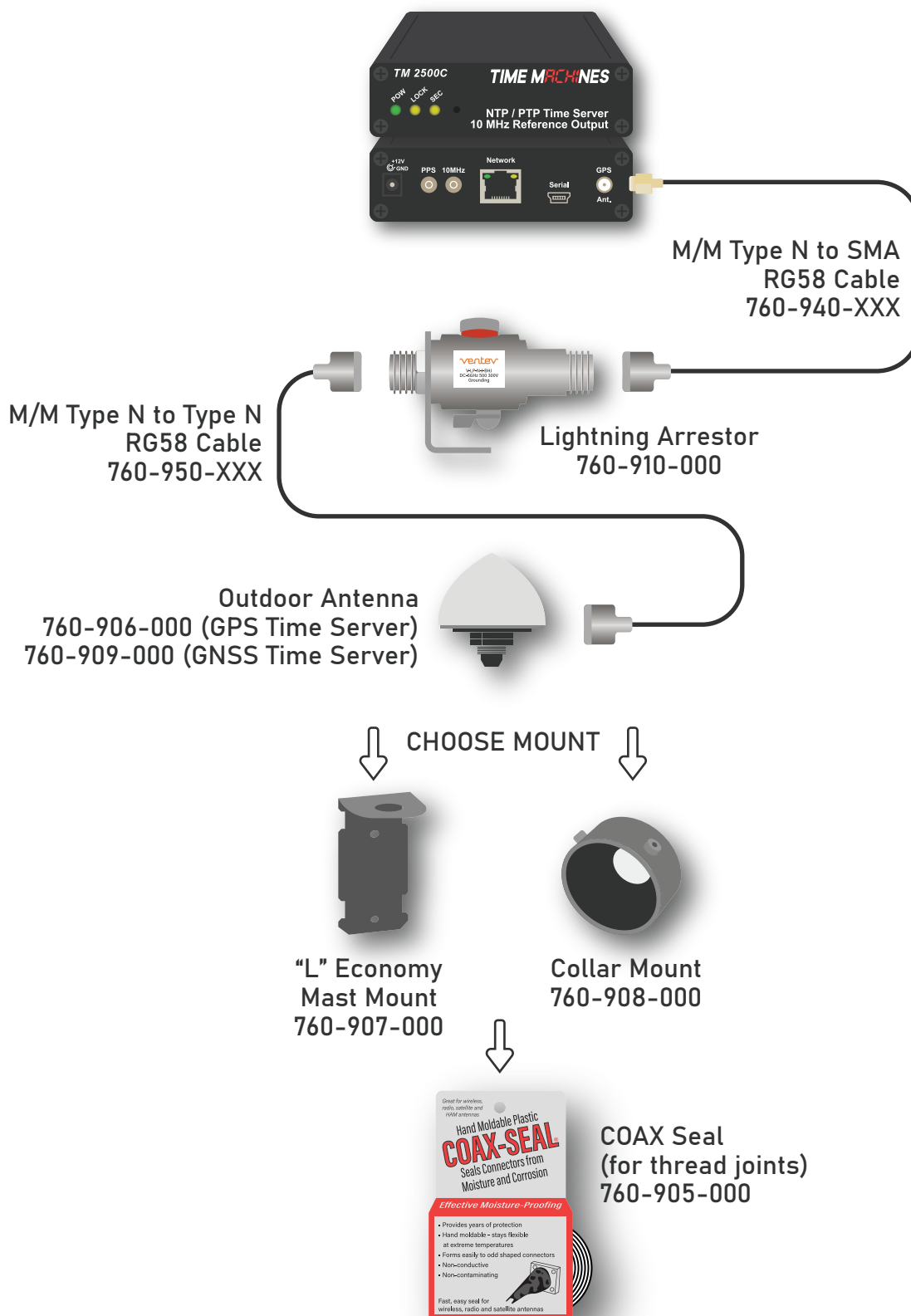
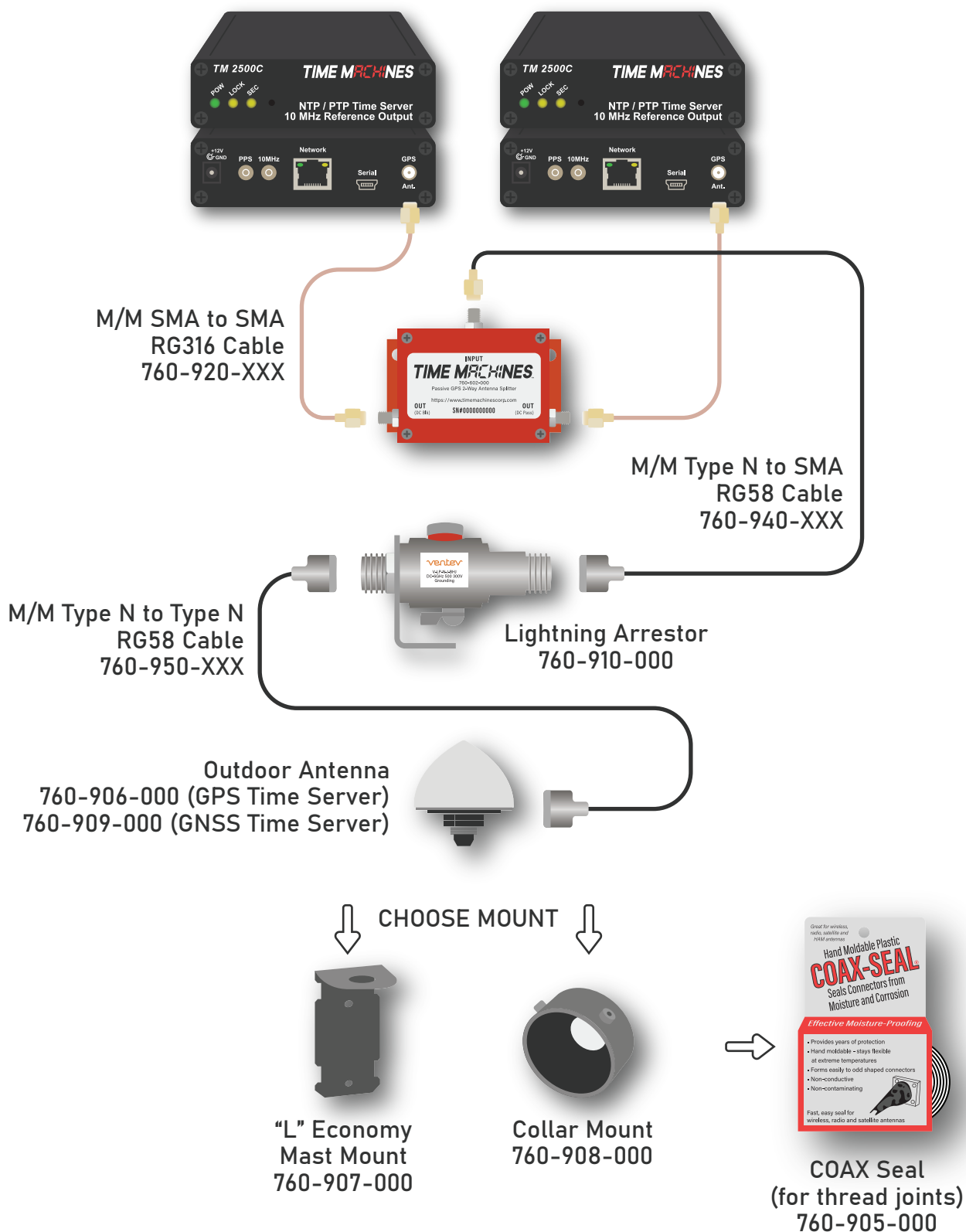


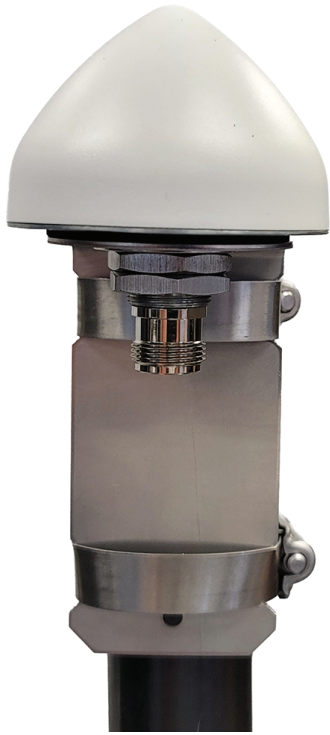


1.

Up to 250 ft of RG58 Cable can be used without additional hardware.
Read pages 4, 5, 6 to learn how to increase cable length over 250 ft.



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Read pages 4, 5, 6 to learn how to increase cable length over 250 ft.



"L" Economy Mast Mount

Supports adjustable hose clamps which can be purchased at local hardware store.
Can also be screwed to surface.
760-907-000



Collar Mount

Goes on top of up to 1.5" OD pole.
Held in place with two set screws.
Cable is contained inside of pole.
760-908-000

WHY ONLY 250FT OF CABLE?

The previous pages of this product overview document list 250ft as the maximum cable length supported by the TimeMachines® time servers with the cables on the website. This is a safe limit when using TimeMachines® time servers, splitters and cables. It includes a factor of safety that makes the setup work reliably in most weather conditions.

What if the antenna needs to be more than 250ft from the server? There are two factors that limit the length of the cable between the time server and antenna.

First Factor: Signal loss in the cable

Antennas used with most GPS receivers have a gain rating. This gain rating has nothing to do with helping a GPS receiver obtain signal lock in a given location. A higher gain rating will not make up for an antenna location that can't see the GPS satellites well. What it is for, is to overcome the signal loss in a cable. The GPS L1 frequency, which is the primary frequency we are interested in for our time servers, is 1575.42 MHz.

The RG58/LMR195 cable that TimeMachines® sells loses about 13dB per 100 ft of cable at the GPS L1 frequency. If the antenna amplifier is 40dB, and there is 250ft of cable, the loss is approximately 30dB, leaving about 10dB of margin. If a splitter is added to the signal path, then another 4-7dB can be lost, plus all the cable connectors add a bit more loss. If the total loss in the cable path exceeds the antennas 40dB gain by much, then the GPS likely will not be able to lock and obtain the timing information required to operate.

Overcoming the signal loss can be done by changing to a higher grade cable, such as LMR400. LMR400 has roughly half the loss of LMR195. It is more expensive, larger diameter, and less flexible, but enables longer cable runs. TimeMachines® does not sell LMR400, but an internet search will reveal many sources.

Second Factor: DC Loss to the Antenna

The second factor that must be overcome is the DC loss from the time server to the antenna. TimeMachines® time servers can put out a maximum of 5V DC. This is required by the antenna to power its internal amplifier circuit. If this voltage is not present, or below a minimum value, then the antenna won't work at all. The amplifier simply doesn't turn on and no GPS signal is present in the cable. When the cable runs become longer than 250ft, there is more voltage lost in the cable between the time server and the antenna. If the cable becomes long enough, the voltage will "droop" enough to degrade or eliminate function.

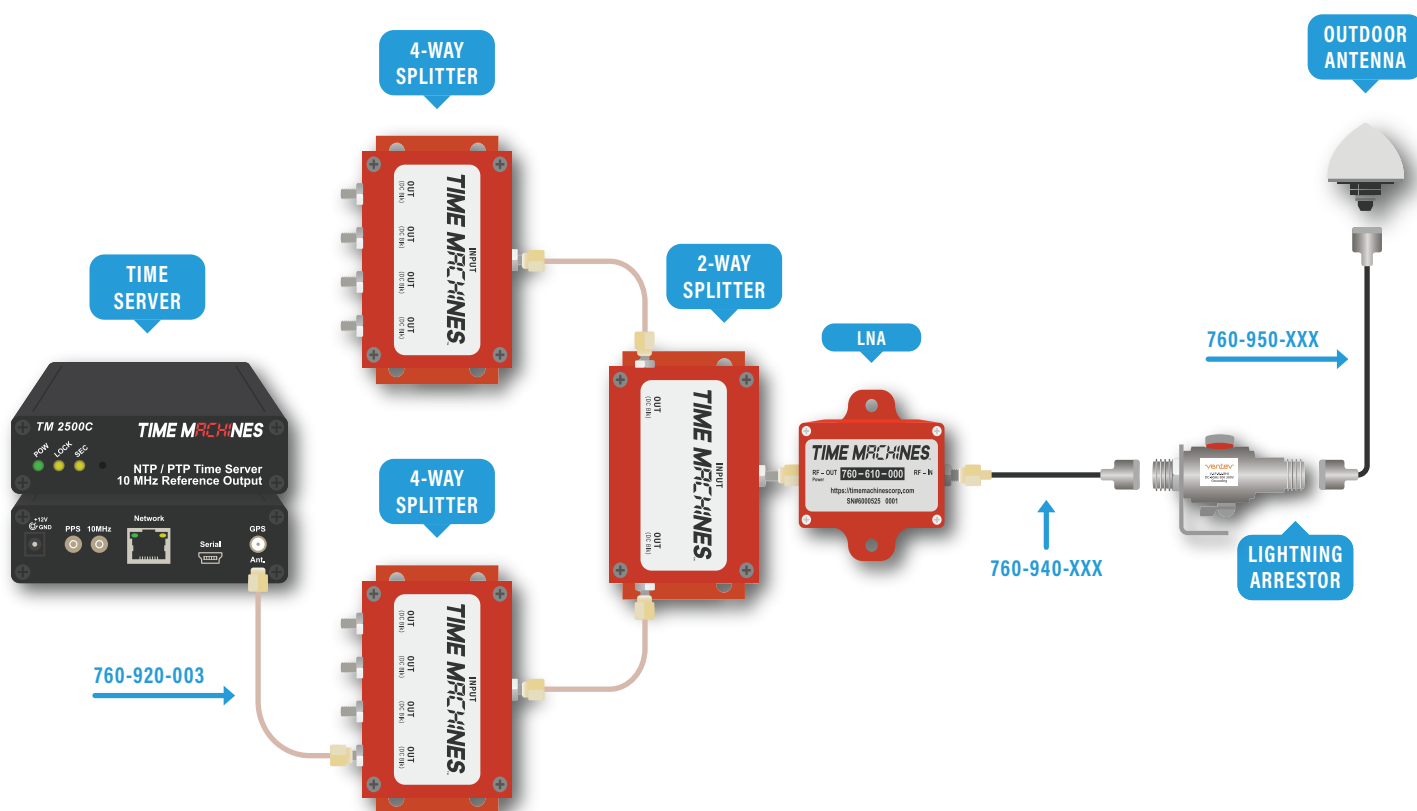
This is more easily overcome than GPS signal loss. Using a TimeMachines® powered splitter, allows putting a higher voltage onto the antenna cable such that more voltage gets to the antenna. The Tallysman antennas that TimeMachines® resells are capable of working from 2.7 to 16 Vdc. The power injectors come with a 9V supply. This voltage is sufficient to overcome the DC loss of a longer cable run. The powered splitter has no gain of its own, it simply functions as a way to inject a higher voltage on to the antenna cable.

The Result: Both the signal loss from the antenna to the time server AND the DC voltage loss from the time server to the antenna must be overcome to extend the cable length much beyond 250ft. If both are not addressed, then signal issues will be a problem and the time server may not function.

GOING LONGER THAN 250FT? SPLITTING TO MULTIPLE TIME SERVERS?

The TimeMachines® GPS Low Noise Amplifier (LNA) product was created to both extend the length of cable that can be used between a time server and the outdoor antenna, as well as allow for a greater number of signal splits to occur downstream of the outdoor antenna.

Using the LNA to allow for more signal splits:

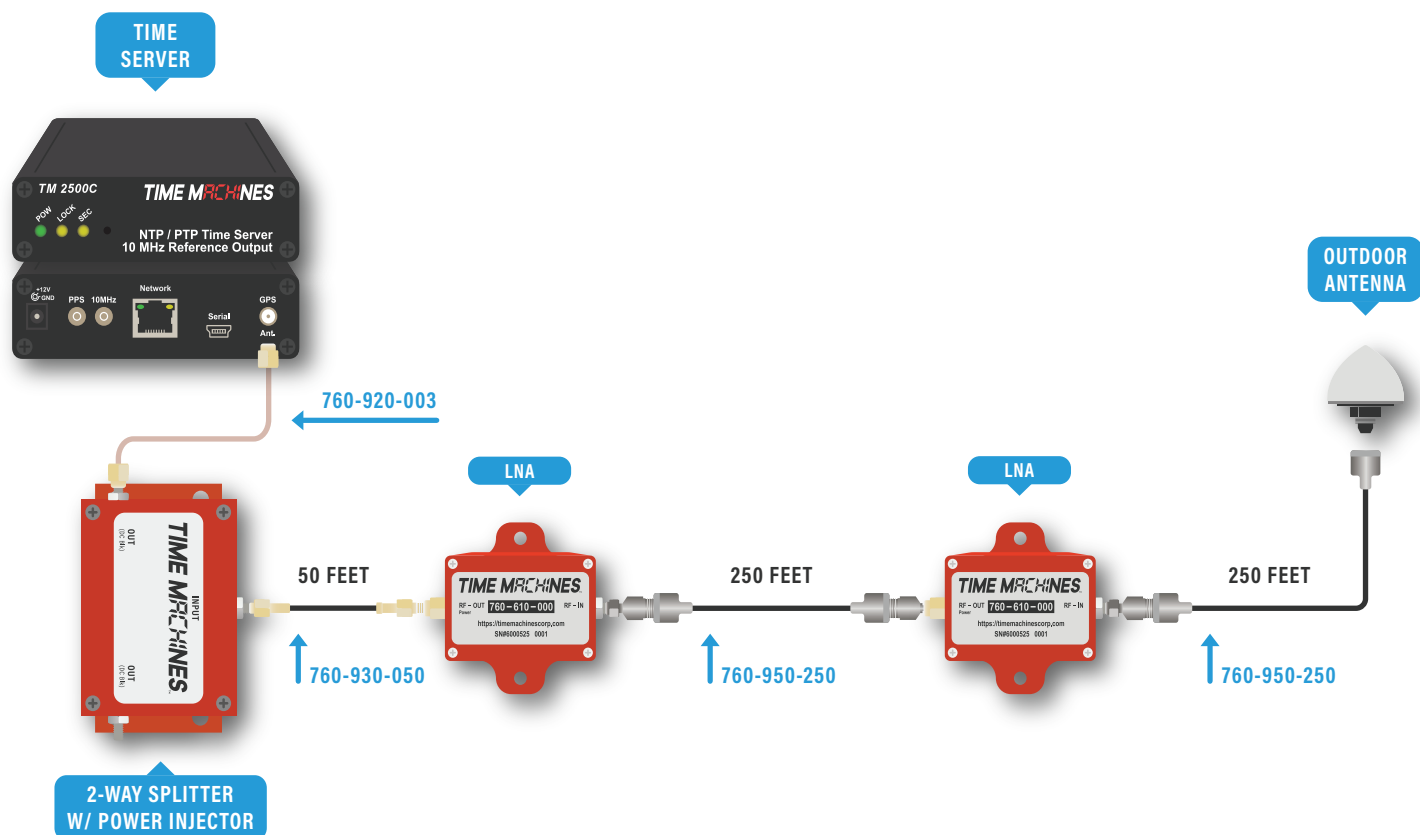


One common use for the LNA is to allow a single antenna to be split to multiple time servers. The 760-610-000 splitter is the model of choice. TimeMachines® makes 2 and 4 port splitters. An ideal 2 port splitter will reduce the signal sent to each of its outputs, roughly in half (3dB loss), while an ideal 4 port splitter will reduce the signal to each port to be about 1/4 of the original input signal (6dB loss). Since there are no ideal splitters, the loss per port is a bit worse. Depending on the length of the cable between the antenna and the splitter, the resulting loss of signal can start to cause issues when multiple splits are required.

In this configuration, power can come from time server directly and no powered splitter is required. Care must be taken to ensure that a DC path exists between a time server and the LNA/Antenna. Confirming the LED is lit on the inside of the LNA can help verify this. Without power, the LNA and the amplifier on the antenna will not function and no signal will be received. No connector adapters are typically needed in this configuration when used with TimeMachines® splitters. The LNA output port can connect directly to the input of the splitter.

USING THE LNA TO SUPPORT LONGER CABLE RUNS:

The second common configuration for the LNA, is to extend cable length beyond the 250ft limit of the RG58/LMR-195 that TimeMachines® sells. SKU 760-611-000 is available for this installation configuration and includes the required Type-N connector adapters.



An LNA is put in-line with the cable. Type-N female adapters are used. A typical spacing is every 250ft of cable. A 760-950-250 cable from the antenna to the first LNA works nicely. Additional runs of the 760-950-250 cable, with an LNA being used to join the cables allow for significant extension of the cable run. The upper limit of this arrangement is not known. As mentioned previously, the moment that a second LNA is introduced to the configuration, a Time Server will not be able to provide sufficient power to the LNA's and a powered splitter will be required such as the 760-602-PWR or 760-604-PWR.