

# SECTION CONTENTS

Electronics Research, Inc. Proposal

Request for Quotation Number EBA392

West Virginia Educational Broadcasting Authority  
Directional FM Antenna for WVDM (FM),  
Bluefield, West Virginia

Prepared for  
Shelly Murray  
State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
P.O. Box 50130  
Charleston, WV 25305-0130  
+1 (304) 558-4115 (fax)  
shelly.l.murray@wv.gov

Bid Opening: January 19, 2012 at 1:30 pm  
Validity: February 19, 2012

## ERI Contacts

Bill Harland  
Vice President of Marketing  
**ELECTRONICS RESEARCH, INC.**  
Telephone: +1 (812) 925-6000, ext. 214  
Facsimile: +1 (812) 925-4026  
Cell: +1 (812) 455-1823  
E-mail: bharland@eriinc.com

1

Request For Quotation  
EBA392 Executed Bid  
Document

2

Request For Quotation  
EBA392 Executed  
Purchasing Affidavit

3

Request For Quotation  
EBA392 Executed  
Addendum 1

4

ERI Exceptions to  
Specifications

5

ERI Proposal and Product  
Information

RECEIVED

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ERI PURCHASING DIVISION  
STATE OF WV

Electronics Research, Inc. • 7777 Gardner Road • Chandler, IN 47610-9219 • USA  
+1 812 925-6000 (tel) • +1 812 925-4030 (fax)

Your Single Source for Broadcast Solutions™ • Call Toll-free at 877 ERI-LINE • Visit Online at [www.eriinc.com](http://www.eriinc.com)



State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

## Request for Quotation

RFQ NUMBER

EBA392

PAGE

1

ADDRESS CORRESPONDENCE TO ATTENTION OF:

SHELLY MURRAY  
304-558-8801

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Electronics Research, Inc.  
7777 Gardner Road  
Chandler, IN 47610-9219

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EDUCATIONAL BROADCASTING  
AUTHORITY  
600 CAPITOL STREET

CHARLESTON, WV  
25301-1223 304-558-3400

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS		
12/15/2011	0%, Net 10 days	Surface Truck	As specified	Included		
BID OPENING DATE: 01/19/2012		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	LS		725-12		
<p>THE WEST VIRGINIA PURCHASING DIVISION, FOR THE AGENCY, THE WEST VIRGINIA EDUCATIONAL BROADCASTING AUTHORITY, IS SOLICITING BIDS FOR A SIDE MOUNT 5 BAY FM ANTENNA SYSTEM WITH VERTICAL POLARIZATION AND ANIT-ICING RADOMES PER THE ATTACHED SPECIFICATIONS.</p> <p>TECHNICAL QUESTIONS MUST BE SUBMITTED IN WRITING TO SHELLY MURRAY IN THE WEST VIRGINIA PURCHASING DIVISION VIA MAIL AT THE ADDRESS SHOWN AT THE TOP OF THIS RFQ, VIA FAX AT 304-558-4115, OR VIA E-MAIL AT SHELLY.L.MURRAY@WV.GOV. DEADLINE FOR ALL TECHNICAL QUESTIONS IS 01/03/2012 AT THE CLOSE OF BUSINESS. ALL TECHNICAL QUESTIONS RECEIVED, IF ANY, WILL BE ADDRESSED BY ADDENDUM AFTER THE DEADLINE.</p> <p>** CD ATTACHMENT OF ATTACHMENT 1</p> <p>ANTENNA</p> <p>CANCELLATION: THE DIRECTOR OF PURCHASING RESERVES THE RIGHT TO CANCEL THIS CONTRACT IMMEDIATELY UPON WRITTEN NOTICE TO THE VENDOR IF THE COMMODITIES AND/OR SERVICES SUPPLIED ARE OF AN INFERIOR QUALITY OR DO NOT CONFORM WITH THE SPECIFICATIONS OF THE BID AND CONTRACT HEREIN.</p>						
SEE REVERSE SIDE FOR TERMS AND CONDITIONS						
SIGNATURE <i>William A. Harland</i>		TELEPHONE +1 (812) 925-6000, Ext. 214		DATE January 17, 2012		
TITLE Vice President of Marketing		FEIN 35-1083384		ADDRESS CHANGES TO BE NOTED ABOVE		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

## GENERAL TERMS & CONDITIONS REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia.
  2. The State may accept or reject in part, or in whole, any bid.
  3. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125 fee.
  4. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods this Purchase Order/Contract becomes void and of no effect after June 30.
  5. Payment may only be made after the delivery and acceptance of goods or services.
  6. Interest may be paid for late payment in accordance with the *West Virginia Code*.
  7. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
  8. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
  9. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
  10. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern the purchasing process.
  11. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
  12. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, the State may deem this contract null and void, and terminate such contract without further order.
  13. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at [www.state.wv.us/admin/purchase/vrc/hipaa.html](http://www.state.wv.us/admin/purchase/vrc/hipaa.html) and is hereby made part of the agreement provided that the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.
  14. **CONFIDENTIALITY:** The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/noticeConfidentiality.pdf>.
  15. **LICENSING:** Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, and the West Virginia Insurance Commission. The vendor must provide all necessary releases to obtain information to enable the director or spending unit to verify that the vendor is licensed and in good standing with the above entities.
  16. **ANTITRUST:** In submitting a bid to any agency for the State of West Virginia, the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the State of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder.
- I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, or person or entity submitting a bid for the same material, supplies, equipment or services and is in all respects fair and without collusion or Fraud. I further certify that I am authorized to sign the certification on behalf of the bidder or this bid.

### INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division. Complete all sections of the quotation form.
2. Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Unit prices shall prevail in case of discrepancy. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
4. All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130
5. Communication during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited (W.Va. C.S.R. §148-1-6.6).



State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

## Request for Quotation

RFQ NUMBER

EBA392

PAGE

2

ADDRESS CORRESPONDENCE TO ATTENTION OF:

SHELLY MURRAY  
304-558-8801

## RFQ COPY

TYPE NAME/ADDRESS HERE

Electronics Research, Inc.  
7777 Gardner Road  
Chandler, IN 47610

EDUCATIONAL BROADCASTING  
AUTHORITY  
600 CAPITOL STREET

CHARLESTON, WV  
25301-1223 304-558-3400

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS		
12/15/2011	0%, Net 10 days	Surface Truck	As specified	Included		
BID OPENING DATE: 01/19/2012		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
<p><b>BANKRUPTCY: IN THE EVENT THE VENDOR/CONTRACTOR FILES FOR BANKRUPTCY PROTECTION, THIS CONTRACT IS AUTOMATICALLY NULL AND VOID, AND IS TERMINATED WITHOUT FURTHER ORDER.</b></p> <p><b>NOTICE</b></p> <p><b>A SIGNED BID MUST BE SUBMITTED TO:</b></p> <p><b>DEPARTMENT OF ADMINISTRATION PURCHASING DIVISION BUILDING 15 2019 WASHINGTON STREET, EAST CHARLESTON, WV 25305-0130</b></p> <p><b>THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:</b></p> <p><b>SEALED BID</b></p> <p><b>BUYER: SHELLY MURRAY</b></p> <p><b>RFQ. NO.: EBA392</b></p> <p><b>BID OPENING DATE: 01/19/2012</b></p> <p><b>BID OPENING TIME: 1:30 PM</b></p> <p><b>PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY TO CONTACT YOU REGARDING YOUR BID:</b></p>						
SEE REVERSE SIDE FOR TERMS AND CONDITIONS						
SIGNATURE <i>William A. Harland</i>		TELEPHONE 41 (812) 925-6000, Ext. 214		DATE January 17, 2012		
TITLE Vice President of Marketing		FEIN 35-1083384		ADDRESS CHANGES TO BE NOTED ABOVE		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'





State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

## Request for Quotation

RFQ NUMBER

EBA392

PAGE

3

ADDRESS CORRESPONDENCE TO ATTENTION OF:

SHELLY MURRAY  
304-558-8801

## RFQ COPY

## TYPE NAME/ADDRESS HERE

Electronics Research, Inc.  
7777 Gardner Road  
Chandler, IN 47610

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EDUCATIONAL BROADCASTING  
AUTHORITY  
600 CAPITOL STREET

CHARLESTON, WV  
25301-1223

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DATE PRINTED	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
12/15/2011	0%, Net 10 days	Surface Truck	As specified	Included

BID OPENING DATE:

01/19/2012

BID OPENING TIME

01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
-----						
CONTACT PERSON (PLEASE PRINT CLEARLY):						
-----						
***** THIS IS THE END OF RFQ EBA392 ***** TOTAL: _____						
Contact Person: Bill Harland Vice President of Marketing Electronics Research, Inc. 7777 Gardner Road Chandler, IN 47610-9219 USA +1 812 925-4020x214 (direct) +1 (812) 925-4026 (fax) +1 812 455-1823 (cell) bharland@eriinc.com						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	William A. Harland	TELEPHONE	+1 (812) 925-6000, Ext. 214	DATE	January 17, 2012
TITLE	Vice President of Marketing	FEIN	35-1083384	ADDRESS CHANGES TO BE NOTED ABOVE	

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

**EBA392**

West Virginia Educational Broadcasting Authority (WVEBA) is seeking bids on a side mount 5 bay FM antenna system with vertical polarization and anti-icing radomes. The antenna shall operate on a frequency of 88.5 MHz.

Delivery of the antenna system shall be no later than March 1, 2012.

Specifications plus 4 attachments:

- Tower Drawing (6 Pages)
- Azimuth of Tower
- Antenna Pattern
- Antenna Pattern tabature

The successful vendor shall be a registered vendor with the State of West Virginia Purchasing Division and will pay the \$125 registration fee.

**ANTENNA****1. General description**

- 1.1. Antenna shall operate on a frequency of 88.5MHz
- 1.2. Antenna shall be 5 bays.
  - 1.2.1. Antenna shall utilize Full Wavelength spacing
  - 1.2.2. Polarization shall be vertical only
  - 1.2.3. Antenna system (antenna, line, and isolator) must deliver a power gain that will result in a 50 KW ERP using a maximum transmitter power of 10 kilowatts
- 1.3. Assembled antenna must accept 10 Kilowatts at a Frequency of 88.5 Megahertz
  - 1.3.1. No beam tilt is requested
  - 1.3.2. Input connector shall be vendor's discretion.
    - 1.3.2.1. All components must be rated to accommodate a power level greater than 10 KW.
  - 1.3.3. Entire antenna and feed mechanism must be pressurizable.
  - 1.3.4. Antenna shall be equipped with anti-icing radomes
    - 1.3.4.1. Antenna heaters will not be acceptable
  - 1.3.5. Antenna will be side mounted with a center of radiation of 54 meters on a self self-supporting AM tower. (Drawing attached- Attachment 1)
    - 1.3.5.1. Tower orientation is defined in Attachment 2
    - 1.3.5.2. Isolation**
  - 1.3.6. The tower is an insulated base AM facility
  - 1.3.7. Vendor shall provide an isolator to allow the FM antenna to be attached to the tower
    - 1.3.7.1. Isolator shall be rated greater than 10 KW input power
    - 1.3.7.2. Isolator shall pass dehydrated air to the transmission line going up the tower to the antenna

- 1.3.8. Vendor shall provide transmission line from the isolator to the transmitter inside the building

#### **1.4. Certification**

- 1.4.1. The mounted antenna must meet the azimuthal pattern described in the attached drawings and table (drawings and table attached- Attachment 3 and 4)

- 1.4.1.1. Azimuthal pattern shall be verified by range testing or field measurements of the installed antenna.

- 1.4.1.1.1. The successful vendor shall provide a complete proof of performance to verify the horizontal plane radiation pattern for both the horizontally and vertically polarized radiation components. This proof of performance may be accomplished using the full size antenna, or individual bays therefrom, mounted on a supporting structure of identical dimensions and configuration as the proposed structure, including all braces, ladders, conduits, coaxial lines, and other appurtenances; **or** by using a carefully manufactured scale model of the entire antenna; **or** the individual bays therefrom, mounted on an equally scaled model of the proposed supporting structure, including all appurtenances.

- 1.4.1.1.2. The successful vendor shall provide a description of the antenna testing facilities and equipment employed, including appropriate photographs or sketches and a description of the testing procedures, including the scale factor, measurements frequency, and equipment calibration.

- 1.4.1.2. Antenna shall be field matched to meet a VSWR of 1.1:1 or better.

#### **2. TRANSMISSION LINE**

- 2.1. Vendor shall supply Transmission line

- 2.1.1. Line shall be of sufficient efficiency to allow 50 KW ERP using 10 KW TPO

- 2.1.2. Antenna connector shall be at vendor's discretion

- 2.1.2.1. All components shall be rated for a power level greater than 10 KW

- 2.1.2.2. All connectors shall be gas pass with the exception of the connector in the building for the transmitter

- 2.1.2.3. Vendor shall provide a 90 degree adapter to interface to the transmitter output

- 2.1.2.4. Transmitter output is 1 5/8" EIA Flange

- 2.1.3. Line shall be air dielectric and pressurized and shall provide pressurization to the antenna

- 2.1.4. Vendor shall provide all hangers, angle adapters, hoisting kits, grounding kits and other items necessary for installation

- 2.1.4.1. Snap in hangers shall not be used
- 2.1.5. Vendor shall provide air dehydration/pressurization unit

### **MOUNTING HARDWARE**

- 3. Vendor must provide mounting hardware and adapters to interface between the tower and antenna.
  - 3.1. The attached fabrication drawing lists the material size for the legs and cross members.
  - 3.2. The orientation of the tower is defined in Attachment 2
    - 3.2.1.1. Antenna must be supported at a distance from the tower to minimize pattern interference.
    - 3.2.1.2. Antenna must be supported in a manner that minimizes flexing at interbay connections.
    - 3.2.1.3. Antirotation support shall be provided and fabricated to absolutely orient the antenna in the proper azimuth
    - 3.2.1.4. All mounting hardware must be galvanized or stainless steel.
    - 3.2.1.5. All hardware shall meet or exceed EIA/TIA RS-222G standard.

### **4. ATTACHMENTS**

- 4.1. Attachment 1 – Tower Fabrication Drawings (6 pages)
- 4.2. Attachment 2 – Tower orientation as surveyed
- 4.3. Azimuth Pattern Graphic
- 4.4. Azimuth Pattern Numeric Table

### **DELIVERY and SHIPPING**

- 5. Delivery of the antenna system shall be no later than March 1, 2012.
- 5.1 Shipping and handling shall be FOB Destination to the West Virginia Educational Broadcasting headquarters and shall be included in the price of the equipment.
- 5.2 The delivery address is West Virginia Public Broadcasting, 600 Capitol Street, Charleston, WV 25301
- 5.3 There shall be 24 hours notice prior to delivery, to the attention of Dave McClanahan, 304-556-4900.

### **6. Warranty**

- 6.1 All products shall be warranted for a minimum of one year.
- 6.1.1 Bidders should state their warranty policy with their bid. They must provide their warranty within 24 hours of a request for the information.

### **INVOICING**

- 7 Itemized invoice shall be sent to:
  - 7.1 West Virginia Educational Broadcasting Authority
    - 7.1.1 Attention Tammy Treadway
    - 7.1.2 P. O. Box 9004
    - 7.1.3 Beckley, WV 25802



## EBA392 Pricing Page 5 Bay FM Sidemount Antenna

Shipping costs shall be included in equipment cost.

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>Price</u>
1	1	Antenna	<u>\$59,192.17</u>
2	1	Transmission Line	<u>\$ 8,5156.85</u>
3	1	Mounting Hardware	<u>Included in Item 1</u>
TOTAL			<u>\$67,709.02</u>

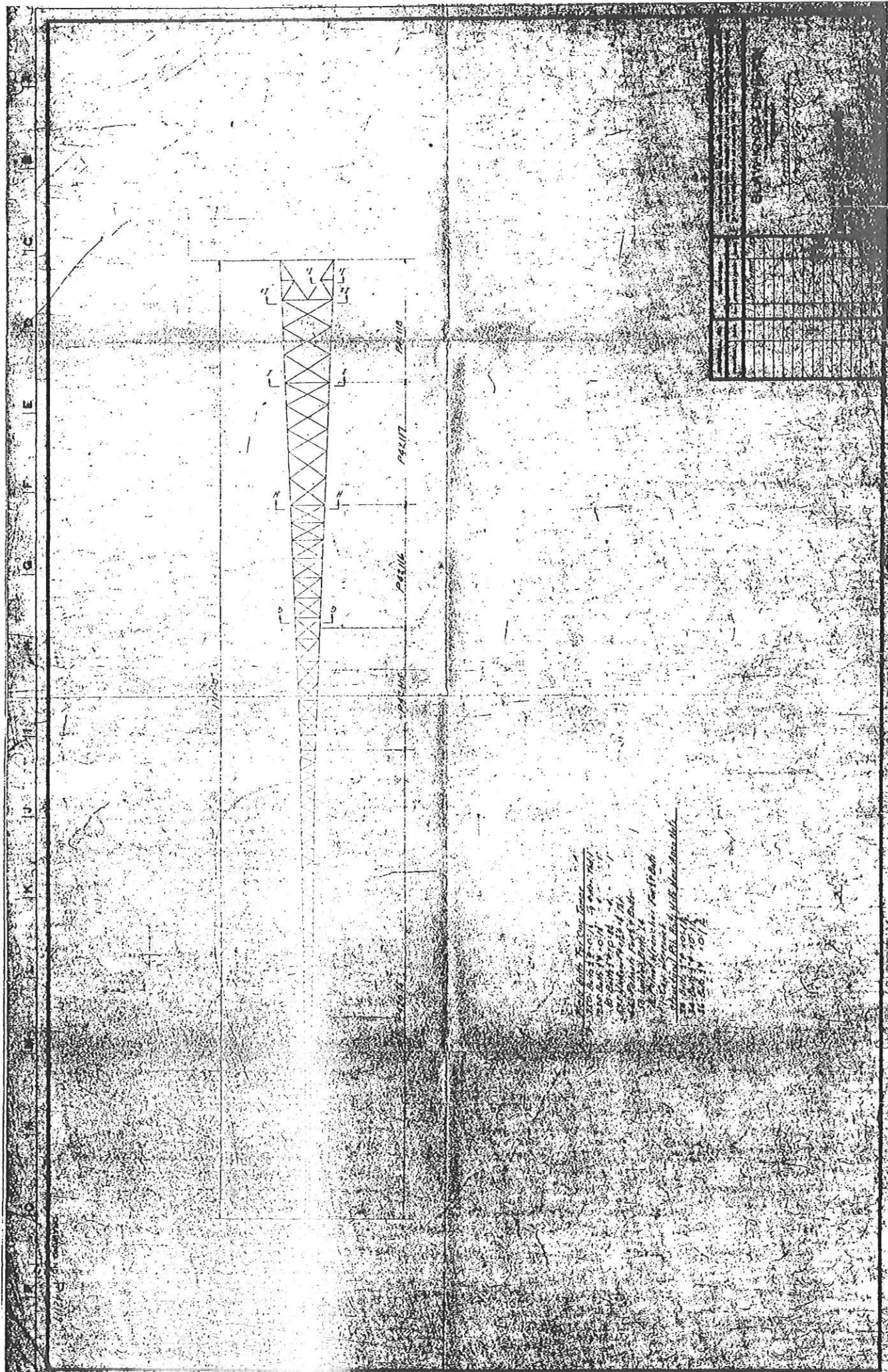
  
\_\_\_\_\_  
Signature of Vendor Representative submitting bid

Date January 17, 2012

William A. Harland  
Vice President of Marketing  
ELRECTRONICS RESEARCH, INC.



800000



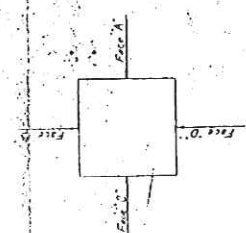
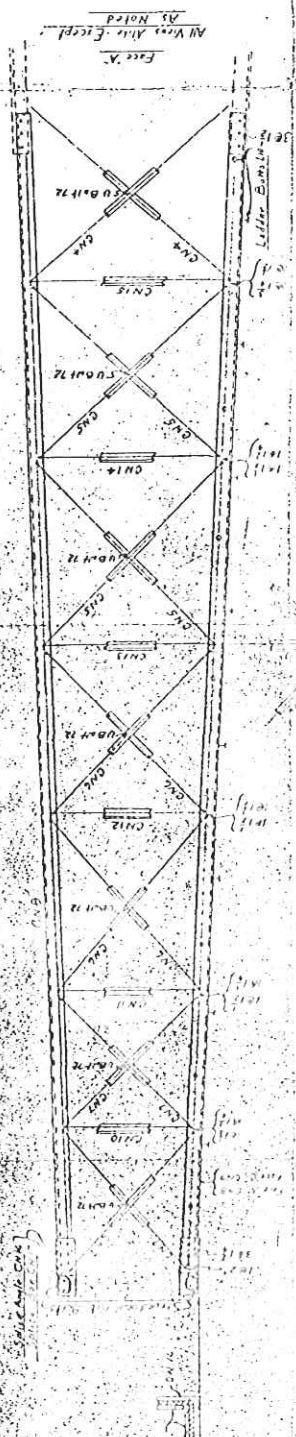
1. 100 ft. long, 10 ft. wide, 10 ft. high  
 2. 100 ft. long, 10 ft. wide, 10 ft. high  
 3. 100 ft. long, 10 ft. wide, 10 ft. high  
 4. 100 ft. long, 10 ft. wide, 10 ft. high  
 5. 100 ft. long, 10 ft. wide, 10 ft. high  
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 9. 100 ft. long, 10 ft. wide, 10 ft. high  
 10. 100 ft. long, 10 ft. wide, 10 ft. high



A B C D E F G H I J K L M N O P

DRAWING NO. P-4215

0000010



SEE DETAIL FOR  
TRUSS MEMBER  
TO BE USED IN THE  
TRUSS BRIDGE  
MANUAL BOOK

REVISIONS		REVISIONS	
NO.	DATE	NO.	DATE
1	10/1/50	1	10/1/50
2	10/1/50	2	10/1/50
3	10/1/50	3	10/1/50
4	10/1/50	4	10/1/50
5	10/1/50	5	10/1/50
6	10/1/50	6	10/1/50
7	10/1/50	7	10/1/50
8	10/1/50	8	10/1/50
9	10/1/50	9	10/1/50
10	10/1/50	10	10/1/50

REVISIONS		REVISIONS	
NO.	DATE	NO.	DATE
1	10/1/50	1	10/1/50
2	10/1/50	2	10/1/50
3	10/1/50	3	10/1/50
4	10/1/50	4	10/1/50
5	10/1/50	5	10/1/50
6	10/1/50	6	10/1/50
7	10/1/50	7	10/1/50
8	10/1/50	8	10/1/50
9	10/1/50	9	10/1/50
10	10/1/50	10	10/1/50











# WEST VIRGINIA PUBLIC BROADCASTING BLUEFIELD RADIO TOWER ORIENTATION DIAGRAM

**Mead & Hunt**

400 TRACY WAY, SUITE 200  
CHARLESTON, WV 25311  
(304) 345-6712 PHONE  
(304) 345-6714 FAX

Date 11/08/11  
Scale 1" = 10'

EXISTING GRAVEL ROAD

FENCE  
COMPOUND

EXISTING 340'  
TOWER

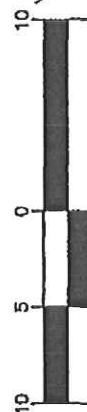
AZ 120° 30' 58"

AZ 209° 30' 58"

AZ 289° 51' 54"

AZ 120° 30' 58"

GRAPHIC SCALE



## LEGEND

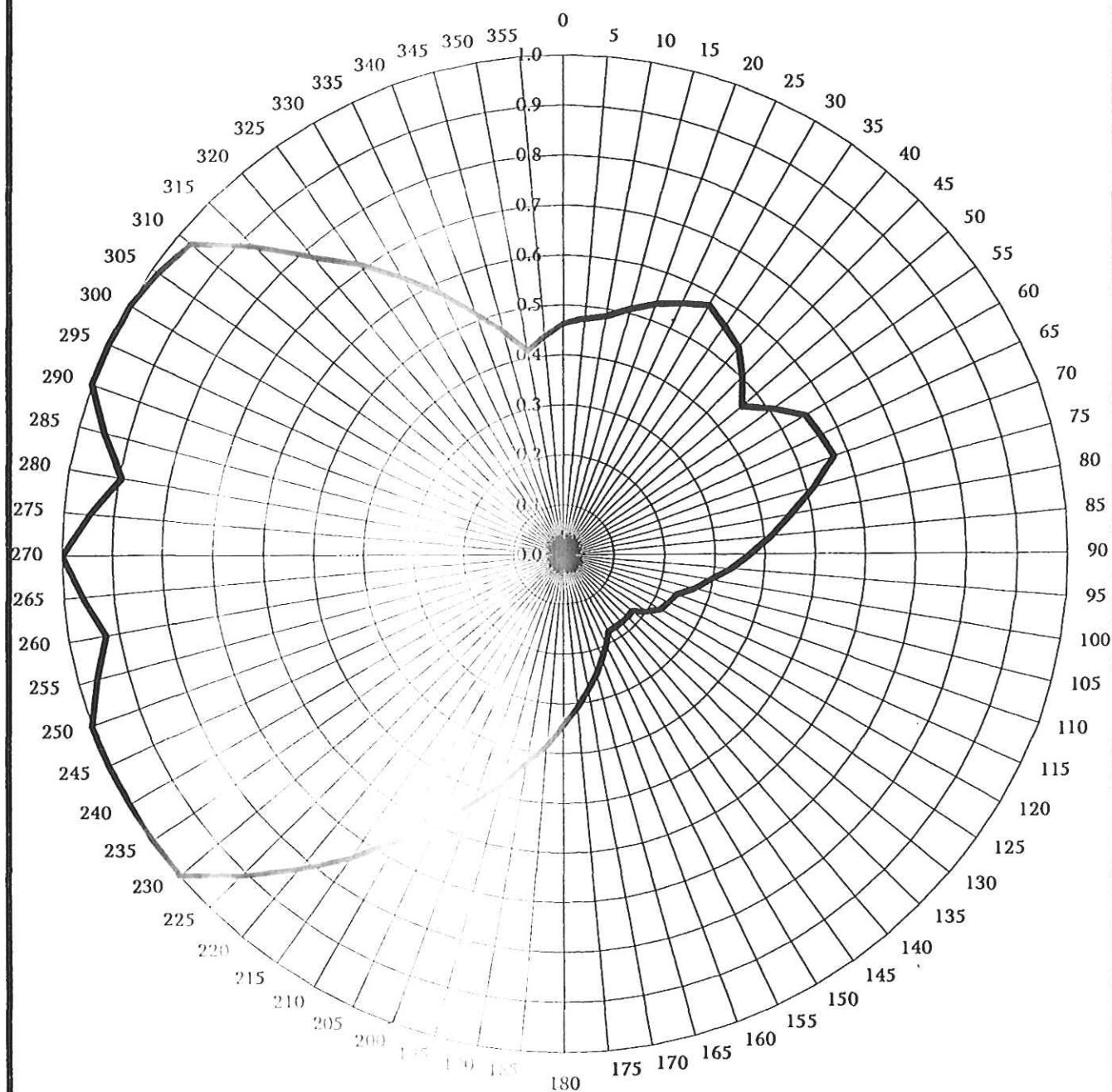
---	PROPERTY LINE
---	TRACT LINE
---	LEASE LINE
---	ROW LINE
-x-	EXISTING FENCE LINE
-x-	PROPOSED FENCE LINE
-G-	GAS LINE
-E-	OVERHEAD POWER
-T-	OVERHEAD TELEPHONE
-UE-	UNDERGROUND POWER
-UT-	UNDERGROUND TELCO.
-E&T-	OVERHEAD POWER/TELEPHONE
SF	PROPOSED SILT FENCE
⊙	5/8" REBAR W/ CAP SET
□	FOUND MONUMENTATION
⊙	CALCULATED POINT
⊙	EXISTING UTILITY POLE
⊙	PROPOSED UTILITY POLE

734W  
CHANGING BY  
3W/YEAR  
MAGNETIC 11/2011  
WV COORDINATE SYSTEM  
OF 1983 SOUTH ZONE





## RELATIVE FIELD AZIMUTH PATTERN

**KESSLER & GEHMAN**

TELECOMMUNICATIONS CONSULTING ENGINEERS

507 N.W. 60th Street, Suite C  
Gainesville, Florida 32607WVDM(FM)  
BLUEFIELD, WV

20110608

EXHIBIT 24.4

TABULATION OF RELATIVE FIELD FOR PROPOSED DIRECTIONAL ANTENNA

<u>AZIMUTH</u>	<u>RELATIVE FIELD</u>	<u>AZIMUTH</u>	<u>RELATIVE FIELD</u>
N000°E	0.463	N180°E	0.343
N010°E	0.486	N190°E	0.427
N020°E	0.534	N200°E	0.531
N030°E	0.575	N210°E	0.661
N040°E	0.541	N220°E	0.823
N050°E	0.462	N230°E	1.000
N060°E	0.555	N240°E	1.000
N070°E	0.571	N250°E	1.000
N080°E	0.459	N260°E	0.925
N090°E	0.369	N270°E	1.000
N100°E	0.296	N280°E	0.895
N110°E	0.238	N290°E	1.000
N120°E	0.222	N300°E	1.000
N130°E	0.178	N310°E	0.971
N140°E	0.178	N320°E	0.780
N150°E	0.178	N330°E	0.641
N160°E	0.222	N340°E	0.515
N170°E	0.276	N350°E	0.414

STATE OF WEST VIRGINIA  
Purchasing Division

# PURCHASING AFFIDAVIT

**West Virginia Code §5A-3-10a states:** No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate.

## DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, limited liability company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

**EXCEPTION:** The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

Under penalty of law for false swearing (**West Virginia Code §61-5-3**), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

## WITNESS THE FOLLOWING SIGNATURE

Vendor's Name: Electronics Research, Inc.

Authorized Signature: *William A. Roth* Date: January 16, 2012

State of Indiana

County of Warrick, to-wit:

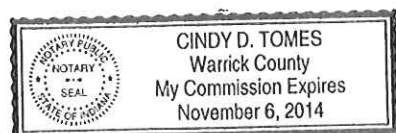
Taken, subscribed, and sworn to before me this 16 day of January, 2011.

My Commission expires 11-06, 2014.

AFFIX SEAL HERE

NOTARY PUBLIC

*Cindy D. Tomes*





State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

# Request for Quotation

RFQ NUMBER

EBA392

PAGE

2

ADDRESS CORRESPONDENCE TO ATTENTION OF:

SHELLY MURRAY  
304-558-8801

RFQ COPY

TYPE NAME/ADDRESS HERE

Electronics Research, Inc.  
7777 Gardner Road  
Chandler, IN 37610

EDUCATIONAL BROADCASTING  
AUTHORITY  
600 CAPITOL STREET

CHARLESTON, WV  
25301-1223 304-558-3400

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS		
01/06/2012	0% Net 30	Surface Truck	Destination	Included		
BID OPENING DATE: 01/19/2012		BID OPENING TIME 01:30PM				
LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
NO. 4 .....						
NO. 5 .....						
I UNDERSTAND THAT FAILURE TO CONFIRM THE RECEIPT OF THE ADDENDUM(S) MAY BE CAUSE FOR REJECTION OF BIDS.						
VENDOR MUST CLEARLY UNDERSTAND THAT ANY VERBAL REPRESENTATION MADE OR ASSUMED TO BE MADE DURING ANY ORAL DISCUSSION HELD BETWEEN VENDOR'S REPRESENTATIVES AND ANY STATE PERSONNEL IS NOT BINDING. ONLY THE INFORMATION ISSUED IN WRITING AND ADDED TO THE SPECIFICATIONS BY AN OFFICIAL ADDENDUM IS BINDING.						
<p>..... SIGNATURE</p> <p>Electronics Research, Inc. ..... COMPANY</p> <p>January 17, 2012 ..... DATE</p>						
NOTE: THIS ADDENDUM ACKNOWLEDGEMENT SHOULD BE SUBMITTED WITH THE BID.						
----- END OF ADDENDUM NO. 1 -----						
SEE REVERSE SIDE FOR TERMS AND CONDITIONS						
SIGNATURE William A. Harland		TELEPHONE +1 (812) 925-6000, Ext. 214		DATE January 17, 2012		
TITLE Vice President of Marketing		FEIN 35-1083384		ADDRESS CHANGES TO BE NOTED ABOVE		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'





State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

## Request for Quotation

RFQ NUMBER

EBA392

PAGE

1

ADDRESS CORRESPONDENCE TO ATTENTION OF:

SHELLY MURRAY  
304-558-8801

RFQ COPY

ELECTRONICS RESEARCH INC  
7777 GARDNER ROAD  
CHANDLER IN 47610-9219

V  
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EDUCATIONAL BROADCASTING  
AUTHORITY  
600 CAPITOL STREET

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CHARLESTON, WV  
25301-1223 304-558-3400

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
01/06/2012	0% Net 30	Surface Truck	Destination	Included

BID OPENING DATE: 01/19/2012 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
----- ADDENDUM NO. 1 -----						
THIS ADDENDUM IS ISSUED TO ADDRESS THE QUESTIONS RECEIVED PRIOR TO THE QUESTION SUBMISSION DEADLINE OF 01/03/2012.						
0001	1	LS		725-12		
ANTENNA						
EXHIBIT 10						
REQUISITION NO.: .....						
ADDENDUM ACKNOWLEDGEMENT						
I HEREBY ACKNOWLEDGE RECEIPT OF THE FOLLOWING CHECKED ADDENDUM(S) AND HAVE MADE THE NECESSARY REVISIONS TO MY PROPOSAL, PLANS AND/OR SPECIFICATION, ETC.						
ADDENDUM NO.'S:						
NO. 1 X .....						
NO. 2 .....						
NO. 3 .....						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	William A. Harland	TELEPHONE	+1 (812) 925-6000, Ext. 214	DATE	January 17, 2012
TITLE	Vice President of Marketing	FEIN	35-1083384	ADDRESS CHANGES TO BE NOTED ABOVE	

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

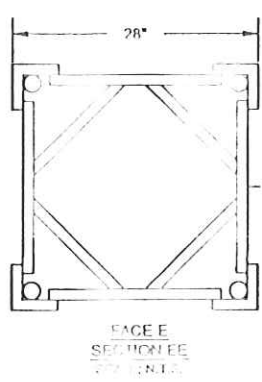
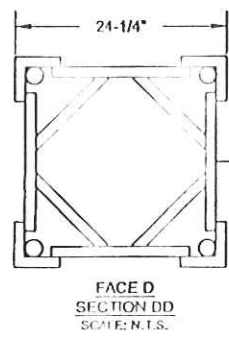
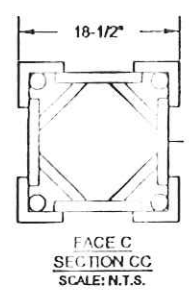
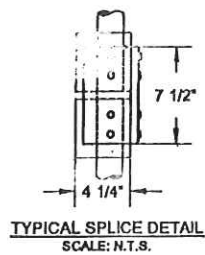
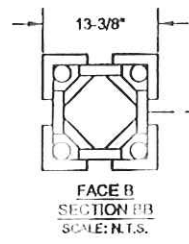
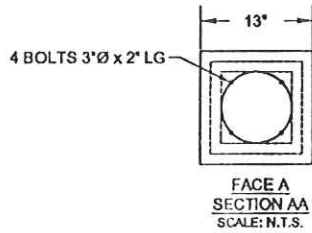
EBA392

**Addendum No. 1**

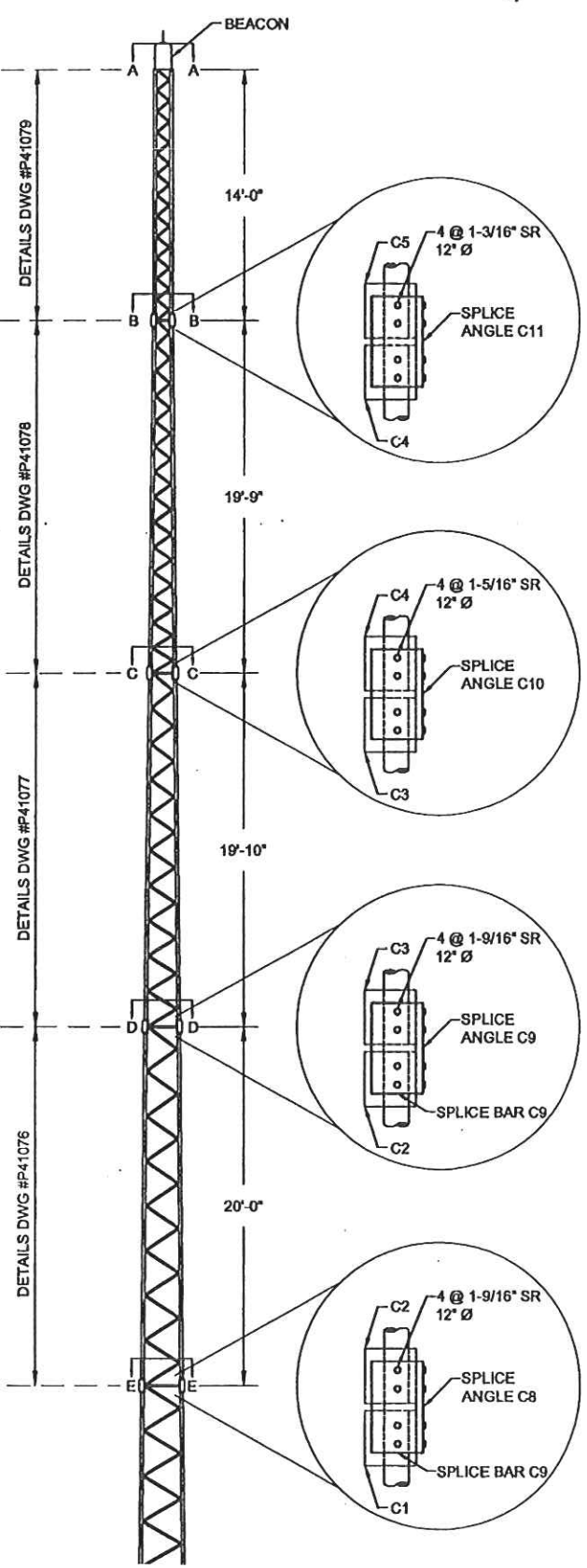
**Question:**

The tower drawing provided ("Drawing 42075.pdf") does not include the face dimensions for sections labeled C5, C4, C3, C2, and C1. Can the detail drawings P-41079, P-41078, P-41077, P-41076, and P-41075 be provided or at minimum can the Drawing 42075.pdf be annotated with the face dimensions at the top and bottom of each tower section? This information is necessary to develop the directional FM antenna design.

**Response:** Please see attachment with inserted tower details.



NOTES:  
1. MEASUREMENTS TAKEN FROM FIELD VERIFICATION ON DEC. 23, 2011.  
2. SEE OWNER'S STRUCTURAL ERECTION DRAWINGS PREPARED BY BLAW-KNOX SHEETS 42116-42119 DATED: NOV. 18, 1946.



PROJECT:		BLUEFIELD	
SCALE:	1" = 10'	DWG. NO.:	
DATE:	01/04/12		



## Exceptions to Specifications

### Exception taken to 50 kW peak ERP requirement

For a number of factors including the: the small tower face size, the minor pattern notches at 280° and 260°, True, the primary coverage required to the northeast, the best product option ERI can propose is a Model P-300-5E-DA vertically polarized FM antenna made directional with vertical parasitics. These requirements and limitations require a reduction in maximum ERP to 40 kW. Please note that this reduction in power level is required to build the product supplied in compliance with FCC requirements. The power handling capability of the products proposed has not been reduced.

Respectfully submitted,



Bill Harland  
Vice President of Marketing  
+1 812 925-4020x214 (direct)  
+1 812 455-1823 (cell)  
bharland@eriinc.com

**Electronics Research, Inc. Proposal**  
**Request for Quotation Number EBA392**  
**West Virginia Educational Broadcasting Authority**  
**Directional FM Antenna for WVDM (FM),**  
**Bluefield, West Virginia**

**Prepared for**

Shelly Murray  
State of West Virginia  
Department of Administration  
Purchasing Division  
2019 Washington Street East  
P.O. Box 50130  
Charleston, WV 25305-0130  
+1 (304) 558-4115 (fax)  
shelly.l.murray@wv.gov

Bid Opening: January 19, 2012 at 1:30 pm  
Validity: February 19, 2012

**ERI Contacts**

Bill Harland  
Vice President of Marketing  
ELECTRONICS RESEARCH, INC.  
Telephone: +1 (812) 925-6000, ext. 214  
Facsimile: +1 (812) 925-4026  
Cell: +1 (812) 455-1823  
E- mail: bharland@eriinc.com

Electronics Research, Inc. • 7777 Gardner Road • Chandler, IN 47610-9219 • USA  
+1 812 925-6000 (tel) • +1 812 925-4030 (fax)

Your Single Source for Broadcast Solutions™ • Call Toll-free at 877 ERI-LINE • Visit Online at [www.eriinc.com](http://www.eriinc.com)

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## Executive Summary

Electronics Research, Inc. submits this information to support its bid response to West Virginia Purchasing Division Request for Quotation EBA392, a directional FM antenna for WVDM (FM), licensed to Bluefield, West Virginia.

The equipment proposed includes a five (5) bay P300 Series vertically polarized directional FM antenna (which includes the required mounting brackets and hardware), an ERI Model 404 FM isolation transformer and a run of 1-5/8-inch air HELIAX transmission line (includes a dehydrator).

### Exception taken to 50 kW peak ERP requirement

For a number of factors including the: the small tower face size, the minor pattern notches at 280° and 260°, True, the primary coverage required to the northeast, the best product option ERI can propose is a Model P-300-5E-DA vertically polarized FM antenna made directional with vertical parasitics. These requirements and limitations require a reduction in maximum ERP to 40 kW. Please note that this reduction in power level is required to build the product supplied in compliance with FCC requirements. The power handling capability of the products proposed has not been reduced.

We believe this bid document is complete enough to provide the individuals reviewing the offers resulting from the request for proposal, with the information needed to evaluate the packages of products and services we offer. ERI is dedicated to serving the antenna and structural needs of the broadcast industry and is the only antenna, transmission line, and tower company focused exclusively on serving broadcast requirements. If you have questions on this proposal or our company please contact Bill Harland (telephone: +1 (812) 925-6000, Ext. 214).



## Quotation

SUBMITTED BY: Bill Harland  
 +1 812 925-4020 x 214 (direct)  
 +1 812 925-4030 (fax)  
[bharland@eriinc.com](mailto:bharland@eriinc.com)

## Quotation

SUBMITTED TO:  
 Shelly Murray  
 State of West Virginia  
 Department of Administration  
 Purchasing Division  
 2019 Washington Street East  
 P.O. Box 50130  
 Charleston, WV 25305-0130  
 +1 (304) 558-4115 (fax)  
[shelly.l.murray@wv.gov](mailto:shelly.l.murray@wv.gov)

QUOTATION NUMBER  
 ERI Response to RFQ EBA392  
 DATE  
 January 19, 2012  
 VALID TO  
 February 19, 2012  
 YOUR REFERENCE  
 Request for Quotation EBA392: WVDM (FM)  
 F.O.B. POINT  
 WV EBA, Charleston, WV  
 PAYMENT TERMS  
 Payable upon receipt of itemized invoice.

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Item	Part #	Description	Extended List Price	Offer Price FOB Destination
<b>Offer Pricing</b>				
		Total Directional FM Antenna and FM Isolation Transformer:	\$66,478.00	\$59,192.17
		Total Transmission Line System:	\$11,924.85	\$8,516.85
		Offer pricing includes transportation of material to:	\$1,771.90	
		West Virginia Public Broadcasting		
		600 Capitol Street		
		Charleston, WV 25301		
		ATTN: Dave McClanahan		
		+1 (304) 556-4900		
		<b>Total all items:</b>	<b>\$80,174.75</b>	<b>\$67,709.02</b>

This quotation is based on the terms and conditions indicated in the quotation body and those included on the final five (5) pages of this quotation and subject to our review and written acceptance of your order at our main business office.

Acceptance by buyer

Please enter our order for the above items in accordance with this quotation.

**Electronics Research, Inc.**

By

Bill Harland

Vice President of Marketing

Company

By

Title

P.O. No.

Date



# Quotation

SUBMITTED TO:  
Shelly Murray  
State of West Virginia  
Department of Administration

QUOTATION NUMBER  
ERI Response to RFQ EBA392  
DATE  
January 19, 2012

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Item	Part #	Description	Unit List Price	Qty	Extended List Price
<b>Directional FM Antenna and FM Isolation Transformer</b>					

001	P300-5BE-DA	Electronics Research Model P300-5BE-DA, Directional FM Panel Antenna. 5 Bay FM Antenna and twenty (20) directors. 3-1/8 inch interbay line, 1-5/8 inch feed element stem, end fed. Input Flange: 3-1/8 inch EIA, female. Includes brackets for mounting on tapered self supporting tower section. 20 kW input power handling capability. Vertically Polarized Antenna. Includes quarter wave DC stub. Full wavelength element spacing. Price includes pattern development and directional FM antenna proof of performance on ERI's full scale test range. Antenna system described in Directional Antenna System Proposed for WVDM, Bluefield, West Virginia dated January 12, 2012.	46,355.00	1	\$46,355.00
-----	-------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------	---	-------------

Additional directors beyond twenty (20) will be invoiced at \$190.00 each.

Additional days of range time beyond the two (2) days allotted will be invoiced at \$2,520.00 per day.

## SPECIFY TUNING AND MOUNTING INFORMATION:

Operating Frequency: 88.5 MHz

Mounting Brackets for:

☐ per Study

Tower Manufacturer: \_\_\_\_\_

Tower Model No: \_\_\_\_\_

LEG OR FACE MOUNTING: Tower face measures \_\_\_\_\_ inches on \_\_\_\_\_ (insides, centers or outsides). Leg measures \_\_\_\_\_ inches outside diameter (if angle member leg, attach sketch indicating angle flange lengths and thickness.)

Antenna Ice Protection Options:

☐ Radomes (extra cost option listed below)

Pattern Measurements:

☐ Directional

PATTERN MEASUREMENTS AND DIRECTIONAL ANTENNAS REQUIRE THE ABOVE INFORMATION AND ALSO THE FOLLOWING:

Tower orientation (true north) and detailed drawings

**Quotation**

SUBMITTED TO:  
 Shelly Murray  
 State of West Virginia  
 Department of Administration

QUOTATION NUMBER  
 ERI Response to RFQ EBA392  
 DATE  
 January 19, 2012

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Item	Part #	Description	Unit List Price	Qty	Extended List Price
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- w/verification from Surveyor:

-

List of items that run through the aperture of the antenna (w/detailed drawings):

-

Construction permit for directional antenna only:

-

-

COMMENTS:

-

-

002	RAD	Radomes (per bay) for P300 Series FM Antennas.	1,724.00	5	\$8,620.00
003	RLA350-150	Plate reducer, 50 ohm, 3-1/8-inch to 1-5/8-inch includes two inner connectors. 1-5/8-inch bullet is removable and mates with captivated 1-5/8-inch inner connectors. Formerly Part Number 1861.	383.00	1	\$383.00
004	IT0038	FM Isolation Transformer Type 404 rated at 10 kW. Input is 1-5/8-inch EIA 50 ohm. Male on one end and 1-5/8-inch EIA 50 ohm female on the other end. Input and output impedance both 50 ohms.	5,120.00	1	\$5,120.00

**FM Isolation Transformer Ordering Information**

**Information Needed**

FM Frequency: \_\_\_\_\_ MHz

FM Transmitter Power Output: \_\_\_\_\_ kW

AM Frequency: \_\_\_\_\_ KHz

AM Transmitter Power Output: \_\_\_\_\_ kW

AM Tower Height: \_\_\_\_\_

Tower Height Listed is expressed in:

\_\_\_ Feet \_\_\_ Meters \_\_\_ Electrical Degrees



# Quotation

SUBMITTED TO:  
Shelly Murray  
State of West Virginia  
Department of Administration

QUOTATION NUMBER  
ERI Response to RFQ EBA392  
DATE  
January 19, 2012

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Item	Part #	Description	Unit List Price	Qty	Extended List Price
		AM Antenna Base Impedance: _____ ohms, J _____			
005	RST-001	One (1) ERI Technician to field match FM antenna after installation. Price includes travel, local living expense, and daily field service rate for one (1) day on site. Customer to provide tower crew for antenna field matching. ERI field service price includes a single (per project) mobilization and indicated number of days on site, for one person. Additional days if required will be charged for at the rate of \$1,750.00 per day. Price valid for the location within the contiguous forty-eight (48) United States only. Contact ERI for pricing in other locations.	6,000.00	1	\$6,000.00
<b>Total Directional FM Antenna and FM Isolation Transformer:</b>					<b>\$66,478.00</b>
<b>Transmission Line System</b>					
<i>The transmission line system provided is based on a 165-foot vertical run and a 75-foot horizontal run. The quantities supplied can be adjusted to accommodate diferent run lengths and the unit prices listed will be applied and invoiced accordingly.</i>					
006	HJ7-50A	Standard coaxial cable, 1-5/8-inch, 50 ohm air HELIAX (Wideband from 0.5-2700 MHz), price per foot.	26.01	240	\$6,242.40
Shipped as two customer specified lengths.					
007	87G	Connector, 1-5/8 EIA Flange, gas block for 1-5/8 air HELIAX (HJ7-series), brass body and silver plated pin with tab flared inner contact and tab flaring outer contact.	453.65	1	\$453.65
008	87R	Connector, 1-5/8 EIA Flange, gas pass for 1-5/8 air HELIAX (HJ7-series), brass body and silver plated pin with tab flared inner contact and tab flaring outer contact.	392.74	3	\$1,178.22
009	ATTACH-AC3	Factory attachment charge for HJ7-50A connectors. Attach one of Item 007 first off reel of length specified for the vertical run (antenna connection) and one of Itemm 007 attached to one end of the line section specified for the horizontal run (FM isolation transformer connection). Third Item 007 and Item 006 shipped loose.	37.39	2	\$74.78
010	ACX150-10SE	1-5/8-inch, 50 ohm, 90 degree miter elbow, swivel flanges, includes inner connector, "O" ring, silicone grease, and flange hardware kit.	357.00	1	\$357.00

## Quotation

**SUBMITTED TO:**

Shelly Murray  
State of West Virginia  
Department of Administration

**QUOTATION NUMBER**

ERI Response to RFQ EBA392

**DATE**

January 19, 2012

**PAGE**

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Item	Part #	Description	Unit List Price	Qty	Extended List Price
011	42396A-2	Standard hangers, qty. 10, for 1-5/8-inch coaxial and EW44 waveguide HELIAX. Hangers do not include hardware kit. When attachment means does not include hardware: 1/2 to 4 inch hangers use 3/8 inch hardware 3/4 inch long Part Number 31769-5 or HWK0005 or 1 inch long Part Number 31769-1 or HWK0001.	24.48	8	\$195.84
012	24312A	Hoisting Grip for 1-5/8-inch coaxial cable and EW44, EW52, and EW63 elliptical waveguides. Use Part Number HGK0001 Hoisting Grip Hanger Kit to permanently secure hoisting grip in place.	31.42	1	\$31.42
013	241088-4	grounding kit, qty. 1, 24-inch cable with 2-hole factory attached lug for 1-5/8-inch coaxial and EW44, EW52, and EW63 waveguide HELIAX	23.69	6	\$142.14
014	SCE-158	Wall/Roof Feed Thru Kit, Single Entrance, for 1-5/8-inch Cable	67.68	1	\$67.68
015	HGK0001	Hoisting grip hanger kit to attach HELIAX hoisting grips to tower. Includes 18-inches of chain, 12-inch x 12-inch turnbuckle, and two shackles. One required for each hoisting grip and one hoisting grip required for each 200-feet of vertical run.	150.00	1	\$150.00
016	31768A	Angle adapter qty. 10 for all waveguides and coaxial cables 1/2-inch to 4-inch. Includes attachment hardware.	61.48	8	\$491.84
017	221213	Connector/Splice weatherproofing kit	19.94	2	\$39.88
018	MOJAVE1	DryLine® Dehydrator, Low-pressure membrane, 19 in rack mountable, 2.0–5.0 psig, with summary alarm, 115 VAC, 60 Hz.	2,500.00	1	\$2,500.00

**Total Transmission Line System:****\$11,924.85****ADDITIONAL NOTES:**

Customer to provide tower crew for antenna field matching.

All prices shown are in US Dollars.

Transmission line listed is a typical set of components required for a system of the specified length provided. Additional items required will be invoiced at the unit prices listed in this quotation. Does not include transmission line required between the combiner output to the gas barrier or from the transmitters to the combiner system input.

Any unpaid balances subject to a 1.8% per month

## Quotation

**SUBMITTED TO:**

Shelly Murray  
State of West Virginia  
Department of Administration

**QUOTATION NUMBER**

ERI Response to RFQ EBA392

**DATE**

January 19, 2012

**PAGE**

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Item	Part #	Description	Unit List Price	Qty	Extended List Price
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finance charge.

Prices do not include installation, except where noted.

Prices do not include any state, local, or other taxes or duty. If these are collected they will be invoiced at cost.

All orders and remittances should be sent to:

ELECTRONICS RESEARCH INC.  
7777 Gardner Road  
Chandler, IN 47610 USA  
Telephone: +1 (812) 925-6000  
Facsimile: +1 (812) 925-4030  
Web Site: <http://www.eriinc.com>

## Project Information Page

Business Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_ Shipping Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_ Facsimile: \_\_\_\_\_

Name of Individual to Receive all Correspondence regarding this Order:

Contact Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_ Shipping Address (for courier shipments): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_ Facsimile: \_\_\_\_\_

Email: \_\_\_\_\_

Special Instructions for  
Equipment Shipment:

Name of Consulting Engineer (if applicable) regarding this Order:

Consultant Name: \_\_\_\_\_

Consultant Mailing Address: \_\_\_\_\_ Consultant Shipping Address (for courier shipments): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_ Facsimile: \_\_\_\_\_

Email: \_\_\_\_\_

SHIP VIA: Normal shipment will be truck or flatbed, per ERI instructions unless otherwise specified:

Other Method: \_\_\_\_\_

Final CP Received? ☐ YES ☐ NO

Desired Ship Date: \_\_\_\_\_

Comments: \_\_\_\_\_





## Terms and Conditions of Sale

### 1. Applicable to all orders

- 1.1. **Acceptance of Proposal:** When the Proposal is signed by Buyer, returned to Electronics Research, Inc. (hereinafter called "ERI"), and accepted by ERI at its offices in Chandler, Indiana, USA, the Proposal shall become a binding agreement for the purchase by buyer from ERI of the Products and/or Services described therein, upon the terms specified, including these Terms and Conditions of Sale, attached to the Proposal. Refundable deposits are charged for some skids and large size cable reels. All orders are subject to a minimum charge of \$50.00 net.
- 1.2. **Acknowledgement of Terms:** By signing the Proposal, Buyer represents and acknowledges that it has fully read, understands, and accepts the terms of the Proposal, including these "Terms and Conditions of Sale" included therein, that the Proposal contains the complete and final agreement of Buyer and ERI with respect to the Products and/or Services described therein; that all other agreements, representations, and warranties, whether oral or in writing, made prior to or at the time of the signing of the Proposal, are merged and replaced therein; and that no change or addition to the Proposal shall be valid and enforceable unless made in writing and signed by an authorized representative of ERI.
- 1.3. **Buyer's Terms and Conditions:** ERI desires to provide its customers with prompt and efficient service. However, to negotiate individually the terms and conditions of each sales contract would substantially impair ERI's ability to provide such service. Accordingly, Products and Services furnished by ERI are sold only on the terms and conditions stated herein, any terms or conditions on Buyer's order to the contrary notwithstanding. ERI's performance of any contract is expressly made conditional on Buyer's agreement to ERI's Terms and Conditions of Sale unless otherwise specifically agreed to, in writing, by ERI. In the absence of such agreement, commencement of performance and/or delivery shall be for Buyer's convenience only and shall not be deemed or construed to be acceptance of Buyer's terms and conditions. If a contract is not earlier formed by mutual agreement, in writing, acceptance of any Product or Service shall be deemed acceptance of the terms and conditions stated herein. In the case of a conflict between the terms and conditions stated herein and those appearing on the face of this Proposal, the latter shall control. All contracts for the sale of Products and/or Services shall be construed under and governed by the laws of the State of Indiana, the location of ERI's primary manufacturing facilities and its corporate headquarters.
- 1.4. **Conditions of Proposal:** ERI's Proposal is subject to the following:
  - 1.4.1. The Buyer warrants that all information supplied by it to ERI for the preparation by ERI of the Proposal, including oral and written correspondence, reports, plans, and specifications are adequate, accurate, workable, and practicable of design, and, if the supplied information is followed, a sufficient and satisfactory result will be achieved. Buyer shall be responsible for all costs incurred by ERI by reason of any inaccurate or incomplete information supplied by Buyer.
  - 1.4.2. UNLESS OTHERWISE SPECIFIED, IN WRITING, ALL PROPOSALS ARE FIRM FOR, AND EXPIRE, THIRTY (30) DAYS AFTER DATE THEREOF AND CONSTITUTE OFFERS, provided, however, that budgetary Proposals and estimates are for preliminary information only and shall neither constitute offers, nor impose any responsibility or liability upon ERI.
  - 1.4.3. Unless otherwise stated in writing by ERI in the Proposal, all prices in a Proposal shall be exclusive of transportation, insurance, taxes (including, without limitation, any sales, use or similar tax, and any tax levied on or assessed to ERI after Product delivery by reason of ERI's security interest in Products), license fees, customs fees, duties and other charges related thereto, and Buyer shall report and pay any and all such shipping charges, premiums, taxes, fees, duties and other charges related thereto, and shall hold ERI harmless there from, provided, however, that if ERI, in its sole discretion, chooses to make any such payment, Buyer shall reimburse ERI in full upon demand.
  - 1.4.4. Stenographical, typographical and clerical errors contained in the Proposal are subject to correction.
  - 1.4.5. Prices set forth in a Proposal are for Products and/or Services only and do not include technical data, proprietary rights of any kind, patent rights, qualification, environmental or other than ERI's standard product performance tests, and other than ERI's normal domestic commercial packaging, unless expressly agreed to in writing by ERI.
  - 1.4.6. Published weights and dimensions are approximate only. Certified dimension drawings can be obtained upon request. Manuals, programs, listings, drawings, or other documentation required hereunder must be referenced specifically.
- 1.5. **Terms of Payment:** Unless otherwise stated in the Proposal, payment is due upon delivery. All payments for Products released and shipped on approved credit accounts shall be due in upon receipt of invoice therefore. Past due balances shall be subject to a late charge of 1.8% per month. Partial shipments will be billed as made and payments therefore are subject to the above terms. Payment shall not be withheld for delay in delivery of required documentation unless a separate price is stated therefor, and then only to the extent of the price stated for such undelivered documentation. ERI may cancel or delay delivery of Products in the event Buyer fails to make prompt payment therefore or in the event of an arrearage in Buyer's account with ERI.
- 1.6. **Performance:** ERI will make all reasonable effort to observe its dates indicated for delivery or other performance. However, ERI shall not be liable in any way because of any delay in performance hereunder due to acceptance of prior orders; technical difficulties; strike; lockout; riot; war; fire; act of God; accident; failure or breakdown of components necessary to complete an order; subcontractor, supplier or Buyer caused delays; inability to obtain or constrain substantial rises in the price of labor, materials or manufacturing facilities; curtailment of or failure to obtain sufficient electrical or other energy supplies; or compliance with any law, or regulation or order, whether valid or invalid, of any cognizant governmental body or any instrumentality thereof now existing or hereafter created; or due to any unforeseen circumstances or causes beyond ERI's control, provided such delay is neither material nor indefinite. ERI's performance shall be deemed suspended during and extended for such time as it is so delayed, and thereafter Buyer shall accept performance hereunder. Delay in performance shall not be considered material or indefinite unless it exceeds or is reasonably estimated by ERI to exceed a period of six (6) months. ERI reserves the right, in its sole discretion, to allocate inventories and current production and substitute suitable materials when, in its opinion, such allocation or substitution is necessary due to such circumstances or causes in the interest of conservation of scarce materials and efficient utilization of high value parts and components. ERI's products may contain remanufactured parts and components. Such parts and components are covered by the same warranty and are subject to the same high standards of quality control applied to other parts and components. No



**Terms and Conditions of Sale (continued)**

penalty clause for delay in performance contained in any Buyer-originated documents of any kind shall be effective. As used herein, "performance" shall include, without limitation, fabrication, shipment, delivery, assembly, installation, testing and warranty repair or replacement, as applicable.

- 1.7. **Change Orders:** Buyer change orders must be in writing and no change shall be made pursuant to this clause unless agreed to in writing and signed by duly authorized representatives of ERI and Buyer. If any such change causes an increase or decrease in the cost or the time required for the performance of any part of the work, an equitable adjustment shall be made in the contract price and schedule. ERI shall have no obligation to commence any extra or changed work without written agreement as to adjustments to contract price and delivery schedules affected thereby.
- 1.8. **Assignments and Terminations:** Any assignment by Buyer of any contract created by the Proposal without the express written consent of ERI is void. No order may be terminated by Buyer except by mutual agreement in writing. Terminations by mutual agreement are subject to the following conditions: (a) Buyer will pay, at applicable contract prices, for all Products which are completely manufactured and allocable to Buyer at the time of ERI's receipt of a request for mutual termination; (b) Buyer will pay all costs, direct and indirect, which have been incurred by ERI with regard to Products which have not been completely manufactured at the time of ERI's receipt of a request for mutual termination, plus a pro rata portion of normal profit on the contract; (c) Buyer will pay a termination charge on all other Products affected by the termination. (d) Orders for standard catalog products may be canceled prior shipment, however any order that has been cut, filled or packaged prior to Seller's receipt of cancellation notice shall be subject to a 20% re-stocking charge. (e) Orders for non-standard products or specially manufactured products may be canceled prior to the start of manufacture provided Buyer reimburses ERI for any actual costs incurred on the order prior to the effective cancellation date. After manufacture commences, orders for non-standard products or specially manufactured products may not be canceled. In the event Buyer terminates such orders, Buyer shall be liable to ERI for termination charges, including, but not limited to, reasonable profits. ERI's normal accounting practices shall be used to determine costs and other charges. To reduce termination charges, ERI will divert completed parts, material or work in process from terminated contracts to other Buyers whenever, in ERI's sole discretion, it is practicable to do so.
- 1.9. **Damages and Liability:** ERI'S AGGREGATE LIABILITY IN DAMAGES OR OTHERWISE SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY ERI FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE. IN NO EVENT SHALL ERI BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, LIQUIDATED, OR SPECIAL DAMAGES, HOWSOEVER CAUSED. Liability to third parties for bodily injury, including death, resulting from ERI's performance shall be determined in accordance with applicable law and shall not be affected by the liability limitations stated above in this paragraph.
- 1.10. **Disputes:** All disputes under any contract concerning Products and/or Services not otherwise resolved between ERI and Buyer shall be resolved in a court of competent jurisdiction in the County of Warrick in the State of Indiana or the United States District Court for the Southern District of Indiana, Evansville Division, and in no other place. Provided, that in ERI's sole discretion, such action may be heard in some other place designated by ERI if necessary to acquire jurisdiction over third persons so that the dispute can be resolved in one action. Buyer hereby consents to the jurisdiction of such court or courts and agrees to appear in any such action upon written notice thereof. No action, regardless of form, arising out of, or in any way connected with, the Products or Services furnished by ERI, may be brought by Buyer more than one (1) year after the cause of action has occurred. If any part, provision or clause of these "Terms and Conditions of sale, or the application thereof to any person or circumstances, is held invalid, void or unenforceable, such holding shall not affect and shall leave valid all other parts, provisions, clauses or applications of these Terms and Conditions remaining, and to this end these Terms and Conditions shall be treated as severable.
- 1.11. **General Conditions:**
  - 1.11.1. No delay or failure on the part of ERI in exercising any right or remedy under any contract resulting from, and/or partial or single exercise thereof, shall constitute a waiver of such right or any other remedy. ERI's rights and remedies under any contract resulting here from are cumulative and not alternative.
  - 1.11.2. If any term of any contract resulting here from or the application thereof shall be illegal, such illegality shall not affect any other term or condition thereof, and such shall continue in full force and effect.
  - 1.11.3. Any contract resulting here from shall be binding upon the heirs, personal representative, successors and permitted assigns of the parties.

**2. Applicable to orders for Products**

- 2.1. **Transportation and Risk of Loss:** Transportation will normally follow Buyer's shipping instructions, but ERI reserves the right to ship Products freight collect and to select the means of transportation and routing when Buyers instructions are deemed unsuitable in ERI's judgment. Unless otherwise advised, ERI may, but shall be under no obligation to, insure to full value of the Products or declare full value thereof to the transportation company at the time of delivery, and all freight and insurance costs shall be for Buyer's account. Risk of loss and/or damage shall pass to Buyer upon delivery of the Products to the transportation company at the FOB point whether or not installation is provided by or under supervision of ERI. Confiscation or destruction of, or damage to Products shall not release, reduce or in any way affect the liability of Buyer therefore. Notwithstanding any defect or nonconformity, or any other matter, such risk of loss and/or damage shall remain in Buyer until the Products are returned at Buyer's expense to such place as ERI may designate, in writing. Buyer, at its expense, shall fully insure Products against all loss and/or damage until ERI has been paid in full or the Products have been returned for whatever reason to ERI. All Products must be inspected upon receipt and claims should be filed with the transportation company when there is evidence of shipping damage, either concealed or external. As used in the clauses appearing herein or attached hereto, "delivery" shall occur when the Product is delivered at the FOB point which shall be the point of manufacture or such other place as ERI shall specify, in writing, notwithstanding installation by or under supervision of ERI.
- 2.2. **Acceptance:** The shipment by ERI of a Product to the Buyer shall constitute acceptance of that Product by Buyer, unless notice of defect or nonconformity is received by ERI within thirty (30) days of receipt of the Product at Buyer's designated receiving address, provided, that for

**Terms and Conditions of Sale (continued)**

Products for which ERI agrees, in writing, to perform acceptance testing after installation, the completion of ERI's applicable acceptance test, or execution of ERI's acceptance form by Buyer, shall constitute acceptance of the Product by Buyer. Notwithstanding the foregoing, any use of a Product by Buyer, its agents, employees, contractors or licensees, for any purpose, after receipt thereof, shall constitute acceptance of that Product by Buyer. ERI may repair or, at its option, replace defective or nonconforming parts after receipt of notice of defect or nonconformity.

- 2.3. **Shipment Delays/Billing in Place:** Upon completion of Buyer's order, any delay in shipment attributable to Buyer, including, but not limited to, Buyer's request to defer the delivery date, shall cause the following to occur: Thirty (30) days after the original shipment date, a storage charge of 1½% of the invoice price per month will be billed to Buyer and title to the shipment will automatically pass to Buyer. ERI will invoice Buyer for completed goods and Buyer will pay in accordance with the terms of the original sale, as the goods will be deemed to have shipped in place. ERI will insure against risk of loss until physical shipment of the goods to a common carrier. A tower shipment date is contingent upon receipt by ERI of all necessary site specific information. This information must be included with the signed Proposal and tower order. Depending upon the nature of the project, site specific information may include, but is not limited to: a site survey showing plot dimensions, topography, and possible obstructions; a geotechnical report; the desired tower orientation; the desired antenna orientation; and a complete shipping address.
- 2.4. **Returns:** Standard catalog products may be returned for credit provided such products are returned within six (6) months after the original shipment date. The minimum value accepted for return from each purchase order is \$50.00. The amount of credit issued for any returned product shall be determined solely by ERI based on the resalable condition of the product. Non-standard products, including products specially manufactured in accordance with Buyer's specifications or tuned to one or more specified operating frequencies may not be returned for credit. Buyer shall obtain ERI's written return goods authorization prior to returning any Product for credit.
- 2.5. **Servicing Warning:** The Products may be dangerous if improperly installed, handled, serviced, refurbished, or reinforced. In the event that repair, maintenance or servicing need to be performed on the Products, Buyer should contact ERI immediately. ERI shall not be liable for any damages or injuries occurring in connection with maintenance, servicing or repair work on the Products done by persons other than ERI or its duly authorized representatives.
- 2.6. **Installation:** Unless this Proposal includes installation services, Buyer is responsible for installation of the Products, including preparation and maintenance of all Products, materials, or services necessary for the operation of the Products not provided by ERI. All installations should be performed by qualified tower climbers and electricians. All OSHA, state and local safety regulations should be observed. Any photos or drawings in product literature, installation manuals, or drawings are used to illustrate a specific point and are not intended to supersede any OSHA, state or local safety regulations.
- 2.7. **Patents and Other Intellectual Property Rights:** ERI will, at its own expense and as set forth herein, defend any action brought against Buyer in respect to any claim that the design or manufacture of any Product in ERI's commercial line of Products or manufactured to specifications set by ERI and furnished hereunder, constitutes an infringement of any patents or other intellectual property rights of the United States. Subject to the provisions in the DAMAGES AND LIABILITY section hereof, ERI will pay all damages and costs either awarded in a suit or paid, in ERI's sole discretion, by way of settlement, which are based on such claim of infringement, provided, that Buyer promptly notifies ERI, in writing, of such claim or infringement and gives ERI full authority, information and assistance in settling or defending such claim, or ERI will, in its sole discretion and at its own expense, either procure a license which will protect Buyer against such claim without cost to Buyer, replace said Product with a non-infringing Product or remove said Product and refund an equitable portion of the price paid by the Buyer to ERI for said Product. ERI shall have no liability whatsoever hereunder with respect to any claims settled by Buyer without ERI's prior written consent. ERI EXPRESSLY EXCLUDES from any liability hereunder, and Buyer shall hold ERI harmless from and against, any expense, loss, costs, damages or liability resulting from claimed infringement of patents, trademarks, copyrights or other intellectual property rights: (a) arising from a use of or a combination of a Product with other equipment, processes, programming applications or materials not furnished under the Proposal; (b) based on items made with the Products furnished under the Proposal; (c) arising out of compliance by ERI with Buyer's designs, specifications or instructions; and/or (d) arising from use or manufacture by anyone of inventions in connection with Products or services sold, used or intended for sale or use in performing contracts with the United States or related subcontracts. The foregoing states ERI's entire liability for any claim based upon or related to any alleged Infringement of any patent or other intellectual property rights.
- 2.8. **Standard Two (2) Year Product Limited Warranty:** Electronics Research, Inc. (ERI) warrants to the original Buyer that its Product is free from defects in material or workmanship
  - 2.8.1. existing at the time of shipment from the factory or
  - 2.8.2. that develop under normal use in a properly installed and maintained system for a period of twenty-four (24) months following the date of shipment, ex-works.
- 2.8.3. **ERI Exclusions:** Expressly excluded from the terms of this limited warranty are defects caused by:
  - 2.8.3.1. faulty installation;
  - 2.8.3.2. all minor system leakage ("leakage" is defined in paragraph 2.8.15), below);
  - 2.8.3.3. equipment leaks and detuning if caused by rough handling or installation;
  - 2.8.3.4. lack of proper inspection and maintenance;
  - 2.8.3.5. unusually severe weather, lightning, icing, acts of God; such events require inspection for, and correction of, such damage;
  - 2.8.3.6. water intrusion, foreign materials in the system;
  - 2.8.3.7. vandalism, physical abuse, tampering, or unauthorized disassembly, repair or modification without explicit written approval of ERI;
  - 2.8.3.8. operation not in accordance with published ratings, specifications, or instructions.



**Terms and Conditions of Sale (continued)**

- 2.8.4. ERI Products are delivered Ex-Works. Unless ERI supervises the transportation, delivery, and/or installation of the product, ERI is not responsible for damage that may result from incorrect or improper transportation, storage, handling or installation of Products.
- 2.8.5. Buyer shall regularly inspect and maintain all ERI manufactured parts and Resale parts in accordance with ERI's and/or manufacturer's inspection and maintenance guidelines and in accordance with all regulations and recommendations of any government agency or body and in accordance with generally accepted industry maintenance standards. An initial inspection shall be conducted promptly after installation to verify that the installation is properly performed in accordance with ERI's and/or the manufacturer's installation instructions and procedures. Such inspections shall be performed at Buyer's expense by qualified personnel, and inspection summary report(s) shall be prepared immediately upon inspection completion. Reports of initial inspections shall be submitted to ERI Customer Service. Buyer shall forever protect, defend, indemnify, and hold ERI free and harmless against all claims, demands, liabilities, cause of action (including, without limitation, legal costs and expenses and reasonable attorney's fees) arising out of, or relating to Buyer's failure to completely discharge its obligations hereunder.
- 2.8.6. Buyer shall follow promptly all recommendations from qualified inspectors and/or ERI regarding the maintenance of all ERI manufactured and Resale structural Products.
- 2.8.7. Upon making a warranty claim, make copies of all preceding inspection reports and dispositions available to ERI for review.
- 2.8.8. Any defective warranted component of an ERI product will be repaired or replaced at the place of manufacture, ex-works, without charge if all defective components are returned by the Buyer to ERI, and ERI inspection discloses that such defects are as reported and are not the result of ERI Exclusions.
- 2.8.9. Under some circumstances, continuity of service may necessitate immediate shipment of repair parts before ERI inspection of defective parts. Under these conditions, ERI requires that Buyer place an order for replacement parts and will require that all defective parts be packaged and returned for factory inspection and determination of warranty status. If failure is determined to be covered by this warranty, credit will be issued for parts ordered by Buyer to expedite replacement.
- 2.8.10. Other than the replacement of defective Products or components ex-works, ERI shall not be responsible for any costs or expenses incurred by the Buyer arising from the identification, removal, and replacement of defective products.
- 2.8.11. ERI, at its sole discretion, may choose to supply warranty parts for repairs on site. In such cases, materials shall be shipped free of additional charge to the site. Losses arising from repair or replacement activities, including those for delays, rigging, and additional installation or maintenance crew time, are not covered under this warranty.
- 2.8.12. Warranty repairs/replacements, whether at factory or on site, will fulfill the term of the original warranty. No extension of the original warranty term will be allowed.
- 2.8.13. "Resale equipment/parts/components" are defined as equipment, parts, or components purchased from another manufacturer or supplier and resold by ERI, shall only carry such manufacturer's or supplier's standard warranty in effect at the time of Product shipment from the supplier.
- 2.8.14. Antenna warranties shall be void if Buyer does not (i) purge and pressurize the antenna system with dry nitrogen or dry air furnished by the Buyer immediately following the installation of the system to initially check for installation leaks and (ii) maintain the antenna under a positive pressure of approximately 2 to 5 pounds per square inch at all times, including prior to installation, using either dry nitrogen or dry air. This warranty is void in the event that the system is pressurized above ERI's published instructions.
- 2.8.15. Minor leakage in a large system can be difficult if not impossible to detect, especially since temperature variations can mask their extent. ERI recommends the installation of dehydration equipment in any significant pressurized system. Minor leakage is beneficial because it causes occasional cycling the dehydration equipment and provides a fresh purge to the system. ERI regards any leak resulting in a system pressure drop of 0.5 PSI per day or less, temperature compensated, as an acceptable leak rate not actionable under these warranty terms.
- 2.8.16. For the scope and purposes of this warranty with regard to ERI manufactured structural towers/parts and resale structural parts, the phrase "Current Standard" is defined as the most current revision of ANSI/TIA-222 Standard including, but not limited to, all relevant appendices and annexes thereof, and all relevant documents incorporated by reference therefrom. This warranty shall be void if the Buyer does not:
- 2.8.16.1. follow all relevant and applicable directives as set forth in the Current Standard;
  - 2.8.16.2. consult and obtain explicit approval from ERI regarding the qualifications of the tower crew chosen to implement/install any structural repairs and/or modifications;
  - 2.8.16.3. consult and obtain explicit approval from ERI prior to implementing changes to the structure serviceability requirements, structure classification, and/or tower appurtenance loading (such as antennas, transmission lines, mounts, ice shields, platforms, ladders, etc.) which varies significantly from the original design parameters as determined by ERI.
- 2.8.17. Adequate VSWR monitoring and protection equipment must be installed and properly maintained in the transmission system to prevent system damage from ice, lightning, and other natural phenomena. Failure to properly install, maintain, or observe the warnings of the VSWR protection equipment voids this warranty, and subsequent damage caused by such failure is not covered under this warranty. ERI recommends purchase of an ERI manufactured or approved VSWR protection unit at time of antenna purchase.
- 2.8.18. If warranty site service is requested, it will be provided pursuant to a Buyer issued purchase order. If defects are not found to be the result of a valid warranty claim an invoice for such service will be issued at prevailing rates.
- 2.8.19. Notification of warranty claim must be provided to ERI within 30 days of the triggering event or detection of the failure.



**Terms and Conditions of Sale (continued)**

- 2.8.20. In no case may the value of the warranty claim exceed the purchase price of the Product.
  - 2.8.21. Warranty services will be provided and valid claims will be honored as long as Buyer is current on all accounts due and owing to ERI.
  - 2.8.22. The foregoing warranty is and shall be in lieu of all other warranties, express or implied, including any implied warranty of merchantability and any implied warranty of fitness for a particular application or purpose. There are no warranties, representations of fact, or promises with respect to signal coverage or strength.
  - 2.8.23. Under no circumstances shall ERI be obligated or liable for special incidental, indirect, consequential or other damages, losses, or expenses in connection with or by reason of the foregoing warranty or by reason of some other type of express or implied warranty found to exist notwithstanding the foregoing disclaimers.
- 2.9. **Warranty Replacement and Adjustment:** All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto and must be received within the applicable warranty period by ERI or its authorized representative. Such claims should include the Product type and serial numbers and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from ERI or its authorized representative for the return and instructions as to how and where such Products should be shipped must be obtained. Any Product returned to ERI for examination shall be sent prepaid via the means of transportation indicated as acceptable by ERI. ERI reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been shipped by non acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason Buyer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit notwithstanding any defect or non conformity in the Product. In all cases ERI has sole responsibility for determining the cause and nature of failure, and ERI's determination with regard thereto shall be final. If it is found that ERI's Product has been returned without cause and is still serviceable, Buyer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may, in ERI's sole discretion, be made on Products so returned.
- 2.10. **General Conditions:**
- 2.10.1. ERI reserves the right to change or modify its design and construction of the Products and/or to substitute materials equal to or superior to or functional equivalents to that originally specified herein provided, however, that any substitution, change or modification shall not materially and adversely affect Buyer's ability to use the Products.
  - 2.10.2. ERI reserves the right to make changes in design and construction of the Products it manufactures for others and to make and/or add improvements in such Products at any time without incurring any obligation to install the same in the products sold herein.
  - 2.10.3. The Buyer shall at its expense engage any qualified engineer necessary to approve ERI's design, obtain building permits, and insure structural integrity of existing structure considering any ERI addition or appurtenance unless otherwise specified in the Proposal. ERI shall furnish construction and installation drawings and engineering data for its Products upon request.
  - 2.10.4. The Proposal is submitted in accordance with the ANSI/EIA/TIA-222 standard in effect as of the date of the Proposal, unless otherwise stated in the body of the Proposal. This standard is intended to set the minimum criteria for the structural design, fabrication and construction of antennas and antenna support structures. It is the responsibility of the Buyer to provide site specific data and design requirements and any requirements differing from those contained in this standard to ERI prior to accepting the Proposal. Please refer to the applicable edition of the ANSI/EIA/TIA-222 standard for further information.
  - 2.10.5. Buyer is responsible for any and all recycling of Products, packaging, reels, shipping crates, and other items associated with the fulfillment of order, as well as for compliance with any mandated "green" initiatives.
3. **Special Terms and Conditions Applied to Field and Installation Services:**
- 3.1. The Proposal is based on work carried out in one continuous operation without interruption or delays due to Buyer supplied missing materials, such as, but not limited to antennas, transmission lines, transmission line hangers, installation drawings, tower components, or electrical power. All material necessary for completing installation, to be furnished by Buyer, must be on the tower site prior to starting of installation or scheduled in such a manner as to avoid delaying crew.
  - 3.2. Downtime resulting from situations beyond the control of ERI or its subsidiary ERI Installations, Inc. as described in 3.1 above, will be billed at normal labor rates.
  - 3.3. The Proposal on labor to install tower and/or antenna and other related equipment is based upon weather and time of day suitable for outdoor construction. Installation, field services and hazardous operations shall not be performed under adverse weather conditions for the safety of ERI personnel. Adverse weather delays shall be charged to Buyer at normal day rates. Certain operations may be performed under adverse weather conditions by mutual agreement and shall be billed at special rates provided in the Proposal. The ERI representative is the sole determinant of suitable and safe conditions while ERI personnel are on site. Adverse weather conditions ("weather days") include, but are not limited to, the following:
    - 3.3.1. Daytime temperatures below 30 degrees Fahrenheit and/or wind chill factors less than 10 degrees Fahrenheit.
    - 3.3.2. Snow in excess of 3 inches in a 24 hour period.
    - 3.3.3. Ice or sleet accumulations of 1/4 inch on the antenna or ground.
    - 3.3.4. Rain in excess of 3 inches in a 5 hour period.
    - 3.3.5. Abnormal mud conditions which prohibit the access of ERI personnel or the operation of equipment.
    - 3.3.6. Winds in excess of 20 mph, when the antenna and/or transmission line is being installed.

**Terms and Conditions of Sale (continued)**

- 3.4. In the event adverse weather causes a delay, ERI will notify the Buyer of those conditions and charges immediately. The responsibility for determine this condition rests with the ERI supervisor on site.
- 3.5. The tower site shall be accessible to workman and installation equipment, using two wheel drive vehicles, under their own power.
- 3.6. Should any conditions exist such that the use of union trades for installation of the tower, accessories and/or foundations is necessary, the prices stated in the Proposal are subject to adjustment unless a union stipulation has been specifically noted in the Proposal. Unless provided by ERI, the foundations must be completed so as to permit continuous work from time ERI's crew reports on the job, and must be finished in accordance with ERI's specifications.
- 3.7. The Buyer assumes all liability resulting from site conditions differing from those specified or agreed to by the Buyer.
- 3.8. Unless otherwise specified in the Proposal, it is also Buyer's responsibility to:
  - 3.8.1. To provide one (1) tagline path (75 feet wide and equal in length to the height of the tower) at the work face, cleared of all obstructions in order to permit a truck to be driven thereon.
  - 3.8.2. Clear a guy path alley and fire lane down each guy radial 25 feet wide on each side of the guy line; and extend this lane 50 feet beyond the outer guy anchor, a 10 foot width of this 50 foot lane must be cleared of all obstructions in order to permit a truck to be driven thereon.
  - 3.8.3. So grade the area immediately surrounding the tower site so as to permit the movement of trucks, cranes and/or other equipment required to handle and install the tower or related appurtenances.
  - 3.8.4. Clear an area a minimum of 200 feet x 200 feet adjacent to the center of the tower to permit unloading, sorting, assembling, working space, and shall provide a hoist and equipment area 20 feet x 50 feet with capabilities for anchoring.
  - 3.8.5. Provide a free and clear radius of 100 feet at the tower base for construction equipment and to allow staging and landing during tower construction and for future service work. This area shall have a rock/gravel surface bedding to support heavy equipment.
  - 3.8.6. Provide fittings and gas required in pressure checking all of the antennas and transmission lines, if required.
  - 3.8.7. A safe and secure work site to prevent theft and vandalism of contractor provided equipment and materials and Buyer delivered materials.
  - 3.8.8. Provide electric power to the base of the tower suitable for powering construction equipment and tools. This also includes permanent electric power for the tower lighting system, if required, in accordance with the current revision of FAA circular AC 70/7460-1
  - 3.8.9. Provide the police service to direct traffic, if in the event the guy lines should cross a public or private road and secure the site from theft or vandalism of ERI equipment.
  - 3.8.10. Provide toilet facilities if required by regulations.
  - 3.8.11. Provide scaled site survey of proposed tower location specifying tower location and orientation, property boundaries, site topography, overhead or buried utility service lines, or any other construction hazards or obstructions.
- 3.9. When foundations are specified as a part of the Proposal, the Proposal for such work is based upon such work being undertaken and completed under "assumed normal" soil conditions as described by the latest revision of the ANSI/EIA-222 code. It shall be the responsibility of the Buyer to supply specific soil descriptive parameters, and ERI shall have an absolute right to rely on written test reports furnished by Buyer in the preparation of foundation drawings and in the installation of foundations. Normal soil conditions do not include rock, saturated soil, frozen soil, peat, or other soil variations similar or dissimilar.
- 3.10. The installation price does not include work such as clearing or grading of tower site; installing, re-locating or repairing utility services; obtaining profiles or surveys; installing grounding systems unless specified; blasting; rock removal; water evacuation; cribbing; installing fill; removal of obstructions; snow removal, installation of planking; road building; clearance for site access; or any other kind of site preparation or site maintenance work.
- 3.11. If necessity dictates non-included labor or materials to be expended resulting from but not limited to, compliance to OSHA or local safety standards, inadequate site accessibility, non-included specified soil conditions, non-included labor or material requirements, then ERI shall be allowed to increase the installation and materials price to include any additional cost incurred, plus a reasonable profit.
- 3.12. ERI has the right to complete installation work early and be compensated for delay damages if other segments of the project, not in ERI control, affect an early completion of any part of ERI's work if ERI submits a reasonable plan to place the Buyer on notice of the intent to finish early and submits documentation of delays.
- 3.13. If requested or approved by the Buyer, ERI may provide accelerated services including overtime and/or multiple crews, as required to maintain the schedule or provide other services, and Buyer agrees to compensate ERI for such services.

## Electronics Research, Inc. Company Profile

### Primary Business and Services

Electronics Research, Inc. is a company focused on serving the needs of the terrestrial radio and television broadcasters with antennas, transmission line, RF components, and structural products. The company is focused on providing high quality and sophisticated engineering solutions to customer problems. ERI Products and Services include:

- UHF and VHF Television Broadcast Antennas
  - TRASAR® VHF and UHF Antennas
  - ALP Series UHF Antennas
  - STINGRAY™ VHF and UHF Panel Antennas
  - Batwing VHF Antennas
- iBOX™ Digital Radio Systems
- Single and Multi-Station FM antennas
  - ROTOTILLER® FM Antennas
- Filters and Combiners
- Rigid Coaxial Transmission Line
  - MACXLine®
- Rectangular and Circular Waveguide
  - GUIDELine®
- Broadcast Master Distributor for Andrew HELIAX®<sup>1</sup> products and accessories
- Guyed and Self-Supporting Towers
- Grounding and Lightning Protection Products
- Turnkey Installation Services
- After-Sales Maintenance and Inspection Services
- Structural Analysis
- Tower Reinforcement, regardless of tower origin
- Tower Rescue and Repair Assistance

### History and Qualifications

Electronics Research, Inc. was established in 1943 to perform avionics research and manufacture aircraft antennas during World War II. Beginning in 1945 the company shifted focus to adapting the newly developed FM wireless technology to civilian use. ERI constructed one of the earliest experimental FM radio stations W9XEV in Glenwood, Indiana.

ERI is the originator of many of the commonly used technologies for FM transmission today, including internally fed circularly polarized FM antennas, and temperature compensated RF filters. The company produces a broad array of single station and broadband FM antenna designs provide superior reliability and performance for any reasonable application. ERI also manufactures a wide array of filter products that can be configured to eliminate undesirable intermodulation products and are used as combining systems for master FM antennas.

ERI began manufacturing towers and providing structural analysis services in 1990. We manufacture guyed and self-supporting towers and produce a line of monopole towers. ERI also has registered structural engineers on staff to provide structural analysis and reinforcement design services to tower owners. ERI has manufactured and installed towers ranging in height

<sup>1</sup> HELIAX® is registered trademark of Andrew Corporation.

from less than 100-feet to 2000-feet. The structural division of ERI also provides a complete line of grounding and lightning protection products.

In November 2003, ERI completed the acquisition of selected assets that comprised Andrew Corporation's television broadcast antenna business. The acquisition included Andrew's MACXLine and GUIDELine transmission line products and the company's complete line of television transmitting antennas. In addition, to purchasing these assets ERI has also entered into an agreement to serve as an Andrew Master Distributor of HELIAX products and accessories to the broadcast market.

Electronics Research corporate headquarters and main manufacturing facility is located in Chandler, Indiana. Our Midwest location provides the benefit of the most convenient, cost effective, product transportation to any part of North America. The ERI facility is located on 100 acres and includes a total of more than 200,000 square feet of indoor manufacturing space. The company takes full advantage of innovative technology, which includes the latest computer modeling, design, and drafting tools; as well as the latest computer controlled machining and milling equipment. ERI's main manufacturing facility also includes an advanced acid cleaning facility and an in-house silver-plating operation. This high degree of vertical integration allows control of product quality at every step during fabrication and final assembly.

Near the main factory complex is ERI's 70-acre test range, capable of full-scale antenna/tower pattern measurements. The company has decades of research and experience at full scale testing and the company's unique blend of individual educated and trained in antenna and structural design result in systems that offer superior performance and reliability. The test range is equipped with the latest in computerized test equipment and also has the latest computer software to measure and predict antenna performance and coverage.

ERI also operates a 25,000 square foot facility for the design and manufacture of RF components and systems outside of Portland, Maine. This area of the country is a center of RF product design and manufacturing for a broad range of military, telecommunications, and broadcast applications. This facility allows ERI access to the unique talent pool available in this area and the focus of this facility is to design and manufacture RF components including motorized coaxial and waveguide switches, NTSC and DTV television RF systems, channel and power combiners, filters, hybrid, directional couplers, and many other components used in television and radio transmission systems.

An antenna system is the final link to the audience and the key to a station's success. For this reason, ERI antennas are a broadcaster's first choice. The superiority and dependability of our FM antenna is proven by the fact that ERI antennas are in service in over 60% of US radio stations and in a significant percentage of every country in North, Central, and South America. ERI antennas have been exported to many overseas FM facilities.

ERI has continuously served the broadcast industry with a dedicated team of engineering professionals, supported by experienced and meticulous craftsman for product fabrication and dedicated project management to insure on time and on budget project delivery, installation, and commissioning.



## Experience

ERI has extensive experience in the design and manufacture of radio and television antenna systems, combining systems, transmission line products, and the management of major projects. Some recent major projects include:

Master FM Antennas and Combiner Systems, Empire State Building, New York, NY  
Master FM Antenna and Combiner System, Prudential Building, Boston, MA  
WCBS-TV Channel 2 Standby Antenna, Viacom Building, New York, NY  
Master FM Antenna and Combiner System, IDS Building, Minneapolis, MN  
Tower, Master FM Antenna, and Combiner System, Richland Towers, Tampa, FL  
Master FM Antenna and Tower, John Hancock Center, Chicago, IL  
Master FM Antenna and Combiner System, Richland Towers, Kansas City, MO  
Master FM Antenna and Combiner System, Richland Towers, Atlanta, GA  
Master FM Antenna and Combiner System, American Tower, Philadelphia, PA  
Master FM Antenna and Combiner System, American Tower, Miami, FL  
Master FM Antenna and Combiner System, American Tower, Houston, TX  
Master FM Antenna and Combiner System, Senior Road Tower Group, Houston, TX  
Master FM Antenna and Combiner System, American Tower, Philadelphia, PA  
Tower, Master FM Antenna and Combiner System, Richland Towers, Oklahoma City, OK

This list is only a partial list of major projects designed, manufactured, and installed by ERI.



## ERI Two (2) Year Product Limited Warranty

**1.1. Standard Two (2) Year Product Limited Warranty:** Electronics Research, Inc. (ERI) warrants to the original Buyer that its Product is free from defects in material or workmanship

- 1.1.1. existing at the time of shipment from the factory or
- 1.1.2. that develop under normal use in a properly installed and maintained system for a period of twenty-four (24) months following the date of shipment, ex-works.
- 1.1.3. **ERI Exclusions:** Expressly excluded from the terms of this limited warranty are defects caused by:
  - 1.1.3.1. faulty installation;
  - 1.1.3.2. all minor system leakage ("leakage" is defined in paragraph 2.8.15), below);
  - 1.1.3.3. equipment leaks and detuning if caused by rough handling or installation;
  - 1.1.3.4. lack of proper inspection and maintenance;
  - 1.1.3.5. unusually severe weather, lightning, icing, acts of God; such events require inspection for, and correction of, such damage;
  - 1.1.3.6. water intrusion, foreign materials in the system;
  - 1.1.3.7. vandalism, physical abuse, tampering, or unauthorized disassembly, repair or modification without explicit written approval of ERI;
  - 1.1.3.8. operation not in accordance with published ratings, specifications, or instructions.
- 1.1.4. ERI Products are delivered Ex-Works. Unless ERI supervises the transportation, delivery, and/or installation of the product, ERI is not responsible for damage that may result from incorrect or improper transportation, storage, handling or installation of Products.
- 1.1.5. Buyer shall regularly inspect and maintain all ERI manufactured parts and Resale parts in accordance with ERI's and/or manufacturer's inspection and maintenance guidelines and in accordance with all regulations and recommendations of any government agency or body and in accordance with generally accepted industry maintenance standards. An initial inspection shall be conducted promptly after installation to verify that the installation is properly performed in accordance with ERI's and/or the manufacturer's installation instructions and procedures. Such inspections shall be performed at Buyer's expense by qualified personnel, and inspection summary report(s) shall be prepared immediately upon inspection completion. Reports of initial inspections shall be submitted to ERI Customer Service. Buyer shall forever protect, defend, indemnify, and hold ERI free and harmless against all claims, demands, liabilities, cause of action (including, without limitation, legal costs and expenses and reasonable attorney's fees) arising out of, or relating to Buyer's failure to completely discharge its obligations hereunder.
- 1.1.6. Buyer shall follow promptly all recommendations from qualified inspectors and/or ERI regarding the maintenance of all ERI manufactured and Resale structural Products.
- 1.1.7. Upon making a warranty claim, make copies of all preceding inspection reports and dispositions available to ERI for review.
- 1.1.8. Any defective warranted component of an ERI product will be repaired or replaced at the place of manufacture, ex-works, without charge if all defective components are returned by the Buyer to ERI, and ERI inspection discloses that such defects are as reported and are not the result of ERI Exclusions.
- 1.1.9. Under some circumstances, continuity of service may necessitate immediate shipment of repair parts before ERI inspection of defective parts. Under these conditions, ERI

requires that Buyer place an order for replacement parts and will require that all defective parts be packaged and returned for factory inspection and determination of warranty status. If failure is determined to be covered by this warranty, credit will be issued for parts ordered by Buyer to expedite replacement.

- 1.1.10. Other than the replacement of defective Products or components ex-works, ERI shall not be responsible for any costs or expenses incurred by the Buyer arising from the identification, removal, and replacement of defective products.
- 1.1.11. ERI, at its sole discretion, may choose to supply warranty parts for repairs on site. In such cases, materials shall be shipped free of additional charge to the site. Losses arising from repair or replacement activities, including those for delays, rigging, and additional installation or maintenance crew time, are not covered under this warranty.
- 1.1.12. Warranty repairs/replacements, whether at factory or on site, will fulfill the term of the original warranty. No extension of the original warranty term will be allowed.
- 1.1.13. "Resale equipment/parts/components" are defined as equipment, parts, or components purchased from another manufacturer or supplier and resold by ERI, shall only carry such manufacturer's or supplier's standard warranty in effect at the time of Product shipment from the supplier.
- 1.1.14. Antenna warranties shall be void if Buyer does not (i) purge and pressurize the antenna system with dry nitrogen or dry air furnished by the Buyer immediately following the installation of the system to initially check for installation leaks and (ii) maintain the antenna under a positive pressure of approximately 2 to 5 pounds per square inch at all times, including prior to installation, using either dry nitrogen or dry air. This warranty is void in the event that the system is pressurized above ERI's published instructions.
- 1.1.15. Minor leakage in a large system can be difficult if not impossible to detect, especially since temperature variations can mask their extent. ERI recommends the installation of dehydration equipment in any significant pressurized system. Minor leakage is beneficial because it causes occasional cycling the dehydration equipment and provides a fresh purge to the system. ERI regards any leak resulting in a system pressure drop of 0.5 PSI per day or less, temperature compensated, as an acceptable leak rate not actionable under these warranty terms.
- 1.1.16. For the scope and purposes of this warranty with regard to ERI manufactured structural towers/parts and resale structural parts, the phrase "Current Standard" is defined as the most current revision of ANSI/TIA-222 Standard including, but not limited to, all relevant appendices and annexes thereof, and all relevant documents incorporated by reference therefrom. This warranty shall be void if the Buyer does not:
  - 1.1.16.1. follow all relevant and applicable directives as set forth in the Current Standard;
  - 1.1.16.2. consult and obtain explicit approval from ERI regarding the qualifications of the tower crew chosen to implement/install any structural repairs and/or modifications;
  - 1.1.16.3. consult and obtain explicit approval from ERI prior to implementing changes to the structure serviceability requirements, structure classification, and/or tower appurtenance loading (such as antennas, transmission lines, mounts, ice shields, platforms, ladders, etc.) which varies significantly from the original design parameters as determined by ERI.
- 1.1.17. Adequate VSWR monitoring and protection equipment must be installed and properly maintained in the transmission system to prevent system damage from ice, lightning, and other natural phenomena. Failure to properly install, maintain, or observe the warnings of the VSWR protection equipment voids this warranty, and subsequent damage caused by such failure is not covered under this warranty. ERI recommends purchase of an ERI manufactured or approved VSWR protection unit at time of antenna purchase.

- 1.1.18. If warranty site service is requested, it will be provided pursuant to a Buyer issued purchase order. If defects are not found to be the result of a valid warranty claim an invoice for such service will be issued at prevailing rates.
- 1.1.19. Notification of warranty claim must be provided to ERI within 30 days of the triggering event or detection of the failure.
- 1.1.20. In no case may the value of the warranty claim exceed the purchase price of the Product.
- 1.1.21. Warranty services will be provided and valid claims will be honored as long as Buyer is current on all accounts due and owing to ERI.
- 1.1.22. **The foregoing warranty is and shall be in lieu of all other warranties, express or implied, including any implied warranty of merchantability and any implied warranty of fitness for a particular application or purpose. There are no warranties, representations of fact, or promises with respect to signal coverage or strength.**
- 1.1.23. Under no circumstances shall ERI be obligated or liable for special incidental, indirect, consequential or other damages, losses, or expenses in connection with or by reason of the foregoing warranty or by reason of some other type of express or implied warranty found to exist notwithstanding the foregoing disclaimers.
- 1.2. Warranty Replacement and Adjustment:** All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto and must be received within the applicable warranty period by ERI or its authorized representative. Such claims should include the Product type and serial numbers and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from ERI or its authorized representative for the return and instructions as to how and where such Products should be shipped must be obtained. Any Product returned to ERI for examination shall be sent prepaid via the means of transportation indicated as acceptable by ERI. ERI reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been shipped by non acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason Buyer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit notwithstanding any defect or non conformity in the Product. In all cases ERI has sole responsibility for determining the cause and nature of failure, and ERI's determination with regard thereto shall be final. If it is found that ERI's Product has been returned without cause and is still serviceable, Buyer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may, in ERI's sole discretion, be made on Products so returned.

## ERI Type P300 Vertically Polarized FM Dipole

**Antennas** Simply Reliable. Simply Rugged. Simply the Best.



- Frequency Range: 88 to 108 MHz
- Internal feed point
- Fully pressurized
- Series fed radiating elements
- Vertical polarization
- Welded feed connections
- Superior VSWR band width
- High input power capacity
- Custom modifications are available
- Corrosion resistant construction
- Modular construction facilitates easy installation and repair
- Minimal weather related VSWR problems
- Beam tilt and/or null fill available
- Rugged brass construction
- Stainless steel support brackets and hardware
- Radomes or deicing heaters not normally required for radial ice less than 1/2 inch
- Radomes are available
- Custom designed antenna supports; poles or LAMBDA™ Optimized Mounting System are also available from ERI

The Type P300 vertically polarized FM dipole antenna, using the same quality materials and manufacturing process that has been used for decades for all ERI FM antennas. The single-bay input power rating 3 kW for the Series A and Series B dipoles. Multiple elements may be used to increase power gain and allowable input power levels. Power gains of up to 13.2 times and input power handling to 20 kW for Series A and 36 kW for Series B. Null fill and beam tilt are also available. For environments subject to heavy icing, radomes are optionally available.

**Adaptable.** When only vertical polarization is required, the Type P300 may be used alone. If horizontal polarization is additionally required, the P300 may be used in combination with any other type of horizontally polarized antenna system.

**Rugged Construction.** The ERI Type P300 antenna is a large diameter radiating dipole which is rugged, light weight and exhibits low wind load forces. The design supports pressurization with dry air or nitrogen to increase peak power ratings and provide a constant positive pressure for improved performance. No other FM antenna manufacturer exhibits the quality of construction that ERI has been providing for half a century.

**Mounting Options.** Each antenna mounting bracket is designed and fabricated to match the tower and mounting specifications of the purchaser. The antenna can be side or pole mounted. Custom designed and fabricated antenna support poles and tower section are also available from ERI. A six foot matching section is provided with all antennas.



### Electrical Specifications

Frequency Range:	88 to 108 MHz, single frequency or multiplexed versions available
Polarization:	Vertical
RF Input:	1-5/8-inch or 3-1/8-inch EIA Flange
Azimuth Pattern Circularity:	$\pm 1$ dB in free space
VSWR at Input:	1.07:1 or less (with field matching) 1.25:1 or less, top pole or Lambda Section mounting; 1.5:1 or less side mount (without field matching)

### ERI FM Antenna Test Range



When the requirement is to distribute undistorted, unimpaired signal in all directions, except a selected area, ERI's family of directional FM antennas provide the solution. ERI has designed, fabricated, and installed directional FM antennas for over 40 years. Utilizing ERI's 70 acre test range all directional antenna designs are verified with full scale measurements and meet the requirements of the Federal Communications Commission. ERI's Antenna Test Range has been in continuous use longer than any other Test Range used by any broadcast antenna supplier. This is important because long experience is needed to fully characterize a test facility so that it delivers accurate results. This process requires years and newly constructed antenna test facilities cannot be trusted to provide accurate and repeatable measurements.

Of equal importance to the directional antenna's pattern is the antenna support structure. ERI is the only manufacturer that can provide both the antenna and its support structure. ERI's exclusive LAMBDA™ Optimized Mounting System and top mounted support poles allow for optimum antenna performance while ensuring a secure, unobstructed antenna aperture. ERI's expertise in every phase of directional antenna development affords a timely and economical response to customer requirements.



## WVDM (FM) Preliminary Power Analysis

Call Letters:	WVDM (FM) Bluefield, West Virginia	
Antenna Model:	P300-5BE-DA	
Frequency:	88.5 MHz	
	<i>100% of pattern envelope (Analog)</i>	
ERP:	40 kW	16.021 dBk
Polarization:	Vertical	
Antenna Gain:	11.524 Numeric	10.616 dB
Antenna Input Power:	3.471 kW	5.405 dBk
Transmission Line Type - Vertical Run:	HJ7-50A 1-5/8-inch air HELIAX	
Vertical Run Length:	165 feet	
Vertical Run Attenuation:	0.190 dB/100-feet	
Transmission Line Type - Horizontal Run:	HJ7-50A 1-5/8-inch air HELIAX	
Horizontal Run Length:	75 feet	
Horizontal Run Attenuation:	0.190 dB/100-feet	
Line Loss:	-0.384 kW	0.456 dB
Line Efficiency:	90.033%	
Power Output FM Isolation Transformer:	3.855 kW	5.861 dBk
FM Isolation Transformer Losses:	-0.045 kW	0.050 dB
Transmitter Power Output:	3.900 kW	5.911 dBk
	<i>85% of pattern envelope (Analog)</i>	
ERP:	40.000 kW	16.021 dBk
Polarization:	Vertical	
Antenna Gain:	15.949 Numeric	12.027 dB
Antenna Input Power:	2.508 kW	3.993 dBk
Transmission Line Type - Vertical Run:	HJ7-50A 1-5/8-inch air HELIAX	
Vertical Run Length:	165 feet	
Vertical Run Attenuation:	0.190 dB/100-feet	
Transmission Line Type - Horizontal Run:	HJ7-50A 1-5/8-inch air HELIAX	
Horizontal Run Length:	75 feet	
Horizontal Run Attenuation:	0.190 dB/100-feet	
Line Loss:	-0.278 kW	0.456 dB
Line Efficiency:	90.033%	
Power Output FM Isolation Transformer:	2.786 kW	4.449 dBk
FM Isolation Transformer Losses:	-0.032 kW	0.050 dB
Transmitter Power Output:	2.818 kW	4.499 dBk

## **WVDM (FM) Technical Proposal**

## ***Directional Antenna System Proposed for WVDM, Bluefield, West Virginia***

January 12, 2012

### **INTRODUCTION**

Electronics Research, Inc. would like to submit this proposal for a custom fabricated FM antenna system. The array will be designed to meet the FCC requirements and provide years of trouble free performance for WVDM. The entire ERI team takes great pride in providing worldwide quality and service matched by none. We sincerely value the opportunity to become your partner in broadcasting excellence.

Electronics Research, Inc. express purpose is the research and development of electromagnetic wave propagation, and has been since 1943. New product design and application is our primary function. ERI enjoys being the industry standard by which all others are measured, and we look forward to providing you the best products and services.

Electronics Research, Inc. is ready, willing and able to be your single source for antenna and tower products. You insist on only the best in programming and studio equipment. Let Electronics Research, Inc. provide you and your audience the best in antenna technology.

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USA

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+1 812 925 4030 (fax)  
877 ERI-LINE (toll-free)

Sales@eriinc.com  
CustomerSupport@eriinc.com  
WWW.eriinc.com



# Directional Antenna System Proposed For WVDM, Bluefield, West Virginia

(Continued)

## ANTENNA DESCRIPTION

### ANTENNA TYPE

The proposed ERI model P300-5BE-DA antenna will consist of five full wavelength spaced bays. Each bay will use one driven vertically polarized radiating element and the custom hardware needed for pattern shaping. Based on measured data, the array will possibly include four vertical parasitic elements per bay. All tests will be performed on a frequency of 88.5 megahertz, which is the center of the FM broadcast channel assigned to WVDM.

### STRUCTURE TO BE USED

The antenna will be tested on a tower, which is the structure the station plans to use to support the proposed array.

### METHOD OF MODELING

The test antenna will consist of two bay levels of the vertically polarized system with the associated vertical parasitic elements. The elements and brackets that will be used in this test will be electrically equivalent to those that will be supplied with the antenna. When the proper pattern shapes have been achieved, the complete array will be installed horizontally at the tuning range and matched for the best bandwidth.

### RADOME OPTIONS

Deicers are not supplied and are not available. The use of radomes is recommended if extreme icing condition will exist at the proposed site.

# Directional Antenna System Proposed For WVDM, Bluefield, West Virginia

(Continued)

## PATTERN DESIGN

The design of the proposed antenna is based on your envelope pattern that was filed with the FCC. The attached pattern and list is the basis for this proposal. The actual patterns when measured will not exceed that of your filed pattern at any azimuth. Maximum effort will be made to develop a vertical pattern shape that will match the envelope pattern as closely as possible.

The vertical maximum relative field pattern obtained from the measured data will have an RMS that is equal to, or greater than 85% of the RMS of your filed envelope pattern.

A calculated vertical plane relative field pattern is shown on Figure #3 attached.

## ANTENNA ORIENTATION

The actual antenna orientation will be determined when the antenna is measured. Blue prints provided with the antenna will show the proper antenna orientation alignment. The antenna alignment procedure should be directed by a licensed surveyor as prescribed by the FCC. It is recommended that you use the same surveyor to verify the orientation of the tower and to align the directional antenna. It is very important that you supply us with accurate information. If not delays and extra cost could occur.

## ANTENNA MOUNTING

The directional antenna should not be mounted on the top of an antenna tower, which includes a top-mounted platform larger than the cross sectional area of the tower in the horizontal plane. No other obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted at the same tower level as the directional antenna. No obstruction of any type is to be within 75 ft. horizontally of the system. The vertical distance to the nearest obstruction should be a minimum of 10 ft. from the directional antenna. Metallic guy wires should be a minimum distance of forty feet horizontally from the antenna.



# Directional Antenna System Proposed For WVDM, Bluefield, West Virginia

(Continued)

## FIELD TUNING

ERI strongly recommends that an ERI trained technician field tune and inspect the installation of all custom-built antenna systems.

## WHAT WE NEED FROM YOU

### COVERAGE AREA

In order to fabricate a directional antenna to best suit your needs we will need the following information. We need to know from the tower the directions and the minimum desired power levels necessary to cities of importance. We need to know the directions to places that maximum power is not necessary.

### FCC FILED PATTERN

We need to know what envelope pattern was filed with the FCC. If it is not the data that we provide, we may not be able to obtain 85% of the envelope pattern.

Before we begin antenna testing we will need a copy of your construction permit.

### STRUCTURE DRAWINGS

We will need accurate prints. The prints need to include all FM and TV broadcast antennas that are 60 meters or less from the proposed directional antenna, the orientation of the support structure relative to true north, size, method of attachment of the leg and support braces in the antenna aperture. The location of guy attachment in the aperture must also be displayed. It is imperative that guy wires that occur forty feet horizontally from the antenna must be made of an insulating material. The location and method of attachment of all conduits, ladders, feed lines, lighting devices, and other appurtenances, which are located in the aperture of the antenna must also be included in the prints.

Directional Antenna System  
Proposed For  
WVDM, Bluefield, West Virginia

(Continued)

It is not ERI's responsibility to determine if the support structure (tower, pole, mast etc.) can safely support this antenna array. If there is any doubt of the support structures ability to safely support the antenna array and the additional installation stresses contact ERI prior to starting any installation procedures.

For further technical specifications, please consult the enclosed attachments. Should you desire any additional information, please contact us directly.

Electronics Research, Inc. values you as a customer. We are truly confident that we build the best antenna systems on the market. An ERI antenna and installation will fulfill your broadcasting needs. We hope to do business with you soon.

Tom Scharf

ELECTRONICS RESEARCH, INC.

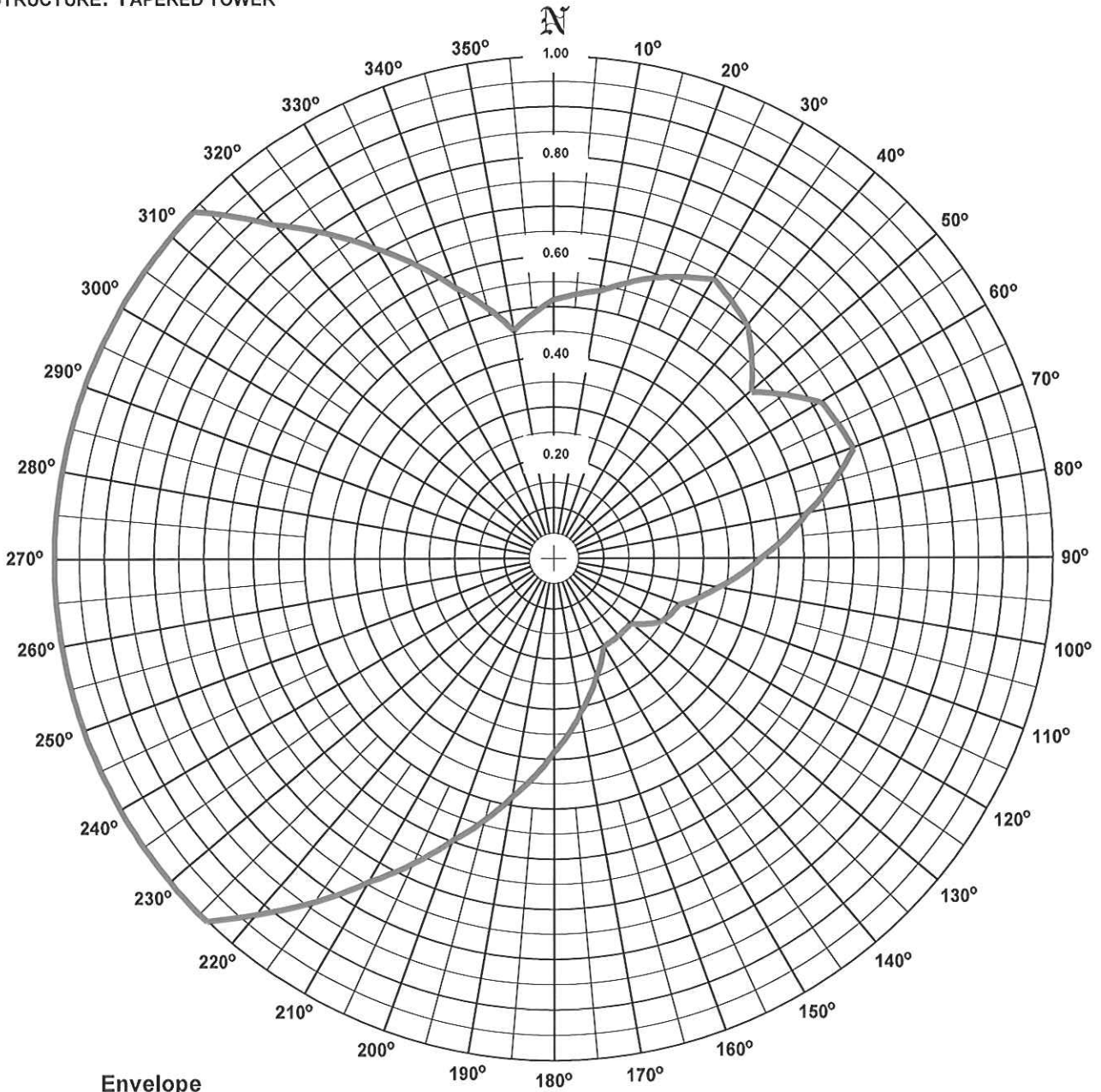
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

# ERI<sup>®</sup> Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone (812) 925-6000 Fax (812) 925-4030 <http://www.eriinc.com/>

FIGURE: 1  
STATION: WVDM  
LOCATION: BLUEFIELD, WV  
ANTENNA TYPE: P300-5BE-DA  
STRUCTURE: TAPERED TOWER

DATE: 1/12/2012  
FREQUENCY: 88.5 MHz  
ORIENTATION: TBD  
MOUNTING: Custom



RMS: 0.681  
Maximum: 1.000 @ 225° True  
Minimum: 0.199 @ 130° True

COMMENTS: ENVELOPE PATTERN: THE MAXIMUM OF THE VERTICAL COMPONENT WILL NOT EXCEED THIS PATTERNS AT ANY AZIMUTH.

# ERI<sup>®</sup> Horizontal Plane Relative Field List

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 <http://www.eriinc.com/>

**Station: WVDM**  
**Location: Bluefield, WV**  
**Frequency: 88.5 MHz**

**Antenna: P300-5BE-DA**  
**Orientation: TBD**  
**Tower: Tapered tower**

**Figure: 1**  
**Date: 1/12/2012**  
**Reference: wvdm1e.fig**

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.517	10.70	10.30	Vertical	180°	0.383	5.87	7.69	Vertical
5°	0.530	11.24	10.51	Vertical	185°	0.430	7.40	8.69	Vertical
10°	0.543	11.79	10.72	Vertical	190°	0.477	9.10	9.59	Vertical
15°	0.570	12.99	11.14	Vertical	195°	0.535	11.46	10.59	Vertical
20°	0.597	14.24	11.53	Vertical	200°	0.593	14.08	11.49	Vertical
25°	0.620	15.35	11.86	Vertical	205°	0.666	17.74	12.49	Vertical
30°	0.642	16.51	12.18	Vertical	210°	0.739	21.82	13.39	Vertical
35°	0.623	15.55	11.92	Vertical	215°	0.829	27.49	14.39	Vertical
40°	0.604	14.62	11.65	Vertical	220°	0.920	33.82	15.29	Vertical
45°	0.560	12.56	10.99	Vertical	225°	1.000	40.00	16.02	Vertical
50°	0.516	10.66	10.28	Vertical	230°	1.000	40.00	16.02	Vertical
55°	0.568	12.91	11.11	Vertical	235°	1.000	40.00	16.02	Vertical
60°	0.620	15.38	11.87	Vertical	240°	1.000	40.00	16.02	Vertical
65°	0.629	15.83	11.99	Vertical	245°	1.000	40.00	16.02	Vertical
70°	0.638	16.28	12.12	Vertical	250°	1.000	40.00	16.02	Vertical
75°	0.575	13.24	11.22	Vertical	255°	1.000	40.00	16.02	Vertical
80°	0.513	10.52	10.22	Vertical	260°	1.000	40.00	16.02	Vertical
85°	0.463	8.56	9.32	Vertical	265°	1.000	40.00	16.02	Vertical
90°	0.412	6.80	8.32	Vertical	270°	1.000	40.00	16.02	Vertical
95°	0.372	5.52	7.42	Vertical	275°	1.000	40.00	16.02	Vertical
100°	0.331	4.38	6.41	Vertical	280°	1.000	40.00	16.02	Vertical
105°	0.298	3.56	5.51	Vertical	285°	1.000	40.00	16.02	Vertical
110°	0.266	2.83	4.52	Vertical	290°	1.000	40.00	16.02	Vertical
115°	0.257	2.64	4.22	Vertical	295°	1.000	40.00	16.02	Vertical
120°	0.248	2.46	3.91	Vertical	300°	1.000	40.00	16.02	Vertical
125°	0.223	2.00	3.00	Vertical	305°	1.000	40.00	16.02	Vertical
130°	0.199	1.58	1.99	Vertical	310°	1.000	40.00	16.02	Vertical
135°	0.199	1.58	1.99	Vertical	315°	0.978	38.28	15.83	Vertical
140°	0.199	1.58	1.99	Vertical	320°	0.872	30.38	14.83	Vertical
145°	0.199	1.58	1.99	Vertical	325°	0.794	25.21	14.02	Vertical
150°	0.199	1.58	1.99	Vertical	330°	0.716	20.52	13.12	Vertical
155°	0.223	2.00	3.00	Vertical	335°	0.646	16.68	12.22	Vertical
160°	0.248	2.46	3.91	Vertical	340°	0.575	13.24	11.22	Vertical
165°	0.278	3.10	4.91	Vertical	345°	0.519	10.77	10.32	Vertical
170°	0.308	3.80	5.80	Vertical	350°	0.463	8.56	9.32	Vertical
175°	0.346	4.78	6.80	Vertical	355°	0.490	9.60	9.82	Vertical

**Polarization:**  
**Maximum Field:**  
**Minimum Field:**  
**RMS:**  
**Maximum ERP:**  
**Maximum Power Gain:**

**Envelope**  
**1.000 @ 225° True**  
**0.199 @ 130° True**  
**0.681**  
**40.000 kW**  
**11.524 (10.616 dB)**

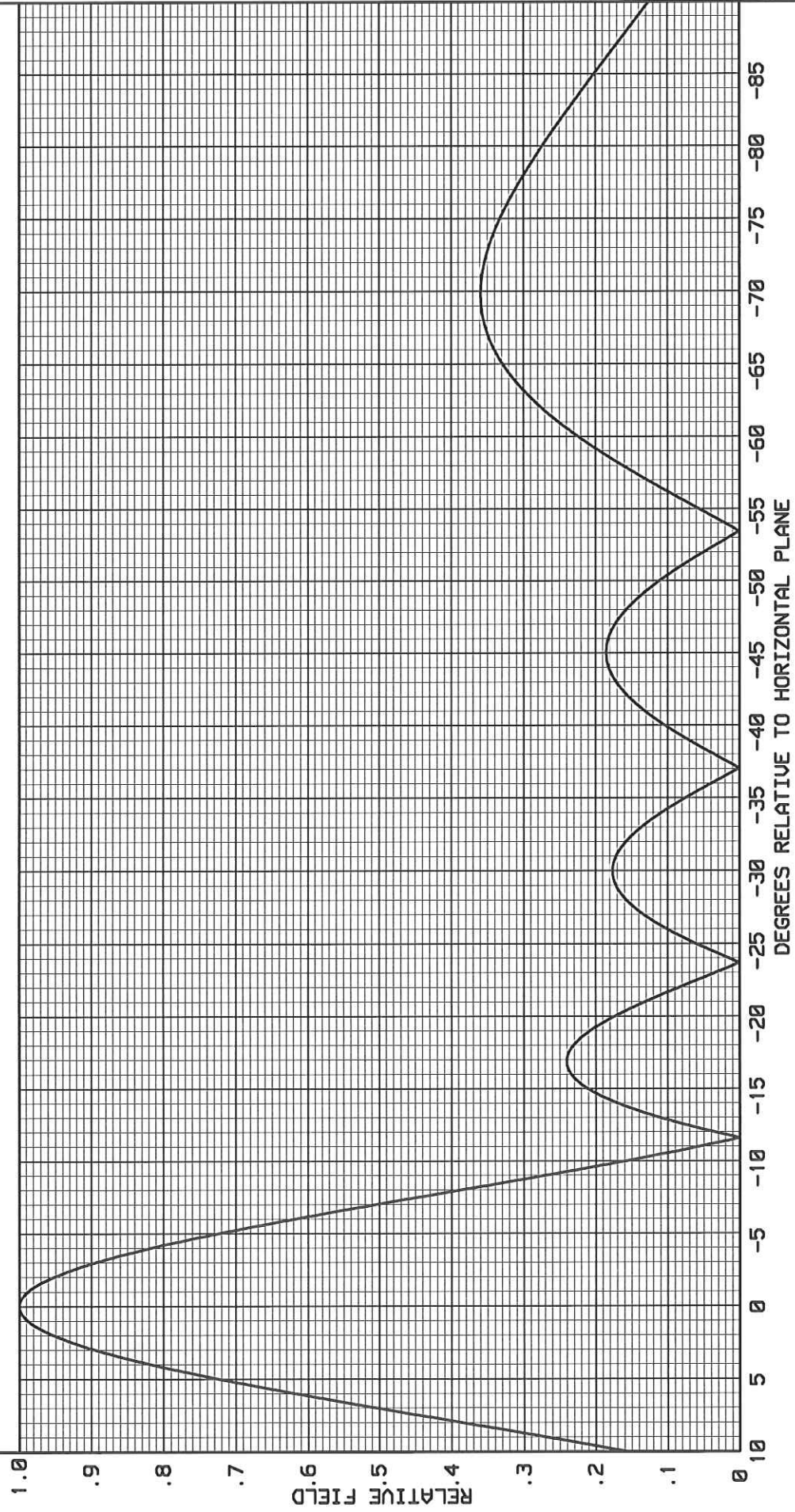
**Total Input Power: 3.471 kW**

ELECTRONICS RESEARCH, INC.  
7777 GARDNER ROAD  
CHANDLER, IN. 47610

FIGURE 3

-----THEORETICAL-----  
VERTICAL PLANE RELATIVE FIELD  
ERI TYPE P-300-5BE-DA  
VERTICALLY POLARIZED ANTENNA  
0 DEGREE(S) ELECTRICAL BEAM TILT  
0 PERCENT FIRST NULL FILL  
0 PERCENT SECOND NULL FILL

APRIL 5, 2002  
ELEMENT SPACING:  
1.0 WAVELENGTH





Directional Antenna  
System Specifications  
Proposed For  
WVDM, Bluefield, West Virginia

(Continued)

**GENERAL SPECIFICATION**

Antenna Type:	P300-5BE-DA
Frequency:	88.5 MHz
Number of bays:	Five

**MECHANICAL SPECIFICATION**

(All Specifications are Approximate)

Mounting:	Custom
System length:	53 ft 3 in
Aperture length required:	64 ft 4 in <sup>1</sup>
The approximate weight:	449 lbs
The effective projected area:	40.65 ft <sup>2</sup> CaAa <sup>2</sup>
Orientation:	TBD <sup>3</sup>
Antenna input flange 3 1/8" female	

**ELECTRICAL SPECIFICATION**

(For directional use)

Maximum vertical ERP:	40.00 kW (16.021 dBk)
Vertical maximum power gain:	11.524 (10.616 dB) <sup>4</sup>
Total input power:	3.471 kW (5.405 dBk)
Total input power based on 85%:	2.508 kW (3.993 dBk) <sup>5</sup>
Maximum power input capabilities:	20 kW <sup>6</sup>

**TUNING SPECIFICATIONS**

VSWR:	1.07 : 1 or less (with field matching)
Beam tilt:	0°
Null fill:	0%

<sup>1</sup> If the antenna is to be mounted at the top of the tower.

<sup>2</sup> The Effective Projected Area of the antenna is based on TIA/EIA-222-F Standards with no ice.

<sup>3</sup> Actual antenna orientation will be determined when the final pattern is developed.

<sup>4</sup> Input power and gain figure are based on your filed FCC pattern. The actual antenna gain figures will be computed when the antenna is measured.

<sup>5</sup> Input power is based on 85% of the RMS of the composite pattern.

<sup>6</sup> The maximum power at the input of the antenna system.

**Type Number: RLA350-150**

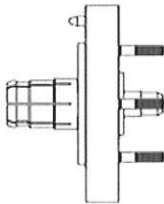
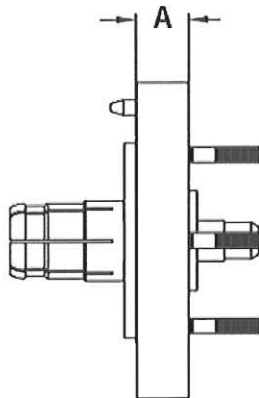


Plate reducer, 50 ohm, 3-1/8-inch to 1-5/8-inch includes two inner connectors. 1-5/8-inch bullet is removable and mates with captivated 1-5/8-inch inner connectors. Formerly Part Number 1861.



**Transmission Line Product Type:** Adapter > Reducer

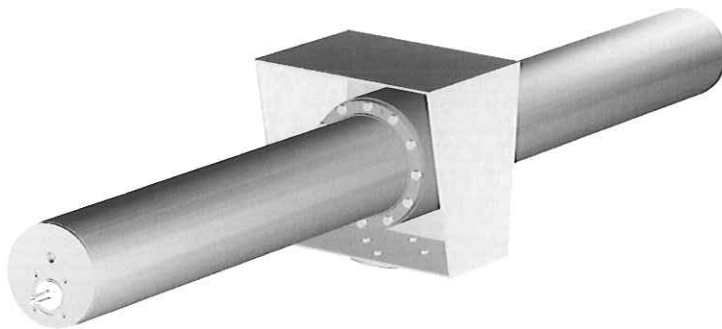
**Impedance:** 50 Ohm

**Line Size:** 3 1/8 inch

**Interface:** 1 5/8 inch 50 Ohm

**Dimension A:** 0.97 inch | 2.46 cm

## Model 404 Isolation Transformer



Isolation transformers couple FM or LPTV power across the base insulator of an AM broadcast station transmitting tower, with little or no effect on the AM base impedance and no mismatch into the FM antenna feed line. An isolation transformer is especially desirable for feeding high impedance AM radiators or towers that are part of a directional array where "bazooka"

isolation systems would have adverse effects.

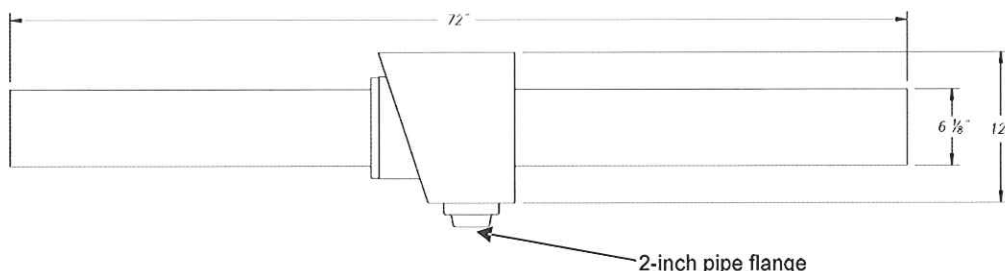
Each isolation transformer is supplied with a weather shield fitted with a 2-inch pipe flange on the bottom to accommodate a mounting pipe. This isolation transformer is designed to be used in a pressurized system with dry gas passing through the unit with a recommended pressure of 3-5 PSI not to exceed 10 PSI. Each Type 404 isolation transformer is factory tested to operate anywhere in the 88 to 108 MHz FM band with no adjustment necessary. LPTV isolation transformers require custom design and manufacturing to achieve high isolation and low VSWR. A horn gap is installed for lightning protection. Both the input and output have a DC short circuit between the inner and outer conductor of the transformer.

### Electrical Specifications

Operating Frequency:	88 MHz to 108 MHz, broadband
VSWR:	1.10:1, maximum
Power Rating (FM):	10 kW
AM Peak Voltage Rating:	7.50 kV
AM Shunt Capacity:	100 pF (approximately)
Insertion Loss:	-0.05 dB, maximum

### Mechanical Specifications

Input and Output Connection:	1-5/8-inch EIA, female
Tank Diameter:	6-1/8-inches (15.5 cm)
Rain Shield:	12-inches (30.5 cm), square
Overall Height:	72-inches (183 cm)
Weight:	112 pounds (50 kg)
Pressurization:	3 to 5 psi (21 to 35 kPa), recommended 10 psi (69 kPa), maximum
Mounting:	2-inch pipe flange



## Transmission Line Product Information



HJ7-50A

HJ7-50A, HELIAX® Standard Air Dielectric Coaxial Cable, corrugated copper, 1-5/8 in, black PE jacket

### Construction Materials

Jacket Material	PE
Dielectric Material	PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Jacket Color	Black
Outer Conductor Material	Corrugated copper

### Dimensions

Nominal Size	1-5/8 in
Cable Volume	14.0 ft³/kft   1300.6 L/km
Cable Weight	1.55 kg/m   1.04 lb/ft
Diameter Over Jacket	50.292 mm   1.980 in
Inner Conductor OD	18.0340 mm   0.7100 in
Outer Conductor OD	46.482 mm   1.830 in

### Electrical Specifications

Cable Impedance	50 ohm $\pm$ 0.5 ohm
Capacitance	22.1 pF/ft   72.5 pF/m
dc Resistance, Inner Conductor	0.722 ohms/km   0.220 ohms/kft
dc Resistance, Outer Conductor	0.328 ohms/km   0.100 ohms/kft
dc Test Voltage	11000 V
Inductance	1.870 $\mu$ H/m   0.570 $\mu$ H/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	10000 V
Operating Frequency Band	1 – 2700 MHz
Peak Power	305.0 kW
Power Attenuation	3.356
Velocity	92%

### Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

### General Specifications

Brand	HELIAX®
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### Mechanical Specifications

Bending Moment	40.7 N-m   30.0 ft lb
----------------	-----------------------

Flat Plate Crush Strength	175.0 lb/in   3.1 kg/mm
Minimum Bend Radius, Multiple Bends	508.00 mm   20.00 in
Number of Bends, minimum	15
Number of Bends, typical	30
Pressurization, maximum	0 N/mm <sup>2</sup>   30 psi
Tensile Strength	340 kg   750 lb

#### Standard Conditions

Attenuation, Ambient Temperature	20 °C   68 °F
Average Power, Ambient Temperature	40 °C   104 °F
Average Power, Inner Conductor Temperature	100 °C   212 °F

#### Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.045	0.014	243.45
1	0.064	0.02	171.92
1.5	0.079	0.024	140.23
2	0.091	0.028	121.34
10	0.204	0.062	53.85
20	0.291	0.089	37.86
30	0.358	0.109	30.77
50	0.465	0.142	23.67
88	0.623	0.19	17.67
100	0.666	0.203	16.53
108	0.693	0.211	15.88
150	0.824	0.251	13.37
174	0.891	0.271	12.36
200	0.959	0.292	11.48
300	1.19	0.363	9.25
400	1.389	0.423	7.92
450	1.481	0.451	7.43
500	1.569	0.478	7.02
512	1.589	0.484	6.93
600	1.733	0.528	6.35
700	1.887	0.575	5.84
800	2.032	0.619	5.42
824	2.066	0.63	5.33
894	2.162	0.659	5.09
960	2.25	0.686	4.89
1000	2.302	0.702	4.78
1250	2.611	0.796	4.22
1500	2.898	0.883	3.80
1700	3.114	0.949	3.54
1800	3.219	0.981	3.42
2000	3.422	1.043	3.22
2100	3.521	1.073	3.13
2200	3.619	1.103	3.04
2300	3.714	1.132	2.96
2500	3.902	1.189	2.82
2700	4.084	1.245	2.70

\* Values typical, guaranteed within 5%

#### Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system





## 31768A

Angle Adapter, standard, 3/8 in tapped hole

### Dimensions

Inside Length	22.23 mm		0.88 in
Inside Width	22.23 mm		0.88 in
Outside Length	44.96 mm		1.77 in
Outside Width	53.34 mm		2.10 in

### General Specifications

Adapter Type	Angle adapter
Material Type	Stainless steel
Package Quantity	10

### Mechanical Specifications

Installation Torque, maximum	15.0 ft lb
Installation Torque, minimum	11.0 ft lb
Material Thickness	4.191 mm   0.165 in
Maximum Loading	Triple stack, 1-5/8 in cable
Mounting	3/8 in tapped hole

### Packed Dimensions

Height	14.2 cm		5.6 in
Length	10.2 cm		4.0 in
Shipping Weight	2.33 kg		5.14 lb
Width	14.2 cm		5.6 in

### Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system



## 42396A-2

Butterfly Hanger for 1-5/8 in coaxial cable

### Dimensions

Nominal Size	1-5/8 in
Compatible Diameter, maximum	52.070 mm   2.050 in
Compatible Diameter, minimum	48.260 mm   1.900 in
Height	70.00 mm   2.76 in
Length	88.90 mm   3.50 in
Width	38.10 mm   1.50 in

### Electrical Specifications

DTF Effect	0.1 dB
Return Loss Effect	0.1 dB

### General Specifications

Hanger Type	Standard butterfly hanger
Cables Per Hanger	1
Color	Silver
Material Type	Stainless steel
Package Quantity	10

### Mechanical Specifications

Axial Load Capability, minimum with no cable slippage	≥ 5 times cable weight
Corrosion Resistance, minimum with no degradation	≥ 500 hours in salt spray chamber
Mounting	3/8 in (M10) drilled cable ladder
Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Vibration Survival	≥ 4 hours at resonant frequency

### Packed Dimensions

Height	25.4 cm   10.0 in
Length	17.7 cm   7.0 in
Shipping Weight	0.56 kg   1.24 lb
Width	39.4 cm   15.5 in

### Regulatory Compliance/Certifications

<b>Agency</b>	<b>Classification</b>
RoHS 2002/95/EC	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)



87G

1-5/8 in EIA Male Flange with gas barrier for 1-5/8 in HJ7-50A air dielectric cable

### General Specifications

Interface	1-5/8 in EIA Male Flange
Body Style	Straight
Brand	HELIAX®
Gas Barrier	Yes
Mounting Angle	Straight

### Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 – 2700 MHz
Cable Impedance	50 ohm
RF Operating Voltage, maximum (vrms)	3880.00 V
dc Test Voltage	11 kV
Insulation Resistance, minimum	5000 MOhm
Average Power	4.9 kW @ 900 MHz
Peak Power, maximum	300.00 kW
Insertion Loss, typical	0.05 dB

### Mechanical Specifications

Outer Contact Attachment Method	Tab-flare
Inner Contact Attachment Method	Thread-in stub
Outer Contact Plating	Unplated
Inner Contact Plating	Silver

### Dimensions

Nominal Size	1-5/8 in
Diameter	61.11 mm   2.41 in
Length	146.05 mm   5.75 in
Weight	1.75 kg   3.86 lb

### Environmental Specifications

Operating Temperature	-40 °C to +150 °C (-40 °F to +302 °F)
Storage Temperature	-70 °C to +100 °C (-94 °F to +212 °F)

### Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
45–1000 MHz	1.02	40.00
1000–2000 MHz	1.04	35.00
2000–3000 MHz	1.05	32.00



87R

1-5/8 in EIA Male Flange without gas barrier for 1-5/8 in HJ7-50A air dielectric cable

### General Specifications

Interface	1-5/8 in EIA Male Flange
Body Style	Straight
Brand	HELIAX®
Gas Barrier	No
Mounting Angle	Straight

### Electrical Specifications

Connector Impedance	50 ohm
Operating Frequency Band	0 - 2700 MHz
Cable Impedance	50 ohm
RF Operating Voltage, maximum (vrms)	3880.00 V
dc Test Voltage	11 kV
Insulation Resistance, minimum	5000 MOhm
Average Power	4.9 kW @ 900 MHz
Peak Power, maximum	300.00 kW
Insertion Loss, typical	0.05 dB

### Mechanical Specifications

Outer Contact Attachment Method	Tab-flare
Inner Contact Attachment Method	Thread-in stub
Outer Contact Plating	Unplated
Inner Contact Plating	Unplated

### Dimensions

Nominal Size	1-5/8 in
Diameter	61.11 mm   2.41 in
Length	125.81 mm   4.95 in
Weight	1.72 kg   3.80 lb

### Environmental Specifications

Operating Temperature	-40 °C to +150 °C (-40 °F to +302 °F)
Storage Temperature	-70 °C to +100 °C (-94 °F to +212 °F)

### Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
45-1000 MHz	1.02	40.00



220498

Standard Grounding Kit for 1-5/8 in corrugated coaxial cable and elliptical waveguide 52 and 63

#### Dimensions

Nominal Size	1-5/8 in
Waveguide Size	WR137   WG14   R70   WR159   WG13   R58
Bonding Conductor Length	1524.0 mm   60 in
Cable Jacketing Removal Length, maximum	59.1 mm   2.3 in
Cable Jacketing Removal Length, minimum	55.9 mm   2.2 in
Compatible Diameter, maximum	50.800 mm   2.000 in
Compatible Diameter, minimum	49.022 mm   1.930 in

#### Electrical Specifications

Current Handling	Tested to withstand 100,000 amps peak current surge
Current Handling Test Method	MIL-STD-1757
Grounding, Bonding and Shielding Test Method	MIL-STD-188-124A
Lightning Protection Test Method	IEC 1024-1

#### General Specifications

Cable Type	Corrugated   Elliptical waveguide
Grounding Kit Type	Standard Grounding Kits
Color	Black
Bonding Conductor Material	Copper
Bonding Conductor Wire Size	6 gauge
Bonding Conductor Jacketing Material	PE
Grounding Strap Material	Copper
Includes	Grounding kit   Hardware   Lug   One roll of 2 in PVC tape   One roll of 24 in butyl rubber tape
Lug Attachment	Field attached
Lug Type	Two-hole lug
Package Quantity	1
Rivet Material	Copper
Weatherproofing Method	Butyl and electric tape

#### Mechanical Specifications

Blowing Rain Test Method	MIL-STD-810, Method 506
Corrosion Test Method	MIL-STD-1344, Method 1001
Freezing Rain/Icing Test Method	MIL-STD-810, Method 521
Humidity Test Method	MIL-STD-1344, Method 1002
Immersion Test Method	IEC 60529:2001, IP68
Operating Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Storage Temperature	-40 °C to +80 °C (-40 °F to +176 °F)





24312A

Lace-up Hoisting Grip for 1-5/8 in coaxial cable and elliptical waveguide 44, 52, and 63

#### Dimensions

Nominal Size	1-5/8 in
Grip Length	685.80 mm   27.00 in
Leader Length	304.80 mm   12.00 in

#### Electrical Specifications

DTF Effect	0.1 dB
Return Loss Effect	0.1 dB

#### General Specifications

Hoisting Grip Type	Lace-up hoisting grip
Attachment Spacing Intervals	61 m   200 ft
Material Type	Stainless steel
Package Quantity	1
Support Clamp	Not included

#### Mechanical Specifications

Pull Load Capacity	950 lb
--------------------	--------

#### Packed Dimensions

Height	3.8 cm   1.5 in
Length	24.0 cm   9.4 in
Width	22.4 cm   8.8 in
Shipping Weight	0.40 kg   0.88 lb

#### Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system



221213

Weatherproofing Kit for Connectors and Splices, includes butyl rubber and PVC tape

#### Dimensions

Nominal Size	1-1/4 in   1-5/8 in   1/2 in   1/4 in   2-1/4 in   3/8 in   5/8 in   7/8 in
--------------	-----------------------------------------------------------------------------

#### General Specifications

Application	Provides additional moisture seal for cable connections
Applications per Kit	Four 1/2 in-7/8 in   Twelve 1/2 in-1/2 in   Twelve 1/2 in-7/8 in to device   Two 1/2 in-2-1/4 in
Includes	One roll of 2 in PVC tape   Six rolls of 2-1/2 in butyl rubber tape   Two rolls of 3/4 in PVC tape
Material Type	Butyl rubber tape   PVC tape
Package Quantity	1

#### Mechanical Specifications

UV Resistance Test Method	Butyl test method in QUV weatherometer cycle of 8 hours UV at 150 °F then 4 hours of condensation at 104 °F   PVC tape test method UL 510, ASTM D1000
UV Resistance, minimum with no degradation	≥ 1000 hours
Weather Resistance Test Method	04AS00-03.6.0   MIL-STD-1344A, Method 1002

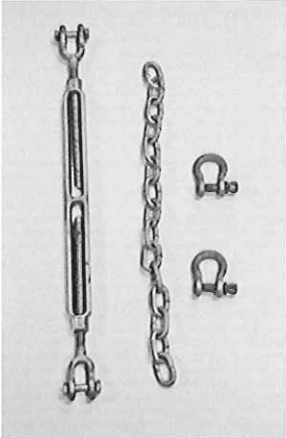
#### Packed Dimensions

Height	19.6 cm   7.7 in
Length	9.6 cm   3.8 in
Shipping Weight	1.52 kg   3.35 lb
Width	17.4 cm   6.9 in

#### Regulatory Compliance/Certifications

<b>Agency</b>	<b>Classification</b>
RoHS 2002/95/EC	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

### HGK0001 Hoisting Grip Hoisting Grip Hanger Kit

Part Number	Photo	Description
HGK0001		Hoisting grip hanger kit to attach HELIAX hoisting grips to tower. Includes 18-inches of chain, 12-inch x 12-inch turnbuckle, and two shackles. One required for each hoisting grip and one hoisting grip required for each 200-feet (60-meters) of vertical run.



## MOJAVE 1

DryLine® Dehydrator, Low-pressure membrane, 19 in rack mountable, 2.0–5.0 psig, with summary alarm, 115 Vac, 60 Hz

- See related products for dc options, sold separately

### Alarm

Alarm Type	Summary
Excess-Run Alarm	10 minutes, factory set
Low-Pressure Alarm	68 mbar   7 kPa   1 psig

### Dimensions

Net Weight	11.79 kg   26.00 lb
Product Depth	25.40 cm   10.00 in
Product Depth, Packed	43.18 cm   17.00 in
Product Height	22.23 cm   8.75 in
Product Height, Packed	42.55 cm   16.75 in
Product Width	48.18 cm   17.00 in
Product Width, Packed	58.42 cm   23.00 in

### Electrical Specifications

Power Cord	USA power cord
Voltage	115 Vac $\pm 10\%$
Alarm Contact Rating	Form C dry contacts, 2 amps at 30 Vdc
Operating Temperature	-10 °C to +40 °C (+14 °F to +100 °F)
Power Consumption	215.0 W
Power Frequency	60 Hz
Power Phase	Single
Suggested Circuit Breaker Size	20 A
Circuit Breaker Requirement	Electrical connections require separate circuits for dehydrator installation

### General Specifications

Dehydrator Type	Automatic Membrane
Voltage Type	ac
Volume Capacity, maximum	1699.00 L   60.00 ft <sup>3</sup>
Cut In Pressure	13.79 kPa   2.00 psig
Cut In/Out Pressure Type	factory set
Cut Out Pressure	34.47 kPa   5.00 psig
Dew Point	Better than -45 °C (-50 °F) at 95% RH at +40 °C (+104 °F)
Flow Rate	4.20 SLPM   0.15 SCFM
Includes	3/8 in polyethylene tubing   90° elbow fitting   Male connector fitting   Needle valve   Power cord   Power cord connector lock   PTFE tape   Screws
Mount Type	Floor   Rack   Shelf   Wall
Port Count	1

MOJAVE I

Port Type	3/8 in PE tube
Rack Type	EIA 19 in
Rack Units	5
Volume Capacity, minimum	42.48 L   1.50 ft <sup>3</sup>



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