

READ INSTRUCTIONS CAREFULLY  
BEFORE PROCEEDING

US BANK/FCC JAN 06 2010  
FEDERAL COMMUNICATIONS COMMISSION  
REMITTANCE ADVICE

Approved by OMB  
3060-0589  
Page 1 of 1

(1) LOCK BOX # 979089		SPECIAL USE ONLY	
		FCC USE ONLY	
SECTION A - PAYER INFORMATION			
(2) PAYER NAME (if paying by credit card enter name exactly as it appears on the card) Jerrold D Miller		(3) TOTAL AMOUNT PAID (U.S. Dollars and cents) \$1,320.00	
(4) STREET ADDRESS LINE NO. 1 3005 S. Leisure World Blvd.			
(5) STREET ADDRESS LINE NO. 2			
(6) CITY Silver Spring		(7) STATE MD	(8) ZIP CODE 20906
(9) DAYTIME TELEPHONE NUMBER (include area code) 301-986-4160		(10) COUNTRY CODE (if not in U.S.A.)	
FCC REGISTRATION NUMBER (FRN) REQUIRED			
(11) PAYER (FRN) 0008190472		(12) FCC USE ONLY	
IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C) COMPLETE SECTION BELOW FOR EACH SERVICE. IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET			
(13) APPLICANT NAME Krol Communications Inc.			
(14) STREET ADDRESS LINE NO. 1 103 North Washington St.			
(15) STREET ADDRESS LINE NO. 2			
(16) CITY Owosso		(17) STATE MI	(18) ZIP CODE 48867
(19) DAYTIME TELEPHONE NUMBER (include area code) 989-725-1925		(20) COUNTRY CODE (if not in U.S.A.)	
FCC REGISTRATION NUMBER (FRN) REQUIRED			
(21) APPLICANT (FRN) 0014509764		(22) FCC USE ONLY	
COMPLETE SECTION C FOR EACH SERVICE. IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET			
(23A) CALL SIGN/OTHER ID WMLM	(24A) PAYMENT TYPE CODE MMR	(25A) QUANTITY 1	
(26A) FEE DUE FOR (PTC) \$615.00	(27A) TOTAL FEE \$615.00	FCC USE ONLY	
(28A) FCC CODE 1 60293		(29A) FCC CODE 2	
(23B) CALL SIGN/OTHER ID WMLM	(24B) PAYMENT TYPE CODE MOR	(25B) QUANTITY 1	
(26B) FEE DUE FOR (PTC) \$705.00	(27B) TOTAL FEE \$705.00	FCC USE ONLY	
(28B) FCC CODE 1 60293		(29B) FCC CODE 2	
SECTION D - CERTIFICATION			
PAID BY CREDIT CARD			
SIGNATURE <i>Jerrold D Miller</i>			

SEE PUBLIC BURDEN ON REVERSE

FCC FORM 159

FEBRUARY 2003 (REVISED)

FOR  
FCC  
USE  
ONLY

**FCC 302-AM**  
**APPLICATION FOR AM**  
**BROADCAST STATION LICENSE**

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY

FILE NO. *BmmL-201001 06AGL*

**SECTION I - APPLICANT FEE INFORMATION**

1. PAYOR NAME (Last, First, Middle Initial)

Krol Communications Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters)  
103 North Washington St.

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY Owosso

STATE OR COUNTRY (if foreign address)  
MI

ZIP CODE  
48867

TELEPHONE NUMBER (include area code)  
989-725-1925

CALL LETTERS  
WMLM

OTHER FCC IDENTIFIER (if applicable)  
FAC ID 60293

2. A. Is a fee submitted with this application?

☒ Yes ☐ No

B. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1112).

☐ Governmental Entity ☐ Noncommercial educational licensee ☐ Other (Please explain):

C. If Yes, provide the following information:

Enter in Column (A) the correct Fee Type Code for the service you are applying for. Fee Type Codes may be found in the "Mass Media Services Fee Filing Guide." Column (B) lists the Fee Multiple applicable for this application. Enter fee amount due in Column (C).

(A) FEE TYPE CODE			(B) FEE MULTIPLE				(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)		FOR FCC USE ONLY
M	M	R	0	0	0	1	\$615.00		

To be used only when you are requesting concurrent actions which result in a requirement to list more than one Fee Type Code.

(A)			(B)				(C)		FOR FCC USE ONLY
M	O	R	0	0	0	1	\$705.00		

ADD ALL AMOUNTS SHOWN IN COLUMN C,  
AND ENTER THE TOTAL HERE.  
THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED  
REMITTANCE.

TOTAL AMOUNT  
REMITTED WITH THIS  
APPLICATION

\$1,320.00

FOR FCC USE ONLY

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Krol Communications Inc. 0014-5097-64		
MAILING ADDRESS 103 North Washington St.		
CITY Owosso	STATE MI	ZIP CODE 48867

2. This application is for: **MOMENT METHOD MODELING**
- ☒ Commercial ☐ Noncommercial
- ☒ AM Directional ☐ AM Non-Directional

Call letters WMLM	Community of License St. Louis, MI	Construction Permit File No. n/a	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
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3. Is the station now operating pursuant to automatic program test authority in accordance with 47 C.F.R. Section 73.1620? N/A

☐ Yes ☐ No

Exhibit No.

If No, explain in an Exhibit.

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met? N/A

☐ Yes ☐ No

Exhibit No.

If No, state exceptions in an Exhibit.

5. Apart from the changes already reported, has any cause or circumstance arisen since the grant of the underlying construction which would result in any statement or representation contained in the construction permit application to be now incorrect?

N/A

Exhibit No.

If Yes, explain in an Exhibit.

6. Has the permittee filed its Ownership Report (FCC Form 323) or ownership certification in accordance with 47 C.F.R. Section 73.3615(b)?

☐ Yes ☐ No

☒ Does not apply

Exhibit No.

If No, explain in an Exhibit.

7. Has an adverse finding been made or an adverse final action been taken by any court or administrative body with respect to the applicant or parties to the application in a civil or criminal proceeding, brought under the provisions of any law relating to the following: any felony; mass media related antitrust or unfair competition; fraudulent statements to another governmental unit; or discrimination?

☐ Yes ☒ No

Exhibit No.

If the answer is Yes, attach as an Exhibit a full disclosure of the persons and matters involved, including an identification of the court or administrative body and the proceeding (by dates and file numbers), and the disposition of the litigation. Where the requisite information has been earlier disclosed in connection with another application or as required by 47 U.S.C. Section 1.65(c), the applicant need only provide: (i) an identification of that previous submission by reference to the file number in the case of an application, the call letters of the station regarding which the application or Section 1.65 information was filed, and the date of filing; and (ii) the disposition of the previously reported matter.

8. Does the applicant, or any party to the application, have a petition on file to migrate to the expanded band (1605-1705 kHz) or a permit or license either in the existing band or expanded band that is held in combination (pursuant to the 5 year holding period allowed) with the AM facility proposed to be modified herein?

☐ Yes ☒ No

If Yes, provide particulars as an Exhibit.

Exhibit No

The APPLICANT hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because use of the same, whether by license or otherwise, and requests and authorization in accordance with this application. (See Section 304 of the Communications Act of 1934, as amended).

The APPLICANT acknowledges that all the statements made in this application and attached exhibits are considered material representations and that all the exhibits are a material part hereof and are incorporated herein as set out in full in

### CERTIFICATION

1. By checking Yes, the applicant certifies that, in the case of an individual applicant, he or she is not subject to a denial of federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. Section 862, or, in the case of a non-individual applicant (e.g., corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits that includes FCC benefits pursuant to that section. For the definition of a "party" for these purposes, see 47 C.F.R. Section 1.2002(b).

☒ Yes ☐ No

2. I certify that the statements in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Name <i>ROD KROL</i>	Signature <i>Rod Krol</i>	
Title <i>PRESIDENT</i>	Date <i>1-5-10</i>	Telephone Number <i>989-725-1925</i>

**WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION**

### FCC NOTICE TO INDIVIDUALS REQUIRED BY THE PRIVACY ACT AND THE PAPERWORK REDUCTION ACT

The solicitation of personal information requested in this application is authorized by the Communications Act of 1934, as amended. The Commission will use the information provided in this form to determine whether grant of the application is in the public interest. In reaching that determination, or for law enforcement purposes, it may become necessary to refer personal information contained in this form to another government agency. In addition, all information provided in this form will be available for public inspection. If information requested on the form is not provided, the application may be returned without action having been taken upon it or its processing may be delayed while a request is made to provide the missing information. Your response is required to obtain the requested authorization.

Public reporting burden for this collection of information is estimated to average 639 hours and 53 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, can be sent to the Federal Communications Commission, Records Management Branch, Paperwork Reduction Project (3060-0627), Washington, D. C. 20554. Do NOT send completed forms to this address.

THE FOREGOING NOTICE IS REQUIRED BY THE PRIVACY ACT OF 1974, P.L. 93-579, DECEMBER 31, 1974, 5 U.S.C. 552a(e)(3), AND THE PAPERWORK REDUCTION ACT OF 1980, P.L. 96-511, DECEMBER 11, 1980, 44 U.S.C. 3507.

## SECTION III - Page 2

9. Description of antenna system (If directional antenna is used, the information requested below should be given for each element of the array. Use separate sheets if necessary.)

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionized, describe fully in an Exhibit.
Uniform Cross section guyed steel towers	60.27	60.88	60.88	Exhibit No. N/A

Excitation ☒ Series ☐ Shunt

Geographic coordinates to nearest second. For directional antenna give coordinates of center of array. For single vertical radiator give tower location.

North Latitude 43 ° 21 ' 08 "	West Longitude 084 ° 36 ' 15 "
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If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits.

Exhibit No.  
N/A

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system.

Exhibit No.  
N/A

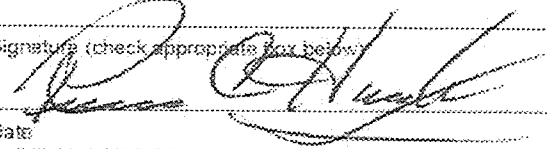
10. In what respect, if any, does the apparatus constructed differ from that described in the application for construction permit or in the permit?

See attached statement

11. Give reasons for the change in antenna or common point resistance.

N/A

I certify that I represent the applicant in the capacity indicated below and that I have examined the foregoing statement of technical information and that it is true to the best of my knowledge and belief.

Name (Please Print or Type) Russell C. Harbaugh, Jr.	Signature (check appropriate box below) 
Address (include ZIP Code) Media Control, Incorporated 27451 Everett Street Southfield, MI 48076	Date 01/04/2010
	Telephone No. (include Area Code) 248-557-7274

☐ Technical Director

☒ Registered Professional Engineer

☐ Chief Operator

☐ Technical Consultant

☐ Other (specify)

**MEDIA CONTROL, INCORPORATED**  
**COMMUNICATIONS ENGINEERING SERVICES**

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**APPLICATION FOR**  
~~**DIRECT MEASUREMENT OF POWER**~~  
*MOMENT METHOD*  
**RADIO STATION WMLM-AM**  
**ST. LOUIS, MICHIGAN**

**December 29, 2009**

**WMLM-AM 1520 KHZ 1KW DA-2**

**APPLICATION FOR  
DIRECT MEASUREMENT OF POWER  
RADIO STATION WMLM-AM  
ST. LOUIS, MICHIGAN**

**WMLM-AM 1520 KHZ 1KW DA-2**

**PROJECT OVERVIEW**

**BACKGROUND**

The following statements and exhibits are presented in support of an application for Direct Measurement of Power for the directional antenna system (DA-D and DA-N) for radio station WMLM-AM, 1520 kHz, St. Louis, Michigan. WMLM-AM is requesting operation under the latest method of moment rules for AM stations.

**WMLM-AM OPERATIONS**

WMLM-AM is licensed to operate on 1520 kHz with 1.0 kW into a daytime four (4) directional antenna array and nighttime six (6) tower directional antenna array. The daytime array uses four (4) towers of the nighttime array with two (2) towers detuned. No changes were made to the towers, transmission lines and ground system. The components in the daytime and nighttime phasors and antenna tuning units were checked for their specified values and all connections tightened.

All six (6) are uniform cross section steel towers are guyed and series excited. All six (6) towers are 60.27 meters above base insulator and 60.88 meters above ground level. Each tower is surrounded by 120-162 equally spaced copper wire radials. Intersecting radials are shortened and bonded to copper straps midway between elements.

The daytime and nighttime directional antenna parameters are presented to demonstrate compliance with the requirements of Section 73.151 (c) of the FCC Rules. As required in the Rules, the daytime and nighttime antenna monitor parameters were adjusted to within +/- 5 percent in ratio and +/- 3 degrees in phase, when referenced to the modeled parameters.

### **METHOD OF MOMENTS MODELING**

The operating parameters for the daytime and nighttime patterns have been determined in accordance with the requirements of Section 73.151 (c) of the Commissions Rules. The daytime and nighttime antenna systems were adjusted to within +/- 5% of sample ratios and +/- 3 degrees in phase of the modeled values, per Commission rules.

A Hewlett Packard 8753C Network Analyzer and a Tunwall Radio directional coupler with associated calibration accessories were used for tower base impedance and Antenna Tuning Unit (ATU) output impedance measurements. The output of the ATU, at a point adjacent to the toroidal transformer, was the measurement point for the tower base and ATU output impedances. The static drain chokes were left in the circuit because of its very high impedance making their impact insignificant to the moments model calculations. The base impedance of each tower was measured with the other five (5) towers open circuited at their measurement points. A second measurement was obtained with its tower base insulator shorted to ground with two (2) copper straps that were two (2) inches wide. The  $X_{oc}$ , depicted on the following sketch, was calculated from the assumed stray capacitance and used as the load to ground in the open circuit method of moments model.

As demonstrated, the measured and modeled base impedance at the ATU output jack with the other towers open circuited at their respective ATU output jacks agree within +/- 2 Ohms resistance and +/- 4 percent reactance, as required in the FCC Rules.



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Method of Moments Modeling Summary Data						
	Mininec		Stray Impedances		Calculated ATU Impedance	
TOWER	R <sub>B</sub> (Ohms)	X <sub>B</sub> (Ohms)	Shunt X <sub>s</sub> (Ohms)	Series X (Ohms)	R <sub>ATU</sub> (Ohms)	X <sub>ATU</sub> (Ohms)
1	122.63	184.98	-2100.00	49.00	146.86	242.44
2	98.34	185.21	-2100.00	59.00	117.98	256.07
3	115.92	188.30	-2100.00	56.00	139.37	254.40
4	114.45	186.93	-2100.00	61.00	137.42	257.97
5	100.98	187.65	-2100.00	58.00	121.43	257.65
6	115.07	174.81	-2100.00	57.00	136.43	239.53

$$R_{ATU} = R_B X_s^2 / (R_B^2 + (X_B + X_s)^2)$$

$$X_{ATU} = +jX_s (R_B^2 + X_B^2 + X_B X_s) / (R_B^2 + (X_B + X_s)^2) + jX_L$$

The following table is a comparison of the measured and modeled impedances.

Method of Moments Modeling Results				
	Measured ATU Output Impedance		Calculated ATU Output Impedance	
TOWER	Open Circuit R (Ohms)	Open Circuit X (Ohms)	Open Circuit R <sub>ATU</sub> (Ohms)	Open Circuit X <sub>ATU</sub> (Ohms)
1	146.60	242.50	146.86	242.44
2	118.20	256.30	117.98	256.07
3	139.30	254.40	139.37	254.40
4	137.20	257.70	137.42	257.97
5	121.80	257.20	121.43	257.65
6	136.50	239.50	136.43	239.53

The above results indicate that the modeled impedances and the measured impedances agree within +/- 2 Ohms resistance and +/- 4 percent in reactance per Section 73.151 (c)(2)(ii) of the Rules.

These derived values were used in the calculation of the tower drive points and the operating parameters of the daytime and nighttime antenna arrays. The method on moment modeling for each driven tower is detailed on the following pages.

# IMPEDANCE

normalization = 50							
freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node = 1, sector 1							
1,520.00	17.562	134.97	136.1	82.6	23.902	-0.72723	-8.1197
source = 2; node = 21, sector 1							
1,520.00	148.76	169.41	225.45	48.7	7.0274	-2.4889	-3.603
source = 2; node = 61, sector 1							
source	=	3;	node	61,	sector	1	
1,520.00	41.859	145.53	151.43	74	12.068	-1.4428	-5.4873
source = 2; node = 81, sector 1							
source	=	4;	node	81,	sector	1	
1,520.00	210.94	160.18	264.86	37.2	6.7403	-2.5965	-3.4677

# CURRENT rms

Frequency = 1520 KHz  
Input power = 1,000.00 watts

Efficiency = 100%

coordinates in degrees

current				mag	phase	real	imaginary
no.	X	Y	Z	(amps)	(deg)	(amps)	(amps)
GND	0	0	0	2.1388	1.8	2.13773	0.0676891
2	0	0	5.78	2.29977	1.3	2.2992	0.0509918
3	0	0	11.56	2.38949	0.9	2.38916	0.0395808
4	0	0	17.34	2.44587	0.7	2.44569	0.0297395
5	0	0	23.12	2.47386	0.5	2.47377	0.0210081
6	0	0	28.9	2.47557	0.3	2.47553	0.0132185
7	0	0	34.68	2.45219	0.1	2.45218	6.30E-03
8	0	0	40.46	2.40468	0	2.40468	2.38E-04
9	0	0	46.24	2.33387	359.9	2.33387	-4.99E-03
10	0	0	52.02	2.24069	359.8	2.24067	-9.37E-03
11	0	0	57.8	2.12613	359.7	2.12609	-0.0129011
12	0	0	63.58	1.99127	359.6	1.99121	-0.0155824
13	0	0	69.36	1.83729	359.5	1.8372	-0.0174062
14	0	0	75.14	1.66544	359.4	1.66534	-0.0183698
15	0	0	80.92	1.47701	359.3	1.47689	-0.0184729
16	0	0	86.7	1.27325	359.2	1.27313	-0.0177172
17	0	0	92.48	1.05527	359.1	1.05515	-0.0161051
18	0	0	98.26	0.823745	359.1	0.823633	-0.0136358
19	0	0	104.04	0.578294	359	0.578202	-0.0102915
20	0	0	109.82	0.315511	358.9	0.315454	-6.00E-03
END	0	0	115.6	0	0	0	0
GND	84.5723	30.7818	0	1.56868	282.3	0.33381	-1.53276
22	84.5723	30.7818	5.78	1.72331	277.8	0.233256	-1.70745
23	84.5723	30.7818	11.56	1.81789	275.2	0.165071	-1.81038
24	84.5723	30.7818	17.34	1.88519	273.2	0.106834	-1.88216
25	84.5723	30.7818	23.12	1.92883	271.7	0.0557906	-1.92802
26	84.5723	30.7818	28.9	1.95016	270.3	0.0109463	-1.95013
27	84.5723	30.7818	34.68	1.94983	269.2	-0.0280861	-1.94963
28	84.5723	30.7818	40.46	1.92834	268.2	-0.0614562	-1.92736
29	84.5723	30.7818	46.24	1.88616	267.3	-0.0892175	-1.88405

**MEDIA CONTROL, INCORPORATED**  
**COMMUNICATIONS ENGINEERING SERVICES**

Daytime Array Moment Method Summary Sheet							
	Drive Point		Current		Shunt	ATU Output	
TOWER	R <sub>D</sub> (Ohms)	X <sub>D</sub> (Ohms)	Magnitude	Phase (Degrees)	X <sub>s</sub> (Ohms)	IATU Magnitude	IATU Angle
1	17.56	134.97	2.1388	1.8	-2100	2.0014	2.312
2	148.76	169.41	1.5687	282.3	-2100	1.4464	286.708
3	Detuned						
4	41.86	145.53	1.8857	4.1	-2100	1.7554	5.327
5	210.94	160.18	1.3853	288.0	-2100	1.2871	294.510
6	Detuned						

IATU = ATU output current for unity base current with no phase shift

$$\text{IATU Magnitude} = ((1 + X_B / X_S)^2 + (R_B / X_S)^2)^{1/2}$$

$$\text{IATU Angle} = \arctan (-R_B / X_S) / (1 + X_B / X_S)$$

	Theoretical Parameters		Mininec Parameters	
TOWER	Ratio	Phase (Degrees)	Ratio	Phase (Degrees)
1	1.000	0.00	1.000	0.0
2	0.800	-91.40	0.723	-75.6
3			Detuned	Detuned
4	0.900	0.00	0.877	3.0
5	0.720	-91.40	0.643	-68.1
6			Detuned	Detuned

The antenna monitor readings, in the daytime mode, have been adjusted to within +/- 5 percent of the above ratios and to within +/- 3 degrees in phase.

# IMPEDANCE

normalization = 50							
freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node = 1, sector 1							
1,520.00	-1.3345	169.45	169.46	90.5	****	****	****
source = 2; node = 21, sector 1							
1,520.00	47.232	189.29	195.09	76	17.116	-1.0161	-6.8067
source = 3; node = 41, sector 1							
1,520.00	187.82	257.72	318.9	53.9	11.004	-1.583	-5.1505
source = 4; node = 61, sector 1							
1,520.00	25.716	148.93	151.14	80.2	19.659	-0.88444	-7.3459
source = 5; node = 81, sector 1							
1,520.00	96.904	209.27	230.62	65.2	11.405	-1.5271	-5.2804
source = 6; node = 101, sector 1							
1,520.00	249.79	421.71	490.13	59.4	19.383	-0.89703	-7.2906

## CURRENT rms

Frequency = 1520 KHz  
Input power = 1,000.00 watts  
Efficiency = 100%  
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.20506	121.2	-0.624088	1.03086
2	0	0	5.78	1.31978	121.2	-0.684274	1.12854
3	0	0	11.56	1.38595	121.2	-0.718973	1.18487
4	0	0	17.34	1.43034	121.3	-0.742251	1.22268
5	0	0	23.12	1.45648	121.3	-0.75594	1.24494
6	0	0	28.9	1.46579	121.3	-0.760798	1.25289
7	0	0	34.68	1.45908	121.3	-0.757249	1.24719
8	0	0	40.46	1.43694	121.3	-0.745603	1.22836
9	0	0	46.24	1.3999	121.2	-0.726157	1.19684
10	0	0	52.02	1.34852	121.2	-0.699216	1.15309
11	0	0	57.8	1.28342	121.2	-0.665103	1.09764
12	0	0	63.58	1.20525	121.2	-0.624193	1.03103
13	0	0	69.36	1.11475	121.2	-0.57689	0.953867
14	0	0	75.14	1.0127	121.1	-0.523628	0.866815
15	0	0	80.92	0.899905	121.1	-0.464859	0.770542
16	0	0	86.7	0.777164	121.1	-0.401028	0.665704
17	0	0	92.48	0.645174	121	-0.332532	0.552876
18	0	0	98.26	0.504382	121	-0.259639	0.432422
19	0	0	104.04	0.354582	120.9	-0.182282	0.30414
20	0	0	109.82	0.193706	120.9	-0.0994363	0.166236
END	0	0	115.6	0	0	0	0
GND	84.5723	30.7818	0	2.09464	4.3	2.08873	0.157254
22	84.5723	30.7818	5.78	2.3189	2.9	2.31596	0.116769
23	84.5723	30.7818	11.56	2.45087	2.1	2.44925	0.089122
24	84.5723	30.7818	17.34	2.5423	1.5	2.54147	0.065306

77	-16.3853	-187.285	92.48	0.634888	119.7	-0.314644	0.551436	
78	-16.3853	-187.285	98.26	0.495695	119.6	-0.244582	0.431153	
79	-16.3853	-187.285	104.04	0.348031	119.4	-0.170967	0.303143	
80	-16.3853	-187.285	109.82	0.189885	119.3	-0.092863	0.165629	
END	-16.3853	-187.285	115.6	0	0	0	0	
GND	66.0928	-156.311	0	2.00323	8.6	1.98071	0.299527	9556
82	66.0928	-156.311	5.805	2.24379	5.7	2.23265	0.223297	
83	66.0928	-156.311	11.61	2.38912	4.1	2.38299	0.171087	
84	66.0928	-156.311	17.415	2.49317	2.9	2.48998	0.125987	
85	66.0928	-156.311	23.22	2.56254	1.9	2.56109	0.085929	
86	66.0928	-156.311	29.025	2.59988	1.1	2.59939	0.050183	
87	66.0928	-156.311	34.83	2.60652	0.4	2.60646	0.01848	
88	66.0928	-156.311	40.635	2.58341	359.8	2.5834	-9.26E-03	
89	66.0928	-156.311	46.44	2.5314	359.3	2.53118	-0.033041	
90	66.0928	-156.311	52.245	2.45137	358.8	2.4508	-0.052834	
91	66.0928	-156.311	58.05	2.34432	358.3	2.34331	-0.068605	
92	66.0928	-156.311	63.855	2.2114	357.9	2.20994	-0.08033	
93	66.0928	-156.311	69.66	2.05386	357.5	2.05198	-0.087995	
94	66.0928	-156.311	75.465	1.8731	357.2	1.87086	-0.091608	
95	66.0928	-156.311	81.27	1.67056	356.9	1.66807	-0.09119	
96	66.0928	-156.311	87.075	1.44767	356.6	1.44507	-0.086777	
97	66.0928	-156.311	92.88	1.20571	356.3	1.20316	-0.078403	
98	66.0928	-156.311	98.685	0.945508	356	0.943197	-0.066076	
99	66.0928	-156.311	104.49	0.666642	355.7	0.664786	-0.049708	
100	66.0928	-156.311	110.295	0.365194	355.5	0.364049	-0.028904	
END	66.0928	-156.311	116.1	0	0	0	0	
GND	148.577	-125.38	0	0.830419	255.1	-0.213369	-0.802539	3963/70
102	148.577	-125.38	5.71	1.03638	248.5	-0.380036	-0.964184	
103	148.577	-125.38	11.42	1.17013	245.4	-0.487472	-1.06375	
104	148.577	-125.38	17.13	1.27487	243.3	-0.573604	-1.13854	
105	148.577	-125.38	22.84	1.35556	241.7	-0.643155	-1.19327	
106	148.577	-125.38	28.55	1.4141	240.4	-0.697922	-1.22987	
107	148.577	-125.38	34.26	1.45132	239.4	-0.738694	-1.24926	
108	148.577	-125.38	39.97	1.46774	238.5	-0.765897	-1.25207	
109	148.577	-125.38	45.68	1.46379	237.8	-0.779798	-1.23879	
110	148.577	-125.38	51.39	1.43988	237.2	-0.78064	-1.2099	
111	148.577	-125.38	57.1	1.39652	236.6	-0.76869	-1.16593	
112	148.577	-125.38	62.81	1.33429	236.1	-0.744238	-1.10744	
113	148.577	-125.38	68.52	1.25387	235.6	-0.707659	-1.03509	
114	148.577	-125.38	74.23	1.15601	235.2	-0.659347	-0.949532	
115	148.577	-125.38	79.94	1.04153	234.8	-0.599755	-0.85152	
116	148.577	-125.38	85.65	0.911251	234.5	-0.529337	-0.741742	
117	148.577	-125.38	91.36	0.765893	234.2	-0.448498	-0.620839	
118	148.577	-125.38	97.07	0.605881	233.8	-0.357469	-0.489191	
119	148.577	-125.38	102.78	0.43084	233.5	-0.255997	-0.346539	
120	148.577	-125.38	108.49	0.238064	233.3	-0.142415	-0.190768	
END	148.577	-125.38	114.2	0	0	0	0	

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**ANTENNA MONITOR AND SAMPLE LINES**

The antenna monitor is a six (6) tower Potomac Instruments AM-19 (204) Serial #1950. This unit was returned to Potomac Instruments for calibration on May 30, 2008. The sample lines are 3/8" Cablewave foam heliax type FCC38-50J that were factory cut to equal lengths and assembled. The sample line characteristics were measured at the connector to the antenna monitor using an AIM 4170 Antenna and Lab Analyzer.

Sample Line Length Characteristics	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Length (Feet)	311.212	311.645	311.212	311.212	311.212	311.212
Length (Meters)	94.882	95.014	94.882	94.882	94.882	94.882
Velocity Factor	0.81	0.81	0.81	0.81	0.81	0.81
Wavelength at 1520 kHz	0.594	0.595	0.594	0.594	0.594	0.594
Wavelength (Degrees)	213.84	214.20	213.84	213.84	213.84	213.84

The length of the sample lines meet the requirements by being within 1.0 electrical degree of each other.

**SAMPLE LINES AND TOROID MEASUREMENTS**

The tower base currents are sampled using Delta Electronics Type TCT-1 shielded toroidal transformers with an output sensitivity of 0.5 Volts/Ampere of RF current. These toroids are located at the output of each antenna tuning unit. The cables with the toroidal samplers were measured at the connector to the antenna monitor.

Sample Line with Toroid Characteristics	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Resistance (Ohms)	52.07	51.07	52.23	52.28	52.17	51.89
Reactance (Ohms)	-j0.76	-j1.07	-j0.80	-j0.60	-j0.65	-j0.50

The impedance of the sample lines with Toroids connected meet the requirements by being within 2.0 Ohms of each other.

### **COMMON POINT IMPEDANCE MEASUREMENT**

The common point impedance was measured using a Delta Electronics OIB-3 Impedance Bridge. Daytime and nighttime measurements were made at the "J" plug that is adjacent to Delta Electronics common point current metering unit. The common point impedance was adjusted to 50.0 +j0.0 Ohms for the day and night directional antenna system inputs.

### **FIELD STRENGTH METER**

A Potomac Instruments field strength meter, Model FIM-21, Serial Number 1222, calibrated November 19, 2008 was utilized for all reference field measurements.

### **REFERENCE FIELD STRENGTH MEASUREMENTS**

Reference field strength measurements were made at three (3) locations along radials at azimuths specified on the present station license along with a major lobe radial for the daytime and nighttime antenna patterns. A tabulation of the radial azimuth, distance to the center of the transmitter site, field strength measurement, GPS coordinates (NAD 27) and a description of the reference location. The distances noted were measured in feet or miles and converted to meters or kilometers.

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**NIGHTTIME ANTENNA ARRAY**

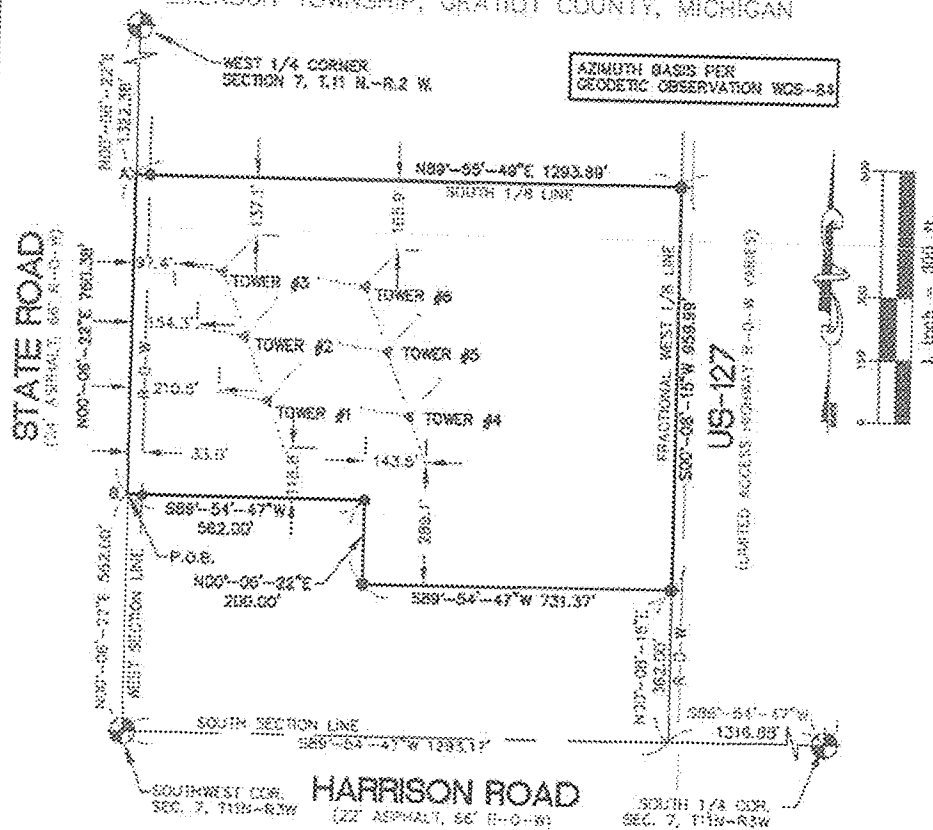
Radial (Azimuth)	Point #	Distance (km)	Field (mV/m)	GPS Coordinates (NAD27)		Description
000	1	2.13	95.0	N43-24-05.9	W084-36-09.9	Northeast corner of the intersection of Butternut Street and S East Street
	2	3.14	45.0	N43-25-31.9	W084-36-07.2	Riverside Drive in front of mail box 918
	3	4.39	24.0	N43-27-57.6	W084-36.03.5	North side of N County Line Road and 0.5 km (0.33 miles) east of SE County Line Road
78	1	2.50	3.2	N43-21-51.1	W084-31-33.7	South side of East Van Buren Road 0.15 km (500 feet) west of North Crapo Road
	2	3.70	1.15	N43-22-12.1	W084-29-18.4	East side of North Wisner Road 0.64 km (0.4 miles) north of East Van Buren Road
	3	4.29	0.71	N43-22-22.6	W084-28-11.1	West side of North 8th Street and 0.077 km (250 feet) north of Stoneman Livestock System sign
112	1	2.56	1.1	N43-19-47.8	W084-31-41.8	North Crapo Road west side 0.6 km (.4 miles) south of East Tyler Road
	2	3.65	1.0	N43-19-14.6	W084-29-44.8	East Polk Road at mail box 5576 and 1.0 km (0.6 mile) west of North Blair Road
	3	3.90	0.8	N43-19-05.6	W084-29-19.1	West side of North Wisner Road 0.3 km (0.17 mile) south of East Polk Road
140	1	1.77	1.6	N43-19-14.7	W084-34-08.0	South side of East Polk Road (6.0 meters) 20 feet west of North Bagley Road
	2	2.58	0.7	N43-18-22.1	W084-33-04.7	North side of Saint Charles Road 0.25 km (800 feet) west of east North Baldwin Road
	3	3.39	0.16	N43-17-29.7	W084-32-04.6	North side of East Washington Road 1.1 km (0.7 miles) east of North Baldwin Road
180	1	1.35	6.5	N43-19-14.8	W084-36-15.6	North side of East Polk Road and 0.05 km (180 feet) west of Route 127 south bound exit road
	2	2.13	3.6	N43-18-09.0	W084-36-15.5	Norton Gibbs Drive at mail box 324
	3	2.43	3.1	N43-17-44.6	W084-36.15.8	East Acadia Street on east side of driveway to garage to house #405 North Jeffery Avenue
228.5	1	1.78	2.2	N43-19-29.1	W084-38-45.5	East side of North Begole Road 0.45 km (0.3 miles) north of west Polk Road
	2	2.64	1.9	N43-18-40.5	W084-40-01.3	West side of North Alger Road 1.0 km (0.6 miles) south of West Polk Road at large culvert
	3	3.47	0.9	N43-17-53.9	W084-41-13.2	East side of North Luce Road at mail box 323 and 0.9 km (0.5 mile) south of West Saint Charles Rd
258	1	2.00	1.7	N43-20-33.2	W084-40-00.3	North Alger Road 0.8 km (0.5 mile) south of West Harrison Road on the east side
	2	2.62	1.5	N43-20-21.1	W084-41-11.1	North Pingree Road in front of mail box 3265
	3	4.55	0.7	N43-19-47.9	W084-44-47.1	East side of North Luce Road across the street from mail box 2612
292	1	2.09	2.64	N43-22-13.9	W084-39-59.8	South Lincoln Avenue 67.7 meters (220 feet) north of West Elizabeth Street
	2	2.75	2.85	N43-22-36.0	W084-41-10.1	At curb in front of front door to 5811 North Luce Road
	3	4.12	1.5	N43-22-16.9	W084-43-36.2	North Rich Road across the street from mail box 6627

The nighttime array field measurements were obtained on December 7, 2009 and December 8, 2009 by Russell C. Harbaugh, Jr.




PART OF THE FRACTIONAL SOUTHWEST 1/4  
OF THE FRACTIONAL SOUTHWEST 1/4  
FRACTIONAL SECTION 7, T11N-R2W  
EMERSON TOWNSHIP, GRATIOT COUNTY, MICHIGAN

05/04/2015



	AZMUTH	DISTANCE
TOWER 1-TOWER 2	AZ 339°-27'-22"	163.55'
TOWER 1-TOWER 3	AZ 339°-45'-07"	328.25'
TOWER 1-TOWER 4	AZ 34°-42'-05"	337.05'
TOWER 1-TOWER 5	AZ 58°-04'-15"	308.73'
TOWER 1-TOWER 6	AZ 39°-04'-11"	358.33'
TOWER 2-TOWER 3	AZ 340°-02'-52"	162.71'
TOWER 4-TOWER 5	AZ 339°-55'-43"	181.87'
TOWER 5-TOWER 6	AZ 333°-58'-00"	162.24'
A-B	AZ 00°-05'-22"	789.26'
B-TOWER 1	AZ 55°-09'-32"	395.88'

  
 J. Edgar Hoover  
 Director

- \* - RECEIVED  
 M - MEASURED  
 □ - SET WOOD STAKE

- - FERRIS IRON  
 \* - SET IRON  
 ⊗ - CONCRETE MONUMENT

- \* - SECTION CORNER  
 \* - 1/8 CORNER  
 Δ - RADIO TOWER



**CMS & D**  
SURVEYING / ENGINEERING  
1985 HORNLAND DRIVE, SUITE B  
MT. PLEASANT, ILLINOIS 60088  
PHONE: (847) 375-0728  
FAX: (847) 375-5042  
EMAIL: info@cms-d.com

SCALE: 1" = 300'	DRAWN BY: WRE
SURVEY DATE: 7-18-09	CHECKED BY: T.E.B.
DATE: 7-17-09	JOB NUMBER: 8907-072
REVISED:	SHEET NUMBER: 1 OF 1

