

# Versatility and Reliability for Broadcast Applications



Meinberg’s microSync<sup>®</sup> RX is a powerful dual-port PTP generator supporting SMPTE ST 2059-2 and many other PTP profiles, all within a 19-inch rack-mount case design. It offers a high level of efficiency and flexibility. This innovative, multipurpose synchronization solution provides various outstanding features, many of which you can also find in Meinberg’s IMS and LANTIME product families.

Key features include two PTP ports, two Management/NTP ports, Black Burst, LTC, Word Clock, and PPS input. This product combines a modern sync reference for IP-based devices and a Signal Pulse Generator for legacy video and audio devices; this makes it a perfect solution for broadcast environments or remote production use cases.

The microSync<sup>®</sup> RX is not only suitable as a high-performance NTP server, but it can also be used as a highly accurate PTP grandmaster. The unit can be managed using the [Meinberg Device Manager](#) software which is available for Windows and Linux platforms.

In addition to the preconfigured inputs and outputs, the microSync can be ordered with different GNSS receivers, oscillator options, an additional OLED display with a rotary knob, and redundant AC and/or DC power supplies.

## Product Highlights

- | Powerful IEEE 1588 Time Server with full SMPTE ST 2059-2 Support
- | Multiple GNSS Receiver Options Available
- | Different Oscillator Options for Advanced Holdover Performance
- | Optional OLED Display with Rotary Knob
- | Redundant Power Supply Configurations
- | Meinberg Device Manager for Configuration and Status Monitoring
- | Three-year Manufacturer’s Warranty
- | Unlimited Technical Support Including Firmware Updates

# Table of Contents

|   |          |  |           |
|---|----------|--|-----------|
| <b>Connectors</b>                                   | <b>3</b> | <b>Jamming and Spoofing Detection</b>            | <b>8</b>  |
| LAN Network Interfaces                              | 3        | Anti-Jamming Technology                          | 8         |
| COM 0 Timestrings                                   | 3        | Anti-Spoofing Technology                         | 8         |
| Status Indicators CPU                               | 3        |  |           |
| Status Indicators Receiver                          | 3        | <b>Multiple Reference Sources</b>                | <b>8</b>  |
| USB Terminal  | 4        |  |           |
| USB Host  | 4        | <b>Intelligent Reference Selection Algorithm</b> | <b>8</b>  |
| PPS In (Pulse Per Second Input)                     | 4        |  |           |
| CLK In (Word Clock Input)                           | 4        | <b>Scope of Delivery</b>                         | <b>9</b>  |
| Status Indicators Input                             | 4        | Optional Expansions – SFP Modules                | 9         |
| Black In (Black Burst Input)                        | 4        |  |           |
| Black Out (Black Burst Output)                      | 4        | <b>Technical Specifications</b>                  | <b>10</b> |
| DARS Out  | 4        | Physical Dimensions                              | 10        |
| Word CLK Out (Word Clock Output)                    | 5        | Mechanical Data                                  | 10        |
| Status Indicators Video Sync Generator (VSG)        | 5        | <b>Environmental Requirements</b>                | <b>10</b> |
| PP 1 Out & PP 2 Out (Programmable Pulse Outputs)    | 5        |  |           |
| LTC / GPIO (Linear Time Code / General Purpose I/O) | 5        | <b>Type Tests</b>                                | <b>11</b> |
|   |          | Safety Tests                                     | 11        |
| <b>Configuration Options</b>                        | <b>6</b> | Environmental Tests                              | 11        |
| Receiver Options                                    | 6        | Electromagnetic Compatibility – Immunity         | 11        |
| Oscillator Options                                  | 6        | Electromagnetic Compatibility – Emission         | 12        |
| Power Supplies                                      | 6        |  |           |
| Display Unit (80x Series)                           | 6        | <b>Compliance</b>                                | <b>12</b> |
|   |          |  |           |
| <b>Performance Level Options</b>                    | <b>6</b> |  |           |
|   |          |  |           |
| <b>Software Specifications</b>                      | <b>7</b> |  |           |
| Protocols & Profiles                                | 7        |  |           |
| Management  | 7        |  |           |
| User Management                                     | 7        |  |           |
| Firmware Management                                 | 7        |  |           |
| Meinberg Device Manager                             | 7        |  |           |
| Self-Diagnosis                                      | 7        |  |           |

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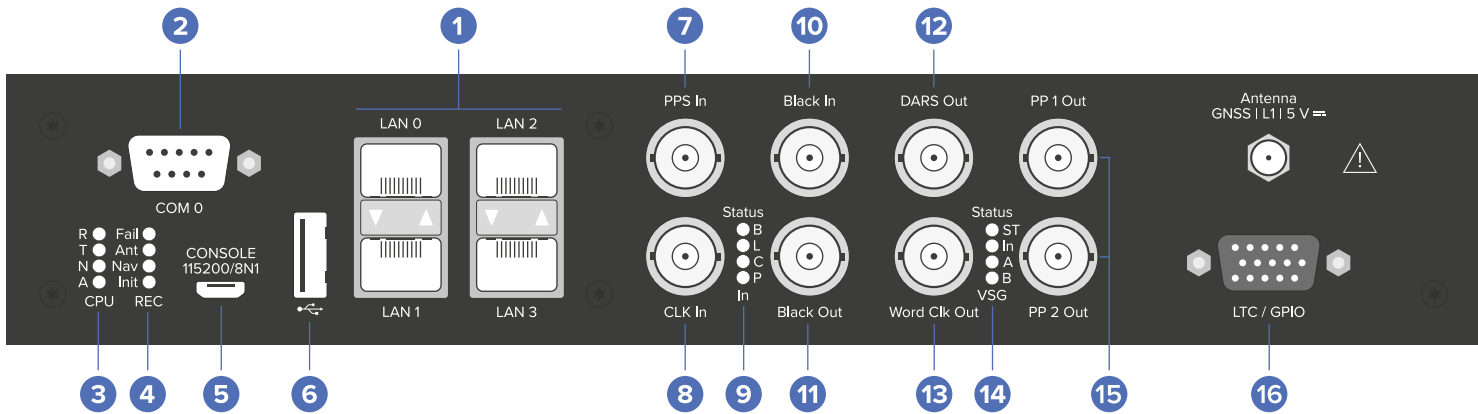
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# Connectors 70x/80x Series



## 1 LAN Network Interfaces

| SIGNAL TYPE                              | LAN 0, 1  | LAN 2, 3  | ACCURACY   | CONNECTION TYPE |
|--|---|---|--|-----------------|
| Gigabit Ethernet (GbE), 10/100/1000 Mbit | Management / NTP<br>10/100/1000 Mbit,<br>RJ45 or 1000FX | Management / NTP<br>10/100/1000 Mbit,<br>RJ45 or 1000FX,<br>LAN 2: PTP Master & Slave<br>LAN 3: PTP Master<br>Synchronous Ethernet:<br><ul style="list-style-type: none"> <li>Master and Slave Capability</li> <li>Compliant to ITU-T G.8261, G.8262 and G.8264</li> <li>Ethernet Synchronization Messaging Channel (ESMC)</li> </ul> | <ul style="list-style-type: none"> <li>NTP: <math>\leq 100 \mu\text{s}</math></li> <li>PTP: <math>\leq 20 \text{ ns}</math></li> </ul> | SFP             |

## 2 COM 0 Timestrings

| SIGNAL OUTPUT | ASSIGNMENT   | CONNECTION TYPE   |
|---------------|--|-------------------|
| RS-232        | <ul style="list-style-type: none"> <li>Pin 2: RxD (Receive)</li> <li>Pin 3: TxD (Transmit)</li> <li>Pin 5: GND (Ground)</li> </ul> | 9 pin D-SUB, male |

## 3 Status Indicators CPU

| R (RECEIVER)  | T (TIME SERVICE)   | N (NETWORK)  | A (ALARM)   |
|---|--|--|---|
| <ul style="list-style-type: none"> <li><b>Blue:</b> Initialisation phase</li> <li><b>Green:</b> The reference clock provides a valid time</li> <li><b>Red:</b> The reference clock does not provide a valid time</li> </ul> | <ul style="list-style-type: none"> <li><b>Green:</b> NTP is synchronized to the reference clock, e.g. GNS</li> <li><b>Red:</b> NTP is not synchronized or switched to the "local clock"</li> </ul> | <ul style="list-style-type: none"> <li><b>Green:</b> All monitored network interfaces are connected</li> <li><b>Red:</b> At least one of the monitored network interfaces is faulty</li> </ul> | <ul style="list-style-type: none"> <li><b>Off:</b> No error</li> <li><b>Red:</b> General error</li> </ul> |

## 4 Status Indicators Receiver

| FAIL   | ANT   | NAV  | INIT  |
|--|---|--|---|
| <ul style="list-style-type: none"> <li><b>Red:</b> No synchronization</li> </ul> | <ul style="list-style-type: none"> <li><b>Green:</b> Antenna connected and clock is synchronized</li> <li><b>Red:</b> No synchronization resp. no antenna connected or short circuit on the antenna line</li> </ul> | <ul style="list-style-type: none"> <li><b>Green:</b> Positioning complete</li> </ul> | <ul style="list-style-type: none"> <li><b>Blue:</b> Initialisation phase</li> <li><b>Green:</b> "Warmed up" - oscillator is adjusted</li> </ul> |

## 5 USB Terminal

| SIGNAL TYPE           | CONNECTION TYPE  |
|-----------------------|------------------|
| USB-to-serial console | Micro-USB Type B |

## 6 USB Host

| SIGNAL TYPE                  | CONNECTION TYPE |
|------------------------------|-----------------|
| USB connector management CPU | USB Type A      |

## 7 PPS In (Pulse Per Second Input)

| SIGNAL INPUT     | SIGNAL LEVEL | PULSE LENGTH                      | CONNECTION TYPE |
|------------------|--------------|-----------------------------------|-----------------|
| Pulse Per Second | TTL          | $\geq 5\mu\text{s}$ , active high | BNC, female     |

## 8 CLK In (Word Clock Input)

| SIGNAL INPUT                                       | SIGNAL LEVEL | SIGNAL RANGE    | CONNECTION TYPE |
|--|--------------|-----------------|-----------------|
| Word Clock Input with programmable frequency range | TTL          | 1 kHz to 10 MHz | BNC, female     |

## 9 Status Indicators Input

| B                          | L                   | C                          | P                   |
|----------------------------|---------------------|----------------------------|---------------------|
| Status of Blackburst Input | Status of LTC Input | Status of Word Clock Input | Status of PPS Input |

## 10 Black In (Black Burst Input)

| SIGNAL INPUT                               | SIGNAL LEVEL                                     | TIME CODE FORMATS  | CONNECTION TYPE |
|--|--|--|-----------------|
| Black Burst (PAL) Input with VITC Reader   | 300 mV <sub>pp</sub> into 75 $\Omega$ unbalanced | PAL SMPTE ST 259M / ITU-R BT.470-6<br>SMPTE ST 12M-1 / SMPTE ST 309M | BNC, female     |
| Input with Prescaler mode (Frequency only) |  |  |                 |

## 11 Black Out (Black Burst Output)

| SIGNAL OUTPUT                           | SIGNAL LEVEL                                     | FORMATS   | CONNECTION TYPE |
|---|--|---|-----------------|
| PAL, NTSC Black Burst with VITC Support | 300 mV <sub>pp</sub> into 75 $\Omega$ unbalanced | <b>Black Burst:</b><br>PAL (SMPTE ST 259M / ITU-R BT.470-6)<br>NTSC (SMPTE ST 170M / ITU-R BT.470-7)<br>VITC (SMPTE ST 12M-1 / SMPTE ST 309M)<br><br><b>Tri-Level Sync:</b><br>720p 50 Hz (SMPTE ST 296M3)<br>1080i 25 Hz (SMPTE ST 274M6)<br>720p 59,94 Hz (SMPTE ST 296M1)<br>1080i 29,97 Hz (SMPTE ST 274M7) | BNC, female     |

## 12 DARS Out

| SIGNAL OUTPUT | SIGNAL LEVEL                | SIGNAL TYPE                           | CONNECTION TYPE |
|---------------|-----------------------------|---------------------------------------|-----------------|
| DARS          | TTL, 2.5 V into 75 $\Omega$ | Base Frequencies: 44.1 kHz and 48 kHz | BNC, female     |

### 13 Word CLK Out (Word Clock Output)

| SIGNAL OUTPUT | SIGNAL LEVEL         | BASE FREQUENCIES   | CONNECTION TYPE |
|---------------|----------------------|--|-----------------|
| Word Clock    | TTL, 2.5 V into 75 Ω | <b>Base Frequency 44.1 kHz:</b><br>Scales: 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8, 16, 32<br>Frequency Range: 1.378125 kHz - 1.4112 MHz<br><br><b>Base Frequency 48 kHz:</b><br>Scales: 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8, 16, 32<br>Frequency Range: 1.5 kHz - 1.536 MHz | BNC, female     |

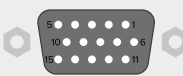
### 14 Status Indicators Video Sync Generator (VSG)

| ST                         | IN                     | A                            | B                    |
|----------------------------|------------------------|------------------------------|----------------------|
| St: Status of internal VSG | Synchronization status | Status of Black Burst output | Status of LTC output |

### 15 PP 1 Out & PP 2 Out (Programmable Pulse Outputs)

| SIGNAL OUTPUT      | SIGNAL LEVEL  | ACCURACY  | CONNECTION TYPE |
|--------------------|---------------|---|-----------------|
| Programmable Pulse | TTL into 50 Ω | <ul style="list-style-type: none"> <li>▪ Pulse Per Second</li> <li>▪ Pulse Per Minute</li> <li>▪ Pulse Per Hour</li> <li>▪ Cyclic Pulse</li> <li>▪ Single Shot</li> <li>▪ Timer</li> <li>▪ Idle</li> <li>▪ All Sync</li> <li>▪ Time Sync</li> <li>▪ Position OK</li> <li>▪ DCF77 Marks</li> <li>▪ Time Code DCLS</li> <li>▪ Serial Time String</li> <li>▪ Synthesizer Frequency</li> <li>▪ PTTI 1PPS</li> </ul> | BNC, female     |

### 16 LTC / GPIO (Linear Time Code / General Purpose I/O)

| SIGNAL INPUT/OUTPUT   | SIGNAL LEVEL                                       | PIN ASSIGNMENT  | CONNECTION TYPE      |
|---|--|---|----------------------|
| <b>Linear Time Code</b> <ul style="list-style-type: none"> <li>▪ 25 fps,</li> <li>▪ 23.98 fps,</li> <li>▪ 29.97 fps,</li> <li>▪ 29.97 fps Drop Frame</li> </ul> | TTL, > 2.5 V <sub>pp</sub> into 50 Ω (Pin 14 + 15) | <ol style="list-style-type: none"> <li>1 LTC_out – LTC symmetric HI Pot. Output</li> <li>2 LTC out + LTC symmetric Lo Pot. Output</li> <li>3 LTC_in + LTC symmetric HI Pot. Input</li> <li>4 LTC in – LTC symmetric Lo Pot. Input</li> <li>5 LTC in, TTL level, Input</li> <li>6 GND</li> <li>7 GND</li> <li>8 GND</li> <li>9 GND</li> <li>10 GND</li> <li>11 DARS + DARS symmetric Hi Pot. Output</li> <li>12 DARS – DARS symmetric Lo Pot. Output</li> <li>13 NC (not connected)</li> <li>14 TIME_SYN TS output, TTL Level</li> <li>15 LTC TTL out LTC output, TTL Level</li> </ol>  | 15 pin D-SUB, female |

# Configuration Options

## Receiver Options

| RECEIVER TYPE  | SIGNAL TYPE           | SUPPLY VOLTAGE | CONNECTION TYPE |
|--|-----------------------|----------------|-----------------|
| GNS: L1 Multi-GNSS (GPS, GLONASS, Galileo, BeiDou), 72-Channel | L1/E1/B1 band         | 5 V DC         | SMA             |
| GPS: Meinberg GPS, 12-Channel                                  | IF (Meinberg Antenna) | 15 V DC        | BNC             |
| GNS-UC: Meinberg Multi-GNSS (GPS, Galileo), 72-Channel         | IF (Meinberg Antenna) | 15 V DC        | BNC             |

## Oscillator Options

| TYPE     | HOLDOVER PERFORMANCE (1 DAY) | HOLDOVER PERFORMANCE (1 YEAR) |
|----------|------------------------------|-------------------------------|
| OCXO HQ  | $\pm 22 \mu\text{s}$         | $\pm 788 \text{ ms}$          |
| OCXO DHQ | $\pm 4.5 \mu\text{s}$        | $\pm 158 \text{ ms}$          |

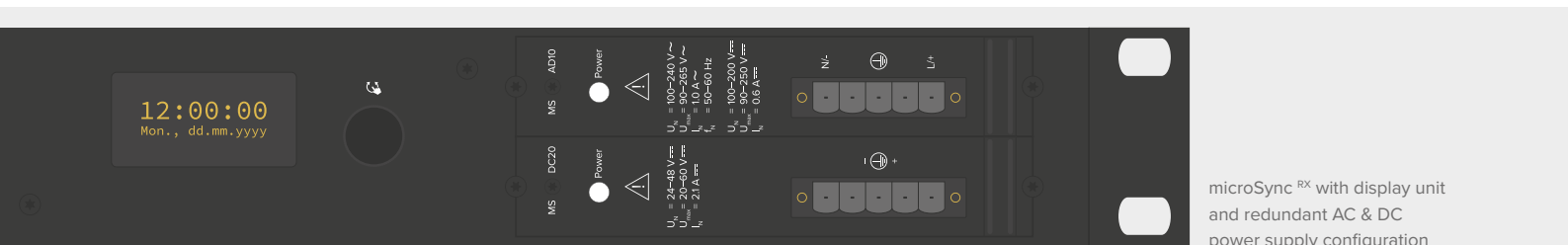
For detailed oscillator specifications, please visit: [www.mbg.link/osc](http://www.mbg.link/osc)

## Power Supplies

| TYPE | NOMINAL VOLTAGE RANGE ( $U_N$ )       | MAXIMUM VOLTAGE RANGE ( $U_{MAX}$ ) | MAXIMUM POWER CONSUMPTION ( $P_{MAX}$ ) |
|------|---------------------------------------|-------------------------------------|---|
| AD   | 100–240 V AC, 50–60 Hz / 100–200 V DC | 90–265 V AC, 47–63 Hz / 90–250 V DC | 50 W                                    |
| DC   | 24–48 V DC                            | 20–60 V DC                          | 50 W                                    |

## Display Unit (80x Series)

| TYPE | SYSTEM ADMINISTRATION OF   | INDICATION  |
|------|--|---|
| OLED | <ul style="list-style-type: none"> <li>IP Address</li> <li>Netmask</li> <li>Gateway</li> <li>DHCP</li> </ul> | <ul style="list-style-type: none"> <li>Time and Date</li> <li>Status of Synchronization Source: OK, SYNC, ASYNC</li> <li>Firmware Version</li> <li>Model and Serial Number</li> </ul> |



microSync<sup>®</sup> with display unit and redundant AC & DC power supply configuration

# Performance Level Options

| PERFORMANCE LEVEL | UNICAST CLIENTS | DELAY REQ./S IN MULTICAST / HYBRID MODE |
|-------------------|-----------------|---|
| PL-A              | 8               | 1024                                    |
| PL-B              | 256             | 32768                                   |
| PL-C              | 512             | 65536                                   |

# Software Specifications

## Protocols & Profiles

| NETWORK PROTOCOLS   | IEEE 1588 PROFILES  |
|---|---|
| <ul style="list-style-type: none"><li>▪ IPv4, IPv6</li><li>▪ NTPv3, NTPv4, SNTP</li><li>▪ PTPv2</li><li>▪ IEC 62439-3 (PRP)</li><li>▪ DHCP, DHCPv6</li><li>▪ DSCP</li><li>▪ IEEE 802.1q VLAN filtering/tagging</li><li>▪ IEEE 802.1p QOS</li><li>▪ SNMPv1/v2/v3</li><li>▪ Remote Syslog Support (UDP)</li></ul> | <ul style="list-style-type: none"><li>▪ IEEE 1588v2 Default Profile</li><li>▪ IEEE C37.238-2011 Power Profile</li><li>▪ IEEE C37.238-2017 Power Profile</li><li>▪ IEC/IEEE 61850-9-3 Power Utility Profile</li><li>▪ Enterprise Profile</li><li>▪ ITU-T G.8265.1, ITU-T G.8275.1, ITU-T G.8275.2 Telecom Profiles</li><li>▪ SMPTE ST 2059-2 Broadcast Profile</li><li>▪ IEEE 802.1AS TSN/AVB Profile</li><li>▪ AES67 Media Profile</li><li>▪ DOCSIS 3.1</li></ul> |

## Management

### User Management

The user management allows to create, manage and delete individual users. Thereby, each user can be given, or withdrawn individual write and read access for all configuration options, as well as read-only rights for status displays. Furthermore, users can be deactivated or added for a limited time. Password changes are also possible, as well as the option of periodically prompting the user to renew its password.

In addition, there are three available predefined role templates (admin, info, status) included that offer the user a preselection of access levels. Based on this, individual rights can be added or deleted. Moreover, management protocols like SNMP, Shell or mbgdevman can be enabled for each user account to limit access to the device.

### Firmware Management

The integrated firmware management of meinbergOS allows to install multiple firmware versions in parallel and choose which one to run. All integrated components and modules (e.g. the GPS receiver part) can be updated with the latest firmware if required.

### Meinberg Device Manager

The Meinberg Device Manager utility is a graphical desktop application that allows to configure Meinberg Devices over an encrypted network connection or a local USB or serial connection. A great advantage of the Meinberg Device Manager is that various devices can be configured and monitored simultaneously.

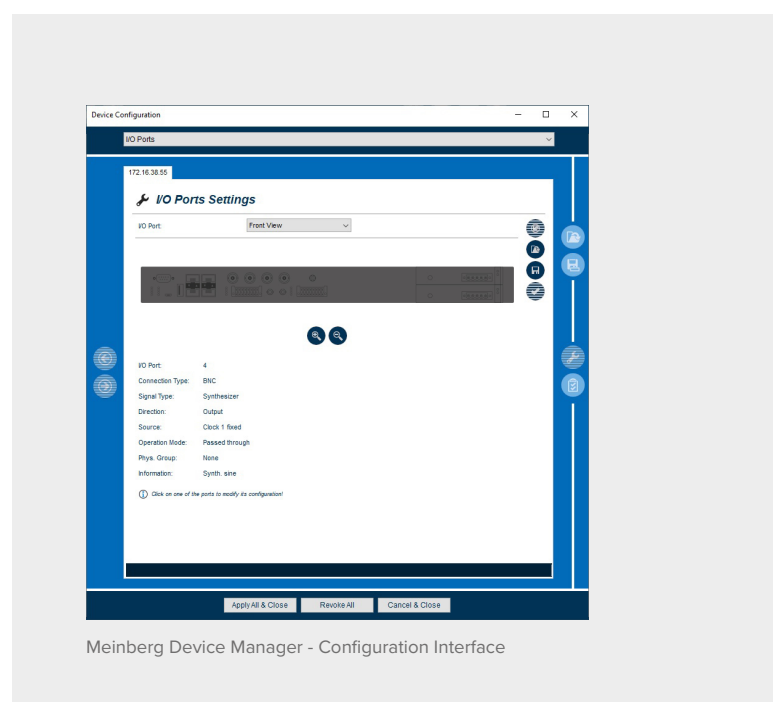
The Meinberg Device Manager for Windows can be used under Windows 7 and all newer versions. Supported Linux distributions include Ubuntu, Mint Linux, Debian, SUSE Linux, CentOS, and others.

The software is delivered on the USB stick included in the scope of delivery and does not have to be installed or copied on the PC. The Meinberg Device Manager can be started directly from the USB data carrier. The computer must be connected to the network in which the microSync system is connected.

Otherwise the software is available for download on our website: [www.meinbergglobal.com/english/sw/mbg-devman.htm](http://www.meinbergglobal.com/english/sw/mbg-devman.htm)

### Self-Diagnosis

The system continuously carries out background checks of various parameters such as system resources, port and receiver states. The user is notified when an incident occurs.



# Jamming and Spoofing Detection

Our GNSS receivers GNS181 and GNS181-UC are able to receive multiple GNSS constellations in parallel. The GNS181-UC can receive GPS and Galileo signals whereas the GNS181 can additionally receive GLONASS and Beidou signals. These receiver types have implemented Jamming and Spoofing Detection technologies.

## Anti-Jamming Technology

The detection of jamming attacks are based on active CW (continuous wave) interference detection and an on-board SAW band pass filter. In case a jamming event occurs where the GNSS satellites cannot be received anymore, the microSync will switch either seamlessly to the next available source in its priority list (e.g. IRIG-B or PTP) or falls back to its internal high quality OCXO which is available at different grades.

## Anti-Spoofing Technology

Spoofing is a process whereby a malicious third party tries to control the reported position via a “fake” GNSS broadcast signal. This may result in the form of reporting incorrect position, velocity or time. To combat against this, the receiver module includes spoofing detection measures to alert the system when signals appear to be suspicious.

The receiver combines a number of checks on the received signals looking for inconsistencies across several parameters. The spoofing detection feature monitors suspicious changes in the GNSS signal indicating external manipulation. The detection is successful when the signal is genuine first and when a transition to the spoofed signal is being observed. The algorithms rely on availability of signals from multiple GNSS constellations.

In case a spoofing attack is detected, the microSync system is notified by the receiver. The microSync system is then in a position to either switch to a different source or run on internal OCXO (available in firmware 2020.08.0 or higher).

# Multiple Reference Sources

The microSync system is able to handle input signals of Multiple Reference Sources (MRS) simultaneously.

The following input signals can be used in a user-configurable order:

- | GNSS
- | Serial Time String + PPS
- | PPS (depending on model)
- | 10 MHz (depending on model)
- | PTP
- | NTP (firmware V2020.08.0 and higher)

In case the signal which has the highest priority is lost, the system will switch to the next available source.

# Intelligent Reference Selection Algorithm

In case that a master signal fails the Intelligent Reference Selection Algorithm (IRSA) takes care that the switching to the next reference signal in the priority list runs automatically and smoothly.

If the next selectable source has an offset that is  $<10 \mu\text{s}$  compared to the previous one the system will slowly adjust to this offset without causing a phase jump. If the offset is larger than  $10\mu\text{s}$ , the system will set the time immediately.

In the event that the original source comes back, the system will again use that source for synchronization.

The IRSA also takes the highly stable holdover performance of the local oscillator into account. It ensures that switching from the superior reference signal to the less accurate one is delayed as long as the highly stable oscillator can provide better accuracy in holdover than the next available reference signal in the priority list.



# Scope of Delivery

| QUANTITY | ITEM  |
|----------|---|
| 1x       | microSync <sup>®</sup> (incl. Mounting Brackets <sup>1</sup> )            |
| 1x       | Antenna, L1 Multi-GNSS / Meinberg GPS Antenna/Converter Unit <sup>2</sup> |
| 1x       | Antenna Cable, 20 m (65.62 ft), SMA / BNC connector <sup>2</sup>          |
| 1x       | Antenna Mounting Kit <sup>2</sup>   |

<sup>1</sup> In order to withstand the environmental tests for vibration, shock and seismic, special mounting brackets are optionally available

<sup>2</sup> Depending on selected receiver

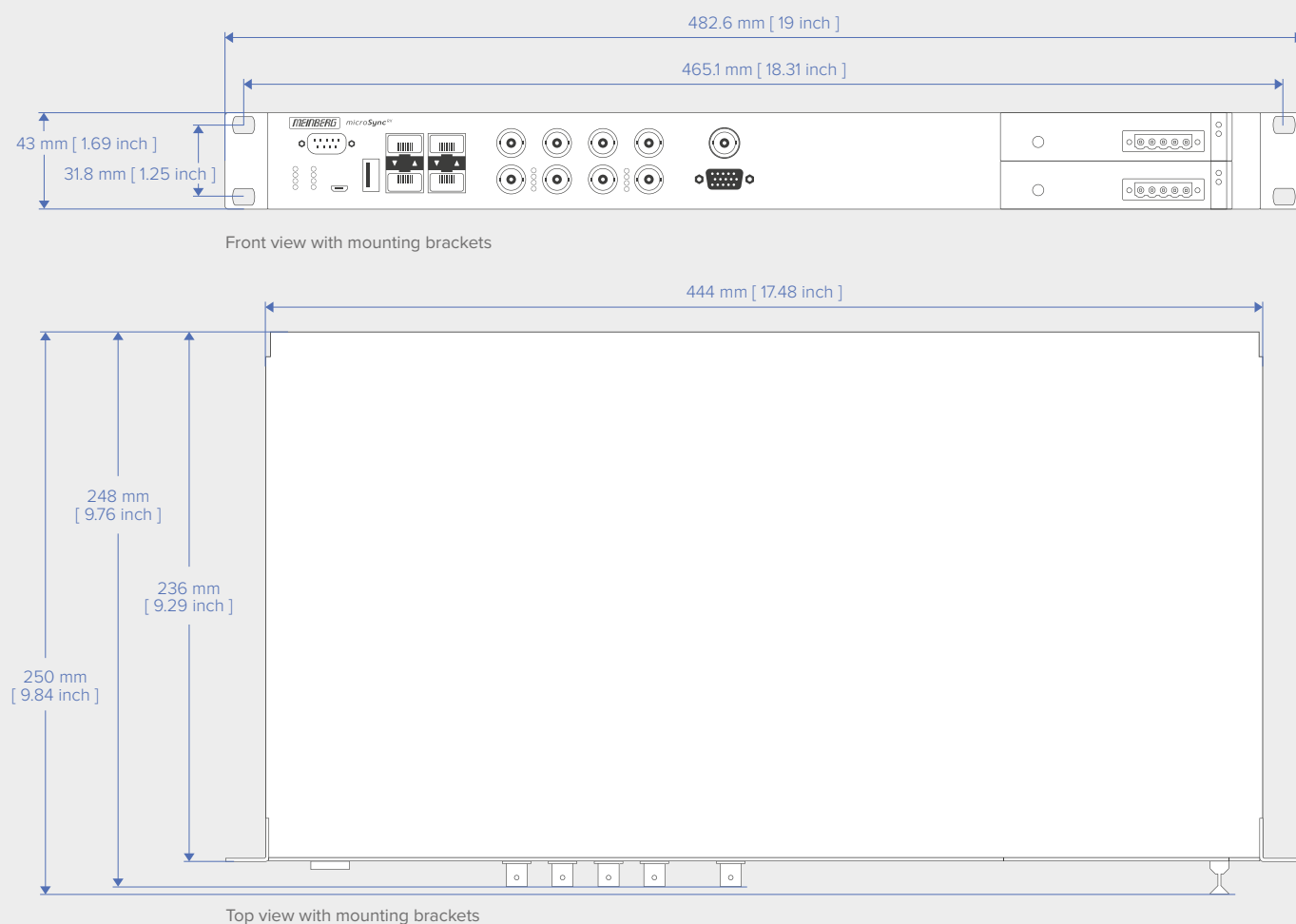
## Optional Expansions – SFP Modules

Recommended and tested transceivers from other vendors which are available at additional costs.

| RJ-45<br>(TRIPLE SPEED 10/100/1000 BASE-T) | SINGLE MODE<br>(1000BASE-LX, 10KM, LC SFP, 1310 NM) | MULTI MODE<br>(1000BASE-SX, LC SFP, 850 NM) |
|--|---|---|
| AVAGO ABCU-5740RZ                          | AVAGO AFCT-5710PZ                                   | AVAGO AFBR-5710PZ                           |
| FINISAR FCLF8521P2BTL                      | FINISAR FTLF1318P3BTL                               | FINISAR FTLF8524P3BNL                       |

# Technical Specifications

## Physical Dimensions



## Mechanical Data

|                                  |   |
|----------------------------------|---|
| Housing Type                     | 19" (Full-Rack), 1U                                   |
| Housing Material                 | Steel   |
| Weight (incl. Mounting Brackets) | approx. 3.7 kg (8.16 lbs), depending on configuration |

## Environmental Requirements

Recommendations for continuous operation.

|                             |  |
|-----------------------------|--|
| Operating Temperature Range | 0 to 50 °C (32 to 122 °F)                    |
| Storage Temperature Range   | -20 to 70 °C (-4 to 158 °F)                  |
| Relative Humidity           | 5 to 95 % (non-condensing) at 40 °C (104 °F) |
| Operating Altitude          | up to 4,000 m (13,123 ft) above sea level    |
| Atmospheric Pressure        | 615 to 1600 hPa                              |

# Type Tests

## Safety Tests

|                                    |                             |      |
|------------------------------------|-----------------------------|------|
| IEC 62368-1<br>Safety Requirements | Overvoltage Category        | II   |
|                                    | Protection Class            | 1    |
|                                    | Degree of Pollution         | 2    |
| IEC 60529                          | Protection Rating / IP Code | IP30 |

## Environmental Tests

|                |  |  |
|----------------|--|--|
| IEC 60068-2-1  | Cold   | -5 °C (23 °F), 16 h  |
| IEC 60068-2-2  | Dry heat                                       | 55 °C (131 °F), 16 h   |
| IEC 60068-2-14 | Change of temperature                          | -5 to 55 °C (23 to 131 °F), 5 cycles, 1 °C (34 °F)/min   |
| IEC 60068-2-30 | Damp heat, cyclic (12 h + 12 h)                | 55 °C (131 °F), 97 % RH, 6 cycles  |
| IEC 60068-2-78 | Damp heat, steady state                        | 40 °C (104 °F), 93 % RH, 240 h   |
| IEC 60255-21-1 | Vibration (sinusoidal) <sup>1</sup><br>Class 1 | 10-150 Hz, 0.5 g <sub>n</sub> , 2 sweeps, 3 axes<br>10-150 Hz, 1 g <sub>n</sub> , 40 sweeps, 3 axes  |
| IEC 60255-21-2 | Shock <sup>1</sup><br>Class 1                  | 5 g <sub>n</sub> , 11 ms, ±3 shocks, 3 axes<br>15 g <sub>n</sub> , 11 ms, ±3 shocks, 3 axes<br>10 g <sub>n</sub> , 16 ms, ±1000 shocks, 3 axes |
| IEC 60255-21-3 | Seismic <sup>1,2</sup><br>Class 1              | 4-35 Hz, 0.5 g <sub>n</sub> , 1 sweep, hor. axes<br>4-35 Hz, 1 g <sub>n</sub> , 1 sweep, ver. axis   |

<sup>1</sup> In order to withstand the tests for vibration, shock and seismic, special mounting brackets are optionally available.

<sup>2</sup> The frequency range deviates from the values required by the standard. In this test, a frequency range of 4-35 Hz instead of 1-35 Hz was used.





## Electromagnetic Compatibility – Immunity





|                |  |   |
|----------------|--|---|
| IEC 61000-4-2  | Immunity test to electrostatic discharges                                  | ±4 kV contact discharge<br>±8 kV air discharge  |
| IEC 61000-4-3  | Immunity test to radiated, radio-frequency, electromagnetic fields         | 10 V/m, 80-1000 MHz, 80% AM (1 kHz)<br>3 V/m, 1400-2700 MHz, 80% AM (1 kHz)   |
| IEC 61000-4-4  | Immunity test to electrical fast transients (Burst)                        | ±2 kV, DC main lines<br>±1 kV, Signal lines   |
| IEC 61000-4-5  | Immunity test to surges  | DC main lines:<br>up to ±0.5 kV line to line<br>up to ±0.5 kV line to earth<br><br>Signal lines:<br>up to ±1 kV line to earth |
| IEC 61000-4-6  | Immunity test to conducted disturbances, induced by radio-frequency fields | 10 V, 0.15-80 MHz, 80% AM (1 kHz)   |
| IEC 61000-4-8  | Immunity test to power frequency magnetic fields                           | 30 A/m  |
| IEC 61000-4-11 | Immunity tests to voltage dips, short interruptions and voltage variations | ΔU 30 % for 1 period<br>ΔU 60 % for 50 periods<br>ΔU 100 % for 5 periods<br>ΔU 100 % for 50 periods                           |
| IEC 61000-4-29 | Immunity test to voltage dips, short interruptions and voltage variations  | ΔU 30 % for 100 ms<br>ΔU 60 % for 100 ms<br>ΔU 100 % for 50 ms  |

## Electromagnetic Compatibility – Emission

|   |  |
|---|--|
| CISPR 16-1-2 and<br>CISPR 16-2-1  | Conducted disturbance voltage measurements |
| CISPR 16-2-3  | Radiated radio disturbance                 |
| CISPR 32  | Conducted disturbance current measurements |
| FCC 47 CFR Part 15<br>section 15.107 (b) [3]<br>RSS-Gen Issue 4 section 8.8 [4] | Conducted emission                         |
| FCC 47 CFR Part 15<br>section 15.109 (b) [3]<br>RSS-Gen Issue 4 section 8.9 [4] | Radiated emission                          |
| ETSI EN 303 413   | Standard for GNSS receiver                 |

## Compliance

|           |   |
|-----------|---|
| CB Scheme |    |
| CE        |    |
| FCC       |    |
| UL        |  |

|       |   |
|-------|---|
| CSA   |    |
| WEEE  |    |
| RoHS  |    |
| REACH |  |