

Antenna Installation Guide

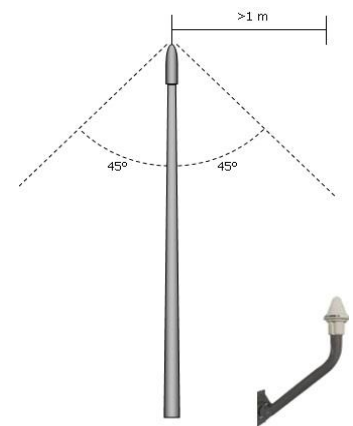
1. Pre Installation

1.1 Antenna Placement

The antenna should always be installed in a position where it has a clear view of the satellites in the sky. When surveying a site prior to installation, consider any fixed or moving obstructions which may affect GNSS reception (E.g. Terrain, Pylons, mobile obstructions...). Avoid close proximity to antennas from other services where possible. The antenna has excellent rejection characteristics to out-of-band signals, as does the GNSS receiver, but high-powered RF signals in close proximity to the antenna may swamp the very low-level signals from the GNSS satellites.

1.2 Reducing the risk of lightning strike

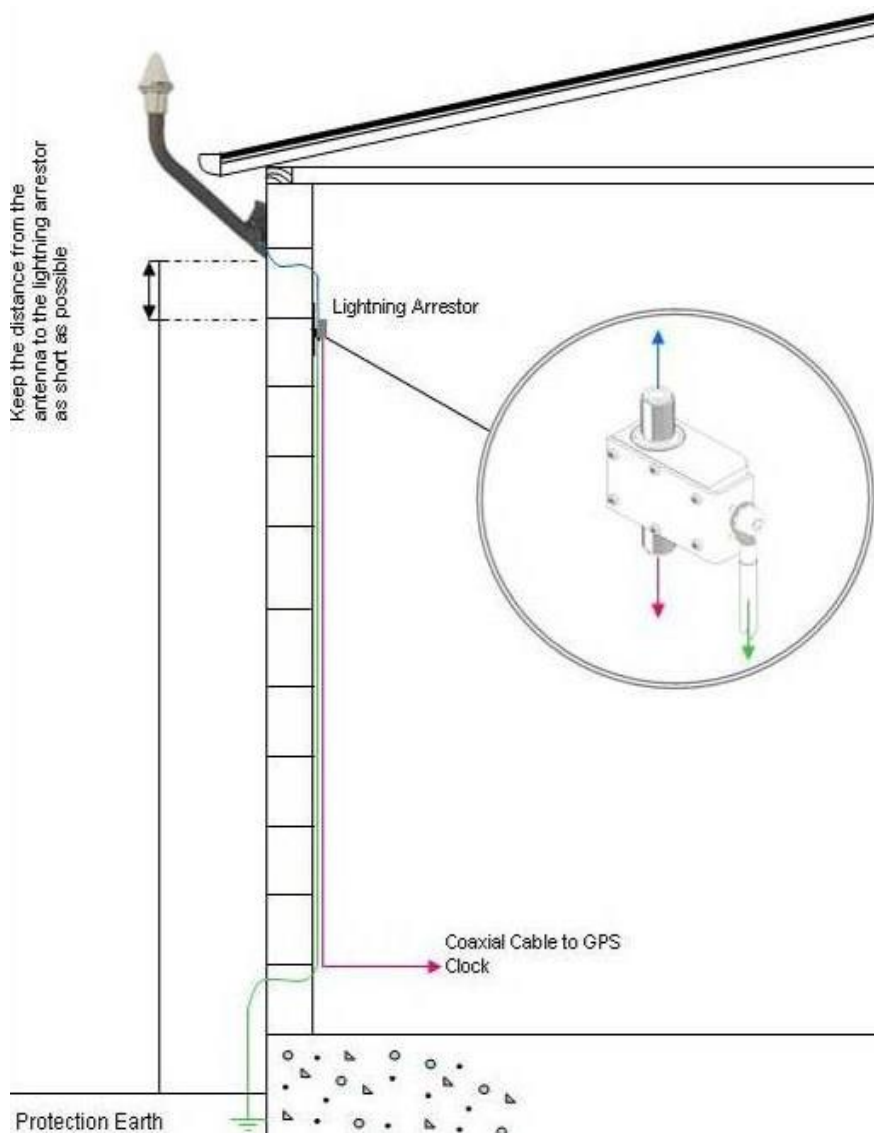
The first line of protection against the effects of lightning-induced surge events involves positioning the antenna in a “lightning-protected zone”. In practice, this means ensuring that there is at least one other earth-bonded structure located in the same rooftop area (e.g. another antenna, or a lightning rod) that reaches significantly higher than the top of the GNSS antenna. The GNSS Antenna should then be mounted so that it lies within a 45-degree angle from the top of the other earth-bonded structure. The GNSS antenna mount itself should also be securely bonded directly to the building protection earth – and not connected via any of the other earthed structures. By following the directions above you will reduce the risk of lightning strike. However, there is no fail-safe way of preventing lightning strike. A lightning arrestor should be installed to reduce the risk of damage caused in this instance.



1.3 Lightning Protection

At installations where lightning frequently occurs, it is prudent to install a lightning arrester between the antenna and clock. Tekron's antenna lightning protection kit provides additional protection through the use of an impulse suppressor. In the event of a lightning derived high voltage surge occurring, the impulse suppressor activates, short-circuiting the cable directly to earth.

For the lightning protector to be effective, it must be firmly mounted to a conductive metal surface that is itself bonded to the building protective earth. Ensure that a good electrical connection is made between the surge protector and the earthing system. All earthing connections should be as short as possible, should have no sharp bends or loops, and should use at least a 4mm² stranded copper wire for earthing the lightning arrester. The preferred mounting position is on the inside of the building's exterior wall, adjacent to the antenna lead entry point.

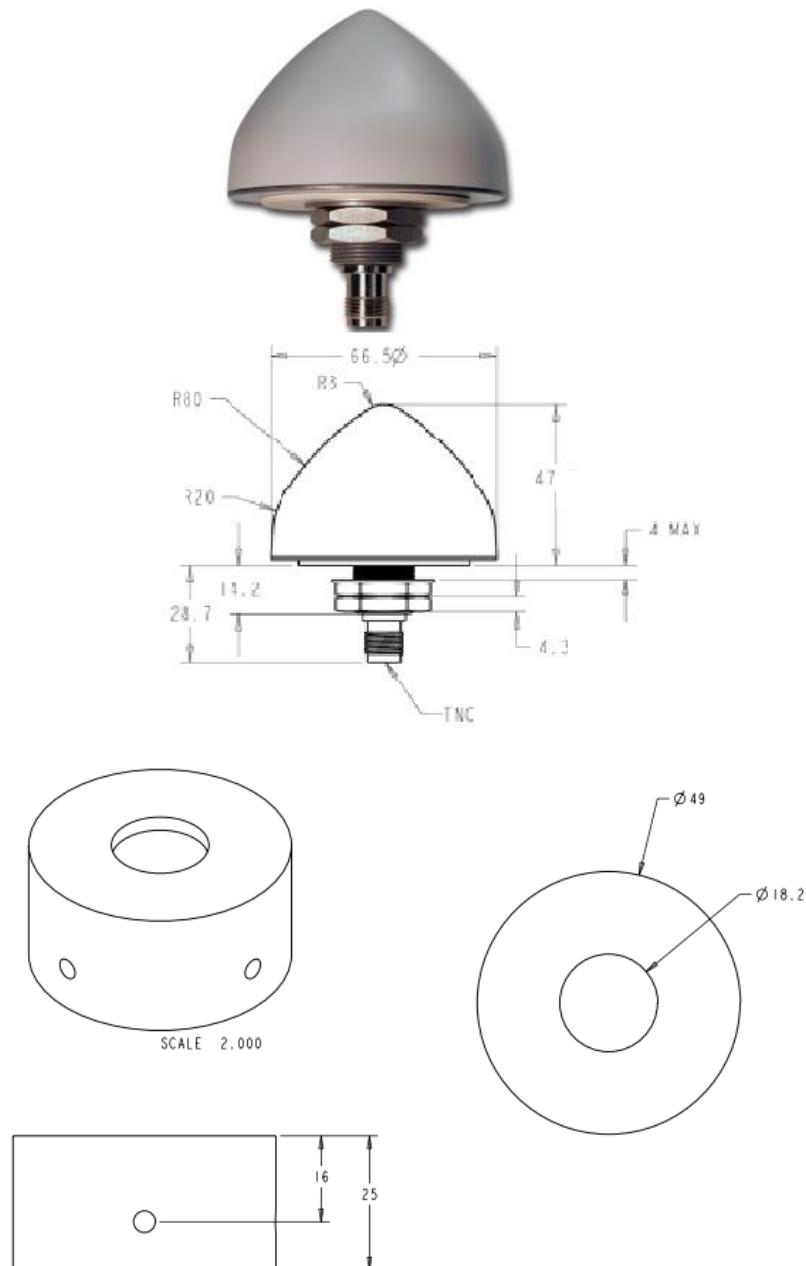


2. Antenna and Cable Installation

2.1 GNSS Antenna

Tekron's standard shipping configuration includes an active GNSS antenna, specifically designed for industrial/static timing environments, together with a pipe-mounting plinth. The mechanical diagram below shows the antenna and pipe mounting plinth attached.

The antenna pipe-mounting plinth is designed to fit over the top of a pipe like a capping. The mount has an internal diameter of 43mm, to fit a pipe with external diameter of between 40 and 42mm (1½inch / 32mm nominal ID galvanized pipe). The top end of the pipe should be cut flat, so that the rubber gasket inside the antenna mount sits flush against it, forming an effective weather seal. The mount is fixed to the pipe with two stainless steel M8 hexagon- socket setscrews (supplied).



2.2 Antenna mounting bracket

The antenna pipe-mounting plinth is designed to fit over the top of a user-supplied pipe like a capping. The pipe should have an external diameter of between 40 and 42mm (1½inch / 32mm nominal ID galvanized pipe). The top end of the pipe should be cut flat, so that the rubber gasket inside the antenna mount sits flush against it, forming an effective weather seal.

Establish the mounting method for the pipe, such as strapping or bolting to a frame on the edge of the building, or strapping to an air conditioning exhaust or similar. The base of the pipe needs to be accessible for the cable entry, if this is not practical, then a hole or slot can be made in the side of the pipe to allow the cable to enter and be passed up to the top of the pipe.

An adjustable antenna mounting bracket can be ordered from Tekron. See section 2.7 for specifications.

2.3 Antenna cable

Calculate the cable length required between the antenna and GNSS Clock, allowing 5 – 10% extra for contingencies.

Tekron clocks can be ordered with 15, 30, or 60 meters of high performance RF cable factory-fitted with a TNC-type male connector at one end, and a SMA male connector at the other. The TNC-type connector mates with the connector on the antenna and provides a robust weather-resistant connection. The smaller SMA connector mates with the connector on the GNSS clock rear panel and is only fractionally larger in diameter than the cable itself; this facilitates installation in conduit and through small apertures.

Custom lengths can be ordered upon request however additional costs may be incurred.

Where antenna cable distance exceeds 60 meters, either lower loss (e.g. CNT-400) cable can be used or an in-line amplifier can be installed. Contact Tekron for further advice.

2.4 Antenna cable installation

While the cable shielding is excellent, the cable should not be routed in close proximity to power cables or other RF cables carrying transmitter signals – in particular, parallel runs are to be avoided if possible. If such runs are absolutely unavoidable, a minimum separation of 300 mm may be used as a guideline.

The GNSS receiver has excellent out of band rejection characteristics, as does the antenna itself. However, sound engineering practice should not rely on these factors alone to guarantee performance. Careful installation will enhance the long-term reliability and on-going stability of the clock.

The absolute minimum bend radius for the antenna cable supplied is 40mm, but it is preferable to use a larger radius if possible. Caution should be taken at all times during the installation of the cable to avoid crushing or shorting the cable.

2.5 GNSS antenna installation

Feed the antenna cable up the mounting bracket/ pipe from the bottom end, through the plinth, and connect directly to the TNC connector on the base of the antenna. It is advisable to wrap self-amalgamating tape around the connector to seal the connection and provide protection against moisture ingress.

Fasten the antenna to the plinth using the four stainless screws supplied with the kit. The complete antenna assembly can then be placed on the mounting bracket/ pipe and secured by tightening the grub screws on the side of the plinth using the supplied Hex key.

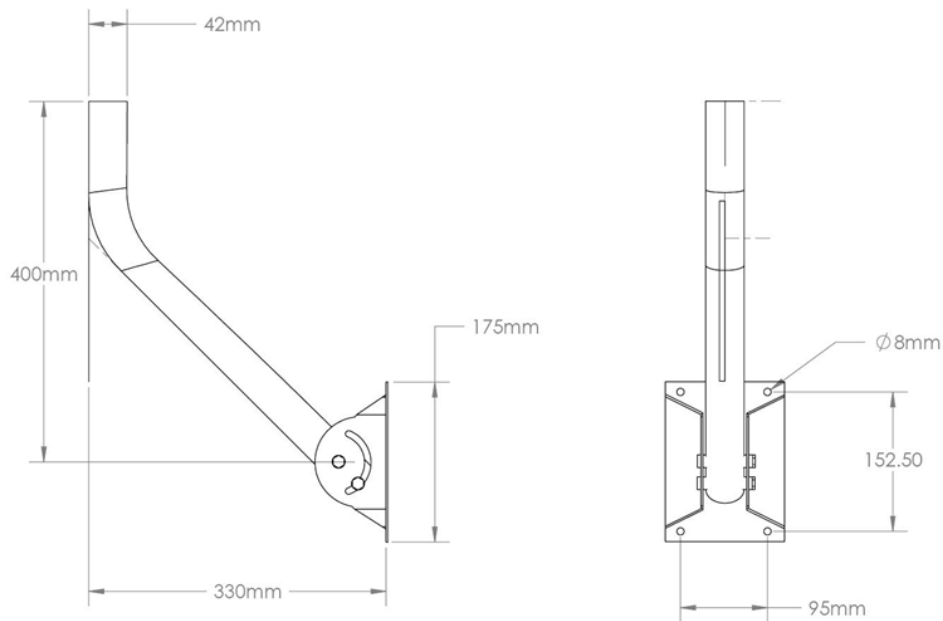
2.6 Installing the lightning protection kit (when applicable)

The lightning protector must be firmly mounted to a conductive metal surface that is itself bonded to the building protective earth. Ensure that a good electrical connection is made between the surge protector and the earthing system. All earthing connections should be as short as possible, should have no sharp bends or loops.

The preferred mounting position is on the inside of the building's exterior wall, adjacent to the antenna lead entry point.

2.7 Adjustable Antenna Mounting Bracket

The steel adjustable antenna mounting bracket will assist in the dissipation of energy should the antenna be struck by lightning. The mounting bracket should be securely bonded directly to the building protection earth – and not connected via any of the other earthed structures.



2.8 Antenna Cable

Environmental Specifications	
Performance Property	OC
Operating Temperature Range	-40 to +85 oC
Electrical Specifications	
Performance Property	Metric
Attenuation (1575.42MHz)	32.80 ~ dB/100 m
Velocity of Propagation	83%
Time Delay	4.00 ~ ns/m
Impedance	50 Ω
Capacitance	79.8 pF/m
Shielding Effectiveness	>90 dB
DC Resistance Inner Conductor	10.830 Ω/km
DC Resistance Outer Conductor	12.760 Ω/km
Voltage Withstand	1500 VDC
Jacket Spark	5000 VRMS
Peak Power	5.6 kW

2.9 Lightning Protection Kit

The NexTek FPL series of protectors reduce lightning transients to very low voltage levels and pass dc through as well. Fine-protectors are usually necessary on sensitive receiver lines that must pass dc, or need protection against HEMP or NEMP surges.

Physical Specifications		
Performance Property	Metric	
Dimensions	Width	32.9 mm
	Depth	32.9 mm
	Height	108 mm
Connector Type	N-Type Female (Both Ends)	
Environmental Specifications		
Performance Property	OC	
Operating Temperature Range	-40 to +90 oC	
Salt Fog	MIL-STD-202 Method 101D / Condition B (35 °C/48 hours)	
Immersion	MIL-STD-202 Method 104A / Condition A (65 °C to 25 °C w/NaCL – 2 cycles)	
Moisture Resistance	MIL-STD-202 Method 106E / 65 °C/98% RH condensing/ 240 hours	
Temperature Shock	MIL-STD-202 Method 107D / Condition B-1 (96 hours at 100 °C)	
Life (Elevated Temperature)	MIL-STD-202 Method 108A / Condition A (96 hours at 100 °C)	
Dust and Waterproof Rating	IEC529 IP68 (dust-tight and water proof 24 hours / 1 m)	
Vibration	MIL-STD-202 Method 204D / Condition D (10 Hz – 2 kHz 0.06" DA / 20 g)	
Mechanical Shock	MIL-STD-202 Method 213 / Condition A (50 g / 11ms ~ 24")	
Electrical Specifications		
Performance Property	Metric	
Operating Voltage	+5 to 6.7 VDC	
Maximum RF Power @ 20oC	30 W	
Frequency	1150 to 1610 MHz	
Insertion Loss	0.1 dB (Typical)	
Surge (Max)	30 kA	
Surge (Max) Multi-strike	20 kA, 8/20 μs (IEC61000-4-5)	
Response Time	10 ns	
Through Current	1 A	

