



SYSTEMS WITH RELIABILITY, LTD.
Broadcast Antenna and Transmission Systems

PATTERN CERTIFICATION

DIRECTIONAL FM ANTENNA 890531MD

January 9, 2003

Station	:	890531MD
Location	:	Ojai, CA
Frequency	:	89.5 MHz
Channel	:	208
Antenna Model	:	FM3/1 DA
Maximum Antenna Gain	:	
Vertical	:	0.946 / -0.239 dB
Horizontal	:	0.946 / -0.239 dB

ANTENNA DESCRIPTION

A custom designed FM3/1 antenna was used to produce the required directional azimuth pattern. The antenna consists of a circularly polarized dipole-radiating element with a horizontal and vertical parasitic system. The array is comprised of one bay that is mounted to a tower pointing **80** degrees true north.

DESCRIPTION OF TEST PROCEDURE

The test antenna consists of a third-scale folded dipole antenna and parasitic system. This antenna was mounted to a 0.75-inch wide pipe with the use of mounting brackets supplied with the finalized antenna. The pipe 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 268.5 MHz. The antenna under test was rotated in a clockwise direction. A gain reference was taken using a dipole tuned to 268.5 MHz. Nowhere, does the received signal exceed a maximum to minimum ratio of 15 dB.

TEST RESULTS

The attached calculations verify that the **RMS** value of this antenna is **93.92 %** of the **RMS** value of the pattern authorized in the related construction permit **BPED-19890531MD**. The vertical component **RMS** value is **0.661**. The horizontal component **RMS** value is **0.705**. The circular polarized component **RMS** value is **0.662**.

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

Measured vertical polarized directivity:	2.290 / 3.60 dB
Measured horizontal polarized directivity:	2.015 / 3.04 dB
Measured circular polarized pattern directivity:	2.282 / 3.58 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:

V-Pol. Gain =	(2.290)(.46806)(0.883)	= 0.946 / -0.239 dB
H-Pol. Gain =	(2.015)(.53194)(0.883)	= 0.946 / -0.239 dB

INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **30 meters** above ground level. 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 **80 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
0496A01	ORIENTATION
0496A00	ELEVATION
0496A02	FM3/1 LAYOUT
2105A13	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 0496A00**. The bay is mounted using the bracket assemblies in **DWG. 0496A00**. The parasitic assembly is shown in **DWG.0496A01** and **DWG.0496A02**. The antenna elements shall be aligned at the same heading as in **DWG.0496A01**. This will ensure that the antenna is oriented properly at 80 degrees.

DOCUMENT EXHIBITS

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

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

TEST EQUIPMENT

Network Analyzer	:	Hewlett Packard Model # 8753C Serial Number : 08753 – 69138 Calibrated 8/26/02, SWR, Inc.
Computer	:	White Mountain 366 Computer
Plotter	:	Hewlett-Packard 7550A
Positioner	:	Orbit Positioner Calibrated 1/10/02, SWR, Inc.

Prepared by:

Harry Turtchanow
SWR, Inc.

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

890531MD Antenna RMS Comparison

PROPOSED ANTENNA

Azimuth Heading	Relative Field
0	1.000
10	1.000
20	1.000
30	1.000
40	1.000
50	1.000
60	1.000
70	1.000
80	1.000
90	1.000
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	1.000
190	1.000
200	0.891
210	0.708
220	0.562
230	0.447
240	0.355
250	0.282
260	0.224

DESIGNED ANTENNA

Azimuth Heading	Relative Field
0	0.950
10	0.960
20	0.940
30	0.950
40	0.990
50	1.000
60	0.990
70	0.980
80	0.960
90	0.940
100	0.920
110	0.890
120	0.870
130	0.830
140	0.840
150	0.890
160	0.950
170	0.990
180	1.000
190	0.940
200	0.850
210	0.680
220	0.550
230	0.410
240	0.330
250	0.230
260	0.200

PROPOSED ANTENNA

Azimuth Heading	Relative Field
270	0.178
280	0.180
290	0.226
300	0.285
310	0.358
320	0.451
330	0.568
340	0.715
350	0.900

Sum of Relative Field Squared : 24.238

Sum Divided by 36 (Readings) : 0.673

Square Root : 0.821

Percentage of Construction Permit Antenna Filled :

DESIGNED ANTENNA

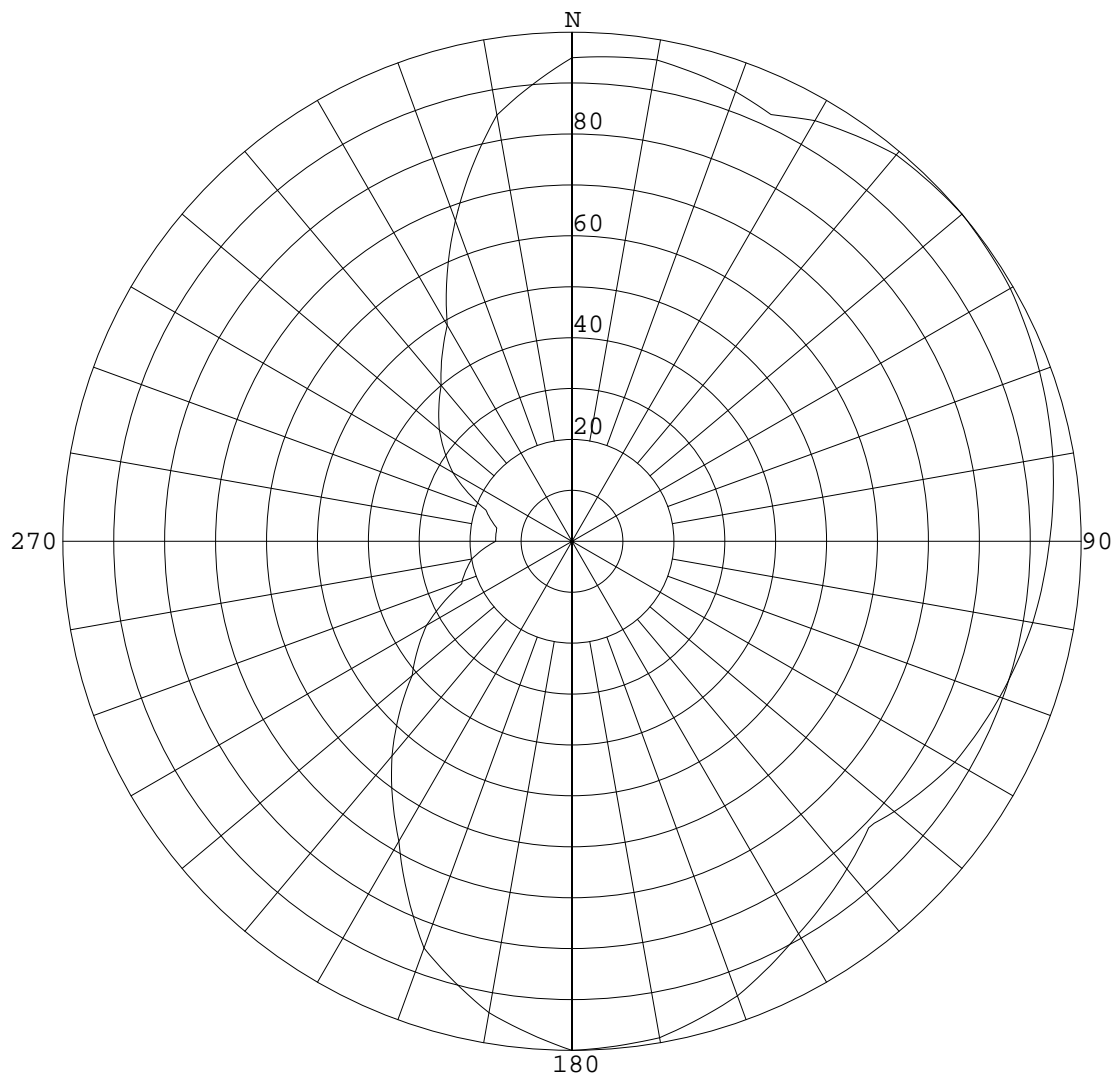
Azimuth Heading	Relative Field
270	0.150
280	0.150
290	0.180
300	0.270
310	0.340
320	0.400
330	0.490
340	0.670
350	0.850

Sum of Relative Field Squared : 21.379

Sum Divided by 36 (Readings) : 0.594

Square Root : 0.771

93.92%



Azimuth Pattern

Scale: Linear
Unit: Relative Field

Systems With Reliability Inc.

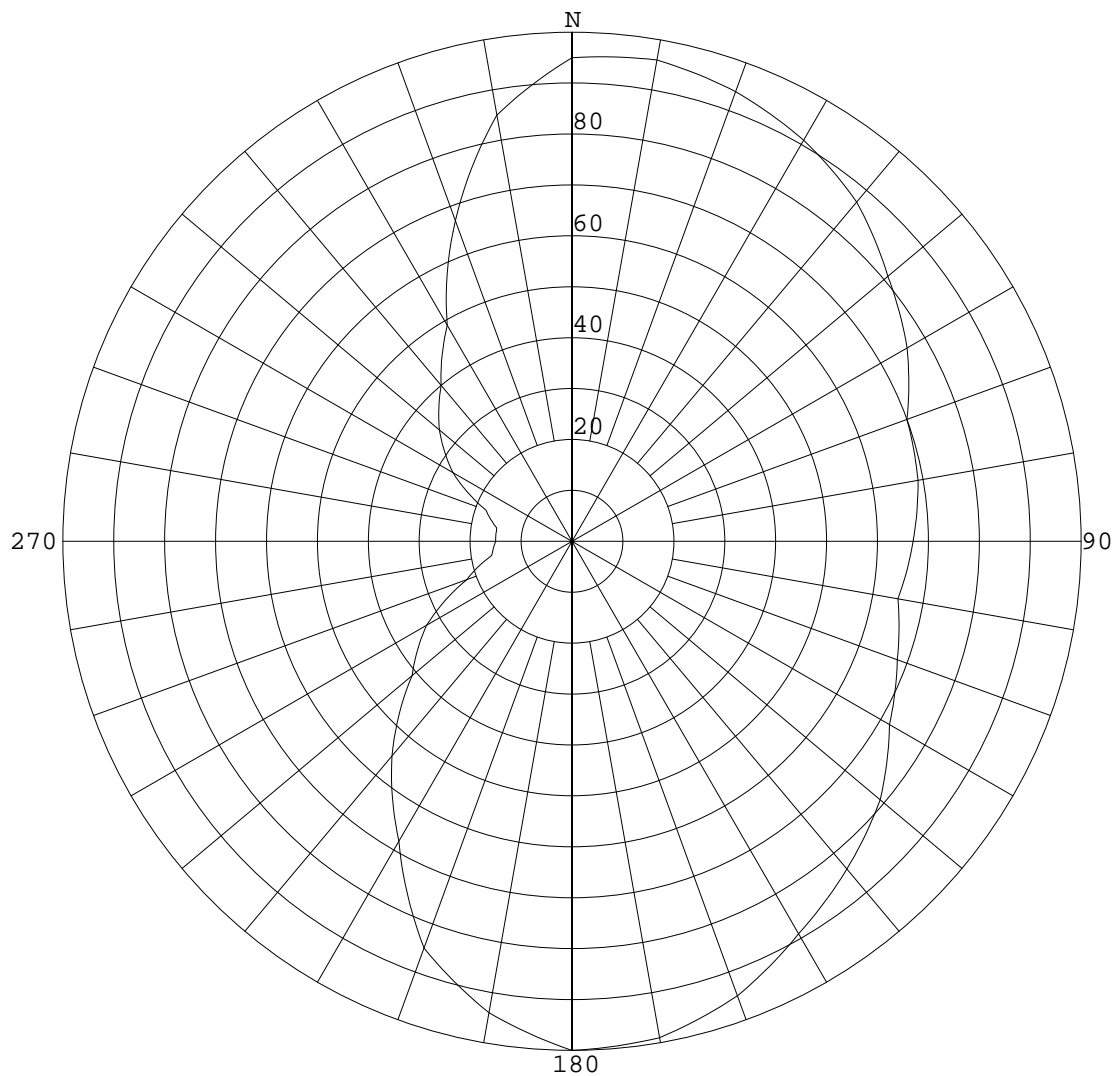
CLIENT: <i>Shepherd Communications Inc. Ex. 1</i>	Date: 1/7/03
ANTENNA TYPE: FM3/1-DA	
FREQUENCY: 89.5	
PATTERN POL.: Circular	CIRCULARITY(+/-dB):
AZ. DIRECTIVITY: 2.2823 / 3.5838dB	PATTERN RMS: 0.662

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.95 (-0.44)	180	1.00 (0.01)
5	.96 (-0.39)	185	.97 (-0.26)
10	.96 (-0.35)	190	.94 (-0.53)
15	.95 (-0.44)	195	.90 (-0.95)
20	.94 (-0.53)	200	.85 (-1.4)
25	.93 (-0.67)	205	.77 (-2.32)
30	.95 (-0.4)	210	.68 (-3.34)
35	.97 (-0.23)	215	.62 (-4.21)
40	.99 (-0.07)	220	.55 (-5.18)
45	1.00 (-0.03)	225	.48 (-6.36)
50	1.00 (0.01)	230	.41 (-7.72)
55	1.00 (-0.02)	235	.37 (-8.61)
60	.99 (-0.04)	240	.33 (-9.6)
65	.99 (-0.12)	245	.28 (-11.18)
70	.98 (-0.19)	250	.23 (-12.73)
75	.97 (-0.27)	255	.22 (-13.31)
80	.96 (-0.35)	260	.20 (-13.94)
85	.95 (-0.45)	265	.18 (-15.09)
90	.94 (-0.55)	270	.15 (-16.42)
95	.93 (-0.64)	275	.15 (-16.42)
100	.92 (-0.72)	280	.15 (-16.42)
105	.91 (-0.84)	285	.17 (-15.6)
110	.89 (-0.96)	290	.18 (-14.85)
115	.88 (-1.09)	295	.23 (-12.92)
120	.87 (-1.22)	300	.27 (-11.34)
125	.85 (-1.43)	305	.31 (-10.29)
130	.83 (-1.65)	310	.34 (-9.34)
135	.82 (-1.77)	315	.37 (-8.61)
140	.84 (-1.5)	320	.40 (-7.94)
145	.87 (-1.25)	325	.45 (-7.01)
150	.89 (-1)	330	.49 (-6.18)
155	.92 (-0.71)	335	.58 (-4.72)
160	.95 (-0.44)	340	.67 (-3.47)
165	.97 (-0.26)	345	.76 (-2.37)
170	.99 (-0.08)	350	.85 (-1.4)
175	1.00 (-0.03)	355	.90 (-0.91)

Systems With Reliability Inc.

CLIENT: *Shepherd Communications Inc. Ex. 1* Date: 1/7/03
 ANTENNA TYPE: FM3/1-DA
 FREQUENCY: 89.5
 PATTERN POL.: Circular CIRCULARITY(+/-dB):
 AZ. DIRECTIVITY: 2.2823 / 3.5838dB PATTERN RMS: 0.662



Azimuth Pattern

Systems With Reliability Inc. Scale: Linear
Unit: Relative Field

CLIENT: *SHEPHERD COMMUNICATIONS INC* *Ex. 2* Date: 1/7/03

ANTENNA TYPE: FM3/1-DA

FREQUENCY: 89.5

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.015 / 3.04dB

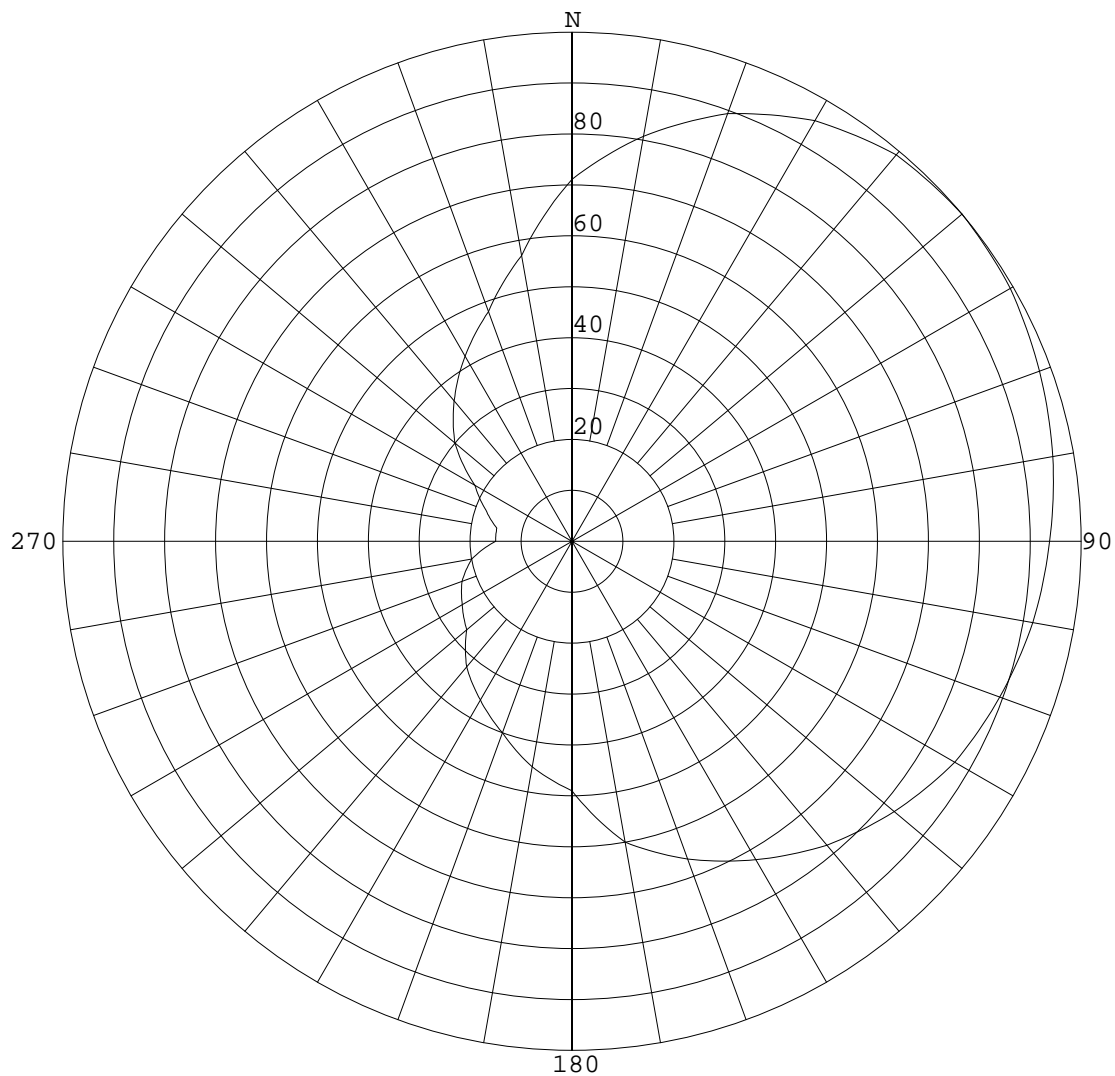
PATTERN RMS: 0.705

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.95 (-0.44)	180	1.00 (0.01)
5	.96 (-0.39)	185	.97 (-0.26)
10	.96 (-0.35)	190	.94 (-0.53)
15	.95 (-0.44)	195	.90 (-0.95)
20	.94 (-0.53)	200	.85 (-1.4)
25	.93 (-0.67)	205	.77 (-2.32)
30	.91 (-0.81)	210	.68 (-3.34)
35	.89 (-1)	215	.62 (-4.21)
40	.87 (-1.2)	220	.55 (-5.18)
45	.84 (-1.5)	225	.48 (-6.36)
50	.81 (-1.82)	230	.41 (-7.72)
55	.79 (-2.09)	235	.37 (-8.61)
60	.76 (-2.37)	240	.33 (-9.6)
65	.73 (-2.72)	245	.28 (-11.18)
70	.70 (-3.09)	250	.22 (-13.11)
75	.70 (-3.15)	255	.19 (-14.38)
80	.69 (-3.21)	260	.16 (-15.86)
85	.68 (-3.34)	265	.16 (-16.14)
90	.67 (-3.47)	270	.15 (-16.42)
95	.66 (-3.6)	275	.15 (-16.42)
100	.65 (-3.73)	280	.15 (-16.42)
105	.67 (-3.53)	285	.17 (-15.6)
110	.68 (-3.34)	290	.18 (-14.85)
115	.70 (-3.09)	295	.23 (-12.92)
120	.72 (-2.84)	300	.27 (-11.34)
125	.76 (-2.43)	305	.31 (-10.29)
130	.79 (-2.04)	310	.34 (-9.34)
135	.82 (-1.77)	315	.37 (-8.61)
140	.84 (-1.5)	320	.40 (-7.94)
145	.87 (-1.25)	325	.45 (-7.01)
150	.89 (-1)	330	.49 (-6.18)
155	.92 (-0.71)	335	.58 (-4.72)
160	.95 (-0.44)	340	.67 (-3.47)
165	.97 (-0.26)	345	.76 (-2.37)
170	.99 (-0.08)	350	.85 (-1.4)
175	1.00 (-0.03)	355	.90 (-0.91)

Systems With Reliability Inc.

CLIENT: <i>SHEPHERD COMMUNICATIONS INC</i>	Ex. 2	Date: 1/7/03
ANTENNA TYPE: FM3/1-DA		
FREQUENCY: 89.5		
PATTERN POL.: Horizontal	CIRCULARITY(+/-dB):	
AZ. DIRECTIVITY:2.015 / 3.04dB	PATTERN RMS: 0.705	



Azimuth Pattern

Scale: Linear
Unit: Relative Field

Systems With Reliability Inc.

CLIENT: *Shepherd Communications Inc.* Ex. 3 Date: 1/7/03

ANTENNA TYPE: FM3/1-DA

FREQUENCY: 89.5

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.29 / 3.6dB

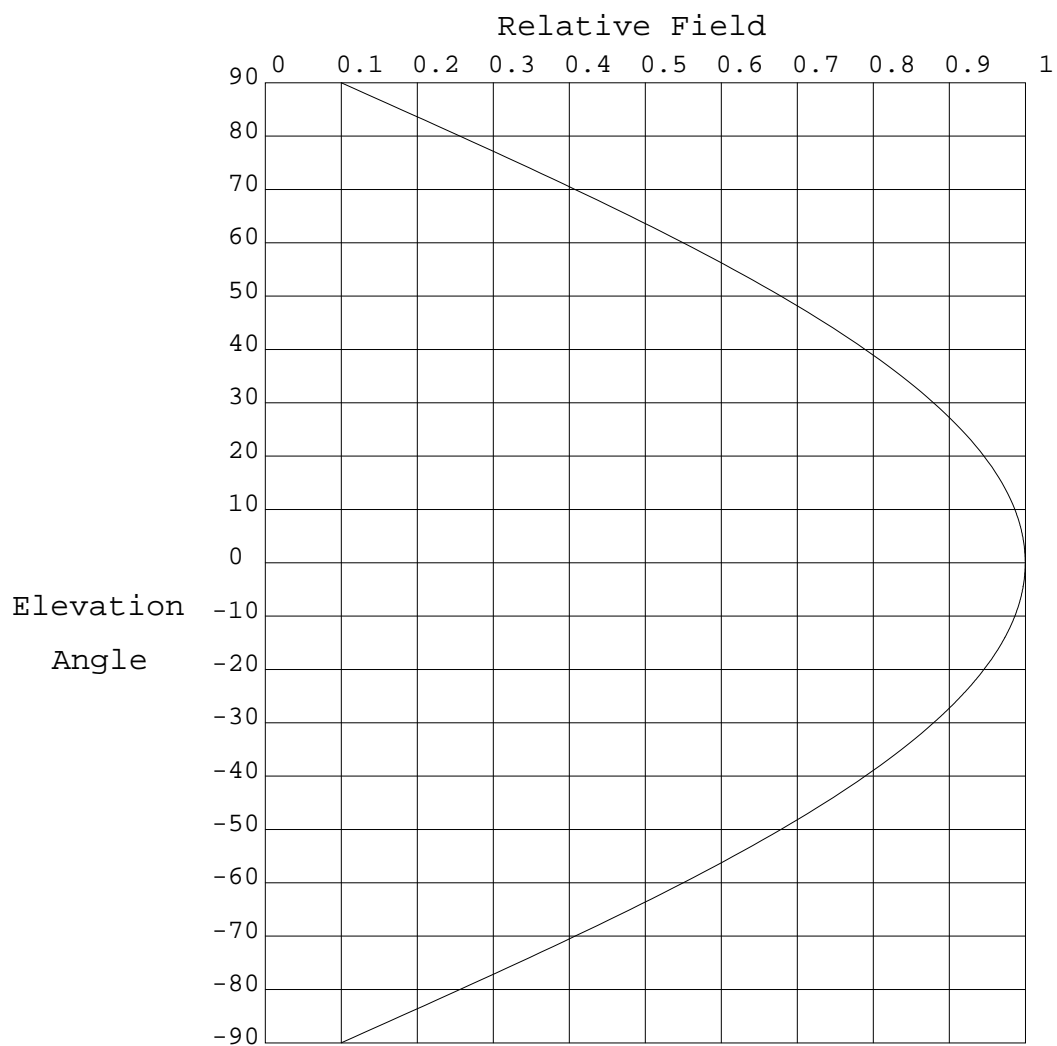
PATTERN RMS: 0.661

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relative Field(dB)
0	.71 (-2.95)	180	.49 (-6.18)
5	.76 (-2.38)	185	.47 (-6.54)
10	.81 (-1.84)	190	.45 (-6.92)
15	.85 (-1.39)	195	.43 (-7.41)
20	.89 (-0.96)	200	.40 (-7.94)
25	.92 (-0.68)	205	.38 (-8.38)
30	.95 (-0.4)	210	.36 (-8.85)
35	.97 (-0.23)	215	.34 (-9.32)
40	.99 (-0.07)	220	.32 (-9.82)
45	1.00 (-0.03)	225	.30 (-10.54)
50	1.00 (0.01)	230	.27 (-11.34)
55	1.00 (-0.02)	235	.26 (-11.68)
60	.99 (-0.04)	240	.25 (-12.04)
65	.99 (-0.12)	245	.24 (-12.38)
70	.98 (-0.19)	250	.23 (-12.73)
75	.97 (-0.27)	255	.22 (-13.31)
80	.96 (-0.35)	260	.20 (-13.94)
85	.95 (-0.45)	265	.18 (-15.09)
90	.94 (-0.55)	270	.15 (-16.42)
95	.93 (-0.64)	275	.15 (-16.42)
100	.92 (-0.72)	280	.15 (-16.42)
105	.91 (-0.84)	285	.17 (-15.6)
110	.89 (-0.96)	290	.18 (-14.85)
115	.88 (-1.09)	295	.20 (-13.94)
120	.87 (-1.22)	300	.22 (-13.11)
125	.85 (-1.43)	305	.26 (-11.67)
130	.83 (-1.65)	310	.30 (-10.43)
135	.80 (-1.9)	315	.33 (-9.6)
140	.78 (-2.16)	320	.36 (-8.85)
145	.75 (-2.48)	325	.39 (-8.16)
150	.72 (-2.82)	330	.42 (-7.51)
155	.69 (-3.17)	335	.45 (-6.92)
160	.66 (-3.54)	340	.48 (-6.36)
165	.63 (-3.97)	345	.53 (-5.58)
170	.60 (-4.42)	350	.57 (-4.87)
175	.55 (-5.26)	355	.64 (-3.86)

Systems With Reliability Inc.

CLIENT: *Shepherd Communications Inc.* Ex. 3 Date: 1/7/03
 ANTENNA TYPE: FM3/1-DA
 FREQUENCY: 89.5
 PATTERN POL.: Vertical CIRCULARITY(+/-dB):
 AZ. DIRECTIVITY:2.29 / 3.6dB PATTERN RMS: 0.661



Elevation Pattern

Scale: Linear

Systems With Reliability Inc.

Units: Field, Relative

CLIENT: <i>Shepherd Communications Inc.</i>	Ex. 4	Date: 1/7/03
ANTENNA TYPE: FM3/1-DA		
FREQUENCY: 89.5		
PATTERN POL.: Circular		
DIRECTIVITY(Peak)0.883/-0.539 dBd	Beam Tilt (Deg.) : 0	
DIRECTIVITY(Horiz0:883/-0.539 dBd	Null Fill(s)(%) 0, 0, 0	

Relative Field Tabulation

Elev. Angle		Rel. Fld(dB)	Elev. Angle		Rel. Fld(dB)	Elev. Angle	
90.0	.10	(-20)	52.0	.654	(-3.687)	14.0	.973 (-0.235)
89.0	.116	(-18.733)	51.0	.666	(-3.525)	13.0	.977 (-0.203)
88.0	.131	(-17.627)	50.0	.679	(-3.369)	12.0	.98 (-0.173)
87.0	.147	(-16.648)	49.0	.69	(-3.217)	11.0	.983 (-0.145)
86.0	.163	(-15.768)	48.0	.702	(-3.071)	10.0	.986 (-0.12)
85.0	.178	(-14.97)	47.0	.714	(-2.928)	9.8	.987 (-0.115)
84.0	.194	(-14.241)	46.0	.725	(-2.791)	9.6	.987 (-0.11)
83.0	.21	(-13.569)	45.0	.736	(-2.658)	9.4	.988 (-0.106)
82.0	.225	(-12.946)	44.0	.747	(-2.529)	9.2	.988 (-0.101)
81.0	.241	(-12.367)	43.0	.758	(-2.404)	9.0	.989 (-0.097)
80.0	.256	(-11.826)	42.0	.769	(-2.283)	8.8	.989 (-0.093)
79.0	.272	(-11.317)	41.0	.779	(-2.167)	8.6	.99 (-0.088)
78.0	.287	(-10.839)	40.0	.789	(-2.054)	8.4	.99 (-0.084)
77.0	.302	(-10.387)	39.0	.799	(-1.944)	8.2	.991 (-0.08)
76.0	.318	(-9.959)	38.0	.809	(-1.839)	8.0	.991 (-0.076)
75.0	.333	(-9.553)	37.0	.819	(-1.737)	7.8	.992 (-0.073)
74.0	.348	(-9.167)	36.0	.828	(-1.638)	7.6	.992 (-0.069)
73.0	.363	(-8.799)	35.0	.837	(-1.543)	7.4	.993 (-0.065)
72.0	.378	(-8.448)	34.0	.846	(-1.451)	7.2	.993 (-0.062)
71.0	.393	(-8.112)	33.0	.855	(-1.363)	7.0	.993 (-0.058)
70.0	.408	(-7.791)	32.0	.863	(-1.277)	6.8	.994 (-0.055)
69.0	.423	(-7.483)	31.0	.871	(-1.195)	6.6	.994 (-0.052)
68.0	.437	(-7.187)	30.0	.879	(-1.116)	6.4	.994 (-0.049)
67.0	.452	(-6.904)	29.0	.887	(-1.04)	6.2	.995 (-0.046)
66.0	.466	(-6.631)	28.0	.895	(-0.967)	6.0	.995 (-0.043)
65.0	.48	(-6.369)	27.0	.902	(-0.897)	5.8	.995 (-0.04)
64.0	.495	(-6.116)	26.0	.909	(-0.83)	5.6	.996 (-0.037)
63.0	.509	(-5.873)	25.0	.916	(-0.765)	5.4	.996 (-0.035)
62.0	.523	(-5.638)	24.0	.922	(-0.704)	5.2	.996 (-0.032)
61.0	.536	(-5.411)	23.0	.928	(-0.645)	5.0	.997 (-0.03)
60.0	.55	(-5.193)	22.0	.934	(-0.589)	4.8	.997 (-0.027)
59.0	.564	(-4.982)	21.0	.94	(-0.535)	4.6	.997 (-0.025)
58.0	.577	(-4.778)	20.0	.946	(-0.485)	4.4	.997 (-0.023)
57.0	.59	(-4.58)	19.0	.951	(-0.437)	4.2	.998 (-0.021)
56.0	.603	(-4.39)	18.0	.956	(-0.391)	4.0	.998 (-0.019)
55.0	.616	(-4.205)	17.0	.961	(-0.348)	3.8	.998 (-0.017)
54.0	.629	(-4.027)	16.0	.965	(-0.308)	3.6	.998 (-0.015)
53.0	.642	(-3.854)	15.0	.969	(-0.271)	3.4	.998 (-0.014)

Systems With Reliability Inc.

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CLIENT: *Shepherd Communications Inc.* Ex. 4 Date: 1/7/03
 ANTENNA TYPE: FM3/1-DA
 FREQUENCY: 89.5
 PATTERN POL.: Circular
 DIRECTIVITY(Peak)0.883/-0.539 dBd Beam Tilt (Deg.) : 0
 DIRECTIVITY(Horiz0:883/-0.539 dBd Null Fill(s)(%) 0, 0, 0

Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)		Elev. Angle	Rel. Fld(dB)		Elev. Angle
3.2	.999 (-0.012)	-4.4	.997 (-0.023)	-12.0	.98 (-0.173)	
3.0	.999 (-0.011)	-4.6	.997 (-0.025)	-12.2	.98 (-0.178)	
2.8	.999 (-0.009)	-4.8	.997 (-0.027)	-12.4	.979 (-0.184)	
2.6	.999 (-0.008)	-5.0	.997 (-0.03)	-12.6	.978 (-0.19)	
2.4	.999 (-0.007)	-5.2	.996 (-0.032)	-12.8	.978 (-0.196)	
2.2	.999 (-0.006)	-5.4	.996 (-0.035)	-13.0	.977 (-0.203)	
2.0	.999 (-0.005)	-5.6	.996 (-0.037)	-13.2	.976 (-0.209)	
1.8	1.00 (-0.004)	-5.8	.995 (-0.04)	-13.4	.975 (-0.215)	
1.6	1.00 (-0.003)	-6.0	.995 (-0.043)	-13.6	.975 (-0.222)	
1.4	1.00 (-0.002)	-6.2	.995 (-0.046)	-13.8	.974 (-0.229)	
1.2	1.00 (-0.002)	-6.4	.994 (-0.049)	-14.0	.973 (-0.235)	
1.0	1.00 (-0.001)	-6.6	.994 (-0.052)	-14.2	.973 (-0.242)	
.8	1.00 (-0.001)	-6.8	.994 (-0.055)	-14.4	.972 (-0.249)	
.6	1.00 (0)	-7.0	.993 (-0.058)	-14.6	.971 (-0.256)	
.4	1.00 (0)	-7.2	.993 (-0.062)	-14.8	.97 (-0.263)	
.2	1.00 (0)	-7.4	.993 (-0.065)	-15.0	.969 (-0.271)	
.0	1.00 (0)	-7.6	.992 (-0.069)	-15.2	.969 (-0.278)	
-.2	1.00 (0)	-7.8	.992 (-0.073)	-15.4	.968 (-0.285)	
-.4	1.00 (0)	-8.0	.991 (-0.076)	-15.6	.967 (-0.293)	
-.6	1.00 (0)	-8.2	.991 (-0.08)	-15.8	.966 (-0.3)	
-.8	1.00 (-0.001)	-8.4	.99 (-0.084)	-16.0	.965 (-0.308)	
-1.0	1.00 (-0.001)	-8.6	.99 (-0.088)	-16.2	.964 (-0.316)	
-1.2	1.00 (-0.002)	-8.8	.989 (-0.093)	-16.4	.963 (-0.324)	
-1.4	1.00 (-0.002)	-9.0	.989 (-0.097)	-16.6	.962 (-0.332)	
-1.6	1.00 (-0.003)	-9.2	.988 (-0.101)	-16.8	.962 (-0.34)	
-1.8	1.00 (-0.004)	-9.4	.988 (-0.106)	-17.0	.961 (-0.348)	
-2.0	.999 (-0.005)	-9.6	.987 (-0.11)	-17.2	.96 (-0.357)	
-2.2	.999 (-0.006)	-9.8	.987 (-0.115)	-17.4	.959 (-0.365)	
-2.4	.999 (-0.007)	-10.0	.986 (-0.12)	-17.6	.958 (-0.374)	
-2.6	.999 (-0.008)	-10.2	.986 (-0.124)	-17.8	.957 (-0.383)	
-2.8	.999 (-0.009)	-10.4	.985 (-0.129)	-18.0	.956 (-0.391)	
-3.0	.999 (-0.011)	-10.6	.985 (-0.134)	-18.2	.955 (-0.4)	
-3.2	.999 (-0.012)	-10.8	.984 (-0.14)	-18.4	.954 (-0.409)	
-3.4	.998 (-0.014)	-11.0	.983 (-0.145)	-18.6	.953 (-0.418)	
-3.6	.998 (-0.015)	-11.2	.983 (-0.15)	-18.8	.952 (-0.427)	
-3.8	.998 (-0.017)	-11.4	.982 (-0.156)	-19.0	.951 (-0.437)	
-4.0	.998 (-0.019)	-11.6	.982 (-0.161)	-19.2	.95 (-0.446)	
-4.2	.998 (-0.021)	-11.8	.981 (-0.167)	-19.4	.949 (-0.456)	

Systems With Reliability Inc.

Page 2 of 3

CLIENT: *Shepherd Communications Inc.* Ex. 4 Date: 1/7/03
 ANTENNA TYPE: FM3/1-DA
 FREQUENCY: 89.5
 PATTERN POL.: Circular
 DIRECTIVITY(Peak)0.883/-0.539 dBd Beam Tilt (Deg.) : 0
 DIRECTIVITY(Horiz0:883/-0.539 dBd Null Fill(s)(%) 0, 0, 0

Relative Field Tabulation

Elev. Angle			Rel. Fld(dB)			Elev. Angle			Rel. Fld(dB)			Elev. Angle		
-19.6	.948	(-0.465)	-27.2	.90	(-0.911)	-54.0	.629	(-4.027)						
-19.8	.947	(-0.475)	-27.4	.899	(-0.924)	-55.0	.616	(-4.205)						
-20.0	.946	(-0.485)	-27.6	.898	(-0.939)	-56.0	.603	(-4.39)						
-20.2	.945	(-0.495)	-27.8	.896	(-0.953)	-57.0	.59	(-4.58)						
-20.4	.944	(-0.505)	-28.0	.895	(-0.967)	-58.0	.577	(-4.778)						
-20.6	.942	(-0.515)	-28.2	.893	(-0.981)	-59.0	.564	(-4.982)						
-20.8	.941	(-0.525)	-28.4	.892	(-0.996)	-60.0	.55	(-5.193)						
-21.0	.94	(-0.535)	-28.6	.89	(-1.01)	-61.0	.536	(-5.411)						
-21.2	.939	(-0.546)	-28.8	.889	(-1.025)	-62.0	.523	(-5.638)						
-21.4	.938	(-0.556)	-29.0	.887	(-1.04)	-63.0	.509	(-5.873)						
-21.6	.937	(-0.567)	-29.2	.886	(-1.055)	-64.0	.495	(-6.116)						
-21.8	.936	(-0.578)	-29.4	.884	(-1.07)	-65.0	.48	(-6.369)						
-22.0	.934	(-0.589)	-29.6	.883	(-1.085)	-66.0	.466	(-6.631)						
-22.2	.933	(-0.6)	-29.8	.881	(-1.101)	-67.0	.452	(-6.904)						
-22.4	.932	(-0.611)	-30.0	.879	(-1.116)	-68.0	.437	(-7.187)						
-22.6	.931	(-0.622)	-31.0	.871	(-1.195)	-69.0	.423	(-7.483)						
-22.8	.93	(-0.633)	-32.0	.863	(-1.277)	-70.0	.408	(-7.791)						
-23.0	.928	(-0.645)	-33.0	.855	(-1.363)	-71.0	.393	(-8.112)						
-23.2	.927	(-0.656)	-34.0	.846	(-1.451)	-72.0	.378	(-8.448)						
-23.4	.926	(-0.668)	-35.0	.837	(-1.543)	-73.0	.363	(-8.799)						
-23.6	.925	(-0.68)	-36.0	.828	(-1.638)	-74.0	.348	(-9.167)						
-23.8	.923	(-0.692)	-37.0	.819	(-1.737)	-75.0	.333	(-9.553)						
-24.0	.922	(-0.704)	-38.0	.809	(-1.839)	-76.0	.318	(-9.959)						
-24.2	.921	(-0.716)	-39.0	.799	(-1.944)	-77.0	.302	(-10.387)						
-24.4	.92	(-0.728)	-40.0	.789	(-2.054)	-78.0	.287	(-10.839)						
-24.6	.918	(-0.74)	-41.0	.779	(-2.167)	-79.0	.272	(-11.317)						
-24.8	.917	(-0.753)	-42.0	.769	(-2.283)	-80.0	.256	(-11.826)						
-25.0	.916	(-0.765)	-43.0	.758	(-2.404)	-81.0	.241	(-12.367)						
-25.2	.914	(-0.778)	-44.0	.747	(-2.529)	-82.0	.225	(-12.946)						
-25.4	.913	(-0.791)	-45.0	.736	(-2.658)	-83.0	.21	(-13.569)						
-25.6	.912	(-0.803)	-46.0	.725	(-2.791)	-84.0	.194	(-14.241)						
-25.8	.91	(-0.816)	-47.0	.714	(-2.928)	-85.0	.178	(-14.97)						
-26.0	.909	(-0.83)	-48.0	.702	(-3.071)	-86.0	.163	(-15.768)						
-26.2	.908	(-0.843)	-49.0	.69	(-3.217)	-87.0	.147	(-16.648)						
-26.4	.906	(-0.856)	-50.0	.679	(-3.369)	-88.0	.131	(-17.627)						
-26.6	.905	(-0.87)	-51.0	.666	(-3.525)	-89.0	.116	(-18.733)						
-26.8	.903	(-0.883)	-52.0	.654	(-3.687)	-90.0	.10	(-20)						
-27.0	.902	(-0.897)	-53.0	.642	(-3.854)	90.0	.00	(-50)						

Systems With Reliability Inc.

Page 3 of 3

CLIENT: *Shepherd Communications Inc.* Ex. 4 Date: 1/7/03
 ANTENNA TYPE: FM3/1-DA
 FREQUENCY: 89.5
 PATTERN POL.: Circular
 DIRECTIVITY(Peak)0.883/-0.539 dBd Beam Tilt (Deg.) : 0
 DIRECTIVITY(Horiz0:883/-0.539 dBd Null Fill(s)(%) 0, 0, 0



SYSTEMS WITH RELIABILITY, Inc.

Broadcast Antenna & Transmission Systems

SYSTEM DATA SHEET

Call Sign	890531MD
Contact	Shepherd Communications Inc.
Location	Ojai, CA
Antenna Model	FM3/1 DA
Channel / Frequency	89.5 MHz

ELECTRICAL SPECIFICATION

Polarization Type	Circular
Polarization Ratio	
H-Pol. (PRH)	53.1940 %
V-Pol. (PRV)	46.8060 %
Elevation Directivity (ED)	0.883
Azimuth Directivity (AD) H-Pol.	2.015
Azimuth Directivity (AD) V-Pol.	2.290
Antenna Gain (GH)	
H-Pol. (GH)	0.946
V-Pol. (GV)	0.946
dB Gain (AG)	
H-Pol. (AGH)	-0.239
V-Pol. (AGV)	-0.239
ERP	
H-Pol. (ERPH)	0.097 kW
V-Pol. (ERPV)	0.097 kW
Line Type	1 5/8-50 Ohm
Attenuation per 100 ft.	0.195 dB/100ft
Line Length (LL)	115.00 ft.
Total Line Attenuation	0.224 dB
Line Efficiency (LE)	94.967 %
Line Loss (LPL)	0.005 kW
Antenna Input Power (AIP)	0.102 kW
Req'd. Transmitter Output Power	0.108 kW

MECHANICAL SPECIFICATION

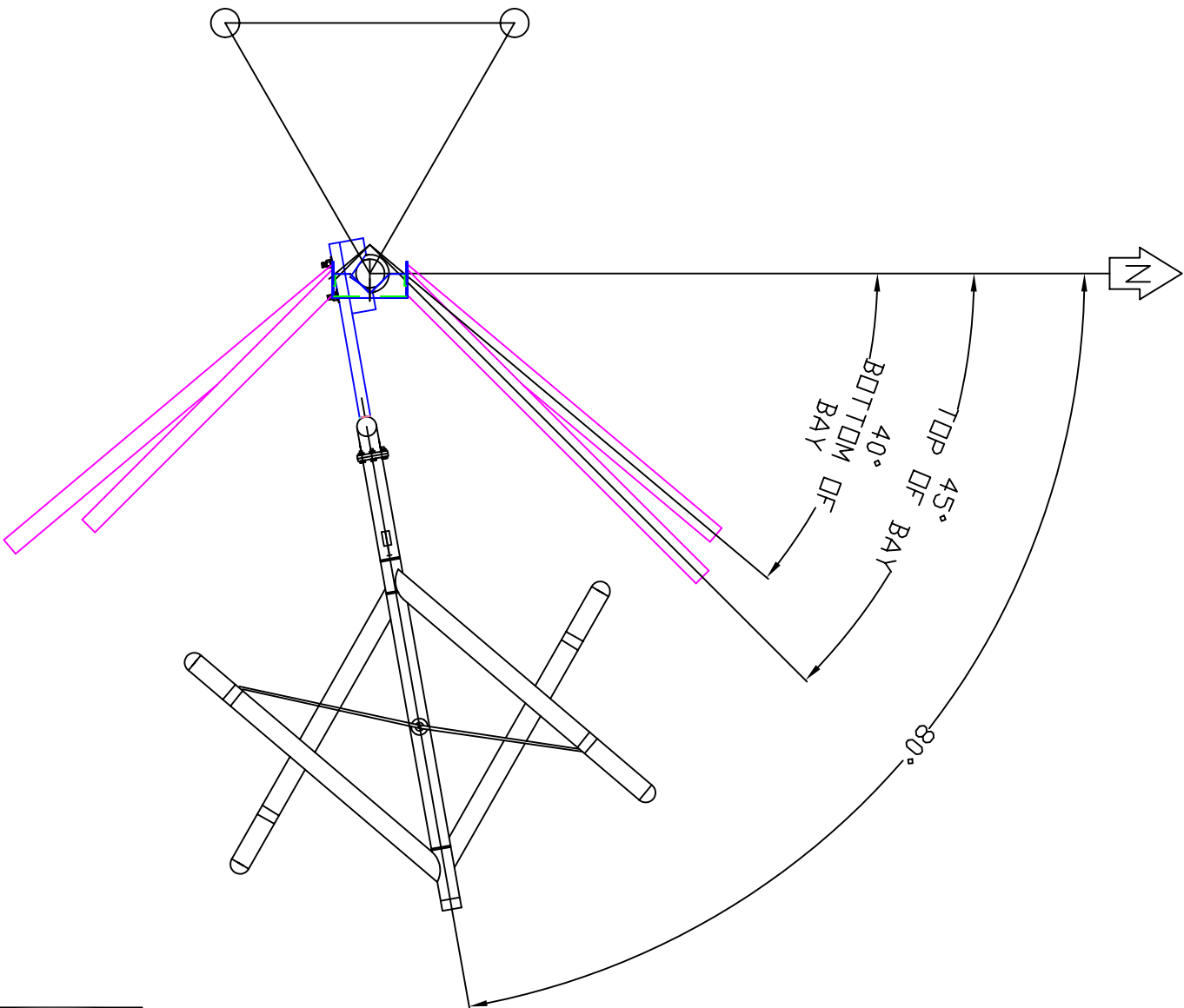
No. Of Bays	1			
Antenna Aperture	0.00	ft.	0.00	m
Center of Radiation AGL	98.40	ft.	30.00	m
Antenna Weight	21.00	lbs.	9.55	kg
Windload (50/33)	45.00	lbs.	20.45	kg

Prepared by:

Harry Turtchanow Jr.

NOTE:

DRAWING
NUMBER: 0496A01



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

TITLE:

ORIENTATION WITH PARASITICS
FM3/1-DA, FREQ. 89.5. SCAPPOOSE, OR.

MATERIAL:

SIZE

A

PARTS MADE BY THIS DRAWING

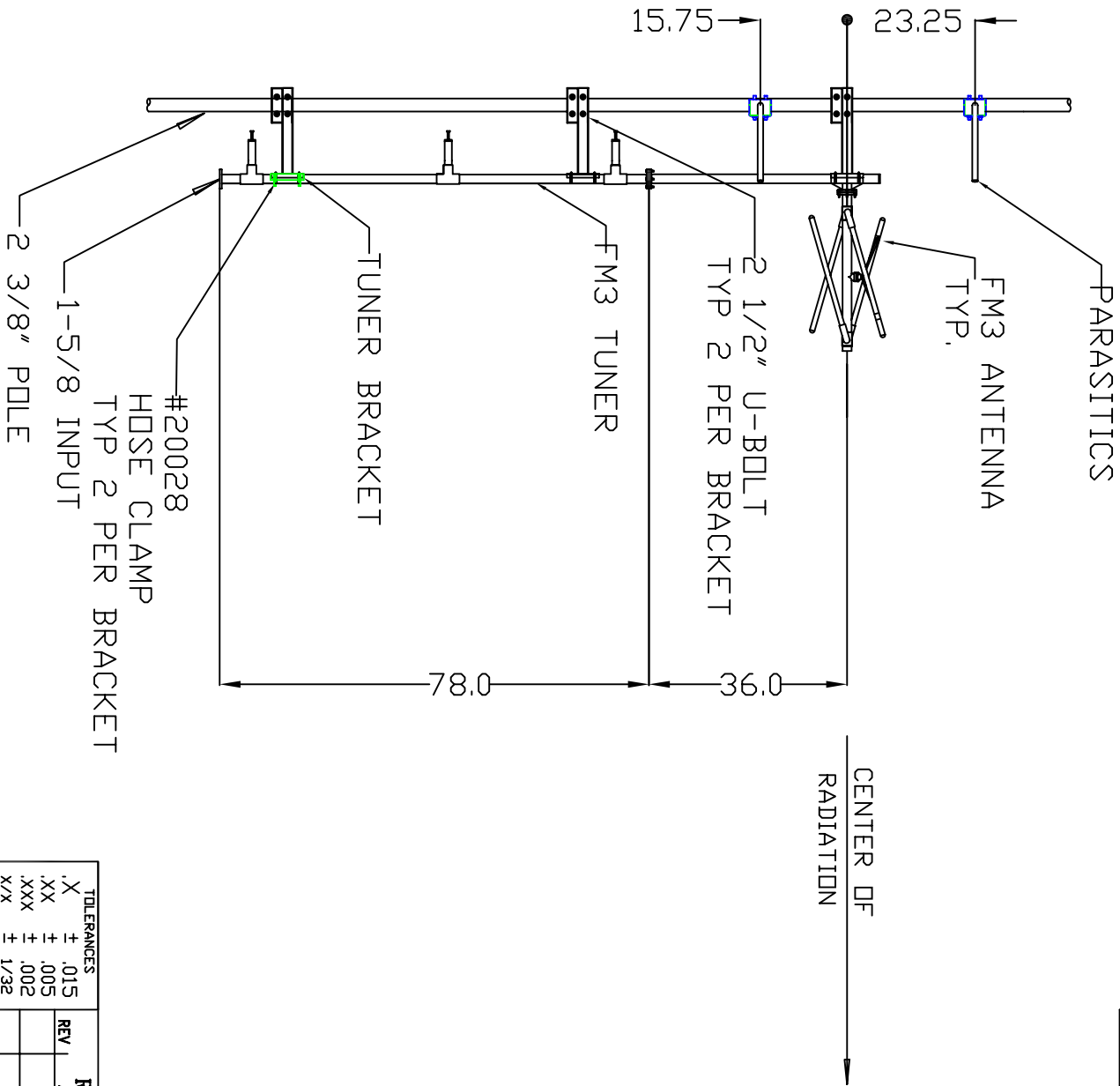
DRAWING
NUMBER: 0496A01

SCALE: NTS NAME: OLA DATE: 1/7/03 SHEET 1 OF 1



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

NOTE:

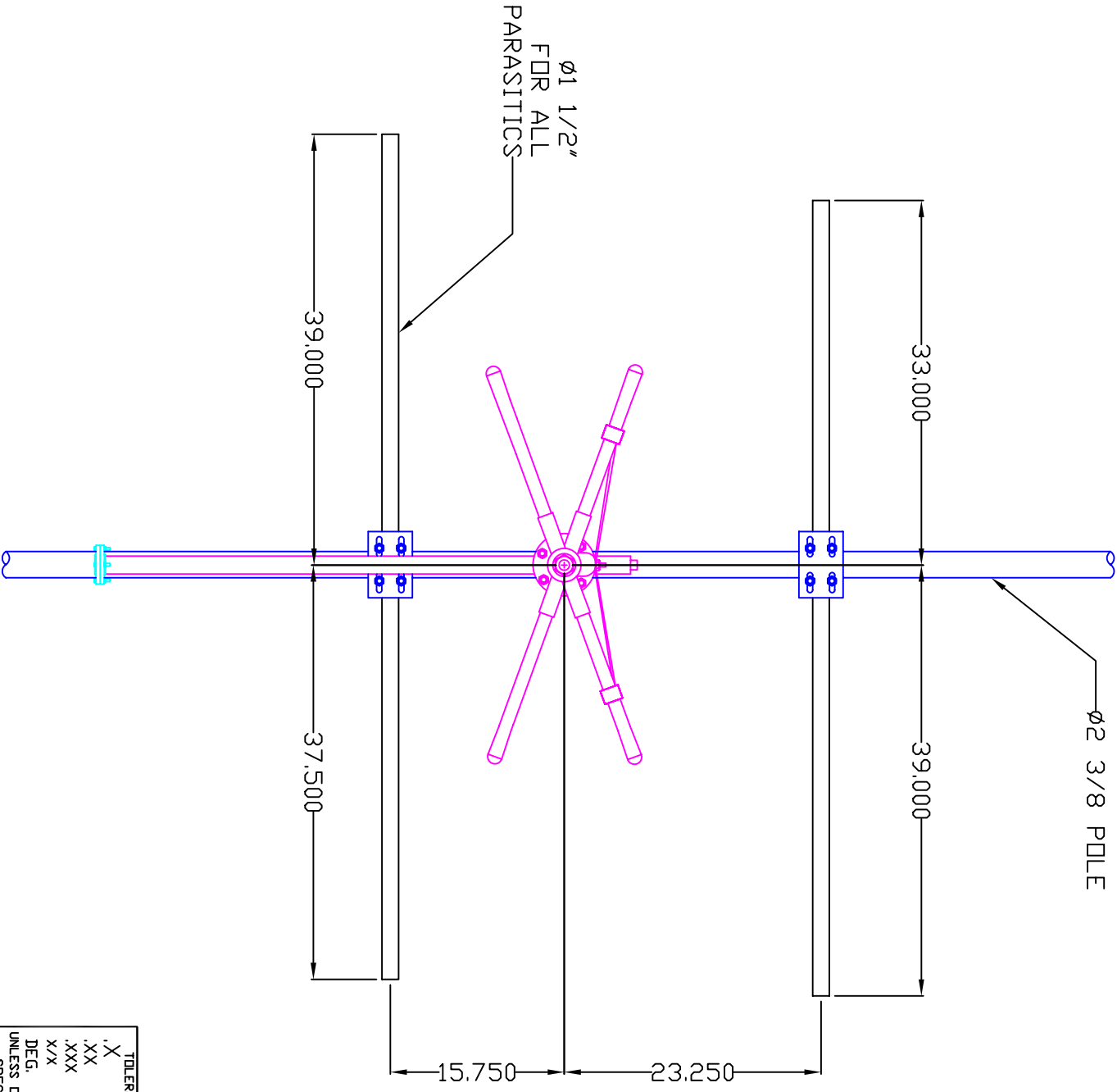


TOLERANCES		REVISION RECORD	
.X	± .015	REV	APPROVAL DATE
.XX	± .005		
.XXX	± .002		
X/X	± 1/32		
DEG.	± 1/2		
UNLESS OTHERWISE SPECIFIED			

TITLE:		FM3/1-DA		SIZE	PARTS MADE BY THIS DRAWING		DRAWING NUMBER:	
MATERIAL:		FREQ. 89.5, SHEPHERD COMMUNICATIONS		A	SCALE: NTS		0496A00	
					NAME: OLA		DATE: 11/26/02	
							SHEET 1 OF 1	

NOTE:

DRAWING
NUMBER: 0496A02



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

TITLE:

PARASITIC PLACEMENT
FM3/1-DA, FREQ. 89.5, SCAPPOOSE, OR.

SIZE

A

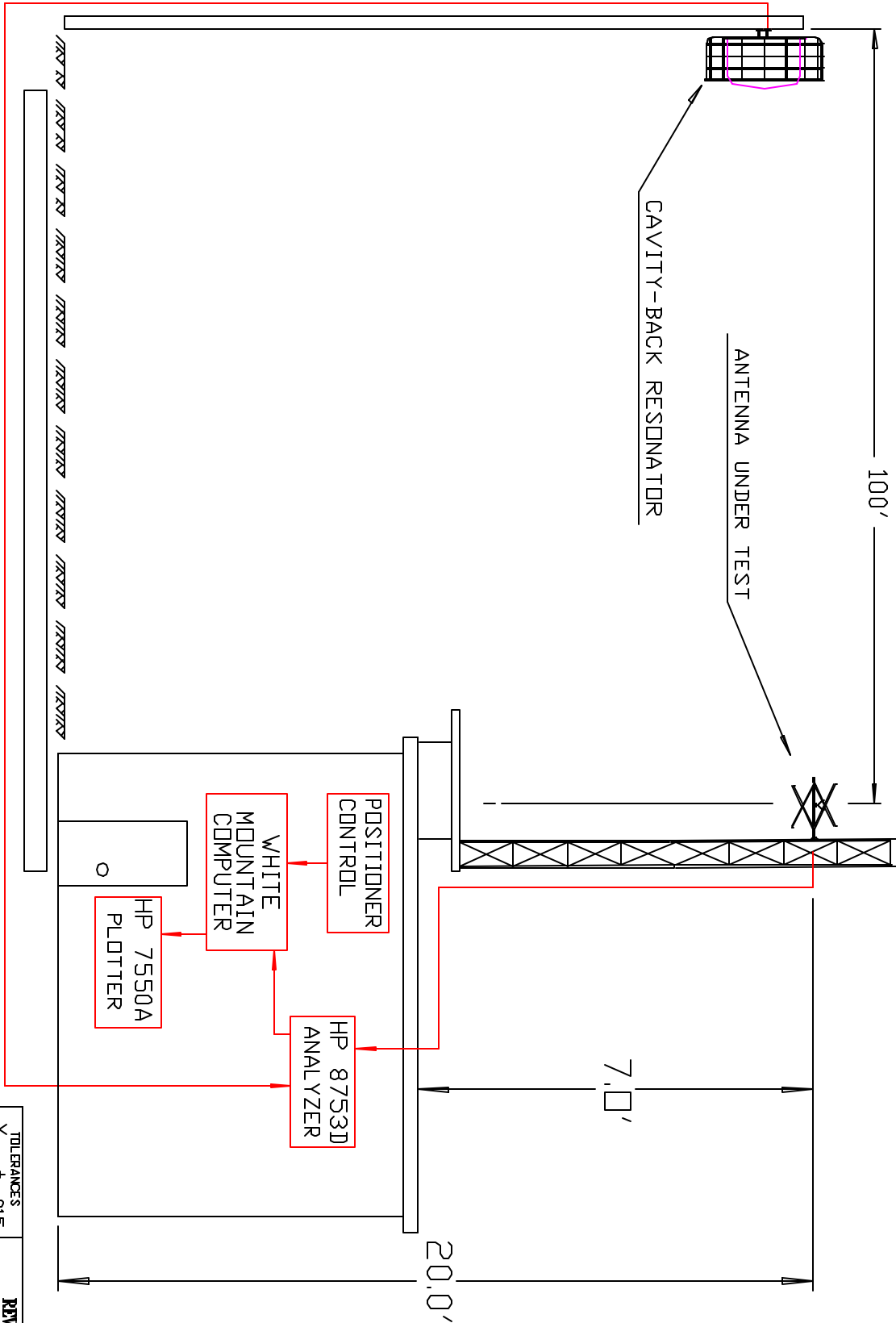
MATERIAL:

PARTS MADE BY THIS DRAWING
SCALE: NTS NAME: OLA DATE: 1/7/03


DRAWING NUMBER: 0496A02
SHEET 1 OF 1

NOTE:

DRAWING NUMBER:
2105A13



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

 SYSTEMS WITH RELIABILITY, INC 619 INDUSTRIAL PARK ROAD EBERSBURG, PENNSYLVANIA 15931		TITLE: TEST RANGE SCHEMATIC CIRCULAR POLARIZED DA		SIZE A		PARTS MADE BY THIS DRAWING		DRAWING NUMBER 2105A13	
MATERIAL				SCALE NTS		NAME OLA		DATE 10/21/02	
								SHEET 1 OF 1	