



INTRODUCING RF-TEST BENCH **RFT01** for *RF Experimenters*

It becomes difficult to procure multiple components and utility functional device to test RF Linear Amplifiers, RF Projects, interfacing our RF prototypes with Spectrum Instrument to check the spectral quality of our rf linear amplifier, connecting a dummy load, whether SWR is correct and what is RF output being generated transmitted and reflected back, terminating at 50 ohms to an rf output.

We need multiple things which need to be procured from various vendors adding multiple shipping cost and time involvement. ON TOP OF IT if we are new to RF Home brewing and Experiments we get puzzled which one to select. To ease off all these for a simpler approach we integrated all in ONE device named “**RF-TEST Bench**”. This has helped many RF Experimenters individuals several Colleges and University Globally with a low cost RF-TEST Bench.

RF-TEST Bench consists of:-

- Two tone generator
- Return loss bridge
- Demodulator
- RF Sampler
- Step Attenuator
- Dummy load

Specifications

TWO TONE GENERATOR

The Two tone generator delivers a standard 2-tone (700Hz and 1900 Hz) audio source for testing radio transmitters, RF amplifier and adjusting modulation settings. It employs two low distortion oscillators (700Hz and 1900 Hz) to analyze SSB and AM transmitter performance for Intermodulation distortion (IMD) products, harmonic splatter, and excessive audio compression and modulation qualities. This type of testing is often used as a measure of transmitter linearity. Linearity affects both SSB fidelity and the amount of SSB splatter which may cause adjacent channel interference.

The Two tone generators operate on a 9V battery. The line level out (150mV – 3V) may be connected directly to the microphone connector of most transceivers. Transmitter linearity may be checked by examining the 2-tone envelope on an oscilloscope or station monitor. For more precise measurements, IMD can be measured with a spectrum analyzer. The Two tone generators make an ideal companion to the SMT and SMT-Pro station monitors as it proves a repeatable modulation source for viewing the trapezoid display.

In addition to the line level output, the two tone generator also has an amplified low distortion 8 ohm output to drive an external speaker. By placing the speaker near the transceiver microphone, the entire modulation chain can be measured. This also allows you to make measurements without the bother of wiring a microphone connector. Also provided directly from the front panel, are screwdriver calibration adjustments for the two tone frequencies and amplitude balance.

Specifications:

- Two tone frequencies: 700Hz 1900Hz
- Wave shape: Sine wave
- THD distortion: Less than 1%
- IM Distortion: -30db or less
- Output level (line): Adjustable 150 mV – 3V P-P
- Output impedance (line): 47K
- Output Level (speaker): Adjustable 100mW – 2 Watt
- Output impedance (speaker): 8ohms
- Amplitude balance range: +/- 20dB
- Frequency adjustment range: +/- 50Hz 700Hz +/- 75Hz 1900Hz
- Frequency stability: Drift less than 1% after 30 minutes warm up
- Power requirements: 10mA 9 volt DC Duracell MN1604 6LR61 or equivalent
- Physical: 1 lbs 4 x 3 x 1.2 in
- Application: Transceiver and Amplifier IMD and distortion testing

RETURN LOSS BRIDGE

The RLB-I internal reference (three ports) is a high performance Return Loss Bridge optimized for ham radio applications. Return Loss Bridges operate by comparing the unknown impedance to reference impedance. The INPUT port is connected to a test frequency source such as an RF oscillator or tracking generator from a spectrum analyzer. The DET (detector) is connected to an oscilloscope or spectrum analyzer for analysis. The DUT (device under test) is connected to the item to be tested such as an antenna, network, coax, or any other device. If the impedances of the internal reference to the DUT are exactly equal, then the detector output will be essentially zero (0)

Specifications:

- Max input power: 15 Watt PEP crest factor 4:1
- Insertion loss: Negligible (< .1 dB)
- Bandwidth: 2-250 MHz (-6dBm)
- VSWR: Better than 1:1.1
- Max Return Loss: > -40 dBm (see graph Return Loss versus frequency)
- Detector output: -10 dB +/- 2 dB into 50 ohms
- Impedance RF IN and Detector OUT: 50ohms
- Connectors: BNC
- Physical: .25 lbs 2.25 x 1.4 x 1.2 in

- Application: High sensitivity antenna, transmission lines, and component and SWR Measurements using an oscilloscope or spectrum analyzer.

DEMODULATOR

It is intended for (QRP) and higher power (QRO) operation. It includes the optional detector biasing supply. When combined with an RF sampler, it allows for precise adjustment of the entire transmitter chain with transceiver output of up to 100 Watts driving linear RF amplifiers. It features a high performance demodulator, a variable base band output and an oscilloscope trigger output. A Linear RF amplifier usually amplifies an RF signal from 20-100 Watts by 20dB or more to about 500-1,500 Watts.

Specifications

- Maximum RF IN: 200W PEP with crest factor of 4: 1
- Bandwidth: 2MHz - 150MHz
- Isolation RF IN/OUT to DEMOD OUT: > 50dB
- Insertion loss: Negligible
- VSWR : Better than 1.1:1
- Return loss: > 25dB
- Impedance DEMOD RF IN/OUT: 50ohms
- Connectors RF IN/OUT: SO-239
- Baseband RF detection: AM and SSB
- Bandwidth Baseband: 10Hz – 30KHz
- Spurious THD: < -60dB
- Linearity 0-100 %
- Modulation: Better than <10%
- Rise/fall time: < 10us aberrations less than 5%
- Output modulation level: -20dB externally variable
- Output trigger level: >1.5V p-p
- Impedance DEMOD OUT: 47K
- Impedance TRIGGER OUT: 47K
- Physical: 1 lbs 4 x 3 x 1.2 in
- Application: Ideally suited for monitoring, testing and analyzing transceiver and RF amplifier transmitter's signals using the trapezoid method; includes a high power sampler/coupler signal conditioner and integrated SSB and AM baseband demodulator.

RF SAMPLER

RF sampler/coupler inductively couples a sample of the high power RF (up to 1.5 KW PEP) passing from the RF IN to the RF OUT connector. The sampled RF signal is at a -85 dB level. This reduced level conditions the RF so that is compatible with most oscilloscope vertical input amplifiers. The sampled signal is very useful for analyzing HF transmissions on an oscilloscope and/or spectrum analyzer. Some of these uses include the measurement and monitoring of RF power output, SSB and AM modulation, CW keying, RTTY signal analysis and the evaluation of two tone testing.

Specifications

- Full-duplex mode
- To cover a power range : up to 1.5kW
- The total attenuation is selectable up to ~ - 85 Db
- Insertion loss: < 0.15 dB
- Return loss: -18 dB @ 50 MHz
- Connectors: SO-239

STEP ATTENUATOR

This attenuator consists of 7 resistive π attenuator sections. Each section consists of a DPDT slide switch and three $\frac{1}{4}$ W, 1% tolerance metal film resistors whose values are chosen to obtain the desired amount of attenuation. The complete unit contains single 1,2,3 and 5 dB sections and three 10 dB sections.

Specifications

- Attenuation: 41db
- Frequency: 225-450 MHz
- Switches: DPDT
- Connectors: BNC

DUMMY LOAD

Specifications

- Resistance value: 50 ohms
- Power: 50 watts
- Connector: SO-239