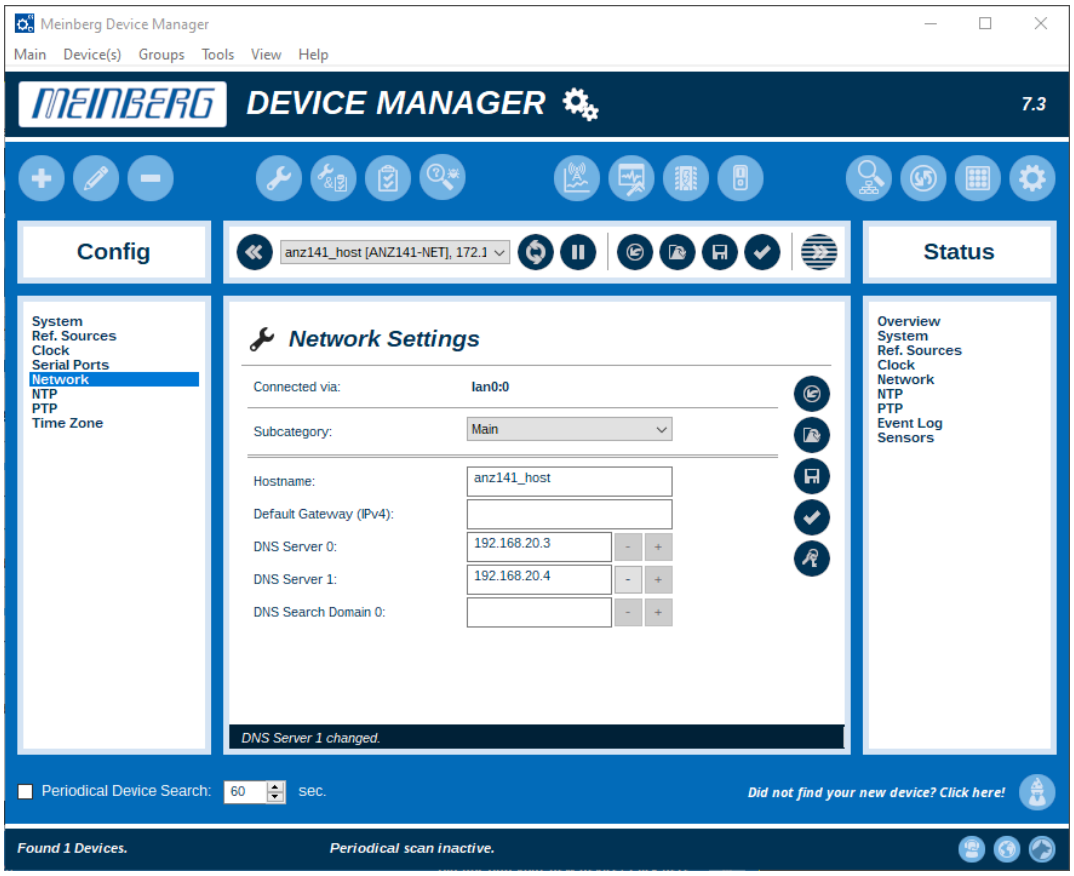
COM1 Baud Rate: The baud rate for serial communication on the **COM1** interface. Refer to Chapter 9.6, "**COM1 Time String I/O (RS-232/RS-422)**" for more information on the baud rate options.

COM1 Framing: The framing for serial communication on the **COM1** interface. Refer to Chapter 9.6, "**COM1 Time String I/O (RS-232/RS-422)**" for more information on the framing options.

COM1 String Type: The string format to be output via the **COM1** interface. Refer to Chapter 16.5, "**Serial Time Strings**" for more information on time string formats.

COM1 Mode: The transmission mode for the **COM1** interface: *per second*, *per minute* or *on request only (?)*. Transmission on request only requires a ? (ASCII code 0x3Fh) to be sent to the RxD pin of the **COM1** port of the ANZ141 to trigger transmission of a single time string.

14.2.3.5 Config - Network



The **Network** page under the **Config** column on the left of the Meinberg Device Manager Dashboard is used to configure the network interface of the ANZ141. The network interface is used to synchronize the ANZ141 to an external NTP server or PTP master, and also for configuration over an IP network.

The **Network** section is divided into two subcategory pages: **Main** and **Interfaces**.

Ensure that you click on the **Apply Configuration** button to apply the new network configuration. The device will be restarted when this is done.

Important!

If the ANZ141 is being configured over an IP network connection, the existing device profile in Meinberg Device Manager may no longer work after a network configuration change and may therefore need to be edited to account for the new network configuration.

If the new network configuration is defective, the ANZ141 will be unable to access your network and the only way to correct the network connection will be via a serial connection.

Main

Hostname: The hostname used to address your ANZ141 in the IP network.

Default Gateway (IPv4): The default gateway for all traffic not addressed to a device within the local subnet. Please note that the ANZ141 does not support IPv6 addressing; this gateway must be an IPv4 address.

DNS Server 0/1: The IPv4 address of a DNS server used for domain name resolution. The + button can be clicked to specify a second DNS server if necessary.

DNS Search Domain 0: A search domain for DNS requests. Only one is possible.

Interfaces

Physical Interface: The physical interface of the ANZ141. As the device has only one network interface, this is set at *lan0*.

Virtual Interface: The virtual interface assigned to the physical interface *lan0*. The ANZ141 only supports one virtual interface, and thus is this set at *lan0:0*.

Label: The label for this virtual interface. This is set at *lan0:0* and cannot be changed for the ANZ141.

DHCP: If you wish to have a DHCP server in your network assign an IPv4 address to your ANZ141, this should be set to *IPv4*. If you have no DHCP server and/or wish to set the address manually, this should be set to *disabled*.

IP Address: If DHCP is *disabled* for your ANZ141, this field should be used to specify the IP address of the device.

Netmask / Prefix Bits: The number of prefix bits denoting the subnet address range within which the network address resides. It is also possible to enter a netmask as four octets here—Meinberg Device Manager will calculate the prefix bits automatically (i.e., if *255.255.255.0* is entered, this field will display *24* when the device has restarted).

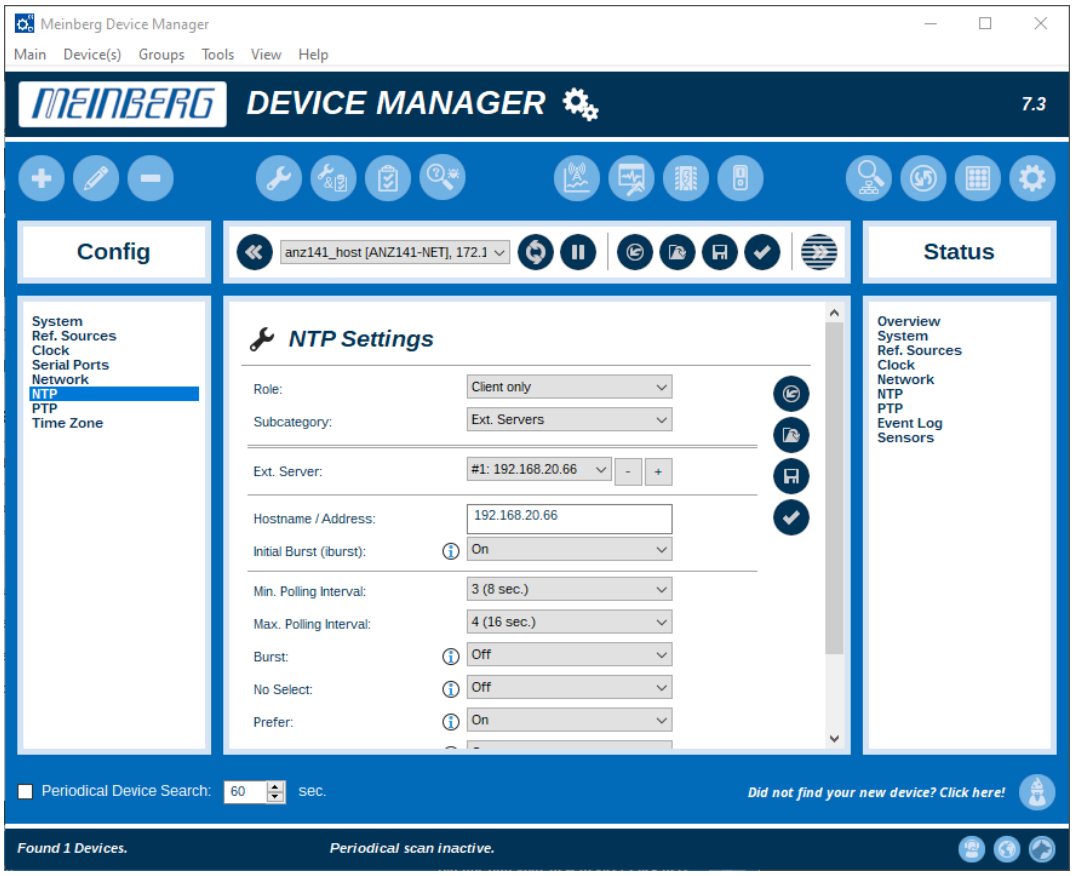
Gateway: This field is disabled for the ANZ141 as the device only has one network interface; the Default Gateway under **Main** is used for traffic sent outside of the subnet.

VLAN: Specifies whether VLAN tagging and PCP prioritization should be used.

VLAN Priority (PCP): Traffic sent by your ANZ141 will be sent with the specified PCP value to enable routing devices to prioritize it accordingly.

VLAN ID: The VLAN tag ID to be used for VLAN segmentation.

14.2.3.6 Config - NTP



The **NTP** page under the **Config** column on the left of the Meinberg Device Manager Dashboard is used to configure the NTP client functionality of the ANZ141.

Ensure that you click on the **Apply Configuration** button to apply the new NTP configuration.

Role: The NTP role to be adopted. The ANZ141 is constructed to operate solely as an NTP client; this is therefore set to "*client only*" and cannot be changed.

Subcategory: The current configuration page. Because the ANZ141 is constructed to operate solely as an NTP client, the only configuration page available is "*Ext. Servers*".

Ext. Server: This is a list of the external servers currently configured for the ANZ141. To add a new server, click on the "+" button, complete the fields below, and click on the "**Apply Configuration**" button. To remove a configured server, select it from the drop-down menu and click on the "–" button.

Hostname/Address: The IPv4 address or hostname of the NTP client.

Initial Burst (iburst): If enabled, the ANZ141 will send an initial 'burst' of eight NTP queries to the NTP server. This helps to ensure that the clock is synchronized to the NTP server more rapidly. The use of *iburst* is strongly recommended for private NTP servers and is therefore enabled by default.

The use of *iburst* when accessing public NTP servers may be frowned upon, however.

Min. Polling Interval & Max. Polling Interval: The minimum and maximum polling intervals for NTP requests to be sent by the ANZ141.

The polling interval is calculated depending on the stability of the clock. A lower polling interval will result in more frequent requests and can increase clock accuracy, especially with private servers. However, very frequent polling of public servers may be frowned upon and some servers may be configured to accept only a certain number of requests in a given timeframe. It is generally advised to not poll a public server more than once every 64 seconds.

Burst: This option causes the NTP client to sent a burst of eight NTP requests at two-second intervals at each polling interval. It is generally only useful for high- jitter communication routes such as telephone lines.

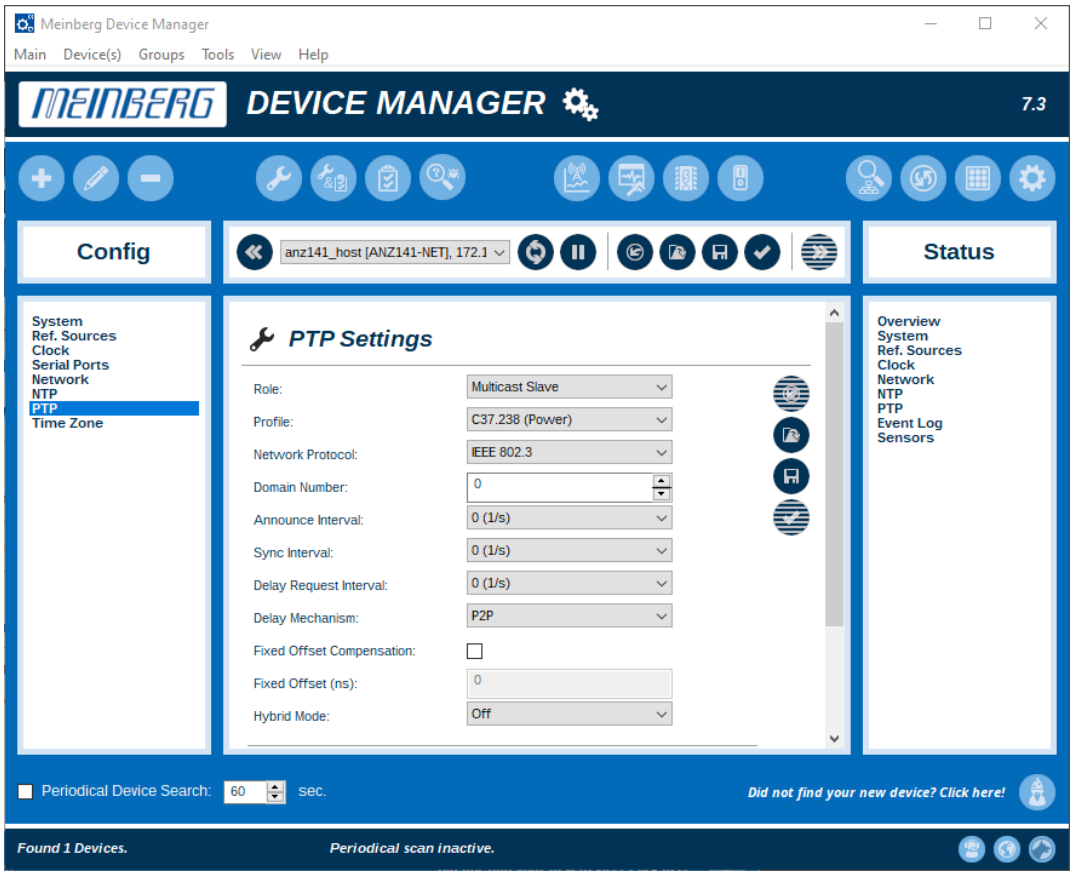
The use of *burst* with public NTP servers is frowned upon.

No Select: If enabled, this NTP server will not be used to synchronize your ANZ141, but the server will still be polled and communication data will be provided in the NTP status section.

Prefer: If enabled, this server will be given priority in server selection among all servers deemed to be functioning correctly.

True: If enabled, this server is automatically assumed to be a 'truechimer' (an NTP server that is deemed to provide accurate UTC time with low jitter). This disables the detection of 'falsetickers' (NTP servers deemed to be unreliable as a result of the client's statistical filtering).

14.2.3.7 Config - PTP



The **PTP** page under the **Config** column on the left of the Meinberg Device Manager Dashboard is used to configure the PTP slave functionality of the ANZ141.

Ensure that you click on the **Apply Configuration** button to apply the new PTP configuration and to confirm unicast master settings.

Role: The PTP slave role to be adopted. The ANZ141 can be configured to listen for PTP messages on the multicast address (*Multicast Slave*) or on one or two fixed master addresses (*Unicast Slave*). Please note that the use of the G.8265.1 telecom profile requires the use of *Unicast Slave* mode.

Profile: The IEEE1588-2008 ("PTPv2") profile to be used.

Custom: The default IEEE1588-2008 profile with all options unlocked. This allows the network protocol, PTPv2 domain number, announce, sync, and delay request intervals, delay measurement mechanism, and fixed offset to be freely set.

C37.238 (Power): The C37.238-2017 profile.

G.8265.1 (Telecom I): The G.8265.1 telecom profile.

Network Protocol: Specifies whether PTP traffic should be sent and received at Layer 2 (IEEE 802.3 data link level) or Layer 3 (IPv4, network level). The G.8265.1 telecom profile requires the use of Layer 3 (IPv4).

Domain Number: The PTPv2 domain number for PTP traffic, a value in the range 0–255. The G.8265.1 telecom profile requires this value to be in the range 4–23.

Fixed Offset Compensation: Enables the application of a fixed offset to the timestamps received from the PTP master.

Fixed Offset (ns): The fixed offset to be applied when **Fixed Offset Compensation** is enabled. This value must be entered in nanoseconds.

Announce Interval: The frequency at which the ANZ141 sends PTP Announce messages. The C.37.238-2017 power profile requires this to be set to one per second (1/s).

Sync Interval: The frequency at which the ANZ141 expects to receive PTP Sync messages. The C.37.238-2017 power profile requires this to be set to one per second (1/s).

Delay Request Interval: The frequency at which the ANZ141 expects to receive PTP Delay Request messages. The C.37.238-2017 power profile requires this to be set to one per second (1/s).

Max. Clock Class: If enabled, the ANZ141 will cease using the PTP master as a reference if the Clock Class of the Grandmaster exceeds the value specified here.

Multicast Mode-Specific Settings

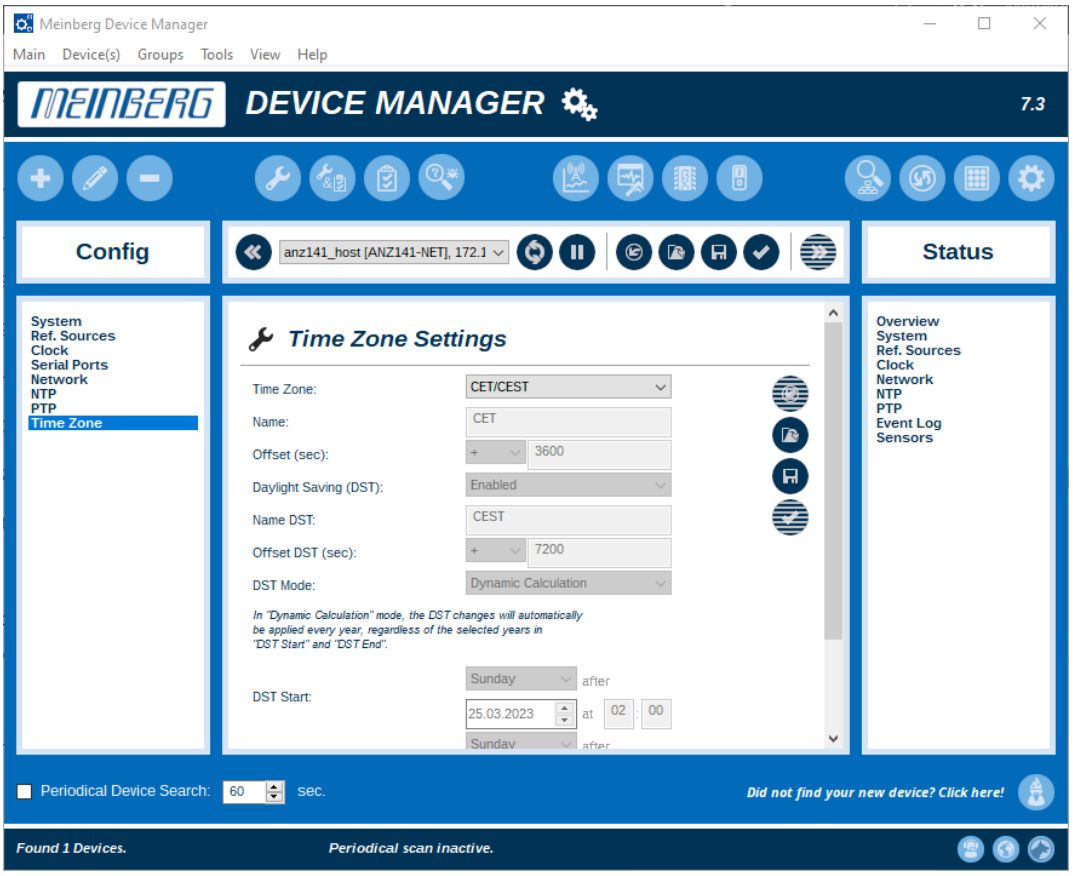
Delay Mechanism: Specifies whether end-to-end (E2E) or peer-to-peer (P2P) delay measurement should be employed. E2E measurement is required for *Unicast Slave* mode and therefore this option is only visible in *Multicast Slave* mode.

Hybrid Mode: If enabled, Delay Request and Delay Response messages are communicated directly between the ANZ141 and its PTP master via unicast in order to optimize bandwidth usage. Announce, Sync, and Follow-Up messages are still sent via multicast.

Unicast Mode-Specific Settings

Unicast Master:	This is a list of the two unicast masters currently configured in the ANZ141. Selecting one from the drop-down menu will display the current configuration for that master in the window.
Address:	The IPv4 or MAC address of the current unicast master selected in the drop-down menu **Unicast Master**.
Clock ID:	The Clock ID (UUID) that this unicast master should have. This can be set to ensure that the unicast master is the exact hardware device that the administrator expects it is to be. The default value *FF:FF:FF:FF:FF:FF:FF:FF* is a wildcard value that allows the device to be any PTP clock available at the specified address.
Transmission Duration (sec.):	Specifies how long the ANZ141 will wait for a message from the **current master** before it times out and returns to *Listening* state.

14.2.3.8 Config - Time Zone



The **Time Zone** page under the **Config** column on the left of the Meinberg Device Manager Dashboard is used to configure the time zone of the ANZ141. This affects certain time-of-day outputs such as serial time strings and IRIG time code.

The ANZ141 offers three pre-defined time zone profiles: UTC, Central European Time (CET), and Eastern European Time (EET). These profiles include specifications for Daylight Saving Time conditions and specific summertime naming conventions.

Other time zones can be defined using the **Custom** function.

Ensure that you click on the **Apply Configuration** button to apply the new Time Zone configuration.

Time Zone:	This provides a number of pre-defined time zones to select from, or allows a custom profile to be defined by selecting "**Custom**".
Name:	The "wintertime" abbreviation (or standard abbreviation for time zones that do not observe Daylight Saving Time) of the custom time zone (e.g., EST for Eastern Standard Time).
Offset (sec):	The offset from UTC in seconds of the custom time zone's "wintertime" or general offset for time zones that do not observe Daylight Saving Time (e.g., *–18000* for Eastern Standard Time).

Daylight Saving (DST):	Specifies whether this time zone observes Daylight Saving Time (*Enabled*) or not (*Disabled*).
Name DST:	The "summertime" abbreviation of the custom time zone (e.g., EDT for Eastern Daylight Time).
Offset DST (sec):	The offset from UTC in seconds of the custom time zone's "summertime" (e.g., *–14400* for Eastern Daylight Time).
DST Mode:	Specifies whether the Daylight Saving Time adjustments are to be performed every year based on the date specified under **DST Start** and **DST End** (*Dynamic Calculation*) or are only applied on that specific date (*Fixed Date*).
DST Start:	The date & time on which the Daylight Saving Time adjustment should be applied (start of "summertime", "clocks go forward").
DST End:	The date & time on which the Daylight Saving Time adjustment should be reversed (start of "wintertime", "clocks go back").

Calculation of DST Start & End Dates

Because most time zones observing Daylight Saving Time measures have a 'floating' date that relates to a given week in a month rather than an absolute date, the *Dynamic Calculation* mode allows the change to be applied on a given day of the week after a certain date.

Examples:

- The time zone **Pacific Standard Time** (PST) switches to **Pacific Daylight Time** (PDT) on the second Sunday in March, and back again to Pacific Standard Time on the first Sunday in November. Therefore, PDT would be set to the Sunday after March 7, and PST to the Sunday after November 7.
- The time zone **Greenwich Mean Time** (GMT) switches to **British Summer Time** (BST) on the last Sunday in March, and back again to Greenwich Mean Time on the last Sunday in October. Therefore, GMT would be set to the Sunday after March 25, and BST would be set to the Sunday after October 25.

14.2.4 Status Review Options in Meinberg Device Manager

The column on the right of the Meinberg Device Manager Dashboard allows information on the ANZ141 in a number of categories to be displayed:

Overview:	A selection and summary of key operating states from other status pages.
System:	The device name, firmware version, serial number, and processor.
Ref. Sources:	The current reference source of the ANZ141 and the state of synchronization with it.
Clock:	The current clock time, synchronization state, and oscillator state.
Network:	Information on the hostname, default gateway, physical network interface, and virtual interface configuration.
NTP:	Information on the NTP client implementation of the ANZ141, as well as performance data for each of the configured NTP servers.
PTP:	Information on the PTP instance running on the ANZ141, as well as performance data for the connection with the current master clock.
Event Log:	The last twenty events recorded by the ANZ141.
Sensors:	The current uptime since last restart of the ANZ141.

15 SNMP Reference

The ANZ141 provides SNMPv1 support that allows a number of status variables to be monitored by a suitable SNMP manager.

These status variables are identified with OIDs (Object IDs), which are sequences of numbers separated by periods ("."). The OID forms a tree-like structure, with each number in the sequence representing a branch or leaf of the number that came before it.

The SNMP support requires the import of custom MIB files into your SNMP manager that implement a new readable branch in your SNMP agent tree. These two required MIB files can be requested from Meinberg and are:

- `MBG-SNMP-ROOT-MIB.mib` *(the root MIB file required for all Meinberg devices)*
- `MBG-ANZ141.mib` *(the device-specific MIB for the ANZ141 family of devices)*

The root OID of all Meinberg SNMP-capable devices is `1.3.6.1.4.1.5597` (or alternatively and simply `enterprises.5597`).

The root OID of the ANZ141 family of devices specifically is `enterprises.5597.50`. For example, on a PC equipped with the tool `snmpwalk`, the status variables of a ANZ141 connected and reachable under the IP address `192.168.1.2` could be acquired as follows:

```
snmpwalk -v1 -c public 192.168.1.2 enterprises.5597.50
```

The SNMP variables provided by the ANZ141 are listed on the next page:

```
mbgSnmpRoot (enterprises.5597)
--> mbgANZ (enterprises.5597.50)
----> mbgANZGeneral (enterprises.5597.50.0)
------> mbgANZSerialNumber (enterprises.5597.50.0.1)
------> mbgSyncboxANZFirmwareRevision (enterprises.5597.50.0.2)
------> mbgANZSystemTime (enterprises.5597.50.0.3)
------> mbgANZCurrentRefSource (enterprises.5597.50.0.4)
------> mbgANZXMRStatus (enterprises.5597.50.0.5)
----> mbgANZNetworkTimeProtocol (enterprises.5597.50.1)
------> mbgANZtpSyncStatus (enterprises.5597.50.1.1)
------> mbgANZNtpSystemPeer (enterprises.5597.50.1.2)
------> mbgANZNtpStratum (enterprises.5597.50.1.3)
------> mbgANZNtpRefSourceTable (enterprises.5597.50.1.4)
--------> mbgANZNtpRefSourceTableEntry (enterprises.5597.50.1.4.x)
----------> mbgANZNtpRefSourceIndex (enterprises.5597.50.1.4.x.1)
----------> mbgANZNtpRefSourceHostname (enterprises.5597.50.1.4.x.2)
----------> mbgANZNtpRefSourceStratum (enterprises.5597.50.1.4.x.3)
----------> mbgANZNtpRefSourceReferenceID (enterprises.5597.50.1.4.x.4)
----------> mbgANZNtpRefSourceReach (enterprises.5597.50.1.4.x.5)
----------> mbgANZNtpRefSourceCurrPoll (enterprises.5597.50.1.4.x.6)
----------> mbgANZNtpRefSourceMinPoll (enterprises.5597.50.1.4.x.7)
----------> mbgANZNtpRefSourceMaxPoll (enterprises.5597.50.1.4.x.8)
----------> mbgANZNtpRefSourceConfigOptions (enterprises.5597.50.1.4.x.9)
----------> mbgANZNtpRefSourcePathDelay (enterprises.5597.50.1.4.x.10)
----------> mbgANZNtpRefSourceOffset (enterprises.5597.50.1.4.x.11)
----------> mbgANZNtpRefSourceJitter (enterprises.5597.50.1.4.x.12)
----> mbgANZPrecisionTimeProtocol (enterprises.5597.50.2)
------> mbgANZPtpProfile (enterprises.5597.50.2.1)
------> mbgANZPtpNwProt (enterprises.5597.50.2.2)
------> mbgANZPtpPortState (enterprises.5597.50.2.3)
------> mbgANZPtpDelayMechanism (enterprises.5597.50.2.4)
------> mbgANZPtpDelayRequestInterval (enterprises.5597.50.2.5)
------> mbgANZPtpTimescale (enterprises.5597.50.2.6)
------> mbgANZPtpUTCOffset (enterprises.5597.50.2.7)
------> mbgANZPtpLeapSecondAnnounced (enterprises.5597.50.2.8)
------> mbgANZPtpGrandmasterClockID (enterprises.5597.50.2.9)
------> mbgANZPtpGrandmasterTimesource (enterprises.5597.50.2.10)
------> mbgANZPtpGrandmasterPriority1 (enterprises.5597.50.2.11)
------> mbgANZPtpGrandmasterClockClass (enterprises.5597.50.2.12)
------> mbgANZPtpGrandmasterClockAccuracy (enterprises.5597.50.2.13)
------> mbgANZPtpGrandmasterClockVariance (enterprises.5597.50.2.14)
------> mbgANZPtpGrandmasterPriority2 (enterprises.5597.50.2.15)
------> mbgANZPtpOffsetToGrandmaster (enterprises.5597.50.2.16)
------> mbgANZPtpMeanPathDelay (enterprises.5597.50.2.17)
----> mbgANZOutputs (enterprises.5597.50.3)
------> mbgANZOutputsTable (enterprises.5597.50.3.1)
--------> mbgANZOutputsTableEntry (enterprises.5597.50.3.1.x)
----------> mbgANZOutputIndex (enterprises.5597.50.3.1.x.2.1)
----------> mbgANZOutputMode (enterprises.5597.50.3.1.x.2.2)
------> mbgANZSerialString1 (enterprises.5597.50.3.2)
------> mbgANZSerialString2 (enterprises.5597.50.3.3)
----> mbgANZConformance (enterprises.5597.50.10)
------> mbgANZCompliances (enterprises.5597.50.10.0)
--------> mbgANZCompliance (enterprises.5597.50.10.0.0)
------> mbgANZGroups (enterprises.5597.50.10.1)
--------> mbgANZObjectsGroup (enterprises.5597.50.10.1.0)
```

16 Technical Appendix: ANZ141

16.1 Technical Specifications: ANZ141

Display:
- 14-digit alphanumeric LED display
- 12 segments as 8-segment digits, 2 segments as 14-segment digits, each 13/14 mm height
- Variable brightness
- Each block of two digits features period indicator used as indicators (e.g., free-run mode, error states)

Buffering:
- Standard model: Integrated capacitor preserves operation of real-time clock (integrated crystal oscillator) for 150 hours without external power supply
- Alternative model: Integrated battery preserves operation of real-time clock (integrated crystal oscillator) for 10 years without external power supply

DCF77 Receiver:
(ANZ141/DCF Model Only)
- Narrowband tuned-frequency receiver with automatic gain control
- Bandwidth: Approx. 40 Hz
- Supply Voltage (Antenna): 5 V
- Reception via external ferrite antenna
- Multiple software checks of incoming timecode
- Parity and consistency check over a two-minute period
- RF distortions indicated by LED and a status character in the output string

Oscillator Accuracy in Free-Run Mode
Free-Run Mode:
While powered on, after 24 hours of synchronous operation: 1×10^{-6}
While powered off, running off capacitor-powered real-time clock: 3×10^{-5}

Serial Interfaces:
Two DSUB-9 ports (**COM0**, **COM1**)
RS-232 (Tx and Rx) or RS-422 (**COM0**: Tx only; **COM1**: Rx only)

Baud Rates: 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1

String Output Modes:
Once per second, once per minute, on request ("?" to Tx, RS-232 only)

Time Zone Profiles:
CET/CEST, EET/EEST, UTC
Other time zones configurable using Meinberg Device Manager

Supported Reference Strings:
Meinberg Standard
Uni Erlangen
ATIS
SAT
Computime

Connectors:
AC Model: IEC 60320 C14
DC Model: 3-pin MSTB

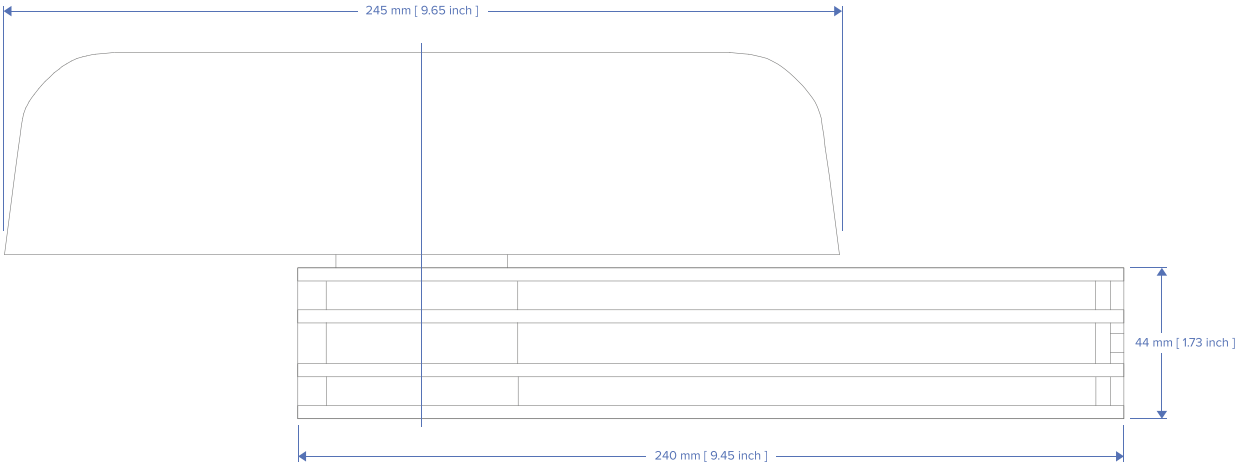
2x DSUB-9 Female Connector
BNC Antenna Input (ANZ141/DCF Only)
RJ45 Network Interface (ANZ141/NET Only)

Supported Antennas:
Meinberg AW02 Antenna for Outdoor Use
Meinberg AI01 Antenna for Indoor Use

Enclosure:	Extruded Aluminum Case	
Dimensions:	**Aluminum Case:**	144 mm x 72 mm x 132 mm (W x H x D)
	Cutout for Control Panel:	140 mm x 68 mm (W x H)
Power Supply:	100–240 V AC, 50–60 Hz 20–60 V DC	
Fuse:	T 1.6 A / 250 V (AC and DC Models)	
Ambient Temperature:	0–50 °C (32–122 °F)	
Relative Humidity:	Max. 85 %	

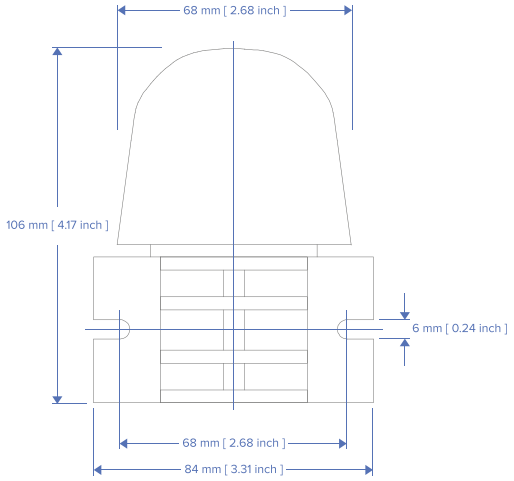
16.2 Technical Specifications: AW02 Antenna

Physical Dimensions:



Specifications:

Input Voltage:	3.5 V – 5 V
Bandwidth:	1 kHz
Signal Level:	50 μV – 5 mV
Connector Type:	Type-N, Female
Housing Material:	ABS Plastic Case
IP Rating:	IP56
Temperature Range:	–25 °C to +65 °C (-13 °F to 149 °F)
Weight:	0.55 kg (1.2 lbs), including mounting kit for wall installation



16.3 General Information about DCF77

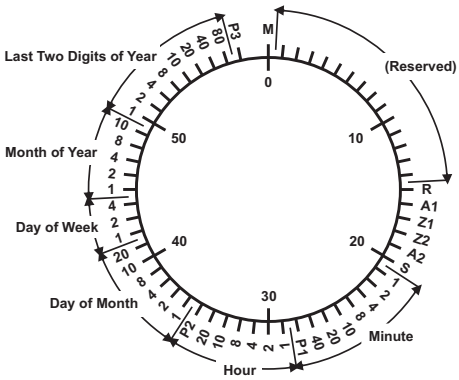
The DCF radio-controlled clocks manufactured by Meinberg receive their signal from the DCF77 long-wave transmitter, which is installed in Mainflingen, near Frankfurt am Main in Germany, and transmits the reference time of the Federal Republic of Germany. This time reference will either be Central European 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-accuracy 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 mark is used to signal that the next minute will begin with the following second mark.

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 summer time and winter time 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	

16.4 Technical Specifications: MBG-S-PRO Surge Protector

The MBG-S-PRO is a surge protector (Phoenix CN-UB-280DC-BB) for coaxial connections. It is patched directly into the antenna line and consists of a replaceable gas discharge tube that redirects the energy from the cable shielding to the ground potential when ignited. Connect the MBG-S-PRO using a ground conductor cable that is as short as possible.

The MBG S-PRO has no dedicated input/output polarity and no preferred installation orientation.

Phoenix CN-UB-280DC-BB

Features:

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

Contents of Package:	Surge Protector with Mounting Bracket and Accessories
Product Type:	Surge Protector for Transmission and Receiver Devices
Construction Type:	In-Line Breaker
Connector Types:	Type-N, Female/Type-N, Female

The original product page of the supplier (see link) of the CN-UB-280DC-BB surge protector provides detailed specifications, as well as a variety of product-specific documents under the link below:

Data Sheet (Download):
https://www.meinbergglobal.com/download/docs/shortinfo/german/cn-ub-280dc-bb_pc.pdf

16.5 Serial Time Strings

16.5.1 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 synchronized 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		

16.5.2 Meinberg GPS Time String

The Meinberg GPS Time String is a sequence of 36 ASCII characters starting with the <STX> (Start-of-Text) character and ending with the <ETX> (End-of-Text) character. Unlike the Meinberg Standard Time String, the

Meinberg GPS Time String does not carry any local time zone or UTC data; it simply carries the direct GPS time without any conversion into UTC. The format is as follows:

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

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 current time:

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

uv Clock status characters:

u:	"#"	Clock is in free-run mode (no exact synchronization)
	" "	(Space, ASCII code 20h) Clock is synchronized (base accuracy is achieved)
v:	"*"	Receiver has not checked its position
	" "	(Space, ASCII code 20h) Receiver has determined its position

G "GPS time" time zone indicator

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

"A"	Announcement of leap second insertion
" "	(Space, ASCII code 20h) nothing announced

lll Number of leap seconds between UTC and GPS Time (UTC = GPS time + number of leap seconds)

<ETX> End-of-Text (ASCII code 03h)

16.5.3 ATIS Time String

The ATIS standard Time String is a sequence of 23 ASCII characters terminated with a <CR» (Carriage Return) character. The standard interface configuration for this string type is 2400 Baud, 7E1. The format is as follows:

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

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:

<GID>	Address of the Receiver, ASCII code 7Fh
<ABS>	Originator of Message, '0', ASCII code 30h
<TSQ>	Telegram Number, '0', ASCII code 30h
<CC>	Command Code 'S' (for 'SET'), ASCII code 53h
<CS>	Command Code 'A' (for 'ALL'), ASCII code 41h
<ST>	Time Status 'C' (for valid time), ASCII code 43h
yymmdd	The current date: yy Year of the Century (00–99) mm Month (01–12) dd Day of month (01–31)
hhmmss	the current time: hh hours (00–23) mm minutes (00–59) ss seconds (00–59, or 60 during leap second)
w	Day of the Week (1–7, 1 = 31h = Monday)
cc	Checksum in hexadecimal, generated from all characters including GID, ABS, TSQ, CC, ST, etc.
<CR>	Carriage Return, ASCII code 0Dh

16.5.4 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:ssxxxxuv*<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 = Monday, ~~7~~)

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, ASCII code 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, ASCII code 20h) nothing announced

<CR> Carriage Return, ASCII code 0Dh

<LF> Line Feed, ASCII code 0Ah

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

16.5.5 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.lllle 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 (ASCII Code 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 (ASCII Code 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 (ASCII Code 20h)

`<ETX>` End-of-Text (ASCII Code 03h)

16.5.6 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 during 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 (ASCII code 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 (ASCII code 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)

16.5.7 NMEA 0183 String (GGA)

The NMEA 0183 GGA String is a sequence of characters starting with the string "$GPGGA" and ending with the characters <CR> (Carriage Return) and <LF> (Line Feed). The format is as follows:

$GPGGA,*hhmmss.ff*,*bbbb.bbbbb*,*n*,*lllll.ll*,*e*,*A*,*vv*,*hhh.h*,*aaa.a*,M,
ggg.g,M,,*0***cs*<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
GGA	Message type ID, in this case "GGA"
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)
bbbb.bbbbb	Geographical latitude of receiver position in degrees Leading characters padded by space characters (ASCII code 20h)
n	Latitudinal hemisphere, with the following characters possible: "N" North of Equator "S" South of Equator
lllll.llllll	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
A	Position fixed (1 = yes, 0 = no)
vv	Number of satellites used (0–12)
hhh.h	HDOP (Horizontal Dilution of Precision)
aaa.h	Mean Sea Level Altitude (MSL Altitude = WGS84 Altitude - Geoid Separation)
M	Meters (unit as fixed value)
ggg.g	Geoid Separation (WGS84 Altitude - MSL Altitude)
M	Meters (unit as fixed value)
cs	Checksum (XOR of all characters except "$" and "*")
<CR>	Carriage Return, ASCII code 0Dh
<LF>	Line Feed, ASCII code 0Ah

16.5.8 NMEA 0183 String (ZDA)

The NMEA 0183 ZDA String is a sequence of 38 ASCII characters starting with the string "$GPZDA" and ending with the characters <CR> (Carriage Return) and <LF> (Line Feed). The format is:

$GPZDA,*hhmmss.ss*,*dd*,*mm*,*yyyy*,*HH*,*II***cs*<CR><LF>

ZDA - Time and Date: UTC, day, month, year, and local time zone.

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 change of second		
hhmmss.ss	UTC time:		
	hh	Hours	(00–23)
	mm	Minutes	(00–59)
	ss	Seconds	(00–59, or 60 during leap second)
HH,II	The local time zone (offset to UTC):		
	HH	Hours	(00–±13)
	II	Minutes	(00–59)
dd,mm,yy	The date:		
	dd	Day of Month	(01–31)
	mm	Month	(01–12)
	yyyy	Year	(0000–9999)
cs	Checksum (XOR of all characters except "$" and "*")		
<CR>	Carriage Return (ASCII code 0Dh)		
<LF>	Line Feed (ASCII code 0Ah)		

16.5.9 ABB SPA Time String

The ABB SPA string is a sequence of 32 ASCII characters, starting with the string ">900WD:" and terminated with the character <CR> (Carriage Return). The format is as follows:

>900WD:*yy-mm-dd[lt]SP>hh.mm;ss.fff:cc*<CR>

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

yy-mm-dd	Current Date:		
	yy	Year without century	(00–99)
	mm	Month	(01–12)
	dd	Day of the month	(01–31)
	<SP>	Space (ASCII code 20h)	
hh.mm;ss.fff	Current Time:		
	hh	Hours	(00–23)
	mm	Minutes	(00–59)
	ss	Seconds	(00–59, or 60 during leap second)
	fff	Milliseconds	(000–999)
cc	Checksum. This is calculated as the XOR sum of the preceding characters. The resultant 8-bit value is reported as a hex value in the form of two ASCII characters (0–9 or A–F)		
<CR>	Carriage Return (ASCII code 0Dh)		

16.5.10 Computime Time String

The Computime time string is a sequence of 24 ASCII characters, starting with the character T and terminated with the character <LF> (Line Feed, ASCII code 0Ah). The format is as follows:

T:*yy:mm:dd:ww:hh:mm:ss*<CR><LF>

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

T	Start character Sent with 1-bit accuracy at the start of the second.		
yy:mm:dd	The current date:		
	yy	Year without century	(00–99)
	mm	Month	(01–12)
	dd	Day of the month	(01–31)
	ww	Day of the week	(1–7, 1 = Monday)
hh:mm:ss	The current time:		
	hh	Hours	(00–23)
	mm	Minutes	(00–59)
	ss	Seconds	(00–59, or 60 during leap second)
<CR>	Carriage Return (ASCII code 0Dh)		
<LF>	Line Feed (ASCII code 0Ah)		

16.5.11 RACAL Standard Time String

The RACAL Standard Time String is a sequence of 16 ASCII characters started by a X character and terminated by the <CR> (Carriage Return, ASCII code 0Dh) character. The format is as follows:

XGU*yymmddhhmmss*<CR>

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:

X	Start character (ASCII code 58h) Sent with one-bit accuracy at the change of each second		
G	Control character (ASCII code 47h)		
U	Control character (ASCII code 55h)		
yymmdd	Current date:		
	yy	Year of Century	(00–99)
	mm	Month	(01–12)
	dd	Day of Month	(01–31)
hh:mm:ss	Current time:		
	hh	Hours	(00–23)
	mm	Minutes	(00–59)
	ss	Seconds	(00–59, or 60 during leap second)
<CR>	Carriage Return (ASCII code 0Dh)		

16.5.12 SYSPLEX-1 Time String

The SYSPLEX-1 time string is a sequence of 16 ASCII characters starting with the <SOH> (Start-of-Header) ASCII control character and terminated with the <LF> (Line Feed, ASCII code 0Ah) character.

Important!

To ensure that the time string can be correctly output and displayed through any given terminal program, a singular "C" (not include quotation marks) must be input.

The format is:

<SOH>*ttt*:*hh*:*mm*:*ss*<CR><LF>

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:

<SOH>	Start-of-Header, ASCII code 01h sent with one-bit accuracy at the change of each second		
ddd	Day of Year	(001–366)	
hh:mm:ss	Current time:		
	hh Hours	(00–23)	
	mm Minutes	(00–59)	
	ss Seconds	(00–59, or 60 during leap second)	
	q Quality Indicator	Space (ASCII code 20h)	Time Sync (GPS Lock)
		"?" (ASCII code 3Fh)	No Time Sync (GPS Fail)
<CR>	Carriage Return (ASCII code 0Dh)		
<LF>	Line Feed (ASCII code 0Ah)		

16.5.13 ION Time String

The ION time string is a sequence of 16 ASCII characters starting with the <SOH> (Start of Header, ASCII code 01h) ASCII control character and ending with the <LF> (Line Feed, ASCII code 0Ah) character. The format is as follows:

<SOH>*ddd:hh:mm:ssq*<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 as defined below:

<SOH>	Start of Header (ASCII code 01h) sent with one-bit accuracy at the change of each second			
ddd	Day of Year		(001–366)	
hh:mm:ss	Current time:			
	hh	Hours	(00–23)	
	mm	Minutes	(00–59)	
	ss	Seconds	(00–59, or 60 while leap second)	
	q	Quality Indicator	Space (ASCII code 20h)	Time Sync (GPS Lock)
			"?" (ASCII code 3Fh)	No Time Sync (GPS Fail)
<CR>	Carriage Return (ASCII code 0Dh)			
<LF>	Line Feed (ASCII code 0Ah)			

16.5.14 ION Blanked Time String

The ION Blanked time string is a sequence of 16 ASCII characters starting with the <SOH> (Start of Header, ASCII code 01h) ASCII control character and ending with the <LF> (Line Feed, ASCII code 0Ah) character. The format is as follows:

<SOH>ddd:hh:mm:ssq<CR><LF>

Important!

The blanking interval of is 2 minutes and 30 seconds long and is added every 5 minutes.

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:

<SOH>	Start of Header (ASCII code 01h) sent with one-bit accuracy at the change of each second			
ddd	Day of Year		(001–366)	
hh:mm:ss	Current time:			
	hh	Hours	(00–23)	
	mm	Minutes	(00–59)	
	ss	Seconds	(00–59, or 60 while leap second)	
	q	Quality Indicator	Space (ASCII code 20h)	Time Sync (GPS Lock)
			"?" (ASCII code 3Fh)	No Time Sync (GPS Fail)
<CR>	Carriage Return (ASCII code 0Dh)			
<LF>	Line Feed (ASCII code 0Ah)			

16.5.15 IRIG-J Timecode

The IRIG-J timecode consists of a string of ASCII characters sent in "701" format, i.e.,:

- 1 Start Bit
- 7 Data Bits
- 1 Parity Bit (odd)
- 1 Stop Bit

The on-time marker of the string is the leading edge of the start bit. The timecode consists of 15 characters, sent once per second at a baud rate of 300 or greater. The format is as follows:

<SOH>*DDD:HH:MM:SS*<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:

<SOH>	"Start of Header" (ASCII code 01h)
DDD	Day of the year (ordinal date, 1–366)
HH, MM, SS	Time of the start bit, specified in hours (HH), minutes (MM), seconds (SS)
<CR>	"Carriage Return" (ASCII code 0Dh)
<LF>	"Line Feed" (ASCII code 0Ah)

16.5.16 6021 Time String

The 6021 time string is a sequence of 18 ASCII characters starting with the <STX> (Start-of-Text, ASCII code 02h) ASCII control character and terminated with the sequence <LF> (Line Feed, ASCII code 0Ah), <CR> (Carriage Return, ASCII code 0Dh), <ETX> (End-of-Text, ASCII code 03h).

It is broadly identical to the **Freelance Time String** (see Chapter 16.5.17), but with a different order to the termination sequence.

The format is as follows:

<STX>*C9hhmmssddmmyy*<LF><CR><ETX>

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:

<STX> Start-of-Text, ASCII code 02h

C Clock status. This is represented as an ASCII nibble*, whereby each bit in the binary sequence has the following meaning:

Bit 0 (LSB)	Leap second announced (1) / not announced (0)
Bit 1	Leap second active (1) / not active (0)
Bit 2	Real-time clock time valid (1) / invalid (0)
Bit 3 (MSB)	Clock is synchronized (1) / not synchronized (0)

Example: If the clock outputs C (ASCII code 0x43h) at this position, this corresponds to a binary value of *1100*, indicating that the RTC time is valid and the clock is synchronized, and that no leap second has been announced, nor is one in effect.

9 UTC status of clock and day of the week. This is represented as an ASCII nibble*, whereby the three least significant bits represent the day of the week and may be any value between 1 and 7 (corresponding to Monday to Sunday). The most significant bit represents the UTC state and will be 1 if set to UTC and 0 if it is a local time zone. Thus, if the clock is outputting local (non-UTC) time, this will be in a range of 1–7, whereas if the clock is outputting UTC time, this value will be in a range of 9–F.

Example: If the clock outputs 9 (ASCII code 0x39h) at this position, this corresponds to a binary value of *1001*. The most significant bit of *1* here indicates that the clock is running on UTC time, while the 3-bit value represented by the least significant bits *001* indicates that the day is Monday.

hhmmss Current time:

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

ddmmyy Current date:

dd	Day	(01–31)
mm	Month	(01–12)
yy	Last two digits of year	(00–99)

<LF> Line Feed (ASCII code 0Ah)

<CR> Carriage Return (ASCII code 0Dh)

<ETX> End-of-Text (ASCII code 03h)

* With ASCII nibbles, the actual ASCII character itself (0–9, A–F, ASCII codes 0x30h–0x39h and 0x41h–0x46h) represents the hexadecimal equivalent of a 4-bit binary sequence. For example, if the clock outputs A at these positions, this is equivalent to a binary sequence of 0x1010b. Please note that it is not the binary equivalent of the ASCII code itself.

16.5.17 Freelance Time String

The Freelance time string is a sequence of 18 ASCII characters starting with the <STX> (Start-of-Text, ASCII code 02h) ASCII control character and terminated with the sequence <CR> (Carriage Return, ASCII code 0Dh), <LF> (Line Feed, ASCII code 0Ah), <ETX> (End-of-Text, ASCII code 03h).

It is broadly identical to the **6021 Time String** (see Chapter **16.5.16**), but with a different order to the termination sequence.

The format is as follows:

<STX>*C9hhmmssddmmyy*<CR><LF><ETX>

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:

<STX> Start-of-Text, ASCII code 02h

C Clock status. This is represented as an ASCII nibble*, whereby each bit in the binary sequence has the following meaning:

Bit 0 (LSB)	Leap second announced (1) / not announced (0)
Bit 1	Leap second active (1) / not active (0)
Bit 2	Real-time clock time valid (1) / invalid (0)
Bit 3 (MSB)	Clock is synchronized (1) / not synchronized (0)

Example: If the clock outputs C (ASCII code 0x43h) at this position, this corresponds to a binary value of *1100*, indicating that the RTC time is valid and the clock is synchronized, and that no leap second has been announced, nor is one in effect.

9 UTC status of clock and day of the week. This is represented as an ASCII nibble*, whereby the three least significant bits represent the day of the week and may be any value between 1 and 7 (corresponding to Monday to Sunday). The most significant bit represents the UTC state and will be 1 if set to UTC and 0 if it is a local time zone. Thus, if the clock is outputting local (non-UTC) time, this will be in a range of 1–7, whereas if the clock is outputting UTC time, this value will be in a range of 9–F.

Example: If the clock outputs 9 (ASCII code 0x39h) at this position, this corresponds to a binary value of *1001*. The most significant bit of *1* here indicates that the clock is running on UTC time, while the 3-bit value represented by the least significant bits *001* indicates that the day is Monday.

hhmmss Current time:

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

ddmmyy Current date:

dd	Day	(01–31)
mm	Month	(01–12)
yy	Last two digits of year	(00–99)

<CR> Carriage Return (ASCII code 0Dh)

<LF> Line Feed (ASCII code 0Ah)

<ETX> End-of-Text (ASCII code 03h)

* With ASCII nibbles, the actual ASCII character itself (0–9, A–F, ASCII codes 0x30h–0x39h and 0x41h–0x46h) represents the hexadecimal equivalent of a 4-bit binary sequence. For example, if the clock outputs A at these positions, this is equivalent to a binary sequence of 0x1010b. Please note that it is not the binary equivalent of the ASCII code itself.

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" and that no impermissible substances are present in our products pursuant to these Directives.

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 Declarations of Conformity

18.1 Declaration of Conformity for Operation in the European Union (ANZ141 Basic, ANZ141/NET)

EU-Konformitätserklärung

Doc ID: ANZ141-June 20, 2024

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

erklärt in alleiniger Verantwortung, dass die Produkte,
declares under its sole responsibility, that the products

Produktbezeichnungen *Product Designations*	ANZ141 ANZ141/NET

auf die sich diese Erklärung bezieht, mit den folgenden Normen und Richtlinien übereinstimmen:
to which this declaration relates are 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, June 20, 2024

Aron Meinberg
Quality Management

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

18.2 Declaration of Conformity for Operation in the United Kingdom (ANZ141 Basic, ANZ141/NET)

UKCA Declaration of Conformity

Doc ID: ANZ141-June 20, 2024

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

declares that the products

Product Designation	ANZ141 ANZ141/NET

to which this declaration relates, are 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 June 20, 2024

Aron Meinberg
Quality Management

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

18.3 Declaration of Conformity for Operation in the European Union (ANZ141/DCF)

EU-Konformitätserklärung

Doc ID: ANZ141/DCF-June 20, 2024

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

Produktbezeichnungen *Product Designations*	ANZ141/DCF

auf die 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:

RED – Richtlinie *Radio Equipment Directive* 2014/53/EU	ETSI EN 300 330 V2.1.1 (2017-02)
EMV – Richtlinie *EMC Directive* 2014/30/EU	EN 61000-6-2:2019 EN 61000-6-3:2021 EN 55032:2015 + AC:2016 + A11:2020 + A1:2020 EN 55035:2017/A11:2020 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03)
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, June 20, 2024

Aron Meinberg
Quality Management

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

18.4 Declaration of Conformity for Operation in the United Kingdom (ANZ141/DCF)

UKCA Declaration of Conformity

Doc ID: ANZ141/DCF-June 20, 2024

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

declares that the product

Product Designation	**ANZ141/DCF**

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

Radio Equipment Regulations 2017 (as amended) *SI 2017/1206*	ETSI EN 300 330 V2.1.1 (2017-02)
Electromagnetic Compatibility Regulations 2016 (as amended) *SI 2016/1091*	EN IEC 61000-6-2:2019 EN IEC 61000-6-3:2021 EN 55032:2015 + AC:2016 + A11:2020 + A1:2020 EN 55035:2017/A11:2020 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03)
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 June 20, 2024

Aron Meinberg
Quality Management