# TimeProvider® 4100 GNSS Antenna Accessories

## Compatible with the TimeProvider 4100 Product Family

## 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 TimeProvider 4100 and the mounting location of the antenna. Any extra cable can be coiled to the side.

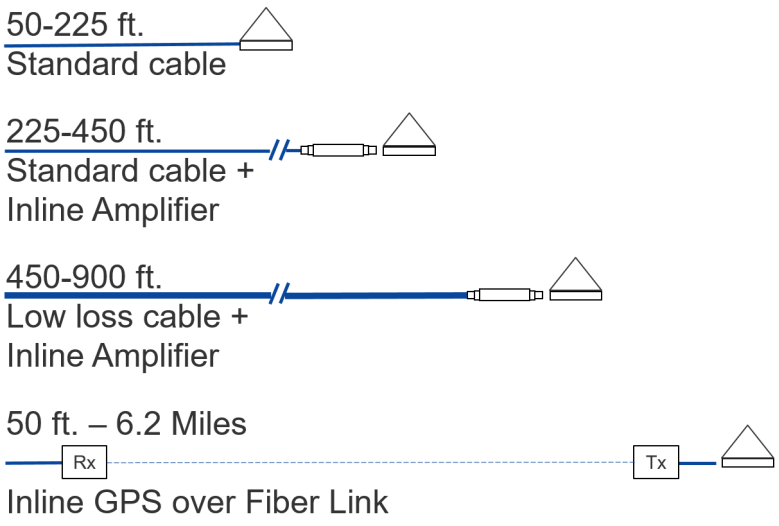
Pre-configured kits that include cable, antenna, and related mounting accessories are available. These kits vary by total cable length and are based on whether a lightning arrestor is required or not. For long cable runs (>225 feet), the components are assembled individually.

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.



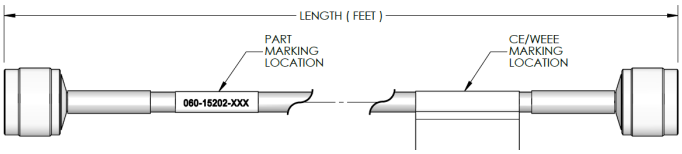
## Key Consideration: ePRTC Operation and Special Calibrated Cables

TimeProvider 4100 units, starting with version 2.1.10, can be configured to operate as an enhanced PRTC (ePRTC) system. A software license to enable ePRTC operation mode needs to be installed.

All GNSS accessories described for either single-band or multi-band, will operate in ePRTC mode.

Specific care needs to be taken regarding calibration. The units themselves are calibrated at the factory. It is important to consider the impact of cables being used. If the GNSS infrastructure is already in place, it is very likely that cables have been measured and the calibration coefficients need to be entered into the TimeProvider 4100 unit configuration.

In case of a green field ePRTC deployment and to facilitate the task of calibration for the customers, some specific calibrated cables are offered. These specific cable assemblies have stringent length tolerances of ± 0.5% of total length. They also include a delay rating that is illustrated by a specific labeling.




These calibrated cables (part numbers 060-15203-XXX) offer several length options from 50 Feet to 450 Feet.

## Key Consideration: Multi-Band Operation and Special Multi-Band Antenna

TimeProvider 4100 units, starting with version 2.2, are equipped with support for multi-band GNSS. Per default these units are configured as single-band units.

Customers who have previously deployed single-band accessories and kits (cables, splitters, amplifiers, antenna) can continue to use these with the TP4100.

Customers who wish to enhance their TimeProvider 4100 unit to take advantage of multi-band capabilities need to upgrade via a software license for multi-band function to be turned on.

The only accessory to upgrade in the deployment is the antenna which needs to be the multi-band antenna as shown below, all other accessories can remain the same.

## Single-Band GPS/Galileo/GLONASS Antenna

The standard antenna used with the TimeProvider 4100 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, 8 dB typical at band-edges |
| **Filtered LNA frequency bandwidth** | 1575 MHz to 1606 MHz |
| **Gain** | 40 dB minimum flatness ±2 dB, 1575 MHz to 1606 MHz |

### Out-of-Band Rejection

| Specification | Value |
|---|---|
| **<1550 MHz** | >50 dB |
| **>1640 MHz** | >70 dB |
| **VSWR (at LNA output)** | <1.5:1 |
| **Noise figure** | 2.5 dB typical |
| **Supply voltage range** | 2.5 Vdc to 16 Vdc nominal (12 Vdc recommended maximum) |
| **Supply current** | 20 mA maximum at 85 °C |
| **Mechanical size** | 66.5 mm diameter × 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 |

## Single-Band Antenna With Beidou Support

### GPS/Galileo/GLONASS/BeiDou

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

| Specification | Value |
|---|---|
| **<1500 MHz** | >50 dB |
| **>1640 MHz** | >70 dB |
| **VSWR (at LNA output)** | <1.5:1 |
| **Noise figure** | 3 dB typical |
| **Supply voltage range** | 2.5 Vdc to 16 Vdc nominal (12 Vdc recommended maximum) |
| **Supply current** | 19 mA maximum at 85 °C |
| **Mechanical size** | 66.5 mm diameter × 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 |

# Multi-Band GNSS Antenna

The Multi-band antenna (Part number 112-00163-000) is an Accutenna® technology antenna providing triple-band GPS/QZSS-L1/L2/L5, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b, BeiDou-B1/B2/B2a, NavIC-L5, including the satellite-based augmentation system (SBAS) available in the region of operation [WAAS (North America), EGNOS (Europe), MSAS (Japan), or GAGAN (India)], plus L-band correction services coverage, and is especially designed for precision triple-frequency positioning.

## Features

- Very low noise preamp (< 2.5 dB typ.)
- Low axial ratio (< 2.0 dB typ.)
- Tight phase center variation
- High-gain LNA gain (37 dB typ.)
- Low current (24 mA typ.)
- ESD circuit protection (15 kV)
- Invariant performance from 2.5 to 16 VDC
- IP69K, REACH, RoHS, and S-9401.V1.0 compliant
- EN45545-2, EN50121, EN50155, and EN61373 compliant

## Benefits

- Great multipath rejection
- Increased system accuracy
- Great signal-to-noise ratio

## Technical

| Specification | Value |
|---|---|
| **Antenna gain (with 100 mm ground plane)** | L1: 4.0 dBic<br>L2: 4.0 dBic<br>B2/E5b: 2.5 dBic<br>E1: 4.0 dBic |
| **Axial ratio** | L1/E1 <1 dB<br>L2 < 1dB<br>E5b < 1.5dB<br>B2 < 1.5dB |
| **Filtered LNA frequency bandwidth** | L-Band: 1525 MHz to 1606 MHz<br>L2/L5: 1164 MHz – 1254 MHz |
| **Gain** | 37 dB Typ. 35 dB min |

## Out-of-Band Rejection

| Specification | Value |
|---|---|
| **VSWR (at LNA output)** | <1.5:1 typ. 1.8:1 max |
| **Noise figure** | 2.5 dB typical at 25°C |
| **Supply voltage range** | 2.5 Vdc to 16 Vdc nominal |
| **Supply current** | 24 mA typ. at 25 °C |
| **Mechanical size** | 66 mm diameter × 21 mm height |
| **Operating temp.** | –40 °C to 85 °C |
| **Weight** | 185 g |
| **Environmental** | IP67, CE, REACH, and RoHS-compliant |
| **Salt fog/spray** | MIL-STD-810F Section 509.4 |

## GNSS-Over-Fiber Kit

| Receiver | Receiver Adapter Cable | Receiver FOL Module | Fiber Bench Cable | Transmitter FOL Module | Antenna Adapter Cable | Lightning Arrestor Adapter Cable | Antenna |
|---|---|---|---|---|---|---|---|
| | BNC(M) – SMA(M)<br>1 meter<br>LMR 240 or equivalent | SMA(F) – SC/APC<br>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) | |
| | |  | |  | | 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 TimeProvider 4100. 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 electro- magnetic 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 in line 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 because 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
- Very low noise figure
- 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 Ω |
| **Frequency range** | 1:1 GHz to 1:7 GHz |
| **Noise figure** | 3.5dB typ., 3.8 dB max |
| **Port-to-port isolation** | 40 dB |
| **DC power** | 3.0 VDC to 12 VDC |
| **Operating current** | 15 mA to 25 mA |
| **Pass through current** | 230 mA |
| **Group delay, L1** | 5 ns |
| **RF connectors** | Female N-type |
| **RoHS, REACH & WEEE, EN60950-1, RED/CE, FCC** | |
| **Compliant** | |
| **Gain** | 0 dB ±1 dB |

## Antenna Kits and Components*

| Description | Part Number |
|---|---|
| Kit: 50 ft. total length: 50 ft. Cable; Antenna Kit | 990-15202-050 |
| Kit: 50 ft. total length: 50 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-050 |
| Kit: 75 ft. total length: 50 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit | 990-15202-075 |
| Kit: 75 ft. total length: 50 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-075 |
| Kit: 100 ft. total length: 100 ft. Cable; Antenna Kit | 990-15202-100 |
| Kit: 100 ft. total length: 100 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-100 |
| Kit: 125 ft. total length: 100 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit | 990-15202-125 |
| Kit: 125 ft. total length: 100 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-125 |
| Kit: 150 ft. total length: 150 ft. Cable; Antenna Kit | 990-15202-150 |
| Kit: 150 ft. total length: 150 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-150 |
| Kit: 175 ft. total length: 150 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit | 990-15202-175 |
| Kit: 175 ft. total length: 150 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-175 |
| Kit: 200 ft. total length: 200 ft. Cable; Antenna Kit | 990-15202-200 |
| Kit: 200 ft. total length: 200 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-200 |
| Kit: 225 ft. total length: 200 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit | 990-15202-225 |
| Kit: 225 ft. total length: 200 ft. Cable; Lightning Arrestor; 25 ft. Cable; Antenna Kit Calibrated Cable for ePRTC application | 990-15203-225 |
| 250 ft. Antenna Cable | 060-15202-250 |
| 250 ft. Antenna Cable (calibrated for ePRTC) | 060-15203-250 |
| 350 ft. Antenna Cable | 060-15202-350 |
| 350 ft. Antenna Cable (calibrated for ePRTC) | 060-15203-350 |
| 450 ft. Antenna Cable | 060-15202-450 |
| 450 ft. Antenna Cable (calibrated for ePRTC) | 060-15203-450 |
| 500 ft. Low Loss Antenna Cable | 060-15202-500 |
| 500 ft. Low Loss Antenna Cable (calibrated for ePRTC) | 060-15203-500 |
| 750 ft. Low Loss Antenna Cable | 060-15202-750 |
| 750 ft. Low Loss Antenna Cable (calibrated for ePRTC) | 060-15203-750 |
| 900 ft. Low Loss Antenna Cable | 060-15202-900 |
| 900 ft. Low Loss Antenna Cable (calibrated for ePRTC) | 060-15203-900 |
| Kit: Antenna (GPS/GLONASS); Mounting Bracket; Adapter cable for chassis | 093-15202-001 |
| Kit: Antenna (GPS/GLONASS/BeiDou); Mounting Bracket; Adapter cable for chassis | 093-15202-006 |
| 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: 1:4 Splitter with two (2) x 3 ft. cables (GPS/GLONASS/BeiDou) | 093-15202-007 |
| 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 |
| TP4100 ANTENNA MOUNTING KIT, GNSS, BRACKET, CBL, TP4100 | 093-15041-001 |

## Very Long Antenna Cable Options

| Description | Part Number |
|---|---|
| L1 GPS Antenna Down/Up Converter & 50 ft cable, External Power Supply | 142-6150-50 |
| L1 GPS Antenna Down/Up Converter & 1000 ft cable (300 m), External Power Supply | 142-6150-1000 |
| L1 GPS Antenna Down/Up Converter & 1250 ft cable (375 m), External Power Supply | 142-6150-1250 |
| L1 GPS Antenna Down/Up Converter & 1500 ft cable (450 m), External Power Supply | 142-6150-1500 |
| Spare L1 GPS Antenna Down/Up Converter with no cable, External Power Supply | 142-6150 |
| Spare L1 GPS Antenna Down Converter | 140-615 |
| Spare L1 GPS Up Converter | 150-615 |
| GPS Lightning Arrestor (for use with down converter only) | 140-017-2 |
| Spare External Down/Up Converter Power Supply | 088-010-1 |

## Multiband Antenna Kits

| Description | Part Number |
|---|---|
| Kit 50 FT, MULTIBAND ANT, CALIBRATED CBL | 990-15204-050 |
| KIT 75 FT, MULTIBAND ANT, CALIBRATED CBL, LIGHTNING ARRSTR | 990-15204-075 |
| KIT 100 FT, MULTIBAND ANT, CALIBRATED CBL | 990-15204-100 |
| KIT 125 FT, MULTIBAND ANT, CALIBRATED CBL, LIGHTNING ARRSTR | 990-15204-125 |
| KIT 150 FT, MULTIBAND ANT, CALIBRATED CBL | 990-15204-150 |
| KIT 175 FT, MULTIBAND ANT, CALIBRATED CBL, LIGHTNING ARRSTR | 990-15204-175 |
| KIT 200 FT, MULTIBAND ANT, CALIBRATED CBL | 990-15204-200 |
| KIT 225 FT, MULTIBAND ANT, CALIBRATED CBL, LIGHTNING ARRSTR | 990-15204-225 |
| KIT, MULTIBAND ANTENNA GPS GALILEO GLONASS BEIDOU, 10FT | 093-15204-001 |