The Advantages of Having it “On Tap”

By Wes Hayward, W7ZOI, and Bob Larkin, W7PUA

Simple RF-Power Measurement

PHOTOS BY JOE BOTTIGLIERI, AA1GW

Making power measurements from *nanowatts* to 100 watts is easy with these simple homebrewed instruments!

Measuring RF power is central to almost everything that we do as radio amateurs and experimenters. Those applications range from simply measuring the power output of our transmitters to our workbench experimentations that call for measuring the LO power applied to the mixers within our receivers. Even our receiver S meters are power indicators.

The power-measuring system described here is based on a recently introduced IC from Analog Devices: the AD8307. The core of this system is a battery operated instrument that allows us to directly measure signals of over 20 mW (+13 dBm) to less than 0.1 nW (−70 dBm). A tap circuit supplements the power meter, extending the upper limit by 40 dB, allowing measurement of up to 100 W (+50 dBm).

The Power Meter

The cornerstone of the power-meter circuit shown in Figure 1 is an Analog Devices AD8307AN logarithmic amplifier IC, U1. Although you might consider the

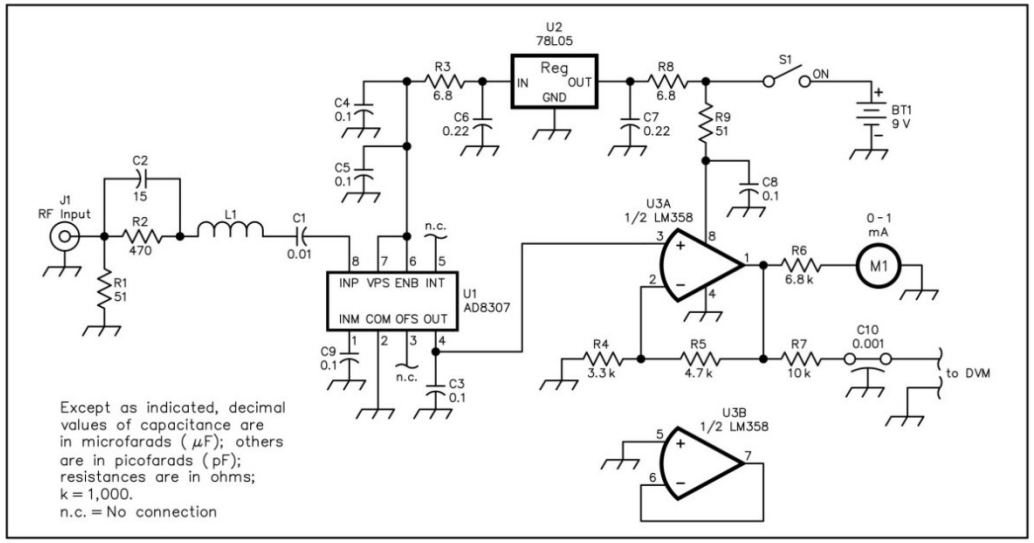


Figure 1—Schematic of the 1- to 500-MHz wattmeter. Unless otherwise specified, resistors are 1/4-W 5%-tolerance carbon-composition or metal-film units. Equivalent parts can be substituted; n.c. indicates no connection. Most parts are available from Kanga US; see Note 2.

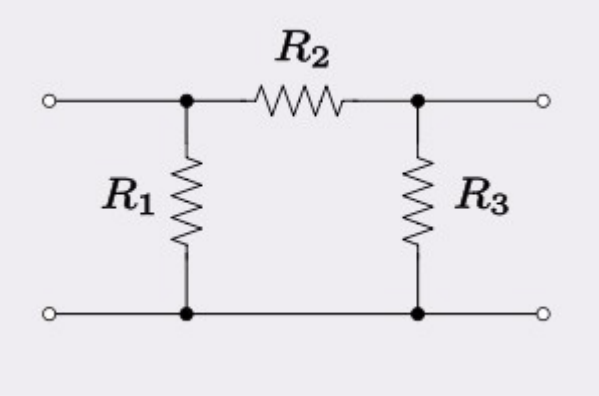
J1—N or BNC connector
L1—1 turn of a C1 lead, 3/16-inch ID; see text.
M1—0-15 V dc (RadioShack 22-410); see text.
S1—SPST toggle
U1—AD8307; see Note 1.
U2—78L05
U3—LM358
Misc: See Note 2; copper-clad board, enclosure (Hammond 1590BB, RadioShack 270-238), hardware.

Resistive 40dB sampling tap

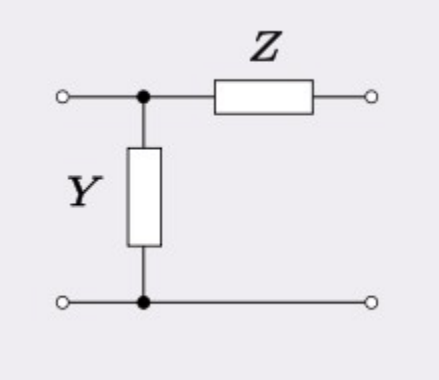
https://www.qsl.net/sz1a/download/build%20an%20rf%20power%20meter.pdf

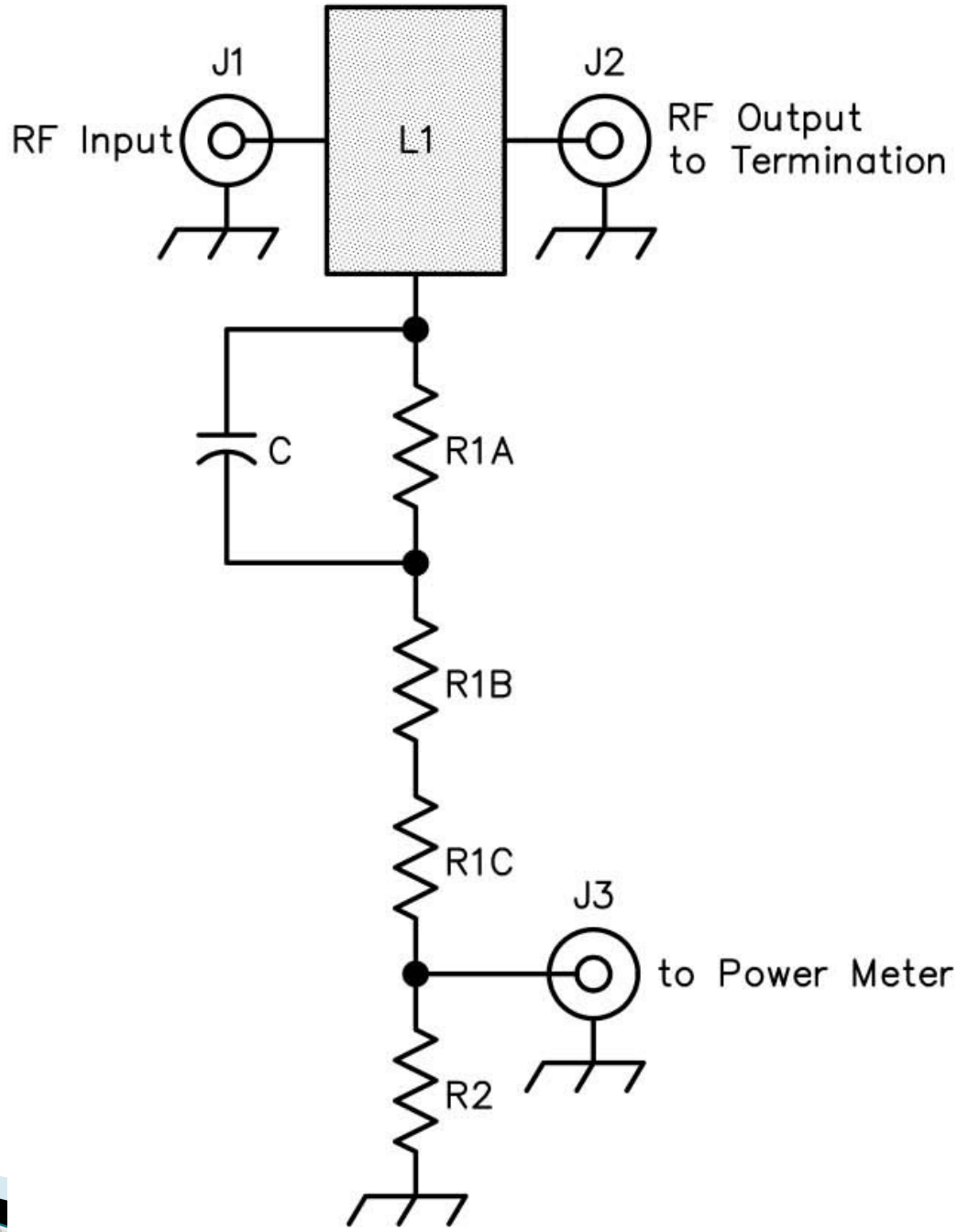
Not a Simple Attenuator!

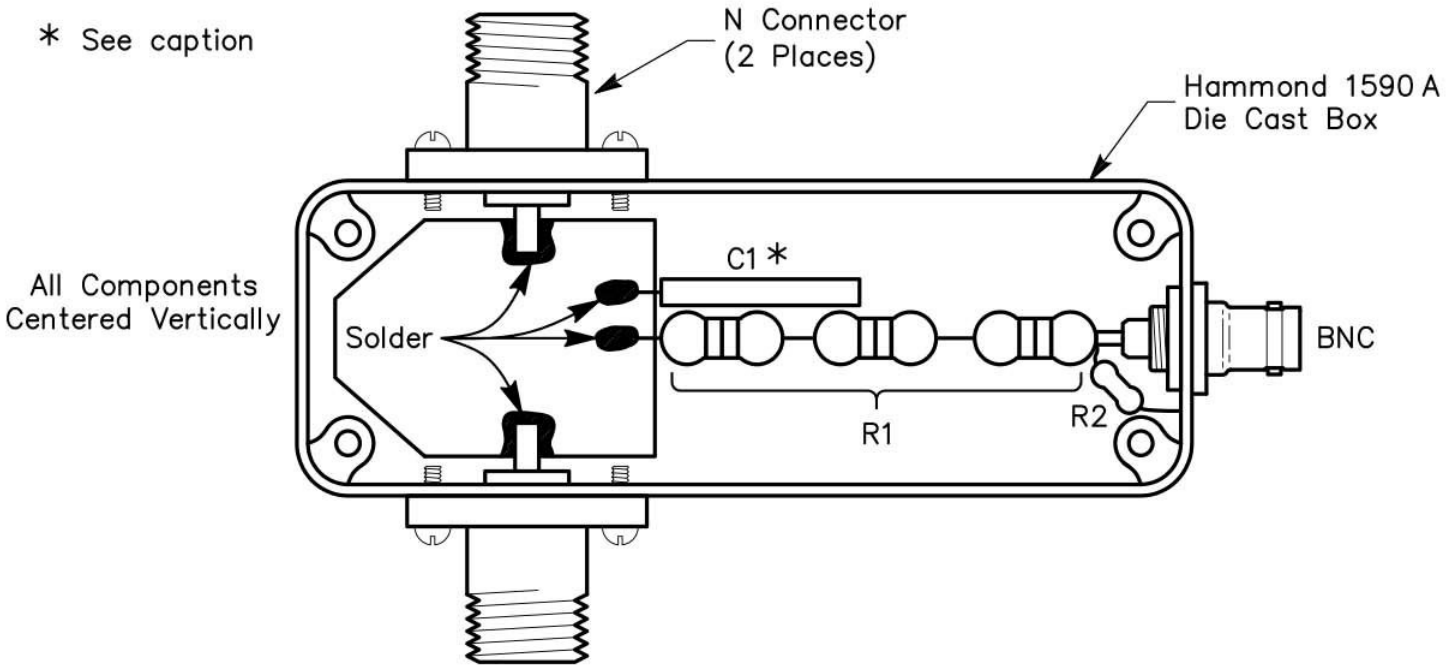
Pi attenuator



L attenuator




J1
RF Input
L1
J2
RF Output
to Termination
C
R1A
R1B
R1C
J3
to Power Meter
R2


* See caption
N Connector
(2 Places)
Hammond 1590 A
Die Cast Box
All Components
Centered Vertically
Solder
C1 *
BNC
R1
R2

Sums!!

- 3x820=2460 Ohms
- 2460+25=2485 Ohms
- 2485/ 25=99.4 (100)

More Sums!!

Power $= V^2/R$

Sampling $1/100^{th}$ voltage

$1/10{,}000^{th}$ power

10dB=10 times

20dB=100 times

30dB=1,000 times

40dB=10,000 times

Trap for Young Players-

- 40dB only valid for 50Ω input Impedance

- E.g. 1MΩ input impedance,

Voltage division - 2510/50=50.2
Power ratio -34dB

Why?

- Power measurements
- Frequency meter sampling
- Oscilloscope sampling

Costs:–

40dB Sampling Tap

Hammond 1590A Diecast box	1		£5.82		
RF Connectors N Type	2	£5.06	£10.12	SO239	£2.36
Sample output 50Ω BNC	1		£1.46		
820Ω Carbon Film Resistor	3	£0.02	£0.06		
51Ω Carbon Film Resistor	1		£0.03		
Brass Plate 1x1.25 inches	1		Donated		
M3 Bolts & Nuts A2 Stainless	8	£0.10	£0.76		
Total			**£18.25**		**£10.49**

Further info:

- https://www.qsl.net/sz1a/download/build%20an%20rf%20power%20meter.pdf
- https://www.minicircuits.com/app/AN40-012.pdf
- http://www.ad5x.com/images/Articles/Tap50dbRevA.pdf


GX3SBL
Stafford and Districts
Amateur Radio Society