

University of Wyoming, Department of Atmospheric Science
GPS Repeater Installation Link Budget Calculation Worksheet

Receive Signal for GPS-L1 (SPS)

See Note 1	Frequency	1575 MHz
	Bandwidth	10 MHz
0	Receive Power @ MSL:	-130.00 dBm

Receive Antenna *

See Note 2	Manufacturer	Panasonic
	Model	VIC100
	Frequency Range	1575.42 +/- 1.023 MHz
1	Antenna Gain:	38.00 dBi

Lightning Arrestor Pigtail (Receive Antenna to Lightning Arrestor) **

See Note 3	Manufacturer	Times Microwave
	Model	LMR-400
	Length	5.00 ft
	Attenuation (db/100ft)	-5.26 dB
	Attenuation due to length	-0.26 dB
	Connector 1 Manufacturer	Times Microwave
	Connector 1 Model	TC-400-NM
	Connector 1 Attenuation	-0.13 dB
	Connector 2 Manufacturer	Times Microwave
	Connector 2 Model	TC-400-NM
	Connector 2 Attenuation	-0.13 dB
2	Pigtail Assembly Attenuation:	-0.51 dB

Lightning Arrestor (Receive Antenna) **

See Note 4	Manufacturer	L-COM
	Model	AL-NFNFB-9
3	Component Attenuation:	-0.40 dB

Cable (Receive Antenna Lightning Arrestor to Amplifier Lightning Arrestor)**

See Note 3	Manufacturer	Times Microwave
	Model	LMR-400
	Length	100.00 ft
	Attenuation (db/100ft)	-5.26 dB
	Attenuation due to length	-5.26 dB
	Connector 1 Manufacturer	Times Microwave
	Connector 1 Model	TC-400-TM
	Connector 1 Attenuation	-0.13 dB
	Connector 2 Manufacturer	Times Microwave
	Connector 2 Model	TC-400-NM
	Connector 2 Attenuation	-0.13 dB
4	Cable Assembly Attenuation:	-5.51 dB

Lightning Arrestor (Amplifier Input) **

See Note 4	Manufacturer	Not Used
	Model	n/a
5	Component Attenuation:	0.00 dB

Attenuator (Amplifier Input) **

See Note 6	Manufacturer	n/a
	Model	
6	Component Attenuation:	0.00 dB

Amplifier *

See Note 5	Manufacturer	GPS Networking
	Model	LA25 with repeater options
	Frequency Range	1176 to 1575 MHz
7	Amplifier Gain:	25.00 dB

Adapter (Amplifier Output to Transmit Antenna Cable) *

See Note 4	Manufacturer	L-Com or similar
	Model	BA579 or similar
	Type	Adapter, TNC-M to SMA-M
8	Component Attenuation:	-0.25 dB

Attenuator (Amplifier Output) **

See Note 6	Manufacturer	XMA Corp.
	Model	2082-6182-06
9	Component Attenuation:	-6.00 dB

Cable (Amplifier to transmit antenna) **

See Note 3	Manufacturer	L-COM
	Model	195 Series
	Length	1.08 feet
	Attenuation (db/100ft)	-14.50 dB
	Attenuation due to length	-0.16 dB
	Connector 1 Manufacturer	L-COM
	Connector 1 Model	ASM-1708
	Connector 1 Attenuation	-0.13 dB
	Connector 2 Manufacturer	L-COM
	Connector 2 Model	ASF-1708
	Connector 2 Attenuation	-0.13 dB
10	Cable Assembly Attenuation:	-0.41 dB

Transmit Antenna *

See Note 7	Manufacturer	Allis Communications Co. , Ltd. (ACC)
	Model	PA175-S
	Frequency Range	1575 +/- 3 MHz
11	Antenna Gain:	4.00 dBic

Free Space Loss (Transmit Antenna to GPS Receiver Antenna @ 100')

See Note 8	$FSL (dB) = -27.55 dB + 20 * \log(F \text{ MHz}) + 20 * \log(\text{distance } m)$	
	Distance	30.48 m
12	Attenuation (Free Space Loss):	-66.08 dB

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* Part of GPS Networking , Inc. GPS Reradiating Kit, Model HNRRKIT

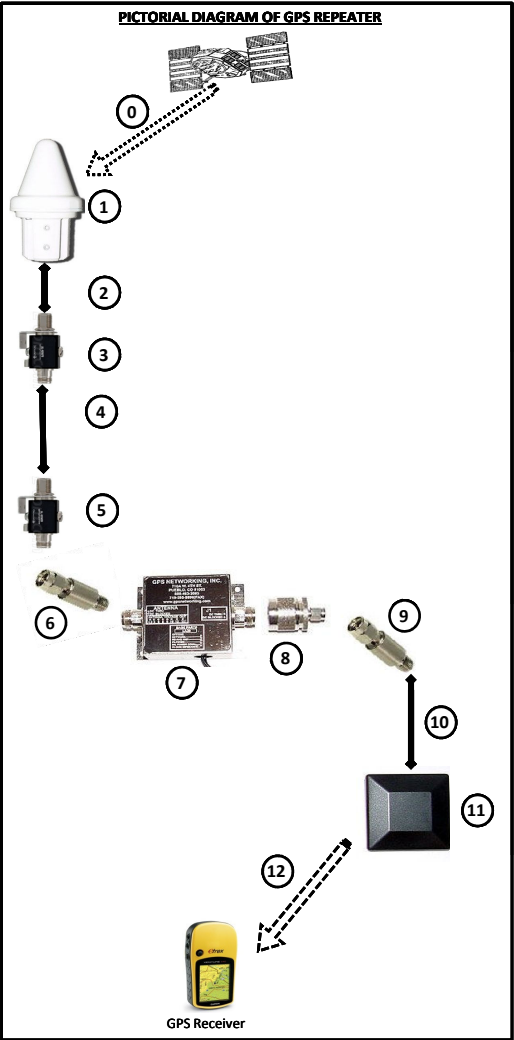
** Supplied by end-user

Connector attenuations are calculated at 1575 MHz

Connector attenuation is calculated as $0.10 * \sqrt{F(\text{GHz})}$ see Note 3

Attenuation is denoted by negative (-) dB

- Note 1: <http://www.navtechgps.com/extra/GNSSfacts.asp>
Note 2: http://pewa.panasonic.com/emp/products/gps_pdf/vic100.pdf
Note 3: <http://www.timesmicrowave.com/>
Note 4: <http://www.l-com.com/home.aspx>
Note 5: <http://gpsnetworking.com/datasheet%20replacements/LA25RPDC2010.pdf>
Note 6: <http://www.xmacorp.com/>
Note 7: <http://www.gpsantennanavigationssystem.com/PA175.htm>
Note 8: http://en.wikipedia.org/wiki/Link_budget



TOTAL SYSTEM GAIN (Σ 1-11): 53.91 dB

Sum of all system gains/attenuations

REPEATED SIGNAL POWER (Σ 0-13): -142.16 dBm @ 100'

Sum of received power, total system gain and free space loss