



M³ Electronix, Inc.

M³ 40dB Tap Attenuator Kit Details



The M³ 40dB Tap Attenuator Kit is a convenience kit. While the design is not unique, and can certainly be built by purchasing the components separately, this kit provides all of the components necessary to construct a 40dB Tap Attenuator for use with the M³ FPM-1 Integrated Frequency Counter/Power Meter for frequencies between 1 and 500 MHz up to 100 Watts. The image above shows the Tap Attenuator connected to the M³ FPM-1 Power Meter using the M³ RF Calibrator as a signal source with 0dBm output at 10 MHz. Click the image for a larger view.

The kit consists of a custom metal enclosure (5"X2"X1") with prepunched 'D-holes' for the two BNC Connectors. All hardware, stand-off posts for mounting the resistors, a BNC T-Connector, a male-to-male BNC Adaptor, and an attenuation logging chart are included.

Click image for larger view



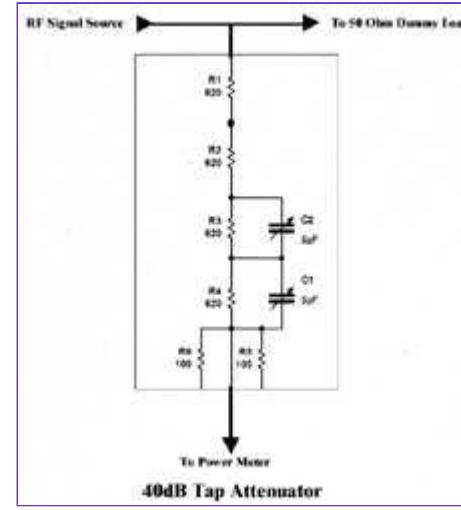
Kit Components

To develop 40dB of attenuation, a 100:1 voltage divider is used. The FPM-1 Power Meter has a 50-ohm input impedance. The output impedance of the M³ Tap

Attenuator is 50-ohms.
When connected together, the total load resistance becomes 25-ohms (two 50-ohm terminations in parallel).
With a load resistance of 25 ohms, the total resistance of the 100:1 divider must be $100 * 25$ which equals 2500 ohms.
2500 ohms total resistance minus the 25 ohm load resistance means that the resistance in the tap must equal 2475 ohms. Any combination of equal value resistors can be used to develop this resistance. We chose to use four 620 ohm 1 Watt 5% resistors. $2475 \text{ ohms} / 4 = 618.75 \text{ ohms.}$

The power limit for the tap attenuator is derived by taking the square root of $P * R$, where P equals the total power dissipation of the 4 resistors ($4 * 1\text{W}$) and R equals the total resistance (2500 ohms). So, $\text{SQRT}(P*R) = \text{SQRT}(4*2500) = \text{SQRT}(10000) = 100 \text{ Watts.}$

Click image for larger view.



Schematic

To allow the tap attenuator to be compensated for higher frequencies, two variable capacitors are placed in parallel with the two 620 ohm resistors nearest to the power meter BNC connector. Without these capacitors the tap attenuator is still within $\pm 2\text{dB}$ of 40dB from 1 to 30 MHz. A signal source (signal generator) which covers the desired frequencies with an output between +5dBm and -20dBm is required to properly adjust the tap attenuator. An MFJ-269™ Antenna Analyzer makes an excellent source if a calibrated signal

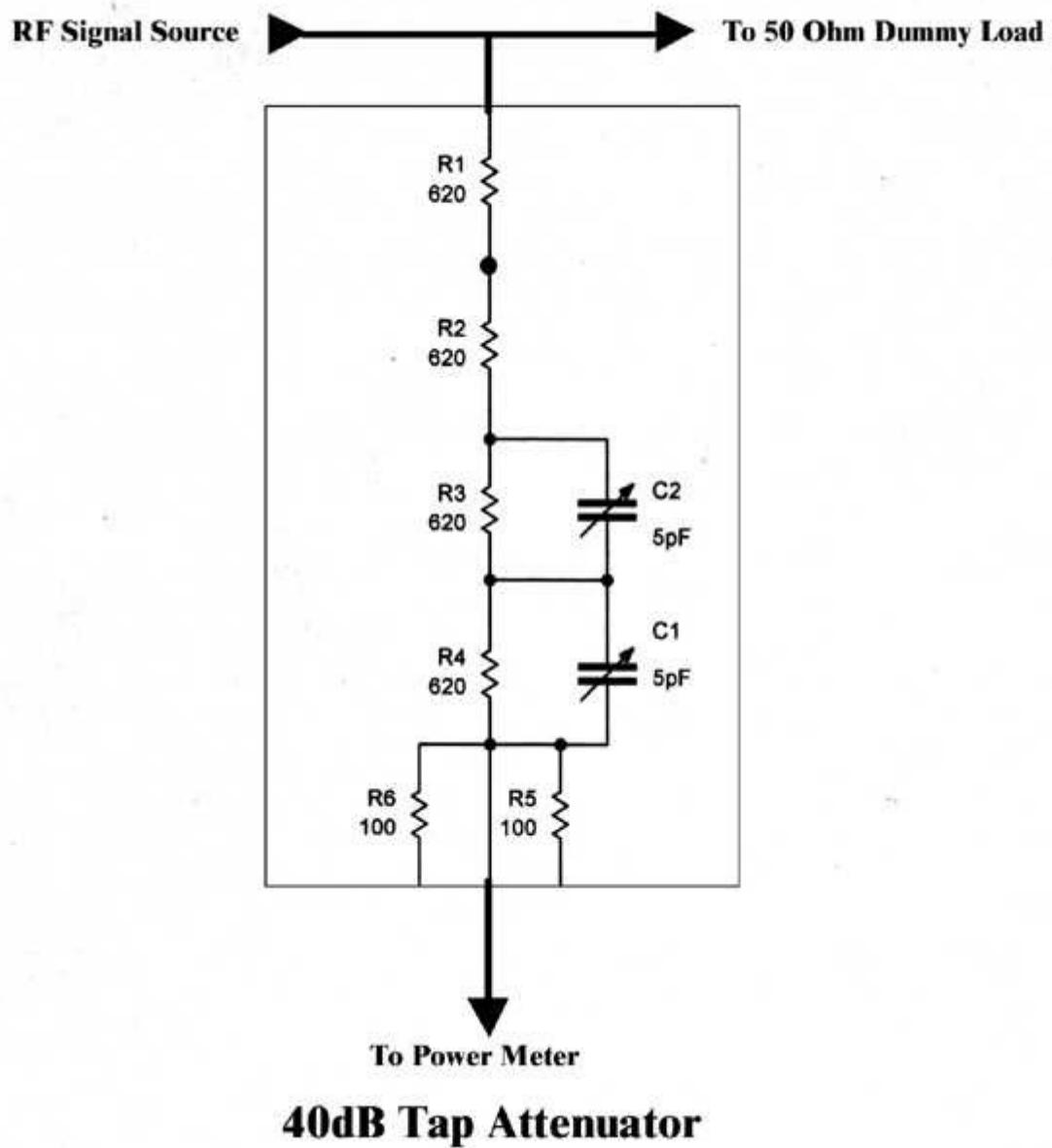


Inside the Attenuator

**generator is not
available.**

Click image for larger view

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M³ Universal Frequency Counter

19.00011 MHz
-39.8 dBm

GATE TIME FUNC HOLD C

GATE ZERO dBm/mW ATT

POWER
1-500MHz
-72dBm +16dBm



OFF



M³ Electronix
40dB Tap Attenuator



Frequency ATT

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INSTRUMENT

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