

FCC Documents

FMEC/1-DA @ 89.7 MHz.

East St. Louis, Illinois

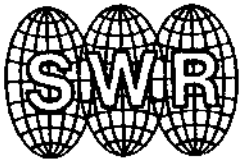
Antenna Model #:..... FMEC/1-DA

Customer:.....New Life Evangelistic Center Inc.

Location:.....East St. Louis, Illinois

Operating Frequency:.....89.7 MHz.

Ship Date:.....March 3, 2000



SYSTEMS WITH RELIABILITY, INC.
Broadcast Antennas and Transmission Systems

619 Industrial Park Road • PO Box 856 • Ebensburg, PA 15931-0856

Phone: (814) 472-5436

FAX: (814) 472-5552

Pattern Certification

Directional FM Antenna

WCBW-FM

March 6, 2000

Station: WCBW-FM

Location: East St. Louis, Illinois

Frequency: 89.7 MHz.

Channel: 209

Antenna Model: FMEC/I-DA

Maximum Antenna Gain:

Horizontal: 1.39 / 1.43 (dB)

Vertical: 1.39 / 1.43 (dB)

Antenna Description

A custom designed FM antenna was used in conjunction with a 12 3/4 inch diameter mast to produce the required directional pattern. The antenna comprised of a one bay radiating element mounted to a mast. All transmission lines, conduit and STL dishes relating to the antenna were in place during testing in a scale model manner. The antenna is a circular polarized dipole radiating element with a horizontal and vertical parasitic system.

Description of the Test Procedure

The test antenna consisted of a 1/3 scale dipole antenna and parasitic system. The antenna under test was mounted directly to a 1/3 scale tower using brackets scaled to the equivalent that is supplied with the finalized antenna. All feed cables were properly grounded during pattern testing. Horizontal and vertical parasitic elements were used to obtain the directional pattern.

The scaled tower mounted vertically was elevated 20 feet on a platform. The source antenna, a horizontal/vertical Cavity-Backed resonator antenna configuration was mounted approximately 100 feet from the test antenna. The source height was adjusted to provide uniform field at the test antenna location. The CBR antenna was operated in the transmit mode at a frequency of (3 x 89.7 Freq. = 269.1 MHz.). The antenna under test was rotated in a clockwise direction while the received signal was recorded on polar coordinate graph paper in a counterclockwise direction. A gain reference was taken using a dipole tuned to 269.1 MHz. No were does the received signal exceed a maximum to minimum of 15 dB.

Document Exhibits

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

Exhibit 1	Measured Azimuth Pattern (Composite)
Exhibit 1A	Measured Field Strength Tabulations (Composite)
Exhibit 2	Measured Horizontally Polarized Azimuth Pattern
Exhibit 2A	Measured Field Strength Tabulations (Horizontal)
Exhibit 3	Measured Vertical Polarized Azimuth Pattern
Exhibit 3A	Measured Field Strength Tabulations (Vertical)
Exhibit 4	Calculated Elevation Pattern
Exhibit 4A	Calculated Elevation Pattern Tabulation


Test Equipment

Network Analyzer: Hewlett-Packard Model # 8753C
Serial #: 08753-69138

Computer: White Mountain 366 Computer

Plotter: HP 7550A

Positioner: Orbit Positioner

Prepared By: 

Robert W. Edmiston Jr.

VP of Production

Test Results

Enclosed calculations verify that the RMS value of this antenna is 85.35% of the RMS of the pattern authorized in the related construction permit (BPED960924MA). The horizontal components RMS value is 56 % the vertical component RMS value is 56%.

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

Measured Horizontal Polarized Directivity:	3.15 /4.99 (dB)
Measured Vertical Polarized Directivity:	3.21 /5.06 (dB)
Measured Composite Azimuth Pattern Directivity:	2.87 /4.58 (dB)

Gain in each polarization is calculated using the following relation:

Gain = Azimuth Directivity x Power Ration Between Polarization x Elevation Directivity

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

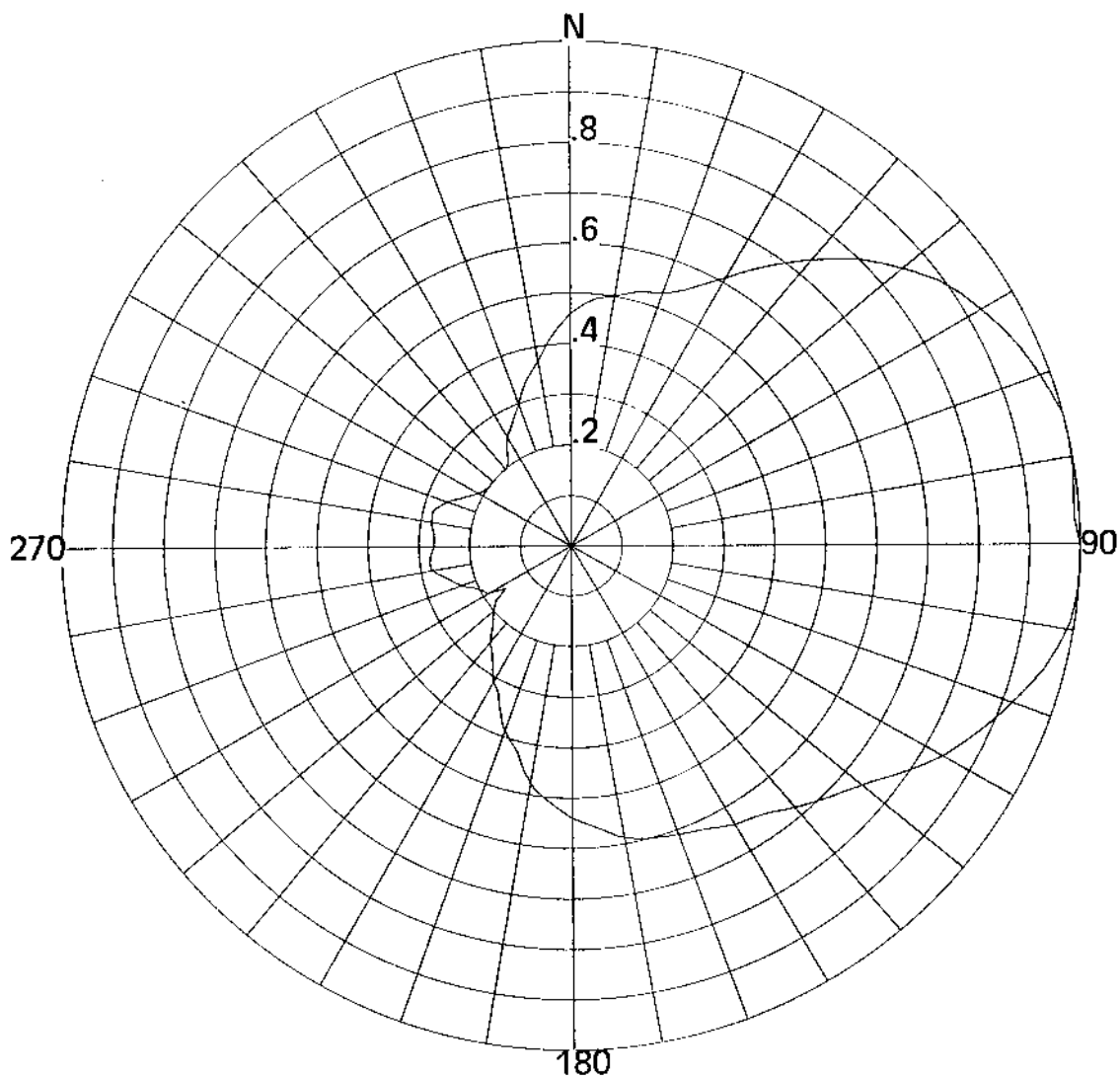
$$\begin{aligned}\text{H-Pol. Gain: } & (3.15)(.504)(.9197)(.95) = 1.39/1.43 \text{ (dB)} \\ \text{V-Pol. Gain: } & (3.21)(.495)(.9197)(.95) = 1.39/1.43 \text{ (dB)}\end{aligned}$$

Installation and Mounting

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be 46 meters above ground level. The antenna aperture is 6 feet. No other antennas are to be mounted within 10 feet of the supplied antenna unless otherwise specified. No other obstructions other than those specified by the original drawings supplied are to be mounted at the same level as the antenna. The antenna is to be orientated 90 degrees true north.

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

<u>Drawing #</u>	<u>Description</u>
0241-C01	Antenna Orientation
0241-C	Elevation View
0241-C02	Typical Antenna Bay (Front View)



Azimuth Pattern

Systems With Reliability Inc.

Scale: Linear
Units: Absolute

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/29/00

ANTENNA TYPE: *FMEC/1-DA*

lwcbw-comp.aazi

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Circular (Composite)*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *2.871 / 4.5803dB*

PATTERN RMS:

Field Strength Tabulation

Azimuth Heading	Field strength(dB)	Azimuth Heading	Field Streng
0	.46 (-6.73)	180	.54 (-5.34)
5	.49 (-6.18)	185	.51 (-5.83)
10	.50 (-6.00)	190	.48 (-6.36)
15	.52 (-5.66)	195	.42 (-7.51)
20	.53 (-5.50)	200	.39 (-8.16)
25	.56 (-5.02)	205	.34 (-9.34)
30	.61 (-4.28)	210	.31 (-10.14)
35	.67 (-3.43)	215	.27 (-11.34)
40	.74 (-2.65)	220	.25 (-12.01)
45	.80 (-1.93)	225	.22 (-13.11)
50	.85 (-1.40)	230	.20 (-13.94)
55	.90 (-.91)	235	.18 (-14.85)
60	.93 (-.62)	240	.19 (-14.38)
65	.96 (-.35)	245	.20 (-13.94)
70	.98 (-.17)	250	.23 (-12.73)
75	1.00 (.01)	255	.25 (-12.01)
80	1.00 (.01)	260	.28 (-11.03)
85	.99 (-.08)	265	.28 (-11.03)
90	1.00 (.01)	270	.27 (-11.34)
95	1.00 (.01)	275	.27 (-11.34)
100	.99 (-.08)	280	.28 (-11.03)
105	.96 (-.35)	285	.28 (-11.03)
110	.92 (-.71)	290	.26 (-11.67)
115	.88 (-1.10)	295	.23 (-12.73)
120	.84 (-1.50)	300	.21 (-13.51)
125	.79 (-2.04)	305	.20 (-13.94)
130	.74 (-2.60)	310	.20 (-13.94)
135	.71 (-2.96)	315	.20 (-13.94)
140	.68 (-3.34)	320	.20 (-13.94)
145	.65 (-3.73)	325	.22 (-13.11)
150	.64 (-3.86)	330	.25 (-12.01)
155	.62 (-4.14)	335	.27 (-11.34)
160	.61 (-4.28)	340	.30 (-10.43)
165	.60 (-4.42)	345	.34 (-9.34)
170	.59 (-4.57)	350	.37 (-8.61)
175	.56 (-5.02)	355	.42 (-7.51)

Systems With Reliability Inc.

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/29/00

ANTENNA TYPE: *FMEC/1-DA*

[wcbw-comp.aaz]

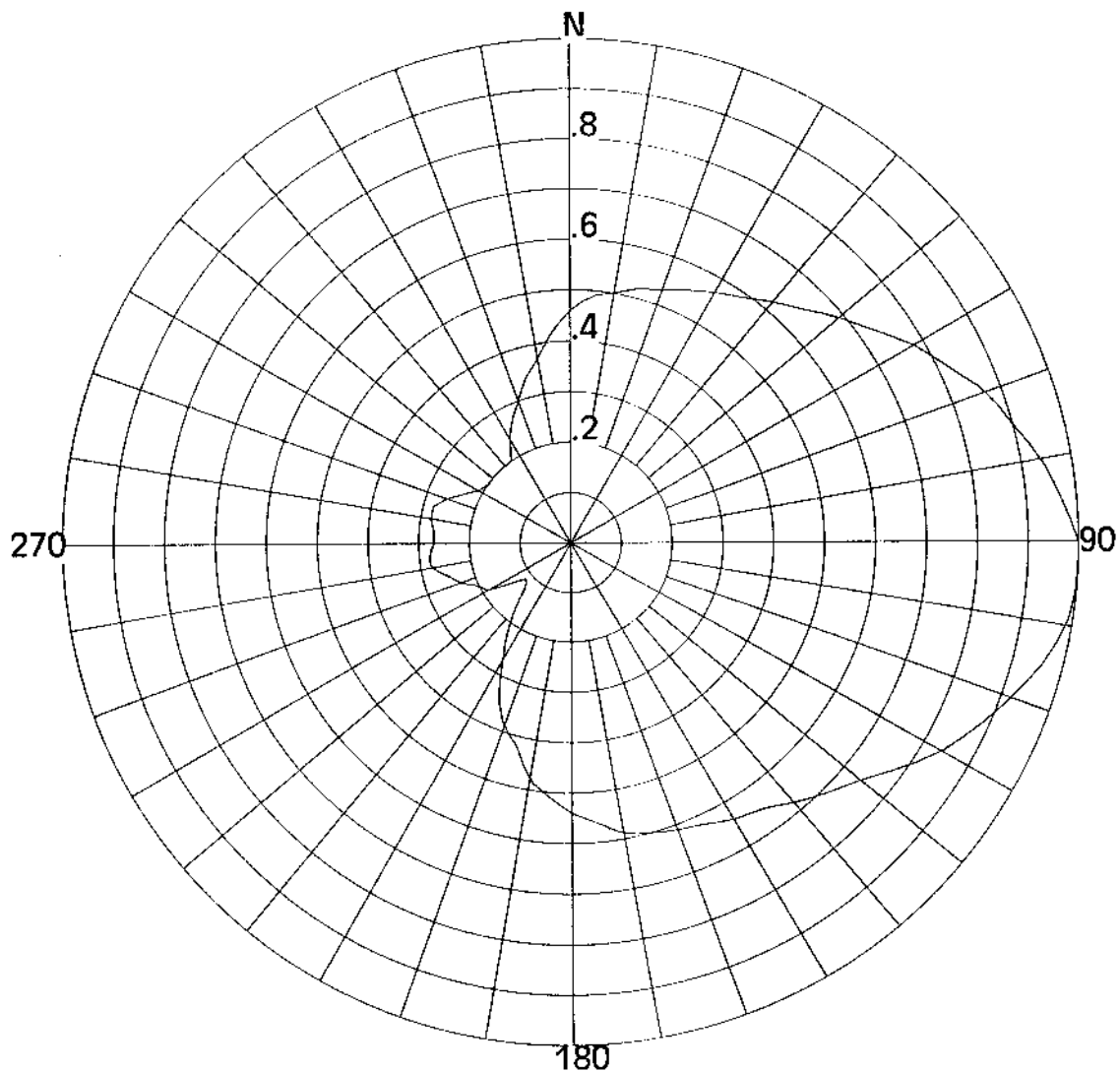
FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Circular [Composite]*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *2.871 / 4.5803dB*

PATTERN RMS:



Azimuth Pattern

Systems With Reliability Inc.

Scale: Linear
Units: Absolute

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/29/00

ANTENNA TYPE: *FMEC/1-DA*

lwcbw-hpol.eazl

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Horizontal*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *3.1563 / 4.9918dB*

PATTERN RMS:

Field Strength Tabulation

Azimuth Heading	Field strength(dB)	Azimuth Heading	Field Streng
0	.46 (-6.73)	180	.54 (-5.34)
5	.49 (-6.18)	185	.51 (-5.83)
10	.50 (-6.00)	190	.48 (-6.36)
15	.52 (-5.66)	195	.42 (-7.51)
20	.53 (-5.50)	200	.39 (-8.16)
25	.55 (-5.18)	205	.34 (-9.34)
30	.57 (-4.87)	210	.27 (-11.34)
35	.59 (-4.57)	215	.22 (-13.11)
40	.62 (-4.14)	220	.17 (-15.34)
45	.65 (-3.73)	225	.13 (-17.65)
50	.69 (-3.21)	230	.11 (-19.09)
55	.73 (-2.72)	235	.13 (-17.65)
60	.78 (-2.15)	240	.19 (-14.38)
65	.82 (-1.71)	245	.20 (-13.94)
70	.87 (-1.20)	250	.23 (-12.73)
75	.90 (-.91)	255	.25 (-12.01)
80	.94 (-.53)	260	.28 (-11.03)
85	.97 (-.26)	265	.28 (-11.03)
90	1.00 (.01)	270	.27 (-11.34)
95	1.00 (.01)	275	.27 (-11.34)
100	.99 (-.08)	280	.28 (-11.03)
105	.96 (-.35)	285	.28 (-11.03)
110	.92 (-.71)	290	.26 (-11.67)
115	.88 (-1.10)	295	.23 (-12.73)
120	.84 (-1.50)	300	.21 (-13.51)
125	.79 (-2.04)	305	.20 (-13.94)
130	.74 (-2.60)	310	.20 (-13.94)
135	.71 (-2.96)	315	.20 (-13.94)
140	.68 (-3.34)	320	.20 (-13.94)
145	.65 (-3.73)	325	.20 (-13.94)
150	.64 (-3.86)	330	.24 (-12.36)
155	.62 (-4.14)	335	.27 (-11.34)
160	.61 (-4.28)	340	.30 (-10.43)
165	.60 (-4.42)	345	.34 (-9.34)
170	.59 (-4.57)	350	.37 (-8.61)
175	.56 (-5.02)	355	.42 (-7.51)

Systems With Reliability Inc.

CLIENT: *New Life Evangelistic Center Inc.*

ANTENNA TYPE: *FMEC/1-DA*

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Horizontal*

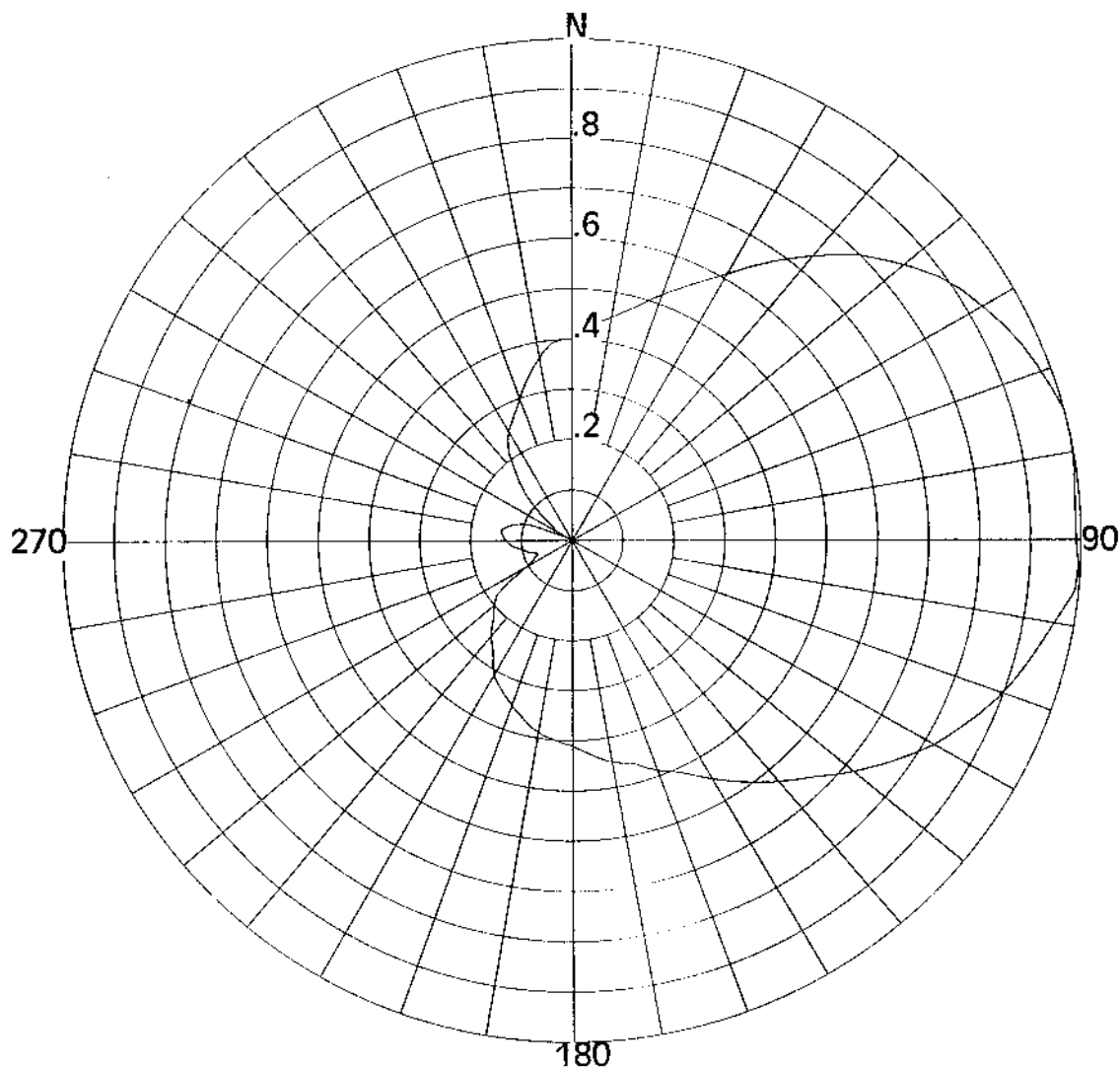
AZ. DIRECTIVITY: *3.1563 / 4.9918dB*

Date: *2/29/00*

lwcbw-hpol.eaz

CIRCULARITY(+/-dB):

PATTERN RMS:



Azimuth Pattern

Systems With Reliability Inc.

Scale: Linear
Units: Absolute

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/28/00

ANTENNA TYPE: *FMEC/1-DA*

[WCBW-Vpol.eaz]

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Vertical*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *3.2121 / 5.0679dB*

PATTERN RMS:

Software Design by: *Micro-Tek Engineering*

Field Strength Tabulation

Azimuth Heading	Field strength(dB)	Azimuth Heading	Field Streng
0	.40 (-7.94)	180	.41 (-7.72)
5	.43 (-7.31)	185	.40 (-7.94)
10	.45 (-6.92)	190	.39 (-8.16)
15	.48 (-6.36)	195	.37 (-8.61)
20	.52 (-5.66)	200	.35 (-9.09)
25	.56 (-5.02)	205	.33 (-9.60)
30	.61 (-4.28)	210	.31 (-10.14)
35	.67 (-3.43)	215	.27 (-11.34)
40	.74 (-2.65)	220	.25 (-12.01)
45	.80 (-1.93)	225	.22 (-13.11)
50	.85 (-1.40)	230	.20 (-13.94)
55	.90 (-.91)	235	.18 (-14.85)
60	.93 (-.62)	240	.10 (-19.91)
65	.96 (-.35)	245	.08 (-21.83)
70	.98 (-.17)	250	.07 (-22.97)
75	1.00 (.01)	255	.09 (-20.82)
80	1.00 (.01)	260	.10 (-19.91)
85	.99 (-.08)	265	.12 (-18.34)
90	.99 (-.08)	270	.13 (-17.65)
95	1.00 (.01)	275	.14 (-17.02)
100	.96 (-.35)	280	.14 (-17.02)
105	.93 (-.62)	285	.12 (-18.34)
110	.90 (-.91)	290	.10 (-19.91)
115	.86 (-1.30)	295	.01 (-40.92)
120	.82 (-1.71)	300	.04 (-27.74)
125	.77 (-2.26)	305	.04 (-27.74)
130	.72 (-2.84)	310	.08 (-21.83)
135	.67 (-3.47)	315	.13 (-17.65)
140	.63 (-4.00)	320	.17 (-15.34)
145	.59 (-4.57)	325	.22 (-13.11)
150	.55 (-5.18)	330	.25 (-12.01)
155	.51 (-5.83)	335	.27 (-11.34)
160	.49 (-6.18)	340	.30 (-10.43)
165	.46 (-6.73)	345	.34 (-9.47)
170	.45 (-6.92)	350	.37 (-8.61)
175	.43 (-7.31)	355	.40 (-7.94)

Systems With Reliability Inc.

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/28/00

ANTENNA TYPE: *FMEC/1-DA*

IWCBW-Vpol.eazl

FREQUENCY: *89.7 MHz.*

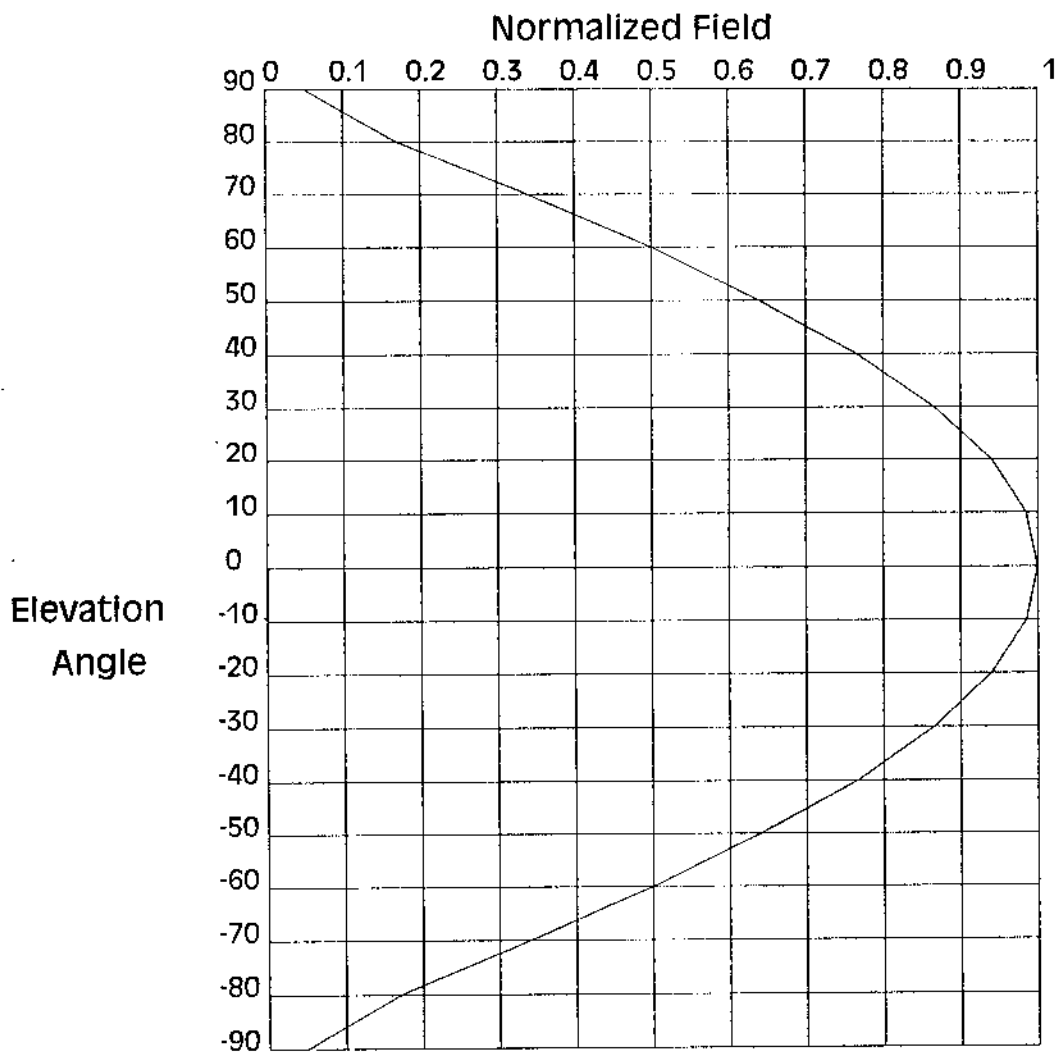
PATTERN POL.: *Vertical*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *3.2121 / 5.0679dB*

PATTERN RMS:

Software Design by: *Micro-Tek Engineering*



Elevation Pattern

Systems With Reliability Inc.

Scale: Linear
Units: Absolute

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/24/00

ANTENNA TYPE: *FMEC/1-DA*

[1bay.ael]

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Circular*

Beam Tilt (Deg.) : *0*

Elev. DIRECTIVITY: *.9197/-.363dBd*

Null Fill (%) : *, ,*

Software Design by: *Micro-Tek Engineering*

Field Strength Tabulation

Elevation Heading	Field strength(dB)	Elevation Heading	Field Streng
6.00	.99 (-.05)	-1.60	1.00 (.01)
5.80	.99 (-.05)	-1.80	1.00 (.00)
5.60	.99 (-.05)	-2.00	1.00 (.00)
5.40	.99 (-.04)	-2.20	1.00 (.00)
5.20	.99 (-.04)	-2.40	1.00 (.00)
5.00	.99 (-.04)	-2.60	1.00 (-.01)
4.80	.99 (-.04)	-2.80	1.00 (-.01)
4.60	.99 (-.03)	-3.00	1.00 (-.01)
4.40	.99 (-.03)	-3.20	1.00 (-.01)
4.20	.99 (-.03)	-3.40	.99 (-.02)
4.00	.99 (-.02)	-3.60	.99 (-.02)
3.80	.99 (-.02)	-3.80	.99 (-.02)
3.60	.99 (-.02)	-4.00	.99 (-.02)
3.40	.99 (-.02)	-4.20	.99 (-.03)
3.20	1.00 (-.01)	-4.40	.99 (-.03)
3.00	1.00 (-.01)	-4.60	.99 (-.03)
2.80	1.00 (-.01)	-4.80	.99 (-.04)
2.60	1.00 (-.01)	-5.00	.99 (-.04)
2.40	1.00 (.00)	-5.20	.99 (-.04)
2.20	1.00 (.00)	-5.40	.99 (-.04)
2.00	1.00 (.00)	-5.60	.99 (-.05)
1.80	1.00 (.00)	-5.80	.99 (-.05)
1.60	1.00 (.01)	-6.00	.99 (-.05)
1.40	1.00 (.01)	-6.20	.99 (-.05)
1.20	1.00 (.01)	-6.40	.99 (-.06)
1.00	1.00 (.01)	-6.60	.99 (-.06)
.80	1.00 (.02)	-6.80	.99 (-.06)
.60	1.00 (.02)	-7.00	.99 (-.06)
.40	1.00 (.02)	-7.20	.99 (-.07)
.20	1.00 (.02)	-7.40	.99 (-.07)
.00	1.00 (.03)	-7.60	.99 (-.07)
-.20	1.00 (.02)	-7.80	.99 (-.07)
-.40	1.00 (.02)	-8.00	.99 (-.08)
-.60	1.00 (.02)	-8.20	.99 (-.08)
-.80	1.00 (.02)	-8.40	.99 (-.08)
-1.00	1.00 (.01)	-8.60	.99 (-.09)
-1.20	1.00 (.01)	-8.80	.99 (-.09)
-1.40	1.00 (.01)	-9.00	.99 (-.09)

Systems With Reliability Inc.

CLIENT: *New Life Evangelistic Center Inc.*

Date: 2/24/00

ANTENNA TYPE: *FMEC/1-DA*

[1bay.aell]

FREQUENCY: *89.7 MHz.*

PATTERN POL.: *Circular*

Beam Tilt (Deg.) : *0*

Elev. DIRECTIVITY: *.9197/-363dBd*

Null Fill (%) : *, ,*

Software Design by: *Micro-Tek Engineerin*

WCBW-FM Antenna RMS Comparision

Proposed Antenna

Azimuth Relative
Heading Field

0	0.60
5	0.62
10	0.63
15	0.66
20	0.68
25	0.71
30	0.74
35	0.78
40	0.81
45	0.86
50	0.90
55	0.93
60	0.96
65	0.98
70	1.00
75	1.00
80	1.00
85	1.00
90	1.00
95	1.00
100	1.00
105	1.00
110	1.00
115	1.00
120	1.00
125	1.00
130	1.00
135	1.00
140	1.00
145	0.99
150	0.97
155	0.93
160	0.88
165	0.82
170	0.76
175	0.70

Designed Antenna

Azimuth Relative
Heading Field

0	0.46
5	0.49
10	0.50
15	0.52
20	0.53
25	0.56
30	0.61
35	0.67
40	0.74
45	0.80
50	0.85
55	0.90
60	0.93
65	0.96
70	0.98
75	1.00
80	1.00
85	0.99
90	1.00
95	1.00
100	0.99
105	0.96
110	0.92
115	0.88
120	0.84
125	0.79
130	0.74
135	0.71
140	0.68
145	0.65
150	0.64
155	0.62
160	0.61
165	0.60
170	0.59
175	0.56

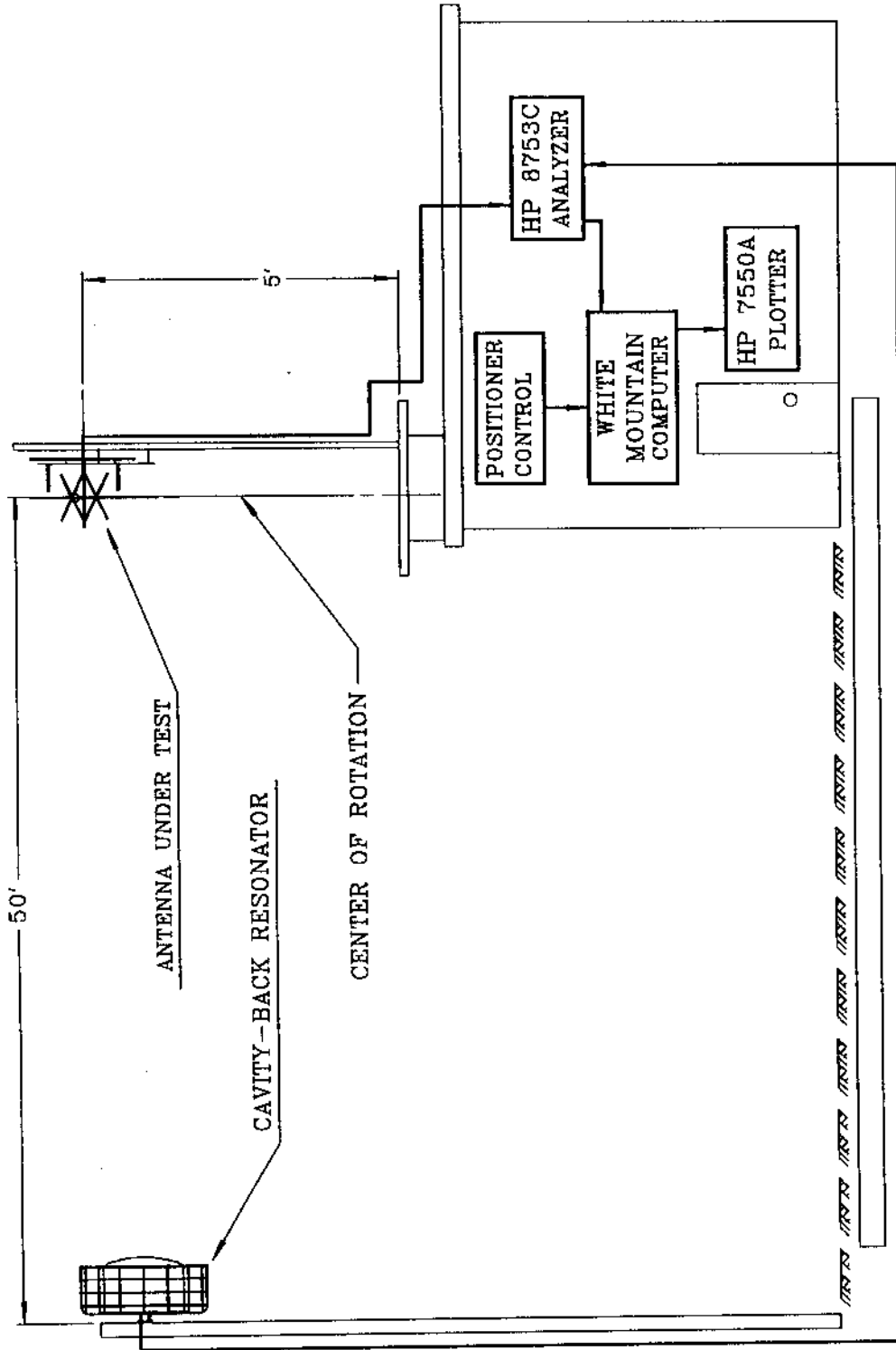
180	0.63
185	0.57
190	0.51
195	0.47
200	0.42
205	0.39
210	0.35
215	0.33
220	0.31
225	0.30
230	0.29
235	0.29
240	0.28
245	0.28
250	0.28
255	0.28
260	0.28
265	0.28
270	0.28
275	0.28
280	0.28
285	0.29
290	0.29
295	0.30
300	0.31
305	0.33
310	0.34
315	0.36
320	0.38
325	0.41
330	0.44
335	0.47
340	0.50
345	0.53
350	0.56
355	0.58

180	0.54
185	0.51
190	0.48
195	0.42
200	0.39
205	0.34
210	0.31
215	0.27
220	0.25
225	0.22
230	0.20
235	0.18
240	0.19
245	0.20
250	0.23
255	0.25
260	0.28
265	0.28
270	0.27
275	0.27
280	0.28
285	0.28
290	0.26
295	0.23
300	0.21
305	0.20
310	0.20
315	0.20
320	0.20
325	0.22
330	0.25
335	0.27
340	0.30
345	0.34
350	0.37
355	0.42

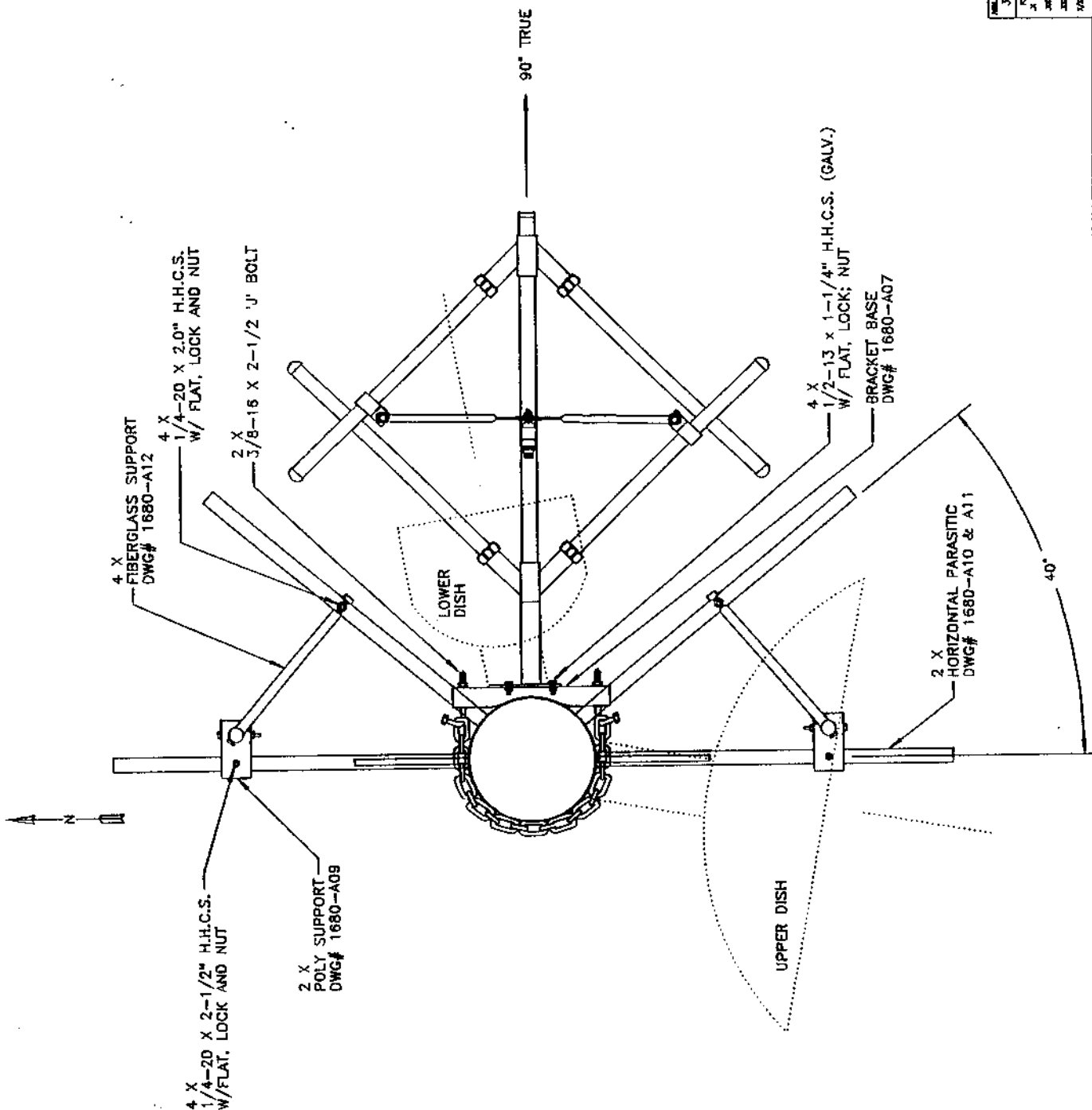
Sum of Relative Fields Squared: 34.39
Sum Divided by 72 (Readings): 0.48
Square Root: 0.69

Sum of Relative Fields Squared: 25.07
Sum Divided by 72 (Readings): 0.35
Square Root: 0.59

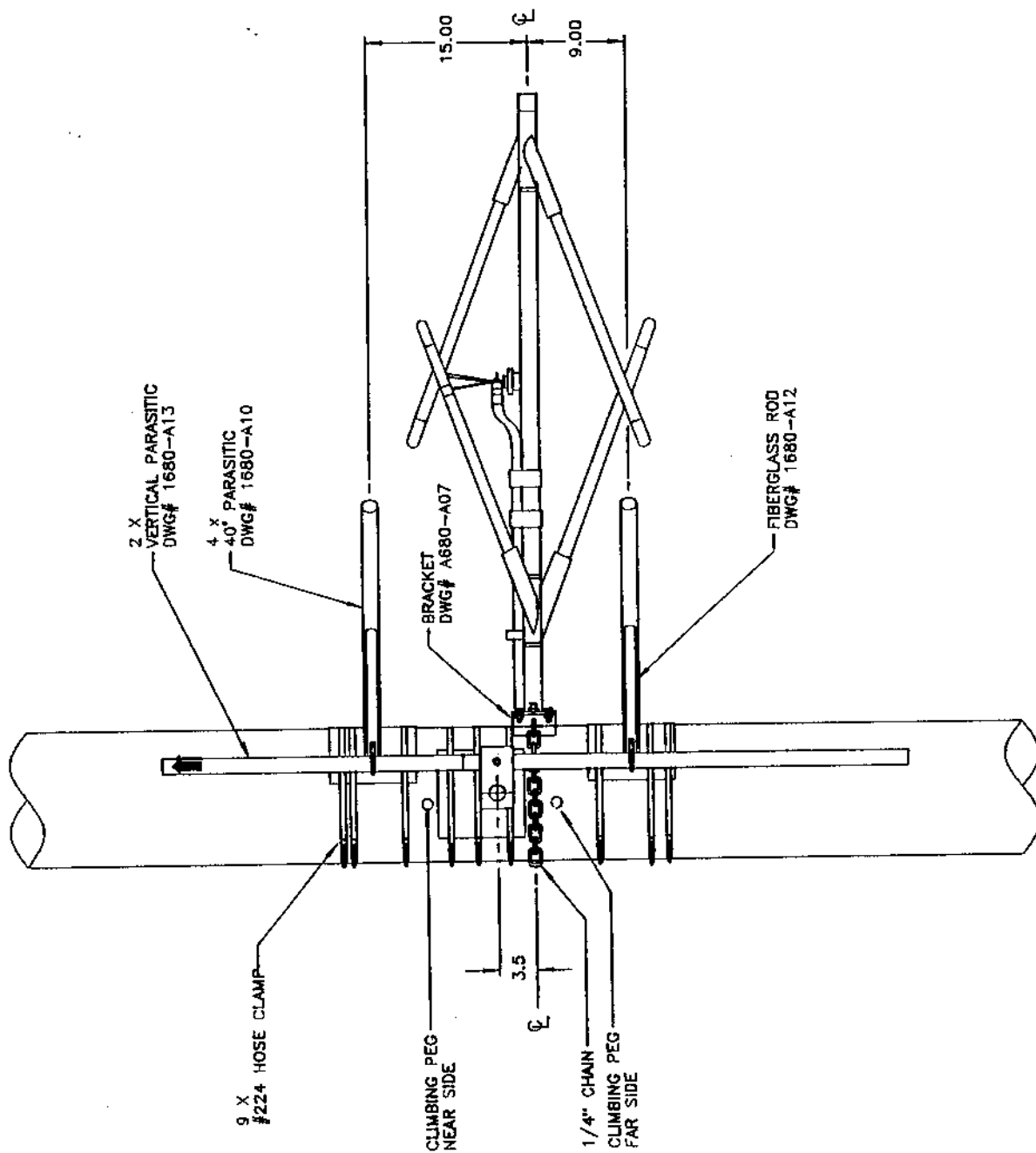
Percentage of Construction Permit Antenna Filled: 85.37%



REV.	10/30/98	S.W.R. INC. EBENSBURG, PA. 15931			
TOLERANCES		TITLE: TEST SCHEMATIC			
.X	± .015	WCBW, 89.7 MHz., MONTICELLO, ILL.			
.XX	± .005	DATE:	SCALE:	DRAWN:	APPROVED: ENG.
.XXX	± .002	7/23/98	NTS	JRM	
X/X	± 1/32	MATERIAL:		DRAWING #	
DEG.	± 1/2	UNLESS OTHERWISE SPECIFIED		2112-A14	

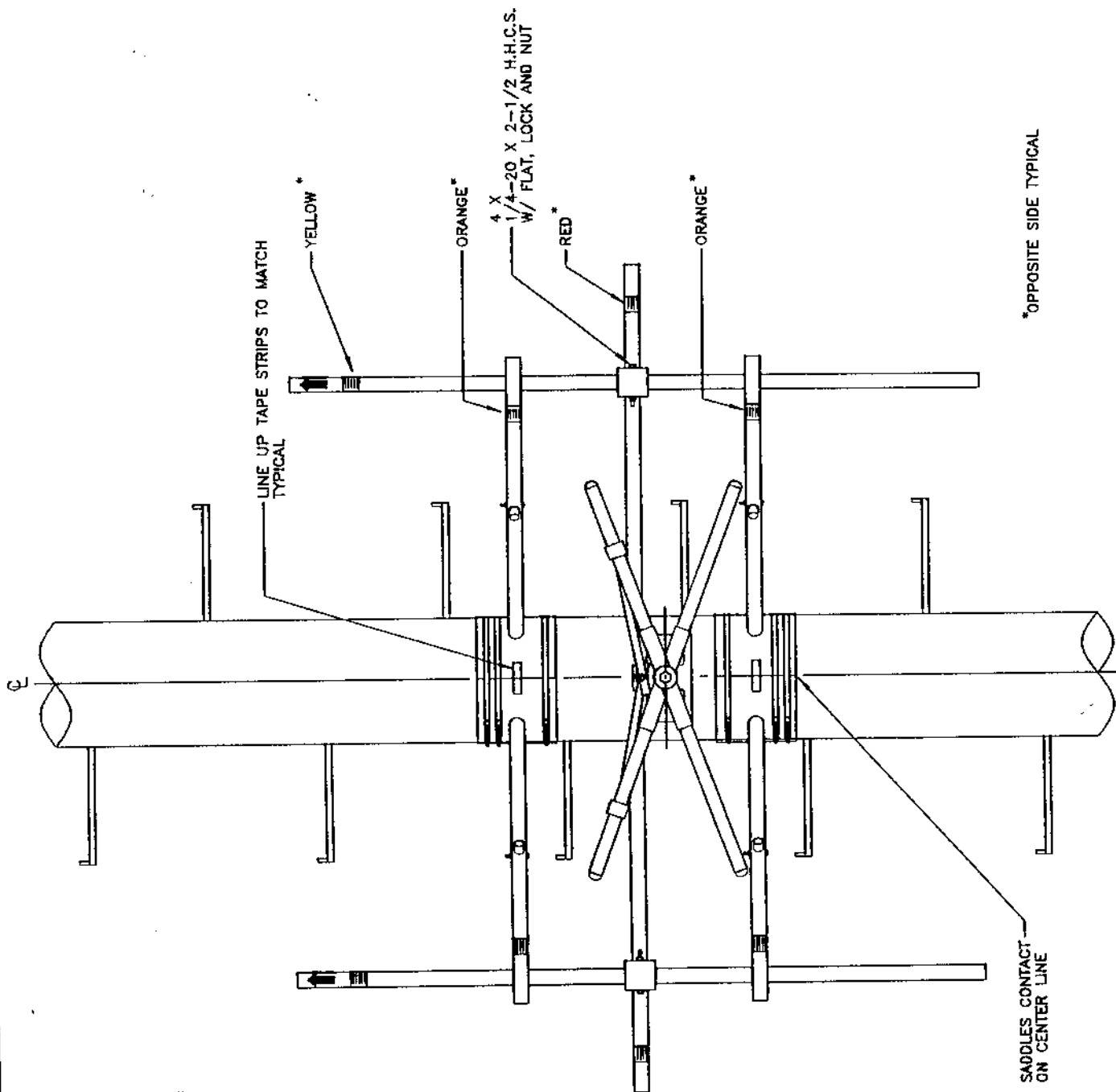


DATE	3/6/00	S.F.E. INC.	0241-C01
DESIGNED BY	W.C.B.	ENGINEERING, PA. 15091	
CHECKED BY	W.C.B.	W.C.B. / J.A.	
APPROVED BY	W.C.B.	ANTENNA ORIENTATION	
DATE	3/2/00	W.C.B., 5817 AVE., MONTICELLO, ILL.	
SCALE	1:1		
REVISION			
DATE			
REVISION			
DATE			
REVISION			



REV.	3/8/00	S.T.E. INC.	EMERSON, PA. 15881
DATE	3/8/00	TITLE	FMCG/1-0A
BY	J. J. J.	ANTENNA ELEVATION	WCSW, 88.7 MHz, MONTICELLO, ILL.
CHECKED	J. J. J.	SCALE	1:1
APPROVED	J. J. J.	DATE	3/2/00
DESIGNED	J. J. J.	BY	J. J. J.
DRAWN	J. J. J.	DATE	3/2/00
INCHES	1:1	FEET	1:1
SCALE	1:1	DATE	3/2/00
PROJECT	0241-C	DATE	3/2/00

DATE	PROVISION	INT
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*OPPOSITE SIDE TYPICAL

S.T.E. INC. ZENESBURG, PA. 15961		TITLE FMEC/1-0A	
ANTENNA ELEVATION WCSW, 88.7 MHz, MONTICELLO, ILL.		DATE 3/2/00	
REV.	DATE	BY	CHKD.
1	3/2/00	JAC	1/5
2	3/2/00	JAC	1/5
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98	3/2/00	JAC	1/5
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100	3/2/00	JAC	1/5

DATE	REVISION	BY