nearby water tower or large surface reflecting the desired signal.

Receiving Antennas

Outdoor antennas for fringe area reception are available from numerous sources. Web site listings can be found for such manufacturers as Andrew Channel Master, Antennas Direct, Winegard and AntennaCraft as well as for numerous retail outlets carrying the antennas of these manufacturers and others. Manufacturers' specified antenna gains vary from averages of 5 to 7 dB for low band VHF, mostly about 10 dB for high VHF and 12 dB or more for UHF. Half-power beam widths are in the order of 70 degrees for low VHF, 35 degrees for high VHF and 35 to 40 degrees for UHF. List prices for individual VHF and UHF or all-band high gain outdoor antennas are in the order of $100 to $165 with lower prices found at the times of special sales.

A useful collection of measured patterns of receiving antennas from a source independent of receiving antenna manufacturers is a paper delivered by Mr. Kerry W. Cozad at the 54th Annual IEEE Broadcast Symposium on October 14, 2004. An even more extensive description of Mr. Cozad's work is found in a paper he delivered at the 2005 National Translator Convention on May 15, 2005.

Rotators

Where television transmitting sites are located at a variety of bearings from the receiving location an antenna rotator is required. Rotators capable of handling the outdoor antennas are available from Radio Shack, Channel Master and others at a cost of about $75 plus about $15 for 100 feet of control cable, permitting adjustment to the optimum orientation from a location at the receiver. Manufacturers provide manuals to

guide the householder on the installation of antennas and rotators so that the cost of hiring an installer can be avoided if desired.

Low-Noise Amplifiers

Mast-mounted low noise amplifiers, at reasonable costs of 60 to 90 dollars, are readily available from equipment suppliers, either via the internet or retail outlets. They perform the useful function of assuring high quality digital television reception at marginal locations. A feature of their use is the substantial improvement of the system noise figure over that provided by the television receiver alone.

System noise figure is equal to the sum of the amplifier noise figure plus the noise figure of the receiver divided by the amplifier gain (all in linear terms). Manufacturers' published noise figures run from 2.5 to about 4.0 dB, with gains varying from 11 to 29 dB. A conservative choice of parameters to illustrate the advantage of using a pre-amplifier at the antenna would be: amplifier noise figure 5 dB (3.16), amplifier gain 20 dB (100), and receiver noise figure of 12 dB (15.85). The resulting system noise figure is 3.32, or 5.2 dB. Considering that the system noise factors used by the Commission for DTV reception are 10 dB for VHF and 7 dB for UHF, a system noise figure of approximately 5 dB can be seen to provide an extra margin to minimize the impact of system mismatches.

Planning Factors

Planning factors currently in use by the Commission, as shown in Table 3 of OET Bulletin No. 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 06, 2004, is shown in the table on the following page:

PlanningFactor	Symbol	Low VHF	High VHF	UHF
Geometric mean frequency (MHz)	F	69	194	615
Dipole factor (dBm-dBu)	K_d	-111.8	-120.8	-130.8
Dipole factor adjustment	K_a	none	none	see below
Thermal noise (dBm)	N_t	-106.2	-106.2	-106.2
Antenna gain (dBd)	G	4	6	10
Downlead line loss	L	1	2	4
System noise figure (dB)	N_s	10	10	7
Required Carrier to Noise ratio (dB)	C/N	15	15	15

Bulletin 69 states as follows:

> "The adjustment, $K_a = 20 \log[615/(\text{channel mid-frequency in MHz})]$, is added to K_d to account for the fact that field strength requirements are greater for UHF channels above the geometric mean frequency of the UHF band and smaller for UHF channels below that frequency. The geometric mean frequency, 615 MHz, is approximately the mid-frequency of channel 38."

From the foregoing discussion of equipment available, and employed by television viewers, factors such as antenna gain and system noise figure are well within the capabilities of receiving systems. As to downlead losses, they too are conservatively stated in the current planning figures. Losses for 50 feet of RG-6 coaxial cable, the downlead recommended for television use, are shown by Channel Master to be: 0.75 to 0.93 dB for low VHF, 1.31 to 1.44 dB for high VHF, and 2.20 to 2.76 dB for UHF.

Since UHF digital television broadcasting will be limited to channels 14 to 51 (470 to 698 MHz) after the transition, the geometric mean frequency of 615 MHz, based on the use of channels 14 to 69 (470 to 806 MHz), no longer applies in the digital world. The appropriate geometric mean frequency for the new channel alignment is 573 MHz and the dipole factor becomes -130.2. However, in light of an absence for need to change other quantities in the table, the planning factor table is not proposed to be changed.

Prediction of Service

Use of the objective determination of field strength above a suitable threshold level is urged strongly as the criterion of whether or not a particular location has available service from a local terrestrial digital broadcast station. The availability at reasonable cost of sophisticated receiving equipment capable of delivering to the receiver strong signals with suitable carrier-to-noise ratios, coupled with the demonstrated improvements in receiver technology, leaves little doubt that, given sufficient signal strength, the viewer will have excellent digital reception. Multipath degradation that affected early receiver designs has been conquered to a substantial degree. Further improvements have been promised and can be expected to be delivered as the demand for product grows.

A method is already available for making those needed predictions of field strength at particular locations—ILLR. The Commission describes the use of the *Individual Location Longley-Rice (ILLR) Computer Program* in OET Bulletin Number 72 of July 2, 2002. That program has been proved to be reliable through comparison with several thousand measurements of received signal strength. No need exists for a new program with one exception. The clutter loss adjustments for UHF channels should be eliminated. Built into the Longley-Rice Model for the prediction of field strength over

irregular terrain are empirical factors based on actual field strength measurements. Addition of a clutter factor adjustment compounds field strength losses and serves to reduce rather than increase reliability of the prediction.

In rare instances where a party chooses to challenge a prediction of the presence or absence of service, that challenge can be met only with appropriate field strength measurements.

Local Field Strength Measurements

A procedure for making field strength measurements at individual locations is described in Commission rules at 73.686(d). With one major modification, that procedure is appropriate for digital television broadcasting. Section 73.686(d)(2)(i) describes the testing equipment and procedure to follow for measuring the received field strength. The equipment and procedure are appropriate to measurement of a NTSC signal, but not digital.

The field strength desired in the NTSC case is that at the peak of the synchronizing pulse. That is a convenient parameter because the synchronizing pulse has a relatively narrow bandwidth and is independent of the varying video modulation. In the digital case, the necessary measurement is the integrated average power over the full 6 MHz band. Instruments used in the NTSC case cover bandwidth too narrow for measurement of the digital signal. The most practical instrument to use for digital power measurement is a spectrum analyzer such as the Agilent Technologies Model E441B ESA-L (list price about $8,000).

Use of a high gain antenna of known characteristics rather than a dipole is strongly recommended to eliminate to the extent possible interfering signals and to reflect the type of antenna employed by the viewers.

Conclusions

Determining the eligibility for satellite-delivered network stations requires an assumption that receiving equipment appropriate to the point of reception is in use. Threshold signal levels presently used as criteria for acceptable reception in the three TV bands are suitable because the planning factors used to develop those levels are consistent with readily available equipment. The presence or absence of those threshold signal levels is best determined by existing ILLR calculation procedures. In the event of challenge to the analytical results, only field testing is appropriate to reach a definitive conclusion. Field testing should be done by the presently specified procedure with the exception of substituting an appropriate wide-band instrument for the narrow-band field strength meter now used for NTSC.

s/Jules Cohen, P.E.

June 16, 2005

Exhibit 1

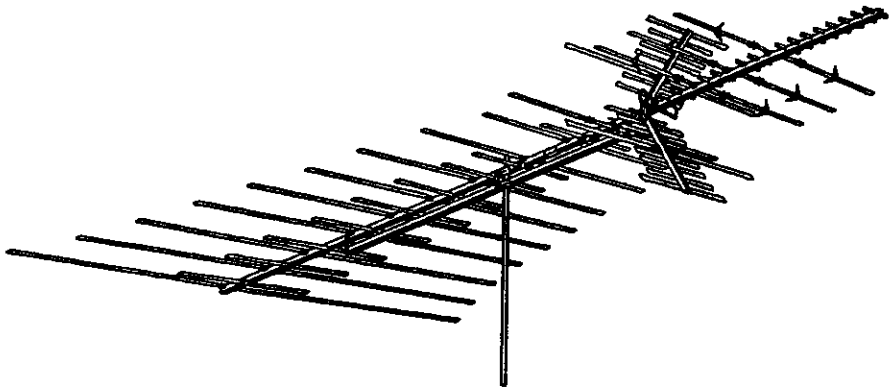
Antennas

Antennacraft Antennas

Engineering Specifications

ANTENNACRAFT®

Model HD1850 Heavy-Duty, High-Definition VHF/UHF/FM Antenna



Model Number:	HD-1850

General:

Channels	2 - 69
Electronic Elements	84
Output Impedance	300 ohms

Physical:

Boom Length	180"
Maximum Width	112"
Vertical Height	36"
Turning Radius	102"
Element Diameter	.375"
Shipping Weight	16.0
Carton Dimensions	7" x 9" x 98"

Performance:

[1] Gain (dB)	
VHF Low Band	6.2
VHF High Band	10.7
UHF Band	10.0
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	66.0
VHF High Band	34.0
UHF Band	37.5
[3] Front-To-Back Ratio (dB)	
VHF Low Band	20.2
VHF High Band	17.3
UHF Band	13.7

1: Over Half-Wave Tuned Dipole (Ch. 2 - 62)

2: -3 dB Down Points

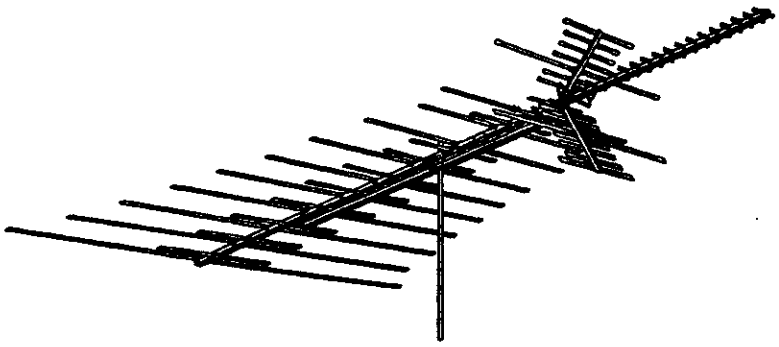
3: Opposite Hemisphere

Antennacraft, P.O. Box 1005, Burlington, IA 52601

Engineering Specifications

ANTENNACRAFT.

Model HD1800 Heavy-Duty, High-Definition VHF/UHF/FM Antenna



Model Number:	HD-1800

General:

Channels	2 - 69
Electronic Elements	69
Output Impedance	300 ohms

Physical:

Boom Length	180"
Maximum Width	112"
Vertical Height	38"
Turning Radius	102"
Element Diameter	.375"
Shipping Weight	15.0
Carton Dimensions	7" x 9" x 98"

Performance:

[1] Gain (dB)	
VHF Low Band	6.2
VHF High Band	9.4
UHF Band	10.0
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	65.0
VHF High Band	35.5
UHF Band	37.5
[3] Front-To-Back Ratio (dB)	
VHF Low Band	20.2
VHF High Band	17.3
UHF Band	13.7

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

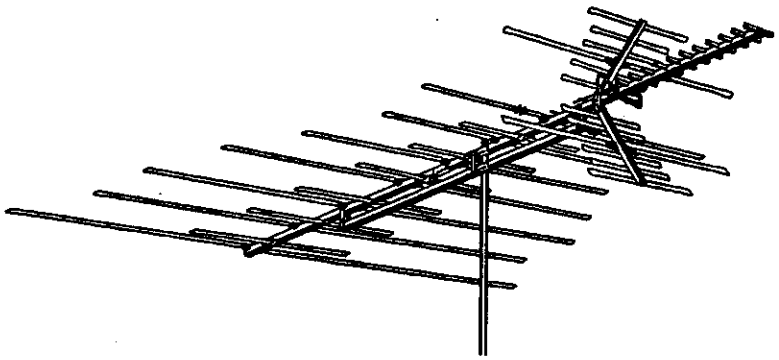
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®

Model HD1200 Heavy-Duty, High-Definition VHF/UHF/FM Antenna



Model Number:	HD-1200

General:

Channels	2 - 69
Electronic Elements	51
Output Impedance	300 ohms

Physical:

Boom Length	120"
Maximum Width	109"
Vertical Height	31"
Turning Radius	78"
Element Diameter	.375"
Shipping Weight	12.0
Carton Dimensions	6.5" x 6.75" x 101"

Performance:

[1] Gain (dB)	
VHF Low Band	5.1
VHF High Band	8.0
UHF Band	8.5
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	67.0
VHF High Band	33.0
UHF Band	39.0
[3] Front-To-Back Ratio (dB)	
VHF Low Band	16.5
VHF High Band	14.0
UHF Band	13.5

1: Over Half-Wave Tuned Dipole (Ch. 2 - 52)

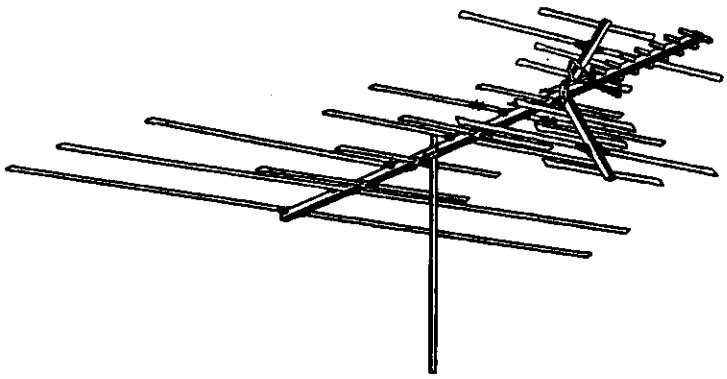
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®

Model HD850 Heavy-Duty, High-Definition VHF/UHF/FM Antenna



Model Number:	HD-850

General:

Channels	2 - 69
Electronic Elements	36
Output Impedance	300 ohms

Physical:

Boom Length	85"
Maximum Width	111"
Vertical Height	24"
Turning Radius	64"
Element Diameter	.375"
Shipping Weight	9.0
Carton Dimensions	6.5" x 6.75" x 101"

Performance:

[1] Gain (dB)	
VHF Low Band	3.3
VHF High Band	6.9
UHF Band	7.7
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	72.0
VHF High Band	36.0
UHF Band	40.0
[3] Front-To-Back Ratio (dB)	
VHF Low Band	11.0
VHF High Band	13.0
UHF Band	12.0

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

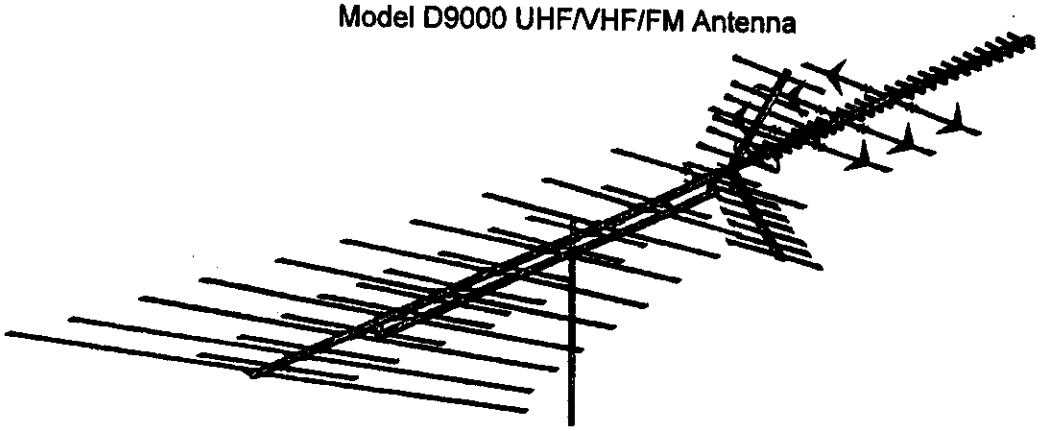
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model D9000 UHF/VHF/FM Antenna



Model Number:	D-9000

General:

Channels	2 - 69
Electronic Elements	91
Output Impedance	300 ohms

Physical:

Boom Length	180"
Maximum Width	112"
Vertical Height	38"
Turning Radius	101.5"
Element Diameter	.375"
Shipping Weight	14.5 lbs.
Carton Dimensions	7" x 8.25" x 101"

Performance:

[1] Gain (dB)	
VHF Low Band	6.0
VHF High Band	9.8
UHF Band	9.9
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	67.0
VHF High Band	35.5
UHF Band	37.5
[3] Front-To-Back Ratio (dB)	
VHF Low Band	20.2
VHF High Band	17.3
UHF Band	13.7

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

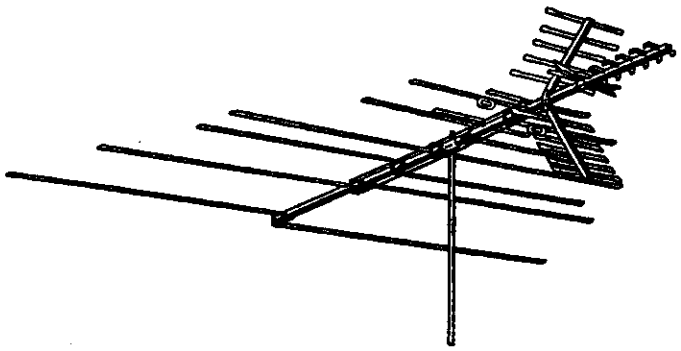
3: Opposite Hemisphere

Antennacraft, P.O. Box 1005, Burlington, IA 52601

Engineering Specifications

ANTENNACRAFT®

Model 4BG30 Permacolor® UHF/VHF/FM



Model Number: 4BG30

General:

Channels	2 - 69
Electronic Elements	31
Output Impedance	300 ohms

Physical:

Boom Length	106"
Maximum Width	108"
Vertical Height	36"
Turning Radius	75"
Element Diameter	.375"
Shipping Weight	8.5 lbs.
Carton Dimensions	5" x 5.25" x 108"

Performance:

1 Gain (dB)	
VHF Low Band	3.9
VHF High Band	7.5
UHF Band	7.0
2 Half-Power Beamwidth (deg.)	
VHF Low Band	71.0
VHF High Band	46.0
UHF Band	44.0
3 Front-To-Back Ratio (dB)	
VHF Low Band	13.6
VHF High Band	12.9
UHF Band	16.0

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

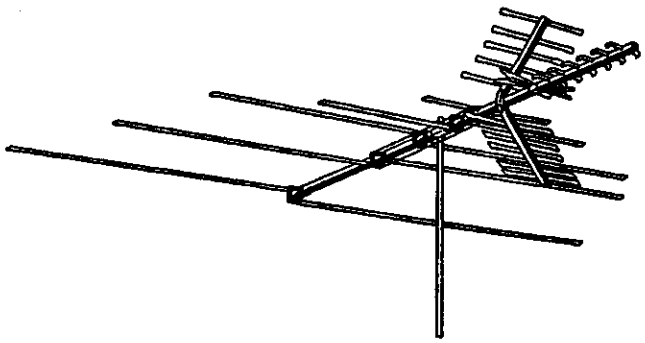
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®

Model 4BG26 Permacolor® UHF/VHF/FM



Model Number:	4BG26

General:

Channels	2 - 69
Electronic Elements	27
Output Impedance	300 ohms

Physical:

Boom Length	91"
Maximum Width	108"
Vertical Height	36"
Turning Radius	68"
Element Diameter	.375"
Shipping Weight	7.1 lbs.
Carton Dimensions	5" x 5.25" x 103"

Performance:

[1] Gain (dB)	
VHF Low Band	3.6
VHF High Band	5.6
UHF Band	7.0
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	73.3
VHF High Band	49.0
UHF Band	53.4
[3] Front-To-Back Ratio (dB)	
VHF Low Band	9.3
VHF High Band	10.4
UHF Band	14.3

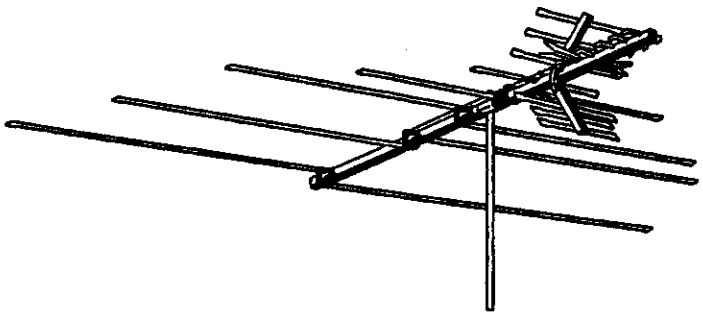
1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®
Model 4BG20 Permacolor® UHF/VHF/FM



UPS

Model Number:	4BG20

General:

Channels	2 - 69
Electronic Elements	21
Output Impedance	300 ohms

Physical:

Boom Length	81"
Maximum Width	108"
Vertical Height	20"
Turning Radius	66"
Element Diameter	.375"
Shipping Weight	6.0 lbs.
Carton Dimensions	6 x 4.75 x 81"

Performance:

[1] Gain (dB)	
VHF Low Band	3.5
VHF High Band	3.9
UHF Band	6.1
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	70.3
VHF High Band	52.0
UHF Band	52.2
[3] Front-To-Back Ratio (dB)	
VHF Low Band	9.3
VHF High Band	10.4
UHF Band	13.8

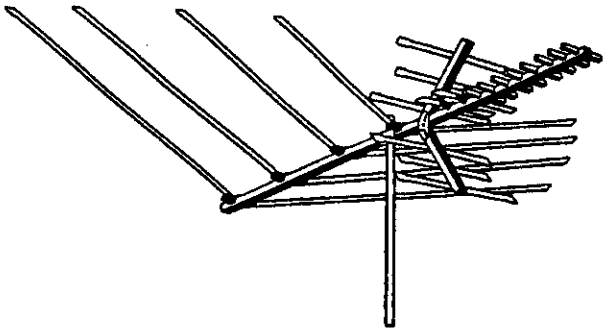
1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®
Model 4BG18 Permacolor® UHF/VHF/FM



Model Number:	4BG18

General:

Channels	2 - 69
Electronic Elements	19
Output Impedance	300 ohms

Physical:

Boom Length	71"
Maximum Width	96"
Vertical Height	25"
Turning Radius	50"
Element Diameter	.375"
Shipping Weight	5.8 lbs.
Carton Dimensions	5.5" x 6.75" x 72"

Performance:

[1] Gain (dB)	
VHF Low Band	2.1
VHF High Band	6.4
UHF Band	5.7
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	79.3
VHF High Band	37.5
UHF Band	41.4
[3] Front-To-Back Ratio (dB)	
VHF Low Band	6.3
VHF High Band	13.2
UHF Band	14.1

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

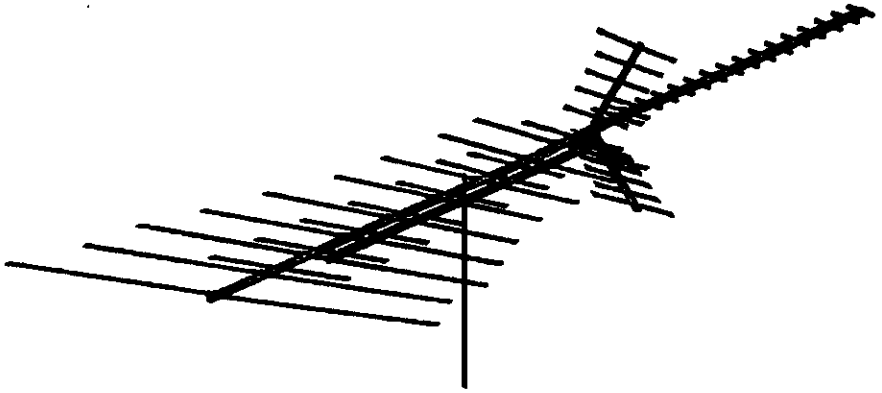
3: Opposite Hemisphere

Antennacraft, P.O. Box 1005, Burlington, IA 52601

Engineering Specifications

ANTENNACRAFT.

Model CCS1843 VHF/UHF/FM Antenna



Model Number:	CCS-1843

General:

Channels	2 - 69
Electronic Elements	54
Output Impedance	300 ohms

Physical:

Boom Length	180"
Maximum Width	110"
Vertical Height	38"
Turning Radius	105"
Element Diameter	.375"
Shipping Weight	11.8 lbs.
Carton Dimensions	6.5" x 6.5" x 101"

Performance:

[1] Gain (dB)	
VHF Low Band	6.0
VHF High Band	9.1
UHF Band	9.3
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	66.7
VHF High Band	41.6
UHF Band	36.4
[3] Front-To-Back Ratio (dB)	
VHF Low Band	19.6
VHF High Band	17.2
UHF Band	16.1

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

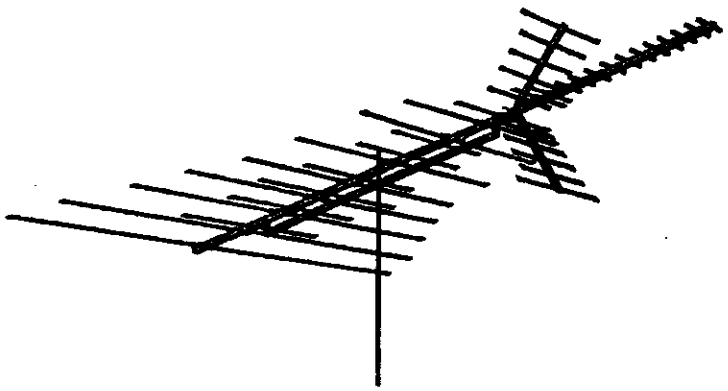
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model CCS1538 VHF/UHF/FM Antenna



Model Number:	CCS-1538

General:

Channels	2 - 69
Electronic Elements	48
Output Impedance	300 ohms

Physical:

Boom Length	150"
Maximum Width	102"
Vertical Height	38"
Turning Radius	93.5"
Element Diameter	.375"
Shipping Weight	10.6 lbs.
Carton Dimensions	6.5" x 6.5" x 81"

Performance:

[1] Gain (dB)	
VHF Low Band	5.5
VHF High Band	8.5
UHF Band	8.3
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	67.0
VHF High Band	43.3
UHF Band	38.6
[3] Front-To-Back Ratio (dB)	
VHF Low Band	14.8
VHF High Band	16.1
UHF Band	13.7

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

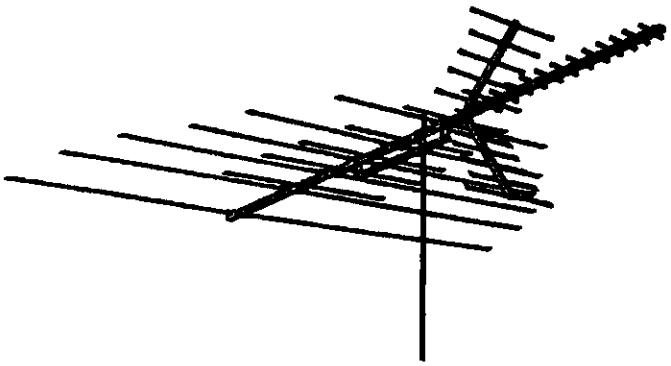
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model CCS1233 VHF/UHF/FM Antenna



Model Number:	CCS-1233

General:

Channels	2 - 69
Electronic Elements	39
Output Impedance	300 ohms

Physical:

Boom Length	120"
Maximum Width	111"
Vertical Height	38"
Turning Radius	79.5"
Element Diameter	.375"
Shipping Weight	9.2 lbs.
Carton Dimensions	6.5" x 6.5" x 81"

Performance:

[1] Gain (dB)	
VHF Low Band	3.9
VHF High Band	7.2
UHF Band	6.8
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	66.7
VHF High Band	31.6
UHF Band	39.2
[3] Front-To-Back Ratio (dB)	
VHF Low Band	13.4
VHF High Band	14.5
UHF Band	11.4

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

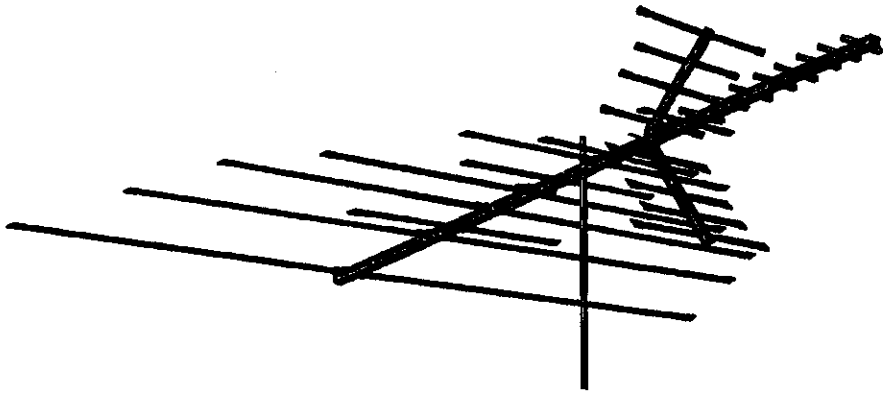
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model CCS1025 VHF/UHF/FM Antenna



Model Number:	CCS-1025

General:

Channels	2 - 69
Electronic Elements	30
Output Impedance	300 ohms

Physical:

Boom Length	100"
Maximum Width	111"
Vertical Height	32"
Turning Radius	72.5"
Element Diameter	.375"
Shipping Weight	7.0 lbs.
Carton Dimensions	6.25" x 6.5" x 81"

Performance:

[1] Gain (dB)	
VHF Low Band	3.6
VHF High Band	6.6
UHF Band	5.9
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	72.0
VHF High Band	35.8
UHF Band	39.4
[3] Front-To-Back Ratio (dB)	
VHF Low Band	10.6
VHF High Band	12.6
UHF Band	10.3

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

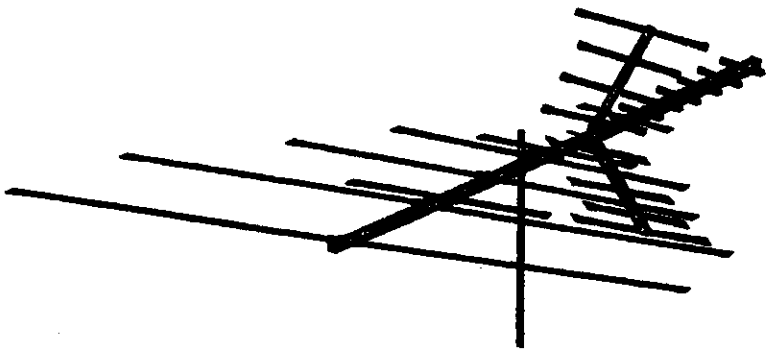
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model CCS822 VHF/UHF/FM Antenna



Model Number:	CCS-822

General:

Channels	2 - 69
Electronic Elements	26
Output Impedance	300 ohms

Physical:

Boom Length	80"
Maximum Width	111"
Vertical Height	32"
Turning Radius	66.5"
Element Diameter	.375"
Shipping Weight	5.8 lbs.
Carton Dimensions	6.5" x 6.5" x 81"

Performance:

[1] Gain (dB)	
VHF Low Band	3.3
VHF High Band	6.1
UHF Band	5.4
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	71.0
VHF High Band	41.8
UHF Band	45.2
[3] Front-To-Back Ratio (dB)	
VHF Low Band	10.1
VHF High Band	11.2
UHF Band	10.9

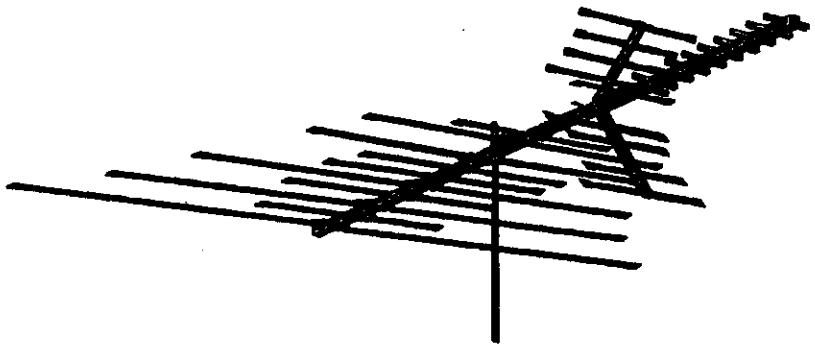
1: Over Half-Wave Tuned Dipole (Ch. 2 - 62)

2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®
Model 5885 ColorKing® VHF/UHF/FM Antenna



Model Number:	5885

General:

Channels	2 - 69
Electronic Elements	34
Output Impedance	300 ohms

Physical:

Boom Length	90"
Maximum Width	102"
Vertical Height	25"
Turning Radius	62"
Element Diameter	.375"
Shipping Weight	6.6 lbs.
Carton Dimensions	7.875" x 6.375" x 54.5"

Performance:

[1] Gain (dB)	
VHF Low Band	2.2
VHF High Band	5.7
UHF Band	5.9
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	72.0
VHF High Band	51.3
UHF Band	42.7
[3] Front-To-Back Ratio (dB)	
VHF Low Band	8.9
VHF High Band	6.9
UHF Band	10.6

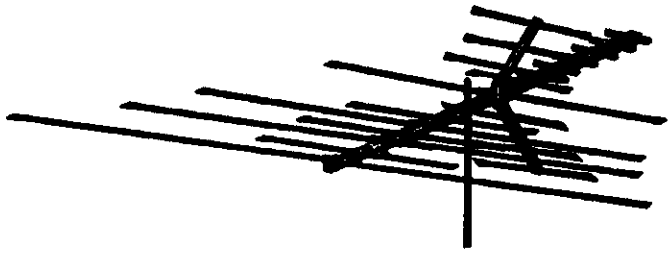
1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT®
Model 5884 ColorKing® VHF/UHF/FM Antenna



Model Number:	5884

General:

Channels	2 - 69
Electronic Elements	25
Output Impedance	300 ohms

Physical:

Boom Length	58"
Maximum Width	102"
Vertical Height	25"
Turning Radius	58"
Element Diameter	.375"
Shipping Weight	5.1 lbs.
Carton Dimensions	6.375" x 5.875" x 58.5"

Performance:

[1] Gain (dB)	
VHF Low Band	2.5
VHF High Band	6.5
UHF Band	6.0
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	70.0
VHF High Band	39.8
UHF Band	45.4
[3] Front-To-Back Ratio (dB)	
VHF Low Band	7.3
VHF High Band	9.0
UHF Band	9.9

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

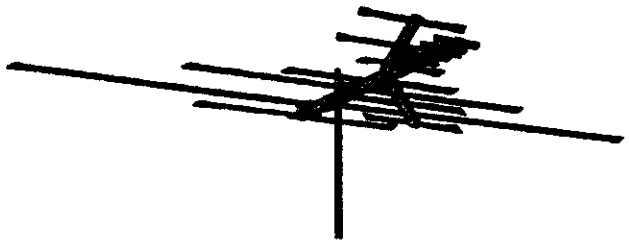
2: -3 dB Down Points

3: Opposite Hemisphere

Antennacraft, P.O. Box 1005, Burlington, IA 52601

Engineering Specifications

ANTENNACRAFT®
Model 5883 ColorKing® VHF/UHF/FM Antenna



Model Number:	5883

General:

Channels	2 - 69
Electronic Elements	16
Output Impedance	300 ohms

Physical:

Boom Length	30"
Maximum Width	98"
Vertical Height	16.25"
Turning Radius	50.5"
Element Diameter	.375"
Shipping Weight	3.5 lbs.
Carton Dimensions	6.375" x 5.875" x 51.375"

Performance:

[1] Gain (dB)	
VHF Low Band	0.5
VHF High Band	4.8
UHF Band	4.1
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	74.7
VHF High Band	52.0
UHF Band	47.0
[3] Front-To-Back Ratio (dB)	
VHF Low Band	1.1
VHF High Band	8.6
UHF Band	7.3

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

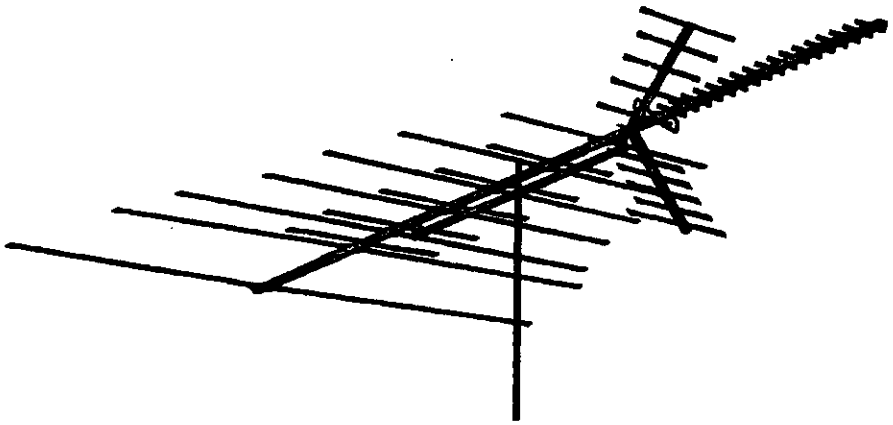
2: -3 dB Down Points

3: Opposite Hemisphere

Engineering Specifications

ANTENNACRAFT.

Model C480 VHF/UHF/FM Antenna



Model Number:	C-480

General:

Channels	2 - 69
Electronic Elements	48
Output Impedance	300 ohms

Physical:

Boom Length	150"
Maximum Width	112"
Vertical Height	38"
Turning Radius	66.5"
Element Diameter	.375"
Shipping Weight	8.7 lbs.
Carton Dimensions	5.75" x 6.75" x 71"

Performance:

[1] Gain (dB)	
VHF Low Band	5.0
VHF High Band	8.6
UHF Band	8.4
[2] Half-Power Beamwidth (deg.)	
VHF Low Band	66.7
VHF High Band	34.5
UHF Band	42.7
[3] Front-To-Back Ratio (dB)	
VHF Low Band	18.0
VHF High Band	15.1
UHF Band	13.0

1: Over Half-Wave Tuned Dipole (Ch. 2 - 69)

2: -3 dB Down Points

3: Opposite Hemisphere