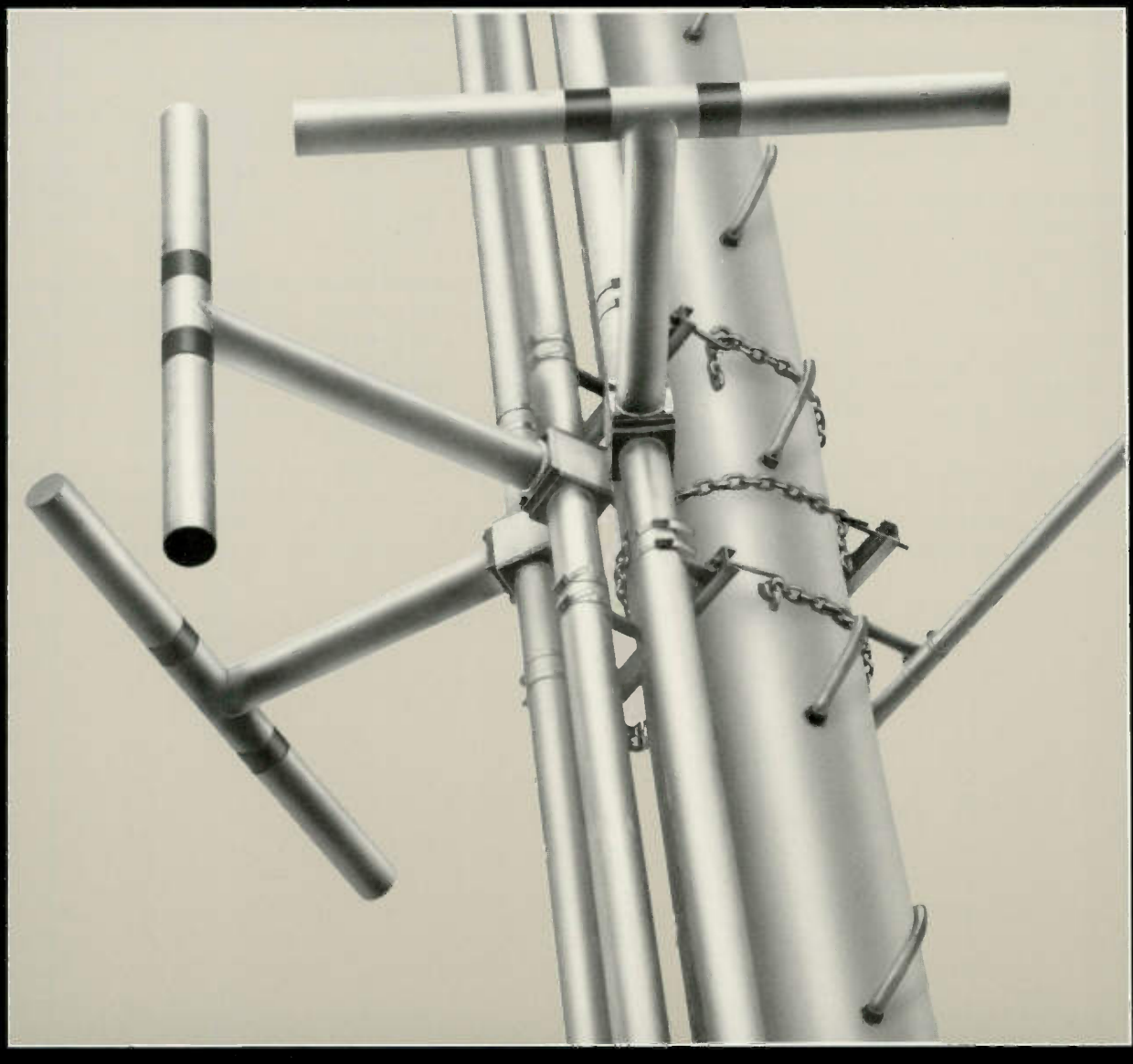
HARRIS

DIRECTIONAL DUAL POLARIZED FM ANTENNA



- Pattern Factory Tested For Proven Results
- Excellent Bandwidth Minimizes Degradation To Stereo And SCA Channels
- Broadband Dipole Elements Reduce Antenna Detuning Under Icing Conditions
- Rugged Brass Element Construction With Stainless Steel Support Brackets Impedes Corrosion

Harris' FMD-(X) is a directional dual polarized FM antenna designed for pole mounting. It is available with up to eight bays and with either 1⅝ inch male or 3⅛ inch female, EIA 50 ohm input. The "X" in the type number indicates the number of bays. The suffix "A" following the complete type number signifies 1⅝" input and the suffix "B" indicates 3⅛" input. (Example—FMD-4A is a 4-bay antenna with 1⅝" input).

UP TO 40 KW INPUT POWER. The maximum power input capability for the "A" series is 12 kilowatts. The maximum power input capability for the "B" series is 20 kilowatts for a single bay, and 40 kilowatts for two (2) through eight (8) bays.

The interbay lines use 3⅛ inch rigid, with three such lines used between bays, two for the horizontal element feeds and one for the vertical element feeds. A combiner, for combining the three transmission line feeds, is used below the bottom bay. A six foot transformer section is used immediately below this combiner.

BROADBAND DIPOLE ELEMENT. The Harris FMD antenna used broadband 3⅛ inch dipole elements that exhibit between a 5 to 7 MHz bandwidth at the 1.5:1 VSWR measurement points. Due to this excellent bandwidth characteristic, the FMD antenna offers minimum degradation to stereo and SCA channels.

The FMD antenna's wide bandwidth also reduces detuning caused by icing conditions. Antenna deicers are typically not required at antenna heights where radial ice does not exceed ¾ of an inch, as VSWR should typically not exceed 1.5:1 under these conditions.

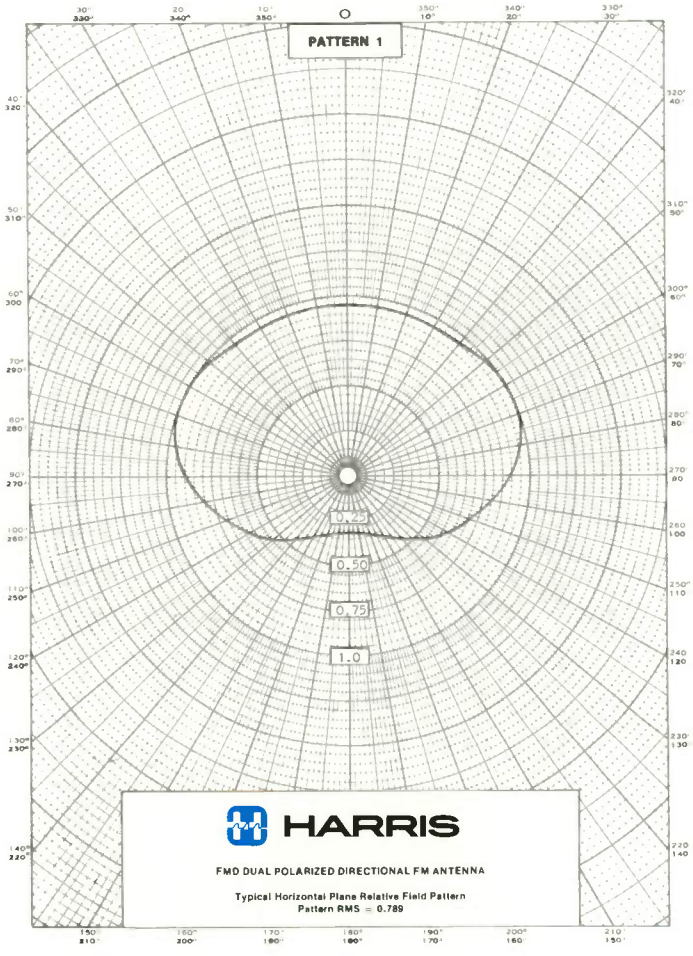
The Harris FMD incorporates 3⅛ inch corrosion resistant brass dipole elements. Each bay level normally uses two driven horizontal elements, one horizontal parasitic reflector and one driven vertical element. In some cases, vertical parasitic elements may be used on each bay for the purpose of further shaping the vertical polarization component.

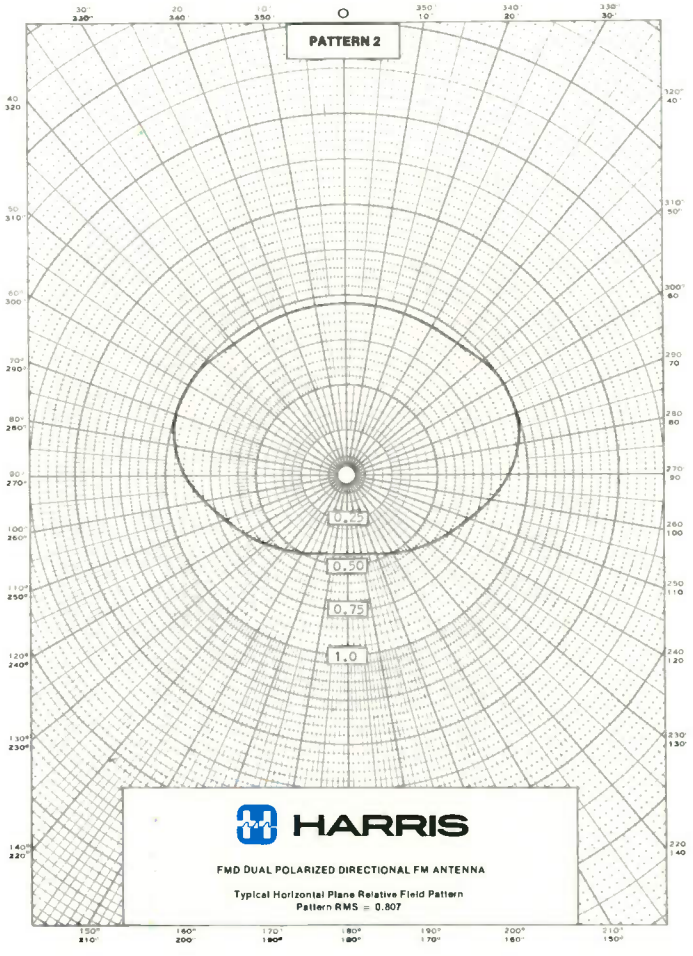
ANTENNA SYSTEM PRESSURIZATION. The antenna system is designed to be pressurized, using dry air or dry nitrogen, and the system should be purged and then pressurized to a positive pressure of approximately 2 to 5 pounds per square inch (0.14 to 0.35 kilograms per square centimeter) immediately following installation.

CUSTOM MOUNTING POLE. The FMD antenna is supplied with a custom matching pole, thereby permitting the support pole to be drop shipped directly to the customer. The directional antenna may be purchased without the pole only on a special quotation basis, in which case there will be an added engineering charge made, and the cost of the Harris pole deducted from this total price. The pole is a hot dip galvanized pedestal mount, with removable step bolts. For poles 30 feet or more in length the minimum wall thickness is 0.500 inch. A plate is provided on the top of the pole as a support for a beacon. Should a buried pole support be desired, specific requirements will be needed for a special price quotation.

ANTENNAS PATTERNED AT FACTORY. Each Harris FMD directional antenna is patterned on a test range, not at the customer's site. A single bay of the antenna (in accordance with FCC pattern test requirements) is mounted on a pole identical (or electrically equivalent) to that on which the antenna is to be finally installed. If the customer supplies his own pole, then complete data on the pole must submitted for final pattern testing.

The antenna is patterned with the test pole erected vertically on a turntable on the antenna range, and measurements made in the xy, or horizontal plane, for both the horizontal and vertical polarization components. Normally, the antenna bay being patterned





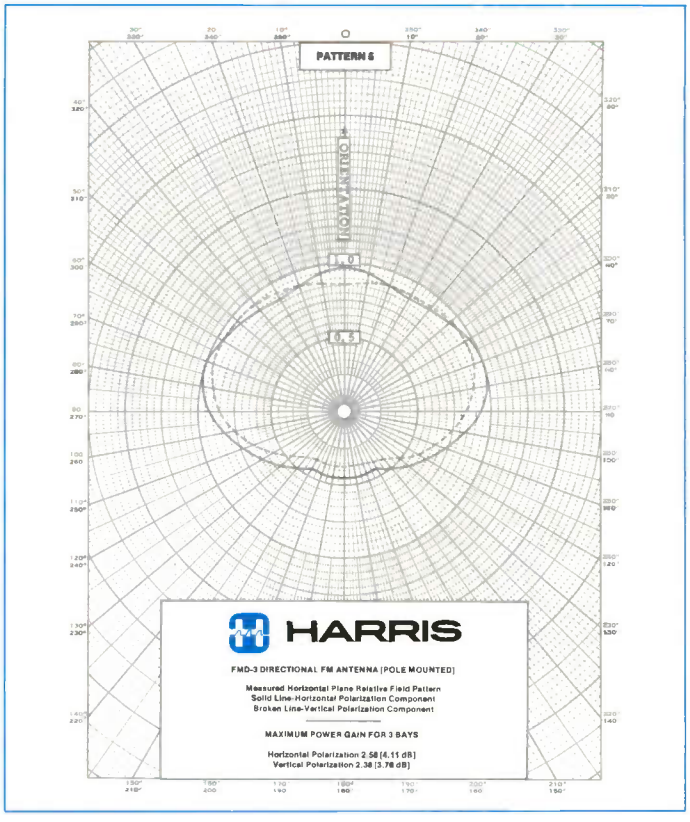
is operated in the transmitting mode. A special dipole receiving antenna, located a sufficient distance away, is used with its output feeding an accurate field intensity meter, and the pattern of the antenna plotted as the test pole is rotated. Patterns for each of the two polarization components are plotted separately. Adjustments are made to the antenna bay in order to achieve a suitable antenna radiation pattern.

The complete antenna is assembled on a steel pole and carefully tuned at the factory. As a result, field trimming should normally not be required.

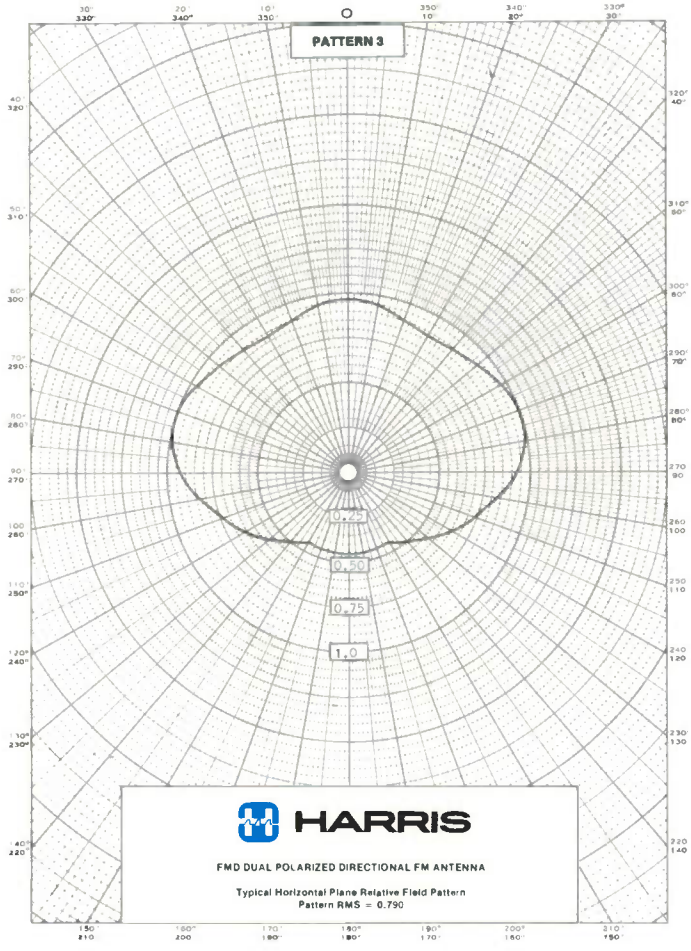
The final pattern achieved may be expected to differ slightly from the initial pattern proposed, so it may be necessary to file an application to modify the construction permit to comply with the exact measured pattern, which the customer will receive upon the completion of the antenna pattern tests.

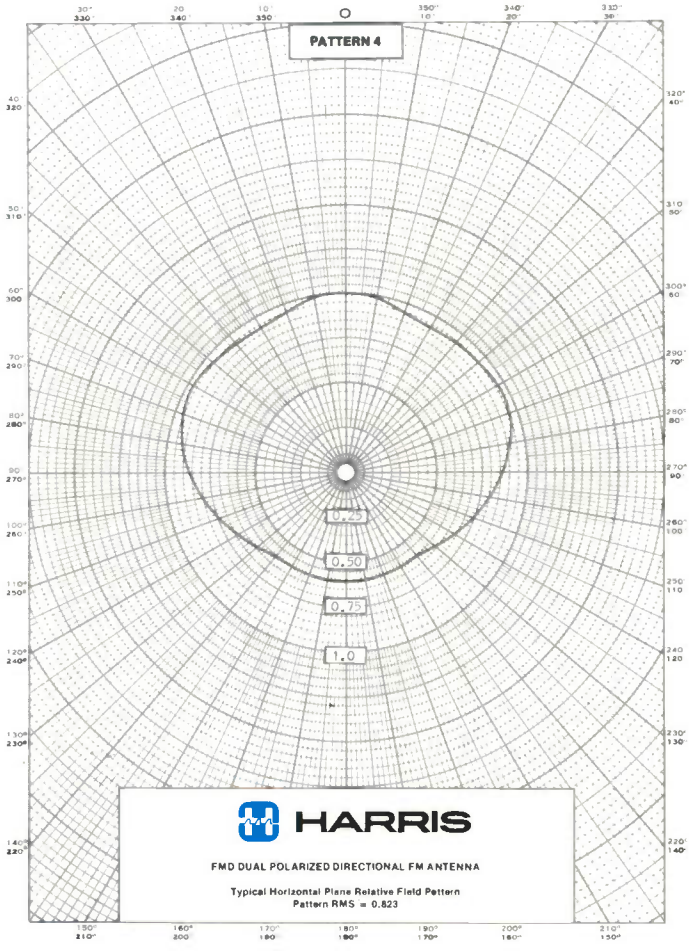
Following the completion of the final patterning of the antenna, Harris will provide the station, and/or its consultant, with the final measured antenna radiation pattern, calculated gain data, and the details of the antenna pattern measurement procedure. This final data is then submitted by the station to the FCC or other broadcasting authority.

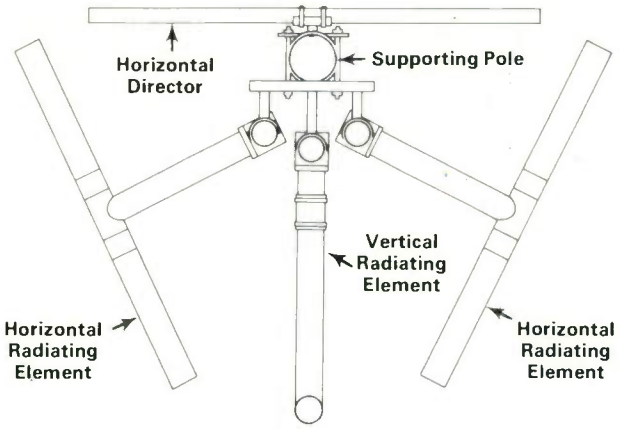
ORDERING INFORMATION. Orders for the Harris Dual Polarized Directional FM Antenna should specify the desired true azimuth orientation, maximum ERP permitted, radiated power limitations and their true orientation, transmission line efficiency (or specify the type of transmission line and its length), and the transmitter power output capability. Such antenna pattern requirements are normally specified by the station's consultant. Ideally, a copy of the FCC construction permit should be supplied so that Harris can assure full compliance with the requirements of such authorization relative to the antenna.



The pattern shown above is that of a three-bay Harris FMD-3 Dual Polarized Directional FM Antenna designed specifically for the 107.7 MHz frequency.







(This side oriented towards main pattern lobe)

HARRIS FMD DUAL POLARIZED
DIRECTIONAL FM ANTENNA-TOP VIEW

ELECTRICAL AND MECHANICAL DATA

HARRIS TYPE NO.	INPUT POWER RATING (KW)	EIA INPUT FLANGE	POLE LENGTH SUPPLIED OR REQUIRED	WEIGHT OF ANTENNA (LESS POLE) LBS.	WEIGHT OF FACTORY SUPPLIED POLE LBS.	WEIGHT OF ANTENNA AND FACTORY SUPPLIED POLE LBS.	WINDLOAD OF ANTENNA (LESS POLE)[1] LBS.	WINDLOAD OF FACTORY SUPPLIED POLE ONLY WITH ½ INCH RADIAL ICE[2] LBS.	TOTAL WINDLOAD OF ANTENNA AND FACTORY SUPPLIED POLE[3] LBS.	HEIGHT ABOVE POLE BASE TO CENTER OF ANTENNA (RADIATION)[4]	O.D. OF REQUIRED SUPPORT POLE IN INCHES
FMD-1A	12	1⅝" Male	25	280	1088	1368	418	1363	1781	22	8⅝ inch
FMD-1B	20	3⅛" Female	25	280	1088	1368	418	1363	1781	22	8⅝ inch
FMD-2A	12	1⅝" Male	35	479	1526	2005	855	1955	2810	26.4	8⅝ inch
FMD-2B	40	3⅛" Female	35	479	1526	2005	855	1955	2810	26.4	8⅝ inch
FMD-3A	12	1⅝" Male	35	678	1975	2653	1293	2812	4105	31	10¾ inch
FMD-3B	40	3⅛" Female	35	678	1975	2653	1293	2812	4105	31	10¾ inch
FMD-4A	12	1⅝" Male	55	977	3216	4193	1731	3462	5193	35.3	10¾ inch
FMD-4B	40	3⅛" Female	55	977	3216	4193	1731	3462	5193	35.3	10¾ inch
FMD-5A	12	1⅝" Male	65	1076	4761	5837	2168	4474	6642	39.7	12¾ inch
FMD-5B	40	3⅛" Female	65	1076	4761	5837	2168	4474	6642	39.7	12¾ inch
FMD-6A	12	1⅝" Male	75	1275	5963	7238	2606	5441	8047	44.2	14 inch
FMD-6B	40	3⅛" Female	75	1275	5963	7238	2606	5441	8047	44.2	14 inch
FMD-7A	12	1⅝" Male	85	1474	7670	9144	3044	6182	9226	48.6	14 inch
FMD-7B	40	3⅛" Female	85	1474	7670	9144	3044	6182	9226	48.6	14 inch
FMD-8A	12	1⅝" Male	95	1673	8896	10569	3481	6633	10114	53	14 inch[5]
FMD-8B	40	3⅛" Female	95	1673	8896	10569	3481	6633	10114	53	14 inch[5]

MAXIMUM POWER GAIN FOR TYPICAL PATTERNS 1-4 ON PREVIOUS PAGES

HARRIS TYPE NO.	PATTERN 1		PATTERN 2		PATTERN 3		PATTERN 4	
	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.
FMD-(1A or 1B)	0.81	0.72	0.79	0.70	0.76	0.70	0.72	0.69
FMD-(2A or 2B)	1.74	1.53	1.70	1.49	1.63	1.50	1.54	1.47
FMD-(3A or 3B)	2.71	2.39	2.64	2.33	2.54	2.34	2.39	2.29
FMD-(4A or 4B)	3.70	3.26	3.61	3.18	3.47	3.19	3.26	3.13
FMD-(5A or 5B)	4.71	4.14	4.58	4.03	4.40	4.05	4.14	3.98
FMD-(6A or 6B)	5.71	5.03	5.56	4.90	5.35	4.92	5.03	4.83
FMD-(7A or 7B)	6.73	5.92	6.55	5.77	6.29	5.79	5.92	5.68
FMD-(8A or 8B)	7.75	6.82	7.55	6.64	7.25	6.67	6.82	6.54

Electrical and Mechanical Notes:

1. Windload based on 50/33 PSF (112 MPH wind) with no ice buildup on antenna.
2. Based on 50 lbs. per square foot with ½ inch radial ice on pole.
3. Combined windload of antenna and pole based on notes 1 and 2. Windload figure based on factory supplied pole with ½ inch radial ice. Windload of antenna with no ice.
4. Based on assumption that centerline of top bay is 3 feet below the top of the support pole.
5. Bottom 2 feet of pole has 16 inch O.D. section.

Notes On Power Gain Data:

Note: The above gain figures are approximate only, but are useful as a guide in determining the number of bays required. The gain figures will vary with the pattern shape, and exact gain figures are determined when the final antenna pattern is achieved.

The power gain for the vertical polarization component is less than the horizontal polarization component since it will differ a bit in shape, and in addition, the vertically polarized component can not exceed the horizontally polarized component at any azimuth.

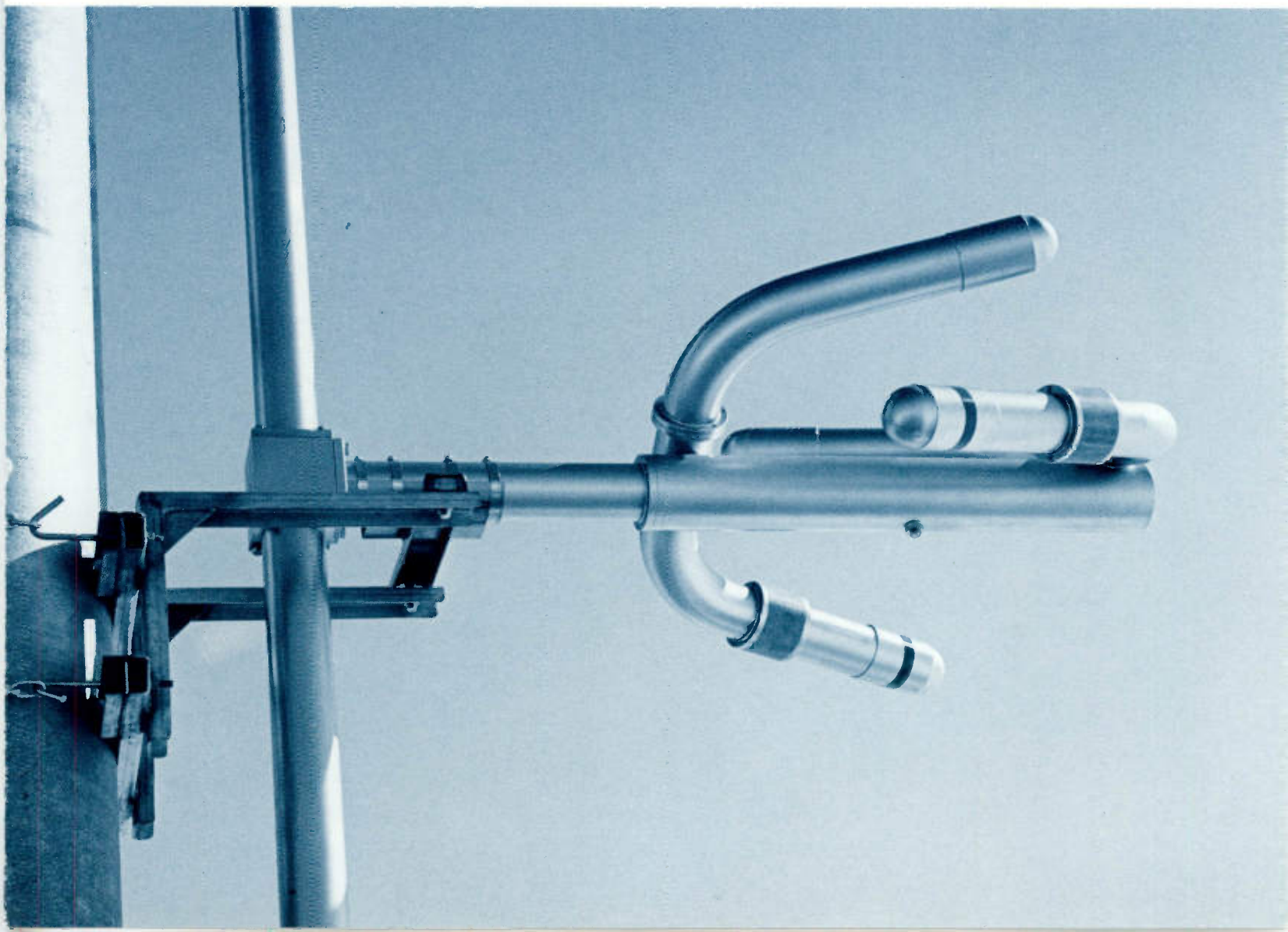
HARRIS MAINTAINS A CONTINUOUS PROGRAM OF PRODUCT IMPROVEMENT AND THEREFORE RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE.

HARRIS CORPORATION BROADCAST DIVISION
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200

HARRIS

SkyGain™

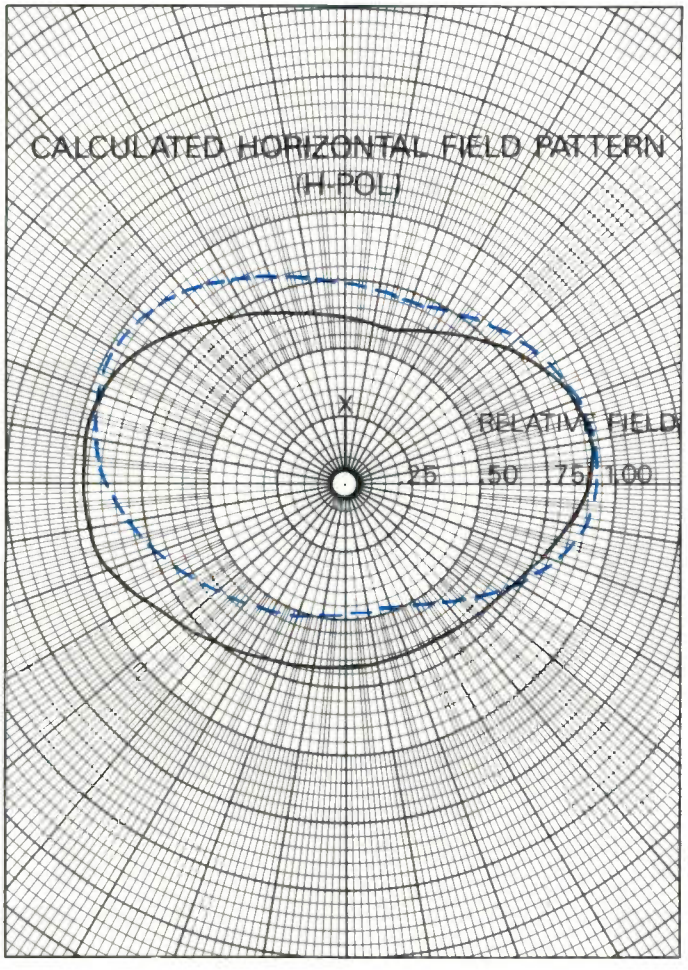
High Power, High Performance Circularly Polarized FM Antenna



The SkyGain™ Antenna Delivers An Excellent Signal . . . Here's Why:

- **Horizontal circularity is typically ±2 dB when pole mounted for uniform signal coverage.**
- **Superior axial ratio provides better fringe area coverage.**
- **High power handling capability provides flexibility in transmission system design.**
- **Inherently low 90° downward radiation to help meet new RFR workplace radiation requirements.**
- **Rugged brass construction along with stainless steel support brackets insure long trouble-free service.**
- **Optional antenna pattern optimization available to meet exact coverage requirements.**

The Harris high power SkyGain circularly polarized FM antenna features very good horizontal circularity and superior axial ratio characteristics. These two characteristics provide superb local coverage and better fringe area coverage than other FM broadcast antennas.



Calculated horizontal field of Harris SkyGain antenna (solid line) compared with previous generation ring design (dashed blue line). Note improved pattern circularity. Antenna measured is pole mounted.

CIRCULARITY

Uniform horizontal circularity is a key to solid signal coverage. The Harris SkyGain antenna exhibits a horizontal polarized circularity of ±2 dB when mounted on a 14 inch O.D. steel pole.

BETTER FRINGE COVERAGE

The Harris SkyGain antenna exhibits better axial ratio than other FM broadcast antennas. This characteristic provides better fringe area coverage for your station.

BANDWIDTH CAPABILITY

The Harris SkyGain FM antenna typically exhibits a 5 MHz frequency bandwidth per given FM channel. This important characteristic, not found in other antennas, provides:

- Low standing wave ratio of 1.07:1 or less, ±200 kHz per given channel (with field trimming). VSWR at antenna input without field trimming is 1.25:1 for pole mounting atop a tower, or 1.5:1 or less when side mounted.
- Minimum degradation to your stereo signal and the expanded SCA channels.
- Multiple station operation: Stations having a frequency separation of up to 5 MHz may be diplexed on a common SkyGain antenna. This capability is important in installations where another antenna cannot be accommodated on a tower. The SkyGain antenna will require electrical deicers in multiplexed operations where antenna icing is likely to occur. Your Harris representative can provide you with additional information on multistation operation along with the additional transmission system accessories needed for this operation.

RADIATING ELEMENT

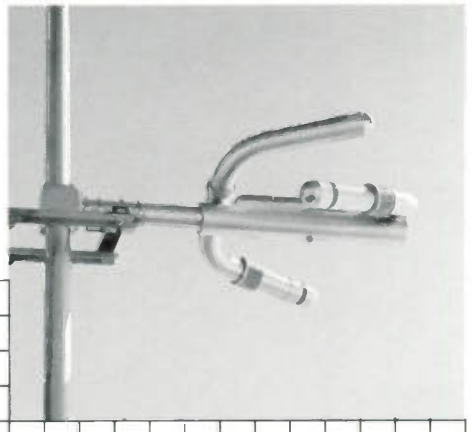
The SkyGain radiating element is of heavy gauge tubular brass construction and has an outside diameter of 3⅛ inches. Unlike other antennas, the silver soldered feed point is completely internal with a pressurized environment up to and including the feed point. This Harris feature minimizes weather-related problems common to other designs.

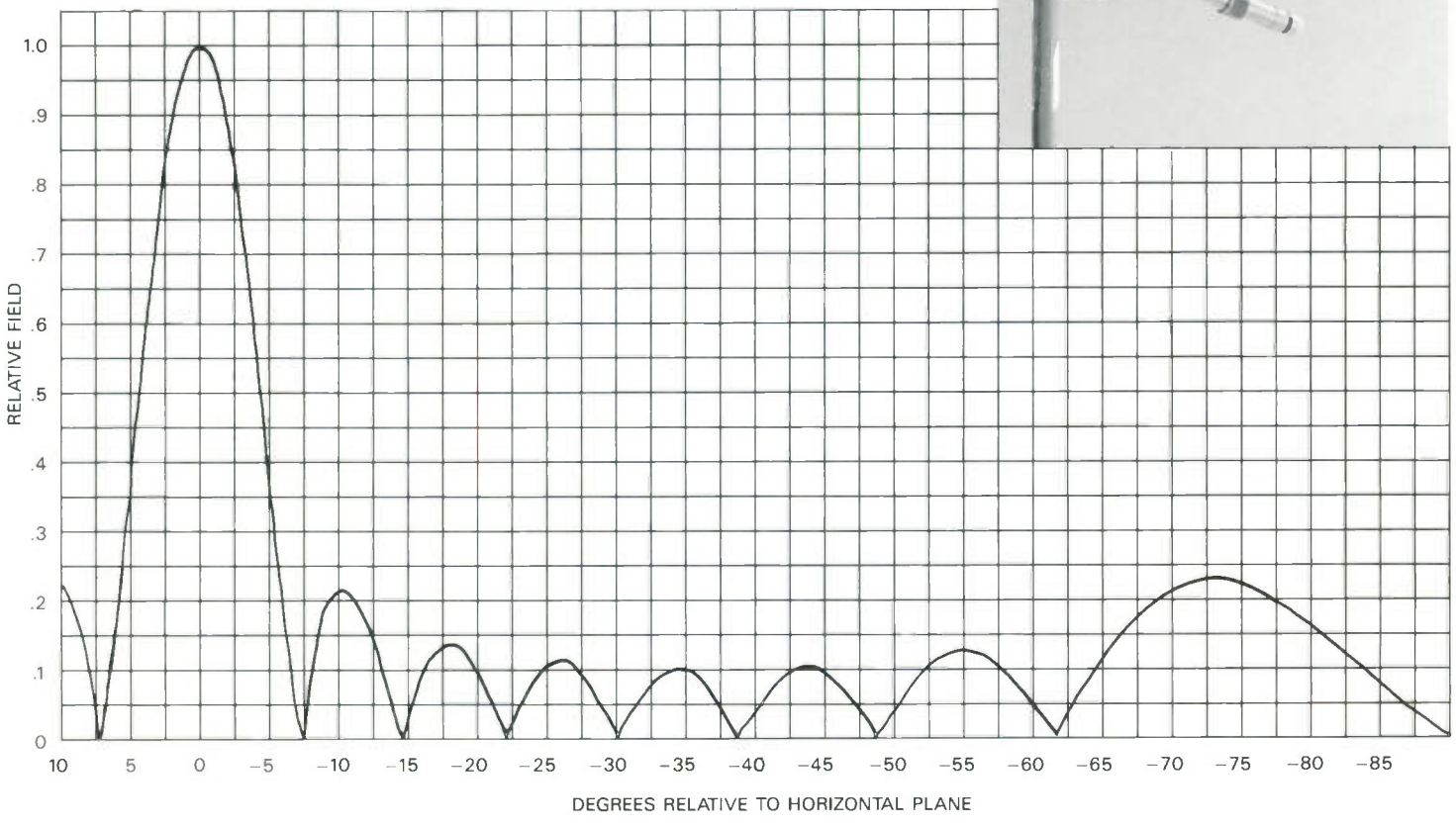
SkyGain antennas are designed for high power operation. Input capability ranges from 20 kW (2 bay) through 39 kW for a 14 bay model. Corona is not a problem as a proven rounded element tip design is used.

HARRIS

SkyGain
Typical Calculated
Vertical Field

8 bays with 0 degree
beam tilt and no null fill





Calculated vertical field of a typical eight bay SkyGain antenna. Note the suppressed amount of 90° downward radiation which helps meet new RFR requirements.

LIGHTNING PROTECTION

Each SkyGain antenna element provides a D.C. short circuit to the inner bay feed system. This new Harris feature limits the amount of damage a lightning strike could have on the antenna, costly transmission line and transmitter hardware.

DEICING

Due to the characteristics of the SkyGain antenna, light antenna icing conditions will not dramatically increase VSWR.

Should the antenna's environment be subject to a heavier icing or frequent icing conditions, the optional 600 watt/220 VAC SkyGain electrical deicers are recommended.

MOUNTING INFORMATION

Corrosion resistant stainless steel mounting brackets and hardware are supplied for tower face mounts up to 48 inches, or for steel pole mounts. Your Harris representative can give you additional information on other SkyGain mounting configurations and associated hardware available to meet your exact requirements.

TOWER SPACE REQUIREMENTS

Tower space requirements in **feet** for the end fed SkyGain antenna array is equal to:

$$\frac{(980) \times (\text{Number of Bays} - 1)}{\text{Frequency in MHz}} + 16 \text{ feet}$$

For center fed, subtract 6 feet.

Tower space requirement in **meters** for the end fed antenna is equal to:

$$\frac{(298.7) \times (\text{Number of Bays} - 1)}{\text{Frequency in MHz}} + 5 \text{ meters}$$

For center fed, subtract two meters.

These formulas provide a structure with five feet above and below the array. Each radiating element extends approximately 15 inches (38 cm) above the center of the element. End fed antennas are supplied with a 72 inch (183 cm) matching transformer section that is attached to the bottom of the element array. On center fed models, this same matching transformer is connected at the center of the antenna array.

DELIVERING THE SIGNAL TO THE LISTENER

When selecting FM antennas, a compromise in product quality is a compromise in signal delivery. With the Harris SkyGain antenna, there are no compromises in quality. From its excellent radiation characteristics to the corrosion resistant mounting hardware, the Harris SkyGain antenna will deliver a strong signal to your listeners over many years of trouble-free service.

SPECIFICATIONS AND ORDERING INFORMATION

Harris Part No.	Model Configuration	Power Gain	dB Gain	Type Feed	Female 50 ohm EIA Input	Power Input Capability	Calculated Weight	Calculated Windload
710-0605-000	FMWH-1AE	0.4611	−3.3623	End	3⅛"	10 kW	108	177
710-0606-000	FMWH-2AE	0.9971	−0.0128	End	3⅛"	20 kW	225	383
710-0607-000	FMWH-2AC	0.9971	−0.0128	Center	3⅛"	20 kW	243	406
710-0609-000	FMWH-3AE	1.5588	1.9278	End	3⅛"	20 kW	342	589
710-0611-000	FMWH-4AE	2.1332	3.2903	End	3⅛"	30 kW	459	795
710-0612-000	FMWH-4AC	2.1332	3.2903	Center	3⅛"	30 kW	477	818
710-0614-000	FMWH-5AE	2.7154	4.3384	End	3⅛"	32 kW	576	1001
710-0617-000	FMWH-6AE	3.3028	5.1888	End	3⅛"	32 kW	693	1207
710-0618-000	FMWH-6AC	3.3028	5.1888	Center	3⅛"	39 kW	711	1231
710-0620-000	FMWH-7AE	3.8935	5.9034	End	3⅛"	32 kW	810	1413
710-0622-000	FMWH-8AE	4.4872	6.5197	End	3⅛"	32 kW	927	1620
710-0623-000	FMWH-8AC	4.4872	6.5197	Center	3⅛"	39 kW	945	1643
710-0626-000	FMWH-10AC	5.6800	7.5435	Center	3⅛"	39 kW	1179	2055
710-0629-000	FMWH-12AC	6.8781	8.3747	Center	3⅛"	39 kW	1413	2467
710-0632-000	FMWH-14AC	8.0800	9.0741	Center	3⅛"	39 kW	1647	2879

FOOTNOTES—(Apply to all models) 1. Horizontal and vertical power gain and dB gain are the same. 2. Power input capability up to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3. Windload based on 50/33 PSF. 112 m.p.h. actual wind velocity. NOTE: Brackets included in weight and windload calculations. 4. Heaters add 4 lbs. to each half loop for a single bay. Heater box, hardware, interbay connecting A.C. cable, and copper conduit add a total of 7 lbs. to each bay. The total effect of adding heaters is 15 lbs. per bay level.

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SKYGAIN OPTIONS

The following options are availble for the SkyGain antenna in order to meet special station requirements. Your Harris representative can provide you with additional information.

SkyGain Electrical Deicers (less control sensors) **710-0667-000**
SkyGain Teflon Element Coating **710-0666-000**
Mounting Brackets for Special Tower Configurations . . . . . **Per Application**
SkyGain Custom Pattern Measurements and Optimization . . . . . **Per Application**

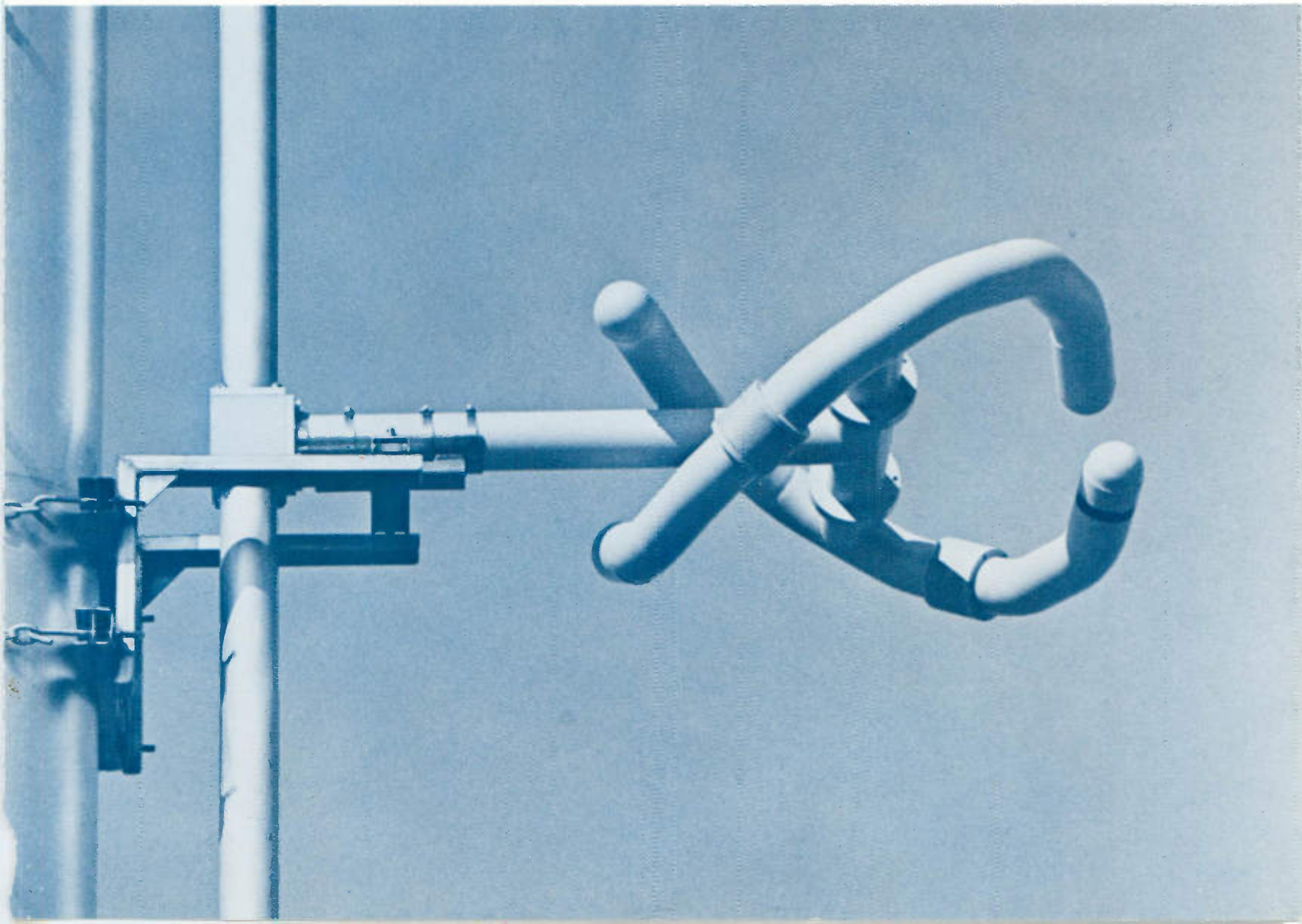
HARRIS CORPORATION BROADCAST GROUP
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200

ADV. 684 PTD. IN U.S.A.

HARRIS

SignalStar™

High Power, High Performance Circularly Polarized FM Antenna



The SignalStar Delivers An Excellent Signal . . . Here's Why:

- **Horizontal circularity is typically ± 2 dB when pole mounted or face mounted on a 24″ tower for uniform signal coverage**
- **Excellent bandwidth minimizes degradation to stereo and SCA channels**
- **High power handling capability provides flexibility in transmission system design**
- **Rugged brass construction and silver-plated inner-conductor connectors insure long, trouble-free service**
- **Standard corrosion-resistant steel support brackets and hardware**
- **Antenna pattern optimization available to meet exact requirements**

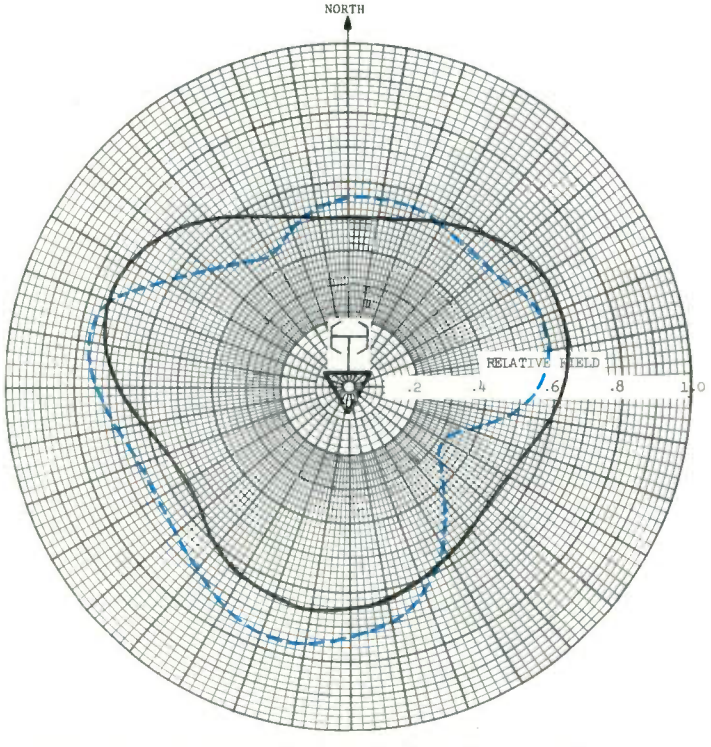
The Harris super power SignalStar circularly polarized FM antenna features excellent circularity along with rugged construction for years of superb signal coverage.

CIRCULARITY

Uniform horizontal circularity is a key to solid signal coverage. The Harris SignalStar antenna exhibits a horizontally polarized circularity of ±2 dB when mounted on a 14 inch O.D. steel pole, or face mounted on a 24″ tower.

For stations that need to side mount the antenna, and require precision coverage, pattern optimization results are available without the expense of range testing. Your Harris representative has complete details on this and other testing services.

CALCULATED HORIZONTAL FIELD PATTERN



Calculated horizontal field of Harris SignalStar antenna (solid line) compared with previous generation ring design (dashed blue line). Note improved pattern and elimination of deep nulls. Antennas are face mounted on 24-inch cross sectional tower.

BANDWIDTH CAPABILITY

The Harris SignalStar antenna offers improved bandwidth over other designs in order to minimize degradation to stereo and new SCA services. The SignalStar typically exhibits a low standing wave ratio of 1.07 or less, ±200 KHz per given channel with field trimming. VSWR at antenna input without field trimming is 1.25 for pole mounting atop a tower, or 1.4 or less when side mounted on a tower without field trimming.

Due to the excellent bandwidth characteristics of the radiating element, multistation operation is possible using a common antenna system. The necessary filtering components are available from Harris for such diplexing or multiplexing operations. Stations having a frequency separation of up to 5 MHz may be diplexed on a common antenna. Increased frequency separation is feasible with optional design modifications. When used as a multiplex antenna, the SignalStar will require deicers or radomes in areas where icing is likely to occur. Field tuning using multiple slugs may be required for multiple station operation.

RADIATING ELEMENT

The SignalStar radiating element is of heavy gauge tubular brass construction, and has an outside diameter of 3⅛ inches. The silver soldered feed point is completely internal, with a pressurized environment up to and including the feed point. This Harris feature minimizes weather related problems common to other FM broadcast antennas.

Each SignalStar radiating element is rated to 40 kW, with the exception of the "A" series end fed 1 and 2 bay antennas and the center fed 2 bay, which are rated at 32 and 39 kW, respectively. Element ratings are limited only by the average power handling capability of the 3⅛ inch rigid coaxial line, which we have conservatively derated from 48 kW to 40 kW. With the SignalStar, unlike other antenna designs, corona is not a problem. A proven rounded element tip design is used.

LIGHTNING PROTECTION

Each SignalStar antenna element provides a D.C. short circuit to the inner bay feed system. This new Harris feature limits the amount of damage a lightning strike could have on the antenna, costly transmission line and transmitter hardware.

DEICING

Due to the excellent design characteristics of the Harris SignalStar antenna, antenna deicer or radomes are typically not required at antenna heights where radial ice does not exceed ½ inch. Under icing conditions of up to ½ inch, VSWR is typically 1.5 or less, assuming the antenna exhibits a normal VSWR of 1.1 or less. Should the antenna's environment be subject to a heavier icing condition, Harris recommends the use of optional SignalStar radomes or electrical element deicers.

MOUNTING INFORMATION

Corrosion resistant stainless steel mounting brackets and hardware are supplied for tower face mounts up to 48 inches, or for steel pole mounts. Your Harris representative can give you additional information on other SignalStar mounting configurations and associated hardware available to meet your exact requirements.

TOWER SPACE REQUIREMENTS

Tower space requirement in **feet** for the end fed SignalStar antenna array is equal to:

$$\frac{(980)\ X\ (\text{Number of Bays} - 1)}{\text{Frequency in MHz}} + 16 \text{ feet}$$

For center fed subtract 6 feet.

Tower space requirement in **meters** for the end fed antenna is equal to:

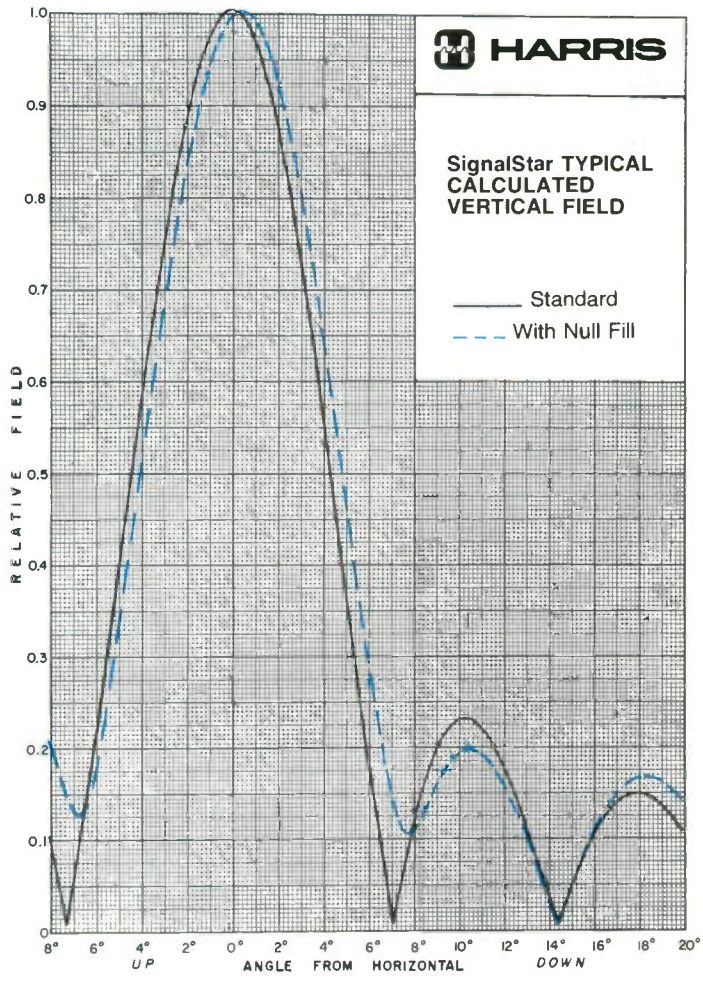
$$\frac{(298.7)\ X\ (\text{Number of Bays} - 1)}{\text{Frequency in MHz}} + 5 \text{ meters}$$

For center fed subtract two meters.

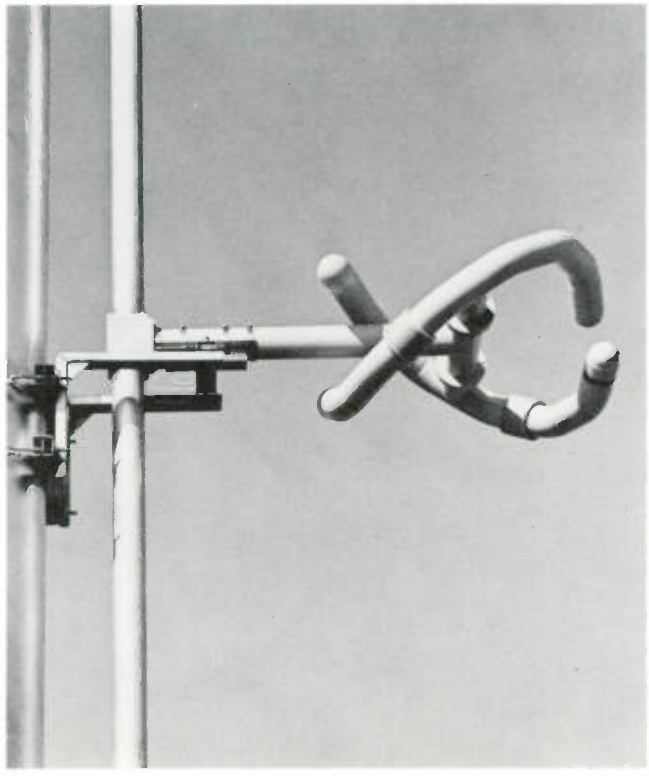
These formulas provide a structure with five feet above and below the array. Each radiating element extends approximately 15 inches (38 cm) above the center of the element. End fed antennas are supplied with a 72 inch (183 cm) matching transformer section that is attached to the bottom of the element array. On center fed models, this same matching transformer is connected at the center of the antenna array.

DELIVERING THE SIGNAL TO THE LISTENER

When selecting FM antennas, a compromise in product quality is a compromise in signal delivery. With the Harris SignalStar antenna, there are no compromises in quality. From its excellent radiation characteristics to the corrosion resistant mounting hardware, the Harris SignalStar antenna will deliver a strong signal to your listeners over many years of trouble-free service.



Calculated vertical field of Harris eight bay SignalStar FM antenna. Solid line represents no beam tilt or null fill. Dashed blue line represents 0.5° beam tilt and 10% first null fill.



SPECIFICATIONS AND ORDERING INFORMATION

Harris Part No.	Model Configuration	Power Gain	DB Gain	Type Feed	Female 50 OHM Input	Power Input Capability	Calculated Weight	Calculated Wind Load	Calculated Weight with Radome and Brackets	Calculated Wind Load with Radome and Brackets
"A" MODEL, 3⅛" INTERBAY LINE, 3⅛" ELEMENT STEM										
710-0473-000	FMXH-1AE	0.4611	−3.3623	End	3⅛"	32kW	119	147	190	364
710-0474-000	FMXH-2AE	0.9971	−0.0128	End	3⅛"	32kW	230	314	381	752
710-0475-000	FMXH-2AC	0.9971	−0.0128	Center	3⅛"	39kW	255	329	390	759
710-0476-000	FMXH-2AC6	0.9971	−0.0128	Center	6⅛"	64kW	306	431	441	995
710-0477-000	FMXH-3AE	1.5588	1.9278	End	3⅛"	32kW	341	480	573	1,140
710-0478-000	FMXH-4AE	2.1332	3.2903	End	3⅛"	32kW	452	647	764	1,528
710-0479-000	FMXH-4AC	2.1332	3.2903	Center	3⅛"	39kW	477	662	773	1,535
710-0480-000	FMXH-4AC6	2.1332	3.2903	Center	6⅛"	64kW	528	768	824	1,780
710-0481-000	FMXH-5AE	2.7154	4.3384	End	3⅛"	32kW	563	814	956	1,915
710-0482-000	FMXH-6AE	3.3028	5.1888	End	3⅛"	32kW	574	981	1,147	2,304
710-0483-000	FMXH-6AC	3.3028	5.1888	Center	3⅛"	39kW	699	996	1,156	2,310
710-0484-000	FMXH-6AC6	3.3028	5.1888	Center	6⅛"	64kW	750	1,106	1,207	2,565
710-0485-000	FMXH-7AE	3.8935	5.9034	End	3⅛"	32kW	785	1,148	1,339	2,692
710-0486-000	FMXH-8AE	4.4872	6.5197	End	3⅛"	32kW	896	1,315	1,530	3,080
710-0487-000	FMXH-8AC	4.4872	6.5197	Center	3⅛"	39kW	921	1,330	1,439	3,086
710-0488-000	FMXH-8AC6	4.4872	6.5197	Center	6⅛"	64kW	972	1,443	1,490	3,348
710-0489-000	FMXH-10AC	5.6800	7.5435	Center	3⅛"	39kW	1,143	1,663	1,923	3,862
710-0490-000	FMXH-10AC6	5.6800	7.5435	Center	6⅛"	64kW	1,194	1,780	1,974	4,134
710-0491-000	FMXH-12AC	6.8781	8.3747	Center	3⅛"	39kW	1,365	1,997	2,305	4,638
710-0492-000	FMXH-12AC6	6.8781	8.3747	Center	6⅛"	64kW	1,416	2,118	2,356	4,919
"B" MODEL, 4⅛" INTERBAY LINE, 4⅛" ELEMENT STEM										
710-0493-000	FMXH-1BE	0.4611	−3.3623	End	6⅛"	40kW	165	214	229	434
710-0494-000	FMXH-2BE	0.9971	−0.0128	End	6⅛"	56kW	303	420	431	860
710-0495-000	FMXH-2BC	0.9971	−0.0128	Center	6⅛"	80kW	342	481	470	921
710-0496-000	FMXH-3BE	1.5888	1.9278	End	6⅛"	56kW	441	626	633	1,286
710-0497-000	FMXH-4BE	2.1332	3.2903	End	6⅛"	56kW	579	831	835	1,712
710-0498-000	FMXH-4BC	2.1332	3.2903	Center	6⅛"	112kW	618	892	874	1,775
710-0499-000	FMXH-5BE	2.7154	4.3384	End	6⅛"	56kW	717	1,037	1,037	2,138
710-0500-000	FMXH-6BE	3.3028	5.1888	End	6⅛"	56kW	855	1,242	1,239	2,564
710-0501-000	FMXH-6BC	3.3028	5.1888	Center	6⅛"	112kW	894	1,303	1,278	2,625
710-0502-000	FMXH-7BE	3.8935	5.9034	End	6⅛"	56kW	993	1,448	1,441	2,990
710-0503-000	FMXH-8BE	4.4872	6.5197	End	6⅛"	56kW	1,131	1,654	1,643	3,416
710-0504-000	FMXH-8BC	4.4872	6.5197	Center	6⅛"	112kW	1,170	1,715	1,682	3,475
710-0505-000	FMXH-10BC	5.6800	7.5435	Center	6⅛"	112kW	1,446	2,126	2,086	4,325
710-0506-000	FMXH-12BC	6.8781	8.3747	Center	6⅛"	112kW	1,722	2,537	2,490	5,175
"C" MODEL, 6⅛" INTERBAY LINE, 4⅛" ELEMENT STEM										
710-0507-000	FMXH-1CE	0.4611	−3.3623	End	6⅛"	40kW	211	273	274	493
710-0508-000	FMXH-2CE	0.9971	−0.0128	End	6⅛"	80kW	416	533	544	973
710-0509-000	FMXH-3CE	1.5888	1.9278	End	6⅛"	120kW	621	793	813	1,453
710-0510-000	FMXH-4CE	2.1332	3.2903	End	6⅛"	120kW	826	1,053	1,082	1,933
710-0511-000	FMXH-5CE	2.7154	4.3384	End	6⅛"	120kW	1,031	1,313	1,351	2,413
710-0512-000	FMXH-6CE	3.3023	5.1888	End	6⅛"	120kW	1,236	1,573	1,620	2,893

FOOTNOTES–(Apply to all models) 1. Horizontal and vertical power gain and dB gain are the same. 2. Power input capability up to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3. Windload based on 50/33 PSF. 112 m.p.h. actual wind velocity. NOTE: Brackets included in weight and windload calculations. 4. Heaters add 4 lbs. to each half loop for a single bay. Heater box, hardware, interbay connecting A.C. cable, and copper conduit add a total of 7 lbs. to each bay. The total effect of adding heaters is 15 lbs. per bay level.

HARRIS MAINTAINS A CONTINUOUS PROGRAM OF PRODUCT IMPROVEMENT, AND THEREFORE RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE.

SIGNALSTAR OPTIONS

The following options are available for the SignalStar antenna in order to meet special requirements. Your Harris representative can provide you with additional information.

SignalStar Radomes **710-0530-000**
SignalStar Electrical Deicers (less control sensor) **710-0532-000**
Mounting Brackets for Special Tower Configurations
SignalStar Pattern Optimization for a 24 inch uniform cross sectional tower
SignalStar Custom Pattern Measurement and Optimization for other structures

HARRIS CORPORATION BROADCAST TRANSMISSION DIVISION
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200

ADV. 656A PTD. IN U.S.A.

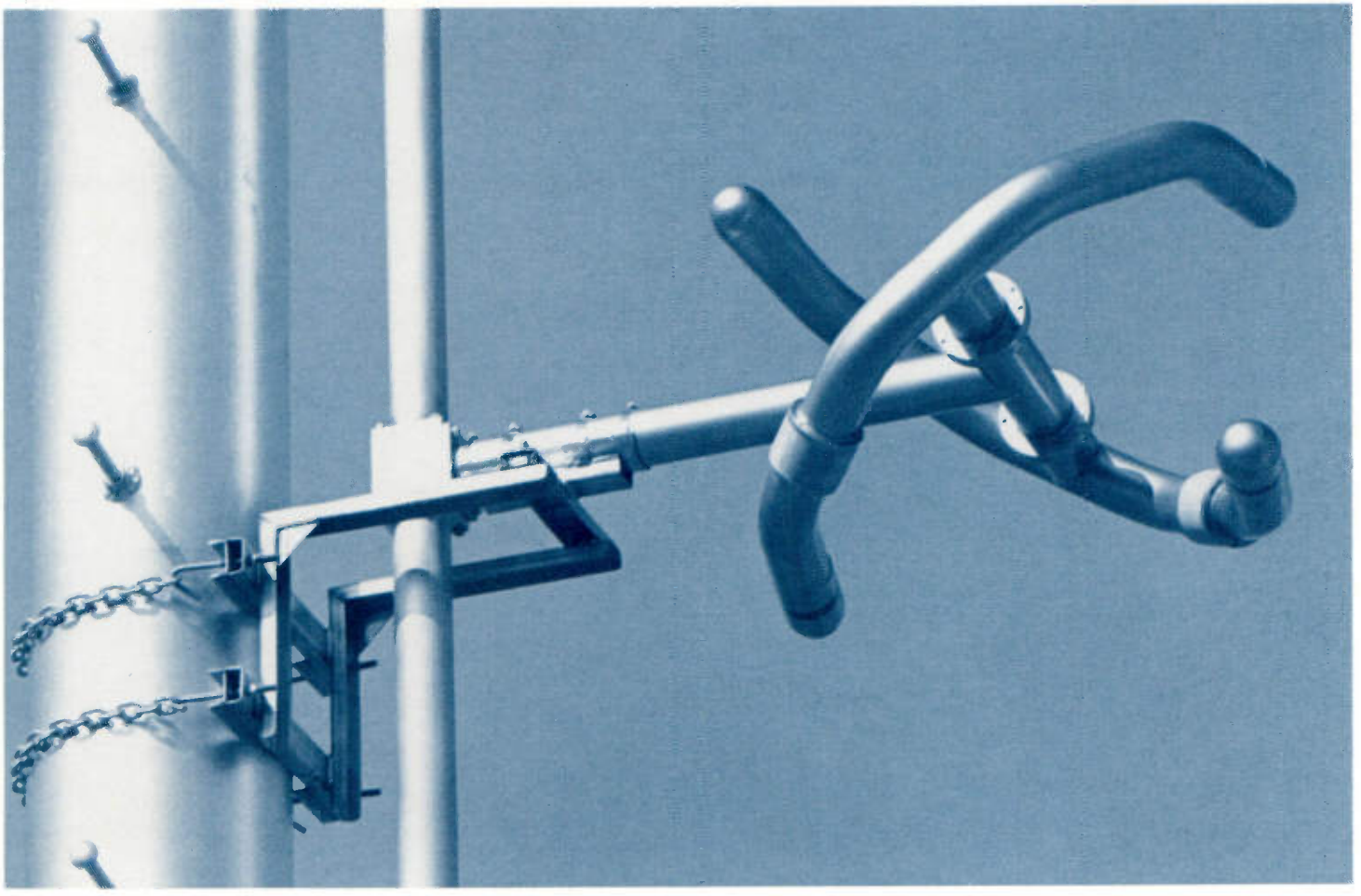
HARRIS

FMH
SUPER-POWER
CIRCULARLY POLARIZED
FM ANTENNA

- **High input power rating permits flexibility in transmitting system design**
- **Capable of multi-station operation**
- **Excellent bandwidth characteristics minimize VSWR and related signal degradation**
- **Internal element feed point minimizes weather related VSWR problems**
- **Rugged brass element construction, along with stainless steel support brackets and hardware, impedes corrosion**

The Harris super-power FMH circularly polarized FM antennas feature unusually high power handling capabilities, excellent bandwidth characteristics, and rugged construction. These features provide excellent performance for many years.

RADIATING ELEMENT. The radiating element is of brass construction, and has an outside diameter of 3-⅛". The silver soldered feed point is completely internal, with a pressurized environment up to the feed point. Each element is rated at 40 kW, with the exceptions of the "A" series end fed 1 and 2 bay antennas and the center fed 2 bay, which are rated at 32 and 39 kW respectively. Element ratings are limited only by the average power handling capability of the 3-⅛" rigid coaxial line, which we have conservatively derated from 48 kW to 40 kW.



The rugged construction means these antennas will withstand the most severe weather extremes and wind velocities up to 150 miles per hour.

BANDWIDTH CAPABILITY. The FMH antenna has a low standing wave ratio of 1.07:1 or less, ±200 kHz per given channel with field trimming. VSWR at antenna input without field trimming is 1.2:1 for pole mounting atop a tower. VSWR at antenna input without field trimming is 1.5:1 or less when side mounted on a tower.

Due to the excellent bandwidth characteristics of the radiating element, multi-station operation is possible using a common antenna system. The necessary filtering components are available from Harris for such diplexing or multiplexing operations. Stations having a frequency separation of up to 4 MHz may be diplexed on a common antenna. However, in the case of 40 kW transmitters, a minimum frequency separation of 1.2 MHz is advisable to avoid excessive heating of filter components. Field tuning requiring multiple slug technology may be required for multiple station operation.

CIRCULARITY. The horizontally polarized radiation pattern is omni-directional when the antenna is pole mounted atop a tower, and circularity is typically ±2 dB when the antenna is mounted on a 14" diameter steel pole. When side mounted, the antenna pattern will be somewhat affected by the supporting structure.

DEICING. Due to the excellent design characteristics of the Harris FMH antenna, antenna deicers or radomes are typically not required at antenna heights where radial ice does not exceed ½ inch. Under icing conditions of up to ½ inch, VSWR is typically 1.5:1 or less, assuming the antenna exhibits a normal VSWR of 1.1:1 or less.

Should the antenna's environment be subject to heavier icing conditions, Harris recommends the use of optional FMH radomes or electrical element deicers.

ANTENNA MODELS. The Harris FMH super-power FM antenna is available in three versions. The "A" version uses a 3-⅛" element feed stem, and 3-⅛" rigid interbay line. It is available in 3-⅛" end fed, 3-⅛" center fed and 6-⅛" center fed models, in arrays of up to 16 bays.

The FMH "B" version uses a 4-⅛" element feed stem, and a 4-⅛" rigid interbay line. It is available in either 6-⅛" end fed or 6-⅛" center fed models in arrays of up to 12 bays.

The FMH "C" version uses a 4-⅛" element feed stem, and a 6-⅛" rigid interbay line, with 6-⅛" end feed. It is available in arrays of up to 6 bays.

Each antenna is supplied with a 6-foot input transformer. The input is 50 ohm EIA with either a 3-⅛" flange or a 6-⅛" flange, depending on the model type. All antennas are completely assembled and tuned to the customer's frequency at the factory. Also, pressure testing is done at that time to assure the customer of a leak-free antenna, provided the antenna is properly installed by a qualified erector and is free of damage.

MOUNTING. Stainless steel mounting brackets and hardware are supplied for standard constant cross section towers having less than 4 ft. face or steel poles at no additional cost. Brackets for mounting on tapered towers are available at additional cost.

DIMENSIONS. Each FMH element is approximately 47-½ inches long, and 30 inches high. Weight is approximately 57 pounds per element with line block.

FMH OPTIONS. The following options are available for the FMH antenna in order to meet special requirements. Your Harris representative can provide you with additional option information for your consideration.

- DC shorting stub for lightning protection.
- FMH radomes or electrical deicers.
- Mounting brackets for special tower configurations.
- FMH custom pattern measurements and optimization.

"A" Model, 3⅛" Interbay Line, 3-⅛" Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER[2] INPUT CAPABILITY	CALCULATED WT. [LBS]	CALCULATED[3] WIND-LOAD [LBS]
	POWER	dB				
FMH-1AE	0.4611	-3.3623	3⅛"	32kW	114	137
FMH-2AE	0.9971	-0.0128	3⅛"	32kW	225	304
FMH-2AC	0.9971	-0.0128	3⅛"	39kW	250	319
FMH-2AC6	0.9971	-0.0128	6⅛"	64kW	301	421
FMH-3AE	1.5588	1.9278	3⅛"	32kW	336	470
FMH-4AE	2.1332	3.2903	3⅛"	32kW	447	637
FMH-4AC	2.1332	3.2903	3⅛"	39kW	472	652
FMH-4AC6	2.1332	3.2903	6⅛"	64kW	523	758
FMH-5AE	2.7154	4.3384	3⅛"	32kW	558	804
FMH-6AE	3.3028	5.1888	3⅛"	32kW	669	971
FMH-6AC	3.3028	5.1888	3⅛"	39kW	694	986
FMH-6AC6	3.3028	5.1888	6⅛"	64kW	745	1096
FMH-7AE	3.8935	5.9034	3⅛"	32kW	780	1138
FMH-8AE	4.4872	6.5197	3⅛"	32kW	891	1305
FMH-8AC	4.4872	6.5197	3⅛"	39kW	916	1320
FMH-8AC6	4.4872	6.5197	6⅛"	64kW	967	1433
FMH-10AC	5.6800	7.5435	3⅛"	39kW	1138	1653
FMH-10AC6	5.6800	7.5435	6⅛"	64kW	1189	1770
FMH-12AC	6.8781	8.3747	3⅛"	39kW	1360	1987
FMH-12AC6	6.8781	8.3747	6⅛"	64kW	1411	2108

"B" Model, 4⅛" Interbay Line, 4-⅛" Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER[2] INPUT CAPABILITY	CALCULATED WT. [LBS]	CALCULATED[3] WIND-LOAD [LBS]
	POWER	dB				
FMH-1BE	0.4611	-3.3623	6⅛"	40kW	159	201
FMH-2BE	0.9971	-0.0128	6⅛"	56kW	297	407
FMH-2BC	0.9971	-0.0128	6⅛"	80kW	336	468
FMH-3BE	1.5888	1.9278	6⅛"	56kW	435	613
FMH-4BE	2.1332	3.2903	6⅛"	56kW	573	818
FMH-4BC	2.1332	3.2903	6⅛"	112kW	612	879
FMH-5BE	2.7154	4.3384	6⅛"	56kW	711	1024
FMH-6BE	3.3028	5.1888	6⅛"	56kW	849	1229
FMH-6BC	3.3028	5.1888	6⅛"	112kW	888	1290
FMH-7BE	3.8935	5.9034	6⅛"	56kW	987	1435
FMH-8BE	4.4872	6.5197	6⅛"	56kW	1125	1641
FMH-8BC	4.4872	6.5197	6⅛"	112kW	1164	1702
FMH-10BC	5.6800	7.5435	6⅛"	112kW	1440	2113
FMH-12BC	6.8781	8.3747	6⅛"	112kW	1716	2524

"C" Model, 6-⅛" Interbay Line, 4-⅛" Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER[2] INPUT CAPABILITY	CALCULATED WT. [LBS]	CALCULATED[3] WIND-LOAD [LBS]
	POWER	dB				
FMH-1CE	0.4611	-3.3623	6⅛"	40kW	205	260
FMH-2CE	0.9971	-0.0128	6⅛"	80kW	410	520
FMH-3CE	1.5888	1.9278	6⅛"	120kW	615	780
FMH-4CE	2.1332	3.2903	6⅛"	120kW	820	1040
FMH-5CE	2.7154	4.3384	6⅛"	120kW	1025	1300
FMH-6CE	3.3028	5.1888	6⅛"	120kW	1230	1560

FOOTNOTES - (Apply to all models)

1. Horizontal and vertical power gain are the same. 2. Power input capability to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3. Windload based on 50/33 PSF. 112 m.p.h. actual wind velocity. NOTE: Brackets included in weight and windload calculations.

HARRIS CORPORATION BROADCAST GROUP
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ADV. 462D PTD. IN U.S.A.

HARRIS

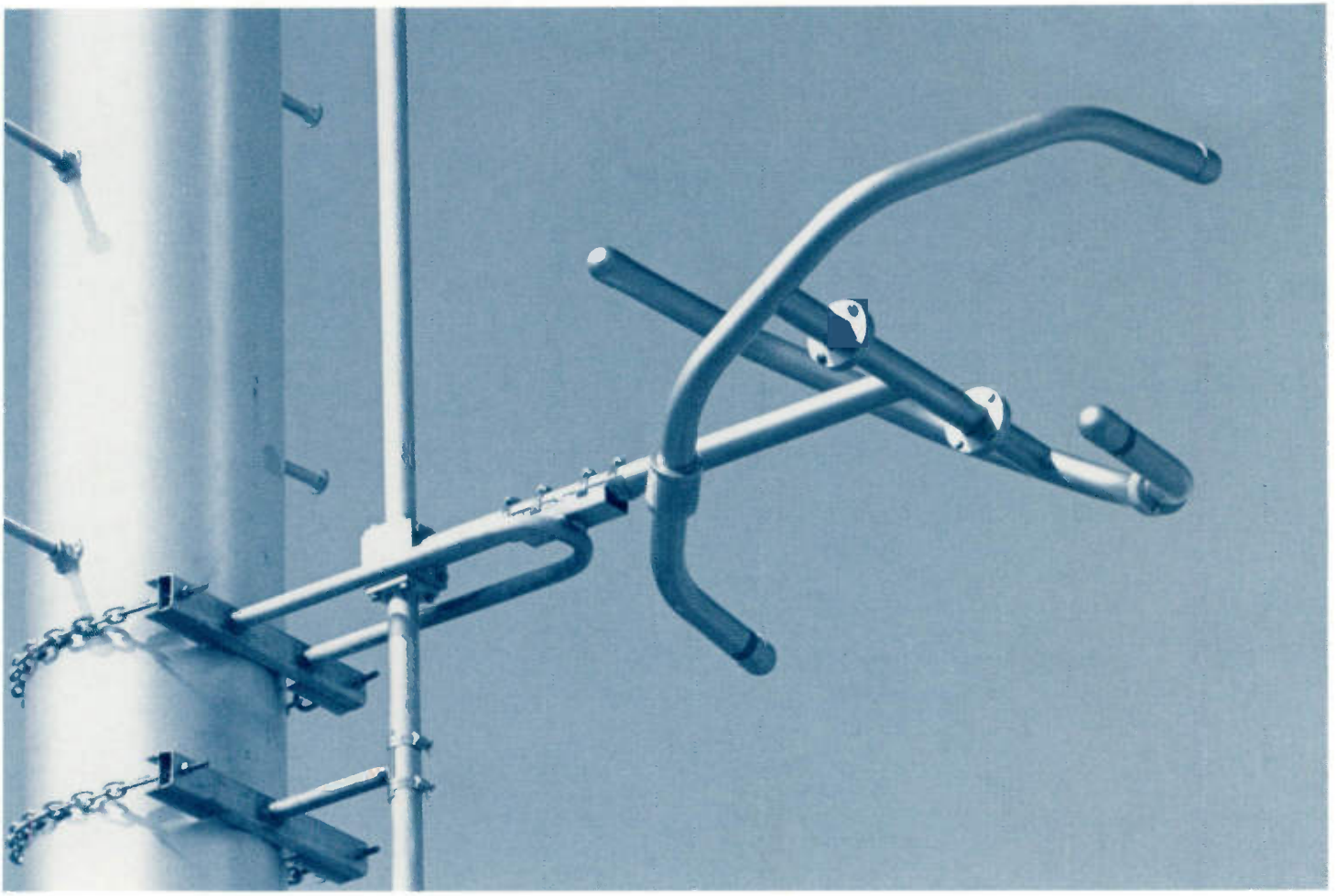
FML LOW POWER CIRCULARLY POLARIZED FM ANTENNA

- **High input power rating permits flexibility in transmitting system design**
- **Rugged brass element construction with stainless steel support brackets impedes corrosion to insure long, trouble-free life**
- **Excellent bandwidth minimizes VSWR and related signal degradation**
- **Custom pattern optimization service available to meet special requirements**

The Harris low power FML circularly polarized FM antenna features excellent bandwidth characteristics and the same rugged construction as Harris' higher-power FM antennas to insure top service and long life.

RADIATING ELEMENT. The radiating element of the FML antenna is of brass tubular construction, with an outside diameter of 1-¾ inches. The feed point is completely internal, with a pressurized environment up to the feed point. This Harris feature minimizes weather related problems common in other FM broadcast antennas.

ANTENNA MODELS. Two versions of the FML are available. The "E" version is an end fed model mounted on 1-⅝ inch, 50 ohm rigid line. The "C" version is center fed, and uses 3-⅛ inch, 50 ohm rigid line.



End fed models have a power input capability of 9 kW, limited by the average power capability of the 1-⅝ inch rigid coaxial line, which we have conservatively derated from 15 kW to 9 kW. The center fed versions have a power input capability of 12 kW with the 3-⅛ inch input feed. Each antenna comes with a 6 foot input transformer. The antenna system feed point is 6 feet below the bottom bay for end fed models, and approximately 6 feet below the center of the antenna for center fed antenna systems. The input is standard 1-⅝ inch EIA female flange for end fed models, and 3-⅛ inch EIA female flange for center fed models.

The element stem is of heavy wall brass tubing assuring that the element will withstand rugged environmental conditions.

RADIATION PATTERN. Complete antenna patterning facilities are available for measuring the antenna radiation patterns. An electrically equivalent full size tower section, approximately 20 feet long, is set up on the antenna range. The exact size and location of the ladder, coaxial transmission lines, conduits and cables are duplicated on this tower section, and an identical antenna element is mounted on the tower for such measurements.

Pattern optimization for the vertical polarization component, or both vertical and horizontal polarization components is available to improve the pattern circularity. Antenna pattern measurement and optimization is at additional cost.

BANDWIDTH CAPABILITY. The FML antenna has a low standing wave ratio of 1.1:1 or less, ±200 kHz per given channel with field trimming. VSWR at antenna input, without field trimming is 1.2:1 for pole mounting atop a tower. VSWR at antenna input, without field trimming, is 1.5:1 or less, when side mounted on a tower.

CIRCULARITY. The horizontally polarized radiation pattern is omnidirectional when the antenna is pole mounted, and circularity is typically ±2 dB when the antenna is mounted on a 14 inch diameter steel pole. When side mounted, the antenna pattern will be affected by the structure.

DEICING. Due to the excellent design characteristics of the Harris FML antenna, antenna deicers or radomes are typically not required at antenna heights where radial ice does not exceed ½ inch. Under icing conditions of up to ½ inch, VSWR is typically 1.5:1 or less, assuming the antenna exhibits a normal VSWR of 1.1:1 or less.

Should the antenna's environment be subject to a heavier icing condition, Harris recommends the use of optional FML radomes or electrical element deicers.

CONSTRUCTION. The radiating element and support stem are of brass tubular construction, using thick wall brass in the support stem. This provides a rugged construction capable of survival under severe weather extremes and with wind velocities up to 150 miles per hour (90 lbs. per square foot on flat members, 60 lbs. per square foot on cylindrical members).

Each antenna is completely assembled and tuned to the customer's frequency at the factory. The antenna is also pressure tested at that time in order to assure an antenna free of leaks.

The mounting brackets are supplied for uniform cross section towers having face dimensions of less than 4 feet or steel poles. Brackets for mounting on tapered towers are available at extra cost. All brackets and hardware are made of stainless steel.

FML OPTIONS. The following options are available for the FML antenna in order to meet special requirements. Your Harris representative can provide you with additional information for your consideration.

- DC shorting stub for lightning protection.
- FML radomes or electrical deicers.
- Mounting brackets for special tower configurations.
- FML custom pattern measurements and optimization.

FML LOW POWER CIRCULARLY POLARIZED FM ANTENNAS

TYPE NO.	POWER GAIN[1]		TYPE FEED	FEMALE 50 OHM INPUT	POWER[2] INPUT CAPABILITY	CALCULATED WEIGHT [LBS.]	CALCULATED[3] WIND LOAD [LBS.]
	POWER	dB					
FML-1E	0.4611	-3.3623	END	1-⅝"	9 kW	57	102
FML-2E	0.9971	-0.0128	END	1-⅝"	9 kW	114	212
FML-3E	1.5588	1.9278	END	1-⅝"	9 kW	170	323
FML-4E	2.1322	3.2903	END	1-⅝"	9 kW	227	433
FML-4C	2.1322	3.2903	CENTER	3-⅛"	12 kW	260	509
FML-5E	2.7154	4.3384	END	1-⅝"	9 kW	283	543
FML-5C	2.7154	4.3384	OFF CENTER	3-⅛"	12 kW	317	620
FML-6E	3.3028	5.1888	END	1-⅝"	9 kW	340	654
FML-6C	3.3028	5.1888	CENTER	3-⅛"	12 kW	373	730
FML-7E	3.8935	5.9034	END	1-⅝"	9 kW	396	764
FML-7C	3.8935	5.9034	OFF CENTER	3-⅛"	12 kW	430	840
FML-8E	4.4872	6.5197	END	1-⅝"	9 kW	453	874
FML-8C	4.4872	6.5197	CENTER	3-⅛"	12 kW	486	950
FML-9C	5.0826	7.0608	OFF CENTER	3-⅛"	12 kW	543	1060
FML-10C	5.6800	7.5435	CENTER	3-⅛"	12 kW	599	1171
FML-11C	6.2783	7.9785	OFF CENTER	3-⅛"	12 kW	656	1281
FML-12C	6.8781	8.3747	CENTER	3-⅛"	12 kW	712	1391
FML-13C	7.4785	8.7381	OFF CENTER	3-⅛"	12 kW	769	1501
FML-14C	8.0800	9.0741	CENTER	3-⅛"	12 kW	825	1612

FOOTNOTES. 1. Horizontal and vertical power gain and dB gain are the same. 2. Power input capability up to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3. Wind load based on 112 mph wind velocity (50/30 psf) and the wind blowing normal to the side of the antenna. Weight and wind load calculations include brackets, interbay line and the transformer section. Calculations based on the frequency of 95 MHz.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

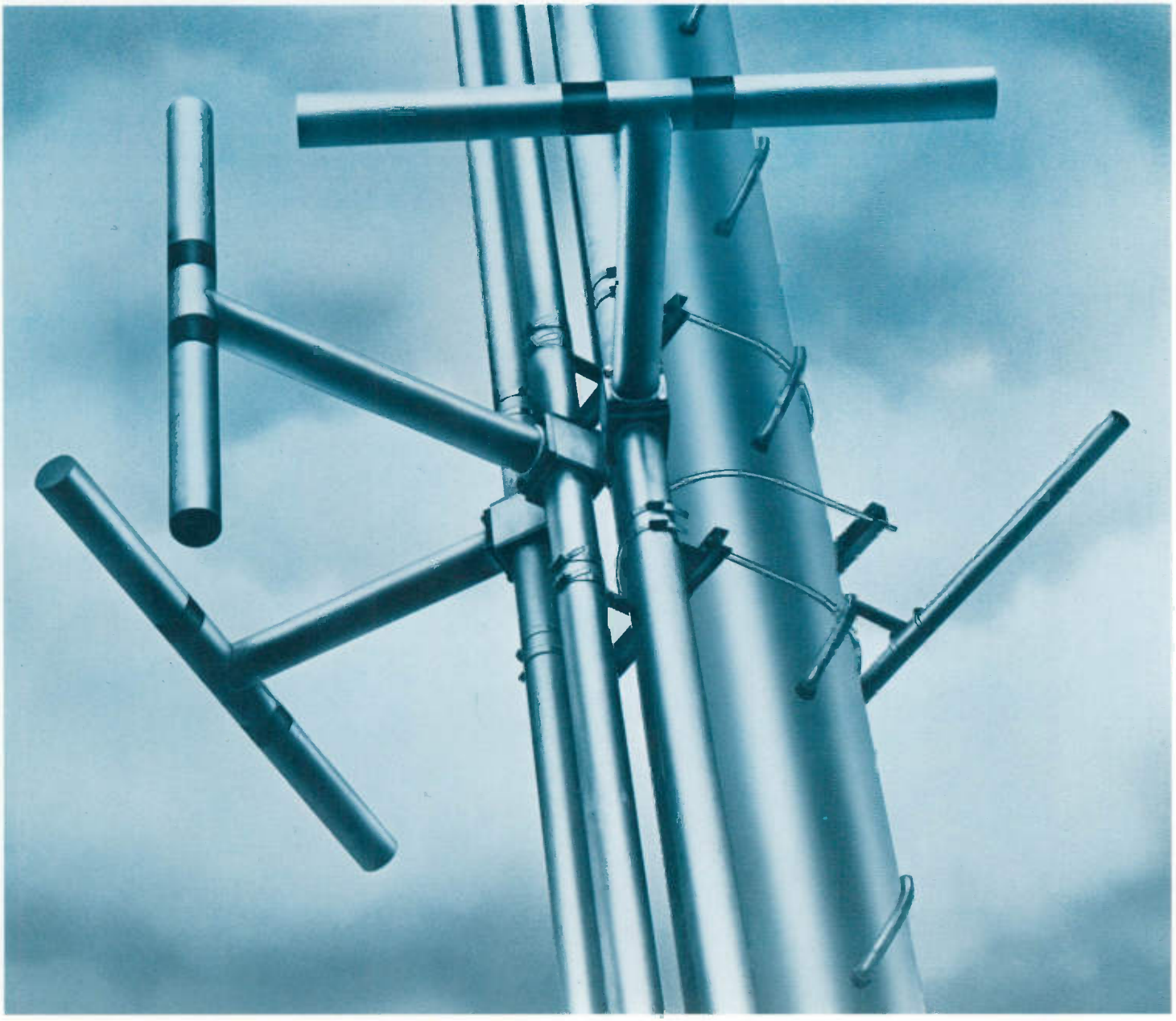
HARRIS CORPORATION BROADCAST GROUP
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200

ADV. 519F PTD. IN U.S.A.

HARRIS
COMMUNICATIONS AND
INFORMATION HANDLING

DIRECTIONAL DUAL POLARIZED FM ANTENNA

- No de-icing required under normal environmental conditions
- Internal feed point to radiating element
- Pattern tested
- Field trimming normally not required
- High power handling capability
- Rugged brass construction
- Stainless steel support brackets
- Wide bandwidth characteristics



Harris' FMD-(X) is a directional dual polarized FM antenna designed for pole mounting. It is available with up to eight bays and with either 1- 5⅛ inch or 3- 1⅝ inch EIA 50 ohm female input. The "X" in the type number indicates the number of bays. The suffix "A" following the complete type number signifies 1- 5⅛ " input and the suffix "B" indicates 3- 1⅝ " input. (Example—FMD-4A is a 4-bay antenna with 1- 5⅛ " input).

UP TO 40 KW INPUT POWER. The maximum power input capability for the "A" series is 12 kilowatts. The maximum power input capability for the "B" series is 20 kilowatts for a single bay, and 40 kilowatts for two (2) through eight (8) bays.

The interbay lines use 3- 1⅝ inch rigid, with three such lines used between bays, two for the horizontal element feeds and one for the vertical element feeds. A combiner, for combining the three transmission line feeds, is used below the bottom bay. A six foot transformer section is used immediately below this combiner.

BROADBAND DIPOLE ELEMENTS. The antenna uses broadband 3- 1⅝ " diameter dipole elements, and these will not require deicing under normal environmental conditions. Each bay level normally uses two driven horizontal elements, one horizontal parasitic reflector and one driven vertical element. In some cases, vertical parasitic elements may be used on each bay for the purpose of further shaping the vertical polarization component.

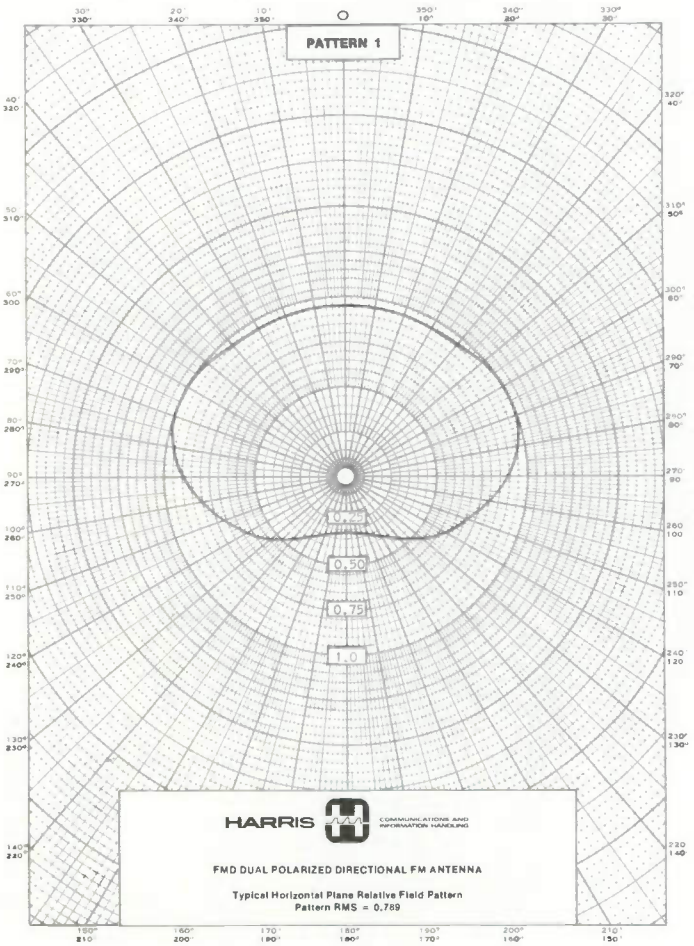
Heaters are not normally required for antenna deicing purposes due to the excellent bandwidth characteristics exhibited by the antenna. Typically, as measured between 1.5:1 VSWR points, the bandwidth is in the region of 5 to 7 MHz. As a result, the antenna could probably experience icing of up to ¾ inch thickness without the VSWR going above 1.5:1.

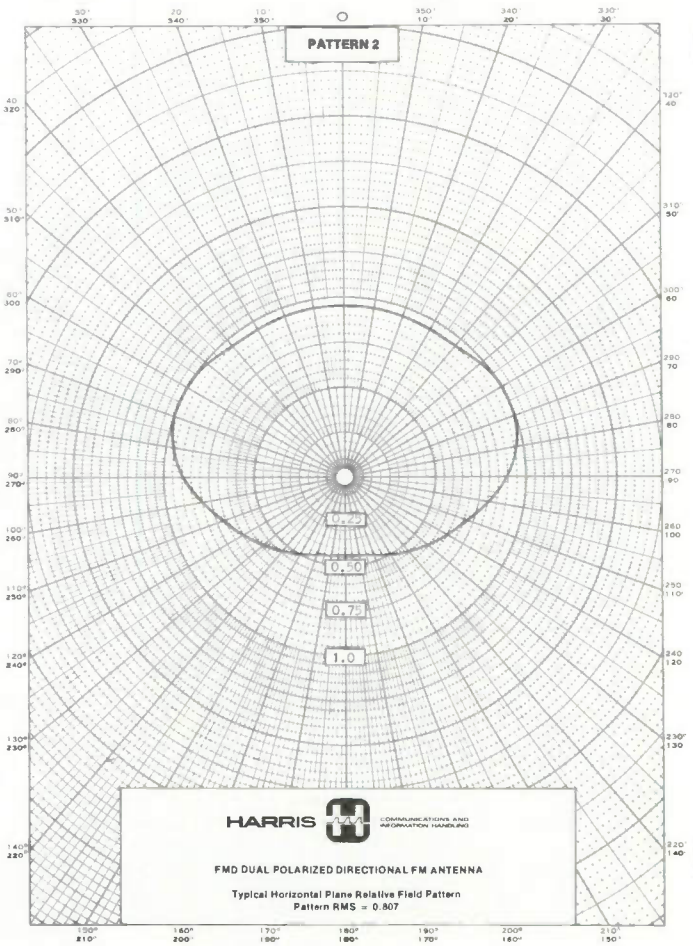
ANTENNA SYSTEM PRESSURIZATION. The antenna system is designed to be pressurized, using dry air or dry nitrogen, and the system should be purged and then pressurized to a positive pressure of approximately 2 to 5 pounds per square inch (0.14 to 0.35 kilograms per square centimeter) immediately following installation.

CUSTOM MOUNTING POLE. The FMD antenna is supplied with a custom matching pole, thereby permitting the support pole to be drop shipped directly to the customer. The directional antenna may be purchased without the pole only on a special quotation basis, in which case there will be an added engineering charge made, and the cost of the Harris pole deducted from this total price. The pole is a hot dip galvanized pedestal mount, with removable step bolts. For poles 30 feet or more in length the minimum wall thickness is 0.500 inch. A plate is provided on the top of the pole as a support for a beacon. Should a buried pole support be desired, specific requirements will be needed for a special price quotation.

ANTENNAS PATTERNED AT FACTORY. Each Harris FMD directional antenna is patterned on a test range, not at the customer's site. A single bay of the antenna (in accordance with FCC pattern test requirements) is mounted on a pole identical (or electrically equivalent) to that on which the antenna is to be finally installed. If the customer supplies his own pole, then complete data on the pole must be submitted for final pattern testing.

The antenna is patterned with the test pole erected vertically on a turntable on the antenna range, and measurements made in the xy, or horizontal plane, for both the horizontal and vertical polarization components. Normally, the antenna bay being patterned is operated in the transmitting mode. A special dipole





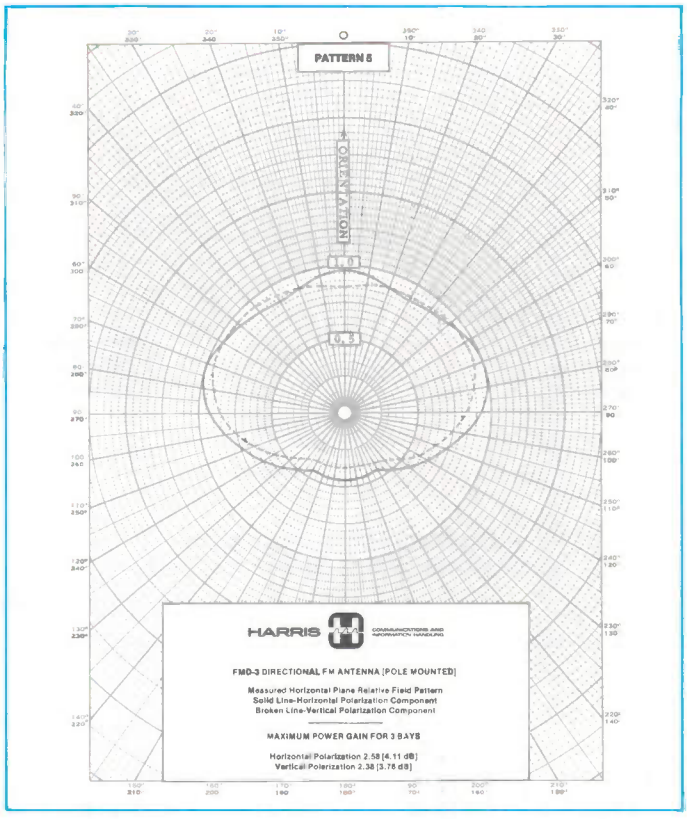
receiving antenna, located a sufficient distance away, is used with its output feeding an accurate field intensity meter, and the pattern of the antenna plotted as the test pole is rotated. Patterns for each of the two polarization components are plotted separately. Adjustments are made to the antenna bay in order to achieve a suitable antenna radiation pattern.

The complete antenna is assembled on a steel pole and carefully tuned at the factory. As a result, field trimming should normally not be required.

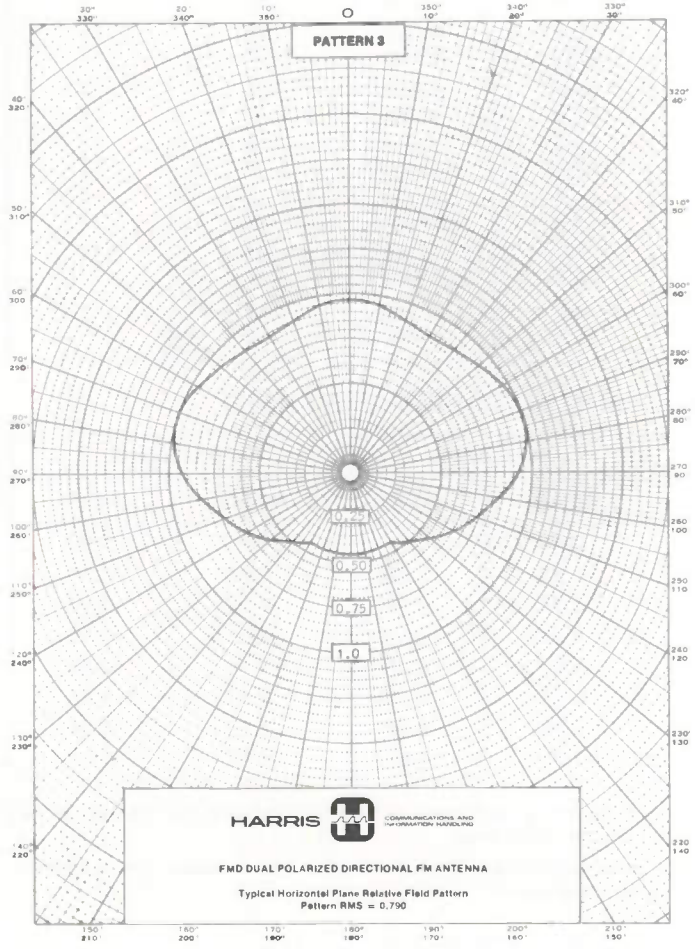
The final pattern achieved may be expected to differ slightly from the initial pattern proposed, so it may be necessary to file an application to modify the construction permit to comply with the exact measured pattern, which the customer will receive upon the completion of the antenna pattern tests.

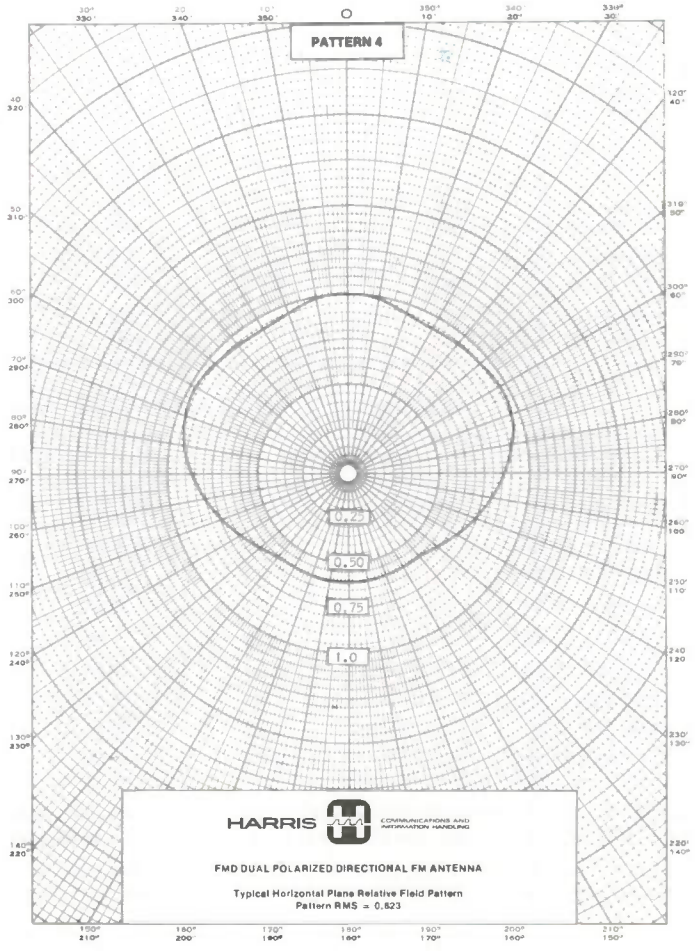
Following the completion of the final patterning of the antenna, Harris will provide the station, and/or its consultant, with the final measured antenna radiation pattern, calculated gain data, and the details of the antenna pattern measurement procedure. This final data is then submitted by the station to the FCC or other broadcasting authority.

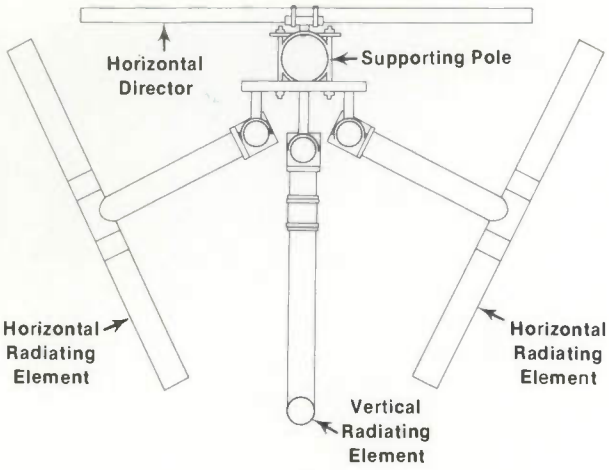
ORDERING INFORMATION. Orders for the Harris Dual Polarized Directional FM Antenna should specify the desired true azimuth orientation, maximum ERP permitted, radiated power limitations and their true orientation, transmission line efficiency (or specify the type of transmission line and its length), and the transmitter power output capability. Such antenna pattern requirements are normally specified by the stations's consultant. Ideally, a copy of the FCC construction permit should be supplied so that the manufacturer can assure full compliance with the requirements of such authorization relative to the antenna.



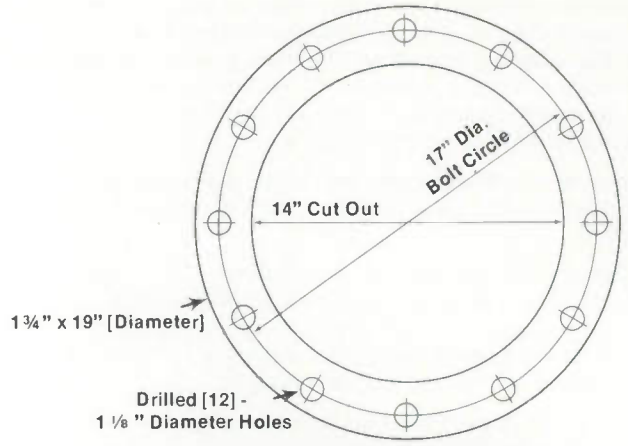
The pattern shown above is that of a three-bay Harris FMD-3 Dual Polarized Directional FM Antenna designed specifically for the 107.7 MHz frequency.







HARRIS FMD DUAL POLARIZED
DIRECTIONAL FM ANTENNA-TOP VIEW



POLE MOUNTING FLANGE
For Harris Dual Polarized
Directional FM Antenna
[Does not apply to FMD-1A or 1B]

ELECTRICAL AND MECHANICAL DATA

HARRIS TYPE NO.	INPUT POWER RATING KW	FEMALE INPUT FLANGE	POLE LENGTH FT	WEIGHT POLE AND ANTENNA LBS	TOTAL WIND LOAD [BASED ON 50/33 PSF] LBS	OVER-TURNING MOMENT FT LBS	HEIGHT ELEC-TRICAL CENTER ABOVE TOWER TOP FT	BOLT CIRCLE DIAMETER INCHES
FMD-1A	12	1 5/8 "	20	606	796	9595	16	9
FMD-1B	20	3 1/8 "	20	626	832	10000	16	9
FMD-2A	12	1 5/8 "	30	2240	1821	30024	21	17
FMD-2B	40	3 1/8 "	30	2260	1856	30593	21	17
FMD-3A	12	1 5/8 "	40	2994	2557	54917	26	17
FMD-3B	40	3 1/8 "	40	3014	2593	55682	26	17
FMD-4A	12	1 5/8 "	50	4245	3490	89308	31	17
FMD-4B	40	3 1/8 "	50	4265	3526	90254	31	17
FMD-5A	12	1 5/8 "	62	5901	4680	153210	38	17
FMD-5B	40	3 1/8 "	62	5921	4716	154407	38	17
FMD-6A	12	1 5/8 "	72	7956	5523	208204	43	17
FMD-6B	40	3 1/8 "	72	7976	5559	209581	43	17
FMD-7A	12	1 5/8 "	82	9250	6350	271315	48	17
FMD-7B	40	3 1/8 "	82	9270	6386	272872	48	17
FMD-8A	12	1 5/8 "	92	11305	7192	343159	53	17
FMD-8B	40	3 1/8 "	92	11325	7227	344847	53	17

MAXIMUM POWER GAIN FOR TYPICAL PATTERNS 1-4 ON PREVIOUS PAGES

HARRIS TYPE NO.	PATTERN 1		PATTERN 2		PATTERN 3		PATTERN 4	
	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.
FMD-(1A or 1B)	0.81	0.72	0.79	0.70	0.76	0.70	0.72	0.69
FMD-(2A or 2B)	1.74	1.53	1.70	1.49	1.63	1.50	1.54	1.47
FMD-(3A or 3B)	2.71	2.39	2.64	2.33	2.54	2.34	2.39	2.29
FMD-(4A or 4B)	3.70	3.26	3.61	3.18	3.47	3.19	3.26	3.13
FMD-(5A or 5B)	4.71	4.14	4.58	4.03	4.40	4.05	4.14	3.98
FMD-(6A or 6B)	5.71	5.03	5.56	4.90	5.35	4.92	5.03	4.83
FMD-(7A or 7B)	6.73	5.92	6.55	5.77	6.29	5.79	5.92	5.68
FMD-(8A or 8B)	7.75	6.82	7.55	6.64	7.25	6.67	6.82	6.54

NOTE: The above power gain figures are approximate only, but are useful as a guide in determining the number of bays required. The gain figures will vary with the pattern shape, and the exact gain figures are determined when the final antenna pattern is achieved.

The power gain for the vertical polarization component is less than the horizontal polarization component since it will differ a bit in shape, and in addition, the vertically polarized component can not exceed the horizontally polarized component at any azimuth.

HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street, Quincy, Illinois 62301

HARRIS
COMMUNICATIONS AND
INFORMATION HANDLING

FMH SUPER-POWER CIRCULARLY POLARIZED FM ANTENNA

- High power handling capability
- Internal feed point to radiating element
- Multi-station capability
- Excellent bandwidth characteristics
- Rugged brass construction
- Silver plated inner-conductor connectors
- Radiused element tips to avoid corona problems
- Stainless steel support brackets and hardware
- Special vertical/horizontal power splits available

The Harris super-power FMH circularly polarized FM antennas feature unusually high power handling capabilities, excellent bandwidth characteristics, and multi-station capability.

RADIATING ELEMENT. The radiating element is of brass construction, and has an outside diameter of 3-⅛ ". The feed point is completely internal, with a pressurized environment up to the feed point. Each element is rated at 40 kW, with the exceptions of the "A" series end fed 1 and 2 bay antennas and the center fed 2 bay, which are rated at 32, 35 and 39 kW respectively. Element ratings are limited only by the average power handling capability of the 3-⅛ " rigid coaxial line, which we have conservatively derated from 48 kW to 40 kW.

The rugged construction means these antennas will withstand the most severe weather extremes and wind velocities up to 150 miles per hour.

BANDWIDTH CAPABILITY. The FMH antenna has a low standing wave ratio of 1.07:1 or less, ± 200 kHz per given channel with field trimming. VSWR at antenna input without field trimming is 1.1:1 for pole mounting atop a tower. VSWR at antenna input without field trimming is 1.5:1 or less when side mounted on a tower.

Due to the excellent bandwidth characteristics of the radiating element, multi-station operation is possible using a common antenna system. The necessary filtering components are available from Harris for such diplexing or multiplexing operations. Stations having a frequency separation of up to 4 MHz may be diplexed on a common antenna. However, in the case of 40 kW transmitters, a minimum frequency separation of 1.2 MHz is advisable to avoid excessive heating of filter components.

CIRCULARITY. The horizontal plane radiation pattern is omni-directional when the antenna is pole mounted atop a tower, and circularity is typically ± 2 dB when the antenna is mounted on a 14" diameter steel pole. When side mounted, the antenna pattern will be somewhat affected by the supporting structure.

DEICING. Deicers are not required in a normal environment, as the typical VSWR is 1.5:1 or less with ½-inch of radial ice. However, heaters for deicing are available.

ANTENNA MODELS. The Harris FMH super-power FM antenna is available in three versions. The "A" version uses a 3-⅛ " element feed stem, and 3-⅛ " rigid interbay line. It is available in 3-⅛ " end fed, 3-⅛ " center fed and 6-⅛ " center fed models, in arrays of up to 12 bays.

The FMH "B" version uses a 4-⅛ " element feed stem, and a 4-⅛ " rigid interbay line. It is available in either 6-⅛ " end fed or 6-⅛' center fed models in arrays of up to 12 bays.

The FMH "C" version uses a 4-⅛ " element feed stem, and 6-⅛ " rigid interbay line, with 6-⅛ " end feed. It is available in arrays of up to 6 bays.

Each antenna is supplied with a 6-foot input transformer. The input is 50 ohm EIA with either a 3-⅛ " flange or a 6-⅛ " flange, depending on the model type. All antennas are completely assembled and tuned to the customer's frequency at the factory. Also, pressure testing is done at that time to assure the customer of a leak-free antenna, provided the antenna is properly installed by a qualified erector and is free of damage.

MOUNTING. Stainless steel mounting brackets and hardware are supplied for standard constant cross section towers or steel poles at no additional cost. Brackets for mounting on tapered towers are available at additional cost.

DIMENSIONS. Each FMH element is approximately 47-½ inches long, and 30 inches high. Weight is approximately 57 pounds per element with line block.

MODEL NUMBERS. Because of the many variations within each FMH model category, it is helpful in ordering to understand the Harris model numbers:

FMH-1BE

1 = 1 bay
B = "B" Model
E = End Fed

FMH-4AC6

4 = 4 bay
A = "A" Model
C = Center Fed
6 = 6-⅛ " input

"A" Model, 3⅛ " Interbay Line, 3-⅛ " Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER INPUT CAPABILITY[2]	CALCULATED WT. [LBS]	CALCULATED WIND-LOAD[3] [LBS]
	POWER	dB				
FMH-1AE	0.5	-3.36	3⅛ "	32kW	114	137
FMH-2AE	1.0	-0.01	3⅛ "	32kW	225	304
FMH-2AC	1.0	-0.01	3⅛ "	39kW	250	319
FMH-2AC6	1.0	-0.01	6⅛ "	64kW	301	421
FMH-3AE	1.5	1.93	3⅛ "	32kW	336	470
FMH-4AE	2.1	3.29	3⅛ "	32kW	447	637
FMH-4AC	2.1	3.29	3⅛ "	39kW	472	652
FMH-4AC6	2.1	3.29	6⅛ "	64kW	523	758
FMH-5AE	2.7	4.34	3⅛ "	32kW	558	804
FMH-6AE	3.3	5.19	3⅛ "	32kW	669	971
FMH-6AC	3.3	5.19	3⅛ "	39kW	694	986
FMH-6AC6	3.3	5.19	6⅛ "	64kW	745	1096
FMH-7AE	3.9	5.90	3⅛ "	32kW	780	1138
FMH-8AE	4.5	6.52	3⅛ "	32kW	891	1305
FMH-8AC	4.5	6.52	3⅛ "	39kW	916	1320
FMH-8AC6	4.5	6.52	6⅛ "	64kW	967	1433
FMH-10AC	5.7	7.54	3⅛ "	39kW	1138	1653
FMH-10AC6	5.7	7.54	6⅛ "	64kW	1189	1770
FMH-12AC	6.9	8.37	3⅛ "	39kW	1360	1987
FMH-12AC6	6.9	8.37	6⅛ "	64kW	1411	2108

"B" Model, 4⅛ " Interbay Line, 4-⅛" Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER INPUT CAPABILITY[2]	CALCULATED WT. [LBS]	CALCULATED WIND-LOAD[3] [LBS]
	POWER	dB				
FMH-1BE	0.5	-3.36	6⅛ "	40kW	159	201
FMH-2BE	1.0	-0.01	6⅛ "	56kW	297	407
FMH-2BC	1.0	-0.01	6⅛ "	80kW	336	468
FMH-3BE	1.5	1.93	6⅛ "	56kW	435	613
FMH-4BE	2.1	3.29	6⅛ "	56kW	573	818
FMH-4BC	2.1	3.29	6⅛ "	112kW	612	879
FMH-5BE	2.7	4.33	6⅛ "	56kW	711	1024
FMH-6BE	3.3	5.19	6⅛ "	56kW	849	1229
FMH-6BC	3.3	5.19	6⅛ "	112kW	888	1290
FMH-7BE	3.9	5.90	6⅛ "	56kW	987	1435
FMH-8BE	4.5	6.52	6⅛ "	56kW	1125	1641
FMH-8BC	4.5	6.52	6⅛ "	112kW	1164	1702
FMH-10BC	5.7	7.54	6⅛ "	112kW	1440	2113
FMH-12BC	6.9	8.37	6⅛ "	112kW	1716	2524

"C" Model, 6-⅛ " Interbay Line, 4-⅛ " Element Stem

TYPE NO.	POWER GAIN[1]		FEMALE 50 OHM INPUT	POWER INPUT CAPABILITY[2]	CALCULATED WT. [LBS]	CALCULATED WIND-LOAD[3] [LBS]
	POWER	dB				
FMH-1CE	0.5	-3.36	6⅛ "	40kW	205	260
FMH-2CE	1.0	-0.01	6⅛ "	80kW	410	520
FMH-3CE	1.5	1.93	6⅛ "	120kW	615	780
FMH-4CE	2.1	3.29	6⅛ "	120kW	820	1040
FMH-5CE	2.7	4.33	6⅛ "	120kW	1025	1300
FMH-6CE	3.3	5.19	6⅛ "	120kW	1230	1560

FOOTNOTES-(Apply to all models)

1. Horizontal and vertical power gain and dB gain are the same. 2. Power input capability up to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3.Windload based on 50/33 PSF. 112 m.p.h. actual wind velocity NOTE: Brackets included in weight and windload calculations.

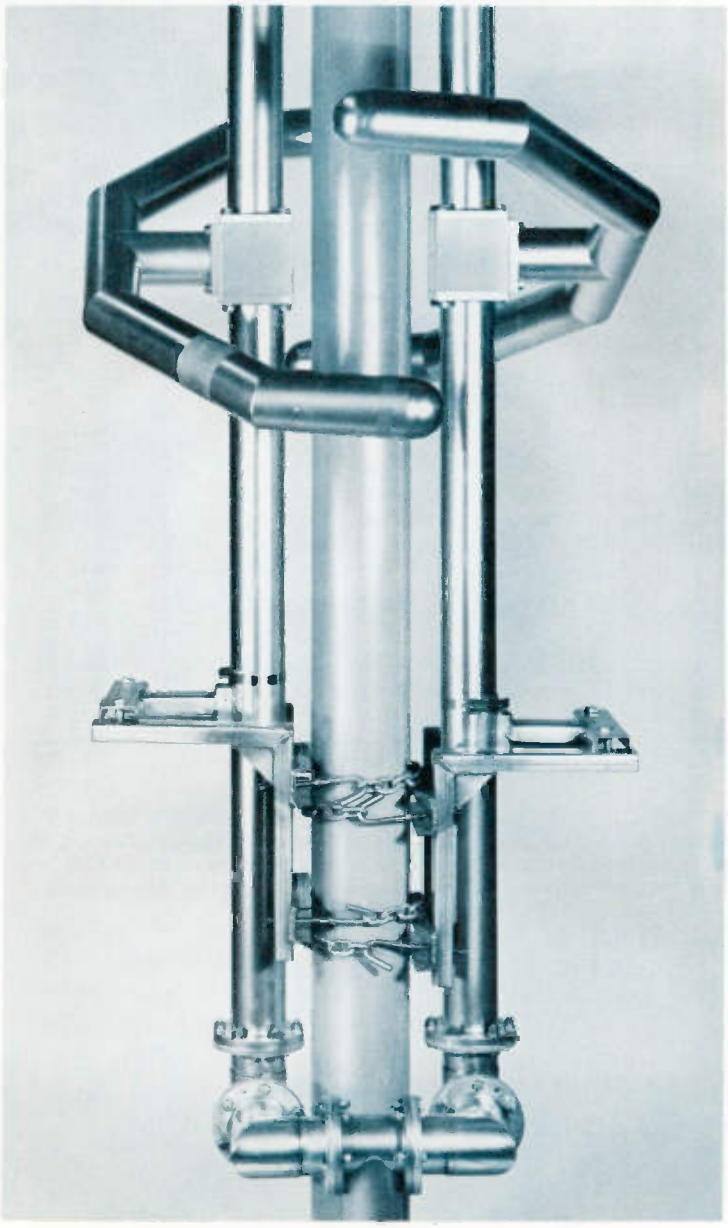
HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street, Quincy, Illinois 62301

CP-5M-776

ADV. 462 PTD. IN U.S.A.

HARRIS
COMMUNICATIONS AND
INFORMATION HANDLING

FMP
SELF-SUPPORTING
CIRCULARLY POLARIZED
FM ANTENNA



- Center mounting eliminates pole interference
- High power handling capability
- Internal feed point to radiating element
- Multi-station capability
- Excellent bandwidth characteristics
- No heaters, de-icers or radomes normally required
- Rugged brass construction
- Silver plated inner-conductor connectors
- Radiused element tips to avoid corona problems
- Stainless steel support brackets and hardware
- Special vertical/horizontal power splits available

The Harris FMP self-supporting circularly polarized FM antennas feature unusually high power handling capabilities, excellent bandwidth characteristics, and multi-station capability. Since the elements are center mounted, interference from the support pole is eliminated.

RADIATING ELEMENT. The radiating element is of brass construction, and has an outside diameter of 3-⅛". The feed point is completely internal, with a pressurized environment up to the feed point. Each element is rated at 40 kW, the ratings limited only by the average power handling capability of the 3-⅛" rigid coaxial line, which we have conservatively derated from 48 kW to 39 kW.

The rugged construction means these antennas will withstand the most severe weather extremes and wind velocities up to 150 miles per hour.

BANDWIDTH CAPABILITY. The FMP antenna has a low standing wave ratio of 1.07:1 or less, ± 200 kHz per given channel with field trimming. VSWR at antenna input without field trimming is 1.1:1 for pole mounting atop a tower.

Due to the excellent bandwidth characteristics of the radiating element, multi-station operation is possible under certain conditions, using a common antenna system. The necessary filtering components are available from Harris for such diplexing or multiplexing operations. Stations having a frequency separation of up to 4 MHz may be diplexed on a common antenna with some conditional limitations.

CIRCULARITY. The horizontal plane radiation pattern, for both horizontal and vertical polarization components, is omnidirectional when the antenna is pole mounted atop a tower. The pattern circularity for both polarization components is typically ± 2 dB.

DEICING. Deicers are not required in a normal environment. The VSWR is rated at 1.5:1 or less with ½-inch of radial ice; however, in field usage VSWR is typically 1.2:1 or less with ½-inch of radial ice.

ANTENNA MODELS. The Harris FMP self-supporting antenna is designed for pole mounting. The element feed stems are 3-⅛". Two 3-⅛" rigid interbay transmission lines are used, with one line on one side of the pole and the second line on the opposite side of the pole.

Normally, one to six bays are end fed, and antennas of over six bays are center fed if an even number of bays or fed at a point ½-bay below center if an odd number of bays.

Each antenna is supplied with a 6-foot transformer section on the input. The input flange is 50 ohm EIA with either 3-⅛" or 6-⅛" flange, or a 4-⅛" 50 ohm flange is also available. All antennas are completely assembled and tuned to the customer's frequency at the factory. Also, pressure testing is done at that time to assure the customer of a leak-free antenna, provided the antenna is properly installed by a qualified erector and is free of damage.

MOUNTING. Stainless steel mounting brackets and hardware are supplied for steel poles. (The pole is not supplied.) Maximum pole deflection must not exceed ¾" per 10 feet of pole length.

DIMENSIONS. Each FMP half-element is approximately 35 inches long and 18 inches high. Weight is approximately 26 pounds per half-element with line block.

MODEL NUMBERS. Because of the many different models, it is helpful in ordering to understand the Harris type numbers. The first digit in the Harris type number following the prefix "FMP-" signifies the number of bays the antenna has. The letter "E" after that digit refers to an end fed version, and the letter "C" means the antenna is center fed. The final digit in the type number identifies the size of the female 50 ohm input, either 3-⅛", 4-⅛" or 6-⅛". See the examples below.

FMP-1E3

1 = 1 bay
E = End Fed
3 = 3 ⅛" Input

FMP-7C6

7 = 7 bays
C = Center Fed
6 = 6 ⅛" input

FMP ANTENNA DATA

TYPE NO.	POWER GAIN[1] POWER	POWER GAIN[1] dB	FEMALE 50 OHM INPUT	POWER INPUT CAPABILITY[2]	CALCULATED WEIGHT [LBS.]	CALCULATED WIND-LOAD[3] [LBS.]
FMP-1E3	0.5	-3.36	3-⅛"	39 kW	185	280
FMP-1E4	0.5	-3.36	4-⅛"	50 kW	245	325
FMP-1E6	0.5	-3.36	6-⅛"	64 kW	245	325
FMP-2E3	1.0	-0.01	3-⅛"	39 kW	335	518
FMP-2E4	1.0	-0.01	4-⅛"	50 kW	395	563
FMP-2E6	1.0	-0.01	6-⅛"	64 kW	395	563
FMP-3E3	1.5	1.93	3-⅛"	39 kW	485	756
FMP-3E4	1.5	1.93	4-⅛"	50 kW	545	801
FMP-3E6	1.5	1.93	6-⅛"	64 kW	545	801
FMP-4E3	2.1	3.29	3-⅛"	39 kW	635	994
FMP-4E4	2.1	3.29	4-⅛"	50 kW	695	1039
FMP-4E6	2.1	3.29	6-⅛"	64 kW	695	1039
FMP-5E3	2.7	4.34	3-⅛"	39 kW	785	1232
FMP-5E4	2.7	4.34	4-⅛"	50 kW	845	1277
FMP-5E6	2.7	4.34	6-⅛"	64 kW	845	1277
FMP-6E3	3.3	5.19	3-⅛"	39 kW	935	1470
FMP-6E4	3.3	5.19	4-⅛"	50 kW	995	1515
FMP-6E6	3.3	5.19	6-⅛"	64 kW	995	1515
FMP-7C3	3.9	5.90	3-⅛"	39 kW	1085	1691
FMP-7C4	3.9	5.90	4-⅛"	50 kW	1145	1736
FMP-7C6	3.9	5.90	6-⅛"	64 kW	1145	1736
FMP-8C3	4.5	6.52	3-⅛"	39 kW	1235	1929
FMP-8C4	4.5	6.52	4-⅛"	50 kW	1295	1974
FMP-8C6	4.5	6.52	6-⅛"	64 kW	1295	1974
FMP-9C3	5.1	7.06	3-⅛"	39 kW	1385	2167
FMP-9C4	5.1	7.06	4-⅛"	50 kW	1445	2212
FMP-9C6	5.1	7.06	6-⅛"	64 kW	1445	2212
FMP-10C3	5.7	7.54	3-⅛"	39 kW	1535	2405
FMP-10C4	5.7	7.54	4-⅛"	50 kW	1595	2450
FMP-10C6	5.7	7.54	6-⅛"	64 kW	1595	2450
FMP-11C3	6.3	7.98	3-⅛"	39 kW	1685	2643
FMP-11C4	6.3	7.98	4-⅛"	50 kW	1745	2688
FMP-11C6	6.3	7.98	6-⅛"	64 kW	1745	2688
FMP-12C3	6.9	8.37	3-⅛"	39 kW	1835	2880
FMP-12C4	6.9	8.37	4-⅛"	50 kW	1895	2925
FMP-12C6	6.9	8.37	6-⅛"	64 kW	1895	2925

FOOTNOTES

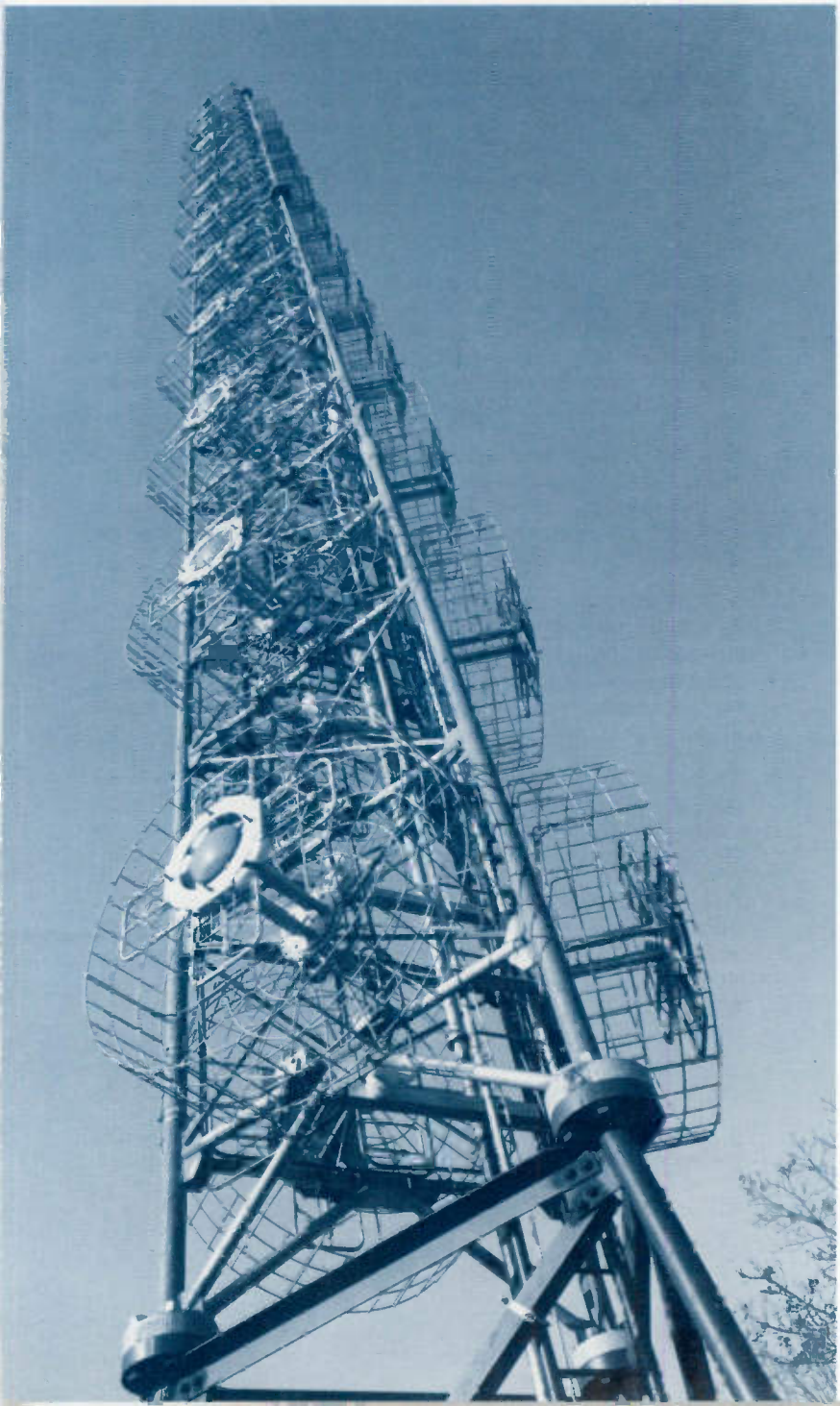
1. Horizontal and vertical power gain and dB gain are the same. 2. Power input capability up to 2,000 ft. above mean sea level. Derating required above 2,000 ft. 3. Windload based on 50/33 PSF. 112 m.p.h. actual wind velocity. NOTE: Brackets included in weight and windload calculations.

HARRIS CORPORATION Broadcast Products Division
P. O. Box 290, Quincy, Illinois 62301 U.S.A.

HARRIS

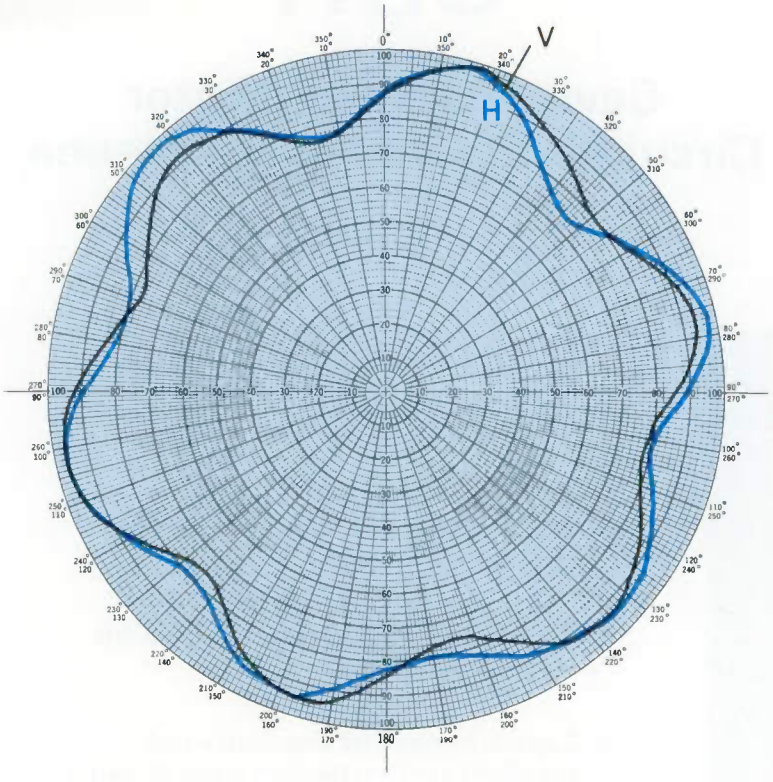
CBR

Cavity Backed Radiator
Circularly Polarized FM Antenna



- The ideal antenna for multistation FM operations
- Wide bandwidth provides low VSWR across the FM band
- Superb horizontal circularity and excellent vertical pattern control insure uniform coverage
- High power handling capabilities provide wide latitude in transmission system design
- Wire-grid cavity design minimizes windloading and the associated cost impact on the support structure
- Available in one, two, three or four around configuration to meet the required coverage contour
- Fully assembled and tested at Harris' full capability antenna test range to insure top performance

Harris CBR...the ideal antenna for multistation FM operations



The Harris Cavity Backed Radiator (CBR) antenna offers ideal characteristics to FM stations desiring the advantages of combined station operation or to stations requiring special directional coverage. Extensive field experience has proven the CBR to be the best approach to circularly polarized FM transmission.

The Harris Cavity Backed Radiator consists of a crossed dipole radiator fed in phase quadrature and mounted within a circular cavity. Rotating RF energy is produced when the cavity is excited by the dipole elements. The signal emanating from the cavity is right-hand circular. The field rotates clockwise as viewed in the direction of propagation. Cavity size is principally determined by beamwidth requirements. A beamwidth of 90 degrees is required for a 4-around array and 120 degrees is required for a 3-around array, (measured at the half-voltage coordinates).

GRID CAVITY

The cavity used in the Harris circularly polarized FM antenna is a welded steel galvanized grid. The cavity grid is supported from a center mounting plate, which also serves as a mounting for the dipole assembly and for attachment of the unit to the supporting structure.

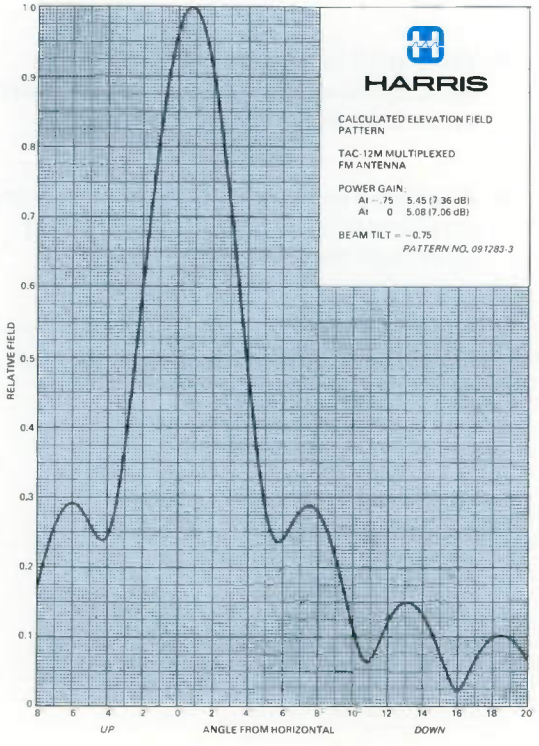
The use of grid cavities and aerodynamic design significantly reduce weight and windload requirements on the supporting structure. This often represents substantial savings in support structure cost compared with other panel style antenna designs.

MULTISTATION OPERATION

Multistation FM operation where two or more stations share the same antenna has increased in popularity due to the inherent cost savings which can be realized. Multistation operation can be achieved only with the wide bandwidth characteristics the Harris CBR antenna offers.

These characteristics are achieved through the use of a broadband radiating element in conjunction with high power hybrid junctions. A VSWR plot of a Harris CBR antenna is shown on the facing page.

Harris also offers the associated combining equipment necessary for multistation operation. Harris' experience with multiplexer installations insures proper combiner operation to optimize the operation of stereo and SCA services.



(Left, top) Measured horizontal (blue line) and vertical (black line) field pattern of 12 bay, 3 around Harris CBR antenna. (Bottom) Elevation pattern of Harris 12 bay, 3 around CBR antenna with beam tilt.

AZIMUTH CIRCULARITY

For omnidirectional operation, the shape of the standard azimuth pattern will vary from omni by less than ±2.0 dB for three-sided tower configurations. With a four-around antenna array, the typical circularity will be comparable.

Stations employing directional arrays will find one of the several patterns available to be ideally suited to their specific needs.

ELEVATION PATTERN

The unique design of the CBR antenna offers precision control of the elevation pattern which is critical in auto receiver reception. Vertical pattern contouring to introduce beam tilt and null fill may be provided by means of standard phase and power distribution techniques.

HIGH POWER CAPABILITIES

The Harris CBR antenna is designed for high power operation enabling station flexibility in transmission system design. Harris' conservative power rating insures adequate design headroom for long term reliability.

The Harris CBR antenna can be configured with one or two input ports. This feature allows the top and bottom six bays of a typical twelve bay antenna to be fed by two independent transmission lines. Should standby operation be necessary, one half of the system may be used at reduced power.

FULL RANGE TESTING

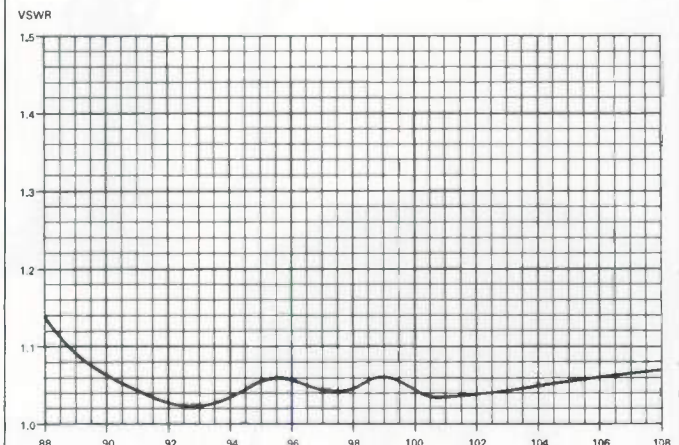
The Harris antenna test range is one of the few facilities in existence capable of complete antenna testing. The range sits atop a 230-foot bluff. Two test transmitters are located in the adjacent bottomland. This unique geographical setting offers ideal conditions for testing approaching the "free space" situation of an installed antenna.

Here the computer plotted azimuth and elevation patterns of a Harris antenna are proven out with highly accurate and sophisticated test equipment—translating the theory of calculated patterns into the reality of actual antenna performance.

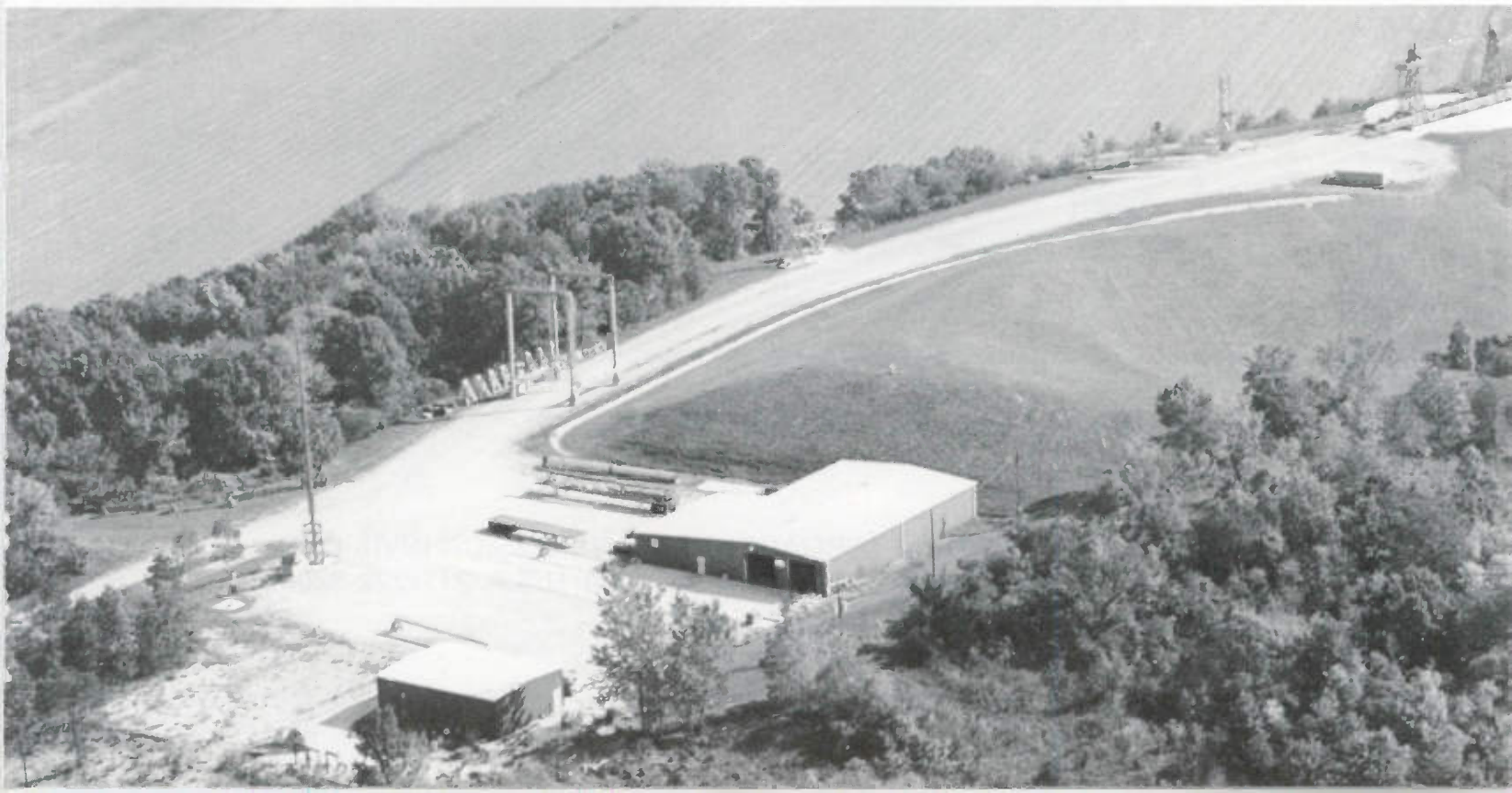
MEETING EXACT REQUIREMENTS

The Harris CBR antenna can meet the exacting requirements of FM broadcasters. Your Harris Representative can provide you with additional information for your review and consideration.

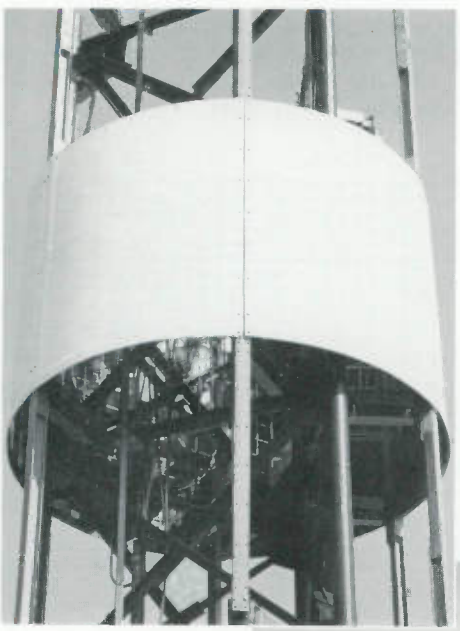
MEASURED VSWR CHARACTERISTIC OF MULTIPLEXED HARRIS CBR FM ANTENNA AT ANTENNA INPUT PORT

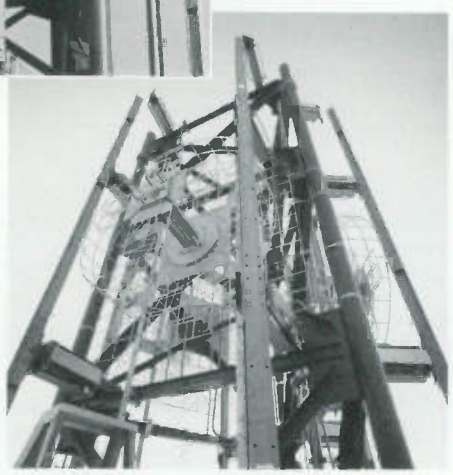


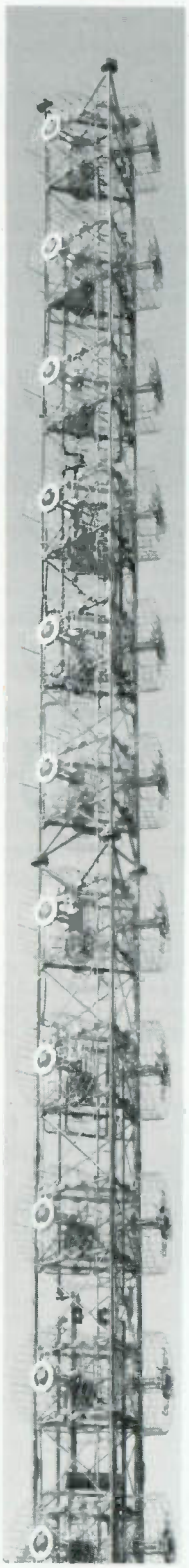
Below — The Harris antenna test range, on the bluffs of the Mississippi River in rural Palmyra, Missouri. Unique geographical setting offers ideal conditions for testing, approaching the "free space" situation of an installed antenna.



Houston, Chicago, Los Angeles... major markets move to Harris CBR







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