

N 42 deg 32 min 16 sec  
W 71 deg 09 min 17 sec

PARTS LIST

REF DES	PART NUMBER	DESCRIPTION	MFR
E1	3G1215A-XS-1	ACTIVE ANTENNA	ANTCOM CORP
W1	LMR-400	COAX CABLE, L = 100 FT	MICROWAVE
LA1	VGLA20RPDC	LINE AMPLIFIER	GPS NETWORKING
W2	LMR-400	COAX CABLE, L = 30 FT	MICROWAVE
E2	2G1215P-XT-1	PASSIVE ANTENNA	ANTCOM CORP

**TEXTRON SYSTEMS** 201 LOWELL ST., WILMINGTON, MA 01887

Title GPS Re-Radiator - Room 3267 (IMS)		
Size A	Document Number <Doc>	Rev -
Date:	Tuesday, October 31, 2006	Sheet 1 of 1

**GPS LINK BUDGET Room 3267 (IMS)**

	L1		L2	
<b>Satellite Transmitter</b>				
Satellite Transmitter Power (25 Watts)	14	dBW	14	dBW
RF Losses in transmitter path	-1.25	dB	-1.25	dB
Antenna Gain (with respect to isotrope)	13.5	dB <sub>i</sub>	13.5	dB <sub>i</sub>
<b>Satellite ERP</b>	<b>26.25</b>	<b>dBW</b>	<b>26.25</b>	<b>dBW</b>
<b>Propagation</b>				
Atmospheric and Polarization Losses	-0.5	dB	-0.5	dB
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB
<b>Received Power on Earth dBW</b>	<b>-1.59E+02</b>	<b>dBW</b>	<b>-1.57E+02</b>	<b>dBW</b>
<b>Received Power on Earth dBm</b>	<b>-1.29E+02</b>	<b>dBm</b>	<b>-1.27E+02</b>	<b>dBm</b>
<b>Facility Re-radiation System</b>				
Gain of Receive Antenna	36.5	dB <sub>i</sub>	36.5	dB
RF Losses in Cable & Connectors (min.) (from Receive Antenna to Amplifier)	-5.261	dB	-4.604	dB
Gain of Line Amplifier (adjusted & measured)	17.4	dB	16.8	dB
RF Losses in Cable & Connectors (meas.) (from Amplifier to Passive Antenna)	-1.9	dB	-1.65	dB
Gain of Passive Radiating Antenna	3.5	dB <sub>i</sub>	3.5	dB <sub>c</sub>
Free Space Path Loss (100ft)	-6.61E+01	dB	-6.39E+01	dB
<b>RF Power Level at 100ft Distance</b>	<b>-1.44E+02</b>	<b>dBm</b>	<b>-1.40E+02</b>	<b>dBm</b>

**Free Space Path Loss Calculations**

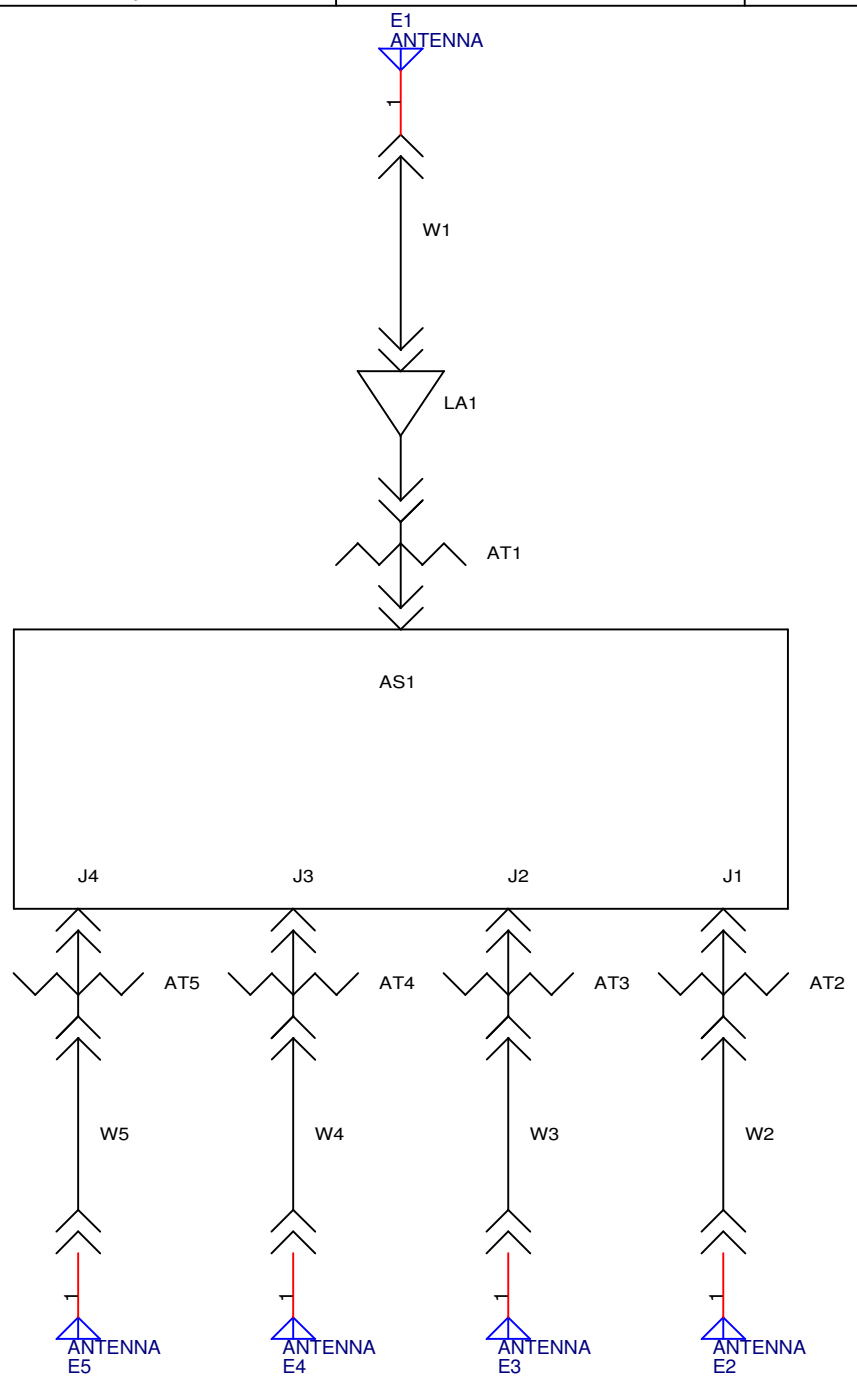
**Satellite to Earth**

where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

**100ft from Passive Antenna**

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB

N 42 deg 32 min 17 sec  
W 71 deg 09 min 15 sec



PARTS LIST

REF DES	PART NUMBER	DESCRIPTION	MFR
E1	3G1215A-XS-1	ACTIVE ANTENNA	ANTCOM CORP
W1	RG213/U	COAX CABLE, L = 23 FT	PASTERNAK
LA1	VGLA20RPDC	LINE AMPLIFIER	GPS NETWORKING
AS1	ALDCBS1X4-N	AMPLIFIED SPLITTER	GPS NETWORKING
W2	RG213/U	COAX CABLE, L = 88.5 FT	PASTERNAK
W3	RG213/U	COAX CABLE, L = 113 FT	PASTERNAK
W4	RG213/U	COAX CABLE, L = 157.5 FT	PASTERNAK
W5	LMR-400	COAX CABLE, L = 59 FT	TIMES MICROWAVE
AT1	MDC1110N-11	ATTENUATOR, 11dB	MIDISCO
AT2	MDC1110N-12	ATTENUATOR, 12dB	MIDISCO
AT3	MDC1110N-10	ATTENUATOR, 10dB	MIDISCO
AT4	MDC1110N-7	ATTENUATOR, 7dB	MIDISCO
AT5	MDC1110N-16	ATTENUATOR, 16dB	MIDISCO
E2 -E5	2G1215P-XT-1	PASSIVE ANTENNA	ANTCOM CORP

**TEXTRON SYSTEMS** 201 LOWELL ST., WILMINGTON, MA 01887

Title: GPS Re-Radiator - Room 3297 (SIL)

Size A	Document Number <Doc>	Rev A
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Date: Thursday, December 21, 2006 Sheet 1 of 1

**GPS LINK BUDGET Room 3297 (SIL)**

	L1				L2				
<b>Satellite Transmitter</b>									
Satellite Transmitter Power (25 Watts)	14				14				
RF Losses in transmitter path	-1.25				-1.25				
Antenna Gain (with respect to isotrope)	13.5				13.5				
<b>Satellite ERP</b>	<b>26.25</b>				<b>26.25</b>				
<b>Propagation</b>									
Atmospheric and Polarization Losses	-0.5				-0.5				
Free Space Path Loss	-1.84E+02				-1.82E+02				
<b>Received Power on Earth dBW</b>	<b>-1.59E+02</b>				<b>-1.57E+02</b>				
<b>Received Power on Earth dBm</b>	<b>-1.29E+02</b>				<b>-1.27E+02</b>				
<b>Facility Re-radiation System</b>									
	<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>		<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>
Gain of Receive Antenna	36.5	36.5	36.5	36.5	dBic	36.5	36.5	36.5	36.5
RF Losses in Cable & Connectors (min.) (from Receive Antenna to Amplifier)	-2	-2	-2	-2	dB	-1.73	-1.73	-1.73	-1.73
Gain of Line Amplifier (measured)	39.83	39.55	39.85	39.87	dB	42.26	42.06	42.29	42.17
RF Losses in Cable & Connectors (from Amplifier to Passive Antenna)	-8.5	-10.79	-15.08	-3.97	dB	-7.34	-9.32	-12.95	-3.48
Gain of Passive Radiating Antenna	3.5	3.5	3.5	3.5	dBic	3.5	3.5	3.5	3.5
Free Space Path Loss (100ft)	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	dB	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01
Additional Attenuators	-23	-21	-18	-27		-23	-21	-18	-27
<b>RF Power Level at 100ft Distance</b>	<b>-1.48E+02</b>	<b>-1.49E+02</b>	<b>-1.50E+02</b>	<b>-1.48E+02</b>	<b>dBm</b>	<b>-1.40E+02</b>	<b>-1.40E+02</b>	<b>-1.41E+02</b>	<b>-1.40E+02</b>

**Free Space Path Loss Calculations**

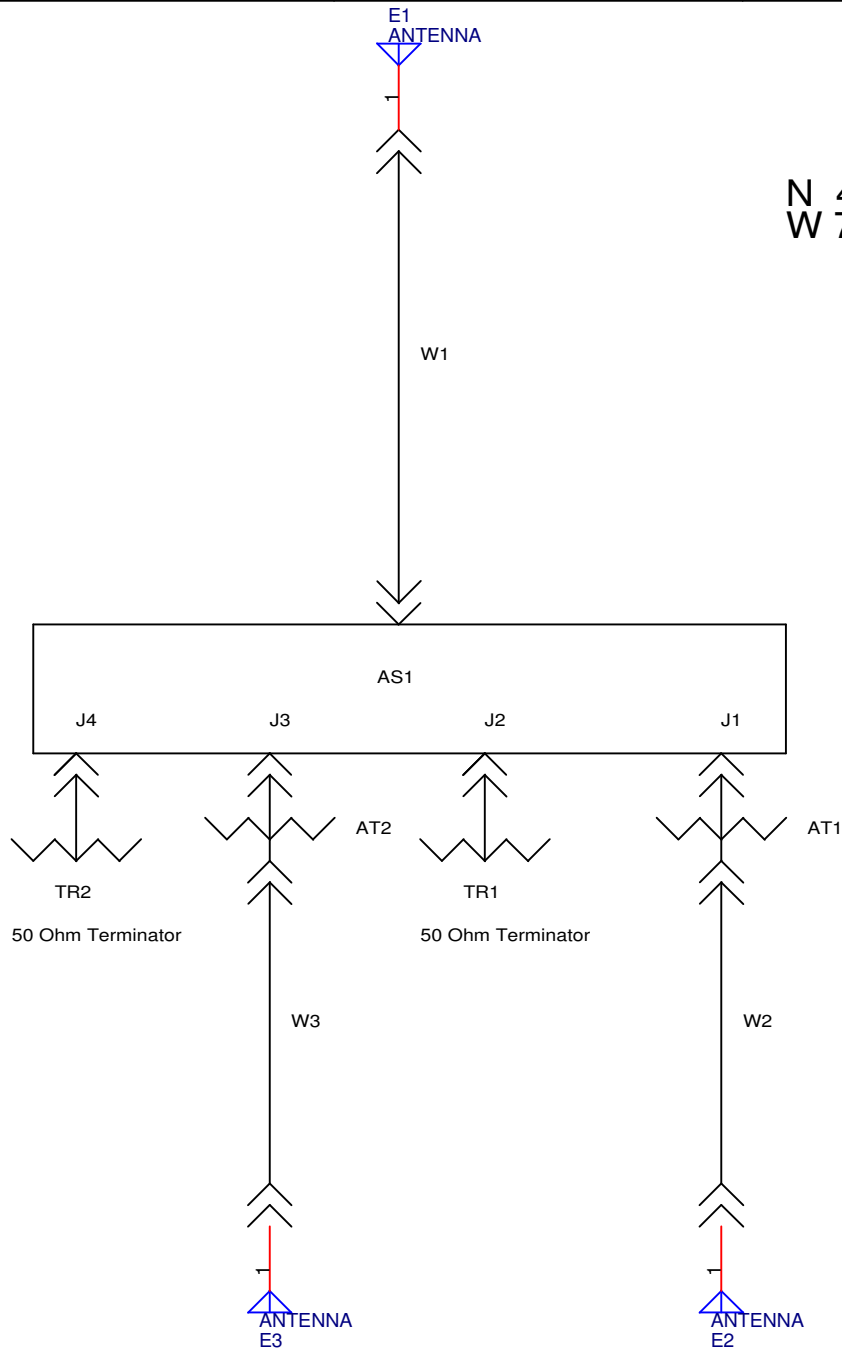
	L1				L2			
where d = distance	2.52E+07	m			2.52E+07	m		
lambda = wavelength = c/f	1.91E-01				2.44E-01			
c = speed of light	3.00E+08	m/sec			3.00E+08	m/sec		
f = frequency	1.57E+09	Hz			1.23E+09	Hz		
Free Space Path Loss	-1.84E+02	dB			-1.82E+02	dB		

**100ft from Passive Antenna**

where d = distance	3.05E+01	m			3.05E+01	m		
lambda = wavelength = c/f	1.91E-01				2.44E-01			
c = speed of light	3.00E+08	m/sec			3.00E+08	m/sec		
f = frequency	1.57E+09	Hz			1.23E+09	Hz		
Free Space Path Loss	-6.61E+01	dB			-6.39E+01	dB		



N 42 deg 32 min 21 sec  
W 71 deg 09 min 18 sec



PARTS LIST

REF DES	PART NUMBER	DESCRIPTION	MFR
E1	3G1215A-XS-1	ACTIVE ANTENNA	ANTCOM CORP
W1	LMR-400	COAX CABLE, L = 50.5 FT	TIMES MICROWAVE
AS1	ALDCBS1X4-N	AMPLIFIED SPLITTER	GPS NETWORKING
W2	LMR-400	COAX CABLE, L = 23 FT	TIMES MICROWAVE
W3	LMR-400	COAX CABLE, L = 100FT	TIMES MICROWAVE
AT1	MDC1110N-1	ATTENUATOR, 1dB	MIDISCO
AT2	MDC1110N-5	ATTENUATOR, 5dB	MIDISCO
E2 -E3	2G1215P-XT-1	PASSIVE ANTENNA	ANTCOM CORP
TR1-TR2	MDC1042M	50 OHM TERMINATOR MAL	MIDISCO

**TEXTRON SYSTEMS** 201 LOWELL ST., WILMINGTON, MA 01887

Title GPS Re-Radiator - Room 4037 (RVA)		
Size A	Document Number <Doc>	Rev A
Date: Thursday, December 21, 2006	Sheet 1	of 1

**GPS LINK BUDGET Room 4037 (RVA)**

	L1				L2			
<b>Satellite Transmitter</b>								
Satellite Transmitter Power (25 Watts)	14				14			
RF Losses in transmitter path	-1.25				-1.25			
Antenna Gain (with respect to isotrope)	13.5				13.5			
<b>Satellite ERP</b>	<b>26.25</b>				<b>26.25</b>			
<b>Propagation</b>								
Atmospheric and Polarization Losses	-0.5				-0.5			
Free Space Path Loss	-1.84E+02				-1.82E+02			
<b>Received Power on Earth dBW</b>	<b>-1.59E+02</b>				<b>-1.57E+02</b>			
<b>Received Power on Earth dBm</b>	<b>-1.29E+02</b>				<b>-1.27E+02</b>			
<b>Facility Re-radiation System</b>								
	<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>	<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>
Gain of Receive Antenna	36.5		36.5		36.5		36.5	
RF Losses in Cable & Connectors (min.) (from Receive Antenna to Amplifier)	-2.65		-2.65		-2.33		-2.33	
Gain of Line Amplifier	18.4		18.4		18.4		18.4	
RF Losses in Cable & Connectors (from Amplifier to Passive Antenna)	-5.254		-1.21		-4.609		-1.06	
Gain of Passive Radiating Antenna	3.5		3.5		3.5		3.5	
Free Space Path Loss (100ft)	-6.61E+01		-6.61E+01		-6.39E+01		-6.39E+01	
Additional Attenuator	-1		-5		-1		-5	
<b>RF Power Level at 100ft Distance</b>	<b>-1.45E+02</b>		<b>-1.45E+02</b>		<b>-1.40E+02</b>		<b>-1.40E+02</b>	

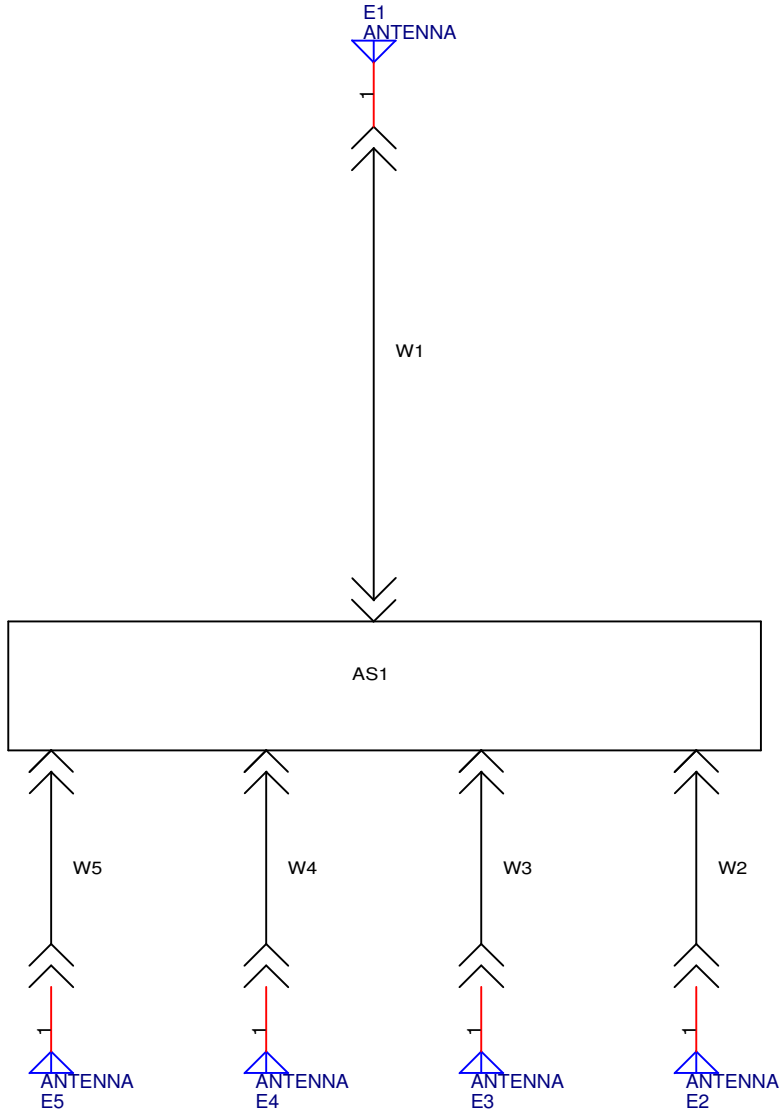
**Free Space Path Loss Calculations**

	L1		L2	
where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

**100ft from Passive Antenna**

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB

N 42 deg 32 min 19 sec  
 W 71 deg 09 min 20 sec



PARTS LIST

REF DES	PART NUMBER	DESCRIPTION	MFR
E1	3G1215A-XS-1	ACTIVE ANTENNA	ANTCOM CORP
W1	RG213/U	COAX CABLE, L = 36 FT	PASTERNAK
AS1	ALDCBS1X4-N	AMPLIFIED SPLITTER	GPS NETWORKING
W2-W5	RG213/U	COAX CABLE, L = 70 FT	PASTERNAK
E2 -E5	2G1215P-XT-1	PASSIVE ANTENNA	ANTCOM CORP

**TEXTRON SYSTEMS** 201 LOWELL ST., WILMINGTON, MA 01887

Title GPS Re-Radiator - Room 4072 (ETL)		
Size A	Document Number <Doc>	Rev A
Date: Thursday, December 21, 2006	Sheet 1	of 1

**GPS LINK BUDGET Room 4072 (ETL)**

	L1				L2				
<b>Satellite Transmitter</b>									
Satellite Transmitter Power (25 Watts)	14				14				
RF Losses in transmitter path	-1.25				-1.25				
Antenna Gain (with respect to isotrope)	13.5				13.5				
<b>Satellite ERP</b>	<b>26.25</b>				<b>26.25</b>				
<b>Propagation</b>									
Atmospheric and Polarization Losses	-0.5				-0.5				
Free Space Path Loss	-1.84E+02				-1.82E+02				
<b>Received Power on Earth dBW</b>	<b>-1.59E+02</b>				<b>-1.57E+02</b>				
<b>Received Power on Earth dBm</b>	<b>-1.29E+02</b>				<b>-1.27E+02</b>				
<b>Facility Re-radiation System</b>									
	<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>		<b>PORT 1</b>	<b>PORT 2</b>	<b>PORT 3</b>	<b>PORT 4</b>
Gain of Receive Antenna (max.)	36.5	36.5	36.5	36.5	dBic	36.5	36.5	36.5	36.5
RF Losses in Cable & Connectors (min.)	-3.44	-3.44	-3.44	-3.44	dB	-2.97	-2.97	-2.97	-2.97
(from Receive Antenna to Amplifier)									
Gain of Line Amplifier	18.4	18.4	18.4	18.4	dB	18.4	18.4	18.4	18.4
RF Losses in Cable & Connectors	-6.68	-6.68	-6.68	-6.68	dB	-5.77	-5.77	-5.77	-5.77
(from Amplifier to Passive Antenna)									
Gain of Passive Radiating Antenna	3.5	3.5	3.5	3.5	dBic	3.5	3.5	3.5	3.5
Free Space Path Loss (100ft)	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	dB	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01
Additional Attenuator	0	0	0	0		0	0	0	0
<b>RF Power Level at 100ft Distance</b>	<b>-1.46E+02</b>	<b>-1.46E+02</b>	<b>-1.46E+02</b>	<b>-1.46E+02</b>	<b>dBm</b>	<b>-1.41E+02</b>	<b>-1.41E+02</b>	<b>-1.41E+02</b>	<b>-1.41E+02</b>

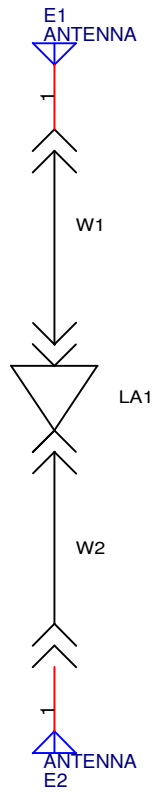
**Free Space Path Loss Calculations**

	L1		L2	
where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

**100ft from Passive Antenna**

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB





N 42 deg 32 min 20 sec  
W 71 deg 09 min 20 sec

PARTS LIST

REF DES	PART NUMBER	DESCRIPTION	MFR
E1	3G1215A-XS-1	ACTIVE ANTENNA	ANTCOM CORP
W1	LMR-400	COAX CABLE, L = 100 FTIMES MICROWAVE	
LA1	VGLA20RPDC	LINE AMPLIFIER	GPS NETWORKING
W2	LMR-400	COAX CABLE, L = 30 FTIMES MICROWAVE	
E2	2G1215P-XT-1	PASSIVE ANTENNA	ANTCOM CORP

**TEXTRON SYSTEMS** 201 LOWELL ST., WILMINGTON, MA 01887

Title GPS Re-Radiator - Room 9002 (SEEK EAGLE)		
Size A	Document Number <Doc>	Rev -
Date:	Thursday, December 21, 2006	Sheet 1 of 1

**GPS LINK BUDGET Room 9002 (Seek Eagle)**

	L1		L2	
<b>Satellite Transmitter</b>				
Satellite Transmitter Power (25 Watts)	14	dBW	14	dBW
RF Losses in transmitter path	-1.25	dB	-1.25	dB
Antenna Gain (with respect to isotrope)	13.5	dBi	13.5	dBi
<b>Satellite ERP</b>	<b>26.25</b>	<b>dBW</b>	<b>26.25</b>	<b>dBW</b>
<b>Propagation</b>				
Atmospheric and Polarization Losses	-0.5	dB	-0.5	dB
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB
<b>Received Power on Earth dBW</b>	<b>-1.59E+02</b>	<b>dBW</b>	<b>-1.57E+02</b>	<b>dBW</b>
<b>Received Power on Earth dBm</b>	<b>-1.29E+02</b>	<b>dBm</b>	<b>-1.27E+02</b>	<b>dBm</b>
<b>Facility Re-radiation System</b>				
Gain of Receive Antenna	36.5	dBic	36.5	dB
RF Losses in Cable & Connectors (min.) (from Receive Antenna to Amplifier)	-5.261	dB	-4.604	dB
Gain of Line Amplifier (measured)	17.4	dB	16.8	dB
RF Losses in Cable & Connectors (meas.) (from Amplifier to Passive Antenna)	-1.9	dB	-1.65	dB
Gain of Passive Radiating Antenna	3.5	dBic	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	dB	-6.39E+01	dB
<b>RF Power Level at 100ft Distance</b>	<b>-1.44E+02</b>	<b>dBm</b>	<b>-1.40E+02</b>	<b>dBm</b>

**Free Space Path Loss Calculations**

**Satellite to Earth**

where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

**100ft from Passive Antenna**

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB