About the T2FD antenna type

**T2FD** is a folded dipole, terminated with a low-inductance 800Ω resistor. Feed impedance is high; use 1:16 balun with coaxial feed. The terminator is low inductance type; power handling up to 90% of transmitter power. The resistor must be cooled properly.

T2FD is a wide band antenna with low SWR over the full designed frequency range; tuner is optional. Antenna length is not critical: it works beyond the designed frequency range, with less radiation, however. Typical total length is 30% to 50% of the wave length of the lowest frequency to be used.

Structural Efficiency varies, in this case from 10% to 50%. The rest of power is burned in the load resistor. *Sophisticated dummy load?*

Yes... T2FD might not be the first choice for QRP operations on the lowest frequencies.

T2FD is a non-resonant, traveling wave antenna, which is rather immune to local wide band noise. T2FD is a extremely quiet RX antenna with very high S/N ratio, *worth to try with digital modes*... The antenna works like standard dipole. Radiation pattern is similar to dipole with the similar dimensions. If you use vertical wire loop and a flat top dipole assembly with high altitude (15-20m), you get pattern similar to half wave dipole, with low takeoff angle... *However, the T2FD might not be the best DX antenna... Use the Force Luke...*

**This T2FD version**

This omni-directional NVIS version was assembled as inverted-V at 5/9/5 m height. The low inverted-V configuration gives the best results for low band NVIS. We try to get the main radiation up...

*The cloud burner effect...* Antenna's full length abt. 40m was fine-tuned to get some of high SWR slopes near some of common ham frequencies. Radiation efficiency should be highest near SWR peaks. Estimated input power range is now up to 100W using SSB/CW and up to 70W using RTTY/PSK. SWR is from 1.1 to 2.0 (full frequency range) with 30m feed line (RG213). We usually use this antenna with automatic coaxial antenna tuner. Antenna’s wire spacing is now 700 mm. 5/700 mm glass fiber spacers were used between the wires, distance between spacers is about 6 m. Nevada Kevlar 32D flexible antenna wire is used as the radiator element. Over dry grounds this antenna type may need counterpoise wires below the antenna. We tested it over average ground type; only minor changes were seen on simulations and SWR measurements.

**Measured SWR:**

- Estimated input power range is now up to 100W using SSB/CW and up to 70W using RTTY/PSK.
- SWR is from 1.1 to 2.0 (full frequency range) with 30m feed line (RG213).

**Structural and Radiation Efficiency %, simulated with NEC:**

- Total Antenna Length: 15 to 56 m
- Wire Spacing: 0.3 to 1.8 m
- Wire Size: 0.5 to 2.5 mm²
- Terminators: 450Ω to 1000Ω
- Balun: 1:16 to 3:16

**Balun 1:16**

Balun type is 50Ω to 800Ω (1:16) ferrite tube transformer. Balun details on separate document on my web page.

**Terminator 800 Ω 120W**

Low-inductance TO-220 resistor set is fitted on a heavy heatsink, dimensions 40 x 66 x 100 mm. Thermal resistance 1.5 K/W. Serial connected resistors (4 pcs) are of type **MP930-200**, 200Ω 30W.
T2FD, Terminated & Twisted Folded Dipole, NVIS
Experimental design, NVIS, 2 to 30 MHz
CC-BY OH1AYR Rev 7.0 Date 23.10.2019

2 MHz 4 MHz 7 MHz
21 MHz 24 MHz 28 MHz
10 MHz 14 MHz 18 MHz

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About the T2FD antenna type

T2FD is a 600-900 ohms folded dipole, terminated with resistor. Feed impedance is coupled with 50/600 ohms voltage balun. It is a wide band antenna with rather low SWR over the full designed frequency range: antenna tuner is seldom needed. Antenna length is not critical: it works also beyond the designed frequency range, with less radiation while transmitting. Free space gain is 3-6 dB below fixed frequency half-wave dipole. Radiation pattern is similar to dipole with the same dimensions. It is a traveling wave antenna, which is rather immune to local noise sources and statics. This is a very quiet RX antenna. T2FD is an ideal construction for wide band reference antennas and for Slow Frequency Hop systems. It is also used as a high-quality receiving antenna, with low power terminator.

Commercial T2FD antennas

T2FD antenna type is widely used by military, commercial and broadcasting services:
- Codan C411
- Racal 3001-901
- Comrod AH51
- Barker & Williamson BDW-90
- Diamond WD-330
- Giovannini 1830/DL-M

T2FD proto

This proto was built for tests as amateur radio stations HF antenna. This antenna is assembled as inverted-V at 2/8/2 m height. SWR is from 1.1 to 2.4 full range: optional use with antenna tuner. 1.8 MHz operation is possible with tuner: low radiation, however. Antennas full length is 44m for frequencies from 3.5 to 30 MHz. Antenna length is tuned to optimal SWR on 7 MHz, so the SWR is below 2.0 on all amateur bands. See the SWR chart. Proto antennas wire spacing is 450 mm, range 200 to 450 mm. 5/500 mm glass fiber spacers was used between the wires, distance between spacers is about 3m. Spacers were fitted with gable ties. This antenna uses horizontal wires; vertical wires are also usable. 1.5 mm2 PVC insulated stranded equipment wire was used as the antenna wire; suitable wire size ranges from 0.5 to 1.5 mm2. Input power range is up to 50W/CW and up to 100W/SSB with the current 50W terminator.
**Terminator Box**

680 Ohms low-inductance resistor is fitted in Al die-cast box. Resistor type is RCH50 680R 50W, Vishay (Elfa).
Optional type is FPA100 680R 200W, Arcol (Elfa).
Both boxes are fitted into an aluminum profile heatsink. Continuous 100% power up to 50W with RCH50, SSB up to 100W. Nylon insulators and 4mm wire-terminals for antenna wires.

**Total Balun/Terminator SWR with 50W resistor**

![Graph showing SWR](image)

**Balun Box**

Transformer type: 50 ohms to 600 ohms voltage balun. Uses Philips Ferrite Toroid 4C64, 36x23x15mm, 2 to 30 MHz. Primary winding is 2x6 turns Suhner Radox 125, 0.5 mm2. Secondary winding is 2x11 turns Suhner Radox 125, 0.5 mm2. The secondary must be wound tightly between the primary. Polypropylene capacitor at 50R input provides a DC block. This capacitor also reduces SWR at lower frequencies. Components are fitted with hot-glue into the Al die-cast box. Nylon insulators and 4mm wire-terminals for antenna wires. Grounded BNC or UHF connector for 50 ohms coaxial feed.

**Support bar**

Terminal/balun boxes are fitted for 450 mm horizontal wire-spacing. It is also possible to use the wires at vertical position. The antenna works like dipole: it is possible to use the antenna as inverted-V or as a sloper to get omni-directional direction pattern. Optimal center-point height is about 9 meters. Minimal wire height from ground is about 2 meters, due the high voltage on wires.
Antenna

Terminator 600R

Wire 0.5 to 1.5mm²

Voltage Balun 50/600R

wire spacing 0.20 to 0.45m

Bolun

C1 3.3 nF 2.5 kV Polypropylene, Rifa, PHE
B1 Torsol, P/N-1016, 4685 38x25x15mm
Toroid, Ferrite CORE, THN8/23/13/15-4CB
Wire Suher Radex 0.5mm², or similar
Terminator 600R 50R, Varley, RC450
600R 200W, Ancon, FPA100

Bolun Winding

Primary 50R

Secondary 600R

2x6 turns parallel

2x11 turns with center tap
Tight winding with primary

T2FD Antenna, 3.5 to 28 MHz, 100W