



(916) 383-1177 Fax: (916) 383-1182
6340 Sky Creek Drive, Sacramento, CA 95828
P.O. Box 292880, Sacramento, CA 95829-2880

DATE: December 6, 2001

FM ANTENNA FOR:

STATION: WSUM

LOCATION: Madison, WI

MODEL NUMBER: JAHD-b-1/1(1)R

FREQUENCY & ERP: 91.7 MHz, 5.6 kW (H), 5.6 kW (V)

ANTENNA INPUT POWER: 2.8 kW

ANTENNA BOOM HEADING: 0° T

ANTENNA GAIN: H-pol V-pol

Relative to dipole 2.0 2.0

(dBd) 3.0 3.0

AZIMUTH PATTERN RMS:

Composite: 0.490

H-pol: 0.450

V-pol: 0.487

CERTIFICATION:

This certification, along with the accompanying antenna specification sheet, antenna mounting sketches, and azimuth and elevation patterns, certifies the construction and measurement of the *JAMPRO* FM CP antenna to the station's requirements, as measured at the *JAMPRO* antenna site in Sacramento, California. The following is an outline of construction methods, pattern measurements, installation requirements and recommended maintenance.

CONSTRUCTION:

A standard model JAHD antenna were mounted on a model tower. This panel was fed by a corporate feed style power divider mounted inside the tower. Connections between the power divider and each panel were made with air dielectric coaxial cables of appropriate lengths. The panel screen size and configuration as well as panel positions and the lengths of the cables were adjusted in order to meet the pattern and gain requirements.

MEASUREMENT:

The full scale antenna was mounted on an exact duplicate of it's final support at the station. We were careful to duplicate conduits, cables and anything peculiar to this mounting. This was then placed on a turntable at the *JAMPRO* antenna range. This directional antenna was used for receiving the radiation from a transmitting antenna that is elevated 25 feet above ground and located at a distance of 7000 feet. This transmitting antenna is capable of transmitting either horizontal or vertical polarization. The frequency of the signal generator was accurately set to station frequency by use of a frequency counter. A spectrum analyzer was used to continuously measure field strength as the antenna was rotated. Field strength at each azimuth was then plotted using a Scientific Atlanta plotter.

MEASUREMENT EQUIPMENT:

Model 3000 Wavetec Signal Generator, S/N 66479

Model 8591E Hewlett-Packard Spectrum Analyzer, S/N 3308A01312, calibrated 5/99

Tuned cavity dipole transmitting antenna

Scientific Atlanta Plotter

INSTALLATION:

The antenna must be installed in exactly the manner in which it was measured at the factory. This is shown in detail on the antenna mounting sketch; including the azimuth bearing of the main boom of the element. The boom must be verified by a surveyor at the site when installation is being completed. Good engineering practice should be followed in any details not covered by specific instructions.

MAINTENANCE:

Annual or regular inspection should be made on an antenna system. At this time, tightness of U-bolts or other fastenings should be routinely checked. Any deterioration of the antenna due to lightning or other causes should be promptly repaired.

CONCLUSION:

In the development of this pattern, *JAMPRO* Antennas, Inc., observed known requirements of the FCC, as stated on the station construction permit.

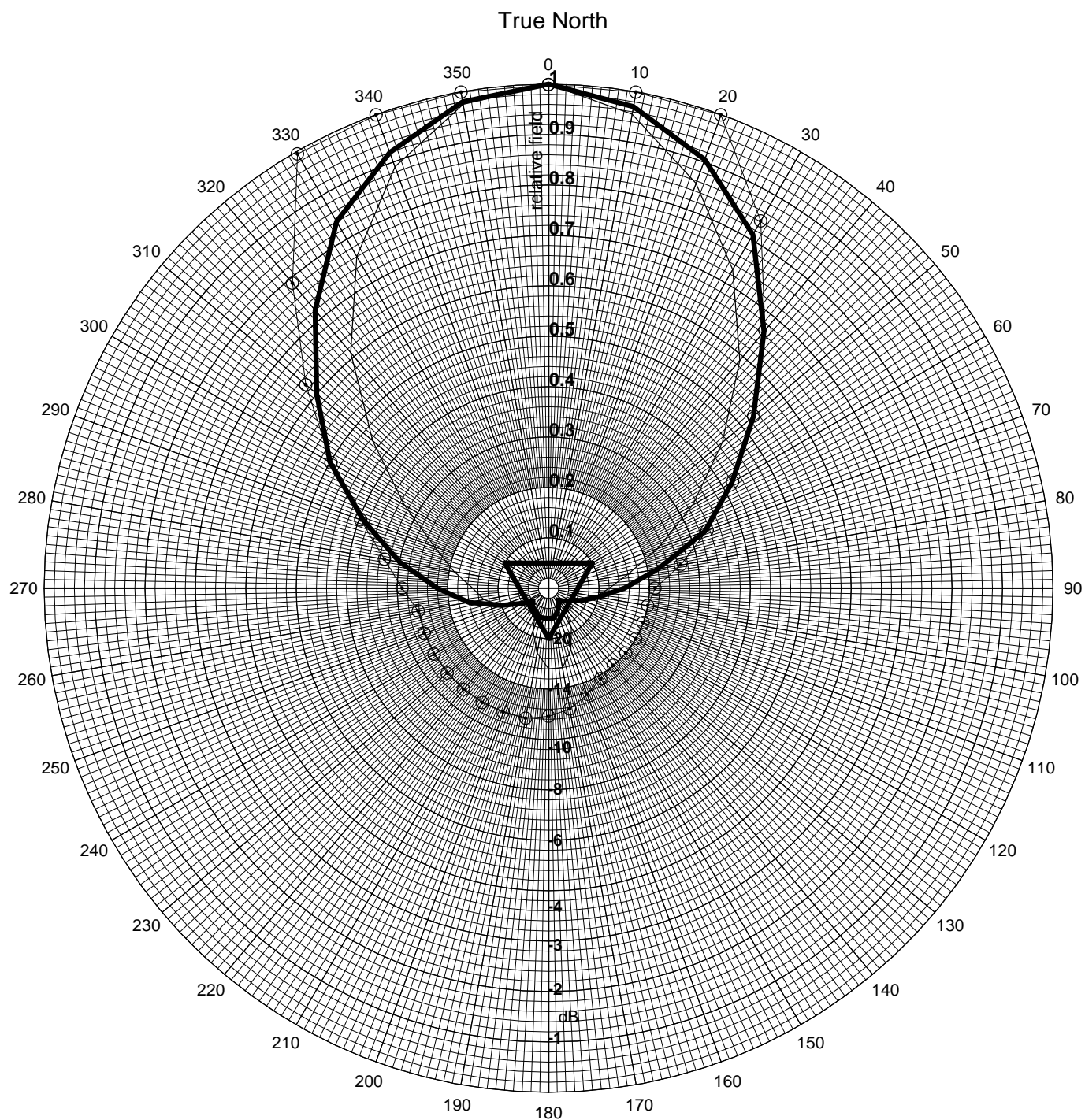
Gain figures and required input power to achieve station ERP, as well as other details, are to be found on the first and accompanying pages.

This certification, with its calculations, were performed by Vyacheslav M. Bulkin, PhD, Antenna Engineer, *JAMPRO* Antennas, Inc.

EXECUTED THIS 6 DAY OF December, 2001



BY: _____
Vyacheslav M. Bulkin, PhD, Antenna Engineer, *JAMPRO* Antennas, Inc.



Azimuth Plane Pattern

Customer: WSUM

Date: November 13, 2001

Frequency 91.7 MHZ

Type Number: JAHD-b-1/1(1)R

MEASURED PATTERN IN FULL SCALE : = V-pol, - H-pol, -o- limits



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Azimuth Pattern Tabulation

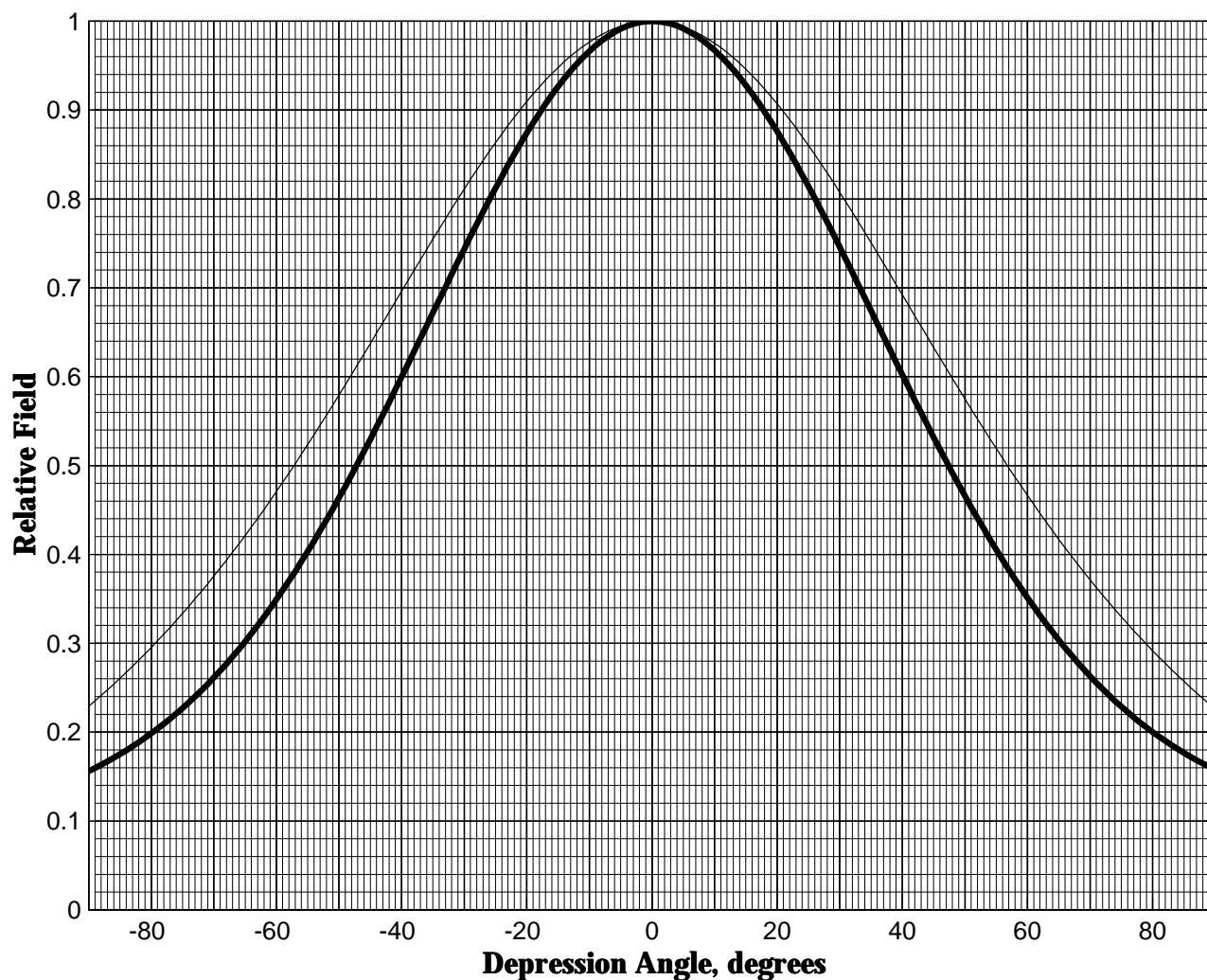
Customer: WSUM

Date: November 13, 2001

Frequency: 91.7 MHz

Type Number: JAHD-b-1/1(1)R

Azimuth	H-pol	V-pol	Limits
0	1.000	1.000	1.000
10	0.955	0.970	1.000
20	0.855	0.905	1.000
30	0.730	0.810	0.841
40	0.590	0.665	0.668
50	0.450	0.530	0.531
60	0.330	0.420	0.422
70	0.230	0.330	0.335
80	0.160	0.220	0.266
90	0.120	0.150	0.211
100	0.095	0.100	0.200
110	0.070	0.070	0.200
120	0.050	0.050	0.200
130	0.050	0.040	0.200
140	0.050	0.030	0.200
150	0.090	0.040	0.207
160	0.130	0.050	0.224
170	0.160	0.060	0.243
180	0.160	0.060	0.254
190	0.130	0.060	0.262
200	0.090	0.060	0.262
210	0.050	0.050	0.262
220	0.020	0.050	0.262
230	0.020	0.040	0.262
240	0.050	0.060	0.262
250	0.100	0.100	0.262
260	0.130	0.160	0.262
270	0.150	0.220	0.290
280	0.190	0.300	0.330
290	0.240	0.390	0.396
300	0.330	0.497	0.498
310	0.455	0.600	0.628
320	0.610	0.720	0.790
330	0.760	0.840	0.995
340	0.890	0.920	1.000
350	0.975	0.980	1.000



Elevation Plane Pattern

Customer: WSUM

Date: November 14, 2001

Frequency 91.7 MHZ

Type Number: JAHD-b-1/1(1)R

Legend = V-pol, - H-pol



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Customer: WSUM

Date: November 13, 2001

Frequency: 91.7 MHz

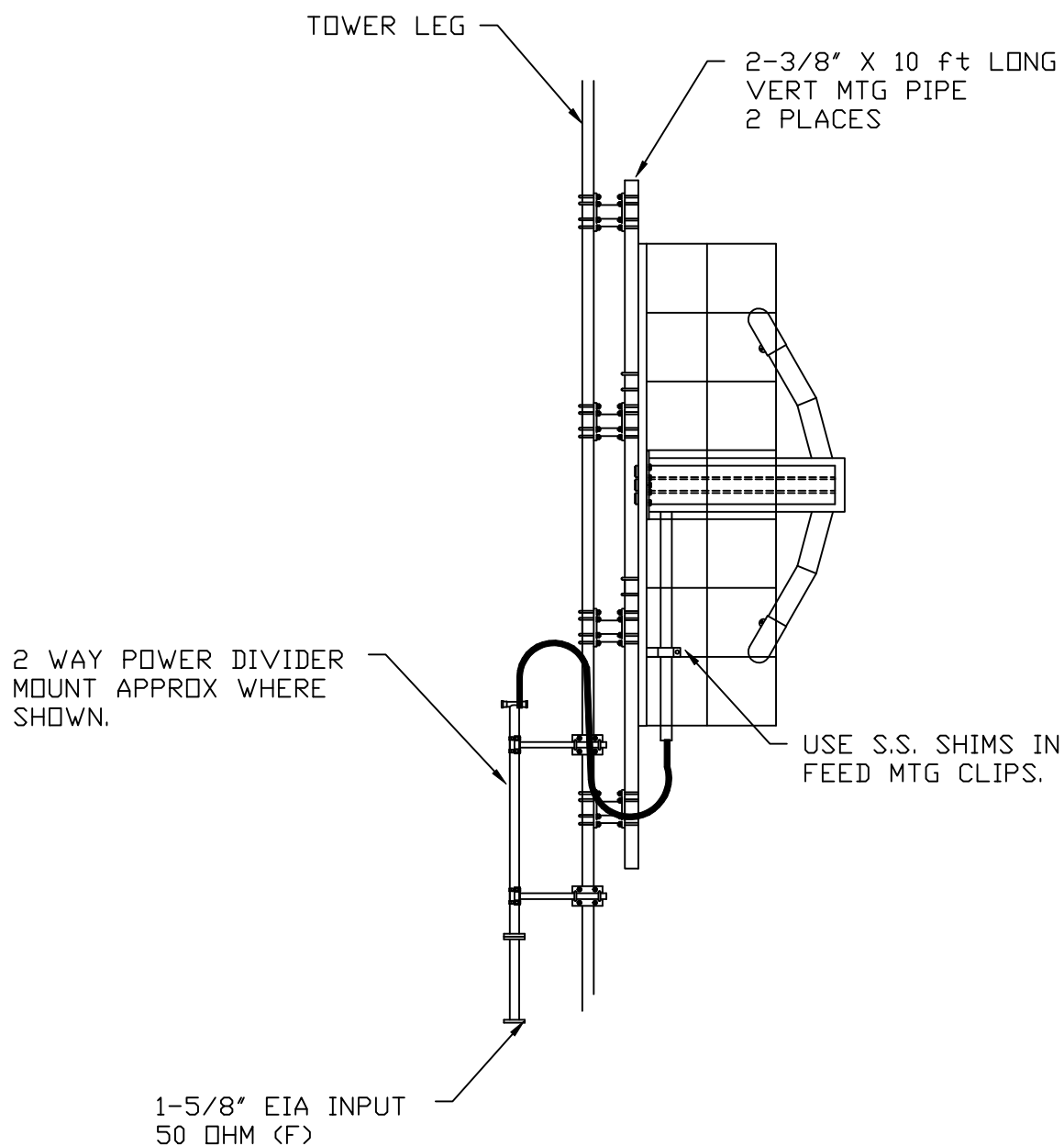
Type Number: JAHD-b-1/1(1)R

<u>Elevation</u> <u>angle</u>	<u>H-pol</u>	<u>V-pol</u>	<u>Elevation</u> <u>angle</u>	<u>H-pol</u>	<u>V-pol</u>	<u>Elevation</u> <u>angle</u>	<u>H-pol</u>	<u>V-pol</u>
10	0.977	0.966	-24	0.870	0.827	-58	0.487	0.372
9	0.981	0.973	-25	0.860	0.814	-59	0.477	0.362
8	0.985	0.978	-26	0.850	0.801	-60	0.466	0.351
7	0.989	0.983	-27	0.840	0.788	-61	0.456	0.341
6	0.992	0.988	-28	0.829	0.774	-62	0.446	0.331
5	0.994	0.991	-29	0.818	0.760	-63	0.436	0.322
4	0.996	0.994	-30	0.808	0.746	-64	0.427	0.313
3	0.998	0.997	-31	0.796	0.732	-65	0.417	0.304
2	0.999	0.999	-32	0.785	0.717	-66	0.408	0.295
1	1.000	1.000	-33	0.774	0.703	-67	0.398	0.287
0	1.000	1.000	-34	0.762	0.689	-68	0.389	0.279
-1	1.000	1.000	-35	0.751	0.674	-69	0.380	0.271
-2	0.999	0.999	-36	0.739	0.660	-70	0.372	0.263
-3	0.998	0.997	-37	0.727	0.645	-71	0.363	0.256
-4	0.996	0.995	-38	0.716	0.631	-72	0.354	0.249
-5	0.994	0.992	-39	0.704	0.616	-73	0.346	0.242
-6	0.991	0.988	-40	0.692	0.602	-74	0.338	0.235
-7	0.988	0.984	-41	0.680	0.588	-75	0.330	0.229
-8	0.984	0.979	-42	0.668	0.574	-76	0.322	0.223
-9	0.980	0.974	-43	0.657	0.560	-77	0.314	0.217
-10	0.975	0.967	-44	0.645	0.546	-78	0.306	0.211
-11	0.970	0.961	-45	0.633	0.532	-79	0.299	0.205
-12	0.965	0.953	-46	0.621	0.518	-80	0.292	0.200
-13	0.959	0.945	-47	0.610	0.505	-81	0.285	0.195
-14	0.953	0.937	-48	0.598	0.492	-82	0.277	0.190
-15	0.946	0.928	-49	0.586	0.479	-83	0.271	0.186
-16	0.939	0.919	-50	0.575	0.466	-84	0.264	0.181
-17	0.932	0.909	-51	0.564	0.453	-85	0.257	0.177
-18	0.924	0.898	-52	0.552	0.441	-86	0.251	0.173
-19	0.916	0.887	-53	0.541	0.429	-87	0.244	0.169
-20	0.907	0.876	-54	0.530	0.417	-88	0.238	0.165
-21	0.898	0.864	-55	0.519	0.405	-89	0.232	0.161
-22	0.889	0.852	-56	0.508	0.394	-90	0.226	0.158
-23	0.880	0.840	-57	0.498	0.383			



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JAHD-1/1 (10924)

REV "- 11/21/2001
10924SID.DWG

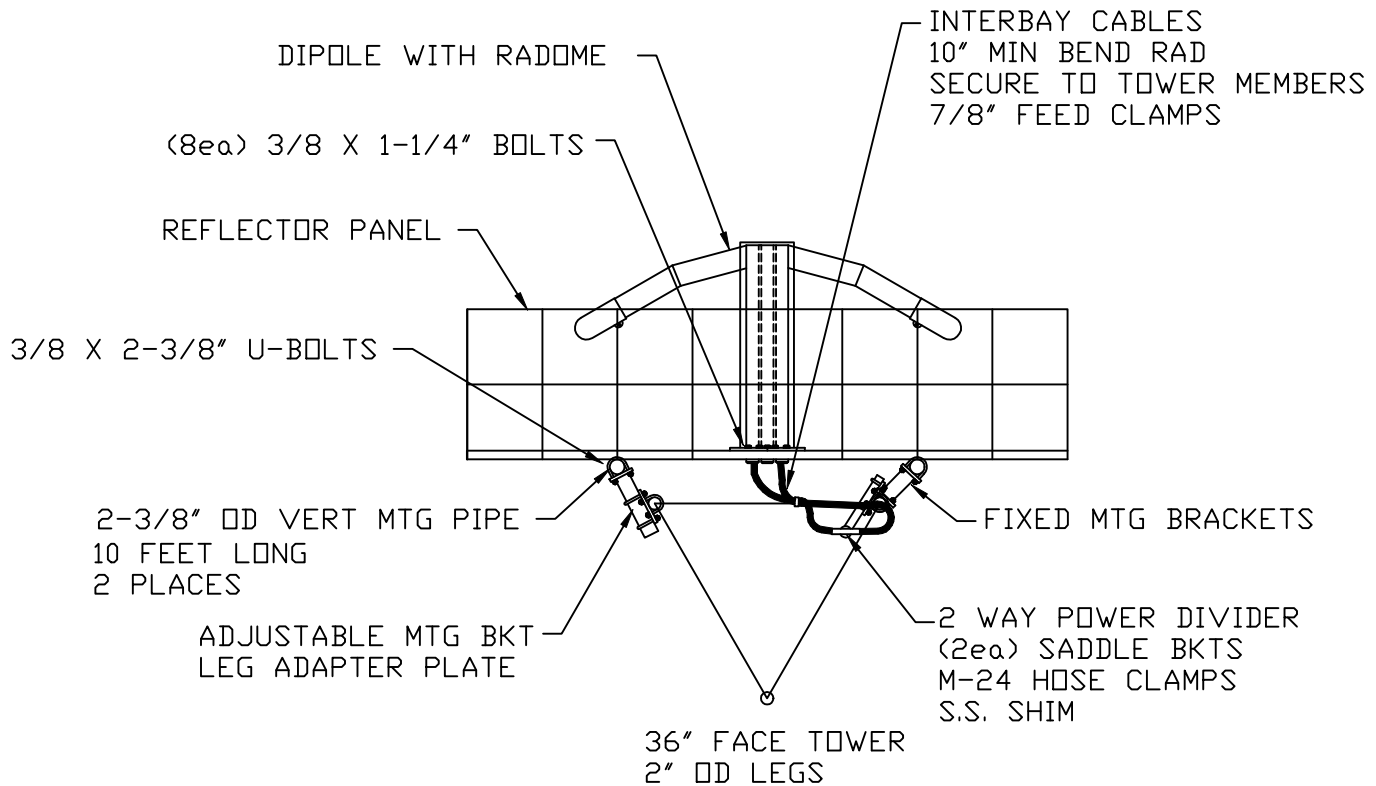


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NOTES;
INSTALL ANTENNA AS SHOWN.
VSWR COULD BE EFFECTED
IF INSTALLED DIFFERENTLY.

STATION CHIEF ENGINEER TO
DETERMINE ON WHICH FACE
ANTENNA IS TO BE MOUNTED.



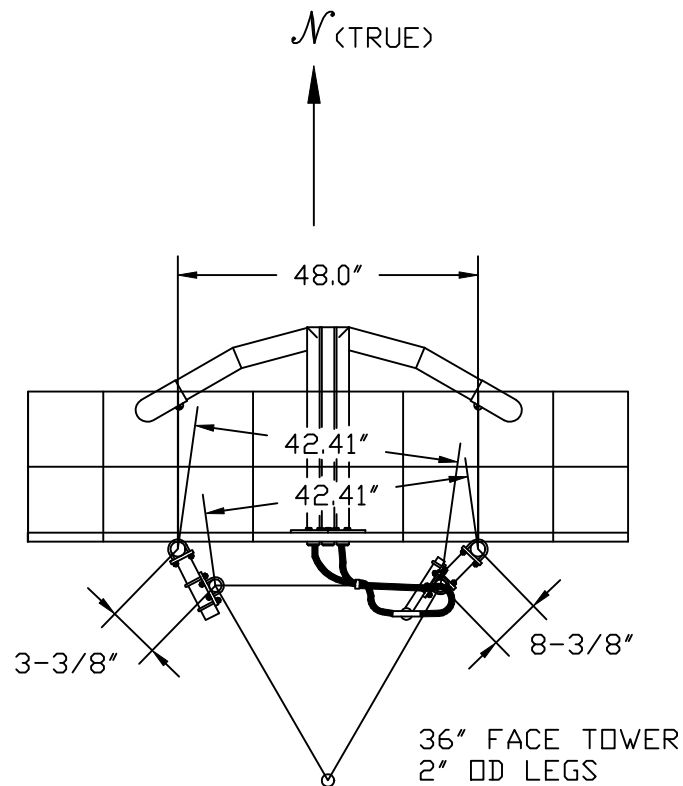
JAHD-1/1 (10924)

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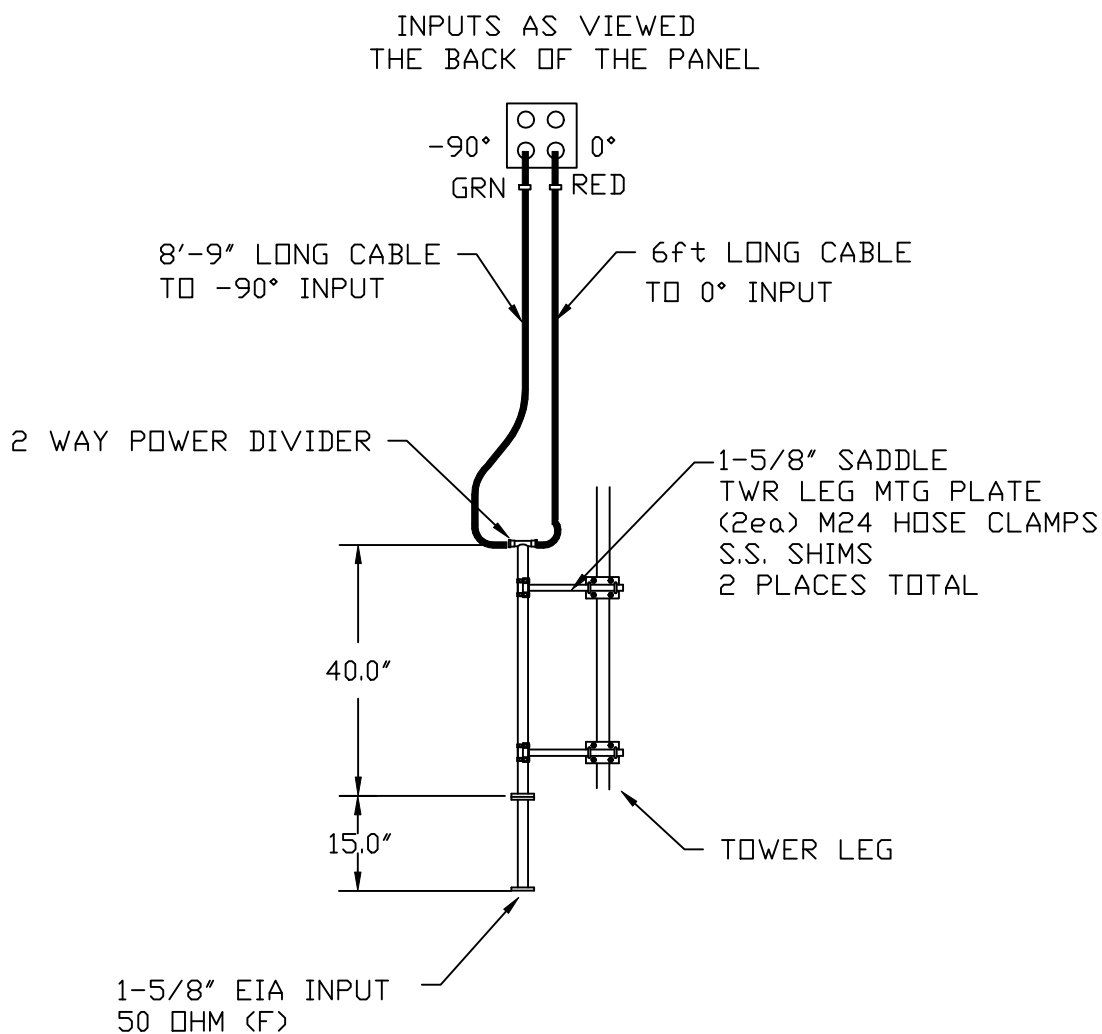
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REV "- " 11/21/2001
10924FED.DWG