Electro-Resales

RF Sampling Port/Tap

L-Pad Version

Product details

The RF Sampler or sampling port is designed to sit in-line with the transmitter and other components of the transmission line before the antenna. Its purpose is to allow a small, safe pick off voltage of the transmitted RF to be used to feed an oscilloscope or other monitoring instrument. This allows the transmitted RF to be examined and measured as required. The RF envelope of AM, CW or SSB transmissions can be viewed real time using this sampling port.

Precautions & Warnings

Whenever dealing with RF energy the user should make sure that they do not come into contact with the RF signal to avoid RF burns or shorting the RF signal and causing damage to the transmitting equipment or other items in the transmission line.

The Sampling Port is built into a rugged die-cast box, this reduces the chances of coming in contact with terminals or components that are RF energized.

When using this port for sampling RF energy always use the lowest power that gives good usable results, we recommend starting all testing start with around 100 Watts of power. Monitor the output voltage on the BNC before attaching to test equipment, in order to avoid damage due to excess voltage.

Please ensure that as the user of this product, you exercise due care and attention to the above warning at all times.

Circuit Details

The port is built around a potential divider balanced to 50 Ohms (L-Pad configuration) this allows the RF voltage generated by the transmitter to be tapped off to provide a safe usable voltage at the sampling port BNC.

The sampler is suitable for transmitted RF monitoring in all modes, however, it is typically used for monitoring SSB and CW transmissions.

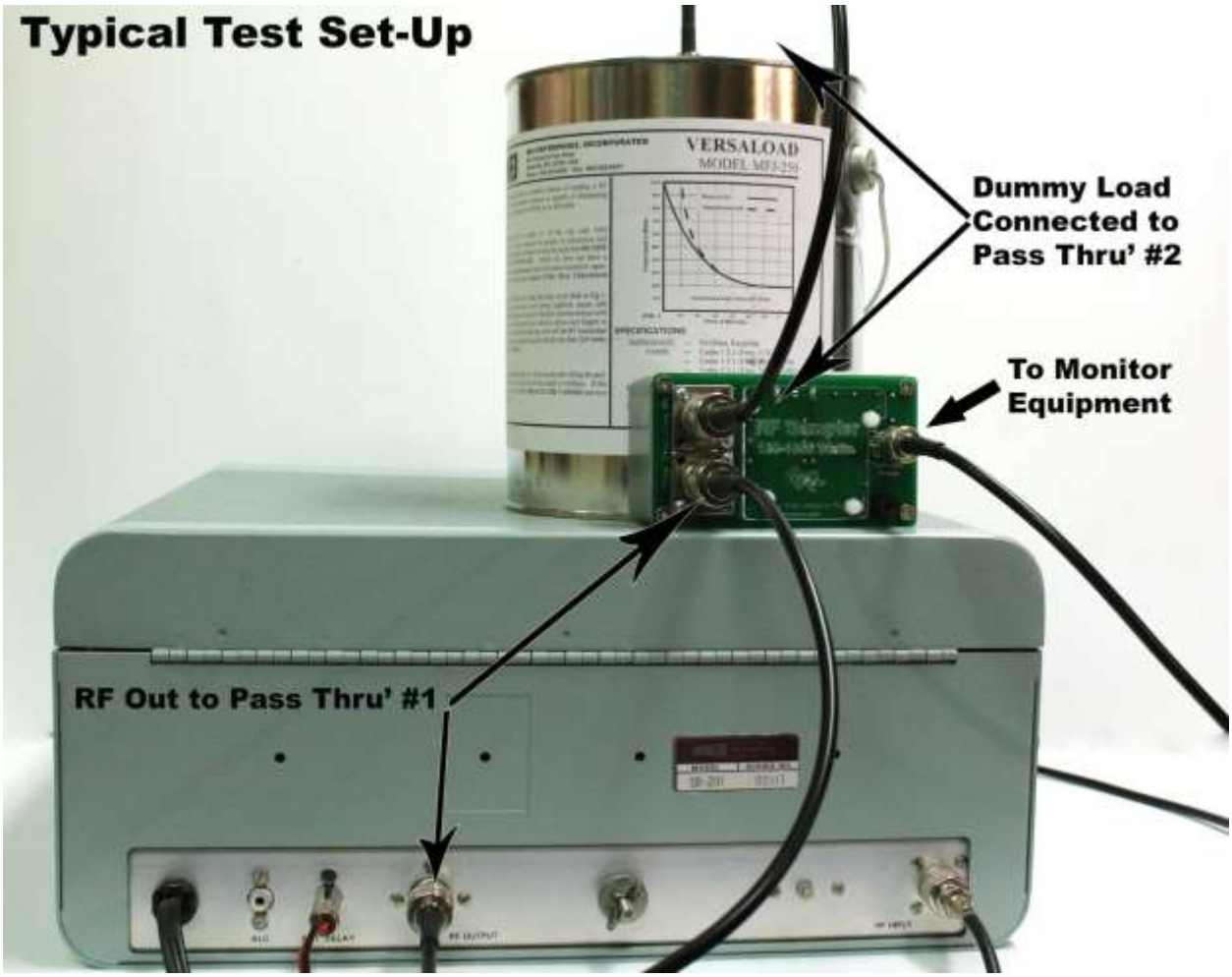
How to use

Installing the sampler is very easy, to assist in setting up, a diagram, “How to connect the RF Sampler in the transmit chain” is provided at the end of this document. The diagram illustrates a typical set up.

It is common to leave the sampler connected to the antenna port directly using a PL259 coupler cable between the antenna port and one of the sampler Pass thru ports. Another suitably terminated coax is connected to the other ‘Pass Thru’ socket and this connects to the antenna or dummy load. This coax continues the transmission path to the antenna or dummy load.

Never connect the ‘Pass Thru’ sockets to the monitoring device, as full RF load is on these sockets!

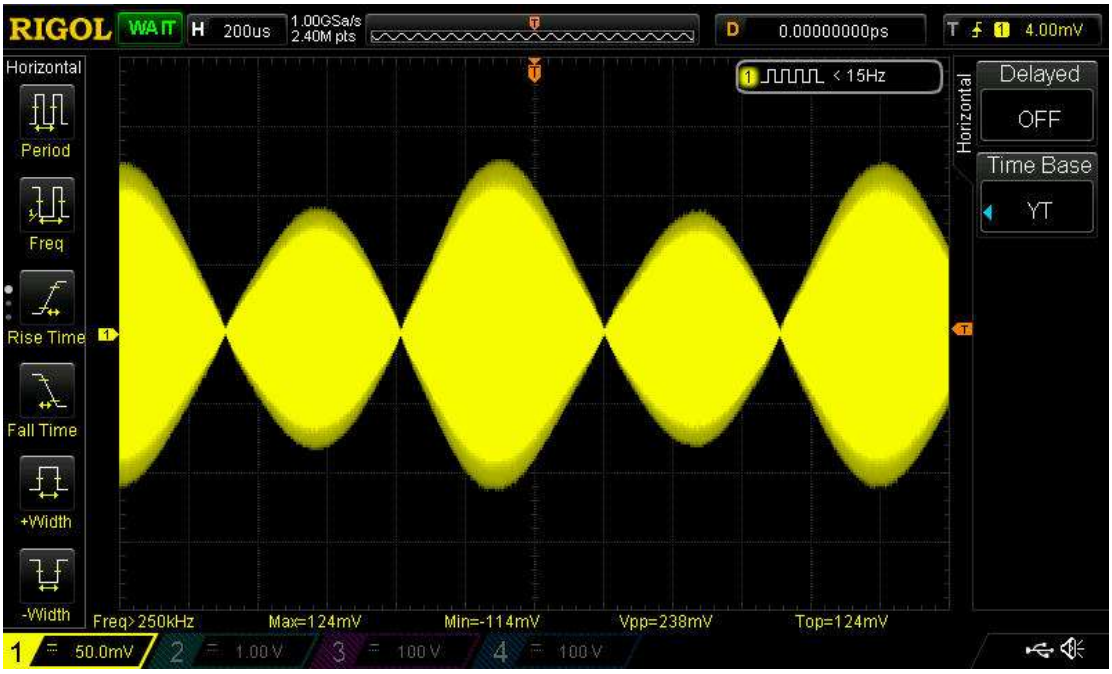
A typical connection between the RF output and the sampler is shown in this image;



A BNC connector is provided for tapping off the sampled RF, connect this socket using a suitably terminated coax cable to the monitoring device. With the sampled RF connected to the oscilloscope for instance, it is usual to set the scope timebase to 2uS, and adjust the other controls to allow the signal to be viewed. Set the input probe to X 1 if that is an option rather than X10. For initial testing set the transmit power level to about 10 Watts and the mode to AM. Keying the transmitter will show the AM carrier signal as a sine wave and by speaking into the microphone the audio should also be seen impressed on the carrier, see photo 1 below.

With SSB (USB or LSB) the carrier will not be seen (suppressed) with audio seen when the microphone is spoken into.

Photo 1 - AM Transmit Audio

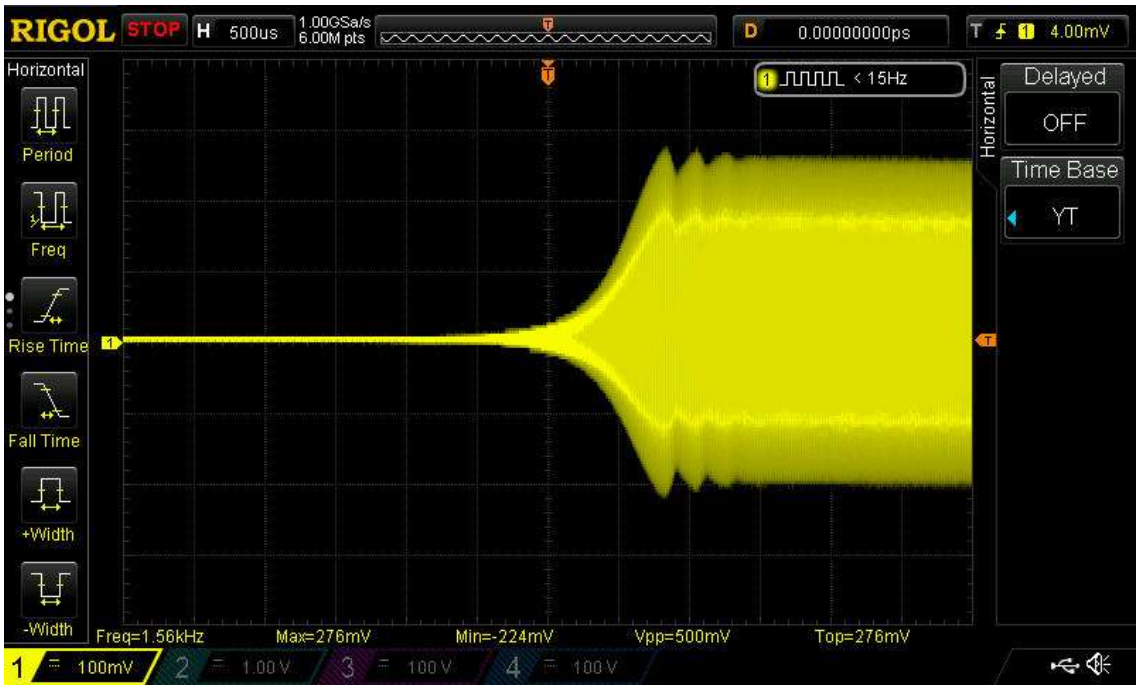


Please note, this image was obtained using a digital scope, while digital scopes are great for this application, analog scopes can in some instances display more relevant ‘real time’ information.

The sampler is suitable for use with AM, SSB, FM & CW modes, and can be used to both observe the signal quality and to make measurements if needed of the transmitted signal.

Photo 2 shows a typical CW waveform captured at 100 Watts, during a Dah key down;

Photo 2 – CW Keying waveform



Operation Theory

The L-Pad configuration provides a voltage reducing potential divider, to ensure that the incoming RF voltage is reduced to a level that allows it to be used safely with test & monitoring equipment. An example calculation is given below for a theoretical input voltage of 2KV (2000V)

1. $Vout = Vin \,.\, \frac{R9}{\sum(R1-R8)+R9}$ Basic Formula to determine voltage divider calculations

2. $Vout = 2000 \,.\, \frac{50}{9400+50}$ Modeled on a 2KV input

3. $Vout = 2000 \,.\, 0.0053$ Reduced to simple terms

4. $Vout = 10.6\ (21.2\ RMS)$ Final result.

Using this information the actual attenuation in db can thus be calculated:

$db_{loss/gain} = 20\ x\ \log_{10} \frac{Vout}{Vin}$ Basic formula to determine db

$db_{loss} = 20\ x\ \log_{10} \frac{21.2}{2000}$ Inserting values from our example above

$db_{Gain} = 20\ x\ \log_{10}\ .\ 0.0106$ Reduced to simple terms

= 20 x -1.9747 = -39.5db Final result

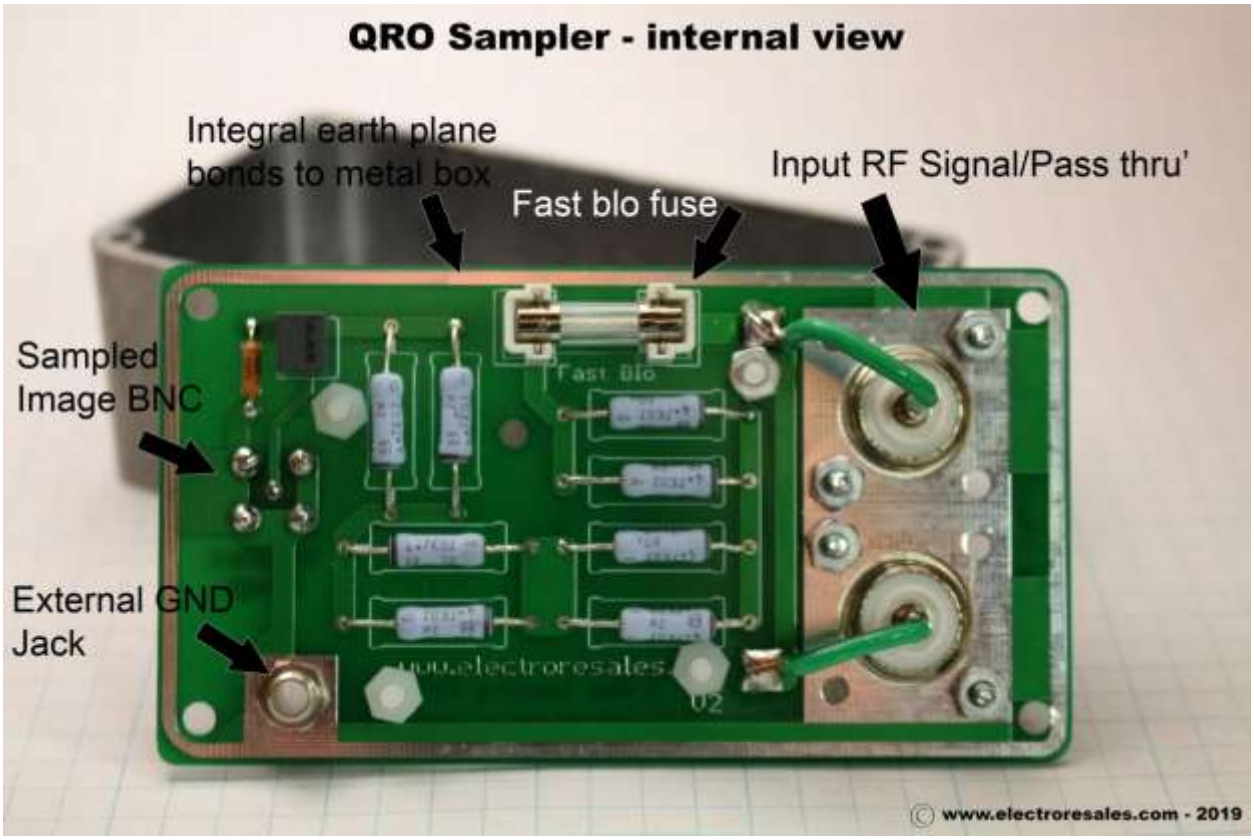
The sampler applies a -40db attenuation of the incoming signal

What's inside the box?

A number of sampling ports are for sale on the web; some are sealed or potted units that don't encourage you to find out what's inside.

We believe you should know what you are buying and have provided the following disclosure photo of our unit

Photo 3 – Sampler inside View



Final Words

The sampling port is designed to provide an easy way to monitor the signal coming from a transmitter to either a dummy load or antenna, as damage to delicate equipment front ends is possible through the incorrect use of this sampling port, it should always be checked for correct connection to the equipment in use/test, and the port itself should be periodically examined to make sure it is in good working condition.

The small Print

DISCLAIMER

Any person who constructs or works on electronic equipment may be exposed to hazards, including physical injury, the risk of electric shock or electrocution.. These hazards can result in health problems, injury, or death. Only qualified persons who understand and are willing to bear these risks themselves should attempt the construction of electronic equipment. By purchasing this item, the buyer acknowledges these risks.

There is a risk of electric shock, electrocution, burns, or fires that is inherent in the construction and use of electronic equipment. By purchasing this item, the buyer acknowledges these risks.

IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE including, but not limited to, property damage, personal injury, death or legal expenses. Buyer's recovery from Seller for any claim shall not exceed the purchase price paid by Buyer for the goods, irrespective of the nature of the claim, whether in warrant, contract or otherwise. By purchasing this item, BUYER AGREES TO INDEMNIFY, DEFEND AND HOLD SELLER HARMLESS FROM ANY CLAIMS BROUGHT BY ANY PARTY REGARDING ITEMS SUPPLIED BY SELLER AND INCORPORATED INTO THE BUYER'S PRODUCT.

Notes