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KIT-160-88
160-Meter Add-On Kit for
DX-88 Vertical Antenna

INSTRUCTION MANUAL

GENERAL INFORMATION

This kit consists of a 160 meter loading coil assembly, a tuning capacitor assembly, a base matching coil assembly, and assembly hardware. This 160 meter kit can easily be added to any DX-88 vertical antenna to provide 160 meter band coverage. This kit will also improve performance on the 80 meter band by increasing the physical length of the antenna. Since the 160 meter coil and tuning capacitor must be manually switched into and out of the circuit, this kit is only recommended for ground-mounted installations.

This 160 meter kit will provide tuneable coverage of the entire 160 meter band, 1800-2000 KHz. You may set the tuning capacitor on the 160 meter kit to any specific operating frequency or you may set the tuning capacitor for the middle of the band and use an antenna tuner or external matching device to match the antenna when you change frequencies within the 160 meter band.

The addition of the 160 meter coil at approximately 5 feet above the base of the antenna provides greater radiation efficiency than trying to match the DX-88 without the 160 meter coil, or with base loading.

The base matching coil will provide a DC ground for the antenna and will also help to bring the VSWR down to 1.0 at resonance. It will need to be replaced or modified to help the match on the 80 meter band. It will not affect operation on 40 through 10 meters.

The loading coil is constructed of heavy wall, high dielectric strength, laminated fiberglass using #12 AWG insulated copper wire and enclosed in a weather protective thermofit cover. The tuning capacitor is made from 2" aluminum tubing with a large air gap and Teflon @ spacers to prevent high voltage flashover. All hardware is stainless steel.

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SPECIFICATIONS (160 meters)

Tuning Range	1800-2000 KHz
Maximum Power	1500 watts PEP 700 Watts Average*
2:1 VSWR Bandwidth	20 KHz
Nominal Impedance	50 ohms
Recommended Radials (not supplied)	16 each, 24 ft (7.3m) 16 each, 14 ft (4.3m)

*5 min. on, 5 min off

INSTALLATION

The Omni DX-88 vertical with the 160 MK-88 160 meter kit should be mounted in the clear, at least 30 feet from buildings, metal fences, metal masts or flagpoles and other large metallic structures.

WARNING

Installation of this product near power lines is dangerous ! For your safety, follow the installation directions.

Do not install this antenna near any power line. Not only is it dangerous to put up and take down, the power lines could cause excessive noise to be received by the radio connected to this antenna.

When DX-88 and 160 MK-88 are installed or the ground, a radial system is normally required. The minimum recommended radial system for efficient 160 meter operation from a city lot consists of 16 radials at 24 feet (7.3 m); long and 16 radials at 14 feet (4.3 m) long. See Figure 1. These wire radials are not supplies

NOTE: Recommended Radial System, Not Supplied with this kit.

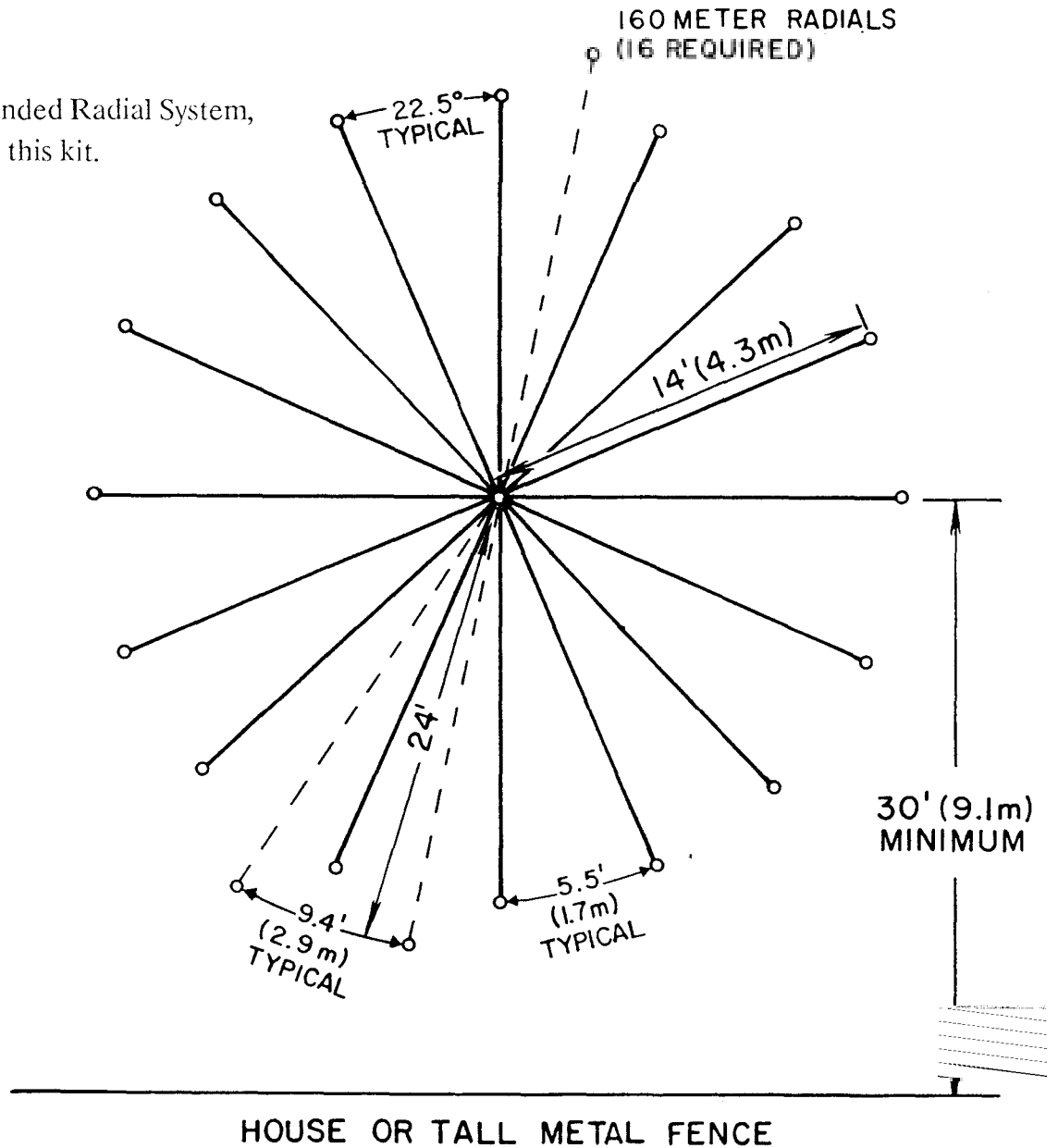


Figure 1 DX-88 Ground Mount Radial System

Since the radials of a ground-mounted vertical are actually on, if not in, the ground, they are coupled by capacitance or conduction to the ground, and thus resonance effects are not important. Basically, the function of ground radials is to provide a low-loss return path for ground currents. Longer radials and more radials will reduce the ground losses and effectively increase the gain of the antenna. See the article entitled "Radial Systems for Ground Mounted Vertical Antennas" by Brian Edward, pages 28-30, QST magazine, June, 1985 for more information.

The radial length of 24 feet (7.3 m) is approximately 0.1 wavelength at 4 MHz. With poor earth conditions (dry, rock soil), the gain of this vertical antenna system will be approximately 3 dB below the gain from a perfect earth or 120 radials. With good earth conditions (agricultural land, low hills), the gain of this vertical antenna system will be approximately 2 dB below the gain from a perfect earth or 120 radials.

On 160 meters, a radial length of 24 feet (7.3 m) is approximately 0.05 wavelength. With poor earth conditions, the gain of this vertical antenna system will be approximately 4 dB below the gain of the same antenna on a perfect earth or 120 radials (0.5 wavelength). With good earth conditions, the gain will be approximately 3 dB below the gain from a perfect earth or 120 radials (0.5 wavelength).

ANTENNA ASSEMBLY

Select the shorting bars, loading coil assembly, capacitor assembly, clamps and hardware as shown in Figure 2. Assemble loosely as shown. Assemble the two new pairs of 1 1/8" x 1" clamps just above the base assembly as shown in Figure 3. Tighten these clamps securely.

If you have already assembled the DX-88 antenna previously, remove the 1 3/8" x 9 3/4" splice tube (Item 7 in Figure 11 of the DX-88 Manual). Replace this tube with the new 160 meter assembly as shown in Figure 3. Tighten all hardware on the 160 meter loading coil assembly, but DO NOT tighten the clamps on the capacitor assembly until instructed to do so.

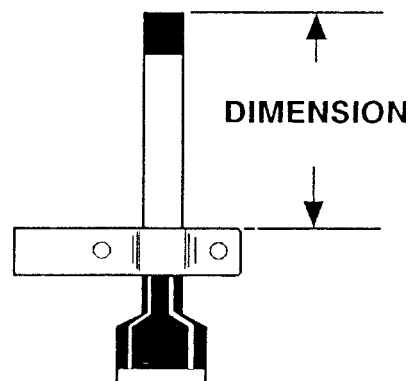
ANTENNA TUNING

Adjust dimensions A + B, C, D, E, F, G, H, and I to the correct dimensions for your operating frequencies as shown in Graphs 1-8.

EXAMPLE I - Amateur

The dimensions for the DX-88 with the 160 MK-88 installed to resonate near the center of each amateur band are: (CW curves)

- A = 13"
- B = 13"
- A + B = 26"
- C = 5"
- D = 2 3/4"
- E = 2 1/4"
- F = 2 1/2"
- G = 3"
- H = 16"
- I = 18"



TYPICAL FOR BOTH
UPPER AND LOWER
EXCEPT WHERE NOTED.

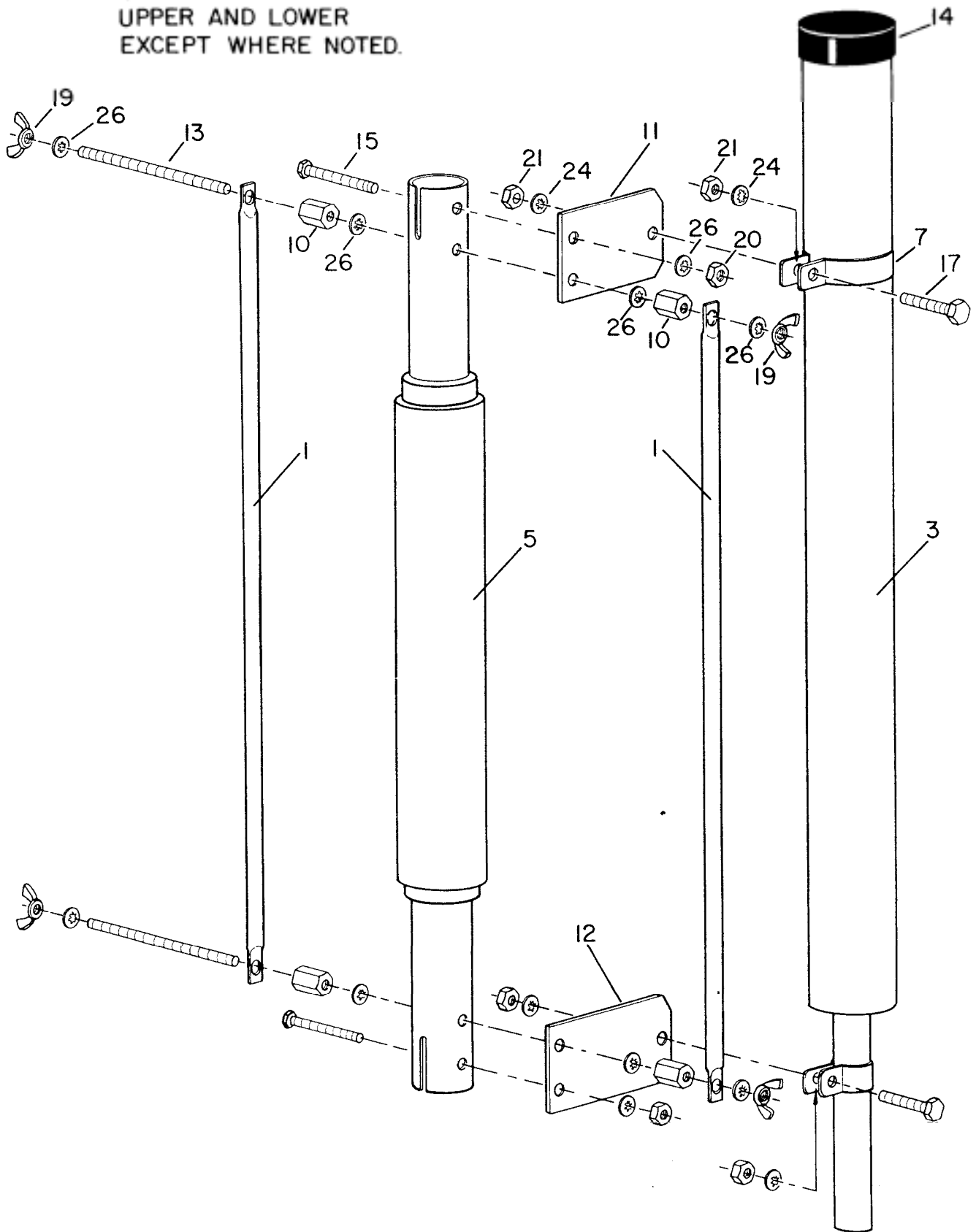


Figure 2 160
Meter Trap

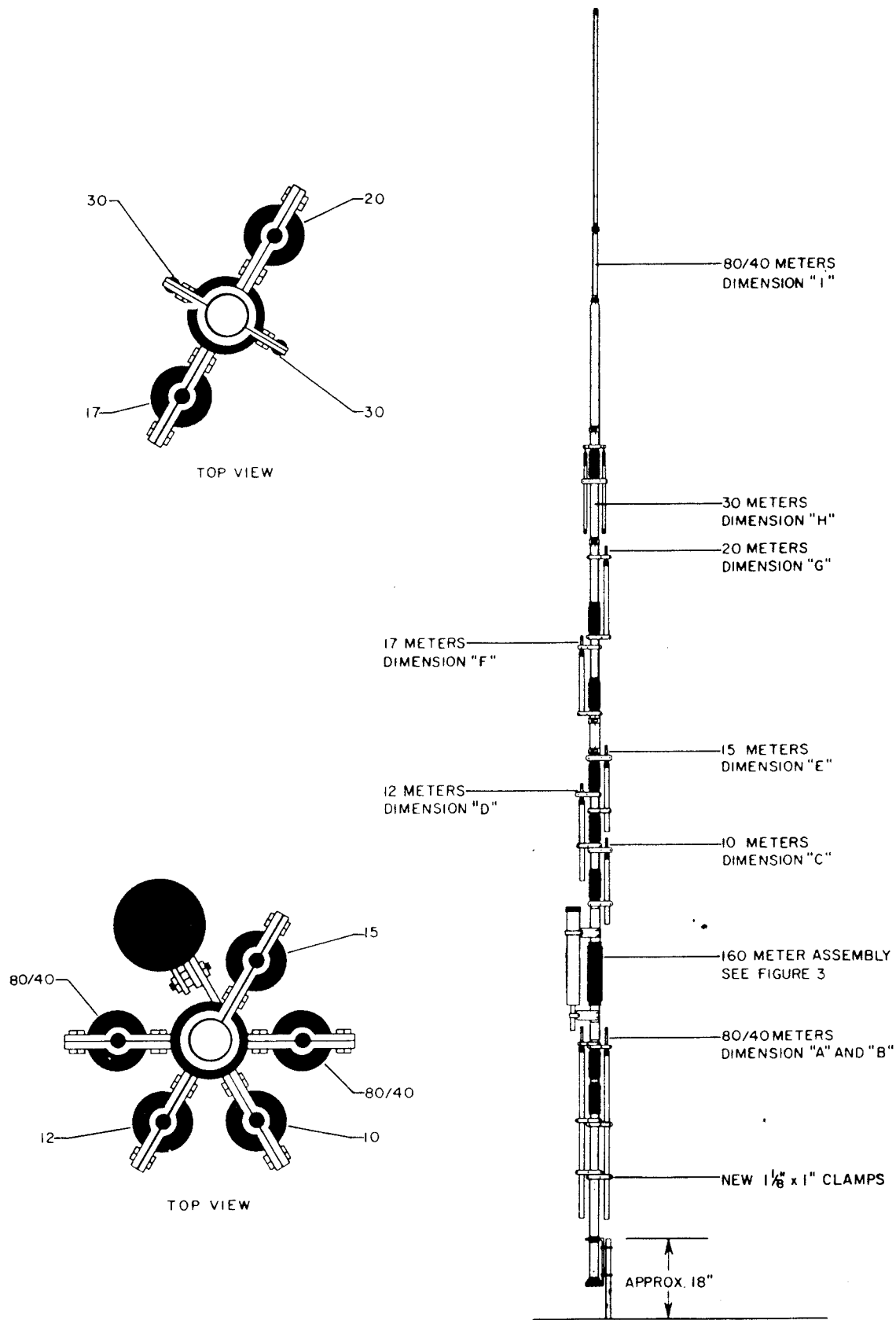
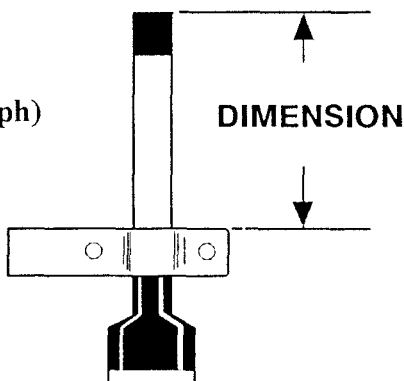


Figure 3 Overall View of DX-88 with Top View Details and 160 MK-88 Installed

EXAMPLE 2 - SWL

The dimensions for this antenna to resonate in the center of the 11, 13, 16, 19, and 31 meter SWL bands, and near the 49 and 90 meter SWL bands are:

- A = 4 3/4"
- B = 4 3/4"
- C = (See Graph)
- D = 4 5/8"
- E = 3 1/2"
- F = 1 3/4"
- G = 7"
- H = 25"
- I = 46"



30 Meter bracket = at bottom of 30 meter capacitors

After assembly for amateur use, check the VSWR on all of the HF bands, 80-10 m, with the shorting bars still attached. High VSWR on 80 meters may be noticed unless the proper 80 meter matching coil is installed at the antenna base. Adjust the dimensions on each band if necessary.

To operate on 160 meters, remove both shorting bars (see Figure 2, Item 1), and set the 80/40 meter capacitors to A = B = 1 3/4". Set the large capacitor tube so that there is a 1 inch gap between it and the lower mounting bracket.

NOTE: DC COIL CONSISTS OF 14 TURNS NO.14 INSULATED SOLID COPPER WIRE. COIL LENGTH IS 2 INCHES. COIL I.D. IS 1.25 INCHES.

Tighten the top tubing clamp to hold the large capacitor tube in position. Refer to the detail with Graph 9. Select the desired frequency of operation on the 160 meter band, and adjust the dimension " X " as shown in Graph 9. Tighten the lower tubing clamp to maintain the correct dimension.

NOTE: Due to some variations, minor capacitor adjustment may be required to resonate the antenna on the desired frequency. Incremental changes of 1 inch of dimension "X" results in a frequency shift of approximately 12 - 13 KHz.

160 METER MATCHING

To achieve low VSWR on 160 meters, replace the 80 meter matching coil with the 160 meter matching coil. The 160 meter matching coil will also provide a DC ground and low VSWR on 40-10 meters. Install this coil assembly as shown in Figure 4. The leads may be formed to suit your installation.

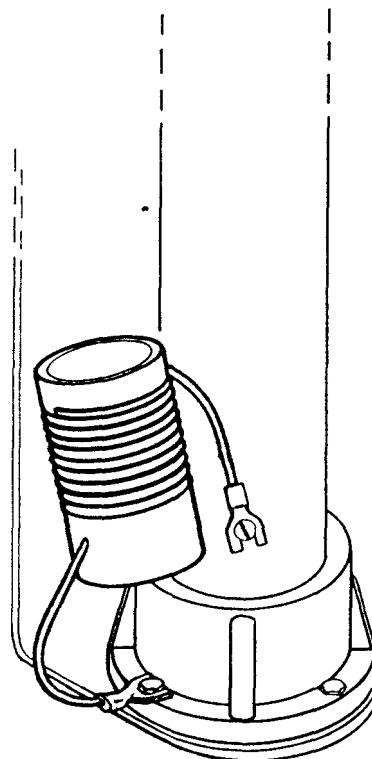
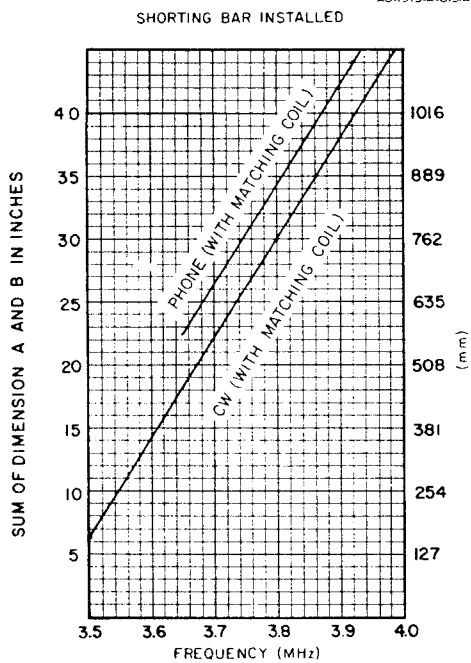
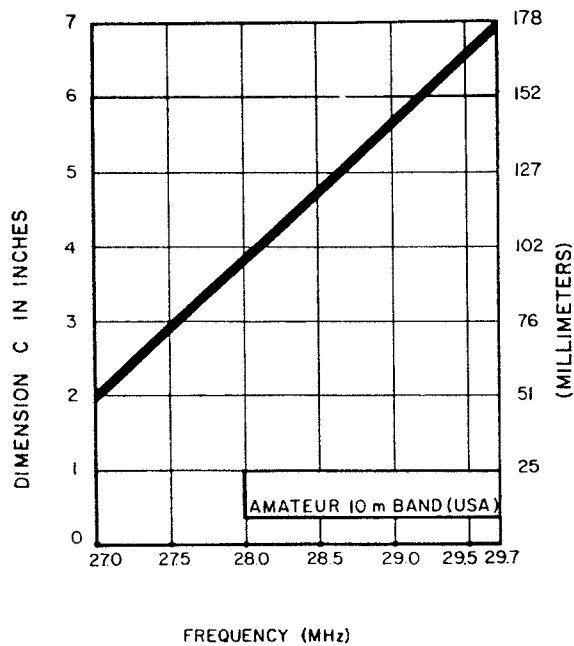


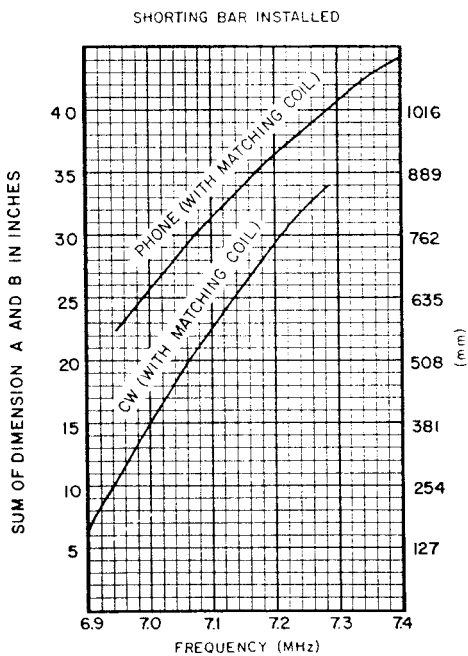
Figure 4 DC Shorting Coil/160 m Matching Coil



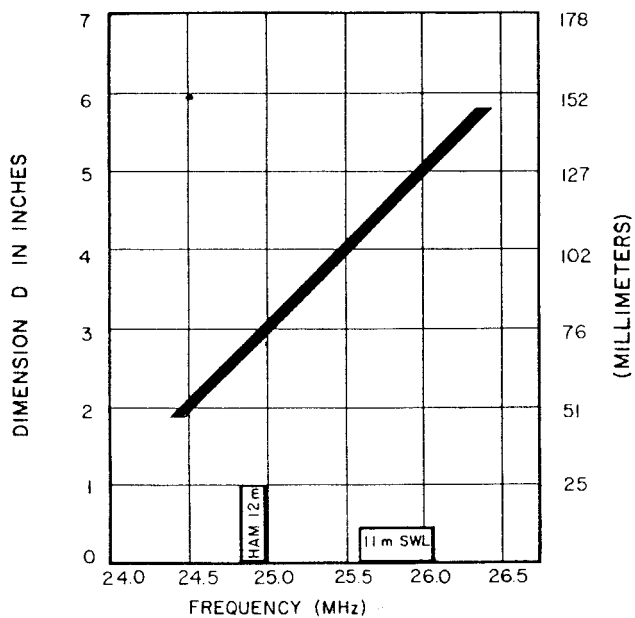
Graph 1
80/40 Meter 3.5 -
4.0 MHz



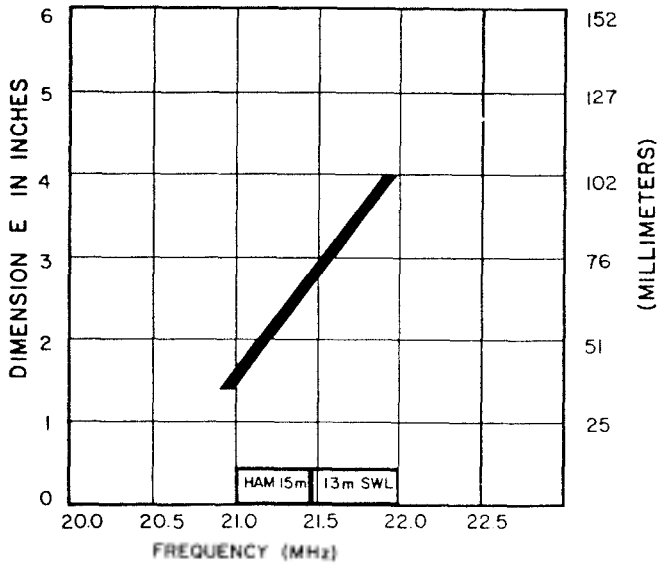
Graph 3 Dimension C 10 Meter
Trap for 27 - 29.7 MHz



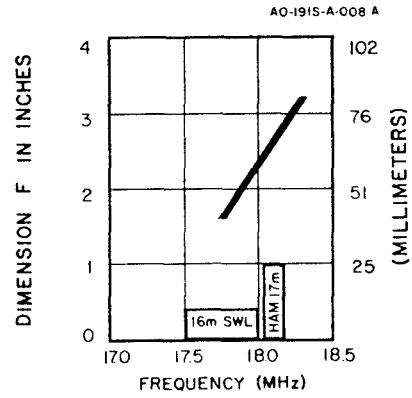
Graph 2 80/40
Meter 6.9 - 7.4
MHz



Graph 4 Dimension D 12 Meter
Trap for 24.5 - 26.5 MHz

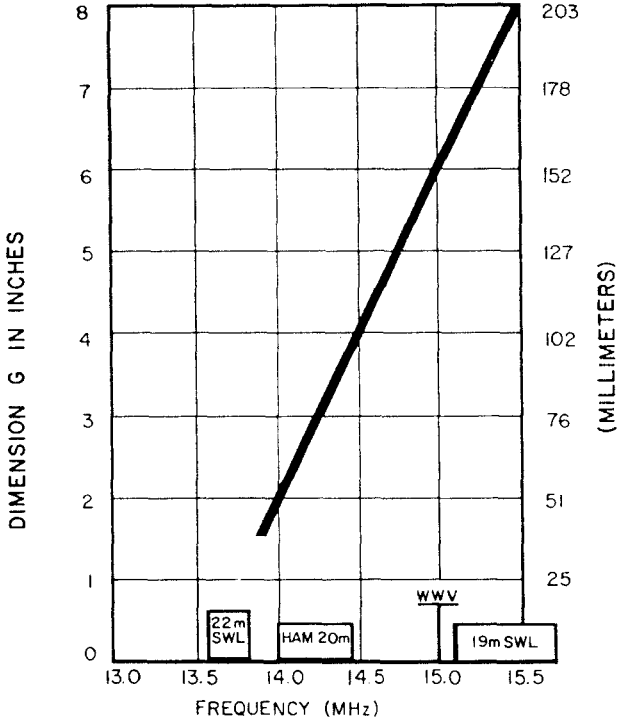


Graph 5
Dimension E
15 Meter Trap for 20.5 - 22 MHz

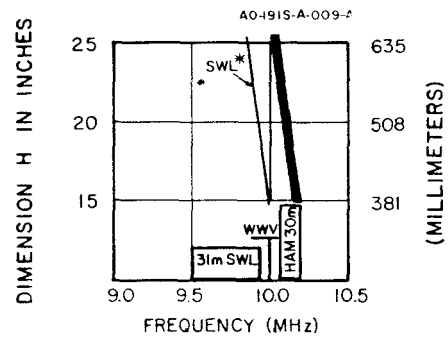


Graph 6
Dimension F
17 Meter Trap for 17.5 - 18.5 MHz

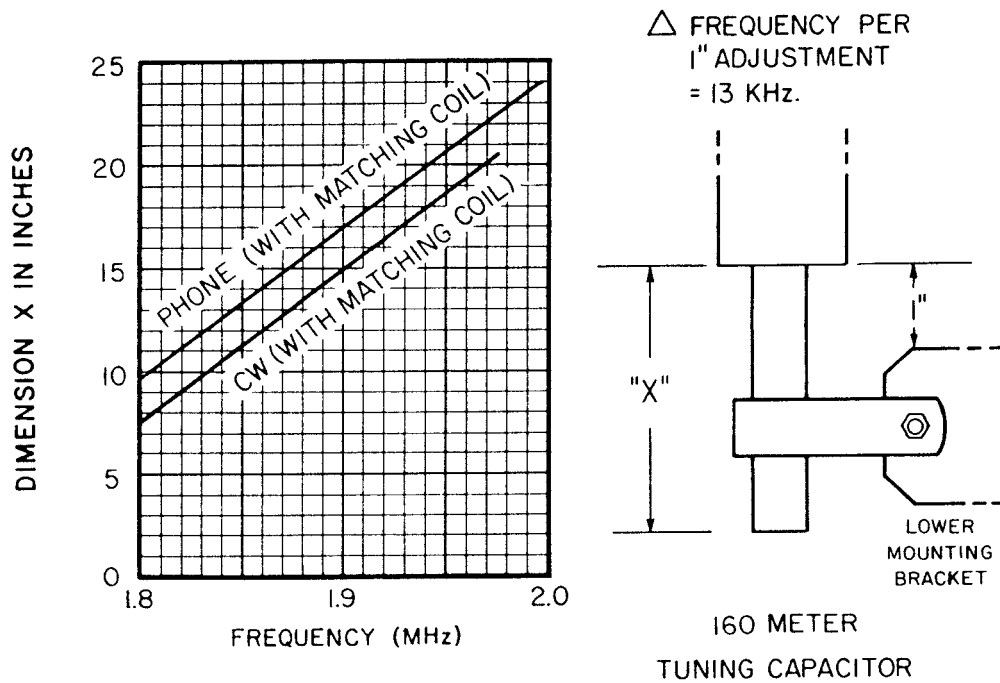
NOTE: THE "SWL" CURVE FOR THIS FREQUENCY RANGE IS OBTAINED BY SLIDING THE 3/8" X 1" X 3/8" CLAMP ASSEMBLY TO THE BOTTOM OF THE 30 METER CAPACITORS, AND RETIGHTENING.



Graph 7
Dimension G
20 Meter Trap for 13.5 - 15.5 MHz



Graph 8
Dimension H
30 Meter Trap for 9.5 - 10.5 MHz



Graph 9
Dimension X 160
Meter Network

SETTING	DIMENSION "H"	DIMENSION "I"
HAM - CW	16 in.	18 in.
HAM-PHONE AND SWL 41/75 METERS	19 in.	28 in.
SWL 49/90 METERS	25 in.	46 in.

Table 1 Dimension H
and I for IIANI and
SWL Settings

OPERATING

When the 160 meter band is not to be used, install both shorting bars, replace the 80 meter matching coil, and adjust the 160 meter capacitor to the minimum dimension "X" (approximately 5"). This allows all other bands (80-10m) to be operational.

NOTE: Always refer to the tuning graphs in this manual when the 160 meter kit is installed on your DX-88 antenna.

Adjust the "A + B" dimension to set the 80 meter and 40 meter operating frequencies.

To switch to 160 meters, remove the shorting bars, replace the 160 meter matching coil, adjust the A and B dimensions to their minimums, and adjust the 160 meter tuning capacitor. If the A and B dimensions are not set to their minimums, the antenna may not be able to resonate near 1800 KHz.

WARNING

Keep this antenna away from the reach of children or pets. When transmitting the antenna and antenna radials are hot with rf proportional to the operating power.

PARTS LIST

Item

2		(Not Used)	
3	578611	Capacitor - 160 meter	1
4	878612	Matching Coil 160 meter.....	1
5	578613	Loading Coil Assembly 160 Meter	1
	878609	Parts Pack 00191S	1
6	169339	Clamp, 7/8"	1
7	171077	Clamp, upper capacitor	1
8		(Not Used)	
9	179734	Clamp, mast/cap	4
10	179789	Standoff, 3/8" x 1/2"	4
11	179790	Mounting bracket, upper, 2 1/4" x 1 7/8"	1
12	179794	Mounting bracket, lower, 2 5/8" x 1 7/8"	1
13	37520 >	Stud, # 10 x 3 3/8", stainless Steel	2
14	455625	Caplug, black.....	1
15	500157	Bolt, #10-24 x 2", hex head, stainless steel	2
16	500158	Bolt, # 10-24 x 1/2", hex head, stainless steel	6
17	502958	Bolt, 1/4"-20 x 1", hex head, stainless steel	2
18		(Not Used)	
19	551153	Wingnut, #10-24, stainless steel	4
20	554071	Nut, #10-24, hex, stainless steel	12
21	554099	Nut, 1/4"-20, hex, stainless steel	4
22		(Not Used)	
23		(Not Used)	
24	562961	Lockwasher, 1/4" internal, stainless steel	4
25		(Not Used)	
26	565697	Lockwasher, #10, internal.....	16

hy-gain® LIMITED WARRANTY

Hy-Gain Warrants to the original owner of this product, if manufactured by **Hy-Gain** and purchased from an authorized dealer or directly from **Hy-Gain** to be free from defects in material and workmanship for a period of 12 months for rotator products and 24 months for antenna products from date of purchase provided the following terms of this warranty are satisfied.

1. The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original or machine reproduction of such proof of-purchase to **Hy-Gain** at the time of warranty service. **Hy-Gain** shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, or forgery shall be cause to void any and all warranty terms immediately.
2. **Hy-Gain** agrees to repair or replace at **Hy-Gain's** option without charge to the original owner any defective product under warranty, provided the product is returned postage prepaid to **Hy-Gain** with a personal check, cashiers check, or money order for \$8.00 covering postage and handling.
3. Under no circumstances is **Hy-Gain** liable for consequential damages to person or property by the use of any **Hy-Gain** products.
4. Out-of-warranty Service: **Hy-Gain** will repair any out-of-warranty product provided the unit is shipped prepaid. All repaired units will be shipped COD to the owner. Repair charges will be added to the COD fee unless other arrangements are made.
5. This warranty is given in lieu of any other warranty expressed or implied.
6. **Hy-Gain** reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.
7. All **Hy-Gain** products to be serviced in-warranty or out-of-warranty should be addressed to **hy-gain, 308 Industrial Park Road, Mississippi 39759, USA** and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase.
8. This warranty gives you specific rights, and you may also have other rights which vary from state to state.