



Released in January, 2002, the **XR-5** is the finest 5-band, single feed line Yagi for the 20-17-15-12-10 mtr bands. The design utilizes Force 12 overlay techniques to incorporate five monoband Yagis on a single boom. It is the product of five years elapsed time, building on experience gained with the C-series and XR-series multi-band Yagis. The **XR-5** is strong, lightweight and computer designed not only for the basic electrical performance, but also computer designed for mechanical strength, durability and low profile. The **XR-5** is rated for 100 mph and the boom is rated for 170 mph without a truss (none is supplied). The “H” model is rated for 120 mph. The mast is attached near the center of the boom, so mast torque is as low as possible. There is also about 30" of clear space in the center for side mounting, or mounting to a ring rotator.

The design of the **XR-5** is a dramatic improvement in multiband Yagi antennas over the typical methods used in past years and decades. The usual methods of covering multiple bands utilize traps in the elements, log-periodic cells, phased drivers, or various combinations of these methods. The primary shortcomings of these methods are losses in the traps, complex mechanical structures with log and phased elements and other compromises to provide a 50 ohm feedpoint impedance for the 50 ohm coax feedline.

Several design features of the **XR-5** will be described in the following paragraph. Knowing it is possible that not everyone who has acquired the **XR-5** is necessarily familiar with Yagi antennas, or beam-type (directional) antennas, it is suggested that a good book, such as the [A.R.R.L. Antenna Book](#) be utilized for further information. Of course, one can always proceed directly and assemble the **XR-5**!

The **XR-5** antenna is highly efficient and does not contain any traps, which typically produce loss in the antenna. It is also not an LPDA (log periodic dipole array), which are designed to provide a certain maximum VSWR across a wide frequency range at the expense of forward gain and pattern. The **XR-5** is a multi-monoband Yagi antenna designed for direct operation in the 20, 17, 15, 12 and 10 meter amateur bands. It is based on the proven Force 12 C-3 (C-series) and C-31XR (XR series) antennas for both electrical and mechanical aspects. The **XR-5** is an expansion of the C-3 and consists of a five (5) monoband Yagis. The Yagis for 20, 17, 15 and 12 meters use a reflector-driver arrangement and the Yagi for 10 meters is set up as a driver-director. There are 10 elements on the 18' boom and all five Yagis overlay the common boom. All elements are full size and follow XR series construction.

The **XR-5** forward gain is almost constant across all the bands. It is in the range of 4.2-4.6dBd, which means 4.2-4.6dB more than a full size dipole at the same height above ground. The pattern is more than one would expect from a basic 2 element Yagi. The F/B ratio will run 14-20dB and the side nulls are in excess of 25dB. A common question is, "How many elements are active on each band?" The answer is that they all are, because all the elements are in the near field, regardless of the band of operation. Some are less "involved" than others, such as the 20 meter reflector is not very active when operating on 10 meters. All the elements, however, are contributing to the excellent pattern. There are 2 full size elements dedicated to each band.

XR-5 Specifications

Electrical

	<u>20 Meters</u>	<u>17 Meters</u>	<u>15 Meters</u>	<u>12 Meters</u>	<u>10 Meters</u>
Freq. Coverage	14.0 - 14.350 MHz	18.068-18.168 MHz	21.0 - 21.450 MHz	24.890-24.990 MHz	28.0 - 29.7 MHz
VSWR	1.4:1 (lowest is <1:2)	<1.4:1	1.7:1 (lowest is <1.4:1)	<1.4:1	1.9:1 (lowest is <1:3:1)
Front-to-Back Ratio	14-20 dB	16	16-20	16	15-22
Front-to-Side Ratio	>25 dB	>25	>25	>25	>24
Gain (dBi) @ 74'	12.3 – 12.6	12.5	12.3 – 12.6	12.5	12.2 – 12.6
Net Gain (dBd)	4.3 - 4.6	4.5	4.3 - 4.6	4.5	4.2 – 4.6
Maximum Power	>5 KW	>5 KW	>5 KW	>5 KW	>5 KW

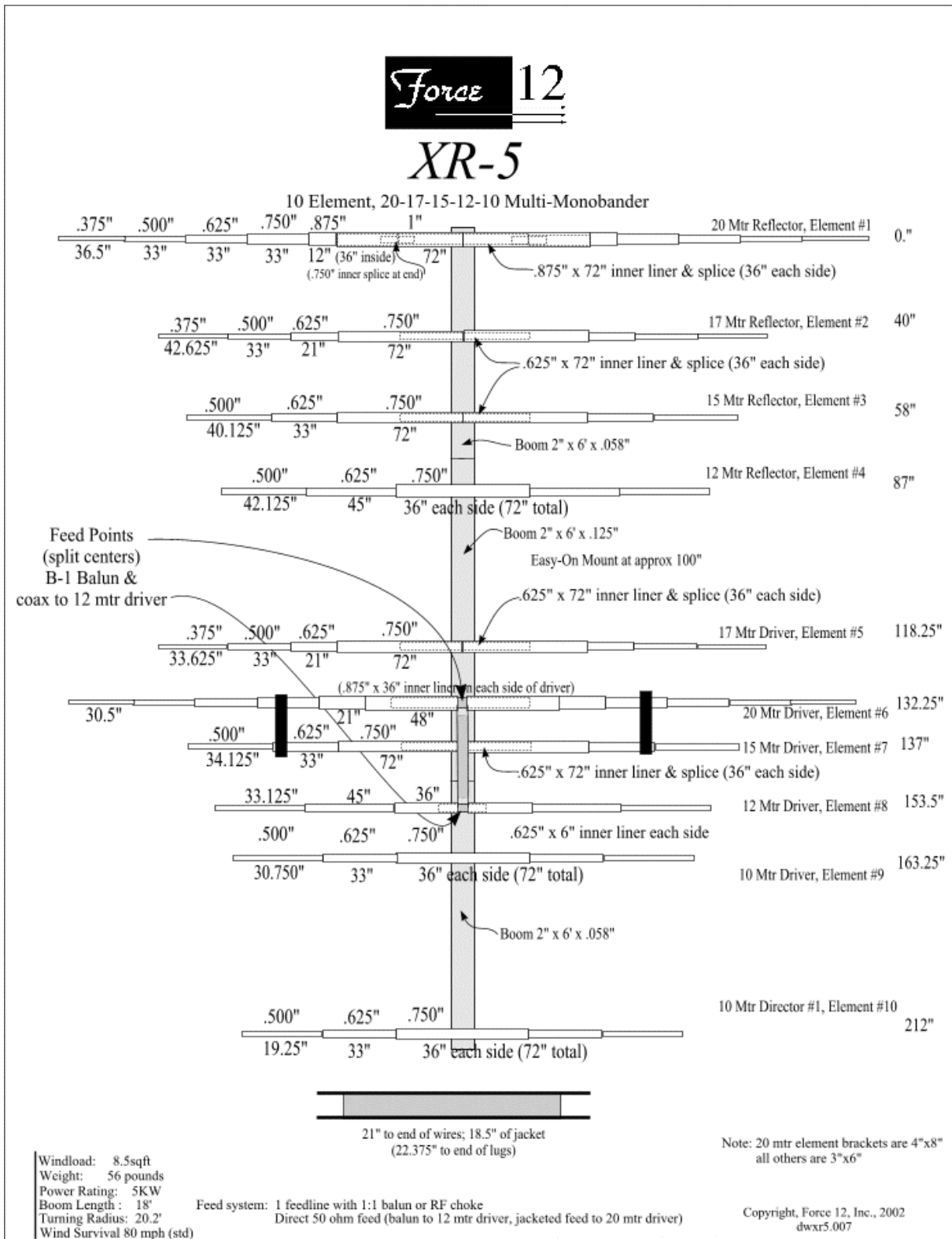
Mechanical**"H"**


	18 ft.	
Number of Elements	10	
Longest Element	37 ft	
Turn Radius	20.2 ft.	
Assembled Weight	56 lbs.	60 lbs.
Wind Load	8.5 sq. ft.	8.5 sq. ft.
Wind Survival	100 MPH	120 MPH

Feed System and Antenna VSWR

The *XR-5* feed system is the key to the antenna and consists of a pair of 3-band open sleeve feed systems. The 3-band open sleeve was developed by Tom Schiller (N6BT), is patented and licensed to Force 12. The coax is connected to the 12 meter driver, which excites 10 meters (in front of it) and also excites 15 meters (behind it). The 12 meter driver is connected through a jacketed feed line to the 20 meter driver. The 20 meter driver is in very close proximity (4") to the 15 meter driver and excites it (as does the 12 meter driver) and also excites the 17 meter driver positioned behind it. The actual method and relationships between the feed system components is more complex, but the result is to enable feeding the *XR-5* directly with a single 50 ohm coaxial feed line. Since this is a balanced antenna, it should be fed through either a 1:1 balun (such as the Force 12 B-1), or a suitable RF choke.

The VSWR curves for the *XR-5* allow full coverage on all five (5) bands, including 10 meters. On 20-17-15-12 meters, the VSWR does not exceed 1.7:1 anywhere in the band. On 10 meters, the VSWR climbs to about 1.9:1 at the top of the band. If there is a long coaxial cable run, the VSWR curves will be flattened out because of the slight amount of loss in the line. The VSWR curves are not symmetrical, nor should they be expected to be so. For example, the 10 mtr curve rises slower on the low side than it does on the high side. Small adjustments can be made to move a response either upward or down in frequency. Doing so will not alter the forward gain or front-to-back ratio of the antenna on these bands. As a short note, a low or high VSWR does not necessarily mean that an antenna works or not. A fine book addressing this is Reflections, published by the A.R.R.L.





XR-5

10 Element, 20-17-15-12-10 Multi-Monobander
Jacketed Feed Line Photo

**Photos of Typical
Delta 2 element**

Jacketed feed line taped to
(feed line between balun & ...)

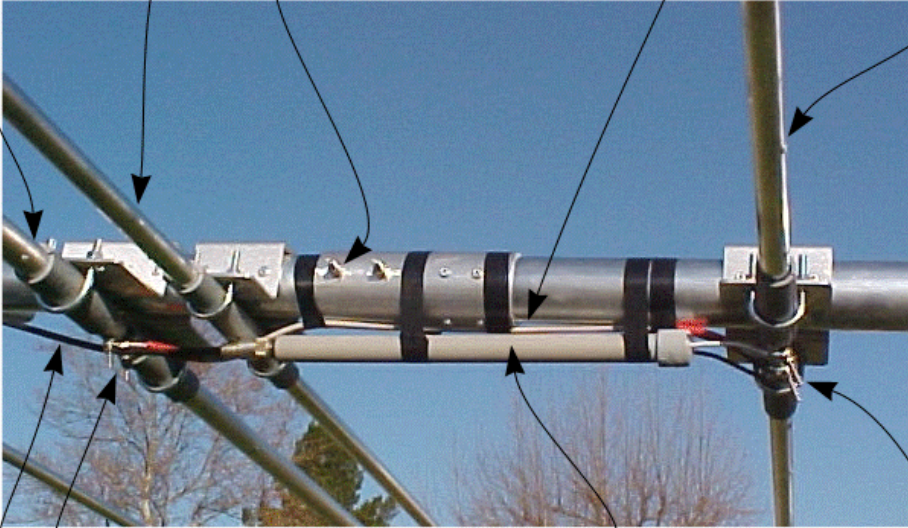
20 Meter Driver, Element #6

15 Meter Driver, Element #7

12 Meter Driver, Element #8

Boom bolts are horizontal

FRONT OF ANTENNA



MAST OVER HERE

Jacketed feed line attached to 20 mtr driver

Coax feed line (smaller diameter RG-8X shown)

Force 12 B-1 balun

Jacketed feed line attached to 12 mtr driver

<p>Windload: 8.5sqft Weight: 56 pounds Power Rating: 5KW Boom Length: 18' Turning Radius: 20.2' Wind Survival 100 mph (std)</p>	<p>Feed system: 1 feedline with 1:1 balun or RF choke Direct 50 ohm feed (balun to 12 mtr driver, jacketed feed to 20 mtr driver)</p>	<p>Protected by U.S.A. Patent, Trademark, Tradedress, Copyright and other International Law. No duplication of design or paperwork is authorized without written statement by Force 12, Inc. Copyright, Force 12, Inc., 2002 dwxr5.feed-1</p>
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