Model VB-215DX

2 Meter 15 Element Yagi for SSB/CW

INSTRUCTION MANUAL

GENERAL DESCRIPTION

The Hy-Gain Model 215DX is a high performance yagi antenna for SSB/CW DXing in the Amateur 2 meter band.

It features 15 elements on a 28 foot (4.03 wavelength) boom, with superior gain, low sidelobes, and high front-to-back ratio. It also features an encapsulated feedpoint and a weatherproof, low loss type N connector for use in all types of climates. The useable frequency range of 144-146 MHz makes the 215DX suitable for 144 MHz EME and terrestrial DX, and 144-146 MHz satellite communications. The 215DX antennas may be easily stacked for increased performance

ELECTRICAL DESIGN

The 215DX design is based upon the DL6WU log-tapered design information. Performance was verified by testing on Hy-Gain's antenna range and by computer modeling with the NEC-2 and Yagi Optimizer(C) computer codes. The antenna's performance characteristics were optimized for the 144-144.5 MHz frequency range. This electrical design also permits the addition of more director elements for additional gain, with little or no retuning.

MECHANICAL DESIGN

The 215DX mechanical design features a 6-section boom which can be easily disassembled and reassembled for portable operations. A sturdy tubular boom support is included to reduce boom droop and to add structural strength for severe icing conditions.

Most hardware is stainless-steel including the element retaining rings (push nuts). All insulators are UV protected. The coaxial balun assembly is made from high quality RG-303/u and RG-142 B/u PTFE dielectric and FEP jacketed coaxial cable

The 215DX is constructed so that the addition of 2 or 3 more directors will not adversely affect the balance or structural integrity of the antenna.

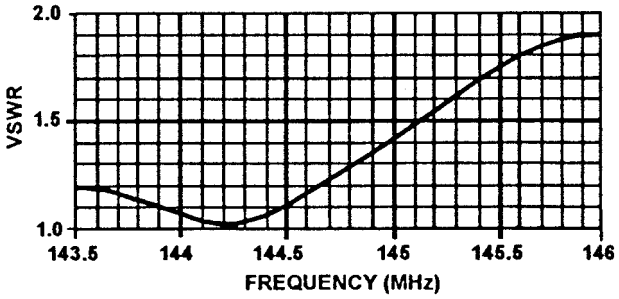


Figure 1
VSWR Chart

SPECIFICATIONS

Electrical

Gain	14.2 dBd at 144.2 MHz 13.9 dBd at 146.0 MHz
Beamwidth	28 degrees (E), 30 degrees (H)
Front-to-Back (all backlobes)	22 dB
Sidelobe Levels	-15 dB (H), -17 dB (E)
Typical VSWR	1.2:1
Maximum Power	1 Kw Ave./2 Kw PEP
Frequency Range (useable)	144.0 - 146.0 MHz
Electrical Boom Length	4.03 wavelengths
Connector	Type N - female

Mechanical

Number of Elements	15
Parasitic Element Diameter	3/16 in. (4.8 mm)
Element Lengths	34 9/16 - 39 3/4 in. (878-1010 mm)
Boom Diameter	1 - 1 1/4 in. (25 - 32 mm)
Boom Length	334 1/2 in. [(27.88 ft) (8.5 m)]
Turning Radius (max)	14' 1 1/2 in. (4.3 m)
Wind Area	2.75 sq. ft. (.256 sq. m)
Weight (net)	13.56 lbs (6.15 kg)
Boom Support	Tubular, 1, 7/8 in. (25.400 mm, 22.225 mm)
Mast Size Accepted	1 1/2 - 2 1/16 in. (38 - 52 mm)
Polarization	Horizontal
Stacking Distances (for maximum G/T)	E plane: 167 in. (4.25 m) H plane: 159 in. (4.03 m)

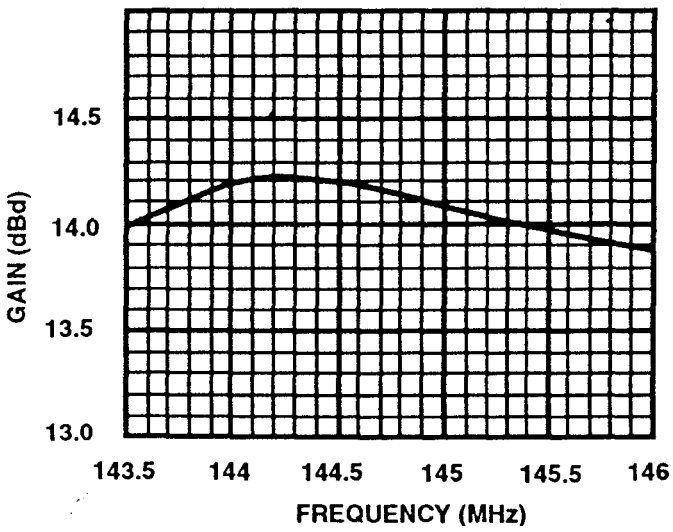


Figure 2
Gain Chart

PREPARATION FOR ASSEMBLY

FOR OVERSEAS CUSTOMERS: If you use the Metric System, see the American-to-Metric conversion table in the rear of this manual. Most illustrations in this manual will provide bcth American and Metric Dimensions.

Choose a moderate-sized clear area to assemble the 215DX Beam. The area must be at least 5' x 6' (1.5 m x 1.8 m) for each boom section. A bench-vise is recommended to hold the booms while the elements are being installed. An alternate method is to drive a 5' (1.5 m) length of mast material into the ground and attach the entire boom and boom-to-mast bracket to this mast temporarily during assembly. If you assemble this antenna over a grassy area, precautions should be taken so that hardware is not accidentally lost during assembly. A concrete driveway is an excellent area for assembly.

Tools: The following tools are required for easy assembly of the 215DX Beam:

Qty	Tool Type
1	Tape measure, 12 ft.
I	Nut Driver, 1/2 in.
1	Nut Driver, 7/16 in.
1	Nut Driver, 3/8 in.
1	Nut Driver 11/32 in.
1	Screwdriver, small flat blade

One nut driver should have a hollow handle. This can be used for pushing on the pushnuts. Standard 'wrenches or adjustable wrenches may also be used in place of the nut drivers.

When unpacking your antenna, check inside of all tubing for small parts and elements. To conserve space, these smaller articles are sometimes put inside larger pieces. Check all parts against the parts list in the rear of this manual to ensure no parts are missing.

Make all measurements to the given dimensions, plus or minus, not more than 1/16 inch! The assembly of this antenna will be easier if you read this manual completely through at least twice and follow the recommended directions. Allow at least 4 hours for assembly.

ASSEMBLY OF THE BOOM-TOMAST BRACKET AND BOOM

Select the boom sleeve, insert, and splice, boom sections and mast bracket parts as shown in Figure 3. Line-up the holes in the 6 boom sections as shown. The #3 and #4 boom sections should meet at the center of the boom-to-mast brackets for best wind area balance.

The boom sections can be identified by their length and diameter. The mating ends of each boom section can be identified by the element mounting hole reference dimensions as shown in Figure 2.

If the elements are to be installed in the boom sections indoors, label each boom end with masking tape at this time, and assemble the boom sections together when the antenna is ready to be attached to the mast.

If the elements are to be installed in the boom outdoors, assemble the boom sections together at that time and tighten all hardware securely.

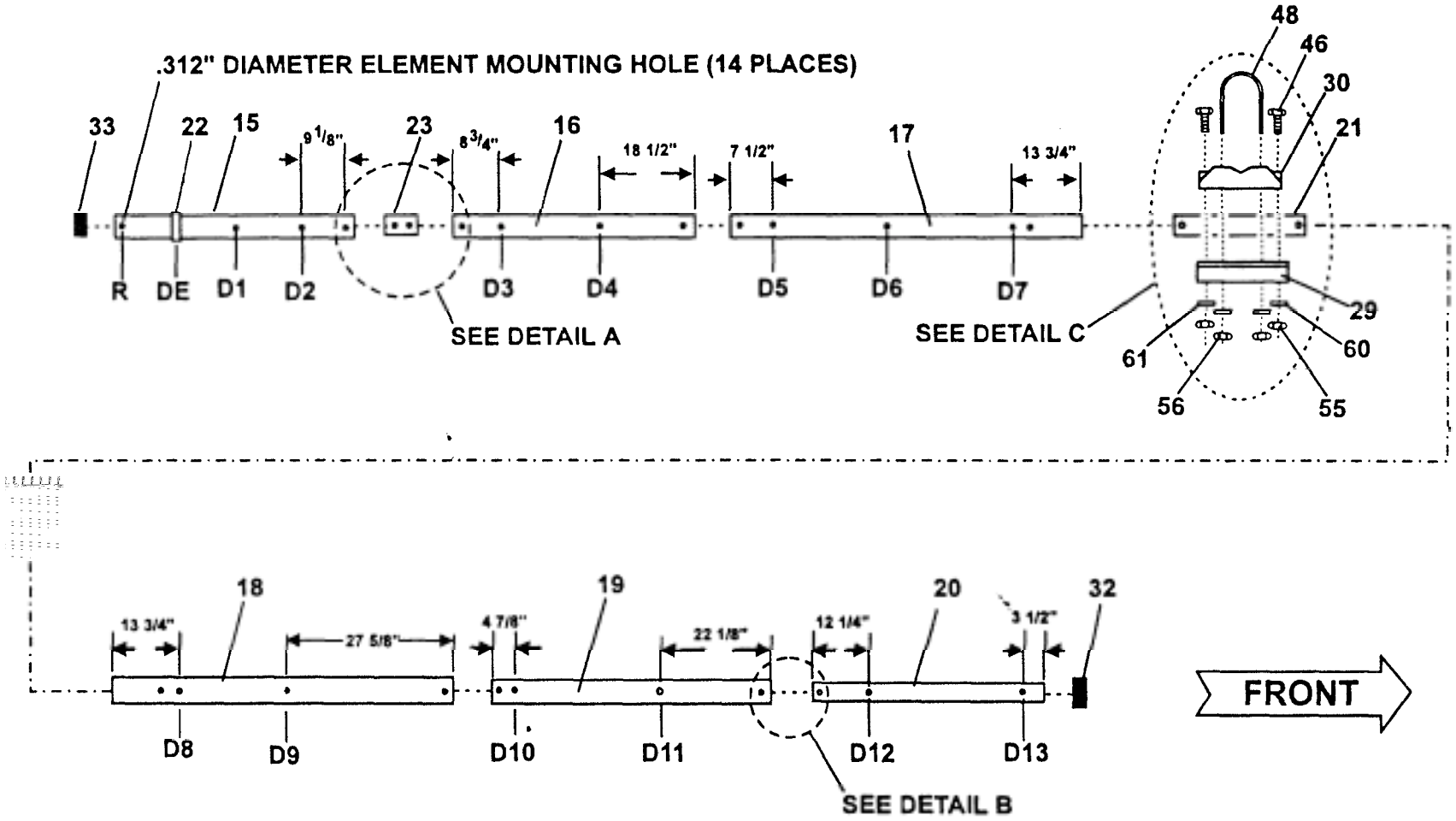
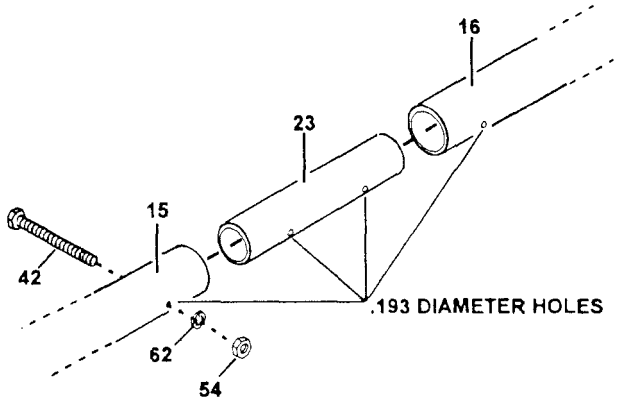
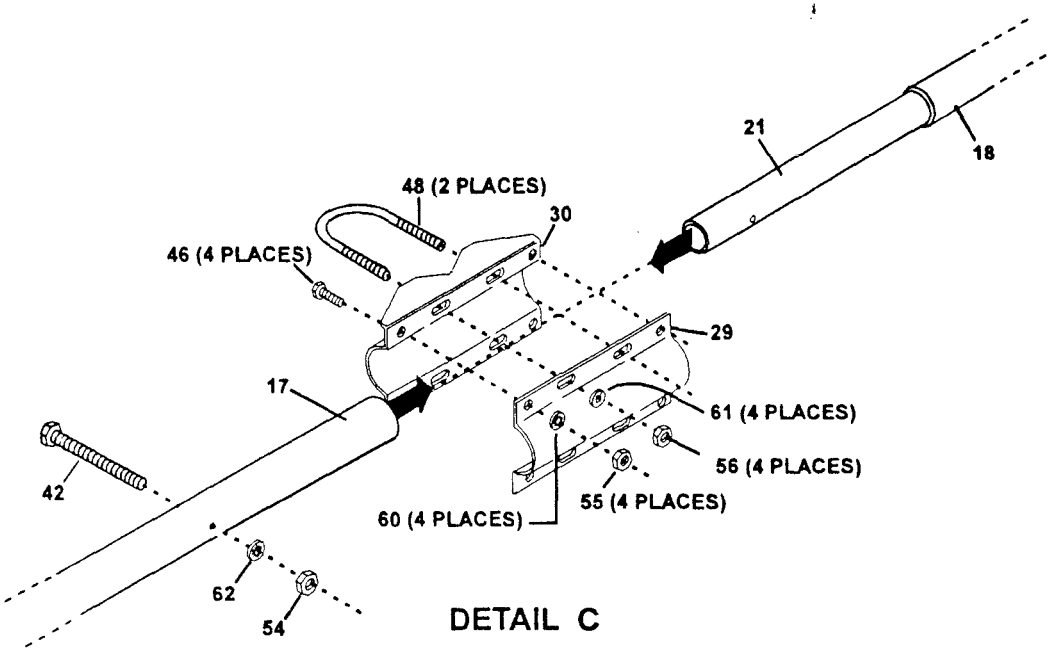


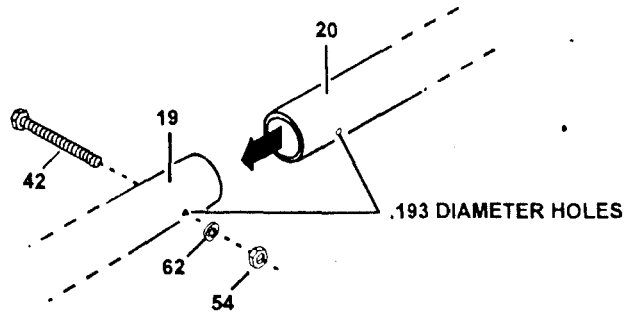
Figure 3 Assembly
of Boom



DETAIL A



DETAIL C



DETAIL B

Item No.	Description	Itean No.	–
15	Boom 1, 1 1/8" x 48", drilled	32	Caplug 1", black
16	Boom 2, 1 1/8" x 48", drilled	33	Caplug, 1 1/8", blue
17	Boom 3, 1 1/4" x 72", drilled	42	Bolt, #10-24 x 1 1/2", hex head
18	Boom 4, 1 1/4" x 70", drilled	46	Bolt, 1/4"-20 x 3/4", hex head
19	Boom 5, 1 1/8" x 57 1/2", drilled	48	U-Bolt, 5/16"-18 x 3 5/8"
20	Boom 6, 1" x 48", drilled	54	Nut, 910-24, hex, stainless steel
21	Center Boom Splice, 1 1/8" x 26"	55	Nut, 1/4"-20, hex head
22	Boom Sleeve, 1 1/4" x 2"	56	Nut, 5/16"-18, hex head
23	Rear Boom Splice, 1" x 6"	60	Lock washer, 1/4" internal, stainless
29	Bracket, Boom Body, 1 1/4"	61	Lockwasher, 5/16" split, stainless steel
30	Bracket, Boom-to-Mast, 1 l/4"	62	Lock-washer, #10, internal, stainless

Figure 4 Assembly of Boom and Boom-To-Mast Bracket

ASSEMBLY OF DRIVEN ELEMENT

Install the two driven element clamps (Item 40) on the boom sleeve (Item 22) and Boom No. 1 (Item 15) using a single 10-24x 2 inch bolt (Item 45) and a No. 10 lockwasher (Item 62) and 10-24 hex nut (Item 54), as shown in Figure 4, Detail A.

Install the two DE halves (Item 25) into the DE clamps using 10-24x1 inch bolts (Item 49), No. 10 lockwashers (Item 62) and 10-24 hex nuts (Item 54). The overall length of the DE should be 38 inches (965 mm). Tighten all hardware securely.

Install the T-match tubes (Item 26), and T-match straps (Item 41) using 1/4 inch and No. 10 hardware as shown in Figure 4, Detail B. Do not tighten hardware at this time.

ELEMENT SPACINGS

Element	Spacings from previous element Inches	MM
DE	163/8	416
D1	73/8	187
D2	14	356
D3	177/8	454
D4	203/4	527
D5	23	584
D6	24 1/2	622
D7	261/4	667
D8	27 1/2	699
D9	285/8	727
D 10	29 1/2	749
Dll	301/2	775
D12	313/8	797
D13	321/4	819

ASSEMBLY OF OTHER ELEMENTS

Select the reflector element 3/16" x 39 3/4" (Item 1), marked with two black bands near one end. Also select two (2) insulators (Item 34) and two (2) pushnuts (Item 52).

Push one of the element insulators onto the reflector, so that it's inside shoulder is 19 5/16 inches (491 mm) from the nearest end.

Insert the long end of the reflector into the mounting holes on the #1 boom section, as shown in Figure 5. Slide another element insulator over the other end of the reflector, and push it onto the element until it seats into the mounting hole. Recheck the exposed length of the reflector and reposition if necessary.

Carefully slip the 3/16 inch pushnuts (Item 52) over each end of the reflector and push them along the element until they are snug against each element insulator. Check the exposed length of each side of the reflector after this process to ensure the correct dimensions. Remove any metal shavings which might short the element to the boom.

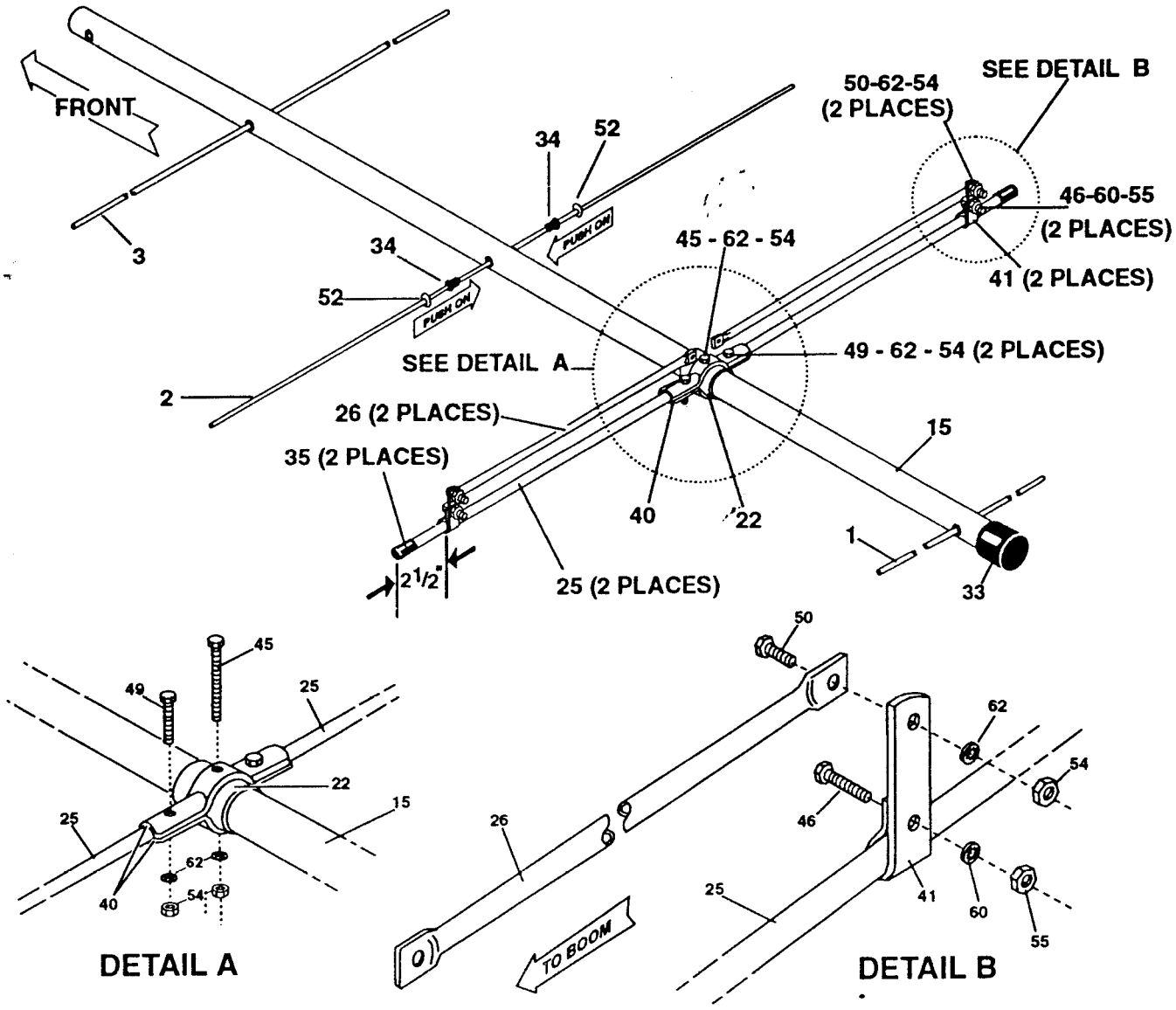
NOTE: You may wish to use a hollow handled nut-driver or the short length of 3/8 inch tubing (Item 67) to help push the element insulators and pushnuts onto each element. If you accidentally slide a pushnut on too far, then you should cut it off the element and try again with one of the spare pushnuts.

Select one each of elements - Dl, D2 (Items 2 and 3). Identify these elements by the length and color bands listed in Table 1. Install these elements on the #1 boom in the holes shown in Figures 3 and 4, using the insulators and pushnuts and methods as described earlier.

Select one each of elements - D3, D4 (Items 4 and 5). Install these elements on the #2 boom in the holes shown in Figure 3.

Select the remaining elements - D5 thru D13 (Items 6-14). Install these elements on the #3, #4, #5 and #6 booms in the remaining holes as shov;n Figure 3.

After the installation of all elements check each exposed length from Table 1. Also check to make sure the elements are in the proper order on each boom section. If any element has to be adjusted or moved, there are extra pushnuts supplied for partial reassembly.



DETAIL A

DETAIL B

See Figures 5 and 6

NOTE: USE IDENTICAL HARDWARE AND COMPONENTS FOR ASSEMBLY OF THE LEFT HALF OF THE T-MATCH TUBE.

Item No.	Description	Item No.	Description
1	Reflector, 3/16" x 39 3/4"	41	T-match strap
2	D1, 3/16" x 37 7/16"	45	Bolt, #10-24 x 2", hex head
3	D2, 3/16" x 37 1/8"	46	Bolt, 1/4"-20 x 3/4", hex head
15	Boom, No. 1, 1 1/8" x 48"	49	Bolt, #10-24 x 1", hex head
22	Boom Sleeve, 1 1/4" x 2"	50	Bolt, # 10-24 x 1/2", hex head
25	Driven Element, 7/16" x 18 1/4"	52	Pushnut, 3/16"
26	3/8" x 16 (T-match tubes)	54	Nut, # 10-24, hex head
34	lnsulator element	55	Nut, 1/4"-20, hex head
35	Caplug, 7/16"	60	Lockwasher, 1/4", internal
40	Driven Element clamp	62	Lockwasher, #10, internal

Figure 5 Rear Boom and Driven Element Assembly

Element	hem No.	Part No.	Total Length Inches	mm	Exposed Length Inches	mm	Color Bands
R	1	160096	393/4	1010	195/16	491	2 - Black/Black
D1	2	160097	377/16	951	185/32	461	1- Brown
D2	3	160098	371/8	943	18	457	1 -Red
D3	4	160099	363/4	933	1713/16	452	1 -Orange
D4	5	160100	367/16	926	1721/32	448	1 - Yellow
D5	6	160101	363/16	919	1715/32	444	1 - Green
D6	7	160102	3515/16	913	1711/32	441	1 - Blue
D7	8	160103	3513/16	910	179/32	439	1 - Violet
D8	9	160104	359/16	903	175/32	436	2 - Violet/Violet
D9	10	160105	353/8	899	171/16	433	1 -White
D10	11	160106	351/8	892	17	432	2-Brown/Black
D11	12	160107	35	889	1615/16	430	2 - Brown/Brown
D12	13	160108	3513116	884 ,	1629/32	429	2 - Brown/Red
D13	14	160109	349/16	878	16 25/32	426	2 - Brown/Orange

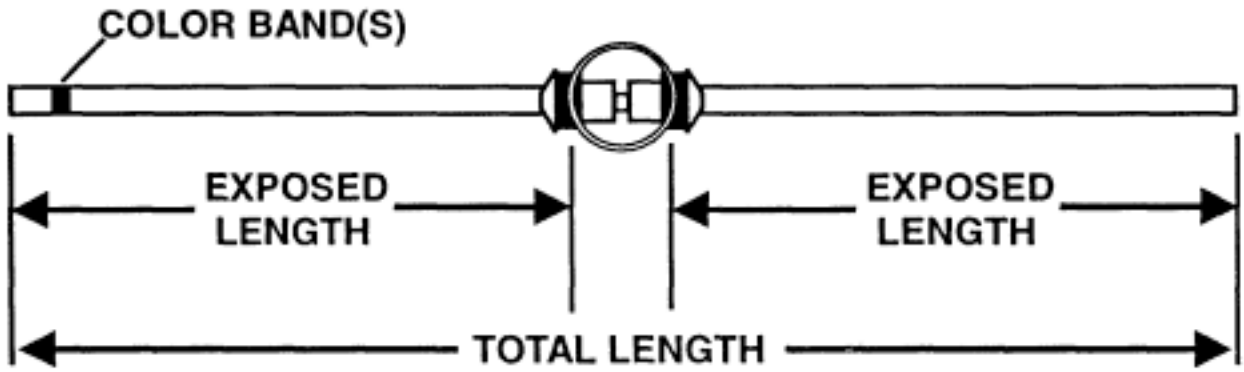


TABLE 1
Element Length and Color Band Identification

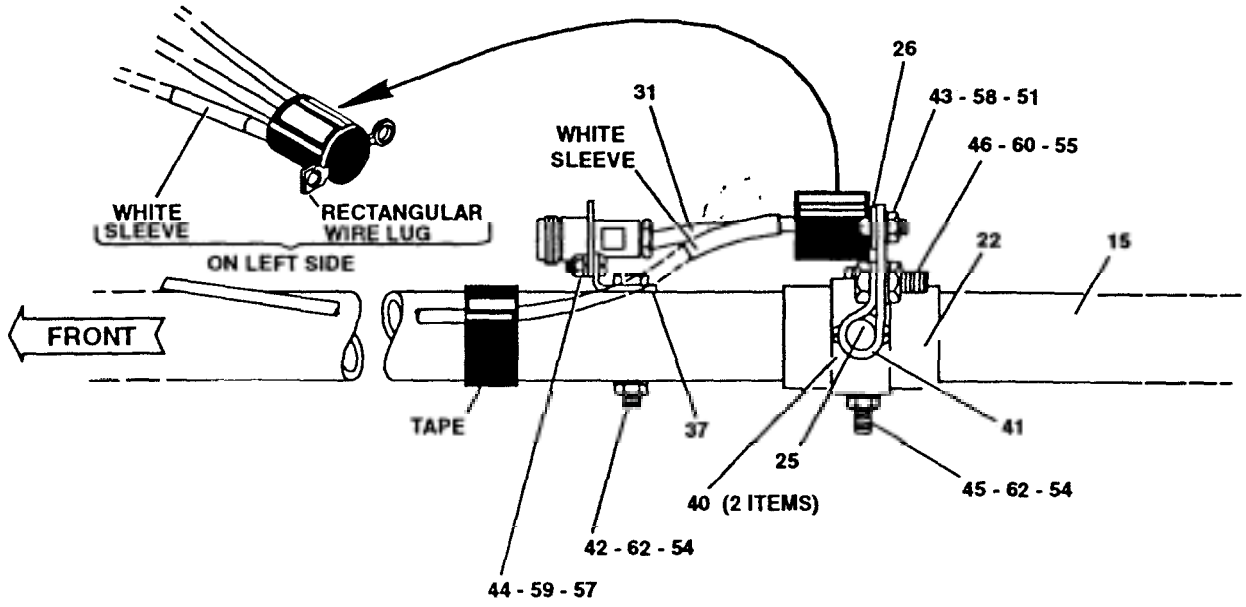
ATTACHMENT OF BALUN ASSEMBLY

Select the balun assembly (Item 31), the connector bracket (Item 37), and the hardware shown in Figure 6. Insert the 10-24 x 1 1/2 inch bolt (Item 42) through the connector bracket before attaching the bracket to the type "N" connector on the balun assembly using 4-40 hardware (Items 44, 59, 57) as shown in Figure 6.

Attach the balun assembly with connector bracket to the boom using 10-24 hardware (Items 42, 62, 54) as shown in Figure 6.

It you are assembling more than one antenna, for stacking, ensure that the square solder lug and shrink-tube marked side of the RG-303 balun are on the same side of every antenna. This is very important for proper phasing of 2 or more antennas.

Attach the balun assembly to the T-match tubes (Item 26) with #8 -32 hardware (Items 43, 58, 51) as shown in Figure 6. Tighten all hardware securely. The feedpoint end of the balun assembly may be taped securely to the boom.



Ite No.	Description	Item No.	Description
15	Boom, No. 1, 1 1/8" x 48"	45	
22	Boom Sleeve, 1 1/4" x 2"	46	Bolt, # 10-24 x 2", hex head
25	Driven Element, 7/16" x 18 1/4"	51	Bolt, 1/4"-20 x 3/4", hex
26	3/8" x 16 (T-match tubes)	54	head Nut, #8-31, hex head
31	Balun Assembly, 215DX	55	Nut, #10-24, hex head
37	Connector Bracket	57	Nut, 1/4"-20, hex head
40	Driven Element clamp	58	Nut, #4-40, hex head
41	T-match strap	59	Lockwasher, #8,
42	Bolt, #10-24 x 1 12", hex head	60	internal Lockwasher,
43	Bolt, #8-32 x 12", round head	62	#4, split Lockwasher,
44	Bolt, #4-40 x 3/8", pan head		

Figure 6
Balun Assembly

ATTACHMENT OF BOOM SUPPORTS

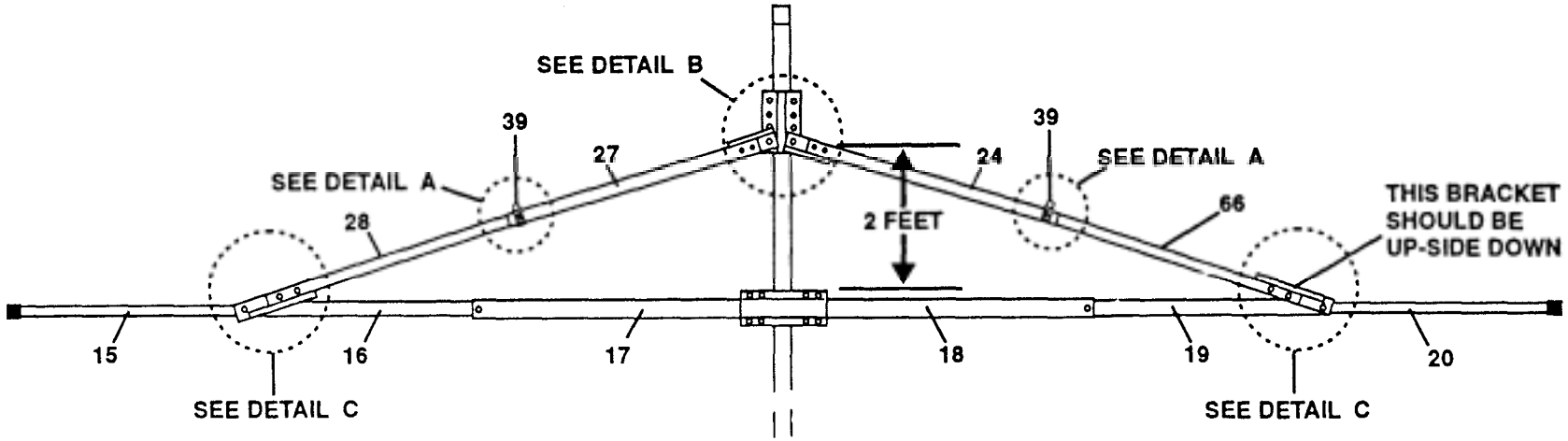
Select the boom support tubes (Items 24, 27, 28), U-bolt (Item 48), U-bracket clamp (Item 38), boom support straps (Item 36) and associated hardware as shown in Figure 7.

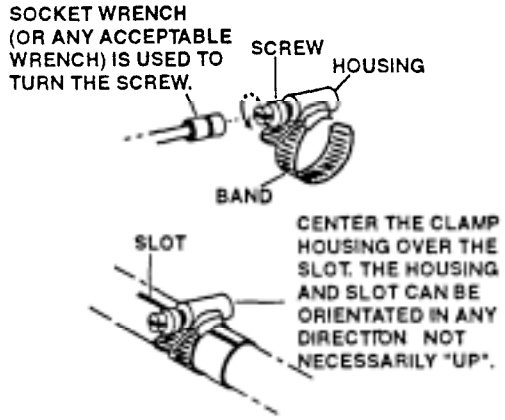
Attach the boom supports to the 1 1/8 inch boom sections as shown in Figure 7. The boom supports can be above the boom tube or below the boom, when installed. Tighten the # 10 hardware

Install the assembled antenna with boom support on a temporary mast at eye-level, so that the boom support tubes may be adjusted to level the boom. The dimensions shown in Figure 7 are close, however some adjustments may be necessary.

Disassemble the U-bolt and U-bracket clamp and tape the boom support tubes to the boom until installation on your mast or tower

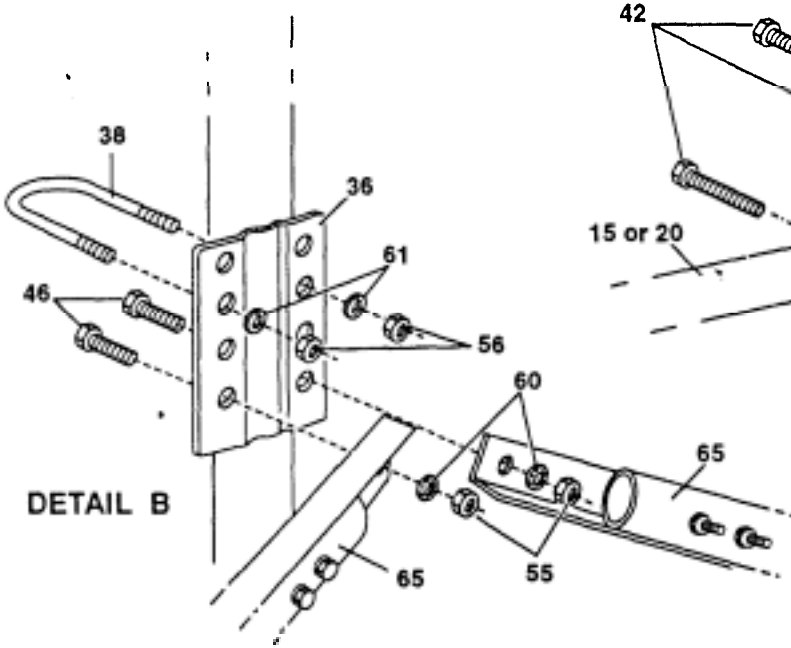
NOTE: The 215DX antenna assembled per these instructions should be balanced with respect to wind load. If you wish to balance this antenna with respect to weight, the boom-to-mast bracket and U-bracket clamp may be moved closer to the D7 element. If used in a phased array, all antennas should be assembled identically.



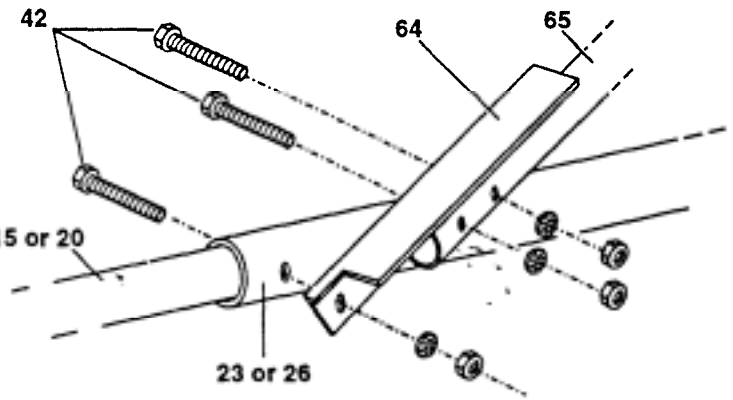


DETAIL A

Item No.	Description
15	Boom 1, 1 1/8" x 48", drilled
16	Boom 2, 1 1/8" x 48", drilled
17	Boom 3, 1 1/4" x 72", drilled
18	Boom 4, 1 14" x 70", drilled
19	Boom 5, 1 1/8" x 57 1/2", drilled
20	Boom 6, 1" x 48", drilled
23	Rear Boom Splice, 1" x 6"
24	Boom Support, 1" x 72"
26,	T-Match tube, 3/8" x 16", drilled
27,	Boom Support, 1" x 60", drilled
28,	Boom Support, 7/8" x 57", drilled
36	Mast Support Plate
38	U-bolt, 5/16"-18 x 2 11/16"



DETAIL B



DETAIL C

Item No.	Description
39	Clamp, tubing, #16
42	Bolt, #10-24 x 1 1/2", hex head, stainless steel
46	Bolt, 1/4"-20 x 3/4", hex head, cap
54	Nut, #10-24, hex head, stainless steel
55	Nut, 1/4"-20, hex head
56	Nut, 5/16" x 18, hex head, stainless steel
60	Lockwasher, 1/4", internal, stainless steel
61	Lockwasher, 5/16" split, stainless steel
62	Lockwasher, #10, internal, stainless steel
64	Support angle, boom
65	Support angle, mast
66	Boom support, 7/8" x 60", drilled

Figure 7
Boom Support

INSTALLATION

Attach your feedline to the type "N" connector on the balun assembly. Tighten securely and tape the coax to the boom every 2 feet for strain relief. Do not allow the feedline to touch any director element.

The driven element and feedline may be positioned on either the bottom or top of the boom; however when stacking 2 or more antennas, the balun assembly and the marked side of each balun should be on the same side for all antennas in the array. The 215DX should be installed with the boom support tubes either above or below the boom. Position the boom-support U-bolt for minimum boom sag, and tighten securely.

Recommended feedline for the 215DX antenna is a low-loss cable such as Belden 8214, 9913, or Times LMR-400 with type "N" connectors.

WARNING

Do Not allow any part of the antenna to touch powerlines. This could cause severe burns and/or fatal injuries.

When mounting the 215DX beam above or below any other antennas, allow at least 5 feet for minimum interaction.

The recommended stacking distances for the 215DX antenna is (167 inches / 4.25 m) in the E-plane and (159 inches / 4.03 m) in the H-plane

SERVICE INFORMATION

If you encounter technical problems and need assistance, you should contact the Telex/Hy-Gain Customer Service Department in Lincoln, NE.

You should retain your sales receipt or other proof of purchase for antennas that are still under warranty. (See separate sheet for Hy-Gain Warranty)

All request, inquires, warranty claims, or to order replacement parts contact:

Hy-Gain
308 Industrial Park Road
Starkville, MS 39759 USA
Phone: (662) 323-9538
Fax: (662) 323-6551

ANNOUNCING

Hy-gain also makes similar antennas for 50 MHz and 4321MHz for SSB/CW DX. Product 230S-1, model 64DX features 4 elements on a 12 foot boom for 50-54 MHz. Product 231S, model 70-31DX features 31 elements on a 24 foot boom for 432-438 MHz. Product 343S, Model 66DX features 6 elements on a 24 foot boom for 50-54 MHz.

OPTIONS·

The 215DX may be modified by adding more directors. The addition of D14, 34 7/16 inches long, at 32 3/4 inches from D 13 and D 15, 34 5/16 inches long at 32 3/4 inches from D14 will produce a gain of 15.0 dBd at 144.2 MHz. These element lengths are valid using the same method of mounting on a 7/8 inch diameter by 67 inches long boom extension. If a 1 inch diameter boom extension is used, these element lengths are still valid. The driven element may need to be changed, however, to obtain a good VSWR.

Look for updates on the Hy-Gain WEB pages:
http://www.hy-gain.com

PARTS

Item No.	Part No.	Description Qty
1	160096	Reflector, 3/16" x 39 3/4" 1
2	160097	D 1, 3/16" x 37 7/16 1
3	160098	D2, 3/16" x 37 1/8" 1
4	160099	D3, 3/16" x 36 3/4" 1
5	160100	D4, 3/16" x 36 7/16 1
6	160101	D5, 3/16" x 36 3/16 1
7	160102	D6, 3/16" x 35 15/16 1
8	160103	D7, 3/16" x 35 13/16" 1
9	160104	D8, 3/16" x 35 9/16 1
10	0160105	D9, 3/16" x 35 3/8" 1
11	160106	D 10, 3/16" x 35 1/8” 1
12	160107	D11, 3/16" x 35" 1
13	160108	D 12, 3/16" x 34 13/16 .....:..... 1
14	160109	D 13, 3/16" x 34 9/16 1
15	179691	Boom 1, 1 1/8" x 48" drilled..... l
16	179692	Boom 2, 1 1/8" x 48" drilled..... l
17	179693	Boom 3, 1 1/4" x 72" drilled.....1
18	179694	Boom 4, 1 1/4" x 70" drilled.....1
19	179695	Boom 5, 1 1/8" x 57 1/2" drilled.....1
20	179696	Boom 6, 1” x 48" drilled 1
21	179697	Center Boom Splice, 1 1/8" x 26".....1
22	179698	Boom Sleeve, 1 1/4" x 2" 1
23	179699	Rear Boom Splice, 1" x 6" 1
24	191027	Boom Support, 1" x 72".....1
25	179701	Driven Element, 7/16" x 18 1/4 2
26	179702	T-Match Tube, 3/8" x 16" drilled.....2
27	191014	Boom Support, 1" x 60", drilled 1
28	191015	Boom Support, 7/8" x 57", drilled 1
29	385144-1	Bracket, Boom Body, 1 1/4" 1
30	385142-1	Bracket, Boom-To-Mast, 1 1/4".....1
31	878271	Balun Assembly, 215DX 1
36	160011	Plate, mast support.....1
	878269	Parts Pack, 232S, Insulator 1
32	450401	Caplug, 1,. Black.....1
33	450421	Caplug, 1 1/8" Blue.....1
34	460337	Insulator, element, Black.....30
35	455644	Caplug, 7/16", Black 2
	878272-2	Parts Pack, 232S, Straps..... 1
37	179663	Connector bracket.....1
38	540036	U-bolt, 5/16"- 18" x 2 11/16 1
39	358758	Clamp, tubing, # 16.....2
40	160055	Boom Element Strap 2
41	160074	DC Clamp, OSCAR.....2

Item	Part No.	Description	Qty
	878270-2	Parts Pack 232S, Assembly Hardware	1
42	500159	Bolt, #10-24 x 1 1/2", hex head	18
43	500185	Bolt, #8-32 x 1/2", round head	3
44	500374	Bolt, #4-40 x 3/8" pan head	3
45	500321	Bolt, #10-24 x 1 3/4", hex head	1
46	505266	Bolt, 1/4" - 20 x 3/4", hex head cap	8
47		(Not Used)	
48	540067	U-Bolt, 5/16" - 18 x 3 5/8"	2
49	504069	Bolt, # 10 - 24 x 1 ", hex head	2
50	500158	Bolt, #10 - 24 x 1/2", hex head	2
51	550063	Nut, #8 - 32, hex head	3
52	550081	Pushnut, 3/16"	35
53		(Not Used)	
54	554071	Nut, #10 - 24, hex head, stainless steel	23
55	554099	Nut, 1/4" - 20, hex head	8
56	555747	Nut, 5/16" - 18, hex head	6
57	559612	Nut, #4 - 40 hex head	3
58	560035	Lockwasher, #8 internal, stainless steel	3
59	561530	Lockwasher, #4 split, stainless steel	3
60	562961	Lockwasher, 1/4" internal, stainless steel	8
61	564792	Lockwasher, 5/16" split, stainless steel	6
62	565697	Lockwasher, #10 internal, stainless steel	23
63		(Not Used)	
64	179856	Support angle boom	2
65	179857	Support angle mast	2
66	191028	Boom support, 7/8" x 60", drilled	1
67	179720	3/8" x 6", tubing	1