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April 29, 2014

Subject: Antenna Kitting

Re: FCC ID: PWO460001

To Whom It May Concern:

The antenna kitting options for model 460001 signal booster were done for 30 Outside Antenna kit options and 16 Inside Antenna kit options. The order of the attached calculations is as follows:

Outside Antenna Kit Options:

1. Kit 314411-40075
2. Kit 314411-5825
3. Kit 314775-0630
4. Kit 301111-0675
5. Kit 301111-5850
6. Kit 311124-400100
7. Kit 311129-5840
8. Kit 311129-0660
9. Kit 311124-0650
10. Kit 311129-400100
11. Kit 311203-40020
12. Kit 311203-5820
13. Kit 311201-0620
14. Kit 301126
15. Kit 301111-11140
16. Kit 314453-5825
17. Kit 314453-40075
18. Kit 314473-0640
19. Kit 311141-0620
20. Kit 311124-1180
21. Kit 311201-1120
22. Kit 311129-11110
23. Kit 314475-1175
24. Kit 301111-400170

25. Kit CANT-0040 With 50' RG-6
26. Kit 311141-1120
27. Kit 314473-1175
28. Kit 311124-5830
29. Kit CANT-0043 With 50' RG-6
30. Kit CANT-0042 With 60' RG-6

Inside Antenna Kit Options:

1. Kit 311135-40060
2. Kit 311135-5820
3. Kit 311155-0630
4. Kit 301121-40010
5. Kit 301151-0610
6. Kit 309900-50N
7. Kit 309902-75F
8. Kit 309903-75F
9. Kit 309904-75F
10. Kit 309905-50N
11. Kit 311155-1150
12. Kit 301151-1110
13. Kit CANT-0045 With 15' RG-6
14. Kit YX-052 With 15' RG-6
15. Kit 301211
16. Kit CANT-0039

Sincerely,

A handwritten signature in black ink, appearing to read 'Patrick L. Cook', written in a cursive style.

Patrick L. Cook

Senior Research and Development Engineer



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

1 Wide Band Directional Antenna With 75' LMR 400 314411-40075

Antenna Gains (dBi)	7.3	7.2	7.8	7.9	9.1
Coax Loss (dB)	2.8	3.0	3.6	4.4	5.4
Final Gain less Loss (dB)	4.5	4.2	4.2	3.5	3.7
Output Power plus Final Gain (dBm EIRP)	28.2	27.8	28.8	28.4	27.0

2 Wide Band Directional Antenna With 25' RG-58 314411-5825

Antenna Gains (dBi)	7.3	7.2	7.8	7.9	9.1
Coax Loss (dB)	2.9	3.1	3.2	5.1	5.4
Final Gain less Loss (dB)	4.4	4.1	4.6	2.8	3.7
Output Power plus Final Gain (dBm EIRP)	28.1	27.7	29.2	27.7	27.0

3 Wide Band Directional Antenna With 30' RG-6 314775-0630

Antenna Gains (dBi)	7.3	7.2	7.8	7.9	9.1
Coax Loss (dB)	3.0	3.2	3.4	5.1	5.3
Final Gain less Loss (dB)	4.3	4	4.4	2.8	3.8
Output Power plus Final Gain (dBm EIRP)	28	27.6	29	27.7	27.1

4 Yagi Antenna 301111 With 75' RG-6 301111-0675

Antenna Gains (dBi)	10.0	10.0	10.8	-6.8	-13.8
Coax Loss (dB)	5.7	6.075	6.3	9.525	9.975
Final Gain less Loss (dB)	4.3	3.925	4.5	-16.325	-23.775
Output Power plus Final Gain (dBm EIRP)	28	27.5	29.1	8.6	-0.5

5 Yagi Antenna 301111 With 50' RG-58 301111-5850

Antenna Gains (dBi)	10.0	10.0	10.8	-6.8	-13.8
Coax Loss (dB)	5.8	6.2	6.5	10.3	10.7
Final Gain less Loss (dB)	4.2	3.8	4.3	-17.1	-24.5
Output Power plus Final Gain (dBm EIRP)	27.9	27.4	28.9	7.8	-1.2



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

6 Yagi Antenna 311129 With 100' LMR 400 311129-400100

Antenna Gains (dBi)	1.95	7.18	9.64	-6.67	-11.97
Coax Loss (dB)	3.7	3.9	4.7	5.8	7.1
Final Gain less Loss (dB)	-1.75	3.28	4.9	-12.47	-19.07
Output Power plus Final Gain (dBm EIRP)	22.0	26.9	29.5	12.4	4.2

7 Yagi Antenna 311129 With 40' RG-58 311129-5840

Antenna Gains (dBi)	1.95	7.18	9.64	-6.67	-11.97
Coax Loss (dB)	4.6	5.0	5.2	8.2	8.6
Final Gain less Loss (dB)	-2.7	2.2	4.4	-14.9	-20.6
Output Power plus Final Gain (dBm EIRP)	21.1	25.8	29.0	10.0	2.7

8 Yagi Antenna 311129 With 60' RG-6 311129-0660

Antenna Gains (dBi)	1.95	7.18	9.64	-6.67	-11.97
Coax Loss (dB)	4.56	4.86	5.0	7.6	8.0
Final Gain less Loss (dB)	-2.61	2.32	4.64	-14.29	-19.95
Output Power plus Final Gain (dBm EIRP)	21.1	25.9	29.2	10.6	3.4

9 Yagi Antenna 311124 With 50' RG-6 311124-0650

Antenna Gains (dBi)	-18.7	-18.7	-23.4	9.1	10.9
Coax Loss (dB)	3.8	4.05	4.2	6.4	6.7
Final Gain less Loss (dB)	-22.50	-22.75	-27.60	2.75	4.25
Output Power plus Final Gain (dBm EIRP)	1.2	0.9	-3.0	27.7	27.6

10 Yagi Antenna 311124 With 100' LMR 400 311124-400100

Antenna Gains (dBi)	-18.7	-18.7	-23.4	9.1	10.9
Coax Loss (dB)	3.7	3.9	4.7	5.8	7.1
Final Gain less Loss (dB)	-22.4	-22.6	-28.1	3.3	3.8
Output Power plus Final Gain (dBm EIRP)	1.3	1	-3.5	28.2	27.1



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

11 Omni Directional Antenna (311203) With 20' LMR 400 311203-40020

Antenna Gains (dBi)	-1.5	-0.24	0.57	-2.51	5.09
Coax Loss (dB)	0.7	0.7	0.7	1.1	1.1
Final Gain less Loss (dB)	-2.2	-0.94	-0.13	-3.61	4.0
Output Power plus Final Gain (dBm EIRP)	21.5	22.7	24.5	21.3	27.3

12 Omni Directional Antenna (311203) With 20' RG-58 311203-5820

Antenna Gains (dBi)	-1.5	-0.24	0.57	-2.51	5.09
Coax Loss (dB)	2.3	2.5	2.6	4.1	4.3
Final Gain less Loss (dB)	-3.8	-2.74	-2.03	-6.61	0.79
Output Power plus Final Gain (dBm EIRP)	19.9	20.9	22.6	18.3	24.1

13 Omni Directional Antenna (311201) With 20' RG-6 311201-0620

Antenna Gains (dBi)	-1.5	-0.24	0.57	-2.51	5.09
Coax Loss (dB)	1.5	1.6	1.7	2.5	2.7
Final Gain less Loss (dB)	-3	-1.84	-1.13	-5.01	2.39
Output Power plus Final Gain (dBm EIRP)	20.7	21.8	23.5	19.9	25.7

14 Mini-Mag Antenna With 12.5' RG-174 301126

Antenna Gains (dBi)	-1.42	-1.69	-1.4	-0.59	0.42
Coax Loss (dB)	2.8	3.0	3.7	4.5	4.7
Final Gain less Loss (dB)	-4.22	-4.69	-5.1	-5.09	-4.28
Output Power plus Final Gain (dBm EIRP)	19.5	18.9	19.5	19.8	19.0

15 Yagi 301111 With 140' RG-11 301111-11140

Antenna Gains (dBi)	10	10	10.8	-6.8	-14.9
Coax Loss (dB)	5.76	6.17	6.43	10.36	10.94
Final Gain less Loss (dB)	4.24	3.83	4.37	-17.16	-25.84
Output Power plus Final Gain (dBm EIRP)	27.9	27.4	29.0	7.7	-2.5



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

16 Panel Antenna With 25' RG-58 314453-5825

Antenna Gains (dBi)	3.84	3.63	4.4	8.21	10.04
Coax Loss (dB)	2.9	3.1	3.2	5.1	5.4
Final Gain less Loss (dB)	0.9	0.5	1.2	3.1	4.6
Output Power plus Final Gain (dBm EIRP)	24.6	24.1	25.8	28.0	27.9

17 Panel Antenna With 75' LMR 400 314453-40075

Antenna Gains (dBi)	3.84	3.63	4.4	8.21	10.04
Coax Loss (dB)	2.8	3.0	3.6	4.4	5.4
Final Gain less Loss (dB)	1.04	0.63	0.8	3.81	4.64
Output Power plus Final Gain (dBm EIRP)	24.7	24.2	25.4	28.7	27.9

18 Panel Antenna With 40' RG-6 314473-0640

Antenna Gains (dBi)	3.84	3.63	4.4	8.21	10.04
Coax Loss (dB)	3.0	3.2	3.4	5.1	5.3
Final Gain less Loss (dB)	0.84	0.43	1.0	3.11	4.74
Output Power plus Final Gain (dBm EIRP)	24.5	24.0	25.6	28.0	28.0

19 Grey Brick w/20' RG-6 311141-0620

Antenna Gains (dBi)	-2.9	-0.6	1.2	-0.4	5.5
Coax Loss (dB)	1.5	1.6	1.7	2.5	2.7
Final Gain less Loss (dB)	-4.4	-2.2	-0.5	-2.9	2.8
Output Power plus Final Gain (dBm EIRP)	19.3	21.4	24.1	22	26.1

20 Yagi 311124 With 80' RG-11 311124-1180

Antenna Gains (dBi)	-18.7	-18.7	-23.4	9.1	10.9
Coax Loss (dB)	3.3	3.5	3.6	5.9	6.3
Final Gain less Loss (dB)	-21.97	-22.20	-27.00	3.18	4.65
Output Power plus Final Gain (dBm EIRP)	1.73	1.4	-2.4	28.1	28.0



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

21 Omni Directional Antenna 311201 With 20' RG-11 311201-1120

Antenna Gains (dBi)	-1.5	-0.2	0.6	-2.5	5.1
Coax Loss (dB)	0.8	0.9	0.9	1.5	1.6
Final Gain less Loss (dB)	-2.32	-1.12	-0.34	-3.99	3.53
Output Power plus Final Gain (dBm EIRP)	21.4	22.5	24.3	20.9	26.8

22 Yagi 311129 With 110' RG-11 311129-11110

Antenna Gains (dBi)	2	7.2	9.6	-6.7	-12
Coax Loss (dB)	4.6	4.8	5.0	8.1	8.6
Final Gain less Loss (dB)	-2.55	2.36	4.63	-14.81	-20.57
Output Power plus Final Gain (dBm EIRP)	21.2	26.0	29.2	10.1	2.7

23 Wide Band Directional Antenna With 75' RG-11 314475-1175

Antenna Gains (dBi)	7.3	7.2	7.8	7.9	9.1
Coax Loss (dB)	3.07	3.3	3.42	5.55	5.9
Final Gain less Loss (dB)	4.23	3.91	4.38	2.35	3.24
Output Power plus Final Gain (dBm EIRP)	27.9	27.5	29.0	27.3	26.5

24 Yagi Antenna 301111 With 170' LMR 400 301111-400170

Antenna Gains (dBi)	10.0	10.0	10.8	-6.8	-13.8
Coax Loss (dB)	5.8	6.1	6.3	9.4	9.8
Final Gain less Loss (dB)	4.2	3.9	4.5	-16.2	-23.6
Output Power plus Final Gain (dBm EIRP)	27.9	27.5	29.1	8.7	-0.3

25 CANT-0040 With 50' RG-6

Antenna Gains (dBi)	3.0	3.0	3.0	5.0	5.0
Coax Loss (dB)	3.8	4.05	4.2	6.4	6.7
Final Gain less Loss (dB)	-0.8	-1.05	-1.2	-1.35	-1.65
Output Power plus Final Gain (dBm EIRP)	22.9	22.6	23.4	23.6	21.7



Fixed Outside Antenna Kit Options

FCC ID: PWO460001

Final Output Power Limited to 30 dBm EIRP in all frequency bands

Uplink Frequency (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Uplink Output Power (dBm)	23.7	23.6	24.6	24.9	23.3

26 Grey Panel With 20' RG-11 311141-1120

Antenna Gains (dBi)	-2.9	-0.6	1.2	-0.4	5.5
Coax Loss (dB)	0.9	0.9	1.0	1.5	1.6
Final Gain less Loss (dB)	-3.75	-1.48	0.25	-1.88	3.94
Output Power plus Final Gain (dBm EIRP)	20.0	22.1	24.9	23.0	27.2

27 Panel Antenna With 75' RG-11 314473-1175

Antenna Gains (dBi)	3.8	3.6	4.4	8.2	10
Coax Loss (dB)	3.0	3.3	3.4	5.5	5.8
Final Gain less Loss (dB)	0.77	0.34	0.98	2.66	4.18
Output Power plus Final Gain (dBm EIRP)	24.5	23.9	25.6	27.6	27.5

28 Yagi Antenna 311124 With 30' RG-58 311124-5830

Antenna Gains (dBi)	-18.7	-18.7	-23.4	9.1	10.9
Coax Loss (dB)	3.5	3.7	3.9	6.2	6.4
Final Gain less Loss (dB)	-22.2	-22.4	-27.3	2.9	4.5
Output Power plus Final Gain (dBm EIRP)	1.52	1.2	-2.7	27.8	27.8

29 CANT-0043 With 50' RG-6

Antenna Gains (dBi)	5.7	5.7	5.7	7.2	7.2
Coax Loss (dB)	3.8	4.05	4.2	6.4	6.7
Final Gain less Loss (dB)	1.90	1.65	1.50	0.85	0.55
Output Power plus Final Gain (dBm EIRP)	25.6	25.3	26.1	25.8	23.9

30 CANT-0042 With 60' RG-6

Antenna Gains (dBi)	10	10	10	12	12
Coax Loss (dB)	4.56	4.86	5.0	7.6	8.0
Final Gain less Loss (dB)	5.4	5.1	5.0	4.4	4.0
Output Power plus Final Gain (dBm EIRP)	29.14	28.7	29.6	29.3	27.3



FCC ID: PWO460001

Uplink Frequency Band (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Measured Uplink Gain (dB)	57.2	58.70	58.20	62.50	61.70
Measured RSSI Shutoff (dBm/MHz)	-62.90	-62.90	-61.30	-67.10	-62.20
MSCL Minimum (dB)	28.30	29.80	30.90	29.40	33.50
6' Separation Distance Path Loss (dB)	34.74	35.57	36.16	42.48	43.21
Polarity Loss	3.0	3.0	3.0	3.0	3.0
Max Antenna Gain Less Cable Loss (dB)	9.44	8.77	8.26	11.20	10.90

1 Inside Antenna Kit 311135-40060: Panel w/60' LMR 400

Antenna Gain Less Cable Loss (dB)	1.54	1.21	1.46	4.66	5.68
Margin (dB)	-7.90	-7.56	-6.80	-6.54	-5.22

2 Inside Antenna Kit 311135-5820: Panel w/20' RG-58

Antenna Gain Less Cable Loss (dB)	1.52	1.14	1.82	4.09	5.75
Margin (dB)	-7.92	-7.63	-6.44	-7.11	-5.15

3 Inside Antenna Kit 311155-0630: Panel w/30' RG-6

Antenna Gain Less Cable Loss (dB)	1.56	1.20	1.88	4.40	6.05
Margin (dB)	-7.88	-7.57	-6.38	-6.80	-4.85

4 Inside Antenna Kit 301121-40010: Dome Antenna w/10' LMR 400

Antenna Gain Less Cable Loss (dB)	-3.19	-1.94	0.06	2.10	2.42
Margin (dB)	-12.63	-10.71	-8.20	-9.10	-8.48

5 Inside Antenna Kit 301151-0610: Dome Antenna w/10' RG-6

Antenna Gain Less Cable Loss (dB)	-3.36	-2.14	-0.08	1.63	2.02
Margin (dB)	-12.80	-10.91	-8.34	-9.57	-8.88

6 Inside Antenna Kit 309900-50N: 2 Panel Antennas and a 50 Ohm 3-Way Splitter

Antenna Gain Less Cable/Splitter Loss (dB)	2.13	2.13	1.33	5.09	7.49
Margin (dB)	-7.31	-6.64	-6.93	-6.11	-3.41

7 Inside Antenna Kit 309902-75F: 2 Panel Antennas and a 75 Ohm 3-Way Splitter

Antenna Gain Less Cable/Splitter Loss (dB)	2.13	2.13	1.33	5.09	7.49
Margin (dB)	-7.31	-6.64	-6.93	-6.11	-3.41

8 Inside Antenna Kit 309903-75F: 3 Panel Antennas and three 75 Ohm 2-Way Splitter

Antenna Gain Less Cable/Splitter Loss (dB)	2.13	2.13	1.33	5.09	7.49
Margin (dB)	-7.31	-6.64	-6.93	-6.11	-3.41

9 Inside Antenna Kit 309904-75F: 1 Panel Antenna and a 75 Ohm 2-Way Splitter

Antenna Gain Less Cable/Splitter Loss (dB)	2.13	2.13	1.33	5.09	7.49
Margin (dB)	-7.31	-6.64	-6.93	-6.11	-3.41

10 Inside Antenna Kit 309905-50N: 3 Panel Antennas and three 50 Ohm 2-Way Splitter

Antenna Gain Less Cable/Splitter Loss (dB)	2.13	2.13	1.33	5.09	7.49
Margin (dB)	-7.31	-6.64	-6.93	-6.11	-3.41

11 Inside Antenna Kit 311155-1150: Panel w/50' RG-11

Antenna Gain Less Cable Loss (dB)	1.80	1.44	2.12	4.51	6.13
Margin (dB)	-7.64	-7.33	-6.14	-6.69	-4.77

12 Inside Antenna Kit 301151-1110: Dome Antenna w/10' RG-11

Antenna Gain Less Cable Loss (dB)	-3.01	-1.77	0.30	2.16	2.57
Margin (dB)	-12.45	-10.54	-7.96	-9.04	-8.33

13 Inside Antenna Kit CANT-0045 w/15' RG-6

Antenna Gain Less Cable Loss (dB)	6.86	6.78	6.74	5.59	5.50
Margin (dB)	-2.58	-1.99	-1.52	-5.61	-5.40

14 Inside Antenna Kit YX-052 w/15' RG-6

Antenna Gain Less Cable Loss (dB)	-0.14	-0.22	-0.26	0.09	0.00
Margin (dB)	-9.58	-8.99	-8.52	-11.11	-10.90

Uplink Frequency Band (MHz)	704-716	777-787	824-849	1710-1755	1850-1915
Measured Uplink Gain (dB)	57.20	58.70	58.20	62.50	61.70
Measured RSSI Shutoff (dBm/MHz)	-62.90	-62.90	-61.30	-67.10	-62.20
MSCL Minimum (dB)	28.30	29.80	30.90	29.40	33.50
4' Separation Distance Path Loss (dB)	31.21	32.05	32.64	38.96	39.68
Polarity Loss	3.0	3.0	3.0	3.0	3.0
Max Antenna Gain Less Cable Loss (dB)	5.91	5.25	4.74	11.20	9.18

15 Inside Antenna Kit 301211: Desktop Antenna w/5' RG-174

Antenna Gain Less Cable Loss (dB)	-0.73	-2.07	-1.28	-1.43	-0.98
Margin (dB)	-6.64	-7.32	-6.02	-12.63	-10.16

16 Inside Antenna Kit CANT-0039

Antenna Gain Less Cable Loss (dB)	1.00	1.00	1.00	1.00	1.00
Margin (dB)	-4.91	-4.25	-3.74	-10.20	-8.18