

**GPS Antenna/Cabling
Recommendations and Issues that often
arise during Installations**

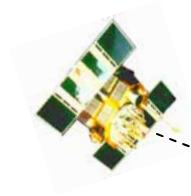
**Hugo/Rich (5-07)
714-724-7069
714-713-8377**

Basic Recommendations for typical GPS Antenna/Cabling Installations

1. Use only high quality GPS Antennas from well known manufacturers, with a preferred antenna gain of at least +30dB and good “Out-of-Band” filtering
2. When installing multiple GPS Antennas, separate them by at least 1m
3. When installing GPS Antennas near other transmission antennas, separate them in height by at least 3m, above or below each other
4. Use only high quality Antenna Cables from well known manufacturers
5. Avoid use of RG-58 cabling for GPS Antenna installations, due to the higher loss (~30dB loss at 50m length)
6. Use instead RG-59 low loss cable and keep as short as possible; no more than 50m (~15dB loss at 50m)
7. If longer lengths are needed, use LMR-400 cable and limit the length to no more than 100m (~16.2dB loss at 100m)
8. If even longer lengths than 100m are needed, use an In-line Amp, but install as close to the antenna as possible. Typical In-line Amps need a minimum of +6dB input to function properly
9. Be kind to the 0.000 000 000 000 000 1 watt GPS signal at the Antenna !!



GPS Antenna Cable Length Examples



GPS Satellite Signal at Antenna:

L1-C/A: -160dBw minimum; -158 to -155dBw typical (Right-Hand Circular Polarized)

Most GPS Antennas have +30 to +38dB gain at Output (must have good "Out-of-Band" filter)

In-Line Amps usually: +15 to +25dB gain

Must be located as close to the antenna as possible;

Must have at least +6dB to function properly

For RG-59, ~15dB loss for 45.75m/150 ft at GPS L1

For RG-59, ~10dB loss for 30.5m/100 ft

For LMR400, ~16.2dB loss for 91.5m/300 ft

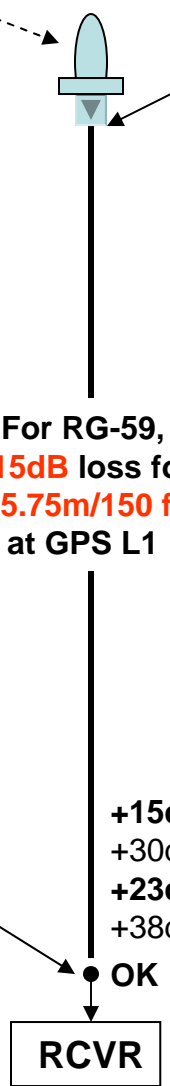
For RG-59, ~30dB loss for 91.5m/300 ft

Commercial GPS Rcvr Input:

-145 to -122 dBw (or better)

Therefore, the Com'l GPS Rcvr needs:

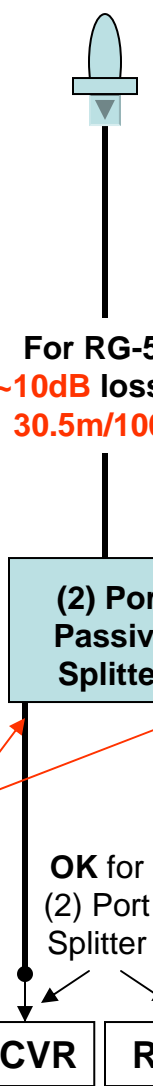
+15dB minimum gain at Rcvr Input (or better)



+15dB with +30dB Ant; +23dB with +38dB Ant.

OK

RCVR



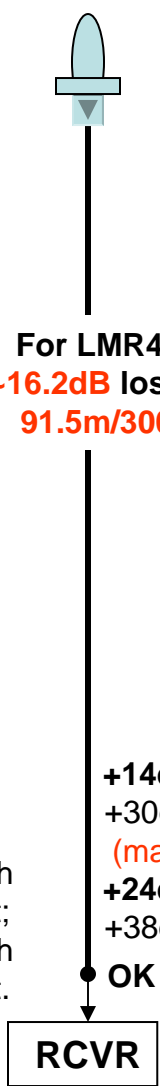
~3dB* loss each Port

OK for (2) Port Splitter

+17dB with +30dB Ant; +25dB with +38dB Ant.

RCVR

RCVR



+14dB with +30dB Ant; (marginal) +24dB with +38dB Ant.

OK

RCVR



+15dB with +30dB Ant and +15dB Amp; +25dB with +35dB Ant and +20dB Amp

OK

RCVR

*~6dB each for (4) Ports; ~9dB each for (8) Ports



FEI-Zyfer Antenna Accessories	Manufacturer's Name and Model	FEI-Zyfer Part Number
ACCESSORIES (Ordered Separately)		
L1 Antenna Kit (+33dB gain antenna and pipe adapter only, no cable)	Panasonic; VIC100 http://pewa.panasonic.com/em/p/products/gps.html	0810383
L1 Antenna Kit (+33dB gain, pipe adapter, and 15.25m/50 ft RG-59)	Panasonic; VIC100	0810384
L1 Band in-line amplifier (+20dB gain, TNC male/TNC female)	Sigma 6	0810428
L1 Band Amplifier with TNC Connectors (+30dB gain) (For other Amp options, see: http://www.fei-zyfer.com/antenna_kits.html)	Sigma 6	0810429
15.25m/50 ft RG-59 cable (5dB loss at 1.575 GHz)	Belden	0420166
30.5m/100 ft RG-59 cable (10dB loss at 1.575 GHz)	Belden	0420167
45.75m/150 ft RG-59 cable (15dB loss at 1.575 GHz)	Belden	0420200
61m/200 ft RG-59 cable (20dB loss at 1.575 GHz)	Belden	0420168
76.2m/250 ft RG-59 cable (25dB loss at 1.575 GHz)	Belden	0420169
91.5m/300 ft RG-59 cable (30dB loss at 1.575 GHz)	Belden	0420170
106.7m/350 ftRG-59 cable (35dB loss at 1.575 GHz)	Belden	0420225
91.5m/300 ft LMR400 cable (16.2dB loss at 1.575 GHz)	Times Microwave	0420171
106.7m/350 ft LMR400 cable (18.9dB loss at 1.575 GHz)	Times Microwave	0420226
122m/400 ft LMR400 cable (21.6dB loss at 1.575 GHz)	Times Microwave	0420172
137m/450 ft LMR400 cable (24.3dB loss at 1.575 GHz)	Times Microwave	0420227
152.4m/500 ft LMR400 cable (27dB loss at 1.575 GHz)	Times Microwave	0420173
167.6m/550 ft LMR400 cable (29.7dB loss at 1.575 GHz)	Times Microwave	0420228

Typical Propagation Delays with GPS-related Hardware

Antennas (L1-only or L1/ L2)	~028 ns
Antenna Splitters	~006 ns
Cable RF Splitters	~075 ns
In-line Antenna Amps	~018 ns
Lightning Suppressors	~011 ns
Fiber Optic Ant. Converters (L-band to FO to L-band)	~25 to 50 ns ? (vendor specific)
RG-8 Ant. Cable, (30 m)	~117 ns
RG-58 Ant. Cable, (30 m)	~131 ns
RG-59 Ant. Cable, (30 m)	~120 ns
RG-213 Ant. Cable, (30 m)	~150 ns
Receiver internal offset to UTC	~ ±25 ns

