

Product specification Sigma-40 Vertical**Technical data**

- Length: 7,3 m
- Bandwidth: 7.0-7.300 MHz, SWR < 2:1
- Power capability: 5 kW
- Wind survival: up to 30 m/s unguyed, up to 45 m/s guyed

The Force 12, Inc. ZR antenna, first introduced in 1995, was a breakthrough in vertical antennas. The key to its performance is that it is an efficient, true vertical dipole. This provides a balanced vertical antenna, vs. having a vertical radiator and radials. The feed point on the ZR is elevated, thereby adding to the performance by slightly lowering the take-off angle and having less current in the lower portion of the antenna in proximity to ground. Overall, the typical ZR antenna has an efficiency greater than 95%, and, depending on the design, as high as 99%. The performance of the ZR has been unchallenged until the new SIGMA design in early 2001.

Since 1997, Force 12, Inc. has designed, built and tested a wide variety of verticals to match the performance of the ZR, but with simplified installation. The result is a new vertical design called the "Sigma" series. All Sigma verticals share the true vertical dipole aspect with the ZR. The main difference is how the antenna is resonated (placed on frequency). The ZR is resonated by using more than a full size vertical dipole, then taking each end of the vertical dipole, rotating them into a circle or square. These ends rotate in the same direction, placing their currents 180 degrees out of phase, which cancels all the energy on them. This leaves the vertical portion to emit the energy. In the Sigma design, the vertical is resonated by using either a "T" bar across each end of the antenna, or "T" bars, plus very high Q center loading coils of small electrical size, having a negligible effect on efficiency.



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The objectives of the Sigma antenna are to maintain efficiencies in the mid-90% range, while keeping the physical size as small as possible. An additional objective is simpler installation. These objectives are accomplished through more design and build time at Force 12, Inc. and less installation time for the customer.

The SIGMA-40 is composed of a center vertical element and two (2) "T" bars, one at each end of the center element. The feedpoint is at the middle of the center element and there are very hi-Q loading coils on each side of the feedpoint. The input feed impedance is approximately 20 ohms. This is increased to 50 ohms using a simple helical hairpin (coil) across the feedpoint.

Some of the hardware is stainless steel. The U-bolts holding the "T" bars is not; however, these have stainless nuts and lock washers. The base uses grade-8 bolts. Stainless U-bolts are not necessary, except in extreme environments and a preferred method is to paint these parts. Stainless hardware is easy to gall, meaning to freeze the nut on the shaft, rendering the bolt useless. If all stainless is required, please contact the factory. The entire antenna can be painted to eliminate any glint in the sun, although all methods have been employed to limit glint already.

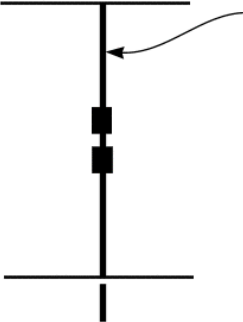
For more information please see attached figures on side 3 and 4.

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Sigma-40
24' Tall 40 Mtr Vertical Dipole
1 of 2

The Sigma-40 is a high efficiency, compressed size vertical dipole. there are no radials, as the is a balanced design (dipole). It is fed at the high current point (center) through a 1:1 current (bead) balun. The feedline should be run away from the antenna, not dropped along side. A convenient method is to attach it to a guy line.



- > The Sigma-40 is free standing, but can be guyed.
- > The cross-bars at the top and bottom are "T-bars" and are end loading and are used for tuning the antenna by adjusting the length.
- > The coils are high-Q center loading. The section of tubing that passes through the coils lowers the inductance and the Q; however, with a beginning Q calculated at 900, this is acceptable.
- > The efficiency of the antenna is about 97%.
- > The height is about 24', plus the base insulator and base post.
- > The feedpoint is a bead balun and the match is a 4-turn hairpin coil attached across the feedpoint. Adjusting the spacing between turns to about 1/2" will match the antenna.
- > The frequency adjustment ranges from about 6.800 up through the 40 mtr band.
- > 2:1 VSWR bandwidth will be about 300 kHz.

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Figure 3. The concept behind the Sigma-40 vertical.

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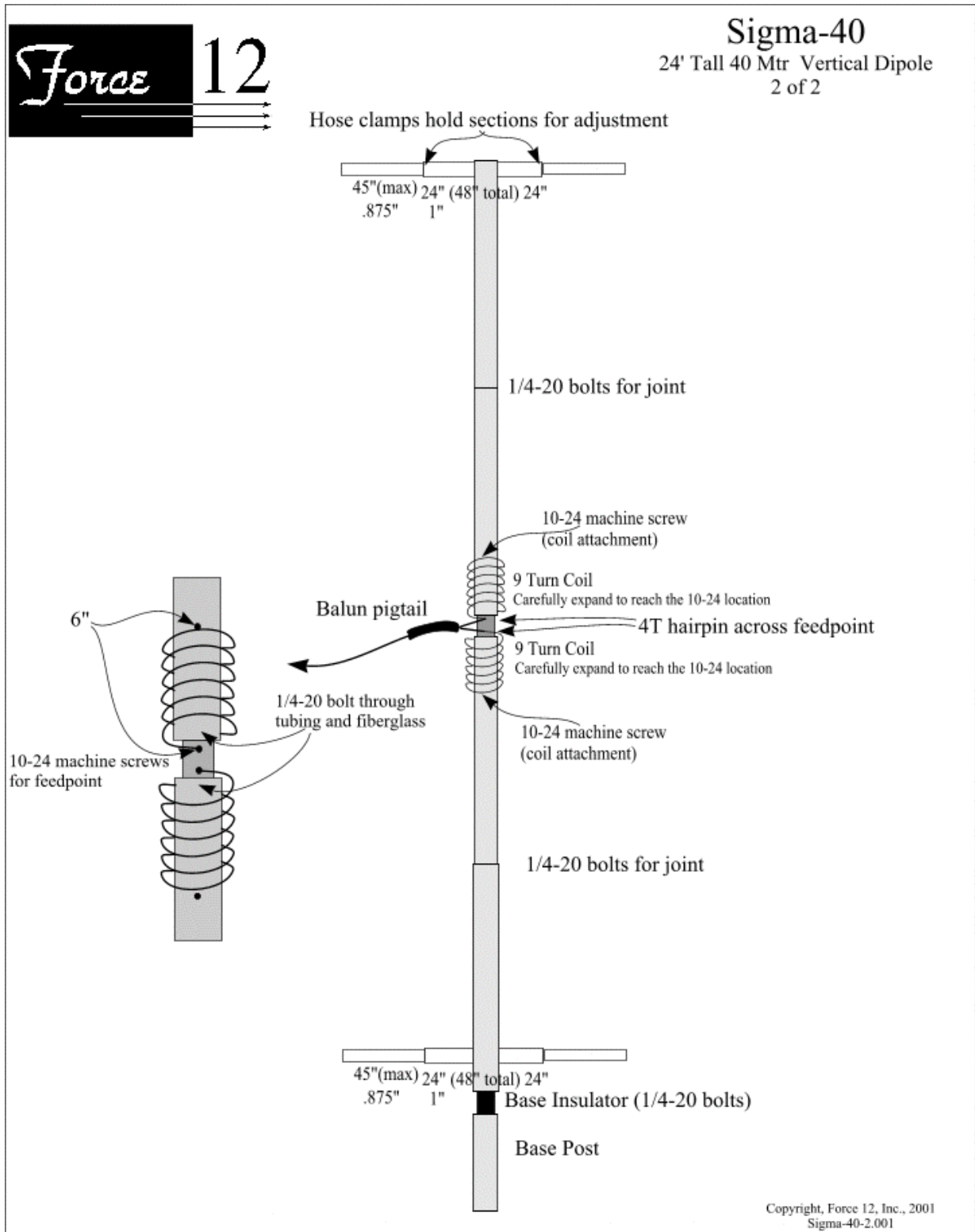


Figure 4. Schematic drawing of the Sigma-40 vertical.