



**SYSTEMS WITH RELIABILITY, LTD.**

Broadcast Antenna and Transmission Systems

## **PATTERN CERTIFICATION**

### **DIRECTIONAL FM ANTENNA**

**KQKL**

**May 1, 2003**

<b>Call Sign</b>	:	KQKL
<b>Location</b>	:	Selma, California
<b>Frequency</b>	:	88.5 MHz
<b>Channel</b>	:	203
<b>Antenna Model</b>	:	FM3/6-DA
<b>Maximum Antenna Gain</b>	:	
<b>Horizontal</b>	:	10.062/ 10.027 dB
<b>Vertical</b>	:	10.062/ 10.027 dB

### **ANTENNA DESCRIPTION**

A custom designed **FM3/6 DA** antenna was used to produce the required directional azimuth pattern. Each antenna bay consists of a circularly polarized dipole-radiating element with a vertical and horizontal parasitic system. The array is comprised of **six** bays, that are spaced a full wavelength apart pointing at a **110 degrees** true north, mounted to a tower.

### **DESCRIPTION OF TEST PROCEDURE**

The test antenna consists of a third-scale dipole antenna and parasitic system. This antenna was mounted to an 8-inch third-scale model tower with the use of mounting brackets supplied with the finalized antenna. The tower was 20 ft. on a platform. All feed cables are properly grounded during pattern testing. Horizontal and vertical parasitic elements were used to obtain the desired directional pattern.

The source antenna, a vertical/horizontal dipole Cavity Back Resonator antenna configuration was mounted approximately 100 feet from the test antenna. The source's height was adjusted to provide a uniform field at the test antenna location. The CBR antenna was operated in the transmit mode at a frequency of 265.5 MHz. The antenna under test was rotated in a clockwise direction. A gain reference was taken using a dipole tuned to 265.5 MHz. Nowhere does the received signal exceed a maximum to minimum ratio of 15 dB.

## DOCUMENT EXHIBITS

The following exhibits are included as part of this Certificate of Compliance:

<b>Exhibit 1</b>	Circular Polarized Azimuth Pattern Field Strength Tabulations (Composite)
<b>Exhibit 2</b>	Measured Horizontal Polarized Azimuth Pattern Measured Field Strength Tabulations (Horizontal)
<b>Exhibit 3</b>	Measured Vertical Polarized Azimuth Pattern Measured Field Strength Tabulations (Vertical)
<b>Exhibit 4</b>	Elevation Pattern Elevation Tabulations
<b>Exhibit 5</b>	Antenna Data Sheet

## TEST EQUIPMENT

<b>Network Analyzer</b>	:	Hewlett Packard Model # 8753C Serial Number : 08753 – 69138 Calibrated 8/26/02, SWR, Inc.
<b>Computer</b>	:	White Mountain 366 Computer
<b>Plotter</b>	:	Hewlett-Packard 7550A
<b>Positioner</b>	:	Orbit Positioner Calibrated 1/06/03, SWR, Inc.

*Prepared by.*



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**Jason Duncan**  
SWR, Inc.

## TEST RESULTS

The attached calculations verify that the **RMS** value of this antenna is **93.34 %** of the **RMS** value of the pattern authorized in the related construction permit **BPH-20020723AEF**. The vertical component **RMS** value is **.575** and the horizontal component **RMS** value is **0.545**.

Azimuth and elevation plots and associated tabulations of this antenna are included with this package.

Measured horizontal polarized directivity	:	3.36529 /5.27022 dB
Measured vertical polarized directivity	:	3.02053 /4.80083 dB
Measured composite azimuth pattern directivity	:	3.0132 /4.79027 dB

Gain in each polarization was calculated using the following relation:

**GAIN** = Azimuth Directivity x Elevation Directivity x Power Ratio Between Polarizations

Using this relationship along with ratio measured at our testing facilities:

**H-Pol. Gain** = (3.36529)(6.321)(0.473006) = **10.062 / 10.027 dB**

**V-Pol. Gain** = (3.02053)(6.321)(0.526994) = **10.062 / 10.027 dB**

## INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **138 meters** above ground level. The antenna (parasitic system included) aperture is **55.57 feet**. No other antennas are to be mounted within **10 feet** of the antenna. No other obstructions other than those specified by original drawings supplied are to be mounted at the same level as the antenna. The antenna is to be oriented **110 degrees** true North.

The parasitic system is custom designed to shape and direct the antenna pattern as required. The systems orientation and the mounting details are described in the following drawings:

DRAWING NO.	TITLE
0608C00	ORIENTATION WITH PARASITICS
0608C01	ANTENNA ORIENTATION
0608A02	PARASITIC STABILIZING BRACKET (BAYS 1-5)
0608A03	PARASITIC STABILIZING BRACKET (BAY 6)
0608A01	VERTICAL PARASITIC INSULATOR
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 0608C00**. Each bay is mounted using the bracket assemblies in **DWG. 0608A02** and **DWG. 0608A03**. The parasitic assembly is shown in **DWG. 0608A02** and **DWG. 0608A03**. All lengths of the dipoles are shown in **DWG. 0608A02** and **DWG. 0608A03**. The antenna elements shall be aligned at the same heading as in **DWG. 0608C01**. This will ensure that the antenna is oriented properly at 110 degrees true north.

## Surveyor's Declaration

I, \_\_\_\_\_, subject to the penalties of perjury, do declare the following:

- 1.) I am a licensed surveyor in the state(s) of \_\_\_\_\_,  
\_\_\_\_\_ and \_\_\_\_\_.
- 2.) I have provided professional services to \_\_\_\_\_ (permit tee name), permit tee of \_\_\_\_\_-FM, \_\_\_\_\_ (city of license), \_\_\_\_\_ (state), during the installation of the \_\_\_\_\_-FM directional antenna.
- 3.) I certify that the \_\_\_\_\_-FM directional antenna has been oriented at the proper azimuth as authorized in the construction permit (FCC File Number \_\_\_\_\_).

Dated: \_\_\_\_\_ mm/dd/yy

## Engineer's Declaration

I, \_\_\_\_\_, subject to the penalties of perjury, do declare the following:

- 1.) I am the holder of a valid General Radio Telephone Operators License, Number \_\_\_\_\_(FCC License No.)
- 2.) I have been a member of the Society of Broadcast Engineer's since 19\_\_\_\_
- 3.) That I have been employed as a technical consultant with the firm of:  
\_\_\_\_\_(firm name), of  
\_\_\_\_\_(city state)
- 4.) That \_\_\_\_\_(Firm's Name) was retained by  
\_\_\_\_\_(Permittee's Name) for the  
purpose of preparing its application for the construction permit of \_\_\_\_\_-FM  
\_\_\_\_\_(City), \_\_\_\_\_(State), from which  
the underlying Construction Permit (FCC File Number \_\_\_\_\_)  
was granted by the Commission.
- 5.) That I am familiar with the terms and conditions of the \_\_\_\_\_-FM  
Construction Permit.
- 6.) I hereby certify that I have overseen the installation of the \_\_\_\_\_-FM  
directional antenna and that the installation was complete to the manufacturer's  
instructions.

Dated: \_\_\_\_\_mm/dd/yy



**SYSTEMS WITH RELIABILITY, INC.**  
**Broadcast Antennas and Transmission Systems**

## KQKL Antenna RMS Comparison

### PROPOSED ANTENNA

Azimuth Heading	Relative Field
0	0.632
10	0.632
20	0.525
30	0.485
40	0.437
50	0.463
60	0.447
70	0.519
80	0.654
90	0.823
100	1.000
110	1.000
120	1.000
130	1.000
140	1.000
150	1.000
160	1.000
170	1.000
180	0.833
190	0.661
200	0.525
210	0.417
220	0.360
230	0.360
240	0.317
250	0.282
260	0.282

### DESIGNED ANTENNA

Azimuth Heading	Relative Field
0	0.538
10	0.555
20	0.525
30	0.480
40	0.437
50	0.448
60	0.447
70	0.519
80	0.654
90	0.788
100	0.882
110	0.944
120	0.981
130	0.997
140	0.971
150	0.980
160	1.000
170	0.960
180	0.833
190	0.661
200	0.525
210	0.417
220	0.360
230	0.340
240	0.279
250	0.215
260	0.256

**PROPOSED ANTENNA**

**Azimuth  
Heading**      **Relative  
Field**

270	0.282
280	0.335
290	0.422
300	0.532
310	0.654
320	0.654
330	0.550
340	0.550
350	0.583

Sum of Relative Field Squared : 15.841

Sum Divided by 36 (Readings) : 0.440

Square Root : 0.663

**Percentage of Construction Permit Antenna Filled :**

**DESIGNED ANTENNA**

**Azimuth  
Heading**      **Relative  
Field**

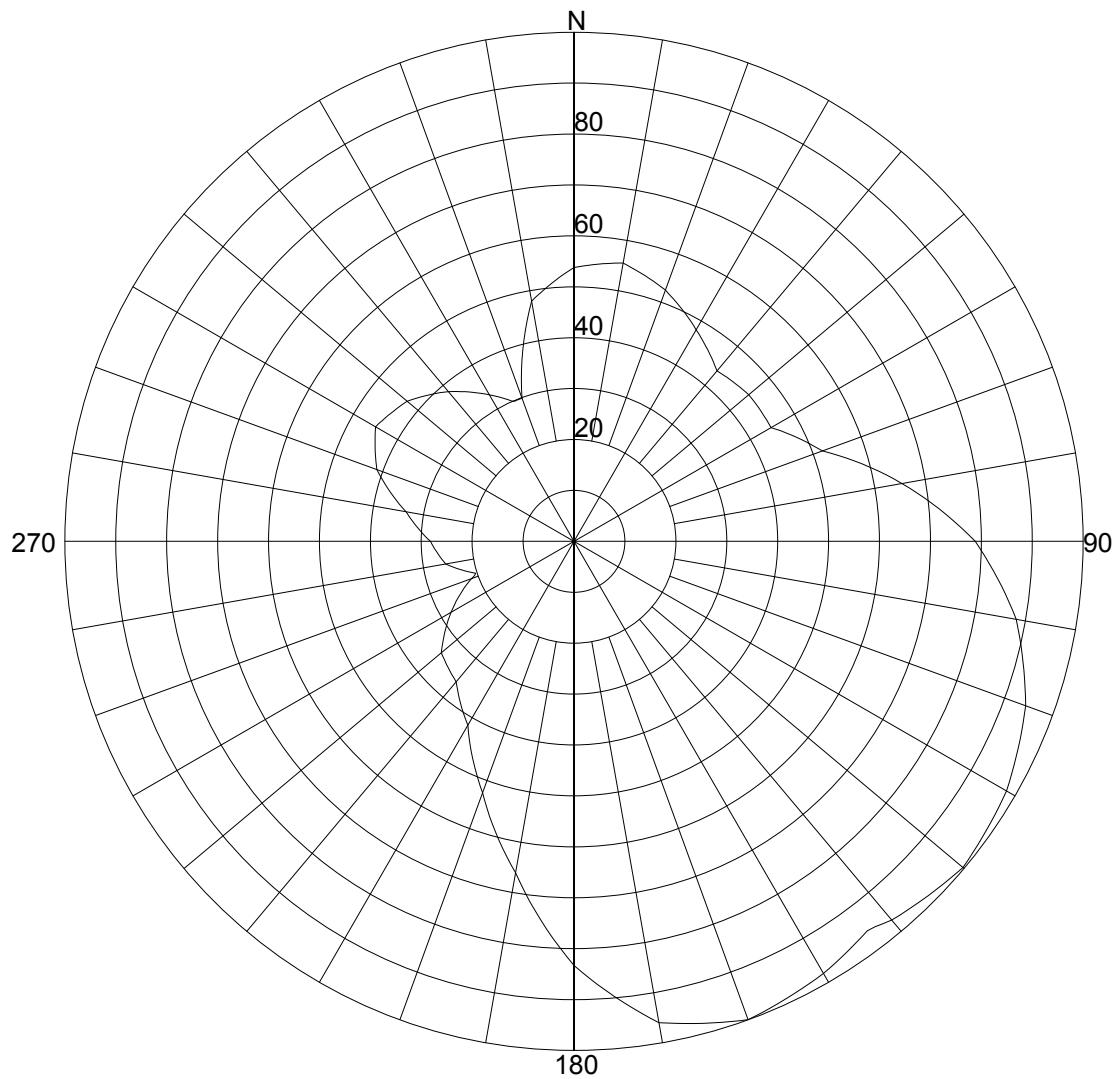
270	0.282
280	0.335
290	0.412
300	0.450
310	0.428
320	0.384
330	0.332
340	0.299
350	0.479

Sum of Relative Field Squared : 13.802

Sum Divided by 36 (Readings) : 0.383

Square Root : 0.619

**93.34%**



## Azimuth Pattern

Scale: Linear

Unit: Relative Field

**Systems With Reliability Inc.**

CLIENT: *KQKL- Exhibit 1*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.0132 / 4.7902dB

PATTERN RMS: 0.576



# Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.5380 (-5.37 )	180	.8330 (-1.58 )
5	.5465 (-5.23 )	185	.7470 (-2.52 )
10	.5550 (-5.1 )	190	.6610 (-3.58 )
15	.5400 (-5.34 )	195	.5930 (-4.52 )
20	.5250 (-5.58 )	200	.5250 (-5.58 )
25	.5025 (-5.96 )	205	.4710 (-6.52 )
30	.4800 (-6.36 )	210	.4170 (-7.58 )
35	.4585 (-6.75 )	215	.3885 (-8.19 )
40	.4370 (-7.17 )	220	.3600 (-8.85 )
45	.4425 (-7.06 )	225	.3500 (-9.09 )
50	.4480 (-6.96 )	230	.3400 (-9.34 )
55	.4475 (-6.96 )	235	.3095 (-10.16 )
60	.4470 (-6.97 )	240	.2790 (-11.06 )
65	.4830 (-6.3 )	245	.2470 (-12.11 )
70	.5190 (-5.68 )	250	.2150 (-13.31 )
75	.5865 (-4.62 )	255	.2230 (-13 )
80	.6540 (-3.68 )	260	.2560 (-11.8 )
85	.7210 (-2.83 )	265	.2690 (-11.37 )
90	.7880 (-2.06 )	270	.2820 (-10.96 )
95	.8350 (-1.56 )	275	.3085 (-10.19 )
100	.8820 (-1.08 )	280	.3350 (-9.47 )
105	.9130 (-0.78 )	285	.3735 (-8.53 )
110	.9440 (-0.49 )	290	.4120 (-7.68 )
115	.9625 (-0.32 )	295	.4310 (-7.29 )
120	.9810 (-0.16 )	300	.4500 (-6.92 )
125	.9890 (-0.09 )	305	.4390 (-7.13 )
130	.9970 (-0.02 )	310	.4280 (-7.35 )
135	.9840 (-0.13 )	315	.4060 (-7.81 )
140	.9710 (-0.25 )	320	.3840 (-8.29 )
145	.9640 (-0.31 )	325	.3580 (-8.9 )
150	.9800 (-0.17 )	330	.3320 (-9.55 )
155	.9900 (-0.08 )	335	.3070 (-10.23 )
160	1.0000 ( 0.01 )	340	.2990 (-10.46 )
165	.9800 (-0.17 )	345	.3890 (-8.18 )
170	.9600 (-0.35 )	350	.4790 (-6.38 )
175	.8965 (-0.94 )	355	.5085 (-5.86 )

## Systems With Reliability Inc.

CLIENT: *KQKL- Exhibit 1*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

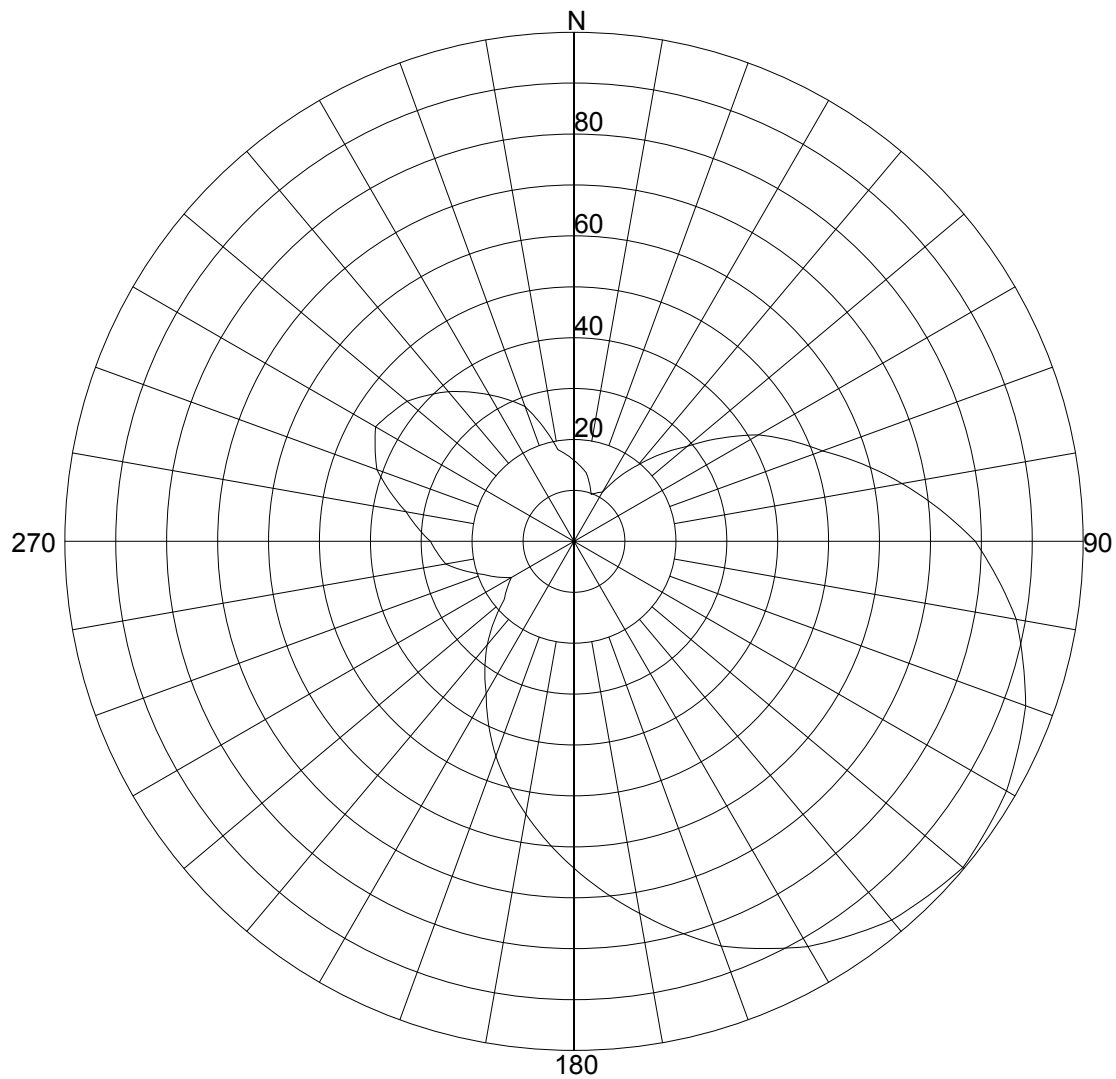
FREQUENCY: 88.5

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.0132 / 4.7902dB

PATTERN RMS: 0.576



## Azimuth Pattern

Scale: Linear

Unit: Relative Field

**Systems With Reliability Inc.**

CLIENT: *KQKL- Exhibit 2*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.36529 / 5.27dB

PATTERN RMS: 0.545

# Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.1590 (-15.92 )	180	.6420 (-3.84 )
5	.1480 (-16.54 )	185	.5930 (-4.52 )
10	.1370 (-17.2 )	190	.5440 (-5.27 )
15	.1175 (-18.53 )	195	.4965 (-6.06 )
20	.0980 (-20.09 )	200	.4490 (-6.94 )
25	.1050 (-19.49 )	205	.3970 (-8 )
30	.1120 (-18.94 )	210	.3450 (-9.22 )
35	.1540 (-16.19 )	215	.3050 (-10.29 )
40	.1960 (-14.11 )	220	.2650 (-11.5 )
45	.2430 (-12.25 )	225	.2220 (-13.03 )
50	.2900 (-10.72 )	230	.1790 (-14.89 )
55	.3540 (-9 )	235	.1605 (-15.84 )
60	.4180 (-7.56 )	240	.1420 (-16.89 )
65	.4685 (-6.57 )	245	.1660 (-15.55 )
70	.5190 (-5.68 )	250	.1900 (-14.38 )
75	.5865 (-4.62 )	255	.2230 (-13 )
80	.6540 (-3.68 )	260	.2560 (-11.8 )
85	.7210 (-2.83 )	265	.2690 (-11.37 )
90	.7880 (-2.06 )	270	.2820 (-10.96 )
95	.8350 (-1.56 )	275	.3085 (-10.19 )
100	.8820 (-1.08 )	280	.3350 (-9.47 )
105	.9130 (-0.78 )	285	.3735 (-8.53 )
110	.9440 (-0.49 )	290	.4120 (-7.68 )
115	.9625 (-0.32 )	295	.4310 (-7.29 )
120	.9810 (-0.16 )	300	.4500 (-6.92 )
125	.9890 (-0.09 )	305	.4390 (-7.13 )
130	.9970 (-0.02 )	310	.4280 (-7.35 )
135	.9840 (-0.13 )	315	.4060 (-7.81 )
140	.9710 (-0.25 )	320	.3840 (-8.29 )
145	.9450 (-0.48 )	325	.3580 (-8.9 )
150	.9190 (-0.72 )	330	.3320 (-9.55 )
155	.8825 (-1.08 )	335	.3070 (-10.23 )
160	.8460 (-1.44 )	340	.2820 (-10.96 )
165	.7940 (-1.99 )	345	.2325 (-12.63 )
170	.7420 (-2.58 )	350	.1830 (-14.7 )
175	.6920 (-3.19 )	355	.1710 (-15.29 )

## Systems With Reliability Inc.

CLIENT: *KQKL- Exhibit 2*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

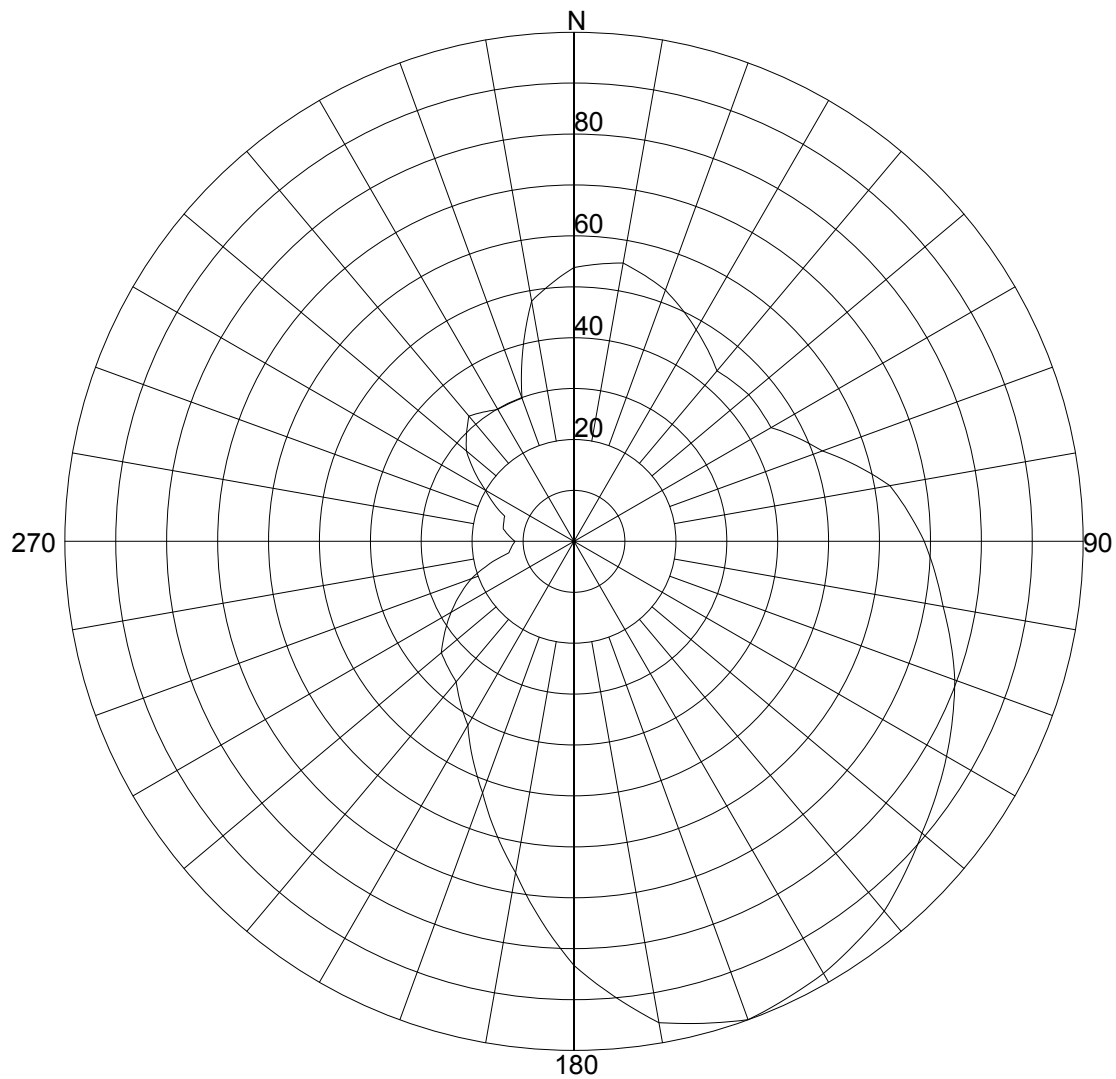
FREQUENCY: 88.5

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.36529 / 5.27dB

PATTERN RMS: 0.545



## Azimuth Pattern

Scale: Linear

Unit: Relative Field

**Systems With Reliability Inc.**

CLIENT: *KQKL- Exhibit 3*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.02053 / 4.8dB

PATTERN RMS: 0.575

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.5380 (-5.37 )	180	.8330 (-1.58 )
5	.5465 (-5.23 )	185	.7470 (-2.52 )
10	.5550 (-5.1 )	190	.6610 (-3.58 )
15	.5400 (-5.34 )	195	.5930 (-4.52 )
20	.5250 (-5.58 )	200	.5250 (-5.58 )
25	.5025 (-5.96 )	205	.4710 (-6.52 )
30	.4800 (-6.36 )	210	.4170 (-7.58 )
35	.4585 (-6.75 )	215	.3885 (-8.19 )
40	.4370 (-7.17 )	220	.3600 (-8.85 )
45	.4425 (-7.06 )	225	.3500 (-9.09 )
50	.4480 (-6.96 )	230	.3400 (-9.34 )
55	.4475 (-6.96 )	235	.3095 (-10.16 )
60	.4470 (-6.97 )	240	.2790 (-11.06 )
65	.4830 (-6.3 )	245	.2470 (-12.11 )
70	.5190 (-5.68 )	250	.2150 (-13.31 )
75	.5745 (-4.8 )	255	.1725 (-15.21 )
80	.6300 (-4 )	260	.1300 (-17.65 )
85	.6590 (-3.61 )	265	.1230 (-18.13 )
90	.6880 (-3.24 )	270	.1160 (-18.64 )
95	.7120 (-2.94 )	275	.1285 (-17.75 )
100	.7360 (-2.65 )	280	.1410 (-16.95 )
105	.7660 (-2.3 )	285	.1430 (-16.83 )
110	.7960 (-1.97 )	290	.1450 (-16.71 )
115	.8205 (-1.71 )	295	.1730 (-15.19 )
120	.8450 (-1.45 )	300	.2010 (-13.89 )
125	.8685 (-1.21 )	305	.2385 (-12.41 )
130	.8920 (-0.98 )	310	.2760 (-11.15 )
135	.9200 (-0.71 )	315	.2985 (-10.47 )
140	.9480 (-0.45 )	320	.3210 (-9.84 )
145	.9640 (-0.31 )	325	.3100 (-10.14 )
150	.9800 (-0.17 )	330	.2990 (-10.46 )
155	.9900 (-0.08 )	335	.2990 (-10.46 )
160	1.0000 ( 0.01 )	340	.2990 (-10.46 )
165	.9800 (-0.17 )	345	.3890 (-8.18 )
170	.9600 (-0.35 )	350	.4790 (-6.38 )
175	.8965 (-0.94 )	355	.5085 (-5.86 )

## Systems With Reliability Inc.

CLIENT: *KQKL- Exhibit 3*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

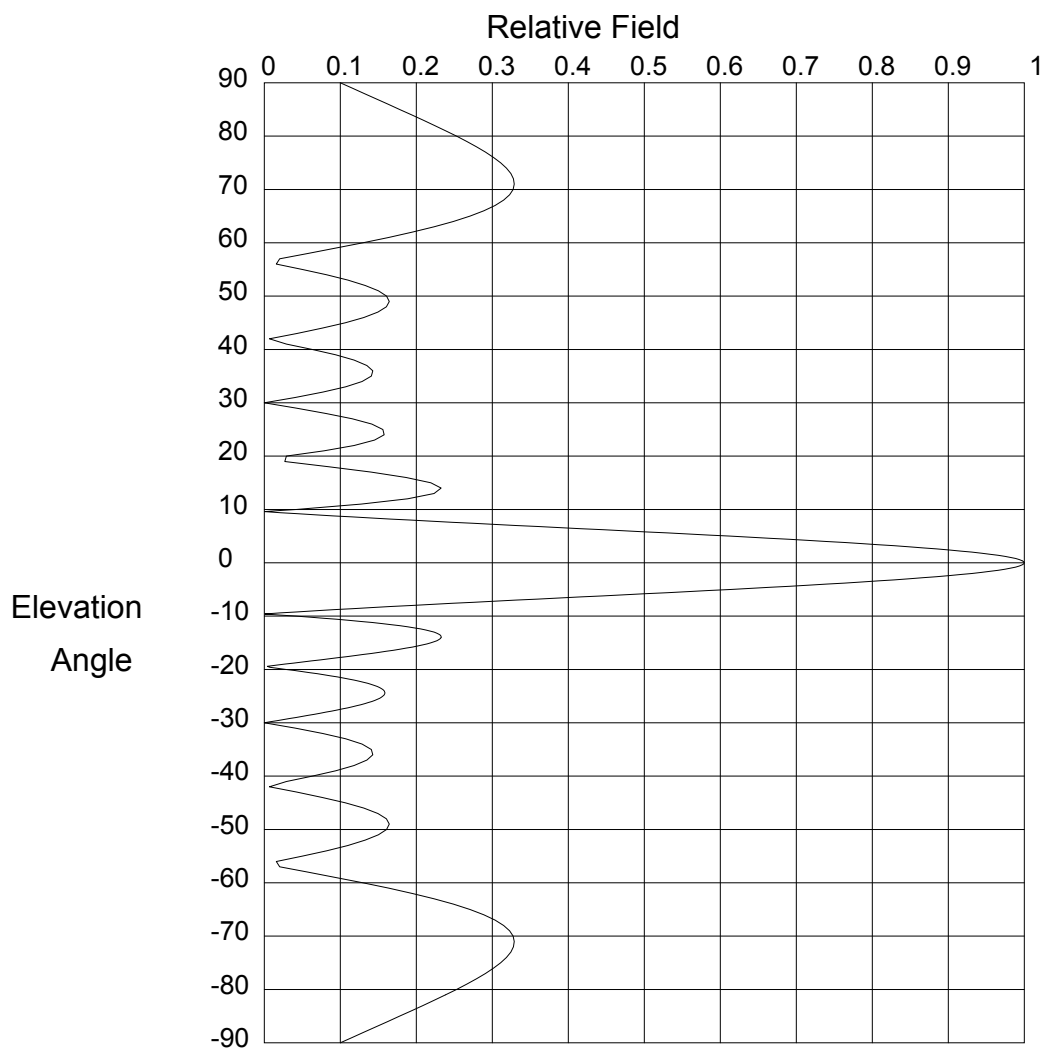
FREQUENCY: 88.5

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.02053 / 4.8dB

PATTERN RMS: 0.575



## Elevation Pattern

Scale: Linear

Units: Field, Relative

**Systems With Reliability Inc.**

CLIENT: *KQKL- Exhibit 4*

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 6.321/8.008 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 6.321/8.008 dBd

Null Fill(s)(%) : 0, 0, 0

# Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
3.2	.829 (-1.634)	-4.4	.691 (-3.211)	-12.0	.189 (-14.489 )
3.0	.848 (-1.429)	-4.6	.665 (-3.538)	-12.2	.198 (-14.083 )
2.8	.867 (-1.239)	-4.8	.639 (-3.886)	-12.4	.206 (-13.739 )
2.6	.885 (-1.064)	-5.0	.613 (-4.256)	-12.6	.213 (-13.451 )
2.4	.901 (-0.903)	-5.2	.586 (-4.649)	-12.8	.218 (-13.213 )
2.2	.917 (-0.756)	-5.4	.558 (-5.067)	-13.0	.223 (-13.022 )
2.0	.931 (-0.623)	-5.6	.53 (-5.512)	-13.2	.227 (-12.873 )
1.8	.944 (-0.503)	-5.8	.502 (-5.985)	-13.4	.23 (-12.765 )
1.6	.955 (-0.397)	-6.0	.474 (-6.489)	-13.6	.232 (-12.695 )
1.4	.966 (-0.303)	-6.2	.445 (-7.028)	-13.8	.233 (-12.661 )
1.2	.975 (-0.222)	-6.4	.417 (-7.603)	-14.0	.233 (-12.663 )
1.0	.982 (-0.154)	-6.6	.388 (-8.22)	-14.2	.232 (-12.699 )
.8	.989 (-0.098)	-6.8	.36 (-8.882)	-14.4	.23 (-12.769 )
.6	.994 (-0.055)	-7.0	.331 (-9.596)	-14.6	.227 (-12.872 )
.4	.997 (-0.025)	-7.2	.303 (-10.369)	-14.8	.224 (-13.008 )
.2	.999 (-0.006)	-7.4	.275 (-11.21)	-15.0	.219 (-13.178 )
.0	1.00 (0)	-7.6	.247 (-12.13)	-15.2	.214 (-13.382 )
-.2	.999 (-0.006)	-7.8	.22 (-13.145)	-15.4	.208 (-13.621 )
-.4	.997 (-0.025)	-8.0	.193 (-14.277)	-15.6	.202 (-13.897 )
-.6	.994 (-0.055)	-8.2	.167 (-15.553)	-15.8	.195 (-14.21 )
-.8	.989 (-0.098)	-8.4	.141 (-17.018)	-16.0	.187 (-14.563 )
-1.0	.982 (-0.154)	-8.6	.116 (-18.737)	-16.2	.179 (-14.959 )
-1.2	.975 (-0.222)	-8.8	.091 (-20.823)	-16.4	.17 (-15.4 )
-1.4	.966 (-0.303)	-9.0	.067 (-23.485)	-16.6	.16 (-15.891 )
-1.6	.955 (-0.397)	-9.2	.044 (-27.201)	-16.8	.151 (-16.437 )
-1.8	.944 (-0.503)	-9.4	.021 (-33.511)	-17.0	.141 (-17.043 )
-2.0	.931 (-0.623)	-9.6	.001 (-63.973)	-17.2	.13 (-17.718 )
-2.2	.917 (-0.756)	-9.8	.022 (-33.336)	-17.4	.119 (-18.472 )
-2.4	.901 (-0.903)	-10.0	.042 (-27.624)	-17.6	.108 (-19.319 )
-2.6	.885 (-1.064)	-10.2	.061 (-24.335)	-17.8	.097 (-20.276 )
-2.8	.867 (-1.239)	-10.4	.079 (-22.058)	-18.0	.085 (-21.369 )
-3.0	.848 (-1.429)	-10.6	.096 (-20.341)	-18.2	.074 (-22.635 )
-3.2	.829 (-1.634)	-10.8	.112 (-18.983)	-18.4	.062 (-24.13 )
-3.4	.808 (-1.855)	-11.0	.128 (-17.877)	-18.6	.05 (-25.942 )
-3.6	.786 (-2.091)	-11.2	.142 (-16.957)	-18.8	.039 (-28.236 )
-3.8	.763 (-2.344)	-11.4	.155 (-16.183)	-19.0	.027 (-31.347 )
-4.0	.74 (-2.615)	-11.6	.167 (-15.527)	-19.2	.016 (-36.193 )
-4.2	.716 (-2.903)	-11.8	.179 (-14.967)	-19.4	.004 (-47.865 )

Systems With Reliability Inc.

Page 1 of 2

CLIENT: KQKL- Exhibit 4

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 6.321/8.008 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 6.321/8.008 dBd

Null Fill(s)(%) : 0, 0, 0

# Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
-19.6	.007 (-42.789)	-27.2	.11 (-19.207)	-54.0	.082 (-21.708 )
-19.8	.018 (-34.726)	-27.4	.103 (-19.746)	-55.0	.05 (-25.949 )
-20.0	.029 (-30.687)	-27.6	.096 (-20.348)	-56.0	.016 (-35.975 )
-20.2	.04 (-27.998)	-27.8	.089 (-21.02)	-57.0	.02 (-33.828 )
-20.4	.05 (-26)	-28.0	.082 (-21.775)	-58.0	.057 (-24.836 )
-20.6	.06 (-24.424)	-28.2	.074 (-22.626)	-59.0	.094 (-20.535 )
-20.8	.07 (-23.136)	-28.4	.066 (-23.596)	-60.0	.13 (-17.743 )
-21.0	.079 (-22.057)	-28.6	.058 (-24.712)	-61.0	.164 (-15.729 )
-21.2	.088 (-21.138)	-28.8	.05 (-26.016)	-62.0	.195 (-14.202 )
-21.4	.096 (-20.346)	-29.0	.042 (-27.575)	-63.0	.223 (-13.015 )
-21.6	.104 (-19.659)	-29.2	.034 (-29.497)	-64.0	.249 (-12.082 )
-21.8	.111 (-19.059)	-29.4	.025 (-31.989)	-65.0	.271 (-11.35 )
-22.0	.118 (-18.535)	-29.6	.017 (-35.513)	-66.0	.289 (-10.781 )
-22.2	.125 (-18.076)	-29.8	.008 (-41.544)	-67.0	.304 (-10.349 )
-22.4	.131 (-17.675)	-30.0	.00 (-50)	-68.0	.315 (-10.034 )
-22.6	.136 (-17.327)	-31.0	.041 (-27.815)	-69.0	.323 (-9.821 )
-22.8	.141 (-17.026)	-32.0	.077 (-22.242)	-70.0	.327 (-9.697 )
-23.0	.145 (-16.768)	-33.0	.107 (-19.39)	-71.0	.329 (-9.654 )
-23.2	.149 (-16.551)	-34.0	.129 (-17.795)	-72.0	.328 (-9.682 )
-23.4	.152 (-16.371)	-35.0	.141 (-17.02)	-73.0	.324 (-9.777 )
-23.6	.154 (-16.228)	-36.0	.143 (-16.897)	-74.0	.319 (-9.931 )
-23.8	.156 (-16.118)	-37.0	.135 (-17.386)	-75.0	.311 (-10.142 )
-24.0	.158 (-16.041)	-38.0	.118 (-18.539)	-76.0	.302 (-10.405 )
-24.2	.159 (-15.997)	-39.0	.094 (-20.549)	-77.0	.291 (-10.718 )
-24.4	.159 (-15.983)	-40.0	.064 (-23.941)	-78.0	.279 (-11.079 )
-24.6	.158 (-16)	-41.0	.029 (-30.681)	-79.0	.266 (-11.487 )
-24.8	.158 (-16.047)	-42.0	.007 (-43.222)	-80.0	.253 (-11.941 )
-25.0	.156 (-16.124)	-43.0	.043 (-27.366)	-81.0	.239 (-12.443 )
-25.2	.154 (-16.231)	-44.0	.077 (-22.315)	-82.0	.224 (-12.994 )
-25.4	.152 (-16.37)	-45.0	.107 (-19.452)	-83.0	.209 (-13.597 )
-25.6	.149 (-16.539)	-46.0	.131 (-17.644)	-84.0	.194 (-14.256 )
-25.8	.146 (-16.741)	-47.0	.149 (-16.509)	-85.0	.178 (-14.977 )
-26.0	.142 (-16.977)	-48.0	.161 (-15.879)	-86.0	.163 (-15.771 )
-26.2	.137 (-17.247)	-49.0	.165 (-15.674)	-87.0	.147 (-16.649 )
-26.4	.133 (-17.555)	-50.0	.161 (-15.864)	-88.0	.131 (-17.628 )
-26.6	.127 (-17.901)	-51.0	.15 (-16.461)	-89.0	.116 (-18.733 )
-26.8	.122 (-18.289)	-52.0	.133 (-17.519)	-90.0	.10 (-20 )
-27.0	.116 (-18.723)	-53.0	.11 (-19.169)	90.0	.00 (-50 )

Systems With Reliability Inc.

Page 2 of 2

CLIENT: KQKL- Exhibit 4

Date: 7/28/2003

ANTENNA TYPE: FM3/6 DA

FREQUENCY: 88.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 6.321/8.008 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 6.321/8.008 dBd

Null Fill(s)(%) : 0, 0, 0





**SYSTEMS WITH RELIABILITY, Inc.**

**Broadcast Antenna & Transmission Systems**

# SYSTEM DATA SHEET

Customer KQKL  
Contact Broadcast Connection  
Location Selma, CA  
Antenna Model FM3/6-DA  
Channel / Frequency 88.5 MHz

## ELECTRICAL SPECIFICATION

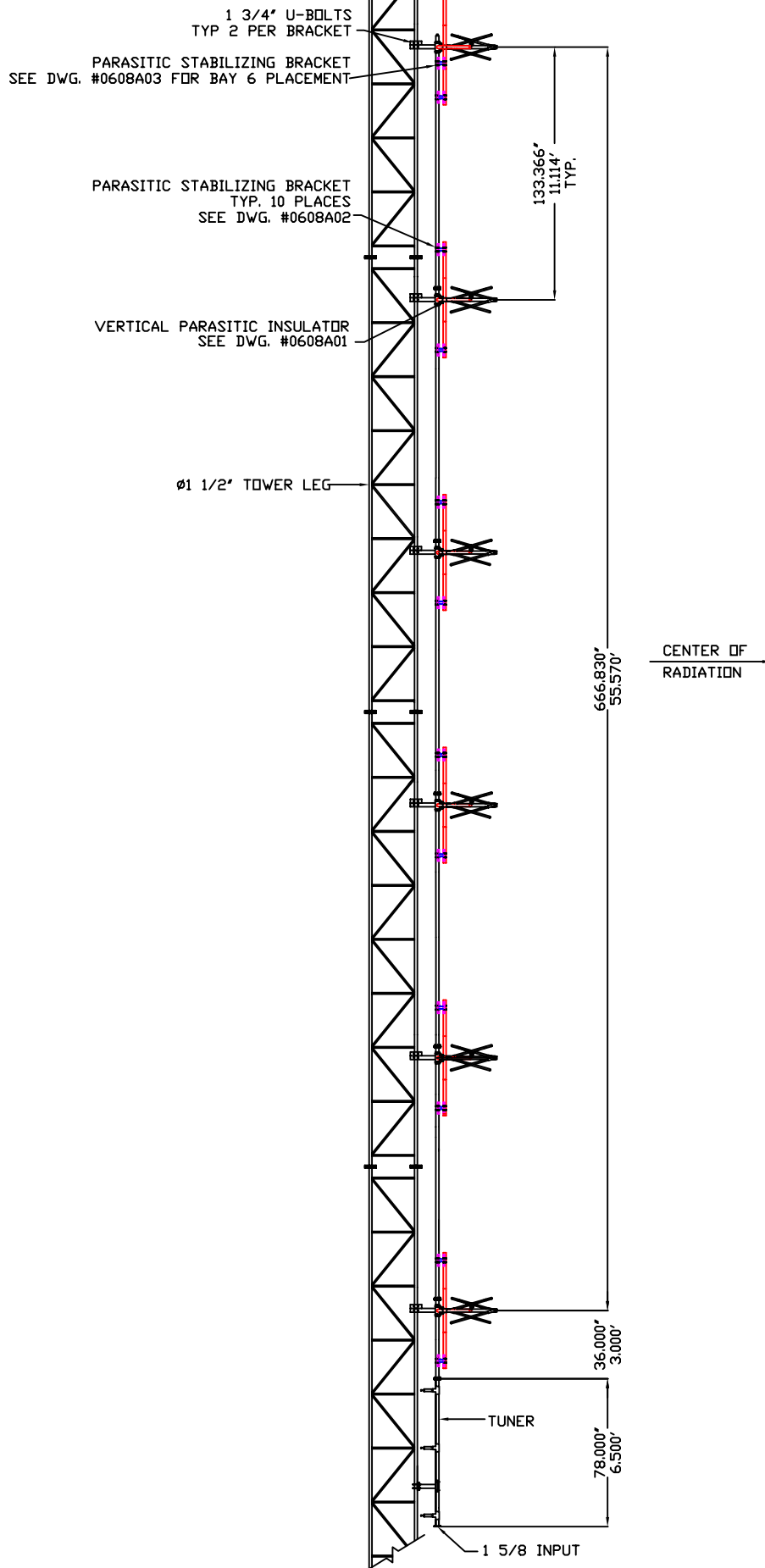
Polarization Type	Circular		
Polarization Ratio			
H-Pol. (PRH)	47.3006	%	
V-Pol. (PRV)	52.6994	%	
Elevation Directivity (ED)	6.321		
Azimuth Directivity (AD) H-Pol.	3.365		
Azimuth Directivity (AD) V-Pol.	3.021		
Antenna Gain (GH)			
H-Pol. (GH)	10.062		
V-Pol. (GV)	10.062		
dB Gain (AG)			
H-Pol. (AGH)	10.027		
V-Pol. (AGV)	10.027		
ERP			
H-Pol. (ERPH)	50.000	kW	
V-Pol. (ERPV)	50.000	kW	
Line Type	1 5/8" Air		
Attenuation per 100 ft.	0.19	dB/100ft	
Line Length (LL)	500.00	ft.	
Total Line Attenuation	0.95	dB	
Line Efficiency (LE)	80.35	%	
Line Loss (LPL)	1.22	kW	
Antenna Input Power (AIP)	4.97	kW	
Req'd. Transmitter Output Power	6.18	kW	

## MECHANICAL SPECIFICATION

No. Of Bays	6			
Antenna Aperture	55.57	ft.	16.94	m
Center of Radiation AGL	452.64	ft.	138.00	m
Antenna Weight	341.00	lbs.	155.00	kg
Windload (50/33)	232.91	lbs.	105.87	kg

Prepared by:

Jason P Duncan



SYSTEMS WITH RELIABILITY, INC.  
619 INDUSTRIAL PARK ROAD  
EBENSBURG, PENNSYLVANIA 15931

TITLE: FM3/6-DA  
KQKL, FREQ. 88.5, SELMA, CA.  
MATERIAL:

SIZE: C  
REV: 1  
2  
3

APPR. DATE

ENGINEER:

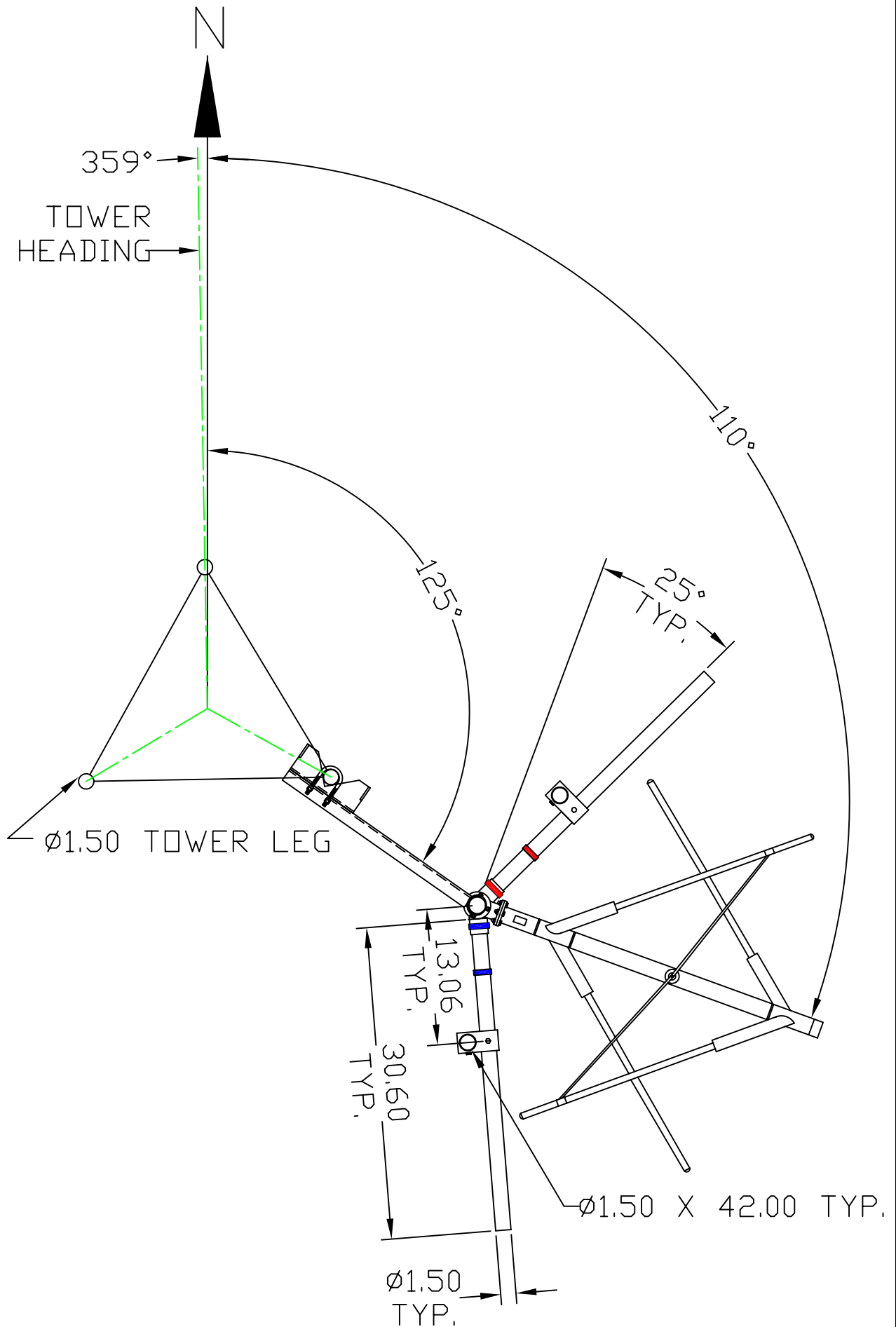
SCALE: NTS

NAME: RAC

DATE: 5/6/03

SHEET 1 OF 1

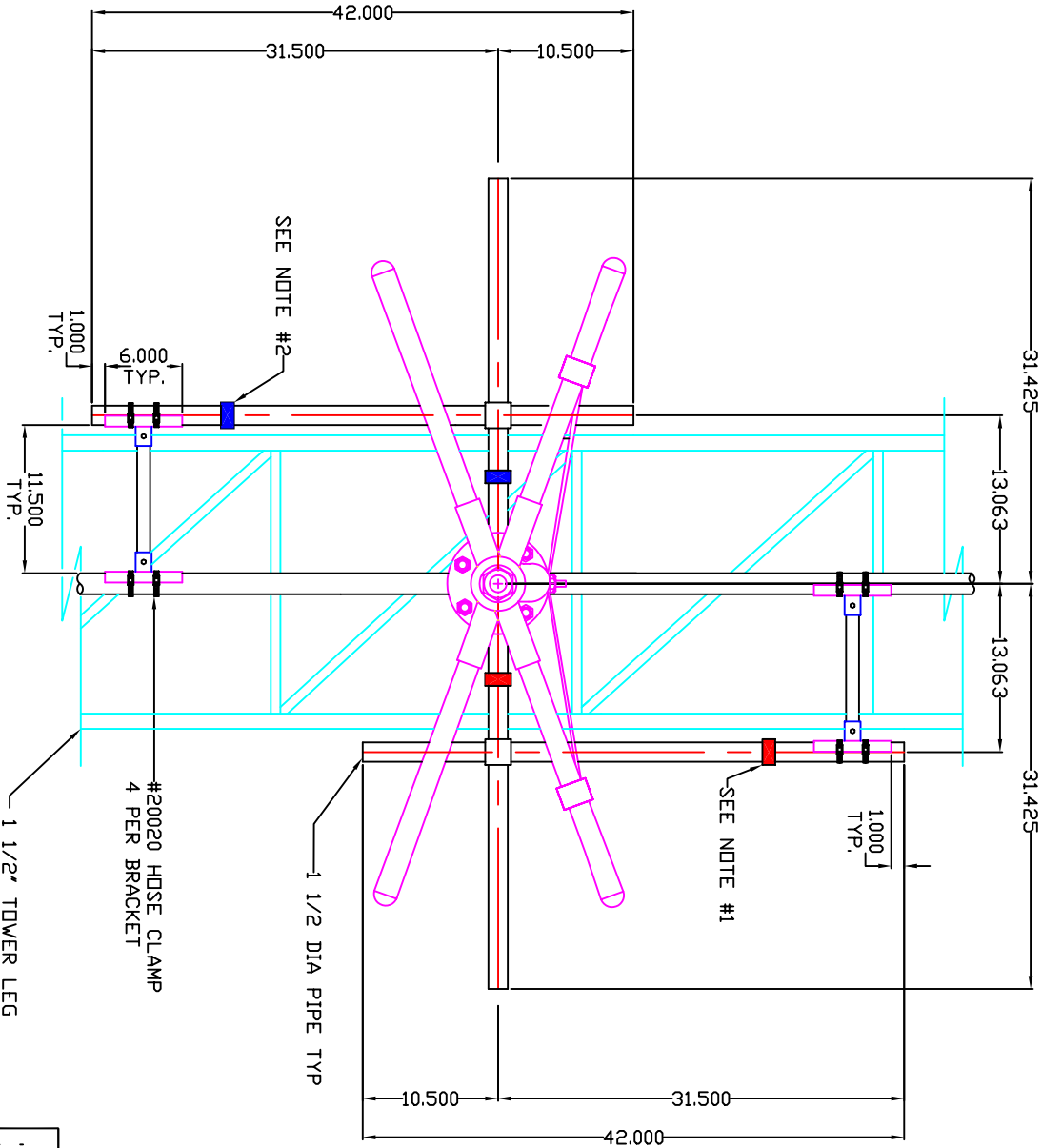
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NUMBER: 0608C00



NOTE:

1. RED TAPE INDICATES RIGHT SIDE PARASITICS
2. BLUE TAPE INDICATES LEFT SIDE PARASITICS

DRAWING  
NUMBER: 0608A02



FRONT VIEW

TOLERANCES		REVISION RECORD		
		REV	APPROVAL	DATE
X	± .015			
.XX	± .005			
.XXX	± .002			
X/X	± 1/32			
DEG.	± 1/2			
UNLESS OTHERWISE SPECIFIED				

TITLE:

FM3/6-DA

KOKL, FREQ. 88.5, SELMA, CA

MATERIAL:

PARASITIC STABILIZING BRACKET  
BAYS 1,2,3,4 & 5 PLACEMENT

SIZE

A

PARTS MADE BY THIS DRAWING

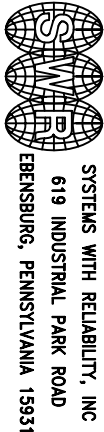
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NAME: RAC

DATE: 5/5/03

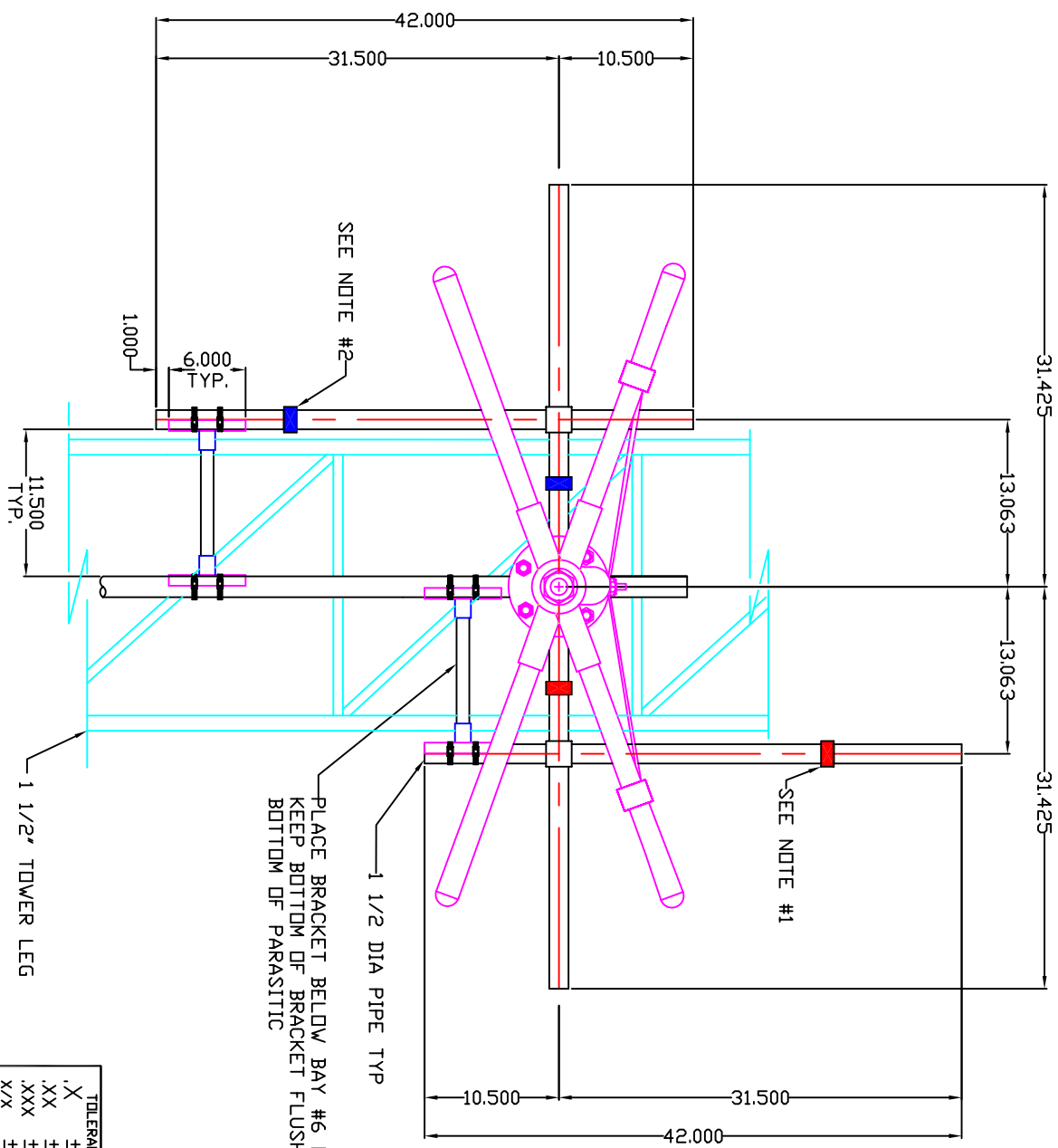
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SYSTEMS WITH RELIABILITY, INC  
619 INDUSTRIAL PARK ROAD  
EBENSBURG, PENNSYLVANIA 15931

NOTE:

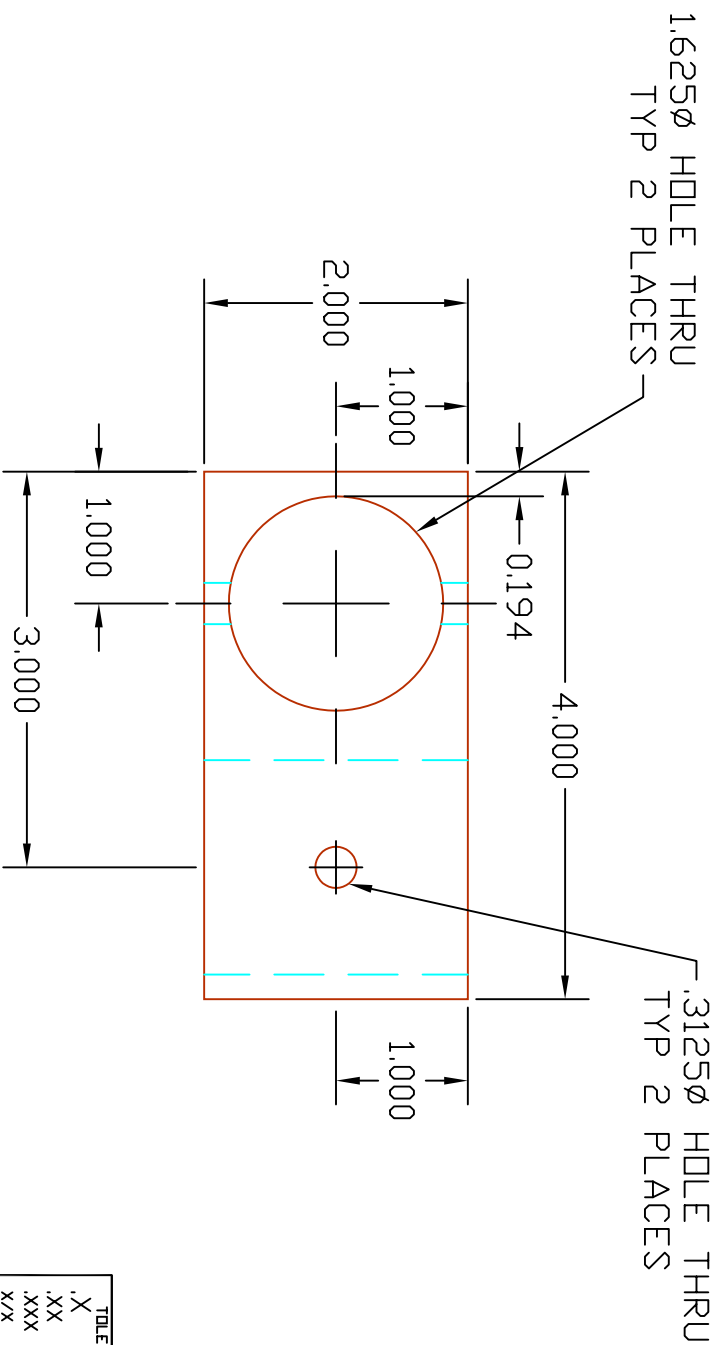
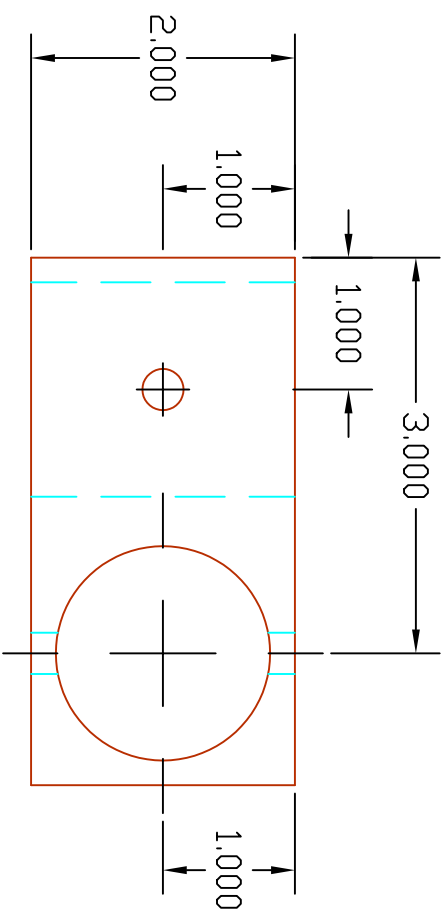
- 1. RED TAPE INDICATES RIGHT SIDE PARASITICS
- 2. BLUE TAPE INDICATES LEFT SIDE PARASITICS



TOLERANCES		REVISION RECORD		
		REV	APPROVAL	DATE
.X	± .015			
.XX	± .005			
.XXX	± .002			
X/X	± 1/32			
DEG.	± 1/2			
UNLESS OTHERWISE SPECIFIED				

FRONT VIEW

		SYSTEMS WITH RELIABILITY, INC 619 INDUSTRIAL PARK ROAD EBENSBURG, PENNSYLVANIA 15931	
TITLE:		FM3/6-DA KOKL, FREQ. 88.5, SELMA, CA	
MATERIAL:		PARASITIC STABILIZING BRACKET BAY #6 PLACEMENT	
SIZE	A	PARTS MADE BY THIS DRAWING	
SCALE:	NTS	NAME:	RAC
DATE:	5/5/03	SHEET	1 OF 1
DRAWING NUMBER:		0608A03	

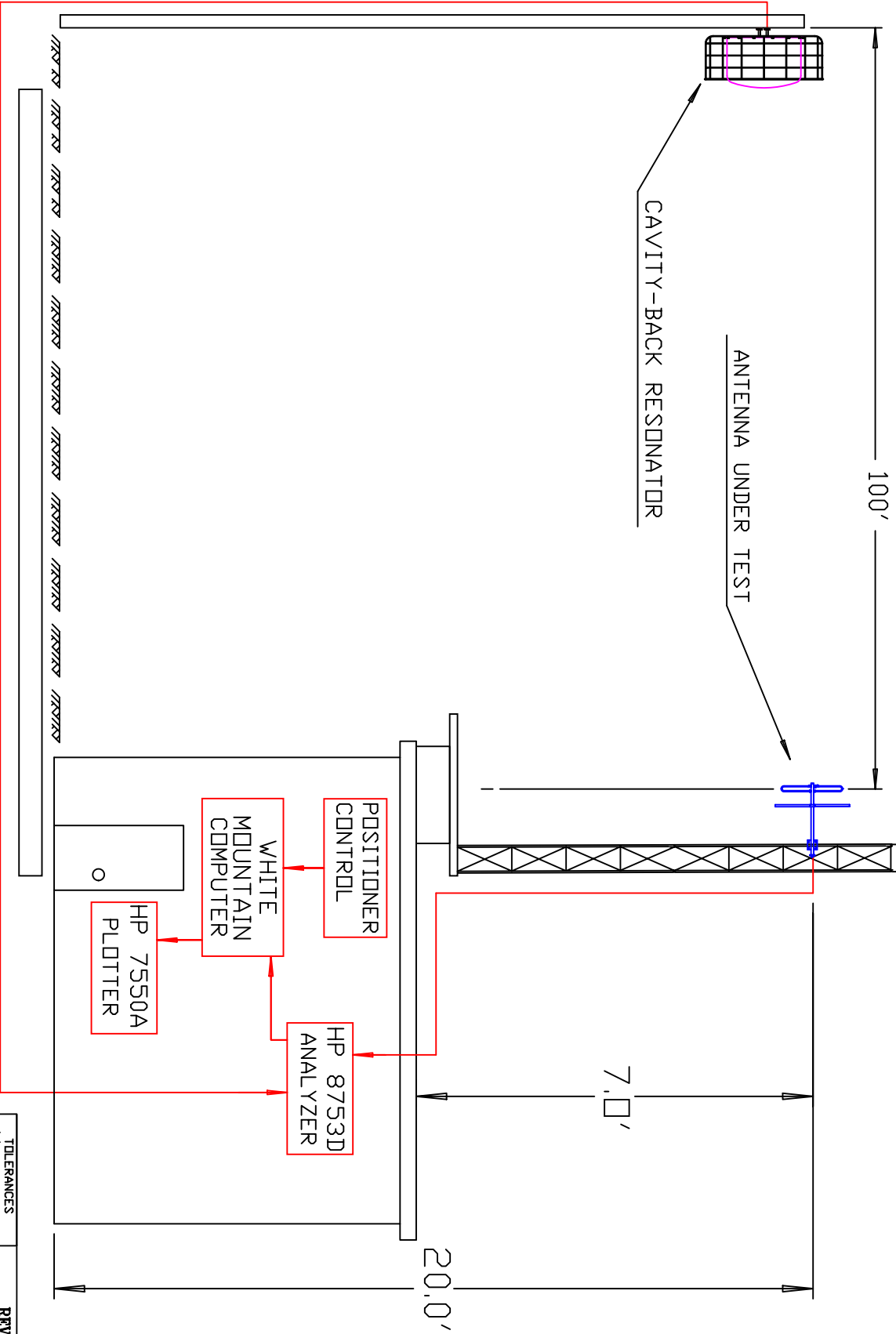


TOLERANCES		REVISION RECORD	
X	± .015	REV	APPROVAL
.XX	± .005		DATE
.XXX	± .002		
X/X	± 1/32		
DEG.	± 1/2		
UNLESS OTHERWISE SPECIFIED			

PART NO.	USE PARTS LIST	DRAWING NUMBER:	0608A01
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PARTS MADE BY THIS DRAWING	NAME: JJC	DATE: 5/02/03	SHEET 10F1
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NOTE:



TOLERANCES		REVISION RECORD	
.X	± .015	REV	APPROVAL DATE
.XX	± .005		
.XXX	± .002		
X/X	± 1/32		
DEG.	± 1/2		
UNLESS OTHERWISE SPECIFIED			

TITLE: TEST RANGE SCHEMATIC		SIZE: A	PARTS MADE BY THIS DRAWING		DRAWING NUMBER: 2105A10
MATERIAL:			SCALE: NTS	NAME: JRM	DATE: 11/1/98
					SHEET 1 OF 1