

# SyncServer

## GNSS Antenna Accessories

Compatible with the SyncServer S600/S650 Series

### Outdoor Antenna Basics

Antenna cables and accessories enable versatile solutions that are easy to achieve. Inline GNSS amplifiers installed at the antenna are an easy way to extend cable runs from 225 feet to up to 900 feet, depending on cable type. Lightning arrestors provide valuable electrical shock protection to the downstream equipment. Antenna cable splitters leverage a single antenna and cable for up to four GNSS receivers.

Ordering antenna components is a simple task. The most important thing you need to have is a rough idea of the total cable length needed between the SyncServer and the mounting location of the antenna. Any extra cable can be coiled to the side.

Pre-configured kits that include cable, antenna, and related mounting accessories are available. These kits vary by total cable length, and are based on whether a lightning arrestor is required or not. For long cable runs (>225 feet), the components are assembled individually.


To assist and simplify configurations up to 900 ft., Microchip has included an Excel-based antenna configurator on the website. The configurator helps you determine the exact part numbers needed for the desired cable length and accessories.

Important: The antenna kit (part number 093-15202-001) includes a short adapter cable with BNC(m)-N(f) connectors. All primary antenna cables use N(m) connectors on either end. A single cable must be used between the adapter cable and the next accessory (lightning arrestor, inline amplifier, or antenna). Lightning arrestors include a 25-foot cable to connect to the next accessory (inline amplifier or antenna).


### Very Long Antenna Cables or Electrical Isolation

For very long antenna cable runs or for electrical isolation and protection from the outside environment, GNSS-over-Fiber links are very useful. Microchip offers a GNSS-over-Fiber link that can transmit the GPS/Galileo/GLONASS/BeiDou signals up to 6.2 miles (10,000 Km) over single mode fiber. The drop-in, intermediate link solution works with the standard Microchip antennas and accessories used to link the receiver to the antenna.


50-225 ft.  
Standard cable



225-450 ft.  
Standard cable +  
Inline Amplifier



450-900 ft.  
Low loss cable +  
Inline Amplifier



50 ft. – 6.2 Miles  
Rx Tx



Inline GPS over Fiber Link

## GPS/Galileo/GLONASS Antenna

The standard antenna used with the SyncServer S600/S650 is a high-gain (40 dB) GNSS antenna covering the GPS L1, Galileo E1, GLONASS L1, and SBAS (WAAS, EGNOS, QZSS and MSAS) frequency band (1575 MHz to 1606 MHz). The antenna has a three-stage low-noise amplifier, with a mid-section SAW with a tight pre-filter to protect against saturation by high-level sub-harmonics and L-Band signals, making it excellent for timing applications. An L-bracket for pole mounting and 3-foot BNC(m) to N(f) cable is also included.



### Technical

| Specification                    | Value                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------|
| 1 dB bandwidth                   | 31 MHz                                                                                        |
| Antenna gain                     | 4.5 dBic                                                                                      |
| Axial ratio                      | <4 dB at 1590 MHz,<br>8 dB typical at band-edges                                              |
| Filtered LNA frequency bandwidth | 1575 MHz to 1606 MHz                                                                          |
| Gain                             | 40 dB minimum flatness $\pm 2$ dB,<br>1575 MHz to 1606 MHz                                    |
| Out-of-band rejection <1550 MHz  | >50 dB                                                                                        |
| Out-of-band rejection >1640 MHz  | >70 dB                                                                                        |
| VSWR (at LNA output)             | <1.5:1                                                                                        |
| Noise figure                     | 2.5 dB typical                                                                                |
| Supply voltage range             | 2.5 V <sub>DC</sub> to 16 V <sub>DC</sub> nominal<br>(12 V <sub>DC</sub> recommended maximum) |
| Supply current                   | 20 mA maximum at 85 °C                                                                        |
| Mechanical size                  | 66.5 mm diameter $\times$ 21 mm height                                                        |
| Operating temp.                  | -40 °C to 85 °C                                                                               |
| Weight                           | 150 g                                                                                         |
| Environmental                    | IP67, CE, REACH, and RoHS-compliant                                                           |
| Salt fog/spray                   | MIL-STD-810F Section 509.4                                                                    |

## GPS/Galileo/GLONASS/BeiDou Antenna

This wide-band antenna is a precision high-gain GNSS antenna covering the BeiDou B1, Galileo E1, GPS L1, GLONASS L1, and SBAS (WAAS, EGNOS, QZSS, and MSAS) frequency band (1557 MHz to 1606 MHz). It provides very circular polarized signal reception through the entire bandwidth of the antenna, thereby providing superior multipath signal rejection. The antenna has a three-stage low noise amplifier, comprised of one input LNA per feed, a mid section SAW to filter the combined output, and a final output gain stage. An additional pre-filter provides extra strong protection from near frequency and strong harmonic signals. An L-bracket for pole mounting and 3-foot BNC(m) to N(f) cable is also included.



### Technical

| Specification                           | Value                                                                                         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------|
| 2 dB bandwidth                          | 47 MHz                                                                                        |
| Antenna gain (with 100 mm ground plane) | 4.25 dBic                                                                                     |
| Axial ratio                             | <2 dB typical, 3 dB max                                                                       |
| Filtered LNA frequency bandwidth        | 1559 MHz to 1606 MHz                                                                          |
| Gain                                    | 40 dB minimum                                                                                 |
| Out-of-band rejection <1500 MHz         | >50 dB                                                                                        |
| Out-of-band rejection >1640 MHz         | >70 dB                                                                                        |
| VSWR (at LNA output)                    | <1.5:1                                                                                        |
| Noise figure                            | 3 dB typical                                                                                  |
| Supply voltage range                    | 2.5 V <sub>DC</sub> to 16 V <sub>DC</sub> nominal<br>(12 V <sub>DC</sub> recommended maximum) |
| Supply current                          | 19 mA maximum at 85 °C                                                                        |
| Mechanical size                         | 66.5 mm diameter $\times$ 21 mm height                                                        |
| Operating temp.                         | -40 °C to 85 °C                                                                               |
| Weight                                  | 150 g                                                                                         |
| Environmental                           | IP67, CE, REACH, and RoHS-compliant                                                           |
| Salt fog/spray                          | MIL-STD-810F Section 509.4                                                                    |

## Anti-Jam Antenna for GPS/Galileo/GLONASS/BeiDou

The Anti-Jam (AJ) Antenna is a precision, high-gain GNSS antenna providing single-band GPS/QZSS-L1, GLONASS-G1, Galileo-E1, and BeiDou-B1 coverage, including SBAS satellites.

By providing a truly circular polarized signal reception through the entire bandwidth of the antenna, the AJ Antenna exhibits superior multipath signal rejection. The antenna also has a strong pre-filter to mitigate inter-modulated signal interference from LTE and other cellular bands.

The design of the AJ Antenna modifies the radiation pattern of the antenna such that it is “deaf” to signals arriving between 10° below to 15° above the horizon while slightly increasing the gain of the antenna at zenith. Since jamming signals typically originate at low elevations below the antenna, which is typically mounted on a rooftop, the AJ Antenna effectively mitigates signals below 15° above the horizon.

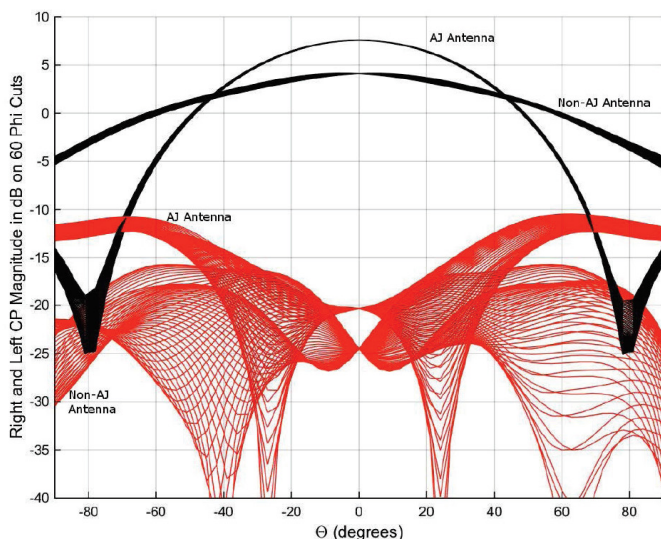
### A Perfect Complement to BlueSky Technology

The AJ antenna perfectly complements the SyncServer BlueSky software option with upgraded SyncServer oscillator, such as an OCXO or Rubidium. The AJ antenna will be the first line of defense from strong intentional, or unintentional GNSS jamming signals. More subtle jamming detection techniques monitored by BlueSky technology leverage awareness of RF interference as well as established thresholds to detect GNSS jamming anomalies in the local area. If jamming is detected, or the GNSS signal is lost, an upgraded SyncServer oscillator will help maintain SyncServer time accuracy for extended periods of time while the jamming issue is resolved.









### Technical

| Specification                    | Value                                                  |
|----------------------------------|--------------------------------------------------------|
| Axial ratio                      | ≤2 dB typical                                          |
| Filtered LNA frequency bandwidth | 1559 MHz to 1606 MHz                                   |
| Gain                             | 38 dB minimum                                          |
| Out-of-band rejection <1500 MHz  | >50 dB                                                 |
| Out-of-band rejection >1640 MHz  | >70 dB                                                 |
| VSWR (at LNA output)             | <1.5:1 typical, 1.8:1 maximum                          |
| Noise figure                     | 3 dB typical                                           |
| Supply voltage range             | 2.5 Vdc to 16 Vdc nominal (12 Vdc recommended maximum) |
| Supply current                   | 19 mA typical                                          |
| Mechanical size                  | 100 mm diameter × 102 mm height                        |
| Operating temp.                  | -40°C to 85°C                                          |
| Weight                           | 370 g                                                  |
| Compliance                       | IP67, FCC, RED/CE, REACH and RoHS-compliant            |
| Salt fog/spray                   | MIL-STD-810F Section 509.4                             |



Radiation pattern of Anti-Jam antenna versus Non-Anti-Jam antenna at 1575 MHz (black = Right hand circular polarized, red = left hand circular polarized)

## GNSS-Over-Fiber Kit

|          | Receiver Adapter Cable                                                            | Receiver FOL Module                                                                        | Fiber Bench Cable                                                                 | Transmitter FOL Module                                                                     | Antenna Adapter Cable                                                               | Lightning Arrestor Adapter Cable                                                                    |         |
|----------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------|
| Receiver | BNC(M) – SMA(M)<br>1 meter<br>LMR 240 or equivalent                               | SMA(F) – SC/APC<br>External PSU with multi-connector<br>PSU power cord with U.S. connector | SC/APC – SC/APC<br>3 meters                                                       | SC/APC – SMA(F)<br>External PSU with multi-connector<br>PSU power cord with U.S. connector | SMA(M) – N(F)<br>1 meter<br>LMR 240 or equivalent                                   | N(M) – N (M)<br>1 foot<br>LMR 240 or equivalent (this is used if lighting arrestor is deployed)     | Antenna |
|          |  |           |  |           |  | <br>use optional |         |

The GNSS-over-Fiber kit is composed of an RF-to-fiber transmitter, a Fiber-to-RF receiver, two external power supplies, and four adapter cables. The fiber cable provided is a 3 meter long cable for bench testing if desired.

The receiver adapter cable and fiber optic receiver connect directly to the SyncServer. The fiber optic transmitter and antenna adapter cable connect directly to the outside antenna cable. The user must provide the single mode 1310 nm cable with SC/APC connectors between the transmitter and the receiver. Maximum length of the fiber cable is 10 kilometers. This solution will work with up to 200 feet of LMR-240 cable between the transmitter and the Microchip supplied GNSS antenna. This solution is electrically matched to only work with Microchip supplied antennas and cable types.

## Specifications

### Electrical

- Transmitter Power Consumption: 1.9W
- Receiver Power Consumption: 1.3W
- Flange mounting PSU with OEM connector: 90-264V, 50/60 Hz, 2 Pin IEC connector
- RF Link: GPS, Galileo, GLONASS, BeiDou (1000-1800 MHz)

### Physical

- Receiver/Transmitter Dimensions: 89 x 46 x 20 mm
- Weight: 130g/each
- RF Connector: SMA(F)
- Fiber connector: SC/APC
- Fiber compatibility: Single mode 1310nm
- Maximum fiber length: 10 kilometers

### Environmental

- Operating Temperature: -10°C to +50°C
- Humidity: 0-95% non-condensing
- Cooling: Convection

Not suitable for outdoor installation unless mounted in appropriate enclosure.

### Certification

- FCC, CE, RoHS
- TAA Compliant

### Product Includes

- One BNC(M)-SMA(M) cable, 1 meter LMR 240 or equivalent
- One SMA(F)-SC/APC Fiber to RF Receiver
- Two External Power Supply Units with mounting brackets and power cords (North American NEMA 1 Type A connector).
- One SC/APC-SC/APC fiber cable, 3 meters
- One SMA(F)-SC/APC RF to Fiber Transmitter
- One SMA(M)-N(F) cable, 1 meter LMR 240 or equivalent
- One N(M)-N(M) cable, 1 foot LMR 240 or equivalent (used if lighting arrestor is deployed)

## GNSS Inline Amplifier

Cable length is a common cause for signal loss between the GNSS antenna and the GNSS receiver. As with any electromagnetic radio wave, GNSS signals become attenuated as they pass through an electrical cable. The amount of signal loss depends on the length and type of cable used. The inline amplifier attaches the antenna and the antenna cable. It uses the same power as the antenna and does not require extra wiring.

### Features

- Extended cable length up to 900 ft depending on the cable type
- Fits inline with antenna cable
- No external power source needed
- Simple installation



### Electrical

| Specification     | Value                 |
|-------------------|-----------------------|
| Nominal gain      | 25 dB 4/0 dB typical  |
| Pass band ripple  | ±2 dB                 |
| Impedance         | 50 Ω                  |
| Noise figure      | 2 dB typical          |
| Bandwidth         | 1.2 GHz to 1.8 GHz    |
| Input VSWR        | 1.5 typical/2 maximum |
| Output VSWR       | 1.5 typical/2 maximum |
| Reverse isolation | >35 dB                |
| Output 1 dB       | -10 dB                |
| Output IP3        | 5 dBm                 |

### Mechanical and Environmental

| Specification   | Value                                |
|-----------------|--------------------------------------|
| Mechanical size | 2.32 in. length x 0.787 in. diameter |
| Connector       | N-Type                               |
| Operating temp. | Range -40 °C to 85 °C                |
| Environmental   | RoHS, REACH, and IP67                |

## GNSS Lightning Arrestor

Lightning does not have to strike the antenna to significantly damage the antenna or the GNSS receiver. Damage is often due to the effects of a lightning strike on a nearby structure, not a direct strike on the antenna itself. Since lightning strikes may induce damaging voltages in the antenna system when striking nearby objects, attempt to locate the antenna away from lightning rods, towers, and other structures that attract lightning. Also, locate the GNSS antenna lower than any nearby structures that are likely to attract a strike.



### Technical

| Specification            | Value                                                   |
|--------------------------|---------------------------------------------------------|
| Type                     | DC pass                                                 |
| Mount type               | Bulkhead mount                                          |
| PIM rated                | N                                                       |
| Standards                | CE-compliant, RoHS-compliant                            |
| Connector                | N                                                       |
| Surge side connector     | Bi-directional N                                        |
| Protected side connector | Bi-directional N                                        |
| Frequency range          | dc to 5 GHz                                             |
| Turn on voltage          | 150 Vdc (spark over)                                    |
| RF power                 | 25 W                                                    |
| VSWR                     | ≤1.2 dB to 1                                            |
| Insertion loss           | ≤0.1 dB                                                 |
| Protocol/application     | Gas tube, DC pass RF coaxial protection for dc to 5 GHz |

The lightning arrestor also ships with 25 ft of either standard or low-loss cable.

## GPS/Galileo/GLONASS/BeiDou Splitter

This multi-band, 4:1 active splitter makes it possible to use a single GNSS referencing antenna/cable arrangement for multiple synchronization systems. The splitter accepts power from all attached GNSS receivers and deterministically selects power from the lowest port number providing the specified input voltage range. If the antenna fails and does not draw current, the splitter will provide all connectors with a current draw lower than 1 mA, indicating an antenna fault.

### Features

- Four ports
- Accepts power from all attached receivers
- Automatically switches on power failure of one receiver
- Antenna failure detection/indication
- Rugged military-grade aluminum enclosure
- Amplification to compensate for signal-splitting loss
- IP67-compliant

### Compatible With

- GPS/QZSS-L1/L2/L5, QZSS-L6
- GLONASS-G1/G2/G3,
- BeiDou-B1/B2/B2a/B3
- Galileo-E1/E5a/E5b/E6



### Technical

| Specification                              | Value                   |
|--------------------------------------------|-------------------------|
| Number of output ports                     | 4                       |
| Input/output impedance                     | 50 $\Omega$             |
| Frequency range                            | 1.1 GHz to 1.7 GHz      |
| Noise figure                               | 3.6 dB typ., 4.0 dB max |
| Port-to-port isolation                     | 42 dB                   |
| DC power                                   | 3.3 Vdc to 12 Vdc       |
| Operating current                          | 15 mA typ., 25 mA max   |
| Pass through current                       | 230 mA                  |
| Group delay, L1                            | 1.4 ns                  |
| RF connectors                              | Female N-type           |
| RoHS, REACH & WEEE, EN60950-1, RED/CE, FCC | Compliant               |
| Gain                                       | 0 dB $\pm$ 1 dB         |

## Antenna Kits and Components\*

| Description                                                                                                                                                     | Part Number   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Kit: Total length: 50 ft, cable: 50 ft; GPS/Galileo/GLONASS antenna kit                                                                                         | 990-15202-050 |
| Kit: Total length: 75 ft, cable: 50 ft; lightning arrestor; cable: 25 ft; GPS/Galileo/GLONASS antenna kit                                                       | 990-15202-075 |
| Kit: Total length: 100 ft, cable: 100 ft; GPS/Galileo/GLONASS antenna kit                                                                                       | 990-15202-100 |
| Kit: Total length: 125 ft, cable: 100 ft; lightning arrestor; cable: 25 ft; GPS/Galileo/GLONASS antenna kit                                                     | 990-15202-125 |
| Kit: Total length: 150 ft, cable: 150 ft; GPS/Galileo/GLONASS antenna kit                                                                                       | 990-15202-150 |
| Kit: Total length: 175 ft, cable: 150 ft; lightning arrestor; cable: 25 ft; GPS/Galileo/GLONASS antenna kit                                                     | 990-15202-175 |
| Kit: Total length: 200 ft, cable: 200 ft; GPS/Galileo/GLONASS antenna kit                                                                                       | 990-15202-200 |
| Kit: Total length: 225 ft, cable: 200 ft; lightning arrestor; cable: 25 ft; GPS/Galileo/GLONASS antenna kit                                                     | 990-15202-225 |
| 250 ft antenna cable                                                                                                                                            | 060-15202-250 |
| 350 ft antenna cable                                                                                                                                            | 060-15202-350 |
| 450 ft antenna cable                                                                                                                                            | 060-15202-450 |
| 500 ft low-loss antenna cable                                                                                                                                   | 060-15202-500 |
| 750 ft low-loss antenna cable                                                                                                                                   | 060-15202-750 |
| 900 ft low-loss antenna cable                                                                                                                                   | 060-15202-900 |
| Kit: GPS/Galileo/GLONASS antenna; mounting bracket; adapter cable for chassis                                                                                   | 093-15202-001 |
| Kit: GPS/Galileo/GLONASS/BeiDou antenna; mounting bracket; adapter cable for chassis                                                                            | 093-15202-006 |
| Kit: Anti-Jamming GPS/Galileo/GLONASS/BeiDou L1 antenna; mounting bracket; adapter cable for chassis                                                            | 093-15202-010 |
| Inline amplifier with adapter                                                                                                                                   | 093-15202-005 |
| Kit: Lightning arrestor with 25 ft cable                                                                                                                        | 093-15202-002 |
| Kit: Lightning arrestor with 25 ft low-loss cable                                                                                                               | 093-15202-003 |
| Kit: GPS/Galileo/GLONASS/BeiDou 1:4 splitter with two 3 ft cables                                                                                               | 093-15202-011 |
| Kit: GNSS-Over-Fiber with RF-to-fiber transmitter; Fiber-to-RF receiver; 2 power supplies; 4 adapter cables, including a 3 meter fiber cable for bench testing. | 093-15203-001 |

\*Note: All antenna specifications are for the standard S600/S650 and L1/E1/10F and B1 frequency class models. For antenna and cable information pertaining to the L1/L2 S650 M-Code model, contact Microchip for details.